

## Plastic Packaged Low Noise PHEMT GaAs FETs

### FEATURES

- 1.5 dB Typical Noise Figure at 12 GHz
- High Associated Gain:  $G_a = 6.5$  dB Typical at 12 GHz
- 21.5 dBm Typical Power at 12 GHz
- 7.5 dB Typical Linear Power Gain at 12 GHz
- $L_g = 0.25 \mu\text{m}$ ,  $W_g = 300 \mu\text{m}$
- Tight  $V_p$  ranges control
- High RF input power handling capability
- 100 % DC Tested
- Low Cost Plastic SOT143 Package

### PHOTO ENLARGEMENT



### DESCRIPTION

The TC2211 is a high performance field effect transistor housed in a plastic package with TC1201 PHEMT Chip. Its low noise figure makes this device suitable for use in low noise amplifiers. All devices are 100 % DC tested to assure consistent quality.

### ELECTRICAL SPECIFICATIONS ( $T_A = 25^\circ\text{C}$ )

| Symbol     | CONDITIONS                                                                                                         | MIN  | TYP   | MAX | UNIT               |
|------------|--------------------------------------------------------------------------------------------------------------------|------|-------|-----|--------------------|
| NF         | Noise Figure at $V_{DS} = 4 \text{ V}$ , $I_{DS} = 25 \text{ mA}$ , $f = 12 \text{ GHz}$                           |      | 1.5   | 2   | dB                 |
| $G_a$      | Associated Gain at $V_{DS} = 4 \text{ V}$ , $I_{DS} = 25 \text{ mA}$ , $f = 12 \text{ GHz}$                        | 5.5  | 6.5   |     | dB                 |
| $P_{1dB}$  | Output Power at 1dB Gain Compression Point, $f = 12 \text{ GHz}$ $V_{DS} = 6 \text{ V}$ , $I_{DS} = 40 \text{ mA}$ | 20.5 | 21.5  |     | dBm                |
| $G_L$      | Linear Power Gain, $f = 12 \text{ GHz}$ $V_{DS} = 6 \text{ V}$ , $I_{DS} = 40 \text{ mA}$                          | 6.5  | 7.5   |     | dB                 |
| $I_{DSS}$  | Saturated Drain-Source Current at $V_{DS} = 2 \text{ V}$ , $V_{GS} = 0 \text{ V}$                                  |      | 90    |     | mA                 |
| $g_m$      | Transconductance at $V_{DS} = 2 \text{ V}$ , $V_{GS} = 0 \text{ V}$                                                |      | 100   |     | mS                 |
| $V_p$      | Pinch-off Voltage at $V_{DS} = 2 \text{ V}$ , $I_D = 0.6 \text{ mA}$                                               |      | -1.0* |     | Volts              |
| $BV_{DGO}$ | Drain-Gate Breakdown Voltage at $I_{DGO} = 0.15 \text{ mA}$                                                        | 9    | 12    |     | Volts              |
| $R_{th}$   | Thermal Resistance                                                                                                 |      | 150   |     | $^\circ\text{C/W}$ |

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

| Symbol    | Parameter              | Rating                                         |
|-----------|------------------------|------------------------------------------------|
| $V_{DS}$  | Drain-Source Voltage   | 7.0 V                                          |
| $V_{GS}$  | Gate-Source Voltage    | -3.0 V                                         |
| $I_{DS}$  | Drain Current          | $I_{DSS}$                                      |
| $I_{GS}$  | Gate Current           | 300 $\mu\text{A}$                              |
| $P_{in}$  | RF Input Power, CW     | 21 dBm                                         |
| $P_T$     | Continuous Dissipation | 400 mW                                         |
| $T_{CH}$  | Channel Temperature    | 175 $^\circ\text{C}$                           |
| $T_{STG}$ | Storage Temperature    | - 65 $^\circ\text{C}$ to +175 $^\circ\text{C}$ |

\* For the tight control of the pinch-off voltage range, we divide TC2211 into 3 model numbers to fit customer design requirement

