

NTMFS4833NS

SENSEFET[®] Power MOSFET 30 V, 156 A, Single N-Channel, SO-8 FL

Features

- Accurate, Lossless Current Sensing
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- CPU Power Delivery
- DC-DC Converters
- Low Side Switching

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	30	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current $R_{\theta JA}$ (Note 1)	I_D	$T_A = 25^\circ\text{C}$	26	A
		$T_A = 85^\circ\text{C}$	18	
Power Dissipation $R_{\theta JA}$ (Note 1)	P_D	$T_A = 25^\circ\text{C}$	2.31	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)	I_D	$T_A = 25^\circ\text{C}$	16	A
		$T_A = 85^\circ\text{C}$	11.6	
Power Dissipation $R_{\theta JA}$ (Note 2)	P_D	$T_A = 25^\circ\text{C}$	0.9	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)	I_D	$T_C = 25^\circ\text{C}$	156	A
		$T_C = 85^\circ\text{C}$	113	
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	$T_C = 25^\circ\text{C}$	86.2	W
Pulsed Drain Current	I_{DM}	312	A	
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	86	A	
Drain to Source DV/DT	dV/dt	6	V/ns	
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}$, $V_{DD} = 30\text{ V}$, $V_{GS} = 10\text{ V}$, $I_L = 35\text{ A}_{pk}$, $L = 1.0\text{ mH}$, $R_G = 25\ \Omega$)	EAS	612.5	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

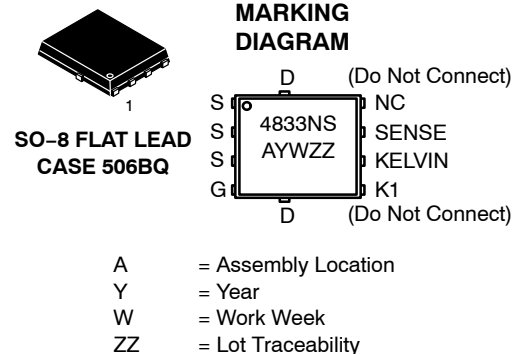
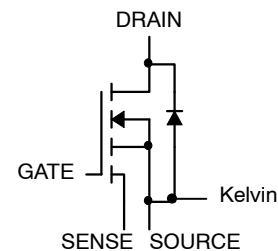
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.



ON Semiconductor[®]

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	2.2 m Ω @ 10 V	156 A
	3.4 m Ω @ 4.5 V	127 A



ORDERING INFORMATION

Device	Package	Shipping [†]
NTMFS4833NST1G	SO-8 FL (Pb-Free)	1500 Tape / Reel
NTMFS4833NST3G	SO-8 FL (Pb-Free)	5000 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.

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	1.45	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	54	
Junction-to-Ambient – Steady State (Note)	$R_{\theta JA}$	138.7	

- Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
- Surface-mounted on FR4 board using the minimum recommended pad size.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			30		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$			1	μA
					$T_J = 125^\circ\text{C}$	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.5		2.5	V	
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			6.8		mV/°C	
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$		1.4	2.2	m Ω
			$I_D = 15\text{ A}$		1.3		
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$		2.3	3.4	
			$I_D = 15\text{ A}$		2.3		
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		100		S	

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 12\text{ V}$		5250		pF
Output Capacitance	C_{OSS}			1080		
Reverse Transfer Capacitance	C_{RSS}			500		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		36	63	nC
Threshold Gate Charge	$Q_{G(TH)}$			3.8		
Gate-to-Source Charge	Q_{GS}			15		
Gate-to-Drain Charge	Q_{GD}			13		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		86		nC

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		21		ns
Rise Time	t_r			60		
Turn-Off Delay Time	$t_{d(OFF)}$			37		
Fall Time	t_f			44		

- Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.
- With 0V potential from sense lead to source lead, i.e. using a virtual ground.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 6)						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 15\text{ A}, R_G = 3.0\ \Omega$		11		ns
Rise Time	t_r			34		
Turn-Off Delay Time	$t_{d(OFF)}$			53		
Fall Time	t_f			34		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.80	1.2	V
			$T_J = 125^\circ\text{C}$		0.67		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$		36		ns	
Charge Time	t_a			18			
Discharge Time	t_b			18			
Reverse Recovery Charge	Q_{RR}			32		nC	

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		0.65		nH
Drain Inductance	L_D			0.005		nH
Gate Inductance	L_G			1.84		nH
Gate Resistance	R_G			1.4		Ω

CURRENT SENSE CHARACTERISTICS

Current Sensing Ratio	I_{ratio}	$V_{GS} = 5\text{ V}, 0-70^\circ\text{C}, 5-20\text{ A}$	357	387	417	
Current Sensing Ratio	I_{ratio}	$V_{GS} = 5\text{ V}, 0-70^\circ\text{C}, 1-5\text{ A}$	351	387	423	
Current Sense Temperature Coefficient (Note 7)				0.006		%/ $^\circ\text{C}$
Mirror Resistance	$r_{m(on)}$	$V_{GS} = 5\text{ V}$		0.80		Ω

5. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
6. Switching characteristics are independent of operating junction temperatures.
7. With 0V potential from sense lead to source lead, i.e. using a virtual ground.

