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°C unless otherwise stated)

	<u> </u>				
Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	30	V
Gate-to-Source Voltage			V_{GS}	±20	V
Continuous Drain		T _A = 25°C	I _D	15.0	Α
Current R _{θJA} (Note 1)		T _A = 80°C		11.2	
Power Dissipation $R_{\theta JA}$ (Note 1)		T _A = 25°C	P _D	2.49	W
Continuous Drain		T _A = 25°C	I _D	22.5	Α
Current R _{θJA} ≤ 10 s (Note 1)		T _A = 80°C		16.8	
Power Dissipation $R_{\theta JA} \le 10 \text{ s (Note 1)}$	Steady	T _A = 25°C	P _D	5.6	W
Continuous Drain	State	T _A = 25°C	I _D	8.2	Α
Current R _{θJA} (Note 2)		T _A = 80°C		6.2	
Power Dissipation $R_{\theta JA}$ (Note 2)		T _A = 25°C	P _D	0.75	W
Continuous Drain		T _C = 25°C	I _D	46	Α
Current R _{θJC} (Note 1)		T _C =80°C	1	34	
Power Dissipation $R_{\theta JC}$ (Note 1)		T _C = 25°C	P _D	23.6	W
Pulsed Drain Current	$T_A = 25^{\circ}$	$T_A = 25^{\circ}C, t_p = 10 \ \mu s$		132	Α
Current Limited by Pa	Current Limited by Package T _A = 25°C		I _{Dmax}	80	Α
Operating Junction and Storage Temperature		T _J , T _{STG}	–55 to +150	°C	
Source Current (Body Diode)		IS	21	Α	
Drain to Source dV/dt		dV/d _t	7.0	V/ns	
Single Pulse Drain-to-Source Avalanche Energy (T_J = 25°C, V_{GS} = 10 V, I_L = 25 A_{pk} , L = 0.1 mH, R_{GS} = 25 Ω) (Note 3)			E _{AS}	31	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.

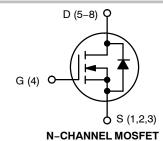
- 1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
- 2. Surface-mounted on FR4 board using the minimum recommended pad size.
- 3. This is the absolute maximum rating. Parts are 100% tested at $T_J = 25$ °C, $V_{GS} = 10 \text{ V}, I_L = 17 \text{ Apk}, E_{AS} = 14 \text{ mJ}.$



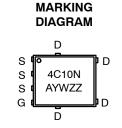
ON Semiconductor®

http://onsemi.com

V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX
30 V	6.95 m Ω @ 10 V	46 A
30 V	10.8 m Ω @ 4.5 V	40 A







= Assembly Location = Year = Work Week W ZZ = Lot Traceabililty

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMFS4C10NT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NTMFS4C10NT3G	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)	$R_{ heta JC}$	5.3	
Junction-to-Ambient - Steady State (Note 4)	$R_{ heta JA}$	50.3	°C/W
Junction-to-Ambient - Steady State (Note 5)	$R_{\theta JA}$	165.9	-C/VV
Junction-to-Ambient - (t ≤ 10 s) (Note 4)	$R_{\theta JA}$	22.2	

- 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	•			•	•		
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}	$V_{GS} = 0 \text{ V}, I_{D(aval)} = 7.1 \text{ A},$ $T_{case} = 25^{\circ}\text{C}, t_{transient} = 100 \text{ ns}$		34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /				14.5		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			1.0	1	
			T _J = 125°C			10	μΑ
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 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		2.2	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	mΩ
		V _{GS} = 4.5 V	I _D = 15 A		8.9	10.8	
Forward Transconductance	9FS	V _{DS} = 1.5 V, I _D = 15 A			43		S
Gate Resistance	R_{G}	T _A = 25°C			1.0		Ω
CHARGES AND CAPACITANCES				•	•	•	•
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V			987		pF
Output Capacitance	Coss				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)}				9.7		
Threshold Gate Charge	Q _{G(TH)}	$V_{GS} = 4.5 \text{ V}, V_{DS} = 15 \text{ V}; I_D = 30 \text{ A}$			1.5		nC
Gate-to-Source Charge	Q_{GS}				2.8		
Gate-to-Drain Charge	Q_{GD}				4.8		1
Gate Plateau Voltage	V_{GP}				3.2		V
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		
Rise Time	t _r				34		ns
Turn-Off Delay Time	t _{d(OFF)}				14		
Fall Time	t _f				7.0		1

