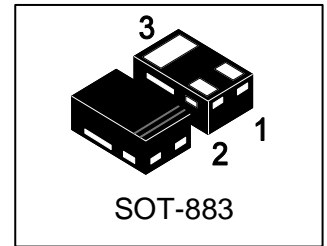


General Purpose Transistors NPN Silicon

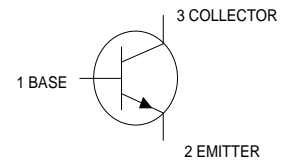
**1. FEATURES**

- We declare that the material of product compliance with RoHS requirements and Halogen Free.



**2. DEVICE MARKING AND ORDERING INFORMATION**

Device	Marking	Shipping
2N3904LP	1A	10000/Tape&Reel



**3. MAXIMUM RATINGS(Ta = 25°C)**

Parameter	Symbol	Limits	Unit
Collector–Emitter Voltage	VCEO	40	Vdc
Collector–Base Voltage	VCBO	60	Vdc
Emitter–Base Voltage	VEBO	6	Vdc
Collector Current — Continuous	IC	200	mAdc

**4. THERMAL CHARACTERISTICS**

Parameter	Symbol	Limits	Unit
Total Device Dissipation, FR–5 Board (Note 1) @ TA = 25°C Derate above 25°C	PD	250 2	mW mW/°C
Thermal Resistance, Junction–to–Ambient(Note 1)	RθJA	500	°C/W
Junction and Storage temperature	TJ,Tstg	–55–+150	°C

1. FR–5 = 1.0× 0.75× 0.062 in.

## 5. ELECTRICAL CHARACTERISTICS (Ta= 25°C)

### OFF CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (IC = 1.0 mA <sub>dc</sub> , IB = 0)	VBR(CEO)	40	-	-	V
Collector–Base Breakdown Voltage (IC = 10 μA <sub>dc</sub> , IE = 0)	VBR(CBO)	60	-	-	V
Emitter–Base Breakdown Voltage (IE = 10 μA <sub>dc</sub> , IC = 0)	VBR(EBO)	6	-	-	V
Collector Cutoff Current ( VCE = 30 Vdc, VEB = 3.0Vdc)	ICEX	-	-	50	nA
Base Cutoff Current (VCE = 30 Vdc, VEB = 3.0Vdc)	IBL	-	-	50	nA

### ON CHARACTERISTICS (Note 2.)

DC Current Gain (IC = 0.1 mA <sub>dc</sub> , VCE = 10 Vdc)	HFE	40	-	-	
(IC = 1.0 mA <sub>dc</sub> , VCE = 1.0 Vdc)		70	-	-	
(IC = 10 mA <sub>dc</sub> , VCE = 1.0 Vdc)		100	-	300	
(IC = 50 mA <sub>dc</sub> , VCE = 1.0 Vdc)		60	-	-	
(IC = 100 mA <sub>dc</sub> , VCE = 1.0 Vdc)		30	-	-	
Collector–Emitter Saturation Voltage (IC = 10 mA <sub>dc</sub> , IB = 1.0 mA <sub>dc</sub> )	VCE(sat)	-	-	0.2	V
(IC = 50 mA <sub>dc</sub> , IB = 5.0 mA <sub>dc</sub> )		-	-	0.3	
Base–Emitter Saturation Voltage (IC = 10 mA <sub>dc</sub> , IB = 1.0 mA <sub>dc</sub> )	VBE(sat)	0.65	-	0.85	V
(IC = 50 mA <sub>dc</sub> , IB = 5.0 mA <sub>dc</sub> )		-	-	0.95	

