

REPLACEMENT TYPE : 2N3904

FEATURES

- NPN silicon epitaxial planar transistor for switching and Amplifier applications
- As complementary type, the PNP transistor HCN3906 is Recommended
- This transistor is also available in the SOT-23 case with the type designation HABT3904



TO-92

1:EMITTER 2:BASE 3:COLLECTOR

MAXIMUM RATINGS ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	V_{CB0}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current-Continuous	I_C	0.2	A
Collector Power Dissipation	P_C	0.625	W
Junction Temperature	T_J	150	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-55 -150	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

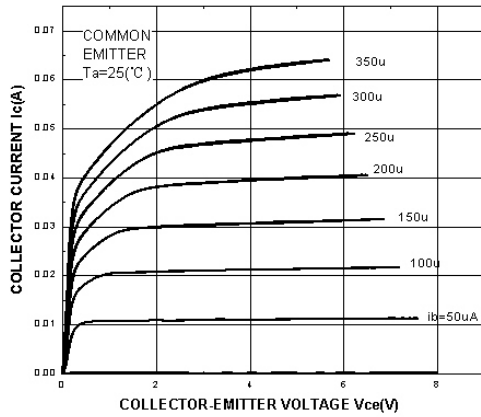
Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	V_{CB0}	$I_C=10\mu\text{A}, I_E=0$	60			V
Collector-Emitter Breakdown Voltage	V_{CEO}	$I_C=1\text{mA}, I_B=0$	40			V
Emitter-Base Breakdown Voltage	V_{EBO}	$I_E=10\mu\text{A}, I_C=0$	6			V
Collector Cut-off Current	I_{CBO}	$V_{CB}=60\text{V}, I_E=0$			0.1	μA
Collector cut-off current	I_{CEO}	$V_{CE}=40\text{V}, I_B=0$			0.1	μA
Emitter Cut-off Current	I_{EBO}	$V_{EB}=5\text{V}, I_C=0$			0.1	μA
DC Current Gain	$h_{FE(1)}$	$V_{CE}=1\text{V}, I_C=10\text{mA}$	100		400	
	$h_{FE(2)}$	$V_{CE}=1\text{V}, I_C=50$	60			
	$h_{FE(3)}$	$V_{CE}=1\text{V}, I_C=100\text{mA}$	30			
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.3	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.95	V
Transition frequency	f_T	$V_{CE}=20\text{V}, I_C=10\text{mA},$	300			MHz
Delay Time	t_d	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V},$			35	ns
Rise Time	t_r	$I_C=10\text{mA}, I_{B1}=1\text{mA}$			35	ns
Storage Time	t_s	$V_{CC}=3\text{V}, I_C=10\text{mA}$			200	ns
Fall Time	t_f	$I_{B1}=I_{B2}=1\text{mA}$			50	ns

CLASSIFICATION OF h_{FE}

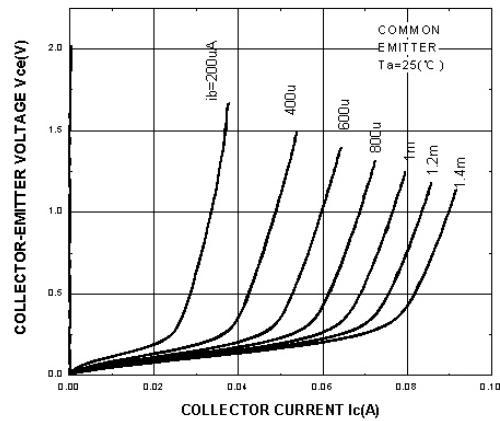
Rank	O	Y	G
Range	100-200	200-300	300-400

