

RoHS Compliant Product  
A suffix of "-C" specifies halogen & lead-free

## FEATURES

- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMBT2907A)
- Ideal for Medium Power Amplification and Switching

## MARKING

1P

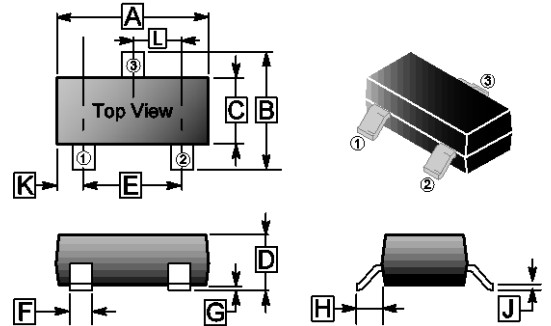
## PACKAGE INFORMATION

Package	MPQ	Leader Size
SOT-23	3K	7 inch

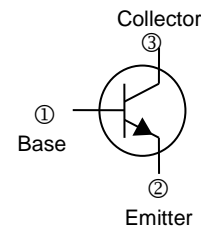
## ORDER INFORMATION

Part Number	Type
MMBT2222A-C	Lead (Pb)-free and Halogen-free

## SOT-23



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.65	3.10	G	0	0.18
B	2.10	3.00	H	0.55	REF.
C	1.10	1.80	J	0.08	0.26
D	0.89	1.40	K	0.60	REF.
E	1.70	2.30	L	0.95	TYP.
F	0.28	0.55			



## ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Collector-Base Voltage	$V_{CB0}$	75	V
Collector-Emitter Voltage	$V_{CEO}$	40	
Emitter-Base Voltage	$V_{EBO}$	6	
Collector Current-Continuous	$I_C$	600	mA
Total Device Dissipation FR-5 Board <sup>1</sup> , $T_A=25^\circ\text{C}$	$P_D$	225	mW
Total Device Dissipation FR-5 Board, Derate above $25^\circ\text{C}$		1.8	mW/ $^\circ\text{C}$
Thermal Resistance, Junction-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate <sup>2</sup> , $T_A=25^\circ\text{C}$	$P_D$	300	mW
Total Device Dissipation Alumina Substrate, Derate above $25^\circ\text{C}$		2.4	mW/ $^\circ\text{C}$
Thermal Resistance, Junction-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction, Storage Temperature	$T_J, T_{STG}$	-55~150	$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise specified)

