

**EC3H02C**

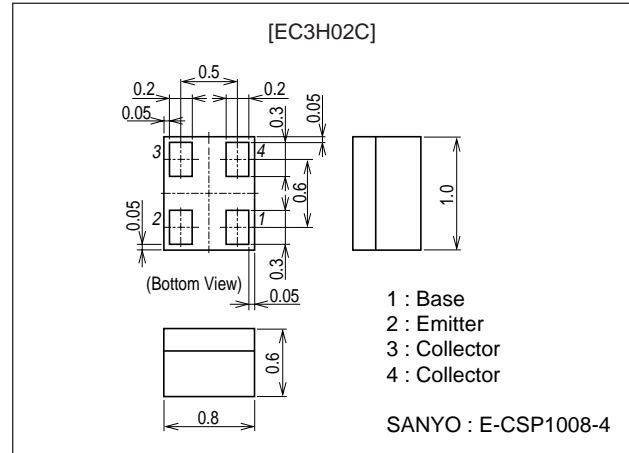
VHF to UHF Wide-Band Low-Noise Amplifier Applications

Features

- Low noise : NF=1.0dB typ (f=1GHz).
- High gain : $|S_{21e}|^2=12\text{dB}$ typ (f=1GHz).
- High cutoff frequency : $f_T=7\text{GHz}$ typ.
- Ultraminiature (1008 size) and thin (0.6mm) leadless package .

Package Dimensions

unit : mm
2184



Specifications

Absolute Maximum Ratings at $T_a=25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------------|-----------|------------|-------------|------------------|
| Collector-to-Base Voltage | V_{CB0} | | 20 | V |
| Collector-to-Emitter Voltage | V_{CEO} | | 10 | V |
| Emitter-to-Base Voltage | V_{EBO} | | 2 | V |
| Collector Current | I_C | | 70 | mA |
| Collector Dissipation | P_C | | 100 | mW |
| Junction Temperature | T_j | | 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | | -55 to +150 | $^\circ\text{C}$ |

Electrical Characteristics at $T_a=25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|------------------------------|------------------|--|---------|------|-----|---------------|
| | | | min | typ | max | |
| Collector Cutoff Current | I_{CBO} | $V_{CB}=10\text{V}, I_E=0$ | | | 1.0 | μA |
| Emitter Cutoff Current | I_{EBO} | $V_{EB}=1\text{V}, I_C=0$ | | | 10 | μA |
| DC Current Gain | h_{FE} | $V_{CE}=5\text{V}, I_C=20\text{mA}$ | 100 | | 180 | |
| Gain-Bandwidth Product | f_T | $V_{CE}=5\text{V}, I_C=20\text{mA}$ | 5 | 7 | | GHz |
| Output Capacitance | C_{ob} | $V_{CB}=10\text{V}, f=1\text{MHz}$ | | 0.7 | 1.2 | pF |
| Reverse Transfer Capacitance | C_{re} | $V_{CB}=10\text{V}, f=1\text{MHz}$ | | 0.45 | | pF |
| Forward Transfer Gain | $ S_{21e} _{21}$ | $V_{CE}=5\text{V}, I_C=20\text{mA}, f=1\text{GHz}$ | 9 | 12 | | dB |
| | $ S_{21e} _{22}$ | $V_{CE}=2\text{V}, I_C=3\text{mA}, f=1\text{GHz}$ | | 8.5 | | dB |
| Noise Figure | NF | $V_{CE}=5\text{V}, I_C=7\text{mA}, f=1\text{GHz}$ | | 1.0 | 1.8 | dB |

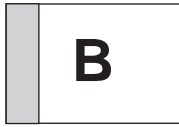
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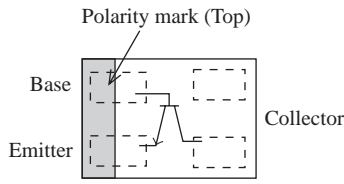
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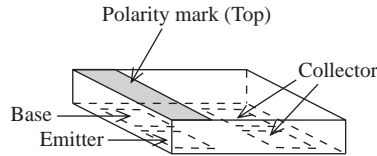
Type No. Indication (Top view)



