# Discrete semiconductors selection guide 2016

Bipolar transistors, diodes, ESD protection, TVS, filtering and signal conditioning, and MOSFETs

# Our extensive package range provides maximum flexibility

**Miniaturization** >> **Medium Power**

## 2 Pins

DSN0402 (SOD992) 0.4 x 0.2 x 0.12
DSN0603-2 (SOD962) 0.6. x 0.3 x 0.3
DSN1006-2 (SOD993) 1.0 x 0.6 x 0.3
DSN1006U-2 (SOD995) 1.0 x 0.6 x 0.3
DFN1006D-2 (SOD882D) 1.0 x 0.6 x 0.37
DFN1006-2 (SOD882) 1.0 x 0.6 x 0.48
SOD523 1.2 x 0.8 x 0.6
DFN1608D-2 (SOD1608) 1.6 x 0.8 x 0.37
DSN1608-2 (SOD963/SOD964) 1.6 x 0.8 x 0.25/0.29
SOD323F 1.7 x 1.25 x 0.7
SOD323 1.7 x 1.25 x 0.95
SOD123F 2.6 x 1.6 x 1.1
CFP3 (SOD123W) 2.6 x 1.7 x 1.0
CFP5 (SOD128) 3.8 x 2.6 x 1.0
CFP15 (SOT1289) 5.8 x 4.3 x 0.78
D2PAK (SOT404) 11.0 x 10.0 x 4.3

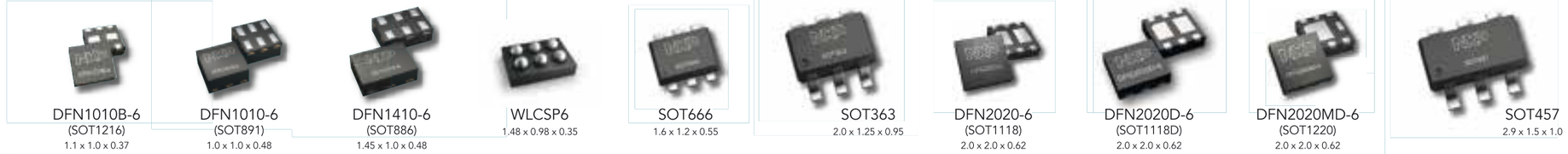
## 3 Pins

DFN1006B-3 (SOT883B) 1.0 x 0.6 x 0.37
DFN1006-3 (SOT883) 1.0 x 0.6 x 0.48
DFN1010D-3 (SOT1215) 1.1 x 1.0 x 0.37
SOT663 1.6 x 1.2 x 0.55
SOT323 2.0 x 1.25 x 0.95
SOT23 2.9 x 1.3 x 1.0
DFN2020-3 (SOT1061) 2.0 x 2.0 x 0.62
DFN2020D-3 (SOT1061D) 2.0 x 2.0 x 0.62
SOT89 4.5 x 2.5 x 1.5
DPAK (SOT428) 6.6 x 6.1 x 2.3

## 4/5 Pins

WLCSP4* 0.8 x 0.8 x 0.35
WLCSP5* 1.51 x 1.14 x 0.65
SOT665 1.6 x 1.2 x 0.55
SOT353 2.0 x 1.25 x 0.95
SOT143B 2.9 x 1.3 x 1.0
LFPAK56 (SOT669) 5.0 x 6.0 x 1.0
SOT223 6.5 x 3.5 x 1.65

## 6 Pins



DFN1010B-6 (SOT1216) 1.1 x 1.0 x 0.37
DFN1010-6 (SOT891) 1.0 x 1.0 x 0.48
DFN1410-6 (SOT886) 1.45 x 1.0 x 0.48
WLCSP6 1.48 x 0.98 x 0.35
SOT666 1.6 x 1.2 x 0.55
SOT363 2.0 x 1.25 x 0.95
DFN2020-6 (SOT1118) 2.0 x 2.0 x 0.62
DFN2020D-6 (SOT1118D) 2.0 x 2.0 x 0.62
DFN2020MD-6 (SOT1220) 2.0 x 2.0 x 0.62
SOT457 2.9 x 1.5 x 1.0

## ≥ 7 Pins

DFN2110-9 (SOT1178) 2.1 x 1.0 x 0.48
DFN2111-7 (SOT1358) 2.1 x 1.1 x 0.5
DFN2510A-10 (SOT1176) 2.5 x 1.0 x 0.48
DFN2520-9 (SOT1333) 2.5 x 2.0 x 0.48
DFN2521-12 (SOT1156-1) 2.5 x 2.1 x 0.5
LFPAK33 (SOT1210) 3.3 x 3.3 x 0.85
DFN4020-14 (SOT1334) 4.0 x 2.0 x 0.48
DFN4040-32 (SOT1318-1) 4.0 x 4.0 x 0.5
DFN5050-32 (SOT617-3) 5.0 x 5.0 x 0.85
LFPAK56D (SOT1205) 5.0 x 6.0 x 1.0

* The exact position of the balls and package dimensions vary.

**Your global partner for discretes**

# Discretes semiconductors selection guide 2016



www.nxp.com/discrete_selection_guide

# Table of Contents

# Our commitment: quality and reliability

**AEC-Q101**

- We qualify our products according to the automotive AEC-Q101 standard and even exceed it's requirements, for instance when doing extended lifetime testing.

go for Quality
customer focused passion to win

- All our processes and manufacturing plants are subject to regular international and internal audits, including the following:
  - ISO9001
  - ISO/TS 16949 for automotive sites
  - ISO14001
  - OHSAS18001

DfX EXCELLENCE

- NXP's Design for Excellence (DfX) program ensures that each new development builds on past learning and that best practices are always employed. The result is continual product improvement.

ZERO DEFECT

- Zero defect is our goal. To ensure continuous improvement failure analysis and the determination to find root causes is performed at all stages of development and production by adoption of quality-analysis tools and methods (e.g. Six-Sigma, Safe-Launch).

**Rigorous attention to detail and commitment to quality have yielded a very low product failure rate of a single-digit part per billion (ppb).**

# Bipolar transistors

# Bipolar transistors portfolio

## What you get when you choose NXP for bipolar transistors

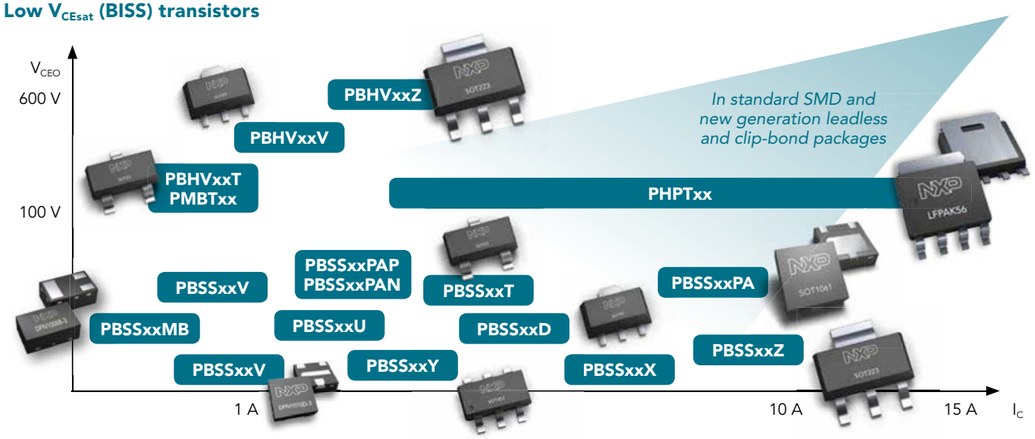
**A comprehensive portfolio for all applications**
Best in class performing transistors from general-purpose to low $V_{CEsat}$ transistors

**A broad range of packages**
Many options for leaded SMD, medium-power clip-bond and ultra-small leadless packages.

**A quality product from an experienced, high volume supplier**

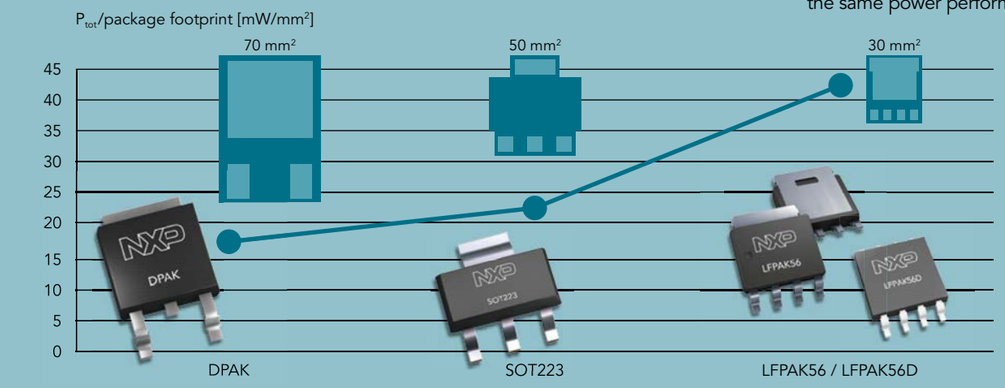
- NXP is strongly committed to automotive quality standards
- NXP has a track record of more than 60 years in developing and producing transistors
- NXP is the #1 in small-signal discretes with a high production capacity

**Low $V_{CEsat}$ (BISS) transistors**




**LFPAK: Same power dissipation but half the size**

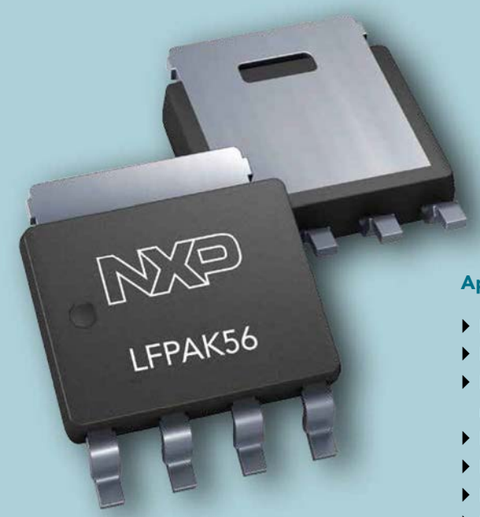
55% package size reduction while retaining the same power performance




Reduced PCB area requirements comparison of DPAK, SOT223 and LFPAK



# Medium-power Bipolar transistors in LFPAK56




**LFPAK56 (SOT669)**
Single package
5 x 6 x 1.1 mm

**Applications**

- Power management
- Loadswitch
- Linear-mode voltage regulator
- Backlight units
- Motor drive
- LED lighting
- Relay replacement
- IGBT drive

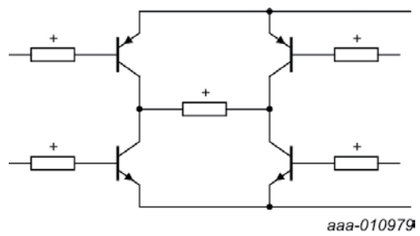

**LFPAK56D (SOT1205)**
Dual package
5 x 6 x 1.1 mm

**In the spotlight**

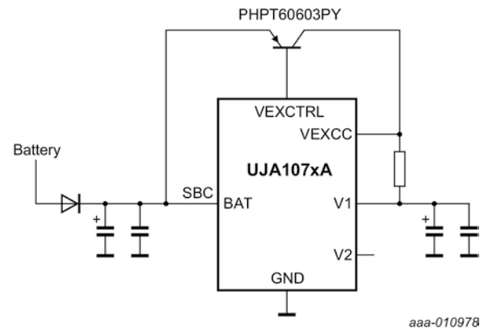
**Bipolar transistors in LFPAK56 and LFPAK56D power packages**

| |
|---|
| High thermal power dissipation up to 3.7 W, Vceo up to 100 V |
| Most types AECQ-101 qualified ($I_C$ = 3 A up to 15 A) |
| 2 types in LFPAK56D with current gain matching of 5% and 10% |
| Reduced PCB area requirements compared to transistors in DPAK |
| Suitable for high-temperature applications up to 175 °C |

**Motor drive (2x PHPT60603NY/PY) or a double LFPAK56D (PHPT610030NK/PK)**




**IVN – System Basis Chip (PHPT60603PY) External pass transistor, linear regulator**



## High-power transistors (single)

| Package | | | | | | | | | | LFPAK56 (SOT669) |
|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | | | | 5 x 6 x 1.1 |
| $V_{CEO}$ (V) | $I_C$ (A) | $I_{CM}$ (A) | $h_{FE}$ min/typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | $V_{CEsat}$ max (mV) | @ $I_C$ (A) | @ $I_B$ (A) | Polarity | |
| 60 | 3 | 8 | 200 / 400 | 0.5 | 2 | 50 | 270 | 3 | 0.3 | NPN | PHPT60603NY |
| | | | 200 / 400 | 0.5 | 2 | 70 | 360 | 3 | 0.3 | PNP | PHPT60603PY |
| 100 | 3 | | 150 / 250 | 0.5 | 10 | 50 | 330 | 3 | 0.3 | NPN | PHPT61003NY |
| | | | 150 / 220 | 0.5 | 10 | 70 | 360 | 2 | 0.2 | PNP | PHPT61003PY |
| | 2 | 6 | 150 / 250 | 0.5 | 10 | 50 | 300 | 2 | 0.2 | NPN | PHPT61002NYC |
| | | | 150 / 220 | 0.5 | 10 | 70 | 400 | 2 | 0.2 | PNP | PHPT61002PYC |

## High-current, high-power transistors

| Package | | | | | | LFPAK56 (SOT669) |
|---|---|---|---|---|---|---|
| Size (mm) | | | | | | 5 x 6 x 1.1 |
| $V_{CEO}$ (V) | $I_C$ (A) | $h_{FE}$ min/typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | Polarity | |
| 40 | 6 | 200/400 | 0.5 | 2 | NPN | PHPT60406NY |
| 40 | 6 | 200/400 | 0.5 | 2 | PNP | PHPT60406PY |
| 40 | 10 | 200/400 | 0.5 | 2 | NPN | PHPT60410NY |
| 40 | 10 | 200/400 | 0.5 | 2 | PNP | PHPT60410PY |
| 40 | 15 | 200/400 | 0.5 | 2 | NPN | PHPT60415NY |
| 40 | 15 | 200/400 | 0.5 | 2 | PNP | PHPT60415PY |
| 60 | 6 | 200/400 | 0.5 | 2 | NPN | PHPT60606NY |
| 60 | 6 | 150/250 | 0.5 | 2 | PNP | PHPT60606PY |
| 60 | 10 | 200/400 | 0.5 | 2 | NPN | PHPT60610NY |
| 60 | 10 | 150/250 | 0.5 | 2 | PNP | PHPT60610PY |
| 100 | 6 | 150/250 | 0.5 | 10 | NPN | PHPT61006NY |
| 100 | 6 | 150/220 | 0.5 | 10 | PNP | PHPT61006PY |
| 100 | 10 | 150/250 | 0.5 | 10 | NPN | PHPT61010NY |
| 100 | 10 | 150/220 | 0.5 | 10 | PNP | PHPT61010PY |

## High-power transistors (double)

| Package | | | | | | | | | | | LFPAK56D (SOT1205) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | | | | | 5 x 6 x 1.1 |
| $V_{CEO}$ (V) | $I_C$ (A) | $I_{CM}$ (A) | $h_{FE}$ typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | $V_{CEsat}$ max (mV) | @ $I_C$ (A) | @ $I_B$ (A) | Polarity | $h_{FE1}$/ $h_{FE2}$ | |
| 100 | 3 | 6 | 150 | 0.5 | 10 | 50 | 300 | 3 | 0.2 | 2XNPN | - | PHPT610030NK |
| | | | | | | 70 | 400 | 3 | 0.2 | 2XPNP | - | PHPT610030PK |
| | | | | | | 50 / 70 | 300 / 400 | 3 | 0.2 | NPN/PNP | - | PHPT61003NPK |
| | | | | | | 50 | 300 | 3 | 0.2 | 2XNPN | 0.95 | PHPT610035NK |
| | | | | | | 70 | 400 | 3 | 0.2 | 2XPNP | 0.9 | PHPT610035PK |







## Low $V_{CEsat}$ (BISS) transistors single NPN

types in **bold** represent new products

| Package | | | | | | | SOT223 (SC-73) | SOT89 (SC-62) | SOT457 (SC-74) | DFN2020-3 (SOT1061) | DFN2020D-3 (SOT1061D) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.9 x 1.5 x 1.0 | 2.0 x 2.0 x 0.62 | 2.0 x 2.0 x 0.62 |
| $P_{tot}$ (mW) | | | | | | | 1700 | 1650 | 750 | 1300 | 1300 |
| $V_{CEO}$ (V) | $I_C$ (A) | $I_{CM}$ (A) | $h_{FE}$ min/typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | | | | | |
| 12 | 5.3 | 10.6 | 300 / 530 | 0.5 | 2 | 18 | | PBSS301NX | | | |
| | 5.8 | 11.6 | 300 / 530 | 0.5 | 2 | 18 | PBSS301NZ | | | | |
| | 6 | 7 | 280 / 440 | 0.5 | 2 | 20 | | | | PBSS4612PA | |
| 20 | 3 | 5 | 220 / 390 | 0.5 | 2 | 40 | | PBSS4320X | | | |
| | 4 | 15 | 300 / 450 | 0.5 | 2 | 30 | | | PBSS301ND | | |
| | 5 | 10 | 300 / 450 | 0.5 | 2 | 35 | | PBSS4520X | | | |
| | 5.3 | 10.6 | 300 / 570 | 0.5 | 2 | 20 | | PBSS302NX | | | |
| | 5.8 | 10.2 | 300 / 570 | 0.5 | 2 | 20 | PBSS302NZ | | | | |
| | 6 | 7 | 280 / 440 | 0.5 | 2 | 20 | | | | PBSS4620PA | |
| | 7 | 15 | 300 / 550 | 0.5 | 2 | 12 | | PBSS4021NX | | | |
| | 8 | 20 | 300 / 550 | 0.5 | 2 | 9 | PBSS4021NZ | | | | |
| 30 | 3 | 5 | 300 / 490 | 0.5 | 2 | 45 | | PBSS4330X | | | |
| | 3 | 5 | 300 / 465 | 0.5 | 2 | 40 | | | | PBSS4330PA | PBSS4330PAS |
| | 3.5 | 6 | 300 / 500 | 0.5 | 2 | 70 | | | PBSS4032ND [3] | | |
| | 4.7 | 10 | 300 / 500 | 0.5 | 2 | 57 | | PBSS4032NX [3] | | | |
| | 5.1 | 10.2 | 300 / 480 | 0.5 | 2 | 20 | | PBSS303NX | | | |
| | 5.4 | 10 | 300 / 500 | 0.5 | 2 | 57 | PBSS4032NZ [3] | | | | |
| | 5.5 | 11 | 300 / 480 | 0.5 | 2 | 20 | PBSS303NZ | | | | |
| | 6 | 7 | 280 / 450 | 0.5 | 2 | 21 | | | | PBSS4630PA | |
| 40 | 2.0 | 3.0 | 300 / – | 0.5 | 5 | 140 | | PBSS4240X | | | |
| | 4 | 15 | 300 / 520 | 0.5 | 2 | 35 | | | PBSS302ND | | |
| | | 10 | 300 / 500 | 0.5 | 2 | 21 | | PBSS4540X | | | |
| | 5 | 10 | 300 / 500 | 0.5 | 2 | 25 | PBSS4540Z | | | | |
| 50 | 2 | 5 | 300 / – | 0.5 | 2 | 90 [2] | | PBSS4250X | | | |
| | 3.0 | 5.0 | 200 / 280 | 0.5 | 2 | 65 | | | PBSS4350D | | |
| | | | 300 / 460 | 0.5 | 2 | 50 | | PBSS4350X | | | |
| | | | 200 / 280 | 0.5 | 2 | 60 [1] | PBSS4350Z | | | | |
| 60 | 3 | 6 | 200 / 360 | 0.5 | 5 | 45 | | | | | **PBSS4360PAS** |
| | | | 200 / – | 0.5 | 5 | 45 | **PBSS4360Z** | | | | |
| | | | 345 / 570 | 0.5 | 2 | 40 | | | PBSS303ND | | |
| | 4.7 | 9.4 | 300 / 520 | 0.5 | 2 | 25 | | PBSS304NX | | | |
| | 5.2 | 10.4 | 300 / 520 | 0.5 | 2 | 25 | PBSS304NZ | | | | |
| | 6 | 7 | 280 / 440 | 0.5 | 2 | 22 | | | | PBSS4560PA | |
| | 6.2 | 15 | 300 / 500 | 0.5 | 2 | 17 | | PBSS4041NX | | | |
| | 7 | 15 | 300 / 500 | 0.5 | 2 | 13 | PBSS4041NZ | | | | |
| 80 | 3 | 6 | 240 / 360 | 0.5 | 2 | 40 | | | PBSS304ND | | |
| | 4 | 10 | 250 / 400 | 0.5 | 2 | 25 | | PBSS4480X | | | |
| | 4.6 | 9.2 | 300 / 470 | 0.5 | 2 | 25 | | PBSS305NX | | | |
| | 5.1 | 10.2 | 300 / 470 | 0.5 | 2 | 25 | PBSS305NZ | | | | |
| | 5.6 | 7 | 270 / 425 | 0.5 | 2 | 25 | | | | PBSS4580PA | |
| 100 | | | 150 / 290 | 0.25 | 10 | 75 | | | PBSS8110D | | |
| | | | 150 / 290 | 0.25 | 10 | 73 | | PBSS8110X | | | |
| | | | 150 / 290 | 0.25 | 10 | 73 | PBSS8110Z | | | | |
| | 3 | 4 | 170 / 275 | 0.5 | 2 | 45 | | | PBSS305ND | | |
| | 4.5 | 9 | 200 / 330 | 0.5 | 2 | 27 | | PBSS306NX | | | |
| | 5.1 | 10.2 | 200 / 330 | 0.5 | 2 | 27 | PBSS306NZ | | | | |
| | 5.2 | 6 | 180 / 285 | 0.5 | 2 | 30 | | | | PBSS8510PA | |

[1] $I_C$ / $I_B$ = 20 [2] $V_{CEsat}$ (max) [3] Optimized for high-speed switching

# Low $V_{CEsat}$ (BISS) transistors single PNP

types in **bold** represent new products

| Package | | | | | | | SOT223 (SC-73) | SOT89 (SC-62) | SOT457 (SC-74) | DFN2020-3 (SOT1061) | DFN2020D-3 (SOT1061D) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.9 x 1.5 x 1.0 | 2.0 x 2.0 x 0.62 | 2.0 x 2.0 x 0.62 |
| $P_{tot}$ (mW) | | | | | | | 1700 | 1650 | 750 | 1300 | 1300 |
| $V_{CEO}$ (V) | $I_C$ (A) | $I_{CM}$ (A) | $h_{FE}$ min/typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | | | | | |
| 12 | 5.3 | 10.6 | 250 / 400 | 0.5 | 2 | 20 | | PBSS301PX | | | |
| | 5.7 | 11.4 | 250 / 400 | 0.5 | 2 | 20 | PBSS301PZ | | | | |
| | 6 | 7 | 220 / 335 | 0.5 | 2 | 20 | | | | PBSS5612PA | |
| 20 | 3 | 5 | 200 / – | 0.5 | 2 | 80 [2] | | | PBSS5320D | | |
| | | | 220 / 450 | 0.5 | 2 | 50 | | PBSS5320X | | | |
| | 4 | 15 | 250 / 400 | 0.5 | 2 | 35 | | | PBSS301PD | | |
| | 5 | 10 | 300 / 430 | 0.5 | 2 | 45 | | PBSS5520X | | | |
| | 5.1 | 10.2 | 250 / 370 | 0.5 | 2 | 25 | | PBSS302PX | | | |
| | 5.5 | 11 | 250 / 370 | 0.5 | 2 | 25 | PBSS302PZ | | | | |
| | 6 | 7 | 230 / 345 | 0.5 | 2 | 25 | | | | PBSS5620PA | |
| | 6.2 | 15 | 250 / 400 | 0.5 | 2 | 18 | | PBSS4021PX | | | |
| | 6.6 | 20 | 250 / 400 | 0.5 | 2 | 16 | PBSS4021PZ | | | | |
| 30 | 2.7 | 5 | 200 / 350 | 0.5 | 2 | 87 | | | PBSS4032PD [3] | | |
| | 3 | 5 | 200 / 380 | 0.5 | 2 | 50 | | PBSS5330X | | | |
| | | | 200 / 320 | 0.5 | 2 | 45 | | | | PBSS5330PA | PBSS5330PAS |
| | 4.2 | 10 | 200 / 350 | 0.5 | 2 | 70 | | PBSS4032PX [3] | | | |
| | 4.4 | 10 | 200 / 350 | 0.5 | 2 | 70 | PBSS4032PZ [3] | | | | |
| | 5.1 | 10.2 | 250 / 400 | 0.5 | 2 | 25 | | PBSS303PX | | | |
| | 6 | 7 | 200 / 335 | 0.5 | 2 | 25 | PBSS303PZ | | | | |
| | | | | | | | | | | PBSS5630PA | |
| 40 | 2.0 | 3.0 | 215 / – | 0.5 | 5 | 170 | | PBSS5240X | | | |
| | 4 | 15 | 200 / 310 | 0.5 | 2 | 46 | | | PBSS302PD | | |
| | | 10 | 250 / 370 | 0.5 | 2 | 33 | | PBSS5540X | | | |
| | 5 | | 250 / 350 | 0.5 | 2 | 40 [1] | PBSS5540Z | | | | |
| 50 | 2.0 | 5 | 200 / – | 0.5 | 2 | 90 [2] | | PBSS5250X | | | |
| | 3.0 | 5.0 | 200 / 300 | 0.5 | 2 | 70 | | | PBSS5350D | | |
| | | | 200 / 375 | 0.5 | 2 | 70 | | PBSS5350X | | | |
| | | | 200 / 300 | 0.5 | 2 | 70 | PBSS5350Z | | | | |
| 60 | 3 | 6 | 130 / 220 | 0.5 | 5 | 55 | | | | | **PBSS5360PAS** |
| | | | 130 / – | 0.5 | 5 | 55 | **PBSS5360Z** | | | | |
| | | | 180 / 265 | 0.5 | 2 | 55 | | | PBSS303PD | | |
| | 4.2 | 8.4 | 200 / 295 | 0.5 | 2 | 35 | | PBSS304PX | | | |
| | 4.5 | 9 | 200 / 295 | 0.5 | 2 | 35 | PBSS304PZ | | | | |
| | 5 | 6 | 170 / 260 | 0.5 | 2 | 35 | | | | PBSS5560PA | |
| | 5 | 15 | 200 / 300 | 0.5 | 2 | 30 | | PBSS4041PX | | | |
| | 5.7 | | 200 / 300 | 0.5 | 2 | 22 | PBSS4041PZ | | | | |
| 80 | 3 | 5 | 155 / 225 | 0.5 | 2 | 55 | | | PBSS304PD | | |
| | 4.0 | | 180 / 265 | 0.5 | 2 | 40 | | | | PBSS5580PA | |
| | | 10 | 200 / 300 | 0.5 | 2 | 35 | | PBSS5480X | | | |
| | | 8 | 200 / 280 | 0.5 | 2 | 36 | | PBSS305PX | | | |
| | 4.5 | 9 | 200 / 280 | 0.5 | 2 | 36 | PBSS305PZ | | | | |
| 100 | 1.0 | 3.0 | 150 / 350 | 0.5 | 5 | 100 | | | PBSS9110D | | |
| | | | 150 / 350 | 0.5 | 5 | 90 | | PBSS9110X | | | |
| | | | 150 / – | 0.5 | 5 | 90 | PBSS9110Z | | | | |
| | 2 | 3 | 175 / 275 | 0.5 | 2 | 65 | | | PBSS305PD | | |
| | 2.7 | 4 | 180 / 295 | 0.5 | 2 | 45 | | | | PBSS9410PA | |
| | 3.7 | 7.4 | 200 / 300 | 0.5 | 2 | 45 | | PBSS306PX | | | |
| | 4.1 | 8.2 | 200 / 300 | 0.5 | 5 | 45 | PBSS306PZ | | | | |

[1] $I_C$ / $I_B$ = 20 [2] $V_{CEsat}$ (max) [3] Optimized for high-speed switching







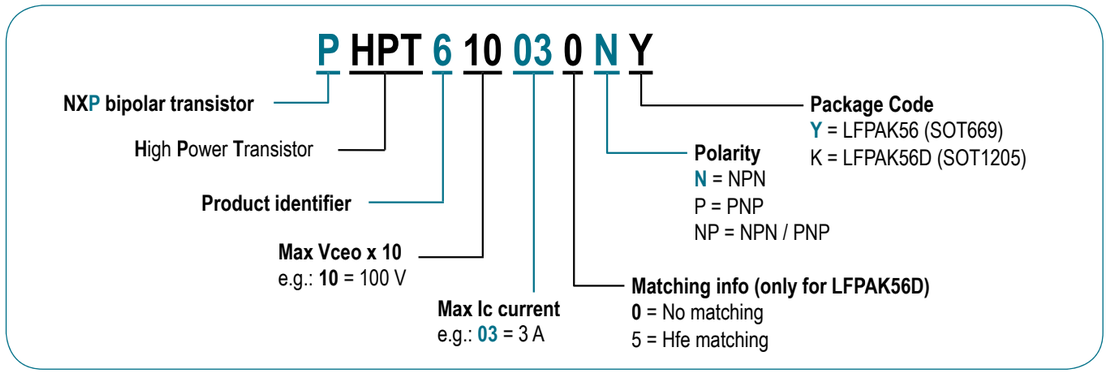
# Low $V_{CEsat}$ (BISS) double transistors

types in **bold** represent new products

| Package | | | | | | | | | SOT96 (SO8) | SOT457 (SC-74) | SOT666 | DFN2020-6 (SOT1118) | DFN2020D-6 (SOT1118D) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | | | 4.9 x 3.9 x 1.75 | 2.9 x 1.5 x 1.0 | 1.6 x 1.2 x 0.55 | 2.0 x 2.0 x 0.62 | 2.0 x 2.0 x 0.62 |
| $P_{tot}$ (mW) | | | | | | | | | 2000 [2] | 750 | 500 | 1300 | 1300 |
| $V_{CEO}$ (V) | $I_C$ (A) | Polarity | $h_{FE}$ min/typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | $V_{CEsat}$ max (mV) | @ $I_C$ (A) | @ $I_B$ (A) | | | | | |
| 15 | 0.5 | 2 x NPN | 200 | 0.01 | 2 | 170 [1] | 250 | 0.5 | 0.05 | | | PBSS2515VS | | |
| | | 2 x PNP | 200 | 0.01 | 2 | 170 [1] | 250 | 0.5 | 0.05 | | | PBSS3515VS | | |
| | | NPN / PNP | 200 | 0.01 | 2 | 170 [1] | 250 | 0.5 | 0.05 | | | PBSS2515VPN | | |
| | | NPN / PNP | 200 | 0.01 | 2 | 170 [1] | 250 | 0.5 | 0.05 | | | | | |
| 20 | 7.5 | NPN / NPN | 300 | 0.5 | 2 | 15 | 150 | 4 | 0.2 | PBSS4021SN | | | | |
| | 6.3 | PNP / PNP | 250 | 0.5 | 2 | 24 | 225 | 4 | 0.2 | PBSS4021SP | | | | |
| | 7.5 / 6.3 | NPN / PNP | 300 / 250 | 0.5 | 2 | 15 / 24 | 150 / 225 | 4 | 0.2 | PBSS4021SPN | | | | |
| 30 | 1 | NPN / NPN | 210 | 0.5 | 2 | 75 | 100 | 0.5 | 0.05 | | | | PBSS4130PAN | |
| | | PNP / PNP | 170 | 0.5 | 2 | 85 | 140 | 0.5 | 0.05 | | | | PBSS5130PAP | |
| | | NPN / PNP | 210 / 170 | 0.5 | 2 | 75 / 85 | 100 / 140 | 0.5 | 0.05 | | | | PBSS4130PANP | |
| | 2 | NPN / NPN | 230 | 0.5 | 2 | 60 | 80 | 0.5 | 0.05 | | | | PBSS4230PAN | |
| | | PNP / PNP | 210 | 0.5 | 2 | 75 | 110 | 0.5 | 0.05 | | | | PBSS5230PAP | |
| | | NPN / PNP | 230 / 210 | 0.5 | 2 | 60 / 75 | 80 / 100 | 0.5 | 0.05 | | | | PBSS4230PANP | |
| 40 | 1.0 | NPN / PNP | 300 / 250 | 0.5 | 5 | 130 / 150 | 500 | 1 | 0.1 | | PBSS4140DPN | | | |
| | 2.0 | NPN / PNP | 300 / 250 | 0.5 | 5 | 80 / 100 | 400 / 530 | 2 | 0.2 | | PBSS4240DPN | | | |
| 50 | 2.7 | 2 x NPN | 300 | 0.5 | 2 | 50 | 340 | 2.7 | 0.27 | PBSS4350SS | | | | |
| | | 2 x PNP | 200 | 0.5 | 2 | 60 | 370 | 2.7 | 0.27 | PBSS5350SS | | | | |
| | | NPN / PNP | 300 / 200 | 0.5 | 2 | 50 / 60 | 340 / 370 | 2.7 | 0.27 | PBSS4350SPN | | | | |
| 60 | 1.0 | 2 x NPN | 200 | 0.5 | 5 | 115 | 250 | 1 | 0.1 | | PBSS4160DS | | | |
| | | 2 x PNP | 150 | 0.5 | 5 | 120 | 330 | 1 | 0.1 | | PBSS5160DS | | | |
| | | NPN / PNP | 200 / 150 | 0.5 | 5 | 115 / 120 | 250 / 330 | 1 | 0.1 | | PBSS4160DPN | | | |
| | 1 | NPN / NPN | 150 | 0.5 | 2 | 90 | 120 | 0.5 | 0.05 | | | | PBSS4160PAN | PBSS4160PANS |
| | | PNP / PNP | 120 | 0.5 | 2 | 125 | 180 | 0.5 | 0.05 | | | | PBSS5160PAP | PBSS5160PAPS |
| | | NPN / PNP | 150 / 120 | 0.5 | 2 | 90 / 125 | 120 / 180 | 0.5 | 0.05 | | | | PBSS4160PANP | PBSS4160PANPS |
| | 2 | NPN / NPN | 210 | 0.5 | 2 | 70 | 90 | 0.5 | 0.05 | | | | PBSS4260PAN | **PBSS4260PANS** |
| | | PNP / PNP | 140 | 0.5 | 2 | 100 | 140 | 0.5 | 0.05 | | | | PBSS5260PAP | **PBSS5260PAPS** |
| | | NPN / PNP | 210 / 140 | 0.5 | 2 | 70 / 100 | 90 / 140 | 0.5 | 0.05 | | | | PBSS4260PANP | **PBSS4260PANPS** |
| | 6.7 | NPN / NPN | 300 | 0.5 | 2 | 20 | 190 | 4 | 0.2 | PBSS4041SN | | | | |
| | 5.9 | PNP / PNP | 200 | 0.5 | 2 | 35 | 330 | 4 | 0.2 | PBSS4041SP | | | | |
| | 6.7 / 5.9 | NPN / PNP | 300 / 200 | 0.5 | 2 | 20 / 35 | 190 / 330 | 4 | 0.2 | PBSS4041SPN | | | | |
| 120 | 1 | NPN / NPN | 240 | 0.1 | 2 | 90 | 120 | 0.5 | 0.05 | | | | PBSS4112PAN | |
| | | PNP / PNP | 190 | 0.1 | 2 | 150 | 220 | 0.5 | 0.05 | | | | PBSS5112PAP | |
| | | NPN / PNP | 240 / 190 | 0.1 | 2 | 90 / 150 | 120 / 220 | 0.5 | 0.05 | | | | PBSS4112PANP | |

[1] $I_c$ / $I_b$=20 [2] Device mounted on a ceramic PCB, Al2O3, standard footprint [3] Optimized for high-speed switching

## Nomenclature for high-power transistors




## Low $V_{CEsat}$ (BISS) transistors single NPN

| Package | | | | SOT23 | SOT323 (SC-70) | SOT363 (SC-88) | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) | DFN1010D-3 (SOT1215) |
|---|---|---|---|---|---|---|---|---|---|
| | | | |  |  |  |  |  |  |
| Size (mm) | | | | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 | 1.1 x 1.0 x 0.37 |
| $P_{tot}$ (mW) | | | | 480 | 350 | 430 | 250 | 250 | 750 |
| $V_{CEO}$ (V) | $I_C$ (A) | $I_{CM}$ (A) | $h_{FE}$ min/typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | | | | | |
| 15 | 0.5 | 1 | 200 / 325 | 0.01 | 2 | - | | | | PBSS2515M | PBSS2515MB | |
| 20 | 1 | 3 | 350 / 470 | 0.1 | 2 | 110 [2] | PBSS4120T | | | | | |
| | 2 | 5 | 220 / 330 | 0.1 | 2 | 45 | PBSS4320T | | | | | |
| | 4.3 | 8 | 300 / 550 | 0.5 | 2 | 21 | PBSS4021NT | | | | | |
| 30 | 1 | 1.5 | 230 / 380 | 0.5 | 2 | 90 | | | | | | PBSS4130QA |
| | | 3 | 300 / 450 | 0.5 | 2 | 120 [2] | PBSS4130T | | | | | |
| | 2 | 3 | 300 / 450 | 0.5 | 2 | 70 | PBSS4230T | | | | | |
| | | | 230 / 380 | 0.5 | 2 | 75 | | | | | | PBSS4230QA |
| | 2.6 | 5 | 300 / 500 | 0.5 | 2 | 80 | PBSS4032NT [3] | | | | | |
| 40 | 0.5 | 1 | 200 / 550 | 0.01 | 2 | 200 [2] | | | | PBSS2540M | PBSS2540MB | |
| | | 2.0 | 300 / 440 | 0.5 | 5 | 130 | | PBSS4140U | | | | |
| | | | 300 / 510 | 0.5 | 5 | 120 | PMMT491A | | | | | |
| | | | 300 / 420 | 0.5 | 5 | 130 | PBSS4140T | | | | | |
| | | 3.0 | 350 / 470 | 0.1 | 2 | 70 | | | PBSS4240Y | | | |
| | | | 300 / 450 | 0.5 | 2 | 70 | PBSS4240T | | | | | |
| 50 | 2 | 5 | 300 / 495 | 0.5 | 2 | 60 | PBSS4350T | | | | | |
| 60 | 1.0 | 1.5 | 150 / 240 | 0.5 | 2 | 90 | | | | | | PBSS4160QA |
| | | | 200 / 420 | 0.5 | 5 | 120 | | PBSS4160U | | | | |
| | | | 200 / 350 | 0.5 | 5 | 110 | PBSS4160T | | | | | |
| | 2 | 3 | 150 / 240 | 0.5 | 2 | 75 | | | | | | PBSS4260QA |
| | 3.8 | 8 | 300 / 500 | 0.5 | 2 | 29 | PBSS4041NT | | | | | |
| 100 | 1.0 | 3.0 | 150 / 400 | 0.25 | 10 | 80 | | | PBSS8110Y | | | |
| | | | 150 / 300 | 0.25 | 10 | 70 | PBSS8110T | | | | | |

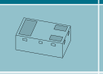
[1] $I_C$ / $I_B$ = 20 [2] $V_{CEsat}$ (max) [3] Optimized for high-speed switching







## Low $V_{CEsat}$ (BISS) transistors single PNP

| Package | | | | SOT23 | SOT323 (SC-70) | SOT363 (SC-88) | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) | DFN1010D-3 (SOT1215) |
|---|---|---|---|---|---|---|---|---|---|
| | | | |  |  |  |  |  |  |
| Size (mm) | | | | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 | 1.1 x 1.0 x 0.37 |
| $P_{tot}$ (mW) | | | | 480 | 350 | 430 | 250 | 250 | 750 |
| $V_{CEO}$ (V) | $I_C$ (A) | $I_{CM}$ (A) | $h_{FE}$ min/typ | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | | | | | |
| 15 | 0.5 | 1 | 200 / 260 | 0.01 | 2 | 150 | | | | PBSS3515M | PBSS3515MB | |
| 20 | 1 | 2 | 300 / 450 | 0.1 | 2 | 125 [2] | PBSS5120T | | | | | |
| | 2.0 | 3 | 225 / – | 0.5 | 2 | 80 [2] | PBSS5220T | | | | | |
| | | 5 | 220 / 420 | 0.5 | 2 | 50 | PBSS5320T | | | | | |
| | 3.5 | 8 | 250 / 400 | 0.5 | 2 | 35 | PBSS4021PT | | | | | |
| 30 | 1 | 1.5 | 180 / 295 | 0.5 | 2 | 85 | | | | | | PBSS5130QA |
| | | 3 | 260 / 350 | 0.5 | 2 | 110 | PBSS5130T | | | | | |
| | 2 | | 300 / 450 | 0.1 | 2 | 70 | PBSS5230T | | | | | |
| | | | 180 / 295 | 0.5 | 2 | 70 | | | | | | PBSS5230QA |
| | 2.4 | 5 | 200 / 320 | 0.5 | 2 | 95 | PBSS4032PT [3] | | | | | |
| 40 | 0.5 | 1 | 200 / 380 | 0.01 | 2 | 220 | | | | PBSS3540M | PBSS3540MB | |
| | 1.0 | 2.0 | 300 / 520 | 0.1 | 5 | 130 | | PBSS5140U | | | | |
| | | | 300 / 800 | 0.1 | 5 | 130 | PMMT591A | | | | | |
| | | | 300 / 510 | 0.1 | 5 | 130 | PBSS5140T | | | | | |
| | | | 300 / – | 0.1 | 2 | 110 [2] | | | PBSS5240Y | | | |
| | | | 300 / 450 | 0.1 | 2 | 70 | PBSS5240T | | | | | |
| 50 | 2.0 | 3 | 200 / – | 0.5 | 2 | 90 [2] | PBSS5250T | | | | | |
| | 2.0 | 5 | 200 / 360 | 0.5 | 2 | 55 | PBSS5350T | | | | | |
| 60 | 1.0 | 1.5 | 120 / 185 | 0.5 | 2 | 125 | | | | | | PBSS5160QA |
| | | | 150 / 250 | 0.5 | 5 | 135 | | PBSS5160U | | | | |
| | | | 150 / 250 | 0.5 | 5 | 120 | PBSS5160T | | | | | |
| | 1.7 | 2.5 | 120 / 185 | 0.5 | 2 | 105 | | | | | | PBSS5260QA |
| | 2.7 | 8 | 200 / 300 | 0.5 | 2 | 49 | PBSS4041PT | | | | | |
| 100 | 1.0 | 3.0 | 150 / – | 0.25 | 5 | 93 | | | PBSS9110Y | | | |
| | | | 150 / 350 | 0.5 | 5 | 95 | PBSS9110T | | | | | |

[1] $I_C$ / $I_B$ = 20 [2] $V_{CEsat}$ (max) [3] Optimized for high-speed switching

**In the spotlight**

**Low $V_{CEsat}$ transistors in DFN1010D-3: 2 A on 1.1 mm² footprint**

- High $I_C$ performance on ultra-small footprint
- $V_{CE}$ 30 V and 60 V
- Leadless DFN1010D-3 (SOT1215) SMD package with solderable sidepads (1.1 x 1.0 x 0.37)
- AEC-Q101 qualified

## Low $V_{CEsat}$ (BISS) load switches

| Package | | | | SOT457 (SC-74) | | SOT363 (SC-88) |
|---|---|---|---|---|---|---|
| | | | |  | |  |
| Size (mm) | | | | 2.9 x 1.5 x 1.0 | | 2.0 x 1.25 x 0.95 |
| $P_{tot}$ (mW) | | | | 750 [1] | 600 [1] | 300 [2] |
| $V_{CEO}$ (V) | $I_C$ (A) | $V_{CEsat}$ max (mV); $I_C$ = 0.5 A; $I_B$ = 0.05 A | R1, R2 (kΩ) |  |  |  |
| 15 | 0.5 | 250 | 2.2 | | | PBLS1501Y |
| | | | 4.7 | | | PBLS1502Y |
| | | | 10 | | | PBLS1503Y |
| | | | 22 | | | PBLS1504Y |
| 20 | 1 | 150 | 2.2 | | PBLS2001D | |
| | | | 4.7 | | PBLS2002D | |
| | | | 10 | | PBLS2003D | |
| | | | 22 | | PBLS2004D | |
| | 1.8 | 70 | 2.2 | PBLS2021D | | |
| | | | 4.7 | PBLS2022D | | |
| | | | 10 | PBLS2023D | | |
| | | | 22 | PBLS2024D | | |
| 40 | 0.5 | 350 | 2.2 | | | PBLS4001Y |
| | | | 4.7 | | | PBLS4002Y |
| | | | 10 | | | PBLS4003Y |
| | | | 22 | | | PBLS4004Y |
| | | | 47 | | | PBLS4005Y |
| | 1 | 170 | 2.2 | | PBLS4001D | |
| | | | 4.7 | | PBLS4002D | |
| | | | 10 | | PBLS4003D | |
| | | | 22 | | PBLS4004D | |
| | | | 47 | | PBLS4005D | |
| 60 | 1 | 180 | 2.2 | | PBLS6001D | |
| | | | 4.7 | | PBLS6002D | |
| | | | 10 | | PBLS6003D | |
| | | | 22 | | PBLS6004D | |
| | | | 47 | | PBLS6005D | |
| | 1.5 | 100 | 2.2 | PBLS6021D | | |
| | | | 4.7 | PBLS6022D | | |
| | | | 10 | PBLS6023D | | |
| | | | 22 | PBLS6024D | | |

[1] Device mounted on a ceramic PCB, $Al_2O_3$, standard footprint
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, and standard footprint

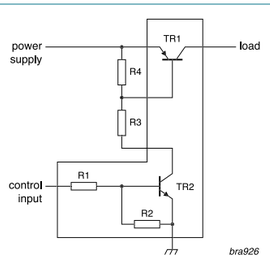
### Key features and benefits

- Very small input current drives high load current
- High efficiency and low-voltage drop due to low $V_{CEsat}$ (BISS) pass transistor
- Replaces expensive P-MOSFETs
- Inherent reverse-current blocking
- Automotive qualified according to AEC-Q101

### Key applications

- Fan driver
- Battery-charge switch
- Supply-line switch
- High-side load

### Low $V_{CEsat}$ (BISS) load switch – the optimal choice for supply-line and high-side switches



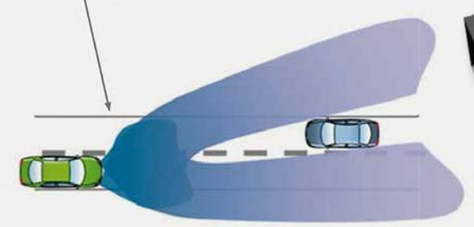


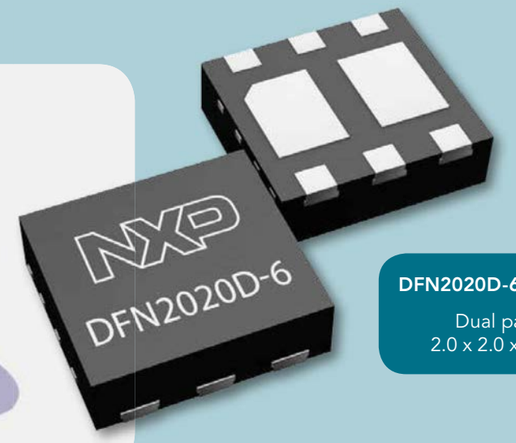



# DFN2020D-6 with solderable sidepads

## Application example: LED lighting in automotive

### Matrix light sketch




**DFN2020D-6 (SOT1118D)**
Dual package
2.0 x 2.0 x 0.62 mm

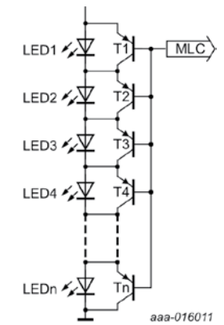
### PBSS5160PAPS in DFN2020D-6

- Industry's first low $V_{CEsat}$ transistor in DFN2020 with 100% solderable sidepads, AOI suitable
- Enables individual dimming in the LED front light matrix solution
- Saves PCB space by replacing two DFN2020D-3 or two SOT89 packages
- Ideal solution for multilayer PCB designs

### Key package benefits

- AEC-Q101 qualified
- Suitable for AOI of solder joints
- Exposed heat sink for excellent thermal and electrical conductivity
- Package size of only 2 x 2 mm and a height of only 0.62 mm
- Single version available in DFN2020D-3
- DFN2020 is an approved and widely available package platform

### Dimming transistor application




### Low $V_{CEsat}$ double transistors portfolio on DFN2020D-6

types in **bold** represent new products

| $V_{CEO}$ (V) | $I_C$ (A) | Polarity | $h_{FE}$ min | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_c$ = 0.5 A; $I_B$ = 0.05 A | Product |
|---|---|---|---|---|---|---|---|
| 20 | 2 | NPN / NPN | 230 | 0.5 | 2 | 60 | **PBSS4220PANS** |
| | | PNP / PNP | 210 | 0.5 | 2 | 70 | **PBSS5220PAPS** |
| 60 | 1 | NPN / NPN | 150 | 0.5 | 2 | 90 | PBSS4160PANS |
| | | PNP / PNP | 120 | 0.5 | 2 | 125 | PBSS5160PAPS |
| | | NPN / PNP | 150 / 120 | 0.5 | 2 | 90 / 125 | PBSS4160PANPS |
| 60 | 2 | NPN / NPN | 210 | 0.5 | 2 | 70 | **PBSS4260PANS** |
| | | PNP / PNP | 140 | 0.5 | 2 | 100 | **PBSS5260PAPS** |
| | | NPN / PNP | 210 / 140 | 0.5 | 2 | 70 / 100 | **PBSS4260PANPS** |

## High-voltage low $V_{CEsat}$ (BISS) transistors

types in **bold** represent new products

| Package | | | SOT223 (SC-73) | SOT89 (SC-62) | SOT1215 | SOT23 |
|---|---|---|---|---|---|---|
| | | | | |  | |
| Size (mm) | | | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 1.1 x 1.0 x 0.37 | 2.9 x 1.3 x 1.0 |
| $P_{tot}$ (mW) | | | 1700 | 1300 | 750 | 250 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (A) | | | | |
| NPN | 150 | 0.5 | | | **PBHV8115QA** | |
| | | 1 | PBHV8115Z | PBHV8115X | | PBHV8115T |
| | | 2 | PBHV8215Z | | | |
| | 180 | 1 | | | | PBHV8118T |
| | 400 | 0.5 | PBHV8540Z | PBHV8540X | | PBHV8540T |
| | | 1 | PBHV8140Z | | | |
| | 500 | 0.15 | | | | PMBTA45 |
| | 600 | 0.5 | PBHV8560Z | | | |
| PNP | 140 | 4 | PBHV9414Z | | | |
| | 150 | 0.5 | | | **PBHV9115QA** | |
| | | 1 | PBHV9115Z | PBHV9115X | | PBHV9115T |
| | | 2 | PBHV9215Z | | | |
| | 600 | 0.5 | PBHV9560Z | | | |
| | | 0.1 | PBHV3160Z | | | |
| | 400 | 0.25 | PBHV9040Z | PBHV9040X | | PBHV9040T |
| | | 0.5 | PBHV9540Z | | | |
| | 500 | 0.15 | PBHV3160Z | | | PBHV9050T |
| | | 0.25 | PBHV9050Z | | | |

**In the spotlight**

**High-voltage low $V_{CEsat}$ (BISS) transistors in SOT223, SOT23 & SOT89**

- Voltage $V_{CEO}$ up to 600 V
- Current $I_C$ up to 4 A (continuous), 10 A (peak)
- $V_{CEsat}$ down to 33 mV
- AEC-Q101 qualified
- New high-voltage low VCEsat (BISS) in DFN1010D-3


## Low $V_{CEsat}$ (BISS) RETs

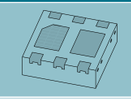
| Package | | | | | SOT23 | |
|---|---|---|---|---|---|---|
| | | | | |  | |
| Size (mm) | | | | | 2.9 x 1.3 x 1.0 | |
| $P_{tot}$ (mW) | | | | | 250 | |
| $V_{CEO}$ (V) | $I_c$ (mA) | | R1 (kΩ) | R2 (kΩ) | NPN | PNP |
| 40 | 600 | R1 = R2 | 1 | 1 | PBRN113ET | PBRP113ET |
| | | | 2.2 | 2.2 | PBRN123ET | PBRP123ET |
| | | R1 ≠ R2 | 1 | 10 | PBRN113ZT | PBRP113ZT |
| | | | 2.2 | 10 | PBRN123YT | PBRP123YT |

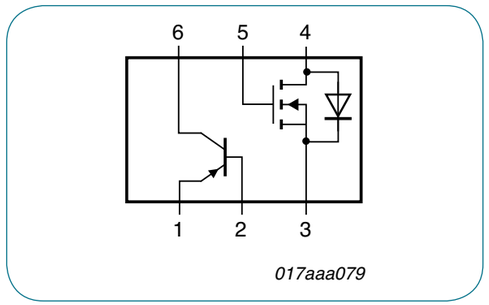






## Low $V_{CEsat}$ (BISS) transistor PNP – N-channel MOSFET combination

| Package | | | | | | | | | | | DFN2020-6 (SOT1118) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |  |
| Size (mm) | | | | | | | | | | | 2.0 x 2.0 x 0.62 |
| $P_{tot}$ (mW) | | | | | | | | | | | 1300 |
| $V_{CEO}$ (V) | $I_C$ (A) | $h_{FE}$ min | $h_{FE}$ max | @ $I_C$ (mA) | @ $V_{CE}$ (V) | $R_{CEsat}$ typ (mΩ) | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $R_{Dson}$ typ (mΩ) | |
| 40 | 2 | 300 | 800 | 100 | 5 | 240 | 30 | 0.7 | 0.66 | 390 | PBSM5240PF |
| | | 100 | - | 100 | 5 | 240 | 30 | 0.7 | 0.66 | 390 | PBSM5240PFH |



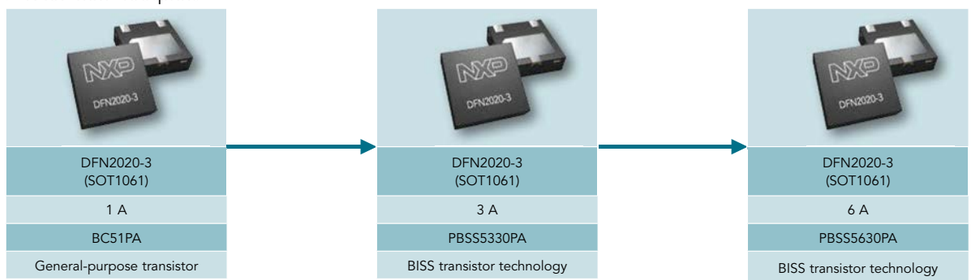

Combination of low $V_{CEsat}$ transistor with N-channel MOSFET in the very small and ultrathin leadless package DFN2020-6 (SOT1118)

## Advantages of low $V_{CEsat}$ (BISS) technology

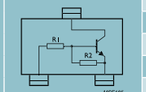
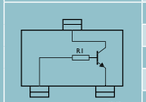
Our BISS (Breakthrough In Small-Signal) transistors show lowest $V_{CEsat}$ values due to an innovative mesh-emitter technology and further technology improvement. They also reduce board space due to improved collector- current capabilities as shown below.

**Improved collector-current capabilities**

- 17.87 mm² footprint

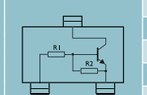
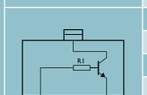


## RETs 100 mA single - Part 1

| Package | | | | | SOT23 | | SOT323 (SC-70) | |
|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | 2.9 x 1.3 x 1.0 | | 2.0 x 1.25 x 0.95 | |
| $P_{tot}$ (mW) | | | | | 250 | | 200 | |
| $V_{CEO}$ (V) | $I_C$ (mA) | Configuration | R1 (kΩ) | R2 (kΩ) | NPN | PNP | NPN | PNP |
| 50 | 100 |  | 1 | 1 | | PDTA113ET | | PDTA113EU |
| | | | 2.2 | 2.2 | PDTC123ET | PDTA123ET | PDTC123EU | PDTA123EU |
| | | | 4.7 | 4.7 | PDTC143ET | PDTA143ET | PDTC143EU | PDTA143EU |
| | | | 10 | 10 | PDTC114ET | PDTA114ET | PDTC114EU | PDTA114EU |
| | | | 22 | 22 | PDTC124ET | PDTA124ET | PDTC124EU | PDTA124EU |
| | | | 47 | 47 | PDTC144ET | PDTA144ET | PDTC144EU | PDTA144EU |
| | | | 100 | 100 | PDTC115ET | PDTA115ET | PDTC115EU | PDTA115EU |
| | | | 1 | 10 | | PDTA113ZT | | PDTA113ZU |
| | | | 2.2 | 10 | PDTC123YT | PDTA123YT | PDTC123YU | PDTA123YU |
| | | | 2.2 | 47 | PDTC123JT | PDTA123JT | PDTC123JU | PDTA123JU |
| | | | 4.7 | 10 | PDTC143XT | PDTA143XT | PDTC143XU | PDTA143XU |
| | | | 4.7 | 47 | PDTC143ZT | PDTA143ZT | PDTC143ZU | PDTA143ZU |
| | | | 10 | 47 | PDTC114YT | PDTA114YT | PDTC114YU | PDTA114YU |
| | | | 22 | 47 | PDTC124XT | PDTA124XT | PDTC124XU | PDTA124XU |
| | | | 47 | 10 | PDTC144VT | PDTA144VT | PDTC144VU | PDTA144VU |
| | | | 47 | 22 | PDTC144WT | PDTA144WT | PDTC144WU | PDTA144WU |
| | |  | 2.2 | - | PDTC123TT | PDTA123TT | PDTC123TU | PDTA123TU |
| | | | 4.7 | - | PDTC143TT | PDTA143TT | PDTC143TU | PDTA143TU |
| | | | 10 | - | PDTC114TT | PDTA114TT | PDTC114TU | PDTA114TU |
| | | | 22 | - | PDTC124TT | PDTA124TT | PDTC124TU | PDTA124TU |
| | | | 47 | - | PDTC144TT | PDTA144TT | PDTC144TU | PDTA144TU |
| | | | 100 | - | PDTC115TT | PDTA115TT | PDTC115TU | PDTA115TU |

## RETs 100 mA single - Part 2

types in **bold** represent new products

| Package | | | | | DFN1006-3 (SOT883) | | DFN1006B-3 (SOT883B) | | SOT1215 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | 1.0 x 0.6 x 0.48 | | 1.0 x 0.6 x 0.37 | | 1.1 x 1.0 x 0.37 | |
| $P_{tot}$ (mW) | | | | | 250 | | 250 | | 750 | |
| $V_{CEO}$ (V) | $I_C$ (mA) | Configuration | R1 (kΩ) | R2 (kΩ) | NPN | PNP | NPN | PNP | NPN | PNP |
| 50 | 100 |  | 1 | 1 | | PDTA113EM | | PDTA113EMB | | |
| | | | 2.2 | 2.2 | PDTC123EM | PDTA123EM | PDTC123EMB | PDTA123EMB | | |
| | | | 4.7 | 4.7 | PDTC143EM | PDTA143EM | PDTC143EMB | PDTA143EMB | **PDTC143EQA** | **PDTA143EQA** |
| | | | 10 | 10 | PDTC114EM | PDTA114EM | PDTC114EMB | PDTA114EMB | **PDTC114EQA** | **PDTA114EQA** |
| | | | 22 | 22 | PDTC124EM | PDTA124EM | PDTC124EMB | PDTA124EMB | **PDTC124EQA** | **PDTA124EQA** |
| | | | 47 | 47 | PDTC144EM | PDTA144EM | PDTC144EMB | PDTA144EMB | **PDTC144EQA** | **PDTA144EQA** |
| | | | 100 | 100 | PDTC115EM | PDTA115EM | PDTC115EMB | PDTA115EMB | | |
| | | | 1 | 10 | | PDTA113ZM | | PDTA113ZMB | | |
| | | | 2.2 | 10 | PDTC123YM | PDTA123YM | PDTC123YMB | PDTA123YMB | | |
| | | | 2.2 | 47 | PDTC123JM | PDTA123JM | PDTC123JMB | PDTA123JMB | **PDTC123XQA** | **PDTA123XQA** |
| | | | 4.7 | 10 | PDTC143XM | PDTA143XM | PDTC143XMB | PDTA143XMB | **PDTC143XQA** | **PDTA143XQA** |
| | | | 4.7 | 47 | PDTC143ZM | PDTA143ZM | PDTC143ZMB | PDTA143ZMB | **PDTC143ZQA** | **PDTA143ZQA** |
| | | | 10 | 47 | PDTC114YM | PDTA114YM | PDTC114YMB | PDTA114YMB | **PDTC114YQA** | **PDTA114YQA** |
| | | | 22 | 47 | PDTC124XM | PDTA124XM | PDTC124XMB | PDTA124XMB | | |
| | | | 47 | 10 | PDTC144VM | PDTA144VM | PDTC144VMB | PDTA144VMB | | |
| | | | 47 | 22 | PDTC144WM | PDTA144WM | PDTC144WMB | PDTA144WMB | | |
| | |  | 2.2 | - | PDTC123TM | PDTA123TM | PDTC123TMB | PDTA123TMB | | |
| | | | 4.7 | - | PDTC143TM | PDTA143TM | PDTC143TMB | PDTA143TMB | | |
| | | | 10 | - | PDTC114TM | PDTA114TM | PDTC114TMB | PDTA114TMB | | |
| | | | 22 | - | PDTC124TM | PDTA124TM | PDTC124TMB | PDTA124TMB | | |
| | | | 47 | - | PDTC144TM | PDTA144TM | PDTC144TMB | PDTA144TMB | | |
| | | | 100 | - | PDTC115TM | PDTA115TM | PDTC115TMB | PDTA115TMB | | |







## RETs 100 mA double

types in **bold** represent new products

| Package | | | | | DFN1010B-6 (SOT1216) | | | SOT363 (SC-88) | | | SOT666 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | 1.1 x 1.0 x 0.37 | | | 2.0 x 1.25 x 0.95 | | | 1.6 x 1.2 x 0.55 | | |
| $P_{tot}$ (mW) | | | | | 350 | | | 300 | | | 300 | | |
| $V_{CEO}$ (V) | $I_C$ (mA) | Configuration | R1 (kΩ) | R2 (kΩ) | NPN / NPN | NPN / PNP | PNP / PNP | NPN / NPN | NPN / PNP | PNP / PNP | NPN / NPN | NPN / PNP | PNP / PNP |
| 50 | 100 | R1 = R2 | 2.2 | 2.2 | | | | PUMH20 | PUMD20 | PUMB20 | PEMH20 | PEMD20 | PEMB20 |
| | | | 4.7 | 4.7 | | | | PUMH15 | PUMD15 | PUMB15 | PEMH15 | PEMD15 | PEMB15 |
| | | | 10 | 10 | **PQMH11** | **PQMD3** | **PQMB11** | PUMH11 | PUMD3 | PUMB11 | PEMH11 | PEMD3 | PEMB11 |
| | | | 22 | 22 | | **PQMD2** | | PUMH1 | PUMD2 | PUMB1 | PEMH1 | PEMD2 | PEMB1 |
| | | | 47 | 47 | **PQMH2** | **PQMD12** | | PUMH2 | PUMD12 | PUMB2 | PEMH2 | PEMD12 | PEMB2 |
| | | | 100 | 100 | | | | PUMH24 | PUMD24 | PUMB24 | PEMH24 | PEMD24 | PEMB24 |
| | | R1 ≠ R2 | 2.2 | 47 | **PQMH10** | **PQMD10** | | PUMH10 | PUMD10 | PUMB10 | PEMH10 | PEMD10 | PEMB10 |
| | | | 4.7 | 10 | | | | PUMH18 | PUMD18 | PUMB18 | PEMH18 | PEMD18 | PEMB18 |
| | | | 4.7 | 47 | **PQMH13** | **PQMD13** | | PUMH13 | PUMD13 | PUMB13 | PEMH13 | PEMD13 | PEMB13 |
| | | | 10 | 47 | **PQMH9** | | | PUMH9 | PUMD9 | PUMB9 | PEMH9 | PEMD9 | PEMB9 |
| | | | 22 | 47 | | **PQMD16** | | PUMH16 | PUMD16 | PUMB16 | PEMH16 | PEMD16 | PEMB16 |
| | | | 47 | 22 | | | | PUMH17 | PUMD17 | PUMB17 | PEMH17 | PEMD17 | PEMB17 |
| | | | 47 / 2.2 | 47 / 47 | | | | | PUMD48 | | | PEMD48 | |
| | | Only R1 | 2.2 | - | | | | PUMH30 | PUMD30 | PUMB30 | PEMH30 | PEMD30 | PEMB30 |
| | | | 4.7 | - | | | | PUMH7 | PUMD6 | PUMB3 | PEMH7 | PEMD6 | PEMB3 |
| | | | 10 | - | | | | PUMH4 | PUMD4 | PUMB4 | PEMH4 | PEMD4 | PEMB4 |
| | | | 22 | - | | | | PUMH19 | PUMD19 | PUMB19 | PEMH19 | PEMD19 | PEMB19 |
| | | | 47 | - | | | | PUMH14 | PUMD14 | PUMB14 | PEMH14 | PEMD14 | PEMB14 |

## RETs 500 mA

types in **bold** represent new products

| Package | | | | | SOT457 (SC-74) | | SOT23 | | SOT323 (SC-70) | | SOT1215 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | 2.9 x 1.5 x 1.0 | | 2.9 x 1.3 x 1.0 | | 2.0 x 1.25 x 0.95 | | 1.1 x 1.0 x 0.37 | |
| $P_{tot}$ (mW) | | | | | 750 | | 250 | | 200 | | 750 | |
| $V_{CEO}$ (V) | $I_C$ (mA) | | R1 (kΩ) | R2 (kΩ) | NPN / NPN | NPN / PNP | NPN | PNP | NPN | PNP | NPN | PNP |
| 50 | 500 | R1 = R2 | 1 | 1 | | | PDTD113ET | PDTB113ET | PDTD113EU | PDTB113EU | **PDTD113EQA** | **PDTB113EQA** |
| | | | 2.2 | 2.2 | | | PDTD123ET | PDTB123ET | PDTD123EU | PDTB123EU | **PDTD123EQA** | **PDTB123EQA** |
| | | | 4.7 | 4.7 | | | PDTD143ET | PDTB143ET | PDTD143EU | PDTB143EU | **PDTD143EQA** | **PDTB143EQA** |
| | | | 10 | 10 | | | PDTD114ET | PDTB114ET | PDTD114EU | PDTB114EU | **PDTD114EQA** | **PDTB114EQA** |
| | | R1 ≠ R2 | 1 | 10 | PIMN31 | PIMC31 | PDTD113ZT | PDTB113ZT | PDTD113ZU | PDTB113ZU | **PDTD113ZQA** | **PDTB113ZQA** |
| | | | 2.2 | 10 | | | PDTD123YT | PDTB123YT | PDTD123YU | PDTB123YU | **PDTD123YQA** | **PDTB123YQA** |
| | | | 4.7 | 10 | | | PDTD143XT | PDTB143XT | PDTD143XU | PDTB143XU | **PDTD143XQA** | **PDTB143XQA** |
| | | Only R1 | 2.2 | - | | | PDTD123TT | PDTB123TT | | | | |

## Single transistors NPN

types in **bold** represent new products

| Package | | | | | SOT23 | SOT323 (SC-70) | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |
|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 1.1 x 1.0 x 0.37 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| $P_{tot}$ (mW) | | | | | 250 | 200 | 750 | 250 | 250 |
| $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min/typ | $h_{FE}$ max | $f_T$ min (MHz) | | | | | |
| 25 | 100 | 450 | 1200 | 100 | | PMST5089 | | | |
| 30 | 100 | 110 - 200 | 450 - 800 | 100 | BC848B | BC848W | | | |
| | | 350 | 900 | 100 | | PMST5088 | | | |
| 32 | 100 | 110 - 420 | 220 - 800 | 100 | BCW31 / 32 / 33 | | | | |
| | | 180 - 380 | 310 - 630 | 250 | BCW60B / C / D | | | | |
| 45 | 100 | 110 - 420 | 220 - 800 | 100 | BC847 / A / B / C | BC847W / AW / BW / CW | BC847AQA / BQA / CQA | BC847AM / BM / CM | BC847AMB / BMB / CMB |
| | | 120 - 380 | 220 - 630 | 100 | BCX70G / H / J / K | | | | |
| | | 110 - 200 | 220 - 450 | 100 | BCW71 / 72 | | | | |
| | | 500 | 1250 | 100 | PMBT6429 | PMST6429 | | | |
| 50 | 100 | 210 - 290 | 340 - 460 | 100 - 150 | 2PD601ART<br>2PD601ARL<br>2PD601ASL | 2PD601ARW / SW | | | |
| | | 250 | 650 | 100 | PMBT6428 | PMST6428 | | | |
| 60 | 100 | 110 - 200 | 220 - 450 | 100 | BCV71 / 72 | | | | |
| 65 | 100 | 110 - 200 | 220 - 450 | 100 | BC846 / A / B | BC846W / AW / BW | | **BC846BM** | BC846BMB |
| 80 | 100 | 20 | 80 | 60 | BSS64 | | | | |
| 50 | 150 | 120 - 200 | 240 - 400 | 80 | NXP3875Y / G | | | | |
| | 150 | 120 - 270 | 270 - 560 | 100 | | 2PC4081Q / R / S | | 2PC4617QM / RM | 2PC4617QMB / RMB |
| | 200 | 210 | 340 | 100 | 2PD601BRL | | | | |
| | | 290 | 460 | 100 | 2PD601BSL | | | | |
| 45 | 500 | 100 - 250 | 250 - 600 | 100 | BC817 / -16 / -25 / -40 | BC817W / -16W / -25W / -40W | BC817 / -25QA / -40QA | | |
| | | 100 | 600 | 100 | BCX19 | | | | |
| 50 | 500 | 85 - 170 | 170 - 340 | 140 - 180 | 2PD602AQL<br>2PD602ARL<br>2PD602ASL | 2PD1820AR / S | | | |
| 60 | 500 | 50 | - | 100 | | PMSTA05 | | | |
| 80 | 500 | 100 | - | 50 | PMBTA06 | PMSTA06 | | | |

## Single transistors PNP

types in **bold** represent new products

| Package | | | | | SOT23 | SOT323 (SC-70) | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |
|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 1.1 x 1.0 x 0.37 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| $P_{tot}$ (mW) | | | | | 250 | 200 | 750 | 250 | 250 |
| $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min/typ | $h_{FE}$ max | $f_T$ min (MHz) | | | | | |
| 30 | 100 | 125 - 220 | 500 - 800 | 100 | BC858B | BC858W | | | |
| 32 | 100 | 120 - 215 | 260 - 500 | 100 | BCW29 / 30 | | | | |
| | | 180 - 380 | 310 - 630 | 100 | BCW61B / C / D | | | | |
| 45 | 100 | 210 - 290 | 340 - 460 | 70 - 80 | 2PB709ART<br>2PB709ARL<br>2PB709ASL | 2PB709ARW / SW | | | |
| | | 180 - 380 | 310 - 630 | 100 | BCX71H / J / K | | | | |
| | | 120 - 215 | 260 - 500 | 100 | BCW69 / 70 | | | | |
| | | 125 - 420 | 250 - 800 | 100 | BC857 / A / B / C | BC857W / AW / BW / CW | BC857AQA / BQA / CQA | BC857AM / BM / CM | BC857AMB / BMB / CMB |
| 60 | 100 | 120 | 260 | 150 | BCW89 | | | | |
| 65 | 100 | 125 - 200 | 250 - 475 | 100 | BC856 / A / B | BC856W / AW / BW | | **BC856BM** | **BC856BMB** |
| 100 | 100 | 30 | - | 50 | BSS63 | | | | |
| 50 | 150 | 120 - 270 | 270 - 560 | 100 | | 2PA1576Q / R / S | | 2PA1774QM / RM / SM | 2PA1774QMB / RMB / SMB |
| | 200 | 210 | 340 | 100 | 2PB709BRL | | | | |
| | | 290 | 460 | 100 | 2PB709BSL | | | | |
| 25 | 500 | 100 | 600 | 80 | BCX18 | | | | |
| 45 | 500 | 100 - 250 | 250 - 600 | 80 | BC807 / -16 / -25 / -40 | BC807W / -16W / -25W / -40W | BC807 / -25QA / -40QA | | |
| | | 100 | 600 | 80 | BCX17 | | | | |
| 50 | 500 | 85 - 170 | 170 - 340 | 100 - 140 | 2PB710ARL<br>2PB710ASL | 2PB1219AQ / R / S | | | |
| 60 | 500 | 100 | - | 50 | | PMSTA55 | | | |
| 80 | 500 | 100 | - | 50 | PMBTA56 | PMSTA56 | | | |







