

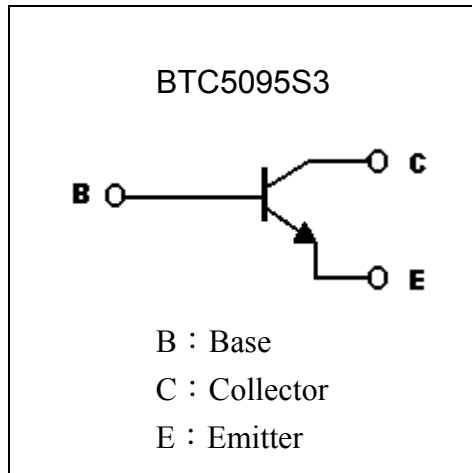
High Cutoff Frequency NPN Epitaxial Planar Transistor

BTC5095S3

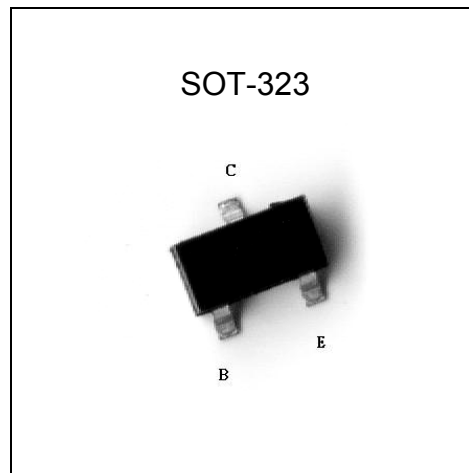
Description

The BTC5095S3 is a NPN Silicon Transistor designed for low noise amplifier at VHF, UHF and CATV band.

Symbol



Outline



Features

- Low Noise and High Gain:
- NF=1.4dB, TYP. @ $V_{CE}=2V$, $I_C=4.2mA$, $f=0.9GHz$
 $G_a=12dB$, TYP. @ $V_{CE}=2V$, $I_C=4.2mA$, $f=0.9GHz$
 $|S_{21}|^2=13.5dB$ @ $V_{CE}=5V$, $I_C=4.5mA$, $f=0.9GHz$

Applications

- Low noise and high gain amplifiers & Oscillator buffer amplifiers
- Cordless Phone : LNA , MIX ,and OSC
- Remote Controller

Absolute Maximum Ratings

- Maximum Ratings ($T_a=25^{\circ}C$)

| Parameters | Symbol | Limits | Unit |
|-------------------------------------|-----------|---------|-------------|
| Collector-Emitter Breakdown Voltage | V_{CEO} | 10 | V |
| Collector-Base Breakdown Voltage | V_{CBO} | 18 | V |
| Emitter-Base Breakdown Voltage | V_{EBO} | 2.5 | V |
| Collector Current | I_C | 20 *1 | mA |
| Collector Power Dissipation | P_d | 150 | mW |
| Junction Temperature | T_j | 125 | $^{\circ}C$ |
| Storage Temperature | T_{stg} | -50~125 | $^{\circ}C$ |

Note: *1 Here we define the point DC current gain drops off.



Electrical Characteristics

- Characterization Information (Ta=25°C)

