

MOSFET - N-Channel Shielded Gate PowerTrench® 150 V, 15 mΩ, 61.3 A



ON Semiconductor®

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NVDS015N15MC

Features

- Shielded Gate MOSFET Technology
- Max $R_{DS(on)}$ = 15 mΩ at $V_{GS} = 10$ V, $I_D = 29$ A
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Primary Side for 48 V Isolated Bus
- SR for MV Secondary Applications

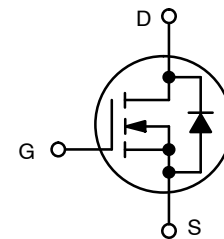
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | Symbol | Value | Unit | |
|--|---|---------------------------|------------------|---|
| Drain-to-Source Voltage | V_{DSS} | 150 | V | |
| Gate-to-Source Voltage | V_{GS} | ± 20 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | I_D 61.3 | A |
| | | $T_C = 100^\circ\text{C}$ | 43.4 | |
| Power Dissipation $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | P_D 107.1 | W |
| | | $T_C = 100^\circ\text{C}$ | 53.6 | |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | I_D 10.5 | A |
| | | $T_A = 100^\circ\text{C}$ | 7.4 | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | P_D 3.1 | W |
| | | $T_A = 100^\circ\text{C}$ | 1.6 | |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}$, $t_p = 10 \mu\text{s}$ | I_{DM} 382 | A | |
| Operating Junction and Storage Temperature Range | T_J , T_{stg} | -55 to +175 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | I_S | 89.3 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 4.4$ A) | E_{AS} | 1301 | mJ | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T_L | 260 | $^\circ\text{C}$ | |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

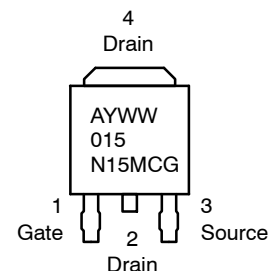
1. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | I_D MAX |
|---------------|------------------|-----------|
| 150 V | 15 mΩ @ 10 V | 61.3 A |



N-CHANNEL MOSFET

MARKING DIAGRAM



015N15MCG = Specific Device Code

A = Assembly Location

Y = Year

WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------------|----------------|-------------|
| NVDS015N15MCT4G | DPAK (Pb-Free) | 2500 / Tube |

†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.

NVDS015N15MC

THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Junction-to-Case – Steady State (Note 2) | $R_{\theta JC}$ | 1.4 | °C/W |
| Junction-to-Ambient – Steady State (Notes 1, 2) | $R_{\theta JA}$ | 47.9 | |

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

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|-------------------|--|---------------------------|----|-----------|---------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 150 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}$, ref to 25°C | | 83 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 120\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1.0 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 1.1 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--|------------------|--|-----|------|-----|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 162\ \mu\text{A}$ | 2.5 | | 4.5 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 162\ \mu\text{A}$, ref to 25°C | | -8.2 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 29\text{ A}$ | | 11.8 | 15 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS} = 10\text{ V}, I_D = 29\text{ A}$ | | 58 | | S |

CHARGES, CAPACITANCES & GATE RESISTANCE

| | | | | | | |
|------------------------------|--------------|---|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 75\text{ V}$ | | 2120 | | pF |
| Output Capacitance | C_{OSS} | | | 595 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 10.5 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}; I_D = 29\text{ A}$ | | 27 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 7 | | |
| Gate-to-Source Charge | Q_{GS} | | | 11 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 4 | | |
| Plateau Voltage | V_{GP} | | | 5.5 | | |

SWITCHING CHARACTERISTICS (Note 3)

| | | | | | | |
|---------------------|--------------|--|--|----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DD} = 75\text{ V}, I_D = 29\text{ A}, R_G = 6\ \Omega$ | | 16 | | ns |
| Rise Time | t_r | | | 5 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 21 | | |
| Fall Time | t_f | | | 4 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|----------|---|--------------------------|--|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 29\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.89 | 1.2 | V |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}$ $di_S/dt = 300\text{ A}/\mu\text{s}, I_S = 29\text{ A}$ | | | 49 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | | | 197 | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}$ $di_S/dt = 1000\text{ A}/\mu\text{s}, I_S = 29\text{ A}$ | | | 34 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | | | 345 | |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

