



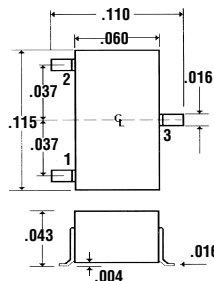
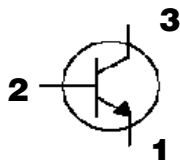
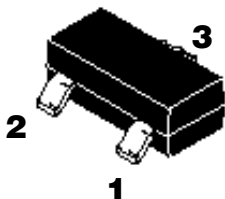
Data Sheet

Description

NPN General Purpose Transistor

Mechanical Dimensions

FMBT3904



SOT-23

Dimensions in inches

Maximum Ratings

Ratings	Symbol	Value	Units
Collector - Emitter Voltage	V_{CE0}	40	Vdc
Collector - Base Voltage	V_{CBO}	60	Vdc
Emitter - Base Voltage	V_{EBO}	6.0	Vdc
Collector Current (Continuous)	I_C	200	mAdc

Thermal Characteristics

Characteristic	Symbol	Max	Units
Total Device Dissipation FR-5 Board (Note1) $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225	mW
Thermal Resistance	$R_{\theta JA}$	1.8	$^\circ\text{C/W}$
Total Device Dissipation Alumina Substrate, $T_A = 25^\circ\text{C}$ (Note 2) Derate above 25°C	P_D	300	mW
Thermal Resistance	$R_{\theta JA}$	2.4	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_{J, T_{STG}}$	-55 to 150	$^\circ\text{C}$

Notes:

(1) FR-5 = 1.0 x 0.75 x 0.062 in.

(2) Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

(3) Pulse test: Pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2.0\%$.

Electrical Characteristics @ 25°C

Off Characteristic	Symbol	Min	Max	Unit
Collector - Emitter Breakdown Voltage (Note 3) ($I_C = 1.0\text{mA}$, $I_B = 0$)	$V_{BR(CEO)}$	40	---	Vdc
Collector - Base Breakdown Voltage ($I_C = 10\mu\text{A}$, $I_E = 0$)	$V_{BR(CBO)}$	60	---	Vdc
Emitter - Base Breakdown Voltage ($I_E = 10\mu\text{A}$, $I_C = 0$)	$V_{BR(EB0)}$	6.0	---	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 Characteristic	Symbol	Min	Max	Unit
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}	40 70 100 60 30	--- --- 300 --- ---	---
Collector - Emitter Saturation Voltage (Note 3) ($I_C = 10\text{mA}$, $I_B = 1.0\text{mA}$) ($I_C = 50\text{mA}$, $I_B = 5.0\text{mA}$)	$V_{CE(sat)}$	--- ---	0.2 0.3	Vdc
Base - Emitter Saturation Voltage (Note 3) ($I_C = 10\text{mA}$, $I_B = 1.0\text{mA}$) ($I_C = 50\text{mA}$, $I_B = 5.0\text{mA}$)	$V_{BE(sat)}$	0.65 ---	0.85 0.95	Vdc
Small-Signal Characteristic				
Current - Gain - Bandwidth Product ($I_C = 10\text{mA}$, $V_{CE} = 20\text{Vdc}$, $f = 100\text{MHz}$)	f_T	300	---	MHz
Output Capacitance ($V_{CB} = 5.0\text{Vdc}$, $I_E = 0$, $f = 1.0\text{MHz}$)	C_{obo}	---	4.0	pF
Input Capacitance ($V_{EB} = 0.5\text{Vdc}$, $I_C = 0$, $f = 1.0\text{MHz}$)	C_{ibo}	---	8.0	pF
Input Impedance ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0\text{mA}$, $f = 1.0\text{kHz}$)	h_{ie}	1.0	10	k Ω
Voltage Feedback Ratio ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0\text{mA}$, $f = 1.0\text{kHz}$)	h_{re}	0.5	8.0	$\times 10^{-4}$
Small - Signal Current Gain ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0\text{mA}$, $f = 1.0\text{kHz}$)	h_{fe}	100	400	---
Output Admittance ($V_{CE} = 10\text{Vdc}$, $I_C = 1.0\text{mA}$, $f = 1.0\text{kHz}$)	h_{oe}	1.0	40	μmhos
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	---	5.0	dB
Switching Characteristic				
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	t_s	---	200	ns
Fall Time ($I_{B1} = I_{B2} = 1.0\text{mA}$)	t_f	---	50	ns