

# NTLJF3118N

## Power MOSFET and Schottky Diode

20 V, 4.6 A,  $\mu$ Cool™ N-Channel, with 2.0 A Schottky Barrier Diode, 2x2 mm WDFN Package

### Features

- WDFN 2x2 mm Package Provides Exposed Drain Pad for Excellent Thermal Conduction
- Footprint Same as SC-88 Package
- 1.8 V  $V_{GS}$  Rated  $R_{DS(on)}$
- Low Profile (< 0.8 mm) for Easy Fit in Thin Environments
- Low  $V_F$  2 A Schottky Diode
- This is a Pb-Free Device

### Applications

- DC-DC Boost/Buck Converter
- Low Voltage Hard Disk DC Power Source

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	20	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 12$	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	3.8	A
			$T_A = 85^\circ\text{C}$	2.8	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	$I_D$	4.6	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	1.5	W
			$t \leq 5$ s	$P_D$	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	2.6	A
		$T_A = 85^\circ\text{C}$	$I_D$	1.9	
Power Dissipation (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	0.7	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	18	A	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode)		$I_S$	1.8	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

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 2 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.



ON Semiconductor®

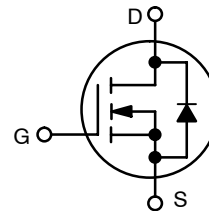
<http://onsemi.com>

### MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ Max	$I_D$ Max
20 V	65 m $\Omega$ @ 4.5 V	3.8 A
	75 m $\Omega$ @ 2.5 V	2.0 A
	120 m $\Omega$ @ 1.8 V	1.7 A

### SCHOTTKY DIODE

$V_R$ Max	$V_F$ Typ	$I_F$ Max
20 V	0.41 V	2.0 A



N-CHANNEL MOSFET

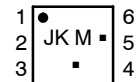


SCHOTTKY DIODE



WDFN6 CASE 506AN

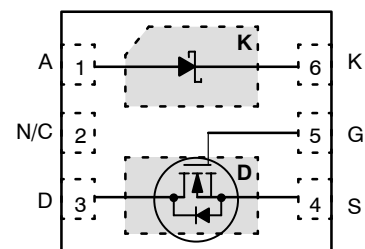
### MARKING DIAGRAM



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

(Note: Microdot may be in either location)

### PIN CONNECTIONS



(Top View)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

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## SCHOTTKY DIODE MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	$V_{RRM}$	20	V
DC Blocking Voltage	$V_R$	20	V
Average Rectified Forward Current	$I_F$	2.0	A

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.

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	83	$^\circ\text{C/W}$
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	58	
Junction-to-Ambient – Steady State Min Pad (Note 4)	$R_{\theta JA}$	177	

3. Surface Mounted on FR4 Board using 2 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.

## MOSFET ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu\text{A}$	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250$ $\mu\text{A}$ , Ref to $25^\circ\text{C}$		10.4		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 16$ V, $V_{GS} = 0$ V	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$
			$T_J = 85^\circ\text{C}$		10	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 8.0$ V			$\pm 100$	nA

### ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$ , $I_D = 250$ $\mu\text{A}$	0.4	0.7	1.0	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-3.0		$\text{mV}/^\circ\text{C}$
Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 4.5$ , $I_D = 3.8$ A		37	65	m $\Omega$
		$V_{GS} = 2.5$ , $I_D = 2.0$ A		46	75	
		$V_{GS} = 1.8$ , $I_D = 1.7$ A		65	120	
Forward Transconductance	$g_{FS}$	$V_{DS} = 10$ V, $I_D = 1.7$ A		4.2		S

### CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0$ V, $f = 1$ MHz, $V_{DS} = 10$ V		271		pF
Output Capacitance	$C_{OSS}$			72		
Reverse Transfer Capacitance	$C_{RSS}$			43		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5$ V, $V_{DS} = 10$ V, $I_D = 3.8$ A		3.7		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.3		
Gate-to-Source Charge	$Q_{GS}$			0.6		
Gate-to-Drain Charge	$Q_{GD}$			1.0		

### SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5$ V, $V_{DD} = 16$ V, $I_D = 1.0$ A, $R_G = 2.0$ $\Omega$		3.8		ns
Rise Time	$t_r$			4.7		
Turn-Off Delay Time	$t_{d(OFF)}$			11.1		
Fall Time	$t_f$			5.8		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0$ V, $I_S = 1.0$ A	$T_J = 25^\circ\text{C}$		0.69	1.0	V
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0$ V, $dI_{SD}/dt_i = 100$ A/ $\mu\text{s}$ , $I_S = 1.0$ A			10.2		ns

5. Pulse Test: Pulse Width  $\leq 300$   $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

6. Switching characteristics are independent of operating junction temperatures.

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## SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	$V_F$	$I_F = 0.1\text{ A}$		0.26	0.35	V
		$I_F = 1.0\text{ A}$		0.35	0.42	
		$I_F = 2.0\text{ A}$		0.41	0.52	
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 20\text{ V}$		0.20	5.0	mA
		$V_R = 10\text{ V}$		0.045	1.0	

## SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ( $T_J = 85^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	$V_F$	$I_F = 0.1\text{ A}$		0.18		V
		$I_F = 1.0\text{ A}$		0.29		
		$I_F = 2.0\text{ A}$		0.36		
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 20\text{ V}$		4.9		mA
		$V_R = 10\text{ V}$		1.6		

## SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ( $T_J = 125^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	$V_F$	$I_F = 0.1\text{ A}$		0.13		V
		$I_F = 1.0\text{ A}$		0.25		
		$I_F = 2.0\text{ A}$		0.33		
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 20\text{ V}$		42		mA
		$V_R = 10\text{ V}$		13		

## SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Capacitance	C	$V_R = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$		52.3		pF

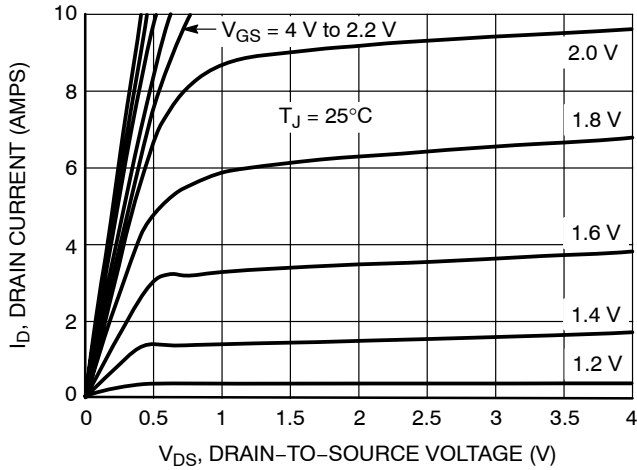
## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTLJF3118NTAG	WDFN6 (Pb-Free)	3000 / Tape & Reel
NTLJF3118NTBG	WDFN6 (Pb-Free)	3000 / Tape & Reel

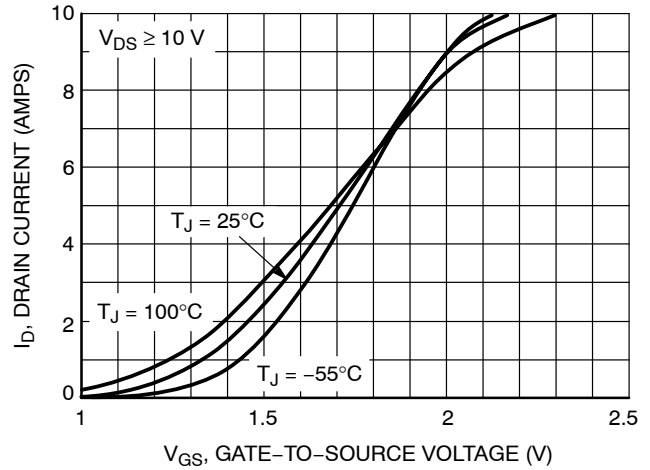
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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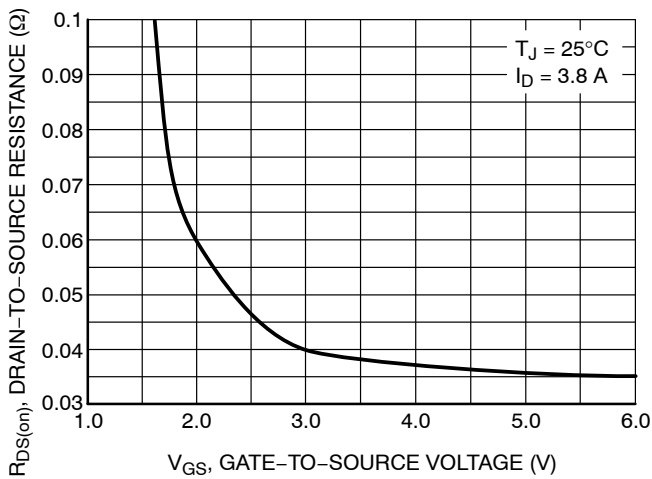
## TYPICAL N-CHANNEL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



