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FDMA1430JP

Integrated P-Channel PowerTrench[®] MOSFET and BJT -30 V, -2.9 A, 90 mΩ

Features

- Max $r_{DS(on)}$ = 90 mΩ at $V_{GS} = -4.5$ V, $I_D = -2.9$ A
- Max $r_{DS(on)}$ = 130 mΩ at $V_{GS} = -2.5$ V, $I_D = -2.6$ A
- Max $r_{DS(on)}$ = 170 mΩ at $V_{GS} = -1.8$ V, $I_D = -1.7$ A
- Max $r_{DS(on)}$ = 240 mΩ at $V_{GS} = -1.5$ V, $I_D = -1$ A
- Low profile - 0.8 mm maximum - in the new package MicroFET 2x2
- HBM ESD protection level > 2 kV typical (Note 3)
- RoHS Compliant

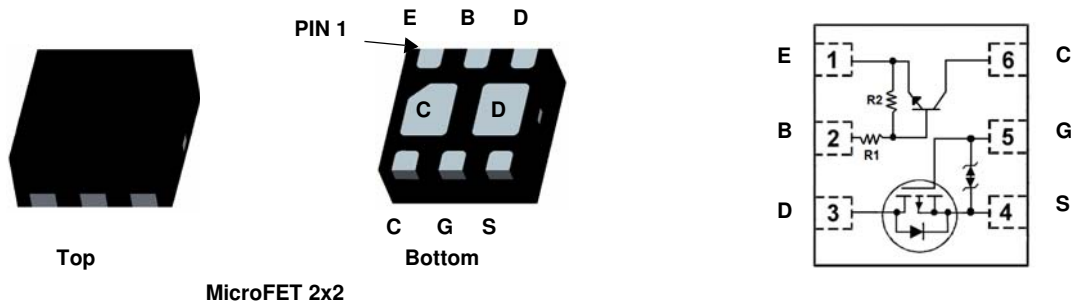


General Description

This device is designed specifically as a single package solution for loadswitching in cellular handset and other ultra-portable applications. It features a 50 V NPN BJT and a 30 V P-ch Trench MOSFET in the space saving MicroFET 2x2 package that offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

Application

- Loadswitching



Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Ratings | Units |
|----------------|--|------------------------------------|------------------|
| V_{DS} | Drain to Source Voltage | -30 | V |
| V_{GS} | Gate to Source Voltage | ± 8 | V |
| I_D | Drain Current -Continuous | $T_A = 25^\circ\text{C}$ (Note 1a) | -2.9 |
| | -Pulsed | | -12 |
| V_{CBO} | Collector-Base Voltage | (Note 4) | 50 |
| V_{CEO} | Collector-Emitter Voltage | (Note 5) | 50 |
| V_{EBO} | Emitter-Base Voltage | | 10 |
| I_C | Collector Current | | 100 |
| P_C | Collector Power Dissipation | | 200 |
| T_J | Junction Temperature | | 150 |
| P_D | Power Dissipation | $T_A = 25^\circ\text{C}$ (Note 1a) | 1.5 |
| | | $T_A = 25^\circ\text{C}$ (Note 1b) | 0.7 |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

Thermal Characteristics

| | | | | |
|-----------------|---|-----------|-----|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient(MOSFET) | (Note 1a) | 86 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient(MOSFET) | (Note 1b) | 173 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|------------|--------------|-----------|------------|------------|
| 143 | FDMA1430JP | MicroFET 2x2 | 7" | 8 mm | 5000 units |

Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

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

Off Characteristics

| | | | | | | |
|--------------------------------------|---|--|-----|-----|---------|----------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$ | -30 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ | | -23 | | mV/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = -24\text{ V}$, $V_{GS} = 0\text{ V}$ | | | -1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 8\text{ V}$, $V_{DS} = 0\text{ V}$ | | | ± 1 | μA |

On Characteristics

| | | | | | | |
|--|--|---|------|------|-----|----------------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$ | -0.4 | -0.6 | -1 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ | | 2.4 | | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = -4.5\text{ V}$, $I_D = -2.9\text{ A}$ | | 67 | 90 | m Ω |
| | | $V_{GS} = -2.5\text{ V}$, $I_D = -2.6\text{ A}$ | | 81 | 130 | |
| | | $V_{GS} = -1.8\text{ V}$, $I_D = -1.7\text{ A}$ | | 98 | 170 | |
| | | $V_{GS} = -1.5\text{ V}$, $I_D = -1\text{ A}$ | | 114 | 240 | |
| | | $V_{GS} = -4.5\text{ V}$, $I_D = -2.9\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$ | | 102 | 133 | |
| g_{FS} | Forward Transconductance | $V_{DS} = -5\text{ V}$, $I_D = -2.9\text{ A}$ | | 11 | | S |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|---|--|-----|-----|----|
| C_{iss} | Input Capacitance | $V_{DS} = -15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$ | | 438 | 580 | pF |
| C_{oss} | Output Capacitance | | | 47 | 70 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 41 | 60 | pF |

Switching Characteristics

| | | | | | | |
|--------------|-------------------------------|---|--|-----|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = -15\text{ V}$, $I_D = -1\text{ A}$, $V_{GS} = -4.5\text{ V}$, $R_{GEN} = 6\text{ }\Omega$ | | 4.8 | 10 | ns |
| t_r | Rise Time | | | 4.4 | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 67 | 107 | ns |
| t_f | Fall Time | | | 21 | 33 | ns |
| Q_g | Total Gate Charge | | | 7.2 | 10 | nC |
| Q_{gs} | Gate to Source Charge | $V_{DD} = -15\text{ V}$, $I_D = -2.9\text{ A}$, $V_{GS} = -4.5\text{ V}$ | | 0.7 | | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | | 1.6 | | nC |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|---------------------------------------|--|--|------|------|----|
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}$, $I_S = -1.1\text{ A}$ (Note 2) | | -0.7 | -1.2 | V |
| t_{rr} | Reverse Recovery Time | $I_F = -2.9\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ | | 16 | 29 | ns |
| Q_{rr} | Reverse Recovery Charge | | | 5 | 10 | nC |

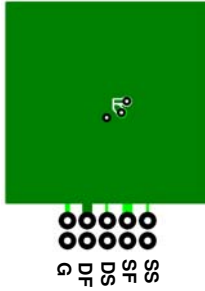
BJT Characteristics

| | | | | | | |
|---------------|--------------------------------------|--|-----|-----|-----|---------------|
| I_{CBO} | Collector Cut-off Current | $V_{CB} = 40\text{ V}$, $I_E = 0\text{ A}$ | | | 0.1 | μA |
| h_{FE} | DC Current Gain | $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$ | 68 | | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$ | | | 0.3 | V |
| f_T | Current Gain Bandwidth Product | $V_{CE} = 10\text{ V}$, $I_C = 5\text{ mA}$ | | 250 | | MHz |
| C_{ob} | Output Capacitance | $V_{CB} = 10\text{ V}$, $I_E = 0\text{ A}$, $f = 1\text{ MHz}$ | | 3.7 | | pF |
| $V_I(off)$ | Input Off Voltage | $V_{CE} = 5\text{ V}$, $I_C = 100\text{ }\mu\text{A}$ | 0.5 | | | V |
| $V_I(on)$ | Input On Voltage | $V_{CE} = 0.2\text{ V}$, $I_C = 5\text{ mA}$ | | | 1.3 | V |
| R1 | Input Resistor | | | 4.7 | | k Ω |
| R1/R2 | Resistor Ratio | | | 0.1 | | |

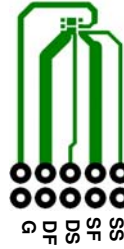
Electrical Characteristics

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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. 86 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 173 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test : Pulse Width < 300 us, 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. Guaranteed by Icbo
5. Guaranteed by Iceo

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

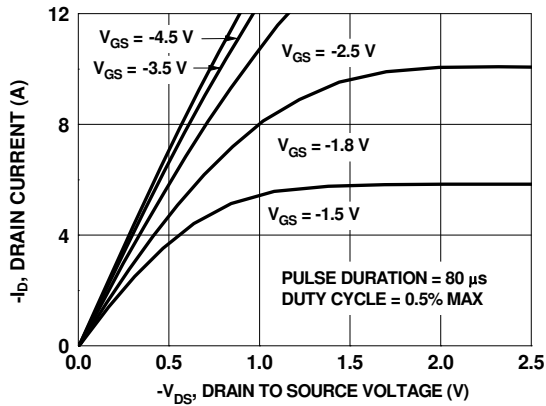


Figure 1. On-Region Characteristics

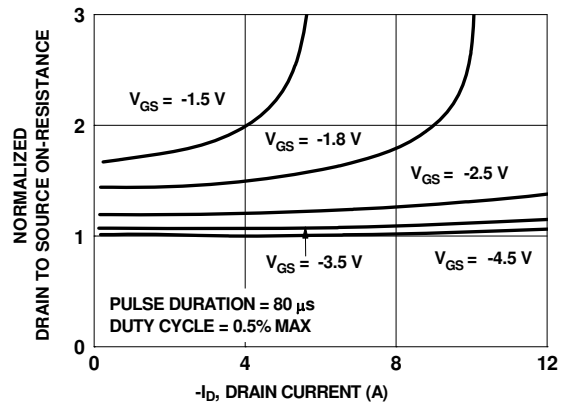


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

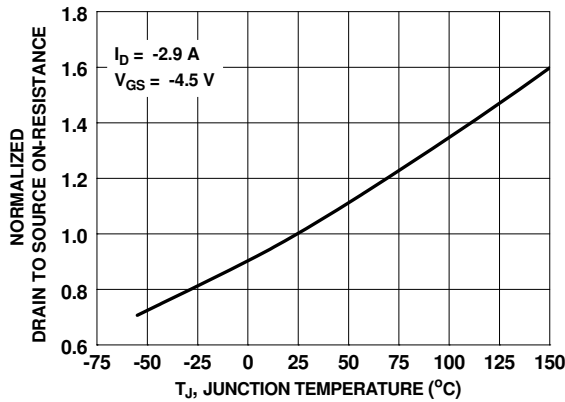


Figure 3. Normalized On-Resistance vs Junction Temperature

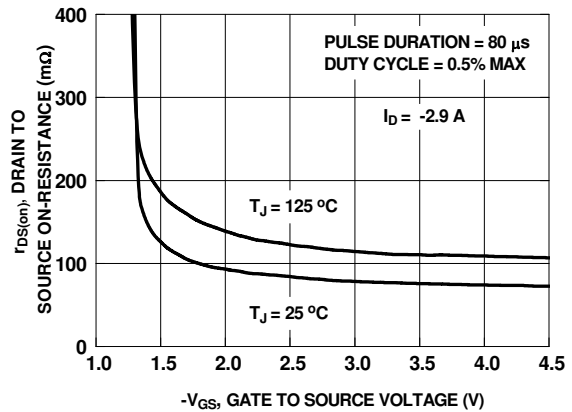


Figure 4. On-Resistance vs Gate to Source Voltage

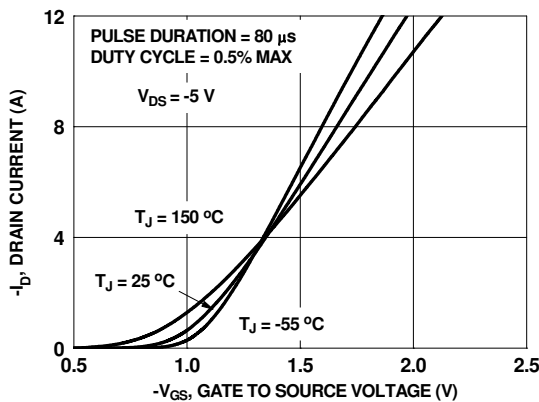


