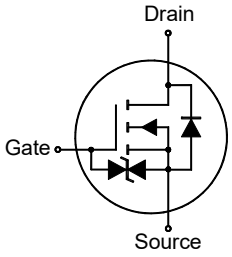
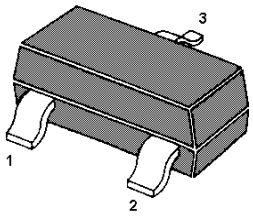
MMFTN1012BK

N-Channel Enhancement Mode MOSFET





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

Features

- Low gate threshold voltage
- Low input capacitance
- Fast switching speed
- Built-in G-S Protection Diode
- 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
- Battery management

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 8	V
Drain Current	I_D	630	mA
Peak Drain Current, Pulsed [1)]	I_{DM}	3	A
Power Dissipation [2)]	P_D	280	mW
Operating Junction and Storage Temperature Range	T_j, T_{stg}	- 55 to + 150	℃

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient [2)]	$R_{\theta JA}$	446	℃/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 in still air.

Dated: 05/07/2023 Rev:05

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	BV_{DSS}	20	-	-	V
Drain-Source Leakage Current at V_{DS} = 20 V	I_{DSS}	-	-	100	nA
Gate Leakage Current at V_{GS} = ± 8 V	I_{GSS}	-	-	± 1	µA
Gate-Source Threshold Voltage at V_{DS} = V_{GS}, I_D = 250 µA	$V_{GS(th)}$	0.5	-	1	V
Drain-Source On-State Resistance at V_{GS} = 4.5 V, I_D = 600 mA at V_{GS} = 2.5 V, I_D = 500 mA at V_{GS} = 1.8 V, I_D = 350 mA	$R_{DS(on)}$	- - -	- - -	0.4 0.5 0.7	Ω
DYNAMIC PARAMETERS					
Forward transfer admittance at V_{DS} = 10 V, I_D = 400 mA	g_{FS}	-	1.4	-	S
Input Capacitance at V_{GS} = 0 V, V_{DS} = 10 V, f = 1 MHz	C_{iss}	-	72	-	pF
Output Capacitance at V_{GS} = 0 V, V_{DS} = 10 V, f = 1 MHz	C_{oss}	-	14	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, V_{DS} = 10 V, f = 1 MHz	C_{rss}	-	12	-	pF
Gate charge total at V_{DS} = 10 V, I_D = 1 A, V_{GS} = 4.5 V at V_{DS} = 10 V, I_D = 1 A, V_{GS} = 2.5 V	Q_g	- -	1.17 0.65	- -	nC
Gate to Source Charge at V_{DS} = 10 V, I_D = 1 A, V_{GS} = 4.5 V	Q_{gs}	-	0.3	-	nC
Gate to Drain Charge at V_{DS} = 10 V, I_D = 1 A, V_{GS} = 4.5 V	Q_{gd}	-	0.2	-	nC
Turn-On Delay Time at V_{GS} = 4.5 V, V_{DS} = 10 V, I_D = 0.5 A, R_g = 10 Ω	$t_{d(on)}$	-	12	-	nS
Turn-On Rise Time at V_{GS} = 4.5 V, V_{DS} = 10 V, I_D = 0.5 A, R_g = 10 Ω	t_r	-	6	-	nS
Turn-Off Delay Time at V_{GS} = 4.5 V, V_{DS} = 10 V, I_D = 0.5 A, R_g = 10 Ω	$t_{d(off)}$	-	13	-	nS
Turn-Off Fall Time at V_{GS} = 4.5 V, V_{DS} = 10 V, I_D = 0.5 A, R_g = 10 Ω	t_f	-	10	-	nS
Body-Diode PARAMETERS					
Diode Forward Voltage at I_S = 0.5 A, V_{GS}= 0 V	V_{SD}	-	-	1.3	V
Body-Diode Continuous Current	I_S	-	-	630	mA
Body Diode Reverse Recovery Time at I_S = 1 A, di/dt = 100 A / µs	t_{rr}	-	5.2	-	nS
Body Diode Reverse Recovery Charge at I_S = 1 A, di/dt = 100 A / µs	Q_{rr}	-	1.2	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

