

NTND31225CZ

MOSFET – Small Signal, Complementary, XLLGAS6, 0.65mm x 0.90mm x 0.4mm 20 V



ON Semiconductor®

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Features

- Advanced Trench Complementary MOSFET
- Offers a Low $R_{DS(ON)}$ Solution in the Ultra Small 0.65 mm × 0.90 mm Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Small Signal Load Switch with Level Shift
- Analog Switch
- High Speed Interfacing
- Optimized for Power Management in Ultra Portable Products

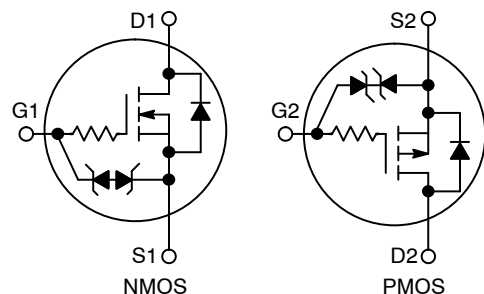
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter | | Symbol | Value | Unit | |
|---|--------------|--------------------------|----------|------------|------------------|
| Drain-to-Source Voltage | NMOS | V_{DSS} | 20 | V | |
| | PMOS | | -20 | | |
| Gate-to-Source Voltage | NMOS | V_{GSS} | ± 8 | V | |
| | PMOS | | ± 8 | | |
| N-Channel Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 220 | mA |
| | | $T_A = 85^\circ\text{C}$ | | 158 | |
| | $t \leq 5$ s | $T_A = 25^\circ\text{C}$ | | 253 | |
| P-Channel Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | -127 | mA |
| | | $T_A = 85^\circ\text{C}$ | | -91 | |
| | $t \leq 5$ s | $T_A = 25^\circ\text{C}$ | | -146 | |
| Power Dissipation (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | P_D | 125 | mW |
| | | $t \leq 5$ s | | 166 | |
| Pulsed Drain Current | NMOS | $t_p = 10 \mu\text{s}$ | I_{DM} | 846 | mA |
| | PMOS | | | -488 | |
| Source Current (Body Diode) | | | I_S | 200 | mA |
| | | | | -200 | |
| Operating Junction and Storage Temperature | | T_J, T_{STG} | | -55 to 150 | $^\circ\text{C}$ |
| | | | | | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | T_L | | 260 | $^\circ\text{C}$ |

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.

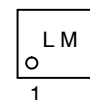
| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | I_D Max |
|--------------------|------------------------|-----------|
| N-Channel 20 V | 1.5 Ω @ 4.5 V | 220 mA |
| | 2.0 Ω @ 2.5 V | |
| | 3.0 Ω @ 1.8 V | |
| | 4.5 Ω @ 1.5 V | |
| P-Channel -20 V | 5.0 Ω @ -4.5 V | -127 mA |
| | 6.0 Ω @ -2.5 V | |
| | 7.0 Ω @ -1.8 V | |
| | 10.0 Ω @ -1.5 V | |

DEVICE SYMBOL



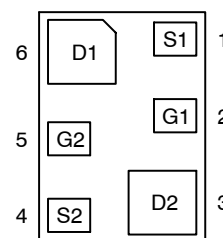
XLLGA6
Case 713AC

MARKING DIAGRAM



L = Specific Device Code
M = Date Code

PINOUT DIAGRAM



(Bottom View)

ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

NTND31225CZ

1. Surface-mounted on FR4 board using the minimum recommended pad size, 1 oz Cu.

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THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|--|-----------------|------------|----------------------|
| Junction-to-Ambient (Note 2) Steady State $t \leq 5$ s | $R_{\theta JA}$ | 998 751 | $^{\circ}\text{C/W}$ |

2. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq), 1 oz copper

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

| Parameter | Symbol | FET | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|-----|----------------|-----|-----|-----|------|
|-----------|--------|-----|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | | |
|-----------------------------------|---------------|---|--|----------------------------|--|-----------|----|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | N | $V_{GS} = 0$ V, $I_D = 250$ μA | 20 | | | V |
| | | P | $V_{GS} = 0$ V, $I_D = -250$ μA | -20 | | | |
| Zero Gate Voltage Drain Current | I_{DSS} | N | $V_{GS} = 0$ V, $V_{DS} = 5$ V | $T_J = 25^{\circ}\text{C}$ | | 50 | nA |
| | | | | $T_J = 85^{\circ}\text{C}$ | | 200 | |
| | | | $V_{GS} = 0$ V, $V_{DS} = 16$ V | $T_J = 25^{\circ}\text{C}$ | | 100 | |
| | | P | $V_{GS} = 0$ V, $V_{DS} = -5$ V | $T_J = 25^{\circ}\text{C}$ | | -50 | |
| | | | | $T_J = 85^{\circ}\text{C}$ | | -200 | |
| | | | $V_{GS} = 0$ V, $V_{DS} = -16$ V | $T_J = 25^{\circ}\text{C}$ | | -100 | |
| Gate-to-Source Leakage Current | I_{GSS} | N | $V_{GS} = 0$ V, $V_{DS} = \pm 5$ V | | | ± 100 | nA |
| | | P | $V_{GS} = 0$ V, $V_{DS} = \pm 5$ V | | | ± 100 | |

