

# NTLJD3182FZ

## Power MOSFET and Schottky Diode

–20 V, –4.0 A, 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                  | $T_A = 25^{\circ}\text{C}$ | $I_D$          | –3.2       | A                  |
|                                                                   |                               | $T_A = 85^{\circ}\text{C}$ |                | –2.3       |                    |
|                                                                   | $t \leq 5\text{ s}$           | $T_A = 25^{\circ}\text{C}$ |                | –4.0       |                    |
| Power Dissipation (Note 1)                                        | Steady State                  | $T_A = 25^{\circ}\text{C}$ | $P_D$          | 1.5        | W                  |
|                                                                   | $t \leq 5\text{ s}$           |                            |                | 2.3        |                    |
| Continuous Drain Current (Note 2)                                 | Steady State                  | $T_A = 25^{\circ}\text{C}$ | $I_D$          | –2.2       | A                  |
|                                                                   |                               | $T_A = 85^{\circ}\text{C}$ |                | –1.6       |                    |
| Power Dissipation (Note 2)                                        | Steady State                  | $T_A = 25^{\circ}\text{C}$ | $P_D$          | 0.71       | W                  |
| Pulsed Drain Current                                              | $t_p = 10\text{ }\mu\text{s}$ |                            | $I_{DM}$       | –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 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.

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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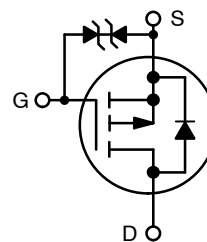
[www.onsemi.com](http://www.onsemi.com)

### 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

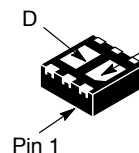
| $V_R$ Max | $V_F$ Max | $I_F$ Max |
|-----------|-----------|-----------|
| 20 V      | 0.47 V    | 2.0 A     |



P-CHANNEL MOSFET



SCHOTTKY DIODE



### MARKING DIAGRAM

WDFN6  
CASE 506AN

|   |     |   |
|---|-----|---|
| 1 | JJM | 6 |
| 2 |     | 5 |
| 3 |     | 4 |

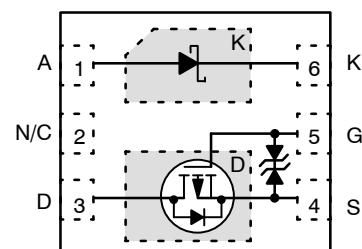
JJ = Specific Device Code

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 on page 3 of this data sheet.

# 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          |
|-----------------------------------------------------------|-------------------|-------------------------------------------------------------|--------------------------|-----|----------|---------------|
| <b>OFF CHARACTERISTICS</b>                                |                   |                                                             |                          |     |          |               |
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$        | -20                      |     |          | V             |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = -250\text{ }\mu\text{A}$ , Ref to $25^\circ\text{C}$ |                          | 13  |          | mV/°C         |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$                | $T_J = 25^\circ\text{C}$ |     | -1.0     | $\mu\text{A}$ |
|                                                           |                   |                                                             | $T_J = 85^\circ\text{C}$ |     | -10      |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$            |                          |     | $\pm 10$ | $\mu\text{A}$ |

## ON CHARACTERISTICS (Note 5)

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

## CHARGES, CAPACITANCES AND GATE RESISTANCE

|                              |              |                                                                      |  |      |     |    |
|------------------------------|--------------|----------------------------------------------------------------------|--|------|-----|----|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -10\text{ V}$     |  | 450  |     | pF |
| Output Capacitance           | $C_{OSS}$    |                                                                      |  | 90   |     |    |
| Reverse Transfer Capacitance | $C_{RSS}$    |                                                                      |  | 62   |     |    |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -2.0\text{ A}$ |  | 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  | $t_{d(ON)}$  | $V_{GS} = -4.5\text{ V}, V_{DD} = -5.0\text{ V}, I_D = -2.0\text{ A}, R_G = 2.0\text{ }\Omega$ |  | 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 | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = -1.0\text{ A}$                                        | $T_J = 25^\circ\text{C}$  |    | -0.73 | -1.0 | V  |
|                          |          |                                                                                   | $T_J = 125^\circ\text{C}$ |    | -0.62 |      |    |
| Reverse Recovery Time    | $t_{RR}$ | $V_{GS} = 0\text{ V}, dI_{SD}/dt = 100\text{ A}/\mu\text{s}, I_S = -1.0\text{ A}$ |                           | 23 |       |      | ns |
| Charge Time              | $t_a$    |                                                                                   |                           | 13 |       |      |    |
| Discharge Time           | $t_b$    |                                                                                   |                           | 10 |       |      |    |
| Reverse Recovery Time    | $Q_{RR}$ |                                                                                   |                           | 10 |       |      | nC |

5. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , 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 | $V_F$  | $I_F = 100\text{ mA}$                       |     | 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<br>(Pb-Free) | 3000 / Tape & Reel |
| NTLJD3182FZTBG      | WDFN6<br>(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.

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

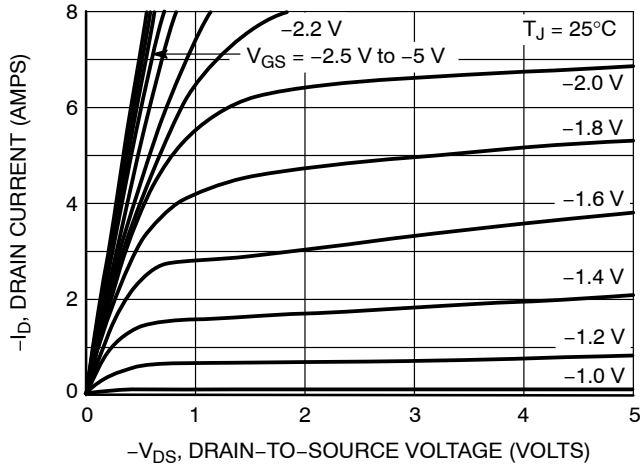


Figure 1. On-Region Characteristics

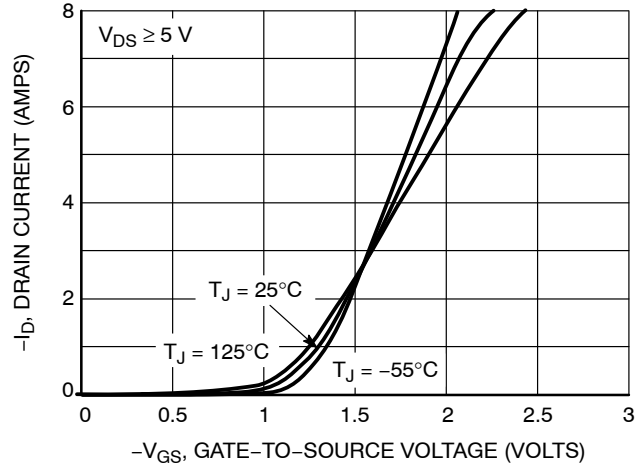


Figure 2. Transfer Characteristics

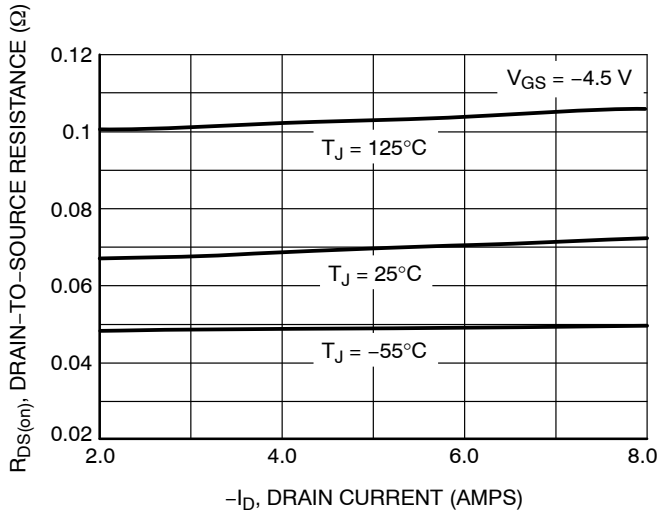


Figure 3. On-Resistance versus Drain Current

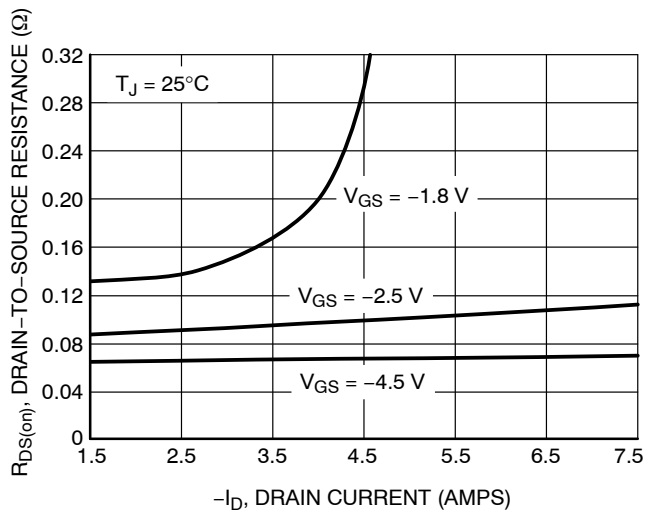


Figure 4. On-Resistance versus Drain Current and Gate Voltage

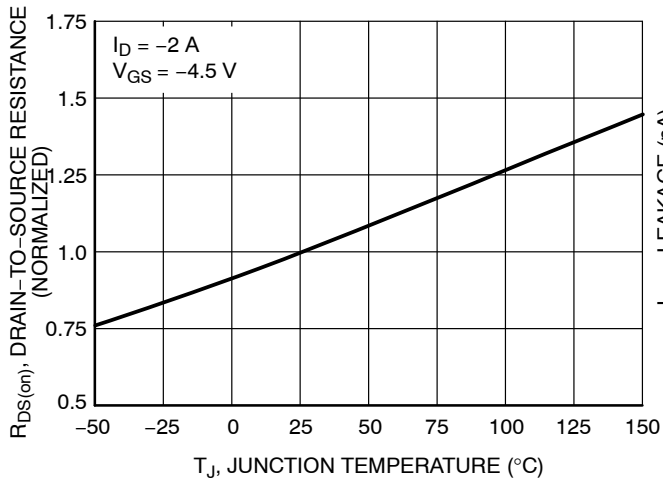


Figure 5. On-Resistance Variation with Temperature

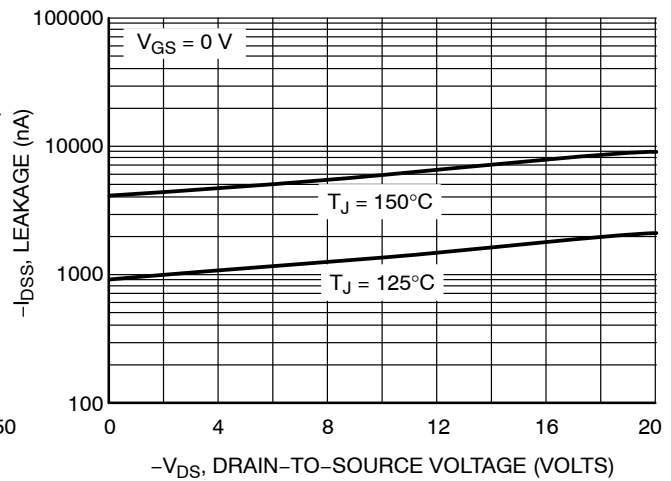


Figure 6. Drain-to-Source Leakage Current versus Voltage

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

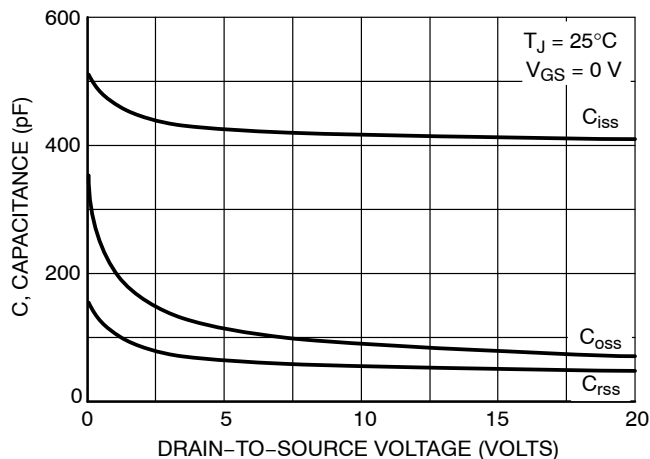


Figure 7. Capacitance Variation

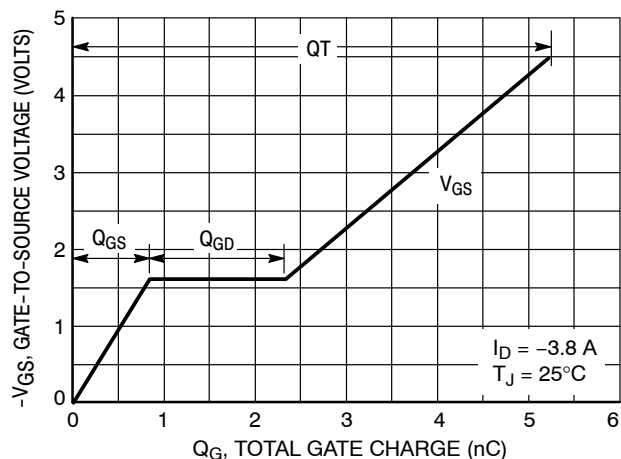


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

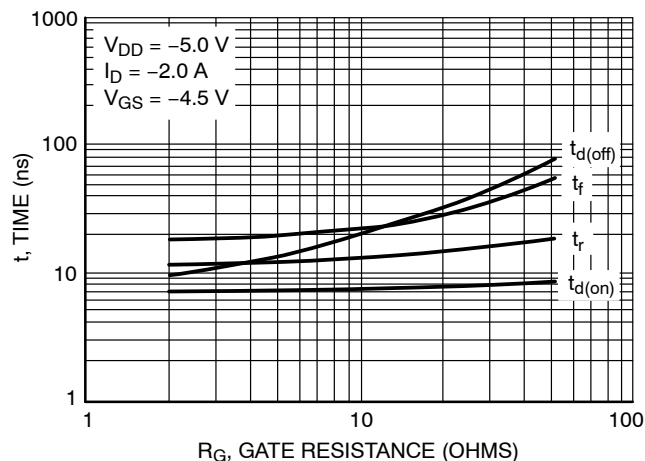


Figure 9. Resistive Switching Time Variation versus Gate Resistance

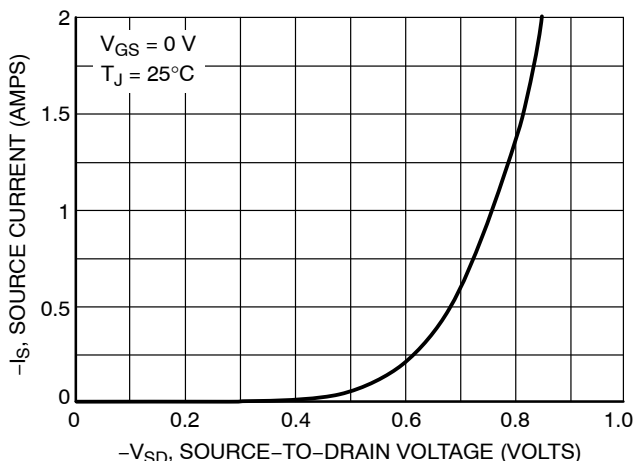


Figure 10. Diode Forward Voltage versus Current

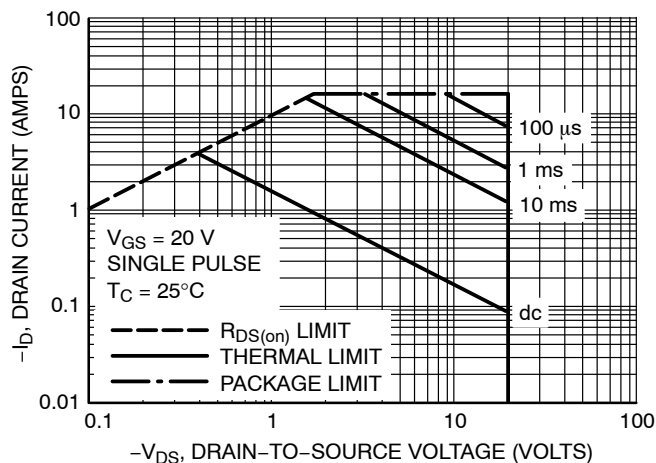


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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

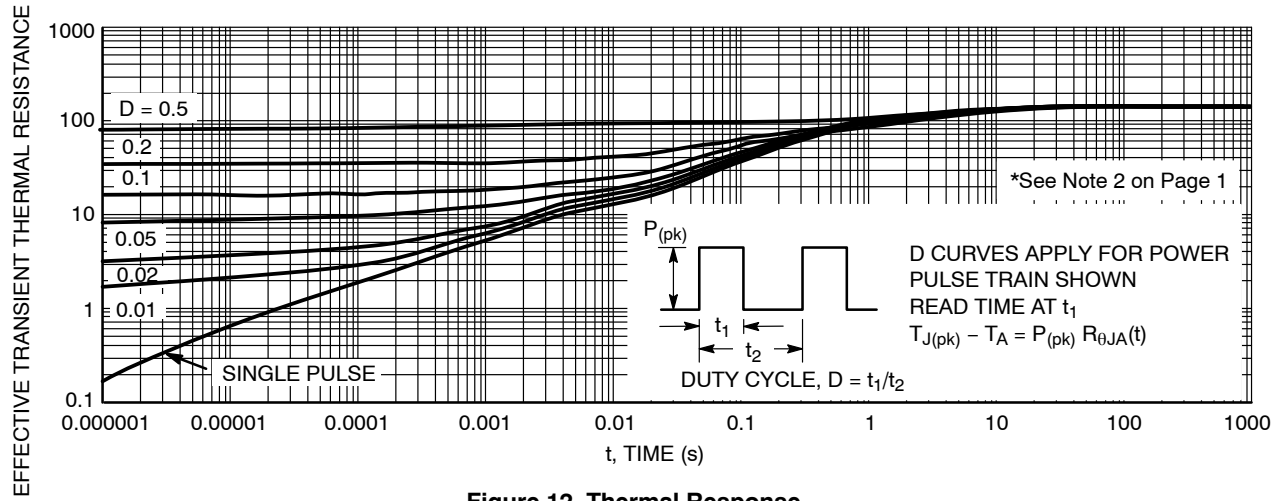


Figure 12. Thermal Response

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

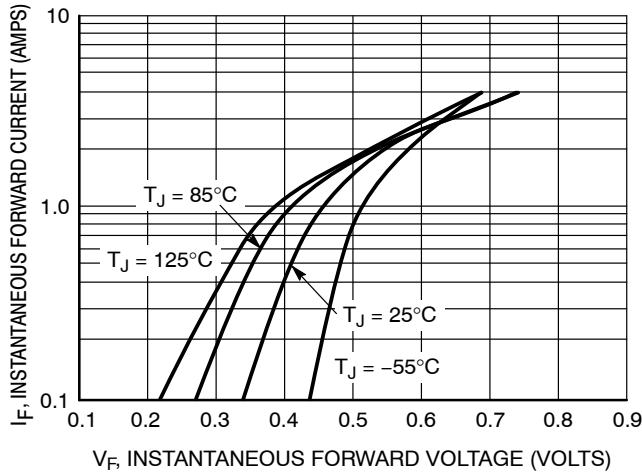


**Figure 13. Typical Forward Voltage**

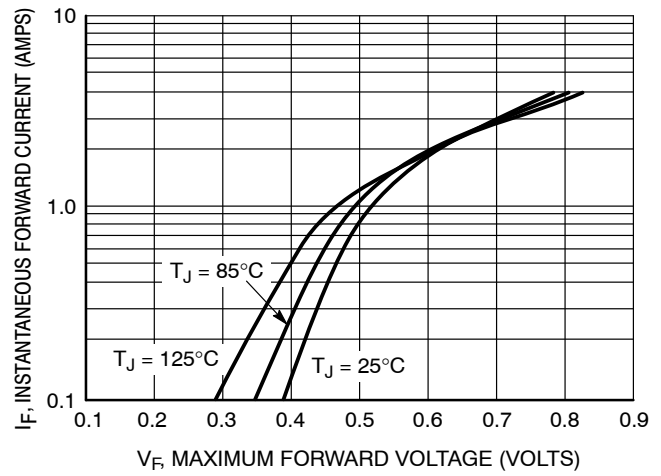


**Figure 14. Maximum Forward Voltage**

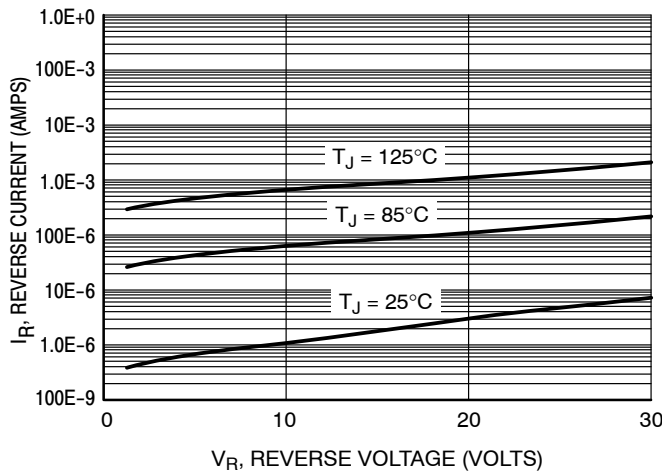


**Figure 15. Typical Reverse Current**

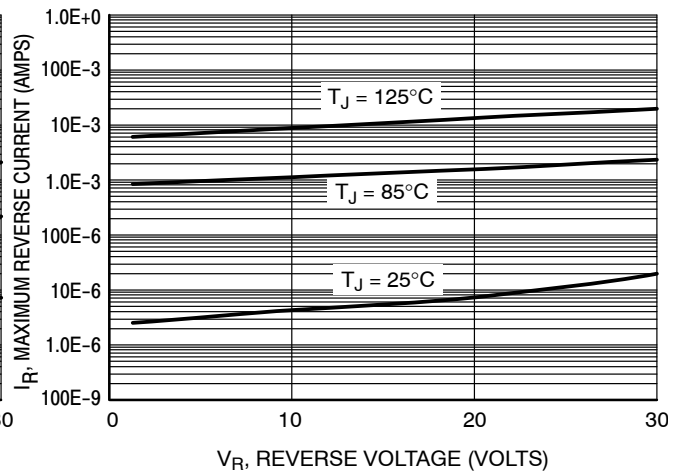
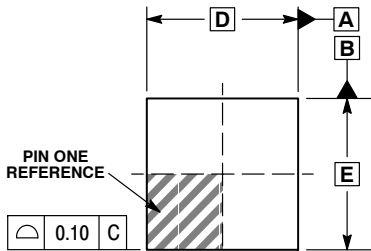


**Figure 16. Maximum Reverse Current**

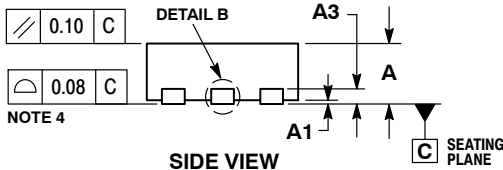
# NTLJD3182FZ

## PACKAGE DIMENSIONS

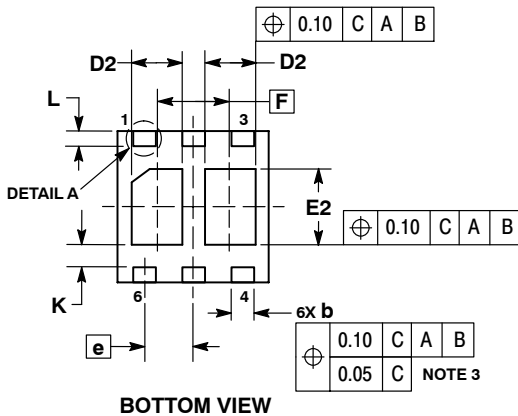
WDFN6 2x2, 0.65P  
CASE 506AN  
ISSUE G



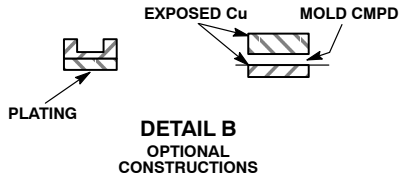
TOP VIEW



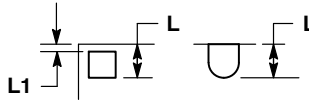
SIDE VIEW



BOTTOM VIEW



DETAIL B  
OPTIONAL  
CONSTRUCTIONS



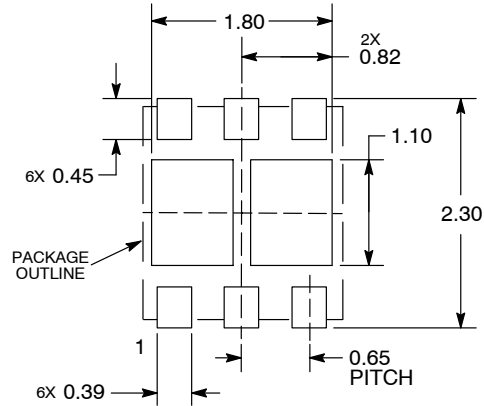
DETAIL A  
OPTIONAL  
CONSTRUCTIONS

### 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        | 0.77 |
| E   | 2.00 BSC    |      |
| E2  | 0.90        | 1.10 |
| e   | 0.65 BSC    |      |
| F   | 0.95 BSC    |      |
| K   | 0.25 REF    |      |
| L   | 0.20        | 0.30 |
| L1  | ---         | 0.10 |

### 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.

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