

## N-Channel Enhancement Mode Power MOSFET

### Description

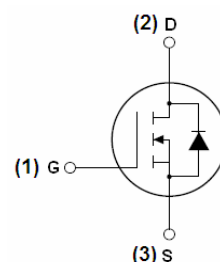
The HM100N20T uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

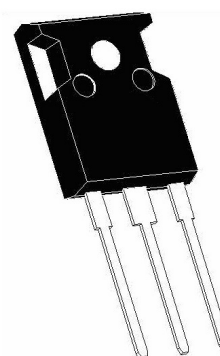
- $V_{DS} = 200V, I_D = 100A$   
 $R_{DS(ON)} < 18m\Omega @ V_{GS} = 10V$
- High density cell design for ultra low  $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

### Application

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



Schematic diagram



TO-247 top view

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**

### Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| HM100N20T      | HM100N20T | TO-247         | -         |            |          |

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

| Parameter                                         | Symbol             | Limit      | Unit          |
|---------------------------------------------------|--------------------|------------|---------------|
| Drain-Source Voltage                              | $V_{DS}$           | 200        | V             |
| Gate-Source Voltage                               | $V_{GS}$           | $\pm 20$   | V             |
| Drain Current-Continuous                          | $I_D$              | 100        | A             |
| Drain Current-Continuous( $T_C = 100^\circ C$ )   | $I_D(100^\circ C)$ | 70.7       | A             |
| Pulsed Drain Current                              | $I_{DM}$           | 400        | A             |
| Maximum Power Dissipation                         | $P_D$              | 400        | W             |
| Derating factor                                   |                    | 2.67       | W/ $^\circ C$ |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$           | 1369       | mJ            |
| Operating Junction and Storage Temperature Range  | $T_J, T_{STG}$     | -55 To 175 | $^\circ C$    |

### Thermal Characteristic

|                                                          |                 |      |              |
|----------------------------------------------------------|-----------------|------|--------------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta JC}$ | 0.38 | $^\circ C/W$ |
|----------------------------------------------------------|-----------------|------|--------------|

Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)