| Parameters | Conditions | Symbol | Min | Typ. | Max | Unit |
|---|----------------------------------|--------------|-----|------|-----|---------|
| Collector Cutoff Current | $V_{CB}=3V, I_E=0$ | I_{CBO} | - | - | 1 | μA |
| Emitter Cutoff Current | $V_{EB}=1V$ | I_{EBO} | - | - | 1 | μA |
| DC Current Gain | $V_{CE}=2V, I_C=1mA$ | $h_{FE(1)}$ | 52 | - | 270 | - |
| | $V_{CE}=6V, I_C=7mA$ | $h_{FE(2)}$ | 52 | - | - | - |
| Cutoff Frequency | $V_{CE}=1V, I_C=10mA$ | f_T | - | 7.6 | - | GHz |
| | $V_{CE}=3V, I_C=12mA$ | | - | 9 | - | GHz |
| Minimum Noise Figure | $V_{CE}=2V, I_C=4.2mA, f=0.9GHz$ | NF_{min} | - | 1.4 | - | dB |
| | $V_{CE}=5V, I_C=4.5mA, f=0.9GHz$ | | - | 1.6 | - | dB |
| Associated Gain | $V_{CE}=2V, I_C=4.2mA, f=0.9GHz$ | G_A | - | 12 | - | dB |
| | $V_{CE}=5V, I_C=4.5mA, f=0.9GHz$ | | - | 13.5 | - | dB |
| Insertion Gain $ S_{21} ^2$ In 50 Ohm system | $V_{CE}=2V, I_C=4.2mA, f=0.9GHz$ | $ S_{21} ^2$ | - | 12.8 | - | dB |
| | $V_{CE}=5V, I_C=4.5mA, f=0.9GHz$ | | - | 13.5 | - | dB |
| Output Capacitance | $V_{CB}=10V, I_E=0, f=0.9GHz$ | C_{ob} | - | 0.7 | 1.0 | pF |

Classification Of $h_{FE(1)}$

| Rank | K | P | Q |
|-------|--------|--------|---------|
| Range | 52~120 | 82~180 | 120~270 |

S-Parameters

- $V_C=2V, I_C=4.2mA, I_B=60\mu A$

| FREQ. (GHz) | S11 | | S21 | | S12 | | S22 | |
|----------------|-------|---------|-------|--------|-------|-------|-------|--------|
| | Mag | Ang | Mag | Ang | Mag | Ang | Mag | Ang |
| 0.3 | 0.604 | -54.55 | 7.842 | 133.59 | 0.067 | 51.54 | 0.669 | -35.46 |
| 0.4 | 0.524 | -68.94 | 7.093 | 123.62 | 0.077 | 48.20 | 0.583 | -39.37 |
| 0.5 | 0.454 | -81.62 | 6.422 | 114.96 | 0.084 | 46.25 | 0.518 | -41.88 |
| 0.6 | 0.399 | -92.38 | 5.768 | 107.71 | 0.090 | 45.71 | 0.468 | -43.32 |
| 0.7 | 0.355 | -102.51 | 5.226 | 101.24 | 0.096 | 45.45 | 0.431 | -44.21 |
| 0.8 | 0.320 | -111.90 | 4.756 | 95.56 | 0.101 | 45.48 | 0.400 | -44.69 |
| 0.9 | 0.291 | -121.04 | 4.367 | 90.53 | 0.107 | 46.55 | 0.380 | -44.62 |
| 1 | 0.268 | -129.71 | 4.011 | 85.55 | 0.113 | 46.59 | 0.364 | -45.20 |
| 1.1 | 0.249 | -138.30 | 3.717 | 81.44 | 0.118 | 47.32 | 0.348 | -45.38 |
| 1.2 | 0.237 | -147.20 | 3.490 | 77.18 | 0.125 | 48.06 | 0.339 | -45.42 |
| 1.3 | 0.225 | -155.29 | 3.229 | 73.05 | 0.131 | 48.45 | 0.330 | -46.12 |
| 1.4 | 0.221 | -163.42 | 3.049 | 69.95 | 0.137 | 48.55 | 0.324 | -46.58 |
| 1.5 | 0.218 | -171.96 | 2.880 | 65.80 | 0.144 | 49.30 | 0.318 | -47.16 |
| 1.6 | 0.216 | -179.45 | 2.708 | 62.11 | 0.151 | 49.54 | 0.314 | -48.21 |
| 1.7 | 0.220 | 173.74 | 2.568 | 59.78 | 0.158 | 49.59 | 0.309 | -48.87 |
| 1.8 | 0.223 | 166.14 | 2.465 | 55.42 | 0.167 | 49.92 | 0.310 | -49.95 |
| 1.9 | 0.229 | 160.61 | 2.311 | 52.89 | 0.173 | 49.56 | 0.305 | -51.14 |



