

NEC

3 V, 1900 MHz LOW NOISE SI MMIC AMPLIFIER

UPC2749T

FEATURES

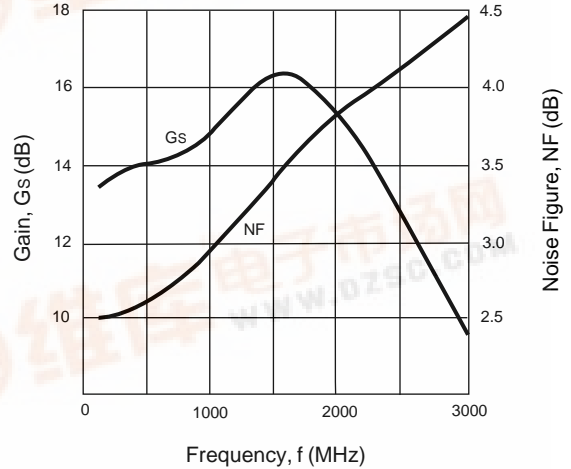
- 16 dB GAIN WITH 4 dB NOISE FIGURE AT 1900 MHz
- LOW VOLTAGE - LOW CURRENT: 6 mA at 3 V
- LOW POWER CONSUMPTION: 18 mW TYP
- SUPER SMALL PACKAGE
- TAPE AND REEL PACKAGING OPTION AVAILABLE

DESCRIPTION

The UPC2749T is a Silicon Monolithic integrated circuit which is manufactured using the NESAT III process. The NESAT III process produces transistors with f_T approaching 20 GHz. This amplifier was designed for buffer amplifier applications in GPS and PCS applications. Operating on a 3 volt supply this IC is ideally suited for hand-held, portable designs.

NEC's stringent quality assurance and test procedures assure the highest reliability and performance.

NOISE FIGURE AND GAIN vs. FREQUENCY
 $V_{CC} = 3.0 V$



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ C$, $Z_L = Z_s = 50\Omega$, $V_{CC} = 3.0 V$)

| PART NUMBER PACKAGE OUTLINE | | | UPC2749T TO6 | | |
|--------------------------------|---|--------------------------|-----------------|------------------------|------------|
| SYMBOLS | PARAMETERS AND CONDITIONS | UNITS | MIN | TYP | MAX |
| I _{CC} | Circuit Current (no signal) | mA | 4 | 6 | 8 |
| G _s | Small Signal Gain, f = 900 MHz f = 1900 MHz | dB dB | 13 | 14.5 16 | 18.5 |
| f _{u1} | Upper Limit Operating Frequency | GHz | 2.5 | 2.9 | |
| P _{1dB} | 1 dB Compressed Output Power at 1900 MHz | dBm | | -12.5 | |
| P _{SAT} | Saturated Output Power, f = 1900 MHz | dBm | -9 | -6 | |
| NF | Noise Figure, f = 900 MHz f = 1900 MHz | dB dB | | 3.2 4.0 | 5.5 |
| R _{LIN} | Input Return Loss, f = 1900 MHz | dB | 7 | 10 | |
| R _{LOUT} | Output Return Loss, f = 1900 MHz | dB | 9.5 | 12.5 | |
| ISOL | Isolation, f = 1900 MHz | dB | 25 | 30 | |
| OIP ₃ | SSB Output Third Order Intercept, f ₁ = 500 MHz, f ₂ = 510 MHz f ₁ = 1000 MHz, f ₂ = 1010 MHz f ₁ = 1900 MHz, f ₂ = 1902 MHz f ₁ = 2000 MHz, f ₂ = 2010 MHz | dBm dBm dBm dBm | | -3 -3 -3.5 -4 | |
| R _{TH} (J-A) | Thermal Resistance (Junction to Ambient) Free Air Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB | °C/W °C/W | | | 620 230 |

Note: The gain at f_u is 3 dB down from the gain at 1900 MHz.

