

# RQA0005MXAQS

## Silicon N-Channel MOS FET

REJ03G1568-0100

Rev.1.00

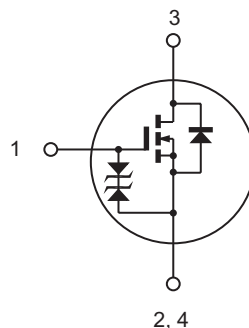
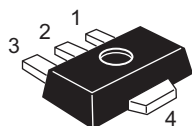
Jul 04, 2007

### Features

- High Output Power, High Gain, High Efficiency  
Pout = +33 dBm, Linear Gain = 21 dB, PAE = 68% (f = 520 MHz)
- Compact package capable of surface mounting

### Outline

RENESAS Package code: PLZZ0004CA-A  
(Package Name : UPAK<sup>®</sup>)



1. Gate
2. Source
3. Drain
4. Source

Note: Marking is "MX".

\*UPAK is a trademark of Renesas Technology Corp.

### Absolute Maximum Ratings

(Ta = 25°C)

| Item                    | Symbol                          | Ratings     | Unit |
|-------------------------|---------------------------------|-------------|------|
| Drain to source voltage | V <sub>DSS</sub>                | 16          | V    |
| Gate to source voltage  | V <sub>GSS</sub>                | ±5          | V    |
| Drain current           | I <sub>D</sub>                  | 0.8         | A    |
| Channel dissipation     | P <sub>ch</sub> <sup>note</sup> | 9           | W    |
| Channel temperature     | T <sub>ch</sub>                 | 150         | °C   |
| Storage temperature     | T <sub>stg</sub>                | -50 to +150 | °C   |

Note: Value at Tc = 25°C

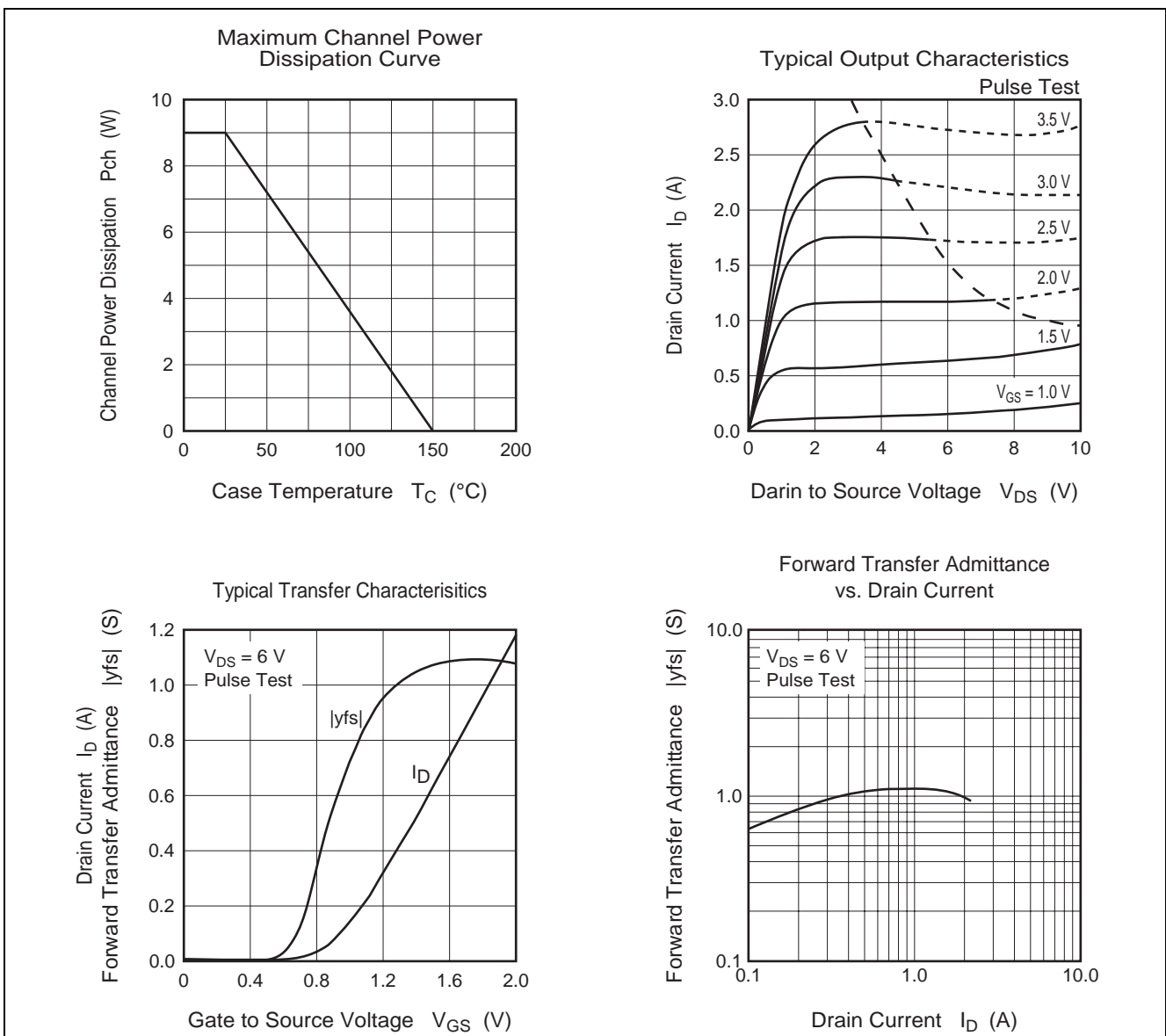
This device is sensitive to electro static discharge. An adequate careful handling procedure is requested.

