

PZT3904T1

Preferred Device

General Purpose Transistor

NPN Silicon

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector–Emitter Voltage | V_{CEO} | 40 | Vdc |
| Collector–Base Voltage | V_{CBO} | 60 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 6.0 | Vdc |
| Collector Current – Continuous | I_C | 200 | mAdc |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------|-----------------|----------------|---------------------------|
| Total Device Dissipation (Note 1) $T_A = 25^\circ\text{C}$ | P_D | 1.5 12 | W mW/ $^\circ\text{C}$ |
| Thermal Resistance Junction–to–Ambient (Note 1) | $R_{\theta JA}$ | 83.3 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance Junction–to–Lead #4 | $R_{\theta JA}$ | 35 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | –55 to +150 | $^\circ\text{C}$ |

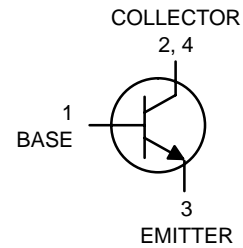
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. FR–4 with 1 oz and 713 mm² of copper area.



ON Semiconductor®

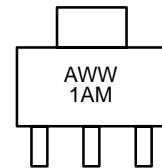
<http://onsemi.com>



MARKING DIAGRAM



SOT–223
CASE 318E
Style 1



1AM = Specific Device Code
A = Assembly Location
WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------|---------|--------------------|
| PZT3904T1 | SOT–223 | 1000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Preferred devices are recommended choices for future use and best overall value.

PZT3904T1

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|-------------------------------------------------------------------------------------------|---------------|-----|-----|------|
| OFF CHARACTERISTICS (Note 2) | | | | |
| Collector – Emitter Breakdown Voltage (Note 3) ($I_C = 1.0\text{ mAdc}$, $I_B = 0$) | $V_{(BR)CEO}$ | 40 | – | Vdc |
| Collector – Base Breakdown Voltage ($I_C = 10\text{ }\mu\text{Adc}$, $I_E = 0$) | $V_{(BR)CBO}$ | 60 | – | |
| Emitter – Base Breakdown Voltage ($I_E = 10\text{ }\mu\text{Adc}$, $I_C = 0$) | $V_{(BR)EBO}$ | 6.0 | – | |
| Base Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $V_{EB} = 3.0\text{ Vdc}$) | I_{BL} | – | 50 | nAdc |
| Collector Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $V_{EB} = 3.0\text{ Vdc}$) | I_{CEX} | – | 50 | |

ON CHARACTERISTICS (Note 3)

| | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------|-------------------------|-----|
| DC Current Gain (Note 2) ($I_C = 0.1\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 10\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 50\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 100\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) | H_{FE} | 40 70 100 60 30 | – – 300 – – | – |
| Collector – Emitter Saturation Voltage (Note 3) ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$) ($I_C = 50\text{ mAdc}$, $I_B = 5.0\text{ mAdc}$) | $V_{CE(sat)}$ | – – | 0.2 0.3 | Vdc |
| Base – Emitter Saturation Voltage (Note 3) ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$) ($I_C = 50\text{ mAdc}$, $I_B = 5.0\text{ mAdc}$) | $V_{BE(sat)}$ | 0.65 – | 0.85 0.95 | Vdc |

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------|-----|-----|------------------|
| Current – Gain – Bandwidth Product ($I_C = 10\text{ mAdc}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$) | f_T | 300 | – | MHz |
| Output Capacitance ($V_{CB} = 5.0\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | C_{obo} | – | 5.0 | pF |
| Input Capacitance ($V_{EB} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$) | C_{ibo} | – | 8.0 | |
| Input Impedance ($V_{CE} = 10\text{ Vdc}$, $I_C = 1.0\text{ mAdc}$, $f = 1.0\text{ kHz}$) | h_{ie} | 1.0 | 10 | k Ω |
| Voltage Feedback Ratio ($V_{CE} = 10\text{ Vdc}$, $I_C = 1.0\text{ mAdc}$, $f = 1.0\text{ kHz}$) | h_{re} | 0.5 | 8.0 | $\times 10^{-4}$ |
| Small – Signal Current Gain ($V_{CE} = 10\text{ Vdc}$, $I_C = 1.0\text{ mAdc}$, $f = 1.0\text{ kHz}$) | h_{fe} | 100 | 400 | – |
| Output Admittance ($V_{CE} = 10\text{ Vdc}$, $I_C = 1.0\text{ mAdc}$, $f = 1.0\text{ kHz}$) | h_{oe} | 1.0 | 40 | μmhos |
| Noise Figure ($V_{CE} = 5.0\text{ Vdc}$, $I_C = 100\text{ }\mu\text{Adc}$, $R_S = 1.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$) | nF | – | 5.0 | dB |

