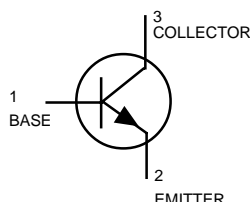
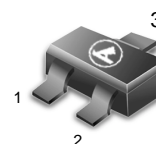


# Preliminary Information

## 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.


**MMBT2222AWT1**


CASE 419-02, STYLE 3  
SOT-323 / SC - 70

### 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

MMBT2222AWT1 = 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  $\leq 2.0\%$ .

**MMBT2222AWT1**
**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS (1)</b>				
DC Current Gain (1) ( $I_C = 0.1\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )	$h_{FE}$	35	—	—
( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )		50	—	
( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )		75	—	
( $I_C = 150\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )		100	—	
( $I_C = 500\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )		40	—	
Collector–Emitter Saturation Voltage(1) ( $I_C = 150\text{ mAdc}$ , $I_B = 15\text{ mAdc}$ )	$V_{CE(sat)}$	—	0.3	Vdc
( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )		—	1.0	
Base–Emitter Saturation Voltage(1) ( $I_C = 150\text{ mAdc}$ , $I_B = 15\text{ mAdc}$ )	$V_{BE(sat)}$	0.6	1.2	Vdc
( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )		—	2.0	

**SMALL–SIGNAL CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = 20\text{ mAdc}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	300	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	—	8.0	pF
Input Capacitance ( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ibo}$	—	30	pF
Input Impedance ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$h_{ie}$	0.25	1.25	k $\Omega$
Voltage Feedback Ratio ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$h_{re}$	—	4.0	$\times 10^{-4}$
Small–Signal Current Gain ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	75	375	—
Output Admittance ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$h_{oe}$	25	200	$\mu\text{mhos}$
Noise Figure ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 100\text{ }\mu\text{A}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )	NF	—	4.0	dB

**SWITCHING CHARACTERISTICS**

Delay Time	( $V_{CC} = 3.0\text{ Vdc}$ , $V_{BE} = -0.5\text{ Vdc}$ $I_C = 150\text{ mAdc}$ , $I_{B1} = 15\text{ mAdc}$ )	$t_d$	—	10	ns
Rise Time		$t_r$	—	25	
Storage Time	( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mAdc}$ $I_{B1} = I_{B2} = 15\text{ mAdc}$ )	$t_s$	—	225	ns
Fall Time		$t_f$	—	60	

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