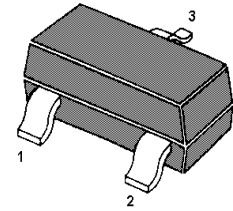
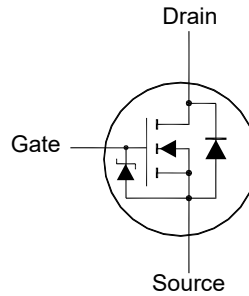


MMFTN301ZK-AH

N-Channel Enhancement Mode MOSFET

Features

- AEC-Q101 Qualified
- Surface-mounted package
- Gate-Source Zener for ESD ruggedness
> 6KV Human Body Model
- Halogen and Antimony Free(HAF),
RoHS compliant
- Typical ESD Protection HBM Class 3A



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

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

Applications

- Portable appliances
- Battery management

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	220	mA
Peak Drain Current, Pulsed ¹⁾	I_{DM}	1.6	A
Total Power Dissipation ²⁾	P_{tot}	350	mW
Operating Junction and Storage Temperature Range	T_j, T_{stg}	- 55 to + 150	$^\circ\text{C}$

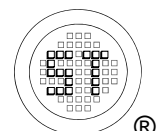
Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	357 ²⁾ 275 ³⁾	$^\circ\text{C}/\text{W}$

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 minimum recommended pad.

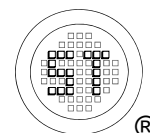
³⁾ Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.



MMFTN301ZK-AH

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
Drain-Source Leakage 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 $V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	$V_{GS(th)}$	0.7	-	1.1	V
Drain-Source On-State Resistance at $V_{GS} = 4.5 \text{ V}$, $I_D = 0.4 \text{ A}$ at $V_{GS} = 2.7 \text{ V}$, $I_D = 0.2 \text{ A}$	$R_{DS(on)}$	- -	- -	4 5	Ω
DYNAMIC PARAMETERS					
Gate resistance at $V_{DS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	R_g	-	38	-	Ω
Forward Transconductance at $V_{DS} = 5 \text{ V}$, $I_D = 0.4 \text{ A}$	g_{FS}	-	760	-	mS
Input Capacitance at $V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{iss}	-	51	-	pF
Output Capacitance at $V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{oss}	-	11	-	pF
Reverse Transfer Capacitance at $V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	C_{rss}	-	8	-	pF
Gate charge total at $V_{DS} = 25 \text{ V}$, $I_D = 1 \text{ A}$, $V_{GS} = 4.5 \text{ V}$	Q_g	-	0.85	-	nC
Gate to Source Charge at $V_{DS} = 25 \text{ V}$, $I_D = 1 \text{ A}$, $V_{GS} = 4.5 \text{ V}$	Q_{gs}	-	0.45	-	nC
Gate to Drain Charge at $V_{DS} = 25 \text{ V}$, $I_D = 1 \text{ A}$, $V_{GS} = 4.5 \text{ V}$	Q_{gd}	-	0.3	-	nC
Turn-On Delay Time at $V_{DD} = 10 \text{ V}$, $I_D = 1 \text{ A}$, $V_{GS} = 4.5 \text{ V}$, $R_G = 51 \Omega$	$t_{d(on)}$	-	13	-	ns
Turn-On Rise Time at $V_{DD} = 10 \text{ V}$, $I_D = 1 \text{ A}$, $V_{GS} = 4.5 \text{ V}$, $R_G = 51 \Omega$	t_r	-	13	-	ns
Turn-Off Delay Time at $V_{DD} = 10 \text{ V}$, $I_D = 1 \text{ A}$, $V_{GS} = 4.5 \text{ V}$, $R_G = 51 \Omega$	$t_{d(off)}$	-	7.7	-	ns
Turn-Off Fall Time at $V_{DD} = 10 \text{ V}$, $I_D = 1 \text{ A}$, $V_{GS} = 4.5 \text{ V}$, $R_G = 51 \Omega$	t_f	-	4.6	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_S = 0.29 \text{ A}$	V_{SD}	-	-	1.2	V
Body-Diode Continuous Current	I_S	-	-	220	mA
Body Diode Reverse Recovery Time at $I_S = 1 \text{ A}$, $di/dt = 100 \text{ A} / \mu\text{s}$	t_{rr}	-	9	-	ns
Body Diode Reverse Recovery Charge at $I_S = 1 \text{ A}$, $di/dt = 100 \text{ A} / \mu\text{s}$	Q_{rr}	-	3.7	-	nc



