# 2SC5772

## Silicon NPN Epitaxial
## VHF/UHF wide band amplifier

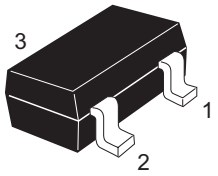
REJ03G0755-0200
(Previous ADE-208-1390)
Preliminary
Rev.2.00
Aug.10.2005

### Features

- High gain bandwidth product
  $f_T$ = 9 GHz typ.
- High power gain and low noise figure ;
  PG = 13 dB typ., NF = 1.1 dB typ. at f = 900 MHz

### Outline

RENESAS Package code: PLSP0003ZB-A
(Package name: MPAK)




1. Emitter
2. Base
3. Collector

Note: Marking is “FR-”.

### Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to base voltage | $V_{CBO}$ | 15 | V |
| Collector to emitter voltage | $V_{CEO}$ | 9 | V |
| Emitter to base voltage | $V_{EBO}$ | 1.5 | V |
| Collector current | $I_C$ | 75 | mA |
| Collector power dissipation | Pc | 700* | mW |
| Junction temperature | Tj | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

* When using aluminum ceramic board (25 x 60 x 0.7 mm)

This data sheet contains tentative specification for new product development. It may partially be subject to change without notice.

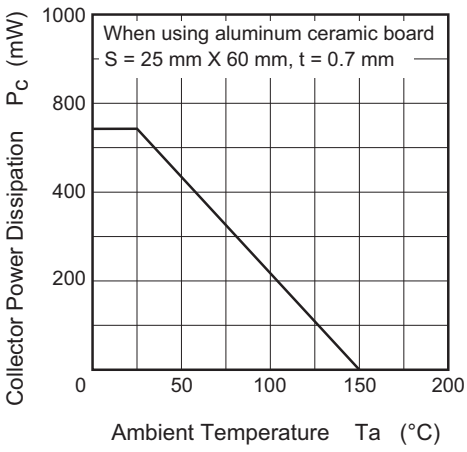
## Electrical Characteristics

(Ta = 25°C)

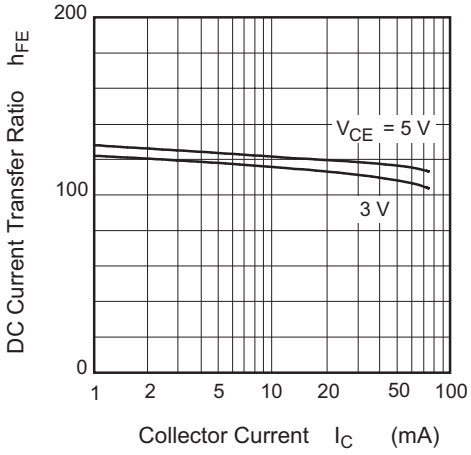
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Collector to base breakdown voltage | $V_{(BR)CBO}$ | 15 | — | — | V | $I_C$ = 10 µA, $I_E$ = 0 |
| Collector cutoff current | $I_{CBO}$ | — | — | 1 | µA | $V_{CB}$ = 12 V, $I_E$ = 0 |
| Collector cutoff current | $I_{CEO}$ | — | — | 1 | mA | $V_{CE}$ = 9 V, $R_{BE}$ = ∞ |
| Emitter cutoff current | $I_{EBO}$ | — | — | 10 | µA | $V_{EB}$ = 1.5 V, $I_C$ = 0 |
| DC current transfer ratio | $h_{FE}$ | 80 | 120 | 160 | | $V_{CE}$ = 5 V, $I_C$ = 20 mA |
| Collector output capacitance | Cob | — | 0.9 | 1.5 | pF | $V_{CB}$ = 5 V, $I_E$ = 0<br>f = 1 MHz |
| Reverse transfer capacitance | Cre | — | 0.7 | — | pF | $V_{CB}$ = 5 V, $I_E$ = 0<br>f = 1 MHz |
| Gain bandwidth product | $f_T$ | 6 | 9 | — | GHz | $V_{CE}$ = 5 V, $I_C$ = 20 mA<br>f = 1 GHz |
| $S_{21}$ parameter | $\|S_{21}\|^2$ | — | 11.8 | — | dB | $V_{CE}$ = 5 V, $I_C$ = 20 mA<br>f = 1 GHz |
| Power gain | PG | 9.5 | 13 | — | dB | $V_{CE}$ = 5 V, $I_C$ = 20 mA<br>f = 900 MHz |
| Noise figure | NF | — | 1.1 | 1.9 | dB | $V_{CE}$ = 5 V, $I_C$ = 5 mA<br>f = 900 MHz |