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ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

| SYMBOLS | PARAMETERS | UNITS | RATINGS |
|------------------|--------------------------------------|-------|-------------|
| V _{CC} | Supply Voltage | V | 4.0 |
| I _{CC} | Total Supply Current | mA | 15 |
| P _{IN} | Input Power | dBm | 0 |
| P _T | Total Power Dissipation ² | mW | 280 |
| T _{OP} | Operating Temperature | °C | -40 to +85 |
| T _{STG} | Storage Temperature | °C | -55 to +150 |

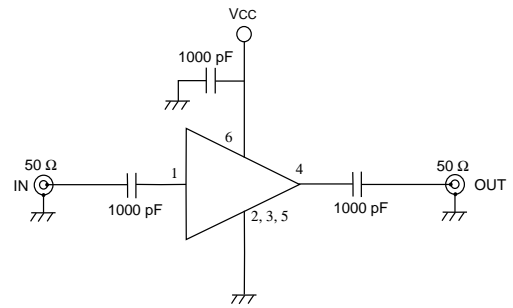
Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB (T_A = 85°C).

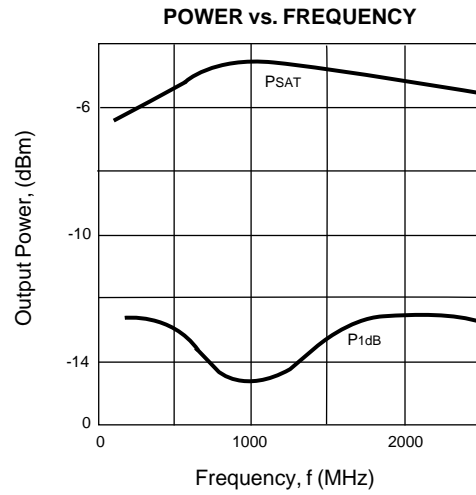
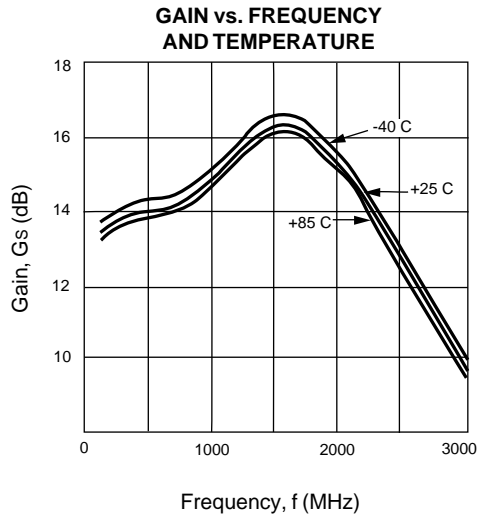
RECOMMENDED OPERATING CONDITIONS

| SYMBOLS | PARAMETERS | UNITS | MIN | TYP | MAX |
|-----------------|-----------------------|-------|-----|-----|-----|
| V _{CC} | Supply Voltage | V | 2.7 | 3 | 3.3 |
| T _{OP} | Operating Temperature | °C | -40 | 25 | 85 |

TEST CIRCUIT



TYPICAL PERFORMANCE CURVES (T_A = 25°C)



UPC2749T

TYPICAL SCATTERING PARAMETERS (TA = 25°C)

