

NTF6P02T3

Power MOSFET -6.0 Amps, -20 Volts

P-Channel SOT-223

Features

- Low $R_{DS(on)}$
- Logic Level Gate Drive
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- Pb-Free Package is Available

Typical Applications

- Power Management in Portables and Battery-Powered Products, i.e.: Cellular and Cordless Telephones and PCMCIA Cards

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

| Rating | Symbol | Value | Unit |
|--|-----------------|-------------|---------------------------|
| Drain-to-Source Voltage | V_{DSS} | -20 | Vdc |
| Gate-to-Source Voltage | V_{GS} | ± 8.0 | Vdc |
| Drain Current (Note 1) | | | |
| - Continuous @ $T_A = 25^\circ\text{C}$ | I_D | -10 | A dc |
| - Continuous @ $T_A = 70^\circ\text{C}$ | I_D | -8.4 | |
| - Single Pulse ($t_p = 10 \mu\text{s}$) | I_{DM} | -35 | A pk |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 8.3 | W |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy - Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = -20 \text{ Vdc}$, $V_{GS} = -5.0 \text{ Vdc}$, $I_{L(pk)} = -10 \text{ A}$, $L = 3.0 \text{ mH}$, $R_G = 25\Omega$) | E_{AS} | 150 | mJ |
| Thermal Resistance | | | $^\circ\text{C}/\text{W}$ |
| - Junction to Lead (Note 1) | $R_{\theta JL}$ | 15 | |
| - Junction to Ambient (Note 2) | $R_{\theta JA}$ | 71.4 | |
| - Junction to Ambient (Note 3) | $R_{\theta JA}$ | 160 | |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

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.

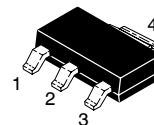
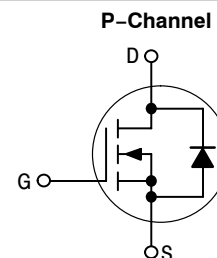
1. Steady State.
2. When surface mounted to an FR4 board using 1" pad size, (Cu. Area 1.127 sq in), Steady State.
3. When surface mounted to an FR4 board using minimum recommended pad size, (Cu. Area 0.412 sq in), Steady State.



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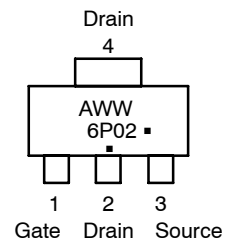
<http://onsemi.com>

-6.0 AMPERES
-20 VOLTS
 $R_{DS(on)} = 44 \text{ m}\Omega$ ($T\psi\pi$.)



SOT-223
CASE 318E
STYLE 3

MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location
WW = Work Week
6P02 = Specific Device Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

| Device | Package | Shipping† |
|------------|----------------------|------------------|
| NTF6P02T3 | SOT-223 | 4000/Tape & Reel |
| NTF6P02T3G | SOT-223 (Pb-Free) | 4000/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.

NTF6P02T3

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|----------------------|----------|------------|-------------|--------------|
| Drain-to-Source Breakdown Voltage (Note 4) (V _{GS} = 0 Vdc, I _D = -250 μAdc) Temperature Coefficient (Positive) | V _{(BR)DSS} | -20 - | -25 -11 | - - | Vdc mV/°C |
| Zero Gate Voltage Drain Current (V _{DS} = -20 Vdc, V _{GS} = 0 Vdc) (V _{DS} = -20 Vdc, V _{GS} = 0 Vdc, T _J = 125°C) | I _{DSS} | - - | - - | -1.0 -10 | μAdc |
| Gate-Body Leakage Current (V _{GS} = ± 8.0 Vdc, V _{DS} = 0 Vdc) | I _{GSS} | - | - | ± 100 | nAdc |

