

FDB33N25TM-VB Datasheet

N-Channel 250 V (D-S) 175 °C MOSFET

| PRODUCT SUMMARY | | | |
|---------------------|---------------------------------|--------------------|----------------------|
| V _{DS} (V) | R _{DS(on)} (Ω) | I _D (A) | Q _g (Typ) |
| 250 | 0.040 at V _{GS} = 10 V | 60 | 95 |
| | 0.045 at V _{GS} = 6 V | 55 | |

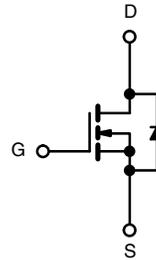
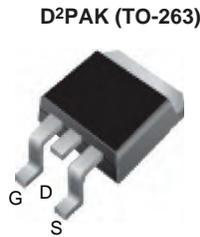
FEATURES

- TrenchFET® Power MOSFETS
- 175 °C Junction Temperature
- New Low Thermal Resistance Package
- Compliant to RoHS Directive 2002/95/EC



APPLICATIONS

- Industrial



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted) | | | |
|---|-----------------------------------|-------------------------------------|------------------|
| Parameter | Symbol | Limit | Unit |
| Drain-Source Voltage | V _{DS} | 250 | V |
| Gate-Source Voltage | V _{GS} | ± 30 | |
| Continuous Drain Current (T _J = 175 °C) | I _D | T _C = 25 °C | 60 |
| | | T _C = 125 °C | 35 |
| Pulsed Drain Current | I _{DM} | 200 | A |
| Avalanche Current | I _{AR} | 35 | |
| Repetitive Avalanche Energy ^a | E _{AR} | 61 | mJ |
| Maximum Power Dissipation ^a | P _D | T _C = 25 °C | 300 ^b |
| | | T _A = 25 °C ^c | 3.75 |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | - 55 to 175 | °C |

| THERMAL RESISTANCE RATINGS | | | |
|--|-------------------|-------|------|
| Parameter | Symbol | Limit | Unit |
| Junction-to-Ambient (PCB Mount) ^c | R _{thJA} | 40 | °C/W |
| Junction-to-Case (Drain) | R _{thJC} | 0.5 | |

Notes:

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

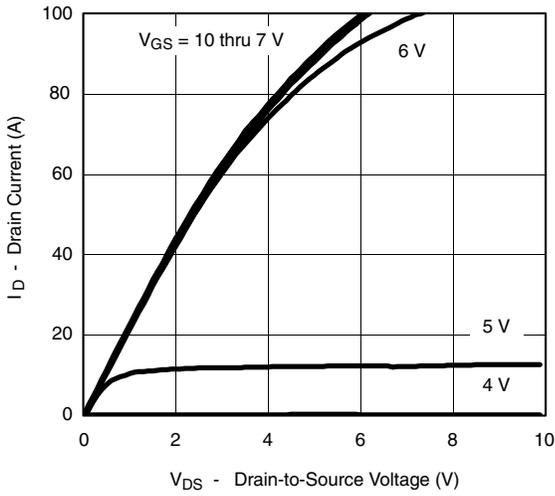
| SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted) | | | | | | |
|---|---------------|---|-------|-------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Min . | Typ. | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 250 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 2 | | 4 | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 30\text{ V}$ | | | ± 250 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | | 50 | |
| | | $V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$ | | | 250 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | 70 | | | A |
| Drain-Source On-State Resistance ^a | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}$ | | 0.040 | | Ω |
| | | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | 0.091 | | |
| | | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$ | | 0.123 | | |
| | | $V_{GS} = 6\text{ V}, I_D = 25\text{ A}$ | | 0.045 | | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 15\text{ V}, I_D = 30\text{ A}$ | | 70 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ | | 5000 | | pF |
| Output Capacitance | C_{oss} | | | 300 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 170 | | |
| Total Gate Charge ^c | Q_g | $V_{DS} = 125\text{ V}, V_{GS} = 10\text{ V}, I_D = 45\text{ A}$ | | 95 | 140 | nC |
| Gate-Source Charge ^c | Q_{gs} | | | 28 | | |
| Gate-Drain Charge ^c | Q_{gd} | | | 34 | | |
| Gate Resistance | R_g | $f = 1\text{ MHz}$ | | 1.6 | | Ω |
| Turn-On Delay Time ^c | $t_{d(on)}$ | $V_{DD} = 100\text{ V}, R_L = 2.78\text{ }\Omega$ $I_D \equiv 45\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$ | | 22 | 35 | ns |
| Rise Time ^c | t_r | | | 220 | 330 | |
| Turn-Off Delay Time ^c | $t_{d(off)}$ | | | 40 | 60 | |
| Fall Time ^c | t_f | | | 145 | 220 | |
| Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^\circ\text{C}$) ^b | | | | | | |
| Continuous Current | I_S | | | | 45 | A |
| Pulsed Current | I_{SM} | | | | 70 | |
| Forward Voltage ^a | V_{SD} | $I_F = 45\text{ A}, V_{GS} = 0\text{ V}$ | | 1 | 1.5 | V |
| Reverse Recovery Time | t_{rr} | $I_F = 45\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | 150 | 225 | ns |
| Peak Reverse Recovery Current | $I_{RM(REC)}$ | | | 12 | 18 | A |
| Reverse Recovery Charge | Q_{rr} | | | 0.9 | 2 | μC |