| | | | | | | | | |
|-----|-------|--------|-------|-------|-------|-------|-------|--------|
| 2 | 0.239 | 154.93 | 2.230 | 50.57 | 0.181 | 49.96 | 0.305 | -52.25 |
| 2.1 | 0.246 | 149.44 | 2.159 | 46.58 | 0.190 | 49.43 | 0.300 | -54.01 |
| 2.2 | 0.255 | 146.00 | 2.032 | 44.85 | 0.198 | 49.13 | 0.298 | -54.87 |
| 2.3 | 0.266 | 141.03 | 2.008 | 41.73 | 0.207 | 48.98 | 0.298 | -56.73 |
| 2.4 | 0.275 | 137.61 | 1.914 | 38.98 | 0.215 | 48.15 | 0.295 | -58.27 |
| 2.5 | 0.283 | 134.78 | 1.845 | 36.23 | 0.225 | 47.73 | 0.293 | -60.00 |
| 2.6 | 0.296 | 131.62 | 1.807 | 34.63 | 0.235 | 47.19 | 0.293 | -61.99 |
| 2.7 | 0.301 | 128.73 | 1.734 | 30.54 | 0.242 | 46.23 | 0.290 | -63.35 |
| 2.8 | 0.314 | 126.55 | 1.678 | 29.10 | 0.252 | 45.96 | 0.292 | -66.03 |

• $V_C=5V$, $I_C=4.5mA$, $I_B=60\mu A$

| FREQ. (GHz) | S11 | | S21 | | S12 | | S22 | |
|----------------|-------|---------|-------|--------|-------|-------|-------|--------|
| | Mag | Ang | Mag | Ang | Mag | Ang | Mag | Ang |
| 0.3 | 0.601 | -50.63 | 8.306 | 135.16 | 0.058 | 51.44 | 0.678 | -29.88 |
| 0.4 | 0.520 | -63.63 | 7.547 | 125.50 | 0.065 | 48.75 | 0.602 | -32.11 |
| 0.5 | 0.448 | -75.05 | 6.868 | 116.98 | 0.072 | 47.60 | 0.546 | -33.33 |
| 0.6 | 0.391 | -84.69 | 6.188 | 109.83 | 0.077 | 47.52 | 0.505 | -33.75 |
| 0.7 | 0.343 | -93.82 | 5.624 | 103.45 | 0.082 | 47.79 | 0.475 | -33.95 |
| 0.8 | 0.304 | -102.33 | 5.124 | 97.83 | 0.087 | 48.29 | 0.451 | -33.81 |
| 0.9 | 0.271 | -110.71 | 4.716 | 92.86 | 0.092 | 49.77 | 0.436 | -33.39 |
| 1 | 0.244 | -118.73 | 4.336 | 87.94 | 0.097 | 50.18 | 0.424 | -33.71 |
| 1.1 | 0.221 | -126.87 | 4.014 | 83.94 | 0.102 | 51.28 | 0.412 | -33.60 |
| 1.2 | 0.204 | -135.86 | 3.777 | 79.76 | 0.108 | 52.42 | 0.407 | -33.56 |
| 1.3 | 0.188 | -144.08 | 3.486 | 75.61 | 0.114 | 53.16 | 0.401 | -34.10 |
| 1.4 | 0.180 | -153.03 | 3.297 | 72.75 | 0.120 | 53.50 | 0.398 | -34.42 |
| 1.5 | 0.174 | -162.61 | 3.121 | 68.59 | 0.126 | 54.63 | 0.395 | -34.93 |
| 1.6 | 0.168 | -171.25 | 2.930 | 64.89 | 0.133 | 55.21 | 0.393 | -35.76 |
| 1.7 | 0.171 | -179.18 | 2.777 | 62.84 | 0.140 | 55.36 | 0.390 | -36.39 |
| 1.8 | 0.173 | 171.39 | 2.676 | 58.35 | 0.148 | 56.18 | 0.393 | -37.29 |
| 1.9 | 0.177 | 164.95 | 2.496 | 55.94 | 0.155 | 55.92 | 0.390 | -38.39 |
| 2 | 0.187 | 158.33 | 2.413 | 53.90 | 0.162 | 56.69 | 0.393 | -39.34 |
| 2.1 | 0.193 | 151.69 | 2.345 | 49.72 | 0.171 | 56.35 | 0.390 | -40.76 |
| 2.2 | 0.202 | 148.00 | 2.192 | 48.29 | 0.178 | 56.24 | 0.389 | -41.57 |
| 2.3 | 0.214 | 142.43 | 2.181 | 45.23 | 0.189 | 56.43 | 0.392 | -43.10 |
| 2.4 | 0.223 | 138.68 | 2.076 | 42.50 | 0.196 | 55.84 | 0.390 | -44.47 |
| 2.5 | 0.230 | 135.64 | 1.997 | 39.66 | 0.206 | 55.56 | 0.390 | -46.00 |
| 2.6 | 0.244 | 132.44 | 1.961 | 38.47 | 0.217 | 55.08 | 0.392 | -47.69 |
| 2.7 | 0.249 | 129.17 | 1.884 | 33.93 | 0.224 | 54.51 | 0.391 | -48.94 |
| 2.8 | 0.262 | 127.23 | 1.820 | 32.88 | 0.235 | 54.48 | 0.395 | -51.05 |