## Double transistors

| Package | | | | | | SOT457 (SC-74) | SOT363 (SC-88) | SOT666 | DFN1010B-6 (SOT1216) |
|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | 2.9 x 1.5 x 1.0 | 2.0 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 1.0 x 1.0 x 0.37 |
| $P_{tot}$ (mW) | | | | | | 750 | 300 | 300 | 350 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min | $h_{FE}$ max | $f_T$ min (MHz) | | | | |
| NPN | 40 | 100 | 120 | 450 | 100 | | PUMX1 | PEMX1 | |
| | 45 | 100 | 200 | 450 | 100 | BC847DS | BC847BS | BC847BV | BC847QAS |
| | 65 | 100 | 110 | - | 100 | | BC846S | | |
| | | | 200 | 450 | 100 | BC846DS | BC846BS | | |
| | 50 | 150 | 120 | 560 | 100 | | PUMX2 | | |
| | 45 | 500 | 160 | 400 | 80 | BC817DS | | | |
| PNP | 40 | 100 | 120 | 450 | 100 | PIMT1 | PUMT1 | PEMT1 | |
| | 45 | 100 | 200 | 450 | 100 | | BC857BS | BC857BV | BC857QAS |
| | 65 | 100 | 110 | - | 100 | | BC856S | | |
| | | | 200 | 450 | 100 | | BC856BS | | |
| | 45 | 500 | 160 | 400 | 80 | BC807DS | | | |
| NPN / PNP | 40 | 100 | 120 | 450 | 100 | | PUMZ1 | PEMZ1 | |
| | 45 | 100 | 200 | 450 | 100 | | BC847BPN | BC847BVN | BC847QAPN |
| | 50 | 100 | 120 | 560 | 100 | PIMZ2 | PUMZ2 | | |
| | 65 | 100 | 200 | 450 | 100 | | BC846BPN | | |
| | 12 | 500 | 200 | - | 250 / 100 | | | PEMZ7 | |
| | 45 | 500 | 160 | 160 | 100 / 800 | BC817DPN | | | |

## Single and double switching transistors

types in **bold** represent new products

| Package | | | | | | | SOT223 (SC-73) | SOT89 (SC-62) | SOT23 | SOT323 (SC-70) | SOT363 (SC-88) | SOT666 | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| $P_{tot}$ (mW) | | | | | | | 1700 | 1300 | 250 | 200 | 300 | 300 | 250 | 250 |
| Configuration | | | | | | | single | single | single | single | double | double | single | single |
| Polarity | $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min | $h_{FE}$ max | $f_T$ min (MHz) | $t_{off}$ (ns) | | | | | | | | |
| NPN | 12 | 100 | 40 | 120 | 400 | 20 | | | BSV52 | | | | | |
| | 40 | 200 | 100 | 300 | 180 | 1200 | | | PMBS3904 | PMSS3904 | | | | |
| | | | | | 300 | 250 | | | | | | | | |
| | 15 | 600 | 40 | 120 | 500 | 20 | | | PMBT2369 | PMST2369 | | | | |
| | 40 | 200 | 100 | 300 | 300 | 250 | | | MMBT3904 | | | | | |
| | | | | | | | | | PMBT3904 | PMST3904 | PMBT3904YS | PMBT3904VS | PMBT3904M | PMBT3904MB |
| | 30 | 600 | 100 | 300 | 250 | 250 | | | PMBT2222 | PMST2222 | | | | |
| | 40 | 600 | 100 | 300 | 250 | 250 | PZT4401 | PXT4401 | PMBT4401 | PMST4401 | **PMBT4401YS** | | | |
| | | | | | 300 | 250 | | | MMBT2222A | | | | | |
| | | | | | | | PZT2222A | PXT2222A | PMBT2222A | PMST2222A | **PMBT2222AYS** | | | |
| | 40 | 800 | 100 | 300 | 300 | 250 | | | BSR14 | | | | | |
| PNP | 40 | 100 | 100 | 300 | 150 | 700 | | | PMBS3906 | PMSS3906 | | | | |
| | 40 | 200 | 100 | 300 | 250 | 300 | | | MMBT3906 | | | | | |
| | | | | | | | | | PMBT3906 | PMST3906 | PMBT3906YS | PMBT3906VS | PMBT3906M | PMBT3906MB |
| | 40 | 600 | 100 | 300 | 200 | 350 | PZT4403 | PXT4403 | PMBT4403 | PMST4403 | **PMBT4403YS** | | | |
| | | | | | | 365 | | | PMBT2907 | | | | | |
| | 60 | 600 | 100 | 300 | 200 | 300 | | | | PMST2907A | | | | |
| | | | | | | 365 | | | BSR16 | | | | | |
| | | | | | | | PZT2907A | PXT2907A | PMBT2907A | | **PMBT2907AYS** | | | |
| NPN / PNP | 40 | 200 | 100 | 300 | 300 / 250 | 250 / 300 | | | | | PMBT3946YPN | PMBT3946VPN | | |

## Medium-power general-purpose transistors

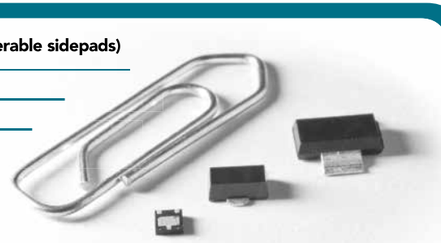
| Package | | | | | | SOT223 (SC-73) | SOT89 (SC-62) | DFN2020-3 (SOT1061) | DFN2020D-3 (SOT1061D) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | |  |  |  |  |
| Size (mm) | | | | | | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.0 x 2.0 x 0.62 | 2.0 x 2.0 x 0.62 |
| $P_{tot}$ (mW) | | | | | | 1700 | 1300 | 1300 | 1300 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (A) | $h_{FE}$ min | $h_{FE}$ max | $f_T$ min (MHz) | | | | |
| NPN | 20 | 2 | 85 - 160 | 375 | 40 | BCP68 / -25 | BC868 / -25 | BC68PA / BC68-25PA | BC68PAS / BC68-25PAS |
| | 45 | 1 | 63 - 100 | 160 - 250 | 100 | BCP54 / -10 / -16 | BCX54 / -10 / -16 | BC54PA / BC54-10PA / BC54-16PA | BC54PAS / BC54-10PAS / BC54-16PAS |
| | 60 | 1 | 63 - 100 | 160 - 250 | 100 | BCP55 / -10 / -16 | BCX55 / -10 / -16 | BC55PA / BC55-10PA / BC55-16PA | BC55PAS / BC55-10PAS / BC55-16PAS |
| | | | 100 | 300 | 100 | BSP41 | BSR41 | | |
| | 80 | 1 | 63 - 100 | 160 - 250 | 100 | BCP56 / -10 / -16 | BCX56 / -10 / -16 | BC56PA / BC56-10PA / BC56-16PA | BC56PAS / BC56-10PAS / BC56-16PAS |
| | | | 40 - 100 | 120 - 300 | 100 | BSP43 | BSR43 | | |
| PNP | 20 | 2 | 85 - 160 | 250 - 375 | 40 | BCP69 / -16 / -25 | BC869 / -16 / -25 | BC69PA / BC69-16PA / BC69-25PA | BC69PAS / BC569-16PAS / BC69-25PAS |
| | 45 | 1 | 63 - 100 | 160 - 250 | 115 [1] - 145 [1] | BCP51 / -10 / -16 | BCX51 / -10 / -16 | BC51PA / BC51-10PA / BC51-16PA | BC51PAS / BC51-10PAS / BC51-16PAS |
| | 60 | 1 | 63 - 100 | 160 - 250 | 100 | BCP52 / -10 / -16 | BCX52 / -10 / -16 | BC52PA / BC52-10PA / BC52-16PA | BC52PAS / BC52-10PAS / BC52-16PAS |
| | | | 40 - 100 | 120 - 300 | 100 | BSP31 | BSR30 / 31 | | |
| | 80 | 1 | 63 - 100 | 160 - 250 | 115 [1] - 145 [1] | BCP53 / -10 / -16 | BCX53 / -10 / -16 | BC53PA / BC53-10PA / BC53-16PA | BC53PAS / BC53-10PAS / BC53-16PAS |
| | | | 40 - 100 | 120 - 300 | 100 | BSP32 / 33 | BSR33 | | |

[1] Typical value

**In the spotlight**

**Medium-power transistors in DFN2020-3 and DFN2020D-3 (with solderable sidepads)**

- Excellent electrical performance on a small 2 x 2 mm footprint
- 80% board space reduction (DFN2020 vs. SOT89)
- 100% solderable sidepads (DFN2020D-3)
- $V_{CEO}$ ranging from 20 V to 80 V
- High collector-current capability $I_C$ up to 2 A
- AEC-Q101 qualified



## High-voltage transistors

| Package | | | | | | SOT223 (SC-73) | SOT89 (SC-62) | SOT457 (SC-74) | SOT23 | SOT323 (SC-70) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | |  |  |  |  |  |
| Size (mm) | | | | | | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 |
| $P_{tot}$ (mW) | | | | | | 1700 | 1300 | 750 | 250 | 200 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min | $h_{FE}$ max | $f_T$ min (MHz) | | | | | |
| NPN | 80 | 100 | 20 | - | 60 | | | | BSS64 | |
| | 140 | 300 | 60 | 250 | 100 | | | | PMBT5550 | PMST5550 |
| | 160 | 300 | 80 | 250 | 100 | | | | PMBT5551 / BSR19A | PMST5551 |
| | 250 | 100 | 50 | - | 60 | BF722 | BF622 | | BF822 | |
| | 300 | 100 | 50 | - | 60 | BF720 | BF620 | | BF820 | BF820W |
| | | | 40 | - | 50 | PZTA42 | PXTA42 | | PMBTA42 | PMSTA42 |
| | 350 | 100 | 40 | - | 70 | BSP19 | BST39 | | | |
| | 400 | 300 | 50 | 200 | 20 | PZTA44 | | | PMBTA44 | |
| PNP | 100 | 100 | 30 | - | 50 | | | | BSS63 | |
| | 250 | 100 | 50 | - | 60 | BF723 | | | | |
| | | | 50 | - | 60 | | BF623 | | BF823 | |
| | 300 | 100 | 50 | - | 60 | | BF621 | | BF821 | |
| | | | 40 | - | 50 | PZTA92 | PXTA92 | | PMBTA92 | PMSTA92 |
| 2 x NPN | 300 | 100 | 40 | - | 50 | | | PMBTA42DS | | |

For high-voltage transistors with increased performance please refer to our high-voltage low $V_{CEsat}$ (BISS) transistor portfolio on page 18.



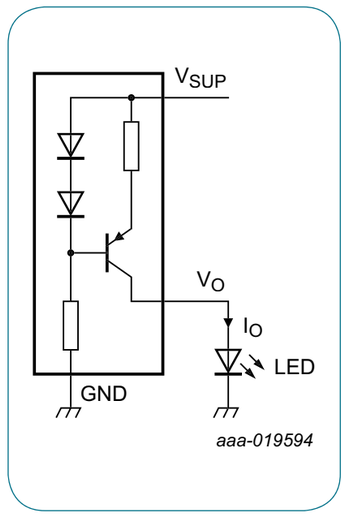


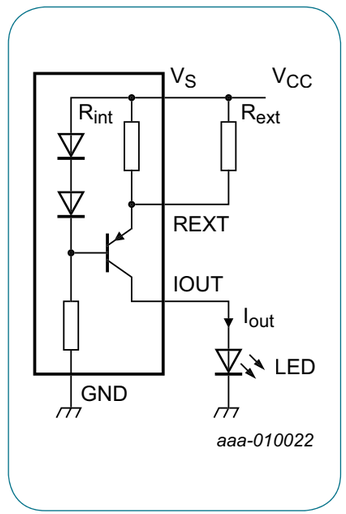


## LED driver

| Package | | SOT457 | SOT23 |
|---|---|---|---|
| | |  |  |
| Size (mm) | | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 |
| $P_{tot}$ (mW) | | 750 | 480 |
| Vs supply voltage [V] | LED drive current [mA] @ Vs=10V | | |
| 18 | 10 | | NCR401T |
| | 20 | | NCR402T |
| 40 | 10 | NCR401U | |
| | 20 | NCR402U | |
| | 50 | NCR405U | |

### Voltage reference for SOT457




### Key features and benefits

- Single-chip constant-current source with reduced component count
- Very small footprint for smaller designs

### Key applications

- Constant-current LED driver
- Generic constant-current source
- Active bias control for audio amplifiers

## Constant-current source

| Package | SOT353 (SC-88A) | | | | |
|---|---|---|---|---|---|
| |  | | | | |
| Size (mm) | 2.0 x 1.25 x 0.95 | | | | |
| $P_{tot}$ (mW) | 335 | | | | |
| Type | PSSI2021SAY | | | | |
| Description | maximum supply voltage | maximum supply current | typical stabilized output current | minimum stabilized output current | maximum stabilized output current |
| Parameter | $V_S$ max (V) | $I_S$ max (mA) | $I_{out}$ typ (µA) | $I_{out}$ min (mA) | $I_{out}$ max (mA) |
| Value | 75 | 2.2 | 15 | 0.015 | 50 |

## Darlington transistors

| Package | | | | | SOT223 (SC-73) | SOT89 (SC-62) | SOT23 |
|---|---|---|---|---|---|---|---|
| | | | | |  |  |  |
| Size (mm) | | | | | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.9 x 1.3 x 1.0 |
| $P_{tot}$ (mW) | | | | | 1700 | 1300 | 250 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min | $f_T$ min (MHz) | | | |
| NPN | 30 | 500 | 10000 | 125 | | | PMBTA13 |
| | | | 20000 | | PZTA14 | PXTA14 | PMBTA14 |
| | | | | 220 | | BCV29 | BCV27 |
| | 45 | 1000 | 2000 | 200 | BSP50 | BST50 | |
| | 60 | 500 | 10000 | 220 | | BCV49 | BCV47 |
| | | 1000 | 2000 | 200 | BSP51 | BST51 | |
| | 80 | | | | BSP52 | BST52 | |
| PNP | 30 | 500 | 20000 | 125 | | | PMBTA64 |
| | | | | 220 | | BCV28 | BCV26 |
| | 45 | 1000 | 2000 | 200 | BSP60 | BST60 | |
| | 60 | 500 | 10000 | 220 | | BCV48 | BCV46 |
| | | 1000 | 2000 | 200 | BSP61 | BST61 | |
| | 80 | | | | BSP62 | BST62 | |

## Schmitt triggers

| Package | | | | | | | SOT143B |
|---|---|---|---|---|---|---|---|
| | | | | | | |  |
| Size (mm) | | | | | | | 2.9 x 1.3 x 1.0 |
| $P_{tot}$ (mW) | | | | | | | 250 |
| Polarity | $V_{CEO}$ (V) TR1 | $V_{CEO}$ (V) TR2 | $I_C$ (mA) | $h_{FE}$ min | $h_{FE}$ max | $V_{CEsat}$ typ (mV) | |
| NPN | 30 | 6 | 100 | 110 | 800 | 250 | BCV63 / B |
| PNP | 30 | 6 | 100 | 220 | 475 | 250 | BCV64B |

## Low-noise transistors

| Package | | | | | | | SOT23 | SOT323 (SC-70) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | |  |  |
| Size (mm) | | | | | | | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 |
| $P_{tot}$ (mW) | | | | | | | 250 | 200 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (mA) | Noise figure max (dB) | $h_{FE}$ min | $h_{FE}$ max | $f_T$ min (MHz) | | |
| NPN | 30 | 100 | 4 | 200 | 450 | 100 | BC849B | BC849BW |
| | | | | 420 | 800 | 100 | BC849C | BC849CW |
| | 45 | 100 | 4 | 200 | 450 | 100 | BC850B | BC850BW |
| | | | | 420 | 800 | 100 | BC850C | BC850CW |
| PNP | 30 | 100 | 4 | 220 | 475 | 100 | BC859B | BC859BW |
| | | | | 420 | 800 | 100 | BC859C | BC859CW |
| | 45 | 100 | 4 | 220 | 475 | 100 | BC860B | BC860BW |
| | | | | 420 | 800 | 100 | BC860C | BC860CW |







## Matched-pair transistors

types in **bold** represent new products

| Package | | | | | | | SOT143B | SOT457 (SC-74) | SOT353 (SC-88A) | SOT363 (SC-88) | | SOT666 | | LFPAK56D (SOT1205) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | |  |  |  |  | |  | |  |
| Size (mm) | | | | | | | 2.9 x 1.3 x 1.0 | 2.9 x 1.5 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | | 1.6 x 1.2 x 0.55 | | 5 x 6 x 1.1 |
| $P_{tot}$ (mW) | | | | | | | 250 | 750 | 300 | 300 | | 300 | | 1250 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min | $h_{FE}$ max | $h_{FE1}/h_{FE2}$ | $V_{BE1}$ - $V_{BE2}$ (mV) | | | | | | | | |
| NPN | 30 | 100 | 110 | 800 | 0.7 [1] | n.a. | BCV61/A/B/C [1] | | | | | | | |
| | 45 | 100 | 200 | 450 | 0.9 [1] | n.a. | BCM61B [1] | | | | | | | |
| | | | | | | 2 | | BCM847DS | | BCM847BS | | BCM847BV | | |
| | | | | | 0.95 | 2 | | | PMP4501G | | PMP4501Y | | PMP4501V | |
| | | | | | 0.98 | 2 | | | PMP4201G | | PMP4201Y | | PMP4201V | |
| | 65 | 100 | 200 | 450 | 0.9 | 2 | | | | BCM846BS | | | | |
| | 100 | 3000 | 150 | 400 | 0.95 | n.a. | | | | | | | | **PHPT610035NK** |
| | Configuration | | | | | |  |  |  |  |  |  |  | |
| PNP | 30 | 100 | 100 | 800 | 0.7 [1] | n.a. | BCV62/A/B/C [1] | | | | | | | |
| | 45 | 100 | 200 | 450 | 0.9 [1] | n.a. | BCM62B [1] | | | | | | | |
| | | | | | | 2 | | BCM857DS | | BCM857BS | | BCM857BV | | |
| | | | | | 0.95 | 2 | | | PMP5501G | | PMP5501Y | | PMP5501V | |
| | | | | | 0.98 | 2 | | | PMP5201G | | PMP5201Y | | PMP5201V | |
| | 65 | 100 | 200 | 450 | 0.9 | 2 | | BCM856DS | | BCM856BS | | | | |
| | 100 | 3000 | 150 | 220 | 0.9 | n.a. | | | | | | | | **PHPT610035PK** |
| | Configuration | | | | | |  |  |  |  |  |  |  | |

[1] $I_{C1}$ / $I_{E2}$

**In the spotlight**

**New transistors in LFPAK56D (SOT1205) power package**

- High thermal power dissipation up to 3 W
- Vceo up to 100 V
- All types AECQ-101 qualified
- 2 types with current gain matching of 5% and 10%
- Reduced PCB size requirements
- High-temperature applications up to 175 °C
- For LED lighting, motor drive, linear regulators, backlight units, PowerMOS, and IGBT drive


### Key features

- Current gain matching to 2, 5, or 10%
- Base-emitter voltage matching to 2 mV
- Choice of standard double transistor pinout or application-optimized pinout
- Common-emitter configuration for 5-pin type
- Range of small, very small, and ultra-small packages

### Key benefits

- Improved performance of current mirror and differential amplifier circuits
- Drop-in replacement for standard double transistors (BCM series)
- Simplified board layout (PMP series)
- Eliminates the need for costly additional trimming

### Key applications

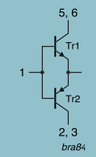
- Current mirrors
- Differential and instrumentation amplifiers
- Logarithmic amplifiers
- Comparators

**Differential amplifier**




**Current mirror**

## MOSFET driver

| $V_{CEO}$ (V) | $I_C$ (A) | $I_{cm}$ [A] | Type | Package | Remark | Configuration |
|---|---|---|---|---|---|---|
| 30 | 0.1 | 0.2 | BCV65 | SOT143B  | General-purpose transistors |   |
| 40 | 0.6 | 1 | PMD2001D | SOT457  | Switching transistors with reduced storage time | |
| | 1 | 2 | PMD3001D | | Low $V_{CEsat}$ | |

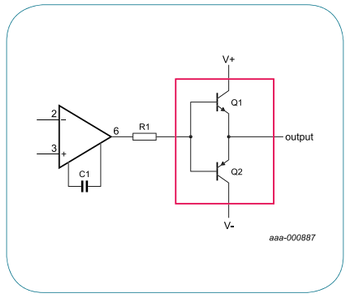
### Key features and benefits

- Three different configurations
- Types available with standard, switching, and low $V_{CEsat}$ (BISS) transistors
- Small footprint

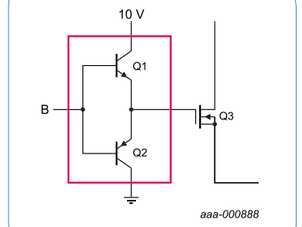
### Key applications

- Power management
  - (Half) bridge push-pull driver
  - Isolated DC/DC converters
  - Secondary synchronous rectification
- Peripheral driver
  - (Half) bridge push-pull driver
  - Motor driver
  - Brushless DC motor driver
  - Op-amp output current booster

**Op-amp booster**




**MOSFET driver for faster switching, lower losses**




## Medium-frequency transistors

| Package | | | | | | SOT23 | SOT323 (SC-70) |
|---|---|---|---|---|---|---|---|
| | | | | | |  |  |
| Size (mm) | | | | | | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 |
| $P_{tot}$ (mW) | | | | | | 250 | 200 |
| Polarity | $V_{CEO}$ (V) | $I_C$ (mA) | $h_{FE}$ min | $h_{FE}$ max | $f_T$ typ (MHz) | | |
| NPN | 15 | 100 | 40 | - | 500 | BF570 | |
| | 20 | 25 | | 85 | >275 | BFS20 | BFS20W |
| | | 30 | 65 | 225 | 260 | BFS19 | |
| | 40 | 25 | 67 | 220 | 380 | BF840 | |
| PNP | 30 | 25 | 25 | 50 | 250 | BF824 | BF824W |
| | 40 | | 50 | - | >325 | BF550 | |



# Diodes

# What you get when you choose NXP for diodes and rectifiers

**A comprehensive portfolio for all kind of applications**
NXP is continually innovating parts by reducing power consumption and size while boosting performance and reliability

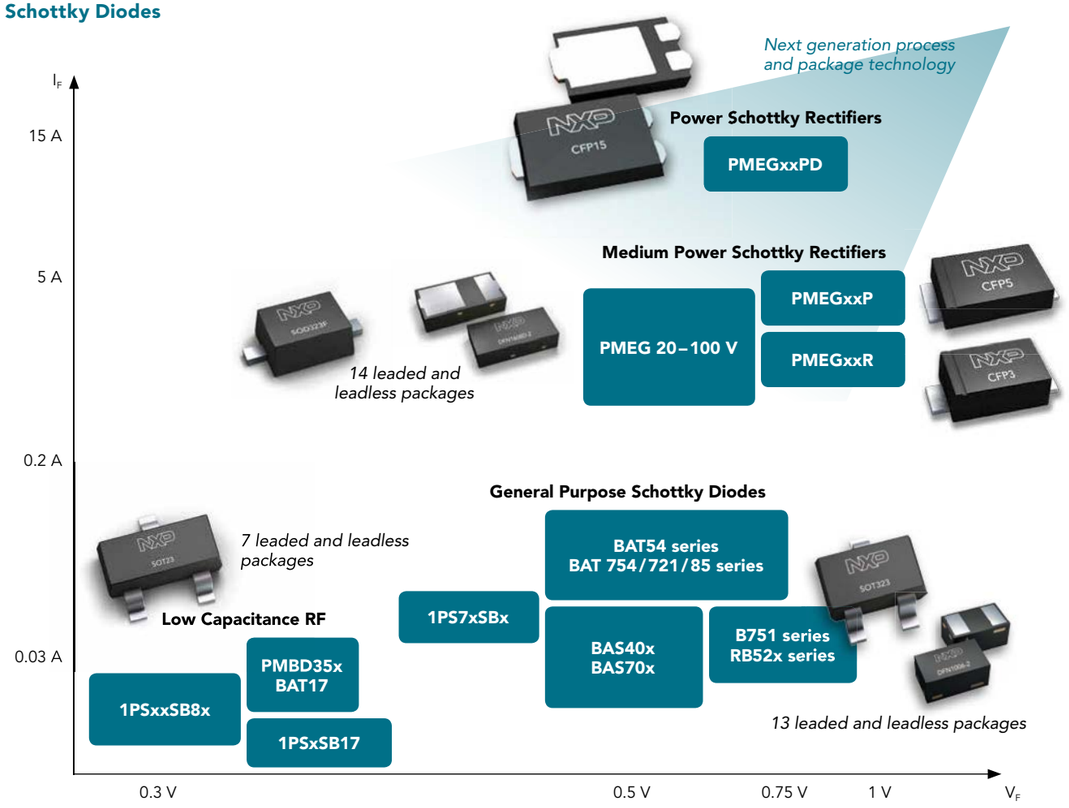
**A broad range of packages**
Including standard leaded SMD, medium-power clip-bond and ultra-small leadless packages with dimensions down to 0.6 x 0.3 x 0.3 mm

**A quality product from an experienced, high volume supplier**

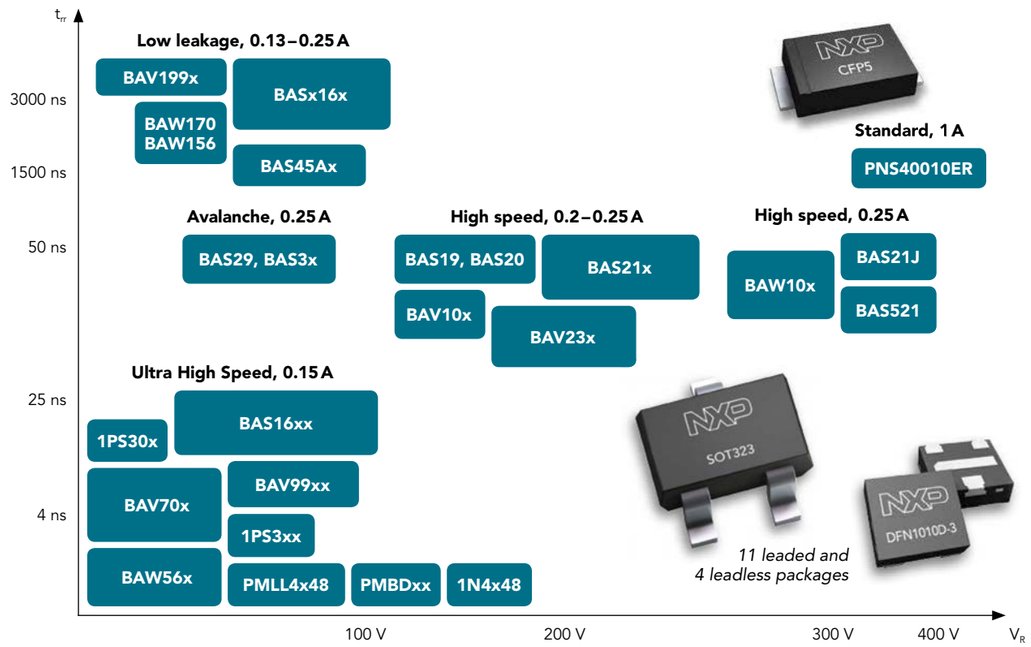
- NXP is strongly committed to automotive quality standards
- NXP has a track record of more than 60 years in developing and producing diodes
- NXP is the #1 in small-signal discretes with a high production capacity

## Portfolio Overview Diodes

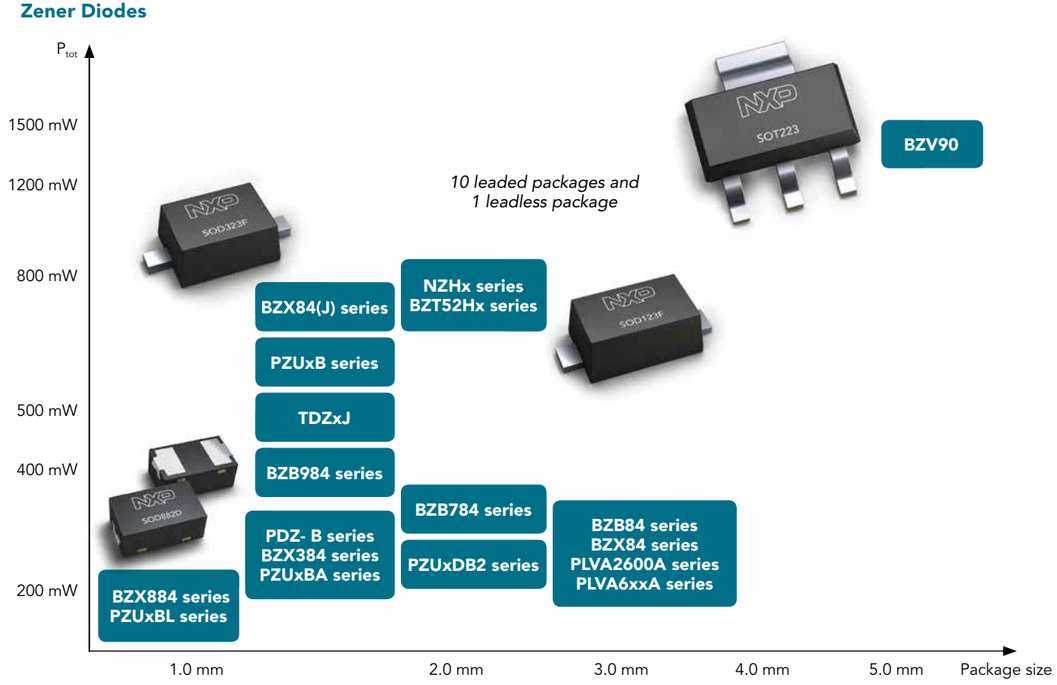
### Schottky Diodes




### Switching Diodes



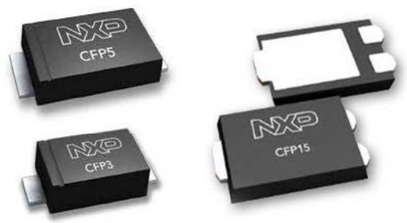

### Zener Diodes



# NXP's FlatPower packages CFP3, CFP5, and CFP15

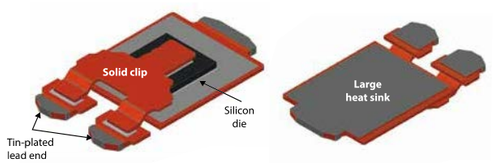
## The medium-power solution for shrinking designs

### Small SMD FlatPower packages in three different versions



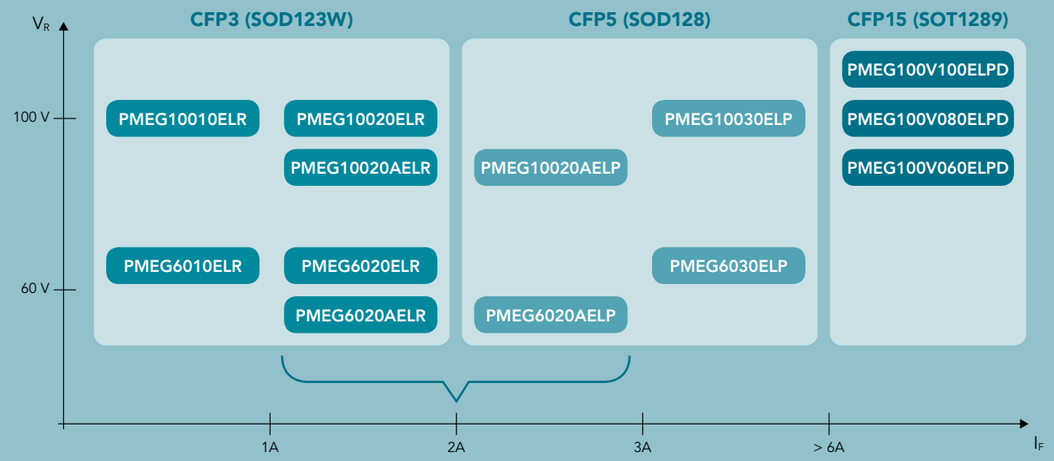

- Flat geometry, of down to 0.78 mm height
- Halogen-free mold compound
- AEC-Q101 qualified

### Robust design




- High-power capability due to wire-free clip-bond technology and heatsink
- Automatic optical inspection of solder joint due to tin-plated lead ends
- Benchmark flat design of only 0.7 mm height

### Low $I_R$ Schottky Portfolio, AEC-Q101




**NXP offers more than 200 products in FlatPower packages, to support a wide range of applications for medium-power rectification and surge protection.**





## Medium-power low $V_F$ Schottky rectifiers single ≥ 1 A - FlatPower packages

types in **bold** represent new products

| $I_F$ max (A) | $V_R$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Package | CFP15 (SOT1289) | CFP5 (SOD128) | CFP3 (SOD123W) |
|---|---|---|---|---|---|---|---|
| | | | | Size (mm) | 5.8 x 4.3 x 0.78 | 3.8 x 2.5 x 1.0 | 2.6 x 1.7 x 1.0 |
| | | | | $P_{tot}$ (mW) @ 1 cm² | 2150 | 1050 | 950 |
| | | | | Optimization | | | |
| 1 | 20 | 340 | 1 | Low $V_F$ | | | PMEG2010ER |
| | | 450 | 0.05 | Low $I_R$ | | | PMEG2010BER |
| | 30 | 360 | 1.5 | Low $V_F$ | | PMEG3010EP | PMEG3010ER |
| | | 450 | 0.05 | Low $I_R$ | | PMEG3010BEP | PMEG3010BER |
| | 40 | 490 | | Low $V_F$ | | PMEG4010EP | PMEG4010ER |
| | | | | Low $V_F$ | | PMEG4010ETP | PMEG4010ETR |
| | 60 | 530 | 0.06 | Low $V_F$ | | PMEG6010EP | PMEG6010ER |
| | | 530 | | Low $V_F$ | | | PMEG6010ETR |
| | | 660 | 0.0003 | Low $I_R$ | | | PMEG6010ELR |
| | 100 | 770 | 0.00015 | Low $I_R$ | | | PMEG10010ELR |
| 2 | 30 | 360 | 3 | Low $V_F$ | | PMEG3020EP | |
| | | 420 | 1.5 | Low $V_F$ | | PMEG3020CEP | PMEG3020ER |
| | | 450 | 0.1 | Low $I_R$ | | PMEG3020BEP | |
| | | 520 | 0.05 | Low $I_R$ | | PMEG3020DEP | PMEG3020BER |
| | 40 | 490 | 0.1 | Low $V_F$ | | PMEG4020EP | PMEG4020ER |
| | | | | Low $V_F$ | | PMEG4020ETP | PMEG4020ETR |
| | 60 | 530 | 0.2 | Low $V_F$ | | PMEG6020EP | PMEG6020ER |
| | | | | Low $V_F$ | | PMEG6020ETP | PMEG6020ETR |
| | | 680 | 0.0007 | Low $I_R$ | | PMEG6020AELP | PMEG6020AELR |
| | | 760 | 0.0003 | Low $I_R$ | | | PMEG6020ELR |
| | 100 | 770 | | Low $I_R$ | | PMEG10020AELP | PMEG10020AELR |
| | | 830 | 0.00015 | Low $I_R$ | | | PMEG10020ELR |
| 3 | 30 | 360 | 5 | Low $V_F$ | | PMEG3030EP | |
| | | 450 | 0.15 | Low $I_R$ | | PMEG3030BEP | |
| | 40 | 490 | 0.2 | Low $V_F$ | | PMEG4030EP | |
| | | | | Low $V_F$ | | PMEG4030ETP | |
| | | 540 | 0.1 | Low $I_R$ | | | PMEG4030ER |
| | 60 | 530 | 0.2 | Low $V_F$ | | PMEG6030EP | |
| | | 475 | 0.4 | Low $V_F$ | | PMEG6030EVP | |
| | | 530 | 0.2 | Low $V_F$ | | PMEG6030ETP | |
| | | 690 | 0.001 | Low $I_R$ | | PMEG6030ELP | |
| | 100 | 770 | 0.00045 | Low $I_R$ | | PMEG10030ELP | |
| 4.5 | 60 | 530 | 0.4 | Low $V_F$ | | PMEG6045ETP | |
| 5 | 30 | 360 | 8 | Low $V_F$ | | PMEG3050EP | |
| | | 450 | 0.25 | Low $I_R$ | | PMEG3050BEP | |
| | 40 | 490 | 0.3 | Low $V_F$ | | PMEG4050EP | |
| | | | | Low $V_F$ | | PMEG4050ETP | |
| | 45 | | | Low $V_F$ | **PMEG045V050EPD** | | |
| | 60 | 560 | 0.4 | Low $V_F$ | **PMEG060V050EPD** | | |
| 6 | 100 | 850 | 0.001 | Low $I_R$ | **PMEG100V060ELPD** | | |
| 8 | 100 | 850 | 0.001 | Low $I_R$ | **PMEG100V080ELPD** | | |
| 10 | 45 | 490 | 0.6 | Low $V_F$ | **PMEG045V100EPD** | | |
| | | | | Low $V_F$ | PMEG45U10EPD | | |
| | | 540 | 0.5 | Low $I_R$ | PMEG45A10EPD | | |
| | 60 | 560 | 0.7 | Low $V_F$ | **PMEG060V100EPD** | | |
| | 100 | 850 | 0.001 | Low $I_R$ | **PMEG100V100ELPD** | | |
| 15 | 45 | 550 | 0.1 | Low $I_R$ | **PMEG045T150EPD** | | |
| | | 580 | | Low $I_R$ | **PMEG45T15EPD** | | |
| | | 490 | 1 | Low $V_F$ | **PMEG045V150EPD** | | |
| | 50 | 550 | 0.1 | Low $I_R$ | **PMEG050T150EPD** | | |
| | | 500 | 1 | Low $V_F$ | **PMEG050V150EPD** | | |

## Medium-power low $V_F$ Schottky rectifiers single ≥ 200 mA - Leadless DSN packages

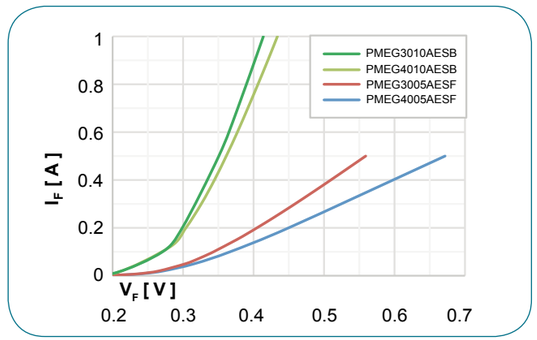
types in **bold** represent new products

| $I_F$ max (A) | $V_R$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Package | DSN0603-2 (SOD962) | DSN1006-2 (SOD993) | DSN1006U-2 (SOD995) |
|---|---|---|---|---|---|---|---|
| | | | | |  |  |  |
| | | | | Size (mm) | 0.6 x 0.3 x 0.3 | 1.0 x 0.6 x 0.28 | 1.0 x 0.6 x 0.28 |
| | | | | $P_{tot}$ (mW) @ 1 cm² | 525 | 1.000 | 1.190 |
| | | | | Optimization | | | |
| 0.2 | 20 | 420 | 0.045 | Low $V_F$ | **PMEG2002AESF** | | |
| | | 490 | 0.0035 | Low $I_R$ | PMEG2002ESF | | |
| | 30 | 470 | 0.08 | Low $V_F$ | **PMEG3002AESF** | | |
| | | 535 | 0.009 | Low $I_R$ | **PMEG3002ESF** | | |
| | 40 | 525 | 0.08 | Low $V_F$ | **PMEG4002AESF** | | |
| | | 600 | 0.0065 | Low $I_R$ | **PMEG4002ESF** | | |
| 0.5 | 20 | 550 | 0.045 | Low $V_F$ | **PMEG2005AESF** | | |
| | | 620 | 0.0035 | Low $I_R$ | **PMEG2005ESF** | | |
| | 30 | 630 | 0.08 | Low $V_F$ | **PMEG3005AESF** | | |
| | | 720 | 0.009 | Low $I_R$ | **PMEG3005ESF** | | |
| | 40 | 820 | 0.08 | Low $V_F$ | **PMEG4005AESF** | | |
| | | 880 | 0.0065 | Low $I_R$ | **PMEG4005ESF** | | |
| 1 | 30 | 480 | 1.25 | Low $V_F$ | | **PMEG3010AESB** | **PMEG3010AESA** |
| | | 565 | 0.045 | Low $I_R$ | | **PMEG3010ESF** | |
| | 40 | 505 | 0.115 | Low $V_F$ | | **PMEG4010AESB** | |
| | | 610 | 0.04 | Low $I_R$ | | **PMEG4010ESB** | |
| | 60 | 625 | 0.65 | Low $V_F$ | | **PMEG6010AESB** | |
| | | 730 | 0.03 | Low $I_R$ | | **PMEG6010ESB** | |

## Forward characteristic survey of Schottkys in DSN1006-2

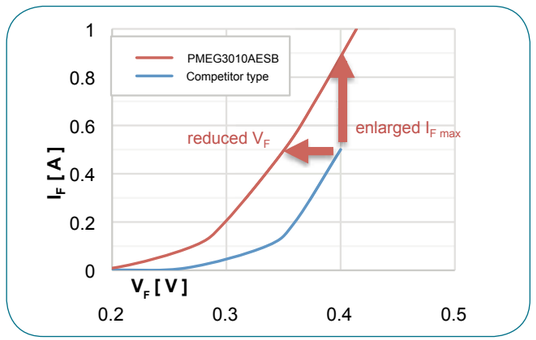
$V_R$:30 V, $I_F$: $I_A$ (typical data)

### Selected DSN Schottky rectifier




This diagram shows the broad variety of the DSN portfolio

### PMEG3010AESB versus competitor type




NXP type has higher forward current specified and has benchmark low $V_F$

### In the spotlight

**PMEG3010AESB, PMEG6010ESB, low $V_F$ Schottky Rectifier**

- 30 / 40 / 60 V, 1A Schottky rectifier in DSN1006-2 (SOD993) package
- Low forward voltage, $V_F$ max = 480 mV @ 1 A (PMEG3010AESB)
- Low leakage current, $I_R$ max = 30 µA @ 60 V (PMEG6010ESB)
- High surge capability up to $I_{FSM}$ = 10 A
- Ideal for LED backlighting in mobile applications






## Medium-power low $V_F$ Schottky rectifiers single ≥ 200 mA - Leadless DFN packages

types in **bold** represent new products

| $I_F$ max (A) | $V_R$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Package | DFN2020-3 (SOT1061) | DFN2020D-3 (SOT1061D) | DFN1608D-2 (SOD1608) | DFN1006-2 (SOD882) | DFN1006D-2 (SOD882D) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | |  |  |  |  |  |
| | | | | Size (mm) | 2.0 x 2.0 x 0.62 | 2.0 x 2.0 x 0.62 | 1.6 x 0.8 x 0.37 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| | | | | $P_{tot}$ (mW) @ 1 cm² | 960 | 960 | 780 | 565 | 660 |
| | | | | Optimization | | | | | |
| 0.2 | 30 | 480 | 0.05 | low $V_F$ | | | | PMEG3002AEL | PMEG3002AELD |
| | 40 | 600 | 0.01 | low $I_R$ | | | | PMEG4002EL | PMEG4002ELD |
| | 60 | 600 | 0.1 | low $V_F$ | | | | | PMEG6002ELD |
| 0.5 | 20 | 390 | 0.2 | low $V_F$ | | | | | PMEG2005BELD |
| | | 410 | 0.3 | low $V_F$ | | | PMEG2005EPK | | |
| | | 440 | 1.5 | low $V_F$ | | | | PMEG2005AEL | PMEG2005AELD |
| | | 500 | 0.03 | low $I_R$ | | | | PMEG2005EL | PMEG2005ELD |
| | 30 | 500 | 0.5 | low $V_F$ | | | | PMEG3005EL | PMEG3005ELD |
| | 40 | 590 | 0.01 | low $I_R$ | | | PMEG4005EPK | | |
| 1 | 20 | 375 | 1.9 | low $V_F$ | PMEG2010EPA | **PMEG2010EPAS** | | | |
| | | 415 | 0.6 | low $V_F$ | | | PMEG2010EPK | | |
| | | 490 | 0.2 | low $V_F$ | | | | | PMEG2010BELD |
| | 40 | 600 | 0.02 | low $I_R$ | | | PMEG4010EPK | | |
| 1.5 | 20 | 420 | 0.9 | low $V_F$ | | | PMEG2015EPK | | |
| | 40 | 610 | 0.03 | low $I_R$ | | | PMEG4015EPK | | |
| 2 | 20 | 420 | 1.9 | low $V_F$ | PMEG2020EPA | **PMEG2020EPAS** | | | |
| | | 450 | 0.9 | low $V_F$ | | | PMEG2020EPK | | |
| | 30 | 470 | 2.5 | low $V_F$ | PMEG3020EPA | **PMEG3020EPAS** | | | |
| | 40 | 535 | 0.1 | low $V_F$ | PMEG4020EPA | **PMEG4020EPAS** | | | |
| | 60 | 530 | 0.2 | low $V_F$ | | | PMEG4020EPK | | |
| | | 575 | 0.25 | low $V_F$ | PMEG6020EPA | **PMEG6020EPAS** | | | |

### Features and benefits

- 33% lower $V_F$ on same footprint
- Low profile of 0.37 mm
- Solderable side pads
- Visual solder inspection

### Applications

- Handheld equipment
- Smartphone backlight units
- Battery chargers
- Shrinked PCB designs

### Differentiated portfolio

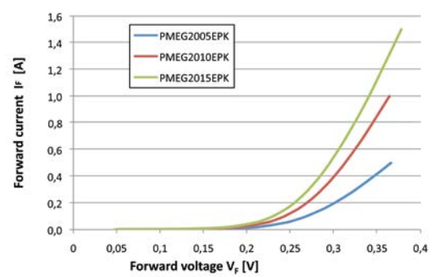
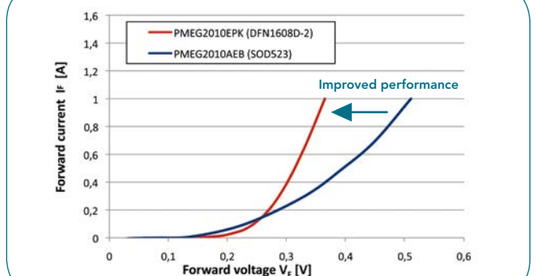



Diagram shows the variety of characteristics in DFN1608D-2 (SOD1608)

### with best performance




PMEG2010EPK shows significant $V_F$ improvement compared to the SOD523 device

## Medium-power low $V_F$ Schottky rectifiers single ≥ 200 mA - Leaded packages

| $I_F$ max (A) | $V_R$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Package | SOT457 (SC-74) | SOT23 | SOD123F | SOT323 (SC-70) | SOD323F (SC-90) | SOD323 (SC-76) | SOT666 | SOD523 (SC-79) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size (mm) | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7 | 1.7 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6 |
| | | | | $P_{tot}$ (mW) @ 1 cm² | 540 | 420 | 830 | 400 | 830 | 570 | 570 | 500 |
| | | | | Optimization | | | | | | | | |
| 0.2 | 30 | 480 | 0.05 | low $V_F$ | | | | | PMEG3002EJ | | | PMEG3002AEB |
| | 40 | 600 | 0.01 | low $I_R$ | | | | | PMEG4002EJ | | | PMEG4002EB |
| | 60 | 600 | 0.1 | low $V_F$ | | | | | PMEG6002EJ | | | PMEG6002EB |
| 0.5 | 20 | 390 | 0.2 | low $V_F$ | | PMEG2005ET | PMEG2005EH | | PMEG2005EJ | PMEG2005AEA | PMEG2005AEV | |
| | | 480 | 0.03 | low $I_R$ | | | | | | | | PMEG2005EB |
| | 30 | 430 | 0.15 | low $V_F$ | | PMEG3005ET | PMEG3005EH | | PMEG3005EJ | PMEG3005AEA | PMEG3005AEV | |
| | | 500 | 0.5 | low $V_F$ | | | | | | | | PMEG3005EB |
| | 40 | 470 | 0.1 | low $V_F$ | | PMEG4005ET | PMEG4005EH | | PMEG4005EJ | PMEG4005AEA | PMEG4005AEV | |
| | | 550 | 1.1 | low $V_F$ | | BAT720 | | 1PS70SB20 | | | | |
| 1 | 20 | 430 | 0.2 | low $V_F$ | | PMEG2010AET | PMEG2010AEH | | | | | |
| | | 500 | 0.2 | low $V_F$ | | PMEG2010ET | PMEG2010EH | | PMEG2010EJ | PMEG2010BEA | PMEG2010BEV | |
| | | 550 | 0.07 | low $I_R$ | | | | | PMEG2010AEJ | PMEG2010EA BAT760 | PMEG2010EV BAT960 | |
| | | 620 | 1.5 | low $V_F$ | | | | | | | | PMEG2010AEB |
| | 30 | 450 | 1 | low $V_F$ | 1PS74SB23 | | | | | | | |
| | | 520 | 0.1 | low $I_R$ | | | PMEG3010CEH | | PMEG3010CEJ | | | |
| | | 560 | 0.15 | low $V_F$ | | PMEG3010ET | PMEG3010EH | | PMEG3010EJ | PMEG3010BEA | PMEG3010BEV | |
| | | 680 | 0.5 | low $V_F$ | | | | | | | | PMEG3010EB |
| | | 570 | 0.05 | low $I_R$ | | | PMEG4010CEH | | PMEG4010CEJ | | | |
| | | 600 | 0.02 | low $I_R$ | | | | | | | | |
| | 40 | 640 | 0.05 | low $V_F$ | | PMEG4010ET | PMEG4010EH | | PMEG4010EJ | PMEG4010BEA | PMEG4010BEV | |
| | 60 | 650 | 0.35 | low $V_F$ | PMEG6010AED | | | | | | | |
| | | 660 | 0.05 | low $I_R$ | | | PMEG6010CEH | | PMEG6010CEJ | | | |
| 1.5 | 20 | 660 | 0.2 | low $I_R$ | | | PMEG2015EH | | PMEG2015EJ | PMEG2015EA | PMEG2015EV | |
| | 30 | 500 | 1 | low $V_F$ | | | PMEG3015EH | | PMEG3015EJ | | PMEG3015EV | |
| 2 | 10 | 460 | 3 | low $V_F$ | | | PMEG1020EH | | PMEG1020EJ | PMEG1020EA | PMEG1020EV | |
| | 20 | 525 | 0.2 | low $V_F$ | | | PMEG2020EH | | PMEG2020EJ | PMEG2020AEA | | |
| | 30 | 620 | 1 | low $V_F$ | | | PMEG3020EH | | PMEG3020EJ | | | |
| 3 | 10 | 530 | 3 | low $V_F$ | | | PMEG1030EH | | PMEG1030EJ | | | |

**In the spotlight**

**Schottky Rectifier in SOD123F and SOD323F**

- Broad portfolio base of 36 types, 20 / 60 V, 0.2 - 3 A
- Optimized either for low $V_F$ or low $I_R$
- High surge capability up to 10 A
- High thermal capability due to flat-lead design
- AEC-Q101 qualified
- Ideal for DC/DC conversion, free-wheeling, reverse polarity protection






## Medium-power low $V_F$ Schottky rectifiers dual ≥ 200 mA

types in **bold** represent new products

| $I_F$ max (A) | $V_R$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Optimization | Package | SOT223 (SC-73) | SOT23 | DFN2020-3 (SOT1061) | DFN2020D-3 (SOT1061D) | SOT666 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Size (mm) | 6.5 x 3.5 x 1.65 | 2.9 x 1.3 x 1.0 | 2.0 x 2.0 x 0.62 | 2.0 x 2.0 x 0.63 | 1.6 x 1.2 x 0.55 |
| | | | | | $P_{tot}$ (mW) @ 1 cm² | 1500 | 250 | 1000 | 1000 | 300 |
| 0.2 | 30 | 480 | 0.03 | low $V_F$ |  | | | | | PMEG3002TV |
| | 60 | 600 | 0.1 | low $V_F$ | | | | | | PMEG6002TV |
| 0.5 | 20 | 390 | 0.2 | low $V_F$ |  | | PMEG2005CT | | | |
| | 30 | 430 | 0.15 | low $V_F$ | | | PMEG3005CT | | | |
| | 40 | 470 | 0.1 | low $V_F$ | | | PMEG4005CT | | | |
| 1.0 | 25 | 450 | 1.0 | low $V_F$ |  | BAT120S | | | | |
| | | | | low $V_F$ |  | BAT120C | | | | |
| | | | | low $V_F$ |  | BAT120A | | | | |
| | 40 | 500 | 0.05 | low $V_F$ |  | | | PMEG4010CPA | **PMEG4010CPAS** | |
| | | 540 | 0.06 | low $V_F$ |  | | | PMEG6010CPA | **PMEG6010CPAS** | |
| | 60 | 650 | 0.35 | low $V_F$ |  | BAT160S | | | | |
| | | | | low $V_F$ |  | BAT160C | | | | |
| | | | | low $V_F$ |  | BAT160A | | | | |
| 2.0 | 20 | 420 | 1.0 | low $V_F$ |  | | | PMEG2020CPA | **PMEG2020CPAS** | |
| | 30 | 440 | 2.0 | low $V_F$ | | | | PMEG3020CPA | **PMEG3020CPAS** | |

## Low $V_F$ (MEGA) Schottky rectifier nomenclature

**PMEG 40 10 A E T P**

**NXP MEGA Schottky rectifier**

Max. reverse voltage in V
e.g. 40 = 40 V

Cont. foward current in A
e.g. 10 = 1.0 A

**Variant number** (optional)

**Internal configuration:**
A = CA
C = CC
**E = single**
P = double, parallel
R = tripple, antiparallel
S = series
V = tripple
W = CA and CC
X = 2 x series
Y = 2 x CC
Z = 2 x CA

**Variant number** (optional)
**L = low $I_R$**
**T = high temperature**
**V = low $I_R$ and low $V_F$**

**Package indicator:**
A = SOD323
B = SOD523
D = SOT457
H = SOD123
J = SOD323F
L = DFN1006-2 (SOD882)
LD = DFN1006D-2 (SOD882D)
**P = SOD128**
PA = DFN2020-3 (SOT1061)

**PAS = DFN2020D-3 (SOT1061D)**
**PD = CFP15 (SOT1289)**
**PK = DFN1608D-2 (SOD1608)**
**R = SOD123W**
**SA = DSN1006U-2 (SOD995)**
**SB = DSN1006-2 (SOD993)**
**SF = DSN0603-2 (SOD962)**
**T = SOT23**
**V = SOT666**

Schottky barrier diodes and rectifiers

## General-purpose Schottky diodes ≤ 250 mA

| $I_F$ max (mA) | $V_R$ max (V) | $V_F$ max (mV) | @ $I_F$ (mA) | $I_R$ max (µA) | @ $V_R$ (V) | Package | SOD80C (MiniMelf) | SOD68 (DO-34) | SOT23 | SOT143B | | SOD123F | SOT323 (SC-70) | SOT363 (SC-88) | SOD323F (SC-90) | SOD323 (SC-76) | SOT666 | SOD523 (SC-79) | DFN1006-2 (SOD882)/ DFN1006-3 (SOT883) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Size (mm) | 3.5 x 1.5 x 1.5 | 3.04 x 1.6 x 0.55 | 2.9 x 1.3 x 1.0 | 2.9 x 1.3 x 1.0 | | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7 | 1.7 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6 | 1.0 x 0.6 x 0.48 |
| | | | | | | $P_{tot}$ (mW) | 300 | 500 | 250 | 250 | | 830 | 250 | 300 | 550 | 400 | 300 | 500 | 250 |
| 70 | 70 | 750 | 10 | 0.1 | 50 | single | | | BAS70 | | | BAS70H | BAS70W | | | 1PS76SB70 | | 1PS79SB70 | BAS70L |
| | | | | | | dual series | | | BAS70-04 | | | | BAS70-04W | | | | | | |
| | | | | | | dual c.c. | | | BAS70-05 | | | | BAS70-05W | | | | | | |
| | | | | | | dual c.a. | | | BAS70-06 | | | | BAS70-06W | | | | | | |
| | | | | | | dual isolated | | | | BAS70-07 | | | | BAS70-07S | | | BAS70-07V | | |
| | | | | | | triple isolated | | | | | | | | | | | BAS70VV | | |
| | | | | | | quad 2x series | | | | | | | | BAS70XY | | | | | |
| 120 | 40 | 370 | 1 | 0.5 | 30 | single | | | | | | | | | | RB751V40 | | RB751S40 | RB751CS40 |
| | | 500 | 10 | 1 | 30 | single | | | BAS40 | | | BAS40H | BAS40W | | | 1PS76SB40 | | 1PS79SB40 | BAS40L |
| | | | | | | dual series | | | BAS40-04 | | | | BAS40-04W | | | | | | |
| | | | | | | dual c.c. | | | BAS40-05 | | | | BAS40-05W | | | | | | |
| | | | | | | dual c.a. | | | BAS40-06 | | | | BAS40-06W | | | | | | |
| | | | | | | dual isolated | | | | BAS40-07 | | | | | | | BAS40-07V | | |
| | | | | | | quad c.c./c.c. | | | | | | | | 1PS88SB48 | | | BAS40-05V | | |
| | | | | | | quad 2x series | | | | | | | | BAS40XY | | | | | |
| 200 | 30 | 300 | 10 | 30 | 10 | single | | | | | | | | | | | | 1PS79SB31 | |
| | | 340 | 10 | 2 | 25 | single | | | BAT754 | | | | | | | | | | |
| | | | | | | dual series | | | BAT754S | | | | | | | | | | |
| | | | | | | dual c.c. | | | BAT754C | | | | | | | | | | |
| | | | | | | dual c.a. | | | BAT754A | | | | | | | | | | |
| | | | | | | triple isolated | | | | | | | | BAT754L | | | | | |
| | | | | | | single | BAS85 | BAT85 | BAT54 | | | BAT54H | BAT54W | | BAT54J | 1PS76SB10 | | 1PS79SB10 | BAT54L |
| | | | | | | dual series | | | BAT54S | | | | BAT54SW | | | | | | |
| | | | | | | dual c.c. | | | BAT54C | | | | BAT54CW | | | | | | BAT54CM |
| | | | | | | dual c.a. | | | BAT54A | | | | BAT54AW | | | | | | |
| | | | | | | dual isolated | | | | BAT74 | | | | BAT74S | | | BAT74V | | |
| | | | | | | triple isolated | | | | | | | | | | | BAT54VV | | |
| | | | | | | quad c.c./c.c. | | | | | | | | | | | BAT54CV | | |
| | | | | | | quad 2x series | | | | | | | | BAT54XY | | | | | |
| | | 500 | 200 | 30 | 10 | single | | | | | | | | | | | | RB521S30 | RB521CS30L |
| | | 600 | 200 | 1 | 10 | single | | | | | | | | | | | | RB520S30 | RB520CS30L |
| | 40 | 300 | 10 | 15 | 30 | single | | | BAT721 | | | | | | | 1PS76SB21 | | | |
| | | | | | | dual series | | | BAT721S | | | | | | | | | | |
| | | | | | | dual c.c. | | | BAT721C | | | | | | | | | | |
| | | | | | | dual c.a. | | | BAT721A | | | | | | | | | | |
| | | 360 | 10 | 0.5 | 25 | single | | | | | | | | | | | | 1PS79SB30 | |
| | | 420 | 30 | 0.5 | 25 | single | | | | | | | BAT854W | | | | | | |
| | | | | | | dual series | | | | | | | BAT854SW | | | | | | |
| | | | | | | dual c.c. | | | | | | | BAT854CW | | | | | | |
| | | | | | | dual c.a. | | | | | | | BAT854AW | | | | | | |
| | 50 | 450 | 10 | 5 | 40 | single | BAS86 | BAT86 | | | | | | | | | | | |
| 250 | 100 | 850 | 250 | 4 | 75 | single | | | | | | BAT46WH | | | BAT46WJ | | | | |

| Single | Dual series | Dual c.c. | Dual c.a. | Dual isolated | Triple isolated | Quad c.c./c.c. | Quad 2x series |
|---|---|---|---|---|---|---|---|
| brb122 | brb124 | brb125 | brb126 | brb127 | brb129 | brb130 | brb131 |
| brb123 | | | | brb128 | | | |
| aaa-001765 | | | | | | | |

## Low-capacitance Schottky diodes

| $I_F$ max (mA) | $V_R$ max (V) | $V_F$ max (mV) | @ $I_F$ (mA) | $C_d$ max (pF) @ $V_R$ = 0 V | Package | SOT23 | SOT323 (SC-70) | SOT363 (SC-88) | SOD323 (SC-76) | SOT666 | SOD523 (SC-79) | DFN1006-2 (SOD882) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Size (mm) | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6 | 1.0 x 0.6 x 0.48 |
| | | | | | $P_{tot}$ (mW) | 250 | 250 | 300 | 400 | 300 | 500 | 250 |
| 30 | 4 | 450 | 1 | 1 | single | BAT17 | | | 1PS76SB17 | | 1PS79SB17 | |
| | | | | | triple isolated | | | | | 1PS66SB17 | | |
| | | | | | dual series | PMBD353 PMBD354 [1] | | | | | | |
| | 15 | 340 | 1 | 1 | single | | 1PS70SB82 | | | | | 1PS10SB82 |
| | | | | | triple isolated | | | 1PS88SB82 | | 1PS66SB82 | | |
| | | | | | dual series | | 1PS70SB84 | | | | | |
| | | | | | dual c.c. | | 1PS70SB85 | | | | | |
| | | | | | dual c.a. | | 1PS70SB86 | | | | | |

[1] Diodes have matched capacitance

# General-purpose Zener diodes

| $I_F$ max (mA) | $P_{ZSM}$ (W) | $V_Z$ nom (V) | $V_Z$ tolerance | Note | Configuration | Series | Package | Size (mm) | $P_{tot}$ (mW) |
|---|---|---|---|---|---|---|---|---|---|
| 500 | - | 3.3~24 | C | Europe | Single | 1N47xxA series | SOD66 (DO-41) | 4.8 x 2.6 x 0.81 | 1000 |
| | 60 | 3.6~75 | | | | BZV85 series | | | |
| 250 | - | 2.1~36 | About 2% | Special | Single | NZX series | SOD27 (DO-35) | 4.25 x 1.85 x 0.56 | 400 |
| | 40 | 2.4~75 | B, C | Europe | | BZX79 series | | | |
| 400 | 40 | 2.4~75 | C | Europe | Single | BZV90 series | SOT223 (SC-73) | 6.5 x 3.5 x 1.65 | 1500 |
| 250 | 40 | 2.4~75 | C | Europe | Single | BZV49 series | SOT89 (SC-62) | 4.5 x 2.5 x 1.5 | 1000 |
| 250 | 40 | 2.4~75 | B, C | Europe | Single | BZV55 series | SOD80C (MiniMelf) | 3.5 x 1.5 x 1.5 | 400 |
| 200 | 40 | 2.4~75 | B, C | Europe | Dual c.a. | BZB84 series | SOT23 | 2.9 x 1.3 x 1.0 | 250 |
| | | | A, B, C | | Single | BZX84 series | | | |
| 250 | 30 | 5~6.8 | 0.2 V | Ave | | PLVA600A series | | | |
| 250 | - | 3.0~30 | About 2.5% | Special | Single | NZH series | SOD123F | 2.6 x 1.6 x 1.1 | 830 |
| | 40 | 2.4~75 | B, C | Europe | | BZT52H series | | | |
| 200 | 40 | 10 | B2 | Japan | Dual isolated | PZU10DB2 series | SOT353 (SC-88A) | 2.0 x 1.25 x 0.95 | 300 |
| 200 | 40 | 2.4~15 | C | Europe | Dual c.a. | BZB784 series | SOT323 (SC-70) | 2.0 x 1.25 x 0.95 | 350 |
| 200 | 30 | 100 | C | Europe | Back-to-back | BZB100A | SOD323 (SC-76) | 1.7 x 1.25 x 0.95 | 300 |
| | 40 | 2.4~36 | B2 | Japan | Single | PDZ-B series | | | |
| 250 | 40 | 2.4~75 | B, C | Europe | | BZX384 series | | | |
| 200 | 40 | 2.4~36 | B, B1, B2, B3 | Japan | | PZUxBA series | | | |
| 200 | 60 | 100 | C | Europe | Single | BZX100A | SOD323F (SC-90) | 1.7 x 1.25 x 0.7 | 550 |
| 200 | 40 | 2.4~36 | B, B1, B2, B3 | Japan | | PZUxB series | | | |
| 250 | 40 | 2.4~75 | B, C | Europe | | BZX84J series | | | |
| 200 | 40 | 2.4~15 | C | Europe | Dual c.a. | BZB984 series | SOT663 | 1.6 x 1.2 x 0.55 | 350 |
| 200 | 40 | 2.4~75 | B, C | Europe | Single | BZX585 series | SOD523 (SC-79) | 1.2 x 0.8 x 0.6 | 300 |
| 200 | 40 | 2.4~75 | B, C | Europe | Single | BZX884 series | DFN1006-2 (SOD882) | 1.0 x 0.6 x 0.48 | 250 |
| | | 2.4~36 | B, B2 | Japan | | PZUxBL series | | | |
| 250 | 40 | 2.4~30 | B | Europe | Single | TDZxJ series | SOD323F | 1.7 x 1.25 x 0.7 | 500 |

Notes:
Japan: B selection: app. 5% $V_z$ tolerance, B1, B2, B3 selections: app. 2% $V_z$ tolerance in sequential intervals
Europe: A selection: app. 1% $V_z$ tolerance, B selection: app. 2% $V_z$ tolerance, C selection: app. 5% $V_z$ tolerance; the selections are in overlapping intervals

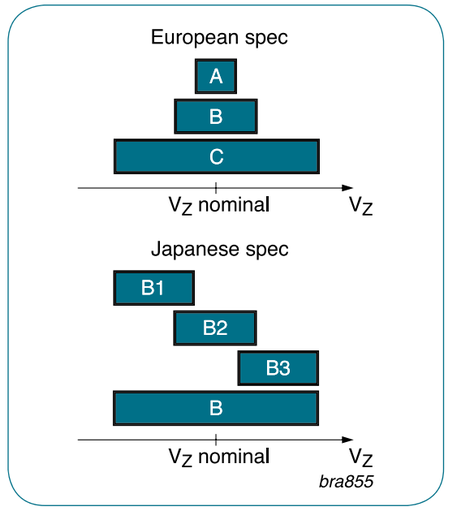
Ave: low-voltage avalanche regulator diodes
Dual c.a.: dual common anode





# Zener diodes specifications

## Differences in Zener specifications




## European spec (BZV, BZX, BZB, 1N47)

| y = | C-series | B-series | A-series |
|---|---|---|---|
| | ±5% | ±2% | ±1% |
| | $V_z$ (V) | $V_z$ (V) | $V_z$ (V) |
| BZX84-y2V4 | 2.2 - 2.6 | 2.35 - 2.45 | 2.37 - 2.43 |
| BZX84-y2V7 | 2.5 - 2.9 | 2.65 - 2.75 | 2.67 - 2.73 |
| BZX84-y3V0 | 2.8 - 3.2 | 2.94 - 3.06 | 2.97 - 3.03 |
| BZX84-y3V3 | 3.1 - 3.5 | 3.23 - 3.37 | 3.26 - 3.34 |
| BZX84-y3V6 | 3.4 - 3.8 | 3.53 - 3.67 | 3.56 - 3.64 |
| BZX84-y3V9 | 3.7 - 4.1 | 3.82 - 3.98 | 3.86 - 3.94 |
| BZX84-y4V3 | 4 - 4.6 | 4.21 - 4.39 | 4.25 - 4.35 |
| BZX84-y4V7 | 4.4 - 5 | 4.61 - 4.79 | 4.65 - 4.75 |
| BZX84-y5V1 | 4.8 - 5.4 | 5 - 5.2 | 5.04 - 5.16 |
| BZX84-y5V6 | 5.2 - 6 | 5.49 - 5.71 | 5.54 - 5.66 |
| BZX84-y6V2 | 5.8 - 6.6 | 6.08 - 6.32 | 6.13 - 6.27 |
| BZX84-y6V8 | 6.4 - 7.2 | 6.66 - 6.94 | 6.73 - 6.87 |
| BZX84-y7V5 | 7 - 7.9 | 7.35 - 7.65 | 7.42 - 7.58 |
| BZX84-y8V2 | 7.7 - 8.7 | 8.04 - 8.36 | 8.11 - 8.29 |
| BZX84-y9V1 | 8.5 - 9.6 | 8.92 - 9.28 | 9 - 9.2 |
| BZX84-y10 | 9.4 - 10.6 | 9.8 - 10.2 | 9.9 - 10.1 |
| BZX84-y11 | 10.4 - 11.6 | 10.8 - 11.2 | 10.8 - 11.11 |
| BZX84-y12 | 11.4 - 12.7 | 11.8 - 12.2 | 11.88 - 12.12 |
| BZX84-y13 | 12.4 - 14.1 | 12.7 - 13.3 | 12.87 - 13.13 |
| BZX84-y15 | 13.8 - 15.6 | 14.7 - 15.3 | 14.85 - 15.15 |
| BZX84-y16 | 15.3 - 17.1 | 15.7 - 16.3 | 15.84 - 16.16 |
| BZX84-y18 | 16.8 - 19.1 | 17.6 - 18.4 | 17.82 - 18.18 |
| BZX84-y20 | 18.8 - 21.2 | 19.6 - 20.4 | 19.8 - 20.2 |
| BZX84-y22 | 20.8 - 23.3 | 21.6 - 22.4 | 21.78 - 22.22 |
| BZX84-y24 | 22.8 - 25.6 | 23.5 - 24.5 | 23.76 - 24.24 |
| BZX84-y27 | 25.1 - 28.9 | 26.5 - 27.5 | 26.73 - 27.27 |
| BZX84-y30 | 28 - 32 | 29.4 - 30.6 | 29.70 - 30.30 |
| BZX84-y33 | 31 - 35 | 32.3 - 33.7 | 32.67 - 33.33 |
| BZX84-y36 | 34 - 38 | 35.3 - 36.7 | 35.64 - 36.36 |
| BZX84-y39 | 37 - 41 | 38.2 - 39.8 | 38.61 - 39.39 |
| BZX84-y43 | 40 - 46 | 42.1 - 43.9 | 42.57 - 43.43 |
| BZX84-y47 | 44 - 50 | 46.1 - 47.9 | - |
| BZX84-y51 | 48 - 54 | 50 - 52 | 50.49 - 51.51 |
| BZX84-y56 | 52 - 60 | 54.9 - 57.1 | - |
| BZX84-y62 | 58 - 66 | 60.8 - 63.2 | - |
| BZX84-y68 | 64 - 72 | 66.6 - 69.4 | - |
| BZX84-y75 | 70 - 79 | 73.5 - 76.5 | 74.25 - 75.75 |

