# MOSFET – Power, Single P-Channel, POWERTRENCH®

**−20 V, −11 A, 13 mΩ**

# FDMA008P20LZ

### General Description

This device is designed specifically for battery charge or load switching in cellular handset and other ultraportable applications. It features a MOSFET with low on−state resistance and zener diode protection against ESD.

The WDFN6 (MicroFET 2.05×2.05) package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

### Features

- Max $r_{DS(on)}$ = 13 mΩ at $V_{GS}$ = −4.5 V, $I_D$ = −2.5 A
- Max $r_{DS(on)}$ = 16 mΩ at $V_{GS}$ = −2.5 V, $I_D$ = −1.4 A
- Max $r_{DS(on)}$ = 20 mΩ at $V_{GS}$ = −1.8 V, $I_D$ = −1.0 A
- Max $r_{DS(on)}$ = 30 mΩ at $V_{GS}$ = −1.5 V, $I_D$ = −0.85 A
- Low Profile − 0.8 mm Maximum − in the New Package WDFN6 (MicroFET 2.05 × 2.05 mm)
- HBM ESD Protection Level > 1 kV Typical (Note 3)
- Free from Halogenated Compounds and Antimony Oxides
- RoHS Compliant

### MOSFET MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted)

| Symbol | Parameter | | Ratings | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | | −20 | V |
| $V_{GS}$ | Gate to Source Voltage | | ±8 | V |
| $I_D$ | Drain Current | Continuous (Note 1a) | −11 | A |
| | | Pulsed (Note 5) | −164 | |
| $E_{AS}$ | Single Pulse Avalanche Energy (Note 4) | | 54 | mJ |
| $P_D$ | Power Dissipation | (Note 1a) | 2.4 | W |
| | | (Note 1b) | 0.9 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | −55 to +150 | °C |

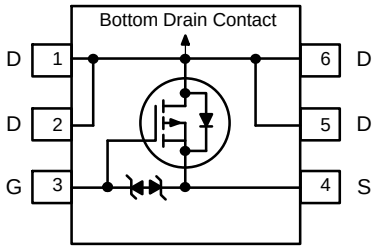
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

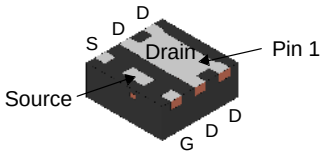
### THERMAL CHARACTERITICS

| Symbol | Parameter | | Ratings | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 52 | °C/W |
| | | (Note 1b) | 145 | |

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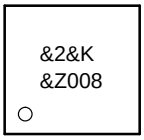



(Bottom View)

**WDFN6 2.05x2.05, 0.65P**
**CASE 483AV**

### MARKING DIAGRAM




&2 = Date Code
&K = Lot Code
&Z = Assembly Plant Code
008 = Specific Device Code

### ORDERING INFORMATION

| Device Marking | Device | Package | Shipping† |
|---|---|---|---|
| 008 | FDMA008P20LZ | WDFN6 (Pb−Free) | 3000 Units/ 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.

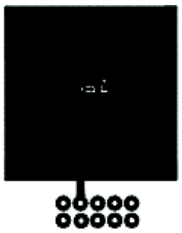
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**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

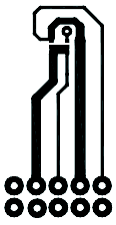
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = −250 μA, $V_{GS}$ = 0 V | −20 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = −250 μA, referenced to 25°C | | −16 | | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = −16 V, $V_{GS}$ = 0 V | | | −1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±8 V, $V_{DS}$ = 0 V | | | ±1 | μA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = −250 μA | −0.4 | −0.65 | −1.4 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = −250 μA, referenced to 25°C | | 3 | | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = −4.5 V, $I_D$ = −2.5 A | | 10 | 13 | mΩ |
| | | $V_{GS}$ = −2.5 V, $I_D$ = −1.4 A | | 12 | 16 | |
| | | $V_{GS}$ = −1.8 V, $I_D$ = −1.0 A | | 15 | 20 | |
| | | $V_{GS}$ = −1.5 V, $I_D$ = −0.85 A | | 20 | 30 | |
| | | $V_{GS}$ = −4.5 V, $I_D$ = −2.5 A, $T_J$ = 125°C | | 12.8 | | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = −5 V, $I_D$ = −2.5 A | | 26 | | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = −10 V, $V_{GS}$ = 0 V, f = 1 MHz | | 3131 | 4383 | pF |
| $C_{oss}$ | Output Capacitance | | | 424 | 594 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 386 | 540 | |
| $R_g$ | Gate Resistance | | | 13 | 25 | Ω |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{d(on)}$ | Turn−On Delay Time | $V_{DD}$ = −10 V, $I_D$ = −2.5 A, $V_{GS}$ = −4.5 V, $R_{GEN}$ = 6 Ω | | 12 | 21 | ns |
| $t_r$ | Rise Time | | | 17 | 30 | |
| $t_{d(off)}$ | Turn−Off Delay Time | | | 239 | 382 | |
| $t_f$ | Fall Time | | | 96 | 153 | |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = −4.5 V, $V_{DD}$ = −10 V, $I_D$ = −2.5 A | | 28 | 39 | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | | 3.6 | | |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | | 6.2 | | |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | |
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = −2 A (Note 2) | | −0.6 | −1.2 | V |
| | | $V_{GS}$ = 0 V, $I_S$ = −2.5 A (Note 2) | | −0.8 | −1.3 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = −6.8 A, di/dt = 100 A/μS | | 28 | 46 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 10 | 17 | nC |

