



THE DATASHEET OF MMBT2222A

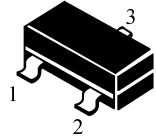


FEATURES

NPN Switching Transistor

SOT-23

- 1. BASE
- 2. EMITTER
- 3. COLLECTOR



MAXIMUM RATINGS

Characteristic	Symbol	MMBT2222	MMBT2222A	Unit
Collector-Emitter Voltage	V_{CEO}	30	40	Vdc
Collector-Base Voltage	V_{CBO}	60	75	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	6.0	Vdc
Collector Current-Continuous	I_c	600	600	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board(1) $T_A=25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW/ $^\circ\text{C}$
Total Device Dissipation Alumina Substrate,(2) $T_A=25^\circ\text{C}$ Derate above 25°C	P_D	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Solder Temperature/Solder Time	T/t	260/10	$^\circ\text{C}/\text{S}$
Junction & Storage Temperature	T_J, T_{stg}	-55to+150 $^\circ\text{C}$	

ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Min	Max	Unit
Collector-Emitter Breakdown Voltage(3) ($I_C=10\text{mA}$, $I_B=0$)	$V_{(BR)CEO}$ MMBT2222 MMBT2222A	30 40	— —	Vdc
Collector-Base Breakdown Voltage ($I_C=10\ \mu\text{A}$, $I_E=0$)	$V_{(BR)CBO}$ MMBT2222 MMBT2222A	60 75	— —	Vdc
Emitter-Base Breakdown Voltage ($I_E=10\ \mu\text{A}$, $I_C=0$)	$V_{(BR)EBO}$ MMBT2222 MMBT2222A	5.0 6.0	—	Vdc
Collector Cutoff Current ($V_{CE}=60\text{Vdc}$, $V_{EB(om)}=3.0\text{Vdc}$)	I_{CEX} MMBT2222A	—	10	nAdc
Collector Cutoff Current ($V_{CB}=50\text{Vdc}$, $I_E=0$) ($V_{CB}=60\text{Vdc}$, $I_E=0$) ($V_{CB}=50\text{Vdc}$, $I_E=0$, $T_A=125^\circ\text{C}$) ($V_{CB}=60\text{Vdc}$, $I_E=0$, $T_A=125^\circ\text{C}$)	I_{CBO} MMBT2222 MMBT2222A MMBT2222 MMBT2222A	— — — —	0.01 0.01 10.0 10.0	μ Adc
Emitter Cutoff Current ($V_{EB}=3.0\text{Vdc}$, $I_C=0$)	I_{EBO} MMBT2222A	—	100	nAdc
Base Cutoff Current ($V_{CE}=60\text{Vdc}$, $V_{EB(om)}=3.0\text{Vdc}$)	I_{BL} MMBT2222A	—	20	nAdc
DC Current Gain	H_{FE}			—
($I_C=0.1\text{mA}$, $V_{CE}=10.0\text{Vdc}$)		35	—	
($I_C=1.0\text{mA}$, $V_{CE}=10.0\text{Vdc}$)		50	—	
($I_C=10\text{mA}$, $V_{CE}=10.0\text{Vdc}$)		75	—	
($I_C=10\text{mA}$, $V_{CE}=10.0\text{Vdc}$, $T_A=-55^\circ\text{C}$)	MMBT2222A	35	—	
($I_C=150\text{mA}$, $V_{CE}=10.0\text{Vdc}$)(3)		100	300	
($I_C=150\text{mA}$, $V_{CE}=1.0\text{Vdc}$)(3)		50	—	
($I_C=500\text{mA}$, $V_{CE}=10.0\text{Vdc}$)(3)	MMBT2222 MMBT2222A	30 40	— —	
Collector-Emitter Saturation Voltage ($I_C=150\text{mA}$, $I_B=15\text{mA}$) ($I_C=500\text{mA}$, $I_B=50\text{mA}$)	$V_{CE(sat)}$ MMBT2222 MMBT2222A MMBT2222 MMBT2222A	— — — —	0.4 0.3 1.6 1.0	Vdc
Base-Emitter Saturation Voltage ($I_C=150\text{mA}$, $I_B=15\text{mA}$) ($I_C=500\text{mA}$, $I_B=50\text{mA}$)	$V_{BE(sat)}$ MMBT2222 MMBT2222A MMBT2222 MMBT2222A	— 0.6 — —	1.3 1.2 2.6 2.0	Vdc

