MMFTP2301

P-Channel Enhancement Mode MOSFET

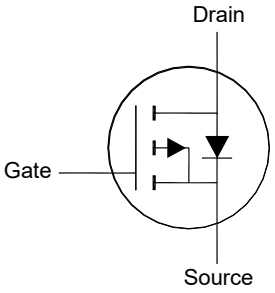
Features

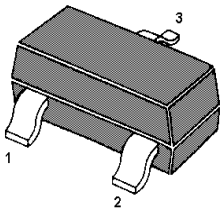
• Advanced trench cell design

Application

• Portable appliances

• Battery management





1. Gate 2. Source 3. Drain
TO-236 Plastic Package

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}	± 10	V
Drain Current - Continuous	$-I_D$	2.8	A
Peak Drain Current, Pulsed [1)]	$-I_{DM}$	10	A
Power Dissipation T_a = 25℃ T_a = 75℃	P_{tot}	1.25 0.8	W
Operating Junction Temperature	T_j	- 55 to + 150	°C
Storage Temperature	T_{stg}	- 55 to + 150	°C

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	100 [2)] 166 [3)]	℃/W

[1)] Repetitive Rating: Pulse width limited by maximum junction temperature.

[2)] Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air,t ≤ 5 sec.

[3)] Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air

Dated: 05/03/2021 Rev: 08

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	$-I_{DSS}$	-	-	1	µA
Gate Leakage Current at V_{GS} = ± 10 V	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at V_{DS} = V_{GS}, $-I_D$ = 250 µA	$-V_{GS(th)}$	0.3	-	1	V
Drain-Source On-State Resistance at $-V_{GS}$ = 4.5 V, $-I_D$ = 2.8 A at $-V_{GS}$ = 2.5 V, $-I_D$ = 2 A	$R_{DS(on)}$	- -	- -	100 150	mΩ
DYNAMIC PARAMETERS					
Input Capacitance at V_{GS} = 0 V, $-V_{DS}$ = 10 V, f = 1 MHz	C_{iss}	-	358	-	pF
Output Capacitance at V_{GS} = 0 V, $-V_{DS}$ = 10 V, f = 1 MHz	C_{oss}	-	57	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, $-V_{DS}$ = 10 V, f = 1 MHz	C_{rss}	-	53	-	pF
Total Gate Charge at $-V_{GS}$ = 4.5 V, $-V_{DS}$ = 10 V, $-I_D$ = 2.5 A	Q_g	-	4.4	-	nC
Gate Source Charge at $-V_{GS}$ = 4.5 V, $-V_{DS}$ = 10 V, $-I_D$ = 2.5 A	Q_{gs}	-	1.3	-	nC
Gate Drain Charge at $-V_{GS}$ = 4.5 V, $-V_{DS}$ = 10 V, $-I_D$ = 2.5 A	Q_{gd}	-	1	-	nC
Turn-On Delay Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 2.5 A, R_g = 4.5 Ω	$t_{d(on)}$	-	9	-	nS
Turn-On Rise Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 2.5 A, R_g = 4.5 Ω	t_r	-	36	-	nS
Turn-Off Delay Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 2.5 A, R_g = 4.5 Ω	$t_{d(off)}$	-	71	-	nS
Turn-Off Fall Time at $-V_{DS}$ = 10 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 2.5 A, R_g = 4.5 Ω	t_f	-	52	-	nS
Body-Diode PARAMETERS					
Diode Forward Voltage at $-I_S$ = 0.75 A, V_{GS} = 0 V	$-V_{SD}$	-	-	1.2	V
Diode Forward Current	$-I_S$	-	-	2.4	A
Body Diode Reverse Recovery Time at $-I_S$ = 2.5 A, di/dt = 100 A / µs	t_{rr}	-	25	-	nS
Body Diode Reverse Recovery Charge at $-I_S$ = 2.5 A, di/dt = 100 A / µs	Q_{rr}	-	6.7	-	nC

