

# General Purpose NPN Epitaxial Planar Transistor

# BTC3906S3

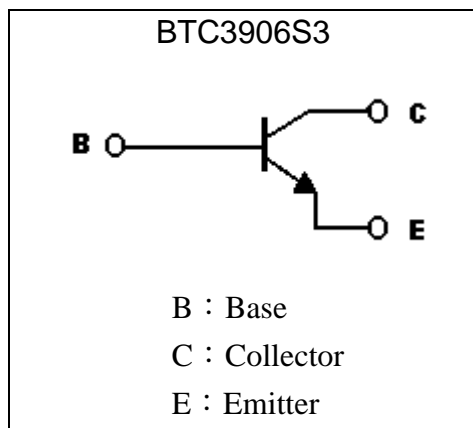
## Description

The BTC3906S3 is designed for general purpose applications requiring high breakdown voltage.

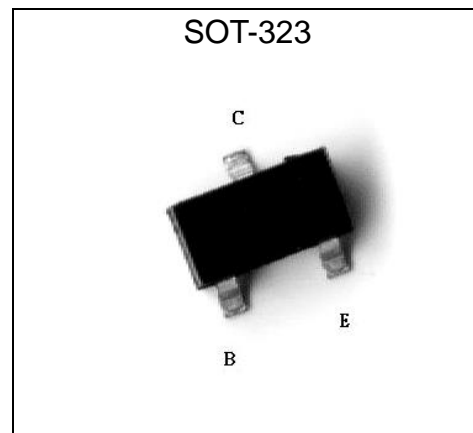
## Features

- High collector-emitter breakdown voltage. ( $BV_{CEO}=160V @ I_C=1mA$ )
- Complement to BTA1514S3
- Pb-free and halogen-free package

## Symbol

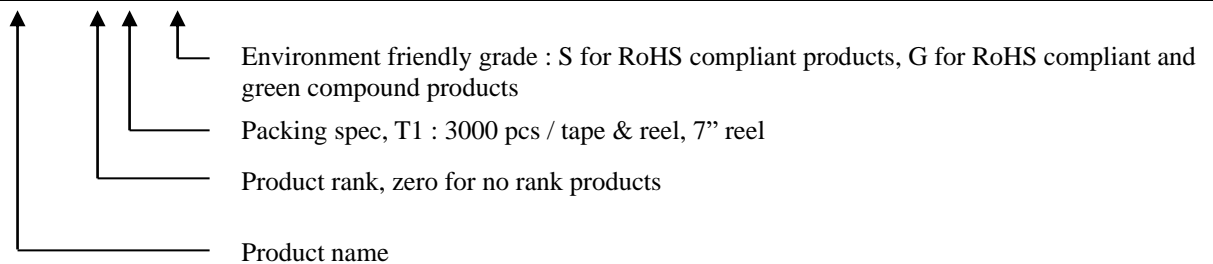


## Outline



## Ordering Information

Device	Package	Shipping
BTC3906S3-X-T1-G	SOT-323 (Pb-free and halogen-free package)	3000 pcs / Tape & Reel





**Absolute Maximum Ratings** (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-Base Voltage	V <sub>CB0</sub>	180	V
Collector-Emitter Voltage	V <sub>CEO</sub>	160	V
Emitter-Base Voltage	V <sub>EBO</sub>	6	V
Collector Current	I <sub>C</sub>	600	mA
Power Dissipation (Ta=25°C)	P <sub>D</sub>	200	mW
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	625	°C/W
Operating Junction Temperature Range	T <sub>j</sub>	-55~+150	°C
Storage Temperature Range	T <sub>stg</sub>	-55~+150	°C

