



TC2201

REV.2\_04/12/2004

## Plastic Packaged Low Noise PHEMT GaAs FETs

## FEATURES

- 1.5 dB Typical Noise Figure at 12 GHz
- High Associated Gain:  
Ga = 7 dB Typical at 12 GHz
- 21.5 dBm Typical Power at 12 GHz
- 8 dB Typical Linear Power Gain at 12 GHz
- $L_g = 0.25 \mu\text{m}$ ,  $W_g = 300 \mu\text{m}$
- 100 % DC Tested
- Low Cost Plastic Micro-X Package

## PHOTO ENLARGEMENT



## DESCRIPTION

The TC2201 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 ( $T_A = 25^\circ\text{C}$ )

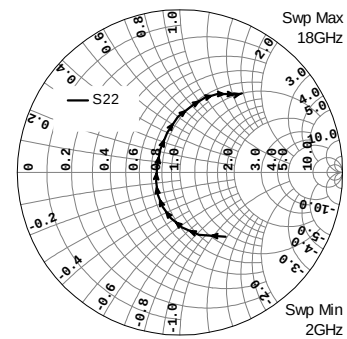
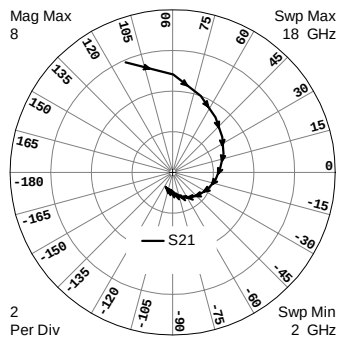
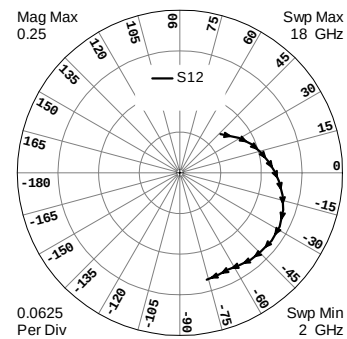
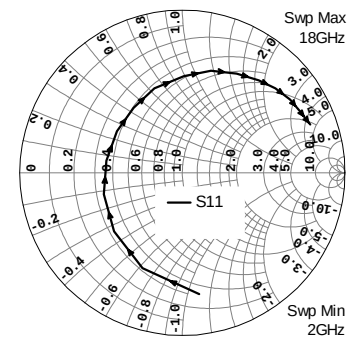
| Symbol     | CONDITIONS                                                                                                            | MIN  | TYP   | MAX | UNIT               |
|------------|-----------------------------------------------------------------------------------------------------------------------|------|-------|-----|--------------------|
| 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 $V_{DS} = 4 \text{ V}$ , $I_{DS} = 25 \text{ mA}$ , $f = 12 \text{ GHz}$                           | 6    | 7     |     | dB                 |
| $P_{1dB}$  | Output Power at 1dB Gain Compression Point, $f = 12 \text{ GHz}$<br>$V_{DS} = 6 \text{ V}$ , $I_{DS} = 40 \text{ mA}$ | 20.5 | 21.5  |     | dBm                |
| $G_L$      | Linear Power Gain, $f = 12 \text{ GHz}$<br>$V_{DS} = 6 \text{ V}$ , $I_{DS} = 40 \text{ mA}$                          | 7    | 8     |     | 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                                                                                                    |      | 80    |     | $^\circ\text{C/W}$ |

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     | 17 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 $^\circ\text{C}$ |

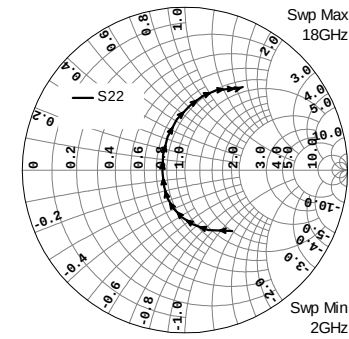
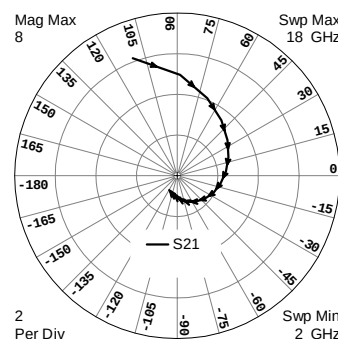
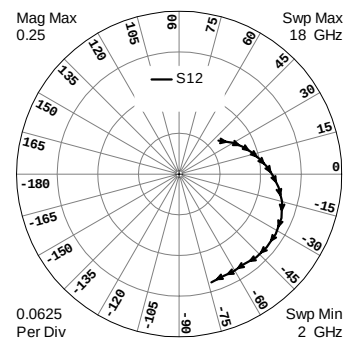
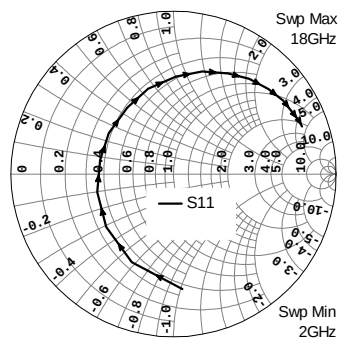
\* For the tight control of the pinch-off voltage range, we divide TC2201 into 3 model numbers to fit customer design requirement  
(1)TC2201P0710 :  $V_p = -0.7 \text{ V}$  to  $-1.0 \text{ V}$  (2)TC2201P0811 :  $V_p = -0.8 \text{ V}$  to  $-1.1 \text{ V}$  (3)TC2201P0912 :  $V_p = -0.9 \text{ V}$  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 ( $T_A=25\text{ }^{\circ}\text{C}$ )** $V_{DS} = 4\text{ V}$ ,  $I_{DS} = 25\text{ mA}$ 

