

NPN EPITAXIAL SILICON TRANSISTOR FOR UHF TUNER OSC/MIX

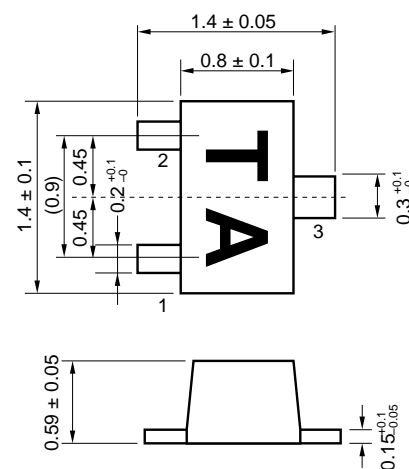
FEATURE

- Ultra super mini-mold thin flat package
(1.4 mm × 0.8 mm × 0.59 mm: TYP.)
- Contains same chip as 2SC5004

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

| PARAMETER | SYMBOL | RATING | UNIT |
|------------------------------|------------------|-------------|------|
| Collector to Base Voltage | V _{CB0} | 20 | V |
| Collector to Emitter Voltage | V _{CEO} | 12 | V |
| Emitter to Base Voltage | V _{EBO} | 3 | V |
| Collector Current | I _C | 60 | mA |
| Total Power Dissipation | P _T | 100 | mW |
| Junction Temperature | T _J | 125 | °C |
| Storage Temperature | T _{stg} | -65 to +125 | °C |

PACKAGE DIMENSIONS (in mm)



PIN CONNECTIONS

- 1: Emitter
- 2: Base
- 3: Collector

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---------------------------------|--|------|------|------|------|
| Collector Cut-off Current | I _{CBO} | V _{CB} = 15 V, I _E = 0 | | | 100 | nA |
| Emitter Cut-off Current | I _{EBO} | V _{EB} = 1 V, I _C = 0 | | | 100 | nA |
| Collector to Emitter Saturation Voltage | V _{CE(sat)} | h _{FE} = 10, I _C = 5 mA | | | 0.5 | V |
| DC Current Gain | h _{FE} | V _{CE} = 5 V, I _C = 5 mA ^{Note 1} | 60 | | 120 | |
| Gain Bandwidth Product | f _T | V _{CE} = 5 V, I _C = 5 mA, f = 1 GHz | 3.0 | 4.3 | | GHz |
| Reverse Transfer Capacitance | C _{re} | V _{CB} = 5 V, I _E = 0, f = 1 MHz ^{Note 2} | | 0.6 | 1.2 | pF |
| Insertion Power Gain | S _{21e} ² | V _{CE} = 5 V, I _C = 5 mA, f = 1 GHz | 5.0 | | | dB |

Notes 1. Pulse measurement P_w ≤ 350 μs, duty cycle ≤ 2 %

2. Collector to base capacitance measured by capacitance meter (automatic balance bridge method) when emitter pin is connected to the guard pin.

Because this product uses high-frequency process, avoid excessive input of static electricity, etc.

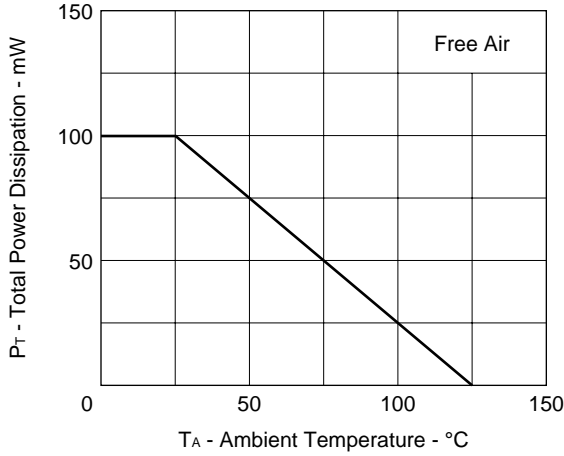
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h_{FE} CLASSIFICATION

