

P-Channel 12 V (G-S) MOSFET

| PRODUCT SUMMARY | | | |
|---------------------|------------------------------------|---------------------------------|-----------------------|
| V _{DS} (V) | R _{DS(on)} (Ω) | I _D (A) ^a | Q _g (Typ.) |
| - 12 | 0.015 at V _{GS} = - 4.5 V | - 25 | 35 nC |
| | 0.021 at V _{GS} = - 2.5 V | - 24 | |
| | 0.023 at V _{GS} = - 1.8 V | - 24 | |

FEATURES

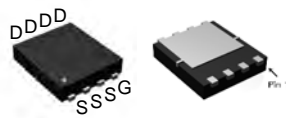
- Halogen-free according to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- Ultra Small DFN3x3 Chipscale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT

Pin Description

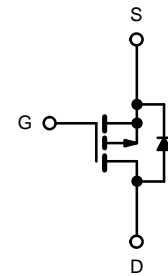
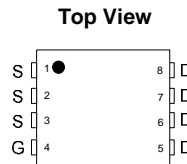
Top View Bottom View



DFN3x3-8(punch type)

APPLICATIONS

- PA Switch
- Battery Switch
- Load Switch



P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted) | | | | |
|---|-----------------------------------|------------------------|-----------------------|---|
| Parameter | Symbol | Limit | Unit | |
| Drain-Source Voltage | V _{DS} | - 12 | V | |
| Gate-Source Voltage | V _{GS} | ± 8 | | |
| Continuous Drain Current (T _J = 150 °C) | I _D | T _C = 25 °C | - 25 | A |
| | | T _C = 70 °C | - 19 | |
| | | T _A = 25 °C | - 20 ^{b, c} | |
| | | T _A = 70 °C | - 11 ^{b, c} | |
| Pulsed Drain Current | I _{DM} | - 80 | | |
| Continuous Source-Drain Diode Current | I _S | T _C = 25 °C | - 26.7 | |
| | | T _A = 25 °C | - 3.5 ^{b, c} | |
| Maximum Power Dissipation | P _D | T _C = 25 °C | 37 | W |
| | | T _C = 70 °C | 26 | |
| | | T _A = 25 °C | 3.9 ^{b, c} | |
| | | T _A = 70 °C | 1.96 ^{b, c} | |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | - 55 to 150 | °C | |
| Package Reflow Conditions ^d | IR/Convection | 260 | | |

Notes:

a. Based on T_C = 25 °C.

b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 s.

d. Refer to IPC/JEDEC (J-STD-020), no manual or hand soldering.

e. In this document, any reference to the Case represents the body of the DFN2X2 device and Foot is the bump.

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Typical | Maximum | Unit |
|---|----------------------------|---------|---------|------|
| Maximum Junction-to-Ambient ^{a, b} | R_{thJA} | 31 | 42 | °C/W |
| Maximum Junction-to-Foot (Drain) | Steady State R_{thJF} | 13 | 16 | |

Notes:

- a. Surface mounted on 1" x 1" FR4 board.
 b. Maximum under steady state conditions is 72 °C/W.

SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|-------------------------|--|------|-------|------|---------------|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$ | -12 | | | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D = -250\text{ }\mu\text{A}$ | | -13.3 | | mV/°C |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | 2.4 | | | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$ | -0.5 | | -1.5 | V |
| Gate-Source Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = 5\text{ V}$ | | | -100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$ | | | -1 | μA |
| | | $V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ °C}$ | | | -10 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \leq 5\text{ V}, V_{GS} = -4.5\text{ V}$ | -20 | | | A |
| Drain-Source On-State Resistance ^a | $R_{DS(on)}$ | $V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$ | | 0.015 | | Ω |
| | | $V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$ | | 0.021 | | |
| | | $V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$ | | 0.023 | | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = -4\text{ V}, I_D = -1\text{ A}$ | | 8.3 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | 2220 | | μF |
| Output Capacitance | C_{oss} | | 865 | | | |
| Reverse Transfer Capacitance | C_{rss} | | 555 | | | |
| Total Gate Charge | Q_g | $V_{DS} = -6\text{ V}, V_{GS} = -5\text{ V}, I_D = -1\text{ A}$ | | 38 | 57 | nC |
| | | | | 35 | 53 | |
| Gate-Source Charge | Q_{gs} | $V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$ | | 7.3 | | |
| Gate-Drain Charge | Q_{gd} | | | 5.9 | | |
| Gate Resistance | R_g | $V_{GS} = -0.1\text{ V}, f = 1\text{ MHz}$ | | 28 | | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -6\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$ | | 14 | 21 | ns |
| Rise Time | t_r | | | 25 | 40 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 380 | 570 | |
| Fall Time | t_f | | | 240 | 360 | |