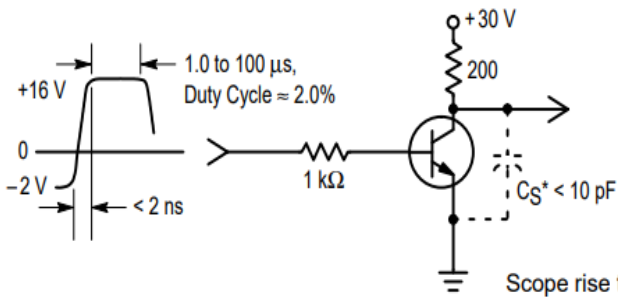
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Collector-Base Breakdown Voltage	V <sub>(BR)CBO</sub>	75	-	-	V	I <sub>C</sub> =10μA, I <sub>E</sub> =0
Collector-Emitter Breakdown Voltage	V <sub>(BR)CEO</sub>	40	-	-		I <sub>C</sub> =10mA, I <sub>B</sub> =0
Emitter-Base Breakdown Voltage	V <sub>(BR)EBO</sub>	6	-	-		I <sub>E</sub> =10μA, I <sub>C</sub> =0
Collector Cut-off Current	I <sub>CBO</sub>	-	-	0.01	μA	V <sub>CB</sub> =60V, I <sub>E</sub> =0
		-	-	10		V <sub>CB</sub> =60V, I <sub>E</sub> =0, T <sub>A</sub> =125°C
Collector Cut-off Current	I <sub>CEx</sub>	-	-	10	nA	V <sub>CE</sub> =30V, V <sub>BE(off)</sub> =3V
Emitter Cut-off Current	I <sub>EBO</sub>	-	-	100	nA	V <sub>EB</sub> =3V, I <sub>C</sub> =0
Base Cut-off Current	I <sub>BL</sub>	-	-	20	nA	V <sub>CE</sub> =60V, V <sub>BE(off)</sub> =3V
DC Current Gain <sup>3</sup>	h <sub>FE</sub>	35	-	-		V <sub>CE</sub> =10V, I <sub>C</sub> =0.1mA
		50	-	-		V <sub>CE</sub> =10V, I <sub>C</sub> =1.0mA
		75	-	-		V <sub>CE</sub> =10V, I <sub>C</sub> =10mA
		100	-	300		V <sub>CE</sub> =10V, I <sub>C</sub> =150mA
		50	-	-		V <sub>CE</sub> =1.0V, I <sub>C</sub> =150mA
		40	-	-		V <sub>CE</sub> =10V, I <sub>C</sub> =500mA
Collector-Emitter Saturation Voltage <sup>3</sup>	V <sub>CE(sat)</sub>	-	-	0.3	V	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA
		-	-	1		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA
Base-Emitter Saturation Voltage <sup>3</sup>	V <sub>BE(sat)</sub>	0.6	-	1.2	V	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA
		-	-	2		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA
Transition Frequency	f <sub>T</sub>	-	300	-	MHz	V <sub>CE</sub> =20V, I <sub>C</sub> =20mA, f=100MHz
Output Capacitance	C <sub>ob</sub>	-	8	-	pF	V <sub>CB</sub> =10V, I <sub>E</sub> =0, f=1MHz
Input Capacitance	C <sub>ibo</sub>	-	25	-		V <sub>EB</sub> =0.5V, I <sub>C</sub> =0, f=1MHz
Input Impedance	h <sub>ie</sub>	2	-	8	kΩ	I <sub>C</sub> =1mA, V <sub>CE</sub> =10V, f=1kHz
		0.25	-	1.25		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V, f=1kHz
Voltage Feedback Ratio	h <sub>re</sub>	-	-	8	X10 <sup>-4</sup>	I <sub>C</sub> =1mA, V <sub>CE</sub> =10V, f=1kHz
		-	-	4		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V, f=1kHz
Small-Signal Current Gain	h <sub>fe</sub>	50	-	300		I <sub>C</sub> =1mA, V <sub>CE</sub> =10V, f=1kHz
		75	-	375		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V, f=1kHz
Output Admittance	h <sub>oe</sub>	5	-	35	μmhos	I <sub>C</sub> =1mA, V <sub>CE</sub> =10V, f=1kHz
		25	-	200		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V, f=1kHz
Collector Base Time Constant	r <sub>b</sub> , C <sub>c</sub>	-	-	150	pS	I <sub>E</sub> =2mA, V <sub>CB</sub> =20V, f=31.8MHz
Noise Figure	NF	-	-	4	dB	I <sub>C</sub> =100μA, V <sub>CE</sub> =10V, R <sub>S</sub> =1kΩ, f=1kHz
Delay Time	t <sub>d</sub>	-	-	10	nS	V <sub>CC</sub> =30V, V <sub>BE(off)</sub> =0.5V, I <sub>C</sub> =150mA, I <sub>B1</sub> =15mA
Rise Time	t <sub>r</sub>	-	-	25		
Storage Time	t <sub>s</sub>	-	-	225	nS	V <sub>CC</sub> =30V, I <sub>C</sub> =15mA, I <sub>B1</sub> =I <sub>B2</sub> =15mA
Fall Time	t <sub>f</sub>	-	-	60		

Notes:

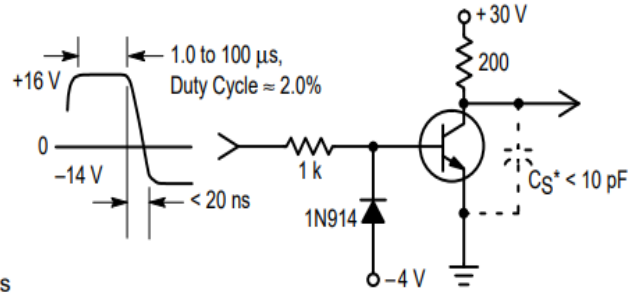
- Surface Mounted on FR-5(1.0x0.75x0.062 in.)
- Surface Mounted on Alumina(0.4x0.3x0.024 in.) 99.5% alumina.
- Pulse Test: Pulse width ≤ 300μs, duty cycle ≤ 2%.

**CHARACTERISTIC CURVES**

**SWITCHING TIME EQUIVALENT TEST CIRCUITS**

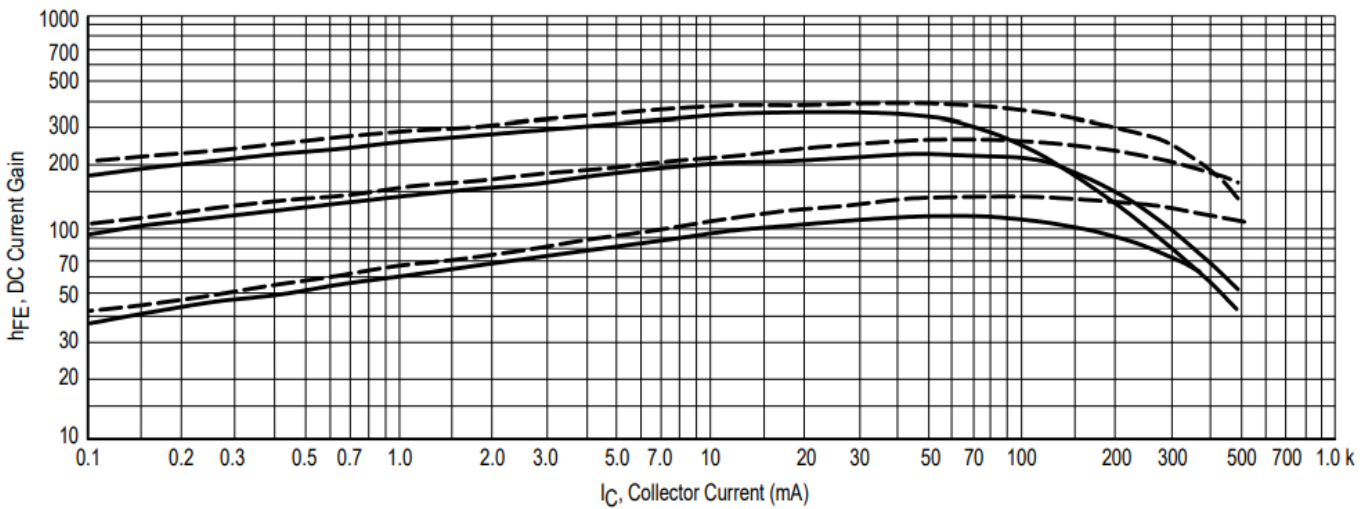