• Smoothed noise data ($V_C=2V$, $I_C=4.2mA$, $I_B=60\mu A$)

| FREQ. (GHz) | FMIN (dB) | GAMMA OPT | | Rn (To 50) | Ga (dB) | F50-S (dB) | F50-M (dB) | G50 (dB) |
|----------------|--------------|-----------|------|---------------|------------|---------------|---------------|-------------|
| | | Mag | Ang | | | | | |
| 0.3 | 0.80 | 0.622 | 13.9 | 0.45 | 18.89 | 1.67 | 2.33 | 17.89 |
| 0.6 | 1.01 | 0.401 | 29.9 | 0.35 | 15.66 | 1.4 | 1.74 | 15.22 |



| | | | | | | | | |
|-----|------|-------|--------|------|-------|------|------|-------|
| 0.9 | 1.21 | 0.282 | 48.2 | 0.29 | 13.05 | 1.42 | 2.01 | 12.80 |
| 1.2 | 1.42 | 0.239 | 68.6 | 0.27 | 10.97 | 1.57 | 1.82 | 10.86 |
| 1.5 | 1.63 | 0.246 | 90.8 | 0.24 | 9.34 | 1.79 | 1.79 | 9.19 |
| 1.8 | 1.84 | 0.276 | 114.6 | 0.21 | 8.08 | 2.04 | 2.45 | 7.84 |
| 2.1 | 2.04 | 0.303 | 139.6 | 0.16 | 7.10 | 2.30 | 1.87 | 6.69 |
| 2.4 | 2.25 | 0.301 | 165.5 | 0.14 | 6.33 | 2.50 | 2.50 | 5.64 |
| 2.7 | 2.46 | 0.242 | -167.8 | 0.17 | 5.68 | 2.62 | 2.71 | 4.78 |
| 2.8 | 2.53 | 0.206 | -158.8 | 0.19 | 5.48 | 2.65 | 2.91 | 4.50 |

• Smoothed noise data ($V_C=5V$, $I_C=4.5mA$, $I_B=60\mu A$)

| FREQ. | FMIN | GAMMA OPT | | Rn | Ga | F50-S | F50-M | G50 |
|-------|------|-----------|--------|---------|-------|-------|-------|-------|
| (GHz) | (dB) | Mag | Ang | (To 50) | (dB) | (dB) | (dB) | (dB) |
| 0.3 | 0.87 | 0.631 | 12.4 | 0.49 | 19.43 | 1.80 | 2.40 | 18.39 |
| 0.6 | 1.08 | 0.411 | 26.3 | 0.38 | 16.36 | 1.51 | 1.84 | 15.83 |
| 0.9 | 1.28 | 0.288 | 42.5 | 0.32 | 13.85 | 1.51 | 2.38 | 13.47 |
| 1.2 | 1.49 | 0.237 | 61.0 | 0.29 | 11.84 | 1.65 | 1.88 | 11.54 |
| 1.5 | 1.70 | 0.233 | 81.7 | 0.27 | 10.24 | 1.85 | 1.88 | 9.89 |
| 1.8 | 1.91 | 0.251 | 104.9 | 0.23 | 9.00 | 2.09 | 2.50 | 8.55 |
| 2.1 | 2.12 | 0.267 | 130.5 | 0.19 | 8.03 | 2.32 | 1.81 | 7.40 |
| 2.4 | 2.33 | 0.256 | 158.5 | 0.16 | 7.27 | 2.51 | 2.61 | 6.35 |
| 2.7 | 2.54 | 0.193 | -170.9 | 0.19 | 6.64 | 2.64 | 2.63 | 5.50 |
| 2.8 | 2.61 | 0.157 | -160.1 | 0.22 | 6.45 | 2.68 | 2.92 | 5.20 |

