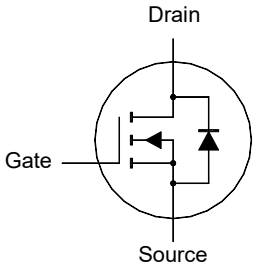
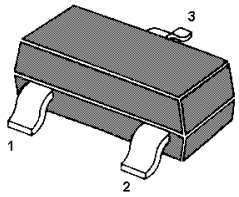
# MMFTN123

## N-Channel Enhancement Mode MOSFET




1. Gate 2. Source 3. Drain
SOT-23 Plastic Package

**Applications**

- Portable appliances
- Low switch appliances

**Absolute Maximum Ratings ($T_a$ = 25℃ unless otherwise specified)**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 100 | V |
| Gate-Source Voltage | $V_{GS}$ | ± 20 | V |
| Drain Current | $I_D$ | 170 | mA |
| Peak Drain Current, Pulsed [1)] | $I_{DM}$ | 680 | mA |
| Total Power Dissipation | $P_{tot}$ | 360 | mW |
| Junction Temperature | $T_j$ | 150 | ℃ |
| Storage Temperature Range | $T_{stg}$ | -55 to +150 | ℃ |

**Thermal Characteristics**

| Parameter | Symbol | Max. | Unit |
|---|---|---|---|
| Thermal Resistance from Junction to Ambient [2)] | $R_{\theta JA}$ | 347 | ℃/W |

[1)] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%,Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C.

[2)] Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

**Characteristics at $T_a$ = 25℃ unless otherwise specified**

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | |
| Drain-Source Breakdown Voltage at $I_D$ = 250 µA | $V_{(BR)DSS}$ | 100 | - | - | V |
| Drain-Source Leakage Current at $V_{DS}$ = 100 V | $I_{DSS}$ | - | - | 1 | µA |
| Gate-Source Leakage Current at $V_{GS}$ = ± 20 V | $I_{GSS}$ | - | - | ± 50 | nA |
| Gate-Source Threshold Voltage at $V_{GS}$ = $V_{DS}$, $I_D$ = 250 µA | $V_{GS(th)}$ | 0.8 | - | 2 | V |
| Drain-Source On-State Resistance at $V_{GS}$ = 10 V, $I_D$ = 170 mA<br>at $V_{GS}$ = 4.5 V, $I_D$ = 170 mA | $R_{DS(ON)}$ | -<br>- | -<br>- | 6<br>10 | Ω |
| **DYNAMIC PARAMETERS** | | | | | |
| Gate resistance at $V_{DS}$ = 0 V, f = 1 MHz | $R_g$ | - | 43 | - | Ω |
| Input Capacitance at $V_{DS}$ = 50 V, $V_{GS}$ = 0 V, f = 1 MHz | $C_{iss}$ | - | 20 | - | pF |
| Output Capacitance at $V_{DS}$ = 50 V, $V_{GS}$ = 0 V, f = 1 MHz | $C_{oss}$ | - | 11 | - | pF |
| Reverse Transfer Capacitance at $V_{DS}$ = 50 V, $V_{GS}$ = 0 V, f = 1 MHz | $C_{rss}$ | - | 6 | - | pF |
| Total Gate Charge at $V_{GS}$ = 10 V, $V_{DD}$ = 50 V, $I_D$ = 1 A | $Q_g$ | - | 1.4 | - | nC |
| Gate-Source Charge at $V_{GS}$ = 10 V, $V_{DD}$ = 50 V, $I_D$ = 1 A | $Q_{gs}$ | - | 0.4 | - | nC |
| Gate-Drain Charge at $V_{GS}$ = 10 V, $V_{DD}$ = 50 V, $I_D$ = 1 A | $Q_{gd}$ | - | 0.3 | - | nC |
| Turn-On Delay Time at $V_{DD}$ = 51 V, $I_D$ = 170 mA, $V_{GS}$ = 10 V, $R_G$ = 6 Ω | $t_{d(on)}$ | - | 20 | - | ns |
| Turn-On Rise Time at $V_{DD}$ = 51 V, $I_D$ = 170 mA, $V_{GS}$ = 10 V, $R_G$ = 6 Ω | $t_r$ | - | 43 | - | ns |
| Turn-Off Delay Time at $V_{DD}$ = 51 V, $I_D$ = 170 mA, $V_{GS}$ = 10 V, $R_G$ = 6 Ω | $t_{d(off)}$ | - | 18 | - | ns |
| Turn-Off Fall Time at $V_{DD}$ = 51 V, $I_D$ = 170 mA, $V_{GS}$ = 10 V, $R_G$ = 6 Ω | $t_f$ | - | 8 | - | ns |
| **Body-Diode PARAMETERS** | | | | | |
| Drain-Source Diode Forward Voltage at $I_S$ = 0.17 A, $V_{GS}$ = 0 V | $V_{SD}$ | - | - | 1.2 | V |

