

MOSFET - Power, Single N-Channel, DUAL COOL® 80 V, 10 mΩ, 61 A

NTMFSC011N08M7

Features

- DUAL COOL Top Side Cooling PQFN Package
- Max $r_{DS(on)}$ = 10 mΩ at $V_{GS} = 10$ V, $I_D = 10$ A
- High Performance Technology for Extremely Low $r_{DS(on)}$
- 100% UIL Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

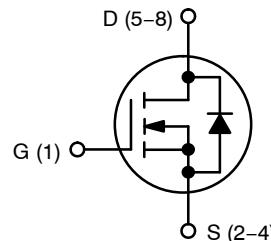
Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	80	V
Gate-to-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current $R_{\theta,JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	I_D	A
		$T_C = 100^\circ\text{C}$		
Power Dissipation $R_{\theta,JC}$ (Note 1)		$T_C = 25^\circ\text{C}$	P_D	W
		$T_C = 100^\circ\text{C}$		
Continuous Drain Current $R_{\theta,JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	I_D	A
		$T_A = 100^\circ\text{C}$		
Power Dissipation $R_{\theta,JA}$ (Notes 1, 2)		$T_A = 25^\circ\text{C}$	P_D	W
		$T_A = 100^\circ\text{C}$		
Pulsed Drain Current	$T_A = 25^\circ\text{C}$, $t_p = 10\ \mu\text{s}$	I_{DM}	180	A
Operating Junction and Storage Temperature Range		T_J , T_{stg}	-55 to +150	°C
Source Current (Body Diode)		I_S	61	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 3.9$ A)		E_{AS}	640	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.

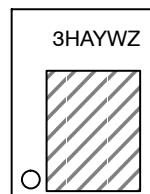
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 1 in² pad size, 1 oz Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

$V_{(BR)DSS}$	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
80 V	10 mΩ @ 10 V	61 A

N-Channel MOSFET



MARKING DIAGRAM



3H = Specific Device Code
 A = Assembly Location
 Y = Year
 W = Work Week
 Z = Assembly Lot Code

ORDERING INFORMATION

Device	Package	Shipping
NTMFSC011N08M7	DFN8 (Pb-Free)	3000 / Tape & Reel

NTMFSC011N08M7

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain to Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	80			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}/T_J}$			49		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 80 \text{ V}$	$T_J = 25^\circ\text{C}$		10	μA
			$T_J = 125^\circ\text{C}$		100	
Zero Gate Voltage Drain Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 20 \text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_D = 120 \mu\text{A}$	2.5	3.3	4.5	V
Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})/T_J}$			-9		$\text{mV}/^\circ\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}$	$I_D = 10 \text{ A}$	7.6	10	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 5 \text{ V}$	$I_D = 10 \text{ A}$	21.5	40	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{iss}	$V_{\text{GS}} = 0 \text{ V}, f = 1 \text{ MHz}$	$V_{\text{DS}} = 0 \text{ V}$		2373		pF
	C_{iss}		$V_{\text{DS}} = 40 \text{ V}$		2080	2700	
Output Capacitance	C_{oss}				286	430	
	C_{rss}				11	17	
Gate Resistance	R_g	$V_{\text{GS}} = 0.5 \text{ V}, f = 1 \text{ MHz}$			1	2	Ω
Threshold Gate Charge	$Q_{\text{g}(\text{th})}$	$V_{\text{GS}} = 0 \text{ to } 2 \text{ V}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 40 \text{ V}; I_D = 10 \text{ A}$		4.3		nC
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 0 \text{ to } 10 \text{ V}$			29.3	38	
Gate to Source Gate Charge	Q_{gs}	$V_{\text{GS}} = 0 \text{ to } 10 \text{ V}$			11.8		
Gate to Drain "Miller" Charge	Q_{gd}				4.3		
Plateau Voltage	V_{GP}				5.5		V
Output Charge	Q_{oss}	$V_{\text{DS}} = 40 \text{ V}, V_{\text{GS}} = 0 \text{ V}$			26		nC

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{DD}} = 40 \text{ V}, I_D = 10 \text{ A}, V_{\text{GS}} = 10 \text{ V}, R_{\text{GEN}} = 6 \Omega$		14		ns
Turn-On Rise Time	t_r			6		ns
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			27		ns
Turn-Off Fall Time	t_f			6		ns

