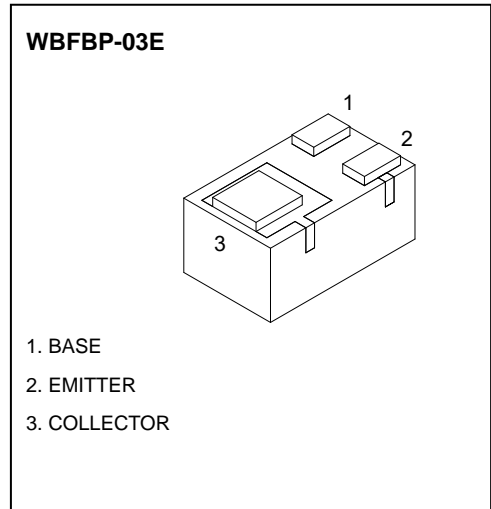




# WBFBP-03E Plastic-Encapsulate Transistors

## TK3904LED03 (NPN)



### DESCRIPTION

- NPN single switching transistor ultra small SMD plastic package

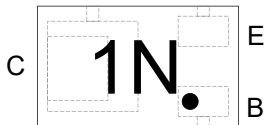
### FEATURE

- Complementary to TK3906LED03
- Single General-Purpose Switching Transistor

### APPLICATION

- General-Purpose Switching and Amplification

### MARKING: 1N



### TOP VIEW

### MAXIMUM RATINGS (T<sub>a</sub>=25°C unless otherwise noted)

| Symbol                            | Parameter  | Value    | Unit      |
|-----------------------------------|--|----------|-----------|
| V <sub>CBO</sub>                  | Collector-Base Voltage                           | 60       | V         |
| V <sub>CEO</sub>                  | Collector-Emitter Voltage                        | 40       | V         |
| V <sub>EBO</sub>                  | Emitter-Base Voltage                             | 6        | V         |
| I <sub>c</sub>                    | Collector Current -Continuous                    | 200      | mA        |
| P <sub>c</sub>                    | Collector Dissipation                            | Note1    | 100 mW    |
|                                   |  | Note2    | 590 mW    |
| R <sub>θJA</sub>                  | Thermal Resistance from Junction to Ambient      | Note1    | 1250 °C/W |
|                                   |  | Note2    | 212 °C/W  |
| T <sub>J</sub> , T <sub>stg</sub> | Operation Junction and Storage Temperature Range | -55~+150 | °C        |

