

NTMFS4945N

Power MOSFET

30 V, 35 A, Single N-Channel, SO-8 FL

Features

- 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

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
Continuous Drain Current $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	I_D	12.4	A
	$T_A = 100^\circ\text{C}$		7.9	
Power Dissipation $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	P_D	2.54	W
Continuous Drain Current $R_{\theta JA} \leq 10$ s (Note 1)	$T_A = 25^\circ\text{C}$	I_D	20	A
	$T_A = 100^\circ\text{C}$		12.6	
Power Dissipation $R_{\theta JA} \leq 10$ s (Note 1)	$T_A = 25^\circ\text{C}$	P_D	6.5	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)	$T_A = 25^\circ\text{C}$	I_D	7.4	A
	$T_A = 100^\circ\text{C}$		4.7	
Power Dissipation $R_{\theta JA}$ (Note 2)	$T_A = 25^\circ\text{C}$	P_D	0.91	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$	I_D	35	A
	$T_C = 100^\circ\text{C}$		22	
Power Dissipation $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$	P_D	19.8	W
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	104	A
Current Limited by Package	$T_A = 25^\circ\text{C}$	I_{Dmax}	100	A
Operating Junction and Storage Temperature	T_J		-55 to	$^\circ\text{C}$
	T_{STG}		+150	
Source Current (Body Diode)		I_S	18	A
Drain to Source dV/dt		dV/dt	8.0	V/ns
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}, V_{DD} = 50$ V, $V_{GS} = 10$ V, $I_L = 23$ A _{pk} , $L = 0.1$ mH, $R_G = 25 \Omega$)		E_{AS}	26.5	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.

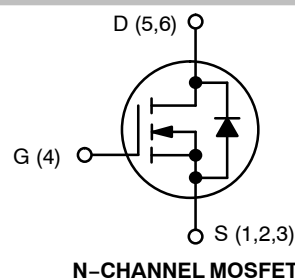
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.



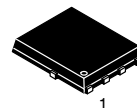
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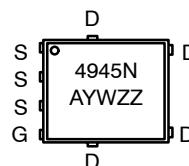
$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	9.0 m Ω @ 10 V	35 A
	13 m Ω @ 4.5 V	



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†
NTMFS4945NT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NTMFS4945NT3G	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.

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	6.3	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	49.3	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	137.5	
Junction-to-Ambient – ($t \leq 10$ s) (Note 3)	$R_{\theta JA}$	19.11	

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.

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 (transient)	$V_{(BR)DSS(t)}$	$V_{GS} = 0\text{ V}, I_{D(aval)} = 9.6\text{ A}, T_{case} = 25^\circ\text{C}, t_{transient} = 100\text{ ns}$	34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		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	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$	6.5	9.0	m Ω
			$I_D = 15\text{ A}$	6.5		
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$	9.7	13	
			$I_D = 15\text{ A}$	9.7		
Forward Transconductance	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 15\text{ A}$		29		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		1205		pF
Output Capacitance	C_{OSS}			452		
Reverse Transfer Capacitance	C_{RSS}			14.4		
Capacitance Ratio	C_{RSS}/C_{ISS}	$V_{GS} = 0\text{ V}, V_{DS} = 15\text{ V}, f = 1\text{ MHz}$		0.012	0.024	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		7.8		nC
Threshold Gate Charge	$Q_{G(TH)}$			2.0		
Gate-to-Source Charge	Q_{GS}			4.2		
Gate-to-Drain Charge	Q_{GD}			1.1		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		17.6		nC

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		10.4		ns
Rise Time	t_r			24		
Turn-Off Delay Time	$t_{d(OFF)}$			17		
Fall Time	t_f			2.6		

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

6. 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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SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 15\text{ A}, R_G = 3.0\ \Omega$		8.0		ns
Rise Time	t_r			20.7		
Turn-Off Delay Time	$t_{d(OFF)}$			21		
Fall Time	t_f			2.1		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.9	1.1	V
			$T_J = 125^\circ\text{C}$		0.84		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$			30.2		ns
Charge Time	t_a				14.6		
Discharge Time	t_b				15.6		
Reverse Recovery Charge	Q_{RR}				18		nC

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		1.00		nH
Drain Inductance	L_D			0.005		nH
Gate Inductance	L_G			1.84		nH
Gate Resistance	R_G			1.1	2.0	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