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

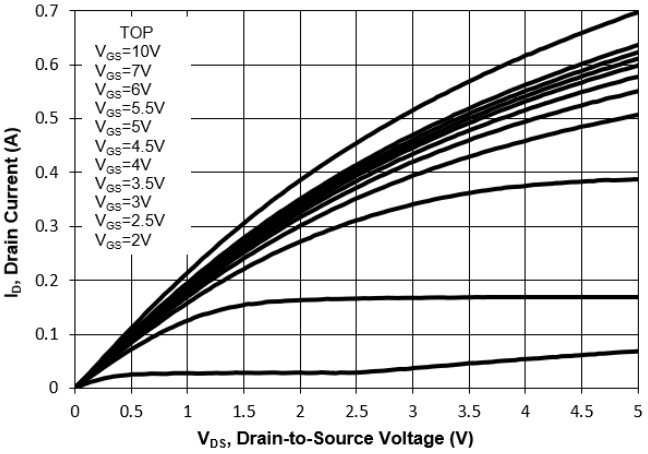



Fig. 2 Typical Transfer Characteristic

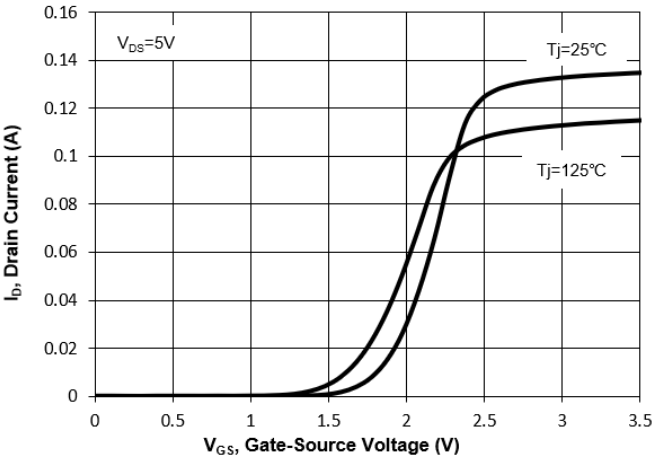



Fig. 3 on-Resistance vs Drain Current

