

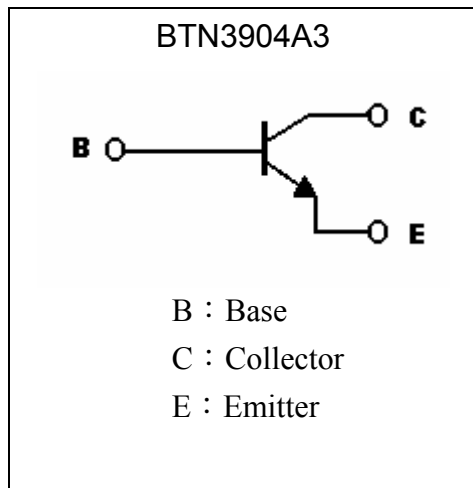
General Purpose NPN Epitaxial Planar Transistor

BTN3904A3

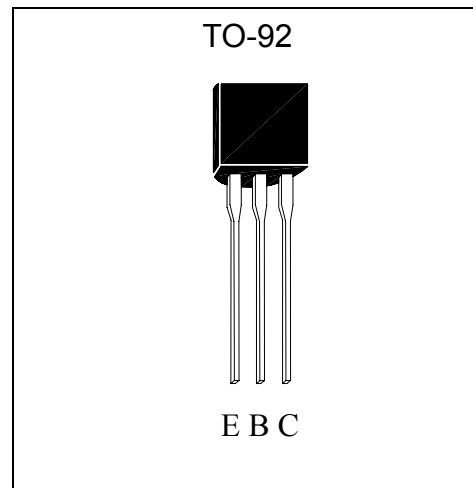
Description

- The BTN3904A3 is designed for general purpose switching amplifier applications.
- Complementary to BTP3906A3.
- Pb-free lead plating package.

Symbol



Outline



Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-Base Voltage	V_{CB0}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current	I_C	200	mA
Power Dissipation	P_d	625	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	-55~+150	°C



Characteristics (Ta=25°C)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
BV_{CBO}	60	-	-	V	$I_C=10\mu A$
BV_{CEO}	40	-	-	V	$I_C=1mA$
BV_{EBO}	6	-	-	V	$I_E=10\mu A$
I_{CEX}	-	-	50	nA	$V_{CE}=30V, V_{BE}=-3V$
* $V_{CE(sat)1}$	-	0.07	0.2	V	$I_C=10mA, I_B=1mA$
* $V_{CE(sat)2}$	-	0.13	0.3	V	$I_C=50mA, I_B=5mA$
* $V_{BE(sat)1}$	0.65	0.8	0.85	V	$I_C=10mA, I_B=1mA$
* $V_{BE(sat)2}$	-	0.85	0.95	V	$I_C=50mA, I_B=5mA$
* h_{FE1}	40	-	-	-	$V_{CE}=1V, I_C=100\mu A$
* h_{FE2}	70	-	-	-	$V_{CE}=1V, I_C=1mA$
* h_{FE3}	100	-	300	-	$V_{CE}=1V, I_C=10mA$
* h_{FE4}	60	-	-	-	$V_{CE}=1V, I_C=50mA$
* h_{FE5}	30	-	-	-	$V_{CE}=1V, I_C=100mA$
f_T	300	-	-	MHz	$V_{CE}=20V, I_C=10mA, f=100MHz$
C_{ob}	-	-	4	pF	$V_{CB}=5V, I_E=0A, f=1MHz$
t_d	-	-	35	ns	$V_{CC}=3V, V_{BE}=-0.5V, I_C=10mA, I_{B1}=1mA$
t_r	-	-	35	ns	
t_{stg}	-	-	200	ns	$V_{CC}=3V, I_C=10mA, I_{B1}=-I_{B2}=1mA$
t_f	-	-	50	ns	

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

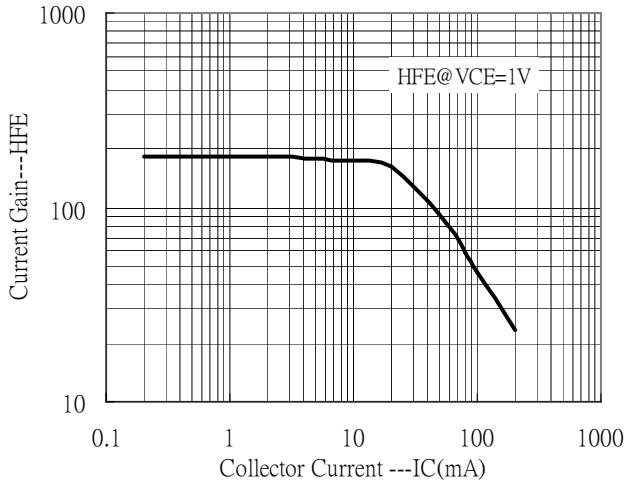
Ordering Information

Device	Package	Shipping
BTN3904A3-0-TB-G	TO-92 (Pb-free lead plating and halogen-free package)	2000 pcs / Tape & Box
BTN3904A3-0-BK-G	TO-92 (Pb-free lead plating and halogen-free package)	1000 pcs/ bag, 10 bags/box, 10boxes/carton