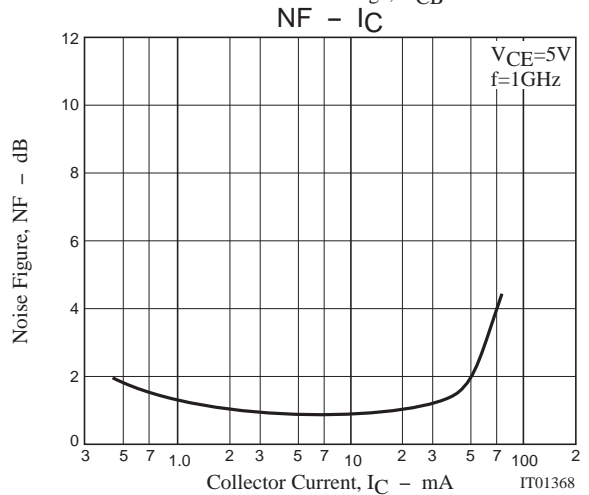
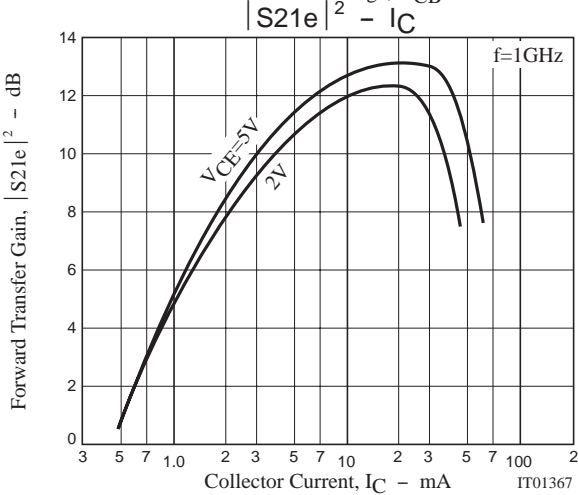
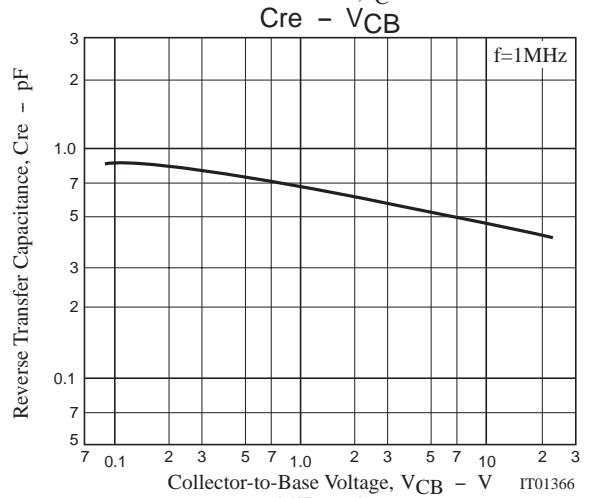
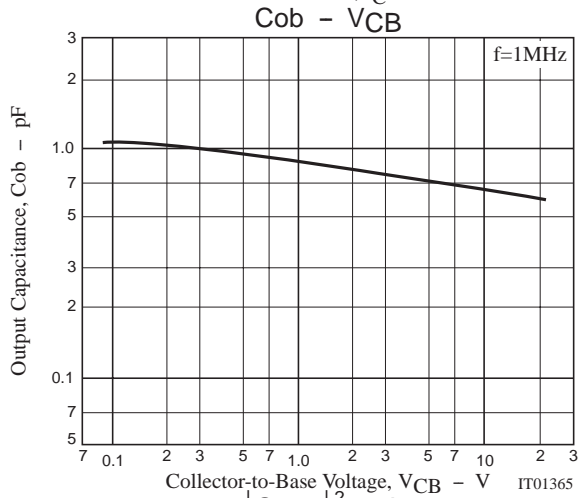
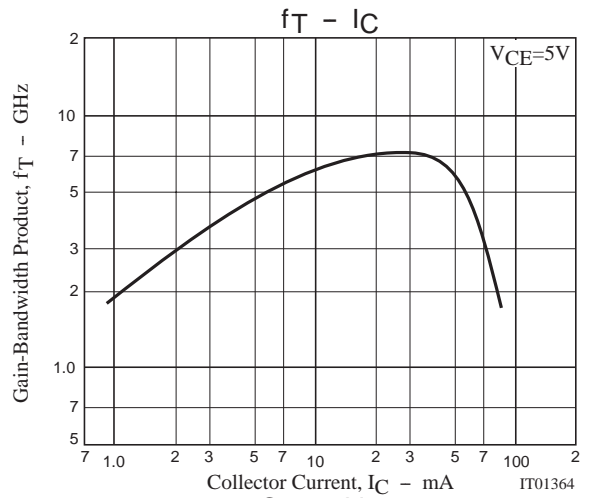
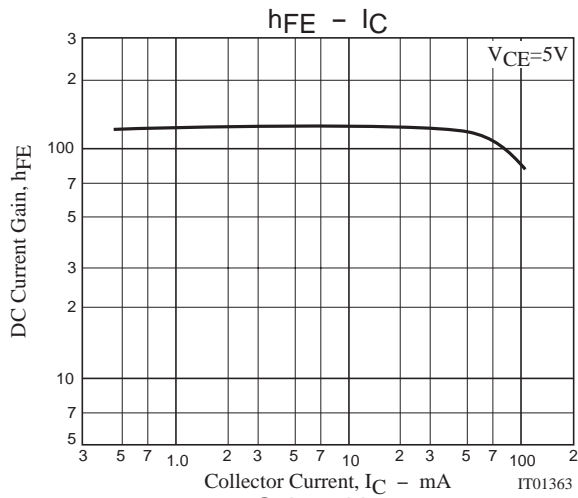
Electrical Connection (Top view)



