

NTLJD3119C

MOSFET – Power, Complementary, WDFN 2X2 mm

20 V/-20 V, 4.6 A/-4.1 A



ON Semiconductor®

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Features

- Complementary N-Channel and P-Channel MOSFET
- WDFN Package with Exposed Drain Pad for Excellent Thermal Conduction
- Footprint Same as SC-88 Package
- Leading Edge Trench Technology for Low On Resistance
- 1.8 V Gate Threshold Voltage
- Low Profile (< 0.8 mm) for Easy Fit in Thin Environments
- This is a Pb-Free Device

Applications

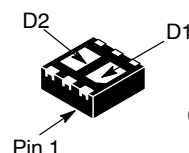
- Synchronous DC-DC Conversion Circuits
- Load/Power Management of Portable Devices like PDA's, Cellular Phones and Hard Drives
- Color Display and Camera Flash Regulators

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

| Parameter | | Symbol | Value | Unit | |
|--|-----------------|------------------------|-----------------------------------|------------|----|
| Drain-to-Source Voltage | N-Ch | V _{DSS} | 20 | V | |
| | P-Ch | | -20 | | |
| Gate-to-Source Voltage | N-Ch | V _{GS} | ±8.0 | V | |
| | P-Ch | | | | |
| N-Channel Continuous Drain Current (Note 1) | Steady State | T _A = 25°C | I _D | 3.8 | A |
| | | T _A = 85°C | | 2.8 | |
| | | t ≤ 5 s | T _A = 25°C | | |
| P-Channel Continuous Drain Current (Note 1) | Steady State | T _A = 25°C | I _D | -3.3 | A |
| | | T _A = 85°C | | -2.4 | |
| | | t ≤ 5 s | T _A = 25°C | | |
| Power Dissipation (Note 1) | Steady State | T _A = 25°C | P _D | 1.5 | W |
| | | | | t ≤ 5 s | |
| N-Channel Continuous Drain Current (Note 2) | Steady State | T _A = 25°C | I _D | 2.6 | A |
| | | T _A = 85°C | | 1.9 | |
| P-Channel Continuous Drain Current (Note 2) | Steady State | T _A = 25°C | I _D | -2.3 | A |
| | | T _A = 85°C | | -1.6 | |
| Power Dissipation (Note 2) | Steady State | T _A = 25°C | P _D | 0.71 | W |
| Pulsed Drain Current | N-Ch | t _p = 10 μs | I _{DM} | 18 | A |
| | | | | P-Ch | |
| Operating Junction and Storage Temperature | | | T _J , T _{STG} | -55 to 150 | °C |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | | T _L | 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.

| V _{(BR)DSS} | R _{DS(on)} MAX | I _D MAX |
|----------------------|-------------------------|--------------------|
| N-Channel 20 V | 65 mΩ @ 4.5 V | 3.8 A |
| | 85 mΩ @ 2.5 V | 2.0 A |
| | 120 mΩ @ 1.8 V | 1.7 A |
| P-Channel -20 V | 100 mΩ @ -4.5 V | -4.1 A |
| | 135 mΩ @ -2.5 V | -2.0 A |
| | 200 mΩ @ -1.8 V | -1.6 A |



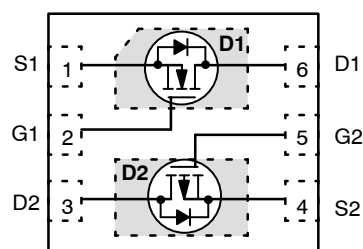
MARKING DIAGRAM



WDFN6
CASE 506AN

JM = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|--------------------|------------------|
| NTLJD3119CTAG | WDFN6 (Pb-Free) | 3000/Tape & Reel |
| NTLJD3119CTBG | 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.

NTLJD3119C

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 mm², 2 oz Cu.

NTLJD3119C

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|-----------|--------|-----|------|
|-----------|--------|-----|------|

SINGLE OPERATION (SELF-HEATED)

| | | | |
|---|-----------------|-----|-----------------------------|
| Junction-to-Ambient – Steady State (Note 3) | $R_{\theta JA}$ | 83 | $^{\circ}\text{C}/\text{W}$ |
| 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 | |

DUAL OPERATION (EQUALLY HEATED)

| | | | |
|---|-----------------|-----|-----------------------------|
| Junction-to-Ambient – Steady State (Note 3) | $R_{\theta JA}$ | 58 | $^{\circ}\text{C}/\text{W}$ |
| Junction-to-Ambient – Steady State Min Pad (Note 4) | $R_{\theta JA}$ | 133 | |
| Junction-to-Ambient – $t \leq 5$ s (Note 3) | $R_{\theta JA}$ | 40 | |

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 mm², 2 oz Cu).

