

# NTLJD3182FZ

## Power MOSFET and Schottky Diode

-20 V, -4.0 A,  $\mu$ Cool™ Single P-Channel & Schottky Barrier Diode, ESD

### Features

- WDFN 2x2 mm Package with Exposed Drain Pads for Excellent Thermal Conduction
- Lowest  $R_{DS(on)}$  Solution in 2x2 mm Package
- Footprint Same as SC-88 Package
- Low Profile (< 0.8 mm) for Easy Fit in Thin Environments
- ESD Protected
- High Current Schottky Diode: 2 A Current Rating
- This is a Pb-Free Device

### Applications

- Optimized for Battery and Load Management Applications in Portable Equipment
- Li-Ion Battery Charging and Protection Circuits
- DC-DC Buck Circuit

### 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		$V_{GS}$	$\pm 8.0$	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	-3.2	A
		$T_A = 85^\circ\text{C}$	-2.3	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	-4.0	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	1.5	W
		$t \leq 5$ s	2.3	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	-2.2	A
		$T_A = 85^\circ\text{C}$	-1.6	
		$T_A = 25^\circ\text{C}$	0.71	
Power Dissipation (Note 2)		$P_D$	0.71	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	-16	A
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode) (Note 2)		$I_S$	-1.0	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$

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

Parameter	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	$V_{RRM}$	30	V
DC Blocking Voltage	$V_R$	30	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.

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, (30 mm<sup>2</sup>, 2 oz Cu).



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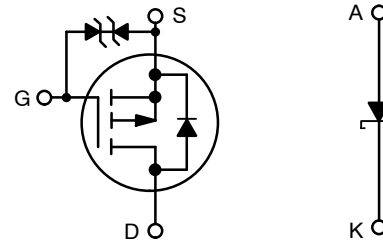
<http://onsemi.com>

### P-CHANNEL MOSFET

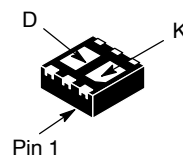
$V_{(BR)DSS}$	$R_{DS(on)}$ Max	$I_D$ Max
-20 V	100 m $\Omega$ @ -4.5 V	-4.0 A
	144 m $\Omega$ @ -2.5 V	
	200 m $\Omega$ @ -1.8 V	

### SCHOTTKY DIODE

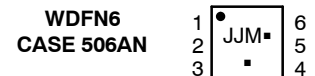
$V_R$ Max	$V_F$ Max	$I_F$ Max
20 V	0.47 V	2.0 A



P-CHANNEL MOSFET    SCHOTTKY DIODE

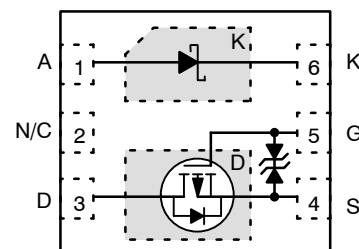


### MARKING DIAGRAM



JJ = 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.

# NTLJD3182FZ

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	83	°C/W
Junction-to-Ambient – Steady State Min Pad (Note 4)	$R_{\theta JA}$	177	
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	54	

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 (30 mm<sup>2</sup>, 2 oz Cu).

## 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, $I_D = -250$ $\mu$ A	-20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250$ $\mu$ A, Ref to $25^\circ\text{C}$		13		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -16$ V, $V_{GS} = 0$ V			-1.0	$\mu$ A
					-10	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 8.0$ V			$\pm 10$	$\mu$ A

### ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$ , $I_D = -250$ $\mu$ A	-0.4		-1.0	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			2.0		mV/°C
Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -2.0$ A		68	100	m $\Omega$
		$V_{GS} = -2.5$ V, $I_D = -2.0$ A		90	144	
		$V_{GS} = -1.8$ V, $I_D = -1.7$ A		125	200	
Forward Transconductance	$g_{FS}$	$V_{DS} = -16$ V, $I_D = -2.0$ A		6.5		S

### CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0$ V, $f = 1.0$ MHz, $V_{DS} = -10$ V		450		pF
Output Capacitance	$C_{OSS}$			90		
Reverse Transfer Capacitance	$C_{RSS}$			62		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5$ V, $V_{DS} = -10$ V, $I_D = -2.0$ A		5.2	7.8	nC
Threshold Gate Charge	$Q_{G(TH)}$			0.3		
Gate-to-Source Charge	$Q_{GS}$			0.84		
Gate-to-Drain Charge	$Q_{GD}$			1.5		

### SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5$ V, $V_{DD} = -5.0$ V, $I_D = -2.0$ A, $R_G = 2.0$ $\Omega$		6.6		ns
Rise Time	$t_r$			9.0		
Turn-Off Delay Time	$t_{d(OFF)}$			14		
Fall Time	$t_f$			12.5		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Recovery Voltage	$V_{SD}$	$V_{GS} = 0$ V, $I_S = -1.0$ A	$T_J = 25^\circ\text{C}$	-0.73	-1.0	V
			$T_J = 125^\circ\text{C}$	-0.62		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0$ V, $dI_{SD}/dt = 100$ A/ $\mu$ s, $I_S = -1.0$ A		23		ns
Charge Time	$t_a$			13		
Discharge Time	$t_b$			10		
Reverse Recovery Time	$Q_{RR}$			10		

5. Pulse Test: Pulse Width  $\leq 300$   $\mu$ s, Duty Cycle  $\leq 2\%$ .  
 6. Switching characteristics are independent of operating junction temperatures.

# NTLJD3182FZ

## 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	$V_F$	$I_F = 100 \text{ mA}$		0.34	0.39	V
		$I_F = 1.0 \text{ A}$		0.47	0.53	
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 30 \text{ V}$		17	20	$\mu\text{A}$
		$V_R = 20 \text{ V}$		3.0	8.0	
		$V_R = 10 \text{ V}$		2.0	4.5	
Capacitance	C	$V_R = 5.0 \text{ V}, f = 1.0 \text{ MHz}$		38		pF

## 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	$V_F$	$I_F = 100 \text{ mA}$		0.22	0.35	V
		$I_F = 1.0 \text{ A}$		0.40	0.50	
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 30 \text{ V}$		0.22	2.5	mA
		$V_R = 20 \text{ V}$		0.11	1.6	
		$V_R = 10 \text{ V}$		0.06	1.2	

## 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	$V_F$	$I_F = 100 \text{ mA}$		0.20	0.29	V
		$I_F = 1.0 \text{ A}$		0.40	0.47	
Maximum Instantaneous Reverse Current	$I_R$	$V_R = 30 \text{ V}$		2.0	20	mA
		$V_R = 20 \text{ V}$		1.1	10.9	
		$V_R = 10 \text{ V}$		0.63	8.4	

## ORDERING INFORMATION

Device Order Number	Package Type	Tape & Reel Size†
NTLJD3182FZTAG	WDFN6 (Pb-Free)	3000 / Tape & Reel
NTLJD3182FZTBG	WDFN6 (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 Specification Brochure, BRD8011/D.

