

MOSFET - N-Channel Silicon Carbide



ON Semiconductor®

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Product Preview

NTBG040N120SC1 1200 V, 40.7 mΩ, 99.5 A

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	1200	V
Gate-to-Source Voltage	V_{GS}	+25/-15	V
Continuous Drain Current $R_{\theta JC}$	$T_C = 25^\circ\text{C}$	I_{DC}	99.5 A
Power Dissipation $R_{\theta JC}$		P_{DC}	614 W
Continuous Drain Current $R_{\theta JC}$	$T_C = 100^\circ\text{C}$	I_{DC}	70.3 A
Power Dissipation $R_{\theta JC}$		P_{DC}	307 W
Continuous Drain Current $R_{\theta JA}$	$T_A = 25^\circ\text{C}$	I_{DA}	TBD A
Power Dissipation $R_{\theta JA}$		P_{DA}	TBD W
Continuous Drain Current $R_{\theta JA}$	$T_A = 100^\circ\text{C}$	I_{DA}	TBD A
Power Dissipation $R_{\theta JA}$		P_{DA}	TBD W
Pulsed Drain Current $R_{\theta JC}$	$T_C = 25^\circ\text{C}$, $t_p = 10 \mu\text{s}$	I_{DM}	443 A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	$^\circ\text{C}$
Source Current (Body Diode)	I_S	129	A
Single Pulse Avalanche Energy ($T_J = 25^\circ\text{C}$, $V_{GS} = 20 \text{ V}$, $I_{LPK} = 1 \text{ A}$, $L = 0.1 \text{ mH}$, $R_G = 25 \Omega$)	E_{AS}	TBD	mJ
Lead Temperature for Soldering Purposes	T_L	TBD	$^\circ\text{C}$

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.

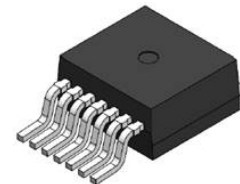
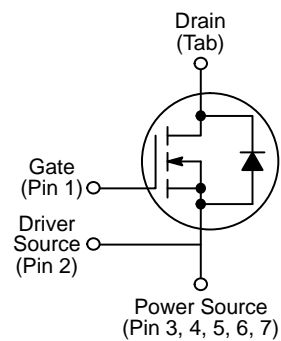
THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.24	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	TBD	

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D \text{ MAX}$
1200 V	40.7 mΩ @ 20 V	99.5 A

N-CHANNEL MOSFET



D2PAK-7L
CASE 418AY

ORDERING INFORMATION

Device	Package	Shipping
NTBG040N120SC1	D ² PAK	TBD

NTBG040N120SC1

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_C = 25^\circ\text{C}$	1200	-	-	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}T_J$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_{Jmax} = 175^\circ\text{C}$	-	0.25	-	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	$T_C = 25^\circ\text{C}$	-	-	10.0	μA
		$T_C = 175^\circ\text{C}$	-	-	250	
Gate-to-Source Leakage Current	I_{GSS}	$V_G = 20\text{ V}, V_D = 0\text{ V}$	-	-	250	nA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_G = 20\text{ V}, I_D = 39.9\text{ A}$	-	40.7	-	m Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_G = V_D, I_D = 9.99\text{e} - 0.3\text{ A}$	-	2.83	-	V
Gate Threshold Voltage Temperature Coefficient	$V_{GS(th)}T_J$		-	-5.37	-	mV/°C
Forward Transconductance	g_{FS}	$V_D = 10.0\text{ V}, I_D = 39.9\text{ A}$	-	16.2	-	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Gate Resistance	R_G	$V_G = 0\text{ V}, V_D = 600\text{ V}$	-	2.23	-	Ω
Input Capacitance	C_{ISS}		-	2426	-	pF
Reverse Transfer Capacitance	C_{RSS}		-	7.69	-	
Output Capacitance	C_{OSS}		-	164	-	
Effective Output Capacitance	C_{OSSef}	$V_{DS} = 0\text{ to }600\text{ V}, V_G = 0\text{ V}$	-	281	-	
Energy Related Output Capacitance	C_{OSSer}		-	201	-	
Coss Stored Energy	E_{OSS}		-	36.3	-	μJ
Total Gate Charge	$Q_{G(tot)}$	$V_D = 960\text{ V}, I_D = 20\text{ A}, V_G = 20\text{ V}$	-	91.2	-	nC
Gate-to-Source Charge	Q_{GS}		-	20.8	-	
Gate-to-Drain Charge	Q_{GD}		-	24.0	-	