ON CHARACTERISTICS (Note 4)

| | | | | | |
|--|---------------------|-------------|----------------|---------------|--------------|
| Gate Threshold Voltage (Note 4) (V _{DS} = V _{GS} , I _D = -250 μAdc) Threshold Temperature Coefficient (Negative) | V _{GS(th)} | -0.4 - | -0.7 2.6 | -1.0 - | Vdc mV/°C |
| Static Drain-to-Source On-Resistance (Note 4) (V _{GS} = -4.5 Vdc, I _D = -6.0 Adc) (V _{GS} = -2.5 Vdc, I _D = -4.0 Adc) (V _{GS} = -2.5 Vdc, I _D = -3.0 Adc) | R _{DS(on)} | - - - | 44 57 57 | 50 70 - | mΩ |
| Forward Transconductance (Note 4) (V _{DS} = -10 Vdc, I _D = -6.0 Adc) | g _{fs} | - | 12 | - | Mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|----------------------|--|------------------|---|-----|------|----|
| Input Capacitance | (V _{DS} = -16 Vdc, V _{GS} = 0 V, f = 1.0 MHz) | C _{iSS} | - | 900 | 1200 | pF |
| Output Capacitance | | C _{oSS} | - | 350 | 500 | |
| Transfer Capacitance | | C _{rSS} | - | 90 | 150 | |
| Input Capacitance | (V _{DS} = -10 Vdc, V _{GS} = 0 V, f = 1.0 MHz) | C _{iSS} | - | 940 | - | pF |
| Output Capacitance | | C _{oSS} | - | 410 | - | |
| Transfer Capacitance | | C _{rSS} | - | 110 | - | |

SWITCHING CHARACTERISTICS (Note 5)

| | | | | | | |
|---------------------|---|---------------------|---|-----|-----|----|
| Turn-On Delay Time | (V _{DD} = -5.0 Vdc, I _D = -1.0 Adc, V _{GS} = -4.5 Vdc, R _G = 6.0 Ω) | t _{d(on)} | - | 7.0 | 12 | ns |
| Rise Time | | t _r | - | 25 | 45 | |
| Turn-Off Delay Time | | t _{d(off)} | - | 75 | 125 | |
| Fall Time | | t _f | - | 50 | 85 | |
| Turn-On Delay Time | (V _{DD} = -16 Vdc, I _D = -6.0 Adc, V _{GS} = -4.5 Vdc, R _G = 2.5 Ω) | t _{d(on)} | - | 8.0 | - | ns |
| Rise Time | | t _r | - | 30 | - | |
| Turn-Off Delay Time | | t _{d(off)} | - | 60 | - | |
| Fall Time | | t _f | - | 60 | - | |
| Gate Charge | (V _{DS} = -16 Vdc, I _D = -6.0 Adc, V _{GS} = -4.5 Vdc) (Note 4) | Q _T | - | 15 | 20 | nC |
| | | Q _{GS} | - | 1.7 | - | |
| | | Q _{gd} | - | 6.0 | - | |

SOURCE-DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|--------------------------------|---|-----------------|-------------|-------------------------|----------------|-----|
| Forward On-Voltage | (I _S = -3.0 Adc, V _{GS} = 0 Vdc) (Note 4) (I _S = -2.1 Adc, V _{GS} = 0 Vdc) (I _S = -3.0 Adc, V _{GS} = 0 Vdc, T _J = 125°C) | V _{SD} | - - - | -0.82 -0.74 -0.68 | -1.2 - - | Vdc |
| Reverse Recovery Time | (I _S = -3.0 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs) (Note 4) | t _{rr} | - | 42 | - | ns |
| | | t _a | - | 17 | - | |
| | | t _b | - | 25 | - | |
| Reverse Recovery Stored Charge | | Q _{RR} | - | 0.036 | - | μC |

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL ELECTRICAL CHARACTERISTICS

