

NTLUF4189NZ

Power MOSFET and Schottky Diode

30 V, N-Channel with 0.5 A Schottky Barrier Diode, 1.6 x 1.6 x 0.55 mm μ Cool™ Package

Features

- Low Qg and Capacitance to Minimize Switching Losses
- Low Profile UDFN 1.6x1.6 mm for Board Space Saving
- Low VF Schottky Diode
- ESD Protected Gate
- This is a Halide-Free Device
- This is a Pb-Free Device

Applications

- DC-DC Boost Converter
- Color Display and Camera Flash Regulators
- Optimized for Power Management Applications for Portable Products, such as Cell Phones, PMP, DSC, GPS, and others

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

Parameter			Symbol	Value	Units
Drain-to-Source Voltage			V _{DSS}	30	V
Gate-to-Source Voltage			V _{GS}	±8.0	V
Continuous Drain Current (Note 1)	Steady State	T _A = 25°C	I _D	1.5	A
		T _A = 85°C		1.1	
	t ≤ 5 s	T _A = 25°C		1.9	
Power Dissipation (Note 1)	Steady State	T _A = 25°C	P _D	0.8	W
		T _A = 25°C		1.3	
Continuous Drain Current (Note 2)	Steady State	T _A = 25°C	I _D	1.2	A
		T _A = 85°C		0.9	
Power Dissipation (Note 2)		T _A = 25°C	P _D	0.5	W
Pulsed Drain Current		t _p = 10 μs	I _{DM}	8.0	A
MOSFET Operating Junction and Storage Temperature			T _J , T _{STG}	-55 to 150	°C
Schottky Operating Junction & Storage Temperature			T _J , T _{STG}	-55 to 125	°C
Source Current (Body Diode) (Note 2)			I _S	1.5	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T _L	260	°C
Gate-to-Source ESD Rating (HBM) per JESD22-A114F			ESD	1000	V

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 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 2 oz. Cu.



ON Semiconductor®

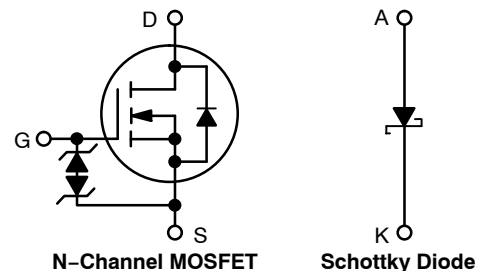
<http://onsemi.com>

MOSFET

V _{(BR)DSS}	R _{DS(on)} MAX	I _D MAX
30 V	200 mΩ @ 4.5 V	1.5 A
	250 mΩ @ 3.0 V	0.5 A
	350 mΩ @ 2.5 V	0.5 A

SCHOTTKY DIODE

V _R MAX	V _F TYP	I _F MAX
30 V	0.52 V	0.5 A

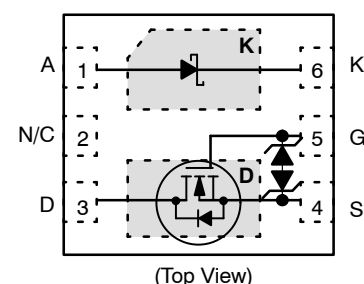


MARKING DIAGRAM



AA = Specific Device Code
M = Date Code
■ = Pb-Free Package

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

NTLUF4189NZ

DEVICE ORDERING INFORMATION

Device	Package	Shipping [†]
NTLUF4189NZTAG	UDFN6 (Pb-Free)	3000 / Tape & Reel
NTLUF4189NZTBG	UDFN6 (Pb-Free)	3000 / 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.

Schottky Diode Maximum Ratings (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Value	Units
Peak Repetitive Reverse Voltage	V _{RRM}	30	V
DC Blocking Voltage	V _R	30	V
Average Rectified Forward Current	I _F	0.5	A

Thermal Resistance Ratings

Parameter	Symbol	Max	Units
Junction-to-Ambient – Steady State (Note 3)	R _{θJA}	155	°C/W
Junction-to-Ambient – t ≤ 5 s (Note 3)	R _{θJA}	100	
Junction-to-Ambient – Steady State min Pad (Note 4)	R _{θJA}	245	

