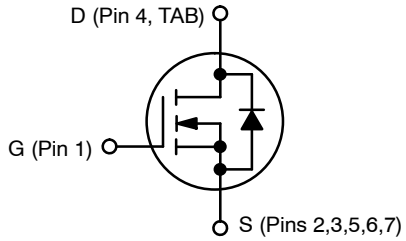
# MOSFET - Power, Single N-Channel, D²PAK7
## 150 V, 7 mΩ, 121 A

# NTBGS6D5N15MC

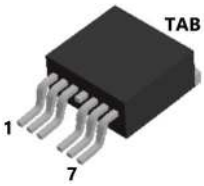
| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 150 V | 7 mΩ @ 10 V | 121 A |
| | 8.7 mΩ @ 8 V | |

### Features
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low $Q_G$ and Capacitance to Minimize Driver Losses
- Lowers Switching Noise/EMI
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications
- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation




**N−CHANNEL MOSFET**




**D²PAK7**
**CASE 418AY**

**MARKING DIAGRAM**


| | |
|---|---|
| NTBGS6D5N15 | = Specific Device Code |
| A | = Assembly Location |
| Y | = Year |
| WW | = Work Week |
| ZZ | = Assembly Lot Number |

**MAXIMUM RATINGS** ($T_J$ = 25°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°C | $I_D$ | 121 | A |
| Power Dissipation $R_{\theta JC}$ (Note 2) | | | $P_D$ | 238 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A$ = 25°C | $I_D$ | 15 | A |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | | | $P_D$ | 3.7 | W |
| Pulsed Drain Current | $T_A$ = 25°C, $t_p$ = 10 μs | | $I_{DM}$ | 1800 | A |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{stg}$ | −55 to +175 | °C |
| Source Current (Body Diode) | | | $I_S$ | 198 | A |
| Single Pulse Drain−to−Source Avalanche Energy ($I_L$ = 60 $A_{pk}$, L = 0.1 mH) | | | $E_{AS}$ | 180 | mJ |
| Lead Temperature for Soldering Purposes (1/8″ from case for 10 s) | | | $T_L$ | 260 | °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 $in^2$, 1 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.

**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| NTBGS6D5N15MC | D²PAK7 (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.

## THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Junction−to−Case − Steady State (Note 2) | $R_{\theta JC}$ | 0.6 | °C/W |
| Junction−to−Ambient − Steady State (Note 1, 2) | $R_{\theta JA}$ | 40 | |

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°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 V, $I_D$ = 250 μA | | 150 | | | V |
| Drain−to−Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D$ = 250 μA, ref to 25°C | | | 59.62 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 120 V | $T_J$ = 25°C | | | 1 | μA |
| | | | $T_J$ = 125°C | | | 10 | μA |
| Gate−to−Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | | ±100 | nA |
| **ON CHARACTERISTICS** (Note 3) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 379 μA | | 2.5 | 3.5 | 4.5 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D$ = 250 μA, ref to 25°C | | | −9.53 | | mV/°C |
| Drain−to−Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 69 A | | | 5.5 | 7 | mΩ |
| | | $V_{GS}$ = 8 V, $I_D$ = 34 A | | | 5.9 | 8.7 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 5 V, $I_D$ = 60.5 A | | | 88 | | S |
| Gate−Resistance | $R_G$ | $T_A$ = 25°C | | | 1.1 | | Ω |
| **CHARGES & CAPACITANCES** | | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 75 V, f = 1 MHz | | | 4745 | | pF |
| Output Capacitance | $C_{OSS}$ | | | | 1370 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | 10.3 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 75 V, $I_D$ = 69 A | | | 57 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 16 | | |
| Gate−to−Source Charge | $Q_{GS}$ | | | | 27 | | |
| Gate−to−Drain Charge | $Q_{GD}$ | | | | 7 | | |
| Output Charge | $Q_{OSS}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 75 V | | | 171 | | nC |
| **SWITCHING CHARACTERISTICS** (Note 4) | | | | | | | |
| Turn−On Delay Time | $t_{d(ON)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 75 V, $I_D$ = 69 A, $R_G$ = 6 Ω | | | 34 | | ns |
| Rise Time | $t_r$ | | | | 75 | | |
| Turn−Off Delay Time | $t_{d(OFF)}$ | | | | 39 | | |
| Fall Time | $t_f$ | | | | 6 | | |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 69 A | $T_J$ = 25°C | | 0.92 | 1.2 | V |
| | | | $T_J$ = 125°C | | 0.82 | | |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS}$ = 0 V, $dI_S/dt$ = 100 A/μs, $I_S$ = 69 A | | | 74 | | ns |
| Charge Time | $t_a$ | | | | 53 | | |
| Discharge Time | $t_b$ | | | | 22 | | |
| Reverse Recovery Charge | $Q_{RR}$ | | | | 141 | | 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. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

