



FDMS86252L

N-Channel Shielded Gate PowerTrench® MOSFET

150 V, 12 A, 56 mΩ

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 56 mΩ at V_{GS} = 10 V, I_D = 4.4 A
- Max $r_{DS(on)}$ = 71 mΩ at V_{GS} = 6 V, I_D = 3.8 A
- Max $r_{DS(on)}$ = 75 mΩ at V_{GS} = 4.5 V, I_D = 3.7 A
- Advanced package and silicon combination for low $r_{DS(on)}$ and high efficiency
- Next generation enhanced body diode technology, engineered for soft recovery
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant



October 2014

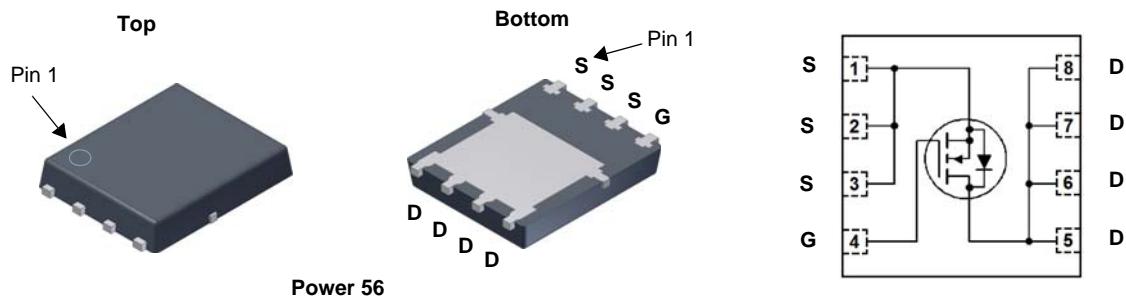


General Description

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.

Applications

- OringFET / Load Switching
- Synchronous Rectification
- DC-DC Conversion



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

| Symbol | Parameter | Ratings | Units |
|-------------------|--|-------------|-------|
| V_{DS} | Drain to Source Voltage | 150 | V |
| V_{GS} | Gate to Source Voltage | ± 20 | V |
| I_D | Drain Current -Continuous T_C = 25 °C | 12 | A |
| | -Continuous T_A = 25 °C (Note 1a) | 4.4 | |
| | -Pulsed (Note 4) | 30 | |
| E_{AS} | Single Pulse Avalanche Energy (Note 3) | 73 | mJ |
| P_D | Power Dissipation T_C = 25 °C | 50 | W |
| | Power Dissipation T_A = 25 °C (Note 1a) | 2.5 | |
| T_J , T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | °C |

Thermal Characteristics

| | | | |
|-----------|---|-----|------|
| R_{0JC} | Thermal Resistance, Junction to Case | 2.5 | °C/W |
| R_{0JA} | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|------------|----------|-----------|------------|------------|
| FDMS86252L | FDMS86252L | Power 56 | 13 " | 12 mm | 3000 units |

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

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

Off Characteristics

| | | | | | | |
|-----------------------------------|---|--|-----|-----|-----------|----------------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$ | 150 | | | V |
| ΔBV_{DSS} ΔT_J | Breakdown Voltage Temperature Coefficient | $I_D = 250 \mu\text{A}$, referenced to 25°C | | 104 | | $\text{mV}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 120 \text{ V}, V_{GS} = 0 \text{ V}$ | | | 1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ | | | ± 100 | nA |

On Characteristics

| | | | | | | |
|--|--|---|---|-----|-----|----------------------------|
| $V_{GS(\text{th})}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$ | 1 | 1.5 | 3 | V |
| $\Delta V_{GS(\text{th})}$ ΔT_J | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250 \mu\text{A}$, referenced to 25°C | | -6 | | $\text{mV}/^\circ\text{C}$ |
| $r_{DS(\text{on})}$ | Static Drain to Source On Resistance | $V_{GS} = 10 \text{ V}, I_D = 4.4 \text{ A}$ | | 46 | 56 | $\text{m}\Omega$ |
| | | $V_{GS} = 6 \text{ V}, I_D = 3.8 \text{ A}$ | | 48 | 71 | |
| | | $V_{GS} = 4.5 \text{ V}, I_D = 3.7 \text{ A}$ | | 52 | 75 | |
| | | $V_{GS} = 10 \text{ V}, I_D = 4.4 \text{ A}, T_J = 125^\circ\text{C}$ | | 90 | 110 | |
| g_{FS} | Forward Transconductance | $V_{DS} = 5 \text{ V}, I_D = 4.4 \text{ A}$ | | 21 | | s |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|--|-----|-----|------|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | | 952 | 1335 | pF |
| C_{oss} | Output Capacitance | | | 74 | 105 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 3 | 5 | pF |
| R_g | Gate Resistance | | 0.1 | 0.6 | 1.8 | Ω |

Switching Characteristics

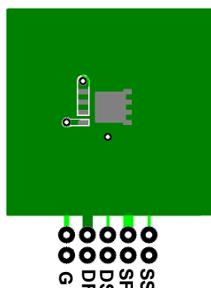
| | | | | | | |
|---------------------|-------------------------------|--|--|--|-----|----|
| $t_{d(\text{on})}$ | Turn-On Delay Time | $V_{DD} = 75 \text{ V}, I_D = 4.4 \text{ A}, V_{GS} = 10 \text{ V}, R_{\text{GEN}} = 6 \Omega$ | | 6.8 | 14 | ns |
| t_r | Rise Time | | | 1.4 | 10 | ns |
| $t_{d(\text{off})}$ | Turn-Off Delay Time | | | 19 | 34 | ns |
| t_f | Fall Time | | | 2.9 | 10 | ns |
| Q_g | Total Gate Charge | $V_{GS} = 0 \text{ V to } 10 \text{ V}$ | | 15 | 21 | nC |
| Q_g | Total Gate Charge | | $V_{GS} = 0 \text{ V to } 4.5 \text{ V}$ | $V_{DD} = 75 \text{ V}, I_D = 4.4 \text{ A}$ | 7.6 | nC |
| Q_{gs} | Gate to Source Charge | | | | 2.1 | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | | | 2.3 | nC |

Drain-Source Diode Characteristics

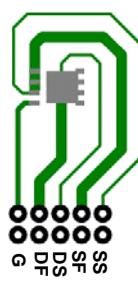
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|----------|------------------------------------|--|--|-----|-----|----|
| V_{SD} | Source-Drain Diode Forward Voltage | $V_{GS} = 0 \text{ V}, I_S = 1.9 \text{ A}$ (Note 2) | | 0.7 | 1.2 | V |
| | | $V_{GS} = 0 \text{ V}, I_S = 4.4 \text{ A}$ (Note 2) | | 0.8 | 1.3 | |
| t_{rr} | Reverse Recovery Time | $I_F = 4.4 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ | | 53 | 85 | ns |
| Q_{rr} | Reverse Recovery Charge | | | 51 | 82 | nC |

Notes:

1. $R_{\text{f}JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\text{f}JC}$ is guaranteed by design while $R_{\text{f}CA}$ is determined by the user's board design.



a. $50^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b. $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

3. E_{AS} of 73 mJ is based on Starting $T_J = 25^\circ\text{C}$, $L = 3 \text{ mH}$, $I_{AS} = 7 \text{ A}$, $V_{DD} = 150 \text{ V}$, $V_{GS} = 10 \text{ V}$. 100% tested at $L = 0.1 \text{ mH}$, $I_{AS} = 24 \text{ A}$.

4. Pulsed I_d limited by junction temperature, $t_d < 100 \mu\text{s}$, please refer to SOA curve for more details.

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

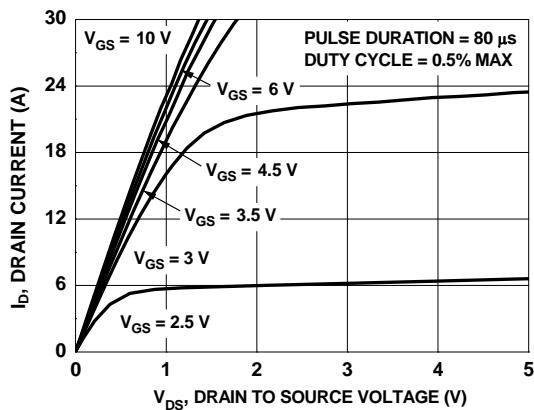


Figure 1. On Region Characteristics

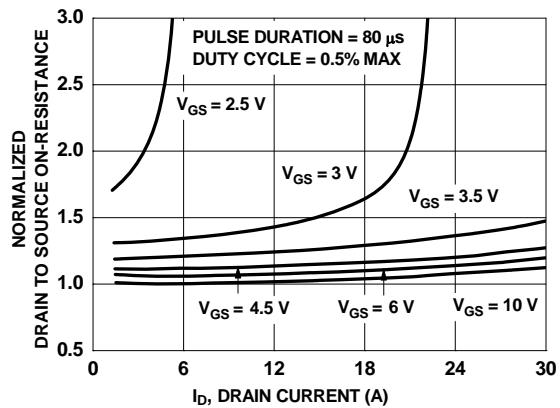


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

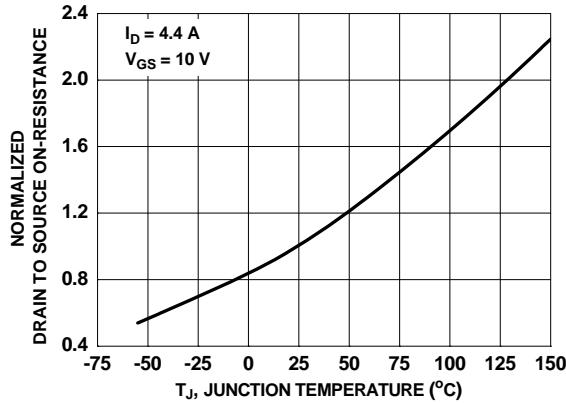


Figure 3. Normalized On Resistance vs Junction Temperature

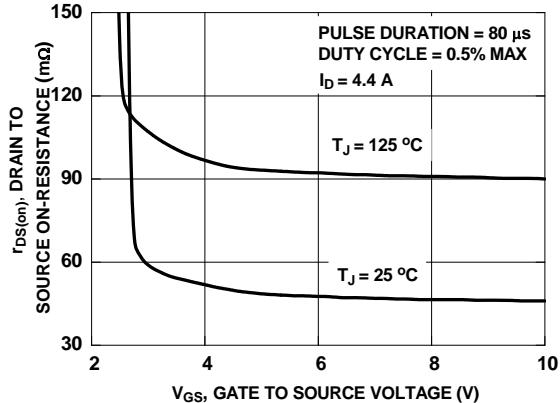


Figure 4. On-Resistance vs Gate to Source Voltage

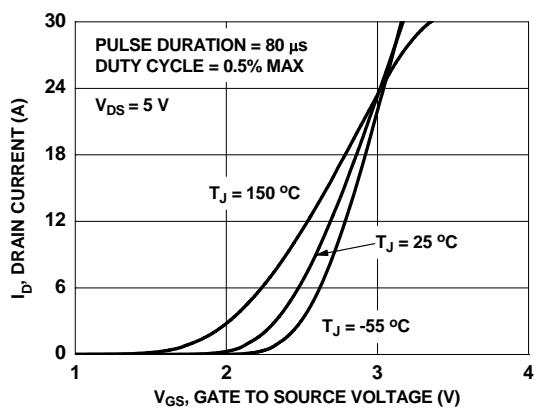


Figure 5. Transfer Characteristics

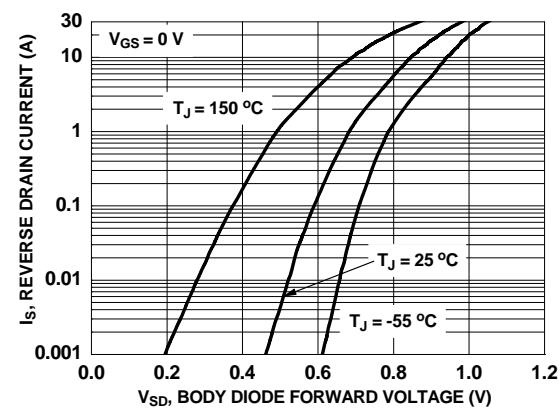


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

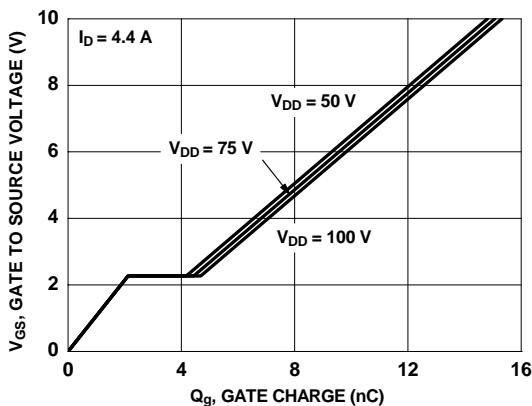


Figure 7. Gate Charge Characteristics

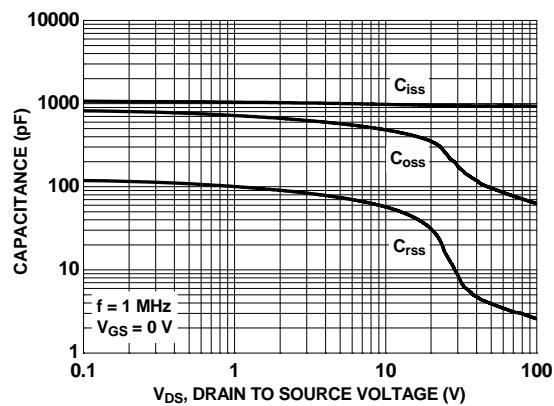


Figure 8. Capacitance vs Drain to Source Voltage

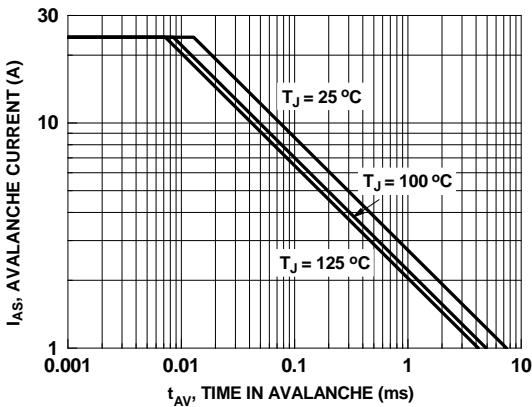


Figure 9. Unclamped Inductive Switching Capability

