

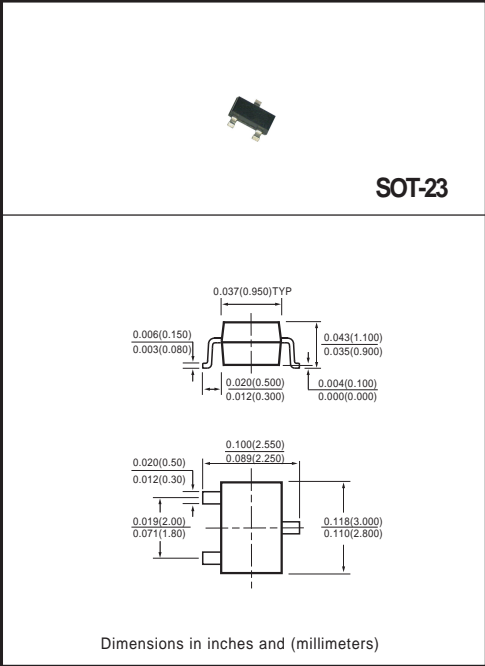
**SOT-23 BIPOLAR TRANSISTORS  
TRANSISTOR(PNP)**

**FEATURES**

- \* As complementary type, the NPN transistor MMBT3904LT1 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.

RATINGS	SYMBOL	VALUE	UNITS
Zener Current ( see Table "Characteristics" )	-	-	-
Max. Steady State Power Dissipation <sup>(1)</sup> @TA=25°C Derate above 25°C	P <sub>D</sub>	300	mW
Max. Operating Temperature Range	T <sub>J</sub>	-55 to +150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	°C

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

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS
Thermal Resistance Junction to Ambient	R θJA	-	-	417	°C/W
Max. Instantaneous Forward Voltage at I <sub>F</sub> = 10mA	V <sub>F</sub>	-	-	-	Volts

NOTES : 1. Alumina=0.4\*0.3\*0.024in.99.5% alumina

**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(2)**

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 60 30	- - 300 - -	-
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 $\Omega$
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	$\mu\text{mhos}$
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	ns
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	ns

NOTES : 2. Pulse Test: Pulse Width $\leq$ 300 $\mu\text{s}$ , Duty Cycle $\leq$ 2.0%