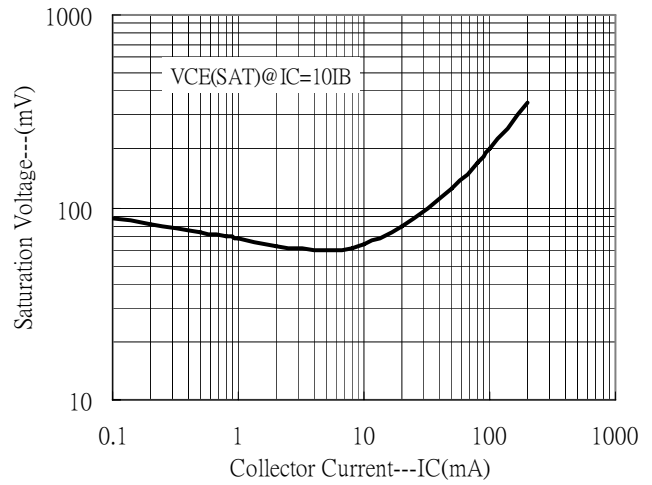


Characteristic Curves

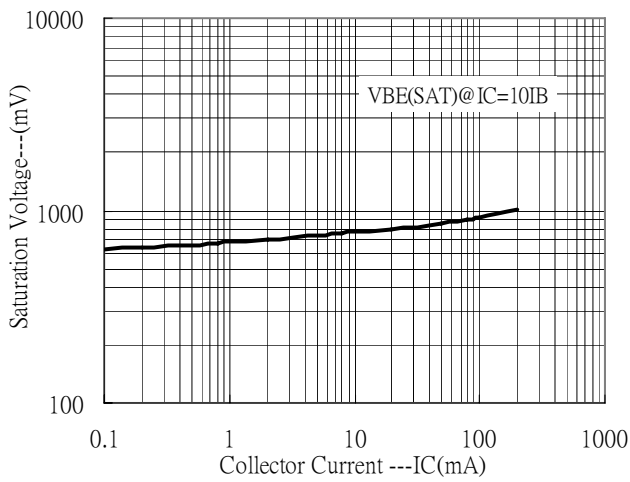
Current Gain vs Collector Current



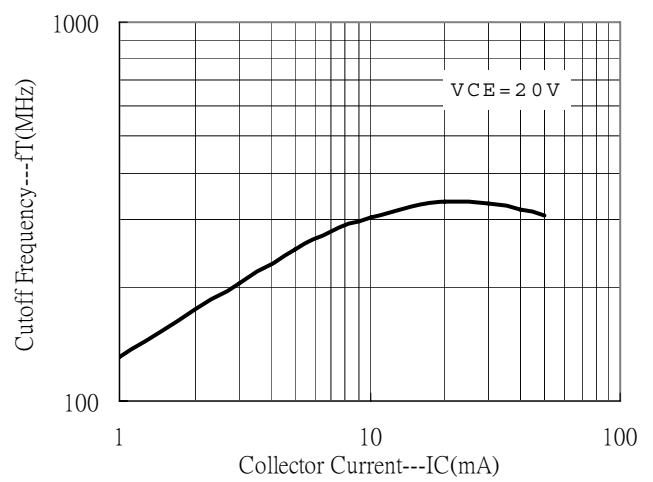
Saturation Voltage vs Collector Current



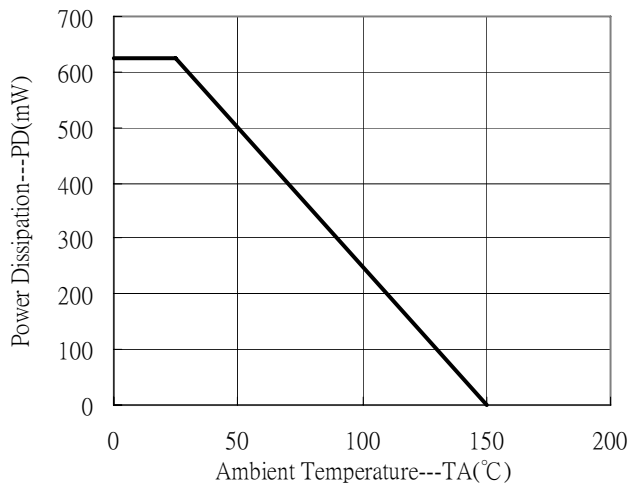
Saturation Voltage vs Collector Current



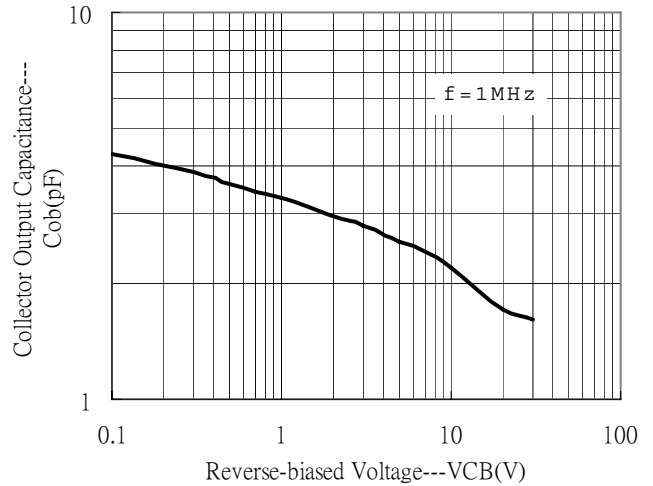
Cutoff Frequency vs Collector Current



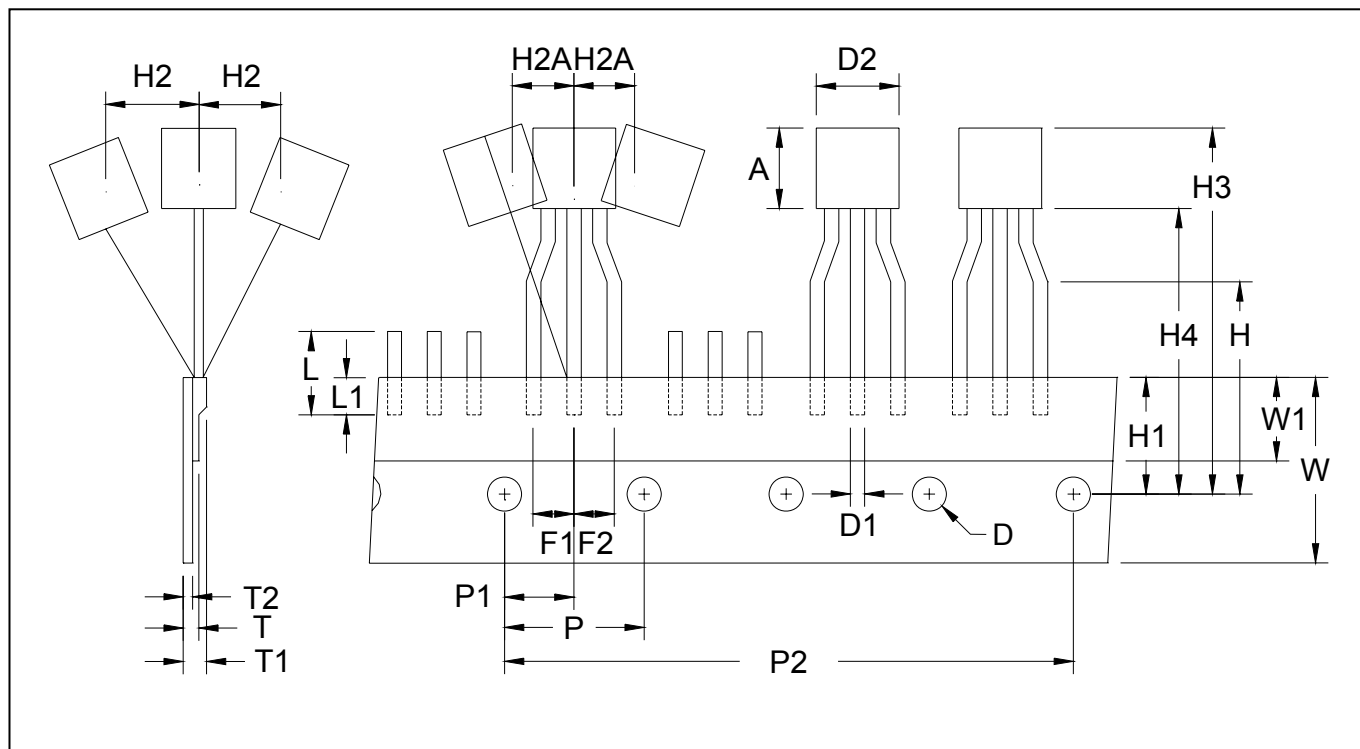
Power Derating Curve



