

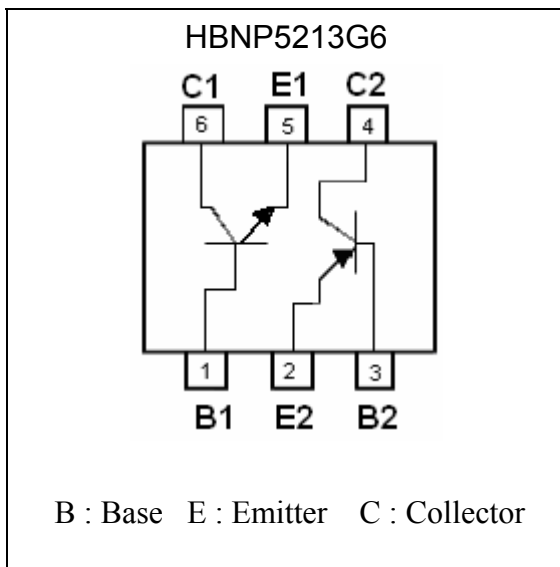
# NPN AND PNP Dual Epitaxial Planar Transistors

## HBNP5213G6

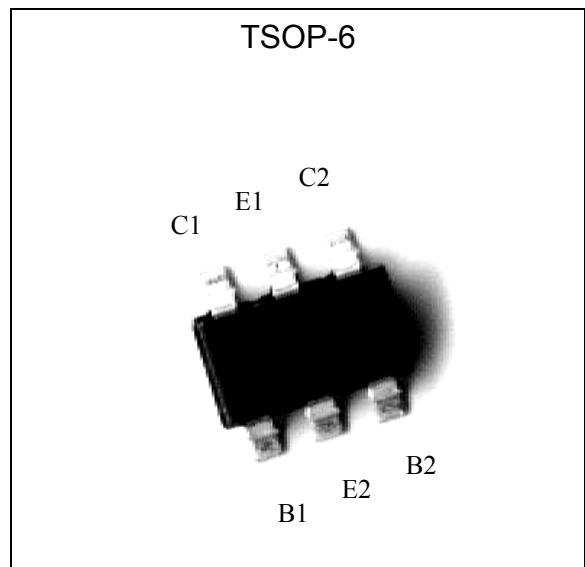
### Features

- High  $BV_{CEO}$
- High current
- Excellent DC current gain characteristics
- Pb-free lead plating and halogen-free package

### Equivalent Circuit

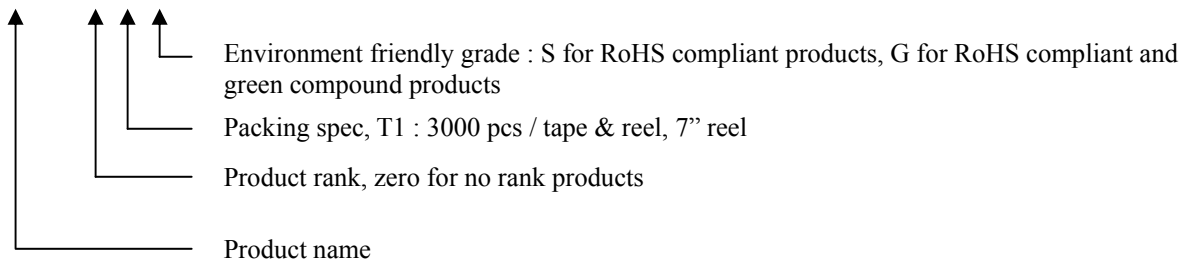


### Outline



### Ordering Information

Device	Package	Shipping
HBNP5213G6-0-T1-G	TSOP-6 (Pb-free lead plating and halogen-free package)	3000 pcs / tape & reel





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

Parameter	Symbol	Limits		Unit
		NPN	PNP	
Collector-Base Voltage	V <sub>CBO</sub>	100	-100	V
Collector-Emitter Voltage	V <sub>CEO</sub>	80	-80	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	-7	V
Collector Current(DC) (Note 1)	I <sub>C</sub>	1	-1	A
Peak Collector Current (Note 2)	I <sub>CP</sub>	2	-2	A
Peak Base Current (Note 2)	I <sub>BP</sub>	200	-200	mA
Total Power Dissipation (Note 1)	P <sub>d</sub>	1.14		W
Linear Derating Factor		0.01		
Operating Junction and Storage Temperature	T <sub>j</sub> , T <sub>stg</sub>	-55~+150		°C
Thermal Resistance, Junction-to-Ambient (Note 1)	R <sub>th,ja</sub>	110		°C/W

Note : 1.Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board, t≤5 sec; 180°C/W when mounted on minimum copper pad  
 2.Pulse width limited by maximum junction temperature

