

MOSFET – N-Channel Shielded Gate POWERTRENCH®

150 V, 85 A, 8.8 mΩ

FDMS8D8N15C

General Description

This N-Channel MV MOSFET is produced using onsemi's advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 8.8 mΩ at V_{GS} = 10 V, I_D = 45 A
- Max $r_{DS(on)}$ = 9.4 mΩ at V_{GS} = 8 V, I_D = 22.5 A
- Low Q_{rr} , Soft Recovery Body Diode
- Lowers Switching Noise/EMI
- MSL1 Robust Package Design
- 100% UIL Tested
- These Devices are Pb-Free and are RoHS Compliant

Applications

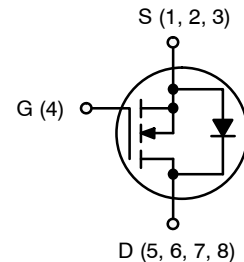
- Primary DC-DC MOSFET
- Synchronous Rectifier in DC-DC and AC-DC
- Motor Drive
- Solar

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

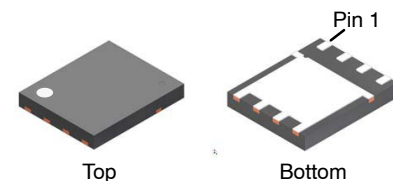
| Symbol | Parameter | Value | Unit |
|----------------|--|-------------------------|------|
| V_{DS} | Drain-to-Source Voltage | 150 | V |
| V_{GS} | Gate-to-Source Voltage | ±20 | V |
| I_D | Drain Current: Continuous, T_C = 25°C (Note 5) Continuous, T_C = 100°C (Note 5) Continuous, T_A = 25°C (Note 1a) Pulsed (Note 4) | 85 54 12.2 340 | A |
| E_{AS} | Single Pulse Avalanche Energy (Note 3) | 102 | mJ |
| P_D | Power Dissipation: T_C = 25°C T_A = 25°C (Note 1a) | 132 2.7 | W |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | °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.

| V_{DS} | $R_{DS(on)}$ MAX | I_D MAX |
|----------|------------------|-----------|
| 150 V | 8.8 mΩ @ 10 V | 85 A |
| | 9.4 mΩ @ 8 V | |



N-CHANNEL MOSFET



**Power 56
(PQFN8)
CASE 483AF**

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

FDMS8D8N15C

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|-----------------|---|-------|----------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 0.95 | $^{\circ}\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | 46 | |

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

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

OFF CHARACTERISTICS

| | | | | | | |
|--------------------------------|---|---|-----|----|-----------|------------------------------|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | $I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$ | 150 | | | V |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, referenced to 25°C | | 86 | | $\text{mV}/^{\circ}\text{C}$ |
| 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

| | | | | | | |
|----------------------------------|--|--|-----|------|------|------------------------------|
| $V_{GS(th)}$ | Gate-to-Source Threshold Voltage | $V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$ | 2.5 | 3.5 | 4.5 | V |
| $\Delta V_{GS(th)} / \Delta T_J$ | Gate-to-Source Threshold Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, referenced to 25°C | | -7.9 | | $\text{mV}/^{\circ}\text{C}$ |
| $r_{DS(on)}$ | Static Drain-to-Source On Resistance | $V_{GS} = 10\ \text{V}$, $I_D = 45\ \text{A}$ | | 7.0 | 8.8 | $\text{m}\Omega$ |
| | | $V_{GS} = 8\ \text{V}$, $I_D = 22.5\ \text{A}$ | | 7.6 | 9.4 | |
| | | $V_{GS} = 10\ \text{V}$, $I_D = 45\ \text{A}$, $T_J = 125^{\circ}\text{C}$ | | 12.8 | 16.1 | |
| g_{FS} | Forward Transconductance | $V_{DS} = 10\ \text{V}$, $I_D = 45\ \text{A}$ | | 120 | 216 | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|-----------|------------------------------|--|--|------|------|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 75\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$ | | 3132 | 3600 | pF |
| C_{oss} | Output Capacitance | | | 927 | 1160 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 5.3 | 9.3 | pF |
| R_g | Gate Resistance | | | 0.73 | 1.2 | Ω |

