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 μCool™ 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 ≤ 5 s	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		tp = 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 mm^2, 2 oz. Cu.

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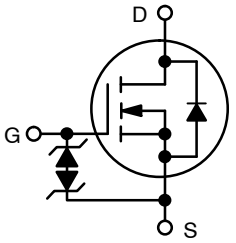
MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ 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

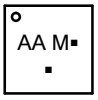


N−Channel MOSFET

Schottky Diode

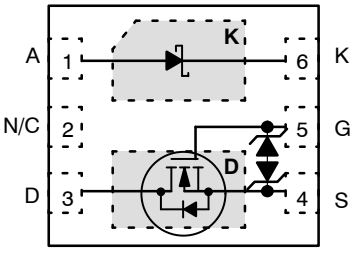
MARKING DIAGRAM

UDFN6
CASE 517AT
μCOOL™



AA = Specific Device Code
M = Date Code
▪ = Pb−Free Package

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

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

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)	$R_{\theta JA}$	155	°C/W
Junction-to-Ambient – t ≤ 5 s (Note 3)	$R_{\theta JA}$	100	
Junction-to-Ambient – Steady State min Pad (Note 4)	$R_{\theta JA}$	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		

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

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
SWITCHING CHARACTERISTICS, VGS = 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

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

TYPICAL MOSFET CHARACTERISTICS

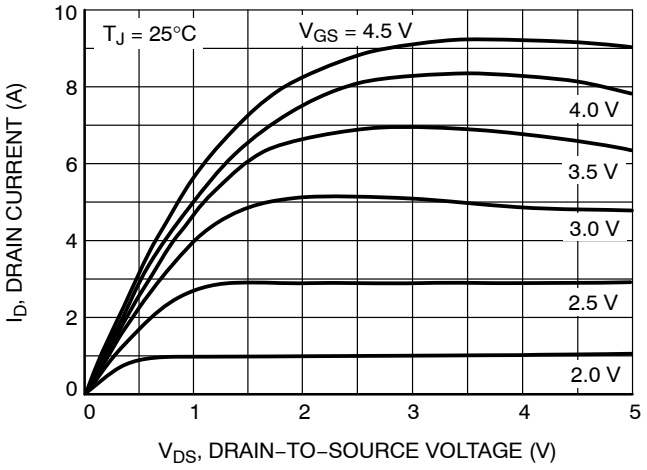


Figure 1. On−Region Characteristics

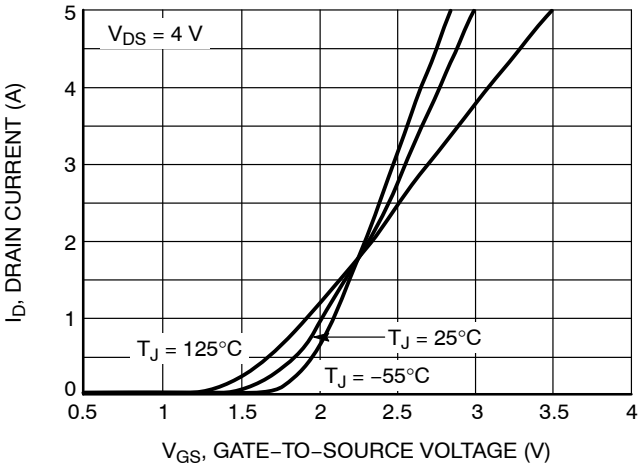


Figure 2. Transfer Characteristics

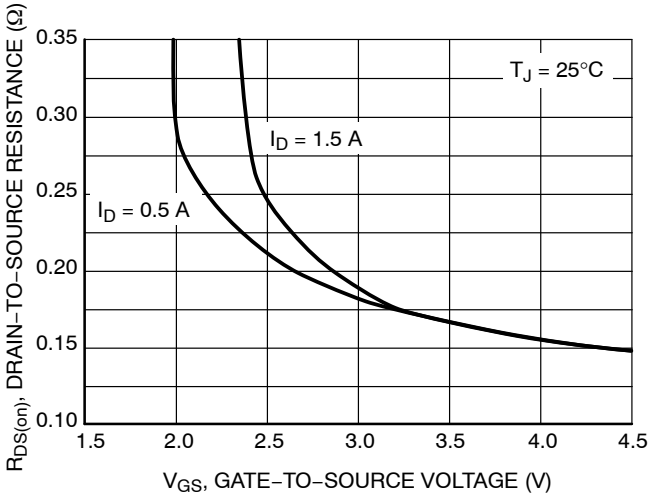


Figure 3. On−Resistance vs. Gate Voltage

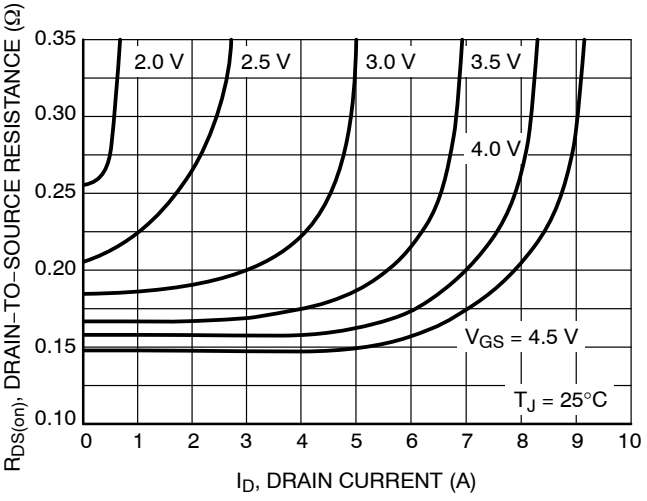


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

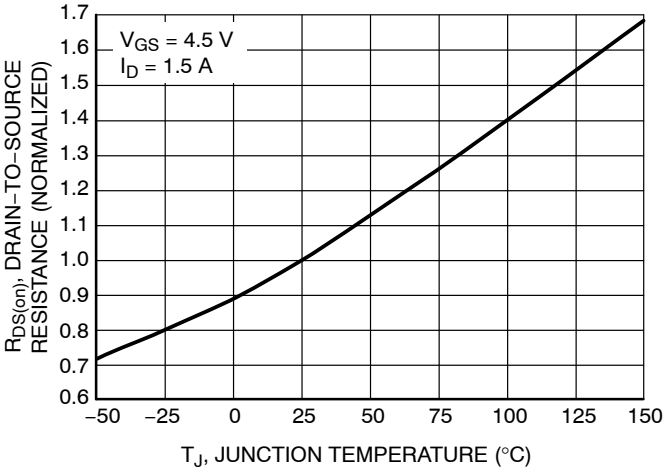


Figure 5. On−Resistance Variation with Temperature

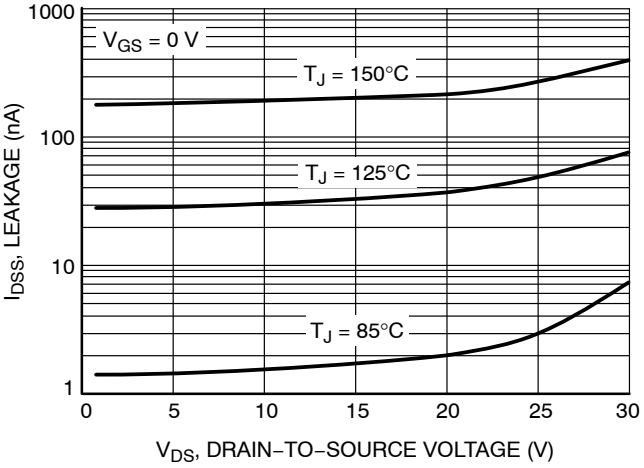


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL MOSFET CHARACTERISTICS

