

NTMFS4933N

Power MOSFET

30 V, 210 A, Single N-Channel, SO-8 FL

Features

- Low $R_{DS(on)}$ to Improve Conduction and Overall Efficiency
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- OR-ing FET, Power Load Switch, Motor Control
- Refer to Application Note AND8195/D for Mounting Information

End Products

- Server, UPS, Fault-Tolerant Power Systems, Hot Swap

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)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	34	A	
		$T_A = 100^{\circ}\text{C}$		21.5		
Power Dissipation $R_{\theta JA}$ (Note 1)		$T_A = 25^{\circ}\text{C}$	P_D	2.74	W	
Continuous Drain Current $R_{\theta JA} \leq 10$ s (Note 1)		$T_A = 25^{\circ}\text{C}$	I_D	43	A	
		$T_A = 100^{\circ}\text{C}$		27		
Power Dissipation $R_{\theta JA} \leq 10$ s (Note 1)		$T_A = 25^{\circ}\text{C}$	P_D	7.3	W	
Continuous Drain Current $R_{\theta JA}$ (Note 2)		$T_A = 25^{\circ}\text{C}$	I_D	20	A	
		$T_A = 100^{\circ}\text{C}$		12.5		
Power Dissipation $R_{\theta JA}$ (Note 2)		$T_A = 25^{\circ}\text{C}$	P_D	1.06	W	
Continuous Drain Current $R_{\theta JC}$ (Note 1)		$T_C = 25^{\circ}\text{C}$	I_D	210	A	
		$T_C = 100^{\circ}\text{C}$		132		
Power Dissipation $R_{\theta JC}$ (Note 1)		$T_C = 25^{\circ}\text{C}$	P_D	104	W	
Pulsed Drain Current		$T_A = 25^{\circ}\text{C}, t_p = 10 \mu\text{s}$		I_{DM}	400	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to +150	$^{\circ}\text{C}$	
Source Current (Body Diode)			I_S	95	A	
Drain to Source DV/DT			dV/dt_i	4.4	V/ns	
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^{\circ}\text{C}, V_{DD} = 24 \text{ V}, V_{GS} = 10 \text{ V}, I_L = 58 \text{ A}_{pk}, L = 0.3 \text{ mH}, R_G = 25 \Omega$)			E_{AS}	504	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.

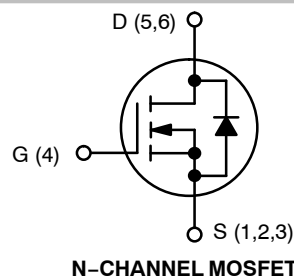
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size. (Cu area = 50 mm² [1 oz])



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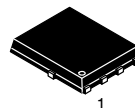
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$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	1.2 m Ω @ 10 V	210 A
	2.0 m Ω @ 4.5 V	

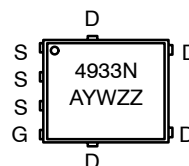


N-CHANNEL MOSFET

MARKING DIAGRAM



SO-8 FLAT LEAD
CASE 488AA
STYLE 1



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

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4933NT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NTMFS4933NT3G	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 Specifications Brochure, BRD8011/D.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	1.1	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	45.6	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	117.5	
Junction-to-Ambient – ($t \leq 10$ s) (Note 3)	$R_{\theta JA}$	17.13	

3. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.

4. Surface-mounted on FR4 board using the minimum recommended pad size. (Cu area = 50 mm² [1 oz])

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$			1.0	μA
					10	
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	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.2	1.6	2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.0		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$		0.9	m Ω
					0.9	
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$		1.5	
			$I_D = 15\text{ A}$		1.5	
Forward Transconductance	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 15\text{ A}$		82		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		10930		pF
Output Capacitance	C_{OSS}			3230		
Reverse Transfer Capacitance	C_{RSS}			92		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		62.1		nC
Threshold Gate Charge	$Q_{G(TH)}$			15.7		
Gate-to-Source Charge	Q_{GS}			27		
Gate-to-Drain Charge	Q_{GD}			10.1		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		148		nC

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		31		ns
Rise Time	t_r			33		
Turn-Off Delay Time	$t_{d(OFF)}$			47		
Fall Time	t_f			23		

