# RQA0003DNS

Silicon N-Channel MOS FET

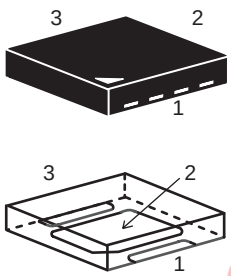
REJ03G0584-0300
Rev.3.00
Oct 12, 2006

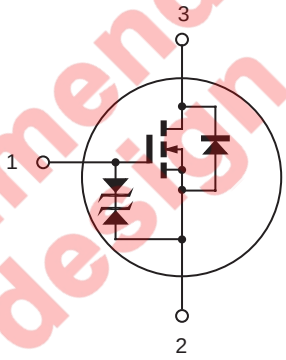
## Features

- High Output Power, High Gain, High Efficiency
  Pout = +36 dBm, Linear Gain = 19 dB, PAE = 65% (f = 520 MHz)
- Small Outline Package (WSON0303-2: 3.0 × 3.0 × 0.8mm)

## Outline

RENESAS Package code: PWSN0002ZA-A
(Package name: HWSON-2 <WSON0303-2>)




1. Gate
2. Source
3. Drain

Note: Marking is “A0003”.

Not recommend for new design

## Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain to source voltage | $V_{DSS}$ | 16 | V |
| Gate to source voltage | $V_{GSS}$ | ±5 | V |
| Drain current | $I_D$ | 2.4 | A |
| Channel dissipation | Pch[note] | 7 | W |
| Channel temperature | Tch | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

Note: Value at Tc = 25°C

This Device is sensitive to Electro Static Discharge. An Adequate careful handling procedure is requested.

## Electrical Characteristics

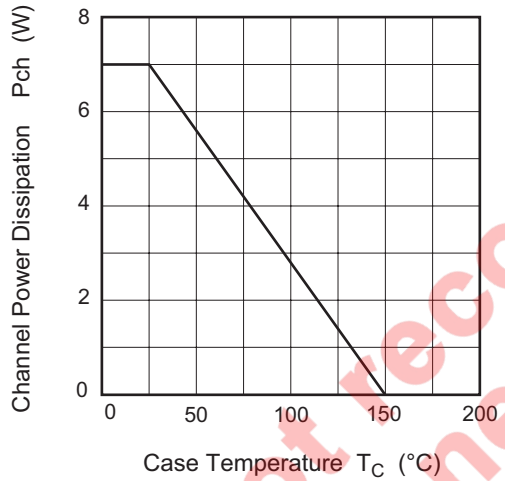
(Ta = 25°C)

| Item | Symbol | Min. | Typ | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Zero gate voltage drain current | $I_{DSS}$ | — | — | 10 | µA | $V_{DS}$ = 16 V, $V_{GS}$ = 0 |
| Gate to source leak current | $I_{GSS}$ | — | — | ±2 | µA | $V_{GS}$ = ±5 V, $V_{DS}$ = 0 |
| Gate to source cutoff voltage | $V_{GS(off)}$ | 0.15 | 0.4 | 0.8 | V | $V_{DS}$ = 6 V, $I_D$ = 1 mA |
| Forward Transfer Admittance | \|yfs\| | 1.7 | 2.4 | 3.1 | S | $V_{DS}$ = 6 V, $I_D$ = 1.2 A |
| Input capacitance | Ciss | — | 44 | — | pF | $V_{GS}$ = 5 V, $V_{DS}$ = 0, f = 1 MHz |
| Output capacitance | Coss | — | 25 | — | pF | $V_{DS}$ = 6 V, $V_{GS}$ = 0, f = 1 MHz |
| Reverse transfer capacitance | Crss | — | 6.0 | — | pF | $V_{DG}$ = 6 V, $V_{GS}$ = 0, f = 1 MHz |
| Output Power | Pout | 35 | 36 | — | dBm | $V_{DS}$ = 6 V, $I_{DQ}$ = 400 mA, f = 520 MHz, Pin = +20 dBm (100 mW) |
| | | 3.16 | 3.98 | — | W | |
| Power Added Efficiency | PAE | 50 | 65 | — | % | |

