PNP and NPN Dual Digital Transistors

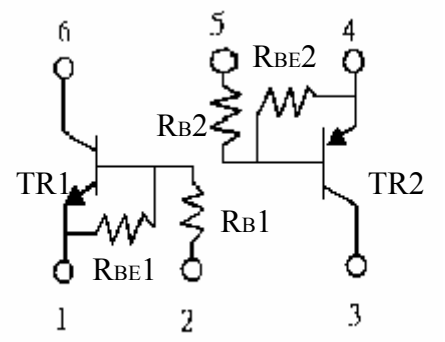
HBCA144EC6

Features

- Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
- The bias resistors consist of thin-film resistors with complete isolation to allow positive biasing of the input for PNP transistor, and negative biasing of the input for NPN transistor. They also have the advantage of almost completely eliminating parasitic effects.
- Only the on/off conditions need to be set for operation, making device design easy.
- One DTA144E chip and one DTC144E chip in a SOT-563 package.
- Mounting by SOT-523 automatic mounting machines is possible.
- Mounting cost and area can be cut in half.
- Transistor elements are independent, eliminating interference.
- Pb-free lead plating and halogen-free package.

Equivalent Circuit

HBCA144EC6

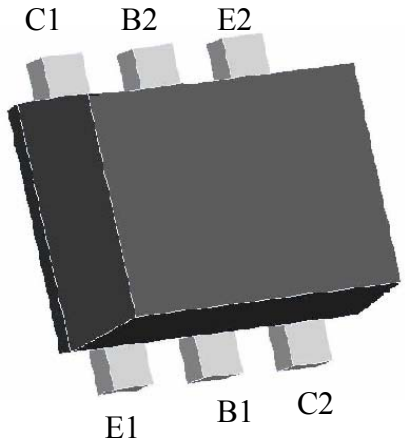


R_{B1}=47kΩ , R_{B2}=47kΩ

R_{BE1}=47kΩ , R_{BE2}=47kΩ

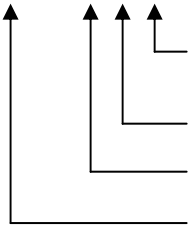
Outline

SOT-563



Ordering Information

Device	Package	Shipping
HBCA144EC6-0-T1-G	SOT-563 (Pb-free lead plating and halogen-free package)	3000 pcs / tape & reel



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

Packing spec, T1 : 3000 pcs / tape & reel, 7” reel

Product rank, zero for no rank products

Product name

Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Limits		Unit
		Tr1(NPN)	Tr2(PNP)	
Supply Voltage	V_{CC}	50	-50	V
Input Voltage	V_{IN}	-10~+40	-40~+10	V
Output Current	I_O	30	-30	mA
	$I_{O(max.)}$	100	-100	mA
Total Power Dissipation	Pd	150 (Note)		mW
Junction Temperature	Tj	150		°C
Storage Temperature	Tstg	-55~+150		°C

Note : 120mW per element must not be exceeded.

Characteristics (Ta=25℃)

•Tr1(NPN)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Input Voltage	$V_{I(off)}$	-	-	0.5	V	V_{CC}=5V, I_O=100μA
	$V_{I(on)}$	3	-	-	V	V_O=0.3V, I_O=2mA
Output Voltage	$V_{O(on)}$	-	-	0.3	V	I_O/I_I=10mA/0.5mA
Input Current	I_I	-	-	0.18	mA	V_I=5V
Output Current	$I_{O(off)}$	-	-	0.5	μA	V_{CC}=50V, V_I=0V
DC Current Gain	G_I	68	-	-	-	V_O=5V, I_O=5mA
Input Resistance	R_1	32.9	47	61.1	kΩ	-
Resistance Ratio	R_2/R_1	0.8	1	1.2	-	-
Transition Frequency	f_T	-	250	-	MHz	V_{CE}=10V, I_C=5mA, f=100MHz *

* Transition frequency of the device

•Tr2(PNP)

