



MMBT2222A

SMALL SIGNAL NPN TRANSISTOR

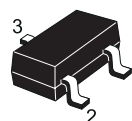
PRELIMINARY DATA

Type	Marking
MMBT2222A	M22

- SILICON EPITAXIAL PLANAR NPN TRANSISTOR
- MINIATURE SOT-23 PLASTIC PACKAGE FOR SURFACE MOUNTING CIRCUITS
- TAPE & REEL PACKING
- THE PNP COMPLEMENTARY TYPE IS MMBT2907A

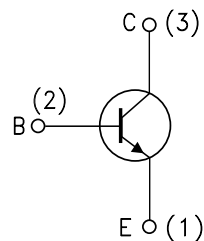
APPLICATIONS

- WELL SUITABLE FOR PORTABLE EQUIPMENT
- SMALL LOAD SWITCH TRANSISTOR WITH HIGH GAIN AND LOW SATURATION VOLTAGE



SOT-23

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Emitter Voltage ($I_E = 0$)	75	V
V_{CEO}	Collector-Emitter Voltage ($I_B = 0$)	40	V
V_{EBO}	Emitter-Base Voltage ($I_C = 0$)	6	V
I_C	Collector Current	0.6	A
I_{CM}	Collector Peak Current ($t_p < 5$ ms)	0.8	A
P_{tot}	Total Dissipation at $T_{amb} = 25$ °C	350	mW
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

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THERMAL DATA

R _{thj-amb} •	Thermal Resistance Junction-Ambient	Max	357.1	°C/W
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• Device mounted on a PCB area of 1 cm².

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I _{CEX}	Collector Cut-off Current (V _{BE} = -3 V)	V _{CE} = 60 V			10	nA
I _{BEX}	Base Cut-off Current (V _{BE} = -3 V)	V _{CE} = 60 V			20	nA
I _{CBO}	Collector Cut-off Current (I _E = 0)	V _{CB} = 75 V V _{CB} = 75 V T _j = 150 °C			10 10	nA μA
I _{EBO}	Emitter Cut-off Current (I _C = 0)	V _{EB} = 3 V			15	nA
V _{(BR)CEO} *	Collector-Emitter Breakdown Voltage (I _B = 0)	I _C = 10 mA	40			V
V _{(BR)CBO}	Collector-Base Breakdown Voltage (I _E = 0)	I _C = 10 μA	75			V
V _{(BR)EBO}	Emitter-Base Breakdown Voltage (I _C = 0)	I _E = 10 μA	6			V
V _{CE(sat)} *	Collector-Emitter Saturation Voltage	I _C = 150 mA I _B = 15 mA I _C = 500 mA I _B = 50 mA			0.3 1	V V
V _{BE(sat)} *	Collector-Base Saturation Voltage	I _C = 150 mA I _B = 15 mA I _C = 500 mA I _B = 50 mA	0.6		1.2 2	V V
h _{FE} *	DC Current Gain	I _C = 0.1 mA V _{CE} = 10 V I _C = 1 mA V _{CE} = 10 V I _C = 10 mA V _{CE} = 10 V I _C = 150 mA V _{CE} = 10 V I _C = 150 mA V _{CE} = 1 V I _C = 500 mA V _{CE} = 10 V	35 50 75 100 50 40		300	
f _T	Transition Frequency	I _C = 20 mA V _{CE} = 20V f = 100MHz		270		MHz
C _{CBO}	Collector-Base Capacitance	I _E = 0 V _{CB} = 10 V f = 1 MHz		4	8	pF
C _{EBO}	Emitter-Base Capacitance	I _C = 0 V _{EB} = 0.5 V f = 1MHz		20	25	pF
NF	Noise Figure	I _C = 0.1 mA V _{CE} = 10 V f = 1 KHz Δf = 200 Hz R _G = 1 KΩ		4		dB
h _{ie} *	Input Impedance	V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz	2 0.25		8 1.25	KΩ KΩ
h _{re} *	Reverse Voltage Ratio	V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz			8 4	10 ⁻⁴ 10 ⁻⁴
h _{fe} *	Small Signal Current Gain	V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz	50 75		300 375	
h _{oe} *	Output Admittance	V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz	5 25		35 200	μS μS