ON CHARACTERISTICS

| | | | | | | | |
|-------------------------------|--------------|---|--|------|------|------|----------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | N | $V_{GS} = V_{DS}$, $I_D = 250$ μA | 0.4 | | 1.0 | V |
| | | P | $V_{GS} = V_{DS}$, $I_D = -250$ μA | -0.4 | | -1.0 | |
| Drain-to-Source On Resistance | $R_{DS(ON)}$ | N | $V_{GS} = 4.5$ V, $I_D = 100$ mA | | 0.8 | 1.5 | Ω |
| | | | $V_{GS} = 2.5$ V, $I_D = 50$ mA | | 1.1 | 2.0 | |
| | | | $V_{GS} = 1.8$ V, $I_D = 20$ mA | | 1.4 | 3.0 | |
| | | | $V_{GS} = 1.5$ V, $I_D = 10$ mA | | 1.8 | 4.5 | |
| | | P | $V_{GS} = -4.5$ V, $I_D = -100$ mA | | 2.1 | 5.0 | |
| | | | $V_{GS} = -2.5$ V, $I_D = -50$ mA | | 2.7 | 6.0 | |
| | | | $V_{GS} = -1.8$ V, $I_D = -20$ mA | | 3.6 | 7.0 | |
| | | | $V_{GS} = -1.5$ V, $I_D = -10$ mA | | 4.2 | 10.0 | |
| Forward Transconductance | g_{FS} | N | $V_{DS} = 5$ V, $I_D = 125$ mA | | 0.48 | | S |
| | | P | $V_{DS} = -5$ V, $I_D = -125$ mA | | 0.35 | | |
| Forward Diode Voltage | V_{SD} | N | $V_{GS} = 0$ V, $I_S = 10$ mA | | 0.6 | 1.0 | V |
| | | P | $V_{GS} = 0$ V, $I_S = -10$ mA | | -0.6 | -1.0 | |

3. Switching characteristics are independent of operating junction temperatures.

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

| Parameter | Symbol | FET | Test Condition | Min | Typ | Max | Unit |
|---------------------|------------------|-----|--|-----|------|-----|------|
| CAPACITANCES | | | | | | | |
| Input Capacitance | C _{ISS} | N | V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V | | 12.3 | | pF |
| Output Capacitance | C _{OSS} | | | | 3.4 | | |
| Reverse Capacitance | C _{RSS} | | | | 2.5 | | |
| Input Capacitance | C _{ISS} | P | V _{GS} = 0 V, f = 1 MHz, V _{DS} = -15 V | | 12.8 | | |
| Output Capacitance | C _{OSS} | | | | 2.8 | | |
| Reverse Capacitance | C _{RSS} | | | | 2.0 | | |

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V

| | | | | | | | |
|---------------------|---------------------|---|--|--|------|--|----|
| Turn-On Delay Time | t _{d(ON)} | N | V _{GS} = 4.5 V, V _{DS} = 15 V, I _D = 200 mA, R _G = 2 Ω | | 16.5 | | ns |
| Rise Time | t _r | | | | 25.5 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | | 142 | | |
| Fall Time | t _f | | | | 80 | | |
| Turn-On Delay Time | t _{d(ON)} | P | V _{GS} = -4.5 V, V _{DS} = -15 V, I _D = -200 mA, R _G = 2 Ω | | 37 | | |
| Rise Time | t _r | | | | 71 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | | 280 | | |
| Fall Time | t _f | | | | 171 | | |

3. Switching characteristics are independent of operating junction temperatures.

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|---------------------|--------------------|
| NTND31225CZTAG | XLLGA6 (Pb-Free) | 8000 / Tape & Reel |

†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.