## Main Characteristics

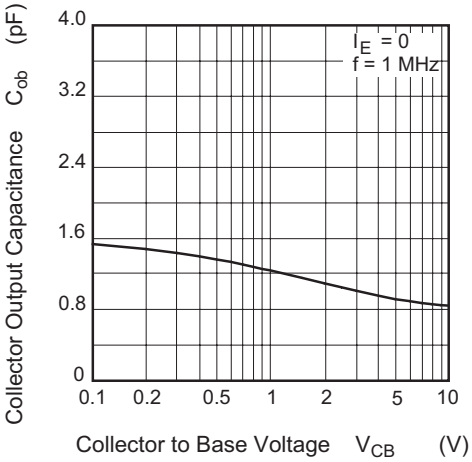
Collector Power Dissipation Curve



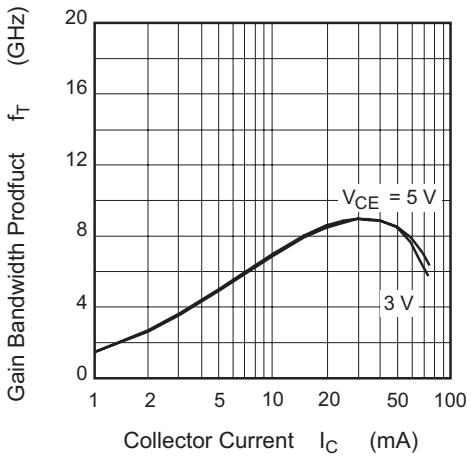

DC Current Transfet Ratio vs. Collector Current



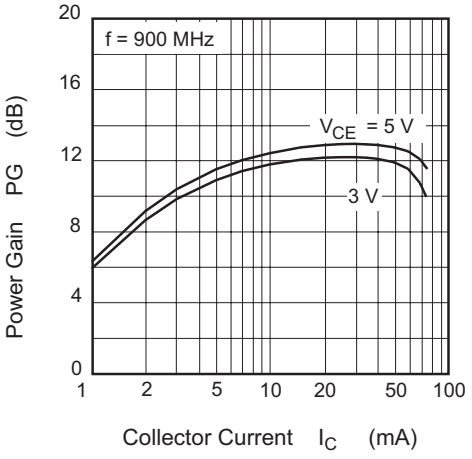

Collector Output Capacitance vs. Collector to Base Voltage



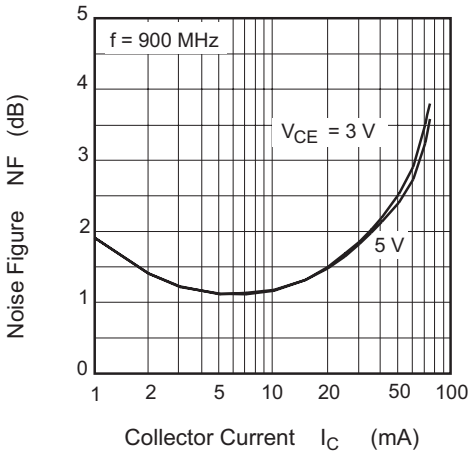

Gain Bandwidth Product vs. Collector Current

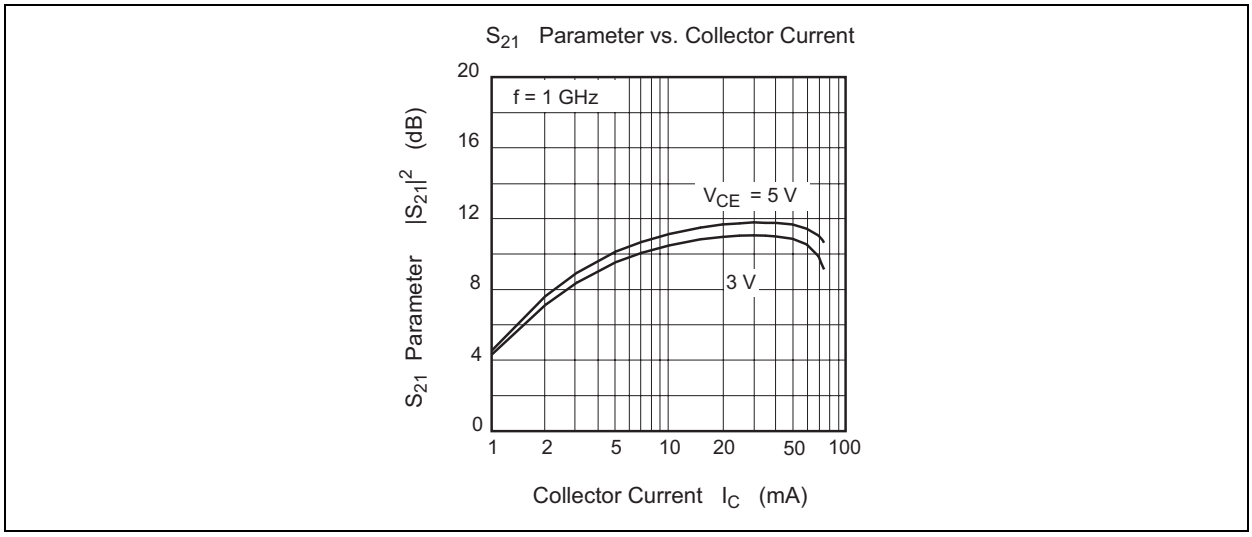



Power Gain vs. Collector Current