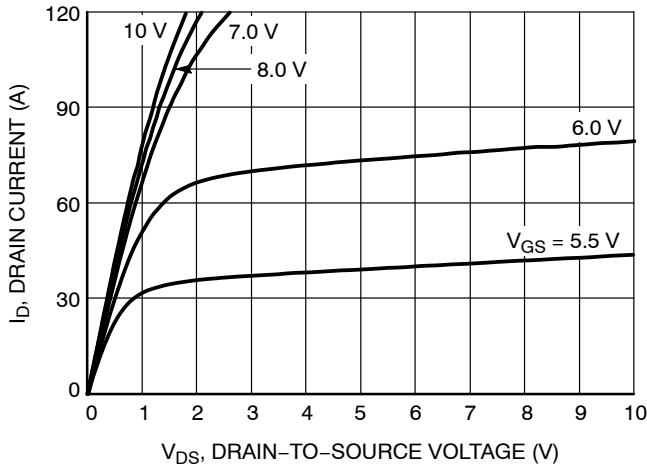


Figure 1. On-Region Characteristics

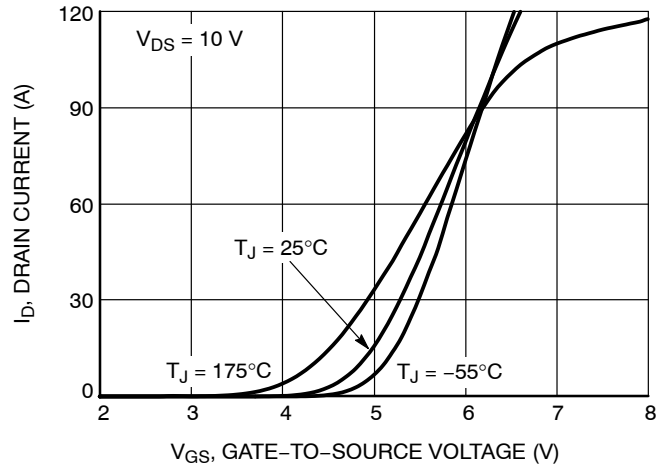


Figure 2. Transfer Characteristics

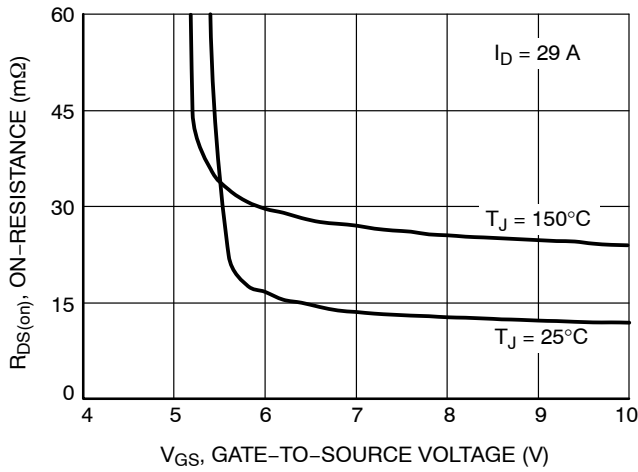


Figure 3. On-Resistance vs. Gate-to-Source Voltage

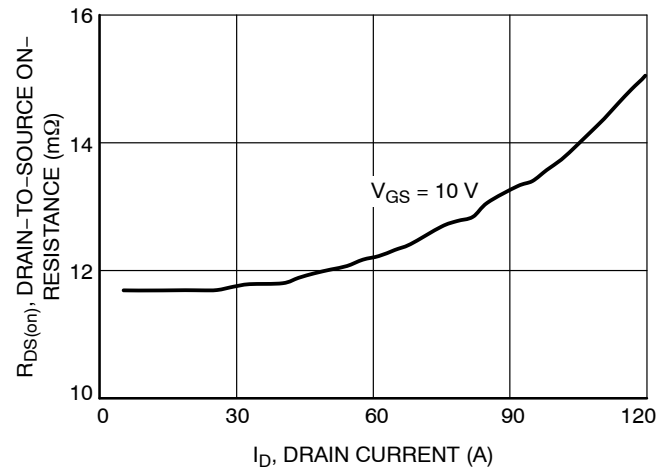


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