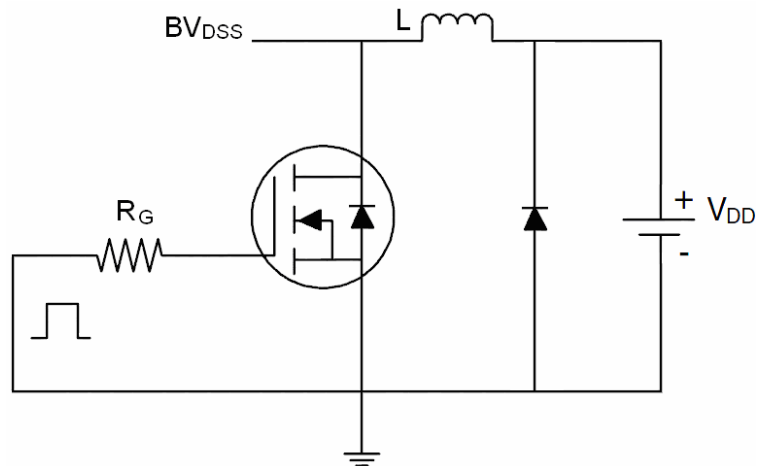
| Parameter                                     | Symbol              | Condition                                                                                | Min | Typ   | Max  | Unit |
|-----------------------------------------------|---------------------|------------------------------------------------------------------------------------------|-----|-------|------|------|
| Off Characteristics                           |                     |                                                                                          |     |       |      |      |
| Drain-Source Breakdown Voltage                | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                                                | 200 | 220   | -    | V    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> =200V, V <sub>GS</sub> =0V                                               | -   | -     | 1    | μA   |
| Gate-Body Leakage Current                     | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                               | -   | -     | ±100 | nA   |
| On Characteristics <sup>(Note 3)</sup>        |                     |                                                                                          |     |       |      |      |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                 | 2   | 3     | 4    | V    |
| Drain-Source On-State Resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =50A                                                | -   | 13.5  | 18   | mΩ   |
| Forward Transconductance                      | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =50A                                                 | 50  | -     | -    | S    |
| Dynamic Characteristics <sup>(Note4)</sup>    |                     |                                                                                          |     |       |      |      |
| Input Capacitance                             | C <sub>ISS</sub>    | V <sub>DS</sub> =50V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                   | -   | 9382  | -    | PF   |
| Output Capacitance                            | C <sub>OSS</sub>    |                                                                                          | -   | 529   | -    | PF   |
| Reverse Transfer Capacitance                  | C <sub>RSS</sub>    |                                                                                          | -   | 206   | -    | PF   |
| Switching Characteristics <sup>(Note 4)</sup> |                     |                                                                                          |     |       |      |      |
| Turn-on Delay Time                            | t <sub>d(on)</sub>  | V <sub>DD</sub> =100V, R <sub>L</sub> =15Ω<br>V <sub>GS</sub> =10V, R <sub>G</sub> =2.5Ω | -   | 35    | -    | nS   |
| Turn-on Rise Time                             | t <sub>r</sub>      |                                                                                          | -   | 30    | -    | nS   |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |                                                                                          | -   | 55    | -    | nS   |
| Turn-Off Fall Time                            | t <sub>f</sub>      |                                                                                          | -   | 25    | -    | nS   |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>DS</sub> =100V, I <sub>D</sub> =50A,<br>V <sub>GS</sub> =10V                      | -   | 150.9 |      | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |                                                                                          | -   | 36.8  |      | nC   |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |                                                                                          | -   | 52.5  |      | nC   |
| Drain-Source Diode Characteristics            |                     |                                                                                          |     |       |      |      |
| Diode Forward Voltage <sup>(Note 3)</sup>     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =50A                                                 | -   |       | 1.2  | V    |
| Diode Forward Current <sup>(Note 2)</sup>     | I <sub>S</sub>      |                                                                                          | -   | -     | 100  | A    |
| Reverse Recovery Time                         | t <sub>rr</sub>     | T <sub>J</sub> = 25°C, I <sub>F</sub> = 50A<br>di/dt = 100A/μs <sup>(Note3)</sup>        | -   | 52    |      | nS   |
| Reverse Recovery Charge                       | Q <sub>rr</sub>     |                                                                                          | -   | 80    |      | nC   |
| Forward Turn-On Time                          | t <sub>on</sub>     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)                     |     |       |      |      |

Notes:

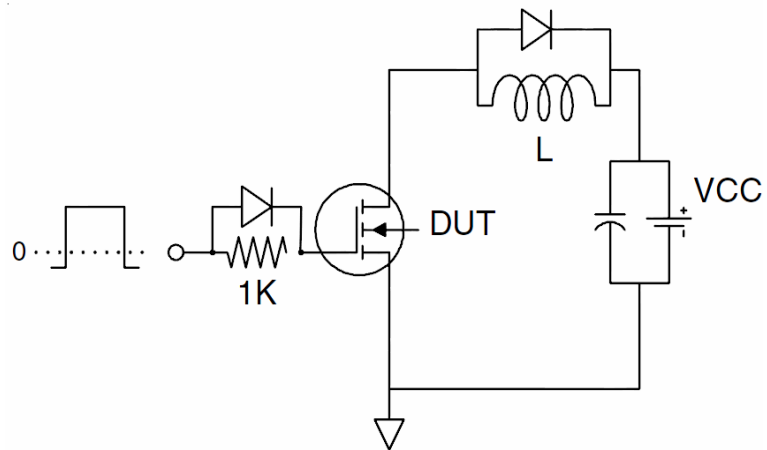
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E<sub>AS</sub> condition: V<sub>DD</sub>=50V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω

## Test Circuit

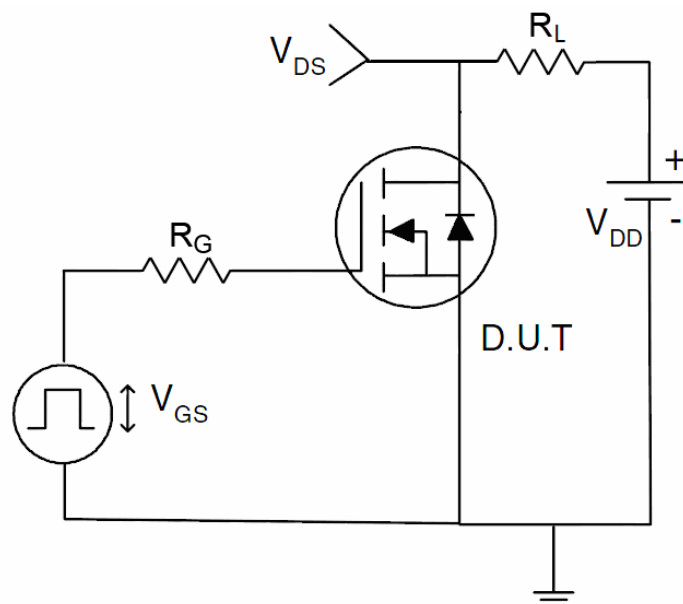
### 1) $E_{AS}$ test Circuits



### 2) Gate charge test Circuit



### 3) Switch Time Test Circuit



# Typical Electrical and Thermal Characteristics (Curves)

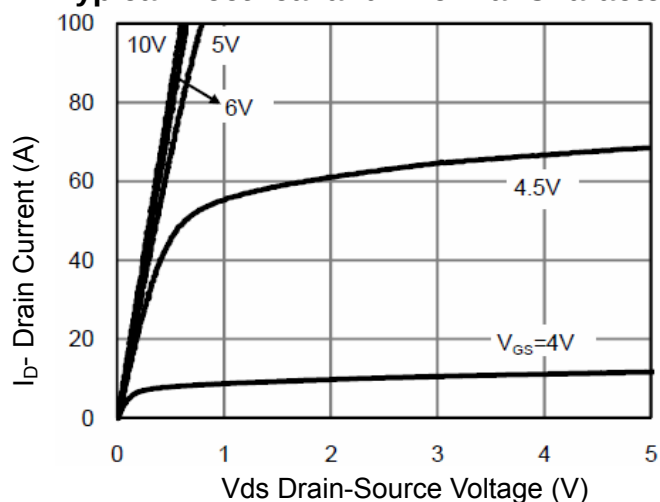


Figure 1 Output Characteristics

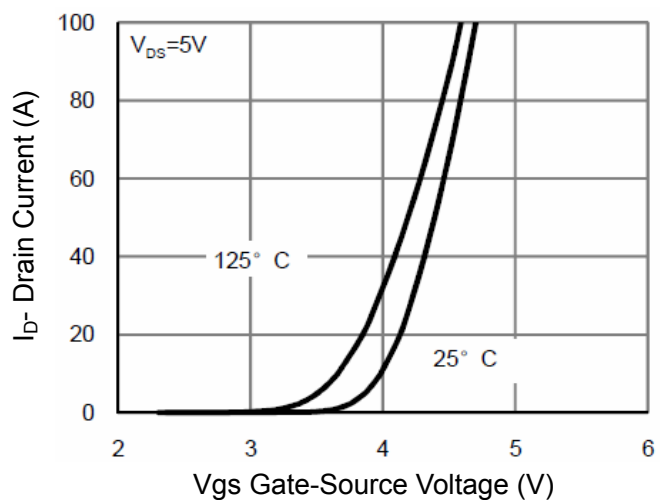


Figure 2 Transfer Characteristics

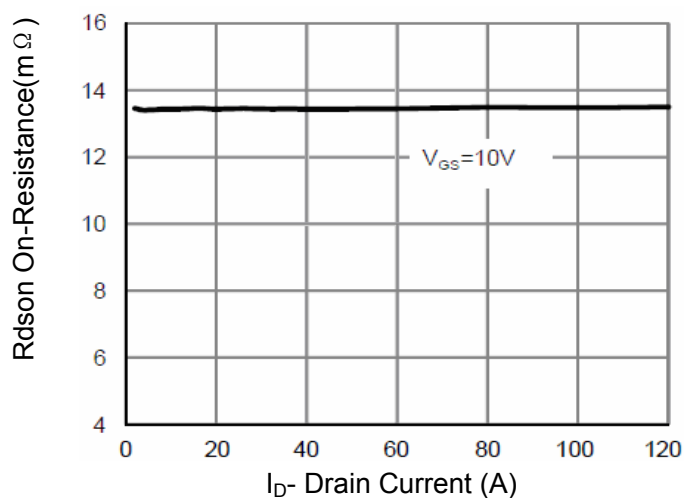


Figure 3  $R_{DS(on)}$ - Drain Current

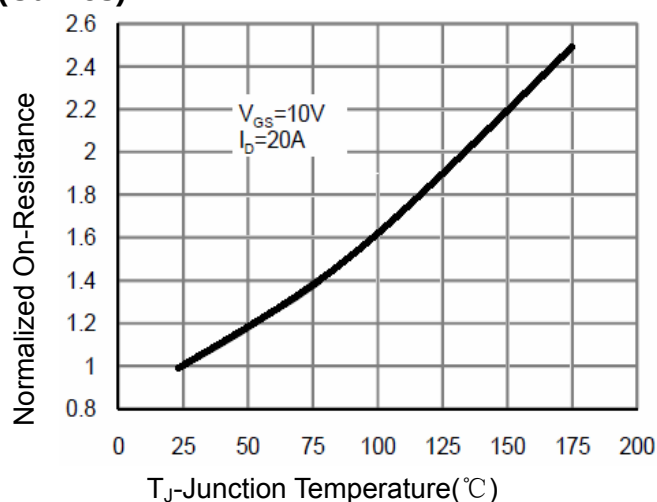


