

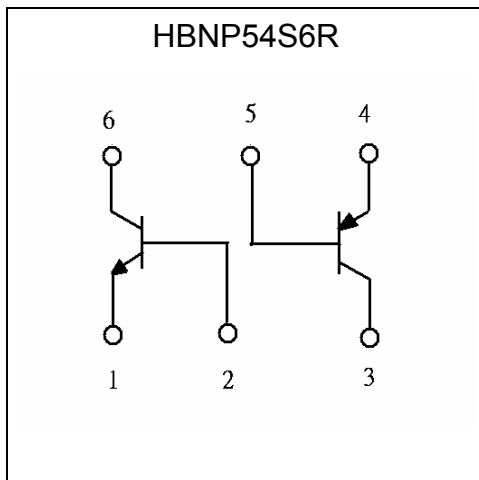
## General Purpose NPN / PNP Epitaxial Planar Transistors (dual transistors)

# HBNP54S6R

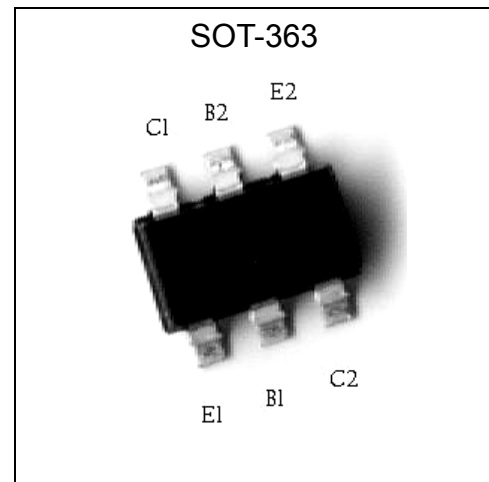
### Features

- Includes a BTC3906 chip and BTA1514 chip in a SOT-363 package.
- Mounting possible with SOT-323 automatic mounting machines.
- Transistor elements are independent, eliminating interference.
- Mounting cost and area can be cut in half.
- Pb-free lead plating package.

### Equivalent Circuit

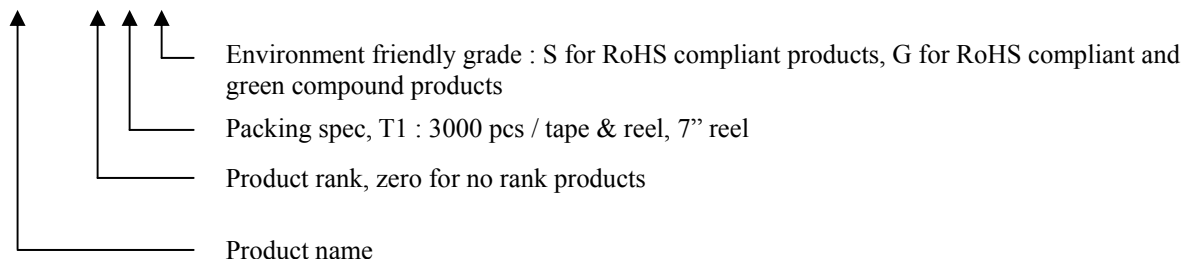


### Outline



### Ordering Information

| Device           | Package                                                    | Shipping               |
|------------------|------------------------------------------------------------|------------------------|
| HBNP54S6R-0-T1-G | SOT-363<br>(Pb-free lead plating and halogen-free package) | 3000 pcs / tape & reel |



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

| Parameter                 | Symbol           | Limits        |           | Unit |
|---------------------------|------------------|---------------|-----------|------|
|                           |                  | TR1 (NPN)     | TR2 (PNP) |      |
| Collector-Base Voltage    | V <sub>CBO</sub> | 180           | -160      | V    |
| Collector-Emitter Voltage | V <sub>CEO</sub> | 160           | -160      | V    |
| Emitter-Base Voltage      | V <sub>EBO</sub> | 6             | -6        | V    |
| Collector Current         | I <sub>C</sub>   | 600           | -600      | mA   |
| Power Dissipation         | P <sub>d</sub>   | 200(total) *1 |           | mW   |
| Junction Temperature      | T <sub>j</sub>   | 150           |           | °C   |
| Storage Temperature       | T <sub>stg</sub> | -55~+150      |           | °C   |

Note: \*1 150mW per element must not be exceeded.