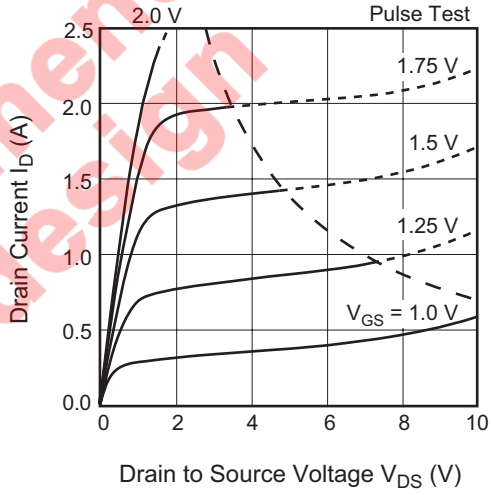
## Main Characteristics

Not recommend for new design

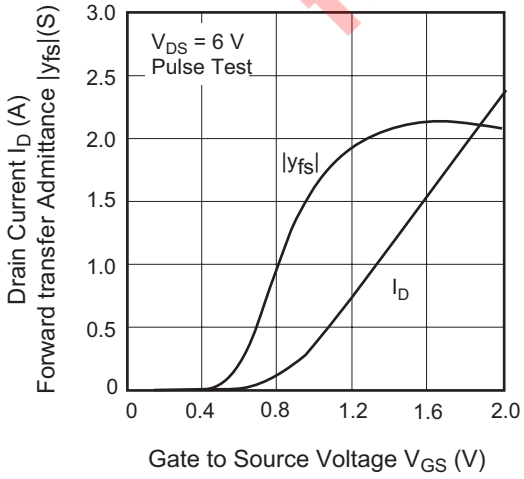
Maximum Channel Power Dissipation Curve



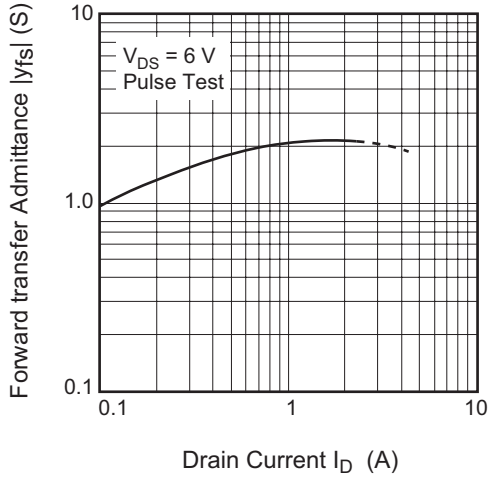

Typical Output Characteristics



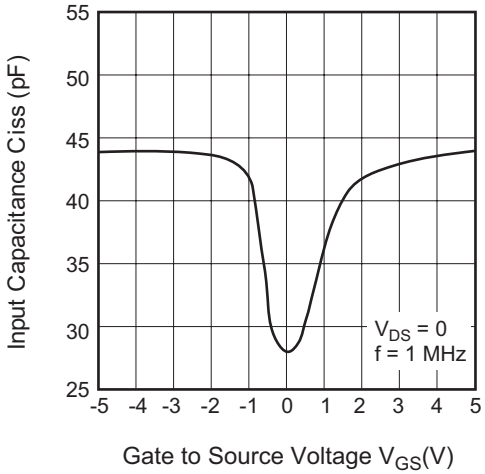

Typical Transfer Characteristics



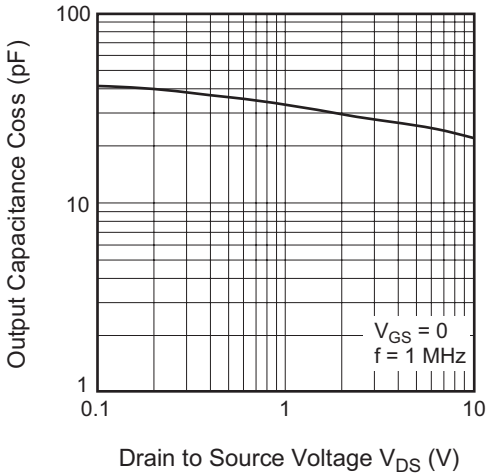

Forward Transfer Admittance vs. Drain Current



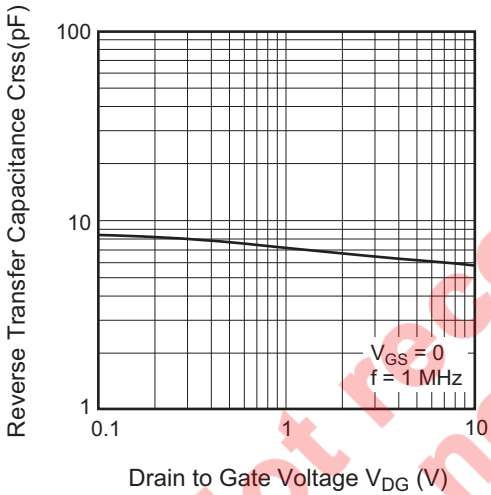
Input Capacitance vs.
Gate to Source Voltage



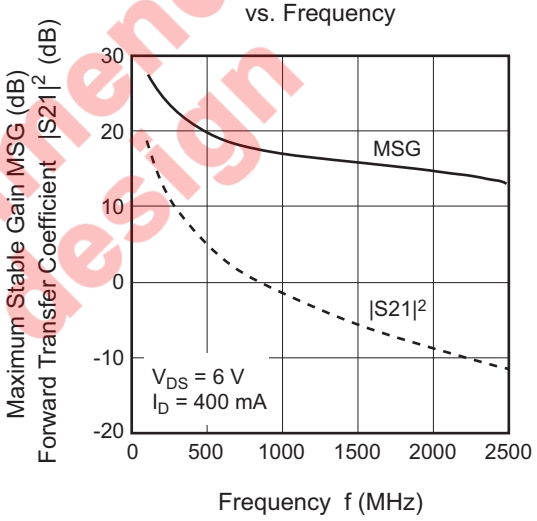

Output Capacitance vs.
Drain to Source Voltage



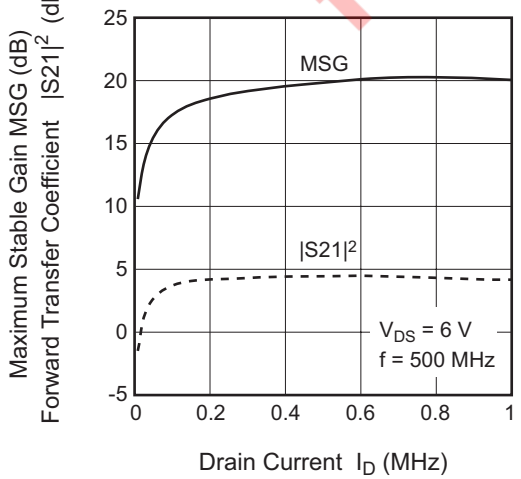

Reverse Transfer Capacitance vs.
Drain to Gate Voltage




Maximum Stable Gain, $|S21|^2$
vs. Frequency

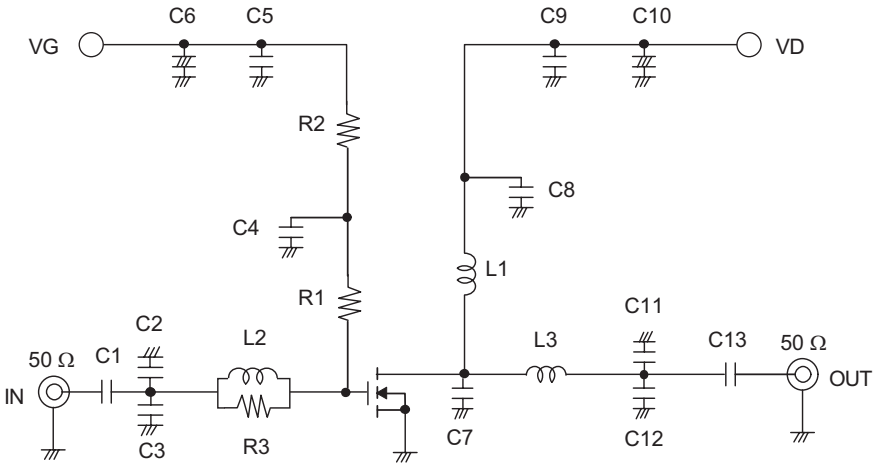



Maximum Stable Gain, $|S21|^2$
vs. Drain Current




Not recommend for new design

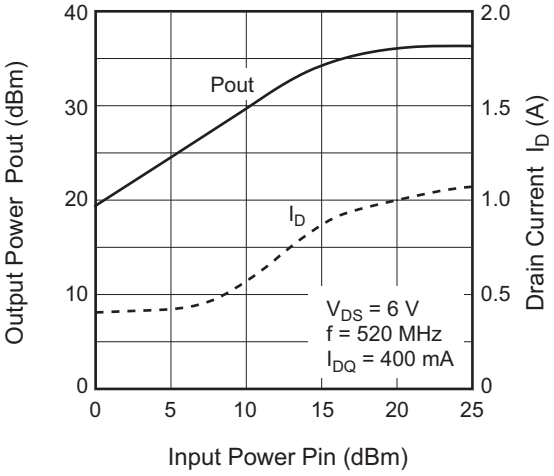
## Evaluation Circuit (f = 520 MHz)



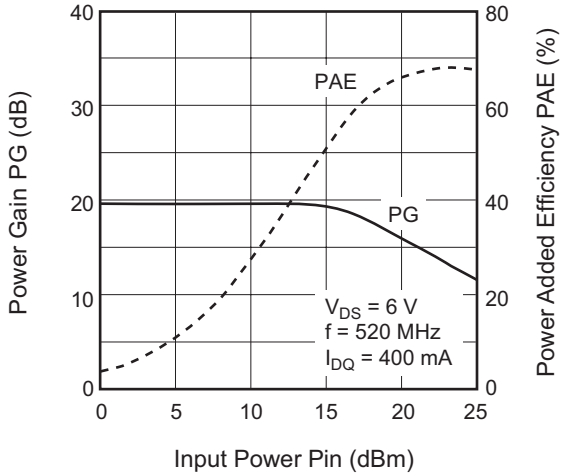

C1, C4, C8, C13: 100 pF Chip Capacitor
C2: 6 pF Chip Capacitor
C3: 20 pF Chip Capacitor
C5, C9: 1000 pF Chip Capacitor
C6, C10: 2.2 μF Electrolysis Capacitor
C7: 3 pF Chip Capacitor
C11: 5 pF Chip Capacitor
C12: 15 pF Chip Capacitor
L1: 8 Turns D : 0.5 mm, ϕ 2.4 mm Enamel Wire
L2: 1.5 nH Chip Inductor
L3: 1.2 nH Chip Inductor
R1: 56 Ω Chip Resistor
R2: 3 kΩ Chip Resistor
R3: 2.2 Ω Chip Resistor

