

NTP30N06L, NTB30N06L

Power MOSFET

30 Amps, 60 Volts, Logic Level,
N-Channel TO-220 and D²PAK

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

Features

- Pb-Free Packages are Available

Typical Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	60	Vdc
Drain-to-Gate Voltage ($R_{GS} = 10\text{ M}\Omega$)	V_{DGR}	60	Vdc
Gate-to-Source Voltage – Continuous – Non-Repetitive ($t_p \leq 10\text{ ms}$)	V_{GS} V_{GS}	± 15 ± 20	Vdc
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Continuous @ $T_A = 100^\circ\text{C}$ – Single Pulse ($t_p \leq 10\text{ }\mu\text{s}$)	I_D I_D I_{DM}	30 15 90	Adc Adc Apk
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	88.2 0.59	W W/ $^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to $+175$	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 50\text{ Vdc}$, $V_{GS} = 5.0\text{ Vdc}$, $L = 0.3\text{ mH}$ $I_{L(pk)} = 26\text{ A}$, $V_{DS} = 60\text{ Vdc}$)	E_{AS}	101	mJ
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.7	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8 in from case for 10 seconds	T_L	260	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

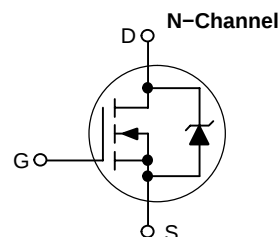


ON Semiconductor®

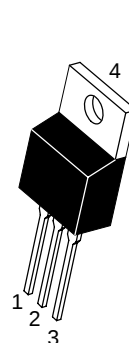
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30 AMPERES, 60 VOLTS

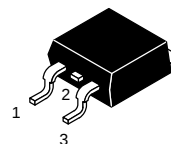
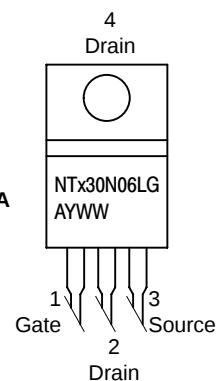
$R_{DS(on)} = 46\text{ m}\Omega$



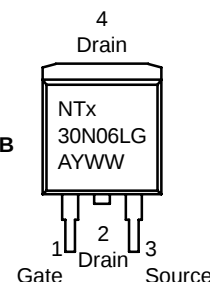
MARKING DIAGRAMS



TO-220
CASE 221A
STYLE 5



D²PAK
CASE 418B
STYLE 2



NTx30N06L = Device Code

x = P or B

A = Assembly Location

Y = Year

WW = Work Week

G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NTP30N06L, NTB30N06L

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 1) ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	60 –	71.8 69	– –	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ($V_{DS} = 60\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 60\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 150^\circ\text{C}$)	I_{DSS}	– –	– –	1.0 10	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 15\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	–	–	± 100	nAdc

ON CHARACTERISTICS (Note 1)

Gate Threshold Voltage (Note 1) ($V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 –	1.7 4.8	2.0 –	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 1) ($V_{GS} = 5.0\text{ Vdc}$, $I_D = 15\text{ Adc}$)	$R_{DS(on)}$	–	38	46	m Ω
Static Drain-to-Source On-Voltage (Note 1) ($V_{GS} = 5.0\text{ Vdc}$, $I_D = 30\text{ Adc}$) ($V_{GS} = 5.0\text{ Vdc}$, $I_D = 15\text{ Adc}$, $T_J = 150^\circ\text{C}$)	$V_{DS(on)}$	– –	1.3 1.06	1.7 –	Vdc
Forward Transconductance (Note 1) ($V_{DS} = 7.0\text{ Vdc}$, $I_D = 15\text{ Adc}$)	g_{FS}	–	21	–	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	($V_{DS} = 25\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{iss}	–	810	1150	pF
Output Capacitance		C_{oss}	–	260	370	
Transfer Capacitance		C_{rss}	–	80	115	

SWITCHING CHARACTERISTICS (Note 2)

