

N-Channel Enhancement Mode Power MOSFET

Description

The HM100N07F uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

General Features

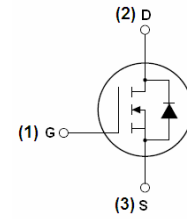
- $V_{DS} = 70V, I_D = 100A$
 $R_{DS(ON)} < 5.5 \text{ m}\Omega @ V_{GS} = 10V$ (Typ: 4.8m Ω)
- High density cell design for ultra low $R_{DS(ON)}$
- Fully characterized avalanche voltage and current
- Special designed for converters and power controls
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

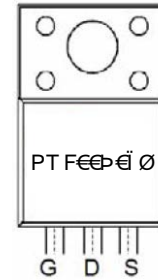
- Power switching application
- Hard switched and High frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

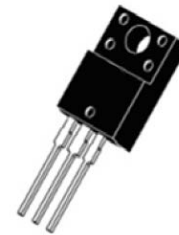
100% ΔV_{DS} TESTED!



Schematic diagram



Marking and pin assignment



TO-220F top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| HM100N07F | HM100N07F | TO-220F | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|--|---------------------------|------------|---------------------|
| Drain-Source Voltage | V_{DS} | 70 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 100 | A |
| Drain Current-Continuous ($T_C = 100^\circ\text{C}$) | $I_D (100^\circ\text{C})$ | 70.7 | A |
| Pulsed Drain Current | I_{DM} | 320 | A |
| Maximum Power Dissipation | P_D | 45 | W |
| Derating factor | | 0.3 | W/ $^\circ\text{C}$ |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 812 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ\text{C}$ |

Thermal Characteristic

| | | | |
|--|-----------------|-----|--------------------|
| Thermal Resistance, Junction-to-Case ^(Note 2) | $R_{\theta JC}$ | 3.3 | $^\circ\text{C/W}$ |
|--|-----------------|-----|--------------------|

Electrical Characteristics (T_A=25°C unless otherwise noted)

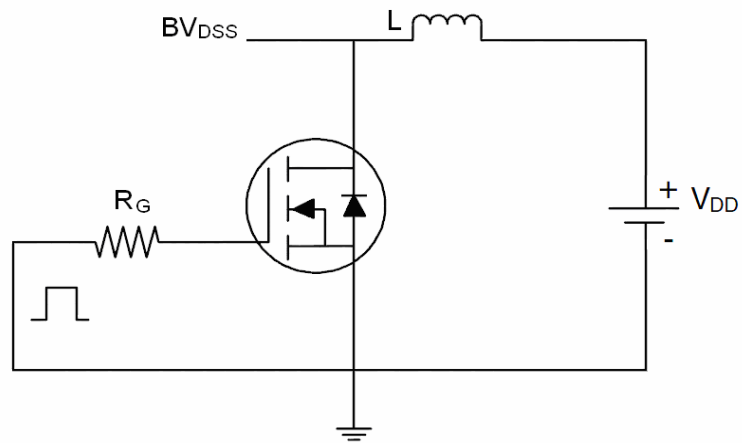
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|------------------------------------|---------------------|--|-----|------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V I _D =250μA | 70 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =70V, V _{GS} =0V | - | - | 1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 2 | 2.85 | 4 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =20A | - | 4.8 | 5.5 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V, I _D =20A | - | 50 | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C _{ISS} | V _{DS} =25V, V _{GS} =0V, F=1.0MHz | - | 4900 | - | PF |
| Output Capacitance | C _{OSS} | | - | 380 | - | PF |
| Reverse Transfer Capacitance | C _{RSS} | | - | 290 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | VDD=35V, RL=15Ω RG=2.5Ω, VGS=10V | - | 17 | - | nS |
| Turn-on Rise Time | t _r | | - | 11 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 55 | - | nS |
| Turn-Off Fall Time | t _f | | - | 15 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =35V, I _D =20A, V _{GS} =10V | - | 100 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 21 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 30 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =20A | - | - | 1.2 | V |
| Diode Forward Current (Note 2) | I _S | | - | - | 100 | A |
| Reverse Recovery Time | t _{rr} | Tj=25℃, I _F =100A di/dt=100A/μs (Note3) | - | | 37 | nS |
| Reverse Recovery Charge | Q _{rr} | | - | | 58 | nC |
| Forward Turn-On Time | t _{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

