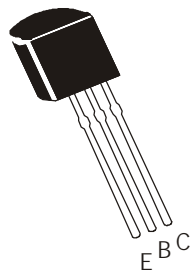


## NPN SILICON PLANAR TRANSISTOR

CD9013



TO-92  
Plastic Package

### General Purpose Audio Amplifier Applications

#### ABSOLUTE MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ Unless Otherwise Specified)

| DESCRIPTION                                      | SYMBOL         | VALUE       | UNITS            |
|--|----------------|-------------|------------------|
| Collector Emitter Voltage                        | $V_{CEO}$      | 30          | V                |
| Collector Base Voltage                           | $V_{CBO}$      | 40          | V                |
| Emitter Base Voltage                             | $V_{EBO}$      | 5           | V                |
| Collector Current Continuous                     | $I_C$          | 500         | mA               |
| Collector Power Dissipation                      | $P_C$          | 625         | mW               |
| Operating And Storage Junction Temperature Range | $T_j, T_{stg}$ | -55 to +150 | $^\circ\text{C}$ |

#### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ\text{C}$ Unless Otherwise Specified)

| DESCRIPTION                          | SYMBOL        | TEST CONDITION                       | MIN | MAX | UNITS |
|--------------------------------------|---------------|--------------------------------------|-----|-----|-------|
| Collector Emitter Voltage            | $V_{CEO}$     | $I_C=1\text{mA}, I_B=0$              | 30  |     | V     |
| Collector Base Voltage               | $V_{CBO}$     | $I_C=100\mu\text{A}, I_E=0$          | 40  |     | V     |
| Emitter Base Voltage                 | $V_{EBO}$     | $I_E=100\mu\text{A}, I_C=0$          | 5   |     | V     |
| Collector Cut off Current            | $I_{CBO}$     | $V_{CB}=25\text{V}, I_E=0$           |     | 100 | nA    |
| Emitter Cut off Current              | $I_{EBO}$     | $V_{BE}=3\text{V}, I_C=0$            |     | 100 | nA    |
| DC Current Gain                      | $*h_{FE}$     | $V_{CE}=1\text{V}, I_C=50\text{mA}$  | 64  | 465 |       |
|                                      | $h_{FE}$      | $V_{CE}=1\text{V}, I_C=500\text{mA}$ | 40  |     |       |
| Collector Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=150\text{mA}, I_B=15\text{mA}$  |     | 0.2 | V     |
|                                      |               | $I_C=500\text{mA}, I_B=50\text{mA}$  |     | 0.6 | V     |
| Base Emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C=150\text{mA}, I_B=15\text{mA}$  |     | 1.0 | V     |
|                                      |               | $I_C=500\text{mA}, I_B=50\text{mA}$  |     | 1.2 | V     |

#### DYNAMIC CHARACTERISTICS

|                      |          |   |     |     |     |
|----------------------|----------|---|-----|-----|-----|
| Output Capacitance   | $C_{ob}$ | $V_{CB}=10\text{V}, f=1\text{MHz}$                    |     | 10  | pF  |
| Transition Frequency | $f_T$    | $I_C=50\text{mA}, V_{CE}=10\text{V}, f=100\text{MHz}$ | 200 |     | MHz |
| Noise Figure         | NF       | $V_{CE}=10\text{V}, I_C=1\text{mA}, f=1\text{KHz}$    |     | 6.0 | dB  |