- 6. Pulse Test: pulse width $\leq 300~\mu s$, 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			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 CHARACTI	ERISTICS						
v _{GS} = 0 v,	V_{SD}	V(iS - 0 V,	T _J = 25°C		0.80	1.1	
	T _J = 125°C		0.67		1		
Reverse Recovery Time	t _{RR}	$V_{GS} = 0 \text{ V, } dI_{S}/dt = 100 \text{ A/}\mu\text{s,}$ $I_{S} = 30 \text{ A}$			26.7		ns
Charge Time	t _a				14.1		
Discharge Time	t _b				12.6		
Reverse Recovery Charge	Q _{RR}				13.7		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

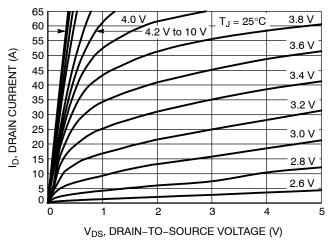


Figure 1. On-Region Characteristics

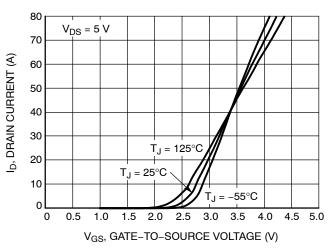


Figure 2. Transfer Characteristics

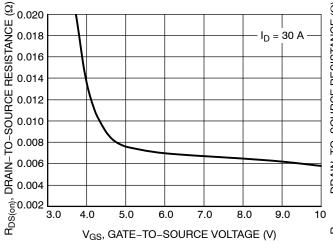


Figure 3. On-Resistance vs. V_{GS}

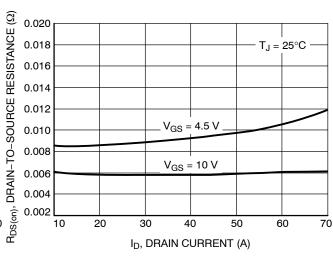


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

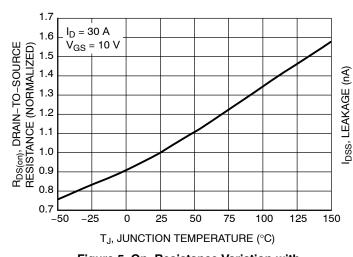


Figure 5. On–Resistance Variation with Temperature

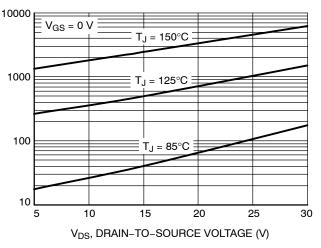


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

10

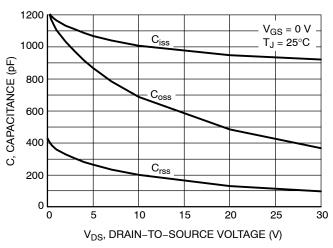
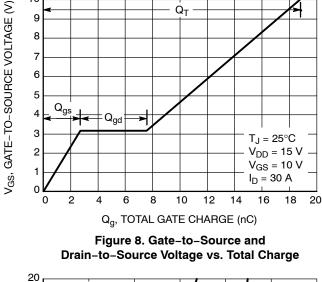