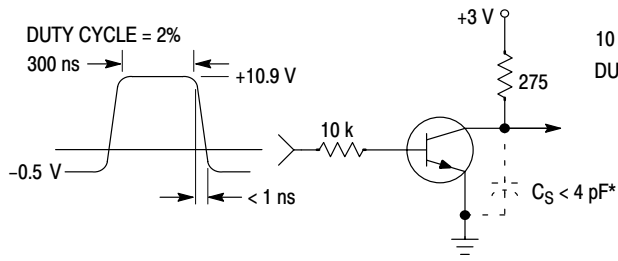
SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|--------------------------------------------------------------------------------------------------------------------|-------|---|-----|----|
| Delay Time | $(V_{CC} = 3.0\text{ Vdc}$, $V_{BE} = -0.5\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $I_{B1} = 1.0\text{ mAdc}$) | t_d | – | 35 | ns |
| Rise Time | | t_r | – | 35 | |
| Storage Time | $(V_{CC} = 3.0\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $I_{B1} = I_{B2} = 1.0\text{ mAdc}$) | t_s | – | 200 | |
| Fall Time | | t_f | – | 50 | |

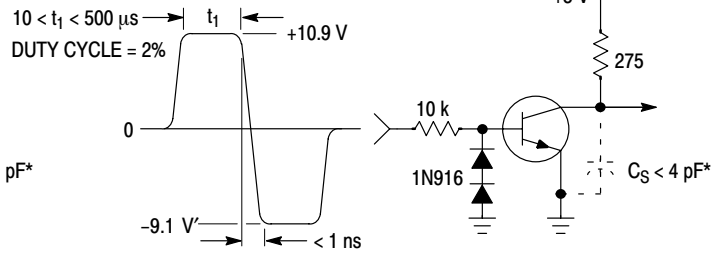
2. $FR-5 = 1.0 \times 0.75 \times 0.062\text{ in.}$

