

**SOT-23 BIPOLAR TRANSISTORS
TRANSISTOR(NPN)**


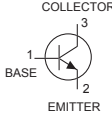
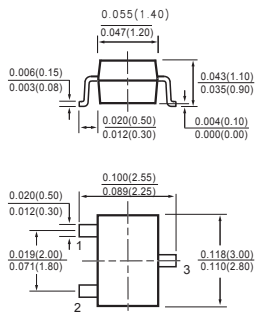
FEATURES

- * Epitaxial planar die construction
- * Complementary PNP Type available(MMBT2907A)

MECHANICAL DATA

- * Case: Molded plastic
- * Epoxy: UL 94V-O rate flame retardant
- * Lead: MIL-STD-202E method 208C guaranteed
- * Mounting position: Any
- * Weight: 0.008 gram

SOT-23

Dimensions in inches and (millimeters)

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25 °C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

MAXIMUM RATINGS (@ TA = 25°C unless otherwise noted)

RATINGS	SYMBOL	VALUE	UNITS
Max. Steady State Power Dissipation ⁽¹⁾ @TA=25°C Derate above 25°C	PD	300	mW
Max. Operating Temperature Range	TJ	150	°C
Storage Temperature Range	TSTG	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (@ TA = 25°C unless otherwise noted)

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS
Thermal Resistance Junction to Ambient	R θJA	-	-	417	°C/W

Notes: 1. Alumina=0.4*0.3*0.024in, 99.5% alumina.
2. " Fully ROHS Compliant ", "100% Sn plating (Pb-free)".

ELECTRICAL CHARACTERISTICS (@TA=25°C unless otherwise noted)

Chatacteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ($I_C = 10\text{mA}$, $I_B = 0$)	$V_{(BR)CEO}$	40	-	Vdc
Collector-Base Breakdown Voltage ($I_C = 10\text{mA}$, $I_E = 0$)	$V_{(BR)CBO}$	75	-	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10\text{mA}$, $I_C = 0$)	$V_{(BR)EBO}$	6.0	-	Vdc
Collector Cutoff Current ($V_{CE} = 60\text{Vdc}$, $V_{EB(off)} = 3.0\text{Vdc}$)	I_{CEX}	-	0.1	μA
Collector Cutoff Current ($V_{CB} = 60\text{Vdc}$, $I_E = 0$) ($V_{CB} = 60\text{Vdc}$, $I_E = 0$, $T_A = 125^\circ\text{C}$)	I_{CBO}	-	0.01 10	μA
Emitter Cutoff Current ($V_{EB} = 3.0\text{Vdc}$, $I_C = 0$)	I_{EBO}	-	0.1	μA
Base Cutoff Current ($V_{CE} = 60\text{Vdc}$, $V_{EB(off)} = 3.0\text{Vdc}$)	I_{BL}	-	20	nA

ON CHARACTERISTICS

DC Current Gain ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $T_A = -55^\circ\text{C}$) ($I_C = 500\text{mA}$, $V_{CE} = 10\text{Vdc}$) (1)	hFE	35 40	- -	-
Collector-Emitter Saturation Voltage (1) ($I_C = 150\text{mA}$, $I_B = 15\text{mA}$) ($I_C = 500\text{mA}$, $I_B = 50\text{mA}$)	$V_{CE(sat)}$	- -	0.3 1.0	Vdc
Base-Emitter Saturation Voltage (1) ($I_C = 150\text{mA}$, $I_B = 15\text{mA}$) ($I_C = 500\text{mA}$, $I_B = 50\text{mA}$)	$V_{BE(sat)}$	0.6 -	1.2 2.0	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain-Bandwidth Product (2) ($I_C = 20\text{mA}$, $V_{CE} = 20\text{Vdc}$, $f = 100\text{MHz}$)	f_T	300	-	MHz
Input Capacitance ($V_{EB} = 0.5\text{Vdc}$, $I_C = 0$, $f = 1.0\text{MHz}$)	C_{ibo}	-	25	pF
Input Impedance ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$)	h_{ie}	2.0 0.25	8.0 1.25	k Ω
Voltage Feedback Ratio ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$)	h_{re}	- -	8.0 4.0	$\times 10^{-4}$
Small-Signal Current Gain ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$)	h_{fe}	50 75	300 375	-
Output Admittance ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$)	h_{oe}	5.0 25	35 200	μmhos
Collector Base Time Constant ($I_E = 20\text{mA}$, $V_{CB} = 20\text{Vdc}$, $f = 31.8\text{MHz}$)	$\tau_{b,Cc}$	-	150	ps
Noise Figure ($I_C = 100\text{mA}$, $V_{CE} = 10\text{Vdc}$, $R_S = 1.0\text{k}\Omega$, $f = 1.0\text{kHz}$)	NF	-	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time Rise Time	($V_{CC} = 30\text{Vdc}$, $V_{BE(off)} = -0.5\text{Vdc}$, $I_C = 150\text{mA}$, $I_{B1} = 15\text{mA}$)	t_d t_r	- -	10 25	ns
Storage Time Fall Time	($V_{CC} = 30\text{Vdc}$, $I_C = 150\text{mA}$, $I_{B1} = I_{B2} = 15\text{mA}$)	t_s t_f	- -	225 60	ns