DRAIN – SOURCE DIODE CHARACTERISTICS

Source to Drain Diode Voltage	V_{SD}	$I_{\text{SD}} = 10 \text{ A}, V_{\text{GS}} = 0 \text{ V}$		0.82	1.2	V
Reverse Recovery Time	T_{RR}	$V_{\text{GS}} = 0 \text{ V}, dI_{\text{SD}}/dt = 100 \text{ A}/\mu\text{s}, I_{\text{S}} = 10 \text{ A}$		41	50	ns
Charge Time	t_a			24.6		
Discharge Time	t_b			16.1		
Reverse Recovery Charge	Q_{RR}			45	58	nC

4. Pulse Test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.

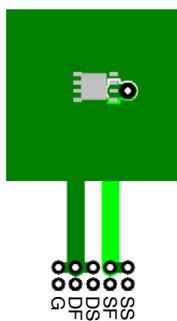
5. Switching characteristics are independent of operating junction temperatures.

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.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Top Source)	1.6	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Bottom Drain)	3.0	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	81	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1c)	27	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1d)	34	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1e)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1f)	19	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1g)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1h)	61	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1i)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1j)	23	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1k)	11	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1l)	13	

6. $R_{\theta JA}$ is determined with the device mounted on a FR-4 board using a specified pad of 2 oz copper as shown below. $R_{\theta JA}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 38°C/W when mounted on a 1 in² pad of 2 oz copper.



b) 81°C/W when mounted on a minimum pad of 2 oz copper.

- c) Still air, 20.9-10.4-12.7 mm Aluminum Heat Sink, 1 in² pad of 2 oz copper
- d) Still air, 20.9-10.4-12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
- e) Still air, 45.2-41.4-11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in² pad of 2 oz copper
- f) Still air, 45.2-41.4-11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
- g) .200FPM Airflow, No Heat Sink, 1 in² pad of 2 oz copper
- h) .200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
- i) .200FPM Airflow, 20.9-10.4-12.7 mm Aluminum Heat Sink, 1 in² pad of 2 oz copper
- j) .200FPM Airflow, 20.9-10.4-12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
- k) .200FPM Airflow, 45.2-41.4-11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in² pad of 2 oz copper
- l) .200FPM Airflow, 45.2-41.4-11.7 mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper

7. Pulse Test: Pulse Width < 300 μ s, Duty cycle < 2.0%.

TYPICAL CHARACTERISTICS

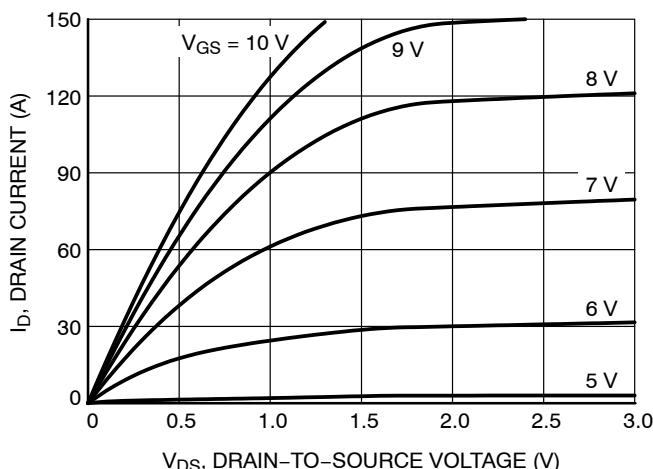


Figure 1. On-Region Characteristics

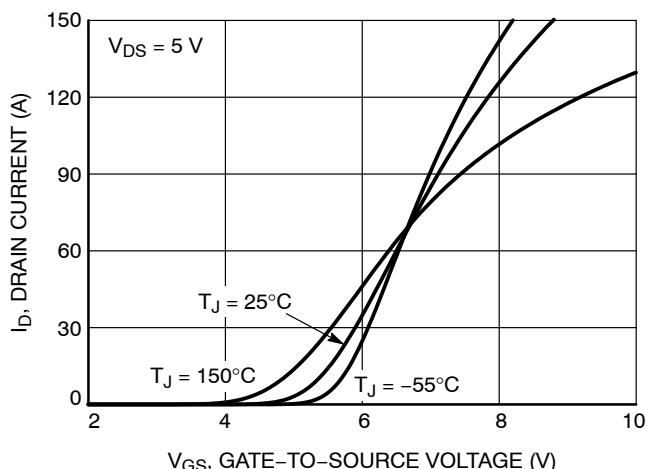


Figure 2. Transfer Characteristics

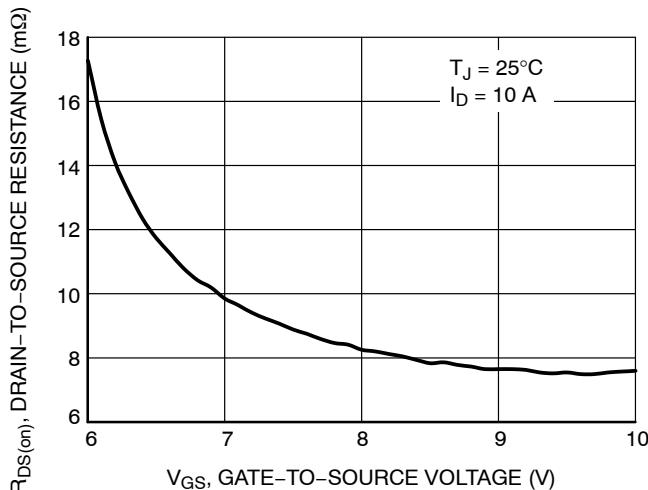


Figure 3. On-Resistance vs. Gate-to-Source Voltage

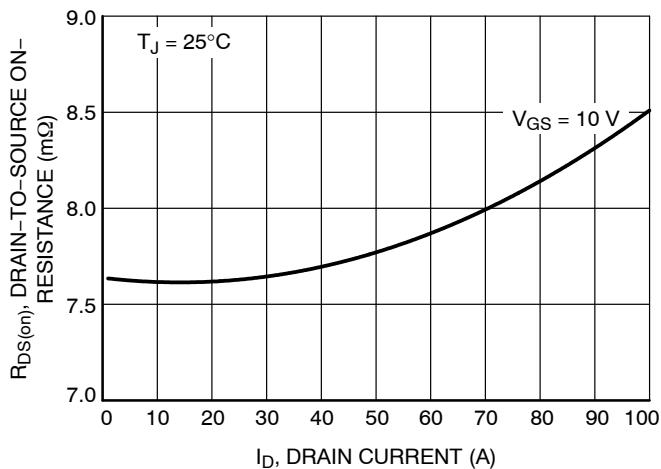