## TYPICAL CHARACTERISTICS

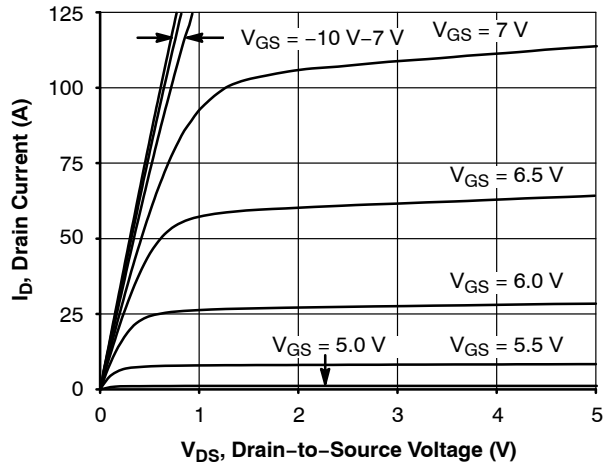



**Figure 1. On−Region Characteristics**

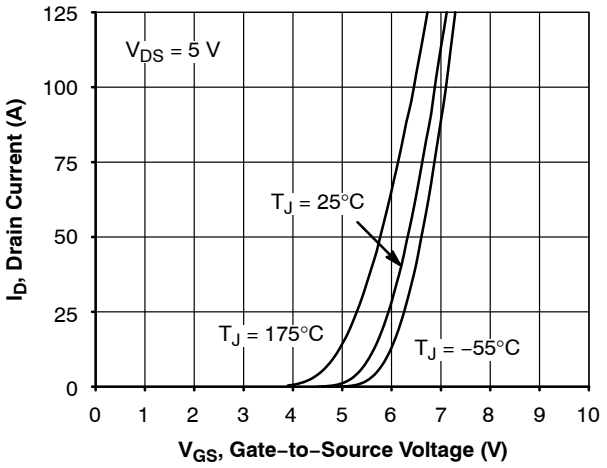



**Figure 2. Transfer Characteristics**

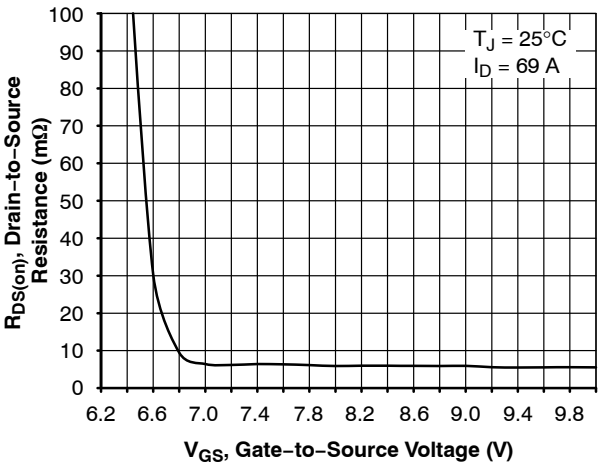



**Figure 3. On−Resistance vs. Gate−to−Source Voltage**

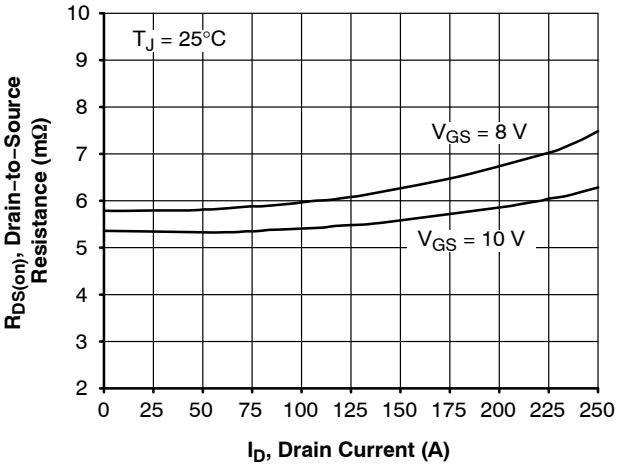



**Figure 4. On−Resistance vs. Drain Current and Gate Voltage**

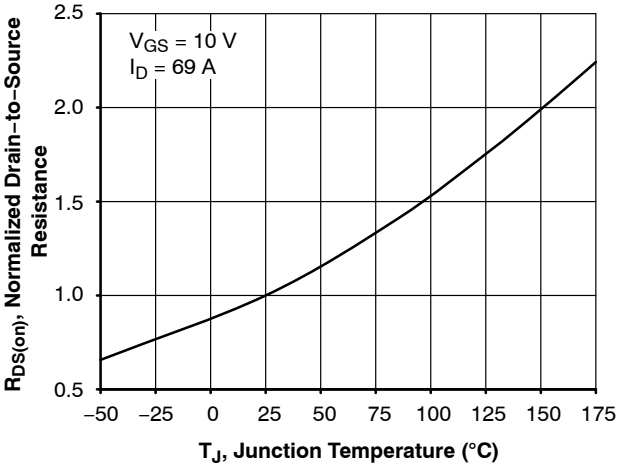



