



# SBFP420D

## UHF to C Band Low Noise Amplifier, Oscillation Applications

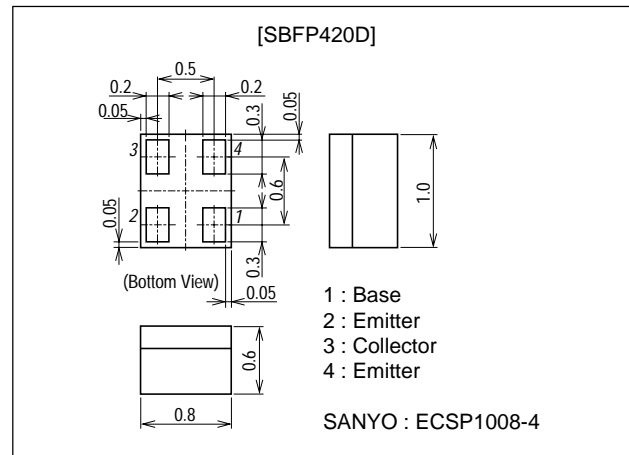
### Features

- Low noise : NF=1.1dB typ (f=1.8GHz).
- High cut-off frequency :  $f_T=20\text{GHz}$  typ ( $V_{CE}=1\text{V}$ ).  
:  $f_T=25\text{GHz}$  typ ( $V_{CE}=3\text{V}$ ).
- Low voltage operation.
- High Gain :  $|S_{21e}|^2=17\text{dB}$  typ (f=1.8GHz).
- Ultrasmall (1008 size), thin (0.6mm) leadless package.

### Package Dimensions

unit : mm

2215



### Specifications

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

| Parameter                    | Symbol    | Conditions | Ratings     | Unit             |
|------------------------------|-----------|------------|-------------|------------------|
| Collector-to-Base Voltage    | $V_{CBO}$ |            | 15          | V                |
| Collector-to-Emitter Voltage | $V_{CEO}$ |            | 4.5         | V                |
| Emitter-to-Base Voltage      | $V_{EBO}$ |            | 1.5         | V                |
| Collector Current            | $I_C$     |            | 35          | 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     | $I_{CBO}$       | $V_{CB}=5\text{V}, I_E=0$                            |         |      | 200  | nA            |
| Emitter Cutoff Current       | $I_{EBO}$       | $V_{EB}=1.5\text{V}, I_C=0$                          |         |      | 35   | $\mu\text{A}$ |
| DC Current Gain              | $h_{FE}$        | $V_{CE}=4\text{V}, I_C=20\text{mA}$                  | 50      |      | 150  |               |
| Gain-Bandwidth Product       | $f_{T1}$        | $V_{CE}=1\text{V}, I_C=10\text{mA}$                  |         | 20   |      | GHz           |
|                              | $f_{T2}$        | $V_{CE}=3\text{V}, I_C=30\text{mA}$                  | 18      | 25   |      | GHz           |
| Reverse Transfer Capacitance | $C_{re}$        | $V_{CB}=1\text{V}, f=1\text{MHz}$                    |         | 0.17 | 0.27 | pF            |
| Forward Transfer Gain        | $ S_{21e} ^2_1$ | $V_{CE}=1\text{V}, I_C=10\text{mA}, f=1.8\text{GHz}$ |         | 16   |      | dB            |
|                              | $ S_{21e} ^2_2$ | $V_{CE}=2\text{V}, I_C=20\text{mA}, f=1.8\text{GHz}$ | 14      | 17   |      | dB            |
| Noise Figure                 | NF              | $V_{CE}=2\text{V}, I_C=5\text{mA}, f=1.8\text{GHz}$  |         | 1.1  | 1.5  | dB            |