**Characteristics** (Ta=25°C)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
BV <sub>CB0</sub>	180	-	-	V	I <sub>C</sub> =100μA
BV <sub>CEO</sub>	160	-	-	V	I <sub>C</sub> =1mA
BV <sub>EBO</sub>	6	-	-	V	I <sub>E</sub> =10μA
I <sub>CB0</sub>	-	-	50	nA	V <sub>CB</sub> =120V
I <sub>EBO</sub>	-	-	50	nA	V <sub>EB</sub> =4V
*V <sub>CE(sat)1</sub>	-	0.1	0.15	V	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA
*V <sub>CE(sat)2</sub>	-	-	0.2	V	I <sub>C</sub> =50mA, I <sub>B</sub> =5mA
*V <sub>BE(sat)1</sub>	-	-	1	V	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA
*V <sub>BE(sat)2</sub>	-	-	1	V	I <sub>C</sub> =50mA, I <sub>B</sub> =5mA
*h <sub>FE1</sub>	100	-	-	-	V <sub>CE</sub> =5V, I <sub>C</sub> =1mA
*h <sub>FE2</sub>	100	-	-	-	V <sub>CE</sub> =5V, I <sub>C</sub> =10mA
*h <sub>FE3</sub>	50	-	-	-	V <sub>CE</sub> =5V, I <sub>C</sub> =50mA
*h <sub>FE4</sub>	120	-	390	-	V <sub>CE</sub> =6V, I <sub>C</sub> =2mA
f <sub>T</sub>	100	-	-	MHz	V <sub>CE</sub> =20V, I <sub>C</sub> =10mA, f=100MHz
C <sub>ob</sub>	-	-	6	pF	V <sub>CB</sub> =20V, I <sub>E</sub> =0A, f=1MHz

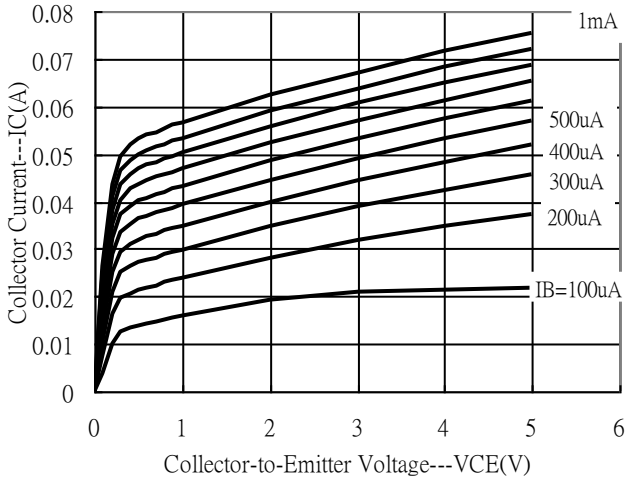
\*Pulse Test: Pulse Width ≤380us, Duty Cycle ≤2%

