

**2SC5276**

## UHF to S Band Low-Noise Amplifier, OSC Applications

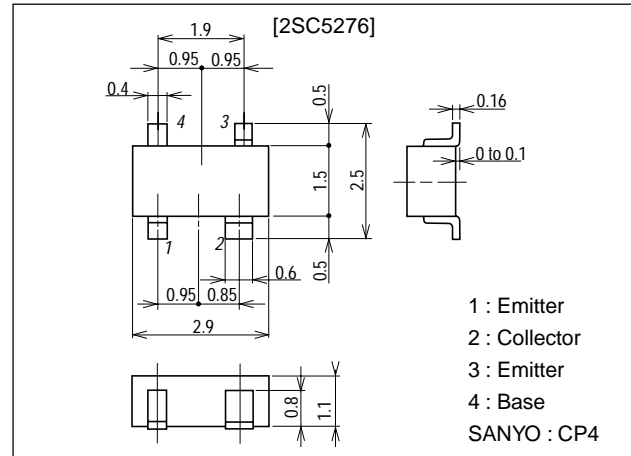
### Features

- Low noise : NF=0.9dB typ (f=1GHz).  
: NF=1.4dB typ (f=1.5GHz).
- High gain :  $|S_{21e}|^2=11\text{dB}$  typ (f=1.5GHz).
- High cutoff frequency :  $f_T=11\text{GHz}$  typ.
- Low-voltage, low-current operation  
( $V_{CE}=1\text{V}$ ,  $I_C=1\text{mA}$ )  
:  $f_T=7\text{GHz}$  type.  
:  $|S_{21e}|^2=6\text{dB}$  typ (f=1.5GHz).

### Package Dimensions

unit:mm

2110A



### Specifications

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

| Parameter                    | Symbol    | Conditions | Ratings     | Unit             |
|------------------------------|-----------|------------|-------------|------------------|
| Collector-to-Base Voltage    | $V_{CBO}$ |            | 20          | V                |
| Collector-to-Emitter Voltage | $V_{CEO}$ |            | 10          | V                |
| Emitter-to-Base Voltage      | $V_{EBO}$ |            | 1.5         | V                |
| Collector Current            | $I_C$     |            | 30          | mA               |
| Collector Dissipation        | $P_C$     |            | 200         | mW               |
| Junction Temperature         | $T_J$     |            | 150         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{stg}$ |            | -55 to +150 | $^\circ\text{C}$ |

#### 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  | $\mu\text{A}$ |
| Emitter Cutoff Current       | $I_{EBO}$ | $V_{EB}=1\text{V}$ , $I_C=0$           |         |      | 10   | $\mu\text{A}$ |
| DC Current Gain              | $h_{FE}$  | $V_{CE}=5\text{V}$ , $I_C=10\text{mA}$ | 60*     |      | 270* |               |
| Gain-Bandwidth Product       | $f_{T1}$  | $V_{CE}=5\text{V}$ , $I_C=10\text{mA}$ | 8       | 11   |      | GHz           |
|                              | $f_{T2}$  | $V_{CE}=1\text{V}$ , $I_C=1\text{mA}$  |         | 7    |      | GHz           |
| Output Capacitance           | $C_{ob}$  | $V_{CB}=10\text{V}$ , $f=1\text{MHz}$  |         | 0.45 | 0.7  | pF            |
| Reverse Transfer Capacitance | $C_{re}$  | $V_{CB}=10\text{V}$ , $f=1\text{MHz}$  |         | 0.25 |      | pF            |

\* : The 2SC5276 is classified by 10mA  $h_{FE}$  as follows :

|    |   |     |    |   |     |     |   |     |
|----|---|-----|----|---|-----|-----|---|-----|
| 60 | 3 | 120 | 90 | 4 | 180 | 135 | 5 | 270 |
|----|---|-----|----|---|-----|-----|---|-----|

