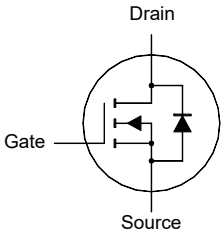
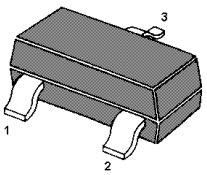
MMBT7002-HAF

N-Channel Enhancement Mode MOSFET

Features

- High density cell design for low $R_{DS(ON)}$
- Voltage controlled small signal switching
- High saturation current capability
- High speed switching
- Halogen and Antimony Free(HAF), RoHS compliant





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

Applications

- Portable appliances
- Battery management
- High speed switch
- Low power DC to DC Converter

Absolute Maximum Ratings (T_a = 25℃)

Parameter		Symbol	Value	Unit
Drain Source Voltage		V_{DSS}	60	V
Drain Gate Voltage ($R_{GS} \leq 1$ MΩ)		V_{DGR}	60	V
Gate Source Voltage	Continuous Pulsed	V_{GSS}	± 20 ± 40	V
Drain Current - Continuous	T_a = 25℃ T_a =100℃	I_D	300 190	mA
Peak Drain Current, Pulsed [1]		I_{DM}	1.5	A
Total Power Dissipation [2]		P_{tot}	350	mW
Operating and Storage Temperature Range		T_J, T_{stg}	- 55 to + 150	℃

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance - Junction to Ambient [2]	$R_{\theta JA}$	357	℃/W

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%,Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C.

[2] Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad.

Dated: 28/09/2021 Rev: 03

Characteristics at T_a = 25℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain Source Breakdown Voltage at I_D = 10 µA	BV_{DSS}	60	-	-	V
Zero Gate Voltage Drain Current at V_{DS} = 60 V	I_{DSS}	-	-	1	µA
Gate Source Leakage Current at V_{GS} = ± 20 V	I_{GSS}	-	-	± 100	nA
Gate Source Threshold Voltage at V_{DS} = V_{GS}, I_D = 250 µA	$V_{GS(th)}$	1	-	2.5	V
Static Drain Source On Resistance at V_{GS} = 10 V, I_D = 500 mA	$R_{DS(ON)}$	-	-	5	Ω
Drain Source On Voltage at V_{GS} = 5 V, I_D = 50 mA at V_{GS} = 10 V, I_D = 500 mA	$V_{DS(ON)}$	- -	- -	0.375 3.75	V
DYNAMIC PARAMETERS					
Forward Transconductance at V_{DS} = 10 V, I_D = 200 mA	g_{FS}	80	-	-	mS
Input Capacitance at V_{DS} = 25 V, f = 1 MHz	C_{iss}	-	22.5	50	pF
Output Capacitance at V_{DS} = 25 V, f = 1 MHz	C_{oss}	-	9	25	pF
Reverse Transfer Capacitance at V_{DS} = 25 V, f = 1 MHz	C_{rss}	-	7.5	10	pF
Total Gate Charge at V_{DS} = 30 V, I_D = 0.2 A , V_{GS} = 10 V	Q_g	-	1.08	-	nC
Gate Source Charge at V_{DS} = 30 V, I_D = 0.2 A , V_{GS} = 10 V	Q_{gs}	-	0.28	-	nC
Gate Drain Charge at V_{DS} = 30 V, I_D = 0.2 A , V_{GS} = 10 V	Q_{gd}	-	0.09	-	nC
Turn-On Delay Time at V_{DD} = 30 V, R_L = 150 Ω, I_D = 0.2 A, V_{GS} = 10 V, R_{GEN} = 25 Ω	$t_{d(on)}$	-	2.7	-	ns
Turn-On Rise Time at V_{DD} = 30 V, R_L = 150 Ω, I_D = 0.2 A, V_{GS} = 10 V, R_{GEN} = 25 Ω	t_r	-	17	-	ns
Turn-Off Delay Time at V_{DD} = 30 V, R_L = 150 Ω, I_D = 0.2 A, V_{GS} = 10 V, R_{GEN} = 25 Ω	$t_{d(off)}$	-	8.5	-	ns
Turn-Off Fall Time at V_{DD} = 30 V, R_L = 150 Ω, I_D = 0.2 A, V_{GS} = 10 V, R_{GEN} = 25 Ω	t_f	-	28	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at V_{GS} = 0 V, I_S = 0.5 A	V_{SD}	-	-	1.2	V
Body Diodes Continuous Current	I_S	-	-	300	mA

