

Application

for switching and amplifier applications

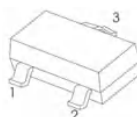
Marking : **MMBT2222T** : M1B

MMBT2222AT :1P

M1B

1P

SOT-23



1.BASE
2.EMITTER
3.COLLECTOR

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value		Unit
		MMBT2222T	MMBT2222AT	
Collector Base Voltage	V_{CBO}	60	75	V
Collector Emitter Voltage	V_{CEO}	30	40	V
Emitter Base Voltage	V_{EBO}	5	6	V
Collector Current	I_C	600		mA
Total Power Dissipation	P_{tot}	200		mW
Junction Temperature	T_j	150		$^{\circ}\text{C}$
Storage Temperature Range	T_S	-55 to +150		$^{\circ}\text{C}$

Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter		Symbol	Min.	Max.	Unit
DC Current Gain					
at $V_{CE} = 10\text{ V}$, $I_C = 0.1\text{ mA}$		h_{FE}	35	-	-
at $V_{CE} = 10\text{ V}$, $I_C = 1\text{ mA}$		h_{FE}	50	-	-
at $V_{CE} = 10\text{ V}$, $I_C = 10\text{ mA}$		h_{FE}	75	-	-
at $V_{CE} = 1\text{ V}$, $I_C = 150\text{ mA}$		h_{FE}	50	-	-
at $V_{CE} = 10\text{ V}$, $I_C = 150\text{ mA}$		h_{FE}	100	300	-
at $V_{CE} = 10\text{ V}$, $I_C = 500\text{ mA}$	MMBT2222T	h_{FE}	30	-	-
	MMBT2222AT	h_{FE}	40	-	-
Collector Base Voltage					
at $I_C = 10\text{ }\mu\text{A}$	MMBT2222T	V_{CBO}	60	-	V
	MMBT2222AT		75	-	
Collector Emitter Voltage					
at $I_C = 10\text{ mA}$	MMBT2222T	V_{CEO}	30	-	V
	MMBT2222AT		40	-	
Emitter Base Voltage					
at $I_E = 10\text{ }\mu\text{A}$	MMBT2222T	V_{EBO}	5	-	V
	MMBT2222AT		6	-	
Collector Base Cutoff Current					
at $V_{CB} = 50\text{ V}$	MMBT2222T	I_{CBO}	-	100	nA
at $V_{CB} = 60\text{ V}$	MMBT2222AT		-	100	
Emitter Base Cutoff Current					
at $V_{EB} = 3\text{ V}$		I_{EBO}	-	100	nA
Collector Emitter Saturation Voltage					
at $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$	MMBT2222T	$V_{CE(sat)}$	-	0.4	V
	MMBT2222AT		-	0.3	
at $I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$	MMBT2222T		-	1.6	
	MMBT2222AT		-	1	
Base Emitter Saturation Voltage					
at $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$	MMBT2222T	$V_{BE(sat)}$	-	1.3	V
	MMBT2222AT		0.6	1.2	
at $I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$	MMBT2222T		-	2.6	
	MMBT2222AT		-	2	
Transition Frequency					
at $V_{CE} = 20\text{ V}$, $-I_E = 20\text{ mA}$, $f = 100\text{ MHz}$		f_T	300	-	MHz
Collector Output Capacitance					
at $V_{CB} = 10\text{ V}$, $f = 100\text{ KHz}$		C_{ob}	-	8	pF
Emitter Input Capacitance					
at $V_{EB} = 0.5\text{ V}$, $f = 100\text{ KHz}$		C_{ib}	-	25	pF
Delay Time					
at $V_{CC} = 30\text{ V}$, $V_{BE(OFF)} = 0.5\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$		t_d	-	10	ns
Rise Time					
at $V_{CC} = 30\text{ V}$, $V_{BE(OFF)} = 0.5\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$		t_r	-	25	ns
Storage Time					
at $V_{CC} = 30\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = -I_{B2} = 15\text{ mA}$		t_{stg}	-	225	ns
Fall Time					
at $V_{CC} = 30\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = -I_{B2} = 15\text{ mA}$		t_f	-	60	ns