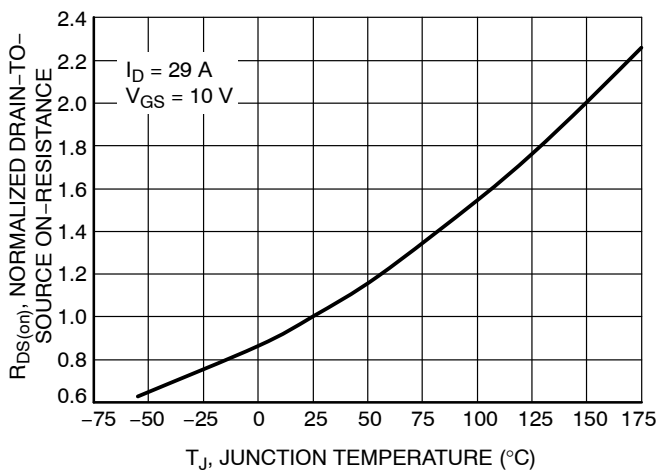


Figure 5. Normalized On-Resistance vs. Junction Temperature

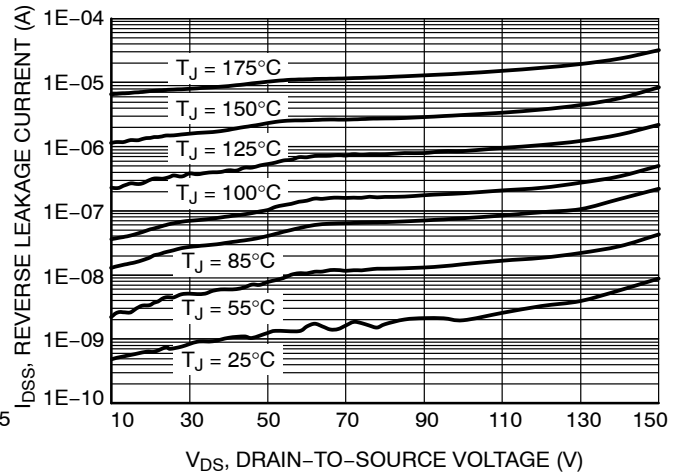


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

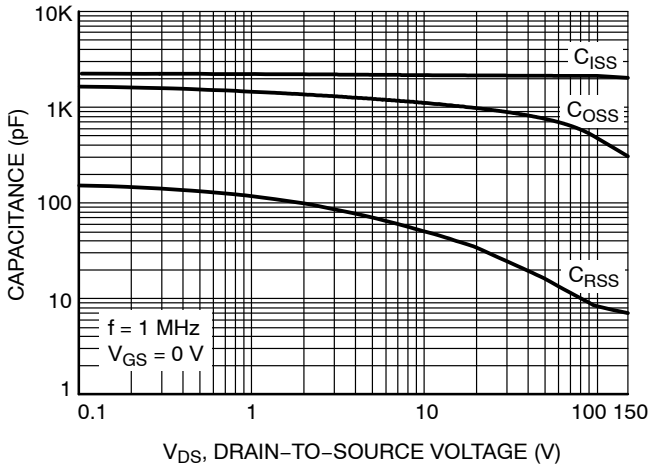


Figure 7. Capacitance vs. Drain-to-Source Voltage

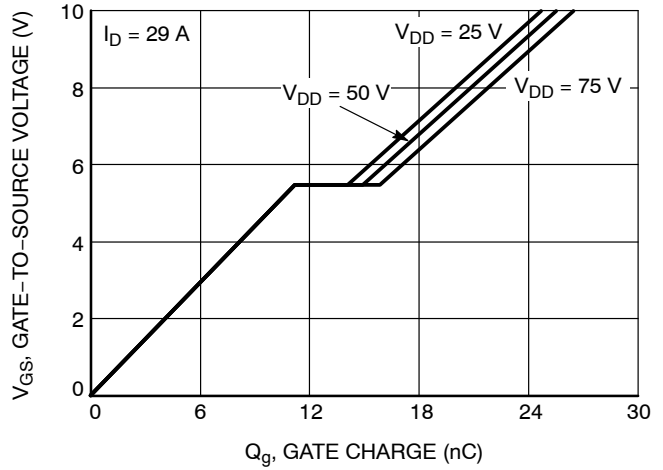


Figure 8. Gate Charge Characteristics

