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October 2016

# FDMA008P20LZ

## Single P-Channel PowerTrench® MOSFET

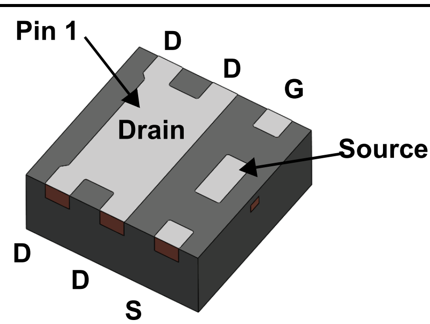
**-20 V, -2.5 A, 13 mΩ**

### Features

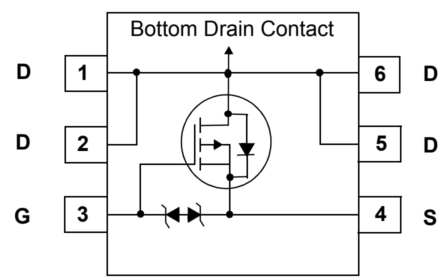
- Max $r_{DS(on)}$ = 13 mΩ at $V_{GS}$ = -4.5 V, $I_D$ = -2.5 A
- Max $r_{DS(on)}$ = 16 mΩ at $V_{GS}$ = -2.5 V, $I_D$ = -1.4 A
- Max $r_{DS(on)}$ = 20 mΩ at $V_{GS}$ = -1.8 V, $I_D$ = -1.0 A
- Max $r_{DS(on)}$ = 30 mΩ at $V_{GS}$ = -1.5 V, $I_D$ = -0.85 A
- Low Profile - 0.8 mm maximum in the new package MicroFET 2x2 mm
- HBM ESD protection level > 1k V typical (Note 3)
- Free from halogenated compounds and antimony oxides
- RoHS Compliant

### 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 MicroFET 2X2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.




MicroFET 2X2 (Bottom View)




## MOSFET Maximum Ratings $T_A$ = 25 °C unless otherwise noted

| Symbol | Parameter | | | Ratings | Units |
|---|---|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | | | -20 | V |
| $V_{GS}$ | Gate to Source Voltage | | | ±8 | V |
| $I_D$ | -Continuous | $T_A$ = 25°C | (Note 1a) | -2.5 | A |
| | -Pulsed | | (Note 5) | -164 | |
| $E_{AS}$ | Single Pluse Avalanche Energy | | (Note 4) | 54 | mJ |
| $P_D$ | Power Dissipation | $T_A$ = 25°C | (Note 1a) | 2.4 | W |
| | Power Dissipation | $T_A$ = 25°C | (Note 1b) | 0.9 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | | -55 to +150 | °C |

### Thermal Characteristics

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

### Package Marking and Ordering Information

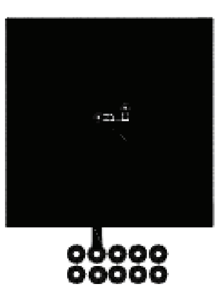
| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDMA008P20LZ | FDMA008P20LZ | MicroFET 2X2 | 7” | 8 mm | 3000 units |

## Electrical Characteristics $T_J$ = 25 °C unless otherwise noted

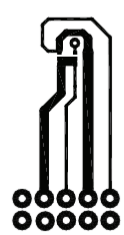
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = -250 μA, $V_{GS}$ = 0 V | -20 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature 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 | $V_{DD}$ = -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 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 386 | 540 | pF |
| $R_g$ | 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 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 239 | 382 | ns |
| $t_f$ | Fall Time | | | 96 | 153 | ns |
| $Q_g$ | 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 Charge | | | 3.6 | | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | | 6.2 | | nC |
| **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 | $I_F$ = -2.5 A, di/dt = 100 A/μs | | 28 | 46 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 10 | 17 | nC |

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in$^2$ pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



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 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 Fig.10 SOA curve for more details.

