



SANYO Semiconductors

DATA SHEET

15GN03C

 — NPN Epitaxial Planar Silicon Transistor
VHF High-frequency Amplifier Applications

Applications

- VHF, RF, MIXER, OSC, IF amplifier.

Features

- High cutoff frequency : $f_T=1.5\text{GHz}$ typ.
- High gain : $|S_{21e}|^2=13\text{dB}$ typ ($f=0.4\text{GHz}$).

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} | | 3 | V |
| Collector Current | I_C | | 70 | 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_{CB0} | $V_{CB}=10\text{V}, I_E=0$ | | | 0.1 | μA |
| Emitter Cutoff Current | I_{EBO} | $V_{EB}=2\text{V}, I_C=0$ | | | 1 | μA |
| DC Current Gain | h_{FE} | $V_{CE}=5\text{V}, I_C=10\text{mA}$ | 100 | | 180 | |
| Gain-Bandwidth Product | f_T | $V_{CE}=5\text{V}, I_C=20\text{mA}$ | 1.0 | 1.5 | | GHz |
| Output Capacitance | C_{ob} | $V_{CB}=10\text{V}, f=1\text{MHz}$ | | 0.95 | 1.25 | pF |
| Reverse Transfer Capacitance | C_{re} | $V_{CB}=10\text{V}, f=1\text{MHz}$ | | 0.65 | | pF |
| Forward Transfer Gain | $ S_{21e} ^2$ | $V_{CE}=5\text{V}, I_C=20\text{mA}, f=0.4\text{GHz}$ | 10 | 13 | | dB |
| Noise Figure | NF | $V_{CE}=3\text{V}, I_C=2\text{mA}, f=0.4\text{GHz}$ | | 1.6 | | dB |

