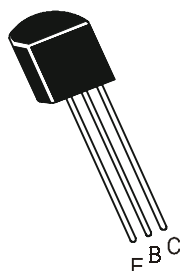


## NPN SILICON PLANAR SWITCHING TRANSISTORS

**2N3903**  
**2N3904**  
**TO92**  
**CBE**



### General Purpose Switching and Amplifier Applications

#### ABSOLUTE MAXIMUM RATINGS(Ta=25 deg C unless otherwise specified)

DESCRIPTION	SYMBOL	VALUE	UNITS
Collector -Emitter Voltage	VCEO	40	V
Collector -Base Voltage	VCBO	60	V
Emitter -Base Voltage	VEBO	6.0	V
Collector Current Continuous	IC	200	mA
Power Dissipation@ Ta=25 degC	PD	625	mW
Derate Above 25 deg C		5.0	mW/deg C
Power Dissipation@ Tc=25 degC	PD	1.5	W
Derate Above 25 deg C		12	mW/deg C
Operating And Storage Junction Temperature Range	Tj, Tstg	-55 to +150	deg C

#### THERMAL RESISTANCE

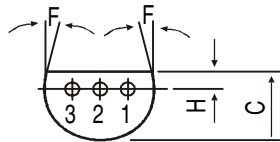
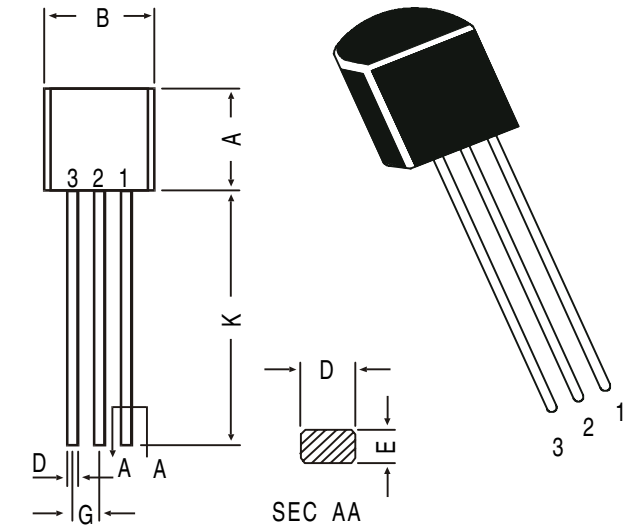
Junction to Case	Rth(j-c)	83.3	deg C/W
Junction to Ambient	Rth(j-a)	200	deg C/W

#### ELECTRICAL CHARACTERISTICS (Ta=25 deg C Unless Otherwise Specified)

DESCRIPTION	SYMBOL	TEST CONDITION	2N3903	2N3904	UNITS
Collector -Emitter Voltage	VCEO	IC=1mA, IB=0	>40	>40	V
Collector -Base Voltage	VCBO	IC=10uA, IE=0	>60	>60	V
Emitter-Base Voltage	VEBO	IE=10uA, IC=0	>6.0	>6.0	V
Collector-Cut off Current	ICEX	VCE=30V, VEB=3V	<50	<50	nA
Base-Cut off Current	IBL	VCE=30V, VEB=3V	<50	<50	nA
DC Current Gain	hFE*	IC=0.1mA, VCE=1V	>20	>40	
		IC=1mA, VCE=1V	>35	>70	
		IC=10mA, VCE=1V	50-150	100-300	
		IC=50mA, VCE=1V	>30	>60	
		IC=100mA, VCE=1V	>15	>30	
Collector Emitter Saturation Voltage	VCE(Sat)*	IC=10mA, IB=1mA	<0.20	<0.20	V
		IC=50mA, IB=5mA	<0.30	<0.30	V
Base Emitter Saturation Voltage	VBE(Sat) *	IC=10mA, IB=1mA	0.65-0.85	0.65-0.85	V
		IC=50mA, IB=5mA	<0.95	<0.95	V

ELECTRICAL CHARACTERISTICS (Ta=25 deg C Unless Otherwise Specified)			2N3903/2N3904		
DESCRIPTION	SYMBOL	TEST CONDITION	2N3903	2N3904	UNITS
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Transistors Frequency	ft	IC=10mA, VCE=20V f=100MHz	>250	>300	MHz
Out-Put Capacitance	Cob	VCB=5V, IE=0 f=1MHz	<4.0	<4.0	pF
Input Capacitance	Cib	VBE=0.5V, IC=0 f=1MHz	<8.0	<8.0	pF
Small Signal Current Gain	hfe	ALL f=1kHz IC=1mA, VCE=10V	50-200	100-400	
Input Impedance	hie	IC=1mA, VCE=10V	1.0-8.0	1.0-10	khoms
Out put Adimttance	hoe	IC=1mA, VCE=10V	1.0-40	1.0-40	umhos
Voltage Feedback Ratio	hre	IC=1mA, VCE=10V	0.1-5.0	0.5-8.0	x10-4
Noise Figure	NF	IC=100uA, VCE=5V Rs=1kohm, f=1kHz	<6.0	<5.0	dB
<b>SWITCHING Time</b>					
Delay time	td	VCC=3V, VBE=0.5V	<35	<35	ns
Rise time	tr	IC=10mA, IB1=1mA	<35	<35	ns
Storage time	ts	VCC=3V, IC=10mA	<175	<200	ns
Fall time	tf	IB1=1B2=1mA	<50	<50	ns
<b>*Pulse Condition: =300us, Duty Cycle=2%</b>					

