

# MOSFET – P-Channel POWERTRENCH®

**-20 V, -6 A, 37 mΩ**

## FDME510PZT

### General Description

This device is designed specifically for battery charging or load switching in cellular handset and other ultraportable applications. It features a MOSFET with low on-state resistance.

The MicroFET™ 1.6x1.6 Thin package offers exceptional thermal performance for its physical size and is well suited to switching and linear mode applications.

### Features

- Max  $r_{DS(on)}$  = 37 mΩ at  $V_{GS} = -4.5$  V,  $I_D = -5$  A
- Max  $r_{DS(on)}$  = 50 mΩ at  $V_{GS} = -2.5$  V,  $I_D = -4$  A
- Max  $r_{DS(on)}$  = 65 mΩ at  $V_{GS} = -1.8$  V,  $I_D = -3$  A
- Max  $r_{DS(on)}$  = 100 mΩ at  $V_{GS} = -1.5$  V,  $I_D = -2$  A
- Low Profile: 0.55 mm Maximum in the New Package MicroFET 1.6x1.6 Thin
- Free from Halogenated Compounds and Antimony Oxides
- HBM ESD Protection Level > 2400 V (Note 3)
- These Devices are Pb-Free and are RoHS Compliant

### MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , Unless otherwise specified)

| Symbol         | Parameter                                                                                                                  | Ratings     | Unit             |
|----------------|----------------------------------------------------------------------------------------------------------------------------|-------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                                                                                                    | -20         | V                |
| $V_{GS}$       | Gate to Source Voltage                                                                                                     | $\pm 8$     | V                |
| $I_D$          | Drain Current<br>Continuous ( $T_A = 25^\circ\text{C}$ ) (Note 1a)<br>Pulsed                                               | -6<br>-15   | A                |
| $P_D$          | Power Dissipation for Single Operation<br>( $T_A = 25^\circ\text{C}$ ) (Note 1a)<br>( $T_A = 25^\circ\text{C}$ ) (Note 1b) | 2.1<br>0.7  | W                |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range                                                                           | -55 to +150 | $^\circ\text{C}$ |

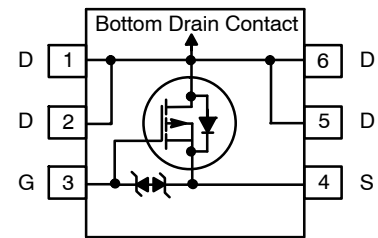
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

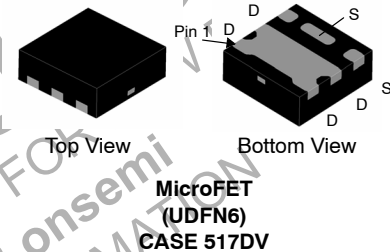
| Symbol          | Parameter                                         | Ratings | Unit               |
|-----------------|---------------------------------------------------|---------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 60      | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1b) | 175     | $^\circ\text{C/W}$ |

| $V_{DS}$ | $I_D$ MAX | $R_{DS(on)}$ MAX |
|----------|-----------|------------------|
| -20 V    | -6 A      | 37 mΩ            |

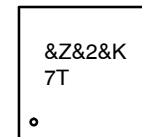
### ELECTRICAL CONNECTION



P-Channel MOSFET



### MARKING DIAGRAM



- &Z = Assembly Plant Code
- &2 = 2-Digit Date Code (YW)
- &K = 2-Digit Lot Traceability Code
- 7T = Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# FDME510PZT

## PACKAGE MARKING AND ORDERING INFORMATION

| Device Marking | Device     | Package                                          | Shipping†                 |
|----------------|------------|--------------------------------------------------|---------------------------|
| 7T             | FDME510PZT | MicroFET 1.6x1.6 Thin<br>(Pb-Free / Halide Free) | 5,000 units / 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](#).

