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NTMFS4841NH

Power MOSFET

30 V, 59 A, Single N-Channel, SO-8FL

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- Low R_G
- These are Pb-Free Devices

Applications

- Refer to Application Note AND8195/D
- CPU Power Delivery
- DC-DC Converters

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DS}	30	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Steady State	Continuous Drain Current $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	I_D 13.5	A
		$T_A = 85^\circ\text{C}$	9.7	
	Power Dissipation $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	P_D 2.16	W
		$T_A = 85^\circ\text{C}$	1.1	
	Continuous Drain Current $R_{\theta JA} \leq 10$ s	$T_A = 25^\circ\text{C}$	I_D 21.8	A
		$T_A = 85^\circ\text{C}$	15.7	
	Power Dissipation $R_{\theta JA} \leq 10$ s	$T_A = 25^\circ\text{C}$	P_D 5.7	W
		$T_A = 85^\circ\text{C}$	2.9	
	Continuous Drain Current $R_{\theta JA}$ (Note 2)	$T_A = 25^\circ\text{C}$	I_D 8.6	A
		$T_A = 85^\circ\text{C}$	6.2	
Power Dissipation $R_{\theta JA}$ (Note 2)	$T_A = 25^\circ\text{C}$	P_D 0.87	W	
	$T_A = 85^\circ\text{C}$	0.45		
Continuous Drain Current $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$	I_D 59	A	
	$T_C = 85^\circ\text{C}$	42.5		
Power Dissipation $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$	P_D 41.7	W	
	$T_C = 85^\circ\text{C}$	21.7		
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$T_A = 25^\circ\text{C}$	I_{DM} 177	A
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)		I_S	35	A
Drain to Source dV/dt		dV/dt	6	V/ns
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 24$ V, $V_{GS} = 10$ V, $I_L = 25.6$ A, $L = 0.3$ mH, $R_G = 25 \Omega$)		EAS	98	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.

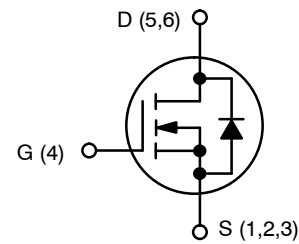
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.



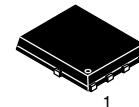
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$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
30 V	6.72 m Ω @ 10 V	59 A
	11.6 m Ω @ 4.5 V	

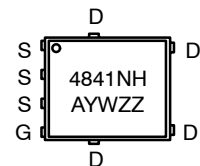


N-CHANNEL MOSFET



SO-8 FLAT LEAD
CASE 488AA
STYLE 1

MARKING DIAGRAM



- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4841NHT1G	SO-8FL (Pb-Free)	1500 / Tape & Reel
NTMFS4841NHT3G	SO-8FL (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 Specifications Brochure, BRD8011/D.

NTMFS4841NH

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	57.8	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	143.5	
Junction-to-Ambient ($t \leq 10$ s)	$R_{\theta JA}$	22.1	

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	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = 250$ μ A	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			28		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0$ V, $V_{DS} = 24$ V	$T_J = 25$ °C		1	μ A
			$T_J = 125$ °C		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = 250$ μ A	1.5	2.1	2.5	V	
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5.6		mV/°C	
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10$ V to 11.5 V	$I_D = 30$ A		4.8	6.72	m Ω
			$I_D = 15$ A		4.8		
		$V_{GS} = 4.5$ V	$I_D = 30$ A		8.8	11.6	
			$I_D = 15$ A		8.5		
Forward Transconductance	g_{FS}	$V_{DS} = 1.5$ V, $I_D = 50$ A		57		S	

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0$ V, $f = 1$ MHz, $V_{DS} = 12$ V	939	1565	2113	pF
Output Capacitance	C_{OSS}		195	325	439	
Reverse Transfer Capacitance	C_{RSS}		103.8	173	242.2	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5$ V, $V_{DS} = 15$ V; $I_D = 30$ A		11.3	15.82	nC
Threshold Gate Charge	$Q_{G(TH)}$			1.4	2.1	
Gate-to-Source Charge	Q_{GS}			5.3	7.9	
Gate-to-Drain Charge	Q_{GD}			4.5	6.8	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 11.5$ V, $V_{DS} = 15$ V, $I_D = 30$ A		24.4	33	nC

