

# RF Transistor

10 V, 70 mA,  $f_T = 1.5$  GHz, NPN Single CP

## 15GN03CA

### Features

- High Cut-off Frequency:  $f_T = 1.5$  GHz typ.
- High Gain:  $|S_{21e}|^2 = 13$  dB typ. ( $f = 0.4$  GHz)
- This is a Pb-Free Device

### Applications

- VHF, RF, MIXER, OSC, IF Amplifier

### ABSOLUTE MAXIMUM RATINGS (at $T_A = 25^\circ\text{C}$ )

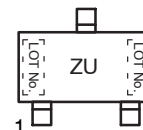
| Parameter                    | Symbol    | Ratings     | Unit             |
|------------------------------|-----------|-------------|------------------|
| Collector-to-Base Voltage    | $V_{CBO}$ | 20          | V                |
| Collector-to-Emitter Voltage | $V_{CEO}$ | 10          | V                |
| Emitter-to-Base Voltage      | $V_{EBO}$ | 3           | V                |
| Collector Current            | $I_C$     | 70          | mA               |
| Collector Dissipation        | $P_C$     | 200         | mW               |
| Junction Temperature         | $T_J$     | 150         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{STG}$ | -55 to +150 | $^\circ\text{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



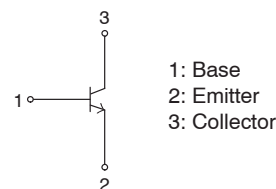
SC-59 / CP3  
CASE 318BJ

### MARKING DIAGRAM



ZU = Specific Device Code

### ELECTRICAL CONNECTION



### ORDERING INFORMATION

| Device        | Package                | Shipping <sup>†</sup> |
|---------------|------------------------|-----------------------|
| 15GN03CA-TB-E | SC-59/CP3<br>(Pb-Free) | 3000 / Tape<br>& Reel |

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

# 15GN03CA

## ELECTRICAL CHARACTERISTICS (at $T_A = 25^\circ\text{C}$ )

| Parameter                    | Symbol        | Conditions                                                    | Ratings |      |      | Unit          |
|------------------------------|---------------|---------------------------------------------------------------|---------|------|------|---------------|
|                              |               |                                                               | Min     | Typ  | Max  |               |
| Collector Cutoff Current     | $I_{CBO}$     | $V_{CB} = 10\text{ V}, I_E = 0\text{ A}$                      | –       | –    | 0.1  | $\mu\text{A}$ |
| Emitter Cutoff Current       | $I_{EBO}$     | $V_{EB} = 2\text{ V}, I_C = 0\text{ A}$                       | –       | –    | 1    | $\mu\text{A}$ |
| DC Current Gain              | $h_{FE}$      | $V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$                     | 100     | –    | 180  |               |
| Gain-Bandwidth Product       | $f_T$         | $V_{CE} = 5\text{ V}, I_C = 20\text{ mA}$                     | 1.0     | 1.5  | –    | GHz           |
| Output Capacitance           | $C_{ob}$      | $V_{CB} = 10\text{ V}, f = 1\text{ MHz}$                      | –       | 0.95 | 1.25 | pF            |
| Reverse Transfer Capacitance | $C_{re}$      |                                                               | –       | 0.65 | –    | pF            |
| Forward Transfer Gain        | $ S_{21e} ^2$ | $V_{CE} = 5\text{ V}, I_C = 20\text{ mA}, f = 0.4\text{ GHz}$ | 10      | 13   | –    | dB            |
| Noise Figure                 | NF            | $V_{CE} = 3\text{ V}, I_C = 2\text{ mA}, f = 0.4\text{ GHz}$  | –       | 1.6  | –    | dB            |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