# NTLJD3182FZ

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

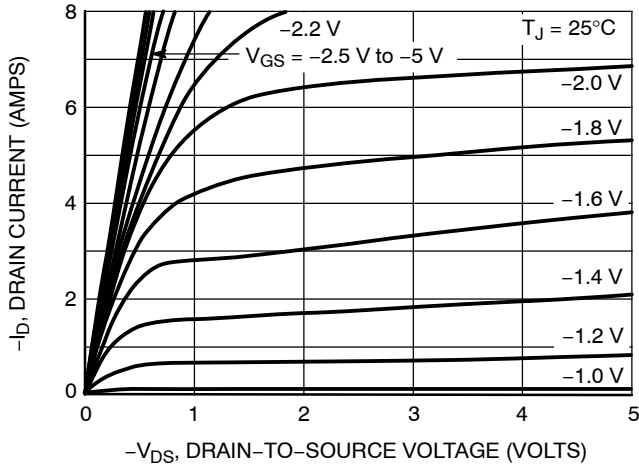


Figure 1. On-Region Characteristics

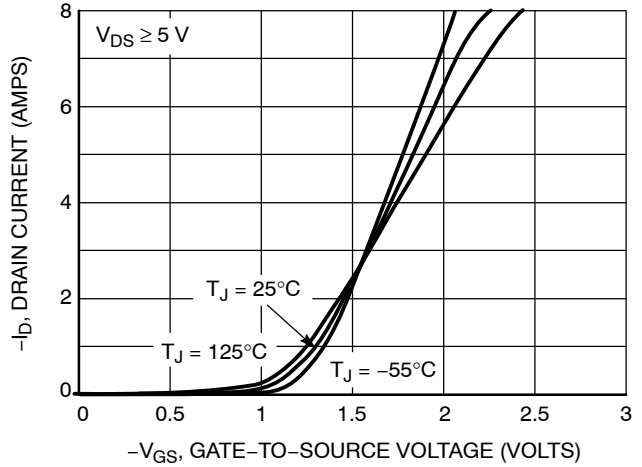


Figure 2. Transfer Characteristics

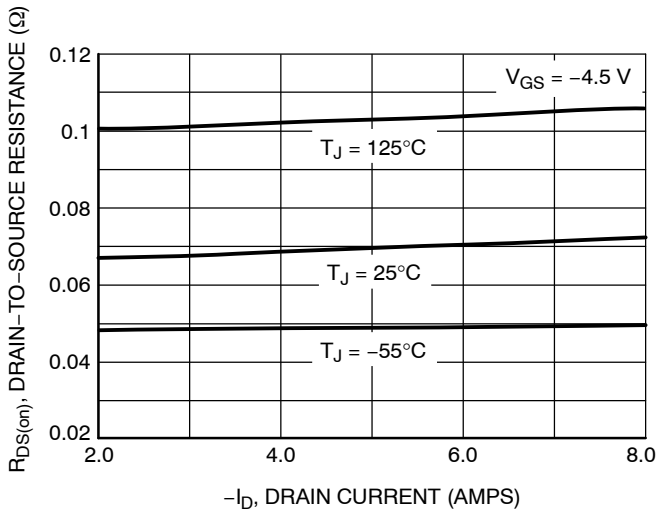


Figure 3. On-Resistance versus Drain Current

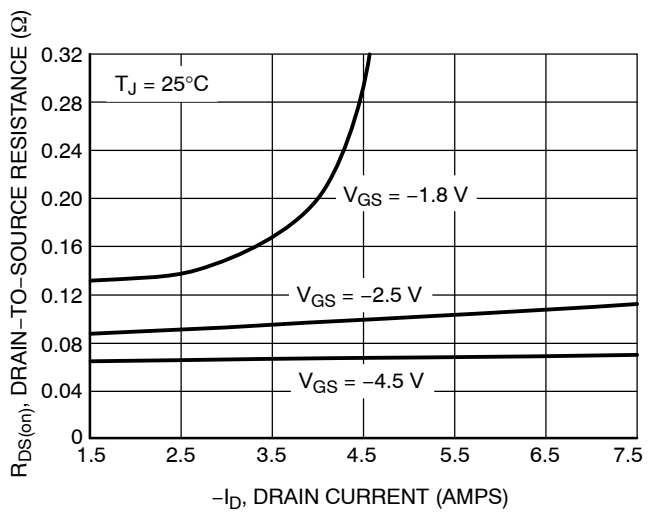


Figure 4. On-Resistance versus Drain Current and Gate Voltage

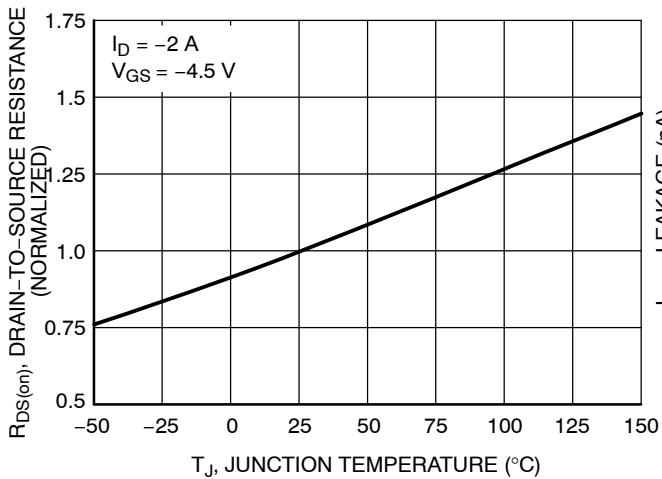