HSPICE 2G.6 Model

• NPN BJT Parameters

| | | | |
|------------------|------------------|-------------------|------------------|
| IS=1.444E-16 (A) | IKR=10.0E-3 | MJE=0.3882 | TR=1.0E-9 (Sec) |
| BF=85.9 | ISC=1.21E-16 | TF=1.22E-11 (Sec) | CJS=2.43E-13 (F) |
| NF=1.0 | NC=1.01 | XTF=1.70 | VJS=0.5734 (V) |
| VAF=45.9 (V) | RB=4.30 (Ohm) | VTF=0.69 (V) | MJS=0.3798 |
| IKF=160.3E-3 (A) | IRB=20.0E-3 (A) | ITF=0.1 (A) | XTB=0.0 |
| ISE=2.0E-18 (A) | RBM=2.78 (Ohm) | PTF=10.0 (deg) | EG=1.11 (eV) |
| NE=2.0 | RE=1.011 (Ohm) | CJC=2.38E-13 (F) | XTI=3.0 |
| BR=18.54 | RC=16.69 (Ohm) | VJC=0.7 (V) | FC=0.9 |
| NR=1.01 | CJE=6.04E-13 (F) | MJC=0.4474 | TNOM=25 (°C) |
| VAR=6.299 | VJE=1.003 (V) | XCJC=0.3 | |