Notes:

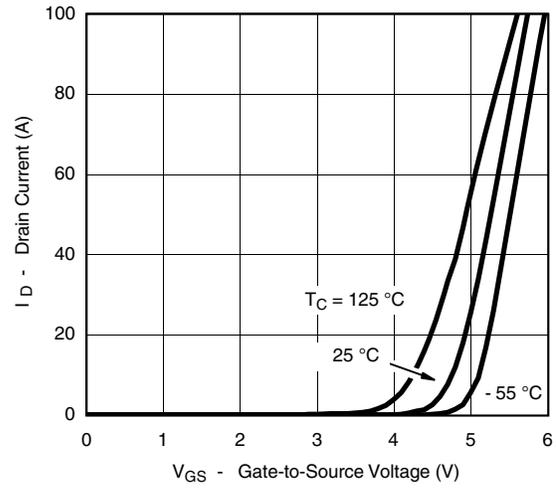
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

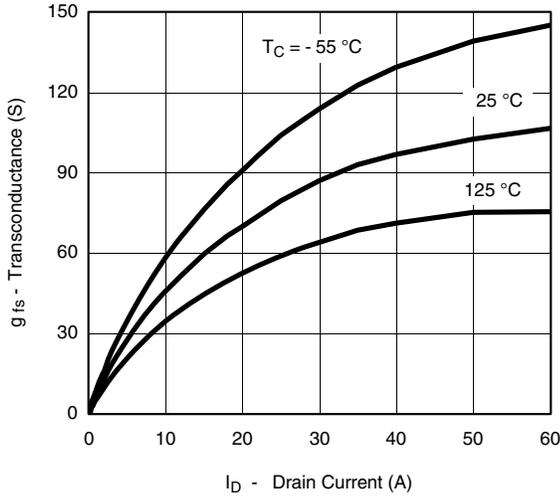
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