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_G = -5/20\text{ V}, I_D = 40\text{ A}, V_D = 960\text{ V}, R_G = 6\ \Omega$	-	25.3	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	29.3	-	
Rise Time	t_r		-	6.75	-	
Fall Time	t_f		-	8.96	-	
Turn-On Switching Loss	E_{ON}		-	0.59	-	mJ
Turn-Off Switching Loss	E_{OFF}		-	0.12	-	
Total Switching Loss	E_{TOT}		-	0.70	-	

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$I_D = 20\text{ A}$	-	3.89	-	V
Reverse Recovery Time	t_{RR}	$I_D = 40\text{ A}, dI/dt = 1000\text{ A}/\mu\text{s}, V_{DS} = 960\text{ V}, V_{GS} = -5/20\text{ V}$	-	74.5	-	ns
Reverse Recovery Charge	Q_{RR}		-	283	-	nC
Reverse Recovery Energy	E_{REC}		-	82.8	-	μJ
Peak Reverse Recovery Current	I_{RRM}		-	9.27	-	A

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.

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TYPICAL CHARACTERISTICS

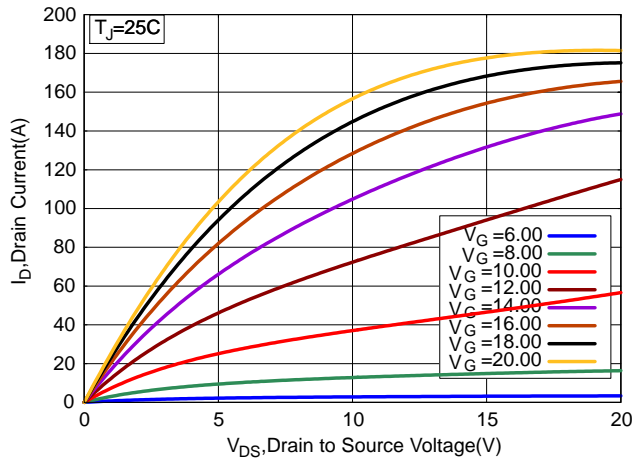


Figure 1. On-Region Characteristics

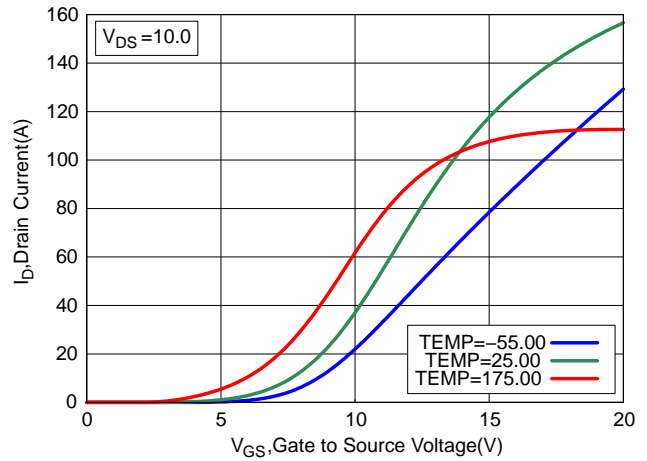


Figure 2. Transfer Characteristics

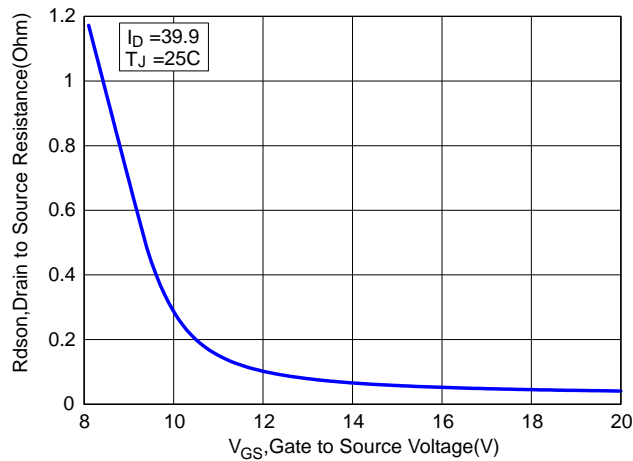


Figure 3. On-Resistance vs. V_{GS}

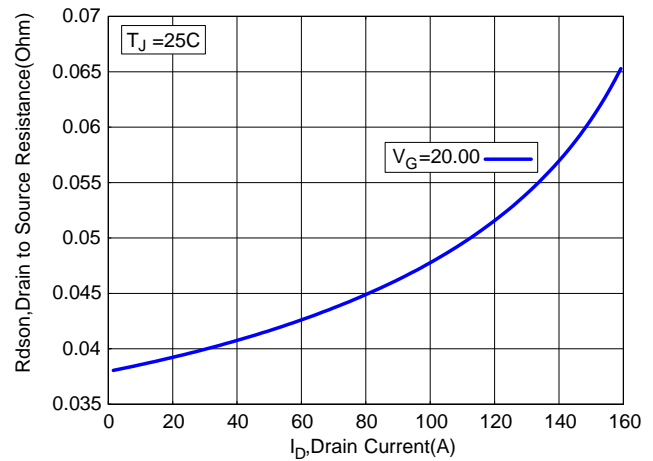


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