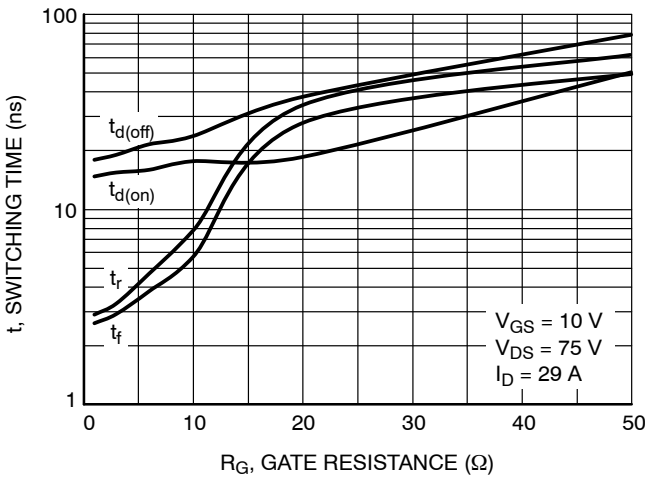


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

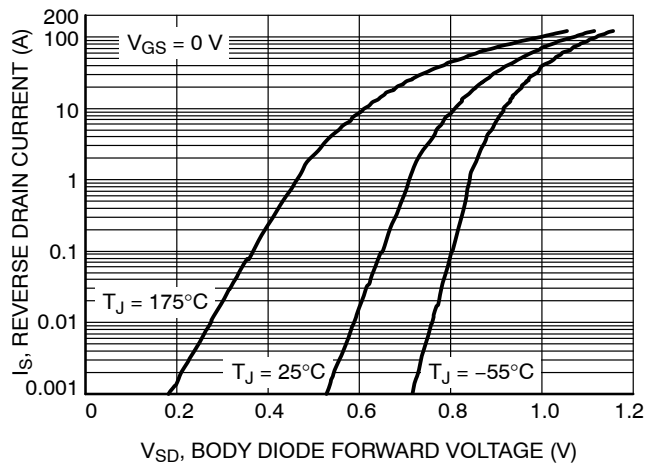


Figure 10. Source-to-Drain Diode Forward Voltage vs. Source Current

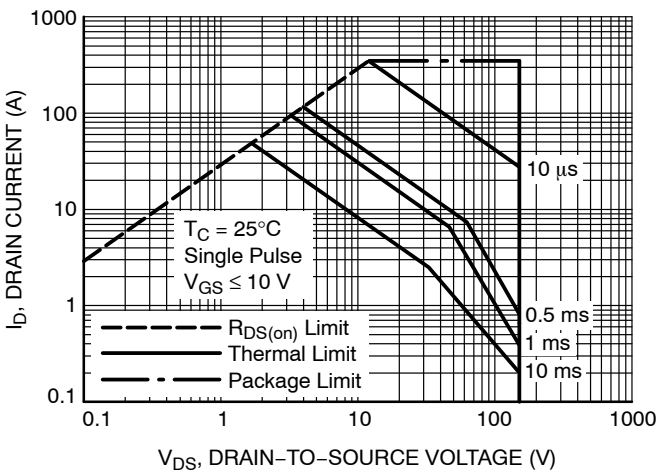


Figure 11. Forward Bias Safe Operating Area

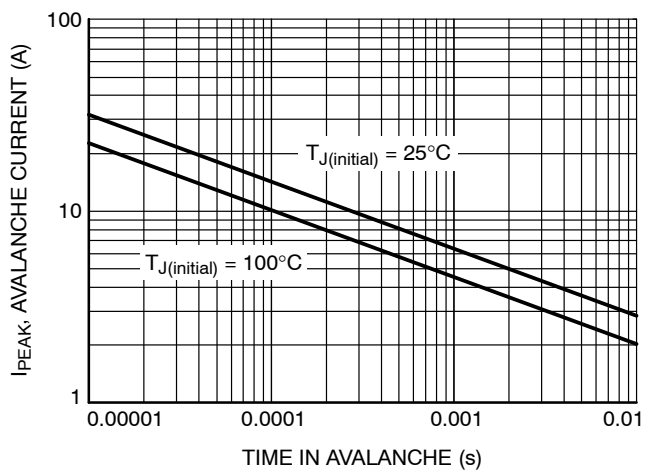


