

MMFTP2333

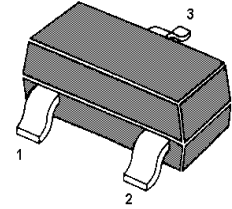
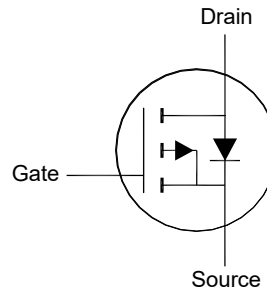
P-Channel Enhancement Mode MOSFET

Features

- Surface-mounted package

Applications

- Load Switch
- Motor / Body Load Control



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

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

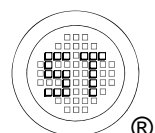
Parameter	Symbol	Value	Unit
Drain-Source Voltage	$-V_{DS}$	12	V
Gate-Source Voltage	V_{GS}	± 8	V
Continuous Drain Current	$-I_D$	5.1	A
Peak Drain Current, Pulsed ¹⁾	$-I_{DM}$	20	A
Power Dissipation ²⁾	P_D	1.25	W
Operating Junction Temperature Range	T_j	- 55 to + 150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 55 to + 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance - Junction to Ambient ²⁾	$R_{\theta JA}$	100	$^\circ\text{C}/\text{W}$

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

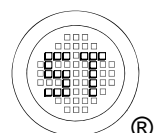
²⁾ Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.



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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 $-I_D = 250 \mu\text{A}$	$-V_{(BR)DSS}$	12	-	-	V
Zero Gate Voltage Drain Current at $-V_{DS} = 12 \text{ V}$	$-I_{DSS}$	-	-	1	μA
Gate-Source Leakage at $V_{GS} = \pm 8 \text{ V}$	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $-I_D = 250 \mu\text{A}$	$-V_{GS(th)}$	0.4	-	1	V
Drain-Source On-State Resistance at $-V_{GS} = 4.5 \text{ V}$, $-I_D = 5.1 \text{ A}$ at $-V_{GS} = 2.5 \text{ V}$, $-I_D = 4.5 \text{ A}$ at $-V_{GS} = 1.8 \text{ V}$, $-I_D = 2 \text{ A}$	$R_{DS(on)}$	-	-	35 45 59	m Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $-V_{DS} = 5 \text{ V}$, $-I_D = 5 \text{ A}$	g_{fs}	-	16	-	S
Gate resistance at $V_{GS} = 0 \text{ V}$, $V_{DS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	R_g	-	4.4	-	Ω
Input Capacitance at $V_{GS} = 0 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $f = 1 \text{ MHz}$	C_{iss}	-	1242	-	pF
Output Capacitance at $V_{GS} = 0 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $f = 1 \text{ MHz}$	C_{oss}	-	188	-	pF
Reverse Transfer Capacitance at $V_{GS} = 0 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $f = 1 \text{ MHz}$	C_{rss}	-	148	-	pF
Total Gate Charge at $-V_{GS} = 4.5 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$ at $-V_{GS} = 2.5 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$	Q_g	-	13 7.8	-	nC
Gate-Source Charge at $-V_{GS} = 4.5 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$	Q_{gs}	-	3	-	nC
Gate-Drain Charge at $-V_{GS} = 4.5 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$	Q_{gd}	-	3	-	nC
Turn-On Delay Time at $-V_{GS} = 10 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$, $R_G = 3.3 \Omega$	$t_{d(on)}$	-	10	-	ns
Turn-On Rise Time at $-V_{GS} = 10 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$, $R_G = 3.3 \Omega$	t_r	-	34	-	ns
Turn-Off Delay Time at $-V_{GS} = 10 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$, $R_G = 3.3 \Omega$	$t_{d(off)}$	-	21	-	ns
Turn-Off Fall Time at $-V_{GS} = 10 \text{ V}$, $-V_{DS} = 10 \text{ V}$, $-I_D = 5.1 \text{ A}$, $R_G = 3.3 \Omega$	t_f	-	7	-	ns
Body-Diode PARAMETERS					
Body Diode Voltage at $-I_S = 1 \text{ A}$	$-V_{SD}$	-	-	1.2	V
Body-Diode Continuous Current	$-I_S$	-	-	5.1	A
Body Diode Reverse Recovery Time at $-I_S = 5.1 \text{ A}$, $di/dt = 100 \text{ A} / \mu\text{s}$	t_{rr}	-	10.4	-	ns
Body Diode Reverse Recovery Charge at $-I_S = 5.1 \text{ A}$, $di/dt = 100 \text{ A} / \mu\text{s}$	Q_{rr}	-	1.7	-	nC



Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

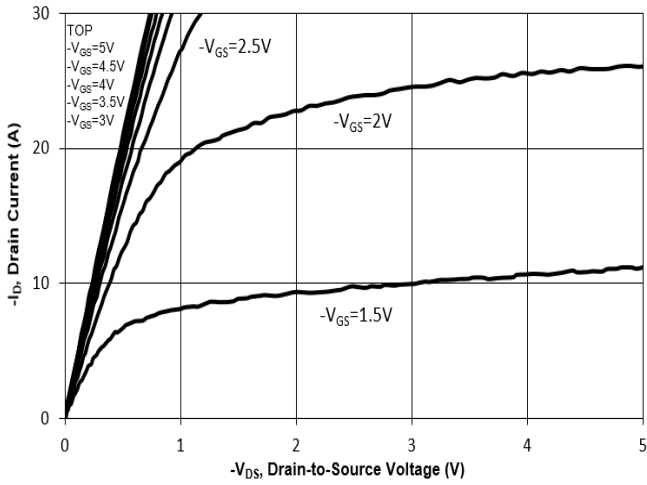


Fig. 3 On-Resistance vs. Drain Current

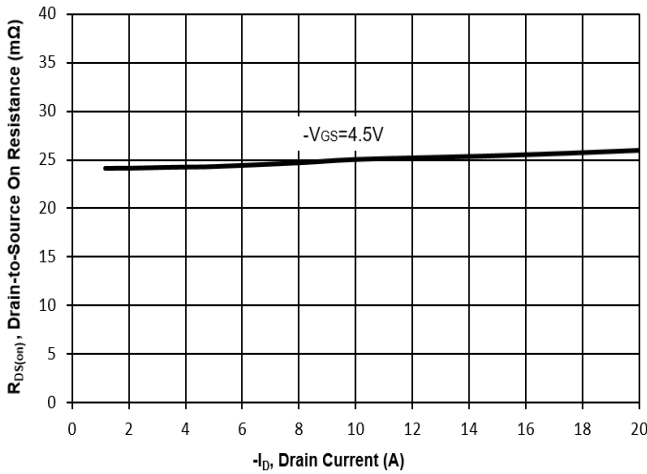


Fig. 5 On-Resistance vs. T_j

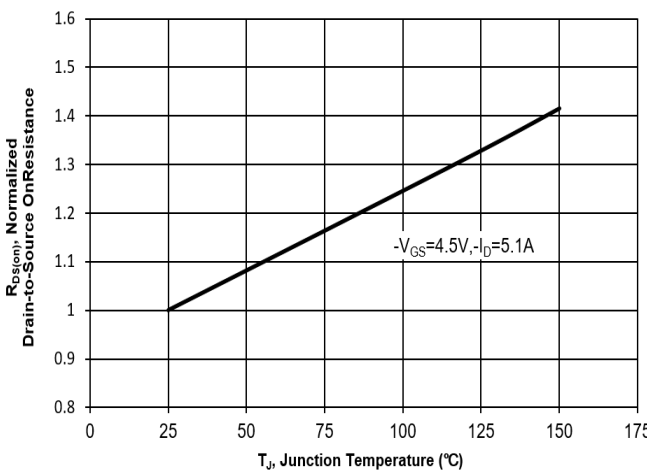


