

MOSFET - N-Channel Shielded Gate PowerTrench® 150 V, 15 mΩ, 50 A

NTDS015N15MC

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
- 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) | I_D | 50 | A |
| Power Dissipation $R_{\theta JC}$ (Note 2) | | | |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | I_D | 11 | A |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | | | |
| Pulsed Drain Current | I_{DM} | 246 | A |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy ($I_L = 10$ A _{pk} , $L = 3$ mH) | E_{AS} | 150 | 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.

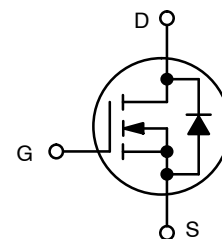
1. Surface-mounted on FR4 board using a 1 in², 2 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.



ON Semiconductor®

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| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | I_D MAX |
|---------------|------------------|-----------|
| 150 V | 15 mΩ @ 10 V | 50 A |

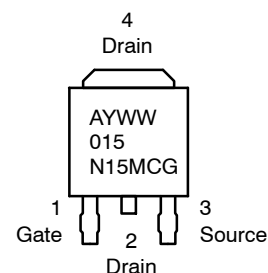


N-CHANNEL MOSFET



DPAK
CASE 369C

MARKING DIAGRAM



015N15MCG = Specific Device Code

A = Assembly Location

Y = Year

WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------------|----------------|-------------|
| NTDS015N15MCT4G | 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.

NTDS015N15MC

THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Junction-to-Case – Steady State (Note 2) | $R_{\theta JC}$ | 1.8 | °C/W |
| Junction-to-Ambient – Steady State (Notes 1, 2) | $R_{\theta JA}$ | 40 | |

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 |
| 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 |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 8\text{ V}, I_D = 15\text{ A}$ | | 12.6 | 16.8 | 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 | | |
| Gate-Resistance | R_G | | | 0.6 | 1.2 | Ω |
| 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 | | V |
| Output Charge | Q_{OSS} | $V_{DD} = 75\text{ V}, V_{GS} = 0\text{ V}$ | | 66 | | nC |

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 | | nC |
| 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 | | nC |