Figure 12. Unclamped Inductive Switching Capability

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TYPICAL CHARACTERISTICS

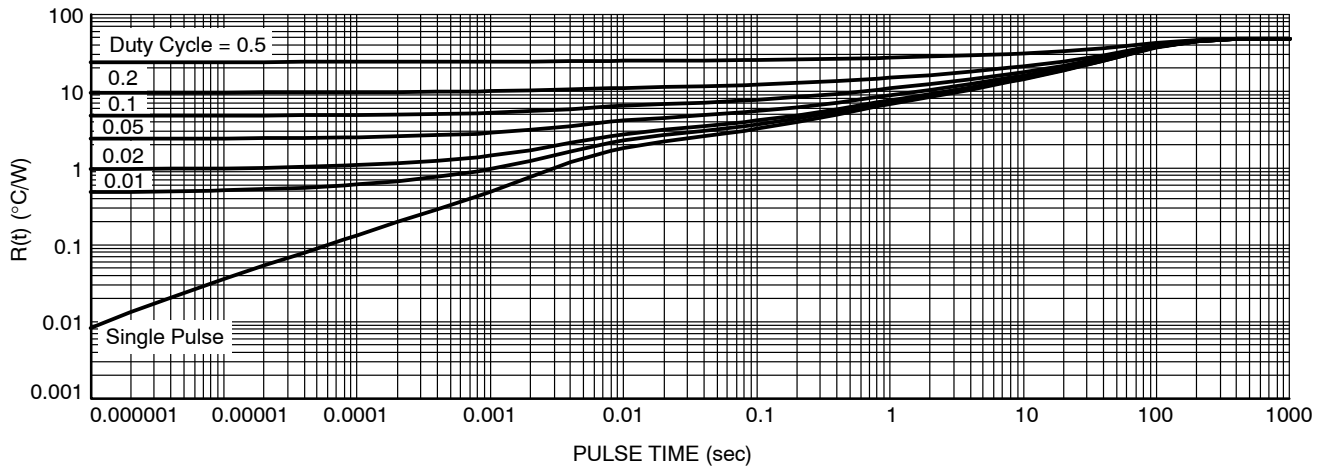
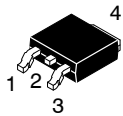


Figure 13. Transient Thermal Impedance

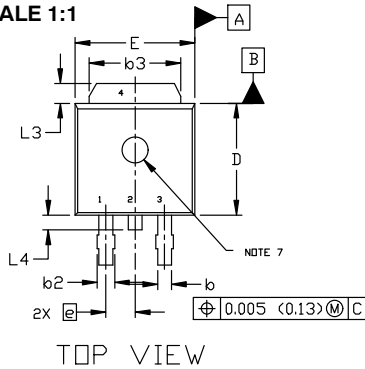
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