TYPICAL CHARACTERISTICS – P-CHANNEL

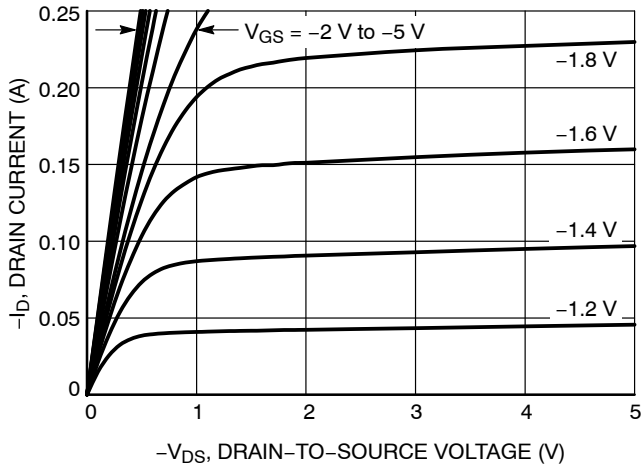


Figure 1. On-Region Characteristics

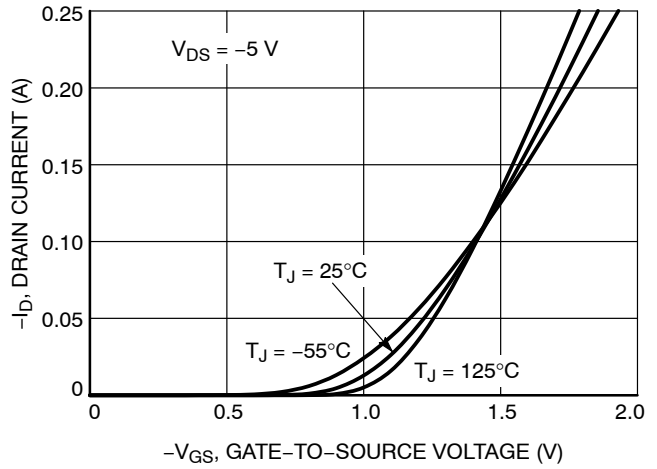


Figure 2. Transfer Characteristics

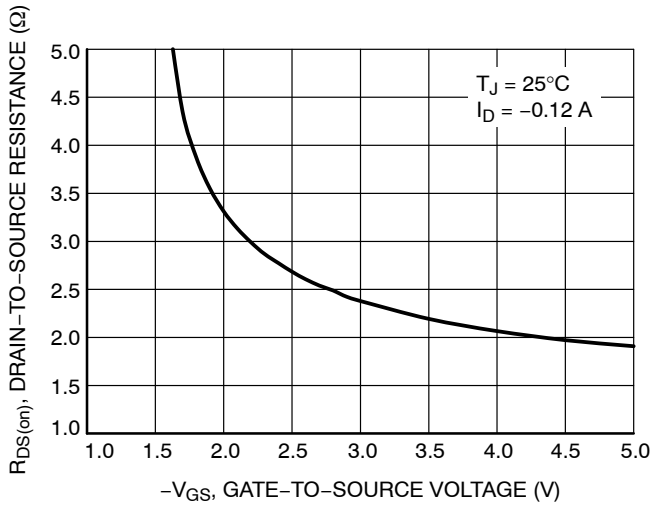


Figure 3. On-Resistance vs. Gate-to-Source Voltage

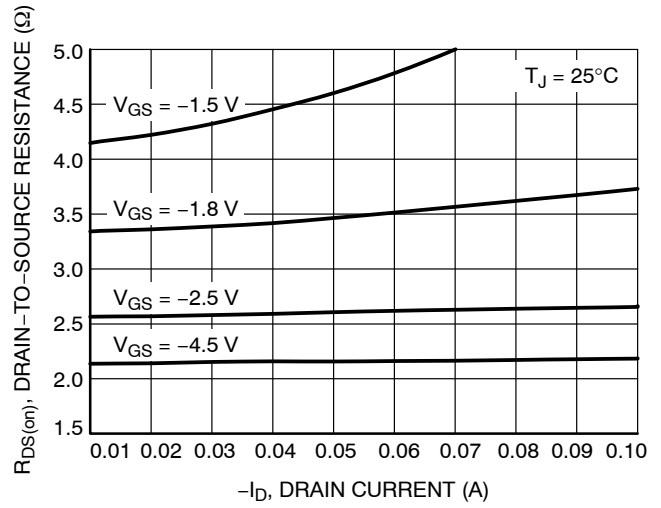


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

