

HIGH FREQUENCY LOW NOISE AMPLIFIER  
NPN SILICON EPITAXIAL TRANSISTOR  
SUPER MINI MOLD**DESCRIPTION**

The 2SC4227 is a low supply voltage transistor designed for VHF, UHF low noise amplifier.

It is suitable for a high density surface mount assembly since the transistor has been applied small mini mold package.

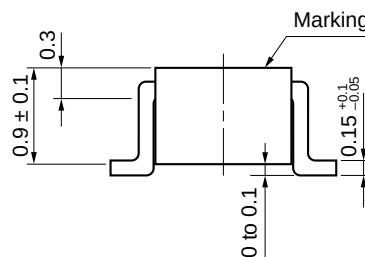
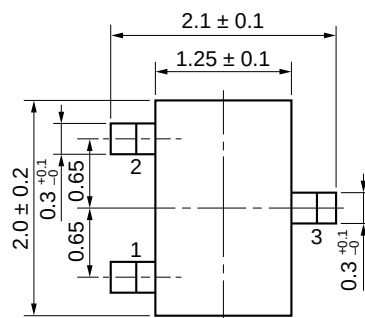
**FEATURES**

- Low Noise  
NF = 1.4 dB TYP. @  $f = 1$  GHz,  $V_{CE} = 3$  V,  $I_C = 7$  mA
- High Gain  
 $|S_{21e}|^2 = 12$  dB TYP. @  $f = 1$  GHz,  $V_{CE} = 3$  V,  $I_C = 7$  mA
- Small Mini Mold Package  
EIAJ: SC-70

**ORDERING INFORMATION**

| PART NUMBER | QUANTITY     | PACKING STYLE                                                                                 |
|-------------|--------------|-----------------------------------------------------------------------------------------------|
| 2SC4227-T1  | 3 Kpcs/Reel. | Embossed tape 8 mm wide.<br>Pin3 (Collector) face to perforation side of the tape.            |
| 2SC4227-T2  | 3 Kpcs/Reel. | Embossed tape 8 mm wide.<br>Pin1 (Emitter), Pin2 (Base) face to perforation side of the tape. |

\* Please contact with responsible NEC person, if you require evaluation sample. Unit sample quantity shall be 50 pcs. (Part No.: 2SC4227)

**PACKAGE DIMENSIONS**  
in millimeters**PIN CONNECTIONS**

1. Emitter
2. Base
3. Collector

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

|                              |                  |             |    |
|------------------------------|------------------|-------------|----|
| Collector to Base Voltage    | V <sub>CBO</sub> | 20          | V  |
| Collector to Emitter Voltage | V <sub>CEO</sub> | 10          | V  |
| Emitter to Base Voltage      | V <sub>EBO</sub> | 1.5         | V  |
| Collector Current            | I <sub>C</sub>   | 65          | mA |
| Total Power Dissipation      | P <sub>T</sub>   | 150         | mW |
| Junction Temperature         | T <sub>J</sub>   | 150         | °C |
| Storage Temperature          | T <sub>stg</sub> | −65 to +150 | °C |

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

| CHARACTERISTIC           | SYMBOL                          | MIN. | TYP. | MAX. | UNIT | TEST CONDITION                                                     |
|--------------------------|---------------------------------|------|------|------|------|--------------------------------------------------------------------|
| Collector Cutoff Current | I <sub>CBO</sub>                |      |      | 0.8  | μA   | V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0                         |
| Emitter Cutoff Current   | I <sub>EBO</sub>                |      |      | 0.8  | μA   | V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0                          |
| DC Current Gain          | h <sub>FE</sub>                 | 40   |      | 240  |      | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA <sup>*1</sup>         |
| Gain Bandwidth Product   | f <sub>T</sub>                  | 4.5  | 7.0  |      | GHz  | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA                       |
| Feedback Capacitance     | C <sub>re</sub>                 |      | 0.45 | 0.9  | pF   | V <sub>CE</sub> = 3 V, I <sub>E</sub> = 0, f = 1 MHz <sup>*2</sup> |
| Insertion Power Gain     | S <sub>21e</sub>   <sup>2</sup> | 10   | 12   |      | dB   | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA, f = 1 GHz            |
| Noise Figure             | NF                              |      | 1.4  | 2.7  | dB   | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA, f = 1 GHz            |

