## DESCRIPTION

The MX3N10G uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. It can be used in a wide variety of applications.

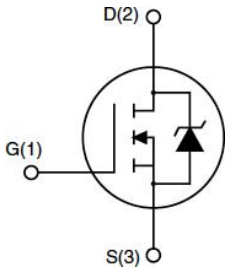
## GENERAL FEATURES

- $V_{DS}$=100V, $I_D$=2.2A
  $R_{DS(ON)}$(Typ.)=260mΩ @ $V_{GS}$=4.5V
  $R_{DS(ON)}$(Typ.)=250mΩ @ $V_{GS}$=10V
- High Density Cell Design for Ultra Low $R_{DS(ON)}$
- Fully Characterized Avalanche Voltage and Current
- Excellent Package for Good Heat Dissipation

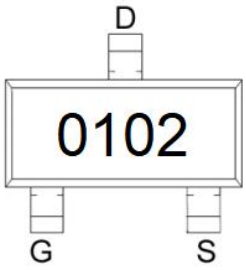
## APPLICATION

- Uninterruptible Power Supply(UPS)
- Hard Switched and High Frequency Circuits
- Power Switching application

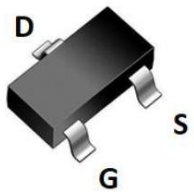
## PINOUT



Schematic diagram



Marking and pin Assignment



SOT-23 top view

## ORDERING INFORMATION

| Part Number | Marking | StorageTemperature | Package | Devices Per Reel |
|---|---|---|---|---|
| MX3N10G | 0102 | -55°C to 150°C | SOT-23 | - |

## ABSOLUTE MAXIMUM RATINGS($T_C$=25°C unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 100 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 2.2 | A |
| Drain Current-Continuous($T_C$=100°C) | $I_D$ | 1.5 | A |
| Pulsed Drain Current(Note1) | $I_{DM}$ | 12 | A |
| Maximum Power Dissipation($T_A$=25°C) | $P_D$ | 2.5 | W |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 150 | °C |

## THERMAL RESISTANCE

| | | | |
|---|---|---|---|
| Thermal Resistance, Junction-to-Ambient(Note2) | $R_{\theta JA}$ | 50 | °C/W |

Note 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

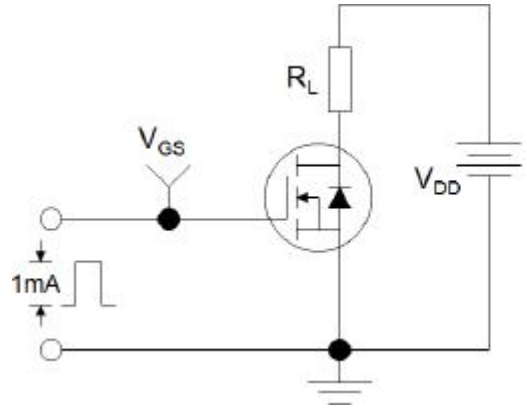
## ELECTRICAL CHARACTERISTICS($T_C$=25°C unless otherwise noted)

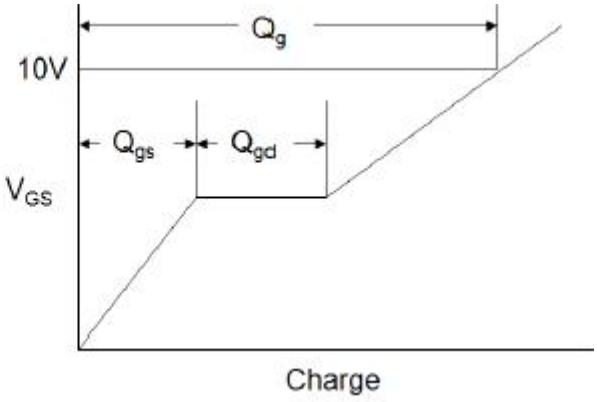
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 100 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=100V, $V_{GS}$=0V | - | - | 1.0 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1.0 | 1.8 | 3.0 | V |
| Drain-Source On-State Resistance(Note2) | $R_{DS(ON)}$ | $V_{GS}$=4.5V, $I_D$=1A | - | 260 | 310 | mΩ |
| | | $V_{GS}$=10V, $I_D$=2A | - | 250 | 280 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=10V, $I_D$=3A | - | 1.1 | - | S |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=50V, $V_{GS}$=0V, F=1.0MHz | - | 330 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 88 | - | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 15 | - | pF |
| **Switching Characteristics** | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=50V, $R_L$=39Ω, $V_{GS}$=10V,$R_G$=1Ω | - | 14 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 54 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 18 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 11 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=50V, $I_D$=1A, $V_{GS}$=10V | - | 5.2 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 1.0 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 1.4 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V, $I_S$=1A | - | - | 1.2 | V |
| Diode Forward Current | $I_S$ | | - | - | 3 | A |
| Pulsed Diode Forwad Current | $I_{SM}$ | | - | - | 12 | A |