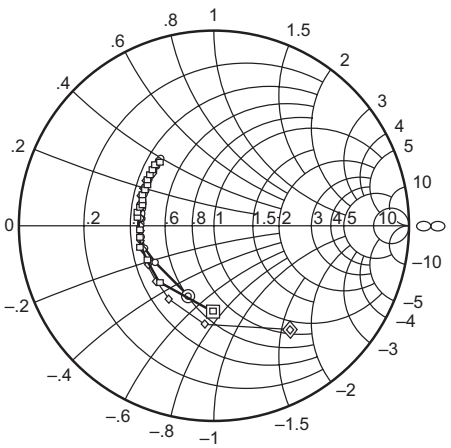



Noise Figure vs. Collector Current



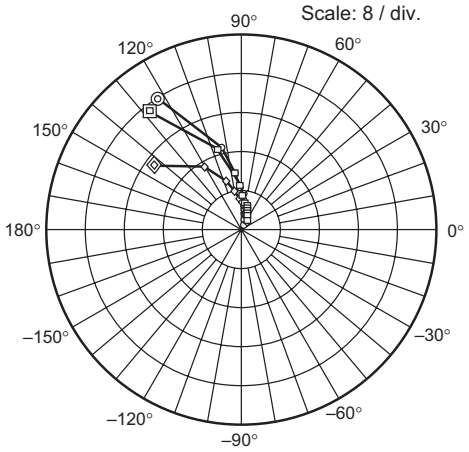


S11 Parameter vs. Frequency



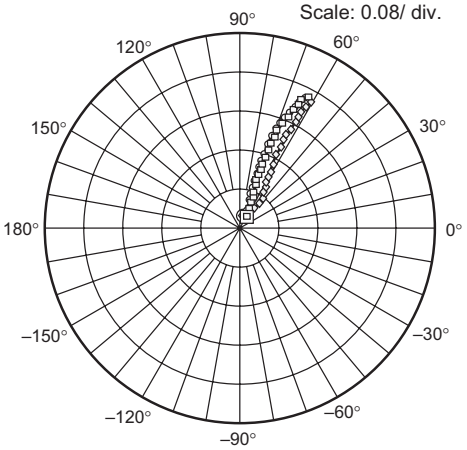

Condition: $V_{CE}$ = 3 V, $Z_O$ = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 30 mA)
( IC = 10 mA)

S21 Paramter vs. Frequency



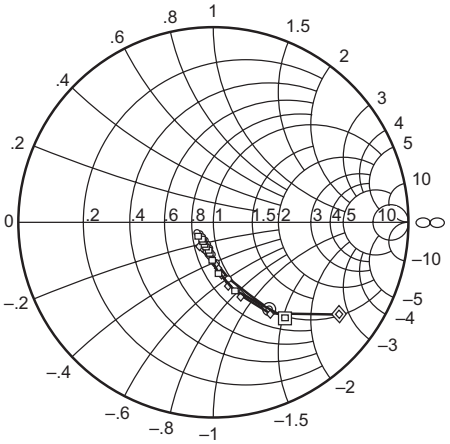

Condition: $V_{CE}$ = 3 V, $Z_O$ = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 30 mA)
( IC = 10 mA)