**Characteristics** (Ta=25°C)**•Q1, TR1 (NPN)**

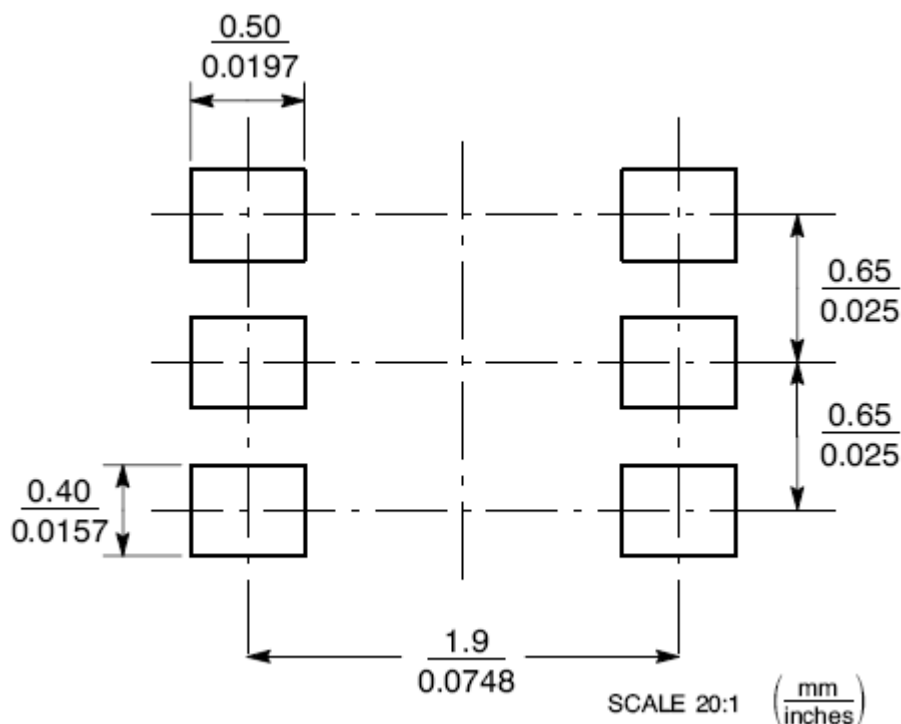
| Symbol                  | Min. | Typ. | Max. | Unit | Test Conditions                                      |
|-------------------------|------|------|------|------|------------------------------------------------------|
| BV <sub>CBO</sub>       | 180  | -    | -    | V    | I <sub>C</sub> =100μA                                |
| BV <sub>CEO</sub>       | 160  | -    | -    | V    | I <sub>C</sub> =1mA                                  |
| BV <sub>EBO</sub>       | 6    | -    | -    | V    | I <sub>E</sub> =10μA                                 |
| I <sub>CBO</sub>        | -    | -    | 50   | nA   | V <sub>CB</sub> =180V                                |
| I <sub>EBO</sub>        | -    | -    | 50   | nA   | V <sub>EB</sub> =6V                                  |
| *V <sub>CE(sat)</sub> 1 | -    | 0.1  | 0.15 | V    | I <sub>C</sub> =10mA, I <sub>B</sub> =1mA            |
| *V <sub>CE(sat)</sub> 2 | -    | -    | 0.2  | V    | I <sub>C</sub> =50mA, I <sub>B</sub> =5mA            |
| *V <sub>BE(sat)</sub> 1 | -    | -    | 0.9  | V    | I <sub>C</sub> =10mA, I <sub>B</sub> =1mA            |
| *V <sub>BE(sat)</sub> 2 | -    | -    | 1.0  | V    | I <sub>C</sub> =50mA, I <sub>B</sub> =5mA            |
| *h <sub>FE</sub> 1      | 100  | -    | -    | -    | V <sub>CE</sub> =5V, I <sub>C</sub> =1mA             |
| *h <sub>FE</sub> 2      | 120  | -    | 270  | -    | V <sub>CE</sub> =5V, I <sub>C</sub> =10mA            |
| *h <sub>FE</sub> 3      | 40   | -    | -    | -    | V <sub>CE</sub> =5V, I <sub>C</sub> =50mA            |
| f <sub>T</sub>          | 100  | -    | -    | MHz  | V <sub>CE</sub> =20V, I <sub>C</sub> =10mA, f=100MHz |
| Cob                     | -    | -    | 6    | pF   | V <sub>CB</sub> =20V, I <sub>E</sub> =0A, f=1MHz     |

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

**• Q2, TR2 (PNP)**

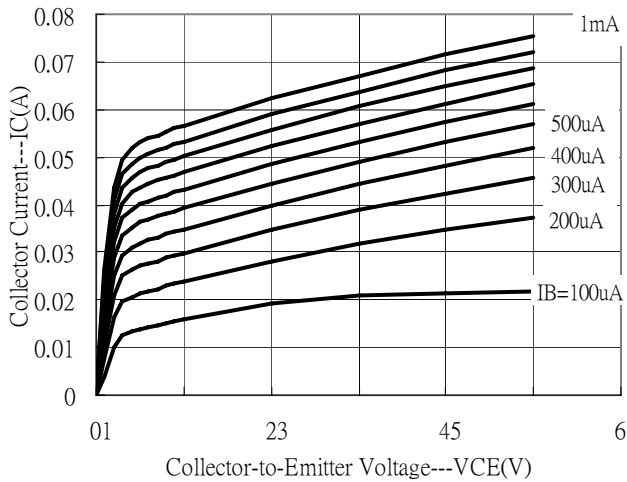
| Symbol          | Min. | Typ. | Max. | Unit | Test Conditions                          |
|-----------------|------|------|------|------|------------------------------------------|
| $BV_{CBO}$      | -160 | -    | -    | V    | $I_C = -50\mu A$                         |
| $BV_{CEO}$      | -160 | -    | -    | V    | $I_C = -1mA$                             |
| $BV_{EBO}$      | -6   | -    | -    | V    | $I_E = -50\mu A$                         |
| $I_{CBO}$       | -    | -    | -50  | nA   | $V_{CB} = -160V$                         |
| $I_{EBO}$       | -    | -    | -50  | nA   | $V_{EB} = -6V$                           |
| $*V_{CE(sat)1}$ | -    | -    | -0.2 | V    | $I_C = -10mA, I_B = -1mA$                |
| $*V_{CE(sat)2}$ | -    | -    | -0.3 | V    | $I_C = -50mA, I_B = -5mA$                |
| $*V_{BE(sat)1}$ | -    | -    | -0.9 | V    | $I_C = -10mA, I_B = -1mA$                |
| $*V_{BE(sat)2}$ | -    | -    | -1.0 | V    | $I_C = -50mA, I_B = -5mA$                |
| $*h_{FE1}$      | 90   | -    | -    | -    | $V_{CE} = -5V, I_C = -1mA$               |
| $*h_{FE2}$      | 120  | -    | 270  | -    | $V_{CE} = -5V, I_C = -10mA$              |
| $*h_{FE3}$      | 40   | -    | -    | -    | $V_{CE} = -5V, I_C = -50mA$              |
| $f_T$           | 100  | -    | -    | MHz  | $V_{CE} = -30V, I_C = -10mA, f = 100MHz$ |
| Cob             | -    | -    | 6    | pF   | $V_{CB} = -30V, I_E = 0A, f = 1MHz$      |