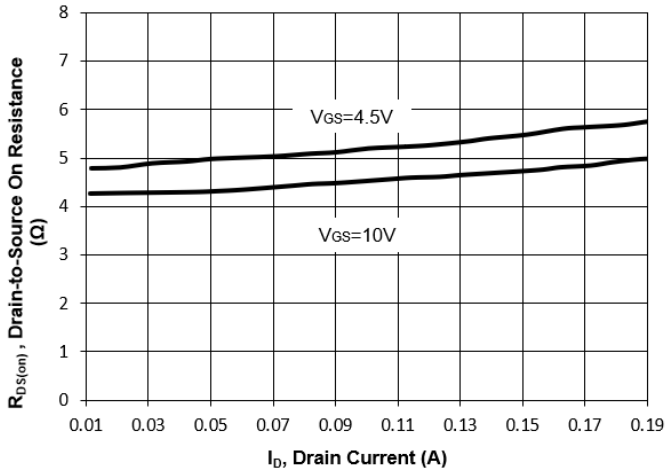



Fig. 4 on-Resistance vs. Gate Voltage

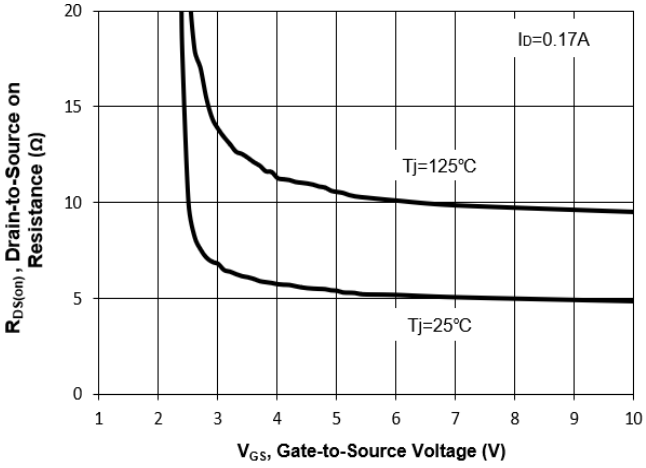



Fig. 5 on-Resistance vs.$T_j$

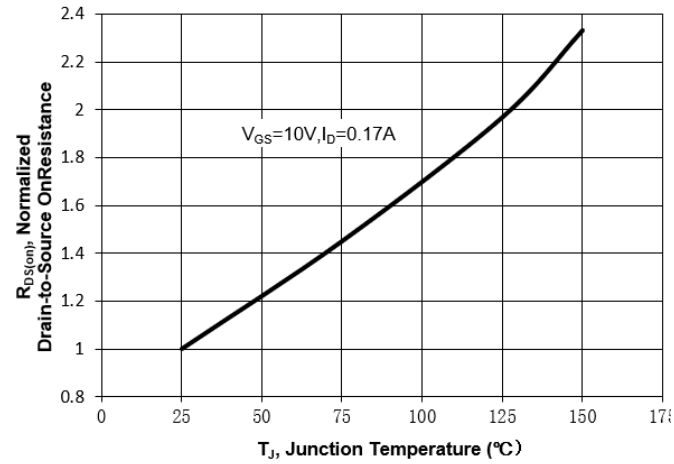
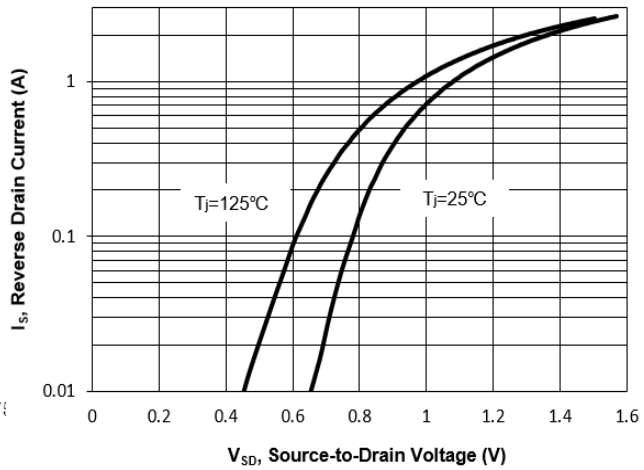