Electrical Characteristics Curves

Fig. 1 Output Characteristics

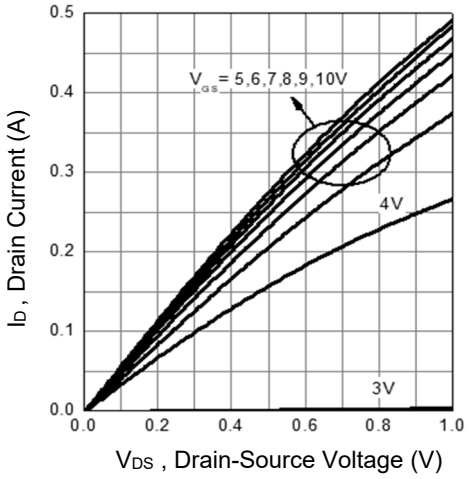


Fig. 2 Transfer Characteristics

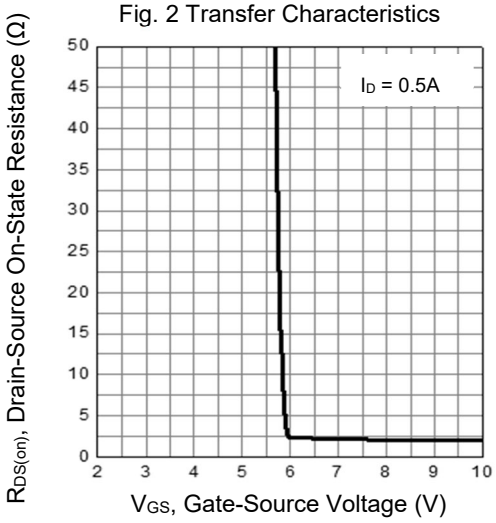


Fig. 3 on-Resistance vs. Drain Current

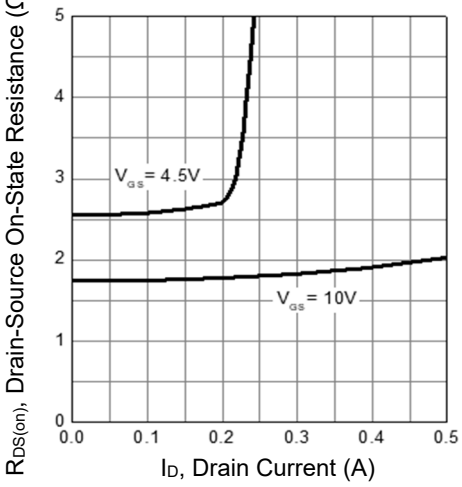


Fig. 4 Body Diode Forward Characteristics