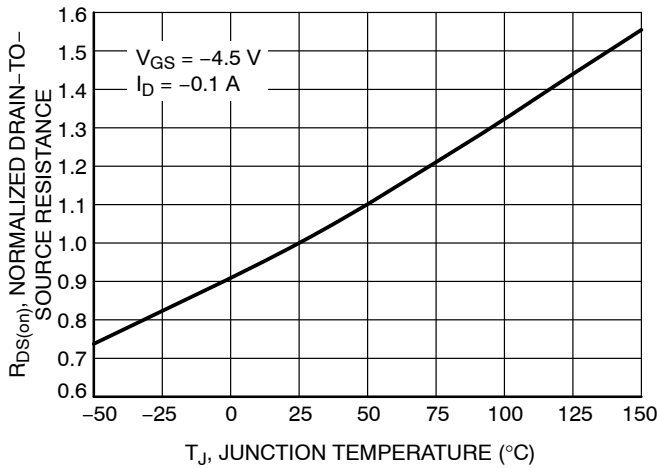


Figure 5. On-Resistance Variation with Temperature

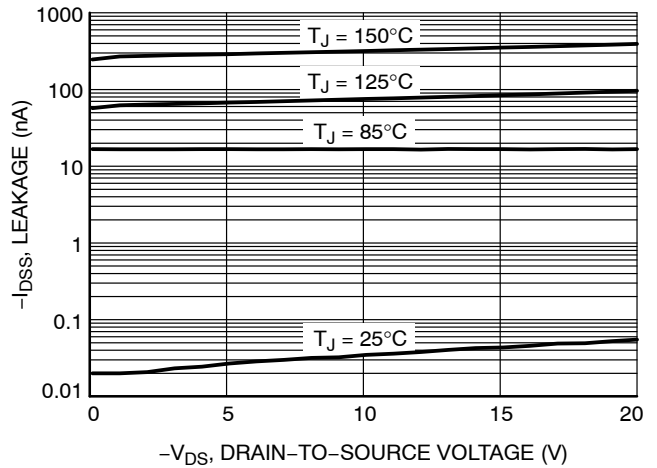


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS – P-CHANNEL

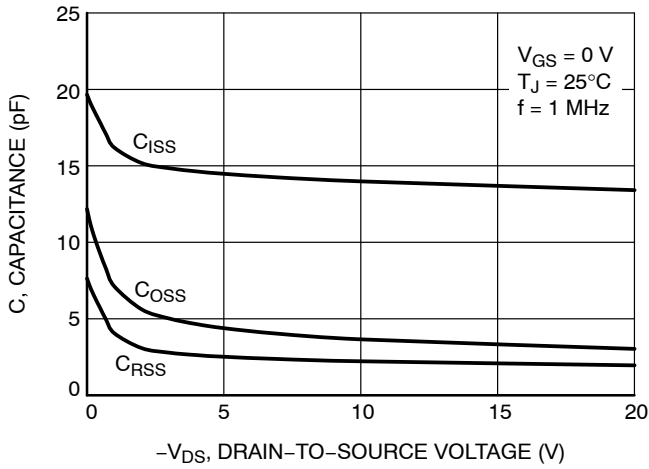


Figure 7. Capacitance Variation

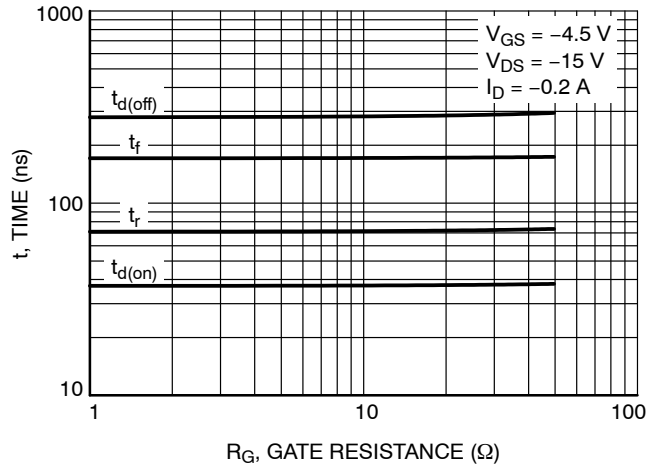


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