MOSFET Electrical Characteristics (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
-----------	--------	----------------	-----	-----	-----	-------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J	I _D = 250 μA, ref to 25°C		22		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 24 V	T _J = 25°C		1.0	μA
			T _J = 85°C		10	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8.0 V			10	μA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	0.4	1.1	1.5	V
Negative Threshold Temp. Coefficient	V _{GS(TH)} /T _J			3.0		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 1.5 A		145	200	mΩ
		V _{GS} = 3.0 V, I _D = 0.5 A		185	250	
		V _{GS} = 2.5 V, I _D = 0.5 A		220	350	
Forward Transconductance	g _{FS}	V _{DS} = 4.0 V, I _D = 0.15 A		1.1		S

CHARGES & CAPACITANCES

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V		95		pF
Output Capacitance	C _{OSS}			15		
Reverse Transfer Capacitance	C _{RSS}			10		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 15 V; I _D = 1.5 A		1.4	3.0	nC
Threshold Gate Charge	Q _{G(TH)}			0.2		
Gate-to-Source Charge	Q _{GS}			0.4		
Gate-to-Drain Charge	Q _{GD}			0.4		

- Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
- Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 2 oz. Cu.
- Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%
- Switching characteristics are independent of operating junction temperatures

NTLUF4189NZ

MOSFET Electrical Characteristics (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 6)						
Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DD} = 15 V, I _D = 1A, R _G = 6 Ω		7.0		ns
Rise Time	t _r			4.5		
Turn-Off Delay Time	t _{d(OFF)}			10.2		
Fall Time	t _f			1.2		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 1A	T _J = 25°C		0.8	1.2	V
			T _J = 85°C		0.75		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _{SD} /dt = 100 A/μs, I _S = 1 A		10.5		ns	
Charge Time	t _a			8.9			
Discharge Time	t _b			1.6			
Reverse Recovery Charge	Q _{RR}			2.1			nC

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Maximum Instantaneous Forward Voltage	V _F	I _F = 10 mA		0.27	0.37	V
		I _F = 100 mA		0.36	0.46	
		I _F = 500 mA		0.52	0.62	
Maximum Instantaneous Reverse Current	I _R	V _R = 10 V		2.0	10	μA
		V _R = 30 V		20	200	

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 85°C unless otherwise specified)

Maximum Instantaneous Forward Voltage	V _F	I _F = 10 mA		0.2		V
		I _F = 100 mA		0.3		
		I _F = 500 mA		0.51		
Maximum Instantaneous Reverse Current	I _R	V _R = 10 V		80		μA
		V _R = 30 V		525		

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 125°C unless otherwise specified)

Maximum Instantaneous Forward Voltage	V _F	I _F = 10 mA		0.14		V
		I _F = 100 mA		0.27		
		I _F = 500 mA		0.51		
Maximum Instantaneous Reverse Current	I _R	V _R = 10 V		600		μA
		V _R = 30 V		3000		

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

Capacitance	C	V _R = 5 V, f = 1.0 MHz		6.0		pF
-------------	---	-----------------------------------	--	-----	--	----

- Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
- Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 2 oz. Cu.
- Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%
- Switching characteristics are independent of operating junction temperatures

