

# MOSFET - Single N-Channel

150 V, 4.1 mΩ, 185 A

## NVBGS4D1N15MC

### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- Lowers Switching Noise/EMI
- AEC-Q101 Qualified and PPAP Capable
- 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

**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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JC}$ (Note 2)	$I_D$	185	A
	$P_D$	316	W
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)	$I_D$	20	A
	$P_D$	3.7	W
Pulsed Drain Current	$I_{DM}$	2564	A
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	°C
Source Current (Body Diode)	$I_S$	263	A
Single Pulse Drain-to-Source Avalanche Energy ( $I_L = 81.5 \text{ A}_{pk}$ , $L = 0.1 \text{ mH}$ )	$E_{AS}$	332	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.

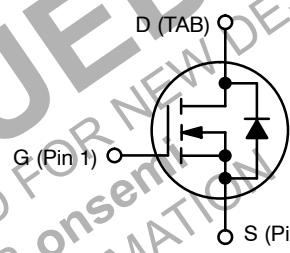
1. Surface-mounted on FR4 board using a 1 in<sup>2</sup>, 1 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

ON

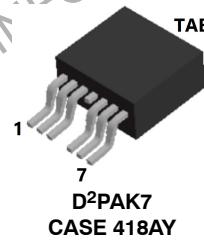
ON Semiconductor®

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$V_{(BR)DSS}$	$R_{DS(ON) \text{ MAX}}$	$I_D \text{ MAX}$
150 V	4.1 mΩ @ 10 V	185 A
	4.7 mΩ @ 8 V	



N-CHANNEL MOSFET



MARKING DIAGRAM



XXXX = Specific Device Code

A = Assembly Location

Y = Year

WW = Work Week

G = Pb-Free Package

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NVBGS4D1N15MC	D2PAK7 (Pb-Free)	800 / Tape & Reel

<sup>†</sup>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.

# NVBGS4D1N15MC

## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 2)	$R_{\theta JC}$	0.5	°C/W
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	40	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	150			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}/T_J}$	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		20.28		mV/°C
Zero Gate Voltage Drain Current	$I_{\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}$ , $V_{\text{DS}} = 120 \text{ V}$	$T_J = 25^\circ\text{C}$		1	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		10	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{\text{GSS}}$	$V_{\text{GS}} = \pm 20 \text{ V}$ , $V_{\text{DS}} = 0 \text{ V}$			$\pm 100$	nA

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}$ , $I_D = 574 \mu\text{A}$	2.5	3.5	4.5	V
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})/T_J}$	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		-10.21		mV/°C
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}$ , $I_D = 104 \text{ A}$		3.3	4.1	mΩ
		$V_{\text{GS}} = 8 \text{ V}$ , $I_D = 52 \text{ A}$		3.5	4.7	
Forward Transconductance	$g_{\text{FS}}$	$V_{\text{DS}} = 5 \text{ V}$ , $I_D = 90 \text{ A}$		10.9		S
Gate-Resistance	$R_G$	$T_A = 25^\circ\text{C}$		1.2		Ω

### CHARGES & CAPACITANCES

Input Capacitance	$C_{\text{ISS}}$	$V_{\text{GS}} = 0 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{\text{DS}} = 75 \text{ V}$		7285		pF
Output Capacitance	$C_{\text{OSS}}$			2025		
Reverse Transfer Capacitance	$C_{\text{RSS}}$			10.6		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 10 \text{ V}$ , $V_{\text{DS}} = 75 \text{ V}$ , $I_D = 104 \text{ A}$		88.9		nC
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			22.8		
Gate-to-Source Charge	$Q_{\text{GS}}$			37.5		
Gate-to-Drain Charge	$Q_{\text{GD}}$			13.0		
Output Charge	$Q_{\text{OSS}}$		$V_{\text{GS}} = 0 \text{ V}$ , $V_{\text{DS}} = 75 \text{ V}$	272		nC