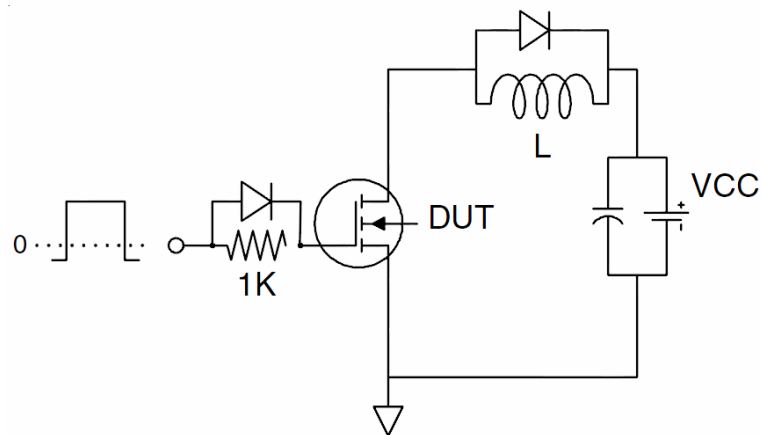
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T_j=25°C, V_{DD}=35V, V_G=10V, L=0.5mH, R_G=25Ω

Test Circuit

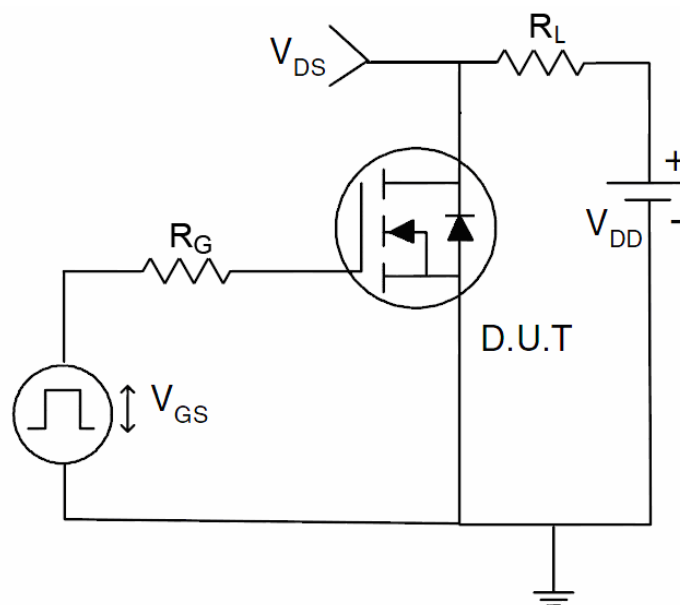
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