## RATING AND CHARACTERISTICS CURVES ( MMBT3906LT1 )

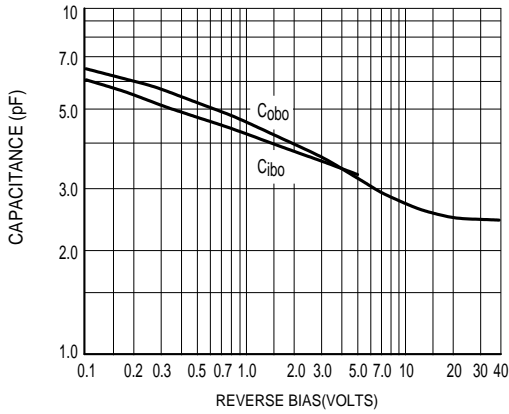


Figure 1 Capacitance

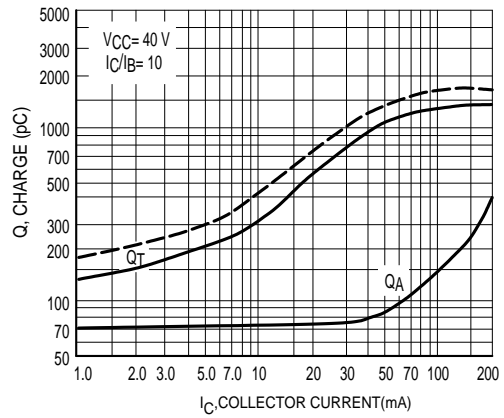


Figure 2 Charge Data

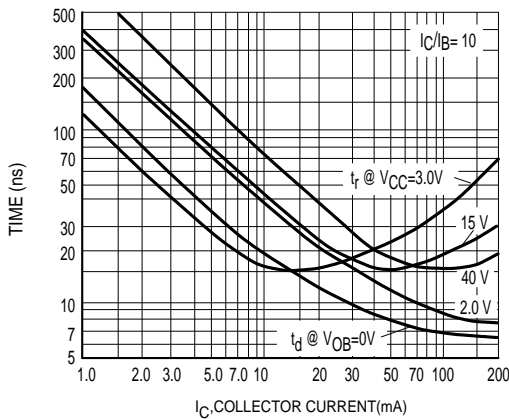


Figure 3 Turn-On Time

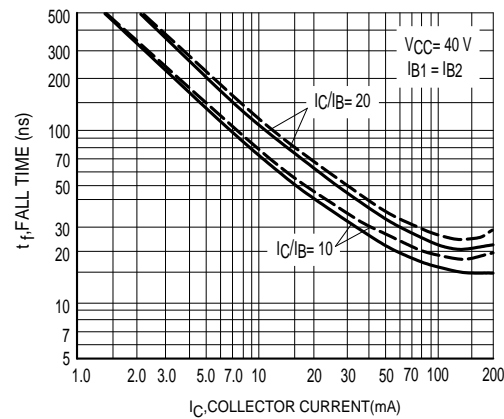


Figure 4 Fall Time

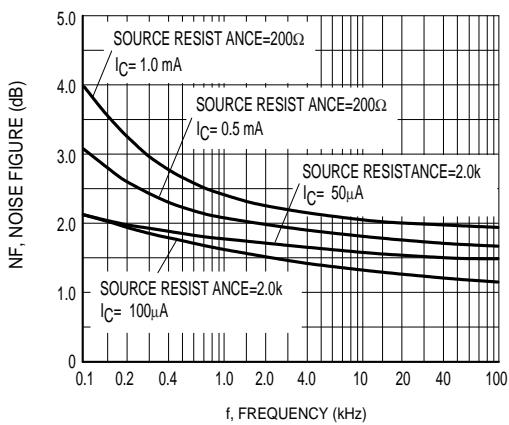


Figure 5

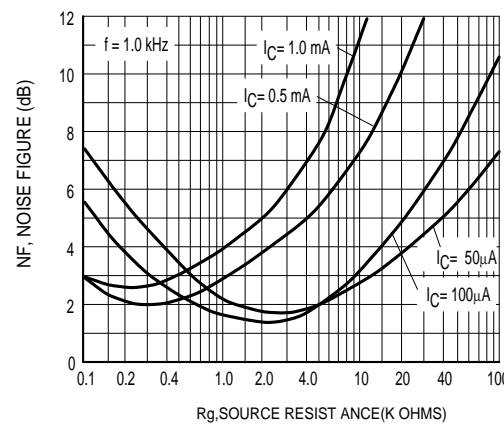


Figure 6

## RATING AND CHARACTERISTICS CURVES ( MMBT3906LT1 )

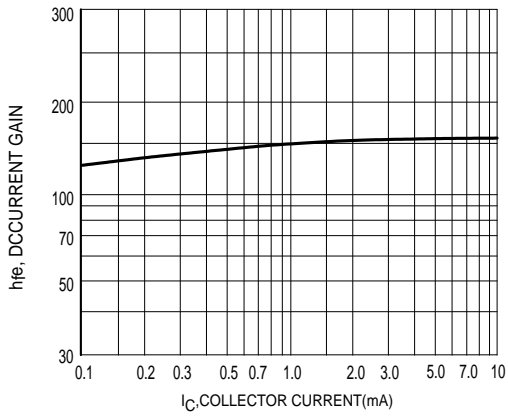


Figure 7 Current Gain

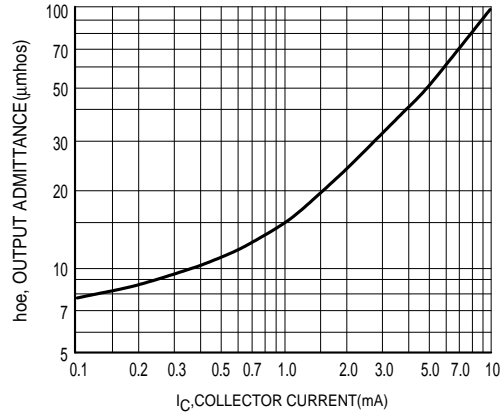


Figure 8 Output Admittance

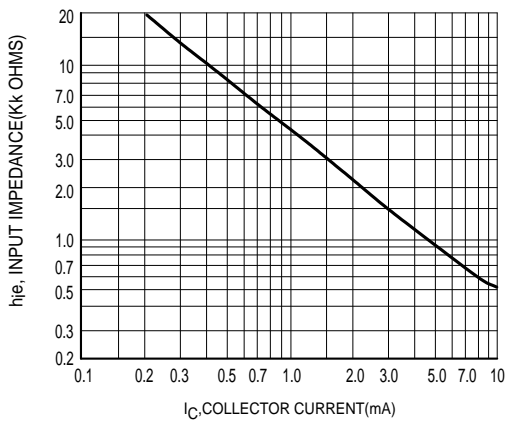


Figure 9 Input Impedance

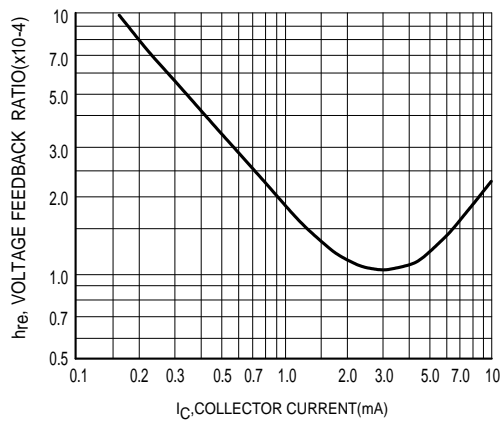


Figure 10 Voltage Feedback Ratio

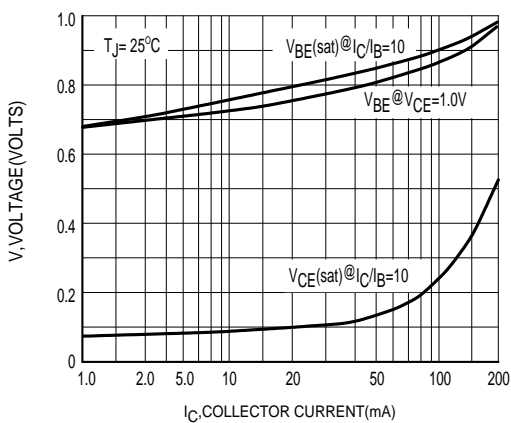


Figure 11 "ON" Voltages

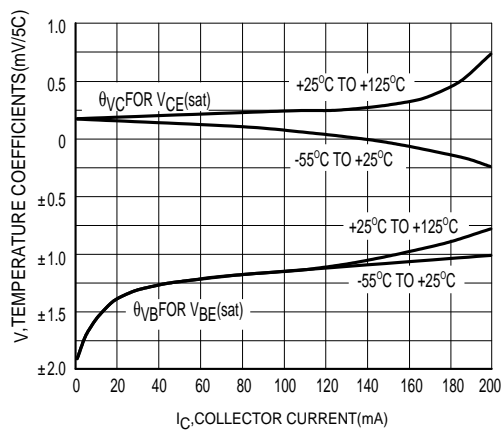


Figure 12 Temperature Coefficients