

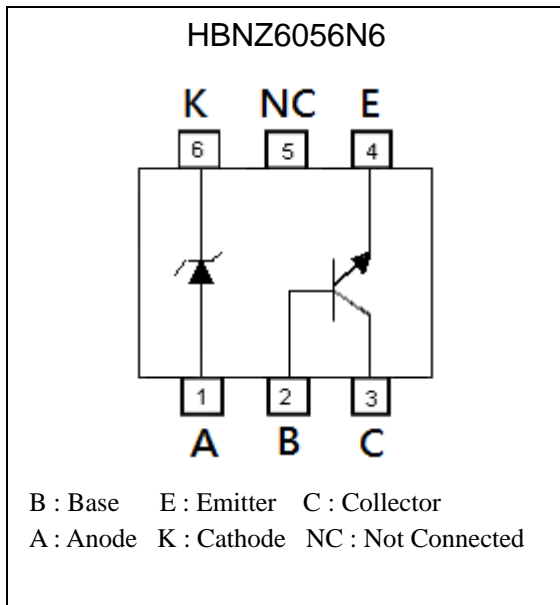
**NPN Transistor with Zener diode**

# HBNZ6056N6

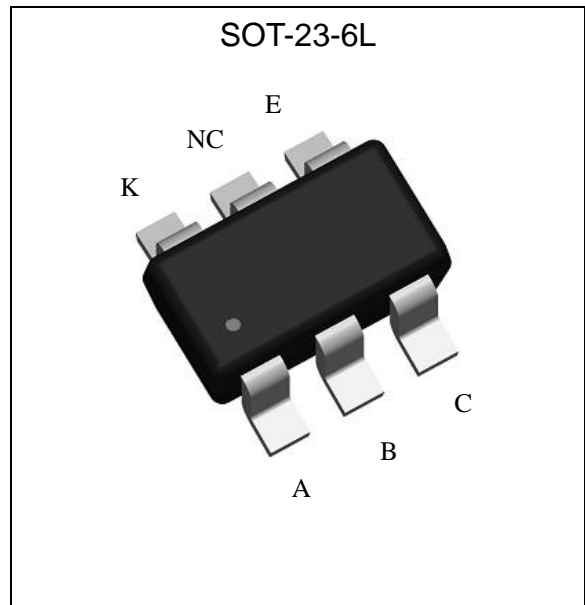
**Features**

- Includes a NPN chip and a Zener diode chip in a SOT-23-6L package.
- Mounting possible with SOT-23 automatic mounting machines.
- Pb-free lead plating package.

**Equivalent Circuit**

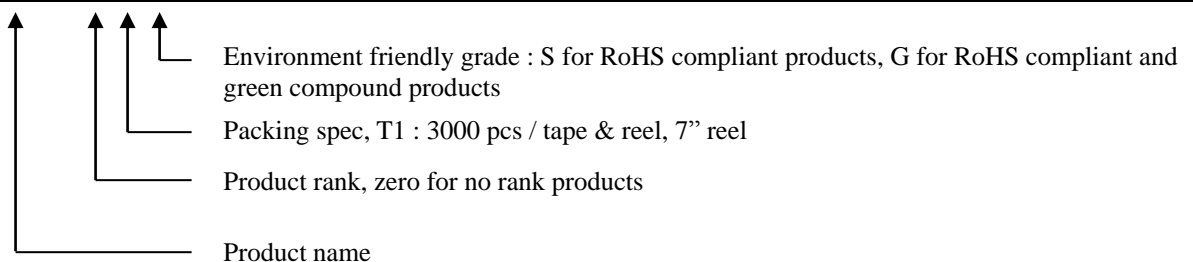


**Outline**



**Ordering Information**

| Device            | Package  | Shipping               |
|-------------------|--|------------------------|
| HBNZ6056N6-0-T1-G | SOT-23-6L<br>(Pb-free lead plating and halogen-free package) | 3000 pcs / tape & reel |





**Absolute Maximum Ratings** (Ta=25°C), NPN Transistor

| Parameter                 | Symbol           | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Base Voltage    | V <sub>CB0</sub> | 75    | V    |
| Collector-Emitter Voltage | V <sub>CE0</sub> | 50    | V    |
| Emitter-Base Voltage      | V <sub>EB0</sub> | 6     | V    |
| Collector Current(DC)     | I <sub>C</sub>   | 600   | mA   |
| Peak Collector Current    | I <sub>CP</sub>  | 1.2   | A    |
| Peak Base Current         | I <sub>BP</sub>  | 100   | mA   |

**Absolute Maximum Ratings** (Ta=25°C), Zener Diode

| Parameter                              | Symbol         | Value | Unit |
|--|----------------|-------|------|
| Forward Voltage @ I <sub>F</sub> =10mA | V <sub>F</sub> | 0.9   | V    |

**Thermal Characteristics**

| Characteristics                              | Symbol                            | Value      | Unit |
|--|-----------------------------------|------------|------|
| Power Dissipation                            | P <sub>D</sub>                    | 300 (Note) | mW   |
| Thermal Resistance, Junction to Ambient, max | R <sub>θJA</sub>                  | 417 (Note) | °C/W |
| Operating Junction and Storage Temperature   | T <sub>j</sub> , T <sub>stg</sub> | -55~+150   | °C   |

Note : .Surface mounted on minimum copper pad.