NTLJD3119C

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

| Parameter | Symbol | N/P | Test Conditions | Min | Typ | Max | Unit |
|---|-------------------|-----|--|---------------------------|------|-----------|---------------|
| OFF CHARACTERISTICS | | | | | | | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | N | $V_{GS} = 0\text{ V}$ | $I_D = 250\ \mu\text{A}$ | 20 | | V |
| | | P | | $I_D = -250\ \mu\text{A}$ | -20 | | |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | N | | | 10.4 | | mV/°C |
| | | P | | | 9.95 | | |
| Zero Gate Voltage Drain Current | I_{DSS} | N | $V_{GS} = 0\text{ V}, V_{DS} = 16\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1.0 | μA |
| | | P | $V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}$ | | | -1.0 | |
| | | N | $V_{GS} = 0\text{ V}, V_{DS} = 16\text{ V}$ | $T_J = 85^\circ\text{C}$ | | 10 | |
| | | P | $V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}$ | | | -10 | |
| Gate-to-Source Leakage Current | I_{GSS} | N | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$ | | | ± 100 | nA |
| | | P | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$ | | | ± 100 | |

ON CHARACTERISTICS (Note 5)

| | | | | | | | | |
|--|------------------|---|---|---------------------------|------|------|------------|---|
| Gate Threshold Voltage | $V_{GS(TH)}$ | N | $V_{GS} = V_{DS}$ | $I_D = 250\ \mu\text{A}$ | 0.4 | 0.7 | 1.0 | V |
| | | P | | $I_D = -250\ \mu\text{A}$ | -0.4 | -0.7 | -1.0 | |
| Gate Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | N | | | -3.0 | | mV/°C | |
| | | P | | | 2.44 | | | |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | N | $V_{GS} = 4.5\text{ V}, I_D = 3.8\text{ A}$ | | 37 | 65 | m Ω | |
| | | P | $V_{GS} = -4.5\text{ V}, I_D = -4.1\text{ A}$ | | 75 | 100 | | |
| | | N | $V_{GS} = 2.5\text{ V}, I_D = 2.0\text{ A}$ | | 46 | 85 | | |
| | | P | $V_{GS} = -2.5\text{ V}, I_D = -2.0\text{ A}$ | | 101 | 135 | | |
| | | N | $V_{GS} = 1.8\text{ V}, I_D = 1.7\text{ A}$ | | 65 | 120 | | |
| | | P | $V_{GS} = -1.8\text{ V}, I_D = -1.6\text{ A}$ | | 150 | 200 | | |
| Forward Transconductance | g_{FS} | N | $V_{DS} = 10\text{ V}, I_D = 1.7\text{ A}$ | | 4.2 | | S | |
| | | P | $V_{DS} = -5.0\text{ V}, I_D = -2.0\text{ A}$ | | 3.1 | | | |

CHARGES, CAPACITANCES AND GATE RESISTANCE

| | | | | | | | | |
|------------------------------|--------------|---|--|--|-----|-----|-------------|----|
| Input Capacitance | C_{ISS} | N | $f = 1.0\text{ MHz}, V_{GS} = 0\text{ V}$ | $V_{DS} = 10\text{ V}$ | | 271 | pF | |
| | | P | | $V_{DS} = -10\text{ V}$ | | 531 | | |
| Output Capacitance | C_{OSS} | N | | $V_{DS} = 10\text{ V}$ | | 72 | | |
| | | P | | $V_{DS} = -10\text{ V}$ | | 91 | | |
| Reverse Transfer Capacitance | C_{RSS} | N | | $V_{DS} = 10\text{ V}$ | | 43 | | |
| | | P | | $V_{DS} = -10\text{ V}$ | | 56 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | N | | $V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.8\text{ A}$ | | 3.7 | | nC |
| | | P | | $V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -2.0\text{ A}$ | | 5.5 | | |
| Threshold Gate Charge | $Q_{G(TH)}$ | N | | $V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.8\text{ A}$ | | 0.3 | | |
| | | P | | $V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -2.0\text{ A}$ | | 0.7 | | |
| Gate-to-Source Charge | Q_{GS} | N | $V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.8\text{ A}$ | | 0.6 | | | |
| | | P | $V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -2.0\text{ A}$ | | 1.0 | | | |
| Gate-to-Drain Charge | Q_{GD} | N | $V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.8\text{ A}$ | | 1.0 | | | |
| | | P | $V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -2.0\text{ A}$ | | 1.4 | | | |