S12 Parameter vs. Frequency



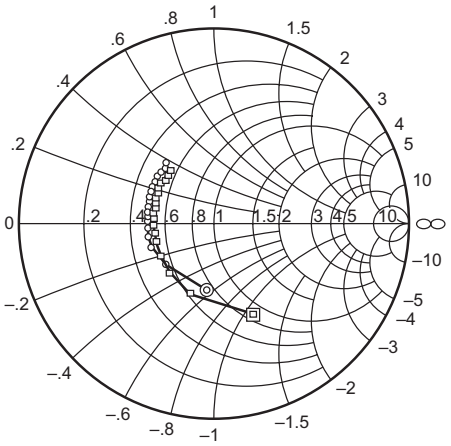

Condition: $V_{CE}$ = 3 V, $Z_O$ = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 30 mA)
( IC = 10 mA)

S22 Parameter vs. Frequency



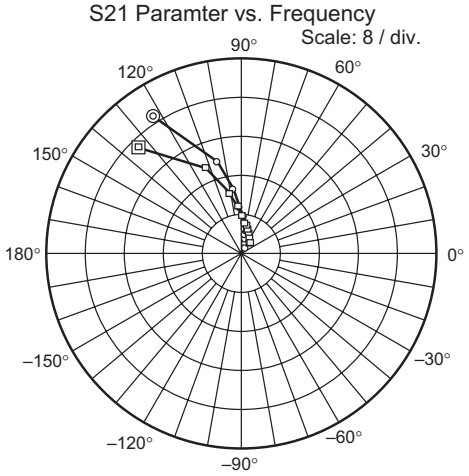

Condition: $V_{CE}$ = 3 V, $Z_O$ = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 30 mA)
( IC = 10 mA)

S11 Parameter vs. Frequency



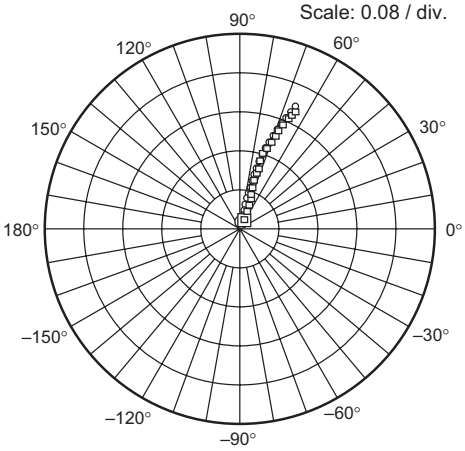

Condition: VCE = 5 V, ZO = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 20 mA)

S21 Paramter vs. Frequency



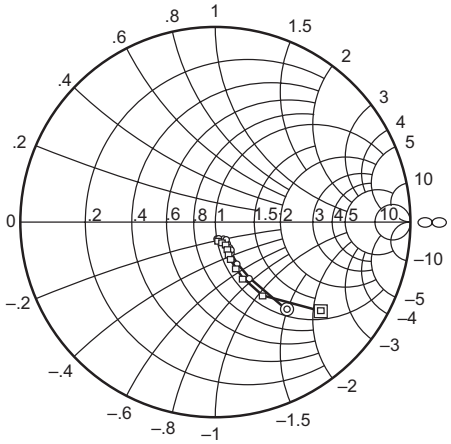

Condition: VCE = 5 V, ZO = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 20 mA)

S12 Parameter vs. Frequency




Condition: VCE = 5 V, ZO = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 20 mA)

S22 Parameter vs. Frequency




Condition: VCE = 5 V, ZO = 50 Ω
100 to 2000 MHz (100 MHz Step)
( IC = 50 mA)
( IC = 20 mA)