| FREQUENCY<br>(GHz) | S11    |         | S21    |         | S12    |        | S22    |         |
|--------------------|--------|---------|--------|---------|--------|--------|--------|---------|
|                    | MAG    | ANG     | MAG    | ANG     | MAG    | ANG    | MAG    | ANG     |
| 2                  | 0.7533 | -82.10  | 5.8916 | 113.12  | 0.0859 | 43.82  | 0.4839 | -54.70  |
| 3                  | 0.6364 | -112.71 | 4.8047 | 89.78   | 0.1056 | 30.65  | 0.4017 | -73.14  |
| 4                  | 0.5532 | -139.52 | 4.0041 | 69.80   | 0.1186 | 21.68  | 0.3378 | -87.89  |
| 5                  | 0.5000 | -164.62 | 3.4244 | 52.15   | 0.1288 | 13.94  | 0.2851 | -101.66 |
| 6                  | 0.4738 | 170.81  | 2.9889 | 35.68   | 0.1373 | 7.11   | 0.2373 | -117.05 |
| 7                  | 0.4758 | 147.55  | 2.6546 | 20.03   | 0.1457 | 0.62   | 0.1922 | -135.22 |
| 8                  | 0.4993 | 127.04  | 2.3605 | 5.53    | 0.1530 | -4.93  | 0.1572 | -159.54 |
| 9                  | 0.5470 | 108.29  | 2.1342 | -9.88   | 0.1612 | -12.31 | 0.1453 | 164.90  |
| 10                 | 0.5944 | 89.06   | 1.9251 | -24.84  | 0.1688 | -19.81 | 0.1859 | 130.54  |
| 11                 | 0.6526 | 74.32   | 1.7184 | -39.43  | 0.1741 | -28.26 | 0.2586 | 107.73  |
| 12                 | 0.6960 | 61.35   | 1.5301 | -53.55  | 0.1752 | -36.56 | 0.3416 | 92.13   |
| 13                 | 0.7377 | 50.52   | 1.3506 | -66.92  | 0.1737 | -44.72 | 0.4175 | 79.61   |
| 14                 | 0.7730 | 42.23   | 1.1924 | -78.45  | 0.1721 | -50.95 | 0.4820 | 71.77   |
| 15                 | 0.8017 | 34.20   | 1.0451 | -89.52  | 0.1687 | -57.89 | 0.5343 | 64.55   |
| 16                 | 0.8164 | 27.35   | 0.9270 | -99.93  | 0.1662 | -63.83 | 0.5688 | 57.79   |
| 17                 | 0.8308 | 23.01   | 0.8452 | -108.84 | 0.1679 | -69.81 | 0.5912 | 53.85   |
| 18                 | 0.8402 | 20.69   | 0.7873 | -116.75 | 0.1692 | -75.99 | 0.6171 | 51.95   |

**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                  | 0.7092 | -85.70  | 6.1747 | 110.84  | 0.0793 | 40.30  | 0.4731 | -52.17  |
| 3                  | 0.6001 | -115.37 | 4.9530 | 88.24   | 0.0956 | 30.10  | 0.3941 | -68.76  |
| 4                  | 0.5269 | -141.91 | 4.0928 | 68.69   | 0.1077 | 22.43  | 0.3361 | -81.69  |
| 5                  | 0.4820 | -166.74 | 3.4853 | 51.43   | 0.1175 | 15.94  | 0.2897 | -93.65  |
| 6                  | 0.4600 | 169.32  | 3.0355 | 35.32   | 0.1261 | 10.21  | 0.2452 | -106.84 |
| 7                  | 0.4702 | 147.81  | 2.6901 | 19.78   | 0.1359 | 4.41   | 0.2032 | -122.75 |
| 8                  | 0.4971 | 124.85  | 2.4024 | 4.75    | 0.1444 | -1.24  | 0.1635 | -142.30 |
| 9                  | 0.5462 | 106.66  | 2.1605 | -10.35  | 0.1540 | -7.63  | 0.1392 | -175.30 |
| 10                 | 0.5999 | 88.59   | 1.9666 | -25.56  | 0.1638 | -15.08 | 0.1639 | 145.59  |
| 11                 | 0.6546 | 74.41   | 1.7593 | -39.71  | 0.1711 | -23.34 | 0.2298 | 117.55  |
| 12                 | 0.7024 | 61.65   | 1.5634 | -54.17  | 0.1746 | -31.78 | 0.3165 | 99.21   |
| 13                 | 0.7466 | 51.47   | 1.3909 | -67.87  | 0.1751 | -39.88 | 0.3953 | 85.80   |
| 14                 | 0.7831 | 41.75   | 1.2182 | -80.02  | 0.1743 | -47.33 | 0.4682 | 76.51   |
| 15                 | 0.8114 | 33.77   | 1.0667 | -91.60  | 0.1705 | -54.30 | 0.5263 | 68.41   |
| 16                 | 0.8244 | 27.17   | 0.9435 | -102.17 | 0.1711 | -61.20 | 0.5666 | 61.49   |
| 17                 | 0.8371 | 23.17   | 0.8587 | -111.25 | 0.1708 | -66.78 | 0.5947 | 57.19   |
| 18                 | 0.8423 | 20.30   | 0.7991 | -118.61 | 0.1736 | -73.44 | 0.6221 | 55.04   |

### OUTLINE DIMENSIONS (in mm)

