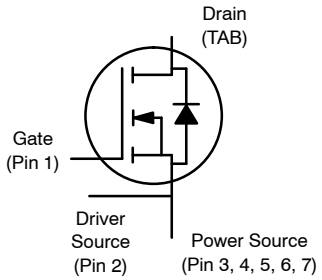
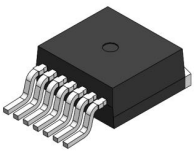
Silicon Carbide (SiC) MOSFET – EliteSiC, 960 mohm, 1700 V, M1, D2PAK-7L

NTBG1000N170M1

$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX
1700 V	960 mΩ @ 20 V	4.3 A



N−CHANNEL MOSFET



D2PAK−7L
CASE 418BJ

Features

- Typ. $R_{DS(on)}$ = 960 mΩ
- Ultra Low Gate Charge (typ. $Q_{G(tot)}$ = 14 nC)
- Low Effective Output Capacitance (typ. C_{oss} = 11 pF)
- 100% Avalanche Tested
- RoHS Compliant

Typical Applications

- Solar Inverters
- Electric Vehicle Charging Stations
- Electric Storing Systems
- SMPS (Switch Mode Power Supplies)
- UPS (Uninterruptible Power Supplies)

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	1700	V
Gate−to−Source Voltage			V_{GS}	−15/+25	V
Recommended Operation Values of Gate−to−Source Voltage		T_C < 175°C	V_{GSop}	−5/+20	V
Continuous Drain Current (Note 2)	Steady State	T_C = 25°C	I_D	4.3	A
Power Dissipation (Note 2)	Steady State	T_C = 25°C	P_D	51	W
Continuous Drain Current (Note 2)	Steady State	T_C = 100°C	I_D	3.0	A
Power Dissipation (Note 2)	Steady State	T_C = 100°C	P_D	25	W
Pulsed Drain Current (Note 3)		T_C = 25°C	I_{DM}	14.6	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode) (Note 2)			I_S	10	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = 6.9 A, L = 1 mH) (Note 4)			E_{AS}	24	mJ
Maximum Temperature for Soldering (10 s)			T_L	270	°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 a FR−4 board using1 in2 pad of 2 oz copper.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
3. Repetitive rating, limited by max junction temperature.
4. E_{AS} of 24 mJ is based on starting T_J = 25°C; L = 1 mH, I_{AS} = 6.9 A, V_{DD} = 120 V, V_{GS} = 18 V.

MARKING DIAGRAM

A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability
BG1000N170M1 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping†
NTBG1000N170M1	D2PAK−7L	800 ea/ Tape&Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Typ	Max	Unit
Junction−to−Case − Steady State (Note 2)	$R_{\theta JC}$	2.9	−	°C/W
Junction−to−Ambient − Steady State (Notes 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 = 1 mA		1700	−	−	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 1 mA, referenced to 25°C		−	0.5	−	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 1700 V	T_J = 25°C	−	−	100	μA
			T_J = 175°C	−	−	1	mA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = +25/−15 V, V_{DS} = 0 V		−	−	±1	μA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 640 μA		1.8	3.2	4.3	V
Recommended Gate Voltage	V_{GOP}			−5	−	+20	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 20 V, I_D = 2 A, T_J = 25°C		−	960	1430	mΩ
		V_{GS} = 20 V, I_D = 2 A, T_J = 175°C		−	1824	−	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 2 A (Note 6)		−	0.6	−	S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 1000 V (Note 6)		−	150	−	pF
Output Capacitance	C_{OSS}			−	11	−	
Reverse Transfer Capacitance	C_{RSS}			−	0.6	−	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −5/20 V, V_{DS} = 800 V, I_D = 2 A (Note 6)		−	14	−	nC
Threshold Gate Charge	$Q_{G(TH)}$			−	1.5	−	
Gate−to−Source Charge	Q_{GS}			−	2.6	−	
Gate−to−Drain Charge	Q_{GD}			−	7.5	−	
Gate−Resistance	R_G	f = 1 MHz		−	5.7	−	Ω
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −5/20 V, V_{DS} = 800 V, I_D = 2 A, R_G = 25 Ω, L = 300 μH Inductive load (Notes 5, 6)		−	6	−	ns
Rise Time	t_r			−	18	−	
Turn−Off Delay Time	$t_{d(OFF)}$			−	11	−	
Fall Time	t_f			−	55	−	
Turn−On Switching Loss	E_{ON}			−	59	−	μJ
Turn−Off Switching Loss	E_{OFF}			−	11	−	
Total Switching Loss	E_{tot}			−	70	−	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Continuous Drain−Source Diode Forward Current (Note 2)	I_{SD}	V_{GS} = −5 V, T_J = 25°C (Note 6)		−	−	10	A
Pulsed Drain−Source Diode Forward Current (Note 3)	I_{SDM}			−	−	50	
Forward Diode Voltage	V_{SD}	V_{GS} = −5 V, I_{SD} = 2 A, T_J = 25°C		−	4.2	−	V
Reverse Recovery Time	t_{RR}	V_{GS} = −5/20 V, I_{SD} = 2 A, dI_S/dt = 1000 A/μs (Note 6)		−	5.9	−	ns
Reverse Recovery Charge	Q_{RR}			−	11	−	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.