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

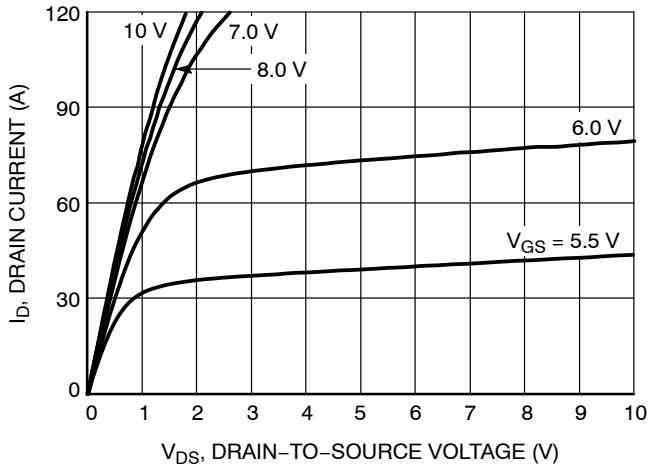


Figure 1. On-Region Characteristics

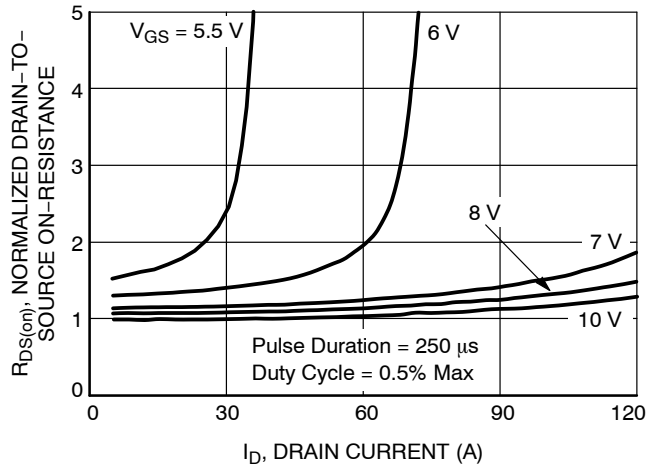


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

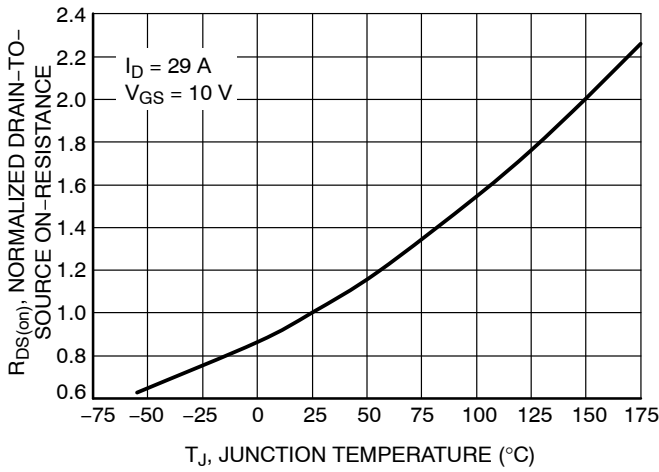


Figure 3. Normalized On-Resistance vs. Junction Temperature

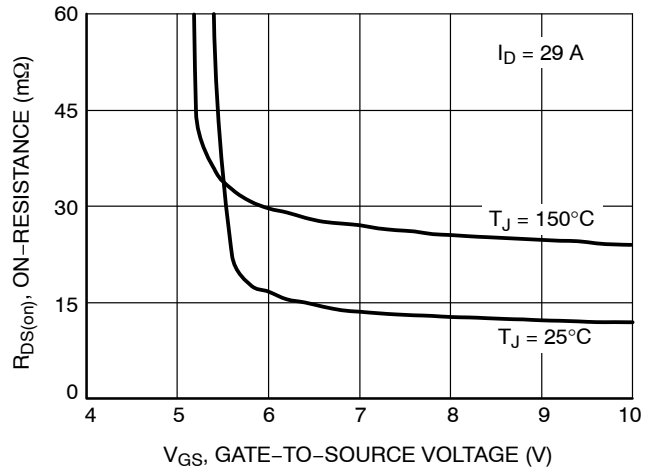


Figure 4. On-Resistance vs. Gate-to-Source Voltage

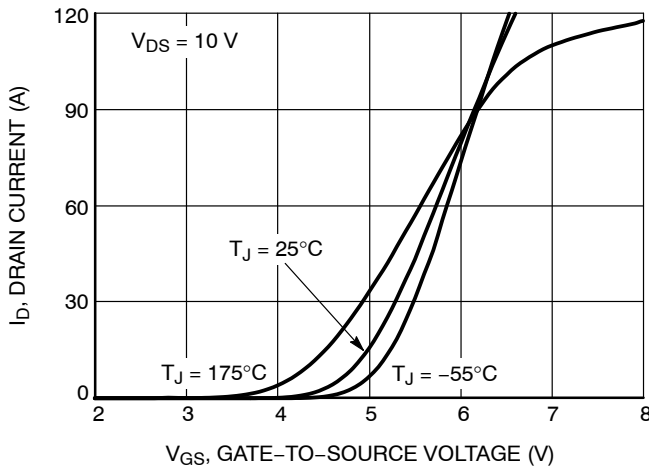


Figure 5. Transfer Characteristics

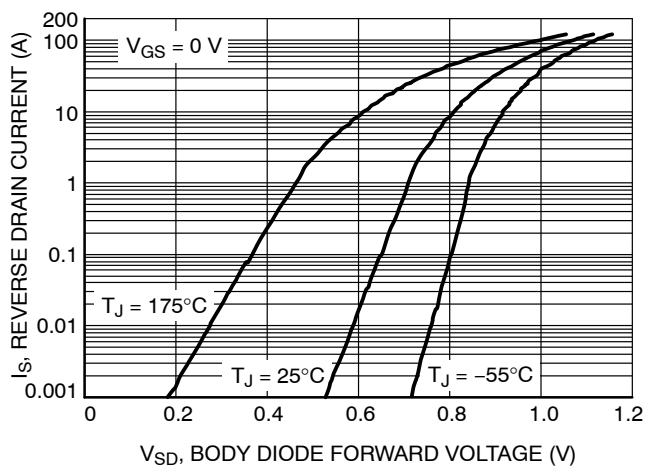


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

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TYPICAL CHARACTERISTICS

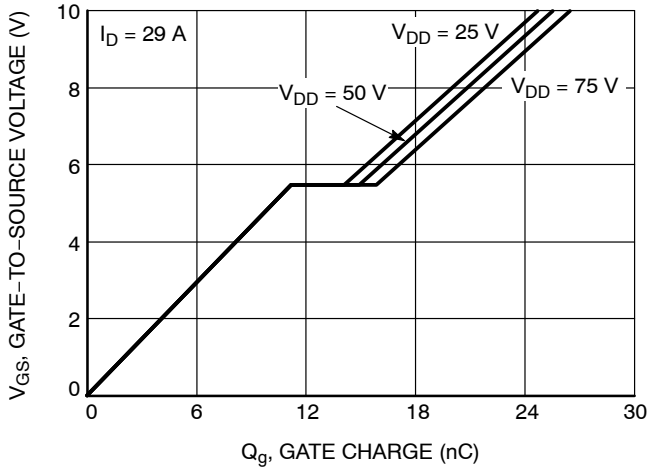