TYPICAL CHARACTERISTIC CURVES

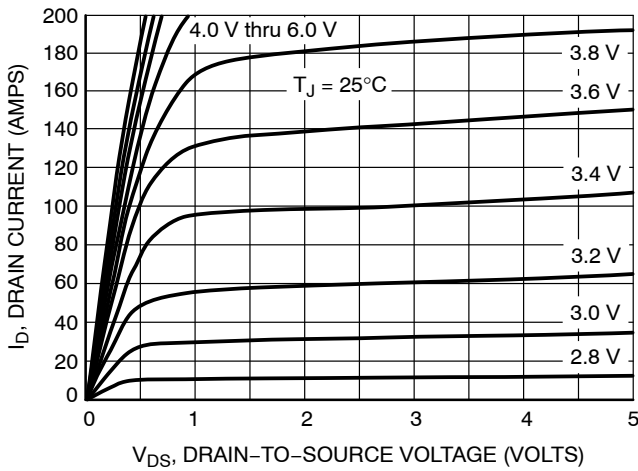


Figure 1. On-Region Characteristics

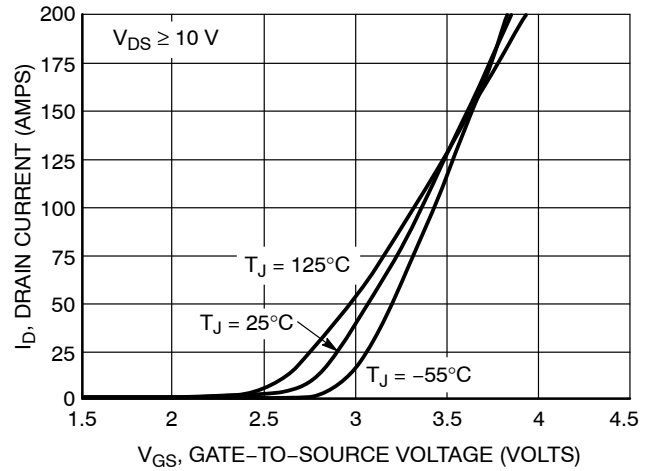


Figure 2. Transfer Characteristics

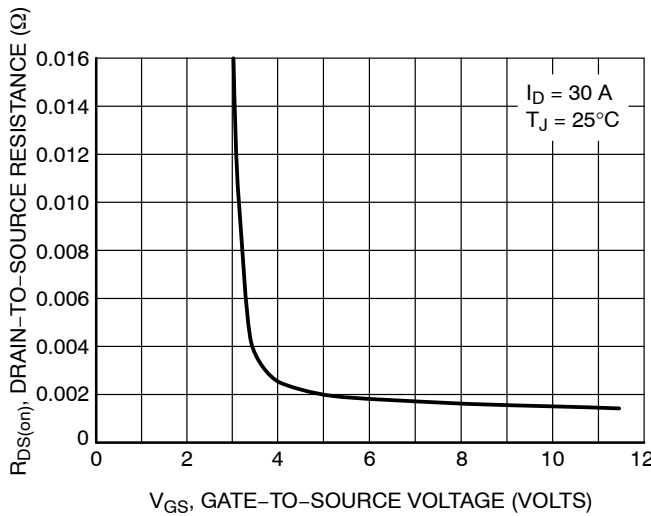


Figure 3. On-Resistance vs. Gate-to-Source Voltage

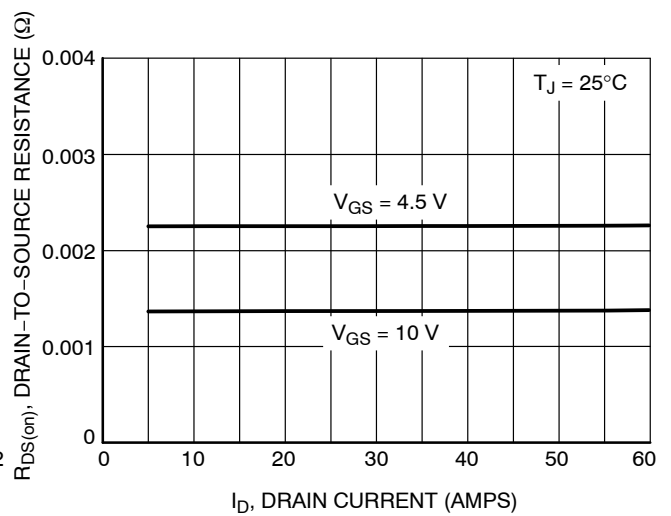


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

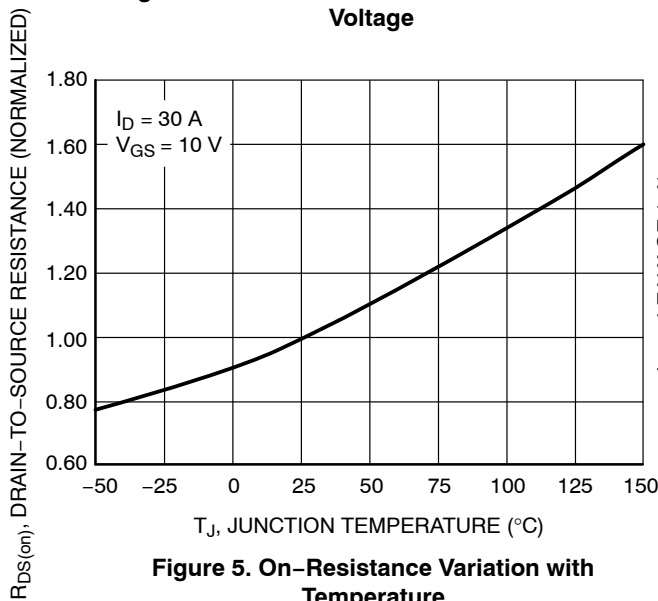


Figure 5. On-Resistance Variation with Temperature