SWITCHING CHARACTERISTICS

| | | | | | | |
|--------------|-------------------------------|--|--|------|----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 75\ \text{V}$, $I_D = 45\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$ | | 23 | 40 | ns |
| t_r | Rise Time | | | 19 | 38 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 30 | 49 | ns |
| t_f | Fall Time | | | 5 | 10 | ns |
| Q_g | Total Gate Charge | $V_{GS} = 0\ \text{V}$ to $10\ \text{V}$, $V_{DD} = 75\ \text{V}$, $I_D = 45\ \text{A}$ | | 38 | 50 | nC |
| Q_{gs} | Gate-to-Source Charge | $V_{DD} = 75\ \text{V}$, $I_D = 45\ \text{A}$ | | 16.4 | | nC |
| Q_{gd} | Gate-to-Drain "Miller" Charge | $V_{DD} = 75\ \text{V}$, $I_D = 45\ \text{A}$ | | 5.7 | | nC |
| Q_{oss} | Output Charge | $V_{DD} = 75\ \text{V}$, $V_{GS} = 0\ \text{V}$ | | 101 | | nC |

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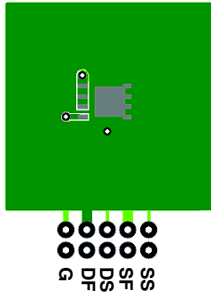
ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---------------------------------------|--|-----|------|------|------|
| DRAIN-SOURCE DIODE CHARACTERISTICS | | | | | | |
| V_{SD} | Source-to-Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 2.2\text{ A}$ (Note 2) | | 0.73 | 0.98 | V |
| | | $V_{GS} = 0\text{ V}, I_S = 45\text{ A}$ (Note 2) | | 0.88 | 1.0 | |
| t_{rr} | Reverse Recovery Time | $I_F = 45\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | 68 | 86 | ns |
| Q_{rr} | Reverse Recovery Charge | | | 108 | 172 | nC |
| t_{rr} | Reverse Recovery Time | $I_F = 45\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}$ | | 39 | 50 | ns |
| Q_{rr} | Reverse Recovery Charge | | | 495 | 748 | nC |

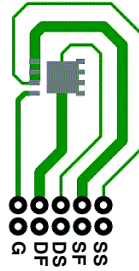
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

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



a) 46°C/W when mounted on a 1 in² pad of 2 oz copper.



b) 115°C/W when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- E_{AS} of 102 mJ is based on starting $T_J = 25^\circ\text{C}$; N-ch: $L = 0.1\text{ mH}$, $I_{AS} = 45.2\text{ A}$, $V_{DD} = 100\text{ V}$, $V_{GS} = 15\text{ V}$. 100% tested at $L = 0.1\text{ mH}$, $I_{AS} = 45.2\text{ A}$.
- Pulsed I_d please refer to Figure 11 SOA graph for more details. (Note: the final number may change pending results on device characterization).
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

PACKAGE MARKING AND ORDERING INFORMATION

| Device | Marking | Package | Reel Size | Tape Width | Quantity |
|-------------|-------------|--|-----------|------------|------------|
| FDMS8D8N15C | FDMS8D8N15C | Power 56 (PQFN8) (Pb-Free / Halogen Free) | 13" | 12 mm | 3000 units |

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

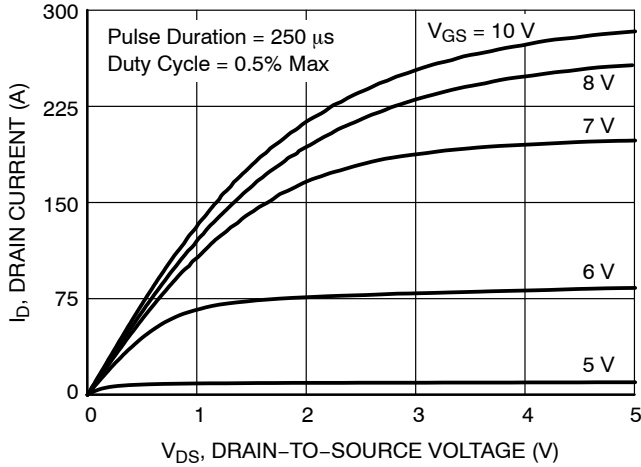


Figure 1. On-Region Characteristics

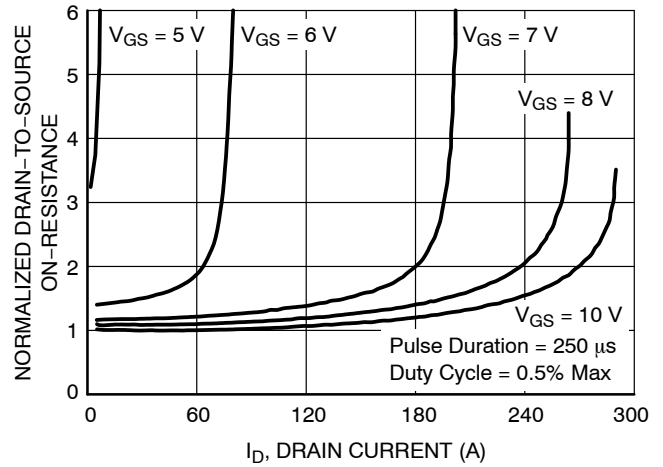


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

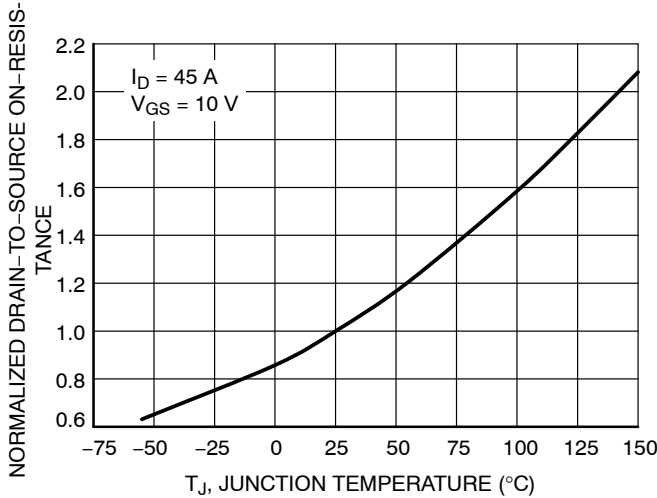


Figure 3. Normalized On-Resistance vs. Junction Temperature

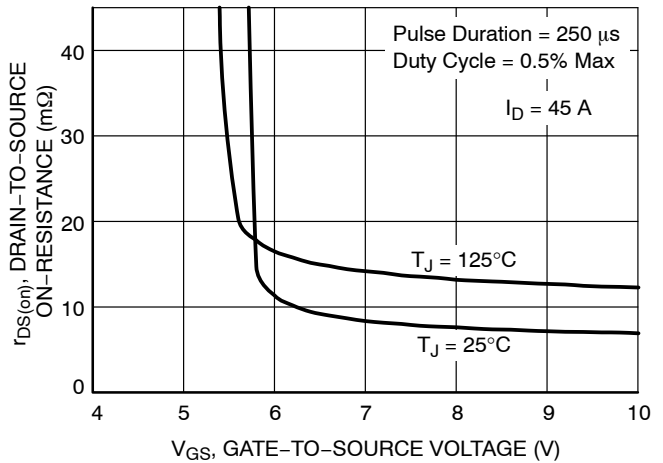


Figure 4. On-Resistance vs. Gate-to-Source Voltage

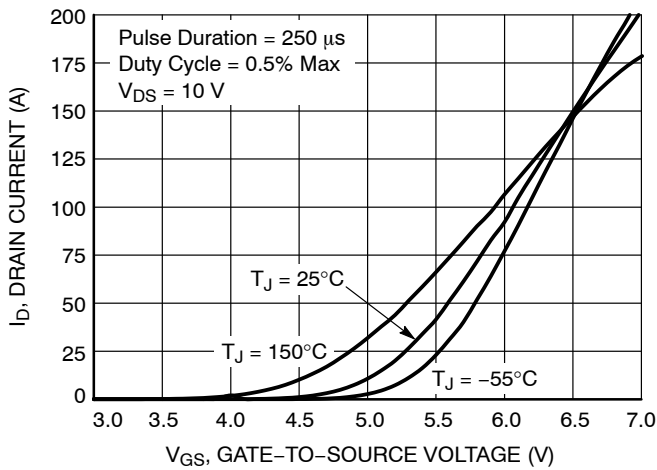


Figure 5. Transfer Characteristics

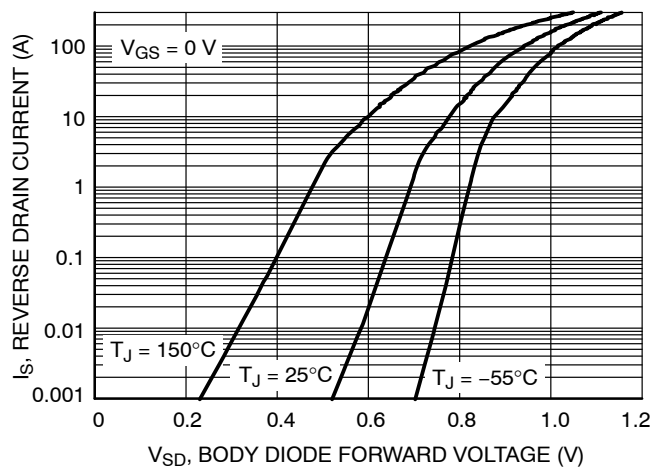


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

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

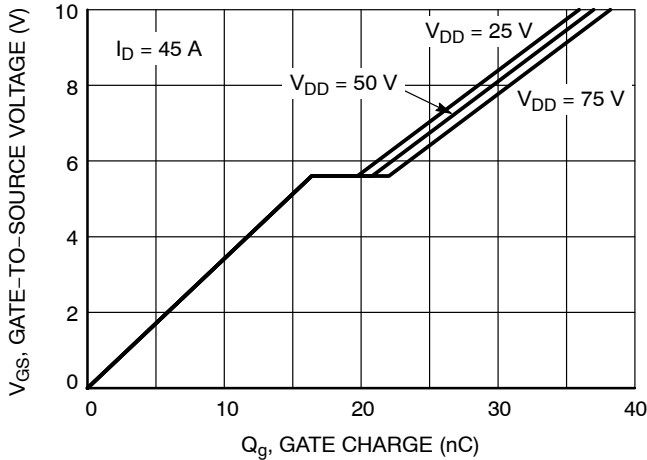


Figure 7. Gate Charge Characteristics

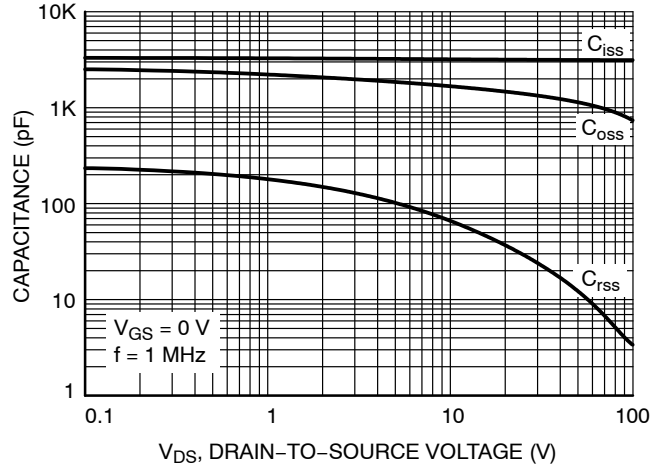


Figure 8. Capacitance vs. Drain-to-Source Voltage

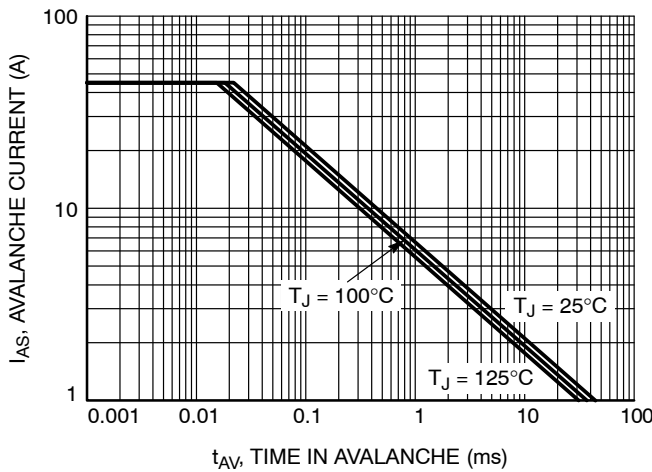


Figure 9. Unclamped Inductive Switching Capability

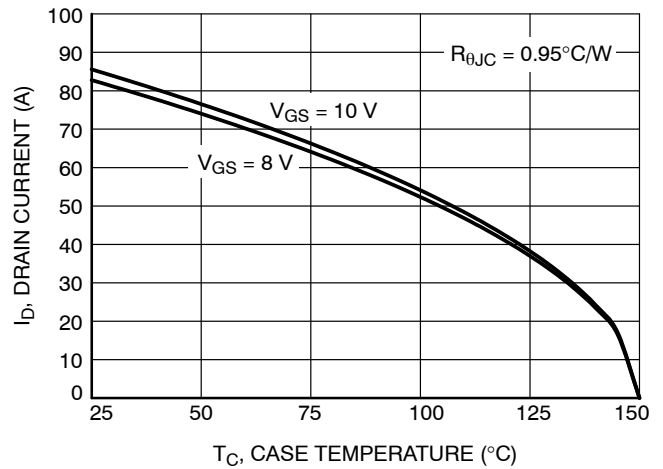


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

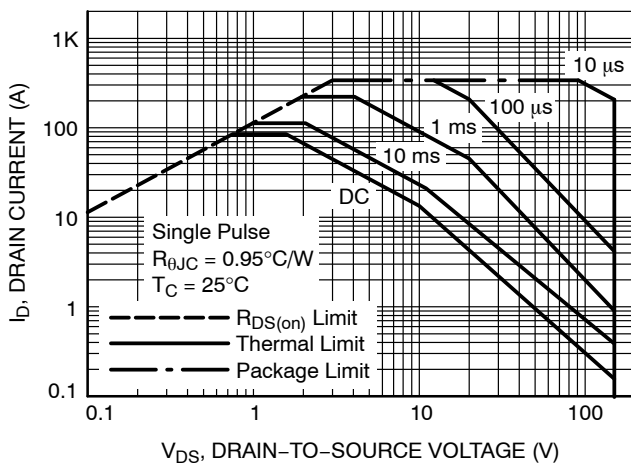


Figure 11. Forward Bias Safe Operating Area

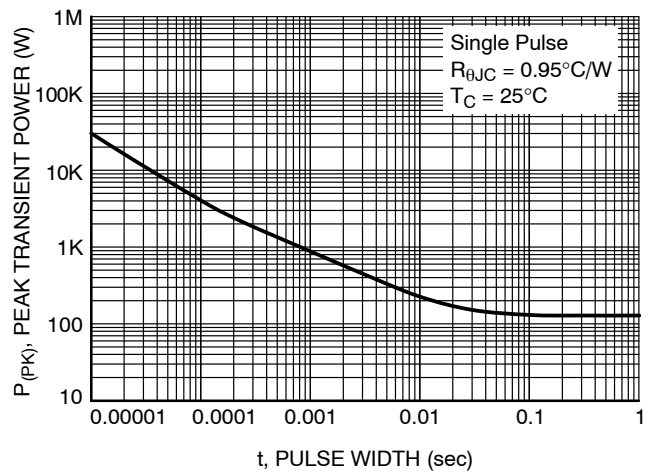