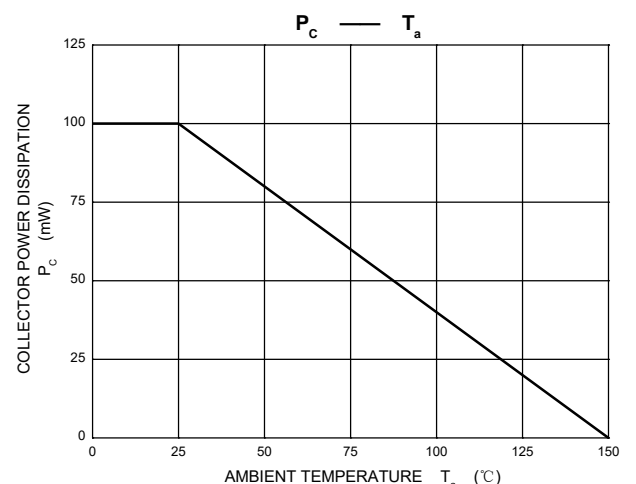
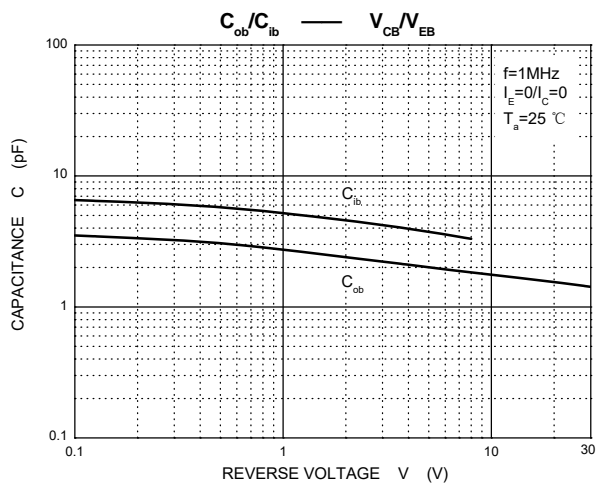
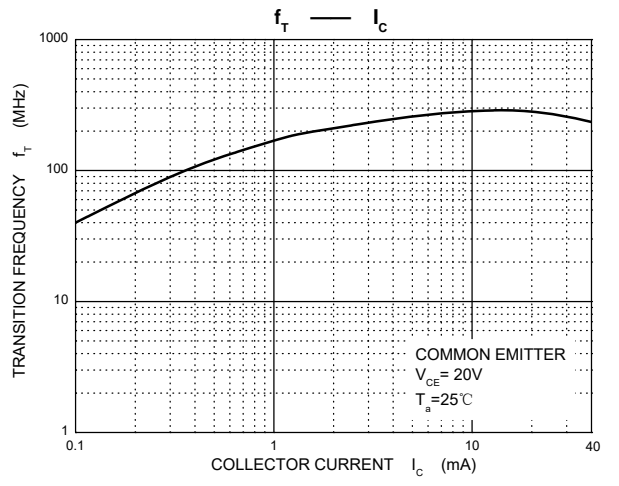
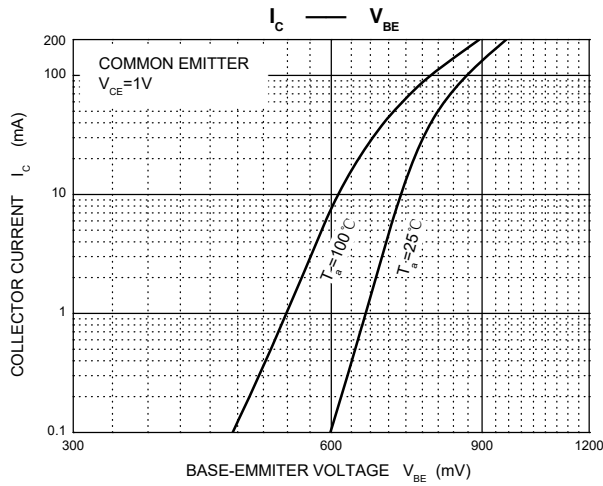
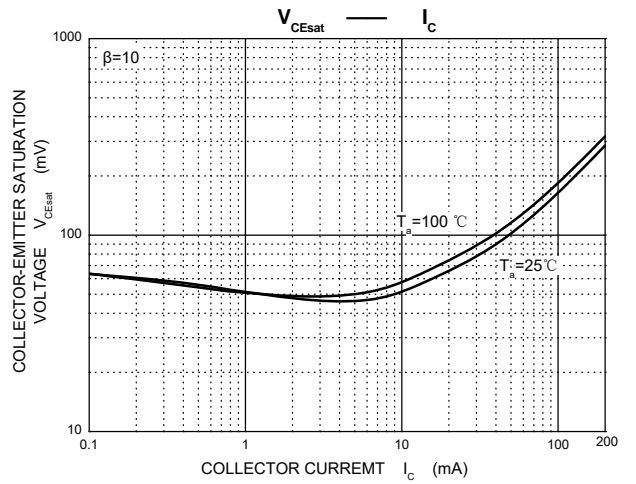
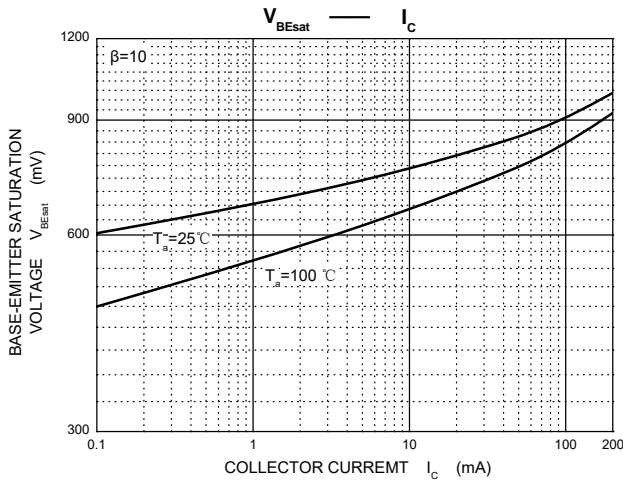
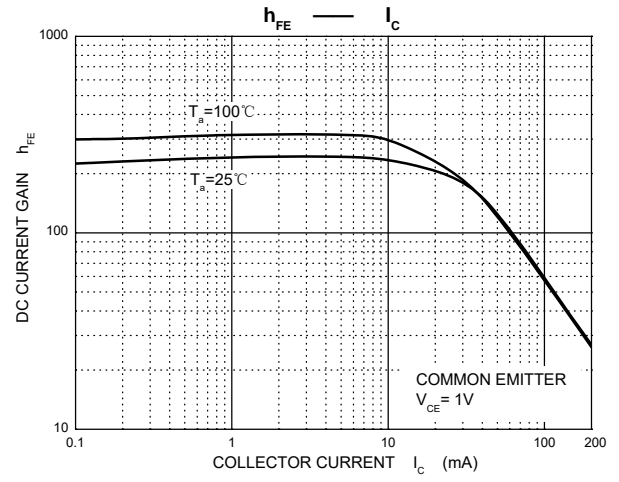
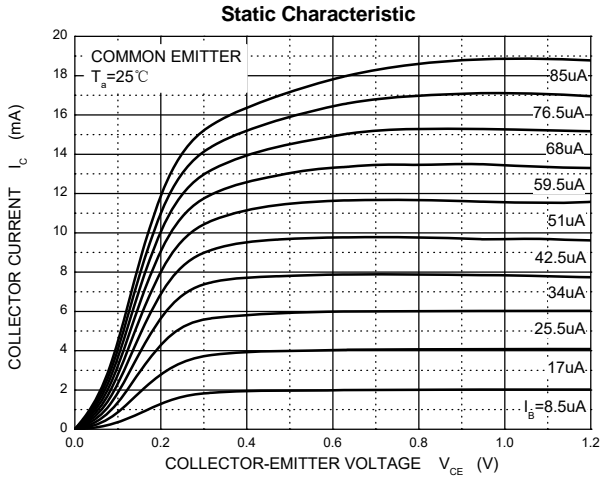
Note:1. Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

