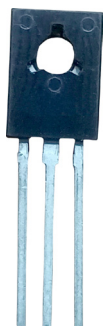


Single Bipolar Transistor multicomp^{PRO}



Application

- Low frequency Power Amplifier

Features:

1. This product is available in AEC-Q101 Compliant and PPAP Capable also.

RoHS
Compliant

Absolute Maximum Ratings (Ta = 25°C Unless otherwise specified)

Parameter	Symbol	CSB649 CSD669	CSB649A	Unit
Collector-base voltage (open emitter)	V _{CBO}	180		V
Collector-emitter voltage (open base)	V _{CEO}	160		
Collector current	I _C	1.5		A
Total power dissipation up to T _C = 25°C	P _C	20		W
Junction temperature	T _J	150		°C
Emitter-base voltage (open collector)	V _{EBO}	5		V
Collector current (peak)	I _{CP}	3		A
Total power dissipation up to T _A = 25°C	P _C	1		W
Storage temperature	T _{stg}	65 to +150		°C

Electrical Characteristics at (Ta = 25°C Unless otherwise specified)

Parameter	Symbol	Test Condition	Min./Min	CSB649 CSD669	CSB649A	Unit
Collector Cut off Current	I _{CBO}	IE = 0; VCB = 160V		10		μA
Breakdown voltages	V _{CEO}	IC = 10mA; IB = 0	Max	120	160	V
		IC = 1mA; IE = 0		180		
	V _{EBO}	IE = 1mA; IC = 0		5		
				1		
Saturation voltage	V _{CEsat}	IC = 500mA; IB = 50mA		1.5		
Base-emitter voltage	V _{BE (on)}	IC = 150mA; VCE = 5V				
DC Current Gain	h _{FE}	IC = 150mA; VCE = 5V	Min	60		
			Max	320	200	
		IC = 500mA; VCE = 5V	Min	30		
Transition frequency	f _T	IC = 150mA; VCE = 5V		140		MHz
Output capacitance	C _{ob}	VCB = 10 V; IE = 0; f = 1 MHz	PNP	27		pF
			NPN	14		

Single Bipolar Transistor multcomp^{PRO}

Classification of h_{FE}

Rank	R	Q	P	E
Range	60 to 120	100 to 200	160 to 320	200 to 400

Note

1. h_{FE} classification

Non A

B 60 - 120	C 100 - 200	D 160-320
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A

D 160-320	C 100 - 200
-----------	-------------

2. Pulse test

3. For PNP device voltage and current values will be negative (-).

Recommended Reflow Solder Profiles

The recommended reflow solder profiles for Pb and Pb-free devices are shown below.

Figure 1 shows the recommended solder profile for devices that have Pb-free terminal plating, and where a Pb-free solder is used.

Figure 2 shows the recommended solder profile for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 1

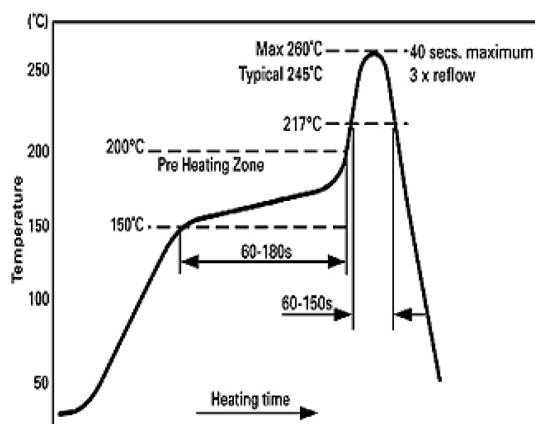
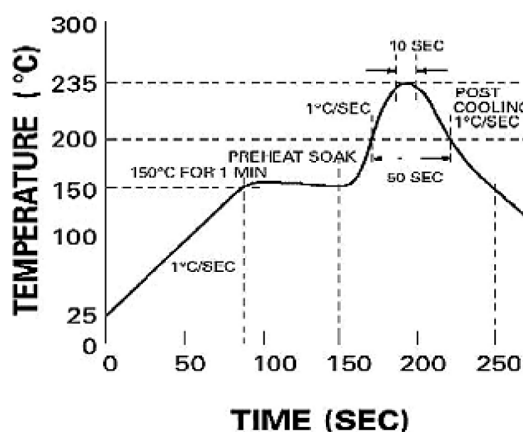


