

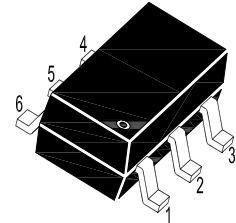
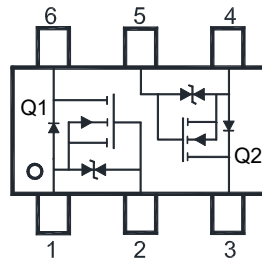
MMFTN138AKDW-AH

Dual N-Channel Enhancement Mode MOSFET

Features

- AEC-Q101 Qualified
- Halogen and Antimony Free(HAF), RoHS compliant
- Typical ESD Protection HBM Class 1C

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. Source1 2. Gate1 3. Drain2
4. Source2 5. Gate2 6. Drain1
SOT-363 Plastic Package

Applications

- Portable appliances

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

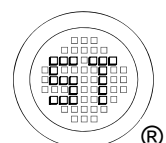
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	50	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current	I_D	360	mA
Peak Drain Current, Pulsed ¹⁾	I_{DM}	1.2	A
Power Dissipation	P_D	236	mW
Operating Junction Temperature	T_j	- 55 to + 150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 55 to + 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient ²⁾	$R_{\theta JA}$	530	$^\circ\text{C/W}$

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

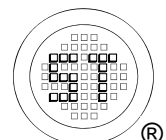
²⁾ Device mounted on FR-4 substrate PC board, with minimum recommended pad layout.



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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
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	$V_{GS(th)}$	0.8	-	1.5	V
Zero Gate Voltage Drain Current at $V_{DS} = 50\ \text{V}$	I_{DSS}	-	-	1	μA
Gate Leakage Current at $V_{GS} = \pm 20\ \text{V}$	I_{GSS}	-	-	± 10	μA
Drain-Source On-State Resistance at $V_{GS} = 10\ \text{V}$, $I_D = 500\ \text{mA}$ at $V_{GS} = 4.5\ \text{V}$, $I_D = 200\ \text{mA}$ at $V_{GS} = 2.5\ \text{V}$, $I_D = 100\ \text{mA}$	$R_{DS(on)}$	- - -	- - -	1.5 1.6 2.5	Ω
DYNAMIC PARAMETERS					
Input Capacitance at $V_{DS} = 25\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{iss}	-	33	-	pF
Output Capacitance at $V_{DS} = 25\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{oss}	-	10	-	pF
Reverse Transfer Capacitance at $V_{DS} = 25\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	C_{rss}	-	8	-	pF
Gate charge total at $V_{DS} = 25\ \text{V}$, $I_D = 1\ \text{A}$, $V_{GS} = 10\ \text{V}$ at $V_{DS} = 25\ \text{V}$, $I_D = 1\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_g	- -	1.3 0.85	- -	nC
Gate to Source Charge at $V_{DS} = 25\ \text{V}$, $I_D = 1\ \text{A}$, $V_{GS} = 10\ \text{V}$	Q_{gs}	-	0.45	-	nC
Gate to Drain Charge at $V_{DS} = 25\ \text{V}$, $I_D = 1\ \text{A}$, $V_{GS} = 10\ \text{V}$	Q_{gd}	-	0.3	-	nC
Turn-On Delay Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 500\ \text{mA}$, $R_G = 25\ \Omega$	$t_{d(on)}$	-	5.4	-	ns
Turn-On Rise Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 500\ \text{mA}$, $R_G = 25\ \Omega$	t_r	-	3	-	ns
Turn-Off Delay Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 500\ \text{mA}$, $R_G = 25\ \Omega$	$t_{d(off)}$	-	6	-	ns
Turn-Off Fall Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 500\ \text{mA}$, $R_G = 25\ \Omega$	t_f	-	30	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $V_{GS} = 0\ \text{V}$, $I_S = 500\ \text{mA}$	V_{SD}	-	-	1.5	V
Body-Diode Continuous Current	I_S	-	-	360	mA