NTLJD3119C

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

| Parameter | Symbol | N/P | Test Conditions | Min | Typ | Max | Unit |
|---|---------------------|-----|---|-----|------|-----|------|
| SWITCHING CHARACTERISTICS (Note 6) | | | | | | | |
| Turn-On Delay Time | t _{d(ON)} | N | V _{GS} = 4.5 V, V _{DD} = 16 V, I _D = 1.0 A, R _G = 2.0 Ω | | 3.8 | | ns |
| Rise Time | t _r | | | | 4.7 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | | 11.1 | | |
| Fall Time | t _f | | | | 5.8 | | |
| Turn-On Delay Time | t _{d(ON)} | P | V _{GS} = -4.5 V, V _{DD} = -10 V, I _D = -2.0 A, R _G = 2.0 Ω | | 5.2 | | |
| Rise Time | t _r | | | | 13.2 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | | 13.7 | | |
| Fall Time | t _f | | | | 19.1 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|-----------------|---|---|-------------------------|-------|------|----|
| Forward Diode Voltage | V _{SD} | N | V _{GS} = 0 V, T _J = 25 °C | I _S = 1.0 A | 0.69 | 1.0 | V |
| | | P | | I _S = -1.0 A | -0.75 | -1.0 | |
| | | N | V _{GS} = 0 V, T _J = 125 °C | I _S = 1.0 A | 0.52 | | |
| | | P | | I _S = -1.0 A | -0.64 | | |
| Reverse Recovery Time | t _{RR} | N | V _{GS} = 0 V, dI _S / dt = 100 A/μs | I _S = 1.0 A | 10.2 | | ns |
| | | P | | I _S = -1.0 A | 16.2 | | |
| Charge Time | t _a | N | | I _S = 1.0 A | 6.0 | | |
| | | P | | I _S = -1.0 A | 10.6 | | |
| Discharge Time | t _b | N | | I _S = 1.0 A | 4.2 | | |
| | | P | | I _S = -1.0 A | 5.6 | | |
| Reverse Recovery Charge | Q _{RR} | N | | I _S = 1.0 A | 3.0 | | nC |
| | | P | | I _S = -1.0 A | 5.7 | | |

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperatures.