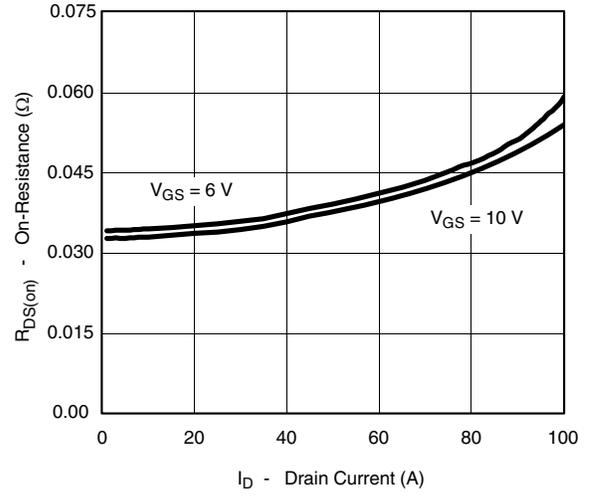
Output Characteristics



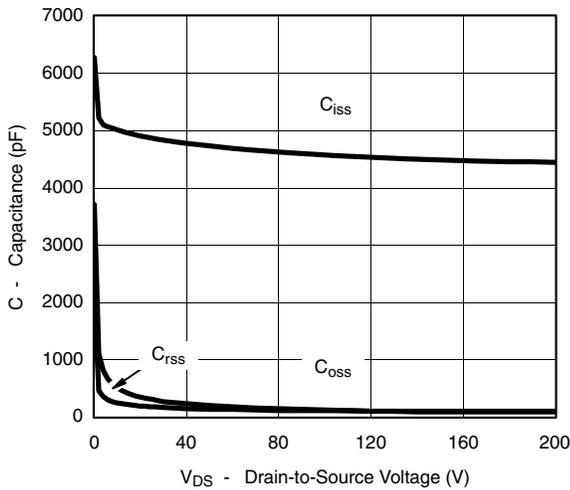
Transfer Characteristics



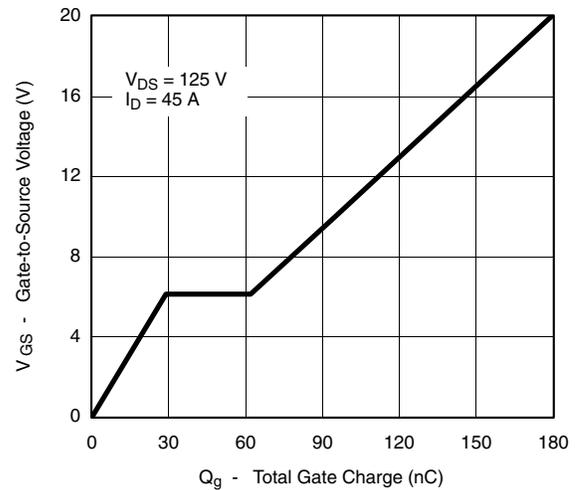
Transconductance



On-Resistance vs. Drain Current

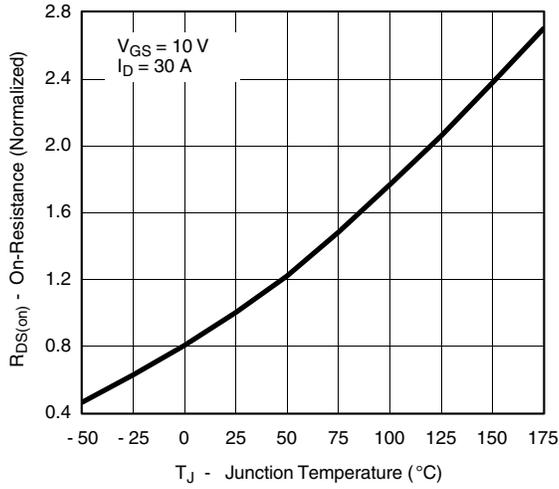


