

FDBL9401L-F085

N-Channel Logic Level PowerTrench[®] MOSFET

40 V, 300 A, 0.55 mΩ

Features

- Typical $R_{DS(on)}$ = 0.47 mΩ at $V_{GS} = 10$ V, $I_D = 80$ A
- Typical $Q_{g(tot)}$ = 269 nC at $V_{GS} = 10$ V, $I_D = 80$ A
- UIS Capability
- Qualified to AEC Q101
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

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

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

| Symbol | Parameter | Value | Unit |
|----------------|--|----------------|---------------------|
| V_{DSS} | Drain-to-Source Voltage | 40 | V |
| V_{GS} | Gate-to-Source Voltage | ±20 | V |
| I_D | Drain Current – Continuous, ($V_{GS} = 10$ V) $T_C = 25^\circ\text{C}$ (Note 1) | 300 | A |
| | Pulsed Drain Current, $T_C = 25^\circ\text{C}$ | (See Figure 4) | A |
| E_{AS} | Single Pulse Avalanche Energy (Note 2) | 913 | mJ |
| P_D | Power Dissipation | 429 | W |
| | Derate Above 25°C | 2.86 | W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature | -55 to +175 | $^\circ\text{C}$ |

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.

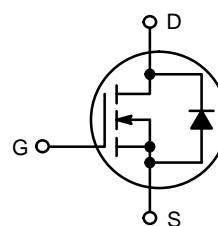
1. Current is limited by bondwire configuration.
2. Starting $T_J = 25^\circ\text{C}$, $L = 530 \mu\text{H}$, $I_{AS} = 64$ A, $V_{DD} = 40$ V during inductor charging and $V_{DD} = 0$ V during time in avalanche.



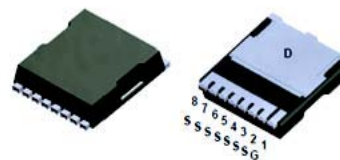
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| V_{DSS} | $R_{DS(on)}$ MAX | I_D MAX |
|-----------|------------------|-----------|
| 40 V | 0.55 mΩ @ 10 V | 300 A |

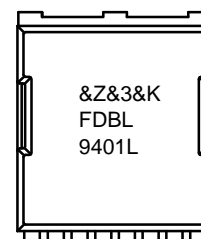


N-CHANNEL MOSFET



H-PSOF8L
CASE 100CU

MARKING DIAGRAM



&Z = Assembly Plant Code
 &3 = Numeric Date Code
 &K = Lot Code
 FDBL9401L = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

FDBL9401L–F085

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|-----------------|--|-------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.35 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 3) | 43 | |

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 2 oz copper.

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

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

OFF CHARACTERISTICS

| | | | | | | |
|------------|-----------------------------------|---|----|---|-----------|---------|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | $I_D = 250 \mu A, V_{GS} = 0 V$ | 40 | – | – | V |
| I_{DSS} | Drain-to-Source Leakage Current | $V_{DS} = 40 V, V_{GS} = 0 V$ $T_J = 25^\circ C$ $T_J = 175^\circ C$ (Note 4) | – | – | 1 2000 | μA |
| I_{GSS} | Gate-to-Source Leakage Current | $V_{GS} = \pm 20 V$ | – | – | ± 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--------------|----------------------------------|---|---|--------------|--------------|------------|
| $V_{GS(th)}$ | Gate-to-Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250 \mu A$ | 1 | 1.7 | 3 | V |
| $R_{DS(on)}$ | Drain-to-Source On Resistance | $V_{GS} = 4.5 V, I_D = 80 A$ | – | 0.59 | 0.76 | m Ω |
| | | $V_{GS} = 10 V, I_D = 80 A$ $T_J = 25^\circ C$ $T_J = 175^\circ C$ (Note 4) | – | 0.47 0.81 | 0.55 0.97 | m Ω |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|--------------|-------------------------------|---|---|-------|-----|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz$ | – | 19550 | – | pF |
| C_{oss} | Output Capacitance | | – | 5630 | – | pF |
| C_{rss} | Reverse Transfer Capacitance | | – | 509 | – | pF |
| R_g | Gate Resistance | $V_{GS} = 0.5 V, f = 1 MHz$ | – | 2.8 | – | Ω |
| $Q_{g(tot)}$ | Total Gate Charge at 10 V | $V_{GS} = 0 V$ to 10 V, $V_{DD} = 32 V, I_D = 80 A$ | – | 269 | 376 | nC |
| $Q_{g(th)}$ | Threshold Gate Charge | $V_{GS} = 0 V$ to 1 V, $V_{DD} = 32 V, I_D = 80 A$ | – | 17 | – | nC |
| Q_{gs} | Gate-to-Source Gate Charge | $V_{DD} = 32 V, I_D = 80 A$ | – | 56 | – | nC |
| Q_{gd} | Gate-to-Drain "Miller" Charge | $V_{DD} = 32 V, I_D = 80 A$ | – | 33 | – | nC |