Figure 4  $R_{DS(on)}$ -Junction Temperature

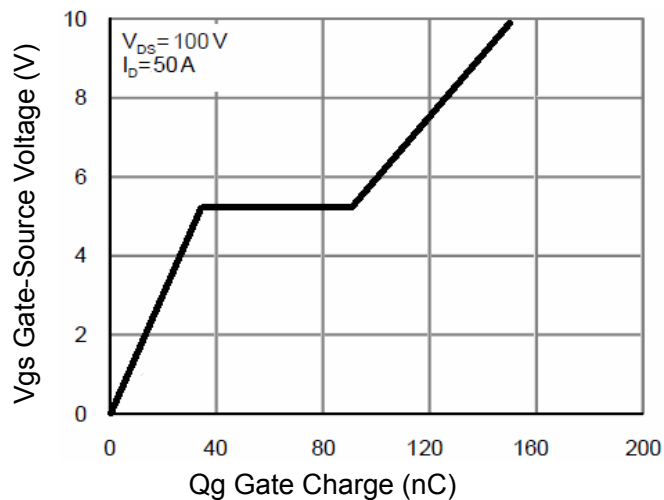


Figure 5 Gate Charge

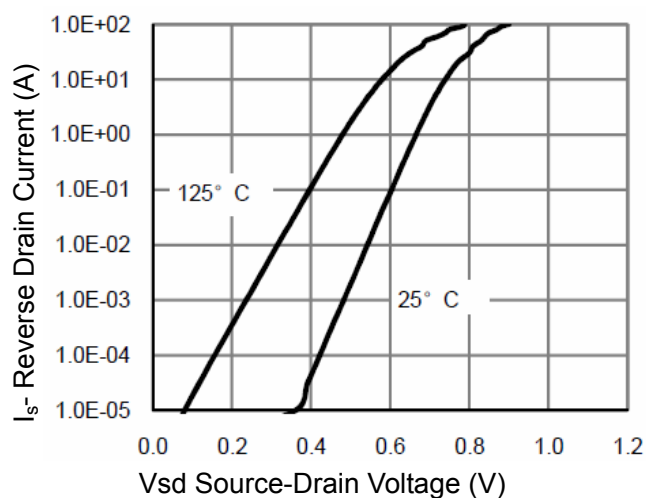


Figure 6 Source- Drain Diode Forward

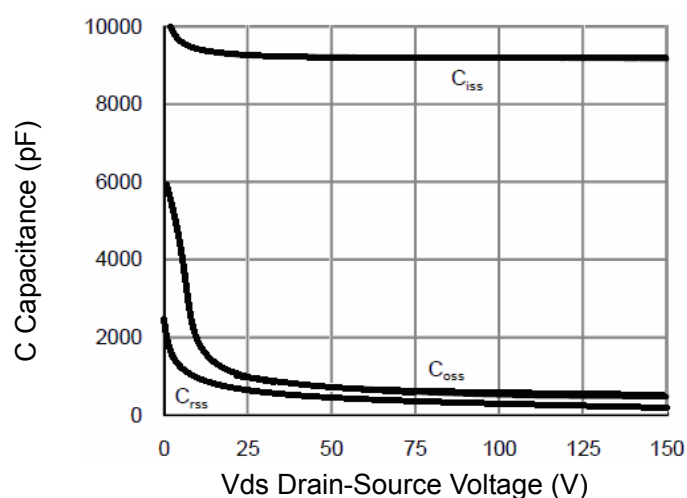


Figure 7 Capacitance vs Vds

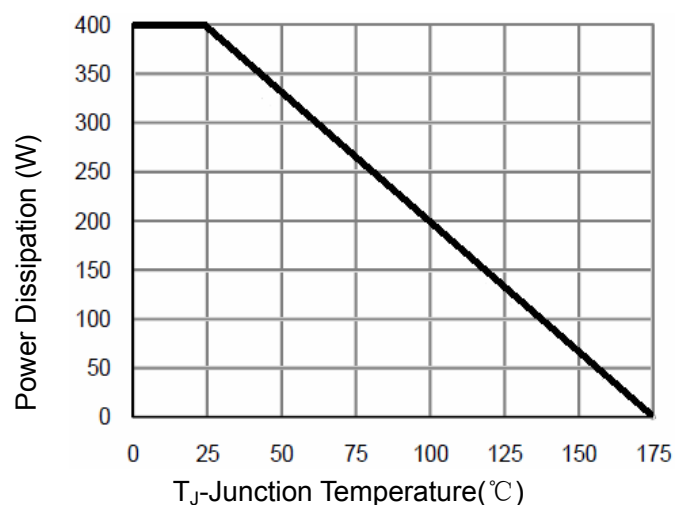


Figure 9 Power De-rating

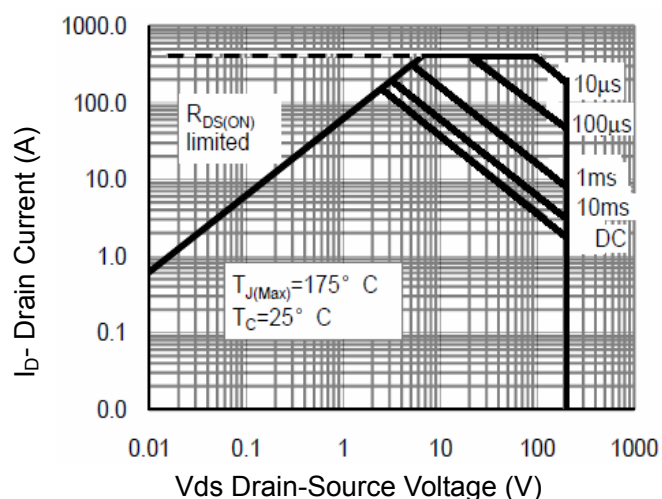


Figure 8 Safe Operation Area

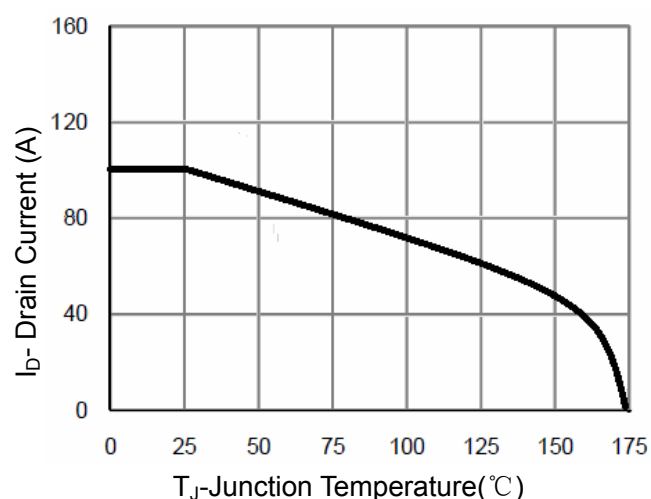


Figure 10 Current De-rating