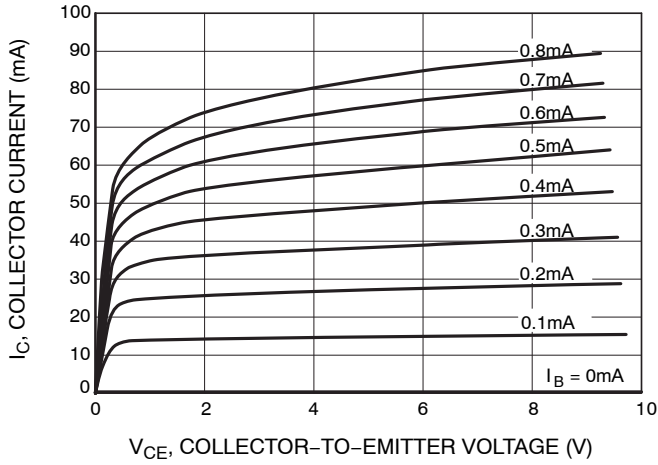


Figure 1.  $I_C - V_{CE}$

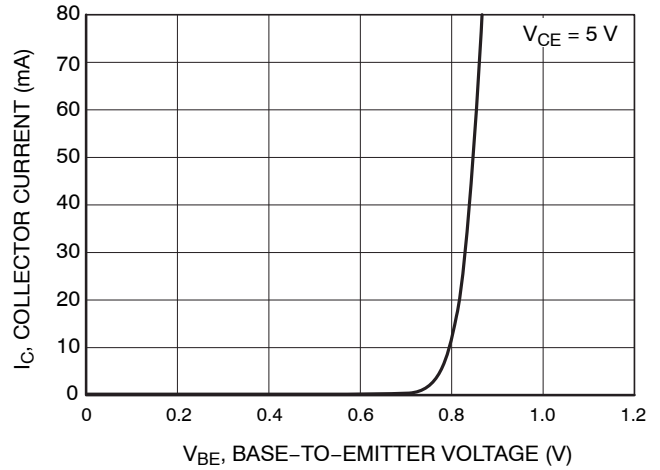


Figure 2.  $I_C - V_{BE}$

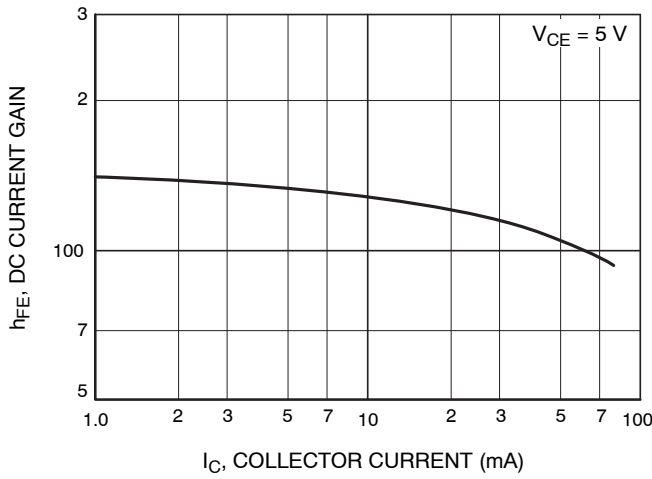


Figure 3.  $h_{FE} - I_C$

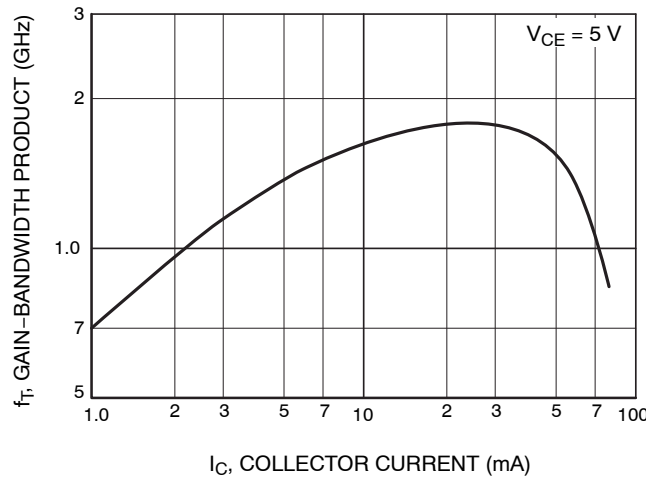


Figure 4.  $f_T - I_C$

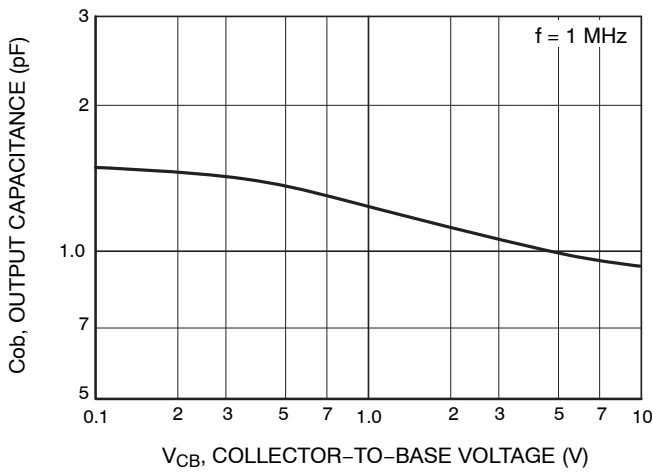


Figure 5.  $C_{ob} - V_{CB}$

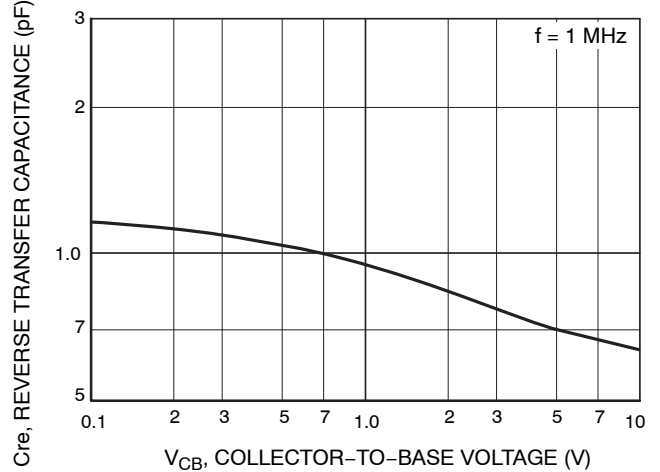


Figure 6.  $C_{re} - V_{CB}$

TYPICAL CHARACTERISTICS (CONTINUED)