## Sparameter

($V_{CE}$ = 3V, $I_C$ = 10mA, Zo = 50Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.651 | -53.8 | 21.22 | 142.8 | 0.035 | 65.6 | 0.802 | -35.5 |
| 200 | 0.502 | -93.8 | 14.62 | 120.0 | 0.054 | 56.9 | 0.554 | -56.2 |
| 300 | 0.431 | -119.6 | 10.48 | 107.6 | 0.067 | 56.0 | 0.401 | -66.9 |
| 400 | 0.396 | -136.4 | 8.09 | 99.8 | 0.079 | 56.9 | 0.317 | -72.8 |
| 500 | 0.381 | -149.9 | 6.57 | 94.2 | 0.091 | 58.9 | 0.263 | -77.2 |
| 600 | 0.364 | -158.7 | 5.54 | 89.7 | 0.103 | 60.3 | 0.227 | -80.4 |
| 700 | 0.365 | -167.2 | 4.78 | 85.9 | 0.116 | 61.6 | 0.201 | -83.3 |
| 800 | 0.364 | -174.6 | 4.22 | 82.5 | 0.128 | 62.5 | 0.183 | -85.6 |
| 900 | 0.362 | 179.5 | 3.75 | 79.3 | 0.141 | 63.1 | 0.168 | -88.3 |
| 1000 | 0.362 | 173.4 | 3.41 | 76.4 | 0.154 | 63.6 | 0.158 | -90.2 |
| 1100 | 0.366 | 168.8 | 3.12 | 73.9 | 0.167 | 63.7 | 0.150 | -92.7 |
| 1200 | 0.366 | 164.6 | 2.89 | 71.2 | 0.179 | 63.8 | 0.144 | -95.0 |
| 1300 | 0.373 | 160.3 | 2.69 | 68.8 | 0.192 | 63.6 | 0.138 | -97.0 |
| 1400 | 0.372 | 155.8 | 2.51 | 66.4 | 0.205 | 63.4 | 0.135 | -99.0 |
| 1500 | 0.379 | 152.6 | 2.37 | 64.3 | 0.217 | 63.2 | 0.133 | -101.7 |
| 1600 | 0.382 | 149.1 | 2.24 | 62.0 | 0.231 | 62.8 | 0.131 | -103.7 |
| 1700 | 0.386 | 145.0 | 2.14 | 60.1 | 0.243 | 62.5 | 0.130 | -106.0 |
| 1800 | 0.393 | 142.2 | 2.03 | 58.0 | 0.254 | 61.8 | 0.129 | -108.2 |
| 1900 | 0.390 | 139.2 | 1.94 | 55.9 | 0.268 | 61.6 | 0.129 | -110.5 |
| 2000 | 0.400 | 135.4 | 1.87 | 54.0 | 0.278 | 60.7 | 0.129 | -112.1 |

($V_{CE}$ = 3V, $I_C$ = 30mA, Zo = 50Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.419 | -90.2 | 30.42 | 127.3 | 0.026 | 63.9 | 0.608 | -53.5 |
| 200 | 0.366 | -132.9 | 17.49 | 107.6 | 0.040 | 64.4 | 0.357 | -74.3 |
| 300 | 0.358 | -151.9 | 11.80 | 98.6 | 0.055 | 67.0 | 0.247 | -85.0 |
| 400 | 0.355 | -163.8 | 8.88 | 93.1 | 0.070 | 69.5 | 0.193 | -91.9 |
| 500 | 0.354 | -173.3 | 7.14 | 89.0 | 0.085 | 70.6 | 0.162 | -98.0 |
| 600 | 0.356 | -178.8 | 5.97 | 85.5 | 0.100 | 71.5 | 0.141 | -102.8 |
| 700 | 0.356 | 174.3 | 5.13 | 82.4 | 0.115 | 71.5 | 0.127 | -107.4 |
| 800 | 0.364 | 169.5 | 4.51 | 79.6 | 0.130 | 71.4 | 0.117 | -111.3 |
| 900 | 0.361 | 165.9 | 4.01 | 77.0 | 0.146 | 71.0 | 0.111 | -114.9 |
| 1000 | 0.359 | 160.6 | 3.64 | 74.6 | 0.160 | 70.6 | 0.105 | -118.5 |
| 1100 | 0.367 | 157.8 | 3.33 | 72.2 | 0.176 | 70.0 | 0.103 | -121.5 |
| 1200 | 0.370 | 153.6 | 3.07 | 70.2 | 0.190 | 69.4 | 0.101 | -124.5 |
| 1300 | 0.368 | 150.1 | 2.86 | 67.7 | 0.204 | 68.3 | 0.099 | -127.0 |
| 1400 | 0.376 | 146.5 | 2.67 | 65.9 | 0.218 | 68.0 | 0.099 | -129.3 |
| 1500 | 0.382 | 144.2 | 2.52 | 63.9 | 0.232 | 67.2 | 0.098 | -131.8 |
| 1600 | 0.387 | 141.0 | 2.38 | 61.8 | 0.247 | 66.4 | 0.099 | -133.9 |
| 1700 | 0.388 | 137.3 | 2.27 | 59.9 | 0.260 | 65.6 | 0.100 | -135.8 |
| 1800 | 0.393 | 134.9 | 2.15 | 58.0 | 0.274 | 64.6 | 0.100 | -138.0 |
| 1900 | 0.394 | 132.8 | 2.07 | 56.3 | 0.288 | 63.8 | 0.102 | -139.9 |
| 2000 | 0.393 | 129.3 | 1.98 | 54.5 | 0.298 | 62.6 | 0.103 | -140.6 |