TYPICAL MOSFET CHARACTERISTICS

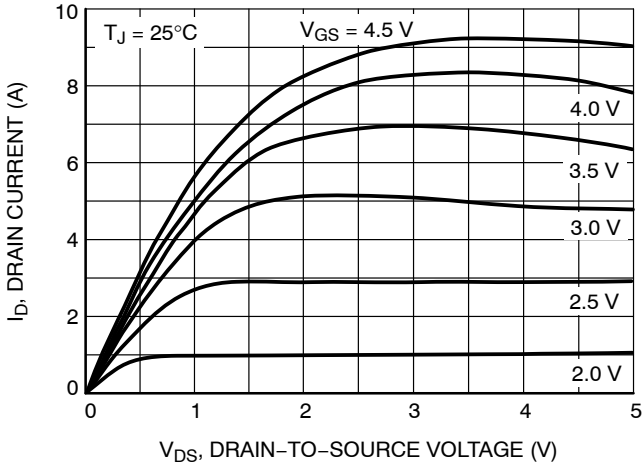


Figure 1. On-Region Characteristics

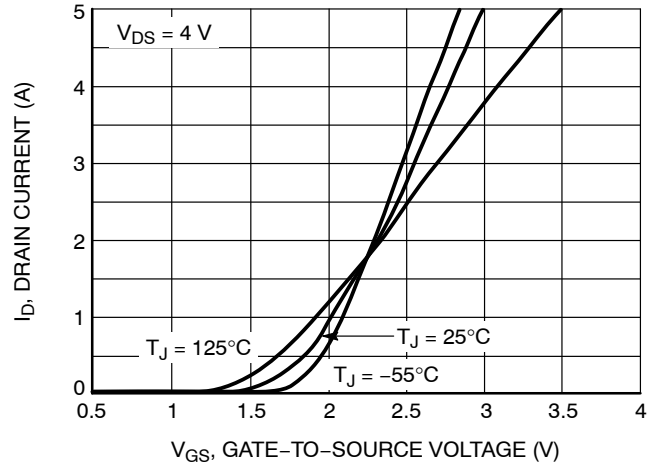


Figure 2. Transfer Characteristics

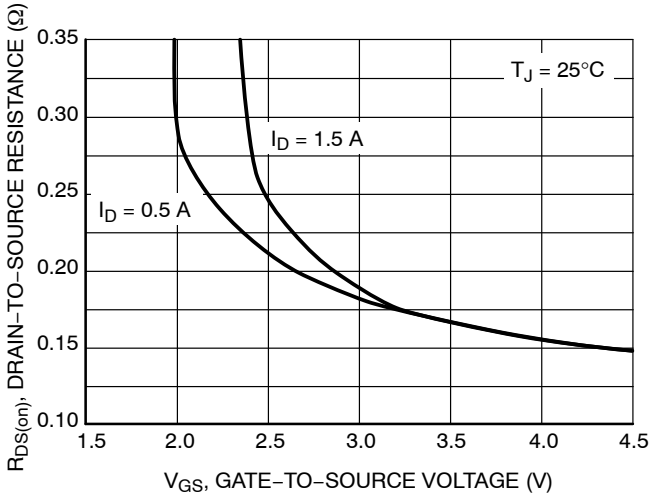


Figure 3. On-Resistance vs. Gate Voltage

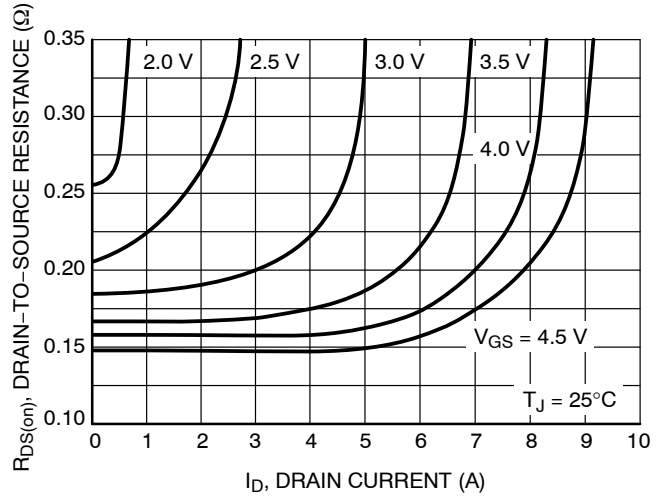


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

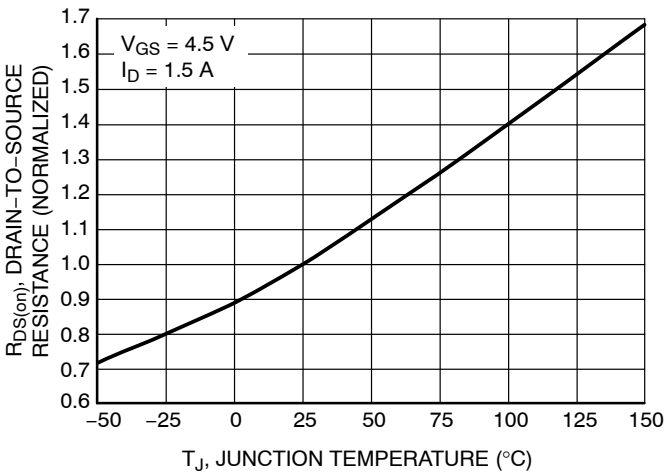


Figure 5. On-Resistance Variation with Temperature

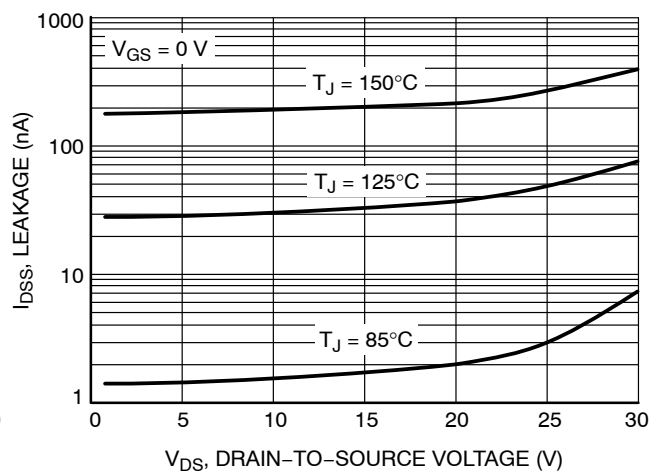


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL MOSFET CHARACTERISTICS

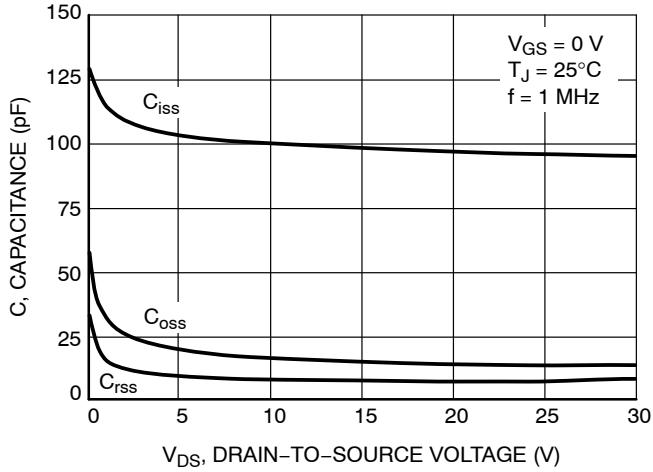