Figure 5. On-Resistance Variation with Temperature

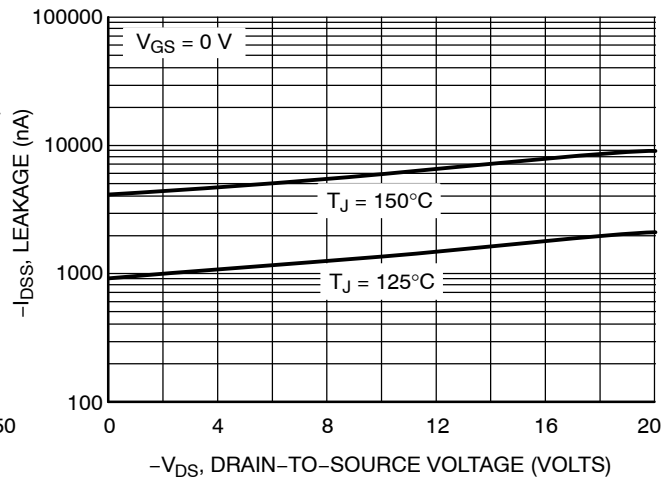


Figure 6. Drain-to-Source Leakage Current versus Voltage

# NTLJD3182FZ

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

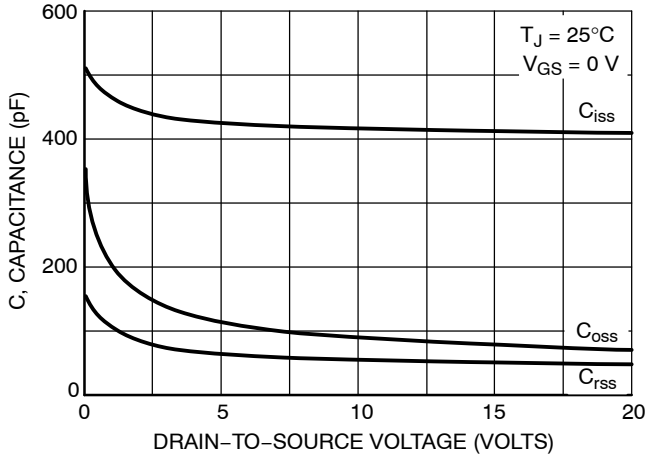


Figure 7. Capacitance Variation

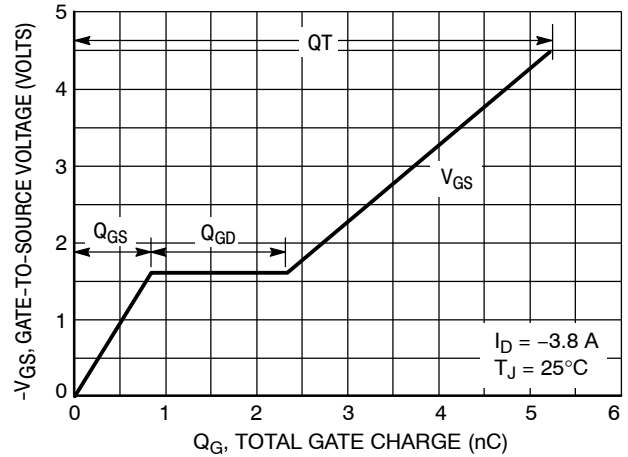


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

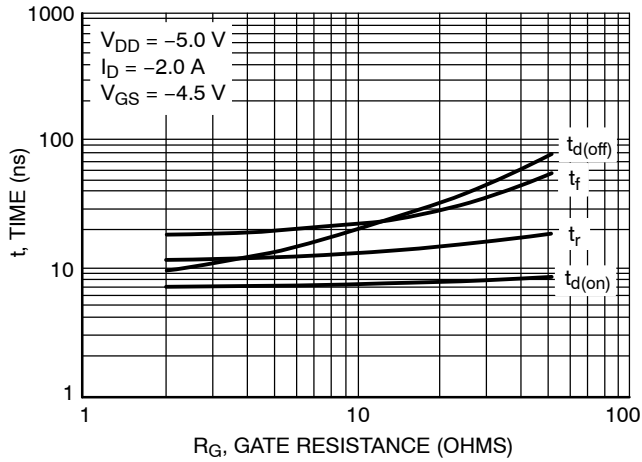


