

NTMFS4C09N

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	4.9	°C/W
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	49.8	
Junction-to-Ambient – Steady State (Note 5)	$R_{\theta JA}$	164.6	
Junction-to-Ambient – ($t \leq 10$ s) (Note 4)	$R_{\theta JA}$	21.0	

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, $I_{D(aval)} = 8.4$ A, $T_{case} = 25^\circ\text{C}$, $t_{transient} = 100$ ns	34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			14.4		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0$ V, $V_{DS} = 24$ V			1.0	μ A
		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			10	
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		2.1	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.8		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 30$ A $V_{GS} = 4.5$ V, $I_D = 18$ A		4.6	5.8	m Ω
				6.8	8.5	
Forward Transconductance	g_{FS}	$V_{DS} = 1.5$ V, $I_D = 15$ A		50		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		1252		pF
Output Capacitance	C_{OSS}			610		
Reverse Transfer Capacitance	C_{RSS}			126		
Capacitance Ratio	C_{RSS}/C_{ISS}	$V_{GS} = 0$ V, $V_{DS} = 15$ V, $f = 1$ MHz		0.101		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5$ V, $V_{DS} = 15$ V; $I_D = 30$ A		10.9		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.9		
Gate-to-Source Charge	Q_{GS}			3.4		
Gate-to-Drain Charge	Q_{GD}			5.4		
Gate Plateau Voltage	V_{GP}			3.1		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10$ V, $V_{DS} = 15$ V; $I_D = 30$ A		22.2		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		10		ns
Rise Time	t_r			32		
Turn-Off Delay Time	$t_{d(OFF)}$			16		
Fall Time	t_f			6.0		

6. Pulse Test: pulse width ≤ 300 μ s, duty cycle $\leq 2\%$.
 7. 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
SWITCHING CHARACTERISTICS (Note 7)						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 15\text{ A}, R_G = 3.0\ \Omega$		7.0		ns
Rise Time	t_r			28		
Turn-Off Delay Time	$t_{d(OFF)}$			20		
Fall Time	t_f			4.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.79	1.1	V
			$T_J = 125^\circ\text{C}$		0.65		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$			31		ns
Charge Time	t_a				15		
Discharge Time	t_b				16		
Reverse Recovery Charge	Q_{RR}				15		nC