**Classification Of h<sub>FE</sub> 4**

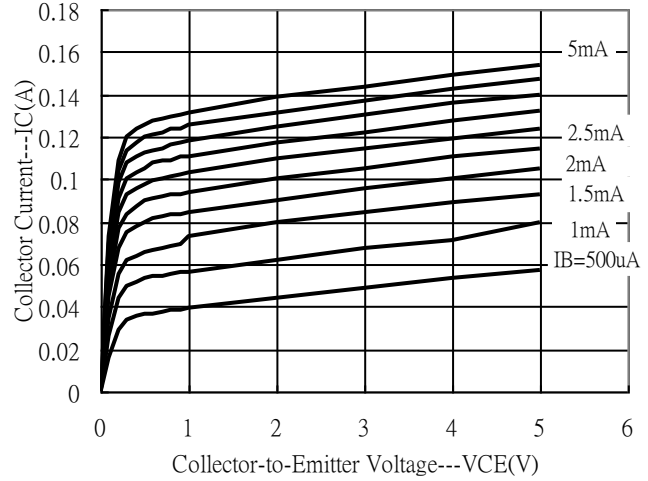
Rank	Q	R
Range	120~270	180~390

**Typical Characteristics**

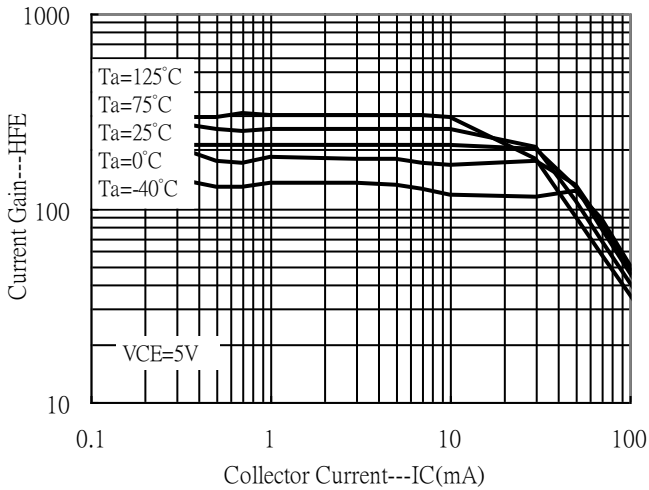
Emitter Grounded Output Characteristics



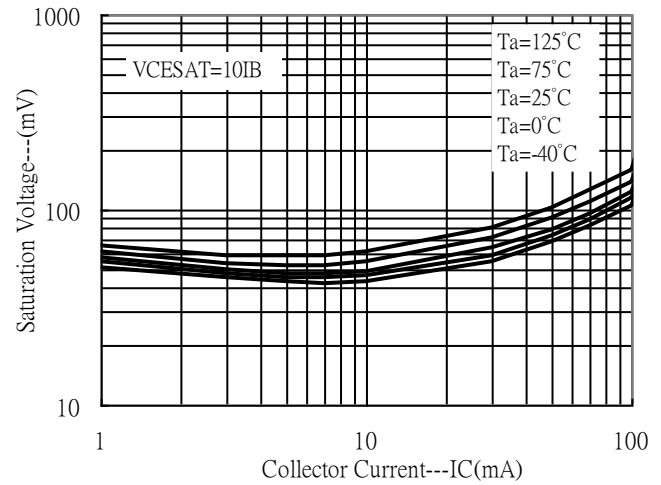
Emitter Grounded Output Characteristics



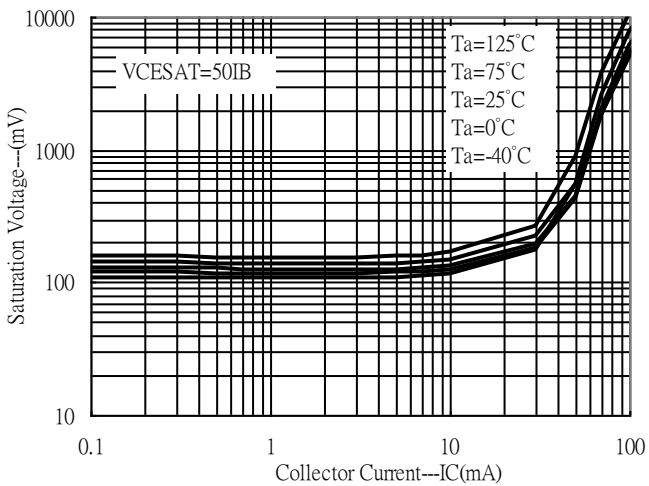
Current Gain vs Collector Current



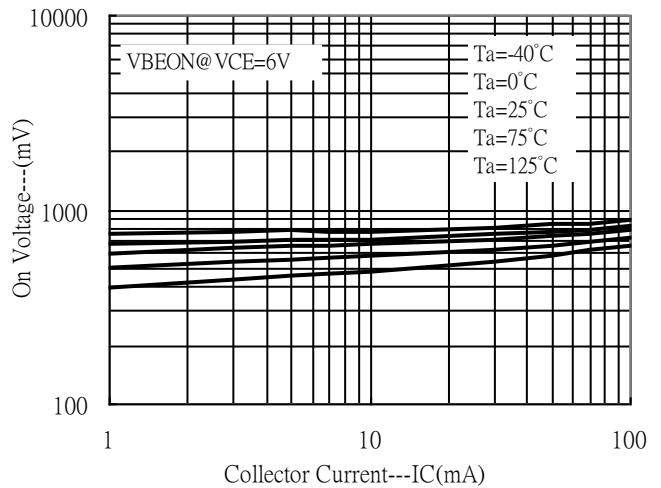
Saturation Voltage vs Collector Current