### Electrical Characteristics

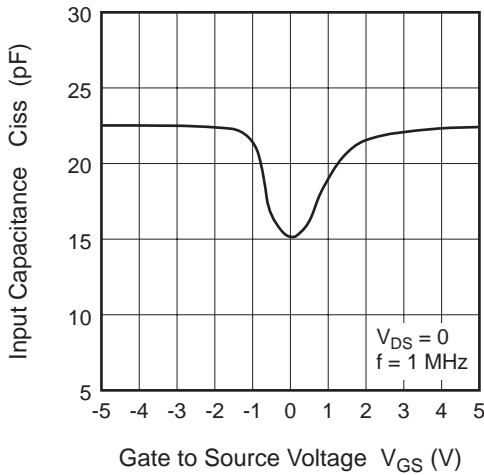
(Ta = 25°C)

| Item                            | Symbol        | Min. | Typ  | Max.    | Unit    | Test Conditions                       |
|---------------------------------|---------------|------|------|---------|---------|---------------------------------------|
| Zero gate voltage drain current | $I_{DSS}$     | —    | —    | 10      | $\mu A$ | $V_{DS} = 16 V, V_{GS} = 0$           |
| Gate to source leakage current  | $I_{GSS}$     | —    | —    | $\pm 2$ | $\mu A$ | $V_{GS} = \pm 5 V, V_{DS} = 0$        |
| Gate to source cutoff voltage   | $V_{GS(off)}$ | 0.15 | 0.45 | 0.75    | V       | $V_{DS} = 6 V, I_D = 1 mA$            |
| Forward Transfer Admittance     | $ y_{fs} $    | —    | 1.1  | —       | S       | $V_{DS} = 6 V, I_D = 600 mA$          |
| Input capacitance               | $C_{iss}$     | —    | 22   | —       | pF      | $V_{GS} = 5 V, V_{DS} = 0, f = 1 MHz$ |
| Output capacitance              | $C_{oss}$     | —    | 12   | —       | pF      | $V_{DS} = 6 V, V_{GS} = 0, f = 1 MHz$ |
| Reverse transfer capacitance    | $C_{rss}$     | —    | 2.6  | —       | pF      | $V_{DG} = 6 V, V_{GS} = 0, f = 1 MHz$ |
| Output Power                    | Pout          | —    | 33   | —       | dBm     | $V_{DS} = 6 V, I_{DQ} = 200 mA$       |
|                                 |               | —    | 2    | —       | W       | $f = 520 MHz, P_{in} = +20 dBm$       |
| Power Added Efficiency          | PAE           | —    | 68   | —       | %       |                                       |