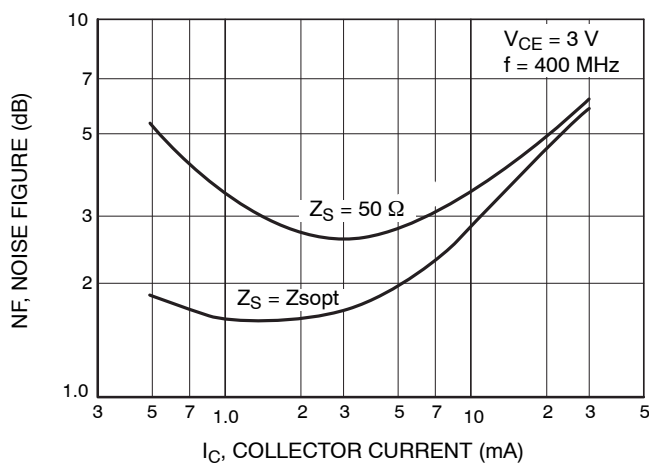


Figure 7. NF –  $I_C$

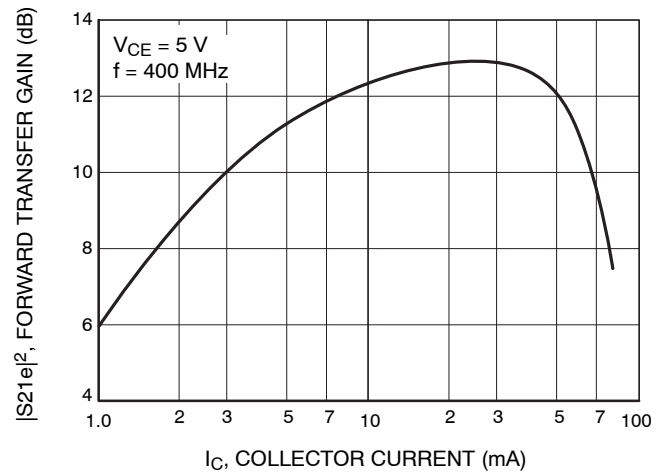


Figure 8.  $|S_{21e}|^2$  –  $I_C$

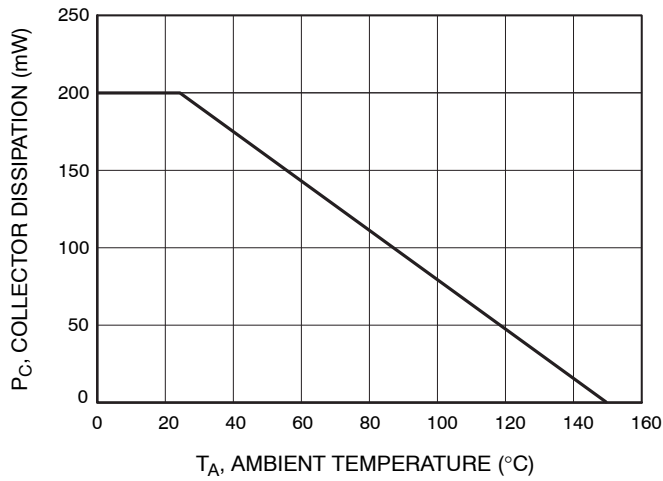


Figure 9.  $P_C$  –  $T_A$

LAND PATTERN EXAMPLE

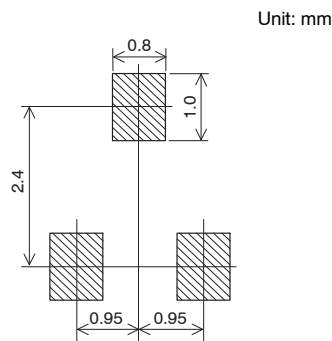


Figure 10. Land Pattern Example

# 15GN03CA

## S PARAMETERS (COMMON EMITTER)

| Freq(MHz) | S11 | ∠S11 | S21 | ∠S21 | S12 | ∠S12 | S22 | ∠S22 |
|-----------|-----|------|-----|------|-----|------|-----|------|
|-----------|-----|------|-----|------|-----|------|-----|------|

$V_{CE} = 5\text{ V}$ ,  $I_C = 1\text{ mA}$ ,  $Z_O = 50\ \Omega$

|      |       |         |       |        |       |       |       |        |
|------|-------|---------|-------|--------|-------|-------|-------|--------|
| 100  | 0.918 | -34.17  | 3.328 | 154.00 | 0.040 | 67.14 | 0.963 | -9.32  |
| 200  | 0.816 | -63.46  | 2.833 | 133.91 | 0.063 | 50.52 | 0.897 | -15.61 |
| 300  | 0.719 | -87.48  | 2.349 | 118.47 | 0.075 | 39.90 | 0.847 | -19.59 |
| 400  | 0.650 | -106.66 | 1.974 | 106.31 | 0.081 | 33.68 | 0.816 | -22.72 |
| 500  | 0.603 | -123.45 | 1.709 | 96.50  | 0.081 | 30.41 | 0.795 | -25.65 |
| 600  | 0.579 | -137.17 | 1.492 | 88.62  | 0.078 | 30.45 | 0.785 | -28.56 |
