

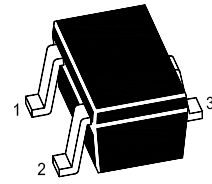
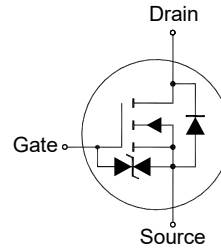
MMBT7002AKW-AH

N-Channel Enhancement Mode MOSFET

Features

- AEC-Q101 Qualified
- Low on resistance $R_{DS(ON)}$
- Low gate threshold voltage
- Low input capacitance
- Halogen and Antimony Free(HAF), RoHS compliant
- Typical ESD Protection HBM Class 2

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. Gate 2. Source 3. Drain
SOT-323 Plastic Package

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

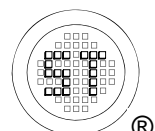
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current (Continuous)	I_D	300	mA
Peak Drain Current, Pulsed ¹⁾	I_{DM}	800	mA
Total Power Dissipation	P_{tot}	200	mW
Operating Junction and Storage Temperature Range	T_j, T_{stg}	- 55 to + 150	$^\circ\text{C}$

Thermal Resistance Ratings

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient ²⁾	$R_{\theta JA}$	625	$^\circ\text{C/W}$

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

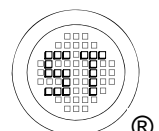
²⁾ Device mounted on FR-4 substrate PC board, with minimum recommended pad layout.



MMBT7002AKW-AH

Characteristics at $T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
Drain Source Breakdown Voltage at $I_D = 10\ \mu\text{A}$	BV_{DSS}	60	-	-	V
Zero Gate Voltage Drain Current at $V_{DS} = 60\ \text{V}$	I_{DSS}	-	-	1	μA
Gate Source Leakage Current at $V_{GS} = \pm 20\ \text{V}$	I_{GSS}	-	-	± 10	μA
Gate Threshold Voltage at $V_{DS} = 10\ \text{V}$, $I_D = 250\ \mu\text{A}$	$V_{GS(th)}$	1	-	2	V
Static Drain Source On-Resistance at $V_{GS} = 10\ \text{V}$, $I_D = 500\ \text{mA}$ at $V_{GS} = 4.5\ \text{V}$, $I_D = 200\ \text{mA}$	$R_{DS(ON)}$	- -	- -	3 4	Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $V_{DS} = 10\ \text{V}$, $I_D = 200\ \text{mA}$	g_{FS}	80	-	-	mS
Gate Resistance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	R_g	-	200	-	Ω
Input Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$	C_{iss}	-	21	-	pF
Output Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$	C_{oss}	-	12	-	pF
Reverse Transfer Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$	C_{rss}	-	0.35	-	pF
Gate charge total at $V_{DS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_g	-	0.44	-	nC
Gate to Source Charge at $V_{DS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_{gs}	-	0.2	-	nC
Gate to Drain Charge at $V_{DS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_{gd}	-	0.1	-	nC
Turn-On Delay Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_G = 25\ \Omega$	$t_{d(on)}$	-	2.7	-	ns
Turn-On Rise Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_G = 25\ \Omega$	t_r	-	2.5	-	ns
Turn-Off Delay Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_G = 25\ \Omega$	$t_{d(off)}$	-	13	-	ns
Turn-Off Fall Time at $V_{DS} = 30\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_G = 25\ \Omega$	t_f	-	8	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_S = 0.5\ \text{A}$, $V_{GS} = 0\ \text{V}$	V_{SD}	-	0.85	-	V
Body-Diode Continuous Current	I_S	-	-	300	mA
Body Diode Reverse Recovery Time at $I_S = 0.5\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	t_{rr}	-	30	-	ns
Body Diode Reverse Recovery Charge at $I_S = 0.5\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	Q_{rr}	-	29	-	nC



Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

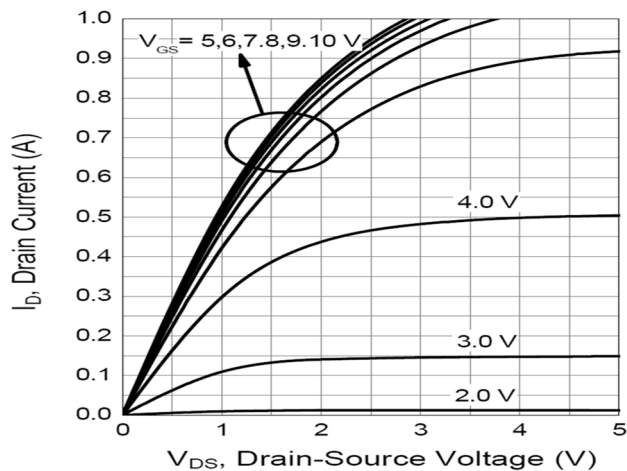


Fig. 2 Typical Transfer Characteristics

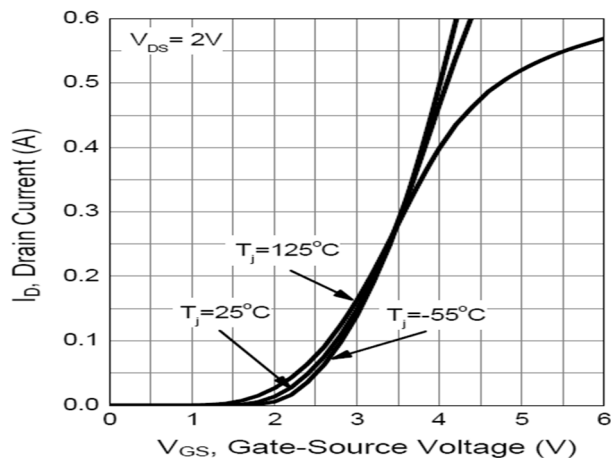


Fig. 3 $R_{DS(on)}$ vs. Gate-Source Voltage

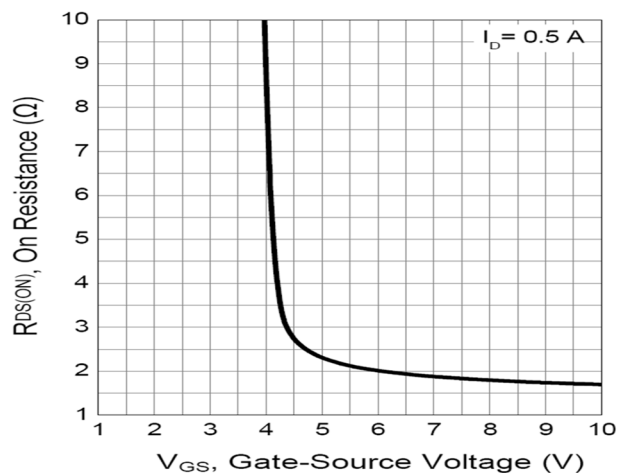


