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FDMS86202ET120

N-Channel Shielded Gate PowerTrench[®] MOSFET

120 V, 102 A, 7.2 mΩ

Features

- Extended T_J rating to 175°C
- Shielded Gate MOSFET Technology
- Max r_{DS(on)} = 7.2 mΩ at V_{GS} = 10 V, I_D = 13.5 A
- Max r_{DS(on)} = 10.3 mΩ at V_{GS} = 6 V, I_D = 11.5 A
- Advanced Package and Silicon combination for low r_{DS(on)} and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

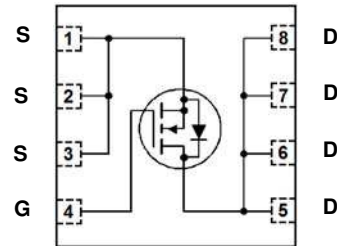
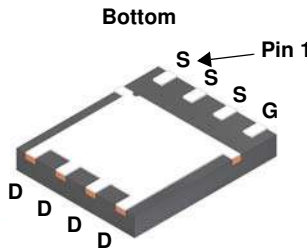
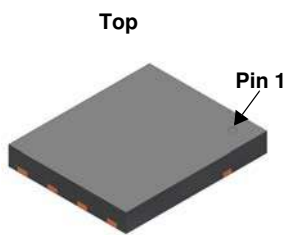


General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

Application

- DC-DC Conversion



Power 56

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

| Symbol | Parameter | Rated | Units |
|-----------------------------------|--------------------------------------------------|----------------------------------|--------|
| V _{DS} | Drain to Source Voltage | 120 | V |
| V _{GS} | Gate to Source Voltage | ±20 | V |
| I _D | Drain Current -Continuous | T _C = 25 °C (Note 5) | 102 |
| | -Continuous | T _C = 100 °C (Note 5) | 72 |
| | -Continuous | T _A = 25 °C (Note 1a) | 13.5 |
| | -Pulsed | (Note 4) | 538 |
| E _{AS} | Single Pulse Avalanche Energy | (Note 3) | 600 mJ |
| P _D | Power Dissipation | T _C = 25 °C | 187 |
| | Power Dissipation | T _A = 25 °C (Note 1a) | 3.3 |
| T _J , T _{STG} | Operating and Storage Junction Temperature Range | -55 to +175 | °C |

Thermal Characteristics

| | | | |
|------------------|---------------------------------------------------|-----|------|
| R _{θJC} | Thermal Resistance, Junction to Case | 0.8 | °C/W |
| R _{θJA} | Thermal Resistance, Junction to Ambient (Note 1a) | 45 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|----------------|----------|-----------|------------|------------|
| FDMS86202ET | FDMS86202ET120 | Power 56 | 13 " | 12 mm | 3000 units |

FDMS86202ET120 N-Channel Shielded Gate PowerTrench[®] MOSFET

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------------------------------------|-------------------------------------------|---------------------------------------------------------------------------|-----|-----|-----------|---------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$ | 120 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ | | 103 | | mV/°C |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 96\text{ V}$, $V_{GS} = 0\text{ V}$ | | | 1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$ | | | ± 100 | nA |

On Characteristics

| | | | | | | |
|----------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------|-----|------|------|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$ | 2.0 | 3.1 | 4.0 | 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 $25\text{ }^\circ\text{C}$ | | -10 | | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10\text{ V}$, $I_D = 13.5\text{ A}$ | | 6.0 | 7.2 | m Ω |
| | | $V_{GS} = 6\text{ V}$, $I_D = 11.5\text{ A}$ | | 8.1 | 10.3 | |
| | | $V_{GS} = 10\text{ V}$, $I_D = 13.5\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$ | | 10.9 | 13.2 | |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{ V}$, $I_D = 13.5\text{ A}$ | | 44 | | S |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|------------------------------------------------------------------------|-----|------|------|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 60\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$ | | 3275 | 4585 | pF |
| C_{oss} | Output Capacitance | | | 460 | 644 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 17 | 30 | pF |
| R_g | Gate Resistance | | 0.1 | 0.9 | 2.7 | Ω |

Switching Characteristics

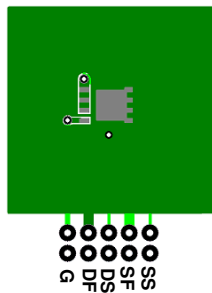
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|--------------|-------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------|------|------|----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 60\text{ V}$, $I_D = 13.5\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$ | | 21 | 33 | ns | |
| t_r | Rise Time | | | 8.75 | 17.5 | ns | |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 27.2 | 44 | ns | |
| t_f | Fall Time | | | 6.1 | 12.2 | ns | |
| Q_g | Total Gate Charge | | $V_{GS} = 0\text{ V}$ to 10 V | | 45 | 64 | nC |
| Q_g | Total Gate Charge | $V_{GS} = 0\text{ V}$ to 6 V | $V_{DD} = 60\text{ V}$, $I_D = 13.5\text{ A}$ | | 29 | 41 | nC |
| Q_{gs} | Gate to Source Charge | | | | 14.3 | | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | | | 9.5 | | nC |

Drain-Source Diode Characteristics

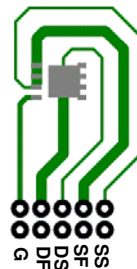
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|----------|---------------------------------------|------------------------------------------------------------|--|------|-----|----|
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}$, $I_S = 2.1\text{ A}$ (Note 2) | | 0.69 | 1.2 | V |
| | | $V_{GS} = 0\text{ V}$, $I_S = 13.5\text{ A}$ (Note 2) | | 0.76 | 1.3 | |
| t_{rr} | Reverse Recovery Time | $I_F = 13.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ | | 79 | 127 | ns |
| Q_{rr} | Reverse Recovery Charge | | | 140 | 224 | nC |

Notes:

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



a) $45\text{ }^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



b) $115\text{ }^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < $300\text{ }\mu\text{s}$, Duty cycle < 2.0%.

3. E_{AS} of 600 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 20\text{ A}$, $V_{DD} = 120\text{ V}$, $V_{GS} = 10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 65\text{ A}$.

4. Pulse I_d please refer to Fig.11 SOA curve for detail.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

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

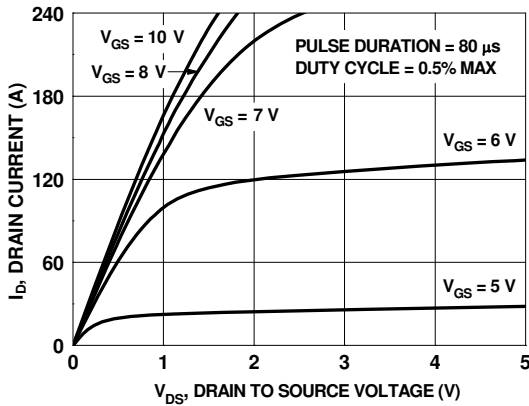


Figure 1. On Region Characteristics

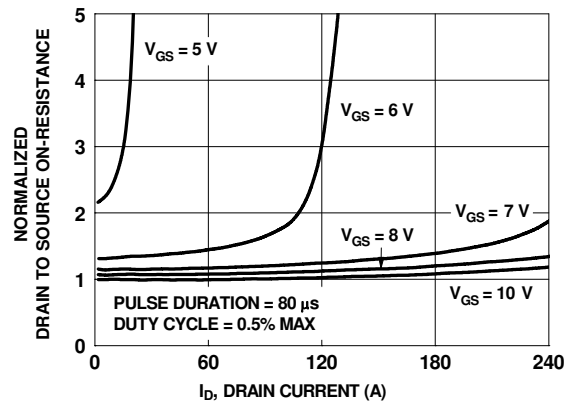


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

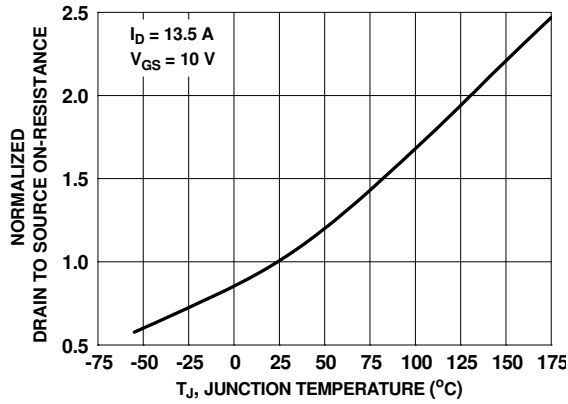


Figure 3. Normalized On Resistance vs Junction Temperature

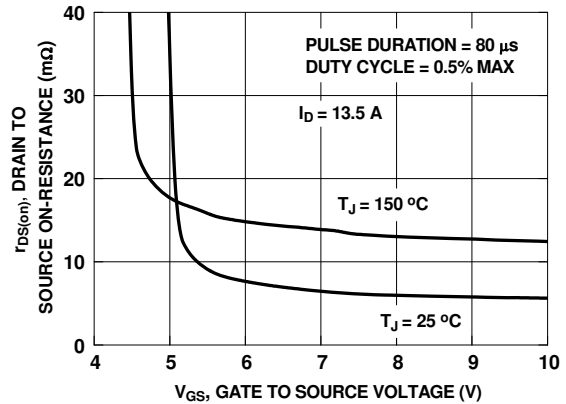


Figure 4. On-Resistance vs Gate to Source Voltage

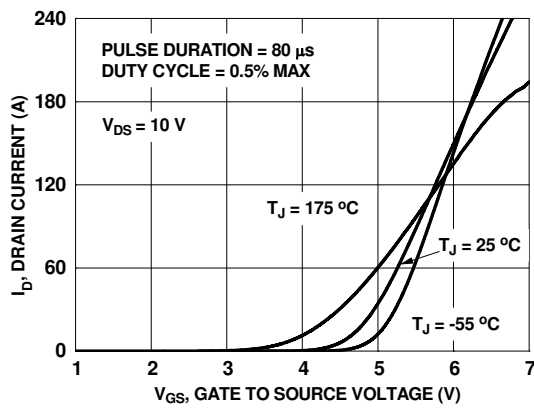


Figure 5. Transfer Characteristics

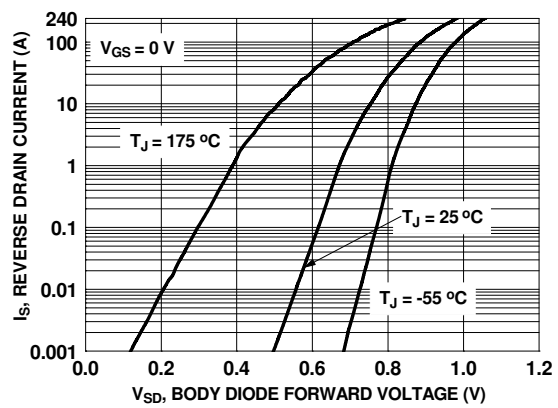


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

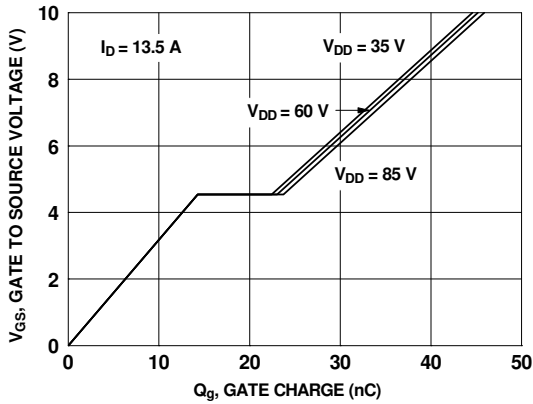


Figure 7. Gate Charge Characteristics

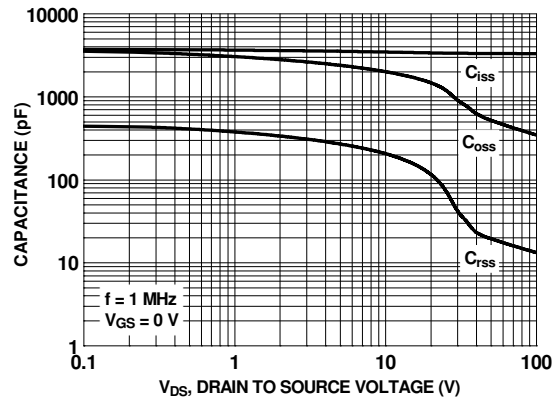


Figure 8. Capacitance vs Drain to Source Voltage

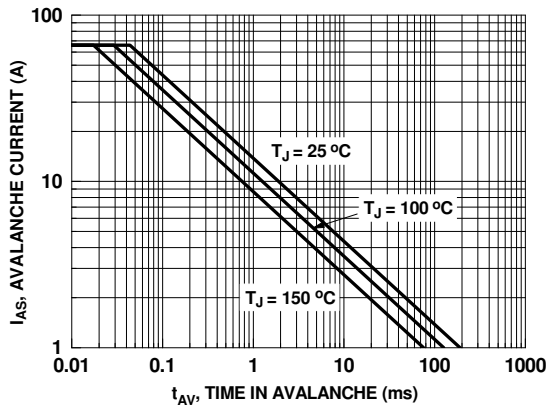


