

P-Channel Enhancement Mode Power MOSFET

Description

The HM35P04D uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge .This device is well suited for high current load applications.

General Features

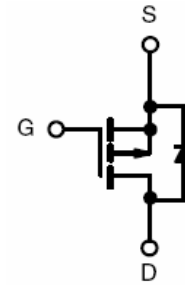
- $V_{DS} = -40V, I_D = -35A$
 $R_{DS(ON)} < 10m\Omega @ V_{GS} = -10V$
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

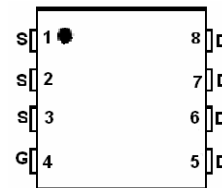
- Power switch
- Load switch in high current applications
- DC/DC converters

100% UIS TESTED!

100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| HM35P04D | HM35P04D | DFN5X6-8L | - | - | - |

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|--------------------|------------|---------------|
| Drain-Source Voltage | V_{DS} | -40 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | -35 | A |
| Drain Current-Continuous($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | -25 | A |
| Pulsed Drain Current | I_{DM} | -105 | A |
| Maximum Power Dissipation | P_D | 65 | W |
| Derating factor | | 0.52 | W/ $^\circ C$ |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 1020 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | $^\circ C$ |

Thermal Characteristic

| | | | |
|--|-----------------|------|----------------------|
| Thermal Resistance, Junction-to-Case(Note 2) | $R_{\theta JC}$ | 1.92 | $^{\circ}\text{C/W}$ |
|--|-----------------|------|----------------------|

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

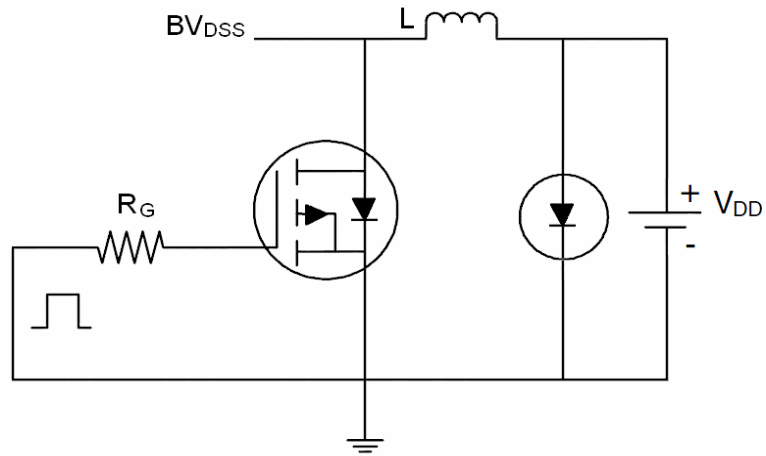
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|---|------|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=-250\mu A$ | -40 | - | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=-40V, V_{GS}=0V$ | - | - | -1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -1.2 | -1.9 | -2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=-10V, I_D=-20A$ | - | 7.5 | 10 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=-10V, I_D=-20A$ | - | 50 | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=-20V, V_{GS}=0V,$ $F=1.0\text{MHz}$ | - | 6460 | - | PF |
| Output Capacitance | C_{oss} | | - | 684 | - | PF |
| Reverse Transfer Capacitance | C_{rss} | | - | 600 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=-20V, R_L=2\Omega,$ $V_{GS}=-10V, R_G=1\Omega$ | - | 15 | - | nS |
| Turn-on Rise Time | t_r | | - | 12 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 35 | - | nS |
| Turn-Off Fall Time | t_f | | - | 18 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=-20, I_D=-20A,$ $V_{GS}=-10V$ | - | 106 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 22 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 27 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=-10A$ | - | - | -1.2 | V |
| Diode Forward Current (Note 2) | I_S | | - | - | -35 | A |
| Reverse Recovery Time | t_{rr} | $T_J = 25^{\circ}\text{C}, I_F = -10A$ $di/dt = -100A/\mu s(\text{Note3})$ | - | 53 | - | nS |
| Reverse Recovery Charge | Q_{rr} | | - | 50 | - | nC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