**NPN Electrical Characteristics** (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
BV <sub>CBO</sub>	100	-	-	V	I <sub>C</sub> =50μA
BV <sub>CEO</sub>	80	-	-	V	I <sub>C</sub> =1mA
BV <sub>EBO</sub>	7	-	-	V	I <sub>E</sub> =50μA
I <sub>CBO</sub>	-	-	100	nA	V <sub>CB</sub> =100V, I <sub>E</sub> =0
I <sub>EBO</sub>	-	-	100	nA	V <sub>EB</sub> =7V, I <sub>C</sub> =0
*V <sub>CE(SAT)</sub>	-	0.15	0.3	V	I <sub>C</sub> =500mA, I <sub>B</sub> =20mA
*V <sub>CE(SAT)</sub>	-	-	0.5	V	I <sub>C</sub> =1A, I <sub>B</sub> =50mA
*V <sub>BE(SAT)</sub>	-	-	1.2	V	I <sub>C</sub> =1A, I <sub>B</sub> =50mA
*h <sub>FE 1</sub>	180	-	390	-	V <sub>CE</sub> =10V, I <sub>C</sub> =150mA
*h <sub>FE 2</sub>	60	-	-	-	V <sub>CE</sub> =10V, I <sub>C</sub> =500mA
f <sub>T</sub>	150	230	-	MHz	V <sub>CE</sub> =10V, I <sub>C</sub> =50mA, f=100MHz
Cob	-	6	15	pF	V <sub>CB</sub> =10V, I <sub>E</sub> =0A, f=1MHz

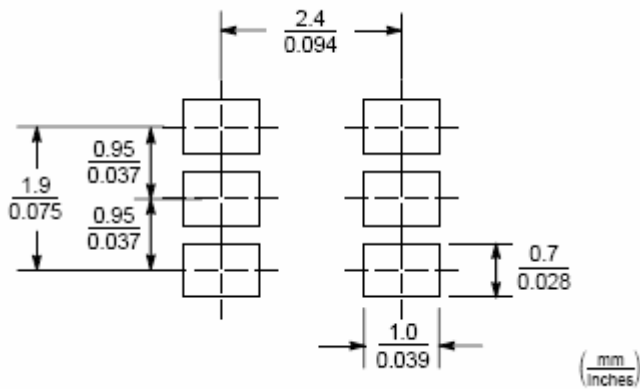
\*Pulse Test: Pulse Width ≤380μs, Duty Cycle≤2%

**PNP Electrical Characteristics** (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
BV <sub>CBO</sub>	-100	-	-	V	I <sub>C</sub> =-100μA
BV <sub>CEO</sub>	-80	-	-	V	I <sub>C</sub> =-10mA
BV <sub>EBO</sub>	-7	-	-	V	I <sub>E</sub> =-10μA
I <sub>CBO</sub>	-	-	-100	nA	V <sub>CB</sub> =-100V
I <sub>EBO</sub>	-	-	-100	nA	V <sub>EB</sub> =-7V
*V <sub>CE(sat)1</sub>	-	-0.16	-0.3	V	I <sub>C</sub> =-500mA, I <sub>B</sub> =-50mA
*V <sub>CE(sat)2</sub>	-	-	-0.6	V	I <sub>C</sub> =-700mA, I <sub>B</sub> =-35mA
*V <sub>BE(sat)</sub>	-	-	-1.2	V	I <sub>C</sub> =-1A, I <sub>B</sub> =-50mA
*h <sub>FE1</sub>	180	-	390	-	V <sub>CE</sub> =-10V, I <sub>C</sub> =-150mA
*h <sub>FE2</sub>	50	-	-	-	V <sub>CE</sub> =-10V, I <sub>C</sub> =-500mA
f <sub>T</sub>	150	200	-	MHZ	V <sub>CE</sub> =-10V, I <sub>C</sub> =-50mA, f=100MHZ
Cob	-	11	15	pF	V <sub>CB</sub> =-10V, I <sub>E</sub> =0A, f=1MHZ

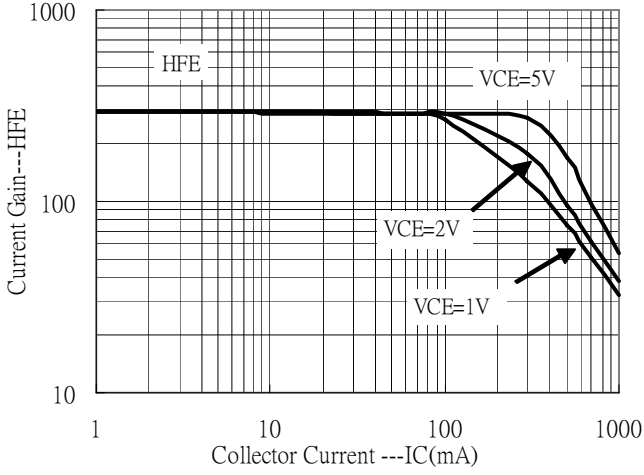
\*Pulse Test: Pulse Width ≤380μs, Duty Cycle ≤2%