Electrical Characteristics Curves

Fig. 1 Output Characteristic

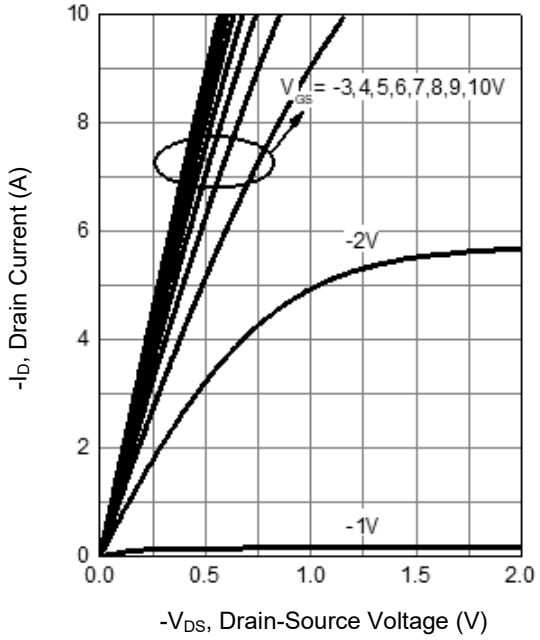


Fig. 2 Transfer Characteristics

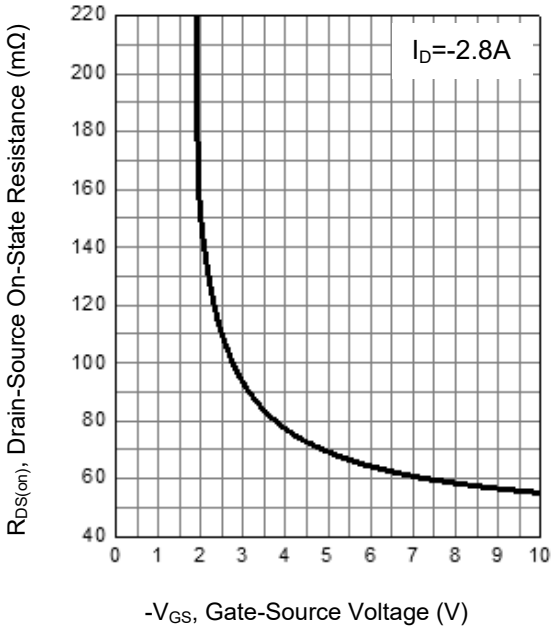


Fig. 3 On-Resistance vs. Drain Current

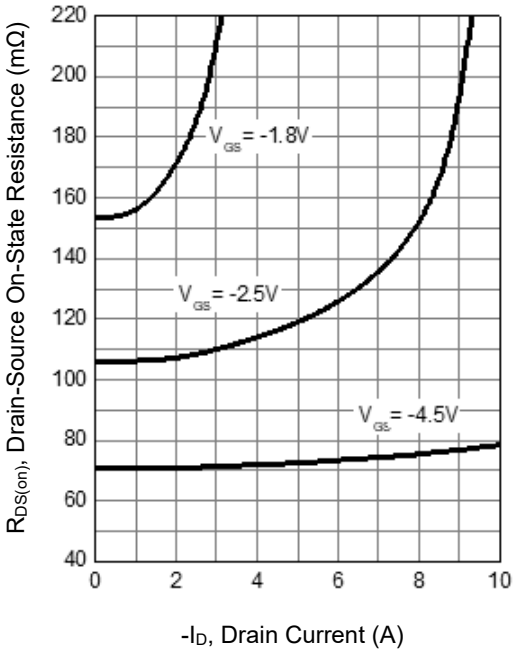
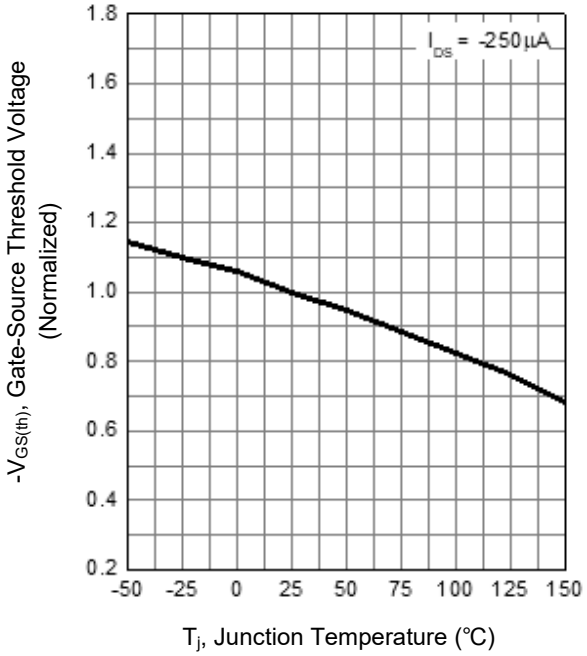