NTLJD3119C

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

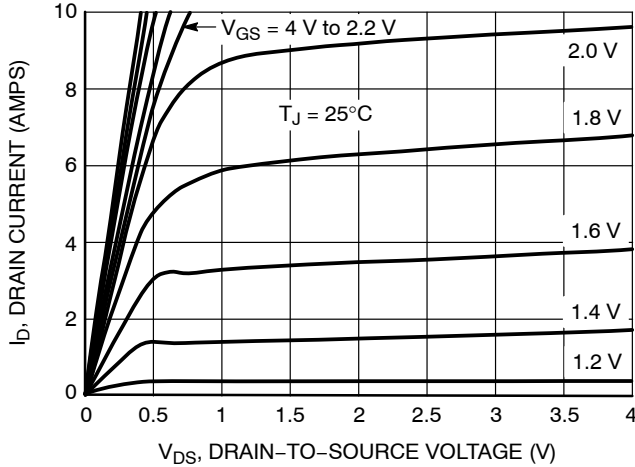


Figure 1. On-Region Characteristics

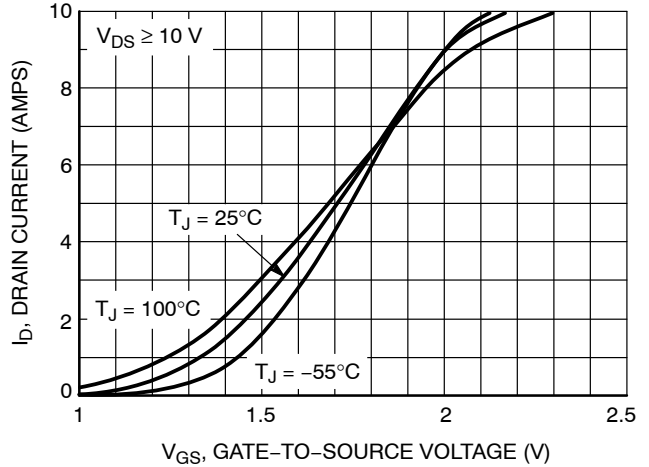


Figure 2. Transfer Characteristics

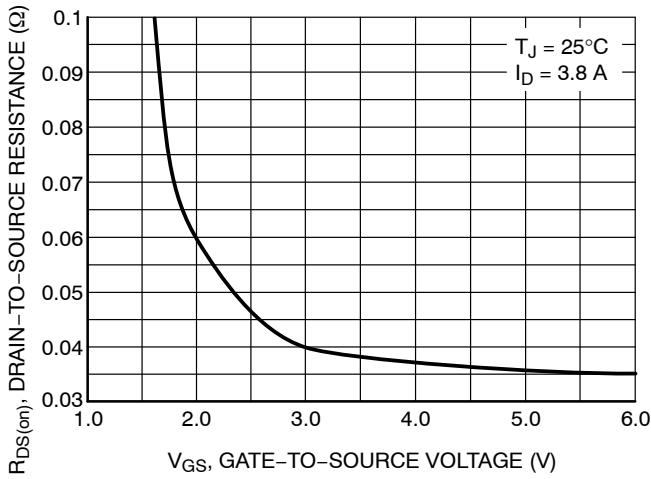


Figure 3. On-Resistance versus Drain Current

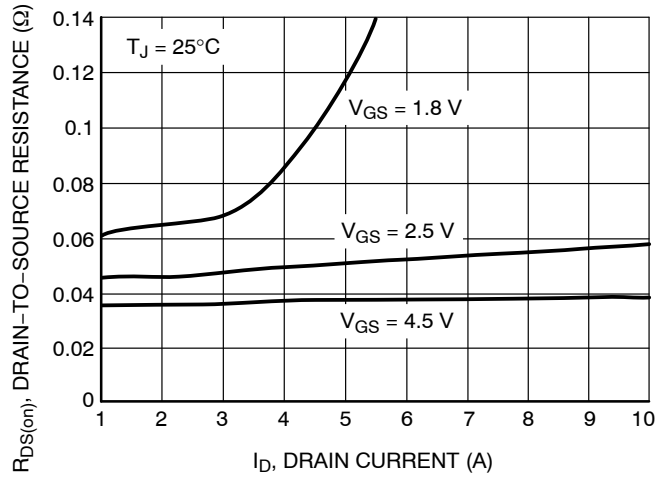


Figure 4. On-Resistance versus Drain Current and Gate Voltage

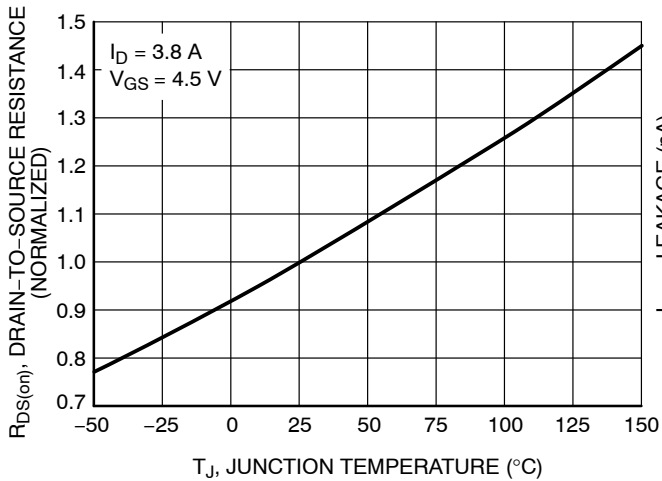