• B'-E' DIODE Parameters

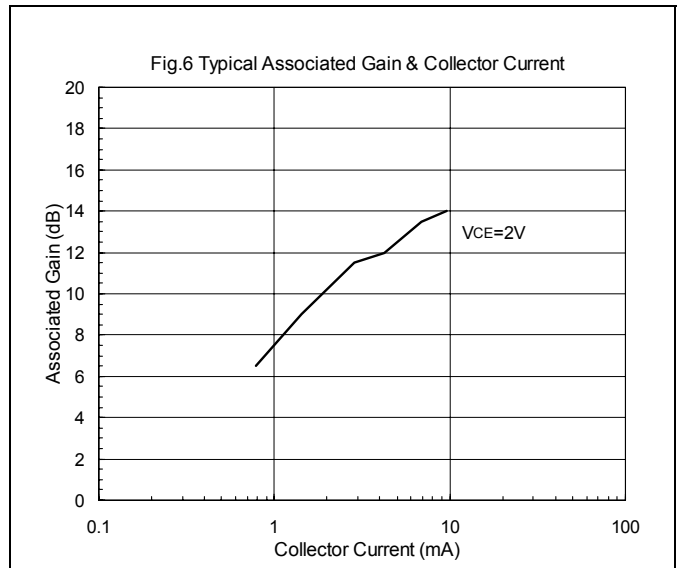
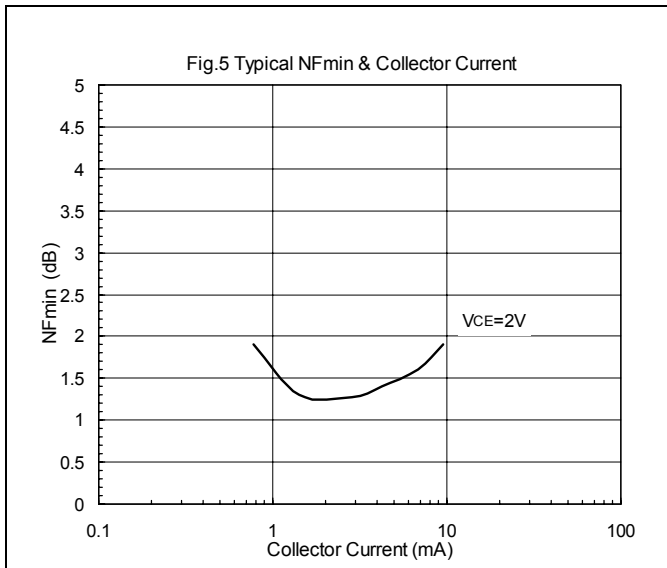
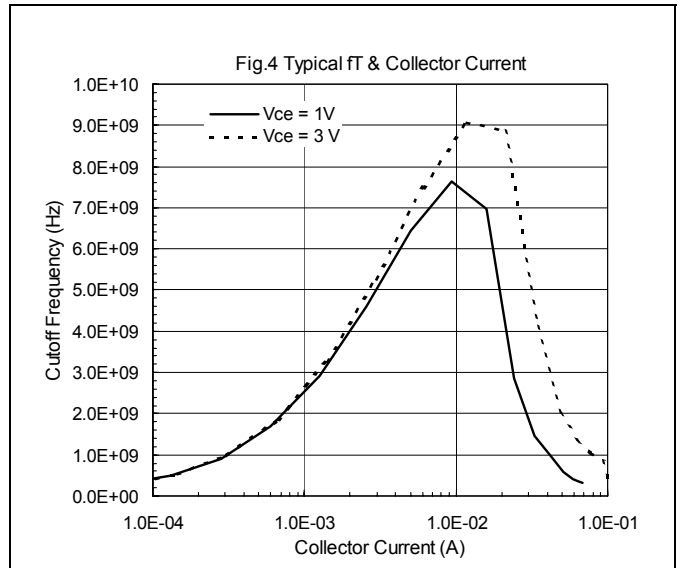
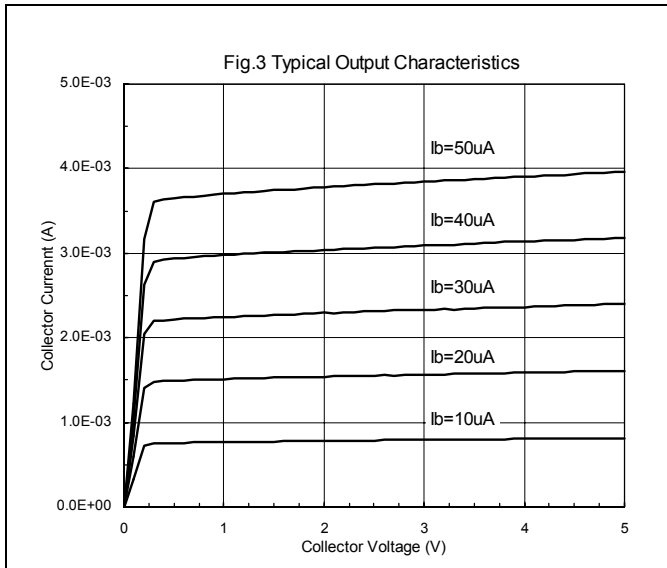
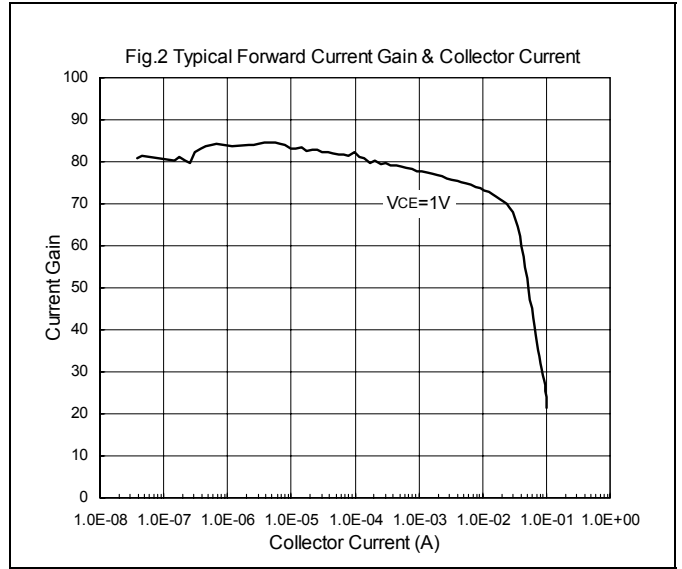
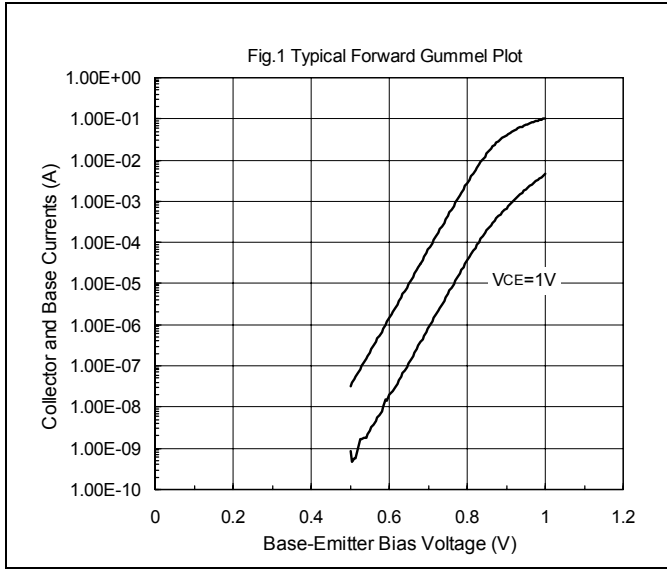
| | | | |
|----------------|-----------------|----------------|--------------|
| IS=1.0E-22 (A) | CJO=1.0E-15 (F) | XTI=3.0 | KF=0.0 |
| RS=10.0 (Ohm) | VJ=1.003 (V) | FC=0.9 | AF=1.0 |
| N=1.0 | M=0.3882 | BV=0.0 (V) | TNOM=25 (°C) |
| TT=0.0 (Sec) | EG=1.11 (eV) | IBV=1.0E-3 (A) | |

