

NTGS3130N

Power MOSFET 20 V, 5.6 A Single N-Channel, TSOP-6

Features

- Leading Edge Trench Technology for Low On Resistance
- Low Gate Charge for Fast Switching
- Small Size (3 x 2.75 mm) TSOP-6 Package
- This is a Pb-Free Device

Applications

- DC-DC Converters
- Lithium Ion Battery Applications
- Load/Power Switching

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

| Rating | | Symbol | Value | Unit | |
|-------------------------------------------------------------------|-----------------------|-----------------------------------|-----------------------|------|---|
| Drain-to-Source Voltage | | V _{DSS} | 20 | V | |
| Gate-to-Source Voltage | | V _{GS} | ±8 | V | |
| Continuous Drain Current (Note 1) | Steady State | I _D | T _A = 25°C | 5.6 | A |
| | | | T _A = 85°C | 4.1 | |
| | t ≤ 10 s | T _A = 25°C | 6.2 | | |
| Power Dissipation (Note 1) | Steady State | P _D | T _A = 25°C | 1.1 | W |
| | | | t ≤ 10 s | 1.4 | |
| Continuous Drain Current (Note 2) | Steady State | I _D | T _A = 25°C | 4.2 | A |
| | | | T _A = 85°C | 3.0 | |
| Power Dissipation (Note 2) | Steady State | P _D | T _A = 25°C | 0.6 | W |
| Pulsed Drain Current | t _p ≤ 10 s | I _{DM} | 19 | A | |
| Operating and Storage Temperature Range | | T _J , T _{stg} | -55 to 150 | °C | |
| Source Current (Body Diode) | | I _S | 1.0 | A | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | T _L | 260 | °C | |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---------------------------------------------|------------------|-----|------|
| Junction-to-Ambient - Steady State (Note 1) | R _{θJA} | 110 | °C/W |
| Junction-to-Ambient - t ≤ 10 s (Note 1) | | 90 | |
| Junction-to-Ambient - Steady State (Note 2) | | 200 | |

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 [1 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size

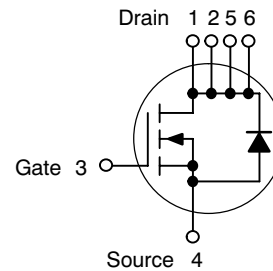


ON Semiconductor®

<http://onsemi.com>

| V _{(BR)DSS} | R _{DS(on)} mAX | I _D Max |
|----------------------|-------------------------|--------------------|
| 20 V | 24 mΩ @ 4.5 V | 5.6 A |
| | 32 mΩ @ 2.5 V | 4.9 A |

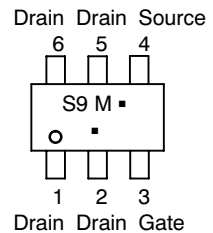
N-Channel



MARKING DIAGRAM & PIN ASSIGNMENT



TSOP-6
CASE 318G
STYLE 1



S9 = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|------------------|------------------|
| NTGS3130NT1G | TSOP-6 (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.

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

| Characteristic | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------------------------------------------------------|--------------------------------------|----------------------------------------------------------------------|-----|-----|-----|-------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-to-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V; I _D = 250 μA | 20 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V _{(BR)DSS} /T _J | | | 9.8 | | mV/°C |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V; V _{DS} = 16 V, T _J = 25°C | | | 1.0 | μA |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0, V _{GS} = ±8 V | | | 100 | nA |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|----------------------------------|-------------------------------------|-------------------------------------------------------------|-----|-----|-----|-------|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = 250 μA | 0.4 | 0.6 | 1.4 | V |
| Negative Temperature Coefficient | V _{GS(TH)} /T _J | | | 3.4 | | mV/°C |
| Drain-to-Source On-Resistance | R _{DS(on)} | V _{GS} = 4.5 V, I _D = 5.6 A | | 19 | 24 | mΩ |
| | | V _{GS} = 2.5 V, I _D = 4.9 A | | 25 | 32 | |
| Forward Transconductance | g _{FS} | V _{DS} = 10 V, I _D = 5.6 A | | 8.2 | | S |

