

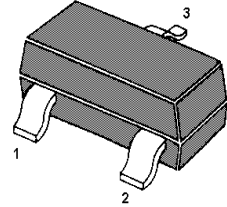
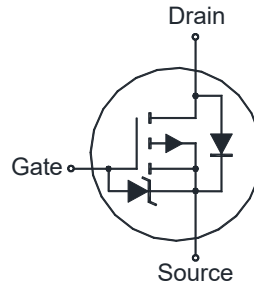
MMFTP304K

P-Channel Enhancement Mode MOSFET

Features

- Surface-mounted package
- 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



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

Applications

- Battery management
- Portable appliances

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

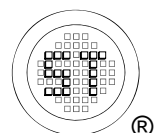
Parameter	Symbol	Value	Unit
Drain-Source Voltage	$-V_{DS}$	25	V
Gate-Source Voltage	$-V_{GS}$	8	V
Drain Current	$-I_D$	0.46	A
Pulsed Drain Current ¹⁾	$-I_{DM}$	1.5	A
Power Dissipation ²⁾	P_D	350	mW
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient ²⁾	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$

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

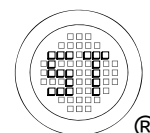
²⁾ Device mounted on FR-4 substrate PC board, with minimum recommended pad layout.



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

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $-I_D = 250 \mu\text{A}$	$-V_{(BR)DSS}$	25	-	-	V
Gate Voltage Drain Current at $-V_{DS} = 20 \text{ V}$	$-I_{DSS}$	-	-	1	μA
Gate-Source Leakage Current at $-V_{GS} = 8 \text{ V}$	$-I_{GSS}$	-	-	100	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $-I_D = 250 \mu\text{A}$	$-V_{GS(th)}$	0.65	-	1.5	V
Drain-Source On-State Resistance at $-V_{GS} = 4.5 \text{ V}$, $-I_D = 0.5 \text{ A}$ at $-V_{GS} = 2.7 \text{ V}$, $-I_D = 0.25 \text{ A}$	$R_{DS(on)}$	-	-	1.1 1.5	Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $-V_{DS} = 5 \text{ V}$, $-I_D = 0.5 \text{ A}$	g_{fs}	-	8.6	-	S
Input Capacitance at $-V_{DS} = 15 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{iss}	-	454	-	pF
Output Capacitance at $-V_{DS} = 15 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{oss}	-	68	-	pF
Reverse Transfer Capacitance at $-V_{DS} = 15 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{rss}	-	64	-	pF
Total Gate Charge at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 1 \text{ A}$ at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 2.5 \text{ V}$, $-I_D = 1 \text{ A}$	Q_g	-	6.6 4	-	nC
Gate-Source Charge at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 1 \text{ A}$	Q_{gs}	-	1	-	nC
Gate-Drain Charge at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 1 \text{ A}$	Q_{gd}	-	2.4	-	nC
Turn-On Delay Time at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 1 \text{ A}$, $R_g = 3.3 \Omega$	$t_{d(on)}$	-	11	-	ns
Turn-On Rise Time at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 1 \text{ A}$, $R_g = 3.3 \Omega$	t_r	-	28	-	ns
Turn-Off Delay Time at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 1 \text{ A}$, $R_g = 3.3 \Omega$	$t_{d(off)}$	-	20	-	ns
Turn-Off Fall Time at $-V_{DS} = 15 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 1 \text{ A}$, $R_g = 3.3 \Omega$	t_f	-	6	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $-I_S = 0.5 \text{ A}$, $V_{GS} = 0 \text{ V}$	$-V_{SD}$	-	-	1.2	V
Body-Diode Continuous Current	$-I_S$	-	-	0.46	A



Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

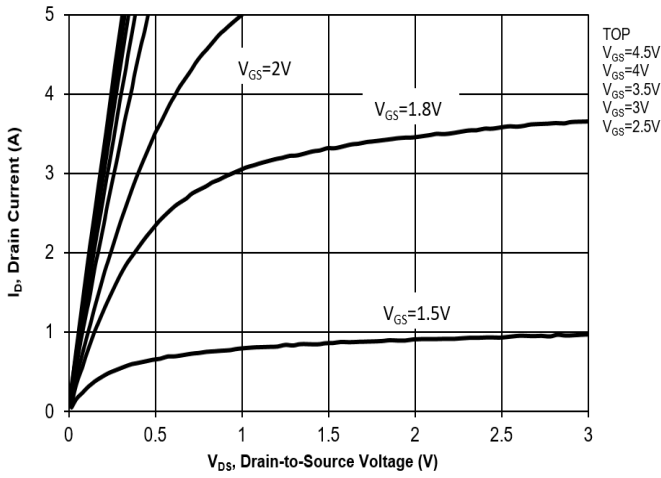


Fig. 2 Typical Transfer Characteristics

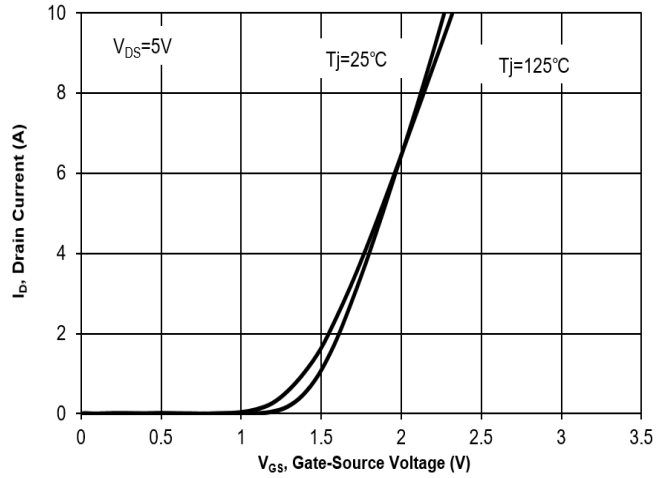


Fig. 3 on-Resistance vs. Drain Current

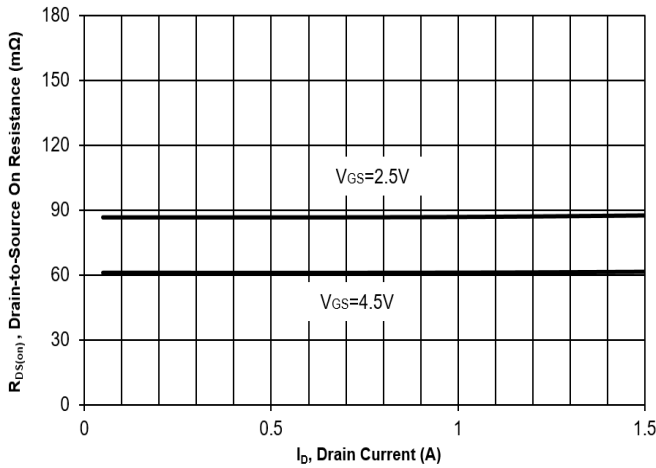