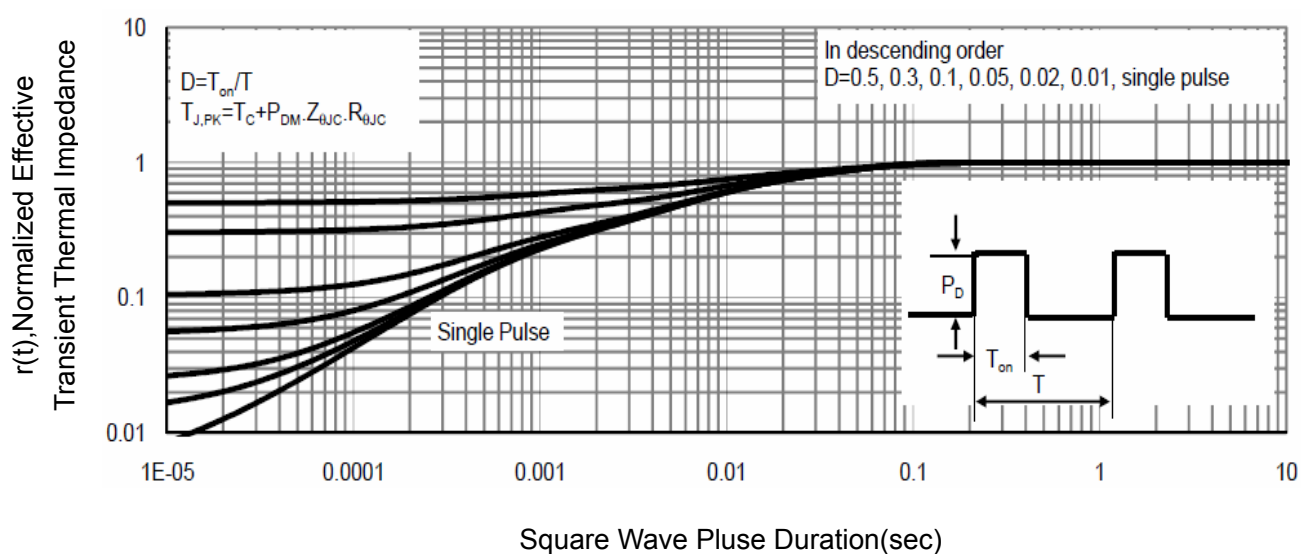
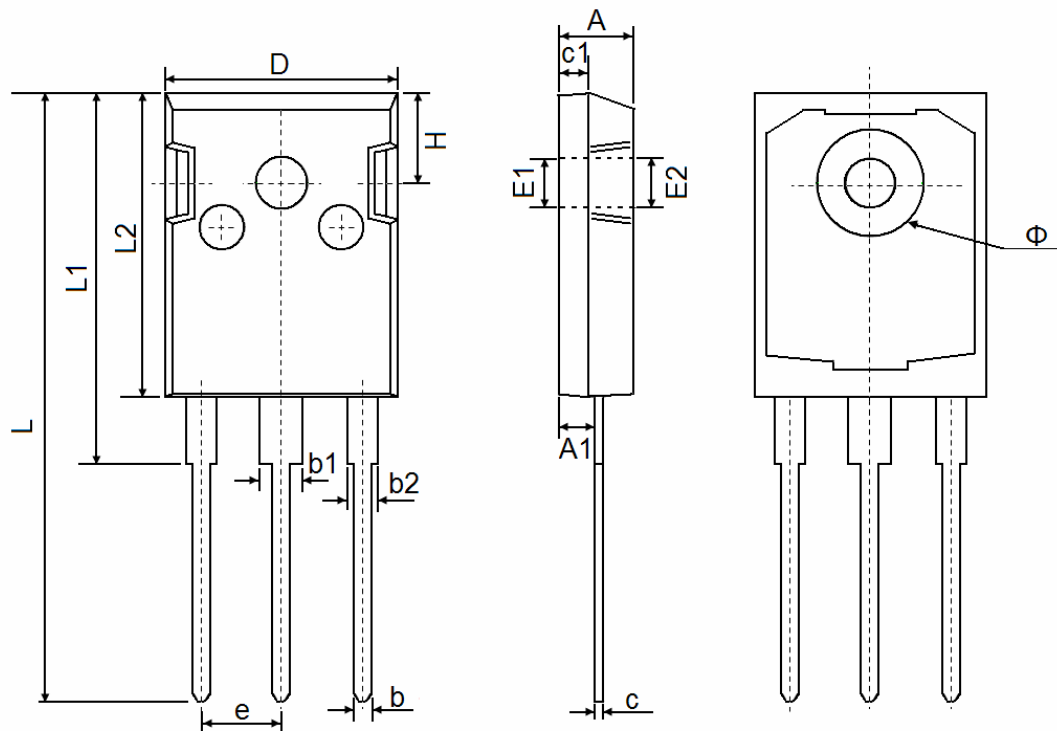


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-247 Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.850                     | 5.150  | 0.191                | 0.200 |
| A1     | 2.200                     | 2.600  | 0.087                | 0.102 |
| b      | 1.000                     | 1.400  | 0.039                | 0.055 |
| b1     | 2.800                     | 3.200  | 0.110                | 0.126 |
| b2     | 1.800                     | 2.200  | 0.071                | 0.087 |
| c      | 0.500                     | 0.700  | 0.020                | 0.028 |
| c1     | 1.900                     | 2.100  | 0.075                | 0.083 |
| D      | 15.450                    | 15.750 | 0.608                | 0.620 |
| E1     | 3.500 REF                 |        | 0.138 REF            |       |
| E2     | 3.600 REF                 |        | 0.142 REF            |       |
| L      | 40.900                    | 41.300 | 1.610                | 1.626 |
| L1     | 24.800                    | 25.100 | 0.976                | 0.988 |
| L2     | 20.300                    | 20.600 | 0.799                | 0.811 |
| Φ      | 7.100                     | 7.300  | 0.280                | 0.287 |
| e      | 5.450 TYP                 |        | 0.215 TYP            |       |
| H      | 5.980 REF                 |        | 0.235 REF            |       |