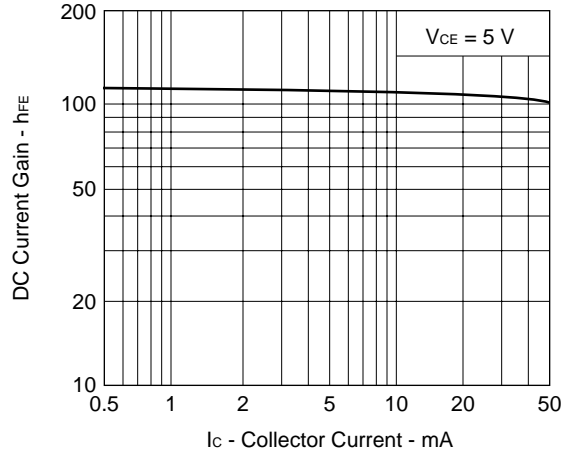
| | | |
|-----------------|----------|-----------|
| RANK | EB | FB |
| Marking | TA | TB |
| h _{FE} | 60 to 90 | 80 to 120 |

TYPICAL CHARACTERISTICS (T_A = 25 °C)

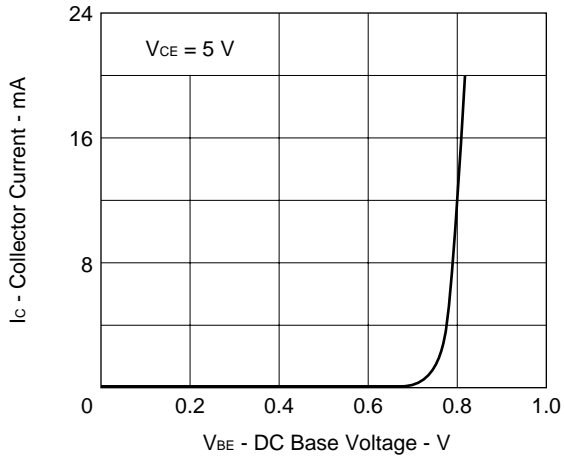
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