Fig. 4 on-Resistance vs. T_J

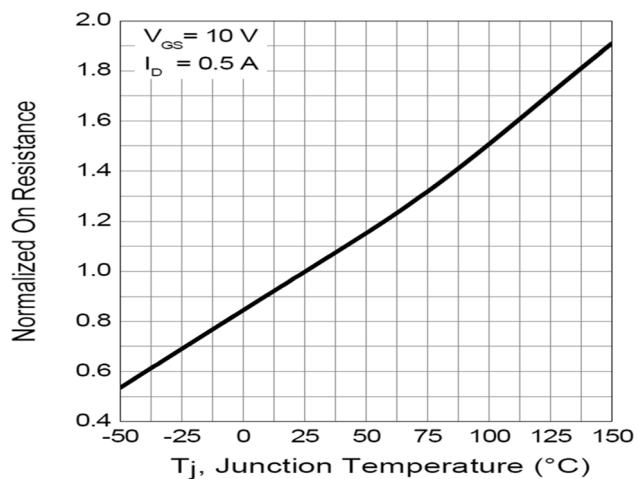


Fig. 5 on-Resistance vs. Drain Current

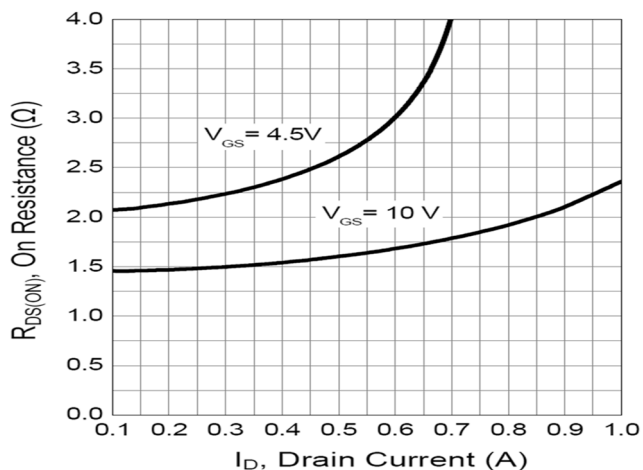
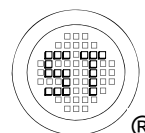
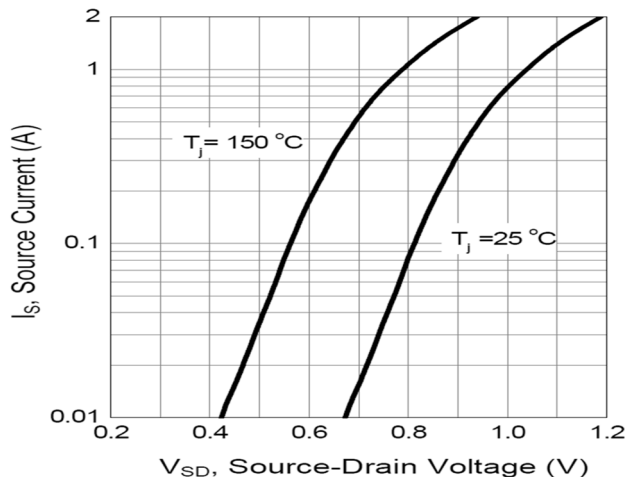