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

7. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

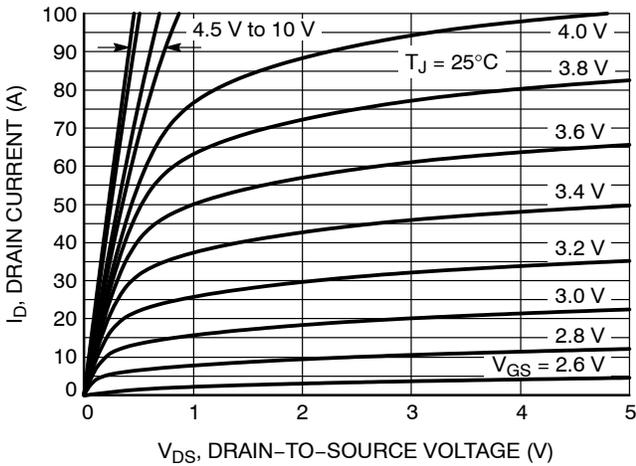


Figure 1. On-Region Characteristics

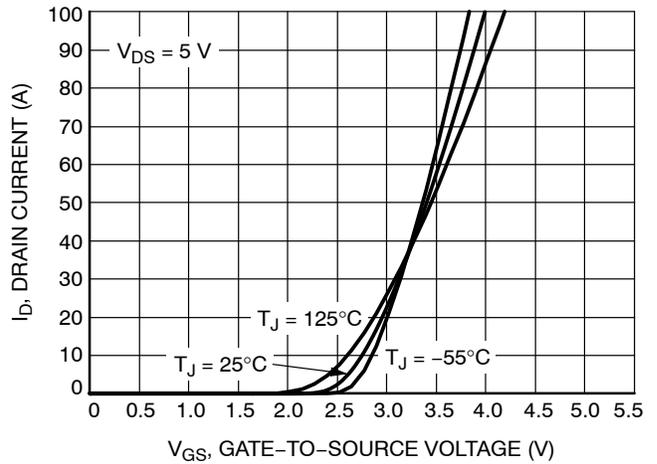


Figure 2. Transfer Characteristics

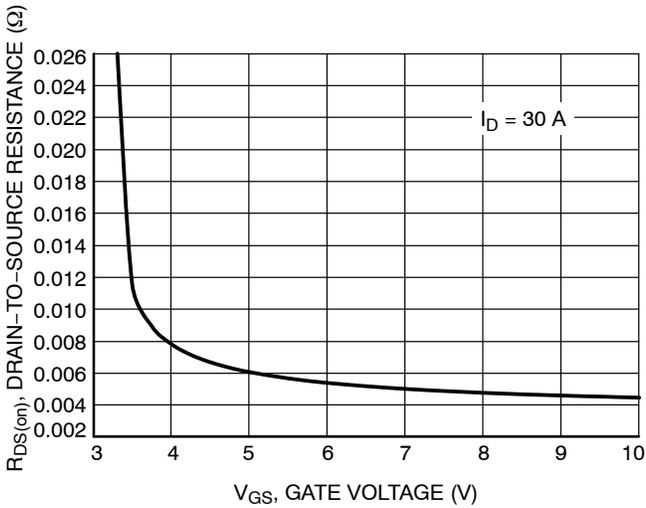


Figure 3. On-Resistance vs. Gate-to-Source Voltage

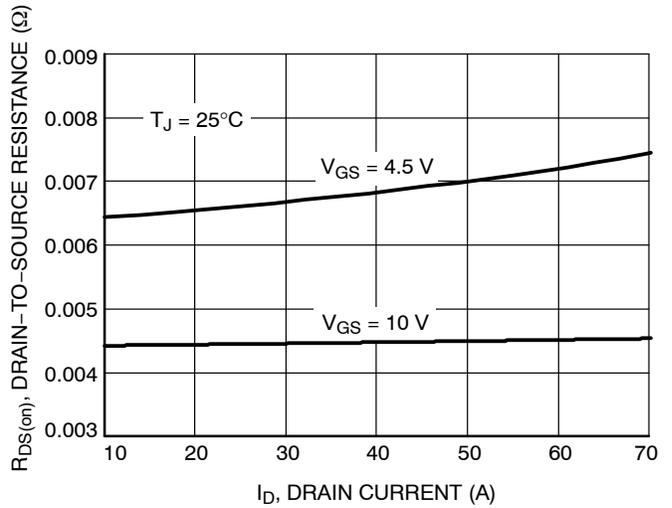


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

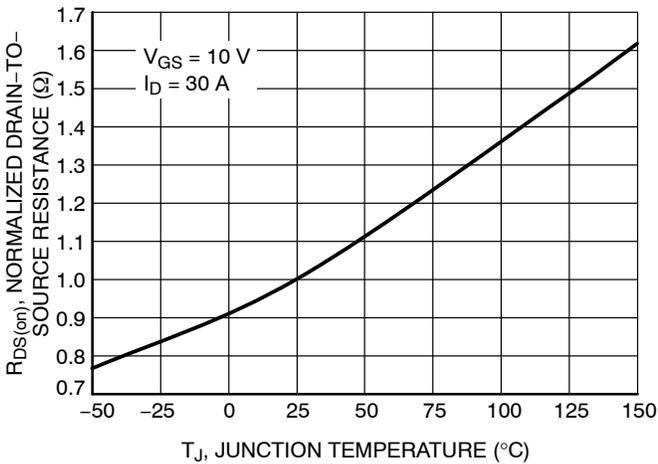