Saturation Voltage vs Collector Current

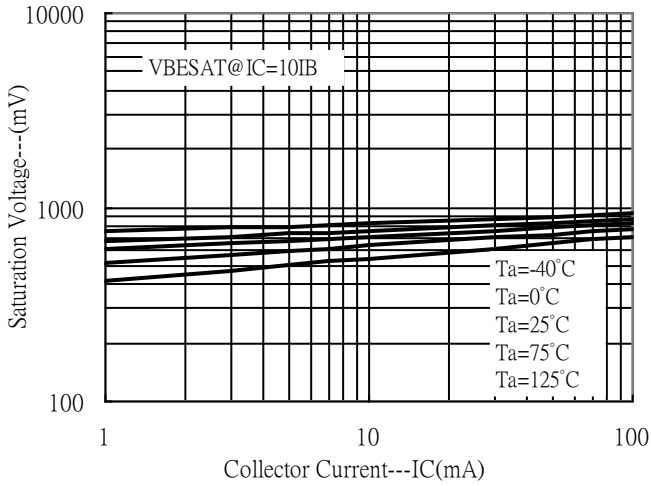


On Voltage vs Collector Current

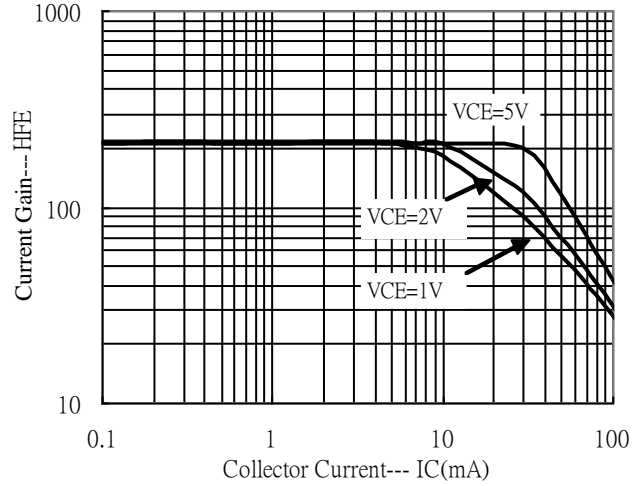


**Typical Characteristics(Cont.)**

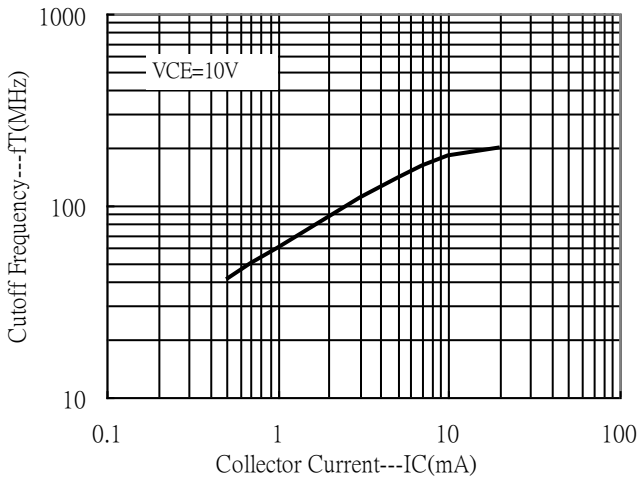
Saturation Voltage vs Collector Current



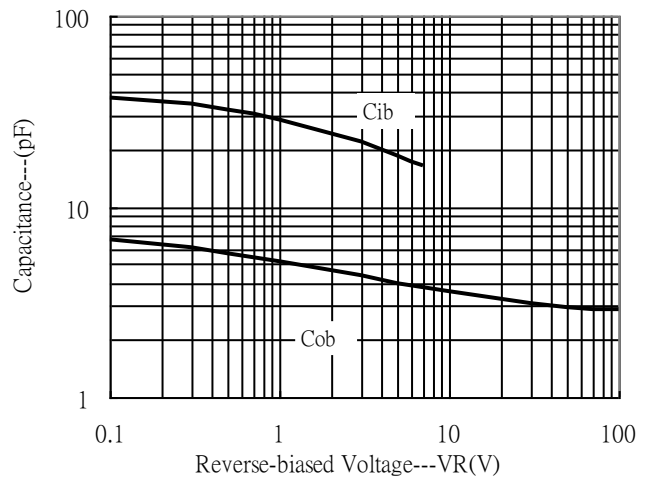
Current Gain vs Collector Current



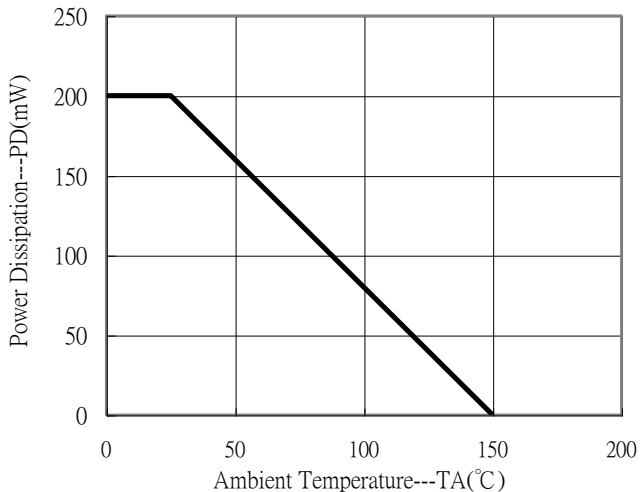
Cutoff Frequency vs Collector Current



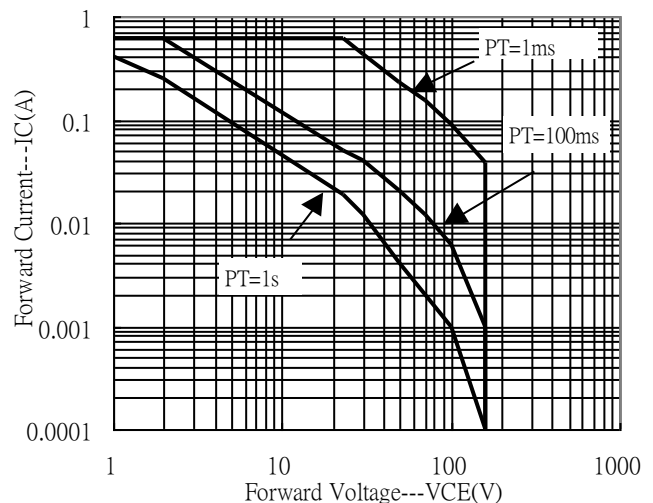
