

N6450-VB Datasheet

N-Channel 100-V (D-S) MOSFET

PRODUCT SUMMARY

| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ (Ω) | I_D (A) |
|-------------------|---------------------------|-----------|
| 100 | 0.009 at $V_{GS} = 10$ V | 65 |

FEATURES

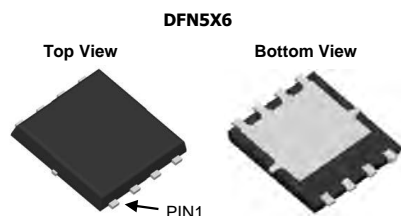
- Trench Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 % R_g Tested



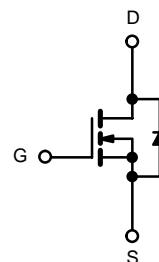
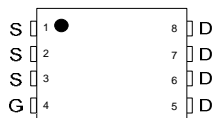
RoHS
COMPLIANT

APPLICATIONS

- Isolated DC/DC Converters



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)

| PARAMETER | SYMBOL | LIMIT | UNIT |
|---|----------------|---------------|----------------------|
| Drain-source voltage | V_{DS} | 100 | V |
| Gate-source voltage | V_{GS} | ± 20 | |
| Continuous drain current ($T_J = 150$ °C) | I_D | $T_C = 25$ °C | 65 |
| | | $T_C = 70$ °C | 60 |
| | | $T_A = 25$ °C | 20 ^{b, c} |
| | | $T_A = 70$ °C | 18.5 ^{b, c} |
| Pulsed drain current ($t = 100$ μ s) | I_{DM} | 180 | A |
| Continuous source-drain diode current | I_S | $T_C = 25$ °C | 60 |
| | | $T_A = 25$ °C | 4.8 ^{b, c} |
| Single pulse avalanche current | I_{AS} | 30 | |
| Single pulse avalanche energy | E_{AS} | 40 | mJ |
| Maximum power dissipation | P_D | $T_C = 25$ °C | 80 |
| | | $T_C = 70$ °C | 50 |
| | | $T_A = 25$ °C | 5 ^{b, c} |
| | | $T_A = 70$ °C | 3.2 ^{b, c} |
| Operating junction and storage temperature range | T_J, T_{stg} | -55 to +150 | °C |
| Soldering recommendations (peak temperature) ^c | | 260 | |

THERMAL RESISTANCE RATINGS

| PARAMETER | SYMBOL | TYPICAL | MAXIMUM | UNIT |
|--|------------|---------|---------|------|
| Maximum junction-to-ambient ^b | R_{thJA} | 20 | 25 | °C/W |
| Maximum junction-to-case (drain) | R_{thJC} | 1.6 | 2 | |