Fig. 4 on-Resistance vs. Gate to Source Voltage

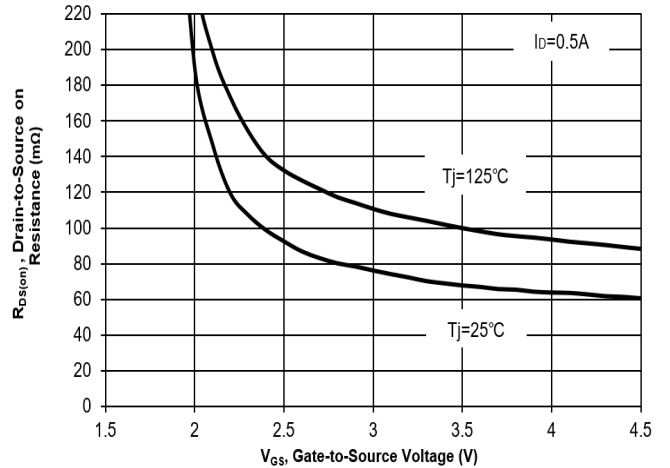


Fig. 5 on-Resistance vs. T_J

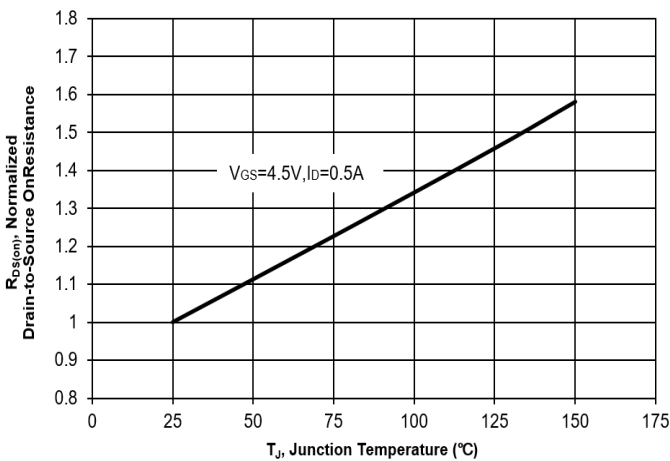
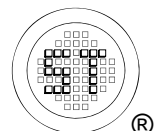
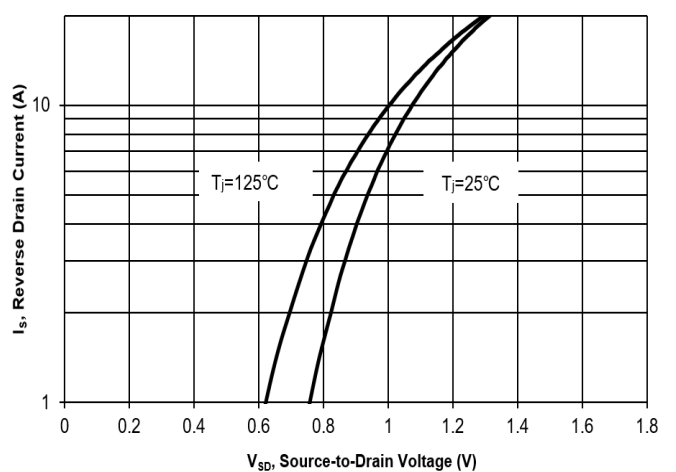