Note 2. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

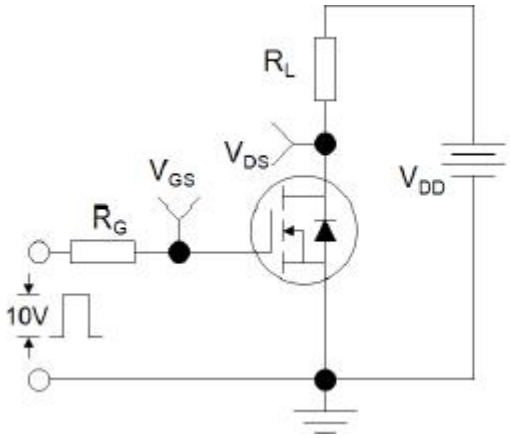
## TEST CIRCUIT

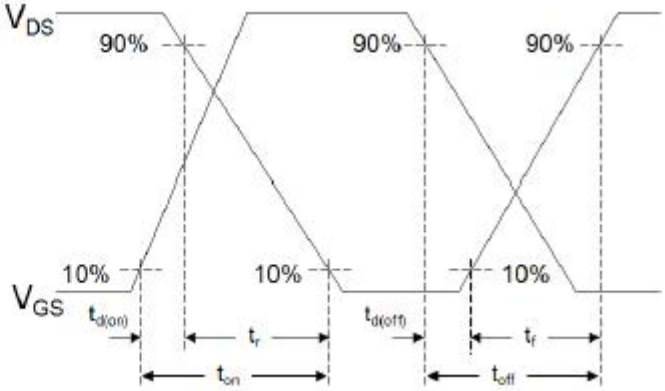
### 1) Gate Charge Test Circuit & Waveform



