# **MOSFET** - Power, Single, N-Channel, SO-8 FL 30 V, 69 A

#### **Features**

- Low R<sub>DS(on)</sub> 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<sub>J</sub> = 25°C unless otherwise stated)

Para	Parameter			Value	Unit
Drain-to-Source Volt	age		$V_{DSS}$	30	V
Gate-to-Source Volta	age		$V_{GS}$	±20	V
Continuous Drain		T <sub>A</sub> = 25°C	I <sub>D</sub>	20.0	Α
Current R <sub>θJA</sub> (Note 1)		T <sub>A</sub> = 80°C		14.9	
Power Dissipation $R_{\theta JA}$ (Note 1)		T <sub>A</sub> = 25°C	P <sub>D</sub>	2.55	W
Continuous Drain		T <sub>A</sub> = 25°C	I <sub>D</sub>	31.6	Α
Current R <sub>θJA</sub> ≤ 10 s (Note 1)		T <sub>A</sub> = 80°C		23.7	
Power Dissipation $R_{\theta JA} \le 10 \text{ s (Note 1)}$	Steady	T <sub>A</sub> = 25°C	P <sub>D</sub>	6.4	W
Continuous Drain	State	T <sub>A</sub> = 25°C	I <sub>D</sub>	11	Α
Current R <sub>0JA</sub> (Note 2)		T <sub>A</sub> = 80°C		8.2	
Power Dissipation $R_{\theta JA}$ (Note 2)		T <sub>A</sub> = 25°C	P <sub>D</sub>	0.77	W
Continuous Drain		T <sub>C</sub> = 25°C	I <sub>D</sub>	69	Α
Current R <sub>0JC</sub> (Note 1)		T <sub>C</sub> =80°C	1	52	
Power Dissipation $R_{\theta JC}$ (Note 1)		T <sub>C</sub> = 25°C	$P_{D}$	30.5	W
Pulsed Drain Current	$T_A = 25^{\circ}$	°C, t <sub>p</sub> = 10 μs	I <sub>DM</sub>	200	Α
Current Limited by Pa	nt Limited by Package T <sub>A</sub> = 25°C		I <sub>Dmax</sub>	80	Α
Operating Junction ar Temperature	Operating Junction and Storage Temperature			-55 to +150	°C
Source Current (Body	Source Current (Body Diode)			28	Α
Drain to Source DV/D	Drain to Source DV/DT			7.0	V/ns
Single Pulse Drain-to-Source Avalanche Energy ( $T_J = 25^{\circ}C$ , $V_{GS} = 10$ V, $I_L = 37$ A <sub>pk</sub> , $L = 0.1$ mH, $R_{GS} = 25$ $\Omega$ ) (Note 3)			E <sub>AS</sub>	68	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			TL	260	°C

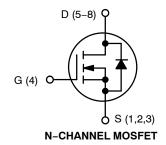
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



### ON Semiconductor®

#### www.onsemi.com

V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub> MAX	I <sub>D</sub> MAX
30 V	4.0 mΩ @ 10 V	69 A
30 V	$6.0~\text{m}\Omega$ @ $4.5~\text{V}$	09 A



#### **DIAGRAM** D SO-8 FLAT LEAD 4C06N CASE 488AA **AYWZZ**

**MARKING** 

STYLE 1

= Assembly Location = Year = Work Week = Lot Traceabililty

#### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
NTMFS4C06NT1G	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.

- 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. Parts are 100% tested at  $T_J = 25^{\circ}C$ ,  $V_{GS} = 10$  V,  $I_L = 27$   $A_{pk}$ , EAS = 36 mJ.

### THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{ heta JC}$	4.1	
Junction-to-Ambient - Steady State (Note 4)	$R_{\theta JA}$	49	°C/W
Junction-to-Ambient - Steady State (Note 5)	$R_{\theta JA}$	162.3	*C/VV
Junction-to-Ambient - (t ≤ 10 s) (Note 4)	$R_{ heta JA}$	19.5	

- 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<sub>J</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit	
OFF CHARACTERISTICS							<b></b>	
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		30			V	
Drain-to-Source Breakdown Voltage (transient)	V <sub>(BR)DSSt</sub>	V <sub>GS</sub> = 0 V, I <sub>D(aval)</sub> = 12.6 A, T <sub>case</sub> = 25°C, t <sub>transient</sub> = 100 ns		34			٧	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> / T <sub>J</sub>				14.4		mV/°C	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	$V_{GS} = 0 V$	T <sub>J</sub> = 25°C			1.0	1	
		V <sub>DS</sub> = 24 V	T <sub>J</sub> = 125°C			10	10 μA	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub>	s = ±20 V			±100	nA	
ON CHARACTERISTICS (Note 6)								
Gate Threshold Voltage	V <sub>GS(TH)</sub>	$V_{GS} = V_{DS}, I_D$	= 250 μΑ	1.3		2.1	V	
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>				3.8		mV/°C	
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 30 A		3.2	4.0		
		V <sub>GS</sub> = 4.5 V	I <sub>D</sub> = 25 A		4.8	6.0	mΩ	
Forward Transconductance	9FS	V <sub>DS</sub> = 1.5 V, I <sub>D</sub> = 15 A			58		S	
Gate Resistance	$R_{G}$	T <sub>A</sub> = 25°C		0.3	1.0	2.0	Ω	
CHARGES AND CAPACITANCES								
Input Capacitance	C <sub>ISS</sub>				1683			
Output Capacitance	C <sub>OSS</sub>	V <sub>GS</sub> = 0 V, f = 1 MH	lz, V <sub>DS</sub> = 15 V		841		pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>				40		1	
Capacitance Ratio	C <sub>RSS</sub> /C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 15 V, f = 1 MHz			0.023			
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 15 V; I <sub>D</sub> = 30 A			11.6			
Threshold Gate Charge	Q <sub>G(TH)</sub>				2.6		]	
Gate-to-Source Charge	$Q_{GS}$				4.7		nC	
Gate-to-Drain Charge	$Q_{GD}$				4.0		1	
Gate Plateau Voltage	V <sub>GP</sub>				3.1		V	
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 15 V; I <sub>D</sub> = 30 A			26		nC	

### **SWITCHING CHARACTERISTICS** (Note 7)

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

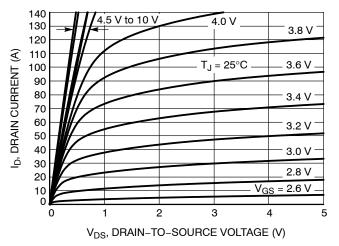
## **ELECTRICAL CHARACTERISTICS** ( $T_J = 25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
SWITCHING CHARACTERISTICS (N	lote 7)				•	•	
Turn-On Delay Time	t <sub>d(ON)</sub>	$V_{GS} = 4.5 \text{ V}, V_{DS} = 15 \text{ V},$ $I_{D} = 15 \text{ A}, R_{G} = 3.0 \Omega$			10		ns ns
Rise Time	t <sub>r</sub>				32		
Turn-Off Delay Time	t <sub>d(OFF)</sub>				18		
Fall Time	t <sub>f</sub>				5.0		
Turn-On Delay Time	t <sub>d(ON)</sub>	$V_{GS}$ = 10 V, $V_{DS}$ = 15 V, $I_{D}$ = 15 A, $R_{G}$ = 3.0 $\Omega$			8.0		ns
Rise Time	t <sub>r</sub>				28		
Turn-Off Delay Time	t <sub>d(OFF)</sub>				24		
Fall Time	t <sub>f</sub>				3.0		
DRAIN-SOURCE DIODE CHARACT	ERISTICS						
Forward Diode Voltage	V <sub>SD</sub>	$V_{GS} = 0 \text{ V},$ $I_{S} = 10 \text{ A}$ $T_{J} = 25^{\circ}\text{C}$ $T_{J} = 125^{\circ}\text{C}$			0.8	1.1	
					0.63		V
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dIS/dt = 100 A/μs, I <sub>S</sub> = 30 A			34		
Charge Time	ta				17		ns
Discharge Time	t <sub>b</sub>				17		
Reverse Recovery Charge	Q <sub>RR</sub>				22		nC