RATING AND CHARACTERISTIC CURVES

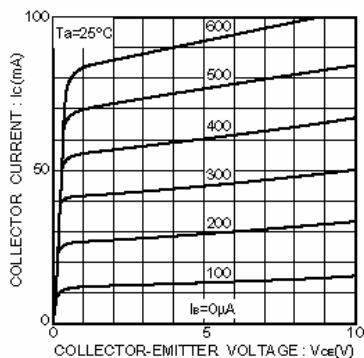


Fig.1 Grounded emitter output characteristics

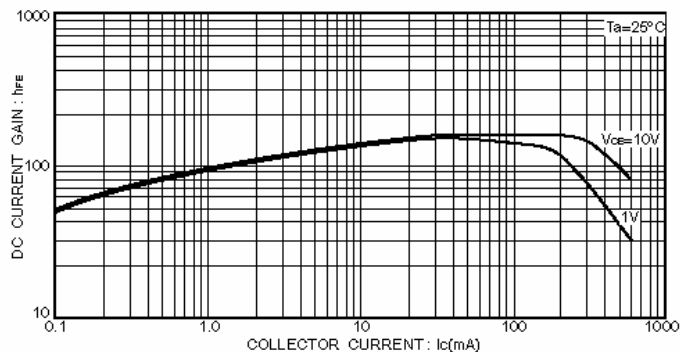


Fig.3 DC current gain vs. collector current(I)

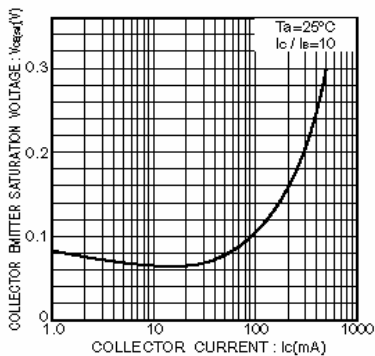


Fig.2 Collector-emitter saturation voltage vs. collector current

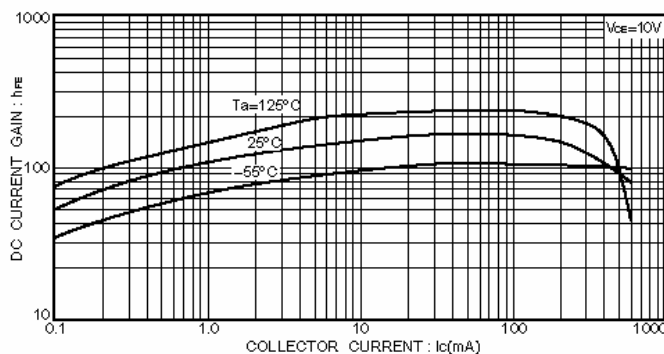


Fig.4 DC current gain vs. collector current(II)