Figure 5. On-Resistance Variation with Temperature

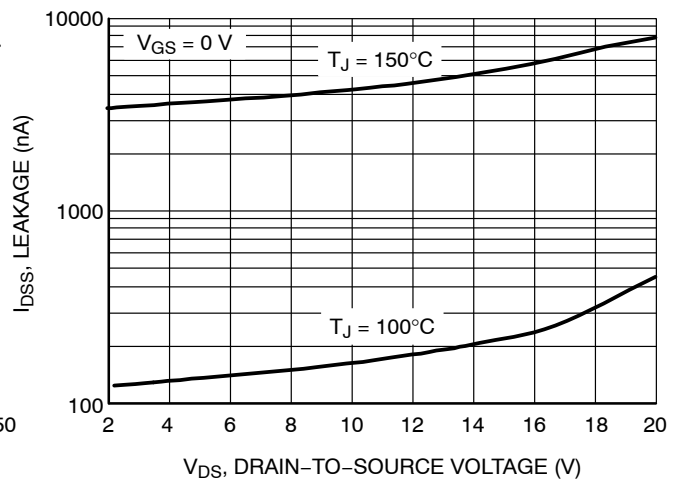


Figure 6. Drain-to-Source Leakage Current versus Voltage

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

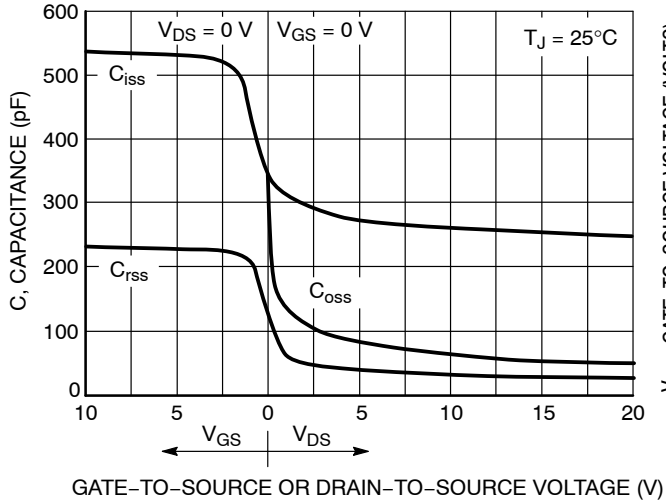


Figure 7. Capacitance Variation

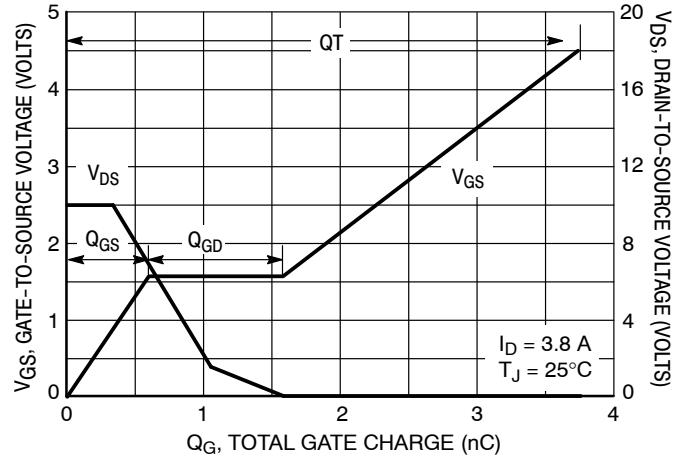


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

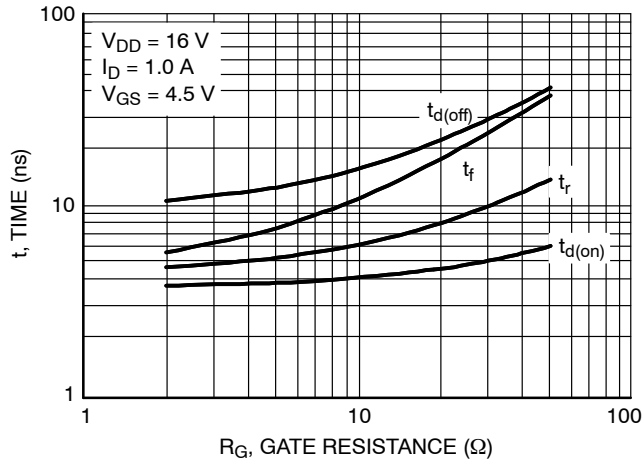


Figure 9. Resistive Switching Time Variation versus Gate Resistance

