

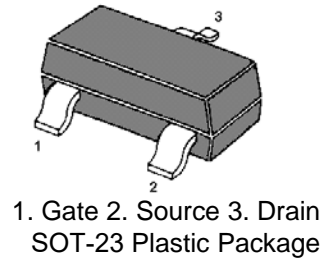
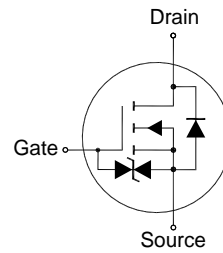
# MMFTN123K

## N-Channel Enhancement Mode MOSFET

### Features

- Typical ESD Protection HBM Class 2

Classification	Voltage Range(V)
0A	< 125
0B	125 to < 250
1A	250 to < 500
1B	500 to < 1000
1C	1000 to < 2000
2	2000 to < 4000
3A	4000 to < 8000
3B	≥ 8000



### Applications

- Portable appliances
- Low switch appliances

### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

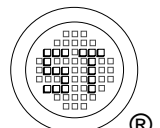
Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	$I_D$	200	mA
Peak Drain Current, Pulsed <sup>1)</sup>	$I_{DM}$	600	mA
Total Power Dissipation	$P_{tot}$	500	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient <sup>2)</sup>	$R_{\theta JA}$	250	$^\circ\text{C/W}$

<sup>1)</sup> Pulse Test: Pulse Width  $\leq 100 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ , Repetitive rating, pulse width limited by junction temperature  $T_{j(MAX)}=150^\circ\text{C}$ .

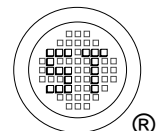
<sup>2)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.



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Characteristics at  $T_a = 25^\circ\text{C}$  unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>					
Drain-Source Breakdown Voltage at $I_D = 250 \mu\text{A}$	$V_{(BR)DSS}$	100	-	-	V
Drain-Source Leakage Current at $V_{DS} = 80 \text{ V}$	$I_{DSS}$	-	-	1	$\mu\text{A}$
Gate-Source Leakage Current at $V_{GS} = \pm 20 \text{ V}$	$I_{GSS}$	-	-	$\pm 10$	$\mu\text{A}$
Gate-Source Threshold Voltage at $V_{GS} = V_{DS}$ , $I_D = 1 \text{ mA}$	$V_{GS(th)}$	1.5	-	2.5	V
Drain-Source On-State Resistance at $V_{GS} = 10 \text{ V}$ , $I_D = 190 \text{ mA}$ at $V_{GS} = 4.5 \text{ V}$ , $I_D = 150 \text{ mA}$	$R_{DS(ON)}$	- -	- -	6 10	$\Omega$
<b>DYNAMIC PARAMETERS</b>					
Gate resistance at $V_{DS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$R_g$	-	38	-	$\Omega$
Input Capacitance at $V_{DS} = 50 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{iss}$	-	39	-	pF
Output Capacitance at $V_{DS} = 50 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{oss}$	-	10	-	pF
Reverse Transfer Capacitance at $V_{DS} = 50 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{rss}$	-	6.6	-	pF
Total Gate Charge at $V_{GS} = 10 \text{ V}$ , $V_{DD} = 30 \text{ V}$ , $I_D = 1 \text{ A}$	$Q_g$	-	1.5	-	nC
Gate-Source Charge at $V_{GS} = 10 \text{ V}$ , $V_{DD} = 30 \text{ V}$ , $I_D = 1 \text{ A}$	$Q_{gs}$	-	0.5	-	nC
Gate-Drain Charge at $V_{GS} = 10 \text{ V}$ , $V_{DD} = 30 \text{ V}$ , $I_D = 1 \text{ A}$	$Q_{gd}$	-	0.6	-	nC
Turn-On Delay Time at $V_{DD} = 50 \text{ V}$ , $I_D = 190 \text{ mA}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 6 \Omega$	$t_{d(on)}$	-	6.5	-	ns
Turn-On Rise Time at $V_{DD} = 50 \text{ V}$ , $I_D = 190 \text{ mA}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 6 \Omega$	$t_r$	-	7.5	-	ns
Turn-Off Delay Time at $V_{DD} = 50 \text{ V}$ , $I_D = 190 \text{ mA}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 6 \Omega$	$t_{d(off)}$	-	10	-	ns
Turn-Off Fall Time at $V_{DD} = 50 \text{ V}$ , $I_D = 190 \text{ mA}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 6 \Omega$	$t_f$	-	85	-	ns
<b>Body-Diode PARAMETERS</b>					
Drain-Source Diode Forward Voltage at $I_S = 0.1 \text{ A}$ , $V_{GS} = 0 \text{ V}$	$V_{SD}$	-	-	1.2	V



## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

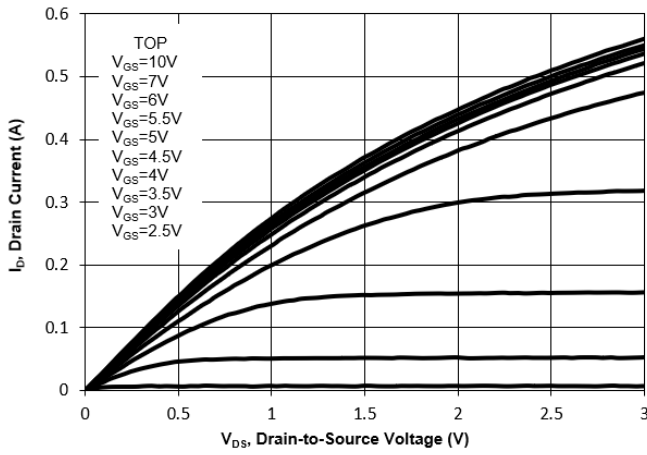


Fig. 2 Typical Transfer Characteristic

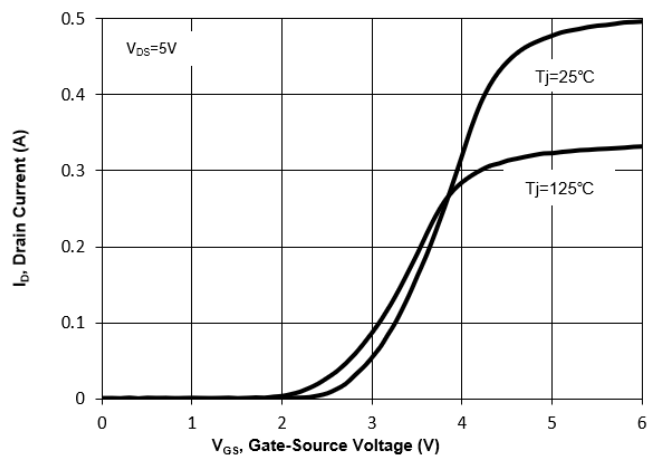


Fig. 3 on-Resistance vs. Drain Current

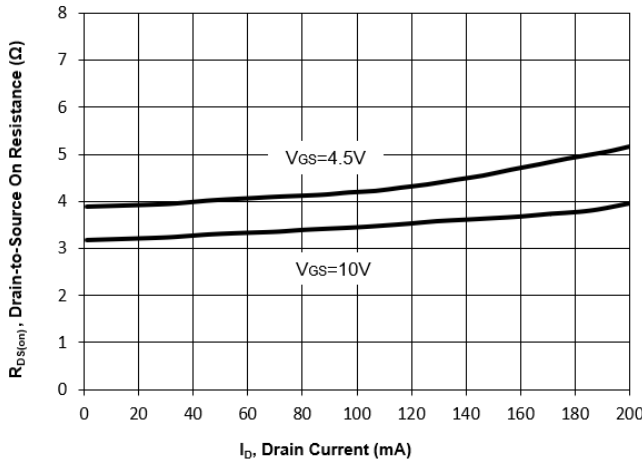