Fig. 6 Typical Forward Characteristic



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

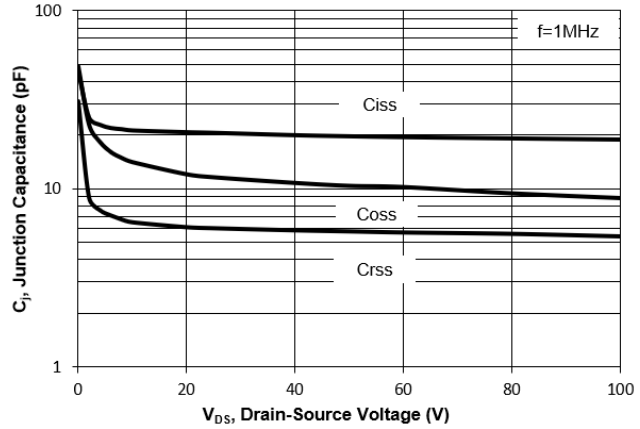



Fig. 8 Drain-Source Leakage Current vs. $T_j$

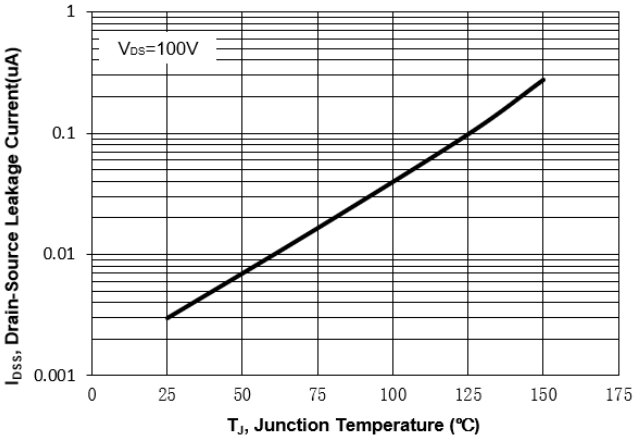



Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

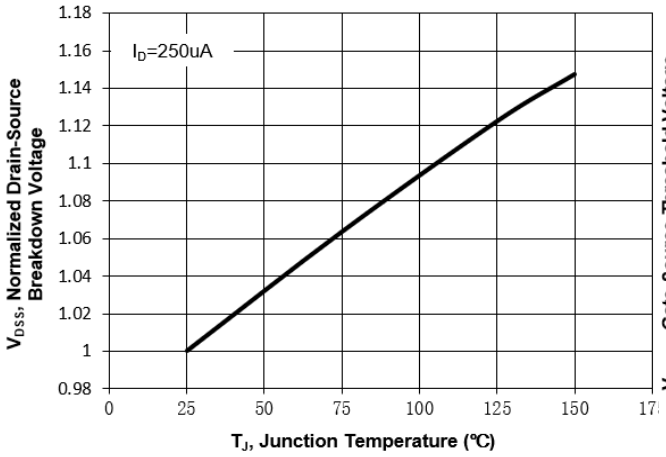



Fig. 10 Gate Threshold Variation vs. $T_j$

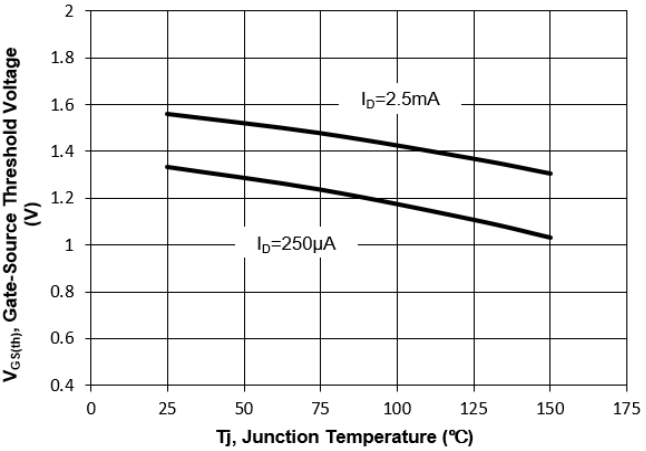
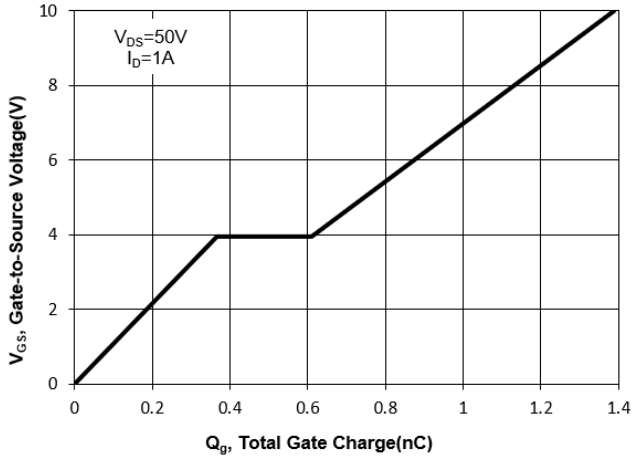



