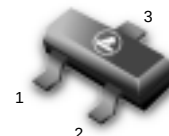
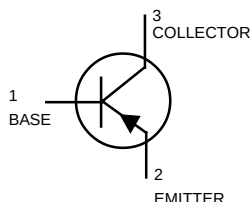


Chopper Transistor

PNP Silicon

MMBT404ALT1



CASE 318-08, STYLE 6
SOT-23 (TO-236AB)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	- 35	Vdc
Collector-Base Voltage	V_{CBO}	- 40	Vdc
Emitter-Base Voltage	V_{EBO}	- 25	Vdc
Collector Current — Continuous	I_C	- 150	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,(1) $T_A = 25^\circ\text{C}$	P_D	225	mW
Derate above 25°C		1.8	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Total Device Dissipation Alumina Substrate, (2) $T_A = 25^\circ\text{C}$	P_D	300	mW
Derate above 25°C		2.4	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

DEVICE MARKING

MMBT404ALT1 = 2N

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ($I_C = -10\text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	- 35	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = -10\text{ }\mu\text{Adc}, I_E = 0$)	$V_{(BR)CBO}$	- 40	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = -10\text{ }\mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	- 25	—	—	Vdc
Collector Cutoff Current ($V_{CE} = -10\text{Vdc}, I_E = 0$)	I_{CBO}	—	—	-100	nAdc
Emitter Cutoff Current ($V_{EB} = -10\text{Vdc}, I_C = 0$)	I_{EBO}	—	—	-100	nAdc

1. FR-5 = $1.0 \times 0.75 \times 0.062\text{ in.}$

2. Alumina = $0.4 \times 0.3 \times 0.024\text{ in.}$ 99.5% alumina.

MMBT404ALT1

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) (Continued)

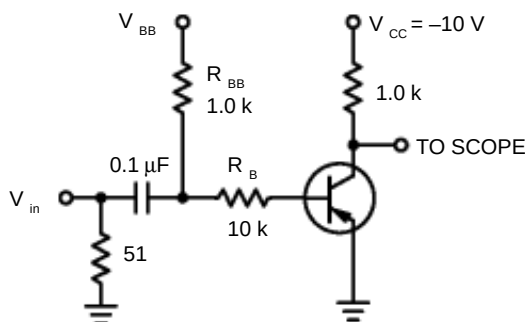
Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain ($I_C = -12\text{mA}$, $V_{CE} = -0.15\text{Vdc}$)	h_{FE}	100	—	400	—
Collector-Emitter Saturation Voltage ($I_C = -12\text{mA}$, $I_B = -0.4\text{mA}$)	$V_{CE(sat)}$	—	—	-0.15	Vdc
($I_C = -24\text{mA}$, $I_B = -1.0\text{mA}$)		—	—	-0.20	
Base-Emitter Saturation Voltage ($I_C = -12\text{mA}$, $I_B = -0.4\text{mA}$)	$V_{BE(sat)}$	—	—	-0.85	Vdc
($I_C = -24\text{mA}$, $I_B = -1.0\text{mA}$)		—	—	-1.00	

SMALL-SIGNAL CHARACTERISTICS

Output Capacitance ($V_{CB} = -6.0\text{Vdc}$, $I_E = 0$, $f = 1.0\text{MHz}$)	C_{obo}	—	—	20	pF
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SWITCHING CHARACTERISTICS

Delay Time ($V_{CC} = -10\text{Vdc}$, $I_C = -10\text{mA}$) (Figure 1)	t_d	—	43	—	ns
Rise Time ($I_{B1} = -1.0\text{mA}$, $I_{BE(off)} = -14\text{Vdc}$)	t_r	—	180	—	ns
Storage Time ($V_{CC} = -10\text{Vdc}$, $I_C = -10\text{mA}$)	t_s	—	675	—	ns
Fall Time ($I_{B1} = I_{B2} = -1.0\text{mA}$) (Figure 1)	t_f	—	160	—	ns



	V_{in} (Volts)	V_{BB} (Volts)
t_{on}, t_d, t_r	-12	+1.4
t_{off}, t_s and t_f	+20.6	-11.6

Voltages and resistor values shown are for $I_C = 10\text{mA}$, $I_C/I_B = 10$ and $I_{B1} = I_{B2}$

Figure 1. Switching Time Test Circuit