Fig. 4 on-Resistance vs. Gate Voltage

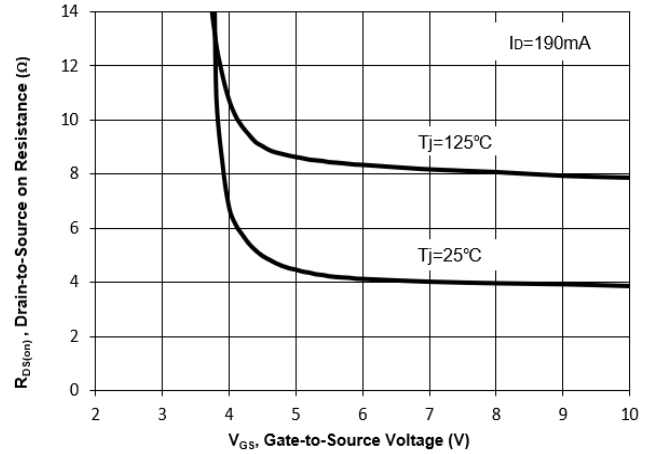


Fig. 5 on-Resistance vs.  $T_J$

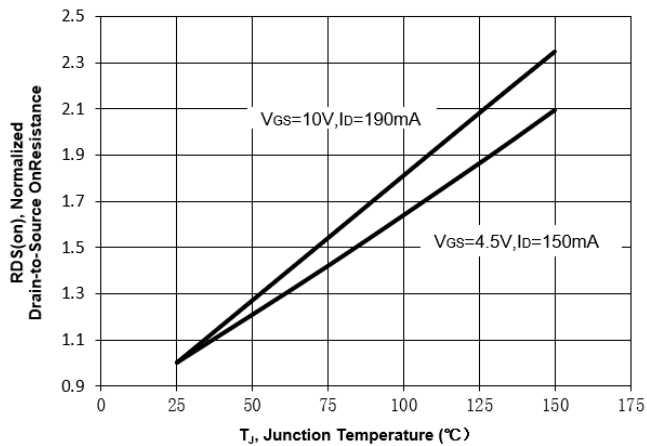
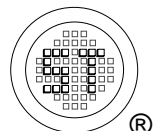
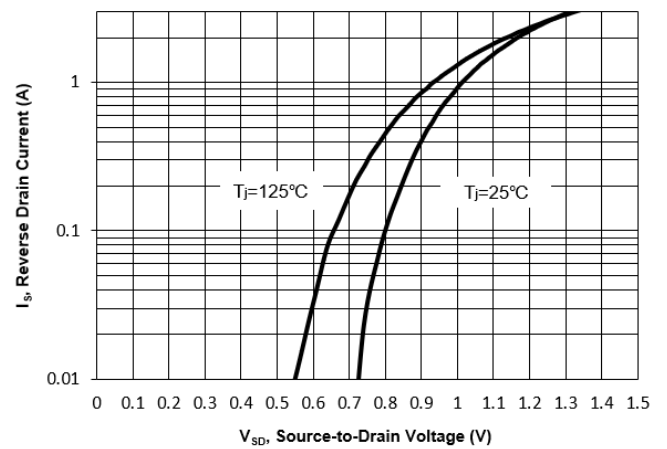