SWITCHING CHARACTERISTICS

| | | | | | | |
|--------------|---------------------|---|---|-----|-----|----|
| t_{on} | Turn-On Time | $V_{DD} = 20 V, I_D = 80 A, V_{GS} = 10 V,$ $R_{GEN} = 6 \Omega$ | – | – | 150 | ns |
| $t_{d(on)}$ | Turn-On Delay Time | | – | 27 | – | ns |
| t_r | Turn-On Rise Time | | – | 49 | – | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | – | 196 | – | ns |
| t_f | Turn-Off Fall Time | | – | 79 | – | ns |
| t_{off} | Turn-Off Time | | – | – | 412 | ns |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|----------|-------------------------------|--|---|------|------|----|
| V_{SD} | Source-to-Drain Diode Voltage | $I_{SD} = 80 A, V_{GS} = 0 V$ | – | 0.78 | 1.25 | V |
| | | $I_{SD} = 40 A, V_{GS} = 0 V$ | – | 0.74 | 1 | |
| t_{rr} | Reverse-Recovery Time | $I_F = 80 A, di_{SD}/dt = 100 A/\mu s$ | – | 130 | 195 | ns |
| Q_{rr} | Reverse-Recovery Charge | | – | 270 | 405 | 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.

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TYPICAL CHARACTERISTICS

