

## ZXMN4A06GT-VB Datasheet

### N-Channel 60-V (D-S) MOSFET

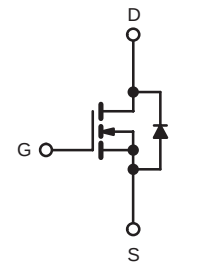
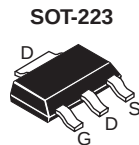
| PRODUCT SUMMARY |                           |           |
|-----------------|---------------------------|-----------|
| $V_{DS}$ (V)    | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
| 60              | 0.028 at $V_{GS} = 10$ V  | 7.0       |
|                 | 0.033 at $V_{GS} = 4.5$ V | 5.6       |

#### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFETs
- 175 °C Maximum Junction Temperature
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted |                                    |                |             |              |                    |
|--------------------------------------------------------------------------------------|------------------------------------|----------------|-------------|--------------|--------------------|
| Parameter                                                                            |                                    | Symbol         | 10 s        | Steady State | Unit               |
| Drain-Source Voltage                                                                 |                                    | $V_{DS}$       | 60          |              | V                  |
| Gate-Source Voltage                                                                  |                                    | $V_{GS}$       | $\pm 20$    |              |                    |
| Continuous Drain Current ( $T_J = 175\text{ }^{\circ}\text{C}$ ) <sup>a</sup>        | $T_A = 25\text{ }^{\circ}\text{C}$ | $I_D$          | 7.0         | 6.0          | A                  |
|                                                                                      | $T_A = 70\text{ }^{\circ}\text{C}$ |                | 6.1         | 5.0          |                    |
| Pulsed Drain Current                                                                 |                                    | $I_{DM}$       | 40          |              |                    |
| Avalanche Current                                                                    |                                    | $I_{AS}$       | 15          |              |                    |
| Single Pulse Avalanche Energy                                                        |                                    | $E_{AS}$       | 11          |              | mJ                 |
| Maximum Power Dissipation <sup>a</sup>                                               | $T_A = 25\text{ }^{\circ}\text{C}$ | $P_D$          | 3.3         | 1.7          | W                  |
|                                                                                      | $T_A = 70\text{ }^{\circ}\text{C}$ |                | 2.3         | 1.2          |                    |
| Operating Junction and Storage Temperature Range                                     |                                    | $T_J, T_{stg}$ | - 55 to 175 |              | $^{\circ}\text{C}$ |

| THERMAL RESISTANCE RATINGS               |               |            |         |         |      |
|------------------------------------------|---------------|------------|---------|---------|------|
| Parameter                                |               | Symbol     | Typical | Maximum | Unit |
| Maximum Junction-to-Ambient <sup>a</sup> | $t \leq 10$ s | $R_{thJA}$ | 36      | 45      | °C/W |
|                                          | Steady State  |            | 75      | 90      |      |
| Maximum Junction-to-Foot (Drain)         | Steady State  | $R_{thJF}$ | 17      | 20      |      |

Notes:

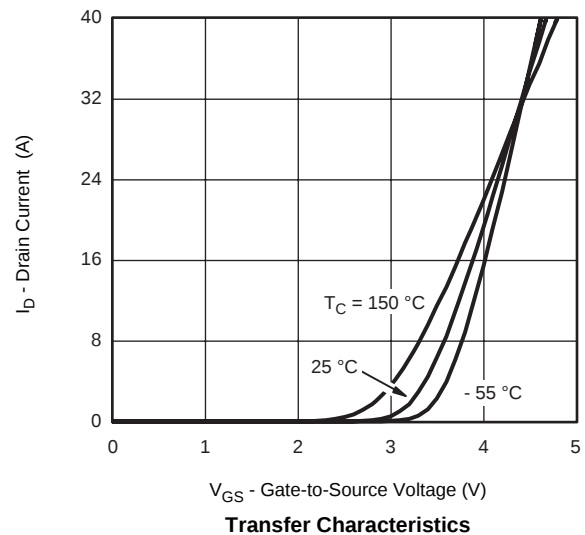
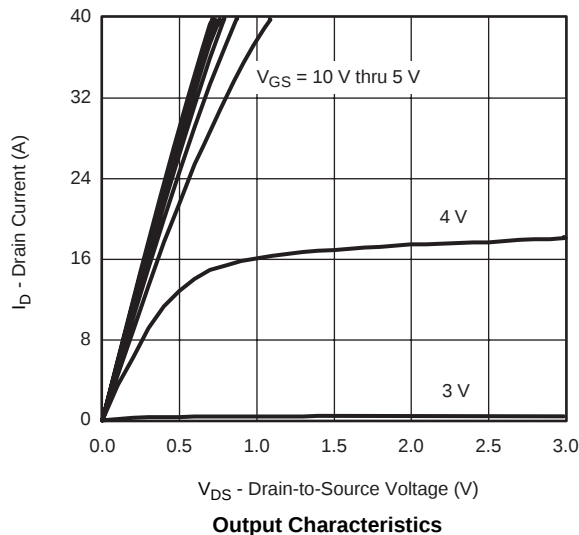
a. Surface Mounted on 1" x 1" FR4 board.

| <b>SPECIFICATIONS</b> $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted |              |                                                                                                                        |      |       |           |               |
|-----------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------|------|-------|-----------|---------------|
| Parameter                                                                         | Symbol       | Test Conditions                                                                                                        | Min. | Typ.  | Max.      | Unit          |
| <b>Static</b>                                                                     |              |                                                                                                                        |      |       |           |               |
| Drain-Source Breakdown Voltage                                                    | $V_{DS}$     | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$                                                                    | 60   |       |           | V             |
| Gate Threshold Voltage                                                            | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$                                                                        | 1    |       | 3         | V             |
| Gate-Body Leakage                                                                 | $I_{GSS}$    | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$                                                                        |      |       | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current                                                   | $I_{DSS}$    | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$                                                                            |      |       | 1         | $\mu\text{A}$ |
|                                                                                   |              | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$                                          |      |       | 20        |               |
| On-State Drain Current <sup>a</sup>                                               | $I_{D(on)}$  | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$                                                                         | 40   |       |           | A             |
| Drain-Source On-State Resistance <sup>a</sup>                                     | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}$                                                                             |      | 0.028 |           | $\Omega$      |
|                                                                                   |              | $V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$                                          |      | 0.032 |           |               |
|                                                                                   |              | $V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$                                          |      | 0.040 |           |               |
|                                                                                   |              | $V_{GS} = 4.5\text{ V}, I_D = 5.1\text{ A}$                                                                            |      | 0.033 |           |               |
| Forward Transconductance <sup>a</sup>                                             | $g_{fs}$     | $V_{DS} = 15\text{ V}, I_D = 6.0\text{ A}$                                                                             |      | 25    |           | S             |
| Diode Forward Voltage <sup>a</sup>                                                | $V_{SD}$     | $I_S = 1.7\text{ A}, V_{GS} = 0\text{ V}$                                                                              |      | 0.8   | 1.2       | V             |
| <b>Dynamic<sup>b</sup></b>                                                        |              |                                                                                                                        |      |       |           |               |
| Total Gate Charge                                                                 | $Q_g$        | $V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}$                                                       |      | 18    | 27        | nC            |
| Gate-Source Charge                                                                | $Q_{gs}$     |                                                                                                                        |      | 3.4   |           |               |
| Gate-Drain Charge                                                                 | $Q_{gd}$     |                                                                                                                        |      | 5.3   |           |               |
| Gate Resistance                                                                   | $R_g$        | $V_{GS} = 0.1\text{ V}, f = 5\text{ MHz}$                                                                              | 0.5  | 1.4   | 2.4       | $\Omega$      |
| Turn-On Delay Time                                                                | $t_{d(on)}$  | $V_{DD} = 30\text{ V}, R_L = 30\text{ }\Omega$<br>$I_D \cong 1\text{ A}, V_{GEN} = 10\text{ V}, R_g = 6\text{ }\Omega$ |      | 10    | 20        | ns            |
| Rise Time                                                                         | $t_r$        |                                                                                                                        |      | 10    | 20        |               |
| Turn-Off Delay Time                                                               | $t_{d(off)}$ |                                                                                                                        |      | 25    | 50        |               |
| Fall Time                                                                         | $t_f$        |                                                                                                                        |      | 12    | 24        |               |
| Source-Drain Reverse Recovery Time                                                | $t_{rr}$     | $I_F = 1.7\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$                                                                 |      | 50    | 80        |               |