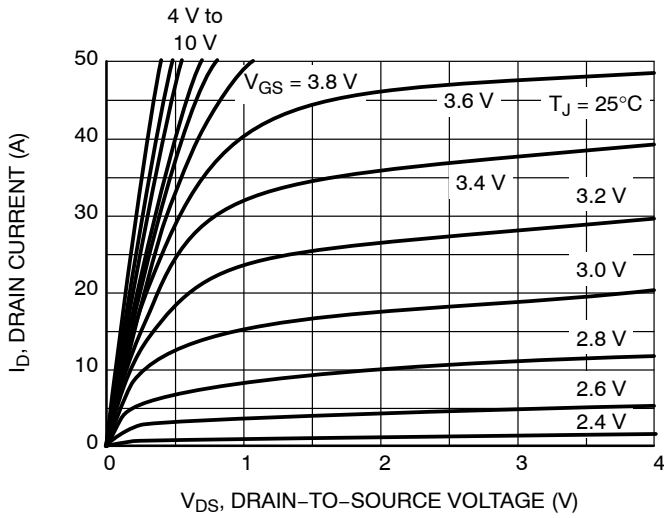


Figure 1. On-Region Characteristics

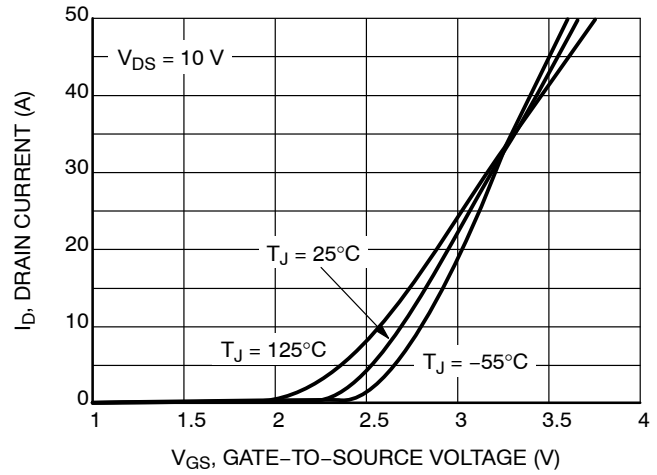


Figure 2. Transfer Characteristics

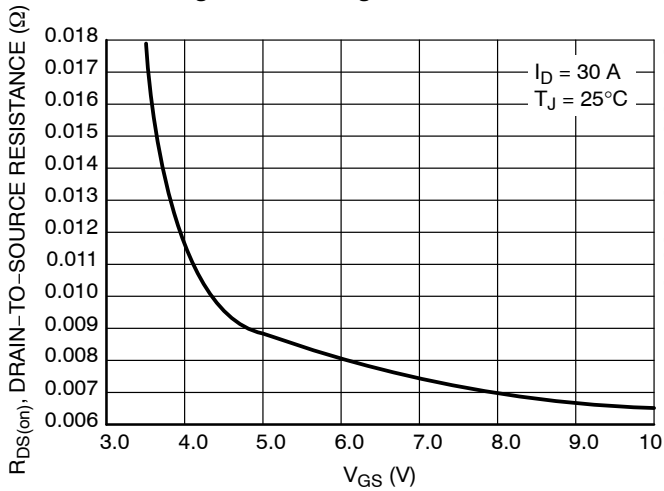


Figure 3. On-Resistance vs. V_{GS}

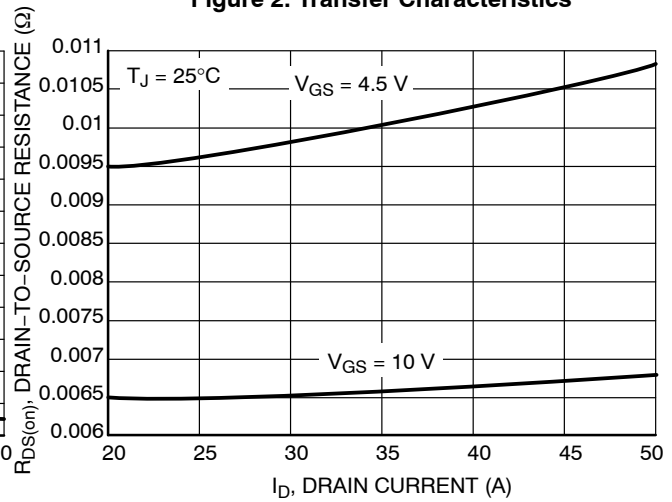


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

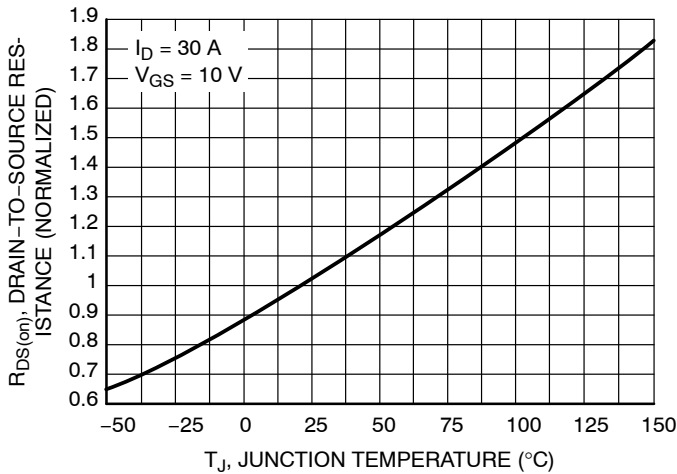


Figure 5. On-Resistance Variation with Temperature

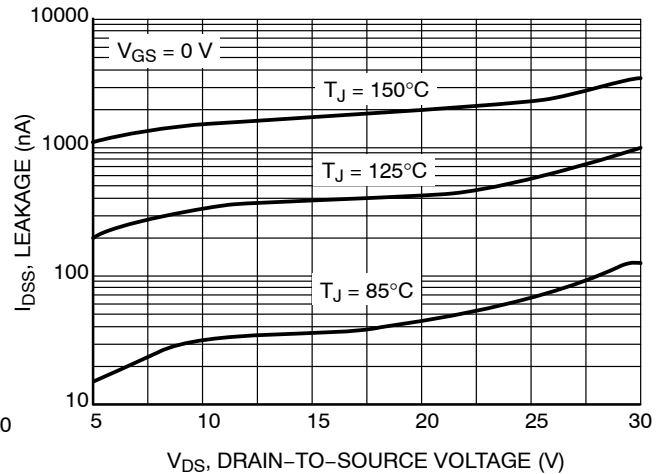


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

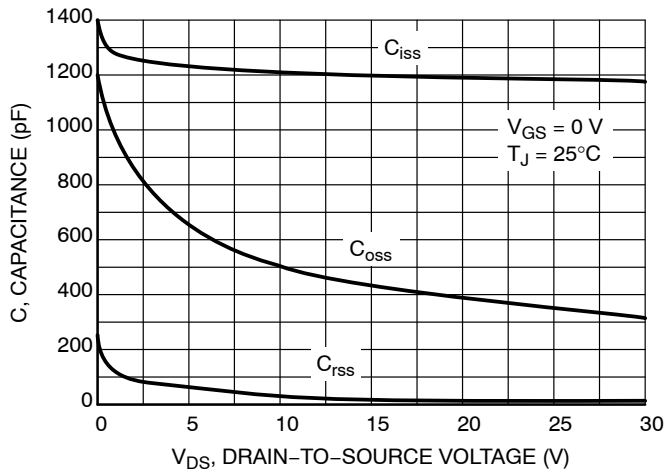


Figure 7. Capacitance Variation