Electrical Characteristics Curves

Fig.1 Transfer Characteristic

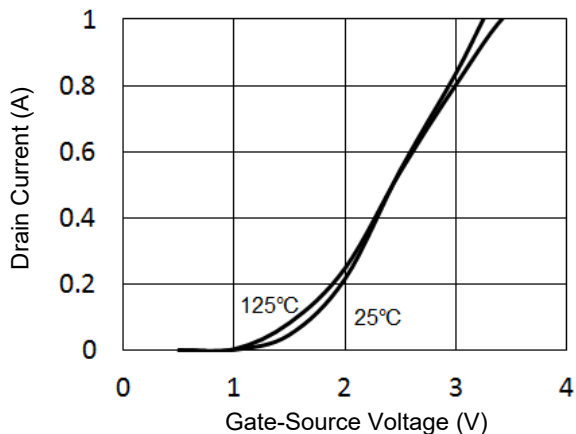


Fig.2 Output Characteristic

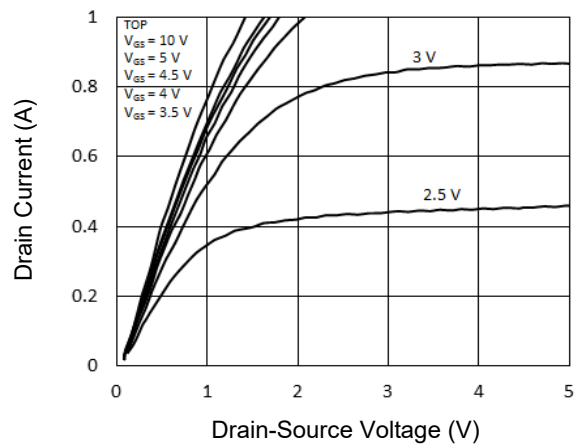


Fig.3 Normalized On-Resistance vs Temperature

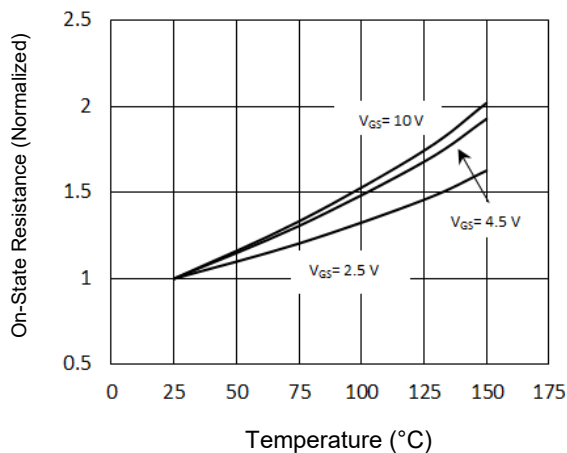


Fig.4 On-Resistance vs Gate-Source Voltage

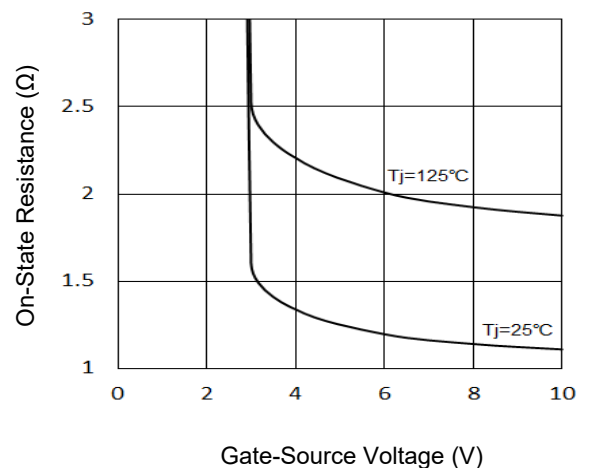


Fig.5 Junction Capacitance

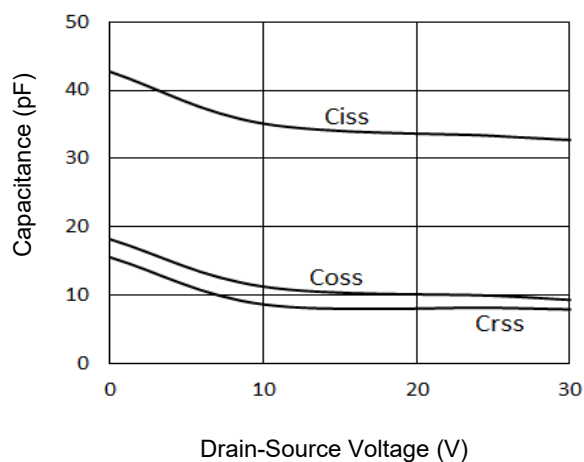
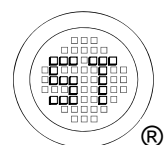
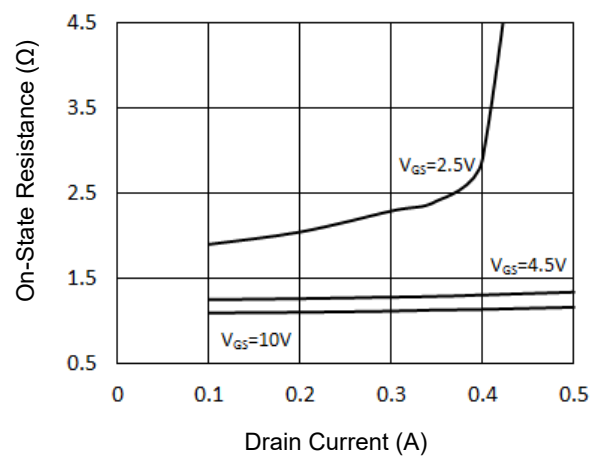