Output Capacitance vs Reverse-biased Voltage



TO-92 Taping Outline

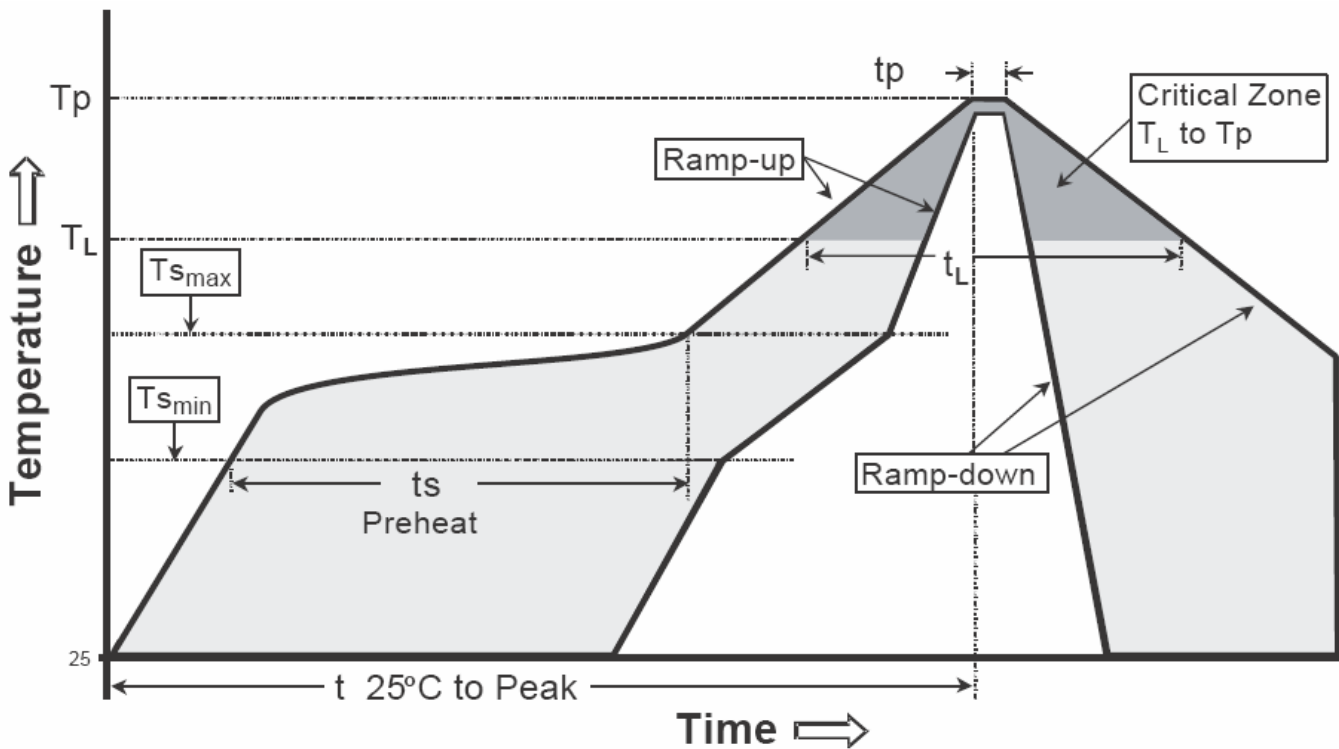


DIM	Item	Millimeters	
		Min.	Max.
A	Component body height	4.33	4.83
D	Tape Feed Diameter	3.80	4.20
D1	Lead Diameter	0.36	0.53
D2	Component Body Diameter	4.33	4.83
F1,F2	Component Lead Pitch	2.40	2.90
F1,F2	F1-F2	-	±0.3
H	Height Of Seating Plane	15.50	16.50
H1	Feed Hole Location	8.50	9.50
H2	Front To Rear Deflection	-	1
H2A	Deflection Left Or Right	-	1
H3	Component Height	-	27
H4	Feed Hole To Bottom Of Component	-	21
L	Lead Length After Component Removal	-	11
L1	Lead Wire Enclosure	2.50	-
P	Feed Hole Pitch	12.50	12.90
P1	Center Of Seating Plane Location	5.95	6.75
P2	4 Feed Hole Pitch	50.30	51.30
T	Over All Tape Thickness	-	0.55
T1	Total Taped Package Thickness	-	1.42
T2	Carrier Tape Thickness	0.36	0.68
W	Tape Width	17.50	19.00
W1	Adhesive Tape Width	5.00	7.00
-	20 pcs Pitch	253	255

