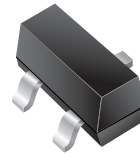


Small Signal Transistor (NPN)

MMBT2222A

Features

NPN Silicon Epitaxial Planar Transistor for switching and amplifier applications.

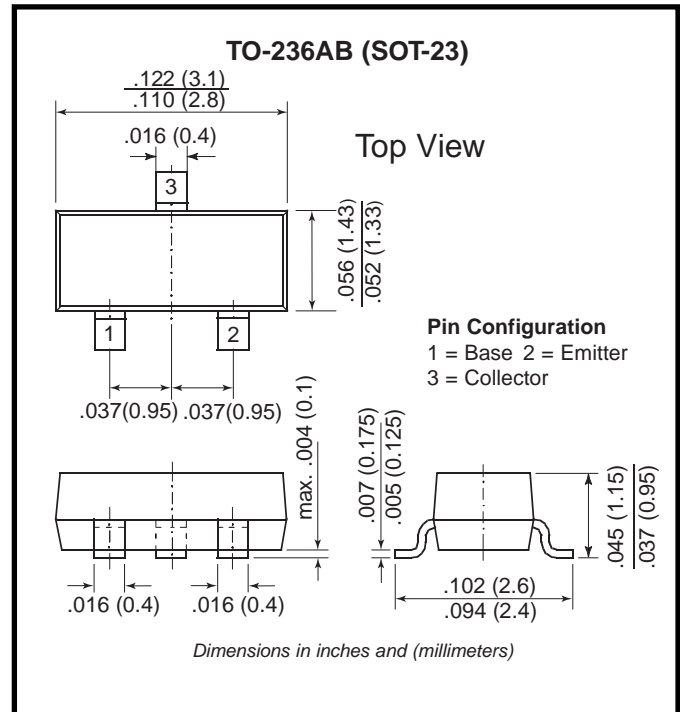
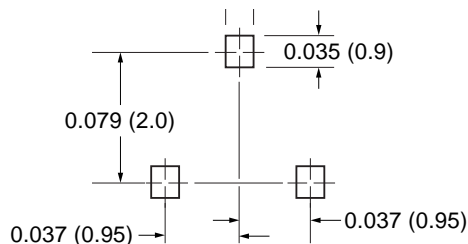


Mechanical Data

Case: SOT-23 Plastic Package

Weight: approx. 0.008g

Mounting Pad Layout



Maximum Ratings & Thermal Characteristics Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	75	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6.0	V
Collector Current	I_C	600	mA
Power Dissipation	on FR-5 Board ⁽¹⁾ $T_A = 25^\circ\text{C}$ Derate above 25°C	225 1.8	mW mW/°C
Power Dissipation	on Alumina Substrate ⁽²⁾ $T_A = 25^\circ\text{C}$ Derate above 25°C	300 2.4	mW mW/°C
Thermal Resistance Junction to Ambient Air	FR-5 Board Alumina Substrate	556 417	°C/W
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_s	-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.