Fig. 6 Typical Forward Characteristic



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

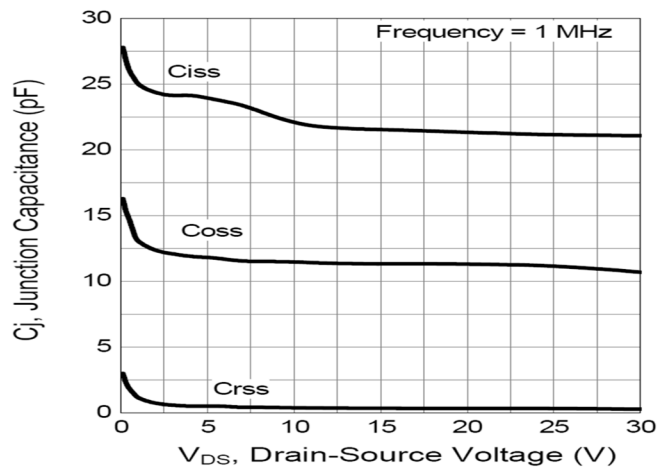


Fig. 8 Gate Charge

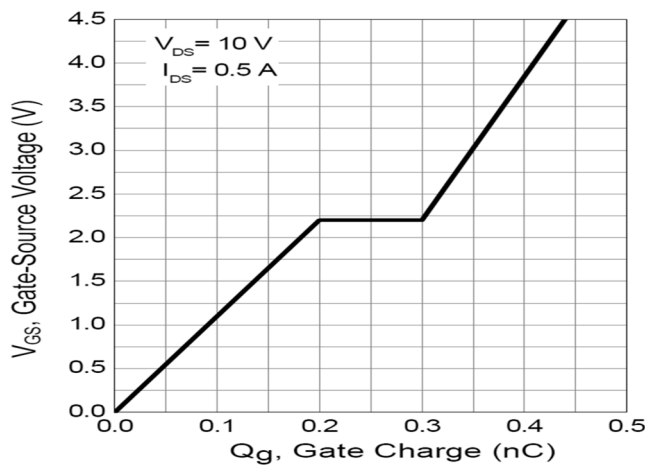
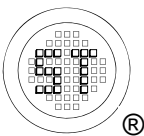
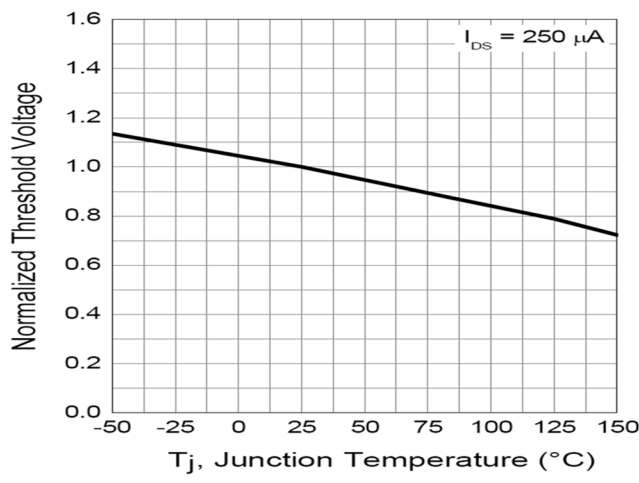