5. E_{ON}/E_{OFF} result is with body diode.
6. Defined by design, not subject to production test.

TYPICAL CHARACTERISTICS

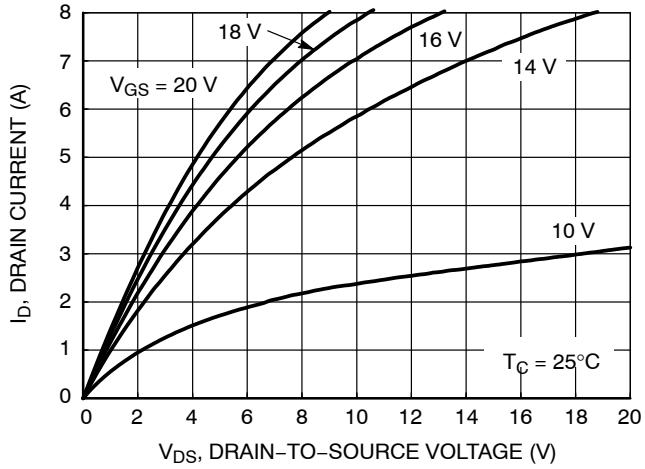


Figure 1. On−Region Characteristics

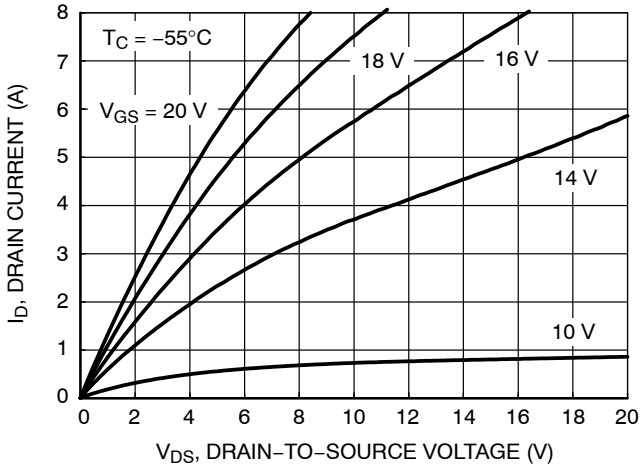


Figure 2. On−Region Characteristics

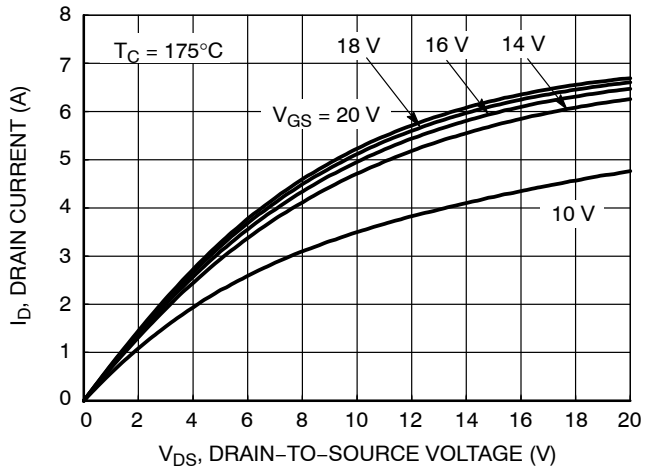


Figure 3. On−Region Characteristics

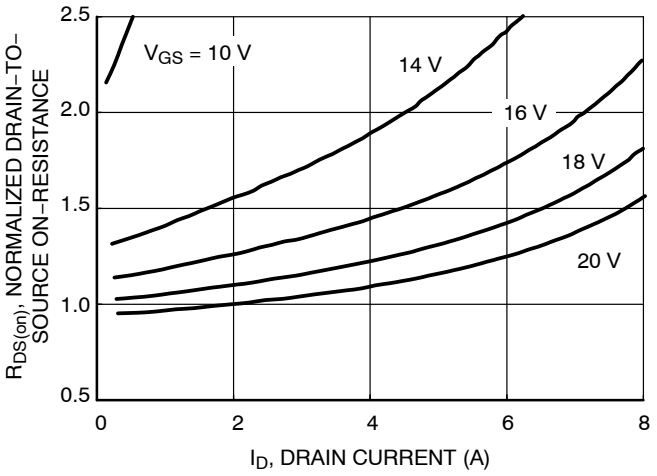


Figure 4. Normalized On−Resistance vs. Drain Current and Gate Voltage

