



# MMBT222A-AU

## NPN GENERAL PURPOSE SWITCHING TRANSISTOR

**VOLTAGE** 40 Volt    **POWER** 225 mWatt

**SOT-23**    Unit : inch(mm)

### FEATURES

- NPN epitaxial silicon, planar design
- Collector-emitter voltage  $V_{CE} = 40V$
- Collector current  $I_C = 600mA$
- AEC-Q101 qualified
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

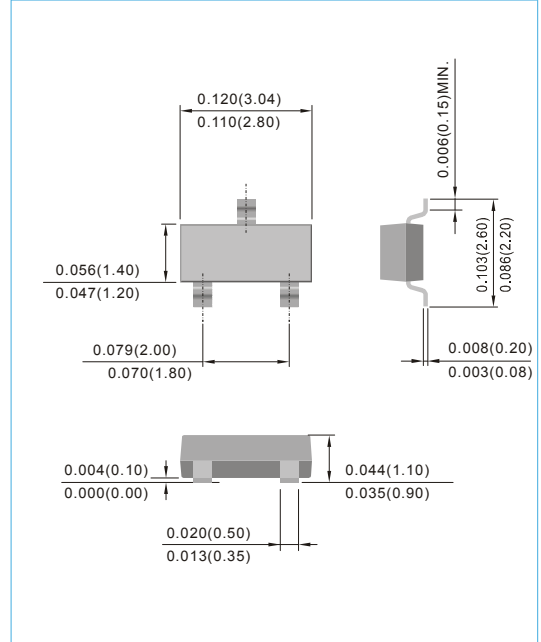
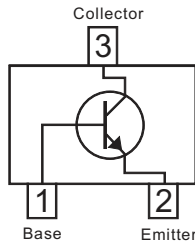
### MECHANICAL DATA

Case: SOT-23, Plastic

Terminals: Solderable per MIL-STD-750, Method 2026

Approx. Weight: 0.0003 ounces, 0.0084 grams

Marking: M2A



### ABSOLUTE RATINGS

Parameter	Symbol	Value	Units
Collector - Emitter Voltage	$V_{CEO}$	40	V
Collector - Base Voltage	$V_{CBO}$	75	V
Emitter - Base Voltage	$V_{EBO}$	6	V
Collector Current - Continuous	$I_C$	600	mA

### THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Units
Max. Power Dissipation (Note 1)	$P_{TOT}$	225	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^{\circ}C/W$
Junction Temperature	$T_J$	-55 to +150	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55 to +150	$^{\circ}C$

Note 1 : Transistor mounted on FR-5 board 1 x 0.75 x 0.062 in.



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## ELECTRICAL CHARACTERISTICS

PARAMETER	Symbol	Test Condition	MIN.	TYP.	MAX.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=1.0mA, I_B=0$	40	-	-	V
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=10\mu A, I_E=0$	75	-	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=10\mu A, I_C=0$	6.0	-	-	V
Base Cutoff Current	$I_{BL}$	$V_{CE}=60V, V_{EB}=3.0V$	-	-	20	nA
Collector Cutoff Current	$I_{CEX}$	$V_{CE}=60V, V_{EB}=3.0V$	-	-	10	nA
	$I_{CBO}$	$V_{CE}=60V, I_E=0, V_{CE}=60V, I_E=0, T_J=125^\circ C$	-	-	10 10	nA uA
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=3.0V, I_C=0,$	-	-	100	nA
DC Current Gain	$h_{FE}$	$I_C=0.1mA, V_{CE}=10V$	35	-	-	-
		$I_C=1.0mA, V_{CE}=10V$	50	-	-	-
		$I_C=10mA, V_{CE}=10V$	75	-	-	-
		$I_C=10mA, V_{CE}=10V, T_J=125^\circ C$	35	-	-	-
		$I_C=150mA, V_{CE}=10V$ (Note 2)	100	-	300	-
		$I_C=150mA, V_{CE}=1V$ (Note 2)	50	-	-	-
$I_C=500mA, V_{CE}=10V$ (Note 2)	40	-	-	-		
Collector - Emitter Saturation Voltage (Note 2)	$V_{CE(SAT)}$	$I_C=150mA, I_B=15mA$ $I_C=500mA, I_B=50mA$	-	-	0.3 1.0	V
Base - Emitter Saturation Voltage (Note 2)	$V_{BE(SAT)}$	$I_C=150mA, I_B=15mA$ $I_C=500mA, I_B=50mA$	0.6 -	- -	1.2 2.0	V
Collector - Base Capacitance	$C_{CBO}$	$V_{CB}=10V, I_E=0, f=1MHz$	-	-	8.0	pF
Emitter - Base Capacitance	$C_{EBO}$	$V_{CB}=0.5V, I_C=0, f=1MHz$	-	-	25	pF
Delay Time	$t_d$	$V_{CC}=3V, V_{BE}=-5V, I_C=150mA, I_B=15mA$	-	-	10	ns
Rise Time	$t_r$	$V_{CC}=3V, V_{BE}=-5V, I_C=150mA, I_B=15mA$	-	-	25	ns
Storage Time	$t_s$	$V_{CC}=30V, I_C=150mA, I_B1=I_B2=15mA$	-	-	225	ns
Fall Time	$t_f$	$V_{CC}=30V, I_C=150mA, I_B1=I_B2=15mA$	-	-	60	ns