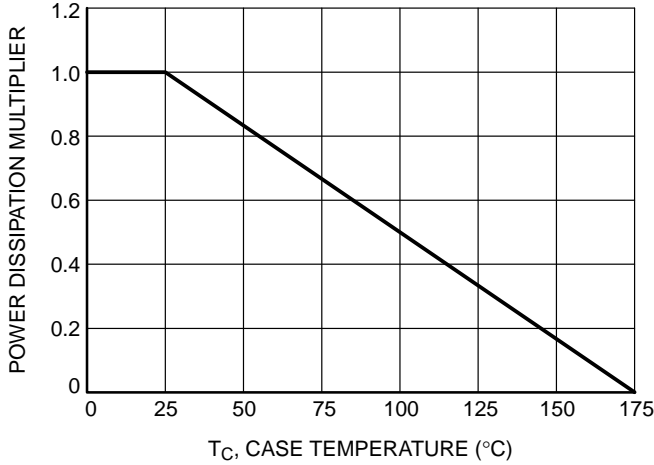


Figure 1. Normalized Power Dissipation vs. Case Temperature

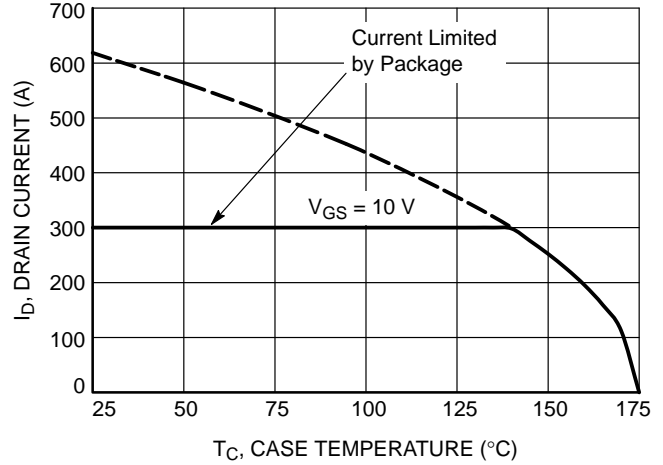


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

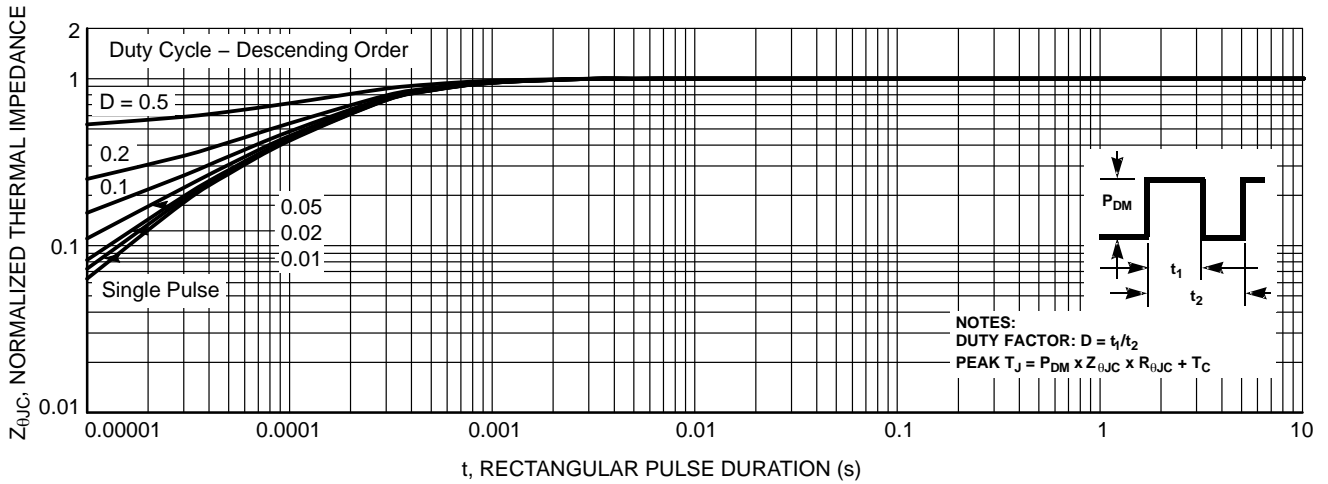


Figure 3. Normalized Maximum Transient Thermal Impedance

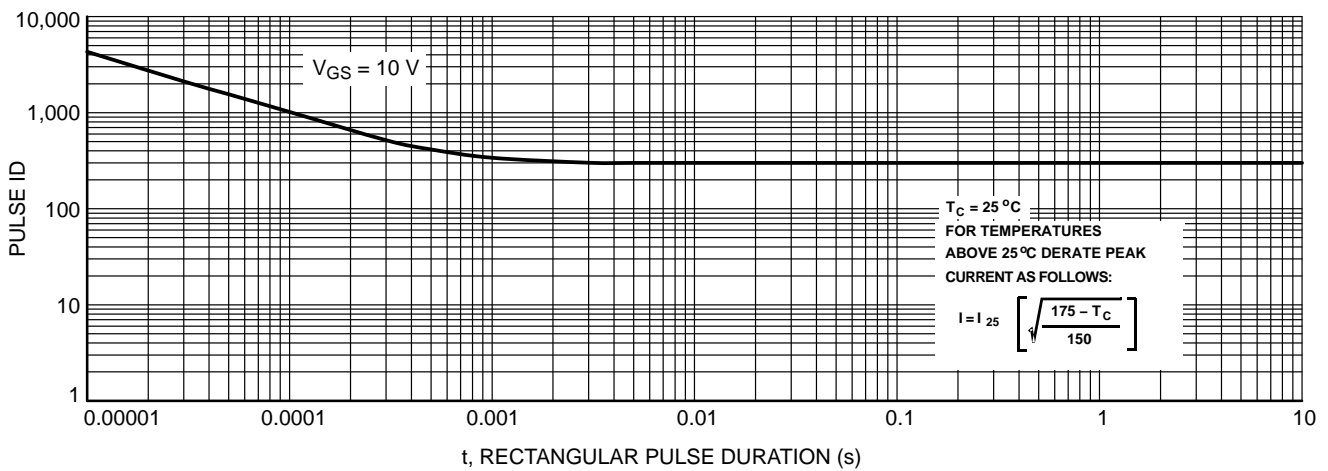


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS

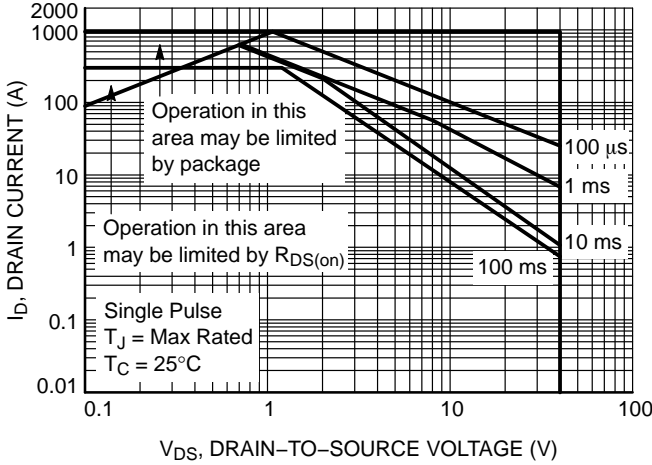


Figure 5. Forward Bias Safe Operating Area

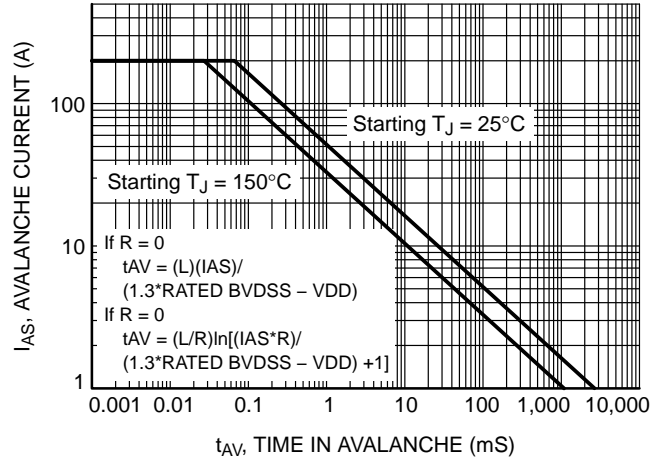