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

6. Switching characteristics are independent of operating junction temperatures.

NTMFS4933N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 15\text{ A}, R_G = 3.0\ \Omega$		20		ns
Rise Time	t_r			26		
Turn-Off Delay Time	$t_{d(OFF)}$			88.6		
Fall Time	t_f			22		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.82	1.1	V
			$T_J = 125^\circ\text{C}$		0.68		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$			73.5		ns
Charge Time	t_a				35.9		
Discharge Time	t_b				37.6		
Reverse Recovery Charge	Q_{RR}				117		nC

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		0.50		nH
Drain Inductance	L_D			0.005		nH
Gate Inductance	L_G			1.84		nH
Gate Resistance	R_G			1.1	2.2	Ω

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

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

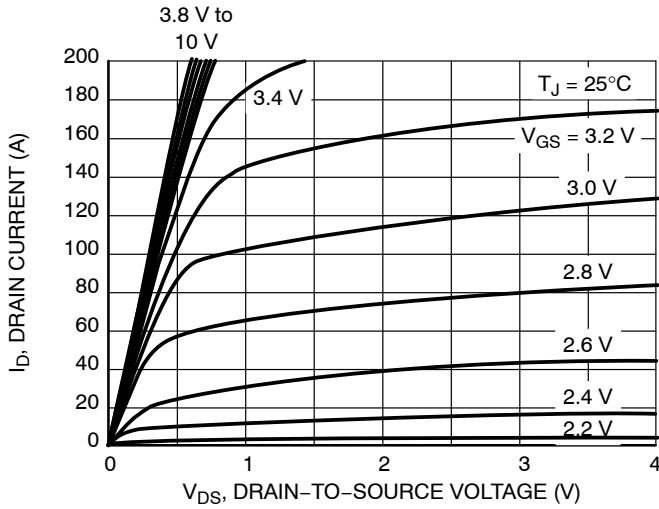


Figure 1. On-Region Characteristics

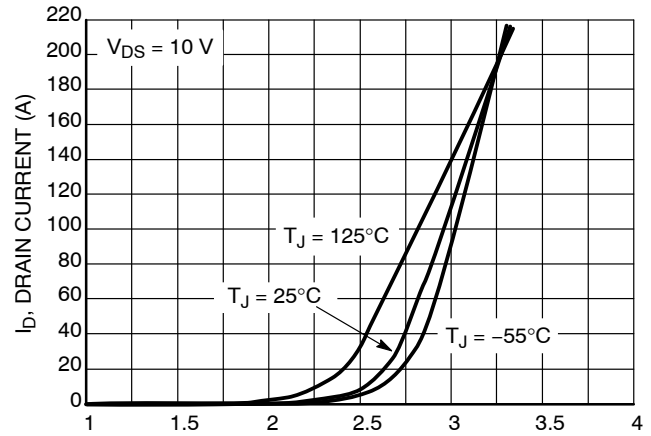


Figure 2. Transfer Characteristics