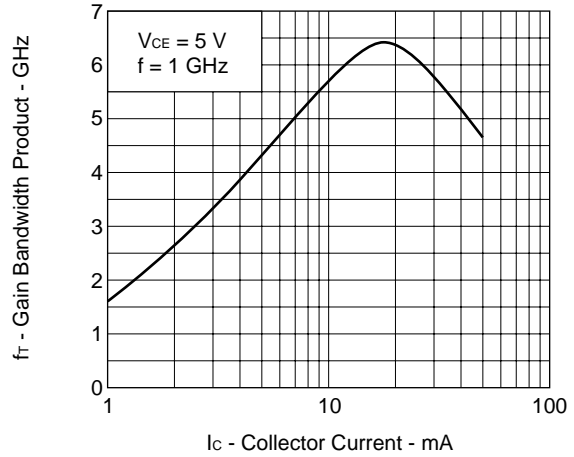
DC CURRENT GAIN vs. COLLECTOR CURRENT



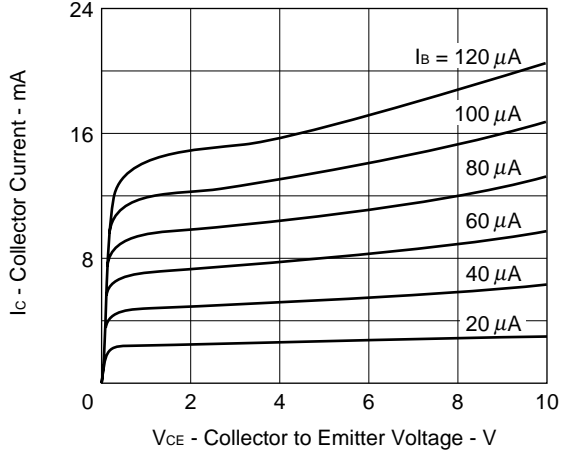
COLLECTOR CURRENT vs. DC BASE VOLTAGE



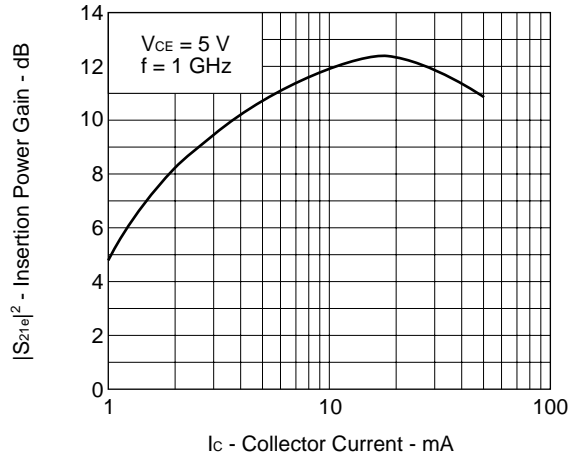
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



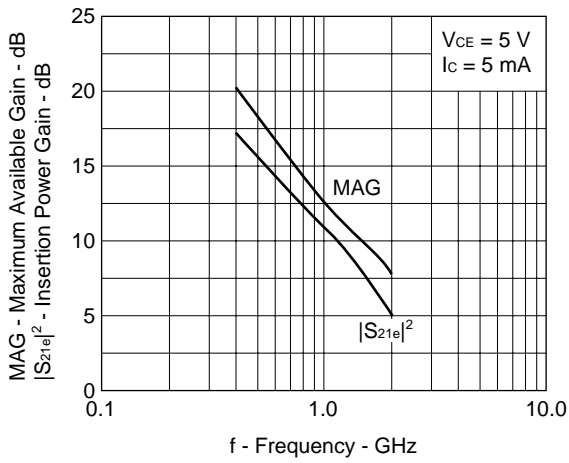
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



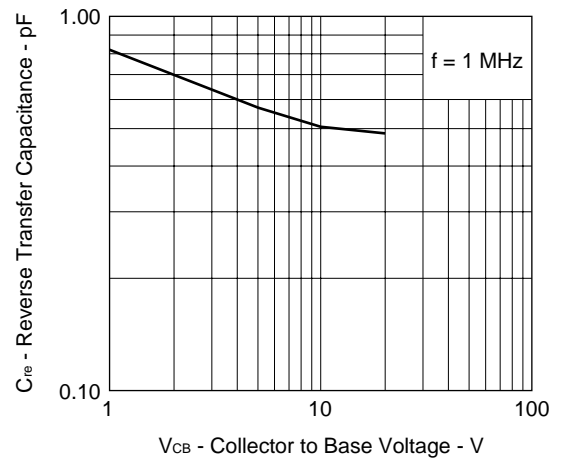
INSERTION POWER GAIN vs. COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN/INSERTION POWER GAIN vs. FREQUENCY



REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



2SC5431 S PARAMETER

V_{CE} = 5.0 V I_c = 5.0 mA, Z₀ = 50 Ω

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 200.00 | 0.675 | -66.0 | 10.641 | 135.2 | 0.052 | 57.8 | 0.786 | -29.4 |
| 400.00 | 0.550 | -108.8 | 7.098 | 111.6 | 0.074 | 46.8 | 0.546 | -41.0 |
| 600.00 | 0.513 | -133.2 | 5.218 | 96.6 | 0.088 | 45.0 | 0.428 | -47.0 |
| 800.00 | 0.489 | -149.5 | 4.145 | 88.0 | 0.097 | 45.5 | 0.377 | -50.1 |
| 1000.00 | 0.487 | -162.2 | 3.458 | 81.6 | 0.108 | 47.9 | 0.345 | -50.9 |
| 1200.00 | 0.501 | -170.9 | 2.973 | 75.0 | 0.119 | 50.1 | 0.316 | -51.8 |
| 1400.00 | 0.508 | -176.5 | 2.566 | 69.0 | 0.133 | 52.1 | 0.290 | -54.8 |
| 1600.00 | 0.498 | 177.3 | 2.279 | 64.7 | 0.143 | 55.0 | 0.269 | -59.4 |
| 1800.00 | 0.502 | 169.8 | 2.018 | 60.4 | 0.153 | 56.4 | 0.257 | -65.0 |
| 2000.00 | 0.524 | 164.0 | 1.800 | 56.0 | 0.162 | 56.5 | 0.246 | -71.1 |
| 2200.00 | 0.545 | 160.2 | 1.645 | 50.1 | 0.176 | 55.6 | 0.233 | -78.4 |
| 2400.00 | 0.560 | 156.9 | 1.559 | 45.5 | 0.191 | 55.4 | 0.229 | -88.3 |
| 2600.00 | 0.571 | 153.6 | 1.475 | 43.0 | 0.210 | 56.1 | 0.236 | -97.3 |
| 2800.00 | 0.585 | 150.5 | 1.337 | 39.9 | 0.222 | 57.1 | 0.239 | -104.3 |
| 3000.00 | 0.602 | 148.5 | 1.246 | 35.4 | 0.226 | 57.1 | 0.240 | -110.6 |

V_{CE} = 5.0 V I_c = 3.0 mA, Z₀ = 50 Ω

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 200.00 | 0.723 | -49.7 | 7.443 | 139.6 | 0.057 | 60.0 | 0.839 | -24.0 |
| 400.00 | 0.525 | -86.6 | 5.234 | 115.4 | 0.082 | 45.9 | 0.617 | -35.2 |
| 600.00 | 0.444 | -111.6 | 3.929 | 99.6 | 0.094 | 41.3 | 0.501 | -41.5 |
| 800.00 | 0.390 | -129.2 | 3.168 | 90.6 | 0.098 | 39.8 | 0.452 | -45.1 |
| 1000.00 | 0.362 | -144.4 | 2.663 | 84.0 | 0.106 | 40.3 | 0.424 | -46.4 |
| 1200.00 | 0.359 | -156.6 | 2.247 | 77.1 | 0.115 | 42.2 | 0.397 | -47.3 |
| 1400.00 | 0.362 | -164.8 | 1.987 | 70.4 | 0.124 | 45.5 | 0.372 | -50.3 |
| 1600.00 | 0.354 | -172.8 | 1.784 | 66.0 | 0.131 | 49.1 | 0.349 | -54.8 |
| 1800.00 | 0.356 | 178.2 | 1.589 | 61.6 | 0.138 | 52.4 | 0.338 | -60.2 |
| 2000.00 | 0.374 | 170.5 | 1.426 | 57.1 | 0.144 | 53.2 | 0.328 | -65.8 |
| 2200.00 | 0.397 | 165.6 | 1.316 | 51.3 | 0.155 | 54.2 | 0.315 | -72.5 |
| 2400.00 | 0.414 | 162.0 | 1.253 | 46.8 | 0.169 | 55.1 | 0.310 | -81.4 |
| 2600.00 | 0.429 | 158.2 | 1.186 | 44.2 | 0.185 | 56.6 | 0.320 | -89.7 |
| 2800.00 | 0.446 | 154.8 | 1.083 | 41.4 | 0.196 | 58.6 | 0.329 | -96.2 |
| 3000.00 | 0.465 | 152.3 | 1.018 | 36.2 | 0.204 | 59.2 | 0.331 | -102.7 |