Marking : MN

 $h_{FE}$  rank : 3, 4, 5

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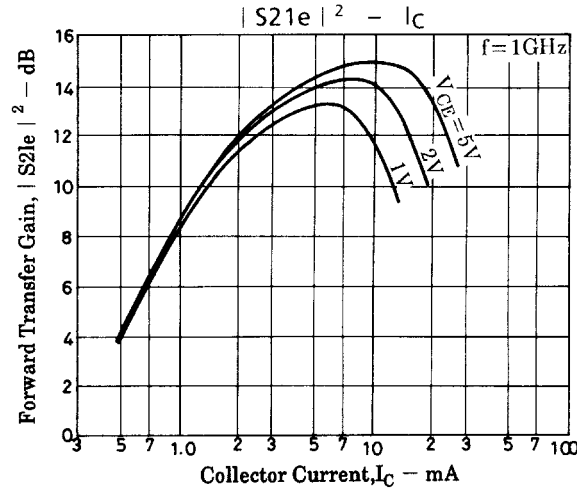
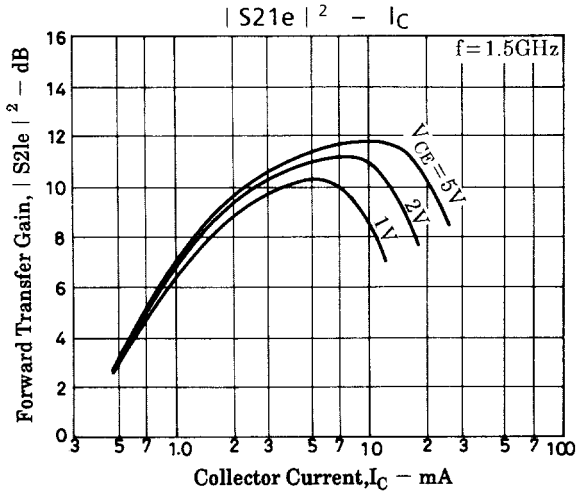
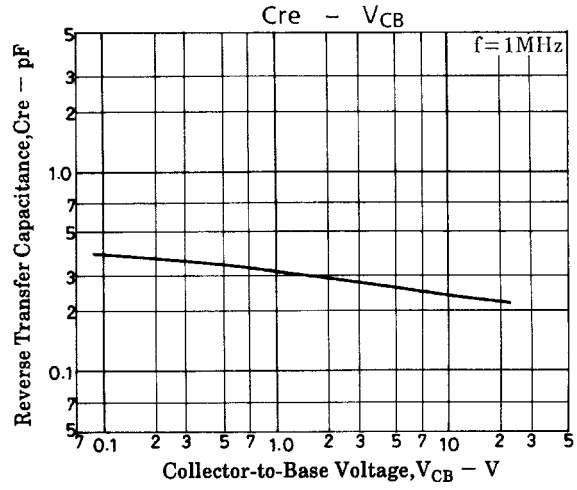
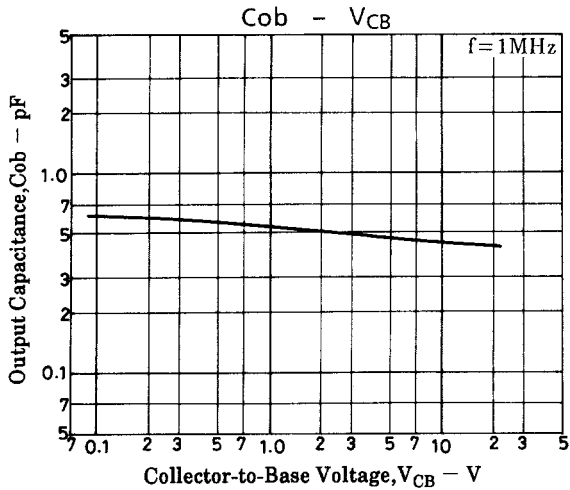
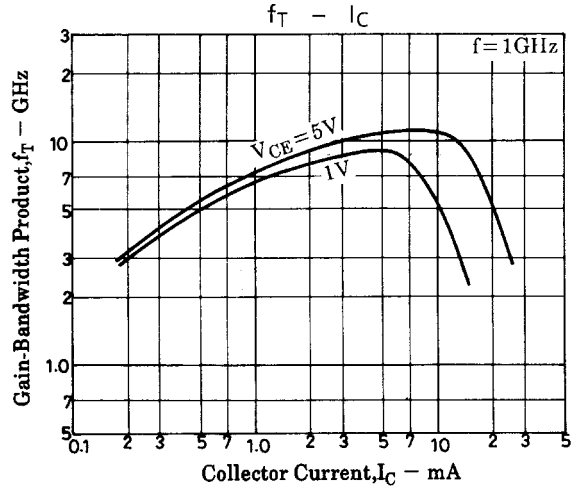
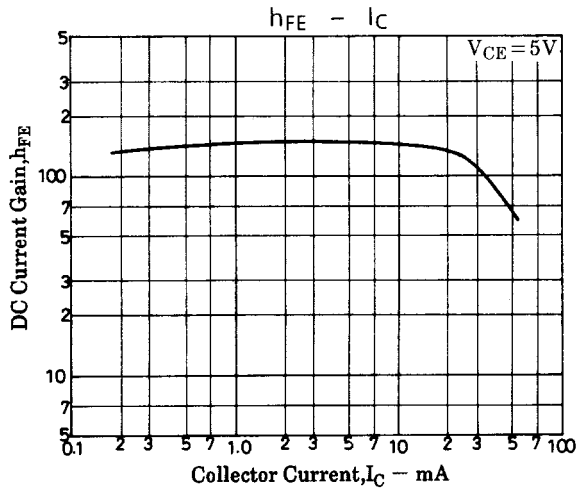
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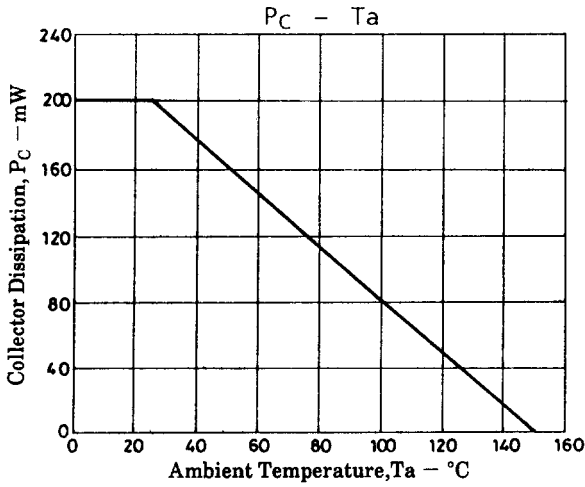
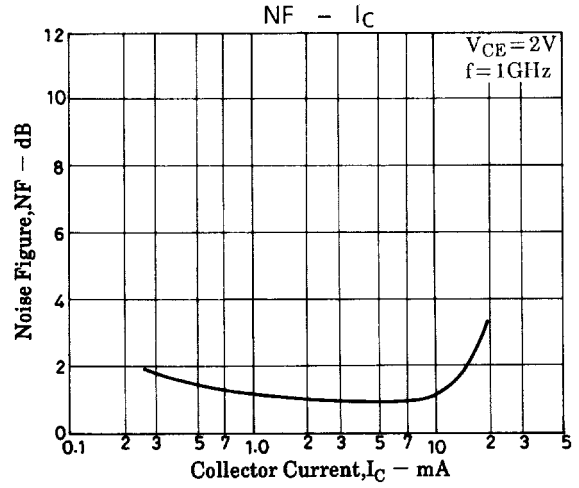
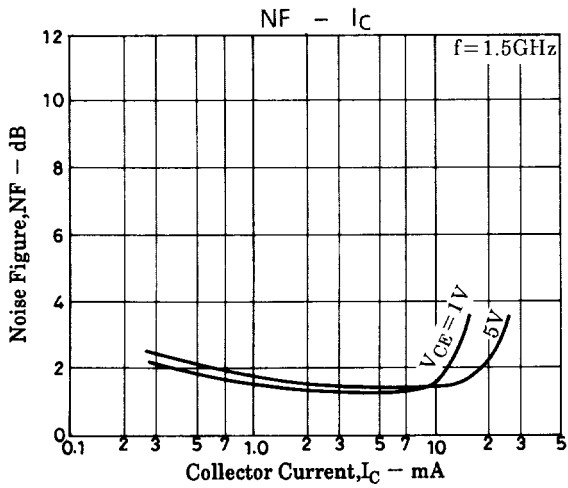
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| Parameter             | Symbol            | Conditions                      | Ratings |     |     | Unit |
|-----------------------|-------------------|---------------------------------|---------|-----|-----|------|
|                       |                   |                                 | min     | typ | max |      |
| Forward Transfer Gain | $ S_{21e} ^2 - 1$ | $V_{CE}=5V, I_C=10mA, f=1.5GHz$ | 9       | 11  |     | dB   |
|                       | $ S_{21e} ^2 - 2$ | $V_{CE}=1V, I_C=1mA, f=1.5GHz$  |         | 6   |     | dB   |
| Noise Figure          | NF1               | $V_{CE}=5V, I_C=5mA, f=1.5GHz$  |         | 1.4 | 3.0 | dB   |
|                       | NF2               | $V_{CE}=2V, I_C=3mA, f=1GHz$    |         | 0.9 |     | dB   |