3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

PZT3904T1



**Figure 1. Delay and Rise Time
Equivalent Test Circuit**



**Figure 2. Storage and Fall Time
Equivalent Test Circuit**

* Total shunt capacitance of test jig and connectors

PZT3904T1

TYPICAL TRANSIENT CHARACTERISTICS

— $T_J = 25^\circ\text{C}$
 - - - $T_J = 125^\circ\text{C}$

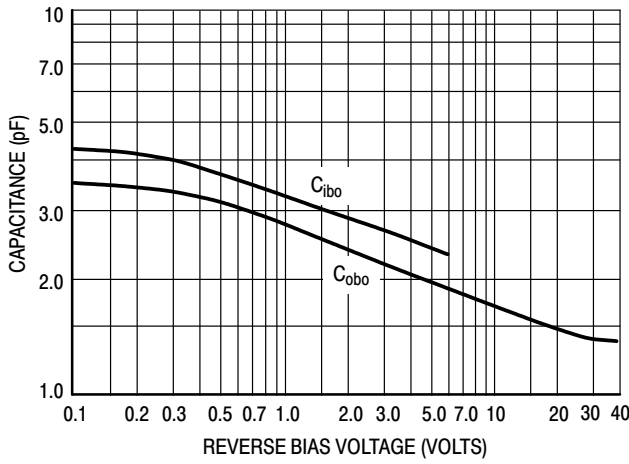


Figure 3. Capacitance

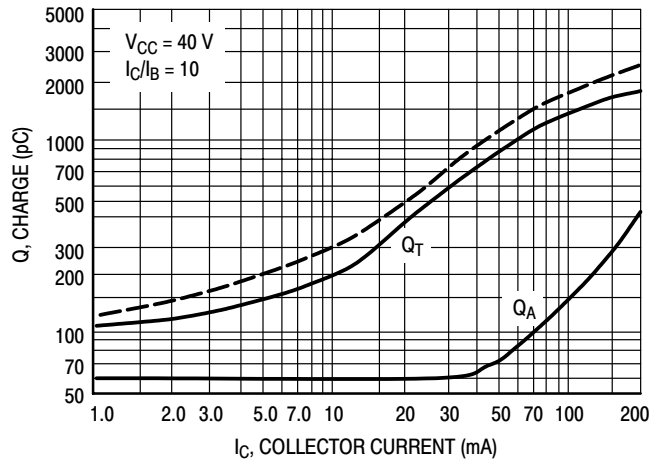


Figure 4. Charge Data

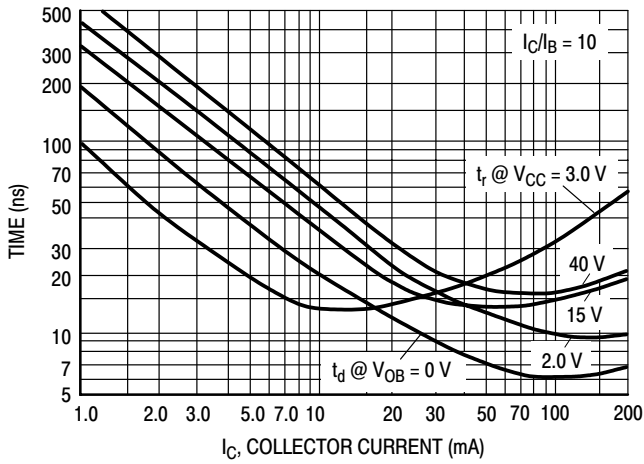