Fig. 2 Typical Transfer Characteristics

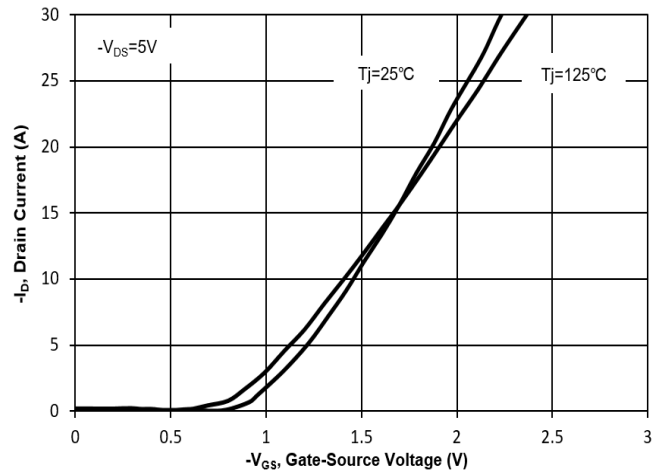


Fig. 4 on-Resistance vs. Gate to Source Voltage

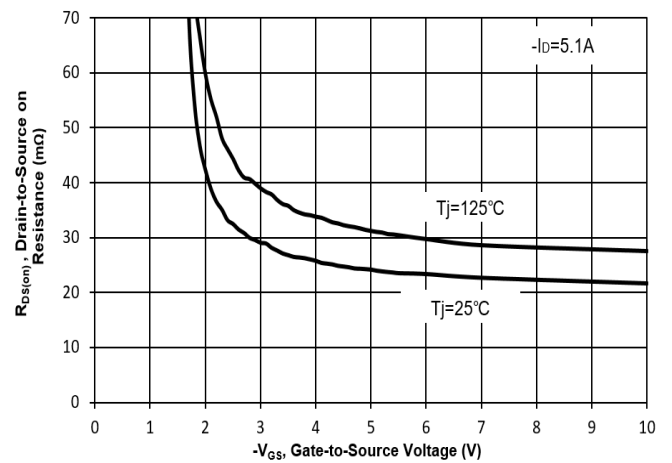
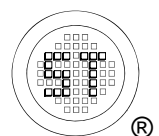
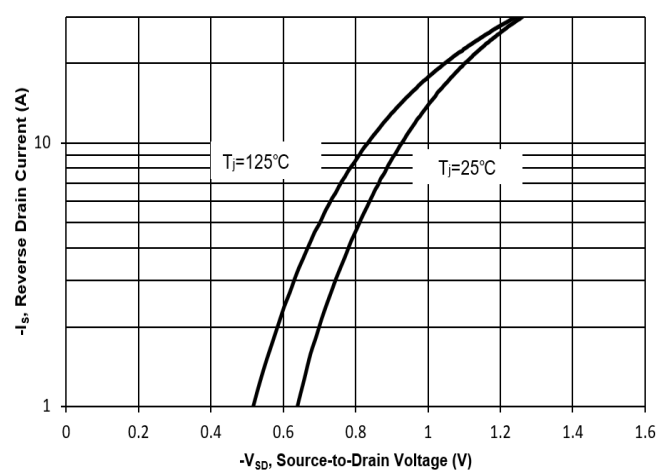