## TO-92 Plastic Package

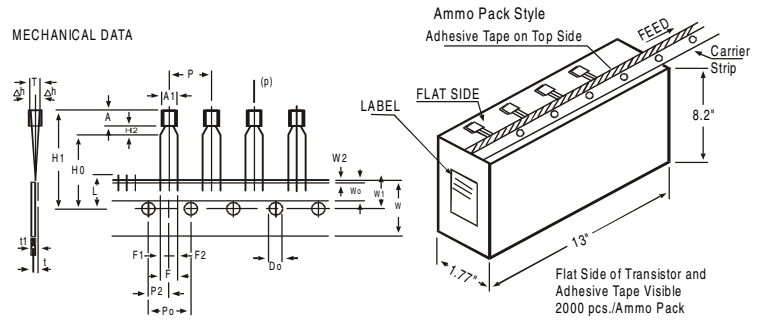


PIN CONFIGURATION  
1. COLLECTOR  
2. BASE  
3. EMITTER

All dimensions in mm.

DIM	MIN.	MAX.
A	4.32	5.33
B	4.45	5.20
C	3.18	4.19
D	0.41	0.55
E	0.35	0.50
F	5 DEG	
G	1.14	1.40
H	1.14	1.53
K	12.70	—

## TO-92 Transistors on Tape and Ammo Pack



All dimensions in mm unless specified otherwise

ITEM	SYMBOL	SPECIFICATION				REMARKS
		MIN.	NOM.	MAX.	TOL.	
BODY WIDTH	A1	4.0		4.8		CUMULATIVE PITCH ERROR 1.0 mm/20 PITCH
BODY HEIGHT	A	4.8		5.2		
BODY THICKNESS	T	3.9		4.2		
PITCH OF COMPONENT	P		12.7		±1	
FEED HOLE PITCH	Po		12.7		±0.3	TO BE MEASURED AT BOTTOM OF CLINCH
FEED HOLE CENTRE TO COMPONENT CENTRE	P2		6.35		±0.4	
DISTANCE BETWEEN OUTER LEADS	F		5.08		+0.6 -0.2	AT TOP OF BODY
COMPONENT ALIGNMENT	Δh		0	1		
TAPE WIDTH	W		18		±0.5	
HOLD-DOWN TAPE WIDTH	W0		6		±0.2	
HOLE POSITION	W1		9		+0.7 -0.5	t1 0.3 - 0.6
HOLD-DOWN TAPE POSITION	W2		0.5		±0.2	
LEAD WIRE CLINCH HEIGHT	H0		16		±0.5	
COMPONENT HEIGHT	H1		23.25			
LENGTH OF SNIPPED LEADS	L		11.0			
FEED HOLE DIAMETER	Do		4		±0.2	
TOTAL TAPE THICKNESS	t		1.2			
LEAD - TO - LEAD DISTANCE F1,	F2		2.54		+0.4 -0.1	
CLINCH HEIGHT	H2			3		
PULL - OUT FORCE	(P)	6N				

### NOTES

1. MAXIMUM ALIGNMENT DEVIATION BETWEEN LEADS NOT TO BE GREATER THAN 0.2 mm.
2. MAXIMUM NON-CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1 mm IN 20 PITCHES.
3. HOLDDOWN TAPE NOT TO EXCEED BEYOND THE EDGE(S) OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
4. NO MORE THAN 3 CONSECUTIVE MISSING COMPONENTS ARE PERMITTED.
5. A TAPE TRAILER, HAVING AT LEAST THREE FEED HOLES ARE REQUIRED AFTER THE LAST COMPONENT.
6. SPLICES SHALL NOT INTERFERE WITH THE SPROCKET FEED HOLES.

## Packing Detail

PACKAGE	STANDARD PACK		INNER CARTON BOX		OUTER CARTON BOX		
	Details	Net Weight/Qty	Size	Qty	Size	Qty	Gr Wt
TO-92 Bulk	1K/polybag	200 gm/1K pcs	3" x 7.5" x 7.5"	5.0K	17" x 15" x 13.5"	80.0K	23 kgs
TO-92 T&A	2K/ammo box	645 gm/2K pcs	12.5" x 8" x 1.8"	2.0K	17" x 15" x 13.5"	32.0K	12.5 kgs

## Notes

### Disclaimer

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