<sup>6.</sup> Pulse Test: pulse width  $\leq 300~\mu s$ , duty cycle  $\leq 2\%$ .
7. Switching characteristics are independent of operating junction temperatures.

#### **TYPICAL CHARACTERISTICS**

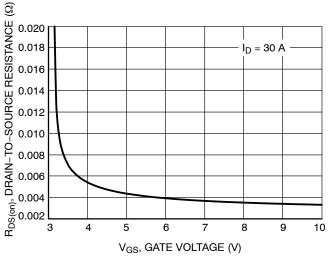
80



70  $V_{DS} = 5 V$ ID, DRAIN CURRENT (A) 60 50 40 30  $T_J = 25^{\circ}C$ 20  $T_J = 125^{\circ}C$ 10  $T_J = -55^{\circ}C$ 0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 V<sub>GS</sub>, GATE-TO-SOURCE VOLTAGE (V)

Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics



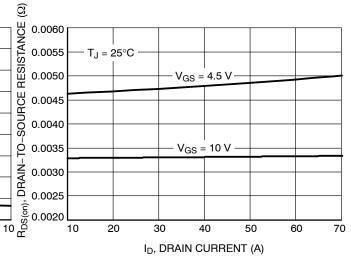
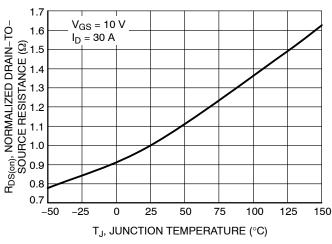