Capacitance

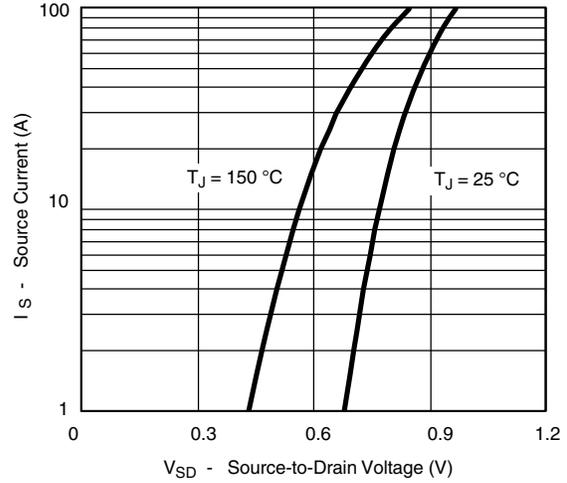


Gate Charge

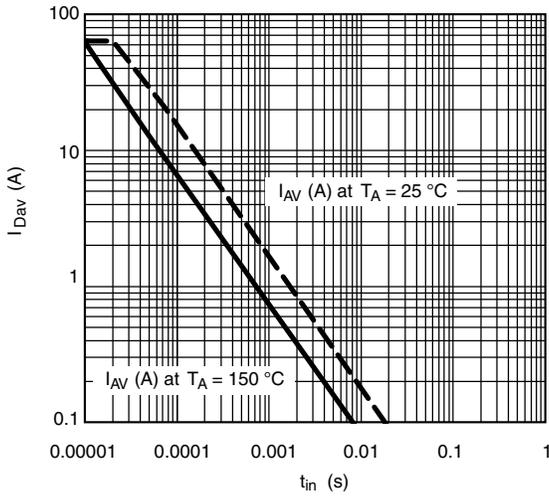
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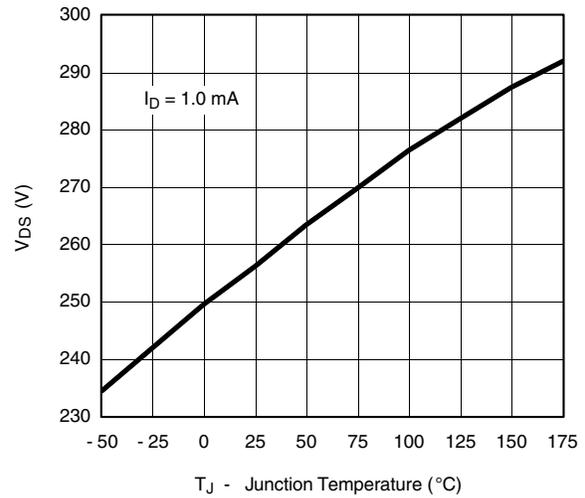
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