Typical Characteristics

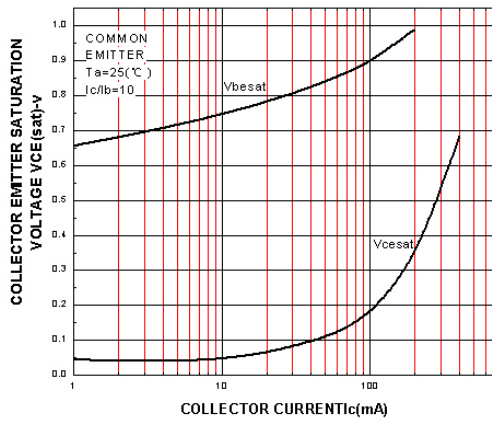
Ic-Vce



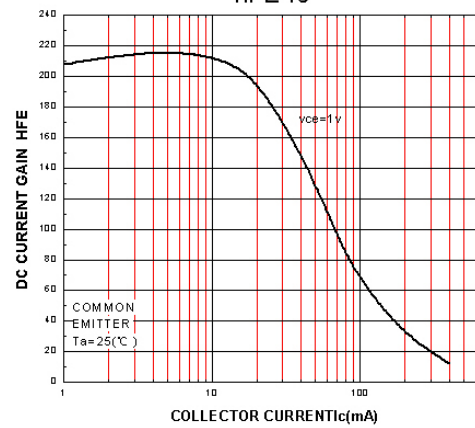
Vce-Ic



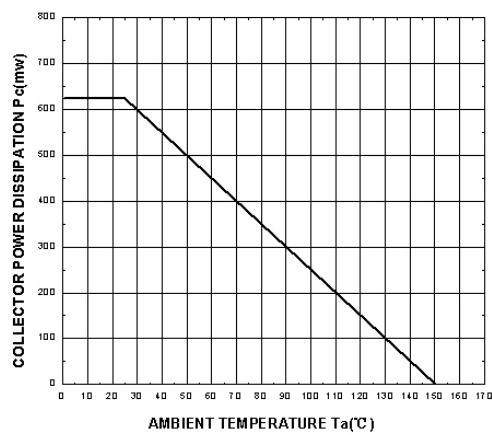
Vcesat-Ic
Vbesat-Ic



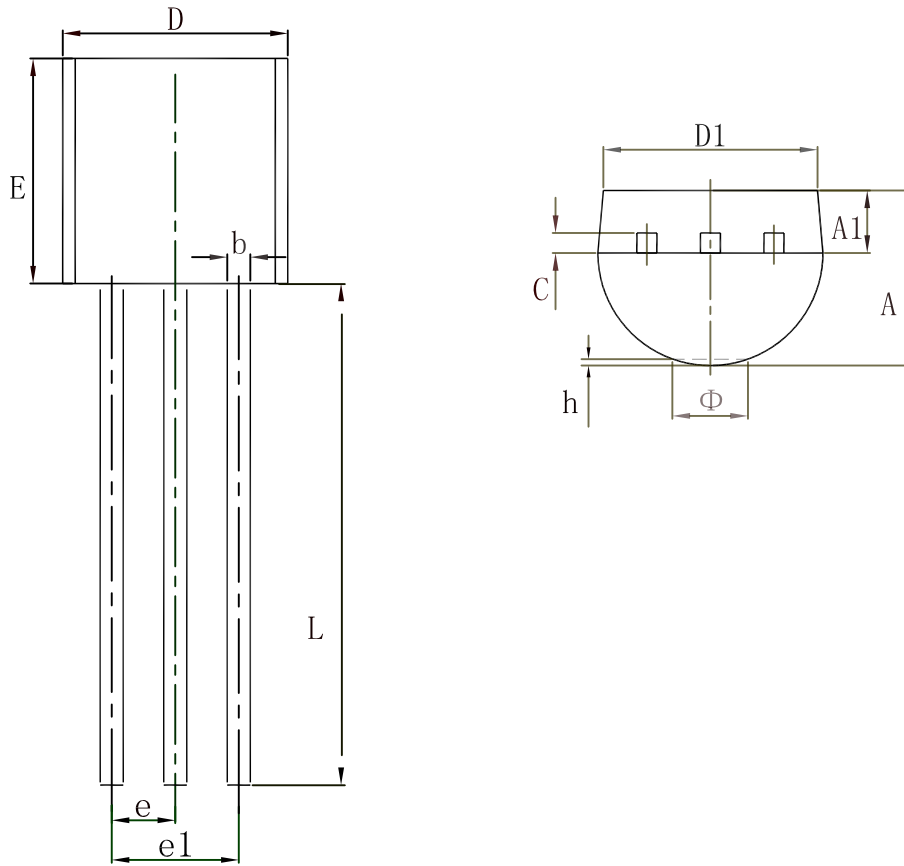
hFE-Ic



Pc-Ta

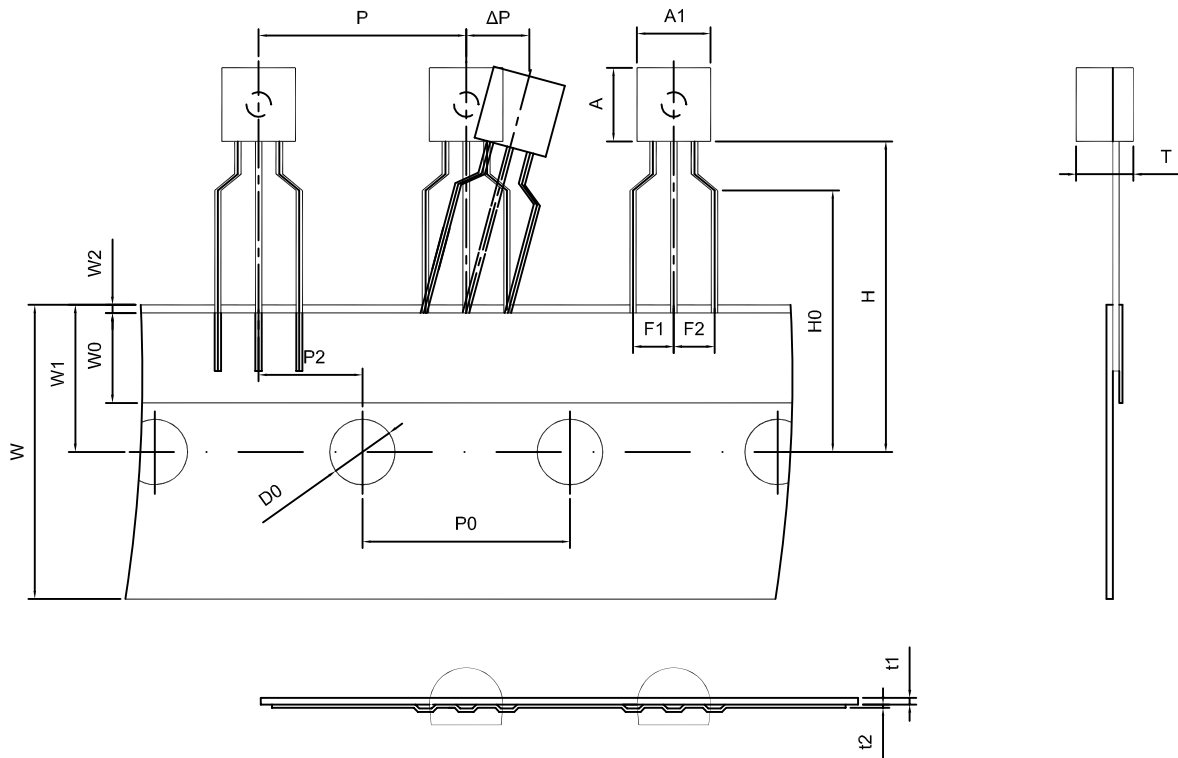


TO-92 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.300	4.700	0.169	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

TO-92 Package Taping Dimension



Dimensions are in millimeter

A1	A	T	P	P0	P2	F1	F2	W
4.5±0.2	4.5±0.2	3.5±0.2	12.7±0.3	12.7±0.2	6.35±0.3	2.5±0.3	2.5±0.3	18.0+1.0/-0.5
W0	W1	W2	H	H0	D0	t1	t2	ΔP
6.0±0.5	9.0±0.5	1.0 MAX.	19.0±1.0	16.0±0.5	4.0±0.5	0.4±0.05	0.2±0.05	0 ± 1.0