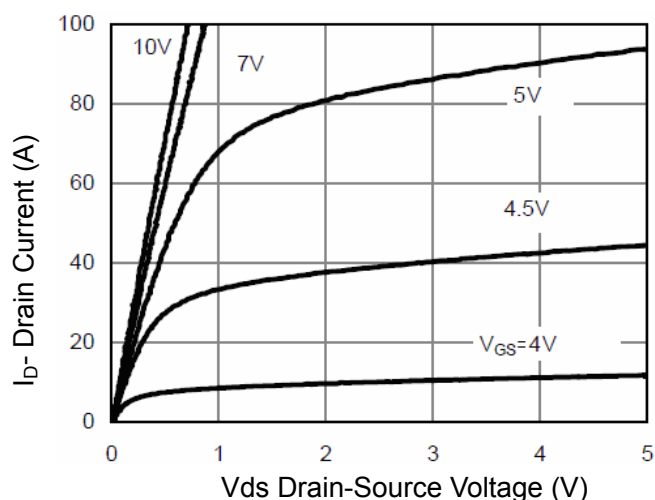


Figure 1 Output Characteristics

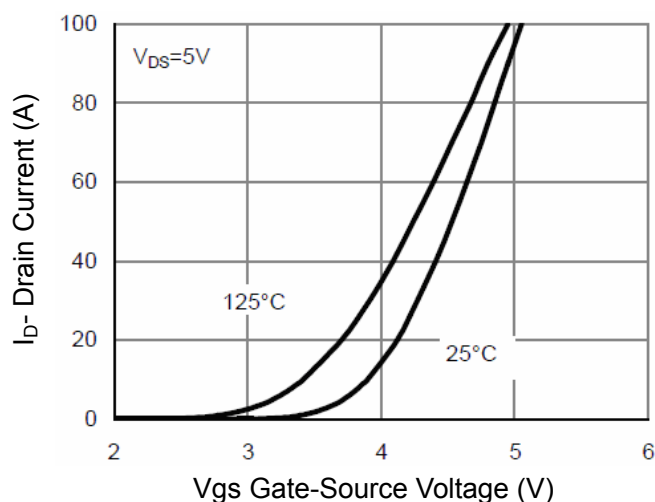


Figure 2 Transfer Characteristics

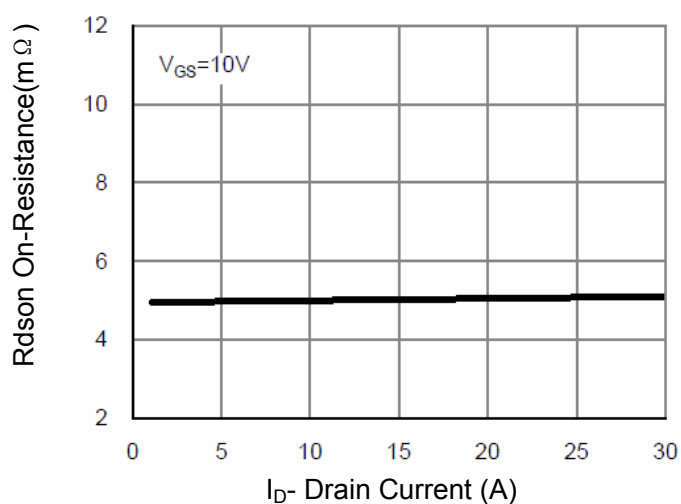


Figure 3 Rdson- Drain Current

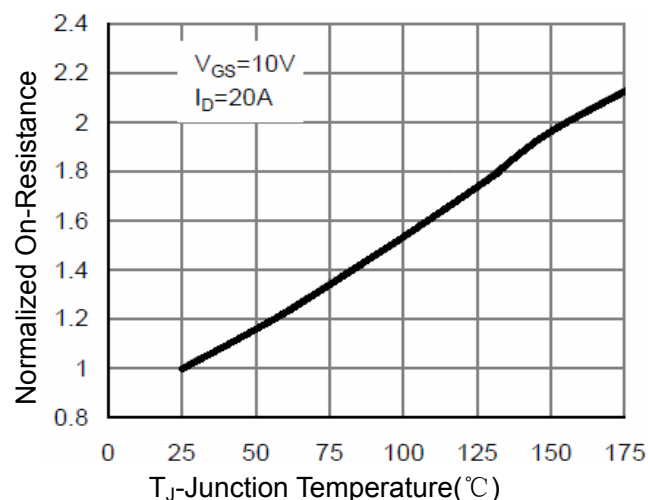


Figure 4 Rdson-Junction Temperature

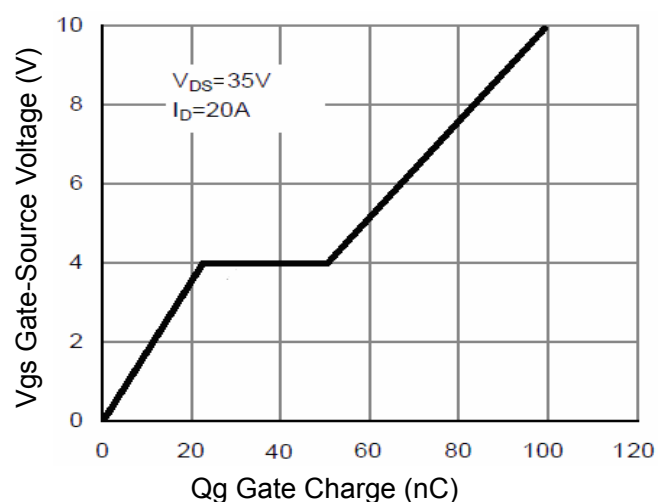


Figure 5 Gate Charge