Not recommend for new design

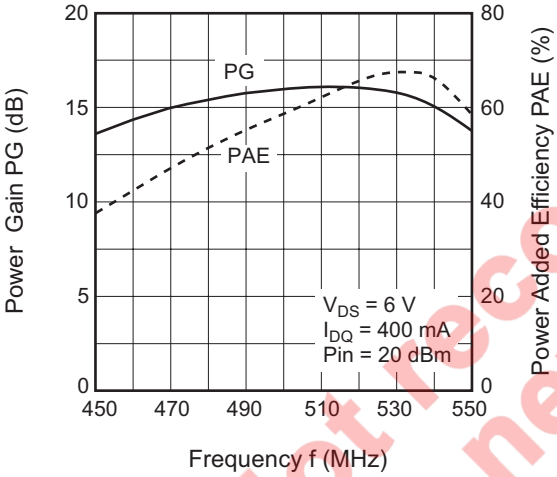
Output Power, Drain Current vs. Input Power



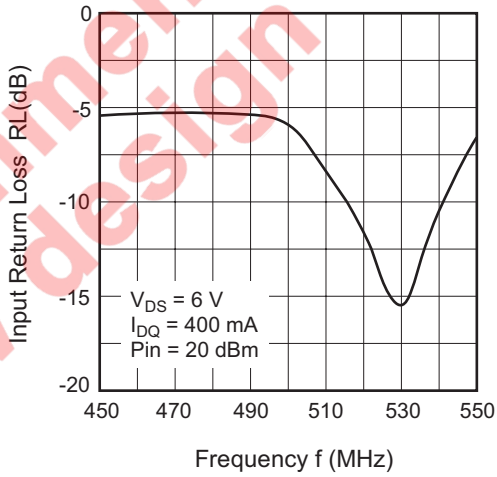

Power Gain, Power Added Efficiency vs. Input Power



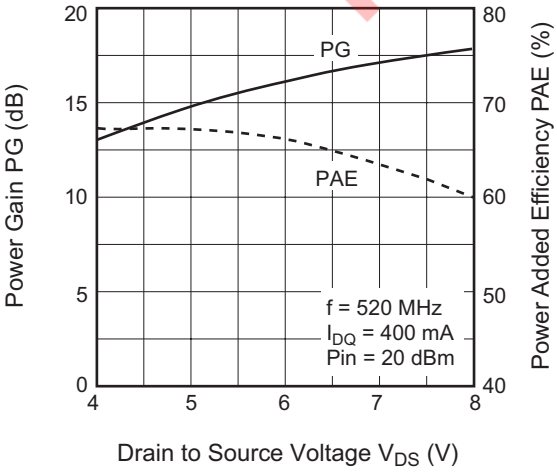

Power Gain, Power Added Efficiency vs. Frequency



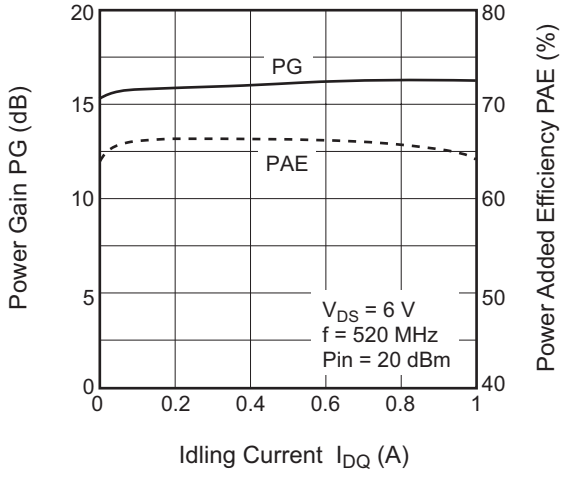

Input Return Loss vs. Frequency




Power Gain, Power Added Efficiency vs. Drain to Source Voltage

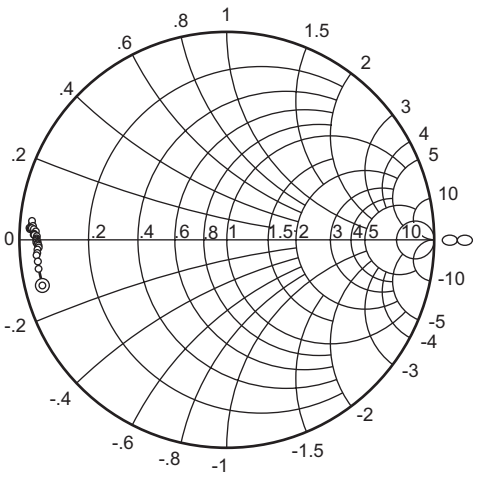



Power Gain, Power Added Efficiency vs. Idling Current



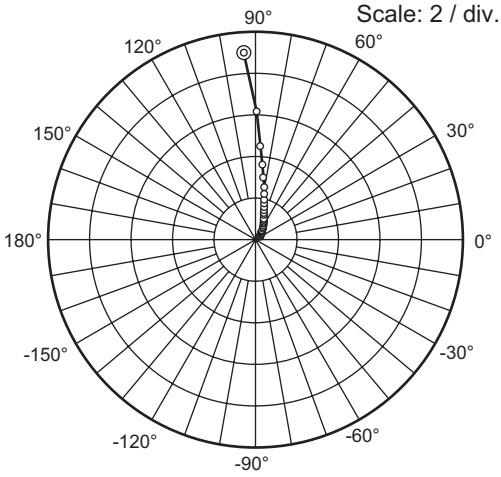

Not recommend for new design

$S_{11}$ Parameter vs. Frequency



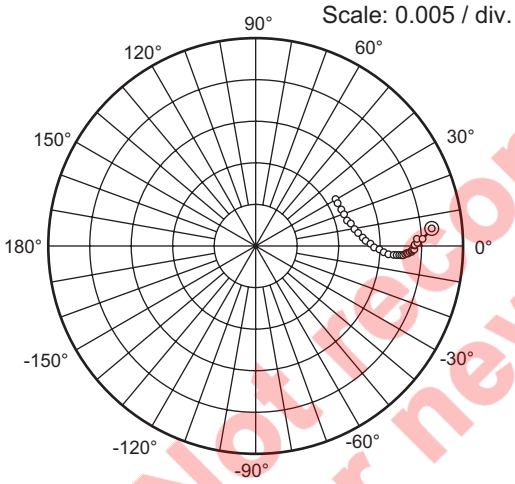

Condition: $V_{DS}$ = 6 V, $I_{DQ}$ = 400 mA, $Z_O$ = 50 Ω
100 to 1000 MHz (50 MHz Step)
1000 to 2500 MHz (100 MHz Step)

$S_{21}$ Parameter vs. Frequency



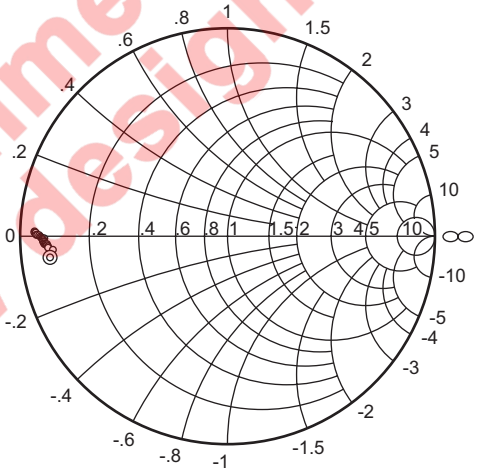

Condition: $V_{DS}$ = 6 V, $I_{DQ}$ = 400 mA, $Z_O$ = 50 Ω
100 to 1000 MHz (50 MHz Step)
1000 to 2500 MHz (100 MHz Step)