Figure 5. Turn-On Time

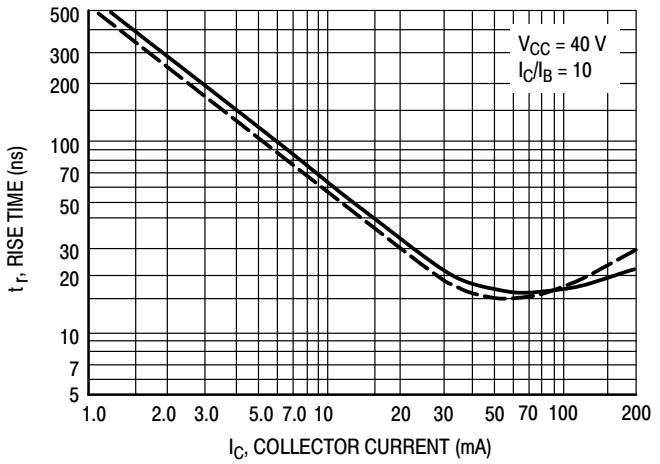


Figure 6. Rise Time

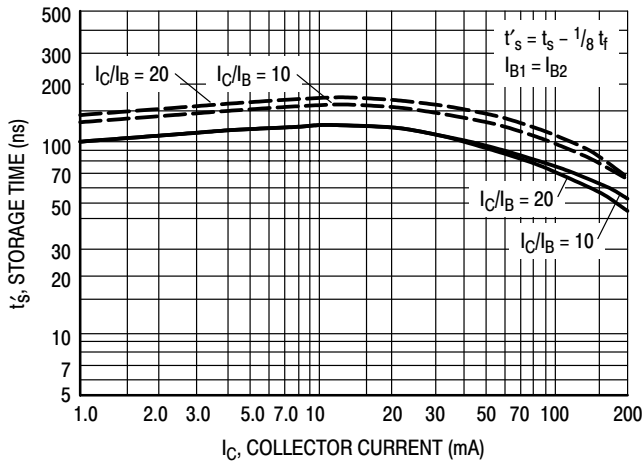


Figure 7. Storage Time

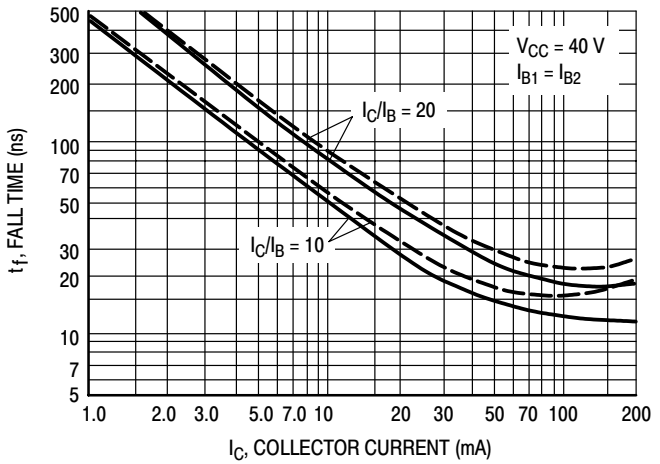


Figure 8. Fall Time

PZT3904T1

TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

($V_{CE} = 5.0$ Vdc, $T_A = 25^\circ\text{C}$, Bandwidth = 1.0 Hz)

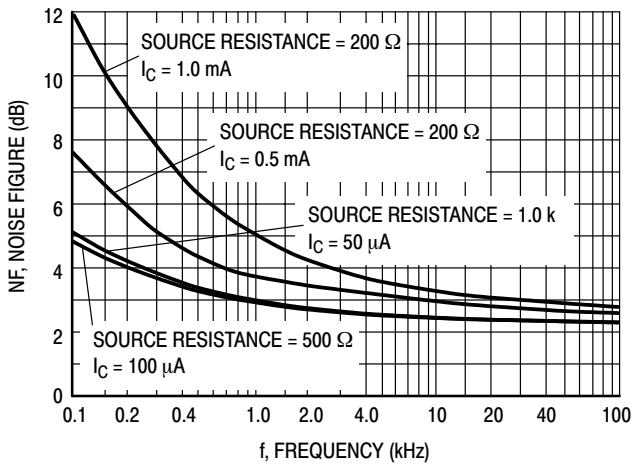


Figure 9.

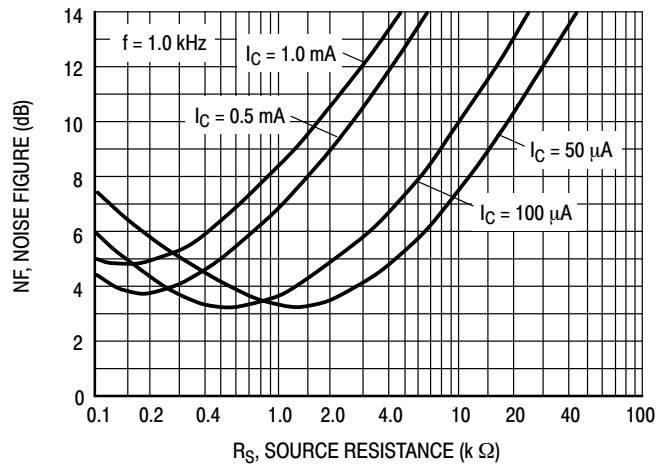


Figure 10.

h PARAMETERS

($V_{CE} = 10$ Vdc, $f = 1.0$ kHz, $T_A = 25^\circ\text{C}$)

