## General Purpose NPN Epitaxial Planar Transistor

# BTD5213L3

## Description

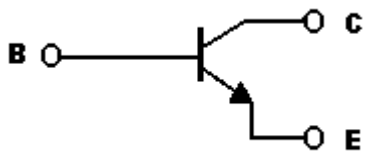
General purpose mainly intended for use in medium power industrial application and for audio amplifier output stage.

## Features

- High collector current and low $V_{CE(SAT)}$.
- Complement to BTB5213L3.
- Pb-free lead plating and halogen-free package.

## Symbol

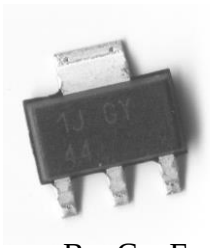
BTD5213L3




B：Base
C：Collector
E：Emitter

## Outline

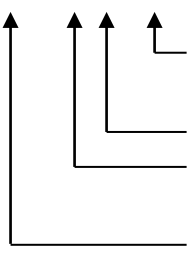
SOT-223



B C E

## Ordering Information

| Device | Package | Shipping |
|---|---|---|
| BTD5213L3-0-T3-G | SOT-223<br>(Pb-free lead plating and halogen-free package) | 2500 pcs / tape & reel |



Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, T3 : 2500 pcs / tape & reel, 13” reel

Product rank, zero for no rank products

Product name

## Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 180 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 100 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 5 | V |
| Collector Current(DC) | $I_C$ | 1 | A |
| Collector Current(Pulse) | $I_{CP}$ | 1.5 | A |
| Base Current(DC) | $I_B$ | 0.4 | A |
| Power Dissipation @$T_A$=25℃ | $P_D$ | 0.8 | W |
| Power Dissipation @$T_C$=25℃ | $P_D$ | 2 | W |
| Operating Junction Temperature Range | Tj | -55~+150 | °C |
| Storage Temperature Range | Tstg | -55~+150 | °C |

## Thermal Data

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-ambient, max | $R_{\theta JA}$ | 156 | °C/W |
| Thermal Resistance, Junction-to-case, max | $R_{\theta JC}$ | 62.5 | °C/W |

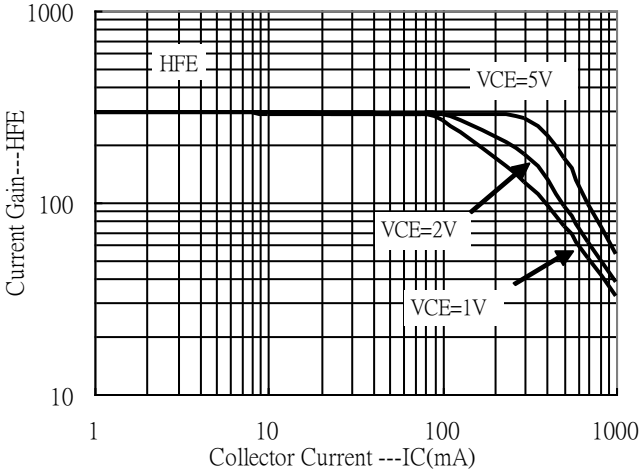
## Characteristics (Ta=25°C)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| $BV_{CBO}$ | 180 | - | - | V | $I_C$=100μA |
| $BV_{CEO}$ | 100 | - | - | V | $I_C$=10mA |
| $BV_{EBO}$ | 5 | - | - | V | $I_E$=10μA |
| $I_{CBO}$ | - | - | 100 | nA | $V_{CB}$=80V |
| $I_{EBO}$ | - | - | 100 | nA | $V_{EB}$=5V |
| *$V_{CE(sat)}$1 | - | 0.15 | 0.3 | V | $I_C$=500mA, $I_B$=50mA |
| *$V_{CE(sat)}$2 | - | - | 0.6 | V | $I_C$=1A, $I_B$=50mA |
| *$V_{BE(sat)}$ | - | - | 1.2 | V | $I_C$=1A, $I_B$=50mA |
| *$V_{BE(on)}$ | - | - | 1.0 | V | $V_{CE}$=2V, $I_C$=500mA |
| *$h_{FE}$1 | 200 | - | - | - | $V_{CE}$=2V, $I_C$=5mA |
| *$h_{FE}$2 | 200 | - | 400 | - | $V_{CE}$=2V, $I_C$=150mA |
| *$h_{FE}$3 | 60 | - | - | - | $V_{CE}$=2V, $I_C$=500mA |
| $f_T$ | - | 125 | - | MHz | $V_{CE}$=10V, $I_C$=50mA, f=100MHz |
| Cob | - | - | 10 | pF | $V_{CB}$=10V, $I_E$=0A,f=1MHz |

