


25V PNP LOW SAT TRANSISTOR WITH N-CHANNEL MOSFET

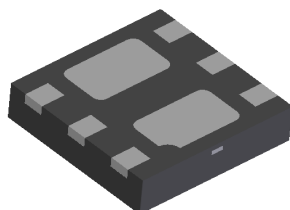
Features

- Combination of PNP low $V_{CE(sat)}$ Transistor and N-Channel MOSFET
- Very low collector-emitter saturation voltage $V_{CE(sat)}$
- High Collector Current Capability I_C and I_{CM}
- High Collector Current Gain (h_{FE}) at high I_C
- P_D up to 2.47W for power demanding applications
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**

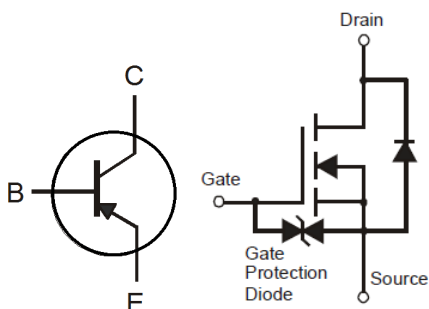
Mechanical Data

- Case: U-DFN2020-6 (Type B)
- UL Flammability Rating 94V-0
- Case Material: Molded Plastic. "Green" Molding Compound.
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - NiPdAu, Solderable per MIL-STD-202, Method 208 
- Weight: 0.007 grams (Approximate)

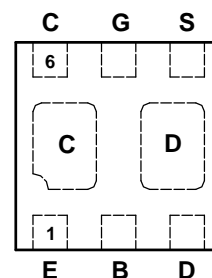
U-DFN2020-6
(Type B)



Top View



Device Symbol



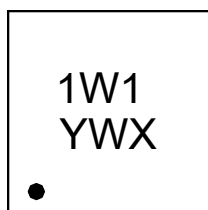
Top View
Pin-Out

Ordering Information (Note 4)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|------------------|---------|--------------------|-----------------|-------------------|
| DTM3A25P20NFDB-7 | 1W1 | 7 | 8 | 3,000 |

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 - See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



- 1W1 = Product Type Marking Code
 Y = Year: 0~9 (Last Digit of the Year)
 W = Week: A~Z: Week 1~26;
 a~z: Week 27~52;
 z represents week 52 and 53
 X = A~Z: Internal Code

BJT Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CBO} | -35 | V |
| Collector-Emitter Voltage | V _{CEO} | -25 | V |
| Emitter-Base Voltage | V _{EBO} | -7 | V |
| Continuous Collector Current | I _C | -3 | A |
| Peak Pulse Current | I _{CM} | -6 | A |
| Base Current | I _B | -500 | mA |

MOSFET Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Units |
|--|------------------|---------------------------------|-------|
| Drain-Source Voltage | V _{DSS} | 20 | V |
| Gate-Source Voltage | V _{GSS} | ±6 | V |
| Continuous Drain Current (Note 5) V _{GS} = 10 V | I _D | @T _A = +25°C 0.63 | A |
| | | @T _A = +85°C 0.45 | |
| Pulsed Drain Current | I _{DM} | 6 | A |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

