Power MOSFET

30 V, 38 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 ($T_J = 25^{\circ}C$ 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 _{0JA}		$T_A = 25^{\circ}C$ $T_A = 80^{\circ}C$	Ι _D	13.0 9.7	Α
(Note 1)					
Power Dissipation $R_{\theta JA}$ (Note 1)		T _A = 25°C	P _D	2.46	W
Continuous Drain		$T_A = 25^{\circ}C$	I _D	19.1	Α
Current R _{θJA} ≤ 10 s (Note 1)		T _A = 80°C		14.3	
Power Dissipation $R_{\theta JA} \le 10 \text{ s (Note 1)}$	Steady	T _A = 25°C	P _D	5.32	W
Continuous Drain	State	T _A = 25°C	I _D	7.2	Α
Current R _{θJA} (Note 2)		T _A = 80°C		5.4	
Power Dissipation $R_{\theta JA}$ (Note 2)		T _A = 25°C	P _D	0.75	W
Continuous Drain		T _C = 25°C	I _D	38	Α
Current R _{θJC} (Note 1)		T _C =80°C		29	
Power Dissipation R _{0JC} (Note 1)		T _C = 25°C	P _D	21.6	W
Pulsed Drain Current	$T_A = 25^{\circ}$	°C, t _p = 10 μs	I_{DM}	106	Α
Current Limited by Pa	ckage	T _A = 25°C	I _{Dmax}	70	Α
Operating Junction and Storage Temperature			T _J , T _{STG}	-55 to +150	°C
Source Current (Body Diode)			I _S	19	Α
Drain to Source DV/DT			dV/d _t	7.0	V/ns
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^{\circ}C$, $V_{GS} = 10$ V, $I_L = 21$ A _{pk} , $L = 0.1$ mH, $R_{GS} = 25$ Ω) (Note 3)			E _{AS}	22	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			TL	260	°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.

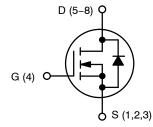
- 1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
- 2. Surface-mounted on FR4 board using the minimum recommended pad size.
- 3. This is the absolute maximum rating. Parts are 100% tested at T_J = 25°C, V_{GS} = 10 V, I_L = 15 Apk, E_{AS} = 11 mJ.



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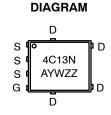
V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX
30 V	9.1 mΩ @ 10 V	38 A
30 V	13.8 mΩ @ 4.5 V	36 A



N-CHANNEL MOSFET



SO-8 FLAT LEAD CASE 488AA STYLE 1



MARKING

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

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMFS4C13NT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NTMFS4C13NT3G	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)	$R_{ heta JC}$	5.8	
Junction-to-Ambient - Steady State (Note 4)	$R_{\theta JA}$	50.8	°C/W
Junction-to-Ambient - Steady State (Note 5)	$R_{\theta JA}$	166.6	- C/VV
Junction-to-Ambient – (t ≤ 10 s) (Note 4)	$R_{\theta JA}$	23.5	

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

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

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
OFF CHARACTERISTICS	•					1	
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		30			V
Drain-to-Source Breakdown Voltage (transient)	V _{(BR)DSSt}	V_{GS} = 0 V, $I_{D(aval)}$ = 6.1 A, T_{case} = 25°C, $t_{transient}$ = 100 ns		34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /				14.9		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	$V_{GS} = 0 \text{ V}, V_{DS} = 24 \text{ V}$				1.0	
		V _{DS} = 24 V	T _J = 125°C			10	μΑ
Gate-to-Source Leakage Current	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS}$	= ±20 V			±100	nA
ON CHARACTERISTICS (Note 6)							
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}, I_D$	= 250 μΑ	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		7.3	9.1	mΩ
		V _{GS} = 4.5 V	I _D = 12 A		11.4	13.8	
Forward Transconductance	9FS	V _{DS} = 1.5 V, I _D = 15 A			40		S
Gate Resistance	R_{G}	T _A = 25°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			770		pF
Output Capacitance	C _{OSS}				443		
Reverse Transfer Capacitance	C _{RSS}				127		
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)}				7.8		
Threshold Gate Charge	Q _{G(TH)}	$V_{GS} = 4.5 \text{ V}, V_{DS} = 15 \text{ V}; I_D = 30 \text{ A}$			1.4		nC
Gate-to-Source Charge	Q_{GS}				2.9		
Gate-to-Drain Charge	Q_{GD}				3.7		
Gate Plateau Voltage	V_{GP}				3.6		V
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 15 V; I _D = 30 A			15.2		nC
SWITCHING CHARACTERISTICS (Note 7)							
Turn-On Delay Time	t _{d(ON)}	$V_{GS} = 4.5 \text{ V}, V_{DS} = 15 \text{ V},$ $I_{D} = 15 \text{ A}, R_{G} = 3.0 \Omega$			9.0		
Rise Time	t _r				35]
Turn-Off Delay Time	t _{d(OFF)}				13		ns
Fall Time	t _f				5.0		1