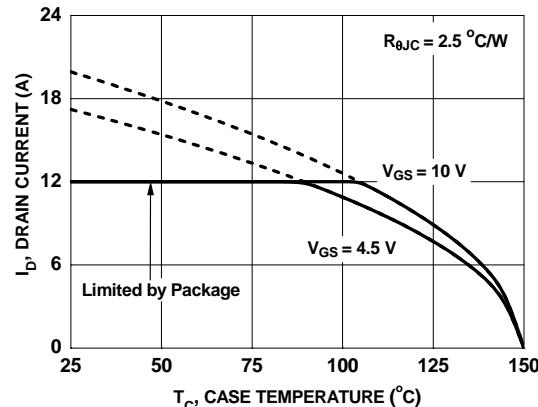


Figure 10. Maximum Continuous Drain Current vs Case Temperature

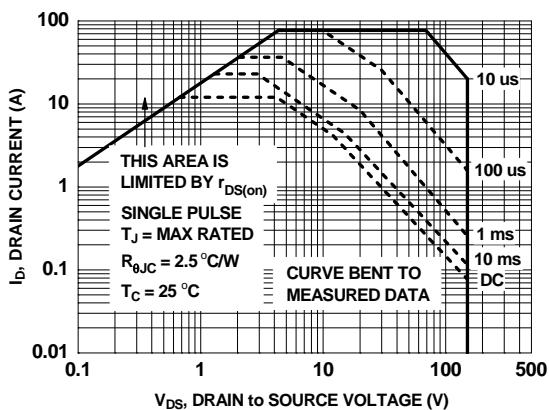


Figure 11. Forward Bias Safe Operating Area

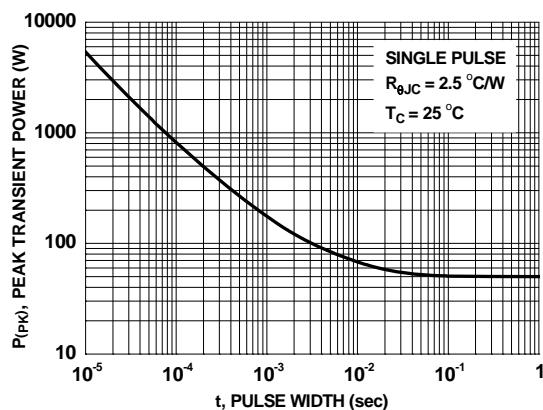


Figure 12. Single Pulse Maximum Power Dissipation

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

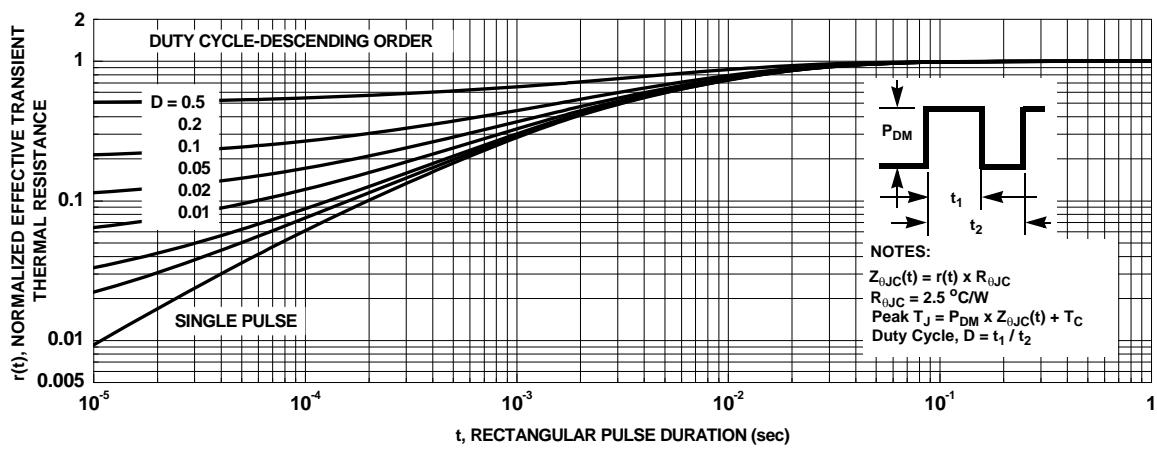
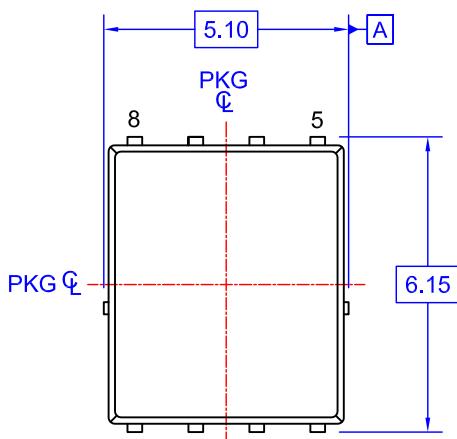
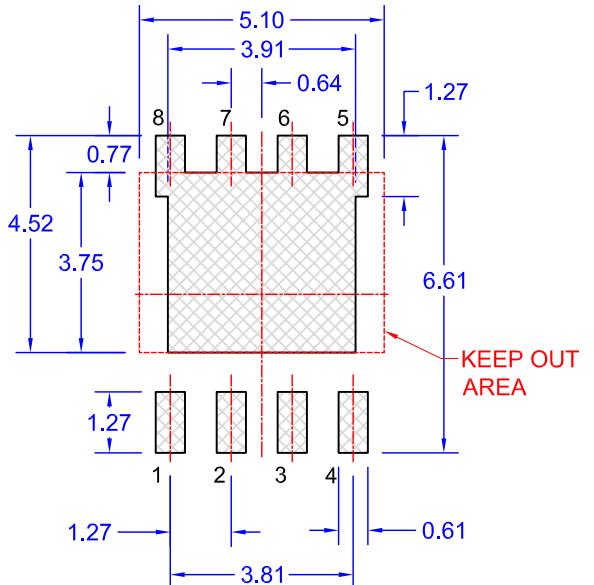
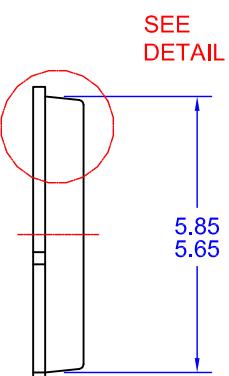