2.Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1cm<sup>2</sup>.

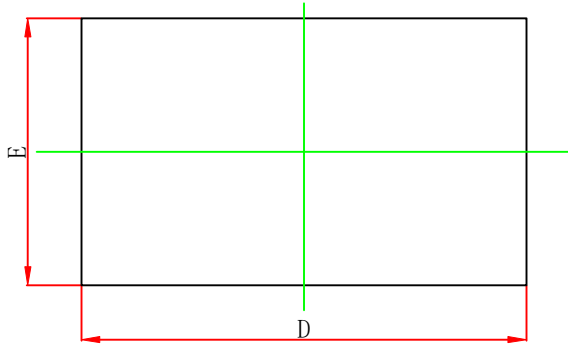
**ELECTRICAL CHARACTERISTICS (Ta=25°C unless otherwise specified)**

| Parameter                            | Symbol        | Test conditions                  | Min | Typ | Max  | Unit    |
|--------------------------------------|---------------|----------------------------------|-----|-----|------|---------|
| Collector-base breakdown voltage     | $V_{(BR)CBO}$ | $I_C=10\mu A, I_E=0$             | 60  |     |      | V       |
| Collector-emitter breakdown voltage  | $V_{(BR)CEO}$ | $I_C=1mA, I_B=0$                 | 40  |     |      | V       |
| Emitter-base breakdown voltage       | $V_{(BR)EBO}$ | $I_E=10\mu A, I_C=0$             | 6   |     |      | V       |
| Collector cut-off current            | $I_{CBO}$     | $V_{CB}=60V, I_E=0$              |     |     | 0.1  | $\mu A$ |
| Collector cut-off current            | $I_{CEX}$     | $V_{CE}=30V, V_{BE(off)}=3V$     |     |     | 50   | nA      |
| Emitter cut-off current              | $I_{EBO}$     | $V_{EB}=5V, I_C=0$               |     |     | 0.1  | $\mu A$ |
| DC current gain                      | $h_{FE}$      | $V_{CE}=1V, I_C=10mA$            | 100 |     | 300  |         |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C=50mA, I_B=5mA$              |     |     | 0.3  | V       |
| Base-emitter saturation voltage      | $V_{BE(sat)}$ | $I_C=50mA, I_B=5mA$              |     |     | 0.95 | V       |
| Transition frequency                 | $f_T$         | $V_{CE}=20V, I_C=10mA, f=100MHz$ | 300 |     |      | MHz     |
| Delay time                           | $t_d$         | $V_{CC}=3V, V_{BE(off)}=0.5V,$   |     |     | 35   | ns      |
| Rise time                            | $t_r$         | $I_C=10mA, I_{B1}=1mA$           |     |     | 35   | ns      |
| Storage time                         | $t_s$         | $V_{CC}=3V, I_C=10mA, I_{B1}=$   |     |     | 200  | ns      |
| Fall time                            | $t_f$         | $I_{B2}=1mA$                     |     |     | 50   | ns      |