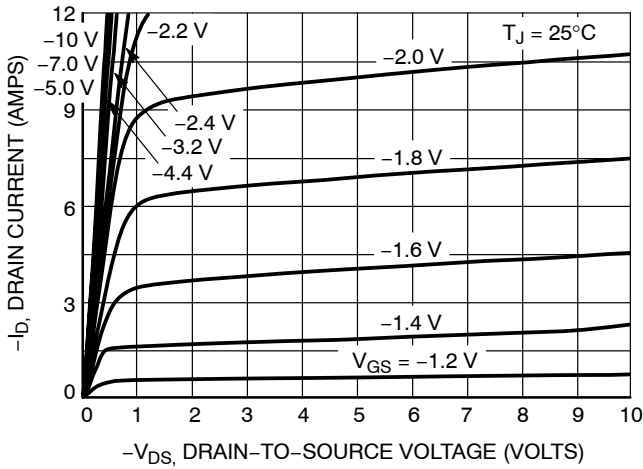


Figure 1. On-Region Characteristics

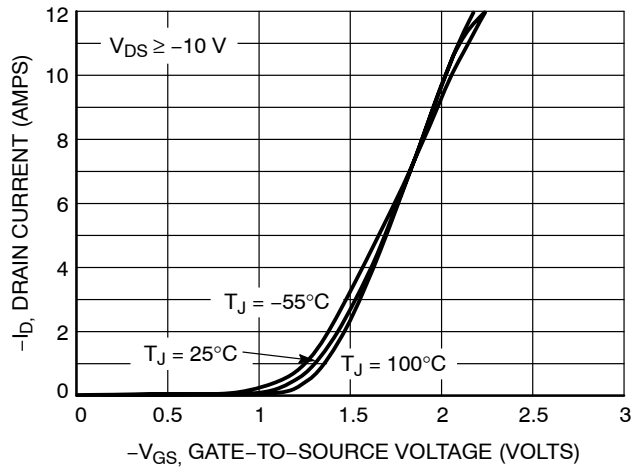


Figure 2. Transfer Characteristics

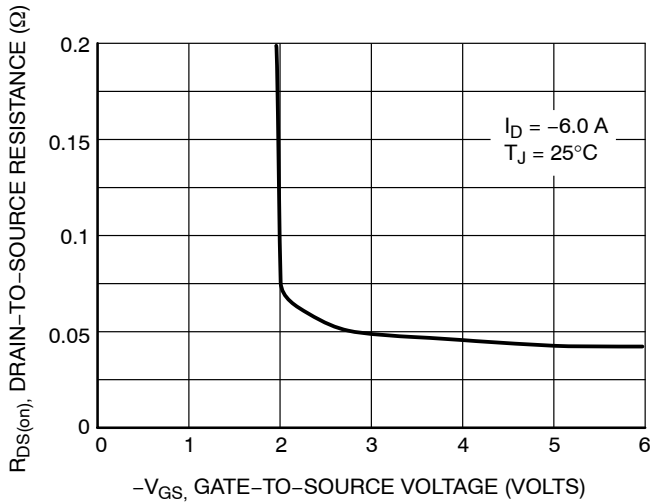


Figure 3. On-Resistance versus Gate-to-Source Voltage

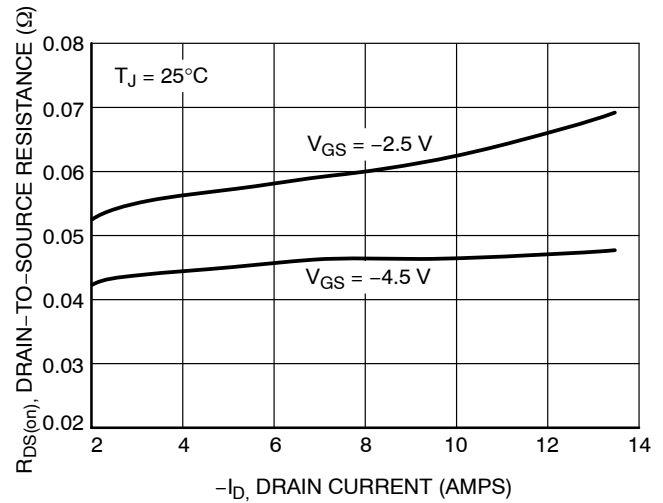