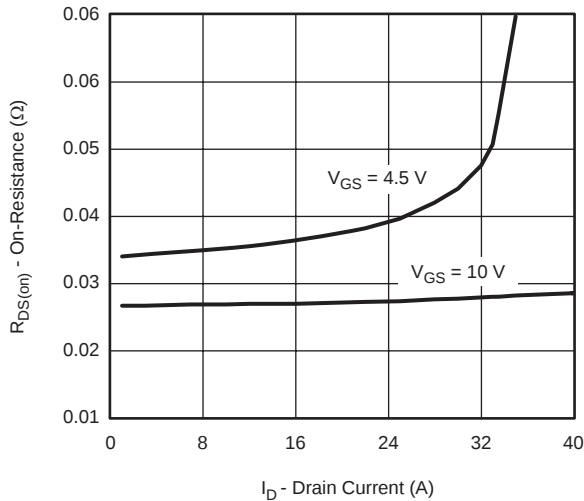
Notes:

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

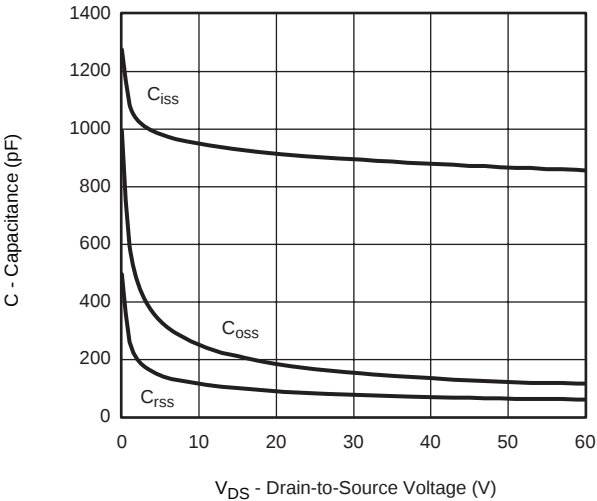
b. Guaranteed by design, not subject to production testing.

**TYPICAL CHARACTERISTICS**  $25\text{ }^{\circ}\text{C}$ , unless otherwise noted

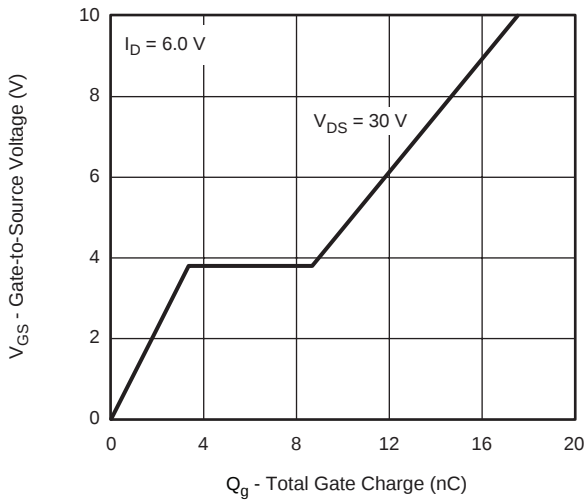
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



