

FEATURES

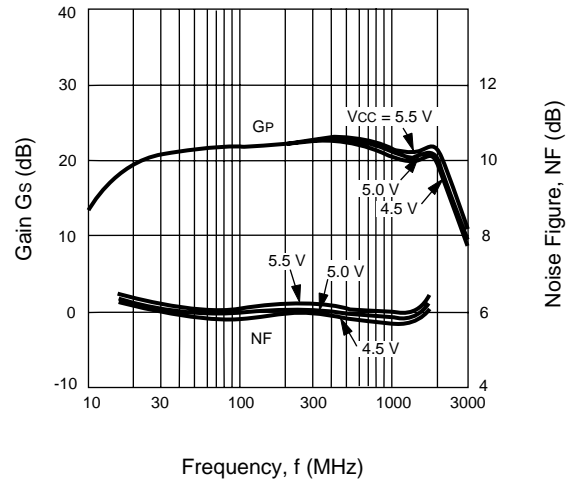
- **HIGH OUTPUT POWER:** +18 dBm PSAT
- **EXCELLENT FREQUENCY RESPONSE:**
2.0 GHz TYP at 3 dB Down
- **HIGH POWER GAIN:** 23 dB TYP at 500 MHz
- **SINGLE SUPPLY VOLTAGE:** 5 V
- **AVAILABLE IN TAPE AND REEL**

DESCRIPTION

The UPC1678 is a silicon monolithic integrated circuit designed as a wide-band amplifier covering the HF to UHF bands. The device features high output power, 18 dBm TYP, high gain, 23 dB TYP and operates from a single 5 volt supply.

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

**NOISE FIGURE AND GAIN
vs. FREQUENCY AND VOLTAGE**



ELECTRICAL CHARACTERISTICS (TA = 25°C, VCC = +5 V, f = 500 MHz, ZL = Zs = 50 Ω)

| PART NUMBER PACKAGE OUTLINE | | | UPC1678G G08 | | |
|--------------------------------|--|-------|-----------------|------|-----|
| SYMBOLS | PARAMETERS AND CONDITIONS | UNITS | MIN | TYP | MAX |
| I _{CC} | Circuit Current at No Input Signal | mA | 40 | 49 | 60 |
| G _s | Small Signal Gain | dB | 21 | 23 | 25 |
| f _{3dB} | Upper Limit Operating Frequency at 3 dB down below the Gain at 100 MHz | MHz | 1700 | 2000 | |
| PSAT | Saturated Output Power | dBm | 15.5 | 17.5 | |
| NF | Noise Figure | dB | | 6 | |
| RLIN | Input Return Loss | dB | 11 | 14 | |
| RLOUT | Output Return Loss | dB | 1 | 4 | |
| ISOL | Isolation | dB | 30 | 35 | |

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

| SYMBOLS | PARAMETERS | UNITS | RATINGS |
|------------------|--------------------------------------|-------|-------------|
| V _{CC} | Power Supply Voltage | V | -0.5 to 6.0 |
| P _{IN} | Input Power | dBm | +10 |
| P _T | Total Power Dissipation ² | mW | 330 |
| T _{OP} | Operating Temperature | °C | -45 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 50 x 50 x 1.6 mm glass epoxy PWB at T_A = +85°C.

RECOMMENDED OPERATING CONDITIONS

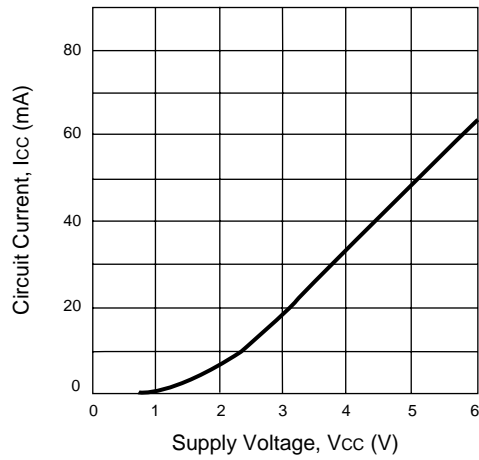
| SYMBOLS | CHARACTERISTICS | UNITS | MIN | TYP | MAX |
|-----------------|-----------------------|-------|-----|-----|-----|
| V _{CC} | Supply Voltage | V | 4.5 | 5.0 | 5.5 |
| T _{OP} | Operating Temperature | °C | -40 | +25 | +85 |

