

L to S BAND LOW NOISE AMPLIFIER
N-CHANNEL HJ-FET

DESCRIPTION

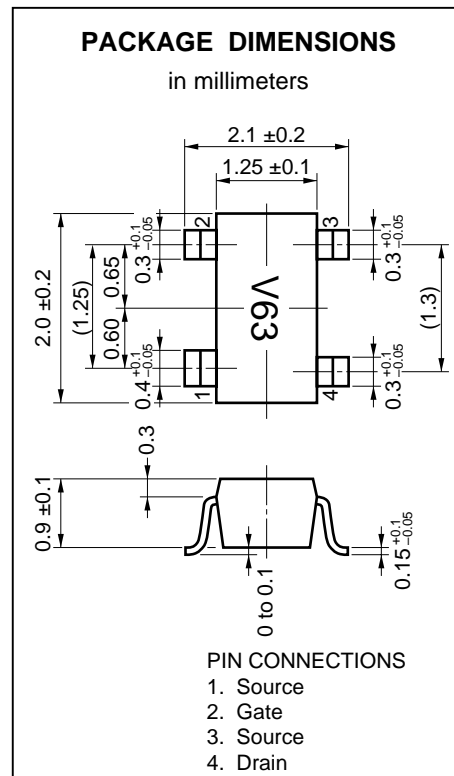
NE34018 is a n-channel HJ-FET housed in MOLD package.

FEATURES

- Low noise figure
NF = 0.6 dB TYP. at f = 2 GHz
- High associated gain
Ga = 16 dB TYP. at f = 2 GHz
- Gate width: $W_g = 400 \mu\text{m}$
- 4 pins super mini mold
- Tape & reel packaging only available

ORDERING INFORMATION

| PART NUMBER | QUANTITY | PACKING STYLE |
|-------------|--------------|--|
| NE34018-T1 | 3 Kpcs/Reel. | Embossed tape 8 mm wide. Pin 3 (Source), Pin 4 (Drain) face to perforation side of the tape. |
| NE34018-T2 | 3 Kpcs/Reel. | Embossed tape 8 mm wide. Pin 1 (Source), Pin 2 (Gate) 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 number for sample order: NE34018)

ABSOLUTE MAXIMUM RATINGS ($T_A = 25 \text{ }^\circ\text{C}$)

| | | | |
|-------------------------|-----------|-------------|------------------|
| Drain to Source Voltage | V_{DS} | 4.0 | V |
| Gate to Source Voltage | V_{GS} | -3.0 | V |
| Gate Current | I_D | I_{DSS} | mA |
| Total Power Dissipation | P_{tot} | 150 | mW |
| Channel Temperature | T_{ch} | 125 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | -65 to +125 | $^\circ\text{C}$ |

RECOMMENDED OPERATING CONDITION (T_A = 25 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-------------------------|-----------------|------|------|------|------|
| Drain to Source Voltage | V _{DS} | | 2 | 3 | V |
| Drain Current | I _D | | 5 | 30 | mA |
| Input Power | P _{in} | | | +10 | dBm |

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

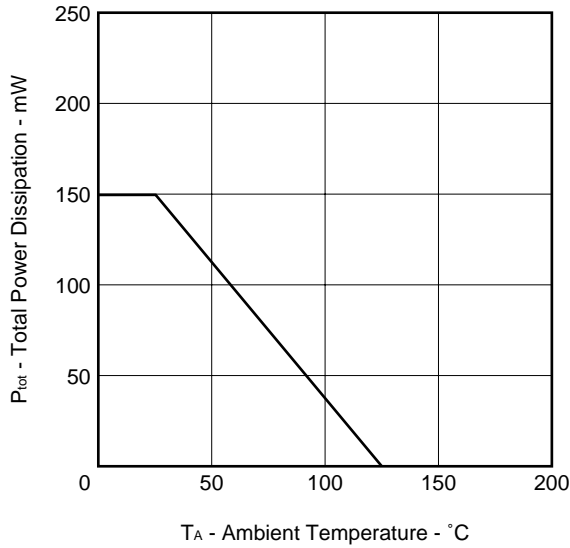
| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|--|----------------------|------|------|------|------|---|
| Gate to Source Leak Current | I _{GSO} | – | 0.5 | 10 | μA | V _{GS} = –3 V |
| Saturated Drain Current | I _{DSS} | 30 | | 120 | mA | V _{DS} = 2 V, V _{GS} = 0 V |
| Gate to Source Cut off Voltage | V _{GS(off)} | –0.2 | –0.8 | –2.0 | V | V _{DS} = 2 V, I _D = 100 μA |
| Transconductance | g _m | 30 | | – | mS | V _{DS} = 2 V, I _D = 5 mA |
| Noise Figure | NF | | 0.6 | 1.0 | dB | V _{DS} = 2 V, I _D = 5 mA, f = 2 GHz |
| Associated Gain | G _a | 14 | 16 | | dB | |
| Power Gain | G _s | | 18 | | dB | |
| Output Power at 1dB Gain Compression Point | P _(1dB) | | 15 | | dBm | V _{DS} = 3 V, I _D = 30 mA (RF off) f = 2 GHz |

I_{DSS} CLASSIFICATION

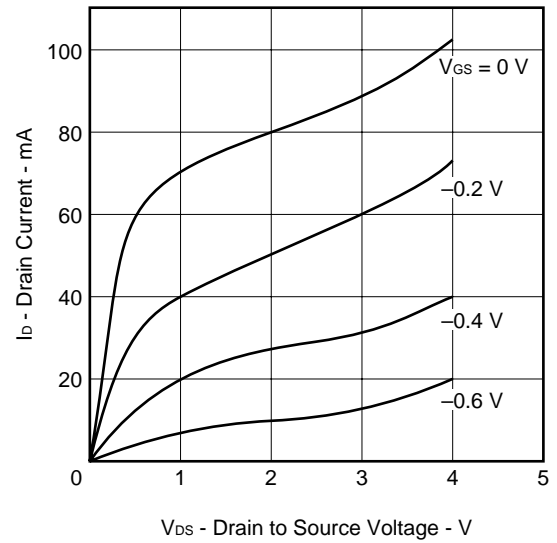
| RANK | I _{DSS} (mA) | MARKING |
|------|-----------------------|---------|
| 63 | 30 to 65 | V63 |
| 64 | 60 to 120 | V64 |