Figure 7. Gate Charge Characteristics

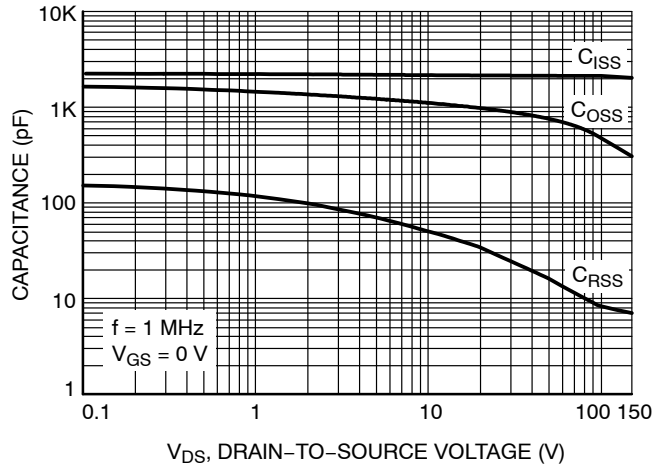


Figure 8. Capacitance vs. Drain-to-Source Voltage

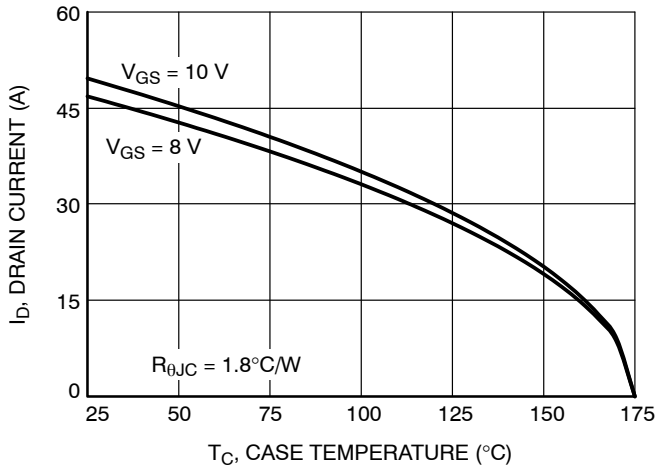


Figure 9. Drain Current vs. Case Temperature

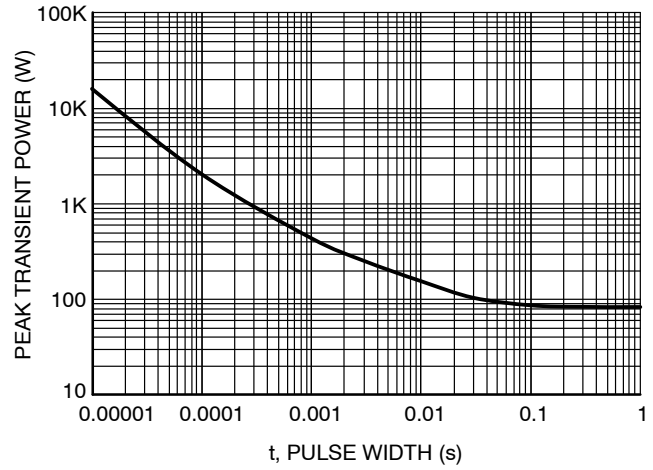


Figure 10. Peak Power

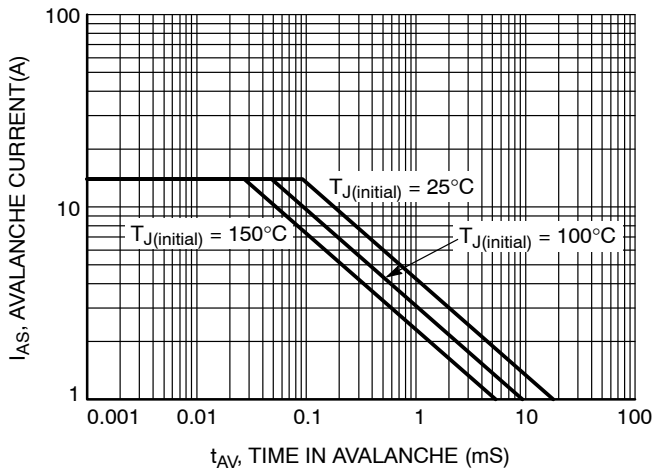


Figure 11. Unclamped Inductive Switching Capability

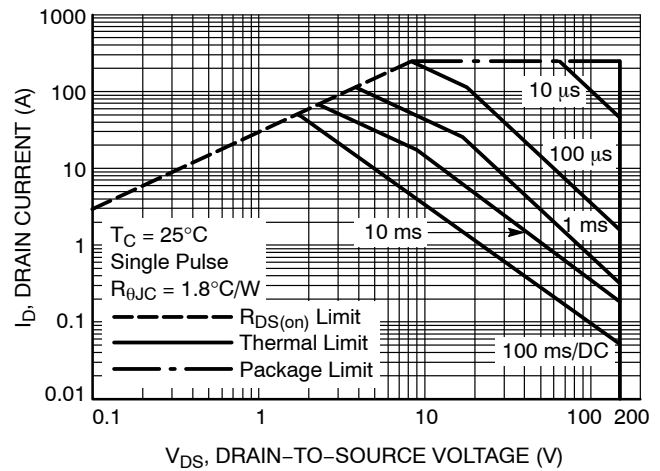


Figure 12. Forward Bias Safe Operating Area

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TYPICAL CHARACTERISTICS

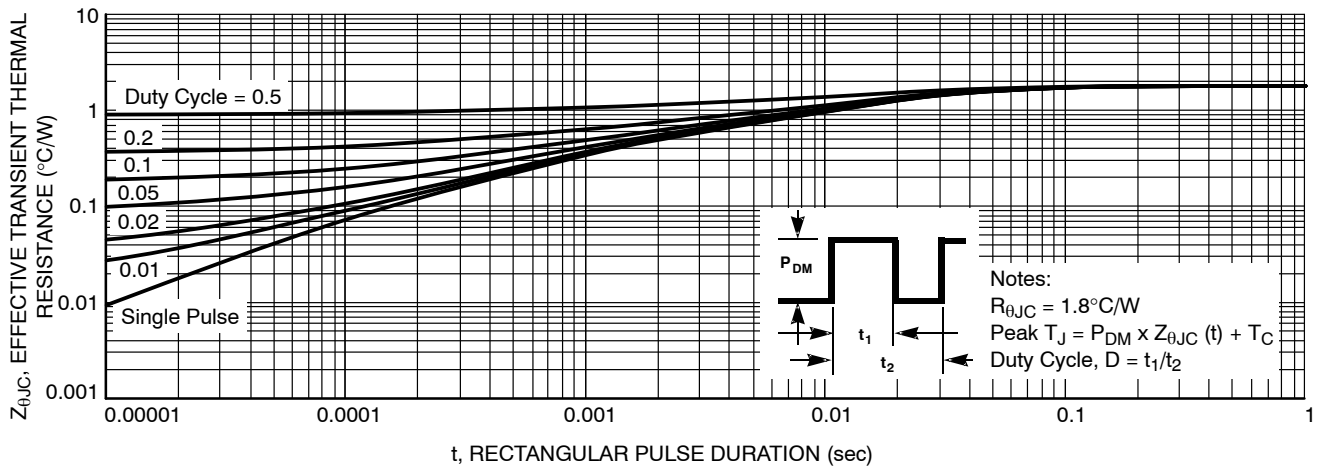
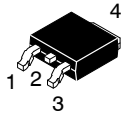


Figure 13. Transient Thermal Impedance

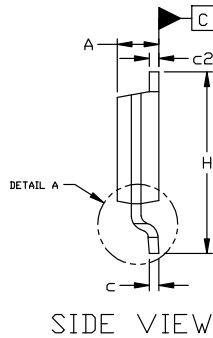