NOTES : 1. Pulse Test: Pulse Width $\leq 300\text{ms}$, Duty Cycle $\leq 2.0\%$
2. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity

RATING AND CHARACTERISTICS CURVES (MMBT2222A)

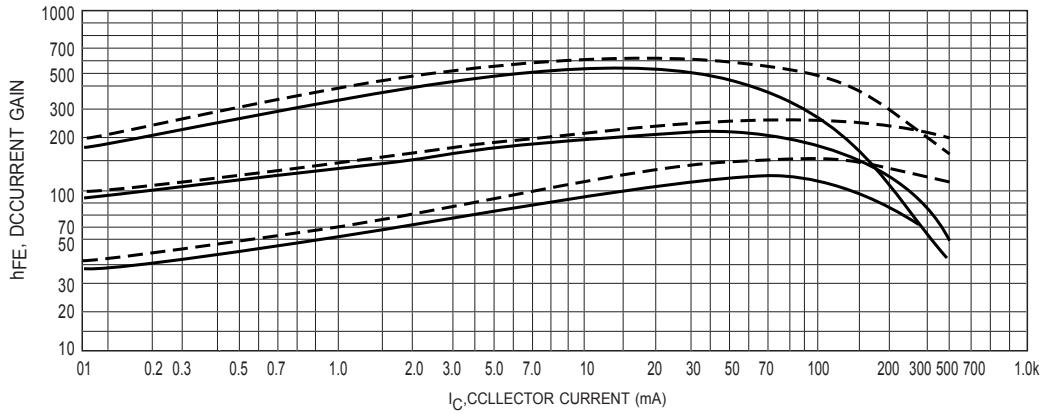


Figure 1. DC Current Gain

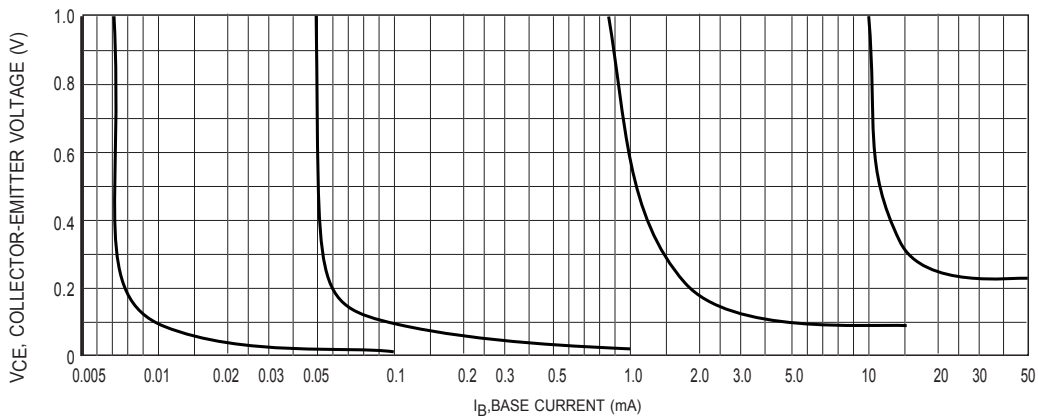


Figure 2. Collector Saturation Region

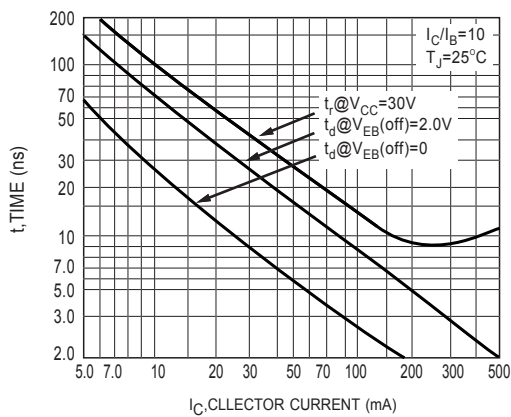


Figure 3. Turn-On Time

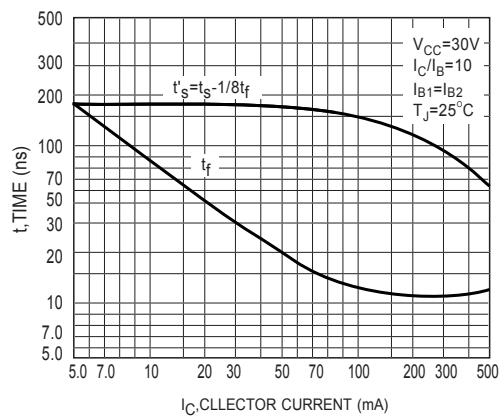


Figure 4. Turn-Off Time

RATING AND CHARACTERISTICS CURVES (MMBT2222A)