Marking : AD

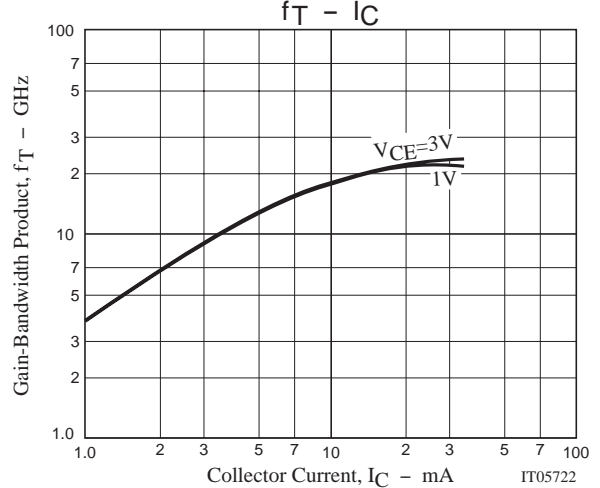
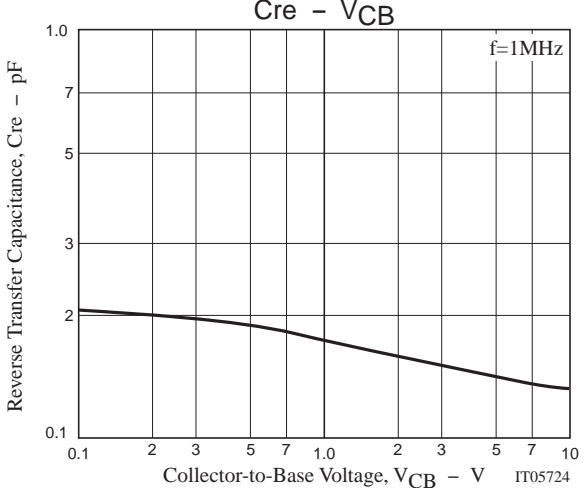
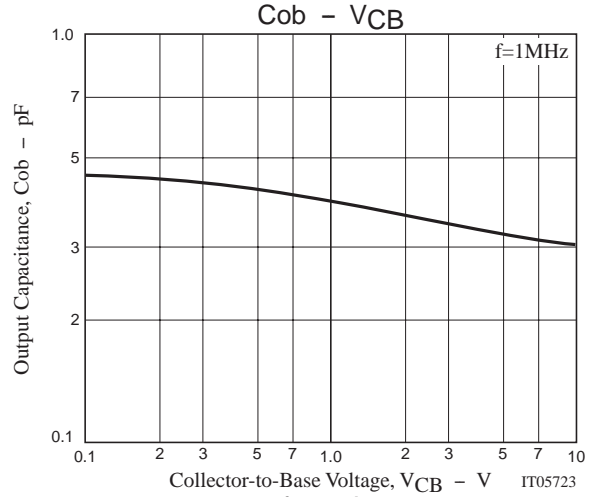
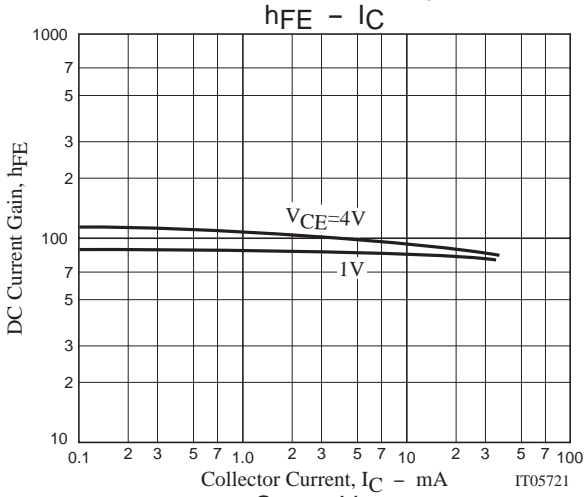
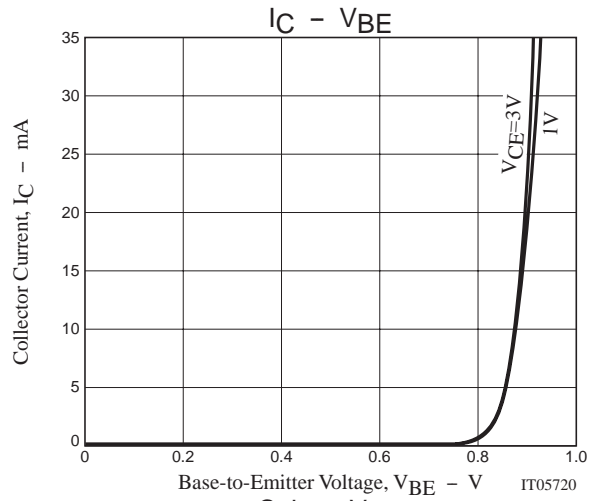
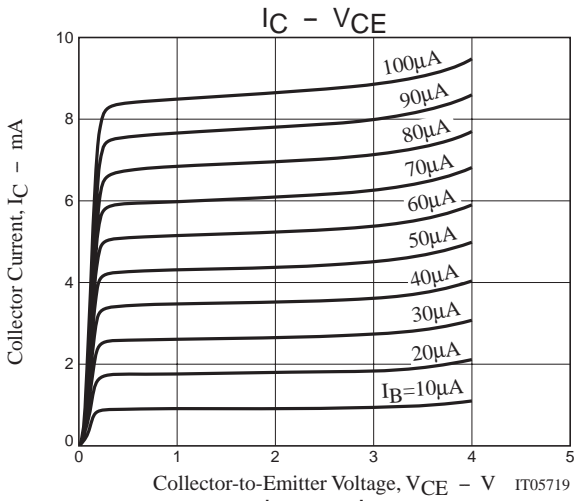
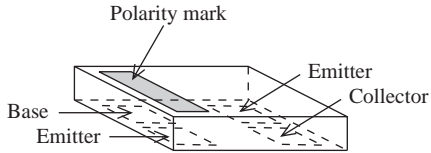
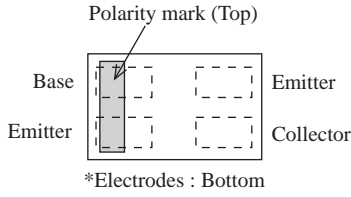
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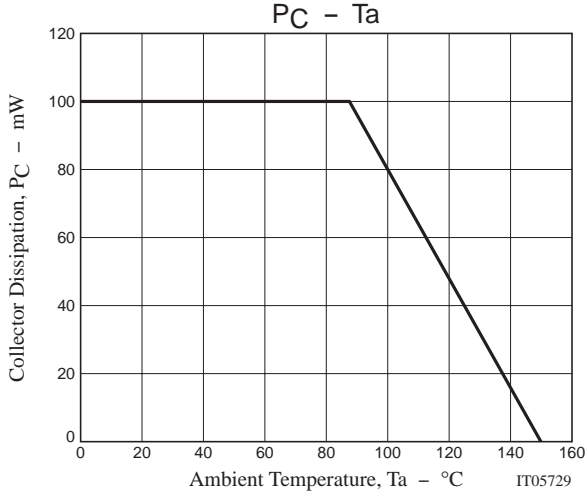
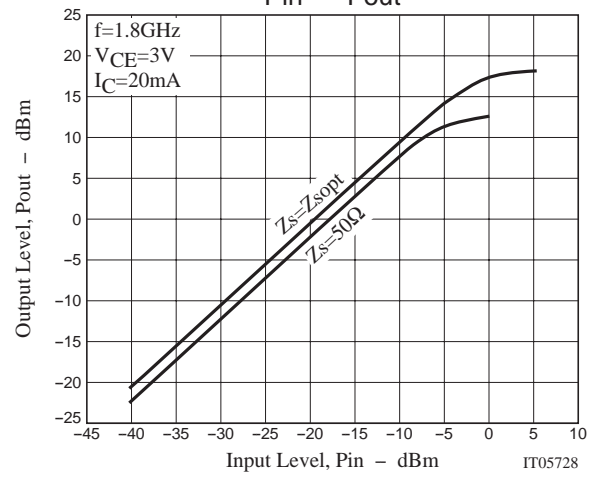
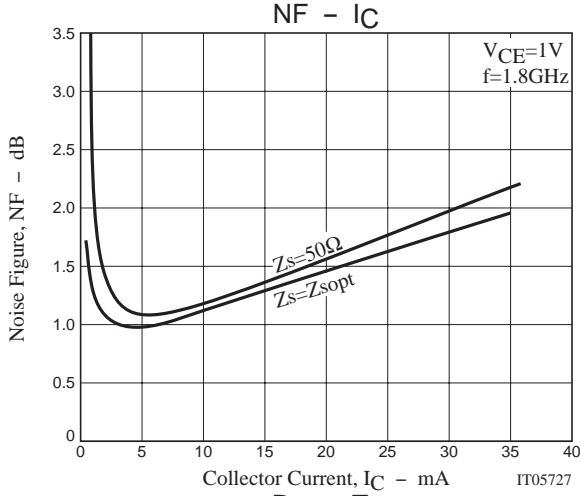
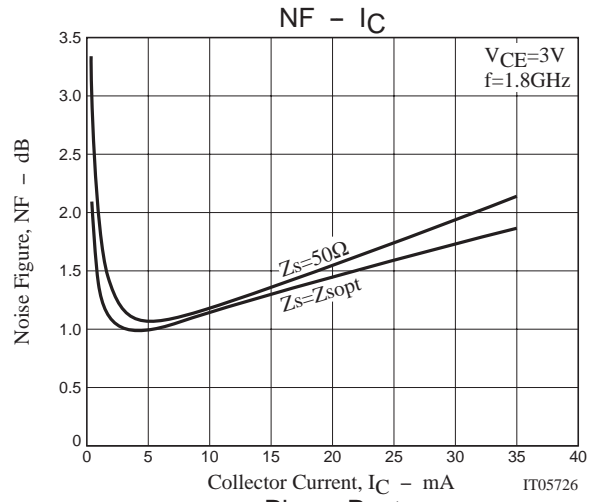
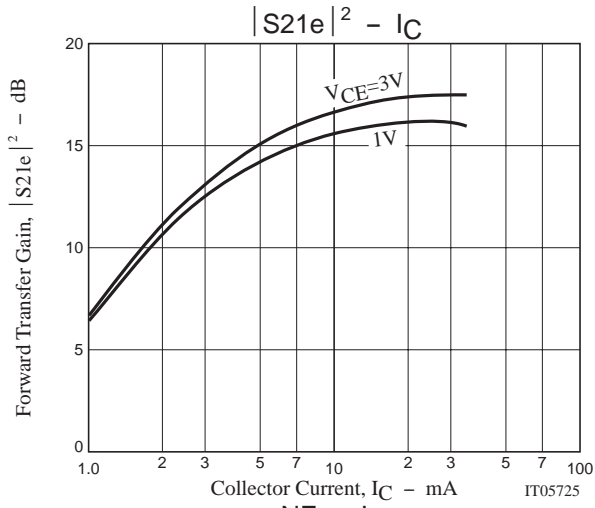
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