Notes

- a. Package limited
 b. Surface mounted on 1" x 1" FR4 board
 c. $t = 10$ s

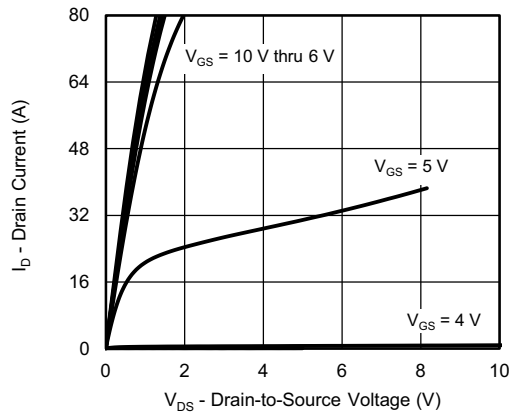
| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | |
|---|--------------------------------------|--|------|-------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | |
| Drain-source breakdown voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | 100 | - | - | V |
| V _{DS} temperature coefficient | ΔV _{DS} /T _J | I _D = 10 mA | - | 81 | - | mV/°C |
| V _{GS(th)} temperature coefficient | ΔV _{GS(th)} /T _J | I _D = 250 μA | - | -7.5 | - | |
| Gate-source threshold voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 3 | - | 5 | V |
| Gate-source leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | - | - | 100 | nA |
| Zero gate voltage drain current | I _{DSS} | V _{DS} = 100 V, V _{GS} = 0 V | - | - | 1 | μA |
| | | V _{DS} = 100 V, V _{GS} = 0 V, T _J = 70 °C | - | - | 15 | |
| On-state drain current ^a | I _{D(on)} | V _{DS} ≥ 10 V, V _{GS} =10 V | 40 | - | - | A |
| Drain-source on-state resistance ^a | R _{DS(on)} | V _{GS} =10 V, I _D = 10 A | - | 0.009 | - | Ω |
| | | V _{GS} = 7.5 V, I _D = 10 A | - | 0.012 | - | |
| Forward transconductance ^a | g _{fs} | V _{DS} = 15 V, I _D = 10 A | - | 46 | - | S |
| Dynamic ^b | | | | | | |
| Input capacitance | C _{iss} | V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz | - | 3970 | - | pF |
| Output capacitance | C _{oss} | | - | 132 | - | |
| Reverse transfer capacitance | C _{rss} | | - | 11.2 | - | |
| Total gate charge | Q _g | V _{DS} = 50 V, V _{GS} = 10 V, I _D = 10 A | - | 20 | - | nC |
| Gate-source charge | Q _{gs} | V _{DS} = 50 V, V _{GS} = 7.5 V, I _D = 10 A | - | 15 | - | |
| Gate-drain charge | Q _{gd} | | - | 6.45 | - | |
| Output charge | Q _{oss} | | - | 3.5 | - | |
| Gate resistance | R _g | V _{DS} = 50 V, V _{GS} = 0 V | - | 22 | - | |
| Turn-on delay time | t _{d(on)} | f = 1 MHz | 0.2 | 0.76 | 1.4 | Ω |
| Rise time | t _r | V _{DD} = 50 V, R _L = 5 Ω, I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω | - | 12 | 24 | ns |
| Turn-off delay time | t _{d(off)} | | - | 5 | 10 | |
| Fall time | t _f | | - | 19 | 38 | |
| Turn-on delay time | t _{d(on)} | | - | 5 | 10 | |
| Rise time | t _r | V _{DD} = 50 V, R _L = 5 Ω, I _D ≅ 10 A, V _{GEN} = 7.5 V, R _g = 1 Ω | - | 15 | 30 | |
| Turn-off delay time | t _{d(off)} | | - | 6 | 12 | |
| Fall time | t _f | | - | 19 | 38 | |
| | | | - | 5 | 10 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous source-drain diode current | I _S | T _C = 25 °C | - | - | 60 | A |
| Pulse diode forward current | I _{SM} | | - | - | 80 | |
| Body diode voltage | V _{SD} | I _S = 5 A, V _{GS} = 0 V | - | 0.78 | 1.1 | V |
| Body diode reverse recovery time | t _{rr} | I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C | - | 43 | 86 | ns |
| Body diode reverse recovery charge | Q _{rr} | | - | 72 | 144 | nC |
| Reverse recovery fall time | t _a | | - | 33 | - | ns |
| Reverse recovery rise time | t _b | | - | 10 | - | |

Notes

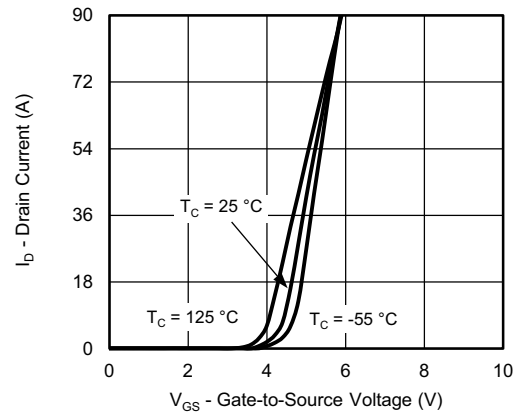
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
 b. Guaranteed by design, not subject to production testing

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.