Fig. 6 Typical Forward Characteristic



# MMFTN123K

## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

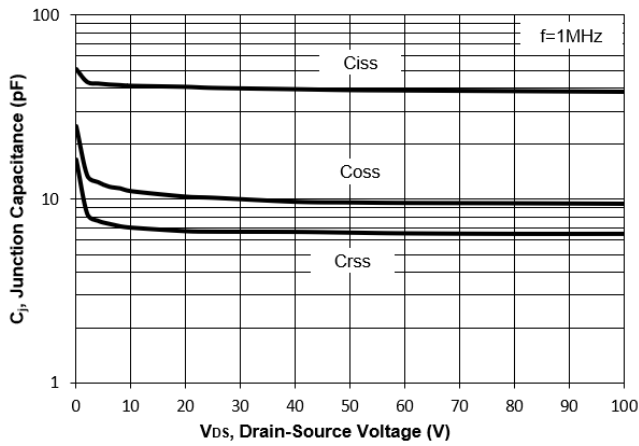


Fig. 8 Drain-Source Leakage Current vs. Tj

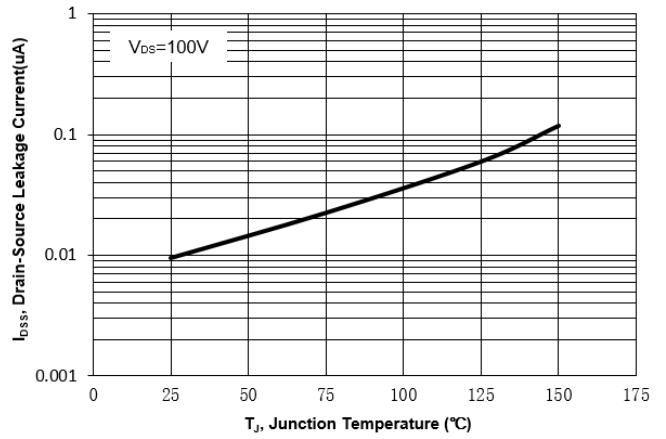


Fig. 9 V(BR)DSS vs. Junction Temperature

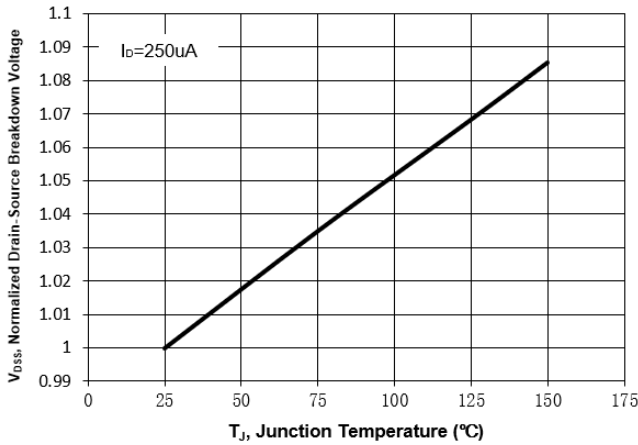


Fig. 10 Gate Threshold Variation vs. Tj

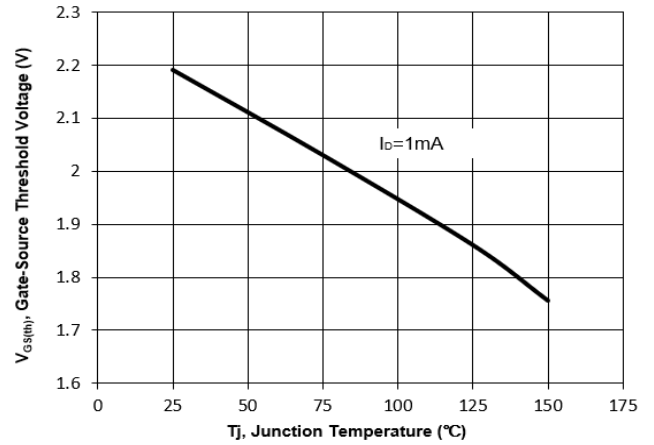
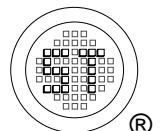
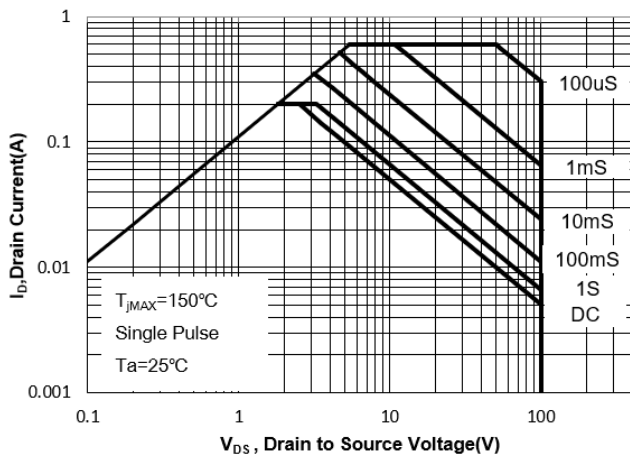