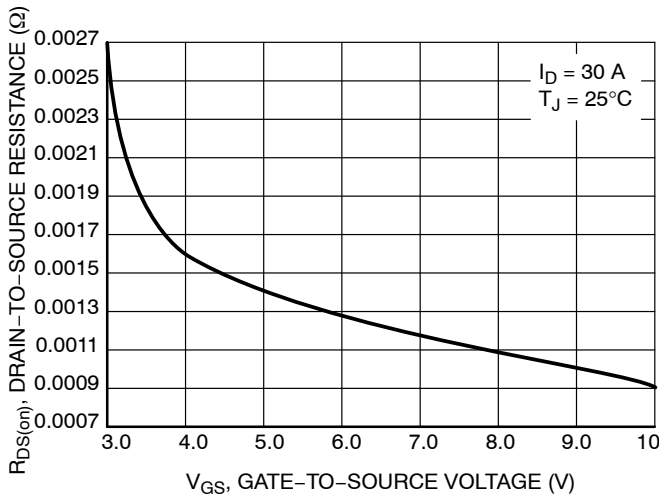


Figure 3. On-Resistance vs. Gate-to-Source Voltage

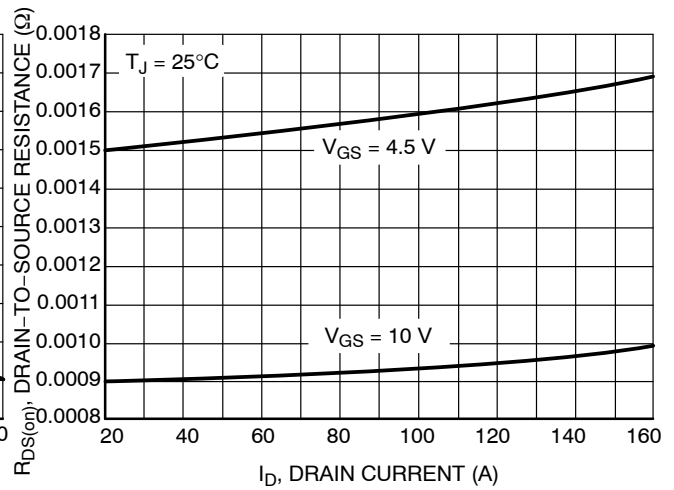


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

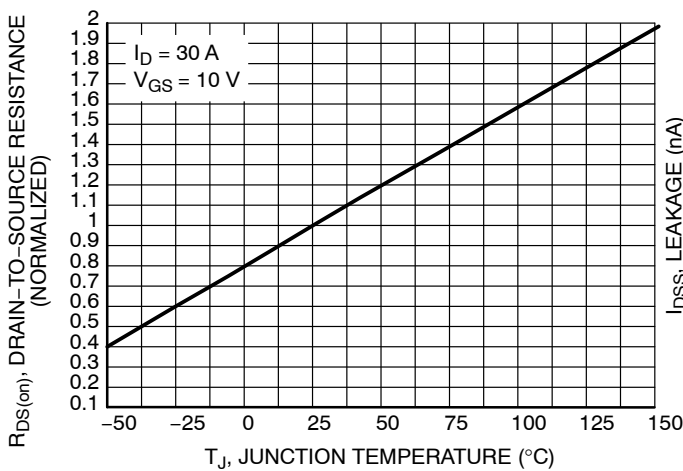


Figure 5. On-Resistance Variation with Temperature

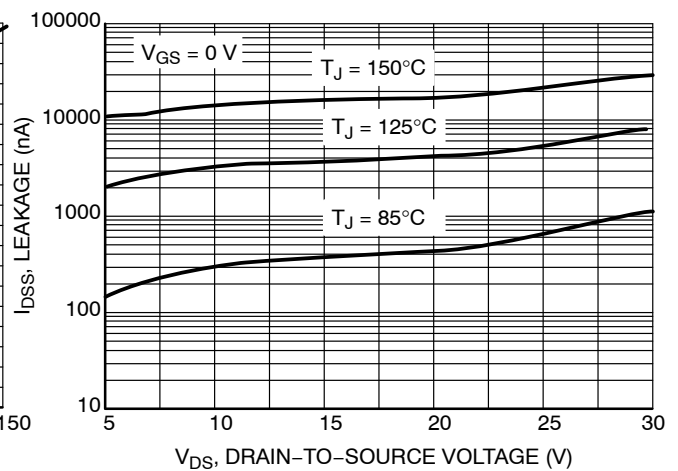


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

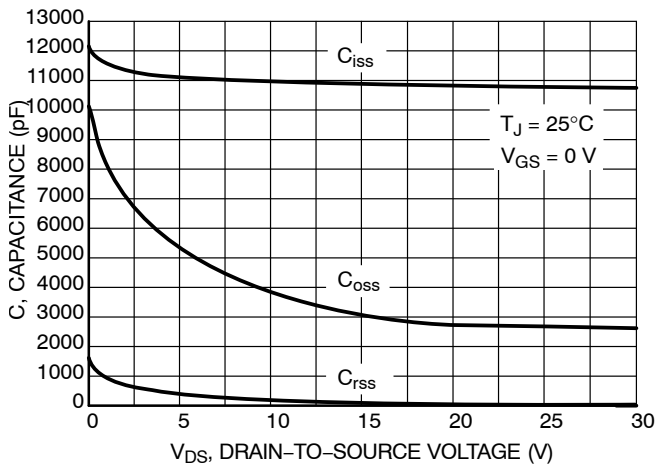


Figure 7. Capacitance Variation

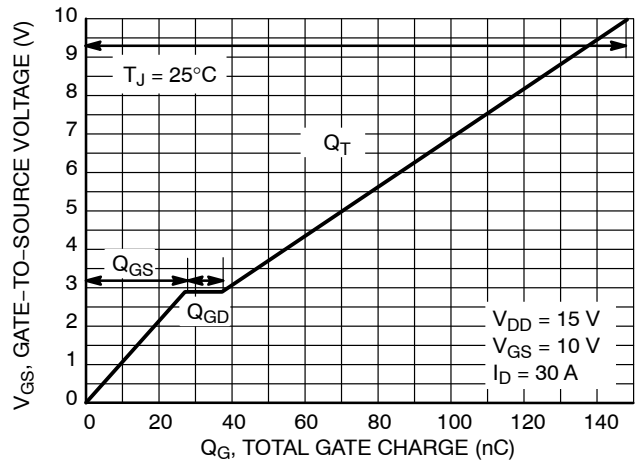