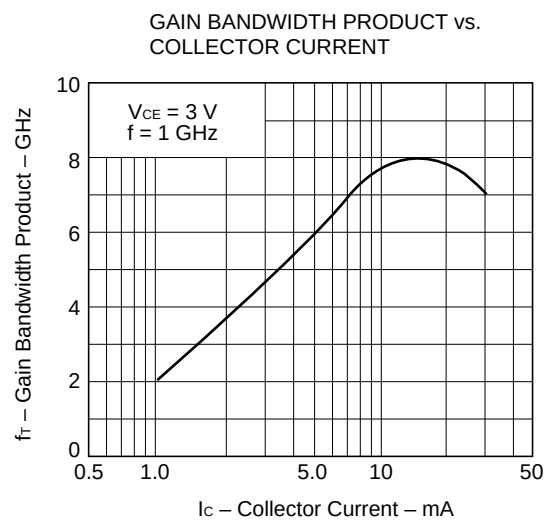
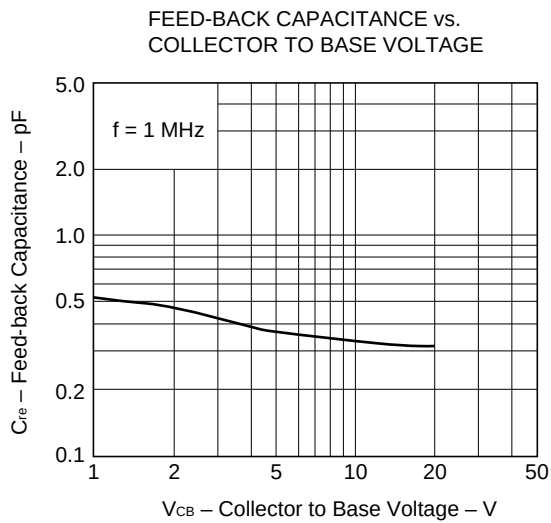
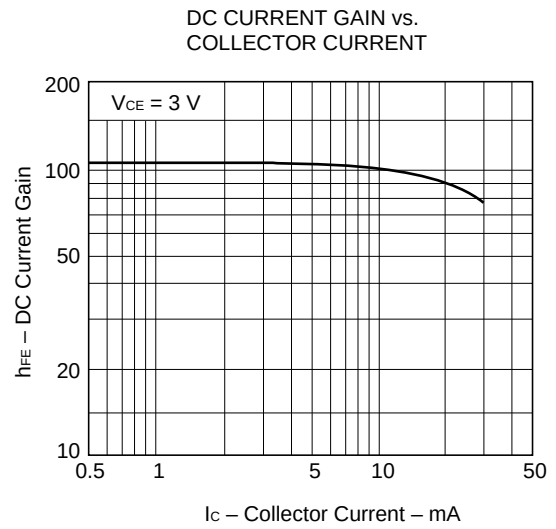
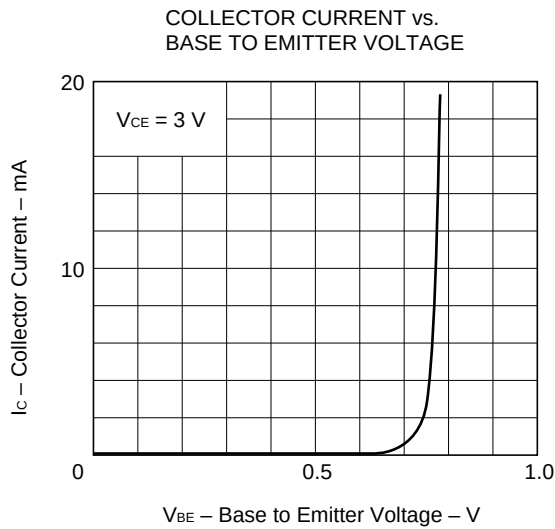
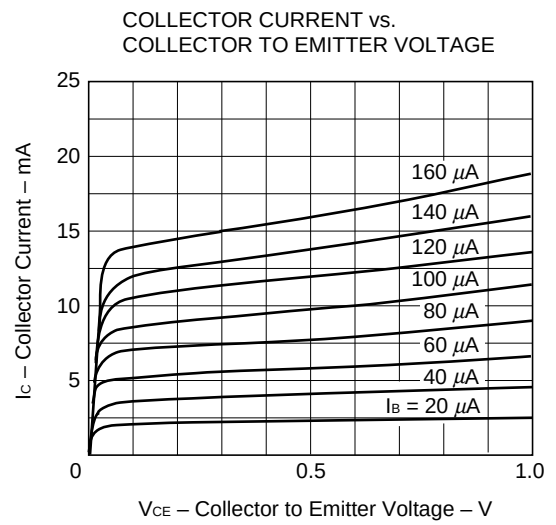
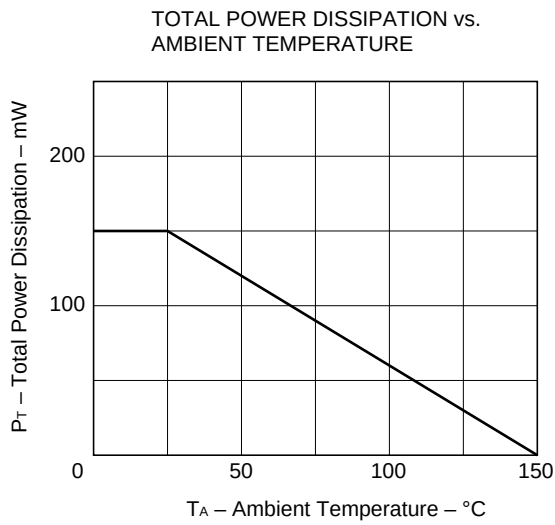
**\*1** Pulse Measurement ; PW ≤ 350 μs, Duty Cycle ≤ 2 % Pulsed.