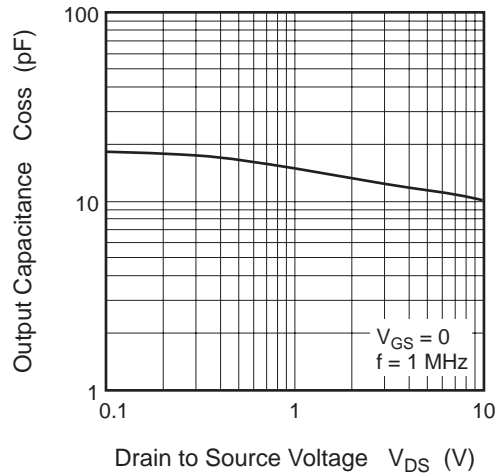
### Main Characteristics



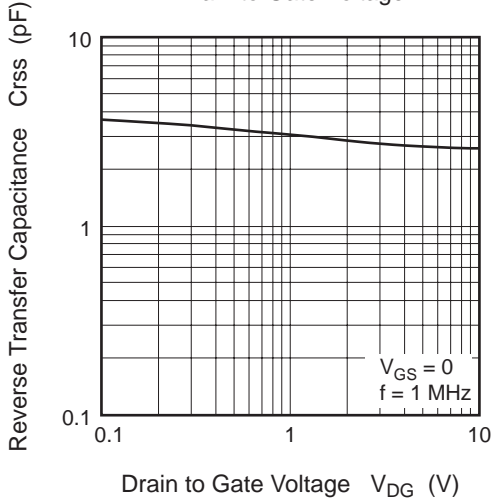
Input Capacitance vs. Gate to Source Voltage



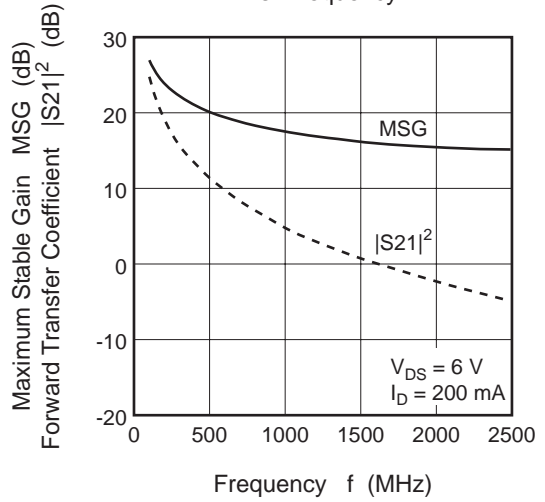
Output Capacitance vs. Drain to Source Voltage



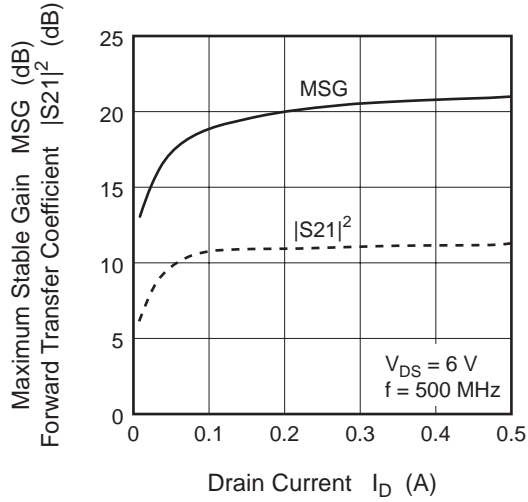
Reverse Transfer Capacitance vs. Drain to Gate Voltage