Figure 4. On-Resistance versus Drain Current and Gate Voltage

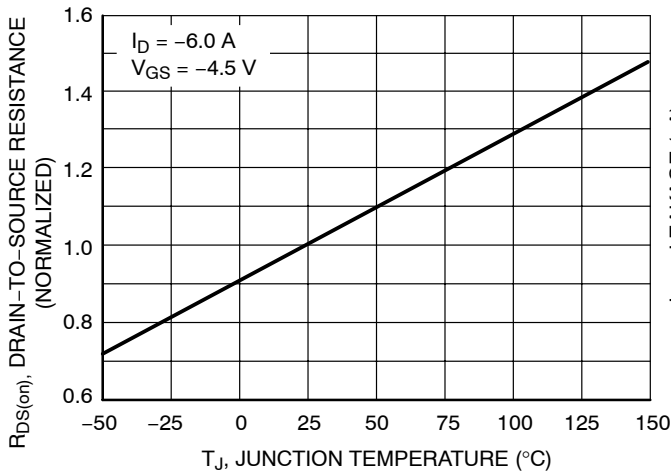


Figure 5. On-Resistance Variation with Temperature

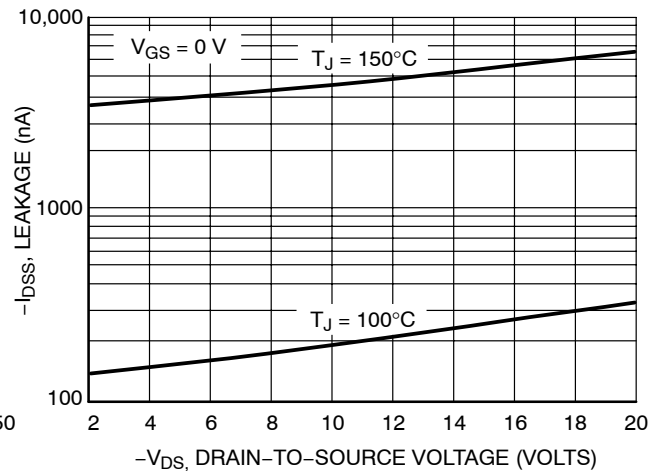


Figure 6. Drain-to-Source Leakage Current versus Voltage

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TYPICAL ELECTRICAL CHARACTERISTICS

