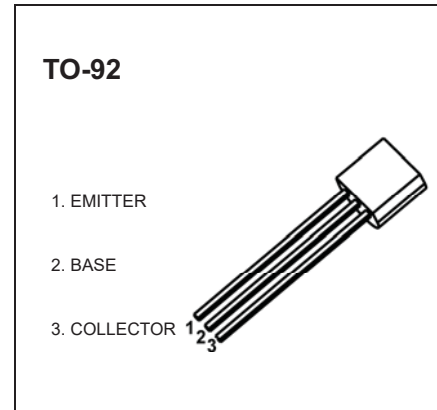


TO-92 Plastic-Encapsulate Transistors

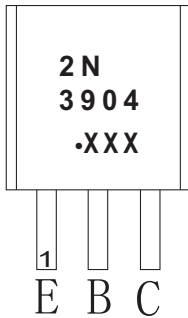
YZPST-2N3904 TRANSISTOR (NPN)

FEATURE

- NPN silicon epitaxial planar transistor for switching and Amplifier applications
- As complementary type, the PNP transistor 2N3906 is Recommended
- This transistor is also available in the SOT-23 case with the type designation MMBT3904

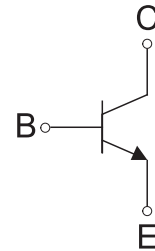


MARKING



2N3904=Device code
 Solid dot=Green molding compound device, if none, the normal device
 XXX=Code

Equivalent Circuit



ORDERING INFORMATION

| Part Number | Package | Packing Method | Pack Quantity |
|-------------|---------|----------------|---------------|
| 2N3904 | TO-92 | Bulk | 1000pcs/Bag |
| 2N3904-TA | TO-92 | Tape | 2000pcs/Box |

MAXIMUM RATINGS (T_a=25°C unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|-----------------------------------|--|---------|------|
| V _{CB0} | Collector-Base Voltage | 60 | V |
| V _{CE0} | Collector-Emitter Voltage | 40 | V |
| V _{EB0} | Emitter-Base Voltage | 6 | V |
| I _C | Collector Current -Continuous | 0.2 | A |
| P _C | Collector Power Dissipation | 0.625 | W |
| T _J , T _{stg} | Operation Junction and Storage Temperature Range | -55-150 | °C |