## Japanese spec (PZU, PDZ)

| y = | B-series | B1-series | B2-series | B3-series |
|---|---|---|---|---|
| | ± 5% | ± 2% | ± 2% | ± 2% |
| | $V_z$ (V) | $V_z$ (V) | $V_z$ (V) | $V_z$ (V) |
| PZU2.4y | 2.3 - 2.6 | - | - | - |
| PZU2.7y | 2.5 - 2.9 | 2.5 - 2.75 | 2.65 - 2.9 | - |
| PZU3.0y | 2.8 - 3.2 | 2.8 - 3.05 | 2.95 - 3.2 | - |
| PZU3.3y | 3.1 - 3.5 | 3.1 - 3.35 | 3.25 - 3.5 | - |
| PZU3.6y | 3.4 - 3.8 | 3.4 - 3.65 | 3.55 - 3.8 | - |
| PZU3.9y | 3.7 - 4.1 | 3.7 - 3.97 | 3.87 - 4.1 | - |
| PZU4.3y | 4.01 - 4.48 | 4.01 - 4.21 | 4.15 - 4.34 | 4.28 - 4.48 |
| PZU4.7y | 4.42 - 4.9 | 4.42 - 4.61 | 4.55 - 4.75 | 4.69 - 4.9 |
| PZU5.1y | 4.84 - 5.37 | 4.84 - 5.04 | 4.98 - 5.2 | 5.14 - 5.37 |
| PZU5.6y | 5.31 - 5.92 | 5.31 - 5.55 | 5.49 - 5.73 | 5.67 - 5.92 |
| PZU6.2y | 5.86 - 6.53 | 5.86 - 6.12 | 6.06 - 6.33 | 6.26 - 6.53 |
| PZU6.8y | 6.47 - 7.14 | 6.47 - 6.73 | 6.65 - 6.93 | 6.86 - 7.14 |
| PZU7.5y | 7.06 - 7.84 | 7.06 - 7.36 | 7.28 - 7.6 | 7.52 - 7.84 |
| PZU8.2y | 7.76 - 8.64 | 7.76 - 8.1 | 8.02 - 8.36 | 8.28 - 8.64 |
| PZU9.1y | 8.56 - 9.55 | 8.56 - 8.93 | 8.85 - 9.23 | 9.15 - 9.55 |
| PZU10y | 9.45 - 10.55 | 9.45 - 9.87 | 9.77 - 10.21 | 10.11 - 10.55 |
| PZU11y | 10.44 - 11.56 | 10.44 - 10.88 | 10.76 - 11.22 | 11.1 - 11.56 |
| PZU12y | 11.42 - 12.6 | 11.42 - 11.9 | 11.74 - 12.24 | 12.08 - 12.6 |
| PZU13y | 12.47 - 13.96 | 12.47 - 13.03 | 12.91 - 13.49 | 13.37 - 13.96 |
| PZU14y | - | - | 13.7 - 14.3 | - |
| PZU15y | 13.84 - 15.52 | 13.84 - 14.46 | 14.34 - 14.98 | 14.85 - 15.52 |
| PZU16y | 15.37 - 17.09 | 15.37 - 16.01 | 15.85 - 16.51 | 16.35 - 17.09 |
| PZU18y | 16.94 - 19.03 | 16.94 - 17.7 | 17.56 - 18.35 | 18.21 - 19.03 |
| PZU20y | 18.86 - 21.08 | 18.86 - 19.7 | 19.52 - 20.39 | 20.21 - 21.08 |
| PZU22y | 20.88 - 23.17 | 20.88 - 21.77 | 21.54 - 22.47 | 22.23 - 23.17 |
| PZU24y | 22.93 - 25.57 | 22.93 - 23.96 | 23.72 - 24.78 | 24.54 - 25.57 |
| PZU27y | 25.1 - 28.9 | - | - | - |
| PZU30y | 28 - 32 | - | - | - |
| PZU33y | 31 - 35 | - | - | - |
| PZU36y | 34 - 38 | - | - | - |

## NZX-series in SOD27

| | $V_z$ (V) | | $V_z$ (V) | | $V_z$ (V) |
|---|---|---|---|---|---|
| NZX2V1B | 2.0 - 2.2 | NZX6V2D | 6.1 - 6.4 | NZX14C | 13.8 - 14.3 |
| NZX2V4A | 2.3 - 2.5 | NZX6V2E | 6.3 - 6.6 | NZX15A | 14.1 - 14.7 |
| NZX2V4B | 2.4 - 2.6 | NZX6V8A | 6.4 - 6.7 | NZX15B | 14.5 - 15.1 |
| NZX2V7A | 2.5 - 2.7 | NZX6V8B | 6.6 - 6.9 | NZX15C | 14.9 - 15.5 |
| NZX2V7B | 2.6 - 2.8 | NZX6V8C | 6.7 - 7 | NZX15X | 14.35 - 15.09 |
| NZX2V7C | 2.7 - 2.9 | NZX6V8D | 6.9 - 7.2 | NZX16A | 15.3 - 15.9 |
| NZX3V0A | 2.8 - 3 | NZX7V5A | 7 - 7.3 | NZX16B | 15.7 - 16.5 |
| NZX3V0B | 2.9 - 3.1 | NZX7V5B | 7.2 - 7.6 | NZX16C | 16.3 - 17.1 |
| NZX3V0C | 3 - 3.2 | NZX7V5C | 7.3 - 7.7 | NZX18A | 16.9 - 17.7 |
| NZX3V3A | 3.1 - 3.3 | NZX7V5D | 7.5 - 7.9 | NZX18B | 17.5 - 18.3 |
| NZX3V3B | 3.2 - 3.4 | NZX7V5X | 7.07 - 7.45 | NZX18C | 18.1 - 19 |
| NZX3V3C | 3.3 - 3.5 | NZX8V2A | 7.7 - 8.1 | NZX20A | 18.8 - 19.7 |
| NZX3V6A | 3.4 - 3.6 | NZX8V2B | 7.9 - 8.3 | NZX20B | 19.5 - 20.4 |
| NZX3V6B | 3.5 - 3.7 | NZX8V2C | 8.1 - 8.5 | NZX20C | 20.2 - 21.2 |
| NZX3V6C | 3.6 - 3.8 | NZX8V2D | 8.3 - 8.7 | NZX22A | 20.9 - 21.9 |
| NZX3V9A | 3.7 - 3.9 | NZX9V1A | 8.5 - 8.9 | NZX22B | 21.6 - 22.6 |
| NZX3V9B | 3.8 - 4 | NZX9V1B | 8.7 - 9.1 | NZX22C | 22.3 - 23.3 |
| NZX3V9C | 3.9 - 4.1 | NZX9V1C | 8.9 - 9.3 | NZX24A | 22.9 - 24 |
| NZX4V3A | 4 - 4.2 | NZX9V1D | 9.1 - 9.5 | NZX24B | 23.6 - 24.7 |
| NZX4V3B | 4.1 - 4.3 | NZX9V1E | 9.3 - 9.7 | NZX24C | 24.3 - 25.5 |
| NZX4V3C | 4.2 - 4.4 | NZX10A | 9.5 - 9.9 | NZX24X | 22.61 - 23.77 |
| NZX4V3D | 4.3 - 4.5 | NZX10B | 9.7 - 10.1 | NZX27A | 25.2 - 26.6 |
| NZX4V7A | 4.4 - 4.6 | NZX10C | 9.9 - 10.3 | NZX27B | 26.2 - 27.6 |
| NZX4V7B | 4.5 - 4.7 | NZX10D | 10.2 - 10.6 | NZX27C | 27.2 - 28.6 |
| NZX4V7C | 4.6 - 4.8 | NZX11A | 10.4 - 10.8 | NZX27X | 26.99 - 28.39 |
| NZX4V7D | 4.7 - 4.9 | NZX11B | 10.7 - 11.1 | NZX30A | 28.2 - 29.6 |
| NZX5V1A | 4.8 - 5 | NZX11C | 10.9 - 11.3 | NZX30B | 29.2 - 30.6 |
| NZX5V1B | 4.9 - 5.1 | NZX11D | 11.1 - 11.6 | NZX30C | 30.2 - 31.6 |
| NZX5V1C | 5 - 5.2 | NZX12A | 11.4 - 11.9 | NZX30X | 29.02 - 30.51 |
| NZX5V1D | 5.1 - 5.3 | NZX12B | 11.6 - 12.1 | NZX33A | 31.2 - 32.6 |
| NZX5V6A | 5.2 - 5.5 | NZX12C | 11.9 - 12.4 | NZX33B | 32.2 - 33.6 |
| NZX5V6B | 5.3 - 5.6 | NZX12D | 12.2 - 12.7 | NZX33C | 33.2 - 34.5 |
| NZX5V6C | 5.4 - 5.7 | NZX12X | 11.44 - 12.03 | NZX36A | 34.2 - 35.7 |
| NZX5V6D | 5.5 - 5.8 | NZX13A | 12.4 - 12.9 | NZX36B | 35.3 - 36.8 |
| NZX5V6E | 5.6 - 5.9 | NZX13B | 12.6 - 13.1 | NZX36C | 36.4 - 38 |
| NZX6V2A | 5.7 - 6 | NZX13C | 12.9 - 13.4 | NZX36X | 35.36 - 37.19 |
| NZX6V2B | 5.8 - 6.1 | NZX14A | 13.2 - 13.7 | | |
| NZX6V2C | 6 - 6.3 | NZX14B | 13.5 - 14 | | |

## General-purpose high-speed switching diodes < 90 V

types in **bold** represent new products

| $V_R$ max (V) | $V_F$ max (V) | @ $I_F$ (mA) | $I_R$ max (nA) | @ $V_R$ (V) | $t_{rr}$ max (ns) | Package | SOD80C (MiniMelf) | SOT23 | SOT143B | SOT323 (SC-70) | SOT363 (SC-88) | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Size (mm) | 3.5 x 1.5 x 1.5 | 2.9 x 1.3 x 1.0 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.1 x 1.0 x 0.37 | 1.0 x 0.6 x 0.48 |
| | | | | | | $P_{tot}$ (mW) | 500 | 250 | 250 | 200 | 300 | 540 | 250 |
| 50 | 1 | 50 | 100 | 50 | 4 | | | BAL74 | | | | | |
| | | | | | | | | BAV74 | | | | | |
| 70 | 1 | 50 | 1000 | 70 | 4 | | | BAL99 | | | | | |
| 75 | 1 | 50 | 1000 | 75 | 4 | | | | BAS28 | | | | |
| | | 100 | 5000 | 75 | 4 | | BAS32L | | | | | | |
| 80 | 1 | 50 | 500 | 80 | 4 | | | | | 1PS300 | | | |
| | | | | | | | | | | 1PS301 | | | |
| | | | | | | | | | | 1PS302 | | | |
| | | | | | | | | BAW56 | | BAW56W | | **BAW56QA** | BAW56M |
| 90 | 1 | 50 | 500 | 80 | 4 | | | | | | BAW56S | | |
| | | | | | | | | | | | BAV756S | | |

## General-purpose, high-speed switching diodes 100 V

types in **bold** represent new products

| $V_R$ max (V) | $V_F$ max (V) | @ $I_F$ (mA) | $I_R$ max (nA) | @ $V_R$ (V) | $t_{rr}$ max (ns) | Package | SOT23 | SOD123F | SOT323 (SC-70) | SOT363 (SC-88) | SOD323 (SC-76) | SOD323F (SC-90) | SOT666 | SOD523 (SC-79) | DFN1010D-3 (SOT1215) | DFN1006-2 (SOD882) | DFN1006-3 (SOT883) | DFN1006D-2 (SOD882D) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Size (mm) | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7 | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6 | 1.1 x 1.0 x 0.37 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| | | | | | | $P_{tot}$ (mW) | 250 | 830 | 200 | 300 | 400 | 550 | 180 | 500 | 540 | 250 | 250 | 250 |
| 100 | 1 | 50 | 500 | 80 | 4 | | | BAS16H | | | BAS316 | BAS16J | | BAS516 | | BAS16L | | BAS16LD |
| | | | | | | | BAS16 | | BAS16W | | | | | | **BAS16QA** | | | |
| | | | | | | | | | | BAS16VY | | | BAS16VV | | | | | |
| | | | | | | | BAV70 | | BAV70W | | | | | | **BAV70QA** | | BAV70M | |
| | | | | | | | | | | BAV70S | | | | | | | | |
| | | | | | | | BAV99 | | BAV99W | | | | | | **BAV99QA** | | | |
| | | | | | | | | | | BAV99S | | | | | | | | |





## General-purpose switching diodes ≥ 100 V

types in **bold** represent new products

| $V_R$ max (V) | $V_F$ max (V) | @ $I_F$ (mA) | $I_R$ max (nA) | @ $V_R$ (V) | $t_{rr}$ max (ns) | Package | SOD80C (MiniMelf) | SOT457 (SC-74) | SOT23 | SOT143B | SOD123F | SOT323 (SC-70) | SOT353 (SC-88A) | SOT363 (SC-88) | SOD323 (SC-76) | SOD323F (SC-90) | SOD523 (SC-79) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Size (mm) | 3.5 x 1.5 x 1.5 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7 | 1.2 x 0.8 x 0.6 |
| | | | | | | $P_{tot}$ (mW) | 300 | 500 | 250 | 250 | 830 | 350 | | 300 | 400 | 550 | 500 |
| 100 | 1 | 100 | 100 | 100 | 50 | | | | BAS19 | | | | | | | | |
| 150 | 1 | 100 | 100 | 150 | 50 | | BAV102 | | | | | | | | | | |
| | | | | | | | | | BAS20 | | | | | | | | |
| ≥200 | 1 | 100 | 100 | 150 | 50 | | BAV103 | | | | BAS21H | | | | BAS321 | | |
| | | | | 200 | | | | | BAS21 | | | BAS21W | | | | | |
| | | | | | | | | | | BAV23 | | | | | | | |
| | | | | | | | | | | | | | **BAS21PG** | | | | |
| | | | | | | | | | BAV23A | | | BAS21AW | | | | | |
| | | | | | | | | | BAV23C | | | | | | | | |
| | | | | | | | | | BAV23S | | | BAS21SW | | | | | |
| | | | | | | | | BAS21AVD | | | | | | | | | |
| | | | | | | | | BAS21VD | | | | | | | | | |
| 300 | 1.1 | 100 | 150 | 250 | 50 | | | | | | | | | | | BAS21J | BAS521 |
| | | | | | | | | | BAS101 | | | | | | | | |
| | | | | | | | | | BAS101S | | | | | | | | |
| | | | | | | | | | | BAW101 | | | | | | | |
| | | | | | | | | | | | | | | BAW101S | | | |

## PN-rectifier

| $V_R$ max (V) | $V_F$ max (V) | (@) $I_F$ (A) | IR max (µA) | (@) $V_R$ (V) | trr max (ns) | Package | CFP3 SOD123W |
|---|---|---|---|---|---|---|---|
| | | | | | | Size (mm) | 2.6 x 1.7 x 1.0 |
| | | | | | | $P_{tot}$ (mW) | 950 |
| 400 | 1.1 | 1 | 1 | 400 | 1800 | | PNS40010ER |

**In the spotlight**

**Dual high-speed switching diode BAS21PG in SOT353 (SC-88A)**

- $V_R$ max = 250 V, $I_F$ max = 225 mA, dual isolated configuration
- Low leakage current: $I_R$ max = 100 nA
- High-speed switching: $t_{rr}$ max = 50 ns
- Low capacitance: $C_d$ max = 2 pF
- AEC-Q101 qualified

## Controlled-avalanche switching diodes

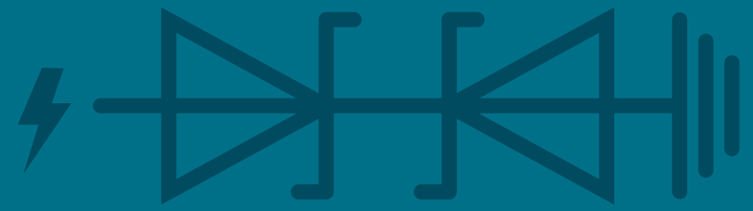
| $V_R$ max (V) | $V_F$ max (V) | @ $I_F$ (mA) | $I_R$ max (nA) @ $V_R$ max | $I_{FSM}$ max (A) | $I_{FRM}$ max (mA) | $C_d$ max (pF) | $t_{rr}$ max (ns) | Package | SOT23 | SOT143B |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Size (mm) | 2.9 x 1.3 x 1.0 | 2.9 x 1.3 x 1.0 |
| | | | | | | | | $P_{tot}$ (mW) | 250 | 250 |
| 60 | 1 | 200 | 100 | 9 | 600 | 2.5 | 6 | | | BAS56 |
| 90 | 1 | 200 | 100 | 10 | 600 | 35 | 50 | | BAS29 | |
| | | | | | | | | | BAS31 | |
| | | | | | | | | | BAS35 | |

## Low-leakage current-switching diodes

types in **bold** represent new products

| $V_R$ max (V) | $V_F$ max (V) | @ $I_F$ (mA) | $I_R$ max (nA) @ $V_R$ max | $t_{rr}$ max (µs) | Package | SOD80C (MiniMelf) | SOD68 (DO-34) | SOT23 | SOD123F | SOT323 (SC-70) | SOD323 (SC-76) | SOD523 (SC-79) | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883) | DFN1006-2 (SOD882) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Size (mm) | 3.5 x 1.5 x 1.5 | 3.04 x 1.6 x 0.55 | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.95 | 1.2 x 0.8 x 0.6 | 1.1 x 1.0 x 0.37 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.48 |
| | | | | | $P_{tot}$ (mW) | 300 | 500 | 250 | 830 | 250 | 400 | 500 | 540 | 250 | 250 |
| 75 | 1 | 10 | 5 | 3 | | | | | BAS116H | | BAS416 | BAS716 | | | **BAS116L** |
| | | | | | | | | BAS116 | | | | | **BAS116QA** | | |
| | | | | | | | | BAV199 | | BAV199W | | | | | |
| | | | | | | | | BAW156 | | | | | | | |
| | | | | | | | | BAV170 | | | | | **BAV170QA** | **BAV170M** | |
| 125 | 1 | 100 | 1 | 1.5 typ | | BAS45AL | BAS45A | | | | | | | | |





# ESD protection, TVS, filtering and signal conditioning

# ESD protection, TVS devices, and EMI filtering

## What you get when you choose NXP

### Solutions for wide application fields

- High-speed data lines
- General interfaces
- Automotive protection
- Supply lines

### A broad range of packages that simplify PCB design

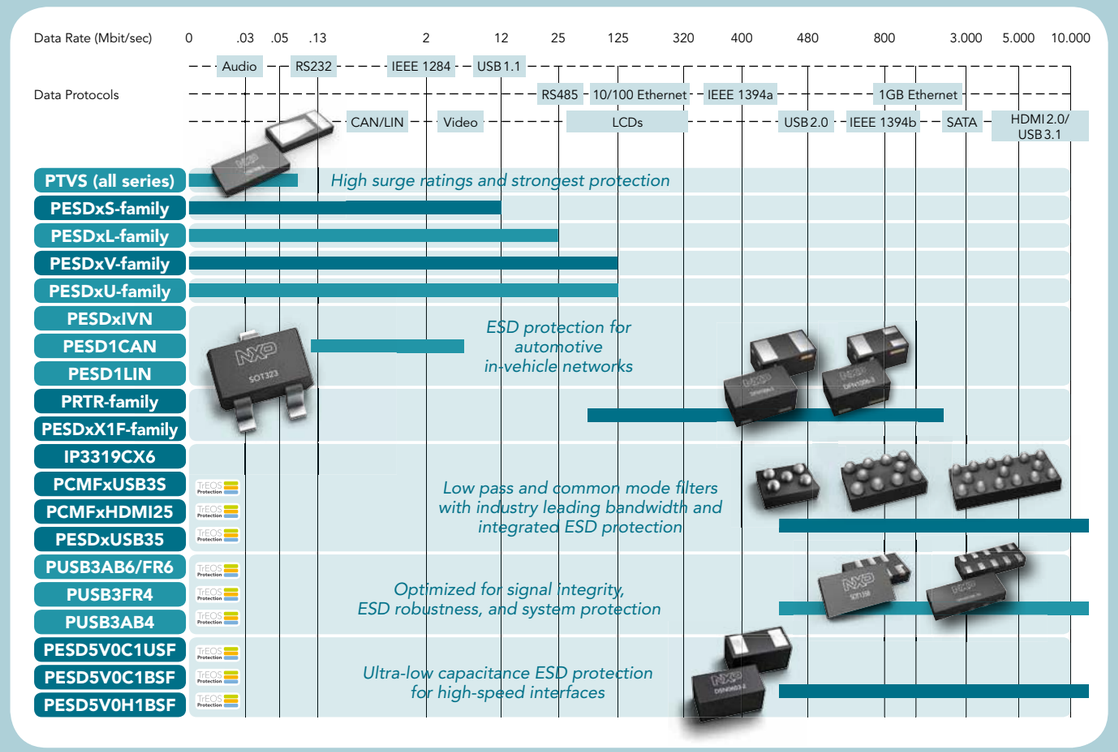
### A quality product from an experienced, high volume supplier

- NXP is strongly committed to automotive quality standards
- NXP has a track record of more than 12 years in developing and producing ESD / TVS devices
- NXP is the #1 in ESD protection with a high production capacity

USB3 / Type C
USB2 / Type C
USB Vbus / charger port / Type C
NFC antenna
Wireless charging
Audio speaker
Battery contact, Vbat
Keys / buttons
SIM, SD3
Audio

CAN, LIN
FlexRay
BroadR-Reach
SENT
LVDS

### Portfolio Overview Diodes




TrEOS Protection

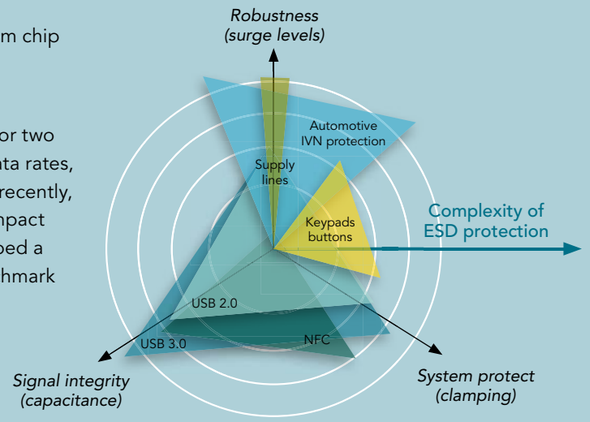
## The best system-chip protection for high-speed data lines (USB 3.1, Type-C connector)

### ESD protection characteristics that count

There are three key parameters for a perfect ESD protection device:

- High robustness against ESD pulses
- Low clamping / dynamic resistance – to protect the system chip
- Low capacitance – to maintain excellent signal integrity in high-speed interfaces

Some applications require good performance in only one or two of these areas. For the latest interfaces with the highest data rates, optimum performance in all three parameters is key. Until recently, improving one the these key parameters had a negative impact on the others. Addressing this challenge, NXP has developed a new ESD technology (TrEOS Protection) that delivers benchmark performance in all three key parameters.




TrEOS Protection = **Extremely low clamping voltage**

Absorbing highest ESD pulses THE key for reliable system protection

+

- Low capacitance down to 0.1 pF
- High robustness up to 9A, 8/20 µs
- Packages optimized for communications interfaces

### TrEOS Protection devices

| Type | device | VRWM (V) | Uni- or bidirectional | Cd typ (pF) | ESD rating max (kV) (Ω) | Rdyn TLP (Ω) | Number of protected lines | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|
| PUSB3FR4 | ESD protection | 3.3 | uni | 0.29 | 15 | 0.27 | 4 | DFN2510A-10 | 2.5 x 1.0 x 0.48 |
| PUSB3FR6 | ESD protection | 3.3 | uni | 0.35 | 15 | 0.29 | 6 | DFN2111-7 | 2.1 x 1.1 x 0.48 |
| PUSB3AB4 | ESD protection | 3.3 | bi | 0.17 | 15 | 0.4 | 4 | DFN2510A-10 | 2.5 x 1.0 x 0.48 |
| PUSB3AB6 | ESD protection | 3.3 | bi | 0.15 | 15 | 0.4 | 6 | DFN2111-7 | 2.1 x 1.1 x 0.48 |
| PCMF1USB3S | Common Mode Filter with ESD protection | 5 | uni | 0.3 | 15 | 0.14 | 2 | WLCSP5 | 0.8 x 1.2 x 0.5 |
| PCMF2USB3S | Common Mode Filter with ESD protection | 5 | uni | 0.3 | 15 | 0.14 | 4 | WLCSP10 | 1.6 x 1.2 x 0.5 |
| PCMF3USB3S | Common Mode Filter with ESD protection | 5 | uni | 0.3 | 15 | 0.14 | 6 | WLCSP15 | 2.4 x 1.2 x 0.5 |
| PESD3V3C1BSF | ESD protection | 3.3 | bi | 0.2 | 20 | 0.23 | 1 | DSN0603-2 | 0.6 x 0.3 x 0.3 |
| PESD5V0R1BSF | ESD protection | 5 | bi | 0.1 | 10 | 0.45 | 1 | DSN0603-2 | 0.6 x 0.3 x 0.3 |
| PESD5V0H1BSF | ESD protection | 5 | bi | 0.15 | 15 | 0.25 | 1 | DSN0603-2 | 0.6 x 0.3 x 0.3 |
| PESD5V0C1BSF | ESD protection | 5 | bi | 0.2 | 20 | 0.23 | 1 | DSN0603-2 | 0.6 x 0.3 x 0.3 |
| PESD5V0C1USF | ESD protection | 5 | uni | 0.45 | 20 | 0.1 | 1 | DSN0603-2 | 0.6 x 0.3 x 0.3 |

# Tiny but mighty – DSN0402

## Reliable ESD protection on minimal space

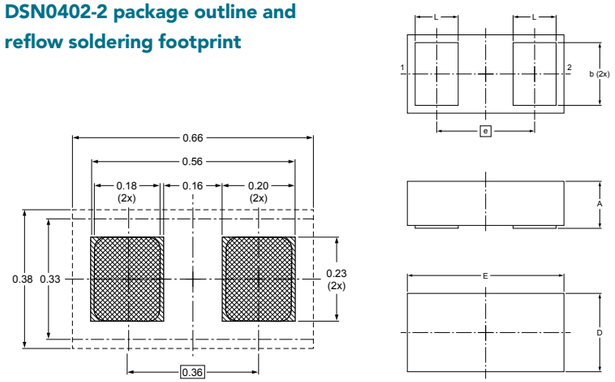
### DSN0402-2 (SOD992) features and benefits

- Ultra-small dimensions: 0.4 x 0.2 mm (01005 inch)
- 45% less package area compared to DSN0603-2
- Only 120 µm in height
- Coated sidewalls enable easier soldering
- Polarity marking
- Halogen and antimony free; RoHS compliant


**DSN0402-2 (SOD992)**

Single package
0.4 x 0.2 x 0.12 mm

### DSN0402-2 package outline and reflow soldering footprint




Dimensions (mm are the original dimensions)

| Unit | | A | E | D | L | b | e |
|---|---|---|---|---|---|---|---|
| mm | max | 0.14 | 0.42 | 0.22 | 0.12 | 0.17 | |
| | nom | 0.12 | 0.40 | 0.20 | 0.11 | 0.16 | 0.25 |
| | min | 0.10 | 0.38 | 0.18 | 0.10 | 0.15 | |

### Ultra-low capacitance in DSN0402

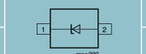
| Type | $V_{rwm}$ | Config | $C_d$ typ | $C_d$ max | $V_{esd}$ |
|---|---|---|---|---|---|
| PESD5V0F1BSH | 5 V | Bi | 0.25 pF | 0.3 pF | 8 kV |





## Ultra low-capacitance ESD protection devices – Part 1

types in **bold** represent new products

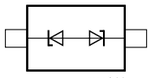
| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | ESD rating [1] max (kV) | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | |
| | | 5 | 0.45 | 0.5 | 20 |  | **PESD5V0C1USF** | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | 5 | 0.6 | 0.75 | 10 | | PESD5V0F1USF | | |
| | | 5 | 0.95 | 1.15 | 8 | | PESD5V0X1ULD | DFN1006D-2 (SOD882D)  | 1.0 x 0.6 x 0.37 |
| | | | 1.55 | 1.75 | 15 | | PESD5V0X1UALD | | |
| | | 16 | 0.83 | 0.98 | 8 | | PESD16VX1UL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | 5 | 0.95 | 1.15 | 8 | | PESD5V0X1UB | SOD523 (SC-79)  | 1.2 x 0.8 x 0.6 |
| | | | 1.55 | 1.75 | 15 | | PESD5V0X1UAB | | |
| | | 80 | 0.6 | 0.75 | 30 |  | NUP1301U | SOT323  | 2.0 x 1.25 x 0.95 |
| | | | | | | | NUP1301 | SOT23  | 2.9 x 1.3 x 1.0 |
| 0 | 1 | 5 | 0.3 | 0.4 | 8 |  | **PESD5V0F1BSH** | DSN0402-2 (SOD992)  | 0.4 x 0.2 x 0.12 |
| | | 3.3 | 0.2 | 0.25 | 20 | | **PESD3V3C1BSF** | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | 5 | 0.1 | 0.15 | 10 | | **PESD5V0R1BSF** | | |
| | | | 0.15 | 0.2 | 15 | | **PESD5V0H1BSF** | | |
| | | | 0.2 | 0.25 | 20 | | **PESD5V0C1BSF** | | |
| | | 5.5 | 0.25 | 0.3 | 10 | | PESD5V0F1BSF | | |
| | | | | | | | PESD5V0F1BRSF | | |
| | | 3.3 | – | 1.1 | 20 | | **PESD3V3X1BCSF** | | |
| | | 5.0 | – | 1.1 | | | **PESD5V0X1BCSF** | | |
| | | 18 | 0.28 | 0.45 | 10 |  | **PESD18VF1BSF** | | |
| | | 24 | 0.25 | 0.4 | | | **PESD24VF1BSF** | | |
| | | 5 | 0.4 | 0.55 | 10 | | PESD5V0F1BLD | DFN1006D-2 (SOD882D)  | 1.0 x 0.6 x 0.37 |
| | | | | | | | PESD5V0F1BRLD | | |
| | | 3.3 | 1.3 | 1.6 | 9 | | PESD3V3X1BL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | 5.5 | 0.4 | 0.55 | 10 | | PESD5V0F1BL | | |
| | | 5 | 0.49 | 0.6 | 8 | | PESD5V0X1BCL | | |
| | | | 0.85 | 0.95 | 15 | | PESD5V0X1BCAL | | |
| | | | 0.9 | 1.3 | 9 | | PESD5V0X1BL | | |
| | | 18 | 0.35 | 0.5 | 10 | | PESD18VF1BL | | |
| | | 24 | 0.3 | 0.45 | 10 | | PESD24VF1BL | | |

[1] according to IEC 61000-4-2 (contact discharge)

### In the spotlight

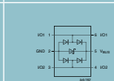
**Ultra low-capacitance ESD protection in DSN0603-2: PESD5V0H1BSF**

- Bidirectional protection for one data line in DSN0603-2
- Ultra-low line capacitance of 0.15 pF
- Ultra-low clamping
- Minimized capacitance variation over voltage
- High ESD robustness = 15 kV
- Ultra-small package DSN0603-2 (0.6 x 0.3 x 0.3 mm)




# Ultra low-capacitance ESD protection devices – Part 2

types in **bold** represent new products

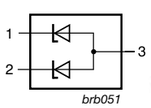
| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | ESD rating [1] max (kV) | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | |
| 2 | 1 | 5 | 0.5 | 0.65 | 10 |  | PESD5V0X2UMB | DFN1006B-3 (SOT883B)  | 1.0 x 0.6 x 0.37 |
| | | | | | | | PESD5V0X2UM | DFN1006-3 (SOT883)  | 1.0 x 0.6 x 0.48 |
| | | | 0.8 | 0.95 | 15 | | PESD5V0X2UAMB | DFN1006B-3 (SOT883B)  | 1.0 x 0.6 x 0.37 |
| | | | | | | | PESD5V0X2UAM | DFN1006-3 (SOT883)  | 1.0 x 0.6 x 0.48 |
| | | | 0.9 | 1.3 | 9 |  | PESD5V0X1BQ | SOT663  | 1.6 x 1.2 x 0.55 |
| | | | | | | | PESD5V0X1BT | SOT23  | 2.9 x 1.3 x 1.0 |
| | 0 | 5.5 | 1 | 1.5 | 8 |  | PRTR5V0U2X | SOT143B  | 2.9 x 1.3 x 1.0 |
| | | | 1.8 | - | 12 | | PRTR5V0U2AX | | |
| | | | 1 | 1.5 | 8 |  | PRTR5V0U2F | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |

[1] according to IEC 61000-4-5 (contact discharge)

## In the spotlight

**Lowest capacitance ESD protection in DFN1006B-3: PESD5V0X2UAMB**

- Unidirectional double protection for two signal lines
- Ultra-low line capacitance of 0.8 pF
- Very low package height of 0.37 mm typ
- High ESD robustness of 15 kV
- AEC-Q101 qualified
- Ideal for high-speed data lines, portable electronics, and communication systems



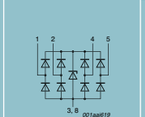
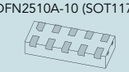






# Ultra low-capacitance ESD protection devices – Part 3

types in **bold** represent new products

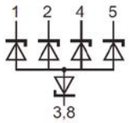
| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | ESD rating [1] max (kV) | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | |
| 4 | 0 | 5.5 | 1 | - | 8 |  | IP4220CZ6 | SOT457 (SC-74)  | 2.9 x 1.5 x 1.0 |
| | | | | | |  | IP4221CZ6-S | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | | | | | |  | IP4221CZ6-XS | DFN1010-6 (SOT891)  | 1.0 x 1.0 x 0.48 |
| | | | | | |  | PRTR5V0U4D | SOT457 (SC-74)  | 2.9 x 1.5 x 1.0 |
| | | | 0.8 | - | 12 |  | IP4285CZ9-TBB | DFN2110-9 (SOT1178)  | 2.1 x 1.0 x 0.48 |
| | | | | | | | **PUSB2X4D** | SOT457 (SC-74)  | 2.9 x 1.5 x 1.0 |
| | | | | | | | **PUSB2X4Y** | SOT363 (SC-88)  | 2.0 x 1.25 x 0.95 |
| | | | 0.6 | - | 8 |  | IP4283CZ10-TBR | DFN2510A-10 (SOT1176)  | 2.5 x 1.0 x 0.48 |

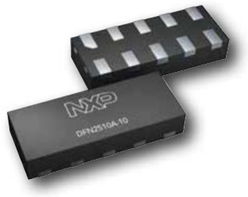
[1] according to IEC 61000-4-5 (contact discharge)

**In the spotlight**

**PUSB3AB4 - ESD protection in very small DFN2510A-10 package for USB3.1 @ 10 Gbps and Thunderbolt**

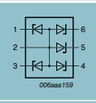
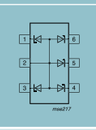
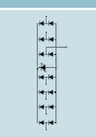
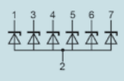
- Protects four very fast data lines of sensitive system chips
- Lowest clamping in the 0.2 pF class
- Very small DFN2510A-10 package (2.5 x 1.0 x 0.48 mm)
- Capacitance < 0.2 pF




## Ultra low-capacitance ESD protection devices – Part 4

types in **bold** represent new products

| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | ESD rating [1] max (kV) | $I_R$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | | |
| 4 | 0 | 5.5 | 0.5 | - | 10 | - |  | IP4294CZ10-TBR | DFN2510A-10 (SOT1176)  | 2.5 x 1.0 x 0.48 |
| | | | | | | | | PUSB3F96 | | |
| | | 3.3 | 0.27 | - | 15 | 0.1 |  | **PUSB3FR4** | | |
| 0 | 3 | 3.3 | 0.17 | 0.2 | | |  | **PUSB3AB4** | | |
| 5 | 4 | 5 | 0.55 | 0.7 | 8 | 0.1 |  | PESD5V0F5UF | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | | | | | | |  | PESD5V0F5UV | SOT666  | 1.6 x 1.2 x 0.55 |
| 0 | 6 | 5.5 | 0.27 | 0.35 | 10 | 0.1 |  | PUSB3TB6 | DFN2111-7 (SOT1358)  | 2.1 x 1.1 x 0.48 |
| 6 | 0 | 3.3 | 0.25 | - | 15 | |  | **PUSB3FR6** | | |
| 0 | 6 | 3.3 | 0.15 | 0.2 | 15 | |  | **PUSB3AB6** | | |

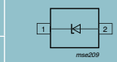
[1] according to IEC 61000-4-2 (contact discharge)





## Low-capacitance ESD protection devices – Part 1

types in **bold** represent new products

| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | $P_{PP}$ [1] max (W) | ESD rating [2] max (kV) | $I_R$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | | | |
| 1 | 0 | 3.3 | 34 | 40 | 45 | 30 | 0.3 |  | PESD3V3L1UL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | 5 | 25 | 30 | 42 | 26 | 0.1 | | PESD5V0L1UL | | |
| | | 5 | 25 | 30 | 42 | 26 | 0.1 | | PESD5V0L1ULD | DFN1006D-2 (SOD882D)  | 1.0 x 0.6 x 0.37 |
| | | 3.3 | 34 | 40 | 45 | 30 | 0.3 | | PESD3V3L1UB | SOD523 (SC-79)  | 1.2 x 0.8 x 0.6 |
| | | 5 | 25 | 30 | 42 | 26 | 0.1 | | PESD5V0L1UB | | |
| | | 5 | 25 | 30 | 42 | 26 | 0.1 | | PESD5V0L1UA | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |
| | | 5 | 12 | 15 | 10 | 30 | 0.1 | | PESD5V0L1USF | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | 3.3 | 2.6 | 3.1 | - | 9 | 0.1 (@ 3 V) | | PESD3V3U1UL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | 5 | 2 | 2.6 | - | 9 | 0.1 | | PESD5V0U1UL | | |
| | | 3.3 | 2.6 | 3.1 | - | 9 | 0.1 (@ 3 V) | | PESD3V3U1UB | SOD523 (SC-79)  | 1.2 x 0.8 x 0.6 |
| | | 5 | 2 | 2.6 | - | 9 | 0.1 | | PESD5V0U1UB | | |
| | | 3.3 | 2.6 | 3.1 | - | 9 | 0.1 (@ 3 V) | | PESD3V3U1UA | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |
| | | 5 | 2 | 2.6 | - | 9 | 0.1 | | PESD5V0U1UA | | |
| 0 | 1 | 5.5 | 12 | 15.4 | 35 | 30 | 0.1 |  | PESD5V0L1BSF | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | 3.3 | 101 | - | 500 | 30 | 2 | | PESD3V3L1BA | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |
| | | 5 | 75 | - | 500 | 30 | 1 | | PESD5V0L1BA | | |
| | | 12 | 19 | - | 200 | 30 | 0.05 | | PESD12VL1BA | | |
| | | 15 | 16 | - | 200 | 30 | 0.05 | | PESD15VL1BA | | |
| | | 24 | 11 | - | 200 | 23 | 0.05 | | PESD24VL1BA | | |

[1] 8 / 20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

[2] according to IEC 61000-4-2 (contact discharge)

# Low-capacitance ESD protection devices – Part 2

types in **bold** represent new products

| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | $P_{PP}$ [1] max (W) | ESD rating [2] max (kV) | $I_R$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | | | |
| 0 | 1 | 5 | 11 | 13 | 45 | 30 | 0.01 |  | PESD5V0V1BL | DFN1006-2 (SOD882) | 1.0 x 0.6 x 0.48 |
| | | 5 | 11 | 13 | 45 | 30 | 0.01 | | PESD5V0V1BLD | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37 |
| | | 5 | 11 | 13 | 45 | 30 | 0.01 | | PESD5V0V1BB | SOD523 (SC-79) | 1.2 x 0.8 x 0.6 |
| | | 5 | 11 | 13 | 45 | 30 | 0.01 | | PESD5V0V1BA | SOD323 (SC-76) | 1.7 x 1.25 x 0.95 |
| | | 5 | 5.3 | 6 | 10 | 20 | 0.1 | | PESD5V0V1BCSF | DSN0603-2 (SOD962) | 0.6 x 0.3 x 0.3 |
| | | 5 | 5.3 | 6 | 20 | 25 | 0.1 | | PESD5V0V1BDSF | | |
| | | 5.5 | 3.5 | 4.5 | 8 | 15 | 0.1 | | PESD5V0V1BSF | | |
| | | 12 | 17 | 25 | 290 | 30 | 0.01 | | PESD12VV1BL | DFN1006-2 (SOD882) | 1.0 x 0.6 x 0.48 |
| | | 15 | 8 | 10 | - | 15 | 0.1 | | IP4302CX2/A | WLCSP2 | 0.7 x 0.52 x 0.40 |
| | | 5 | 2.9 | 3.5 | - | 10 | 0.1 | | PESD5V0U1BL | DFN1006-2 (SOD882) | 1.0 x 0.6 x 0.48 |
| | | | | | | | | | PESD5V0U1BLD | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37 |
| | | | | | | | | | PESD5V0U1BB | SOD523 (SC-79) | 1.2 x 0.8 x 0.6 |
| | | | | | | | | | PESD5V0U1BA | SOD323 (SC-76) | 1.7 x 1.25 x 0.95 |
| 2 | 1 | 3.3 | 22 | 28 | 30 | 15 | 0.3 |  | PESD3V3L2UM | DFN1006-3 (SOT883) | 1.0 x 0.6 x 0.48 |
| | | 5 | 16 | 19 | 30 | 15 | 0.025 | | PESD5V0L2UM | | |
| | | | | | - | 15 | 0.025 | | PESD5V0L2UMB | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37 |
| | | | 38 | 46 | 70 | 30 | 0.09 (@ 4 V) |  | PESD5V0L2UU | SOT323 (SC-70) | 2.0 x 1.25 x 0.95 |
| | | 6 | 34 | 40 | 60 | 30 | 0.018 (@ 4.3 V) | | PESD6V0L2UU | | |

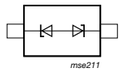
[1] 8 / 20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

[2] according to IEC 61000-4-5 (contact discharge)

## In the spotlight

**PESD12VV1BL: Lowest capacitance ESD protection in DFN1006-2**

- Bidirectional protection for one data line
- Very low line capacitance of 17 pF
- High ESD robustness of 30 kV
- AEC-Q101 qualified
- Ultra-small package DFN1006-2 (SOD882) with a height of only 0.48 mm typ
- Ideal for portable electronics, communication systems, or audio and video equipment



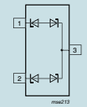
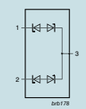
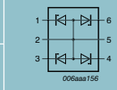
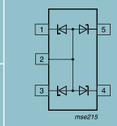
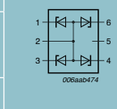
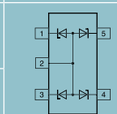






# Low-capacitance ESD protection devices – Part 3

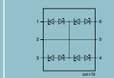
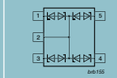
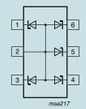
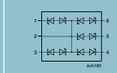
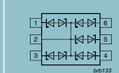
types in **bold** represent new products

| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | $P_{PP}$ [1] max (W) | ESD rating [2] max (kV) | $I_R$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | | | |
| 0 | 2 | 3.3 | 101 | | 350 | 30 | 2 |  | PESD3V3L2BT | SOT23 | 2.9 x 1.3 x 1.0 |
| | | 5 | 75 | | | 30 | 1 | | PESD5V0L2BT | | |
| | | 12 | 19 | - | | 30 | 0.05 | | PESD12VL2BT | | |
| | | 15 | 16 | | 200 | 30 | 0.05 | | PESD15VL2BT | | |
| | | 24 | 11 | | | 23 | 0.05 | | PESD24VL2BT | | |
| | | 5 | 35 | 45 | 130 | 30 | 0.1 | | PESD5V0S2BT | | |
| | | | 2.9 | 3.5 | - | 10 | 0.1 | | PESD5V0U2BT | | |
| | | | | | - | | |  | PESD5V0U2BM | DFN1006-3 (SOT883) | 1.0 x 0.6 x 0.48 |
| | | | | | - | | | | PESD5V0U2BMB | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37 |
| | | | 18 | 20 | 110 | 30 | 0.01 | | **PESD5V0V2BM** | DFN1006-3 (SOT883) | |
| | | | | | | | | | **PESD5V0V2BMB** | DFN1006B-3 (SOT883B) | |
| 4 | 3 | 3.3 | 22 | 28 | 30 | 20 | 0.3 |  | PESD3V3L4UF | DFN1410-6 (SOT886) | 1.45 x 1.0 x 0.48 |
| | | 5 | 16 | 19 | 30 | 20 | 0.025 | | PESD5V0L4UF | | |
| | | 3.3 | 22 | 28 | 30 | 20 | 0.3 |  | PESD3V3L4UW | SOT665 | 1.6 x 1.2 x 0.55 |
| | | 5 | 16 | 19 | 30 | 20 | 0.025 | | PESD5V0L4UW | | |
| | | 3.3 | 22 | 28 | 30 | 20 | 0.3 | | PESD3V3L4UG | SOT353 (SC-88A) | 2.0 x 1.25 x 0.95 |
| | | 5 | 16 | 19 | 30 | 20 | 0.025 | | PESD5V0L4UG | | |
| | | 3.3 | 13 | 17 | 25 | 10 | 1 |  | PESD3V3V4UK | DFN1010-6 (SOT891) | 1.0 x 1.0 x 0.48 |
| | | 5 | 12 | 15 | 25 | 15 | 0.3 | | PESD5V0V4UK | | |
| | | 9 | 6.5 | 10 | 28 | 8 | 0.1 | | PESD9V0V4UK | | |
| | | 3.3 | 15 | 18 | 16 | 12 | 0.3 |  | PESD3V3V4UW | SOT665 | 1.6 x 1.2 x 0.55 |
| | | 5 | 12 | 15 | 16 | 12 | 0.025 | | PESD5V0V4UW | | |

[1] 8 / 20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

[2] according to IEC 61000-4-5 (contact discharge)

# Low-capacitance ESD protection devices – Part 4

| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | $P_{PP}$ [1] max (W) | ESD rating [2] max (kV) | $I_R$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | | | |
| 0 | 4 | 5 | 2.9 | 3.5 | - | 10 | 0.1 |  | PESD5V0U4BF | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | | 5 | 2.9 | 3.5 | - | 10 | 0.1 |  | PESD5V0U4BW | SOT665  | 1.6 x 1.2 x 0.55 |
| 5 | 4 | 3.3 | 20 | 24 | 28 | 15 | 2 |  | PESD3V3L5UK | DFN1010-6 (SOT891)  | 1.0 x 1.0 x 0.48 |
| | | 5 | 18.5 | 22 | 30 | 20 | 0.5 | | PESD5V0L5UK | | |
| | | 3.3 | 22 | 28 | 25 | 20 | 0.3 | | PESD3V3L5UF | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | | 5 | 16 | 19 | 25 | 20 | 0.025 | | PESD5V0L5UF | | |
| | | 3.3 | 22 | 28 | 25 | 20 | 0.3 |  | PESD3V3L5UV | SOT666  | 1.6 x 1.2 x 0.55 |
| | | 5 | 16 | 19 | 25 | 20 | 0.025 | | PESD5V0L5UV | | |
| | | 3.3 | 22 | 28 | 25 | 20 | 0.3 | | PESD3V3L5UY | SOT363 (SC-88)  | 2.0 x 1.25 x 0.95 |
| | | 5 | 16 | 19 | 25 | 20 | 0.025 | | PESD5V0L5UY | | |
| 0 | 5 | 5 | 2.9 | 3.5 | - | 10 | 0.1 |  | PESD5V0U5BF | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | | 5 | 2.9 | 3.5 | - | 10 | 0.1 |  | PESD5V0U5BV | SOT666  | 1.6 x 1.2 x 0.55 |

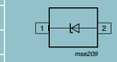
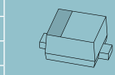
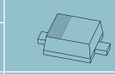
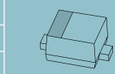
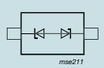
[1] 8 / 20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

[2] according to IEC 61000-4-5 (contact discharge)





# Standard ESD protection devices – Part 1

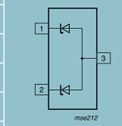
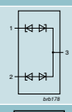
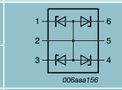
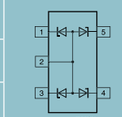
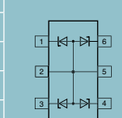
| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | $P_{PP}$ [1] max (W) | ESD rating [2] max (kV) | $I_R$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | | | |
| 1 | 0 | 5 | 35 | 42 | 40 | 30 | 0.1 |  | PESD5V0S1USF | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | 3.3 | 207 | 300 | 150 | 30 | 2 | | PESD3V3S1UL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | 5 | 152 | 200 | 150 | 30 | 1 | | PESD5V0S1UL | | |
| | | 12 | 38 | 75 | 150 | 30 | 0.05 | | PESD12VS1UL | | |
| | | 15 | 32 | 70 | 150 | 30 | 0.05 | | PESD15VS1UL | | |
| | | 24 | 23 | 50 | 150 | 23 | 0.05 | | PESD24VS1UL | | |
| | | 36 | 18 | 30 | 150 | 30 | 0.01 | | PESD36VS1UL | | |
| | | 5 | 152 | 200 | 150 | 30 | 1 | | PESD5V0S1ULD | DFN1006D-2 (SOD882D)  | 1.0 x 0.6 x 0.37 |
| | | 12 | 38 | 75 | 150 | 30 | 0.05 | | PESD12VS1ULD | | |
| | | 15 | 32 | 70 | 150 | 30 | 0.05 | | PESD15VS1ULD | | |
| | | 24 | 23 | 50 | 150 | 23 | 0.05 | | PESD24VS1ULD | | |
| | | 3.3 | 207 | 300 | 330 | 30 | 2 | | PESD3V3S1UB | SOD523 (SC-79)  | 1.2 x 0.8 x 0.6 |
| | | 5 | 152 | 200 | 260 | 30 | 1 | | PESD5V0S1UB | | |
| | | 12 | 38 | 75 | 180 | 30 | 0.05 | | PESD12VS1UB | | |
| | | 15 | 32 | 70 | 160 | 30 | 0.05 | | PESD15VS1UB | | |
| | | 24 | 23 | 50 | 160 | 23 | 0.05 | | PESD24VS1UB | | |
| | | 5 | 480 | 530 | 890 | 30 | 4 | | PESD5V0S1UA | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |
| | | 12 | 160 | 180 | 600 | 30 | 0.1 | | PESD12VS1UA | | |
| | | 24 | 23 | 50 | 160 | 23 | 0.05 | | PESD24VS1UA | | |
| | | 5 | 480 | 530 | 890 | 30 | 4 | | PESD5V0S1UJ | SOD323F (SC-90)  | 1.7 x 1.25 x 0.7 |
| | | 12 | 160 | 180 | 600 | 30 | 0.1 | | PESD12VS1UJ | | |
| | | 2.5 | 229 | 300 | 260 | 30 | 6 | | PESD5Z2.5 | SOD523 (SC-79)  | 1.2 x 0.8 x 0.6 |
| | | 3.3 | 172 | 200 | 260 | 30 | 0.05 | | PESD5Z3.3 | | |
| | | 5 | 89 | 150 | 180 | 30 | 0.05 | | PESD5Z5.0 | | |
| | | 6 | 78 | 150 | 180 | 30 | 0.01 | | PESD5Z6.0 | | |
| | | 7 | 69 | 150 | 180 | 30 | 0.01 | | PESD5Z7.0 | | |
| | | 12 | 35 | 75 | 200 | 30 | 0.01 | | PESD5Z12 | | |
| 0 | 1 | 5.5 | 35 | 45 | 100 | 30 | 0.1 |  | PESD5V0S1BSF | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | 5 | 35 | 45 | 130 | 30 | 0.1 | | PESD5V0S1BL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | 5 | 35 | 45 | 130 | 30 | 0.1 | | PESD5V0S1BLD | DFN1006D-2 (SOD882D)  | 1.0 x 0.6 x 0.37 |
| | | 5 | 35 | 45 | 130 | 30 | 0.1 | | PESD5V0S1BB | SOD523 (SC-79)  | 1.2 x 0.8 x 0.6 |
| | | 5 | 35 | 45 | 130 | 30 | 0.1 | | PESD5V0S1BA | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |

[1] 8 / 20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

[2] according to IEC 61000-4-2 (contact discharge)

# Standard ESD protection devices – Part 2

types in **bold** represent new products

| Number of protected lines | | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | $P_{pp}$ [1] max (W) | ESD rating [2] max (kV) | $I_R$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unidirectional | Bidirectional | | | | | | | | | | |
| 2 | 1 | 3.3 | 200 | 275 | 150 | 23 | 3 |  | PESD3V3S2UQ | SOT663  | 1.6 x 1.2 x 0.55 |
| | | 5 | 150 | 215 | 150 | 30 | 0.3 | | PESD5V0S2UQ | | |
| | | 12 | 38 | 100 | 150 | 30 | 0.03 | | PESD12VS2UQ | | |
| | | 15 | 32 | 70 | 150 | 30 | 0.05 | | PESD15VS2UQ | | |
| | | 24 | 23 | 50 | 150 | 23 | 0.05 | | PESD24VS2UQ | | |
| | | 3.3 | 207 | 300 | 330 | 30 | 2 | | PESD3V3S2UT | SOT23  | 2.9 x 1.3 x 1.0 |
| | | 5.2 | 152 | 200 | 260 | 30 | 1 | | PESD5V2S2UT | | |
| | | 12 | 38 | 75 | 180 | 30 | 1 | | PESD12VS2UT | | |
| | | 15 | 32 | 70 | 160 | 30 | 1 | | PESD15VS2UT | | |
| | | 24 | 23 | 50 | 160 | 23 | 1 | | PESD24VS2UT | | |
| | | 36 | 17 | 35 | 160 | 30 | 1 (@ 30 V) | | PESD36VS2UT | | |
| | | 3.3 | 207 | 300 | 330 | 30 | 2 |  | PESD3V3S2UAT | | |
| | | 5 | 152 | 200 | 260 | 30 | 1 | | PESD5V0S2UAT | | |
| | | 15 | 32 | 70 | 160 | 30 | 0.05 | | PESD15VS2UAT | | |
| | | 24 | 23 | 50 | 160 | 23 | 0.05 | | PESD24VS2UAT | | |
| 0 | 2 | 5 | 35 | 45 | 130 | 30 | 0.1 |  | **PESD5V0S2BQA** | SOT1215  | 1.1 x 1.0 x 0.37 |
| 4 | 3 | 3.3 | 110 | 300 | 110 | 30 | 1 (@ 3 V) |  | PESD3V3S4UF | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | | 5 | 85 | 220 | 110 | 30 | 0.1 (@ 4.3 V) | | PESD5V0S4UF | | |
| | | 3 | 107 | 125 | - | 8 | 1 |  | BZA956A | SOT665  | 1.6 x 1.2 x 0.55 |
| | | 4 | 90 | 105 | - | 8 | 0.5 | | BZA962A | | |
| | | 4.3 | 78 | 90 | - | 8 | 0.1 | | BZA968A | | |
| | | 3 | 200 | 240 | - | 8 | 2 | | BZA856A | SOT353 (SC-88A)  | 2.0 x 1.25 x 0.95 |
| | | 3 | 200 | 240 | - | 8 | 2 |  | BZA456A | SOT457 (SC-74)  | 2.9 x 1.5 x 1.0 |
| | | 4 | 165 | 200 | - | 15 | 0.7 | | BZA462A | | |
| | | 15 | 37 | 48 | - | 8 | 0.1 | | BZA420A | | |
| | | 3.3 | 215 | 300 | 200 | 30 | 0.8 | | PESD3V3S4UD | | |
| | | 5 | 165 | 220 | 200 | 30 | 0.2 | | PESD5V0S4UD | | |
| | | 24 | 40 | 70 | 200 | 23 | 0.015 | | PESD24VS4UD | | |
| 5 | 4 | 3.3 | 215 | 300 | 200 | 30 | 0.8 |  | PESD3V3S5UD | | |
| | | 5 | 165 | 220 | 200 | 30 | 0.2 | | PESD5V0S5UD | | |
| | | 12 | 73 | 100 | 200 | 30 | 0.015 | | PESD12VS5UD | | |
| | | 15 | 60 | 90 | 200 | 30 | 0.015 | | PESD15VS5UD | | |
| | | 24 | 45 | 70 | 200 | 23 | 0.015 | | PESD24VS5UD | | |
| 0 | 4 | 5 | 45 | 75 | - | 15 | 0.1 |  | BZA408B | | |

[1] 8 / 20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

[2] according to IEC 61000-4-2 (contact discharge)





# USB 2.0 protection and filtering

types in **bold** represent new products

| Baseband interface | Number of protected lines | $R_{line}$ | $C_{line}$ (pF) | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|
| USB2.0 (Plastic package) | 2 | - | 1.0 | ESD protection for up to 2 ultra high-speed datalines | PRTR5V0U2X | SOT143B  | 2.9 x 1.3 x 1.0 |
| | | | 1.8 | ESD protection for up to 2 ultra high-speed datalines with 12 kV ESD robustness | PRTR5V0U2AX | | |
| | | | | ESD protection for up to 2 ultra high-speed datalines | PRTR5V0U2F | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | 3 + 1 | | | USB protection for USB OTG with 5.5 V Vbat protection | PUSBM5V5X4-TL | DFN1616-6 (SOT1189)  | 1.6 x 1.6 x 0.48 |
| | | | | USB protection for USB OTG with 12 V Vbat protection | PUSBM12VX4-TL | | |
| | | | | USB protection for USB OTG with 30 V Vbat protection | PUSBM30VX4-TL | | |
| | 4 | | 0.8 | Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection | **PUSB2X4Y** | SOT363 (SC-88)  | 2.0 x 1.25 x 0.95 |
| | | | 1 | Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection | **PUSB2X4D** | SOT457 (SC-74)  | 2.9 x 1.5 x 1.0 |
| | | | | Dual ESD protection for USB2.0 high-speed, SD-card, SIM card | IP4220CZ6 | | |
| | | | | Dual ESD protection for USB2.0 high-speed, SD-card, SIM card | PRTR5V0U4D | | |
| | | | | ESD protection for USB2.0 high-speed, SD-card, SIM card | IP4221CZ6-S | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
| | | | | Dual ESD protection for USB2.0 high-speed, SD-card, SIM-card | IP4221CZ6-XS | DFN1010-6 (SOT891)  | 1.0 x 1.0 x 0.48 |

# Common Mode Filter for USB 2.0

types in **bold** represent new products

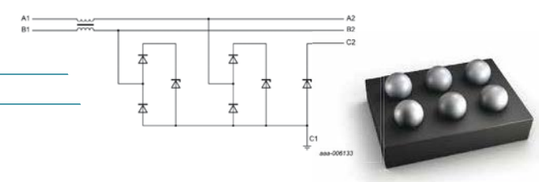
| Baseband interface | Number of protected lines | $C_{line}$ (pF) | ESD rating [1] max (kV) | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|
| USB2.0 | 2 | 1.5 | 15 | Common Mode filter with ESD protection for high-speed interfaces such as USB 2.0 | **IP3319CX6** | WLCSP6  | 1.34 x 0.95 x 0.57 |

[1] according to IEC 61000-4-2 (contact discharge)

## In the spotlight

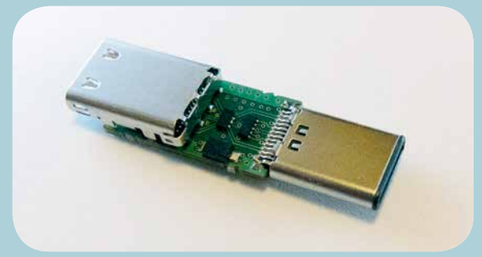
**IP3319CX6 - Common Mode Filter for USB2.0**

- Very wide differential pass band >1 GHz
- Very broadband Common Mode attenuation
- Very low clamping ESD protection, excellent SoC protection
- Very small WLCSP6 package (footprint area 1.34 x 0.95 mm)

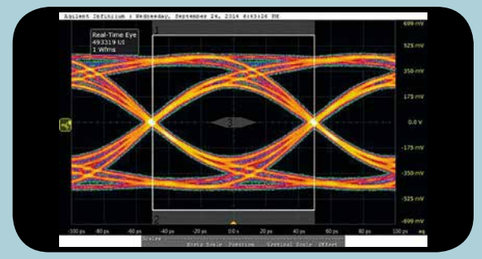


# NXP paves the way for USB Type-C connector

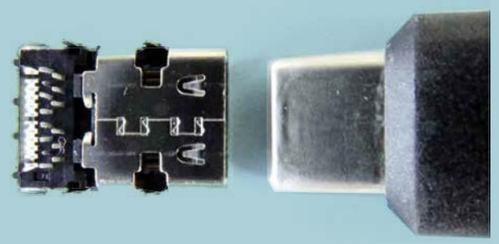
## USB 3.x protection and filtering



USB Type-C evaluation board with NXP protection solutions



PUSB3FR4 on standard FR4 testboard



USB Type-C receptacle USB Type-C plug

### PUSB3FR4 and the new Type-C connector

The perfect match. PUSB3FR4 supports protection for the new Type-C connector, in order to enable direction-agnostic connection, faster charging and the smallest solution to support SuperSpeed USB.

### USB 3.1 introduces data rates up to 10 Gbps

As shown in the eye diagram, NXP offers protection, which supports data rates up to 10 Gbps with low capacitance and optimized package layouts.

### USB 3.x and eSATA protection and filtering for high-speed and super-speed lines

types in **bold** represent new products

| Baseband interface | Number of protected lines | $C_d$ (pF) | ESD rating max (kV) | Rdyn (Ω) | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|
| USB3.0 - 5 Gbps | 4 | 0.55 | 8 | 0.3 / 0.4 | ESD Protection for high-speed interfaces | IP4292CZ10-TBR | DFN2510A-10 (SOT1176) | 2.5 x. 1.0 x 0.48 |
| | | 0.5 | 10 | | | IP4294CZ10-TBR | | |
| | | | | | | **PUSB3F96** | | |
| USB3.1 - 10 Gbps | 4 | 0.17 | 15 | 0.4 | TrEOS Protection | **PUSB3AB4** | | |
| | 6 | 0.29 | 15 | 0.27 | | **PUSB3FR6** | DFN2111-7 (SOT1358) | 2.1 x 1.1 x 0.48 |
| | | 0.27 | 15 | 0.5 | | **PUSB3TB6** | | |
| | | 0.15 | 15 | 0.4 | | **PUSB3AB6** | | |
| | 4 | 0.29 | 15 | 0.27 | | **PUSB3FR4** | DFN2510A-10 (SOT1176) | 2.5 x. 1.0 x 0.48 |
| | 1 | 0.1 | 10 | 0.45 | | **PESD5V0R1BSF** | DSN0603-2 (SOD962) | 0.6 x 0.3 x 0.3 |
| | | 0.15 | 15 | 0.25 | | **PESD5V0H1BSF** | | |
| | | 0.2 | 20 | 0.23 | | **PESD5V0C1BSF** | | |
| | | 0.2 | 20 | 0.23 | | **PESD3V3CIBSF** | | |
| | | 0.45 | 20 | 0.1 | | **PESD5V0C1USF** | | |
| | 2 | 0.25 | 15 | 0.16 | | **PESD1USB3S** | WLCSP5 | 1.2 x 0.8 x 0.6 |
| | | 0.25 | 15 | 0.14 | Common Mode Filter with TrEOS Protection for ultra high-speed interfaces | **PCMF1USB3S** | | |

http://www.nxp.com/products/discretes-and-logic/esd-protection-tvs-filtering-and-signal-conditioning/usb-type-c-protection-family:GRP_13811



# Common Mode Filter for USB 3.x

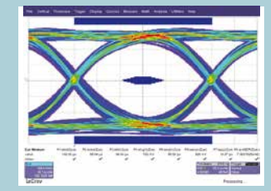
### NXPs Common Mode Filter offer:

- Best in class system-level protection due to deep snap-back and very low dynamic resistance
- Very wide-band Common Mode rejection to cover all critical frequencies
- Improved RF performance and small footprint compared to separate ESD/CMF solutions
- Protection for MIPI CSI, DSI, USB3.x, and HDMI 2.0

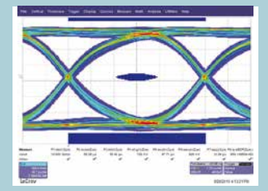
### Key Features of PCMFxUSB3S

- ESD protection is available in the same footprint, allowing last-minute changes between Common Mode Filter with ESD (PCMF) and ESD protection only (PESD)
- No ferrite saturation, widest differential pass-band compared to other Si-based solutions and Ferrite-based solutions with additional 15GHz ESD protection
- Lowest ESD-clamping compared to all other Common Mode Filters: provides high system-level robustness even for the most sensitive USB3.1 transceiver
- Strongest Common Mode rejection for the USB3.1 fundamentals at 2.5 and 5 GHz of all USB3 Common Mode Filters
- Smallest footprint
- PCMF1USB3S allows very easy RF-routing together with the new USB Type-C connector

### USB 3.x 10 Gbps eye diagrams

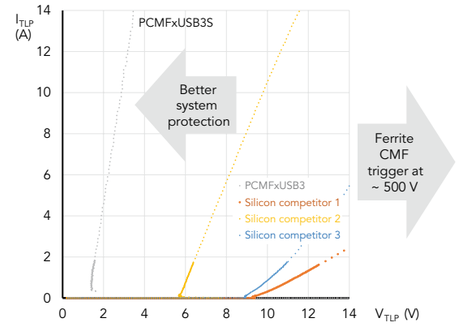


PCMFxUSB3S



Only test board

### Clamping performance of PCMFxUSB3S compared to other silicon Common Mode Filter




The superior system-level protection is shown in the lower TLP clamping voltage

### Common Mode Filter for USB 3.x

types in **bold** represent new products

| Baseband interface | Number of protected line pairs | Type | Differential Mode 3dB frequency | Common Mode rejection 800 MHz - 10 GHz | $C_d$ typical | $V_{RWM}$ | ESD rating | Channel series resistance | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| USB3.x | 1 | **PCMF1USB3S** | 6 GHz | >12 | 0.3 | 5 | 15 | 3 | WLCSP5 | 0.8 x 1.2 x 0.5 |
| | 2 | **PCMF2USB3S** | | | | | | | WLCSP10 | 1.6 x 1.2 x 0.5 |
| | 3 | **PCMF3USB3S** | | | | | | | WLCSP15 | 2.4 x 1.2 x 0.5 |
| | 1 | **PESD1USB3S** | 17 GHz | ESD protection only | 0.5 | | | | WLCSP5 | 0.8 x 1.2 x 0.5 |
| | 2 | **PESD2USB3S** | | | | | | | WLCSP10 | 1.6 x 1.2 x 0.5 |
| | 3 | **PESD3USB3S** | | | | | | | WLCSP15 | 2.4 x 1.2 x 0.5 |

[1] according to IEC 61000-4-2 (contact discharge)

## Common Mode Filter for video interfaces

types in **bold** represent new products

| Baseband interface | Number of protected line pairs unidirectional | Number of protected line pairs bidirectional | Type | Differential Mode 3 dB frequency (typ.) | $C_d$ pF typical | $V_{rwm}$ | ESD rating [1] max (kV) | Channel series resistance | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| MIPI D-PHY | 2 | 0 | PCMF2DFN1 | >2 GHz | 0.8 | 5 | 15 | 5 Ω | DFN2520-9 (SOT1333) | 2.5 x 2.0 x 0.48 |
| | 3 | | PCMF3DFN1 | >2 GHz | | | | | DFN4020-14 (SOT1334) | 4.0 x 2.0 x 0.48 |
| HDMI2.0 | 1 | | **PCMF1HDMI2S** | >6 GHz | 0.3 | | | 3 Ω | WLCSP5 | 0.8 x 1.2 x 0.5 |
| | 2 | | **PCMF2HDMI2S** | | | | | | WLCSP10 | 1.6 x 1.2 x 0.5 |
| | 3 | | **PCMF3HDMI2S** | | | | | | WLCSP15 | 2.4 x 1.2 x 0.5 |

[1] according to IEC 61000-4-2 (contact discharge)

**In the spotlight**

**PCMFxHDMI2S series:**
**1, 2 and 3 line pair Common Mode Filters with ESD protection for HDMI 1.4 and 2.0**

- Very wide differential pass band >6 GHz
- Very broadband Common Mode attenuation
- Very low clamping ESD protection, excellent SoC protection
- Smallest footprint


## Ethernet protection

types in **bold** represent new products

| Baseband interface | Number of protected lines | $C_{line}$ (pF) | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|
| LAN | 1 | 0.6 | Ethernet ESD protection $V_{RWM}$ = 3.3 V | PESD3V3U1UT | SOT23 | 2.9 x 1.3 x 1.0 |
| | | | Ethernet ESD protection $V_{RWM}$ = 5.0 V | PESD5V0U1UT | | |
| | | | Ethernet ESD protection $V_{RWM}$ = 12 V | PESD12VU1UT | | |
| | | | Ethernet ESD protection $V_{RWM}$ = 15 V | PESD15VU1UT | | |
| | | | Ethernet ESD protection $V_{RWM}$ = 24 V | PESD24VU1UT | | |
| | 4 | 1 | Ethernet ESD protection | IP4220CZ6 | SOT457 (SC-74) | 2.9 x 1.5 x 1.0 |



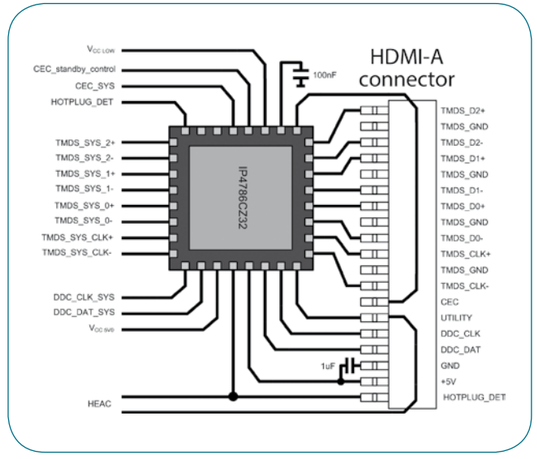


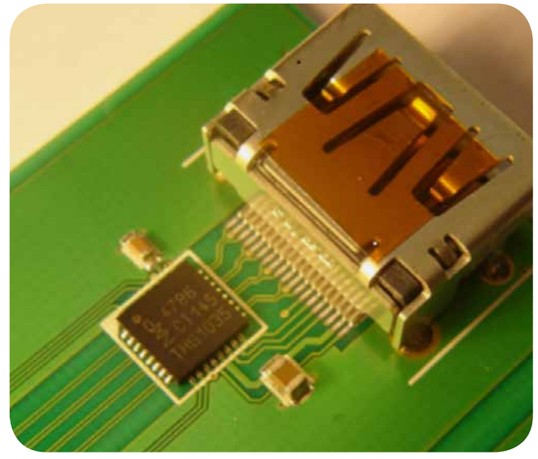
## HDMI and memory-card signal conditioning

types in **bold** represent new products

| Interface | Number of protected lines | Buffer | Level shifer | $C_{line}$ (pF) | Resistor (Ω) | LDO | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| HDMI tx | 5 | yes | yes | - | internal | - | Fully integrated for HDMI control lines including buffer for DDC, CEC, and Hot Plug module | IP4791CZ12 | DFN2521-12 (SOT1156) | 2.5 x 2.1 x 0.48 |
| | 13 | | | 100 Ω differential impedance | | CEC LDO. 5 V LDO | Fully integrated HDMI source solution with current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | IP4786CZ32 | DFN5050-32 (SOT617) | 5.0 x 5.0 x 0.85 |
| | | | | | | | Fully integrated HDMI sink solution with buffer, and level shifter for DDC, CEC, and Hot Plug | | | |
| | | | | | | | Fully integrated HDMI source solution with enhanced ESD protection, current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | | | |
| | | | | | | | Fully integrated HDMI source solution with small package, current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | IP4786CZ32S | DFN4040-32 (SOT1318-1) | 4.0 x 4.0 x 0.50 |
| HDMI2.0 | 13 | yes | yes | 100 Ω differential impedance | integrated | – | Fully integrated HDMI source solution with current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | **IP4786CZ32** | DFN5050-32 (SOT617) | 5.0 x 5.0 x 0.85 |
| | | | | | | | | **IP4787CZ32** | | 5.0 x 5.0 x 0.85 |
| | | | | | | | Fully integrated HDMI source solution with enhanced ESD protection, current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | **IP4788CZ32** | | 5.0 x 5.0 x 0.85 |
| | | | | | | | Fully integrated HDMI source solution in a small package with current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | **IP4786CZ32S** | DFN4040-32 (SOT1318-1) | 4.0 x 4.0 x 0.5 |
| SD3.0 | 6 | yes | yes | - | internal | – | SD 3.0-compliant memory card with integrated dual voltage- level translator with EMI filter and ESD protection | **IP4856CX25/C** | WLCSP25 | 2.4 x 2.4 x 0.4 |
| | | | | | | 1.8 V LDO | Fully integrated SD 3.0 card level shifter with buffer technology, LDO, and EMI filter | IP4855CX25 | WLCSP25 | 2.4 x 2.4 x 0.4 |

**The IP478x-series offers a complete HDMI-interface in one package.**



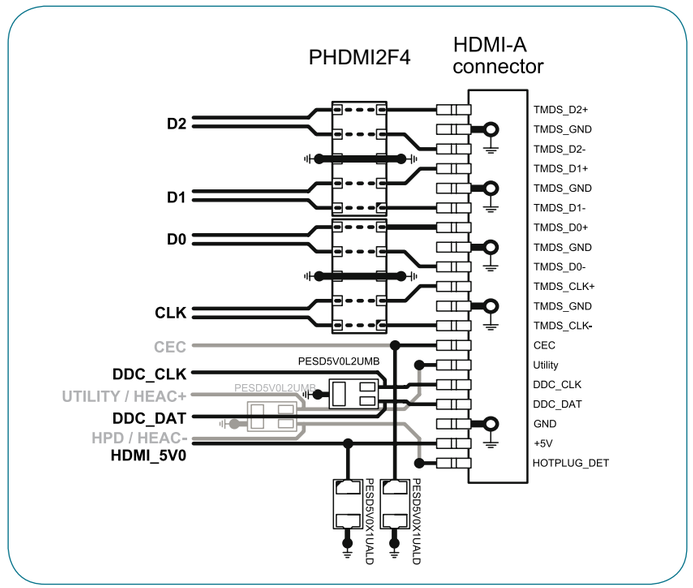
ESD protection, TVS, filtering and signal conditioning

## Video interface protection

types in **bold** represent new products

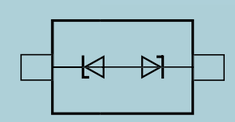
| Baseband interface | Number of protected lines | $C_{line}$ (pF) | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|
| Display port | 4 | 0.6 | ESD protection for ultra high-speed interfaces | IP4283CZ10-TBR | DFN2510A-10 (SOT1176)  | 2.5 x 1.0 x 0.48 |
| | | 0.55 | ESD protection for ultra high-speed interfaces | IP4292CZ10-TBR | | |
| | | 0.5 | ESD protection for ultra high-speed interfaces | IP4294CZ10-TBR | | |
| | | | ESD protection for ultra high-speed interfaces | **PHDMI2F4** | | |
| | | 0.8 | ESD protection for ultra high-speed interfaces | IP4285CZ9-TBB | DFN2110-9 (SOT1178)  | 2.1 x 1.0 x 0.48 |
| HDMI | 4 | 0.6 | ESD protection for ultra high-speed interfaces | IP4283CZ10-TBR | DFN2510A-10 (SOT1176)  | 2.5 x 1.0 x 0.48 |
| | | 0.8 | ESD protection for ultra high-speed interfaces | IP4285CZ9-TBB | DFN2110-9 (SOT1178)  | 2.1 x 1.0 x 0.48 |
| | | 0.55 | ESD protection for ultra high-speed interfaces | IP4292CZ10-TBR | DFN2510A-10 (SOT1176)  | 2.5 x 1.0 x 0.48 |
| | | 0.5 | ESD protection for HDMI 2.0 | **PHDMI2F4** | | |
| | | | ESD protection for ultra high-speed interfaces | IP4294CZ10-TBR | | |
| LVDS | 4 | 0.8 | Very low clamp ESD protection with 12 kV IEC ruggedness | **PUSB2X4D** | SOT457 (SC-74)  | 2.9 x 1.5 x 1.0 |
| | | 0.8 | Very low clamp ESD protection with 12 kV IEC ruggedness | **PUSB2X4Y** | SOT363 (SC-88)  | 2.0 x 1.25 x 0.95 |

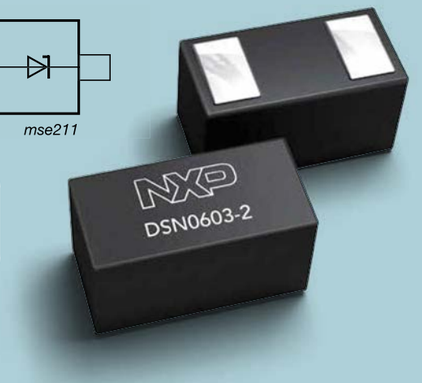
### PHDMI2F4 PESD HDMI application schematic






# NFC antenna protection




**DSN0603-2 (SOD962)**
Single package
0.6 x 0.3 x 0.3 mm

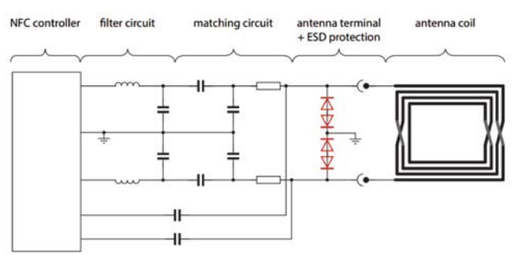
### Features

- Bidirectional configuration, allowing operating voltages up to 18 or 24 V
- Very low capacitance, enabling easy design of the antenna-matching circuit
- Very small voltage dependency of the diode capacitance, avoiding intermodulation distortion
- Small form-factor packages of 1006 (0402 inch) and 0603 (0201 inch) standard size

### Benefits

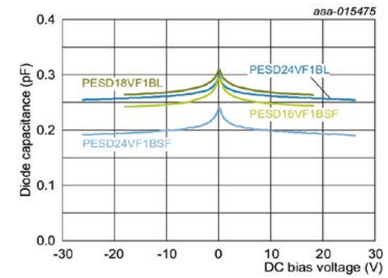
The phone's NFC antenna is often integrated into the battery cover or the battery itself and is connected to the NFC tags via small contacts on the phone, creating an entry point for ESD strikes that are potentially hazardous to the NFC IC. These new NXP devices are optimized for the requirements of th NFC system and ensure the best-possible protection of the NFC IC.