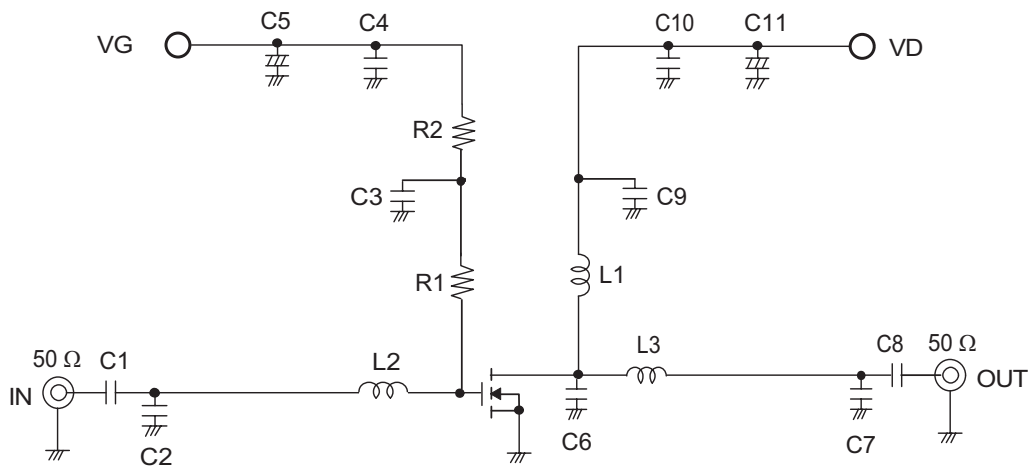
Maximum Stable Gain,  $|S_{21}|^2$  vs. Frequency