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

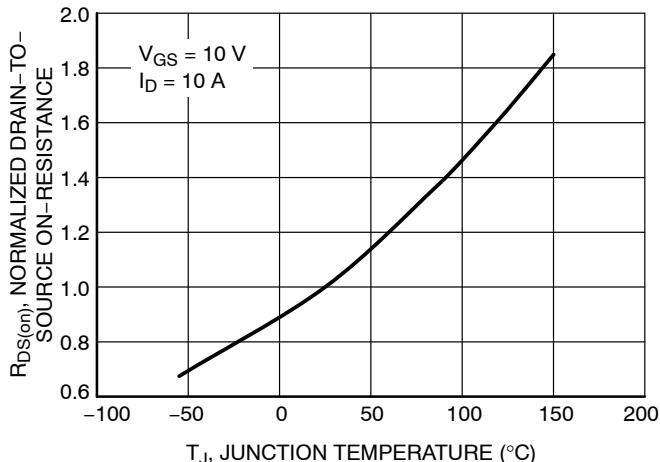


Figure 5. On-Resistance Variation with Temperature

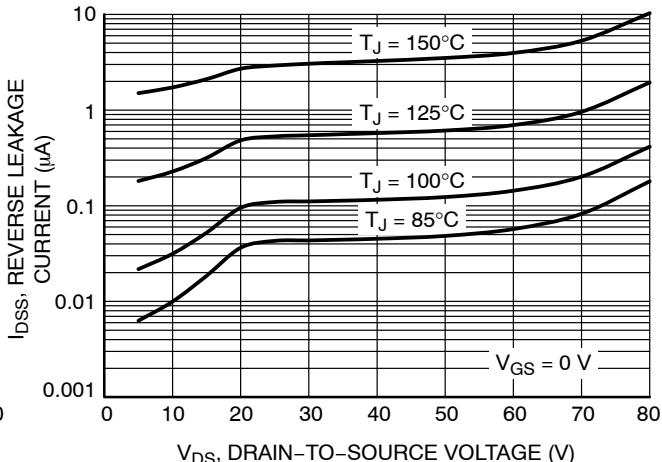


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

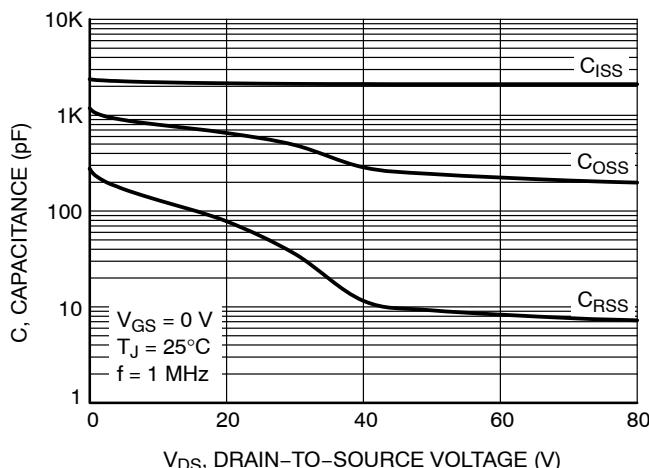


Figure 7. Capacitance Variation

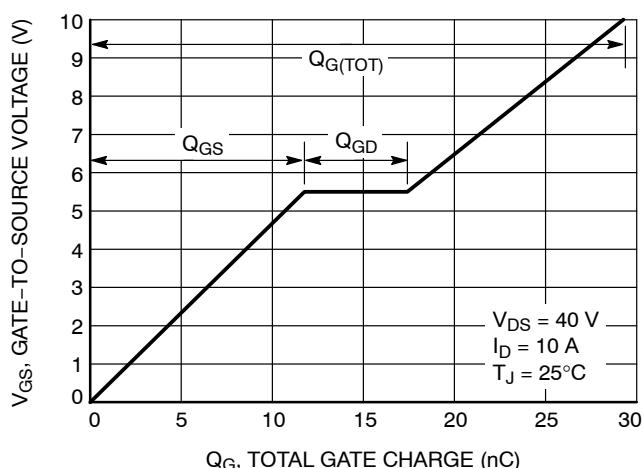