**Recommended Soldering Footprint**

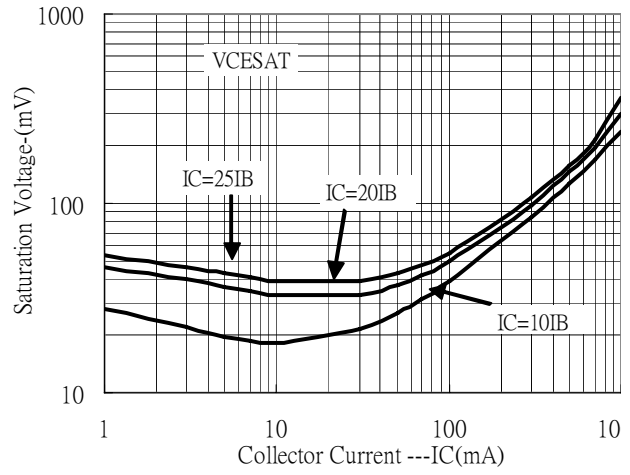


**Q1, NPN Typical Characteristics**

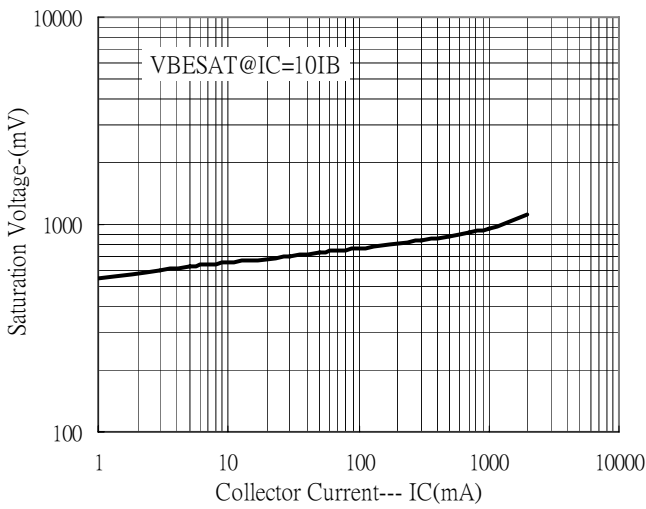
Current Gain vs Collector Current



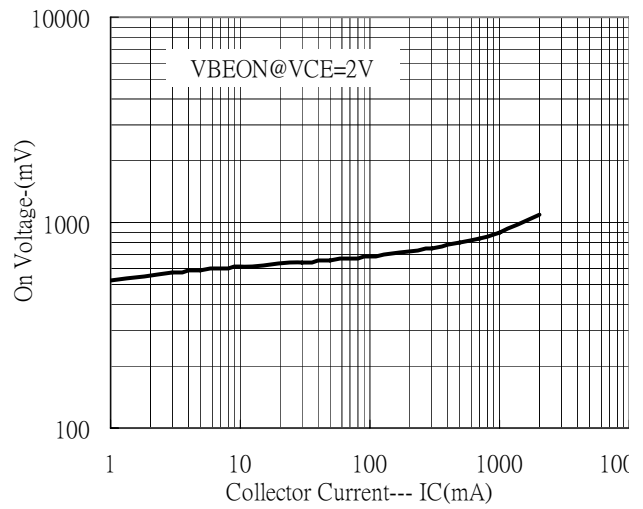