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5$ V, $V_{DS} = 15$ V, $I_D = 15$ A, $R_G = 3.0$ Ω		12.1	18.1	ns
Rise Time	t_r			23.3	34.9	
Turn-Off Delay Time	$t_{d(OFF)}$			14.1	21.1	
Fall Time	t_f			4.9	7.3	
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 11.5$ V, $V_{DS} = 15$ V, $I_D = 15$ A, $R_G = 3.0$ Ω		7.2	10.7	ns
Rise Time	t_r			20.6	30.9	
Turn-Off Delay Time	$t_{d(OFF)}$			21.9	32.9	
Fall Time	t_f			2.9	4.4	

- Pulse Test: pulse width ≤ 300 μ s, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.86	1.2	V
			$T_J = 125^\circ\text{C}$		0.71		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$			18.8		ns
Charge Time	t_a				11.4		
Discharge Time	t_b				7.4		
Reverse Recovery Charge	Q_{RR}				6.7	26.7	

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		0.93		nH
Drain Inductance	L_D			0.005		
Gate Inductance	L_G			1.84		
Gate Resistance	R_G			0.90		

- Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

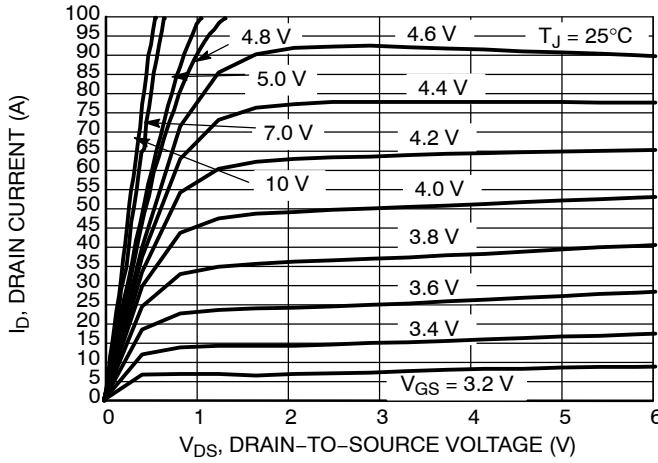


Figure 1. On-Region Characteristics

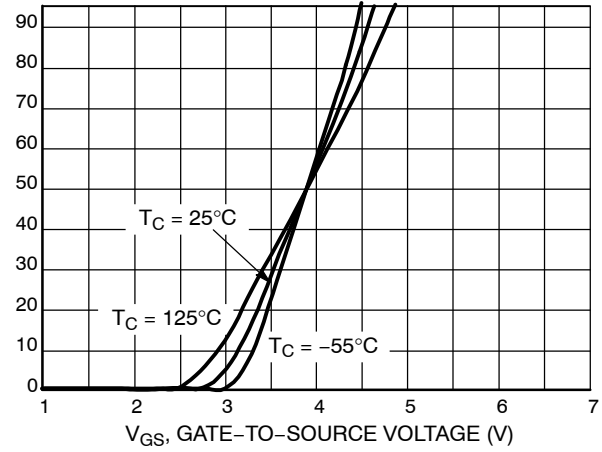


Figure 2. Transfer Characteristics

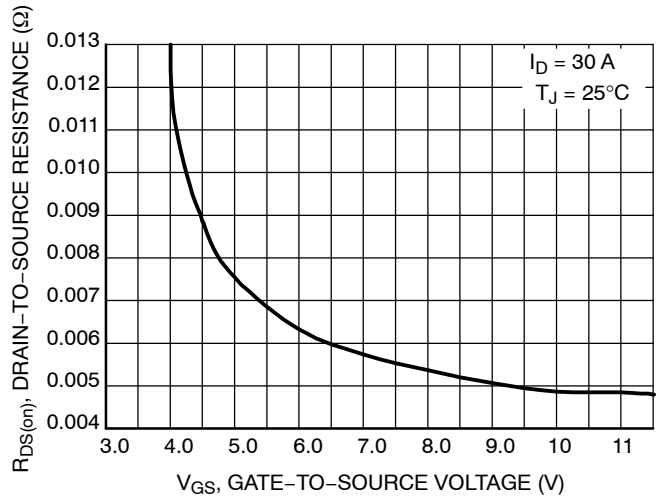


Figure 3. On-Resistance versus Gate-to-Source Voltage

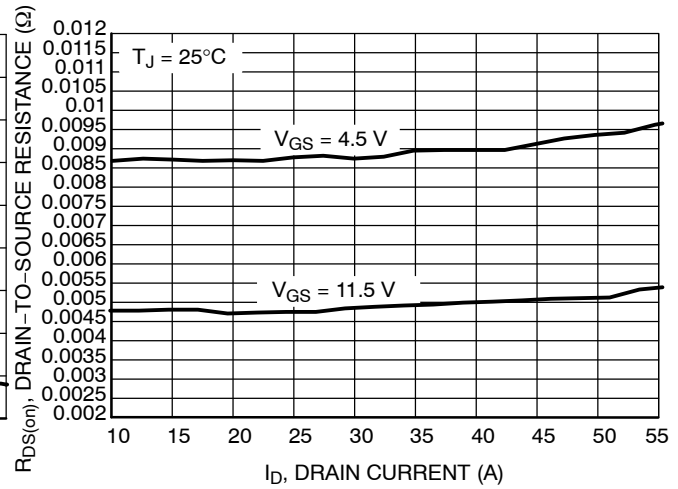


Figure 4. On-Resistance versus Drain Current and Gate Voltage

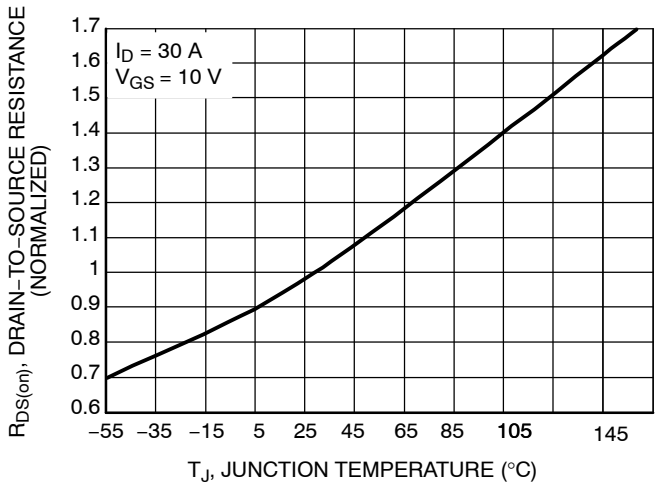


Figure 5. On-Resistance Variation with Temperature

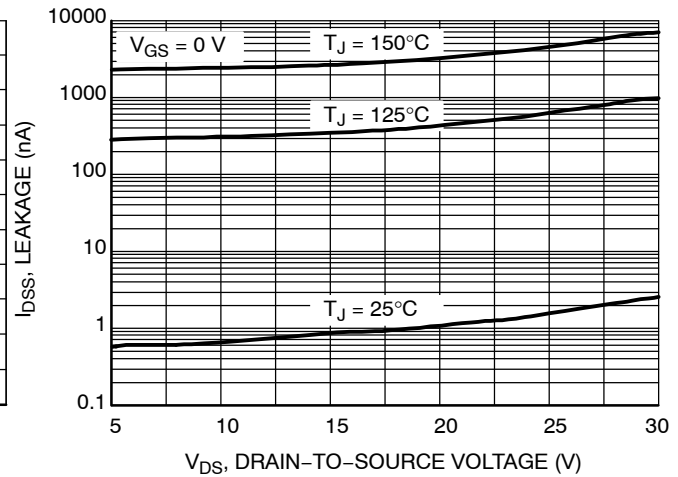


Figure 6. Drain-to-Source Leakage Current versus Voltage