Figure 2



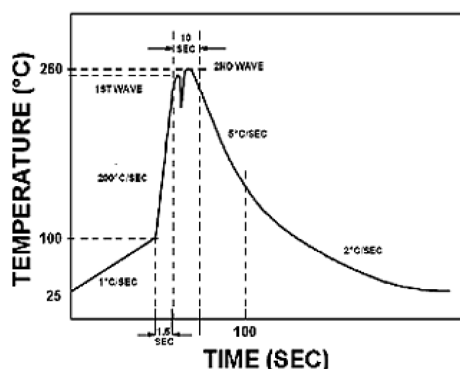
Single Bipolar Transistor multicom^{PRO}

Reflow profiles in tabular form

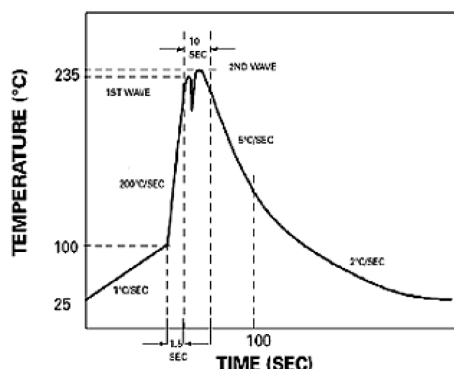
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
Preheat – Temperature Range – Time	150-170°C 60-180 seconds	150-200°C 60-180 seconds
Time maintained above: – Temperature – Time	200°C 30-50 seconds	217°C 60-150 seconds
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	40 seconds
Ramp-Down Rate	3°C/second max.	6°C/second max.

Recommended Wave Solder Profiles

The Recommended solder Profile For Devices with Pb-free terminal plating where a Pb-free solder is used



The Recommended solder Profile For Devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with leaded solder



Wave Profiles in Tabular Form

Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~200°C/second	~200°C/second
Heating rate during preheat	Typical 1-2, Max 4°C/sec	Typical 1-2, Max 4°C/Sec
Final preheat Temperature	Within 125°C of Solder Temp	Within 125°C of Solder Temp
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	10 seconds
Ramp-Down Rate	5°C/second max.	5°C/second max.