Figure 7. Capacitance Variation

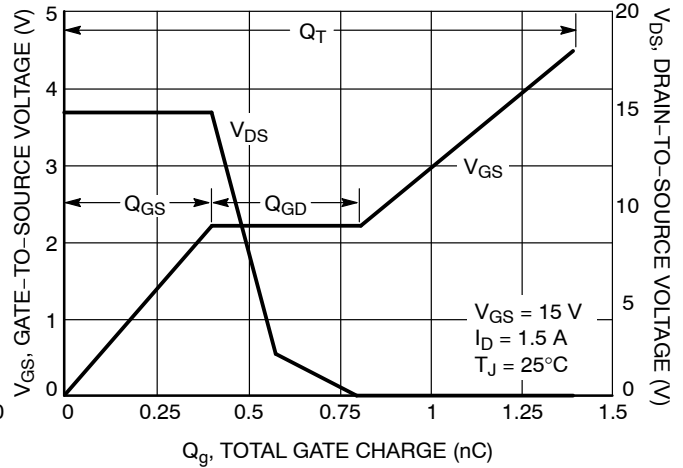


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

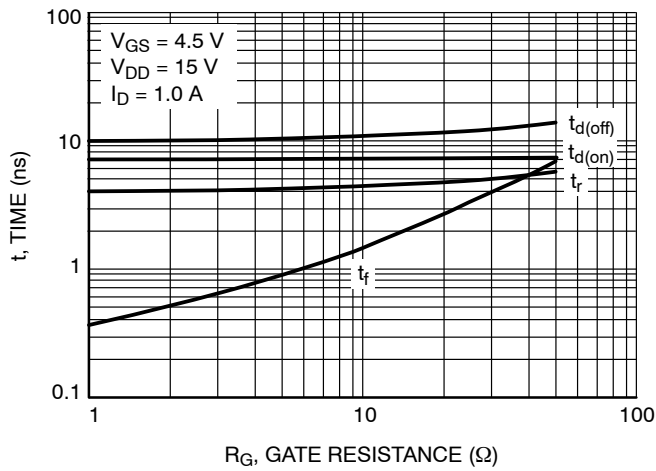


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

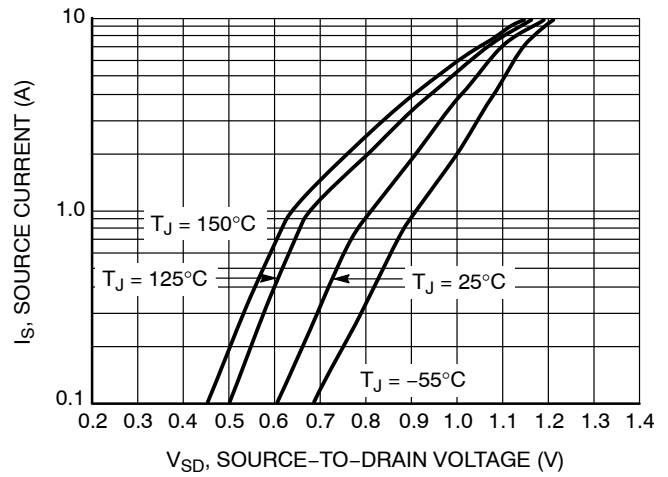


Figure 10. Diode Forward Voltage vs. Current

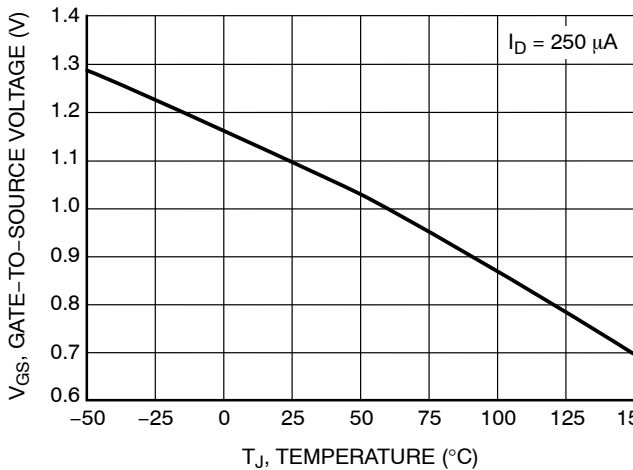


Figure 11. Threshold Voltage

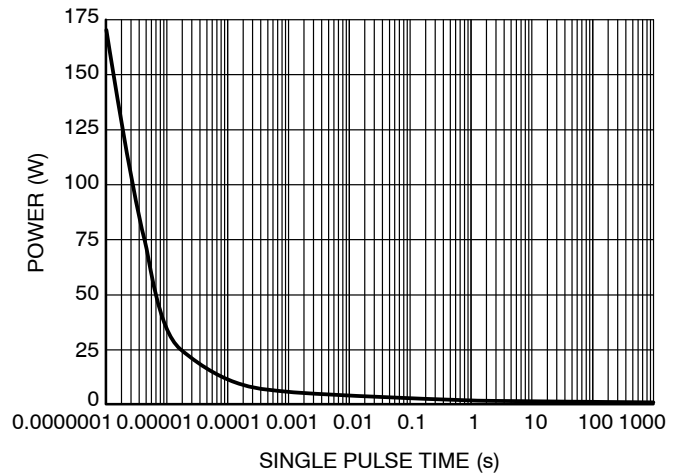


Figure 12. Single Pulse Maximum Power Dissipation

NTLUF4189NZ

TYPICAL MOSFET CHARACTERISTICS

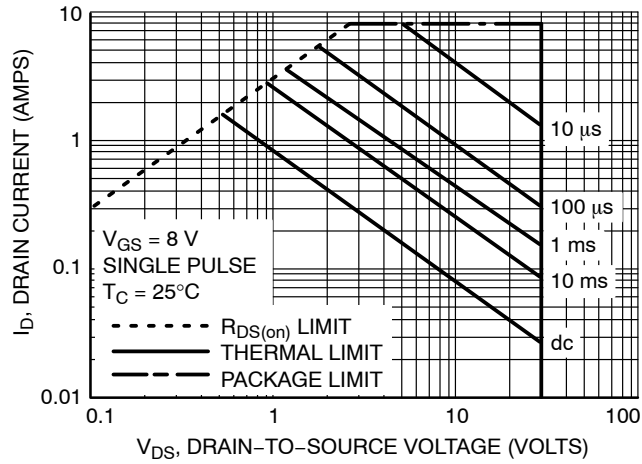


Figure 13. Maximum Rated Forward Biased Safe Operating Area