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

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

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
SWITCHING CHARACTERISTICS (N	ote 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			6.0		- ns
Rise Time	t _r				26		
Turn-Off Delay Time	t _{d(OFF)}				16		
Fall Time	t _f				3.0		
DRAIN-SOURCE DIODE CHARACT	ERISTICS						
Forward Diode Voltage	V_{SD}	V _{SD} V _{GS} = 0 V, I _S = 10 A	T _J = 25°C		0.82	1.1	V
			T _J = 125°C		0.69		
Reverse Recovery Time	t _{RR}	$V_{GS} = 0 \text{ V, dIS/dt} = 100 \text{ A/}\mu\text{s,}$ $I_{S} = 30 \text{ A}$			23.4		
Charge Time	t _a				12.1		ns
Discharge Time	t _b				11.3		
Reverse Recovery Charge	Q _{BB}				9.7		nC

^{6.} Pulse Test: pulse width \leq 300 μ s, duty cycle \leq 2%.
7. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

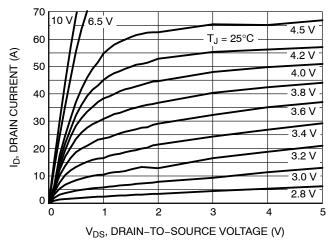


Figure 1. On-Region Characteristics

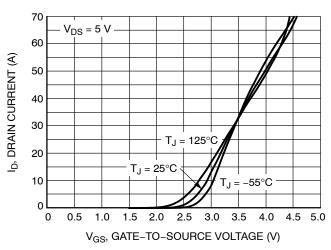


Figure 2. Transfer Characteristics

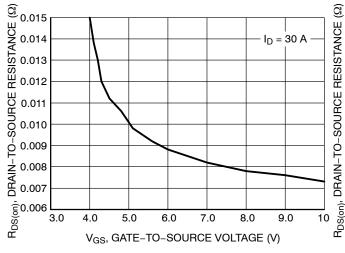


Figure 3. On-Resistance vs. V_{GS}

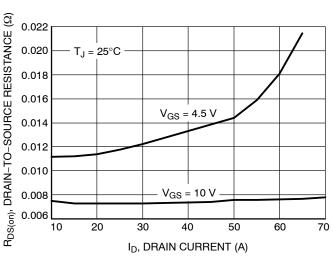