Saturation Voltage vs Collector Current



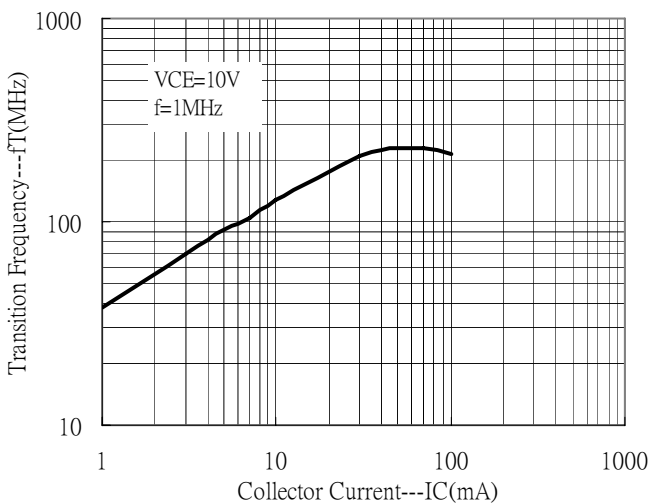
Saturation Voltage vs Collector Current



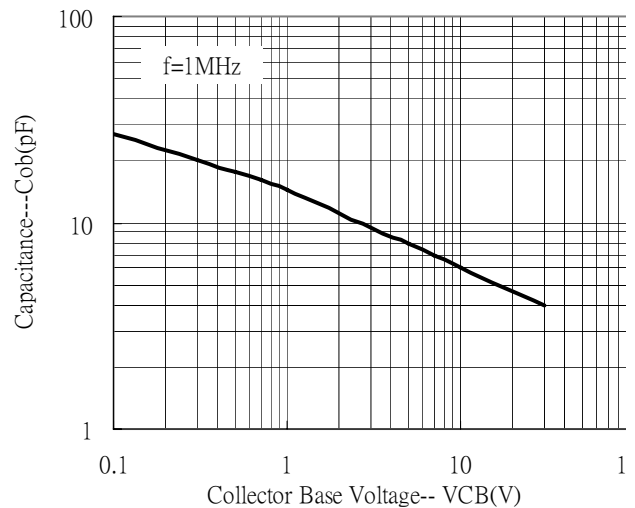
On Voltage vs Collector Current



Transition Frequency vs Collector Current