| 700  | 0.562 | -149.31 | 1.328 | 81.55  | 0.074 | 30.61 | 0.779 | -31.42 |
| 800  | 0.557 | -159.59 | 1.197 | 75.34  | 0.070 | 34.97 | 0.777 | -34.68 |
| 900  | 0.557 | -168.64 | 1.094 | 70.12  | 0.068 | 41.63 | 0.773 | -38.02 |
| 1000 | 0.560 | -176.38 | 1.003 | 65.13  | 0.066 | 50.34 | 0.773 | -41.22 |

$V_{CE} = 5\text{ V}$ ,  $I_C = 3\text{ mA}$ ,  $Z_O = 50\ \Omega$

|      |       |         |       |        |       |       |       |        |
|------|-------|---------|-------|--------|-------|-------|-------|--------|
| 100  | 0.799 | -55.14  | 7.483 | 141.00 | 0.033 | 59.88 | 0.886 | -14.45 |
| 200  | 0.641 | -93.26  | 5.412 | 118.03 | 0.047 | 44.28 | 0.773 | -18.84 |
| 300  | 0.553 | -118.80 | 4.036 | 104.19 | 0.050 | 40.23 | 0.719 | -21.00 |
| 400  | 0.512 | -136.73 | 3.182 | 94.58  | 0.052 | 40.73 | 0.693 | -22.61 |
| 500  | 0.492 | -150.89 | 2.627 | 86.95  | 0.055 | 44.74 | 0.683 | -24.93 |
| 600  | 0.488 | -161.99 | 2.244 | 80.86  | 0.056 | 49.28 | 0.677 | -27.44 |
| 700  | 0.487 | -171.08 | 1.958 | 75.25  | 0.059 | 55.44 | 0.675 | -30.18 |
| 800  | 0.492 | -178.68 | 1.749 | 70.37  | 0.063 | 62.40 | 0.675 | -33.31 |
| 900  | 0.502 | -174.60 | 1.575 | 65.89  | 0.068 | 67.82 | 0.674 | -36.39 |
| 1000 | 0.508 | -168.93 | 1.433 | 61.61  | 0.078 | 74.10 | 0.677 | -39.25 |