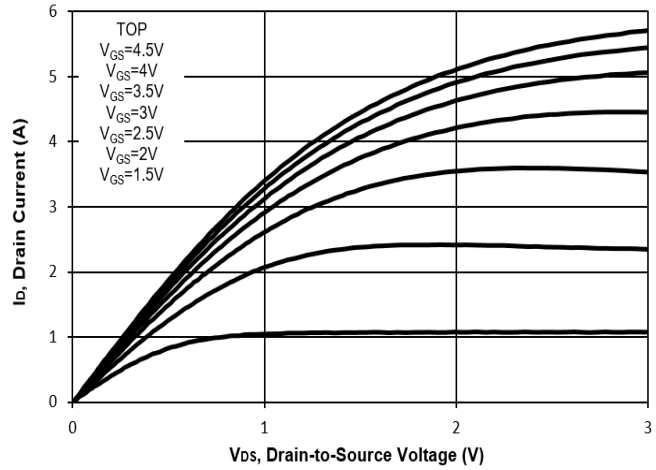


Fig. 2 Typical Transfer Characteristics

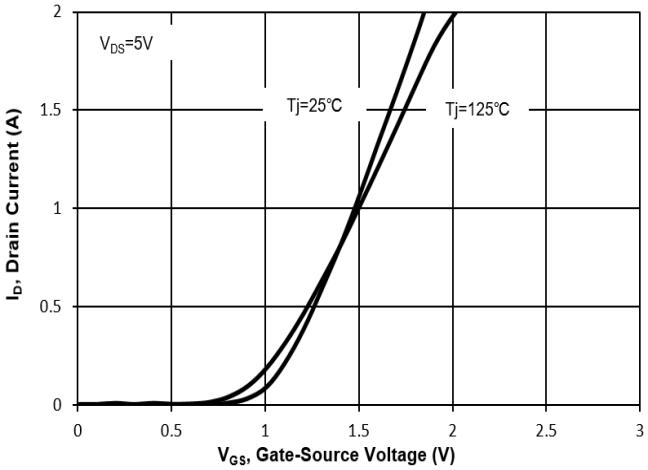


Fig. 3 on-Resistance vs. Drain Current

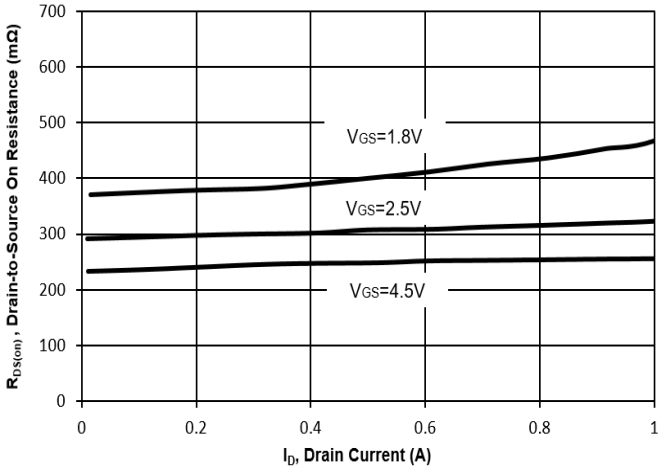