$*h_{FE}$  CLASSIFICATION

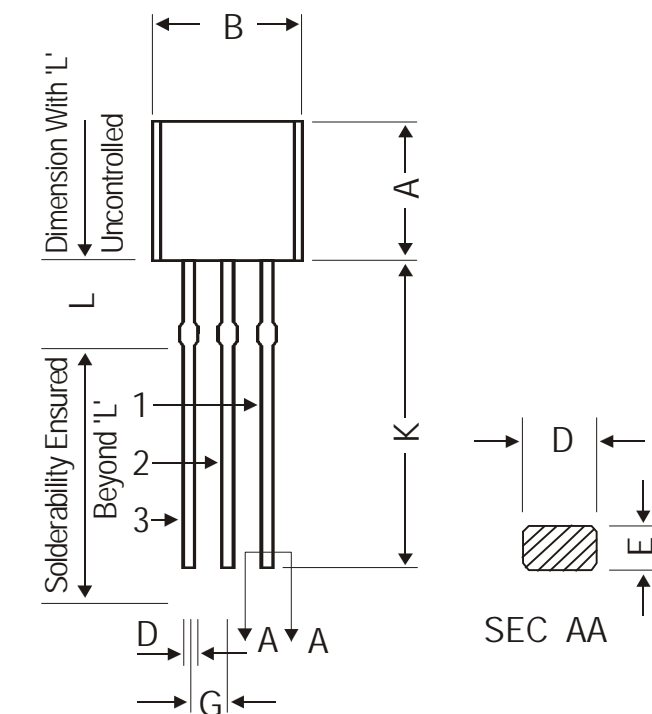
D/E/F:64 - 135

G/H/I: 118 - 305

J: 278 - 465

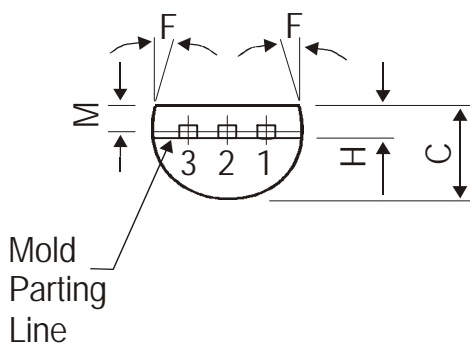
# TO-92 Plastic Package

## TO-92 Plastic Package



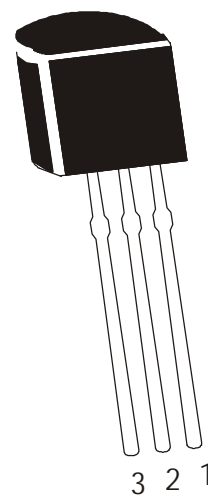
| DIM | MIN.  | MAX.  |
|-----|-------|-------|
| A   | 4.32  | 5.33  |
| B   | 4.45  | 5.20  |
| C   | 3.18  | 4.19  |
| D   | 0.41  | 0.55  |
| E   | 0.35  | 0.50  |
| F   | 5 DEG |       |
| G   | 1.14  | 1.40  |
| H   | 1.20  | 1.40  |
| K   | 12.70 | —     |
| L   | 1.982 | 2.082 |
| M   | 1.03  | 1.20  |

All dimensions are in mm



### PIN CONFIGURATION

1. COLLECTOR
2. BASE
3. EMITTER



The TO-92 Package, Tape and Ammo Pack Drawings are correct as on the date of issue/revision of this Data Sheet.

The currently valid dimensions and information, may please be confirmed from the TO-92 Drawing in the Packages and Packing Section of the Product Catalogue.

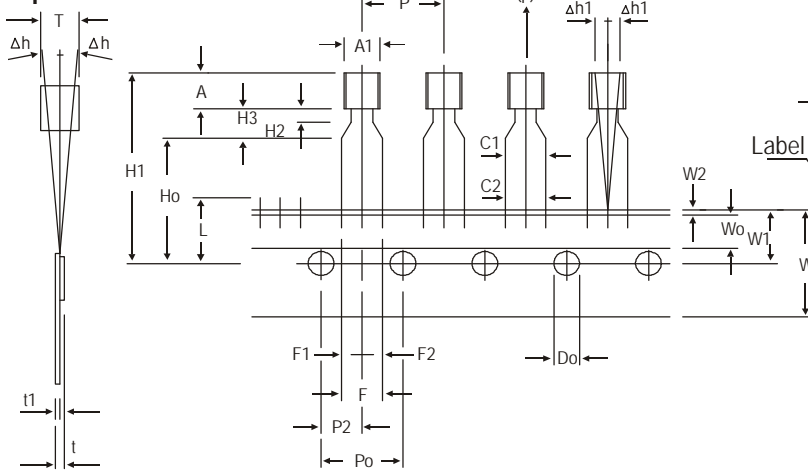
### Packing Details

| 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"  | 5K  | 17" x 15" x 13.5" | 80K | 23 kgs   |
| TO-92 T&A  | 2K/ammo box   | 645 gm/2K pcs  | 12.5" x 8" x 1.8" | 2K  | 17" x 15" x 13.5" | 32K | 12.5 kgs |