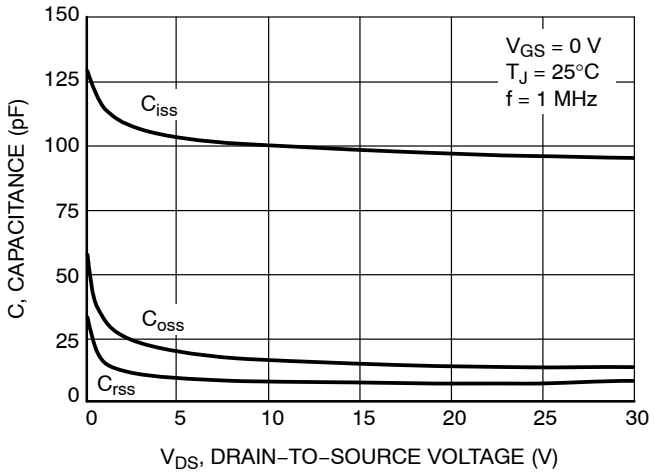


Figure 7. Capacitance Variation

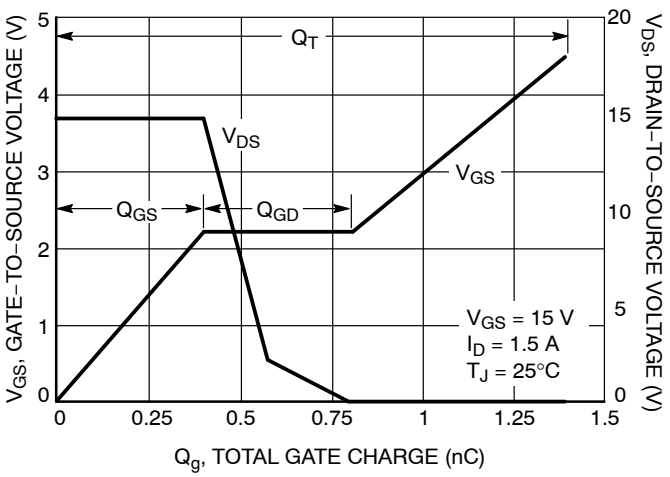


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

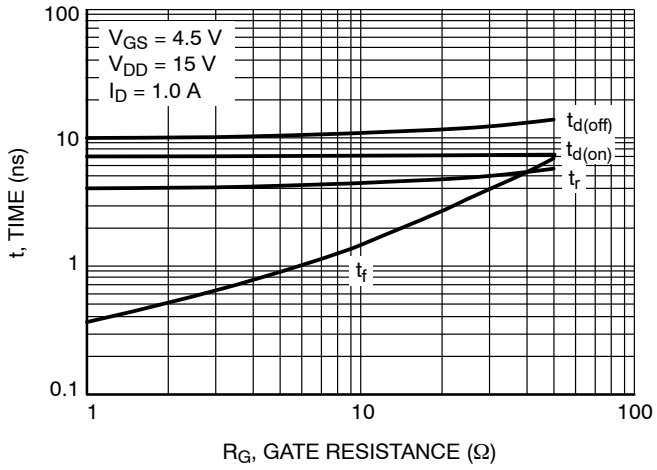


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

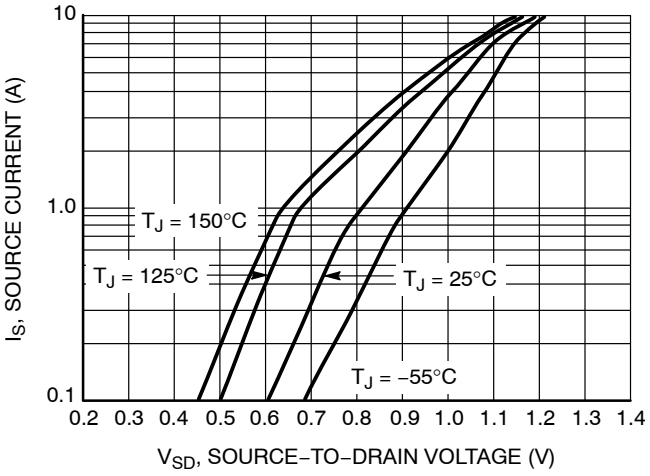


Figure 10. Diode Forward Voltage vs. Current

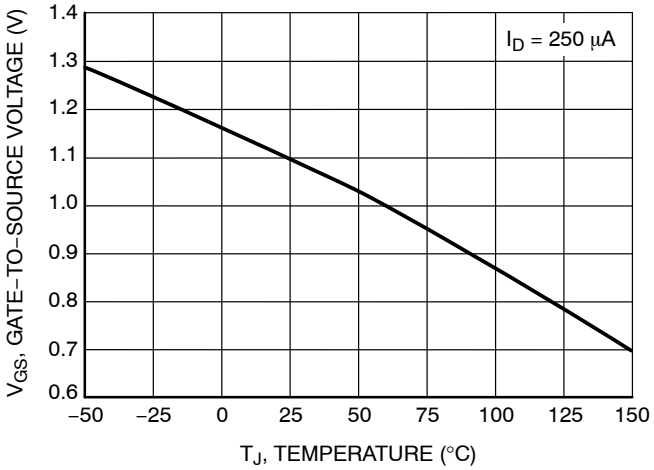


Figure 11. Threshold Voltage

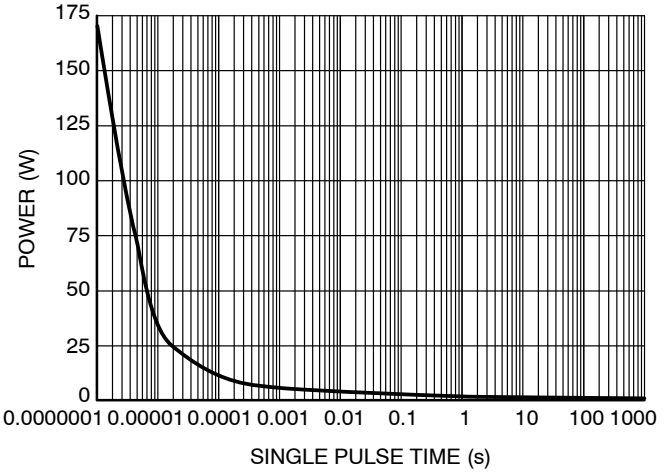


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL MOSFET CHARACTERISTICS

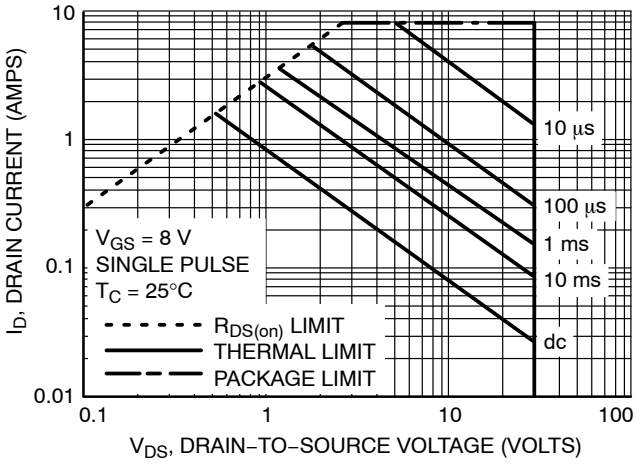


Figure 13. Maximum Rated Forward Biased Safe Operating Area