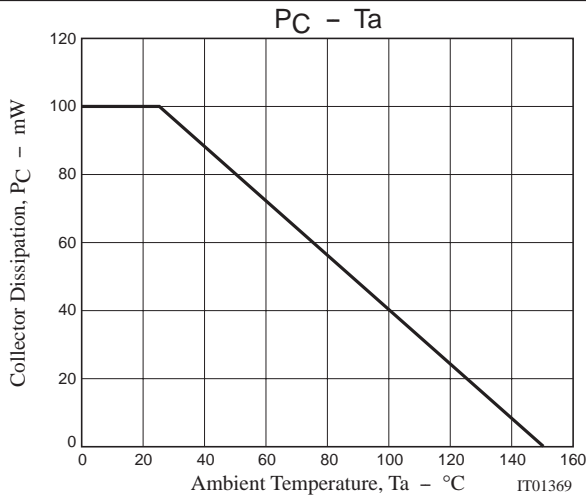
*Electrodes : on the bottom



This product adopts a high-frequency process. Please be careful when handling it because it is susceptible to static electricity.



EC3H02C



S Parameters (Common emitter)

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.955 | -22.6 | 3.418 | 163.3 | 0.056 | 76.0 | 0.975 | -10.5 |
| 200 | 0.922 | -43.0 | 3.109 | 148.7 | 0.104 | 63.2 | 0.921 | -19.6 |
| 400 | 0.845 | -77.2 | 2.617 | 124.8 | 0.165 | 44.2 | 0.794 | -32.9 |
| 600 | 0.782 | -101.8 | 2.156 | 107.7 | 0.189 | 31.3 | 0.694 | -41.5 |
| 800 | 0.746 | -119.1 | 1.788 | 94.2 | 0.200 | 23.5 | 0.630 | -47.7 |
| 1000 | 0.734 | -131.1 | 1.498 | 83.7 | 0.201 | 17.7 | 0.596 | -52.2 |
| 1200 | 0.717 | -141.2 | 1.326 | 74.6 | 0.198 | 14.7 | 0.573 | -57.6 |
| 1400 | 0.707 | -148.9 | 1.154 | 66.6 | 0.193 | 12.0 | 0.559 | -61.9 |
| 1600 | 0.708 | -155.5 | 1.029 | 60.2 | 0.182 | 10.7 | 0.561 | -66.1 |
| 1800 | 0.711 | -161.6 | 0.953 | 54.6 | 0.171 | 10.8 | 0.561 | -71.6 |
| 2000 | 0.712 | -166.5 | 0.880 | 49.3 | 0.160 | 13.0 | 0.569 | -76.5 |