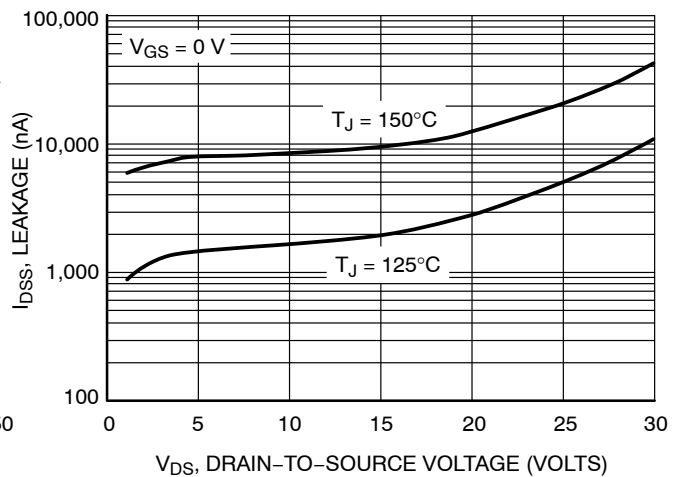


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTIC CURVES

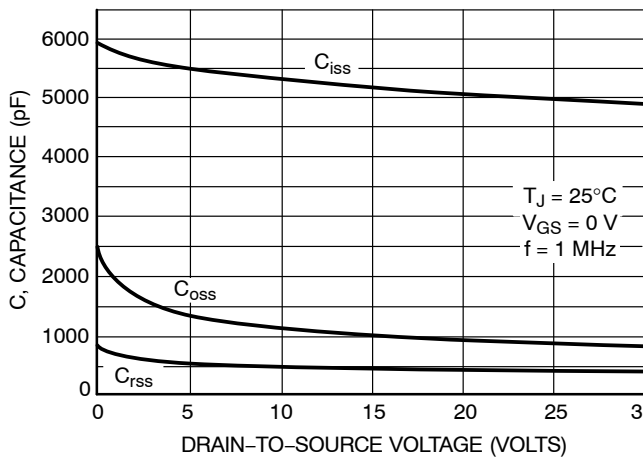


Figure 7. Capacitance Variation

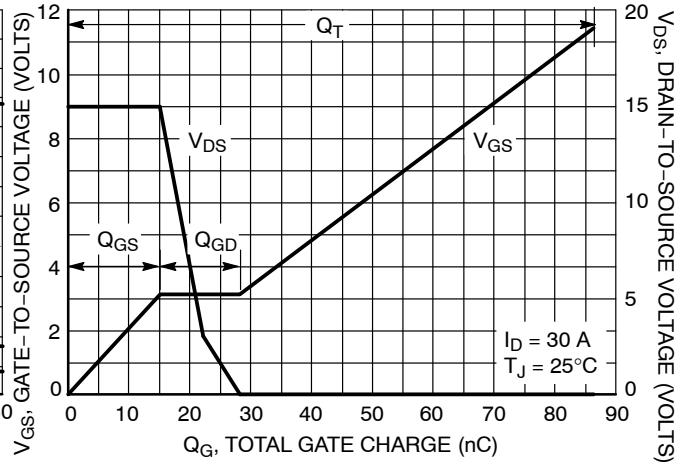


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

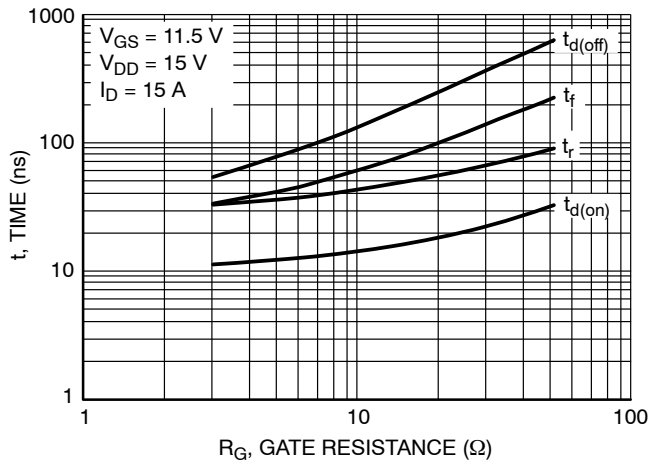


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

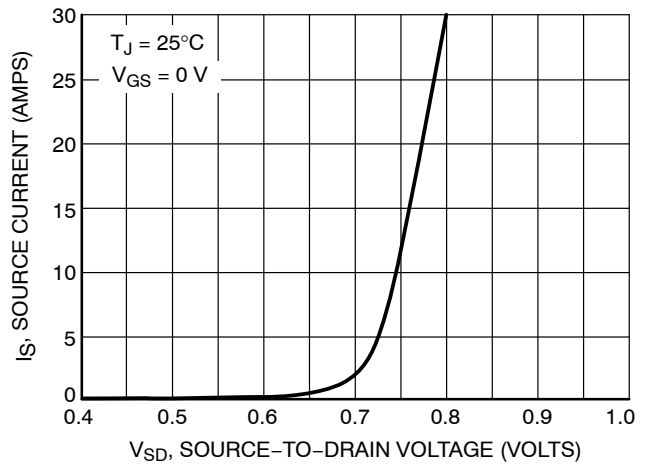


Figure 10. Diode Forward Voltage vs. Current

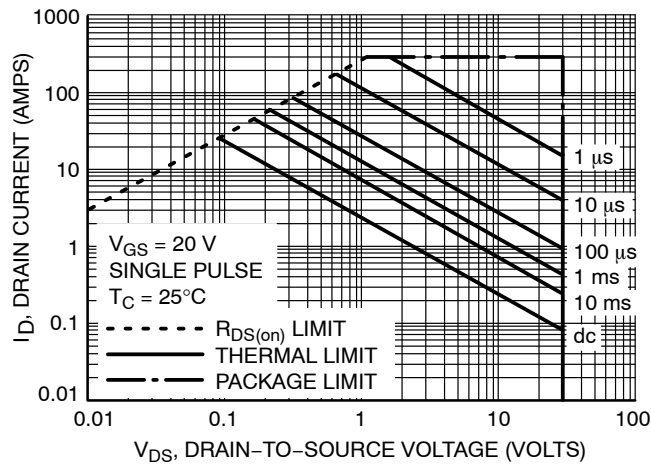