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------------|-----|-----|-----|------|
|--------|-----------|-----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                     |                                           |                                                 |     |     |     |       |
|-------------------------------------|-------------------------------------------|-------------------------------------------------|-----|-----|-----|-------|
| BV <sub>DSS</sub>                   | Drain to Source Breakdown Voltage         | I <sub>D</sub> = -250 μA, V <sub>GS</sub> = 0 V | -20 | -   | -   | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Breakdown Voltage Temperature Coefficient | I <sub>D</sub> = -250 μA, referenced to 25°C    | -   | -13 | -   | mV/°C |
| I <sub>DSS</sub>                    | Zero Gate Voltage Drain Current           | V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V  | -   | -   | -1  | μA    |
| I <sub>GSS</sub>                    | Gate to Source Leakage Current            | V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0 V   | -   | -   | ±10 | μA    |

### ON CHARACTERISTICS

|                                       |                                                          |                                                                                                                                                                                                                                                                                     |      |                            |                             |       |
|---------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------|-----------------------------|-------|
| V <sub>GS(th)</sub>                   | Gate to Source Threshold Voltage                         | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA                                                                                                                                                                                                                        | -0.4 | -0.5                       | -1.0                        | V     |
| ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub> | Gate to Source Threshold Voltage Temperature Coefficient | I <sub>D</sub> = -250 μA, referenced to 25°C                                                                                                                                                                                                                                        | -    | 3                          | -                           | mV/°C |
| r <sub>DS(on)</sub>                   | Drain to Source On Resistance                            | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5 A<br>V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -4 A<br>V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -3 A<br>V <sub>GS</sub> = -1.5 V, I <sub>D</sub> = -2 A<br>V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5 A, T <sub>J</sub> = 125°C | -    | 31<br>38<br>48<br>57<br>40 | 37<br>50<br>65<br>100<br>60 | mΩ    |
| g <sub>FS</sub>                       | Forward Transconductance                                 | V <sub>DS</sub> = -5 V, I <sub>D</sub> = -5 A                                                                                                                                                                                                                                       | -    | 21                         | -                           | S     |

### DYNAMIC CHARACTERISTICS

|                  |                              |                                                              |   |      |      |    |
|------------------|------------------------------|--------------------------------------------------------------|---|------|------|----|
| C <sub>iss</sub> | Input Capacitance            | V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V,<br>f = 1 MHz | - | 1120 | 1490 | pF |
| C <sub>oss</sub> | Output Capacitance           |                                                              | - | 155  | 210  | pF |
| C <sub>rss</sub> | Reverse Transfer Capacitance |                                                              | - | 140  | 210  | pF |

### SWITCHING CHARACTERISTICS

|                     |                               |                                                                                                     |   |     |     |    |
|---------------------|-------------------------------|-----------------------------------------------------------------------------------------------------|---|-----|-----|----|
| t <sub>d(on)</sub>  | Turn-On Delay Time            | V <sub>DD</sub> = -10 V, I <sub>D</sub> = -5 A,<br>V <sub>GS</sub> = -4.5 V, R <sub>GEN</sub> = 6 Ω | - | 6.5 | 13  | ns |
| t <sub>r</sub>      | Rise Time                     |                                                                                                     | - | 10  | 16  | ns |
| t <sub>d(off)</sub> | Turn-Off Delay Time           |                                                                                                     | - | 93  | 149 | ns |
| t <sub>f</sub>      | Fall Time                     |                                                                                                     | - | 54  | 86  | ns |
| Q <sub>g</sub>      | Total Gate Charge             | V <sub>DD</sub> = -10 V, I <sub>D</sub> = -5 A<br>V <sub>GS</sub> = -4.5 V                          | - | 16  | 22  | nC |
| Q <sub>gs</sub>     | Gate to Source Gate Charge    |                                                                                                     | - | 1.6 | -   | nC |
| Q <sub>gd</sub>     | Gate to Drain "Miller" Charge |                                                                                                     | - | 4   | -   | nC |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                 |                                       |                                                         |   |      |      |    |
|-----------------|---------------------------------------|---------------------------------------------------------|---|------|------|----|
| V <sub>SD</sub> | Source to Drain Diode Forward Voltage | V <sub>GS</sub> = 0 V, I <sub>S</sub> = -1.6 A (Note 2) | - | -0.6 | -1.2 | V  |
| t <sub>rr</sub> | Reverse Recovery Time                 | I <sub>F</sub> = -5 A, di/dt = 100 A/μs                 | - | 38   | 61   | ns |
| Q <sub>rr</sub> | Reverse Recovery Charge               |                                                         | - | 16   | 29   | 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.

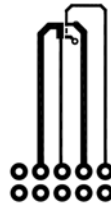
## FDME510PZT

### NOTES:

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is determined by the user's board design.



