

MOSFET - Power, Single P-Channel POWERTRENCH®

-40 V, -100 A, 4.4 mΩ

FDD9507L-F085

Features

- Typical $R_{DS(on)}$ = 3.3 mΩ at $V_{GS} = -10$ V, $I_D = -80$ A
- Typical $G_{g(tot)}$ = 110 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
- Electrical Power Steering
- Integrated Starter/Alternator
- Distributed Power Architectures and VRM
- 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 | ±16 | V |
| I_D | Drain Current - Continuous, ($V_{GS} = -10$ V) $T_C = 25^\circ\text{C}$ (Note 1) | -100 | A |
| | Pulsed Drain Current, $T_C = 25^\circ\text{C}$ | (See Figure 4) | A |
| E_{AS} | Single Pulse Avalanche Energy (Note 2) | 259 | mJ |
| P_D | Power Dissipation | 227 | W |
| | Derate Above 25°C | 1.52 | 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.

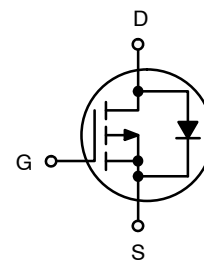
1. Current is limited by bondwire configuration.
2. Starting $T_J = 25^\circ\text{C}$, $L = 0.1$ mH, $I_{AS} = -72$ A, $V_{DD} = -40$ V during inductor charging and $V_{DD} = 0$ V during time in avalanche.



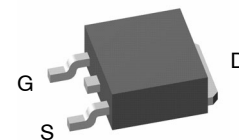
ON Semiconductor®

www.onsemi.com

| V_{DSS} | $R_{DS(ON)}$ MAX | I_D MAX |
|-----------|------------------|-----------|
| -40 V | 4.4 mΩ @ -10 V | -100 A |

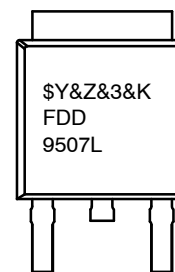


P-CHANNEL MOSFET



DPAK3 (TO-252)
CASE 369AS

MARKING DIAGRAM



| | |
|----------|-------------------------|
| \$Y | = ON Semiconductor Logo |
| &Z | = Assembly Plant Code |
| &3 | = Numeric Date Code |
| &K | = Lot Code |
| FDD9507L | = Specific Device Code |

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

FDD9507L-F085

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|-----------------|--|-------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.66 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 3) | 52 | |

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.

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

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

OFF CHARACTERISTICS

| | | | | | | |
|------------|-----------------------------------|--|-----|---|-----------|---------------------|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | $I_D = -250 \mu\text{A}, V_{GS} = 0 \text{ V}$ | -40 | - | - | V |
| I_{DSS} | Drain-to-Source Leakage Current | $V_{DS} = -40 \text{ V}, V_{GS} = 0 \text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 175^\circ\text{C}$ (Note 4) | - | - | 1 | μA mA |
| I_{GSS} | Gate-to-Source Leakage Current | $V_{GS} = \pm 16 \text{ V}$ | - | - | ± 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--------------|--------------------------------------|---|----|-----|-----|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$ | -1 | -2 | -3 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = -4.5 \text{ V}, I_D = -80 \text{ A}, T_J = 25^\circ\text{C}$ | - | 4.9 | 7.2 | m Ω |
| | | $V_{GS} = -10 \text{ V}, I_D = -80 \text{ A}$ $T_J = 25^\circ\text{C}$ $T_J = 175^\circ\text{C}$ (Note 4) | - | 3.3 | 4.4 | |
| | | | - | 5.3 | 7.1 | |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|---------------|-------------------------------|--|---|------|-----|----------|
| C_{iss} | Input Capacitance | $V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | - | 6250 | - | pF |
| C_{oss} | Output Capacitance | | - | 2640 | - | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 61 | - | pF |
| R_g | Gate Resistance | $f = 1 \text{ MHz}$ | - | 19.3 | - | Ω |
| $Q_{g(tot)}$ | Total Gate Charge | $V_{GS} = 0 \text{ V to } -10 \text{ V}, V_{DD} = -20 \text{ V}, I_D = -80 \text{ A}$ | - | 100 | 130 | nC |
| $Q_{g(-4.5)}$ | Total Gate Charge | $V_{GS} = 0 \text{ V to } -4.5 \text{ V}, V_{DD} = -20 \text{ V}, I_D = -80 \text{ A}$ | - | 46 | - | nC |
| $Q_{g(th)}$ | Threshold Gate Charge | $V_{GS} = 0 \text{ V to } -2 \text{ V}, V_{DD} = -20 \text{ V}, I_D = -80 \text{ A}$ | - | 13 | - | nC |
| Q_{gs} | Gate to Source Charge | $V_{DD} = -20 \text{ V}, I_D = -80 \text{ A}$ | - | 22 | - | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | $V_{DD} = -20 \text{ V}, I_D = -80 \text{ A}$ | - | 13 | - | nC |