Fig. 6 Typical Body-Diode Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

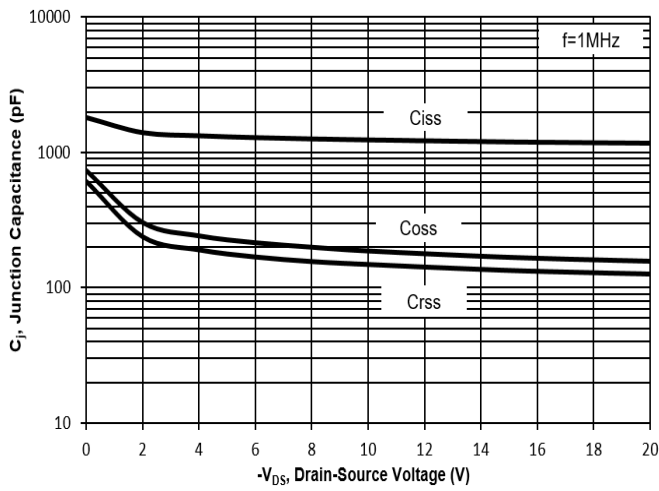


Fig. 8 Drain-Source Leakage Current vs. T_J

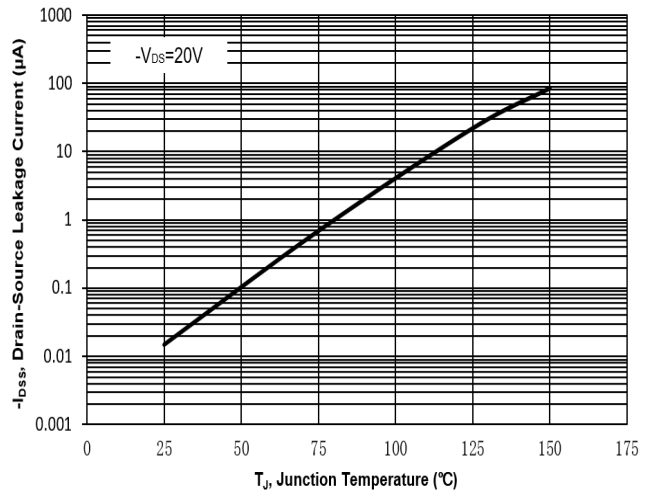


Fig. 9 V_{(BR)DSS} vs. Junction Temperature

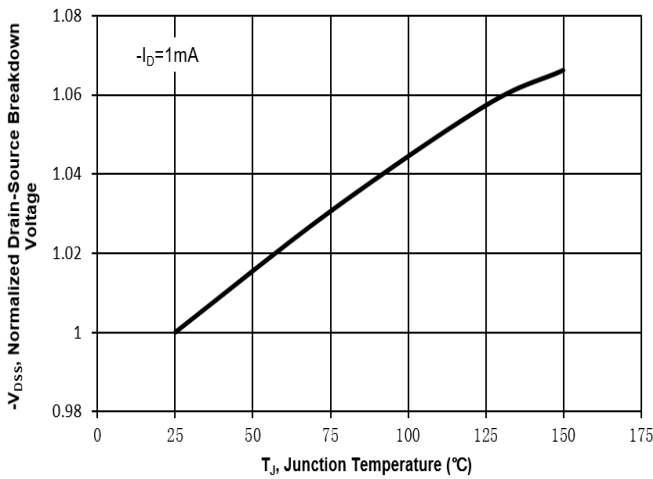


Fig. 10 Gate-Source Threshold Voltage vs. T_J

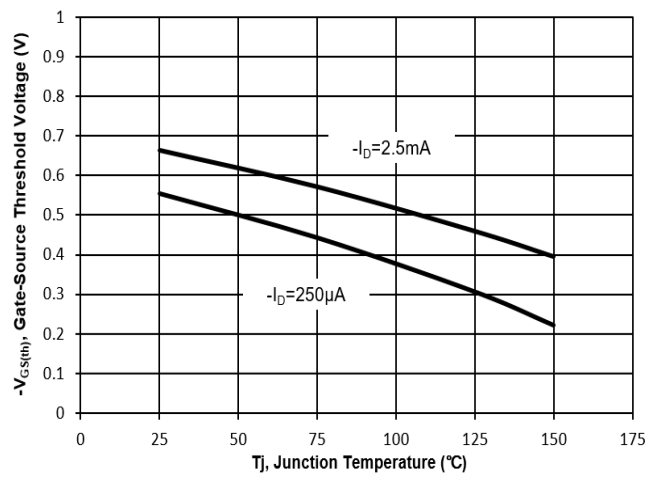
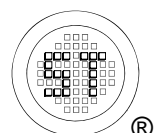
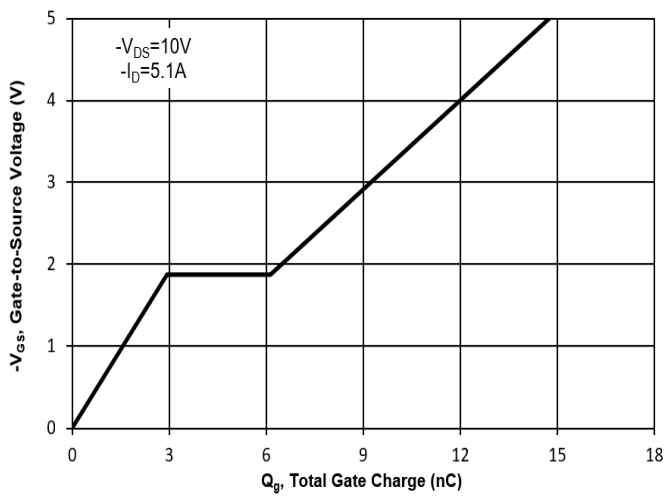