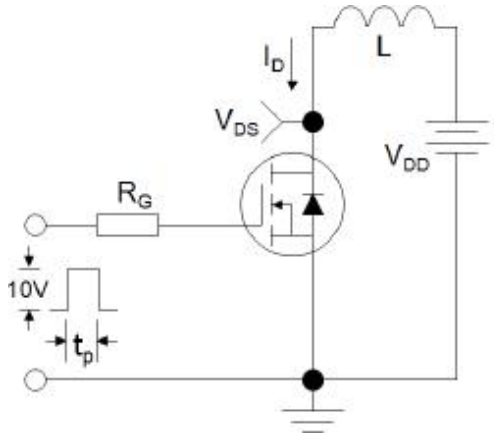



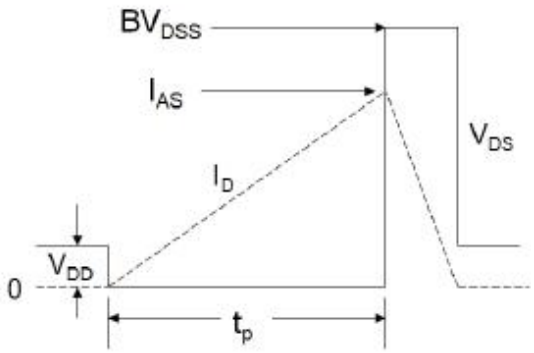

### 2) Resistive Switching Test Circuit & Waveforms



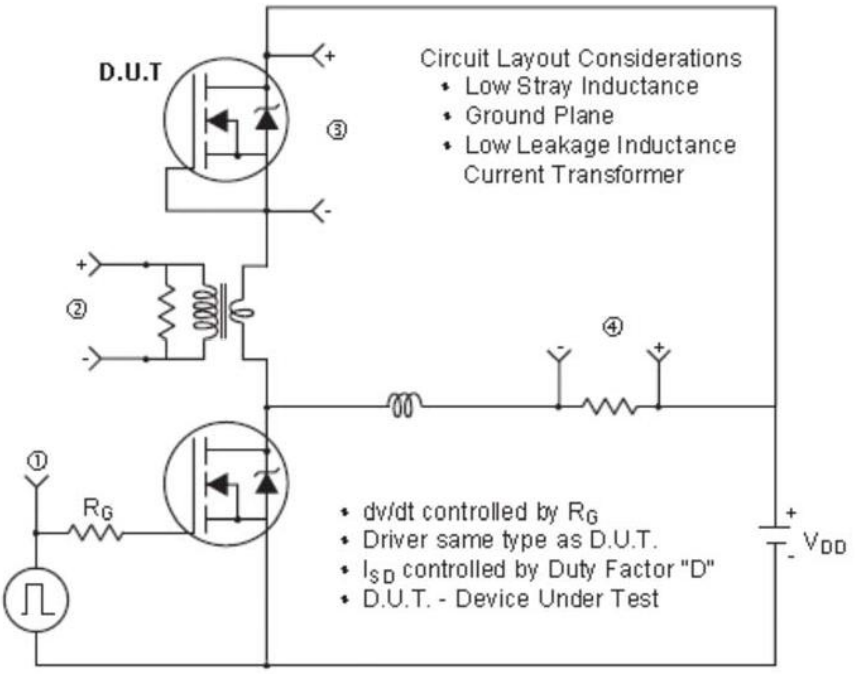

### 3) Unclamped Inductive Switching Test Circuit & Waveforms

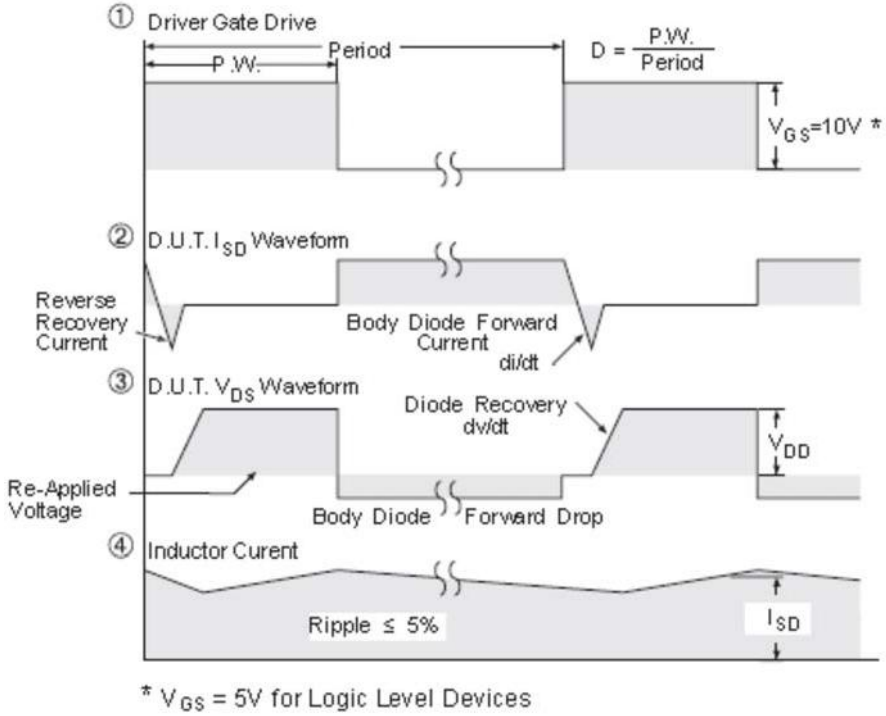


## TEST CIRCUIT

### 4) Peak Diode Recovery dv/dt Test Circuit & Waveforms (For N-channel)

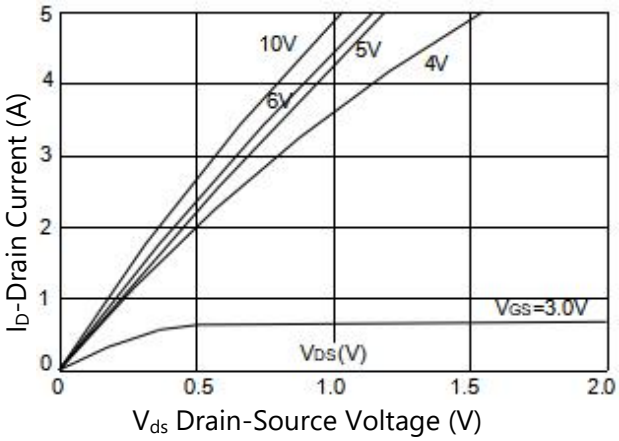