Fig. 4 Gate-Source Threshold Voltage vs. T_j



Electrical Characteristics Curves

Fig. 5 On-Resistance vs. Junction Temperature

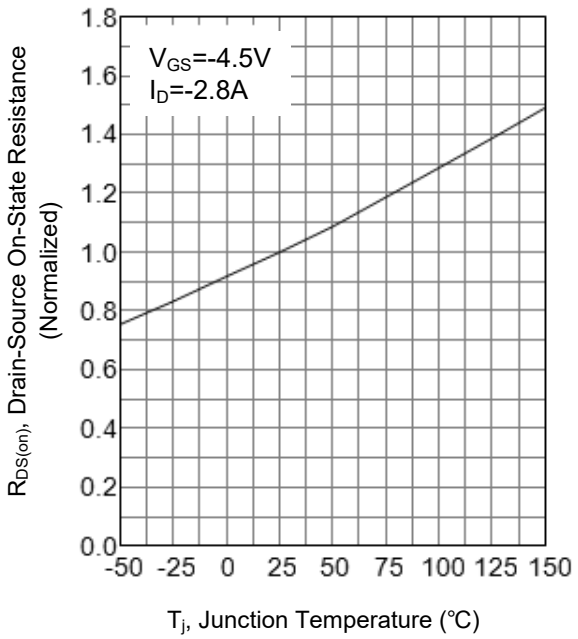


Fig. 6 Typical Forward Characteristic

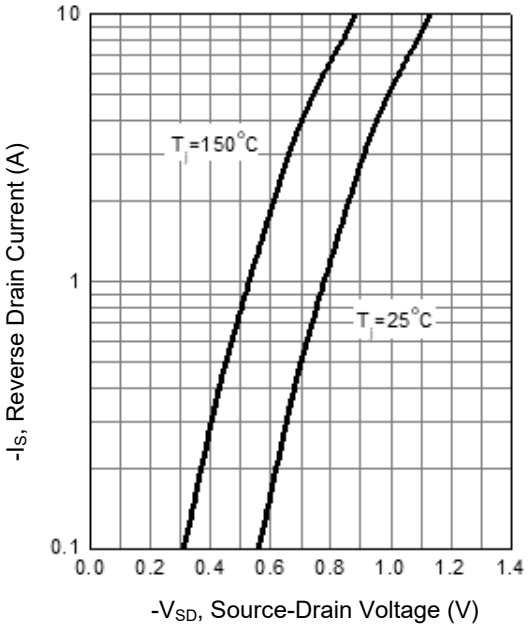


Fig. 7 Capacitance Characteristic

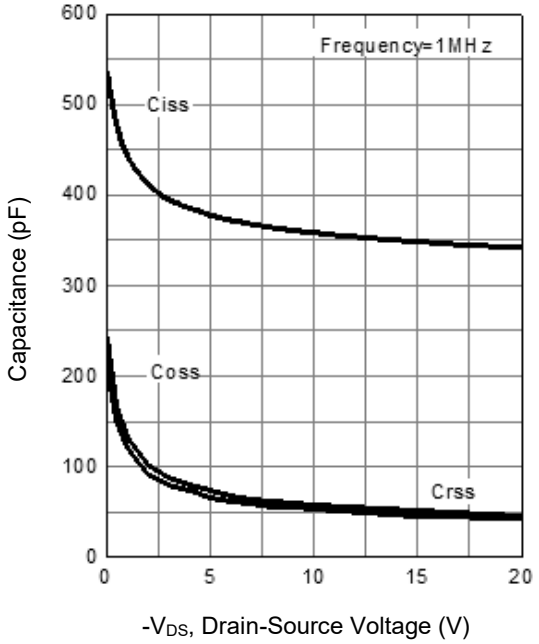
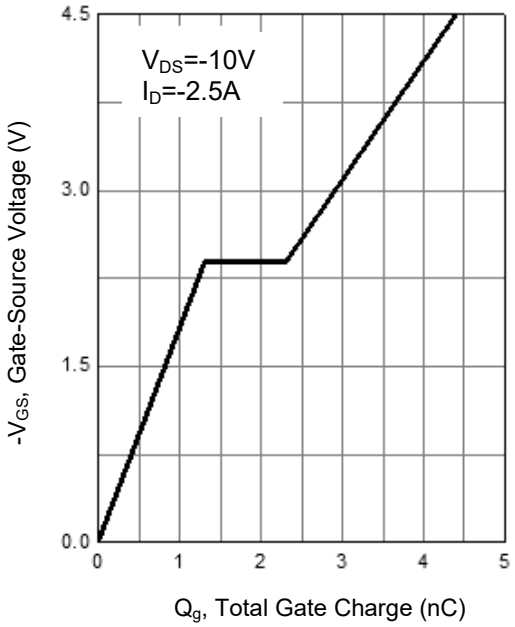


