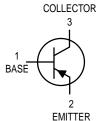
Preliminary Information

General Purpose Transistor PNP 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.



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	VCEO	-60	Vdc
Collector-Base Voltage	V _{СВО}	-60	Vdc
Emitter-Base Voltage	V _{EBO}	-5.0	Vdc
Collector Current — Continuous	lС	-600	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board ⁽¹⁾ T _A = 25°C	PD	150	mW
Thermal Resistance Junction to Ambient	$R_{ heta JA}$	833	°C/W
Junction and Storage Temperature	T _J , T _{stg}	-55 to +150	°C

DEVICE MARKING

MMBT2907AWT1 = 20

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symb	ool Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage ⁽²⁾ (IC = -10 mAdc, I _B = 0)	V(BR)C	EO -60	_	Vdc
Collector-Base Breakdown Voltage (I _C = -10 mAdc, I _E = 0)	V(BR)C	CBO -60		Vdc
Emitter-Base Breakdown Voltage (I _E = -10 μAdc, I _C = 0)	V(BR)E	BO -5.0	_	Vdc
Base Cutoff Current (VCE = -30 Vdc, VEB(off) = -0.5 Vdc)	I _{BL}	_	-50	nAdc
Collector Cutoff Current (VCE = -30 Vdc, VEB(off) = -0.5 Vdc)	ICE	×	-50	nAdc

- 1. $FR-5 = 1.0 \times 0.75 \times 0.062$ in.
- 2. Pulse Test: Pulse Width \leq 300 μ s, Duty Cycle \leq 2.0%.

Thermal Clad is a registered trademark of the Berquist Company.

Preferred devices are Motorola recommended choices for future use and best overall value.

MMBT2907AWT1

Motorola Preferred Device





MMBT2907AWT1

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

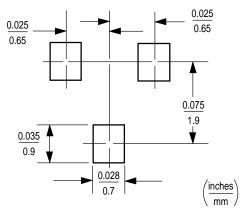
Characteristic			Min	Max	Unit
ON CHARACTERISTICS(1)					
$ \begin{array}{c} \text{DC Current Gain (1)} \\ \text{(I}_{\text{C}} = -0.1 \text{ mAdc, V}_{\text{CE}} = -10 \text{ Vdc)} \\ \text{(I}_{\text{C}} = -1.0 \text{ mAdc, V}_{\text{CE}} = -10 \text{ Vdc)} \\ \text{(I}_{\text{C}} = -10 \text{ mAdc, V}_{\text{CE}} = -10 \text{ Vdc)} \\ \text{(I}_{\text{C}} = -150 \text{ mAdc, V}_{\text{CE}} = -10 \text{ Vdc)} \\ \text{(I}_{\text{C}} = -500 \text{ mAdc, V}_{\text{CE}} = -10 \text{ Vdc)} \\ \end{array} $		H _{FE}	75 100 100 100 50	_ _ _ _	1
Collector-Emitter Saturation Voltage ⁽¹⁾ (I _C = -150 mAdc, I _B = -15 mAdc) (I _C = -500 mAdc, I _B = -50 mAdc)		VCE(sat)	-	-0.4 -1.6	Vdc
Base-Emitter Saturation Voltage(1) (IC = -150 mAdc, IB = -15 mAdc) (IC = -500 mAdc, IB = -50 mAdc)		V _{BE} (sat)	_ _	-1.3 -2.6	Vdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I _C = -50 mAdc, V _{CE} = 20 Vdc, f = 100 M	Hz)	fΤ	200	_	MHz
Output Capacitance (V _{CB} = -10 Vdc, I _E = 0, f = 1.0 MHz)		C _{obo}	_	8.0	pF
Input Capacitance (V _{EB} = -2.0 Vdc, I _C = 0, f = 1.0 MHz)		C _{ibo}	_	30	pF
SWITCHING CHARACTERISTICS					
Turn-On Time		ton	_	45	
Delay Time	$V_{CC} = -30 \text{ Vdc},$ $I_{C} = -150 \text{ mAdc}, I_{B1} = -15 \text{ mAdc}$	t _d		10	
Rise Time		t _r		40	ns
Storage Time		t _S		80	113
Fall Time	(V _{CC} = -6.0 Vdc, I _C = -150 mAdc, I _{B1} = I _{B2} = 15 mAdc)	t _f		30	
Turn–Off Time		toff	_	100	