TYPICAL CHARACTERISTICS (T_A = 25 °C)

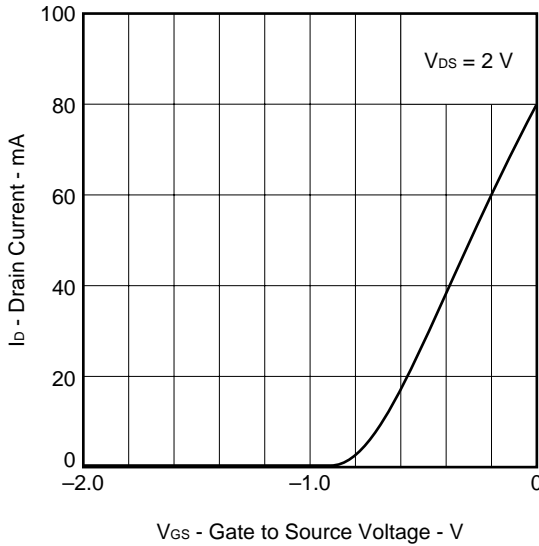
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



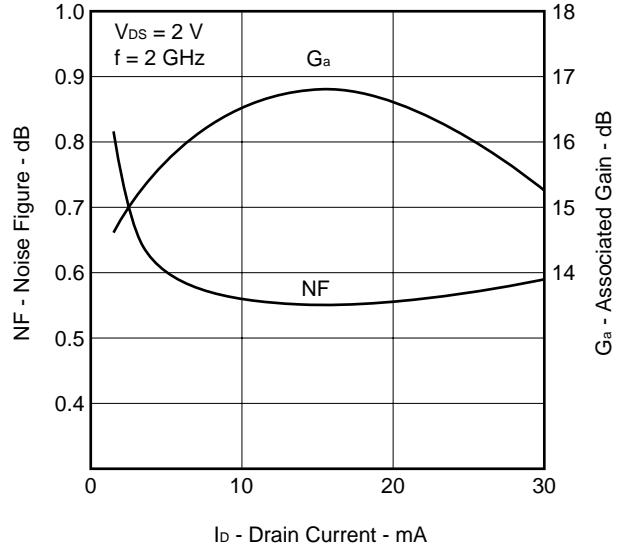
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT



S-PARAMETER

MAG. AND ANG.

$V_{DS} = 2\text{ V}$, $I_D = 5\text{ mA}$

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) |
| 500 | .997 | -15.9 | 5.053 | 165.6 | .020 | 82.6 | .805 | -9.0 |
| 600 | .994 | -19.1 | 5.070 | 162.8 | .024 | 80.1 | .801 | -10.7 |
| 700 | .989 | -22.0 | 4.994 | 160.1 | .027 | 79.0 | .800 | -12.3 |
| 800 | .983 | -25.1 | 4.992 | 157.4 | .031 | 77.0 | .798 | -13.9 |
| 900 | .978 | -27.9 | 4.975 | 154.9 | .035 | 75.1 | .797 | -15.4 |
| 1000 | .972 | -31.0 | 4.893 | 152.0 | .039 | 73.7 | .793 | -17.0 |
| 1100 | .954 | -33.8 | 4.879 | 149.4 | .042 | 71.8 | .791 | -18.4 |
| 1200 | .960 | -36.1 | 4.824 | 147.1 | .045 | 71.0 | .792 | -19.6 |
| 1300 | .951 | -38.8 | 4.790 | 144.6 | .048 | 69.9 | .785 | -20.9 |
| 1400 | .945 | -41.2 | 4.746 | 142.2 | .050 | 68.9 | .782 | -22.2 |
| 1500 | .934 | -43.7 | 4.696 | 139.8 | .054 | 68.2 | .780 | -23.4 |
| 1600 | .926 | -46.3 | 4.655 | 137.4 | .056 | 65.4 | .777 | -24.4 |
| 1700 | .914 | -48.4 | 4.588 | 135.1 | .058 | 65.7 | .775 | -25.5 |
| 1800 | .901 | -50.7 | 4.526 | 132.8 | .061 | 63.9 | .769 | -26.3 |
| 1900 | .887 | -52.9 | 4.463 | 130.7 | .063 | 62.7 | .766 | -27.3 |
| 2000 | .807 | -58.3 | 4.308 | 124.8 | .064 | 58.5 | .699 | -27.7 |
| 2100 | .787 | -60.6 | 4.241 | 122.6 | .066 | 57.1 | .697 | -28.6 |
| 2200 | .775 | -62.9 | 4.193 | 120.4 | .067 | 56.1 | .685 | -29.8 |
| 2300 | .755 | -64.7 | 4.122 | 118.4 | .070 | 55.8 | .680 | -30.2 |
| 2400 | .745 | -66.8 | 4.069 | 116.5 | .070 | 54.8 | .675 | -31.1 |
| 2500 | .732 | -68.5 | 4.017 | 114.7 | .072 | 55.0 | .671 | -31.9 |
| 2600 | .720 | -70.8 | 3.977 | 112.7 | .074 | 54.5 | .666 | -32.5 |
| 2700 | .706 | -72.8 | 3.913 | 110.7 | .075 | 53.1 | .657 | -33.6 |
| 2800 | .691 | -75.3 | 3.892 | 108.9 | .077 | 53.1 | .656 | -34.1 |
| 2900 | .677 | -77.2 | 3.833 | 106.9 | .078 | 51.7 | .650 | -34.8 |
| 3000 | .657 | -79.5 | 3.783 | 105.0 | .080 | 51.5 | .642 | -35.6 |