### Circuit diagram




Using tiny packages makes PCB design more flexible

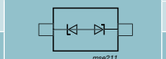
### Diode capacitance versus bias voltage




The highly linear diode capacitance, with very small variation, minimizes signal degradation

### NFC antenna protection

types in **bold** represent new products

| Interface | Number of protected lines (Bidirectional) | $V_{RWM}$ [V] | $C_{line}$ typ [pF] | $C_{line}$ max [pF] | ESD rating [1] max [kV] | Configuration | Type | Package | Size |
|---|---|---|---|---|---|---|---|---|---|
| NFC Antenna | 1 | 18 | 0.28 | 0.45 | 10 |  mse211 | **PESD18VF1BSF** | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | | | | | | **PESD1NFC-SF** | | |
| | | | 0.35 | 0.5 | 10 | | PESD18VF1BL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | | | | | | **PESD1NFC-L** | | |
| | | 24 | 0.25 | 0.4 | 10 | | **PESD24VF1BSF** | DSN0603-2 (SOD962)  | 0.6 x 0.3 x 0.3 |
| | | | | | | | **PESD2NFC-SF** | | |
| | | | 0.3 | 0.45 | 10 | | PESD24VF1BL | DFN1006-2 (SOD882)  | 1.0 x 0.6 x 0.48 |
| | | | | | | | **PESD2NFC-L** | | |

[1] according to IEC 61000-4-2 (contact discharge)

## LCD/camera protection and filtering

| Baseband interface | Number of protected lines | Line small-signal equivalents | | | Digital interface clock speed (MHz) | Insertion loss S21 ~ -3 dB (MHz) | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|
| | | $R_{line}$ (Ω) | $C_{line}$ (pF) | $L_{line}$ (nH) | | | | | |
| | 4 | 40 | 18 | - | ~100 | 300 | IP4252CZ8-4 -TTL | DFN1714-8 (SOT1166)  | 1.7 x 1.35 x 0.52 |
| | | 100 | 45 | - | ~40 | 130 | IP4254CZ8-4-TTL | | |
| | | | 15 | - | ~110 | 330 | IP4251CZ8-4-TTL | | |
| | | 200 | 45 | - | ~35 | 110 | IP4253CZ8-4-TTL | | |
| | 6 | 40 | 18 | - | ~100 | 300 | IP4252CZ12-6-TTL | DFN2514-12 (SOT1167)  | 2.5 x 1.35 x 0.53 |
| | | 100 | 45 | - | ~40 | 130 | IP4254CZ12-6-TTL | | |
| | | | 15 | - | ~110 | 330 | IP4251CZ12-6-TTL | | |
| | | 200 | 45 | - | ~35 | 110 | IP4253CZ12-6-TTL | | |
| | | 100 | 54 | - | ~35 | 98 | PEMI6CSP/RW | WLCSP15  | 2.36 x 1.05 x 0.61 |
| | 8 | 40 | 18 | - | ~100 | 300 | IP4252CZ16-8-TTL | DFN3314-16 (SOT1168)  | 3.3 x 1.35 x 0.53 |
| | | 100 | 45 | - | ~40 | 130 | IP4254CZ16-8-TTL | | |
| | | | 15 | - | ~110 | 330 | IP4251CZ16-8-TTL | | |
| | | 200 | 45 | - | ~35 | 110 | IP4253CZ16-8-TTL | | |
| | | 100 | 54 | - | ~35 | 98 | PEMI8CSP/RW/P | WLCSP20  | 3.16 x 1.05 x 0.61 |





## Audio interface protection and filtering

| Baseband interface | Number of protected lines | Line small-signal equivalents | | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|
| | | $R_{line}$ | $C_{line}$ (pF) | | | | |
| Audio | 2 | - | 18 | 2 line bidirectional with $I_{PPM}$=9A | PESD5V0V2BM | SOT883  | 1.0 x 0.6 x 0.48 |
| | | | | | PESD5V0V2BMB | SOT883B  | 1.0 x 0.6 x 0.37 |
| | | 68 Ω | 110 | Single-ended or differential microphone | IP4049CX5/LF | WLCSP5  | 0.91 x 1.28 x 0.65 |

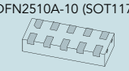
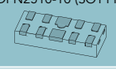
## Memory- and SIM-card protection and filtering

types in **bold** represent new products

| Baseband interface | Number of protected lines | Line small-signal equivalents | | Digital interface clock speed (MHz) | Remark | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|
| | | $R_{line}$ | $C_{line}$ (pF) | | | | | |
| SIM card | 3 | 47 Ω / 100 Ω | 20 | ~20 | Integrated SIM-card EMI filter and ESD protection | IP4264CZ8-20-TTL | DFN1714-8 (SOT1166)  | 1.7 x 1.35 x 0.52 |
| | 4 | - | 1 | ~240 | Quad-channel, low-capacitance ESD protection | IP4221CZ6-S | DFN1410-6 (SOT886)  | 1.0 x 1.0 x 0.48 |
| | | | | | Quad-channel, low-capacitance ESD protection | IP4221CZ6-XS | DFN1010-6 (SOT891)  | 1.0 x 1.0 x 0.48 |
| SD-card / MMC | 6 | 40 Ω | 12 | >52 | (Mini) SD card/trans flash ESD protection, EMI filter | **IP4252CZ12-6-TTL** | DFN2514-12 (SOT1167)  | 2.5 x 1.35 x 0.53 |
| | | 40 Ω / 100 Ω | 11 | - | 6-channel Micro-SD memory-card interface ESD protection filter | IP4340CX15 | WLCSP15  | 1.56 x 1.56 x 0.5 |
| SD 3.0 | 6 | - | 0.27 | 5000 | 6-line bidirectional ESD protection for ultra high-speed interfaces | **PUSB3TB6** | DFN2111-7 (SOT1358)  | 2.1 x 1.1 x 0.5 |
| | | | 0.35 | | | **PUSB3FR6** | | |
| | | | 0.15 | | | **PUSB3AB6** | | |

## Automotive high-speed network protection

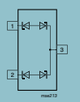
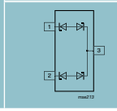
types in **bold** represent new products

| Number of protected lines | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $I_{RM}$ max @3V (µA) | ESD rating [1] max (kV) | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|
| 4 | 5.5 | 0.5 | 1 | 10 |  | **PESD2LVDS** | DFN2510A-10 (SOT1176)  | 2.5 x 1.0 x 0.5 |
| | 5.5 | 0.6 | 1 | 8 | | PESD1LVDS | DFN2510-10 (SOT1165)  | 2.5 x 1.0 x 0.48 |
| | 5.5 | 0.6 | 1 | 8 |  | PRTR5V0U4D | SOT457  | 2.9 x 1.5 x 1.0 |

[1] according to IEC 61000-4-2 (contact discharge)

## Automotive in-vehicle network bus line protection

types in **bold** represent new products

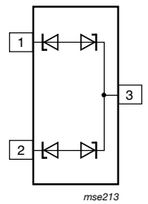
| Number of protected lines bidirectional | $V_{RWM}$ (V) | $C_{line}$ typ (pF) | $C_{line}$ max (pF) | $P_{PP}$ [1] max (W) | ESD rating [2] max (kV) | $I_r$ max [µA] @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 (diode 1)<br>24 (diode 2) | 13 | 17 | 160 | 23 | 0.05 |  | PESD1LIN | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |
| 2 | 24 | 11 | 17 | 200 | 23 | 0.05 |  | PESD1CAN | SOT23  | 2.9 x 1.3 x 1.0 |
| | | 25 | 30 | 230 | 30 | 0.01 | | PESD2CAN | | |
| | | 11 | 17 | 200 | 23 | 0.05 | | PESD1FLEX | | |
| | | 9.3 | 12 | 150 | 23 | 0.05 | | PESD1CAN-U | SOT323  | 2.0 x 1.25 x 0.95 |
| 1 | 26.5 | 9.3 | 11 | 150 | 23 | 0.05 |  | **PESD1IVN-U** | SOT323  | 2.0 x 1.25 x 0.95 |
| 2 | | | | | | |  | **PESD2IVN-U** | | |

[1] 8 / 20 µs surge pulse according to IEC 61000-4-5 [2] according to IEC 61000-4-2 (contact discharge)

**In the spotlight**

### PESD2IVN-U: CAN bus protection in very small SOT323 package

- Protection for 2 in-vehicle network BUS lines
- High reverse standoff voltage $V_{RWM}$ = 26.5 V
- Very small SOT323 package (2.0 x 1.25 x 0.95 mm)
- AEC-Q101 compliant
- ESD robustness of up to 23 kV (contact)
- Very good capacitance matching







# Surge protection for charger ports in mobile devices


**DSN1608-2 (SOD963)**
Single package
1.6 x 0.8 x 0.25 mm

A new powerful surge protection device in a 1.6 x 0.8 mm small, and 0.25 mm low package for slim mobiles

Surge pulses from the power supply, e.g. via a car charger, are a severe threat for the charger port VBUS line of smart phones and other portables.Supply voltages of these chargers often exceed the 5 V level – requiring high reverse standoff voltages.

NXP's PTVSxZ1USK series is ideally suited to protect the charger port and offers

- Superior electrical performance
- High PCB design flexibility
- Easy routing

### Features and benefits

- 7 types from $V_{RWM}$ = 5 to 26 V
- High surge rating
- Very compact and thin package
- Low leakage current: down to 1 nA, reduces power consumption
- Dynamic resistance down to 0.06 Ohm
- High ESD robustness: $V_{ESD}$ = 30 kV (IEC61000-4-2)

### TVS diodes for mobile applications in DSN1608-2

| Type | Package | Type | Package | $V_{RWM}$ (V) | $V_{br}$ min (V) | $V_{br}$ max (V) | $V_{cl}$ @ $I_{ppm}$ 8/20µs (V) | $I_{ppm}$ 8/20µs (A) | $P_{ppm}$ 8/20µs (W) | $V_{cl}$ @ $I_{ppm}$ 10/1000µs (V) | $I_{ppm}$ 10/1000µs (A) | $P_{ppm}$ 10/1000µs (W) | $I_{rm}$ typ @ $V_{rwm}$ (nA) | $I_{rm}$ max @ $V_{rwm}$ (nA) | Rdyn (TLP) - 8/20µs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PTVS5V0Z1USK | SOD964<br>1.6 x 0.8 x 0.37 | PTVS5V0Z1USKN | SOD963<br>1.6 x 0.8 x 0.25 | 5 | 6.4 | 7.80 | 18 | 80 | 1200 | 12 | 20 | 200 | 1 | 1000 | 0.06 |
| PTVS7V5Z1USK | | PTVS7V5Z1USKN | | 7.5 | 8.33 | 9.65 | 24 | 92 | 2000 | 13.9 | 17.5 | 200 | 0.1 | 200 | 0.08 |
| PTVS10VZ1USK | | PTVS10VZ1USKN | | 10 | 11.1 | 12.9 | 27.5 | 73 | 2000 | 17.8 | 11.1 | 170 | 0.1 | 200 | 0.1 |
| PTVS12VZ1USK | | PTVS12VZ1USKN | | 12 | 13.3 | 15.4 | 29 | 65 | 2100 | 19.9 | 10.1 | 180 | 0.1 | 200 | 0.1 |
| PTVS15VZ1USK | | PTVS15VZ1USKN | | 15 | 16.7 | 19.4 | 35.4 | 52 | 1700 | 27.6 | 7.5 | 175 | 0.1 | 200 | 0.1 |
| PTVS18VZ1USK | | PTVS18VZ1USKN | | 18 | 20 | 23.2 | 40.5 | 41 | 1700 | 30.2 | 6.9 | 190 | 0.1 | 200 | 0.17 |
| PTVS20VZ1USK | | PTVS20VZ1USKN | | 20 | 22.2 | 25.4 | 47 | 38 | 1800 | 36.0 | 6 | 175 | 0.1 | 200 | 0.16 |
| PTVS26VZ1USK | | PTVS26VZ1USKN | | 26 | 28.9 | 33.4 | 61 | 30 | 1600 | 48.0 | 3.76 | 150 | 0.1 | 200 | 0.16 |

### Battery and charger port protection – PESD devices

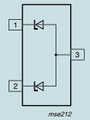
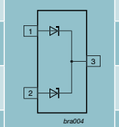
| Baseband interface | Number of protected lines | $C_{line}$ (pF) | $V_{RWM}$ (V) | $I_{PPM}$ 8/20µs (A) | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|
| Battery & charger protection | 1 x uni | 160 | 12 | 22.5 | PESD12VS1UJ | SOD323F (SC-90)  | 1.7 x 1.25 x 0.7 |
| | | 480 | 5 | 22.5 | PESD5V0S1UJ | | |
| | | 160 | 12 | 47 | PESD12VS1UA | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |
| | | 480 | 5 | 47 | PESD5V0S1UA | | |
| | 2 x bi | 18 | 5 | 9 | PESD5V0V2BM | SOT883  | 1.0 x 0.6 x 0.48 |
| | | 18 | 5 | 9 | PESD5V0V2BMB | SOT883B  | 1.0 x 0.6 x 0.37 |
| | | 35 | 5 | 15 | PESD5V0S2BQA | SOT1215  | 1.1 x 1.0 x 0.37 |

## TVS diodes for mobile applications

| Power (W) (10 / 1000 µs waveform) [1] | $V_{RWM}$ (V) | $V_{BR}$ min (V) @ $I_R$ | $V_{BR}$ typ (V) @ $I_R$ | $V_{BR}$ max (V) @ $I_R$ | $I_R$ (mA) | $V_{CL}$ max [1] (V) @ $I_{PP}$ | $I_{PP}$ [1] (A) | $I_{RM}$ typ (µA) @ $V_{RWM}$ | $I_{RM}$ max (µA) @ $V_{RWM}$ | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 7.5 | 8.33 | 8.77 | 9.21 | 1 | 12.9 | 23.3 | 0.3 | 50 | PTVS7V5U1UPA | DFN2020-3 (SOT1061)  | 2.0 x 2.0 x 0.62 |
| | 10 | 11.1 | 11.7 | 12.3 | 1 | 17 | 17.6 | 0.008 | 2.5 | PTVS10VU1UPA | | |
| | 12 | 13.3 | 14 | 14.7 | 1 | 19.9 | 15.1 | 0.005 | 2.5 | PTVS12VU1UPA | | |
| | 15 | 16.7 | 17.6 | 18.5 | 1 | 24.4 | 12.3 | 0.001 | 0.1 | PTVS15VU1UPA | | |
| | 18 | 20 | 21 | 22.1 | 1 | 29.2 | 10.3 | 0.001 | 0.1 | PTVS18VU1UPA | | |
| | 26 | 28.9 | 30.4 | 31.9 | 1 | 42.1 | 7 | 0.001 | 0.1 | PTVS26VU1UPA | | |

[1] 10 / 1000 µs according to IEC 61643-321

## TVS diodes, 24 / 40 W

| Power (W) (10 / 1000 µs waveform) [1] | $V_{RWM}$ (V) | $V_{BR}$ min (V) @ $I_R$ | $V_{BR}$ typ (V) @ $I_R$ | $V_{BR}$ max (V) @ $I_R$ | $I_R$ (mA) | ESD rating [1] max (kV) | $C_{line}$ typ (pF) | $V_{CL}$ max [1] (V) @ $I_{PP}$ | $I_{PP}$ [1] (A) | $I_{RM}$ max (µA) @ $V_{RWM}$ | Configuration | Type | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 3 | 5.32 | 5.6 | 5.88 | 20 | 30 | 210 | 8 | 3 | 5 |  mse212 | MMBZ5V6AL | SOT23  | 2.9 x 1.3 x 1.0 |
| | 3 | 5.89 | 6.2 | 6.51 | 1 | 30 | 175 | 8.7 | 2.76 | 0.2 | | MMBZ6V2AL | | |
| | 4.5 | 6.48 | 6.8 | 7.14 | 1 | 30 | 150 | 9.6 | 2.5 | 0.3 | | MMBZ6V8AL | | |
| | 6 | 8.65 | 9.1 | 9.56 | 1 | 30 | 155 | 14 | 1.7 | 0.1 | | MMBZ9V1AL | | |
| | 6.5 | 9.5 | 10 | 10.5 | 1 | 30 | 130 | 14.2 | 1.7 | 0.02 | | MMBZ10VAL | | |
| 40 | 8.5 | 11.4 | 12 | 12.6 | 1 | 30 | 110 | 17 | 2.35 | 0.005 | | MMBZ12VAL | | |
| | 12 | 14.25 | 15 | 15.75 | 1 | 30 | 85 | 21 | 1.9 | 0.005 | | MMBZ15VAL | | |
| | 14.5 | 17.1 | 18 | 18.9 | 1 | 30 | 70 | 25 | 1.6 | 0.005 | | MMBZ18VAL | | |
| | 17 | 19 | 20 | 21 | 1 | 30 | 65 | 28 | 1.4 | 0.005 | | MMBZ20VAL | | |
| | 22 | 25.65 | 27 | 28.35 | 1 | 30 | 48 | 40 | 1 | 0.005 | | MMBZ27VAL | | |
| | 26 | 31.35 | 33 | 34.65 | 1 | 30 | 45 | 46 | 0.87 | 0.005 | | MMBZ33VAL | | |
| | 8.5 | 11.4 | 12 | 12.6 | 1 | 30 | 110 | 17 | 2.35 | 0.005 |  bra004 | MMBZ12VDL | | |
| | 12.8 | 14.3 | 15 | 15.8 | 1 | 30 | 85 | 21.2 | 1.9 | 0.005 | | MMBZ15VDL | | |
| | 14.5 | 17.1 | 18 | 18.9 | 1 | 30 | 70 | 25 | 1.6 | 0.005 | | MMBZ18VCL | | |
| | 17 | 19 | 20 | 21 | 1 | 30 | 65 | 28 | 1.4 | 0.005 | | MMBZ20VCL | | |
| | 22 | 25.65 | 27 | 28.35 | 1 | 30 | 48 | 38 | 1 | 0.005 | | MMBZ27VCL | | |
| | 26 | 31.35 | 33 | 34.65 | 1 | 30 | 45 | 46 | 0.87 | 0.005 | | MMBZ33VCL | | |

[1] 10 / 1000 µs according to IEC 61643-321 [2] according to IEC 61000-4-2 (contact discharge)



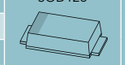


## TVS diodes, 400 W

| Power (W) (10/1000 µs waveform) [1] | $V_{RWM}$ (V) | $V_{BR}$ min (V) @ $I_R$ | $V_{BR}$ typ (V) @ $I_R$ | $V_{BR}$ max (V) @ $I_R$ | $I_R$ (mA) | $V_{CL}$ max [1] (V) @ $I_{PP}$ | $I_{PP}$ [1] (A) | $I_{RM}$ typ (µA) @ $V_{RWM}$ | $I_{RM}$ max (µA) @ $V_{RWM}$ | Type ($T_j$ max = 150 °C) | Type ($T_j$ max = 185 °C) | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 350 | 3.5 | 5.20 | 5.60 | 6.00 | 10 | 8.0 | 43.8 | 5 | 600 | PTVS3V3S1UR | PTVS3V3S1UTR | SOD123W  | 2.6 x 1.7 x 1.0 |
| 400 | 5.0 | 6.40 | 6.70 | 7.00 | 10 | 9.2 | 43.5 | 5 | 400 | PTVS5V0S1UR | PTVS5V0S1UTR | | |
| | 6.0 | 6.67 | 7.02 | 7.37 | 10 | 10.3 | 38.8 | 5 | 400 | PTVS6V0S1UR | PTVS6V0S1UTR | | |
| | 6.5 | 7.22 | 7.60 | 7.98 | 10 | 11.2 | 35.7 | 5 | 250 | PTVS6V5S1UR | PTVS6V5S1UTR | | |
| | 7.0 | 7.78 | 8.20 | 8.60 | 10 | 12.0 | 33.3 | 3 | 100 | PTVS7V0S1UR | PTVS7V0S1UTR | | |
| | 7.5 | 8.33 | 8.77 | 9.21 | 1 | 12.9 | 31.0 | 0.2 | 50 | PTVS7V5S1UR | PTVS7V5S1UTR | | |
| | 8.0 | 8.89 | 9.36 | 9.83 | 1 | 13.6 | 29.4 | 0.03 | 25 | PTVS8V0S1UR | PTVS8V0S1UTR | | |
| | 8.5 | 9.44 | 9.92 | 10.40 | 1 | 14.4 | 27.8 | 0.01 | 10 | PTVS8V5S1UR | PTVS8V5S1UTR | | |
| | 9.0 | 10.00 | 10.55 | 11.10 | 1 | 15.4 | 26.0 | 0.005 | 5 | PTVS9V0S1UR | PTVS9V0S1UTR | | |
| | 10 | 11.10 | 11.70 | 12.30 | 1 | 17.0 | 23.5 | 0.005 | 2.5 | PTVS10VS1UR | PTVS10VS1UTR | | |
| | 11 | 12.20 | 12.85 | 13.50 | 1 | 18.2 | 22.0 | 0.005 | 2.5 | PTVS11VS1UR | PTVS11VS1UTR | | |
| | 12 | 13.30 | 14.00 | 14.70 | 1 | 19.9 | 20.1 | 0.005 | 2.5 | PTVS12VS1UR | PTVS12VS1UTR | | |
| | 13 | 14.40 | 15.15 | 15.90 | 1 | 21.5 | 18.6 | 0.001 | 0.1 | PTVS13VS1UR | PTVS13VS1UTR | | |
| | 14 | 15.60 | 16.40 | 17.20 | 1 | 23.2 | 17.2 | 0.001 | 0.1 | PTVS14VS1UR | PTVS14VS1UTR | | |
| | 15 | 16.70 | 17.60 | 18.50 | 1 | 24.4 | 16.4 | 0.001 | 0.1 | PTVS15VS1UR | PTVS15VS1UTR | | |
| | 16 | 17.80 | 18.75 | 19.70 | 1 | 26.0 | 15.4 | 0.001 | 0.1 | PTVS16VS1UR | PTVS16VS1UTR | | |
| | 17 | 18.90 | 19.90 | 20.90 | 1 | 27.6 | 14.5 | 0.001 | 0.1 | PTVS17VS1UR | PTVS17VS1UTR | | |
| | 18 | 20.00 | 21.00 | 22.10 | 1 | 29.2 | 13.7 | 0.001 | 0.1 | PTVS18VS1UR | PTVS18VS1UTR | | |
| | 20 | 22.20 | 23.35 | 24.50 | 1 | 32.4 | 12.3 | 0.001 | 0.1 | PTVS20VS1UR | PTVS20VS1UTR | | |
| | 22 | 24.40 | 25.60 | 26.90 | 1 | 35.5 | 11.3 | 0.001 | 0.1 | PTVS22VS1UR | PTVS22VS1UTR | | |
| | 24 | 26.70 | 28.10 | 29.50 | 1 | 38.9 | 10.3 | 0.001 | 0.1 | PTVS24VS1UR | PTVS24VS1UTR | | |
| | 26 | 28.90 | 30.40 | 31.90 | 1 | 42.1 | 9.5 | 0.001 | 0.1 | PTVS26VS1UR | PTVS26VS1UTR | | |
| | 28 | 31.10 | 32.80 | 34.40 | 1 | 45.4 | 8.8 | 0.001 | 0.1 | PTVS28VS1UR | PTVS28VS1UTR | | |
| | 30 | 33.30 | 35.10 | 36.80 | 1 | 48.4 | 8.3 | 0.001 | 0.1 | PTVS30VS1UR | PTVS30VS1UTR | | |
| | 33 | 36.70 | 38.70 | 40.60 | 1 | 53.3 | 7.5 | 0.001 | 0.1 | PTVS33VS1UR | PTVS33VS1UTR | | |
| | 36 | 40.00 | 42.10 | 44.20 | 1 | 58.1 | 6.9 | 0.001 | 0.1 | PTVS36VS1UR | PTVS36VS1UTR | | |
| | 40 | 44.40 | 46.80 | 49.10 | 1 | 64.5 | 6.2 | 0.001 | 0.1 | PTVS40VS1UR | PTVS40VS1UTR | | |
| | 43 | 47.80 | 50.30 | 52.80 | 1 | 69.4 | 5.8 | 0.001 | 0.1 | PTVS43VS1UR | PTVS43VS1UTR | | |
| | 45 | 50.00 | 52.65 | 55.30 | 1 | 72.7 | 5.5 | 0.001 | 0.1 | PTVS45VS1UR | PTVS45VS1UTR | | |
| | 48 | 53.30 | 56.10 | 58.90 | 1 | 77.4 | 5.2 | 0.001 | 0.1 | PTVS48VS1UR | PTVS48VS1UTR | | |
| | 51 | 56.70 | 59.70 | 62.70 | 1 | 82.4 | 4.9 | 0.001 | 0.1 | PTVS51VS1UR | PTVS51VS1UTR | | |
| | 54 | 60.00 | 63.15 | 66.30 | 1 | 87.1 | 4.6 | 0.001 | 0.1 | PTVS54VS1UR | PTVS54VS1UTR | | |
| | 58 | 64.40 | 67.80 | 71.20 | 1 | 93.6 | 4.3 | 0.001 | 0.1 | PTVS58VS1UR | PTVS58VS1UTR | | |
| | 60 | 66.70 | 70.20 | 73.70 | 1 | 96.8 | 4.1 | 0.001 | 0.1 | PTVS60VS1UR | PTVS60VS1UTR | | |
| | 64 | 71.10 | 74.85 | 78.60 | 1 | 103.0 | 3.9 | 0.001 | 0.1 | PTVS64VS1UR | PTVS64VS1UTR | | |

## TVS diodes, 600 W

| Power (W) (10 / 1000 µs waveform) [1] | $V_{RWM}$ (V) | $V_{BR}$ min (V) @ $I_R$ | $V_{BR}$ typ (V) @ $I_R$ | $V_{BR}$ max (V) @ $I_R$ | $I_R$ (mA) | $V_{CL}$ max [1] (V) @ $I_{PP}$ | $I_{PP}$ [1] (A) | $I_{RM}$ typ (µA) @ $V_{RWM}$ | $I_{RM}$ max (µA) @ $V_{RWM}$ | Type ($T_j$ max = 150 °C) | Type ($T_j$ max = 185 °C) | Package | Size (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 600 | 3.5 | 5.20 | 5.60 | 6.00 | 10 | 8 | 75 | 5 | 600 | PTVS3V3P1UP | PTVS3V3P1UTP | SOD128 | 3.8 x 2.6 x 1.0 |
| | 5 | 6.40 | 6.70 | 7.00 | 10 | 9.2 | 65.2 | 5 | 400 | PTVS5V0P1UP | PTVS5V0P1UTP | | |
| | 6 | 6.67 | 7.02 | 7.37 | 10 | 10.3 | 58.3 | 5 | 400 | PTVS6V0P1UP | PTVS6V0P1UTP | | |
| | 6.5 | 7.22 | 7.60 | 7.98 | 10 | 11.2 | 53.6 | 5 | 250 | PTVS6V5P1UP | PTVS6V5P1UTP | | |
| | 7 | 7.78 | 8.20 | 8.60 | 10 | 12 | 50 | 3 | 100 | PTVS7V0P1UP | PTVS7V0P1UTP | | |
| | 7.5 | 8.33 | 8.77 | 9.21 | 1 | 12.9 | 46.5 | 0.2 | 50 | PTVS7V5P1UP | PTVS7V5P1UTP | | |
| | 8 | 8.89 | 9.36 | 9.83 | 1 | 13.6 | 44.1 | 0.03 | 25 | PTVS8V0P1UP | PTVS8V0P1UTP | | |
| | 8.5 | 9.44 | 9.92 | 10.40 | 1 | 14.4 | 41.7 | 0.01 | 10 | PTVS8V5P1UP | PTVS8V5P1UTP | | |
| | 9 | 10.00 | 10.55 | 11.10 | 1 | 15.4 | 39 | 0.005 | 5 | PTVS9V0P1UP | PTVS9V0P1UTP | | |
| | 10 | 11.10 | 11.70 | 12.30 | 1 | 17 | 35.3 | 0.005 | 2.5 | PTVS10VP1UP | PTVS10VP1UTP | | |
| | 11 | 12.20 | 12.85 | 13.50 | 1 | 18.2 | 33 | 0.005 | 2.5 | PTVS11VP1UP | PTVS11VP1UTP | | |
| | 12 | 13.30 | 14.00 | 14.70 | 1 | 19.9 | 30.2 | 0.005 | 2.5 | PTVS12VP1UP | PTVS12VP1UTP | | |
| | 13 | 14.40 | 15.15 | 15.90 | 1 | 21.5 | 27.9 | 0.001 | 0.1 | PTVS13VP1UP | PTVS13VP1UTP | | |
| | 14 | 15.60 | 16.40 | 17.20 | 1 | 23.2 | 25.9 | 0.001 | 0.1 | PTVS14VP1UP | PTVS14VP1UTP | | |
| | 15 | 16.70 | 17.60 | 18.50 | 1 | 24.4 | 24.6 | 0.001 | 0.1 | PTVS15VP1UP | PTVS15VP1UTP | | |
| | 16 | 17.80 | 18.75 | 19.70 | 1 | 26 | 23.1 | 0.001 | 0.1 | PTVS16VP1UP | PTVS16VP1UTP | | |
| | 17 | 18.90 | 19.90 | 20.90 | 1 | 27.6 | 21.7 | 0.001 | 0.1 | PTVS17VP1UP | PTVS17VP1UTP | | |
| | 18 | 20.00 | 21.00 | 22.10 | 1 | 29.2 | 20.5 | 0.001 | 0.1 | PTVS18VP1UP | PTVS18VP1UTP | | |
| | 20 | 22.20 | 23.35 | 24.50 | 1 | 32.4 | 18.5 | 0.001 | 0.1 | PTVS20VP1UP | PTVS20VP1UTP | | |
| | 22 | 24.40 | 25.60 | 26.90 | 1 | 35.5 | 16.9 | 0.001 | 0.1 | PTVS22VP1UP | PTVS22VP1UTP | | |
| | 24 | 26.70 | 28.10 | 29.50 | 1 | 38.9 | 15.4 | 0.001 | 0.1 | PTVS24VP1UP | PTVS24VP1UTP | | |
| | 26 | 28.90 | 30.40 | 31.90 | 1 | 42.1 | 14.2 | 0.001 | 0.1 | PTVS26VP1UP | PTVS26VP1UTP | | |
| | 28 | 31.10 | 32.80 | 34.40 | 1 | 45.4 | 13.2 | 0.001 | 0.1 | PTVS28VP1UP | PTVS28VP1UTP | | |
| | 30 | 33.30 | 35.10 | 36.80 | 1 | 48.4 | 12.4 | 0.001 | 0.1 | PTVS30VP1UP | PTVS30VP1UTP | | |
| | 33 | 36.70 | 38.70 | 40.60 | 1 | 53.3 | 11.3 | 0.001 | 0.1 | PTVS33VP1UP | PTVS33VP1UTP | | |
| | 36 | 40.00 | 42.10 | 44.20 | 1 | 58.1 | 10.3 | 0.001 | 0.1 | PTVS36VP1UP | PTVS36VP1UTP | | |
| | 40 | 44.40 | 46.80 | 49.10 | 1 | 64.5 | 9.3 | 0.001 | 0.1 | PTVS40VP1UP | PTVS40VP1UTP | | |
| | 43 | 47.80 | 50.30 | 52.80 | 1 | 69.4 | 8.6 | 0.001 | 0.1 | PTVS43VP1UP | PTVS43VP1UTP | | |
| | 45 | 50.00 | 52.65 | 55.30 | 1 | 72.7 | 8.3 | 0.001 | 0.1 | PTVS45VP1UP | PTVS45VP1UTP | | |
| | 48 | 53.30 | 56.10 | 58.90 | 1 | 77.4 | 7.8 | 0.001 | 0.1 | PTVS48VP1UP | PTVS48VP1UTP | | |
| | 51 | 56.70 | 59.70 | 62.70 | 1 | 82.4 | 7.3 | 0.001 | 0.1 | PTVS51VP1UP | PTVS51VP1UTP | | |
| | 54 | 60.00 | 63.15 | 66.30 | 1 | 87.1 | 6.9 | 0.001 | 0.1 | PTVS54VP1UP | PTVS54VP1UTP | | |
| | 58 | 64.40 | 67.80 | 71.20 | 1 | 93.6 | 6.4 | 0.001 | 0.1 | PTVS58VP1UP | PTVS58VP1UTP | | |
| | 60 | 66.70 | 70.20 | 73.70 | 1 | 96.8 | 6.2 | 0.001 | 0.1 | PTVS60VP1UP | PTVS60VP1UTP | | |
| | 64 | 71.10 | 74.85 | 78.60 | 1 | 103 | 5.8 | 0.001 | 0.1 | PTVS64VP1UP | PTVS64VP1UTP | | |



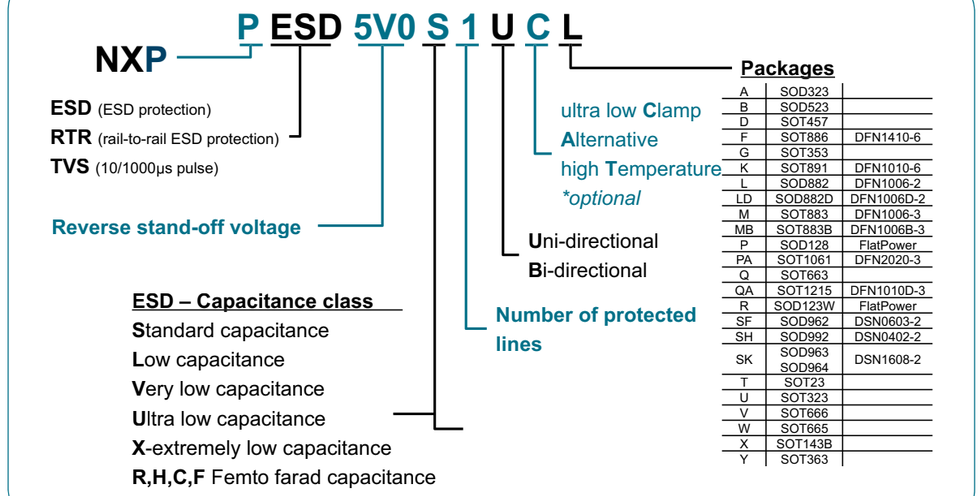

[1] 10 / 1000 µs according to IEC 61643-321

**In the spotlight**

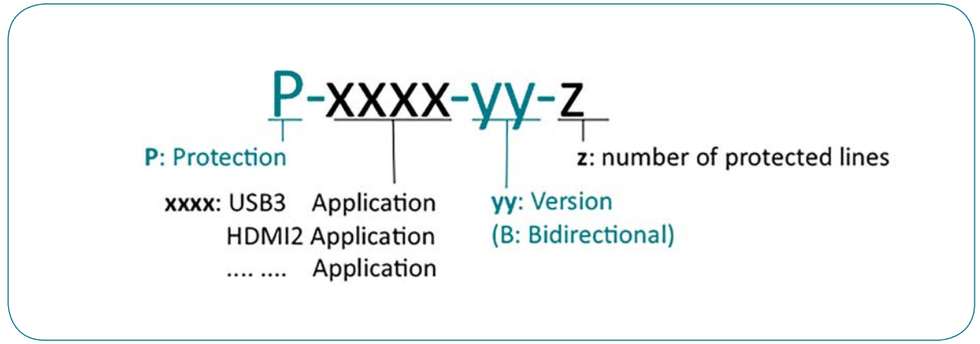
**High-temperature TVS series in FlatPower package**

- Available in 400 W (PTVSxS1UTR) and 600 W (PTVSxP1UTP) power classes with 35 devices each
- Very high maximal junction temperature of 185 °C
- Reverse standoff voltages from 3.3 to 64 V
- Low height, high performance - save board space by replacing SMA & SMB packages with low-profile SOD123W and SOD128 packages
- AEC-Q101 qualified

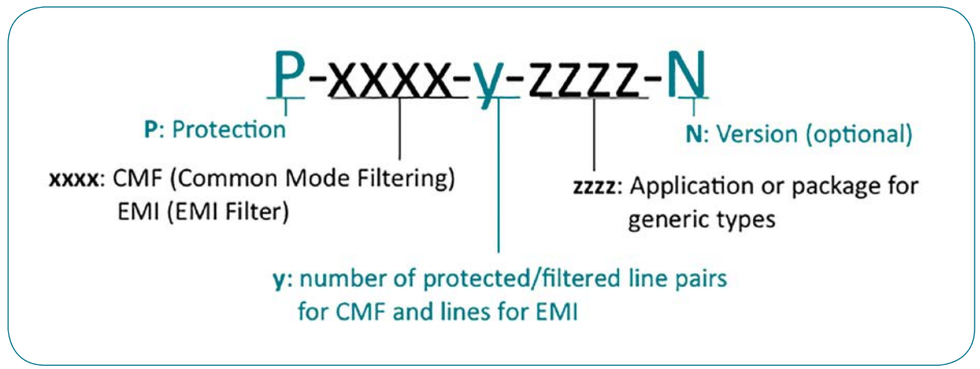

## Protection and signal-conditioning nomenclature

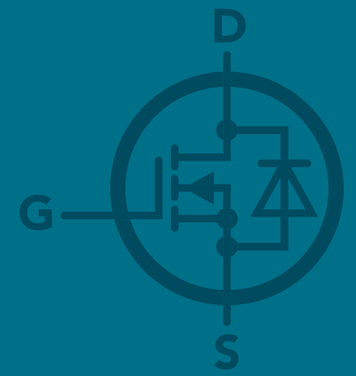



## Application specific protection nomenclature




## Application specific filtering nomenclature






# MOSFETs

# Small-signal MOSFET portfolio

## What you get when you choose NXP for small-signal MOSFETs

**A comprehensive portfolio for all applications**
Best in class performing transistors from commodity to low RDSon MOSFETs

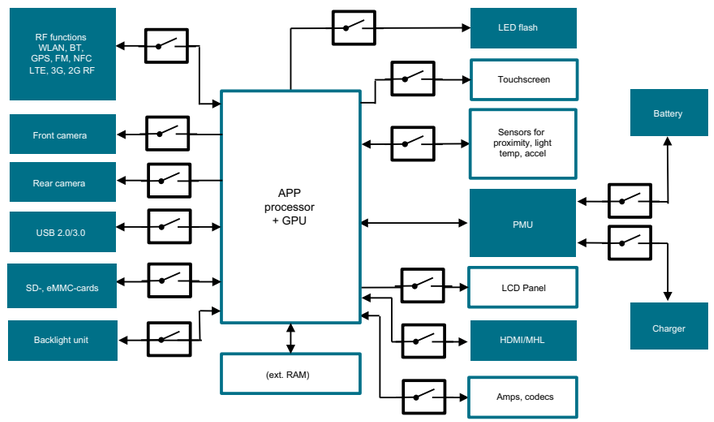
**A broad range of packages**
Many options for WLCSP, leaded SMD and ultra-small leadless packages.

**A quality product from an experienced, high volume supplier**

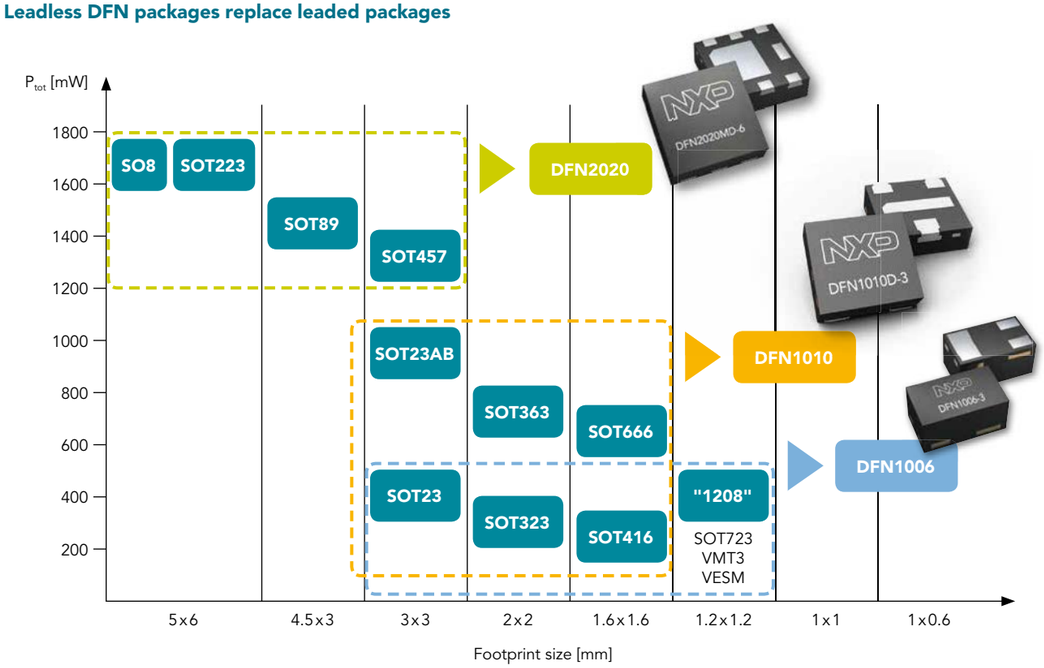
- NXP is strongly committed to automotive quality standards
- NXP has a track record of more than 60 years in developing and producing discretes
- NXP is the #1 in small-signal discretes with a high production capacity

| | Leaded packages | Leadless packages | WLCSP |
|---|---|---|---|
| High $R_{DSon}$ |  ▸2N7002 family ▸NX7002AK family ▸BSS84 family ▸BSS138 family ▸NX3008 family  | | |
| Low $R_{DSon}$ | ▸PMT…/ PHT… SOT223 ▸PMV … SOT23 ▸PMN … SOT457 ▸PMF … SOT323 ▸PMG … SOT363 | ▸PMPB … single DFN2020 ▸PMDPB … dual DFN2020 ▸PMZ … single DFN1006 ▸PMXB … single DFN1010 ▸PMDXB ... dual DFN1010 |  ▸PMCM4 … WLCSP4 ▸PMCM6 … WLCSP6 |

**Block diagram for typical MOSFET application**

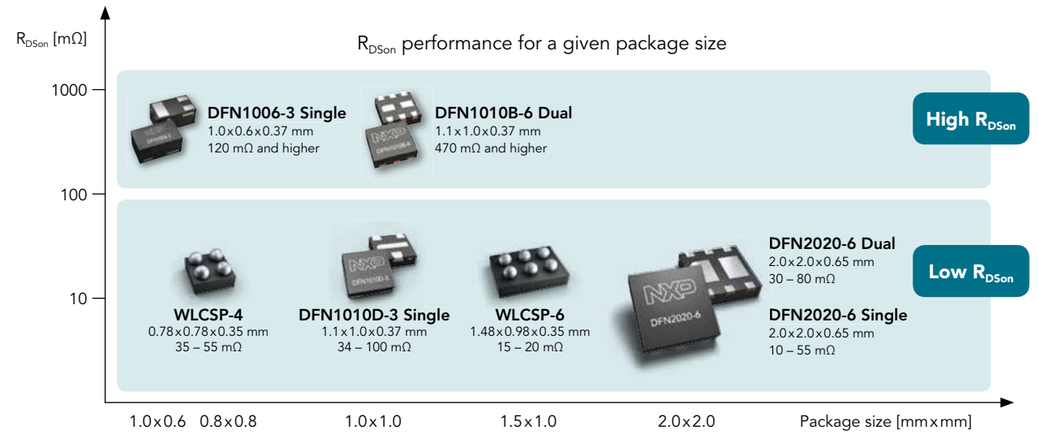



**Leadless DFN packages replace leaded packages**




Leadless packages provide the same power capability compared to larger packages on a smaller size or provide a better thermal performance on the same footprint size.
For that reason they replace established leaded packages in many applications.

**Leadless DFN and WLCSP packages – dedicated solutions for your application**



# Small-signal MOSFETs in ultra-small DFN1006 and DFN1006B packages

types in **bold** represent new products

| Package | | | | | | | | | | | | | | | | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |  |  |
| Size (mm) | | | | | | | | | | | | | | | | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| $P_{tot}$ (mW) | | | | | | | | | | | | | | | | 250 | 250 |
| Polarity | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protec-tion (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = | | | | | | | |
| | | | | | | | | | | 10 V | 4.5 V | 2.5 V | 1.8 V | 1.5 V | 1.2 V | | |
| N-channel | 20 | 8 | 1.9 | 0.45 | 0.95 | 5.3 | 16 | 1.6 | 2 | - | 120 | 160 | 210 | 270 | - | **PMZ130UNE** | |
| | | | 1.6 | 0.45 | 0.95 | 5.3 | 16 | 1.6 | 2 | - | 170 | 200 | 240 | 300 | - | | **PMZB150UNE** |
| | | | 1 | 0.5 | 0.95 | 6 | 86 | 0.45 | 2 | - | 270 | 360 | 470 | 600 | - | **PMZ290UNE2** | **PMZB290UNE2** |
| | | | 0.6 | 0.45 | 0.95 | 5.6 | 19 | 0.4 | 1 | - | 470 | 620 | 845 | 1125 | 2210 | PMZ600UNE | PMZB600UNE |
| | 30 | 8 | 1.5 | 0.45 | 0.95 | 5 | 17 | 1.6 | 2 | - | 210 | 240 | 270 | 300 | - | **PMZ200UNE** | **PMZB200UNE** |
| | | | 1 | 0.45 | 0.95 | 4 | 12 | 0.8 | 2 | - | 390 | 460 | 30 | 610 | - | **PMZ390UNE** | **PMZB390UNE** |
| | | | 0.59 | 0.45 | 0.95 | 4 | 12 | 0.6 | 2 | - | 550 | 660 | 770 | 890 | - | **PMZ550UNE** | **PMZB550UNE** |
| | 60 | 20 | 0.45 | 1.1 | 2.1 | 5 | 12 | 0.5 | 2 | 1000 | 1300 | - | - | - | - | 2N700BKM | 2N7002BKMB |
| | | | 0.35 | 1.1 | 2.1 | 4.7 | 6.9 | 1 | 2 | 2200 | 2500 | - | - | - | - | NX7002BKM | NX7002BKMB |
| P-channel | 20 | 8 | 1.4 | 0.45 | 0.95 | 4 | 26 | 1.3 | 1.8 | - | 330 | 420 | 520 | - | - | PMZ350UPE | PMZB350UPE |
| | | | 0.5 | 0.45 | 0.95 | 2.3 | 13.5 | 1.19 | 1 | - | 1020 | 1270 | 1700 | 2300 | 3500 | PMZ950UPE | PMZB950UPE |
| | 30 | 8 | 1 | 0.45 | 0.95 | 2.9 | 22 | 1.45 | 2 | - | 430 | 470 | 750 | 950 | - | **PMZ320UPE** | **PMZB320UPE** |
| | | | 0.41 | 0.45 | 0.95 | 3 | 14 | 0.7 | 2 | - | 1200 | 1700 | 2100 | 3000 | - | **PMZ1200UNE** | **PMZB1200UPE** |
| | 50 | 20 | 0.23 | 1.1 | 2.1 | 13 | 48 | 0.26 | 1 | 4500 | 5700 | - | - | - | - | BSS84AKM | BSS84AKMB |

### Key features

- N- and P-channel
- Low $R_{DSon}$ down to 120 mΩ
- $I_D$ up to 1.9 A
- Low voltage drive ($V_{GS(th)}$ = 0.65 V typ)
- Voltage range of 20 to 60 V
- ESD protection of up to 2 kV

### Package

- 1.0 x 0.6 mm footprint
- Single package with different heights:
  - 0.5 mm for DFN1006 (SOT883)
  - 0.37 mm for DFN1006B (SOT883B)
- Power dissipation ($P_{tot}$) of 360 mW

### Key applications

- Smartphones
- Wearables
- Tablets

### DFN1006 – The ideal replacement for SOT416






# Small-signal MOSFETs in DFN1010D-3 single and DFN1010B-3 dual packages

types in **bold** represent new products

| Package | | | | | | | | | | | | | | | | | DFN1010D-3 (SOT1215) | DFN1010B-6 (SOT1216) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | |  |  |
| Size (mm) | | | | | | | | | | | | | | | | | 1.1 x 1.0 x 0.37 | 1.1 x 1.0 x 0.37 |
| $P_{tot}$ (mW) | | | | | | | | | | | | | | | | | 1000 | 350 |
| Configuration | Polarity | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protec-tion (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = | | | | | | | |
| | | | | | | | | | | | 10 V | 4.5 V | 2.5 V | 1.8 V | 1.5 V | 1.2 V | | |
| Single | N-channel | 12 | 8 | 3.2 | 0.4 | 0.9 | 6 | 18 | 6.6 | 1 | - | 34 | 39 | 46 | 50 | 121 | PMXB40UNE | |
| | | 20 | 8 | 3.2 | 0.5 | 0.9 | 6 | 17 | 5.7 | 1 | - | 42 | 48 | 56 | 64 | - | PMXB43UNE | |
| | | 30 | 20 | 3.2 | 1 | 2 | 3 | 11 | 3.6 | - | 49 | 56 | - | - | - | - | PMXB56EN | |
| | | | | 3.2 | 1 | 2.5 | 3 | 11 | 6 | 1 | 44 | 56 | - | - | - | - | PMXB65ENE | |
| | | 80 | 20 | 1.1 | 1.3 | 2.7 | 2 | 9 | 3 | 2 | 345 | 390 | - | - | - | - | PMXB360ENEA | |
| | P-channel | 12 | 8 | 3.2 | 0.4 | 1 | 6.2 | 27 | 6.7 | 1.5 | - | 59 | 78 | 120 | 198 | 880 | PMXB65UPE | |
| | | 20 | 8 | 2.9 | 0.4 | 1 | 6 | 29 | 6.8 | 1 | - | 69 | 86 | 130 | 205 | 950 | PMXB75UPE | |
| | | | | 1.2 | 0.45 | 0.95 | 3 | 18 | 1.25 | 1.5 | - | 350 | 450 | 600 | 760 | 1200 | PMXB350UPE | |
| | | 30 | 20 | 2.4 | 1 | 2.5 | 4 | 16 | 6.2 | 1 | 100 | 125 | - | - | - | - | PMXB120EPE | |
| Dual | N-ch | 20 | 8 | 0.6 | 0.45 | 0.95 | 5.6 | 19 | 0.4 | 1 | - | 470 | 620 | 845 | 1125 | 2210 | | PMDXB600UNE |
| | | 30 | 8 | 0.59 | 0.45 | 0.95 | 4 | 12 | 0.6 | 2 | - | 550 | 660 | 770 | 890 | - | | **PMDXB550UNE** |
| | | 60 | 20 | 0.26 | 1.1 | 2.1 | 4.7 | 6.9 | 1 | 2 | 2200 | 2500 | - | - | - | - | | NX7002BKXB |
| | P-ch | 20 | 8 | 0.5 | 0.45 | 0.95 | 2.3 | 13.5 | 1.19 | 1 | - | 1020 | 1270 | 1700 | 2300 | 3500 | | PMDXB950UPE |
| | | 30 | 8 | 0.41 | 0.45 | 0.95 | 3 | 14 | 0.7 | 2 | - | 1200 | 1700 | 2100 | 3000 | - | | **PMDXB1200UPE** |
| Complementary | N | 20 | 8 | 0.6 | 0.45 | 0.95 | 5.6 | 19 | 0.4 | 1 | - | 470 | 620 | 845 | 1125 | 2210 | | PMCXB900UE |
| | P | 20 | 8 | 0.5 | 0.45 | 0.95 | 2.3 | 13.5 | 1.19 | 1 | - | 1020 | 1270 | 1700 | 2300 | 3500 | | |
| | N | 30 | 8 | 0.59 | 0.45 | 0.95 | 4 | 12 | 0.6 | 2 | - | 550 | 660 | 770 | 890 | - | | **PMCXB1000UE** |
| | P | 30 | 8 | 0.41 | 0.45 | 0.95 | 3 | 14 | 0.7 | 2 | - | 1200 | 1700 | 2100 | 3000 | - | | |

### Key features

- N- and P-channel
- Low $R_{DSon}$ to 34 mΩ
- $I_D$ to 3.2 A
- Low voltage drive ($V_{GS(th)}$ = 0.65 V typ)
- Voltage range of 12 to 80 V
- ESD protection to more than 1 kV

### Package

- 1.1 x 1.0 x 0.37 mm package size
- Single and dual packages
- High power dissipation ($P_{tot}$) of 1000 mW single and 350 mW for dual package
- Single package with tin-plated, solderable side pads for improved mounting and automotive conformity

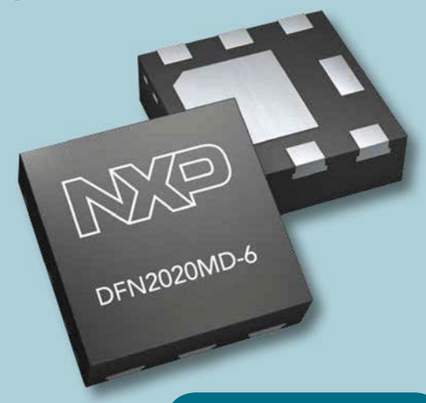
### DFN1010B-6 dual – The ideal replacement for SOT363

# DFN2020 – The low $R_{DSon}$ choice for values > 10 mΩ

**In the spotlight**

**PMPB15XP – Low $R_{DSon}$ P-channel MOSFET in DFN2020**

- 12 V P-channel with $R_{DSon}$ of 15 mΩ @ $V_{GS}$ = 4.5 V (typ)
- $I_D$ max of 11.8 A for medium current load switch
- Small and leadless ultrathin SMD plastic package: 2.0 x 2.0 x 0.65 mm
- Exposed drain pad for excellent thermal conduction
- $R_{DSon}$ specified to 1.8 V for low drive voltages




**DFN2020MD-6 (SOT1220)**

Single package
2 x 2 x 0.65 mm

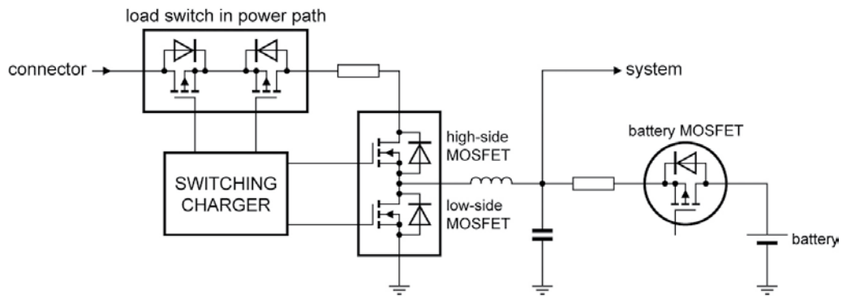
## Key features

- N- and P-channel
- Low $R_{DSon}$ down to 10 mΩ
- $I_D$ up to 13 A
- Low voltage drive ($V_{GS(th)}$ = 0.65 V typ)
- Voltage range of 12 to 100 V
- ESD protection of 3 kV

## Package

- 2.0 x 2.0 x 0.65 mm package size
- Single and dual packages
- High power dissipation ($P_{tot}$) of 1250 mW for single and dual packages
- Single package with tin-plated, solderable side pads for improved mounting and automotive conformity

## Generic charging path application




## Products for charging path application

| Type | Package | $V_{DS}$/$V_{GS}$ (V) | $I_D$ (A) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = | | | | Application |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 10 V | 4.5 V | 2.5 V | 1.8 V | |
| PMPB15XP | DFN2020MD-6 | 12 / 12 | 11.8 | 1.5 | - | 15 | 17 | 21 | Charger Switch, Battery FET |
| PMPB20EN | DFN2020MD-6 | 30 / 20 | 10.4 | - | 16.5 | 20.5 | - | - | Buck Converter |
| PMPB10XNE | DFN2020MD-6 | 20 / 18 | 12.9 | 2.2 | - | 10 | 12 | 16 | Battery Pack |





## Small-signal MOSFETs in DFN2020MD-6 single and DFN2020-6 dual packages

types in **bold** represent new products

| Package | | | | | | | | | | | | | | | DFN2020MD-6 (SOT1220) | DFN2020-6 (SOT1118) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | | | | | | | | | 2.0 x 2.0 x 0.65 | 2.0 x 2.0 x 0.65 |
| $P_{tot}$ (mW) | | | | | | | | | | | | | | | 1250 | 1250 |
| Configuration | Polarity | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = | | | | | |
| | | | | | | | | | | | 10 V | 4.5 V | 2.5 V | 1.8 V | | |
| Single | N-channel | 20 | 8 | 11.3 | 0.4 | 1 | 9 | 26 | 8.8 | 2 | - | 14 | 17 | 21 | **PMPB12UNE** | |
| | | | 12 | 12.9 | 0.4 | 0.9 | 13 | 54 | 23 | 2.2 | - | 10 | 12 | 16 | PMPB10XNE | |
| | | | | 5.9 | 0.75 | 1.25 | 16 | 49 | 31 | 2 | - | 14 | 20 | - | **PMPB20XNEA** | |
| | | | | 10.4 | 0.4 | 0.9 | 9 | 31 | 13.4 | - | - | 18 | 21 | 23 | PMPB15XN | |
| | | | | 10.1 | 0.4 | 0.9 | 9 | 31 | 11.6 | 2.1 | - | 19 | 23 | 31 | PMPB23XNE | |
| | | 30 | 12 | 11.3 | 0.4 | 0.9 | 12 | 54 | 24 | 2.2 | - | 13 | 14 | 17 | PMPB13XNE | |
| | | | | 5 | 0.4 | 0.9 | 8 | 33 | 12.4 | 2.1 | - | 28 | 32 | 37 | PMPB29XNE | |
| | | | | 5.5 | 0.45 | 1.2 | 6 | 21 | 5.1 | - | - | 37 | 55 | - | PMPB33XN | |
| | | | 20 | 13 | 1 | 2 | 9 | 17 | 13.7 | - | 12 | 14 | - | - | PMPB11EN | |
| | | | | 10.4 | 1 | 2 | 9 | 9 | 7.2 | - | 16.5 | 20.5 | - | - | PMPB20EN | |
| | | 60 | 20 | 4 | 1.3 | 2.7 | 4.5 | 13.5 | 7.5 | 1 | 42 | 48 | - | - | **PMPB55ENEA** | |
| | | | | 3 | 1.3 | 2.7 | 4 | 10.5 | 6.2 | 2.7 | 72 | 85 | - | - | PMPB85ENEA | |
| | | 80 | 20 | 2.8 | 1.3 | 2.7 | 5 | 15 | 9.9 | 2.8 | 80 | 92 | - | - | PMPB95ENEA | |
| | | | | 1.9 | 1.3 | 2.7 | 3.5 | 9.5 | 4.8 | 2 | 175 | 195 | - | - | PMPB215ENEA | |
| | P-channel | 12 | 12 | 11.8 | 0.47 | 0.9 | 18 | 85 | 67 | - | - | 15 | 17 | 21 | PMPB15XP | |
| | | 20 | 12 | 10.3 | 0.47 | 0.9 | 16 | 43 | 28.8 | - | - | 19 | 21 | 27 | PMPB19XP | |
| | | | | 10.3 | 0.47 | 0.9 | 13 | 92 | 30 | 2.4 | - | 19 | 22 | 28 | PMPB20XPE | |
| | | | | 5 | 0.47 | 0.9 | 12 | 91 | 30 | 2.3 | - | 28 | 31 | 36 | PMPB29XPE | |
| | | | | 7.9 | 0.47 | 0.9 | 12 | 62 | 15 | - | - | 30 | 35 | 45 | PMPB33XP | |
| | | | | 5 | 0.47 | 0.9 | 9 | 57 | 15.6 | 2.3 | - | 39 | 45 | 56 | PMPB43XPE | |
| | | 30 | 12 | 5 | 0.47 | 0.9 | 15 | 28 | 14 | - | - | 47 | 54 | 74 | PMPB47XP | |
| | | | 20 | 8.8 | 1 | 2.5 | 10 | 28 | 30 | - | 24 | 32 | - | - | PMPB27EP | |
| | | | | 6.8 | 1 | 2.5 | 7.4 | 27 | 17 | - | 40 | 55 | - | - | PMPB48EP | |
| Dual | N-ch | 20 | 12 | 5.3 | 0.4 | 0.9 | 4 | 40 | 14.4 | - | - | 32 | 40 | 60 | | PMDPB30XN |
| | | 30 | 12 | 3.1 | 0.75 | 1.25 | 9 | 19 | 2.9 | 2 | - | 55 | 72 | - | | **PMDPB56XNEA** |
| | | | | 3.1 | 0.5 | 1.5 | 6 | 18 | 1.65 | 1.8 | - | 95 | 130 | - | | **PMDPB95XNE2** |
| | P-channel | 20 | 8 | 4.5 | 0.45 | 0.95 | 7 | 41 | 6.3 | 2 | - | 58 | 74 | 97 | | PMDPB58UPE |
| | | | | 3.7 | 0.45 | 0.95 | 6 | 47 | 5.4 | 2 | - | 82 | 107 | 142 | | PMDPB85UPE |
| | | | 12 | 4.5 | 0.47 | 0.9 | 4 | 135 | 16.5 | - | - | 55 | 75 | 110 | | PMDPB55XP |
| | | | | 4.2 | 0.75 | 1.25 | 7 | 33 | 5 | 2 | - | 66 | 98 | | | PMDPB70XPE |
| | | | | 3.7 | 0.4 | 1 | 6 | 120 | 5.7 | - | - | 80 | 95 | 120 | | PMDPB80XP |
| | | 30 | 12 | 3.8 | 0.45 | 1 | 3 | 112 | 5.2 | - | - | 70 | 89 | - | | PMDPB70XP |
| MOSFET-Schottky | P | 20 | 12 | 3.7 | 0.4 | 1 | 6 | 120 | 5.7 | - | - | 80 | 95 | 120 | | PMFPB8032XP |
| | | | | 3.7 | 0.4 | 1 | 6 | 120 | 5.7 | - | - | 80 | 95 | 120 | | PMFPB8040XP |
| Pre-biased NPN | P | 30 | 12 | 3.4 | 0.45 | 1 | 3 | 112 | 5.2 | - | - | 85 | 105 | - | | PMC85XP |
| Complementary | N | 20 | 12 | 5.3 | 0.4 | 0.9 | 4 | 40 | 14.4 | - | - | 26 | 33 | 50 | | PMCPB5530X |
| | P | 20 | 12 | 4.5 | 0.4 | 0.9 | 4 | 40 | 8.1 | - | - | 55 | 75 | 110 | | |

# Small-signal MOSFETs in WLCSP4 and WLCSP6 packages

**WLCSP6**

Single package
1.48 x 0.98 x 0.35 mm

### Key features

- N- and P-channel
- Low $R_{DSon}$ down to 15 mΩ
- $I_D$ up to 9.6 A
- Low voltage drive ($V_{GSth}$ = 0.6 V typ)
- $V_{DS}$ voltage of 12V
- ESD protection of 2 kV

### Package

- Two package outlines
  - WLCSP4: 0.78 x 0.78 mm package size
  - WLCSP6: 1.48 x 0.98 mm package size
- Ultra-low height of 0.35 mm
- High power dissipation ($P_{tot}$) of 1300 mW

