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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



NTMFS4C290N

Power MOSFET

30 V, 46 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)	I_D	$T_A = 25^\circ\text{C}$	15.0	A
		$T_A = 80^\circ\text{C}$	11.2	
Power Dissipation $R_{\theta JA}$ (Note 1)	P_D	2.49	W	
Continuous Drain Current $R_{\theta JA} \leq 10$ s (Note 1)	I_D	$T_A = 25^\circ\text{C}$	22.5	A
		$T_A = 80^\circ\text{C}$	16.8	
Power Dissipation $R_{\theta JA} \leq 10$ s (Note 1)	P_D	5.6	W	
Continuous Drain Current $R_{\theta JA}$ (Note 2)	I_D	$T_A = 25^\circ\text{C}$	8.2	A
		$T_A = 80^\circ\text{C}$	6.2	
Power Dissipation $R_{\theta JA}$ (Note 2)	P_D	0.75	W	
Continuous Drain Current $R_{\theta JC}$ (Note 1)	I_D	$T_C = 25^\circ\text{C}$	46	A
		$T_C = 80^\circ\text{C}$	34	
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	23.6	W	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	132	A
Current Limited by Package	$T_A = 25^\circ\text{C}$	I_{Dmax}	80	A
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	21	A	
Drain to Source dV/dt	dV/dt	7.0	V/ns	
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}, V_{GS} = 10$ V, $I_L = 25$ Apk, $L = 0.1$ mH, $R_{GS} = 25 \Omega$) (Note 3)	E_{AS}	31	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$	

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.

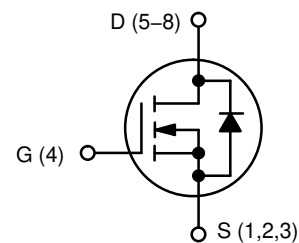
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.
3. This is the absolute maximum rating. Parts are 100% tested at $T_J = 25^\circ\text{C}$, $V_{GS} = 10$ V, $I_L = 17$ Apk, $E_{AS} = 14$ mJ.



ON Semiconductor®

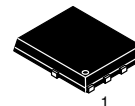
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$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
30 V	6.95 m Ω @ 10 V	46 A
	10.8 m Ω @ 4.5 V	

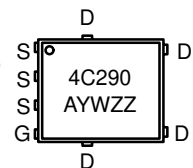


N-CHANNEL MOSFET

MARKING DIAGRAMS



SO-8 FLAT LEAD
CASE 488AA
STYLE 1



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

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4C290NT1G	SO-8 FL (Pb-Free)	1500 / 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)	$R_{\theta JC}$	5.3	°C/W
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	50.3	
Junction-to-Ambient – Steady State (Note 5)	$R_{\theta JA}$	165.9	
Junction-to-Ambient – ($t \leq 10$ s) (Note 4)	$R_{\theta JA}$	22.2	

4. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
 5. 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	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = 250$ μ A	30			V
Drain-to-Source Breakdown Voltage (transient)	$V_{(BR)DSS(t)}$	$V_{GS} = 0$ V, $I_{D(aval)} = 7.1$ A, $T_{case} = 25^\circ\text{C}$, $t_{transient} = 100$ ns	34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			14.5		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0$ V, $V_{DS} = 24$ V			1.0	μ A
		$T_J = 25^\circ\text{C}$			10	
		$T_J = 125^\circ\text{C}$				
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 100	nA

ON CHARACTERISTICS (Note 6)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = 250$ μ A	1.3		2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.7		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 30$ A		5.8	6.95	m Ω
		$V_{GS} = 4.5$ V, $I_D = 15$ A		8.9	10.8	
Forward Transconductance	g_{FS}	$V_{DS} = 1.5$ V, $I_D = 15$ A		43		S
Gate Resistance	R_G	$T_A = 25^\circ\text{C}$	0.3	1.0	2.0	Ω

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0$ V, $f = 1$ MHz, $V_{DS} = 15$ V		987		pF
Output Capacitance	C_{OSS}			574		
Reverse Transfer Capacitance	C_{RSS}			162		
Capacitance Ratio	C_{RSS}/C_{ISS}	$V_{GS} = 0$ V, $V_{DS} = 15$ V, $f = 1$ MHz		0.165		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5$ V, $V_{DS} = 15$ V; $I_D = 30$ A		9.7		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.5		
Gate-to-Source Charge	Q_{GS}			2.8		
Gate-to-Drain Charge	Q_{GD}			4.8		
Gate Plateau Voltage	V_{GP}			3.2		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10$ V, $V_{DS} = 15$ V; $I_D = 30$ A		18.6		nC