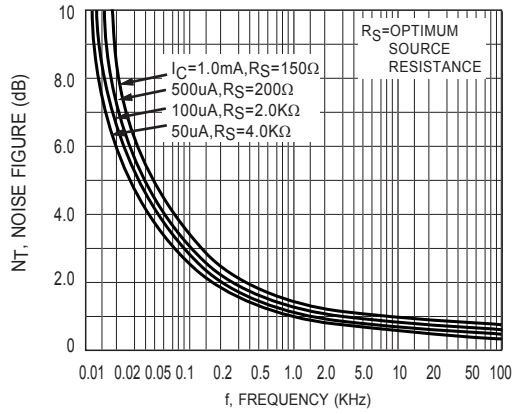


Figure 5. Frequency Effects

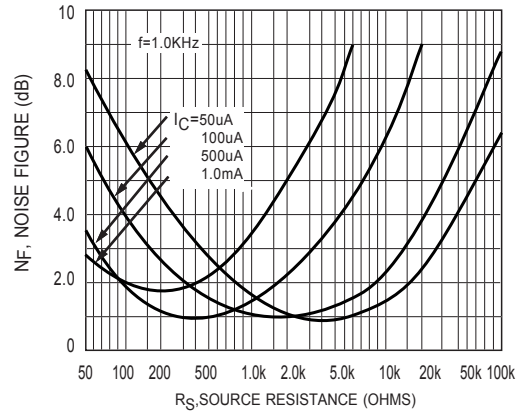


Figure 6. Source Resistance Effects

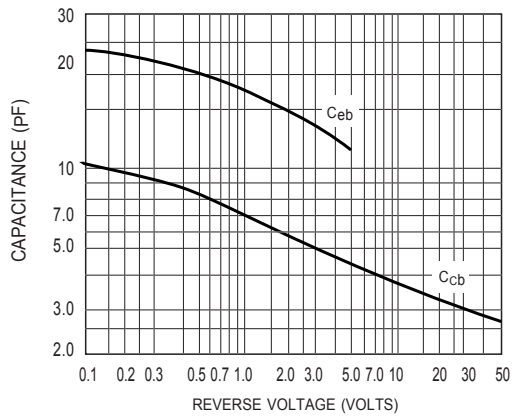


Figure 7. Capacitances

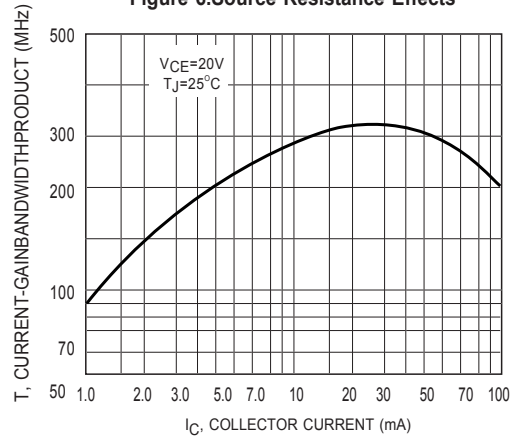


Figure 8. Current-Gain Bandwidth Product

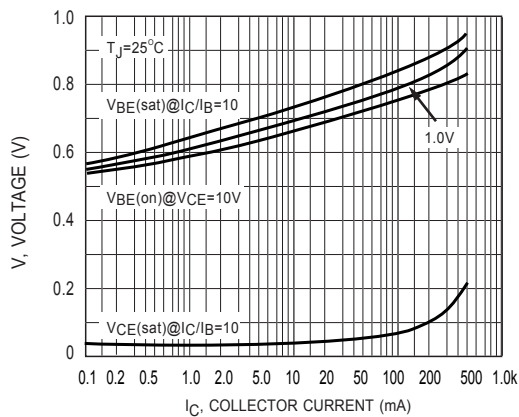


Figure 9. "On" Voltages

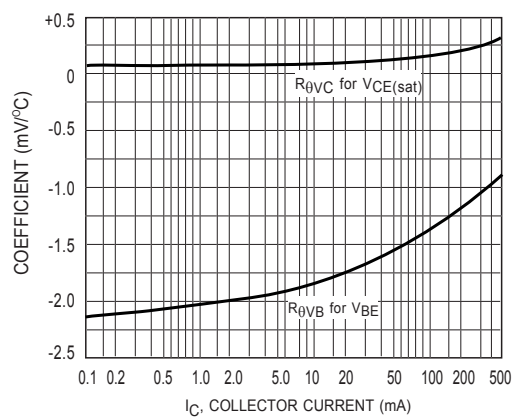


Figure 10. Temperature Coefficients

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