Figure 3. On-Resistance vs. Gate-to-Source Voltage

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



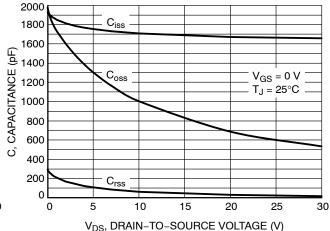


Figure 5. On–Resistance Variation with Temperature

Figure 6. Capacitance Variation

#### **TYPICAL CHARACTERISTICS**

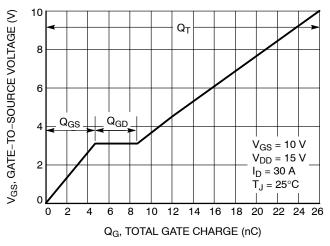


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

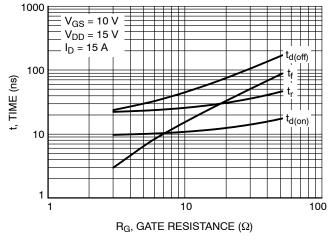


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

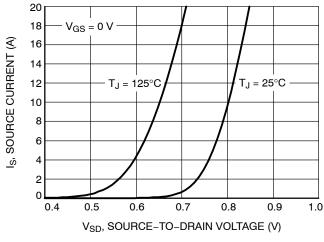


Figure 9. Diode Forward Voltage vs. Current

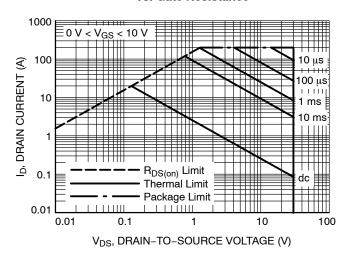


Figure 10. Maximum Rated Forward Biased Safe Operating Area

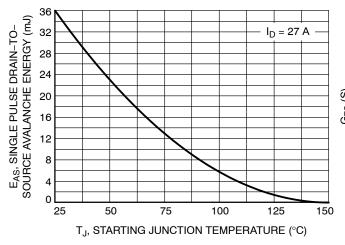


Figure 11. Maximum Avalanche Energy vs. Starting Junction Temperature

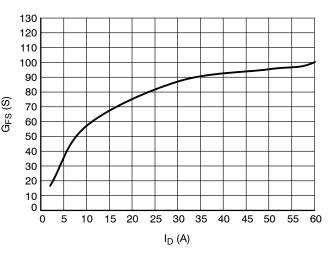


Figure 12. G<sub>FS</sub> vs. I<sub>D</sub>

### **TYPICAL CHARACTERISTICS**

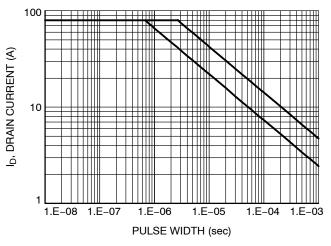


Figure 13. Avalanche Characteristics

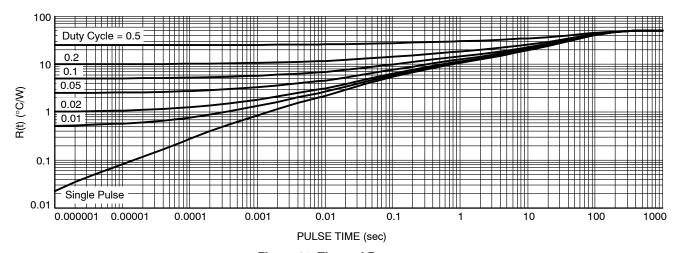


Figure 14. Thermal Response



0.10

0.10

SIDE VIEW

DFN5 5x6, 1.27P (SO-8FL) CASE 488AA ISSUE N

**DATE 25 JUN 2018** 

#### NOTES:

BURRS

- DIMENSIONING AND TOLERANCING PER
- ASME Y14.5M, 1994.
  CONTROLLING DIMENSION: MILLIMETER.
  DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE

	MILLIMETERS				
DIM	MIN	NOM	MAX		
Α	0.90	1.00	1.10		
A1	0.00		0.05		
b	0.33	0.41	0.51		
С	0.23	0.28	0.33		
D	5.00	5.15	5.30		
D1	4.70	4.90	5.10		
D2	3.80	4.00	4.20		
E	6.00	6.15	6.30		
E1	5.70	5.90	6.10		
E2	3.45	3.65	3.85		
е		1.27 BSC	;		
G	0.51	0.575	0.71		
K	1.20	1.35	1.50		
L	0.51	0.575	0.71		
L1	0.125 REF				
М	3.00	3.40	3.80		
A	0 0		12 °		

### **GENERIC** MARKING DIAGRAM\*



XXXXXX = Specific Device Code

= Assembly Location Α

Υ = Year W = Work Week ZZ = Lot Traceability

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot " ■", may or may not be present. Some products may not follow the Generic Marking.





**DETAIL A** 

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

DOCUMENT NUMBER:	98AON14036D	Electronic versions are uncontrolled except when accessed directly from the Document Repositor Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	DFN5 5x6, 1.27P (SO-8FL)		PAGE 1 OF 1	

ON Semiconductor and unare trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ÓN Semiconductor does not convey any license under its patent rights nor the rights of others

onsemi, ONSEMI, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at <a href="www.onsemi.com/site/pdf/Patent-Marking.pdf">www.onsemi.com/site/pdf/Patent-Marking.pdf</a>. Onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi 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. Buyer is responsible for its products and applications using onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications provided by onsemi. "Typical" parameters which may be provided in onsemi 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. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi products are not designed, intended, or authorized for use as a critical component in life support systems or any EDA class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer pu

#### **PUBLICATION ORDERING INFORMATION**

LITERATURE FULFILLMENT: Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT North American Technical Support: Voice Mail: 1 800-282-9855 Toll Free USA/Canada Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative