

# MOSFET – Power, P-Channel, Schottky Diode, μCool 2x2 mm

**-20 V, -4.1 A, 2.0 A**

## NTLJF3117P

### Features

- FETKY™ Configuration with MOSFET plus Low Vf Schottky Diode
- μCOOL™ Package Provides Exposed Drain Pad for Excellent Thermal Conduction
- 2x2 mm Footprint Same as SC-88 Package Design
- Independent Pinout Provides Circuit Design Flexibility
- Low Profile (< 0.8 mm) for Easy Fit in Thin Environment
- High Current Schottky Diode: 2 A Current Rating
- This is a Pb-Free Device

### Applications

- Optimized for Portable Applications like Cell Phones, Digital Cameras, Media Players, etc.
- DC-DC Buck Circuit
- Li-Ion Battery Applications
- Color Display and Camera Flash Regulators

### MAXIMUM RATINGS (T<sub>J</sub> = 25 °C unless otherwise noted)

| Parameter                                                         |                        |                        | Symbol                            | Value      | Unit |
|-------------------------------------------------------------------|------------------------|------------------------|-----------------------------------|------------|------|
| Drain-to-Source Voltage                                           |                        |                        | V <sub>DSS</sub>                  | −20        | V    |
| Gate-to-Source Voltage                                            |                        |                        | V <sub>GS</sub>                   | ±8.0       | V    |
| Continuous Drain Current (Note 1)                                 | Steady State           | T <sub>A</sub> = 25 °C | I <sub>D</sub>                    | −3.3       | A    |
|                                                                   |                        | T <sub>A</sub> = 85 °C |                                   | −2.4       |      |
|                                                                   | t ≤ 5 s                | T <sub>A</sub> = 25 °C |                                   | −4.1       |      |
| Power Dissipation (Note 1)                                        | Steady State           | T <sub>A</sub> = 25 °C | P <sub>D</sub>                    | 1.5        | W    |
|                                                                   | t ≤ 5 s                |                        |                                   | 2.3        |      |
| Continuous Drain Current (Note 2)                                 | Steady State           | T <sub>A</sub> = 25 °C | I <sub>D</sub>                    | −2.3       | A    |
|                                                                   |                        | T <sub>A</sub> = 85 °C |                                   | −1.6       |      |
| Power Dissipation (Note 2)                                        | Steady State           | T <sub>A</sub> = 25 °C | P <sub>D</sub>                    | 0.71       | W    |
| Pulsed Drain Current                                              | t <sub>p</sub> = 10 μs |                        | I <sub>DM</sub>                   | −20        | A    |
| Operating Junction and Storage Temperature                        |                        |                        | T <sub>J</sub> , T <sub>STG</sub> | −55 to 150 | °C   |
| Source Current (Body Diode) (Note 2)                              |                        |                        | I <sub>S</sub>                    | −1.9       | A    |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) |                        |                        | T <sub>L</sub>                    | 260        | °C   |

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.

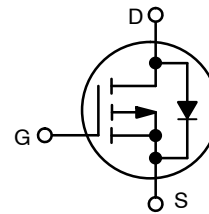
- Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
- Surface Mounted on FR4 Board using the minimum recommended pad size of 30 mm<sup>2</sup>, 2 oz Cu.

### MOSFET

| V <sub>(BR)DSS</sub> | R <sub>DS(on)</sub> MAX | I <sub>D</sub> MAX (Note 1) |
|----------------------|-------------------------|-----------------------------|
| -20 V                | 100 mΩ @ -4.5 V         | -4.1 A                      |
|                      | 135 mΩ @ -2.5 V         |                             |
|                      | 200 mΩ @ -1.8 V         |                             |

### SCHOTTKY DIODE

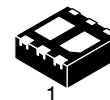
| V <sub>R</sub> MAX | V <sub>F</sub> TYP | I <sub>F</sub> MAX |
|--------------------|--------------------|--------------------|
| 30 V               | 0.47 V             | 2.0 A              |



P-CHANNEL MOSFET

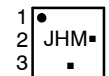


SCHOTTKY DIODE



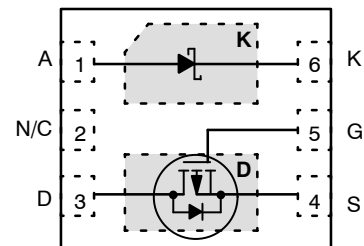
WDFN6  
CASE 506AN

### MARKING DIAGRAM



JH = 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 7 of this data sheet.

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

| 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    |

**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- $t \leq 5\text{ s}$ (Note 3) | $R_{\theta JA}$ | 54  |                      |
| Junction-to-Ambient-Steady State Min Pad (Note 4) | $R_{\theta JA}$ | 177 |                      |

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<sup>2</sup>, 2 oz Cu.

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------|--------|-----------------|-----|-----|-----|------|
|-----------|--------|-----------------|-----|-----|-----|------|

**OFF CHARACTERISTICS**

|                                                           |                   |                                                                       |                                    |      |           |                        |
|-----------------------------------------------------------|-------------------|-----------------------------------------------------------------------|------------------------------------|------|-----------|------------------------|
| 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 $25\text{ }^{\circ}\text{C}$ |                                    | 9.95 |           | mV/ $^{\circ}\text{C}$ |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$                          | $T_J = 25\text{ }^{\circ}\text{C}$ |      | -1.0      | $\mu\text{A}$          |
|                                                           |                   |                                                                       | $T_J = 85\text{ }^{\circ}\text{C}$ |      | -10       |                        |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$                      |                                    |      | $\pm 100$ | nA                     |

**ON CHARACTERISTICS** (Note 5)

|                                            |                  |                                                  |      |      |      |                        |
|--------------------------------------------|------------------|--------------------------------------------------|------|------|------|------------------------|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$ | -0.4 | -0.7 | -1.0 | V                      |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |                                                  |      | 2.44 |      | mV/ $^{\circ}\text{C}$ |
| Drain-to-Source On-Resistance              | $R_{DS(on)}$     | $V_{GS} = -4.5\text{ V}, I_D = -2.0\text{ A}$    |      | 75   | 100  | m $\Omega$             |
|                                            |                  | $V_{GS} = -2.5\text{ V}, I_D = -2.0\text{ A}$    |      | 101  | 135  |                        |
|                                            |                  | $V_{GS} = -1.8\text{ V}, I_D = -1.6\text{ A}$    |      | 150  | 200  |                        |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = -5.0\text{ V}, I_D = -2.0\text{ A}$    |      | 3.1  |      | S                      |

**CHARGES, CAPACITANCES AND GATE RESISTANCE**

|                              |              |                                                                      |  |     |     |          |
|------------------------------|--------------|----------------------------------------------------------------------|--|-----|-----|----------|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -10\text{ V}$     |  | 531 |     | pF       |
| Output Capacitance           | $C_{OSS}$    |                                                                      |  | 91  |     |          |
| Reverse Transfer Capacitance | $C_{RSS}$    |                                                                      |  | 56  |     |          |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -2.0\text{ A}$ |  | 5.5 | 6.2 | nC       |
| Threshold Gate Charge        | $Q_{G(TH)}$  |                                                                      |  | 0.7 |     |          |
| Gate-to-Source Charge        | $Q_{GS}$     |                                                                      |  | 1.0 |     |          |
| Gate-to-Drain Charge         | $Q_{GD}$     |                                                                      |  | 1.4 |     |          |
| Gate Resistance              | $R_G$        |                                                                      |  | 8.8 |     | $\Omega$ |

**SWITCHING CHARACTERISTICS** (Note 6)

|                     |              |                                                                                                |  |      |  |    |
|---------------------|--------------|------------------------------------------------------------------------------------------------|--|------|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = -4.5\text{ V}, V_{DD} = -5.0\text{ V}, I_D = -1.0\text{ A}, R_G = 6.0\text{ }\Omega$ |  | 5.2  |  | ns |
| Rise Time           | $t_r$        |                                                                                                |  | 13.2 |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                                |  | 13.7 |  |    |
| Fall Time           | $t_f$        |                                                                                                |  | 19.1 |  |    |

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

6. Switching characteristics are independent of operating junction temperatures.



# NTLJF3117P

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

| Parameter                                 | Symbol       | Test Conditions                                                                              | Min | Typ  | Max | Unit |
|-------------------------------------------|--------------|----------------------------------------------------------------------------------------------|-----|------|-----|------|
| <b>SWITCHING CHARACTERISTICS</b> (Note 6) |              |                                                                                              |     |      |     |      |
| Turn-On Delay Time                        | $t_{d(ON)}$  | $V_{GS} = -4.5\text{ V}, V_{DD} = -10\text{ V},$<br>$I_D = -2.0\text{ A}, R_G = 2.0\ \Omega$ |     | 5.5  |     | ns   |
| Rise Time                                 | $t_r$        |                                                                                              |     | 15   |     |      |
| Turn-Off Delay Time                       | $t_{d(OFF)}$ |                                                                                              |     | 19.8 |     |      |
| Fall Time                                 | $t_f$        |                                                                                              |     | 21.6 |     |      |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|                          |          |                                                                                        |                           |  |       |      |    |
|--------------------------|----------|----------------------------------------------------------------------------------------|---------------------------|--|-------|------|----|
| Forward Recovery Voltage | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = -1.0\text{ A}$                                             | $T_J = 25^\circ\text{C}$  |  | -0.75 | -1.0 | V  |
|                          |          |                                                                                        | $T_J = 125^\circ\text{C}$ |  | -0.64 |      |    |
| Reverse Recovery Time    | $t_{RR}$ | $V_{GS} = 0\text{ V}, dI_{SD}/dt = 100\text{ A}/\mu\text{s},$<br>$I_S = -1.0\text{ A}$ |                           |  | 16.2  |      | ns |
| Charge Time              | $t_a$    |                                                                                        |                           |  | 10.6  |      |    |
| Discharge Time           | $t_b$    |                                                                                        |                           |  | 5.6   |      |    |
| Reverse Recovery Time    | $Q_{RR}$ |                                                                                        |                           |  | 5.7   |      | nC |

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

6. Switching characteristics are independent of operating junction temperatures.

## 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 | $V_F$  | $I_F = 0.1\text{ A}$ |     | 0.34 | 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  |               |

## 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 | $V_F$  | $I_F = 0.1\text{ A}$ |     | 0.22 | 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 | $V_F$  | $I_F = 0.1\text{ A}$ |     | 0.2  | 0.29 | V    |
|                                       |        | $I_F = 1.0\text{ A}$ |     | 0.4  | 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  |      |

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

| Parameter   | Symbol | Test Conditions                          | Min | Typ | Max | Unit |
|-------------|--------|------------------------------------------|-----|-----|-----|------|
| Capacitance | C      | $V_R = 5.0\text{ V}, f = 1.0\text{ MHz}$ |     | 38  |     | pF   |

7. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).

8. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm<sup>2</sup>, 2 oz cu.

9. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

10. Switching characteristics are independent of operating junction temperatures.



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

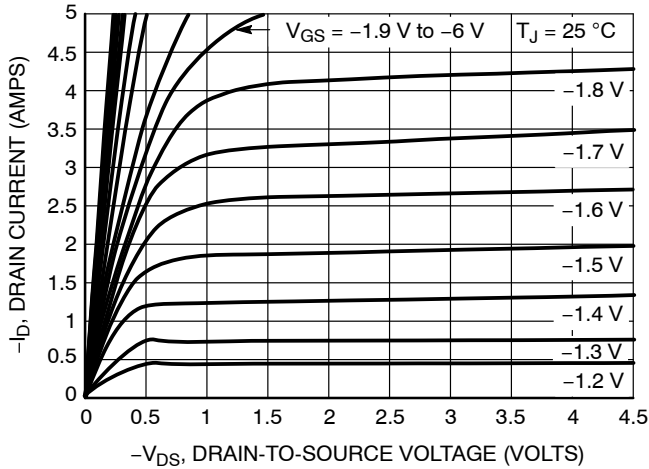


Figure 1. On-Region Characteristics

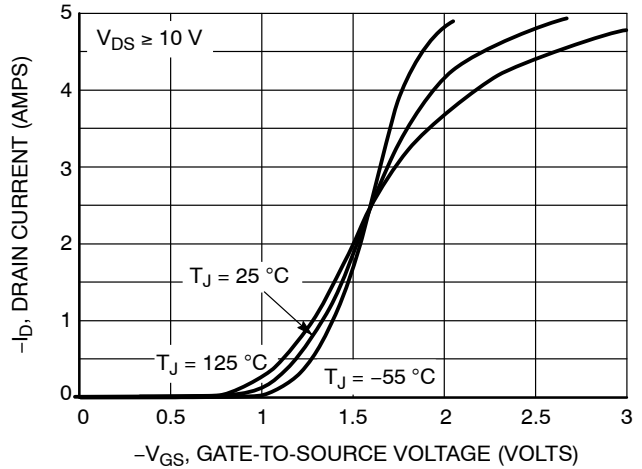


Figure 2. Transfer Characteristics

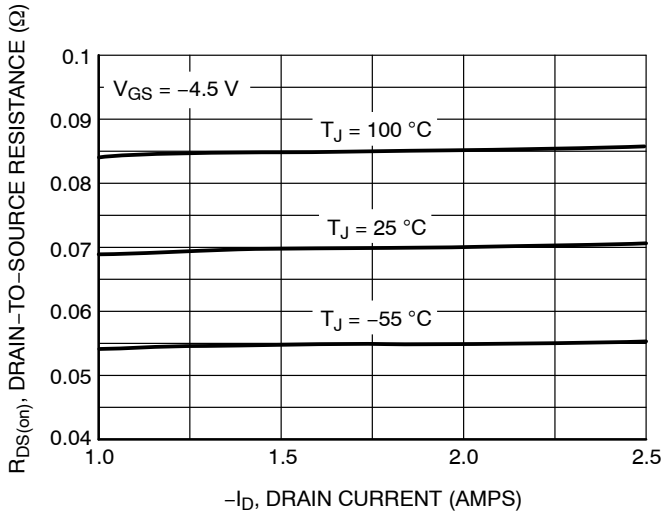


Figure 3. On-Resistance versus Drain Current

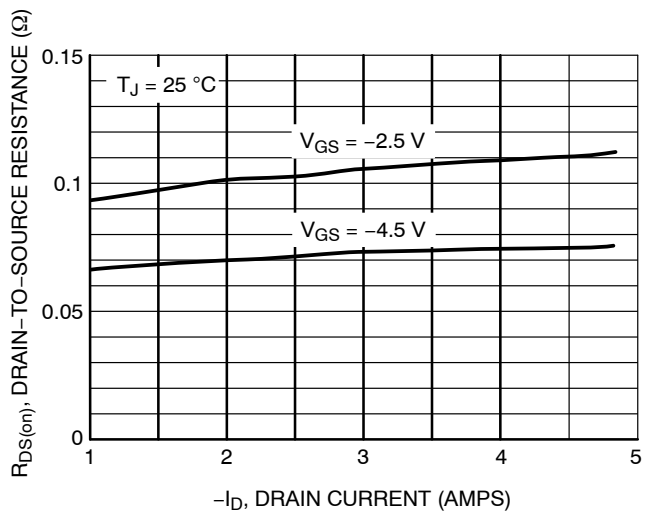


Figure 4. On-Resistance versus Drain Current and Gate Voltage

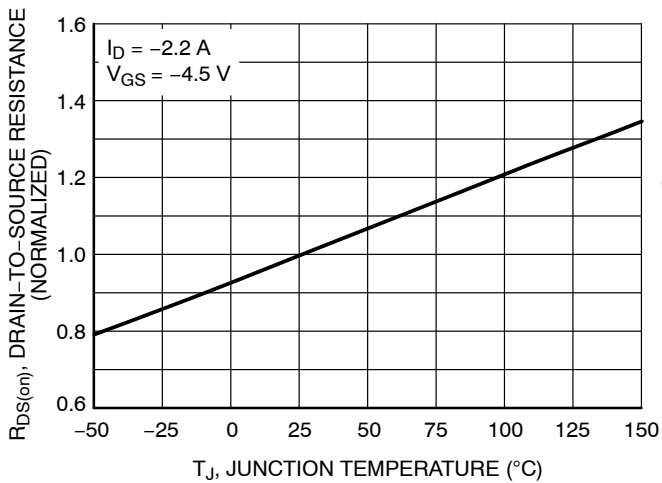


Figure 5. On-Resistance Variation with Temperature

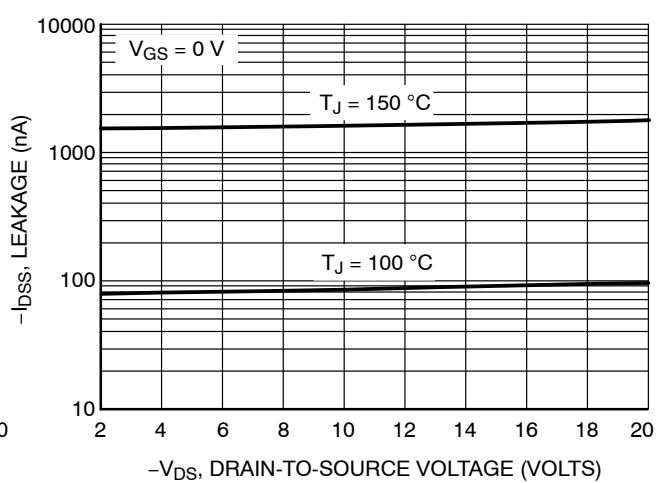


Figure 6. Drain-to-Source Leakage Current versus Voltage

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

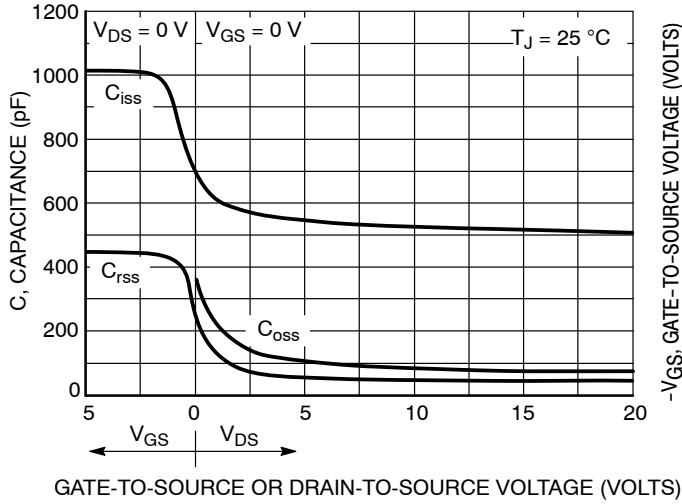


Figure 7. Capacitance Variation

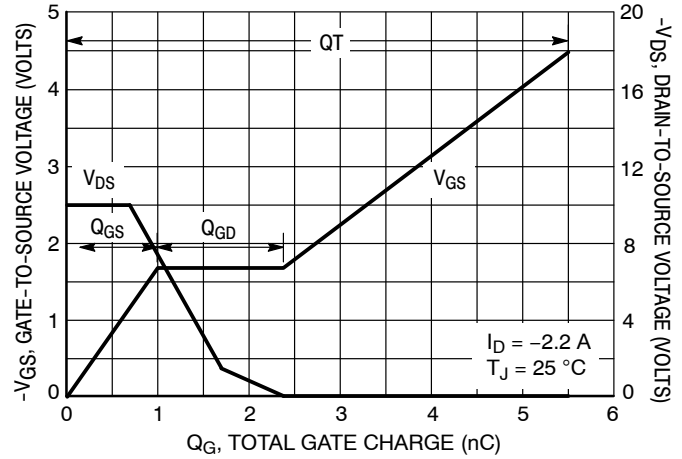


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

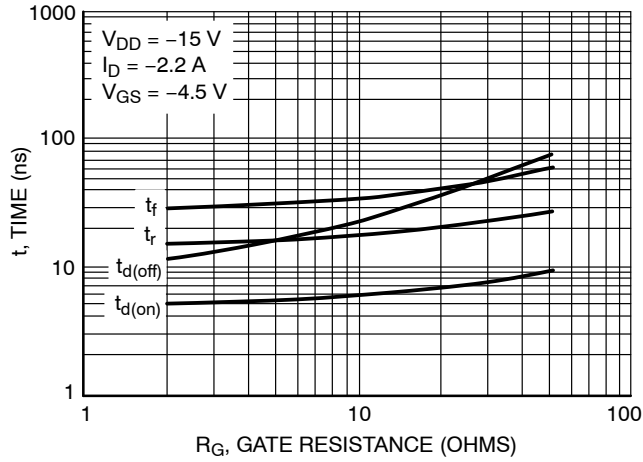


Figure 9. Resistive Switching Time Variation versus Gate Resistance

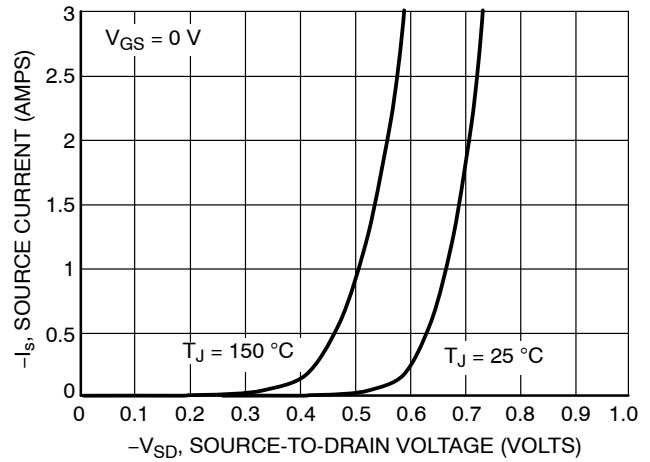


Figure 10. Diode Forward Voltage versus Current

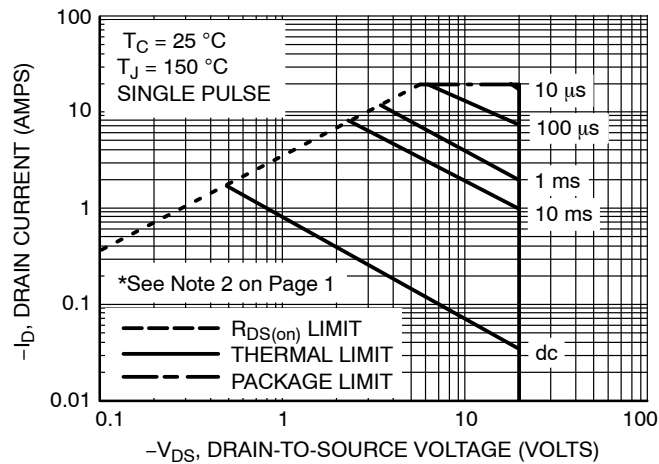


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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