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.

1. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.



a. 52 °C/W when mounted on a 1 $in^2$ pad of 2 oz copper



b. 145 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. The diode connected between the gate and the source serves only as protection against ESD. No gate overvoltage rating is implied.
4. $E_{AS}$ of 54 mJ is based on starting $T_J$ = 25°C, L = 3 mH, $I_{AS}$ = 6 A, $V_{DD}$ = 20 V, $V_{GS}$ = 4.5 V. 100% test at L = 0.1 mH, $I_{AS}$ = 19 A.
5. Pulsed Id please refer to Figure 10. SOA curve for more details.

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

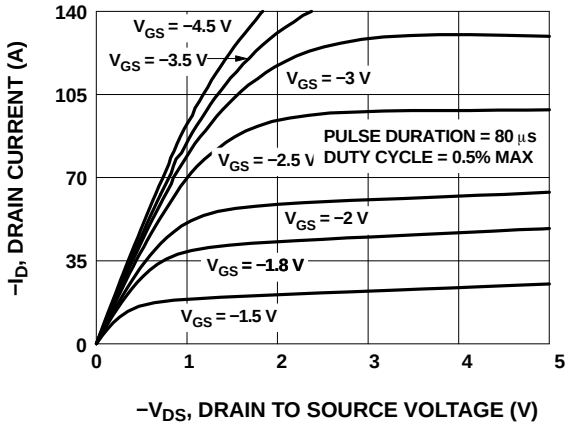



**Figure 1. On−Region Characteristics**

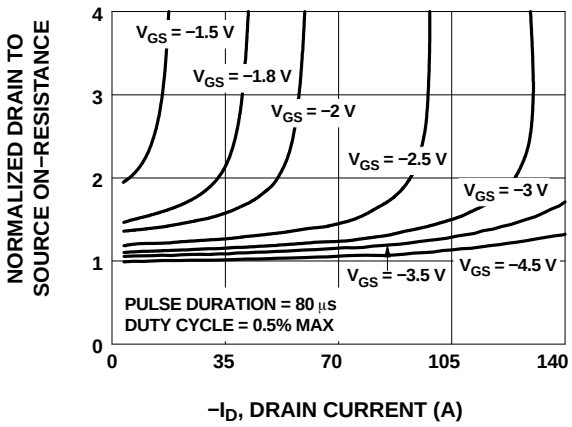



**Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage**

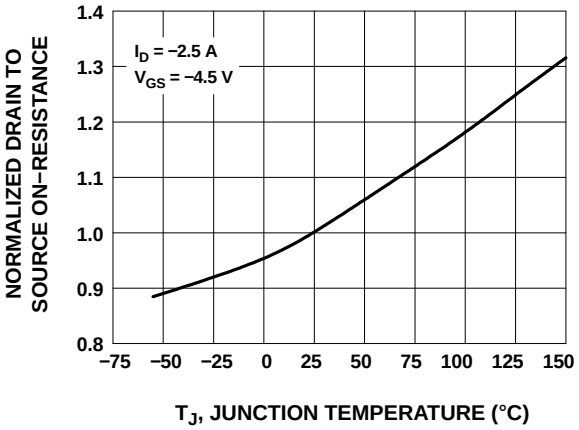



**Figure 3. Normalized On−Resistance vs. Junction Temperature**

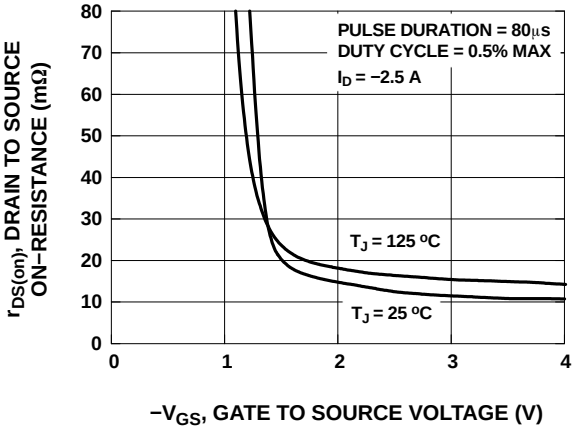



**Figure 4. On−Resistance vs. Gate to Source Voltage**

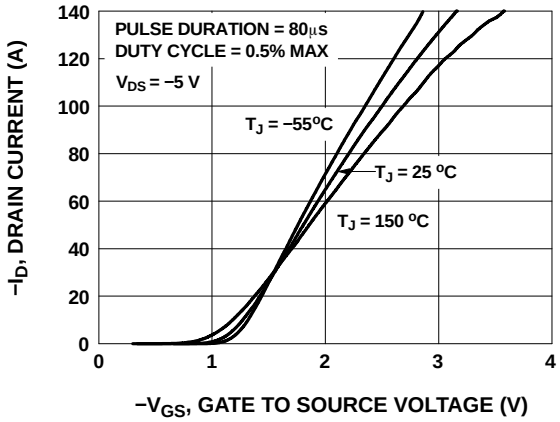



**Figure 5. Transfer Characteristics**

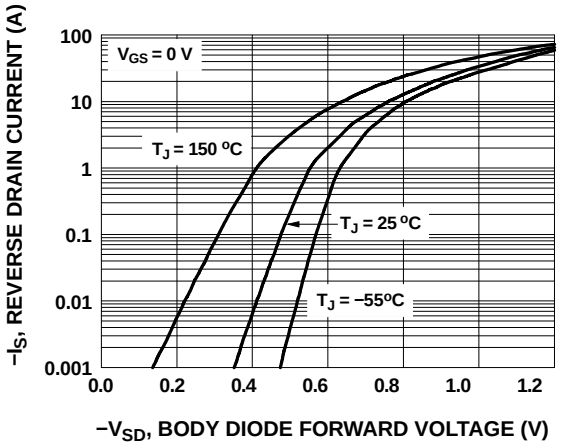



**Figure 6. Source to Drain Diode Forward Voltage vs. Source Current**

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted) (continued)