\*Pulse Test: Pulse Width  $\leq 380\mu s$ , Duty Cycle  $\leq 2\%$

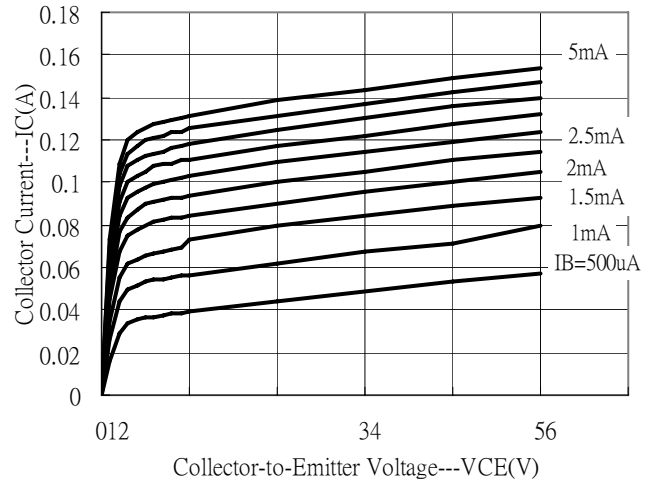
**Recommended Soldering Footprint**


## Q1, Typical Characteristics

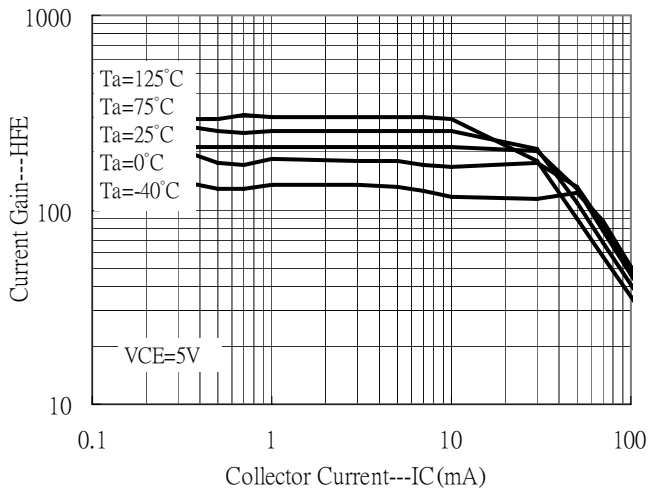
Emitter Grounded Output Characteristics



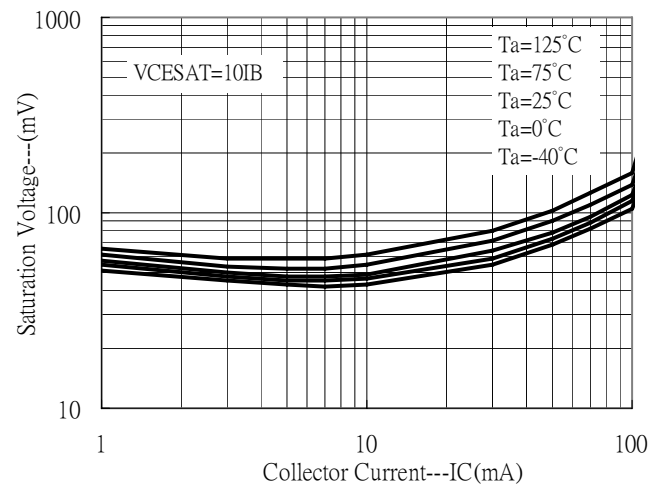
Emitter Grounded Output Characteristics



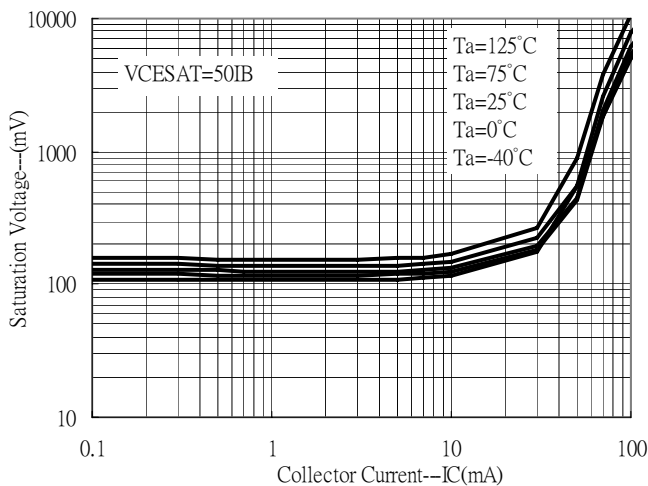
Current Gain vs Collector Current



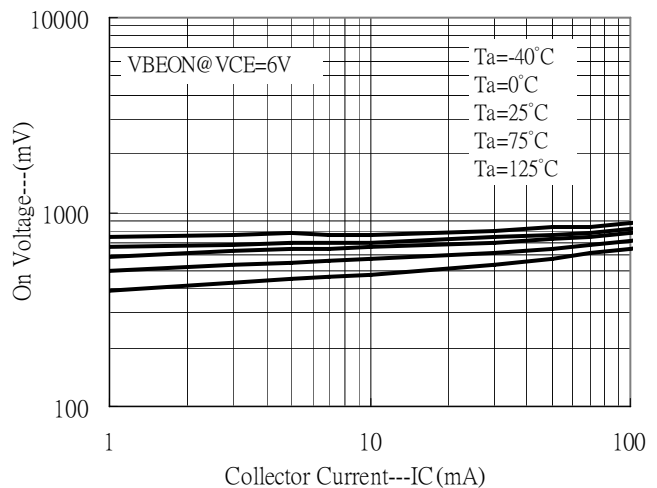
Saturation Voltage vs Collector Current



Saturation Voltage vs Collector Current

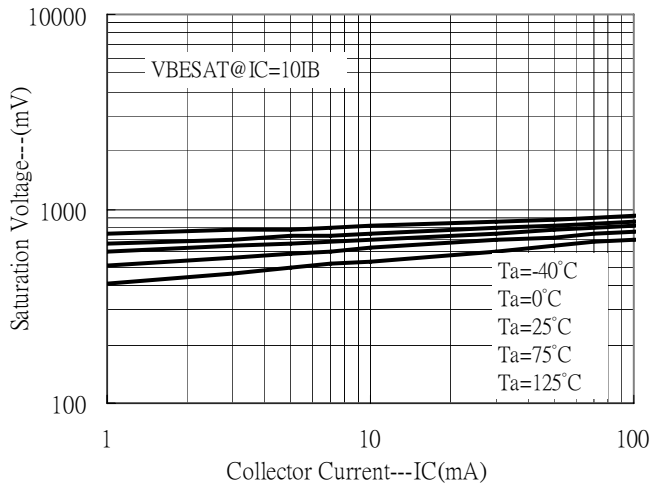


On Voltage vs Collector Current

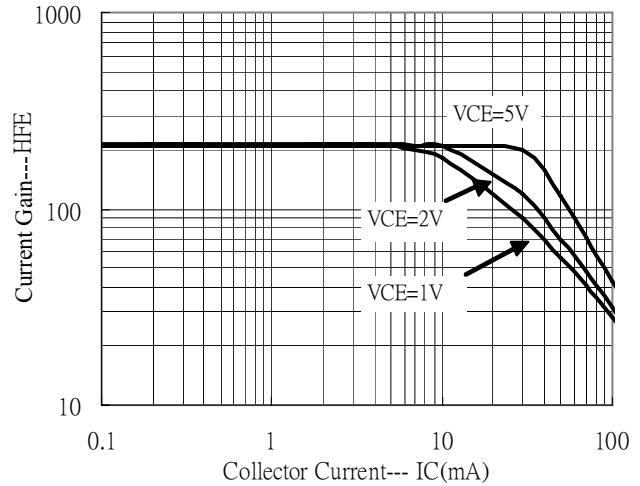