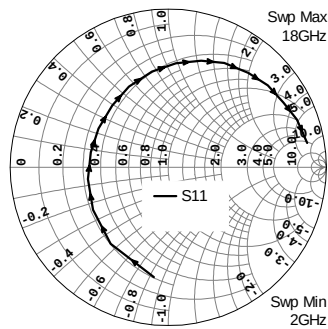
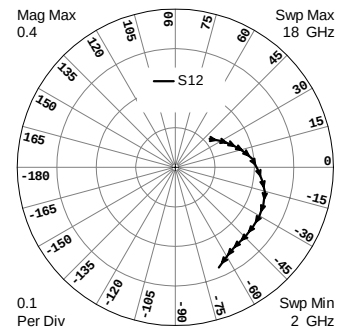
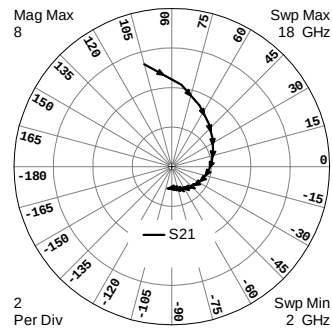
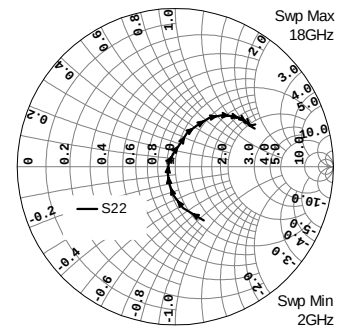
(1) TC2211P0710 :  $V_p = -0.7 \text{ V}$  to  $-1.0 \text{ V}$

(2) TC2211P0811 :  $V_p = -0.8 \text{ V}$  to  $-1.1 \text{ V}$

(3) TC2211P0912 :  $V_p = -0.9 \text{ V}$  to  $-1.2 \text{ V}$

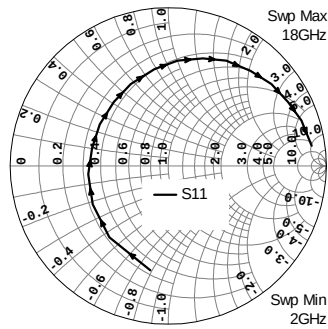
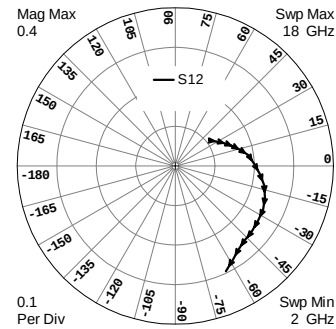
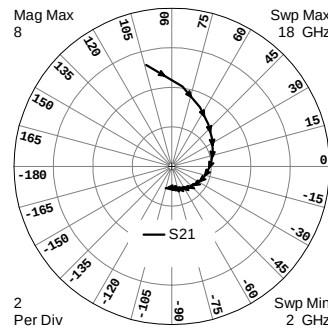
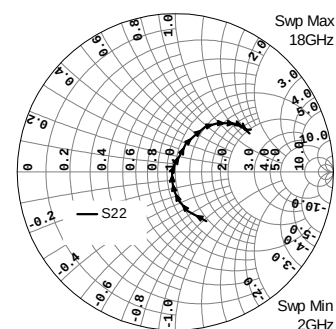
If required, customer can specify the requirement in purchasing document. For special  $V_p$  requirement, please contact factory for details.