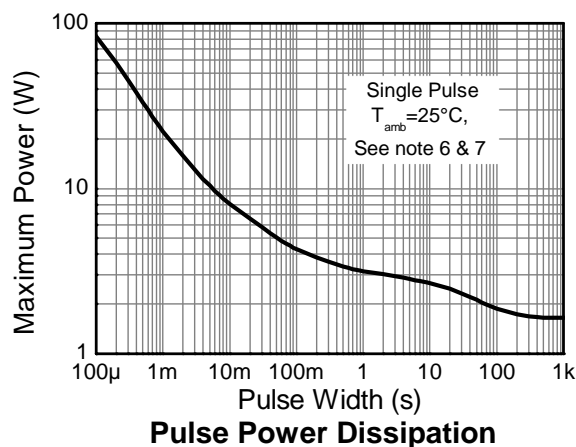
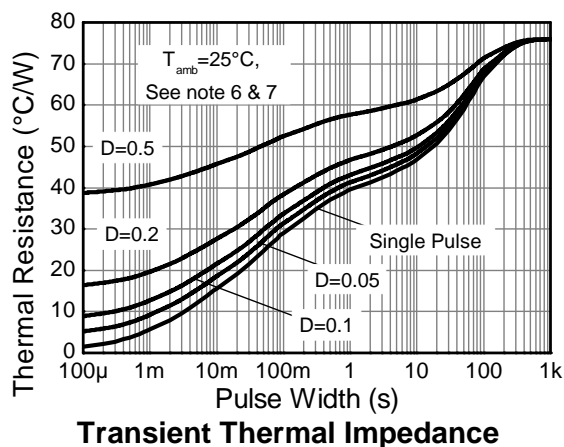
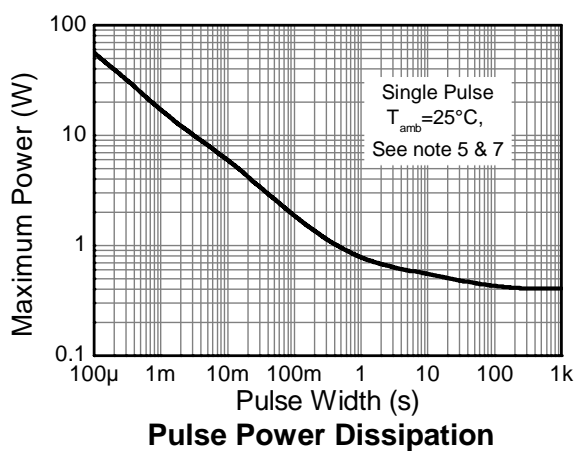
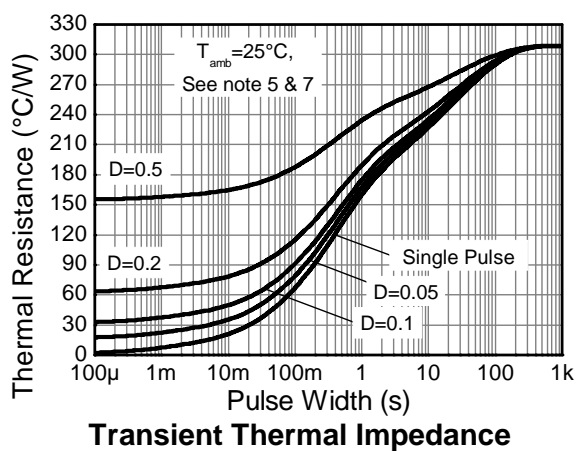
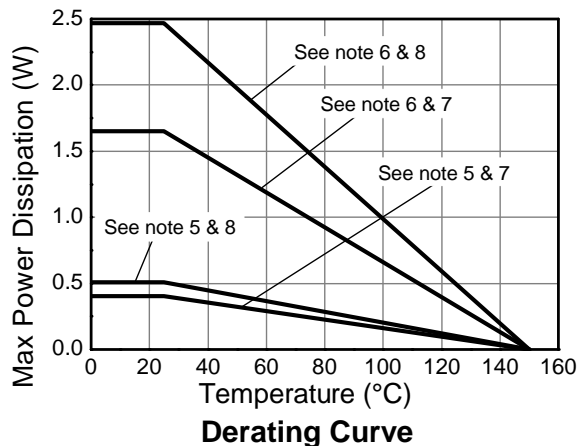
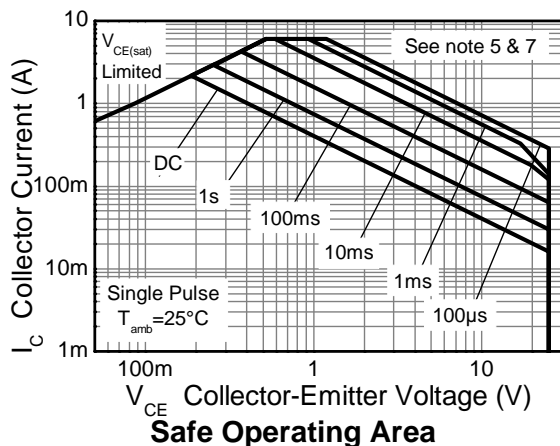
| Characteristic | | Symbol | Value | Unit |
|---|---------------|-----------------------------------|-------------|------|
| Power Dissipation | (Notes 5 & 7) | P _D | 405 | mW |
| | (Notes 5 & 8) | | 510 | |
| | (Notes 6 & 7) | | 1,650 | |
| | (Notes 6 & 8) | | 2,470 | |
| Thermal Resistance, Junction to Ambient | (Notes 5 & 7) | R _{θJA} | 308 | °C/W |
| | (Notes 5 & 8) | | 245 | |
| | (Notes 6 & 7) | | 76 | |
| | (Notes 6 & 8) | | 51 | |
| Thermal Resistance, Junction to Lead | (Note 9) | R _{θJL} | 18 | °C/W |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