Electrical Characteristics (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DC Current Gain	hFE	V _{CE} = 10 V, I _C = 0.1 mA	35	—	—	—
		V _{CE} = 10 V, I _C = 1 mA	50	—	—	
		V _{CE} = 10 V, I _C = 10 mA	75	—	—	
		V _{CE} = 10 V, I _C = 10 mA T _A = -55°C	35	—	—	
		V _{CE} = 10 V, I _C = 150 mA ⁽¹⁾	100	—	300	
		V _{CE} = 10 V, I _C = 500 mA ⁽¹⁾ V _{CE} = 1.0 V, I _C = 150 mA ⁽¹⁾	40 50	— —	— —	
Collector-Base Breakdown Voltage	V _{(BR)CBO}	I _C = 10 μA, I _E = 0	75	—	—	V
Collector-Emitter Breakdown Voltage ⁽¹⁾	V _{(BR)CEO}	I _C = 10 mA, I _B = 0	40	—	—	V
Emitter-Base Breakdown Voltage	V _{(BR)EBO}	I _C = 10 μA, I _C = 0	6.0	—	—	V
Collector-Emitter Saturation Voltage ⁽¹⁾	V _{CEsat}	I _C = 150 mA, I _B = 15 mA	—	—	0.3	V
		I _C = 500 mA, I _B = 50 mA	—	—	1.0	
Base-Emitter Saturation Voltage ⁽¹⁾	V _{BEsat}	I _C = 150 mA, I _B = 15 mA	0.6	—	1.2	V
		I _C = 500 mA, I _B = 50 mA	—	—	2.0	
Collector Cut-off Current	I _{CEx}	V _{EB} = 3 V, V _{CE} = 60 V	—	—	10	nA
Collector Cut-off Current	I _{CBO}	V _{CB} = 60 V, I _E = 0	—	—	10	nA
		V _{CB} = 50 V, I _E = 0 V T _A = 125°C	—	—	10	μA
Base Cut-off Current	I _{BL}	V _{EB} = 3 V, V _{CE} = 60 V	—	—	20	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} = 3 V _{DC} , I _C = 0	—	—	100	nA
Current Gain-Bandwidth Product	f _T	V _{CE} = 20 V, I _C = 20 mA f = 100 MHz	300	—	—	MHz
Output Capacitance	C _{obo}	V _{CB} = 10 V, f = 1 MHz, I _E = 0	—	—	8	pF
Input Capacitance	C _{ibo}	V _{EB} = 0.5 V, f = 1 MHz, I _C = 0	—	—	25	pF
Noise Figure	NF	V _{CE} = 10 V, I _C = 100 μA, R _S = 1 kΩ, f = 1 kHz	—	—	4.0	dB
Input Impedance	h _{ie}	V _{CE} = 10 V, I _C = 1 mA f = 1 kHz	2	—	8.0	kΩ
		V _{CE} = 10 V, I _C = 10 mA f = 1 kHz	0.25	—	1.25	
Small Signal Current Gain	h _{fe}	V _{CE} = 10 V, I _C = 1 mA, f = 1 kHz	50	—	300	—
		V _{CE} = 10 V, I _C = 10 mA, f = 1 kHz	75	—	375	
Voltage Feedback Ratio	h _{re}	V _{CE} = 10 V, I _C = 1 mA, f = 1 kHz	50 75	— —	300 375	—
Output Admittance	h _{oe}	V _{CE} = 10 V, I _C = 1 mA, f = 1 kHz	5.0	—	35	μS
		V _{CE} = 10 V, I _C = 10 mA, f = 1 kHz	25	—	200	

Note:

(1) Pulse Test: Pulse width ≤ 300 μs - Duty cycle ≤ 2%

Electrical Characteristics (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Collector Base Time Constant	$r_b' C_C$	$I_E = 20 \text{ mA}, V_{CB} = 20 \text{ V}, f = 31.8 \text{ MHz}$	—	—	150	ps
Delay Time (see fig. 1)	t_d	$I_{B1} = 15 \text{ mA}, I_C = 150 \text{ mA}, V_{CC} = 30\text{V}, V_{BE} = -0.5 \text{ V}$	—	—	10	ns
Rise Time (see fig. 1)	t_r	$I_{B1} = 15 \text{ mA}, I_C = 150 \text{ mA}, V_{CC} = 30\text{V}, V_{BE} = -0.5 \text{ V}$	—	—	25	ns
Storage Time (see fig. 2)	t_s	$I_{B1} = I_{B2} = 15 \text{ mA}, I_C = 150 \text{ mA}, V_{CC} = 30\text{V}$	—	—	225	ns
Fall Time (see fig. 2)	t_f	$I_{B1} = I_{B2} = 15 \text{ mA}, I_C = 150 \text{ mA}, V_{CC} = 30\text{V}$	—	—	60	ns

Switching Time Equivalent Test Circuit

Figure 1. Turn-ON Time

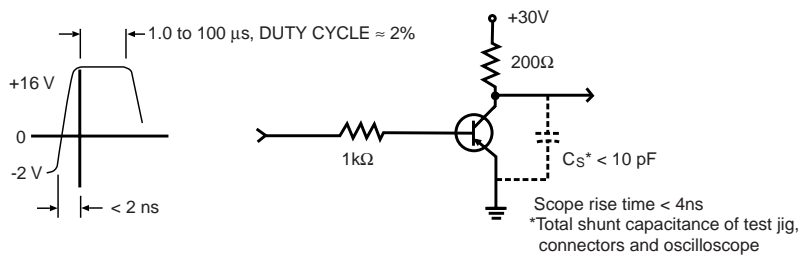


Figure 2. Turn-OFF Time

