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FDMB2307NZ

Dual Common Drain N-Channel PowerTrench[®] MOSFET 20 V, 9.7 A, 16.5 mΩ

Features

- Max $r_{S1S2(on)}$ = 16.5 mΩ at $V_{GS} = 4.5$ V, $I_D = 8$ A
- Max $r_{S1S2(on)}$ = 18 mΩ at $V_{GS} = 4.2$ V, $I_D = 7.4$ A
- Max $r_{S1S2(on)}$ = 21 mΩ at $V_{GS} = 3.1$ V, $I_D = 7$ A
- Max $r_{S1S2(on)}$ = 24 mΩ at $V_{GS} = 2.5$ V, $I_D = 6.7$ A
- Low Profile - 0.8 mm maximum - in the new package MicroFET 2x3 mm
- HBM ESD protection level > 2 kV (Note 3)
- RoHS Compliant

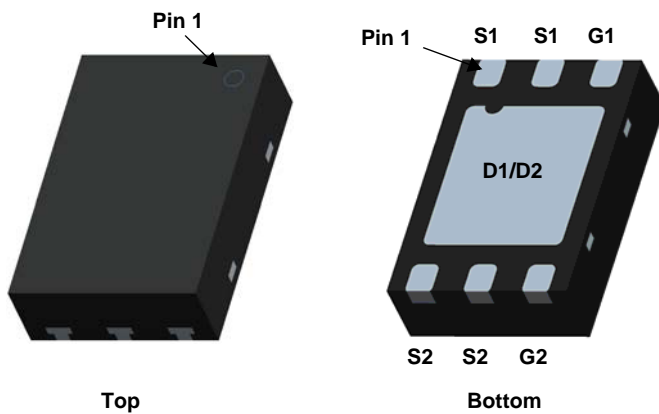


General Description

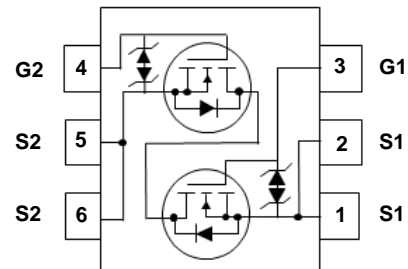
This device is designed specifically as a single package solution for Li-Ion battery pack protection circuit and other ultra-portable applications. It features two common drain N-channel MOSFETs, which enables bidirectional current flow, on Fairchild's advanced PowerTrench[®] process with state of the art MicroFET Leadframe, the FDMB2307NZ minimizes both PCB space and $r_{S1S2(on)}$.

Application

- Li-Ion Battery Pack



MLP 2x3



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Conditions | Rating | Units |
|----------------|--|--------------------------------------|-------------|------------------|
| V_{S1S2} | Source1 to Source2 Voltage | | 20 | V |
| V_{GS} | Gate to Source Voltage | (Note 4) | ± 12 | V |
| I_{S1S2} | Source1 to Source2 Current | -Continuous $T_A = 25^\circ\text{C}$ | 9.7 | A |
| | | -Pulsed | 40 | |
| P_D | Power Dissipation | $T_A = 25^\circ\text{C}$ (Note 1a) | 2.2 | W |
| | Power Dissipation | $T_A = 25^\circ\text{C}$ (Note 1b) | 0.8 | |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | | -55 to +150 | $^\circ\text{C}$ |

Thermal Characteristics

| | | | | |
|-----------------|---|-----------|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient(Dual Operation) | (Note 1a) | 57 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient(Dual Operation) | (Note 1b) | 161 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|------------|---------|-----------|------------|------------|
| 307 | FDMB2307NZ | MLP 2x3 | 7" | 8 mm | 3000 units |

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

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

Off Characteristics

| | | | | | | |
|------------|--|---|--|--|----|---------------|
| I_{S1S2} | Zero Gate Voltage Source1 to Source2 Current | $V_{S1S2} = 16\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = 12\text{ V}, V_{S1S2} = 0\text{ V}$ | | | 10 | μA |