Maximum Stable Gain,  $|S_{21}|^2$  vs. Drain Current

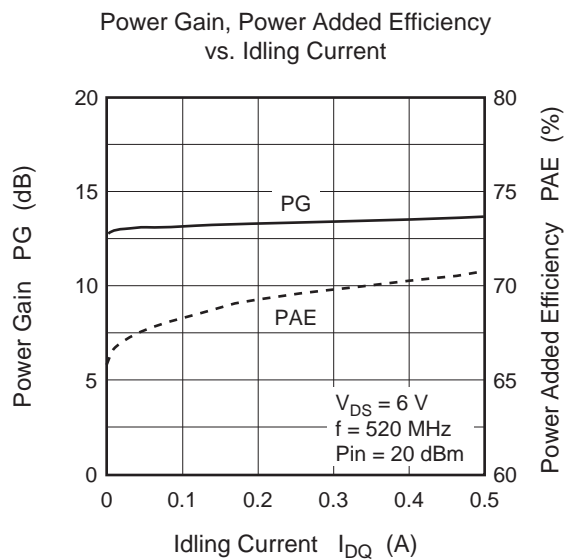
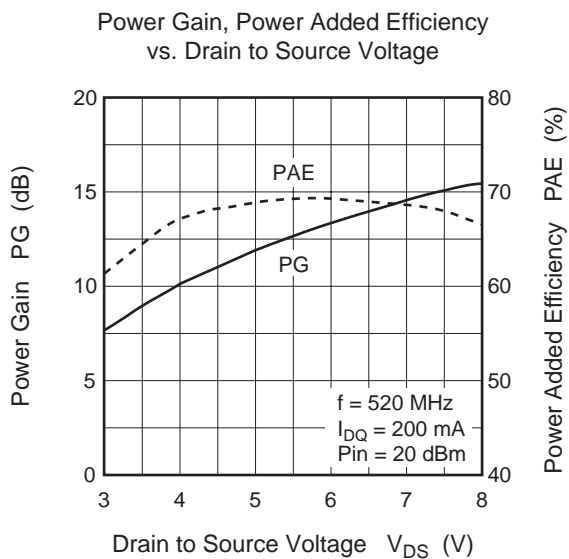
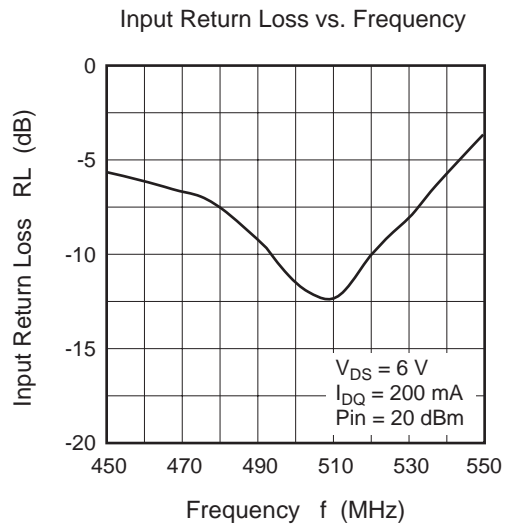
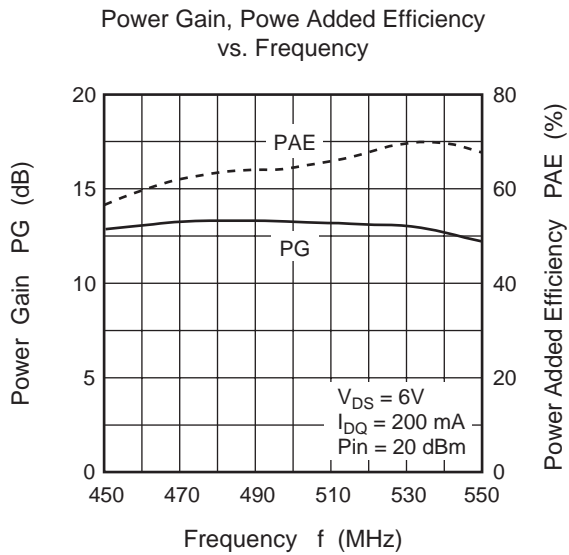
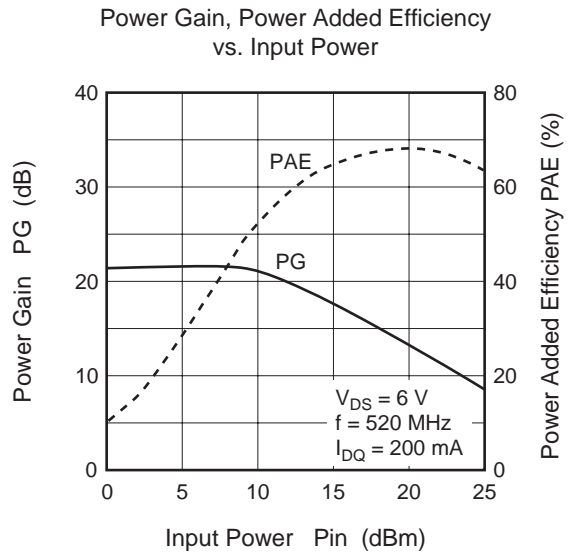
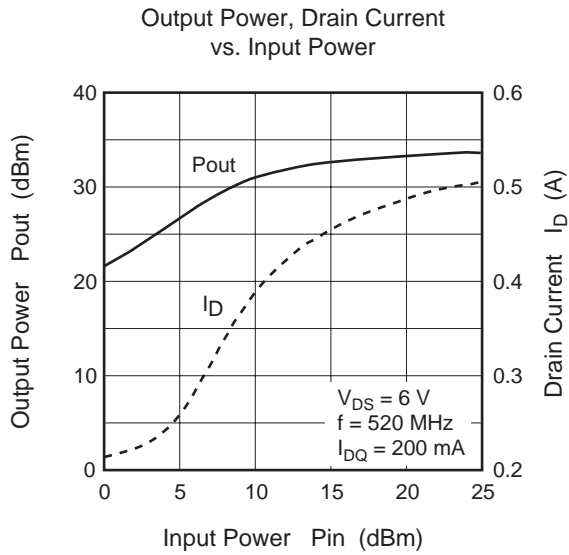