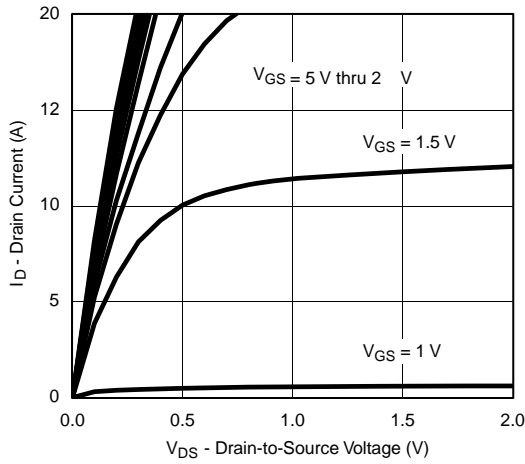
| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|---|----------|---|------|--------|-------|---------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25\text{ }^\circ\text{C}$ | | - 8 | | A |
| Pulse Diode Forward Current | I_{SM} | | | - 25 | | |
| Body Diode Voltage | V_{SD} | $I_S = -1\text{ A}, V_{GS} = 0\text{ V}$ | | - 0.65 | - 1.2 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_F = -1\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$ | | 311 | 467 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 1.136 | 1.705 | μC |
| Reverse Recovery Fall Time | t_a | | | 116 | | ns |
| Reverse Recovery Rise Time | t_b | | | 195 | | |

Notes:

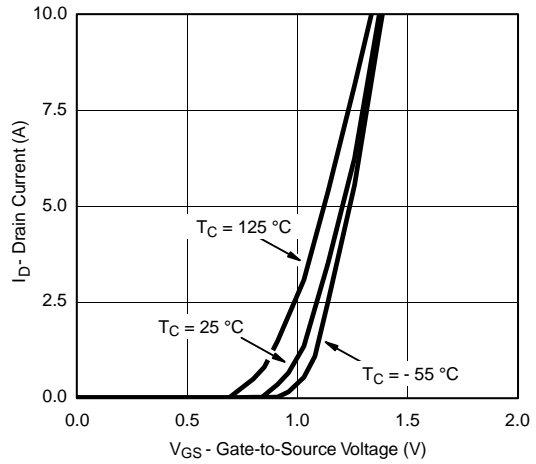
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.

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.

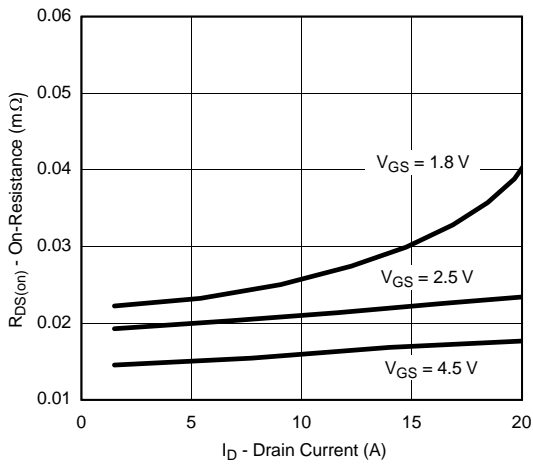
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