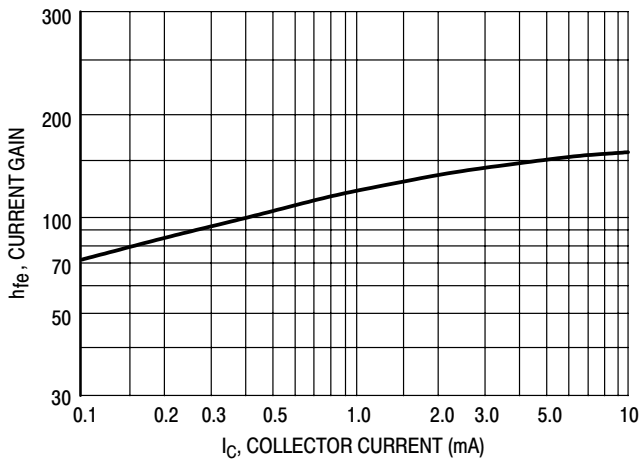


Figure 11. Current Gain

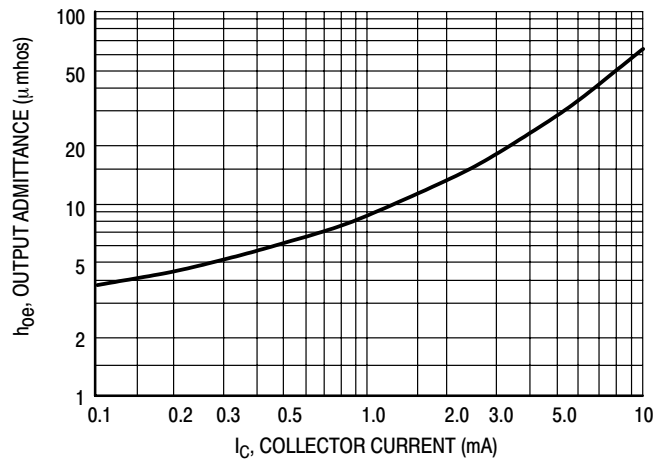


Figure 12. Output Admittance

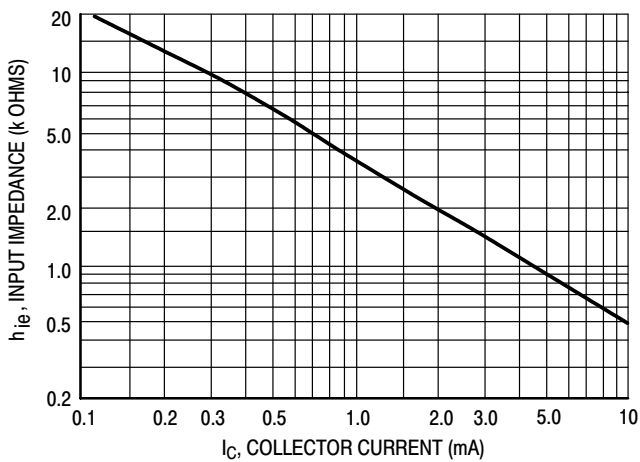


Figure 13. Input Impedance

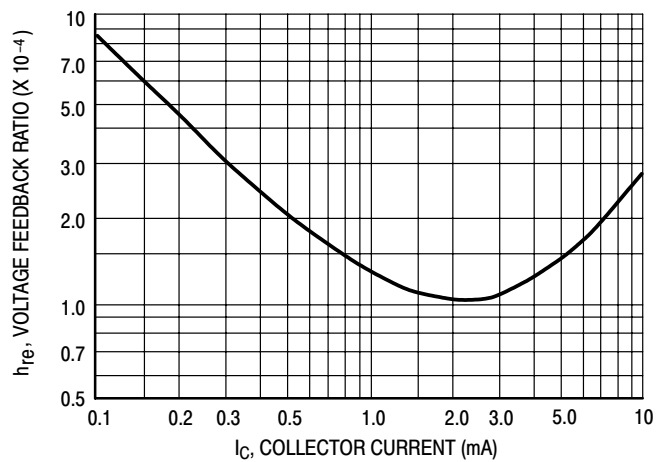


Figure 14. Voltage Feedback Ratio

PZT3904T1

TYPICAL STATIC CHARACTERISTICS

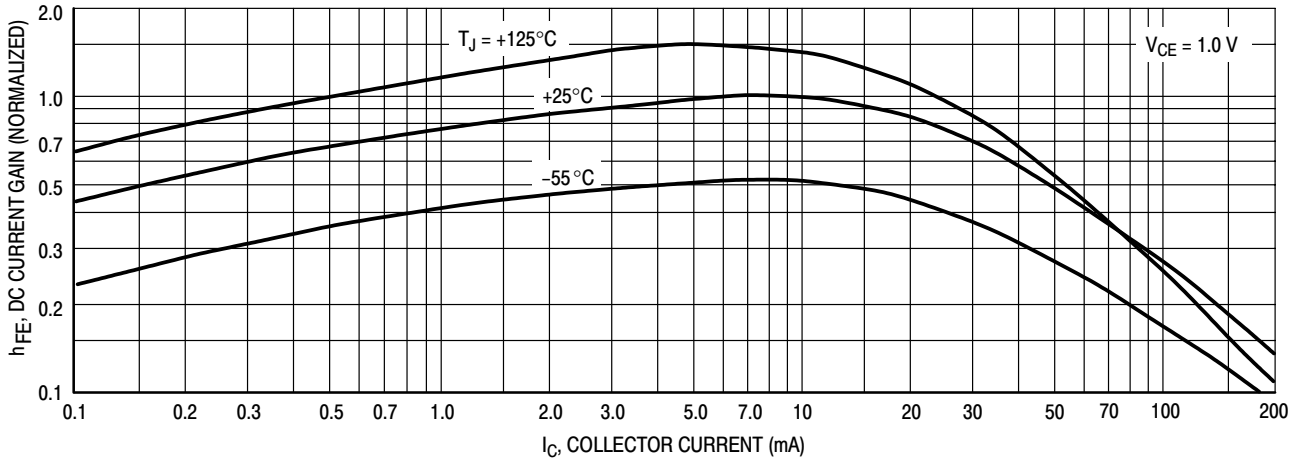


Figure 15. DC Current Gain

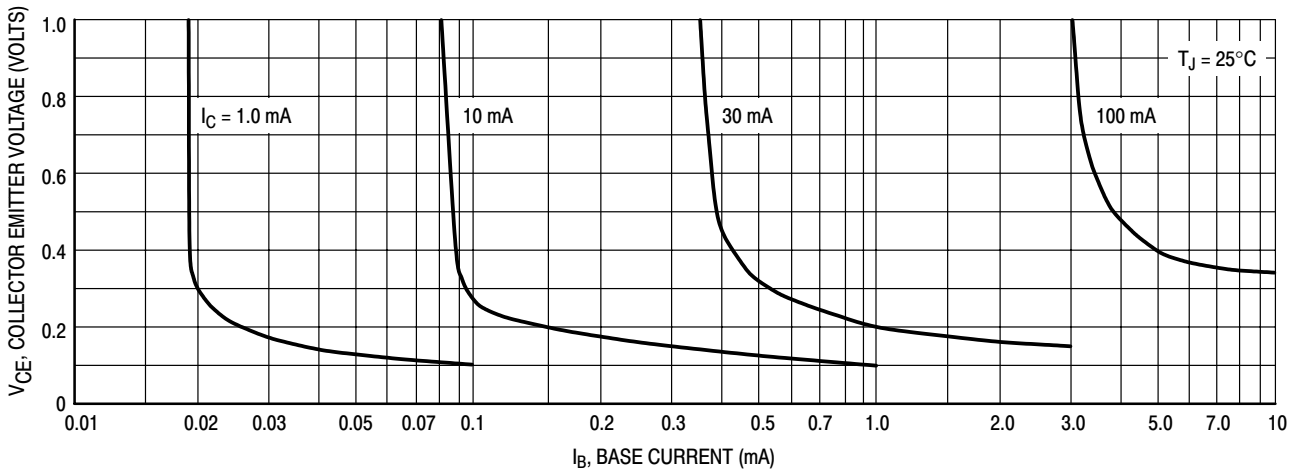


Figure 16. Collector Saturation Region