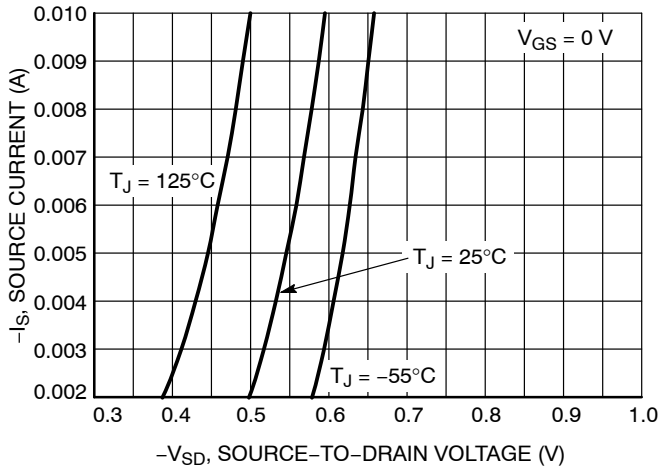


Figure 9. Diode Forward Voltage vs. Current

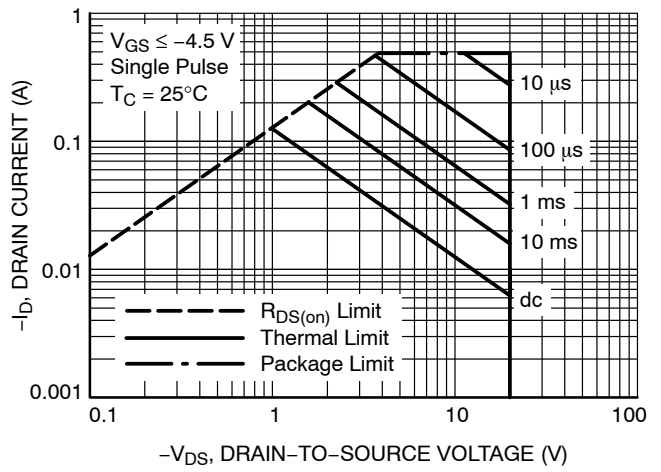


Figure 10. Maximum Rated Forward Biased Safe Operating Area

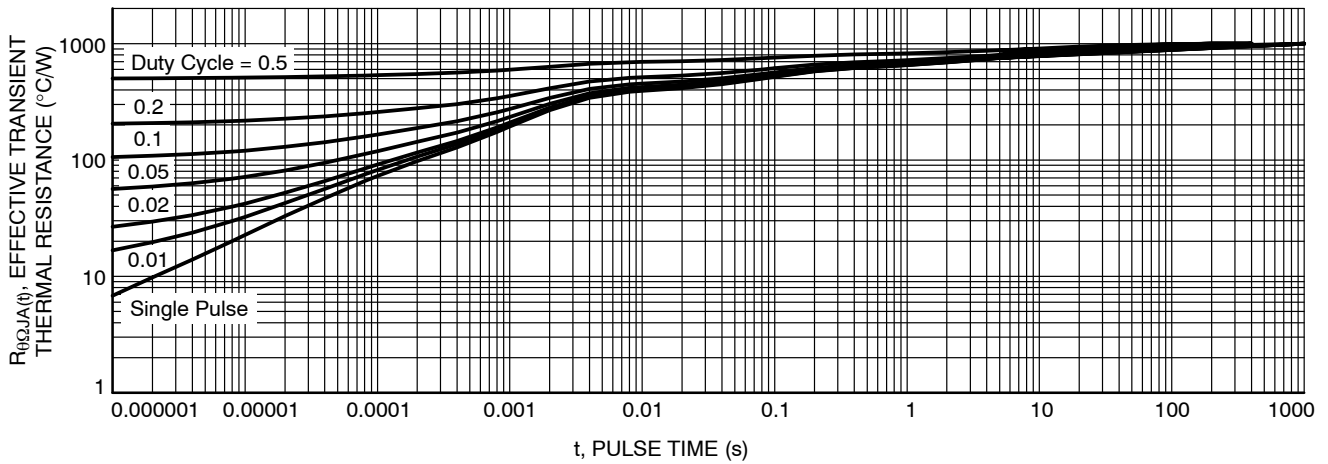


Figure 11. Thermal Response

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TYPICAL CHARACTERISTICS – N-CANNEL