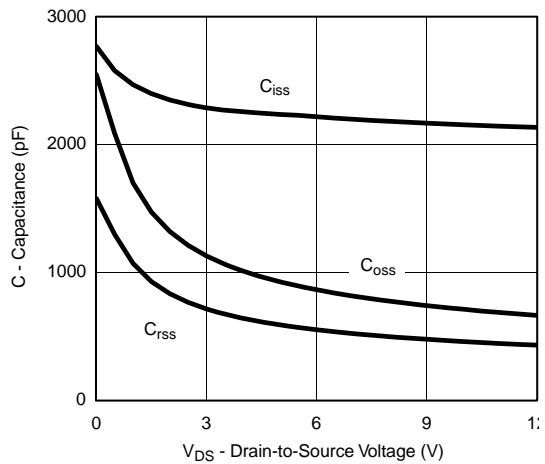
Output Characteristics



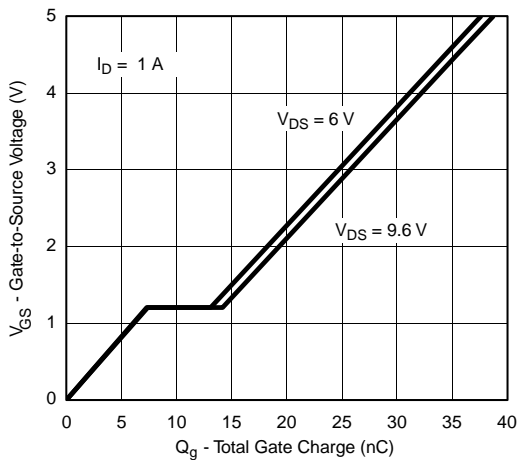
Transfer Characteristics



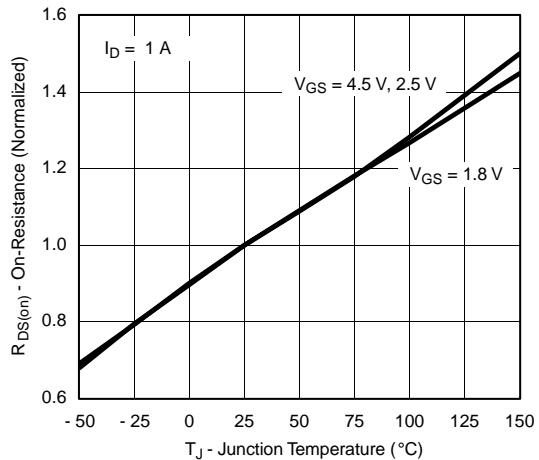
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