**\*2** Measured with 3 terminals bridge, Emitter and Case should be grounded.

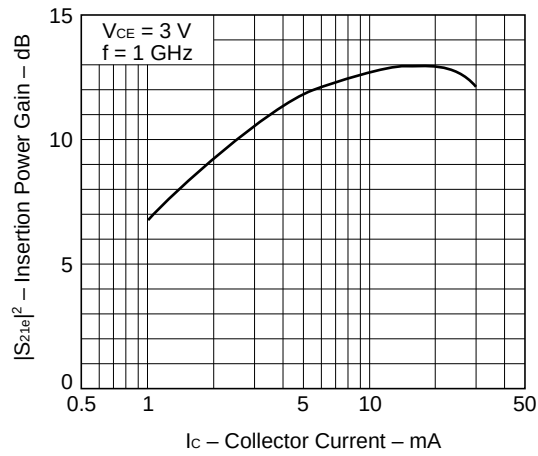
**h<sub>FE</sub> Classification**

|                 |          |           |            |
|-----------------|----------|-----------|------------|
| Rank            | R33      | R34       | R35        |
| Marking         | R33      | R34       | R35        |
| h <sub>FE</sub> | 40 to 90 | 70 to 150 | 110 to 240 |

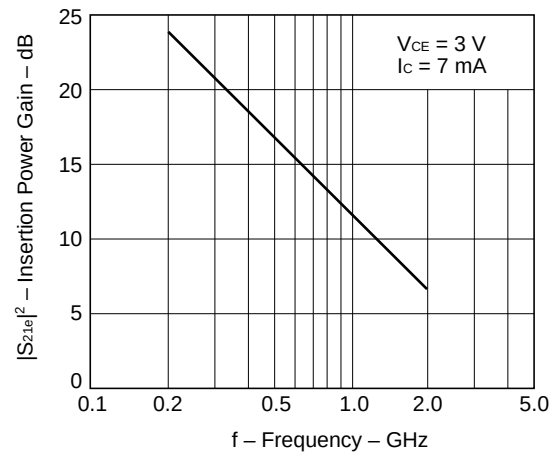
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