SWITCHING CHARACTERISTICS (Note 7)

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		9.0		ns
Rise Time	t_r			34		
Turn-Off Delay Time	$t_{d(OFF)}$			14		
Fall Time	t_f			7.0		

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 7)						
Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DS} = 15 V, I _D = 15 A, R _G = 3.0 Ω		7.0		ns
Rise Time	t _r			26		
Turn-Off Delay Time	t _{d(OFF)}			18		
Fall Time	t _f			4.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 10 A	T _J = 25°C		0.80	1.1	V
			T _J = 125°C		0.67		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 30 A		26.7		ns	
Charge Time	t _a			14.1			
Discharge Time	t _b			12.6			
Reverse Recovery Charge	Q _{RR}			13.7		nC	

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.

6. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

7. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

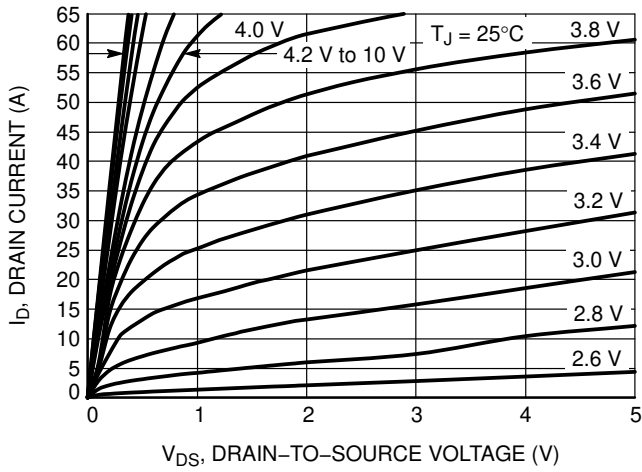


Figure 1. On-Region Characteristics

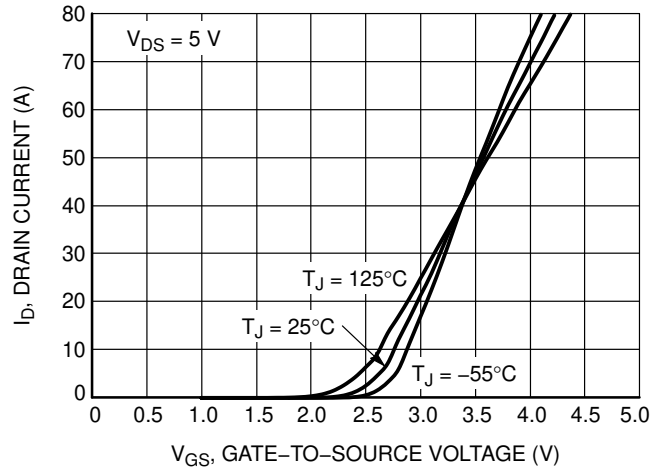


Figure 2. Transfer Characteristics

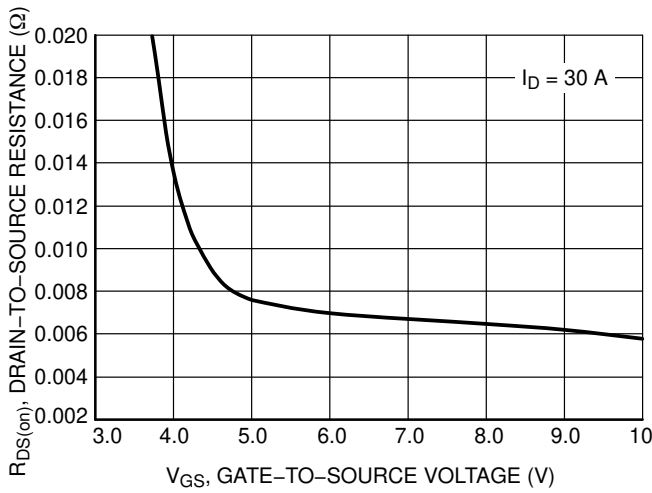


Figure 3. On-Resistance vs. V_{GS}