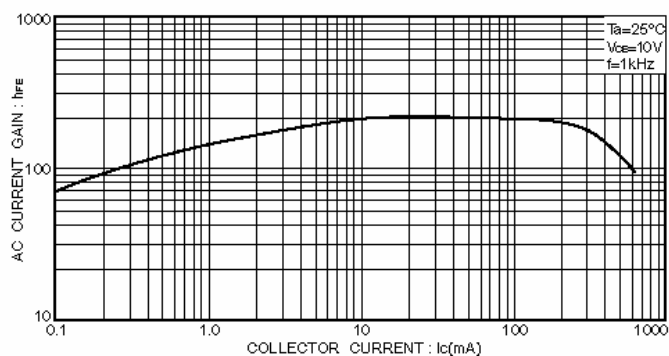


Fig.5 AC current gain vs. collector current

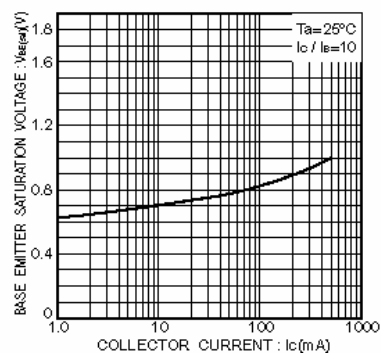


Fig.6 Base-emitter saturation voltage vs. collector current

RATING AND CHARACTERISTIC CURVES

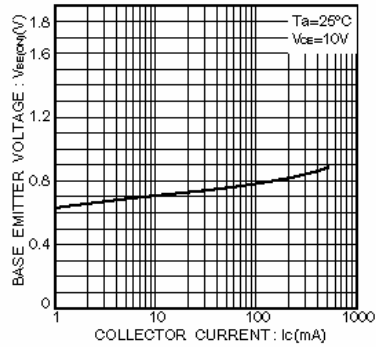


Fig.7 Grounded emitter propagation characteristics

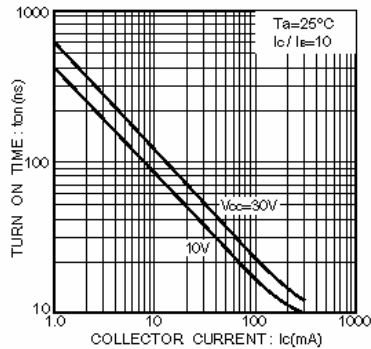


Fig.8 Turn-on time vs. collector current

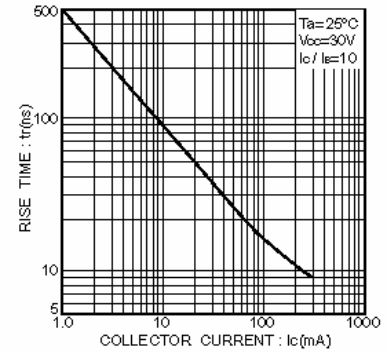


Fig.9 Rise time vs. collector current

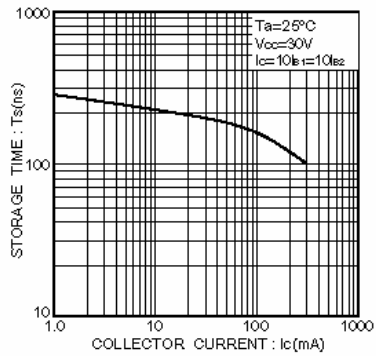


Fig.10 Storage time vs. collector current

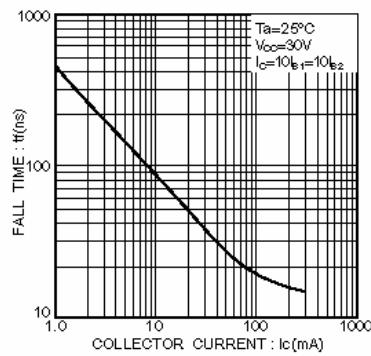


Fig.11 Fall time vs. collector current

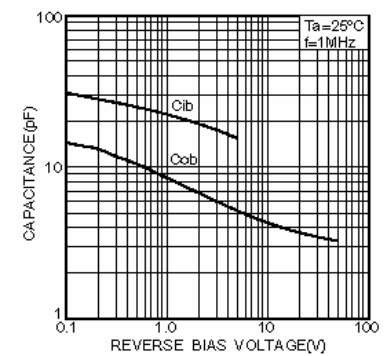


Fig.12 Input / output capacitance vs. voltage

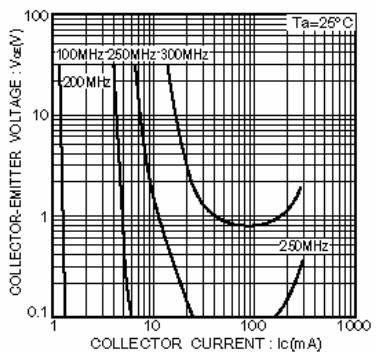


Fig.13 Gain bandwidth product

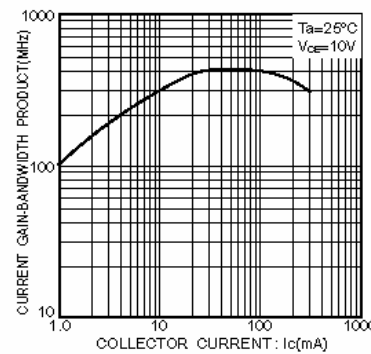
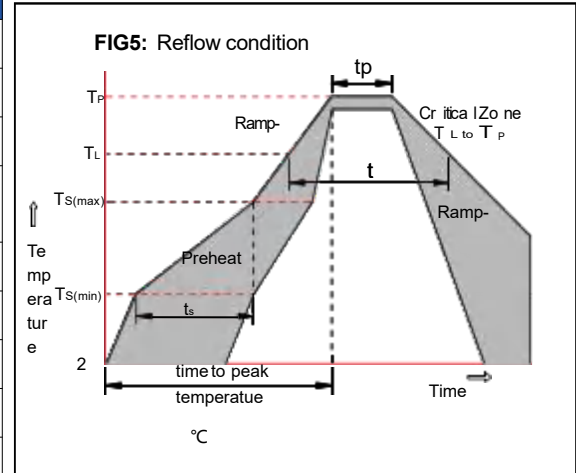


Fig.14 Gain bandwidth product vs. collector current

Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150 °C
	-Temperature Max($T_{s(max)}$)	+200 °C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3 °C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3 °C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217 °C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5) °C
