

**MMBT2222A**  
NPN TRANSISTOR



**VOLTAGE:** 40 Volts

**CURRENT:** 0.6 Amperes

SOT-23

Marking and Polarity

**FEATURES**

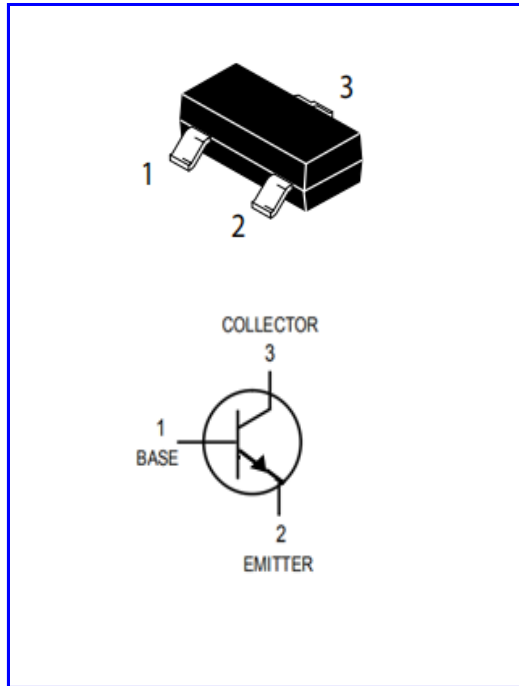
- NPN Medium Power Amplifier and Switching
- Suitable for Driver Stage of Small Motor

**MECHANICAL DATA**

- **Package:** SOT-23
- **Epoxy UL:** 94V-0
- **Mounting position:** Any
- **Weight:** approx. 0.01g

**DEVICE MARKING**

Device	Marking
MMBT2222A	1P



**Maximum Ratings (Ratings at 25°C ambient temperature unless otherwise specified.)**

Parameter	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	75	V
Collect-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6	V
Collector Current	$I_C$	0.6	A
Collector Power Dissipation	$P_C$	300	mW

**Thermal Characteristics (Ratings at 25°C ambient temperature unless otherwise specified.)**

Junction Temperature	$T_J$	-55 to 150	°C
Storage Temperature Range	$T_{STG}$	-55 to 150	°C
Typical thermal resistance	$R_{\theta JA}$	417	°C/W



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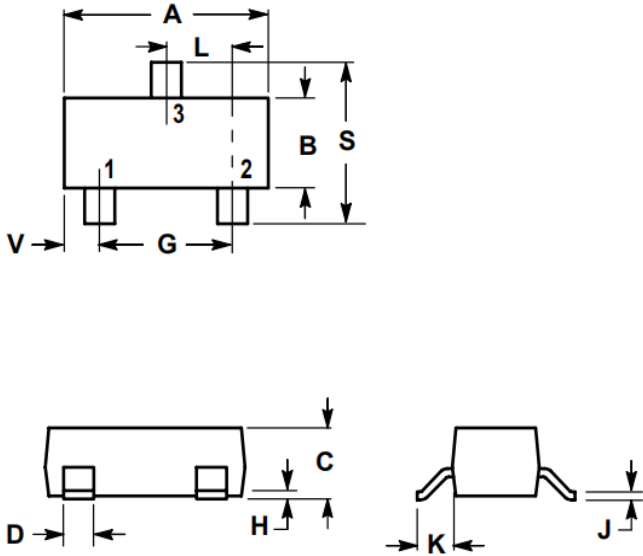
**ELECTRICAL CHARACTERISTICS** ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)