MMFTN301ZK-AH

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

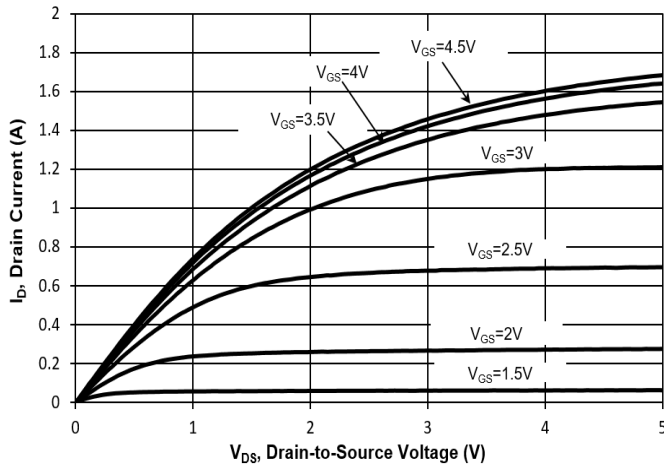


Fig. 2 Typical Transfer Characteristics

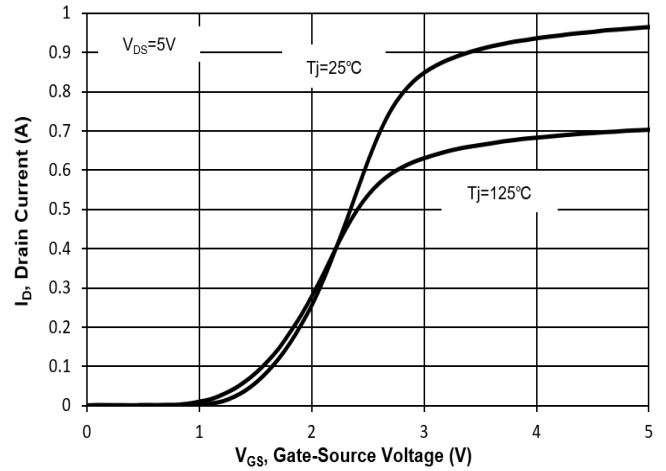


Fig. 3 On-Resistance vs. Drain Current

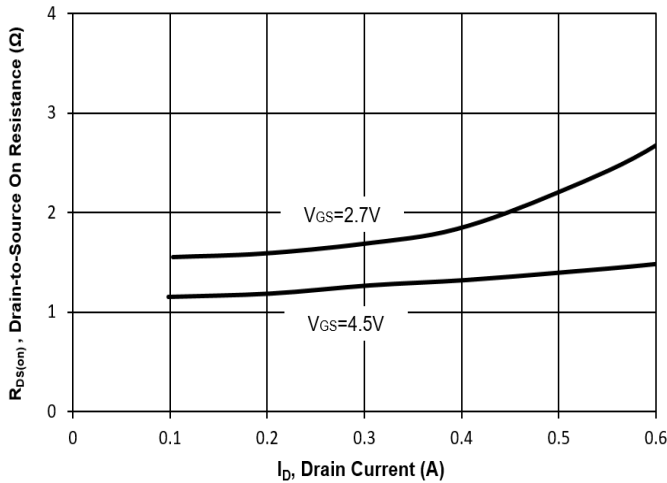