Figure 6. Unclamped Inductive Switching Capability

Note: Refer to ON Semiconductor Application Notes AN7514 and AN7515

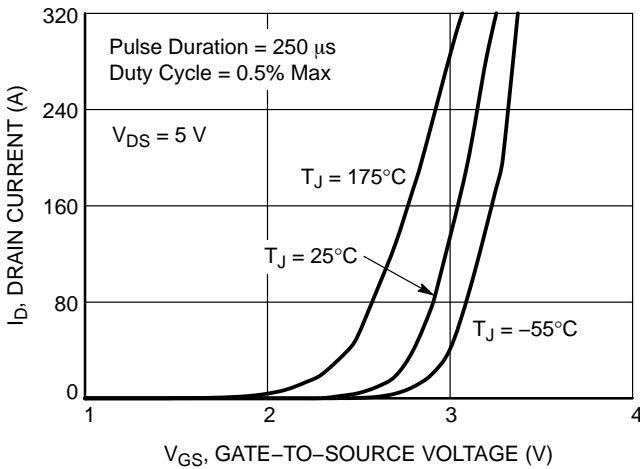


Figure 7. Transfer Characteristics

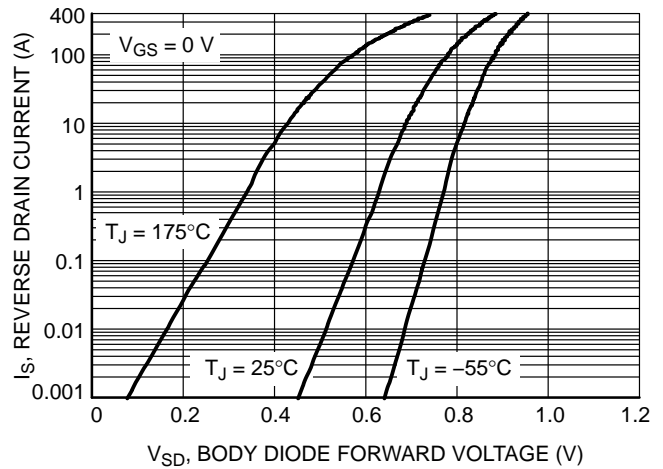


Figure 8. Forward Diode Characteristics

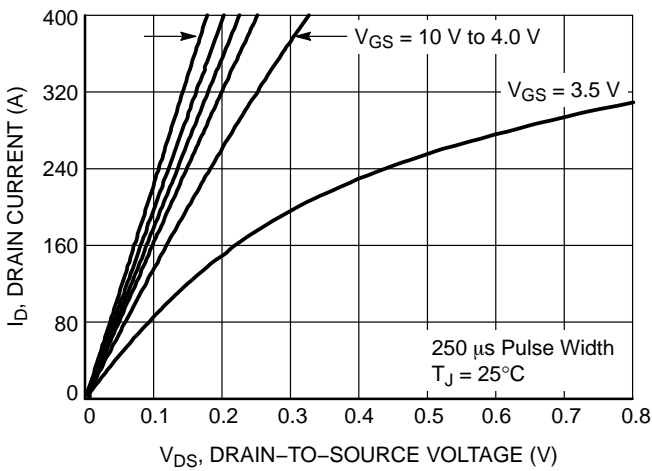


Figure 9. Saturation Characteristics

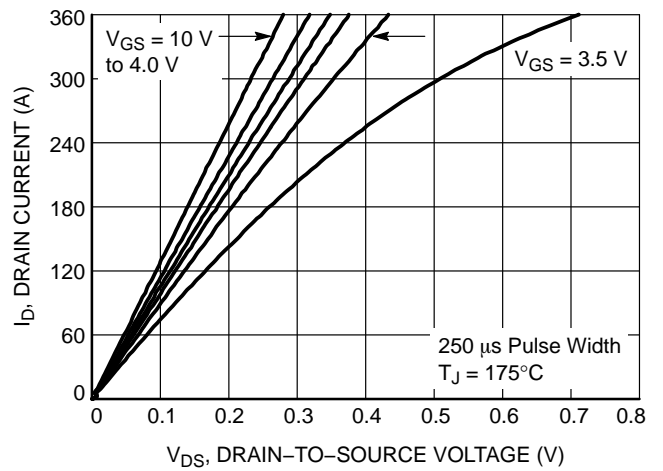


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS

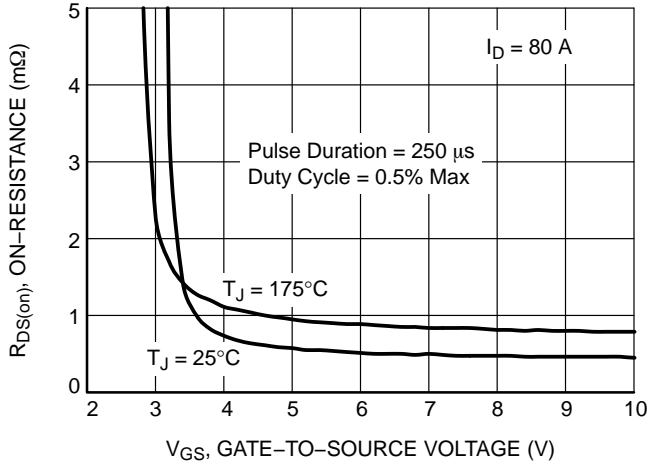


Figure 11. $R_{DS(on)}$ vs. Gate Voltage