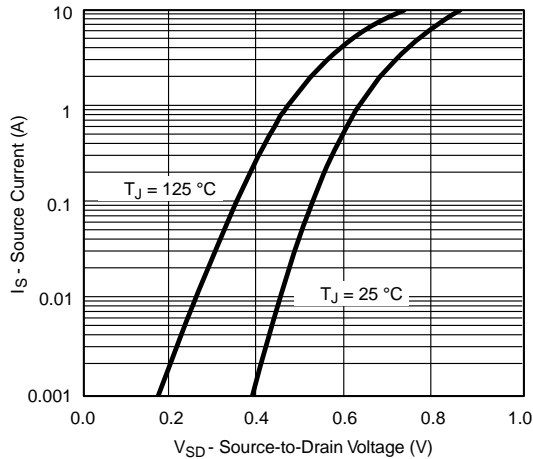


Gate Charge

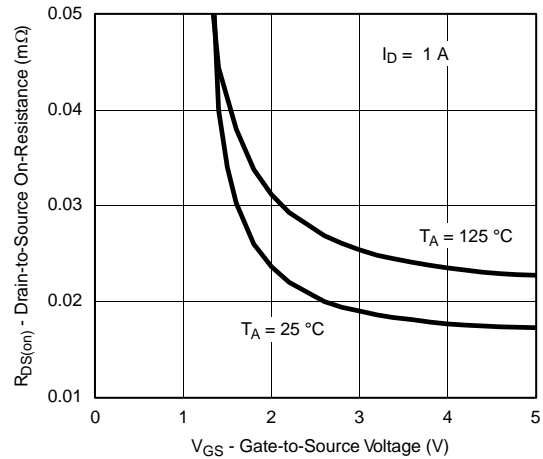


On-Resistance vs. Junction Temperature

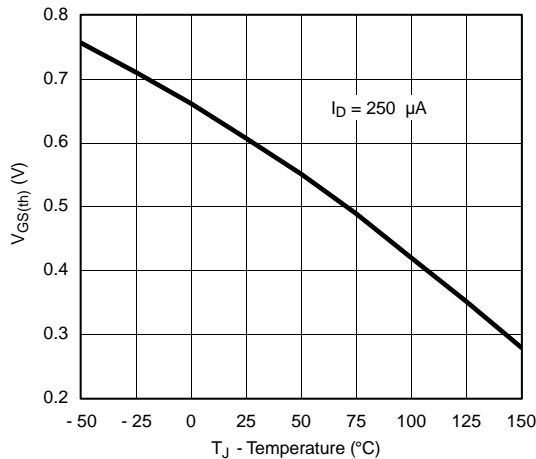
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



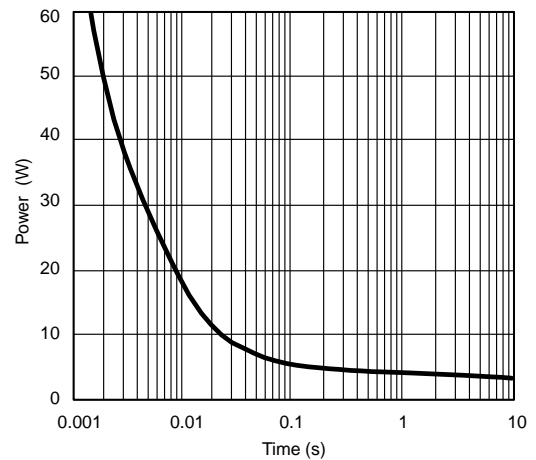
Source-Drain Diode Forward Voltage



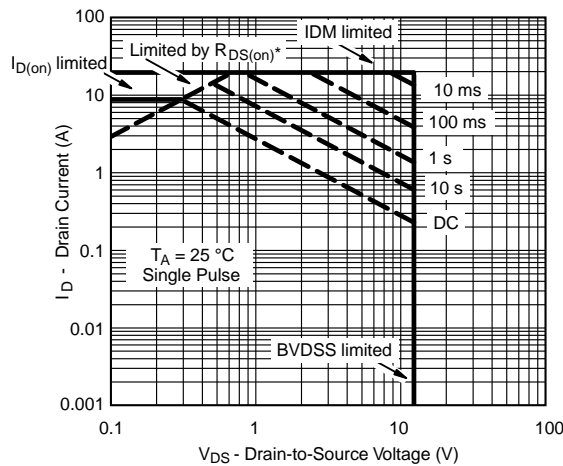
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