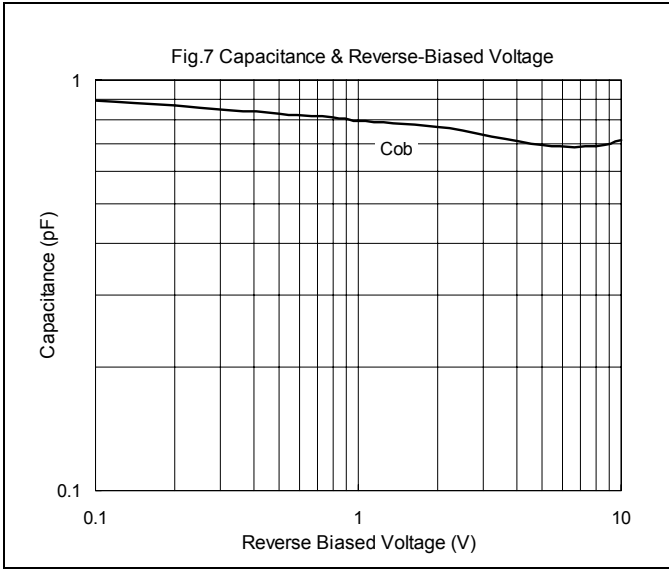
• C'-S' DIODE Parameters

| | | | |
|----------------|-----------------|------------|--------------|
| IS=1.0E-22 (A) | CJO=1.0E-15 (F) | XTI=3.0 | KF=0.0 |
| RS=0.0 (Ohm) | VJ=0.5734 (V) | FC=0.5 | AF=1.0 |
| N=1.0 | M=0.3798 | BV=0.0 (V) | TNOM=27 (°C) |