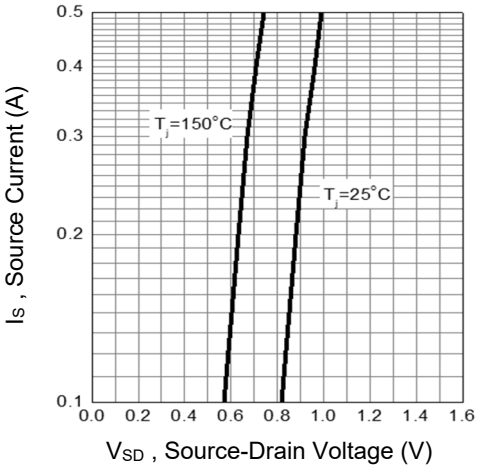


Fig. 5 $R_{DS(on)}$ vs. T_j

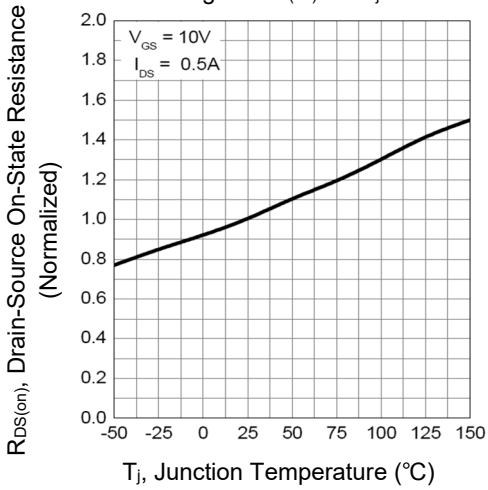
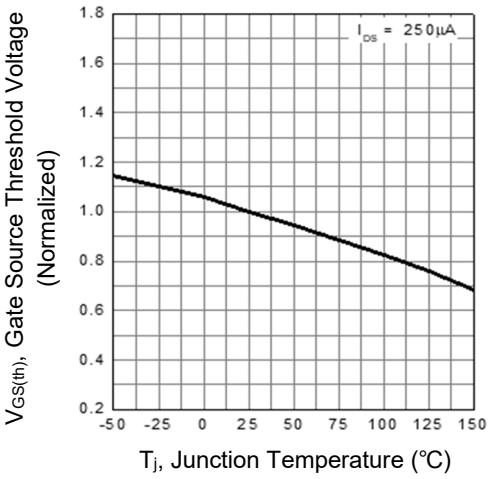


Fig. 6 $V_{GS(th)}$ vs T_j



Electrical characteristic curve

Fig. 7 Capacitance

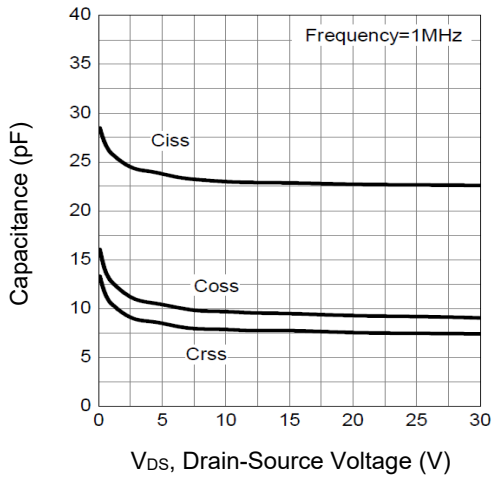
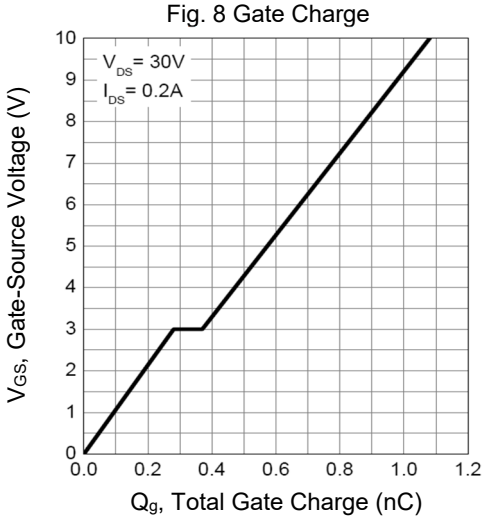