**Figure 5. On−Resistance Variation vs. Temperature**

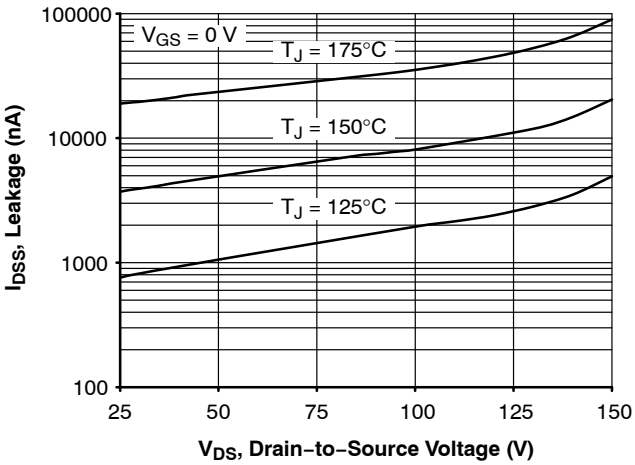



**Figure 6. Drain−to−Source Leakage Current vs. Voltage**

## TYPICAL CHARACTERISTICS (Continued)

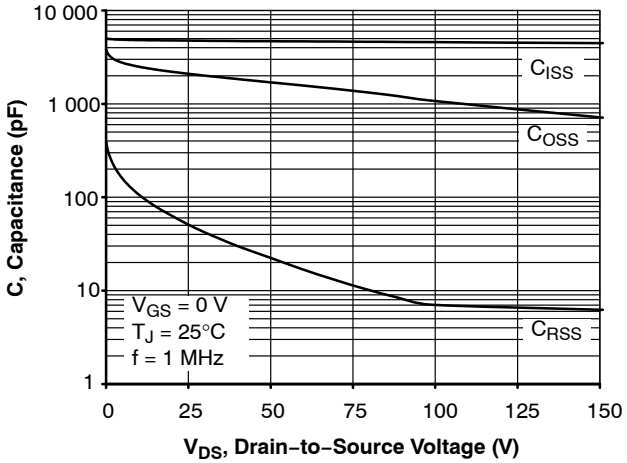



**Figure 7. Capacitance Variation**

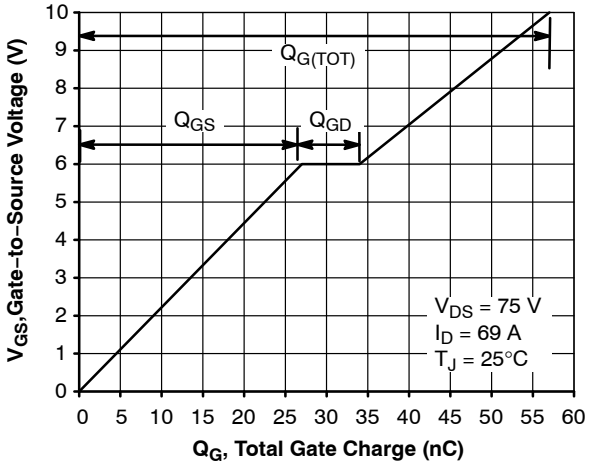



**Figure 8. Gate−to−Source vs. Total Charge**

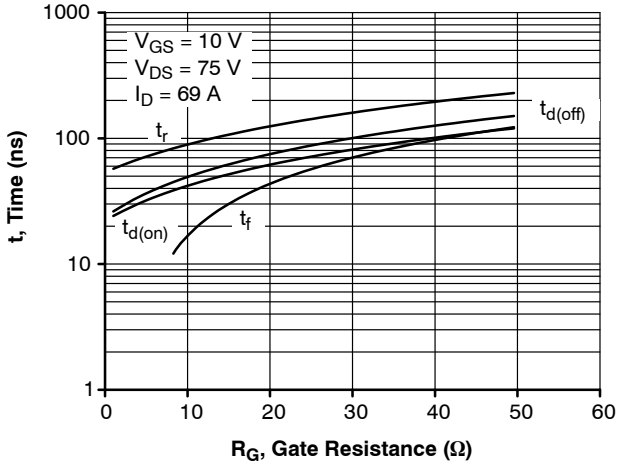



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

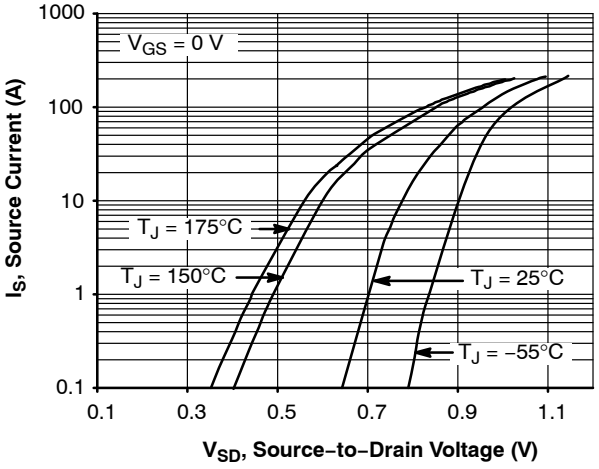