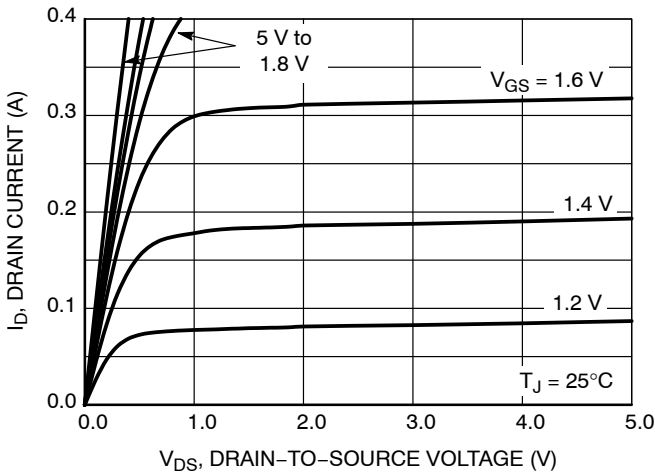


Figure 12. On-Region Characteristics

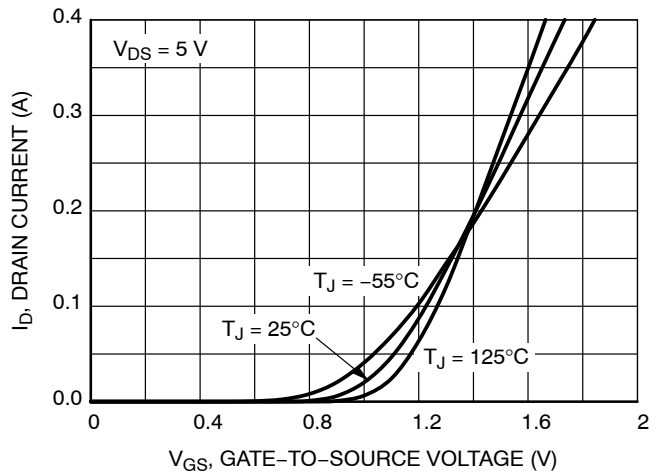


Figure 13. Transfer Characteristics

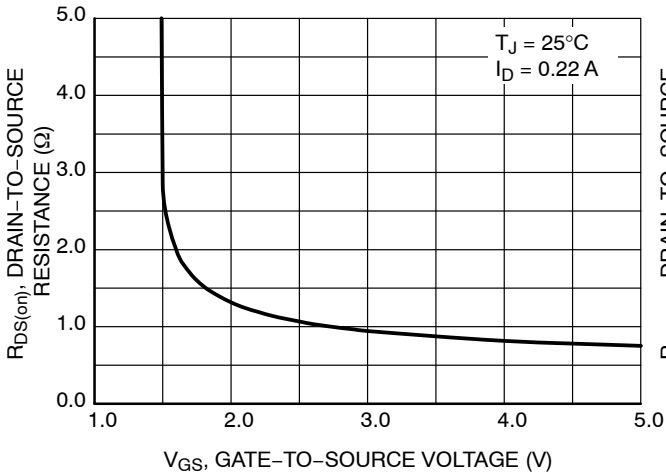


Figure 14. On-Resistance vs. Gate-to-Source Voltage

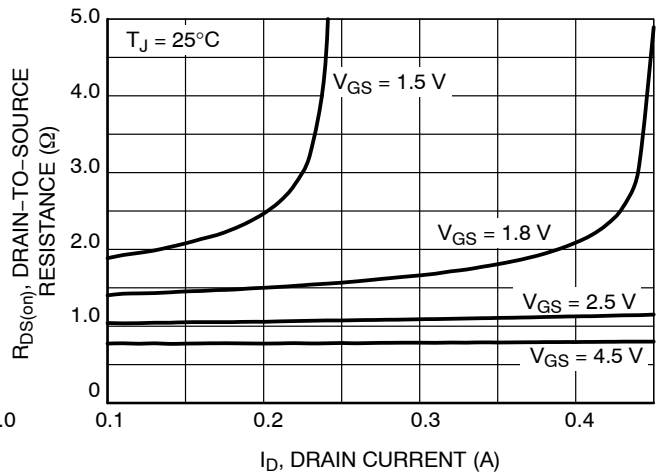


Figure 15. On-Resistance vs. Drain Current and Gate Voltage

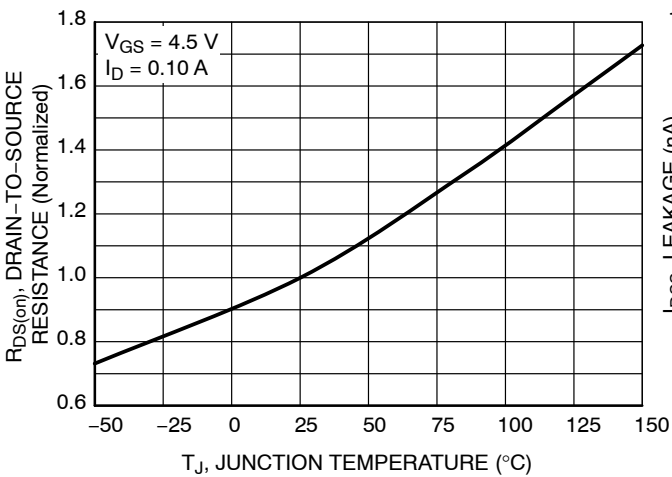


Figure 16. On-Resistance Variation with Temperature

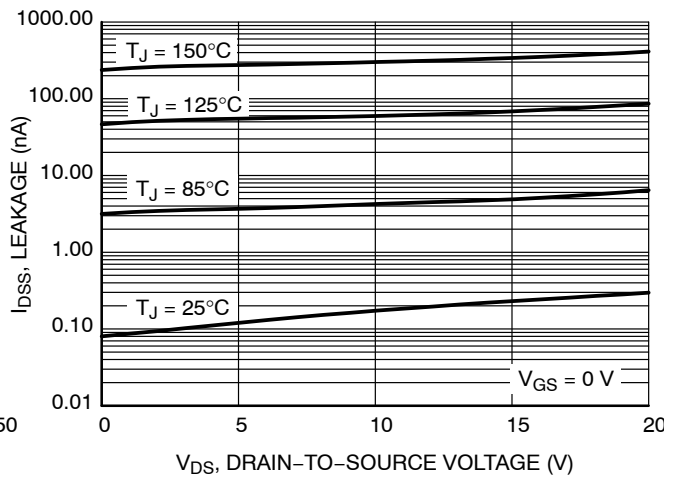


Figure 17. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS – N-CANNEL

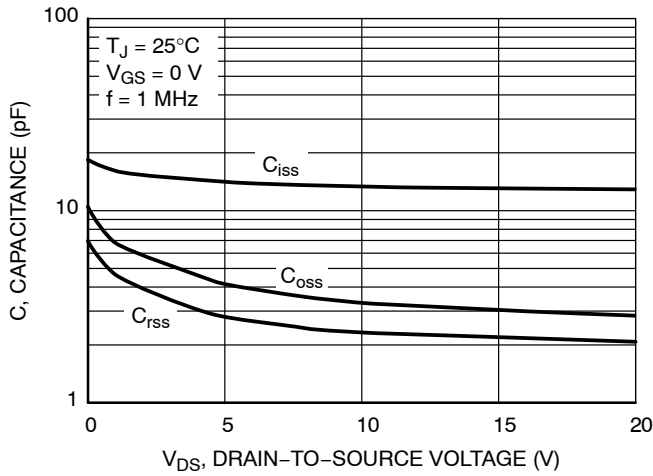


Figure 18. Capacitance Variation

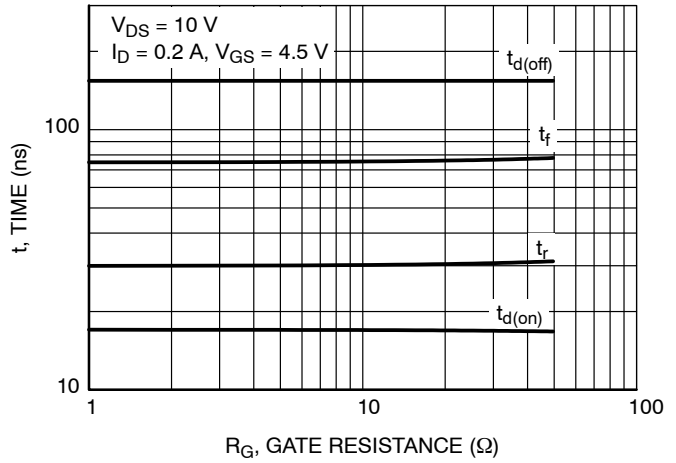