Marking : ZU

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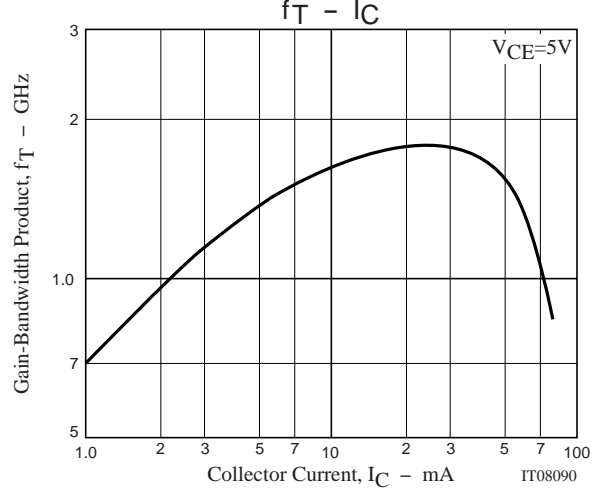
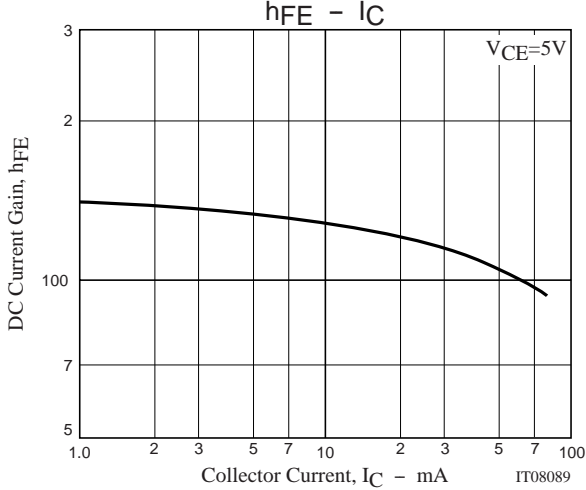
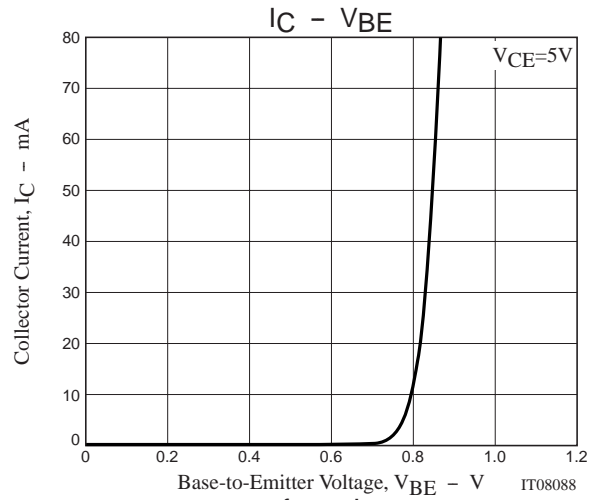
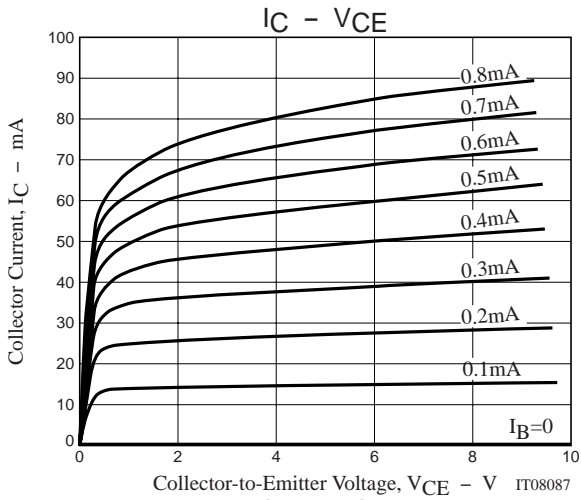
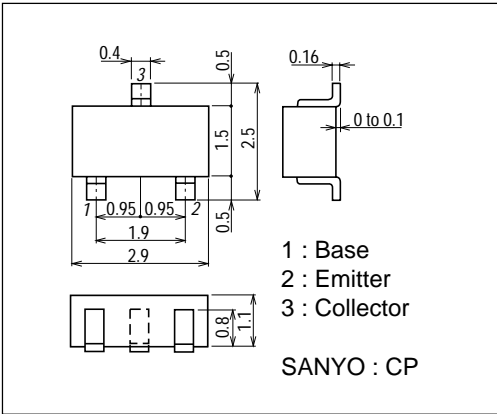
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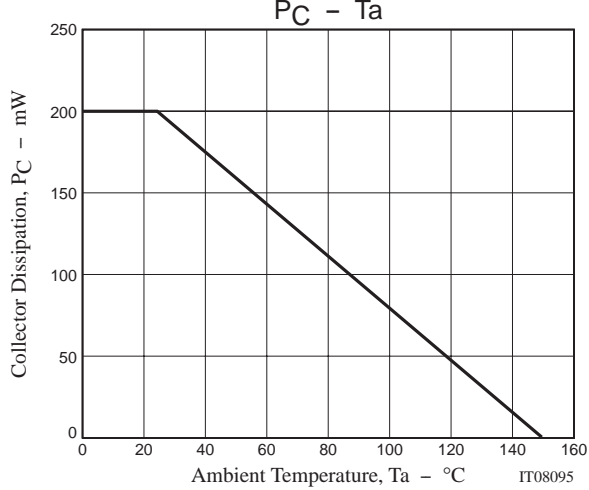
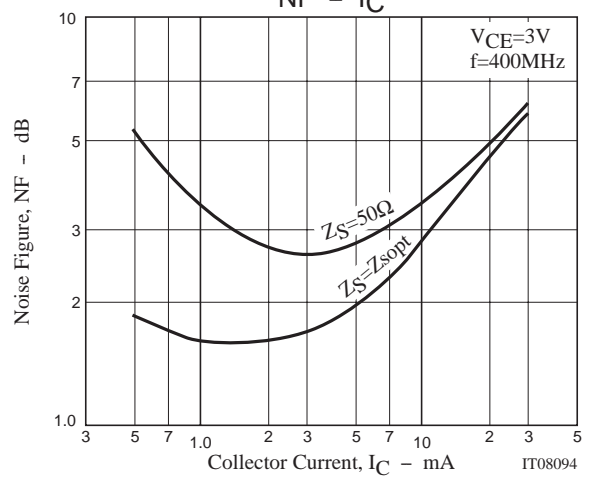
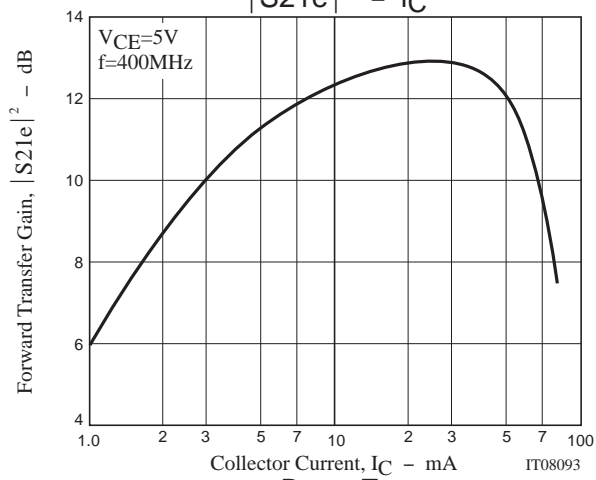
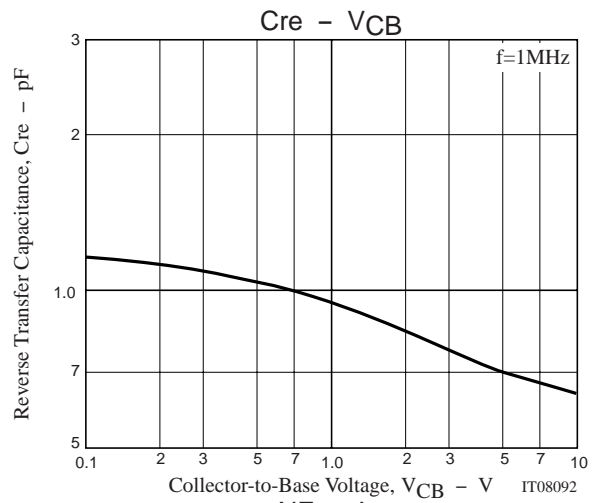
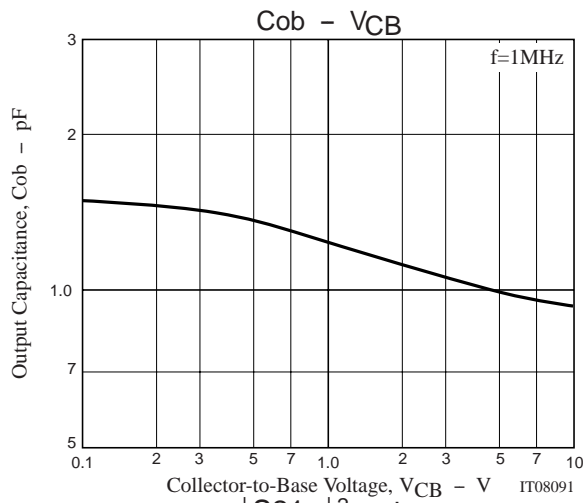
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Package Dimensions