- a) 60°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



- b) 175°C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300  $\mu$ s, Duty cycle < 2.0%.
3. The diode connected between the gate and source serves only as protection ESD. No gate overvoltage rating is implied.

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THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
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TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

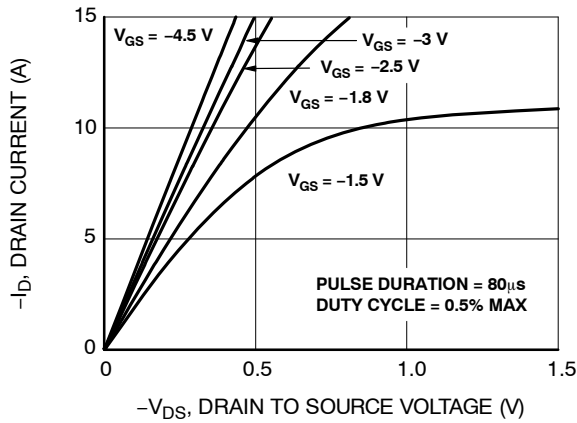


Figure 1. On-Region Characteristics

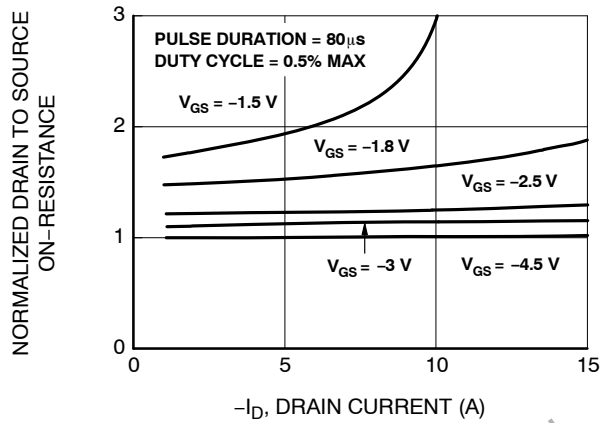


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

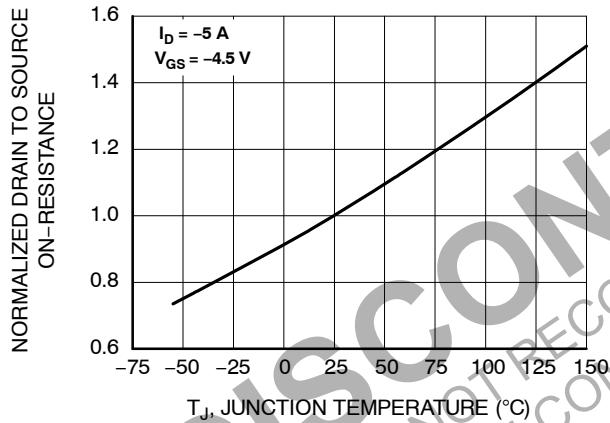


Figure 3. Normalized On Resistance vs. Junction Temperature

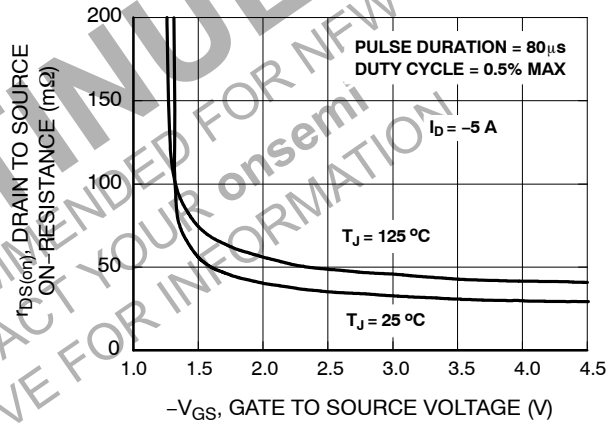


Figure 4. On-Resistance vs. Gate to Source Voltage

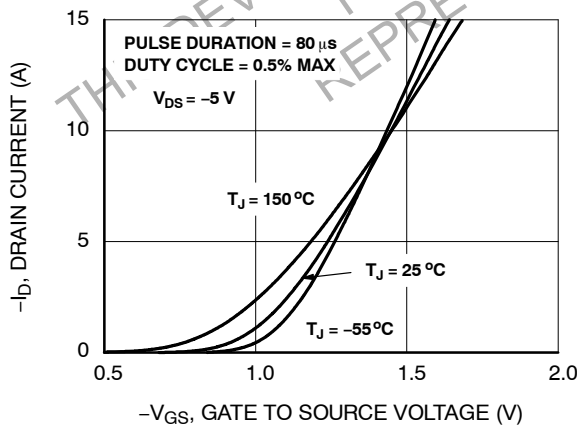


Figure 5. Transfer Characteristics

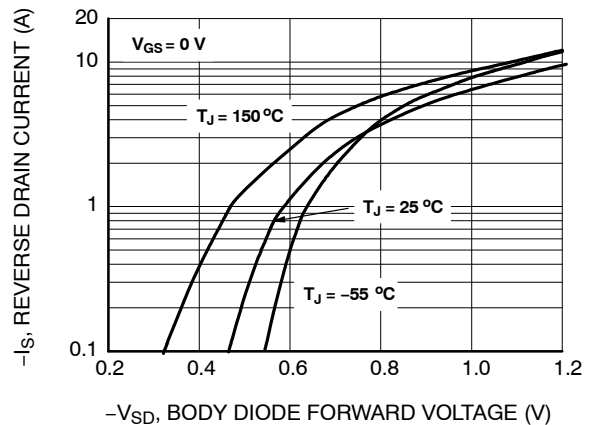


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise noted) (continued)