# SBFP420D

## Electrical Connection (Top view)



# SBFP420D



## SBFP420D

### S Parameters (Common emitter)

VCE=1V, IC=1mA, ZO=50Ω

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200       | 0.965           | -11.9            | 2.513           | 167.8            | 0.025           | 81.7             | 0.992           | -7.1             |
| 400       | 0.955           | -22.6            | 2.215           | 157.9            | 0.047           | 74.3             | 0.968           | -13.6            |
| 600       | 0.932           | -35.0            | 2.442           | 149.3            | 0.068           | 67.3             | 0.935           | -19.4            |
| 800       | 0.903           | -46.4            | 2.437           | 139.3            | 0.087           | 60.5             | 0.898           | -24.9            |
| 1000      | 0.888           | -55.1            | 2.087           | 131.7            | 0.102           | 54.3             | 0.858           | -30.1            |
| 1200      | 0.843           | -69.4            | 2.483           | 124.3            | 0.115           | 49.1             | 0.813           | -33.9            |
| 1400      | 0.811           | -80.1            | 2.465           | 117.8            | 0.127           | 44.1             | 0.787           | -37.4            |
| 1600      | 0.811           | -86.4            | 2.054           | 112.3            | 0.132           | 38.8             | 0.741           | -43.1            |
| 1800      | 0.777           | -96.8            | 2.094           | 105.5            | 0.140           | 36.0             | 0.704           | -44.4            |
| 2000      | 0.760           | -103.9           | 1.917           | 100.0            | 0.146           | 32.3             | 0.680           | -46.9            |
| 2200      | 0.733           | -113.3           | 1.933           | 94.8             | 0.150           | 28.9             | 0.656           | -49.5            |
| 2400      | 0.725           | -119.3           | 1.770           | 90.4             | 0.152           | 26.0             | 0.636           | -51.8            |
| 2600      | 0.711           | -126.1           | 1.685           | 85.7             | 0.153           | 23.5             | 0.612           | -54.4            |
| 2800      | 0.692           | -133.2           | 1.648           | 81.3             | 0.154           | 21.7             | 0.592           | -56.3            |
| 3000      | 0.684           | -138.6           | 1.543           | 77.3             | 0.154           | 19.8             | 0.576           | -58.2            |
| 3200      | 0.665           | -145.7           | 1.543           | 73.3             | 0.154           | 18.3             | 0.562           | -60.1            |
| 3400      | 0.661           | -150.7           | 1.461           | 69.8             | 0.153           | 16.9             | 0.550           | -61.9            |
| 3600      | 0.653           | -156.0           | 1.409           | 66.3             | 0.152           | 15.8             | 0.539           | -64.0            |
| 3800      | 0.644           | -161.3           | 1.374           | 62.8             | 0.151           | 15.1             | 0.528           | -65.8            |
| 4000      | 0.642           | -165.7           | 1.309           | 59.6             | 0.150           | 14.4             | 0.520           | -67.6            |
| 4200      | 0.633           | -170.8           | 1.281           | 56.3             | 0.148           | 14.0             | 0.512           | -69.5            |
| 4400      | 0.629           | -175.2           | 1.236           | 53.3             | 0.147           | 13.8             | 0.504           | -71.4            |
| 4600      | 0.628           | -179.4           | 1.191           | 50.3             | 0.146           | 13.8             | 0.498           | -73.3            |
| 4800      | 0.623           | 176.3            | 1.160           | 47.6             | 0.145           | 14.0             | 0.492           | -75.3            |
| 5000      | 0.622           | 172.4            | 1.113           | 44.9             | 0.144           | 14.5             | 0.488           | -77.2            |
| 5200      | 0.618           | 168.4            | 1.090           | 42.2             | 0.143           | 15.0             | 0.483           | -79.2            |
| 5400      | 0.616           | 164.5            | 1.060           | 39.5             | 0.142           | 15.8             | 0.478           | -81.3            |
| 5600      | 0.615           | 160.8            | 1.028           | 37.0             | 0.142           | 16.7             | 0.474           | -83.3            |
| 5800      | 0.612           | 157.0            | 1.004           | 34.5             | 0.142           | 17.8             | 0.470           | -85.4            |
| 6000      | 0.613           | 153.5            | 0.971           | 32.2             | 0.143           | 19.0             | 0.467           | -87.5            |