Fig. 4 on-Resistance vs. Gate-Source Voltage

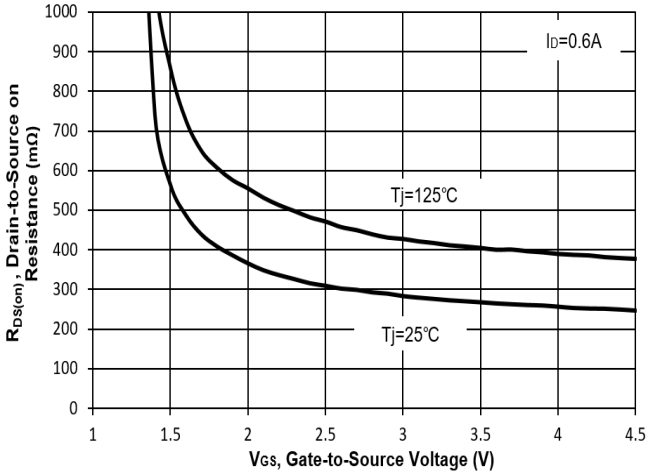


Fig. 5 on-Resistance vs.T_j

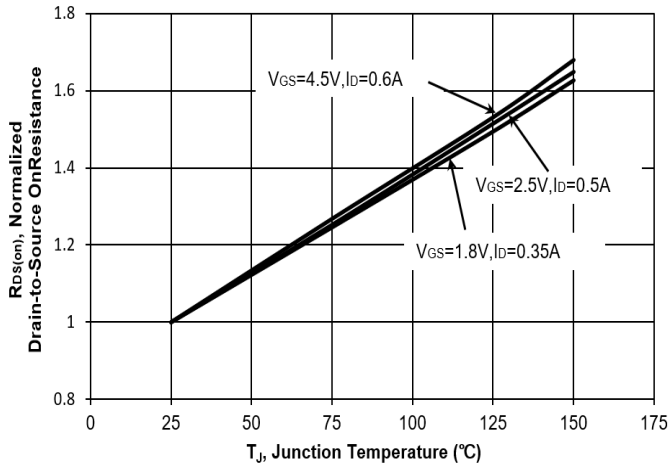
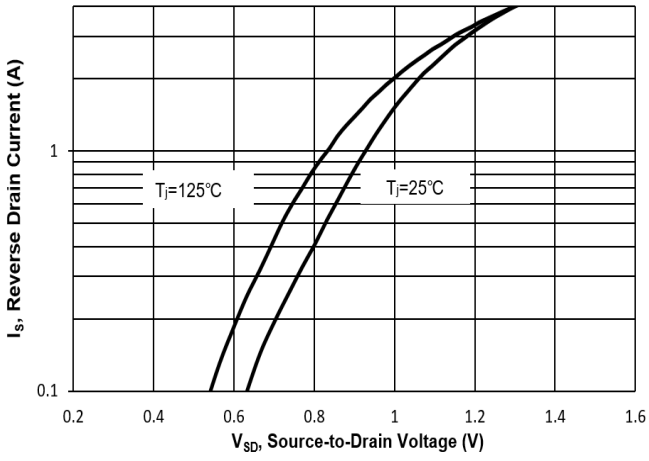