**NPN Transistor Electrical Characteristics (T<sub>j</sub>=25°C, unless otherwise specified)**

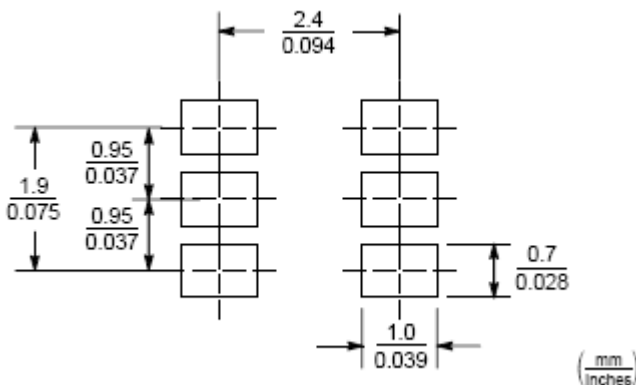
| Symbol                | Min. | Typ. | Max. | Unit | Test Conditions                                      |
|-----------------------|------|------|------|------|--|
| BVCBO                 | 75   | -    | -    | V    | I <sub>C</sub> =10μA                                 |
| BVCEO                 | 50   | -    | -    | V    | I <sub>C</sub> =10mA                                 |
| BVEBO                 | 6    | -    | -    | V    | I <sub>E</sub> =10μA                                 |
| ICBO                  | -    | -    | 100  | nA   | V <sub>CB</sub> =60V                                 |
| ICEX                  | -    | -    | 100  | nA   | V <sub>CE</sub> =60V, V <sub>EB</sub> =0.3V          |
| IEBO                  | -    | -    | 100  | nA   | V <sub>EB</sub> =6V                                  |
| *V <sub>CE(sat)</sub> | -    | -    | 0.3  | V    | I <sub>C</sub> =150mA, I <sub>B</sub> =15mA          |
| *V <sub>CE(sat)</sub> | -    | -    | 0.5  | V    | I <sub>C</sub> =500mA, I <sub>B</sub> =50mA          |
| *V <sub>BE(sat)</sub> | -    | -    | 0.95 | V    | I <sub>C</sub> =150mA, I <sub>B</sub> =15mA          |
| *V <sub>BE(sat)</sub> | -    | -    | 1.2  | V    | I <sub>C</sub> =500mA, I <sub>B</sub> =50mA          |
| h <sub>FE</sub>       | 50   | -    | -    | -    | V <sub>CE</sub> =1V, I <sub>C</sub> =100μA           |
| h <sub>FE</sub>       | 80   | -    | -    | -    | V <sub>CE</sub> =1V, I <sub>C</sub> =1mA             |
| h <sub>FE</sub>       | 80   | -    | -    | -    | V <sub>CE</sub> =1V, I <sub>C</sub> =10mA            |
| *h <sub>FE</sub>      | 100  | -    | 300  | -    | V <sub>CE</sub> =1V, I <sub>C</sub> =150mA           |
| *h <sub>FE</sub>      | 40   | -    | -    | -    | V <sub>CE</sub> =2V, I <sub>C</sub> =500mA           |
| f <sub>T</sub>        | 300  | -    | -    | MHz  | V <sub>CE</sub> =20V, I <sub>C</sub> =20mA, f=100MHz |
| Cob                   | -    | -    | 8    | pF   | V <sub>CB</sub> =10V, f=1MHz                         |

**Zener Diode Electrical Characteristics (T<sub>j</sub>=25°C, unless otherwise specified)**

| Symbol          | Min. | Typ. | Max. | Unit | Test Conditions            |
|-----------------|------|------|------|------|----------------------------|
| V <sub>Z</sub>  | 5.49 | -    | 5.73 | V    | I <sub>ZT</sub> =5mA       |
| V <sub>F</sub>  | -    | -    | 0.9  | V    | I <sub>F</sub> =10mA       |
| Z <sub>ZK</sub> | -    | -    | 900  | Ω    | I <sub>Z</sub> =0.5mA      |
| Z <sub>ZT</sub> | -    | -    | 30   | Ω    | I <sub>Z</sub> =5mA        |
| I <sub>R</sub>  | -    | -    | 1    | μA   | V <sub>R</sub> =2V         |
| C               | -    | -    | 250  | pF   | V <sub>R</sub> =0V, f=1MHz |

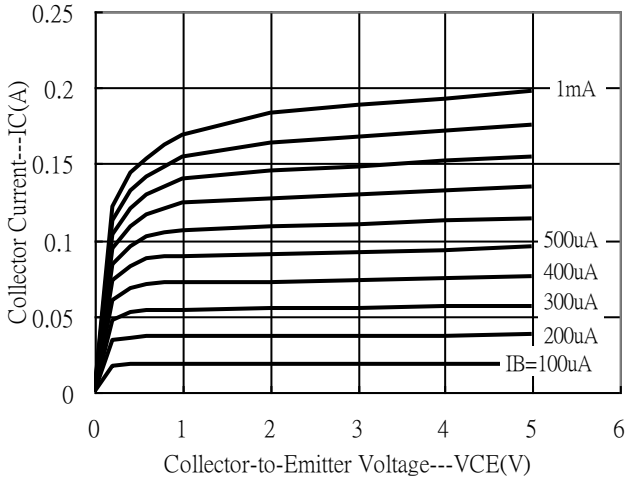
\*Pulse Test: Pulse Width ≤380μs, Duty Cycle≤2%