On Characteristics

| | | | | | | |
|----------------|---|---|------|------|------|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{S1S2}, I_{S1S2} = 250\ \mu\text{A}$ | 0.6 | 1 | 1.5 | V |
| $r_{S1S2(on)}$ | Static Source1 to Source2 On Resistance | $V_{GS} = 4.5\text{ V}, I_{S1S2} = 8\text{ A}$ | 10.5 | 13.5 | 16.5 | m Ω |
| | | $V_{GS} = 4.2\text{ V}, I_{S1S2} = 7.4\text{ A}$ | 11 | 14 | 18 | |
| | | $V_{GS} = 3.1\text{ V}, I_{S1S2} = 7\text{ A}$ | 11.5 | 16 | 21 | |
| | | $V_{GS} = 2.5\text{ V}, I_{S1S2} = 6.7\text{ A}$ | 12 | 18 | 24 | |
| | | $V_{GS} = 4.5\text{ V}, I_{S1S2} = 8\text{ A}, T_J = 125^\circ\text{C}$ | 11 | 20 | 29 | |
| g_{FS} | Forward Transconductance | $V_{S1S2} = 5\text{ V}, I_{S1S2} = 8\text{ A}$ | | 41 | | S |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|---|-----|------|------|----------|
| C_{iss} | Input Capacitance | $V_{S1S2} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | 1760 | 2640 | pF |
| C_{oss} | Output Capacitance | | | 229 | 345 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 211 | 320 | pF |
| R_g | Gate Resistance (Note 5) | | 0.1 | 2.6 | 8 | Ω |

Switching Characteristics

| | | | | | | |
|--------------|----------------------------------|---|--|-----|----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{S1S2} = 10\text{ V}, I_{S1S2} = 8\text{ A}, V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$ | | 12 | 22 | ns |
| t_r | Rise Time | | | 19 | 34 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 32 | 51 | ns |
| t_f | Fall Time | | | 9.5 | 17 | ns |
| Q_g | Total Gate Charge | | $V_{G1S1} = 0\text{ V to } 5\text{ V}$ | | 20 | 28 |
| Q_g | Total Gate Charge | $V_{G1S1} = 0\text{ V to } 4.5\text{ V}$ | | 18 | 25 | nC |
| Q_{gs} | Gate1 to Source1 Charge | $V_{S1S2} = 10\text{ V}, I_{S1S2} = 8\text{ A}, V_{G2S2} = 0\text{ V}$ | | 2.8 | | nC |
| Q_{gd} | Gate1 to Source2 "Miller" Charge | | | 5.3 | | nC |

Source1- Source2 Diode Characteristics

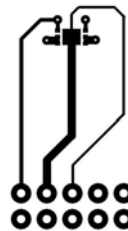
| | | | | | | |
|-----------|--|---|--|-----|-----|---|
| I_{fss} | Maximum Continuous Source1-Source2 Diode Forward Current | | | 8 | A | |
| V_{fss} | Source1 to Source2 Diode Forward Voltage | $V_{G1S1} = 0\text{ V}, V_{G2S2} = 4.5\text{ V}, I_{fss} = 8\text{ A}$ (Note 2) | | 0.8 | 1.2 | V |

NOTES:

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



a. 57 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 161 °C/W when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.
- As an N-ch device, the negative V_{gs} rating is for low duty cycle pulse occurrence only. No continuous rating is implied.
- R_g is measured on 100% of the die at wafer level.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