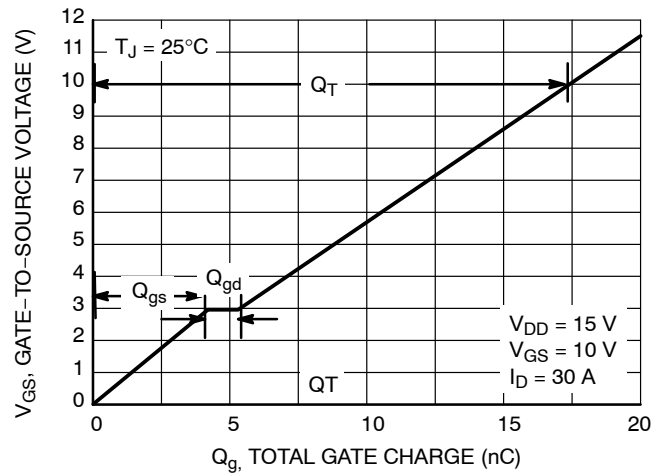


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

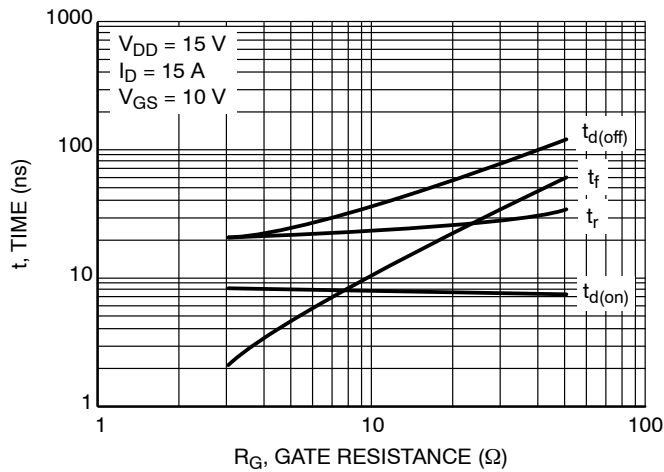


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

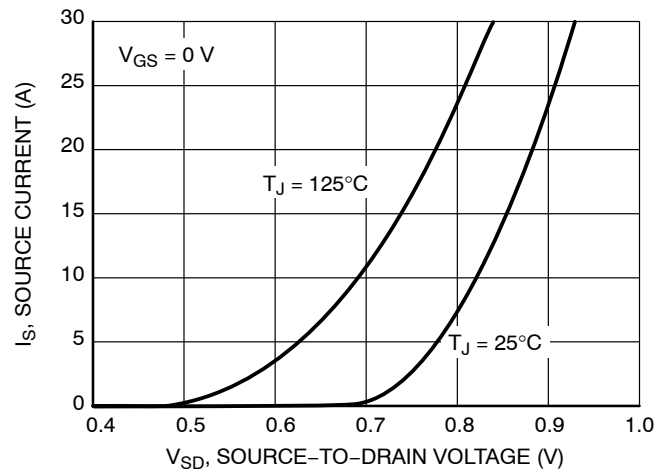


Figure 10. Diode Forward Voltage vs. Current

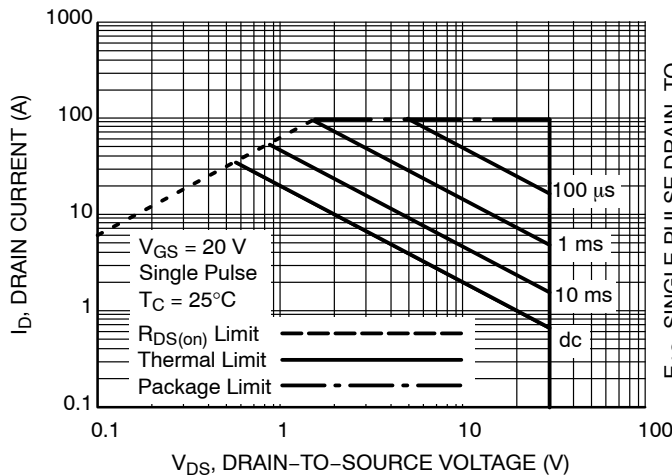


Figure 11. Maximum Rated Forward Biased Safe Operating Area

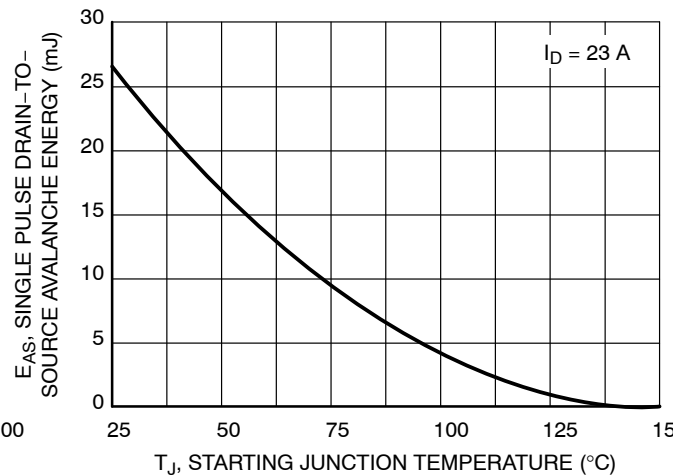


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL CHARACTERISTICS

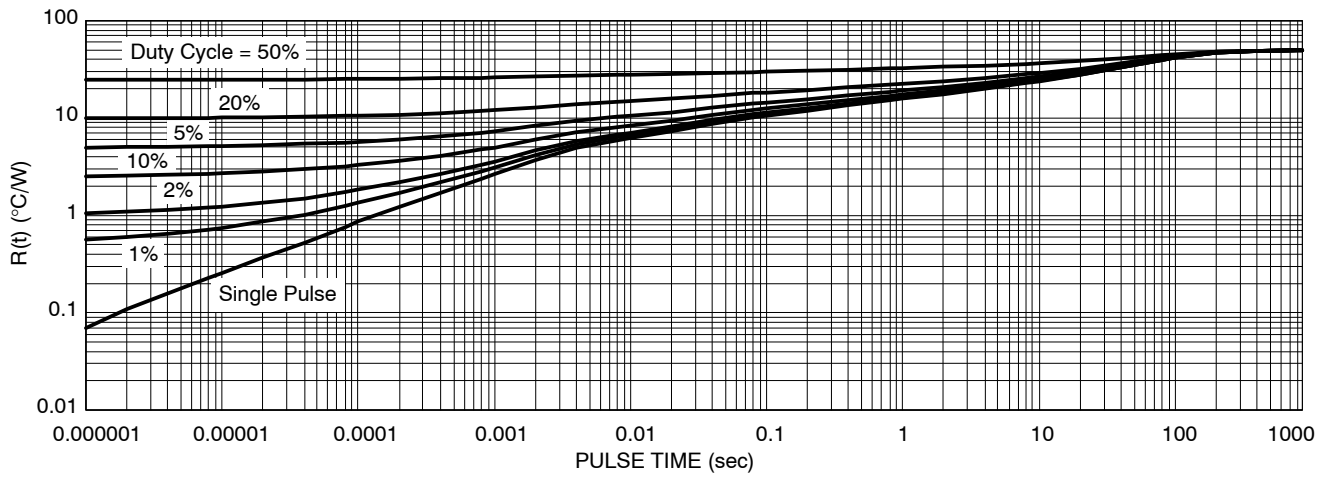


Figure 13. Thermal Response

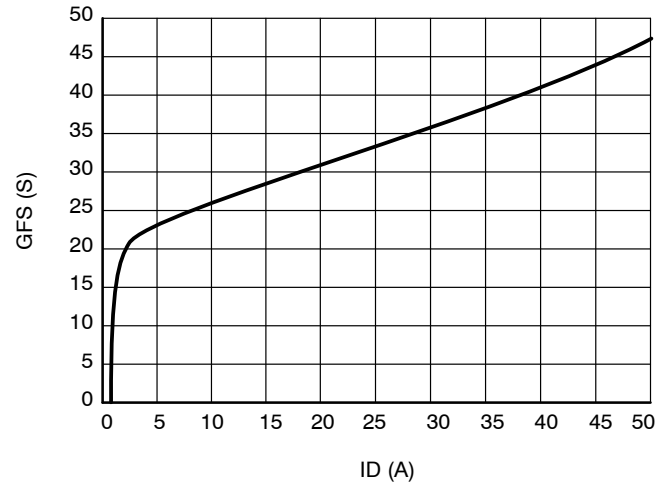