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

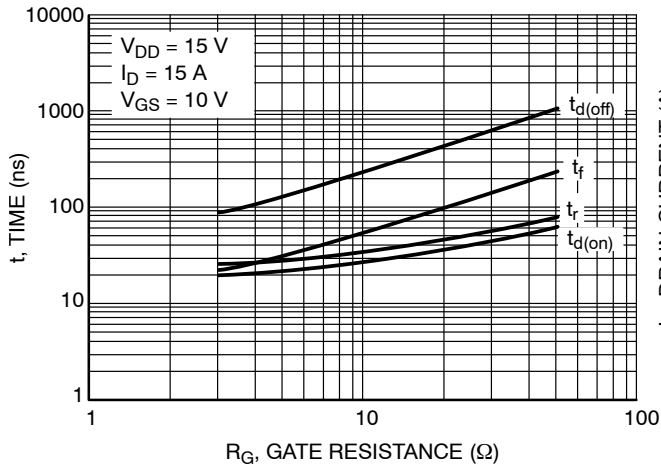


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

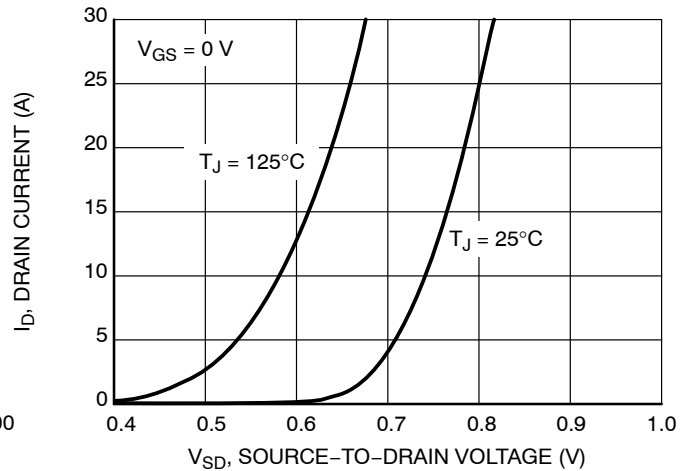


Figure 10. Diode Forward Voltage vs. Current

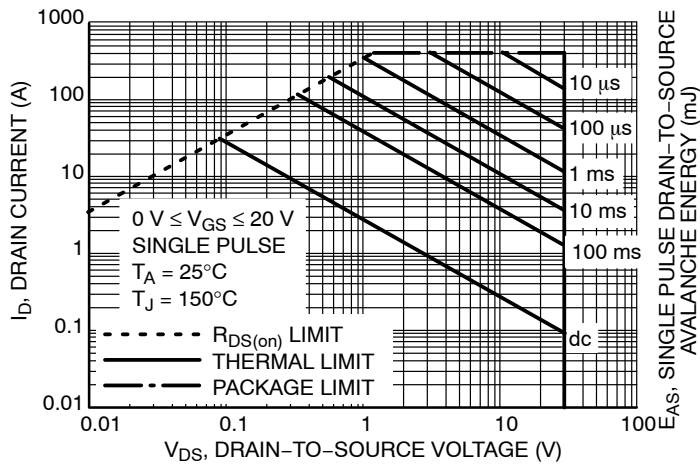


Figure 11. Maximum Rated Forward Biased Safe Operating Area

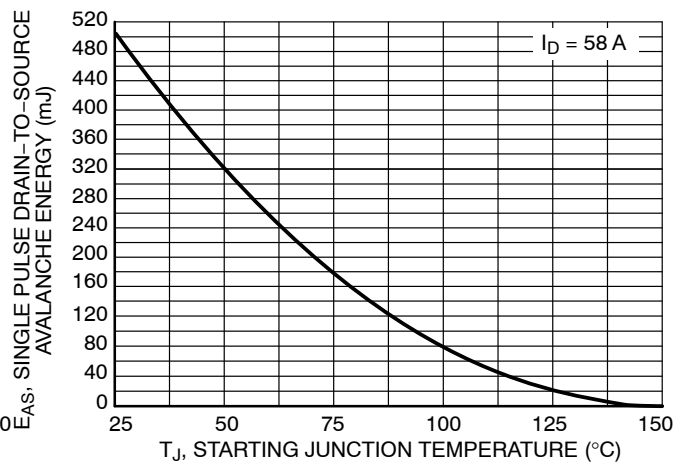


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL CHARACTERISTICS

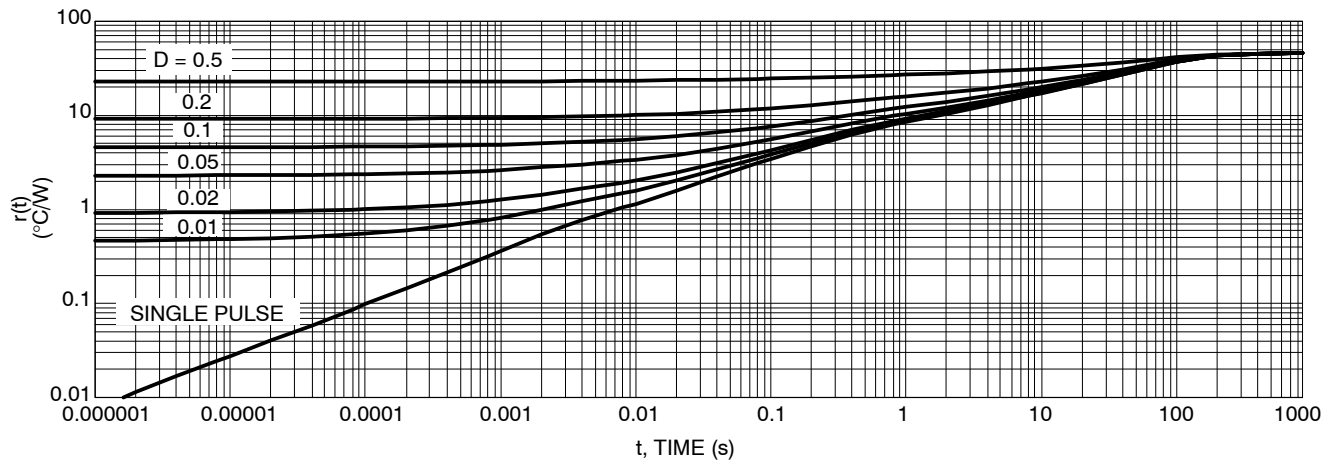