## Q1, Typical Characteristics(Cont.)

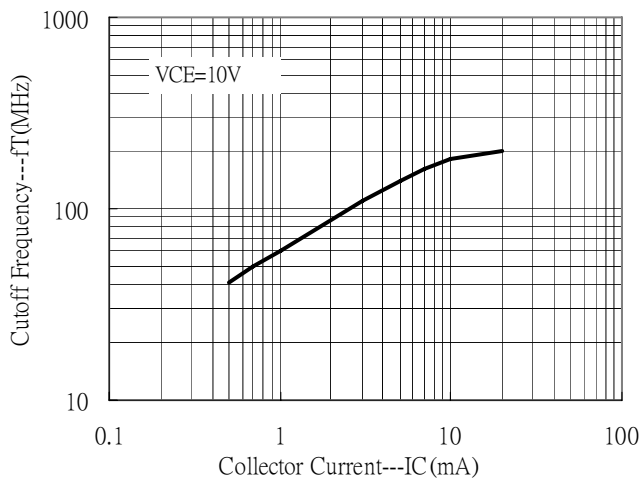
Saturation Voltage vs Collector Current



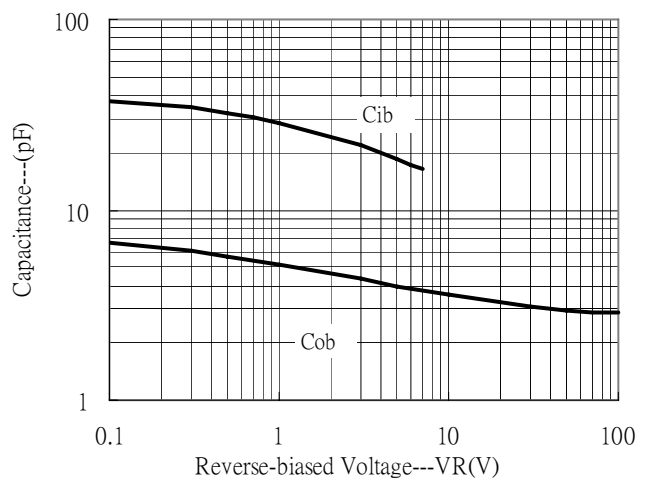
Current Gain vs Collector Current



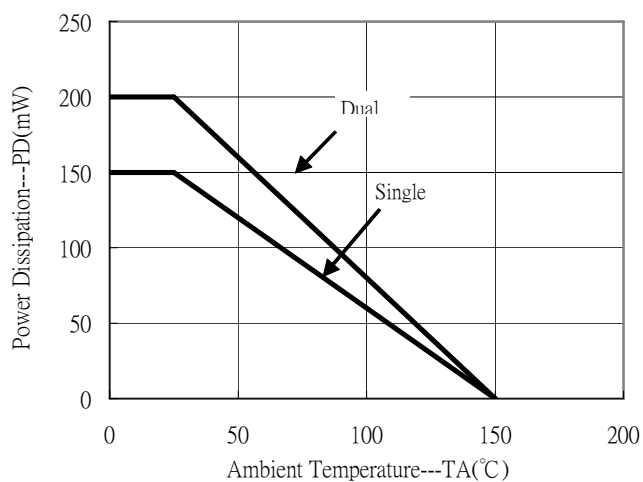
Cutoff Frequency vs Collector Current



Capacitance vs Reverse-biased Voltage

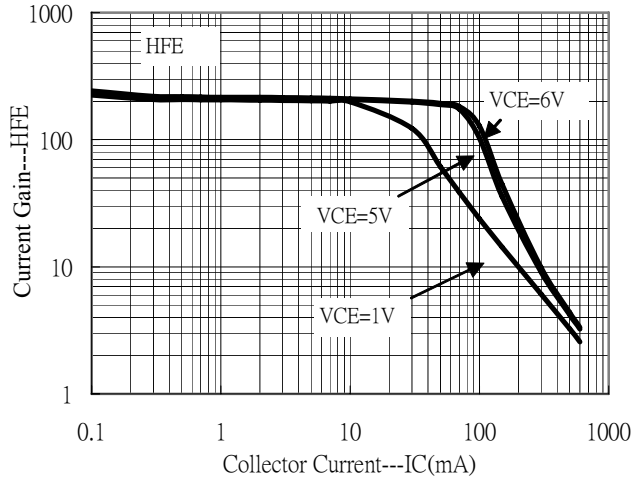


Power Derating Curves

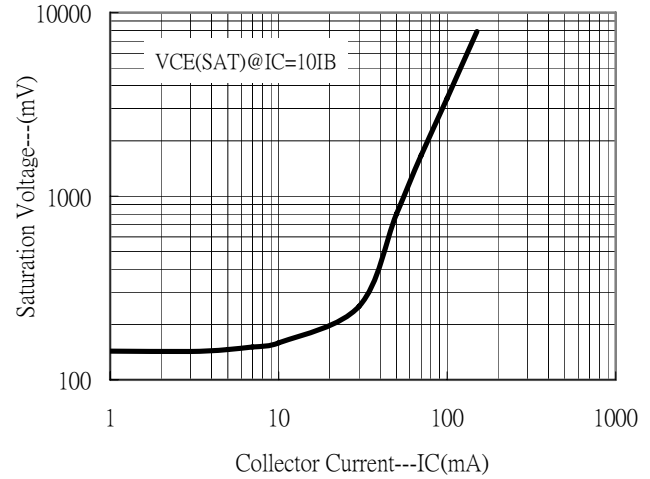


## Q2, Typical Characteristics

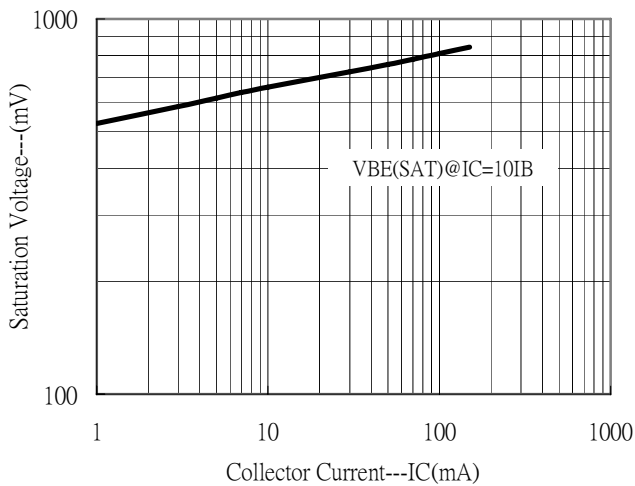
Current Gain vs Collector Current



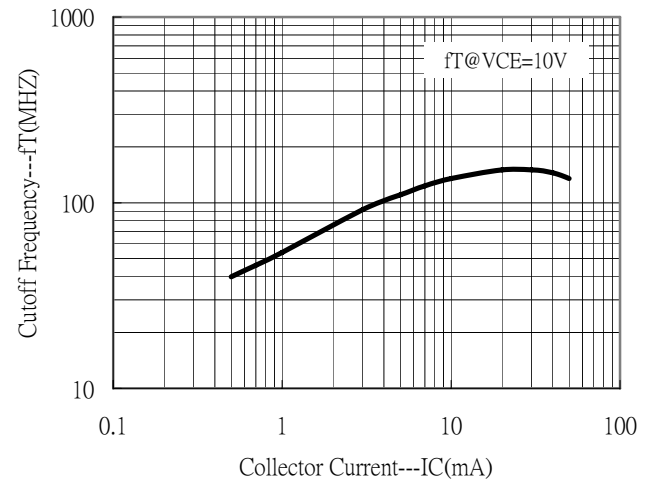
Saturation Voltage vs Collector Current



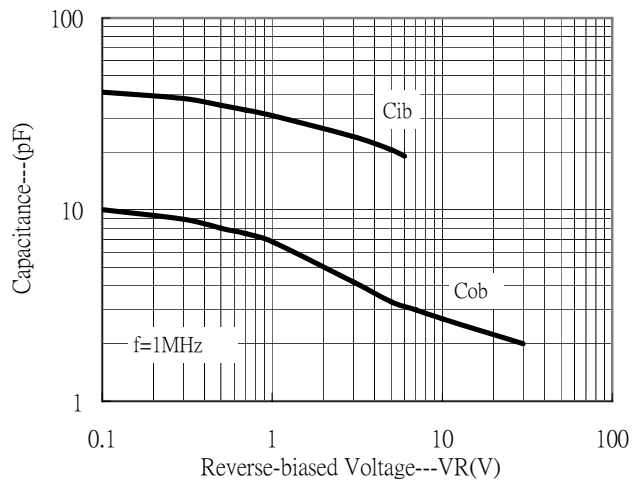