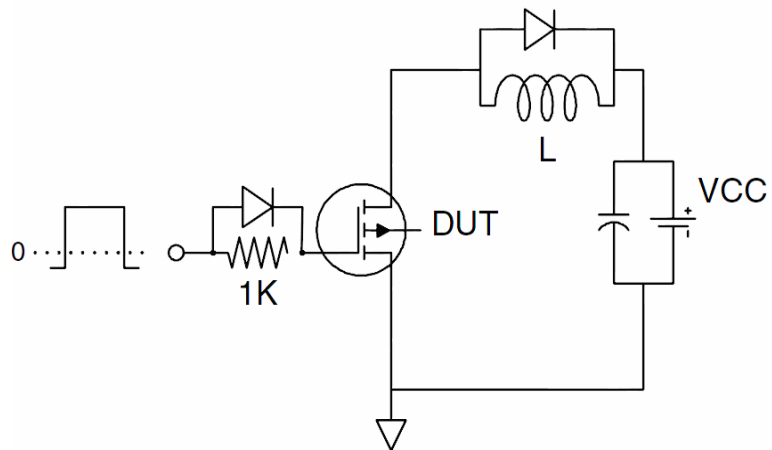
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: $T_J=25^{\circ}\text{C}, V_{DD}=-20V, V_G=-10V, L=1\text{mH}, R_g=25\Omega, I_{AS}=45A$

Test Circuit

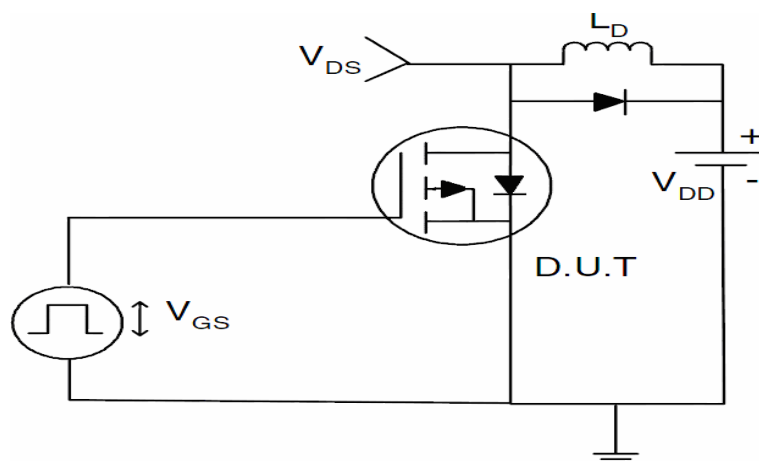
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