Figure 9. Unclamped Inductive Switching Capability

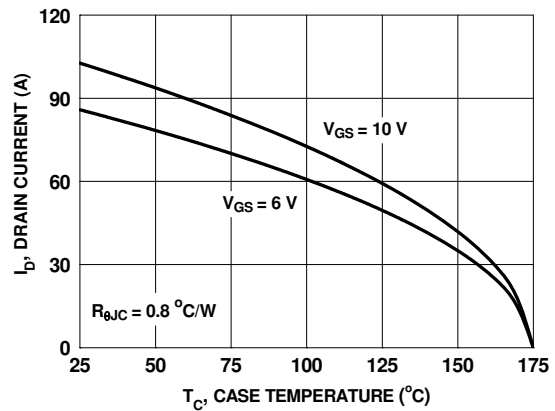


Figure 10. Maximum Continuous Drain Current vs Case Temperature

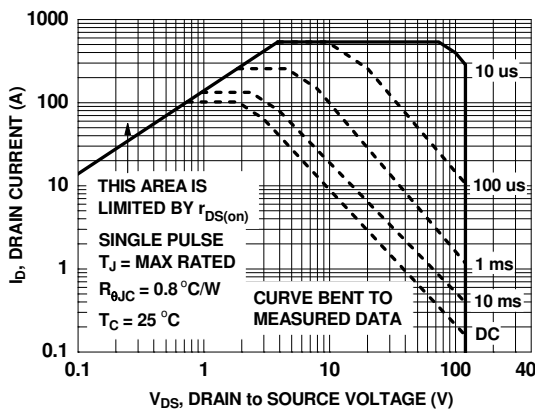


Figure 11. Forward Bias Safe Operating Area

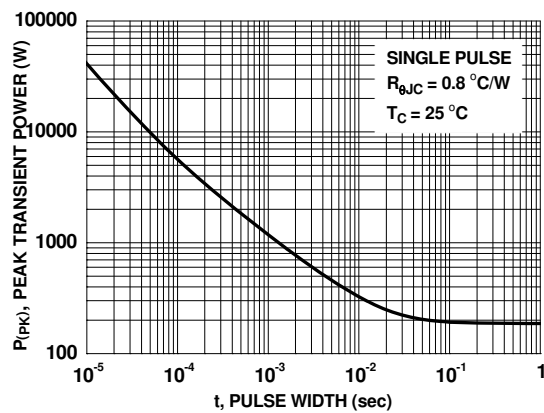


Figure 12. Single Pulse Maximum Power Dissipation

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

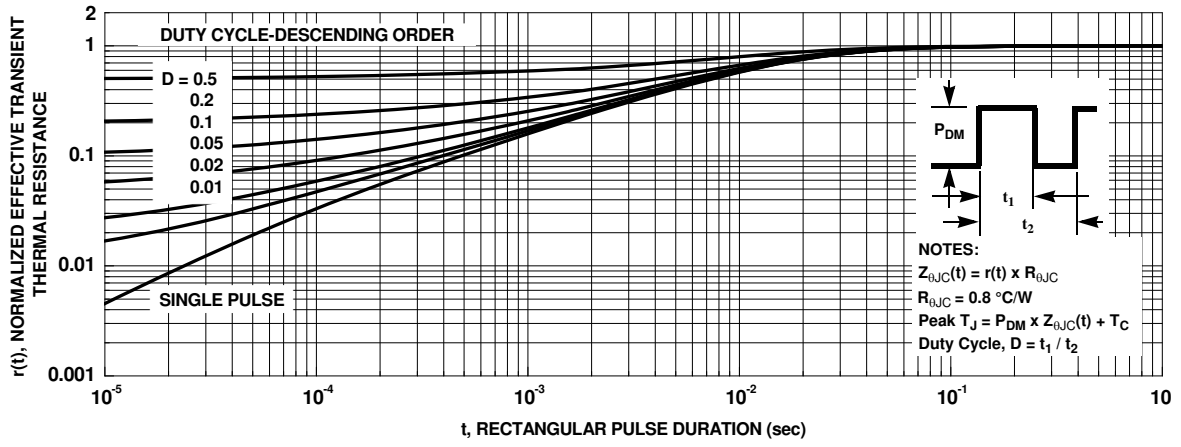
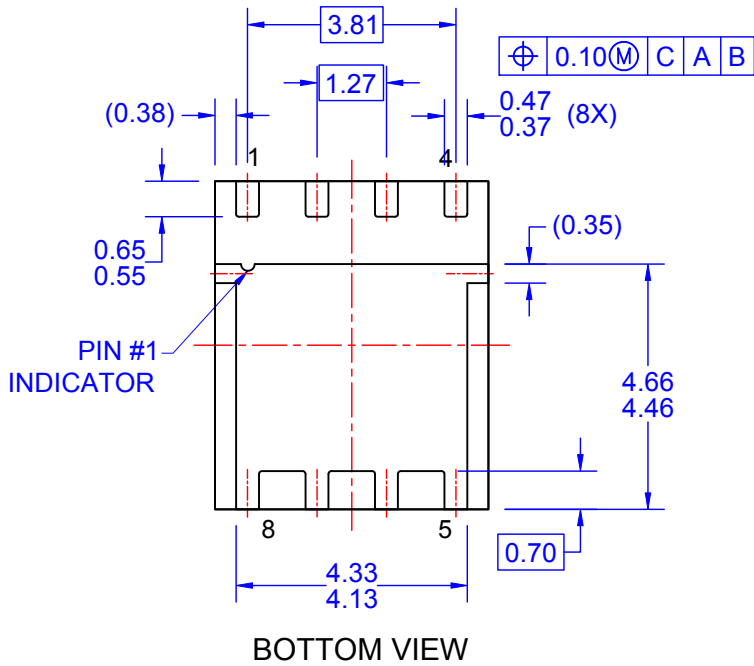
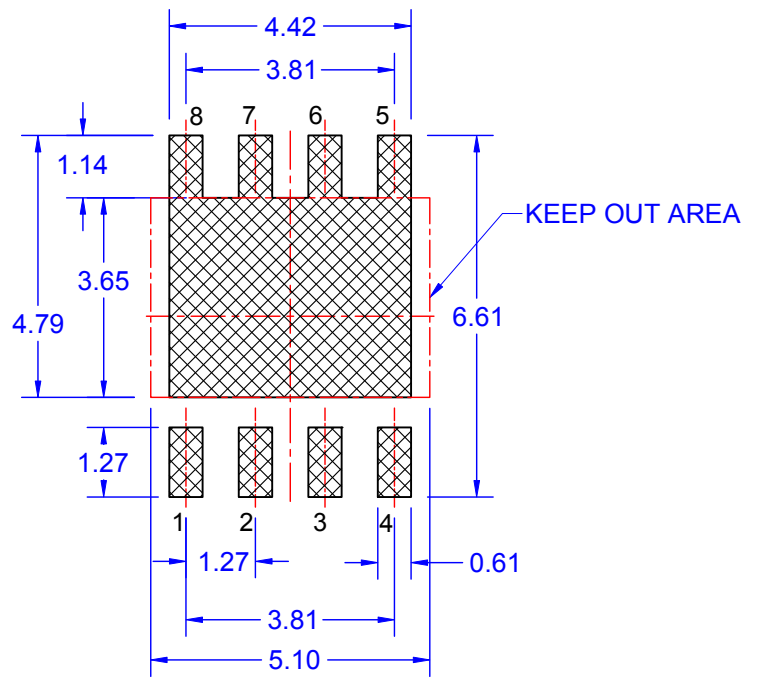