## Evaluation Circuit (f = 520 MHz)



|         |  |
|---------|--|
| C1, C8  | 68 pF Chip Capacitor                         |
| C2      | 16 pF Chip Capacitor                         |
| C3, C9  | 100 pF Chip Capacitor                        |
| C4, C10 | 1000 pF Chip Capacitor                       |
| C5, C11 | 2.2 $\mu$ F Electrolysis Capacitor           |
| C6      | 4 pF Chip Capacitor                          |
| C7      | 11 pF Chip Capacitor                         |
| L1      | 8 Turns D: 0.5 mm, $\phi$ 2.4 mm Enamel Wire |
| L2      | 2.2 nH Chip Inductor                         |
| L3      | 3.3 nH Chip Inductor                         |
| R1      | 33 $\Omega$ Chip Resistor                    |
| R2      | 2.7 k $\Omega$ Chip Resistor                 |

Micro strip line width = 2.2 mm / 50  $\Omega$ ,  $\epsilon_r$  3.6

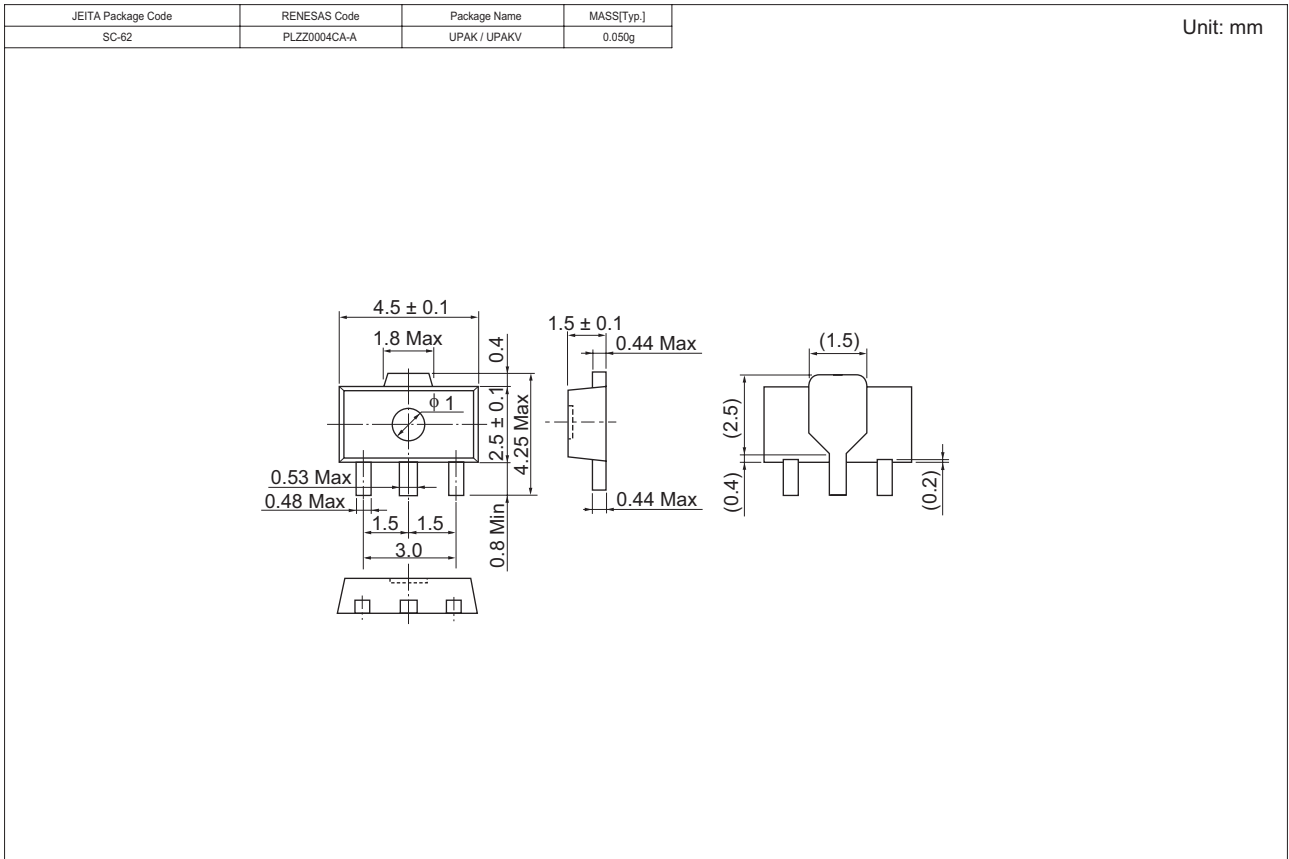


## S Parameter

 $(V_{DS} = 6\text{ V}, I_{DQ} = 200\text{ mA}, Z_o = 50\ \Omega)$ 

| f (MHz) | S11   |            | S21   |            | S12   |            | S22   |            |
|---------|-------|------------|-------|------------|-------|------------|-------|------------|
|         | MAG   | ANG (deg.) | MAG   | ANG (deg.) | MAG   | ANG (deg.) | MAG   | ANG (deg.) |
| 100     | 0.843 | -136.4     | 12.72 | 104.1      | 0.037 | -5.7       | 0.765 | -150.7     |
| 150     | 0.863 | -154.9     | 11.92 | 89.1       | 0.037 | -6.3       | 0.727 | -162.2     |
| 200     | 0.853 | -161.8     | 9.13  | 79.6       | 0.037 | -7.4       | 0.728 | -166.8     |
| 250     | 0.847 | -167.1     | 7.38  | 72.5       | 0.037 | -13.4      | 0.730 | -170.8     |
| 300     | 0.844 | -170.8     | 6.16  | 66.1       | 0.037 | -19.0      | 0.733 | -173.5     |
| 350     | 0.843 | -173.7     | 5.27  | 60.0       | 0.037 | -24.0      | 0.734 | -175.5     |
| 400     | 0.841 | -176.2     | 4.59  | 54.2       | 0.037 | -29.2      | 0.735 | -177.3     |
| 450     | 0.840 | -178.2     | 4.08  | 48.7       | 0.037 | -33.6      | 0.736 | -178.8     |
| 500     | 0.841 | 180.0      | 3.65  | 43.3       | 0.036 | -38.4      | 0.738 | 180.0      |