AMP. PARAMETERS

V_{DS} = 2 V, I_D = 5 mA

| FREQUENCY MHz | G _{Umax} dB | G _{Amax} dB | S ₂₁ ² dB | S ₁₂ ² dB | K | Delay ns | Mason's U dB | G ₁ dB | G ₂ dB |
|------------------|-------------------------|-------------------------|--------------------------------------|--------------------------------------|-----|-------------|-----------------|----------------------|----------------------|
| 500 | 40.42 | | 14.07 | -34.10 | .02 | .078 | | 21.81 | 4.53 |
| 600 | 37.65 | | 14.10 | -32.49 | .04 | .078 | | 19.09 | 4.46 |
| 700 | 35.02 | | 13.97 | -31.28 | .05 | .074 | | 16.61 | 4.44 |
| 800 | 33.18 | | 13.97 | -30.09 | .07 | .074 | | 14.81 | 4.40 |
| 900 | 31.99 | | 13.94 | -29.02 | .09 | .070 | | 13.68 | 4.37 |
| 1000 | 30.73 | | 13.79 | -28.27 | .10 | .079 | | 12.63 | 4.31 |
| 1100 | 28.48 | | 13.77 | -27.56 | .14 | .072 | | 10.45 | 4.26 |
| 1200 | 28.95 | | 13.67 | -26.99 | .13 | .065 | | 11.01 | 4.28 |
| 1300 | 28.01 | | 13.61 | -26.40 | .14 | .068 | | 10.24 | 4.16 |
| 1400 | 27.36 | | 13.53 | -25.95 | .15 | .068 | | 9.73 | 4.11 |
| 1500 | 26.48 | | 13.43 | -25.35 | .16 | .065 | | 8.97 | 4.08 |
| 1600 | 25.87 | | 13.36 | -25.02 | .19 | .067 | | 8.48 | 4.02 |
| 1700 | 25.04 | | 13.23 | -24.73 | .20 | .064 | | 7.82 | 3.98 |
| 1800 | 24.27 | | 13.11 | -24.35 | .23 | .065 | | 7.27 | 3.88 |
| 1900 | 23.54 | | 12.99 | -23.99 | .26 | .057 | | 6.72 | 3.83 |
| 2000 | 20.17 | | 12.68 | -23.88 | .47 | .164 | 27.008 | 4.57 | 2.92 |
| 2100 | 19.63 | | 12.55 | -23.67 | .50 | .063 | 25.640 | 4.20 | 2.89 |
| 2200 | 19.19 | | 12.45 | -23.48 | .52 | .059 | 25.263 | 3.99 | 2.75 |
| 2300 | 18.67 | | 12.30 | -23.16 | .55 | .056 | 24.878 | 3.67 | 2.70 |
| 2400 | 18.34 | | 12.19 | -23.05 | .57 | .054 | 24.607 | 3.51 | 2.64 |
| 2500 | 18.00 | | 12.08 | -22.91 | .59 | .049 | 25.175 | 3.33 | 2.59 |
| 2600 | 17.70 | | 11.99 | -22.65 | .60 | .056 | 25.565 | 3.17 | 2.54 |
| 2700 | 17.30 | | 11.85 | -22.46 | .63 | .055 | 24.387 | 3.00 | 2.45 |
| 2800 | 17.07 | | 11.80 | -22.24 | .63 | .050 | 25.422 | 2.82 | 2.45 |
| 2900 | 16.71 | | 11.67 | -22.10 | .67 | .057 | 24.032 | 2.66 | 2.38 |
| 3000 | 16.31 | | 11.56 | -21.89 | .69 | .053 | 23.850 | 2.45 | 2.30 |

S-PARAMETER

MAG. AND ANG.

$V_{DS} = 2\text{ V}$, $I_D = 10\text{ mA}$

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) |
| 500 | .988 | -18.2 | 7.217 | 163.2 | .018 | 80.7 | .722 | -9.7 |
| 600 | .982 | -21.8 | 7.184 | 160.0 | .022 | 79.7 | .717 | -11.6 |
| 700 | .974 | -25.0 | 7.070 | 156.9 | .025 | 77.5 | .717 | -13.4 |
| 800 | .964 | -28.4 | 6.995 | 153.8 | .029 | 77.4 | .711 | -15.0 |
| 900 | .954 | -31.5 | 6.928 | 150.8 | .032 | 75.0 | .710 | -16.6 |
| 1000 | .942 | -34.7 | 6.797 | 147.9 | .035 | 74.4 | .705 | -18.1 |
| 1100 | .924 | -37.8 | 6.707 | 144.9 | .038 | 71.9 | .702 | -19.7 |
| 1200 | .922 | -40.4 | 6.607 | 142.3 | .042 | 72.7 | .700 | -20.8 |
| 1300 | .909 | -43.2 | 6.506 | 139.5 | .044 | 70.6 | .694 | -21.9 |
| 1400 | .897 | -45.8 | 6.387 | 136.8 | .046 | 70.4 | .690 | -23.4 |
| 1500 | .880 | -48.4 | 6.286 | 134.4 | .049 | 68.6 | .688 | -24.4 |
| 1600 | .868 | -50.9 | 6.179 | 131.7 | .052 | 68.2 | .683 | -25.3 |
| 1700 | .851 | -53.2 | 6.055 | 129.3 | .053 | 67.1 | .680 | -26.4 |
| 1800 | .836 | -55.3 | 5.937 | 126.9 | .055 | 66.5 | .675 | -27.1 |
| 1900 | .817 | -57.6 | 5.829 | 124.7 | .058 | 65.7 | .671 | -27.8 |
| 2000 | .735 | -63.0 | 5.570 | 119.4 | .058 | 61.7 | .604 | -27.3 |
| 2100 | .710 | -65.4 | 5.453 | 117.0 | .060 | 61.2 | .600 | -28.1 |
| 2200 | .697 | -67.6 | 5.354 | 114.8 | .061 | 60.0 | .590 | -29.1 |
| 2300 | .675 | -69.4 | 5.242 | 112.8 | .064 | 59.6 | .586 | -29.5 |
| 2400 | .662 | -71.5 | 5.148 | 110.9 | .065 | 59.4 | .580 | -30.1 |
| 2500 | .647 | -73.0 | 5.057 | 109.0 | .067 | 59.5 | .577 | -30.6 |
| 2600 | .634 | -75.2 | 4.977 | 107.1 | .069 | 58.6 | .573 | -31.2 |
| 2700 | .617 | -77.3 | 4.880 | 105.1 | .071 | 58.7 | .567 | -32.1 |
| 2800 | .602 | -79.5 | 4.819 | 103.4 | .073 | 58.4 | .567 | -32.5 |
| 2900 | .584 | -81.5 | 4.734 | 101.4 | .075 | 57.6 | .559 | -33.2 |
| 3000 | .564 | -83.6 | 4.640 | 99.5 | .076 | 56.6 | .553 | -33.8 |