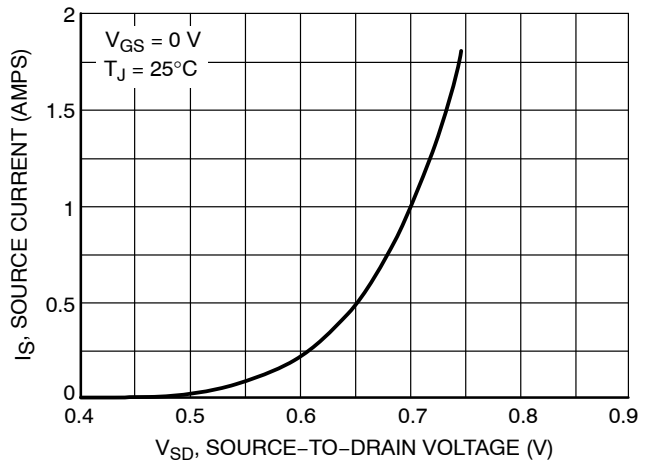


Figure 10. Diode Forward Voltage versus Current

NTLJD3119C

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

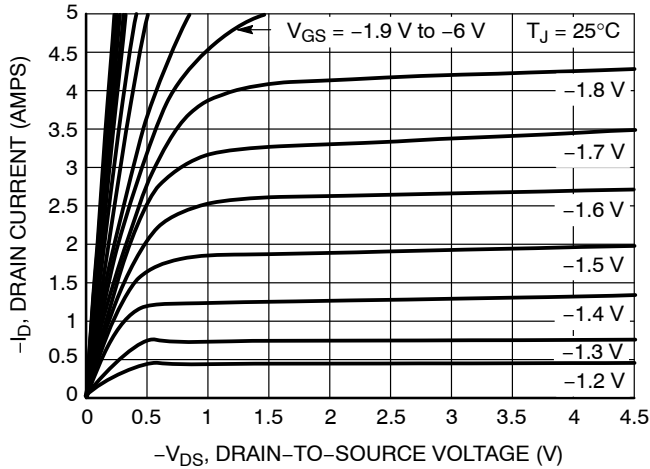


Figure 11. On-Region Characteristics

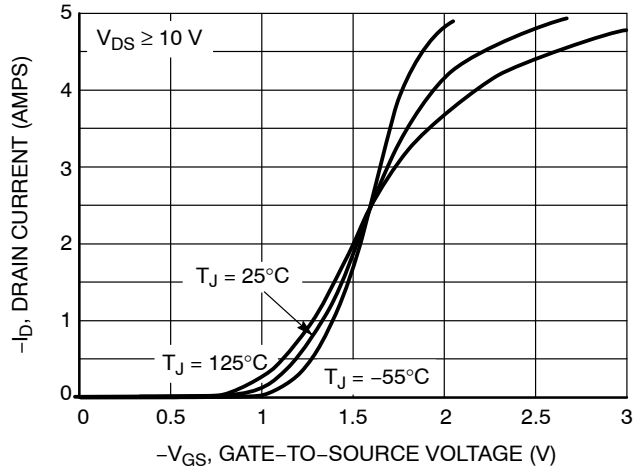


Figure 12. Transfer Characteristics

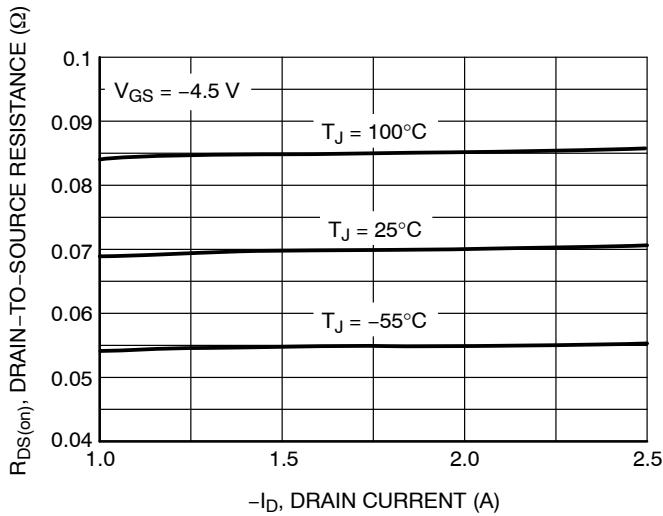


Figure 13. On-Resistance versus Drain Current

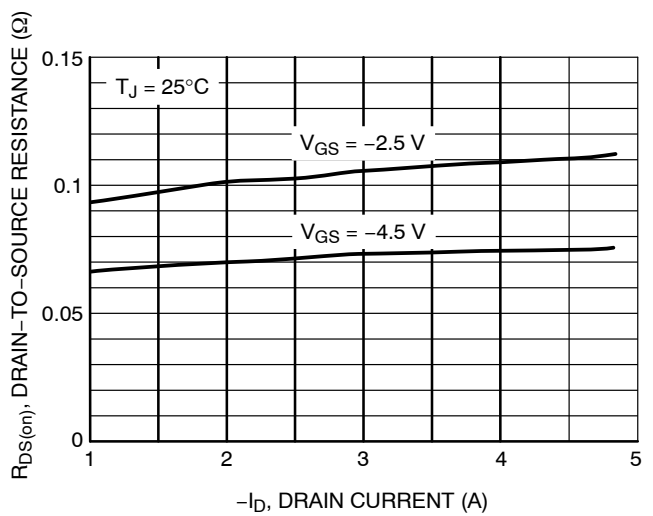