Figure 9. Resistive Switching Time Variation versus Gate Resistance

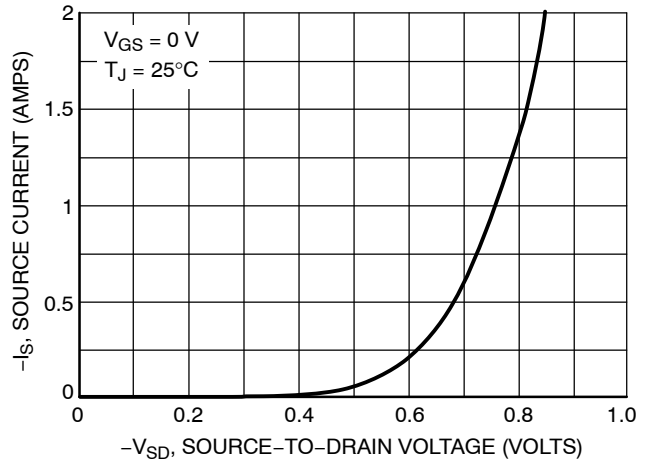


Figure 10. Diode Forward Voltage versus Current

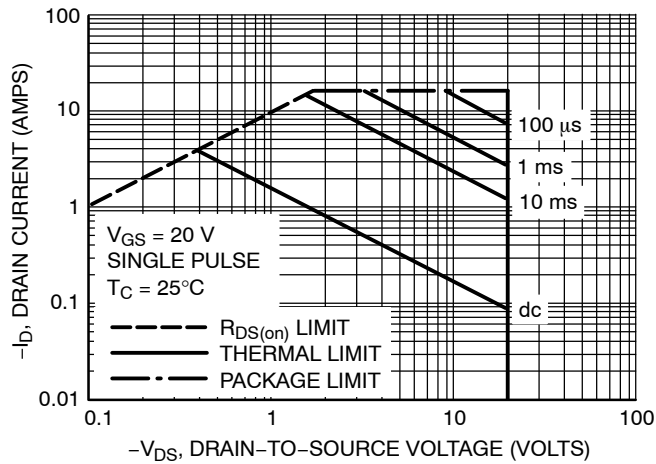


Figure 11. Maximum Rated Forward Biased Safe Operating Area

# NTLJD3182FZ

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

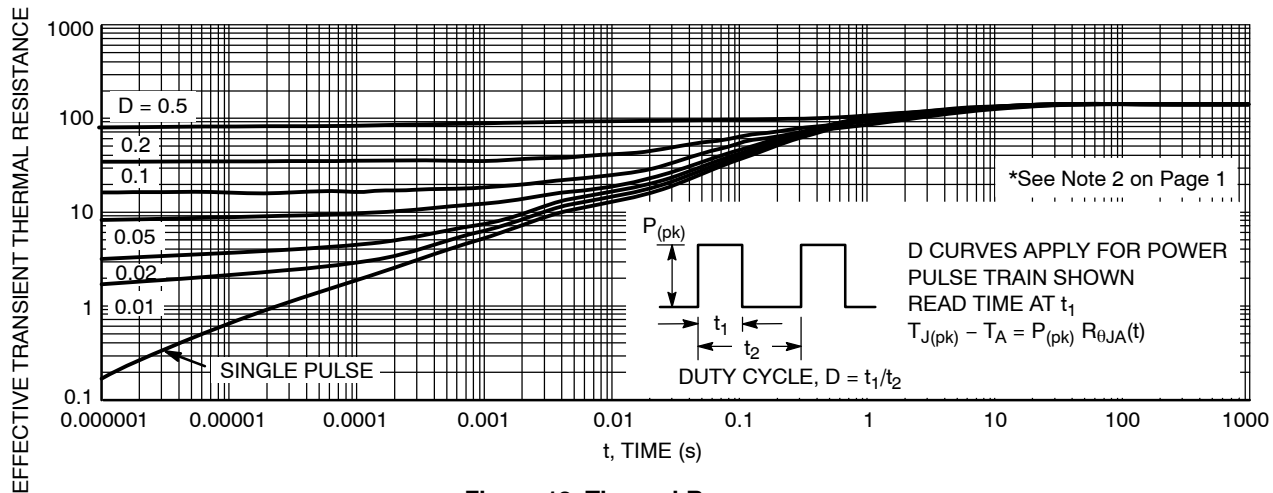


Figure 12. Thermal Response

# NTLJD3182FZ

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