* $V_{GS}$ = 5V for Logic Level Devices

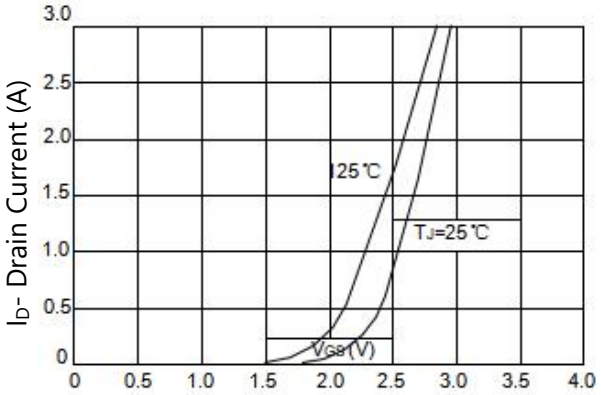
## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

### Figure 1. Output Characteristics



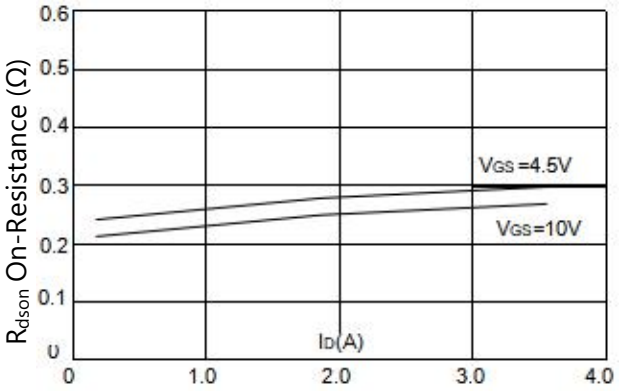

$V_{ds}$ Drain-Source Voltage (V)

### Figure 2. Transfer Characteristics



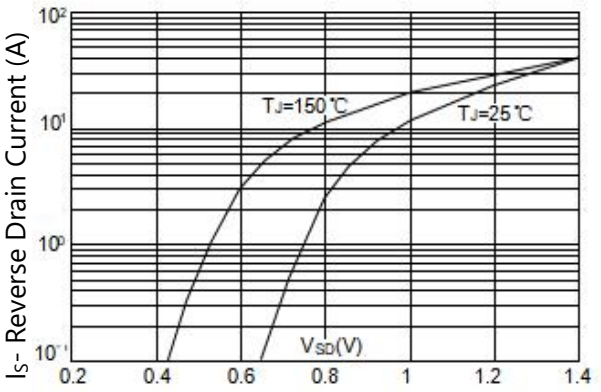

$V_{gs}$ Gate-Source Voltage (V)