Figure 12. Single Pulse Maximum Power Dissipation

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

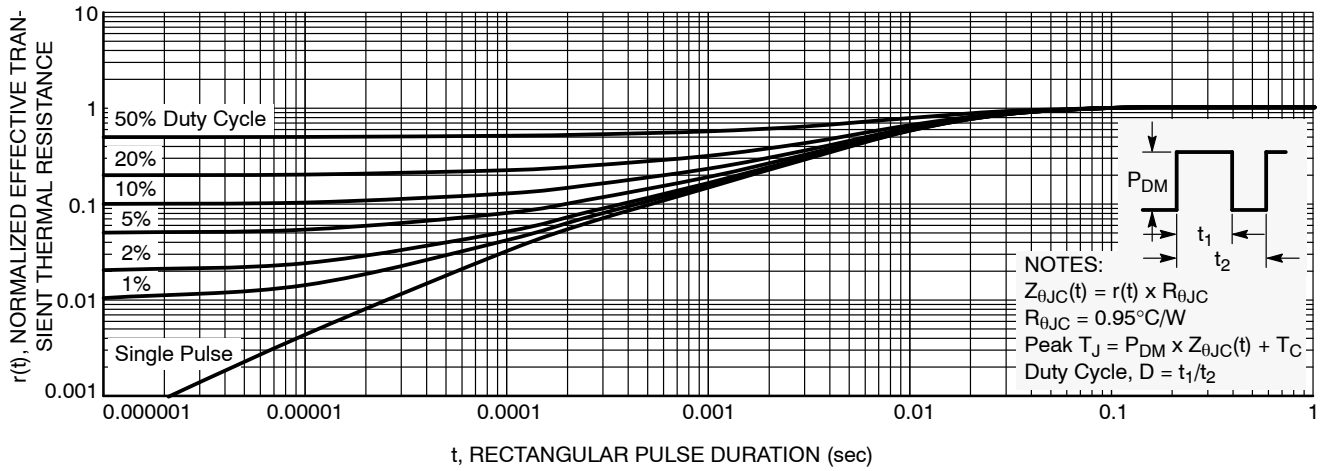
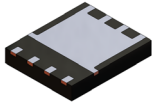
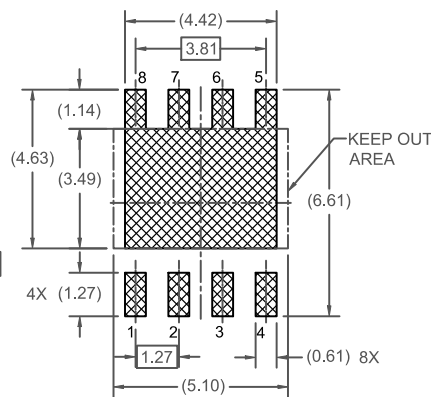
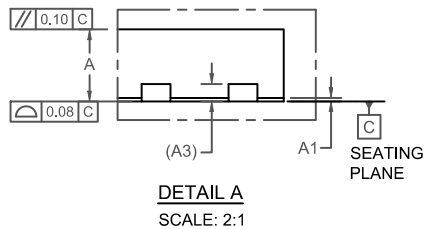
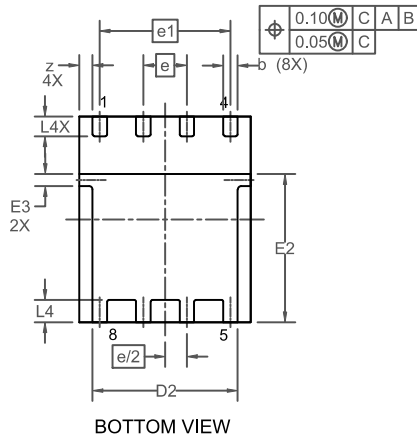
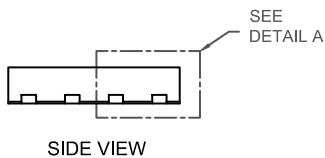
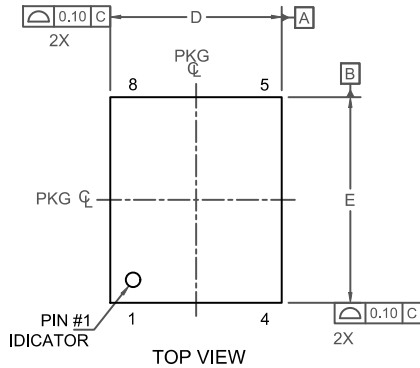


Figure 13. Junction-to-Case Transient Thermal Response Curve


PQFN8 5X6, 1.27P
CASE 483AF
ISSUE A

DATE 06 JUL 2021


LAND PATTERN
RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES: UNLESS OTHERWISE SPECIFIED

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

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | - | 0.05 |
| A3 | 0.20 REF. | | |
| b | 0.37 | 0.42 | 0.47 |
| D | 4.90 | 5.00 | 5.10 |
| D2 | 4.13 | 4.23 | 4.33 |
| E | 5.90 | 6.00 | 6.10 |
| E2 | 4.23 | 4.33 | 4.43 |
| E3 | 0.35 REF. | | |
| e | 1.27 BSC | | |
| e/2 | 0.635 BSC | | |
| e1 | 3.81 BSC | | |
| L | 0.52 | 0.57 | 0.62 |
| L4 | 0.55 | 0.65 | 0.75 |
| z | 0.38 REF | | |

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DESCRIPTION: PQFN8 5X6, 1.27P

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