Capacitance vs Reverse-biased Voltage



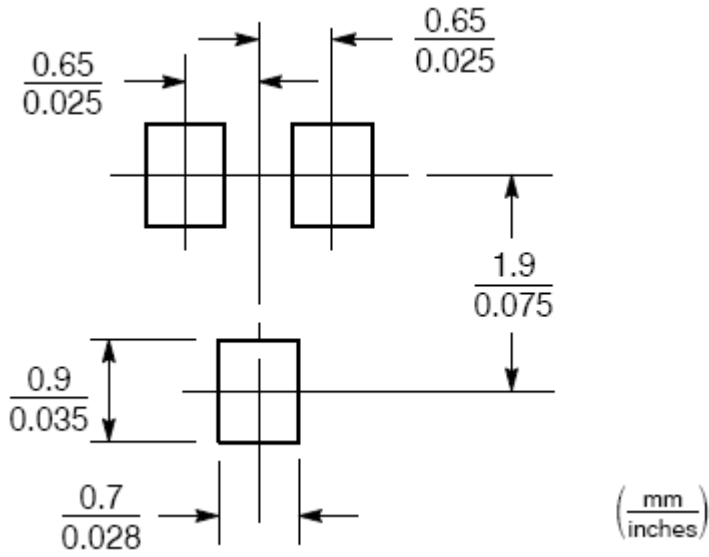
Power Derating Curve



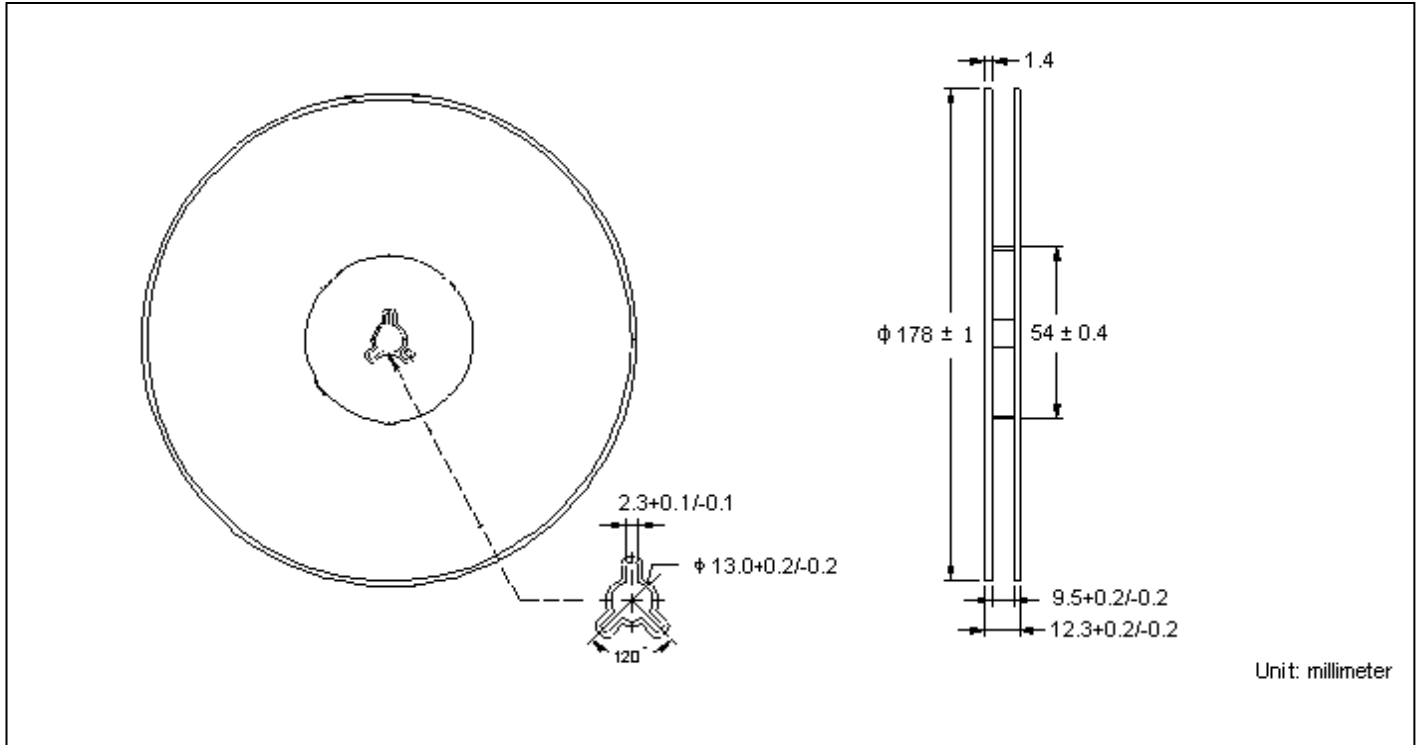
Safe Operating Area



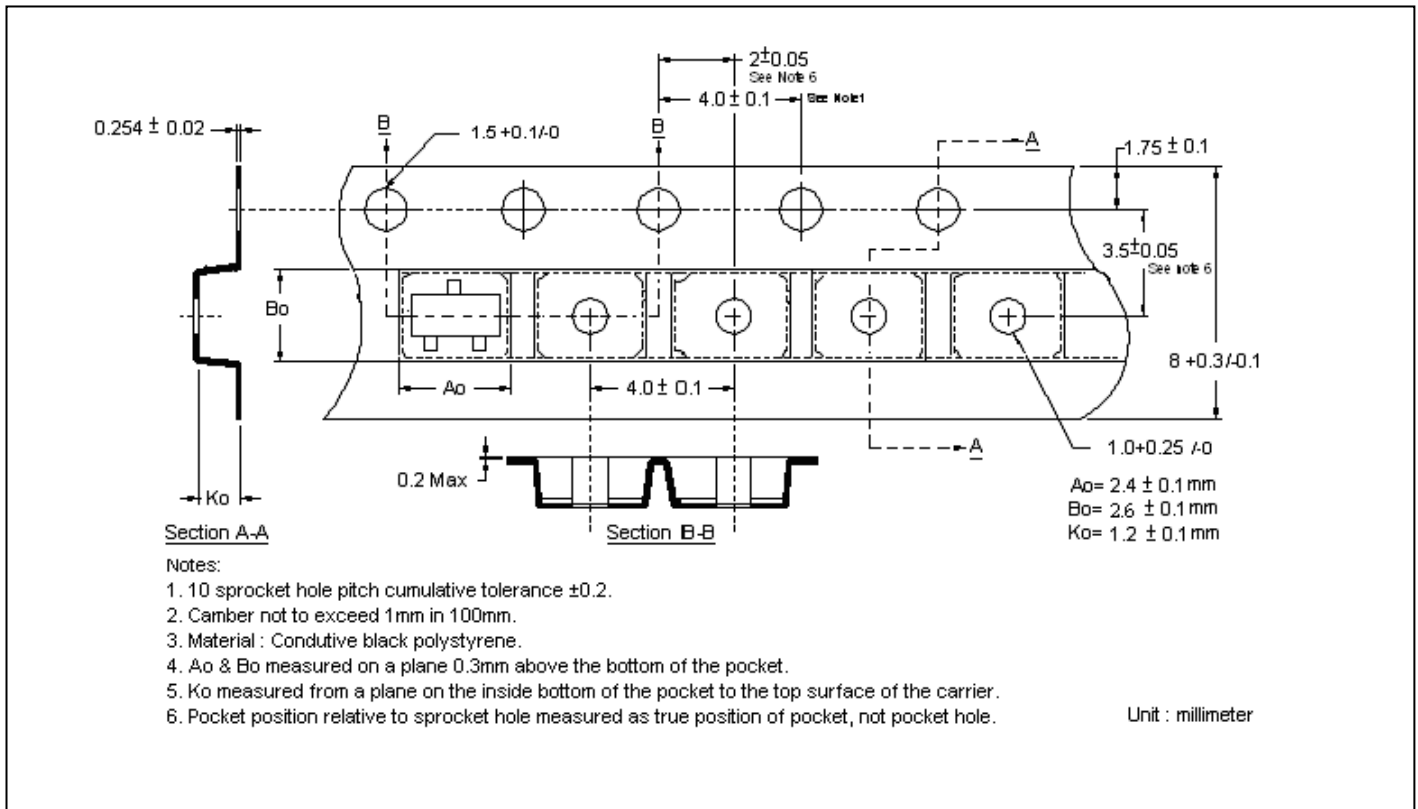
### Recommended Soldering Footprint



**Reel Dimension**



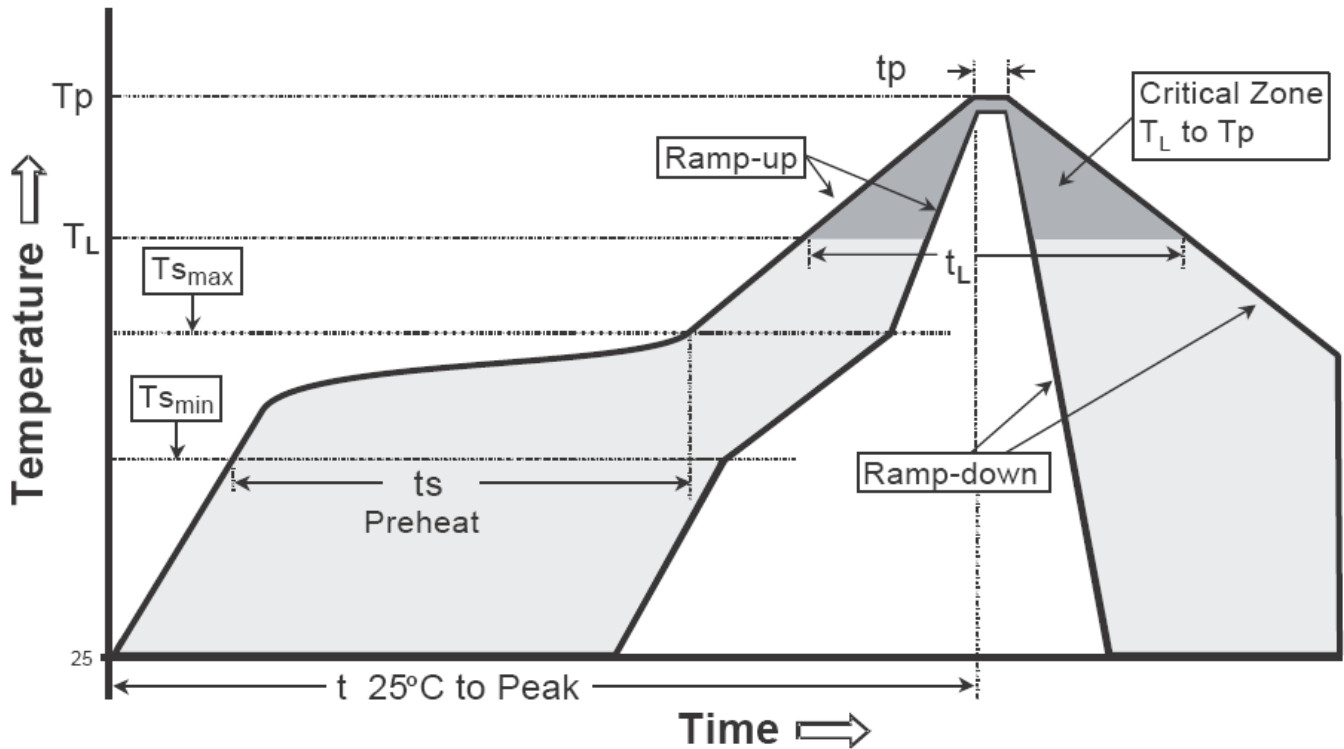
**Carrier Tape Dimension**



**Recommended wave soldering condition**

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak Temperature(T <sub>p</sub> )	