Figure 14. On-Resistance versus Drain Current and Gate Voltage

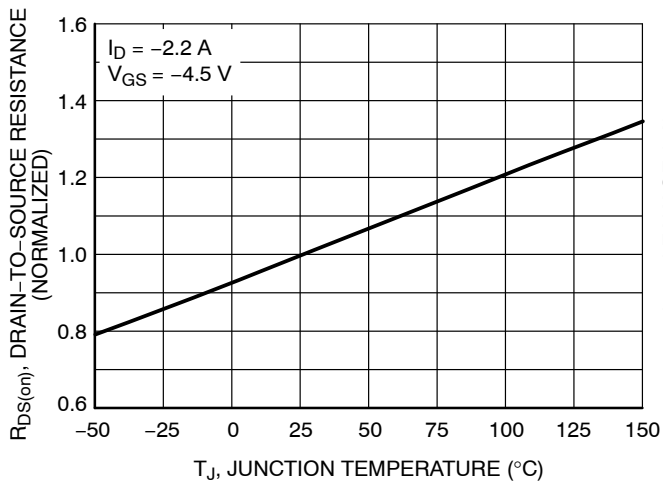


Figure 15. On-Resistance Variation with Temperature

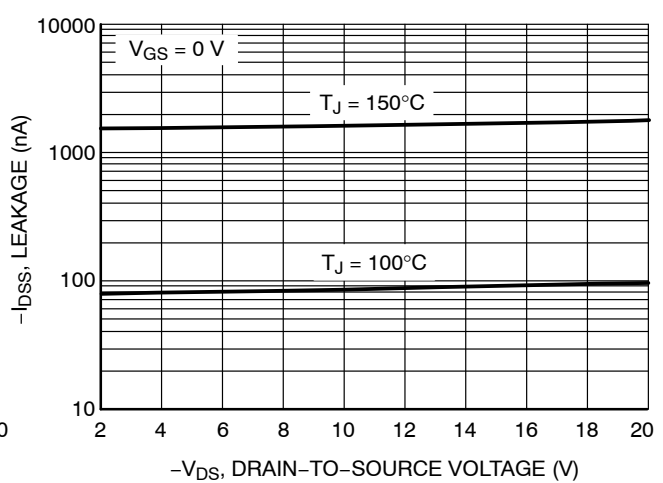


Figure 16. Drain-to-Source Leakage Current versus Voltage

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

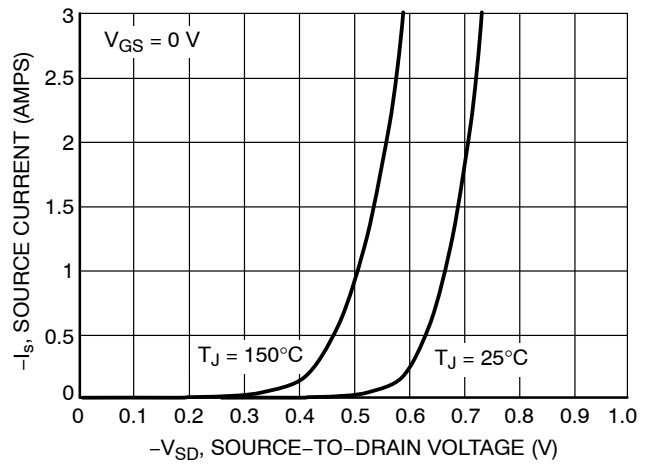
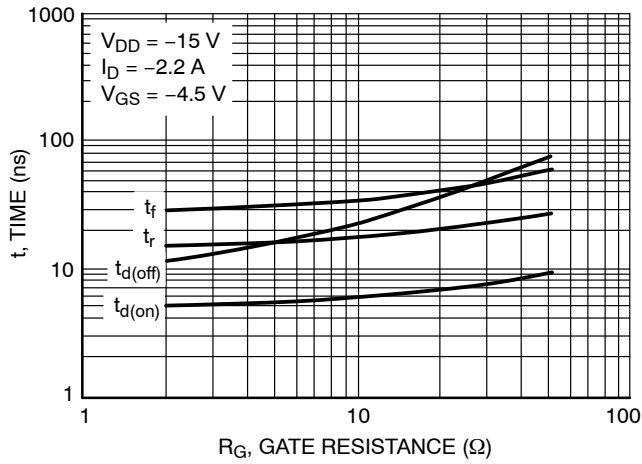
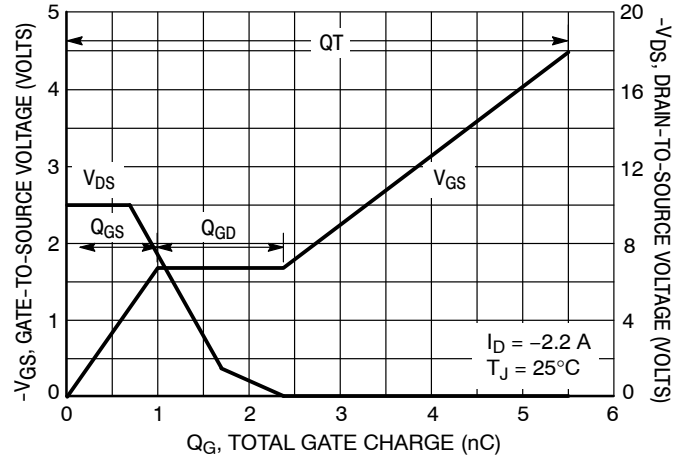
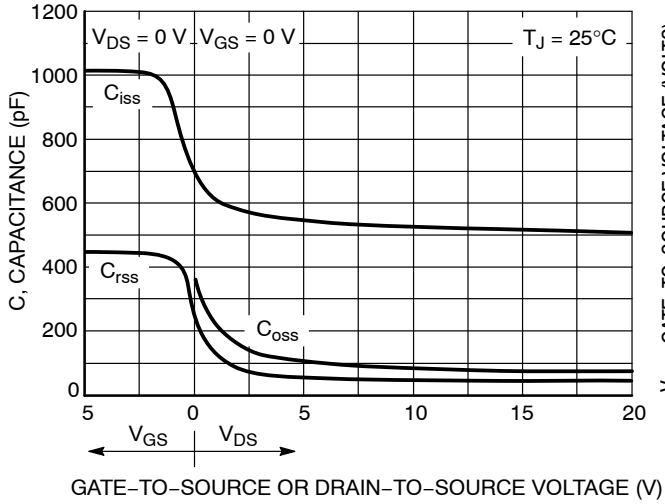