$S_{12}$ Parameter vs. Frequency




Condition: $V_{DS}$ = 6 V, $I_{DQ}$ = 400 mA, $Z_O$ = 50 Ω
100 to 1000 MHz (50 MHz Step)
1000 to 2500 MHz (100 MHz Step)

$S_{22}$ Parameter vs. Frequency




Condition: $V_{DS}$ = 6 V, $I_{DQ}$ = 400 mA, $Z_O$ = 50 Ω
100 to 1000 MHz (50 MHz Step)
1000 to 2500 MHz (100 MHz Step)

Not recommend for new design

## S Parameter

($V_{DS}$ = 6 V, $I_{DQ}$ = 50 mA, Zo = 50 Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) |
| 100 | 0.840 | -155.9 | 7.81 | 94.3 | 0.050 | 4.9 | 0.739 | -160.8 |
| 150 | 0.833 | -164.0 | 5.33 | 87.1 | 0.049 | -1.5 | 0.731 | -166.1 |
| 200 | 0.838 | -167.5 | 3.87 | 82.2 | 0.047 | -5.2 | 0.753 | -168.1 |
| 250 | 0.834 | -169.5 | 3.07 | 77.9 | 0.046 | -9.0 | 0.760 | -169.1 |
| 300 | 0.837 | -170.7 | 2.53 | 74.2 | 0.046 | -11.8 | 0.765 | -169.6 |
| 350 | 0.838 | -171.6 | 2.14 | 70.8 | 0.045 | -14.4 | 0.771 | -170.0 |
| 400 | 0.841 | -172.3 | 1.84 | 67.7 | 0.044 | -17.0 | 0.781 | -170.1 |
| 450 | 0.846 | -172.8 | 1.61 | 64.7 | 0.043 | -19.4 | 0.789 | -170.3 |
| 500 | 0.851 | -173.4 | 1.43 | 61.8 | 0.042 | -21.7 | 0.798 | -170.4 |
| 550 | 0.856 | -173.6 | 1.27 | 59.4 | 0.041 | -23.7 | 0.806 | -170.5 |
| 600 | 0.864 | -173.9 | 1.15 | 56.6 | 0.040 | -25.5 | 0.816 | -170.7 |
| 650 | 0.869 | -174.2 | 1.04 | 54.2 | 0.039 | -27.5 | 0.822 | -171.0 |
| 700 | 0.874 | -174.4 | 0.94 | 51.7 | 0.038 | -29.3 | 0.831 | -171.3 |
| 750 | 0.878 | -174.5 | 0.86 | 49.2 | 0.036 | -31.0 | 0.838 | -171.5 |
| 800 | 0.883 | -174.8 | 0.79 | 46.8 | 0.035 | -32.8 | 0.843 | -171.7 |
| 850 | 0.886 | -174.9 | 0.72 | 44.6 | 0.034 | -33.9 | 0.848 | -172.0 |
| 900 | 0.891 | -175.4 | 0.67 | 42.6 | 0.033 | -35.1 | 0.853 | -172.2 |
| 950 | 0.892 | -175.5 | 0.62 | 40.6 | 0.031 | -36.5 | 0.858 | -172.5 |
| 1000 | 0.892 | -175.9 | 0.57 | 38.6 | 0.030 | -37.7 | 0.861 | -172.6 |
| 1050 | 0.894 | -176.5 | 0.53 | 36.7 | 0.029 | -38.3 | 0.866 | -172.8 |
| 1100 | 0.897 | -176.9 | 0.50 | 35.1 | 0.028 | -39.4 | 0.870 | -173.1 |
| 1150 | 0.903 | -177.6 | 0.47 | 33.6 | 0.027 | -40.1 | 0.876 | -173.2 |
| 1200 | 0.911 | -177.7 | 0.44 | 32.2 | 0.025 | -40.7 | 0.880 | -173.3 |
| 1250 | 0.917 | -177.9 | 0.41 | 31.1 | 0.024 | -41.2 | 0.887 | -173.6 |
| 1300 | 0.923 | -177.8 | 0.39 | 29.9 | 0.023 | -41.3 | 0.891 | -173.7 |
| 1350 | 0.923 | -177.9 | 0.36 | 28.4 | 0.022 | -41.9 | 0.896 | -173.9 |
| 1400 | 0.924 | -178.1 | 0.34 | 27.0 | 0.021 | -42.4 | 0.900 | -174.1 |
| 1450 | 0.927 | -178.3 | 0.33 | 25.7 | 0.021 | -42.4 | 0.904 | -174.3 |
| 1500 | 0.928 | -178.7 | 0.31 | 24.4 | 0.020 | -42.5 | 0.906 | -174.5 |
| 1550 | 0.927 | -178.6 | 0.29 | 23.3 | 0.019 | -42.7 | 0.909 | -174.9 |
| 1600 | 0.926 | -178.7 | 0.28 | 22.5 | 0.018 | -42.5 | 0.913 | -175.1 |
| 1650 | 0.926 | -179.1 | 0.26 | 21.1 | 0.017 | -42.3 | 0.915 | -175.5 |
| 1700 | 0.920 | -179.6 | 0.25 | 20.0 | 0.016 | -42.0 | 0.918 | -175.7 |
| 1750 | 0.920 | 180.0 | 0.24 | 19.0 | 0.015 | -41.6 | 0.920 | -176.1 |
| 1800 | 0.926 | 179.3 | 0.22 | 17.9 | 0.015 | -40.7 | 0.925 | -176.4 |
| 1850 | 0.934 | 178.9 | 0.21 | 17.0 | 0.014 | -40.3 | 0.926 | -176.5 |
| 1900 | 0.943 | 178.8 | 0.21 | 16.4 | 0.013 | -39.5 | 0.927 | -176.8 |
| 1950 | 0.950 | 178.8 | 0.20 | 15.7 | 0.013 | -38.9 | 0.931 | -177.2 |
| 2000 | 0.956 | 179.0 | 0.19 | 15.2 | 0.012 | -37.5 | 0.936 | -177.3 |
| 2050 | 0.956 | 179.1 | 0.18 | 14.5 | 0.011 | -36.1 | 0.936 | -177.4 |
| 2100 | 0.952 | 179.1 | 0.17 | 14.1 | 0.011 | -34.8 | 0.939 | -177.8 |
| 2150 | 0.949 | 179.1 | 0.17 | 13.5 | 0.010 | -32.5 | 0.943 | -177.9 |
| 2200 | 0.945 | 178.8 | 0.16 | 12.9 | 0.010 | -30.6 | 0.945 | -178.0 |
| 2250 | 0.940 | 178.5 | 0.15 | 12.2 | 0.009 | -29.0 | 0.945 | -178.2 |
| 2300 | 0.940 | 178.2 | 0.15 | 11.7 | 0.008 | -26.1 | 0.946 | -178.4 |
| 2350 | 0.941 | 177.8 | 0.14 | 11.1 | 0.008 | -23.0 | 0.951 | -178.5 |
| 2400 | 0.942 | 177.5 | 0.14 | 10.4 | 0.008 | -19.0 | 0.951 | -178.7 |
| 2450 | 0.941 | 177.3 | 0.13 | 10.2 | 0.007 | -16.1 | 0.951 | -178.9 |
| 2500 | 0.945 | 176.7 | 0.13 | 9.4 | 0.007 | -12.7 | 0.953 | -179.2 |