ELECTRICAL CHARACTERISTICS

$T_a=25^\circ\text{C}$ unless otherwise specified

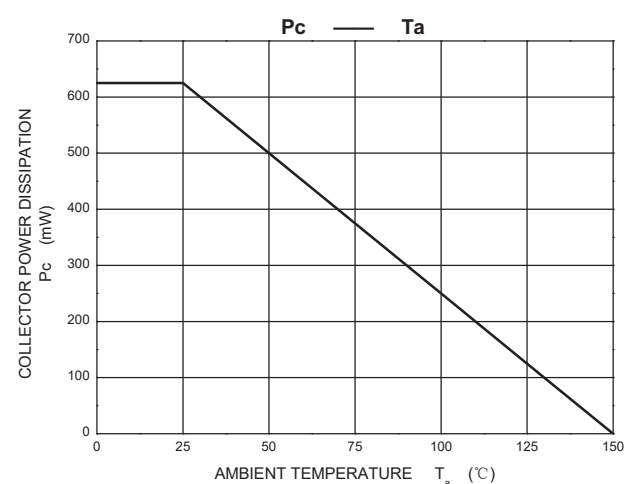
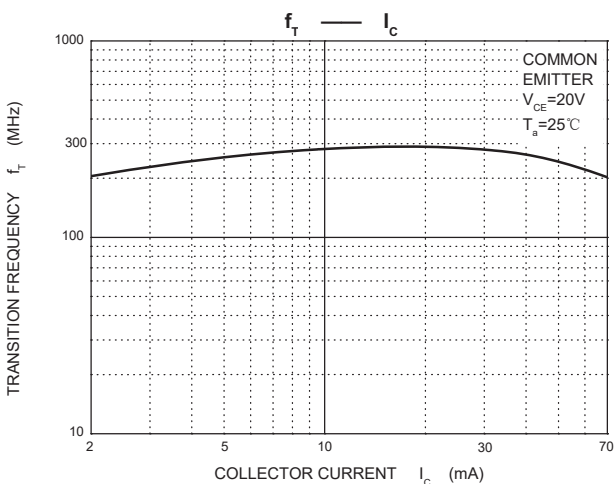
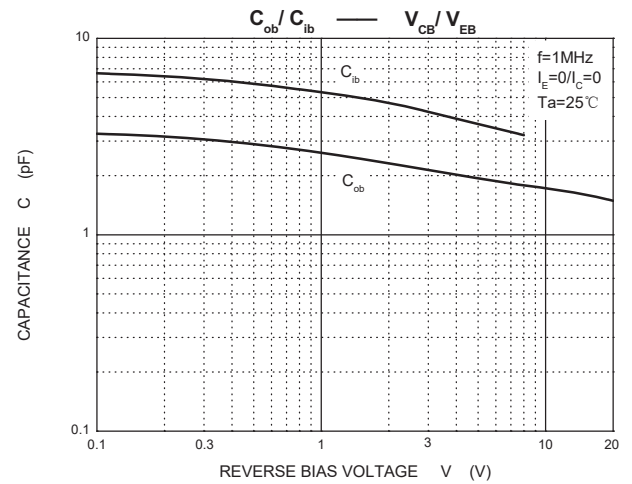
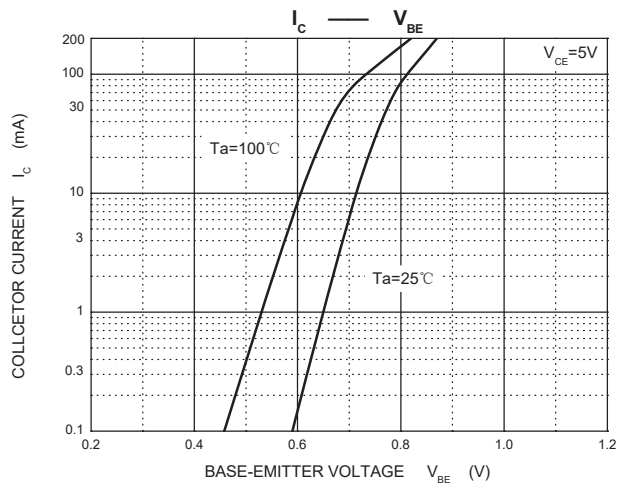
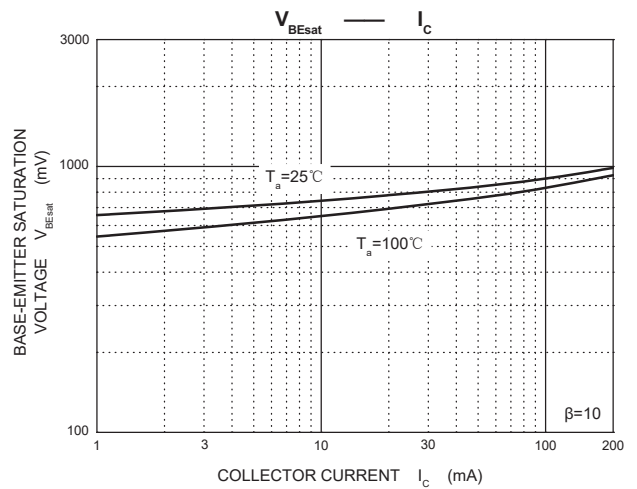
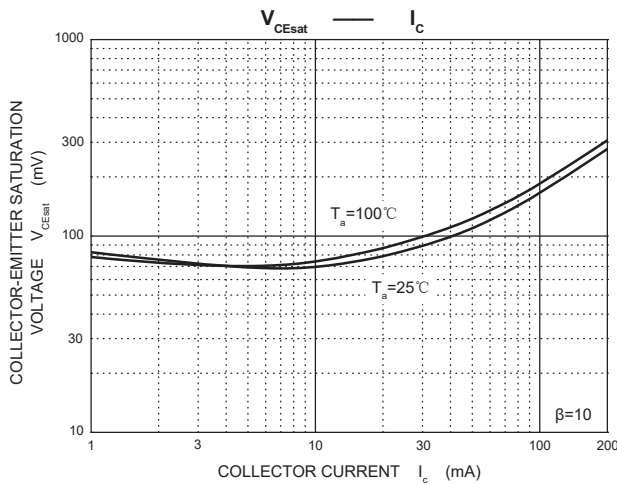
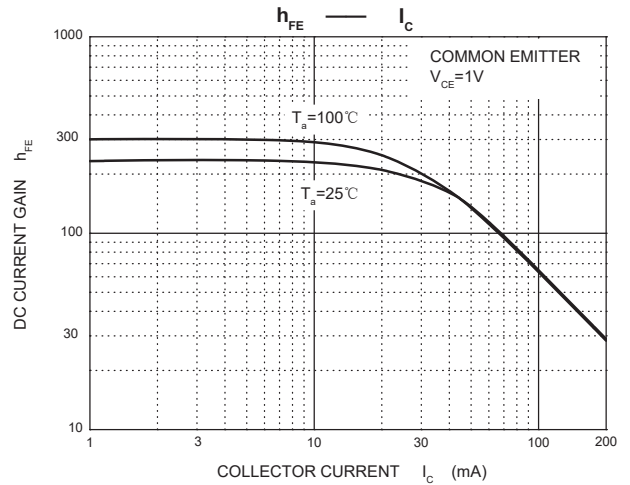
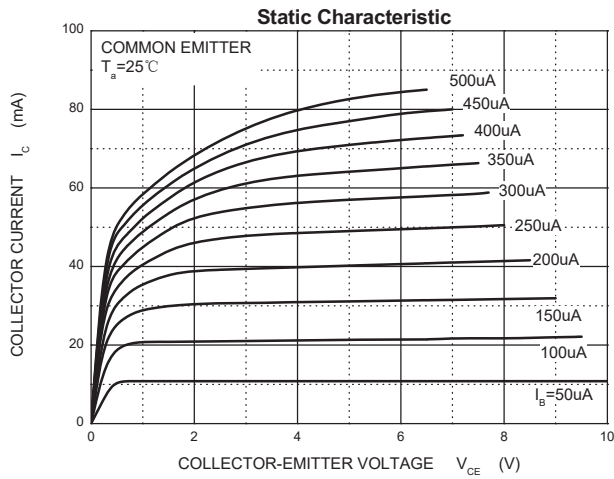
| Parameter | Symbol | Test conditions | Min | Typ | Max | Unit |
|--------------------------------------|---------------|---|-----|-----|------|---------------|
| Collector-base breakdown voltage | $V_{(BR)CBO}$ | $I_C=10\text{KA}, I_E=0$ | 60 | | | V |
| Collector-emitter breakdown voltage | $V_{(BR)CEO}$ | $I_C=1\text{mA}, I_B=0$ | 40 | | | V |
| Emitter-base breakdown voltage | $V_{(BR)EBO}$ | $I_E=10\text{KA}, I_C=0$ | 6 | | | V |
| Collector cut-off current | I_{CBO} | $V_{CB}=60\text{V}, I_E=0$ | | | 0.1 | μA |