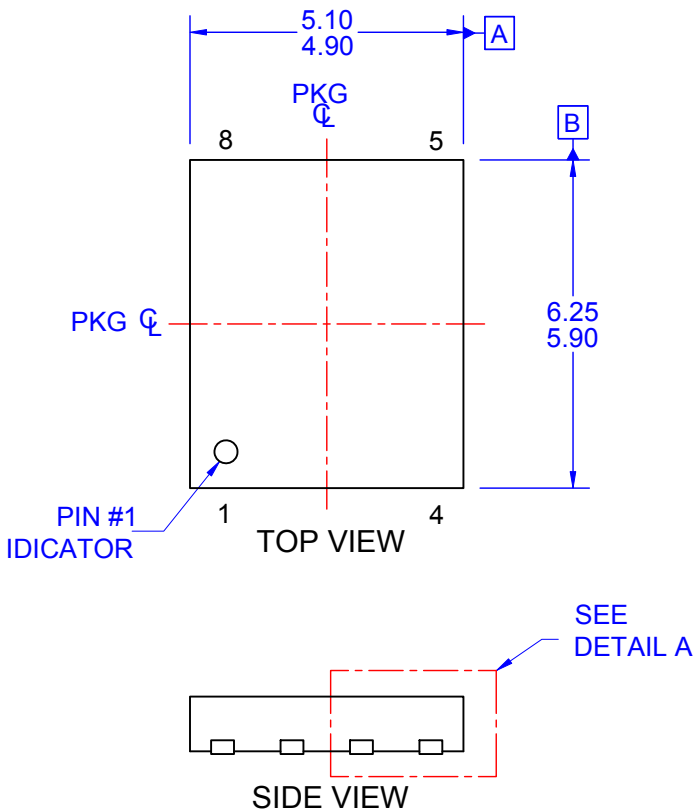
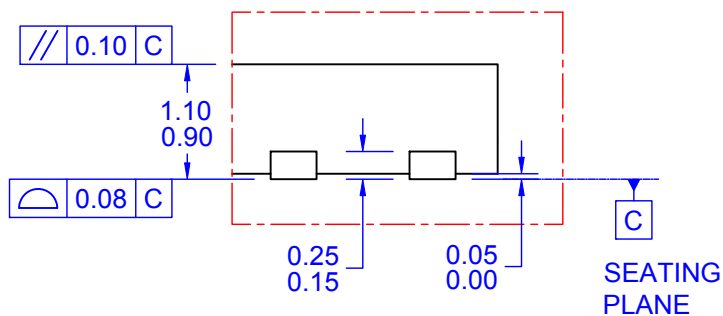


Figure 13. Junction-to-Ambient Transient Thermal Response Curve




- NOTES: UNLESS OTHERWISE SPECIFIED
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 - B) ALL DIMENSIONS ARE IN MILLIMETERS.
 - C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
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DETAIL A
SCALE: 2:1



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