Fig. 11 Safe Operation Area



## Test Circuits

Fig.1-1 Switching times test circuit

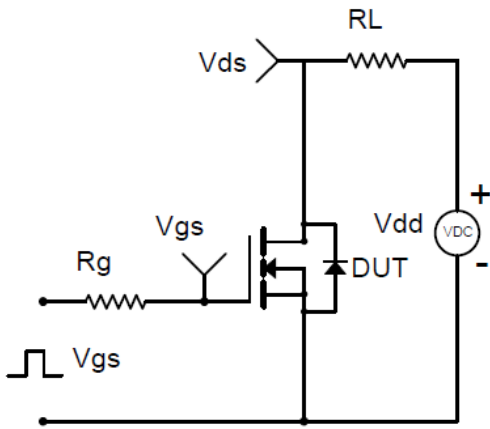


Fig.1-2 Switching Waveform

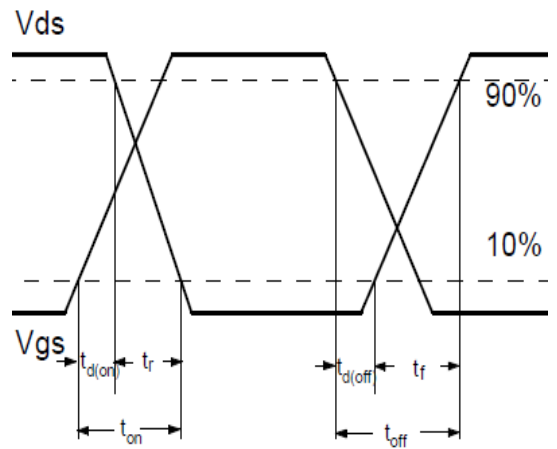


Fig.2-1 Gate charge test circuit

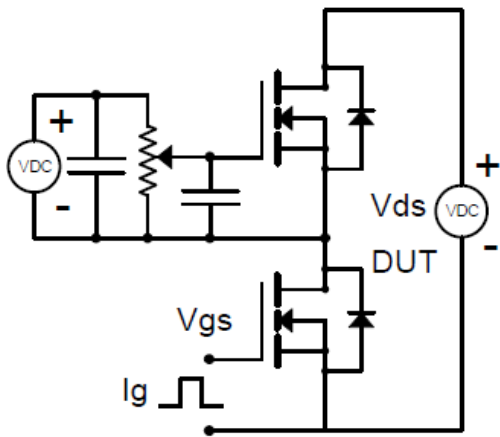
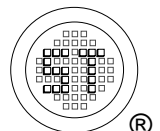
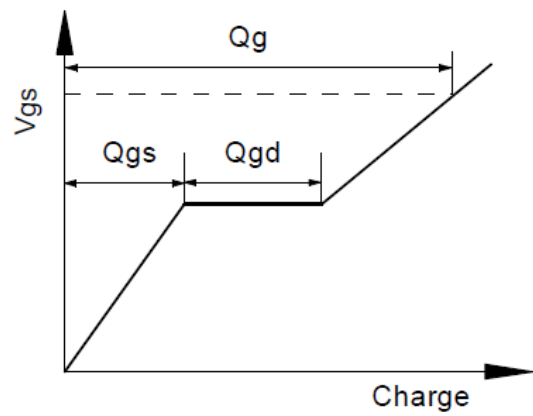


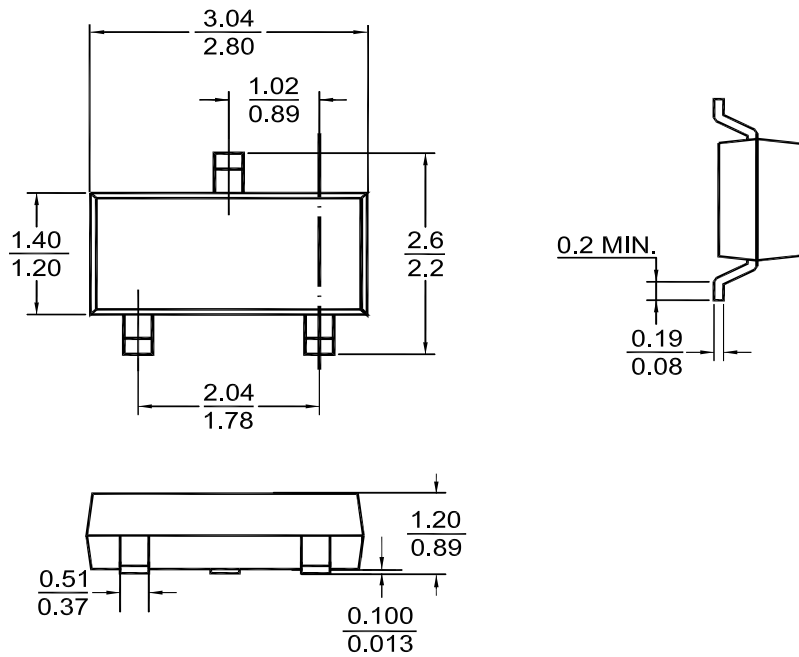
Fig.2-2 Gate charge waveform



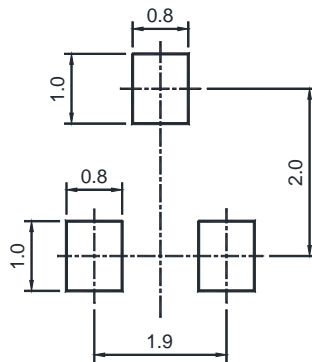
# MMFTN123K

## 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	
SOT-23	8	4 ± 0.1	0.157 ± 0.004	178	7	3,000

## Marking information

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