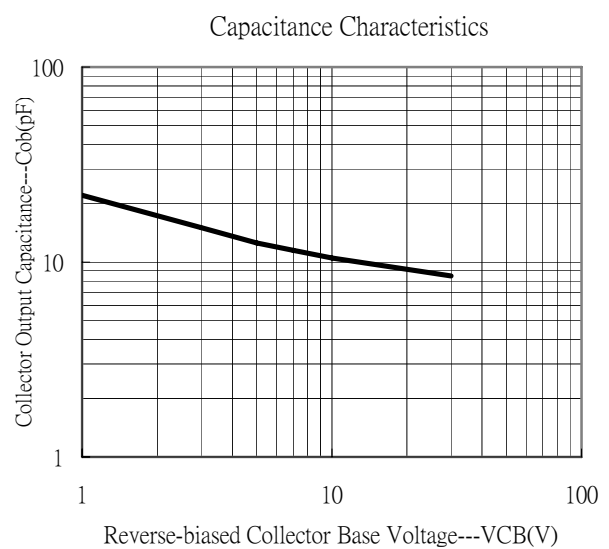
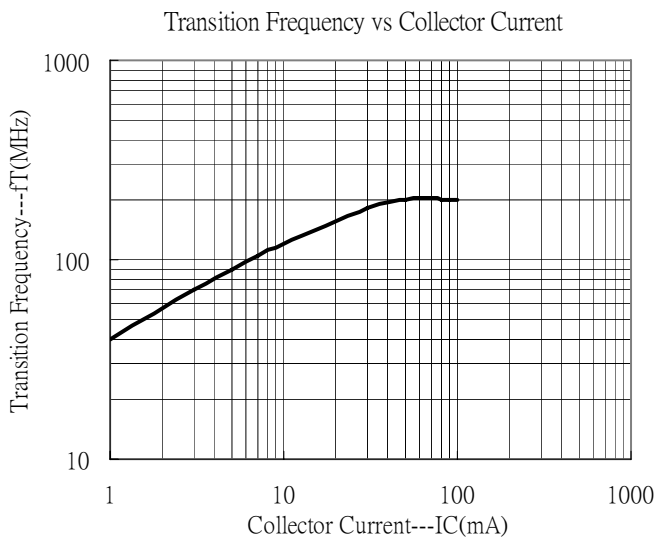
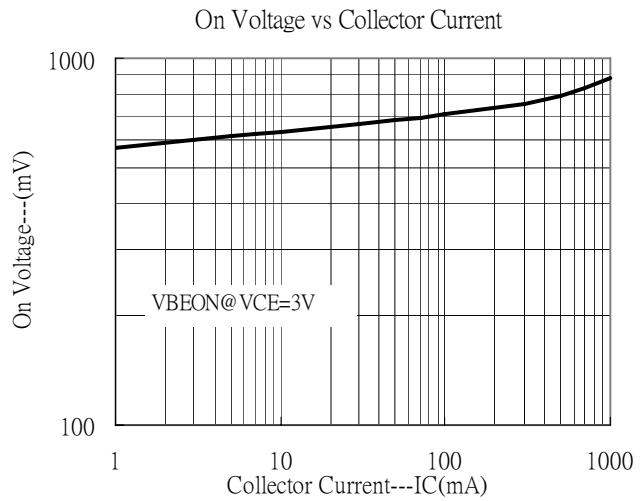
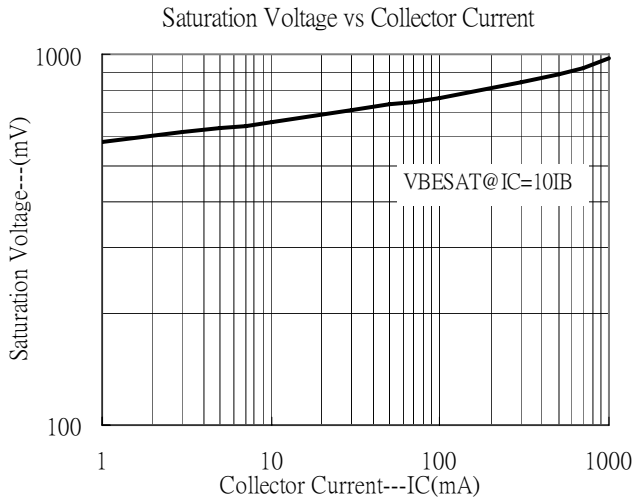
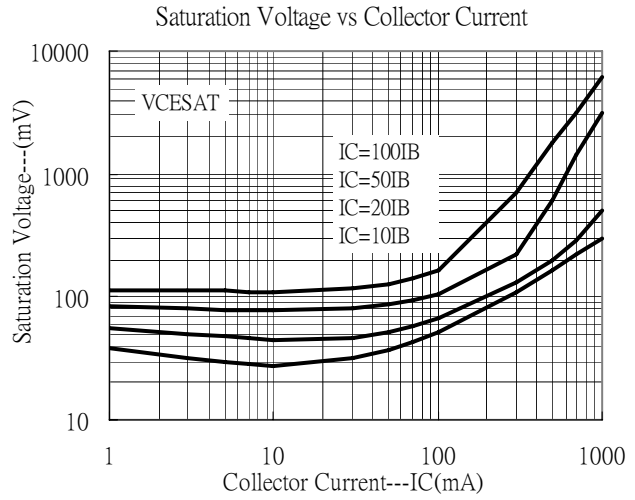
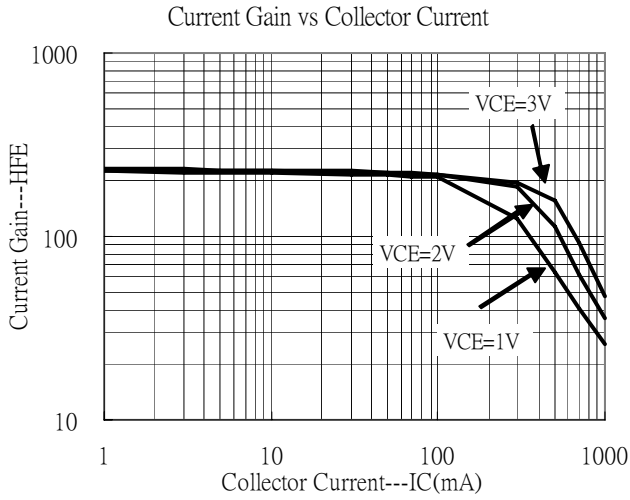