SWITCHING CHARACTERISTICS

| | | | | | | |
|--------------|----------------|--|---|-----|-----|----|
| t_{on} | Turn-On Time | $V_{DD} = -20 \text{ V}, I_D = -80 \text{ A}, V_{GS} = -10 \text{ V},$ $R_{GEN} = 6 \Omega$ | - | - | 21 | ns |
| $t_{d(on)}$ | Turn-On Delay | | - | 10 | - | ns |
| t_r | Rise Time | | - | 6 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay | | - | 400 | - | ns |
| t_f | Fall Time | | - | 132 | - | ns |
| t_{off} | Turn-Off Time | | - | - | 710 | ns |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|----------|---------------------------------------|---|---|-------|------|----|
| V_{SD} | Source to Drain Diode Forward Voltage | $I_{SD} = -80 \text{ A}, V_{GS} = 0 \text{ V}$ | - | -0.9 | -1.3 | V |
| | | $I_{SD} = -40 \text{ A}, V_{GS} = 0 \text{ V}$ | - | -0.85 | -1.2 | |
| t_{rr} | Reverse Recovery Time | $I_F = -80 \text{ A}, dI_{SD}/dt = 100 \text{ A}/\mu\text{s}$ | - | 87 | 113 | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 115 | 150 | 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 $T_J = 175^\circ\text{C}$. Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