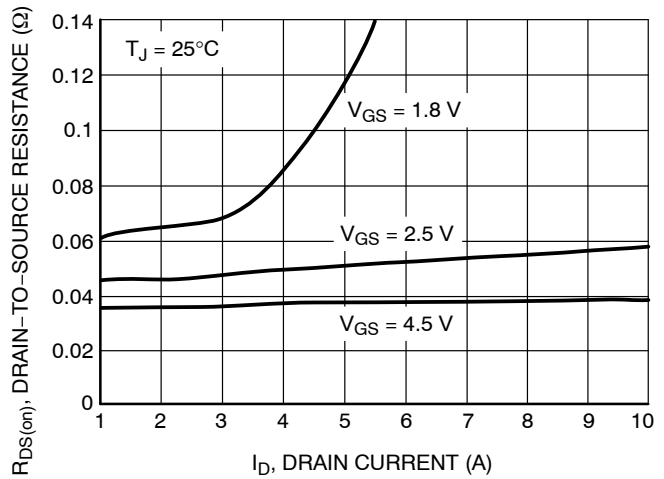
**Figure 1. On-Region Characteristics**



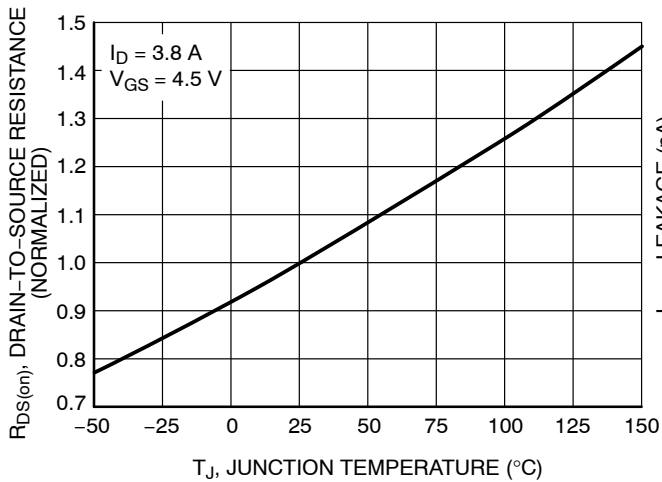
**Figure 2. Transfer Characteristics**



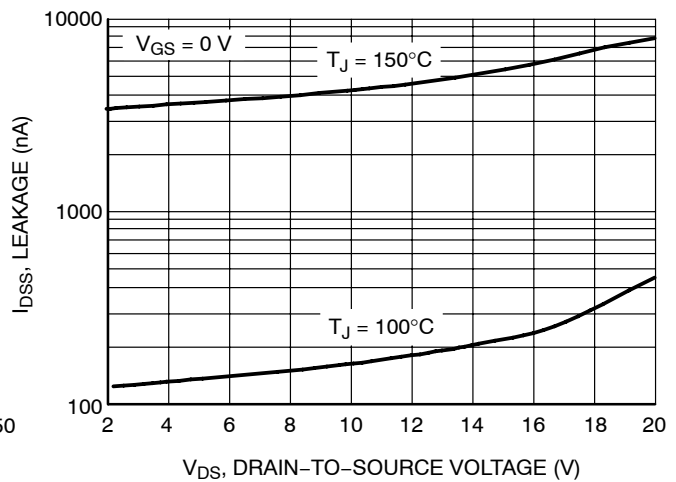
**Figure 3. On-Resistance versus Drain Current**