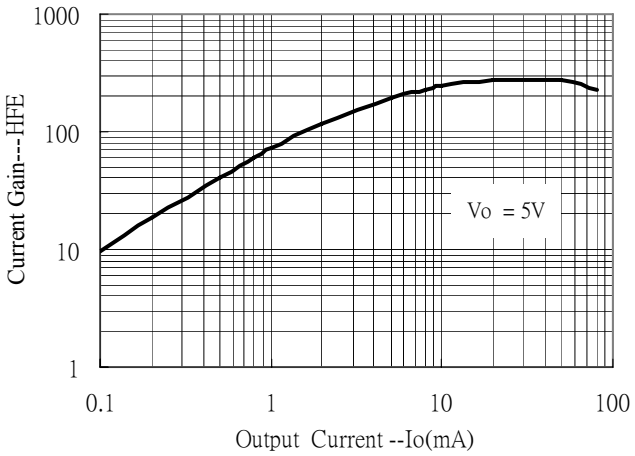
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Input Voltage	$V_{I(off)}$	-	-	-0.5	V	V_{CC}=-5V, I_O=-100μA
	$V_{I(on)}$	-3	-	-	V	V_O=-0.3V, I_O=-2mA
Output Voltage	$V_{O(on)}$	-	-	-0.3	V	I_O/I_I=-10mA/-0.5mA
Input Current	I_I	-	-	-0.18	mA	V_I=-5V
Output Current	$I_{O(off)}$	-	-	-0.5	μA	V_{CC}=-50V, V_I=0V
DC Current Gain	G_I	68	-	-	-	V_O=-5V, I_O=-5mA
Input Resistance	R_1	32.9	47	61.1	kΩ	-
Resistance Ratio	R_2/R_1	0.8	1	1.2	-	-
Transition Frequency	f_T	-	250	-	MHz	V_{CE}=-10V, I_C=-5mA, f=100MHz *

* Transition frequency of the device

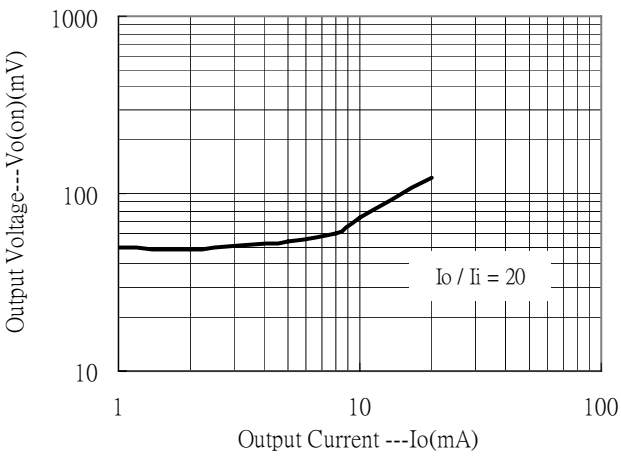
Characteristic Curves

•Tr1(NPN)

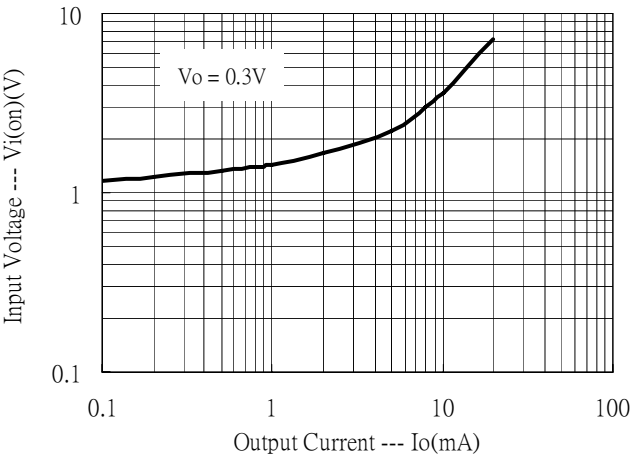
DC Current Gain vs Output Current



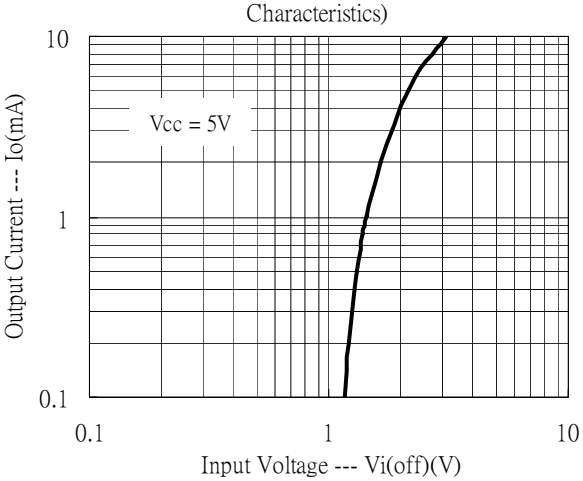
Output Voltage vs Output Current



Input Voltage vs Output Current (ON Characteristics)

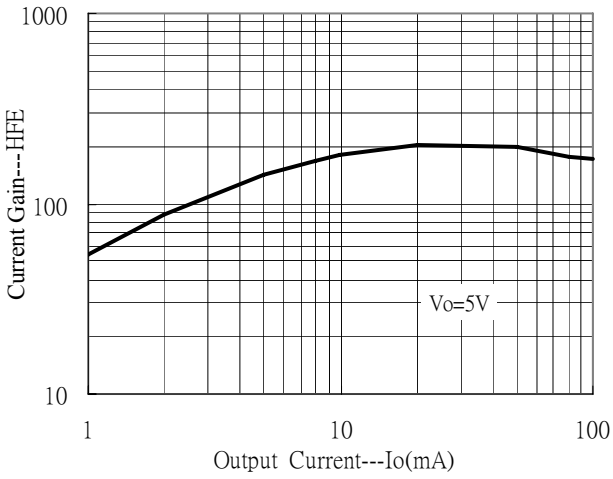


Output Current vs Input Voltage (OFF Characteristics)

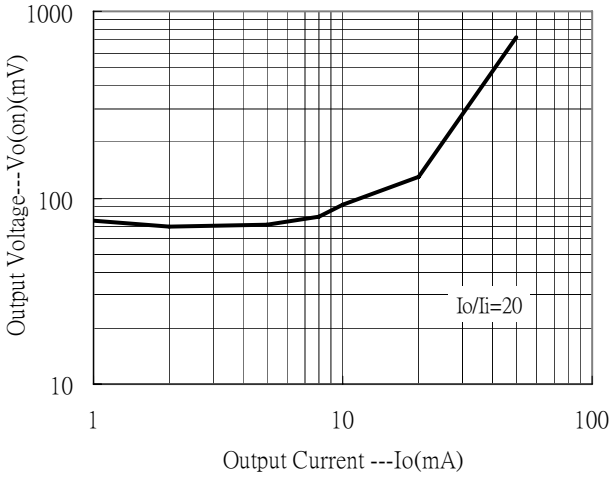


•Tr2(PNP)