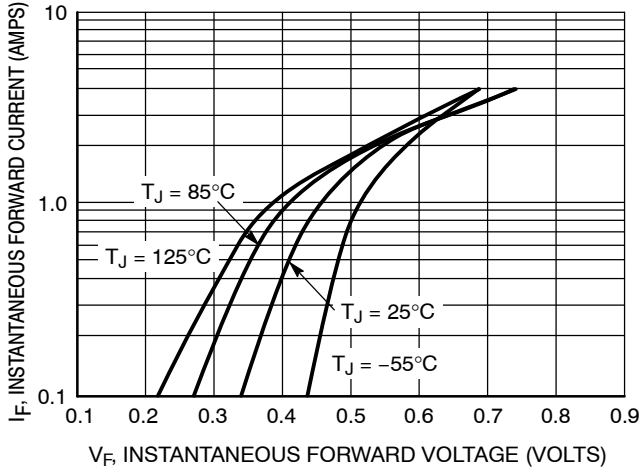


Figure 13. Typical Forward Voltage

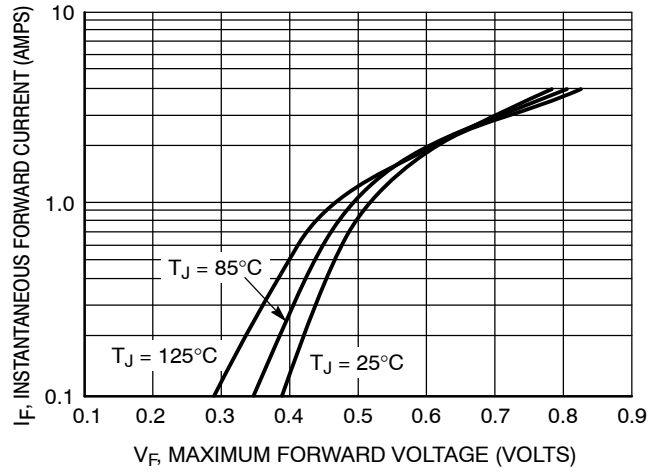


Figure 14. Maximum Forward Voltage

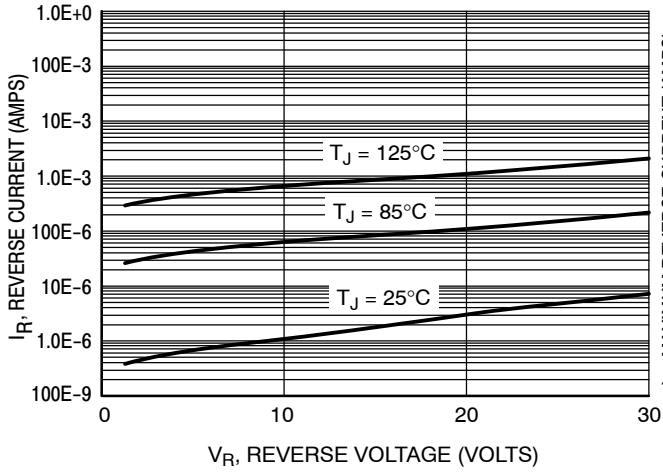


Figure 15. Typical Reverse Current

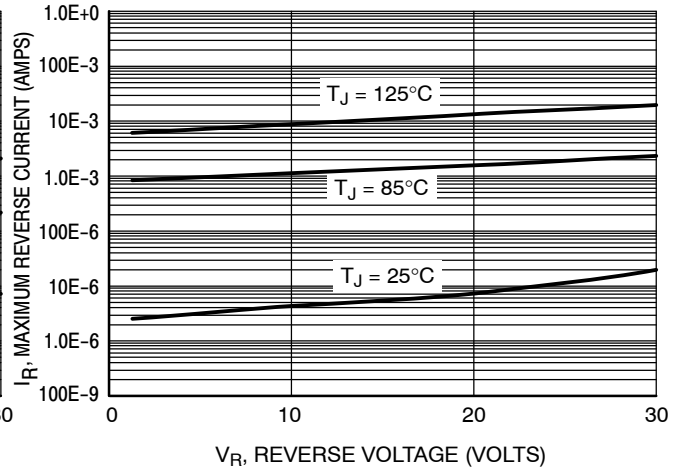
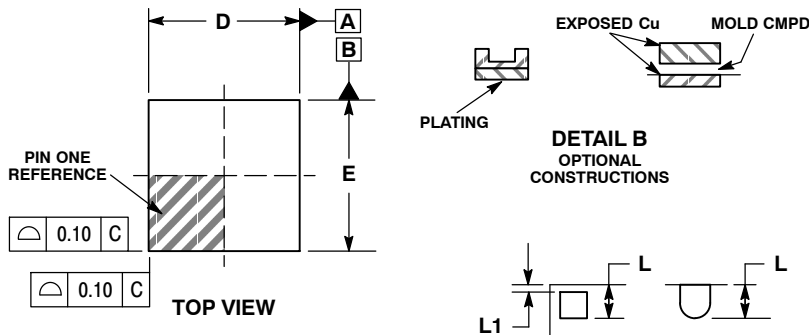


Figure 16. Maximum Reverse Current

# NTLJD3182FZ

## PACKAGE DIMENSIONS

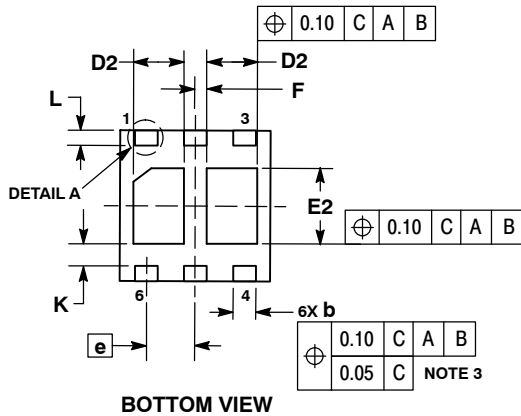