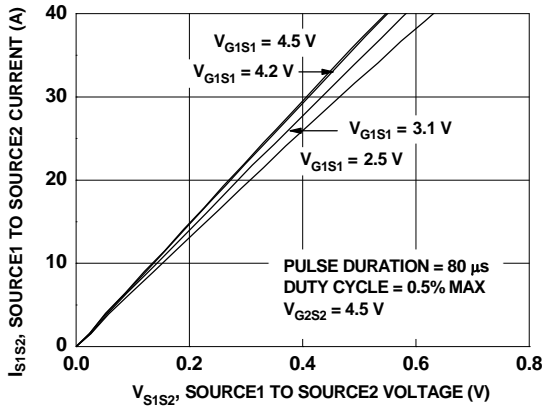


Figure 1. On-Region Characteristics

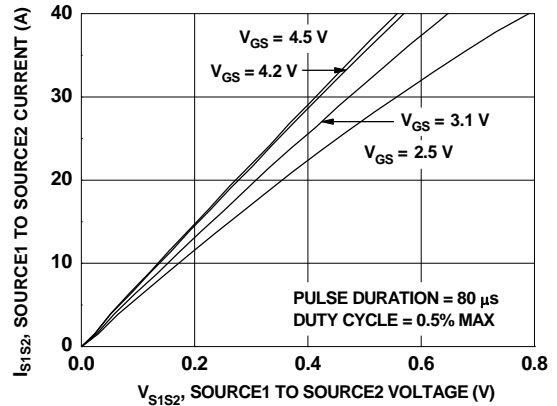


Figure 2. On-Region Characteristics

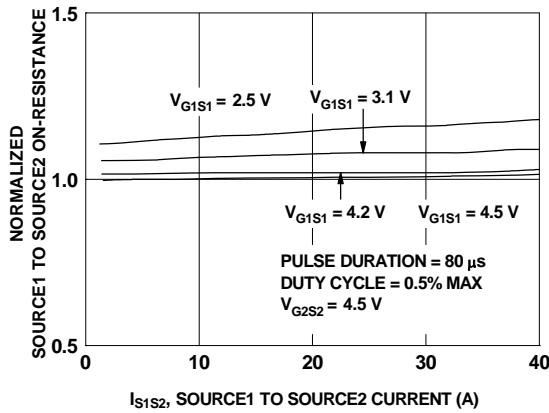


Figure 3. Normalized On-Resistance vs Source1 to Source2 Current and Gate Voltage

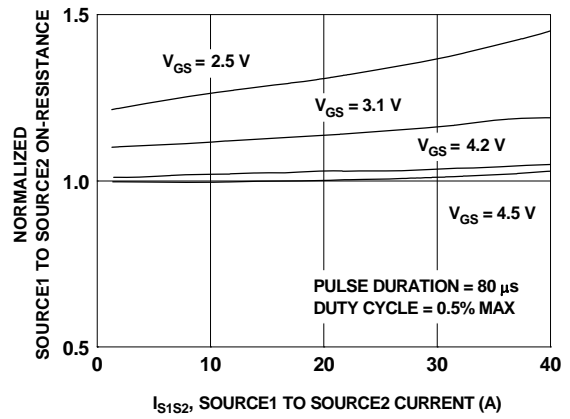


Figure 4. Normalized On-Resistance vs Source1 to Source2 Current and Gate Voltage