Vcc = 3.0 V, Icc = 6 mA

| FREQUENCY (GHz) | S11 | | S21 | | S12 | | S22 | | K ¹ | S21 (dB) |
|--------------------|-------|--------|------|--------|-------|-------|-------|--------|----------------|-------------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG | | |
| 0.10 | 0.049 | 1.9 | 4.67 | 1.3 | 0.001 | 150.9 | 0.009 | -169.1 | 106.8 | 13.4 |
| 0.20 | 0.046 | -23.9 | 4.85 | -8.2 | 0.001 | 152.4 | 0.024 | 107.5 | 102.8 | 13.7 |
| 0.30 | 0.044 | -55.1 | 4.95 | -16.8 | 0.001 | 153.8 | 0.041 | 91.0 | 100.6 | 13.9 |
| 0.40 | 0.043 | -89.7 | 4.97 | -23.0 | 0.001 | 155.1 | 0.058 | 80.0 | 100.1 | 13.9 |
| 0.50 | 0.046 | -132.7 | 4.99 | -29.4 | 0.002 | 156.4 | 0.074 | 72.2 | 49.7 | 14.0 |
| 0.60 | 0.055 | -164.0 | 5.01 | -35.3 | 0.003 | 155.8 | 0.089 | 64.3 | 32.9 | 14.0 |
| 0.70 | 0.071 | 171.8 | 5.06 | -41.0 | 0.004 | 155.9 | 0.105 | 56.5 | 24.3 | 14.1 |
| 0.80 | 0.094 | 153.8 | 5.19 | -47.4 | 0.005 | 154.4 | 0.120 | 48.4 | 18.8 | 14.3 |
| 0.90 | 0.115 | 137.5 | 5.29 | -54.0 | 0.006 | 152.4 | 0.138 | 39.7 | 15.3 | 14.5 |
| 1.00 | 0.138 | 127.5 | 5.51 | -59.9 | 0.008 | 149.0 | 0.149 | 29.3 | 10.9 | 14.8 |
| 1.10 | 0.165 | 118.1 | 5.72 | -67.2 | 0.011 | 145.4 | 0.160 | 20.2 | 7.6 | 15.1 |
| 1.20 | 0.199 | 107.8 | 5.94 | -75.2 | 0.013 | 140.8 | 0.170 | 10.1 | 6.1 | 15.5 |
| 1.30 | 0.233 | 98.2 | 6.14 | -84.2 | 0.016 | 135.5 | 0.178 | -1.3 | 4.7 | 15.8 |
| 1.40 | 0.265 | 89.0 | 6.33 | -93.4 | 0.019 | 128.9 | 0.181 | -13.8 | 3.8 | 16.0 |
| 1.50 | 0.298 | 80.0 | 6.46 | -103.3 | 0.021 | 123.0 | 0.179 | -27.5 | 3.3 | 16.2 |
| 1.60 | 0.323 | 70.7 | 6.48 | -113.7 | 0.024 | 116.1 | 0.171 | -41.4 | 2.8 | 16.2 |
| 1.70 | 0.352 | 61.7 | 6.38 | -124.3 | 0.025 | 107.8 | 0.158 | -53.7 | 2.7 | 16.1 |
| 1.80 | 0.367 | 53.0 | 6.25 | -133.9 | 0.027 | 105.5 | 0.141 | -76.2 | 2.5 | 15.9 |
| 1.90 | 0.377 | 45.2 | 6.10 | -144.3 | 0.028 | 101.6 | 0.123 | -95.1 | 2.5 | 15.7 |
| 2.00 | 0.379 | 37.2 | 5.86 | -153.7 | 0.031 | 96.7 | 0.110 | -112.2 | 2.4 | 15.4 |
| 2.10 | 0.371 | 30.8 | 5.47 | -163.9 | 0.032 | 91.3 | 0.094 | -138.4 | 2.5 | 14.8 |
| 2.20 | 0.363 | 26.0 | 5.18 | -172.1 | 0.032 | 87.1 | 0.094 | -165.2 | 2.7 | 14.3 |
| 2.30 | 0.357 | 22.1 | 4.81 | -179.8 | 0.033 | 83.2 | 0.094 | 168.2 | 2.8 | 13.6 |
| 2.40 | 0.350 | 19.0 | 4.49 | 173.0 | 0.033 | 80.6 | 0.104 | 145.0 | 3.0 | 13.0 |
| 2.50 | 0.340 | 16.1 | 4.17 | 166.1 | 0.033 | 78.6 | 0.118 | 126.5 | 3.2 | 12.4 |
| 2.60 | 0.331 | 14.4 | 3.92 | 160.0 | 0.033 | 77.3 | 0.136 | 112.6 | 3.5 | 11.9 |
| 2.70 | 0.321 | 12.3 | 3.64 | 153.7 | 0.033 | 76.2 | 0.155 | 99.5 | 3.7 | 11.2 |
| 2.80 | 0.311 | 11.8 | 3.44 | 148.7 | 0.034 | 74.8 | 0.174 | 91.5 | 3.8 | 10.7 |
| 2.90 | 0.301 | 10.8 | 3.19 | 142.9 | 0.035 | 74.5 | 0.193 | 81.5 | 4.0 | 10.1 |
| 3.00 | 0.290 | 10.2 | 3.03 | 138.1 | 0.036 | 73.2 | 0.210 | 75.3 | 4.1 | 9.6 |

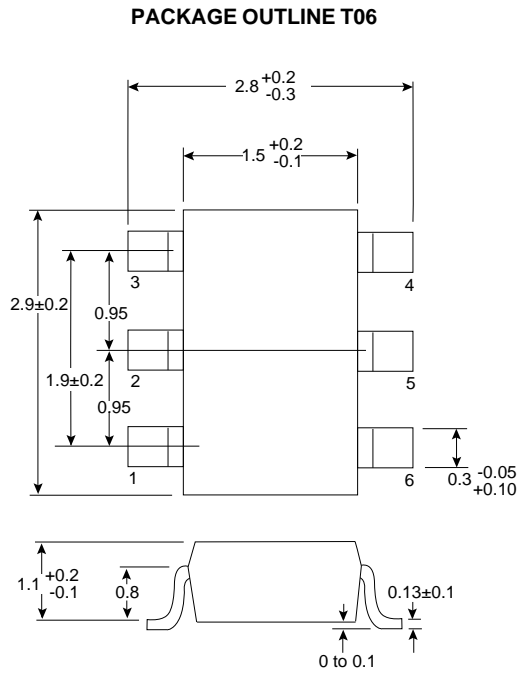
Note:

1. K Factor Calculation:

$$K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12} S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

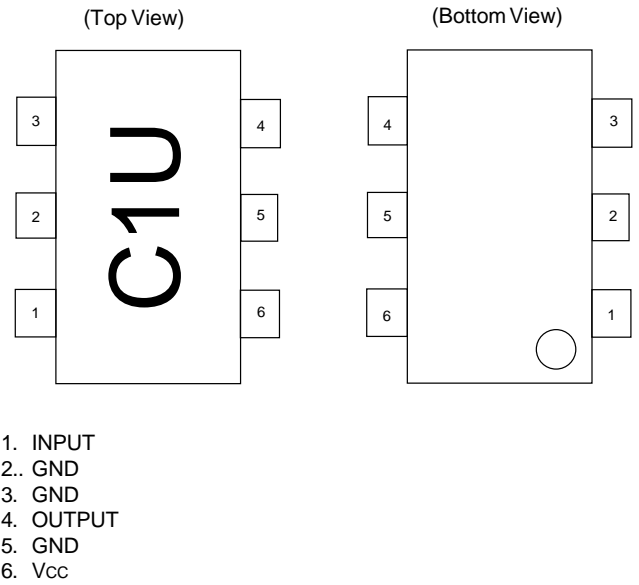
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OUTLINE DIMENSIONS (Units in mm)

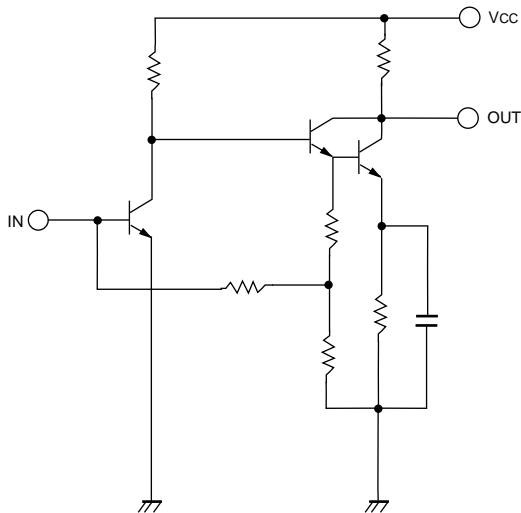


Note:
All dimensions are typical unless otherwise specified.

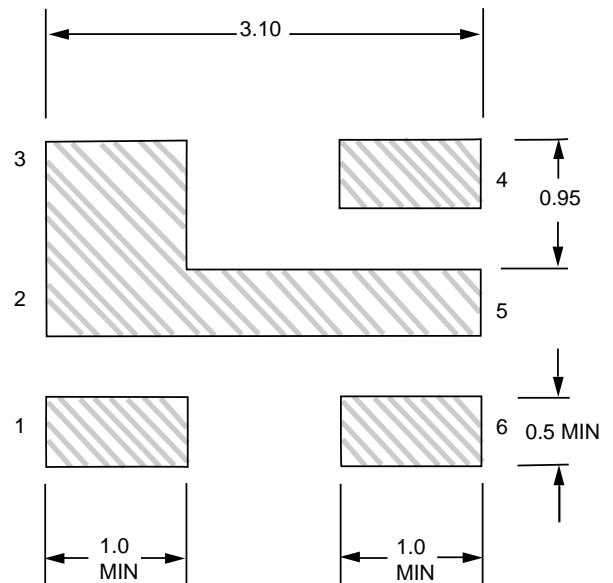
LEAD CONNECTIONS



EQUIVALENT CIRCUIT



RECOMMENDED P.C.B. LAYOUT (Units in mm)



ORDERING INFORMATION

| PART NUMBER | QTY |
|-------------|---------|
| UPC2749T-E3 | 3K/Reel |

Note:
Embossed Tape, 8 mm wide.