**Figure 1. Turn-On Time**

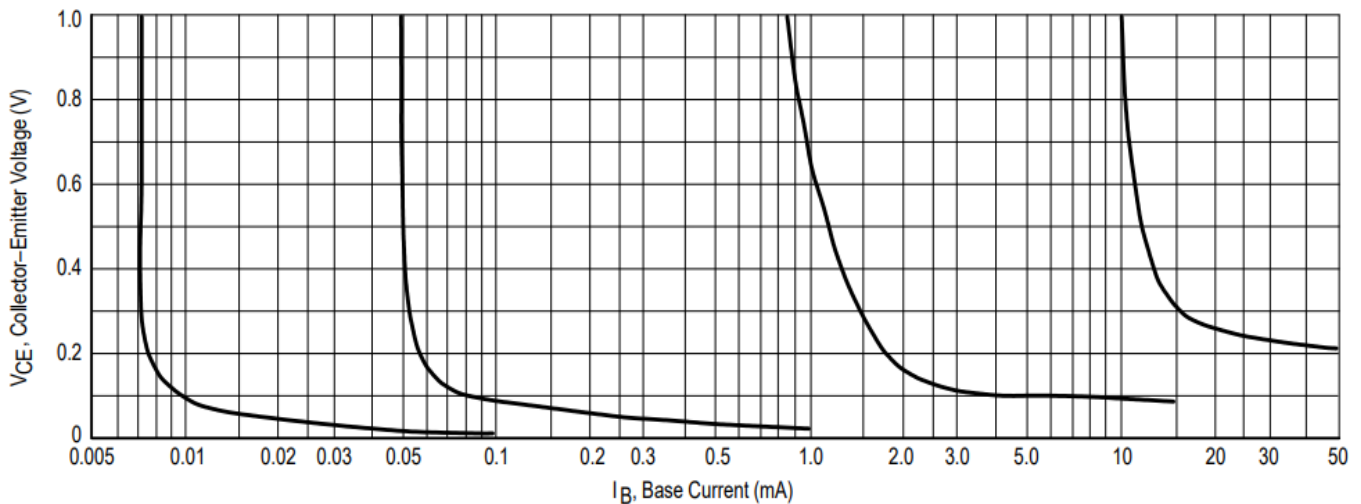


**Figure 2. Turn-Off Time**

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

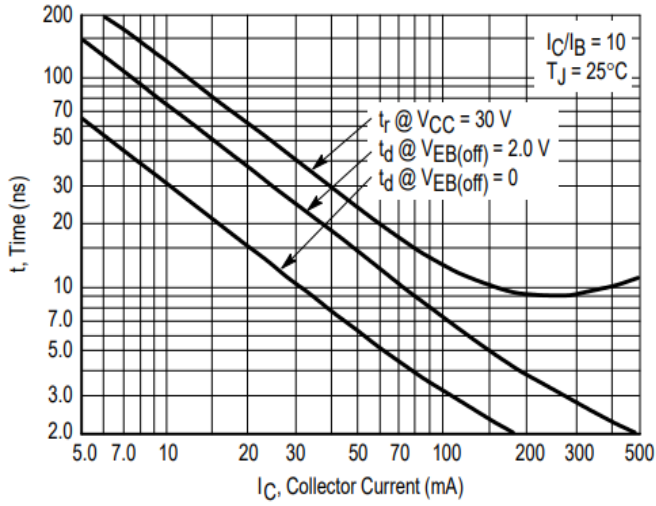


**Figure 3. DC Current Gain**

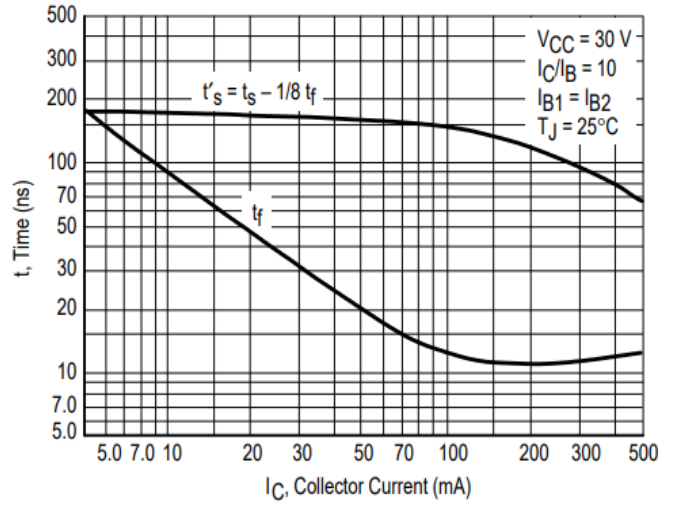


**Figure 4. Collector Saturation Region**

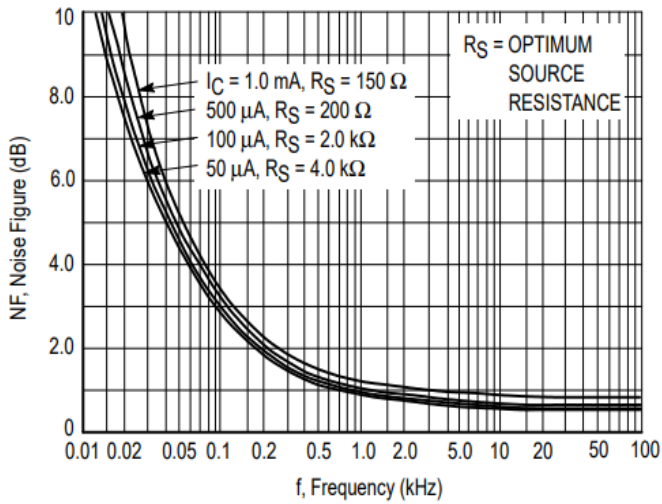