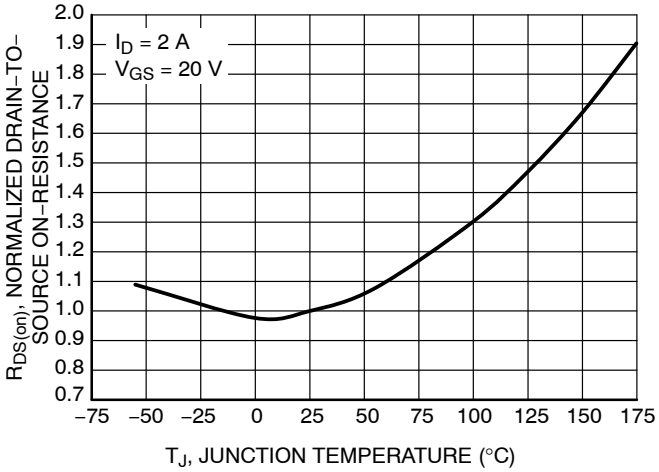


Figure 5. Normalized On−Resistance Variation with Temperature

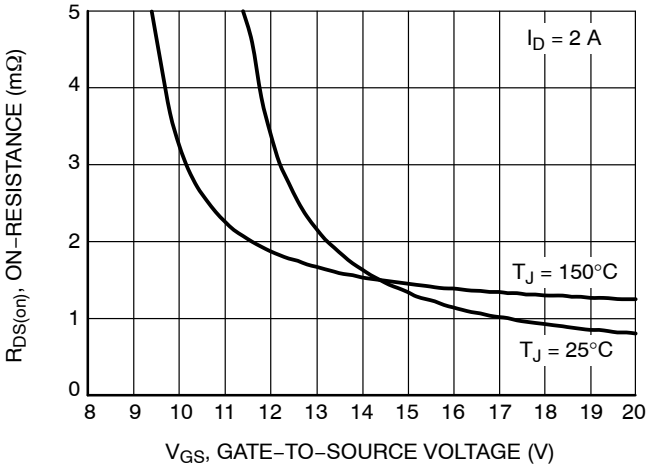


Figure 6. On−Resistance vs. Gate−to−Source Voltage

TYPICAL CHARACTERISTICS

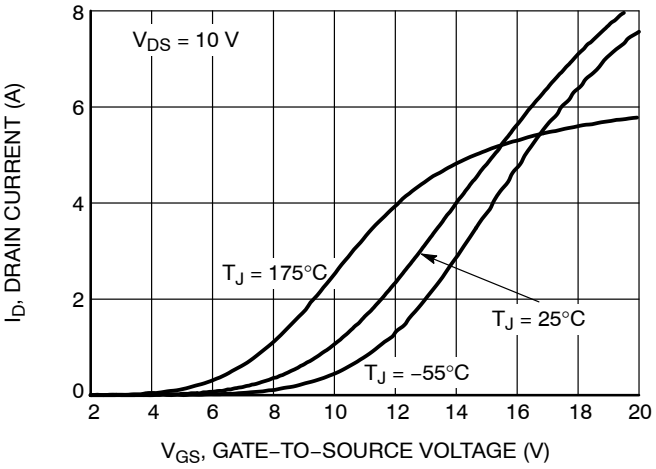


Figure 7. Transfer Characteristics

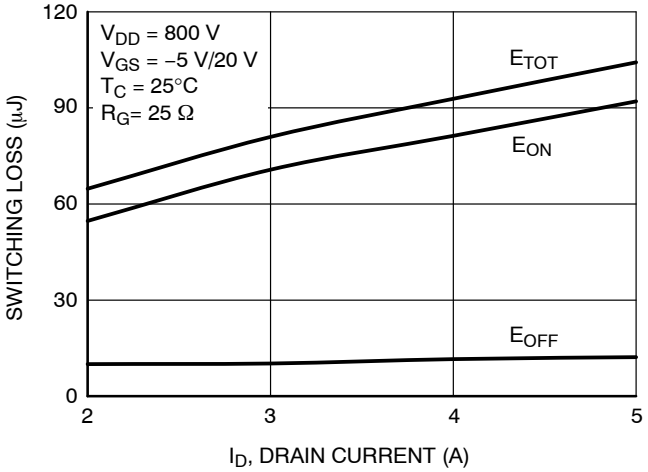


Figure 8. Switching Loss vs. Drain Current

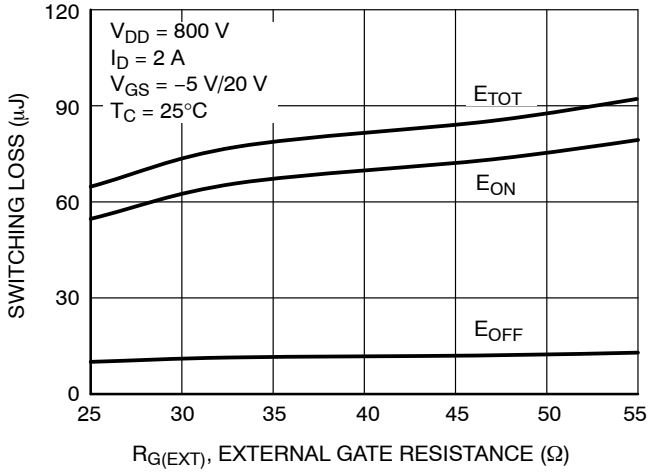


Figure 9. Switching Loss vs. Gate Resistance