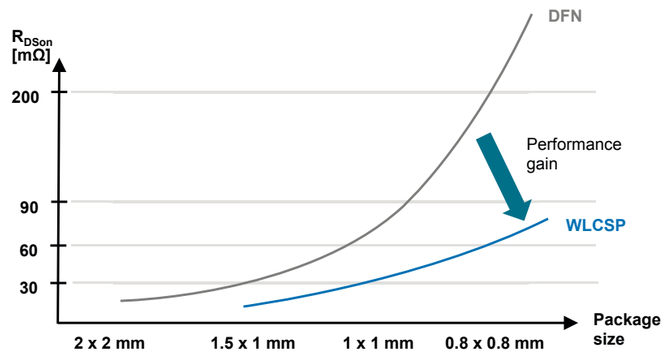
**In the spotlight**

**PMCM6501VPE– Ultra-low $R_{DSon}$ P-ch MOSFET in WLCSP6**

- 12 V P-ch with $R_{DSon}$ of typ. 19 mΩ @ $V_{GS}$ = 4.5 V
- $I_D$ max of 8.2 A for high current load switch
- Ultra-small footprint: 1.48 x 0.98 x 0.35 mm
- Low voltage gate drive with $V_{GSth}$ typ. 0.6V
- $R_{DSon}$ specified down to 1.8 V for low drive voltages

types in **bold** represent new products

| Package | | | | | | | | | WLCSP4 | WLCSP6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | | | | | | | | | 0.78 x 0.78 x 0.35 | 1.48 x 0.98 x 0.35 |
| $P_{tot}$ (mW) | | | | | | | | | 1300 | 1300 |
| Polarity | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = 4.5 V | 2.5 V | 1.8 V | 1.5 V | | |
| N | 12 | 8 | 5 | 0.4 | 0.9 | 6.3 | 27 | 5.5 | 2 | 57 | 66 | 77 | 90 | **PMCM440VNE** | |
| | | | 6 | 0.4 | 0.9 | 6.3 | 30 | 6 | 2 | 36 | 46 | 60 | 86 | **PMCM4401VNE** | |
| | | | 8.4 | 0.4 | 0.9 | 11 | 80 | 15.4 | 2 | 21 | 24 | 28 | 33 | | **PMCM650VNE** |
| | | | 9.6 | 0.4 | 0.9 | 10.8 | 97.5 | 16.1 | 2 | 15 | 18 | 22 | 30 | | **PMCM6501VNE** |
| P | 12 | 8 | 4.9 | 0.4 | 0.9 | 4.8 | 25.1 | 6.8 | 2 | 55 | 77 | 110 | - | **PMCM4401VPE** | |
| | | | 8.2 | 0.4 | 0.9 | 8 | 72 | 19.6 | 2 | 19 | 25 | 37 | - | | **PMCM6501VPE** |




### MOSFETs in WLCSP

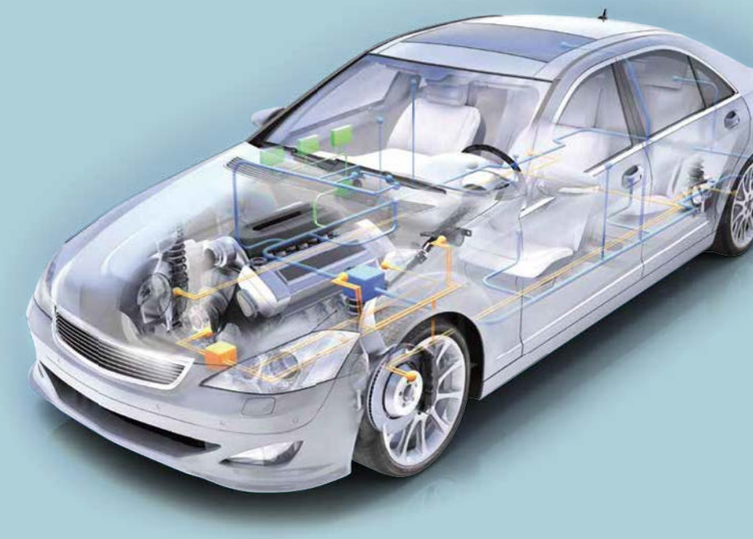
- Improved $R_{DSon}$ performance compared to DFN packages
- Smallest footprint
- High power capability of 1300 mW
- Ideal for mobile and space-constrained applications



# Small-signal MOSFETs for automotive


**DFN2020MD-6 (SOT1220)**

Single package
2 x 2 x 0.65 mm



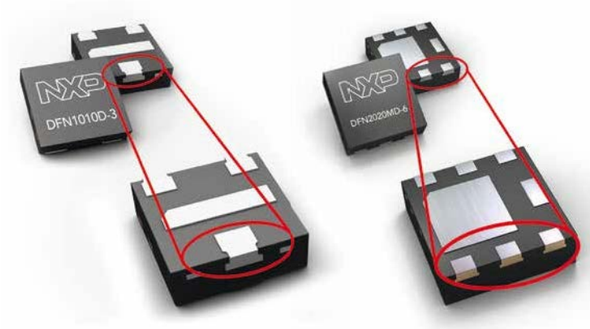
- Broad portfolio of standard leaded packages in SOT23 and SOT457 and innovative leadless DFN packages with solderable side pads
- Low $R_{DSon}$ MOSFETS with $R_{DSon}$ down to 14 mΩ
- Standard high $R_{DSon}$ MOSFETs in different packages with 2 kV ESD protection
- Broad portfolio of 60 V low $R_{DSon}$ MOSFETs

**In the spotlight**

**PMPB85ENEA - Automotive-compliant 60 V N-channel MOSFET with $I_D$ max of 4.4 A in DFN2020MD-6 (SOT1220)**

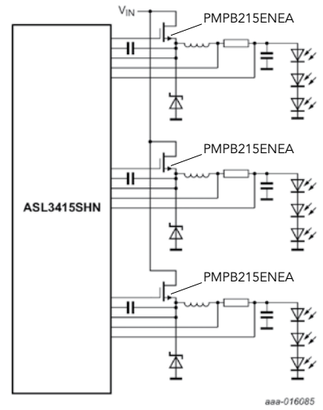
- 60 V N-channel with $R_{DSon}$ of typ. 72mΩ @ $V_{GS}$ = 10 V
- Small and leadless ultrathin SMD plastic package: 2.0 x 2.0 x 0.65 mm
- Exposed drain pad for excellent thermal conduction
- ESD protection to 2 kV HBM
- AEC-Q101 qualified

### DFN1010 and DFN2020 with solderable side pads




Tin plated solderable side pads
enable automatic optical inspection (AOI)

### Reference design for LED lighting




MOSFETs

Small-Signal MOSFETs

# Automotive-compliant small-signal MOSFETs

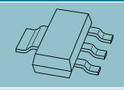
types in **bold** represent new products

| Package | | | | | | | | | | | | | | | SOT223 | SOT457 (SC-74) | SOT23 | SOT363 (SC-88) | SOT323 (SC-70) | SOT666 | DFN-2020MD-6 (SOT1220) | DFN2020-6 (SOT1118) | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |  |  |  |  |  |  |  |  |  |  |
| Size (mm) | | | | | | | | | | | | | | | 6.5 x 3.5 x 1.65 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 2.0 x 2.0 x 0.65 | 2.0 x 2.0 x 0.65 | 1.1 x 1.0 x 0.37 | 1.0 x 0.6 x 0.5 |
| $P_{tot}$ (mW) | | | | | | | | | | | | | | | 1700 | 600 | 250 | 300 | 200 | 300 | 1250 | 1250 | 1000 | 250 |
| Polarity | Configuration | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = 10 V | 4.5 V | 2.5 V | 1.8 V | | | | | | | | | | |
| N-channel | single | 20 | 8 | 4.7 | 0.45 | 1 | 8.2 | 39.5 | 6.2 | 2 | - | 24 | 29 | 40 | | **PMN28UNEA** | **PMV28UNEA** | | | | | | | |
| | | | 12 | 6.3 | 0.75 | 1.25 | 16 | 44 | 9.9 | 2 | - | 16 | 24 | - | | | **PMV20XNEA** | | | | **PMPB20XNEA** | | | |
| | | 30 | 8 | 0.4 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | | | NX3008NBK | | NX3008NBKW | | | | | |
| | | | 12 | 3.1 | 0.75 | 1.25 | 9 | 19 | 2.9 | 2 | - | 55 | 72 | - | | | | | | | | **PMDPB56XNEA** | | |
| | | | 20 | 5.5 | 1 | 2.5 | 8 | 33 | 12.6 | 2 | 17 | 22 | - | - | | **PMN25ENEA** | **PMV25ENEA** | | | | | | | |
| | | | | 3.9 | 1 | 2.5 | 6.3 | 14.1 | 6 | 2 | 30 | 39 | - | - | | | **PMV50ENEA** | | | | | | | |
| | | | | 3 | 1 | 2.5 | 6 | 11 | 3.6 | 2 | 54 | 70 | - | - | | | **PMV100ENEA** | | | | | | | |
| | | 40 | 20 | 3.1 | 1 | 2.5 | - | - | - | 1 | 65 | 88 | - | - | | | **PMV65ENEA** | | | | | | | |
| | | | | 2.5 | 1 | 2.5 | 14 | 14 | 2.4 | 1 | 95 | 120 | - | - | | | PMV130ENEA | | | | | | | |
| | | 60 | 20 | 4 | 1.3 | 2.7 | 4.5 | 13.5 | 7,5 | 1 | 42 | 48 | - | - | | | | | | | **PMPB55ENEA** | | | |
| | | | | 3.1 | 1.3 | 2.7 | 9 | 33 | 12.7 | 2 | 46 | 52 | - | - | | **PMN55ENEA** | **PMV55ENEA** | | | | | | | |
| | | | | 4 | 1.3 | 2.7 | 4 | 10.5 | 6.2 | 2.7 | 72 | 85 | - | - | | | | | | | PMPB85ENEA | | | |
| | | | | 2.1 | 1.3 | 2.7 | 6.4 | 15.9 | 5.9 | 2 | 96 | 108 | - | - | | **PMN120ENEA** | **PMV120ENEA** | | | | | | | |
| | | | | 1.5 | 1.3 | 2.7 | 6.3 | 13 | 3.9 | 2 | 176 | 196 | - | - | | **PMN230ENEA** | **PMV230ENEA** | | | | | | | |
| | | | | 0.8 | 1.3 | 2.7 | 5.3 | 10.2 | 2.4 | 2 | 300 | 332 | - | - | | | **PMV450ENEA** | | | | | | | |
| | | | | 0.36 | 0.9 | 1.5 | 5 | 13 | 0.72 | - | 900 | 1000 | - | - | | | BSS138P | | BSS138PW | | | | | |
| | | | | 0.36 | 0.48 | 1.6 | 10 | 58 | 0.6 | 1.5 | 1000 | 1100 | 1400 | - | | | BSS138BK | | BSS138BKW | | | | | |
| | | | | 0.3 | 1 | 2.5 | 11 | 19 | 0.5 | 2 | 1000 | 1300 | - | - | | | 2N7002BK | | 2N7002BKW | | | | | 2N7002BKM |
| | | | | 0.3 | 1 | 2.5 | 16 | 60 | 1.09 | 3 | 1100 | 1300 | - | - | | | 2N7002CK | | | | | | | |
| | | | | 0.2 | 0.8 | 1.5 | 5 | 36 | 0.39 | yes | 2700 | 3000 | 4000 | - | | | BSS138AKA | | | | | | | |
| | | 80 | 20 | 1.9 | 1.3 | 2.7 | 3.5 | 9.5 | 4.8 | 2 | 175 | 195 | - | - | | | | | | | PMPB215ENEA | | | |
| | | | | 2.8 | 1.3 | 2.7 | 5 | 15 | 9.9 | 2.8 | 80 | 92 | - | - | | | | | | | PMPB95ENEA | | | |
| | | | | 1.1 | 1.3 | 2.7 | 2 | 9 | 3 | 2 | 345 | 390 | - | - | | | | | | | | | PMXB360ENEA | |
| | | 100 | 20 | 1.5 | 1.3 | 2.7 | 4.8 | 9.3 | 4.5 | 1 | 285 | 300 | - | - | **PMT280ENEA** | | | | | | | | | |
| | | | | 1.1 | 1.3 | 2.7 | 5.7 | 10.2 | 2.9 | 1 | 527 | 555 | - | - | **PMT560ENEA** | | | | | | | | | |
| | dual | 20 | 8 | 0.8 | 0.5 | 0.95 | 10 | 117 | 0.45 | 2 | - | 380 | 620 | 1100 | | | | | | PMDT290UNE | | | | |
| | | 30 | 8 | 0.4 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | | | | NX3008NBKS | | NX3008NBKV | | | | |
| | | 60 | 20 | 0.3 | 1 | 2.5 | 11 | 19 | 0.5 | 2 | 1000 | 1300 | - | - | | | | 2N7002BKS | | | | | | |
| | | | | 0.36 | 0.48 | 1.6 | 10 | 58 | 0.6 | 1.5 | 1000 | 1100 | 1400 | - | | | | BSS138BKS | | | | | | |
| | | | | 0.36 | 0.9 | 1.5 | 5 | 13 | 0.72 | - | 900 | 1000 | - | - | | | | BSS138PS | | | | | | |
| P-channel | single | 20 | 8 | 6 | 0.45 | 0.95 | 8 | 50 | 15.6 | 4 | - | 37 | 45 | 59 | | PMN40UPEA | | | | | | | | |
| | | | | 2 | 0.5 | 1.1 | 7 | 50 | 6 | - | - | 100 | 155 | 210 | | | NX2301P | | | | | | | |
| | | | 12 | 4.5 | 0.45 | 0.95 | 11 | 83 | 14.7 | 2 | - | 27 | 38 | 50 | | | **PMV27UPEA** | | | | | | | |
| | | | | 5.7 | 0.75 | 1.25 | 15 | 37 | 15 | 2 | - | 27 | 39 | - | | PMN27XPEA | | | | | | | | |
| | | | | 5.7 | 0.75 | 1.25 | 17 | 33 | 11.5 | 2 | - | 41 | 56 | - | | PMN42XPEA | | | | | | | | |
| | | | | 4.5 | 0.75 | 1.25 | 7.9 | 59 | 11 | 2 | - | 28 | 42 | - | | **PMN30XPEA** | **PMV30XPEA** | | | | | | | |
| | | | | 3.5 | 0.75 | 1.25 | 11 | 61 | 8.5 | - | - | 48 | 71 | - | | **PMN48XPA** | **PMV48XPA** | | | | | | | |
| | | | | 4.1 | 0.75 | 1.25 | 15 | 51 | 8.7 | - | - | 48 | 72 | - | | | | | | | | | | |
| | | | | 2.8 | 0.75 | 1.25 | 7 | 36 | 5 | 2 | - | 67 | 99 | - | | | **PMV65XPEA** | | | | | | | |
| | | | | 4.1 | 0.75 | 1.25 | 7 | 40 | 5.2 | 2 | - | 70 | 101 | - | | PMN70XPEA | | | | | | | | |
| | | | | 2.3 | 0.7 | 1.3 | 5.3 | 36 | 3.4 | 2 | - | 100 | 155 | - | | | **PMV100XPEA** | | | | | | | |
| | | 30 | 8 | 0.23 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | | | NX3008PBK | | NX3008PBKW | | | | | |
| | | | 20 | 4.2 | 1 | 3 | 6.1 | 3.7 | 12.8 | 2 | 35 | 47 | - | - | | **PMN50EPEA** | **PMV50EPEA** | | | | | | | |
| | | 40 | 20 | 1.5 | 1 | 2.5 | 4 | 26 | 4.7 | 1 | 180 | 220 | - | - | | | PMV250EPEA | | | | | | | |
| | | 50 | 20 | 0.2 | 1.1 | 2.1 | 24 | 73 | 0.26 | 1 | 5300 | 6000 | - | - | | | BSS84AK | | BSS84AKW | | | | | BSS84AKM |
| | | 60 | 20 | 2.2 | 1 | 3 | - | - | - | 2 | 99 | 110 | - | - | | **PMN100EPEA** | **PMV100EPEA** | | | | | | | |
| | | | | 0.9 | 1 | 3 | - | - | - | 2 | 217 | 241 | - | - | | **PMN240EPEA** | **PMV240EPEA** | | | | | | | |
| | | 70 | 20 | 2.3 | 1 | 3 | - | - | - | 2 | 156 | 177 | - | - | **PMT200EPEA** | | | | | | | | | |
| | dual | 20 | 8 | 0.55 | 0.5 | 1.3 | 48 | 152 | 0.76 | 2 | - | 670 | 1200 | 1800 | | | | | | PMDT670UPE | | | | |
| | | 30 | 8 | 0.2 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | | | | NX3008PBKS | | NX3008PBKV | | | | |
| | | 50 | 20 | 0.16 | 1.1 | 2.1 | 24 | 73 | 0.26 | 1 | 5300 | 6000 | - | - | | | | BSS84AKS | | BSS84AKV | | | | |
| N | Compl | 20 | 8 | 0.73 | 0.5 | 0.95 | 10 | 117 | 0.45 | 2 | - | 290 | 420 | 600 | | | | PMGD290UCEA | | | | | | |
| P | | 20 | 8 | 0.5 | 0.5 | 1.3 | 48 | 152 | 0.76 | 2 | - | 670 | 1200 | 1800 | | | | | | | | | | |

Small-signal MOSFETs

# Small-signal MOSFETs single (N-channel)

types in **bold** represent new products

| Package | | | | | | | | | | | | | SOT223 | SOT457 (SC-74) | SOT23 | SOT323 (SC-70) | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |  |  |  |  |  |  |
| Size (mm) | | | | | | | | | | | | | 6.5 x 3.5 x 1.65 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| $P_{tot}$ (mW) | | | | | | | | | | | | | 1700 | 600 | 250 | 200 | 250 | 250 |
| $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = 10 V | 4.5 V | 2.5 V | 1.8 V | | | | | | |
| 20 | 8 | 4.7 | 0.45 | 1 | 8.2 | 39.5 | 6.2 | 2 | - | 24 | 29 | 40 | | **PMN28UNEA** | **PMV28UNEA** | | | |
| | | 1.9 | 0.4 | 1 | 8 | 31 | 2.2 | 2 | - | 63 | 77 | 114 | | | | **PMF63UNE** | | |
| | | 2.2 | 0.4 | 1 | 6 | 21 | 2.6 | 2 | - | 64 | 78 | 110 | | | **PMV65UNE** | | | |
| | | 1.9 | 0.45 | 0.95 | 5.3 | 16 | 1.6 | 2 | - | 120 | 155 | 195 | | | | | **PMZ130UNE** | |
| | | 1.6 | 0.45 | 0.95 | 5.3 | 16 | 1.6 | 2 | - | 155 | 190 | 235 | | | | | | **PMZB150UNE** |
| | | 1 | 0.5 | 0.95 | 6 | 86 | 0.45 | 2 | - | 270 | 360 | 470 | | | | | **PMZ290UNE2** | **PMZB290UNE2** |
| | | 0.6 | 0.45 | 0.95 | 5.6 | 19 | 0.4 | 1 | - | 470 | 620 | 845 | | | | | PMZ600UNE | PMZB600UNE |
| | 12 | 6.3 | 0.75 | 1.25 | 16 | 44 | 9.9 | 2 | - | 16 | 24 | - | | | **PMV20XNEA** | | | |
| | | 8.6 | 0.47 | 0.9 | 7 | 135 | 7.7 | - | - | 15 | 18 | 22 | | | PMV16XN | | | |
| | | 9.1 | 0.4 | 0.9 | 9 | 31 | 12 | 1 | - | 15 | 19 | 22 | | **PMN16XNE** | | | | |
| | | 5.4 | 0.4 | 0.9 | 7 | 35 | 6.2 | - | - | 24 | 30 | 40 | | | PMV30UN2 | | | |
| | | 6 | 0.4 | 0.9 | 5.5 | 22 | 5.1 | 1 | - | 28 | 38 | 42 | | **PMN30UNE** | | | | |
| 30 | 8 | 1.5 | 0.45 | 0.95 | 5 | 17 | 1.6 | 2 | - | 210 | 240 | 270 | | | | | **PMZ200UNE** | **PMZB200UNE** |
| | | 1 | 0.45 | 0.95 | 4 | 12 | 0.8 | 2 | - | 390 | 460 | 530 | | | | | **PMZ390UNE** | **PMZB390UNE** |
| | | 0.59 | 0.45 | 0.95 | 4 | 12 | 0.6 | 2 | - | 550 | 660 | 770 | | | | | **PMZ550UNE** | **PMZB550UNE** |
| | | 0.4 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | | | NX3008NBK | NX3008NBKW | | |
| | 12 | 7.2 | 0.4 | 0.9 | 8 | 33 | 12.4 | 2 | - | 19 | 22 | 17 | | | PMV20XNE | | | |
| | | 5.7 | 0.4 | 0.9 | 9 | 34 | 7 | - | - | 33 | 42 | 54 | | **PMN30UN** | | | | |
| | | 4.4 | 0.4 | 0.9 | 9 | 34 | 7 | - | - | 36 | 43 | 56 | | | PMV40UN2 | | | |
| | | 0.9 | 0.5 | 1.5 | 8 | 11 | 0.74 | 2 | - | 234 | 324 | - | | | | **PMF250XNE** | | |
| | 20 | 7.6 | 1 | 2 | 9 | 9 | 7.2 | - | 17 | 21 | - | - | | | PMV20EN | | | |
| | | 5.5 | 1 | 2.5 | 8 | 33 | 12.6 | 2 | 17 | 22 | - | - | | **PMN25ENEA** | **PMV25ENEA** | | | |
| | | 3.9 | 1 | 2.5 | 6.3 | 14.1 | 6 | 2 | 30 | 39 | - | - | | | **PMV50ENEA** | | | |
| | | 3.1 | 1 | 2.5 | 18 | 78 | 6.5 | - | 28 | 37 | - | - | | | PMV37EN2 | | | |
| | | 4.5 | 1 | 2.5 | 3 | 11 | 6 | 1 | 30 | 44 | - | - | | **PMN40ENE** | | | | |
| | | 5.1 | 1 | 2 | 3 | 11 | 3.6 | - | 35 | 43 | - | - | | | PMV45EN2 | | | |
| | | 2.1 | 1 | 2.5 | 3 | 15 | 2.6 | 2 | 70 | 90 | - | - | | | **PMV90ENE** | | | |
| | | 0.18 | 0.8 | 1.5 | 10 | 51 | 0.34 | - | 2700 | 3000 | 4000 | - | | | NX3020NAK | NX3020NAKW | | |
| 40 | 20 | 3,1 | 1 | 2,5 | - | - | - | 1 | 65 | 88 | - | - | | | **PMV65ENEA** | | | |
| | | 2.5 | 1 | 2.5 | 14 | 14 | 2.4 | 1 | 95 | 120 | - | - | | | PMV130ENEA | | | |
| 55 | 10 | 0.3 | 0.4 | 1.3 | 4 | 11 | 1 | 3 | - | 2300 | 2400 | 3100 | | | BSH111BK | | | |
| 60 | 20 | 3.1 | 1.3 | 2.7 | 9 | 33 | 12.7 | 2 | 46 | 52 | | - | | **PMN55ENEA** | **PMV55ENEA** | | | |
| | | 2.1 | 1.3 | 2.7 | 6.4 | 15.9 | 5.9 | 2 | 96 | 108 | - | - | | **PMN120ENEA** | **PMV120ENEA** | | | |
| | | 1.5 | 1.3 | 2.7 | 6.3 | 13 | 3.9 | 2 | 176 | 196 | - | - | | **PMN230ENEA** | **PMV230ENEA** | | | |
| | | 0.8 | 1.3 | 2.7 | 5.3 | 10.2 | 2.4 | 2 | 300 | 332 | - | - | | | **PMV450ENEA** | | | |
| | | 0.19 | 0.8 | 1.5 | 6 | 11 | 0.33 | yes | 2800 | 3500 | 4500 | - | | | **NX138AK** | **NX138AKW** | | |
| | | 0.27 | 0.5 | 1.5 | 7.9 | 12.5 | 0.49 | 2 | 2100 | 2200 | 2600 | - | | | **NX138BK** | **NX138BKW** | | |
| | | 0.1 | 0.6 | 1.4 | 2 | 5 | | 2 | 2800 | 3800 | - | - | | | BSN20BK | | | |
| | | 0.19 | 1.1 | 2.1 | 12 | 34 | 0.33 | yes | 3000 | 3700 | - | - | | | NX7002AK | NX7002AKW | | |
| | | 0.27 | 1.1 | 2.1 | 4.7 | 6.9 | 1 | 2 | 2200 | 2500 | - | - | | | NX7002BK | NX7002BKW | NX7002BKM | NX7002BKMB |
| 100 | 20 | 1.5 | 1.3 | 2.7 | 4.8 | 9.3 | 4.5 | 1 | 285 | 300 | - | - | **PMT280ENEA** | | | | | |
| | | 1.1 | 1.3 | 2.7 | 5.7 | 10.2 | 2.9 | 1 | 527 | 555 | - | - | **PMT560ENEA** | | | | | |

Small-signal MOSFETs

## Small-signal MOSFETs single (P-channel)

types in **bold** represent new products

| Package | | | | | | | | | SOT223 | SOT457 (SC-74) | SOT23 | SOT363 (SC-88) | SOT323 (SC-70) | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |  |  |  |  |  |  |  |
| Size (mm) | | | | | | | | | 6.5 x 3.5 x 1.65 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.0 x 0.6 x 0.48 | 1.0 x 0.6 x 0.37 |
| $P_{tot}$ (mW) | | | | | | | | | 1700 | 600 | 250 | 300 | 200 | 250 | 250 |
| $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = 10 V | 4.5 V | 2.5 V | 1.8 V | | | | |
| 20 | 8 | 5.7 | 0.45 | 0.95 | 39 | 122 | 21 | - | - | 27 | 36 | 57 | | PMN27UP | | | | | |
| | | 5.6 | 0.45 | 0.95 | 11 | 83 | 14.7 | 2 | - | 27 | 38 | 50 | | | PMV27UPE | | | | |
| | | 5.3 | 0.45 | 0.95 | 41 | 122 | 14.7 | 2 | - | 30 | 38 | 51 | | | PMV33UPE | | | | |
| | | 5.4 | 0.45 | 0.95 | 34 | 128 | 15.5 | - | - | 34 | 42 | 57 | | PMN34UP | PMV32UP | | | | |
| | | 6 | 0.45 | 0.95 | 29 | 84 | 15.6 | 4 | - | 37 | 45 | 59 | | PMN40UPE | | | | | |
| | | 4 | 0.47 | 0.9 | - | - | 10.5 | 3 | - | 50 | 57 | 70 | | PMN50UPE | PMV50UPE | | | | |
| | | 2 | 0.5 | 1.1 | 7 | 50 | 6 | - | - | 100 | 155 | 210 | | | NX2301P | | | | |
| | | 1.2 | 0.45 | 0.95 | 33 | 52 | 3.3 | - | - | 170 | 210 | 280 | | | PMV160UP | | | | |
| | | 0.75 | 0.4 | - | 6.5 | 65 | - | - | - | 180 | - | 420 | | | BSH205G2 | | | | |
| | | 1.4 | 0.45 | 0.95 | 9 | 35 | 1.3 | 1.8 | - | 330 | 420 | 520 | | | | | | PMZ350UPE | PMZB350UPE |
| | | 0.5 | 0.45 | 0.95 | 2.3 | 13.5 | 1.19 | 1 | - | 1020 | 1270 | 1700 | | | | | | **PMZ950UPE** | **PMZB950UPE** |
| | 12 | 4.5 | 0.75 | 1.25 | 7.9 | 59 | 11 | 2 | - | 28 | 42 | - | | **PMN30XPEA** | **PMV30XPEA** | | | | |
| | | 5.7 | 0.75 | 1.25 | 37 | 66 | 15 | 2 | - | 27 | 39 | - | | PMN27XPE | | | | | |
| | | 6.8 | 0.47 | 0.9 | 12 | 62 | 15 | - | - | 30 | 35 | 48 | | **PMN30XP** | | | | | |
| | | 5.7 | 0.75 | 1.25 | 44 | 60 | 11.5 | 2 | - | 41 | 56 | - | | PMN42XPE | | | | | |
| | | 4.1 / 3.5 | 0.75 | 1.25 | 24 | 84 | 8.5 | - | - | 48 | 71 | - | | PMN48XP | PMV48XP | | | | |
| | | 4.4 | 0.47 | 0.9 | 7 | 135 | 7.7 | - | - | 48 | 60 | 82 | | | PMV50XP | | | | |
| | | 4.7 | 0.47 | 0.9 | 5.1 | 141 | 8.5 | - | - | 50 | 64 | 88 | | **PMN52XP** | | | | | |
| | | 3.9 | 0.55 | 0.95 | 28 | 101 | 7.6 | - | - | 65 | 90 | - | | | PMV65XP | | | | |
| | | 3.3 | 0.75 | 1.25 | 7 | 36 | 5 | 2 | - | 67 | 99 | - | | | PMV65XPE | | | | |
| | | 4.1 | 0.75 | 1.25 | 20 | 57 | 5.2 | 2 | - | 70 | 101 | - | | PMN70XPE | | | | | |
| | | 3.9 | 0.47 | 0.9 | 6 | 120 | 5 | - | - | 72 | 88 | 110 | | **PMN70XP** | | | | | |
| | | 3.2 | 0.47 | 0.9 | 6 | 120 | 5 | - | - | 77 | 95 | 120 | | | PMV75UP | | | | |
| | | 3.2 | 0.45 | 1 | 20 | 170 | 5 | - | - | 80 | 95 | 120 | | PMN80XP | | | | | |
| | | 2 | 0.65 | 1.15 | 48 | 64 | 4.8 | - | - | 90 | 125 | - | | | | PMG85XP | | | |
| | | 2.3 | 0.7 | 1.3 | 5.3 | 36 | 3.4 | 2 | - | 100 | 155 | - | | | **PMV100XPEA** | | | | |
| | | 1 | 0.65 | 1.15 | 26 | 44 | 2.6 | - | - | 175 | 240 | - | | | | | PMF170XP | | |
| 30 | 8 | 1 | 0.45 | 0.95 | 2.9 | 22 | 1.45 | 2 | - | 400 | 480 | 600 | | | | | | **PMZ320UPE** | **PMZB320UPE** |
| | | 0.41 | 0.45 | 0.95 | 3 | 14 | 0.7 | 2 | - | 1200 | 1700 | 2100 | | | | | | **PMZ1200UPE** | **PMZB1200UPE** |
| | | 0.23 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | | | NX3008PBK | | NX3008PBKW | | |
| | 20 | 4.2 | 1 | 3 | 6.1 | 3.7 | 12.8 | 2 | 35 | 47 | - | - | | **PMN50EPEA** | **PMV50EPEA** | | | | |
| | | 3.3 | 1 | 3 | - | - | - | 2 | 60 | 96 | - | - | | **PMN70EPE** | | | | | |
| 40 | 20 | 1.8 | 1 | 2.5 | 10 | 40 | 4.7 | 1 | 180 | 220 | - | - | | | PMV250EPEA | | | | |
| 50 | 20 | 0.2 | 1.1 | 2.1 | 24 | 73 | 0.26 | 1 | 5300 | 6000 | - | - | | | BSS84AK | | BSS84AKW | BSS84AKM | BSS84AKMB |
| 60 | 20 | 2.2 | 1 | 3 | - | - | - | 2 | 99 | 110 | - | - | | **PMN100EPEA** | **PMV100EPEA** | | | | |
| | | 0.9 | 1 | 3 | - | - | - | 2 | 217 | 241 | - | - | | **PMN240EPEA** | **PMV240EPEA** | | | | |
| 70 | 20 | 2.3 | 1 | 3 | - | - | - | 2 | 156 | 177 | - | - | **PMT200EPEA** | | | | | | |

[1] SOT23 with enhanced thermal performance

## Small-signal MOSFET–Schottky combination

| Package | | | | | | | | | | | | | DFN2020-6 (SOT1118) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |  |
| Size (mm) | | | | | | | | | | | | | 2.0 x 2.0 x 0.65 |
| $P_{tot}$ (mW) | | | | | | | | | | | | | 1250 |
| Configuration | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | $I_F$ (A) | $V_R$ (V) | $V_F$ typ. (mV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = 4.5 V | 2.5 V | 1.8 V | |
| Single + Schottky | 20 | 8 | 3.7 | 0.4 | 1 | 20 | 170 | 5.7 | 2 | 30 | 455 | 80 | 95 | 120 | PMFPB8040XP |
| | | | 3.7 | 0.4 | 1 | 20 | 170 | 5.7 | 2.2 | 30 | 325 | 80 | 95 | 120 | PMFPB8032XP |

**In the spotlight**

**PMV75UP – 20 V, 77 mΩ P-channel MOSFET**

- Cross of Si2301 types
- Low-voltage gate drive with VGSth = 0.68 V (typ)
- Industry-standard SOT23 package
- $R_{DSon}$ specified to 1.8 V for low drive voltages

Small-signal MOSFETs

## Small-signal MOSFETs dual

types in **bold** represent new products

| Package | | | | | | | | | | SOT363 (SC-88) | SOT666 | DFN2020-6 (SOT1118) | DFN1010B-6 (SOT1216) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |  |  |  |  |
| Size (mm) | | | | | | | | | | 2.0 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 2.0 x 2.0 x 0.65 | 1.0 x 1.0 x 0.37 |
| $P_{tot}$ (mW) | | | | | | | | | | 300 | 300 | 1250 | 350 |
| Polarity | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = | | | |
| | | | | | | | | | | 10 V | 4.5 V | 2.5 V | 1.8 V | | | | |
| N-channel | 20 | 8 | 0.8 | 0.5 | 0.95 | 10 | 117 | 0.45 | 2 | - | 290 | 420 | 600 | | PMDT290UNE | | |
| | | | 0.6 | 0.45 | 0.95 | 5.6 | 19 | 0.4 | 1 | - | 470 | 620 | 845 | | | | PMDXB600UNE |
| | | 12 | 5.3 | 0.4 | 0.9 | 4 | 40 | 14.4 | - | - | 32 | 40 | 60 | | | PMDPB30XN | |
| | 30 | 8 | 0.59 | 0.45 | 0.95 | 4 | 12 | 0.6 | 2 | - | 550 | 660 | 770 | | | | **PMDXB550UNE** |
| | | | 0.35 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | NX3008NBKS | NX3008NBKV | | |
| | | 12 | 3.1 | 0.75 | 1.25 | 9 | 19 | 2.9 | 2 | - | 55 | 72 | - | | | **PMDPB56XNEA** | |
| | | | 3.1 | 0.5 | 1.5 | 6 | 18 | 1.65 | 1.8 | - | 95 | 130 | - | | | **PMDPB95XNE2** | |
| | | | 1 | 0.5 | 1.5 | 6.5 | 14 | 0.7 | 2 | - | 170 | 240 | - | **PMGD175XNE** | | | |
| | | 20 | 0.18 | 0.8 | 1.5 | 10 | 51 | 0.34 | yes | 2700 | 3000 | 4000 | - | NX3020NAKS | NX3020NAKV | | |
| | 60 | 20 | 0.18 | 0.8 | 1.5 | 6 | 11 | 0.33 | yes | 2800 | 3500 | 4500 | - | **NX138AKS** | | | |
| | | | 0.26 | 0.5 | 1.5 | 7.9 | 12.5 | 0.49 | 2 | 2100 | 2200 | 2600 | - | **NX138BKS** | | | |
| | | | 0.17 | 1.1 | 2.1 | 12 | 34 | 0.33 | yes | 3000 | 3700 | - | - | NX7002AKS | | | |
| | | | 0.26 | 1.1 | 2.1 | 4.7 | 6.9 | 1 | 2 | 2200 | 2500 | - | - | NX7002BKS | | | NX7002BKXB |
| P-channel | 20 | 8 | 0.55 | 0.5 | 1.3 | 48 | 152 | 0.76 | 2 | - | 670 | 1200 | 1800 | | PMDT670UPE | | |
| | | | 4.5 | 0.45 | 0.95 | 7 | 41 | 6.3 | 2 | - | 58 | 74 | 97 | | | PMDPB58UPE | |
| | | | 0.5 | 0.45 | 0.95 | 2.3 | 13.5 | 1.19 | 1 | - | 1020 | 1270 | 1700 | | | | PMDXB950UPE |
| | | | 3.7 | 0.45 | 0.95 | 6 | 47 | 5.4 | 2 | - | 82 | 107 | 142 | | | PMDPB85UPE | |
| | | 12 | 4.5 | 0.47 | 0.9 | 4 | 135 | 16.5 | - | - | 55 | 75 | 110 | | | PMDPB55XP | |
| | | | 4.2 | 0.75 | 1 | 7 | 33 | 5 | 2 | - | 66 | 98 | - | | | PMDPB70XPE | |
| | | | 3.7 | 0.4 | 1 | 6 | 120 | 5.7 | - | - | 80 | 95 | 120 | | | PMDPB80XP | |
| | 30 | 8 | 0.41 | 0.45 | 0.95 | 3 | 14 | 0.7 | 2 | - | 1200 | 1700 | 2100 | | | | **PMDXB1200UPE** |
| | | | 0.2 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | NX3008PBKS | NX3008PBKV | | |
| | | 12 | 3.8 | 0.45 | 1 | 3 | 112 | 5.2 | - | - | 70 | 89 | - | | | PMDPB70XP | |
| | 50 | 20 | 0.16 | 1.1 | 2.1 | 24 | 73 | 0.26 | 1 | 4500 | 5700 | - | - | BSS84AKS | BSS84AKV | | |

## Small-signal MOSFETs complementary

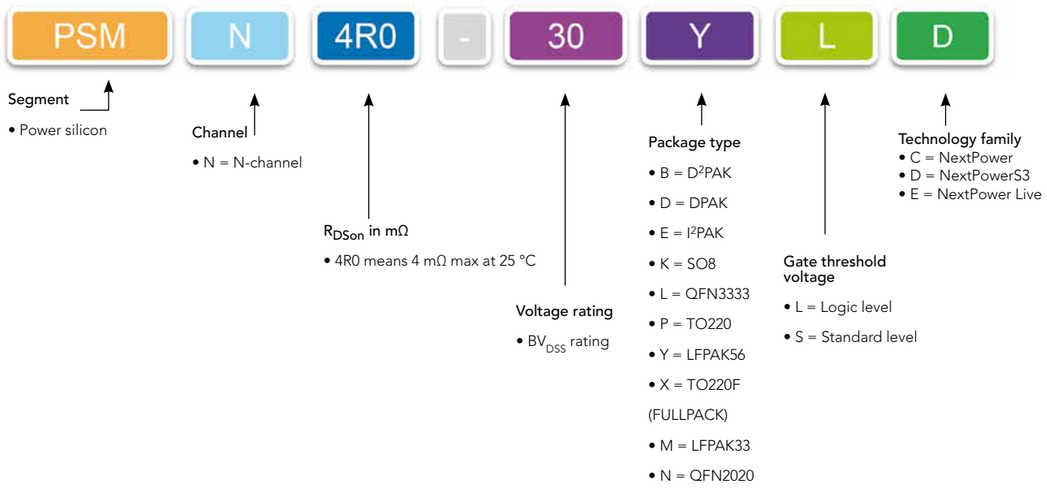
types in **bold** represent new products

| Package | Type | Polarity | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GSth}$ min (V) | $V_{GSth}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 10 V | 4.5 V | 2.5 V | 1.8 V | 1.5 V | 1.2 V |
|  **SOT666** (1.6 x 1.2 x 0.55) | NX1029X | N | 60 | 20 | 0.33 | 1.1 | 2.1 | 11 | 19 | 0.5 | 2 | 1000 | 1300 | - | - | - | - |
| | | P | 50 | 20 | 0.17 | 1.1 | 2.1 | 24 | 73 | 0.26 | 1 | 4500 | 5100 | - | - | - | - |
| | NX3008CBKV | N | 30 | 8 | 0.4 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | - | - |
| | | P | 30 | 8 | 0.22 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | - | - |
| | PMDT290UCE | N | 20 | 8 | 0.8 | 0.5 | 0.95 | 10 | 117 | 0.45 | 2 | - | 290 | 420 | 600 | - | - |
| | | P | 20 | 8 | 0.55 | 0.5 | 1.3 | 48 | 152 | 0.76 | 2 | - | 670 | 1200 | 1800 | - | - |
|  **SOT363 (SC-88)** (2.0 x 1.25 x 0.95) | NX3008CBKS | N | 30 | 8 | 0.35 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | - | - |
| | | P | 30 | 8 | 0.2 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | - | - |
|  **DFN1010B-6** (1.1 x 1.0 x 0.37) | PMCXB900UE | N | 20 | 8 | 0.6 | 0.45 | 0.95 | 5.6 | 19 | 0.4 | 1 | - | 470 | 620 | 845 | 1125 | 2210 |
| | | P | 20 | 8 | 0.5 | 0.45 | 0.95 | 2.3 | 13.5 | 1.19 | 1 | - | 1020 | 1270 | 1700 | 2300 | 3500 |
| | **PMCXB1000UE** | N | 30 | 8 | 0.59 | 0.45 | 0.95 | 4 | 12 | 0.6 | 2 | - | 550 | 660 | 770 | 890 | - |
| | | P | 30 | 8 | 0.41 | 0.45 | 0.95 | 3 | 14 | 0.7 | 2 | - | 1200 | 1700 | 2100 | 3000 | - |
|  **DFN2020-6** (2.0 x 2.0 x 0.65) | PMCPB5530X | N | 20 | 12 | 5.3 | 0.4 | 0.9 | 19 | 56 | 14.4 | - | - | 26 | 33 | 50 | - | - |
| | | P | 20 | 12 | 4.5 | 0.47 | 0.9 | 18 | 56 | 16.5 | - | - | 55 | 75 | 110 | - | - |

## 4 steps select a power MOSFET

1. Select a voltage, e.g. 40 V
2. Select a package, e.g. LFPAK56
3. Choose an $R_{DSon}$ from our extensive range
4. Select a type and visit www.nxp.com/mosfets to download datasheets and models, and order samples

### PSMN part numbering






# High-performance power MOSFETs

### MOSFET package selection

Through-hold

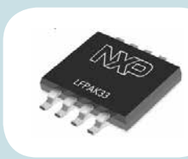
Surface-mount

**TO220**
- Industry standard
- Up to 150 A

**LFPAK56**
- Power SO8
- Up to 100 A

**TO220F**
- Industry standard
- Up to 75 A

**LFPAK33**
- QFN/DFN3333 compatible
- Up to 70 A

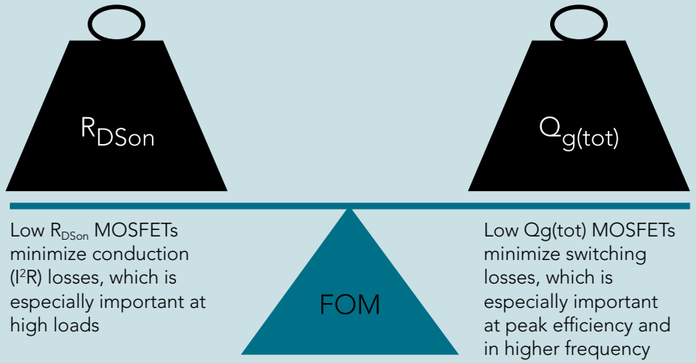


**I²PAK**
- Industry standard
- Up to 120 A

**D²PAK**
- Industry standard
- Up to 120 A

# Featured product: **NextPowerS3**

## NextPowerS3 – perfectly balanced for DC/DC switching applications




### The challenge

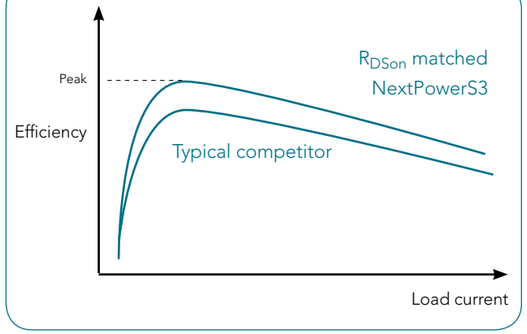
Low $R_{DSon}$ MOSFETs typically need a big die.

Low $Q_{g(tot)}$ MOSFETs typically need a small die.

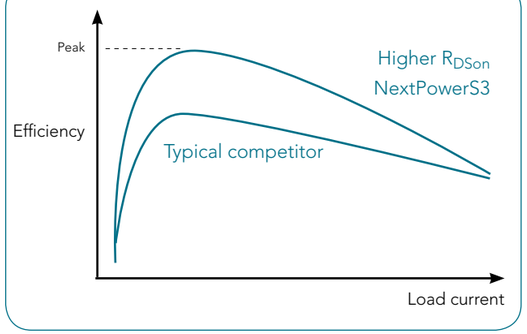
The challenge for manufacturers is to create optimized power MOSFETS that have both low $R_{DSon}$ and low $Q_{g(tot)}$.

Welcome to NextPowerS3.

The Figure of Merit (FOM) of a MOSFET is calculated as the product of the $R_{DSon}$ and $Q_{g(tot)}$. A low FOM indicates good MOSFET performance in switching applications.




Comparing the performance of a NextPowerS3 MOSFET with a competitor of similar $R_{DSon}$ typically shows an efficiency performance advantage across the load range. Since conduction losses are the same for both devices, the advantage is more noticeable at lower loads where switching losses contribute proportionally more.




Using a NextPowerS3 MOSFET, with a higher $R_{DSon}$ than a competitor device, reduces the $Q_{g(tot)}$ still further, resulting in an improved peak efficiency. At higher loads, increased conduction losses cancel out the switching advantages and the two parts show similar performance.



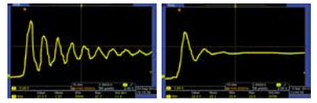
# Featured product: **NextPowerS3**

### High switching frequencies

Increasing switching frequency from 300 KHz to 1 MHz allows a 70 - 80% reduction in inductor size. NextPowerS3's excellent switching performance enables such design choices with minimal loss of efficiency.

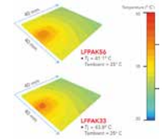
### Low spiking

Typical competitor NextPowerS3



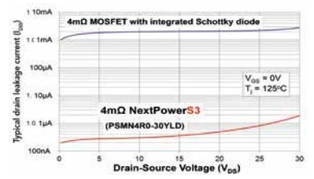
Thanks to optimised output capacitance, body diode and channel structure, NextPowerS3 MOSFETs exhibit "soft-recovery" switching behaviour, resulting in lower voltage spikes, faster decays and virtually no gate glitches.

### Thermal efficiency



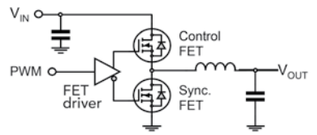
Packaged in the copper-clip based LFPAK package, NextPowerS3 features excellent thermal performance. As $R_{DSon}$ rises with temperature, keeping MOSFETs cool helps efficiency as well as reliability.

### Low leakage



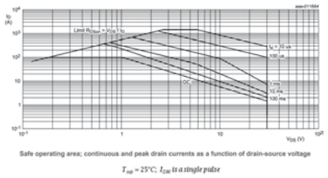

Unique SchottkyPlus technology offers the benefits of an integrated Schottky diode without the problems associated with leakage current.

### Specialist high sides




The NextPowerS3 portfolio contains devices with multiple busbars and low $R_g$ optimized for use as control FETs, further improving system efficiencies.

### Improved SOA

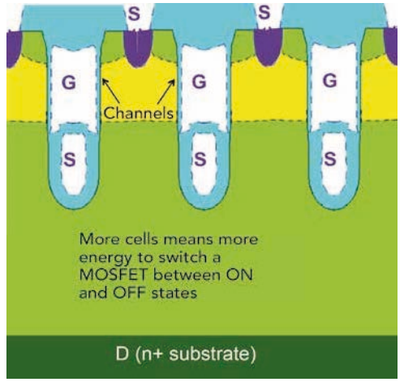


A wide cell pitch makes NextPowerS3 an excellent choice for hot-swap, e-Fuse, and power OR-ing applications.

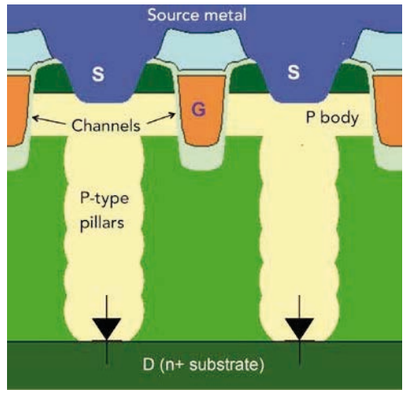
| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $R_{DSon}$ [max] @ $V_{GS}$ = 4.5 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|---|
| LFPAK33 (SOT1210) | PSMN2R4-30MLD | 30 | 2.4 | 3.2 | 70 | 16 |
| | PSMN4R2-30MLD | 30 | 4.3 | 5.7 | 70 | 9.2 |
| | PSMN7R5-30MLD | 30 | 7.6 | 10.3 | 57 | 5.8 |
| Power-SO (LFPAK56) | PSMN0R9-30YLD | 30 | 0.87 | 1.09 | 100 | 51 |
| | PSMN1R0-30YLD | 30 | 1.02 | 1.3 | 100 | 38 |
| | PSMN1R2-30YLD | 30 | 1.24 | 1.6 | 100 | 32 |
| | PSMN1R4-30YLD | 30 | 1.42 | 1.85 | 100 | 27.6 |
| | PSMN2R4-30YLD | 30 | 2.4 | 3.1 | 100 | 18 |
| | PSMN3R0-30YLD | 30 | 3.1 | 4 | 100 | 14.5 |
| | PSMN4R0-30YLD | 30 | 4 | 5.5 | 95 | 9.6 |
| | PSMN6R0-30YLD | 30 | 6 | 8.35 | 66 | 6.7 |
| | PSMN6R1-30YLD | 30 | 6 | 8.35 | 66 | 6.8 |
| | PSMN7R5-30YLD | 30 | 7.5 | 10.2 | 51 | 5.8 |
| | PSMN1R0-40YLD | 40 | 1.1 | | 100 | 54 |
| | PSMN1R4-40YLD | 40 | 1.4 | | 100 | 45 |

# Featured product: **NextPowerS3 – the technology**

Typical competitor




NextPowerS3




### The importance of cell design

The outstanding performance of NextPowerS3 is largely attributable to NXP's unique "Super-junction" technology and optimization of cell structures.

Most manufacturers of low-voltage MOSFETs use "Split Gate" technology to achieve low $R_{DSon}$.

NextPowerS3 uses a different approach to its cell design.

### The drive for $R_{DSon}$

A MOSFET's $R_{DSon}$ is given by the formula:
$R_{DSon} = R_{channel} + R_{drift} + R_{substrate} + (R_{package})$
Many manufacturers focus on reducing $R_{channel}$ to drive $R_{DSon}$ down.

NXP's Super-junction allows for an optimization of all three components for reduction in $R_{DSon}$, while also enhancing switching performance and Safe Operating Area (SOA).

### Maximizing switching performance

Switching losses result from the energy required to charge / discharge all the cell capacitances across the device. The total charge required is referred to as $Q_{g(tot)}$.

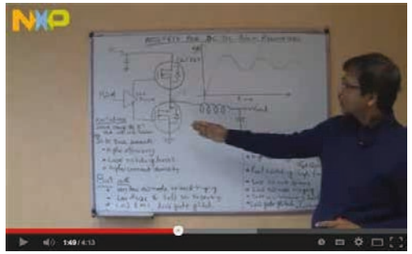
With NextPower S3, $Q_{g(tot)}$ is lower and switching losses are kept to a minimum. This is especially beneficial at peak efficiency and in higher-frequency designs, which have a higher number of switching events.

### SOA and other benefits

When a device is operating in its linear mode, the channel current generates localized heating effects, which can cause failure.

NXP has optimized the cell structure to keep this heating effect under control. As a result, NextPowerS3 enjoys a particularly strong SOA, which is important in hot-swap, e-Fuse, and power OR-ing designs.


**Reverse recovery and diode leakage in SMPS**
www.nxp.com/quicklearning33




**NextPowerS3 MOSFETs for DC/DC buck regulators**
www.nxp.com/quicklearning32



# NextPower Live! MOSFETs for a non-stop world

## Reliable linear-mode performance AND low $R_{DSon}$ efficiency in *hot-swap* and *soft-start* applications



**Non-stop applications**

- Cloud computing
- Network storage
- Communications infrastructure
- Industrial process control
- Transaction processing
- Traffic monitoring & signaling
- CCTV security

**Non-stop equipment**

- Blade and rack servers
- Routers, switches & base stations
- RAID arrays
- Industrial PCs
- Programmable Logic Controllers (PLCs)
- CCTV digital video recorders
- "Hot-swap" & "soft-start" systems

# Featured product: **NextPower Live**

Mobile phones, ATMs, the internet, traffic signals – so much of our daily life depends on 24/7/365 computers, communications, and storage, made possible by rack-based systems that can be maintained with the power on. NextPower Live MOSFETs are designed specifically for such applications:

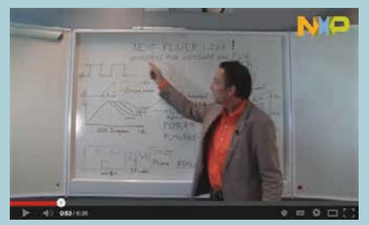
- When a replacement board is plugged into a live system, it is important that the in-rush current is carefully controlled, so as to protect the components on the board and ensure that other parts of the system experience no power disruption. This application requires MOSFETs with strong linear mode performance and a wide safe operating area (SOA) to manage current effectively and reliably.
- Once the replacement board is safely installed, the MOSFET is turned fully ON. In this mode of operation, a low $R_{DSon}$ is of primary importance, helping to keep temperatures low while maximizing system efficiency.
- Only NextPower Live MOSFETs offer reliable linear mode performance **AND** low $R_{DSon}$ efficiency.

### NextPower Live portfolio

| Package | 30 V<br>for 12 V supplies used in computing applications | 100 V<br>for 48 V supplies used in computing telecommunications |
|---|---|---|
| $D^2PAK$<br>(SOT404)  | PSMN1R5-30BLE<br>PSMN3R4-30BLE | PSMN4R8-100BSE<br>PSMN7R6-100BSE |
| TO220  | | PSMN4R8-100PSE<br>PSMN7R8-100PSE |
| LFPAK56<br>(Power-SO8)  | PSMN2R0-30YLE | PSMN013-100YSE |
| LFPAK33  | | (specifically for PoE applications)<br><br>PSMN040-100MSE<br>PSMN075-100MSE |

Power MOSFET operation in linear mode
www.nxp.com/quicklearning34

MOSFETs for Power-over-Ethernet (PoE) PSE applications
www.nxp.com/quicklearning36



Next Power Live! MOSFETs for HOT SWAP and Power over Ethernet
www.nxp.com/quicklearning29

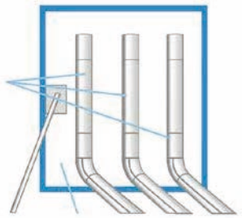


# Featured product: **NextPower Cordless**

- Battery-powered tools, including everything from small engraving devices and screwdrivers to heavy-duty saws and agricultural tools, present a wide variety of requirements for driving the motor. The MOSFETs used in these systems have to perform at demanding levels and must have:
- Low on-resistance for optimum battery life
- Low thermal resistance for reduced junction temperature (for greater reliability)
- High current capability (when the motor stalls, for example)
- Choice of logic- and standard-level gate drives, depending on battery voltage
- Excellent avalanche ruggedness to withstand high-load conditions
- Environmental robustness (wide operating/storage temperatures, harsh vibrations)
- Competitive cost

Overall, the motor-control MOSFET needs to deliver automotive-grade performance at a commercially competitive price

**Typical Power Tools MOSFET internal construction**

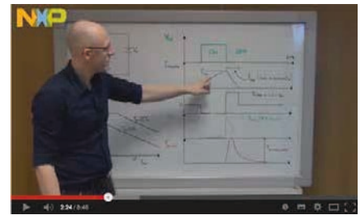



NXP has developed a range of MOSFETs specifically aimed at motor-control applications. These are based on our highly reliable, automotive-qualified silicon, with specific package enhancements such as thicker wires and multiple bond points (“stitch bonding”) to spread the current evenly over the die surface.

NXP’s long history in automotive MOSFETs means we have the know-how to produce devices with excellent avalanche ruggedness. The same expertise deployed in power steering and ABS systems worldwide is put to use in our devices for motor control and that means performance you can count on.

Max current ($I_D$[max]) depends largely on the number and diameter of the aluminium bond wires. The NXP Power Tools portfolio is typically based on a standard of three 500 µm wires, allowing for an $I_D$[max] rating of up to 150 A in a TO220 package.

Some low RDSon devices, based on NXP's LFPAK56 (Power-SO8 compatible) package, can support an ID[max] of 300A, perfect for power tool applications where the motor control MOSFETs must be able to support high torque levels, even during “locked-rotor” events.



Single-shot avalance ruggedness
www.nxp.com/quicklearning35

NextPower Cordless MOSFETs for battery-powered tools
www.nxp.com/quicklearning28

## NextPower Cordless portfolio

| Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $R_{DSon}$ [max] @ $V_{GS}$ = 4.5 V (mΩ) | $I_D$ [max] (A) | EAS at rated current [mJ] | Package | Gate theshold |
|---|---|---|---|---|---|---|---|
| PSMN0R9-30YLD | 30 | 0.87 | 1.09 | 300 | - | | Logic Level |
| PSMN1R0-30YLD | 30 | 1.02 | 1.3 | 300 | - | | Logic Level |
| PSMN2R0-30YL | 30 | 2 | 2.63 | 100 | 151 | LFPAK56 | Logic Level |
| PSMN2R0-30YLE | 30 | 2 | 3.5 | 100 | 370 | LFPAK56 | Logic Level |
| PSMN2R5-30YL | 30 | 2.4 | 3.16 | 100 | 103 | LFPAK56 | Logic Level |
| PSMN2R6-30YLC | 30 | 2.8 | 3.65 | 100 | 50 | LFPAK56 | Logic Level |
| PSMN1R9-40PL | 40 | 1.7 | 1.94 | 150 | 1008 | TO220 (SOT78) | Logic Level |
| PSMN2R1-40PL | 40 | 2.2 | 2.6 | 150 | 622 | TO220 (SOT78) | Logic Level |
| PSMN1R5-40PS | 40 | 1.6 | - | 120 | 1400 | TO220 (SOT78) | Standard Level |
| PSMN2R2-40PS | 40 | 2.1 | - | 100 | 1240 | TO220 (SOT78) | Standard Level |
| PSMN2R5-60PL | 60 | 2.6 | 3.15 | 150 | 655 | TO220 (SOT78) | Logic Level |
| PSMN2R6-60PS | 60 | 2.9 | - | 150 | 519 | TO220 (SOT78) | Standard Level |
| PSMN3R3-60PL | 60 | 3.4 | 3.8 | 130 | 404 | TO220 (SOT78) | Logic Level |
| PSMN3R9-60PS | 60 | 3.9 | - | 130 | 372 | TO220 (SOT78) | Standard Level |
| PSMN4R2-60PL | 60 | 4.3 | 4.3 | 130 | 372 | TO220 (SOT78) | Logic Level |
| PSMN7R6-60PS | 60 | 7.8 | - | 92 | 110 | TO220 (SOT78) | Standard Level |

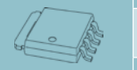
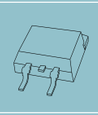
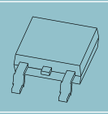
For the most current product information go to www.nxp.com/mosfets (updated daily!)


Heavy-duty tools with large batteries require MOSFETs that withstand higher currents. NXP's TO-220 NextPower Cordless devices handle up to 150A. The high-reliability LFPAK56 is ideal for smaller tools and space-constrained applications.





## Power MOSFETs 20 - 25 V

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $R_{DSon}$ [max] @ $V_{GS}$ = 4.5 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669)  | PH3120L | 20 | 2.65 | 3.7 | 100 | 48.5 |
| | PH2520U | 20 | | 2.7 | 100 | 78 |
| | PSMN0R9-25YLC | 25 | 0.99 | 1.25 | 100 | 51 |
| | PSMN1R1-25YLC | 25 | 1.15 | 1.5 | 100 | 39 |
| | PSMN1R2-25YL | 25 | 1.2 | 1.85 | 100 | 50.6 |
| | PSMN1R2-25YLC | 25 | 1.3 | 1.7 | 100 | 31 |
| | PSMN1R5-25YL | 25 | 1.5 | 2.2 | 100 | 36 |
| | PSMN2R2-25YLC | 25 | 2.4 | 3.15 | 100 | 18 |
| | PSMN2R9-25YLC | 25 | 3.15 | 4.1 | 100 | 16 |
| | PSMN4R0-25YLC | 25 | 4.5 | 5.8 | 84 | 10.9 |
| | PSMN6R0-25YLB | 25 | 6.1 | 7.9 | 73 | 9 |
| | PSMN6R5-25YLC | 25 | 6.5 | 8.5 | 64 | 8.4 |
| | PH2925U | 25 | | 3 | 100 | 92 |
| LFPAK33 (SOT1210)  | PSMN2R8-25MLC | 25 | 2.8 | 3.75 | 70 | 16.3 |
| | PSMN3R9-25MLC | 25 | 4.15 | 5.55 | 70 | 9.7 |
| | PSMN9R0-25MLC | 25 | 8.65 | 11.3 | 55 | 5.4 |
| $D^2PAK$ (SOT404)  | PHB66NQ03LT | 25 | 10.5 | | 66 | 12 |
| DPAK (SOT428)  | PHD38N02LT | 20 | | | 44.7 | 15.1 |
| | PHD97NQ03LT | 25 | 6.3 | 10.6 | 75 | 11.7 |
| SO8 (SOT96-1)  | PSMN006-20K | 20 | | 5 | 32 | 32 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

# Power MOSFETs 30 V – Part 1

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $R_{DSon}$ [max] @ $V_{GS}$ = 4.5 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669)  | PSMN0R9-30YLD | 30 | 0.87 | 1.09 | 300 | 51 |
| | PSMN1R0-30YLD | 30 | 1.02 | 1.3 | 300 | 38.2 |
| | PSMN1R0-30YLC | 30 | 1.15 | 1.4 | 100 | 50 |
| | PSMN1R2-30YLD | 30 | 1.24 | 1.6 | 100 | 32 |
| | PSMN1R2-30YLC | 30 | 1.25 | 1.65 | 100 | 38 |
| | PSMN1R3-30YL | 30 | 1.3 | 1.95 | 100 | 46.6 |
| | PSMN1R4-30YLD | 30 | 1.42 | 1.85 | 100 | 27.6 |
| | PSMN1R5-30YL | 30 | 1.5 | 1.9 | 100 | 36.2 |
| | PSMN1R5-30YLC | 30 | 1.55 | 2.05 | 100 | 30 |
| | PSMN1R7-30YL | 30 | 1.7 | 2.1 | 100 | 36.2 |
| | PSMN2R0-30YL | 30 | 2 | 2.63 | 100 | 30 |
| | PSMN2R0-30YLE | 30 | 2 | 3.5 | 100 | 87 |
| | PSMN2R2-30YLC | 30 | 2.15 | 2.8 | 100 | 26 |
| | PSMN2R4-30YLD | 30 | 2.4 | 3.1 | 100 | 18 |
| | PSMN2R5-30YL | 30 | 2.4 | 3.16 | 100 | 27 |
| | PSMN2R6-30YLC | 30 | 2.8 | 3.65 | 100 | 18 |
| | PSMN3R0-30YL | 30 | 3 | 4.04 | 100 | 21 |
| | PSMN3R0-30YLD | 30 | 3.1 | 4 | 100 | 14.5 |
| | PSMN3R2-30YLC | 30 | 3.5 | 4.55 | 100 | 14.2 |
| | PSMN3R5-30YL | 30 | 3.5 | 4.61 | 100 | 19 |
| | PSMN4R0-30YL | 30 | 4 | 5.25 | 100 | 17.6 |
| | PSMN4R0-30YLD | 30 | 4 | 5.5 | 95 | 9.6 |
| | PSMN4R1-30YLC | 30 | 4.35 | 5.7 | 92 | 11 |
| | PSMN4R5-30YLC | 30 | 4.8 | 6.1 | 84 | 9.6 |
| | PSMN5R0-30YL | 30 | 5 | 6.7 | 91 | 14.1 |
| | PSMN6R0-30YL | 30 | 6 | 7.87 | 79 | 11 |
| | PSMN6R0-30YLD | 30 | 6 | 8.35 | 66 | 6.7 |
| | PSMN6R1-30YLD | 30 | 6 | 8.35 | 66 | 6.4 |
| | PSMN6R0-30YLB | 30 | 6.5 | 8.1 | 71 | 9 |
| | PSMN7R0-30YL | 30 | 7 | 9.1 | 76 | 10 |
| | PSMN7R0-30YLC | 30 | 7.1 | 8.9 | 61 | 7.9 |
| | PSMN7R5-30YLD | 30 | 7.5 | 10.2 | 51 | 5.8 |
| | PSMN9R1-30YL | 30 | 9.1 | 13.6 | 57 | 8.4 |
| | PSMN9R5-30YLC | 30 | 9.8 | 12.1 | 44 | 5 |
| | PSMN011-30YLC | 30 | 11.6 | 14.5 | 37 | 4.9 |
| | PSMN013-30YLC | 30 | 13.6 | 16.9 | 32 | 4 |
| LFPAK33 (SOT1210)  | PSMN2R4-30MLD | 30 | 2.4 | 3.2 | 70 | 16 |
| | PSMN2R9-30MLC | 30 | 2.95 | 3.8 | 70 | 16.7 |
| | PSMN3R0-30MLC | 30 | 3.15 | 4.05 | 70 | 16.1 |
| | PSMN4R2-30MLD | 30 | 4.3 | 5.7 | 70 | 9.2 |
| | PSMN4R4-30MLC | 30 | 4.65 | 6 | 70 | 10.6 |
| | PSMN7R0-30MLC | 30 | 7 | 9 | 67 | 8.2 |
| | PSMN7R5-30MLD | 30 | 7.6 | 10.3 | 57 | 5.8 |
| | PSMN9R8-30MLC | 30 | 9.8 | 12.4 | 50 | 5 |
| | PSMN013-30MLC | 30 | 13.6 | 16.9 | 39 | 3.7 |
| | PSMN020-30MLC | 30 | 18.1 | 27 | 31.8 | 4.6 |
| D²PAK (SOT404)  | PSMNR90-30BL | 30 | 1 | 1.4 | 120 | 118 |
| | PSMN1R5-30BLE | 30 | 1.5 | 1.85 | 120 | 228 |
| | PSMN1R8-30BL | 30 | 1.8 | 2.1 | 100 | 83 |
| | PSMN1R6-30BL | 30 | 1.9 | 2.2 | 100 | 101 |
| | PSMN2R0-30BL | 30 | 2.1 | 2.9 | 100 | 55 |
| | PSMN2R7-30BL | 30 | 3 | 3.7 | 100 | 32 |
| | PSMN3R4-30BL | 30 | 3.3 | 3.8 | 100 | 31 |
| | PSMN3R4-30BLE | 30 | 3.4 | 5 | 120 | 81 |
| | PSMN4R3-30BL | 30 | 4.1 | 5.2 | 100 | 19 |
| | PSMN017-30BL | 30 | 17 | 23.3 | 32 | 5.1 |
| | PSMN022-30BL | 30 | 22.6 | 29.6 | 30 | 4.4 |

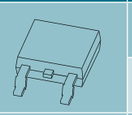
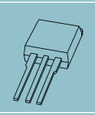
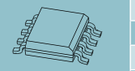
For the most current product information go to www.nxp.com/mosfets (updated daily!)