Not recommend for new design

## S Parameter

($V_{DS}$ = 6 V, $I_{DQ}$ = 100 mA, Zo = 50 Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) |
| 100 | 0.875 | -161.9 | 8.51 | 93.5 | 0.035 | 4.5 | 0.797 | -167.5 |
| 150 | 0.873 | -168.3 | 5.76 | 88.1 | 0.034 | 0.0 | 0.786 | -171.3 |
| 200 | 0.875 | -171.1 | 4.20 | 84.1 | 0.033 | -2.2 | 0.805 | -172.6 |
| 250 | 0.872 | -172.8 | 3.34 | 81.0 | 0.033 | -5.0 | 0.810 | -173.3 |
| 300 | 0.869 | -173.7 | 2.77 | 78.4 | 0.033 | -6.6 | 0.812 | -173.8 |
| 350 | 0.871 | -174.6 | 2.36 | 75.7 | 0.033 | -8.2 | 0.814 | -174.0 |
| 400 | 0.870 | -175.1 | 2.05 | 73.3 | 0.032 | -10.2 | 0.823 | -174.2 |
| 450 | 0.871 | -175.8 | 1.81 | 71.1 | 0.032 | -11.7 | 0.827 | -174.2 |
| 500 | 0.873 | -176.2 | 1.62 | 68.7 | 0.031 | -13.4 | 0.830 | -174.3 |
| 550 | 0.876 | -176.4 | 1.45 | 66.7 | 0.031 | -14.7 | 0.837 | -174.5 |
| 600 | 0.881 | -176.5 | 1.32 | 64.5 | 0.030 | -16.0 | 0.841 | -174.5 |
| 650 | 0.883 | -176.8 | 1.20 | 62.3 | 0.030 | -17.4 | 0.845 | -174.8 |
| 700 | 0.885 | -176.9 | 1.10 | 60.1 | 0.029 | -18.7 | 0.849 | -175.0 |
| 750 | 0.884 | -177.1 | 1.01 | 58.1 | 0.028 | -19.9 | 0.853 | -175.1 |
| 800 | 0.889 | -177.2 | 0.94 | 55.9 | 0.027 | -21.1 | 0.854 | -175.3 |
| 850 | 0.893 | -177.3 | 0.87 | 53.9 | 0.027 | -22.1 | 0.856 | -175.5 |
| 900 | 0.895 | -177.6 | 0.81 | 51.9 | 0.026 | -22.8 | 0.857 | -175.5 |
| 950 | 0.897 | -177.7 | 0.75 | 50.1 | 0.025 | -23.8 | 0.860 | -175.6 |
| 1000 | 0.894 | -177.9 | 0.70 | 48.5 | 0.025 | -24.6 | 0.862 | -175.6 |
| 1050 | 0.896 | -178.1 | 0.66 | 46.6 | 0.024 | -25.3 | 0.863 | -175.7 |
| 1100 | 0.898 | -178.8 | 0.62 | 44.9 | 0.023 | -25.8 | 0.865 | -175.7 |
| 1150 | 0.903 | -179.1 | 0.59 | 43.7 | 0.022 | -26.3 | 0.871 | -175.8 |
| 1200 | 0.910 | -179.2 | 0.55 | 42.2 | 0.021 | -26.5 | 0.873 | -175.8 |
| 1250 | 0.918 | -179.2 | 0.52 | 41.2 | 0.021 | -26.8 | 0.879 | -175.9 |
| 1300 | 0.919 | -179.3 | 0.50 | 40.0 | 0.020 | -26.8 | 0.881 | -175.9 |
| 1350 | 0.918 | -179.4 | 0.47 | 38.6 | 0.019 | -27.0 | 0.885 | -175.9 |
| 1400 | 0.920 | -179.5 | 0.44 | 37.1 | 0.019 | -27.0 | 0.888 | -176.0 |
| 1450 | 0.920 | -179.6 | 0.42 | 35.5 | 0.018 | -26.9 | 0.892 | -176.1 |
| 1500 | 0.924 | -179.7 | 0.40 | 34.5 | 0.017 | -26.8 | 0.895 | -176.3 |
| 1550 | 0.924 | -179.7 | 0.38 | 33.2 | 0.017 | -26.4 | 0.897 | -176.5 |
| 1600 | 0.920 | -179.9 | 0.36 | 32.3 | 0.016 | -26.2 | 0.900 | -176.6 |
| 1650 | 0.921 | 179.8 | 0.35 | 31.1 | 0.016 | -25.8 | 0.902 | -176.8 |
| 1700 | 0.915 | 179.5 | 0.33 | 29.9 | 0.015 | -25.2 | 0.905 | -177.1 |
| 1750 | 0.918 | 178.9 | 0.32 | 28.9 | 0.014 | -24.7 | 0.907 | -177.3 |
| 1800 | 0.920 | 178.4 | 0.30 | 27.6 | 0.014 | -23.3 | 0.911 | -177.5 |
| 1850 | 0.932 | 178.2 | 0.29 | 26.6 | 0.013 | -22.5 | 0.913 | -177.7 |
| 1900 | 0.940 | 178.1 | 0.28 | 26.1 | 0.013 | -21.7 | 0.913 | -177.9 |
| 1950 | 0.944 | 178.0 | 0.27 | 25.1 | 0.012 | -20.3 | 0.918 | -178.2 |
| 2000 | 0.949 | 178.1 | 0.26 | 24.3 | 0.012 | -18.8 | 0.923 | -178.2 |
| 2050 | 0.950 | 178.4 | 0.25 | 23.8 | 0.011 | -17.0 | 0.924 | -178.3 |
| 2100 | 0.946 | 178.3 | 0.24 | 22.9 | 0.011 | -15.4 | 0.926 | -178.6 |
| 2150 | 0.941 | 178.2 | 0.23 | 22.3 | 0.010 | -13.3 | 0.931 | -178.8 |
| 2200 | 0.940 | 178.1 | 0.22 | 21.6 | 0.010 | -11.1 | 0.932 | -178.8 |
| 2250 | 0.942 | 177.9 | 0.21 | 21.0 | 0.010 | -8.9 | 0.934 | -178.9 |
| 2300 | 0.938 | 177.5 | 0.20 | 20.2 | 0.009 | -6.1 | 0.935 | -179.1 |
| 2350 | 0.940 | 177.3 | 0.20 | 19.6 | 0.009 | -3.7 | 0.940 | -179.2 |
| 2400 | 0.940 | 176.9 | 0.19 | 19.0 | 0.009 | 0.1 | 0.939 | -179.3 |
| 2450 | 0.943 | 176.8 | 0.18 | 18.3 | 0.009 | 2.2 | 0.939 | -179.5 |
| 2500 | 0.943 | 176.2 | 0.18 | 17.4 | 0.008 | 5.6 | 0.942 | -179.8 |