SMALL-SIGNAL CHARACTERISTICS

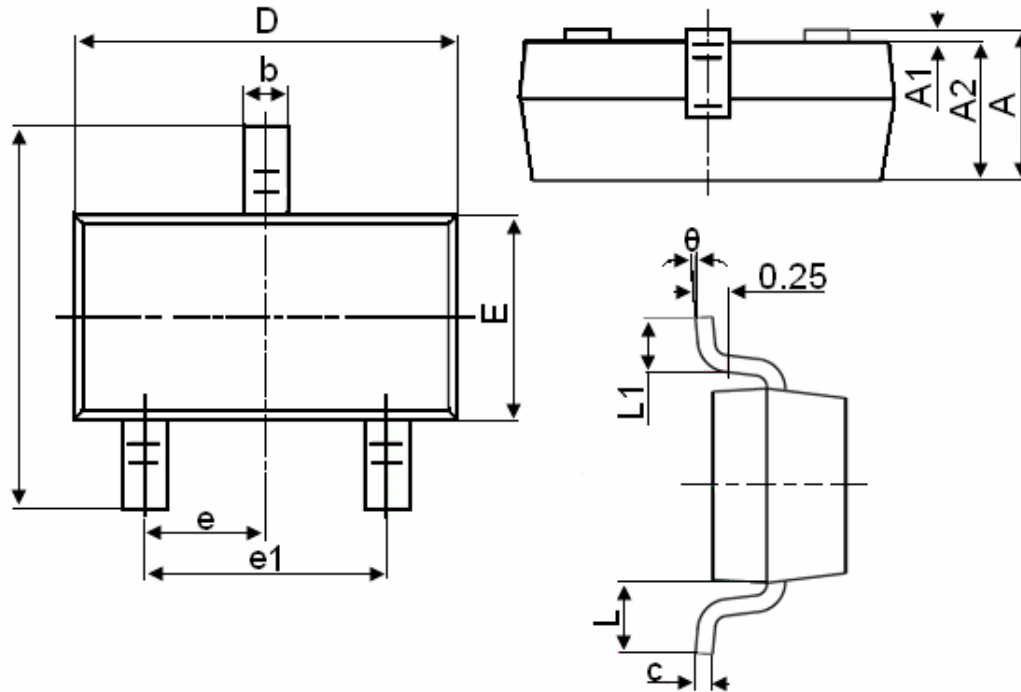
Characteristic	Symbol	Min	Max	Unit
Current-Gain-Bandwidth Product ($I_C=20\text{mA dc}$, $V_{CE}=20\text{V dc}$, $f=100\text{MHz}$)	f_T MMBT2222 MMBT2222A	250 300	— —	MHz
Output Capacitance ($V_{CB}=10.0\text{V dc}$, $I_E=0$, $f=1.0\text{MHz}$)	C_{obo}	—	80	pF
Input Capacitance ($V_{EB}=0.5\text{V dc}$, $I_C=0$, $f=1.0\text{MHz}$)	C_{ibo} MMBT2222 MMBT2222A	— —	30 25	pF
Input Impedance ($I_C=1.0\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$) ($I_C=10\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$)	h_{ie} MMBT2222A MMBT2222A	2.0 0.25	8.0 1.25	k Ω
Voltage Feedback Ratio ($I_C=1.0\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$) ($I_C=10\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$)	h_{re} MMBT2222A MMBT2222A	— —	8.0 4.0	$\times 10^{-4}$
Small-Signal Current Gain ($I_C=1.0\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$) ($I_C=10\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$)	h_{fe} MMBT2222A MMBT2222A	50 75	300 375	—
Output Admittance ($I_C=1.0\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$) ($I_C=10\text{mA dc}$, $V_{CE}=10\text{V dc}$, $f=1.0\text{kHz}$)	h_{oe} MMBT2222A MMBT2222A	5.0 25	35 200	μmhos
Collector-Base Time Constant ($I_E=20\text{mA dc}$, $V_{CB}=20\text{V dc}$, $f=31.8\text{MHz}$)	r_b, C_c MMBT2222A	—	150	ps
Noise Figure ($I_C=100\mu\text{A dc}$, $V_{CE}=10\text{V dc}$, $R_s=1.0\text{k}\Omega$, $f=1.0\text{kHz}$)	NF MMBT2222A	—	4.0	dB

SWITCHING CHARACTERISTICS

Characteristic	Symbol	Min	Max	Unit
Delay Time	t_d	—	10	ns
Rise Time				
Storage Time	t_s	—	225	ns
Fall Time				
	t_f	—	60	

- FR-5=1.0×0.75×0.062in.
- Alumina=0.4×0.3×0.024in.99.5%alumina.
- Pulse Width≤300us;Duty Cycle≤2.0%.
- f_T is defined as the frequency at which (h_{fe}) extrapolates to unity.

SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

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