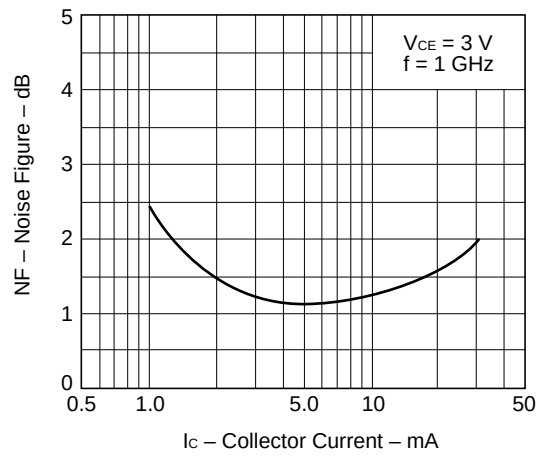
INSERTION POWER GAIN vs.  
COLLECTOR CURRENT



INSERTION POWER GAIN vs.  
FREQUENCY



NOISE FIGURE vs.  
COLLECTOR CURRENT



**S-PARAMETER**(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 7 mA, Z<sub>O</sub> = 50 Ω)

| FREQUENCY |      | S11    |        | S21   |      | S12  |      | S22   |  |
|-----------|------|--------|--------|-------|------|------|------|-------|--|
| MHz       | MAG  | ANG    | MAG    | ANG   | MAG  | ANG  | MAG  | ANG   |  |
| 100.00    | .804 | -23.8  | 11.631 | 154.8 | .023 | 74.8 | .920 | -16.5 |  |
| 200.00    | .692 | -48.6  | 10.839 | 137.5 | .040 | 64.1 | .791 | -27.7 |  |
| 300.00    | .581 | -70.3  | 9.722  | 123.8 | .050 | 59.9 | .675 | -33.5 |  |
| 400.00    | .489 | -89.0  | 8.519  | 112.9 | .060 | 56.7 | .597 | -37.0 |  |
| 500.00    | .419 | -104.9 | 7.434  | 104.1 | .067 | 55.9 | .538 | -38.7 |  |
| 600.00    | .376 | -117.1 | 6.468  | 97.5  | .075 | 55.6 | .497 | -40.0 |  |
| 700.00    | .342 | -128.6 | 5.729  | 91.8  | .082 | 55.7 | .467 | -41.0 |  |
| 800.00    | .321 | -138.4 | 5.115  | 86.7  | .089 | 56.3 | .443 | -41.7 |  |
| 900.00    | .305 | -147.3 | 4.630  | 82.5  | .096 | 56.1 | .427 | -42.5 |  |
| 1000.00   | .296 | -155.2 | 4.207  | 78.5  | .104 | 56.4 | .412 | -43.6 |  |
| 1100.00   | .289 | -162.2 | 3.879  | 74.8  | .111 | 56.0 | .401 | -44.6 |  |
| 1200.00   | .284 | -169.3 | 3.595  | 71.4  | .119 | 56.4 | .393 | -45.8 |  |
| 1300.00   | .282 | -175.3 | 3.349  | 68.1  | .127 | 56.2 | .384 | -47.3 |  |
| 1400.00   | .281 | 179.0  | 3.133  | 64.8  | .136 | 56.0 | .379 | -48.8 |  |
| 1500.00   | .283 | 173.8  | 2.945  | 61.9  | .143 | 55.4 | .372 | -50.1 |  |
| 1600.00   | .283 | 168.6  | 2.780  | 58.8  | .151 | 55.0 | .367 | -51.8 |  |
| 1700.00   | .285 | 163.8  | 2.631  | 56.2  | .160 | 54.4 | .363 | -53.7 |  |
| 1800.00   | .286 | 159.9  | 2.514  | 53.3  | .168 | 53.9 | .359 | -55.4 |  |
| 1900.00   | .289 | 155.4  | 2.390  | 50.5  | .177 | 53.3 | .354 | -57.3 |  |
| 2000.00   | .293 | 151.8  | 2.293  | 47.8  | .186 | 52.5 | .351 | -59.2 |  |