| Collector cut-off current | I_{CEX} | $V_{CE}=30\text{V}, V_{EB(off)}=3\text{V}$ | | | 0.05 | μA |
| Emitter cut-off current | I_{EBO} | $V_{EB}=5\text{V}, I_C=0$ | | | 0.1 | μA |
| DC current gain | h_{FE1} | $V_{CE}=1\text{V}, I_C=10\text{mA}$ | 100 | | 400 | |
| | h_{FE2} | $V_{CE}=1\text{V}, I_C=50\text{mA}$ | 60 | | | |
| | h_{FE3} | $V_{CE}=1\text{V}, I_C=100\text{mA}$ | 30 | | | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C=50\text{mA}, I_B=5\text{mA}$ | | | 0.3 | V |
| Base-emitter saturation voltage | $V_{BE(sat)}$ | $I_C=50\text{mA}, I_B=5\text{mA}$ | | | 0.95 | V |
| Transition frequency | f_T | $V_{CE}=20\text{V}, I_C=10\text{mA}, f=100\text{MHz}$ | 300 | | | MHz |
| Delay Time | t_d | $V_{CC}=3\text{V}, V_{BE}=0.5\text{V},$ | | | 35 | ns |
| Rise Time | t_r | $I_C=10\text{mA}, I_{B1}=1\text{mA}$ | | | 35 | ns |
| Storage Time | t_s | $V_{CC}=3\text{V}, I_C=10\text{mA}$ | | | 200 | ns |
| Fall Time | t_f | $I_{B1}=I_{B2}=1\text{mA}$ | | | 50 | ns |

