

MMFTN138

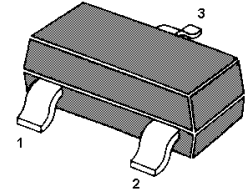
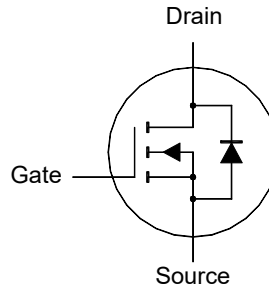
N-Channel Enhancement Mode MOSFET

Features

- Surface-mounted package

Applications

- Portable appliances
- Battery management



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

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

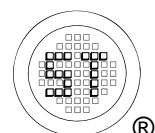
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	50	V
Drain-Gate Voltage ($R_{GS} \leq 20\text{ K}\Omega$)	V_{DGR}	50	V
Gate-Source Voltage - Continuous	V_{GSS}	± 20	V
Gate-Source Voltage - Non-Repetitive ($T_P < 50\ \mu\text{s}$)		± 40	
Drain Current	I_D	300	mA
Peak Drain Current, Pulsed ¹⁾	I_{DM}	1.5	A
Power Dissipation ²⁾	P_D	360	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-Junction to Ambient ²⁾	$R_{\theta JA}$	350	$^\circ\text{C/W}$

¹⁾ Pulse Test: Pulse Width $\leq 100\ \mu\text{s}$, Duty Cycle $\leq 2\%$, Repetitive rating, pulse width limited by $T_{J(MAX)}$.

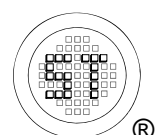
²⁾ Device mounted on FR-4 substrate PC board, with minimum recommended pad layout.



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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 $I_D = 250 \mu\text{A}$	BV_{DSS}	50	-	-	V
Drain-Source Leakage Current at $V_{DS} = 50 \text{ V}$ at $V_{DS} = 30 \text{ V}$	I_{DSS}	- -	- -	500 100	nA
Gate Leakage Current at $V_{GS} = \pm 20 \text{ V}$	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $I_D = 1 \text{ mA}$	$V_{GS(th)}$	0.8	-	1.6	V
Drain-Source On-State Resistance at $V_{GS} = 10 \text{ V}$, $I_D = 220 \text{ mA}$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 220 \text{ mA}$	$R_{DS(on)}$	- -	- -	3.5 6	Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $V_{DS} = 10 \text{ V}$, $I_D = 220 \text{ mA}$	g_{FS}	-	0.26	-	S
Input Capacitance at $V_{DS} = 30 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{iss}	-	20	-	pF
Output Capacitance at $V_{DS} = 30 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{oss}	-	3.5	-	pF
Reverse Transfer Capacitance at $V_{DS} = 30 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{rss}	-	1.2	-	pF
Total Gate Charge at $V_{DS} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 0.3 \text{ A}$ at $V_{DS} = 30 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 0.3 \text{ A}$	Q_g	- -	1.1 0.52	- -	nC
Gate-Source Charge at $V_{DS} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 0.3 \text{ A}$	Q_{gs}	-	0.18	-	nC
Gate-Drain Charge at $V_{DS} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 0.3 \text{ A}$	Q_{gd}	-	0.09	-	nC
Turn-On Delay Time at $V_{DD} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 0.3 \text{ A}$, $R_G = 4.5 \Omega$	$t_{d(on)}$	-	2.4	-	ns
Turn-On Rise Time at $V_{DD} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 0.3 \text{ A}$, $R_G = 4.5 \Omega$	t_r	-	18	-	ns
Turn-Off Delay Time at $V_{DD} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 0.3 \text{ A}$, $R_G = 4.5 \Omega$	$t_{d(off)}$	-	10.5	-	ns
Turn-Off Fall Time at $V_{DD} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 0.3 \text{ A}$, $R_G = 4.5 \Omega$	t_f	-	34.5	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_S = 440 \text{ mA}$	V_{SD}	-	-	1.4	V
Body-Diode Continuous Current	I_S	-	-	300	mA
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	1.5	A



Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

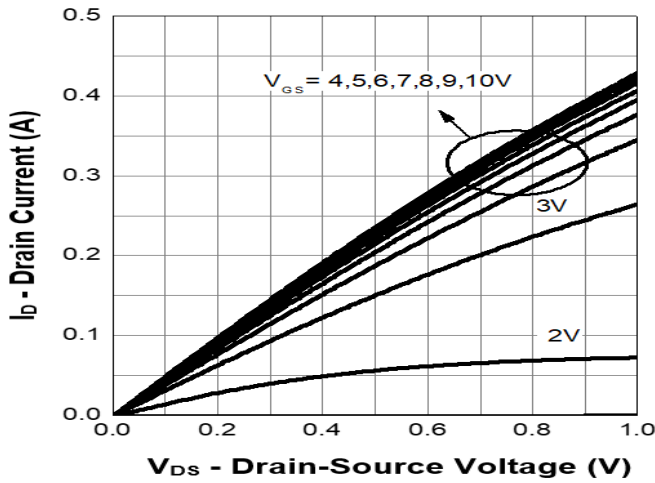


Fig. 2 Gate Threshold Variation vs. T_j

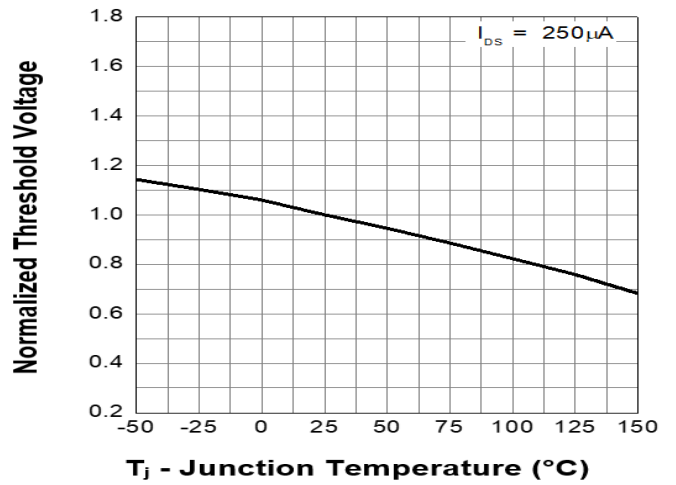


Fig. 3 Typical Transfer Characteristics

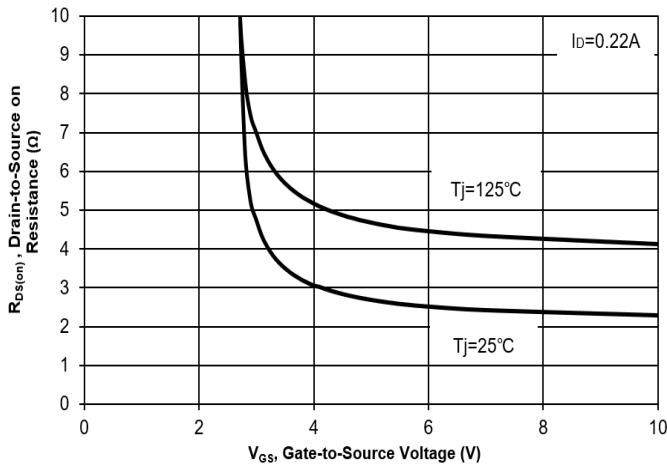


Fig. 4 On-Resistance vs. T_j

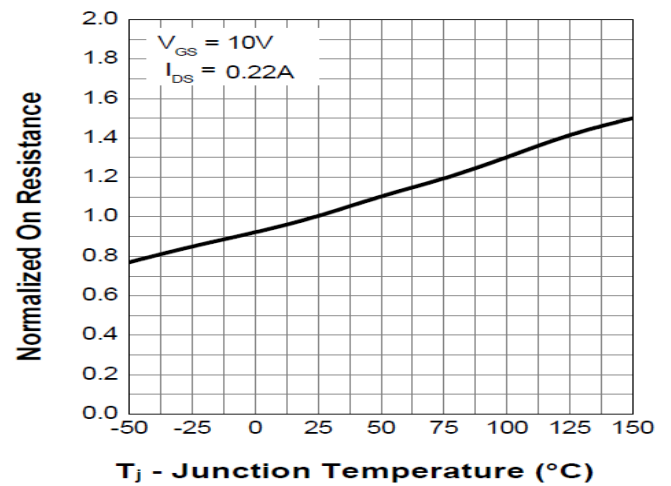