Figure 13. Thermal Response

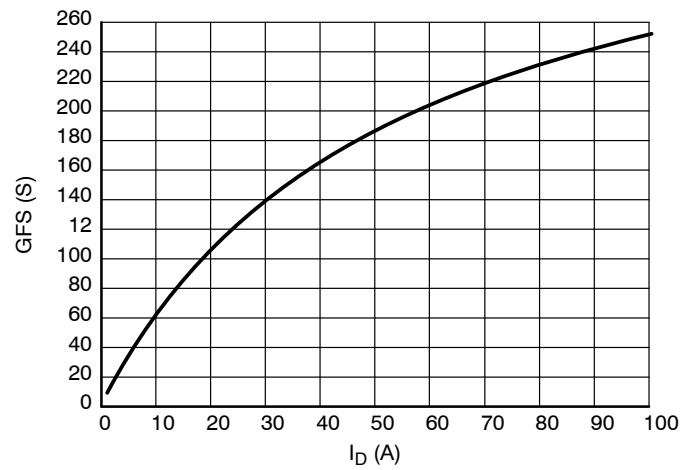
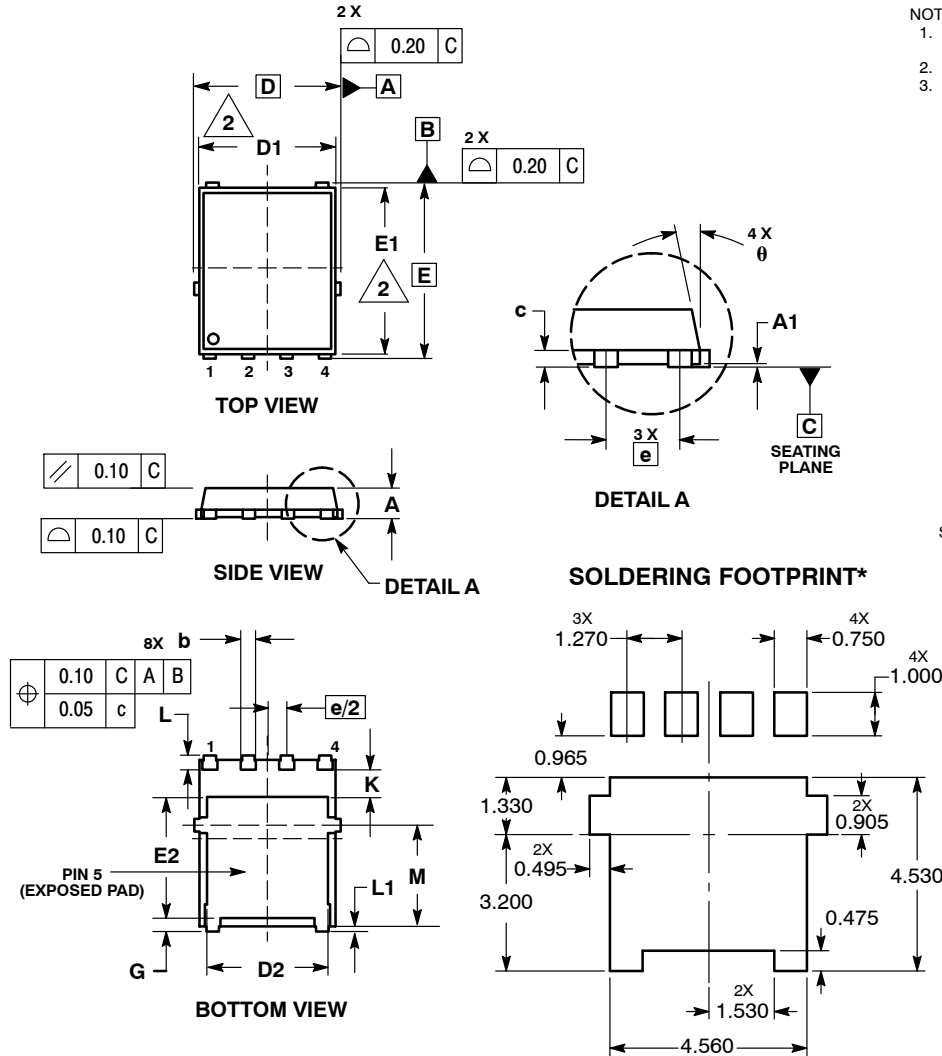


Figure 14. GFS vs. I_D

NTMFS4933N

PACKAGE DIMENSIONS

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



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	4.50	4.90	5.10
D2	3.50	---	4.22
E	6.15 BSC		
E1	5.50	5.80	6.10
E2	3.45	---	4.30
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 °

*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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