Turn-On Delay Time	($V_{DD} = 30\text{ Vdc}$, $I_D = 30\text{ Adc}$, $V_{GS} = 5.0\text{ Vdc}$, $R_G = 9.1\text{ }\Omega$) (Note 1)	$t_{d(on)}$	–	10	20	ns
Rise Time		t_r	–	200	400	
Turn-Off Delay Time		$t_{d(off)}$	–	15.6	30	
Fall Time		t_f	–	62	120	
Gate Charge	($V_{DS} = 48\text{ Vdc}$, $I_D = 30\text{ Adc}$, $V_{GS} = 5.0\text{ Vdc}$) (Note 1)	Q_T	–	16	32	nC
		Q_1	–	3.9	–	
		Q_2	–	10	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	($I_S = 30\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) (Note 1) ($I_S = 30\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 150^\circ\text{C}$)	V_{SD}	– –	1.01 1.03	1.2 –	Vdc
Reverse Recovery Time	($I_S = 30\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$) (Note 1)	t_{rr}	–	50	–	ns
		t_a	–	32	–	
		t_b	–	17	–	
Reverse Recovery Stored Charge		Q_{RR}	–	0.082	–	μC

1. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.
2. Switching characteristics are independent of operating junction temperatures.

NTP30N06L, NTB30N06L

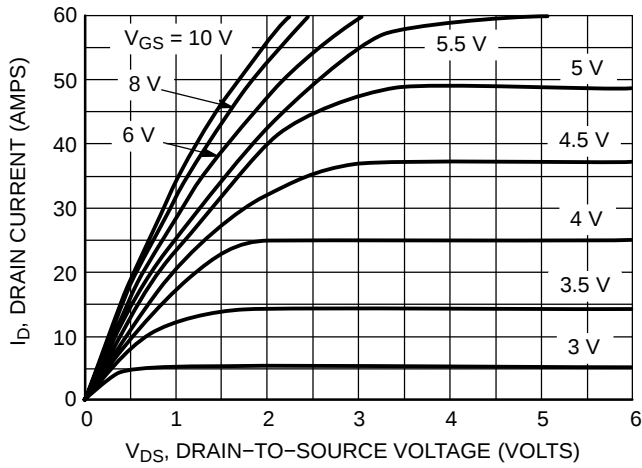


Figure 1. On-Region Characteristics

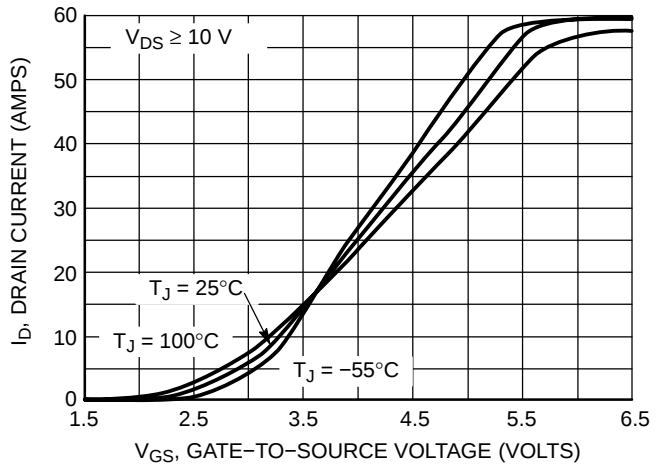


Figure 2. Transfer Characteristics

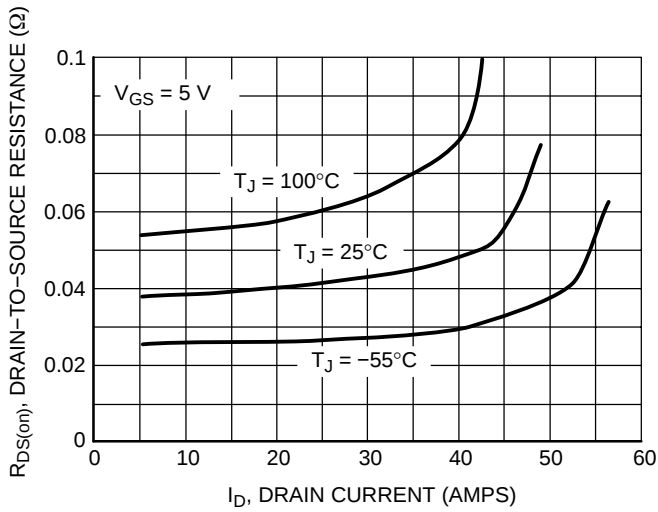


Figure 3. On-Resistance versus Gate-to-Source Voltage

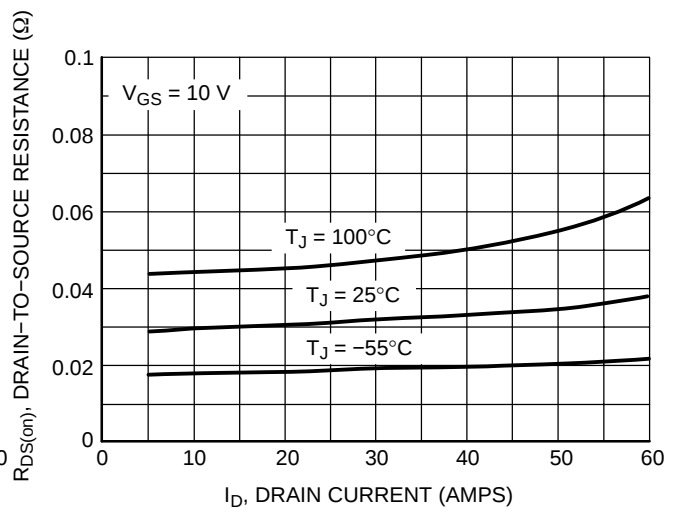


Figure 4. On-Resistance versus Drain Current and Gate Voltage

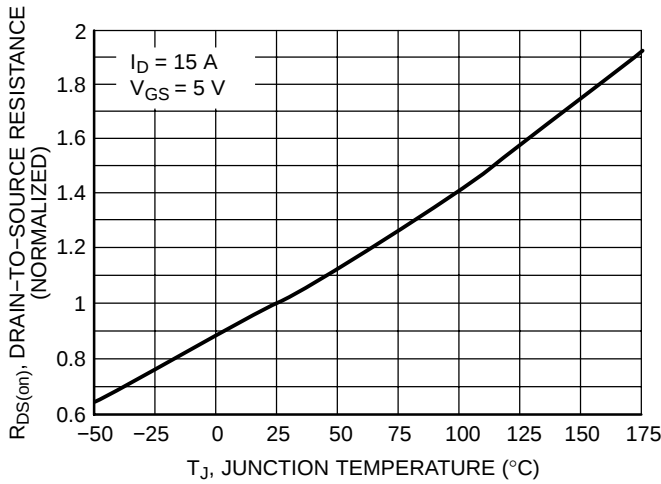


Figure 5. On-Resistance Variation with Temperature

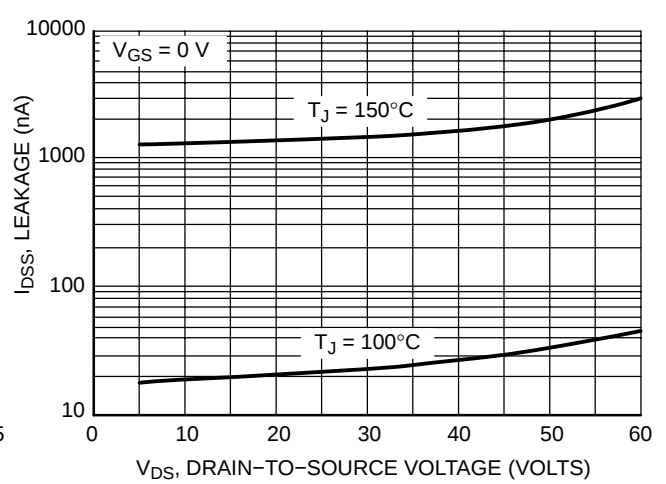