**TYPICAL SCATTERING PARAMETERS (T<sub>A</sub>=25 °C)**

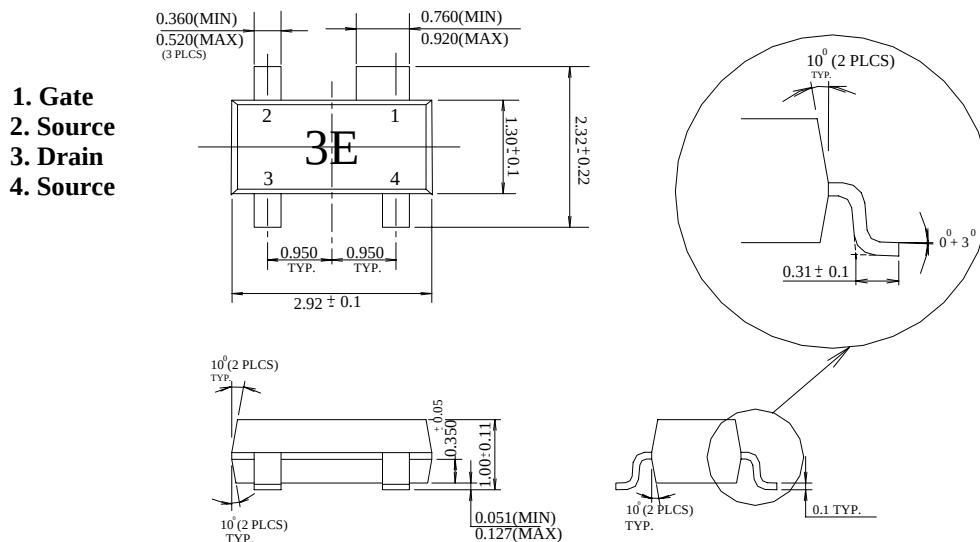
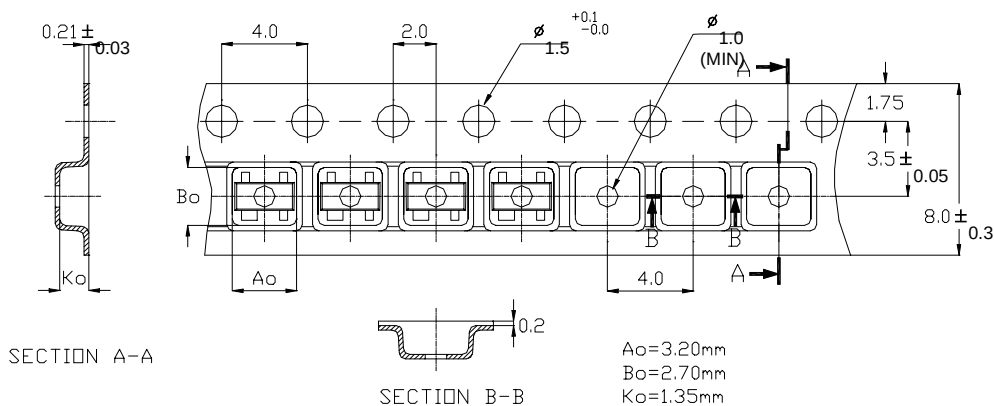
 V<sub>DS</sub> = 4 V, I<sub>DS</sub> = 25 mA


| FREQUENCY<br>(GHz) | S11    |         | S21    |         | S12    |        | S22    |         |
|--------------------|--------|---------|--------|---------|--------|--------|--------|---------|
|                    | MAG    | ANG     | MAG    | ANG     | MAG    | ANG    | MAG    | ANG     |
| 2                  | 0.6999 | -97.55  | 5.3659 | 105.10  | 0.1127 | 39.71  | 0.3838 | -62.15  |
| 3                  | 0.6047 | -127.04 | 4.1625 | 83.38   | 0.1340 | 29.75  | 0.2657 | -79.50  |
| 4                  | 0.5465 | -150.57 | 3.3927 | 65.51   | 0.1502 | 23.32  | 0.1809 | -93.67  |
| 5                  | 0.5139 | -171.52 | 2.8823 | 49.75   | 0.1655 | 17.33  | 0.1122 | -110.30 |
| 6                  | 0.4983 | 169.10  | 2.5261 | 35.13   | 0.1806 | 12.00  | 0.0610 | -142.34 |
| 7                  | 0.5047 | 150.95  | 2.2504 | 21.36   | 0.1952 | 6.37   | 0.0498 | 144.49  |
| 8                  | 0.5278 | 132.16  | 2.0333 | 5.81    | 0.2094 | -1.70  | 0.0917 | 95.82   |
| 9                  | 0.5677 | 116.10  | 1.8558 | -7.76   | 0.2228 | -8.89  | 0.1539 | 76.92   |
| 10                 | 0.6139 | 99.71   | 1.7107 | -20.59  | 0.2353 | -15.49 | 0.2262 | 70.78   |
| 11                 | 0.6598 | 85.73   | 1.5598 | -32.59  | 0.2422 | -22.95 | 0.2942 | 62.32   |
| 12                 | 0.7045 | 72.88   | 1.4317 | -44.68  | 0.2461 | -30.44 | 0.3747 | 55.37   |
| 13                 | 0.7477 | 61.79   | 1.3153 | -55.99  | 0.2473 | -37.31 | 0.4407 | 47.71   |
| 14                 | 0.7818 | 49.72   | 1.2204 | -67.41  | 0.2490 | -44.51 | 0.4846 | 41.21   |
| 15                 | 0.8152 | 39.40   | 1.1386 | -76.80  | 0.2493 | -50.20 | 0.5174 | 36.25   |
| 16                 | 0.8366 | 29.31   | 1.0922 | -85.95  | 0.2537 | -55.96 | 0.5359 | 31.19   |
| 17                 | 0.8672 | 20.34   | 1.0896 | -94.23  | 0.2626 | -61.00 | 0.5428 | 28.40   |
| 18                 | 0.8923 | 9.98    | 1.1270 | -101.69 | 0.2760 | -66.50 | 0.5334 | 29.19   |