V_{CE} = 5.0 V, I_c = 1.0 mA, Z₀ = 50 Ω

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 200.00 | 0.886 | -32.7 | 3.235 | 150.8 | 0.066 | 66.7 | 0.948 | -12.9 |
| 400.00 | 0.711 | -62.0 | 2.597 | 127.7 | 0.109 | 49.9 | 0.821 | -22.2 |
| 600.00 | 0.616 | -86.9 | 2.130 | 109.4 | 0.131 | 39.3 | 0.722 | -30.2 |
| 800.00 | 0.538 | -104.5 | 1.844 | 97.1 | 0.139 | 32.5 | 0.682 | -36.4 |
| 1000.00 | 0.481 | -120.1 | 1.577 | 87.9 | 0.145 | 27.7 | 0.666 | -39.6 |
| 1200.00 | 0.448 | -134.2 | 1.362 | 79.1 | 0.148 | 26.0 | 0.639 | -41.9 |
| 1400.00 | 0.437 | -145.2 | 1.222 | 70.8 | 0.148 | 27.7 | 0.611 | -45.7 |
| 1600.00 | 0.421 | -154.8 | 1.116 | 64.9 | 0.144 | 29.8 | 0.584 | -50.7 |
| 1800.00 | 0.407 | -165.5 | 1.008 | 59.5 | 0.138 | 32.6 | 0.574 | -56.6 |
| 2000.00 | 0.417 | -175.6 | 0.915 | 54.3 | 0.135 | 34.1 | 0.566 | -62.5 |
| 2200.00 | 0.439 | 177.1 | 0.849 | 47.8 | 0.138 | 37.8 | 0.550 | -69.0 |
| 2400.00 | 0.455 | 172.0 | 0.812 | 43.3 | 0.143 | 42.2 | 0.542 | -77.8 |
| 2600.00 | 0.466 | 167.2 | 0.768 | 40.5 | 0.152 | 47.0 | 0.558 | -86.0 |
| 2800.00 | 0.480 | 162.4 | 0.701 | 37.4 | 0.159 | 51.8 | 0.573 | -92.3 |
| 3000.00 | 0.499 | 158.8 | 0.661 | 32.5 | 0.167 | 55.6 | 0.566 | -98.7 |

V_{CE} = 3.0 V, I_c = 5.0 mA, Z₀ = 50 Ω

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 200.00 | 0.597 | -65.7 | 9.659 | 130.5 | 0.056 | 53.8 | 0.719 | -35.9 |
| 400.00 | 0.431 | -106.4 | 6.136 | 107.4 | 0.075 | 44.3 | 0.463 | -49.2 |
| 600.00 | 0.375 | -130.0 | 4.420 | 93.7 | 0.086 | 43.7 | 0.354 | -55.6 |
| 800.00 | 0.347 | -146.7 | 3.497 | 86.2 | 0.093 | 44.8 | 0.305 | -58.8 |
| 1000.00 | 0.340 | -160.1 | 2.911 | 80.3 | 0.105 | 47.0 | 0.272 | -59.9 |
| 1200.00 | 0.348 | -169.5 | 2.441 | 74.2 | 0.116 | 49.1 | 0.246 | -61.7 |
| 1400.00 | 0.355 | -175.6 | 2.153 | 68.4 | 0.130 | 51.6 | 0.225 | -66.0 |
| 1600.00 | 0.352 | 177.6 | 1.925 | 64.4 | 0.142 | 54.4 | 0.210 | -71.9 |
| 1800.00 | 0.359 | 170.0 | 1.706 | 60.4 | 0.152 | 56.4 | 0.200 | -78.5 |
| 2000.00 | 0.381 | 163.8 | 1.533 | 56.1 | 0.161 | 56.4 | 0.192 | -86.1 |
| 2200.00 | 0.404 | 160.0 | 1.411 | 50.7 | 0.175 | 55.8 | 0.185 | -96.3 |
| 2400.00 | 0.421 | 157.0 | 1.343 | 46.6 | 0.191 | 55.7 | 0.191 | -107.2 |
| 2600.00 | 0.435 | 153.7 | 1.270 | 44.3 | 0.209 | 56.3 | 0.206 | -115.6 |
| 2800.00 | 0.454 | 150.8 | 1.162 | 41.6 | 0.220 | 57.4 | 0.218 | -122.2 |
| 3000.00 | 0.472 | 149.0 | 1.088 | 36.6 | 0.227 | 57.0 | 0.228 | -129.3 |