Fig. 6 Typical Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

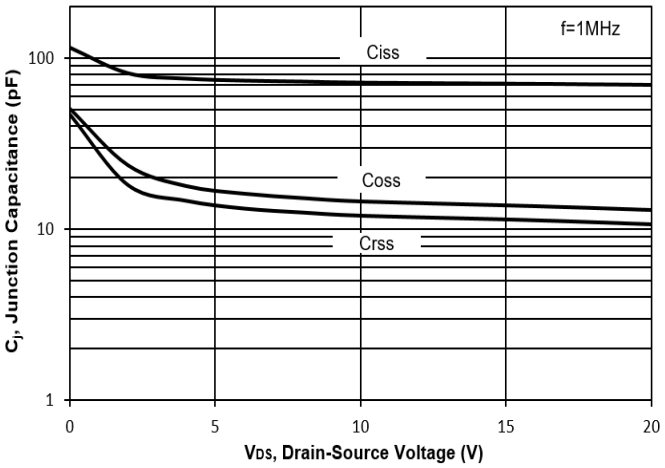


Fig. 8 Drain-Source Leakage Current vs. T_j

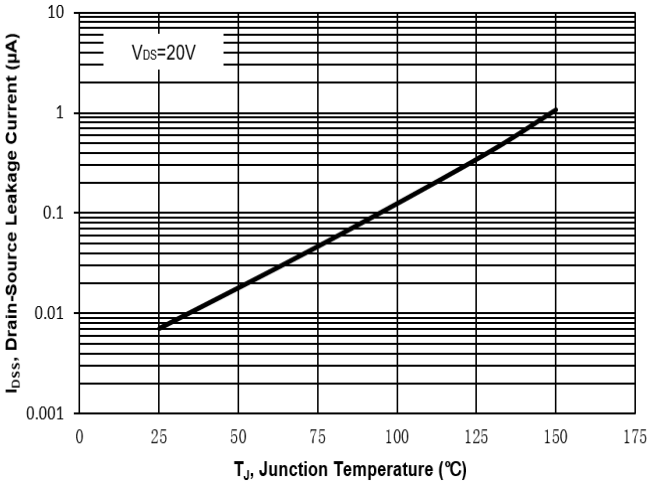


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

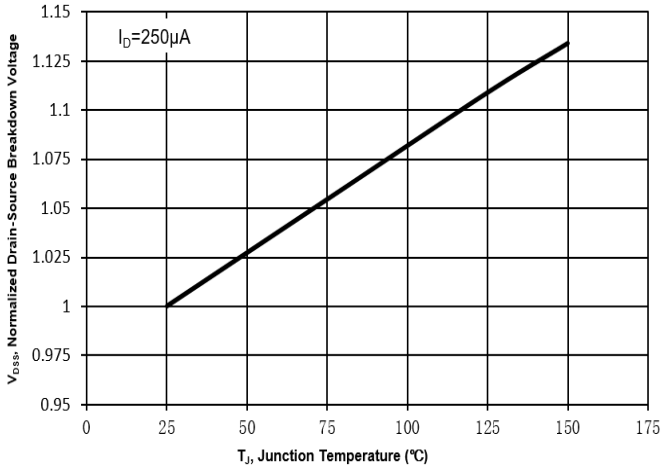


Fig. 10 Gate Threshold Variation vs. T_j

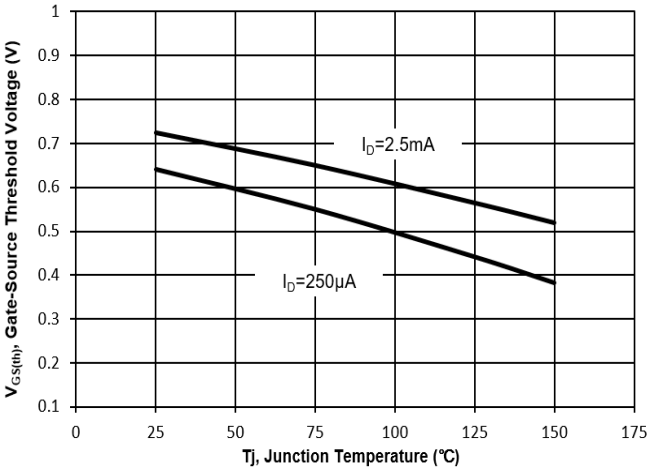
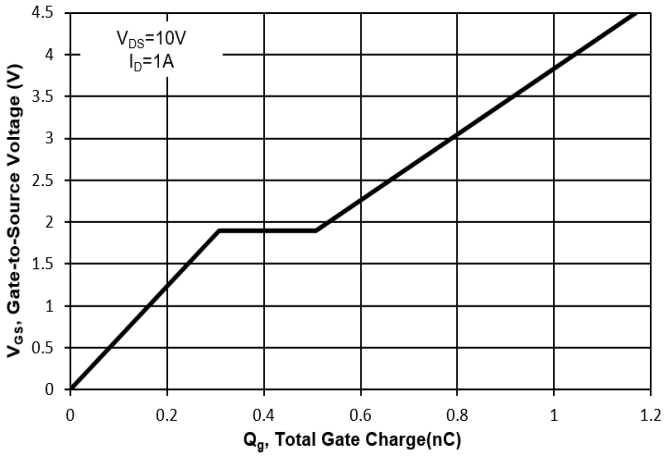


