## HIGH FREQUENCY LOW NOISE AMPLIFIER NPN SILICON EPITAXIAL TRANSISTOR 4 PINS MINI MOLD

## FEATURES

- Low Noise, High Gain
- Low Voltage Operation
- Low Feedback Capacitance

$$
\text { Cre }=0.3 \mathrm{pF} \text { TYP. }
$$

## ORDERING INFORMATION

| PART <br> NUMBER | QUANTITY | PACKING STYLE |
| :--- | :---: | :--- |
| 2 SC4957-T1 | $3 \mathrm{Kpcs} /$ Reel. | Embossed tape 8 mm wide. <br> Pin3 (Base), Pin4 (Emitter) face to perforation side <br> of the tape. |
| 2 SC4957-T2 | $3 \mathrm{Kpcs} /$ Reel. | Embossed tape 8 mm wide. <br> Pin1 (Collector), Pin2 (Emitter) face to perforation <br> side of the tape. |

* Please contact with responsible NEC person, if you require evaluation sample. Unit sample quantity shall be 50 pcs. (Part No.: 2SC4957)

| ABSOLUTE MAXIMUM RATINGS ( $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ ) |  |  |  |
| :---: | :---: | :---: | :---: |
| Collector to Base Voltage | Vсbo | 9 | V |
| Collector to Emitter Voltage | Vceo | 6 | V |
| Emitter to Base Voltage | Vebo | 2 | V |
| Collector Current | Ic | 30 | mA |
| Total Power Dissipation | $\mathrm{P}_{\text {T }}$ | 180 | mW |
| Junction Temperature | T ${ }^{\text {j}}$ | 150 | ${ }^{\circ} \mathrm{C}$ |
| Storage Temperature | Tstg | -65 to +150 | C |

## PACKAGE DIMENSIONS

in millimeters


## PIN CONNECTIONS

1. Collector
2. Emitter
3. Base
4. Emitter

ELECTRICAL CHARACTERISTICS ( $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ )

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITION |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Collector Cutoff Current | Icвo |  |  | 0.1 | $\mu \mathrm{A}$ | V CB $=5 \mathrm{~V}, \mathrm{le}=0$ |
| Emitter Cutoff Current | Iebo |  |  | 0.1 | $\mu \mathrm{A}$ | $\mathrm{V}_{\mathrm{EB}}=1 \mathrm{~V}, \mathrm{Ic}=0$ |
| DC Current Gain | hfe | 75 |  | 150 |  | $\mathrm{V}_{\text {CE }}=3 \mathrm{~V}, \mathrm{lc}=10 \mathrm{~mA}^{* 1}$ |
| Gain Bandwidth Product | ${ }_{\text {f }}$ |  | 12 |  | GHz | $\mathrm{V}_{\text {ce }}=3 \mathrm{~V}, \mathrm{Ic}=10 \mathrm{~mA}$ |
| Feed-back Capacitance | Cre |  | 0.3 | 0.5 | pF | $\mathrm{V}_{\text {св }}=3 \mathrm{~V}, \mathrm{le}=0, \mathrm{f}=1 \mathrm{MHz}^{* 2}$ |
| Insertion Power Gain | $\left\|S_{210}\right\|^{2}$ | 9 | 11 |  | dB | $\mathrm{V}_{\text {CE }}=3 \mathrm{~V}, \mathrm{lc}=10 \mathrm{~mA}, \mathrm{f}=2.0 \mathrm{GHz}$ |
| Noise Figure | NF |  | 1.5 | 2.5 | dB | $\mathrm{V}_{\text {ce }}=3 \mathrm{~V}, \mathrm{Ic}=3 \mathrm{~mA}, \mathrm{f}=2.0 \mathrm{GH}$ |

*1 Pulse Measurement; PW $\leq 350 \mu \mathrm{~s}$, Duty Cycle $\leq 2$ \% Pulsed.
*2 Measured with 3 terminals bridge, Emitter and Case should be grounded.