V_{CE} = 3.0 V, I_c = 3.0 mA, Z₀ = 50 Ω

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 200.00 | 0.707 | -53.0 | 7.303 | 137.7 | 0.064 | 58.0 | 0.814 | -27.8 |
| 400.00 | 0.514 | -91.3 | 5.041 | 113.3 | 0.091 | 43.6 | 0.575 | -40.8 |
| 600.00 | 0.439 | -116.2 | 3.754 | 97.8 | 0.102 | 38.9 | 0.457 | -48.1 |
| 800.00 | 0.391 | -133.8 | 3.018 | 88.9 | 0.107 | 37.8 | 0.404 | -52.1 |
| 1000.00 | 0.369 | -148.6 | 2.525 | 82.3 | 0.116 | 38.2 | 0.372 | -53.8 |
| 1200.00 | 0.370 | -159.9 | 2.132 | 75.2 | 0.125 | 40.2 | 0.343 | -55.5 |
| 1400.00 | 0.374 | -167.5 | 1.885 | 68.7 | 0.135 | 43.3 | 0.318 | -59.4 |
| 1600.00 | 0.367 | -175.1 | 1.693 | 64.2 | 0.141 | 46.6 | 0.299 | -64.8 |
| 1800.00 | 0.370 | 176.3 | 1.506 | 59.8 | 0.148 | 49.4 | 0.289 | -70.7 |
| 2000.00 | 0.390 | 168.9 | 1.355 | 55.2 | 0.155 | 50.2 | 0.280 | -77.1 |
| 2200.00 | 0.413 | 164.3 | 1.251 | 49.5 | 0.167 | 50.7 | 0.268 | -85.6 |
| 2400.00 | 0.430 | 160.7 | 1.189 | 45.0 | 0.180 | 51.9 | 0.272 | -95.6 |
| 2600.00 | 0.444 | 157.1 | 1.126 | 42.7 | 0.196 | 53.3 | 0.286 | -104.0 |
| 2800.00 | 0.462 | 153.8 | 1.028 | 39.5 | 0.206 | 54.8 | 0.297 | -110.4 |
| 3000.00 | 0.480 | 151.4 | 0.964 | 34.6 | 0.214 | 55.2 | 0.303 | -117.3 |

V_{CE} = 3.0 V, I_c = 1.0 mA, Z₀ = 50 Ω

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 200.00 | 0.878 | -34.4 | 3.225 | 149.4 | 0.076 | 65.6 | 0.939 | -14.8 |
| 400.00 | 0.699 | -64.9 | 2.556 | 125.7 | 0.123 | 48.1 | 0.796 | -25.3 |
| 600.00 | 0.607 | -90.1 | 2.080 | 107.1 | 0.148 | 37.3 | 0.691 | -34.0 |
| 800.00 | 0.531 | -107.9 | 1.791 | 94.8 | 0.154 | 30.0 | 0.647 | -40.4 |
| 1000.00 | 0.477 | -123.5 | 1.524 | 85.4 | 0.161 | 25.2 | 0.626 | -43.9 |
| 1200.00 | 0.450 | -137.4 | 1.316 | 76.4 | 0.164 | 23.3 | 0.596 | -46.6 |
| 1400.00 | 0.442 | -148.0 | 1.184 | 68.0 | 0.163 | 24.6 | 0.567 | -50.9 |
| 1600.00 | 0.427 | -157.3 | 1.081 | 62.1 | 0.159 | 26.6 | 0.543 | -56.5 |
| 1800.00 | 0.415 | -167.7 | 0.976 | 56.8 | 0.152 | 28.8 | 0.534 | -62.8 |
| 2000.00 | 0.426 | -177.6 | 0.883 | 51.5 | 0.148 | 29.8 | 0.526 | -69.2 |
| 2200.00 | 0.450 | -175.6 | 0.821 | 45.2 | 0.150 | 33.0 | 0.509 | -76.5 |
| 2400.00 | 0.467 | 170.7 | 0.786 | 40.7 | 0.153 | 37.3 | 0.508 | -86.2 |
| 2600.00 | 0.477 | 166.1 | 0.741 | 37.9 | 0.161 | 42.2 | 0.527 | -94.4 |
| 2800.00 | 0.492 | 161.5 | 0.676 | 34.8 | 0.167 | 46.5 | 0.541 | -100.8 |
| 3000.00 | 0.511 | 158.0 | 0.638 | 29.9 | 0.174 | 50.0 | 0.536 | -107.8 |

[MEMO]

[MEMO]

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