Fig. 11 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

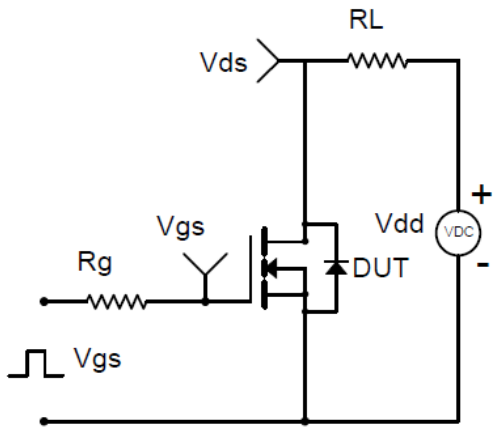


Fig.1-2 Switching Waveform

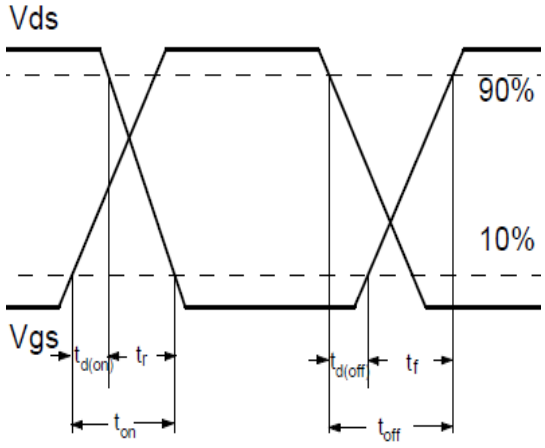


Fig.2-1 Gate charge test circuit

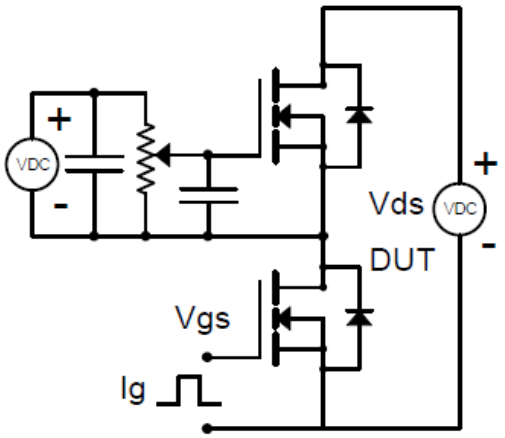
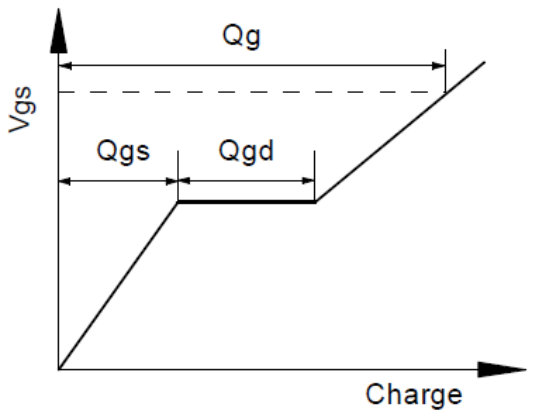
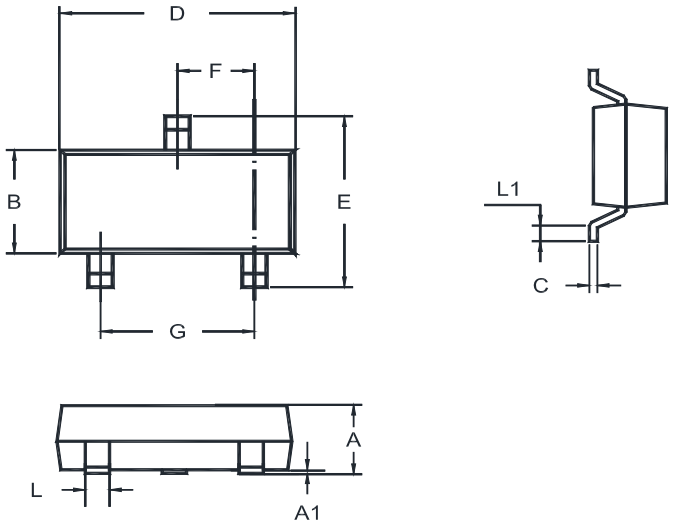


Fig.2-2 Gate charge waveform

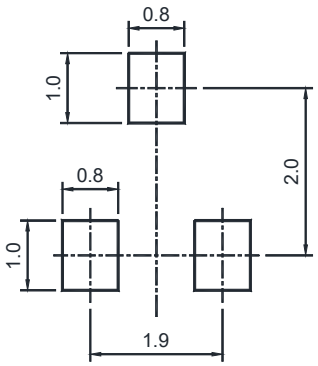


Package Outline (Dimensions in mm) SOT-23



Unit	A	A1	B	C	D	E	F	G	L	L1
mm	1.20 0.89	0.100 0.013	1.40 1.20	0.19 0.08	3.04 2.80	2.6 2.2	1.02 0.89	2.04 1.78	0.51 0.37	0.2 MIN

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

" VC " = Part No.

" YM " = Date Code Marking

" Y " = Year

" M " = Month

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