Figure 5. Transfer Characteristics

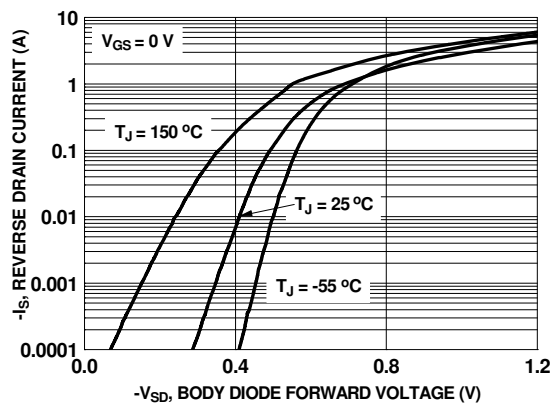


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

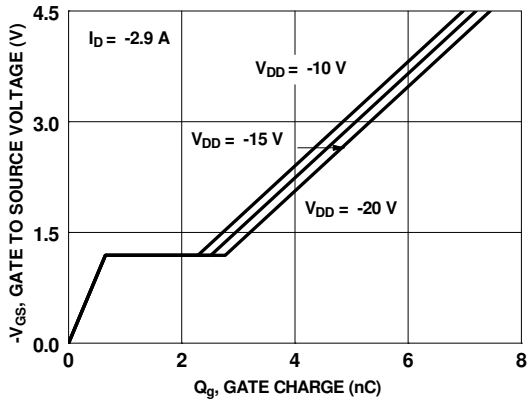


Figure 7. Gate Charge Characteristics

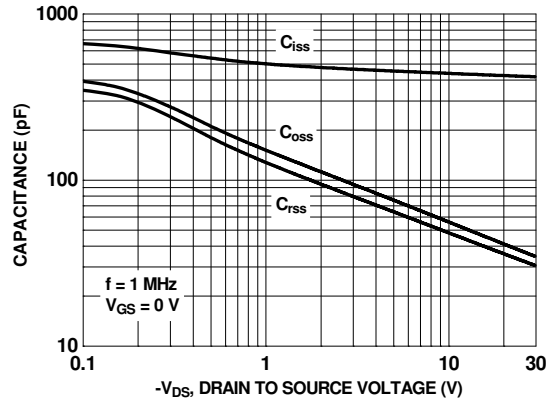


Figure 8. Capacitance vs Drain to Source Voltage

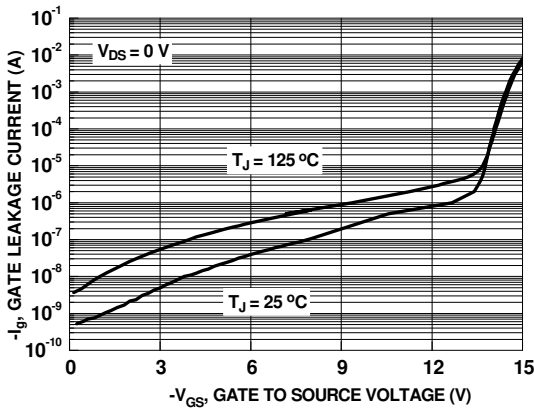


Figure 9. Gate Leakage vs Gate to Source Voltage

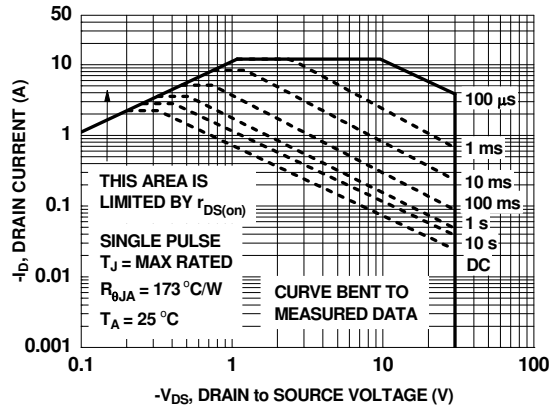