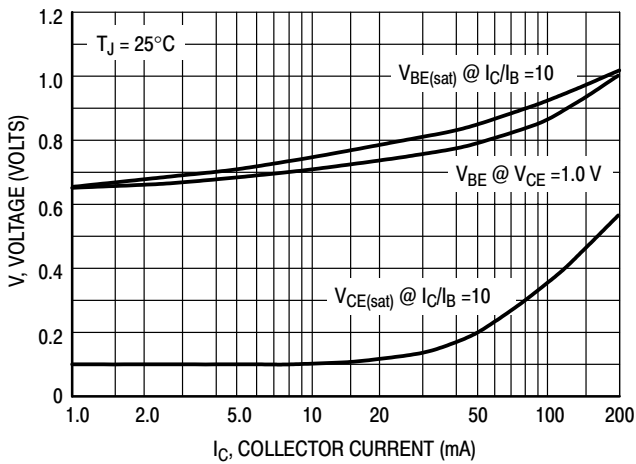


Figure 17. "ON" Voltages

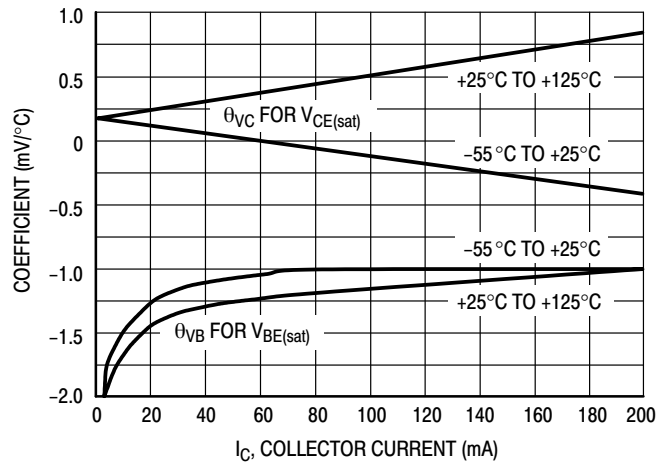
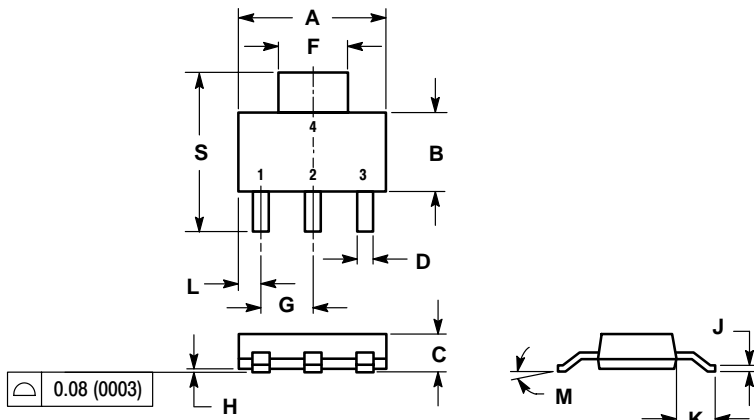


Figure 18. Temperature Coefficients

PZT3904T1

PACKAGE DIMENSIONS

SOT-223 (TO-261)
CASE 318E-04
ISSUE K

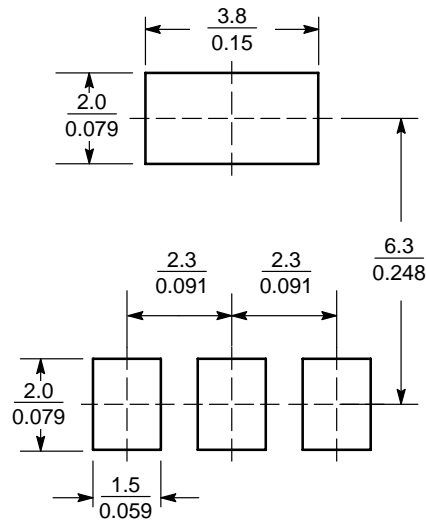


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|--------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.249 | 0.263 | 6.30 | 6.70 |
| B | 0.130 | 0.145 | 3.30 | 3.70 |
| C | 0.060 | 0.068 | 1.50 | 1.75 |
| D | 0.024 | 0.035 | 0.60 | 0.89 |
| F | 0.115 | 0.126 | 2.90 | 3.20 |
| G | 0.087 | 0.094 | 2.20 | 2.40 |
| H | 0.0008 | 0.0040 | 0.020 | 0.100 |
| J | 0.009 | 0.014 | 0.24 | 0.35 |
| K | 0.060 | 0.078 | 1.50 | 2.00 |
| L | 0.033 | 0.041 | 0.85 | 1.05 |
| M | 0° | 10° | 0° | 10° |
| S | 0.264 | 0.287 | 6.70 | 7.30 |

- STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

SOLDERING FOOTPRINT



PZT3904T1

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