($V_{CE}$ = 3V, $I_C$ = 50mA, Zo = 50Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.365 | -111.0 | 31.77 | 122.3 | 0.023 | 65.4 | 0.530 | -58.5 |
| 200 | 0.363 | -147.7 | 17.40 | 104.2 | 0.037 | 68.1 | 0.299 | -77.7 |
| 300 | 0.370 | -162.8 | 11.60 | 96.2 | 0.052 | 71.0 | 0.207 | -87.5 |
| 400 | 0.368 | -172.3 | 8.71 | 91.0 | 0.068 | 72.8 | 0.163 | -94.0 |
| 500 | 0.374 | -179.4 | 6.97 | 87.3 | 0.083 | 73.4 | 0.137 | -99.7 |
| 600 | 0.375 | 174.9 | 5.84 | 84.0 | 0.099 | 73.8 | 0.121 | -104.7 |
| 700 | 0.378 | 170.4 | 5.02 | 81.2 | 0.114 | 73.6 | 0.110 | -108.8 |
| 800 | 0.383 | 165.8 | 4.41 | 78.4 | 0.129 | 73.4 | 0.103 | -112.5 |
| 900 | 0.381 | 161.7 | 3.91 | 76.0 | 0.146 | 72.7 | 0.099 | -116.4 |
| 1000 | 0.384 | 157.4 | 3.55 | 73.3 | 0.161 | 72.4 | 0.095 | -119.2 |
| 1100 | 0.389 | 153.7 | 3.25 | 71.2 | 0.177 | 71.6 | 0.093 | -122.6 |
| 1200 | 0.394 | 150.4 | 3.00 | 69.0 | 0.190 | 70.7 | 0.092 | -125.1 |
| 1300 | 0.395 | 147.3 | 2.80 | 66.7 | 0.204 | 69.7 | 0.091 | -127.8 |
| 1400 | 0.398 | 144.1 | 2.61 | 64.8 | 0.219 | 69.2 | 0.092 | -129.7 |
| 1500 | 0.407 | 141.7 | 2.46 | 62.9 | 0.233 | 68.2 | 0.092 | -132.2 |
| 1600 | 0.410 | 139.0 | 2.33 | 60.8 | 0.248 | 67.4 | 0.093 | -134.0 |
| 1700 | 0.407 | 135.2 | 2.21 | 59.0 | 0.262 | 66.5 | 0.095 | -135.9 |
| 1800 | 0.414 | 133.5 | 2.10 | 57.2 | 0.275 | 65.5 | 0.096 | -137.7 |
| 1900 | 0.412 | 130.3 | 2.02 | 55.0 | 0.289 | 64.8 | 0.098 | -139.5 |
| 2000 | 0.423 | 127.6 | 1.93 | 53.1 | 0.300 | 63.6 | 0.099 | -140.4 |

($V_{CE}$ = 5V, $I_C$ = 20mA, Zo = 50Ω)