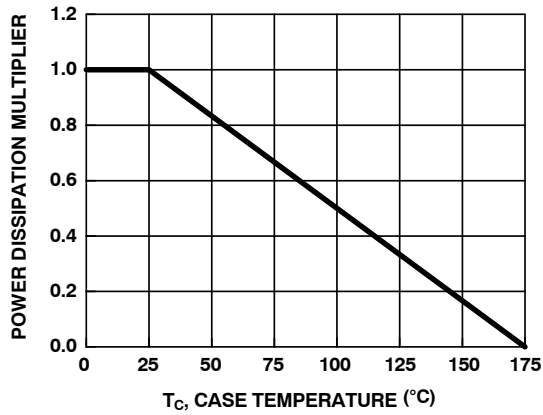


Figure 1. Normalized Power Dissipation vs. Case Temperature

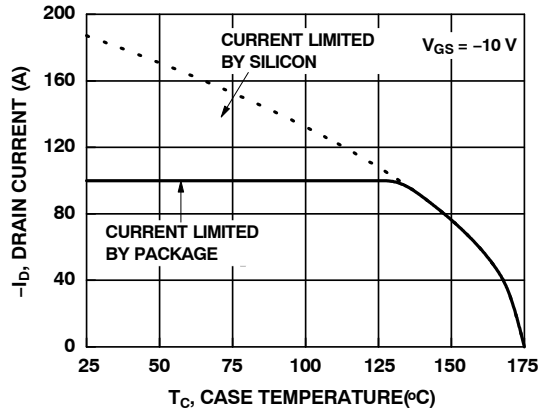


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

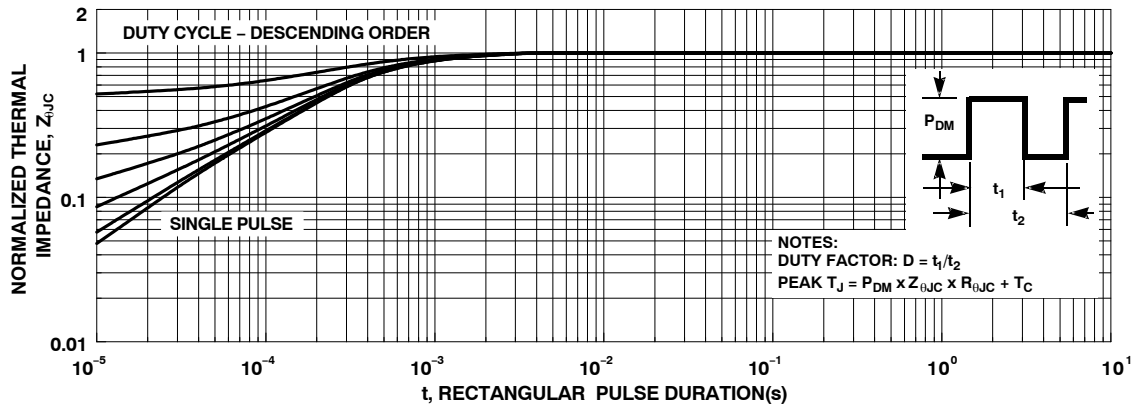


Figure 3. Normalized Maximum Transient Thermal Impedance

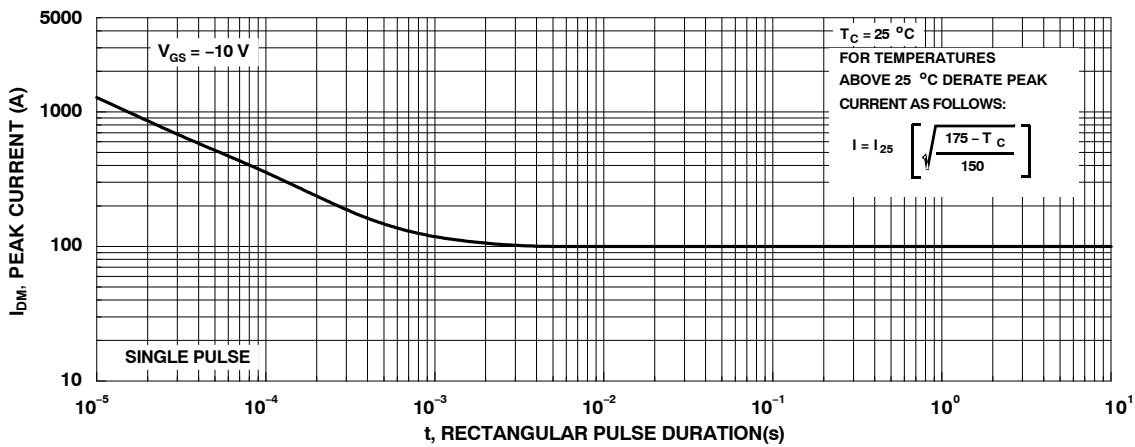


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS

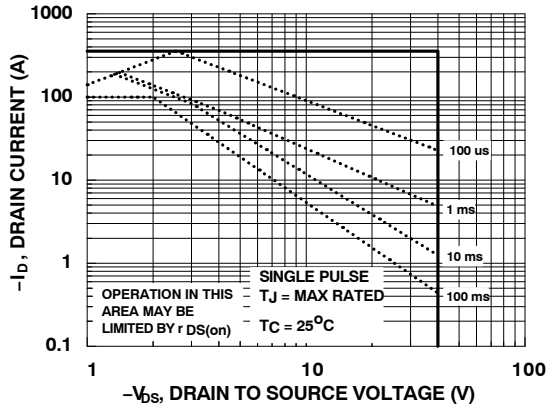


Figure 5. Forward Bias Safe Operating Area

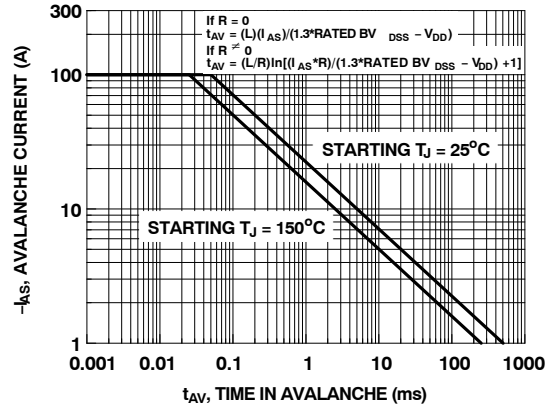


Figure 6. Unclamped Inductive Switching Capability

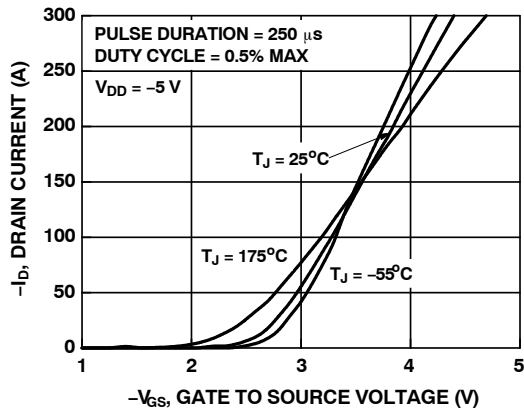


Figure 7. Transfer Characteristics

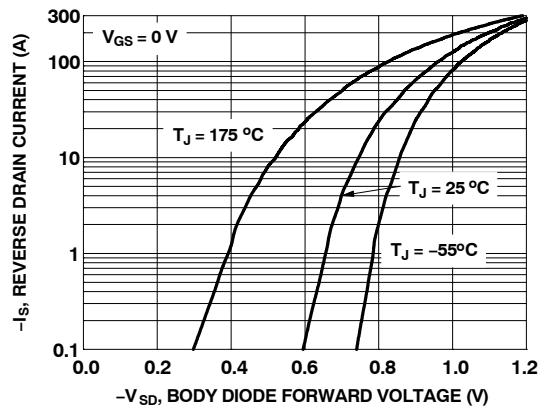


Figure 8. Forward Diode Characteristics

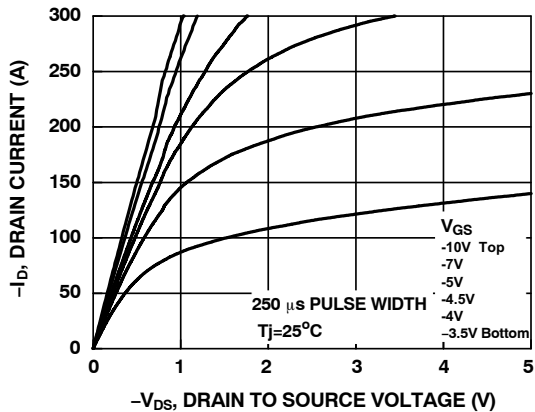


Figure 9. Saturation Characteristics

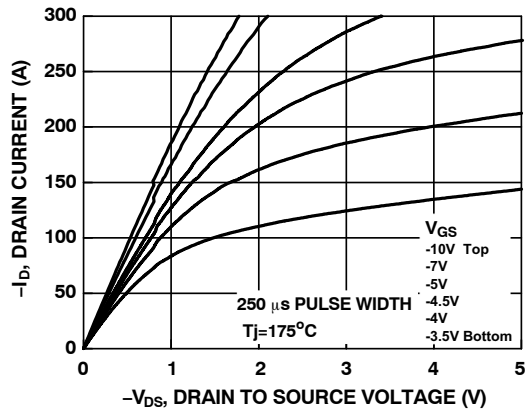