Figure 14. GFS vs. ID

PACKAGE DIMENSIONS

The drawing illustrates the mechanical specifications of a 5-pin D-subminiature connector. It includes the following views and dimensions:

- TOP VIEW:** Shows the connector's footprint with dimensions $2X$, 0.20 , C , D , A , B , $2X$, 0.20 , C , $E1$, E , and pin positions 1, 2, 3, 4. A feature with a triangular symbol and '2' is also indicated.
- SIDE VIEW:** Shows the profile of the connector with dimensions 0.10 , C , A , and 0.10 , C . A dashed circle indicates the location of **DETAIL A**.
- DETAIL A:** A magnified view of the contact area showing dimensions $4X$, θ , $A1$, C , $SEATING PLANE$, $3X$, e , and c .
- SOLDERING FOOTPRINT:** Shows the dimensions for the solder pads, including $3X$, 1.270 , 0.965 , 1.330 , $2X$, 0.495 , 3.200 , 1.530 , $2X$, 4.560 , and 0 .
- BOTTOM VIEW:** Shows the underside of the connector with dimensions $8X$, b , 0.10 , C , A , B , 0.05 , c , L , 1 , 4 , K , $E2$, $PIN 5 EXPOSED PAD$, $L1$, M , G , $D2$, and $e/2$.

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	4.50	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°

PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN

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