CHARGES, CAPACITANCE, & GATE RESISTANCE

| | | | | | | |
|------------------------------|---------------------|--------------------------------------------------------------------------|--|------|------|----|
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1 MHz, V _{DS} = 16 V | | 935 | | pF |
| Output Capacitance | C _{OSS} | | | 169 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 104 | | |
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1 MHz, V _{DS} = 10 V | | 965 | | pF |
| Output Capacitance | C _{OSS} | | | 198 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 110 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 4.5 V, V _{DS} = 16 V, I _D = 5.6 A | | 13.2 | 20.3 | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 0.60 | | |
| Gate-to-Source Charge | Q _{GS} | | | 1.5 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 4.2 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 4.5 V, V _{DS} = 5.0 V, I _D = 6.2 A | | 11.8 | 18.0 | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 0.6 | | |
| Gate-to-Source Charge | Q _{GS} | | | 1.4 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 2.7 | | |

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 4)

| | | | | | | |
|---------------------|---------------------|---------------------------------------------------------------------------------------------|--|------|------|----|
| Turn-On Delay Time | t _{d(ON)} | V _{GS} = 4.5 V, V _{DD} = 16 V, I _D = 1 A, R _G = 3 Ω | | 6.3 | 12.6 | ns |
| Rise Time | t _r | | | 7.3 | 13.5 | |
| Turn-Off Delay Time | t _{d(OFF)} | | | 21.7 | 35.1 | |
| Fall Time | t _f | | | 9.7 | 17.6 | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|-----------------|----------------------------------------------------------------------------------|-----------------------|--|------|-----|----|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = 1.0 A | T _J = 25°C | | 0.7 | 1.2 | V |
| Reverse Recovery Time | t _{RR} | V _{GS} = 0 Vdc, dI _{SD} /dt = 100 A/μs, I _S = 1.0 A | | | 20.4 | | ns |
| Charge Time | t _a | | | | 8.1 | | |
| Discharge Time | t _b | | | | 11.6 | | |
| Reverse Recovery Charge | Q _{RR} | | | | | 8.8 | |

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperature.