Fig. 9 Gate Threshold Variation vs. Tj



Test Circuits

Fig.1-1 Switching times test circuit

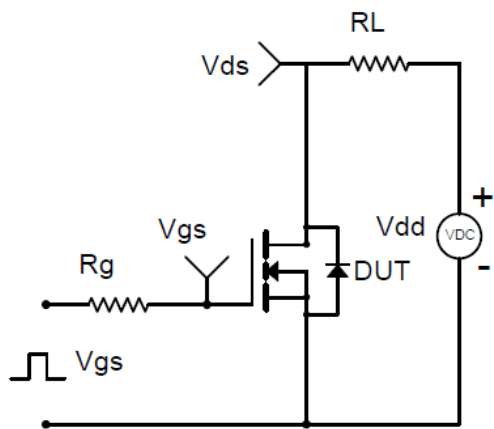


Fig.1-2 Switching Waveform

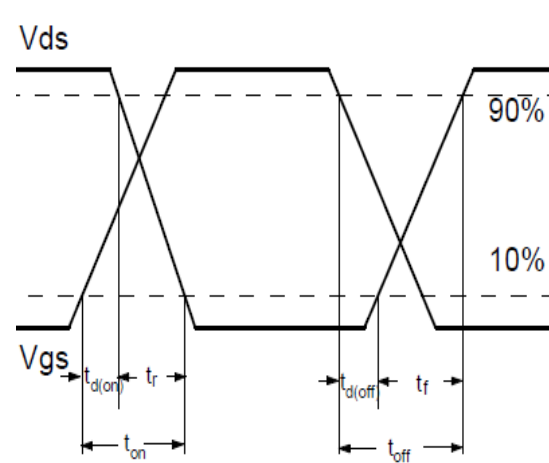


Fig.2-1 Gate charge test circuit

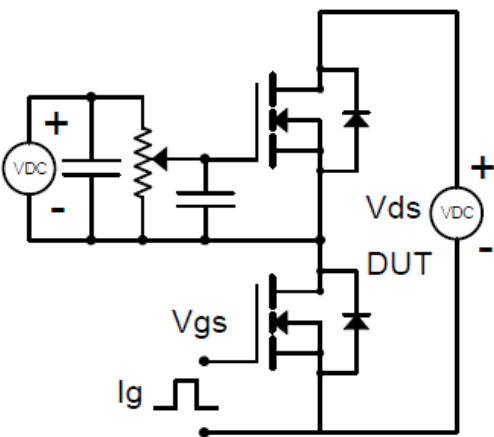
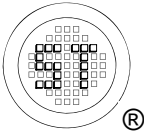
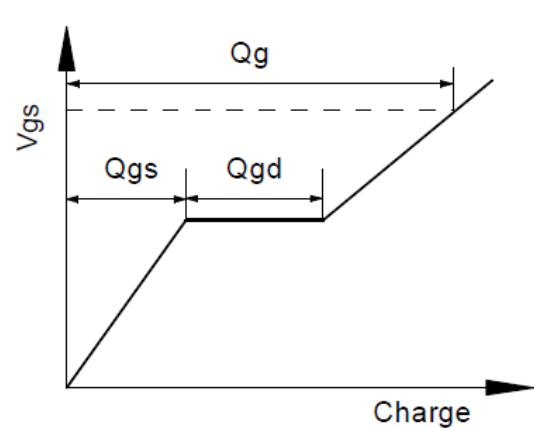


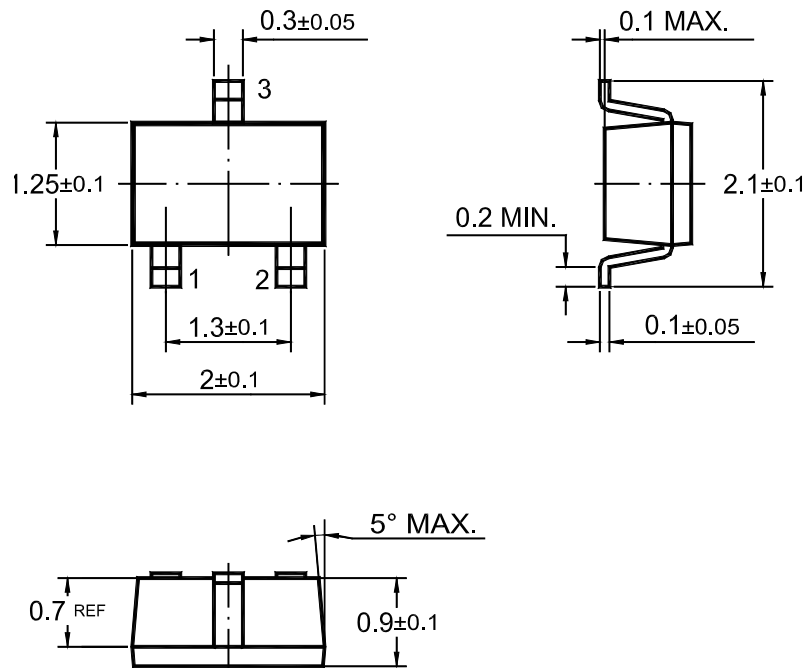
Fig.2-2 Gate charge waveform



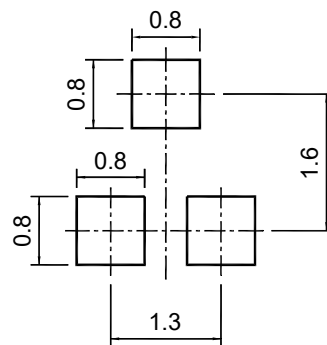
MMBT7002AKW-AH

PACKAGE OUTLINE(Dimensions in mm)

SOT-323



Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-323	8	4 ± 0.1	0.157 ± 0.004	178	7	3,000

Marking information

" K72 " = Part No.
 " • " = HAF (Halogen and Antimony Free)
 " YM " = Date Code Marking
 " Y " = Year
 " M " = Month
 Font type: Arial