Not recommend for new design

## S Parameter

($V_{DS}$ = 6 V, $I_{DQ}$ = 200 mA, Zo = 50 Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) |
| 100 | 0.903 | -165.0 | 8.86 | 93.3 | 0.026 | 5.2 | 0.838 | -171.4 |
| 150 | 0.902 | -170.5 | 6.00 | 88.8 | 0.025 | 1.1 | 0.826 | -174.1 |
| 200 | 0.903 | -173.0 | 4.37 | 85.8 | 0.025 | 0.4 | 0.845 | -175.1 |
| 250 | 0.899 | -174.5 | 3.49 | 83.3 | 0.024 | -1.6 | 0.847 | -175.5 |
| 300 | 0.896 | -175.5 | 2.91 | 81.2 | 0.024 | -2.7 | 0.848 | -175.9 |
| 350 | 0.896 | -176.2 | 2.48 | 79.2 | 0.024 | -3.4 | 0.851 | -176.1 |
| 400 | 0.893 | -176.5 | 2.16 | 77.4 | 0.024 | -4.8 | 0.856 | -176.1 |
| 450 | 0.895 | -177.3 | 1.92 | 75.3 | 0.024 | -5.5 | 0.859 | -176.4 |
| 500 | 0.896 | -177.8 | 1.73 | 73.4 | 0.024 | -6.7 | 0.862 | -176.5 |
| 550 | 0.898 | -178.1 | 1.56 | 71.8 | 0.023 | -7.1 | 0.865 | -176.7 |
| 600 | 0.901 | -178.1 | 1.42 | 70.0 | 0.023 | -8.0 | 0.869 | -176.9 |
| 650 | 0.902 | -178.4 | 1.31 | 68.1 | 0.023 | -8.9 | 0.870 | -177.0 |
| 700 | 0.904 | -178.5 | 1.20 | 66.5 | 0.022 | -9.5 | 0.873 | -177.3 |
| 750 | 0.901 | -178.7 | 1.11 | 64.4 | 0.022 | -10.7 | 0.874 | -177.4 |
| 800 | 0.902 | -178.7 | 1.03 | 62.6 | 0.022 | -11.1 | 0.874 | -177.6 |
| 850 | 0.907 | -178.9 | 0.96 | 60.8 | 0.021 | -11.6 | 0.872 | -177.8 |
| 900 | 0.906 | -179.1 | 0.90 | 59.1 | 0.021 | -11.8 | 0.872 | -177.9 |
| 950 | 0.908 | -179.3 | 0.84 | 57.5 | 0.020 | -12.5 | 0.874 | -178.0 |
| 1000 | 0.904 | -179.3 | 0.79 | 56.0 | 0.020 | -12.7 | 0.873 | -177.8 |
| 1050 | 0.903 | -179.9 | 0.74 | 54.3 | 0.019 | -12.9 | 0.872 | -178.0 |
| 1100 | 0.906 | 179.8 | 0.71 | 53.0 | 0.019 | -13.2 | 0.872 | -178.0 |
| 1150 | 0.912 | 179.5 | 0.67 | 51.6 | 0.018 | -13.4 | 0.877 | -177.9 |
| 1200 | 0.914 | 179.4 | 0.64 | 50.5 | 0.018 | -13.1 | 0.877 | -177.8 |
| 1250 | 0.919 | 179.3 | 0.60 | 49.5 | 0.017 | -13.0 | 0.881 | -177.9 |
| 1300 | 0.923 | 179.4 | 0.57 | 48.1 | 0.017 | -12.6 | 0.882 | -177.8 |
| 1350 | 0.920 | 179.5 | 0.55 | 46.9 | 0.017 | -12.5 | 0.885 | -177.9 |
| 1400 | 0.923 | 179.3 | 0.52 | 45.5 | 0.016 | -12.3 | 0.887 | -177.8 |
| 1450 | 0.925 | 179.2 | 0.49 | 44.3 | 0.016 | -11.8 | 0.890 | -177.8 |
| 1500 | 0.926 | 179.1 | 0.48 | 43.1 | 0.015 | -11.1 | 0.891 | -178.0 |
| 1550 | 0.923 | 179.1 | 0.45 | 41.9 | 0.015 | -10.6 | 0.893 | -178.1 |
| 1600 | 0.922 | 179.0 | 0.43 | 40.8 | 0.015 | -9.9 | 0.894 | -178.2 |
| 1650 | 0.921 | 178.6 | 0.41 | 39.6 | 0.014 | -9.3 | 0.898 | -178.4 |
| 1700 | 0.917 | 178.5 | 0.40 | 38.5 | 0.014 | -8.6 | 0.898 | -178.5 |
| 1750 | 0.918 | 178.0 | 0.38 | 37.2 | 0.013 | -7.5 | 0.901 | -178.7 |
| 1800 | 0.923 | 177.5 | 0.37 | 36.0 | 0.013 | -6.3 | 0.905 | -178.9 |
| 1850 | 0.931 | 177.2 | 0.35 | 35.1 | 0.013 | -5.0 | 0.906 | -178.9 |
| 1900 | 0.935 | 177.2 | 0.34 | 34.2 | 0.012 | -3.8 | 0.907 | -179.1 |
| 1950 | 0.943 | 177.2 | 0.33 | 33.5 | 0.012 | -2.4 | 0.911 | -179.3 |
| 2000 | 0.946 | 177.4 | 0.32 | 32.6 | 0.012 | -0.9 | 0.916 | -179.4 |
| 2050 | 0.947 | 177.5 | 0.31 | 31.9 | 0.011 | 1.2 | 0.916 | -179.4 |
| 2100 | 0.943 | 177.7 | 0.30 | 31.2 | 0.011 | 2.6 | 0.918 | -179.6 |
| 2150 | 0.941 | 177.5 | 0.28 | 30.6 | 0.011 | 4.3 | 0.923 | -179.8 |
| 2200 | 0.939 | 177.4 | 0.27 | 29.8 | 0.011 | 6.2 | 0.924 | -179.7 |
| 2250 | 0.938 | 177.0 | 0.26 | 29.0 | 0.011 | 8.7 | 0.925 | -179.9 |
| 2300 | 0.934 | 176.8 | 0.25 | 28.3 | 0.010 | 10.6 | 0.926 | 179.9 |
| 2350 | 0.936 | 176.4 | 0.25 | 27.3 | 0.010 | 13.1 | 0.932 | 179.9 |
| 2400 | 0.939 | 176.1 | 0.24 | 26.7 | 0.010 | 15.8 | 0.931 | 179.9 |
| 2450 | 0.937 | 176.0 | 0.23 | 26.0 | 0.010 | 16.9 | 0.931 | 179.7 |
| 2500 | 0.941 | 175.6 | 0.23 | 25.3 | 0.010 | 19.2 | 0.932 | 179.5 |