Recommended wave soldering condition

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

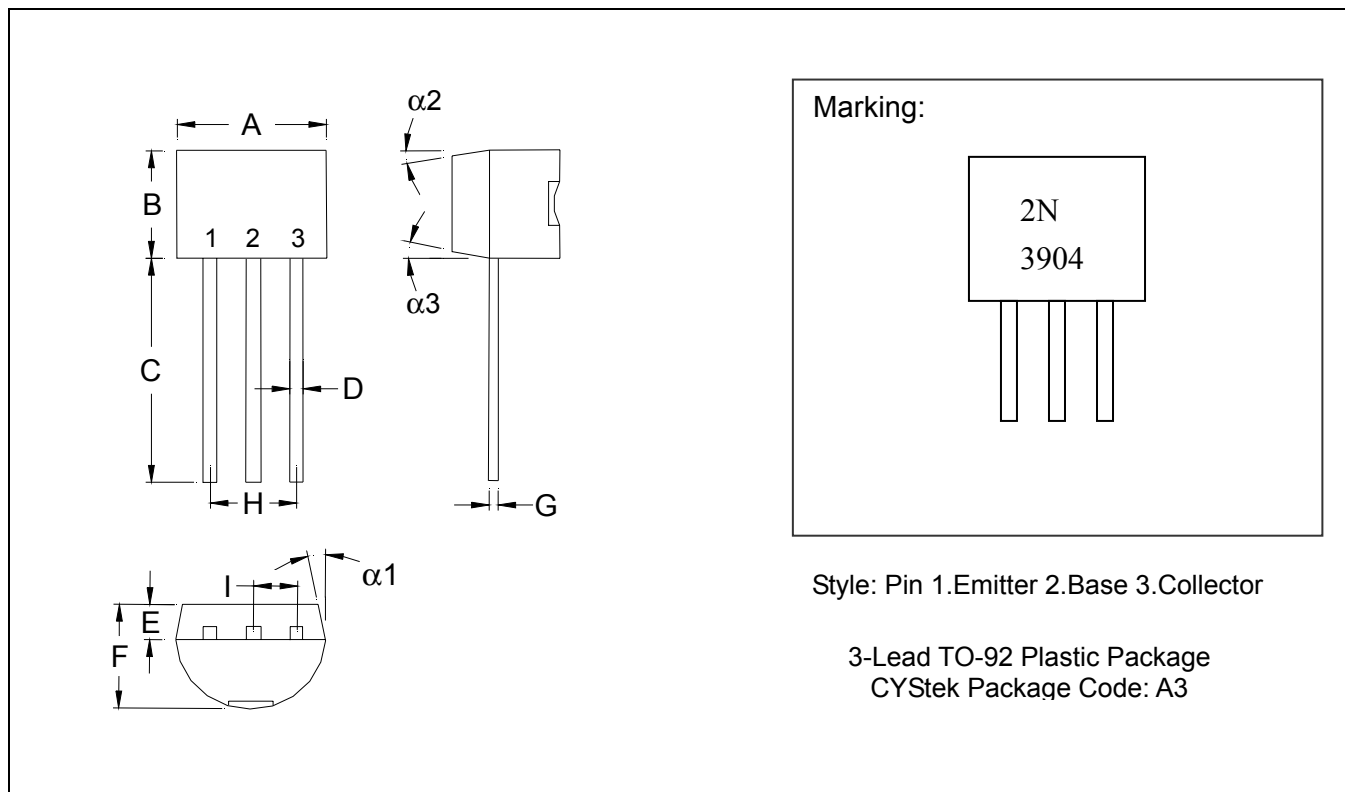
Recommended temperature profile for IR reflow



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.

TO-92 Dimension



*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1704	0.1902	4.33	4.83	G	0.0142	0.0220	0.36	0.56
B	0.1704	0.1902	4.33	4.83	H	-	*0.1000	-	*2.54
C	0.5000	-	12.70	-	I	-	*0.0500	-	*1.27
D	0.0142	0.0220	0.36	0.56	$\alpha 1$	-	*5°	-	*5°
E	-	*0.0500	-	*1.27	$\alpha 2$	-	*2°	-	*2°
F	0.1323	0.1480	3.36	3.76	$\alpha 3$	-	*2°	-	*2°

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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