AMP. PARAMETERS

V_{DS} = 2 V, I_D = 10 mA

| FREQUENCY MHz | G _{Umax} dB | G _{Amax} dB | S ₂₁ ² dB | S ₁₂ ² dB | K | Delay ns | Mason's U dB | G ₁ dB | G ₂ dB |
|------------------|-------------------------|-------------------------|--------------------------------------|--------------------------------------|-----|-------------|-----------------|----------------------|----------------------|
| 500 | 36.72 | | 17.17 | -34.88 | .08 | .089 | | 16.35 | 3.20 |
| 600 | 34.68 | | 17.13 | -33.03 | .10 | .089 | | 14.42 | 3.14 |
| 700 | 33.00 | | 16.99 | -31.95 | .13 | .086 | | 12.88 | 3.13 |
| 800 | 31.44 | | 16.90 | -30.71 | .13 | .087 | | 11.48 | 3.06 |
| 900 | 30.33 | | 16.81 | -29.79 | .16 | .083 | | 10.48 | 3.04 |
| 1000 | 29.14 | | 16.65 | -29.03 | .18 | .081 | | 9.51 | 2.98 |
| 1100 | 27.83 | | 16.53 | -28.43 | .22 | .081 | | 8.35 | 2.95 |
| 1200 | 27.55 | | 16.40 | -27.64 | .21 | .074 | | 8.23 | 2.93 |
| 1300 | 26.71 | | 16.27 | -27.23 | .24 | .077 | | 7.59 | 2.86 |
| 1400 | 25.99 | | 16.11 | -26.69 | .25 | .075 | | 7.08 | 2.81 |
| 1500 | 25.23 | | 15.97 | -26.24 | .29 | .068 | | 6.48 | 2.79 |
| 1600 | 24.63 | | 15.82 | -25.75 | .30 | .072 | | 6.08 | 2.73 |
| 1700 | 23.92 | | 15.64 | -25.45 | .33 | .068 | | 5.58 | 2.70 |
| 1800 | 23.33 | | 15.47 | -25.15 | .36 | .067 | | 5.21 | 2.65 |
| 1900 | 22.70 | | 15.31 | -24.68 | .38 | .061 | | 4.78 | 2.60 |
| 2000 | 20.26 | | 14.92 | -24.71 | .60 | .148 | 28.512 | 3.37 | 1.97 |
| 2100 | 19.72 | | 14.73 | -24.48 | .64 | .066 | 27.821 | 3.05 | 1.94 |
| 2200 | 19.32 | | 14.57 | -24.29 | .67 | .062 | 26.935 | 2.89 | 1.86 |
| 2300 | 18.85 | | 14.39 | -23.88 | .69 | .054 | 26.358 | 2.64 | 1.83 |
| 2400 | 18.52 | | 14.23 | -23.71 | .71 | .054 | 26.420 | 2.50 | 1.78 |
| 2500 | 18.19 | | 14.08 | -23.54 | .73 | .051 | 26.588 | 2.36 | 1.76 |
| 2600 | 17.90 | | 13.94 | -23.21 | .74 | .054 | 26.416 | 2.23 | 1.73 |
| 2700 | 17.53 | | 13.77 | -23.02 | .76 | .056 | 26.641 | 2.08 | 1.69 |
| 2800 | 17.29 | | 13.66 | -22.78 | .77 | .048 | 27.042 | 1.95 | 1.68 |
| 2900 | 16.94 | | 13.50 | -22.53 | .80 | .056 | 26.181 | 1.81 | 1.63 |
| 3000 | 16.58 | | 13.33 | -22.43 | .83 | .053 | 24.840 | 1.66 | 1.59 |

S-PARAMETER

MAG. AND ANG.