Not recommend for new design

## S Parameter

($V_{DS}$ = 6 V, $I_{DQ}$ = 300 mA, Zo = 50 Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) |
| 100 | 0.911 | -165.6 | 8.96 | 93.4 | 0.023 | 5.1 | 0.854 | -172.7 |
| 150 | 0.913 | -171.0 | 6.07 | 89.1 | 0.022 | 2.1 | 0.840 | -175.0 |
| 200 | 0.917 | -173.6 | 4.43 | 86.3 | 0.021 | 1.3 | 0.860 | -175.9 |
| 250 | 0.912 | -174.8 | 3.55 | 84.1 | 0.021 | -0.7 | 0.861 | -176.3 |
| 300 | 0.906 | -176.0 | 2.95 | 82.3 | 0.021 | -1.0 | 0.863 | -176.7 |
| 350 | 0.908 | -176.5 | 2.52 | 80.4 | 0.021 | -1.3 | 0.864 | -176.8 |
| 400 | 0.907 | -177.3 | 2.20 | 78.8 | 0.021 | -2.1 | 0.868 | -176.9 |
| 450 | 0.902 | -177.8 | 1.96 | 77.0 | 0.021 | -3.0 | 0.872 | -177.1 |
| 500 | 0.907 | -178.3 | 1.76 | 75.4 | 0.021 | -3.5 | 0.873 | -177.2 |
| 550 | 0.906 | -178.6 | 1.60 | 73.8 | 0.020 | -4.1 | 0.877 | -177.4 |
| 600 | 0.909 | -178.7 | 1.46 | 72.1 | 0.020 | -4.5 | 0.879 | -177.5 |
| 650 | 0.909 | -178.9 | 1.34 | 70.4 | 0.020 | -5.0 | 0.880 | -177.8 |
| 700 | 0.909 | -179.1 | 1.23 | 68.8 | 0.020 | -5.4 | 0.883 | -178.0 |
| 750 | 0.910 | -179.1 | 1.14 | 67.2 | 0.020 | -6.2 | 0.884 | -178.1 |
| 800 | 0.910 | -179.2 | 1.06 | 65.2 | 0.019 | -6.4 | 0.882 | -178.3 |
| 850 | 0.912 | -179.3 | 0.99 | 63.8 | 0.019 | -6.5 | 0.881 | -178.5 |
| 900 | 0.912 | -179.7 | 0.93 | 62.2 | 0.019 | -6.4 | 0.881 | -178.7 |
| 950 | 0.914 | -179.8 | 0.88 | 60.5 | 0.018 | -7.2 | 0.882 | -178.7 |
| 1000 | 0.910 | -179.9 | 0.82 | 58.9 | 0.018 | -7.4 | 0.880 | -178.7 |
| 1050 | 0.907 | 179.8 | 0.78 | 57.4 | 0.018 | -6.9 | 0.879 | -178.8 |
| 1100 | 0.911 | 179.3 | 0.74 | 56.1 | 0.017 | -7.1 | 0.881 | -178.7 |
| 1150 | 0.915 | 179.0 | 0.70 | 54.9 | 0.017 | -7.0 | 0.881 | -178.8 |
| 1200 | 0.920 | 179.0 | 0.67 | 53.8 | 0.016 | -6.7 | 0.882 | -178.7 |
| 1250 | 0.922 | 178.8 | 0.63 | 52.9 | 0.016 | -6.1 | 0.884 | -178.7 |
| 1300 | 0.926 | 178.9 | 0.60 | 51.6 | 0.016 | -5.9 | 0.885 | -178.6 |
| 1350 | 0.920 | 178.9 | 0.57 | 50.3 | 0.015 | -5.2 | 0.888 | -178.6 |
| 1400 | 0.925 | 178.8 | 0.55 | 49.2 | 0.015 | -5.0 | 0.889 | -178.6 |
| 1450 | 0.928 | 178.6 | 0.53 | 47.8 | 0.015 | -4.3 | 0.891 | -178.7 |
| 1500 | 0.926 | 178.7 | 0.50 | 46.6 | 0.014 | -3.5 | 0.891 | -178.7 |
| 1550 | 0.926 | 178.6 | 0.48 | 45.5 | 0.014 | -2.6 | 0.894 | -178.8 |
| 1600 | 0.925 | 178.5 | 0.46 | 44.4 | 0.014 | -2.1 | 0.895 | -178.9 |
| 1650 | 0.921 | 178.3 | 0.44 | 43.3 | 0.014 | -1.2 | 0.897 | -179.0 |
| 1700 | 0.920 | 178.0 | 0.42 | 42.3 | 0.013 | -0.3 | 0.898 | -179.2 |
| 1750 | 0.919 | 177.5 | 0.41 | 41.0 | 0.013 | 0.8 | 0.900 | -179.3 |
| 1800 | 0.926 | 177.0 | 0.39 | 39.7 | 0.013 | 2.2 | 0.903 | -179.6 |
| 1850 | 0.933 | 176.9 | 0.38 | 39.0 | 0.013 | 3.7 | 0.905 | -179.5 |
| 1900 | 0.938 | 176.9 | 0.37 | 38.1 | 0.012 | 4.9 | 0.905 | -179.7 |
| 1950 | 0.944 | 176.7 | 0.36 | 37.2 | 0.012 | 6.3 | 0.909 | -179.9 |
| 2000 | 0.946 | 177.1 | 0.34 | 36.3 | 0.012 | 8.0 | 0.913 | -180.0 |
| 2050 | 0.948 | 177.2 | 0.33 | 35.8 | 0.012 | 9.6 | 0.914 | -180.0 |
| 2100 | 0.944 | 177.1 | 0.32 | 34.9 | 0.011 | 10.9 | 0.917 | 179.8 |
| 2150 | 0.942 | 177.0 | 0.31 | 34.3 | 0.011 | 13.1 | 0.920 | 179.7 |
| 2200 | 0.939 | 177.0 | 0.30 | 33.4 | 0.011 | 14.3 | 0.922 | 179.8 |
| 2250 | 0.937 | 176.7 | 0.29 | 32.6 | 0.011 | 16.1 | 0.922 | 179.6 |
| 2300 | 0.936 | 176.4 | 0.28 | 31.9 | 0.011 | 18.3 | 0.924 | 179.5 |
| 2350 | 0.935 | 176.1 | 0.27 | 30.8 | 0.011 | 20.3 | 0.929 | 179.5 |
| 2400 | 0.940 | 175.8 | 0.27 | 30.2 | 0.011 | 23.0 | 0.928 | 179.4 |
| 2450 | 0.940 | 175.7 | 0.26 | 29.6 | 0.011 | 23.9 | 0.927 | 179.3 |
| 2500 | 0.941 | 175.2 | 0.25 | 28.7 | 0.011 | 26.0 | 0.930 | 179.0 |