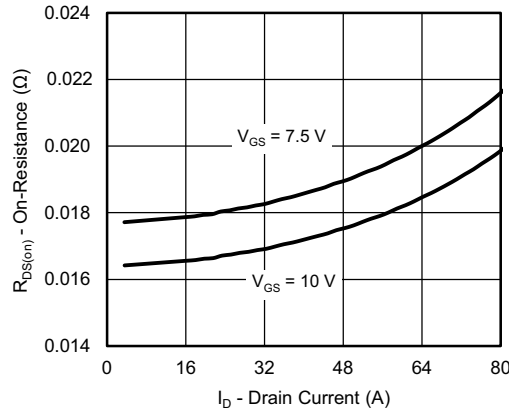
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



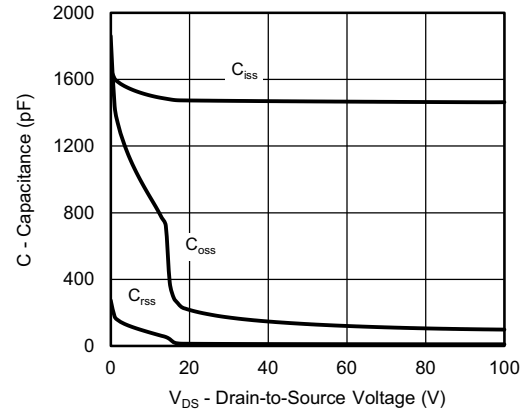
Output Characteristics



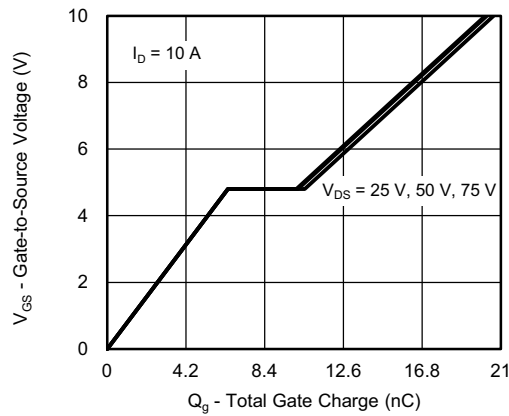
Transfer Characteristics



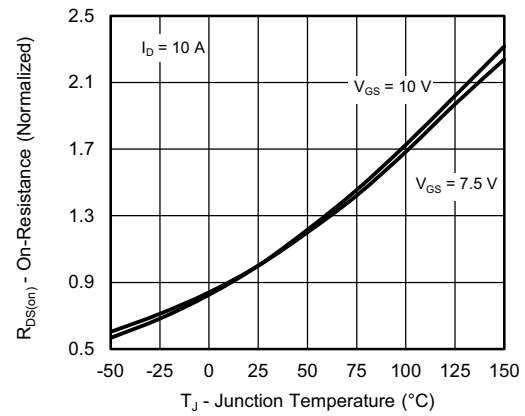
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

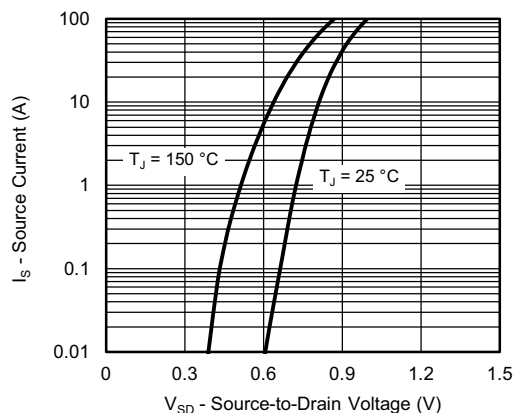


Gate Charge

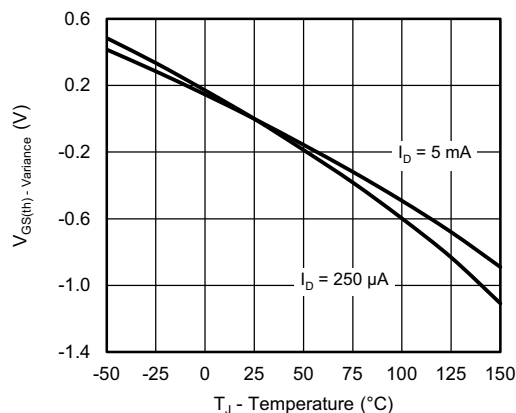


On-Resistance vs. Junction Temperature

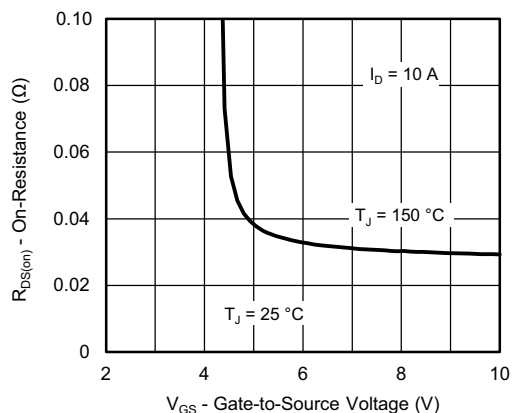
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