$V_{CE} = 5\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $Z_O = 50\ \Omega$

|      |       |         |        |        |       |       |       |        |
|------|-------|---------|--------|--------|-------|-------|-------|--------|
| 100  | 0.703 | -69.63  | 10.162 | 132.63 | 0.030 | 54.51 | 0.821 | -16.94 |
| 200  | 0.550 | -109.80 | 6.625  | 110.25 | 0.037 | 43.19 | 0.704 | -19.31 |
| 300  | 0.490 | -133.75 | 4.733  | 98.16  | 0.041 | 44.91 | 0.660 | -20.36 |
| 400  | 0.464 | -149.68 | 3.666  | 89.82  | 0.045 | 49.05 | 0.643 | -21.83 |
| 500  | 0.458 | -161.66 | 3.003  | 83.25  | 0.049 | 56.14 | 0.635 | -23.97 |
| 600  | 0.460 | -170.95 | 2.537  | 77.83  | 0.054 | 60.18 | 0.632 | -26.46 |
| 700  | 0.465 | -178.51 | 2.212  | 72.71  | 0.058 | 65.91 | 0.631 | -29.05 |
| 800  | 0.472 | -174.93 | 1.962  | 68.10  | 0.067 | 71.03 | 0.633 | -32.06 |
| 900  | 0.482 | -169.11 | 1.764  | 64.09  | 0.075 | 76.57 | 0.634 | -35.26 |
| 1000 | 0.491 | -164.18 | 1.602  | 59.88  | 0.085 | 78.96 | 0.635 | -38.26 |

$V_{CE} = 5\text{ V}$ ,  $I_C = 10\text{ mA}$ ,  $Z_O = 50\ \Omega$

|      |       |         |        |        |       |       |       |        |
|------|-------|---------|--------|--------|-------|-------|-------|--------|
| 100  | 0.568 | -91.34  | 13.492 | 121.50 | 0.022 | 51.19 | 0.729 | -18.79 |
| 200  | 0.463 | -130.04 | 7.837  | 102.18 | 0.030 | 50.01 | 0.628 | -18.37 |
| 300  | 0.435 | -149.86 | 5.435  | 92.29  | 0.035 | 56.54 | 0.598 | -18.84 |
| 400  | 0.427 | -162.69 | 4.153  | 85.23  | 0.041 | 59.99 | 0.587 | -20.20 |
| 500  | 0.431 | -171.77 | 3.374  | 79.57  | 0.047 | 67.05 | 0.586 | -22.36 |
| 600  | 0.438 | -179.07 | 2.842  | 74.63  | 0.055 | 70.37 | 0.585 | -24.64 |
| 700  | 0.446 | -174.71 | 2.460  | 69.90  | 0.062 | 74.51 | 0.587 | -27.44 |
| 800  | 0.457 | -169.18 | 2.181  | 65.54  | 0.072 | 78.16 | 0.588 | -30.30 |
| 900  | 0.469 | -164.67 | 1.954  | 61.61  | 0.080 | 80.51 | 0.592 | -33.49 |
| 1000 | 0.482 | -160.55 | 1.775  | 57.60  | 0.092 | 82.60 | 0.596 | -36.43 |

# 15GN03CA

## S PARAMETERS (COMMON EMITTER) (continued)

| Freq(MHz) | S11 | ∠S11 | S21 | ∠S21 | S12 | ∠S12 | S22 | ∠S22 |
|-----------|-----|------|-----|------|-----|------|-----|------|
|-----------|-----|------|-----|------|-----|------|-----|------|

