Power MOSFET

40 V, 2.65 m Ω , 145 A, Dual N-Channel

Features

- Small Footprint (5x6 mm) for Compact Design
- Low R_{DS(on)} to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	40	V
Gate-to-Source Voltage			V_{GS}	±20	V
Continuous Drain		$T_C = 25^{\circ}C$ I_D		145	Α
Current R _{0JC} (Notes 1, 2, 3)	Steady	T _C = 100°C		105	
Power Dissipation	State	T _C = 25°C	P_{D}	125	W
R _{θJC} (Notes 1, 2)		T _C = 100°C		62	
Continuous Drain		T _A = 25°C	I _D	25	Α
Current R _{0JA} (Notes 1, 2, 3)	Steady	T _A = 100°C		18	
Power Dissipation	State	T _A = 25°C	P_{D}	3.5	W
R _{θJA} (Notes 1 & 2)		T _A = 100°C		1.8	
Pulsed Drain Current	T _A = 25	°C, t _p = 10 μs	I _{DM}	644	Α
Operating Junction and Storage Temperature			T _J , T _{stg}	–55 to + 175	°C
Source Current (Body Diode)			I _S	91	Α
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 11 A)			E _{AS}	171	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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case - Steady State	$R_{\theta JC}$	1.38	°C/W
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	46.9	

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- 2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
- 3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

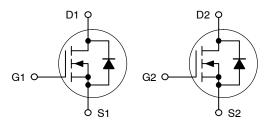


ON Semiconductor®

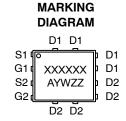
www.onsemi.com

V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX
40 V	2.65 m Ω @ 10 V	445.0
40 V	3.9 m Ω @ 4.5 V	145 A

Dual N-Channel







A = Assembly Location

Y = Year

W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

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}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		40			V	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /				23		mV/°C	
Zero Gate Voltage Drain Current	I _{DSS}	$V_{GS} = 0 V$,	T _J = 25 °C			10	_	
		$V_{DS} = 40 \text{ V}$	T _J = 125°C			100	μΑ	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS}	= 20 V			100	nA	
ON CHARACTERISTICS (Note 4)						•		
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}$, $I_D = 90 \mu A$		1.2		2.2	V	
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J				-5.2		mV/°C	
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 20 A		2.2	2.65		
		V _{GS} = 4.5 V	I _D = 20 A		3.0	3.9	mΩ	
Forward Transconductance	9FS	V _{DS} = 15 V, I _D = 50 A			138		S	
CHARGES, CAPACITANCES & GATE RESIS	STANCE				•	•		
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 25 V			3170		pF	
Output Capacitance	C _{OSS}				1270			
Reverse Transfer Capacitance	C _{RSS}				48			
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 32 V; I _D = 50 A			25			
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 32 V; I _D = 50 A			54		1	
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 4.5 V, V _{DS} = 32 V; I _D = 50 A			5.7		nC V	
Gate-to-Source Charge	Q _{GS}				10.7			
Gate-to-Drain Charge	Q_{GD}				7.0			
Plateau Voltage	V_{GP}				5.7			
SWITCHING CHARACTERISTICS (Note 5)						•		
Turn-On Delay Time	t _{d(ON)}	V_{GS} = 4.5 V, V_{DS} = 32 V, I_{D} = 5 A, R_{G} = 1.0 Ω			14.8		- ns	
Rise Time	t _r				16.8			
Turn-Off Delay Time	t _{d(OFF)}				34.9			
Fall Time	t _f				15.2			
DRAIN-SOURCE DIODE CHARACTERISTIC	cs					•		
Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 20 A	T _J = 25°C		0.8			
			T _J = 125°C		0.7		V	
Reverse Recovery Time	t _{RR}	$V_{GS} = 0 \text{ V, } dI_{S}/dt = 50 \text{ A/}\mu\text{s,}$ $I_{S} = 5 \text{ A}$			54		ns	
Charge Time	t _a				24			
Discharge Time	t _b				30			
Reverse Recovery Charge	Q _{RR}				55		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.