Fig. 11 Gate Charge



**Test Circuits**

Fig.1-1 Switching times test circuit

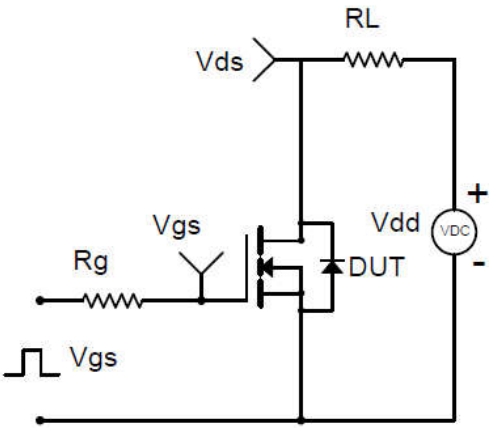



Fig.1-2 Switching Waveform

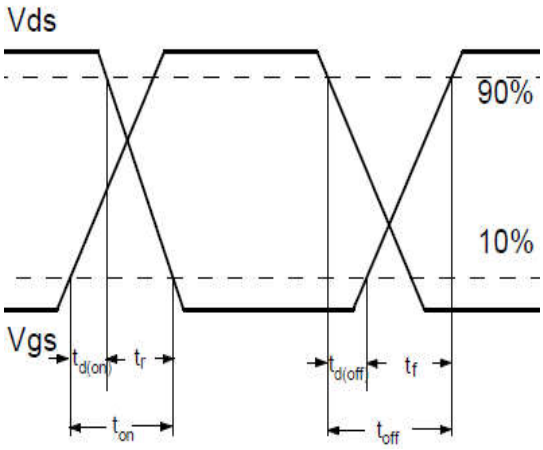



Fig.2-1 Gate charge test circuit

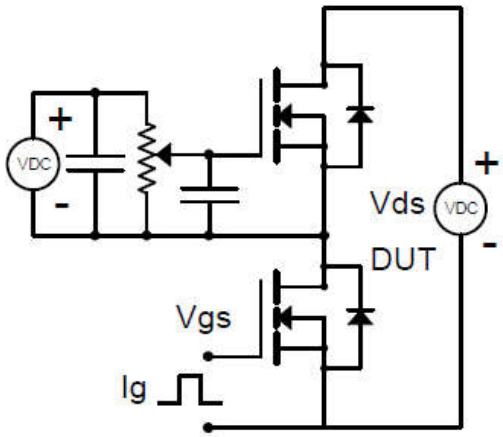
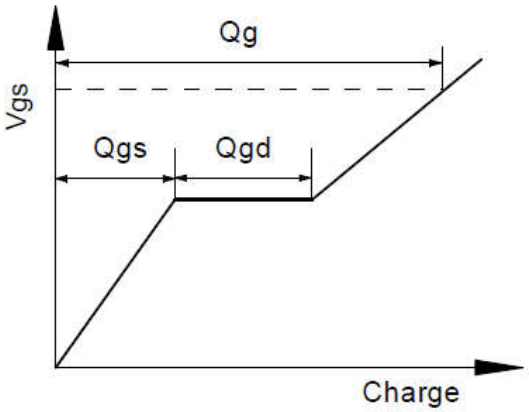
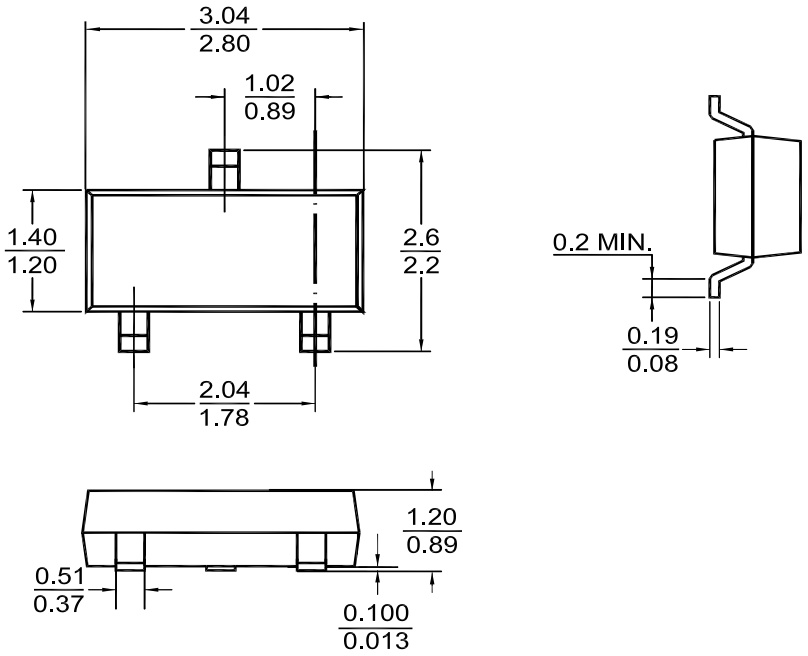



Fig.2-2 Gate charge waveform

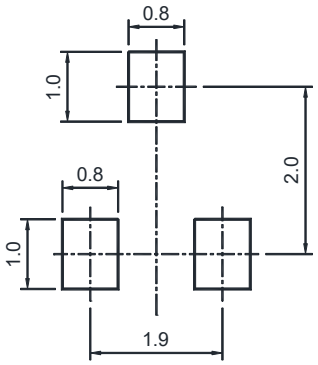


## Package Outline (Dimensions in mm)

**SOT-23**




## Recommended Soldering Footprint




### Packing information

| Package | Tape Width (mm) | Pitch | | Reel Size | | Per Reel Packing Quantity |
|---|---|---|---|---|---|---|
| | | mm | inch | mm | inch | |
| TO-236 | 8 | 4 ± 0.1 | 0.157 ± 0.004 | 178 | 7 | 3,000 |

## Marking information

" SA " = Part No.
" YM " = Date Code Marking
" Y " = Year
" M " = Month
Font type: Arial