Figure 5. On-Resistance Variation with Temperature

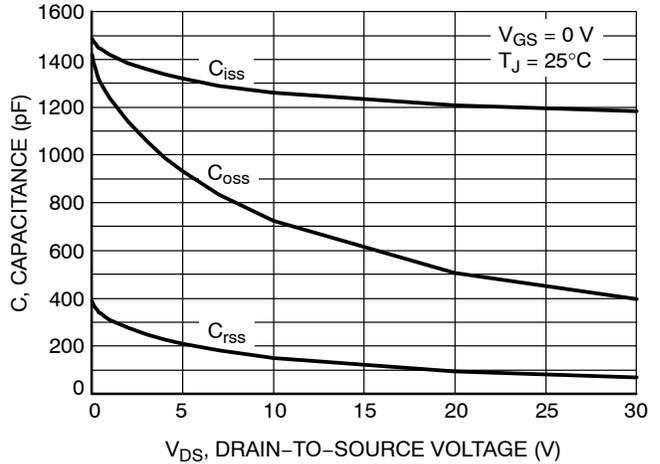


Figure 6. Capacitance Variation

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TYPICAL CHARACTERISTICS

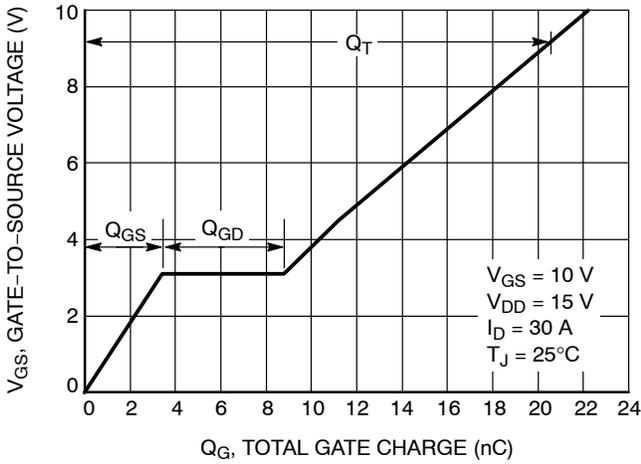


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

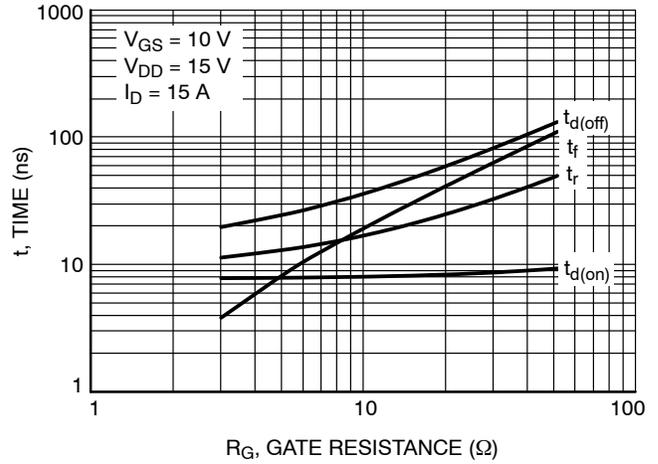


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

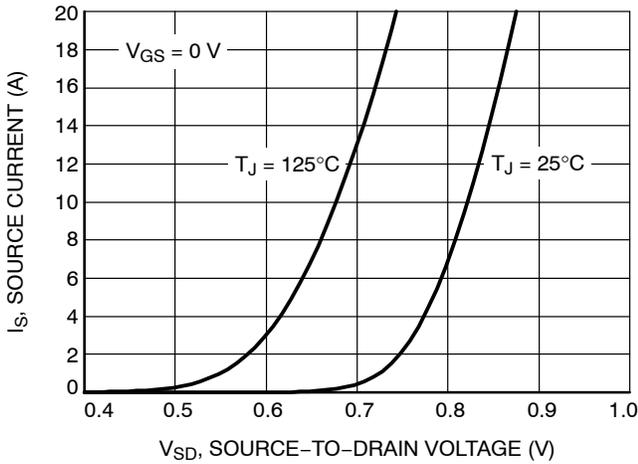


Figure 9. Diode Forward Voltage vs. Current