Fig. 6 Typical Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

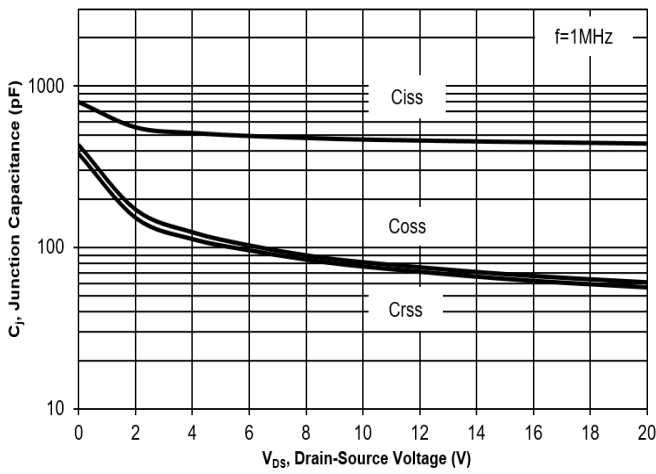


Fig. 8 Drain-Source Leakage Current vs. T_j

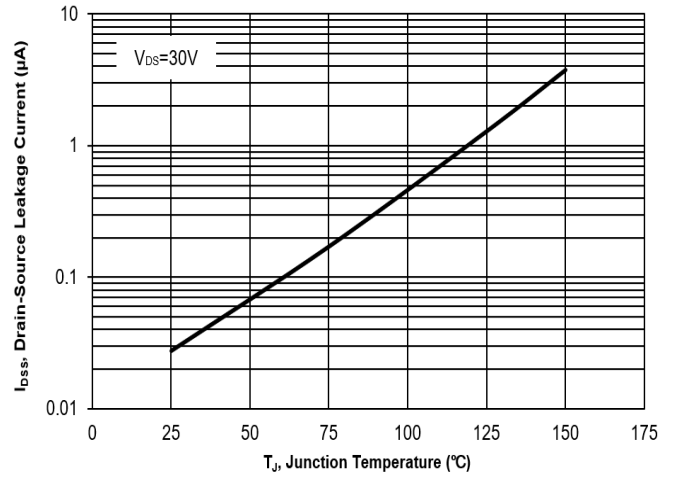


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

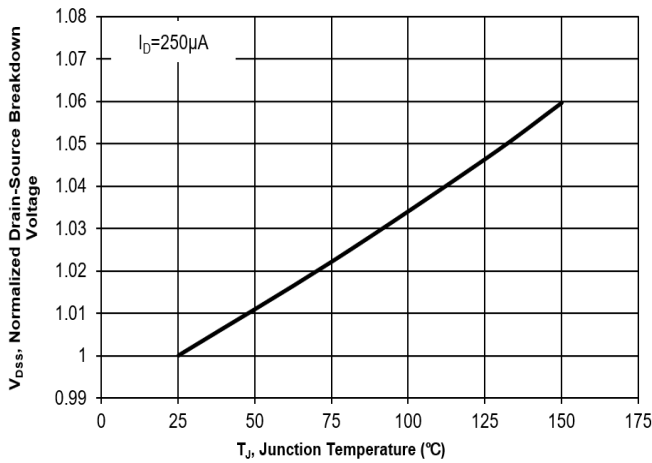


Fig. 10 Gate-Source Threshold Voltage vs. T_j

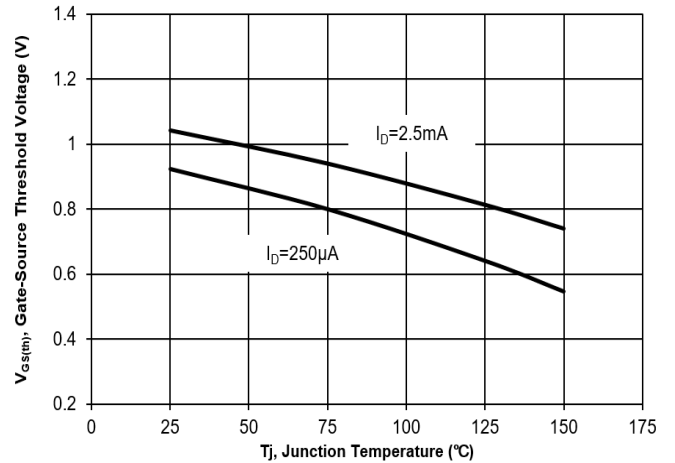
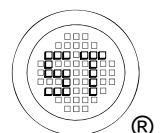
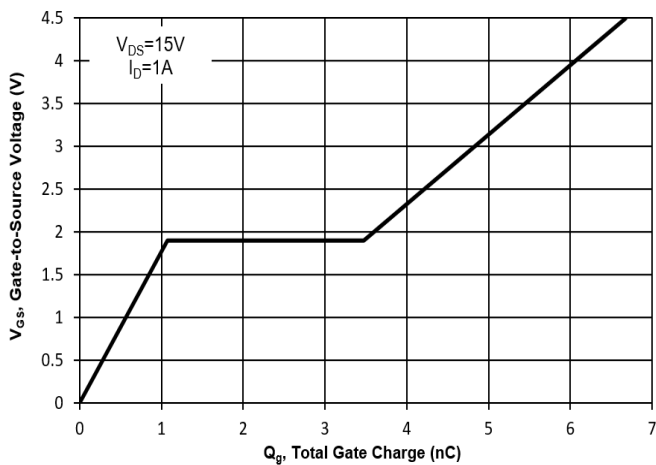