4. Pulse Test: pulse width $\leq 300~\mu s$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

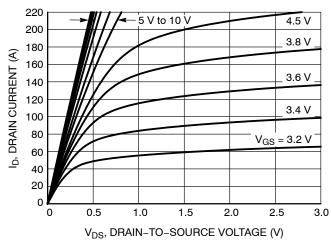


Figure 1. On-Region Characteristics

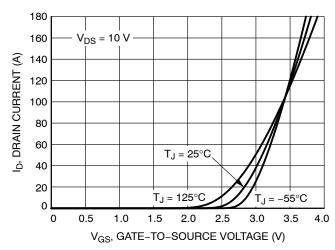


Figure 2. Transfer Characteristics

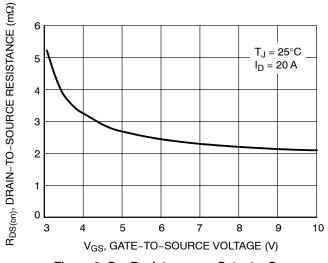


Figure 3. On-Resistance vs. Gate-to-Source Voltage

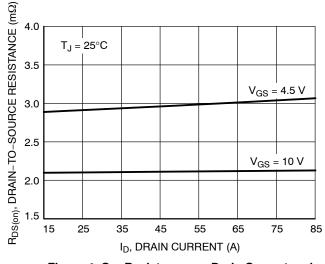


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

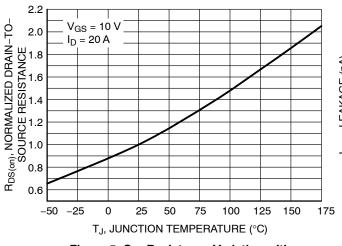


Figure 5. On–Resistance Variation with Temperature

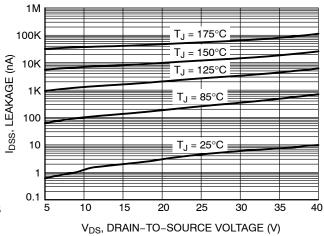


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

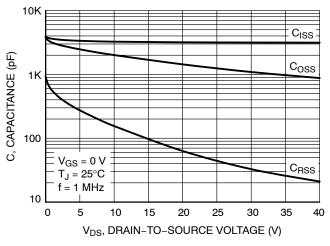


Figure 7. Capacitance Variation

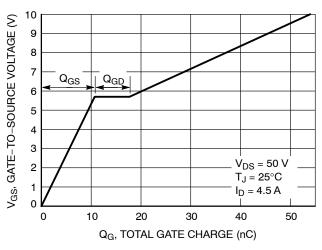


Figure 8. Gate-to-Source vs. Total Charge

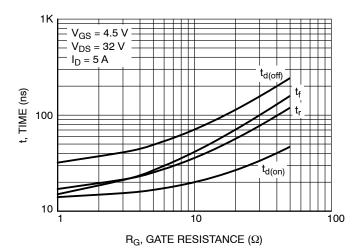


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

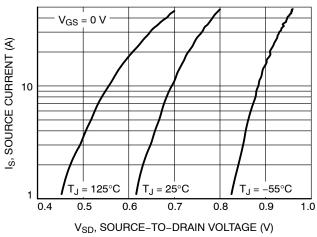


Figure 10. Diode Forward Voltage vs. Current

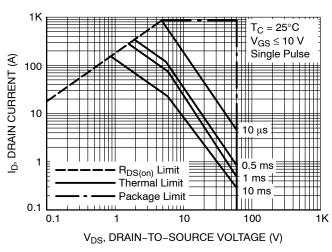


Figure 11. Maximum Rated Forward Biased Safe Operating Area

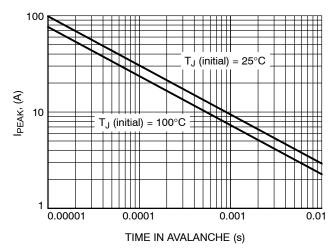


Figure 12. $I_{\mbox{\scriptsize PEAK}}$ vs. Time in Avalanche

TYPICAL CHARACTERISTICS

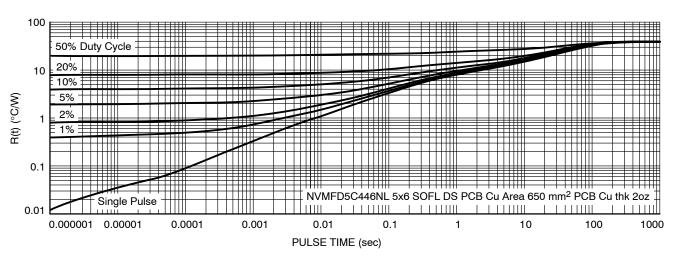


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

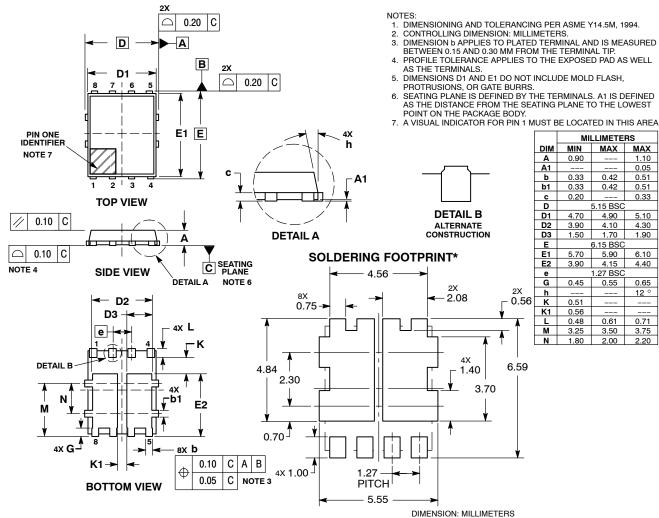
Device	Marking	Package	Shipping [†]
NTMFD5C446NLT1G	5C446L	DFN8 (Pb-Free)	1500 / Tape & Reel

[†]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.

PACKAGE DIMENSIONS

DFN8 5x6, 1.27P Dual Flag (SO8FL-Dual)

CASE 506BT **ISSUE E**



*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 in are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. 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.

Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA 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 purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT

Literature Distribution Center for ON Semiconductor 19521 E. 32nd Pkwy, Aurora, Colorado 80011 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

Europe, Middle East and Africa Technical Support: Phone: 421 33 790 2910 Japan Customer Focus Center

ON Semiconductor Website: www.onsemi.com

MILLIMETERS

MAX

0.42

0.42

15 BS

4.90

4.10

.15 BS

5.90

0.55

0.61

3.50

MAX

1.10

0.51

0.51

0.33

5.10

4.30

1.90

6.10

4.40

0.65

12 °

0.71

3.75

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

For additional information, please contact your local Sales Representative

Phone: 81-3-5817-1050