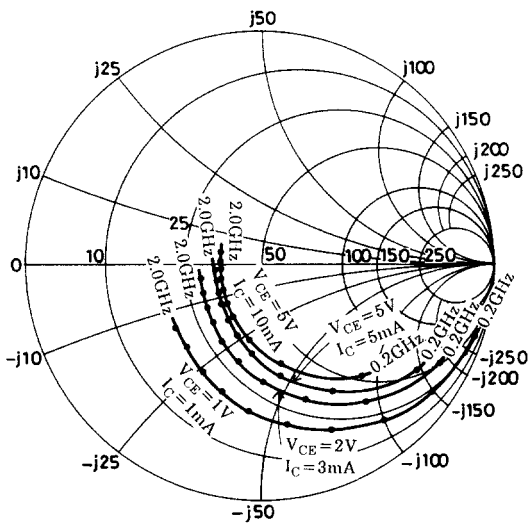


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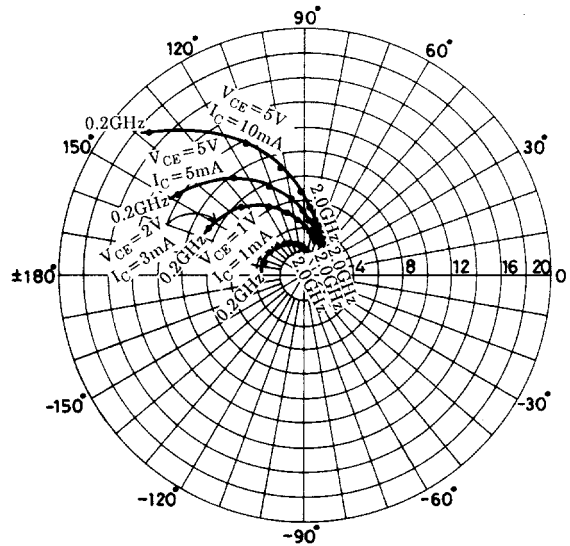


## S Parameters

S11e :  $f = 200$  to  $2000\text{MHz}$  (200MHz step)

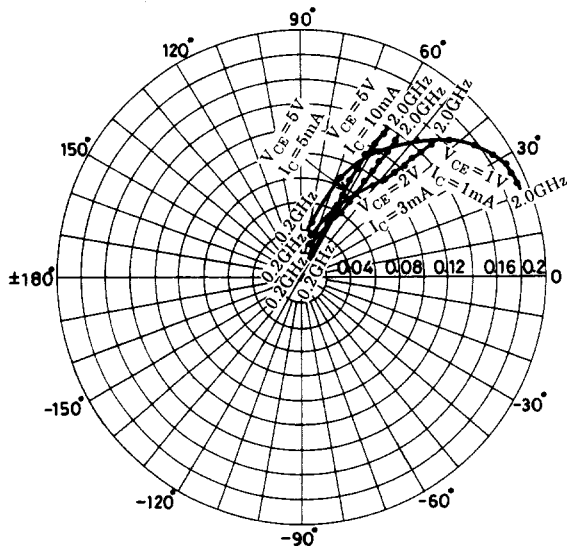


S21e :  $f = 200$  to  $2000\text{MHz}$  (200MHz step)

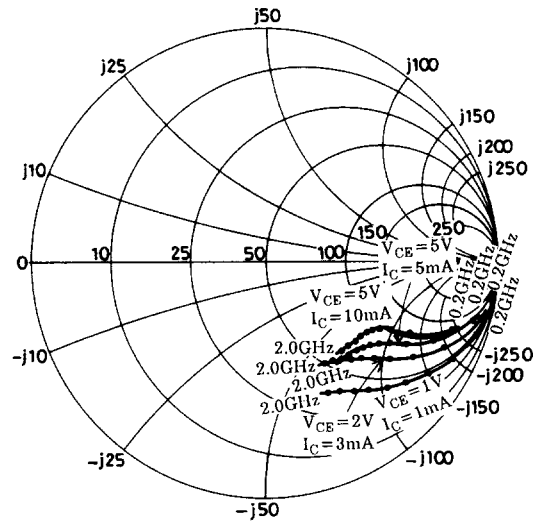


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S12e : f= 200 to 2000MHz (200MHz step)



S22e : f= 200 to 2000MHz (200MHz step)



## S parameters (Common emitter)

V<sub>CE</sub>=5V, I<sub>C</sub>=5mA, 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        | 0.789           | -34.0            | 12.209          | 148.5            | 0.029           | 72.3             | 0.914           | -16.3            |
| 400        | 0.610           | -60.1            | 9.707           | 125.8            | 0.048           | 62.4             | 0.785           | -25.6            |
| 600        | 0.474           | -79.5            | 7.653           | 110.7            | 0.061           | 58.2             | 0.692           | -25.6            |
| 800        | 0.372           | -95.6            | 6.212           | 99.2             | 0.072           | 56.6             | 0.632           | -33.6            |
| 1000       | 0.311           | -108.2           | 5.172           | 90.8             | 0.082           | 56.1             | 0.594           | -36.1            |
| 1200       | 0.264           | -122.2           | 4.459           | 83.0             | 0.093           | 55.9             | 0.570           | -38.6            |
| 1400       | 0.225           | -135.5           | 3.905           | 76.3             | 0.103           | 55.5             | 0.553           | -41.5            |
| 1600       | 0.204           | -147.9           | 3.464           | 70.7             | 0.113           | 55.5             | 0.539           | -44.5            |
| 1800       | 0.188           | -161.6           | 3.121           | 64.9             | 0.124           | 54.7             | 0.528           | -48.2            |
| 2000       | 0.184           | -175.1           | 2.855           | 59.7             | 0.135           | 54.2             | 0.527           | -51.6            |

V<sub>CE</sub>=5V, 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        | 0.629           | -47.8            | 17.118          | 137.6            | 0.025           | 69.4             | 0.839           | -20.3            |
| 400        | 0.421           | -77.9            | 11.829          | 114.0            | 0.040           | 63.6             | 0.681           | -26.7            |
| 600        | 0.316           | -98.0            | 8.649           | 101.1            | 0.052           | 62.7             | 0.605           | -28.9            |
| 800        | 0.245           | -117.5           | 6.785           | 91.2             | 0.064           | 62.8             | 0.562           | -30.7            |
| 1000       | 0.209           | -130.0           | 5.536           | 84.4             | 0.075           | 63.0             | 0.540           | -32.9            |
| 1200       | 0.183           | -147.2           | 4.719           | 77.6             | 0.088           | 62.9             | 0.528           | -35.2            |
| 1400       | 0.168           | -161.6           | 4.103           | 72.0             | 0.100           | 62.5             | 0.517           | -37.9            |
| 1600       | 0.162           | -174.0           | 3.626           | 66.7             | 0.112           | 61.9             | 0.510           | -41.4            |
| 1800       | 0.164           | 173.1            | 3.255           | 61.7             | 0.124           | 60.5             | 0.503           | -45.4            |
| 2000       | 0.170           | 160.6            | 2.962           | 56.8             | 0.135           | 59.3             | 0.502           | -49.1            |

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

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200        | 0.860      | -28.3           | 8.645      | 154.3           | 0.036      | 73.8            | 0.943      | -15.2           |
| 400        | 0.725      | -52.2           | 7.452      | 133.4           | 0.063      | 62.5            | 0.839      | -26.1           |
| 600        | 0.598      | -71.6           | 6.200      | 117.7           | 0.081      | 55.4            | 0.744      | -33.3           |
| 800        | 0.490      | -88.6           | 5.210      | 105.1           | 0.094      | 51.1            | 0.667      | -38.4           |
| 1000       | 0.417      | -102.6          | 4.458      | 95.5            | 0.104      | 48.9            | 0.615      | -42.3           |
| 1200       | 0.358      | -116.9          | 3.901      | 86.7            | 0.114      | 47.5            | 0.579      | -45.5           |
| 1400       | 0.311      | -129.4          | 3.452      | 79.3            | 0.124      | 46.4            | 0.552      | -48.6           |
| 1600       | 0.285      | -141.5          | 3.072      | 72.8            | 0.132      | 46.3            | 0.531      | -51.9           |
| 1800       | 0.262      | -154.3          | 2.783      | 66.4            | 0.141      | 45.6            | 0.513      | -55.7           |
| 2000       | 0.252      | -167.3          | 2.551      | 60.9            | 0.150      | 44.5            | 0.505      | -59.0           |

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

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 200        | 0.952      | -18.3           | 3.431      | 163.0           | 0.045      | 78.1            | 0.983      | -10.2           |
| 400        | 0.896      | -36.0           | 3.331      | 145.5           | 0.086      | 67.4            | 0.945      | -19.6           |
| 600        | 0.830      | -51.8           | 3.020      | 132.9           | 0.119      | 57.6            | 0.892      | -27.7           |
| 800        | 0.753      | -67.1           | 2.756      | 119.8           | 0.145      | 49.5            | 0.837      | -34.9           |
| 1000       | 0.681      | -80.9           | 2.543      | 108.6           | 0.163      | 42.6            | 0.782      | -41.5           |
| 1200       | 0.617      | -92.9           | 2.373      | 97.8            | 0.177      | 37.0            | 0.743      | -46.4           |
| 1400       | 0.557      | -107.1          | 2.184      | 88.4            | 0.185      | 32.1            | 0.699      | -51.5           |
| 1600       | 0.509      | -118.6          | 2.011      | 79.8            | 0.191      | 28.1            | 0.666      | -55.9           |
| 1800       | 0.461      | -132.1          | 1.888      | 71.6            | 0.191      | 25.5            | 0.640      | -60.6           |
| 2000       | 0.440      | -144.0          | 1.737      | 64.5            | 0.191      | 23.0            | 0.618      | -64.5           |

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