### Figure 3. On-resistance vs Drain Current



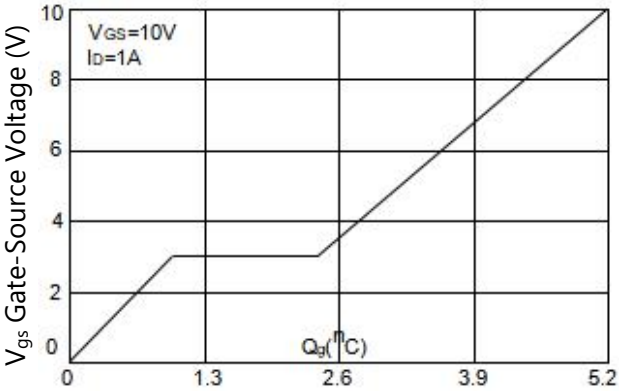

$I_D$-Drain Current (A)

### Figure 4. Source-Drain Diode Forward



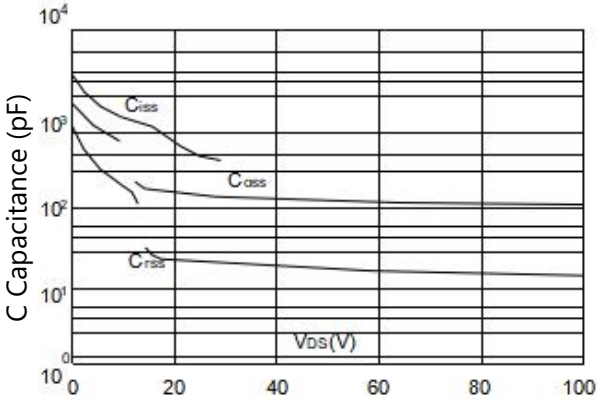

$V_{sd}$ Source-Drain Voltage (V)

### Figure 5. Gate Charge




Qg Gate Charge (nC)

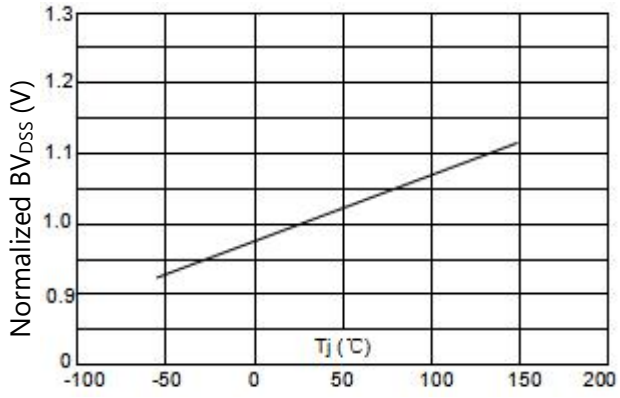
### Figure 6. Capacitance Characteristics




$V_{ds}$ Drain-Source Voltage (V)

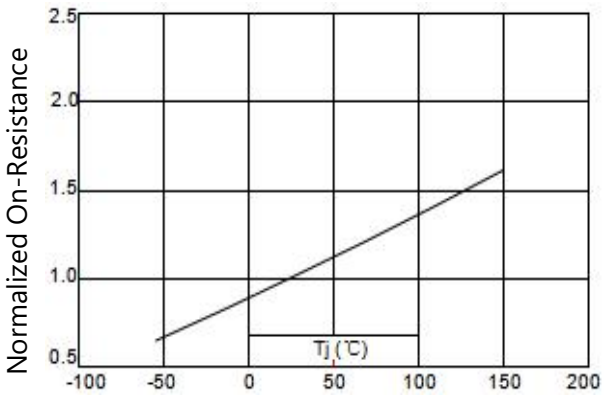
## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