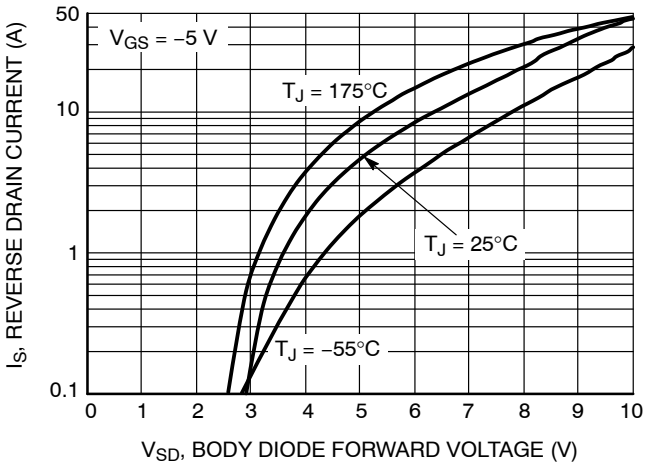


Figure 10. Diode Forward Voltage vs. Current

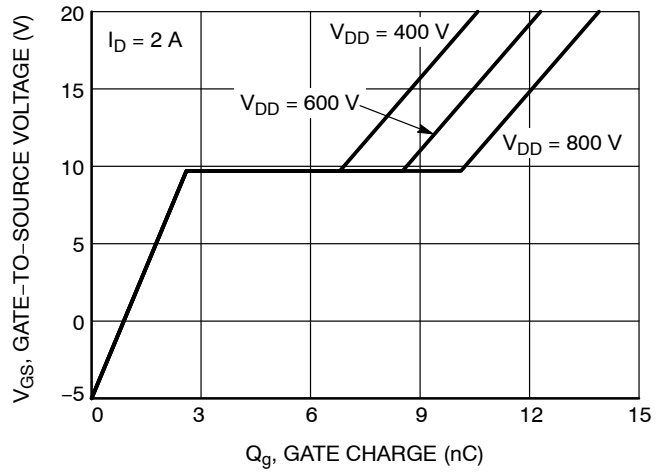


Figure 11. Gate−to−Source Voltage vs. Total Charge

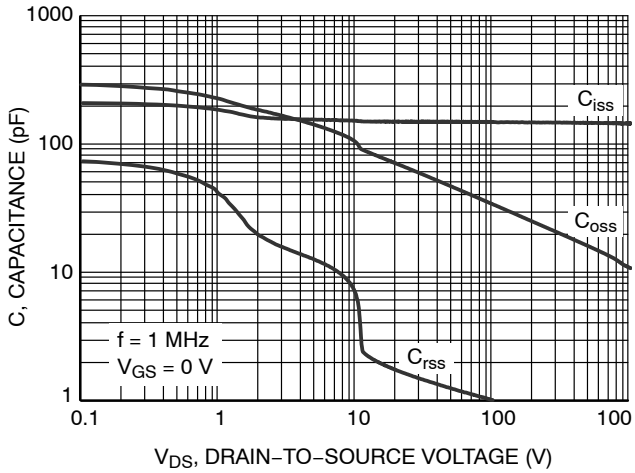


Figure 12. Capacitance vs. Drain−to−Source Voltage

TYPICAL CHARACTERISTICS

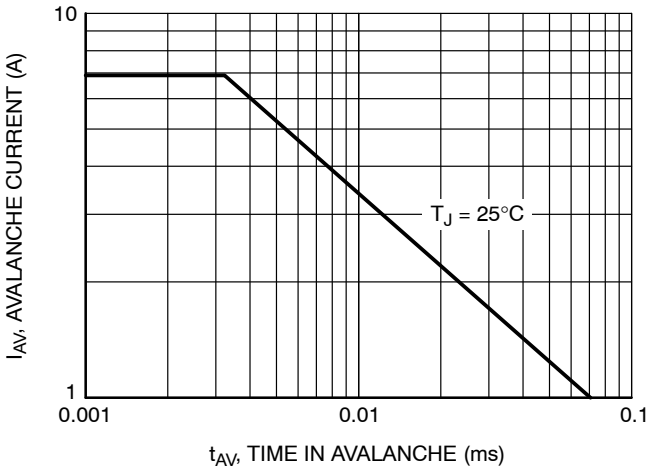


Figure 13. Unclamped Inductive Switching Capability

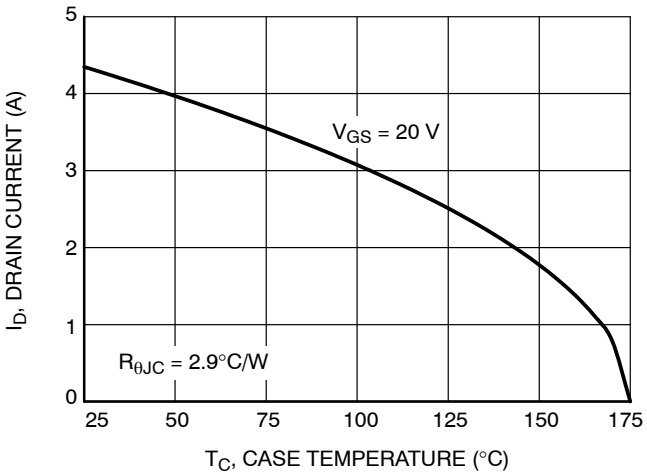