| 550     | 0.842 | 178.4      | 3.31  | 37.9       | 0.036 | -42.7      | 0.741 | 178.8      |
| 600     | 0.843 | 176.9      | 3.02  | 32.6       | 0.035 | -47.0      | 0.743 | 177.8      |
| 650     | 0.844 | 175.6      | 2.78  | 27.5       | 0.035 | -51.4      | 0.746 | 176.9      |
| 700     | 0.845 | 174.3      | 2.56  | 22.2       | 0.035 | -55.3      | 0.746 | 176.0      |
| 750     | 0.844 | 173.1      | 2.38  | 17.1       | 0.034 | -59.6      | 0.748 | 174.9      |
| 800     | 0.845 | 171.8      | 2.21  | 12.0       | 0.034 | -63.9      | 0.750 | 174.0      |
| 850     | 0.845 | 170.6      | 2.07  | 6.9        | 0.033 | -67.9      | 0.753 | 173.2      |
| 900     | 0.848 | 169.5      | 1.94  | 1.9        | 0.033 | -71.9      | 0.755 | 172.4      |
| 950     | 0.851 | 168.4      | 1.83  | -3.1       | 0.032 | -76.0      | 0.758 | 171.4      |
| 1000    | 0.853 | 167.4      | 1.73  | -8.0       | 0.032 | -79.8      | 0.760 | 170.5      |
| 1050    | 0.856 | 166.4      | 1.64  | -12.9      | 0.031 | -83.8      | 0.764 | 169.7      |
| 1100    | 0.858 | 165.5      | 1.55  | -17.7      | 0.031 | -87.6      | 0.765 | 168.7      |
| 1150    | 0.860 | 164.5      | 1.47  | -22.5      | 0.030 | -91.4      | 0.769 | 167.8      |
| 1200    | 0.861 | 163.5      | 1.40  | -27.4      | 0.030 | -95.3      | 0.774 | 166.9      |
| 1250    | 0.862 | 162.5      | 1.33  | -32.1      | 0.029 | -98.9      | 0.778 | 166.1      |
| 1300    | 0.864 | 161.5      | 1.27  | -37.0      | 0.029 | -102.6     | 0.780 | 165.3      |
| 1350    | 0.865 | 160.5      | 1.21  | -41.8      | 0.028 | -106.3     | 0.784 | 164.4      |
| 1400    | 0.867 | 159.4      | 1.16  | -46.6      | 0.028 | -109.9     | 0.789 | 163.5      |
| 1450    | 0.868 | 158.5      | 1.11  | -51.3      | 0.027 | -113.4     | 0.792 | 162.8      |
| 1500    | 0.871 | 157.5      | 1.06  | -56.0      | 0.027 | -116.7     | 0.794 | 161.9      |
| 1550    | 0.874 | 156.6      | 1.02  | -60.6      | 0.026 | -120.2     | 0.796 | 161.1      |
| 1600    | 0.876 | 155.7      | 0.98  | -65.4      | 0.025 | -123.4     | 0.799 | 160.2      |