(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 5 mA, Z<sub>O</sub> = 50 Ω)

| FREQUENCY |      | S11    |        | S21   |      | S12  |      | S22   |  |
|-----------|------|--------|--------|-------|------|------|------|-------|--|
| MHz       | MAG  | ANG    | MAG    | ANG   | MAG  | ANG  | MAG  | ANG   |  |
| 100.00    | .818 | -29.4  | 14.580 | 156.2 | .023 | 79.9 | .932 | -14.4 |  |
| 200.00    | .689 | -54.3  | 12.120 | 137.5 | .040 | 65.1 | .824 | -23.4 |  |
| 300.00    | .594 | -73.1  | 10.142 | 124.6 | .052 | 55.0 | .716 | -30.3 |  |
| 400.00    | .500 | -89.8  | 8.340  | 114.4 | .063 | 58.5 | .620 | -32.2 |  |
| 500.00    | .457 | -102.8 | 7.300  | 107.5 | .069 | 56.4 | .577 | -34.2 |  |
| 600.00    | .404 | -115.0 | 6.211  | 101.0 | .081 | 54.9 | .525 | -35.1 |  |
| 700.00    | .377 | -124.4 | 5.496  | 96.8  | .084 | 59.5 | .511 | -36.1 |  |
| 800.00    | .359 | -134.3 | 4.908  | 91.4  | .091 | 58.4 | .471 | -36.2 |  |
| 900.00    | .342 | -141.5 | 4.450  | 88.1  | .097 | 58.4 | .458 | -35.3 |  |
| 1000.00   | .335 | -150.3 | 4.018  | 84.7  | .100 | 61.2 | .440 | -36.5 |  |
| 1100.00   | .326 | -155.9 | 3.750  | 81.4  | .112 | 61.8 | .442 | -36.8 |  |
| 1200.00   | .321 | -162.4 | 3.410  | 78.1  | .115 | 61.4 | .417 | -37.8 |  |
| 1300.00   | .317 | -167.2 | 3.181  | 75.6  | .124 | 62.3 | .412 | -38.5 |  |
| 1400.00   | .321 | -173.4 | 2.995  | 72.5  | .131 | 63.9 | .411 | -39.9 |  |
| 1500.00   | .318 | -177.5 | 2.802  | 69.8  | .138 | 63.6 | .407 | -40.4 |  |
| 1600.00   | .320 | 176.6  | 2.665  | 67.3  | .149 | 66.4 | .400 | -41.1 |  |
| 1700.00   | .323 | 173.2  | 2.533  | 66.1  | .156 | 65.3 | .394 | -43.7 |  |
| 1800.00   | .326 | 167.8  | 2.369  | 63.0  | .162 | 65.9 | .394 | -44.3 |  |
| 1900.00   | .331 | 165.6  | 2.275  | 61.0  | .177 | 65.4 | .390 | -45.5 |  |
| 2000.00   | .333 | 161.4  | 2.196  | 59.2  | .183 | 64.5 | .384 | -47.6 |  |

**S-PARAMETER**(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 3 mA, Z<sub>O</sub> = 50 Ω)

| FREQUENCY |      | S11    |       | S21   |      | S12  |      | S22   |  |
|-----------|------|--------|-------|-------|------|------|------|-------|--|
| MHz       | MAG  | ANG    | MAG   | ANG   | MAG  | ANG  | MAG  | ANG   |  |
| 100.00    | .906 | −22.7  | 9.710 | 161.6 | .026 | 82.5 | .962 | −10.6 |  |
| 200.00    | .810 | −43.7  | 8.541 | 145.3 | .049 | 63.8 | .895 | −18.3 |  |
| 300.00    | .742 | −60.6  | 7.695 | 133.4 | .062 | 58.7 | .811 | −25.8 |  |
| 400.00    | .638 | −76.6  | 6.580 | 122.4 | .073 | 56.0 | .732 | −27.7 |  |
| 500.00    | .587 | −89.8  | 5.934 | 114.1 | .082 | 53.4 | .680 | −31.2 |  |
| 600.00    | .524 | −102.2 | 5.148 | 107.1 | .091 | 49.7 | .624 | −33.5 |  |
| 700.00    | .490 | −111.4 | 4.627 | 102.2 | .094 | 51.8 | .603 | −34.4 |  |
| 800.00    | .460 | −121.4 | 4.181 | 96.0  | .099 | 51.2 | .568 | −35.0 |  |
| 900.00    | .435 | −129.9 | 3.827 | 92.6  | .101 | 52.9 | .540 | −35.7 |  |
| 1000.00   | .427 | −138.2 | 3.443 | 88.1  | .107 | 50.9 | .523 | −36.7 |  |
| 1100.00   | .404 | −144.9 | 3.199 | 84.2  | .115 | 53.7 | .512 | −36.8 |  |
| 1200.00   | .399 | −151.7 | 2.989 | 79.8  | .113 | 56.6 | .500 | −38.6 |  |
| 1300.00   | .392 | −157.9 | 2.779 | 77.4  | .121 | 54.9 | .489 | −39.2 |  |
| 1400.00   | .392 | −163.6 | 2.638 | 73.5  | .126 | 56.4 | .483 | −40.4 |  |
| 1500.00   | .386 | −169.1 | 2.443 | 71.3  | .135 | 56.4 | .477 | −41.8 |  |
| 1600.00   | .380 | −174.5 | 2.344 | 68.0  | .137 | 60.0 | .477 | −42.4 |  |
| 1700.00   | .382 | −179.7 | 2.239 | 65.3  | .143 | 59.5 | .466 | −44.4 |  |
| 1800.00   | .389 | 176.1  | 2.113 | 63.0  | .151 | 59.4 | .461 | −44.9 |  |
| 1900.00   | .383 | 172.5  | 2.025 | 61.4  | .154 | 62.6 | .456 | −46.9 |  |
| 2000.00   | .387 | 168.3  | 1.922 | 58.2  | .163 | 62.0 | .464 | −48.3 |  |