* Pulsed: Pulse duration = 300 μs, duty cycle ≤ 2 %

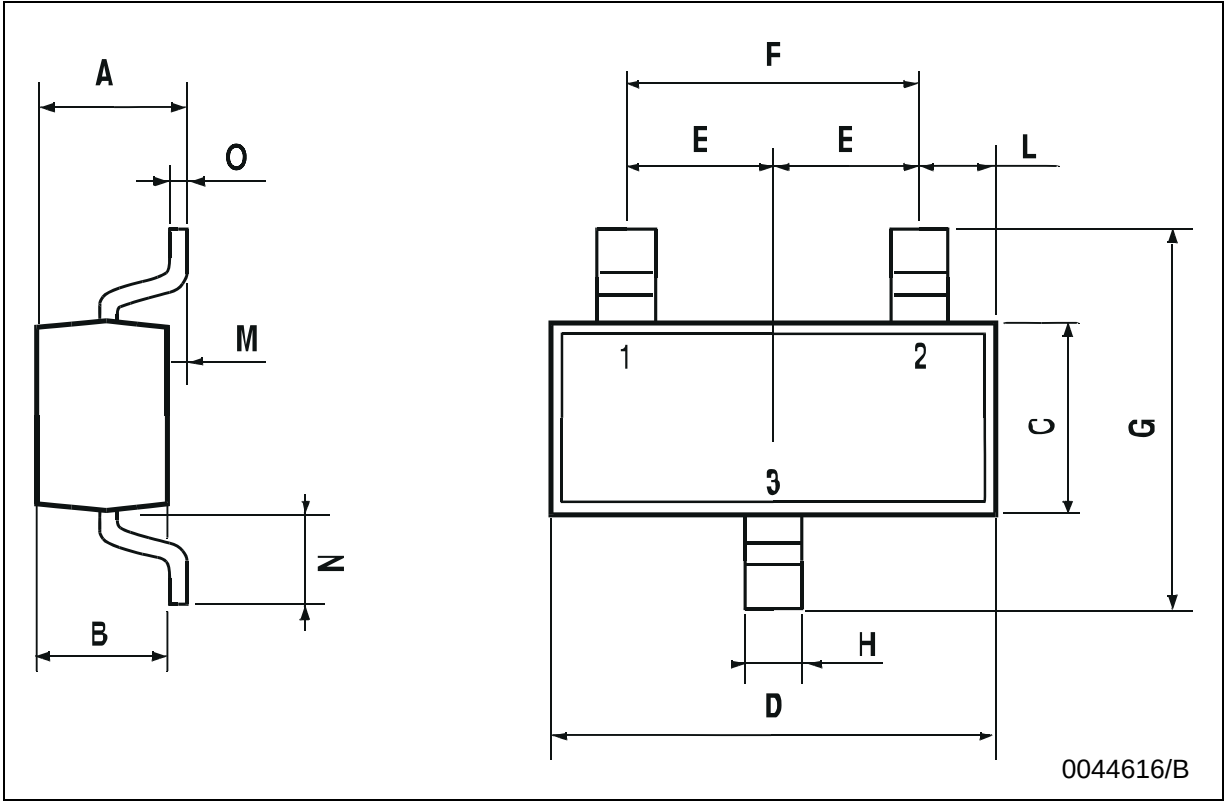
ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_d	Delay Time	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$ $V_{CC} = 30\text{ V}$		5	10	ns
t_r	Rise Time			12	25	ns
t_s	Storage Time	$I_C = 150\text{ mA}$ $I_{B1} = -I_{B2} = 15\text{ mA}$ $V_{CC} = 30\text{ V}$		185	225	ns
t_f	Fall Time			24	60	ns

* Pulsed: Pulse duration = 300 μs , duty cycle $\leq 2\%$

SOT-23 MECHANICAL DATA

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.85		1.1	33.4		43.3
B	0.65		0.95	25.6		37.4
C	1.20		1.4	47.2		55.1
D	2.80		3	110.2		118
E	0.95		1.05	37.4		41.3
F	1.9		2.05	74.8		80.7
G	2.1		2.5	82.6		98.4
H	0.38		0.48	14.9		18.8
L	0.3		0.6	11.8		23.6
M	0		0.1	0		3.9
N	0.3		0.65	11.8		25.6
O	0.09		0.17	3.5		6.7



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