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

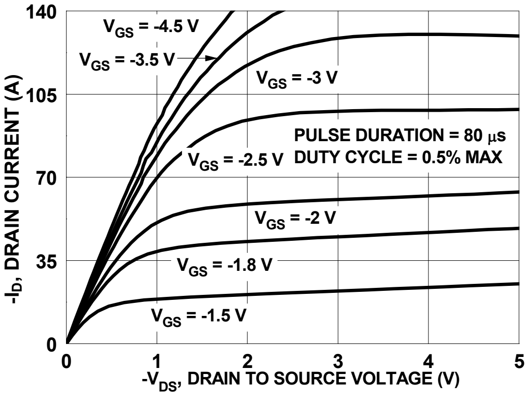



Figure 1. On-Region Characteristics

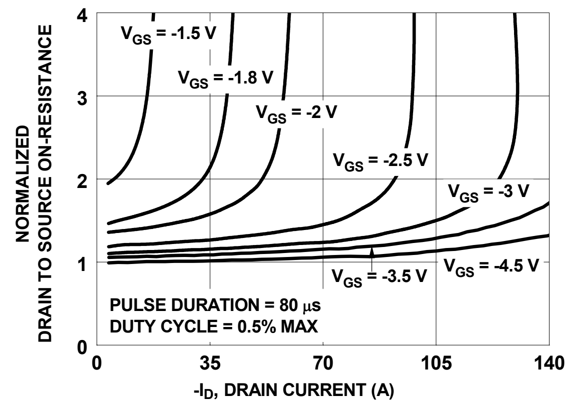



Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

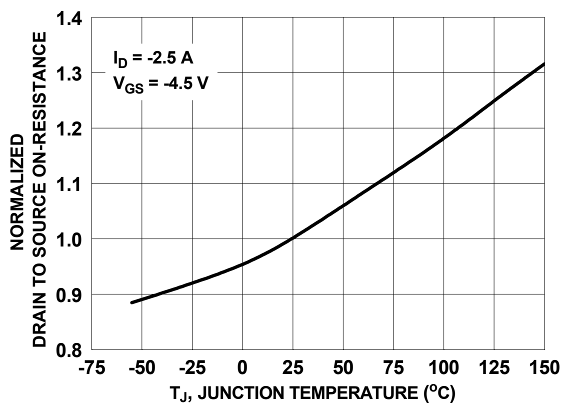



Figure 3. Normalized On-Resistance vs Junction Temperature

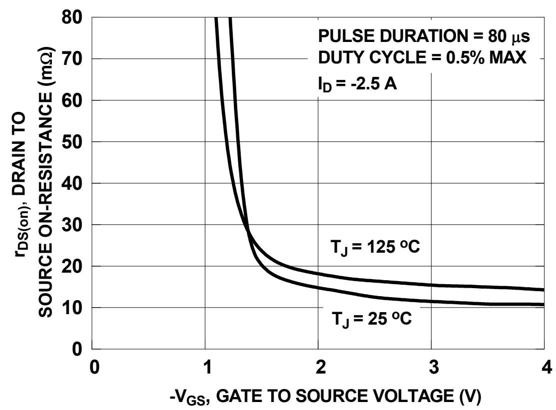