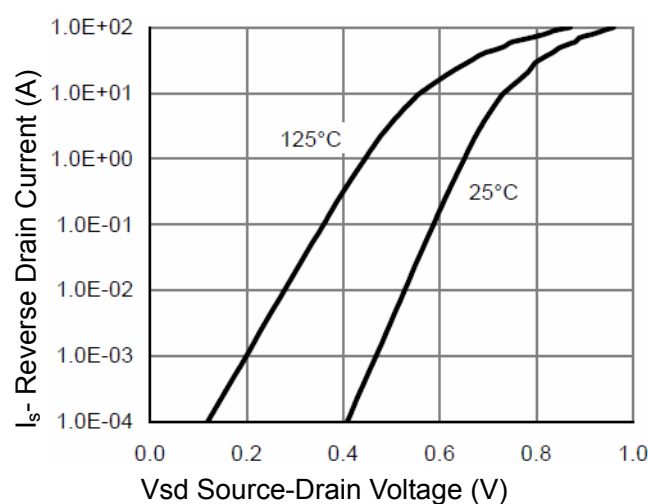


Figure 6 Source- Drain Diode Forward

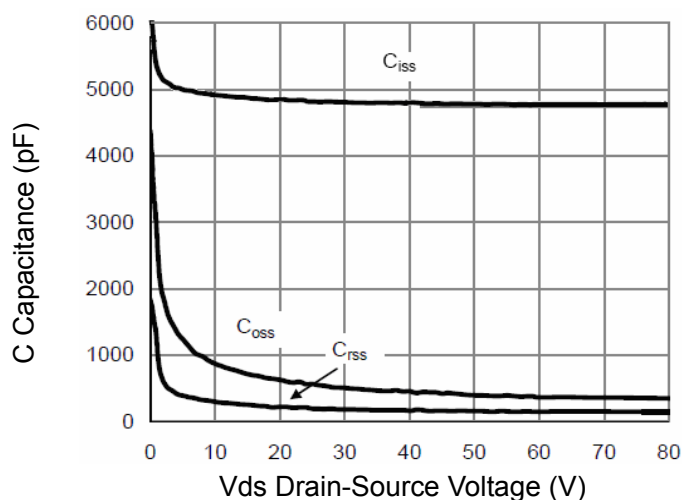


Figure 7 Capacitance vs Vds

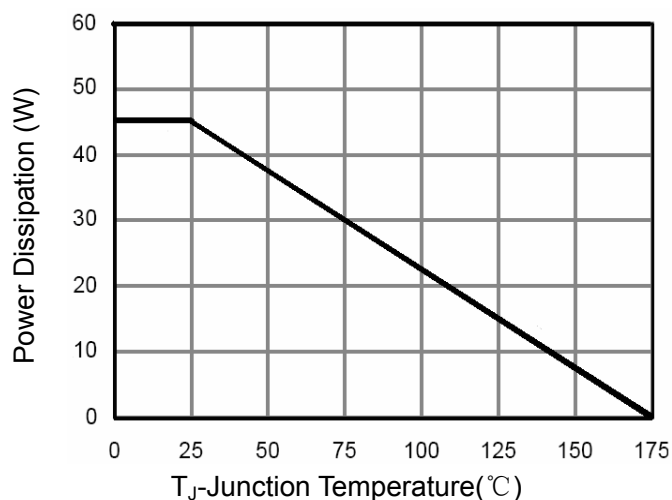


Figure 9 Power De-rating

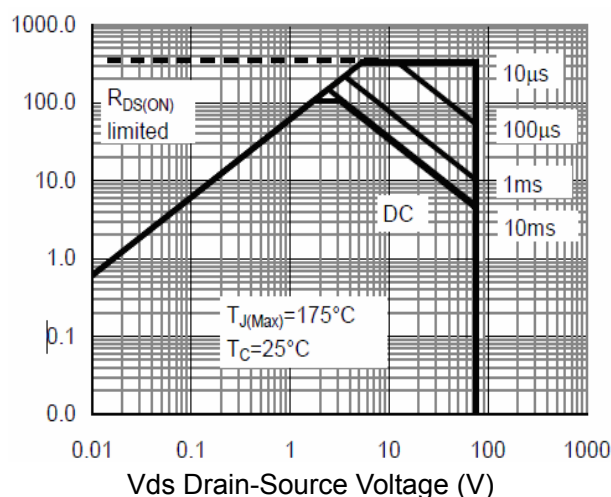


Figure 8 Safe Operation Area

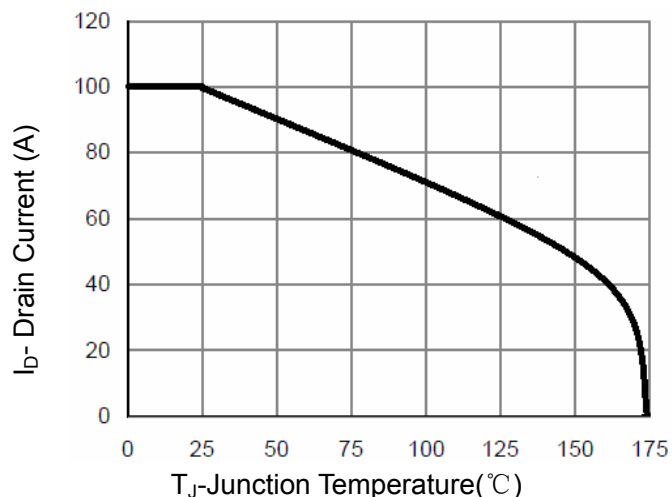


Figure 10 ID Current De-rating

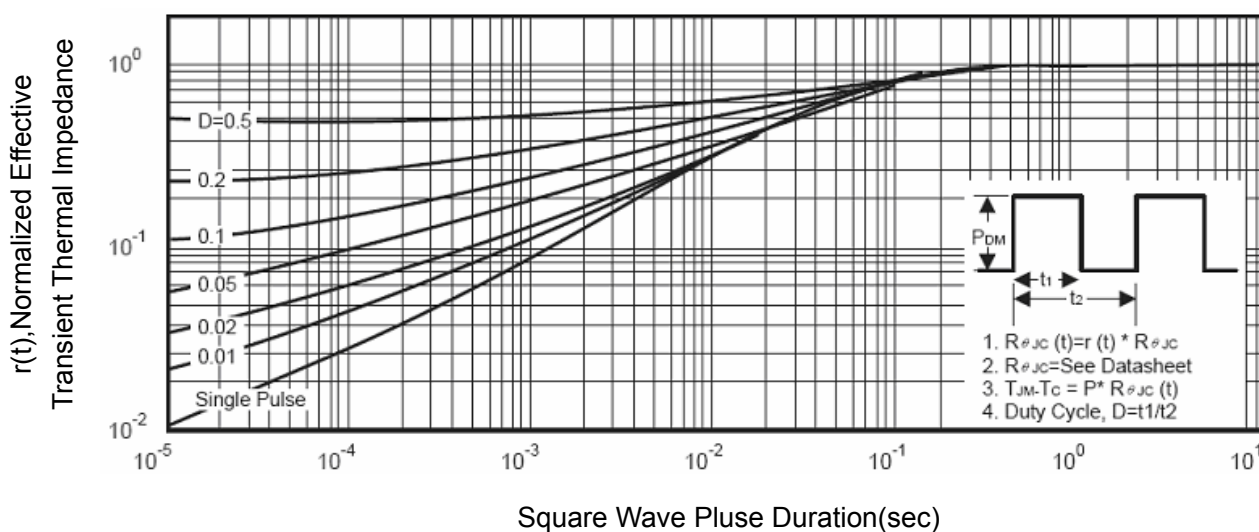