Fig.6 On-Resistance vs Drain Current



Electrical Characteristics Curves

Fig.7 B_{VDSS} vs Temperature

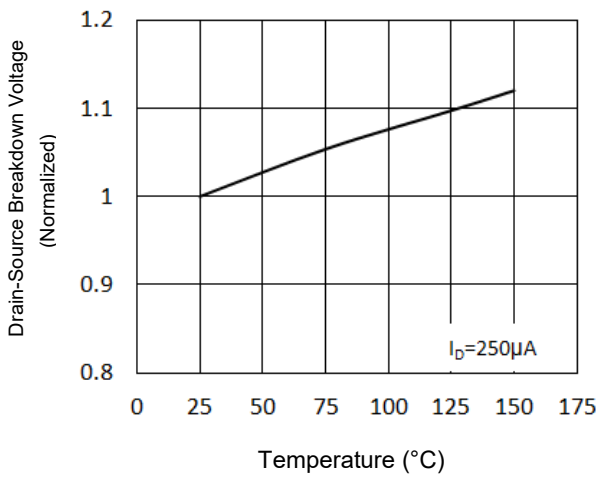


Fig.8 V_{GS(th)} Variation vs Temperature

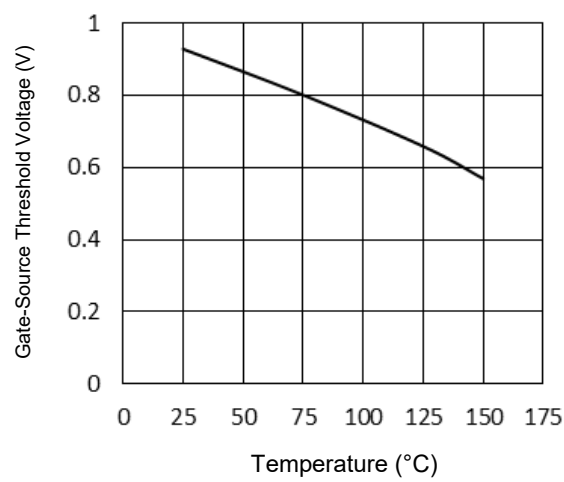


Fig.9 Diode Forward Voltage vs Current

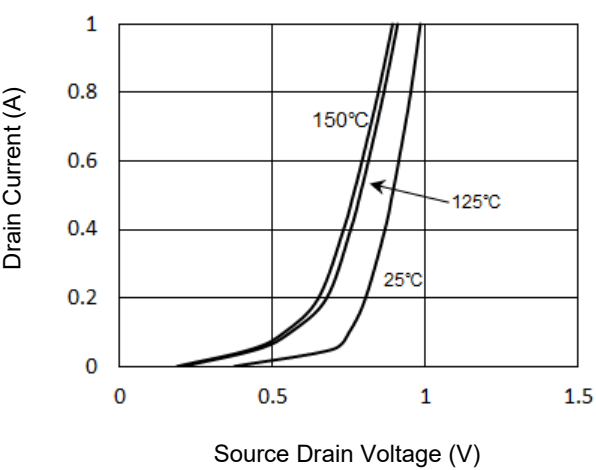
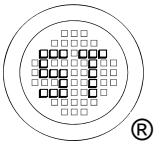
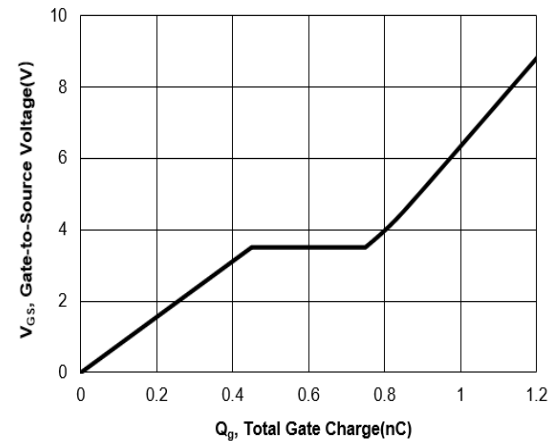