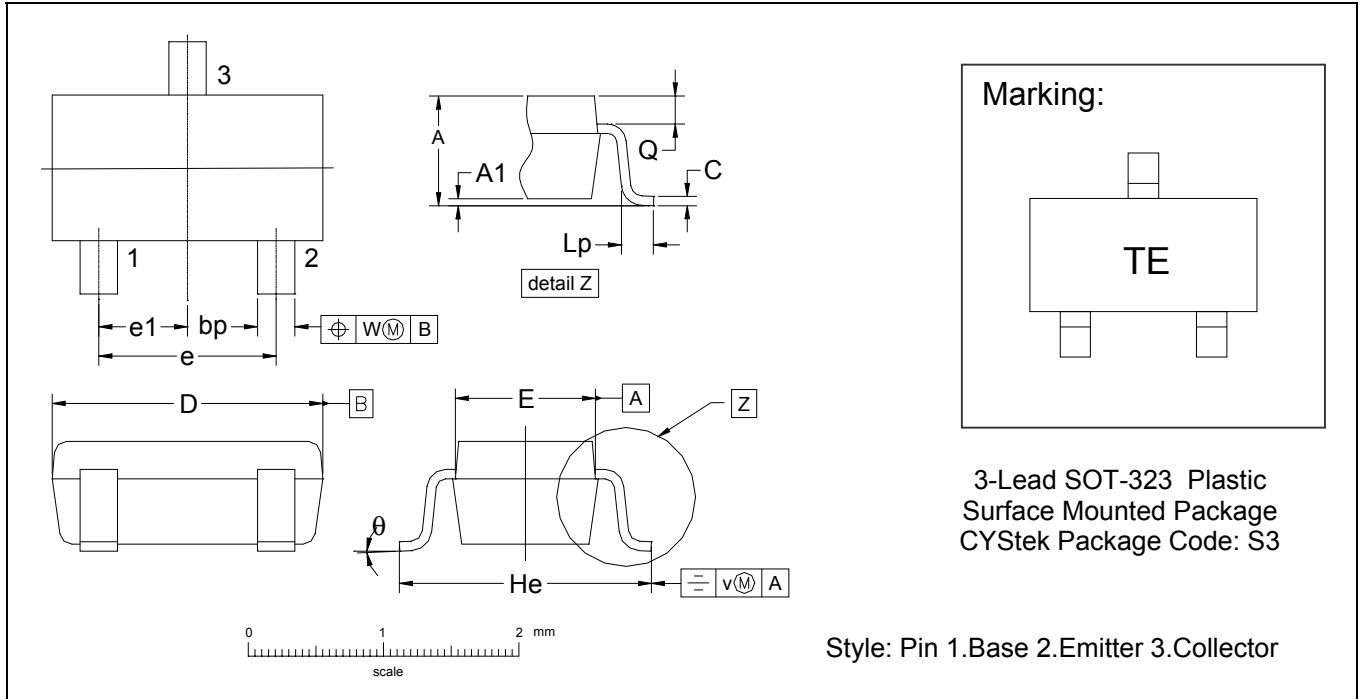


Characteristic Curves





SOT-323 Dimension



*: Typical

| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|--------|-------------|------|-----|--------|--------|-------------|------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.0315 | 0.0433 | 0.80 | 1.10 | e1 | 0.0256 | - | 0.65 | - |
| A1 | 0.0000 | 0.0039 | 0.00 | 0.10 | He | 0.0787 | 0.0886 | 2.00 | 2.25 |
| bp | 0.0118 | 0.0157 | 0.30 | 0.40 | Lp | 0.0059 | 0.0177 | 0.15 | 0.45 |
| C | 0.0039 | 0.0098 | 0.10 | 0.25 | Q | 0.0051 | 0.0091 | 0.13 | 0.23 |
| D | 0.0709 | 0.0866 | 1.80 | 2.20 | v | 0.0079 | - | 0.2 | - |
| E | 0.0453 | 0.0531 | 1.15 | 1.35 | w | 0.0079 | - | 0.2 | - |
| e | 0.0512 | - | 1.3 | - | θ | - | - | 10° | 0° |

Notes: 1.Controlling dimension: millimeters.
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
 3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: 42 Alloy ; solder plating
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

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