ESD Ratings (Note 10)

| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge – Human Body Model | ESD HBM | 3,000 | V | 3A |
| Electrostatic Discharge – Machine Model | ESD MM | 200 | V | C |

- Notes:
- For a device mounted with the exposed collector pads on minimum recommended pad layout that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
 - Same as note (5), except the device is mounted with the collector pad on 28mm x 28mm (8cm²) 2oz copper.
 - For a dual device with one active die.
 - For dual device with 2 active die running at equal power.
 - Thermal resistance from junction to solder-point (on the exposed collector pads).
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating information

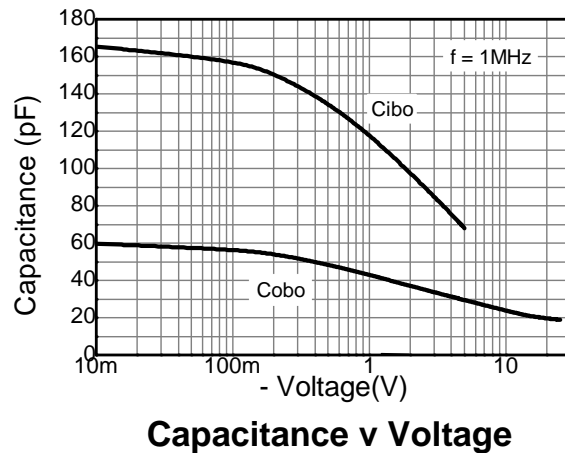
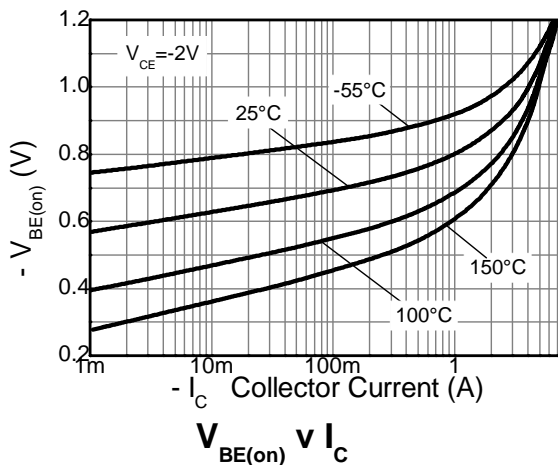
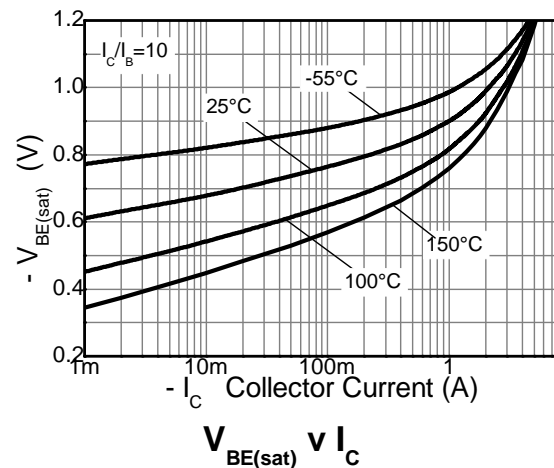
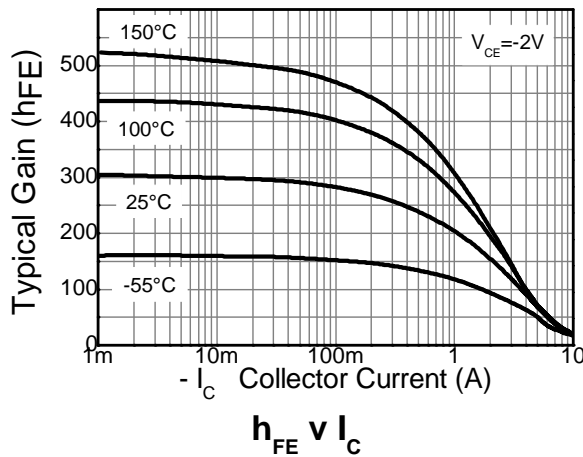
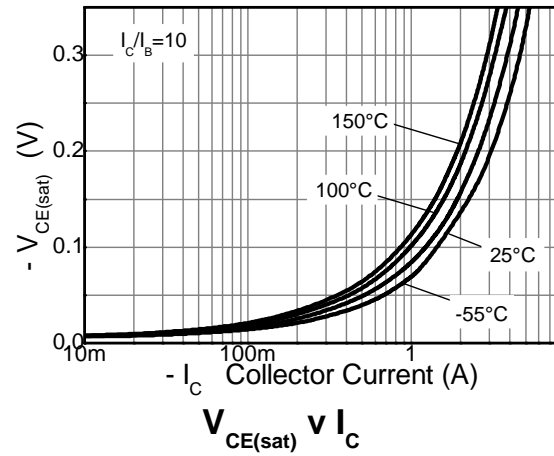
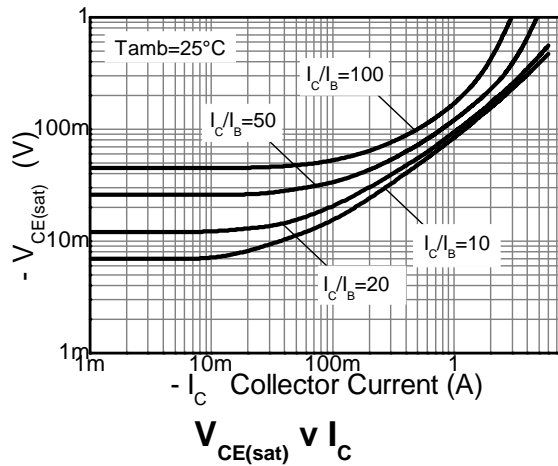