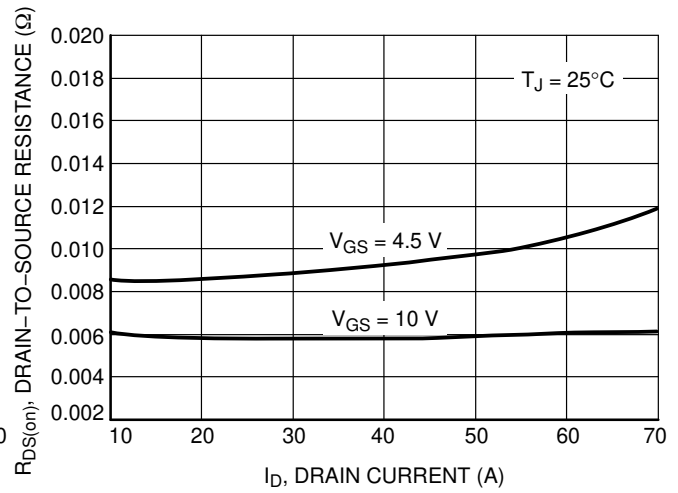


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

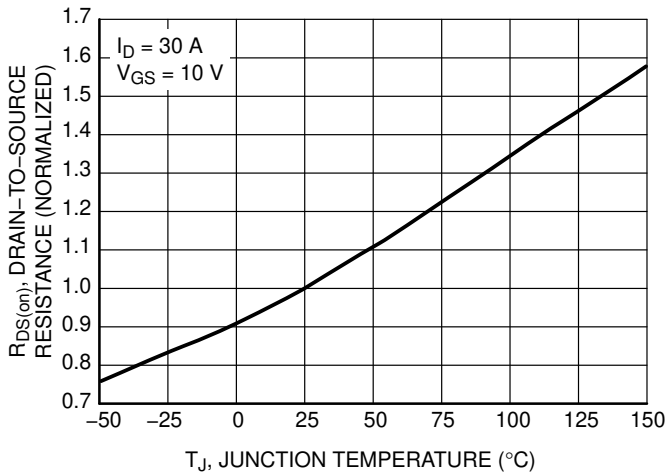


Figure 5. On-Resistance Variation with Temperature

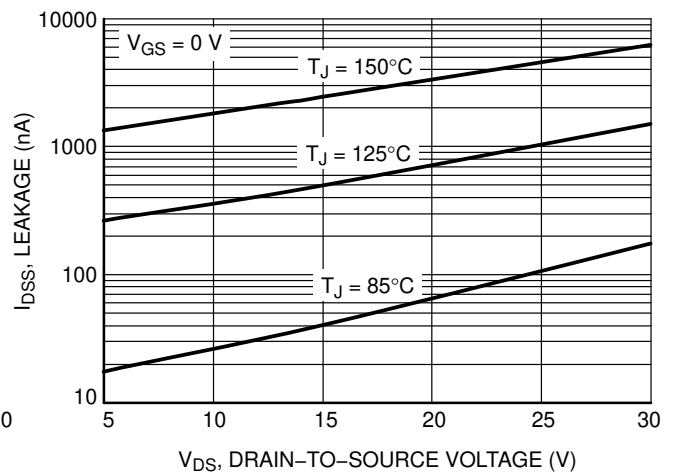


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

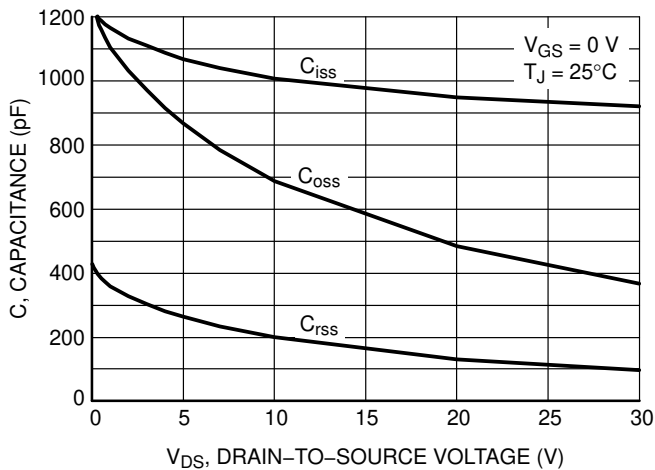


Figure 7. Capacitance Variation

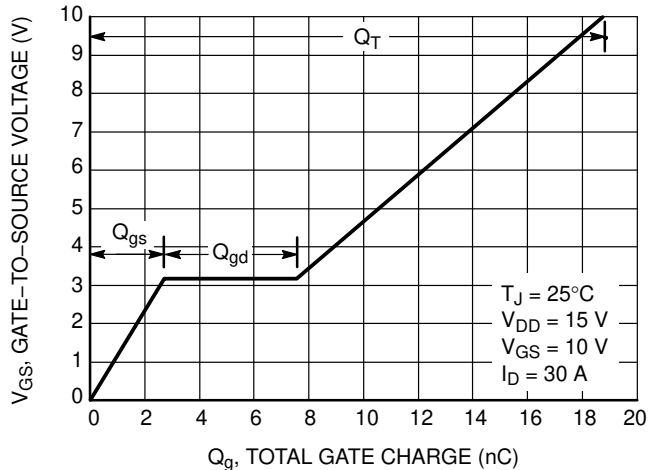


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

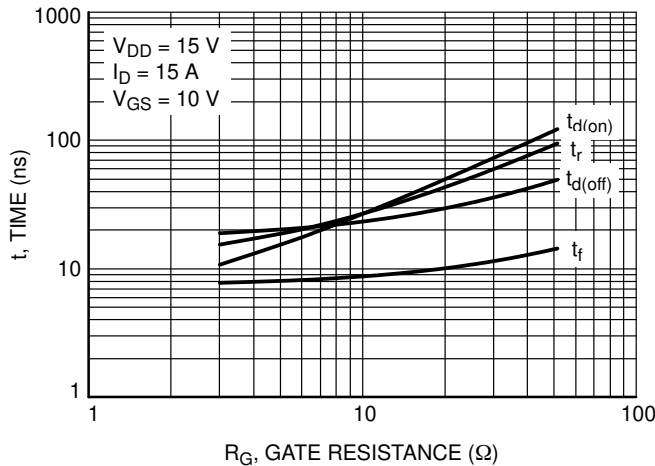


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