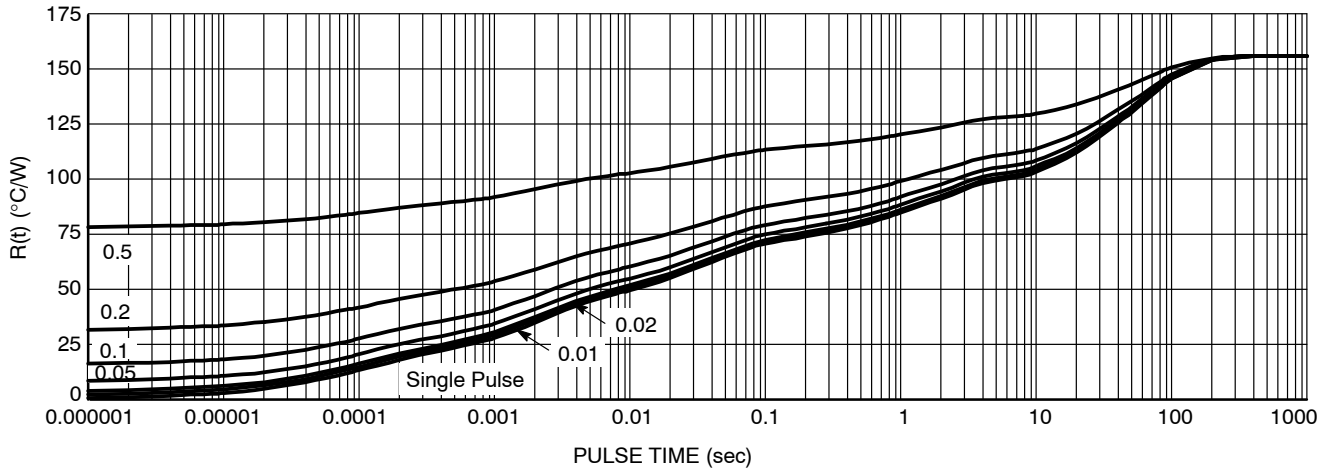


Figure 14. FET Thermal Response

NTLUF4189NZ

TYPICAL SCHOTTKY CHARACTERISTICS

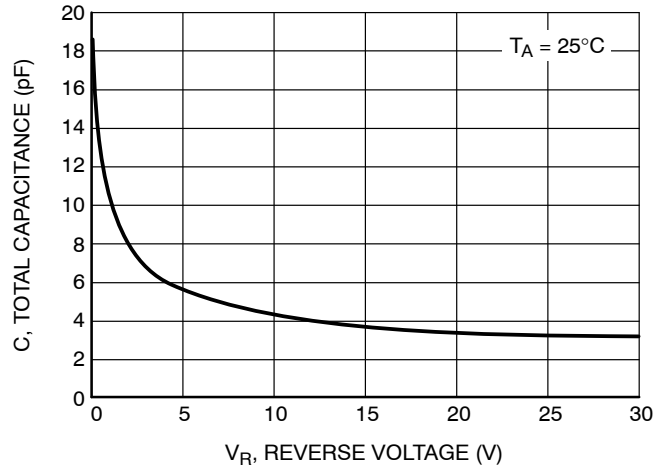


Figure 15. Total Capacitance

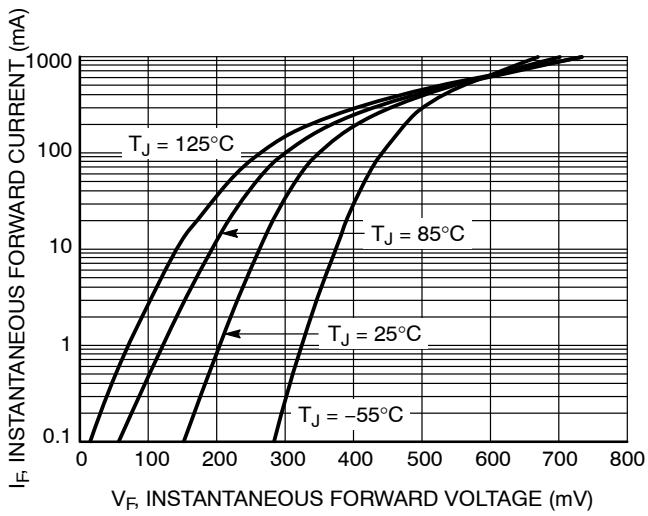


Figure 16. Typical Forward Voltage

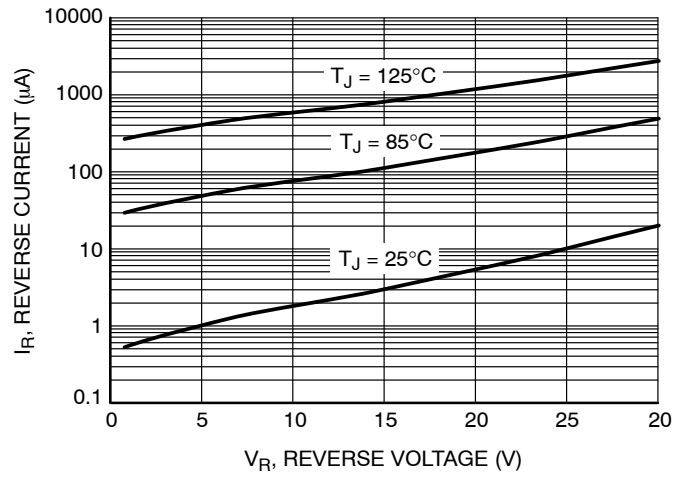


Figure 17. Typical Reverse Current

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

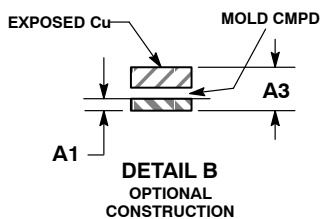
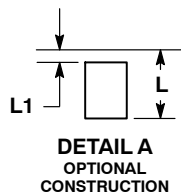
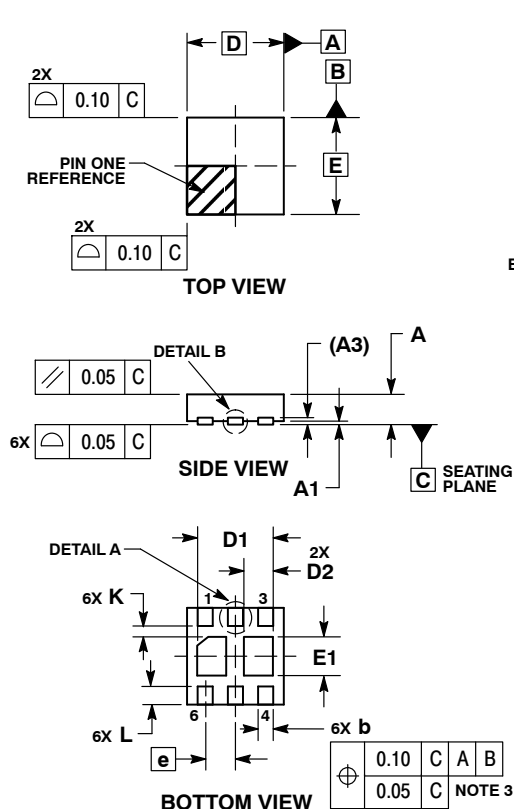
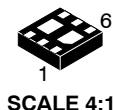
ON Semiconductor®



UDFN6 1.6x1.6, 0.5P