## SBFP420D

### S Parameters (Common emitter)

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200       | 0.825      | -21.6           | 10.855     | 158.3           | 0.023      | 79.0            | 0.953      | -16.0           |
| 400       | 0.785      | -39.8           | 9.143      | 144.6           | 0.040      | 65.7            | 0.858      | -28.7           |
| 600       | 0.706      | -64.1           | 9.668      | 132.4           | 0.053      | 57.5            | 0.758      | -38.1           |
| 800       | 0.658      | -80.1           | 8.470      | 122.4           | 0.062      | 52.4            | 0.668      | -45.6           |
| 1000      | 0.608      | -95.8           | 7.634      | 113.3           | 0.069      | 48.8            | 0.592      | -51.5           |
| 1200      | 0.553      | -112.3          | 7.130      | 104.8           | 0.075      | 46.6            | 0.530      | -55.5           |
| 1400      | 0.527      | -123.6          | 6.391      | 98.7            | 0.079      | 44.6            | 0.488      | -58.7           |
| 1600      | 0.512      | -133.0          | 5.733      | 93.5            | 0.083      | 44.8            | 0.444      | -62.5           |
| 1800      | 0.498      | -140.6          | 5.158      | 89.0            | 0.088      | 44.2            | 0.410      | -64.7           |
| 2000      | 0.489      | -147.6          | 4.692      | 85.1            | 0.092      | 43.6            | 0.384      | -66.8           |
| 2200      | 0.480      | -154.1          | 4.317      | 81.3            | 0.096      | 43.6            | 0.362      | -68.9           |
| 2400      | 0.476      | -159.4          | 3.973      | 78.1            | 0.100      | 43.7            | 0.344      | -70.7           |
| 2600      | 0.468      | -165.0          | 3.700      | 74.7            | 0.105      | 43.8            | 0.327      | -72.6           |
| 2800      | 0.464      | -169.9          | 3.451      | 71.8            | 0.110      | 43.9            | 0.313      | -74.3           |
| 3000      | 0.460      | -174.3          | 3.232      | 68.9            | 0.114      | 44.0            | 0.301      | -76.0           |
| 3200      | 0.458      | -178.7          | 3.051      | 66.1            | 0.119      | 43.8            | 0.291      | -77.7           |
| 3400      | 0.456      | 177.4           | 2.883      | 63.6            | 0.123      | 43.9            | 0.282      | -79.3           |
| 3600      | 0.455      | 173.5           | 2.737      | 60.9            | 0.128      | 43.8            | 0.275      | -81.1           |
| 3800      | 0.453      | 169.9           | 2.604      | 58.4            | 0.134      | 43.6            | 0.268      | -82.7           |
| 4000      | 0.453      | 166.4           | 2.485      | 56.0            | 0.139      | 43.3            | 0.261      | -84.5           |
| 4200      | 0.452      | 162.9           | 2.375      | 53.5            | 0.144      | 42.9            | 0.256      | -86.2           |
| 4400      | 0.452      | 159.7           | 2.275      | 51.3            | 0.149      | 42.6            | 0.251      | -88.2           |
| 4600      | 0.452      | 156.5           | 2.186      | 48.9            | 0.155      | 42.2            | 0.247      | -90.1           |
| 4800      | 0.452      | 153.5           | 2.102      | 46.7            | 0.160      | 41.6            | 0.243      | -92.0           |
| 5000      | 0.452      | 150.4           | 2.026      | 44.5            | 0.166      | 40.9            | 0.240      | -93.9           |
| 5200      | 0.451      | 147.4           | 1.956      | 42.3            | 0.172      | 40.5            | 0.237      | -95.8           |
| 5400      | 0.452      | 144.5           | 1.889      | 40.1            | 0.177      | 39.9            | 0.234      | -97.8           |
| 5600      | 0.452      | 141.6           | 1.830      | 38.0            | 0.183      | 39.2            | 0.231      | -99.9           |
| 5800      | 0.452      | 138.7           | 1.771      | 35.9            | 0.189      | 38.7            | 0.229      | -101.9          |
| 6000      | 0.453      | 136.0           | 1.718      | 33.9            | 0.195      | 38.0            | 0.227      | -103.8          |