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note :1. All temperatures refer to topside of the package, measured on the package body surface.  
 2.For devices mounted on FR-4 PCB of 1.6mm or equivalent grade PCB. If other grade PCB is used, care should be taken to match the coefficients of thermal expansion between components and PCB. If they are not matched well, the solder joints may crack or the bodies of the parts may crack or shatter as the assembly cools.

**SOT-323 Dimension**

**Marking:**

C

G1 ● ×

B E

Device Code ——— Date Code

Assembly site code : blank → site 1, ● → site 2

Style: Pin 1.Base 2.Emitter 3.Collector

3-Lead SOT-323 Plastic Surface Mounted Package  
 CYStek Package Code: S3

Date Code: Year+Month  
 Year: 3→2003, 4→2004  
 Month: 1→1, 2→2, . . .  
 9→9, A→10, B→11, C→12

\*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.035	0.043	0.900	1.100	E1	0.045	0.053	1.150	1.350
A1	0.000	0.004	0.000	0.100	e	0.026 TYP		0.650 TYP	
A2	0.035	0.043	0.900	1.000	e1	0.047	0.055	1.200	1.400
b	0.005	0.016	0.150	0.400	L	0.010	0.018	0.260	0.460
c	0.001	0.006	0.050	0.150	L1	0.021 REF		0.525 REF	
D	0.079	0.087	2.000	2.200	θ	0°	8°	0°	8°
E	0.085	0.096	2.150	2.450					

**Notes:** 1.Controlling dimension: millimeters.  
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.  
 3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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