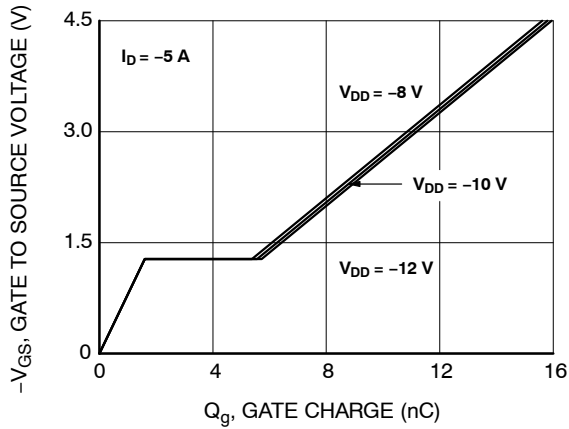


Figure 7. Gate Charge Characteristics

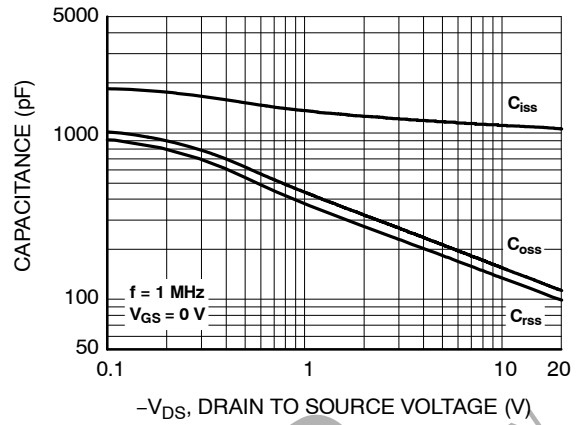


Figure 8. Capacitance vs. Drain to Source Voltage

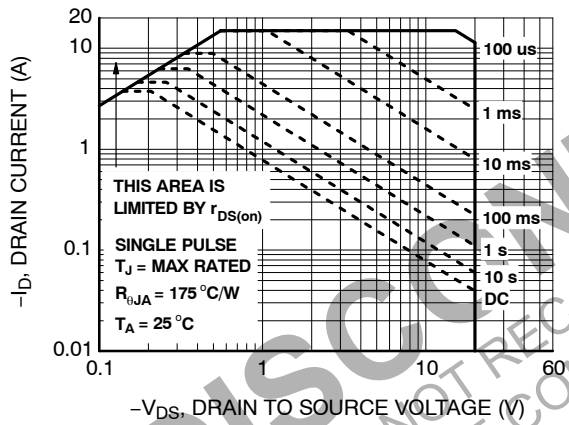


Figure 9. Forward Bias Safe Operating Area

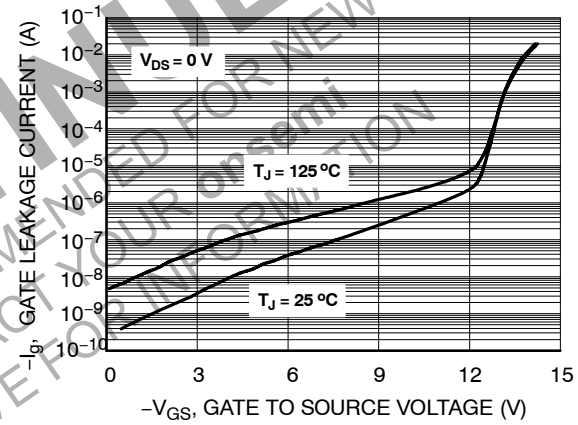