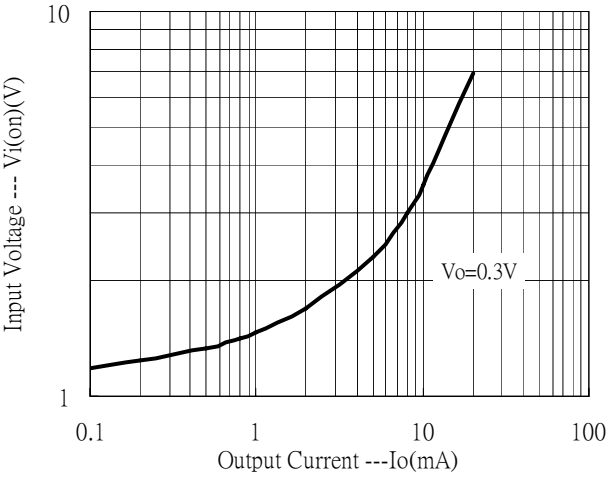
DC Current Gain vs Output Current



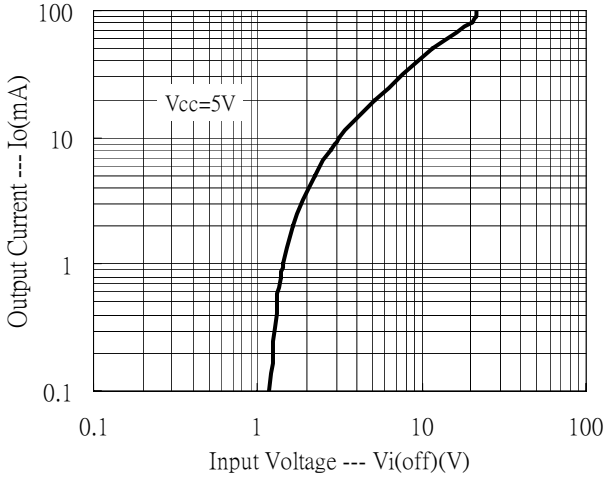
Output Voltage vs Output Current