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

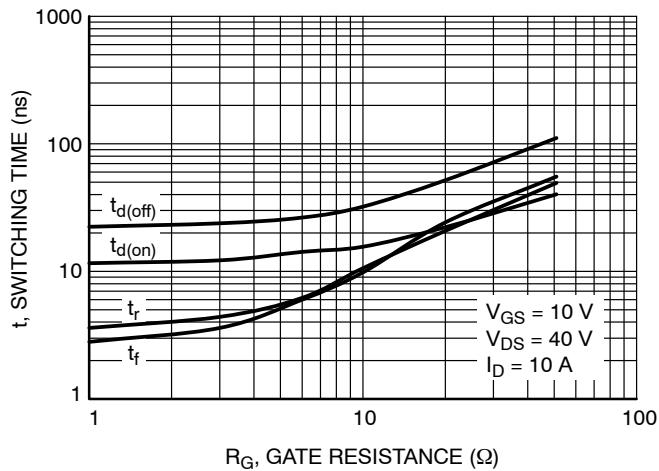


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

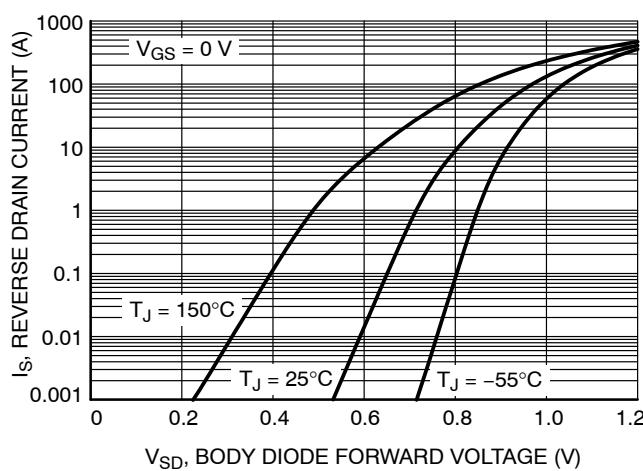


Figure 10. Diode Forward Voltage vs. Current

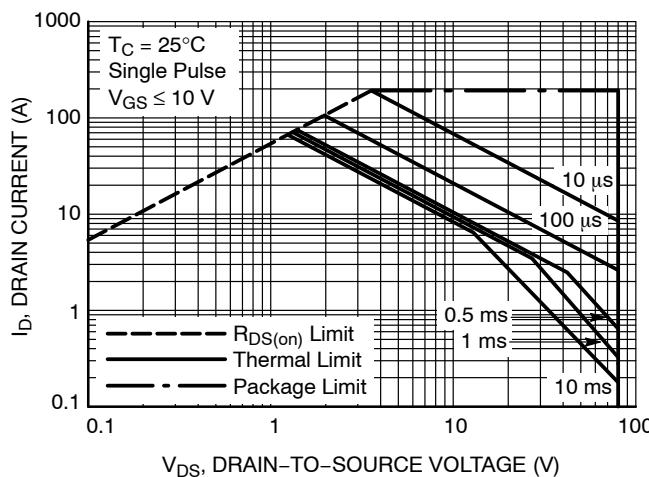
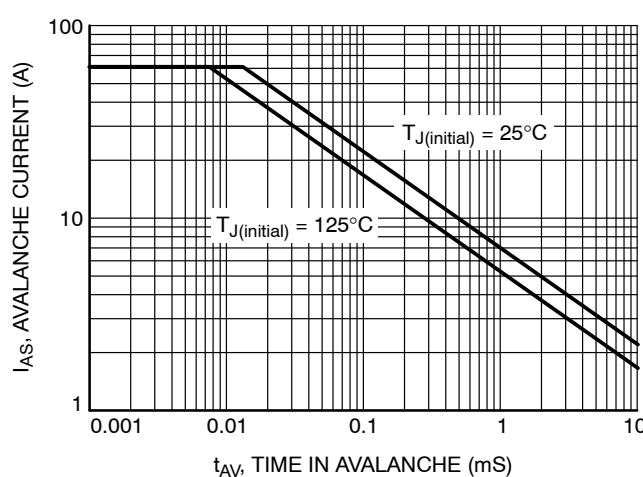
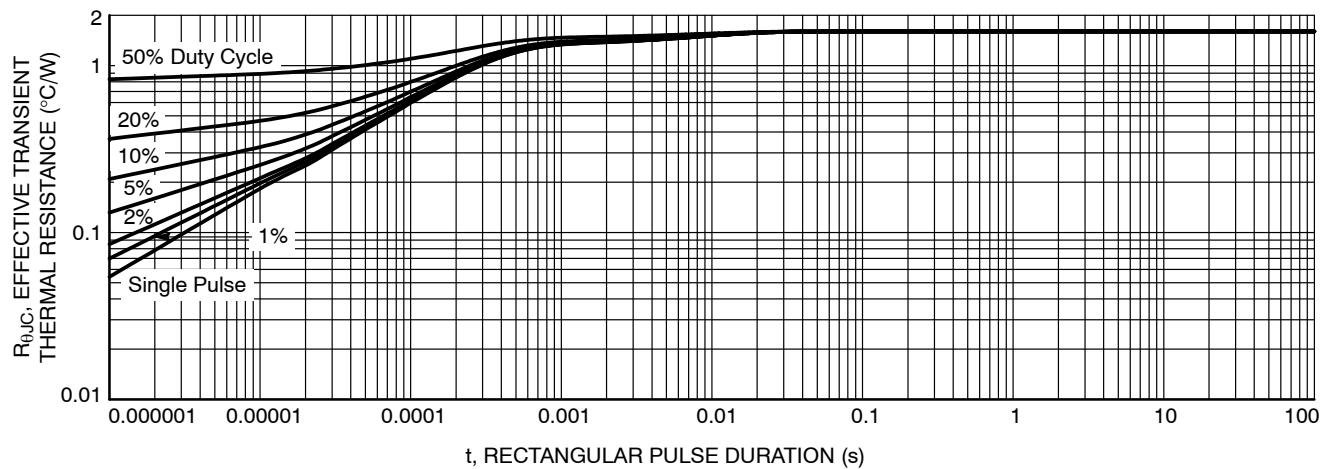