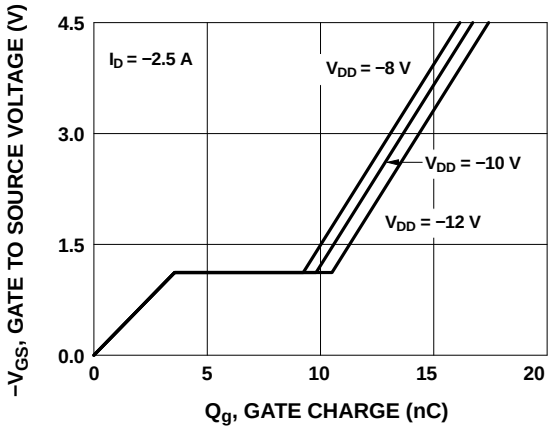



**Figure 7. Gate Charge Characteristics**

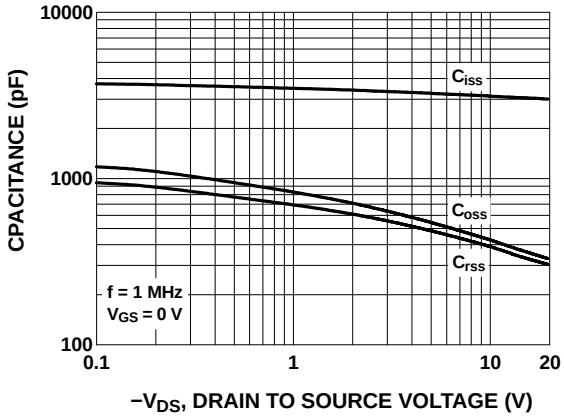



**Figure 8. Capacitance vs. Drain to Source Voltage**

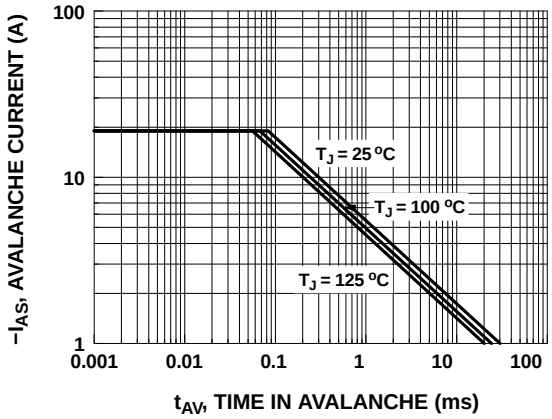



**Figure 9. Unclamped Inductive Switching Capability**

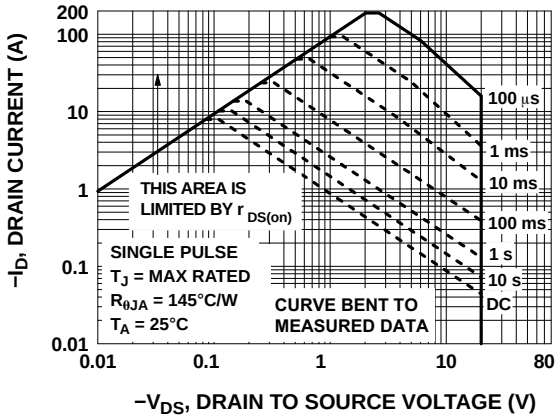