Figure 19. Resistive Switching Time Variation versus Gate Resistance

Figure 20. Diode Forward Voltage versus Current

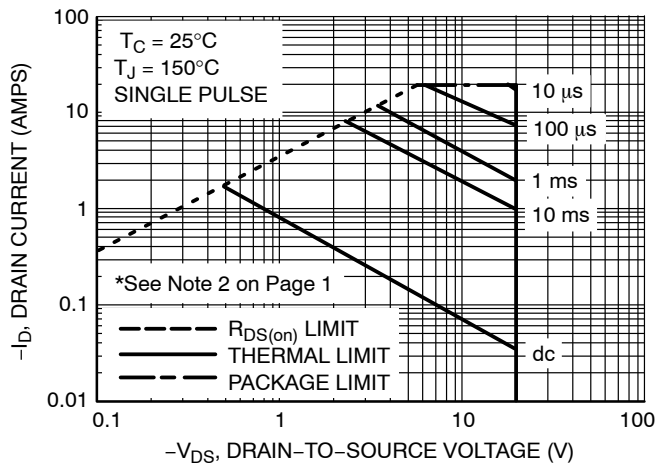


Figure 21. Maximum Rated Forward Biased Safe Operating Area

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

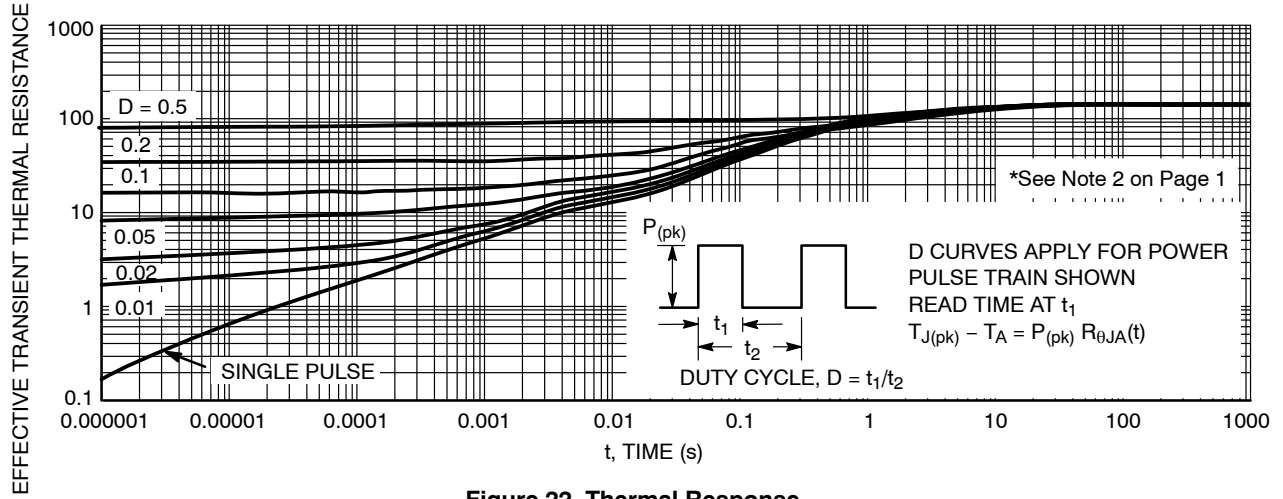
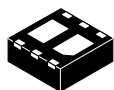


Figure 22. Thermal Response

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

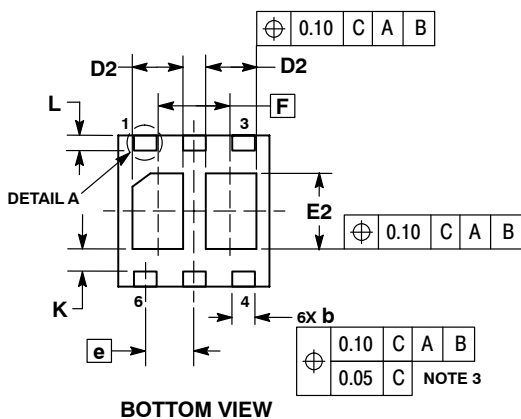
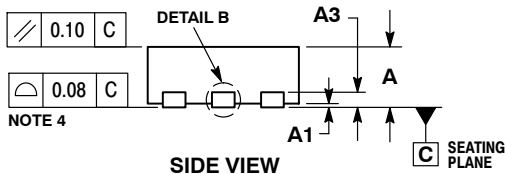
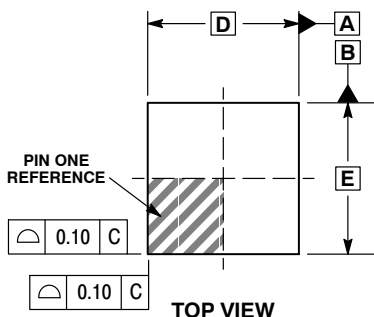
ON Semiconductor®



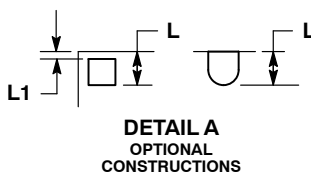
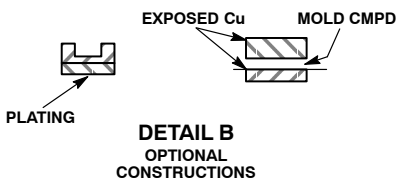
SCALE 4:1

WDFN6 2x2, 0.65P
CASE 506AN
ISSUE G

DATE 22 AUG 2013



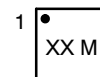
- | | | |
|---|---|---|
| <p>STYLE 1:</p> <p>PIN 1. SOURCE 1</p> <p>2. GATE 1</p> <p>3. DRAIN 2</p> <p>4. SOURCE 2</p> <p>5. GATE 2</p> <p>6. DRAIN 1</p> | <p>STYLE 2:</p> <p>PIN 1. ANODE</p> <p>2. N/C</p> <p>3. DRAIN</p> <p>4. SOURCE</p> <p>5. GATE</p> <p>6. CATHODE</p> | <p>STYLE 3:</p> <p>PIN 1. SOURCE 1</p> <p>2. GATE 1</p> <p>3. SOURCE 2</p> <p>4. DRAIN 2</p> <p>5. GATE 2</p> <p>6. DRAIN 1</p> |
|---|---|---|



- 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 |

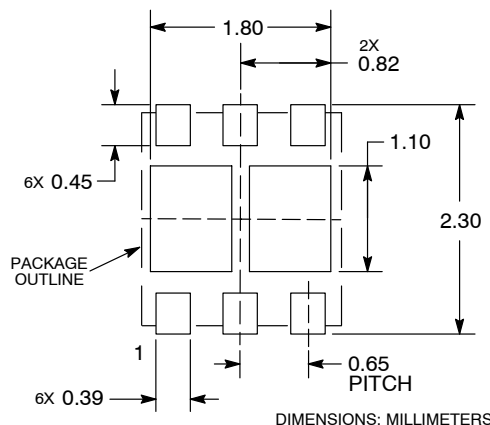
GENERIC MARKING DIAGRAM*



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 "μ", may or may not be present.

SOLDERMASK DEFINED MOUNTING FOOTPRINT



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| DESCRIPTION: | WDFN6 2X2, 0.65P | PAGE 1 OF 1 |

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