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.818 | -47.9 | 13.330 | 150.0 | 0.049 | 64.3 | 0.869 | -29.8 |
| 200 | 0.739 | -83.2 | 10.545 | 129.6 | 0.076 | 49.6 | 0.681 | -50.0 |
| 400 | 0.661 | -122.9 | 6.688 | 107.4 | 0.098 | 37.8 | 0.445 | -71.3 |
| 600 | 0.627 | -142.2 | 4.726 | 95.9 | 0.106 | 35.4 | 0.334 | -81.7 |
| 800 | 0.616 | -153.8 | 3.653 | 87.5 | 0.114 | 36.3 | 0.279 | -89.2 |
| 1000 | 0.614 | -161.8 | 2.989 | 80.7 | 0.122 | 38.4 | 0.252 | -94.7 |
| 1200 | 0.611 | -167.3 | 2.534 | 75.1 | 0.130 | 40.8 | 0.238 | -99.0 |
| 1400 | 0.607 | -172.2 | 2.207 | 70.1 | 0.139 | 43.1 | 0.231 | -102.8 |
| 1600 | 0.607 | -176.6 | 1.965 | 65.5 | 0.149 | 45.1 | 0.227 | -106.4 |
| 1800 | 0.610 | 179.8 | 1.776 | 61.1 | 0.159 | 47.1 | 0.230 | -109.8 |
| 2000 | 0.609 | 176.9 | 1.627 | 57.0 | 0.171 | 48.6 | 0.237 | -112.1 |

$V_{CE}=2V, I_C=3mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.890 | -32.1 | 9.129 | 158.3 | 0.042 | 72.1 | 0.938 | -17.1 |
| 200 | 0.827 | -59.6 | 7.989 | 141.0 | 0.073 | 57.6 | 0.824 | -30.2 |
| 400 | 0.725 | -98.7 | 5.823 | 117.5 | 0.104 | 41.8 | 0.618 | -45.5 |
| 600 | 0.666 | -121.9 | 4.355 | 103.4 | 0.115 | 34.5 | 0.496 | -52.3 |
| 800 | 0.641 | -136.9 | 3.448 | 93.1 | 0.121 | 32.2 | 0.429 | -56.5 |
| 1000 | 0.631 | -147.3 | 2.854 | 85.1 | 0.125 | 32.0 | 0.392 | -59.9 |
| 1200 | 0.624 | -154.9 | 2.436 | 78.5 | 0.128 | 33.1 | 0.372 | -62.9 |
| 1400 | 0.618 | -161.3 | 2.124 | 72.8 | 0.131 | 35.2 | 0.360 | -66.0 |
| 1600 | 0.616 | -166.7 | 1.894 | 67.5 | 0.134 | 37.6 | 0.352 | -69.1 |
| 1800 | 0.618 | -171.4 | 1.715 | 62.7 | 0.139 | 40.3 | 0.351 | -72.9 |
| 2000 | 0.618 | -175.1 | 1.571 | 58.1 | 0.144 | 43.2 | 0.357 | -76.4 |