Figure 10. Gate Leakage Current vs. Gate to Source Voltage

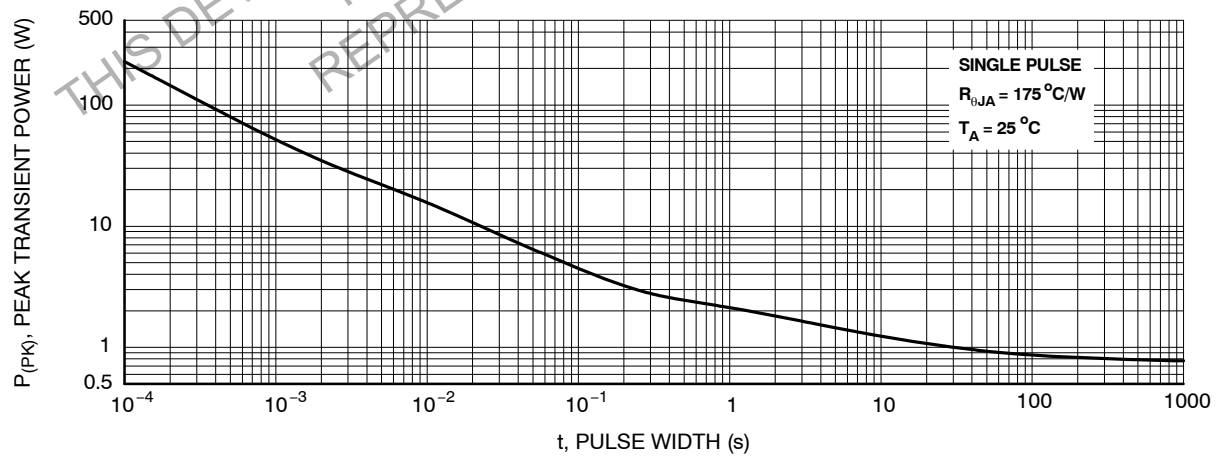


Figure 11. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise noted) (continued)

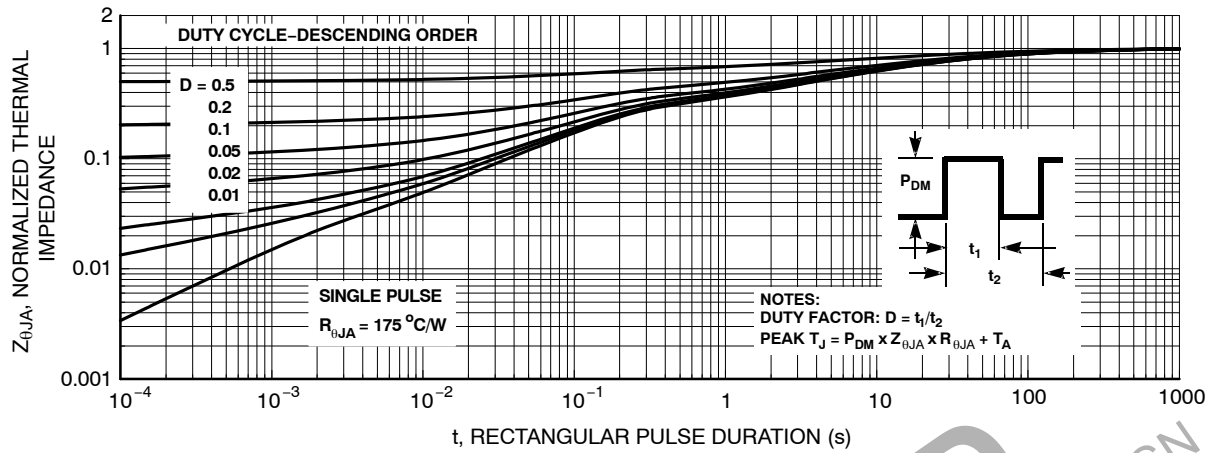
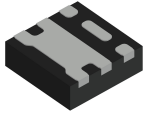