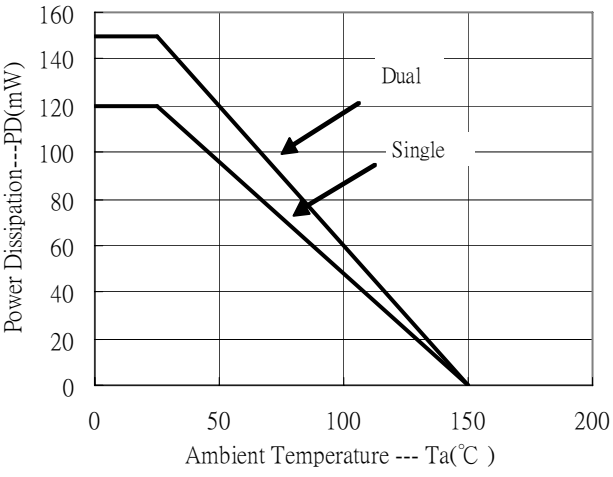
Input Voltage vs Output Current (ON Characteristics)



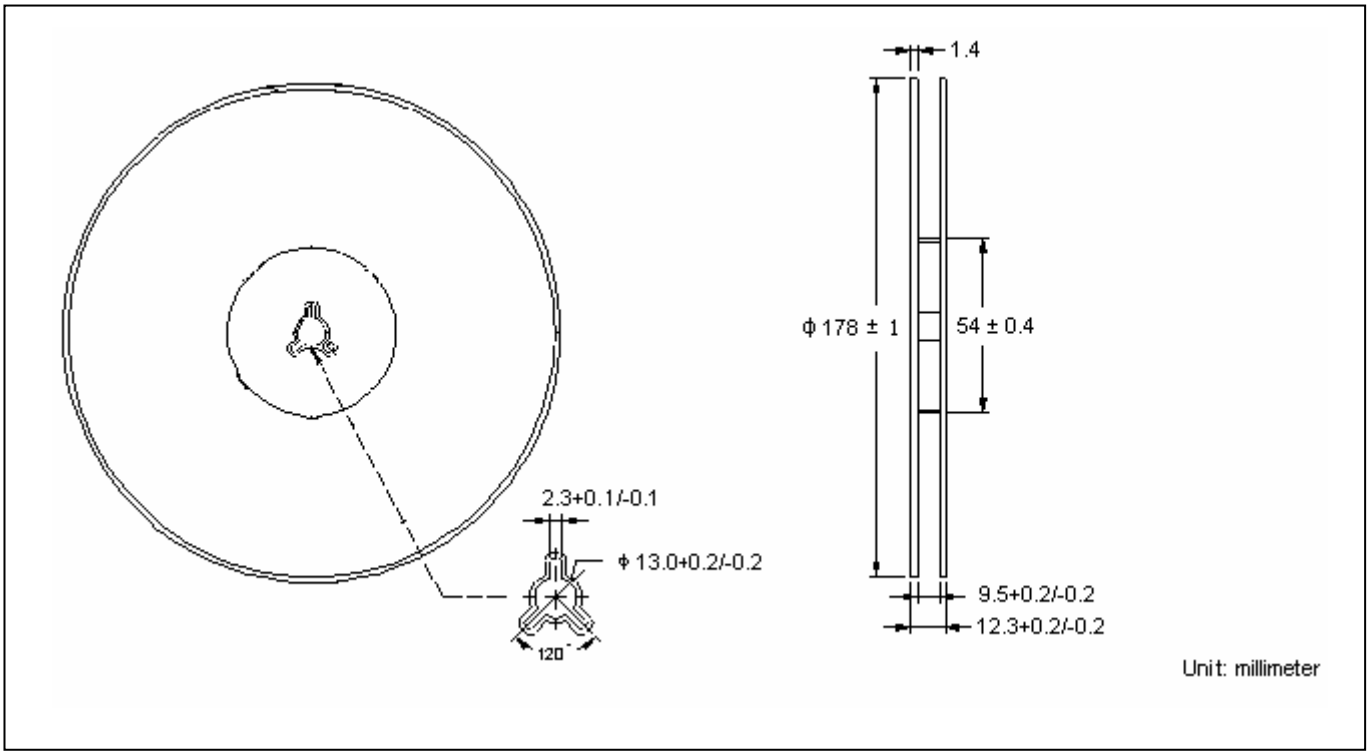
Output Current vs Input Voltage (OFF Characteristics)