$V_{CE} = 5\text{ V}$ ,  $I_C = 15\text{ mA}$ ,  $Z_O = 50\ \Omega$

|      |       |         |        |        |       |       |       |        |
|------|-------|---------|--------|--------|-------|-------|-------|--------|
| 100  | 0.506 | -103.02 | 14.843 | 116.40 | 0.020 | 52.22 | 0.680 | -19.13 |
| 200  | 0.433 | -139.11 | 8.300  | 98.87  | 0.027 | 55.27 | 0.595 | -17.41 |
| 300  | 0.418 | -156.74 | 5.691  | 89.86  | 0.032 | 60.47 | 0.571 | -17.79 |
| 400  | 0.416 | -167.49 | 4.336  | 83.26  | 0.040 | 65.01 | 0.567 | -19.20 |
| 500  | 0.423 | -175.59 | 3.518  | 77.72  | 0.047 | 70.77 | 0.564 | -21.38 |
| 600  | 0.434 | 177.94  | 2.949  | 72.99  | 0.056 | 75.36 | 0.566 | -23.76 |
| 700  | 0.441 | 172.60  | 2.558  | 68.36  | 0.064 | 77.18 | 0.566 | -26.43 |
| 800  | 0.454 | 167.70  | 2.257  | 64.14  | 0.073 | 80.34 | 0.573 | -29.43 |
| 900  | 0.468 | 163.21  | 2.026  | 60.20  | 0.084 | 82.23 | 0.576 | -32.58 |
| 1000 | 0.478 | 159.35  | 1.833  | 56.21  | 0.094 | 82.82 | 0.579 | -35.40 |

$V_{CE} = 5\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $Z_O = 50\ \Omega$

|      |       |         |        |        |       |       |       |        |
|------|-------|---------|--------|--------|-------|-------|-------|--------|
| 100  | 0.473 | -110.94 | 15.555 | 113.24 | 0.018 | 48.75 | 0.651 | -18.99 |
| 200  | 0.420 | -144.96 | 8.504  | 96.80  | 0.025 | 55.46 | 0.577 | -16.75 |
| 300  | 0.412 | -160.51 | 5.806  | 88.35  | 0.032 | 64.32 | 0.556 | -16.94 |
| 400  | 0.412 | -170.47 | 4.415  | 81.97  | 0.040 | 69.43 | 0.553 | -18.38 |
| 500  | 0.423 | -177.81 | 3.567  | 76.52  | 0.047 | 73.49 | 0.552 | -20.62 |
| 600  | 0.434 | 176.33  | 2.998  | 72.06  | 0.054 | 76.85 | 0.554 | -23.22 |
| 700  | 0.443 | 171.32  | 2.597  | 67.40  | 0.064 | 79.43 | 0.555 | -25.76 |
| 800  | 0.457 | 166.61  | 2.289  | 62.99  | 0.075 | 80.21 | 0.562 | -28.77 |
| 900  | 0.470 | 162.56  | 2.044  | 58.98  | 0.084 | 82.61 | 0.567 | -31.92 |
| 1000 | 0.484 | 159.03  | 1.849  | 54.97  | 0.095 | 83.62 | 0.572 | -34.90 |

$V_{CE} = 5\text{ V}$ ,  $I_C = 30\text{ mA}$ ,  $Z_O = 50\ \Omega$

|      |       |         |        |        |       |       |       |        |
|------|-------|---------|--------|--------|-------|-------|-------|--------|
| 100  | 0.444 | -121.15 | 16.032 | 109.59 | 0.018 | 56.45 | 0.620 | -18.33 |
| 200  | 0.414 | -151.46 | 8.590  | 94.42  | 0.023 | 58.54 | 0.558 | -15.68 |
| 300  | 0.413 | -164.93 | 5.826  | 86.42  | 0.031 | 69.33 | 0.543 | -15.93 |
| 400  | 0.418 | -173.75 | 4.420  | 80.00  | 0.040 | 71.41 | 0.541 | -17.58 |
| 500  | 0.429 | 179.87  | 3.560  | 74.72  | 0.048 | 75.89 | 0.545 | -19.95 |
| 600  | 0.442 | 174.95  | 2.980  | 69.97  | 0.056 | 78.14 | 0.546 | -22.37 |
| 700  | 0.454 | 170.06  | 2.575  | 65.31  | 0.067 | 79.78 | 0.550 | -25.11 |
| 800  | 0.467 | 165.62  | 2.268  | 61.02  | 0.077 | 81.97 | 0.556 | -27.94 |
| 900  | 0.485 | 161.83  | 2.027  | 57.14  | 0.086 | 83.95 | 0.563 | -31.50 |
| 1000 | 0.497 | 158.27  | 1.829  | 53.02  | 0.096 | 84.97 | 0.570 | -34.37 |