**Recommended Soldering Footprint**

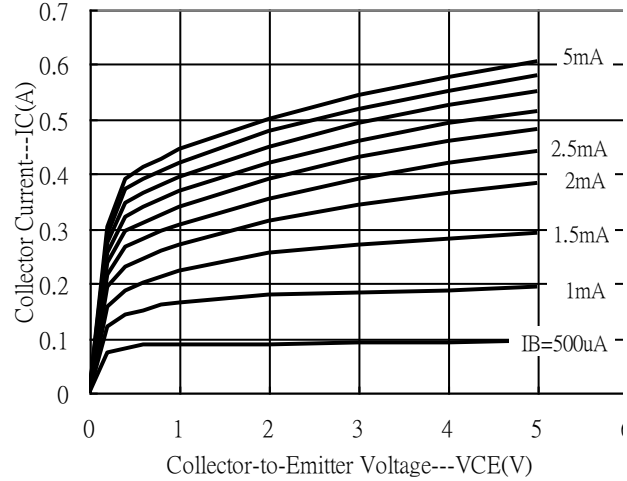


**NPN Transistor Typical Characteristics**

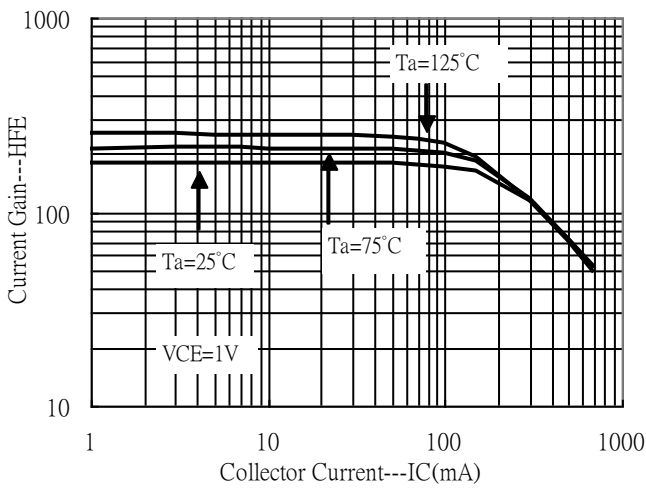
Emitter Grounded Output Characteristics



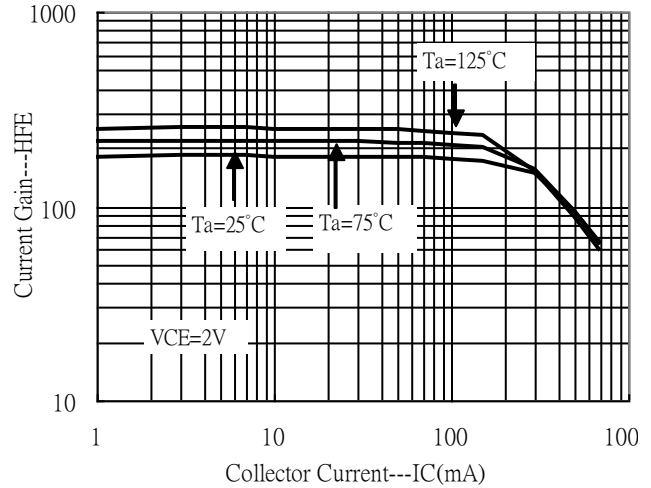
Emitter Grounded Output Characteristics



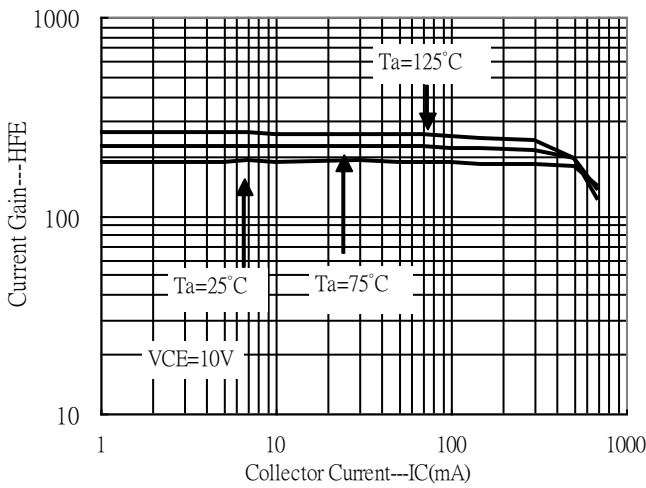