## hfe Classification

| Rank | T83 |
| :---: | :---: |
| Marking | T83 |
| hFE | 75 to 150 |

TYPICAL CHARACTERISTICS ( $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ )


COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



## S-PARAMETER

$\left(\mathrm{V}_{\mathrm{Ce}}=3 \mathrm{~V}, \mathrm{Ic}=1 \mathrm{~mA}, \mathrm{Zo}=50 \Omega\right)$

| f | $\mathrm{S}_{11}$ |  | S21 |  | S12 |  | S22 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| (GHz) | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.200 | . 935 | -14.9 | 3.466 | 165.9 | . 034 | 79.7 | . 991 | -7.9 |
| 0.400 | . 891 | -30.0 | 3.392 | 151.4 | . 066 | 73.1 | . 962 | -16.1 |
| 0.600 | . 830 | -44.6 | 3.269 | 137.9 | . 096 | 61.6 | . 916 | -22.6 |
| 0.800 | . 759 | -58.8 | 3.090 | 125.8 | . 119 | 53.2 | . 870 | -29.2 |
| 1.000 | . 677 | -74.2 | 2.891 | 113.5 | . 138 | 45.6 | . 813 | -35.1 |
| 1.200 | . 597 | -88.4 | 2.690 | 102.0 | . 154 | 40.6 | . 764 | -41.2 |
| 1.400 | . 521 | -104.0 | 2.519 | 92.4 | . 161 | 33.9 | . 706 | -46.0 |
| 1.600 | . 467 | -119.3 | 2.327 | 82.0 | . 172 | 31.2 | . 662 | -50.4 |
| 1.800 | . 418 | -134.6 | 2.190 | 73.1 | . 177 | 27.0 | . 619 | -55.3 |
| 2.000 | . 391 | -152.1 | 2.052 | 64.9 | . 177 | 23.4 | . 581 | -60.1 |
| 2.200 | . 382 | -168.4 | 1.909 | 56.5 | . 180 | 19.8 | . 550 | -64.5 |
| 2.400 | . 384 | 175.2 | 1.793 | 49.2 | . 189 | 22.1 | . 531 | -68.5 |
| 2.600 | . 379 | 163.6 | 1.684 | 42.4 | . 181 | 19.6 | . 484 | -73.2 |
| 2.800 | . 408 | 151.4 | 1.574 | 36.1 | . 189 | 18.3 | . 482 | -78.0 |
| 3.000 | . 431 | 142.5 | 1.482 | 31.5 | . 184 | 18.0 | . 454 | -84.7 |

$\left(\mathrm{V}_{\mathrm{CE}}=3 \mathrm{~V}, \mathrm{Ic}=3 \mathrm{~mA}, \mathrm{Zo}=50 \Omega\right)$

| f | $\mathrm{S}_{11}$ |  |  | $\mathrm{~S}_{21}$ |  |  |  |  |  |  |
| :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | :---: | :---: |
| $(\mathrm{GHz})$ | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| 0.200 | .813 | -24.5 | 8.901 | 156.5 | .034 | 79.6 | .955 | -13.4 |  |  |
| 0.400 | .693 | -46.7 | 7.806 | 135.6 | .058 | 67.4 | .862 | -24.7 |  |  |
| 0.600 | .563 | -65.0 | 6.683 | 119.4 | .078 | 59.1 | .758 | -31.6 |  |  |
| 0.800 | .453 | -81.5 | 5.677 | 106.9 | .092 | 53.5 | .669 | -37.3 |  |  |
| 1.000 | .362 | -98.3 | 4.878 | 95.8 | .105 | 50.1 | .606 | -40.8 |  |  |
| 1.200 | .290 | -115.6 | 4.249 | 86.1 | .112 | 47.5 | .553 | -45.2 |  |  |
| 1.400 | .250 | -133.3 | 3.771 | 78.6 | .123 | 46.3 | .509 | -48.4 |  |  |
| 1.600 | .217 | -153.6 | 3.363 | 70.7 | .141 | 43.2 | .472 | -52.4 |  |  |
| 1.800 | .206 | -171.5 | 3.053 | 63.4 | .149 | 42.5 | .438 | -55.7 |  |  |
| 2.000 | .221 | 170.3 | 2.807 | 57.1 | .158 | 39.6 | .407 | -60.9 |  |  |
| 2.200 | .238 | 153.4 | 2.571 | 50.5 | .169 | 39.1 | .388 | -65.7 |  |  |
| 2.400 | .264 | 142.1 | 2.382 | 45.0 | .178 | 36.3 | .362 | -70.1 |  |  |
| 2.600 | .285 | 132.7 | 2.219 | 39.6 | .197 | 35.2 | .326 | -73.4 |  |  |
| 2.800 | .317 | 124.4 | 2.080 | 34.3 | .204 | 35.4 | .317 | -79.0 |  |  |
| 3.000 | .344 | 119.8 | 1.953 | 29.7 | .223 | 32.9 | .302 | -87.6 |  |  |