Figure 7. Capacitance Variation



 Q_T

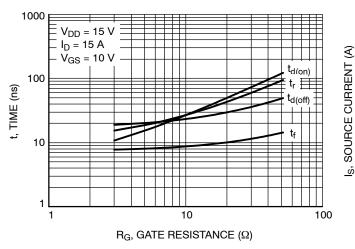


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

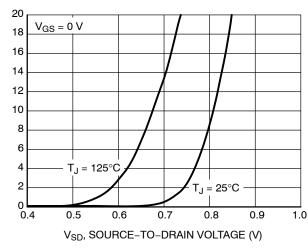


Figure 10. Diode Forward Voltage vs. Current

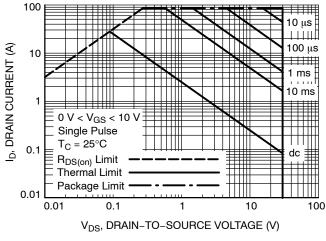


Figure 11. Maximum Rated Forward Biased Safe Operating Area

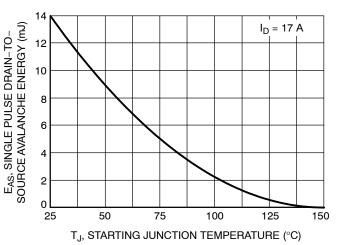


Figure 12. Maximum Avalanche Energy vs. **Starting Junction Temperature**

TYPICAL CHARACTERISTICS

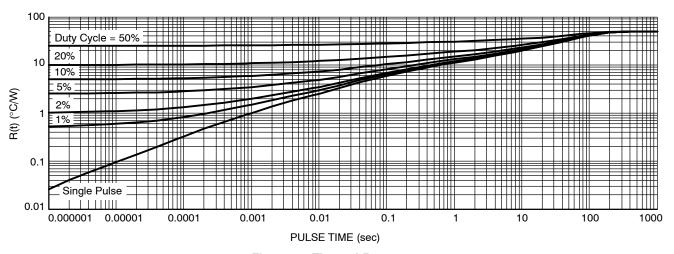


Figure 13. Thermal Response

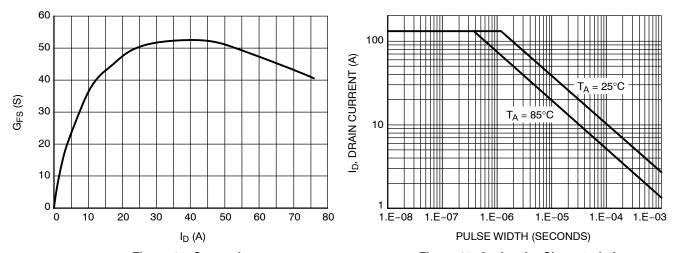
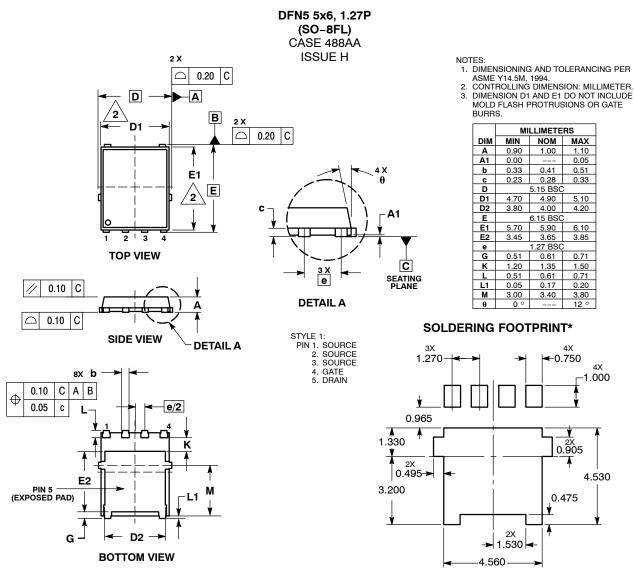


Figure 14. G_{FS} vs. I_D

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.

ON Semiconductor and was are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILC is an Equal Opportu

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor P.O. Box 5163, Denver, Colorado 80217 USA

Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada Email: orderlit@onsemi.com

N. American Technical Support: 800–282–9855 Toll Free USA/Canada

Furnne Middle Fast and Africa Technical Support:

Europe, Middle East and Africa Technical Support: Phone: 421 33 790 2910

Japan Customer Focus Center Phone: 81-3-5817-1050 ON Semiconductor Website: www.onsemi.com

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative