

MOSFET – POWERTRENCH® N-Channel

80 V, 220 A, 3.0 mΩ

FDBL86366-F085

Features

- Typical $R_{DS(on)}$ = 2.4 mΩ at V_{GS} = 10 V, I_D = 80 A
- Typical $Q_{g(tot)}$ = 86 nC at V_{GS} = 10 V, I_D = 80 A
- UIS Capability
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

Applications

- Automotive Engine Control
- PowerTrain Management
- Solenoid and Motor Drivers
- Integrated Starter/Alternator
- Primary Switch for 12 V Systems

MOSFET MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

| Symbol | Parameter | Ratings | Unit |
|-----------------|---|--------------|------|
| V_{DS} | Drain-to-Source Voltage | 80 | V |
| V_{GS} | Gate-to-Source Voltage | ±20 | V |
| I_D | Drain Current – Continuous (V_{GS} = 10 V, T_C = 25°C (Note 1)) | 220 | A |
| | Pulsed Drain Current, T_C = 25°C | See Figure 4 | |
| E_{AS} | Single Pulse Avalanche Energy (Note 2) | 205 | mJ |
| P_D | Power Dissipation | 300 | W |
| | Derate Above 25°C | 2.0 | W/°C |
| T_J, T_{STG} | Operating and Storage Temperature | –55 to +175 | °C |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.5 | °C/W |
| $R_{\theta JA}$ | Maximum Thermal Resistance, Junction to Ambient (Note 3) | 43 | °C/W |

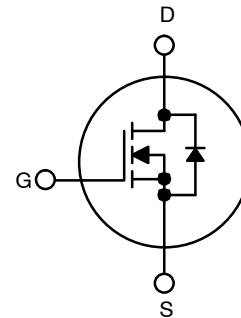
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Current is limited by silicon.
2. Starting T_J = 25°C, L = 0.1 mH, I_{AS} = 64 A, V_{DD} = 80 V during inductor charging and V_{DD} = 0 V during time in avalanche.
3. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design, while $R_{\theta JA}$ is determined by the board design. The maximum rating presented here is based on mounting on a 1 in² pad of 2oz copper.



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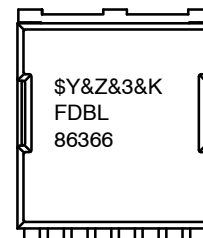


N-Channel



H-PSOF8L
CASE 100CU

MARKING DIAGRAM



| | |
|-----------|-------------------------|
| \$Y | = ON Semiconductor Logo |
| &Z | = Assembly Plant Code |
| &3 | = Numeric Date Code |
| &K | = Lot Code |
| FDBL86366 | = Specific Device Code |

ORDERING INFORMATION

| Device | Top Mark | Package | Shipping† |
|--------------------|-----------|----------|--------------------------|
| FDBL86366 –F085 | FDBL86366 | H-PSOF8L | 2000 Units/ Tape&Reel |

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

FDBL86366–F085

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

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

OFF CHARACTERISTICS

| | | | | | | |
|-------------------|-----------------------------------|--|----|---|------|----|
| BV _{DSS} | Drain-to-Source Breakdown Voltage | I _D = 250 μA, V _{GS} = 0 V | 80 | – | – | V |
| I _{DSS} | Drain-to-Source Leakage Current | V _{DS} = 80 V, V _{GS} = 0 V | – | – | 1 | μA |
| | | T _J = 25°C | | | 1 | mA |
| I _{GSS} | Gate-to-Source Leakage Current | V _{GS} = ±20 V | – | – | ±100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|---------------------|----------------------------------|---|-----|-----|-----|----|
| V _{GS(th)} | Gate to Source Threshold Voltage | V _{GS} = V _{DS} , I _D = 250 μA | 2.0 | 3.0 | 4.0 | V |
| R _{DS(on)} | Drain to Source on Resistance | I _D = 80 A, V _{GS} = 10 V | – | 2.4 | 3.0 | mΩ |
| | | T _J = 175°C (Note 4) | | 4.9 | 6.1 | mΩ |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|---------------------|-------------------------------|--|---|------|-----|----|
| C _{iss} | Input Capacitance | V _{DS} = 40 V, V _{GS} = 0 V, f = 1 MHz | – | 6320 | – | pF |
| C _{oss} | Output Capacitance | | – | 1030 | – | pF |
| C _{rss} | Reverse Transfer Capacitance | | – | 32 | – | pF |
| R _g | Gate Resistance | f = 1 MHz | – | 2.1 | – | Ω |
| Q _{g(ToT)} | Total Gate Charge at 10 V | V _{GS} = 0 to 10 V | – | 86 | 112 | nC |
| Q _{g(th)} | Threshold Gate Charge | V _{GS} = 0 to 2 V | | 12 | 18 | nC |
| Q _{gs} | Gate-to-Source Gate Charge | V _{DD} = 64 V, I _D = 80 A | – | 30 | – | nC |
| Q _{gd} | Gate-to-Drain "Miller" Charge | | – | 18 | – | nC |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|----------------|--|---|----|----|----|
| t _{on} | Turn-On Time | V _{DD} = 40 V, I _D = 80 A, V _{GS} = 10 V, R _{GEN} = 6 Ω | – | – | 98 | ns |
| t _{d(on)} | Turn-On Delay | | – | 30 | – | ns |
| t _r | Rise Time | | – | 34 | – | ns |
| t _{d(off)} | Turn-Off Delay | | – | 40 | – | ns |
| t _f | Fall Time | | – | 17 | – | ns |
| t _{off} | Turn-Off Time | | – | – | 86 | ns |

DRAIN-SOURCE DIODE CHARACTERISTIC

| | | | | | | |
|-----------------|-------------------------------|---|---|----|------|----|
| V _{SD} | Source-to-Drain Diode Voltage | I _{SD} = 80 A, V _{GS} = 0 V | – | – | 1.25 | V |
| | | I _{SD} = 40 A, V _{GS} = 0 V | – | – | 1.2 | V |
| t _{rr} | Reverse-Recovery Time | I _F = 80 A, dI _{SD} /dt = 100 A/μs, V _{DD} = 64 V | – | 80 | 120 | ns |
| Q _{rr} | Reverse-Recovery Charge | | – | 95 | 140 | 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.

4. The maximum value is specified by design at T_J = 175°C. Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

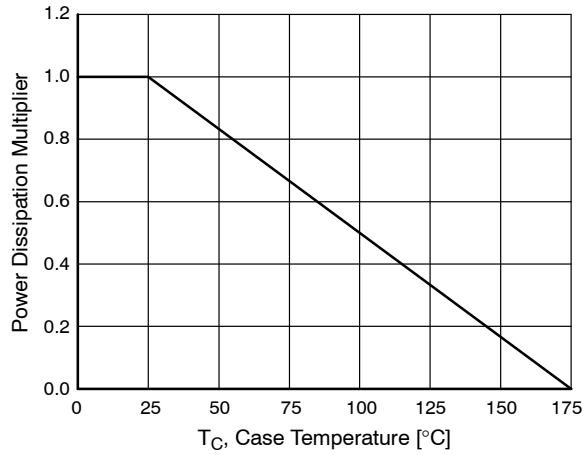


Figure 1. Normalized Power Dissipation vs. Case Temperature

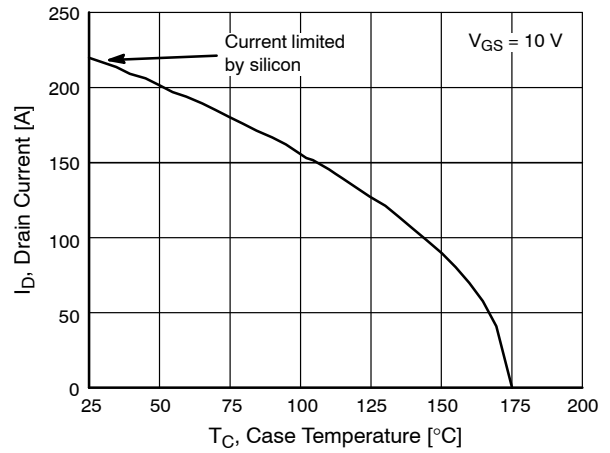


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

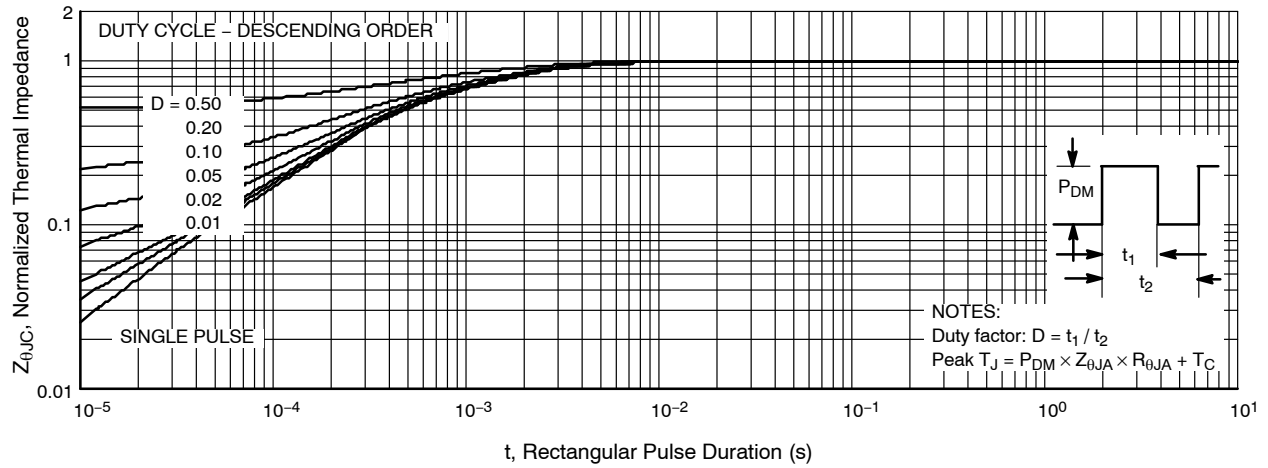


Figure 3. Normalized Maximum Transient Thermal Impedance

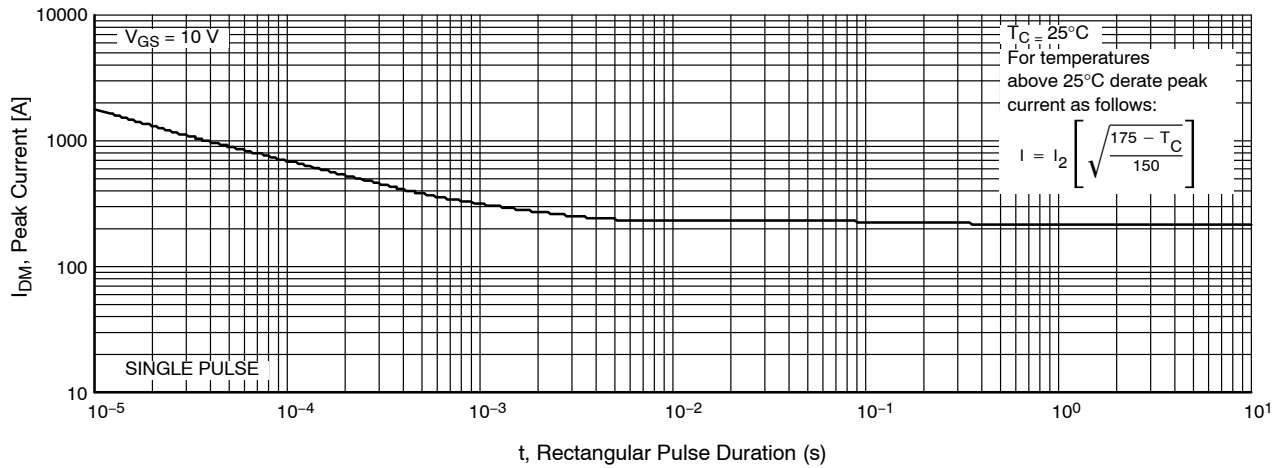


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS (continued)

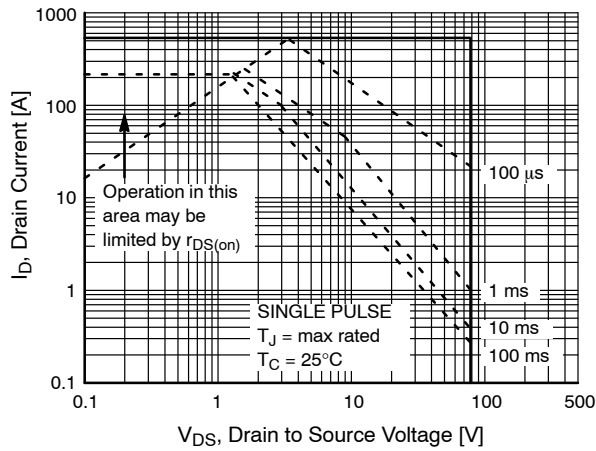


Figure 5. Forward Bias Safe Operating Area

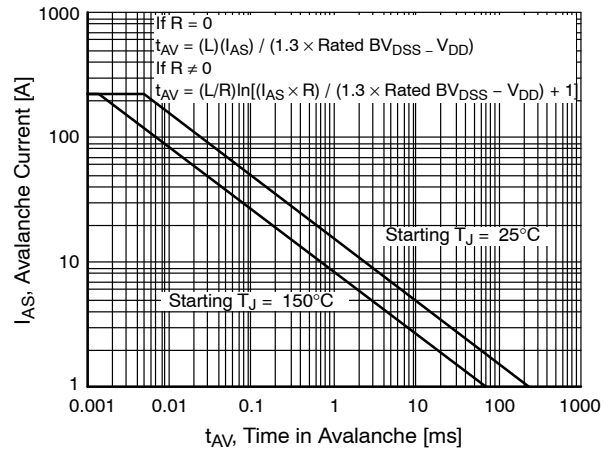
NOTE: Refer to ON Semiconductor Application Notes [AN7514](#) and [AN7515](#).

Figure 6. Unclamped Inductive Switching Capability

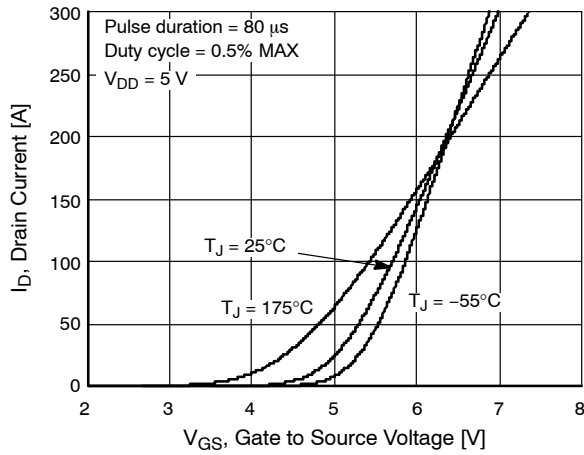


Figure 7. Transfer Characteristics

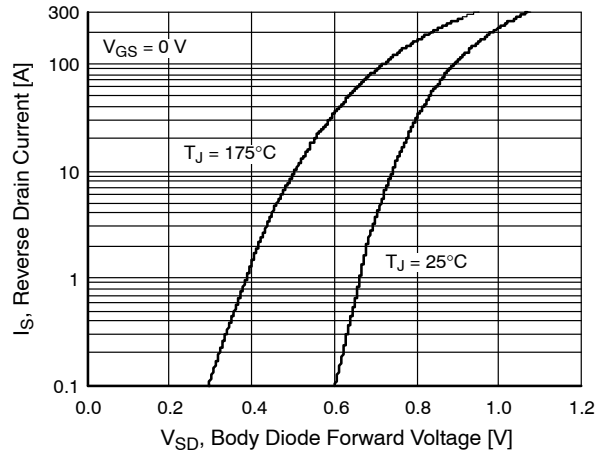


Figure 8. Forward Diode Characteristics

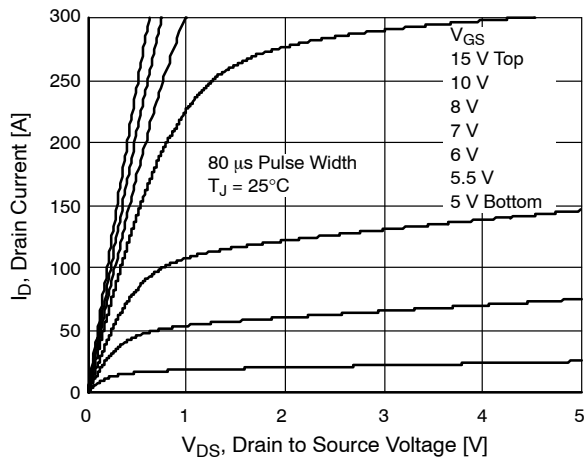


Figure 9. Saturation Characteristics

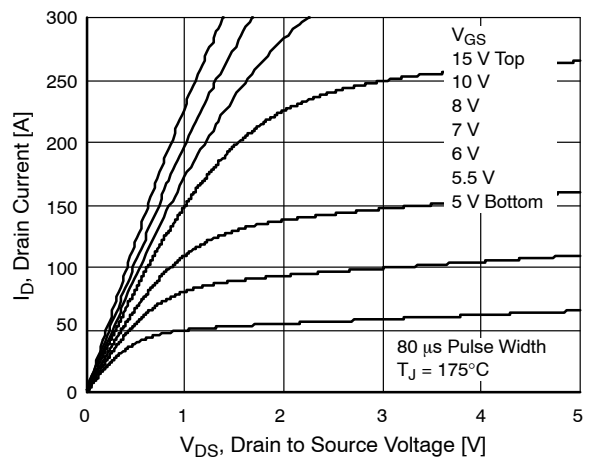


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS (continued)

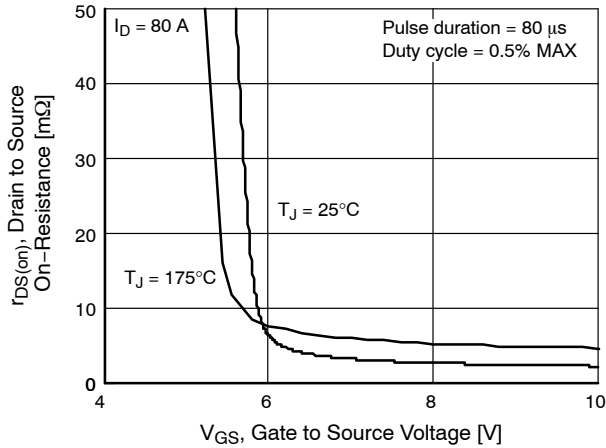


Figure 11. $R_{DS(on)}$ vs. Gate Voltage

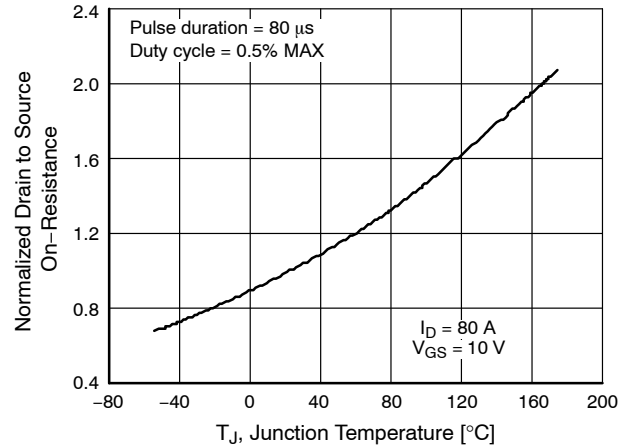


Figure 12. Normalized $R_{DS(on)}$ vs. Junction Temperature

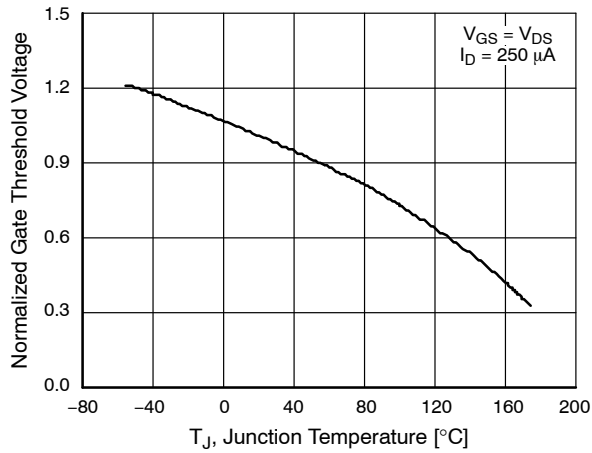


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

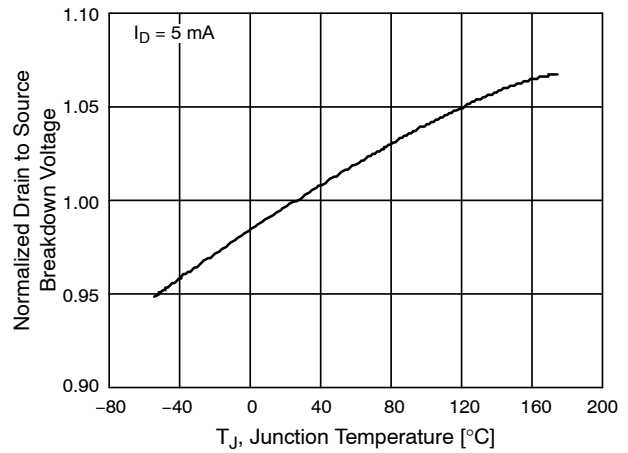


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

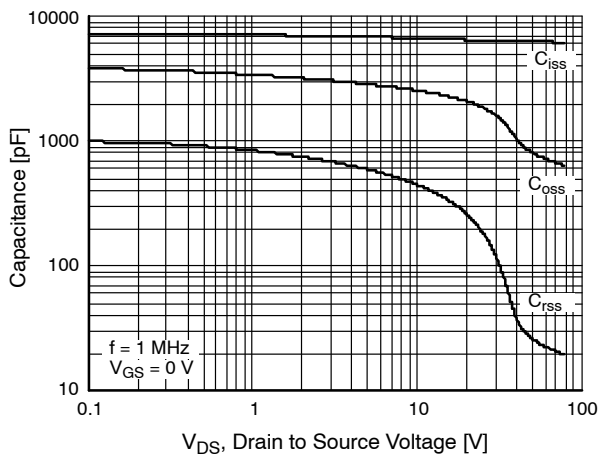


Figure 15. Capacitance vs. Drain to Source Voltage

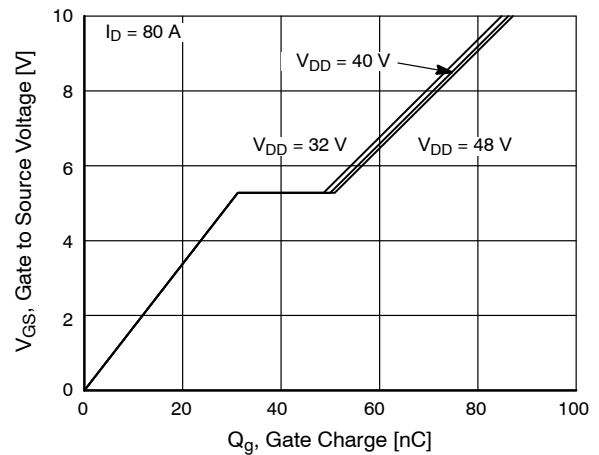
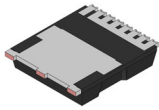