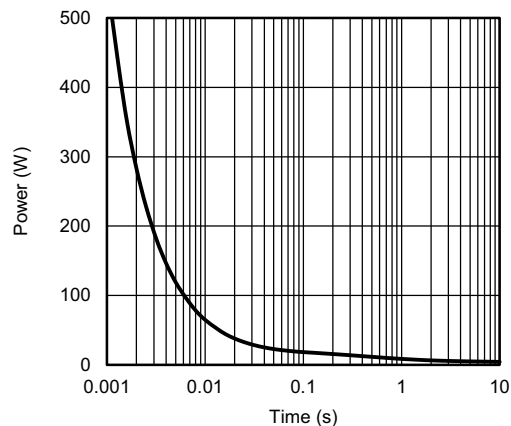
Source-Drain Diode Forward Voltage



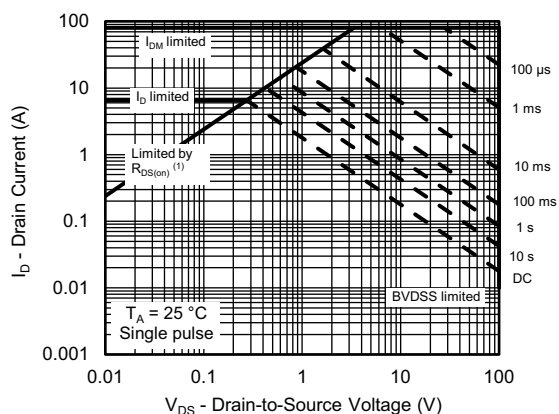
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage

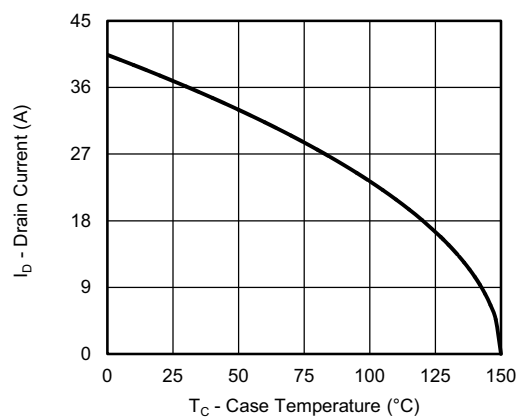
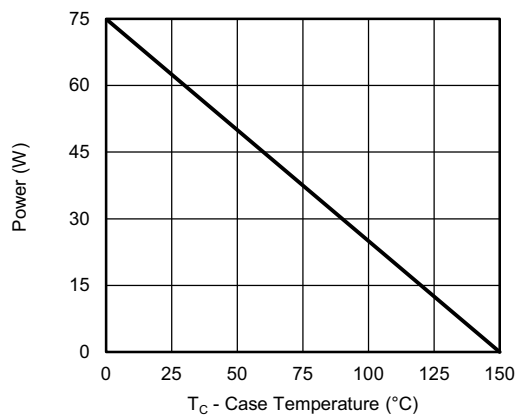
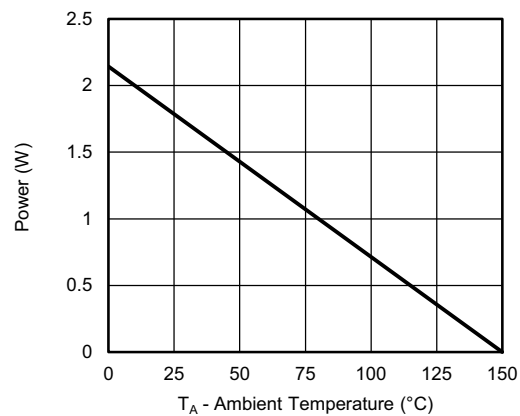