Fig. 5 On-Resistance vs. Drain Current

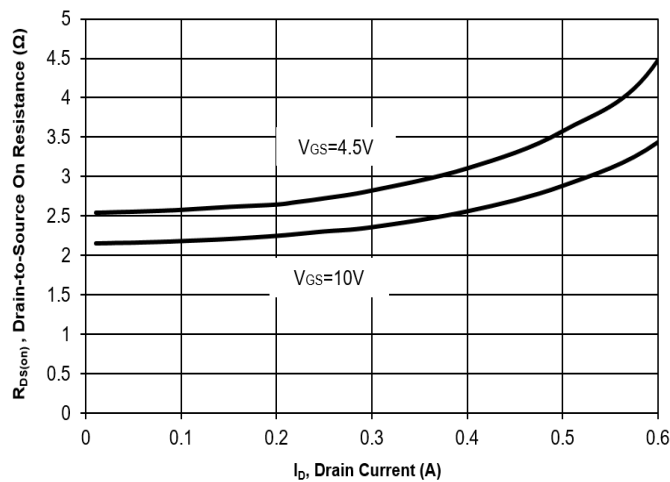
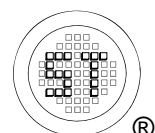
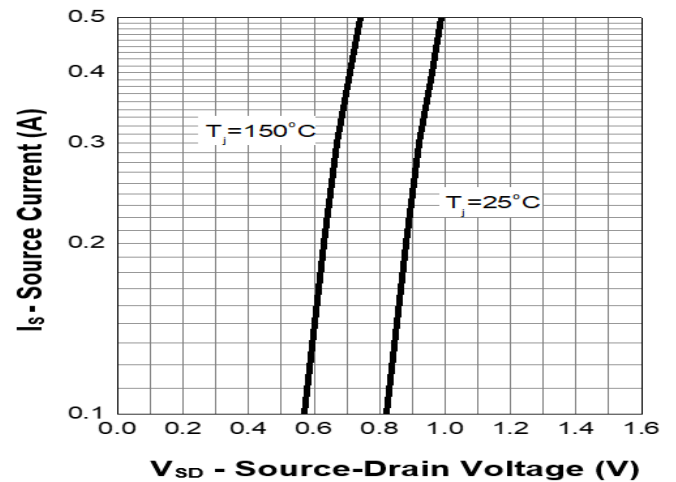


Fig. 6 Typical Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

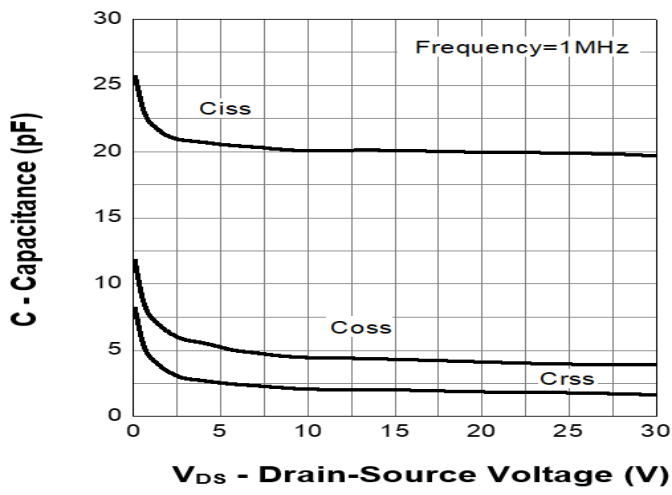
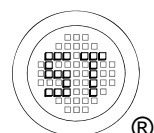
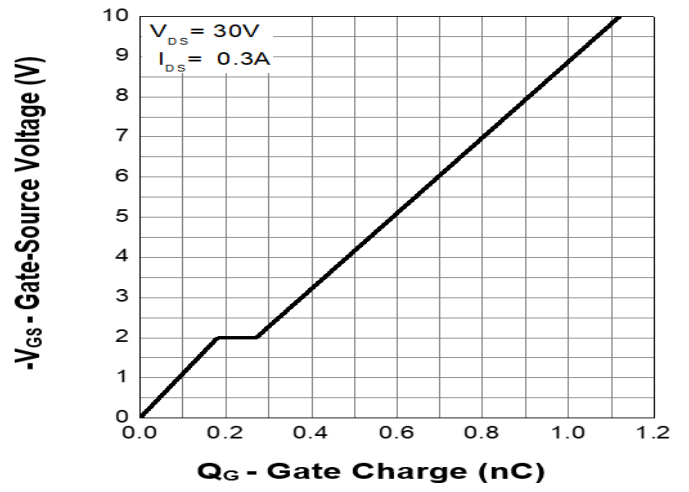