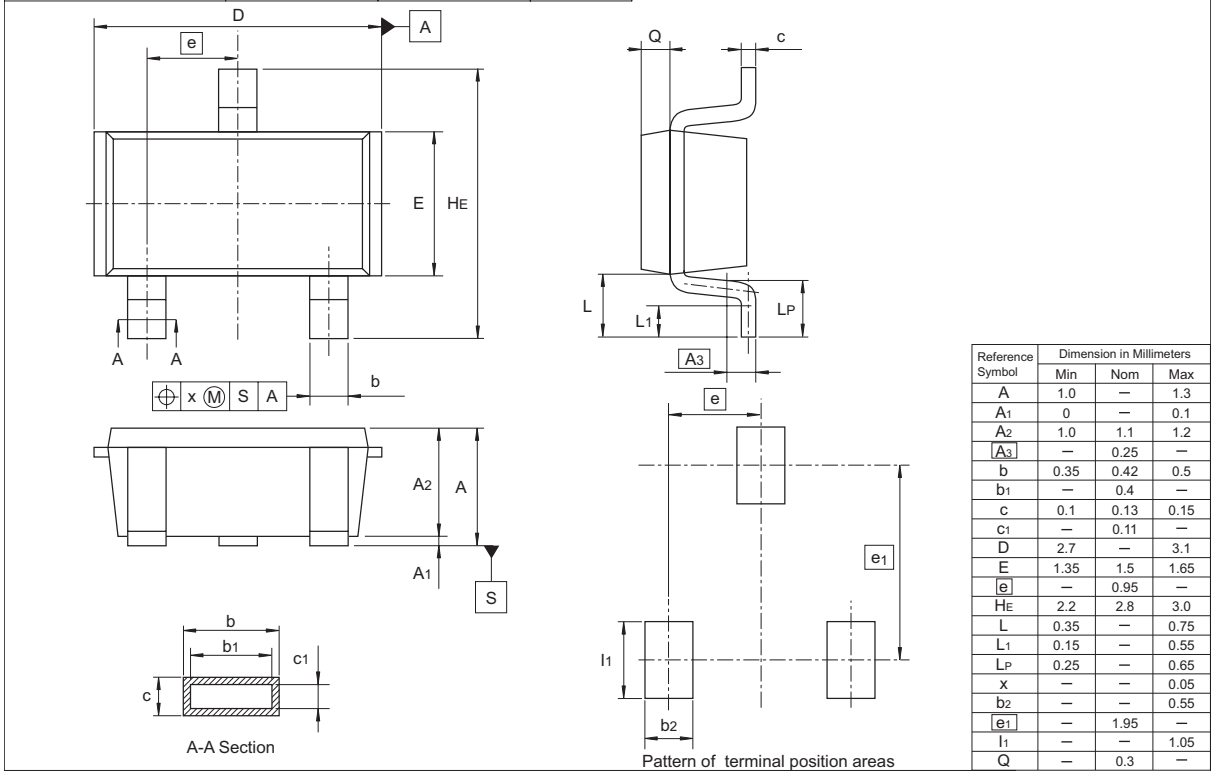
| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.505 | -66.9 | 29.11 | 134.6 | 0.026 | 65.8 | 0.707 | -40.5 |
| 200 | 0.381 | -108.9 | 18.04 | 112.9 | 0.040 | 62.3 | 0.448 | -57.3 |
| 300 | 0.337 | -132.7 | 12.44 | 102.5 | 0.053 | 64.6 | 0.318 | -63.3 |
| 400 | 0.320 | -148.4 | 9.46 | 96.2 | 0.065 | 66.7 | 0.252 | -65.8 |
| 500 | 0.311 | -161.0 | 7.63 | 91.6 | 0.079 | 68.2 | 0.211 | -67.2 |
| 600 | 0.305 | -168.4 | 6.40 | 87.7 | 0.092 | 69.2 | 0.184 | -67.9 |
| 700 | 0.308 | -176.8 | 5.51 | 84.5 | 0.105 | 69.7 | 0.165 | -68.5 |
| 800 | 0.306 | 177.7 | 4.84 | 81.4 | 0.119 | 70.1 | 0.152 | -69.2 |
| 900 | 0.311 | 172.1 | 4.30 | 78.8 | 0.133 | 70.0 | 0.142 | -70.5 |
| 1000 | 0.309 | 166.8 | 3.90 | 76.1 | 0.145 | 69.8 | 0.134 | -71.1 |
| 1100 | 0.313 | 163.3 | 3.57 | 73.7 | 0.159 | 69.5 | 0.128 | -72.7 |
| 1200 | 0.321 | 158.2 | 3.29 | 71.4 | 0.172 | 69.0 | 0.124 | -74.2 |
| 1300 | 0.318 | 154.7 | 3.06 | 69.1 | 0.184 | 68.3 | 0.119 | -75.5 |
| 1400 | 0.323 | 150.1 | 2.86 | 67.2 | 0.198 | 67.9 | 0.117 | -77.2 |
| 1500 | 0.333 | 147.6 | 2.69 | 65.1 | 0.210 | 67.3 | 0.114 | -79.1 |
| 1600 | 0.338 | 145.0 | 2.53 | 63.0 | 0.223 | 66.6 | 0.113 | -80.9 |
| 1700 | 0.338 | 139.3 | 2.41 | 61.0 | 0.236 | 66.1 | 0.113 | -83.2 |
| 1800 | 0.344 | 136.8 | 2.29 | 59.1 | 0.248 | 65.1 | 0.111 | -85.5 |
| 1900 | 0.344 | 134.7 | 2.19 | 57.3 | 0.260 | 64.5 | 0.110 | -88.0 |
| 2000 | 0.351 | 131.2 | 2.10 | 55.5 | 0.271 | 63.4 | 0.110 | -89.6 |