Single Pulse Power, Junction-to-Ambient

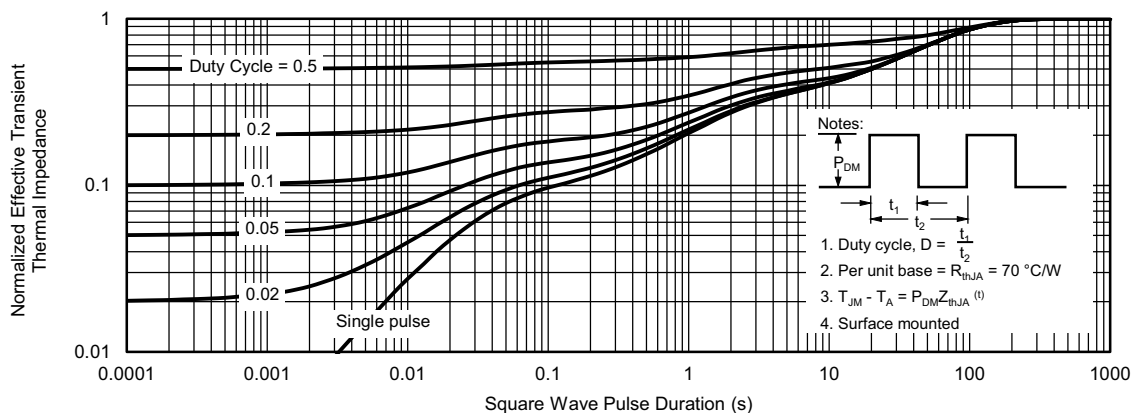
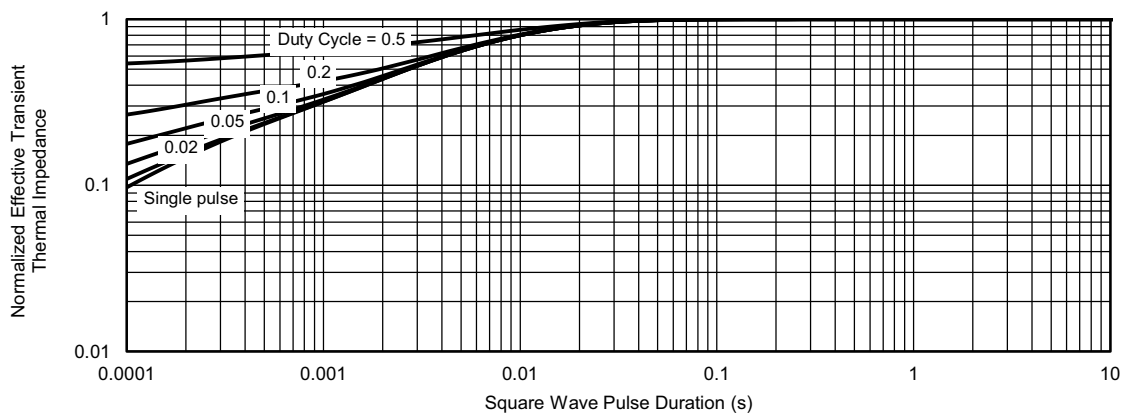