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS

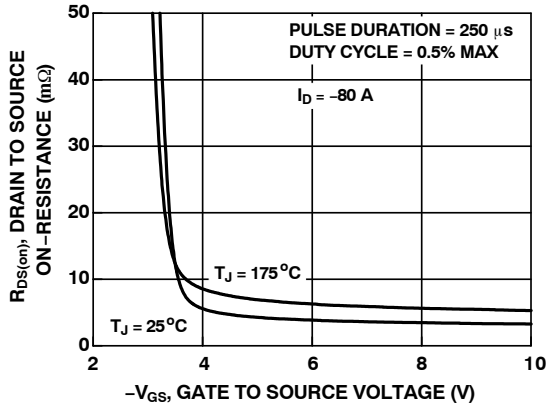


Figure 11. $R_{DS(on)}$ vs. Gate Voltage

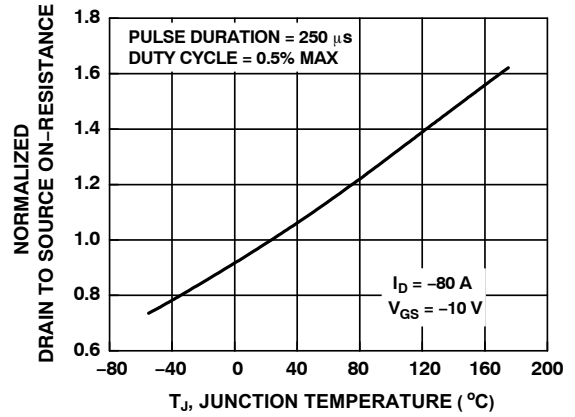


Figure 12. Normalized $R_{DS(on)}$ vs. Junction Temperature

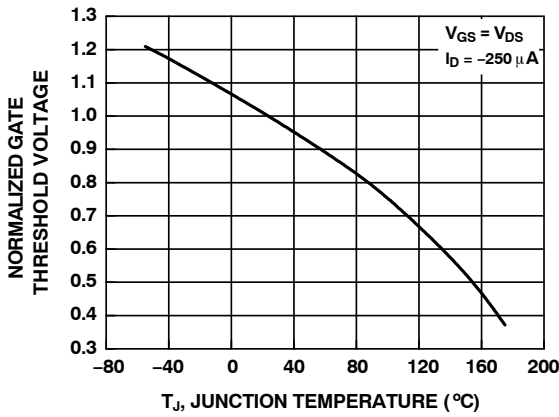


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

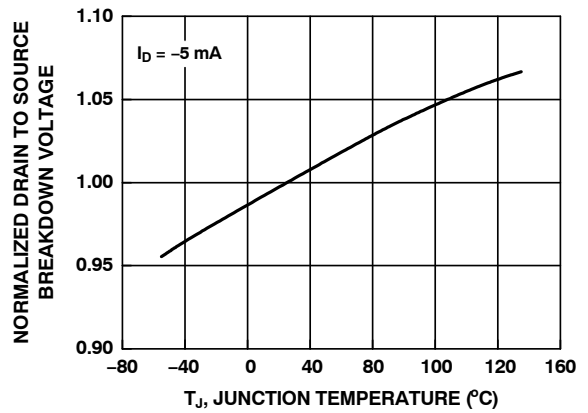


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

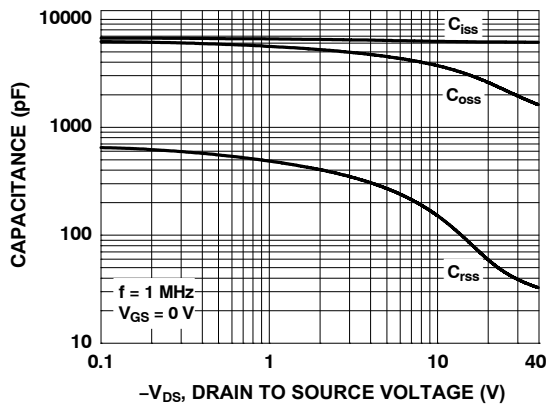


Figure 15. Capacitance vs. Drain to Source Voltage

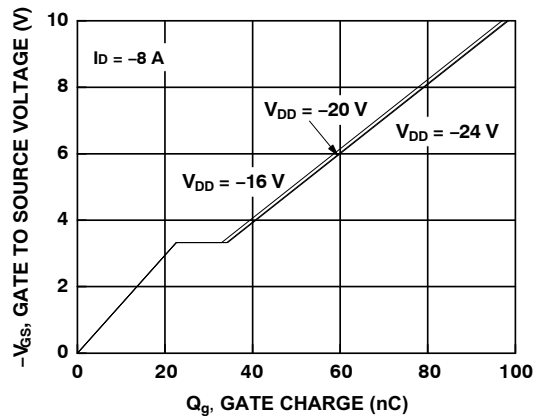


Figure 16. Gate Charge vs. Gate to Source Voltage

FDD9507L-F085

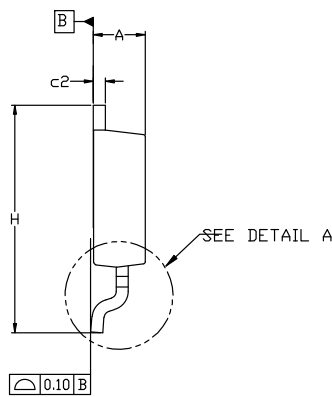
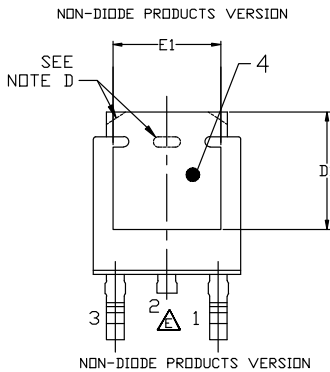
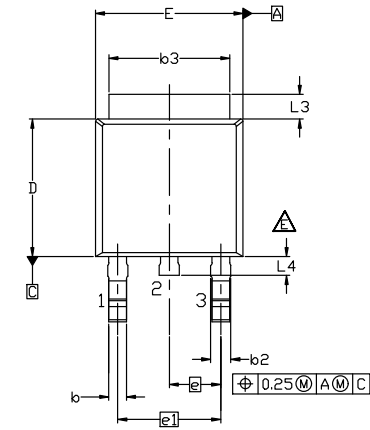
ORDERING INFORMATION

| Device | Marking | Package | Reel Size | Tape Width | Quantity |
|---------------|----------|--|-----------|------------|------------|