Time within 5 °C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6 °C/sec. Max
Time 25 °C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260 °C

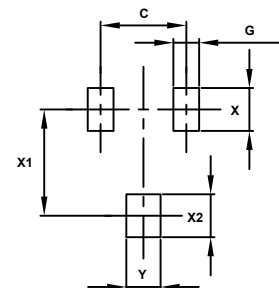


Package Dimensions & Suggested Pad Layout

SOT-523

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.900	0.028	0.035
A1	0.000	0.100	0.000	0.004
A2	0.700	0.800	0.028	0.031
b1	0.150	0.250	0.006	0.010
b2	0.250	0.350	0.010	0.014
c	0.100	0.200	0.004	0.008
D	1.500	1.700	0.059	0.067
E	0.700	0.900	0.028	0.035
E1	1.450	1.750	0.057	0.069
e	0.500 TYP.		0.020 TYP.	
e1	0.900	1.100	0.035	0.043
L	0.400 REF.		0.016 REF.	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

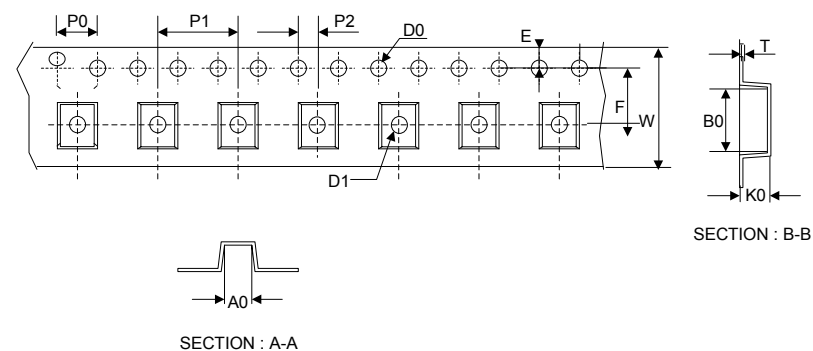
Dimensions in inches and (millimeters)



Dimensions	Value (in mm)
C	1.00
G	0.45
X	0.70
X1	1.40
X2	0.70
Y	0.60

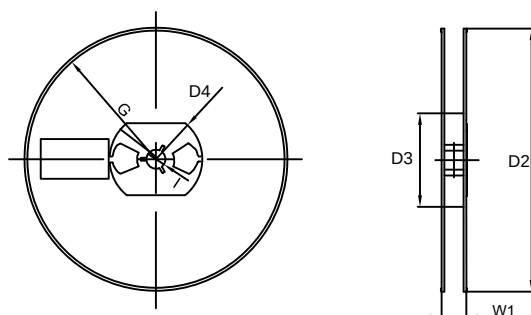
Tape & reel specification

Tape



Symbol	Dimension (mm)
P0	4.00±0.20
P1	4.00±0.20
P2	2.00±0.20
D0	1.55±0.20
D1	0.65±0.20
E	1.55±0.25
F	3.60±0.20
W	8.00±0.20
A0	2.10±0.20
B0	2.20±0.20
K0	1.10±0.20
T	0.20±0.20
D2	177.0±5.0
D3	55Min.
D4	R24.6±2.0
G	R82.0±2.0
I	13.0±2.0
W1	10.20±3.0

7" Reel



Quantity: 3000PCS