(1) $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

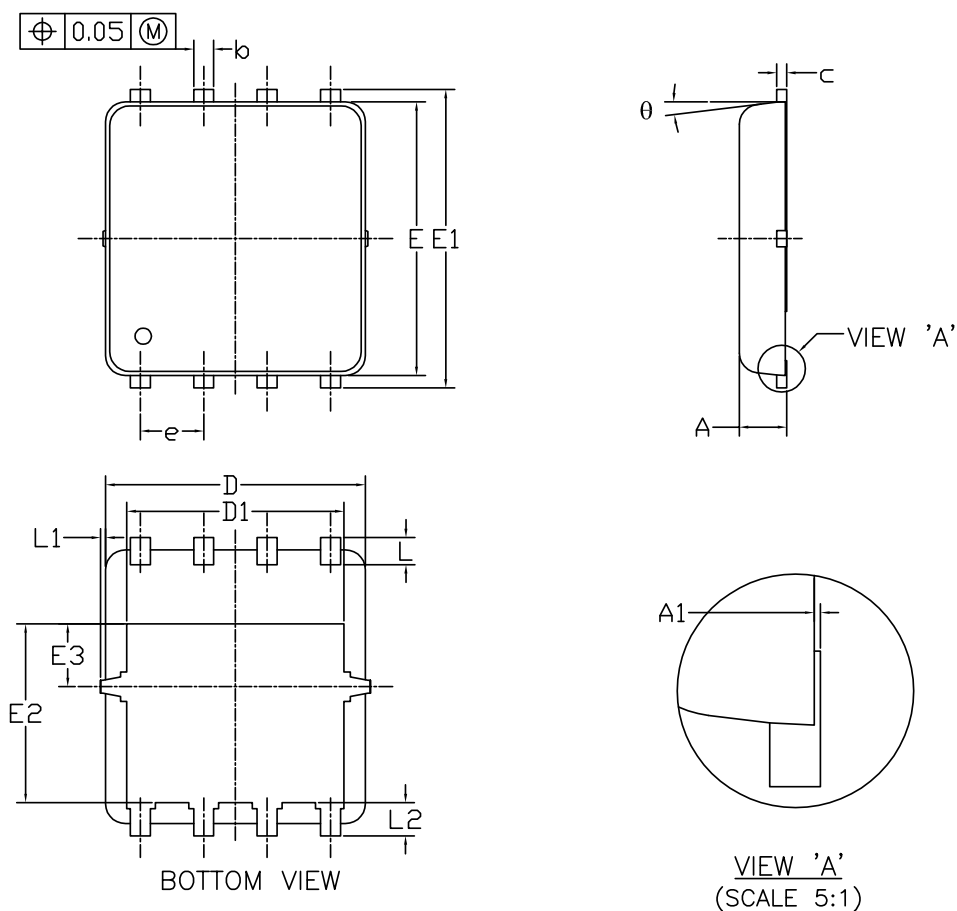
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Current Derating ^a

Power, Junction-to-Case

Power, Junction-to-Ambient
Note

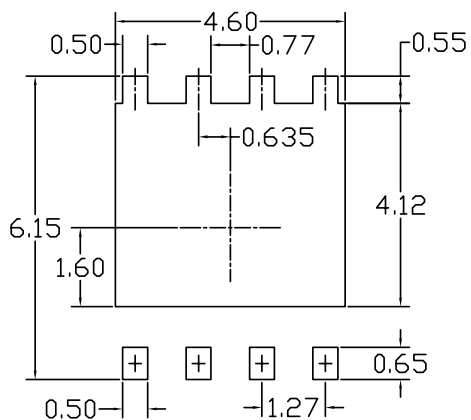
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

DFN5x6_8L_EP1_P PACKAGE OUTLIN



RECOMMENDED LAND PATTERN



| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---------|---------------------------|-------|-------|----------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.85 | 0.95 | 1.00 | 0.033 | 0.037 | 0.039 |
| A1 | 0.00 | --- | 0.05 | 0.000 | --- | 0.002 |
| b | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| c | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| D | 5.10 | 5.20 | 5.30 | 0.201 | 0.205 | 0.209 |
| D1 | 4.25 | 4.35 | 4.45 | 0.167 | 0.171 | 0.175 |
| E | 5.45 | 5.55 | 5.65 | 0.215 | 0.219 | 0.222 |
| E1 | 5.95 | 6.05 | 6.15 | 0.234 | 0.238 | 0.242 |
| E2 | 3.525 | 3.625 | 3.725 | 0.139 | 0.143 | 0.147 |
| E3 | 1.175 | 1.275 | 1.375 | 0.046 | 0.050 | 0.054 |
| e | 1.27 BSC | | | 0.050 BSC | | |
| L | 0.45 | 0.55 | 0.65 | 0.018 | 0.022 | 0.026 |
| L1 | 0 | --- | 0.15 | 0 | --- | 0.006 |
| L2 | 0.68 REF | | | 0.027 REF | | |
| θ | 0° | --- | 10° | 0° | --- | 10° |

NOTE

UNIT: mm

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

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