Figure 19. Resistive Switching Time Variation vs. Gate Resistance

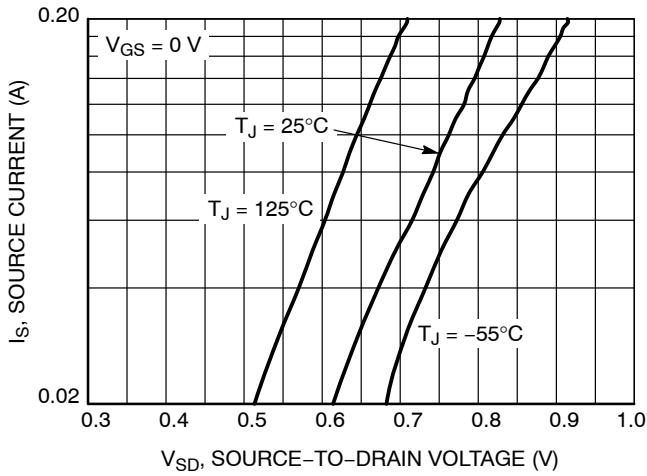


Figure 20. Diode Forward Voltage vs. Current

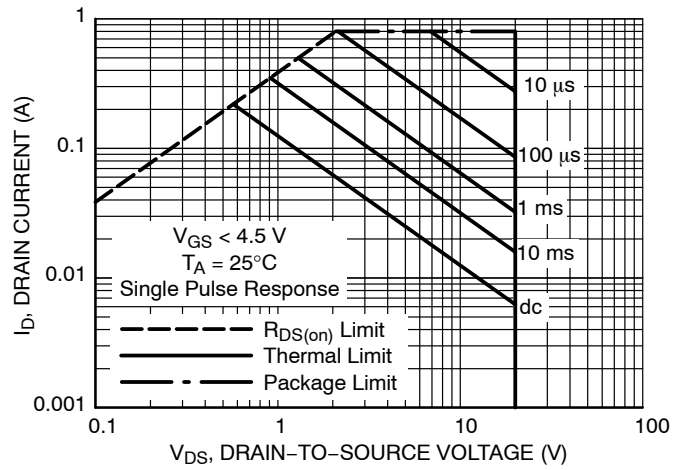


Figure 21. Maximum Rated Forward Biased Safe Operating Area

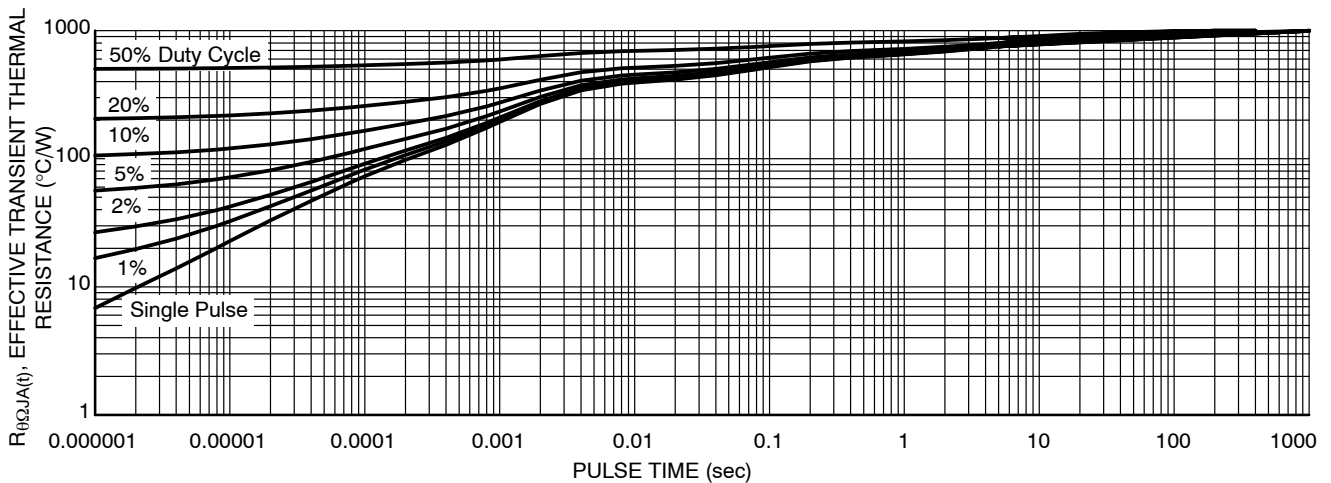


Figure 22. Thermal Response

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

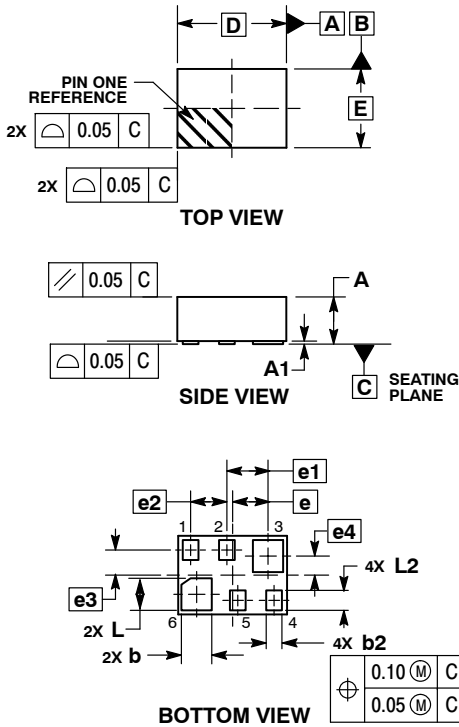
ON Semiconductor®



SCALE 8:1

XLLGA6 0.90x0.65
CASE 713AC
ISSUE O

DATE 19 JUN 2014



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994 .
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. POSITIONAL TOLERANCE APPLIES TO ALL SIX LEADS.

| MILLIMETERS | | |