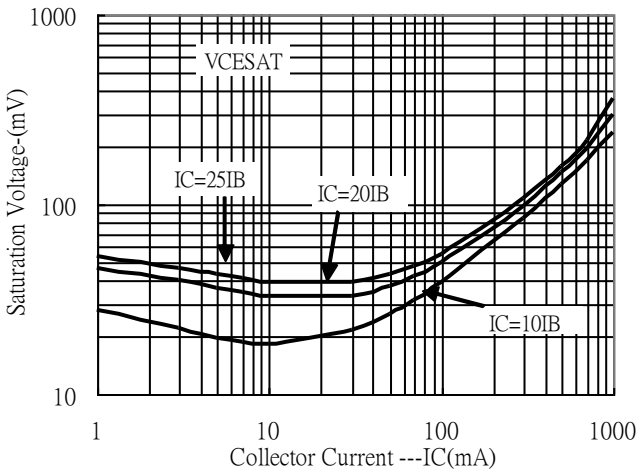
*Pulse Test: Pulse Width ≤380μs, Duty Cycle≤2%

## Typical Characteristics

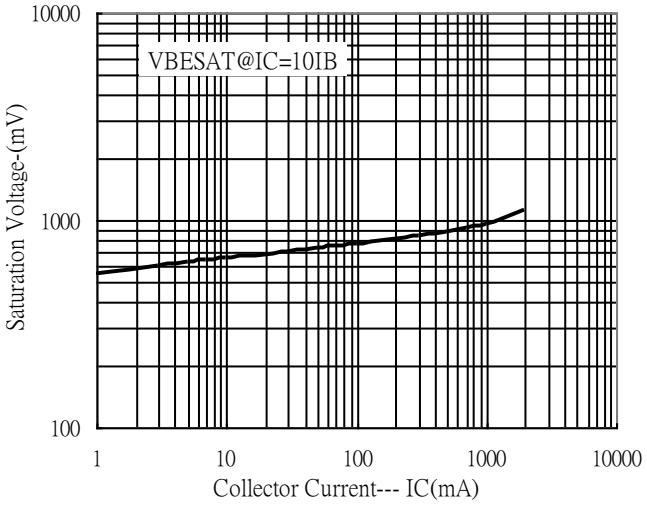
Current Gain vs Collector Current



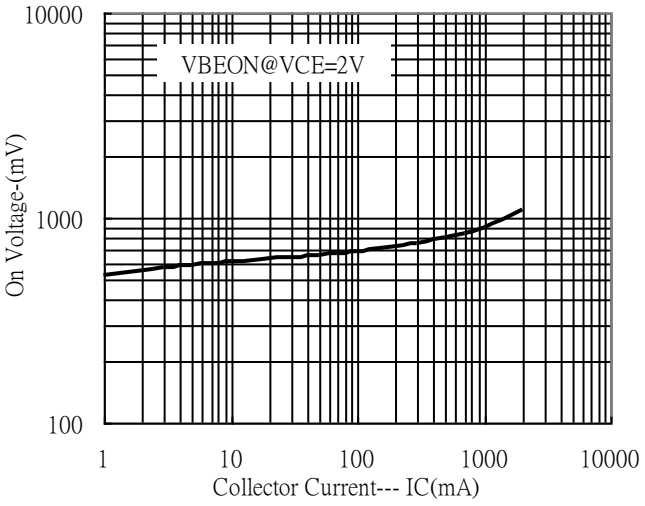

