

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

FEATURES

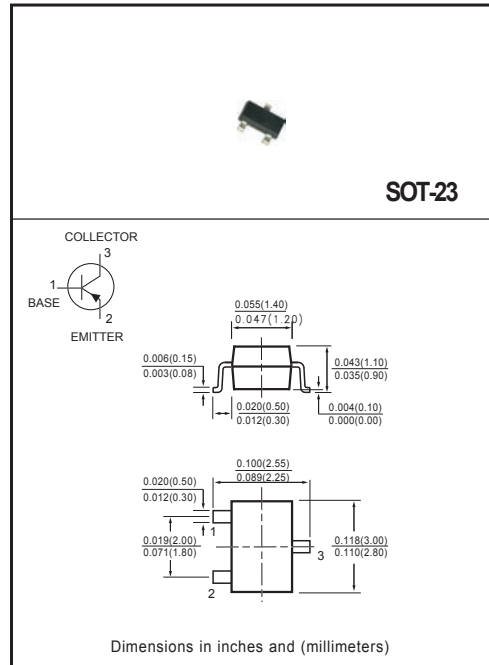
- * As complementary type, the NPN transistor MMBT3904 is Recommended
- * Epitaxial planar die construction

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

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	P _D	300	mW
Max. Operating Temperature Range	T _J	150	°C
Storage Temperature Range	T _{STG}	-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 (@ $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage (2) ($I_C = -1.0\text{mA}$, $I_B = 0$)	$V_{(BR)CEO}$	-40	-	Vdc
Collector-Base Breakdown Voltage ($I_C = -100\mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	-40	-	Vdc
Emitter-Base Breakdown Voltage ($I_E = -100\mu\text{A}$, $I_C = 0$)	$V_{(BR)EBO}$	-5.0	-	Vdc
Base Cutoff Current ($V_{CE} = -30\text{Vdc}$, $V_{EB} = -3.0\text{Vdc}$)	I_{BL}	-	-50	nAdc
Collector Cutoff Current ($V_{CE} = -30\text{Vdc}$, $V_{EB} = -3.0\text{Vdc}$)	I_{CEX}	-	-50	nAdc

ON CHARACTERISTICS(1)

DC Current Gain ($I_C = -0.1\text{mA}$, $V_{CE} = -1.0\text{Vdc}$) ($I_C = -1.0\text{mA}$, $V_{CE} = -1.0\text{Vdc}$) ($I_C = -10\text{mA}$, $V_{CE} = -1.0\text{Vdc}$) ($I_C = -50\text{mA}$, $V_{CE} = -1.0\text{Vdc}$) ($I_C = -100\text{mA}$, $V_{CE} = -1.0\text{Vdc}$)	h_{FE}	60	-	-
		80	-	
		100	300	
		60	-	
		30	-	
Collector-Emitter Saturation Voltage ($I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$) ($I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$)	$V_{CE(sat)}$	-	-0.25 -0.4	Vdc
Base-Emitter Saturation Voltage ($I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$) ($I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$)	$V_{BE(sat)}$	-0.65 -	-0.85 -0.95	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain-Bandwidth Product ($I_C = -10\text{mA}$, $V_{CE} = -20\text{Vdc}$, $f = 100\text{MHz}$)	f_T	250	-	MHz
Output Capacitance ($V_{CB} = -5.0\text{Vdc}$, $I_E = 0$, $f = 1.0\text{MHz}$)	C_{obo}	-	4.5	pF
Input Capacitance ($V_{EB} = -0.5\text{Vdc}$, $I_C = 0$, $f = 1.0\text{MHz}$)	C_{ibo}	-	10	pF
Input Impedance ($V_{CE} = -10\text{Vdc}$, $I_C = -1.0\text{mA}$, $f = 1.0\text{kHz}$)	h_{ie}	2.0	12	k Ω
Voltage Feedback Ratio ($V_{CE} = -10\text{Vdc}$, $I_C = -1.0\text{mA}$, $f = 1.0\text{kHz}$)	h_{re}	0.1	10	$\times 10^{-4}$
Small-Signal Current Gain ($V_{CE} = -10\text{Vdc}$, $I_C = -10\text{mA}$, $f = 1.0\text{kHz}$)	h_{fe}	100	400	-
Output Admittance ($V_{CE} = -10\text{Vdc}$, $I_C = -1.0\text{mA}$, $f = 1.0\text{kHz}$)	h_{oe}	3.0	60	umhos
Noise Figure ($V_{CE} = -5.0\text{Vdc}$, $I_C = -100\mu\text{A}$, $R_S = 1.0\text{k}\Omega$, $f = 1.0\text{kHz}$)	NF	-	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = -3.0\text{Vdc}$, $V_{BE} = 0.5\text{Vdc}$, $I_C = -10\text{mA}$, $I_{B1} = -1.0\text{mA}$)	t_d	-	35	ns
Rise Time		t_r	-	35	
Storage Time	$(V_{CC} = -3.0\text{Vdc}$, $I_C = -10\text{mA}$, $I_{B1} = I_{B2} = -1.0\text{mA}$)	t_s	-	225	ns
Fall Time		t_f	-	75	