PIN DESCRIPTIONS

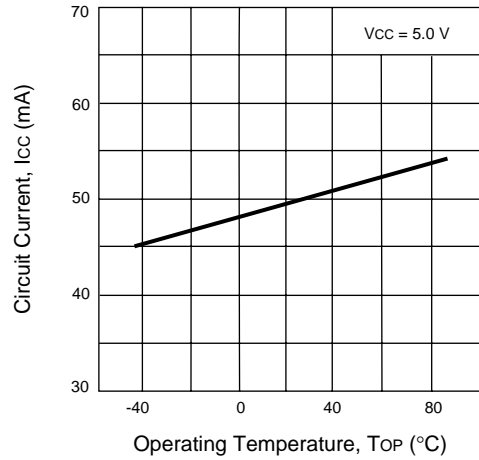
| Pin No. | Pin Name | Applied Voltage (V) | Description | Internal Equivalent Circuit |
|-----------------------|-----------------|---------------------|---|-----------------------------|
| 1 | Input | – | Signal input pin. An internal matching circuit, configured with resistors, enables 50 Ω connection over a wide bandwidth. A multi-feedback circuit is designed to cancel the deviations of h _{FE} and resistance. This pin must be coupled to the signal source with a blocking capacitor. | |
| 5 | Output | | Signal output pin. Connect an inductor between this pin and V _{CC} to supply current to the internal output transistors. | |
| 8 | V _{CC} | 4.5 to 5.5 | Power supply pin. This pin should be externally equipped with a bypass capacitor to minimize ground impedance. | |
| 2 3 4 6 7 | GND | 0 | Ground pins. These pins should be connected to system ground with minimum inductance. Ground pattern on the board should be formed as wide as possible. All the ground pins must be connected together with wide ground pattern to minimize impedance difference. | |

TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)

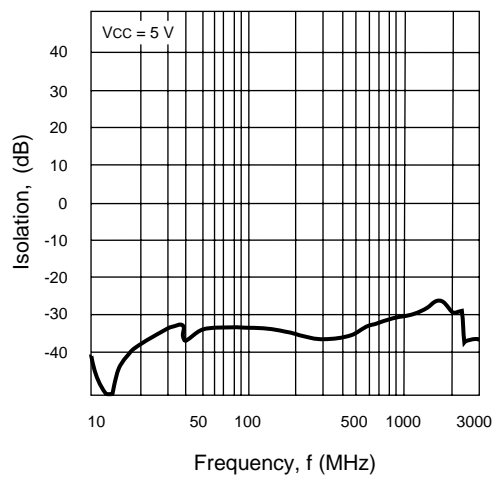
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



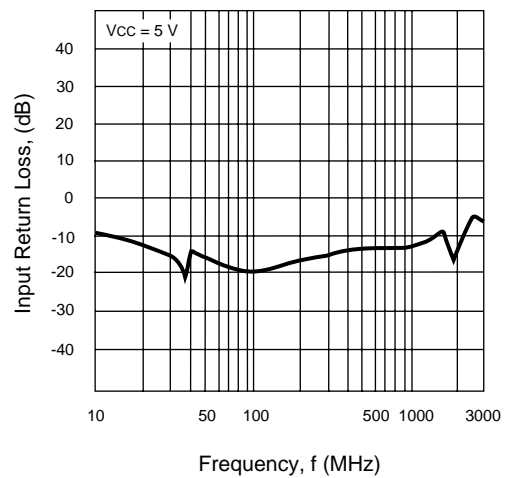
CIRCUIT CURRENT vs. OPERATING TEMPERATURE