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TYPICAL CHARACTERISTICS

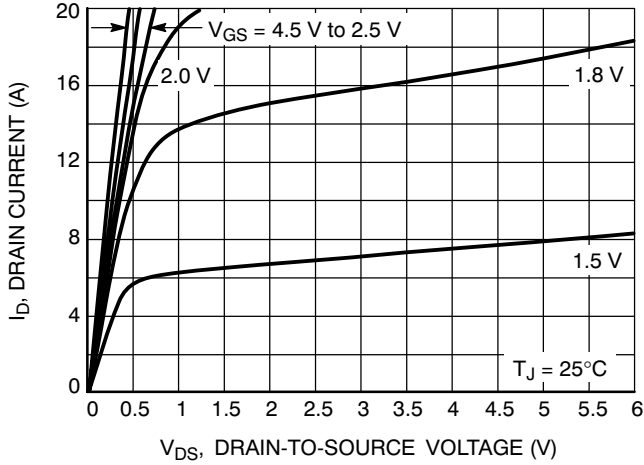


Figure 1. On-Region Characteristics

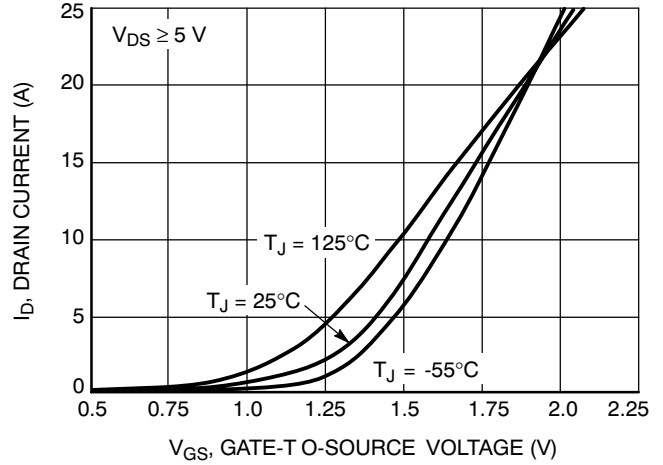


Figure 2. Transfer Characteristics

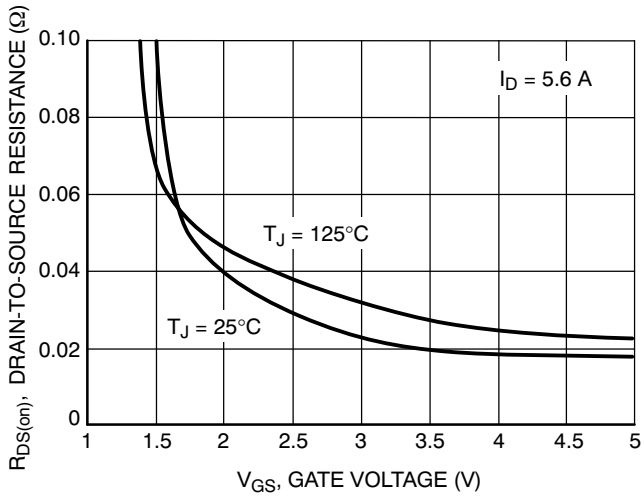


Figure 3. On-Resistance vs. Gate-to-Source Voltage

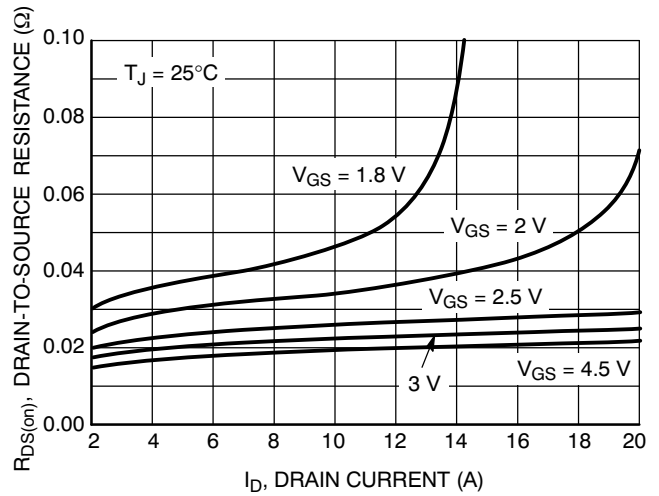


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

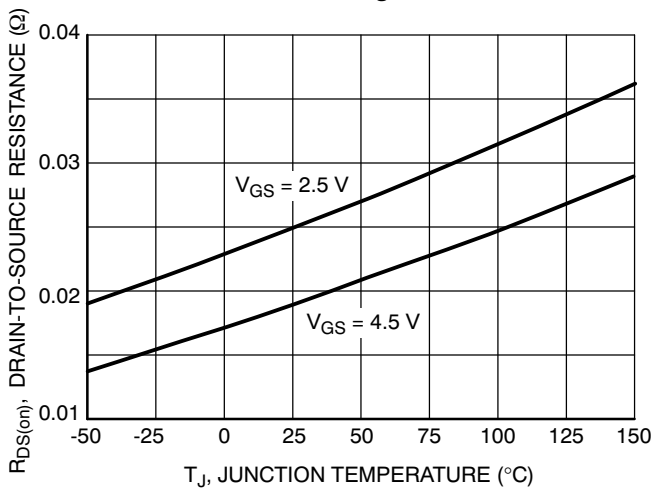


Figure 5. On-Resistance Variation with Temperature

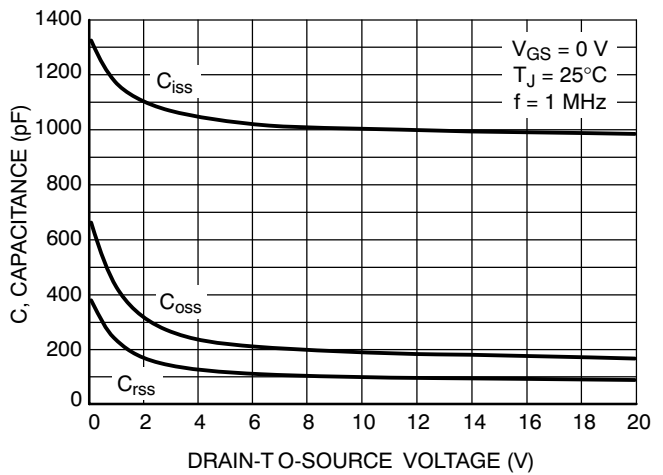


Figure 6. Capacitance Variation

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TYPICAL CHARACTERISTICS

