

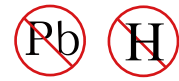


# DATA SHEET

SEMICONDUCTOR

MMBT2222AW

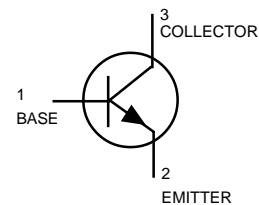
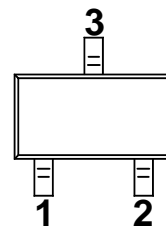
## Preliminary Information General Purpose Transistors



### NPN Silicon

These transistors are designed for general purpose amplifier applications. They are housed in the SOT-323/SC-70 package which is designed for low power surface mount applications.

### SOT-323



### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	40	Vdc
Collector-Base Voltage	$V_{CBO}$	75	Vdc
Emitter-Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current — Continuous	$I_C$	600	mAdc

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, $T_A = 25^\circ\text{C}$	$P_D$	150	mW
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

### DEVICE MARKING

MMBT2222AW = 1P

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage (1) ( $I_C = 1.0 \text{ mAdc}, I_B = 0$ )	$V_{(BR)CEO}$	40	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 10 \mu\text{Adc}, I_E = 0$ )	$V_{(BR)CBO}$	75	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \mu\text{Adc}, I_C = 0$ )	$V_{(BR)EBO}$	6.0	—	Vdc
Base Cutoff Current ( $V_{CE} = 60 \text{ Vdc}, V_{EB} = 3.0 \text{ Vdc}$ )	$I_{BL}$	—	20	nAdc
Collector Cutoff Current ( $V_{CE} = 60 \text{ Vdc}, V_{EB} = 3.0 \text{ Vdc}$ )	$I_{CEX}$	—	10	nAdc

1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

# DEVICE CHARACTERISTICS

## MMBT2222AW

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS (1)</b>				
DC Current Gain (1)	$h_{FE}$			—
(I <sub>C</sub> = 0.1 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )		35	—	
(I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )		50	—	
(I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )		75	—	
(I <sub>C</sub> = 150 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )		100	—	
(I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )		40	—	
Collector–Emitter Saturation Voltage(1)	V <sub>CE(sat)</sub>			V <sub>dc</sub>
(I <sub>C</sub> = 150 mA <sub>dc</sub> , I <sub>B</sub> = 15 mA <sub>dc</sub> )		—	0.3	
(I <sub>C</sub> = 500 mA <sub>dc</sub> , I <sub>B</sub> = 50 mA <sub>dc</sub> )		—	1.0	
Base–Emitter Saturation Voltage(1)	V <sub>BE(sat)</sub>			V <sub>dc</sub>
(I <sub>C</sub> = 150 mA <sub>dc</sub> , I <sub>B</sub> = 15 mA <sub>dc</sub> )		0.6	1.2	
(I <sub>C</sub> = 500 mA <sub>dc</sub> , I <sub>B</sub> = 50 mA <sub>dc</sub> )		—	2.0	

### SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product (I <sub>C</sub> = 20 mA <sub>dc</sub> , V <sub>CE</sub> = 20V <sub>dc</sub> , f = 100 MHz)	f <sub>T</sub>	300	—	MHz
Output Capacitance (V <sub>CB</sub> = 10 V <sub>dc</sub> , I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>obo</sub>	—	8.0	pF
Input Capacitance (V <sub>EB</sub> = 0.5 V <sub>dc</sub> , I <sub>C</sub> = 0, f = 1.0 MHz)	C <sub>ibo</sub>	—	30	pF
Input Impedance (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 10 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>ie</sub>	0.25	1.25	k Ω
Voltage Feedback Ratio (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 10 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>re</sub>	—	4.0	X 10 <sup>-4</sup>
Small–Signal Current Gain (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 10 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>fe</sub>	75	375	—
Output Admittance (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 10 mA <sub>dc</sub> , f = 1.0 kHz)	h <sub>oe</sub>	25	200	μmhos
Noise Figure (V <sub>CE</sub> = 10 V <sub>dc</sub> , I <sub>C</sub> = 100 μA <sub>dc</sub> , R <sub>S</sub> = 1.0 kΩ, f = 1.0 kHz)	NF	—	4.0	dB

### SWITCHING CHARACTERISTICS

Delay Time	(V <sub>CC</sub> = 3.0 V <sub>dc</sub> , V <sub>BE</sub> = -0.5 V <sub>dc</sub> I <sub>C</sub> = 150 mA <sub>dc</sub> , I <sub>B1</sub> = 15 mA <sub>dc</sub> )	t <sub>d</sub>	—	10	ns
Rise Time		t <sub>r</sub>	—	25	
Storage Time	(V <sub>CC</sub> = 30 V <sub>dc</sub> , I <sub>C</sub> = 150 mA <sub>dc</sub> I <sub>B1</sub> = I <sub>B2</sub> = 15 mA <sub>dc</sub> )	t <sub>s</sub>	—	225	ns
Fall Time		t <sub>f</sub>	—	60	

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

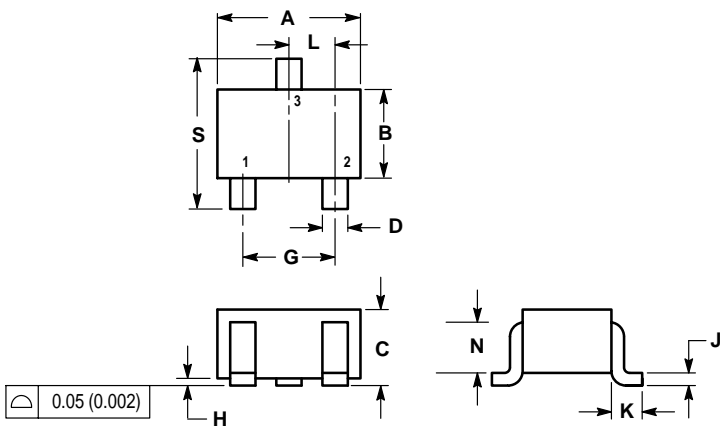
# PACKAGE OUTLINE & DIMENSIONS

## MMBT2222AW

### SC-70 / SOT-323

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.032	0.040	0.80	1.00
D	0.012	0.016	0.30	0.40
G	0.047	0.055	1.20	1.40
H	0.000	0.004	0.00	0.10
J	0.004	0.010	0.10	0.25
K	0.017 REF		0.425 REF	
L	0.026 BSC		0.650 BSC	
N	0.028 REF		0.700 REF	
S	0.079	0.095	2.00	2.40