unit : mm
2018B



15GN03C



15GN03C

S Parameters (Common emitter)

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.918 | -34.17 | 3.328 | 154.00 | 0.040 | 67.14 | 0.963 | -9.32 |
| 200 | 0.816 | -63.46 | 2.833 | 133.91 | 0.063 | 50.52 | 0.897 | -15.61 |
| 300 | 0.719 | -87.48 | 2.349 | 118.47 | 0.075 | 39.90 | 0.847 | -19.59 |
| 400 | 0.650 | -106.66 | 1.974 | 106.31 | 0.081 | 33.68 | 0.816 | -22.72 |
| 500 | 0.603 | -123.45 | 1.709 | 96.50 | 0.081 | 30.41 | 0.795 | -25.65 |
| 600 | 0.579 | -137.17 | 1.492 | 88.62 | 0.078 | 30.45 | 0.785 | -28.56 |
| 700 | 0.562 | -149.31 | 1.328 | 81.55 | 0.074 | 30.61 | 0.779 | -31.42 |
| 800 | 0.557 | -159.59 | 1.197 | 75.34 | 0.070 | 34.97 | 0.777 | -34.68 |
| 900 | 0.557 | -168.64 | 1.094 | 70.12 | 0.068 | 41.63 | 0.773 | -38.02 |
| 1000 | 0.560 | -176.38 | 1.003 | 65.13 | 0.066 | 50.34 | 0.773 | -41.22 |