Saturation Voltage vs Collector Current



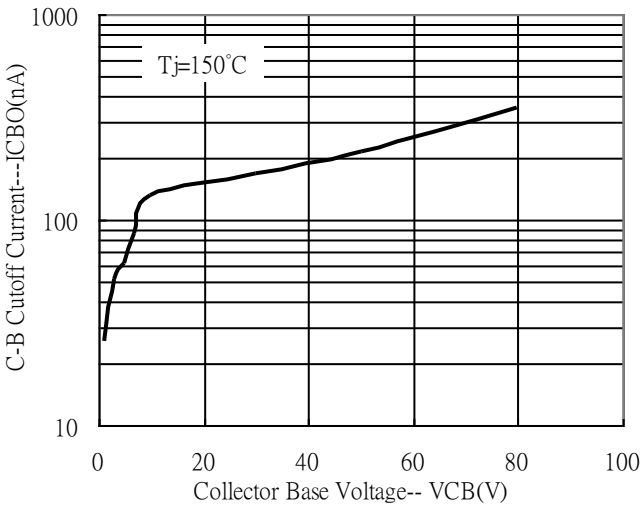

Saturation Voltage vs Collector Current



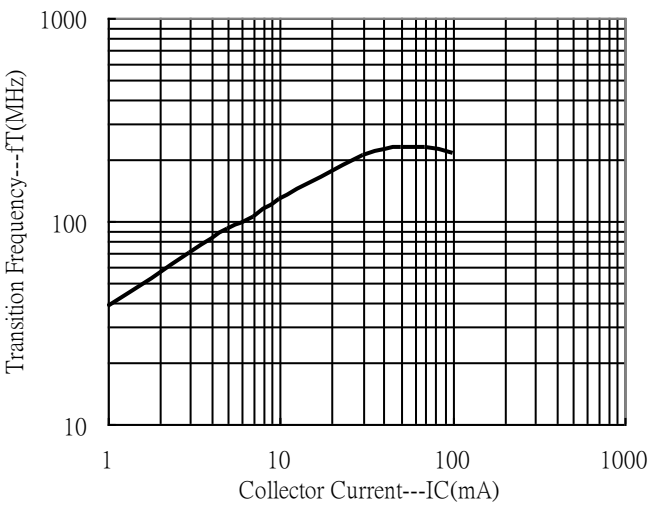

On Voltage vs Collector Current