**Figure 10. Diode Forward Voltage vs. Current**

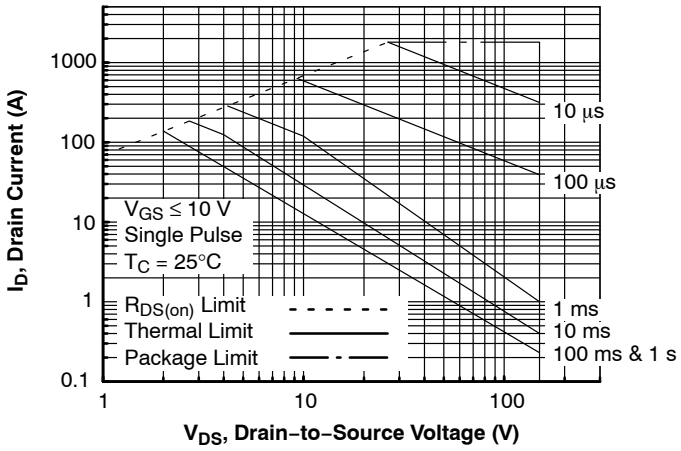



**Figure 11. Maximum Rated Forward Biased Safe Operating Area**

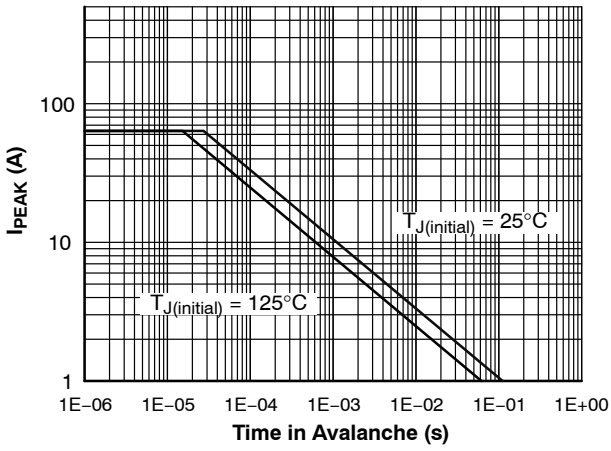



**Figure 12. Maximum Drain Current vs. Time in Avalanche**

## TYPICAL CHARACTERISTICS (Continued)

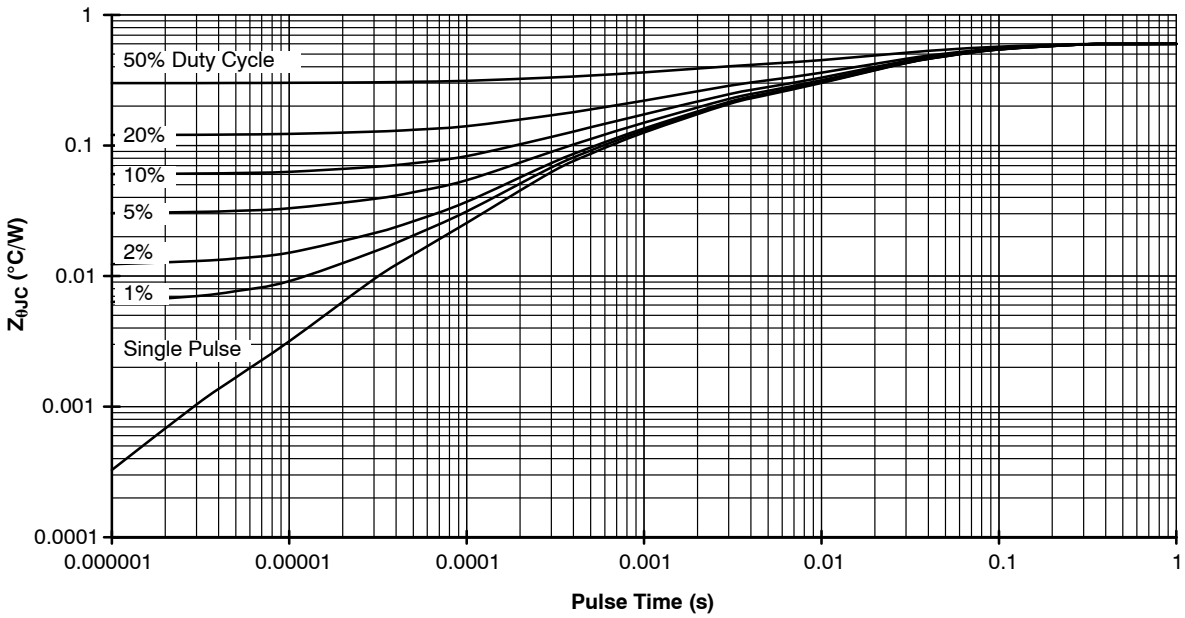


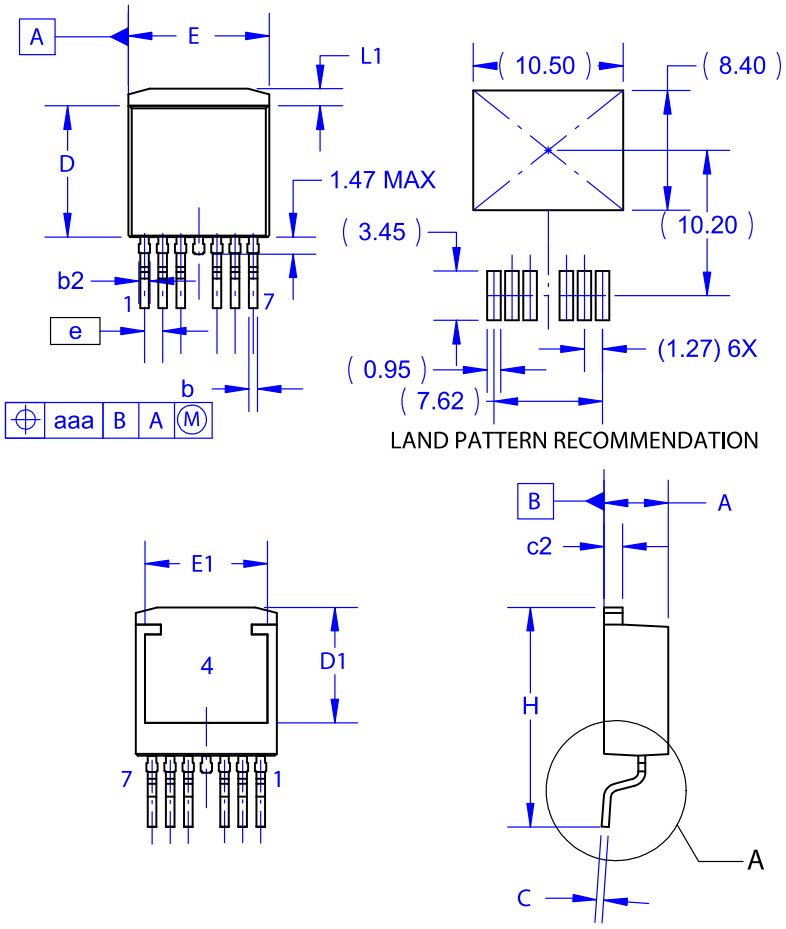

**Figure 13. Thermal Response**

# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

ON Semiconductor®

**D2PAK7 (TO−263 7 LD)**
CASE 418AY