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TYPICAL CHARACTERISTICS

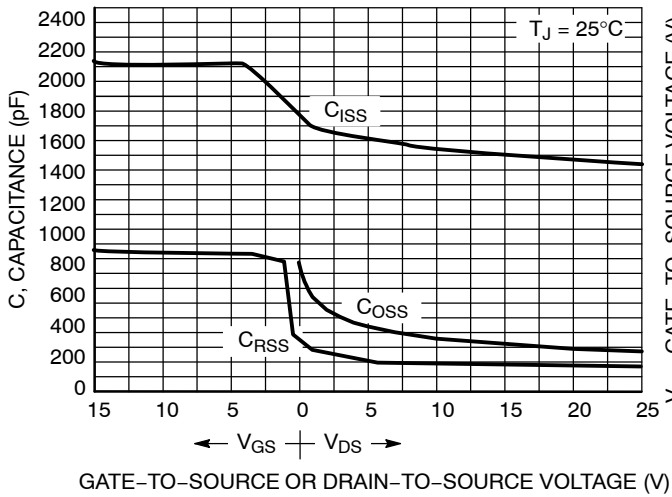


Figure 7. Capacitance Variation

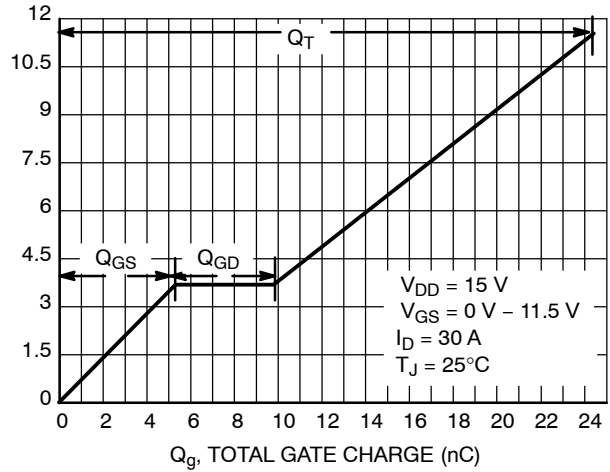


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Gate Charge

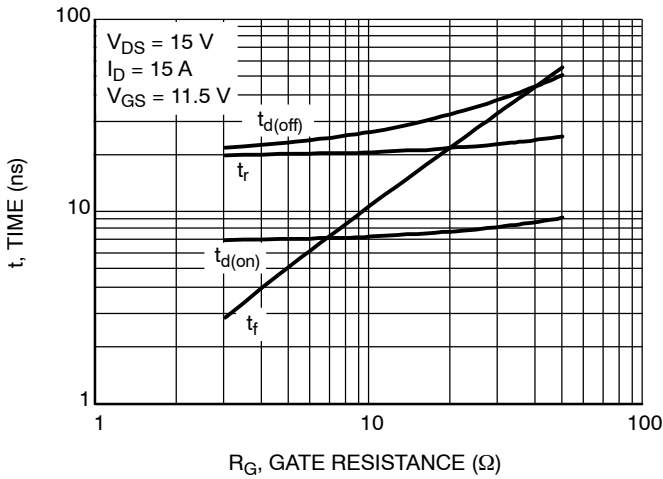


Figure 9. Resistive Switching Time Variation versus Gate Resistance

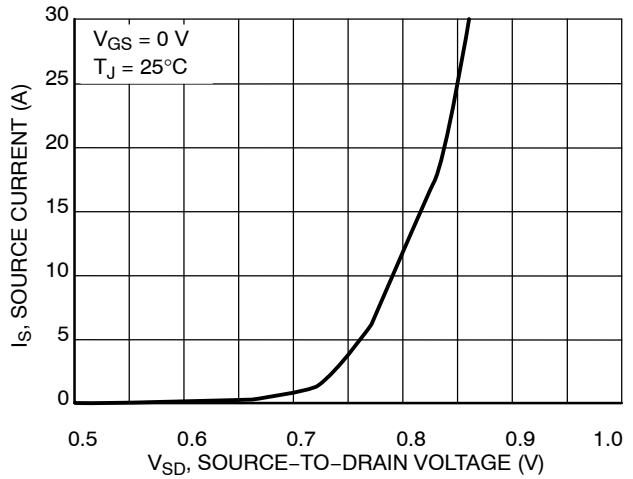


Figure 10. Diode Forward Voltage versus Current

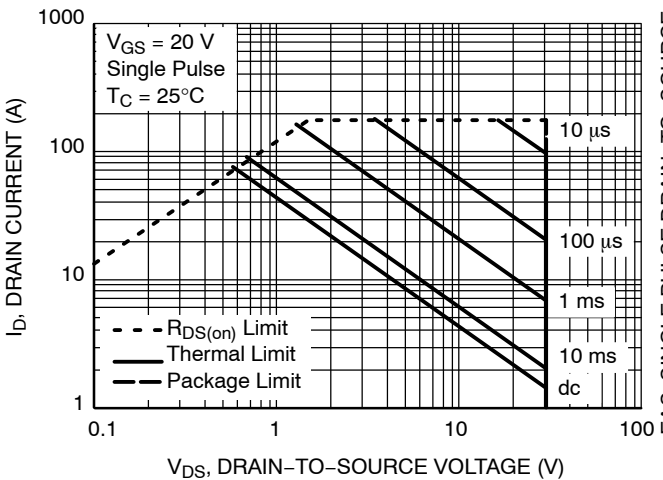


Figure 11. Maximum Rated Forward Biased Safe Operating Area

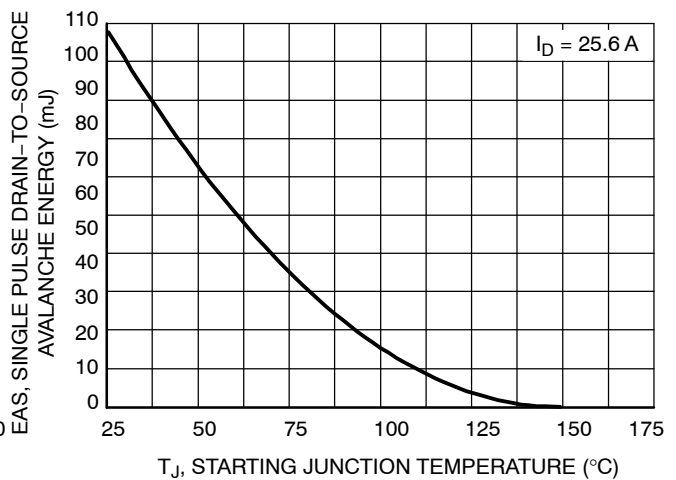


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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TYPICAL CHARACTERISTICS