**TYPICAL SCATTERING PARAMETERS (T<sub>A</sub>=25 °C)**

 V<sub>DS</sub> = 6 V, I<sub>DS</sub> = 40 mA


| FREQUENCY<br>(GHz) | S11    |         | S21    |         | S12    |        | S22    |         |
|--------------------|--------|---------|--------|---------|--------|--------|--------|---------|
|                    | MAG    | ANG     | MAG    | ANG     | MAG    | ANG    | MAG    | ANG     |
| 2                  | 0.6681 | -99.70  | 5.2865 | 104.24  | 0.1064 | 37.18  | 0.3684 | -57.65  |
| 3                  | 0.5858 | -129.55 | 4.0847 | 82.50   | 0.1263 | 28.85  | 0.2591 | -72.46  |
| 4                  | 0.5351 | -153.10 | 3.3207 | 64.67   | 0.1422 | 23.08  | 0.1812 | -83.40  |
| 5                  | 0.5082 | -173.98 | 2.8250 | 48.98   | 0.1567 | 18.11  | 0.1171 | -93.75  |
| 6                  | 0.4947 | 166.69  | 2.4709 | 34.40   | 0.1713 | 13.24  | 0.0609 | -108.93 |
| 7                  | 0.5062 | 148.64  | 2.2092 | 20.39   | 0.1869 | 8.46   | 0.0211 | 175.98  |
| 8                  | 0.5316 | 130.28  | 2.0052 | 5.27    | 0.2008 | 0.85   | 0.0565 | 89.27   |
| 9                  | 0.5694 | 114.69  | 1.8259 | -8.54   | 0.2155 | -5.75  | 0.1177 | 72.69   |
| 10                 | 0.6175 | 98.32   | 1.6860 | -21.35  | 0.2301 | -12.29 | 0.1898 | 69.23   |
| 11                 | 0.6674 | 84.96   | 1.5447 | -33.79  | 0.2406 | -19.60 | 0.2610 | 62.03   |
| 12                 | 0.7144 | 72.20   | 1.4328 | -45.93  | 0.2483 | -26.65 | 0.3431 | 56.25   |
| 13                 | 0.7593 | 61.19   | 1.3122 | -57.56  | 0.2510 | -33.66 | 0.4079 | 49.11   |
| 14                 | 0.7959 | 49.10   | 1.2180 | -69.19  | 0.2553 | -41.18 | 0.4555 | 42.41   |
| 15                 | 0.8324 | 38.47   | 1.1482 | -79.01  | 0.2575 | -47.12 | 0.4943 | 37.80   |
| 16                 | 0.8584 | 28.11   | 1.0956 | -88.46  | 0.2644 | -52.66 | 0.5161 | 32.93   |
| 17                 | 0.8894 | 18.77   | 1.0979 | -97.09  | 0.2779 | -58.43 | 0.5213 | 30.50   |
| 18                 | 0.9160 | 8.01    | 1.1489 | -105.25 | 0.2951 | -64.37 | 0.5137 | 31.58   |

**OUTLINE DIMENSIONS (Unit : mm)**

**Tape & Reel Package Orientation (Unit:mm)**


|                        |      |
|------------------------|------|
| Standard Reel Size     | 7"   |
| Standard Reel Quantity | 3000 |