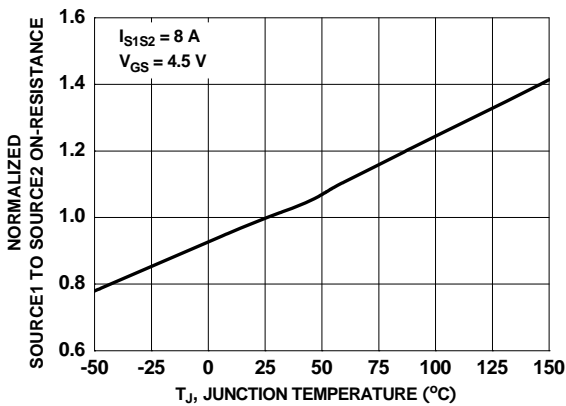


Figure 5. Normalized On Resistance vs Junction Temperature

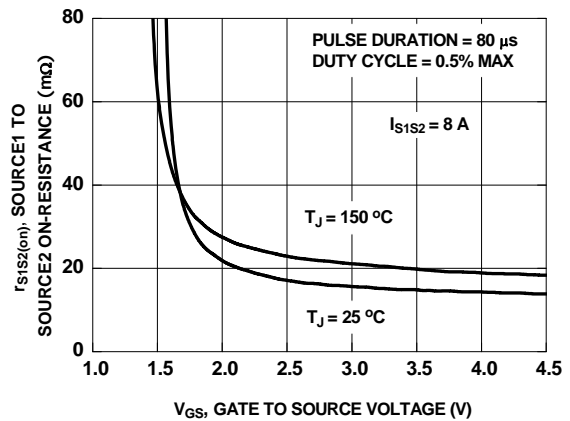


Figure 6. On Resistance vs Gate to Source Voltage

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

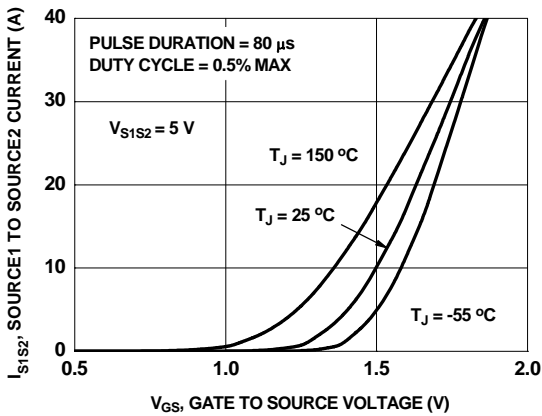


Figure 7. Transfer Characteristics

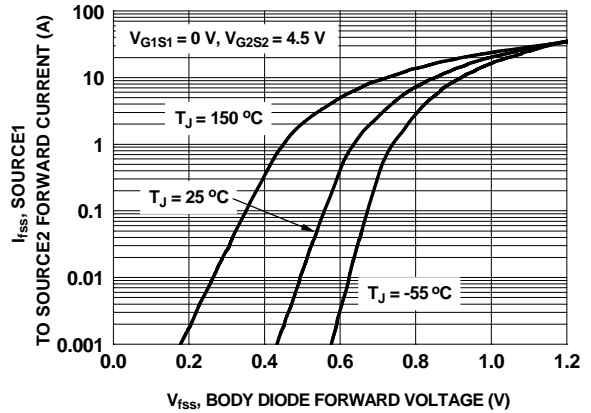


Figure 8. Source1 to Source2 Diode Forward Voltage vs Source Current