Capacitance Characteristics

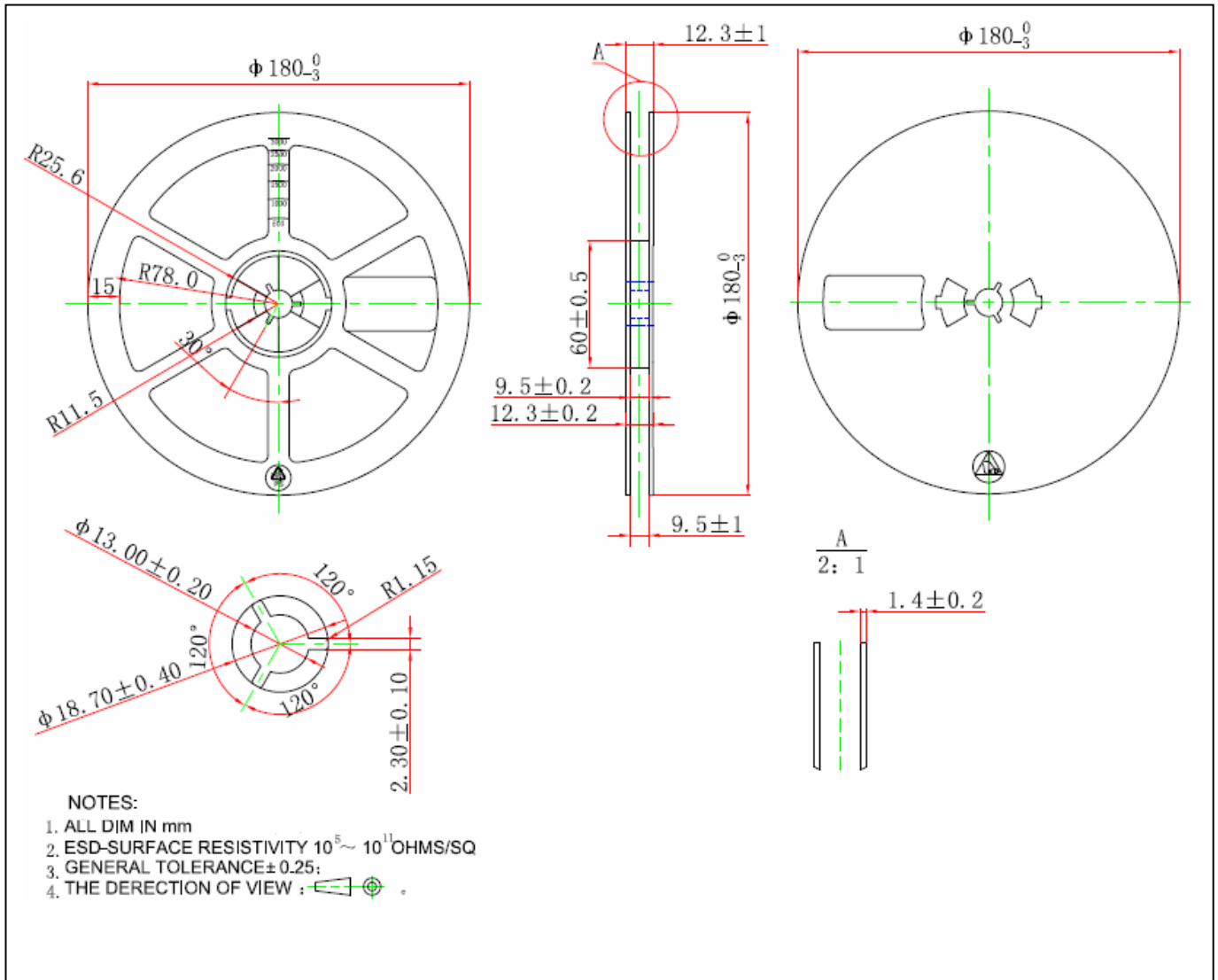




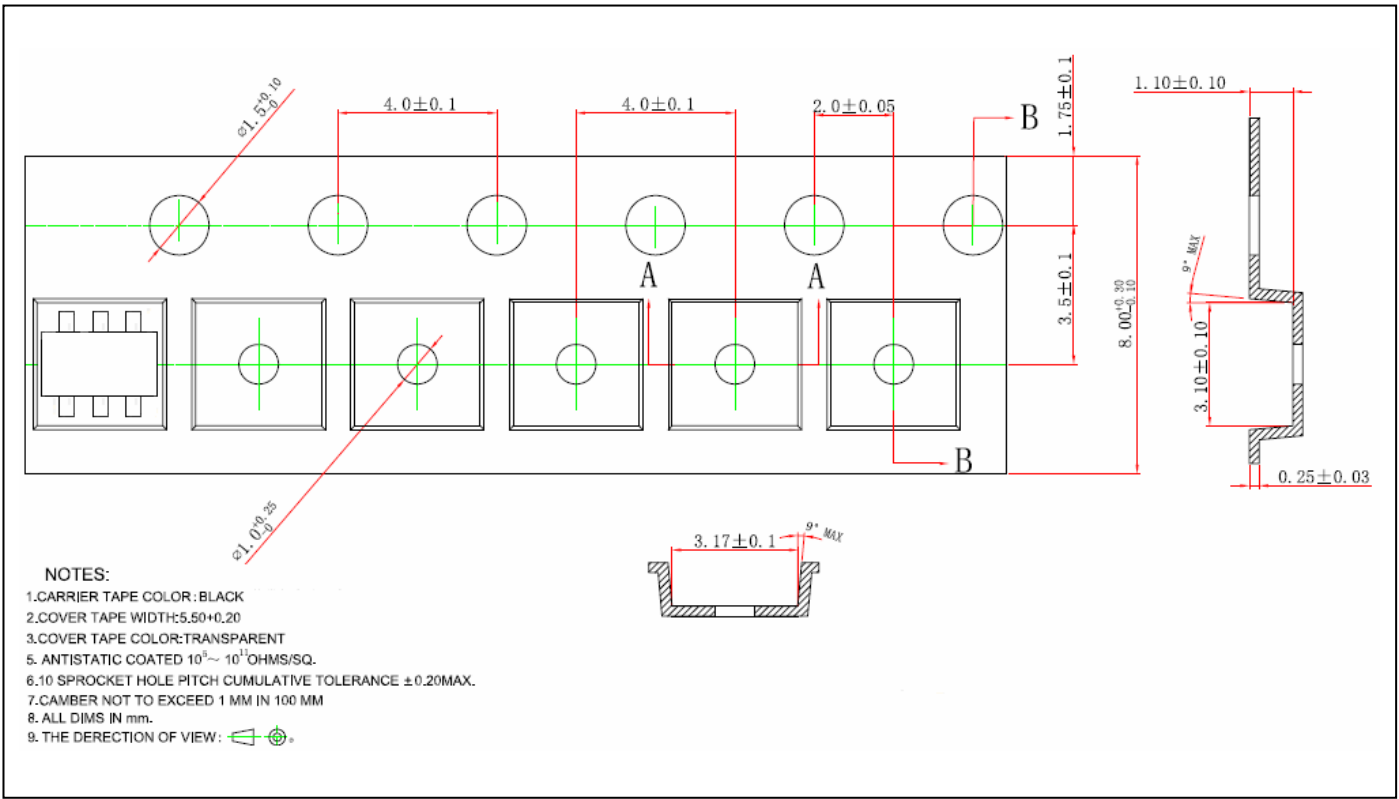
## Q2, PNP Typical Characteristics



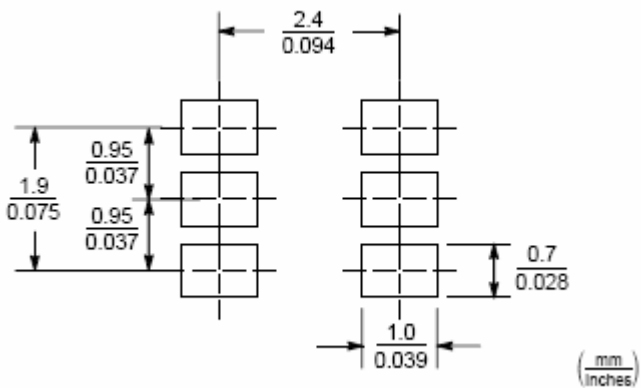
**Reel Dimension**



### Carrier Tape Dimension



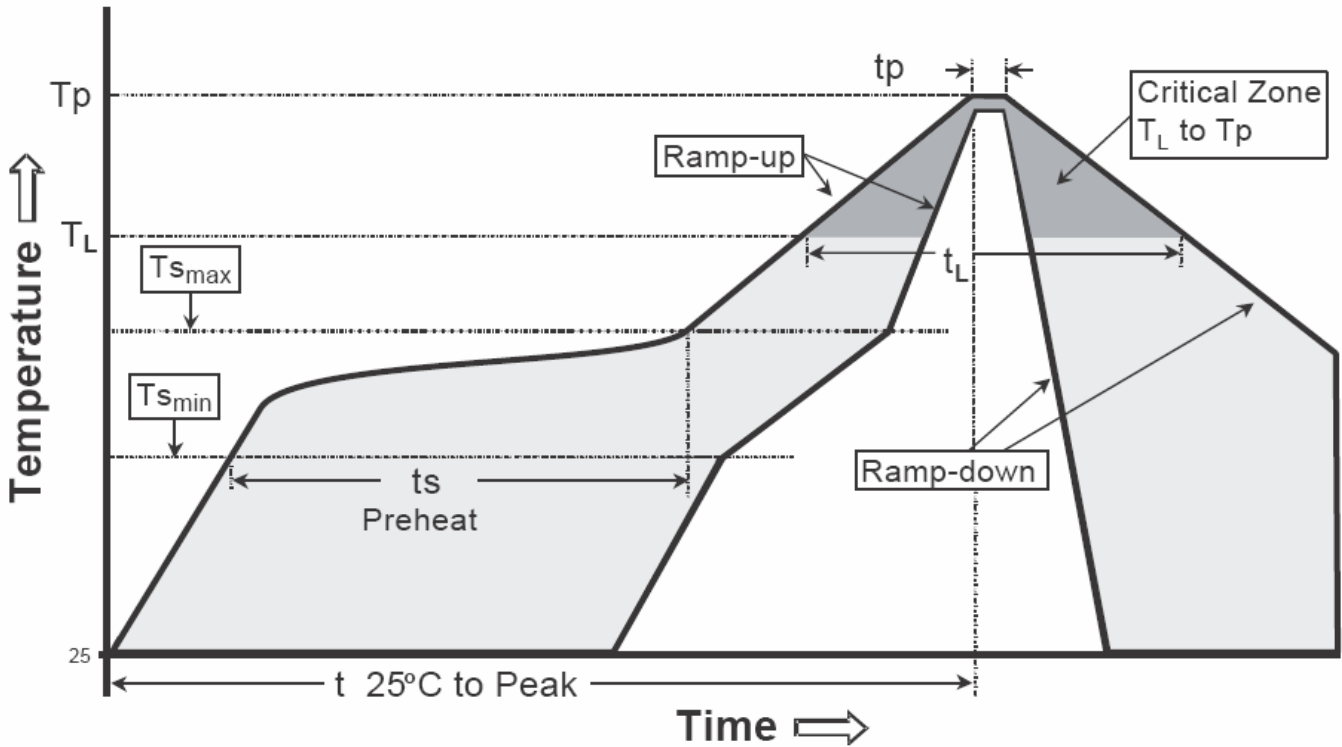
### Recommended Soldering Footprint



**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**

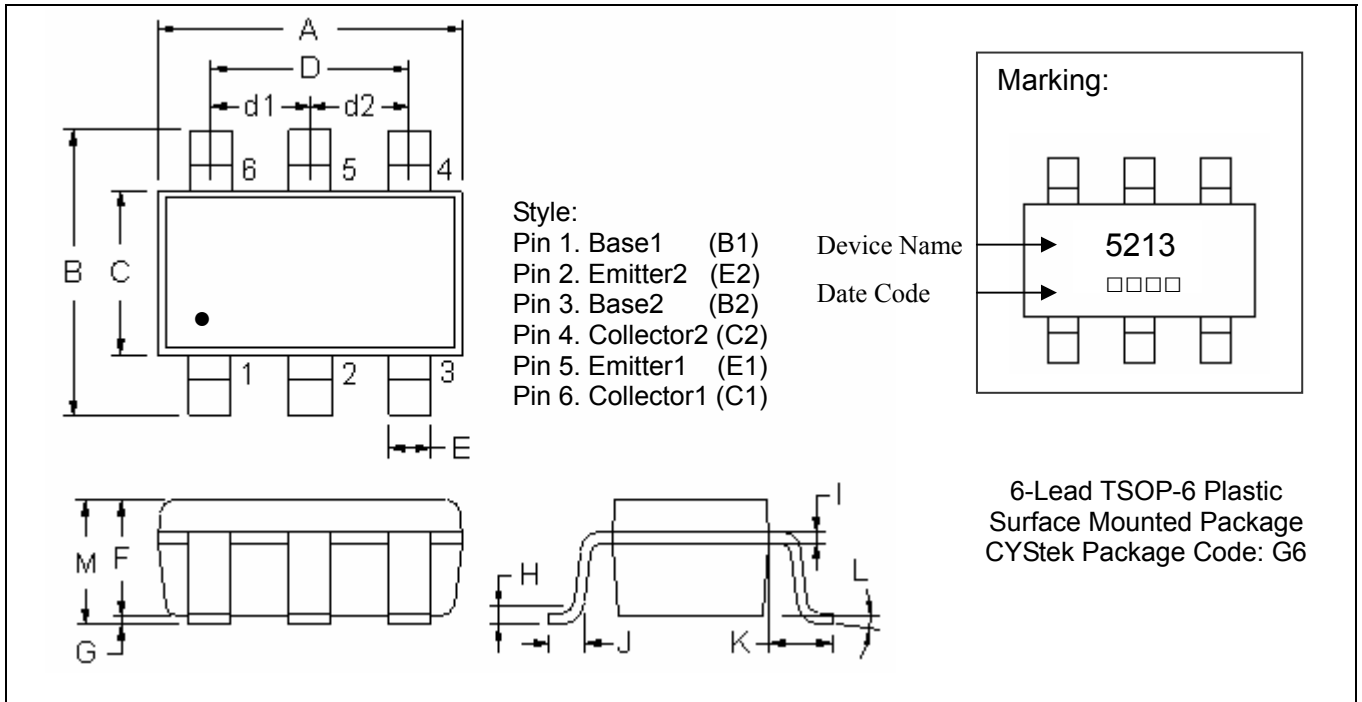


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(Ts min)	100°C	150°C
-Temperature Max(Ts max)	150°C	200°C
-Time(ts min to ts max)	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (Tl)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



**TSOP-6 Dimension**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1063	0.1220	2.70	3.10	G	0	0.0039	0	0.10
B	0.1024	0.1181	2.60	3.00	H	-	0.0098	-	0.25
C	0.0551	0.0709	1.40	1.80	I	0.0047 REF		0.12 REF	
D	0.0748 REF		1.90 REF		J	0.0177 REF		0.45 REF	
d1	0.0374 REF		0.95 REF		K	0.0236 REF		0.60 REF	
d2	0.0374 REF		0.95 REF		L	0°	10°	0°	10°
E	0.0118	0.0197	0.30	0.50	M	-	0.0433	-	1.10
F	0.0276	0.0394	0.70	1.00					

**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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