ISSUE C

DATE 15 JUL 2019




NOTES:

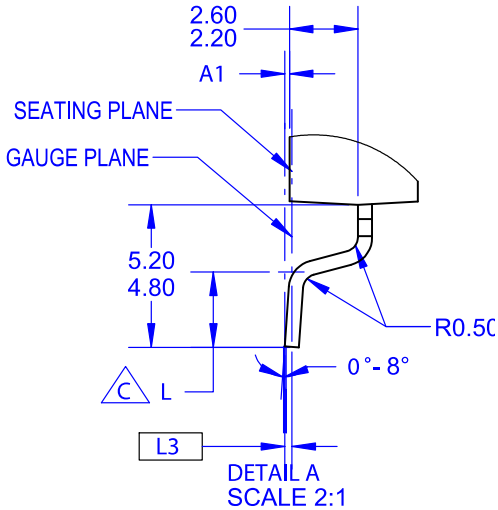
A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. OUT OF JEDEC STANDARD VALUE.
D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
F. LAND PATTERN RECOMMENDATION PER IPC. TO127P1524X465-8N.

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.30 | 4.50 | 4.70 |
| A1 | 0.00 | 0.10 | 0.20 |
| b2 | 0.70 | 0.80 | 0.90 |
| b | 0.50 | 0.60 | 0.70 |
| c | 0.40 | 0.50 | 0.60 |
| c2 | 1.20 | 1.30 | 1.40 |
| D | 9.00 | 9.20 | 9.40 |
| D1 | 7.70 | ~ | ~ |
| E | 9.70 | 9.90 | 10.20 |
| E1 | 8.38 | 8.58 | 8.78 |
| e | ~ | 1.27 | ~ |
| H | 15.10 | 15.40 | 15.70 |
| L | 2.44 | 2.64 | 2.84 |
| L1 | 1.00 | 1.20 | 1.40 |
| L3 | ~ | 0.25 | ~ |
| aaa | ~ | ~ | 0.25 |

### GENERIC MARKING DIAGRAM*


XXXX = Specific Device Code
A = Assembly Location
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:** | **D2PAK7 (TO−263 7 LD)** | **PAGE 1 OF 1** |

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