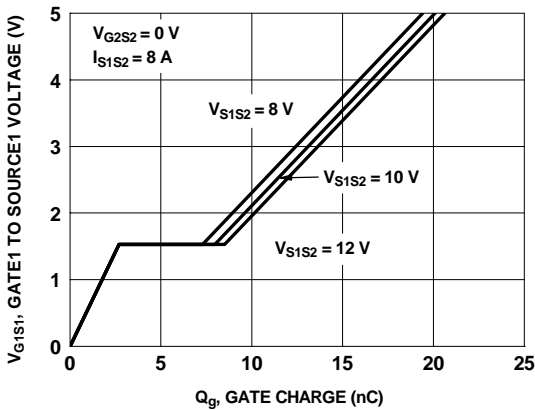


Figure 9. Gate Charge Characteristics

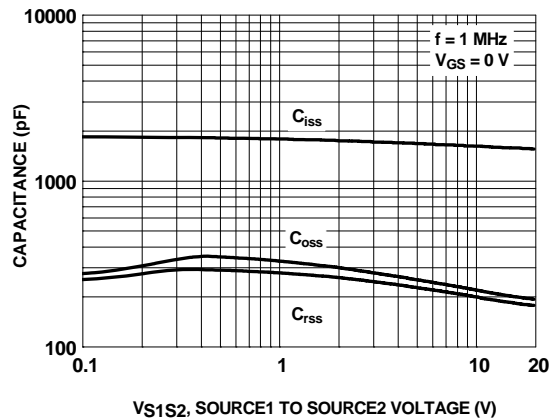


Figure 10. Capacitance vs Source1 to Source2 Voltage

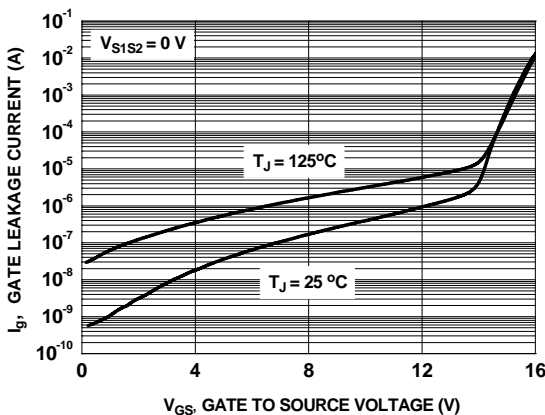


Figure 11. Gate Leakage Current vs Gate to Source Voltage

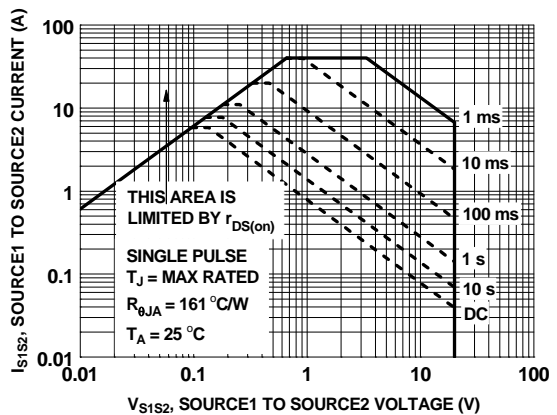
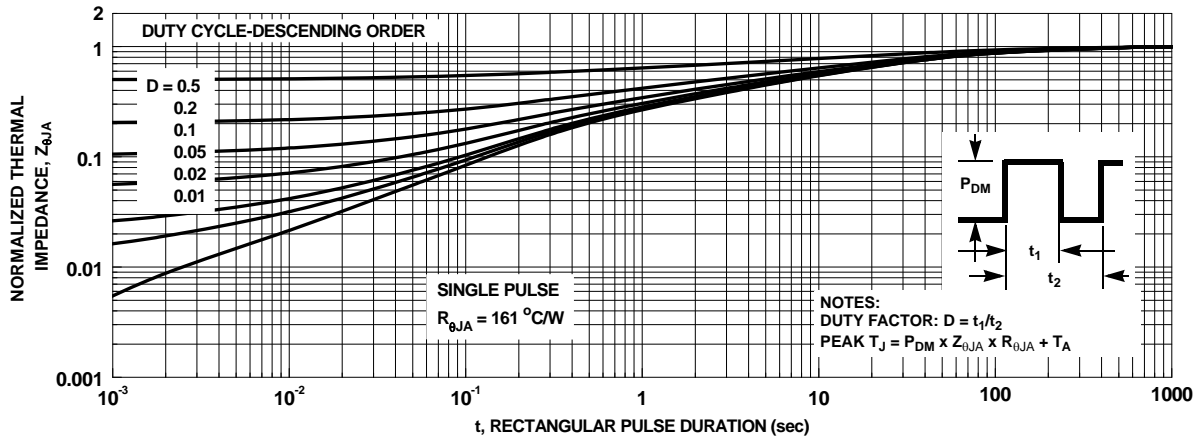
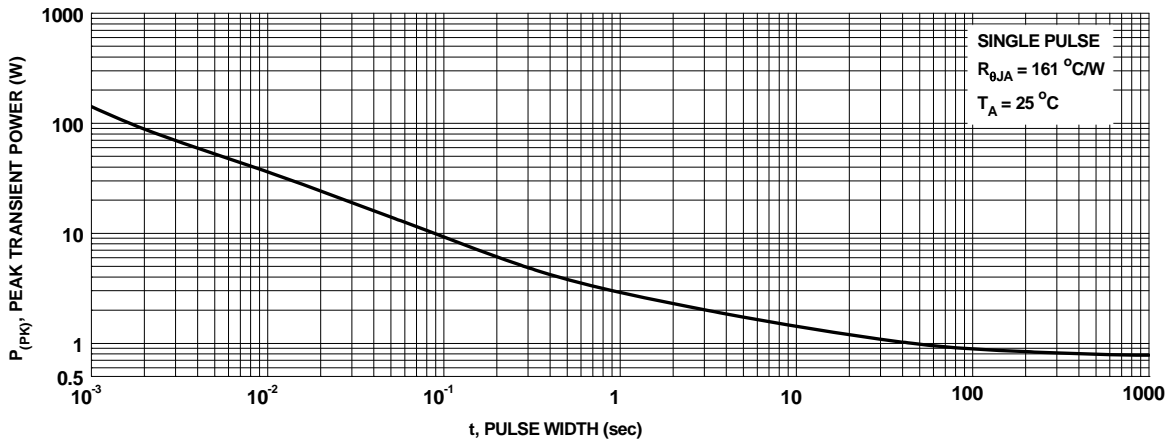
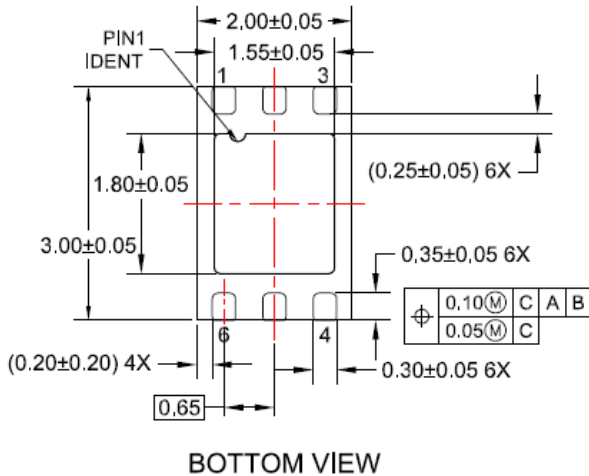