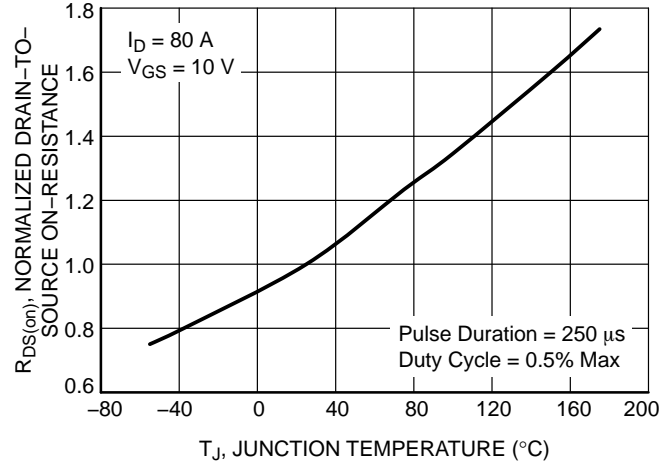


Figure 12. Normalized $R_{DS(on)}$ vs. Junction Temperature

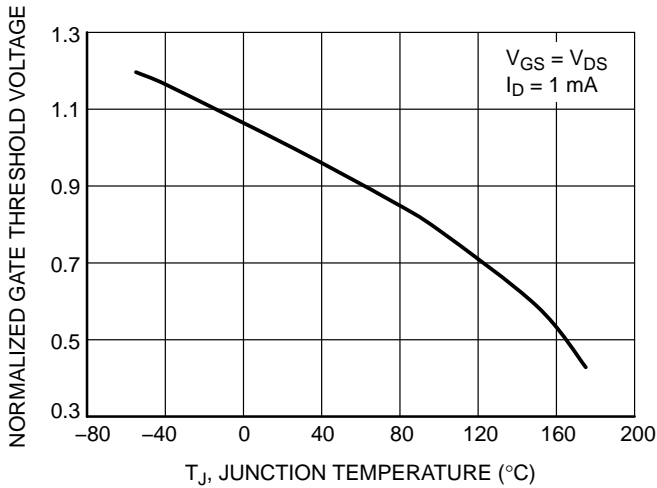


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

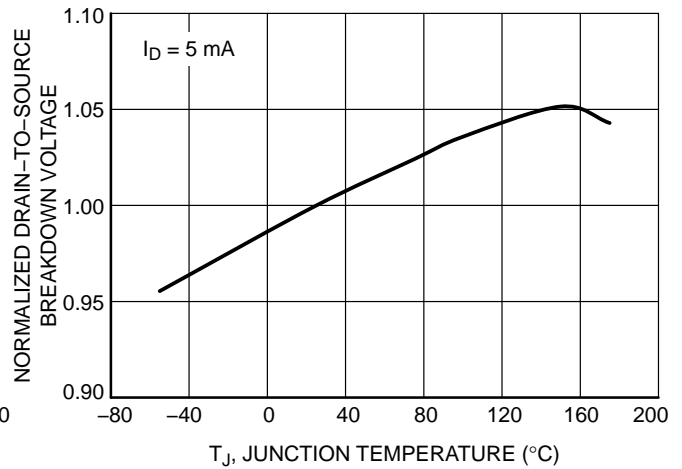


Figure 14. Normalized Drain-to-Source Breakdown Voltage vs. Junction Temperature

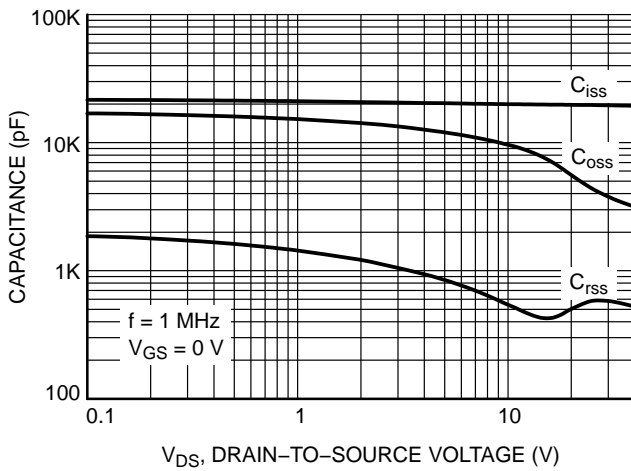


Figure 15. Capacitance vs. Drain-to-Source Voltage

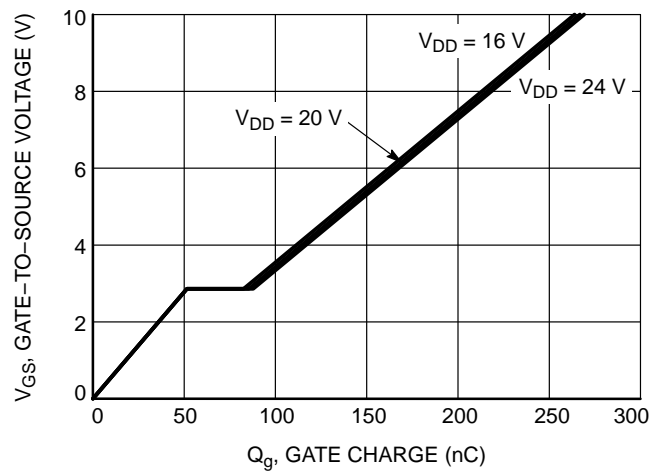


Figure 16. Gate Charge vs. Gate-to-Source Voltage

FDBL9401L-F085