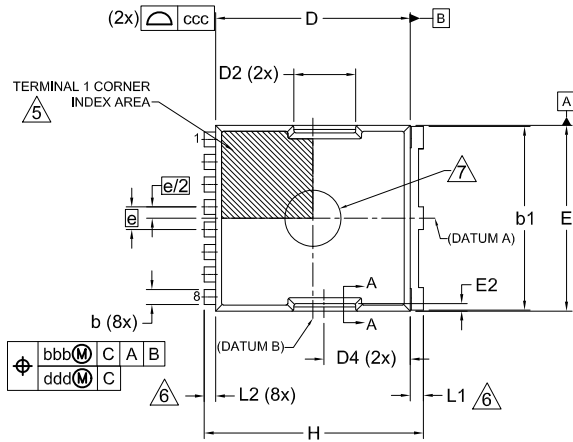
Figure 16. Gate Charge vs. Gate to Source Voltage

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

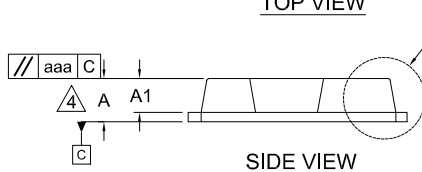


H-PSOF8L 11.68x9.80x2.30, 1.20P
CASE 100CU
ISSUE D

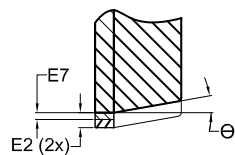
DATE 25 APRIL 2024



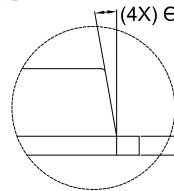
TOP VIEW



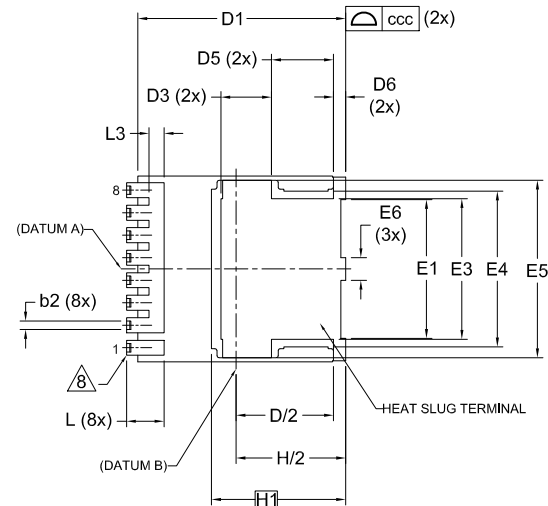
SIDE VIEW



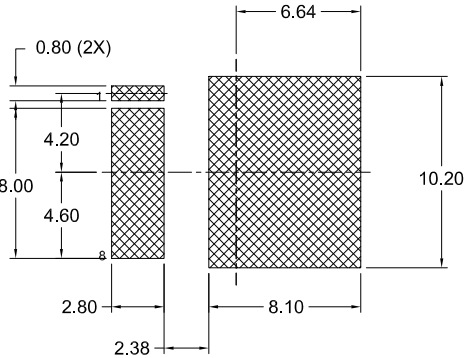
DETAIL "A"
SCALE: 2X



DETAIL "B"
SCALE: 2X



BOTTOM VIEW



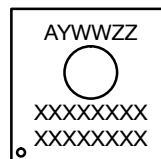
LAND PATTERN
RECOMMENDATION

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

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.

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 | 9.47 |
| 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 |
| Θ | 10° REF | | |
| Θ1 | 10° REF | | |
| aaa | 0.20 | | |
| bbb | 0.25 | | |
| ccc | 0.20 | | |
| ddd | 0.20 | | |
| eee | 0.10 | | |

| | | |
|-------------------------|--|---|
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