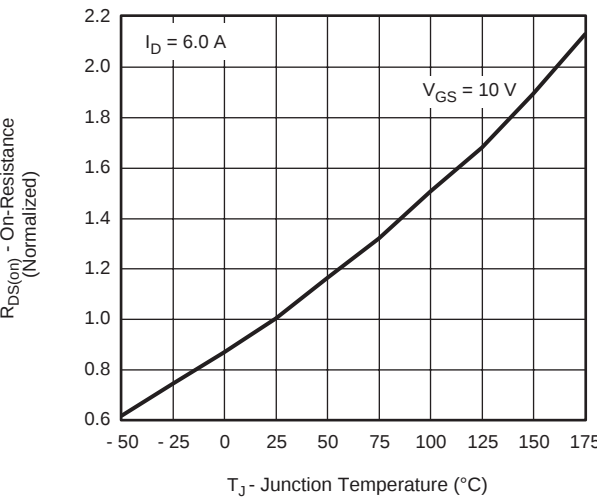
On-Resistance vs. Drain Current



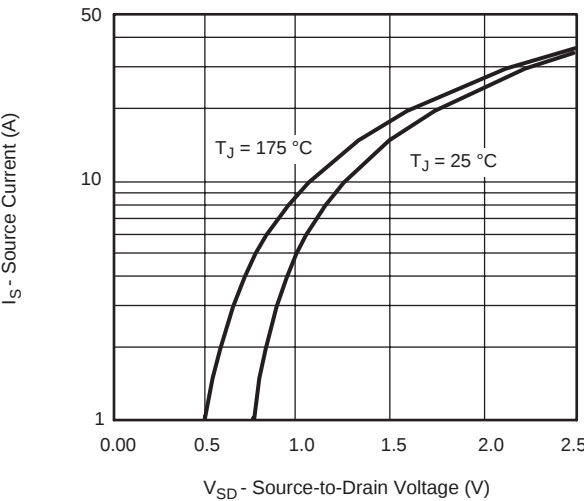
Capacitance



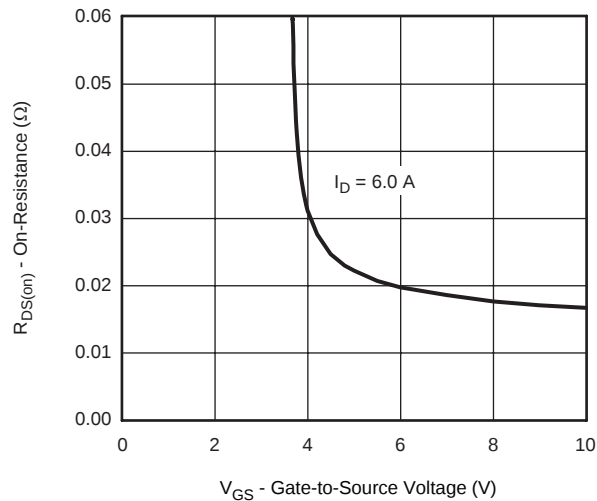
Gate Charge