Figure 14. Maximum Continuous Drain Current vs. Case Temperature

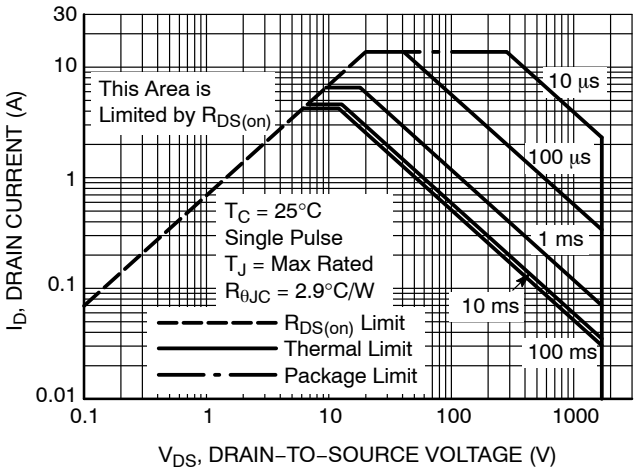


Figure 15. Maximum Rated Forward Biased Safe Operating Area

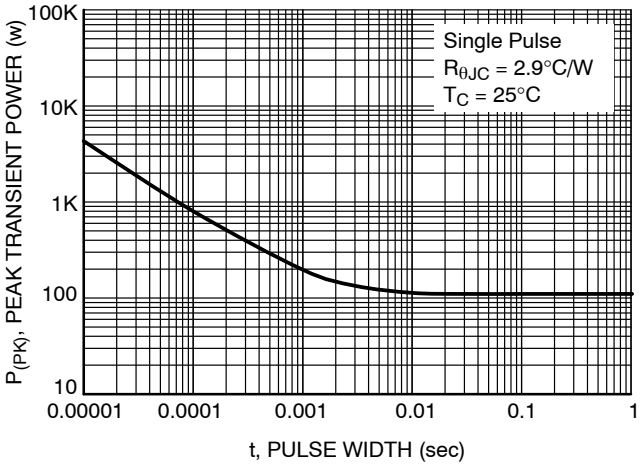


Figure 16. Single Pulse Maximum Power Dissipation

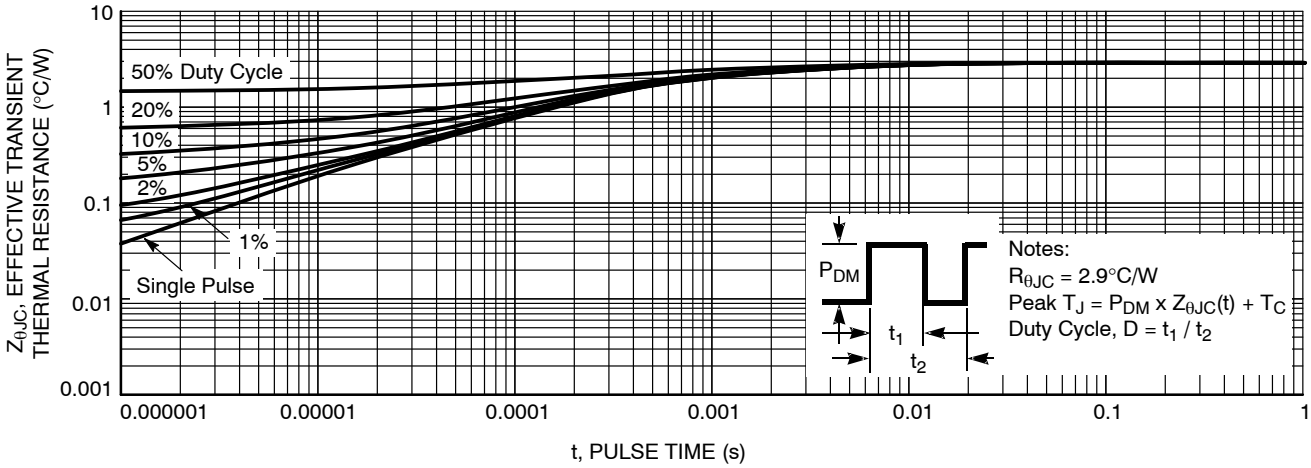


Figure 17. Transient Thermal Impedance

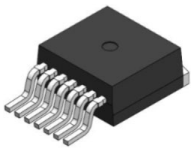
ESD RATINGS

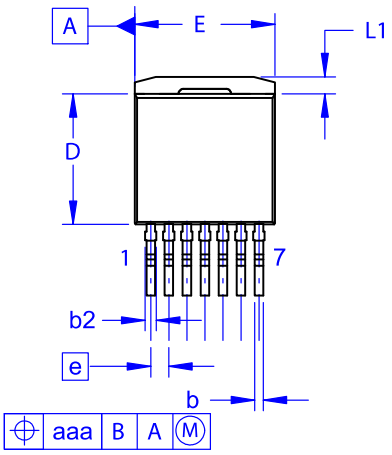
ESD Test	Classification	Standard