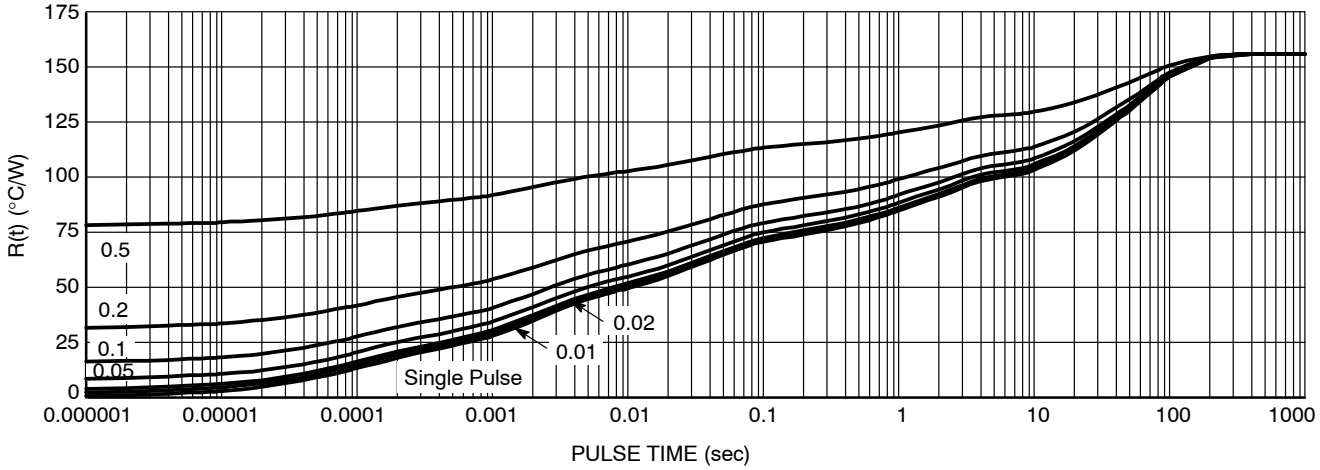


Figure 14. FET Thermal Response

TYPICAL SCHOTTKY CHARACTERISTICS

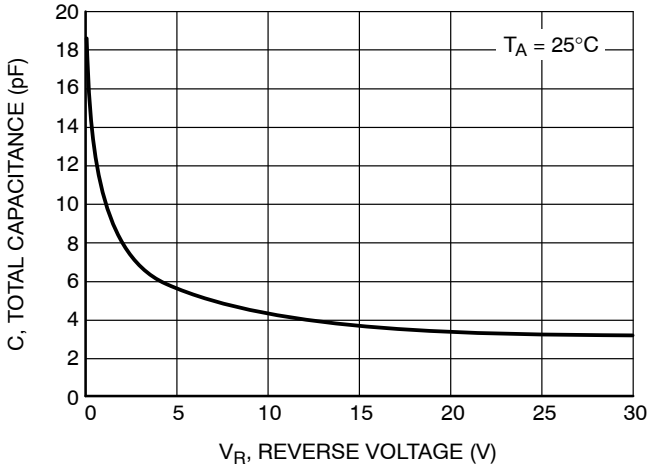


Figure 15. Total Capacitance

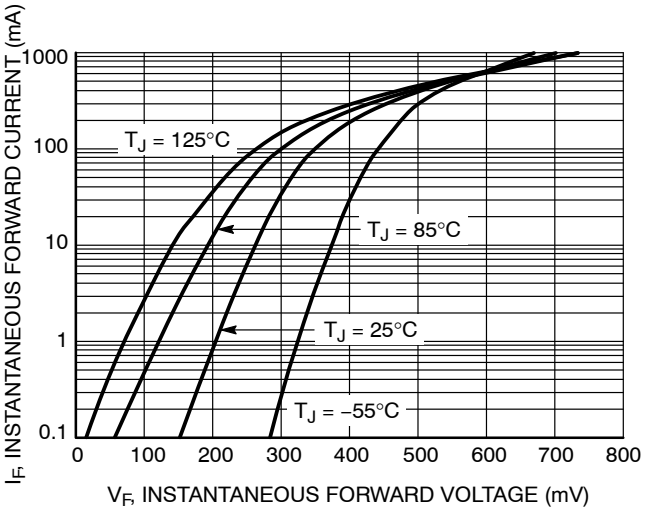


Figure 16. Typical Forward Voltage

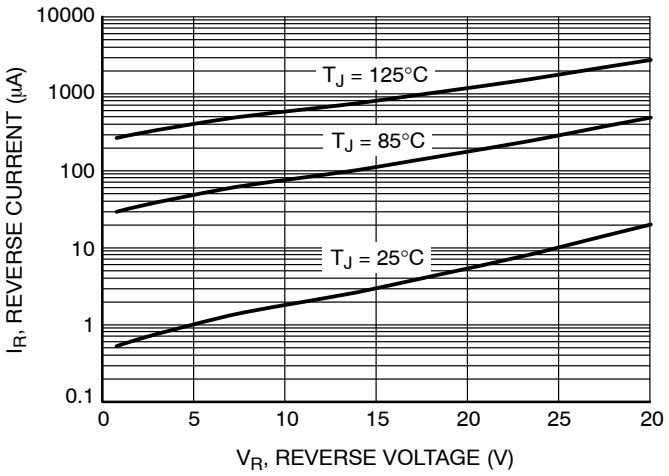
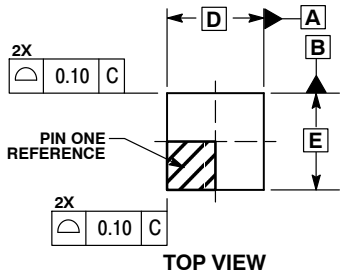


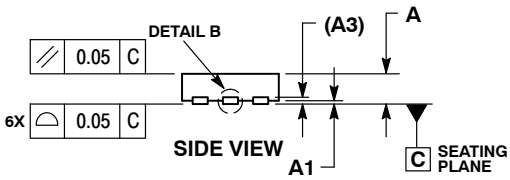
Figure 17. Typical Reverse Current

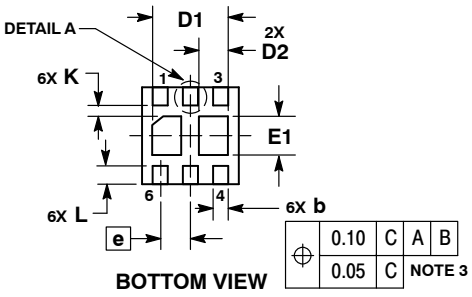
SCALE 4:1

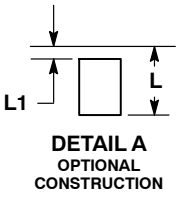
UDFN6 1.6x1.6, 0.5P
CASE 517AT
ISSUE O

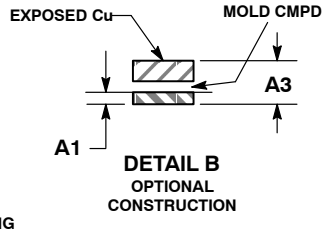
DATE 02 SEP 2008







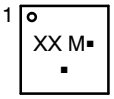




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	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*

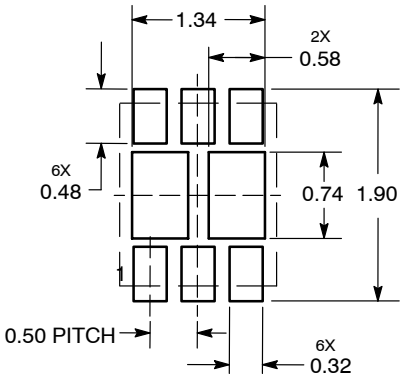


XX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(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. Some products may not follow the Generic Marking.

SOLDERMASK DEFINED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** 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:	**UDFN6, 1.6X1.6, 0.5P**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales

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