Current Gain vs Collector Current



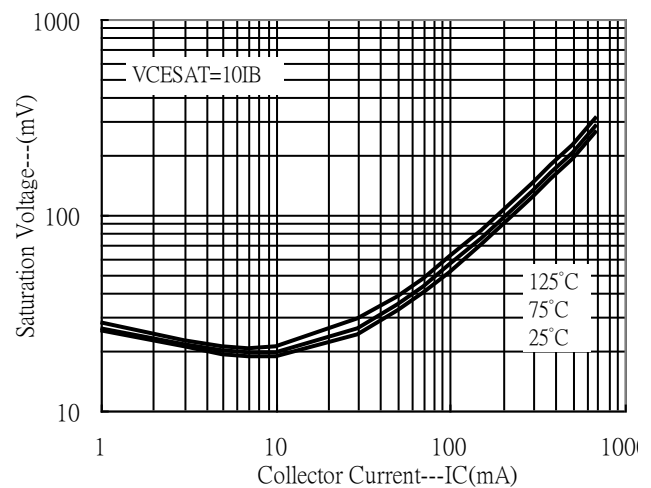
Current Gain vs Collector Current



Current Gain vs Collector Current

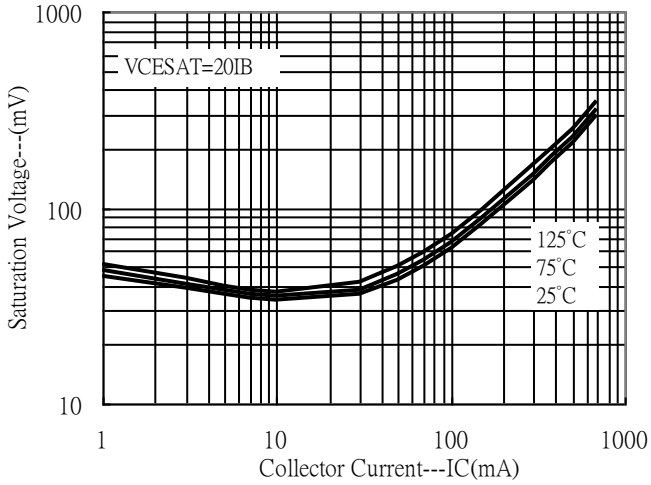


Saturation Voltage vs Collector Current

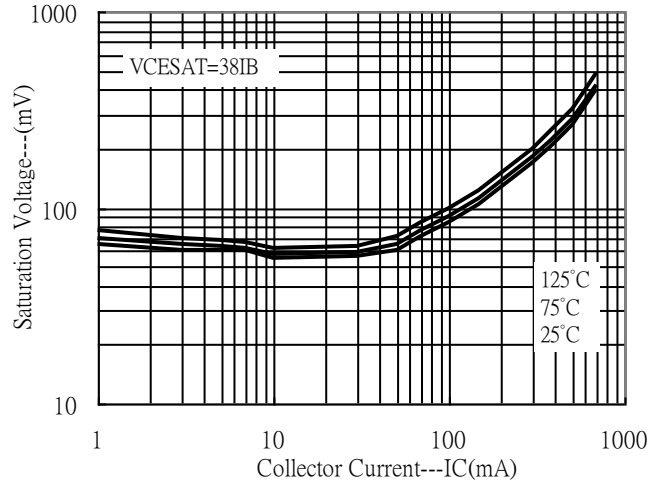


**NPN Transistor Typical Characteristics (Cont.)**

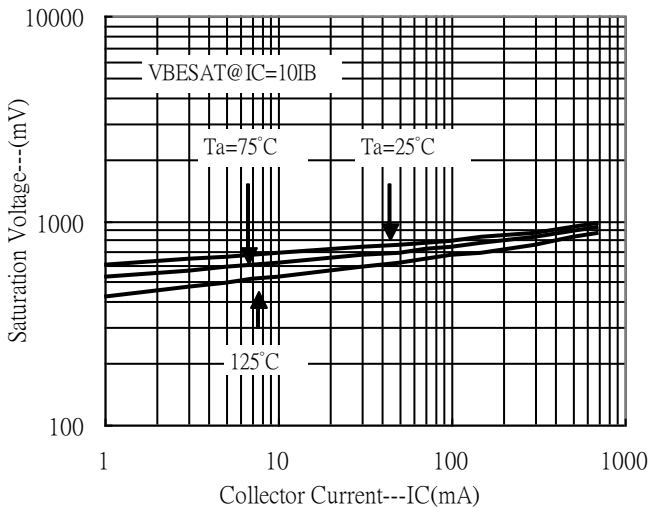