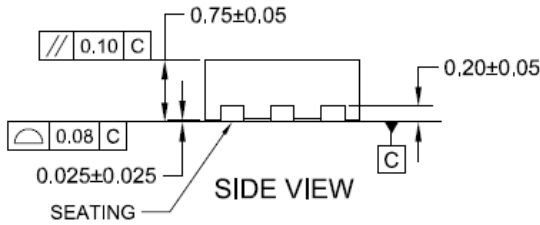
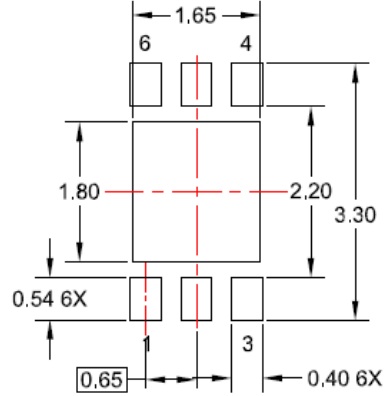
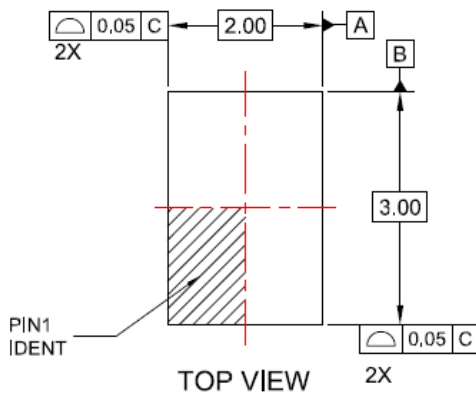


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted



Dimensional Outline and Pad Layout



NOTES:

- A. PACKAGE CONFORMS TO JEDEC MO-229 EXCEPT WHERE NOTED.
- B. DRAWING FILENAME: MKT-MLP06Qrev3.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
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