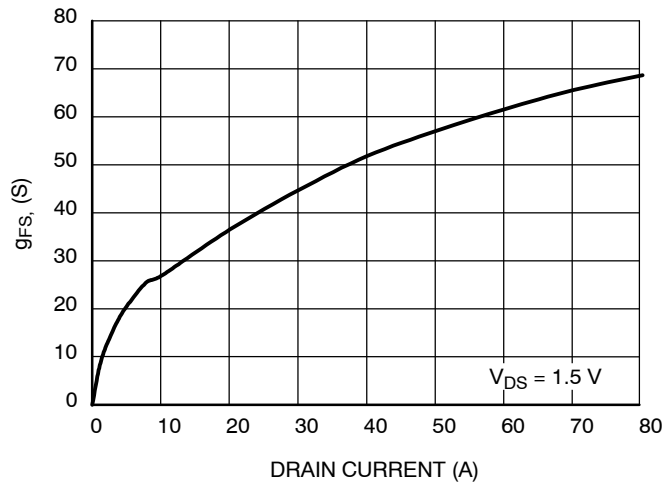


Figure 13. g_{FS} versus Drain Current

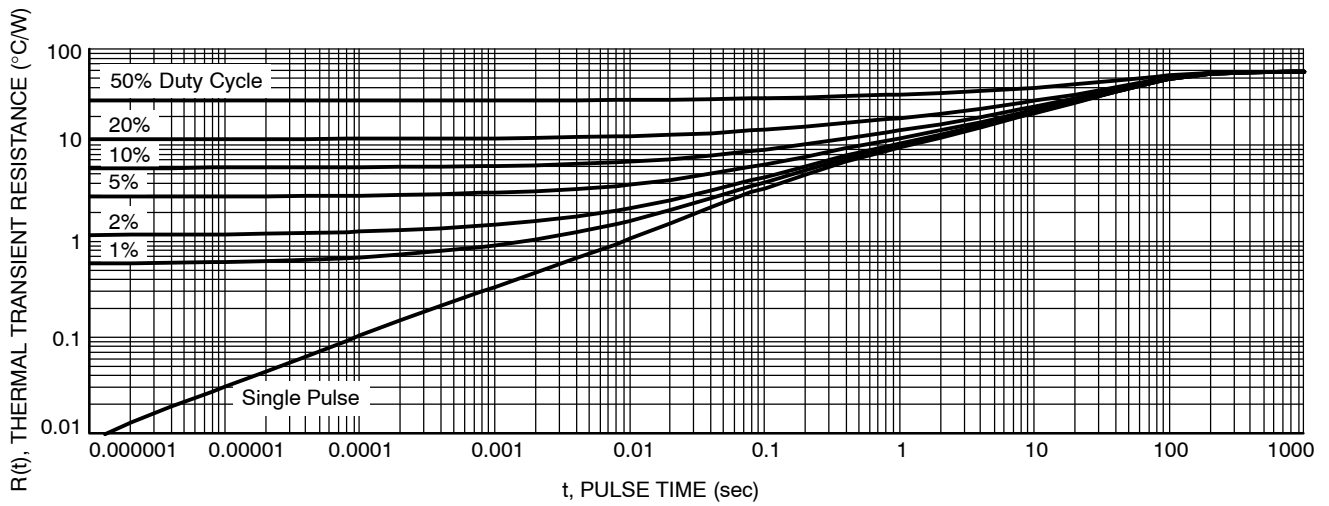
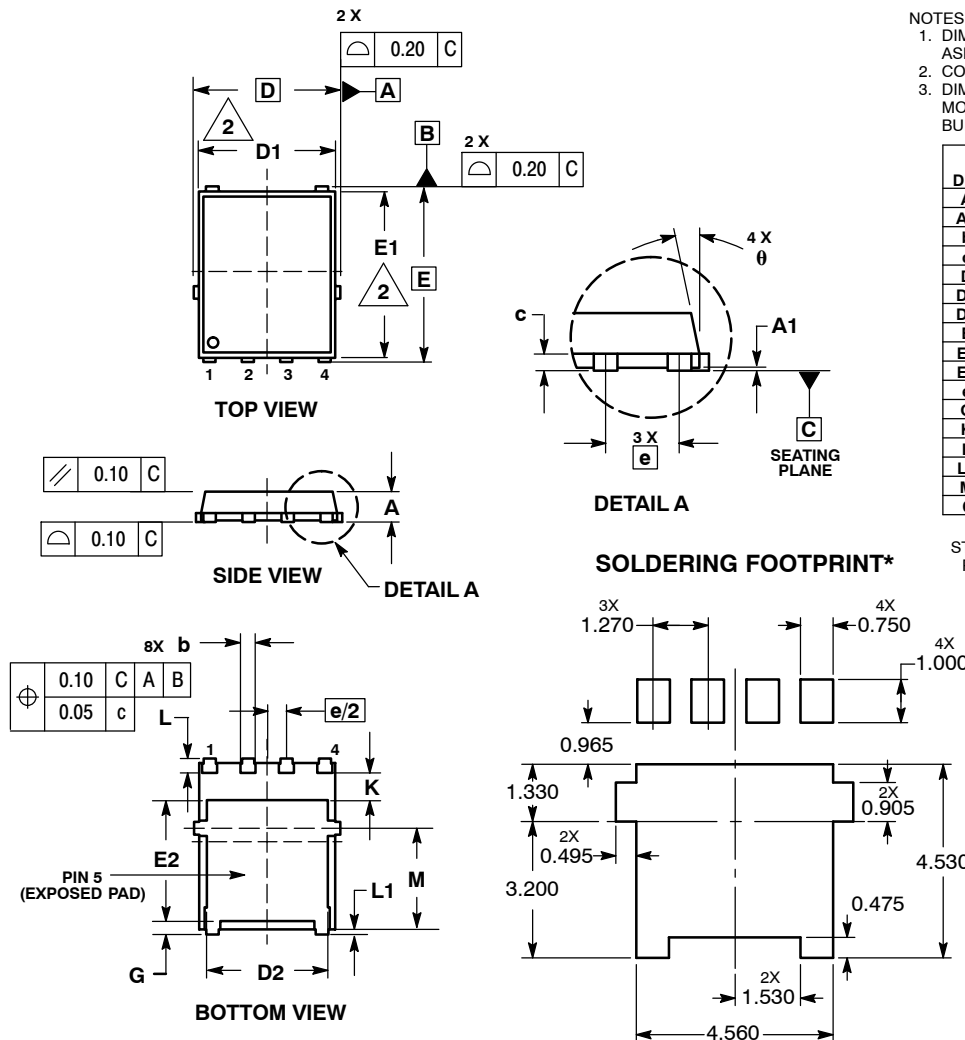


Figure 14. Thermal Resistance

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PACKAGE DIMENSIONS

DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE H



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.15 BSC		
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.15 BSC		
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.61	0.71
K	1.20	1.35	1.50
L	0.51	0.61	0.71
L1	0.05	0.17	0.20
M	3.00	3.40	3.80
θ	0 °	---	12 °

- STYLE 1:
 1. SOURCE
 2. SOURCE
 3. SOURCE
 4. GATE
 5. DRAIN

*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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