Fig. 8 Gate Charge



Test Circuits

Fig.1-1 Switching times test circuit

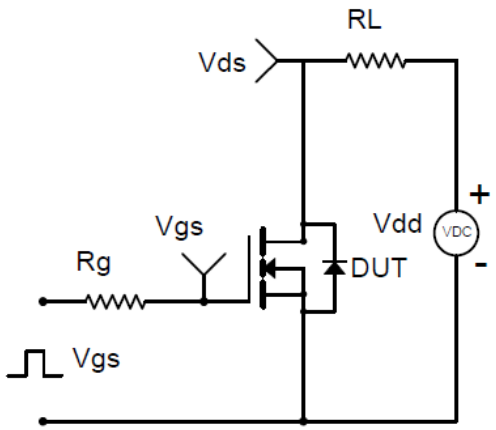


Fig.1-2 Switching Waveform

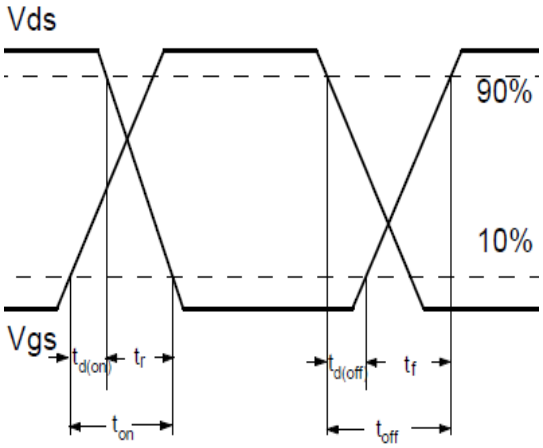


Fig.2-1 Gate charge test circuit

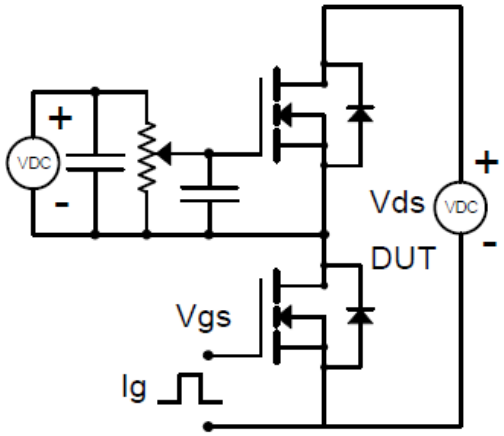
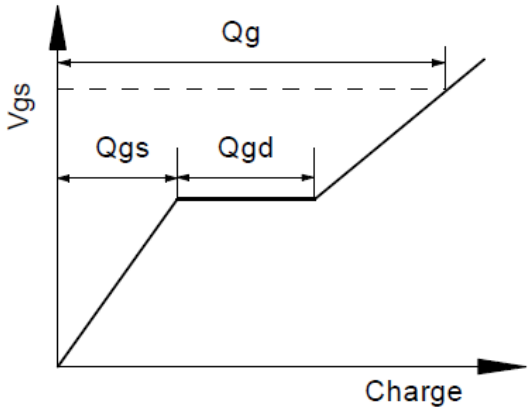
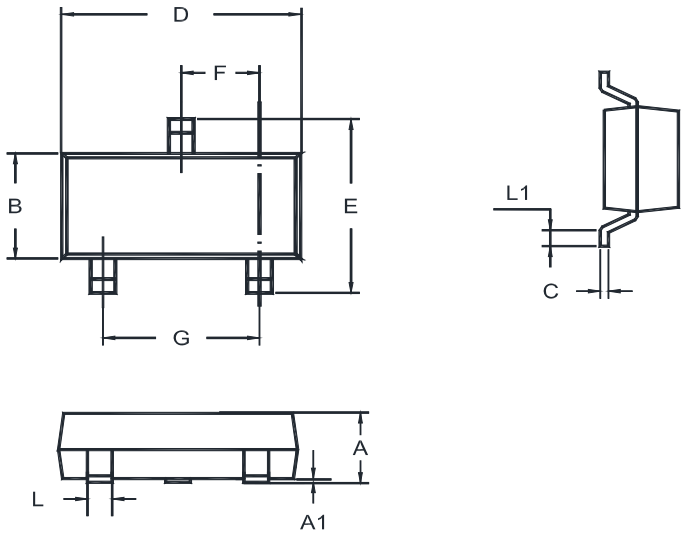


Fig.2-2 Gate charge waveform



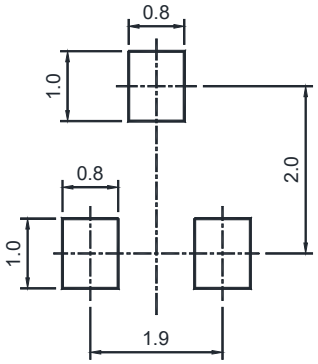
MMBT7002-HAF

Package Outline (Dimensions in mm) SOT-23



Unit	A	A1	B	C	D	E	F	G	L	L1
mm	1.20 0.89	0.100 0.013	1.40 1.20	0.19 0.08	3.04 2.80	2.6 2.2	1.02 0.89	2.04 1.78	0.51 0.37	0.2 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

" S72 " = Part No.
" • " = HAF (Halogen and Antimony Free)
" YM " = Date Code Marking
" Y " = Year
" M " = Month
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