Typical Electrical Characteristics - BJT PNP (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|----------------------|-------------------------|-------------------------|--------------------|----------|---|
| Collector-Base Breakdown Voltage | BV _{CBO} | -35 | -60 | - | V | I _C = -100μA |
| Collector-Emitter Breakdown Voltage (Note 11) | BV _{CEO} | -25 | -40 | - | V | I _C = -10mA |
| Emitter-Base Breakdown Voltage | BV _{EBO} | -7 | -8.4 | - | V | I _E = -100μA |
| Collector Cutoff Current | I _{CBO} | - | <1 | -50 -0.5 | nA μA | V _{CB} = -28V V _{CB} = -28V, T _A = +100°C |
| Emitter Cutoff Current | I _{EBO} | - | <1 | -50 | nA | V _{EB} = -5.6V |
| Collector Emitter Cutoff Current | I _{CES} | - | - | -100 | nA | V _{CE} = -32V |
| Static Forward Current Transfer Ratio (Note 11) | h _{FE} | 200 130 100 25 | 320 230 180 50 | 500 - - - | - | I _C = -100mA, V _{CE} = -2V I _C = -1A, V _{CE} = -2V I _C = -2A, V _{CE} = -2V I _C = -6A, V _{CE} = -2V |
| Collector-Emitter Saturation Voltage (Note 11) | V _{CE(sat)} | - | -85 -229 | -150 -350 | mV | I _C = -1A, I _B = -100mA I _C = -3A, I _B = -300mA |
| Base-Emitter Turn-On Voltage (Note 11) | V _{BE(on)} | - | -786 | -850 | mV | I _C = -1A, V _{CE} = -5V |
| Base-Emitter Saturation Voltage (Note 11) | V _{BE(sat)} | - | -895 | -1,000 | mV | I _C = -1A, I _B = -100mA |

Note: 11. Measured under pulsed conditions. Pulse width ≤ 300 μs. Duty cycle ≤ 2%.