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.799 | -55.14 | 7.483 | 141.00 | 0.033 | 59.88 | 0.886 | -14.45 |
| 200 | 0.641 | -93.26 | 5.412 | 118.03 | 0.047 | 44.28 | 0.773 | -18.84 |
| 300 | 0.553 | -118.80 | 4.036 | 104.19 | 0.050 | 40.23 | 0.719 | -21.00 |
| 400 | 0.512 | -136.73 | 3.182 | 94.58 | 0.052 | 40.73 | 0.693 | -22.61 |
| 500 | 0.492 | -150.89 | 2.627 | 86.95 | 0.055 | 44.74 | 0.683 | -24.93 |
| 600 | 0.488 | -161.99 | 2.244 | 80.86 | 0.056 | 49.28 | 0.677 | -27.44 |
| 700 | 0.487 | -171.08 | 1.958 | 75.25 | 0.059 | 55.44 | 0.675 | -30.18 |
| 800 | 0.492 | -178.68 | 1.749 | 70.37 | 0.063 | 62.40 | 0.675 | -33.31 |
| 900 | 0.502 | 174.60 | 1.575 | 65.89 | 0.068 | 67.82 | 0.674 | -36.39 |
| 1000 | 0.508 | 168.93 | 1.433 | 61.61 | 0.078 | 74.10 | 0.677 | -39.25 |

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.703 | -69.63 | 10.162 | 132.63 | 0.030 | 54.51 | 0.821 | -16.94 |
| 200 | 0.550 | -109.80 | 6.625 | 110.25 | 0.037 | 43.19 | 0.704 | -19.31 |
| 300 | 0.490 | -133.75 | 4.733 | 98.16 | 0.041 | 44.91 | 0.660 | -20.36 |
| 400 | 0.464 | -149.68 | 3.666 | 89.82 | 0.045 | 49.05 | 0.643 | -21.83 |
| 500 | 0.458 | -161.66 | 3.003 | 83.25 | 0.049 | 56.14 | 0.635 | -23.97 |
| 600 | 0.460 | -170.95 | 2.537 | 77.83 | 0.054 | 60.18 | 0.632 | -26.46 |
| 700 | 0.465 | -178.51 | 2.212 | 72.71 | 0.058 | 65.91 | 0.631 | -29.05 |
| 800 | 0.472 | 174.93 | 1.962 | 68.10 | 0.067 | 71.03 | 0.633 | -32.06 |
| 900 | 0.482 | 169.11 | 1.764 | 64.09 | 0.075 | 76.57 | 0.634 | -35.26 |
| 1000 | 0.491 | 164.18 | 1.602 | 59.88 | 0.085 | 78.96 | 0.635 | -38.26 |

$V_{CE}=5V, I_C=10mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.568 | -91.34 | 13.492 | 121.50 | 0.022 | 51.19 | 0.729 | -18.79 |
| 200 | 0.463 | -130.04 | 7.837 | 102.18 | 0.030 | 50.01 | 0.628 | -18.37 |
| 300 | 0.435 | -149.86 | 5.435 | 92.29 | 0.035 | 56.54 | 0.598 | -18.84 |
| 400 | 0.427 | -162.69 | 4.153 | 85.23 | 0.041 | 59.99 | 0.587 | -20.20 |
| 500 | 0.431 | -171.77 | 3.374 | 79.57 | 0.047 | 67.05 | 0.586 | -22.36 |
| 600 | 0.438 | -179.07 | 2.842 | 74.63 | 0.055 | 70.37 | 0.585 | -24.64 |
| 700 | 0.446 | 174.71 | 2.460 | 69.90 | 0.062 | 74.51 | 0.587 | -27.44 |
| 800 | 0.457 | 169.18 | 2.181 | 65.54 | 0.072 | 78.16 | 0.588 | -30.30 |
| 900 | 0.469 | 164.67 | 1.954 | 61.61 | 0.080 | 80.51 | 0.592 | -33.49 |
| 1000 | 0.482 | 160.55 | 1.775 | 57.60 | 0.092 | 82.60 | 0.596 | -36.43 |

15GN03C

S Parameters (Common emitter)

$V_{CE}=5V, I_C=15mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.506 | -103.02 | 14.843 | 116.40 | 0.020 | 52.22 | 0.680 | -19.13 |
| 200 | 0.433 | -139.11 | 8.300 | 98.87 | 0.027 | 55.27 | 0.595 | -17.41 |
| 300 | 0.418 | -156.74 | 5.691 | 89.86 | 0.032 | 60.47 | 0.571 | -17.79 |
| 400 | 0.416 | -167.49 | 4.336 | 83.26 | 0.040 | 65.01 | 0.567 | -19.20 |
| 500 | 0.423 | -175.59 | 3.518 | 77.72 | 0.047 | 70.77 | 0.564 | -21.38 |
| 600 | 0.434 | 177.94 | 2.949 | 72.99 | 0.056 | 75.36 | 0.566 | -23.76 |
| 700 | 0.441 | 172.60 | 2.558 | 68.36 | 0.064 | 77.18 | 0.566 | -26.43 |
| 800 | 0.454 | 167.70 | 2.257 | 64.14 | 0.073 | 80.34 | 0.573 | -29.43 |
| 900 | 0.468 | 163.21 | 2.026 | 60.20 | 0.084 | 82.23 | 0.576 | -32.58 |
| 1000 | 0.478 | 159.35 | 1.833 | 56.21 | 0.094 | 82.82 | 0.579 | -35.40 |