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTP30N06L, NTB30N06L

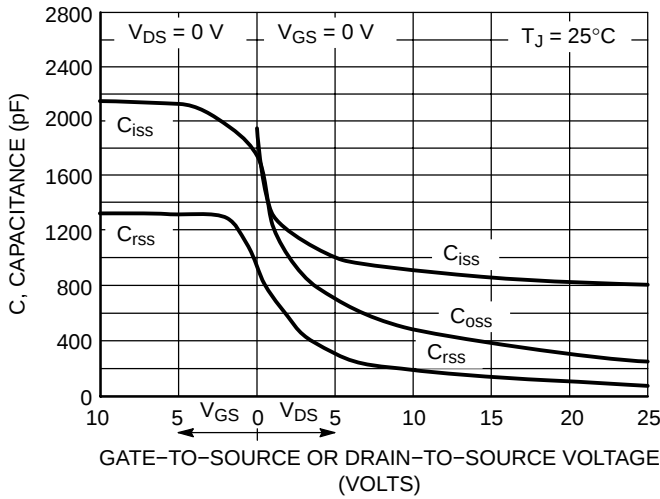


Figure 7. Capacitance Variation

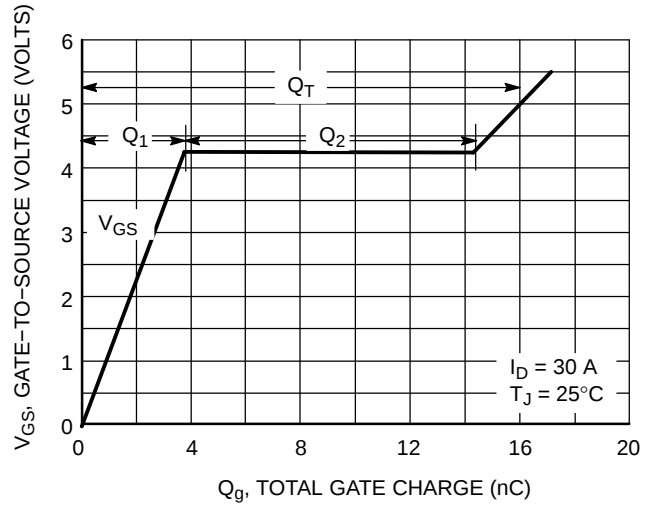


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

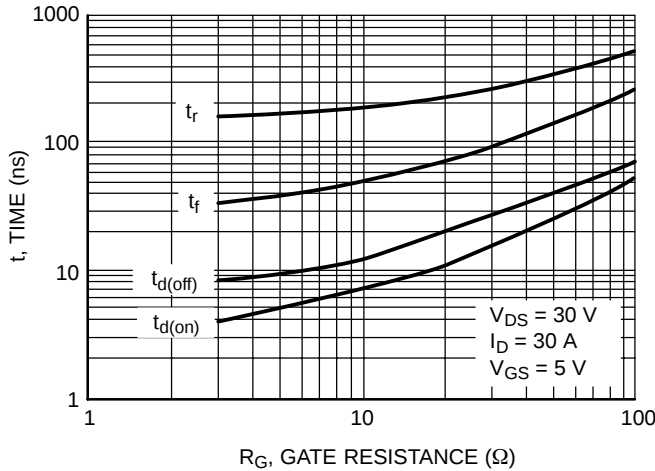


Figure 9. Resistive Switching Time Variation versus Gate Resistance

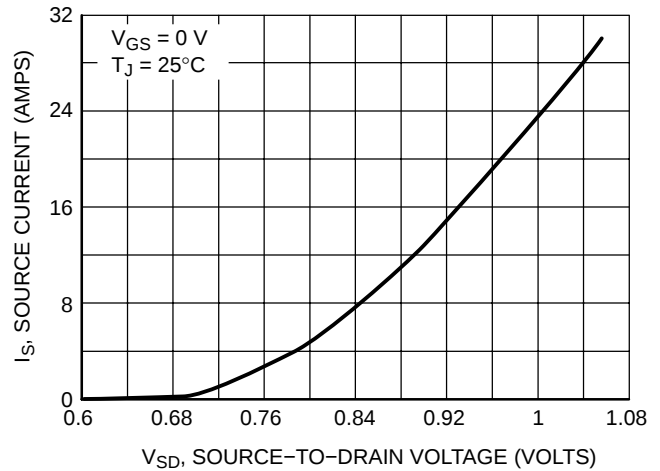


Figure 10. Diode Forward Voltage versus Current

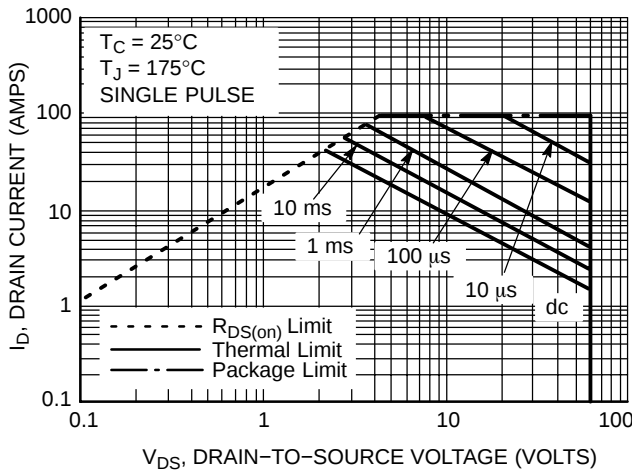


Figure 11. Maximum Rated Forward Biased Safe Operating Area

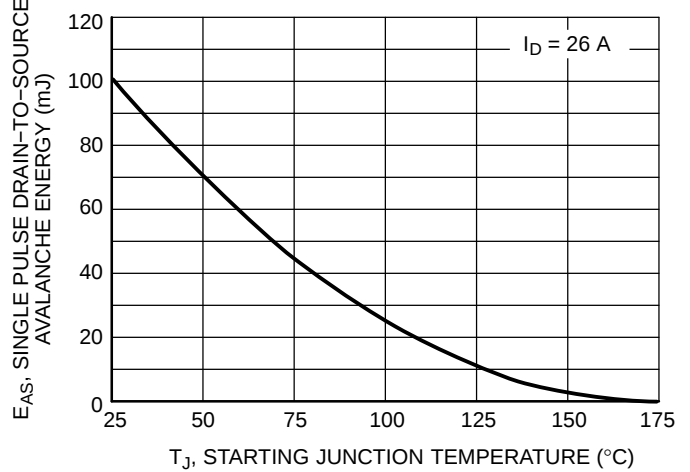


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

NTP30N06L, NTB30N06L

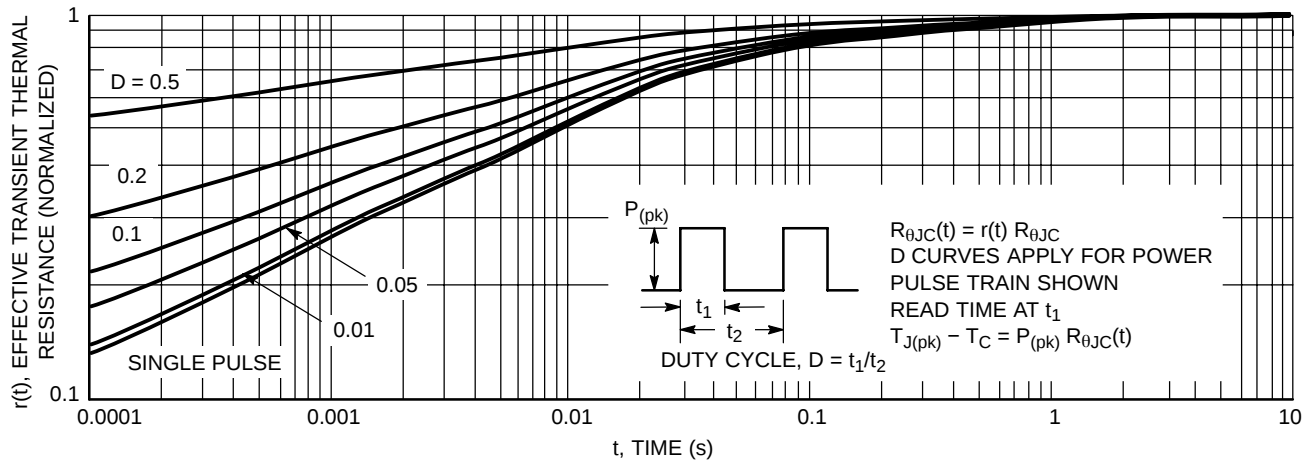


Figure 13. Thermal Response