**Figure 4. On-Resistance versus Drain Current and Gate Voltage**



**Figure 5. On-Resistance Variation with Temperature**



**Figure 6. Drain-to-Source Leakage Current versus Voltage**

TYPICAL N-CHANNEL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

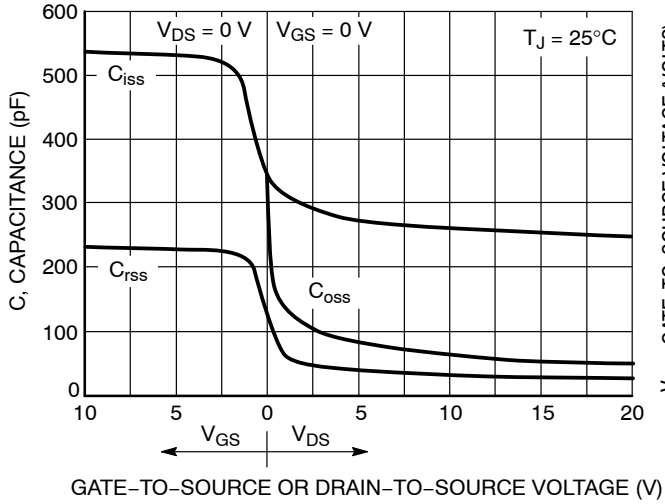


Figure 7. Capacitance Variation

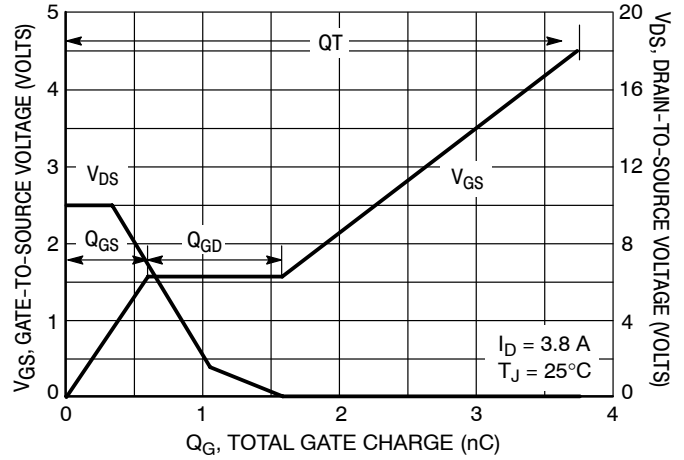


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

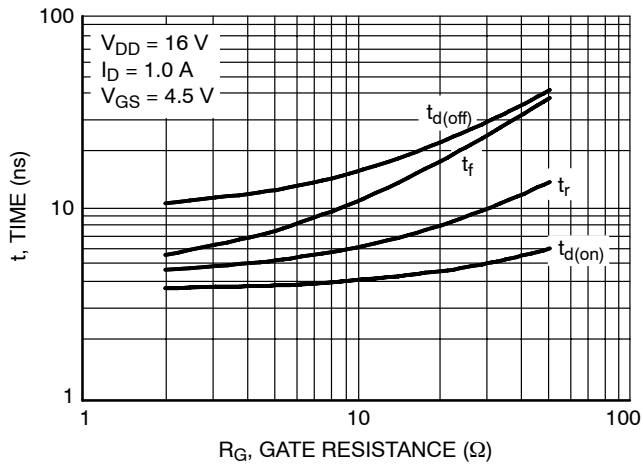


Figure 9. Resistive Switching Time Variation versus Gate Resistance

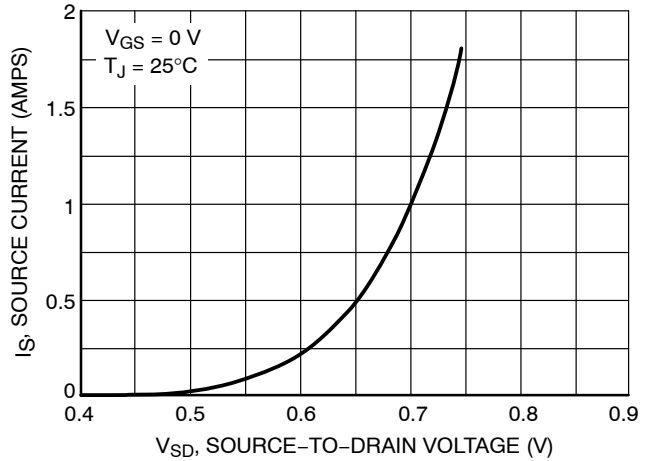


Figure 10. Diode Forward Voltage versus Current

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## TYPICAL SCHOTTKY PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