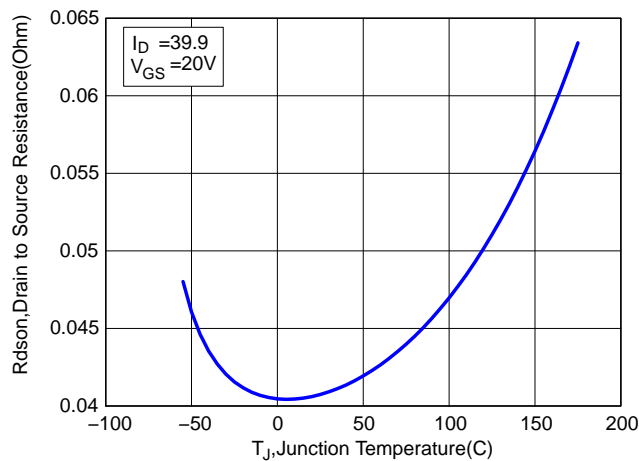


Figure 5. On-Resistance Variation with Temperature

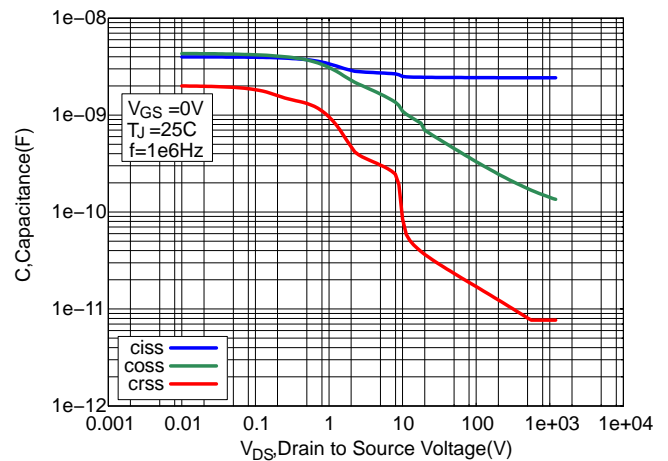


Figure 6. Capacitance Variation

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TYPICAL CHARACTERISTICS

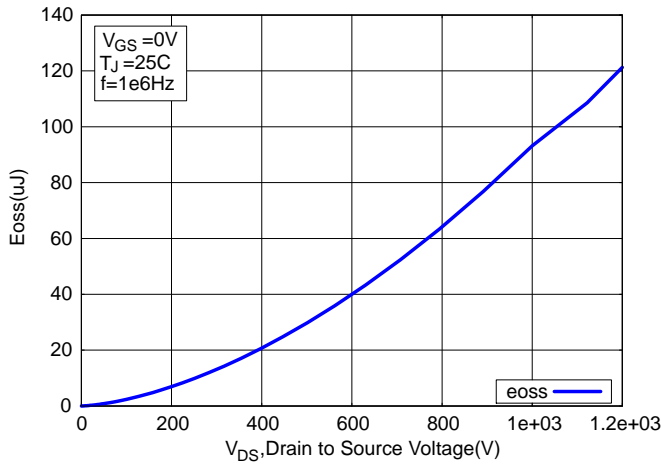


Figure 7. Eoss vs. Drain-to-Source Voltage

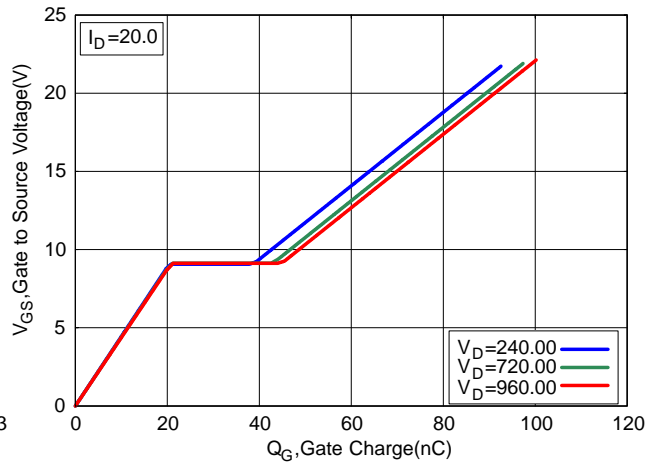


Figure 8. Gate-to-Source Voltage vs. Total Charge

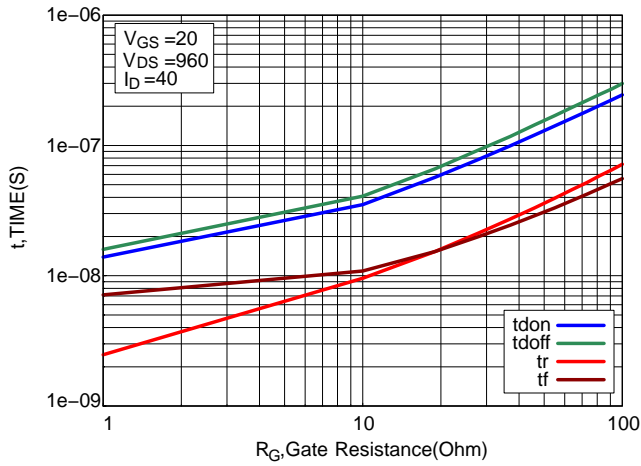


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

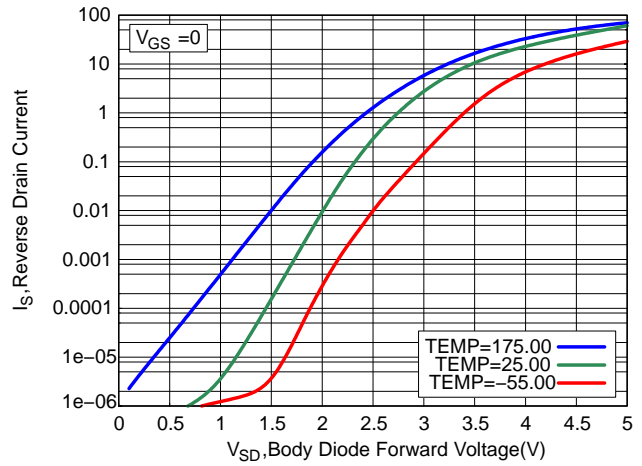