$V_{DS} = 2\text{ V}$, $I_D = 20\text{ mA}$

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) |
| 500 | .978 | -20.1 | 9.298 | 160.9 | .017 | 82.7 | .637 | -10.0 |
| 600 | .968 | -23.9 | 9.160 | 157.3 | .021 | 80.2 | .635 | -11.8 |
| 700 | .954 | -27.5 | 9.000 | 153.9 | .023 | 79.8 | .632 | -13.7 |
| 800 | .943 | -31.1 | 8.848 | 150.5 | .026 | 77.7 | .627 | -15.3 |
| 900 | .929 | -34.4 | 8.700 | 147.3 | .029 | 76.6 | .627 | -16.8 |
| 1000 | .913 | -37.7 | 8.501 | 144.0 | .032 | 74.7 | .621 | -18.0 |
| 1100 | .891 | -40.8 | 8.335 | 141.0 | .035 | 74.7 | .618 | -19.6 |
| 1200 | .884 | -43.5 | 8.162 | 138.0 | .037 | 74.3 | .617 | -20.5 |
| 1300 | .865 | -46.4 | 7.972 | 135.2 | .040 | 74.2 | .613 | -21.7 |
| 1400 | .849 | -48.9 | 7.801 | 132.3 | .042 | 71.9 | .607 | -23.0 |
| 1500 | .830 | -51.4 | 7.607 | 129.8 | .045 | 71.7 | .606 | -24.0 |
| 1600 | .815 | -54.0 | 7.440 | 127.1 | .047 | 71.1 | .603 | -24.7 |
| 1700 | .793 | -56.3 | 7.247 | 124.7 | .049 | 70.0 | .599 | -25.6 |
| 1800 | .775 | -58.3 | 7.074 | 122.2 | .051 | 69.4 | .598 | -26.2 |
| 1900 | .754 | -60.4 | 6.913 | 119.9 | .053 | 68.8 | .593 | -26.8 |
| 2000 | .674 | -65.8 | 6.573 | 115.0 | .053 | 66.1 | .528 | -25.1 |
| 2100 | .648 | -68.1 | 6.417 | 112.7 | .056 | 65.5 | .526 | -25.7 |
| 2200 | .632 | -70.2 | 6.265 | 110.5 | .057 | 64.5 | .516 | -26.7 |
| 2300 | .610 | -71.9 | 6.113 | 108.6 | .059 | 64.6 | .515 | -26.7 |
| 2400 | .596 | -73.7 | 5.976 | 106.7 | .061 | 64.6 | .510 | -27.3 |
| 2500 | .579 | -75.2 | 5.849 | 105.0 | .063 | 65.0 | .509 | -27.8 |
| 2600 | .566 | -77.1 | 5.727 | 103.1 | .065 | 63.8 | .507 | -28.2 |
| 2700 | .548 | -79.3 | 5.610 | 101.1 | .068 | 64.3 | .502 | -29.1 |
| 2800 | .532 | -81.2 | 5.499 | 99.4 | .069 | 63.3 | .502 | -29.4 |
| 2900 | .515 | -83.0 | 5.399 | 97.5 | .071 | 64.1 | .498 | -30.0 |
| 3000 | .496 | -84.8 | 5.272 | 95.7 | .073 | 62.4 | .493 | -30.4 |

AMP. PARAMETERS

V_{DS} = 2 V, I_D = 20 mA

| FREQUENCY MHz | G _{Umax} dB | G _{Amax} dB | S ₂₁ ² dB | S ₁₂ ² dB | K | Delay ns | Mason's U dB | G1 dB | G2 dB |
|------------------|-------------------------|-------------------------|--------------------------------------|--------------------------------------|-----|-------------|-----------------|----------|----------|
| 500 | 35.28 | | 19.37 | -35.33 | .12 | .098 | | 13.65 | 2.26 |
| 600 | 33.54 | | 19.24 | -33.71 | .16 | .098 | | 12.07 | 2.24 |
| 700 | 31.81 | | 19.09 | -32.71 | .18 | .097 | | 10.51 | 2.22 |
| 800 | 30.66 | | 18.94 | -31.61 | .21 | .094 | | 9.55 | 2.17 |
| 900 | 29.62 | | 18.79 | -30.78 | .24 | .088 | | 8.66 | 2.17 |
| 1000 | 28.49 | | 18.59 | -29.78 | .28 | .092 | | 7.78 | 2.12 |
| 1100 | 27.38 | | 18.42 | -29.14 | .31 | .085 | | 6.86 | 2.09 |
| 1200 | 26.91 | | 18.24 | -28.63 | .32 | .082 | | 6.59 | 2.08 |
| 1300 | 26.08 | | 18.03 | -28.04 | .34 | .079 | | 6.00 | 2.05 |
| 1400 | 25.38 | | 17.84 | -27.49 | .38 | .079 | | 5.53 | 2.00 |
| 1500 | 24.70 | | 17.62 | -26.88 | .40 | .071 | | 5.08 | 1.99 |
| 1600 | 24.13 | | 17.43 | -26.49 | .42 | .073 | | 4.74 | 1.97 |
| 1700 | 23.43 | | 17.20 | -26.16 | .46 | .068 | | 4.30 | 1.93 |
| 1800 | 22.90 | | 16.99 | -25.88 | .49 | .070 | | 3.98 | 1.92 |
| 1900 | 22.33 | | 16.79 | -25.46 | .52 | .062 | | 3.66 | 1.88 |
| 2000 | 20.40 | | 16.35 | -25.44 | .72 | .137 | 29.694 | 2.63 | 1.42 |
| 2100 | 19.92 | | 16.15 | -25.02 | .75 | .064 | 28.981 | 2.37 | 1.41 |
| 2200 | 19.50 | | 15.94 | -24.90 | .79 | .062 | 27.785 | 2.21 | 1.35 |
| 2300 | 19.08 | | 15.72 | -24.53 | .81 | .052 | 27.569 | 2.02 | 1.34 |
| 2400 | 18.74 | | 15.53 | -24.25 | .82 | .053 | 27.816 | 1.91 | 1.31 |
| 2500 | 18.41 | | 15.34 | -23.96 | .84 | .048 | 28.156 | 1.77 | 1.30 |
| 2600 | 18.13 | | 15.16 | -23.71 | .85 | .053 | 27.486 | 1.68 | 1.29 |
| 2700 | 17.79 | | 14.98 | -23.29 | .86 | .053 | 28.589 | 1.55 | 1.26 |
| 2800 | 17.51 | | 14.80 | -23.18 | .88 | .047 | 27.386 | 1.44 | 1.26 |
| 2900 | 17.22 | | 14.65 | -22.93 | .89 | .054 | 28.295 | 1.34 | 1.24 |
| 3000 | 16.88 | | 14.44 | -22.71 | .92 | .050 | 26.323 | 1.22 | 1.21 |

S-PARAMETERS

MAG. AND ANG.