### SMALL–SIGNAL CHARACTERISTICS

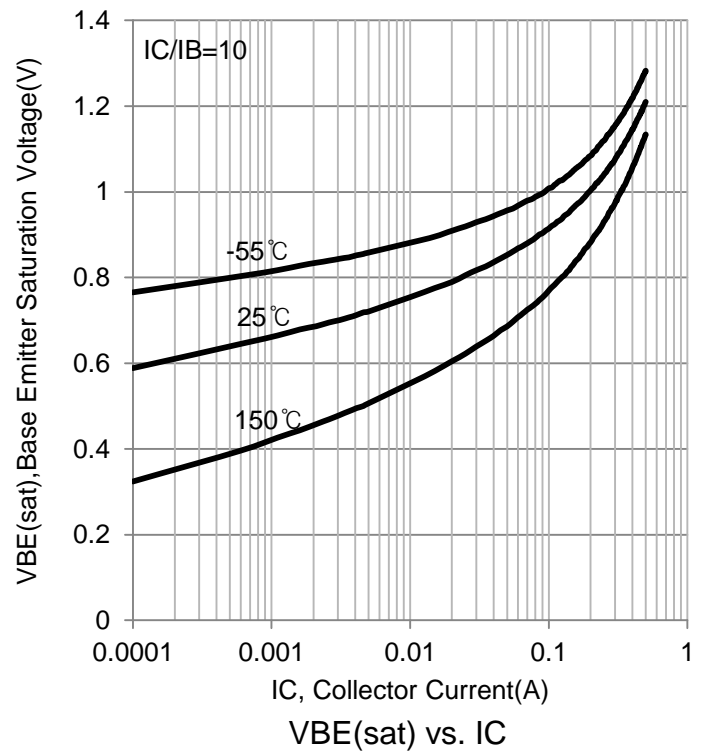
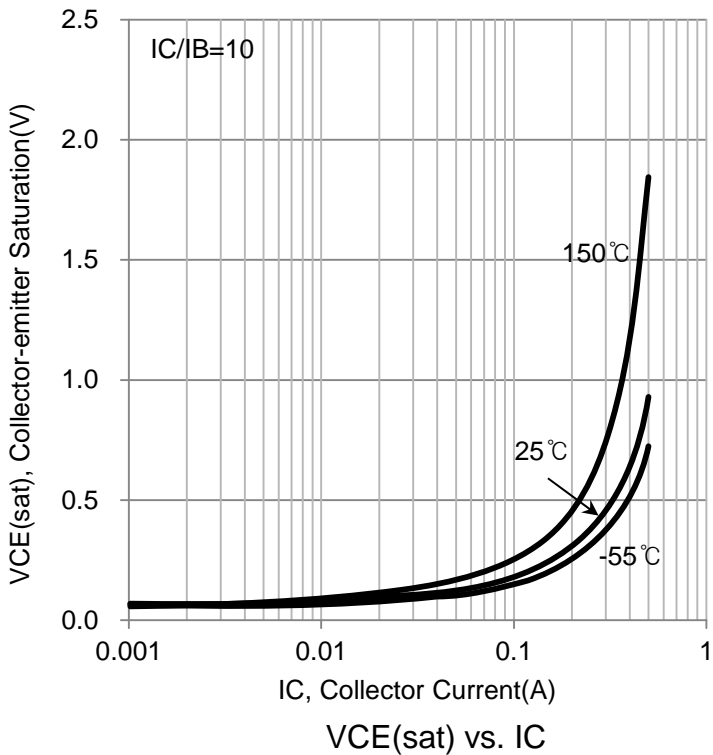
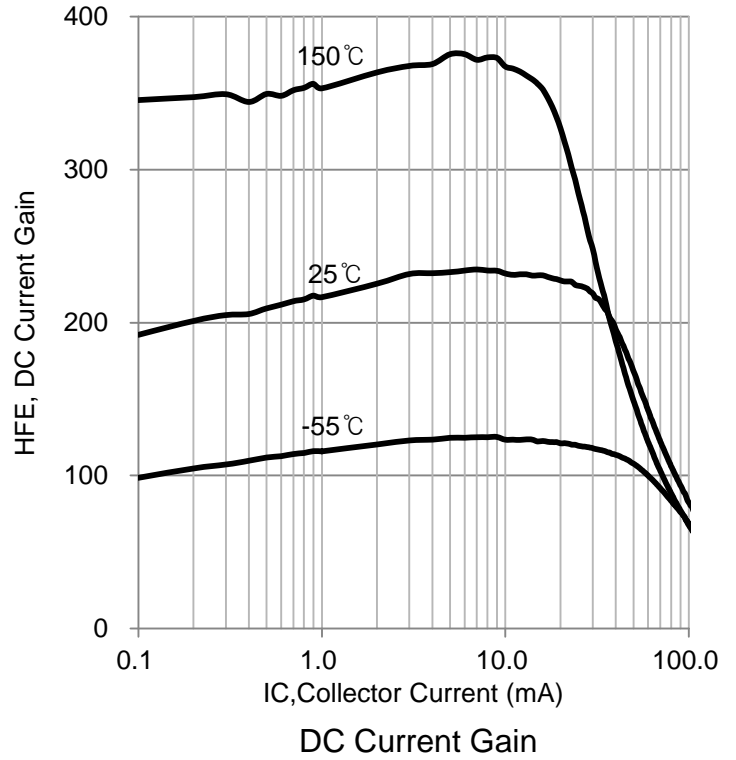
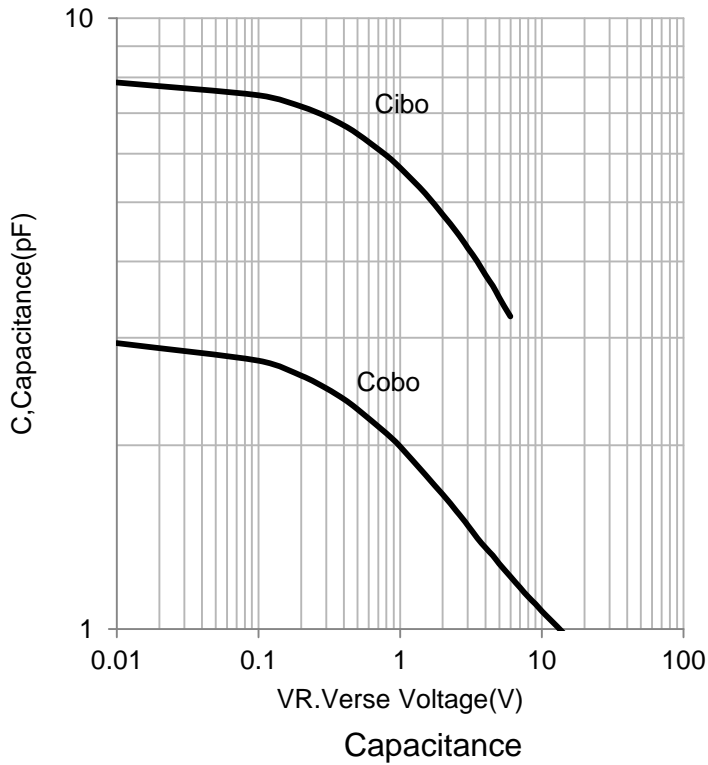
Current–Gain — Bandwidth Product (IC = 10mA <sub>dc</sub> , VCE= 20Vdc, f = 100MHz)	fT	300	-	-	MHz
Output Capacitance (VCB = 5.0 Vdc, IE = 0, f = 1.0 MHz)	Cobo	-	-	4	pF
Input Capacitance (VEB = 0.5 Vdc, IC = 0, f = 1.0 MHz)	Cibo	-	-	8	pF