## SBFP420D

### S Parameters (Common emitter)

V<sub>CE</sub>=1V, I<sub>C</sub>=10mA, Z<sub>O</sub>=50Ω

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200       | 0.685           | -32.5            | 18.349          | 152.1            | 0.021           | 74.8             | 0.904           | -22.9            |
| 400       | 0.622           | -59.7            | 15.120          | 135.3            | 0.033           | 61.7             | 0.747           | -38.6            |
| 600       | 0.536           | -90.8            | 14.363          | 120.7            | 0.043           | 56.8             | 0.619           | -48.5            |
| 800       | 0.499           | -108.7           | 11.882          | 110.8            | 0.049           | 54.8             | 0.523           | -55.5            |
| 1000      | 0.466           | -124.5           | 10.160          | 102.6            | 0.055           | 53.8             | 0.452           | -60.7            |
| 1200      | 0.446           | -136.7           | 8.770           | 96.4             | 0.061           | 53.3             | 0.399           | -64.3            |
| 1400      | 0.435           | -145.9           | 7.659           | 91.4             | 0.065           | 53.8             | 0.362           | -67.3            |
| 1600      | 0.429           | -153.5           | 6.757           | 87.1             | 0.072           | 54.0             | 0.331           | -70.6            |
| 1800      | 0.425           | -159.8           | 6.029           | 83.4             | 0.078           | 54.2             | 0.303           | -72.9            |
| 2000      | 0.422           | -165.3           | 5.446           | 80.1             | 0.083           | 54.2             | 0.284           | -75.2            |
| 2200      | 0.421           | -170.4           | 4.968           | 77.1             | 0.089           | 54.2             | 0.266           | -77.3            |
| 2400      | 0.419           | -174.9           | 4.566           | 74.2             | 0.095           | 54.2             | 0.252           | -79.3            |
| 2600      | 0.418           | -179.2           | 4.222           | 71.4             | 0.101           | 54.4             | 0.240           | -81.4            |
| 2800      | 0.416           | 176.9            | 3.925           | 68.9             | 0.107           | 54.0             | 0.229           | -83.5            |
| 3000      | 0.416           | 173.3            | 3.667           | 66.4             | 0.114           | 53.7             | 0.221           | -85.1            |
| 3200      | 0.415           | 169.7            | 3.442           | 64.1             | 0.120           | 53.1             | 0.213           | -87.1            |
| 3400      | 0.415           | 166.4            | 3.253           | 61.7             | 0.127           | 52.6             | 0.207           | -89.1            |
| 3600      | 0.415           | 163.2            | 3.079           | 59.4             | 0.133           | 52.1             | 0.201           | -91.1            |
| 3800      | 0.415           | 160.1            | 2.923           | 57.2             | 0.140           | 51.5             | 0.196           | -93.0            |
| 4000      | 0.415           | 157.2            | 2.788           | 54.9             | 0.146           | 50.4             | 0.192           | -95.1            |
| 4200      | 0.416           | 154.2            | 2.660           | 52.7             | 0.153           | 49.8             | 0.188           | -97.2            |
| 4400      | 0.416           | 151.5            | 2.546           | 50.7             | 0.160           | 49.0             | 0.185           | -99.3            |
| 4600      | 0.417           | 148.7            | 2.444           | 48.6             | 0.167           | 48.1             | 0.182           | -101.4           |
| 4800      | 0.417           | 145.9            | 2.347           | 46.5             | 0.173           | 47.2             | 0.179           | -103.7           |
| 5000      | 0.417           | 143.2            | 2.262           | 44.5             | 0.180           | 46.2             | 0.177           | -105.6           |
| 5200      | 0.418           | 140.5            | 2.182           | 42.4             | 0.186           | 45.0             | 0.175           | -107.8           |
| 5400      | 0.418           | 138.0            | 2.104           | 40.4             | 0.192           | 44.2             | 0.173           | -110.2           |
| 5600      | 0.419           | 135.4            | 2.036           | 38.4             | 0.199           | 43.1             | 0.172           | -112.3           |
| 5800      | 0.420           | 132.8            | 1.971           | 36.4             | 0.205           | 42.1             | 0.170           | -114.5           |
| 6000      | 0.420           | 130.3            | 1.911           | 34.5             | 0.212           | 40.9             | 0.169           | -116.9           |

## SBFP420D

### S Parameters (Common emitter)

V<sub>CE</sub>=1V, I<sub>C</sub>=20mA, Z<sub>O</sub>=50Ω

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200       | 0.483           | -61.7            | 25.818          | 143.2            | 0.016           | 72.0             | 0.830           | -30.6            |
| 400       | 0.458           | -100.6           | 20.544          | 122.8            | 0.027           | 61.2             | 0.624           | -47.6            |
| 600       | 0.420           | -122.2           | 17.275          | 110.4            | 0.035           | 60.2             | 0.490           | -56.9            |
| 800       | 0.410           | -137.3           | 13.707          | 102.0            | 0.040           | 59.7             | 0.403           | -63.0            |
| 1000      | 0.402           | -148.5           | 11.322          | 95.7             | 0.048           | 60.8             | 0.346           | -67.5            |
| 1200      | 0.399           | -156.9           | 9.556           | 90.8             | 0.054           | 61.4             | 0.303           | -71.0            |
| 1400      | 0.397           | -163.5           | 8.268           | 86.6             | 0.060           | 62.2             | 0.275           | -73.8            |
| 1600      | 0.398           | -169.1           | 7.234           | 83.1             | 0.068           | 63.2             | 0.251           | -77.4            |
| 1800      | 0.398           | -173.9           | 6.438           | 79.9             | 0.075           | 62.5             | 0.233           | -79.7            |
| 2000      | 0.398           | -178.3           | 5.798           | 77.0             | 0.081           | 62.1             | 0.218           | -82.5            |
| 2200      | 0.399           | 177.8            | 5.275           | 74.4             | 0.088           | 61.8             | 0.205           | -84.8            |
| 2400      | 0.400           | 174.2            | 4.844           | 71.8             | 0.095           | 61.4             | 0.195           | -87.4            |
| 2600      | 0.400           | 170.7            | 4.470           | 69.3             | 0.102           | 60.8             | 0.186           | -89.8            |
| 2800      | 0.400           | 167.5            | 4.150           | 67.0             | 0.109           | 60.1             | 0.178           | -92.0            |
| 3000      | 0.400           | 164.5            | 3.874           | 64.8             | 0.117           | 59.4             | 0.172           | -94.3            |
| 3200      | 0.401           | 161.6            | 3.630           | 62.7             | 0.124           | 58.6             | 0.167           | -96.5            |
| 3400      | 0.401           | 158.6            | 3.429           | 60.5             | 0.131           | 57.5             | 0.163           | -98.8            |
| 3600      | 0.401           | 155.9            | 3.243           | 58.3             | 0.138           | 56.6             | 0.159           | -101.3           |
| 3800      | 0.402           | 153.3            | 3.076           | 56.2             | 0.146           | 55.6             | 0.156           | -103.7           |
| 4000      | 0.403           | 150.6            | 2.932           | 54.1             | 0.153           | 54.6             | 0.153           | -106.0           |
| 4200      | 0.404           | 148.1            | 2.795           | 52.1             | 0.160           | 53.4             | 0.150           | -108.4           |
| 4400      | 0.404           | 145.6            | 2.675           | 50.1             | 0.168           | 52.2             | 0.148           | -110.9           |
| 4600      | 0.405           | 143.1            | 2.567           | 48.1             | 0.175           | 51.1             | 0.147           | -113.1           |
| 4800      | 0.405           | 140.6            | 2.465           | 46.2             | 0.181           | 49.9             | 0.145           | -115.6           |
| 5000      | 0.406           | 138.2            | 2.376           | 44.2             | 0.188           | 48.6             | 0.144           | -117.8           |
| 5200      | 0.407           | 135.7            | 2.289           | 42.2             | 0.195           | 47.6             | 0.143           | -120.6           |
| 5400      | 0.407           | 133.3            | 2.207           | 40.3             | 0.202           | 46.4             | 0.143           | -123.1           |
| 5600      | 0.408           | 131.0            | 2.136           | 38.4             | 0.209           | 45.1             | 0.142           | -125.5           |
| 5800      | 0.408           | 128.6            | 2.067           | 36.5             | 0.216           | 43.9             | 0.142           | -127.9           |
| 6000      | 0.408           | 126.1            | 2.004           | 34.6             | 0.223           | 42.5             | 0.141           | -130.2           |