Fig. 8 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

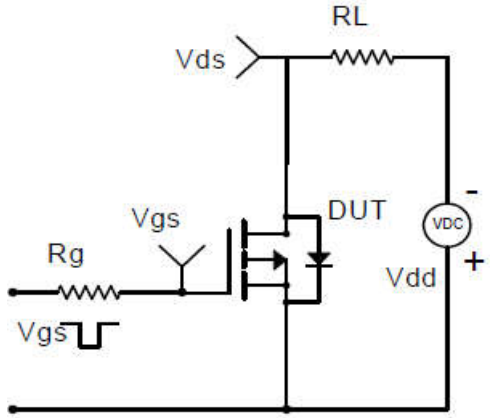


Fig.1-2 Switching Waveform

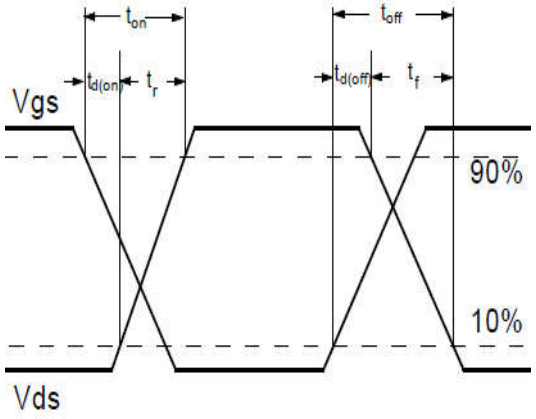


Fig.2-1 Gate charge test circuit

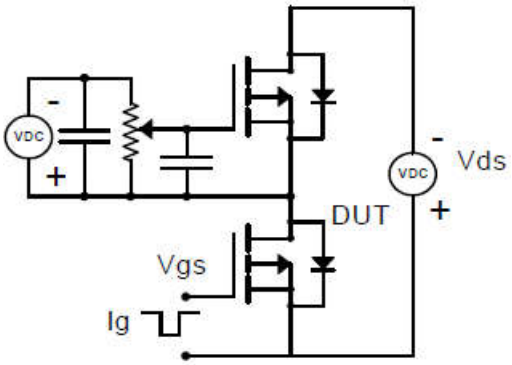
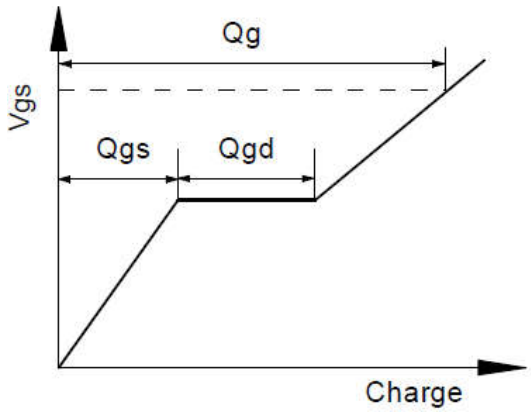
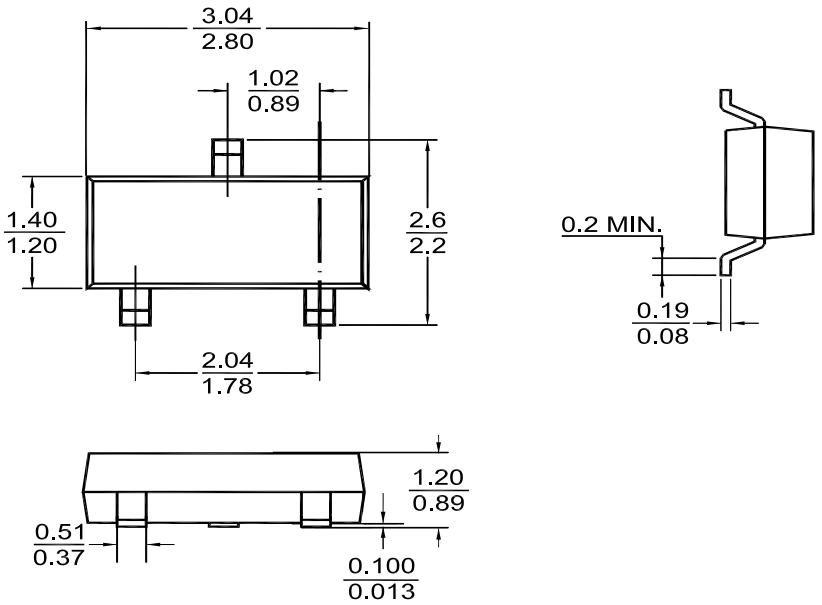


Fig.2-2 Gate charge waveform

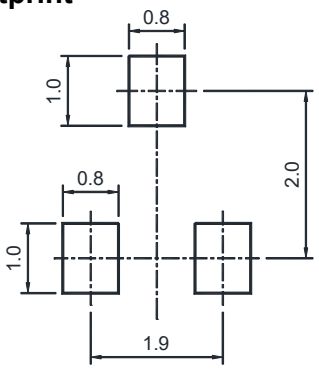


PACKAGE OUTLINE

Plastic surface mounted package (Dimensions in mm) **TO-236**



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

" M01 " = Part No.
"YM" = Date Code Marking
"Y" = Year
"M" = Month
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