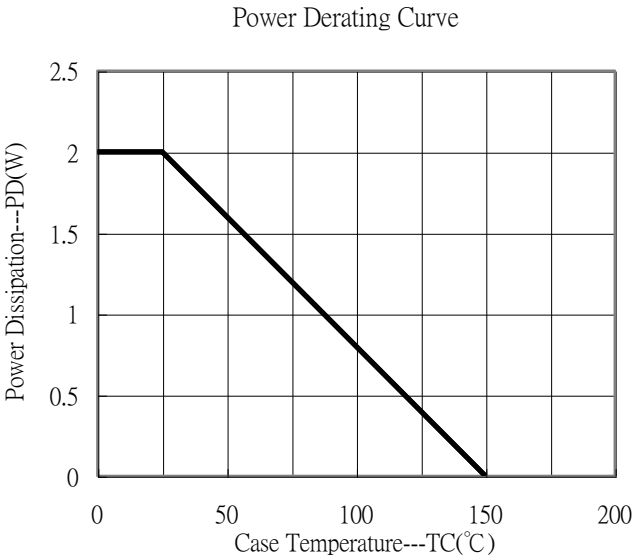

Typical Cutoff Current Characteristics



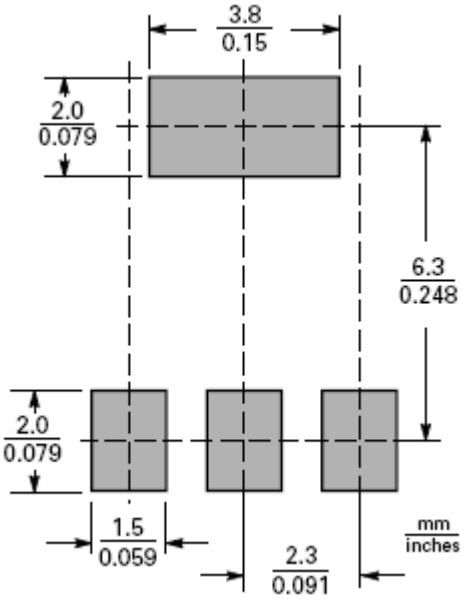

Transition Frequency vs Collector Current



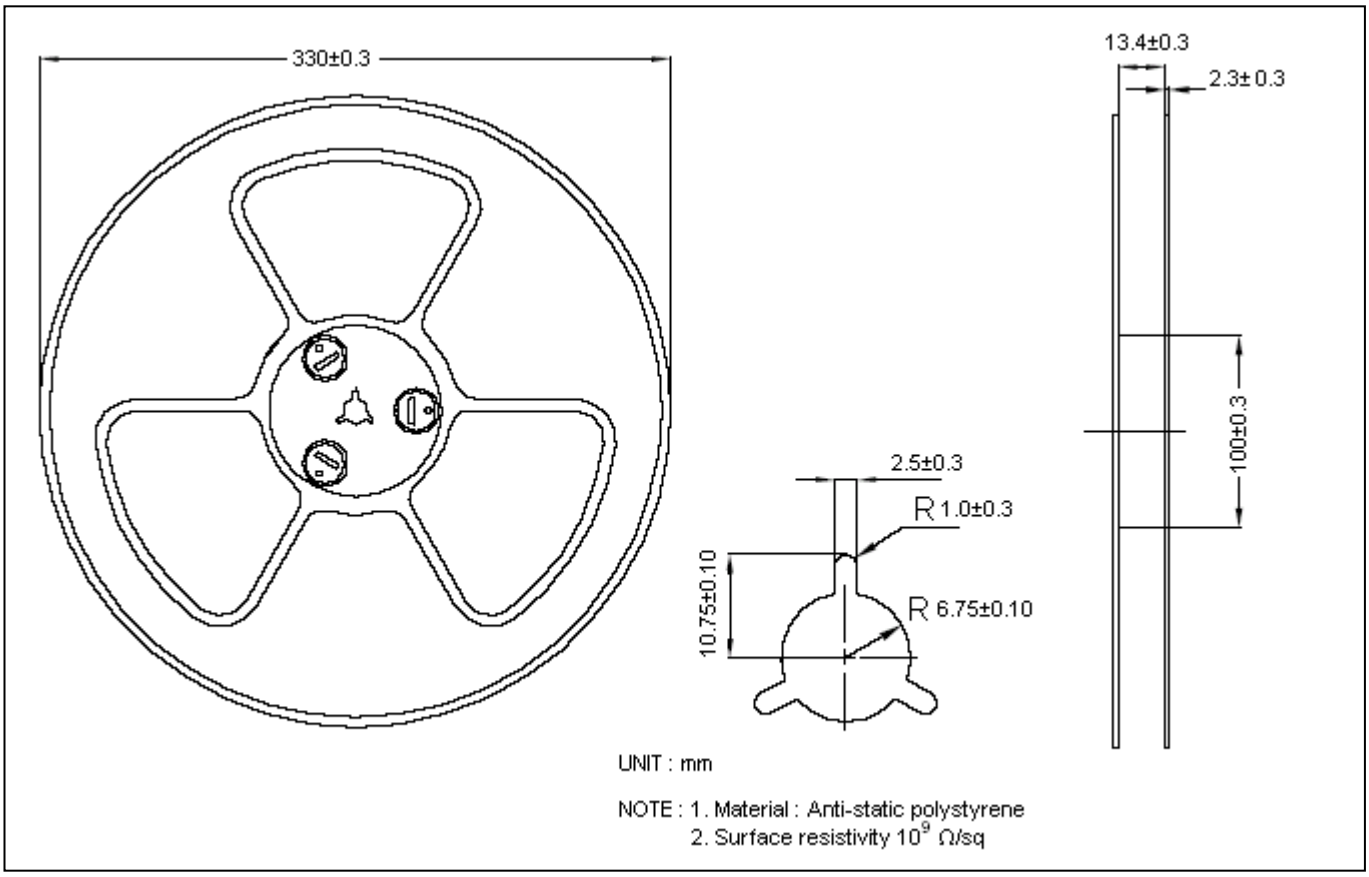
## Typical Characteristics(Cont.)