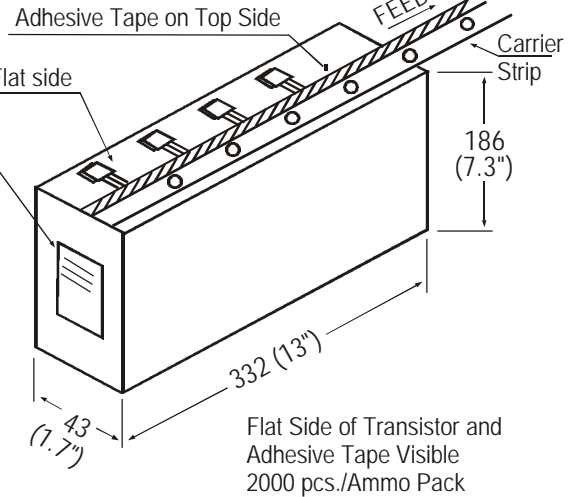
# TO-92 Plastic Package

## TO-92 Tape and Ammo Pack

### Tape Mechanical Data



### Ammo Pack Style



All dimensions are in mm

| ITEM                                    | SYMBOL  | SPECIFICATION |      |       |                |
|---|---------|---------------|------|-------|----------------|
|   |         | 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 |       | ± 1.0          |
| *1 FEED HOLE PITCH                      | Po      |               | 12.7 |       | ± 0.3          |
| *2 FEED HOLE CENTRE TO COMPONENT CENTRE | P2      |               | 6.35 |       | ± 0.4          |
| DISTANCE BETWEEN OUTER LEADS            | F       |               | 5.08 |       | + 0.6<br>- 0.2 |
| *3 COMPONENT ALIGNMENT SIDE VIEW        | Δh      |               | 0    | 1.0   |                |
| *4 COMPONENT ALIGNMENT FRONT VIEW       | Δh1     |               | 0    | 1.3   |                |
| TAPE WIDTH                              | W       |               | 18   |       | ± 0.5          |
| HOLD-DOWN TAPE WIDTH                    | Wo      |               | 6    |       | ± 0.2          |
| HOLE POSITION                           | W1      |               | 9    |       | + 0.7<br>- 0.5 |
| HOLD-DOWN TAPE POSITION                 | W2      |               | 0.5  |       | ± 0.2          |
| LEAD WIRE CLINCH HEIGHT                 | Ho      |               | 16   |       | ± 0.5          |
| COMPONENT HEIGHT                        | H1      |               |      | 23.25 |                |
| LENGTH OF SNIPPED LEADS                 | L       |               |      | 11.0  |                |
| FEED HOLE DIAMETER                      | Do      |               | 4    |       | ± 0.2          |
| *5 TOTAL TAPE THICKNESS                 | t       |               |      | 1.2   |                |
| LEAD - TO - LEAD DISTANCE               | F1, F2  |               | 2.54 |       | + 0.4<br>- 0.1 |
| STAND OFF                               | H2      | 0.45          |      | 1.45  |                |
| CLINCH HEIGHT                           | H3      |               |      | 3.0   |                |
| LEAD PARALLELISM                        | C1 - C2 |               |      | 0.22  |                |
| PULL - OUT FORCE                        | (p)     | 6N            |      |       |                |

### NOTES

1. Maximum alignment deviation between leads will not to be greater than 0.2mm.
2. Maximum non-cumulative variation between tape feed holes shall not exceed 1 mm in 20 pitches.
3. Holddown tape will not exceed beyond the edge(s) of carrier tape and there shall be no exposure of adhesive.
4. There will be no more than three (3) consecutive missing components in a tape.
5. A tape trailer, having at least three feed holes are provided after the last component in a tape.
6. Splices should not interfere with the sprocket feed holes.

### REMARKS

- \*1 Cumulative pitch error 1.0 mm/20 pitch  
 \*2 To be measured at bottom of clinch  
 \*3 At top of body  
 \*4 At top of body  
 \*5 t1 0.3 – 0.6 mm

### Disclaimer

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