Fig. 11 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

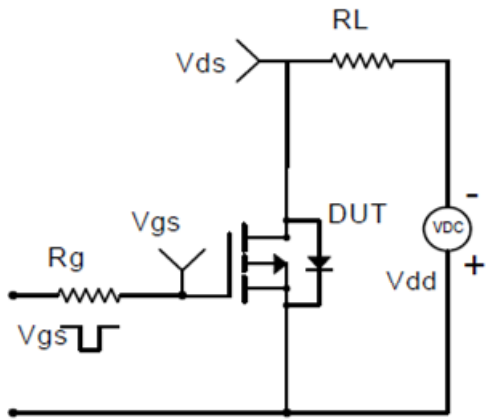


Fig.1-2 Switching Waveform

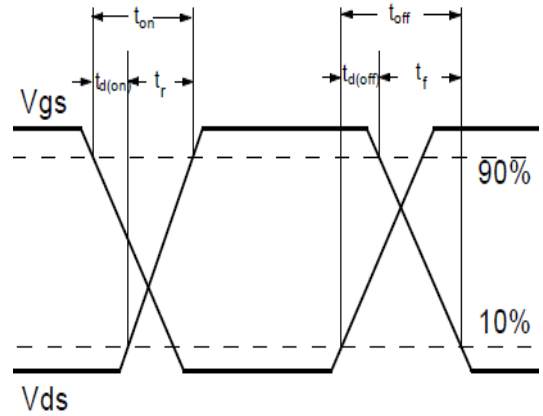


Fig.2-1 Gate charge test circuit

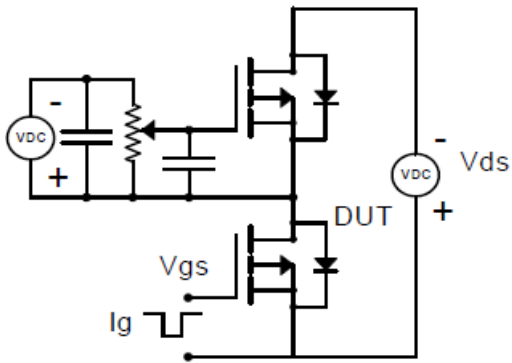
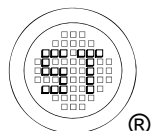
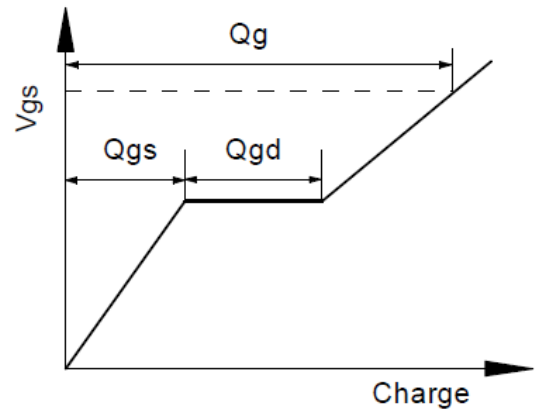


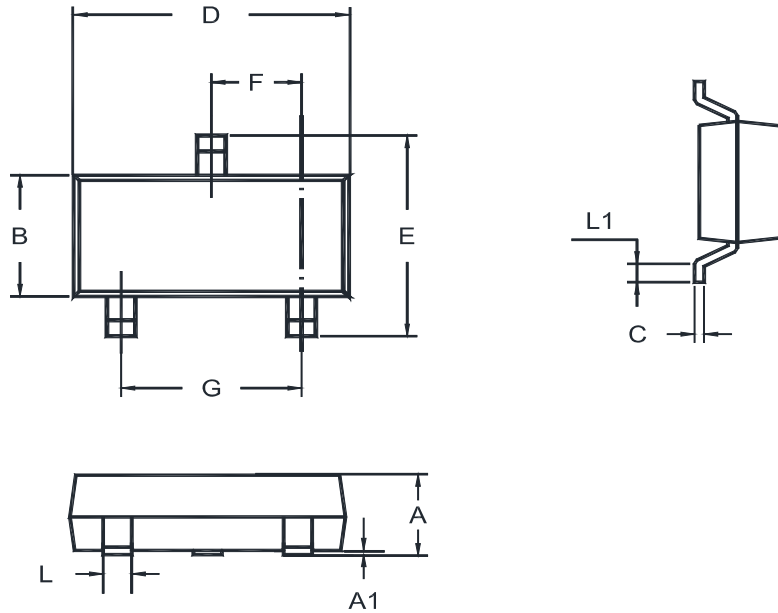
Fig.2-2 Gate charge waveform



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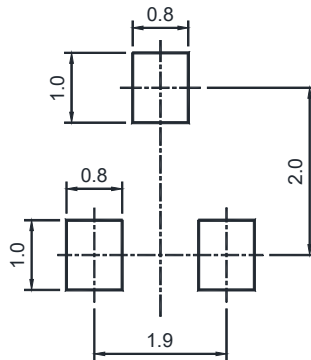
Package Outline (Dimensions in mm)

SOT-23



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

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