Fig. 10 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

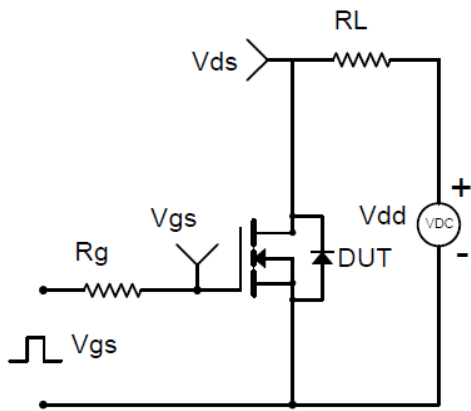


Fig.1-2 Switching Waveform

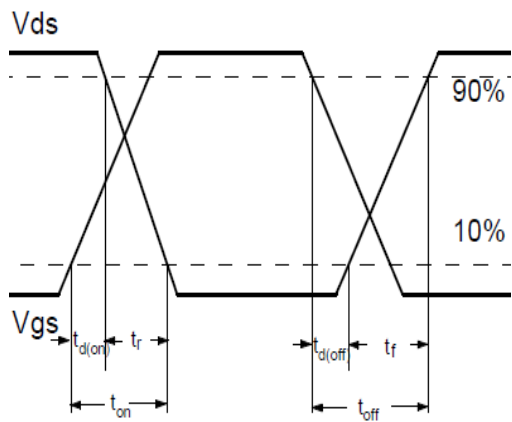


Fig.2-1 Gate charge test circuit

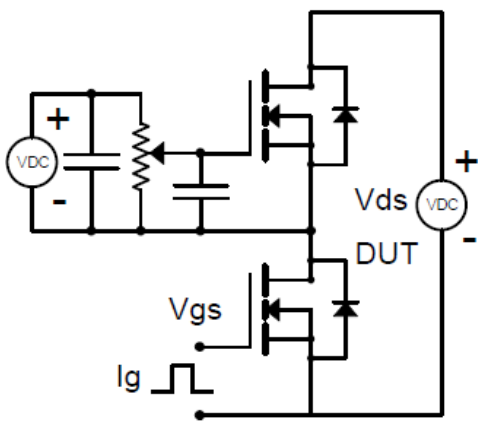
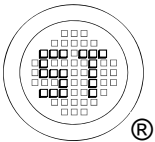
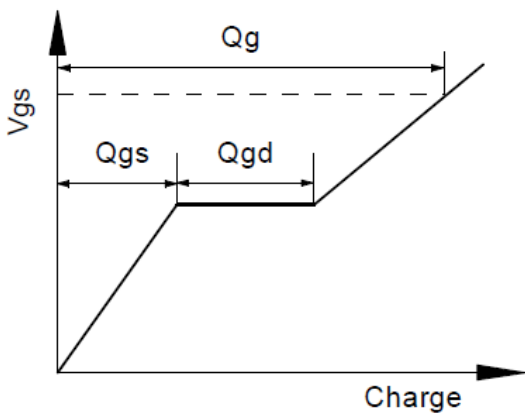


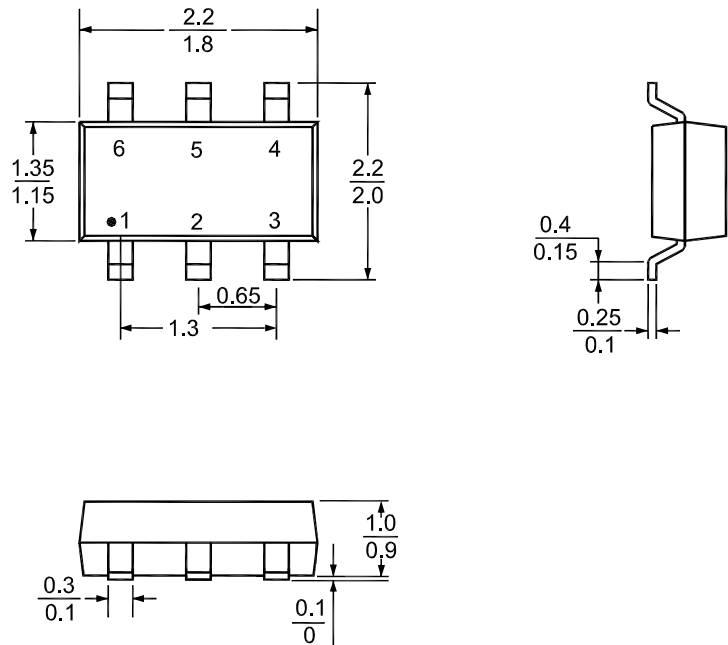
Fig.2-2 Gate charge waveform



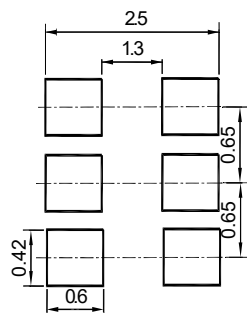
MMFTN138AKDW-AH

Package Outline Dimensions (Units: mm)

SOT-363



Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-363	8	4 ± 0.1	0.157 ± 0.004	178	7	3,000

Marking information

" • " = HAF (Halogen and Antimony Free)
" LN " = Part No.
YM = Date Code Marking
Y = Year
M = Month
Font type: Arial