**CHARACTERISTIC CURVES**



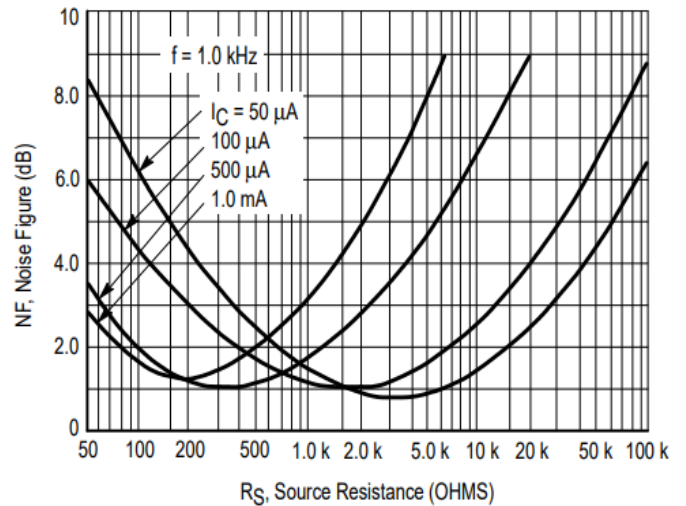
**Figure 5. Turn-On Time**



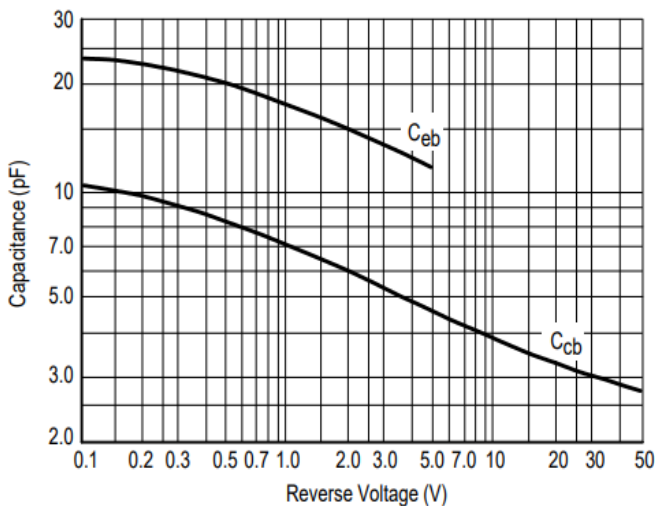
**Figure 6. Turn-Off Time**



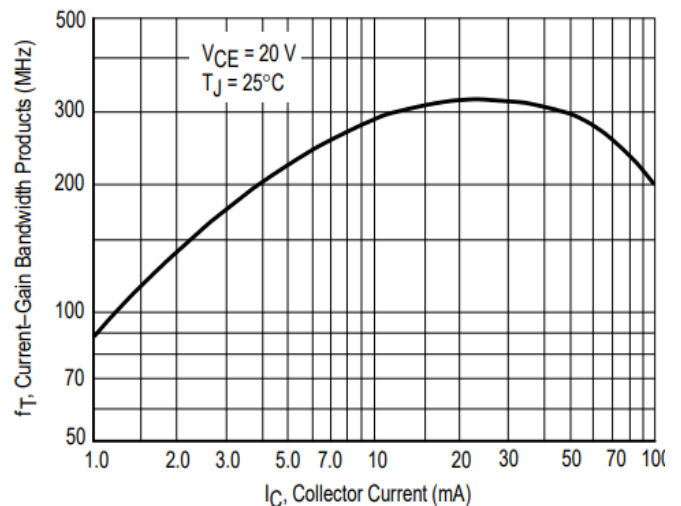
**Figure 7. Frequency Effects**



**Figure 8. Source Resistance Effects**

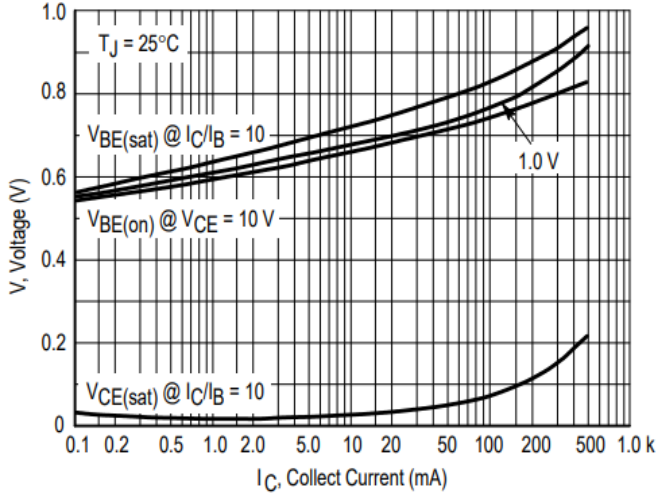