ESD−HBM	0B (125 V to <250 V)	ANSI/ESDA/JEDEC JS−001
ESD−CDM	C3 (>1000 V)	ANSI/ESDA/JEDEC JS−002

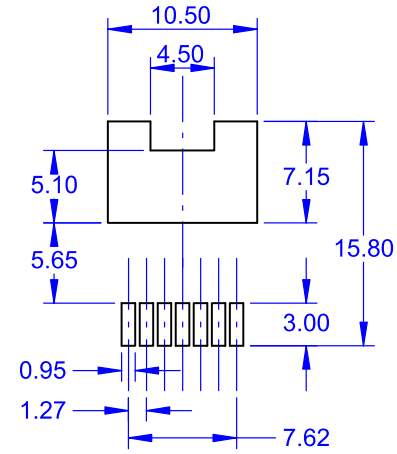
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

D²PAK7 (TO−263−7L HV)
CASE 418BJ
ISSUE B

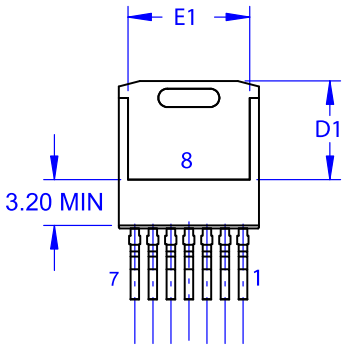
DATE 16 AUG 2019

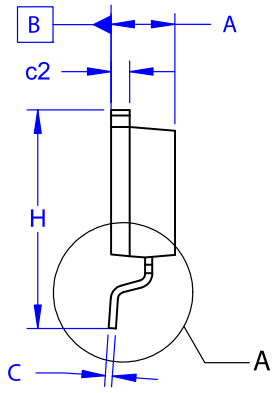






LAND PATTERN RECOMMENDATION





NOTES:

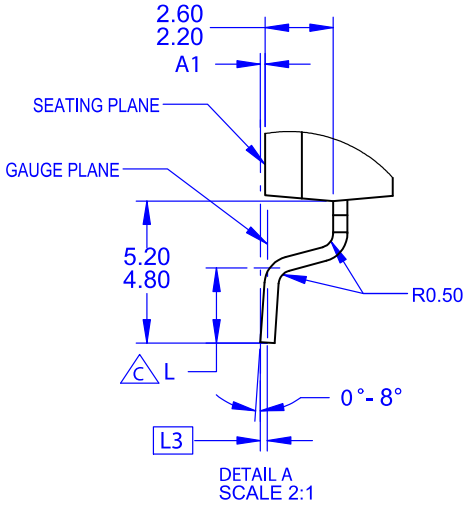
A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. OUT OF JEDEC STANDARD VALUE.
D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	0.00	0.10	0.20
b2	0.60	0.70	0.80
b	0.51	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	6.15	6.80	7.15
E	9.70	9.90	10.20
E1	7.15	7.65	8.15
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.



DETAIL A
SCALE 2:1

DOCUMENT NUMBER:	**98AON84234G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**D²PAK7 (TO−263−7L HV)**	**PAGE 1 OF 1**

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