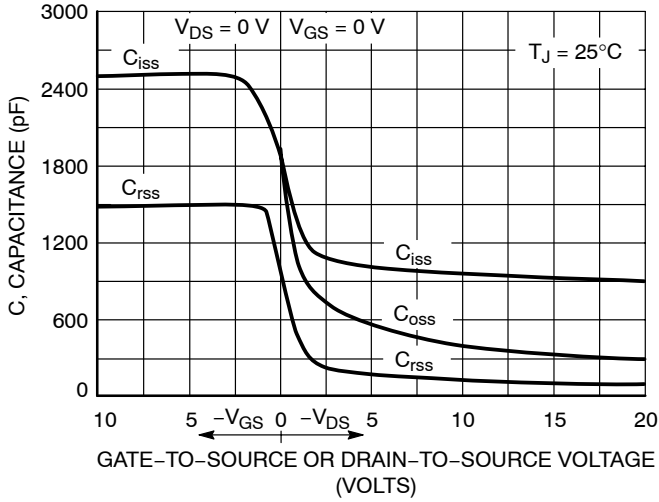


Figure 7. Capacitance Variation

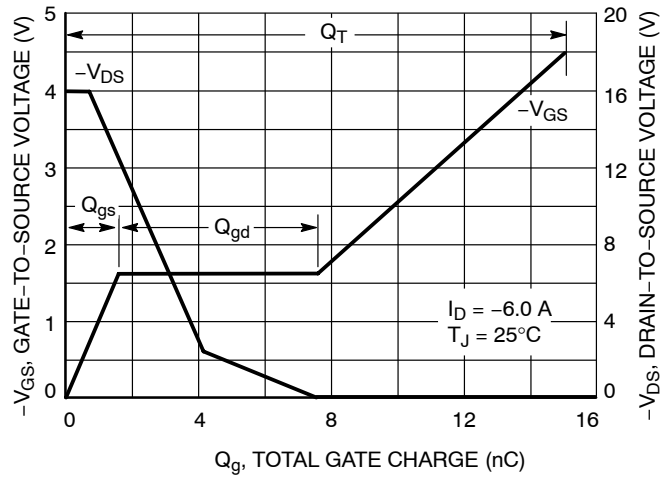


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

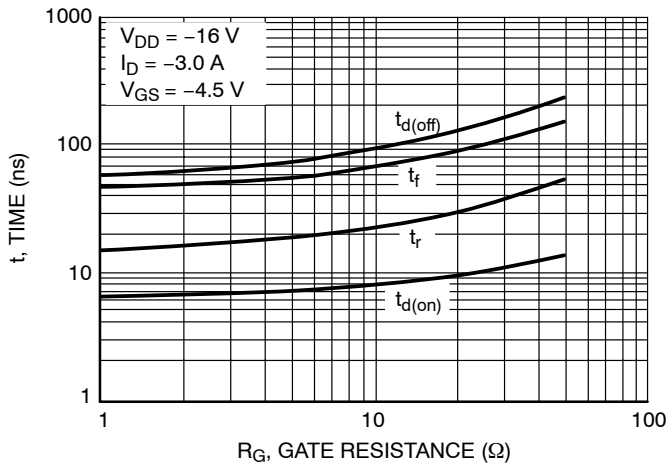


Figure 9. Resistive Switching Time Variation versus Gate Resistance

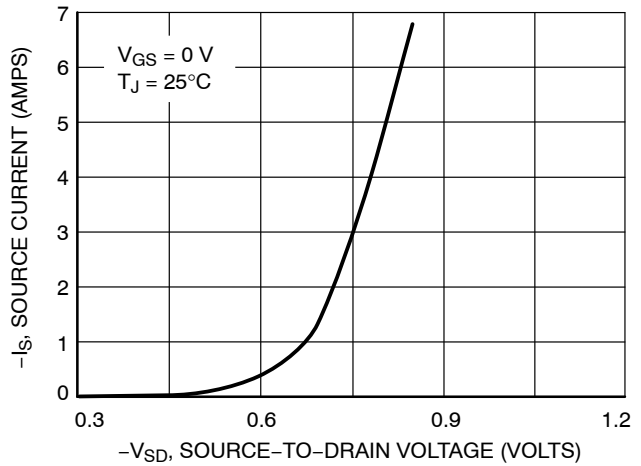


Figure 10. Diode Forward Voltage versus Current

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TYPICAL ELECTRICAL CHARACTERISTICS