($V_{CE}$ = 5V, $I_C$ = 50mA, Zo = 50Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.360 | -99.4 | 34.20 | 124.3 | 0.020 | 66.9 | 0.567 | -48.7 |
| 200 | 0.329 | -139.8 | 19.03 | 105.6 | 0.034 | 68.2 | 0.330 | -60.7 |
| 300 | 0.323 | -157.8 | 12.76 | 97.1 | 0.047 | 71.6 | 0.233 | -63.2 |
| 400 | 0.323 | -168.1 | 9.58 | 92.1 | 0.061 | 73.6 | 0.186 | -63.4 |
| 500 | 0.326 | -176.6 | 7.69 | 88.2 | 0.075 | 74.1 | 0.160 | -63.3 |
| 600 | 0.328 | 177.5 | 6.42 | 85.0 | 0.089 | 74.6 | 0.142 | -63.4 |
| 700 | 0.326 | 172.1 | 5.51 | 82.0 | 0.103 | 74.4 | 0.131 | -63.6 |
| 800 | 0.332 | 166.9 | 4.85 | 79.2 | 0.117 | 74.1 | 0.122 | -63.9 |
| 900 | 0.335 | 163.3 | 4.30 | 76.9 | 0.131 | 73.6 | 0.116 | -65.2 |
| 1000 | 0.336 | 159.3 | 3.90 | 74.3 | 0.145 | 73.3 | 0.112 | -65.9 |
| 1100 | 0.338 | 155.0 | 3.56 | 72.2 | 0.158 | 72.4 | 0.108 | -67.9 |
| 1200 | 0.349 | 151.7 | 3.28 | 69.9 | 0.172 | 72.0 | 0.106 | -69.5 |
| 1300 | 0.347 | 148.8 | 3.05 | 67.9 | 0.185 | 71.0 | 0.103 | -70.9 |
| 1400 | 0.350 | 144.3 | 2.85 | 65.9 | 0.198 | 70.4 | 0.102 | -73.3 |
| 1500 | 0.360 | 142.0 | 2.67 | 64.0 | 0.210 | 69.7 | 0.101 | -75.5 |
| 1600 | 0.362 | 139.2 | 2.52 | 62.1 | 0.224 | 68.7 | 0.101 | -77.7 |
| 1700 | 0.361 | 135.3 | 2.40 | 60.1 | 0.237 | 67.9 | 0.101 | -80.0 |
| 1800 | 0.373 | 133.4 | 2.28 | 58.1 | 0.249 | 66.9 | 0.101 | -82.5 |
| 1900 | 0.366 | 130.6 | 2.19 | 56.3 | 0.262 | 66.2 | 0.101 | -85.5 |
| 2000 | 0.383 | 127.4 | 2.10 | 54.6 | 0.272 | 65.2 | 0.102 | -87.1 |

## Package Dimensions

| JEITA Package Code | RENESAS Code | Package Name | MASS[Typ.] |
|---|---|---|---|
| SC-59A | PLSP0003ZB-A | MPAK(T) / MPAK(T)V, MPAK / MPAKV | 0.011g |




| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| A | 1.0 | — | 1.3 |
| $A_1$ | 0 | — | 0.1 |
| $A_2$ | 1.0 | 1.1 | 1.2 |
| $A_3$ | — | 0.25 | — |
| b | 0.35 | 0.42 | 0.5 |
| $b_1$ | — | 0.4 | — |
| c | 0.1 | 0.13 | 0.15 |
| $c_1$ | — | 0.11 | — |
| D | 2.7 | — | 3.1 |
| E | 1.35 | 1.5 | 1.65 |
| e | — | 0.95 | — |
| $H_E$ | 2.2 | 2.8 | 3.0 |
| L | 0.35 | — | 0.75 |
| $L_1$ | 0.15 | — | 0.55 |
| $L_P$ | 0.25 | — | 0.65 |
| x | — | — | 0.05 |
| $b_2$ | — | — | 0.55 |
| $e_1$ | — | 1.95 | — |
| $l_1$ | — | — | 1.05 |
| Q | — | 0.3 | — |

## Ordering Information

| Part Name | Quantity | Shipping Container |
|---|---|---|
| 2SC5772FR-TL-E | 3000 | ϕ 178 mm Reel, 8 mm Emboss Taping |

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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## RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

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