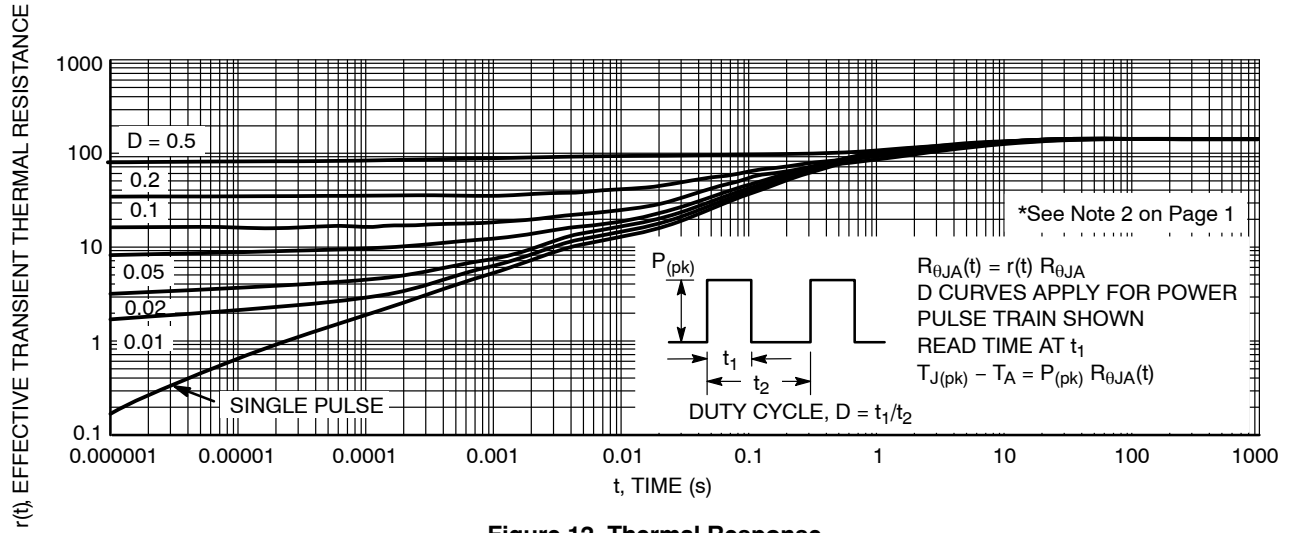


Figure 12. Thermal Response

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

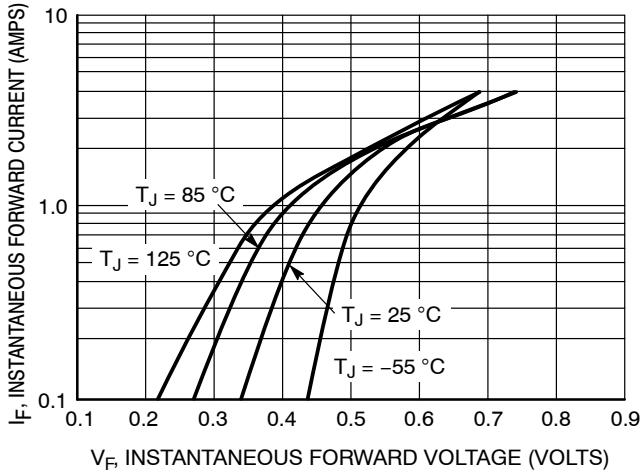


Figure 13. Typical Forward Voltage

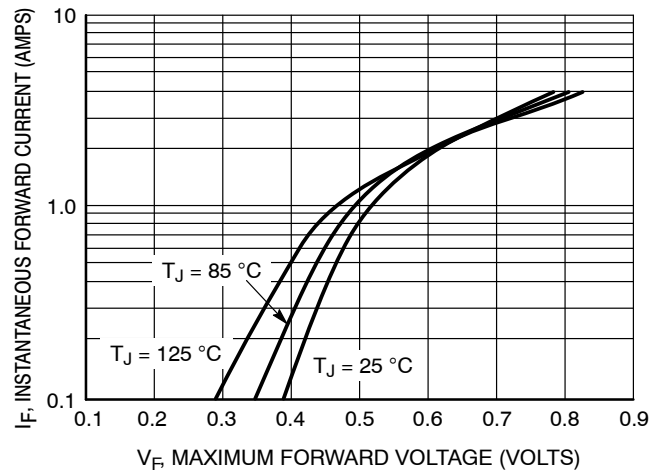


Figure 14. Maximum Forward Voltage

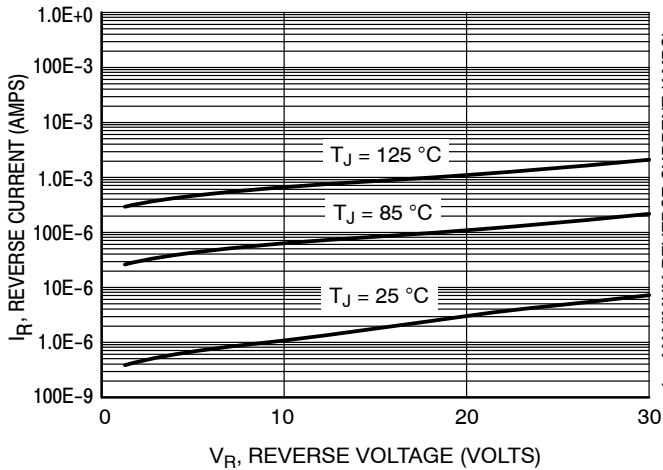


Figure 15. Typical Reverse Current

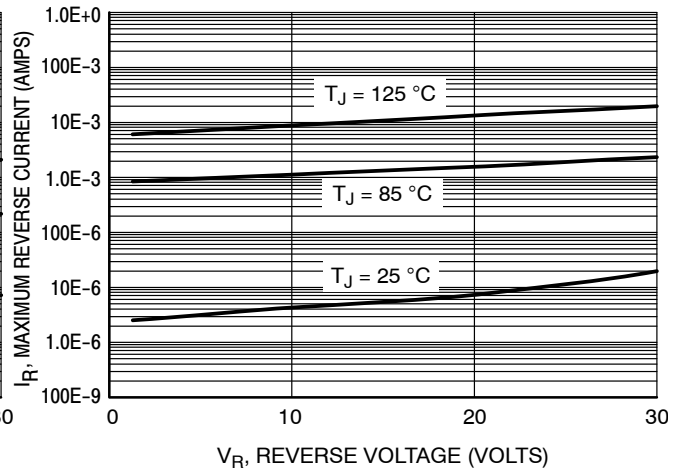


Figure 16. Maximum Reverse Current

ORDERING INFORMATION

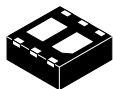
| Device        | Package            | Shipping <sup>†</sup> |
|---------------|--------------------|-----------------------|
| NTLJF3117PT1G | WDFN6<br>(Pb-Free) | 3000 / Tape & Reel    |

<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](#).

## REVISION HISTORY

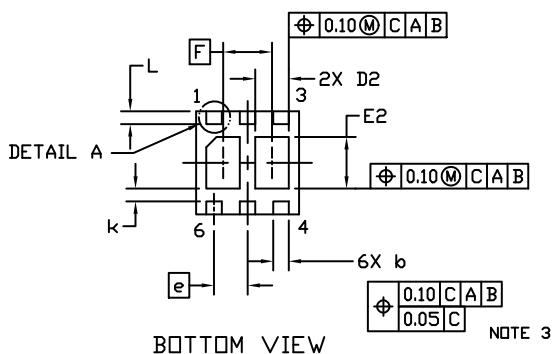
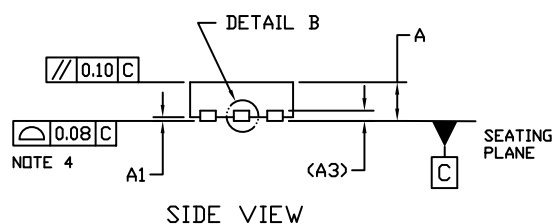
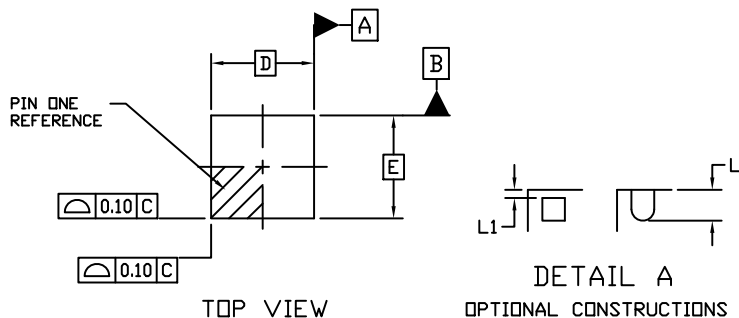
| Revision | Description of Changes                           | Date     |
|----------|--------------------------------------------------|----------|
| 4        | Rebranded the Data Sheet to <b>onsemi</b> format | 2/9/2026 |

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.



WDFN6 2x2, 0.65P  
CASE 506AN  
ISSUE H

DATE 25 JAN 2022



GENERIC  
MARKING DIAGRAM\*



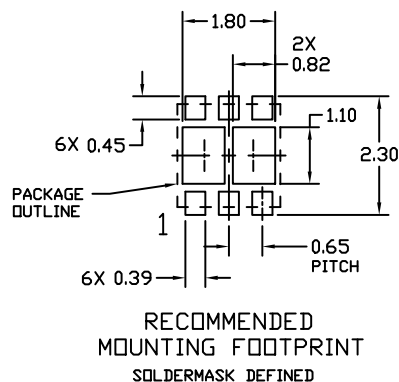
XX = Specific Device Code  
M = Date Code

\*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.

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 PADS 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 |



|                  |                  |                                                                                                                                                                                  |
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| DESCRIPTION:     | WDFN6 2x2, 0.65P | PAGE 1 OF 1                                                                                                                                                                      |

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