Fig. 8 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

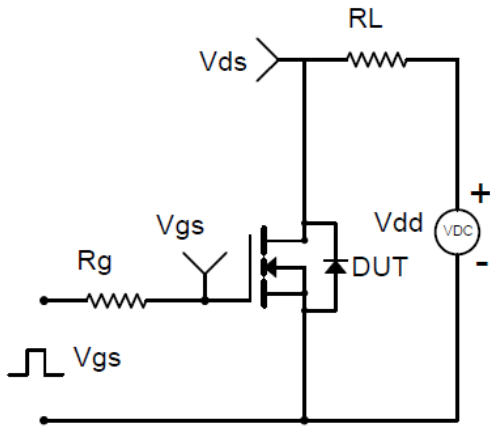


Fig.1-2 Switching Waveform

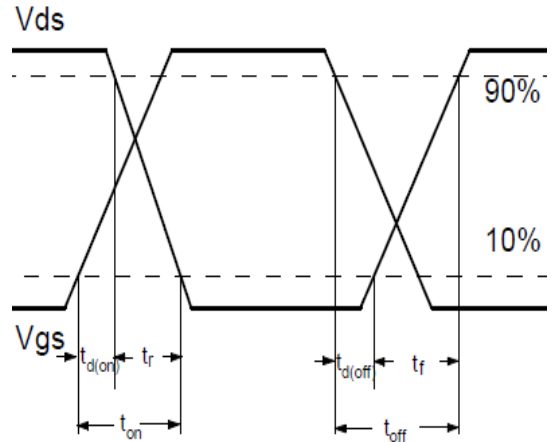


Fig.2-1 Gate charge test circuit

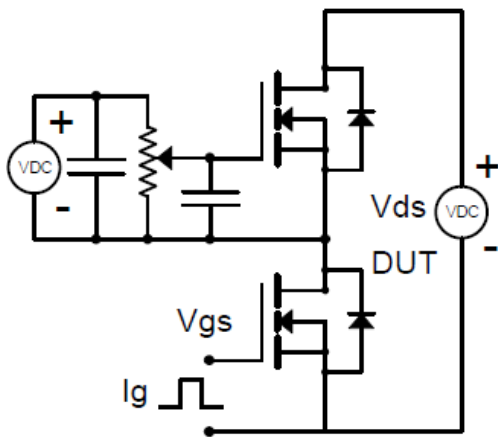
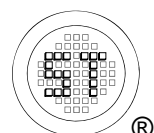
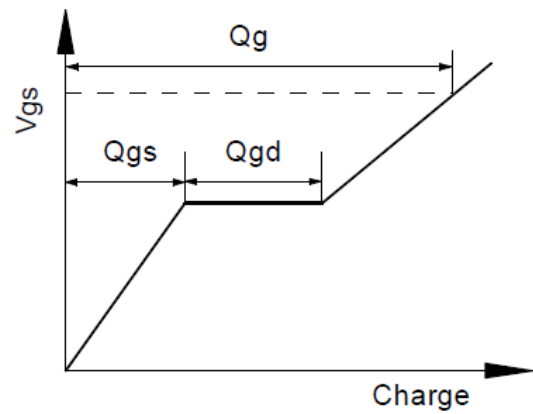


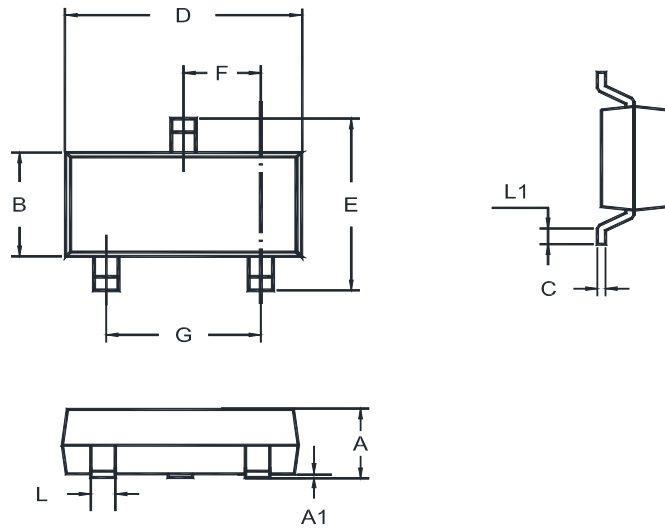
Fig.2-2 Gate charge waveform



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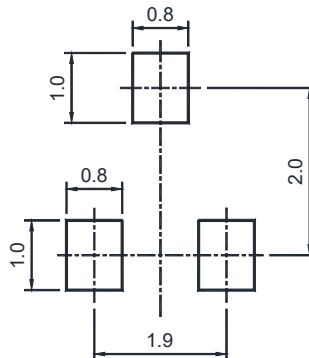
Package Outline (Dimensions in mm)

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

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