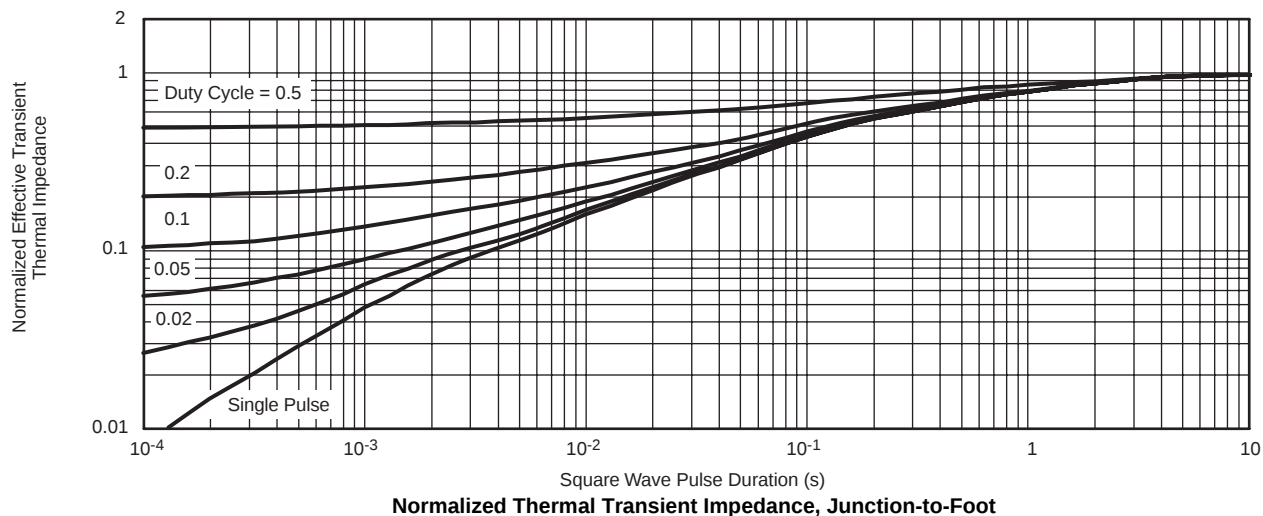
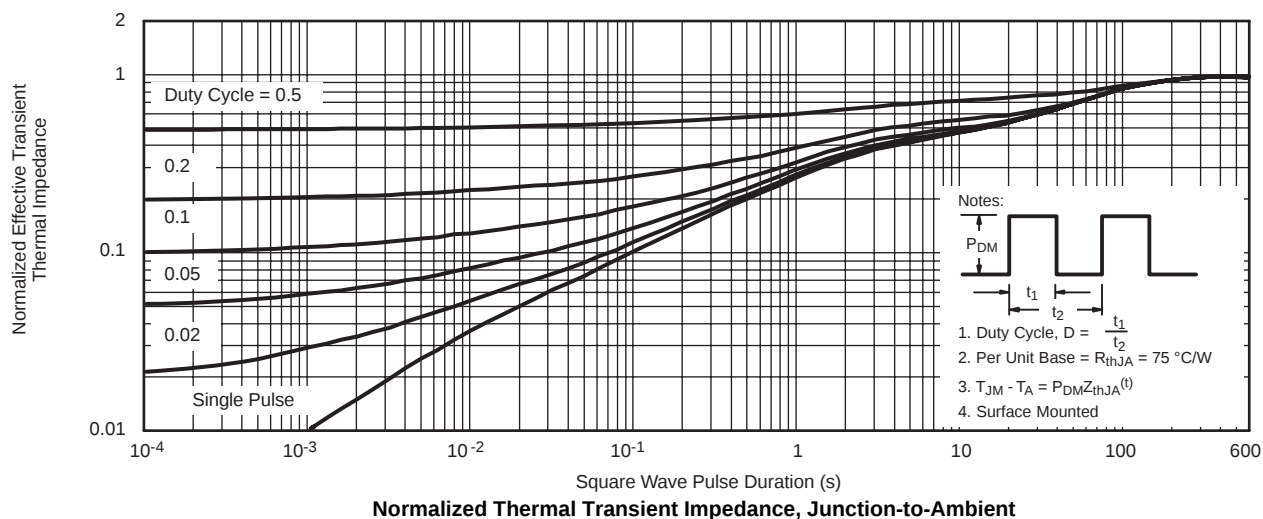
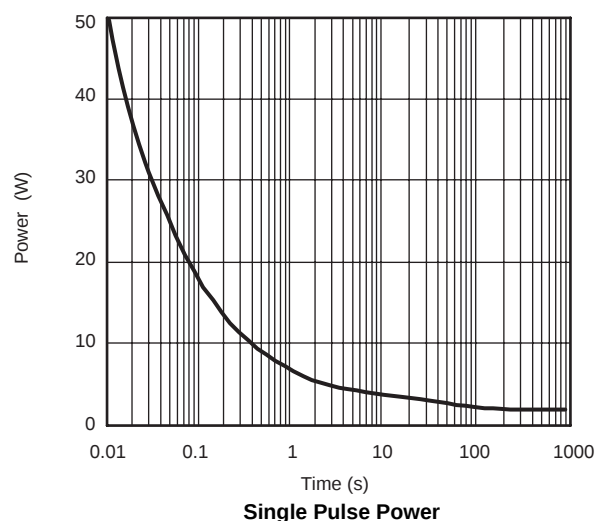
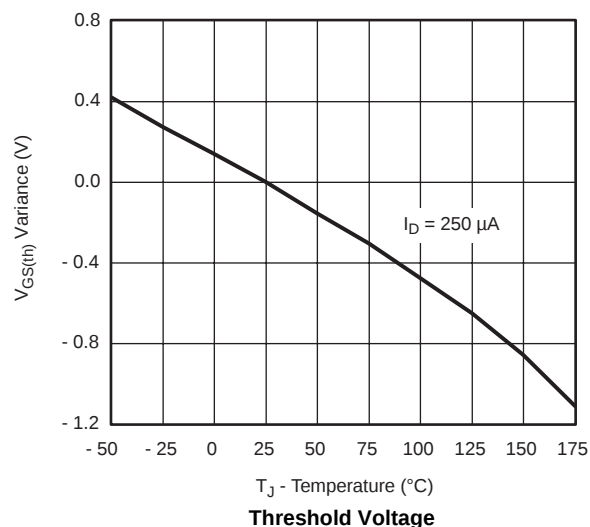
On-Resistance vs. Junction Temperature