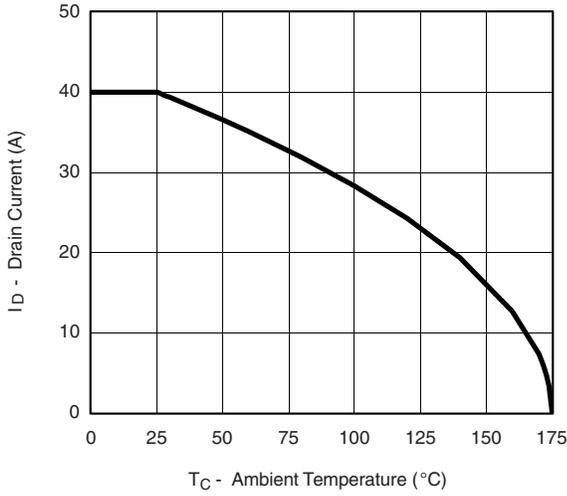


Avalanche Current vs. Time

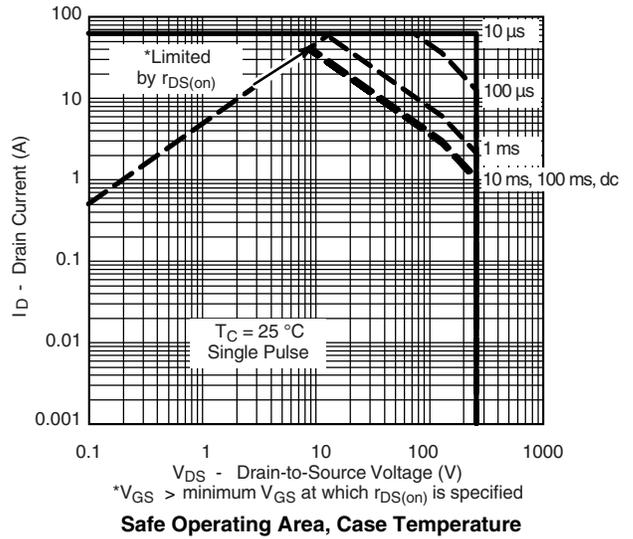


Drain Source Breakdown vs. Junction Temperature

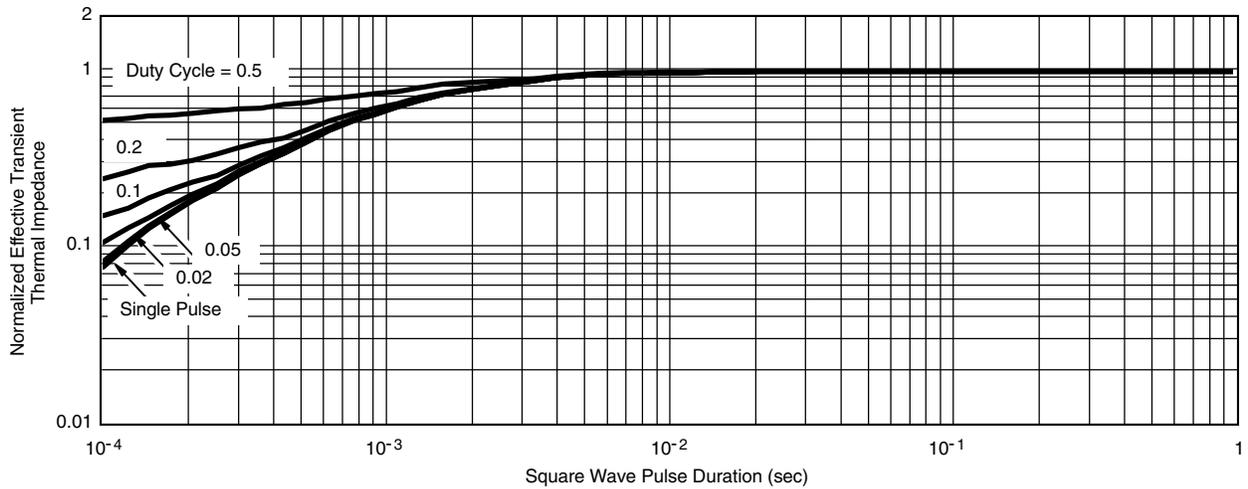
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature

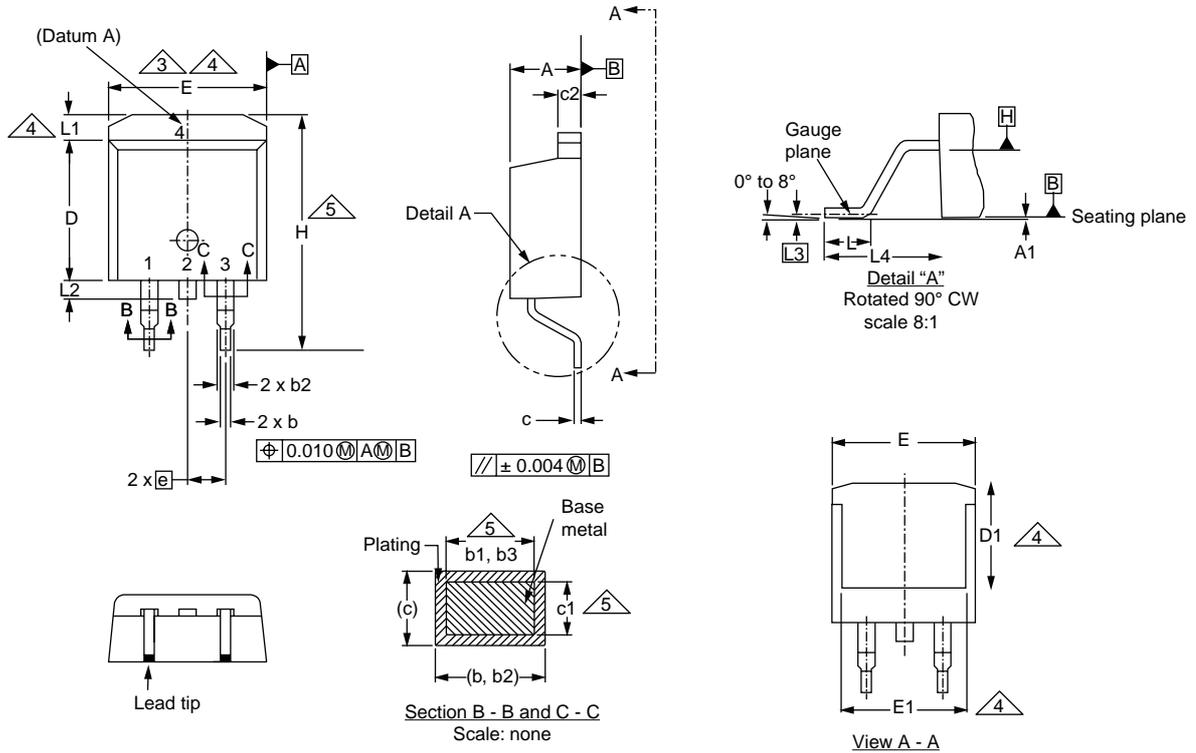


Safe Operating Area, Case Temperature



Normalized Thermal Transient Impedance, Junction-to-Case

TO-263AB (HIGH VOLTAGE)



| DIM. | MILLIMETERS | | INCHES | |
|------|-------------|------|--------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.06 | 4.83 | 0.160 | 0.190 |
| A1 | 0.00 | 0.25 | 0.000 | 0.010 |
| b | 0.51 | 0.99 | 0.020 | 0.039 |
| b1 | 0.51 | 0.89 | 0.020 | 0.035 |
| b2 | 1.14 | 1.78 | 0.045 | 0.070 |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 |
| c | 0.38 | 0.74 | 0.015 | 0.029 |
| c1 | 0.38 | 0.58 | 0.015 | 0.023 |
| c2 | 1.14 | 1.65 | 0.045 | 0.065 |
| D | 8.38 | 9.65 | 0.330 | 0.380 |

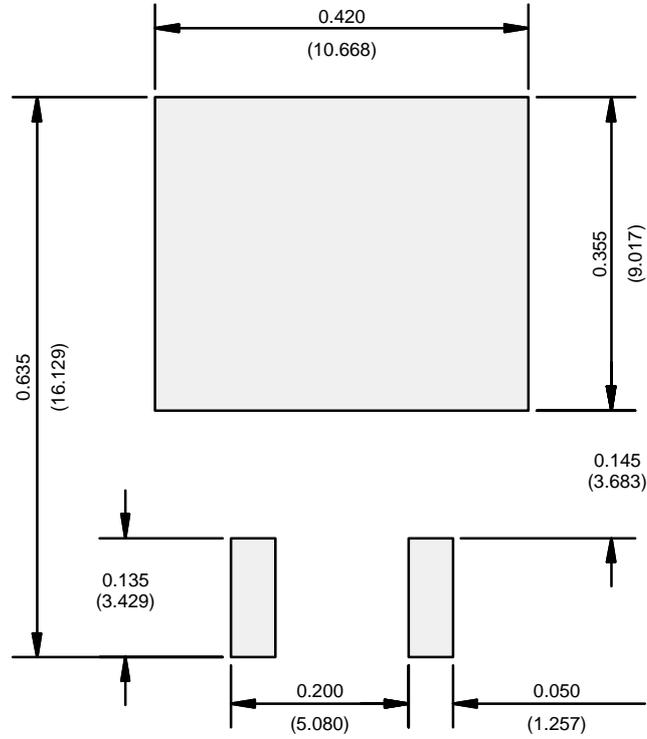
| DIM. | MILLIMETERS | | INCHES | |
|------|-------------|-------|-----------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| D1 | 6.86 | - | 0.270 | - |
| E | 9.65 | 10.67 | 0.380 | 0.420 |
| E1 | 6.22 | - | 0.245 | - |
| e | 2.54 BSC | | 0.100 BSC | |
| H | 14.61 | 15.88 | 0.575 | 0.625 |
| L | 1.78 | 2.79 | 0.070 | 0.110 |
| L1 | - | 1.65 | - | 0.066 |
| L2 | - | 1.78 | - | 0.070 |
| L3 | 0.25 BSC | | 0.010 BSC | |
| L4 | 4.78 | 5.28 | 0.188 | 0.208 |

ECN: S-82110-Rev. A, 15-Sep-08
DWG: 5970

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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