Fig. 4 On-Resistance vs. Gate-Source Voltage

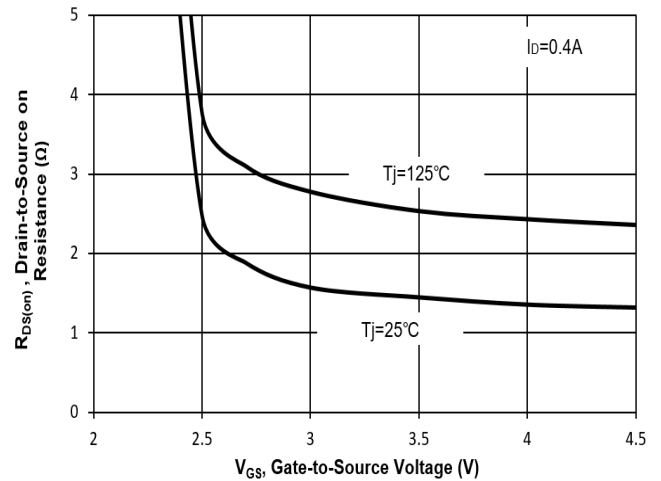


Fig. 5 On-Resistance vs. T_J

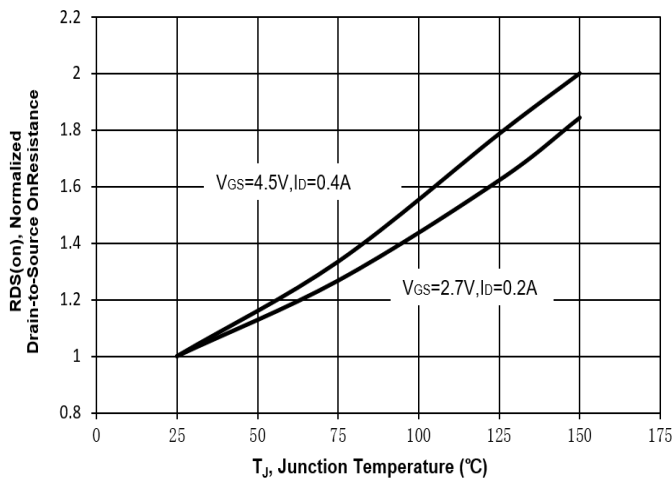
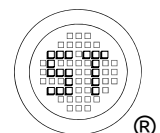
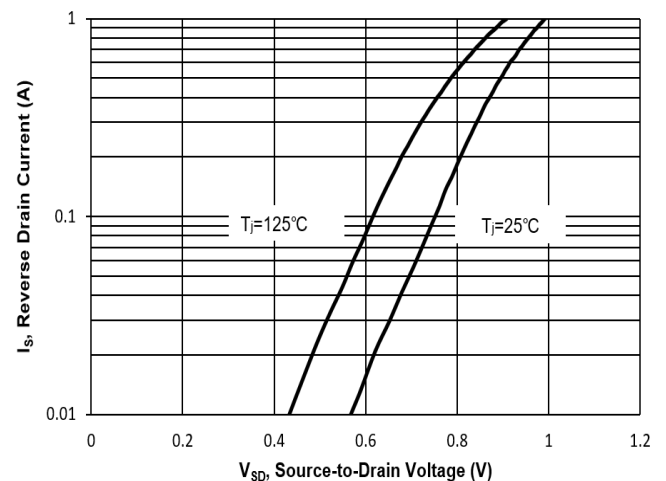