Note : Pulse Test: Pulse Width \leq 300ms,Duty Cycle \leq 2.0%

RATING AND CHARACTERISTICS CURVES (MMBT3906)

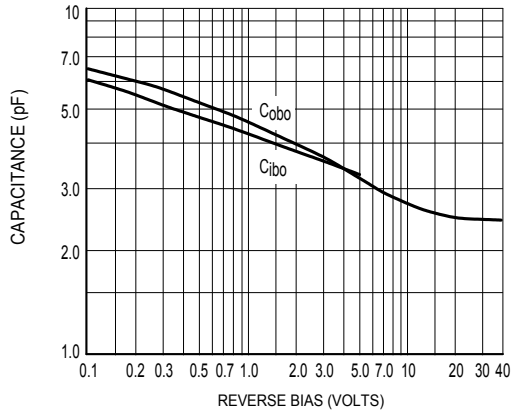


Figure 1 Capacitance

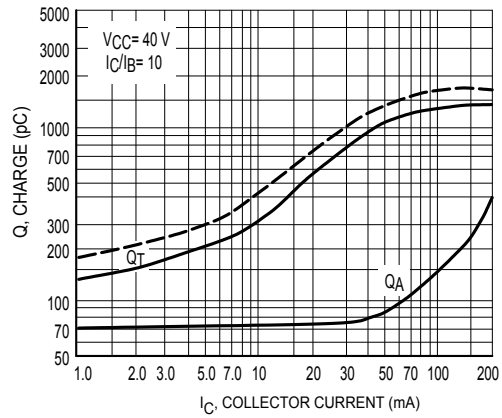


Figure 2 Charge Data

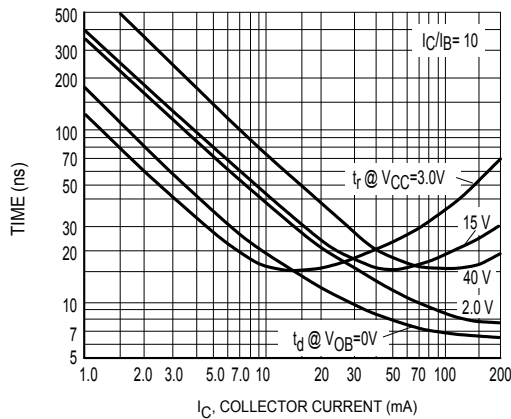


Figure 3 Turn-On Time

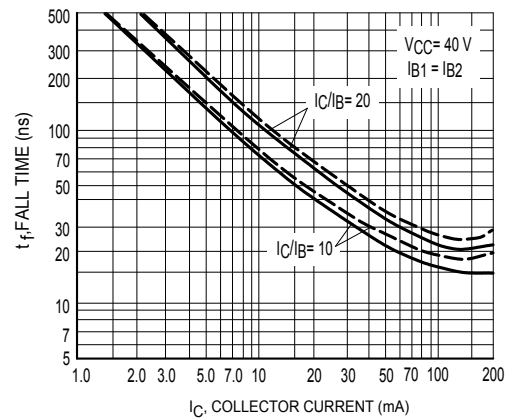


Figure 4 Fall Time

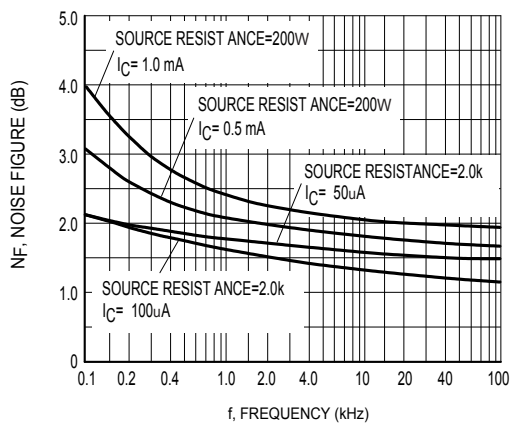


Figure 5

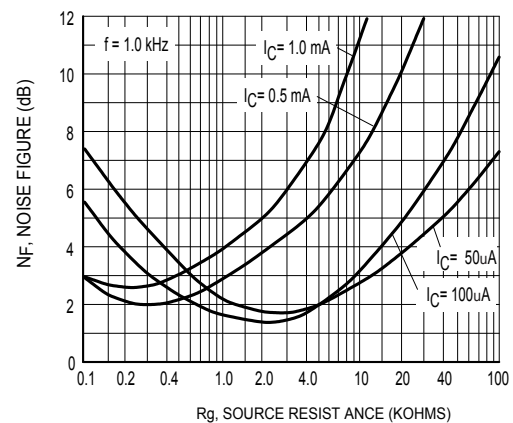


Figure 6

RATING AND CHARACTERISTICS CURVES (MMBT3906)