Figure 4. On-Resistance vs Gate to Source Voltage

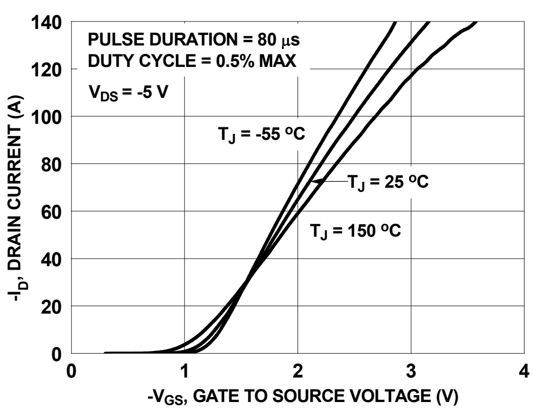



Figure 5. Transfer Characteristics

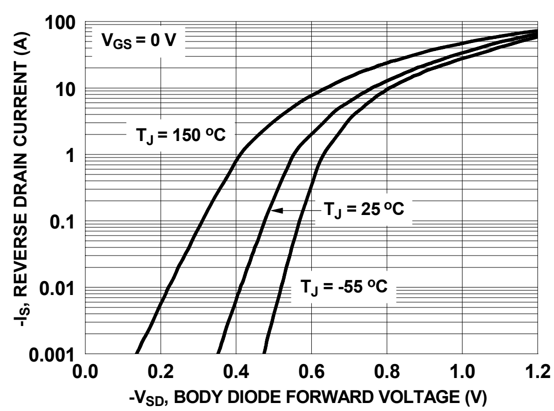



Figure 6. Source to Drain Diode Forward Voltage vs Source Current

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

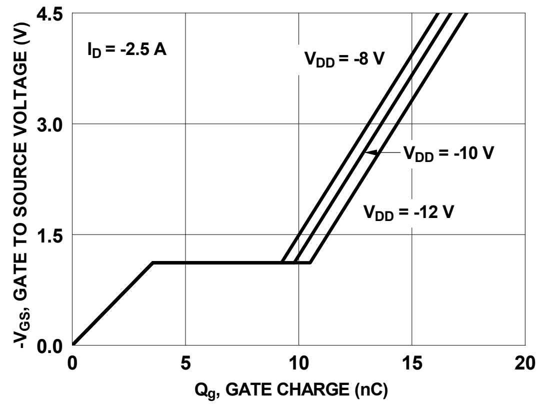



**Figure 7. Gate Charge Characteristics**

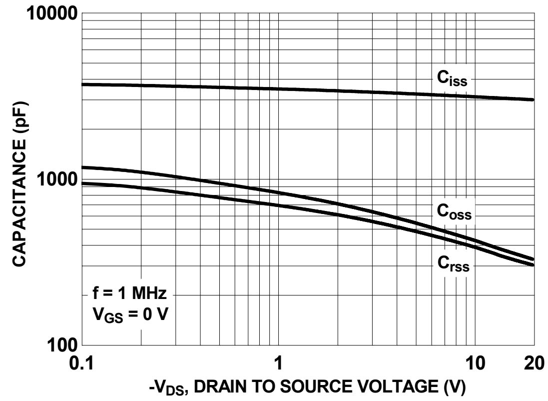