Fig. 11 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

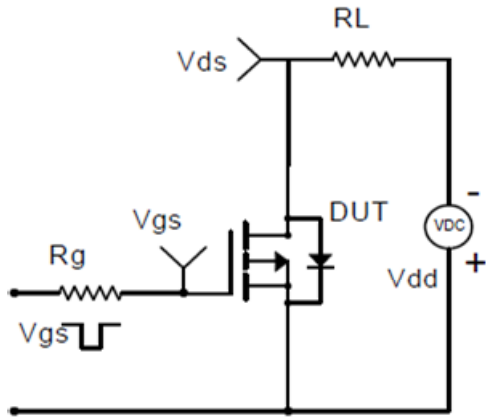


Fig.1-2 Switching Waveform

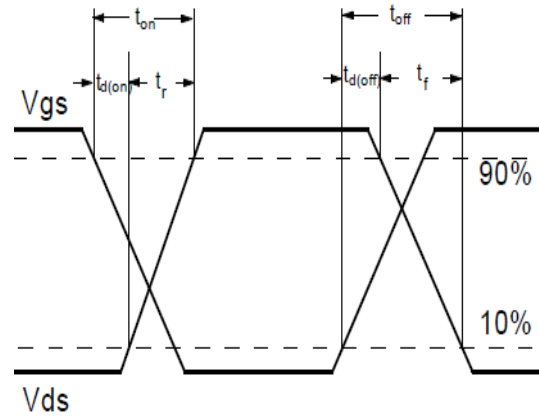


Fig.2-1 Gate charge test circuit

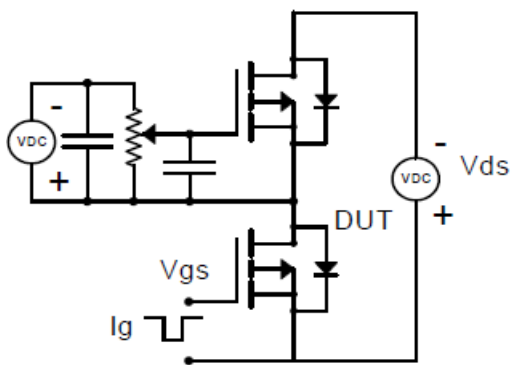
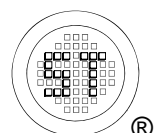
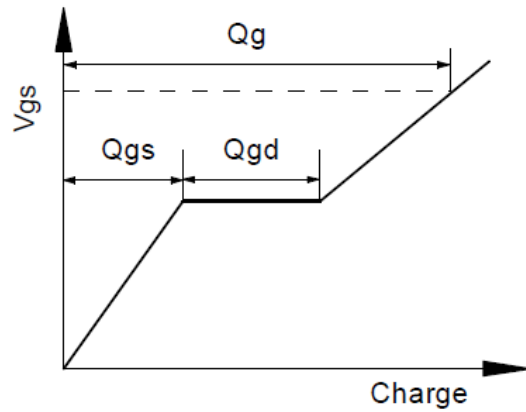


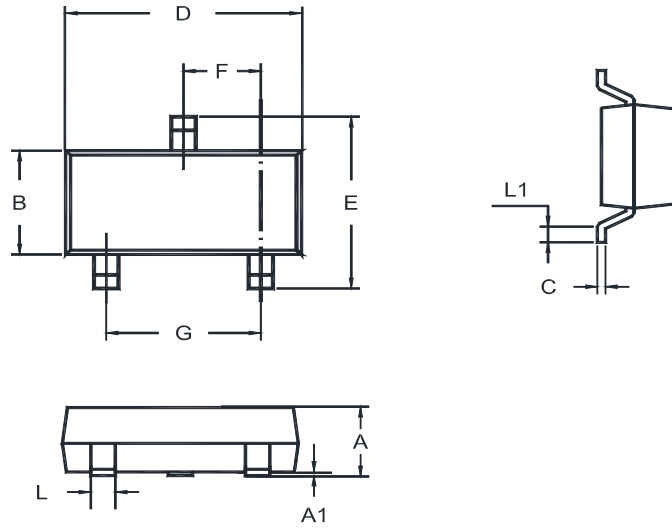
Fig.2-2 Gate charge waveform



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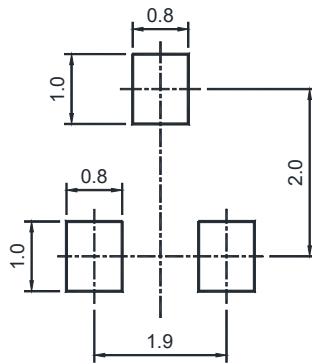
Package Outline (Dimensions in mm)

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

- " P6 " = Part No.
 - " YM " = Date Code Marking
 - " Y " = Year
 - " M " = Month
- Font type: Arial