Fig. 6 Typical Body-Diode Forward Characteristics



MMFTN301ZK-AH

Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

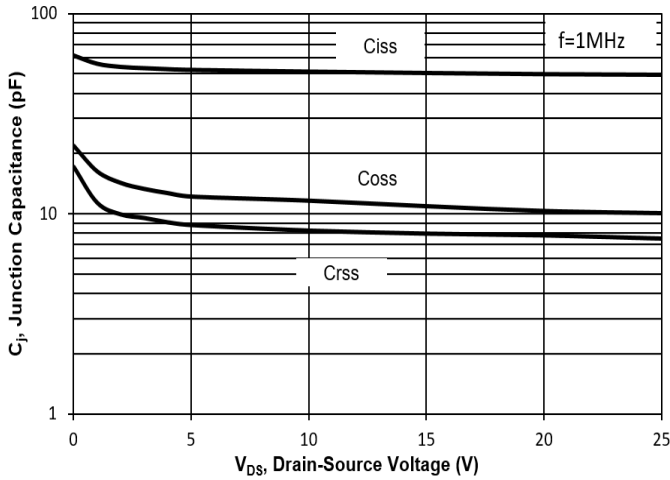


Fig. 8 Drain-Source Leakage Current vs. Tj

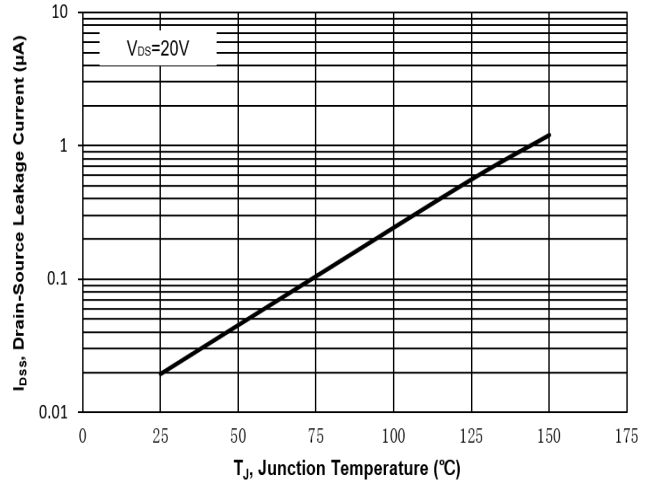


Fig. 9 V(BR)DSS vs. Junction Temperature

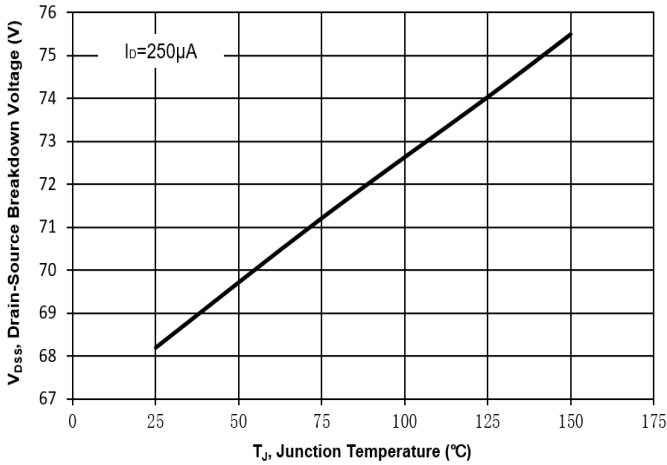


Fig. 10 Gate Threshold Variation vs. Tj

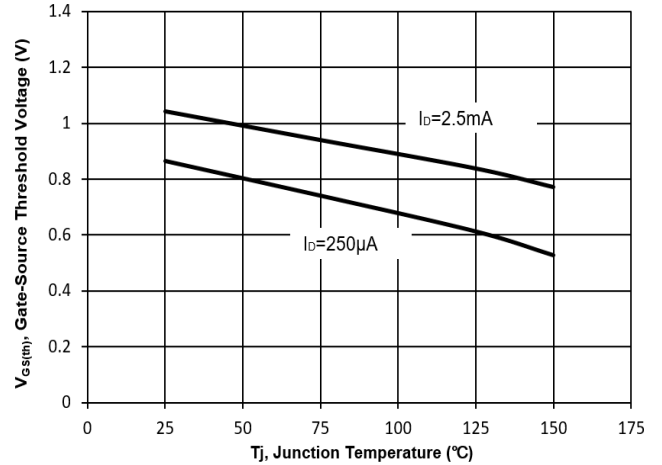
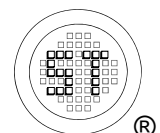
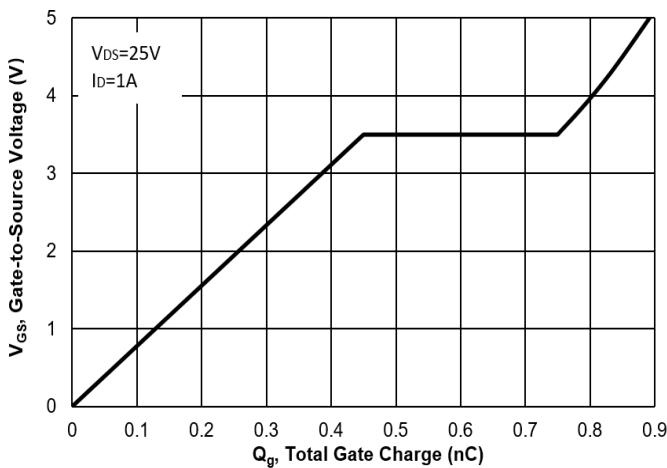