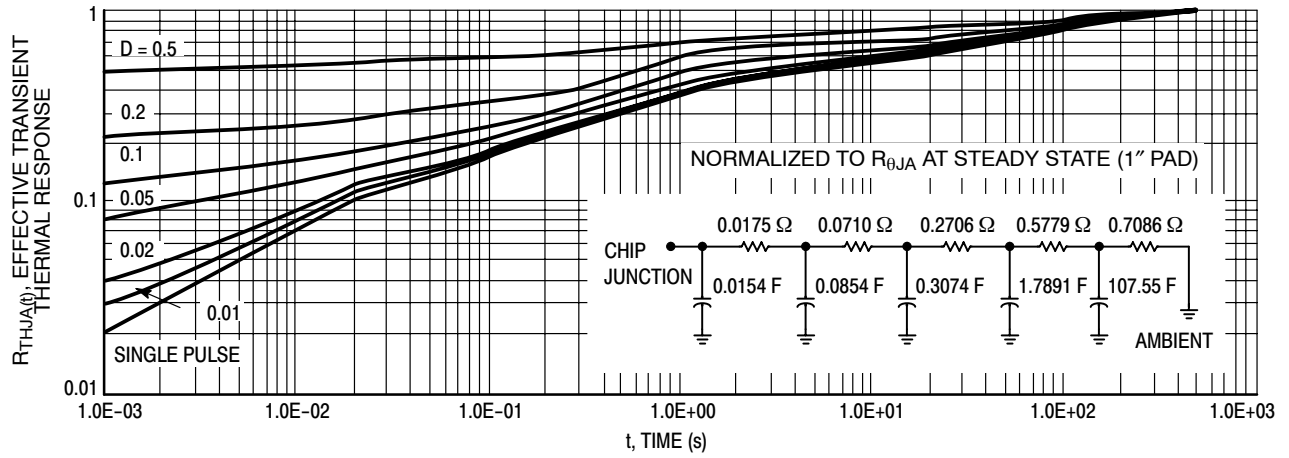
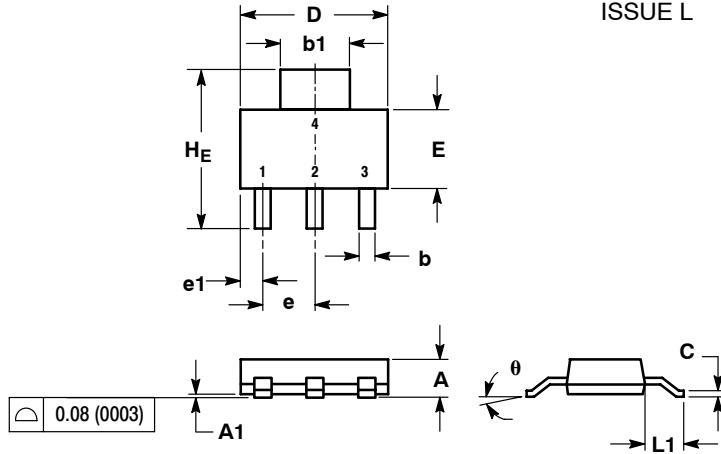


Figure 11. FET Thermal Response

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PACKAGE DIMENSIONS

SOT-223 (TO-261)
CASE 318E-04
ISSUE L

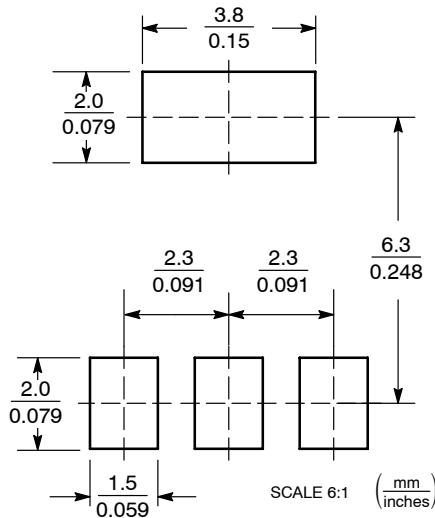


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.50 | 1.63 | 1.75 | 0.060 | 0.064 | 0.068 |
| A1 | 0.02 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.60 | 0.75 | 0.89 | 0.024 | 0.030 | 0.035 |
| b1 | 2.90 | 3.06 | 3.20 | 0.115 | 0.121 | 0.126 |
| c | 0.24 | 0.29 | 0.35 | 0.009 | 0.012 | 0.014 |
| D | 6.30 | 6.50 | 6.70 | 0.249 | 0.256 | 0.263 |
| E | 3.30 | 3.50 | 3.70 | 0.130 | 0.138 | 0.145 |
| e | 2.20 | 2.30 | 2.40 | 0.087 | 0.091 | 0.094 |
| e1 | 0.85 | 0.94 | 1.05 | 0.033 | 0.037 | 0.041 |
| L1 | 1.50 | 1.75 | 2.00 | 0.060 | 0.069 | 0.078 |
| HE | 6.70 | 7.00 | 7.30 | 0.264 | 0.276 | 0.287 |
| θ | 0° | - | 10° | 0° | - | 10° |

- STYLE 3:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. 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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