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

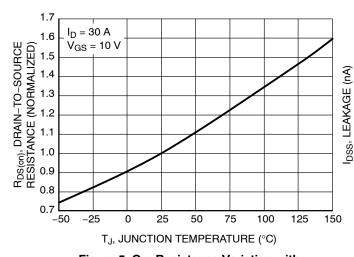


Figure 5. On–Resistance Variation with Temperature

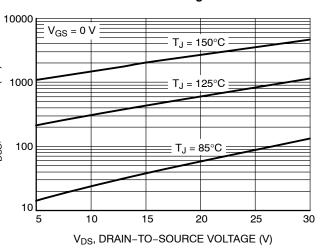


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

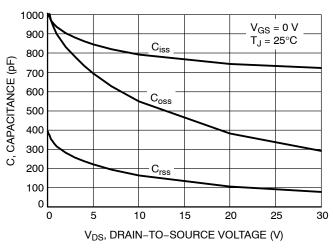


Figure 7. Capacitance Variation

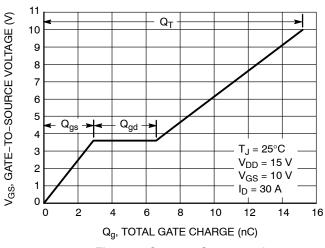


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

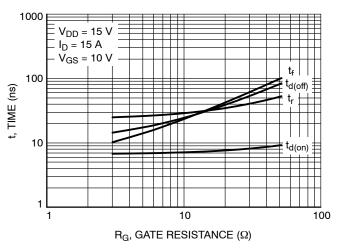


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

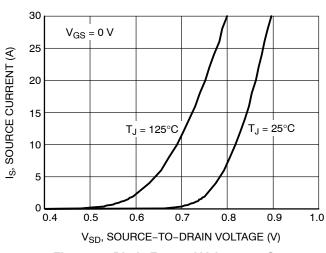


Figure 10. Diode Forward Voltage vs. Current

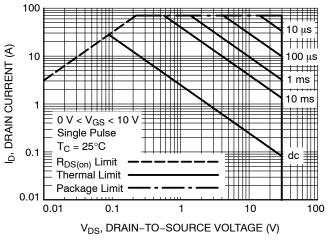


Figure 11. Maximum Rated Forward Biased Safe Operating Area

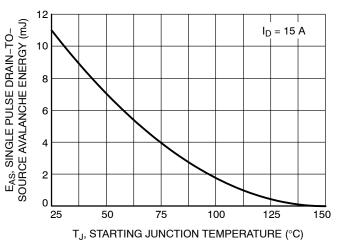


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

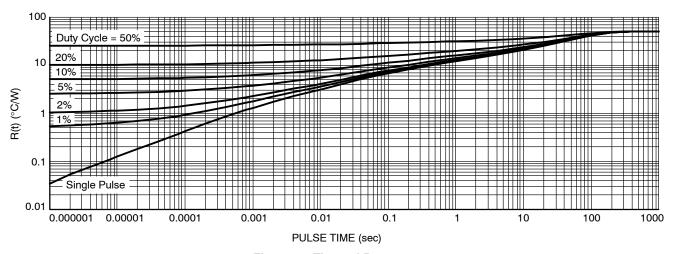


Figure 13. Thermal Response

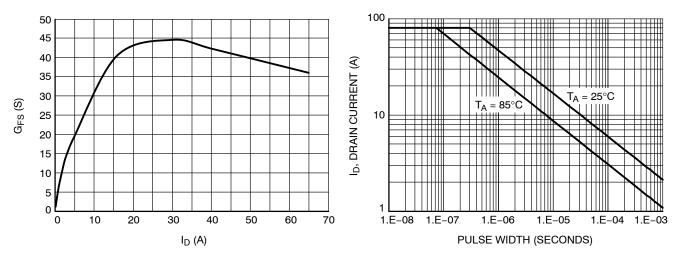
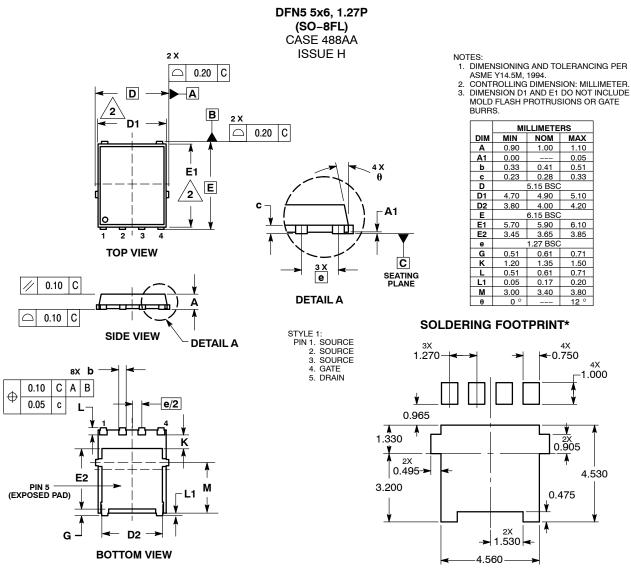


Figure 14. G_{FS} vs. I_D

Figure 15. Avalanche Characteristics

PACKAGE DIMENSIONS



*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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