### SWITCHING CHARACTERISTICS, $V_{\text{GS}} = 10 \text{ V}$ (Note 3)

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 10 \text{ V}$ , $V_{\text{DS}} = 75 \text{ V}$ , $I_D = 104 \text{ A}$ , $R_G = 6 \Omega$		49		ns
Rise Time	$t_r$			38		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			64		
Fall Time	$t_f$			10		

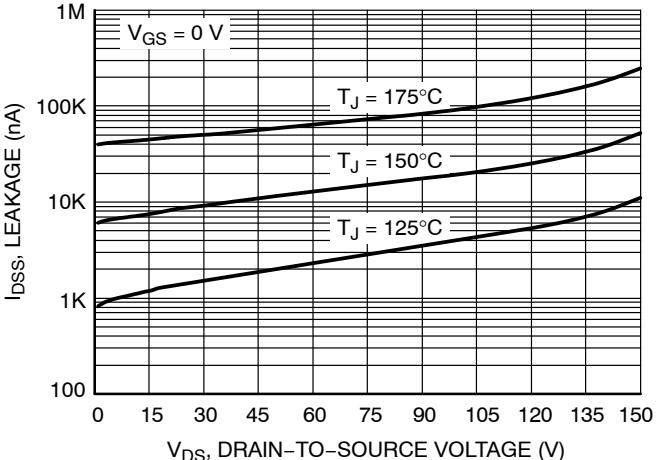
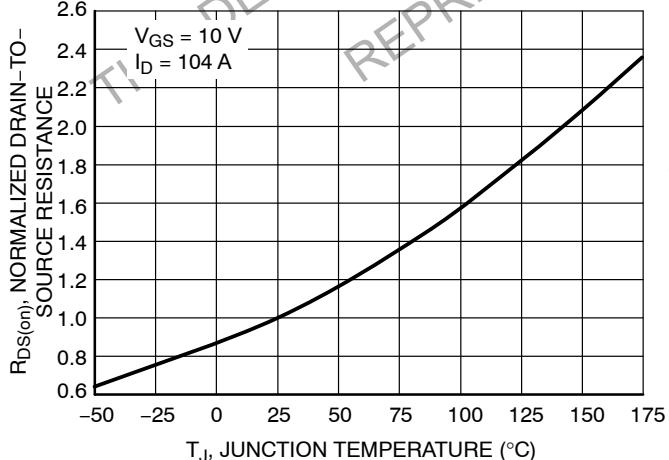
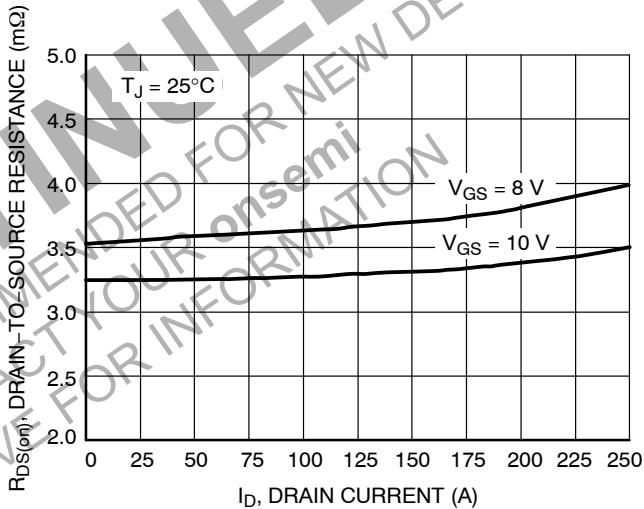
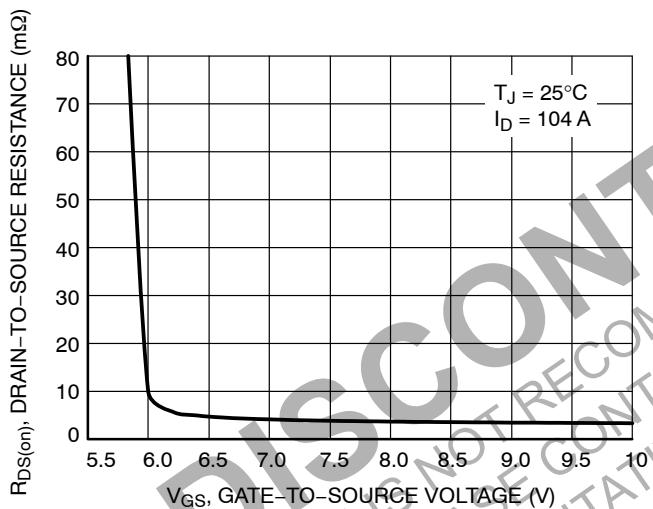
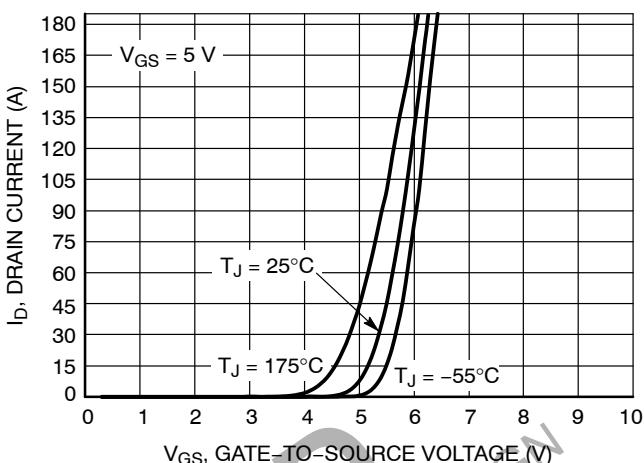
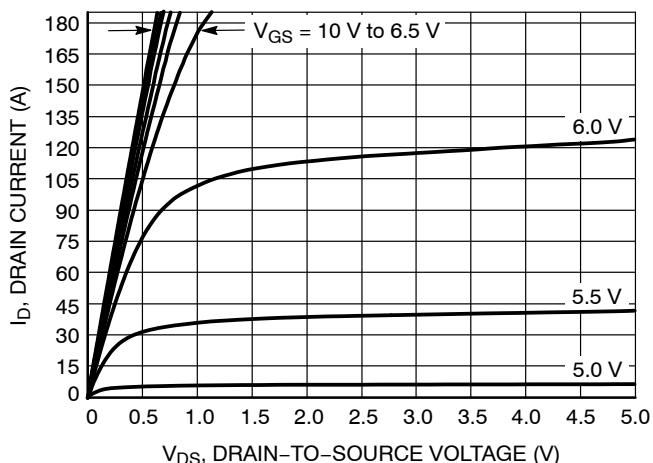
### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{\text{SD}}$	$V_{\text{GS}} = 0 \text{ V}$ , $I_S = 104 \text{ A}$ , $T_J = 25^\circ\text{C}$		0.88	1.2	V
		$V_{\text{GS}} = 0 \text{ V}$ , $I_S = 104 \text{ A}$ , $T_J = 125^\circ\text{C}$		0.79		
Reverse Recovery Time	$t_{\text{RR}}$	$V_{\text{GS}} = 0 \text{ V}$ , $I_S = 104 \text{ A}$ , $dI_S/dt = 100 \text{ A}/\mu\text{s}$		89		ns
Charge Time	$t_a$			47		
Discharge Time	$t_b$			42		
Reverse Recovery Charge	$Q_{\text{RR}}$			164		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 temperature

## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS

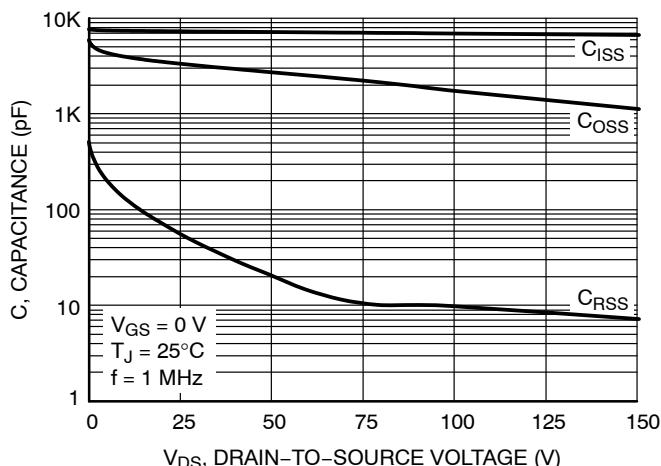


Figure 7. Capacitance Variation

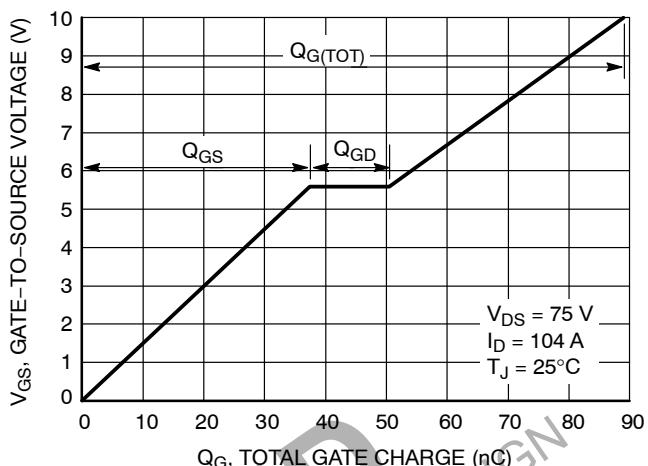


Figure 8. Gate-to-Source Voltage vs. Total Charge

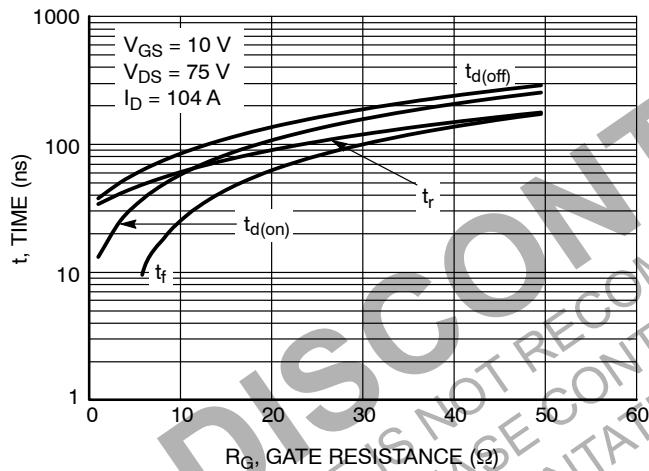


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

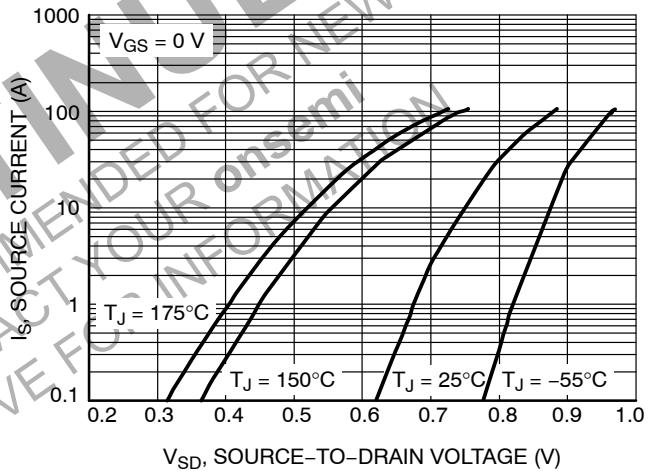


Figure 10. Diode Forward Voltage vs. Current

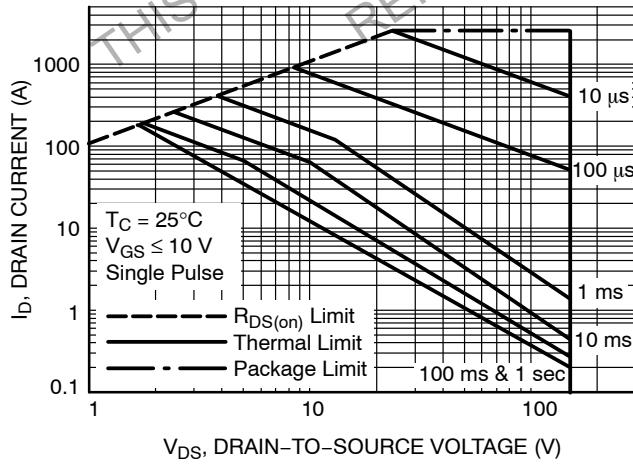