## SBFP420D

### S Parameters (Common emitter)

V<sub>CE</sub>=3V, I<sub>C</sub>=1mA, Z<sub>O</sub>=50Ω

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200       | 0.968           | -11.0            | 2.452           | 168.9            | 0.019           | 82.4             | 0.995           | -5.7             |
| 400       | 0.959           | -21.1            | 2.176           | 159.8            | 0.037           | 76.5             | 0.978           | -11.0            |
| 600       | 0.940           | -32.5            | 2.399           | 151.7            | 0.054           | 69.3             | 0.954           | -15.7            |
| 800       | 0.914           | -43.4            | 2.439           | 142.2            | 0.069           | 63.3             | 0.926           | -20.4            |
| 1000      | 0.902           | -51.6            | 2.071           | 135.0            | 0.082           | 57.7             | 0.896           | -24.8            |
| 1200      | 0.860           | -65.1            | 2.508           | 127.9            | 0.093           | 52.9             | 0.859           | -28.2            |
| 1400      | 0.828           | -75.6            | 2.526           | 121.5            | 0.103           | 48.0             | 0.839           | -31.4            |
| 1600      | 0.831           | -81.4            | 2.059           | 116.1            | 0.108           | 42.5             | 0.798           | -36.6            |
| 1800      | 0.796           | -91.8            | 2.149           | 109.4            | 0.116           | 40.0             | 0.764           | -37.7            |
| 2000      | 0.779           | -98.8            | 1.963           | 103.9            | 0.121           | 36.3             | 0.743           | -40.1            |
| 2200      | 0.750           | -108.3           | 2.004           | 98.7             | 0.125           | 33.1             | 0.721           | -42.5            |
| 2400      | 0.740           | -114.4           | 1.841           | 94.3             | 0.128           | 30.1             | 0.702           | -44.6            |
| 2600      | 0.726           | -121.1           | 1.743           | 89.7             | 0.128           | 27.7             | 0.679           | -47.0            |
| 2800      | 0.704           | -128.4           | 1.720           | 85.2             | 0.129           | 25.8             | 0.658           | -48.8            |
| 3000      | 0.696           | -133.8           | 1.605           | 81.2             | 0.130           | 24.1             | 0.643           | -50.5            |
| 3200      | 0.675           | -141.0           | 1.618           | 77.1             | 0.130           | 22.6             | 0.629           | -52.2            |
| 3400      | 0.669           | -146.3           | 1.534           | 73.6             | 0.130           | 21.4             | 0.617           | -53.9            |
| 3600      | 0.660           | -151.6           | 1.477           | 70.0             | 0.128           | 20.4             | 0.605           | -55.7            |
| 3800      | 0.649           | -157.1           | 1.445           | 66.4             | 0.128           | 19.5             | 0.594           | -57.3            |
| 4000      | 0.646           | -161.7           | 1.374           | 63.3             | 0.127           | 19.0             | 0.585           | -58.9            |
| 4200      | 0.635           | -167.0           | 1.349           | 59.9             | 0.126           | 18.9             | 0.577           | -60.6            |
| 4400      | 0.629           | -171.7           | 1.304           | 56.8             | 0.125           | 19.0             | 0.569           | -62.3            |
| 4600      | 0.627           | -175.9           | 1.253           | 53.9             | 0.124           | 19.1             | 0.562           | -64.0            |
| 4800      | 0.621           | 179.6            | 1.223           | 51.1             | 0.123           | 19.4             | 0.556           | -65.9            |
| 5000      | 0.619           | 175.6            | 1.173           | 48.4             | 0.123           | 20.2             | 0.551           | -67.6            |
| 5200      | 0.615           | 171.3            | 1.148           | 45.6             | 0.122           | 20.8             | 0.545           | -69.4            |
| 5400      | 0.612           | 167.4            | 1.116           | 42.9             | 0.121           | 22.2             | 0.540           | -71.2            |
| 5600      | 0.610           | 163.4            | 1.081           | 40.4             | 0.122           | 23.1             | 0.535           | -73.0            |
| 5800      | 0.606           | 159.5            | 1.057           | 37.8             | 0.122           | 24.5             | 0.530           | -75.0            |
| 6000      | 0.606           | 155.9            | 1.021           | 35.5             | 0.123           | 25.8             | 0.527           | -76.7            |