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$V_{CE}=2V, I_C=10mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.715 | -60.8 | 21.486 | 143.7 | 0.035 | 62.1 | 0.806 | -36.1 |
| 200 | 0.643 | -98.6 | 15.499 | 122.8 | 0.051 | 49.2 | 0.580 | -56.8 |
| 400 | 0.589 | -135.1 | 9.112 | 103.3 | 0.065 | 44.8 | 0.355 | -75.8 |
| 600 | 0.570 | -151.5 | 6.296 | 93.9 | 0.075 | 47.3 | 0.261 | -84.5 |
| 800 | 0.564 | -161.1 | 4.816 | 86.9 | 0.087 | 50.9 | 0.215 | -90.9 |
| 1000 | 0.563 | -167.7 | 3.921 | 81.1 | 0.098 | 53.6 | 0.192 | -95.4 |
| 1200 | 0.560 | -172.3 | 3.308 | 76.3 | 0.112 | 56.0 | 0.181 | -99.0 |
| 1400 | 0.558 | -176.2 | 2.867 | 72.1 | 0.125 | 57.7 | 0.172 | -102.6 |
| 1600 | 0.558 | 180.0 | 2.550 | 68.1 | 0.139 | 58.8 | 0.169 | -105.3 |
| 1800 | 0.562 | 176.8 | 2.293 | 64.2 | 0.155 | 59.5 | 0.170 | -107.8 |
| 2000 | 0.561 | 174.4 | 2.092 | 60.5 | 0.169 | 59.8 | 0.176 | -109.2 |

$V_{CE}=5V, I_C=7mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.797 | -42.9 | 17.630 | 152.0 | 0.030 | 68.4 | 0.892 | -22.3 |
| 200 | 0.708 | -76.1 | 14.170 | 132.4 | 0.048 | 55.1 | 0.723 | -36.7 |
| 400 | 0.608 | -116.0 | 9.186 | 110.4 | 0.064 | 45.4 | 0.494 | -48.9 |
| 600 | 0.565 | -136.4 | 6.534 | 98.9 | 0.073 | 44.6 | 0.385 | -52.5 |
| 800 | 0.550 | -148.8 | 5.055 | 90.8 | 0.081 | 46.8 | 0.329 | -54.0 |
| 1000 | 0.547 | -157.0 | 4.134 | 84.3 | 0.089 | 49.9 | 0.299 | -55.4 |
| 1200 | 0.541 | -163.2 | 3.497 | 79.0 | 0.098 | 52.4 | 0.285 | -56.7 |
| 1400 | 0.537 | -168.1 | 3.025 | 74.4 | 0.109 | 55.0 | 0.277 | -57.9 |
| 1600 | 0.539 | -172.5 | 2.687 | 70.0 | 0.119 | 57.0 | 0.270 | -60.1 |
| 1800 | 0.540 | -176.5 | 2.425 | 65.8 | 0.130 | 58.6 | 0.271 | -63.0 |
| 2000 | 0.540 | -179.4 | 2.212 | 61.9 | 0.142 | 59.9 | 0.277 | -65.8 |

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.618 | -71.5 | 30.252 | 138.1 | 0.023 | 60.6 | 0.748 | -37.0 |
| 200 | 0.554 | -110.5 | 20.311 | 117.7 | 0.034 | 52.7 | 0.511 | -52.9 |
| 400 | 0.519 | -143.1 | 11.419 | 100.5 | 0.046 | 54.5 | 0.306 | -62.6 |
| 600 | 0.507 | -156.8 | 7.810 | 92.4 | 0.058 | 58.7 | 0.230 | -64.0 |
| 800 | 0.504 | -165.0 | 5.941 | 86.2 | 0.071 | 62.2 | 0.193 | -64.9 |
| 1000 | 0.505 | -170.5 | 4.816 | 81.1 | 0.084 | 64.7 | 0.175 | -66.0 |
| 1200 | 0.504 | -174.3 | 4.051 | 76.8 | 0.098 | 66.2 | 0.167 | -67.0 |
| 1400 | 0.502 | -177.8 | 3.502 | 73.0 | 0.112 | 67.2 | 0.162 | -68.2 |
| 1600 | 0.504 | 178.9 | 3.107 | 69.3 | 0.127 | 67.4 | 0.159 | -70.1 |
| 1800 | 0.508 | 176.0 | 2.788 | 65.7 | 0.142 | 67.4 | 0.161 | -72.4 |
| 2000 | 0.507 | 173.9 | 2.539 | 62.3 | 0.155 | 67.1 | 0.169 | -74.8 |

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