Saturation Voltage vs Collector Current



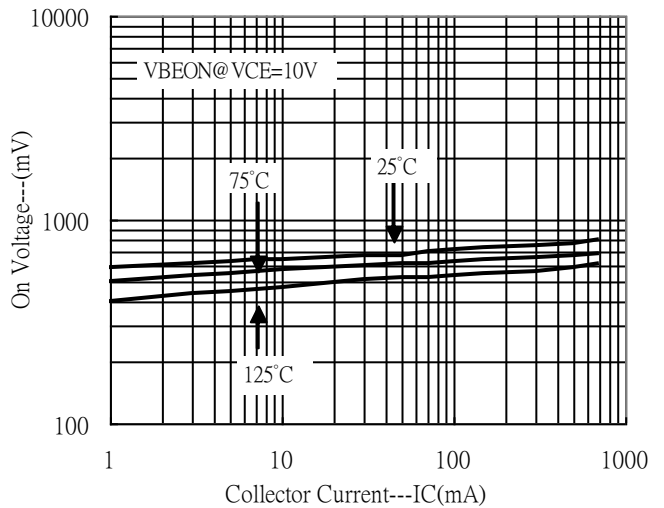
Saturation Voltage vs Collector Current



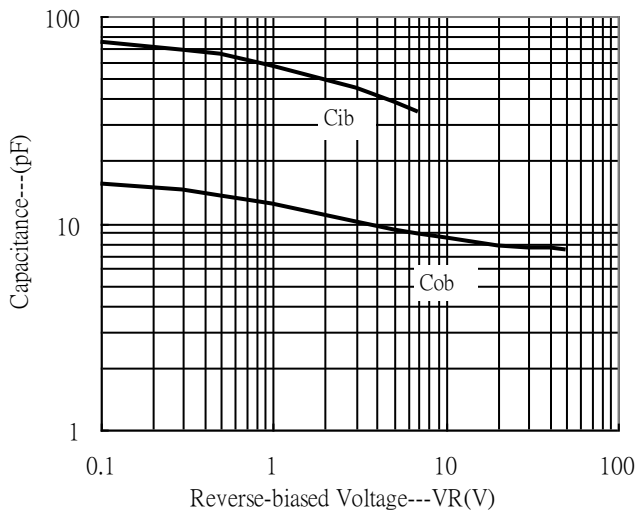
Saturation Voltage vs Collector Current



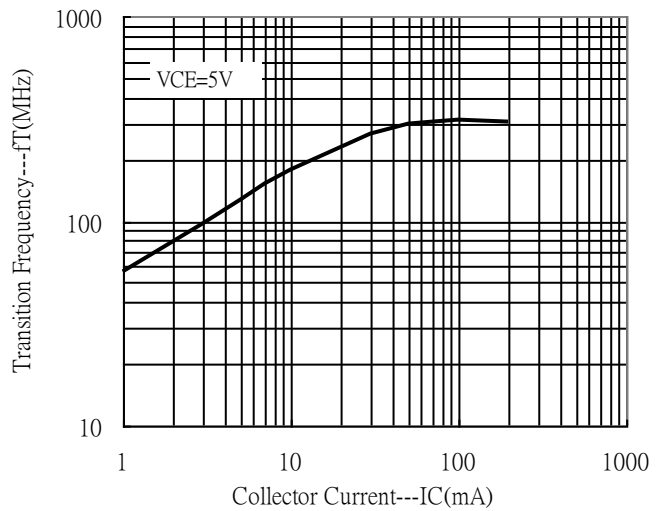
On Voltage vs Collector Current



Capacitance vs Reverse-biased Voltage