$V_{DS} = 3\text{ V}$, $I_D = 5\text{ mA}$

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) |
| 500 | .991 | -15.2 | 5.038 | 165.1 | .020 | 79.3 | .817 | -9.8 |
| 600 | .984 | -18.1 | 5.040 | 162.2 | .024 | 79.0 | .812 | -11.7 |
| 700 | .982 | -20.8 | 4.984 | 159.4 | .027 | 76.7 | .809 | -13.6 |
| 800 | .973 | -23.8 | 4.958 | 156.6 | .031 | 77.2 | .807 | -15.2 |
| 900 | .970 | -26.6 | 4.958 | 154.1 | .034 | 74.4 | .806 | -16.8 |
| 1000 | .964 | -29.0 | 4.892 | 151.4 | .038 | 73.4 | .803 | -18.6 |
| 1100 | .944 | -32.0 | 4.850 | 148.6 | .040 | 70.8 | .797 | -20.1 |
| 1200 | .947 | -34.2 | 4.791 | 146.2 | .044 | 70.3 | .794 | -21.5 |
| 1300 | .938 | -36.7 | 4.764 | 143.8 | .048 | 69.6 | .791 | -23.1 |
| 1400 | .929 | -38.9 | 4.722 | 141.4 | .050 | 68.9 | .788 | -24.3 |
| 1500 | .920 | -41.3 | 4.675 | 139.0 | .052 | 67.2 | .789 | -25.7 |
| 1600 | .911 | -43.6 | 4.640 | 136.6 | .056 | 66.5 | .786 | -27.2 |
| 1700 | .901 | -45.7 | 4.579 | 134.4 | .058 | 65.1 | .780 | -28.3 |
| 1800 | .890 | -47.9 | 4.527 | 132.2 | .061 | 64.1 | .778 | -29.4 |
| 1900 | .878 | -49.8 | 4.473 | 130.0 | .063 | 62.9 | .775 | -30.5 |
| 2000 | .815 | -57.5 | 4.306 | 123.9 | .063 | 58.4 | .687 | -29.1 |

AMP. PARAMETERS

| FREQUENCY MHz | G _{Umax} dB | G _{Amax} dB | S ₂₁ ² dB | S ₁₂ ² dB | K | Delay ns | Mason's U dB | G ₁ dB | G ₂ dB |
|------------------|-------------------------|-------------------------|--------------------------------------|--------------------------------------|-----|-------------|-----------------|----------------------|----------------------|
| 500 | 36.20 | | 14.05 | -34.16 | .09 | .080 | 39.523 | 17.38 | 4.78 |
| 600 | 33.77 | | 14.05 | -32.46 | .09 | .080 | | 15.04 | 4.69 |
| 700 | 32.94 | | 13.95 | -31.29 | .11 | .077 | | 14.37 | 4.62 |
| 800 | 31.24 | | 13.91 | -30.13 | .10 | .077 | | 12.75 | 4.58 |
| 900 | 30.67 | | 13.91 | -29.27 | .12 | .071 | | 12.22 | 4.55 |
| 1000 | 29.74 | | 13.79 | -28.52 | .13 | .074 | | 11.46 | 4.49 |
| 1100 | 27.71 | | 13.72 | -27.86 | .18 | .077 | | 9.61 | 4.38 |
| 1200 | 27.80 | | 13.61 | -27.10 | .17 | .066 | | 9.87 | 4.32 |
| 1300 | 27.04 | | 13.56 | -26.43 | .17 | .069 | | 9.22 | 4.26 |
| 1400 | 26.34 | | 13.48 | -26.01 | .18 | .066 | | 8.64 | 4.22 |
| 1500 | 25.76 | | 13.40 | -25.69 | .20 | .066 | | 8.12 | 4.24 |
| 1600 | 25.18 | | 13.33 | -25.10 | .21 | .067 | | 7.68 | 4.18 |
| 1700 | 24.52 | | 13.21 | -24.80 | .23 | .061 | | 7.24 | 4.07 |
| 1800 | 24.00 | | 13.12 | -24.36 | .24 | .061 | | 6.84 | 4.05 |
| 1900 | 23.40 | | 13.01 | -24.05 | .26 | .062 | | 6.41 | 3.99 |
| 2000 | 20.18 | | 12.68 | -23.97 | .47 | .169 | 27.557 | 4.73 | 2.77 |

S-PARAMETERS

MAG. AND ANG.

