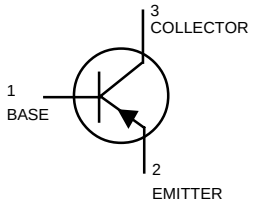
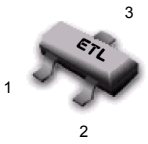
ETL
SEMICONDUCTOR

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 °C	P_D	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate, (2) T_A = 25°C	P_D	300	mW
Derate above 25°C		2.4	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	–55 to +150	°C

DEVICE MARKING

MMBT404ALT1 = 2N

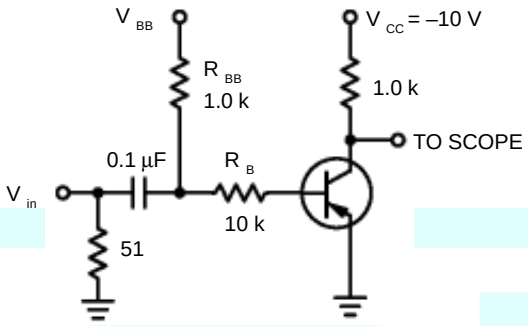
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = –10 mAdc, I_B = 0)	$V_{(BR)CEO}$	– 35	—	—	Vdc
Collector– Emitter Breakdown Voltage (I_C = –10 µAdc, I_E = 0)	$V_{(BR)CBO}$	– 40	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = –10 µAdc, I_C = 0)	$V_{(BR)EBO}$	– 25	—	—	Vdc
Collector Cutoff Current (V_{CE} = –10Vdc, I_E = 0)	I_{CBO}	—	—	–100	nAdc
Emitter Cutoff Current (V_{EB} = –10Vdc, I_C = 0)	I_{EBO}	—	—	–100	nAdc

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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = –12 mAdc, V_{CE} = – 0.15 Vdc)	h_{FE}	100	—	400	—
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$				Vdc
(I_C = –12mAdc, I_B = – 0.4 mAdc)		—	—	– 0.15	
(I_C = – 24mAdc, I_B = – 1.0 mAdc)		—	—	– 0.20	
Base–Emitter Saturation Voltage	$V_{BE(sat)}$				Vdc
(I_C = –12mAdc, I_B = – 0.4 mAdc)		—	—	– 0.85	
(I_C = –24mAdc, I_B = – 1.0 mAdc)		—	—	– 1.00	
SMALL–SIGNAL CHARACTERISTICS					
Output Capacitance (V_{CB}= – 6.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	—	—	20	pF
SWITCHING CHARACTERISTICS					
Delay Time(V_{CC} = –10Vdc, I_C = –10 mVdc) (Figure 1)	t_d	—	43	—	ns
Rise Time (I_{B1} = –1.0 mAdc, $I_{BE(off)}$ = –14Vdc)	t_r	—	180	—	ns
Storage Time (V_{CC} = –10 Vdc, I_C = –10 mAdc)	t_s	—	675	—	ns
Fall Time (I_{B1} = I_{B2} = –1.0 mAdc)(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 mA, I_C/I_B = 10 and I_{B1} = I_{B2}

Figure 1. Switching Time Test Circuit