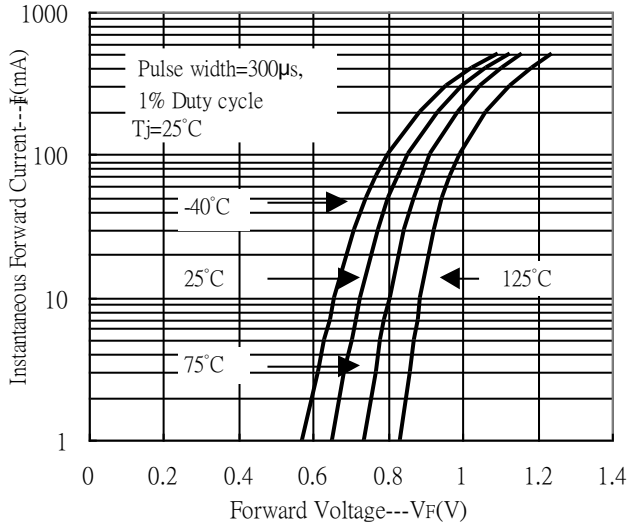


Transition Frequency vs Collector Current

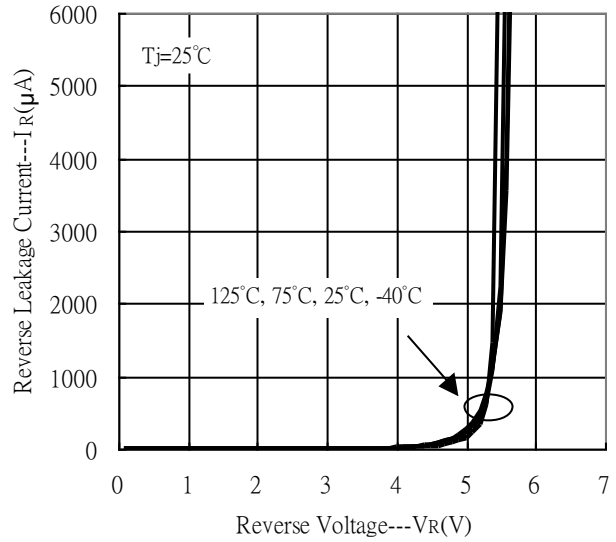


## Zener Diode Typical Characteristics

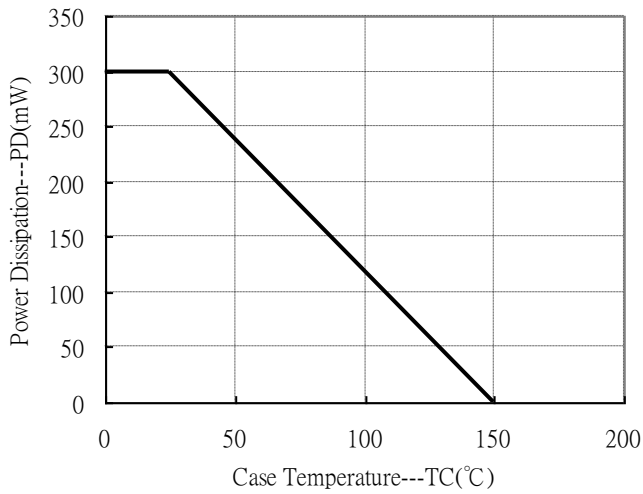
Forward Current vs Forward Voltage



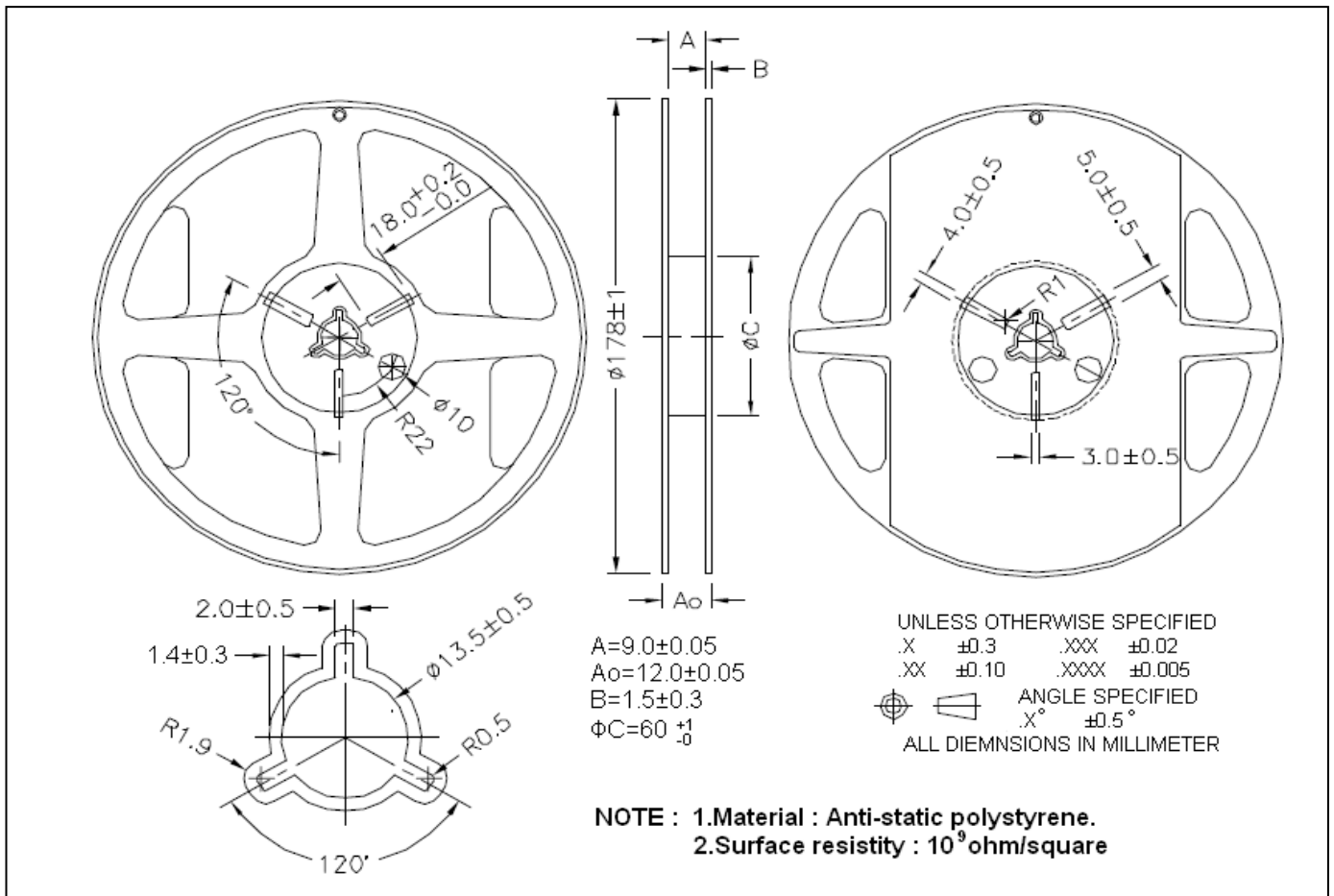
Reverse Leakage Current vs Reverse Voltage