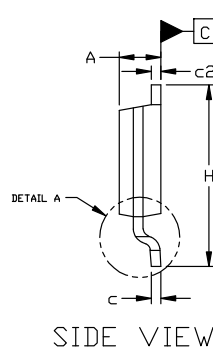
DPAK (SINGLE GAUGE) CASE 369C ISSUE G

DATE 31 MAY 2023

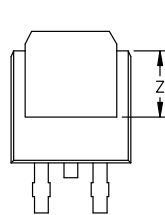
SCALE 1:1



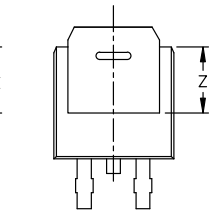
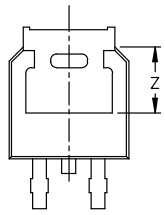
TOP VIEW



SIDE VIEW

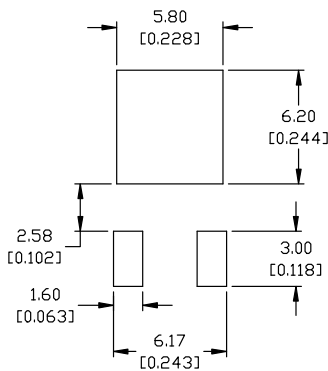


BOTTOM VIEW



BOTTOM VIEW

ALTERNATE CONSTRUCTIONS



RECOMMENDED MOUNTING FOOTPRINT*

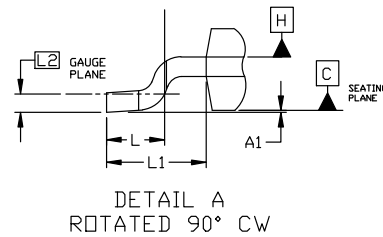
*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

- | | | | | |
|--|--|---|---|--|
| 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. CATHODE 2. ANODE 3. GATE 4. ANODE | STYLE 5: PIN 1. GATE 2. ANODE 3. CATHODE 4. ANODE |
| STYLE 6: PIN 1. MT1 2. MT2 3. GATE 4. MT2 | STYLE 7: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR | STYLE 8: PIN 1. N/C 2. CATHODE 3. ANODE 4. CATHODE | STYLE 9: PIN 1. ANODE 2. CATHODE 3. RESISTOR ADJUST 4. CATHODE | STYLE 10: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. ANODE |

NOTES:

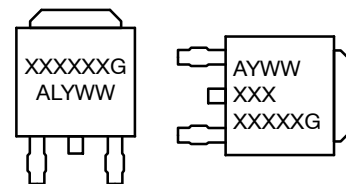
- DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994.
- CONTROLLING DIMENSION: INCHES
- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
- DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
- OPTIONAL MOLD FEATURE.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.086 | 0.094 | 2.18 | 2.38 |
| A1 | 0.000 | 0.005 | 0.00 | 0.13 |
| b | 0.025 | 0.035 | 0.63 | 0.89 |
| b2 | 0.028 | 0.045 | 0.72 | 1.14 |
| b3 | 0.180 | 0.215 | 4.57 | 5.46 |
| c | 0.018 | 0.024 | 0.46 | 0.61 |
| c2 | 0.018 | 0.024 | 0.46 | 0.61 |
| D | 0.235 | 0.245 | 5.97 | 6.22 |
| E | 0.250 | 0.265 | 6.35 | 6.73 |
| e | 0.090 | BSC | 2.29 | BSC |
| H | 0.370 | 0.410 | 9.40 | 10.41 |
| L | 0.055 | 0.070 | 1.40 | 1.78 |
| L1 | 0.114 | REF | 2.90 | REF |
| L2 | 0.020 | BSC | 0.51 | BSC |
| L3 | 0.035 | 0.050 | 0.89 | 1.27 |
| L4 | ---- | 0.040 | --- | 1.01 |
| Z | 0.155 | ---- | 3.93 | --- |



DETAIL A
ROTATED 90° CW

GENERIC MARKING DIAGRAM*



- IC**
 XXXXXX = Device Code
 A = Assembly Location
 L = Wafer Lot
 Y = Year
 WW = Work Week
 G = Pb-Free Package
- Discrete**
 AYWW
 XXX
 XXXXXG

*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.

| | | |
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