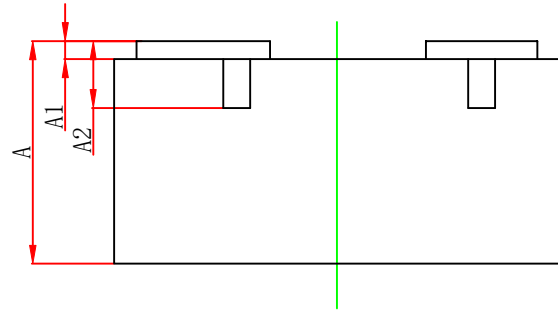
# Typical Characteristics



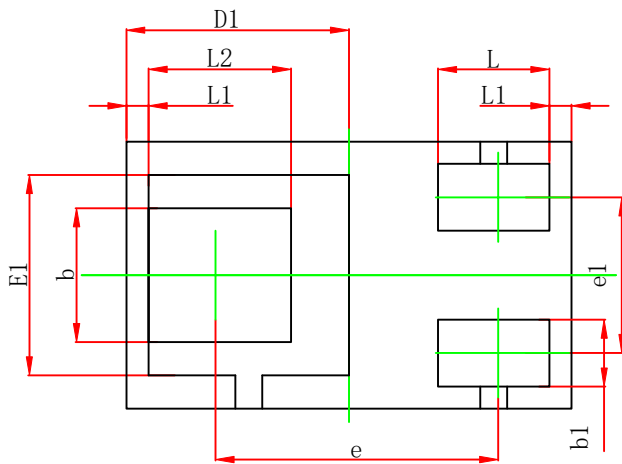
## WBFBP-03E Package Outline Dimensions



TOP VIEW



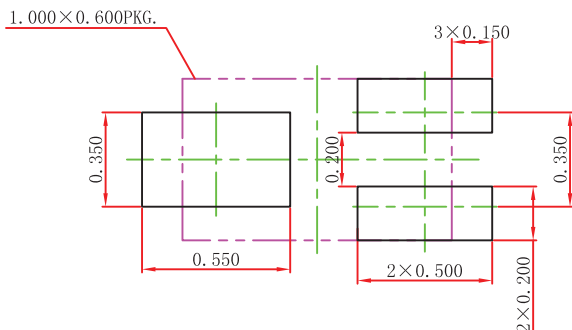
SIDE VIEW



BOTTOM VIEW

| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 0.450                     | 0.550 | 0.018                | 0.022 |
| A1     | 0.010                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.150REF.                 |       | 0.006REF.            |       |
| D      | 0.950                     | 1.050 | 0.037                | 0.041 |
| E      | 0.550                     | 0.650 | 0.022                | 0.026 |
| D1     | 0.500REF.                 |       | 0.020REF.            |       |
| E1     | 0.450REF.                 |       | 0.018REF.            |       |
| b      | 0.250                     | 0.350 | 0.010                | 0.014 |
| b1     | 0.100                     | 0.200 | 0.004                | 0.008 |
| e      | 0.635REF.                 |       | 0.025REF.            |       |
| e1     | 0.300                     | 0.400 | 0.012                | 0.016 |
| L      | 0.200                     | 0.300 | 0.008                | 0.012 |
| L1     | 0.050REF.                 |       | 0.002REF.            |       |
| L2     | 0.270                     | 0.370 | 0.011                | 0.015 |

## WBFBP-03E Suggested Pad Layout



**Note:**

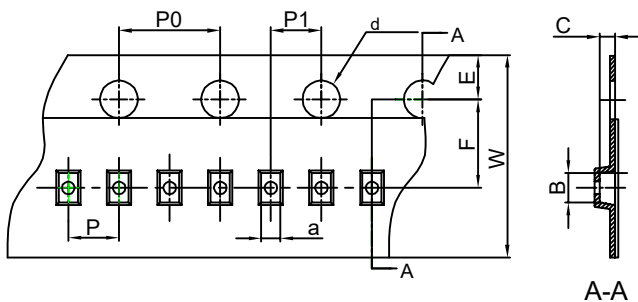
1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.050\text{mm}$ .
3. The pad layout is for reference purposes only.