CLASSIFICATION OF h_{FE1}

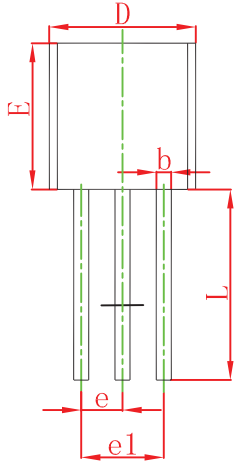
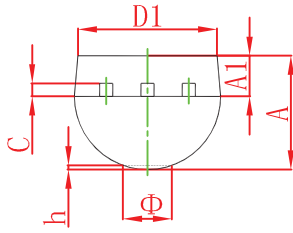
| Rank | O | Y | G |
|-------|---------|---------|---------|
| Range | 100-200 | 200-300 | 300-400 |



Typical Characteristics

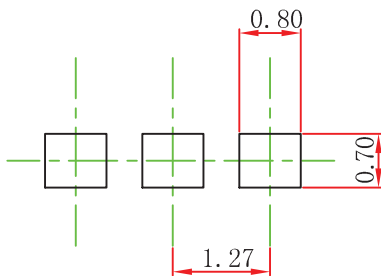


TO-92 Package Outline Dimensions



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 3.300 | 3.700 | 0.130 | 0.146 |
| A1 | 1.100 | 1.400 | 0.043 | 0.055 |
| b | 0.380 | 0.550 | 0.015 | 0.022 |
| c | 0.360 | 0.510 | 0.014 | 0.020 |
| D | 4.300 | 4.700 | 0.169 | 0.185 |
| D1 | 3.430 | | 0.135 | |
| E | 4.300 | 4.700 | 0.169 | 0.185 |
| e | 1.270 TYP | | 0.050 TYP | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 14.100 | 14.500 | 0.555 | 0.571 |
| K | | 1.600 | | 0.063 |
| h | 0.000 | 0.380 | 0.000 | 0.015 |