**Figure 9. Capacitances**

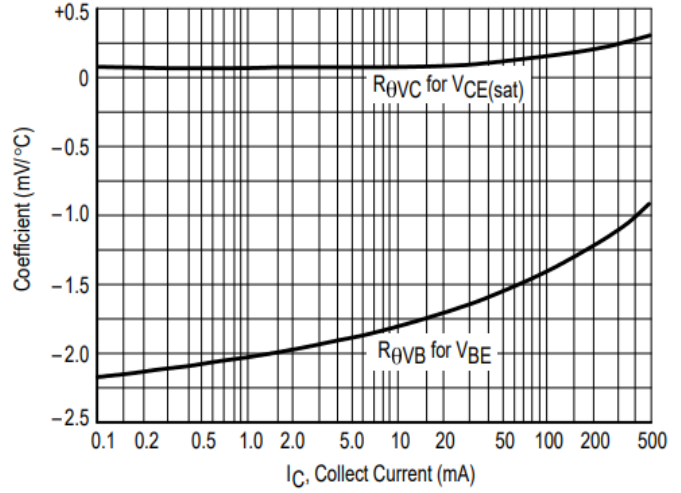


**Figure 10. Current-Gain Bandwidth Product**

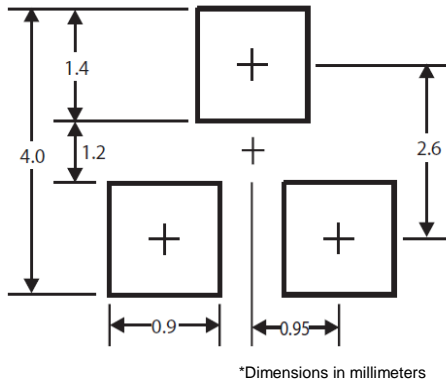
**CHARACTERISTIC CURVES**



**Figure 11. "On" Voltages**



**Figure 12. Temperature Coefficients**



**Figure 13. Mounting Pad Layout**