PACKAGE MARKING AND ORDERING INFORMATION

| Device | Marking | Package | Reel Size | Tape Width | Quantity |
|----------------|-----------|--------------------------------------|-----------|------------|------------|
| FDBL9401L-F085 | FDBL9401L | H-PSOF8L (Pb-Free / Halogen Free) | 13" | 24 mm | 2000 Units |

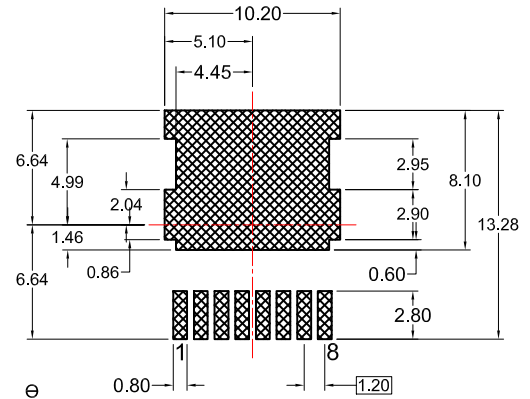
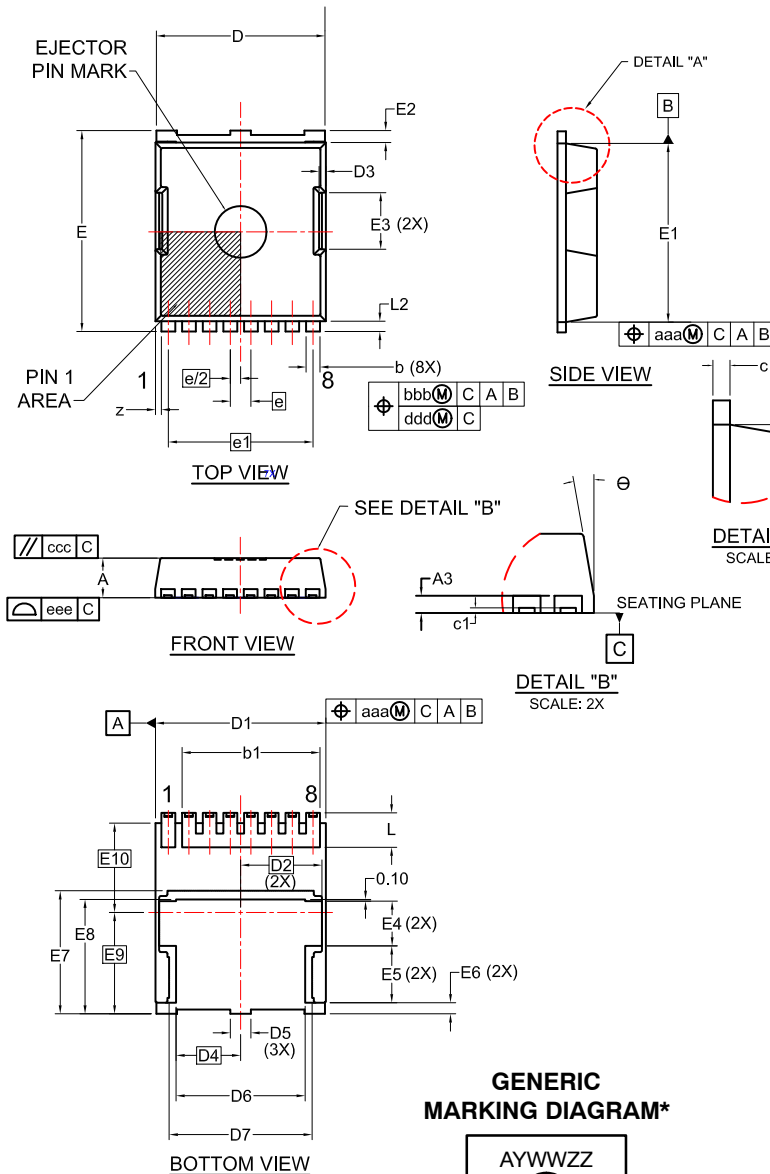
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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H-PSOF8L 11.68x9.80 CASE 100CU ISSUE A