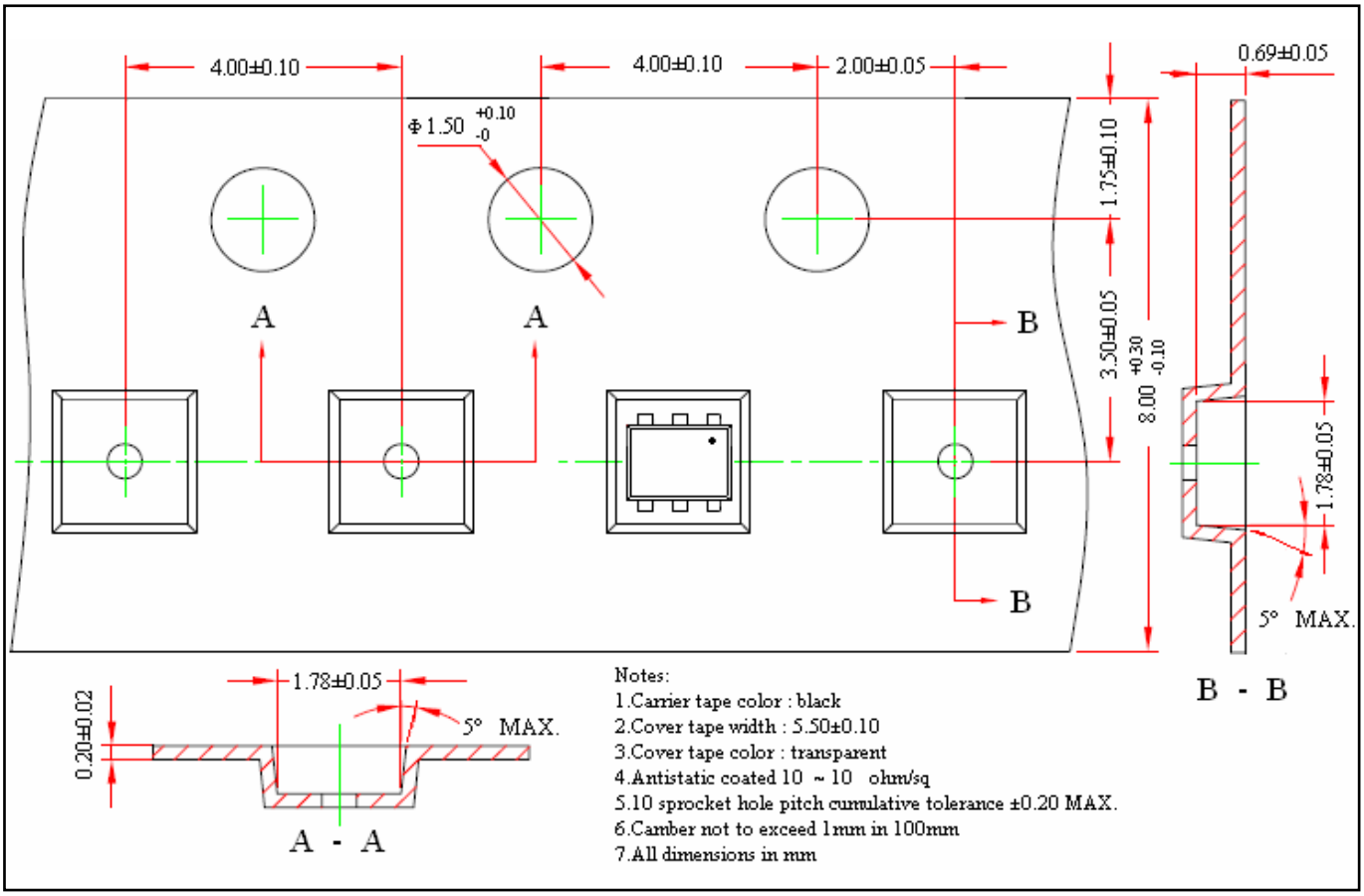
Power Derating Curves



Reel Dimension



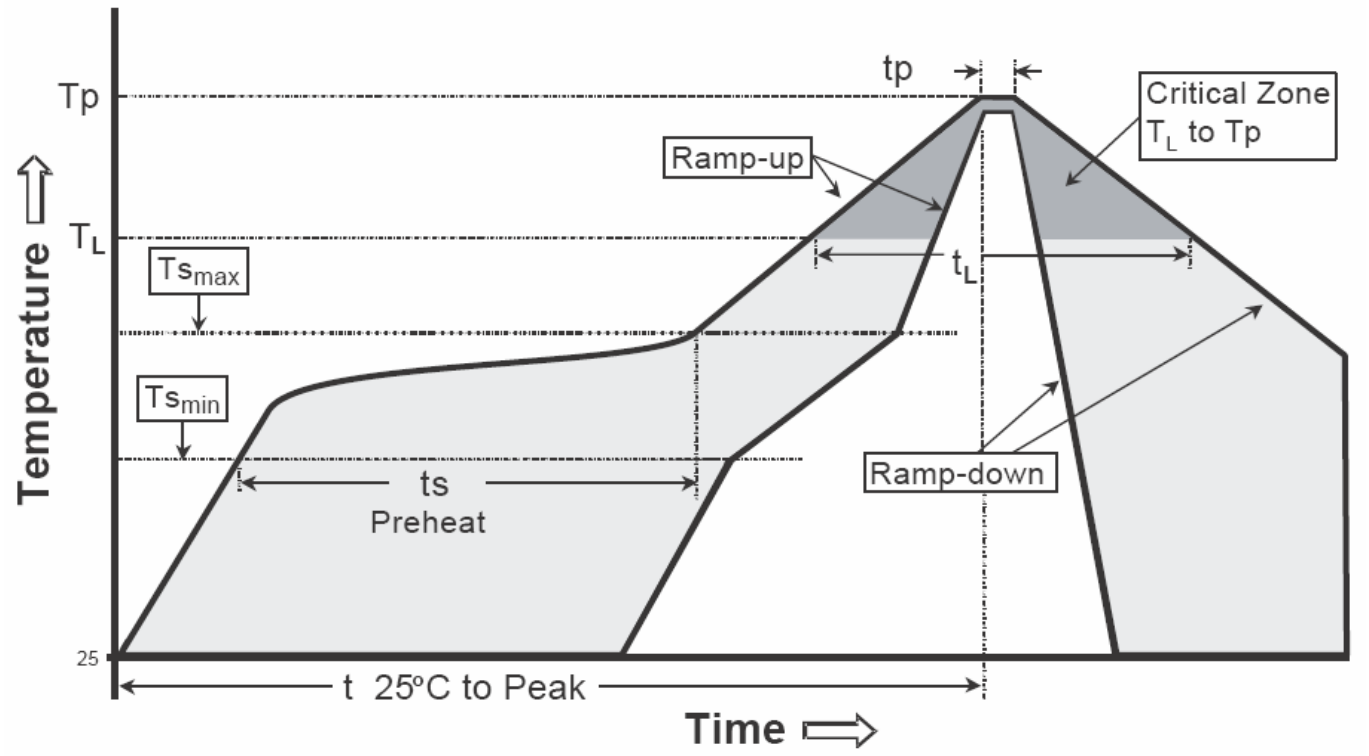
Carrier Tape Dimension



Recommended wave soldering condition

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

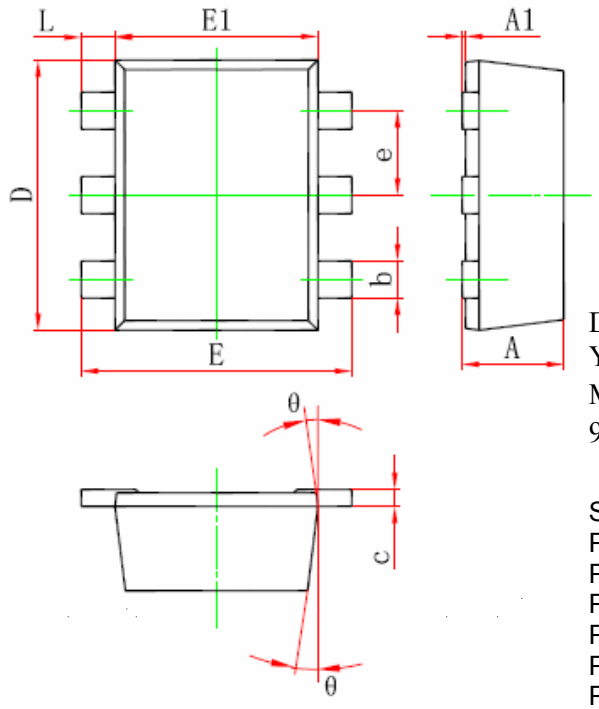
Recommended temperature profile for IR reflow



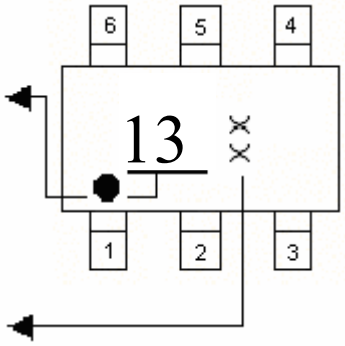
Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 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-563 Dimension



Marking:



Product Code

Date Code: Year+Month
Year: 6→2006, 7→2007
Month: 1→1, 2→2, • • •
9→9, A→10, B→11, C→12

Style:
Pin 1. Emitter1 (E1)
Pin 2. Base1 (B1)
Pin 3. Collector2 (C2)
Pin 4. Emitter2 (E2)
Pin 5. Base2 (B2)
Pin 6. Collector1 (C1)

6-Lead SOT-563 Plastic
Surface Mounted Package
CYStek Package Code: C6

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.021	0.024	0.525	0.600	b	0.007	0.011	0.170	0.270
A1	0.000	0.002	0.000	0.050	E1	0.043	0.051	1.100	1.300
e	0.018	0.022	0.450	0.550	E	0.059	0.067	1.500	1.700
c	0.004	0.006	0.090	0.160	L	0.004	0.012	0.100	0.300
D	0.059	0.067	1.500	1.700	θ	7° REF		7° REF	

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.