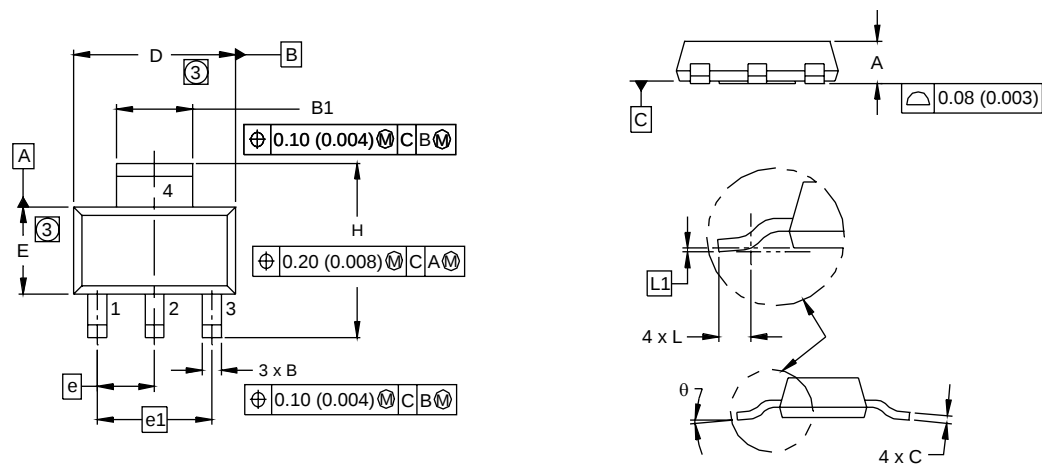
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted


SOT-223 (HIGH VOLTAGE)



| DIM. | MILLIMETERS |      | INCHES     |       |
|------|-------------|------|------------|-------|
|      | MIN.        | MAX. | MIN.       | MAX.  |
| A    | 1.55        | 1.80 | 0.061      | 0.071 |
| B    | 0.65        | 0.85 | 0.026      | 0.033 |
| B1   | 2.95        | 3.15 | 0.116      | 0.124 |
| C    | 0.25        | 0.35 | 0.010      | 0.014 |
| D    | 6.30        | 6.70 | 0.248      | 0.264 |
| E    | 3.30        | 3.70 | 0.130      | 0.146 |
| e    | 2.30 BSC    |      | 0.0905 BSC |       |
| e1   | 4.60 BSC    |      | 0.181 BSC  |       |
| H    | 6.71        | 7.29 | 0.264      | 0.287 |
| L    | 0.91        | -    | 0.036      | -     |
| L1   | 0.061 BSC   |      | 0.0024 BSC |       |
| θ    | -           | 10°  | -          | 10°   |

- Notes**
1. Dimensioning and tolerancing per ASME Y14.5M-1994.
  2. Dimensions are shown in millimeters (inches).
  3. Dimension do not include mold flash.
  4. Outline conforms to JEDEC outline TO-261AA.

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