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTIC CURVES

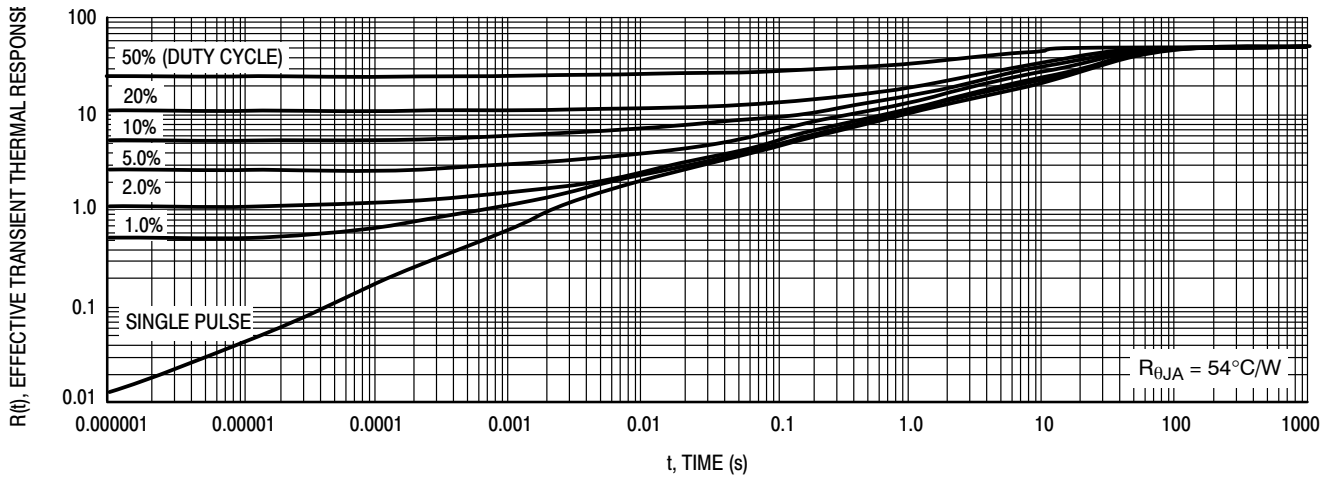
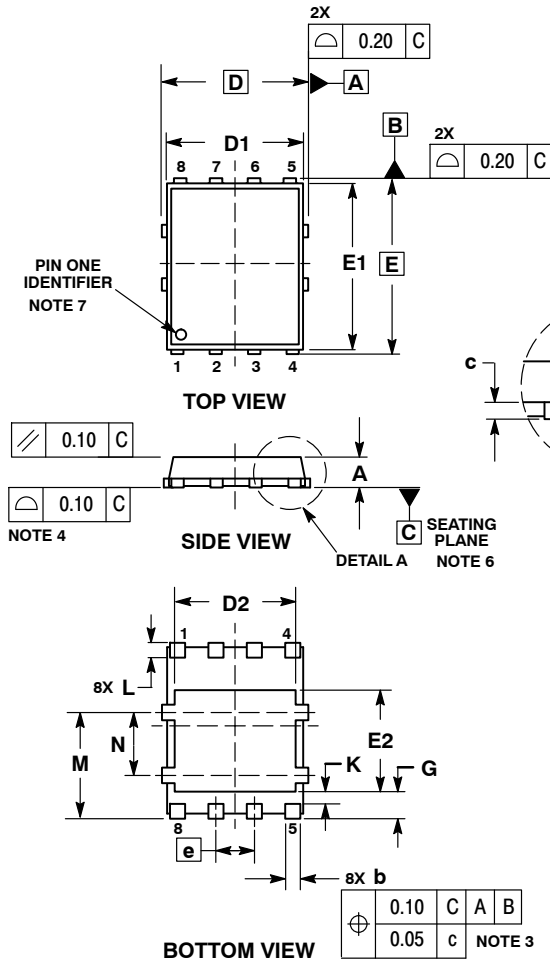


Figure 12. FET Thermal Response

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PACKAGE DIMENSIONS

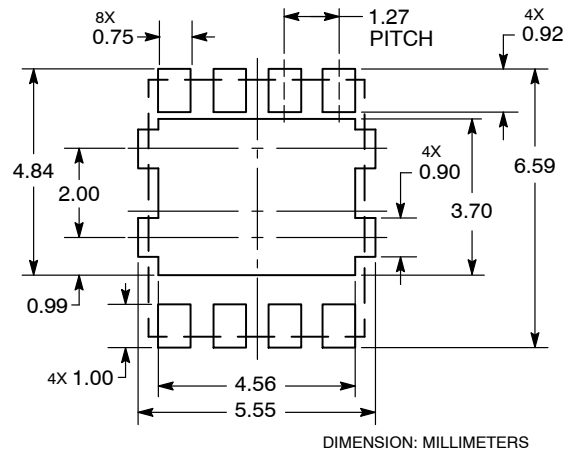
DFN8 5x6, 1.27P
CASE 506BQ-01
ISSUE C



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
 4. PROFILE TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINAL.
 5. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
 6. 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.
 7. A VISUAL INDICATOR FOR PIN 1 MUST BE LOCATED IN THIS AREA.

DIM	MILLIMETERS	
	MIN	MAX
A	0.90	1.10
A1	---	0.05
b	0.33	0.51
c	0.20	0.33
D	5.15 BSC	
D1	4.50	5.10
D2	3.90	4.30
E	6.15 BSC	
E1	5.50	6.10
E2	3.00	3.50
e	1.27 BSC	
G	0.80	1.20
h	---	12°
K	0.20	---
L	0.51	0.71
M	3.25	3.75
N	1.80	2.20

SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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