Figure 10. Diode Forward Voltage vs. Current

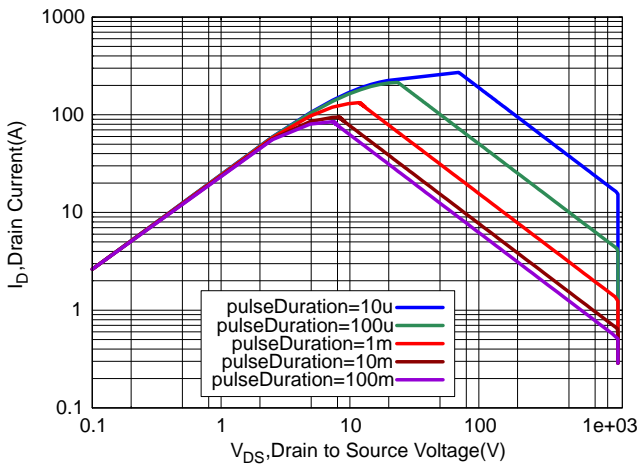


Figure 11. Maximum Rated Forward Biased Safe Operating Area

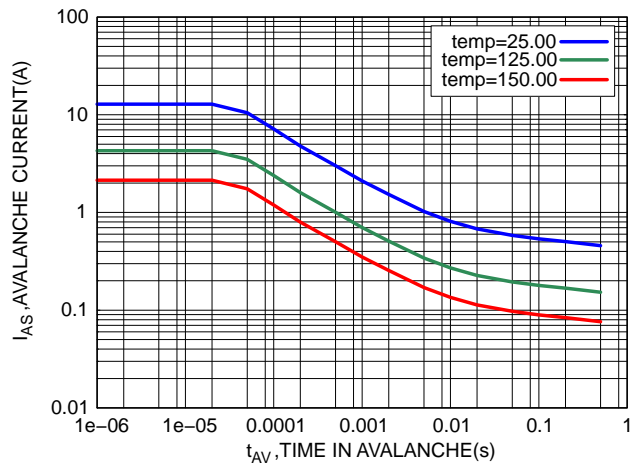


Figure 12. Ipeak vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

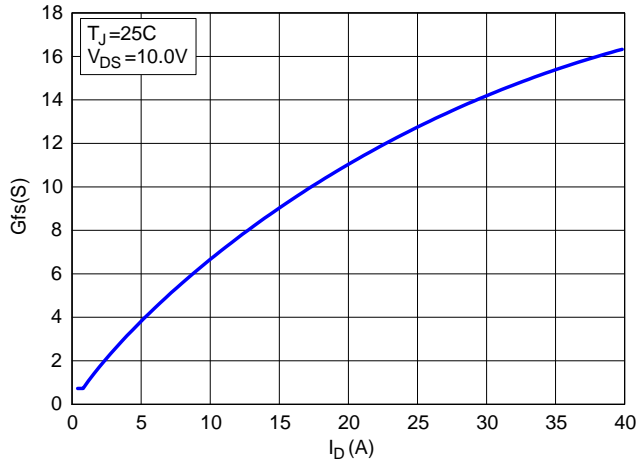


Figure 13. GFS vs. ID

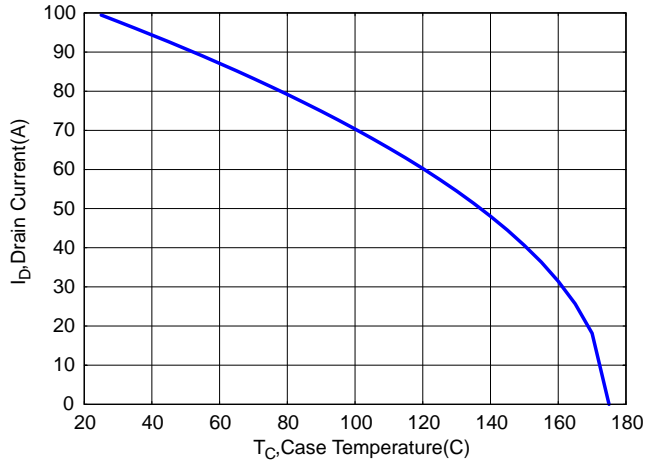


Figure 14. Maximum Current vs. Case Temperature

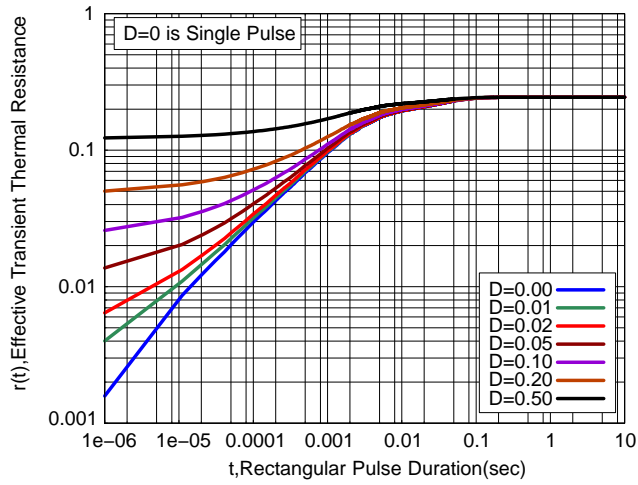
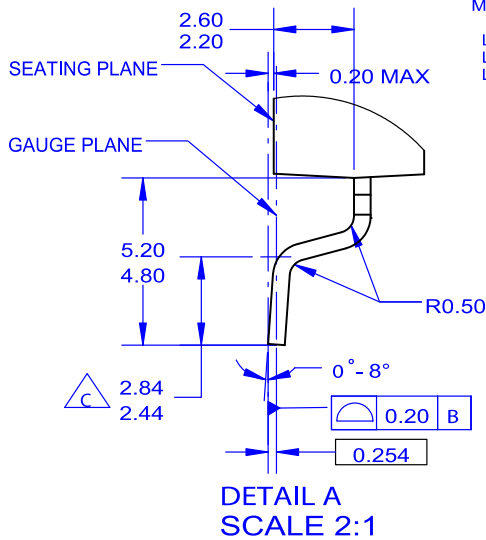
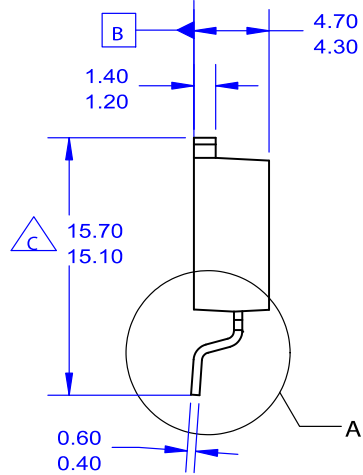
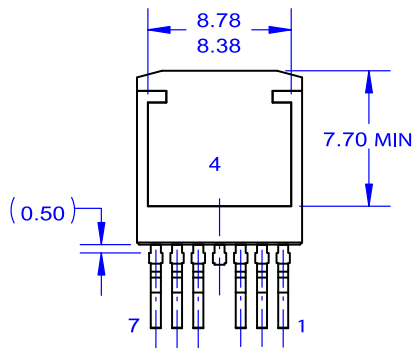
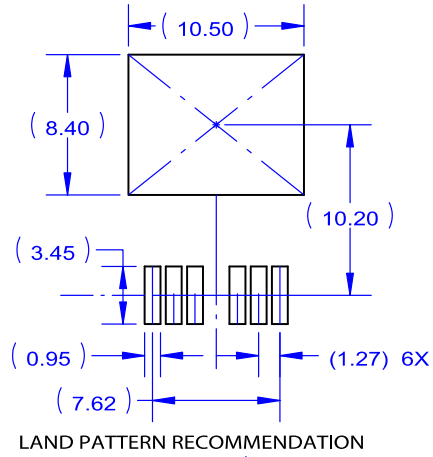