DATE 06 JAN 2020



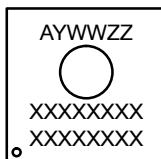
LAND PATTERN RECOMMENDATION
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

- NOTES:
1. PACKAGE STANDARD REFERENCE: JEDEC MO-299, ISSUE A.
 2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
 3. CONTROLLING DIMENSION: MILLIMETERS.
 4. COPLANARITY APPLIES TO THE EXPOSED WELL AS THE TERMINALS.
 5. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
 6. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS | | |
|-----|-------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 2.20 | 2.30 | 2.40 |
| A3 | 0.40 | 0.50 | 0.60 |
| b | 0.70 | 0.80 | 0.90 |
| b1 | 8.00 REF | | |
| c | 0.40 | 0.50 | 0.60 |
| c1 | 0.10 | -- | -- |
| D | 9.70 | 9.80 | 9.90 |
| D1 | 9.80 | 9.90 | 10.00 |
| D2 | 4.73 BSC | | |
| D3 | 0.40 REF | | |
| D4 | 3.75 BSC | | |
| D5 | -- | 1.20 | -- |
| D6 | 7.40 | 7.50 | 7.60 |
| D7 | (8.30) | | |
| E | 11.58 | 11.68 | 11.78 |
| E1 | 10.28 | 10.38 | 10.48 |
| E2 | 0.60 | 0.70 | 0.80 |
| E3 | 3.30 REF | | |
| E4 | -- | 2.60 | -- |

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| e | 1.20 BSC | | |
| e/2 | 0.60 BSC | | |
| e1 | 8.40 BSC | | |
| K | 1.50 | 1.57 | 1.70 |
| L | 1.90 | 2.00 | 2.10 |
| L2 | 0.50 | 0.60 | 0.70 |
| z | 0.35 REF | | |
| θ | 0° | -- | 12° |
| aaa | 0.20 | | |
| bbb | 0.25 | | |
| ccc | 0.20 | | |
| ddd | 0.20 | | |
| eee | 0.10 | | |
| E5 | -- | 3.30 | -- |
| E6 | -- | 0.65 | -- |
| E7 | 7.15 REF | | |
| E8 | 6.55 | 6.65 | 6.75 |
| E9 | 5.89 BSC | | |
| E10 | 5.19 BSC | | |

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.

| | | |
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| DESCRIPTION: | H-PSOF8L 11.68x9.80 | PAGE 1 OF 1 |

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