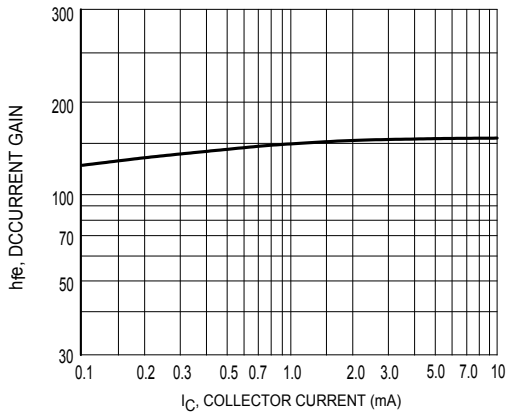


Figure 7 Current Gain

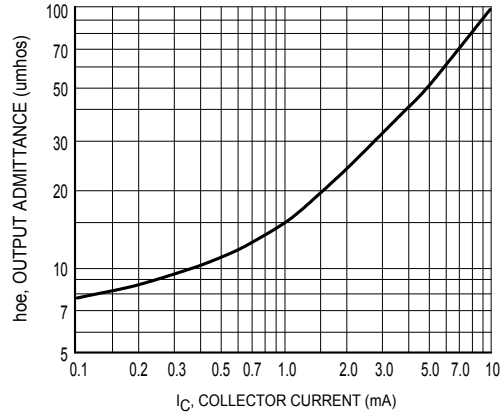


Figure 8 Output Admittance

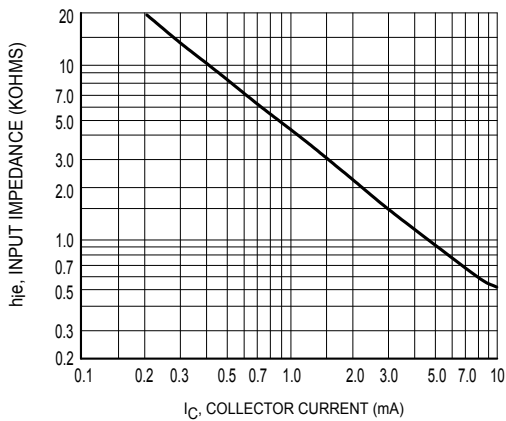


Figure 9 Input Impedance

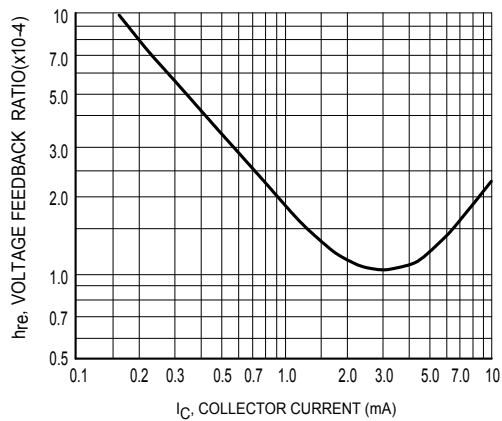


Figure 10 Voltage Feedback Ratio

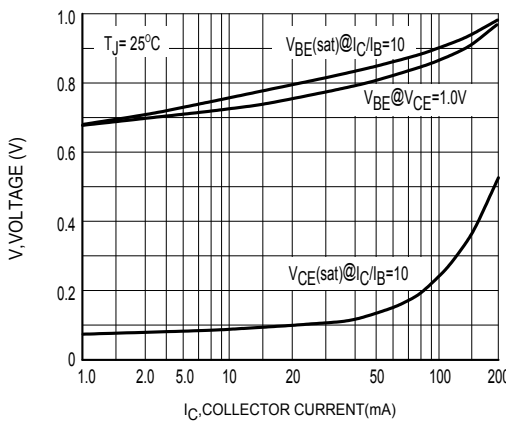


Figure 11 "ON" Voltages

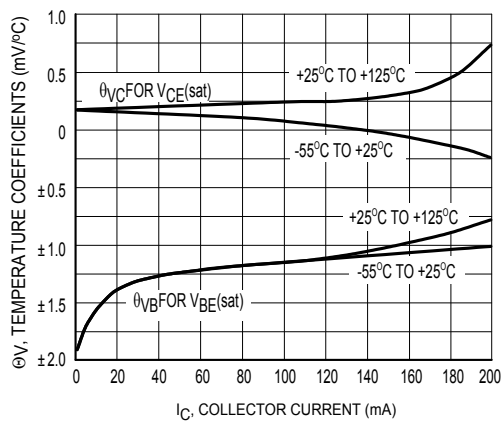


Figure 12 Temperature Coefficients

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