Note 2: Pulse Test: Pulse Width  $\leq 300 \mu s$ , Duty Cycle  $\leq 2.0\%$ .

### SWITCHING TIME EQUIVALENT TEST CIRCUITS

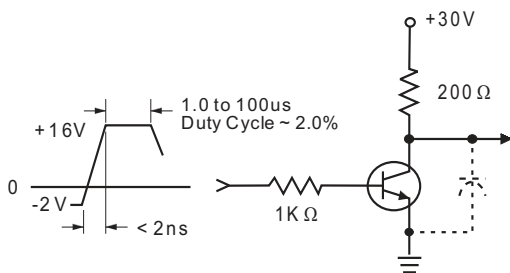


Fig. 1 Turn-On Time

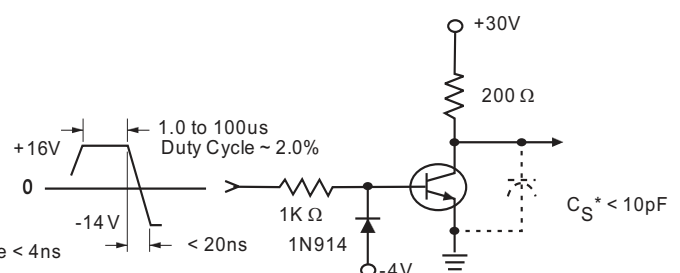
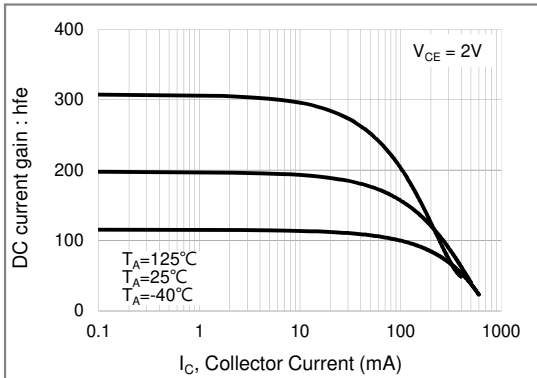


Fig. 2 Turn-Off Time

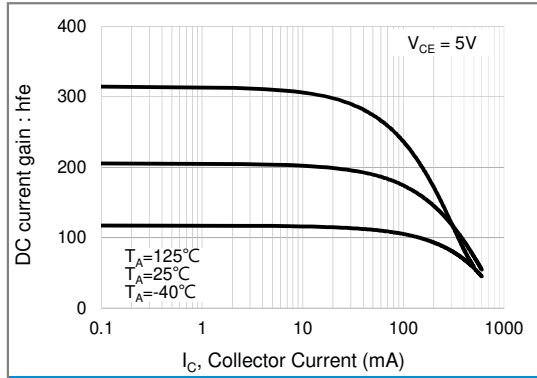
\* Total shunt capacitance of test jig, connectors, and oscilloscope