# Power MOSFETs 30 V – Part 2

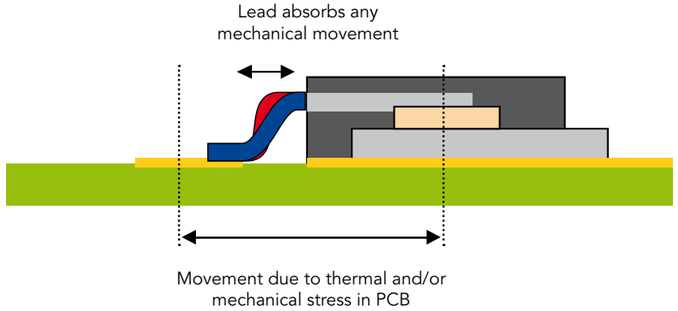
types in **bold** represent new products

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $R_{DSon}$ [max] @ $V_{GS}$ = 4.5 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|---|
| DPAK (SOT428)  | PHD101NQ03LT | 30 | 5.5 | | 75 | 23 |
| | PHD71NQ03LT | 30 | 10 | | 75 | 13.2 |
| TO-220AB (SOT78)  | PSMN1R1-30PL | 30 | 1.3 | 1.6 | 120 | 118 |
| | PSMN1R6-30PL | 30 | 1.7 | 2.1 | 100 | 101 |
| | PSMN1R8-30PL | 30 | 1.8 | 2.3 | 100 | 83 |
| | PSMN2R0-30PL | 30 | 2.1 | 2.8 | 100 | 55 |
| | PSMN2R7-30PL | 30 | 2.7 | 3.6 | 100 | 32 |
| | PSMN3R4-30PL | 30 | 3.4 | 4.1 | 100 | 31 |
| | PSMN4R3-30PL | 30 | 4.3 | 6.2 | 100 | 19 |
| | PHP36N03LT | 30 | 17 | 22 | 43.4 | 18.5 |
| | PSMN017-30PL | 30 | 17 | 23.4 | 32 | 5.1 |
| | PSMN022-30PL | 30 | 22 | 34 | 30 | 4.4 |
| I²PAK (SOT226)  | PSMN1R1-30EL | 30 | 1.3 | 1.6 | 120 | 118 |
| | PSMN017-30EL | 30 | 17 | 23.4 | 32 | 5.1 |
| SO8 (SOT96-1)  | PHK31NQ03LT | 30 | 4.4 | 5.6 | 30.4 | 33 |
| | PSMN005-30K | 30 | 5.5 | 8 | | 34 |
| | PHK18NQ03LT | 30 | 8.9 | 12.5 | 20.3 | 10.6 |
| | PHK13N03LT | 30 | 20 | 26 | 13.8 | 10.7 |
| | PHK12NQ03LT | 30 | | 14 | 11.8 | |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

## LFPAK for mechanical and thermal ruggedness

**NXP LFPAK**




LFPAK pins provide compliance while allowing for thermal expansion due to temperature differences between the MOSFET and the PCB, and allowing for mechanical strain due to PCB bending and flexing

# Power MOSFETs 40 V

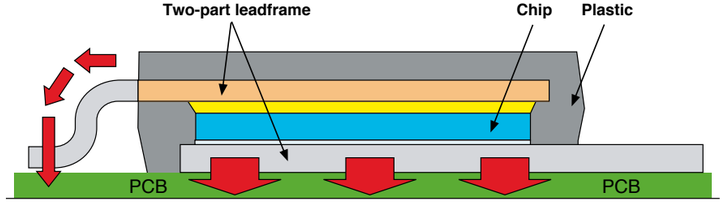
types in **bold** represent new products

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $R_{DSon}$ [max] @ $V_{GS}$ = 4.5 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | PSMN1R0-40YLD | 40 | 1.1 | 1.4 | 100 | 59 |
| | PSMN1R4-40YLD | 40 | 1.4 | 1.85 | 100 | 45 |
| | PSMN1R6-40YLC | 40 | 1.55 | 1.8 | 100 | 59 |
| | PSMN1R8-40YLC | 40 | 1.8 | 2.1 | 100 | 45 |
| | PSMN2R6-40YS | 40 | 2.8 | | 100 | 63 |
| | PSMN3R3-40YS | 40 | 3.3 | | 100 | 49 |
| | PH4840S | 40 | 4.1 | | 94.5 | 67 |
| | PSMN4R0-40YS | 40 | 4.2 | | 100 | 38 |
| | PSMN5R8-40YS | 40 | 5.7 | | 90 | 28.8 |
| | PSMN8R3-40YS | 40 | 8.6 | | 70 | 20 |
| | PSMN014-40YS | 40 | 14 | | 46 | 12 |
| D²PAK (SOT404) | PSMN1R1-40BS | 40 | 1.3 | | 120 | 136 |
| | PSMN2R2-40BS | 40 | 2.2 | | 100 | 130 |
| | PSMN2R8-40BS | 40 | 2.9 | | 100 | 71 |
| | PSMN4R5-40BS | 40 | 4.5 | | 100 | 35 |
| | PSMN8R0-40BS | 40 | 7.6 | | 77 | 21 |
| TO-220AB (SOT78) | PSMN1R5-40PS | 40 | 1.6 | | 150 | 136 |
| | PSMN1R9-40PL | 40 | 1.7 | 1.94 | 150 | 230 |
| | PSMN2R1-40PL | 40 | 2.2 | 2.6 | 150 | 168.9 |
| | PSMN2R2-40PS | 40 | 2.1 | | 100 | 110 |
| | PSMN2R8-40PS | 40 | 2.8 | | 100 | 71 |
| | PSMN4R5-40PS | 40 | 4.6 | | 100 | 35 |
| | PSMN8R0-40PS | 40 | 7.6 | | 77 | 17 |
| I²PAK (SOT226) | PSMN1R5-40ES | 40 | 1.6 | | 120 | 136 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

## Power-SO8 (LFPAK) Design

- Low thermal resistance
- Low electrical resistance
- Low inductance








# Power MOSFETs 55 - 60 V

types in **bold** represent new products

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | PH955L | 55 | 8.3 | 62.5 | 42 |
| | **PSMN4R0-60YS** | **60** | **4** | **100** | **56** |
| | **PSMN4R1-60YL** | **60** | **4.1** | **100** | **103** |
| | **PSMN5R2-60YL** | **60** | **5.2** | **100** | **78.4** |
| | PSMN5R5-60YS | 60 | 5.2 | 100 | 56 |
| | **PSMN5R6-60YL** | **60** | **5.6** | **100** | **66.8** |
| | PSMN7R0-60YS | 60 | 6.4 | 89 | 45 |
| | **PSMN7R5-60YL** | **60** | **7.5** | **86** | **60.6** |
| | PSMN8R5-60YS | 60 | 8 | 76 | 39 |
| | PSMN012-60YS | 60 | 11.1 | 59 | 28.4 |
| | **PSMN013-60YL** | **60** | **13** | **53** | **33.2** |
| | PSMN017-60YS | 60 | 15.7 | 44 | 20 |
| | PSMN030-60YS | 60 | 24.7 | 29 | 13 |
| LFPAK33 (SOT1210) | PSMN011-60ML | 60 | 11.3 | 61 | 37.2 |
| | PSMN011-60MS | 60 | 11.3 | 61 | 23 |
| D2PAK (SOT404) | PHB191NQ06LT | 55 | 3.7 | 75 | 95.6 |
| | PHB21N06LT | 55 | 70 | 19 | |
| | PHB20N06T | 55 | 75 | 20.3 | 11 |
| | PSMN1R7-60BS | 60 | 2 | 120 | 137 |
| | PSMN3R0-60BS | 60 | 3.2 | 100 | 130 |
| | PSMN004-60B | 60 | 3.6 | 75 | 168 |
| | PSMN4R6-60BS | 60 | 4.4 | 100 | 70.8 |
| | PSMN7R6-60BS | 60 | 7.8 | 92 | 38.7 |
| | PSMN015-60BS | 60 | 14.8 | 50 | 20.9 |
| | PHB32N06LT | 60 | 37 | 34 | 17 |
| DPAK (SOT428) | PHD20N06T | 55 | 77 | 18 | 11 |
| TO-220AB (SOT78) | PHP191NQ06LT | 55 | 3.7 | 75 | 95.6 |
| | PHP20N06T | 55 | 75 | 20.3 | 11 |
| | PSMN2R0-60PS | 60 | 2.2 | 120 | 137 |
| | PSMN2R5-60PL | 60 | 2.6 | 150 | 223 |
| | PSMN2R6-60PS | 60 | 2.6 | 150 | 140 |
| | PSMN3R0-60PS | 60 | 3 | 100 | 130 |
| | PSMN3R3-60PL | 60 | 3.4 | 130 | 175 |
| | PSMN3R9-60PS | 60 | 3.9 | 130 | 103 |
| | PSMN4R2-60PL | 60 | 3.9 | 130 | 151 |
| | PSMN4R6-60PS | 60 | 4.6 | 100 | 70.8 |
| | PSMN7R6-60PS | 60 | 7.8 | 92 | 38.7 |
| | PSMN015-60PS | 60 | 14.8 | 50 | 20.9 |
| I2PAK (SOT226) | PSMN2R0-60ES | 60 | 2.2 | 120 | 137 |
| | PSMN3R0-60ES | 60 | 3 | 100 | 130 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

# Power MOSFETs 75 - 80 V

types in **bold** represent new products

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | **PSMN8R0-80YL** | **80** | **8** | **100** | **104** |
| | PSMN8R2-80YS | 80 | 8.5 | 82 | 55 |
| | **PSMN010-80YL** | **80** | **10** | **84** | **84.7** |
| | PSMN011-80YS | 80 | 11 | 67 | 45 |
| | PSMN013-80YS | 80 | 12.9 | 60 | 37 |
| | **PSMN014-80YL** | **80** | **14** | **62** | **56.9** |
| | PSMN018-80YS | 80 | 18 | 45 | 26 |
| | **PSMN025-80YL** | **80** | **25** | **37** | **34.3** |
| | PSMN026-80YS | 80 | 27.5 | 34 | 20 |
| | PSMN041-80YL | 80 | 41 | 25 | 21.9 |
| | PSMN045-80YS | 80 | 45 | 24 | 12.5 |
| D2PAK (SOT404) | PSMN005-75B | 75 | 5 | 75 | 165 |
| | PSMN008-75B | 75 | 8.5 | 75 | 122.8 |
| | PHB110NQ08T | 75 | 9 | 75 | 113.1 |
| | PHB29N08T | 75 | | 27 | 19 |
| | PSMN2R8-80BS | 80 | 3 | 120 | 139 |
| | PSMN3R3-80BS | 80 | 3.5 | 120 | 111 |
| | PSMN4R4-80BS | 80 | 4.5 | 100 | 125 |
| | PSMN5R0-80BS | 80 | 5.1 | 100 | 101 |
| | PSMN6R5-80BS | 80 | 6.9 | 100 | 71 |
| | PSMN8R7-80BS | 80 | 8.7 | 90 | 52 |
| | PSMN012-80BS | 80 | 11 | 74 | 36 |
| | PSMN017-80BS | 80 | 17 | 50 | 26 |
| | PSMN050-80BS | 80 | 46 | 22 | 11 |
| TO-220AB (SOT78) | PSMN005-75P | 75 | 5 | 75 | 165 |
| | PHP79NQ08LT | 75 | 16 | 73 | 30 |
| | PHP29N08T | 75 | | 27 | 19 |
| | PSMN3R3-80PS | 80 | 3.3 | 120 | 139 |
| | PSMN3R5-80PS | 80 | 3.5 | 120 | 139 |
| | PSMN4R4-80PS | 80 | 4.1 | 100 | 112 |
| | PSMN4R3-80PS | 80 | 4.3 | 120 | 111 |
| | PSMN5R0-80PS | 80 | 4.7 | 100 | 87 |
| | PSMN6R5-80PS | 80 | 6.9 | 100 | 71 |
| | PSMN8R7-80PS | 80 | 8.7 | 90 | 52 |
| | PSMN012-80PS | 80 | 11 | 74 | 36 |
| | PSMN017-80PS | 80 | 17 | 50 | 26 |
| I2PAK (SOT226) | PSMN3R3-80ES | 80 | 3.3 | 120 | 139 |
| | PSMN3R5-80ES | 80 | 3.5 | 120 | 139 |
| | PSMN4R3-80ES | 80 | 4.3 | 120 | 111 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)





# Power MOSFETs 100 V

types in **bold** represent new products

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | **PSMN012-100YL** | **100** | **11.9** | **85** | **118** |
| | PSMN012-100YS | 100 | 12 | 60 | 64 |
| | PSMN013-100YSE | 100 | 13 | 82 | 75 |
| | **PSMN015-100YL** | **100** | **14.7** | **69** | **86.3** |
| | PSMN016-100YS | 100 | 16.3 | 51 | 54 |
| | **PSMN019-100YL** | **100** | **18** | **56** | **72.4** |
| | PSMN020-100YS | 100 | 20.5 | 43 | 41 |
| | **PSMN021-100YL** | **100** | **21.5** | **49** | **65.6** |
| | PH20100S | 100 | 23 | 34.3 | 39 |
| | PSMN028-100YS | 100 | 27.5 | 42 | 33 |
| | PSMN038-100YL | 100 | 37.5 | 30 | 21.6 |
| | PSMN039-100YS | 100 | 39.5 | 28.1 | 23 |
| | PSMN069-100YS | 100 | 72.4 | 17 | 14 |
| LFPAK33 (SOT1210) | PSMN040-100MSE | 100 | 36.6 | 30 | 30 |
| | PSMN075-100MSE | 100 | 71 | 18 | 16.4 |
| D2PAK (SOT404) | PSMN3R8-100BS | 100 | 3.9 | 120 | 170 |
| | PSMN4R8-100BSE | 100 | 4.8 | 120 | 196 |
| | PSMN5R6-100BS | 100 | 5.6 | 100 | 141 |
| | PSMN7R0-100BS | 100 | 6.8 | 100 | 125 |
| | PSMN7R6-100BSE | 100 | 7.6 | 75 | 128 |
| | PSMN009-100B | 100 | 8.8 | 75 | 156 |
| | PSMN9R5-100BS | 100 | 9.6 | 89 | 82 |
| | PSMN013-100BS | 100 | 13.9 | 68 | 59 |
| | PSMN015-100B | 100 | 15 | 75 | 90 |
| | PSMN016-100BS | 100 | 16 | 57 | 49 |
| | PHB45NQ10T | 100 | 25 | 47 | 61 |
| | PSMN027-100BS | 100 | 26.8 | 37 | 30 |
| | PHB47NQ10T | 100 | 28 | 47 | 66 |
| | PSMN034-100BS | 100 | 34.5 | 32 | 23.8 |
| | PHB27NQ10T | 100 | 50 | 28 | 30 |
| | PHB18NQ10T | 100 | 90 | 18 | 21 |
| DPAK (SOT428) | PSMN025-100D | 100 | 25 | 47 | 61 |
| TO-220AB (SOT78) | PSMN4R3-100PS | 100 | 4.3 | 120 | 170 |
| | **PSMN4R8-100PSE** | **100** | **5** | **120** | **196** |
| | PSMN5R0-100PS | 100 | 5 | 120 | 170 |
| | PSMN5R6-100PS | 100 | 5.6 | 100 | 141 |
| | PSMN7R0-100PS | 100 | 6.8 | 100 | 125 |
| | **PSMN7R8-100PSE** | **100** | **7.8** | **83** | **128** |
| | PSMN8R5-100PS | 100 | 8.5 | 100 | 111 |
| | PSMN009-100P | 100 | 8.8 | 75 | 156 |
| | PSMN9R5-100PS | 100 | 9.6 | 89 | 82 |
| | PSMN013-100PS | 100 | 13.9 | 68 | 59 |
| | PSMN015-100P | 100 | 15 | 75 | 90 |
| | PSMN016-100PS | 100 | 16 | 57 | 49 |
| | PHP45NQ10T | 100 | 25 | 47 | 61 |
| | PSMN027-100PS | 100 | 26.8 | 37 | 30 |
| | PSMN034-100PS | 100 | 34.5 | 32 | 23.8 |
| | PHP18NQ10T | 100 | 90 | 18 | 21 |
| I2PAK (SOT226) | PSMN4R3-100ES | 100 | 4.3 | 120 | 170 |
| | PSMN5R0-100ES | 100 | 5 | 120 | 170 |
| | PSMN7R0-100ES | 100 | 6.8 | 100 | 125 |
| | PSMN8R5-100ES | 100 | 8.5 | 100 | 111 |
| | PSMN013-100ES | 100 | 13.9 | 68 | 59 |
| SC-73 (SOT223) | PHT6NQ10T | 100 | 90 | 6.5 | 21 |
| | PHT4NQ10T | 100 | 250 | 3.5 | 7.4 |
| SO8 (SOT96-1) | PSMN038-100K | 100 | 38 | | 43 |
| | PHKD3NQ10T | 100 | 90 | 3 | 21 |



For the most current product information go to www.nxp.com/mosfets (updated daily!)

# Power MOSFETs 105 - 150 V

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | PSMN059-150Y | 150 | 59 | 43 | 27.9 |
| D²PAK (SOT404) | PSMN030-150B | 150 | 30 | 55.5 | 98 |
| | PSMN035-150B | 150 | 35 | 50 | 79 |
| | PHB45NQ15T | 150 | 42 | 45.1 | 32 |
| DPAK (SOT428) | PSMN063-150D | 150 | 63 | 29 | 55 |
| TO-220AB (SOT78) | PHP45NQ11T | 105 | 25 | 47 | 60 |
| | PSMN015-110P | 110 | 15 | 75 | 90 |
| | PHP27NQ11T | 110 | 50 | 27.6 | 30 |
| | PHP23NQ11T | 110 | 70 | 23 | 22 |
| | PHP18NQ11T | 110 | 90 | 18 | 21 |
| | PSMN6R3-120PS | 120 | 6.7 | 70 | 207.1 |
| | PSMN7R8-120PS | 120 | 7.9 | 70 | 167 |
| | PSMN030-150P | 150 | 30 | 55.5 | 98 |
| | PSMN035-150P | 150 | 35 | 50 | 79 |
| | PHP30NQ15T | 150 | 63 | 29 | 55 |
| | PHP28NQ15T | 150 | 65 | 28.5 | 24 |
| I²PAK (SOT226) | PSMN6R3-120ES | 120 | 6.7 | 70 | 207.1 |
| | PSMN7R8-120ES | 120 | 7.9 | 70 | 167 |
| SO8 (SOT96-1) | PHK5NQ15T | 150 | 75 | 5 | 29 |
| | PSMN085-150K | 150 | 85 | | 40 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

## P-channel

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $R_{DSon}$ [max] @ $V_{GS}$ = 4.5 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|---|
| SO8 (SOT96-1) | PMK30EP | -30 | 19 | 30 | -14.9 | 50 |
| | PMK35EP | -30 | 19 | 35 | -14.9 | 42 |
| | PHP225 | -30 | 250 | 400 | - | 10 |
| | PMK50XP | -20 | - | 50 | -7.9 | 10 |
| | PHK04P02T | -16 | - | 120 | -4.66 | 7.2 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

## Multi-chip

| Package | Type number | Channel type | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|---|
| SO8 (SOT96-1) | PHP225 | P | -30 | 250 | - | 10 |
| | PHKD6N02LT | N | 20 | - | 10.9 | 15.3 |
| | PHKD13N03LT | N | 30 | 20 | 10.4 | 10.7 |
| | PHN203 | N | 30 | 30 | 6.3 | 14.6 |
| | PHN210T | N | 30 | 100 | 3.4 | 6 |
| | PHC21025 | N/P | 30 | 250 | - | 10 |
| | PHKD3NQ10T | N | 100 | 90 | 3 | 21 |
| | PHC2300 | N/P | 300 | 6000 | - | 6.24 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)



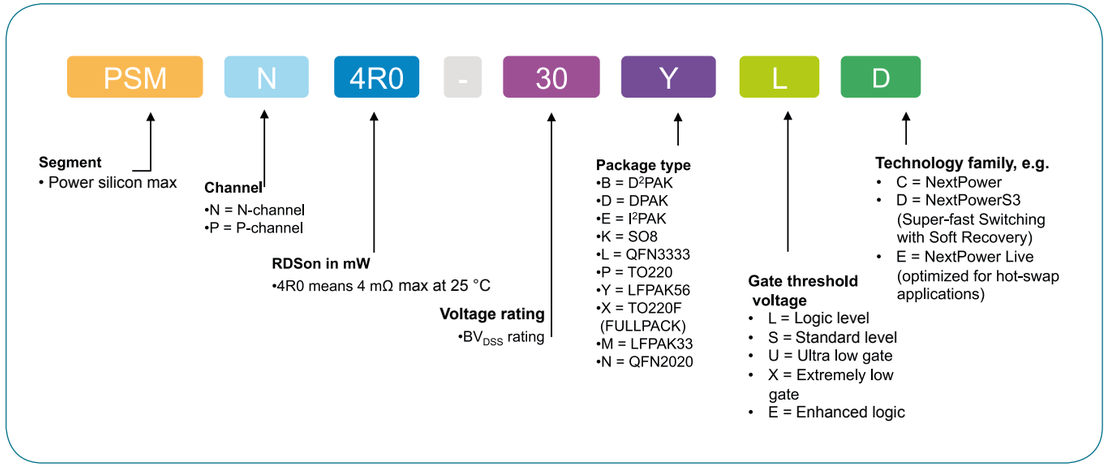


# Power MOSFETs 200 V

| Package | Type number | $V_{DS}$ [max] (V) | $R_{DSon}$ [max] @ $V_{GS}$ = 10 V (mΩ) | $I_D$ [max] (A) | $Q_{G(tot)}$ [typ] (nC) |
|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | PSMN102-200Y | 200 | 102 | 21.5 | 30.7 |
| D²PAK (SOT404) | PSMN057-200B | 200 | 57 | 39 | 96 |
| | PSMN070-200B | 200 | 70 | 35 | 77 |
| | PHB33NQ20T | 200 | 77 | 32.7 | 32.2 |
| | PHB20NQ20T | 200 | 130 | 20 | 65 |
| DPAK (SOT428) | PSMN130-200D | 200 | 130 | 20 | 65 |
| | PHD9NQ20T | 200 | 400 | 8.7 | 24 |
| TO-220AB (SOT78) | PSMN057-200P | 200 | 57 | 39 | 96 |
| | PSMN070-200P | 200 | 70 | 35 | 77 |
| | PHP33NQ20T | 200 | 77 | 32.7 | 32.2 |
| | PHP20NQ20T | 200 | 130 | 20 | 65 |
| | PHP9NQ20T | 200 | 400 | 8.7 | 24 |
| SO8 (SOT96-1) | PSMN165-200K | 200 | 165 | - | 40 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

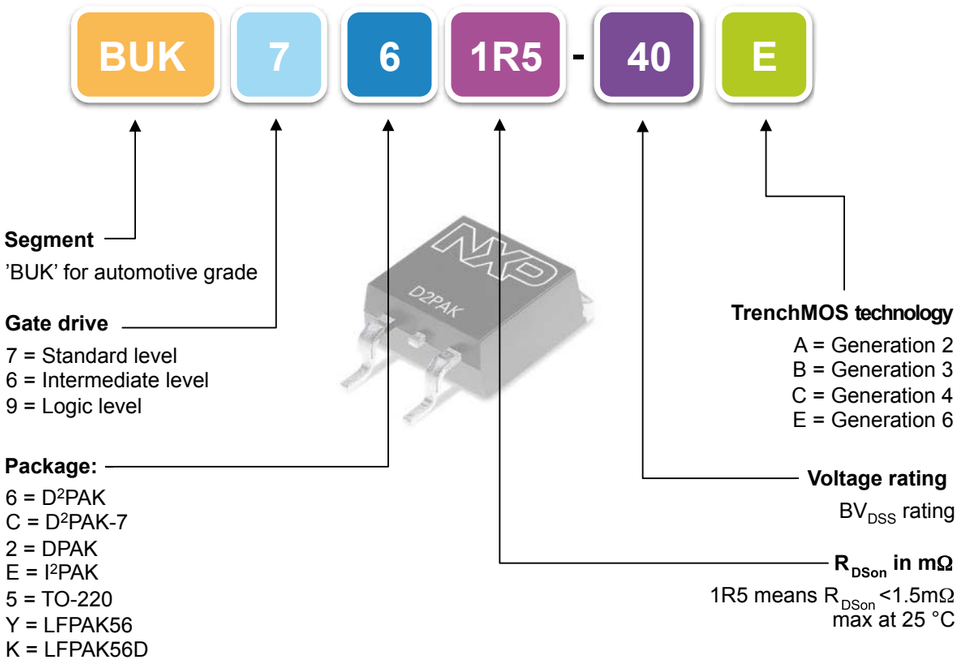
### PSMN part numbering



## 4 steps to select an automotive MOSFET

1. Select a voltage, e.g. 40 V
2. Select a package, e.g $D^2PAK$
3. Choose an $R_{DSon}$ from our extensive range
4. Select a 'BUK' type and visit www.nxp.com/automotivemosfets to download datasheets and models, and order samples

### Automotive-grade MOSFET product numbering




## High-performance automotive MOSFETs

### MOSFET package selection

#### Through-hold

**TO220**
- Industry standard
- 120 A

**I²PAK**
- Industry standard
- 120 A

#### Surface-mount

##### Premium performance

**D²PAK-7**
- Highest performance
- 190 A

**D²PAK**
- Industry standard
- 120 A

##### Space saving

**LFPAK56**
- PowerSO8
- 100 A

**LFPAK56D**
- Dual Power-SO8
- 40 A per channel

**DPAK**
- Industry standard
- Proven reliability
- 100 A

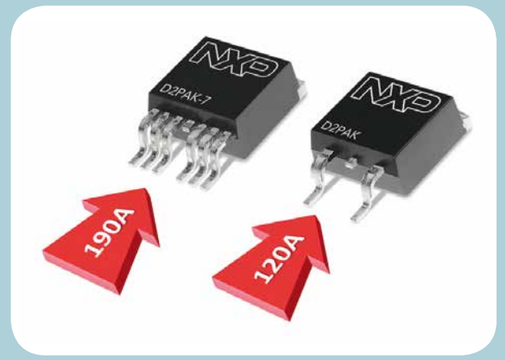
**SOT223**
- Industry standard
- Proven reliability

All packages are automotive AEC-Q101 qualified to 175 °C and RoHs compliant

# D²PAK Family

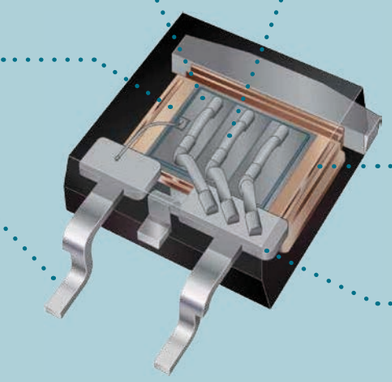
**D²PAK Family - Premium performance SMD products**

The NXP D²PAK portfolio is ideally suited for high power automotive application areas such as powertrain and chassis & safety. Combining advanced TrenchMOS technology with high current packaging enables a product that delivers ultra low on-state resistance and thermal performance within an industry standard footprint. NXP offers the broadest range of automotive grade D²PAK across $V_{DS}$ 30V-100V.




Fully AEC-Q101 qualified to 175 °C

- Advanced Silicon Technology
  - Low resistance
- PbSnAg soldered die attach
  - High mechanical reliability
  - Pb-Free reflow 245 °C
- Industry standard footprint for ease of use
- Multiple stitch bonded source wires
  - 190A $I_D$ max rating
  - High current transient robustness
  - Even current sharing
- Lowest thermal resistance
- 100% avalanche screened at high current for low PPM



**POWERTRAIN**
- Engine Control
- Gearbox/Clutch
- Engine Fan
- Electric Vehicle
- Micro-Hybrid drive
- DCDC converters

**CHASSIS & SAFETY**
- Electric Power Steering (EPS)
- Vehicle Stability (ESP)
- Braking Systems (ABS)
- Electric Parking Brake (EPB)

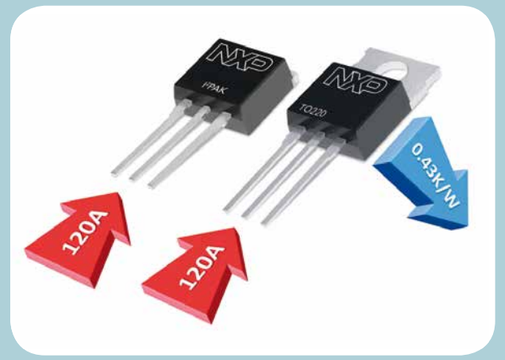
**BODY & SECURITY**
- Climate control (HVAC)
- Wiper Systems



# I²PAK/TO-220

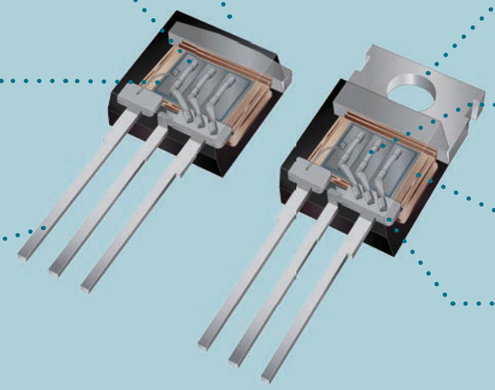
**I²PAK/TO-220 - High performance through-hole products**

Providing industry leading performance for through hole products NXP's I²PAK/TO-220 portfolio enables the separation of the electrical and thermal pathways to optimise module performance. The convenience of the tab for screw mounting on the TO-220 is complemented by industry standard footprint and excellent current handling performance. Similarly the I²PAK can be readily soldered down to form a low resistance path.




Fully AEC-Q101 qualified to 175 °C

- Clamp or solder mounting
- Advanced Silicon Technology
  - Low resistance
- PbSnAg soldered die attach
  - High mechanical reliability
  - Pb-Free reflow 245 °C
- Separated current from heat paths
- Clamp or screw mounting
- High current transient robustness
- Low thermal resistance
- 100% avalanche screened at high current for low PPM



**POWERTRAIN**
- Engine Control
- Engine Fan
- Electric Vehicle
- Micro-Hybrid drive
- DCDC converters

**CHASSIS & SAFETY**
- Electric Power Steering (EPS)
- Braking Systems (ABS)
- Electric Parking Brake (EPB)

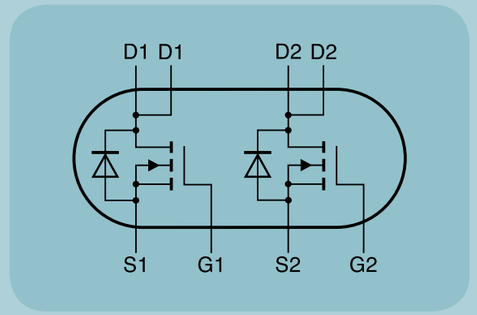
**BODY & SECURITY**
- Climate Control (HVAC)
- Wiper Systems
- Electric Horn

# LFPAK56

## The Power-SO8 that packs a punch

Providing a true alternative to DPAK, NXP's LFPAK56 portfolio gives industry-leading performance in a truly iinnovative, automotive-grade package. Saving a considerable amount of space compared to traditional DPAK solutions, the LFPAK56 offers designers flexibility and reliability without compromising thermal performance.


Fully AEC-Q101 qualified to 175 °C

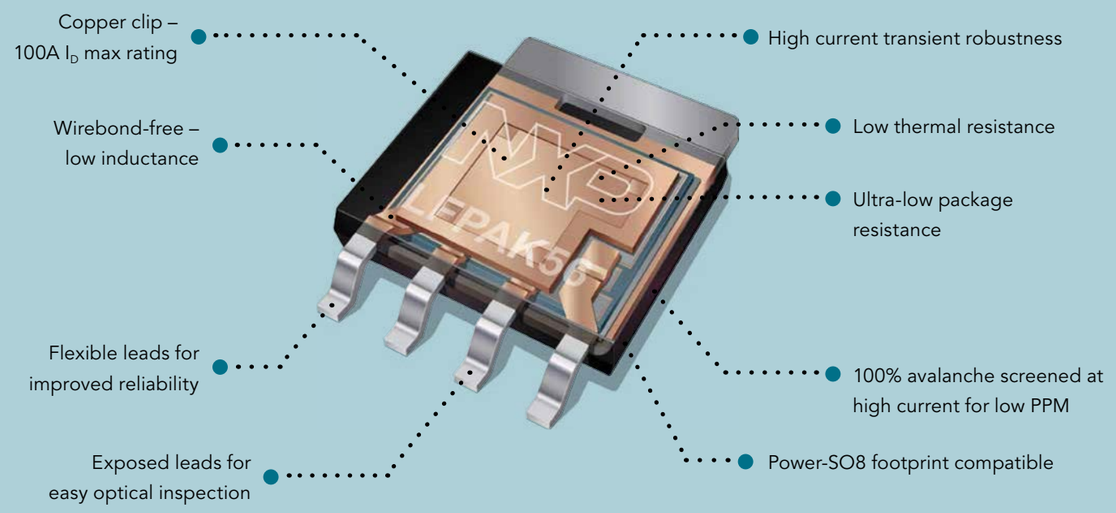


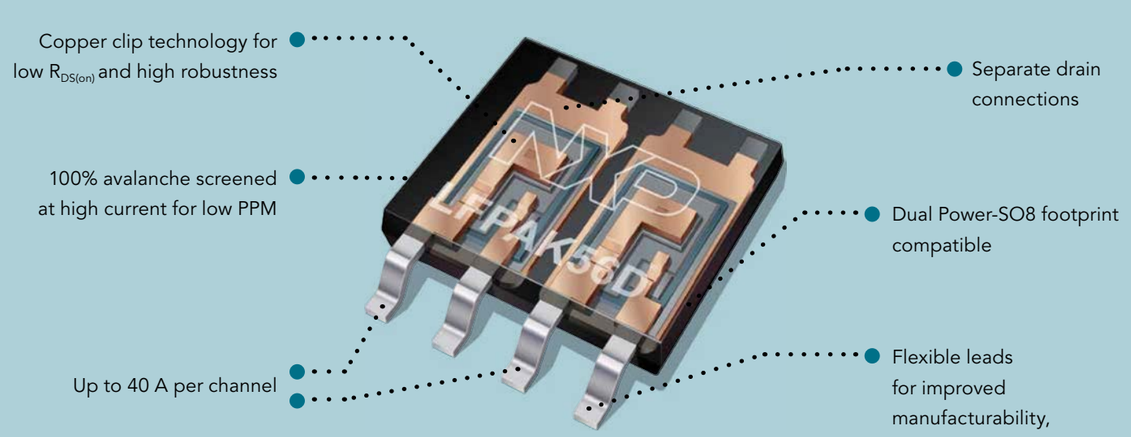

Fully AEC-Q101 qualified to 175 °C

# LFPAK56D

## The ultimate dual MOSFET

Packing even more into the Power-SO8 footprint, the LFPAK56D fits two MOSFETs into one robust package without compromising on performance. NXP's cutting-edge copper-clip technology allows for exceptional current handling, ultra-low package resistance, and supreme robustness and reliability. Perfect for situations where space is at a premium, the LFPAK56D offers power performance.



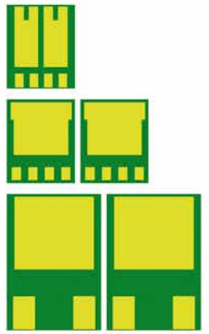




**POWERTRAIN**
- Engine management
- Gearbox / clutch
- Engine fan
- Fuel / water pump
- Auxiliary valves

**CHASSIS & SAFETY**
- Vertical stability (ESP)
- Braking systems (ABS)
- Airbag
- Electric Parking Brake (EPB)

**BODY & SECURITY**
- Body control module
- Climate control (HVAC)
- Wiper systems
- Electric windows
- Electric mirrors
- Electric seats
- Sunroof
- Lighting

**LFPAK56D footprint comparison**

| Product | Pad layout | Footprint area |
|---|---|---|
|  |  | 31 mm² |
| | | 62 mm² |
| | | 140 mm² |

Automotive MOSFETs

# Automotive-compliant small-signal MOSFETs

types in **bold** represent new products

| Package | | | | | | | | | | | | | | | SOT223 | SOT457 (SC-74) | SOT23 | SOT363 (SC-88) | SOT323 (SC-70) | SOT666 | DFN-2020MD-6 (SOT1220) | DFN2020-6 (SOT1118) | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |  |  |  |  |  |  |  |  |  |  |
| Size (mm) | | | | | | | | | | | | | | | 6.5 x 3.5 x 1.65 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 2.0 x 2.0 x 0.65 | 2.0 x 2.0 x 0.65 | 1.1 x 1.0 x 0.37 | 1.0 x 0.6 x 0.5 |
| $P_{tot}$ (mW) | | | | | | | | | | | | | | | 1700 | 600 | 250 | 300 | 200 | 300 | 1250 | 1250 | 1000 | 250 |
| Polarity | Configuration | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS}$ = 10 V | 4.5 V | 2.5 V | 1.8 V | | | | | | | | | | |
| N-channel | single | 20 | 8 | 4.7 | 0.45 | 1 | 8.2 | 39.5 | 6.2 | 2 | - | 24 | 29 | 40 | | **PMN28UNEA** | **PMV28UNEA** | | | | | | | |
| | | | 12 | 6.3 | 0.75 | 1.25 | 16 | 44 | 9.9 | 2 | - | 16 | 24 | - | | | **PMV20XNEA** | | | | **PMPB20XNEA** | | | |
| | | 30 | 8 | 0.4 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | | | NX3008NBK | | NX3008NBKW | | | | | |
| | | | 12 | 3.1 | 0.75 | 1.25 | 9 | 19 | 2.9 | 2 | - | 55 | 72 | - | | | | | | | | **PMDPB56XNEA** | | |
| | | | 20 | 5.5 | 1 | 2.5 | 8 | 33 | 12.6 | 2 | 17 | 22 | - | - | | **PMN25ENEA** | **PMV25ENEA** | | | | | | | |
| | | | | 3.9 | 1 | 2.5 | 6.3 | 14.1 | 6 | 2 | 30 | 39 | - | - | | | **PMV50ENEA** | | | | | | | |
| | | | | 3 | 1 | 2.5 | 6 | 11 | 3.6 | 2 | 54 | 70 | - | - | | | **PMV100ENEA** | | | | | | | |
| | | 40 | 20 | 3.1 | 1 | 2.5 | - | - | - | 1 | 65 | 88 | - | - | | | **PMV65ENEA** | | | | | | | |
| | | | | 2.5 | 1 | 2.5 | 14 | 14 | 2.4 | 1 | 95 | 120 | - | - | | | PMV130ENEA | | | | | | | |
| | | 60 | 20 | 4 | 1.3 | 2.7 | 4.5 | 13.5 | 7,5 | 1 | 42 | 48 | - | - | | | | | | | **PMPB55ENEA** | | | |
| | | | | 3.1 | 1.3 | 2.7 | 9 | 33 | 12.7 | 2 | 46 | 52 | - | - | | **PMN55ENEA** | **PMV55ENEA** | | | | | | | |
| | | | | 4 | 1.3 | 2.7 | 4 | 10.5 | 6.2 | 2.7 | 72 | 85 | - | - | | | | | | | PMPB85ENEA | | | |
| | | | | 2.1 | 1.3 | 2.7 | 6.4 | 15.9 | 5.9 | 2 | 96 | 108 | - | - | | **PMN120ENEA** | **PMV120ENEA** | | | | | | | |
| | | | | 1.5 | 1.3 | 2.7 | 6.3 | 13 | 3.9 | 2 | 176 | 196 | - | - | | **PMN230ENEA** | **PMV230ENEA** | | | | | | | |
| | | | | 0.8 | 1.3 | 2.7 | 5.3 | 10.2 | 2.4 | 2 | 300 | 332 | - | - | | | **PMV450ENEA** | | | | | | | |
| | | | | 0.36 | 0.9 | 1.5 | 5 | 13 | 0.72 | - | 900 | 1000 | - | - | | | BSS138P | | BSS138PW | | | | | |
| | | | | 0.36 | 0.48 | 1.6 | 10 | 58 | 0.6 | 1.5 | 1000 | 1100 | 1400 | - | | | BSS138BK | | BSS138BKW | | | | | |
| | | | | 0.3 | 1 | 2.5 | 11 | 19 | 0.5 | 2 | 1000 | 1300 | - | - | | | 2N7002BK | | 2N7002BKW | | | | | 2N7002BKM |
| | | | | 0.3 | 1 | 2.5 | 16 | 60 | 1.09 | 3 | 1100 | 1300 | - | - | | | 2N7002CK | | | | | | | |
| | | | | 0.2 | 0.8 | 1.5 | 5 | 36 | 0.39 | yes | 2700 | 3000 | 4000 | - | | | BSS138AKA | | | | | | | |
| | | 80 | 20 | 1.9 | 1.3 | 2.7 | 3.5 | 9.5 | 4.8 | 2 | 175 | 195 | - | - | | | | | | | PMPB215ENEA | | | |
| | | | | 2.8 | 1.3 | 2.7 | 5 | 15 | 9.9 | 2.8 | 80 | 92 | - | - | | | | | | | PMPB95ENEA | | | |
| | | | | 1.1 | 1.3 | 2.7 | 2 | 9 | 3 | 2 | 345 | 390 | - | - | | | | | | | | | PMXB360ENEA | |
| | | 100 | 20 | 1.5 | 1.3 | 2.7 | 4.8 | 9.3 | 4.5 | 1 | 285 | 300 | - | - | **PMT280ENEA** | | | | | | | | | |
| | | | | 1.1 | 1.3 | 2.7 | 5.7 | 10.2 | 2.9 | 1 | 527 | 555 | - | - | **PMT560ENEA** | | | | | | | | | |
| | dual | 20 | 8 | 0.8 | 0.5 | 0.95 | 10 | 117 | 0.45 | 2 | - | 380 | 620 | 1100 | | | | | | PMDT290UNE | | | | |
| | | 30 | 8 | 0.4 | 0.6 | 1.1 | 26 | 88 | 0.52 | 2 | - | 1000 | 1400 | 2000 | | | | NX3008NBKS | | NX3008NBKV | | | | |
| | | 60 | 20 | 0.3 | 1 | 2.5 | 11 | 19 | 0.5 | 2 | 1000 | 1300 | - | - | | | | 2N7002BKS | | | | | | |
| | | | | 0.36 | 0.48 | 1.6 | 10 | 58 | 0.6 | 1.5 | 1000 | 1100 | 1400 | - | | | | BSS138BKS | | | | | | |
| | | | | 0.36 | 0.9 | 1.5 | 5 | 13 | 0.72 | - | 900 | 1000 | - | - | | | | BSS138PS | | | | | | |
| P-channel | single | 20 | 8 | 6 | 0.45 | 0.95 | 8 | 50 | 15.6 | 4 | - | 37 | 45 | 59 | | PMN40UPEA | | | | | | | | |
| | | | | 2 | 0.5 | 1.1 | 7 | 50 | 6 | - | - | 100 | 155 | 210 | | | NX2301P | | | | | | | |
| | | | 12 | 4.5 | 0.45 | 0.95 | 11 | 83 | 14.7 | 2 | - | 27 | 38 | 50 | | | **PMV27UPEA** | | | | | | | |
| | | | | 5.7 | 0.75 | 1.25 | 15 | 37 | 15 | 2 | - | 27 | 39 | - | | PMN27XPEA | | | | | | | | |
| | | | | 5.7 | 0.75 | 1.25 | 17 | 33 | 11.5 | 2 | - | 41 | 56 | - | | PMN42XPEA | | | | | | | | |
| | | | | 4.5 | 0.75 | 1.25 | 7.9 | 59 | 11 | 2 | - | 28 | 42 | - | | **PMN30XPEA** | **PMV30XPEA** | | | | | | | |
| | | | | 3.5 | 0.75 | 1.25 | 11 | 61 | 8.5 | - | - | 48 | 71 | - | | **PMN48XPA** | **PMV48XPA** | | | | | | | |
| | | | | 4.1 | 0.75 | 1.25 | 15 | 51 | 8.7 | - | - | 48 | 72 | - | | | | | | | | | | |
| | | | | 2.8 | 0.75 | 1.25 | 7 | 36 | 5 | 2 | - | 67 | 99 | - | | | **PMV65XPEA** | | | | | | | |
| | | | | 4.1 | 0.75 | 1.25 | 7 | 40 | 5.2 | 2 | - | 70 | 101 | - | | PMN70XPEA | | | | | | | | |
| | | | | 2.3 | 0.7 | 1.3 | 5.3 | 36 | 3.4 | 2 | - | 100 | 155 | - | | | **PMV100XPEA** | | | | | | | |
| | | 30 | 8 | 0.23 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | | | NX3008PBK | | NX3008PBKW | | | | | |
| | | | 20 | 4.2 | 1 | 3 | 6.1 | 3.7 | 12.8 | 2 | 35 | 47 | - | - | | **PMN50EPEA** | **PMV50EPEA** | | | | | | | |
| | | 40 | 20 | 1.5 | 1 | 2.5 | 4 | 26 | 4.7 | 1 | 180 | 220 | - | - | | | PMV250EPEA | | | | | | | |
| | | 50 | 20 | 0.2 | 1.1 | 2.1 | 24 | 73 | 0.26 | 1 | 5300 | 6000 | - | - | | | BSS84AK | | BSS84AKW | | | | | BSS84AKM |
| | | 60 | 20 | 2.2 | 1 | 3 | - | - | - | 2 | 99 | 110 | - | - | | **PMN100EPEA** | **PMV100EPEA** | | | | | | | |
| | | | | 0.9 | 1 | 3 | - | - | - | 2 | 217 | 241 | - | - | | **PMN240EPEA** | **PMV240EPEA** | | | | | | | |
| | | 70 | 20 | 2.3 | 1 | 3 | - | - | - | 2 | 156 | 177 | - | - | **PMT200EPEA** | | | | | | | | | |
| | dual | 20 | 8 | 0.55 | 0.5 | 1.3 | 48 | 152 | 0.76 | 2 | - | 670 | 1200 | 1800 | | | | | | PMDT670UPE | | | | |
| | | 30 | 8 | 0.2 | 0.6 | 1.1 | 49 | 103 | 0.55 | 2 | - | 2800 | 5300 | - | | | | NX3008PBKS | | NX3008PBKV | | | | |
| | | 50 | 20 | 0.16 | 1.1 | 2.1 | 24 | 73 | 0.26 | 1 | 5300 | 6000 | - | - | | | | BSS84AKS | | BSS84AKV | | | | |
| N | Compl | 20 | 8 | 0.73 | 0.5 | 0.95 | 10 | 117 | 0.45 | 2 | - | 290 | 420 | 600 | | | | PMGD290UCEA | | | | | | |
| P | | 20 | 8 | 0.5 | 0.5 | 1.3 | 48 | 152 | 0.76 | 2 | - | 670 | 1200 | 1800 | | | | | | | | | | |

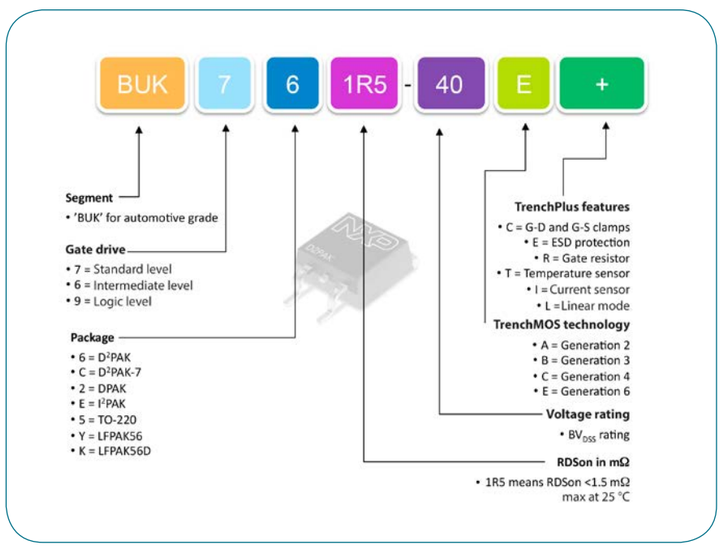
## 30 V N-channel automotive TrenchMOS

types in **bold** represent new products

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | BUK9Y07-30B | 30 | 6 | 7 | 75 | 1.42 |
| | BUK7Y07-30B | 30 | 7 | | 75 | 1.42 |
| | BUK9Y11-30B | 30 | 9 | 11 | 59 | 2 |
| | BUK7Y10-30B | 30 | 10 | | 67 | 1.76 |
| | BUK9Y22-30B | 30 | 19 | 22 | 37.7 | 2.53 |
| | BUK7Y20-30B | 30 | 20 | | 39.5 | 2.53 |
| LFPAK56D (SOT1205) | BUK7K5R1-30E | 30 | 5.1 | | 40 | 2.21 |
| | BUK7K5R6-30E | 30 | 5.6 | | 40 | 2.36 |
| | **BUK9K5R1-30E** | **30** | **4.4** | **5.3** | **40** | **2.21** |
| | **BUK9K5R6-30E** | **30** | **4.7** | **5.8** | **40** | **2.36** |
| D²PAK (SOT404) | BUK962R8-30B | 30 | 2.4 | 2.8 | 75 | 0.5 |
| | BUK762R7-30B | 30 | 2.7 | | 75 | 0.5 |
| | BUK763R4-30B | 30 | 3.4 | | 75 | 0.59 |
| | BUK9605-30A | 30 | 4.6 | 5 | 75 | 0.65 |
| | BUK9607-30B | 30 | 5 | 7 | 75 | 0.95 |
| | BUK7607-30B | 30 | 7 | | 75 | 0.95 |
| DPAK (SOT428) | BUK9214-30A | 30 | 12 | 14 | 63 | 1.4 |
| | BUK6213-30A | 30 | 13 | | 55 | 1.4 |
| TO-220AB (SOT78A) | BUK952R8-30B | 30 | 2.4 | 2.8 | 75 | 0.5 |
| | BUK9507-30B | 30 | 5 | 7 | 75 | 0.95 |
| | BUK7507-30B | 30 | 7 | | 75 | 0.95 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

### Automotive TrenchMOS part numbering








## 40 V N-channel automotive TrenchMOS – Part 1

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | BUK9Y3R0-40E | 40 | 2.5 | 3 | 100 | 0.77 |
| | BUK7Y3R5-40E | 40 | 3.5 | | 100 | 0.9 |
| | BUK9Y3R5-40E | 40 | 3.6 | 3.8 | 100 | 0.9 |
| | BUK9Y4R4-40E | 40 | 3.7 | 4.4 | 100 | 1.02 |
| | BUK7Y4R4-40E | 40 | 4.4 | | 100 | 1.02 |
| | BUK9Y7R6-40E | 40 | 6 | 7.6 | 79 | 1.58 |
| | BUK7Y7R6-40E | 40 | 7.6 | | 79 | 1.58 |
| | BUK9Y09-40B | 40 | 8 | 9 | 75 | 1.42 |
| | BUK7Y08-40B | 40 | 8 | | 75 | 1.42 |
| | BUK9Y12-40E | 40 | 10 | 12 | 52 | 2.31 |
| | BUK9Y14-40B | 40 | 11 | 14 | 56 | 1.8 |
| | BUK7Y12-40E | 40 | 12 | | 52 | 2.31 |
| | BUK7Y13-40B | 40 | 13 | | 58 | 1.8 |
| | BUK9Y21-40E | 40 | 17 | 21 | 33 | 3.33 |
| | BUK7Y21-40E | 40 | 21 | | 33 | 3.33 |
| | BUK9Y27-40B | 40 | 24 | 27 | 34 | 2.53 |
| | BUK9Y29-40E | 40 | 25 | 29 | 25 | 4.03 |
| | BUK7Y25-40B | 40 | 25 | | 35.3 | 2.53 |
| | BUK7Y29-40E | 40 | 29 | | 26 | 4.03 |
| LFPAK56D (SOT1205) | BUK7K6R2-40E | 40 | 5.8 | | | 2.21 |
| | BUK9K6R2-40E | 40 | 6 | 6.2 | 40 | 2.21 |
| | BUK9K6R8-40E | 40 | 6.1 | 7.2 | 40 | 2.36 |
| | BUK7K6R8-40E | 40 | 6.8 | | | 2.36 |
| | BUK9K8R7-40E | 40 | 8 | 9.4 | 30 | 2.84 |
| | BUK7K8R7-40E | 40 | 8.5 | | | 2.84 |
| | BUK9K18-40E | 40 | 16 | 19.5 | 30 | 3.96 |
| | BUK7K18-40E | 40 | 19 | | 24.2 | 3.96 |
| | BUK9K25-40E | 40 | 24 | 29 | 18.2 | 4.68 |
| | BUK7K25-40E | 40 | 25 | | | 4.68 |
| D²PAK (SOT404) | BUK961R6-40E | 40 | 1.4 | 1.6 | 120 | 0.43 |
| | BUK762R0-40E | 40 | 2 | | 120 | 0.51 |
| | BUK962R6-40E | 40 | 2.4 | 2.8 | 100 | 0.57 |
| | BUK762R6-40E | 40 | 2.6 | | 100 | 0.57 |
| | BUK963R1-40E | 40 | 2.7 | 3.1 | 100 | 0.64 |
| | BUK963R2-40B | 40 | 2.8 | 3.2 | 100 | 0.5 |
| | BUK762R9-40E | 40 | 2.9 | | 100 | 0.64 |
| | BUK763R1-40B | 40 | 3.1 | | 75 | 0.5 |
| | BUK964R1-40E | 40 | 3.5 | 4.1 | 75 | 0.82 |
| | BUK9604-40A | 40 | 4 | 4.4 | 75 | 0.5 |
| | BUK964R4-40B | 40 | 4 | 4.4 | 75 | 0.59 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

## 40 V N-channel automotive TrenchMOS – Part 2

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| $D^2PAK$ (SOT404)  | BUK764R0-40E | 40 | 4 | | 75 | 0.82 |
| | BUK965R4-40E | 40 | 4.4 | 5.4 | 75 | 1.09 |
| | BUK7604-40A | 40 | 4.5 | | 75 | 0.5 |
| | BUK765R3-40E | 40 | 4.9 | | 75 | 1.09 |
| | BUK9606-40B | 40 | 5 | 6.4 | 75 | 0.74 |
| | BUK765R2-40B | 40 | 5.2 | | 75 | 0.74 |
| | BUK9609-40B | 40 | 7 | 9 | 75 | 0.95 |
| | BUK768R1-40E | 40 | 7.2 | | 75 | 1.56 |
| | BUK7608-40B | 40 | 8 | | 75 | 0.95 |
| | BUK761R6-40E | 40 | 1.57 | | 120 | 0.43 |
| | BUK761R7-40E | 40 | 1.6 | | 120 | 0.46 |
| DPAK (SOT428)  | BUK9209-40B | 40 | 7 | 9 | 75 | 0.95 |
| | BUK7208-40B | 40 | 8 | | 75 | 0.95 |
| TO-220AB (SOT78A)  | BUK751R8-40E | 40 | 1.8 | | 120 | 0.43 |
| | BUK752R3-40E | 40 | 2.3 | | 120 | 0.51 |
| | BUK953R2-40B | 40 | 2.8 | 3.2 | 100 | 0.5 |
| | BUK753R1-40E | 40 | 3.1 | | 100 | 0.64 |
| | BUK9504-40A | 40 | 4 | 4.4 | 75 | 0.5 |
| | BUK954R4-40B | 40 | 4 | 4.4 | 75 | 0.59 |
| | BUK9506-40B | 40 | 5 | 6.4 | 75 | 0.74 |
| | BUK755R2-40B | 40 | 5.2 | | 75 | 0.74 |
| | BUK9509-40B | 40 | 7 | 9 | 75 | 0.95 |
| | BUK758R3-40E | 40 | 7.4 | | 75 | 1.56 |
| | BUK7508-40B | 40 | 8 | | 75 | 0.95 |
| $I^2PAK$ (SOT226)  | BUK7E1R8-40E | 40 | 1.8 | | 120 | 0.43 |
| | BUK7E1R9-40E | 40 | 1.9 | | 120 | 0.46 |
| | BUK7E2R3-40E | 40 | 2.3 | | 120 | 0.51 |
| | BUK7E3R1-40E | 40 | 3.1 | | 100 | 0.64 |
| | BUK9E04-40A | 40 | 4 | 4.4 | 75 | 0.5 |
| | BUK7E04-40A | 40 | 4.5 | | 75 | 0.5 |
| | BUK7E8R3-40E | 40 | 7.4 | | 75 | 1.56 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)





## 55 - 60 V N-channel automotive TrenchMOS – Part 1

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669)  | BUK9Y12-55B | 55 | 11 | 12 | 61.8 | 1.42 |
| | BUK7Y12-55B | 55 | 12 | | 61.8 | 1.42 |
| | BUK9Y19-55B | 55 | 17.3 | 19 | 46 | 1.8 |
| | BUK7Y18-55B | 55 | 18 | | 47.4 | 1.76 |
| | BUK9Y40-55B | 55 | 36 | 40 | 26 | 2.5 |
| | BUK9Y4R8-60E | 60 | 4.1 | 4.8 | 100 | 0.63 |
| | BUK7Y4R8-60E | 60 | 4.8 | | 100 | 0.63 |
| | BUK9Y6R0-60E | 60 | 5.2 | 6 | 100 | 0.77 |
| | BUK9Y7R2-60E | 60 | 5.6 | 7.2 | 100 | 0.9 |
| | BUK7Y6R0-60E | 60 | 6 | | 100 | 0.77 |
| | BUK7Y7R2-60E | 60 | 7.2 | | 100 | 0.9 |
| | BUK9Y8R7-60E | 60 | 7.5 | 8.7 | 86 | 1.02 |
| | BUK7Y8R7-60E | 60 | 8.7 | | 87 | 1.02 |
| | BUK9Y15-60E | 60 | 13 | 15 | 53 | 1.58 |
| | BUK7Y15-60E | 60 | 15 | | 53 | 1.59 |
| | BUK9Y25-60E | 60 | 21.5 | 25 | 34 | 2.31 |
| | BUK7Y25-60E | 60 | 25 | | 34 | 2.31 |
| | BUK9Y43-60E | 60 | 38 | 43 | 22 | 3.33 |
| | BUK7Y43-60E | 60 | 43 | | 22 | 3.33 |
| | BUK9Y59-60E | 60 | 52 | 59 | 16.7 | 4.03 |
| | BUK7Y59-60E | 60 | 59 | | 17 | 4.03 |
| LFPAK56D (SOT1205)  | BUK7K12-60E | 60 | 9.3 | | | 2.21 |
| | BUK9K12-60E | 60 | 10.7 | 11.5 | 35 | 2.21 |
| | BUK7K13-60E | 60 | 10 | | 40 | 2.36 |
| | BUK9K13-60E | 60 | 11.2 | 12.5 | 40 | 2.36 |
| | BUK7K17-60E | 60 | 14 | | | 2.84 |
| | BUK9K17-60E | 60 | 15.6 | 17 | 26 | 2.84 |
| | BUK7K35-60E | 60 | 30 | | 20.7 | 3.96 |
| | BUK9K35-60E | 60 | 32 | 35 | 22 | 3.96 |
| | BUK7K52-60E | 60 | 45 | | 15.4 | 4.68 |
| | BUK9K52-60E | 60 | 49 | 55 | 16 | 4.68 |
| $D^2PAK$ (SOT404)  | BUK964R2-55B | 55 | 3.7 | 4.2 | 75 | 0.5 |
| | BUK764R0-55B | 55 | 4 | | 75 | 0.5 |
| | BUK9606-55B | 55 | 5.4 | 6 | 75 | 0.58 |
| | BUK9606-55A | 55 | 5.8 | 6.3 | 75 | 0.5 |
| | BUK7606-55B | 55 | 6 | | 75 | 0.59 |
| | BUK7606-55A | 55 | 6.3 | | 75 | 0.5 |
| | BUK9608-55B | 55 | 7 | 8.4 | 75 | 0.74 |
| | BUK7607-55B | 55 | 7.1 | | 75 | 0.74 |
| | BUK9608-55A | 55 | 7.5 | 8 | 75 | 0.59 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

## 55 - 60 V N-channel automotive TrenchMOS – Part 2

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| D²PAK (SOT404)  | BUK7608-55A | 55 | 8 | | 75 | 0.59 |
| | BUK9612-55B | 55 | 10 | 12 | 75 | 0.95 |
| | BUK7610-55AL | 55 | 10 | | 75 | 0.5 |
| | BUK7611-55A | 55 | 11 | | 75 | 0.9 |
| | BUK7611-55B | 55 | 11 | | 75 | 0.95 |
| | BUK9614-55A | 55 | 13 | 14 | 73 | 1 |
| | BUK9616-55A | 55 | 15 | 16 | 66 | |
| | BUK9620-55A | 55 | 18 | 20 | 54 | 1.2 |
| | BUK7620-55A | 55 | 20 | | 54 | 1.2 |
| | BUK9624-55A | 55 | 21.7 | 24 | 46 | 1.4 |
| | BUK7624-55A | 55 | 24 | | 47 | |
| | BUK9628-55A | 55 | 25 | 28 | 42 | 1.5 |
| | BUK7628-55A | 55 | 28 | | 42 | |
| | BUK9635-55A | 55 | 32 | 35 | 34 | 1.8 |
| | BUK7635-55A | 55 | 35 | | 35 | 1.7 |
| | BUK9675-55A | 55 | 68 | 75 | 20 | 2.4 |
| | BUK7675-55A | 55 | 75 | | 20.3 | 2.4 |
| | BUK962R5-60E | 60 | 2.3 | 2.5 | 120 | 0.43 |
| | BUK762R4-60E | 60 | 2.4 | | 120 | 0.43 |
| | BUK962R8-60E | 60 | 2.5 | 2.8 | 120 | 0.46 |
| | BUK762R6-60E | 60 | 2.6 | | 120 | 0.46 |
| | BUK963R3-60E | 60 | 3 | 3.3 | 120 | 0.51 |
| | BUK763R1-60E | 60 | 3.1 | | 120 | 0.51 |
| | BUK964R2-60E | 60 | 3.9 | 4.2 | 100 | 0.57 |
| | BUK763R9-60E | 60 | 3.9 | | 100 | 0.57 |
| | BUK964R8-60E | 60 | 4.4 | 4.8 | 100 | 0.64 |
| | BUK764R4-60E | 60 | 4.5 | | 100 | 0.64 |
| | BUK966R5-60E | 60 | 5.9 | 6.5 | 75 | 0.82 |
| | BUK766R0-60E | 60 | 6 | | 75 | 0.82 |
| | BUK969R0-60E | 60 | 8 | 9 | 75 | 1.09 |
| | BUK768R3-60E | 60 | 8.3 | | 75 | 1.09 |
| | BUK9614-60E | 60 | 12.8 | 14 | 56 | 1.56 |
| | BUK7613-60E | 60 | 13 | | 58 | 1.56 |
| D²PAK-7 (SOT427)  | BUK9C10-55BIT | 55 | 9 | 10 | 75 | 0.78 |
| DPAK (SOT428)  | BUK9212-55B | 55 | 10 | 12 | 75 | 0.95 |
| | BUK7210-55B | 55 | 10 | | 75 | 0.95 |
| | BUK7212-55B | 55 | 12 | | 75 | 0.95 |
| | BUK9215-55A | 55 | 13.6 | 15 | 62 | 1.3 |
| | BUK7215-55A | 55 | 15 | | 62 | 1.3 |
| | BUK9219-55A | 55 | 17.6 | 19 | 55 | 1.3 |

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## 55 - 60 V N-channel automotive TrenchMOS – Part 3

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| DPAK (SOT428)  | BUK7219-55A | 55 | 19 | | 55 | 1.3 |
| | BUK9222-55A | 55 | 20 | 22 | 48 | 1.5 |
| | BUK9225-55A | 55 | 22 | 25 | 43 | 1.6 |
| | BUK7222-55A | 55 | 22 | | 48 | 1.5 |
| | BUK7230-55A | 55 | 30 | | 38 | 1.7 |
| | BUK9237-55A | 55 | 33 | 37 | 32 | 1.94 |
| | BUK7237-55A | 55 | 37 | | 32.3 | 1.9 |
| | BUK9245-55A | 55 | 40 | 45 | 28 | 2.1 |
| | BUK9277-55A | 55 | 69 | 77 | 18 | 2.93 |
| | BUK7277-55A | 55 | 77 | | 18 | 2.9 |
| | BUK92150-55A | 55 | 125 | 140 | 11 | 4.1 |
| | BUK72150-55A | 55 | 150 | | 11 | 4.1 |
| TO-220AB (SOT78A)  | BUK954R2-55B | 55 | 3.7 | 4.2 | 75 | 0.5 |
| | BUK754R0-55B | 55 | 4 | | 75 | 0.5 |
| | BUK7506-55A | 55 | 6.3 | | 75 | 0.5 |
| | BUK9508-55B | 55 | 7 | 8.4 | 75 | 0.74 |
| | BUK7507-55B | 55 | 7.1 | | 75 | 0.74 |
| | BUK7508-55A | 55 | 8 | | 75 | 0.59 |
| | BUK7509-55A | 55 | 9 | | 75 | 0.71 |
| | BUK9511-55A | 55 | 10 | 11 | 75 | 0.9 |
| | BUK9512-55B | 55 | 10 | 12 | 75 | 0.95 |
| | BUK7511-55B | 55 | 11 | | 75 | 0.95 |
| | BUK9514-55A | 55 | 13 | 14 | 73 | 1 |
| | BUK9518-55A | 55 | 16 | 18 | 61 | 1.1 |
| | BUK7516-55A | 55 | 16 | | 65.7 | 1.1 |
| | BUK7520-55A | 55 | 20 | | 54 | 1.2 |
| | BUK7528-55A | 55 | 28 | | 42 | 1.5 |
| | BUK9535-55A | 55 | 32 | 35 | 34 | 1.8 |
| | BUK7535-55A | 55 | 35 | | 35 | 1.7 |
| | BUK9575-55A | 55 | 68 | 75 | 20 | 2.4 |
| | BUK7575-55A | 55 | 75 | | 20.3 | 2.4 |
| | BUK953R5-60E | 60 | 3.4 | 3.7 | 120 | 0.51 |
| | BUK954R8-60E | 60 | 4.5 | 4.9 | 100 | 0.64 |
| I²PAK (SOT226)  | BUK9E06-55B | 55 | 5.4 | 6 | 75 | 0.58 |
| | BUK9E06-55A | 55 | 5.8 | 6.3 | 75 | 0.5 |
| | BUK9E08-55B | 55 | 7 | 8.4 | 75 | 0.74 |
| | BUK7E2R6-60E | 60 | 2.6 | | 120 | 0.43 |
| | BUK7E3R5-60E | 60 | 3.5 | | 120 | 0.51 |
| | BUK7E4R6-60E | 60 | 4.6 | | 100 | 0.64 |
| | BUK7E13-60E | 60 | 13 | | 58 | 1.56 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

# 75 - 80 V N-channel automotive TrenchMOS

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | BUK9Y19-75B | 75 | 18 | 19 | 48.2 | 1.42 |
| | BUK7Y18-75B | 75 | 18 | | 49 | 1.42 |
| | BUK9Y30-75B | 75 | 28 | 30 | 34 | 1.8 |
| | BUK7Y28-75B | 75 | 28 | | 35.5 | 1.76 |
| | BUK9Y58-75B | 75 | 53 | 58 | 20.73 | 2.53 |
| | BUK7Y7R8-80E | 80 | 7.8 | | 100 | 0.63 |
| | BUK9Y8R5-80E | 80 | 8 | 8.5 | 100 | 0.63 |
| | BUK7Y9R9-80E | 80 | 9.9 | | 89 | 0.77 |
| | BUK9Y11-80E | 80 | 10 | 11 | 84 | 0.77 |
| | BUK9Y14-80E | 80 | 14 | 15 | 62 | 1.02 |
| | BUK7Y14-80E | 80 | 14 | | 65 | 1.02 |
| | BUK9Y25-80E | 80 | 25 | 27 | 37 | 1.58 |
| | BUK7Y25-80E | 80 | 25 | | 39 | 1.58 |
| | BUK9Y41-80E | 80 | 41 | 45 | 24 | 2.33 |
| | BUK7Y41-80E | 80 | 41 | | 25 | 2.31 |
| | BUK9Y72-80E | 80 | 72 | 78 | 15 | 3.33 |
| | BUK7Y72-80E | 80 | 72 | | 16 | 3.33 |
| | BUK9Y107-80E | 80 | 98 | 107 | 11.8 | 4.03 |
| | BUK7Y98-80E | 80 | 98 | | 12.3 | 4.03 |
| D²PAK (SOT404) | BUK9606-75B | 75 | 5.5 | 6.1 | 75 | 0.5 |
| | BUK7606-75B | 75 | 5.6 | | 75 | 0.5 |
| | BUK9609-75A | 75 | 8.5 | 9 | 75 | 0.65 |
| | BUK7609-75A | 75 | 9 | | 75 | 0.65 |
| | BUK7613-75B | 75 | 13 | | 75 | 0.95 |
| | BUK9616-75B | 75 | 14 | 16.4 | 67 | 0.95 |
| | BUK7623-75A | 75 | 23 | | 53 | 1.1 |
| | BUK763R8-80E | 80 | 3.8 | | 120 | 0.43 |
| | BUK964R2-80E | 80 | 4 | 4.2 | 120 | 0.43 |
| | BUK764R2-80E | 80 | 4.2 | | 120 | 0.46 |
| | BUK964R7-80E | 80 | 4.5 | 4.7 | 120 | 0.46 |
| | BUK769R6-80E | 80 | 9.6 | | 75 | 0.82 |
| | BUK9611-80E | 80 | 10 | 11 | 75 | 0.82 |
| DPAK (SOT428) | BUK7214-75B | 75 | 14 | | 69 | 0.95 |
| | BUK9217-75B | 75 | 15 | 17 | 64 | 0.95 |
| | BUK9226-75A | 75 | 24.6 | 26 | 45 | 1.3 |
| | BUK7226-75A | 75 | 26 | | 45 | 1 |
| TO-220AB (SOT78A) | BUK9506-75B | 75 | 5.5 | 6.1 | 75 | 0.5 |
| | BUK7509-75A | 75 | 9 | | 75 | 0.65 |
| | BUK7513-75B | 75 | 13 | | 75 | 0.95 |
| | BUK753R8-80E | 80 | 4 | | 120 | 0.43 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)





# 100 V N-channel automotive TrenchMOS – Part 1

types in **bold** represent new products

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| LFPAK56; Power-SO8 (SOT669) | BUK9Y12-100E | 100 | 11.9 | 12 | 85 | 0.63 |
| | BUK7Y12-100E | 100 | 12 | | 85 | 0.63 |
| | BUK9Y15-100E | 100 | 14.7 | 15 | 69 | 0.77 |
| | BUK7Y15-100E | 100 | 15 | | 68 | 0.77 |
| | BUK9Y19-100E | 100 | 18 | 19 | 56 | 0.9 |
| | BUK7Y19-100E | 100 | 19 | | 56 | 0.9 |
| | BUK9Y22-100E | 100 | 21.5 | 22 | 49 | 1.02 |
| | BUK7Y22-100E | 100 | 22 | | 49 | 1.02 |
| | BUK9Y38-100E | 100 | 37.5 | 38 | 30 | 1.58 |
| | BUK7Y38-100E | 100 | 38 | | 30 | 1.58 |
| | BUK9Y53-100B | 100 | 49 | 53 | 23 | 2 |
| | BUK7Y53-100B | 100 | 53 | | 24.8 | 1.76 |
| | BUK9Y65-100E | 100 | 63.3 | 65 | 19 | 2.31 |
| | BUK7Y65-100E | 100 | 65 | | 19 | 2.31 |
| | BUK9Y104-100B | 100 | 99 | 104 | 14.8 | 2.53 |
| | BUK7Y102-100B | 100 | 102 | | 15 | 2.53 |
| | BUK9Y113-100E | 100 | 110 | 113 | 12 | 3.33 |
| | BUK7Y113-100E | 100 | 113 | | 12 | 3.33 |
| | BUK9Y153-100E | 100 | 146 | 153 | 9.4 | 4.03 |
| | BUK7Y153-100E | 100 | 153 | | 9.4 | 4.03 |
| LFPAK56D (SOT1205) | **BUK7K29-100E** | **100** | **24.5** | | **29.5** | **2.21** |
| | BUK9K29-100E | 100 | 27 | 29 | 30 | 2.21 |
| | **BUK7K32-100E** | **100** | **27.5** | | **29** | **2.36** |
| | BUK9K32-100E | 100 | 31 | 33 | 26 | 2.36 |
| | **BUK7K45-100E** | **100** | **37.6** | | **21.4** | **2.84** |
| | BUK9K45-100E | 100 | 42 | 45 | 21 | 2.84 |
| | **BUK7K89-100E** | **100** | **82.5** | | **13** | **3.96** |
| | BUK9K89-100E | 100 | 85 | 89 | 12.5 | 3.96 |
| | **BUK7K134-100E** | **100** | **121** | | **9.8** | **4.68** |
| | BUK9K134-100E | 100 | 154 | 159 | 8.5 | 4.68 |
| D²PAK (SOT404) | BUK765R0-100E | 100 | 5 | | 120 | 0.43 |
| | BUK965R8-100E | 100 | 5.6 | 5.8 | 120 | 0.43 |
| | BUK768R1-100E | 100 | 8.1 | | 100 | 0.57 |
| | BUK969R3-100E | 100 | 8.9 | 9.3 | 100 | 0.57 |
| | BUK9610-100B | 100 | 9.7 | 10 | 75 | 0.5 |
| | BUK7610-100B | 100 | 10 | | 75 | 0.5 |
| | BUK7613-100E | 100 | 13 | | 72 | 0.82 |
| | BUK9615-100E | 100 | 14 | 15 | 66 | 0.82 |
| | BUK9615-100A | 100 | 14.4 | 15 | 75 | 0.65 |
| | BUK9620-100B | 100 | 18.5 | 20 | 63 | 0.75 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)

## 100 V N-channel automotive TrenchMOS – Part 2

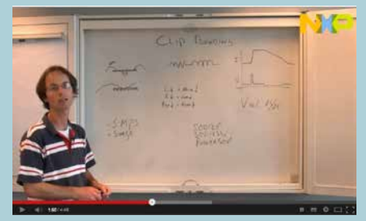
types in **bold** represent new products

| Package name | Type number | $V_{DS}$ [max] [V] | $R_{DSon}$ [max] @ 10 V [mΩ] | $R_{DSon}$ [max] @ 5 V [mΩ] | $I_D$ [max] @ 25 °C [A] | $R_{th(j-mb)}$ [max] [K/W] |
|---|---|---|---|---|---|---|
| $D^2PAK$ (SOT404) | BUK7620-100A | 100 | 20 | | 63 | 0.75 |
| | BUK7626-100B | 100 | 26 | | 49 | 0.95 |
| | BUK9628-100A | 100 | 27 | 28 | 49 | 0.9 |
| | BUK9629-100B | 100 | 27 | 29 | 46 | 0.95 |
| | BUK7628-100A | 100 | 28 | | 47 | 0.9 |
| | BUK7631-100E | 100 | 31 | | 34 | 1.56 |
| | BUK7635-100A | 100 | 35 | | 41 | 1 |
| | BUK9637-100E | 100 | 36 | 37 | 31 | 1.56 |
| | BUK9640-100A | 100 | 39 | 40 | 39 | 0.95 |
| | BUK7640-100A | 100 | 40 | | 37 | 1.1 |
| | BUK9660-100A | 100 | 58 | 60 | 26 | 1.4 |
| | BUK7660-100A | 100 | 60 | | 26 | 1.4 |
| | BUK9675-100A | 100 | 72 | 75 | 23 | 1.5 |
| | BUK7675-100A | 100 | 75 | | 23 | 1.5 |
| | BUK96180-100A | 100 | 173 | 180 | 11 | 2.8 |
| DPAK (SOT428) | BUK7227-100B | 100 | 27 | | 48 | 0.95 |
| | BUK9230-100B | 100 | 28 | 30 | 47 | 0.95 |
| | BUK9240-100A | 100 | 38.6 | 40 | 33 | 1.3 |
| | BUK7240-100A | 100 | 40 | | 34 | 1.3 |
| | BUK9275-100A | 100 | 72 | 75 | 21.7 | 1.7 |
| | BUK7275-100A | 100 | 75 | | 21.7 | 1.7 |
| TO-220AB (SOT78A) | BUK755R4-100E | 100 | 5.2 | | 120 | 0.43 |
| | BUK9510-100B | 100 | 9.7 | 10 | 75 | 0.5 |
| | BUK7510-100B | 100 | 10 | | 75 | 0.5 |
| | BUK9515-100A | 100 | 14.4 | 15 | 75 | 0.65 |
| | BUK7515-100A | 100 | 15 | | 75 | 0.5 |
| | BUK9520-100B | 100 | 18.5 | 20 | 63 | 0.75 |
| | BUK9520-100A | 100 | 19 | 20 | 63 | 0.75 |
| | BUK7520-100A | 100 | 20 | | 63 | 0.75 |
| | BUK7526-100B | 100 | 26 | | 49 | 0.95 |
| | BUK9529-100B | 100 | 27 | 29 | 46 | 0.95 |
| | BUK7528-100A | 100 | 28 | | 47 | 0.9 |
| | BUK9535-100A | 100 | 34 | 35 | 41 | 1 |
| | BUK7535-100A | 100 | 35 | | 41 | 1 |
| | BUK9575-100A | 100 | 72 | 75 | 23 | 1.5 |
| | BUK7575-100A | 100 | 75 | | 23 | 1.5 |
| $I^2PAK$ (SOT226) | BUK7E5R2-100E | 100 | 5.2 | | 120 | 0.43 |

For the most current product information go to www.nxp.com/mosfets (updated daily!)