Fig. 11 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

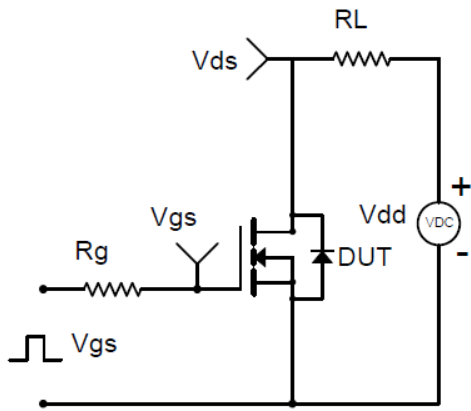


Fig.1-2 Switching Waveform

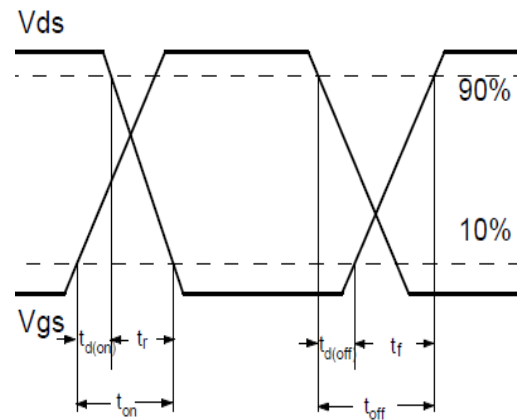


Fig.2-1 Gate charge test circuit

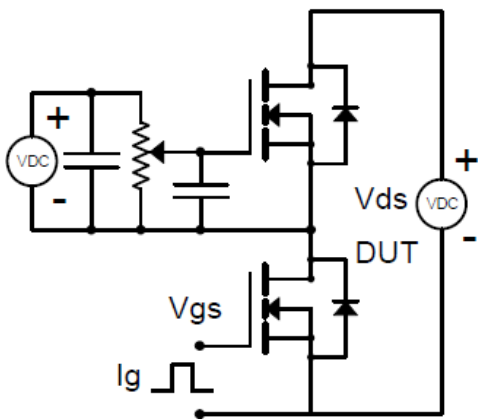
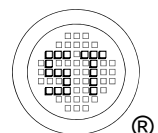
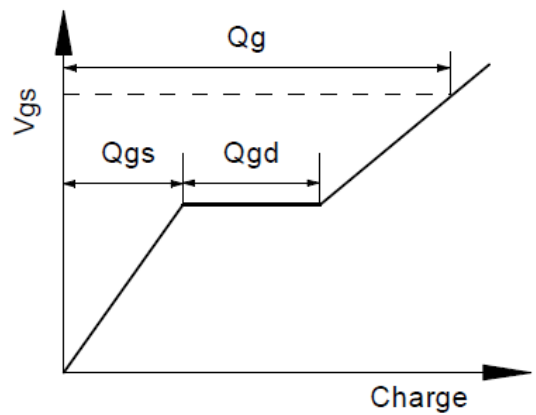


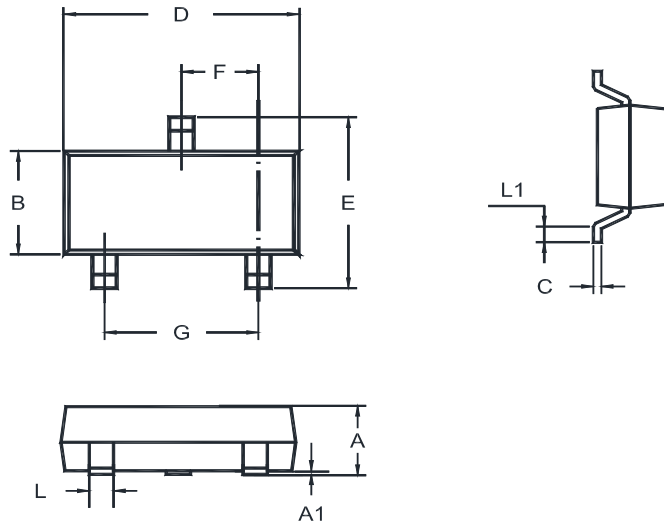
Fig.2-2 Gate charge waveform



MMFTN301ZK-AH

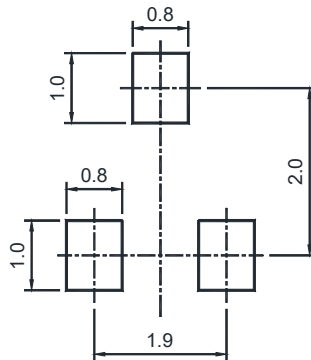
Package Outline (Dimensions in mm)

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



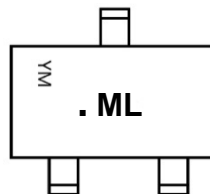
Packing information

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

- " ML " = Part No.
- " • " = HAF (Halogen and Antimony Free)
- " YM " = Date Code Marking
- " Y " = Year
- " M " = Month

Font type: Arial



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