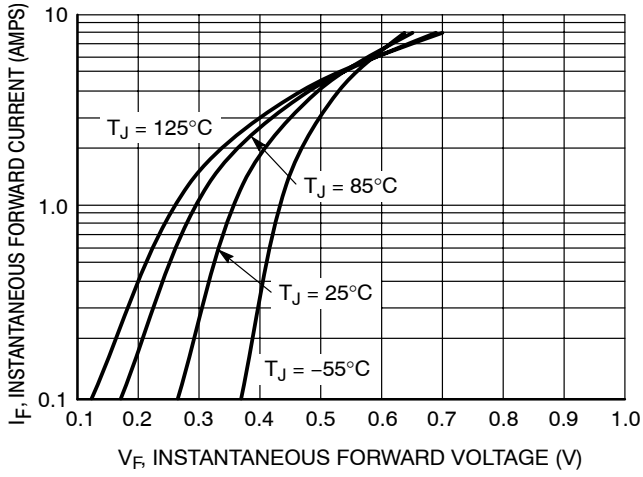


Figure 11. Typical Forward Voltage

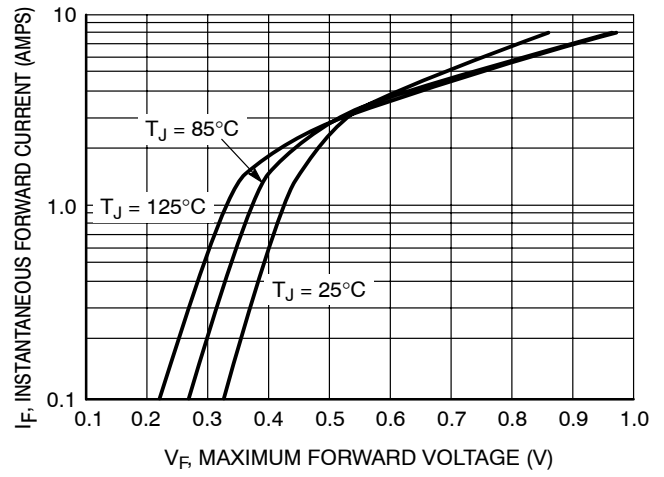


Figure 12. Maximum Forward Voltage

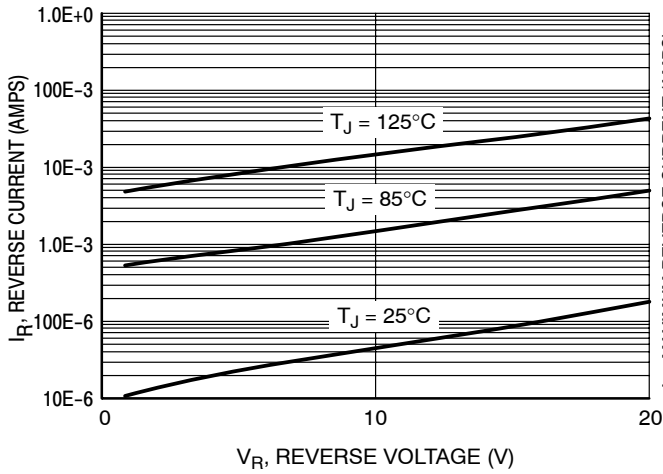


Figure 13. Typical Reverse Current

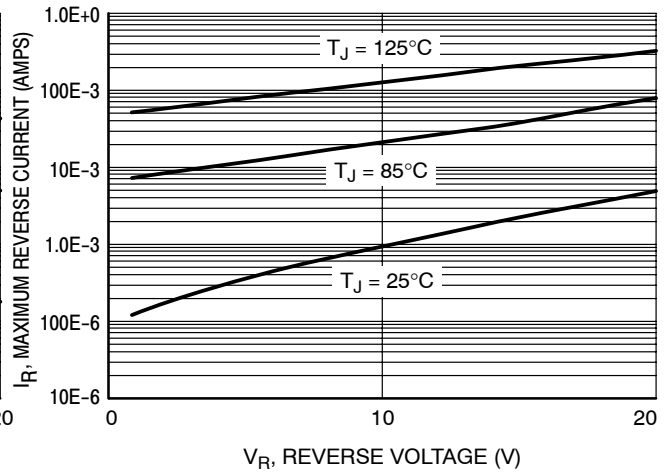
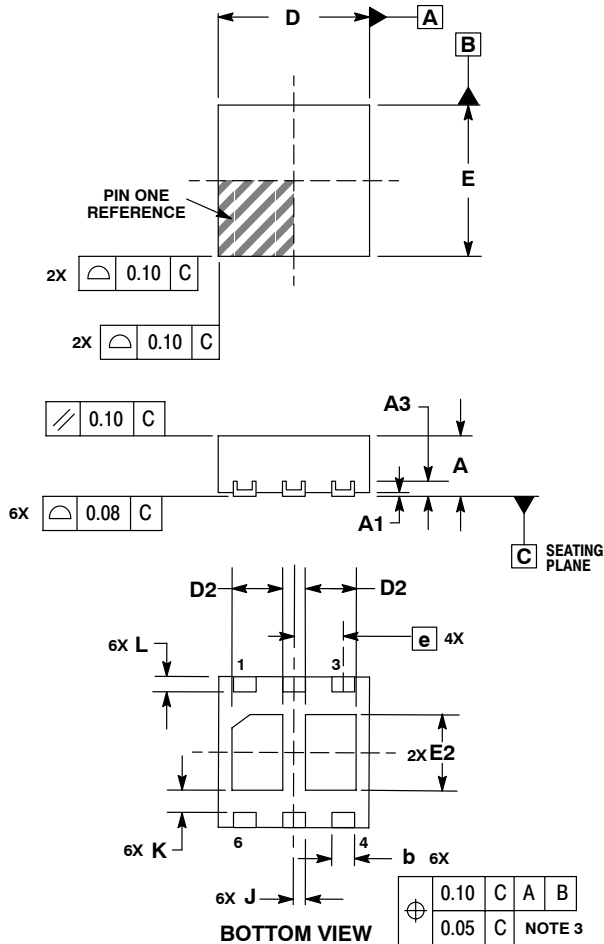


Figure 14. Maximum Reverse Current

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## PACKAGE DIMENSIONS

WDFN6, 2x2  
CASE 506AN-01  
ISSUE B

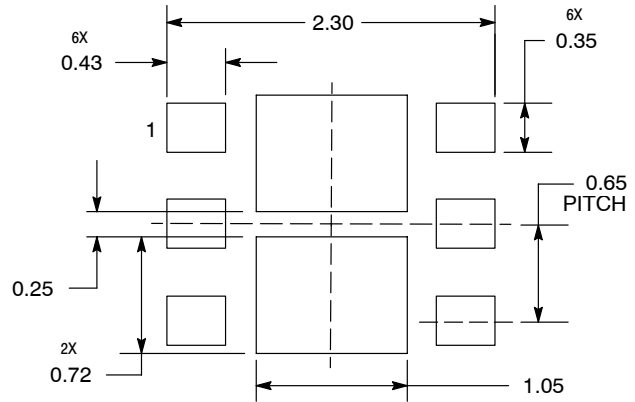


**NOTES:**

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 0.20mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.25	0.35
D	2.00 BSC	
D2	0.57	0.77
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
K	0.25 REF	
L	0.20	0.30
J	0.15 REF	

**SOLDERING 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.

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