

MOSFET – Power, Single N-Channel, TOLL

40 V, 240 A, 1.21 mΩ

FDBL9406-F085T6

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- Lowers Switching Noise/EMI
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

| Symbol | Parameter | | Value | Unit | |
|----------------|--|--|---------------------------|------------------|---|
| V_{DSS} | Drain-to-Source Voltage | | 40 | V | |
| V_{GS} | Gate-to-Source Voltage | | +20/-16 | V | |
| I_D | Continuous Drain Current $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | 240 | A |
| | | | $T_C = 100^\circ\text{C}$ | 179.4 | |
| P_D | Power Dissipation $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | 136.4 | W |
| | | | $T_C = 100^\circ\text{C}$ | 68.2 | |
| I_D | Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | 45 | A |
| | | | $T_A = 100^\circ\text{C}$ | 31.8 | |
| P_D | Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | 4.3 | W |
| | | | $T_A = 100^\circ\text{C}$ | 2.1 | |
| I_{DM} | Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | 2817 | A | |
| T_J, T_{stg} | Operating Junction and Storage Temperature Range | | -55 to +175 | $^\circ\text{C}$ | |
| I_S | Source Current (Body Diode) | | 221 | A | |
| E_{AS} | Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 42.5 \text{ A}$) | | 271 | mJ | |
| T_L | Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s) | | 260 | $^\circ\text{C}$ | |

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.

THERMAL RESISTANCE MAXIMUM RATINGS

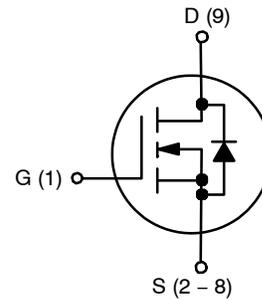
| Symbol | Parameter | Value | Unit |
|-----------------|---|-------|---------------------------|
| $R_{\theta JC}$ | Junction-to-Case – Steady State (Note 2) | 1.1 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient – Steady State (Note 2) | 35 | |

1. Surface-mounted on FR4 board using a 1 in² pad size, 1 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 40 V | 1.21 mΩ @ 10 V | 240 A |



H-PSOF8L
CASE 100CU



ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------------|--------------------|---------------------|
| FDBL9406-F085T6 | H-PSOF8L (Pb-Free) | 2,000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

FDBL9406–F085T6

Table 1. ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|----------------------------|---|--|-----|------|-----------|---------------|
| OFF CHARACTERISTICS | | | | | | |
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$ | 40 | | | V |
| $V_{(BR)DSS}/T_J$ | Drain-to-Source Breakdown Voltage Temperature Coefficient | $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$ | | 24.9 | | mV/°C |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V}$ $T_J = 25^\circ\text{C}$ | | | 10 | μA |
| I_{GSS} | Gate-to-Source Leakage Current | $V_{DS} = 0 \text{ V}, V_{GS} = +20/-16 \text{ V}$ | | | ± 100 | nA |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|------------------|--|---|---|------|------|------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 190 \mu\text{A}$ | 2 | 2.8 | 3.5 | V |
| $V_{GS(th)}/T_J$ | Negative Threshold Temperature Coefficient | | | -6.9 | | mV/°C |
| $R_{DS(on)}$ | Drain-to-Source On Resistance | $V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$ | | 1.1 | 1.21 | m Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 15 \text{ V}, I_D = 50 \text{ A}$ | | 143 | | S |

CHARGES & CAPACTIANCES

| | | | | | | |
|--------------|------------------------------|--|--|------|--|----|
| C_{iss} | Input Capacitance | $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$ | | 4960 | | pF |
| C_{oss} | Output Capacitance | | | 2800 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 62 | | pF |
| $Q_{G(tot)}$ | Total Gate Charge | $V_{GS} = 10 \text{ V}, V_{DS} = 20 \text{ V}, I_D = 50 \text{ A}$ | | 75 | | nC |
| $Q_{G(th)}$ | Threshold Gate Charge | | | 9 | | nC |
| Q_{gs} | Gate-to-Source Charge | | | 22 | | nC |
| Q_{gd} | Gate-to-Drain Charge | | | 16 | | nC |

SWITCHING CHARACTERISTICS, $V_{GS} = 10 \text{ V}$ (Note 3)

| | | | | | | |
|--------------|---------------------|--|--|----|--|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{GS} = 10 \text{ V}, V_{DS} = 20 \text{ V}, I_D = 50 \text{ A}, R_G = 6 \Omega$ | | 27 | | ns |
| t_r | Rise Time | | | 44 | | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 61 | | ns |
| t_f | Fall Time | | | 26 | | ns |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|----------|-------------------------|---|--|-----|-----|----|
| V_{SD} | Forward Diode Voltage | $I_S = 50 \text{ A}, V_{GS} = 0 \text{ V}$ $T_J = 25^\circ\text{C}$ | | 0.8 | 1.2 | V |
| | | $I_S = 50 \text{ A}, V_{GS} = 0 \text{ V}$ $T_J = 125^\circ\text{C}$ | | 0.6 | | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0 \text{ V}, di_S/dt = 100 \text{ A}/\mu\text{s}, I_S = 50 \text{ A}$ | | 78 | | ns |
| t_a | Charge Time | | | 39 | | ns |
| t_b | Discharge Time | | | 39 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 101 | | 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.

3. Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS

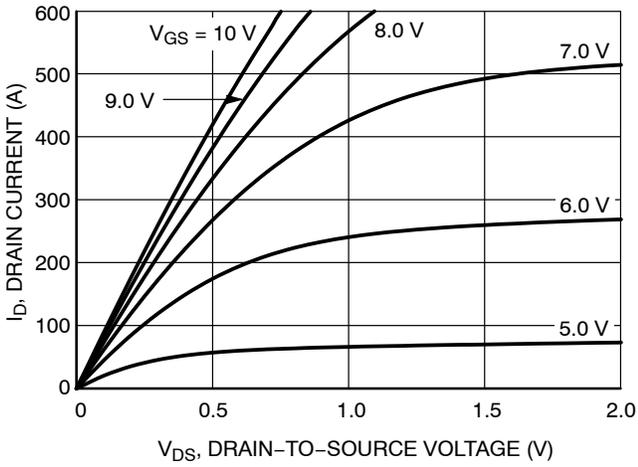


Figure 1. On-Region Characteristics

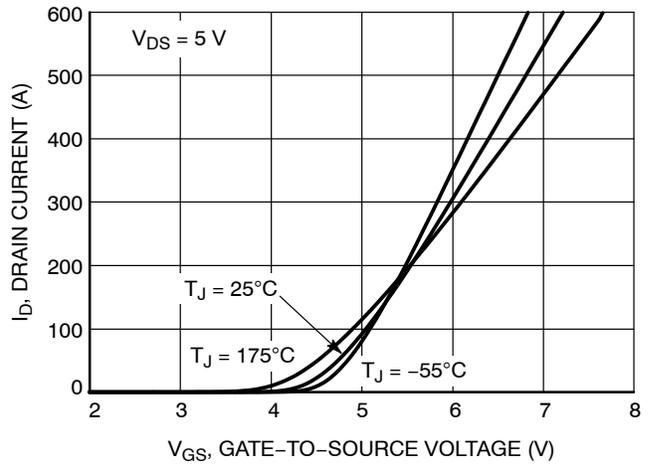


Figure 2. Transfer Characteristics

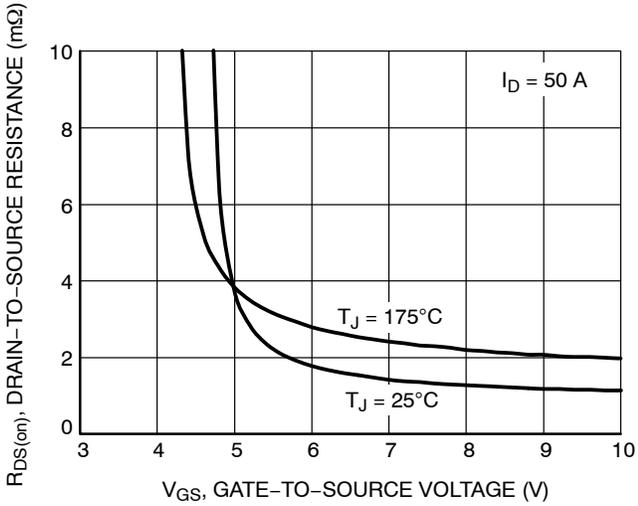


Figure 3. On-Resistance vs. Gate-to-Source Voltage

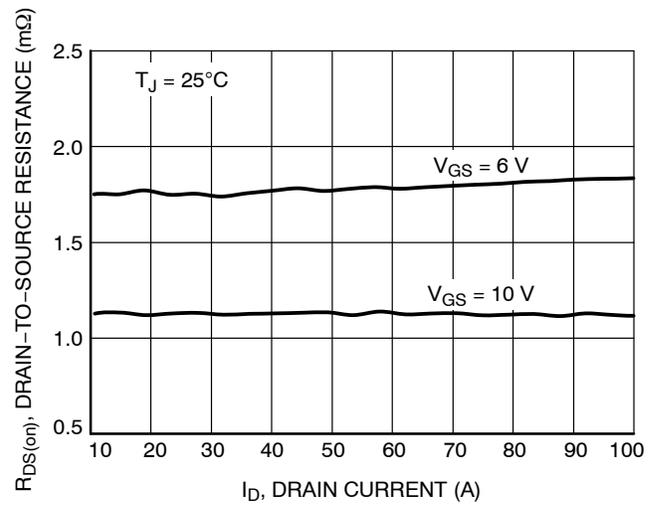


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

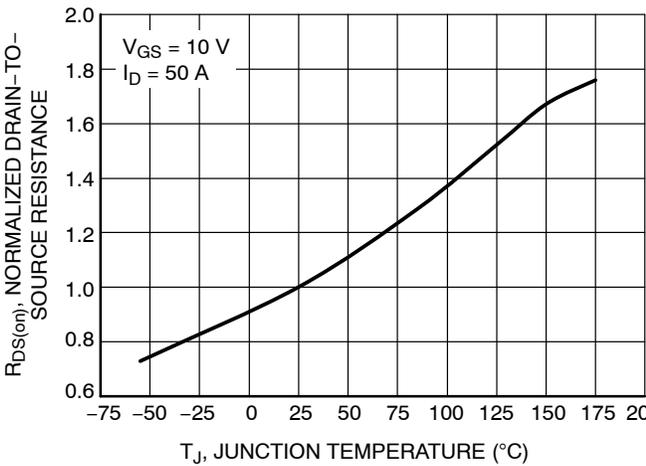


Figure 5. On-Resistance Variation with Temperature

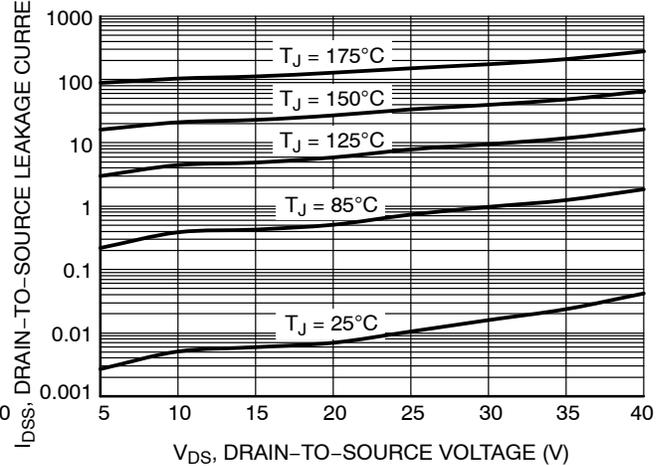


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (continued)

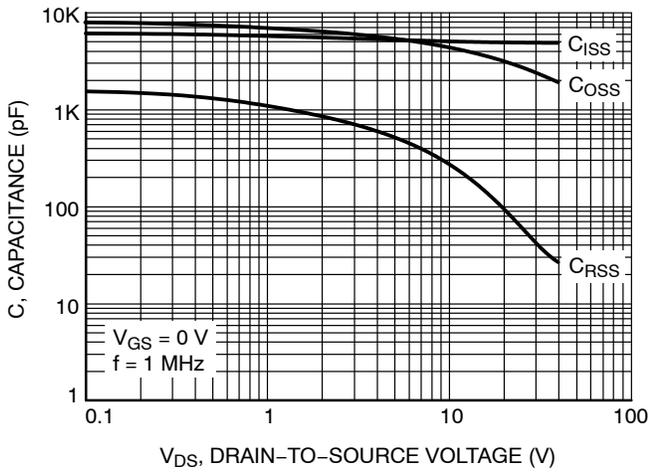


Figure 7. Capacitance Variation

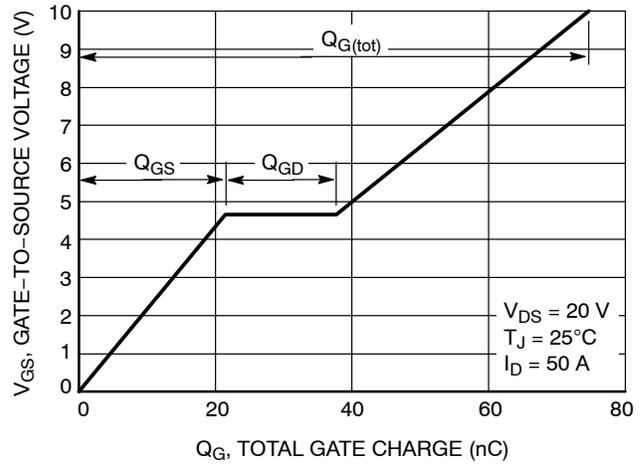


Figure 8. Gate-to-Source Voltage vs. Total Charge

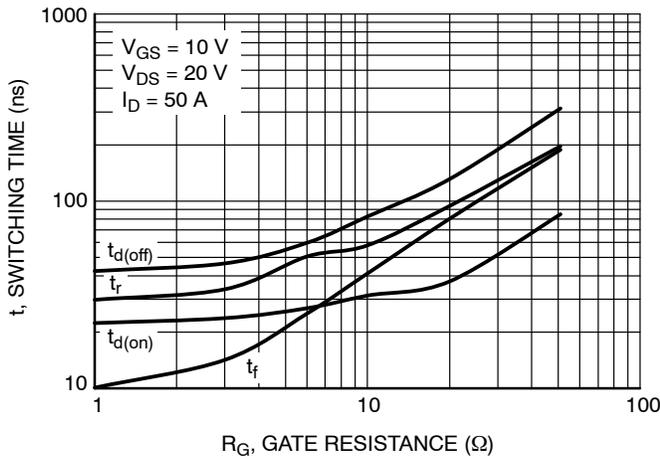


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

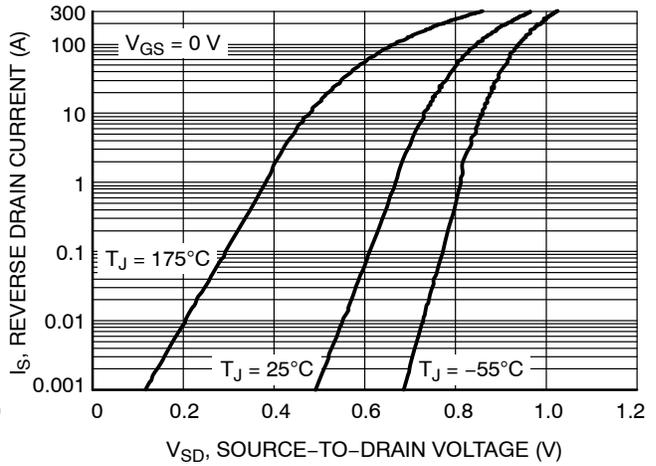


Figure 10. Diode Forward Voltage vs. Current

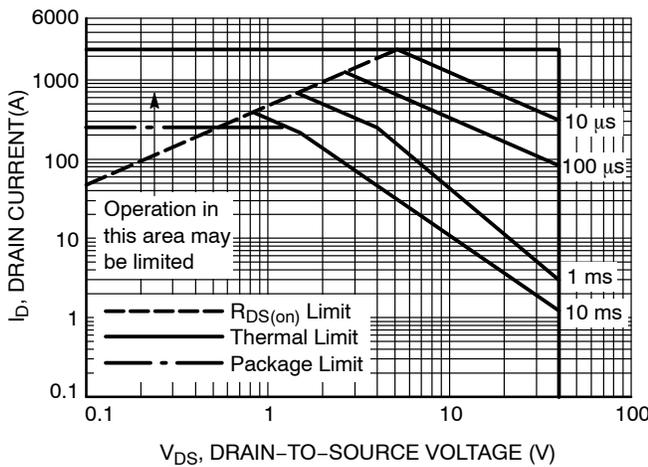


Figure 11. Maximum Rated Forward Biased Safe Operating Area

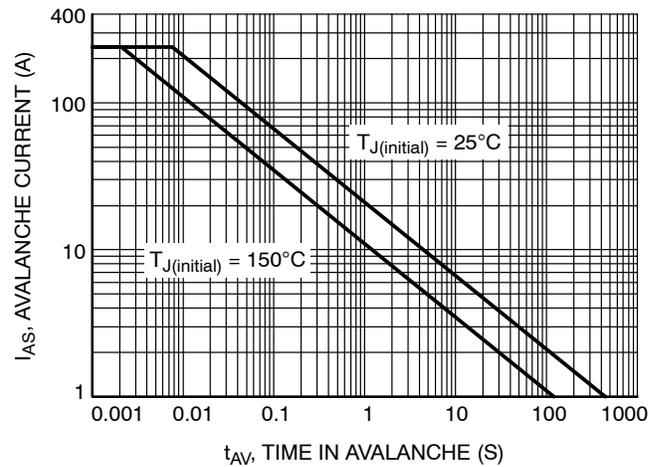


Figure 12. Maximum Drain Current vs. Time in Avalanche

TYPICAL CHARACTERISTICS (continued)

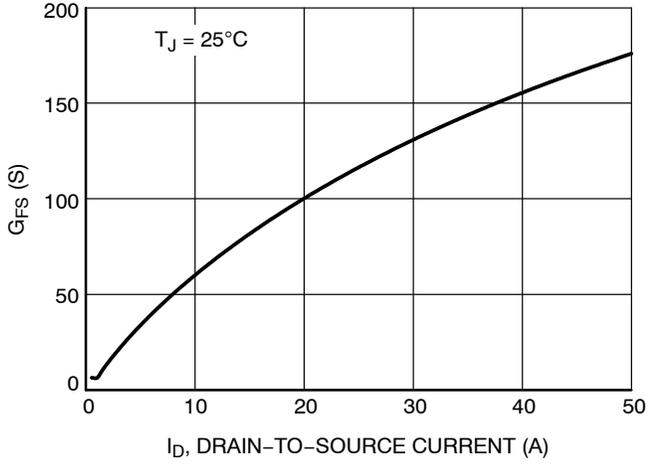


Figure 13. G_{FS} vs. I_D

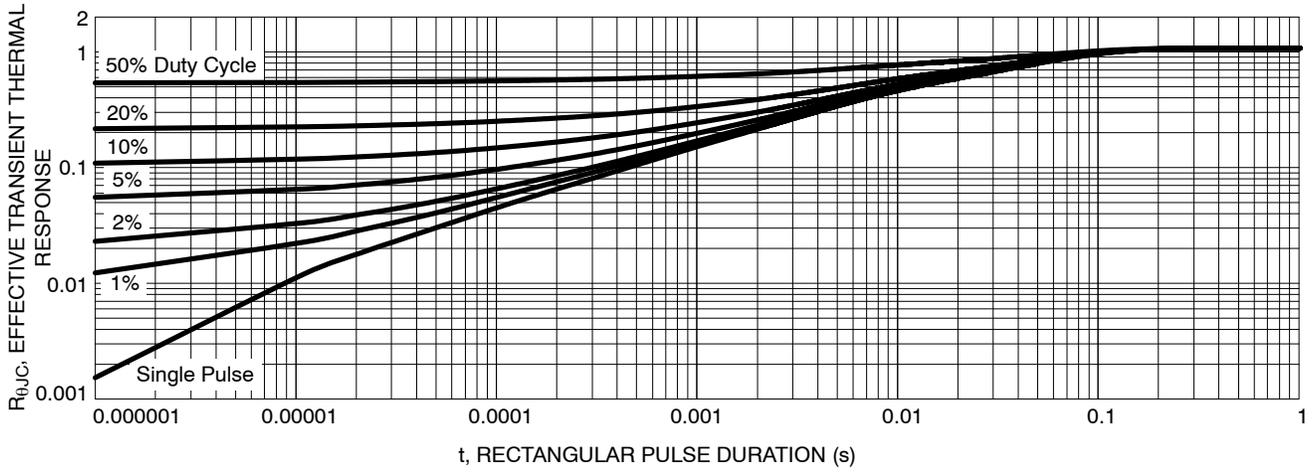
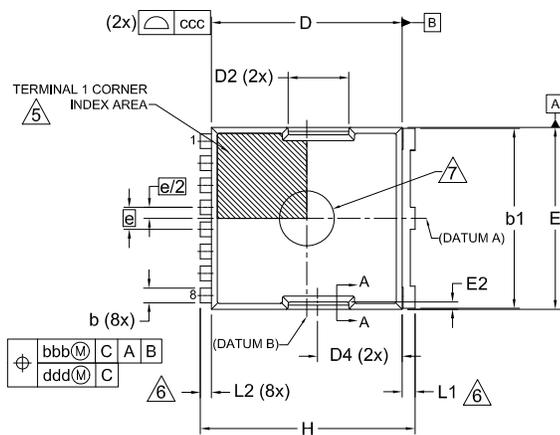


Figure 14. Thermal Response

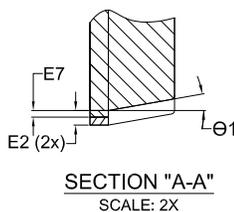


H-PSOF8L 11.68x9.80x2.30, 1.20P
CASE 100CU
ISSUE F

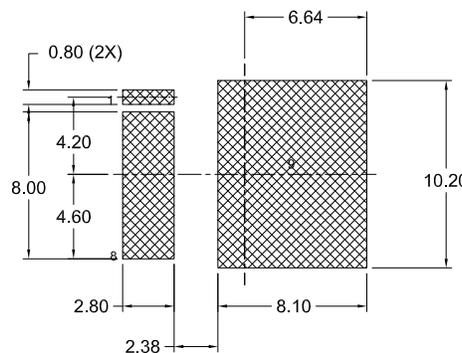
DATE 30 JUL 2024



TOP VIEW

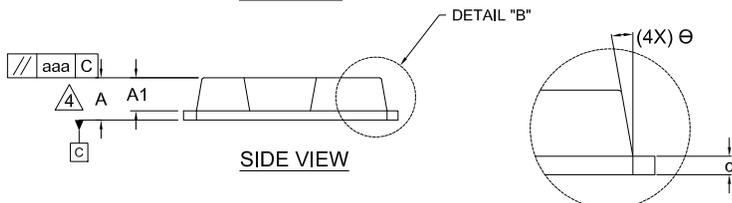


SECTION "A-A"
SCALE: 2X



LAND PATTERN
RECOMMENDATION

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

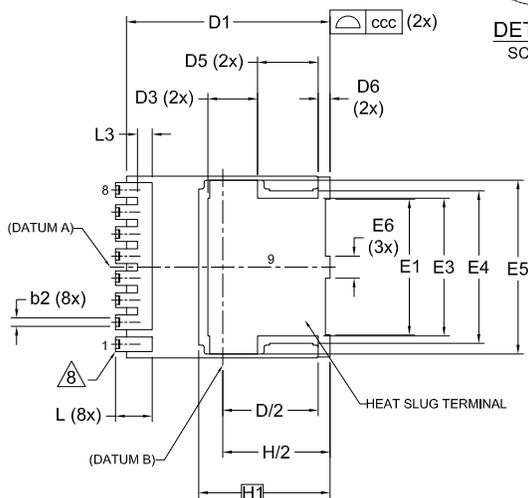


SIDE VIEW

DETAIL "B"
SCALE: 2X

NOTES:

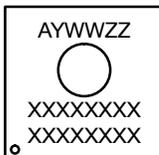
1. PACKAGE STANDARD REFERENCE: JEDEC MO-299, ISSUE B.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
3. "e" REPRESENTS THE TERMINAL PITCH.
4. THIS DIMENSION INCLUDES ENCAPSULATION THICKNESS "A1", AND PACKAGE BODY THICKNESS, BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g., EXTERNAL OR CHIP CAPACITORS. AN INTEGRAL HEATSLUG IS NOT CONSIDERED AS ATTACHED FEATURE.
5. A VISUAL INDEX FEATURE MUST BE LOCATED WITHIN THE HATCHED AREA.
6. DIMENSIONS b1,L1,L2 APPLY TO PLATED TERMINALS.
7. THE LOCATION AND SIZE OF EJECTOR MARKS ARE OPTIONAL.
8. THE LOCATION AND NUMBER OF FUSED LEADS ARE OPTIONAL.



BOTTOM VIEW

GENERIC MARKING DIAGRAM*

- A = Assembly Location
- Y = Year
- WW = Work Week
- ZZ = Assembly Lot Code
- XXXX = Specific Device Code



*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

| DIM | MILLIMETERS | | |
|-----|-------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 2.20 | 2.30 | 2.40 |
| A1 | 1.70 | 1.80 | 1.90 |
| b | 0.70 | 0.80 | 0.90 |
| b1 | 9.70 | 9.80 | 9.90 |
| b2 | 0.35 | 0.45 | 0.55 |
| c | 0.40 | 0.50 | 0.60 |
| D | 10.28 | 10.38 | 10.48 |
| D/2 | 5.09 | 5.19 | 5.29 |
| D1 | 10.98 | 11.08 | 11.18 |
| D2 | 3.20 | 3.30 | 3.40 |
| D3 | 2.60 | 2.70 | 2.80 |
| D4 | 4.45 | 4.55 | 4.65 |
| D5 | 3.20 | 3.30 | 3.40 |
| D6 | 0.55 | 0.65 | 0.75 |
| E | 9.80 | 9.90 | 10.00 |
| E1 | 7.30 | 7.40 | 7.50 |
| E2 | 0.30 | 0.40 | 0.50 |
| E3 | 7.40 | 7.50 | 7.60 |
| E4 | 8.20 | 8.30 | 8.40 |

| DIM | MILLIMETERS | | |
|---------|-------------|-------|-------|
| | MIN. | NOM. | MAX. |
| E5 | 9.36 | 9.46 | 9.56 |
| E6 | 1.10 | 1.20 | 1.30 |
| E7 | 0.15 | 0.18 | 0.21 |
| e | 1.20 BSC | | |
| e/2 | 0.60 BSC | | |
| H | 11.58 | 11.68 | 11.78 |
| H/2 | 5.74 | 5.84 | 5.94 |
| H1 | 7.15 BSC | | |
| L | 1.90 | 2.00 | 2.10 |
| L1 | 0.60 | 0.70 | 0.80 |
| L2 | 0.50 | 0.60 | 0.70 |
| L3 | 0.70 | 0.80 | 0.90 |
| theta | 10° REF | | |
| theta 1 | 10° REF | | |
| aaa | 0.20 | | |
| bbb | 0.25 | | |
| ccc | 0.20 | | |
| ddd | 0.20 | | |
| eee | 0.10 | | |

| | | |
|------------------|---------------------------------|--|
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| DESCRIPTION: | H-PSOF8L 11.68x9.80x2.30, 1.20P | PAGE 1 OF 1 |

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