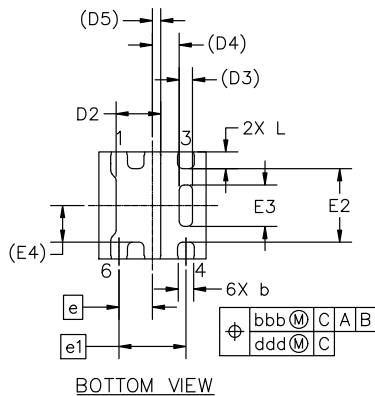
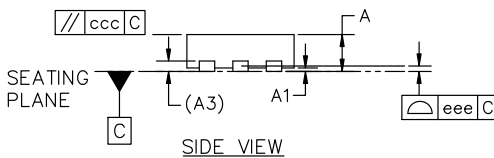
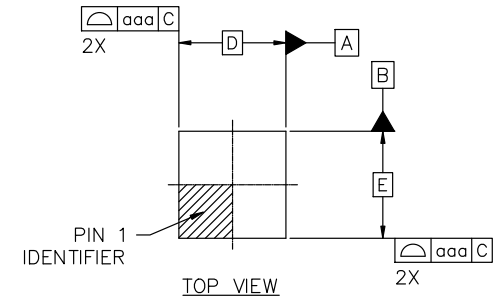
Figure 12. Junction-to-Ambient Transient Thermal Response Curve

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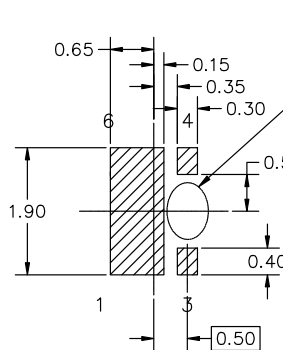
**UDFN6 1.60x1.60x0.50, 0.50P**  
**CASE 517DV**  
**ISSUE A**

DATE 31 OCT 2024

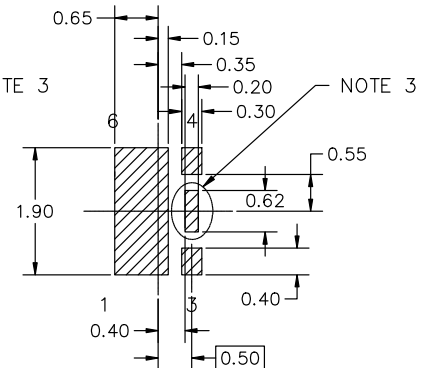


| MILLIMETERS |           |      |      |
|-------------|-----------|------|------|
| DIM         | MIN       | NOM  | MAX  |
| A           | 0.45      | 0.50 | 0.55 |
| A1          | 0.00      | 0.02 | 0.05 |
| A3          | 0.15 REF  |      |      |
| D           | 1.60 BSC  |      |      |
| D2          | 0.62      | 0.67 | 0.72 |
| D3          | 0.20 REF  |      |      |
| D4          | 0.40 REF  |      |      |
| D5          | 0.125 REF |      |      |
| E           | 1.60 BSC  |      |      |
| E2          | 1.05      | 1.10 | 1.15 |
| E3          | 0.57      | 0.62 | 0.67 |
| E4          | 0.55 REF  |      |      |
| b           | 0.20      | 0.25 | 0.30 |
| e           | 0.50 BSC  |      |      |
| e1          | 1.00 BSC  |      |      |
| L           | 0.20      | 0.25 | 0.30 |

| TOLERANCE FORM AND POSITION |      |
|-----------------------------|------|
| aaa                         | 0.10 |
| bbb                         | 0.10 |
| ccc                         | 0.10 |
| ddd                         | 0.05 |
| eee                         | 0.08 |



Option 1



Option 2

**NOTES:**

1. DIMENSIONING AND TOLERANCING AS PER ASMEY14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NO VIAS OR TRACES ALLOWED IN THE AREA

**RECOMMENDED MOUNTING FOOTPRINT**

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference manual. SOLDERM/D.

|                         |                                    |                                                                                                                                                                                  |
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| <b>DESCRIPTION:</b>     | <b>UDFN6 1.60x1.60x0.50, 0.50P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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