Typical Electrical Characteristics - BJT PNP (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



Typical Electrical Characteristics – MOS N-Channel (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|----------------------|-----|-------|------|------|---|
| OFF CHARACTERISTICS (Note 12) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 20 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | — | — | 100 | nA | V _{DS} = 20V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±1.0 | μA | V _{GS} = ±4.5V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 12) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 0.5 | — | 1.0 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS (ON)} | — | 0.3 | 0.4 | Ω | V _{GS} = 4.5V, I _D = 600mA |
| | | | 0.4 | 0.5 | | V _{GS} = 2.5V, I _D = 500mA |
| | | | 0.5 | 0.7 | | V _{GS} = 1.8V, I _D = 350mA |
| Forward Transfer Admittance | Y _{FS} | — | 1.4 | — | S | V _{DS} = 10V, I _D = 400mA |
| Diode Forward Voltage | V _{SD} | — | 0.7 | 1.2 | V | V _{GS} = 0V, I _D = 150mA |
| DYNAMIC CHARACTERISTICS (Note 13) | | | | | | |
| Input Capacitance | C _{iss} | — | 60.67 | — | pF | V _{DS} = 16V, V _{GS} = 0V f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 9.68 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 5.37 | — | pF | |
| Total Gate Charge | Q _G | — | 736.6 | — | pC | V _{GS} = 4.5V, V _{DS} = 10V, I _D = 250mA |
| Gate-to-Source Charge | Q _{GS} | — | 93.6 | — | pC | |
| Gate-to-Drain Charge | Q _{GD} | — | 116.6 | — | pC | |
| SWITCHING CHARACTERISTICS | | | | | | |
| Turn-On Delay Time | t _{d(on)} | — | 5.1 | — | ns | V _{DD} = 10V, V _{GS} = 4.5V, R _L = 47Ω, R _G = 10Ω, I _D = 200mA |
| Rise Time | t _r | — | 7.4 | — | | |
| Turn-Off Delay Time | t _{d(off)} | — | 26.7 | — | | |
| Fall Time | t _f | — | 12.3 | — | | |

Notes: 12. Short duration pulse test used to minimize self-heating effect.
13. Guaranteed by design. Not subject to production testing.

Typical Electrical Characteristics – MOS N-Channel (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