# Quick learning videos



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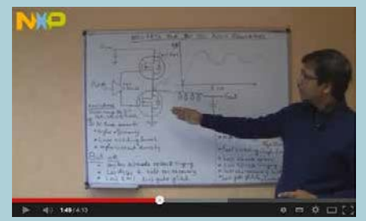
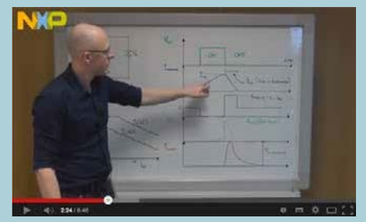
Next Power Live! MOSFETs for HOT SWAP and Power over Ethernet
www.nxp.com/quicklearning29



NextPowerS3 MOSFETs for DC/DC buck regulators
www.nxp.com/quicklearning32

Reverse recovery and diode leakage in SMPS
www.nxp.com/quicklearning33

Power MOSFET operation in Linear Mode
www.nxp.com/quicklearning34



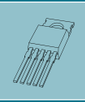
Single-shot avalance ruggedness
www.nxp.com/quicklearning35

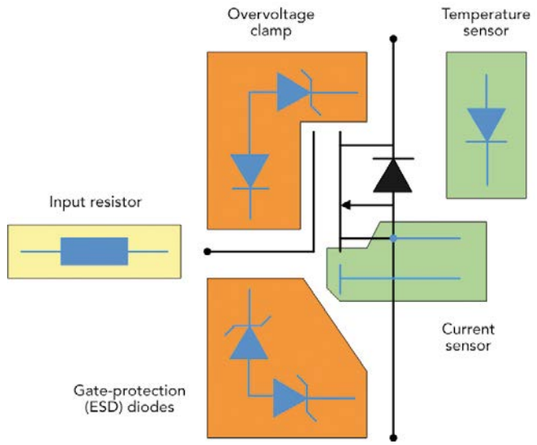
Power MOSFETs and thermal modelling
www.nxp.com/quicklearning43

MOSFETs for Power-over-Ethernet (PoE) PSE applications
www.nxp.com/quicklearning36

## TrenchPLUS MOSFETs

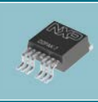
TrenchPLUS is a range of standard MOSFETs with additional protection features, such as current and temperature sensing components, overvoltage clamps, and gate-protection (ESD) diodes. The system microcontroller can use data gathered from these sensors to implement cost-effective protection features, thus eliminating the need to design with protected power devices. All the standard products listed below offer one or more "PLUS" features. Custom versions can be developed for high-volume applications.

| $V_{DS}$ (V) | $R_{DSon}$ (max) @ 10 V (mΩ) | $R_{DSon}$ (max) @ 5 V (mΩ) | $I_D$ (max) @ 25 °C (A) | Temperature sensing | Current sensing | Gate source clamps | Gate drain clamps | Gate resistor | Surface-mount package | | Leaded package | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 7-pin D²PAK (SOT427) | 5-pin D²PAK (SOT426) | TO220AB (SOT78C) | 5-pin TO220 (SOT263B-01) |
| | | | | | | | | |  |  |  |  |
| | | | | | | | | | 10.0 x 15 x 4.5 | 10.0 x 15.0 x 4.5 | 15.0 x 10.0 x 4.5 | 10.0 x 19.0 x 4.5 |
| 34 | 6 | | 75 | | | • | • | • | | | BUK7L06-34ARC | |
| 34 | 11 | | 75 | | | • | • | • | | | BUK7L11-34ARC | |
| 40 | 4.1 | | 75 | • | | | | | | BUK714R1-40BT | | |
| 40 | 5 | | 75 | | • | • | | | | BUK7105-40AIE | | BUK7905-40AIE |
| 40 | 5 | | 75 | • | | • | | | | BUK7105-40ATE | | BUK7905-40ATE |
| 40 | 5 | | 75 | | | | | | | | | BUK7905-40AI |
| 40 | 6 | | 75 | • | • | • | | | BUK7C06-40AITE | | | |

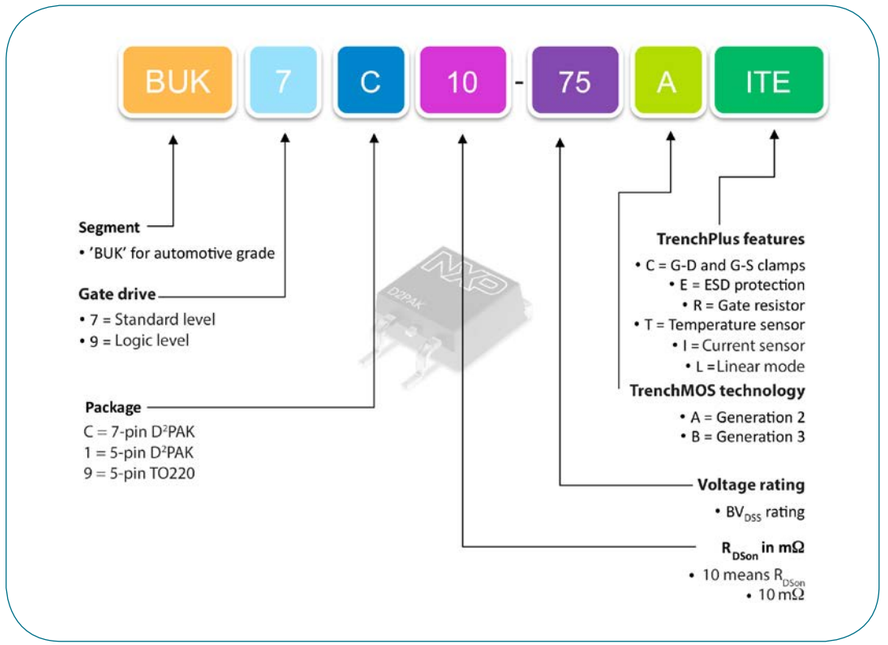





## TrenchPLUS MOSFETs

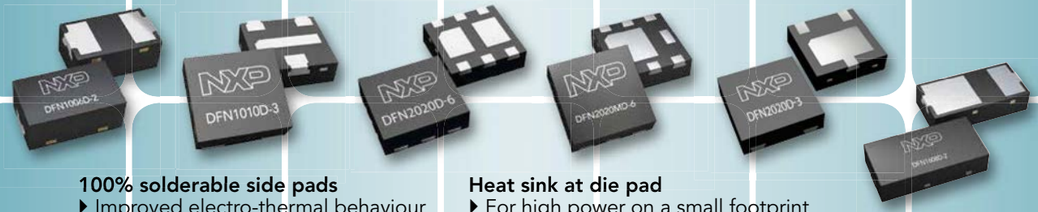
| $V_{DS}$ (V) | $R_{DSon}$ (max) @ 10 V (mΩ) | $R_{DSon}$ (max) @ 5 V (mΩ) | $I_D$ (max) @ 25 °C (A) | Temperature sensing | Current sensing | Gate source clamps | Gate drain clamps | Gate resistor | Surface-mount package | | Leaded package | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 7-pin D²PAK (SOT427) | 5-pin D²PAK (SOT426) | TO220AB (SOT78C) | 5-pin TO220 (SOT263B-01) |
| | | | | | | | | |  |  |  |  |
| | | | | | | | | | 10.0 x 15 x 4.5 | 10.0 x 15.0 x 4.5 | 15.0 x 10.0 x 4.5 | 10.0 x 19.0 x 4.5 |
| 40 | 6.6 | 7 | 75 | • | | • | • | | | BUK9107-40ATC | | BUK9907-40ATC |
| 40 | 8 | | 75 | • | | • | • | | | BUK7107-40ATC | | BUK7907-40ATC |
| 40 | 8 | | 75 | | • | • | | | | BUK7108-40AIE | | BUK7908-40AIE |
| 55 | 6.6 | 7 | 75 | • | | • | | | | BUK9107-55ATE | | |
| 55 | 7 | | 75 | | • | • | | | | BUK7107-55AIE | | BUK7907-55AIE |
| 55 | 7 | | 75 | • | | • | | | | BUK7107-55ATE | | BUK7907-55ATE |
| 55 | 8 | | 75 | • | • | • | | | BUK7C08-55AITE | | | |
| 55 | 9 | 10 | 75 | • | • | | | | BUK9C10-55BIT | | | |
| 75 | 9 | | 75 | | • | • | | | | BUK7109-75AIE | | BUK7909-75AIE |
| 75 | 9 | | 75 | • | | • | | | | BUK7109-75ATE | | BUK7909-75ATE |
| 75 | 10 | | 75 | • | • | • | | | BUK7C10-75AITE | | | |

### Automotive TrenchPLUS part numbering



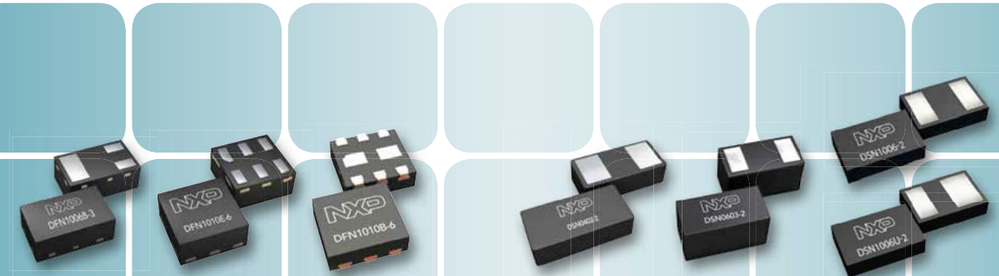
# The next generation of packaging

## DFN / DSN packages – high performance on a smaller footprint



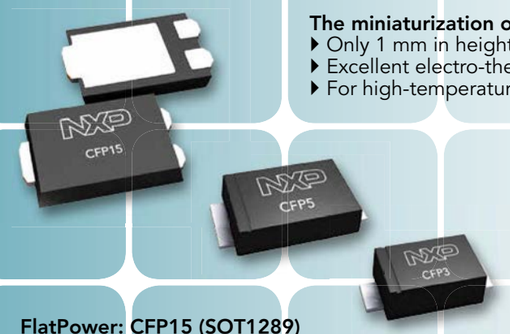

**100% solderable side pads**
- Improved electro-thermal behaviour
- For visual solder inspection

**Heat sink at die pad**
- For high power on a small footprint
- Enabling smaller designs

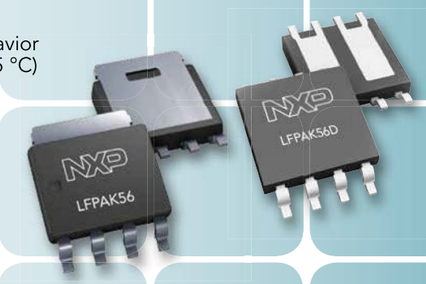



**Smallest packages**
- Outline down to 0.4 x 0.2 mm
- Height down to 0.12 mm
- For ultra-compact and slim designs

## True power packages for smart efficiency – with solid wireless-clip design



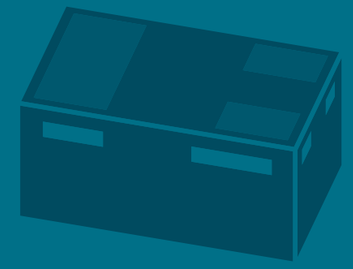

**The miniaturization of power**
- Only 1 mm in height
- Excellent electro-thermal behavior
- For high-temperature use (175 °C)




**FlatPower: CFP15 (SOT1289)**
**CFP5 (SOD128) / CFP3 (SOD123W)**
- Same performance as SMA / SMB on a much smaller footprint

**LFPAK56/56D (SOT669 / SOT1205)**
- Same performance as DPAK, on a much smaller footprint





# Packages

# Package details and packing methods SMD – Part 1

| Package details | | | | | Packing methods | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pins | Package | Package size (l x w x h) (mm) | Lead pitch (mm) | Package | Packing method and tape dimension | Reel dimension (d x w) (mm) | Packing quantity and ordering code (12NC ending) | | | | | | | | | | | | | | | |
| | | | | | | | 500 | 800 | 1000 | 1400 | 1500 | 2000 | 2500 | 3000 | 4000 | 4500 | 5000 | 6000 | 8000 | 9000 | 10000 |
| 2 | DSN0402-2 (SOD992) | 0.4 x 0.2 x 0.12 | 0.25 | | 2 mm pitch, 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | | -315 |
| | DSN1006-2 (SOD993) | 1.0 x 0.6 x 0.3 | 0.65 | | 2 mm pitch, 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | | -315 |
| | DSN1006U-2 (SOD995) | 1.0 x 0.6 x 0.3 | 0.55 | | 2 mm pitch, 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | | -315 |
| | DFN1006-2 (SOD882) | 1.0 x 0.6 x 0.48 | 0.65 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | | -315 |
| | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37 | 0.65 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | | -315 |
| | DFN1608D-2 (SOD 1608) | 1.6 x 0.8 x 0.37 | 0.94 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | -315 | | |
| | DSN1608-2 (SOD964) | 1.6 x 0.8 x 0.37 | 0.94 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | -315 | | |
| | DFN1608-2 (SOD963) | 1.6 x 0.8 x 0.25 | 0.885 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | -315 | | |
| | DSN0603-2 (SOD962) | 0.6 x 0.3 x 0.3 | 0.4 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | -315 | |
| | SOD80C (MiniMelf) | 3.5 x 1.5 x 1.5 | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | -115 | | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 330 x 8 | | | | | | | | | | | | | | | -135 |
| | SOD123F | 2.6 x 1.6 x 1.1 | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | CFP3 (SOD123W) | 2.6 x 1.7 x 1.0 | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | CFP5 (SOD128) | 3.8 x 2.5 x 1.0 | | | 4 mm pitch. 12 mm tape and reel | 180 x 12 | | | | | | | | -115 | | | | | | | |
| | SOD323 (SC-76) | 1.7 x 1.25 x 0.95 | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | | | | | 10 reels in one box | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | SOD323F (SC-90) | 1.7 x 1.25 x 0.7 | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | SOD523 (SC-79) | 1.2 x 0.8 x 0.6 | | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | -315 | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | CFP15 (SOT1289) | 5.8 x 4.3 x 0.78 | 2.13 | | 8 mm pitch. 12 mm tape and reel | 330 x 12 | | | | | -146 | | | | | | | -139 | | | |
| | D2PAK (SOT404) | 10 x 9.6 x 4.3 | 5.08 | | 16 mm pitch. 24 mm tape and reel | 330 x 24 | | 118 | | | | | | | | | | | | | |
| 3 | DFN1006-3 (SOT883) | 1.0 x 0.6 x 0.48 | 0.65 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | | -315 |
| | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37 | 0.65 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | | | -315 |
| | DFN1010D-3 (SOT1215) | 1.1 x 1.0 x 0.37 | 0.75 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | -115 | | | |
| | DFN2020-3 (SOT1061) | 2.0 x 2.0 x 0.62 | 1.3 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | DFN2020D-3 (SOT1061D) | 2.0 x 2.0 x 0.62 | 1.3 | | 4 mm pitch, 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | DPAK (SOT428) | 6.6 x 6.1 x 2.3 | 4.57 | | 8 mm pitch. 16 mm tape and reel | 330 x 16 | | | | | | | -118 | | | | | | | | |
| | SOT23 | 2.9 x 1.3 x 1.0 | 0.95 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -215 | | | | | | | |
| | | | | | | 286 x 8 | | | | | | | | | | | | | | | -235 |
| | | | | | 10 reels in one box | 180 x 8 | | | | | | | | -185 | | | | | | | |
| | SOT89 (SC-62) | 4.5 x 2.5 x 1.5 | 1.5 | | 8 mm pitch. 12 mm tape and reel | 180 x 12 | | | -115 | | | | | | | | | | | | |
| | | | | | 8 mm pitch. 12 mm tape and reel | 330 x 12 | | | | | | | | | -135 | | | | | | |
| | | | | | 8 mm pitch. 12 mm tape and reel | 180 x 12 | | | -146 | | | | | | | | | | | | |
| | | | | | 8 mm pitch. 12 mm tape and reel | 180 x 12 | | | -147 | | | | | | | | | | | | |





# Package details and packing methods SMD – Part 2

| Package details | | | | | Packing methods | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pins | Package | Package size (l x w x h) (mm) | Lead pitch (mm) | Package | Packing method and tape dimension | Reel dimension (d x w) (mm) | Packing quantity and ordering code (12NC ending) | | | | | | | | | | | | | | | |
| | | | | | | | 500 | 800 | 1000 | 1400 | 1500 | 2000 | 2500 | 3000 | 4000 | 4500 | 5000 | 6000 | 8000 | 9000 | 10000 |
| 3 | SOT323 (SC-70) | 2.0 x 1.25 x 0.95 | 0.65 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | SOT663 | 1.2 x 1.6 x 0.55 | 0.5 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -115 | | | | | | |
| 4 | LFPAK56 (SOT669) | 4.9 x 4.45 x 1.0 | 1.27 | | 8 mm pitch. 12 mm tape and reel | 180 x 12 | | | | | -115 | | | | | | | | | | |
| | SOT143B | 2.9 x 1.3 x 1.0 | 1.9 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -215 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -235 |
| | SOT223 (SC-73) | 6.5 x 3.5 x 1.65 | 2.3 | | 8 mm pitch. 12 mm tape and reel | 180 x 12 | | | -115 | | | | | | | | | | | | |
| | | | | | 8 mm pitch. 12 mm tape and reel | 330 x 12 | | | | | | | | | -135 | | | | | | |
| 5 | SOT353 (SC-88 A) | 2.0 x 1.25 x 0.95 | 0.65 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -125 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -165 |
| | SOT665 | 1.6 x 1.2 x 0.55 | 0.5 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | -315 | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -115 | | | | | | | |
| 6 | DFN1010-6 (SOT891) | 1.0 x 1.0 x 0.48 | 0.35 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | -132 | | | | |
| | DFN1010B-6 (SOT1216) | 1.1 x 1.0 x 0.37 | 0.35 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | -147 | | | | |
| | DFN1410-6 (SOT886) | 1.45 x 1.0 x 0.48 | 0.5 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | -115 | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | -132 | | | | |
| | DFN1616-6 (SOT 1189) | 1.6 x 1.6 x 0.48 | 0.5 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -115 | | | | | | |
| | DFN2020-6 (SOT 1118) | 2.0 x 2.0 x 0.62 | 0.65 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | | | | | | | | | | -184 | | | | | | | |
| | DFN2020D-6 (SOT1118D) | 2.0 x 2.0 x 0.62 | 0.65 | | 4 mm pitch, 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | DFN2020MD-6 (SOT1220) | 2.0 x 2.0 x 0.62 | 0.65 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | | | | | | | | | | -125 | | | | | | | |
| | SOT363 (SC-88) | 2.0 x 1.25 x 0.95 | 0.65 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -125 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -165 |
| | SOT457 (SC-74) | 2.9 x 1.5 x 1.0 | 0.95 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -115 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -135 |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | -125 | | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 286 x 8 | | | | | | | | | | | | | | | -165 |
| | SOT666 | 1.6 x 1.2 x 0.55 | 0.5 | | 2 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | | | -315 | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -115 | | | | | | | |
| 7 | DFN2111-7 (SOT1358) | 2.1 x 1.1 x 0.5 | 1.3 | | 4 mm pitch, 8 mm tape and reel | 180 x 9 | | | | | | | | 471 | | | | | | | |
| | D2PAK-7 (SOT428) | 10 x 15.3 x 4.3 | - | | 16 mm pitch, 24 mm tape and reel | 330 x 24 | | x | | | | | | | | | | | | | |

# Package details and packing methods SMD – Part 3

| Package details | | | | | Packing methods | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pins | Package | Package size (l x w x h) (mm) | Lead pitch (mm) | Package | Packing method and tape dimension | Reel dimension (d x w) (mm) | Packing quantity and ordering code (12NC ending) | | | | | | | | | | | | | | |
| | | | | | | | 500 | 800 | 1000 | 1400 | 1500 | 2000 | 2500 | 3000 | 4000 | 4500 | 5000 | 6000 | 8000 | 9000 | 10000 |
| 8 | LFPAK33 (SOT1210) | 3.3 x 3.3 x 0.85 | - | | 8 mm pitch, 12 mm tape and reel | 180 x 12 | | | | | x | | | | | | | | | | |
| | DFN1714-8 (SOT1166) | 1.7 x 1.35 x 0.52 | 0.4 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -115 | | | | | | |
| | | | | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -132 | | | | | | |
| | DFN1714U-8 (SOT983) | 1.7 x 1.35 x 0.48 | 0.4 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -118 | | | | | | |
| | SOT96 (S08) | 4.9 x 3.9 x 1.75 | 1.27 | | 8 mm pitch. 12 mm tape and reel | 180 x 12 | | | -115 | | | | | | | | | | | | |
| | | | | | 8 mm pitch. 12 mm tape and reel | 330 x 12 | | | | | | | -518 | | | | | | | | |
| | | | | | 8 mm pitch. 12 mm tape and reel | 331 x 12 | | | | | | | -118 | | | | | | | | |
| | LFPAK56D (SOT1205) | 4.9 x 4.45 x 1.0 | 1.27 | | 8 mm pitch. 12 mm tape and reel | 180 x 12 | | | | | -115 | | | | | | | | | | |
| 9 | DFN2110-9 (SOT1178) | 2.1 x 1.0 x 0.48 | 0.4 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -115 | | | | | | |
| | DFN2520-9 (SOT1333) | 2.5 x 2.0 x 0.48 | 0.5 | | | - | | | | | | | | | -132 | | | | | | |
| 10 | DFN2510-10 (SOT1165) | 2.5 x 1.0 x 0.48 | 0.5 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | -115 | | | | |
| | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48 | 0.5 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | | | -115 -471 | | | | |
| 12 | DFN2514-12 (SOT1167) | 2.5 x 1.35 x 0.53 | 0.4 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -132 | | | | | | |
| | DFN2521-12 (SOT 1156) | 2.5 x 2.1 x 0.48 | 0.4 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -132 | | | | | | |
| 14 | DFN4020-14 (SOT1334) | 4.0 x 2.0 x 0.48 | 0.5 | | 4 mm pitch, 12 mm tape and reel | 180 x 12 | | | | | | | | | -115 | | | | | | |
| | DFN3312-16 (SOT 1159) | 3.3 x 1.2 x 0.48 | 0.4 | | 4 mm pitch. 12 mm tape and reel | 180 x 12 | | | | | | | | | -132 | | | | | | |
| | DFN3314-16 (SOT1168) | 3.3 x 1.35 x 0.53 | 0.4 | | 4 mm pitch. 8 mm tape and reel | 180 x 8 | | | | | | | | | -132 | | | | | | |
| | SOT519 (SSOP16) | 4.9 x 3.9 x 1.73 | 0.635 | | 8 mm pitch. 12 mm tape and reel | 330 x 12 | | | | | | | -118 | | | | | | | | |
| 20 | SOT360 (TSSOP20) | 6.5 x 4.4 x 1.1 | 0.65 | | 12 mm pitch. 16 mm tape and reel | 330 x 16 | | | | | | | -118 | | | | | | | | |
| 32 | DFN5050-32 (SOT617) | 5.0 x 5.0 x 1.0 | 0.5 | | 8 mm pitch. 12 mm tape and reel | 330 x 12 | | | | | | | | | | | | -118 | | | |
| | | | | | 8 mm pitch. 12 mm tape and reel | 330 x 12 | | | | | | | | | | | | -128 | | | |





# Package details and packing methods WLCSP

| Basic Type | Length x width x height | # of balls | Pitch | Package | Package name |
|---|---|---|---|---|---|
| IP3319CX6 | 1.34 x 0.95 x 0.57 | 6 | 0.4 | | WLCSP6 |
| IP4049CX5 | 1.28 x 0.91 x 0.65 | 5 | 0.5 | | WLCSP5 |
| IP4340CX15 | 1.56 x 1.56 x 0.47 | 15 | 0.4 | | WLCSP15 |
| IP4369CX4 | 0.76 x 0.76 x 0.5 | 4 | 0.4 | | WLCSP4 |
| PEMI6CSP-RW | 2.36 x 1.05 x 0.61 | 15 | 0.4 | | WLCSP15 |
| PEMI8CSP-RW-P | 3.16 x 1.05 x 0.61 | 20 | 0.4 | | WLCSP20 |
| PMCM440VNE | 0.78 x 0.78 x 0.35 | 4 | 0.4 | | WLCSP4 |
| PMCM4401VNE | 0.78 x 0.78 x 0.35 | 4 | 0.4 | | WLCSP4 |
| PMCM650VNE | 1.48 x 0.98 x 0.35 | 6 | 0.5 | | WLCSP6 |
| PMCM440VPE | 0.78 x 0.78 x 0.35 | 4 | 0.4 | | WLCSP4 |
| PMCM4401VPE | 0.78 x 0.78 x 0.35 | 4 | 0.4 | | WLCSP4 |
| PMCM650VPE | 1.48 x 0.98 x 0.35 | 6 | 0.5 | | WLCSP6 |

## Packing details glass diodes, single ended and through hole packages

| Pins/ leads | Package | Packing method and tape/reel/tube dimensions | Package | Ordering code (12 NC ending) | Packing quantity |
|---|---|---|---|---|---|
| 2 | SOD27 | 26 mm tape ammo pack, axial |  | -143 | 5000 pcs |
| | | 52 mm tape ammo pack, axial | | -133 | 10000 pcs |
| | | 52 mm reel pack, axial | | -113 | 10000 pcs |
| | SOD66 | 52 mm tape ammo pack, axial |  | -133 | 10000 pcs |
| | | 52 mm reel pack, axial | | -113 | 10000 pcs |
| | SOD68 | 26 mm tape ammo pack, axial |  | -143 | 5000 pcs |
| | | 52 mm reel pack, axial | | -113 | 10000 pcs |
| | | 52 mm tape ammo pack, axial | | -133 | 10000 pcs |
| 3 | SOT78 (TO-220) | Rail packing, 50 pcs/tube, tube length = 520 mm |  | -127 | 20 tubes x 50 pcs |
| | SOT186A (TO-220F) | Rail packing, 50 pcs/tube, tube length = 520 mm |  | -127 | 20 tubes x 50 pcs |
| | I2PAK (SOT226) | Rail packing, 50 pcs/tube, tube length = 520 mm |  | -127 | 20 tubes x 50 pcs |
| 5 | SOT263B-1 | Rail packing |  | -127 | 20 tubes x 50 pcs |





## Package cross reference list – Part 1

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| µQFN-10L | ST | DFN2510A-10 (SOT1176) | 10 |
| µQFN-10L | ST | DFN2520-9 (SOT1333) | 9 |
| µQFN-2L | ST | DFN1006-2 (SOD882) | 2 |
| 6 Lead DFN | ON Semi | DFN2020-6 (SOT1118) | 6 |
| CL2 | Toshiba | DSN0402-2 (SOD992) | 2 |
| CLP0603 | Vishay | DSN0603-2 (SOD962) | 2 |
| CMAK/ CMPAK | Renesas | SOT323 | 3 |
| CMPAK/ CMAK | Renesas | SOT323 | 3 |
| CMPAK-5(T) | Renesas | SOT353 | 5 |
| CMPAK-6 | Renesas | SOT363 | 6 |
| CP4 | Toshiba | SOT143B | 4 |
| CS6 | Toshiba | DFN1010-6 (SOT891) | 6 |
| CST3 | Toshiba | DFN1006-3 (SOT883) | 3 |
| CST3 | Toshiba | DFN1006B-3 (SOT883B) | 3 |
| CTS2 (fSC) | Toshiba | DFN1006-2 (SOD882) | 2 |
| CTS2 (fSC) | Toshiba | DFN1006D-2 (SOD882D) | 2 |
| D²PAK | ON Semi | D²PAK (SOT404) | 3 |
| D²PAK | Vishay | D²PAK (SOT404) | 3 |
| D²PAK 3 | ON Semi | D²PAK (SOT404) | 3 |
| D²PAK* | Diodes Inc. | D²PAK (SOT404) | 3 |
| DFN1006-3 | Diodes Inc. | DFN1006-3 (SOT883) | 3 |
| DFN1006H4-3 | Diodes Inc. | DFN1006-3 (SOT883) | 3 |
| DFN1411* | Diodes Inc. | DFN1010D-3 (SOT1215) | 3 |
| DFN2 | ST | DSN0603-2 (SOD962) | 2 |
| DPAK | ON Semi | DPAK (SOT428) | 3 |
| DS014 | Infineon | SOT 108 | 14 |
| DSN2, 0.6 x 0.3 | ON Semi | DSN0603-2 (SOD962) | 2 |
| DSN2, 0.4 x 0.2 | ON Semi | DSN0402-2 (SOD992) | 2 |
| DSN2, 1.0 x 0.6 | ON Semi | DSN1006-2 (SOD993) | 2 |
| DSN2, 1.6 x 0.8 | ON Semi | DFN1608D-2 (SOD1608) | 2 |
| DSN2, 1.0 x 0.6 | ON Semi | DFN1006D-2 (SOD882D) | 2 |
| DSN2, 1.6 x 0.8 | ON Semi | DFN1608D-2 (SOD1608) | 2 |
| EMD2 | Rohm | SOD523 | 2 |
| EMD3/EMT3 | Rohm | DFN1006-3 (SOT883) | 3 |
| EMD5/EMT5 | Rohm | SOT665 | 5 |
| EMD6/EMT6/WEMT6 | Rohm | SOT666 | 6 |
| EMT3 | Rohm | DFN1006-3 (SOT883) | 3 |
| EMT3/EMD3 | Rohm | DFN1006-3 (SOT883) | 3 |
| EMT3F* | Rohm | DFN1006-3 (SOT883) | 3 |
| EMT5* | Rohm | SOT666 | 6 |
| EMT5/EMD5 | Rohm | SOT665 | 5 |
| EMT6 | Rohm | SOT666 | 6 |
| EMT6/EMD6/WEMT6 | Rohm | SOT666 | 6 |
| ES6 | Toshiba | SOT666 | 6 |
| ES6 ESV | Toshiba | SOT666 | 6 |
| ESC/TESC | Toshiba | SOD523 | 2 |
| ESM | Toshiba | DFN1006-3 (SOT883) | 3 |
| ESV | Toshiba | SOT665 | 5 |
| ESV | Toshiba | SOT666 | 6 |

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| FM8 | Toshiba | SOT96 | 8 |
| FS6* | Toshiba | DFN1010B-6 (SOT1216) | 6 |
| GMD2 | Rohm | DSN0603-2 (SOD962) | 2 |
| HUML2020L8 (Dual) | Rohm | DFN2020-6 (SOT1118) | 6 |
| HUML2020L8 (Single) | Rohm | DFN2020MD-6 (SOT1220) | 6 |
| KMD2 | Rohm | DFN1608D-2 (SOD1608) | 2 |
| LDPAK(S)-(1) | Renesas | D²PAK (SOT404) | 3 |
| LFPAK | Renesas | LFPAK (SOT669) | 5 |
| LG A 1.0 x 0.6mm | Texas Instruments | DFN1006B-3 (SOT883B) | 3 |
| LLD | Renesas | SOD80C | 2 |
| LLDS | Rohm | SOD80C | 2 |
| LLP1006-2L | Vishay | DFN1006-2 (SOD882) | 2 |
| LLP1006-2L | Vishay | DFN1006D-2 (SOD882D) | 2 |
| LLP1006-2M | Vishay | DFN1006-2 (SOD882) | 2 |
| LLP1006-2M | Vishay | DFN1006D-2 (SOD882D) | 2 |
| LLP75-7L | Vishay | DFN1616-6 (SOT1189) | 6 |
| LPDS/LPTS | Rohm | D²PAK (SOT404) | 3 |
| LPTS/LPDS | Rohm | D²PAK (SOT404) | 3 |
| M-Flat | Toshiba | SOD128 | 2 |
| Micro 3 | Int. Rectifier | SOT23 | 3 |
| Micro 6 | Int. Rectifier | SOT457 | 6 |
| MiCRO FOOT 0.8 x 0.8* | Vishay | DFN1010D-3 (SOT1215) | 3 |
| MiCRO FOOT 1 x 1.2* | Vishay | DFN1010D-3 (SOT1215) | 3 |
| MICRO FOOT 1 x 1.5* | Vishay | DFN1010D-3 (SOT1215) | 3 |
| MiCRO FOOT 1.6 x 1.6* | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| MiCRO FOOT 1 x 1* | Vishay | DFN1010D-3 (SOT1215) | 3 |
| MICRO FOOT* | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| MicroFET | Fairchild | DFN2020MD-6 (SOT1220) | 6 |
| MicroFET 1.6 x 1.6* | Fairchild | DFN2020MD-6 (SOT1220) | 6 |
| MiniMelf | Diodes Inc. | SOD80C | 2 |
| MiniMelf | ST | SOD80C | 2 |
| MiniMelf | Vishay | SOD80C | 2 |
| MP6 | Renesas | DSN0603-2 (SOD962) | 2 |
| MPAK | Renesas | SOT23 | 3 |
| MPAK | Renesas | SOT23 | 3 |
| MPAK-4R | Renesas | SOT143B | 4 |
| MPT3 | Rohm | SOT89 | 3 |
| PG-TD SON-8 | Infineon | LFPAK (SOT669) | 5 |
| PMDT | Rohm | SOD128 | 2 |
| PMDU | Rohm | SOD123W | 2 |
| PowerDI123 | Diodes Inc. | SOD123F | 2 |
| PowerDI123 | Diodes Inc. | SOD123W | 2 |
| PowerDI323 | Diodes Inc. | SOD323F | 2 |
| PowerDi5 | Diodes Inc. | CFP15 (SOT1289) | 3 |
| PowerFLAT (6 x 5) | ST | LFPAK (SOT669) | 5 |
| PowerFLAT (6 x 5) | ST | LFPAK56D (SOT1205) | 5 |
| PowerPAK SC-70 | Vishay | DFN2020-6 (SOT1118) | 6 |
| PowerPAK SC-70 | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| PowerPAK SC-70 | Vishay | DFN2020MD-6 (SOT1220) | 6 |

Types with * show footprint compability only

## Package cross reference list – Part 2

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| PowerPAK SC706L | Vishay | DFN2020-3 (SOT1061) | 3 |
| PowerPak SC-70-6L | Vishay | DFN2020-6 (SOT1118) | 6 |
| PowerPAK SC-75* | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| PowerPak SC-75-6L* | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| PowerPAK SO-8 | Vishay | LFPAK (SOT669) | 5 |
| PW-Mini | Toshiba | SOT89 | 3 |
| S08 | Vishay | SOT96 | 8 |
| SC2 | Toshiba | DSN0603-2 (SOD962) | 2 |
| SC59 | Diodes Inc. | SOT23 | 3 |
| SC70 | ON Semi | SOT323 | 3 |
| SC-70 | ON Semi | SOT323 | 3 |
| SC-70, 3 leads | Vishay | SOT323 | 3 |
| SC70-3 | Vishay | SOT323 | 3 |
| SC70-3 | AOS | SOT323 | 3 |
| SC70-5L | Semtech | SOT353 | 5 |
| SC70-6 | Vishay | SOT363 | 6 |
| SC70-6 | AOS | SOT363 | 6 |
| SC70-6 | Fairchild | SOT363 | 6 |
| SC70-6L | Semtech | SOT363 | 6 |
| SC74 TSOP6 | Infineon | SOT457 | 6 |
| SC-74 TSOP-6 | ON Semi | SOT457 | 6 |
| SC75 | Infineon | DFN1006-3 (SOT883) | 3 |
| SC-75 | ON Semi | DFN1006-3 (SOT883) | 3 |
| SC-75 | Semtech | DFN1006-3 (SOT883) | 3 |
| SC75A | Vishay | DFN1006-3 (SOT883) | 3 |
| SC-75A | Vishay | DFN1006-3 (SOT883) | 3 |
| SC79 | Infineon | SOD523 | 2 |
| SC-88 | ON Semi | SOT363 | 6 |
| SC88/SC 7 0-6/SOT 363 6 LEAD | ON Semi | SOT363 | 6 |
| SC-88A | ON Semi | SOT353 | 5 |
| SC89 | Fairchild | SOT666 | 6 |
| SC-89 | Semtech | SOT666 | 6 |
| SC89-3 | Vishay | DFN1006-3 (SOT883) | 3 |
| SC89-3 | ON Semi | DFN1006-3 (SOT883) | 3 |
| SC89-3 | Fairchild | DFN1006-3 (SOT883) | 3 |
| SC89-6 | Vishay | SOT666 | 6 |
| SC89-6 | AOS | SOT666 | 6 |
| SC89-6 | Fairchild | SOT666 | 6 |
| SC89-6lead | Vishay | SOT666 | 6 |
| S-Flat | Toshiba | SOD123F | 2 |
| S-Flat | Toshiba | SOD123W | 2 |
| SLP0402P2X3 | Semtech | DSN0402-2 (SOD992) | 2 |
| SLP1006P2 | Semtech | DFN1006-2 (SOD882) | 2 |
| SLP1006P2T | Semtech | DFN1006D-2 (SOD882D) | 2 |
| SLP1006P3 | Semtech | DFN1006-3 (SOT883) | 3 |
| SLP1006P3T | Semtech | DFN1006B-3 (SOT883B) | 3 |
| SLP1510N6 | Semtech | DFN1410-6 (SOT886) | 6 |

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| SLP1610N2 | Semtech | DFN1608D-2 (SOD1608) | 2 |
| SLP1610P4 | Semtech | DFN2510A-10 (SOT1176) | 10 |
| SLP1610P4 | Semtech | DFN2520-9 (SOT1333) | 9 |
| SLP1616P6 | Semtech | DFN1616-6 (SOT1189) | 6 |
| SLP1713P8 | Semtech | DFN1714-8 (SOT1166) | 8 |
| SLP1713P8 | Semtech | DFN1714U-8 (SOT983) | 8 |
| SLP2010P8T | Semtech | DFN2110-9 (SOT1178) | 9 |
| SLP2513P12 | Semtech | DFN2514-12 (SOT1167) | 12 |
| SLP3313P16 | Semtech | DFN3314-16 (SOT1168) | 16 |
| SM6 VS-6 | Toshiba | SOT457 | 6 |
| SMA flat | ST | SOD128 | 2 |
| SMD TO-263 | Renesas | D²PAK (SOT404) | 3 |
| SMD0402 | Rohm | DSN0402-2 (SOD992) | 2 |
| SMD6/SMT6 | Rohm | SOT457 | 6 |
| SMD6/SMZ6 | Rohm | SOT457 | 6 |
| SMFPAK-6 | Renesas | SOT666 | 6 |
| S-Mini | Toshiba | SOT23 | 3 |
| S-Mini TSM | Toshiba | SOT23 | 3 |
| SMPAK | Renesas | DFN1006-3 (SOT883) | 3 |
| SMPC TO-277A | Vishay | CFP15 (SOT1289) | 3 |
| SMT3 | Rohm | SOT23 | 3 |
| SMT5* | Rohm | SOT457 | 6 |
| SMT6 | Rohm | SOT457 | 6 |
| SMZ6/SMD6 | Rohm | SOT457 | 6 |
| SO-8 FL | ON Semi | LFPAK (SOT669) | 5 |
| SOD-123 | ST | SOD123F | 2 |
| SOD-123-FL | ON Semi | SOD123F | 2 |
| SOD-123-FL | ON Semi | SOD123W | 2 |
| SOD323 | Infineon | SOD323 | 2 |
| SOD323 | Vishay | SOD323 | 2 |
| SOD323 | Semtech | SOD323 | 2 |
| SOD-323 | ON Semi | SOD323 | 2 |
| SOD-323 | Diodes Inc. | SOD323 | 2 |
| SOD-323 | ST | SOD323 | 2 |
| SOD523 | Diodes Inc. | SOD523 | 2 |
| SOD523 | Vishay | SOD523 | 2 |
| SOD523 | Semtech | SOD523 | 2 |
| SOD-523 | ON Semi | SOD523 | 2 |
| SOD-523 | ST | SOD523 | 2 |
| SOD882 | ST | DFN1006-2 (SOD882) | 2 |
| SOD882T | ST | DFN1006D-2 (SOD882D) | 2 |
| SOD923-2* | ON Semi | DFN1006-2 (SOD882) | 2 |
| SOIC-8 NB | ON Semi | SOT96 | 8 |
| SON 2x2 | Texas Instruments | DFN2020MD-6 (SOT1220) | 6 |
| SON 3x3* | Texas Instruments | DFN2020MD-6 (SOT1220) | 6 |
| SOP8 | Rohm | SOT96 | 8 |
| SOP-8 | Renesas | SOT96 | 8 |
| SOPH | Rohm | SOT 108 | 14 |
| SOT 143 | Infineon | SOT143B | 4 |

Types with * show footprint compability only





## Package cross reference list – Part 3

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| SOT063* | ON Semi | DFN101 OB-6 (SOT1216) | 6 |
| SOT-143 | Semtech | SOT143B | 4 |
| SOT-143 | Diodes Inc. | SOT143B | 4 |
| SOT223 | Vishay | SOT223 | 4 |
| SOT223 | Infineon | SOT223 | 4 |
| SOT223 | Fairchild | SOT223 | 4 |
| SOT223 | ON Semi | SOT223 | 4 |
| SOT223 | Diodes Inc. | SOT223 | 4 |
| SOT-223 | ON Semi | SOT223 | 4 |
| SOT-223 | Diodes Inc. | SOT223 | 4 |
| SOT23 | Infineon | SOT23 | 3 |
| SOT23 | ST | SOT23 | 3 |
| SOT23 | Vishay | SOT23 | 3 |
| SOT23 | Semtech | SOT23 | 3 |
| SOT23 | Diodes Inc. | SOT23 | 3 |
| SOT23 | AOS | SOT23 | 3 |
| SOT23 | ON Semi | SOT23 | 3 |
| SOT-23 | ON Semi | SOT23 | 3 |
| SOT-23 | Diodes Inc. | SOT23 | 3 |
| SOT23-3 | Diodes Inc. | SOT23 | 3 |
| SOT23-3 | AOS | SOT23 | 3 |
| SOT23-3 | ON Semi | SOT23 | 3 |
| SOT23-5 | AOS | SOT457 | 6 |
| SOT23-5 | Diodes Inc. | SOT457 | 6 |
| SOT23-6 | Diodes Inc. | SOT457 | 6 |
| SOT23-6 | ST | SOT457 | 6 |
| SOT23-6 | Diodes Inc. | SOT457 | 6 |
| SOT23-6L | Semtech | SOT457 | 6 |
| SOT23F | Toshiba | SOT23 | 3 |
| SOT23F | Diodes Inc. | SOT23 | 3 |
| SOT26 | Diodes Inc. | SOT457 | 6 |
| SOT323 | Infineon | SOT323 | 3 |
| SOT323 | Diodes Inc. | SOT323 | 3 |
| SOT323 | Fairchild | SOT323 | 3 |
| SOT-323 | Diodes Inc. | SOT323 | 3 |
| SOT-323 | ST | SOT323 | 3 |
| SOT353 | Diodes Inc. | SOT353 | 5 |
| SOT353 | Vishay | SOT353 | 5 |
| SOT353 | Diodes Inc. | SOT363 | 6 |
| SOT363 | Infineon | SOT363 | 6 |
| SOT363 | Diodes Inc. | SOT363 | 6 |
| SOT-363 | Diodes Inc. | SOT363 | 6 |
| SOT523 | Diodes Inc. | DFN1006-3 (SOT883) | 3 |
| SOT523F | Fairchild | DFN1006-3 (SOT883) | 3 |
| SOT-553 | ON Semi | SOT665 | 5 |
| SOT563 | Diodes Inc. | SOT666 | 6 |
| SOT-563 | ON Semi | SOT666 | 6 |
| SOT563-6 | ON Semi | SOT666 | 6 |
| SOT563F | Fairchild | SOT666 | 6 |

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| SOT666 | Infineon | SOT666 | 6 |
| SOT723* | ON Semi | DFN1010D-3 (SOT1215) | 3 |
| SOT723-3* | ON Semi | DFN1010D-3 (SOT1215) | 3 |
| SOT89 | Infineon | SOT89 | 3 |
| SOT89 | Diodes Inc. | SOT89 | 3 |
| SOT-89 | ON Semi | SOT89 | 3 |
| SOT89-3L | Diodes Inc. | SOT89 | 3 |
| SOT963 | ON Semi | DFN1010-6 (SOT891) | 6 |
| SOT963* | Diodes Inc. | DFN1010B-6 (SOT1216) | 6 |
| SRP-F | Renesas | SOD123W | 2 |
| SS CSP2 | Toshiba | DFN1006-3 (SOT883) | 3 |
| SSD3/SST3 | Rohm | SOT23 | 3 |
| SSM | Toshiba | DFN1006-3 (SOT883) | 3 |
| SSOT3 | Fairchild | SOT23 | 3 |
| SSOT6 | Fairchild | SOT457 | 6 |
| SSOT6 FLMP | Fairchild | SOT457 | 6 |
| SST3 | Rohm | SOT23 | 3 |
| SST3/SSD3 | Rohm | SOT23 | 3 |
| ST01005 | STM | DSN0402-2 (SOD992) | 2 |
| Stmite flat | ST | SOD123W | 2 |
| T0263 | Diodes Inc. | D²PAK(SOT404) | 3 |
| T0263-3 | Infineon | D²PAK (SOT404) | 3 |
| Thin PowerPAK SC70 | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| Thin PowerPAK SC-70 | Vishay | DFN2020-6 (SOT1118) | 6 |
| Thin PowerPAK SC-70 | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| Thin PowerPAK SC75* | Vishay | DFN2020MD-6 (SOT1220) | 6 |
| TO-220S | Renesas | D²PAK (SOT404) | 3 |
| TO-220SM | Toshiba | D²PAK (SOT404) | 3 |
| TO-252 (MP-3ZK) | Renesas | DPAK (SOT428) | 3 |
| TO-252 reverse, TO-252 | Vishay | DPAK (SOT428) | 3 |
| TO-252, TO-252 reverse | Vishay | DPAK (SOT428) | 3 |
| TO-252-3/-3-23 | Infineon | DPAK (SOT428) | 3 |
| TO-263 3-lead | Vishay | D²PAK (SOT404) | 3 |
| TO-263AB | Vishay | D²PAK (SOT404) | 3 |
| TSLP-2-1 | Infineon | DFN1006-2 (SOD882) | 2 |
| TSLP-2-7/-17 | Infineon | DFN1006D-2 (SOD882D) | 2 |
| TSLP-3-1, -15 | Infineon | DFN1006B-3 (SOT883B) | 3 |
| TSLP-3-4 | Infineon | DFN1006-3 (SOT883) | 3 |
| TSLP-9-1 | Infineon | DFN2510A-10 (SOT 1176) | 10 |
| TSLP-9-1 | Infineon | DFN2520-9 (SOT1333) | 9 |
| TSMT5* | Rohm | SOT457 | 6 |
| TSMT6 | Rohm | SOT457 | 6 |
| TSNP-2-2 | Infineon | DFN1608D-2 (SOD 1608) | 2 |
| TSOP6 | Vishay | SOT457 | 6 |
| TSOP6 | AOS | SOT457 | 6 |
| TSOP6 | ON Semi | SOT457 | 6 |
| TSOP-6 | Renesas | SOT457 | 6 |
| TSOP-6/ TSOP6 | Vishay | SOT457 | 6 |
| TSSLP-2-1 | Infineon | DSN0603-2 (SOD962) | 2 |

Types with * show footprint compability only

# Package cross reference list – Part 4

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| TSSOP20 | Toshiba | SOT360 | 20 |
| TSSOP20 | Renesas | SOT360 | 20 |
| TSST8* | Rohm | DFN2020MD-6 (SOT1220) | 6 |
| TUMT3 | Rohm | SOT323 | 3 |
| TUMT5* | Rohm | DFN2020-6 (SOT1118) | 6 |
| TUMT6* | Rohm | DFN2020-6 (SOT1118) | 6 |
| UDFN 1.6 x 1.6 | ON Semi | DFN1616-6 (SOT1189) | 6 |
| UDFN 1.7 x 1.35, 0.4P | ON Semi | DFN1714U-8 (SOT983) | 8 |
| UDFN 10 2.5 x 1, 0.5P | ON Semi | DFN2520-9 (SOT1333) | 9 |
| UDFN 10 2.5 x 2 | ON Semi | DFN2520-9 (SOT1333) | 9 |
| UDFN10 2.5 x 1, 0.5P | ON Semi | DFN2510A-10 (SOT1176) | 10 |
| UDFN12, 2.5 x 1.35, 0.4P | ON Semi | DFN2514-12 (SOT1167) | 12 |
| U-DFN2020-3 Type B 2.0 x 2.0 x 0.6 | Diodes Inc. | DFN2020-3 (SOT1061) | 3 |
| U-DFN2020-6 | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6 |
| UDFN2020-6 Type B | Diodes Inc. | DFN2020-6 (SOT1118) | 6 |
| UDFN2020-6 Type E | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6 |
| U-DFN2523-6* | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6 |
| UDFN6 | Toshiba | DFN2020-6 (SOT1118) | 6 |
| UDFN6 | ON Semi | DFN2020MD-6 (SOT1220) | 6 |
| UDFN-6 WDFN6 | ON Semi | DFN2020MD-6 (SOT1220) | 6 |
| UDFN6B | Toshiba | DFN2020MD-6 (SOT1220) | 6 |
| UDRN 16 4 x 2 | ON Semi | DFN4020-14 (SOT1334) | 14 |
| UF6 | Toshiba | SOT363 | 6 |
| UF6/ USV/ US6 | Toshiba | SOT363 | 6 |
| UFP | Renesas | SOD523 | 2 |
| UMD2 | Rohm | SOD323F | 2 |
| UMD3/UMT3 | Rohm | SOT323 | 3 |
| UMD5/UMT5 | Rohm | SOT353 | 5 |
| UMD6/ UMT6 | Rohm | SOT363 | 6 |
| UMLP 1.6 x 1.6* | Fairchild | DFN2020MD-6 (SOT1220) | 6 |
| UMT3 | Rohm | SOT323 | 3 |
| UMT3F* | Rohm | SOT323 | 3 |
| UMT5/ UMD5 | Rohm | SOT353 | 5 |
| UMT6 | Rohm | SOT363 | 6 |
| UMT6/ UMD6 | Rohm | SOT363 | 6 |
| UPAK (SOT89) | Renesas | SOT89 | 3 |
| URP | Renesas | SOD323 | 2 |
| US6 | Toshiba | SOT363 | 6 |
| US6/ UF6/ USV | Toshiba | SOT363 | 6 |
| use | Toshiba | SOD323 | 2 |
| US-Flat | Toshiba | SOD323F | 2 |
| USM | Toshiba | SOT323 | 3 |
| USV | Toshiba | SOT353 | 5 |
| USV | Toshiba | SOT363 | 6 |
| USV/ US6/ UF6/ | Toshiba | SOT363 | 6 |
| VESM* | Toshiba | DFN1010D-3 (SOT1215) | 3 |
| VML0806* | Rohm | DFN1006B-3 (SOT883B) | 3 |
| VML1006 | Rohm | DFN1006-3 (SOT883) | 3 |

| Type | Competitor | NXP | Pins/ Leads |
|---|---|---|---|
| VMN2* | Rohm | DFN1006-2 (SOD882) | 2 |
| VMN2* | Rohm | DFN1006D-2 (SOD882D) | 2 |
| VMN3* | Rohm | DFN1006-3 (SOT883) | 3 |
| VMT3* | Rohm | DFN1010D-3 (SOT1215) | 3 |
| VMT6* | Rohm | DFN101 OB-6 (SOT1216) | 6 |
| VS6 | Toshiba | SOT457 | 6 |
| VSON-5 | Renesas | SOT665 | 5 |
| WDFN 10 2.5 x 2 | ON Semi | DFN2520-9 (SOT1333) | 9 |
| WDFN 16 4 x 2 | ON Semi | DFN4020-14 (SOT1334) | 14 |
| WDFN3 | ON Semi | DFN2020-3 (SOT1061) | 3 |
| W-DFN3020-8* | Diodes Inc. | DFN2020-6 (SOT1118) | 6 |
| WDFN6 | ON Semi | DFN2020-6 (SOT1118) | 6 |
| WDFN6 | ON Semi | DFN2020MD-6 (SOT1220) | 6 |
| WEMT6 | Rohm | SOT666 | 6 |
| WEMT6/ EMT6/ EMD6 | Rohm | SOT666 | 6 |
| WLCSP 1 x 1* | Fairchild | WLCSP4 | 3 |
| WLCSP1.6 x 1.6* | AOS | WLCSP6 | 6 |
| WLCSP2 | ON Semi | DSN0603-2 (SOD962) | 2 |
| WLCSP-4* | Fairchild | WLCSP4 | 3 |
| WLCSP-4* | ON Semi | WLCSP4 | 3 |
| WLL-2-2 | Infineon | DSN0402-2 (SOD992) | 2 |
| WLP1.5x 1.5* | Texas Instruments | DFN2020MD-6 (SOT1220) | 6 |
| WLPI.Ox 1.0* | Texas Instruments | DFN1010D-3 (SOT1215) | 3 |
| WLPI.Ox 1.5* | Texas Instruments | DFN2020MD-6 (SOT1220) | 6 |
| X1 -DFN 1006-3 | Diodes Inc. | DFN1006-3 (SOT883) | 3 |
| X1-DFN1212-3* | Diodes Inc. | DFN1010D-3 (SOT1215) | 3 |
| X1-DFN1616-6* | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6 |
| X2-DFN0806-3 | Diodes Inc. | DFN1006-3 (SOT883) | 3 |
| X2-DFN1006-2 | Diodes Inc. | DFN1006D-2 (SOD882D) | 2 |
| X2-DFN1006-3 | Diodes Inc. | DFN1006B-3 (SOT883B) | 3 |
| X2-DFN1010-3 | Diodes Inc. | DFN1010D-3 (SOT1215) | 3 |
| X2-DFN1310-6* | Diodes Inc. | DFN1010B-6 (SOT1216) | 6 |
| X2-DFN2015-3* | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6 |
| X2-DFN2020-6 | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6 |
| X3-DFN0603-2 | Diodes Inc. | DSN0603-2 (SOD962) | 2 |
| X3DFN-2 | ON Semi | DSN0603-2 (SOD962) | 2 |
| XDFN3 | ON Semi | DFN1006-3 (SOT883) | 3 |
| XI-DFN1006-2 | Diodes Inc. | DFN1006-2 (SOD882) | 2 |

Types with * show footprint compability only





# Package cross reference matrix – Part 1

| Pins/ leads | NXP | Industry standard names | Size (l x w x h) (mm) | $P_{tot}$ (mW) | Package | Competitor synonyms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Rohm | Toshiba | ON Semi | Renesas | Infineon | Diodes Inc | ST | Vishay | Semtech |
| 2 | DSN0402-2 (SOD992) | | 0.4 x 0.2 x 0.12 | | | SMD0402 | CL2 | DSN2 0.4 x 0.2 | | WLL-2-2 | | ST01005 | | SLP0402P2X3 |
| | DSN1006-2 (SOD993) | | 1.0 x 0.6 x 0.3 | | | | | DSN2 1.0 x 0.6 | | | | | | |
| | DSN1006U-2 (SOD995) | | 1.0 x 0.6 x 0.3 | | | | | DSN2 1.0 x 0.6 | | | | | | |
| | DFN1006-2 (SOD882) | | 1.0 x 0.6 x 0.48 | 250 | | (VMN2) | CTS2 (fSC) | (SOD923-2) | | TSLP-2-1 | XI-DFN1006-2 | SOD 882 uQFN-2L | LLP1006-2M LLP1006-2L | SLP1006P2 |
| | DFN1006D-2 (SOD882D) | | 1.0 x 0.6 x 0.37 | 250 | | (VMN2) | CTS2 (fSC) | DSN2 1.0 x 0.6 | | TSLP-2-7/ -17 | X2-DFN1006-2 | SOD882T | LLP1006-2L LLP1006-2M | SLP1006P2T |
| | DFN1608D-2 (SOD1608) | | 1.6 x 0.8 x 0.37 | 780 | | KMD2 | | DSN2 1.6 x 0.8 | | TSNP-2-2 | | | | SLP1610N2 |
| | DSN0603-2 (SOD962) | | 0.6 x 0.3 x 0.3 | 525 | | GMD2 | SC2 | DSN2, X3DFN-2 WLCSP2 | MP6 | TSS-LP-2-1 | X3-DFN0603-2 | DFN2 | CLP0603 | SLP0603P2X3 |
| | SOD80C | Mini-Melf | 3.5 x 1.5 x 1.5 | 300 | | LLDS | | | LLD | | MiniMelf | MiniMelf | MiniMelf | |
| | SOD123F | | 2.6 x 1.6 x 1.1 | 830 | | | S-Flat | SOD-123-FL | | | PowerDI123 | SOD-123 | | |
| | SOD123W | | 2.6 x 1.7 x 1.0 | 900 | | PMDU | S-Flat | SOD-123-FL | SRP-F | | PowerDI123 | Stmite flat | | |
| | SOD128 | | 3.8 x 2.5 x 1.0 | 1000 | | PMDT | M-Flat | | | | | SMA flat | | |
| | SOD323 | SC-76 | 1.7 x 1.25 x 0.95 | 400 | | | USC | SOD-323 | URP | SOD323 | SOD-323 | SOD-323 | SOD323 | SOD323 |
| | SOD323F | SC-90 | 1.7 x 1.25 x 0.7 | 830 | | UMD2 | US-Flat | | | | PowerDI323 | | | |
| | SOD523 | SC-79 | 1.2 x 0.8 x 0.6 | 500 | | EMD2 | ESC/ TESC | SOD-523 | UFP | SC79 | SOD523 | SOD-523 | SOD523 | SOD523 |
| 3 | CFP15 (SOT1289) | | 5.8 x 4.3 x 0.78 | 1200 | | | | | | | PowerDi5 | | SMPC TO-277A | |
| | DFN1006-3 (SOT883) | SC-101 | 1.0 x 0.6 x 0.48 | 250 | | VML1006 | SS CSP2 | XDFN3 | | TSLP-3-4 | X1 -DFN 1006-3 | | | SLP1006P3 |
| | DFN1006B-3 (SOT883B) | | 1.0 x 0.6 x 0.37 | 250 | | VML1006 | CST3 | XDFN3 | | TSLP-3-1, -15 | X2-DFN1006-3 | | | SLP1006P3T |
| | DFN1010D-3 (SOT1215) | | 1.1 x 1.0 x 0.37 | 325 | | (VMT3) | (VESM) | (SOT723) | | | X2-DFN1010-3 | | | |
| | DFN2020-3 (SOT1061) | HU-SON3 | 2.0 x 2.0 x 0.62 | 1300 | | | | WDFN3 | | | U-DFN2020-3 Type B 2.0 x 2.0 x 0.6 | | PowerPAK SC706L | |
| | DFN2020D-3 (SOT1061D) | | 2.0 x 2.0 x 0.62 | 1300 | | | | WDFN3 | | | U-DFN2020-3 Type B 2.0 x 2.0 x 0.6 | | PowerPAK SC706L | |
| | DPAK (SOT428) | | 6.6 x 6.1 x 2.3 | | | | | DPAK | TO-252 (MP-3ZK) | TO-252-3/-3-2 3 | | | TO-252,TO-252 reverse | |
| | D2PAK (SOT404) | | 11.0 x 11.0 x 4.3 | | | LPDS/ LPTS | TO-220SM | D2PAK D2PAK 3 | TO-220S / SMD TO-263 LDPAK(S)-(1) | T0263-3 | T0263 (D2PAK) | | TO-263 3-lead TO-263AB / D2PAK | |
| | SOT23 | | 2.9 x 1.3 x 1.0 | 250 | | SSD3/ SST3 | S-Mini TSM | SOT-23 | MPAK | SOT23 | SOT-23 | SOT23 | SOT23 | SOT23 |
| | SOT89 | SC-62 | 4.5 x 2.5 x 1.5 | 1300 | | MPT3 | PW-Mini | SOT-89 | UPAK (SOT89) | SOT89 | SOT89 | | | |
| | SOT323 | SC-70 | 2.0 x 1.25 x 0.95 | 200 | | UMD3/ UMT3 TUMT3 | USM | SC-70 | CMAK/ CMPAK | SOT323 | SOT-323 | SOT-323 | SC-70 3 leads | SOT-323 |

Types in brackets (…) show footprint compatibility only

## Package cross reference matrix – Part 2

| Pins/ leads | NXP | Industry standard names | Size (l x w x h) (mm) | $P_{tot}$ (mW) | Package | Competitor synonyms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Rohm | Toshiba | ON Semi | Renesas | Infineon | Diodes Inc | ST | Vishay | Semtech |
| 4 | LFPAK56 (SOT669) | Power-S08 | 4.9 x 4.45 x 1.0 | 3000 | | | | SO-8 FL | LFPAK | PG-TD-SON-8 | Power-Di5060-8 | PowerFLAT (6x5) | PowerPAK SO-8 | |
| | SOT143B | | 2.9 x 1.3 x 1.0 | 250 | | | CP4 | | MPAK-4R | SOT143 | SOT-143 | | | SOT-143 |
| | SOT223 | SC-73 | 6.5 x 3.5 x 1.65 | 1700 | | | | SOT-223 | | SOT223 | SOT-223 | | SOT223 | |
| 5 | SOT353 | SC-88 A | 2.0 x 1.25 x 0.95 | 300 | | UMD5/ UMT5 | USV | SC-88 A | CMPAK-5C0 | | SOT353 | | SOT353 | SC70-5L |
| | SOT665 | | 1.6 x 1.2 x 0.55 | 300 | | EMD5/ EMT5 | ESV | SOT-553 | VSON-5 | | | | | |
| 6 | DFN1010-6 (SOT891) | x SON6 | 1.0 x 1.0 x 0.48 | | | | CS6 | SOT963 | | | | | | |
| | DFN1010B-6 (SOT1216) | | 1.1 x 1.0 x 0.37 | 350 | | (VMT6) | (FS6) | (SOT063) | | | (SOT963) | | | |
| | DFN1410-6 (SOT886) | x SON6 | 1.45 x 1.0 x 0.48 | 250 | | | | | | | | | | SLP1510N6 |
| | DFN1616-6 (SOT1189) | H x SON6 | 1.6 x 1.6 x 0.48 | | | | | UDFN 1.6 x 1.6 | | | | | LLP75-/L | SLP1616P6 |
| | DFN2020-6 (SOT1118) | | 2.0 x 2.0 x 0.62 | 1300 | | HU-ML2020L8 (Dual) | UDFN6 | 6 Lead DFN WDFN6 | | | UDFN2020-6 Type B | | PowerPAK SC-70 Thin PowerPAK SC-70 | |
| | DFN2020D-6 (SOT1118D) | | 2.0 x 2.0 x 0.62 | 1300 | | HU-ML2020L8 (Dual) | UDFN6 | 6 Lead DFN WDFN6 | | | UDFN2020-6 Type B | | PowerPAK SC-70 Thin PowerPAK SC-70 | |
| | DFN2020MD-6 (SOT1220) | | 2.0 x 2.0 x 0.62 | 1250 | | HU-ML2020L8 (Single) | UDFN6B | UDFN-6 WDFN6 | | | UDFN2020-6 Type E | | PowerPAK SC-70 Thin PowerPAK SC-70 | |
| | SOT363 | SC-88 | 2.0 x 1.25 x 0.95 | 300 | | UMD6/ UMT6 | US6 UF6 USV | SC-88 | CMPAK-6 | SOT363 | SOT-363 | | SC70-6 | SC70-6L |
| | SOT457 | SC-74 | 2.9 x 1.5 x 1.0 | 750 | | SMD6/ SMT6 | SM6 VS-6 | SC-74 TSOP-6 | TSOP-6 | SC74 TSOP6 | SOT23-6 SOT26 | | TSOP6 TSOP-6 | SOT23-6L |
| | SOT666 | | 1.6 x 1.2 x 0.55 | 300 | | EMD6/ EMT6 WEMT6 | ES6 ESV | SOT-563 | SMFPAK-6 | SOT666 | SOT563 | | SC89-6lead | SC-89 |
| 8 | LFPAK56D (SOT1205) | | 4.9 x 4.45 x 1.0 | 3000 | | | | | | | | PowerFLAT (6x5) | | |
| | SOT96 | S08 | 4.9 x 3.9 x 1.75 | 1500 | | SOP8 | FM8 | SOIC-8 NB | SOP-8 | | | | S08 | |
| | DFN1714-8 (SOT 1166) | HUSON8 | 1.7 x 1.35 x 0.52 | | | | | | | | | | | SLP1713P8 |
| | DFN1714U-8 (SOT983) | H x SON8 | 1.7 x 1.35 x 0.48 | | | | | UDFN 1.7 x 1.35, 0.4P | | | | | | SLP1713P8 |
| 9 | DFN2110-9 (SOT1178) | x SON9 | 2.1 x 1.0 x 0.48 | | | | | | | | | | | SLP2010P8T |
| | DFN2520-9 (SOT1333) | | | | | | | WDFN 10 2.5 x 2 UDFN10 2.5 x 2 | | | | | | |
| 10 | DFN2510-10 (SOT 1165) | x SON10 | 2.5 x 1.0 x 0.48 | | | | | UDFN10 2.5 x 1, 0.5P | | TSLP-9-1 | | pQFN-10L | | SLP1610P4 |
| | DFN2510A-10 (SOT1176) | x SON10 | 2.5 x 1.0 x 0.48 | | | | | UDFN10 2.5 x 1, 0.5P | | TSLP-9-1 | | pQFN-10L | | SLP1610P4 |
| | DFN2626-10 (SOT 1197) | | 2.6 x 2.6 x 0.48 | | | | | UDFN10 2.6 x 2.6, 0.5P | | | | | | SLP2626P10 |

Types in brackets (…) show footprint compatibility only



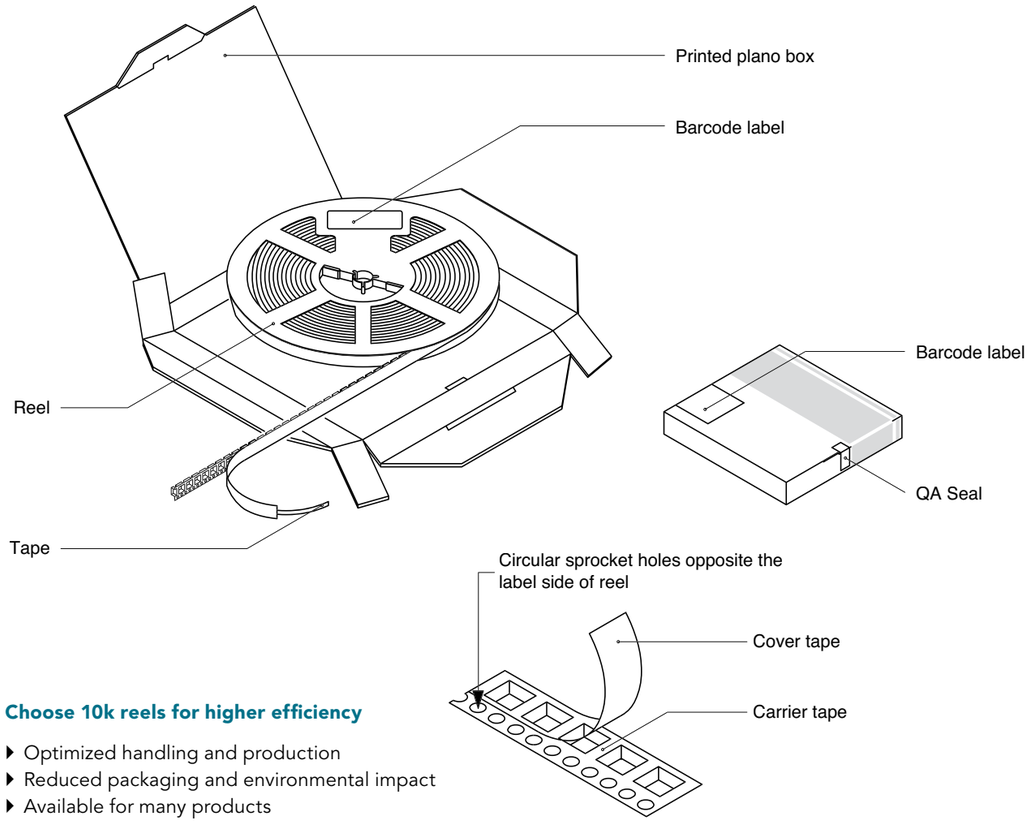


## Package cross reference matrix – Part 3

| Pins/ leads | NXP | Industry standard names | Size (l x w x h) (mm) | $P_{tot}$ (mW) | Package | Competitor synonyms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Rohm | Toshiba | ON Semi | Renesas | Infineon | Diodes Inc | ST | Vishay | Semtech |
| 12 | DFN2512-12 (SOT 1158) | H x - SON12 | 2.5 x 1.2 x 0.48 | | | | | UDFN12, 2.5 x 1.2, 0.4P | | | | | | |
| | DFN2514-12 (SOT 1167) | HU-SON12 | 2.5 x 1.35 x 0.53 | | | | | UDFN12, 2.5 x 1.35, 0.4P | | | | | | SLP2513P12 |
| 14 | DFN4020-14 (SOT 1334) | | 4.0 x 2.0 x 0.48 | | | | | WDFN 16 4 x 2 UDRN 16 4 x 2 | | | | | | |
| | SOT 108 | S014 | 8.65 x 3.9 x 1.75 | | | SOP 14 | | | | DS014 | | | | |
| 16 | DFN3312-16 (SOT 1159) | H x - SON16 | 3.3 x 1.2 x 0.48 | | | | | UDFN 16, 3.5 x 1.2, 0.4P | | | | | | |
| | DFN3314-16 (SOT 1168) | HU-SON16 | 3.3 x 1.35 x 0.53 | | | | | | | | | | | SLP3313P16 |
| 20 | SOT360 | TSSOP20 | 6.5 x 4.4 x 1.1 | | | | | TSSOP20 | | TSSOP20 | | | | |

Types in brackets (…) show footprint compatibility only

### Tape and reel pack for SMD and WLCSP packages




### Choose 10k reels for higher efficiency

- Optimized handling and production
- Reduced packaging and environmental impact
- Available for many products

# Product orientation (tape and reel pack)

## 2 pin packages

| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | DFN1006-2 (SOD882) | 315 |
| | DFN1006D-2 (SOD882D) | 315 |
| | DFN1608D-2 (SOD1608) | 315 |
| | DSN0603-2 (SOD962) | 315 |
| | DSN0402-2 (SOD992) | 315 |
| | DSN1006-2 (SOD993) | 315 |
| | DSN1006U-2 (SOD995) | 315 |
| | DSN1608-2 (SOD963, SOD964) | 315 |
| | SOD80 | 115, 135 |
| | SOD123F | 115 |
| | CFP3 (SOD123W) | 115 |
| | CFP5 (SOD128) | 115 |
| | SOD323 | 115, 135 |
| | SOD323F | 115 |
| | SOD523 | 115, 135, 315, 335 |