## Recommended soldering footprint



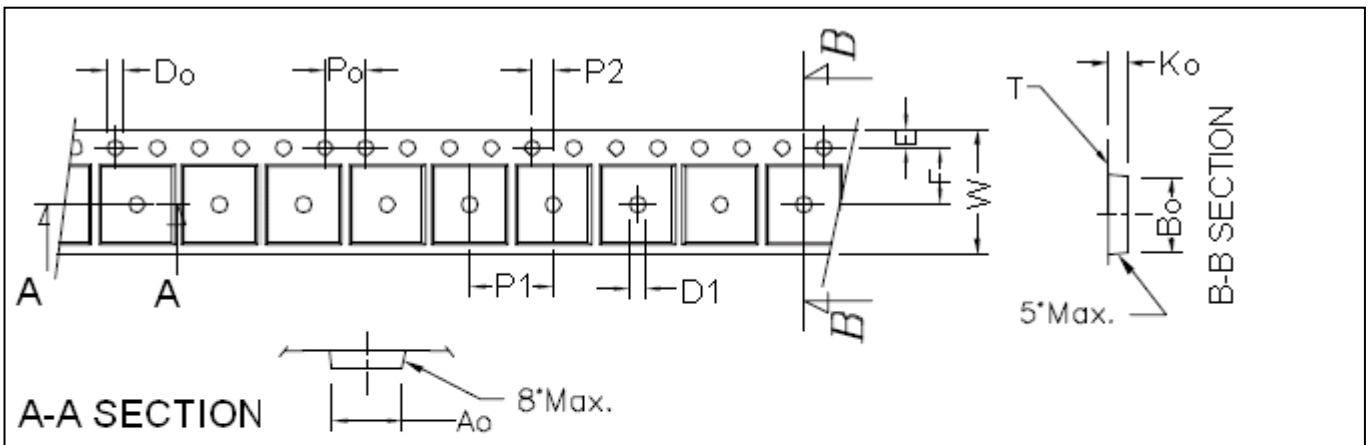
## Reel Dimension




UNIT : mm

NOTE : 1. Material : Anti-static polystyrene
2. Surface resistivity $10^9$ Ω/sq

## Carrier Tape Dimension



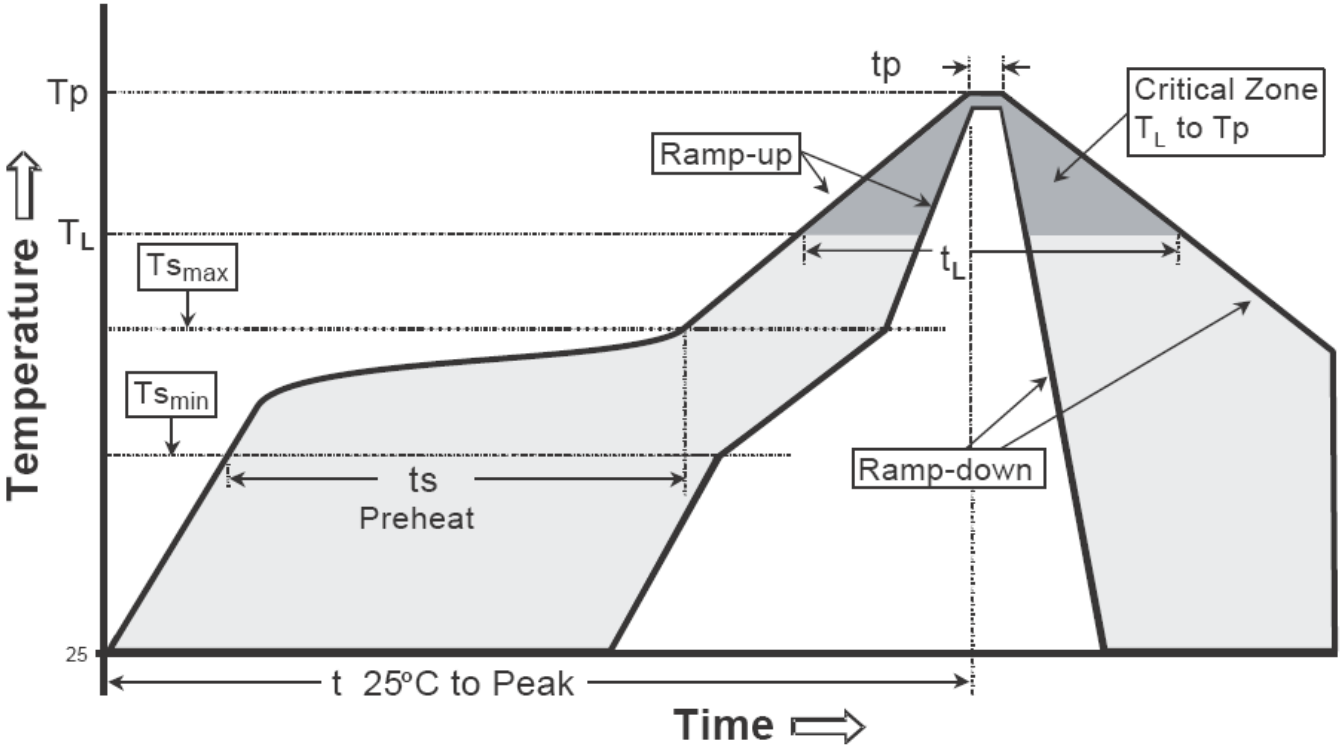

| Symbol | Ao | Bo | Ko | Po | P1 | P2 | T |
|---|---|---|---|---|---|---|---|
| Spec | 6.83±0.1 | 7.42±0.1 | 1.88±0.1 | 4.0±0.1 | 8.0±0.10 | 2.0±0.05 | 0.292±0.02 |
| Symbol | E | F | Do | D1 | W | 10Po | |
| Spec | 1.75±0.1 | 5.5±0.05 | 1.60±0.1 | 1.5±0.25 | $12^{+0.3}_{-0.1}$ | 40.0±0.2 | |

Unit : mm

## Recommended wave soldering condition

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

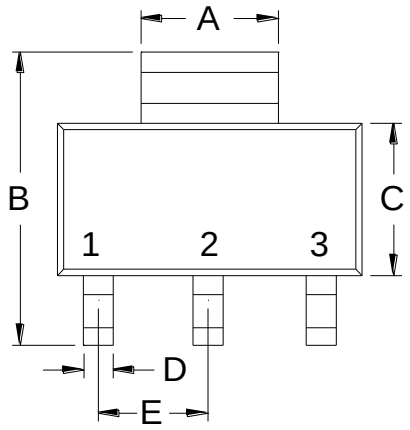
## Recommended temperature profile for IR reflow

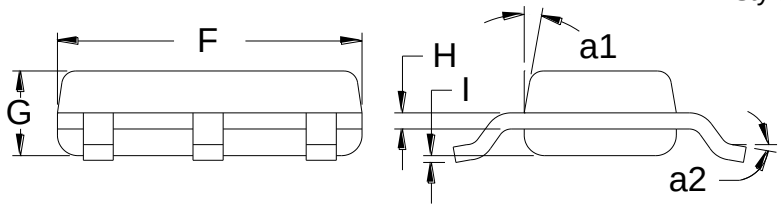


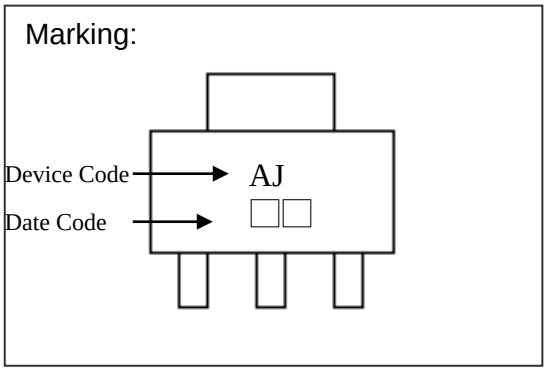

| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|---|---|