### SWITCHING CHARACTERISTICS

Delay Time	(VCC = 3.0 Vdc, VBE=-0.5Vdc, IC = 10mA <sub>dc</sub> , IB1 = 1.0 mA <sub>dc</sub> )	td	-	-	35	ns
Rise Time		tr	-	-	35	
Storage Time	(VCC = 3.0 Vdc, IC = 10 mA <sub>dc</sub> , IB1 = IB2 = 1.0 mA <sub>dc</sub> )	ts	-	-	200	
Fall Time		tf	-	-	50	

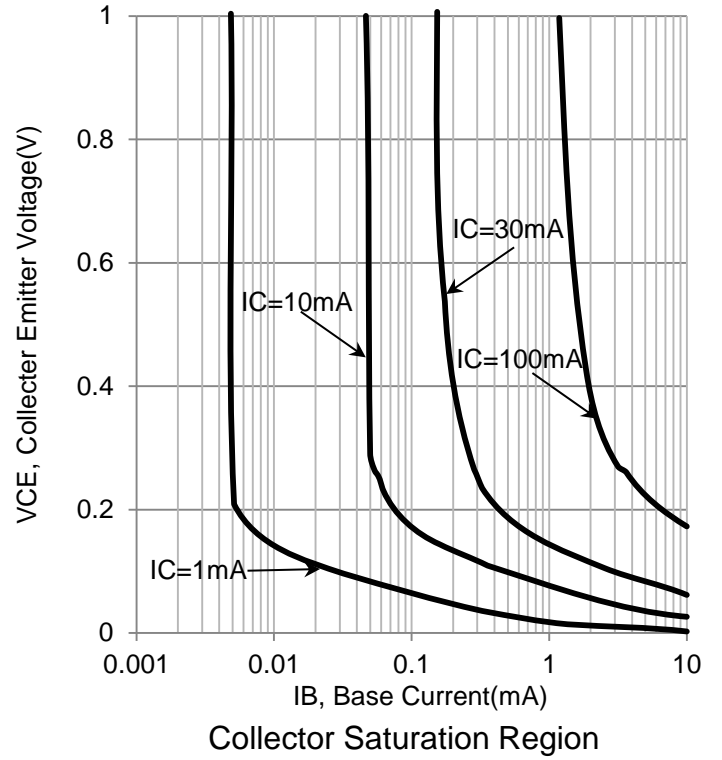
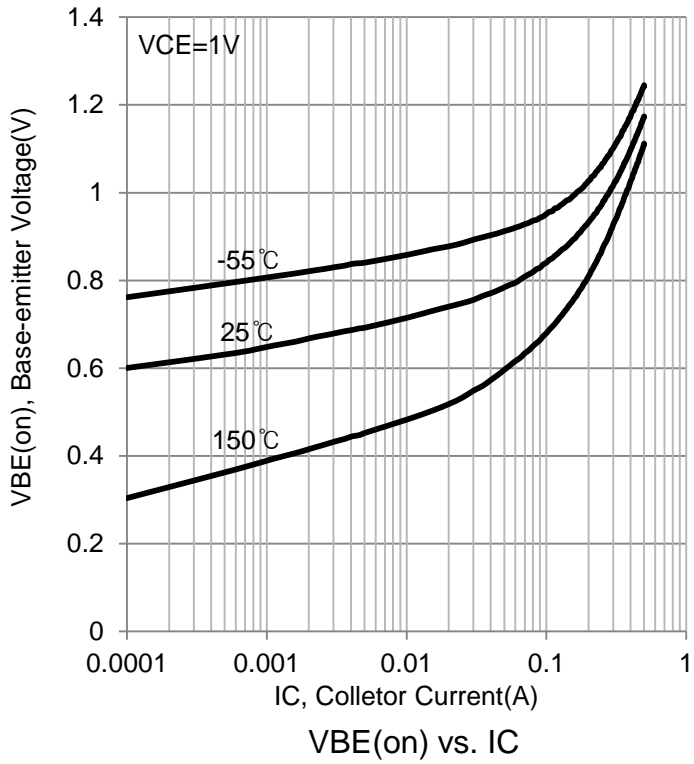
2.Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

## 6. ELECTRICAL CHARACTERISTICS CURVES

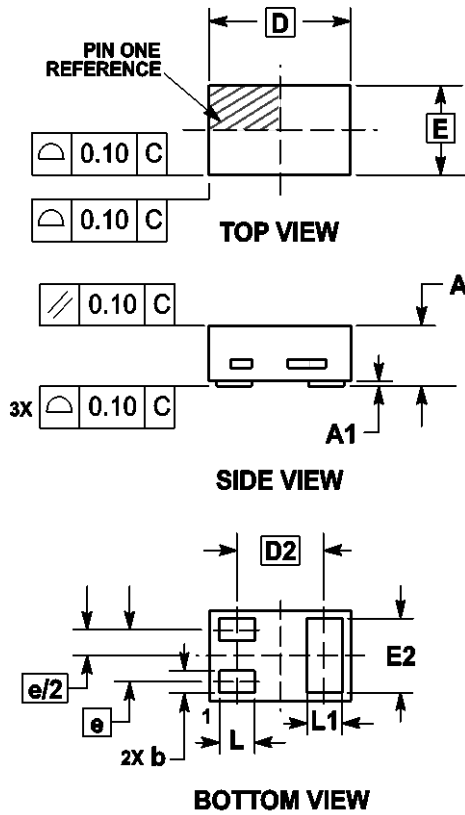




# 2N3904LP



## 7. OUTLINE AND DIMENSIONS

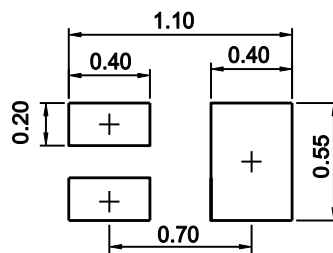


Notes:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.43	0.48	0.53	0.017	0.019	0.021
A1	0.00	---	0.05	0.000	---	0.002
b	0.10	0.15	0.2	0.004	0.006	0.008
D	0.95	1	1.05	0.037	0.039	0.041
D2	0.64REF			0.025REF		
e	0.34REF			0.013REF		
E	0.50	0.6	0.65	0.020	0.024	0.026
E2	0.44	0.49	0.54	0.017	0.019	0.021
L	0.19	0.24	0.29	0.007	0.009	0.011
L1	0.22	0.27	0.32	0.009	0.011	0.013

## 8. SOLDERING FOOTPRINT



**DIMENSIONS: MILLIMETERS**