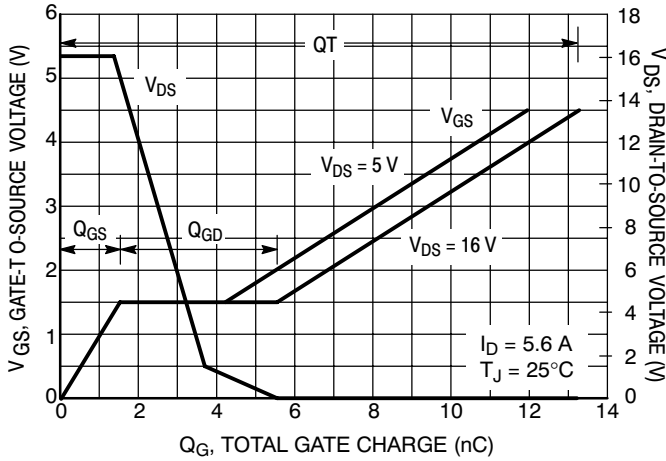


Figure 7. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

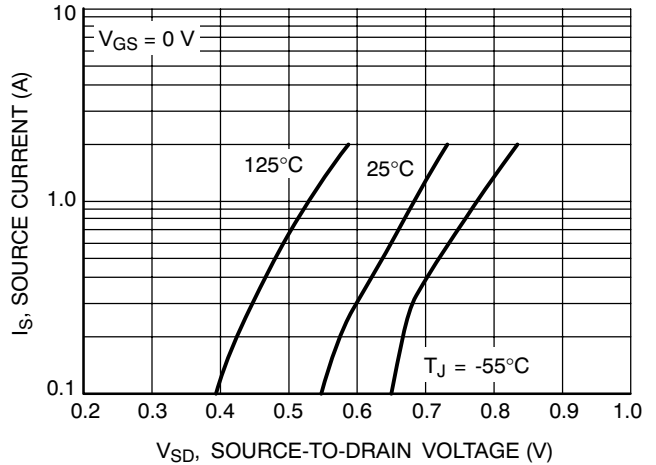


Figure 8. Diode Forward Voltage vs. Current

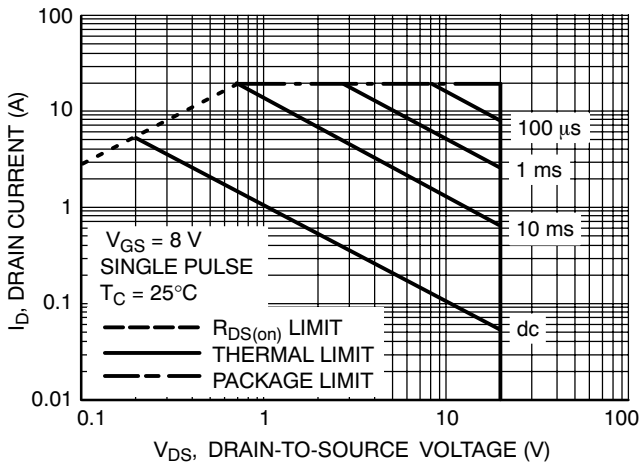


Figure 9. Maximum Rated Forward Biased Safe Operating Area

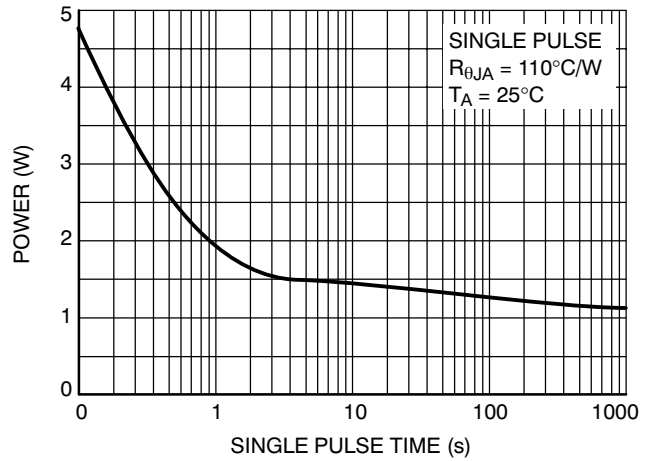


Figure 10. Single Pulse Maximum Power Dissipation

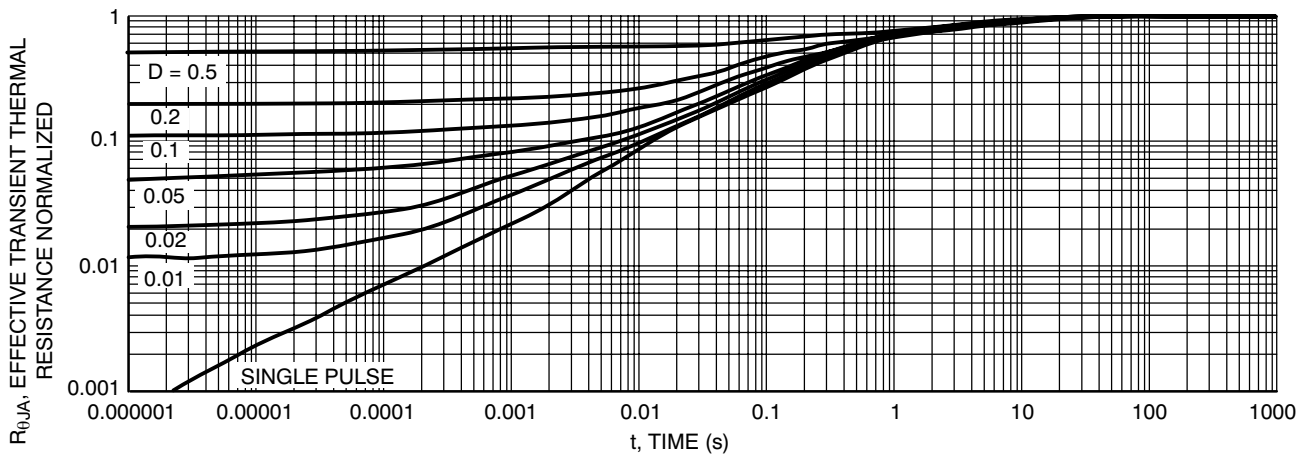
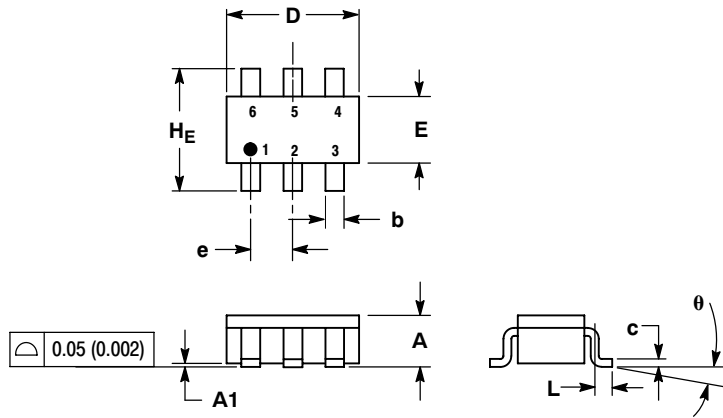


Figure 11. Thermal Response

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PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE S

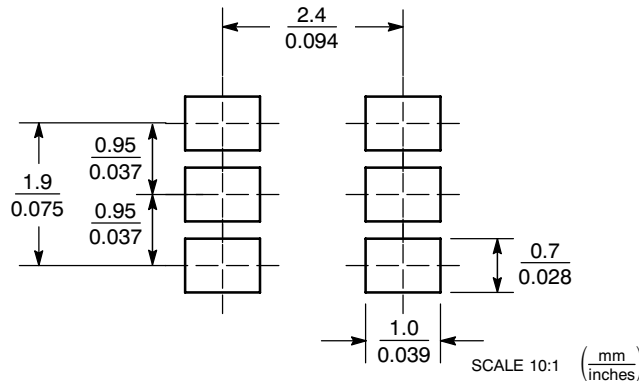


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
 4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.25 | 0.38 | 0.50 | 0.010 | 0.014 | 0.020 |
| c | 0.10 | 0.18 | 0.26 | 0.004 | 0.007 | 0.010 |
| D | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| E | 1.30 | 1.50 | 1.70 | 0.051 | 0.059 | 0.067 |
| e | 0.85 | 0.95 | 1.05 | 0.034 | 0.037 | 0.041 |
| L | 0.20 | 0.40 | 0.60 | 0.008 | 0.016 | 0.024 |
| HE | 2.50 | 2.75 | 3.00 | 0.099 | 0.108 | 0.118 |
| θ | 0° | - | 10° | 0° | - | 10° |

- STYLE 1:
- PIN 1. DRAIN
 - DRAIN
 - GATE
 - SOURCE
 - DRAIN
 - DRAIN

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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