Figure 10. Forward Bias Safe Operating Area

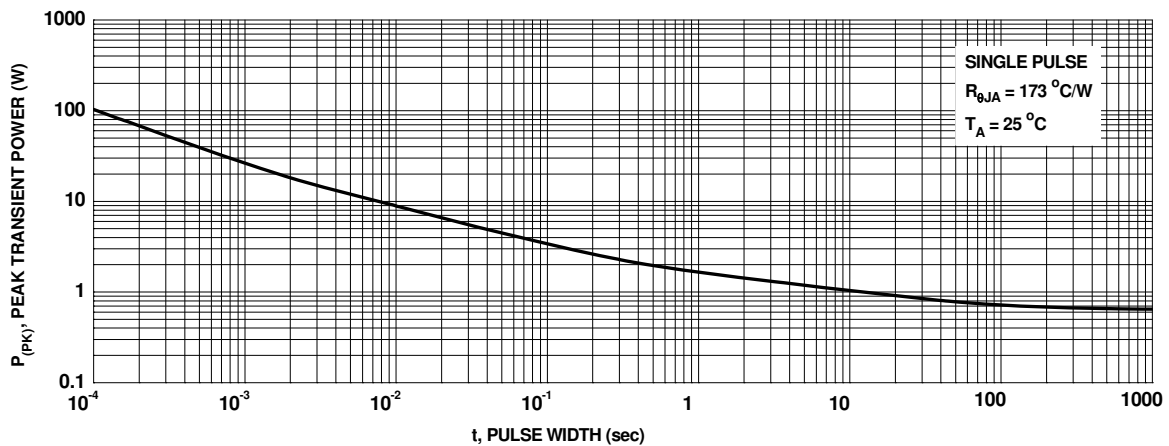


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

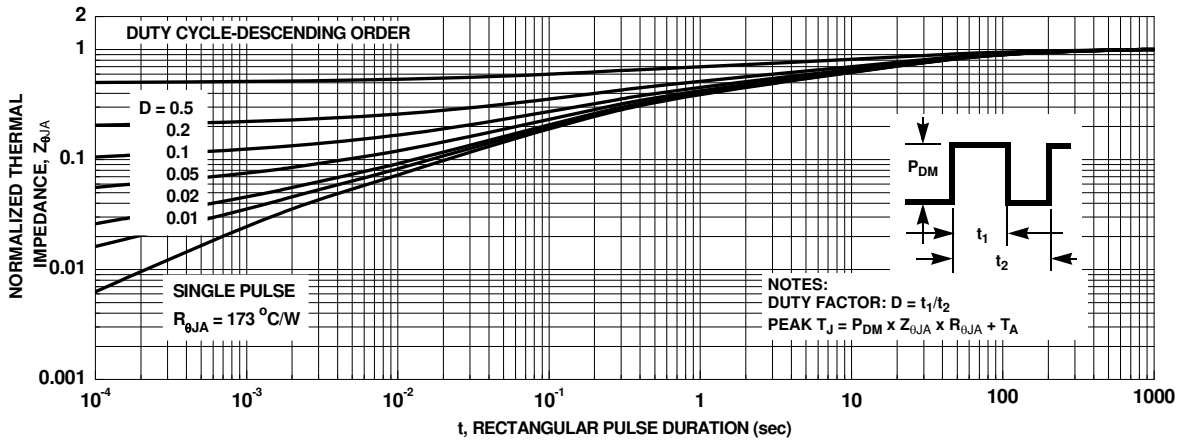
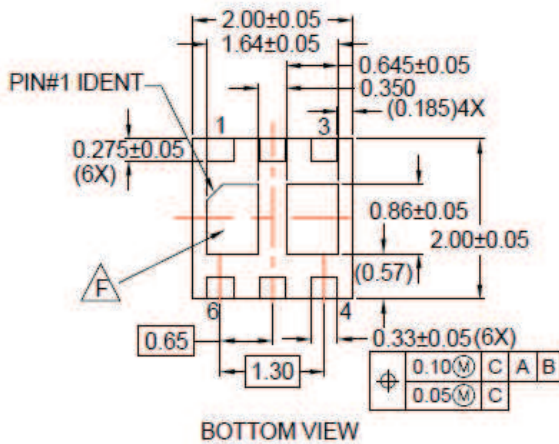
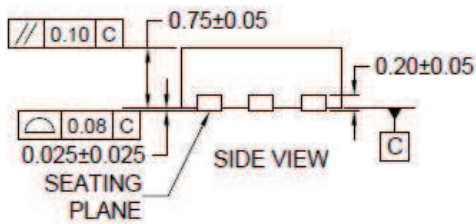
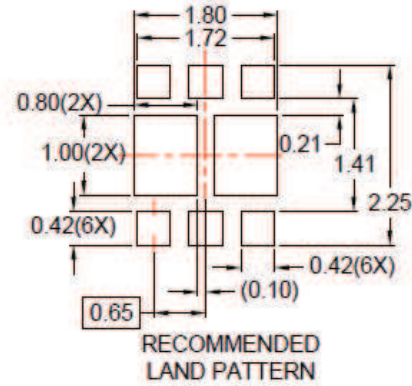
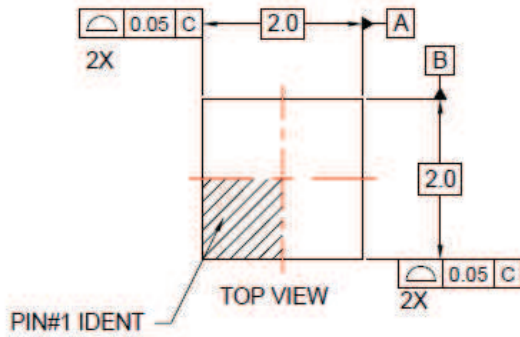


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

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