Figure 11. Safe Operating Area

Figure 12. I_{PEAK} vs. Time in Avalanche

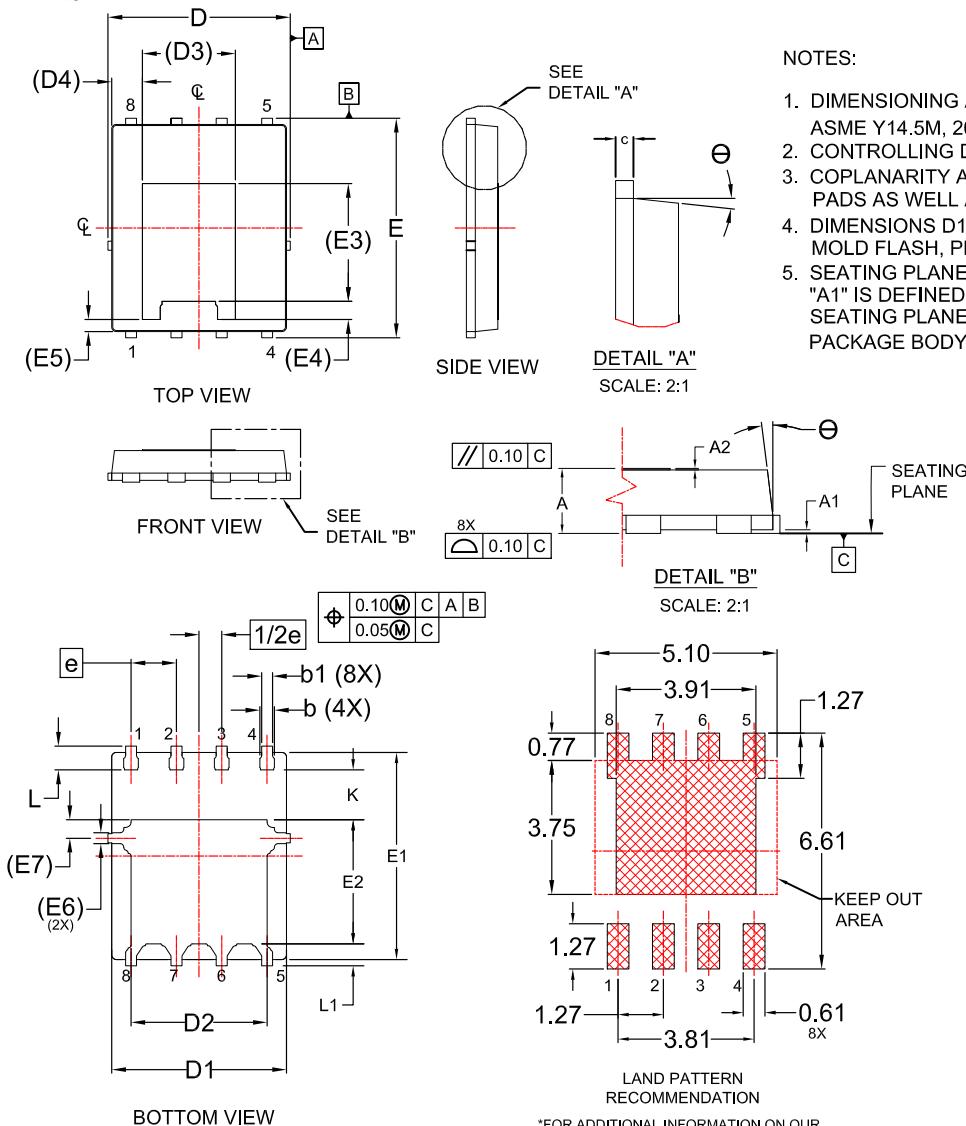
TYPICAL CHARACTERISTICS**Figure 13. Thermal Response**

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DFN8 5x6.15, 1.27P, DUAL COOL
CASE 506EG
ISSUE D

DATE 25 AUG 2020



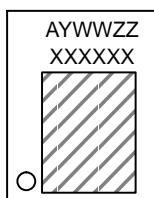
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.85	0.90	0.95
A1	-	-	0.05
A2	-	-	0.05
b	0.31	0.41	0.51
b1	0.21	0.31	0.41
c	0.20	0.25	0.30
D	4.90	5.00	5.10
D1	4.80	4.90	5.00
D2	3.67	3.82	3.97
D3	2.60 REF		
D4	0.86 REF		
E	6.05	6.15	6.25
E1	5.70	5.80	5.90
E2	3.38	3.48	3.58
E3	3.30 REF		
E4	0.50 REF		
E5	0.34 REF		
E6	0.30 REF		
E7	0.52 REF		
e	1.27 BSC		
1/2e	0.635 BSC		
K	1.30	1.40	1.50
L	0.56	0.66	0.76
L1	0.52	0.62	0.72
Θ	0°	---	12°

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SODERRM/D.

**GENERIC
MARKING DIAGRAM***



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

*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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