## 3 pin packages

| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | SOT89 | 146 |
| Orientation in tape | Package | Packing 12NC ending |
|  | DFN1006-3 (SOT883) | 315 |
| | DFN1006B-3 (SOT883B) | 315 |
| | SOT23 | 185, 215, 235 |
| | SOT323 | 115, 135 |

| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | DFN1010D-3 (SOT1215) | 147 |
| | DFN2020-3 (SOT1061) | 115, 135 |
| | DFN2020D-3 (SOT1061D) | 115, 135 |
| | SOT89 | 115, 135 |
| | SOT663 | 115 |
| | CFP15 (SOT1289) | 139, 146 |
| | DPAK (SOT428) | 118 |
| | D2PAK (SOT404) | 118 |
| Orientation in tape | Package | Packing 12NC ending |
|  | SOT89 | 147 |

## 4 pin packages

| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | LFPAK56 (SOT669) | 115 |
| | WLCSP4 | 084 |
| Orientation in tape | Package | Packing 12NC ending |
|  | SOT143B | 215, 235 |
| | SOT223 | 115, 135 |

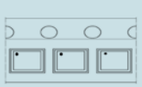
| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | | |
| Orientation in tape | Package | Packing 12NC ending |
|  | | |

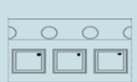
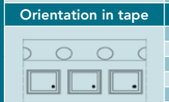
## 5 pin packages

| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | WLCSP5 | 087 |
| Orientation in tape | Package | Packing 12NC ending |
|  | | |

| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | SOT353 | 115, 135 |
| | SOT665 | 115 |
| Orientation in tape | Package | Packing 12NC ending |
|  | | |

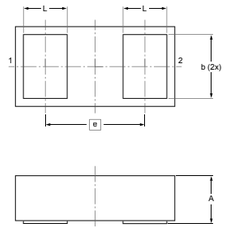
## > 6 pin packages

| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | DFN1410-6 (SOT886) | 115 |
| | DFN1616-6 (SOT1189) | 115 |
| | DFN2020MD-6 (SOT1220) | 184 |
| | LFPAK33 (SOT1210) | 115 |
| | LFPAK56D (SOT1205) | 115 |
| | WLCSP6 | 023 |
| Orientation in tape | Package | Packing 12NC ending |
|  | DFN1010-6 (SOT891) | 132 |
| | DFN1410-6 (SOT886) | 132 |
| | DFN2020MD-6 (SOT1220) | 125 |
| | SOT363 | 125, 165 |
| | SOT457 | 125, 165 |

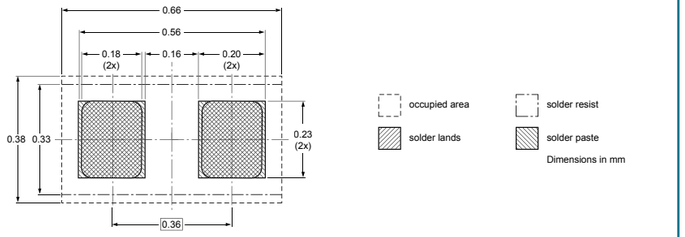
| Orientation in tape | Package | Packing 12NC ending |
|---|---|---|
|  | DFN2020-6 (SOT1118) | 115 |
| | DFN2020D-6 (SOT1118D) | 115 |
| | DFN2020MD-6 (SOT1220) | 115 |
| | DFN1010B-6 (SOT1216) | 147 |
| | SOT363 | 115, 135 |
| | SOT457 | 115, 135 |
| | SOT666 | 115, 315 |
| Orientation in tape | Package | Packing 12NC ending |
|  | | |

# Outline and footprint drawings

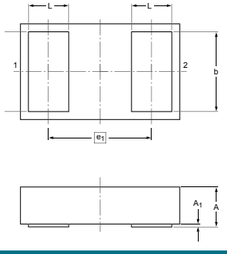
## 2-pin SMD packages



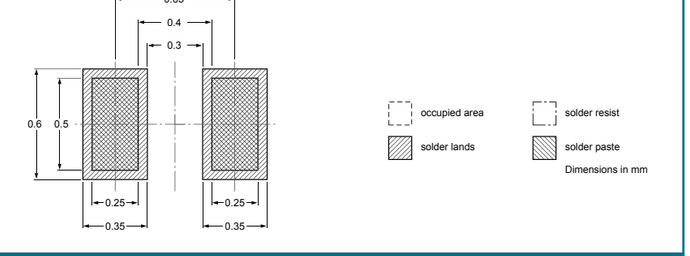

DSN0402-2 (SOD992)



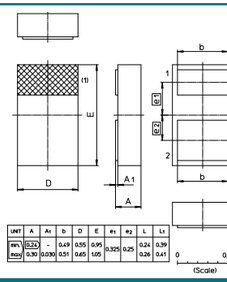

DSN0402-2 (SOD992)



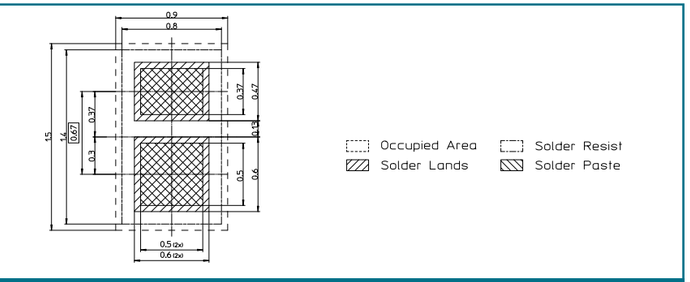

DSN1006-2 (SOD993)




DSN1006-2 (SOD993)




DSN1006U-2 (SOD995)

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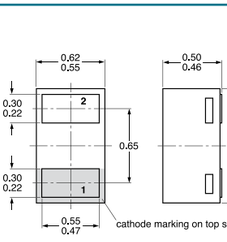
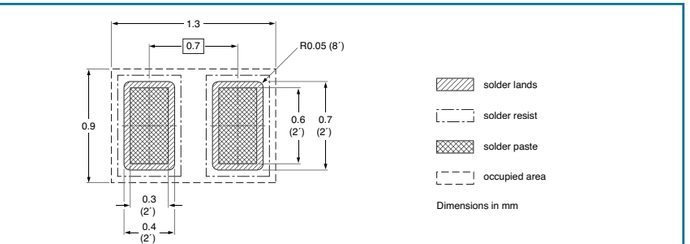



DFN1006-2 (SOD882)



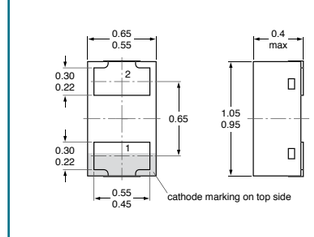

DFN1006-2 (SOD882)

Dimensions in mm

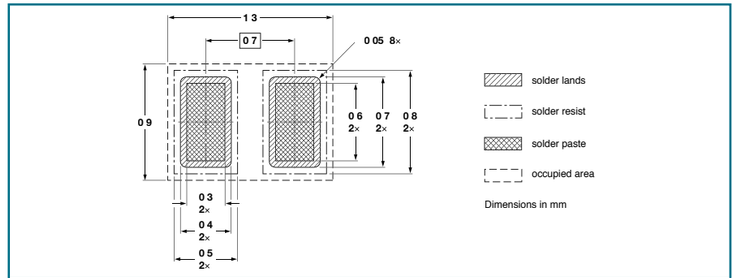




## 2-pin SMD packages




DFN1006D-2 (SOD882D)

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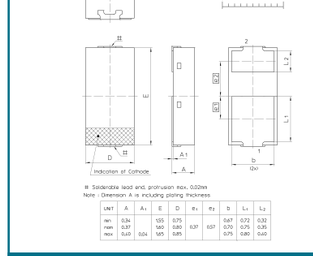


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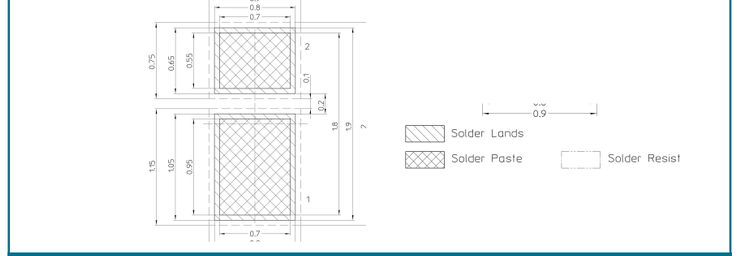
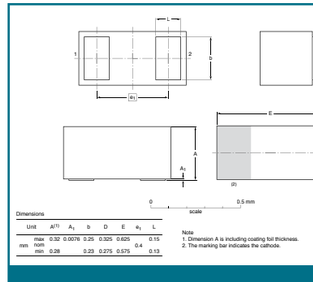
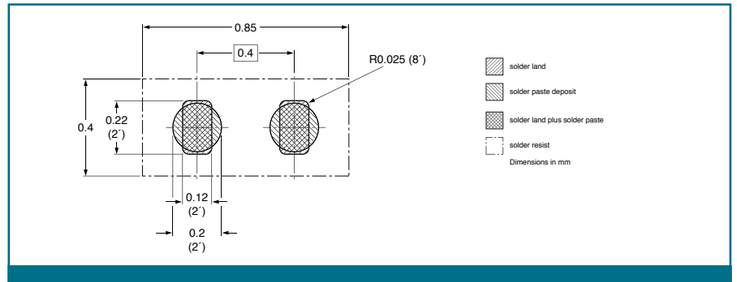


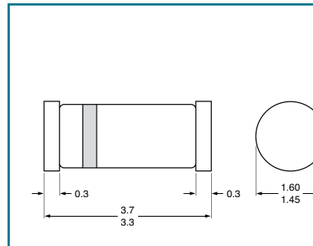

DFN1608D-2 (SOD1608)



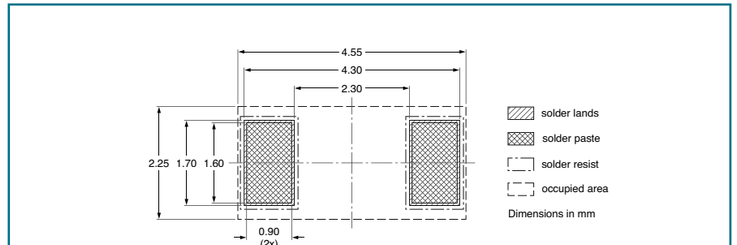

DSN0603-2 (SOD962)




DSN0603-2 (SOD962) and DSN0603B-2 (SOD962B)



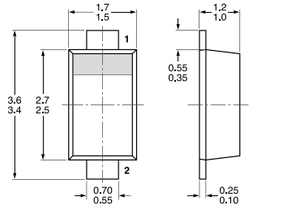

SOD80C



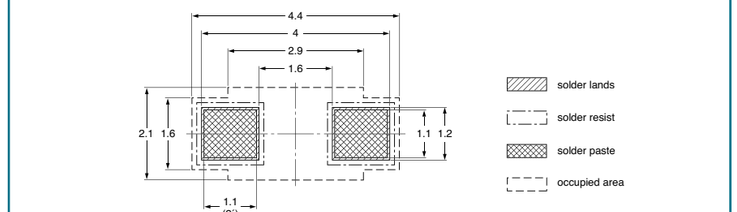

SOD80C

Dimensions in mm

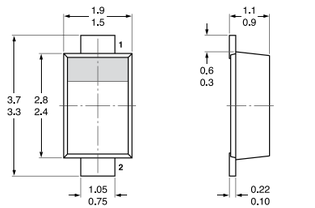
## 2-pin SMD packages



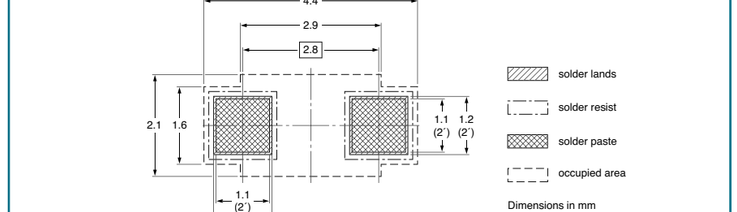

SOD123F



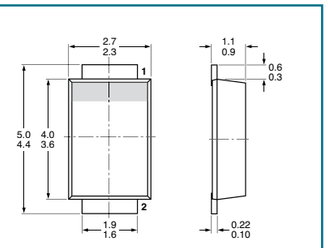

SOD123F



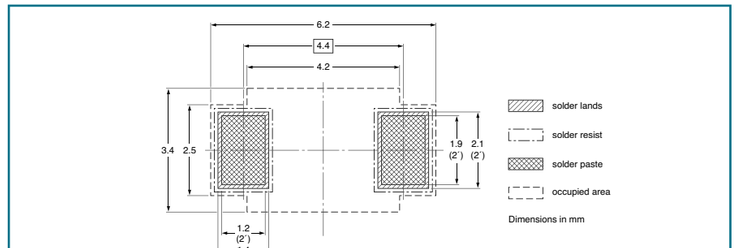

SOD123W



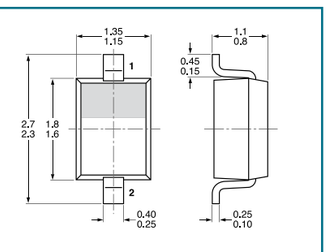

SOD123W



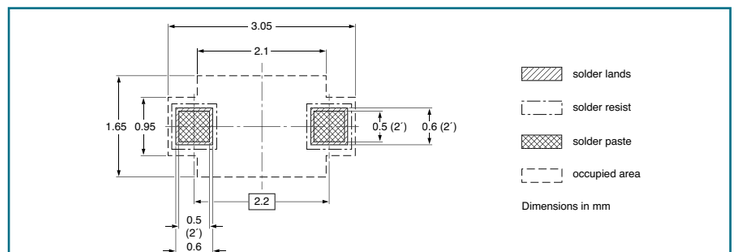

SOD128




SOD128




SOD323 (SC-76)



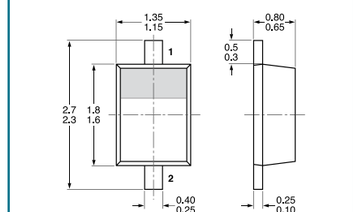

SOD323 (SC-76)

Dimensions in mm

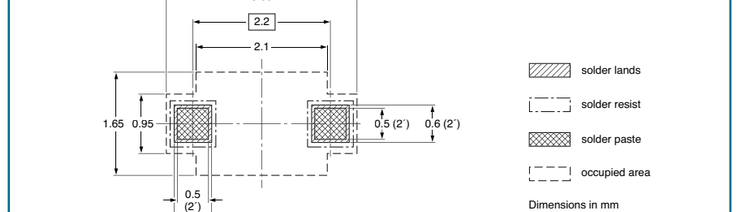




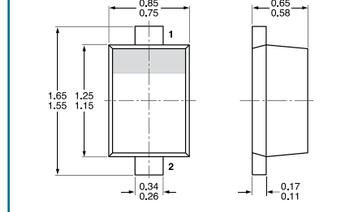
## 2-pin SMD packages



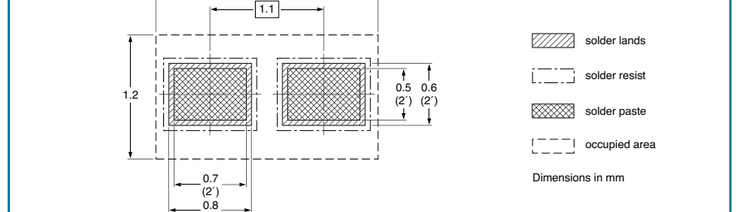

SOD323F (SC-90)




SOD323F (SC-90)

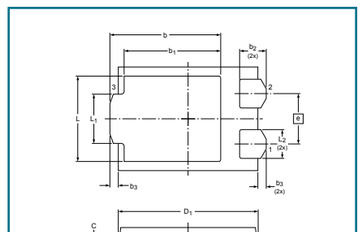



SOD523 (SC-79)

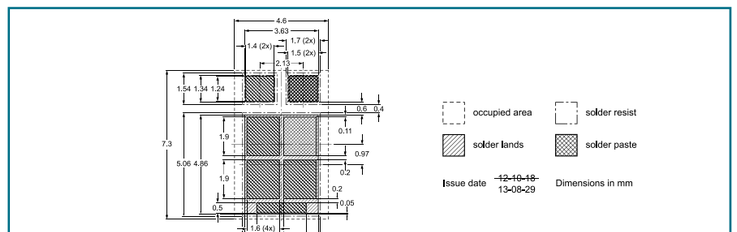



SOD523 (SC-79)

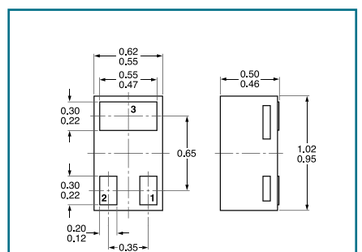
## 3-pin SMD packages



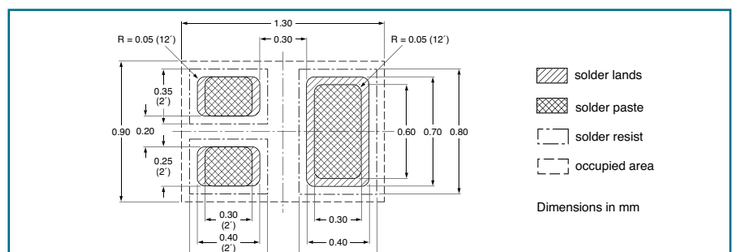

CFP15 (SOT1289)




CFP15 (SOT1289)



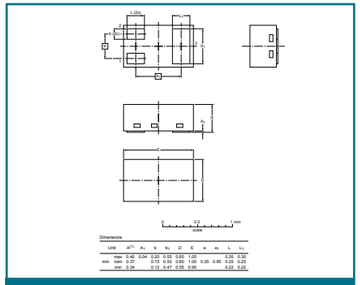

DFN1006-3 (SOT883)



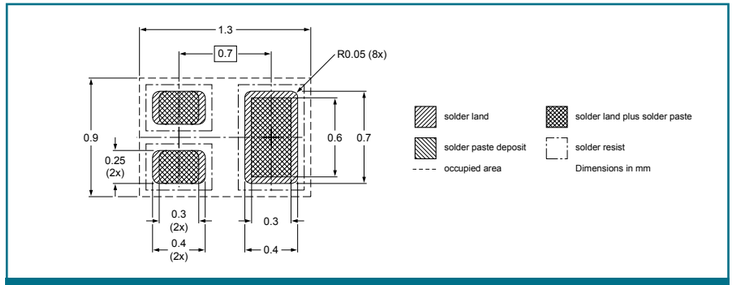

DFN1006-3 (SOT883)

Dimensions in mm

## 3-pin SMD packages



DFN1006B-3 (SOT883B)

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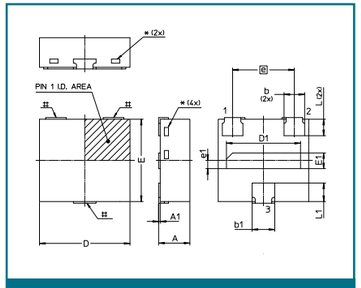
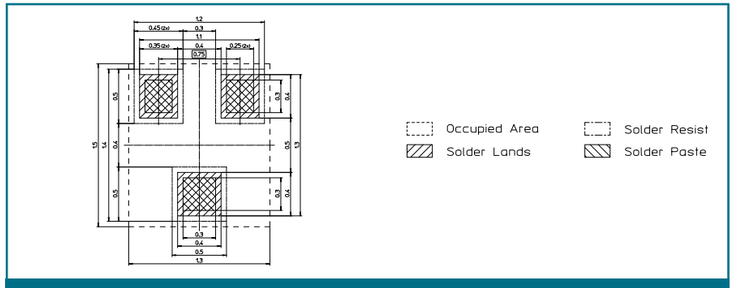
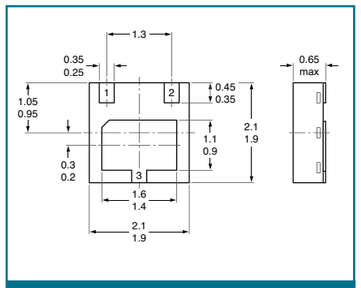


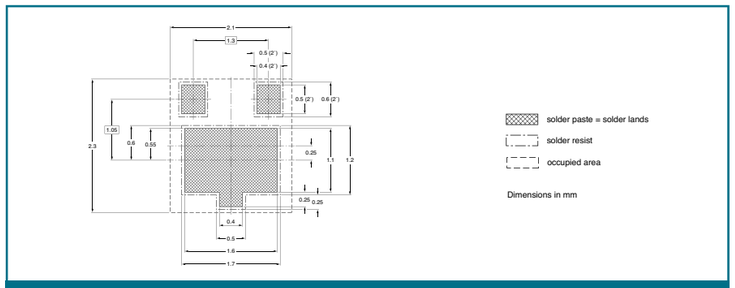

DFN1010D-3 (SOT1215)




DFN1010D-3 (SOT1215)




DFN2020-3 (SOT1061)

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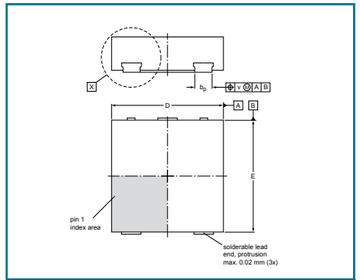
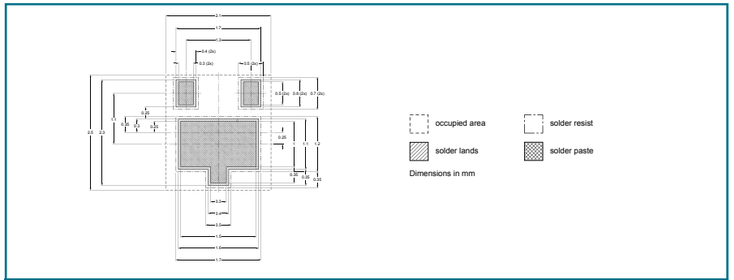



DFN2020D-3 (SOT1061D)



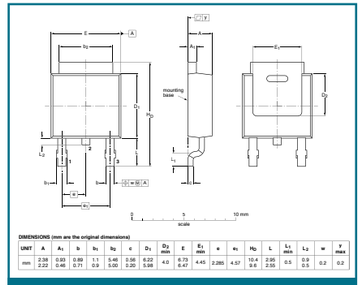

DFN2020D-3 (SOT1061D)

Dimensions in mm

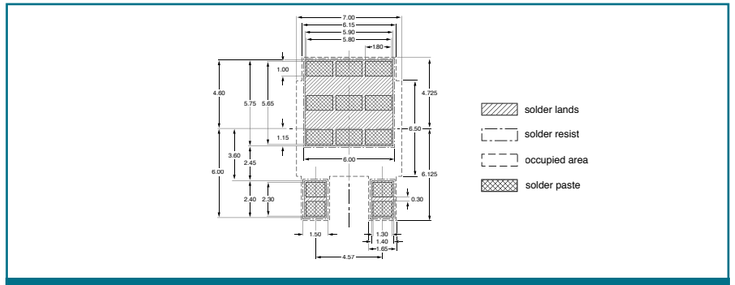




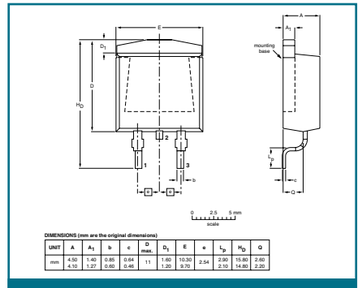
## 3-pin SMD packages



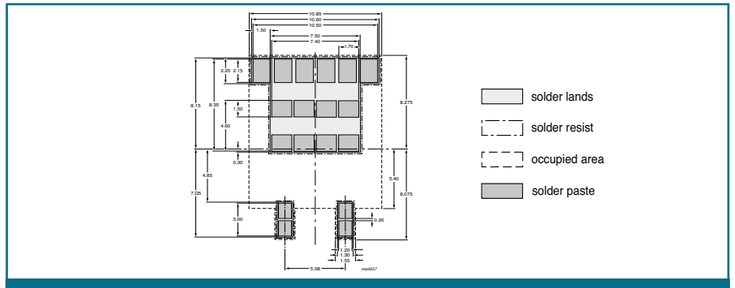
DPAK (SOT428)



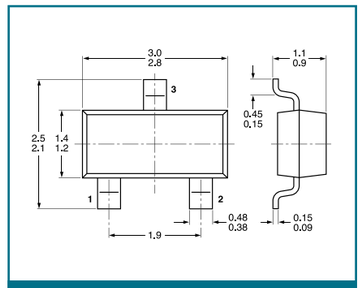

DPAK (SOT428)



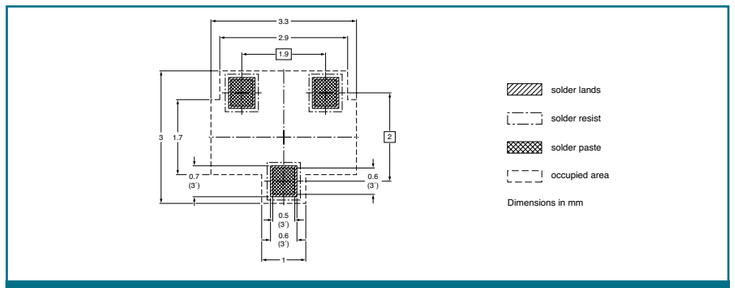
D²PAK (SOT404)



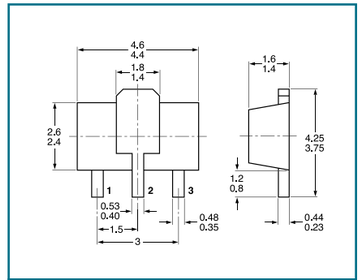

D²PAK (SOT404)



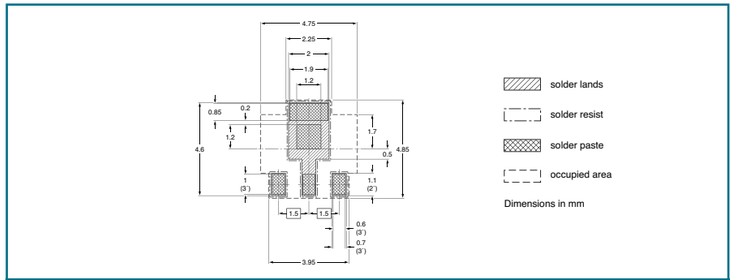
SOT23




SOT23



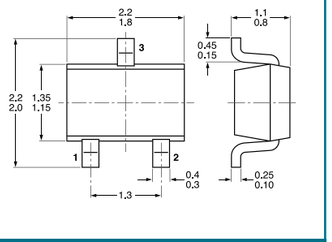
SOT89 (SC-62)



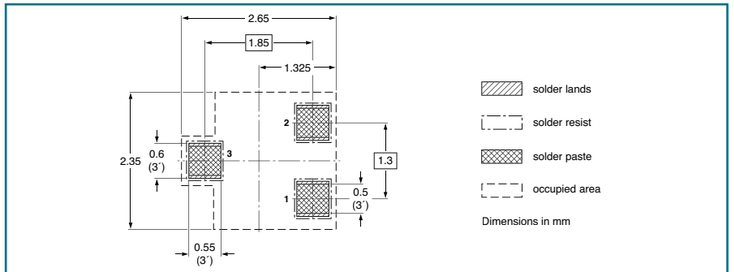

SOT89 (SC-62)

Dimensions in mm

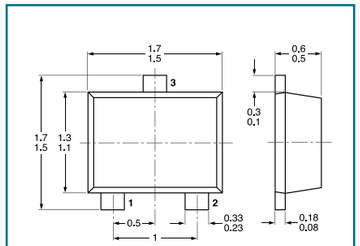
## 3-pin SMD packages



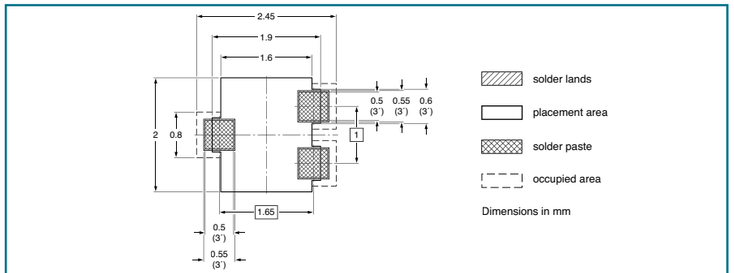

SOT323 (SC-70)




SOT323 (SC-70)

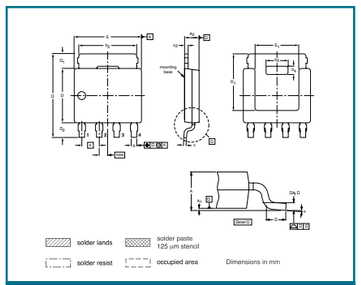



SOT663

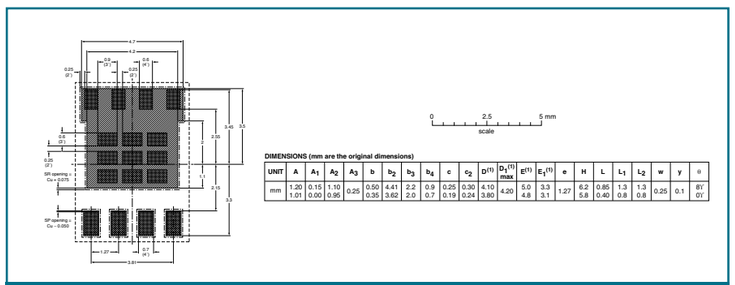



SOT663

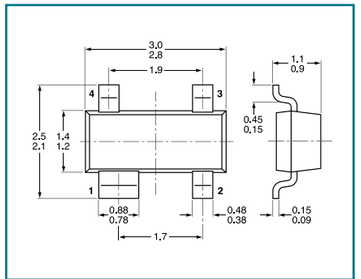
## 4-pin SMD packages



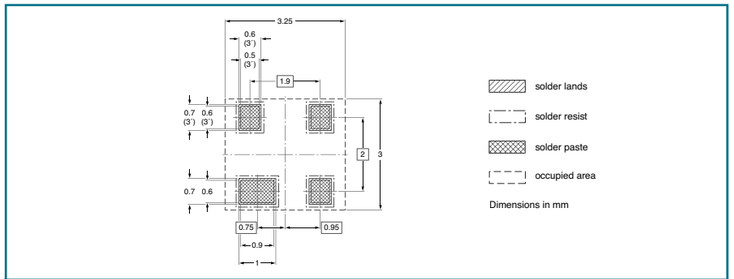

LFPAK56 (SOT669)




LFPAK56 (SOT669)




SOT143B



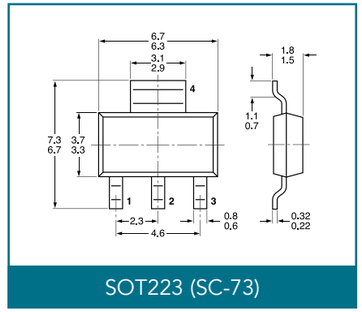

SOT143B

Dimensions in mm

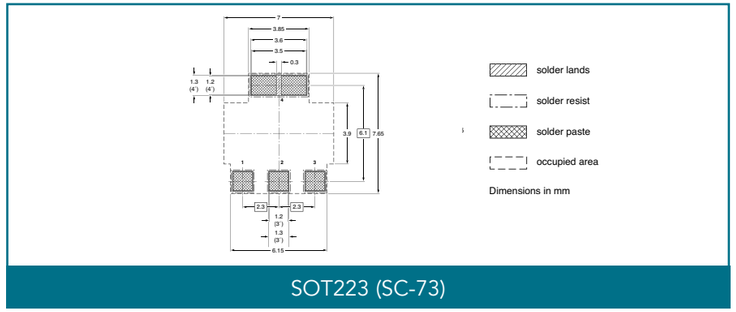




## 4-pin SMD packages

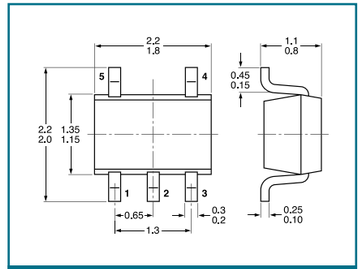



SOT223 (SC-73)

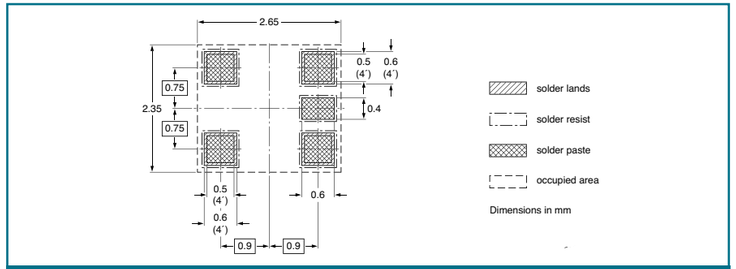



SOT223 (SC-73)

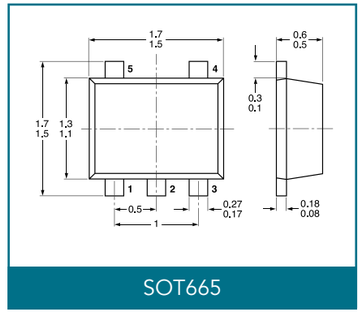
## 5-pin SMD packages



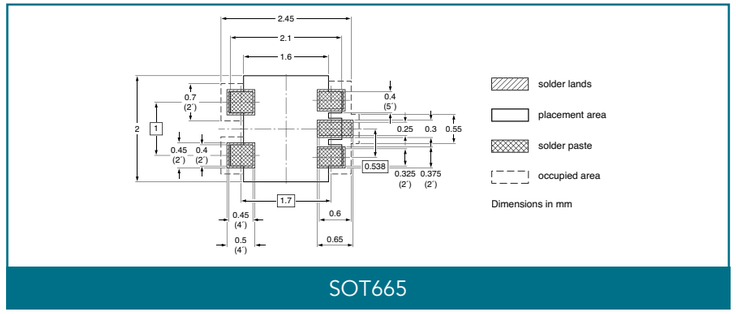

SOT353 (SC-88A)




SOT353 (SC-88A)

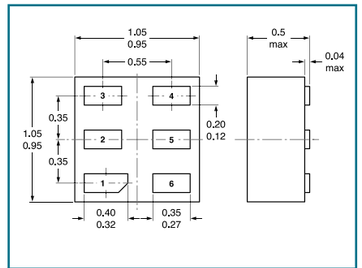



SOT665

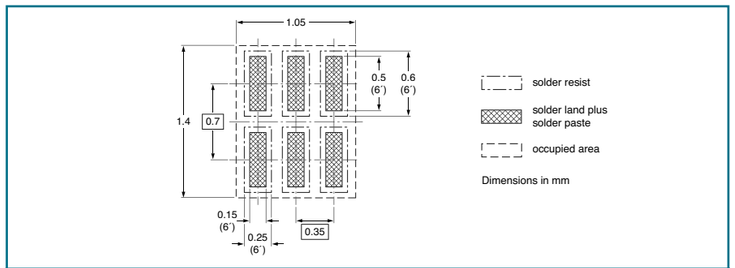



SOT665

## 6-pin SMD packages



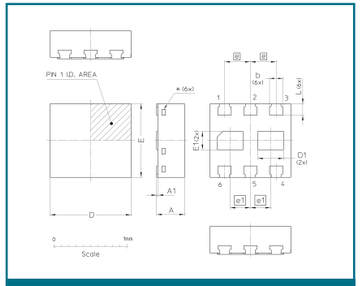

DFN1010-6 (SOT891)



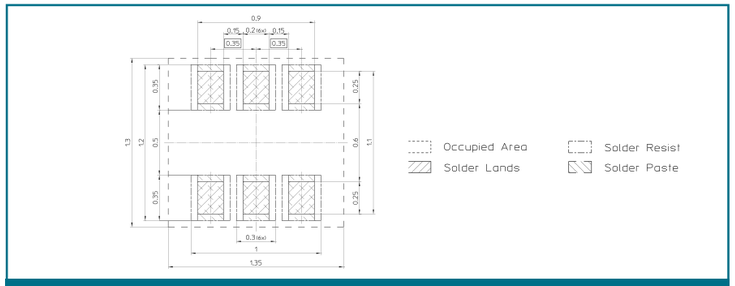

DFN1010-6 (SOT891)

Dimensions in mm

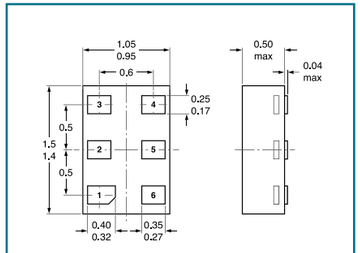
## 6-pin SMD packages



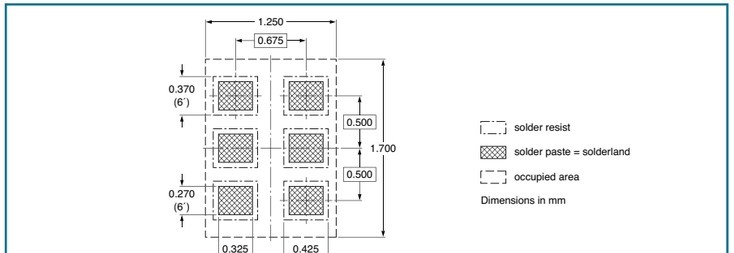

DFN1010B-6 (SOT1216)



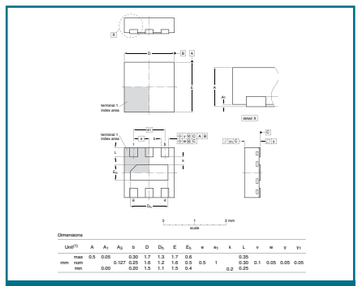

DFN1010B-6 (SOT1216)



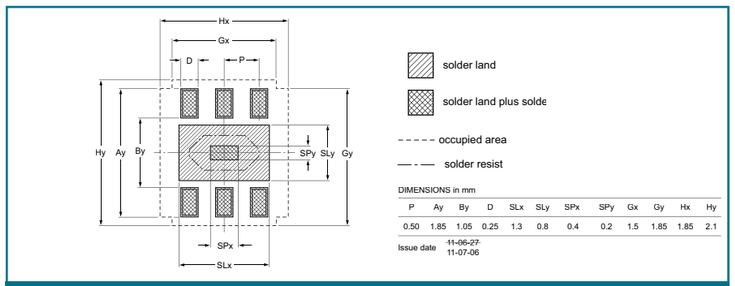

DFN1410-6 (SOT886)



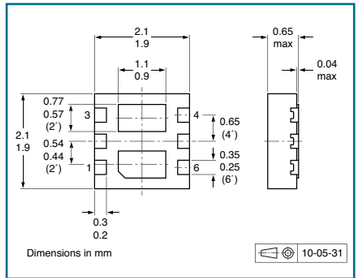

DFN1410-6 (SOT886)



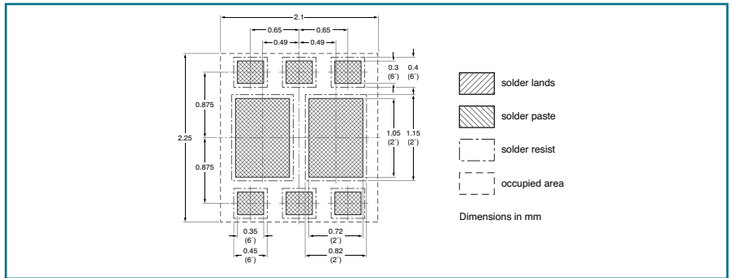

DFN1616-6 (SOT1189)




DFN1616-6 (SOT1189)




DFN2020-6 (SOT1118)



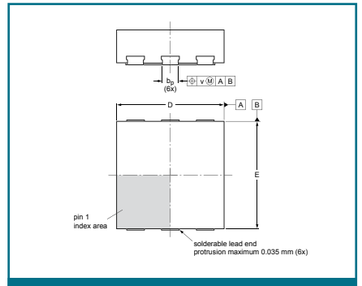

DFN2020-6 (SOT1118)

Dimensions in mm

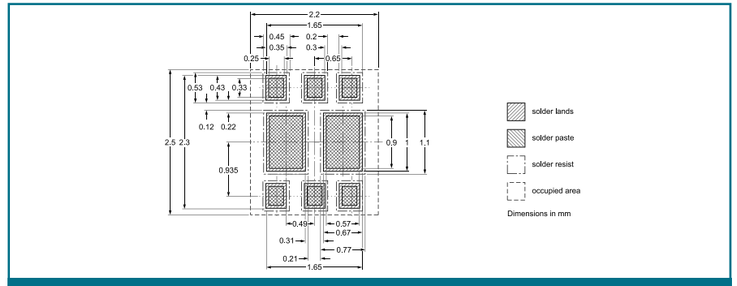




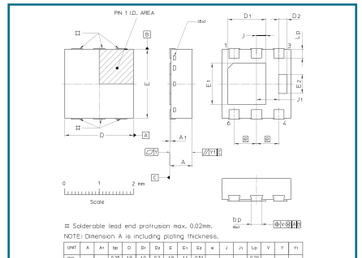
## 6-pin SMD packages



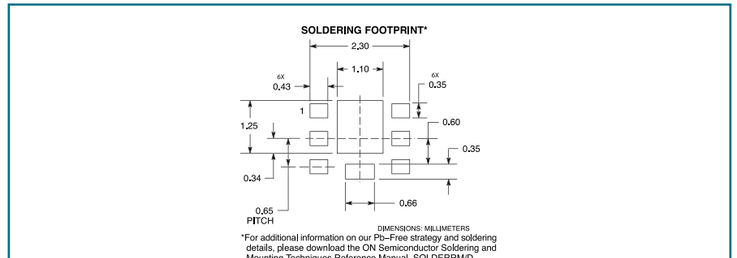

DFN2020D-6 (SOT1118D)



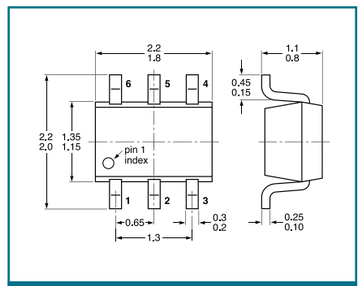

DFN2020D-6 (SOT1118D)



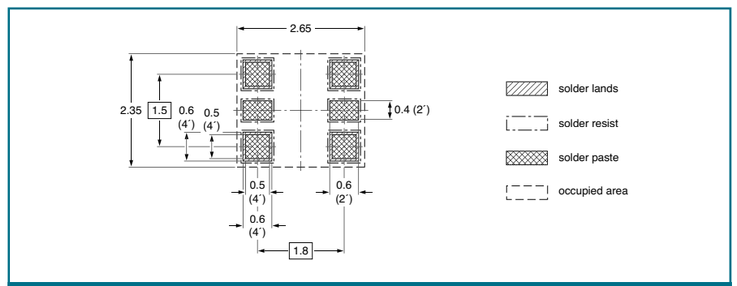

DFN2020MD-6 (SOT1220)



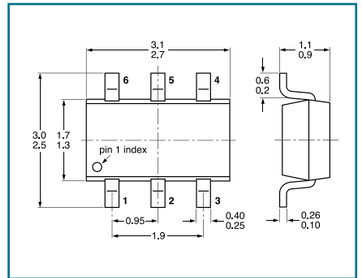

DFN2020MD-6 (SOT1220)



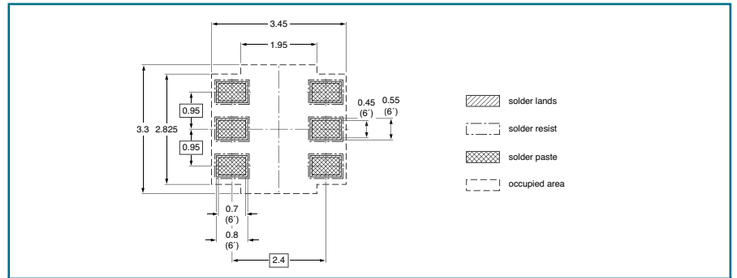

SOT363 (SC-88)




SOT363 (SC-88)



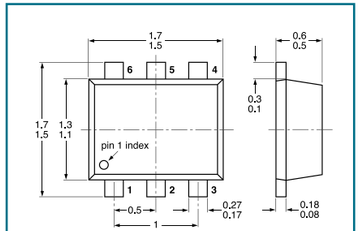

SOT457 (SC-74)



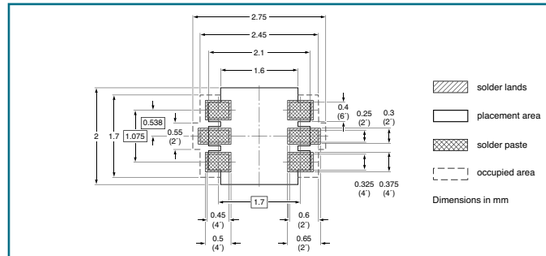

SOT457 (SC-74)

Dimensions in mm

## 6-pin SMD packages

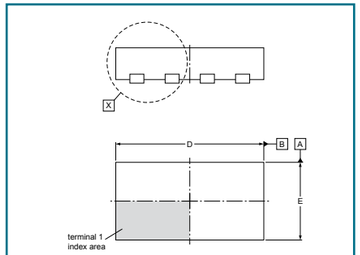



SOT666

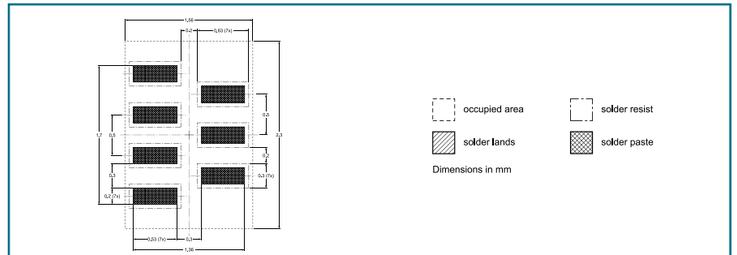



SOT666

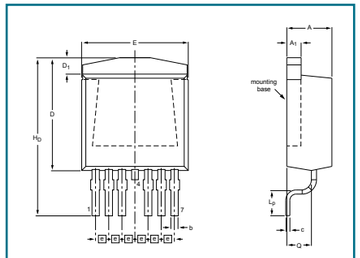
## 7-pin SMD packages



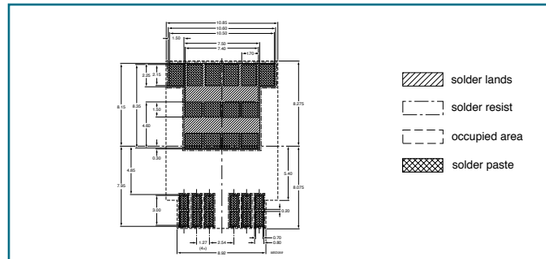

DFN2111-7 (SOT1358)




DFN2111-7 (SOT1358)

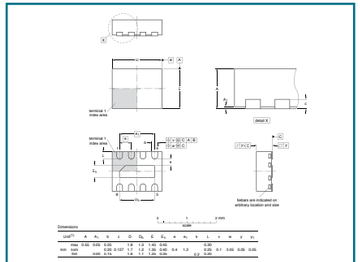



D2PAK-7 (SOT428)

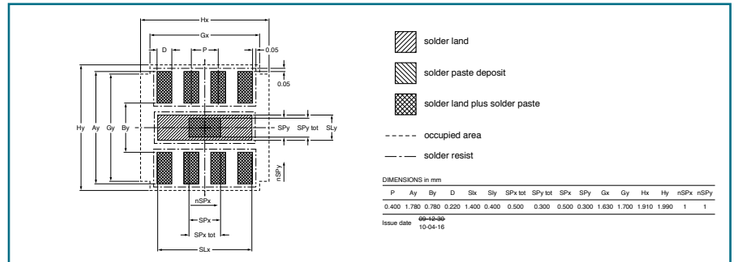



D2PAK-7 (SOT428)

## 8-pin SMD packages




DFN1714-8 (SOT1166)



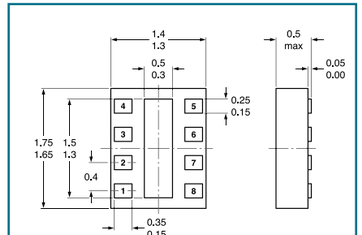

DFN1714-8 (SOT1166)

Dimensions in mm

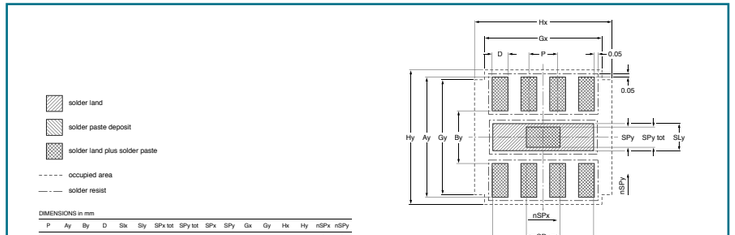




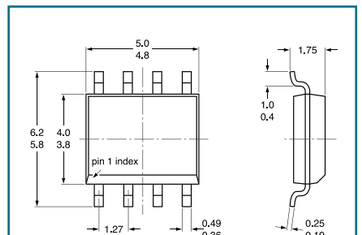
## 8-pin SMD packages



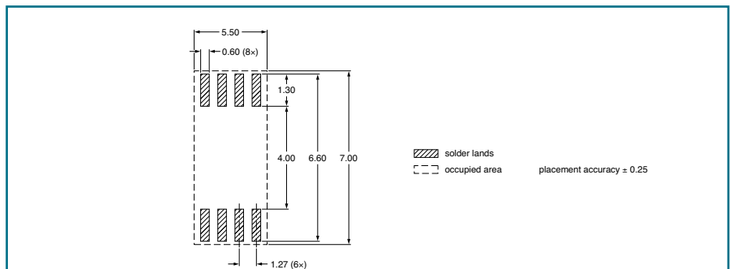

DFN1714U-8 (SOT983)



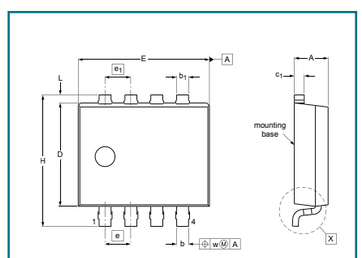

DFN1714U-8 (SOT983)



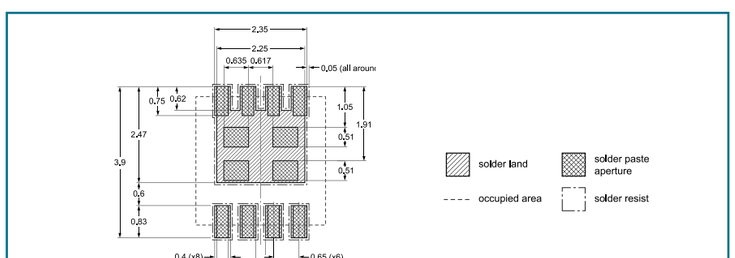

SOT96 (SO8)



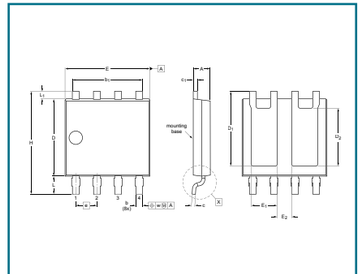

SOT96 (SO8)



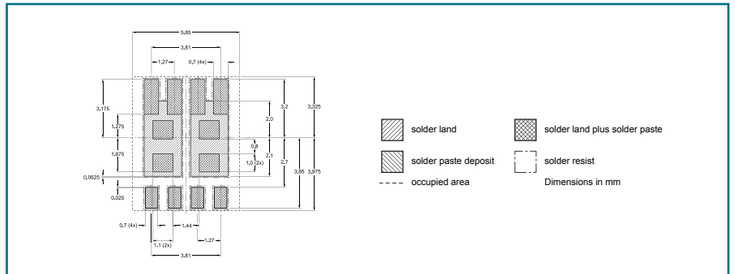

LFPAK33 (SOT1210)




LFPAK33 (SOT1210)



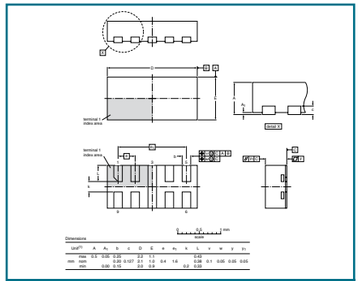

LFPAK56D (SOT1205)



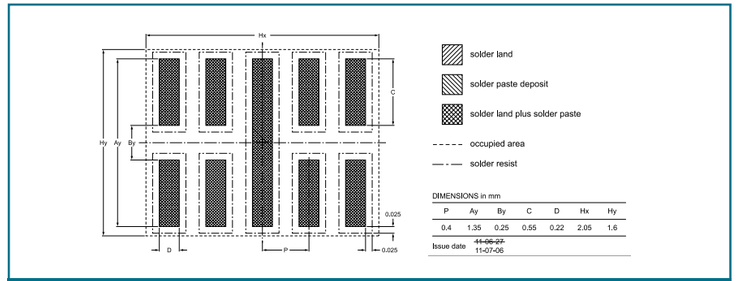

LFPAK56D (SOT1205)

Dimensions in mm

## More than 8-pin SMD packages



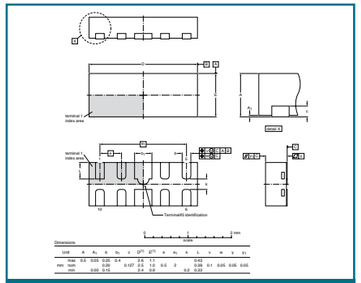
DFN2110-9 (SOT1178)



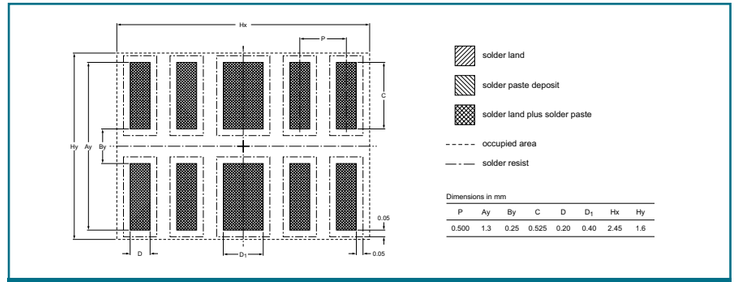

| P | Ay | By | C | D | Hx | Hy |
|---|---|---|---|---|---|---|
| 0.4 | 1.35 | 0.25 | 0.55 | 0.22 | 2.05 | 1.6 |

Issue date ~~11-05-27~~ 11-07-06

DFN2110-9 (SOT1178)



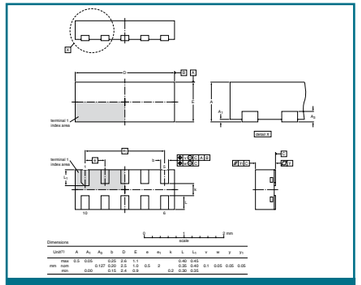
DFN2510-10 (SOT1165)



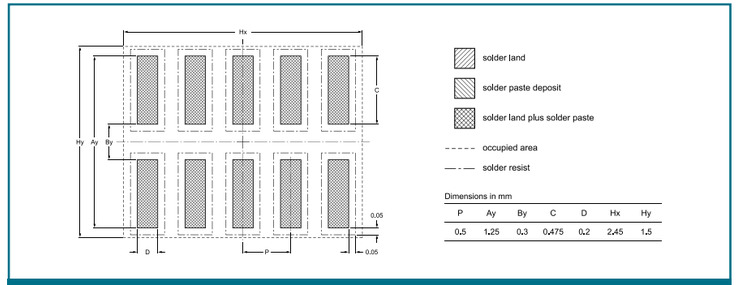

Dimensions in mm

| P | Ay | By | C | D | D1 | Hx | Hy |
|---|---|---|---|---|---|---|---|
| 0.500 | 1.3 | 0.25 | 0.525 | 0.20 | 0.40 | 2.45 | 1.6 |

DFN2510-10 (SOT1165)



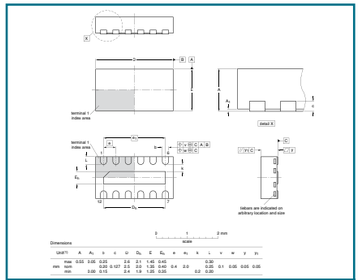
DFN2510A-10 (SOT1176)



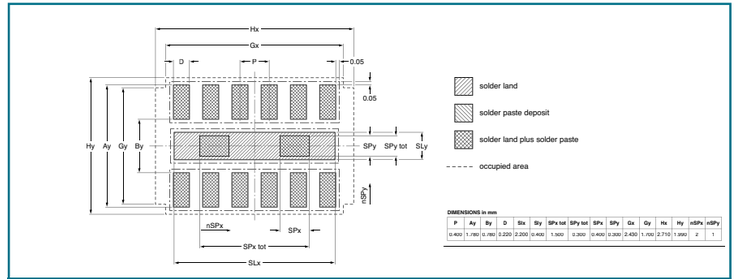

Dimensions in mm

| P | Ay | By | C | D | Hx | Hy |
|---|---|---|---|---|---|---|
| 0.5 | 1.25 | 0.3 | 0.475 | 0.2 | 2.45 | 1.5 |

DFN2510A-10 (SOT1176)



DFN2514-12 (SOT1167)




DIMENSIONS in mm

| P | Ay | By | D | Six | Siy | SPx tot | SPy tot | SPx | SPy | Gx | Gy | Hx | Hy | nSPx | nSPy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.400 | 1.780 | 0.780 | 0.220 | 3.000 | 0.400 | 2.250 | 0.300 | 0.200 | 0.300 | 2.450 | 1.100 | 2.710 | 1.990 | 2 | 1 |

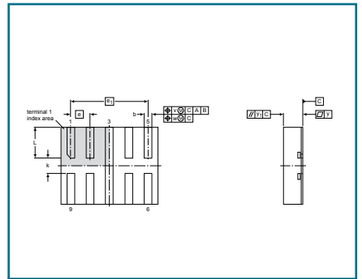
DFN2514-12 (SOT1167)

Dimensions in mm

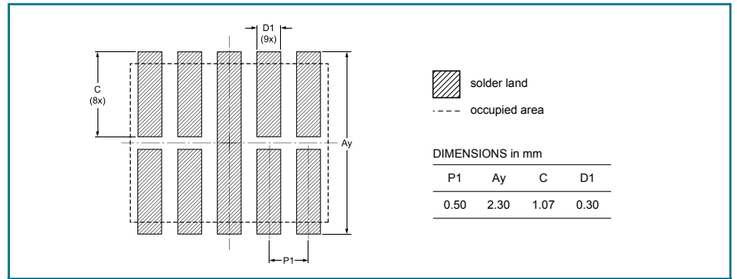




## More than 8-pin SMD packages



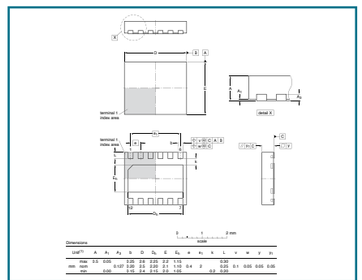
DFN2520-9 (SOT1333)



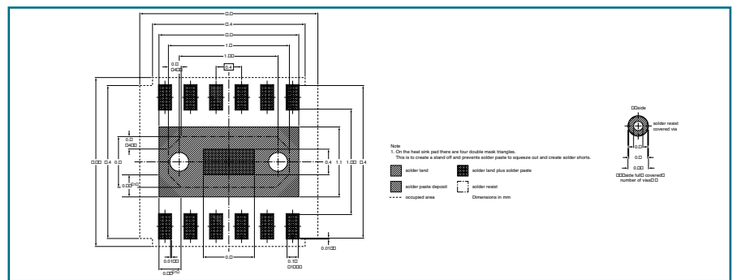

DIMENSIONS in mm

| P1 | Ay | C | D1 |
|---|---|---|---|
| 0.50 | 2.30 | 1.07 | 0.30 |

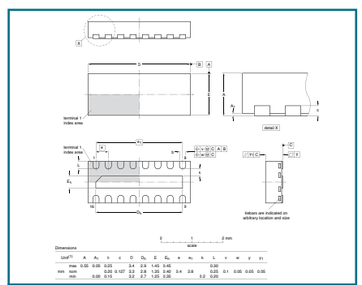
DFN2520-9 (SOT1333)



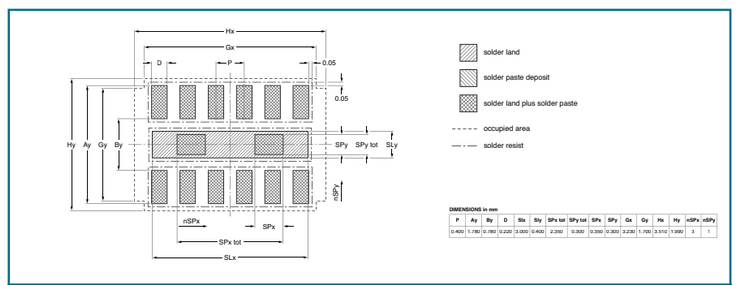
DFN2521-12 (SOT1156)




DFN2521-12 (SOT1156)



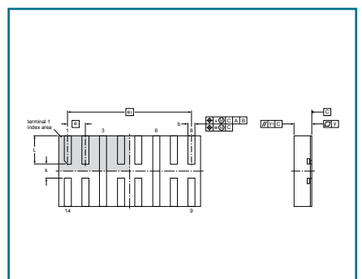
DFN3314-16 (SOT1168)



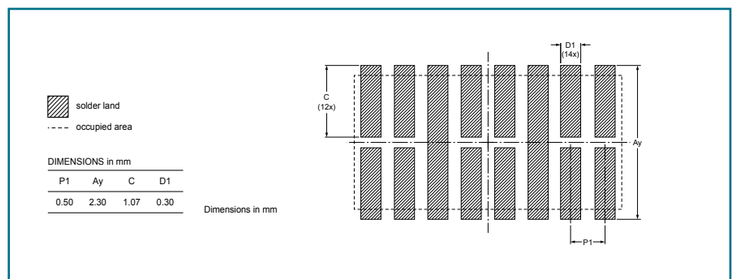

DIMENSIONS in mm

| P | Ay | By | D | Six | Siy | SPx tot | SPy tot | SPx | SPy | Gx | Gy | Hx | Hy | nSPx | nSPy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.400 | 1.780 | 0.780 | 0.220 | 3.000 | 0.400 | 2.250 | 0.300 | 0.200 | 0.300 | 3.230 | 1.150 | 3.510 | 1.990 | 3 | 1 |

DFN3314-16 (SOT1168)



DFN4020-14 (SOT1334)




DIMENSIONS in mm

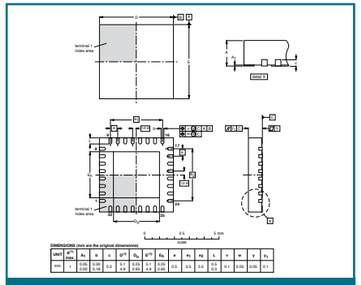
| P1 | Ay | C | D1 |
|---|---|---|---|
| 0.50 | 2.30 | 1.07 | 0.30 |

Dimensions in mm

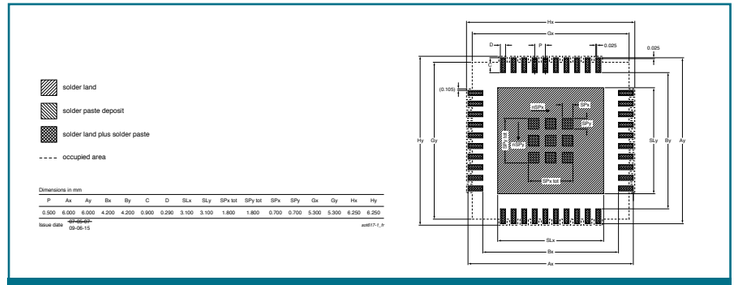
DFN4020-14 (SOT1334)

Dimensions in mm

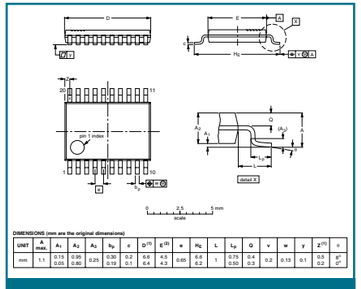
## More than 8-pin SMD packages



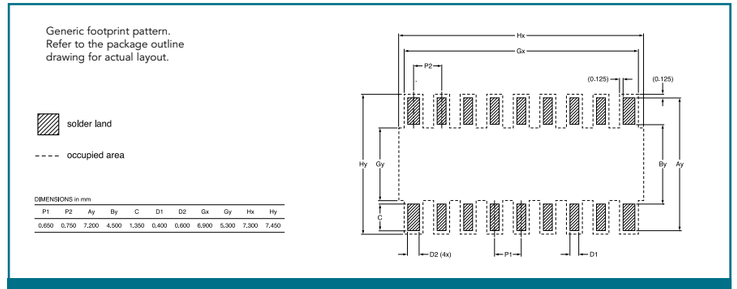

DFN5050-32 (SOT617)



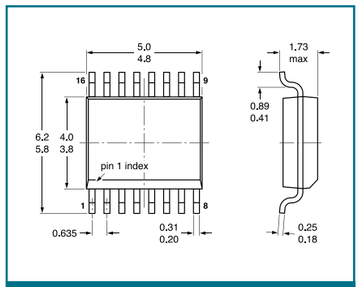

DFN5050-32 (SOT617)



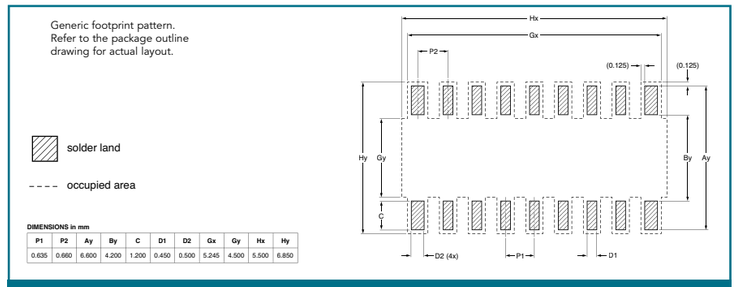

SOT360 (TSSOP20)




SOT360 (TSSOP20)

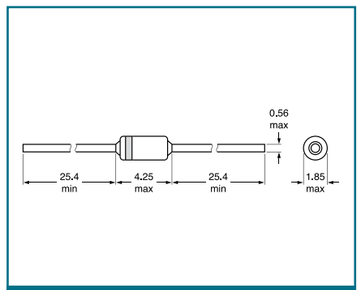



SOT519 (SSOP16)

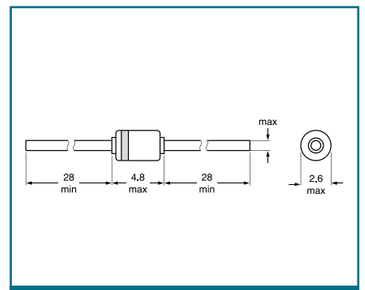



SOT519 (SSOP16)

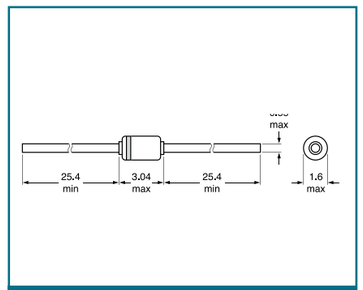
## Glass diodes




SOD27 (DO-35)




SOD66 (DO-41)



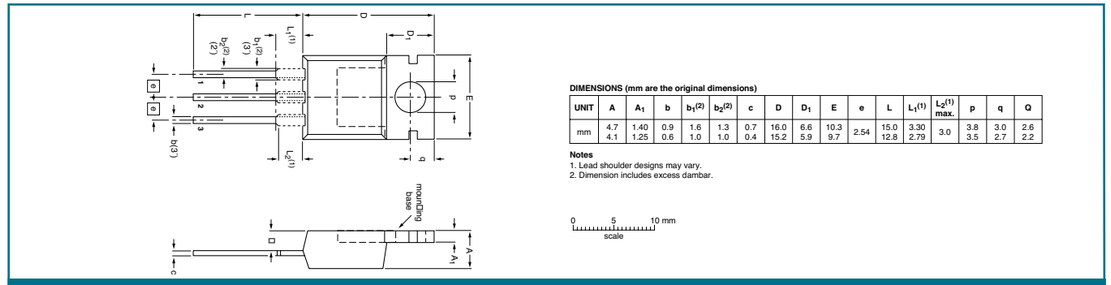

SOD68 (DO-34)

Dimensions in mm

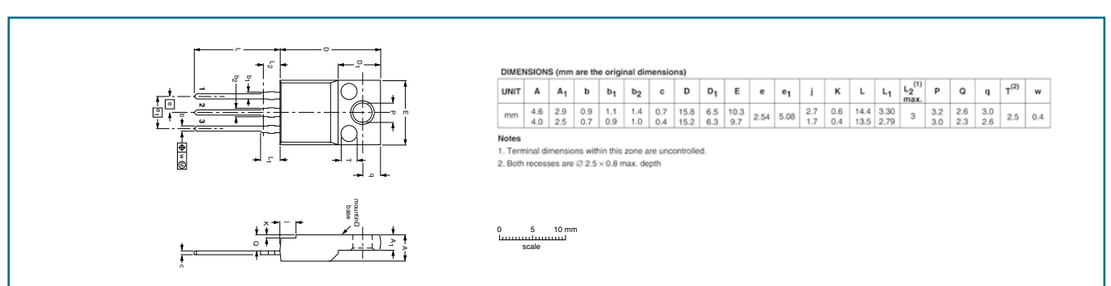




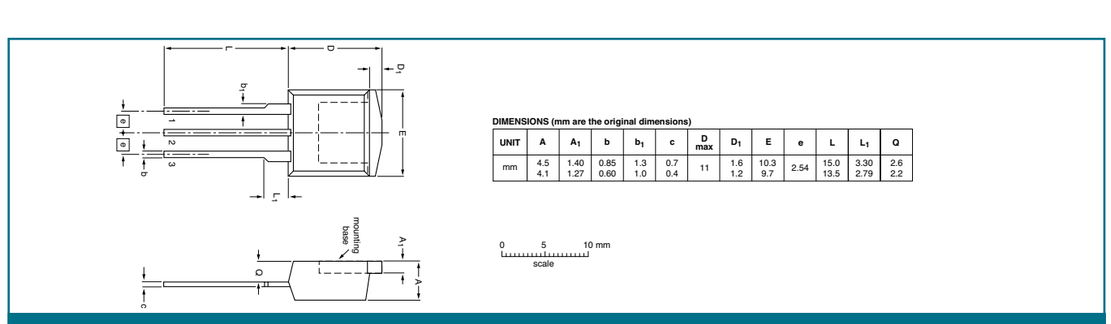
## Single-ended and through-hole packages



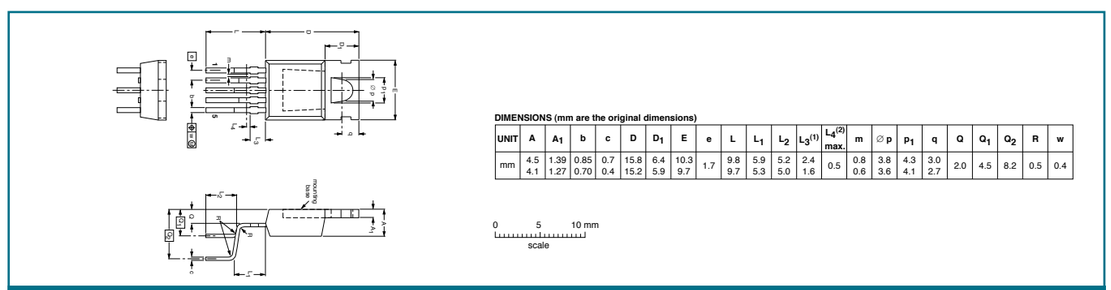

SOT78 (TO220AB)




SOT186A (isolated TO220AB)




SOT226




SOT263B-1

Dimensions in mm

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