CASE 517AT-01
ISSUE O

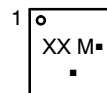
DATE 02 SEP 2008



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL.
 4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13	REF
b	0.20	0.30
D	1.60	BSC
E	1.60	BSC
e	0.50	BSC
D1	1.14	1.34
D2	0.38	0.58
E1	0.54	0.74
K	0.20	---
L	0.15	0.35
L1	---	0.10

GENERIC MARKING DIAGRAM*



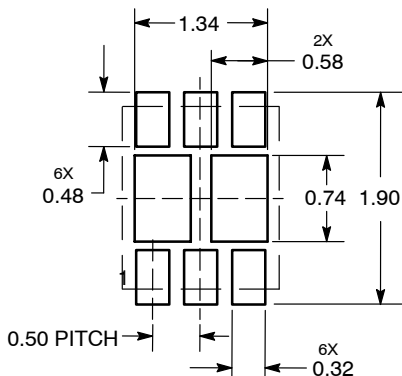
- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

*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.

SOLDERMASK DEFINED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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:	98AON32372E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	6 PIN UDFN, 1.6X1.6, 0.5P	PAGE 1 OF 1

ON Semiconductor and ON are 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. ON 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 www.onsemi.com/site/pdf/Patent-Marking.pdf. **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 information 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 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 **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** 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:

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