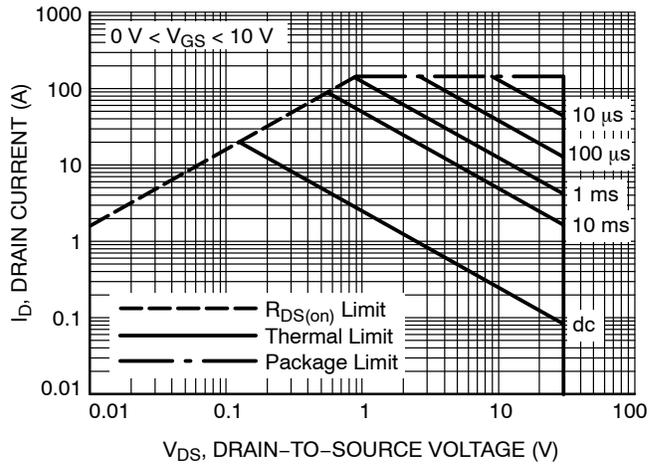


Figure 10. Maximum Rated Forward Biased Safe Operating Area

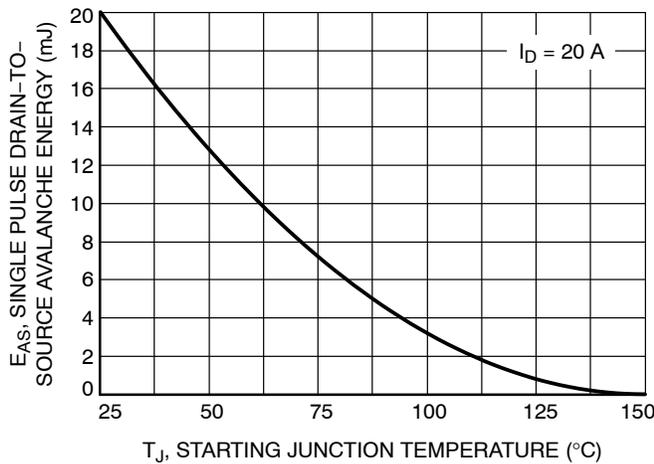


Figure 11. Maximum Avalanche Energy vs. Starting Junction Temperature

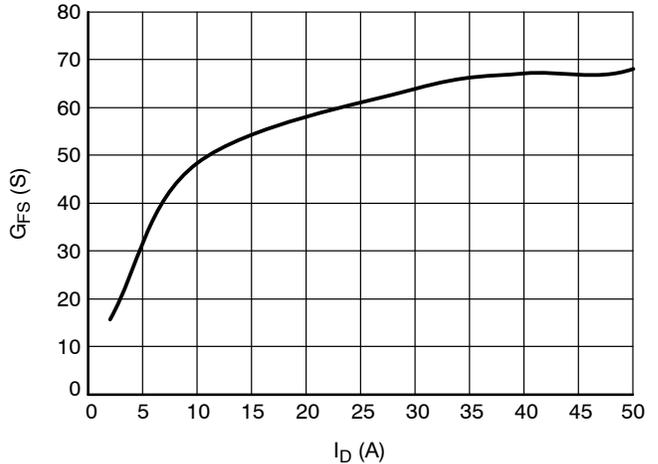


Figure 12. G_{FS} vs. I_D

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TYPICAL CHARACTERISTICS

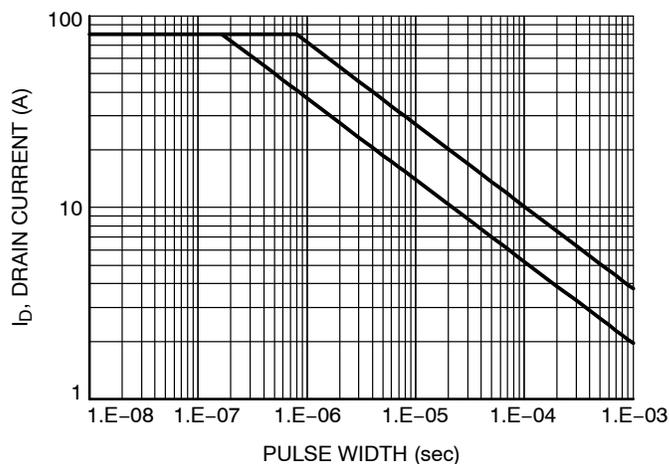


Figure 13. Avalanche Characteristics

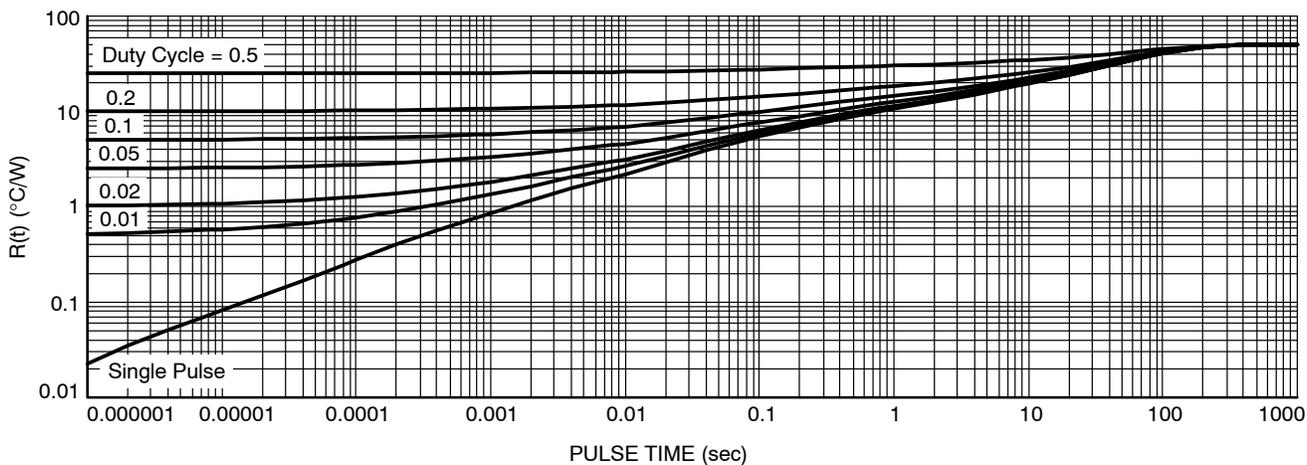


Figure 14. Thermal Response