## SBFP420D

### S Parameters (Common emitter)

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200       | 0.842      | -18.9           | 10.781     | 160.6           | 0.015      | 74.9            | 0.968      | -12.4           |
| 400       | 0.808      | -35.1           | 9.216      | 147.7           | 0.031      | 68.0            | 0.891      | -22.4           |
| 600       | 0.733      | -56.5           | 9.827      | 136.2           | 0.042      | 62.2            | 0.810      | -29.8           |
| 800       | 0.680      | -71.8           | 8.816      | 126.2           | 0.051      | 55.8            | 0.734      | -35.9           |
| 1000      | 0.631      | -85.8           | 7.959      | 117.4           | 0.057      | 52.6            | 0.665      | -40.7           |
| 1200      | 0.562      | -102.7          | 7.659      | 108.4           | 0.063      | 50.7            | 0.610      | -43.7           |
| 1400      | 0.527      | -114.3          | 6.938      | 102.1           | 0.066      | 48.1            | 0.570      | -46.4           |
| 1600      | 0.508      | -123.6          | 6.235      | 96.7            | 0.071      | 48.0            | 0.527      | -49.3           |
| 1800      | 0.490      | -131.7          | 5.643      | 91.9            | 0.075      | 47.6            | 0.494      | -51.0           |
| 2000      | 0.476      | -139.0          | 5.140      | 87.8            | 0.079      | 47.1            | 0.469      | -52.7           |
| 2200      | 0.463      | -146.1          | 4.746      | 83.9            | 0.082      | 47.1            | 0.446      | -54.2           |
| 2400      | 0.457      | -151.7          | 4.366      | 80.5            | 0.086      | 46.9            | 0.428      | -55.5           |
| 2600      | 0.447      | -157.7          | 4.068      | 77.1            | 0.090      | 47.1            | 0.410      | -57.1           |
| 2800      | 0.441      | -163.0          | 3.800      | 74.0            | 0.094      | 47.3            | 0.395      | -58.2           |
| 3000      | 0.435      | -167.7          | 3.558      | 71.1            | 0.098      | 47.3            | 0.383      | -59.4           |
| 3200      | 0.430      | -172.5          | 3.361      | 68.3            | 0.102      | 47.6            | 0.373      | -60.8           |
| 3400      | 0.428      | -176.7          | 3.173      | 65.7            | 0.107      | 47.4            | 0.363      | -61.9           |
| 3600      | 0.424      | 179.2           | 3.013      | 63.0            | 0.111      | 47.5            | 0.355      | -63.3           |
| 3800      | 0.423      | 175.3           | 2.865      | 60.5            | 0.116      | 47.5            | 0.347      | -64.6           |
| 4000      | 0.422      | 171.5           | 2.731      | 58.0            | 0.120      | 47.0            | 0.340      | -65.9           |
| 4200      | 0.420      | 167.9           | 2.611      | 55.6            | 0.125      | 46.9            | 0.334      | -67.3           |
| 4400      | 0.420      | 164.4           | 2.500      | 53.3            | 0.130      | 46.7            | 0.329      | -68.7           |
| 4600      | 0.419      | 161.0           | 2.399      | 51.0            | 0.135      | 46.1            | 0.323      | -70.2           |
| 4800      | 0.419      | 157.8           | 2.304      | 48.8            | 0.140      | 45.7            | 0.318      | -71.8           |
| 5000      | 0.419      | 154.6           | 2.218      | 46.6            | 0.145      | 45.3            | 0.315      | -73.3           |
| 5200      | 0.419      | 151.5           | 2.141      | 44.3            | 0.150      | 44.9            | 0.310      | -74.8           |
| 5400      | 0.418      | 148.4           | 2.068      | 42.2            | 0.156      | 44.2            | 0.307      | -76.5           |
| 5600      | 0.418      | 145.3           | 2.001      | 40.0            | 0.160      | 43.7            | 0.303      | -78.1           |
| 5800      | 0.419      | 142.3           | 1.935      | 37.9            | 0.166      | 43.1            | 0.300      | -79.8           |
| 6000      | 0.420      | 139.4           | 1.875      | 35.9            | 0.172      | 42.5            | 0.297      | -81.4           |

## SBFP420D

### S Parameters (Common emitter)

VCE=3V, IC=10mA, ZO=50Ω

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 200       | 0.709           | -27.1            | 18.955          | 155.1            | 0.015           | 74.2             | 0.927           | -17.6            |
| 400       | 0.651           | -50.3            | 15.902          | 139.2            | 0.027           | 65.6             | 0.799           | -29.8            |
| 600       | 0.547           | -79.2            | 15.340          | 124.6            | 0.035           | 60.1             | 0.687           | -37.4            |
| 800       | 0.497           | -97.1            | 12.952          | 114.5            | 0.041           | 57.5             | 0.599           | -42.6            |
| 1000      | 0.453           | -113.0           | 11.179          | 105.9            | 0.047           | 56.7             | 0.533           | -46.2            |
| 1200      | 0.422           | -126.2           | 9.750           | 99.2             | 0.052           | 56.9             | 0.483           | -48.6            |
| 1400      | 0.404           | -136.3           | 8.549           | 93.9             | 0.055           | 56.8             | 0.447           | -50.4            |
| 1600      | 0.395           | -144.5           | 7.567           | 89.4             | 0.062           | 57.5             | 0.414           | -52.4            |
| 1800      | 0.389           | -151.4           | 6.757           | 85.5             | 0.066           | 57.1             | 0.388           | -54.0            |
| 2000      | 0.384           | -157.5           | 6.108           | 82.0             | 0.071           | 57.2             | 0.367           | -55.4            |
| 2200      | 0.380           | -163.1           | 5.572           | 78.9             | 0.077           | 57.3             | 0.349           | -56.8            |
| 2400      | 0.377           | -167.9           | 5.119           | 76.0             | 0.082           | 57.4             | 0.335           | -57.9            |
| 2600      | 0.374           | -172.8           | 4.732           | 73.1             | 0.087           | 57.2             | 0.322           | -59.2            |
| 2800      | 0.372           | -177.1           | 4.397           | 70.5             | 0.093           | 57.4             | 0.311           | -60.4            |
| 3000      | 0.370           | 178.9            | 4.107           | 68.0             | 0.098           | 56.8             | 0.300           | -61.6            |
| 3200      | 0.369           | 175.1            | 3.855           | 65.6             | 0.104           | 56.4             | 0.293           | -62.8            |
| 3400      | 0.369           | 171.5            | 3.638           | 63.3             | 0.110           | 55.8             | 0.285           | -64.1            |
| 3600      | 0.368           | 168.0            | 3.442           | 60.9             | 0.116           | 55.2             | 0.279           | -65.4            |
| 3800      | 0.368           | 164.8            | 3.269           | 58.7             | 0.121           | 54.7             | 0.273           | -66.7            |
| 4000      | 0.369           | 161.6            | 3.111           | 56.4             | 0.128           | 54.0             | 0.267           | -68.0            |
| 4200      | 0.369           | 158.4            | 2.966           | 54.3             | 0.134           | 53.3             | 0.262           | -69.5            |
| 4400      | 0.369           | 155.4            | 2.837           | 52.2             | 0.140           | 52.5             | 0.258           | -71.1            |
| 4600      | 0.370           | 152.4            | 2.721           | 50.1             | 0.146           | 51.5             | 0.253           | -72.6            |
| 4800      | 0.371           | 149.6            | 2.612           | 48.0             | 0.151           | 50.7             | 0.250           | -74.3            |
| 5000      | 0.371           | 146.8            | 2.515           | 46.0             | 0.158           | 49.6             | 0.247           | -76.0            |
| 5200      | 0.371           | 144.0            | 2.424           | 43.9             | 0.164           | 48.8             | 0.243           | -77.4            |
| 5400      | 0.372           | 141.3            | 2.337           | 41.9             | 0.169           | 47.9             | 0.241           | -79.2            |
| 5600      | 0.373           | 138.5            | 2.260           | 39.9             | 0.175           | 46.9             | 0.237           | -80.8            |
| 5800      | 0.373           | 135.8            | 2.184           | 38.0             | 0.182           | 46.0             | 0.234           | -82.6            |
| 6000      | 0.375           | 133.2            | 2.116           | 36.1             | 0.188           | 44.9             | 0.232           | -84.3            |