Not recommend for new design

## S Parameter

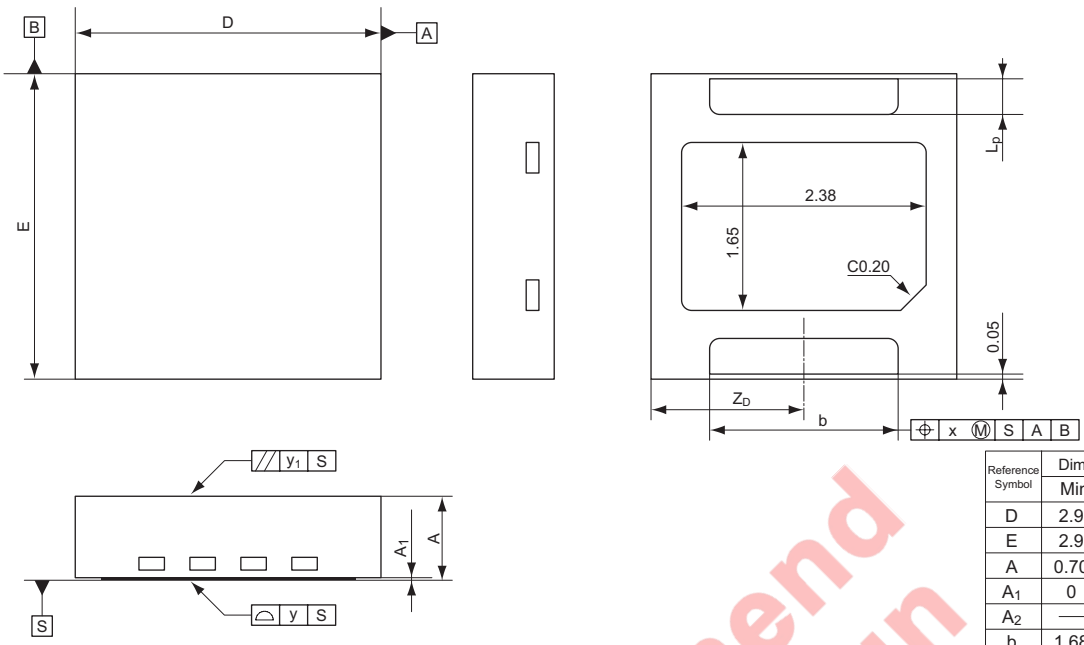
($V_{DS}$ = 6 V, $I_{DQ}$ = 400 mA, Zo = 50 Ω)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) | MAG | ANG (deg.) |
| 100 | 0.916 | -166.0 | 9.03 | 93.5 | 0.021 | 5.5 | 0.861 | -173.3 |
| 150 | 0.917 | -171.2 | 6.14 | 89.4 | 0.020 | 2.2 | 0.847 | -175.5 |
| 200 | 0.918 | -173.4 | 4.50 | 86.7 | 0.019 | 2.3 | 0.866 | -176.2 |
| 250 | 0.917 | -175.2 | 3.59 | 84.3 | 0.020 | 1.0 | 0.869 | -176.6 |
| 300 | 0.914 | -175.8 | 2.99 | 82.3 | 0.019 | 0.3 | 0.870 | -176.9 |
| 350 | 0.910 | -176.8 | 2.56 | 80.5 | 0.019 | 0.0 | 0.872 | -177.1 |
| 400 | 0.909 | -177.6 | 2.23 | 78.8 | 0.019 | -1.2 | 0.877 | -177.2 |
| 450 | 0.909 | -178.0 | 1.97 | 77.3 | 0.019 | -1.4 | 0.878 | -177.3 |
| 500 | 0.911 | -178.4 | 1.78 | 75.6 | 0.019 | -1.8 | 0.881 | -177.4 |
| 550 | 0.912 | -178.7 | 1.61 | 74.2 | 0.019 | -2.1 | 0.883 | -177.6 |
| 600 | 0.912 | -178.8 | 1.47 | 72.7 | 0.019 | -2.4 | 0.885 | -177.7 |
| 650 | 0.915 | -179.0 | 1.35 | 71.3 | 0.019 | -2.8 | 0.886 | -177.9 |
| 700 | 0.913 | -179.1 | 1.24 | 69.5 | 0.018 | -2.8 | 0.889 | -178.2 |
| 750 | 0.913 | -179.3 | 1.15 | 68.1 | 0.018 | -3.3 | 0.890 | -178.3 |
| 800 | 0.916 | -179.5 | 1.07 | 66.6 | 0.018 | -3.6 | 0.889 | -178.5 |
| 850 | 0.917 | -179.6 | 1.00 | 65.1 | 0.018 | -3.8 | 0.887 | -178.7 |
| 900 | 0.915 | -179.9 | 0.94 | 63.6 | 0.017 | -3.7 | 0.887 | -178.9 |
| 950 | 0.916 | -180.0 | 0.89 | 62.1 | 0.017 | -3.9 | 0.888 | -178.9 |
| 1000 | 0.913 | 179.8 | 0.83 | 60.6 | 0.017 | -3.8 | 0.887 | -178.9 |
| 1050 | 0.913 | 179.5 | 0.79 | 59.1 | 0.017 | -3.4 | 0.885 | -179.1 |
| 1100 | 0.915 | 179.1 | 0.75 | 57.8 | 0.016 | -3.6 | 0.885 | -179.1 |
| 1150 | 0.918 | 178.8 | 0.72 | 56.5 | 0.016 | -3.5 | 0.887 | -179.1 |
| 1200 | 0.923 | 178.8 | 0.68 | 55.6 | 0.016 | -2.8 | 0.887 | -179.0 |
| 1250 | 0.925 | 178.7 | 0.65 | 54.8 | 0.015 | -2.6 | 0.888 | -179.2 |
| 1300 | 0.927 | 178.7 | 0.62 | 53.5 | 0.015 | -1.6 | 0.889 | -179.0 |
| 1350 | 0.929 | 178.7 | 0.59 | 52.2 | 0.015 | -1.2 | 0.891 | -179.0 |
| 1400 | 0.927 | 178.6 | 0.56 | 51.0 | 0.014 | -0.7 | 0.893 | -179.0 |
| 1450 | 0.928 | 178.5 | 0.54 | 49.7 | 0.014 | -0.2 | 0.894 | -179.0 |
| 1500 | 0.929 | 178.5 | 0.52 | 48.6 | 0.014 | 0.7 | 0.894 | -179.1 |
| 1550 | 0.929 | 178.5 | 0.50 | 47.4 | 0.014 | 1.9 | 0.894 | -179.2 |
| 1600 | 0.924 | 178.3 | 0.47 | 46.5 | 0.013 | 2.3 | 0.897 | -179.3 |
| 1650 | 0.924 | 178.0 | 0.45 | 45.2 | 0.013 | 3.2 | 0.898 | -179.4 |
| 1700 | 0.922 | 177.6 | 0.44 | 43.9 | 0.013 | 4.2 | 0.899 | -179.5 |
| 1750 | 0.923 | 177.3 | 0.42 | 42.9 | 0.013 | 5.9 | 0.901 | -179.7 |
| 1800 | 0.929 | 176.9 | 0.41 | 41.7 | 0.013 | 7.0 | 0.903 | -179.8 |
| 1850 | 0.936 | 176.7 | 0.39 | 40.7 | 0.012 | 8.3 | 0.905 | -179.9 |
| 1900 | 0.940 | 176.7 | 0.38 | 40.1 | 0.012 | 9.2 | 0.904 | 180.0 |
| 1950 | 0.945 | 176.6 | 0.37 | 39.1 | 0.012 | 11.1 | 0.909 | 179.8 |
| 2000 | 0.948 | 176.8 | 0.36 | 38.4 | 0.012 | 12.9 | 0.914 | 179.7 |
| 2050 | 0.948 | 176.9 | 0.35 | 37.8 | 0.012 | 14.5 | 0.913 | 179.7 |
| 2100 | 0.948 | 176.9 | 0.33 | 37.1 | 0.012 | 15.4 | 0.916 | 179.5 |
| 2150 | 0.944 | 176.8 | 0.32 | 36.4 | 0.012 | 17.1 | 0.921 | 179.4 |
| 2200 | 0.942 | 176.7 | 0.31 | 35.5 | 0.011 | 18.8 | 0.921 | 179.6 |
| 2250 | 0.942 | 176.5 | 0.30 | 34.8 | 0.011 | 20.7 | 0.921 | 179.3 |
| 2300 | 0.938 | 176.2 | 0.29 | 33.9 | 0.011 | 22.6 | 0.924 | 179.2 |
| 2350 | 0.938 | 175.8 | 0.28 | 33.0 | 0.011 | 24.5 | 0.928 | 179.1 |
| 2400 | 0.940 | 175.6 | 0.28 | 32.3 | 0.011 | 27.0 | 0.927 | 179.1 |
| 2450 | 0.944 | 175.2 | 0.27 | 31.7 | 0.011 | 28.0 | 0.927 | 179.0 |
| 2500 | 0.943 | 174.9 | 0.26 | 30.8 | 0.011 | 29.8 | 0.928 | 178.8 |

Not recommend for new design

## Package Dimensions

| Package Name | JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|---|
| HWSON-2 | — | PWSN0002ZA-A | — | 0.022g |




| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | 2.9 | 3.0 | 3.1 |
| E | 2.9 | 3.0 | 3.1 |
| A | 0.70 | 0.75 | 0.80 |
| $A_1$ | 0 | — | 0.05 |
| $A_2$ | — | — | — |
| b | 1.68 | 1.73 | 1.78 |
| e | — | — | — |
| $L_p$ | — | 0.33 | — |
| x | — | — | — |
| y | — | — | 0.08 |
| $y_1$ | — | — | 0.10 |
| $Z_D$ | — | 1.50 | — |

Not recommend for new design

## Ordering Information

| Part Name | Quantity | Shipping Container |
|---|---|---|
| RQA0003DNSTR-E | 2000 pcs. | φ178 mm Reel, 12 mm Emboss Taping |

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   (2) surgical implantations
   (3) healthcare intervention (e.g., excision, administration of medication, etc.)
   (4) any other purposes that pose a direct threat to human life
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