## S-PARAMETER

$\left(\mathrm{V}_{\text {Ce }}=3 \mathrm{~V}, \mathrm{Ic}=5 \mathrm{~mA}, \mathrm{Zo}=50 \Omega\right)$

| f | $\mathrm{S}_{11}$ |  |  | $\mathrm{~S}_{21}$ |  | $\mathrm{~S}_{12}$ |  |  |
| :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| $(\mathrm{GHz})$ | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
|  |  |  |  |  |  |  |  |  |
| 0.200 | .716 | -31.0 | 12.446 | 150.0 | .030 | 73.7 | .918 | -17.3 |
| 0.400 | .553 | -55.6 | 10.005 | 126.8 | .053 | 65.2 | .777 | -28.8 |
| 0.600 | .412 | -74.5 | 8.004 | 110.6 | .067 | 60.3 | .659 | -34.0 |
| 0.800 | .315 | -91.6 | 6.521 | 99.2 | .084 | 56.2 | .577 | -38.0 |
| 1.000 | .243 | -109.4 | 5.457 | 89.4 | .099 | 58.4 | .526 | -40.5 |
| 1.200 | .190 | -130.1 | 4.678 | 80.7 | .106 | 53.6 | .488 | -44.5 |
| 1.400 | .167 | -152.1 | 4.099 | 74.1 | .120 | 51.9 | .447 | -46.9 |
| 1.600 | .161 | -174.4 | 3.628 | 67.1 | .133 | 49.3 | .420 | -51.2 |
| 1.800 | .162 | 167.5 | 3.287 | 60.5 | .146 | 48.0 | .389 | -55.1 |
| 2.000 | .193 | 149.8 | 3.008 | 54.9 | .157 | 46.3 | .354 | -59.2 |
| 2.200 | .220 | 137.4 | 2.748 | 48.6 | .169 | 44.9 | .341 | -63.9 |
| 2.400 | .252 | 128.7 | 2.552 | 43.7 | .185 | 39.6 | .315 | -69.2 |
| 2.600 | .267 | 122.3 | 2.366 | 38.6 | .201 | 40.2 | .291 | -71.6 |
| 2.800 | .311 | 116.7 | 2.212 | 33.7 | .211 | 37.0 | .270 | -76.9 |
| 3.000 | .330 | 112.1 | 2.079 | 29.2 | .228 | 35.6 | .260 | -88.5 |

$(\mathrm{V}$ ce $=3 \mathrm{~V}, \mathrm{Ic}=10 \mathrm{~mA}, \mathrm{Zo}=50 \Omega)$

| $f$ | $\mathrm{S}_{11}$ |  | S21 |  | $\mathrm{S}_{12}$ |  | S 22 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| (GHz) | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.200 | . 536 | -42.2 | 17.753 | 139.3 | . 024 | 66.6 | . 840 | -22.7 |
| 0.400 | . 349 | -68.1 | 12.387 | 115.1 | . 041 | 67.9 | . 654 | -31.7 |
| 0.600 | . 232 | -88.4 | 9.189 | 100.7 | . 057 | 64.3 | . 547 | -34.1 |
| 0.800 | . 165 | -107.1 | 7.205 | 91.0 | . 071 | 60.3 | . 489 | -35.7 |
| 1.000 | . 124 | -130.9 | 5.913 | 82.8 | . 090 | 62.7 | . 451 | -37.5 |
| 1.200 | . 106 | -163.8 | 5.000 | 75.3 | . 103 | 61.1 | . 413 | -41.4 |
| 1.400 | . 116 | 173.3 | 4.352 | 69.7 | . 122 | 58.4 | . 394 | -43.4 |
| 1.600 | . 137 | 153.2 | 3.841 | 63.5 | . 138 | 54.9 | . 367 | -47.4 |
| 1.800 | . 149 | 137.7 | 3.463 | 57.5 | . 145 | 54.6 | . 338 | -51.0 |
| 2.000 | . 184 | 129.3 | 3.168 | 52.5 | . 170 | 51.2 | . 319 | -55.9 |
| 2.200 | . 216 | 121.9 | 2.876 | 46.7 | . 184 | 48.0 | . 298 | -63.7 |
| 2.400 | . 249 | 117.4 | 2.676 | 42.1 | . 191 | 46.4 | . 282 | -67.7 |
| 2.600 | . 270 | 111.3 | 2.486 | 37.3 | . 208 | 42.9 | . 241 | -71.9 |
| 2.800 | . 306 | 109.1 | 2.319 | 32.9 | . 221 | 39.2 | . 236 | -76.7 |
| 3.000 | . 328 | 105.5 | 2.183 | 28.4 | . 238 | 36.7 | . 210 | -89.3 |

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