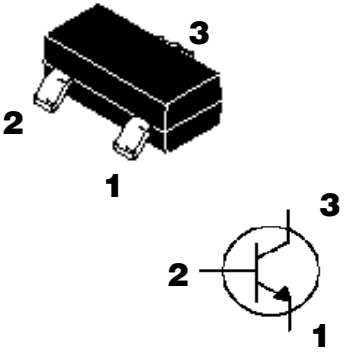
Semiconductor *Data Sheet*

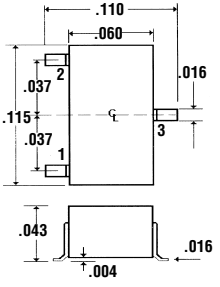
Description

NPN General Purpose Transistor

Mechanical Dimensions

FMBT3904





SOT-23 *Dimensions in inches*

Maximum Ratings

Ratings	Symbol	Value	Units
Collector - Emitter Voltage	V_{CEO}	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°C	P_D	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate, T_A = 25°C (Note 2)	P_D	300	mW
Derate above 25°C		2.4	mW/°C
Thermal Resistance	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{STG}	-55 to 150	°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 μs, duty cycle $\leq$ 2.0%.

Semiconductor *Data Sheet*

FMBT3904 NPN General Purpose Transistor

Electrical Characteristics @ 25°C

Off Characteristic	Symbol	Min	Max	Unit
Collector - Emitter Breakdown Voltage (Note 3) (I_C = 1.0mAdc, I_B = 0)	$V_{BR(CEO)}$	40	---	Vdc
Collector - Base Breakdown Voltage (I_C = 10μAdc, I_E = 0)	$V_{BR(CBO)}$	60	---	Vdc
Emitter - Base Breakdown Voltage (I_E = 10μAdc, I_C = 0)	$V_{BR(EBO)}$	6.0	---	Vdc
Base Cutoff Current (V_{CE} = 30Vdc, V_{EB} = 3.0Vdc)	I_{BL}	---	50	nAdc
Collector Cutoff Current (V_{CE} = 30Vdc, V_{EB} = 3.0Vdc)	I_{CEX}	---	50	nAdc

On Characteristic	Symbol	Min	Max	Unit
DC Current Gain	H_{FE}			---
(I_C = 0.1 mAdc, V_{CE} = 1.0 Vdc)		40	---	
(I_C = 1.0 mAdc, V_{CE} = 1.0 Vdc)		70	---	
(I_C = 10 mAdc, V_{CE} = 1.0 Vdc)		100	300	
(I_C = 50 mAdc, V_{CE} = 1.0 Vdc)		60	---	
(I_C = 100 mAdc, V_{CE} = 1.0 Vdc)		30	---	
Collector - Emitter Saturation Voltage (Note 3)	$V_{CE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)		---	0.2	
(I_C = 50 mAdc, I_B = 5.0 mAdc)		---	0.3	
Base - Emitter Saturation Voltage (Note 3)	$V_{BE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)		0.65	0.85	
(I_C = 50 mAdc, I_B = 5.0 mAdc)		---	0.95	

Small-Signal Characteristic	Symbol	Min	Max	Unit
Current - Gain - Bandwidth Product (I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	300	---	MHz
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	---	4.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	---	8.0	pF
Input Impedance (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{ie}	1.0	10	kΩ
Voltage Feedback Ratio (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{re}	0.5	8.0	$x10^{-4}$
Small - Signal Current Gain (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{fe}	100	400	---
Output Admittance (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{oe}	1.0	40	μmhos
Noise Figure (V_{CE} = 5.0 Vdc, I_C = 100 μAdc, R_S = 1.0 kΩ, f = 1.0 kHz)	NF	---	5.0	dB

Switching Characteristic		Symbol	Min	Max	Unit
Delay Time	(V_{CC} = 3.0 Vdc, V_{BE} = 0.5 Vdc,	t_d	---	35	ns
Rise Time	I_C = -10 mAdc, I_{B1} = 1.0 mAdc)	t_r	---	35	
Storage Time	(V_{CC} = 3.0 Vdc, I_C = 10 mAdc,	t_s	---	200	ns
Fall Time	I_{B1} = I_{B2} = 1.0 mAdc)	t_f	---	50	