|-------------|-----------|-------|
| DIM | MIN | MAX |
| A | 0.340 | 0.440 |
| A1 | 0.000 | 0.050 |
| b | 0.200 | 0.300 |
| b2 | 0.080 | 0.180 |
| D | 0.900 BSC | |
| E | 0.650 BSC | |
| e | 0.295 BSC | |
| e1 | 0.340 BSC | |
| e2 | 0.300 BSC | |
| e3 | 0.208 BSC | |
| e4 | 0.158 BSC | |
| L | 0.215 | 0.315 |
| L2 | 0.115 | 0.215 |

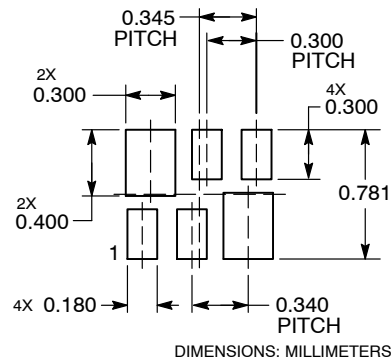
GENERIC MARKING DIAGRAM*



- X = 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.

RECOMMENDED SOLDERING FOOTPRINT*



*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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| DESCRIPTION: | XLLGA6 0.90X0.65 | PAGE 1 OF 1 |

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