(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 7 mA, Z<sub>O</sub> = 50 Ω)

| FREQUENCY |       | S11    |       | S21   |      | S12  |      | S22   |  |
|-----------|-------|--------|-------|-------|------|------|------|-------|--|
| MHz       | MAG   | ANG    | MAG   | ANG   | MAG  | ANG  | MAG  | ANG   |  |
| 100.00    | 1.009 | −14.5  | 3.544 | 168.8 | .027 | 78.6 | .994 | −5.6  |  |
| 200.00    | .955  | −29.7  | 3.359 | 156.3 | .055 | 73.6 | .969 | −10.1 |  |
| 300.00    | .937  | −42.6  | 3.277 | 147.1 | .073 | 63.4 | .947 | −15.9 |  |
| 400.00    | .864  | −56.2  | 3.034 | 136.6 | .091 | 57.7 | .898 | −18.8 |  |
| 500.00    | .838  | −67.3  | 2.891 | 128.6 | .107 | 51.1 | .865 | −22.1 |  |
| 600.00    | .775  | −79.3  | 2.674 | 120.0 | .116 | 46.6 | .824 | −25.8 |  |
| 700.00    | .745  | −88.5  | 2.485 | 114.2 | .125 | 45.2 | .803 | −27.5 |  |
| 800.00    | .708  | −99.1  | 2.338 | 106.8 | .127 | 41.2 | .776 | −29.7 |  |
| 900.00    | .670  | −107.9 | 2.177 | 101.4 | .132 | 40.2 | .740 | −31.5 |  |
| 1000.00   | .649  | −116.8 | 2.052 | 96.0  | .135 | 37.2 | .723 | −33.7 |  |
| 1100.00   | .621  | −124.0 | 1.914 | 90.8  | .131 | 36.6 | .719 | −34.2 |  |
| 1200.00   | .608  | −131.8 | 1.819 | 86.0  | .129 | 35.4 | .700 | −36.3 |  |
| 1300.00   | .587  | −138.5 | 1.713 | 82.4  | .130 | 35.2 | .691 | −37.6 |  |
| 1400.00   | .587  | −144.5 | 1.628 | 77.7  | .128 | 36.1 | .681 | −39.2 |  |
| 1500.00   | .573  | −152.6 | 1.533 | 73.4  | .127 | 36.0 | .662 | −40.7 |  |
| 1600.00   | .559  | −157.1 | 1.464 | 70.3  | .124 | 37.5 | .660 | −42.7 |  |
| 1700.00   | .562  | −164.2 | 1.421 | 67.2  | .120 | 39.1 | .658 | −44.0 |  |
| 1800.00   | .557  | −168.9 | 1.350 | 64.7  | .122 | 43.3 | .658 | −46.0 |  |
| 1900.00   | .557  | −173.9 | 1.296 | 61.1  | .122 | 45.2 | .641 | −47.8 |  |
| 2000.00   | .551  | −178.6 | 1.240 | 58.0  | .124 | 48.5 | .643 | −50.1 |  |

[MEMO]

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NEC devices are classified into the following three quality grades:

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Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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Anti-radioactive design is not implemented in this product.