**Figure 8. Capacitance vs Drain to Source Voltage**

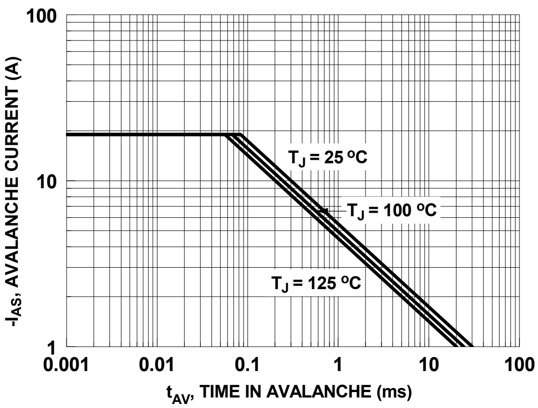



**Figure 9. Unclamped Inductive Switching Capability**

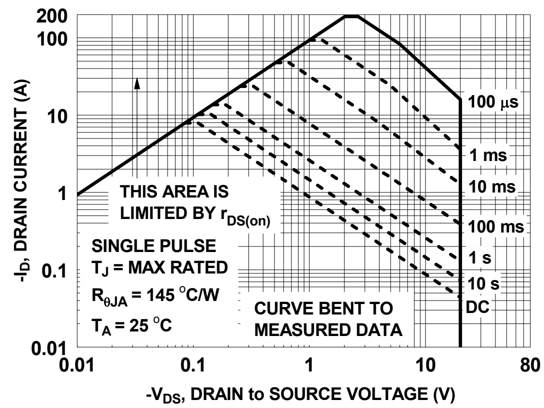



**Figure 10. Forward Bias Safe Operating Area**

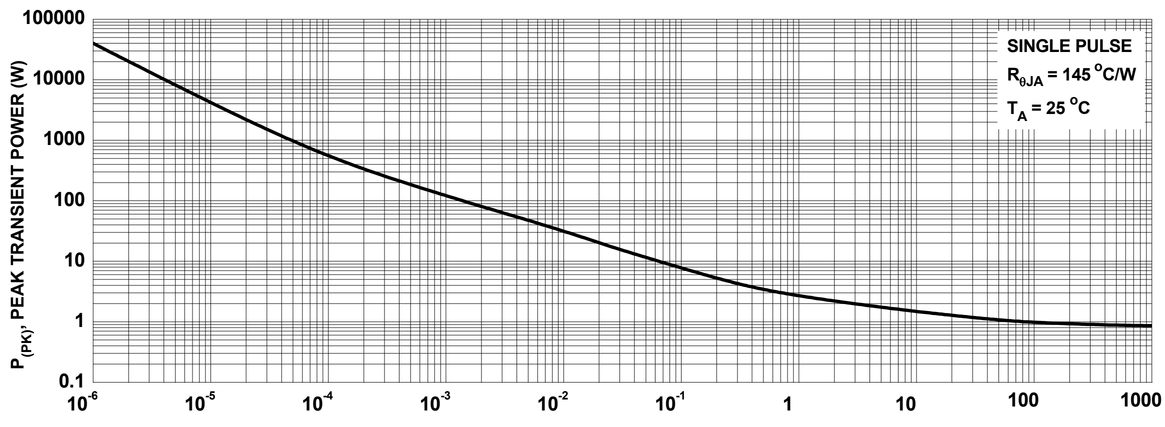



**Figure 11. Single Pulse Maximum Power Dissipation**

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