Saturation Voltage vs Collector Current



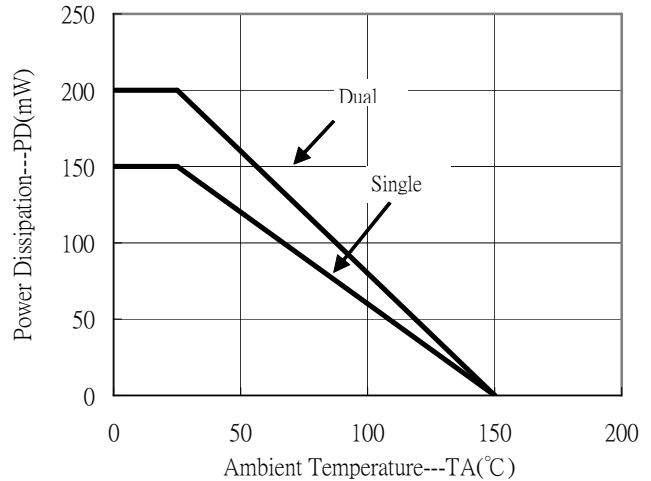
Cutoff Frequency vs Collector Current



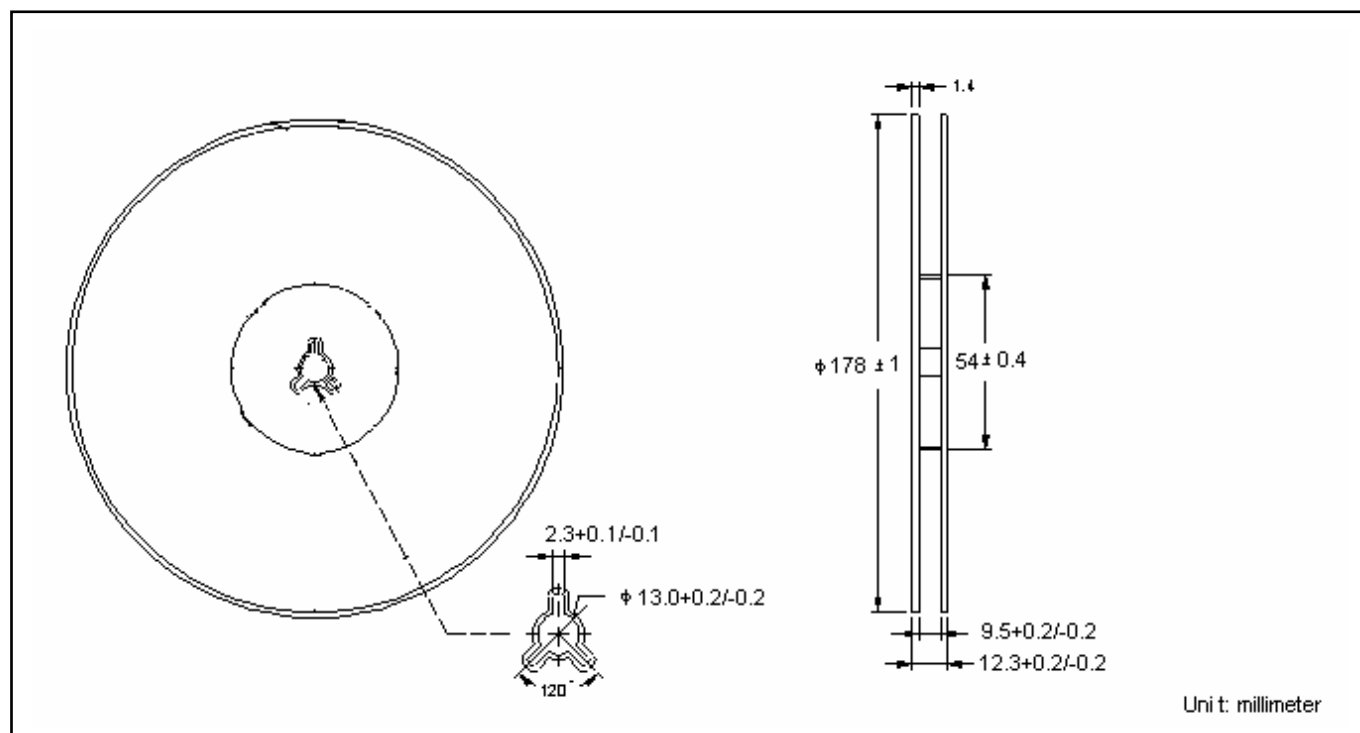
Capacitance Characteristics



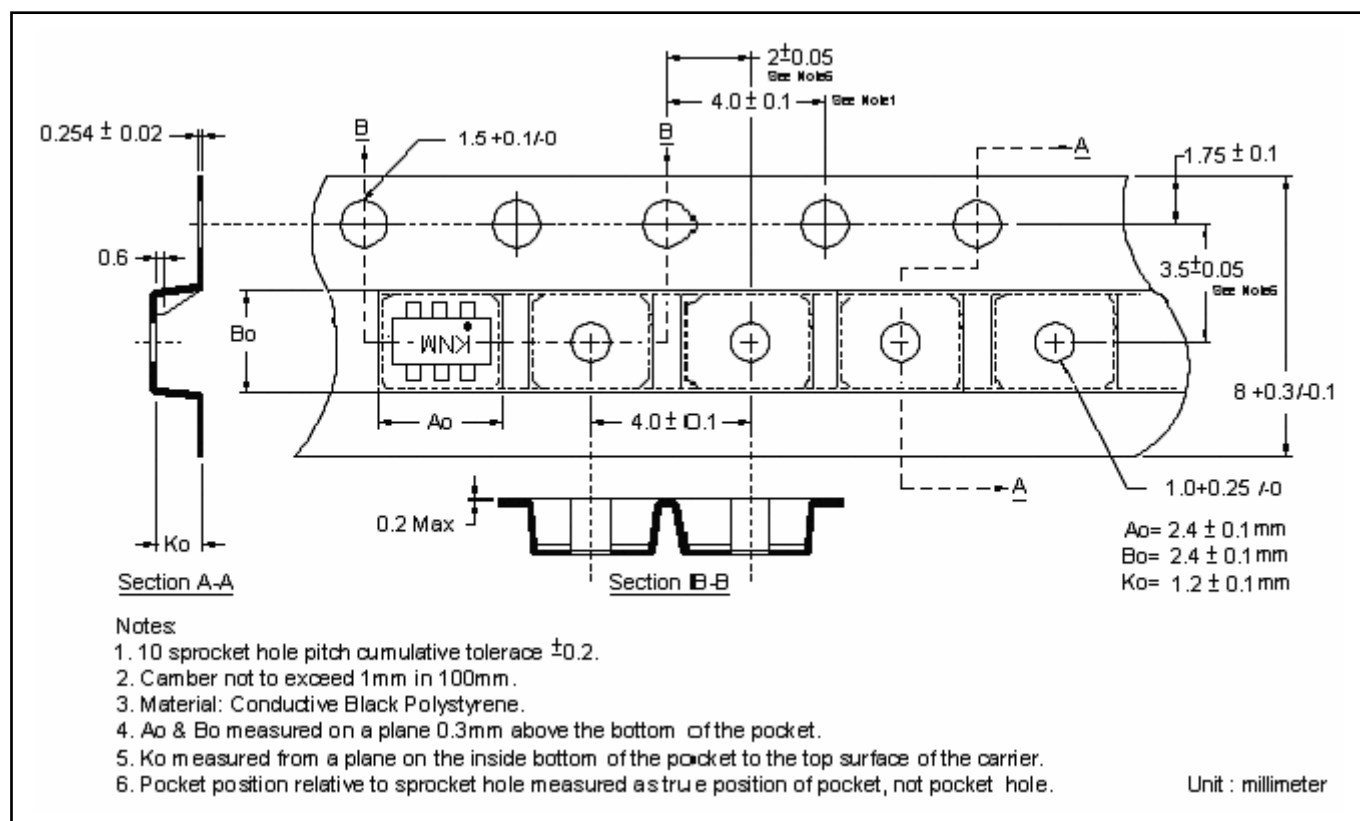
Power Derating Curves



## Reel Dimension



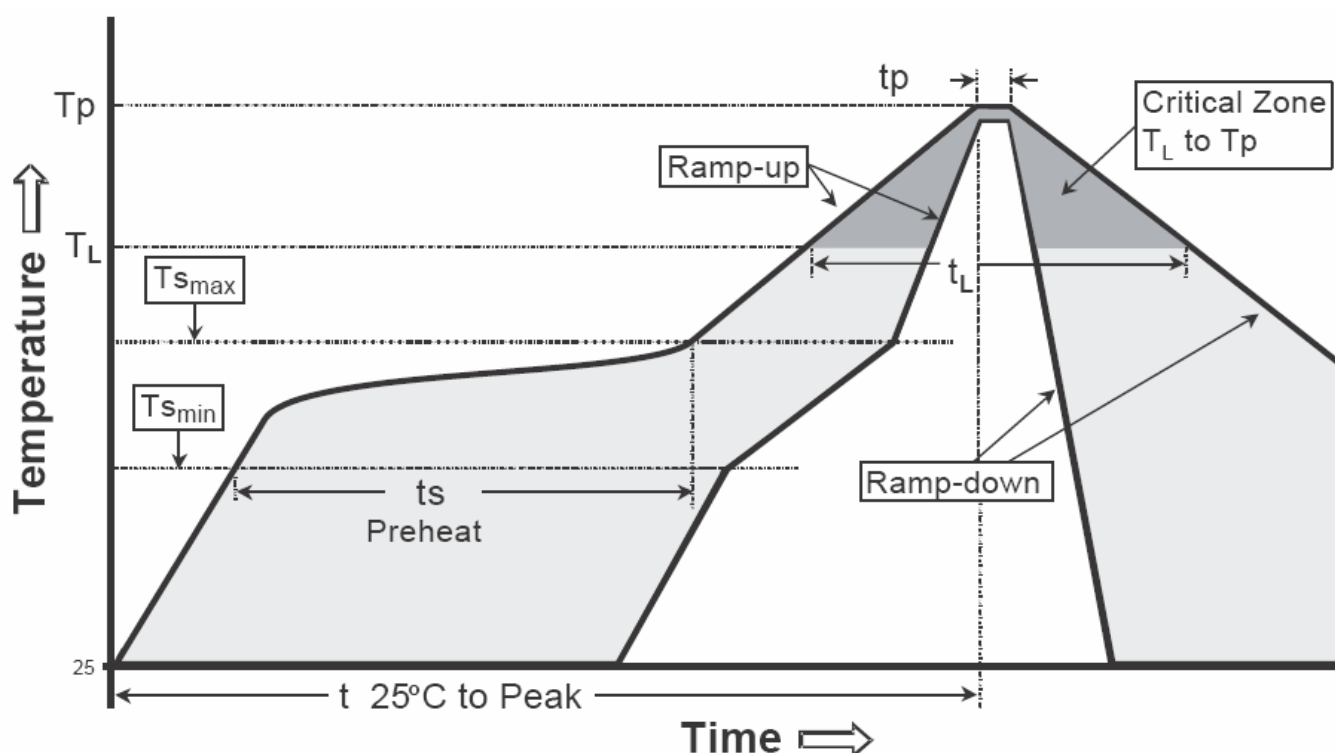
## Carrier Tape Dimension



### Recommended wave soldering condition

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

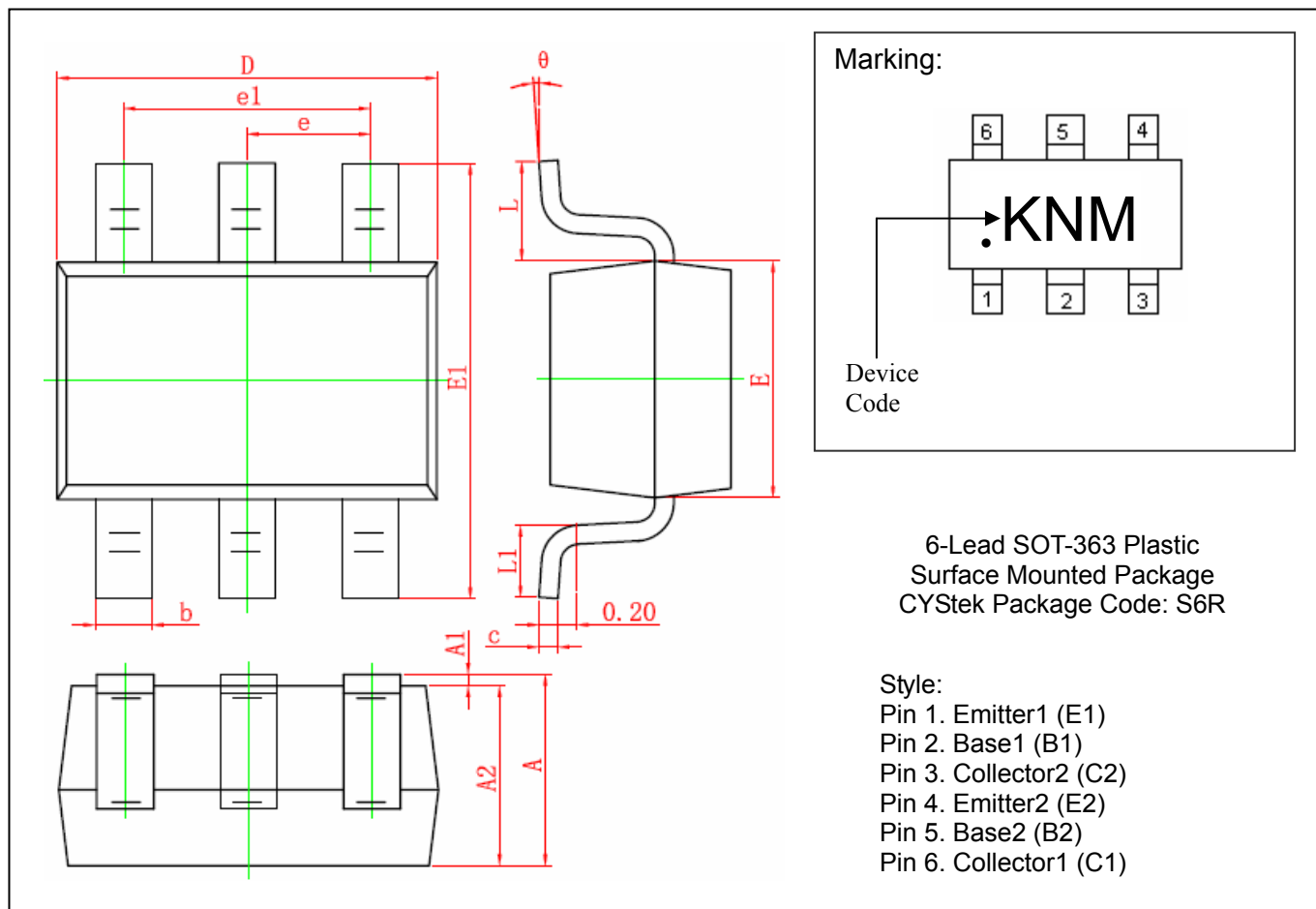
### Recommended temperature profile for IR reflow



| Profile feature                                | Sn-Pb eutectic Assembly | Pb-free Assembly |