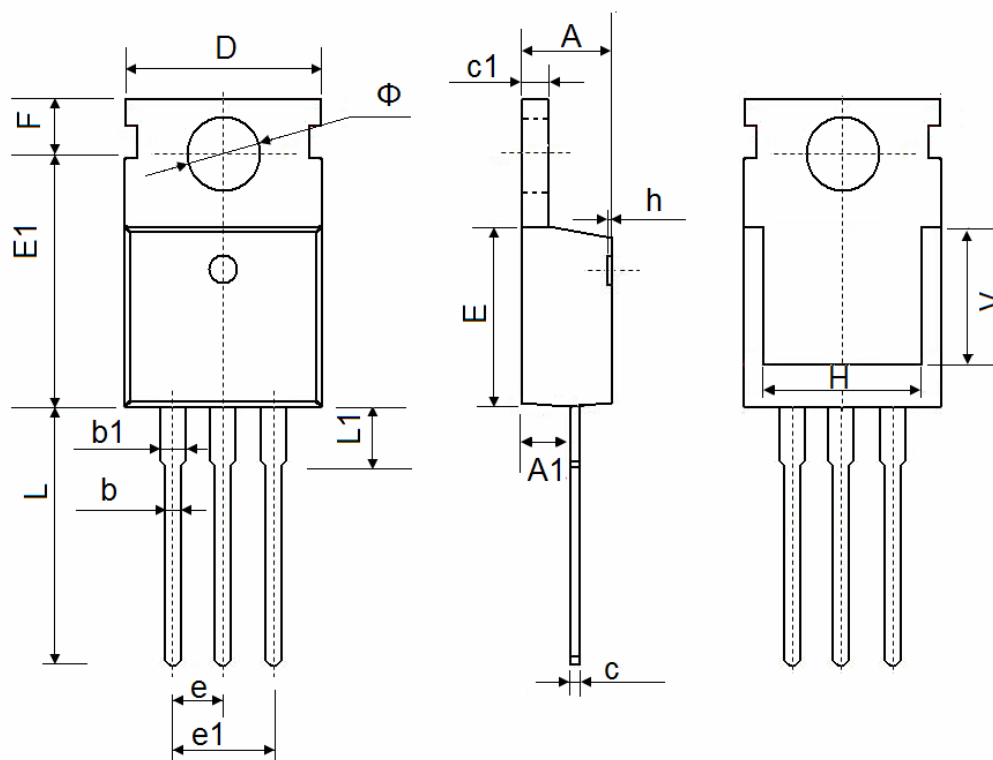


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.400 | 4.600 | 0.173 | 0.181 |
| A1 | 2.250 | 2.550 | 0.089 | 0.100 |
| b | 0.710 | 0.910 | 0.028 | 0.036 |
| b1 | 1.170 | 1.370 | 0.046 | 0.054 |
| c | 0.330 | 0.650 | 0.013 | 0.026 |
| c1 | 1.200 | 1.400 | 0.047 | 0.055 |
| D | 9.910 | 10.250 | 0.390 | 0.404 |
| E | 8.9500 | 9.750 | 0.352 | 0.384 |
| E1 | 12.650 | 12.950 | 0.498 | 0.510 |
| e | 2.540 TYP. | | 0.100 TYP. | |
| e1 | 4.980 | 5.180 | 0.196 | 0.204 |
| F | 2.650 | 2.950 | 0.104 | 0.116 |
| H | 7.900 | 8.100 | 0.311 | 0.319 |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| L | 12.900 | 13.400 | 0.508 | 0.528 |
| L1 | 2.850 | 3.250 | 0.112 | 0.128 |
| V | 7.500 REF. | | 0.295 REF. | |
| Φ | 3.400 | 3.800 | 0.134 | 0.150 |