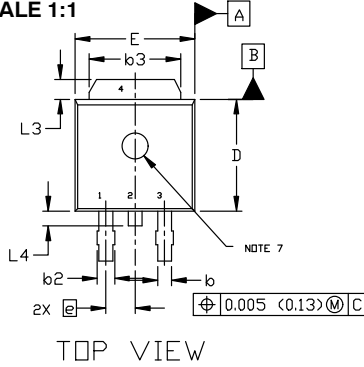
**MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS**



**DPAK (SINGLE GAUGE)
CASE 369C
ISSUE G**

DATE 31 MAY 2023

SCALE 1:1



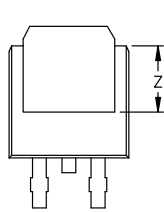
NOTES:

1. DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
4. 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.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

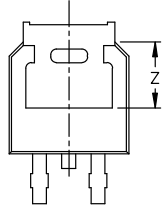
| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.086 | 0.094 | 2.18 | 2.38 |
| A1 | 0.000 | 0.005 | 0.00 | 0.13 |
| b | 0.025 | 0.035 | 0.63 | 0.89 |
| b2 | 0.028 | 0.045 | 0.72 | 1.14 |
| b3 | 0.180 | 0.215 | 4.57 | 5.46 |
| c | 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 | --- |

TOP VIEW

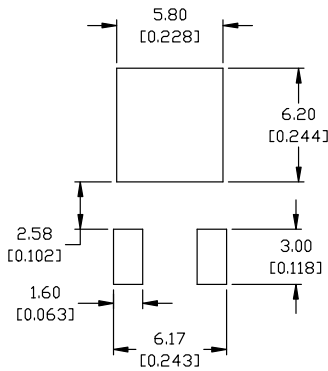
SIDE VIEW



BOTTOM VIEW



ALTERNATE CONSTRUCTIONS
BOTTOM VIEW



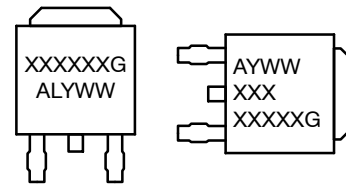
RECOMMENDED MOUNTING FOOTPRINT*

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

GENERIC MARKING DIAGRAM*



- | | |
|--------|---------------------|
| XXXXXX | = Device Code |
| A | = Assembly Location |
| L | = Wafer Lot |
| Y | = Year |
| WW | = Work Week |
| G | = Pb-Free Package |

*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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| DESCRIPTION: | DPAK (SINGLE GAUGE) | PAGE 1 OF 1 |

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