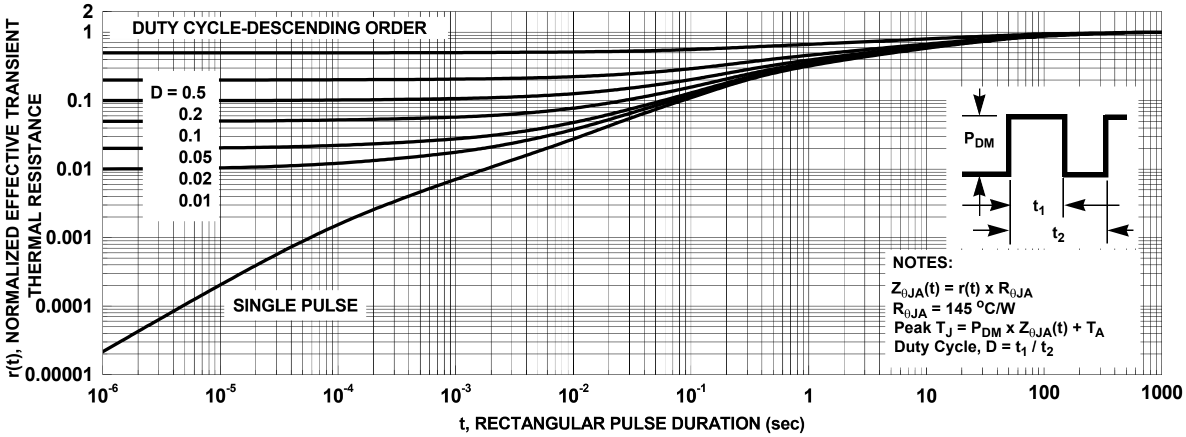
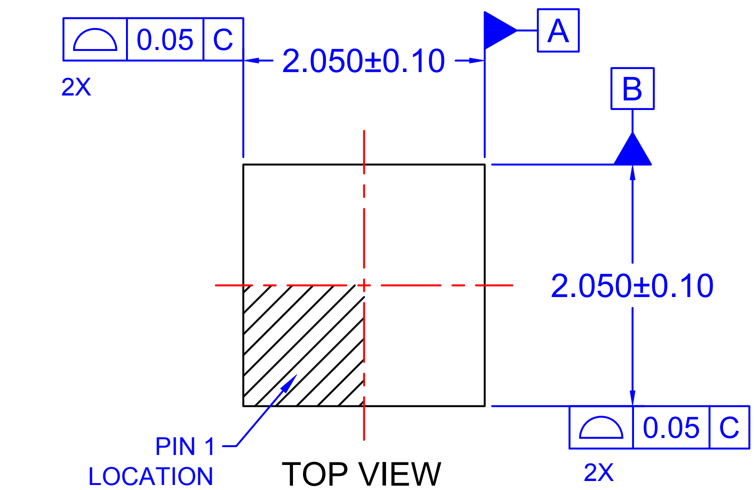
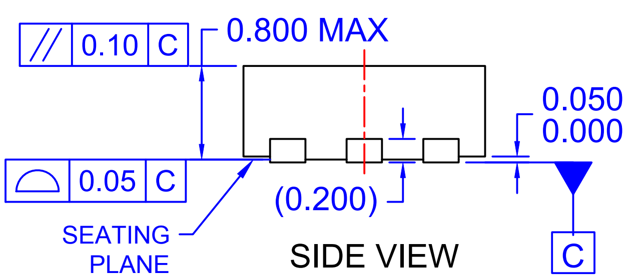
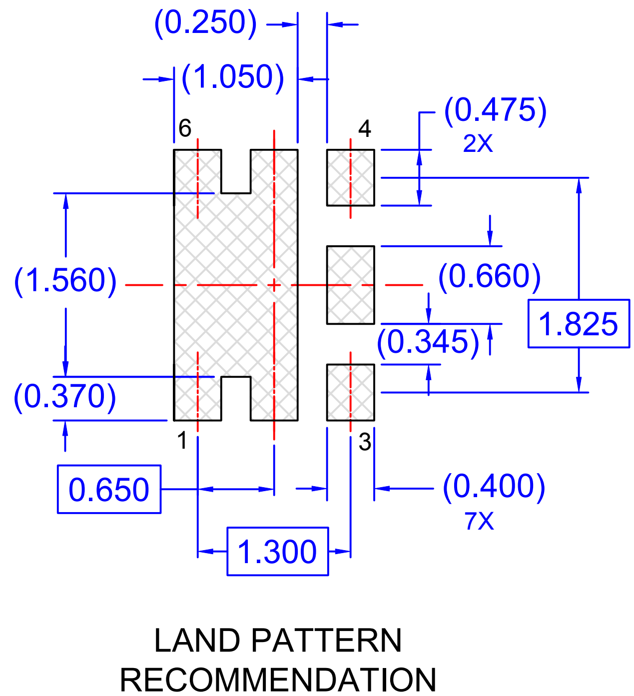
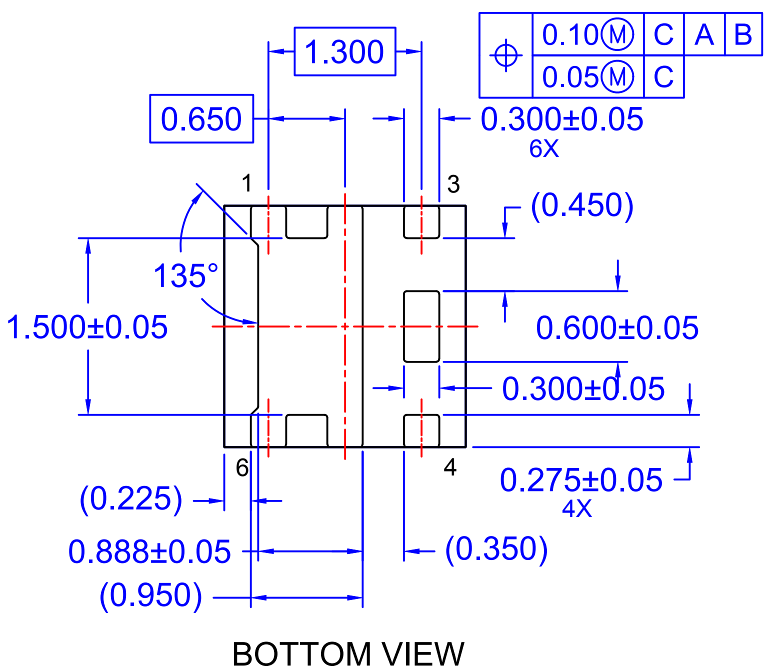



**Figure 12. Junction-to-Ambient Transient Thermal Response Curve**




NOTES:

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