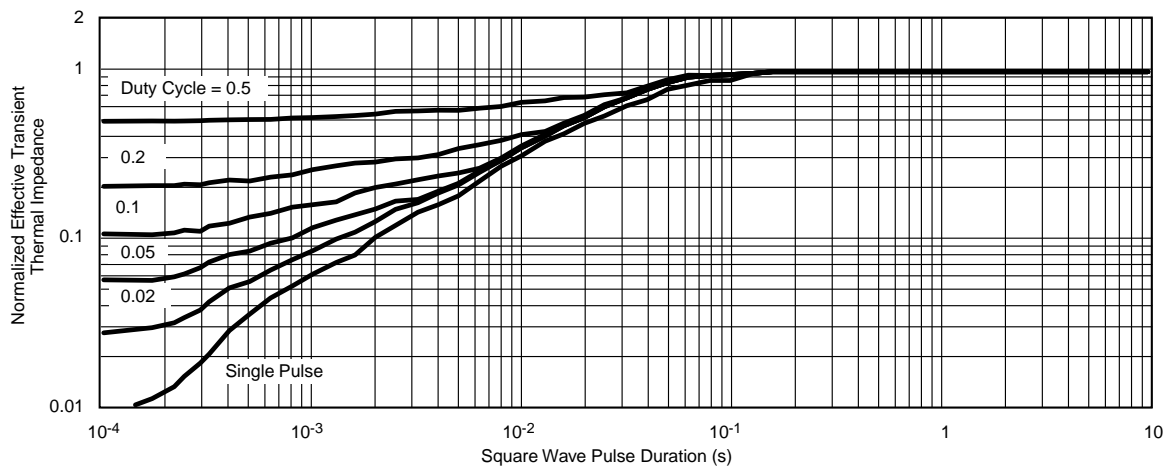
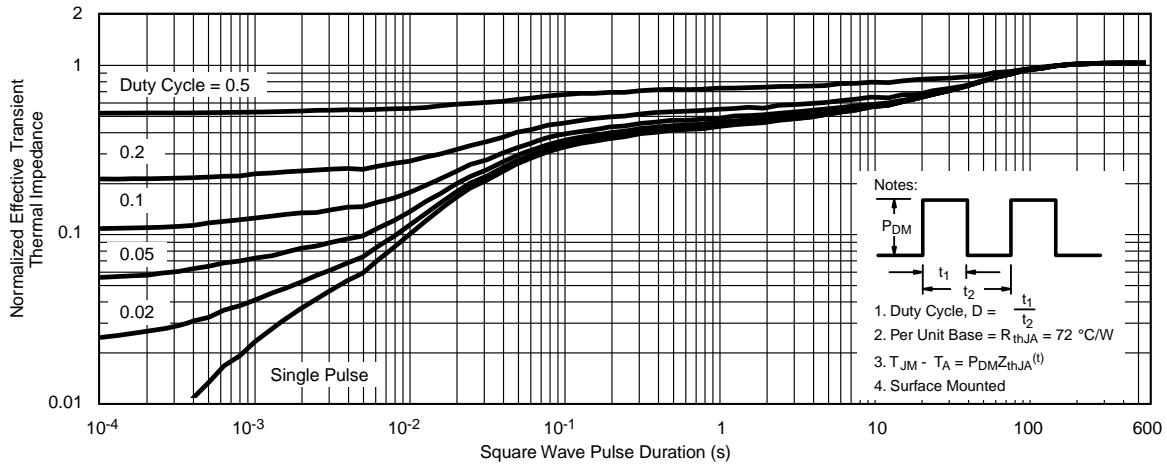
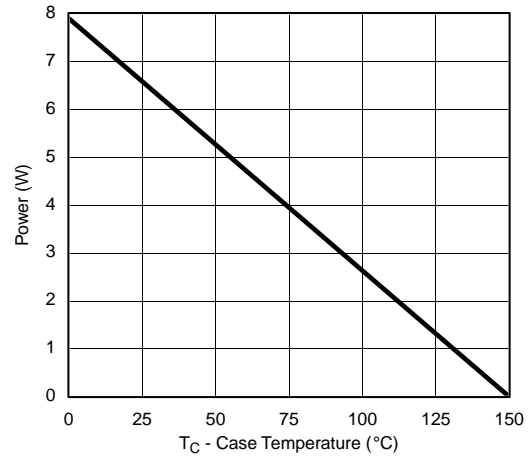
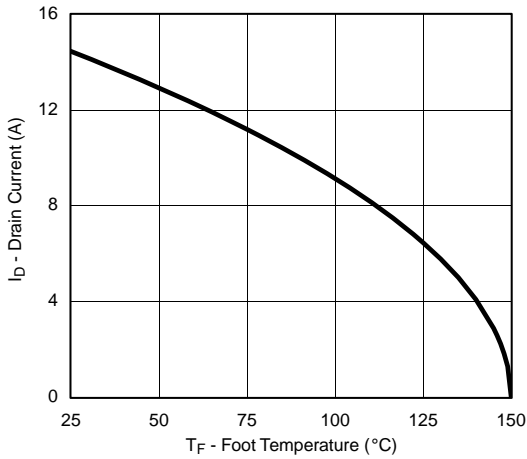