Figure 11. Maximum Rated Forward Biased Safe Operating Area

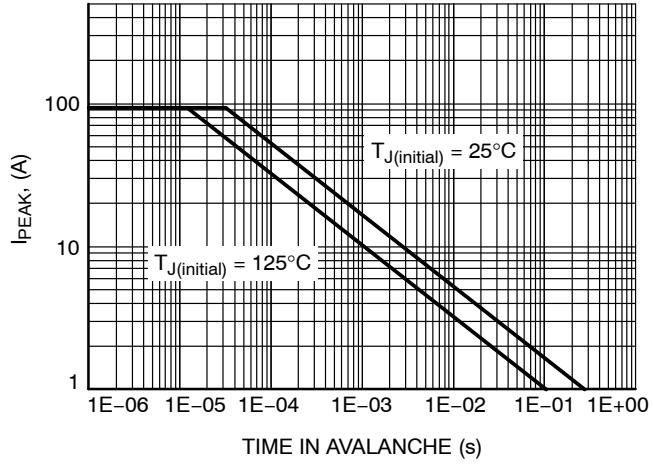


Figure 12. Maximum Drain Current vs. Time in Avalanche

## TYPICAL CHARACTERISTICS

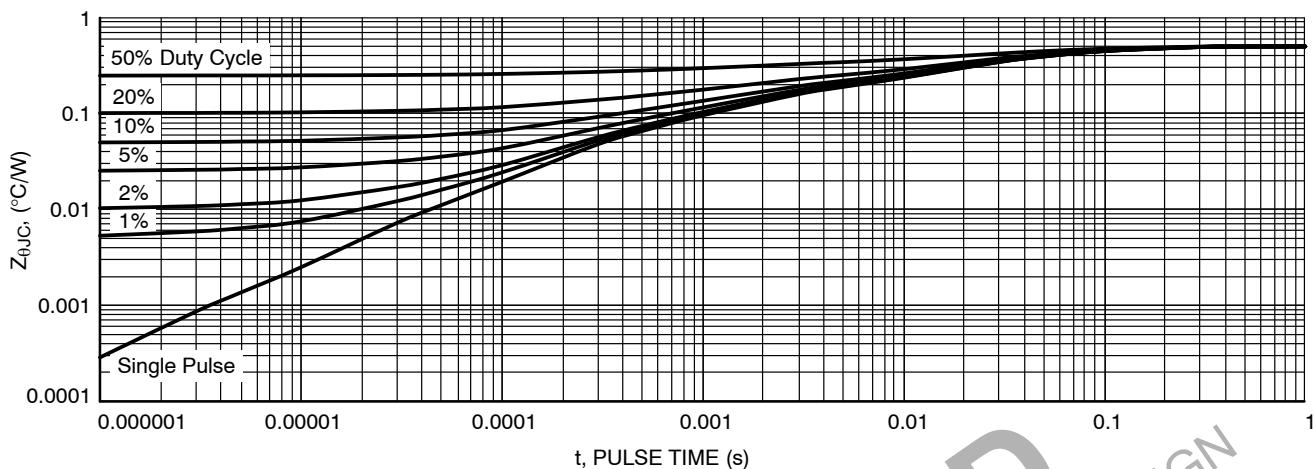
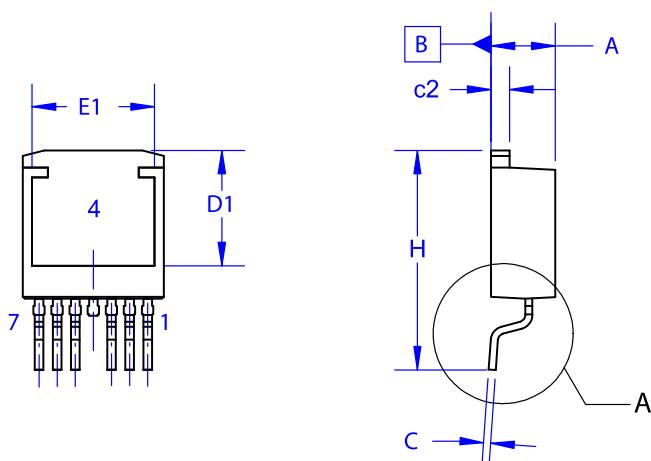
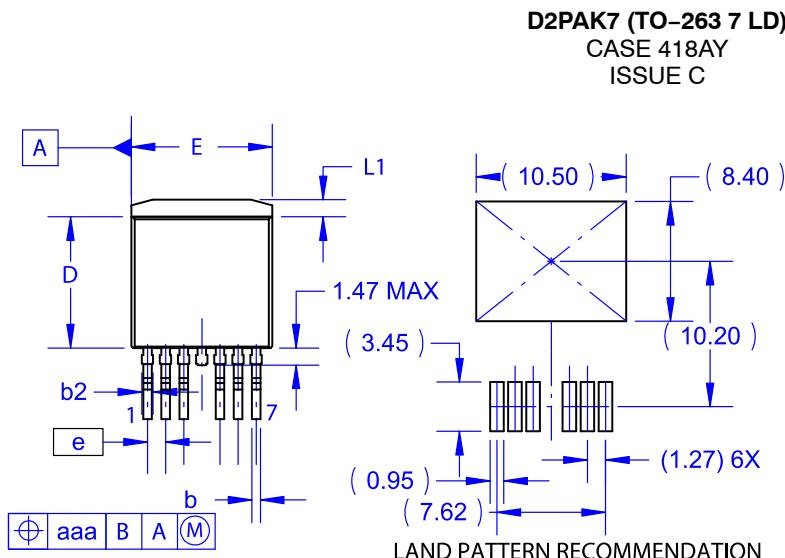


Figure 13. Thermal Response

**DISCONTINUED**  
THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
PLEASE CONTACT YOUR onsemi  
REPRESENTATIVE FOR INFORMATION



**GENERIC  
MARKING DIAGRAM\***



XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

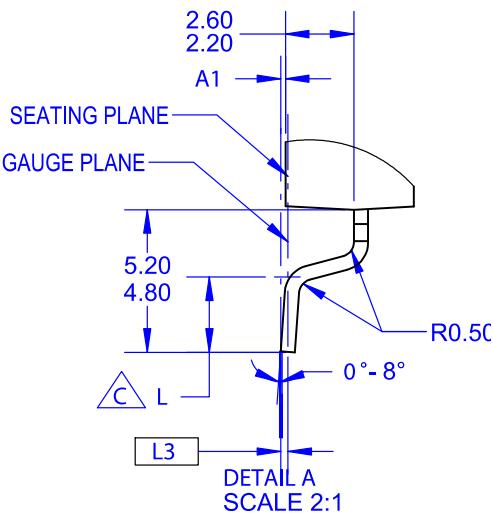
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

DATE 15 JUL 2019

NOTES:

- A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- △ 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



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