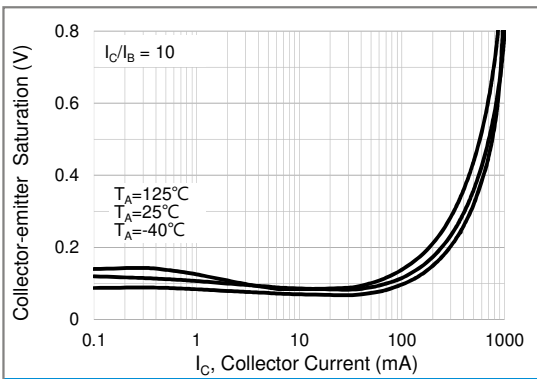
# MMBT222A-AU



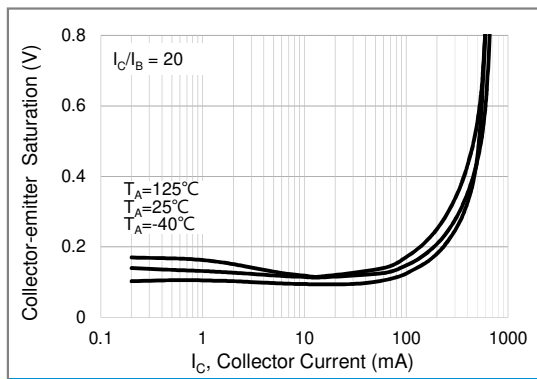
**Fig.3 DC Current Gain**



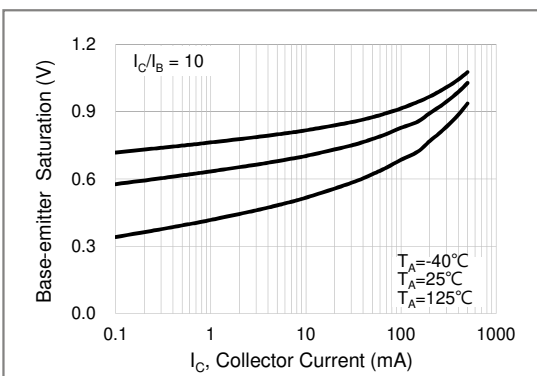
**Fig.4 DC Current Gain**



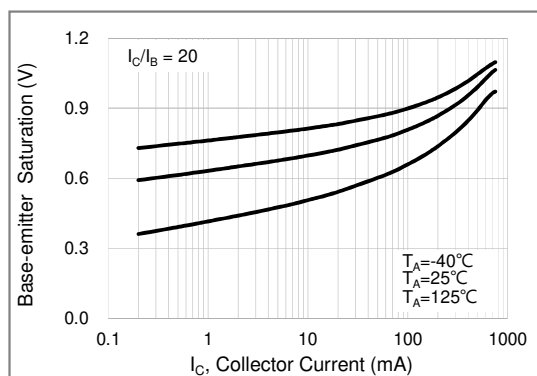
**Fig.5 Collector-Emitter Saturation Voltage**



**Fig.6 Collector-Emitter Saturation Voltage**



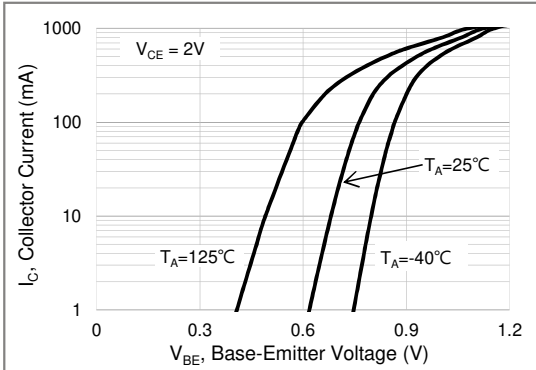
**Fig.7 Base-Emitter Saturation Voltage**



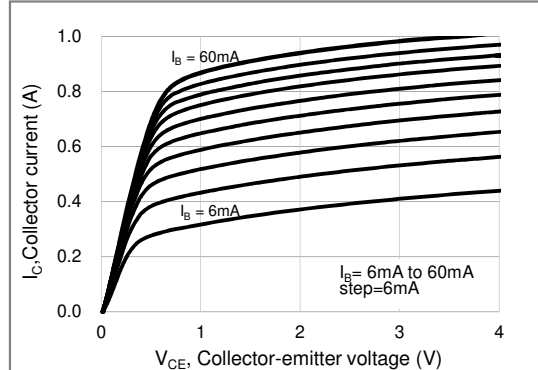
**Fig.8 Base-Emitter Saturation Voltage**



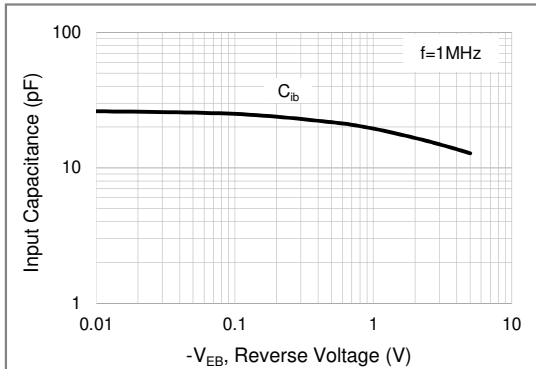
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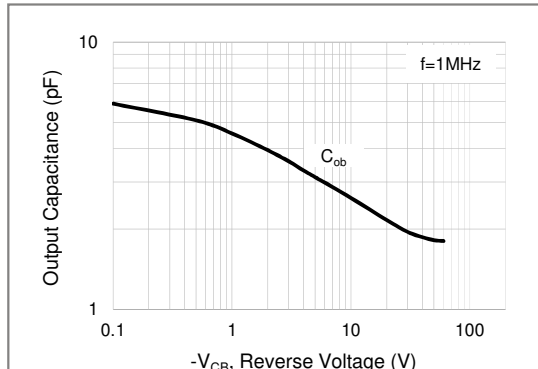
**Fig.9 Base-Emitter Voltage**