Single Pulse Power, Junction-to-Ambient

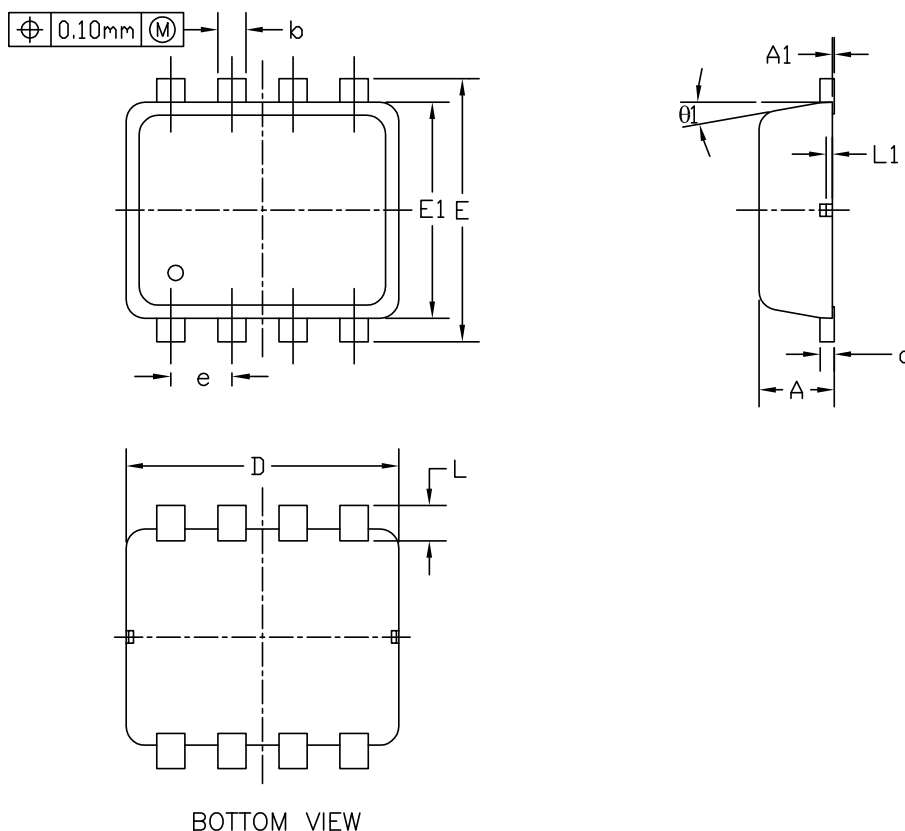


Safe Operating Area, Junction-to-Ambient

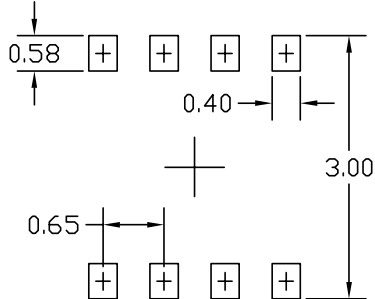
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



DFN3x3A_8L_NEP_P PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---------|---------------------------|------|------|----------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.70 | 0.80 | 0.90 | 0.028 | 0.031 | 0.035 |
| A1 | 0.00 | — | 0.05 | 0.000 | — | 0.002 |
| b | 0.24 | 0.30 | 0.35 | 0.009 | 0.012 | 0.014 |
| c | 0.08 | 0.15 | 0.25 | 0.003 | 0.006 | 0.010 |
| D | 2.80 | 2.90 | 3.00 | 0.110 | 0.114 | 0.118 |
| E | 2.70 | 2.80 | 2.90 | 0.106 | 0.110 | 0.114 |
| E1 | 2.20 | 2.30 | 2.40 | 0.0087 | 0.091 | 0.095 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.20 | 0.38 | 0.45 | 0.008 | 0.015 | 0.018 |
| L1 | 0.05 | — | 0.10 | 0.002 | — | 0.004 |
| theta1 | 0° | 10° | 12° | 0° | 10° | 12° |

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MIL EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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