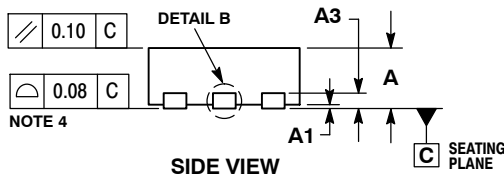
WDFN6, 2x2  
CASE 506AN-01  
ISSUE D



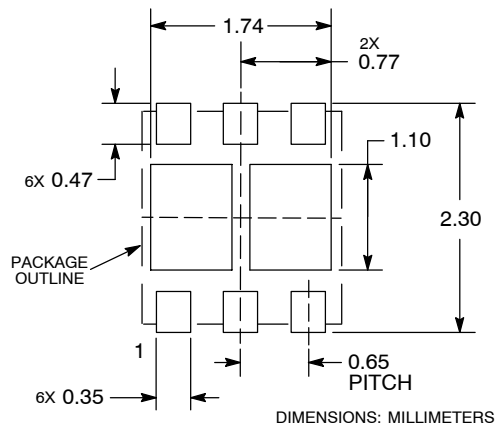
NOTES:

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 THE TERMINAL TIP.
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	0.67
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
F	0.15 BSC	
K	0.25 REF	
L	0.20	0.30
L1	---	0.10



### SOLDERMASK DEFINED MOUNTING FOOTPRINT



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