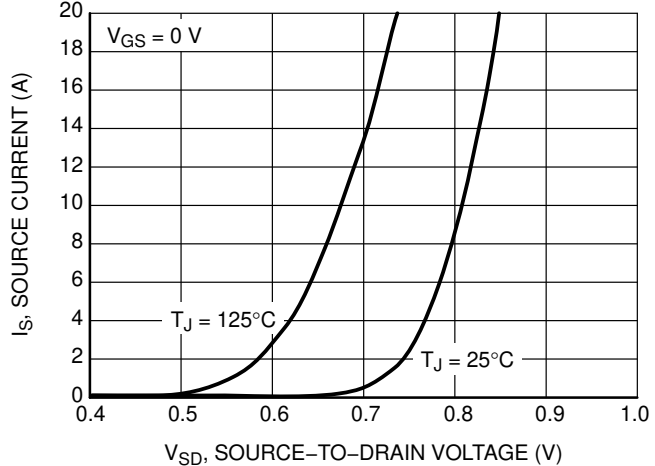


Figure 10. Diode Forward Voltage vs. Current

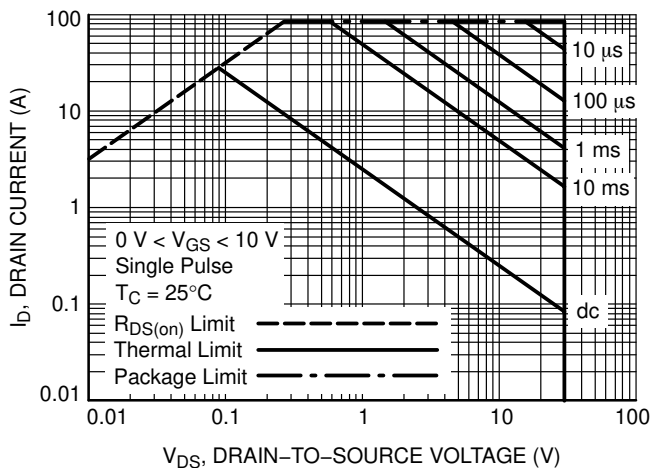


Figure 11. Maximum Rated Forward Biased Safe Operating Area

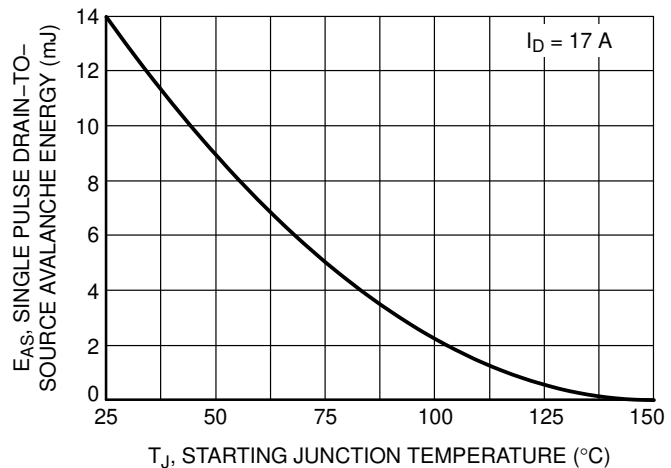


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL CHARACTERISTICS

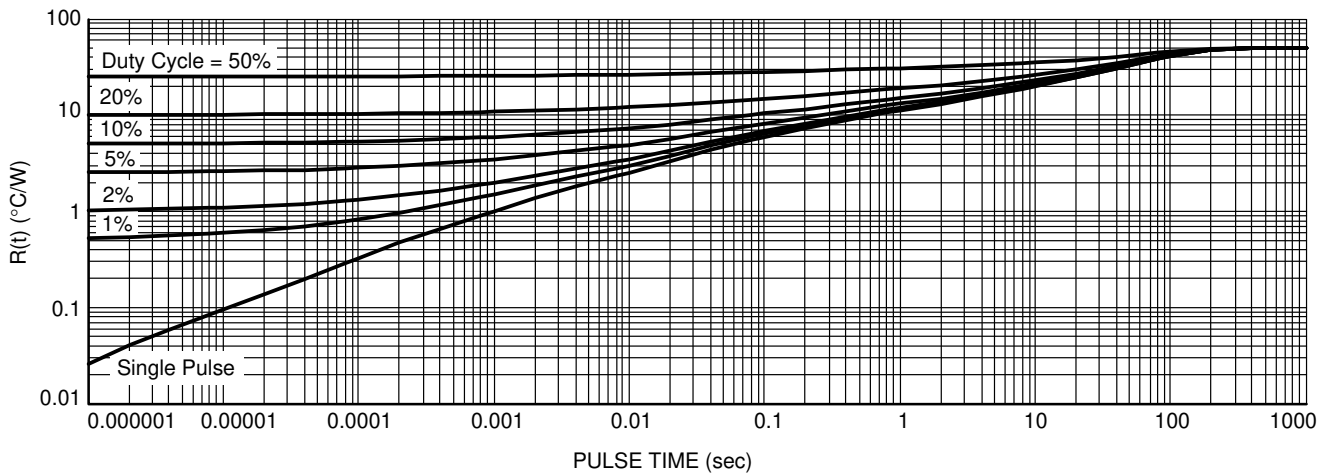


Figure 13. Thermal Response

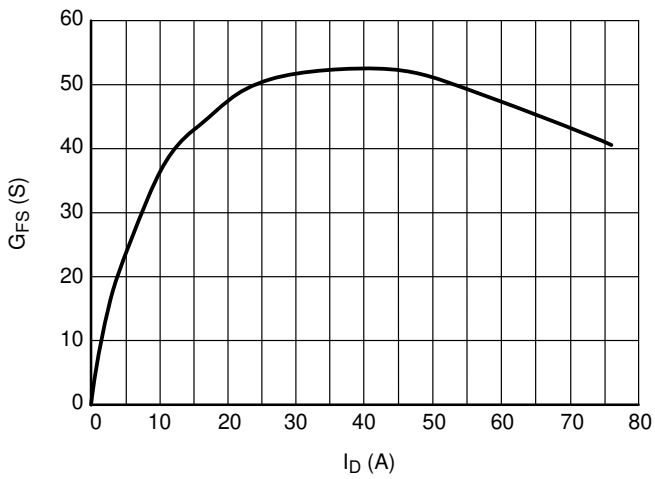


Figure 14. G_{FS} vs. I_D

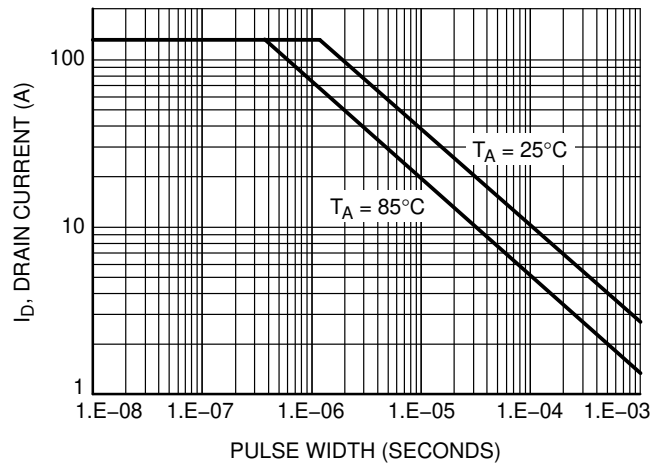


Figure 15. Avalanche Characteristics