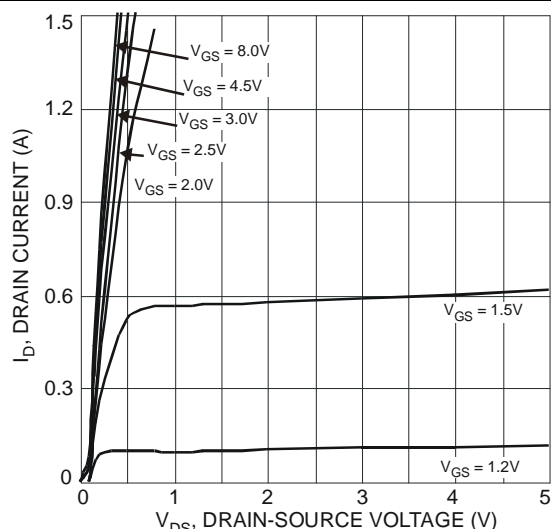


Fig. 1 Typical Output Characteristics

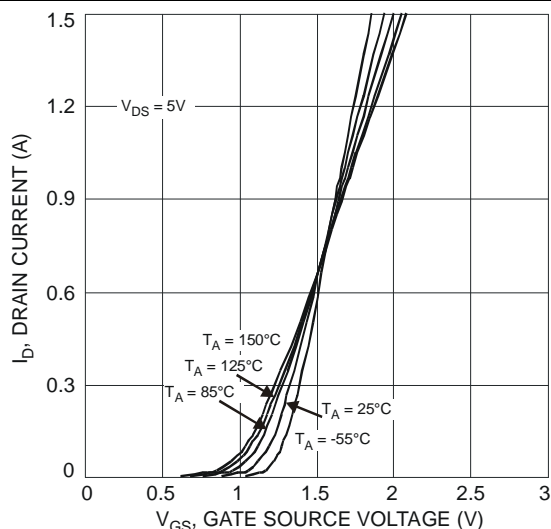


Fig. 2 Typical Transfer Characteristics

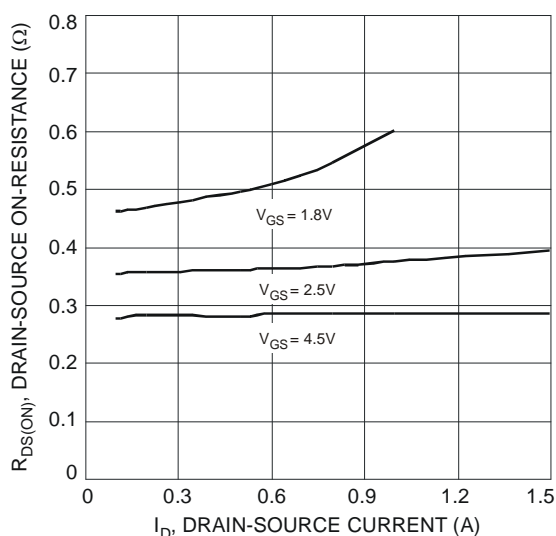


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

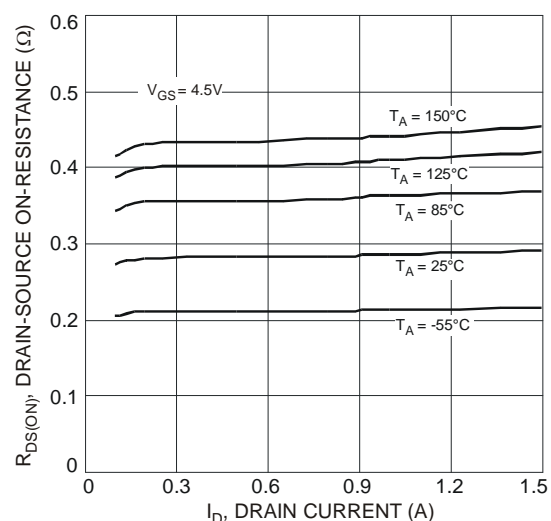


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

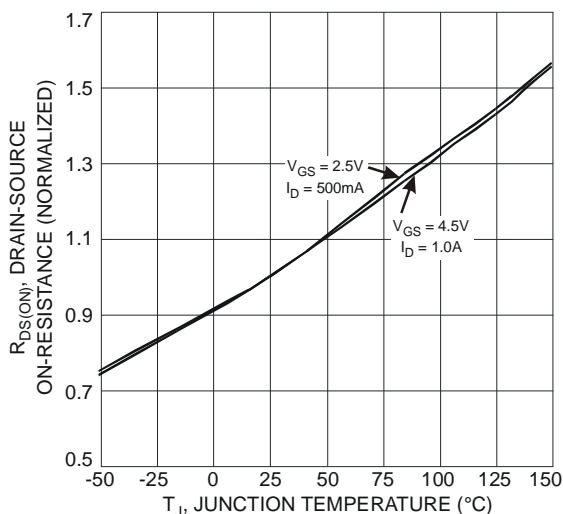


Fig. 5 On-Resistance Variation with Temperature

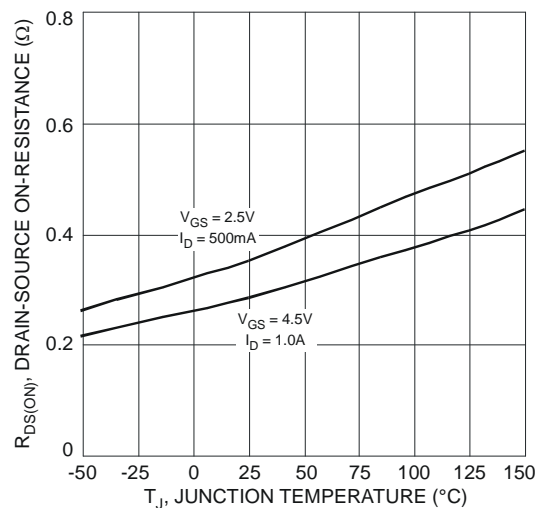


Fig. 6 On-Resistance Variation with Temperature

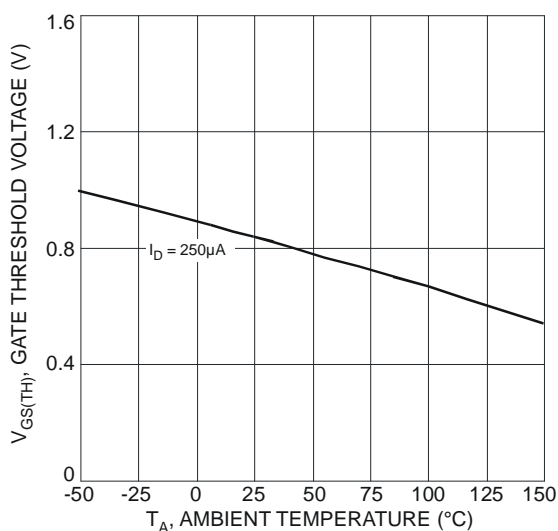


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