**Figure 10. Forward Bias Safe Operating Area**

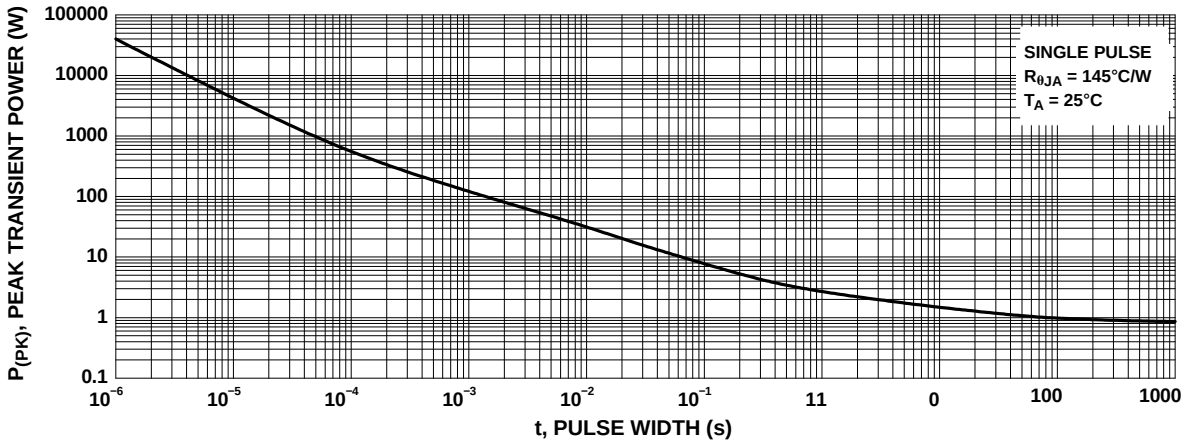



**Figure 11. Single Pulse Maximum Power Dissipation**

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted) (continued)

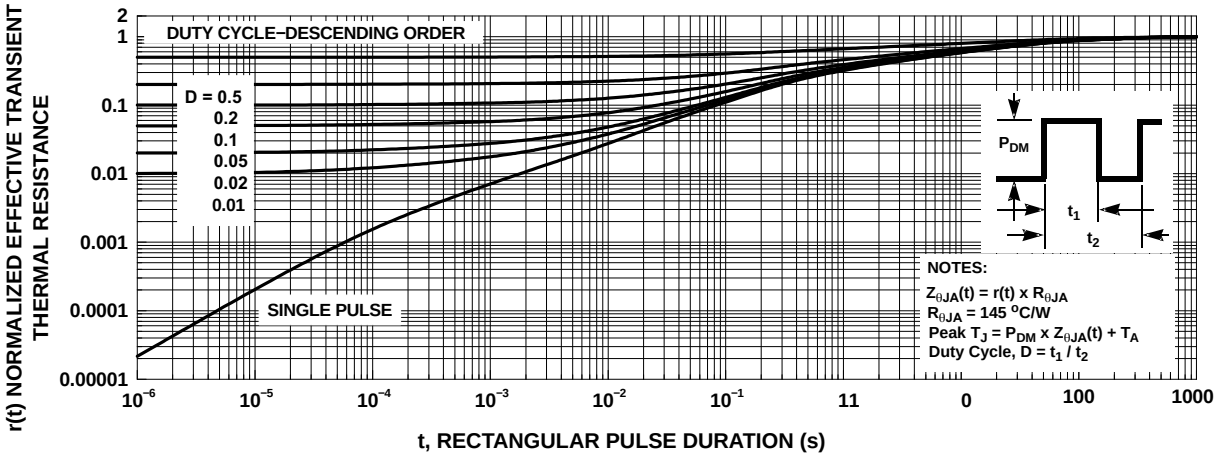
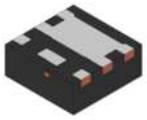