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.473 | -110.94 | 15.555 | 113.24 | 0.018 | 48.75 | 0.651 | -18.99 |
| 200 | 0.420 | -144.96 | 8.504 | 96.80 | 0.025 | 55.46 | 0.577 | -16.75 |
| 300 | 0.412 | -160.51 | 5.806 | 88.35 | 0.032 | 64.32 | 0.556 | -16.94 |
| 400 | 0.412 | -170.47 | 4.415 | 81.97 | 0.040 | 69.43 | 0.553 | -18.38 |
| 500 | 0.423 | -177.81 | 3.567 | 76.52 | 0.047 | 73.49 | 0.552 | -20.62 |
| 600 | 0.434 | 176.33 | 2.998 | 72.06 | 0.054 | 76.85 | 0.554 | -23.22 |
| 700 | 0.443 | 171.32 | 2.597 | 67.40 | 0.064 | 79.43 | 0.555 | -25.76 |
| 800 | 0.457 | 166.61 | 2.289 | 62.99 | 0.075 | 80.21 | 0.562 | -28.77 |
| 900 | 0.470 | 162.56 | 2.044 | 58.98 | 0.084 | 82.61 | 0.567 | -31.92 |
| 1000 | 0.484 | 159.03 | 1.849 | 54.97 | 0.095 | 83.62 | 0.572 | -34.90 |

$V_{CE}=5V, I_C=30mA, Z_O=50\Omega$

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.444 | -121.15 | 16.032 | 109.59 | 0.018 | 56.45 | 0.620 | -18.33 |
| 200 | 0.414 | -151.46 | 8.590 | 94.42 | 0.023 | 58.54 | 0.558 | -15.68 |
| 300 | 0.413 | -164.93 | 5.826 | 86.42 | 0.031 | 69.33 | 0.543 | -15.93 |
| 400 | 0.418 | -173.75 | 4.420 | 80.00 | 0.040 | 71.41 | 0.541 | -17.58 |
| 500 | 0.429 | 179.87 | 3.560 | 74.72 | 0.048 | 75.89 | 0.545 | -19.95 |
| 600 | 0.442 | 174.95 | 2.980 | 69.97 | 0.056 | 78.14 | 0.546 | -22.37 |
| 700 | 0.454 | 170.06 | 2.575 | 65.31 | 0.067 | 79.78 | 0.550 | -25.11 |
| 800 | 0.467 | 165.62 | 2.268 | 61.02 | 0.077 | 81.97 | 0.556 | -27.94 |
| 900 | 0.485 | 161.83 | 2.027 | 57.14 | 0.086 | 83.95 | 0.563 | -31.50 |
| 1000 | 0.497 | 158.27 | 1.829 | 53.02 | 0.096 | 84.97 | 0.570 | -34.37 |

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.436 | -135.54 | 15.112 | 105.16 | 0.016 | 53.23 | 0.591 | -16.61 |
| 200 | 0.431 | -160.16 | 7.915 | 91.13 | 0.021 | 62.83 | 0.547 | -14.06 |
| 300 | 0.439 | -170.89 | 5.332 | 83.37 | 0.030 | 71.57 | 0.538 | -15.05 |
| 400 | 0.447 | -177.86 | 4.022 | 77.04 | 0.039 | 75.43 | 0.538 | -16.92 |
| 500 | 0.462 | 176.77 | 3.231 | 71.43 | 0.046 | 77.82 | 0.543 | -19.30 |
| 600 | 0.477 | 172.03 | 2.708 | 66.71 | 0.057 | 81.23 | 0.548 | -22.35 |
| 700 | 0.490 | 167.59 | 2.318 | 61.92 | 0.065 | 82.45 | 0.553 | -25.43 |
| 800 | 0.507 | 163.59 | 2.037 | 57.52 | 0.076 | 84.13 | 0.559 | -28.69 |
| 900 | 0.523 | 159.90 | 1.813 | 53.42 | 0.087 | 86.15 | 0.566 | -32.45 |
| 1000 | 0.539 | 156.32 | 1.629 | 49.36 | 0.099 | 87.07 | 0.573 | -35.73 |

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