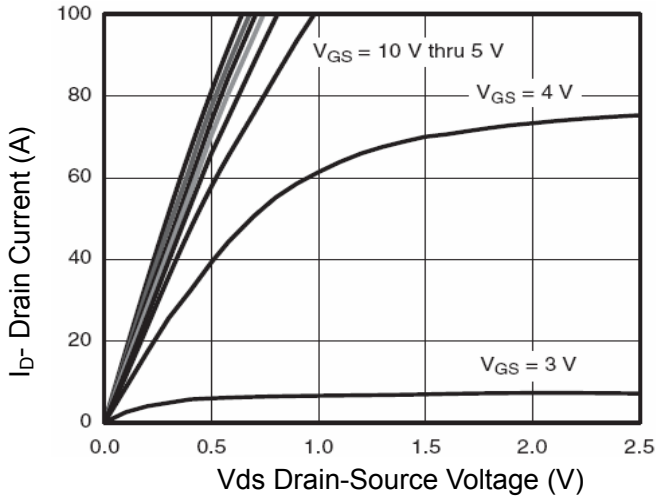


Figure 1 Output Characteristics

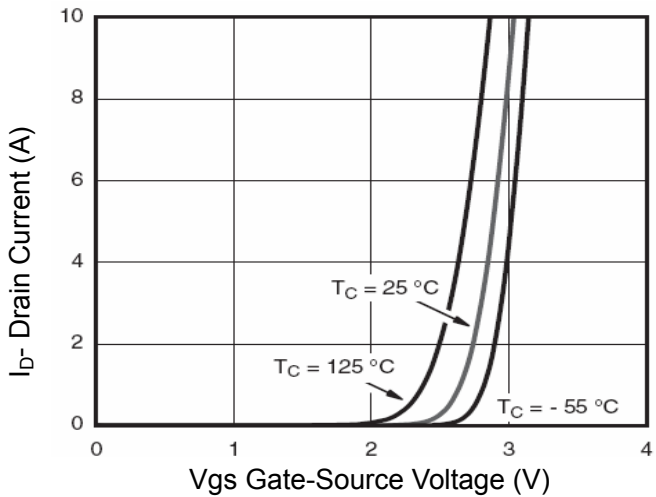


Figure 2 Transfer Characteristics

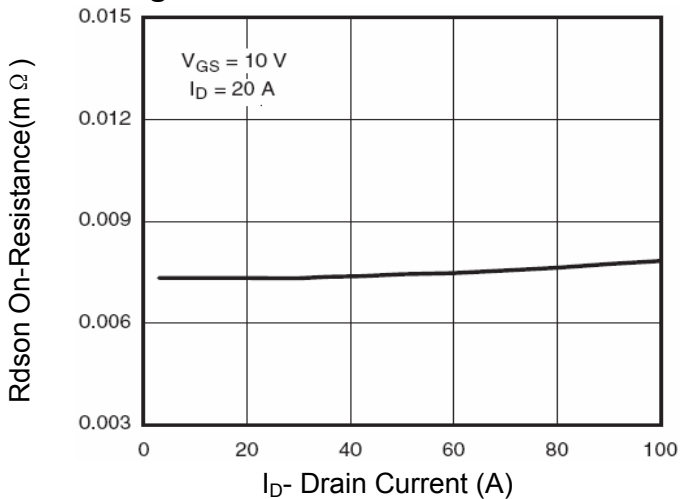


Figure 3 Rdson- Drain Current

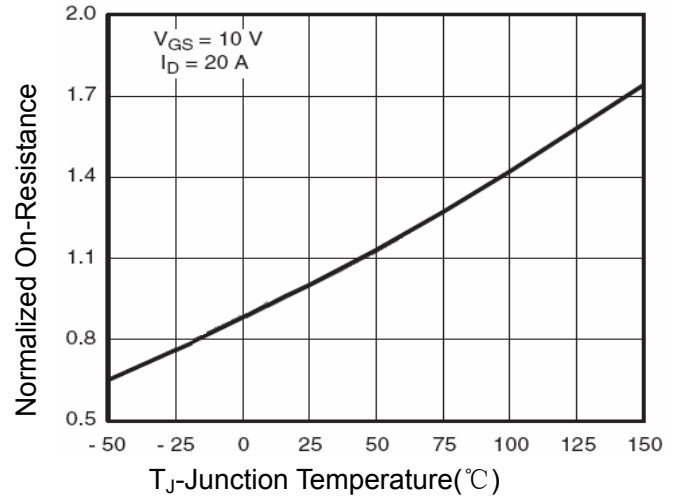


Figure 4 Rdson-Junction Temperature

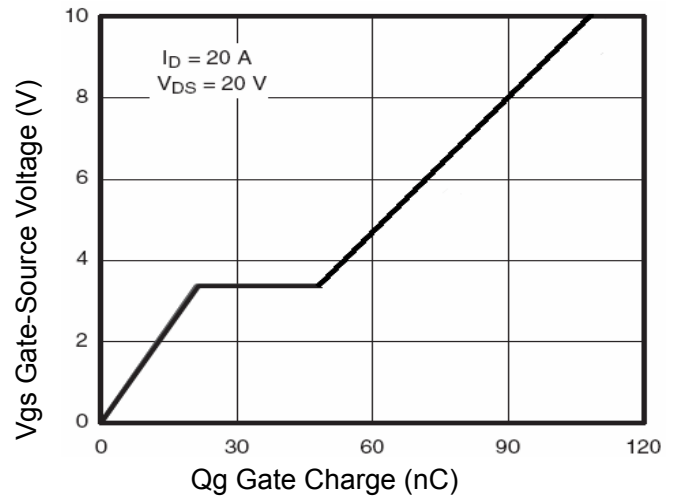


Figure 5 Gate Charge

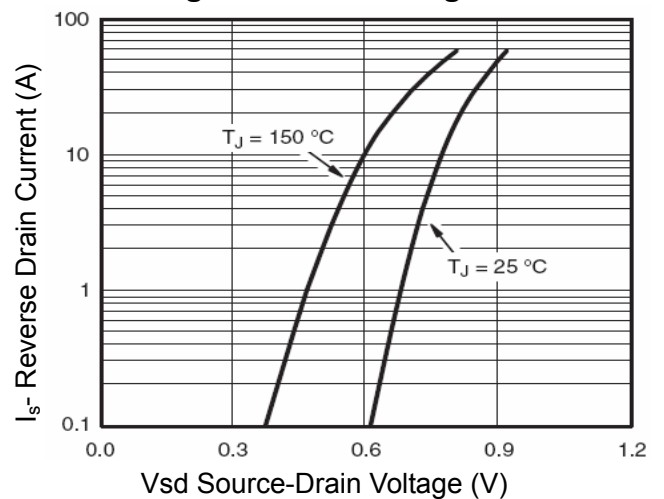


Figure 6 Source- Drain Diode Forward

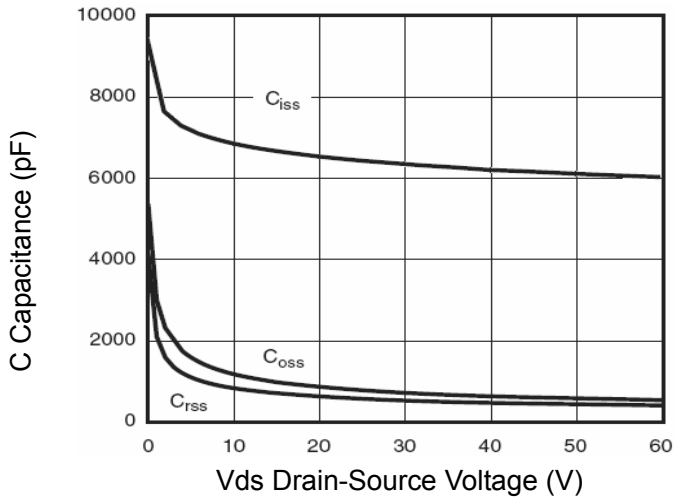


Figure 7 Capacitance vs Vds

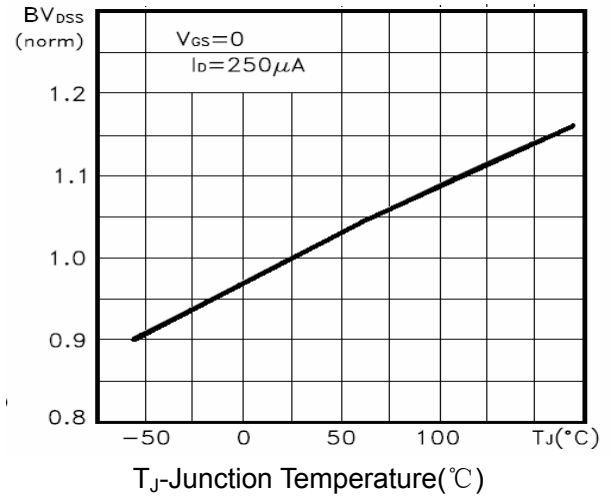


Figure 9 BV_{DSS} vs Junction Temperature

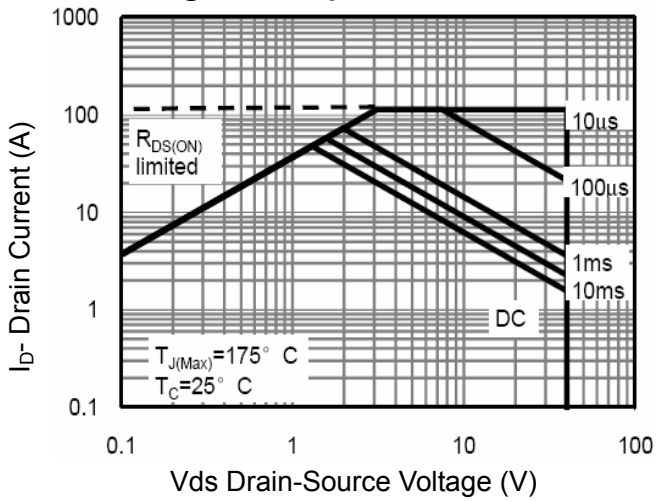


Figure 8 Safe Operation Area

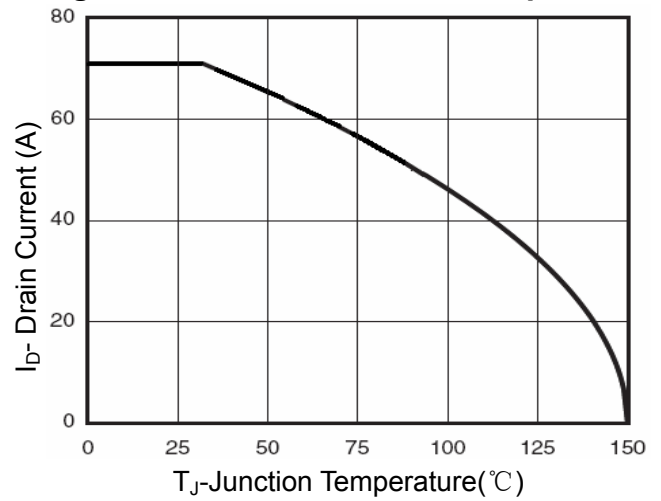


Figure 10 I_D Current Derating vs Junction Temperature

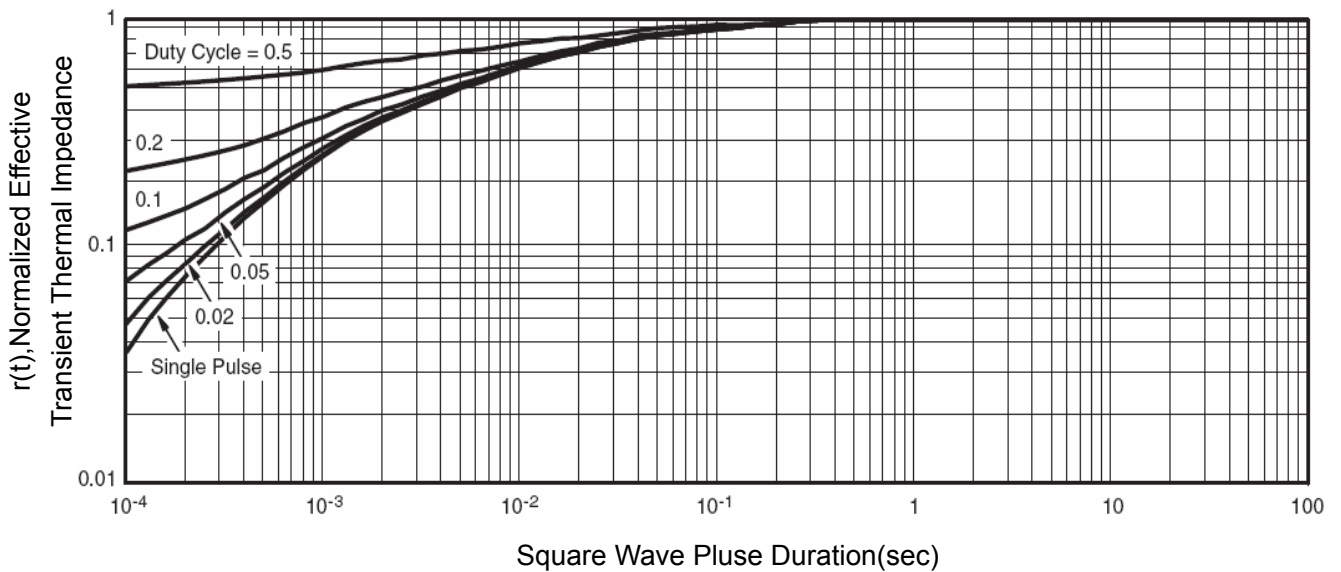
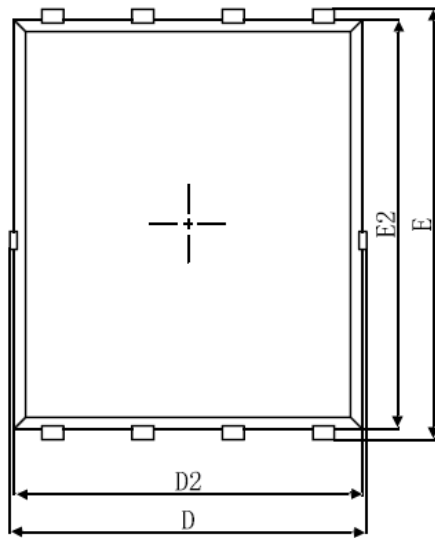