Dimensions : Millimetres

Single Bipolar Transistor multicomp^{PRO}

Typical Characteristics Curves

Fig. 1. Maximum Collector Dissipation

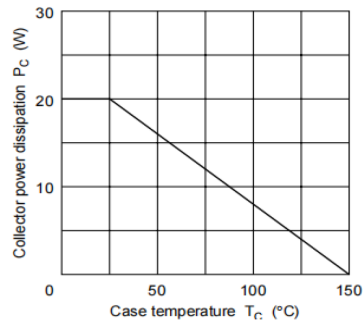


Fig. 2. Typical Output Characteristics

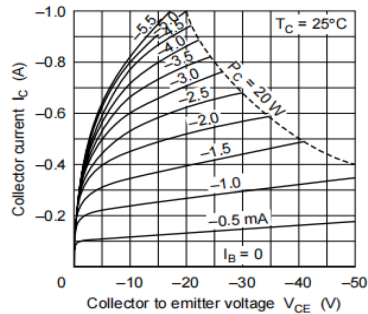


Fig. 3. Area of Safe Operation

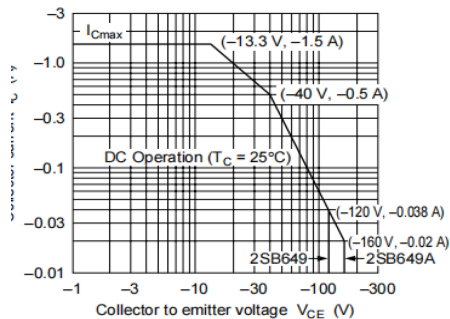


Fig. 7. Gain Bandwidth Product vs. Collector Current

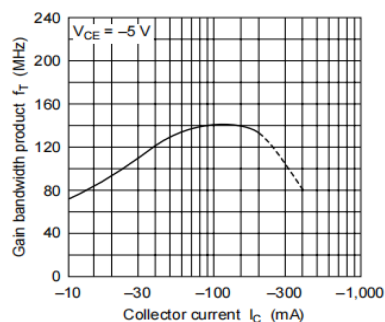


Fig. 4. Typical Transfer Characteristics

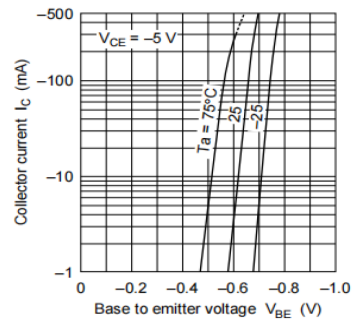


Fig. 5. DC Current Transfer Ratios vs. Collector Current

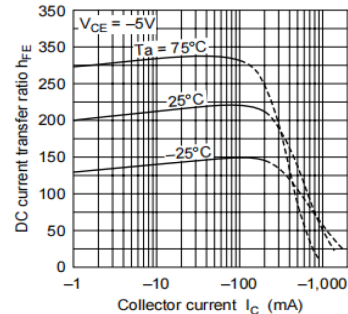


Fig. 6. Base to Emitter Saturation Voltage vs. Collector Current

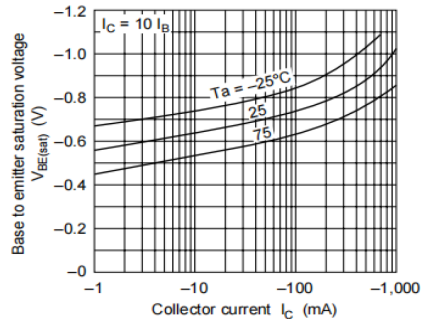
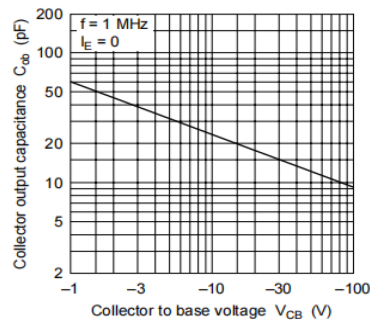
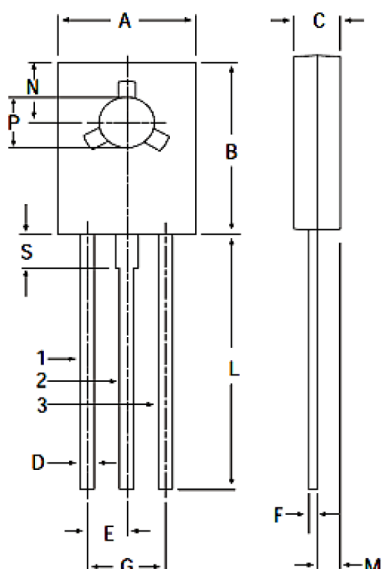


Fig. 8. Gain Bandwidth Product vs. Collector Current



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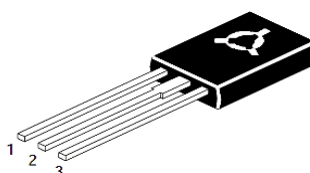
TO-18 Leaded Plastic Package



DIM	MIN	MAX
A	7.4	7.8
B	10.5	10.8
C	2.4	2.7
D	0.7	0.9
E	2.25 TYP.	
F	0.49	
G	4.5 TYP.	
L	15.7 TYP.	
M	1.27 TYP.	
N	3.75 TYP.	
P	3	3.2
S	2.5 TYP.	

PIN CONFIGURATION

1. EMITTER
2. COLLECTOR
3. BASE



Part Number Table

Description	Part Number
Single Bipolar Transistor, PNP, 160V, 1500mA, 20W, TO-18	CSB649
Single Bipolar Transistor, PNP, 160V, 1500mA, 20W, TO-18	CSB649A
Single Bipolar Transistor, NPN, 160V, 1500mA, 20W, TO-18	CSD669

Dimensions : Millimetres

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