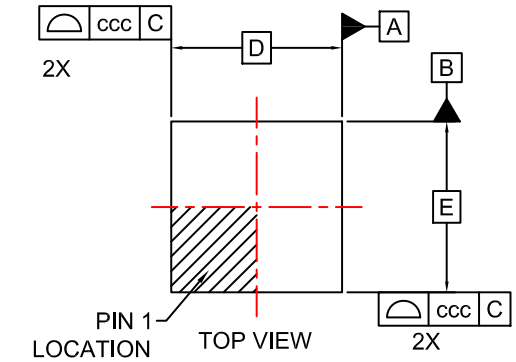

**Figure 12. Junction−to−Ambient Transient Thermal Response Curve**

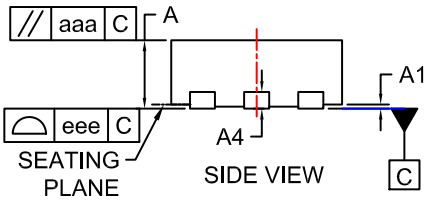
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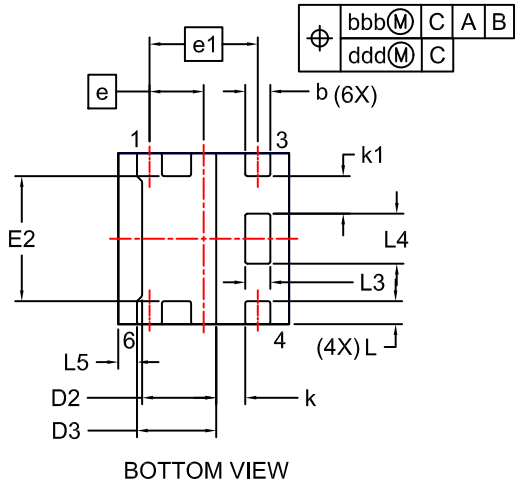


**WDFN6 2.05X2.05, 0.65P**
CASE 483AV
ISSUE A

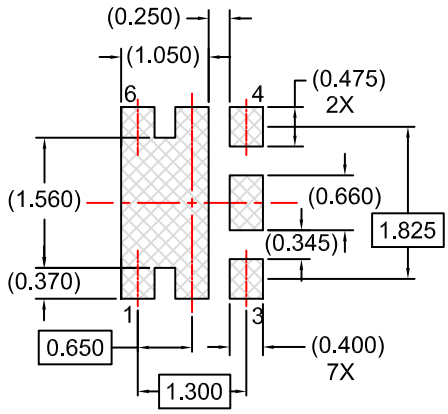
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NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS.
2. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.60 | 0.70 | 0.80 |
| A1 | 0.00 | - | 0.05 |
| A4 | | (0.20) | |
| b | 0.25 | 0.30 | 0.35 |
| D | 1.95 | 2.05 | 2.15 |
| D2 | 0.84 | 0.89 | 0.94 |
| D3 | | (0.95) | |
| E | 1.95 | 2.05 | 2.15 |
| E2 | 1.45 | 1.50 | 1.55 |
| e | | 0.65 BSC | |
| e1 | | 1.30 BSC | |
| k | | (0.35) | |
| k1 | | (0.45) | |
| L | 0.18 | 0.28 | 0.38 |
| L3 | 0.25 | 0.30 | 0.35 |
| L4 | 0.55 | 0.60 | 0.65 |
| L5 | | (0.23) | |
| aaa | | 0.10 | |
| bbb | | 0.10 | |
| ccc | | 0.05 | |
| ddd | | 0.05 | |
| eee | | 0.05 | |

| | | | |
|---|---|---|---|
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