## SBFP420D

### S Parameters (Common emitter)

$V_{CE}=3V, I_C=20mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200       | 0.521      | -41.9           | 29.747     | 149.1           | 0.013      | 75.8            | 0.866      | -22.8           |
| 400       | 0.451      | -76.8           | 23.811     | 129.0           | 0.022      | 65.1            | 0.698      | -35.6           |
| 600       | 0.389      | -106.1          | 19.370     | 114.5           | 0.029      | 64.6            | 0.574      | -42.2           |
| 800       | 0.366      | -123.5          | 15.515     | 105.4           | 0.034      | 63.2            | 0.491      | -46.0           |
| 1000      | 0.353      | -136.7          | 12.836     | 98.6            | 0.040      | 64.0            | 0.435      | -48.4           |
| 1200      | 0.345      | -146.6          | 10.875     | 93.3            | 0.046      | 64.4            | 0.394      | -50.2           |
| 1400      | 0.342      | -154.7          | 9.403      | 88.9            | 0.052      | 64.6            | 0.362      | -51.6           |
| 1600      | 0.341      | -161.1          | 8.260      | 85.0            | 0.058      | 65.5            | 0.341      | -53.1           |
| 1800      | 0.340      | -166.5          | 7.347      | 81.7            | 0.064      | 65.0            | 0.321      | -54.6           |
| 2000      | 0.341      | -171.5          | 6.612      | 78.7            | 0.070      | 64.9            | 0.304      | -56.0           |
| 2200      | 0.341      | -175.8          | 6.017      | 75.9            | 0.076      | 64.3            | 0.290      | -57.2           |
| 2400      | 0.341      | -179.9          | 5.520      | 73.3            | 0.082      | 63.8            | 0.279      | -58.4           |
| 2600      | 0.340      | 176.3           | 5.090      | 70.7            | 0.088      | 63.8            | 0.268      | -59.7           |
| 2800      | 0.341      | 172.7           | 4.721      | 68.4            | 0.095      | 63.0            | 0.259      | -60.8           |
| 3000      | 0.340      | 169.4           | 4.406      | 66.1            | 0.101      | 62.3            | 0.252      | -62.2           |
| 3200      | 0.341      | 166.3           | 4.127      | 64.0            | 0.107      | 61.5            | 0.245      | -63.5           |
| 3400      | 0.341      | 163.2           | 3.894      | 61.8            | 0.114      | 60.7            | 0.239      | -64.8           |
| 3600      | 0.342      | 160.2           | 3.679      | 59.6            | 0.120      | 59.6            | 0.234      | -66.2           |
| 3800      | 0.343      | 157.3           | 3.490      | 57.6            | 0.126      | 58.7            | 0.229      | -67.7           |
| 4000      | 0.343      | 154.4           | 3.323      | 55.5            | 0.133      | 57.8            | 0.224      | -69.3           |
| 4200      | 0.344      | 151.7           | 3.166      | 53.4            | 0.140      | 56.6            | 0.221      | -70.8           |
| 4400      | 0.345      | 149.0           | 3.027      | 51.5            | 0.146      | 55.4            | 0.216      | -72.4           |
| 4600      | 0.346      | 146.2           | 2.902      | 49.5            | 0.153      | 54.2            | 0.213      | -74.1           |
| 4800      | 0.347      | 143.7           | 2.785      | 47.6            | 0.159      | 53.4            | 0.210      | -75.8           |
| 5000      | 0.348      | 141.2           | 2.680      | 45.6            | 0.165      | 52.0            | 0.207      | -77.5           |
| 5200      | 0.348      | 138.6           | 2.581      | 43.6            | 0.171      | 50.9            | 0.204      | -79.2           |
| 5400      | 0.350      | 136.2           | 2.488      | 41.7            | 0.178      | 49.9            | 0.202      | -80.9           |
| 5600      | 0.351      | 133.6           | 2.405      | 39.8            | 0.184      | 48.7            | 0.199      | -82.8           |
| 5800      | 0.352      | 131.1           | 2.326      | 37.9            | 0.191      | 47.4            | 0.196      | -84.5           |
| 6000      | 0.353      | 128.7           | 2.252      | 36.1            | 0.197      | 46.2            | 0.194      | -86.3           |

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