|------------------------------------------------|-------------------------|------------------|
| Average ramp-up rate (Tsmax to Tp)             | 3°C/second max.         | 3°C/second max.  |
| Preheat                                        |                         |                  |
| -Temperature Min(Ts min)                       | 100°C                   | 150°C            |
| -Temperature Max(Ts max)                       | 150°C                   | 200°C            |
| -Time(ts min to ts max)                        | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                         |                         |                  |
| -Temperature (Tl)                              | 183°C                   | 217°C            |
| - Time (tL)                                    | 60-150 seconds          | 60-150 seconds   |
| Peak Temperature(Tp)                           | 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-363 Dimension



| DIM | Millimeters |       | Inches |       | DIM      | Millimeters |       | Inches |       |
|-----|-------------|-------|--------|-------|----------|-------------|-------|--------|-------|
|     | Min.        | Max.  | Min.   | Max.  |          | Min.        | Max.  | Min.   | Max.  |
| A   | 0.900       | 1.100 | 0.035  | 0.043 | E1       | 2.150       | 2.450 | 0.085  | 0.096 |
| A1  | 0.000       | 0.100 | 0.000  | 0.004 | e        | 0.650       | TYP   | 0.026  | TYP   |
| A2  | 0.900       | 1.000 | 0.035  | 0.039 | e1       | 1.200       | 1.400 | 0.047  | 0.055 |
| b   | 0.150       | 0.350 | 0.006  | 0.014 | L        | 0.525       | REF   | 0.021  | REF   |
| c   | 0.080       | 0.150 | 0.003  | 0.006 | L1       | 0.260       | 0.460 | 0.010  | 0.018 |
| D   | 2.000       | 2.200 | 0.079  | 0.087 | $\theta$ | 0°          | 8°    | 0°     | 8°    |
| E   | 1.150       | 1.350 | 0.045  | 0.053 |          |             |       |        |       |

**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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