| Average ramp-up rate (Tsmax to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat<br>−Temperature Min($T_S$ min)<br>−Temperature Max($T_S$ max)<br>−Time(ts min to ts max) | <br>100°C<br>150°C<br>60-120 seconds | <br>150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>−Temperature ($T_L$)<br>− Time ($t_L$) | <br>183°C<br>60-150 seconds | <br>217°C<br>60-150 seconds |
| Peak Temperature($T_P$) | 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 : All temperatures refer to topside of the package, measured on the package body surface.

## SOT-223 Dimension




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

3-Lead SOT-223 Plastic
Surface Mounted Package
CYStek Package Code: L3

*: Typical

| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.1142 | 0.1220 | 2.90 | 3.10 | G | 0.0551 | 0.0709 | 1.40 | 1.80 |
| B | 0.2638 | 0.2874 | 6.70 | 7.30 | H | 0.0098 | 0.0138 | 0.25 | 0.35 |
| C | 0.1299 | 0.1457 | 3.30 | 3.70 | I | 0.0008 | 0.0039 | 0.02 | 0.10 |
| D | 0.0236 | 0.0315 | 0.60 | 0.80 | a1 | *13° | - | *13° | - |
| E | *0.0906 | - | *2.30 | - | a2 | 0° | 10° | 0° | 10° |
| F | 0.2480 | 0.2638 | 6.30 | 6.70 | | | | | |

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