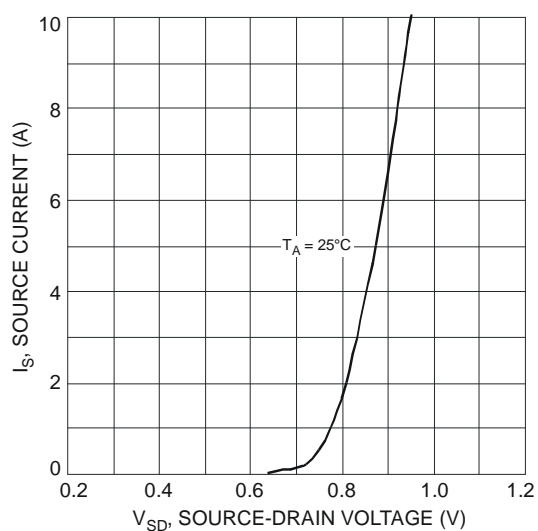


Fig. 8 Diode Forward Voltage vs. Current

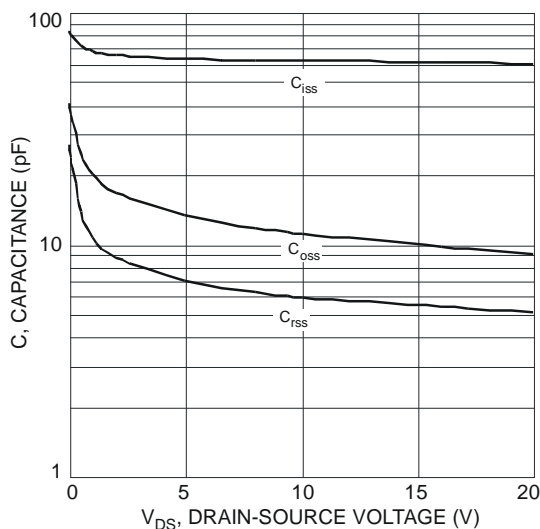


Fig. 9 Typical Capacitance

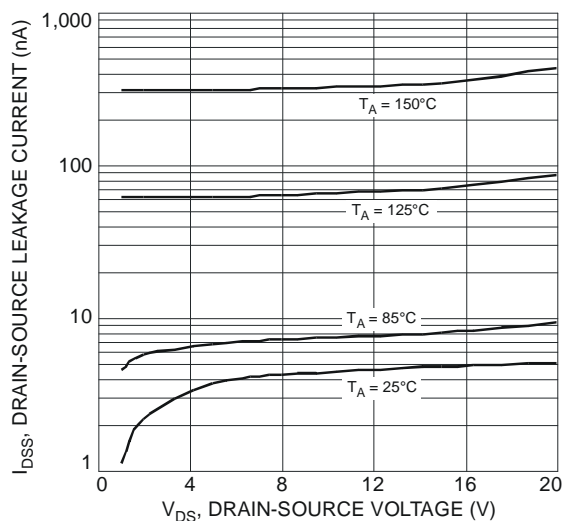


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

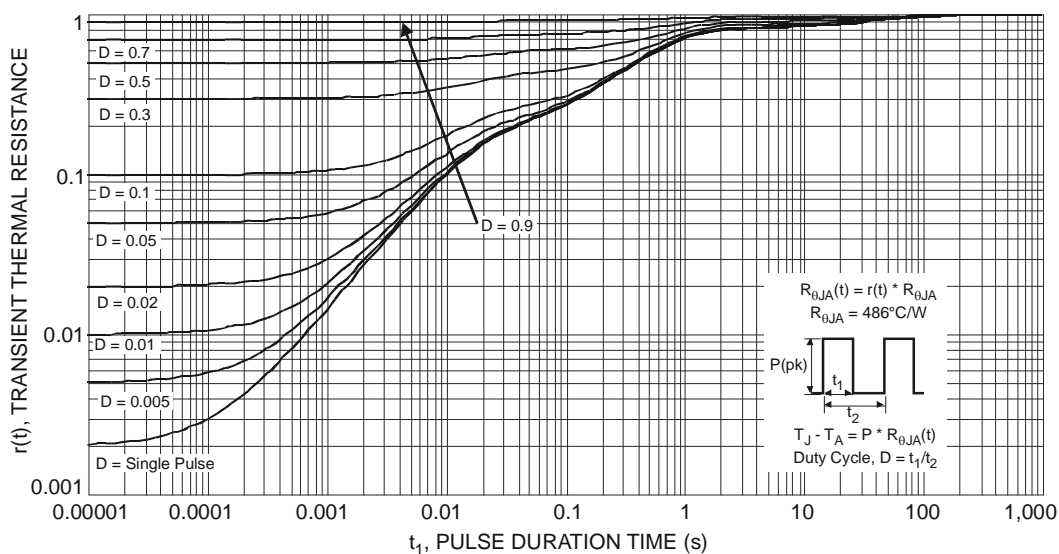
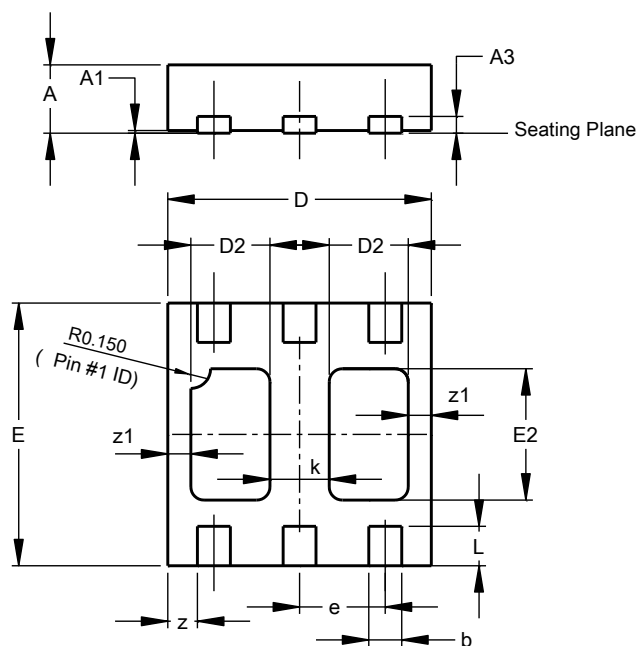


Fig. 11 Transient Thermal Response

Package Outline Dimensions

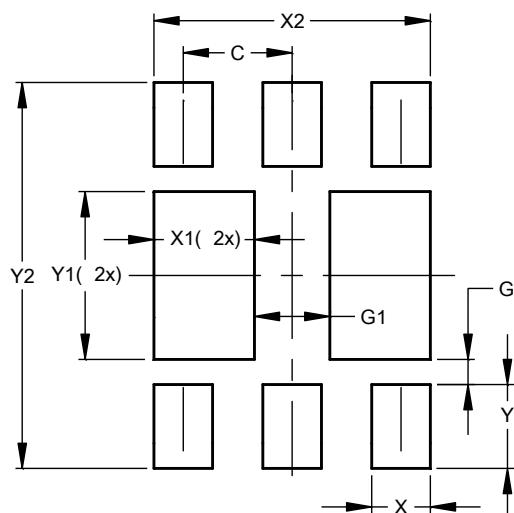
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



| U-DFN2020-6 Type B | | | |
|-----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.545 | 0.605 | 0.575 |
| A1 | 0.00 | 0.05 | 0.02 |
| A3 | - | - | 0.13 |
| b | 0.20 | 0.30 | 0.25 |
| D | 1.95 | 2.075 | 2.00 |
| D2 | 0.50 | 0.70 | 0.60 |
| e | - | - | 0.65 |
| E | 1.95 | 2.075 | 2.00 |
| E2 | 0.90 | 1.10 | 1.00 |
| k | - | - | 0.45 |
| L | 0.25 | 0.35 | 0.30 |
| z | - | - | 0.225 |
| z1 | - | - | 0.175 |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



| Dimensions | Value (in mm) |
|------------|------------------|
| C | 0.650 |
| G | 0.150 |
| G1 | 0.450 |
| X | 0.350 |
| X1 | 0.600 |
| X2 | 1.650 |
| Y | 0.500 |
| Y1 | 1.000 |
| Y2 | 2.300 |

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