V_{DS} = 3 V, I_D = 10 mA

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) |
| 500 | .982 | -17.5 | 7.163 | 162.7 | .019 | 82.5 | .736 | -10.5 |
| 600 | .973 | -20.9 | 7.082 | 159.4 | .022 | 79.5 | .732 | -12.4 |
| 700 | .965 | -24.0 | 7.001 | 156.2 | .025 | 76.7 | .729 | -14.4 |
| 800 | .953 | -27.2 | 6.905 | 153.1 | .028 | 75.6 | .725 | -16.2 |
| 900 | .944 | -30.3 | 6.849 | 150.2 | .032 | 74.8 | .720 | -17.8 |
| 1000 | .934 | -33.0 | 6.738 | 147.3 | .035 | 73.4 | .717 | -19.5 |
| 1100 | .913 | -36.3 | 6.624 | 144.1 | .037 | 72.4 | .713 | -21.2 |
| 1200 | .909 | -38.6 | 6.514 | 141.6 | .040 | 70.8 | .708 | -22.5 |
| 1300 | .894 | -41.3 | 6.415 | 138.7 | .043 | 71.0 | .706 | -24.0 |
| 1400 | .882 | -43.7 | 6.323 | 136.2 | .046 | 69.7 | .702 | -25.2 |
| 1500 | .866 | -46.2 | 6.219 | 133.6 | .048 | 67.6 | .700 | -26.5 |
| 1600 | .853 | -48.5 | 6.123 | 131.0 | .050 | 67.0 | .697 | -27.9 |
| 1700 | .837 | -50.6 | 6.004 | 128.8 | .052 | 67.2 | .692 | -29.0 |
| 1800 | .823 | -52.8 | 5.897 | 126.4 | .055 | 66.5 | .689 | -29.9 |
| 1900 | .808 | -54.7 | 5.800 | 124.1 | .057 | 65.4 | .685 | -31.0 |
| 2000 | .747 | -62.5 | 5.514 | 118.6 | .058 | 61.2 | .593 | -28.2 |

AMP. PARAMETERS

| FREQUENCY MHz | G _{Umax} dB | G _{Amax} dB | S ₂₁ ² dB | S ₁₂ ² dB | K | Delay ns | Mason's U dB | G ₁ dB | G ₂ dB |
|------------------|-------------------------|-------------------------|--------------------------------------|--------------------------------------|-----|-------------|-----------------|----------------------|----------------------|
| 500 | 35.08 | | 17.10 | -34.56 | .09 | .093 | | 14.59 | 3.38 |
| 600 | 33.03 | | 17.00 | -33.28 | .13 | .093 | | 12.69 | 3.34 |
| 700 | 31.88 | | 16.90 | -32.21 | .16 | .088 | | 11.69 | 3.29 |
| 800 | 30.40 | | 16.78 | -30.97 | .18 | .086 | | 10.38 | 3.24 |
| 900 | 29.55 | | 16.71 | -29.89 | .19 | .081 | | 9.66 | 3.18 |
| 1000 | 28.64 | | 16.57 | -29.23 | .21 | .082 | | 8.93 | 3.14 |
| 1100 | 27.29 | | 16.42 | -28.63 | .24 | .088 | | 7.79 | 3.08 |
| 1200 | 26.89 | | 16.28 | -27.89 | .26 | .070 | | 7.59 | 3.02 |
| 1300 | 26.11 | | 16.14 | -27.29 | .27 | .080 | | 6.97 | 3.00 |
| 1400 | 25.51 | | 16.02 | -26.83 | .29 | .068 | | 6.53 | 2.95 |
| 1500 | 24.82 | | 15.87 | -26.32 | .32 | .074 | | 6.02 | 2.92 |
| 1600 | 24.28 | | 15.74 | -25.98 | .34 | .072 | | 5.65 | 2.89 |
| 1700 | 23.64 | | 15.57 | -25.60 | .35 | .062 | | 5.25 | 2.83 |
| 1800 | 23.12 | | 15.41 | -25.23 | .37 | .066 | | 4.91 | 2.80 |
| 1900 | 22.61 | | 15.27 | -24.82 | .39 | .064 | | 4.59 | 2.75 |
| 2000 | 20.25 | | 14.83 | -24.80 | .61 | .152 | 28.504 | 3.55 | 1.88 |

S-PARAMETERS

MAG. AND ANG.

$V_{DS} = 3\text{ V}$, $I_D = 30\text{ mA}$

| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) | MAG. | ANG. (deg.) |
| 500 | .974 | -20.9 | 10.260 | 159.9 | .016 | 82.5 | .625 | -9.7 |
| 600 | .961 | -24.8 | 10.103 | 156.1 | .018 | 80.4 | .620 | -11.5 |
| 700 | .947 | -28.5 | 9.901 | 152.5 | .022 | 79.9 | .618 | -13.3 |
| 800 | .931 | -32.2 | 9.688 | 149.1 | .025 | 78.7 | .614 | -14.8 |
| 900 | .915 | -35.5 | 9.505 | 145.6 | .028 | 76.8 | .614 | -16.2 |
| 1000 | .894 | -39.0 | 9.260 | 142.3 | .030 | 76.4 | .608 | -17.7 |
| 1100 | .875 | -41.9 | 9.057 | 139.2 | .032 | 76.3 | .607 | -18.9 |
| 1200 | .863 | -44.7 | 8.850 | 136.2 | .035 | 74.8 | .605 | -19.8 |
| 1300 | .843 | -47.5 | 8.618 | 133.3 | .036 | 73.8 | .599 | -20.9 |
| 1400 | .825 | -50.1 | 8.399 | 130.4 | .039 | 73.5 | .595 | -21.9 |
| 1500 | .806 | -52.5 | 8.182 | 127.9 | .042 | 72.1 | .594 | -22.8 |
| 1600 | .788 | -55.2 | 7.980 | 125.2 | .044 | 72.6 | .593 | -23.6 |
| 1700 | .768 | -57.1 | 7.770 | 122.6 | .046 | 71.8 | .590 | -24.4 |
| 1800 | .747 | -59.2 | 7.550 | 120.2 | .048 | 72.5 | .588 | -24.9 |
| 1900 | .726 | -61.2 | 7.356 | 118.1 | .050 | 71.2 | .586 | -25.5 |
| 2000 | .646 | -66.6 | 6.989 | 113.2 | .050 | 67.4 | .521 | -23.5 |