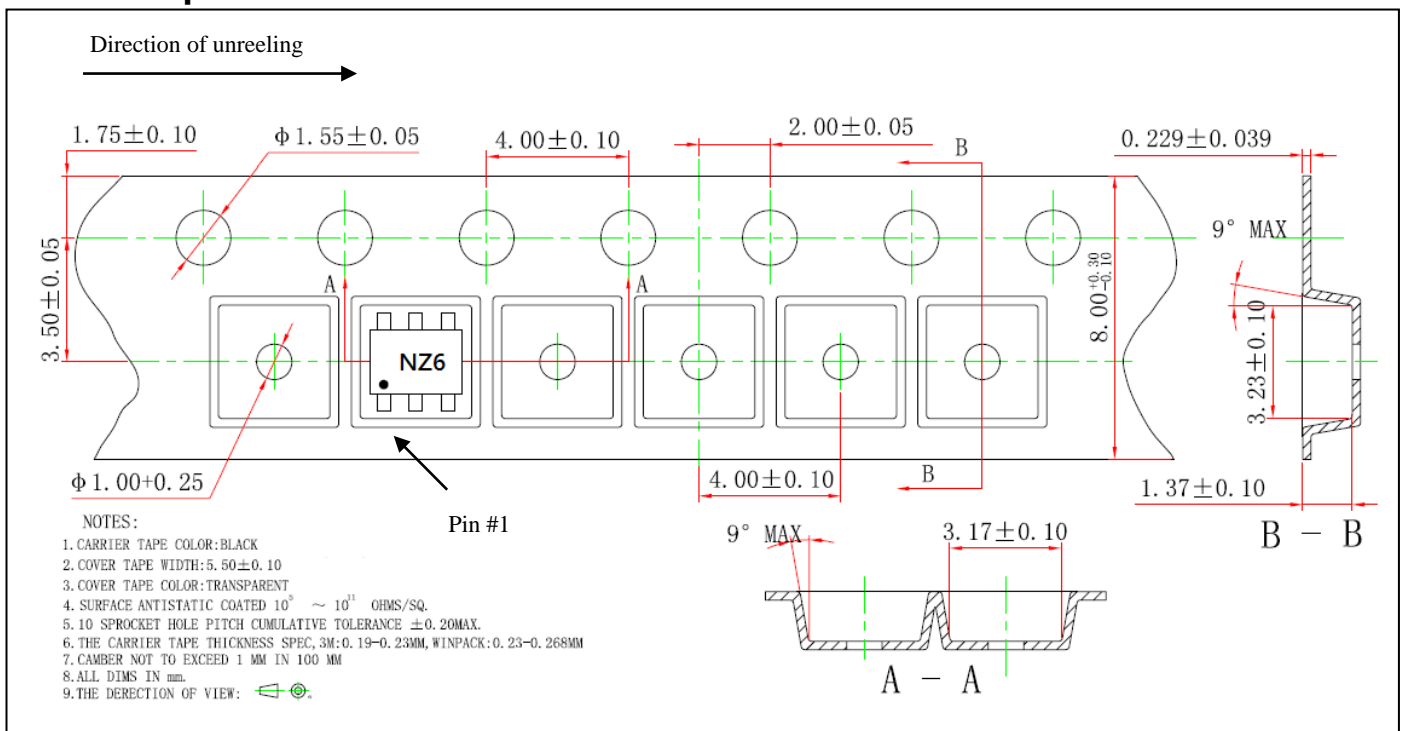
Power Derating Curve



**Reel Dimension**



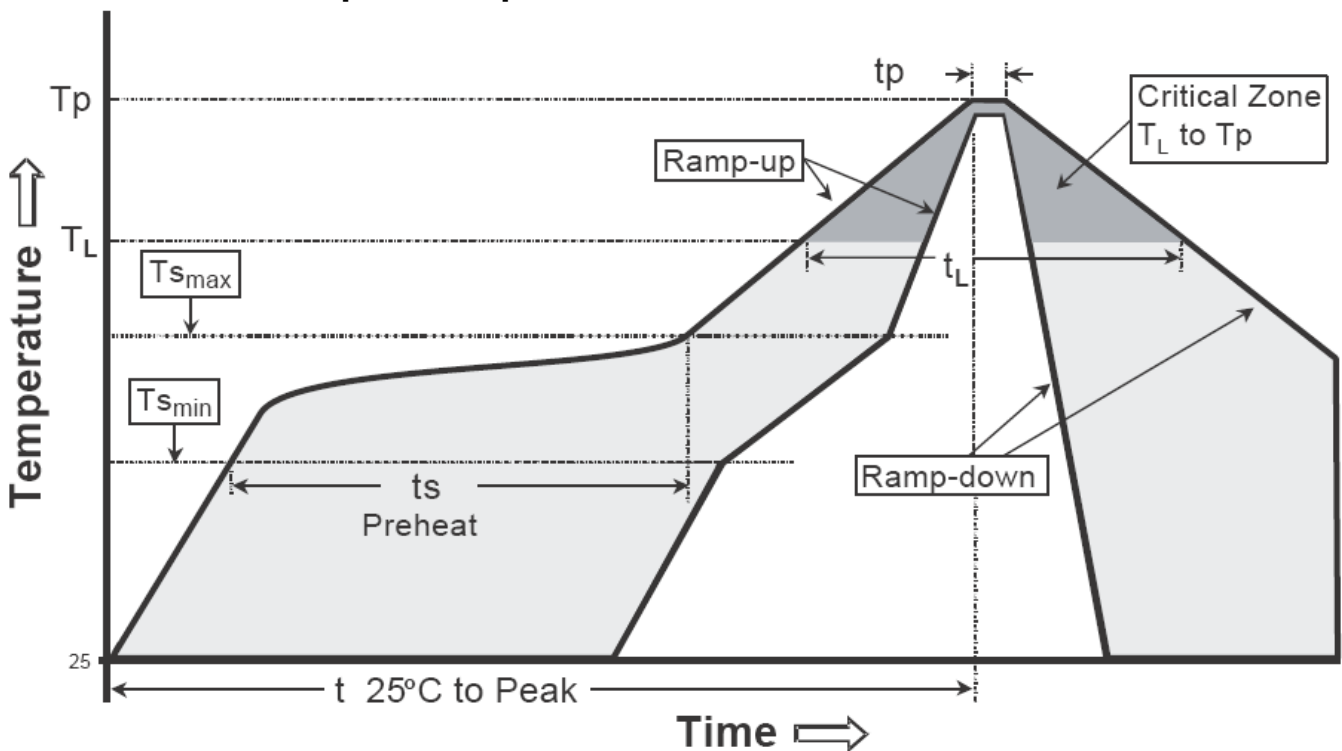
**Carrier Tape Dimension**



**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**

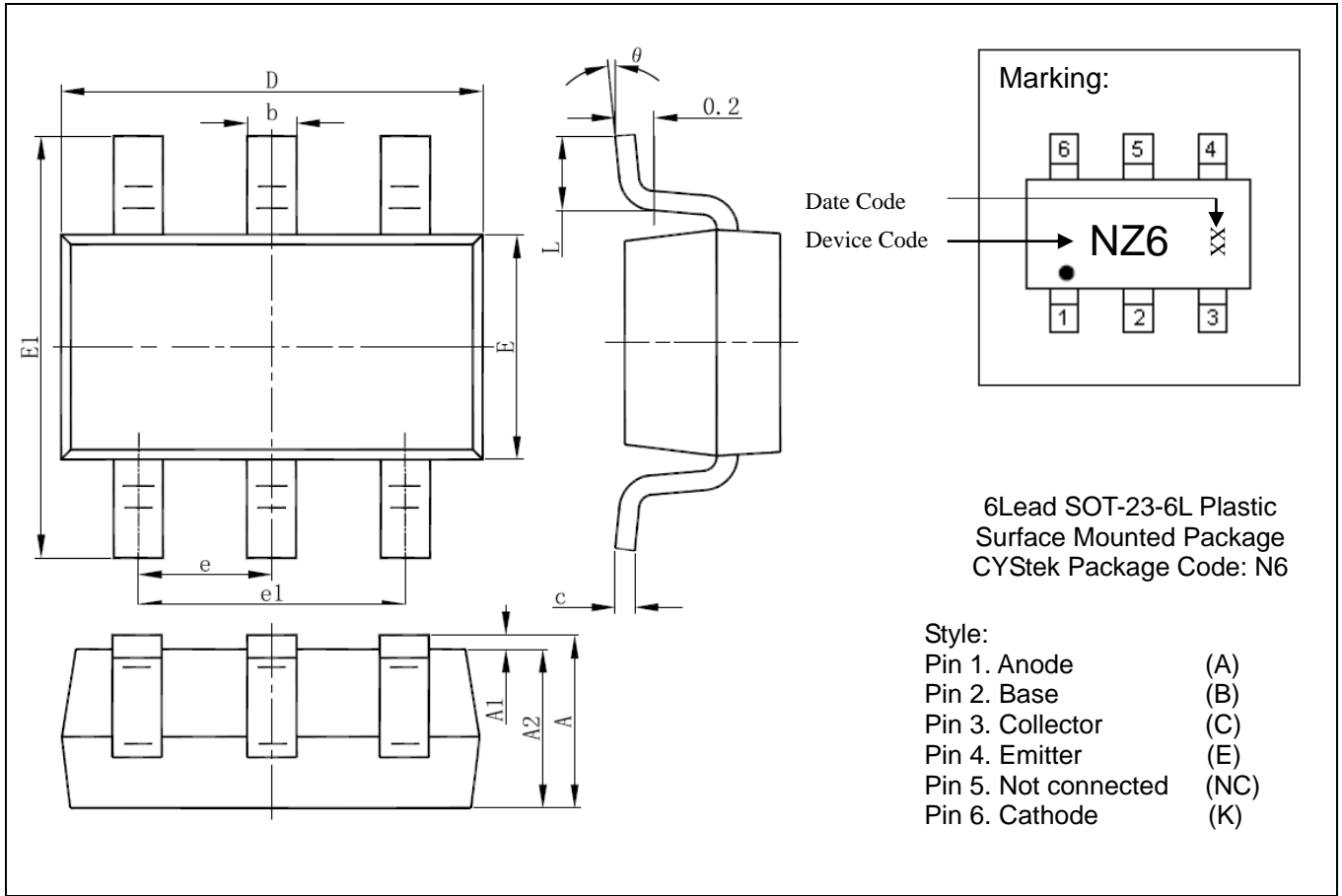


| Profile feature                                | Sn-Pb eutectic Assembly | Pb-free Assembly |
|--|-------------------------|------------------|
| Average ramp-up rate (Tsmax to Tp)             | 3°C/second max.         | 3°C/second max.  |
| Preheat  |                         |                  |
| -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-23-6L Dimension**



| DIM | Millimeters |       | Inches |       | DIM | Millimeters |       | Inches      |       |
|-----|-------------|-------|--------|-------|-----|-------------|-------|-------------|-------|
|     | Min.        | Max.  | Min.   | Max.  |     | Min.        | Max.  | Min.        | Max.  |
| A   | 1.050       | 1.250 | 0.041  | 0.049 | E   | 1.500       | 1.700 | 0.059       | 0.067 |
| A1  | 0.000       | 0.100 | 0.000  | 0.004 | E1  | 2.650       | 2.950 | 0.104       | 0.116 |
| A2  | 1.050       | 1.150 | 0.041  | 0.045 | e   | 0.950 (BSC) |       | 0.037 (BSC) |       |
| b   | 0.300       | 0.500 | 0.012  | 0.020 | e1  | 1.800       | 2.000 | 0.071       | 0.079 |
| c   | 0.100       | 0.200 | 0.004  | 0.008 | L   | 0.300       | 0.600 | 0.012       | 0.024 |
| D   | 2.820       | 3.020 | 0.111  | 0.119 | θ   | 0°          | 8°    | 0°          | 8°    |

**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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