| 1650    | 0.878 | 154.8      | 0.94  | -70.1      | 0.025 | -126.8     | 0.801 | 159.3      |
| 1700    | 0.879 | 154.0      | 0.91  | -74.8      | 0.024 | -130.3     | 0.803 | 158.5      |
| 1750    | 0.879 | 153.2      | 0.88  | -79.3      | 0.024 | -133.2     | 0.805 | 157.4      |
| 1800    | 0.880 | 152.4      | 0.85  | -83.8      | 0.023 | -136.4     | 0.808 | 156.4      |
| 1850    | 0.882 | 151.5      | 0.82  | -88.2      | 0.023 | -139.6     | 0.812 | 155.5      |
| 1900    | 0.886 | 150.2      | 0.79  | -92.7      | 0.022 | -142.7     | 0.814 | 154.5      |
| 1950    | 0.888 | 148.9      | 0.76  | -97.3      | 0.022 | -146.0     | 0.818 | 153.4      |
| 2000    | 0.890 | 147.8      | 0.74  | -101.7     | 0.021 | -149.0     | 0.820 | 152.5      |
| 2050    | 0.893 | 146.8      | 0.71  | -106.2     | 0.021 | -151.9     | 0.825 | 151.7      |
| 2100    | 0.897 | 145.9      | 0.69  | -110.6     | 0.020 | -155.0     | 0.826 | 150.7      |
| 2150    | 0.900 | 145.0      | 0.67  | -115.2     | 0.020 | -157.7     | 0.829 | 149.6      |
| 2200    | 0.902 | 144.1      | 0.65  | -119.7     | 0.019 | -160.4     | 0.832 | 148.6      |
| 2250    | 0.904 | 143.3      | 0.63  | -124.1     | 0.019 | -163.0     | 0.837 | 147.8      |
| 2300    | 0.904 | 142.5      | 0.61  | -128.6     | 0.019 | -165.3     | 0.839 | 146.9      |
| 2350    | 0.904 | 141.7      | 0.59  | -133.0     | 0.018 | -168.3     | 0.839 | 145.9      |
| 2400    | 0.903 | 140.9      | 0.57  | -137.5     | 0.018 | -170.7     | 0.841 | 144.8      |
| 2450    | 0.901 | 139.9      | 0.55  | -142.0     | 0.018 | -173.1     | 0.843 | 144.0      |
| 2500    | 0.898 | 138.9      | 0.54  | -146.5     | 0.017 | -175.5     | 0.842 | 143.0      |

### Package Dimensions



### Ordering Information

| Part Name     | Quantity  | Shipping Container                      |
|---------------|-----------|---|
| RQA0005MXTL-E | 1000 pcs. | $\phi 178$ mm reel, 12 mm emboss taping |

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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