AMP. PARAMETERS

| FREQUENCY MHz | GU _{max} dB | GA _{max} dB | $ S_{21} ^2$ dB | $ S_{12} ^2$ dB | K | Delay ns | Mason's U dB | G1 dB | G2 dB |
|------------------|-------------------------|-------------------------|--------------------|--------------------|-----|-------------|-----------------|----------|----------|
| 500 | 35.31 | | 20.22 | -36.03 | .15 | .103 | | 12.94 | 2.15 |
| 600 | 33.31 | | 20.09 | -34.85 | .19 | .103 | | 11.12 | 2.11 |
| 700 | 31.84 | | 19.91 | -33.23 | .21 | .100 | | 9.83 | 2.09 |
| 800 | 30.56 | | 19.72 | -32.13 | .25 | .097 | | 8.77 | 2.06 |
| 900 | 29.50 | | 19.56 | -31.12 | .28 | .095 | | 7.88 | 2.05 |
| 1000 | 28.32 | | 19.33 | -30.59 | .32 | .093 | | 6.98 | 2.01 |
| 1100 | 27.43 | | 19.14 | -29.81 | .34 | .086 | | 6.29 | 2.00 |
| 1200 | 26.85 | | 18.94 | -29.05 | .37 | .085 | | 5.93 | 1.98 |
| 1300 | 26.02 | | 18.71 | -28.76 | .40 | .079 | | 5.38 | 1.93 |
| 1400 | 25.34 | | 18.48 | -28.20 | .43 | .081 | | 4.96 | 1.90 |
| 1500 | 24.70 | | 18.26 | -27.62 | .46 | .070 | | 4.55 | 1.89 |
| 1600 | 24.14 | | 18.04 | -27.03 | .47 | .073 | | 4.21 | 1.88 |
| 1700 | 23.53 | | 17.81 | -26.74 | .51 | .071 | | 3.87 | 1.86 |
| 1800 | 22.94 | | 17.56 | -26.38 | .53 | .068 | | 3.54 | 1.84 |
| 1900 | 22.41 | | 17.33 | -26.03 | .56 | .059 | | 3.25 | 1.82 |
| 2000 | 20.61 | | 16.89 | -25.99 | .78 | .135 | 29.365 | 2.35 | 1.37 |

NOISE PARAMETER

$V_{DS} = 2\text{ V}$, $I_D = 5\text{ mA}$

| Freq (GHz) | NF _{min} (dB) | G _a (dB) | Γ _{opt} | | R _n /50 |
|------------|------------------------|---------------------|------------------|-------------|--------------------|
| | | | MAG. | ANG. (deg.) | |
| 0.9 | 0.51 | 21.2 | 0.69 | 15 | 0.26 |
| 1.0 | 0.52 | 20.8 | 0.68 | 17 | 0.25 |
| 1.5 | 0.57 | 18.2 | 0.63 | 25 | 0.24 |
| 2.0 | 0.61 | 16.2 | 0.61 | 35 | 0.23 |
| 2.5 | 0.62 | 14.4 | 0.56 | 46 | 0.21 |
| 3.0 | 0.65 | 13.3 | 0.44 | 59 | 0.17 |

$V_{DS} = 2\text{ V}$, $I_D = 10\text{ mA}$

| Freq (GHz) | NF _{min} (dB) | G _a (dB) | Γ _{opt} | | R _n /50 |
|------------|------------------------|---------------------|------------------|-------------|--------------------|
| | | | MAG. | ANG. (deg.) | |
| 0.9 | 0.43 | 22.0 | 0.62 | 13 | 0.20 |
| 1.0 | 0.44 | 21.6 | 0.61 | 14 | 0.20 |
| 1.5 | 0.49 | 19.0 | 0.58 | 23 | 0.19 |
| 2.0 | 0.52 | 16.5 | 0.57 | 34 | 0.18 |
| 2.5 | 0.54 | 14.9 | 0.52 | 45 | 0.17 |
| 3.0 | 0.57 | 13.8 | 0.36 | 57 | 0.13 |

$V_{DS} = 3\text{ V}$, $I_D = 10\text{ mA}$

| Freq (GHz) | NF _{min} (dB) | G _a (dB) | Γ _{opt} | | R _n /50 |
|------------|------------------------|---------------------|------------------|-------------|--------------------|
| | | | MAG. | ANG. (deg.) | |
| 0.9 | 0.43 | 22.2 | 0.61 | 11 | 0.21 |
| 1.0 | 0.44 | 21.8 | 0.60 | 13 | 0.20 |
| 1.5 | 0.49 | 19.2 | 0.57 | 22 | 0.20 |
| 2.0 | 0.52 | 16.7 | 0.57 | 33 | 0.19 |
| 2.5 | 0.54 | 15.1 | 0.52 | 45 | 0.18 |
| 3.0 | 0.57 | 14.0 | 0.37 | 58 | 0.14 |

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

<TYPES OF SURFACE MOUNT DEVICE>

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (C10535E).

| Soldering process | Soldering conditions | Symbol |
|------------------------|---|-----------|
| VPS | Package peak temperature: 215 °C, Time: 40 seconds MAX. (200 °C MIN.), Number of times: 3, Number of days: not limited* | VP15-00-3 |
| Wave soldering | Soldering bath temperature: 260 °C MAX., Time: 10 seconds MAX., Number of times: 1, Number of days: not limited* | WS60-00-1 |
| Infrared ray reflow | Peak package's surface temperature: 230 °C below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 3, Exposure limit*: None | IR30-00-3 |
| Partial heating method | Terminal temperature: 230 °C or below, Flow time: 10 seconds or below, Exposure limit*: None | |

* Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Note Do not apply more than a single process at once, except for "Partial heating method".

PRECAUTION Avoid high static voltage and electric fields, because this device is Hetero Junction field effect transistor with shottky barrier gate.

[MEMO]

Caution

The Great Care must be taken in dealing with the devices in this guide.

The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned.

Keep the law concerned and so on, especially in case of removal.

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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

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.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.