



MMBT2222A

SMALL SIGNAL NPN TRANSISTOR

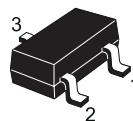
PRELIMINARY DATA

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

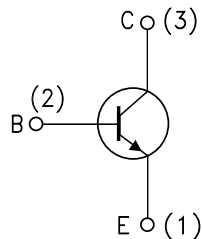
APPLICATIONS

- 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

MMBT2222A

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 ($T_{case} = 25\text{ °C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CEX}	Collector Cut-off Current ($V_{BE} = -3\text{ V}$)	$V_{CE} = 60\text{ V}$			10	nA
I_{BEX}	Base Cut-off Current ($V_{BE} = -3\text{ V}$)	$V_{CE} = 60\text{ V}$			20	nA
I_{CBO}	Collector Cut-off Current ($I_E = 0$)	$V_{CB} = 75\text{ V}$ $V_{CB} = 75\text{ V}$ $T_j = 150\text{ °C}$			10 10	nA μA
I_{EBO}	Emitter Cut-off Current ($I_C = 0$)	$V_{EB} = 3\text{ V}$			15	nA
$V_{(BR)CEO}^*$	Collector-Emitter Breakdown Voltage ($I_B = 0$)	$I_C = 10\text{ mA}$	40			V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ($I_E = 0$)	$I_C = 10\text{ μA}$	75			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ($I_C = 0$)	$I_E = 10\text{ μA}$	6			V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$ $I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$			0.3 1	V V
$V_{BE(sat)}^*$	Collector-Base Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$ $I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$	0.6		1.2 2	V V
h_{FE}^*	DC Current Gain	$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 1\text{ V}$ $I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$	35 50 75 100 50 40		300	
f_T	Transition Frequency	$I_C = 20\text{ mA}$ $V_{CE} = 20\text{ V}$ $f = 100\text{ MHz}$		270		MHz
C_{CBO}	Collector-Base Capacitance	$I_E = 0$ $V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$		4	8	pF
C_{EBO}	Emitter-Base Capacitance	$I_C = 0$ $V_{EB} = 0.5\text{ V}$ $f = 1\text{ MHz}$		20	25	pF
NF	Noise Figure	$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$ $f = 1\text{ KHz}$ $\Delta f = 200\text{ Hz}$ $R_G = 1\text{ K}\Omega$		4		dB
h_{ie}^*	Input Impedance	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ $f = 1\text{ KHz}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $f = 1\text{ KHz}$	2 0.25		8 1.25	K Ω K Ω
h_{re}^*	Reverse Voltage Ratio	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ $f = 1\text{ KHz}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $f = 1\text{ KHz}$			8 4	10^{-4} 10^{-4}
h_{fe}^*	Small Signal Current Gain	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ $f = 1\text{ KHz}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $f = 1\text{ KHz}$	50 75		300 375	
h_{oe}^*	Output Admittance	$V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ $f = 1\text{ KHz}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $f = 1\text{ KHz}$	5 25		35 200	μS μS

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

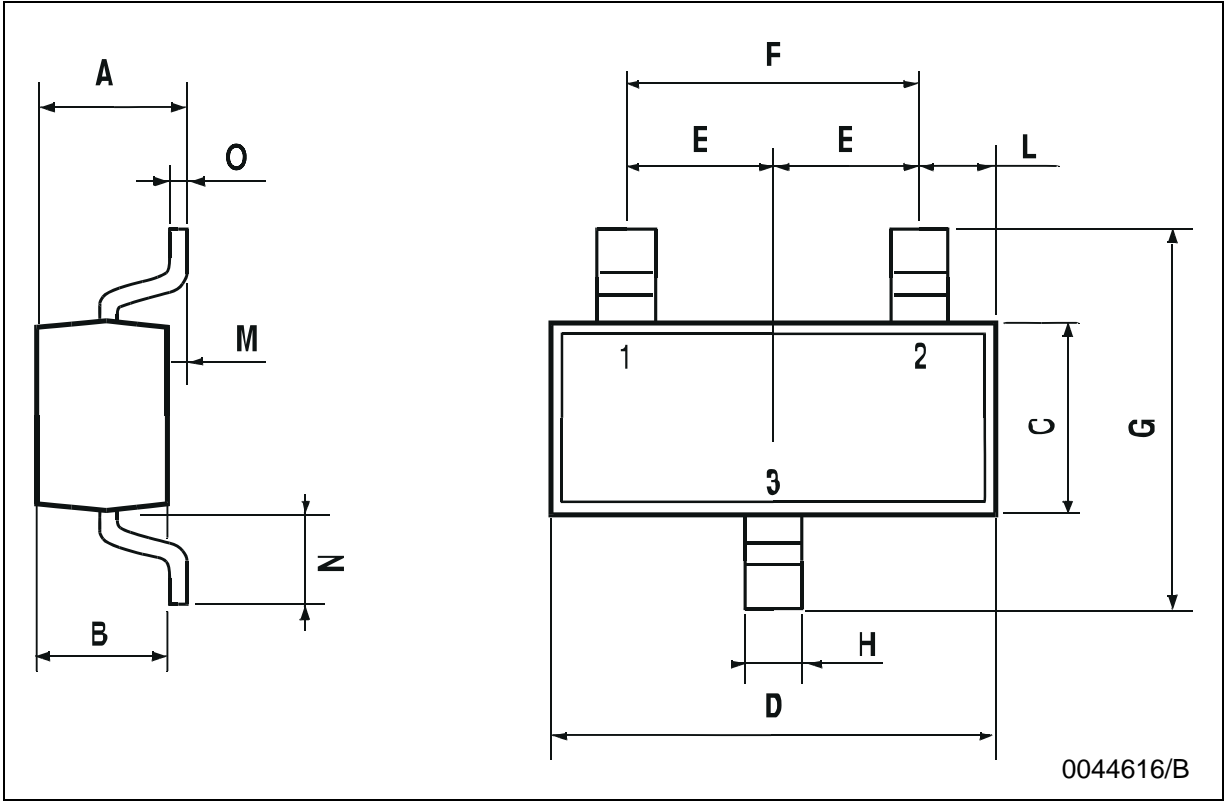
ELECTRICAL CHARACTERISTICS (Continued)

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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