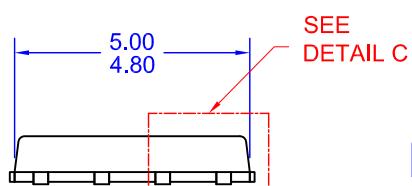
Figure 13. Junction-to-Case Transient Thermal Response Curve



TOP VIEW

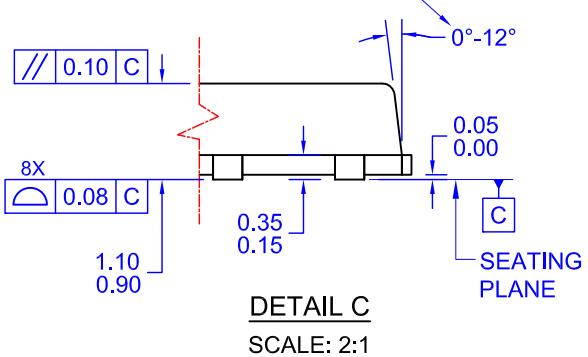


LAND PATTERN
RECOMMENDATION

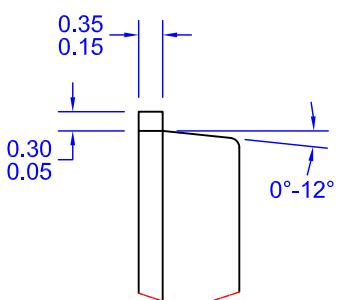


SIDE VIEW

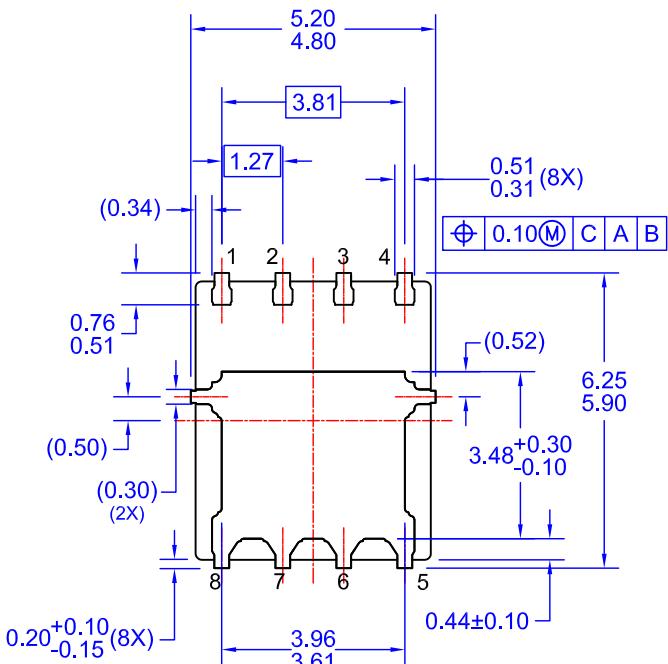
OPTIONAL DRAFT
ANGLE MAY APPEAR
ON FOUR SIDES
OF THE PACKAGE



DETAIL C
SCALE: 2:1



DETAIL B
SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA, DATED OCTOBER 2002.
- DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
- DRAWING FILE NAME: PQFN08AREV10





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| Datasheet Identification | Product Status | Definition |
|--------------------------|-----------------------|---|
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