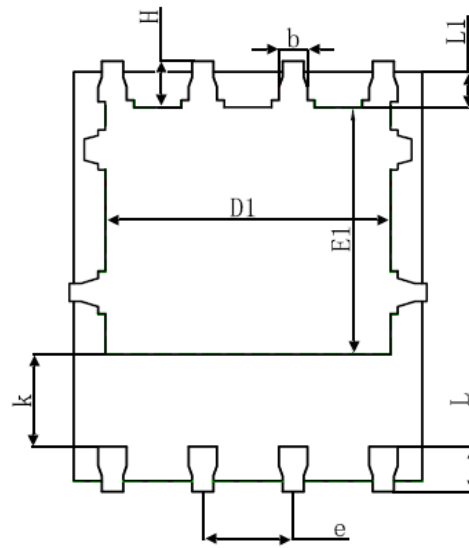


Figure 11 Normalized Maximum Transient Thermal Impedance

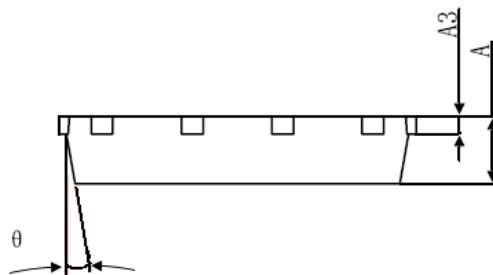
DFN5X6-8L Package Information



Top View
[顶视图]



Bottom View
[背视图]



Side View
[侧视图]

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.000 | 0.035 | 0.039 |
| A3 | 0.254REF. | | 0.010REF. | |
| D | 4.944 | 5.096 | 0.195 | 0.201 |
| E | 5.974 | 6.126 | 0.235 | 0.241 |
| D1 | 3.910 | 4.110 | 0.154 | 0.162 |
| E1 | 3.375 | 3.575 | 0.133 | 0.141 |
| D2 | 4.824 | 4.976 | 0.190 | 0.196 |
| E2 | 5.674 | 5.826 | 0.223 | 0.229 |
| k | 1.190 | 1.390 | 0.047 | 0.055 |
| b | 0.350 | 0.450 | 0.014 | 0.018 |
| e | 1.270TYP. | | 0.050TYP. | |
| L | 0.559 | 0.711 | 0.022 | 0.028 |
| L1 | 0.424 | 0.576 | 0.017 | 0.023 |
| H | 0.574 | 0.726 | 0.023 | 0.029 |
| θ | 8° | 12° | 8° | 12° |