| FDD9507L-F085 | FDD9507L | DPAK3 (TO-252) (Pb-Free / Halogen Free) | 13" | 16 mm | 2500 Units |

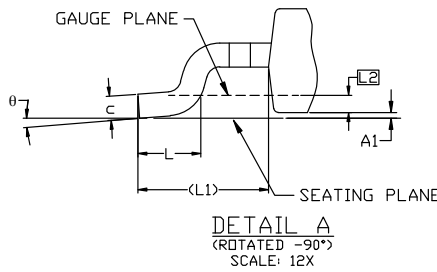


**DPAK3 6.10x6.54x2.29, 4.57P
CASE 369AS
ISSUE B**

DATE 20 DEC 2023



- NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE F, VARIATION AA.
 B) ALL DIMENSIONS ARE IN MILLIMETERS.
 C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2018.
 D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
 E) FOR DIODE PRODUCTS, L4 IS 0.25 MM MAX PLASTIC BODY STUB WITHOUT CENTER LEAD.
 F) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
 G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TD228P991X239-3N.

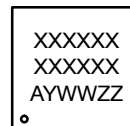


LAND PATTERN RECOMMENDATION

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

| DIM | MILLIMETERS | | |
|-----|-------------|------|-------|
| | MIN. | NOM. | MAX. |
| A | 2.18 | 2.29 | 2.39 |
| A1 | 0.00 | - | 0.127 |
| b | 0.64 | 0.77 | 0.89 |
| b2 | 0.76 | 0.95 | 1.14 |
| b3 | 5.21 | 5.34 | 5.46 |
| c | 0.45 | 0.53 | 0.61 |
| c2 | 0.45 | 0.52 | 0.58 |
| D | 5.97 | 6.10 | 6.22 |
| D1 | 5.21 | --- | --- |
| E | 6.35 | 6.54 | 6.73 |
| E1 | 4.32 | --- | --- |
| e | 2.286 BSC | | |
| e1 | 4.572 BSC | | |
| H | 9.40 | 9.91 | 10.41 |
| L | 1.40 | 1.59 | 1.78 |
| L1 | 2.90 REF | | |
| L2 | 0.51 BSC | | |
| L3 | 0.89 | 1.08 | 1.27 |
| L4 | --- | --- | 1.02 |
| θ | 0° | --- | 10° |

GENERIC MARKING DIAGRAM*



*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.

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

| | | |
|-------------------------|------------------------------------|--|
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| DESCRIPTION: | DPAK3 6.10x6.54x2.29, 4.57P | PAGE 1 OF 1 |

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