TO-92 Suggested Pad Layout



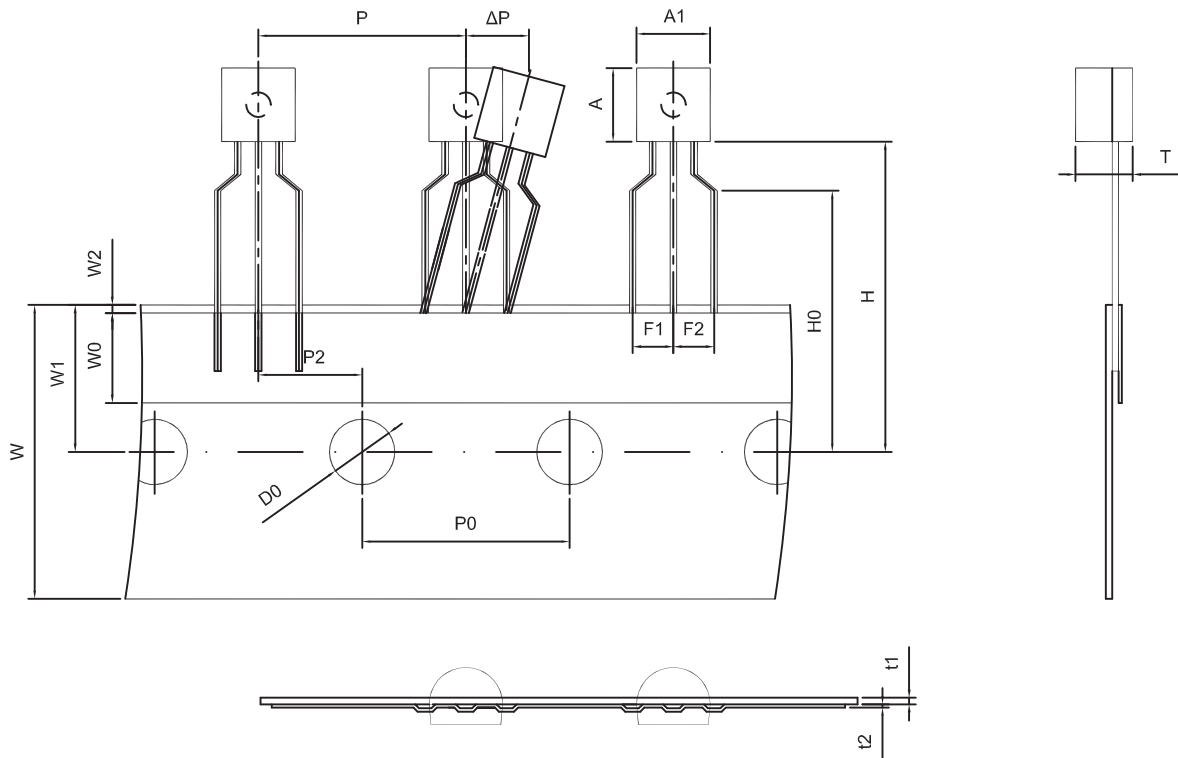
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

NOTICE

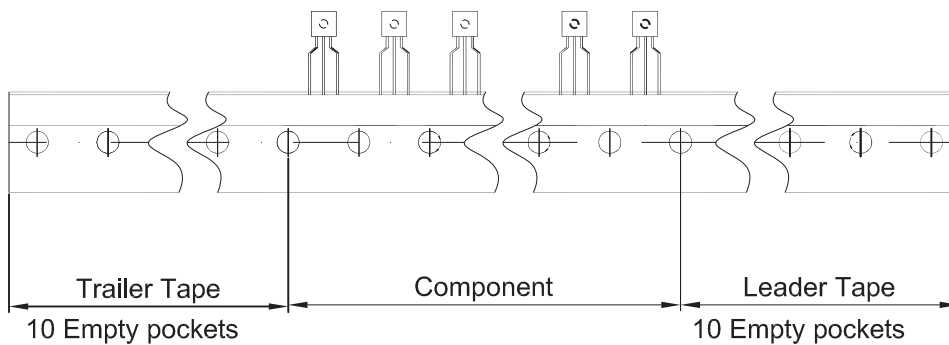
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TO-92 Tape and Reel



Dimensions are in millimeter

| A1 | A | T | P | P0 | P2 | F1 | F2 | W |
|-----|-----|----------|------|------|------|-----|-----|------|
| 4.5 | 4.5 | 3.5 | 12.7 | 12.7 | 6.35 | 2.5 | 2.5 | 18.0 |
| W0 | W1 | W2 | H | H0 | D0 | t1 | t2 | ΔP |
| 6.0 | 9.0 | 1.0 MAX. | 19.0 | 16.0 | 4.0 | 0.4 | 0.2 | 0 |



| Package | Box | Box Size(mm) | Carton | Carton Size(mm) |
|---------|----------|--------------|------------|-----------------|
| TO-92 | 2000 pcs | 333×162×43 | 20,000 pcs | 350×340×250 |