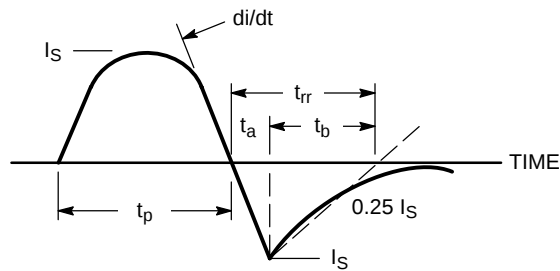


Figure 14. Diode Reverse Recovery Waveform

ORDERING INFORMATION

Device	Package	Shipping [†]
NTP30N06L	TO-220	50 Units / Rail
NTP30N06LG	TO-220 (Pb-Free)	50 Units / Rail
NTB30N06L	D ² PAK	50 Units / Rail
NTB30N06LG	D ² PAK (Pb-Free)	50 Units / Rail
NTB30N06LT4	D ² PAK	800 Tape & Reel
NTB30N06LT4G	D ² PAK (Pb-Free)	800 Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



D²PAK 3
CASE 418B-04
ISSUE L

DATE 17 FEB 2015

SCALE 1:1

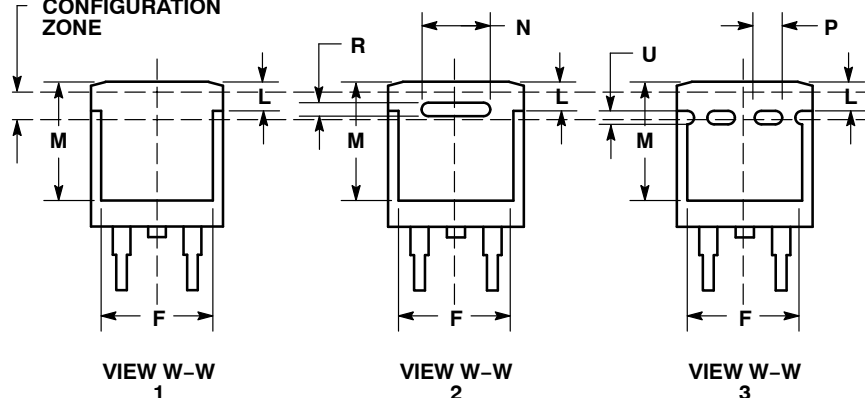


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100	BSC	2.54	BSC
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197	REF	5.00	REF
P	0.079	REF	2.00	REF
R	0.039	REF	0.99	REF
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

VARIABLE
CONFIGURATION
ZONE



STYLE 1:

- PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 3:

- PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 4:

- PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 5:

- PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 6:

- PIN 1. NO CONNECT
2. CATHODE
3. ANODE
4. CATHODE

MARKING INFORMATION AND FOOTPRINT ON PAGE 2

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D²PAK 3
CASE 418B-04
ISSUE L

DATE 17 FEB 2015

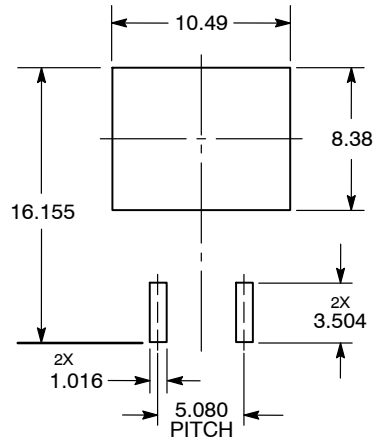
**GENERIC
MARKING DIAGRAM***



xx = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package
AKA = Polarity Indicator

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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