**Figure 7. $BV_{DSS}$ vs Junction Temperature**



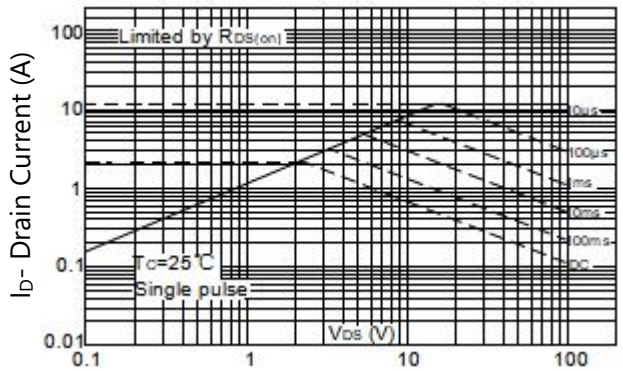

$T_J$-Junction Temperature (°C)

**Figure 8. $R_{dson}$ vs Junction Temperature**



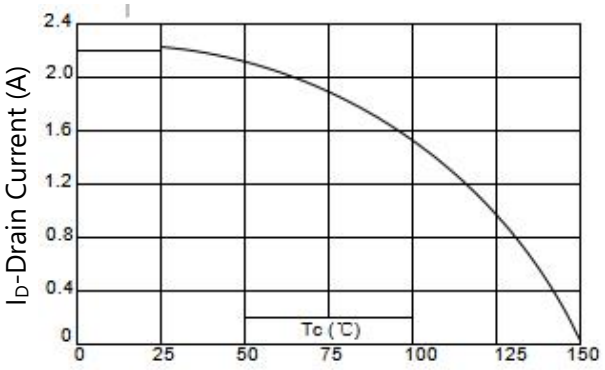

$T_J$-Junction Temperature(°C)

**Figure 9. Safe Operation Area**



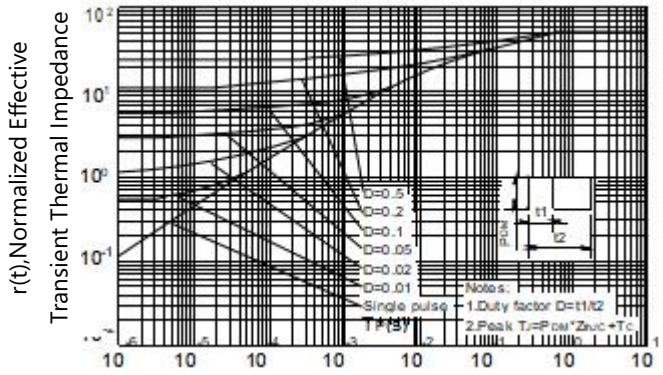

$V_{ds}$ Drain-Source Voltage (V)

**Figure 10. Drain Current vs Case Temperature**




$T_C$-Case Temperature(°C)

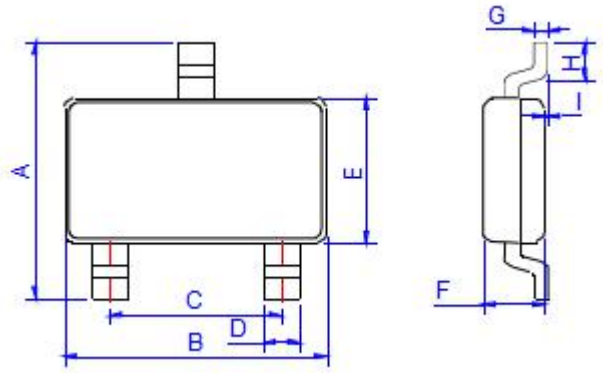
**Figure 11. Normalized Maximum Transient Thermal Impedance**




Square Wave Pulse Duration(sec)

## PACKAGE INFORMATION

**SOT-23**




| Symbol | Dimensions in Millimeters | | | Dimensions in Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.30 | 2.40 | 2.50 | 0.091 | 0.095 | 0.098 |
| B | 2.80 | 2.90 | 3.00 | 0.110 | 0.114 | 0.118 |
| C | 1.90 REF | | | 0.075 REF | | |
| D | 0.35 | 0.40 | 0.45 | 0.014 | 0.016 | 0.018 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| F | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| G | - | 0.10 | 0.15 | - | 0.004 | 0.006 |
| H | 0.20 | - | - | 0.008 | - | - |
| I | 0 | - | 0.10 | 0 | - | 0.004 |