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MMBT2222A Silicon NPN Transistor General Purpose Amp SOT-23 Type Surface Mount Package

Absolute Maximum Ratings: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Collector-Base Voltage, V_{CBO}	75V
Collector-Emitter Voltage, V_{CEO}	40V
Emitter-Base Voltage, V_{EBO}	6V
Continuous Collector Current, I_C	600mA
Total Device Dissipation (FR-5 Board, Note 1), P_D	225mW
Derate above $+25^\circ\text{C}$	1.8mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (FR-5 Board, Note 1), R_{thJA}	556 $^\circ\text{C/W}$
Total Device Dissipation (Alumina Substrate, Note 2), P_D	300mW
Derate above $+25^\circ\text{C}$	2.4mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Alumina Substrate, Note 2), R_{thJA}	417 $^\circ\text{C/W}$
Operating Junction Temperature Range, T_J	-55° to $+150^\circ\text{C}$
Storage Temperature Range, T_{stg}	-55° to $+150^\circ\text{C}$

Note 1. FR-5 = 1.000 (25.4mm) x .750 (19.05mm) x .062 (1.57mm).

Note 2. Alumina = .400 (10.2mm) x .300 (7.62mm) x .024 (.609mm), 99.5% alumina.

Electrical Characteristics: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}$, $I_E = 0$	75	—	—	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 10\text{mA}$, $I_B = 0$	40	—	—	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}$, $I_C = 0$	6	—	—	V
Collector Cutoff Current	I_{CBO}	$V_{CB} = 60\text{V}$, $I_E = 0$	—	—	0.01	μA
		$V_{CB} = 60\text{V}$, $I_E = 0$, $T_A = +125^\circ\text{C}$	—	—	10	μA
	I_{CEX}	$V_{CE} = 60\text{V}$, $V_{EB(off)} = 3\text{V}$	—	—	10	nA
Emitter Cutoff Current	I_{EBO}	$V_{EB} = 3\text{V}$, $I_C = 0$	—	—	10	nA
Base Cutoff Current	I_{BL}	$V_{CE} = 60\text{V}$, $V_{EB(off)} = 3\text{V}$	—	—	20	nA

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
ON Characteristics (Note 3)						
DC Current Gain	h _{FE}	V _{CE} = 10V, I _C = 0.1mA	35	–	–	
		V _{CE} = 10V, I _C = 1mA	50	–	–	
		V _{CE} = 10V, I _C = 10mA	75	–	–	
		V _{CE} = 10V, I _C = 10mA, T _A = –55°C	35	–	–	
		V _{CE} = 1V, I _C = 150mA	50	–	–	
		V _{CE} = 10V, I _C = 150mA	100	–	300	
		V _{CE} = 10V, I _C = 500mA	40	–	–	
Collector–Emitter Saturation Voltage	V _{CE(sat)}	I _C = 150mA, I _B = 15mA	–	–	0.3	V
		I _C = 500mA, I _B = 50mA	–	–	1.0	V
Base–Emitter Saturation Voltage	V _{BE(sat)}	I _C = 150mA, I _B = 15mA	0.6	–	1.2	V
		I _C = 500mA, I _B = 50mA	–	–	2.0	V
Small–Signal Characteristics						
Current Gain–Bandwidth Product	f _T	I _C = 20mA, V _{CB} = 20V, f = 100MHz	300	–	–	MHz
Output Capacitance	C _{obo}	V _{CB} = 10V, I _E = 0, f = 1MHz	–	–	8	pF
Input Capacitance	C _{ibo}	V _{EB} = 0.5V, I _C = 0, f = 1MHz	–	–	25	pF
Input Impedance	h _{ie}	V _{CE} = 10V, I _C = 1mA, f = 1kHz	2	–	8	kΩ
		V _{CE} = 10V, I _C = 10mA, f = 1kHz	0.25	–	1.25	kΩ
Voltage Feedback Ratio	h _{re}	V _{CE} = 10V, I _C = 1mA, f = 1kHz	–	–	8	x 10 ⁴
		V _{CE} = 10V, I _C = 10mA, f = 1kHz	–	–	4	x 10 ⁴
Small–Signal Current Gain	h _{fe}	V _{CE} = 10V, I _C = 1mA, f = 1kHz	50	–	300	
		V _{CE} = 10V, I _C = 10mA, f = 1kHz	75	–	375	
Output Admittance	h _{oe}	V _{CE} = 10V, I _C = 1mA, f = 1kHz	5	–	35	μmhos
		V _{CE} = 10V, I _C = 10mA, f = 1kHz	25	–	200	μmhos
Collector–Base Time Constant	rb'C _C	V _{CB} = 20V, I _E = 20mA, f = 31.8MHz	–	–	150	ps
Noise Figure	NF	I _C = 100μA, V _{CE} = 10V, R _S = 1kΩ,,f = 1kHz	–	–	4	dB
Switching Characteristics						
Delay Time	t _d	V _{CC} = 30V, I _C = 150mA, V _{BE(off)} = 0.5V, I _{B1} = 15mA	–	–	10	ns
Rise Time	t _r		–	–	25	ns
Storage Time	t _s	V _{CC} = 30V, I _C = 150mA, I _{B1} = I _{B2} = 15mA	–	–	225	ns
Fall Time	t _f		–	–	60	ns

Note 3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