Characteristic	Test Condition	Symbol	Min.	Typ.	Max.	Unit
Collector-Emitter Breakdown Voltage	$I_C=10\text{mA}, I_B=0$	$V_{(BR)CEO}$	40	-	-	V
Collector-Base Breakdown Voltage	$I_C=10\mu\text{A}, I_E=0$	$V_{(BR)CBO}$	75	-	-	V
Emitter-Base Breakdown Voltage	$I_E=10\mu\text{A}, I_C=0$	$V_{(BR)EBO}$	6	-	-	V
Collector Cutoff Current	$V_{CB}=60\text{V}, I_E=0$	$I_{CBO}$	-	-	0.01	$\mu\text{A}$
Emitter Cutoff Current	$V_{EB}=3\text{V}, I_C=0$	$I_{EBO}$	-	-	0.1	$\mu\text{A}$
DC Current Gain	$V_{CE}=10\text{V}, I_C=150\text{mA}$	$H_{FE}$	100	-	300	
Collector-Emitter Saturation Voltage	$I_C=150\text{mA}, I_B=15\text{mA}$	$V_{CE(Sat)}$	-	-	0.3	V
Base-Emitter Saturation Voltage	$I_C=150\text{mA}, I_B=15\text{mA}$	$V_{BE(Sat)}$	-	-	1.2	V
Transition Frequency	$V_{CE}=20\text{V}, I_C=20\text{mA}$ $f=100\text{MHz}$	$F_T$	300	-	-	MHz
Delay Time	$V_{CC}=30\text{Vdc}, V_{BE(off)}=-0.5\text{Vdc}$ $I_C=150\text{mA}, I_B=15\text{mA}$	$t_d$	-	-	10	ns
Rise Time	$V_{CC}=30\text{Vdc}, V_{BE(off)}=-0.5\text{Vdc}$ $I_C=150\text{mA}, I_B=15\text{mA}$	$t_r$	-	-	25	ns
Storage Time	$V_{CC}=30\text{Vdc}, I_C=150\text{mA}$ $I_B=I_{B2}=15\text{mA}$	$t_s$	-	-	225	ns
Fall Time	$V_{CC}=30\text{Vdc}, I_C=150\text{mA}$ $I_B=I_{B2}=15\text{mA}$	$t_f$	-	-	60	ns

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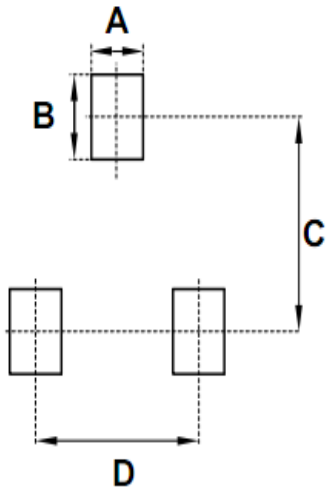
**OUTLINE DRAWINGS**



**SOT-23**

OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.800	-	3.040	0.1102	-	0.1197
B	1.200	-	1.400	0.0472	-	0.0551
C	0.890	-	1.110	0.0350	-	0.0437
D	0.370	-	0.500	0.0146	-	0.0197
G	1.780	-	2.040	0.0701	-	0.0803
H	0.013	-	0.100	0.0005	-	0.0039
J	0.085	-	0.177	0.0033	-	0.0070
K	0.350	-	0.690	0.0138	-	0.0272
L	0.890	-	1.020	0.0350	-	0.0402
S	2.100	-	2.640	0.0827	-	0.1039
V	0.450	-	0.600	0.0177	-	0.0236

**MOUNTING PAD LAYOUT**



**SOT-23**

RECOMMENDED MOUNTING PAD DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	0.600	-	-	0.0236	-
B	-	0.800	-	-	0.0315	-
C	-	2.020	-	-	0.0795	-
D	-	1.900	-	-	0.0748	-

**PACKING INFORMATION**

**SOT-23**

Package Method	Reel Size (mm)	Quantity (pcs/reel)	Inner Box Size LxWxH(mm)	Quantity (pcs/Inner Box)	Carton Size LxWxH(mm)	Quantity (pcs/carton)
Tape Reel	Φ180	3000	340x340x40	6000	364x364x360	160000

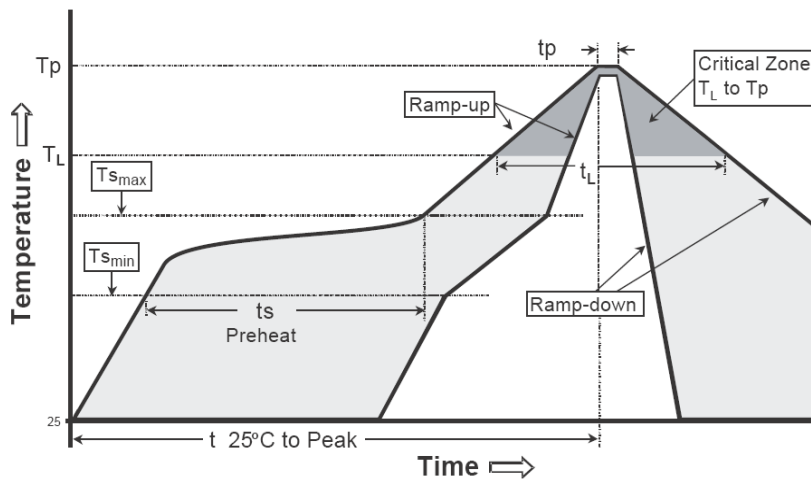
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**Recommended wave soldering condition**

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat -Temperature Min(TS min) -Temperature Max(TS max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (T <sub>L</sub> ) - Time (t <sub>L</sub> )	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(T <sub>P</sub> )	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(t <sub>p</sub> )	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

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