$V_{CE} = 5\text{ V}$ ,  $I_C = 50\text{ mA}$ ,  $Z_O = 50\ \Omega$

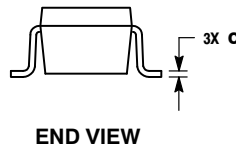
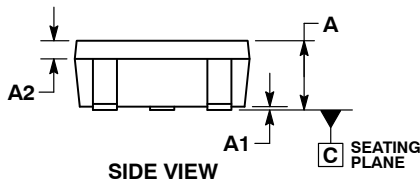
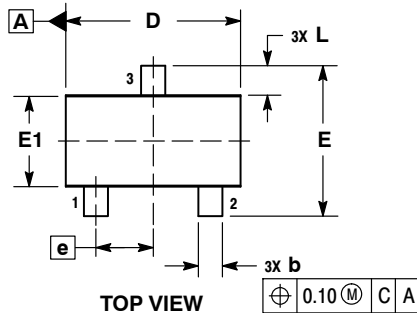
|      |       |         |        |        |       |       |       |        |
|------|-------|---------|--------|--------|-------|-------|-------|--------|
| 100  | 0.436 | -135.54 | 15.112 | 105.16 | 0.016 | 53.23 | 0.591 | -16.61 |
| 200  | 0.431 | -160.16 | 7.915  | 91.13  | 0.021 | 62.83 | 0.547 | -14.06 |
| 300  | 0.439 | -170.89 | 5.332  | 83.37  | 0.030 | 71.57 | 0.538 | -15.05 |
| 400  | 0.447 | -177.86 | 4.022  | 77.04  | 0.039 | 75.43 | 0.538 | -16.92 |
| 500  | 0.462 | 176.77  | 3.231  | 71.43  | 0.046 | 77.82 | 0.543 | -19.30 |
| 600  | 0.477 | 172.03  | 2.708  | 66.71  | 0.057 | 81.23 | 0.548 | -22.35 |
| 700  | 0.490 | 167.59  | 2.318  | 61.92  | 0.065 | 82.45 | 0.553 | -25.43 |
| 800  | 0.507 | 163.59  | 2.037  | 57.52  | 0.076 | 84.13 | 0.559 | -28.69 |
| 900  | 0.523 | 159.90  | 1.813  | 53.42  | 0.087 | 86.15 | 0.566 | -32.45 |
| 1000 | 0.539 | 156.32  | 1.629  | 49.36  | 0.099 | 87.07 | 0.573 | -35.73 |



SCALE 2:1

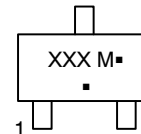
**SC-59 / CP3**  
**CASE 318BJ**  
**ISSUE O**

DATE 09 JAN 2015


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER SIDE.
4. DIMENSIONS D AND E1 ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
5. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 AND 0.20 FROM THE TIP.

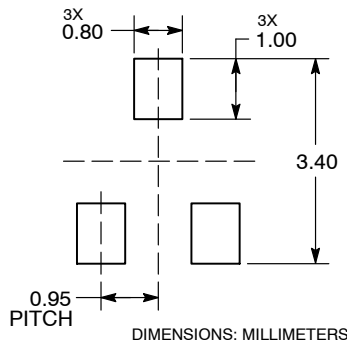
| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.95        | 1.35 |
| A1  | 0.00        | 0.10 |
| A2  | 0.20        | 0.40 |
| b   | 0.35        | 0.50 |
| c   | 0.10        | 0.20 |
| D   | 2.75        | 3.05 |
| E   | 2.30        | 2.70 |
| E1  | 1.35        | 1.65 |
| e   | 0.95 BSC    |      |
| L   | 0.35        | 0.75 |

**GENERIC MARKING DIAGRAM**


XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking.  
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

**RECOMMENDED SOLDERING FOOTPRINT\***


\*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, [SOLDERRM/D](#).

|                         |                    |                                                                                                                                                                                     |
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| <b>DESCRIPTION:</b>     | <b>SC-59 / CP3</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

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