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

INFORMATION FOR USING THE SOT-323/SC-70 SURFACE MOUNT PACKAGE

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



SOT-323/SC-70

SOT-323/SC-70 POWER DISSIPATION

The power dissipation of the SOT–323/SC–70 is a function of the pad size. This can vary from the minimum pad size for soldering to a pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by $\mathsf{T}_{J(max)}$, the maximum rated junction temperature of the die, $\mathsf{R}_{\theta JA}$, the thermal resistance from the device junction to ambient, and the operating temperature, T_A . Using the values provided on the data sheet for the SOT–323/SC–70 package, P_D can be calculated as follows:

$$P_D = \frac{T_{J(max)} - T_{A}}{R_{\theta,JA}}$$

The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values into the equation for an ambient temperature T_A of 25°C, one can calculate the power dissipation of the device which in this case is 150 milliwatts.

$$P_D = \frac{150^{\circ}C - 25^{\circ}C}{833^{\circ}C/W} = 150 \text{ milliwatts}$$

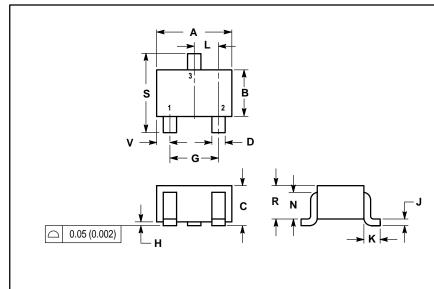
The 833°C/W for the SOT-323/SC-70 package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 150 milliwatts. There are other alternatives to achieving higher power dissipation from the SOT-323/SC-70 package. Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad™. Using a board material such as Thermal Clad, an aluminum core board, the power dissipation can be doubled using the same footprint.

SOLDERING PRECAUTIONS

The melting temperature of solder is higher than the rated temperature of the device. When the entire device is heated to a high temperature, failure to complete soldering within a short time could result in device failure. Therefore, the following items should always be observed in order to minimize the thermal stress to which the devices are subjected.

- Always preheat the device.
- The delta temperature between the preheat and soldering should be 100°C or less.*
- When preheating and soldering, the temperature of the leads and the case must not exceed the maximum temperature ratings as shown on the data sheet. When using infrared heating with the reflow soldering method, the difference shall be a maximum of 10°C.
- The soldering temperature and time shall not exceed 260°C for more than 10 seconds.
- When shifting from preheating to soldering, the maximum temperature gradient shall be 5°C or less.
- After soldering has been completed, the device should be allowed to cool naturally for at least three minutes.
 Gradual cooling should be used as the use of forced cooling will increase the temperature gradient and result in latent failure due to mechanical stress.
- Mechanical stress or shock should not be applied during cooling.
- * Soldering a device without preheating can cause excessive thermal shock and stress which can result in damage to the device.

PACKAGE DIMENSIONS



NOTES

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

	INCHES		MILLIN	IETERS	
DIM	MIN	MAX	MIN	MAX	
Α	0.071	0.087	1.80	2.20	
В	0.045	0.053	1.15	1.35	
С	0.035	0.049	0.90	1.25	
D	0.012	0.016	0.30	0.40	
G	0.047	0.055	1.20	1.40	
Н	0.000	0.004	0.00	0.10	
J	0.004	0.010	0.10	0.25	
K	0.017 REF		0.425	0.425 REF	
L	0.026 BSC		0.650	BSC	
N	0.028 REF		0.700	REF	
R	0.031	0.039	0.80	1.00	
S	0.079	0.087	2.00	2.20	
٧	0.012	0.016	0.30	0.40	

STYLE 3: PIN 1. BASE 2. EMITTER 3. COLLECTOR

CASE 419-02 ISSUE H SOT-323/SC-70

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