**NOTICE**

JSCJ reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to any product herein. JSCJ does not assume any liability arising out of the application or use of any product described herein.

## WBFBP-03E(1.0×0.6×0.5) Tape and Reel

### WBFBP-03E(1.0×0.6×0.5) Embossed Carrier Tape

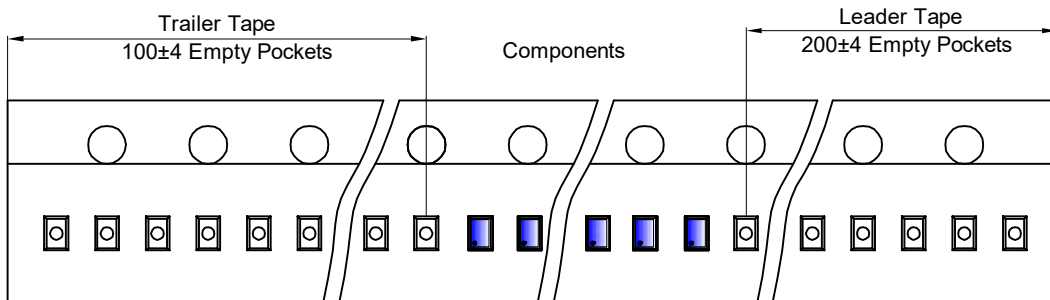


#### Packaging Description:

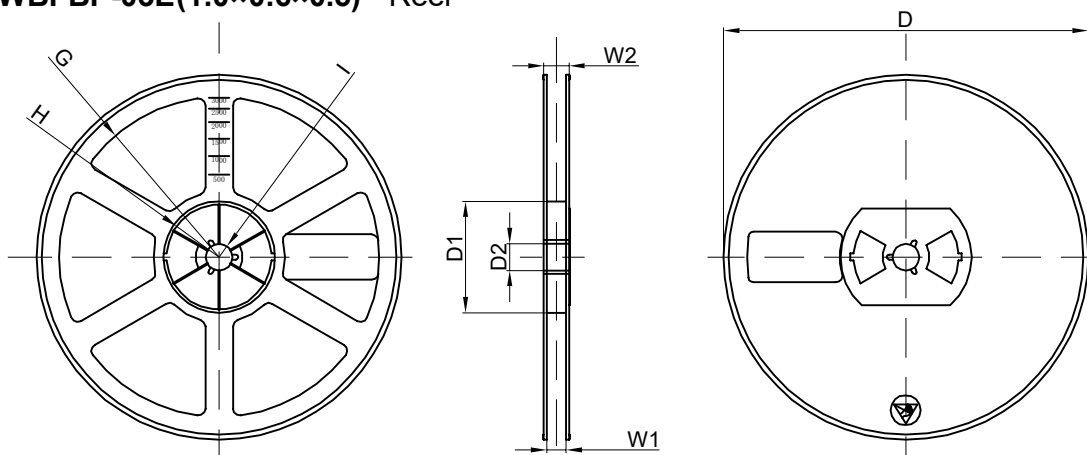
**WBFBP-03E(1.0×0.6×0.5)** parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 10,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

| Dimensions are in millimeter  |      |      |      |       |      |      |      |      |      |      |
|-------------------------------|------|------|------|-------|------|------|------|------|------|------|
| Pkg type                      | a    | B    | C    | d     | E    | F    | P0   | P    | P1   | W    |
| <b>WBFBP-03E(1.0×0.6×0.5)</b> | 0.66 | 1.15 | 0.66 | Ø1.50 | 1.75 | 3.50 | 4.00 | 2.00 | 2.00 | 8.00 |

### WBFBP-03E(1.0×0.6×0.5) Tape Leader and Trailer



### WBFBP-03E(1.0×0.6×0.5) Reel



| Dimensions are in millimeter |         |       |       |        |        |       |      |       |
|------------------------------|---------|-------|-------|--------|--------|-------|------|-------|
| Reel Option                  | D       | D1    | D2    | G      | H      | I     | W1   | W2    |
| 7" Dia                       | Ø178.00 | 54.40 | 13.00 | R78.00 | R25.60 | R6.50 | 9.50 | 12.30 |

| REEL      | Reel Size | Box         | Box Size(mm) | Carton      | Carton Size(mm) | G.W.(kg) |
|-----------|-----------|-------------|--------------|-------------|-----------------|----------|
| 10000 pcs | 7 inch    | 150,000 pcs | 203×203×195  | 600,000 pcs | 438×438×220     |          |