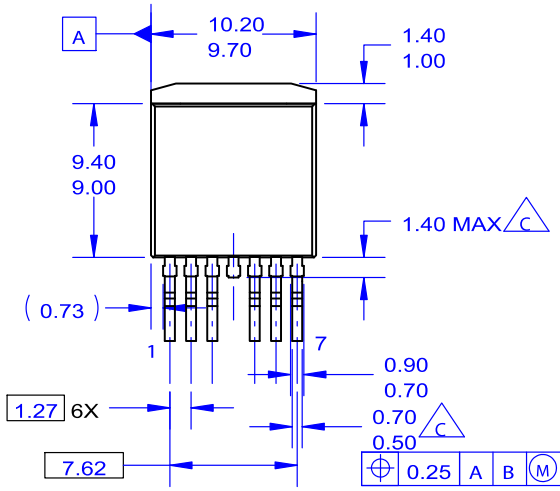


Figure 15. Thermal Response

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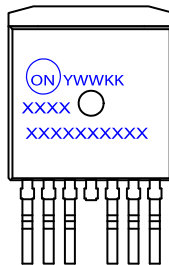
PACKAGE DIMENSIONS

D2PAK7 (TO-263 7 LD)
CASE 418AY
ISSUE A



MARKING:

LINE 1 - LOGO & DATE CODE
 LINE 2 - DEVICE MARKING
 LINE 3 - DEVICE MARKING




PIN1 - GATE
 PIN2 - SOURCE
 PIN3 - SOURCE
 PIN4 - DRAIN
 PIN5 - SOURCE
 PIN6 - SOURCE
 PIN7 - SOURCE

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.
- F. LAND PATTERN RECOMMENDATION PER IPC. TO127P1524X465-8N.

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