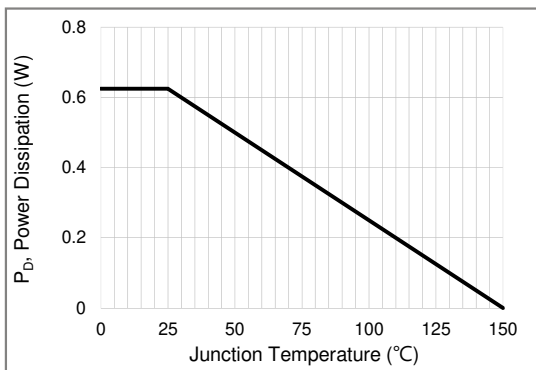
**Fig.10 Collector Current**



**Fig.11 Input Capacitance**



**Fig.12 Output Capacitance**



**Fig.13 Power Derating Curve**

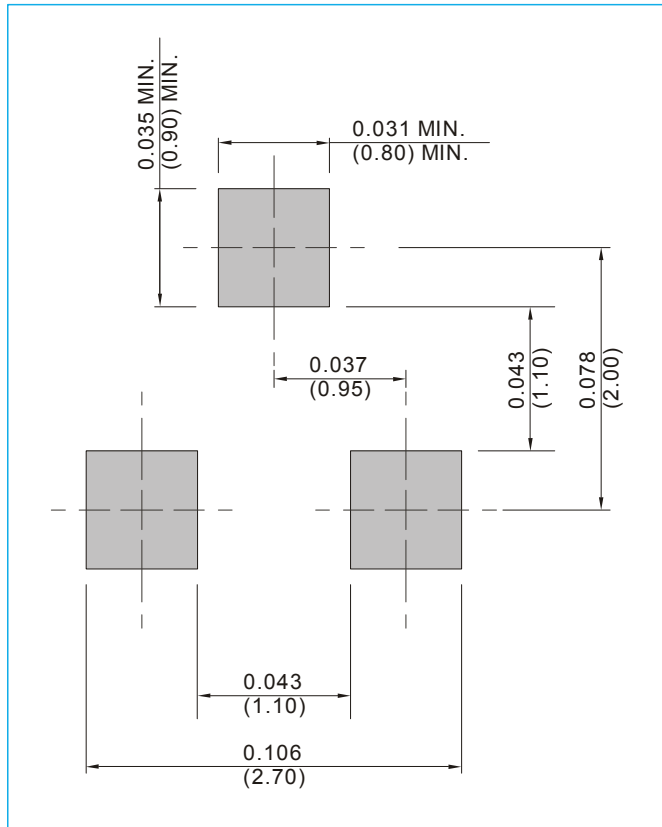


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## MOUNTING PAD LAYOUT

**SOT-23**

Unit : inch(mm)



## ORDER INFORMATION

- Packing information  
T/R - 12K per 13" plastic Reel  
T/R - 3K per 7" plastic Reel



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## Part No.\_packing code\_Version

MMBT2222A-AU\_R1\_000A1

MMBT2222A-AU\_R2\_000A1

For example :

**RB500V-40\_R2\_00001**



Packing Code <b>XX</b>				Version Code <b>XXXXX</b>		
Packing type	1 <sup>st</sup> Code	Packing size code	2 <sup>nd</sup> Code	HF or RoHS	1 <sup>st</sup> Code	2 <sup>nd</sup> ~5 <sup>th</sup> Code
Tape and Ammunition Box (T/B)	<b>A</b>	N/A	<b>0</b>	<b>HF</b>	<b>0</b>	serial number
Tape and Reel (T/R)	<b>R</b>	7"	<b>1</b>	<b>RoHS</b>	<b>1</b>	serial number
Bulk Packing (B/P)	<b>B</b>	13"	<b>2</b>			
Tube Packing (T/P)	<b>T</b>	26mm	<b>X</b>			
Tape and Reel (Right Oriented) (TRR)	<b>S</b>	52mm	<b>Y</b>			
Tape and Reel (Left Oriented) (TRL)	<b>L</b>	PANASERT T/B CATHODE UP (PBCU)	<b>U</b>			
FORMING	<b>F</b>	PANASERT T/B CATHODE DOWN (PBCD)	<b>D</b>			



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