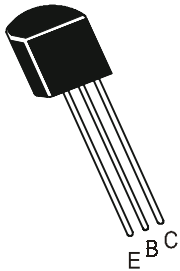


NPN SILICON PLANAR SWITCHING TRANSISTORS

**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 |

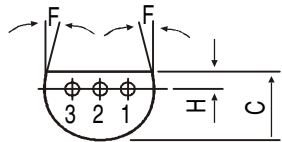
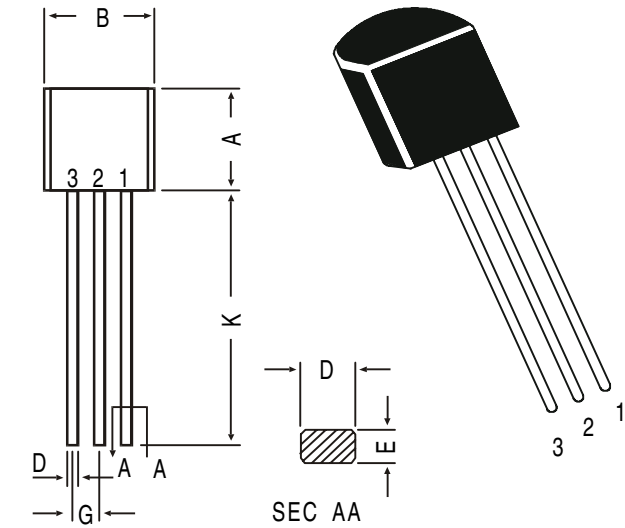
ELECTRICAL CHARACTERISTICS (Ta=25 deg C Unless Otherwise Specified)**2N3903/2N3904**

| DESCRIPTION | SYMBOL | TEST CONDITION | 2N3903 | 2N3904 | UNITS |
|-------------------------------------|--------|--------------------------------------|---------|---------|-------|
| SMALL SIGNAL CHARACTERISTICS | | | | | |
| 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 |
| SWITCHING Time | | | | | |
| 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 |

*Pulse Condition: =300us, Duty Cycle=2%

TO-92 Plastic Package

TO-92 Transistors on Tape and Ammo Pack



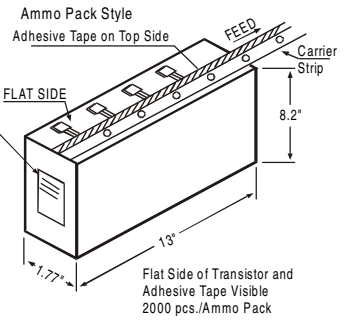
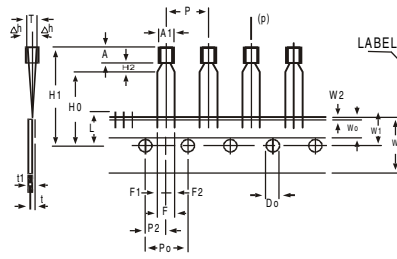
PIN CONFIGURATION
 1. COLLECTOR
 2. BASE
 3. EMITTER

SEC AA

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 | — |

MECHANICAL DATA



All dimensions in mm unless specified otherwise

| ITEM | SYMBOL | SPECIFICATION | | | | REMARKS |
|---|--------|---------------|------|-------|--------------|----------------|
| | | MIN. | NOM. | MAX. | TOL. | |
| BODY WIDTH | A1 | 4.0 | | 4.8 | | |
| 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 | |
| FEED HOLE CENTRE TO COMPONENT CENTRE | P2 | | 6.35 | | ±0.4 | |
| DISTANCE BETWEEN OUTER LEADS | F | 5.08 | | | +0.6 -0.2 | |
| COMPONENT ALIGNMENT | Δh | 0 | | 1 | | AT TOP OF BODY |
| TAPE WIDTH | W | 18 | | | ±0.5 | |
| HOLD-DOWN TAPE WIDTH | W0 | 6 | | | ±0.2 | |
| HOLE POSITION | W1 | 9 | | | +0.7 -0.5 | |
| 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 | | ±0.3 - 0.6 |
| 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

The product information and the selection guides facilitate selection of the CDIL's Discrete Semiconductor Device(s) best suited for application in your product(s) as per your requirement. It is recommended that you completely review our Data Sheet(s) so as to confirm that the Device(s) meet functionality parameters for your application. The information furnished on the CDIL Web Site/CD is believed to be accurate and reliable. CDIL however, does not assume responsibility for inaccuracies or incomplete information. Furthermore, CDIL does not assume liability whatsoever, arising out of the application or use of any CDIL product; neither does it convey any license under its patent rights nor rights of others. These products are not designed for use in life saving/support appliances or systems. CDIL customers selling these products (either as individual Discrete Semiconductor Devices or incorporated in their end products), in any life saving/support appliances or systems or applications do so at their own risk and CDIL will not be responsible for any damages resulting from such sale(s).

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