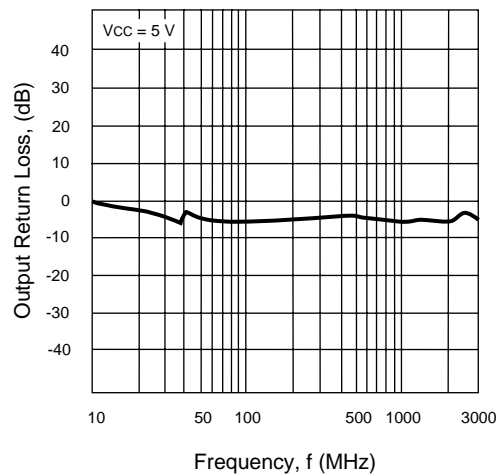
ISOLATION vs. FREQUENCY



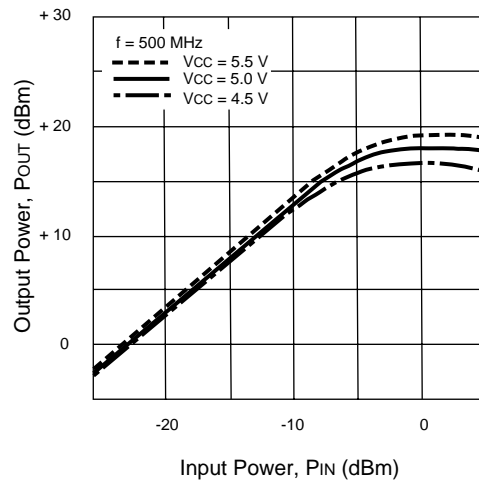
INPUT RETURN LOSS vs. FREQUENCY



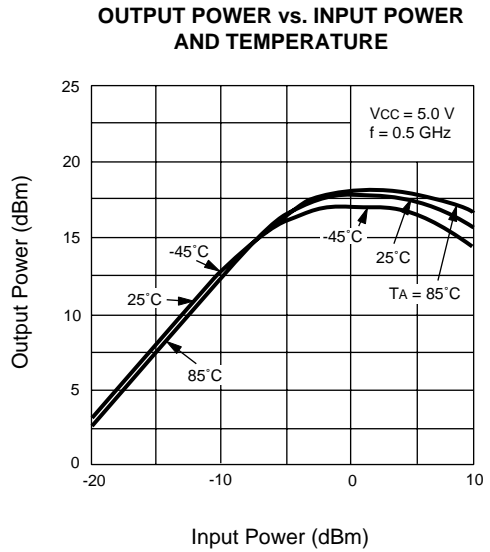
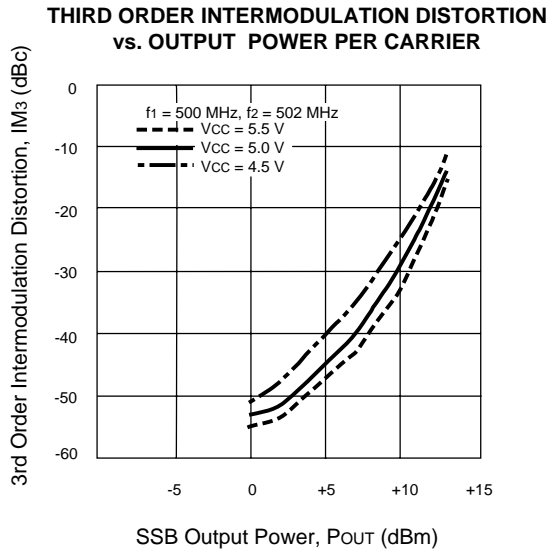
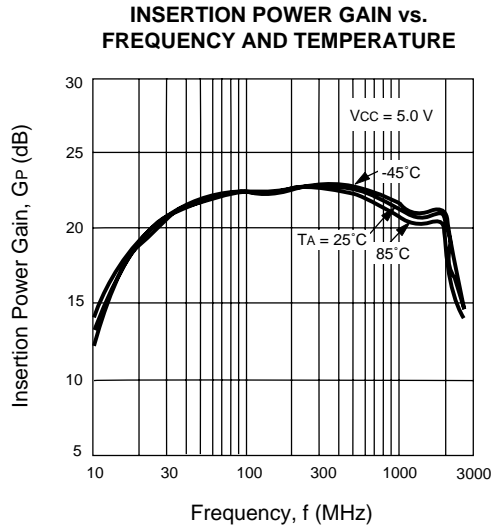
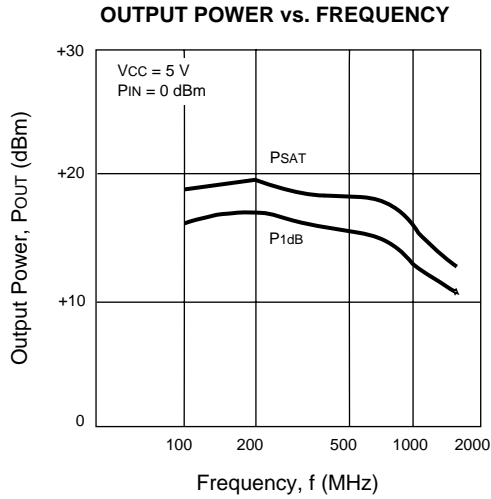
OUTPUT RETURN LOSS vs. FREQUENCY



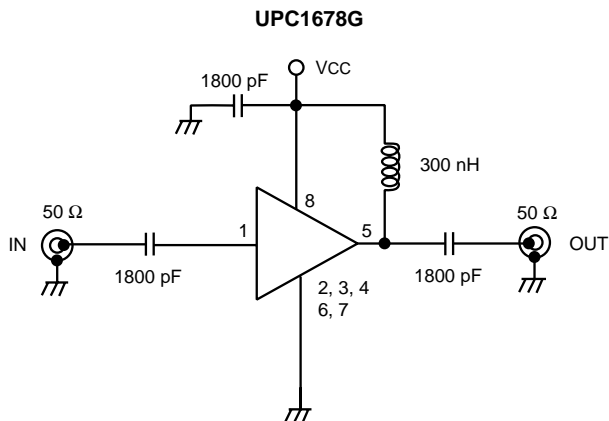
OUTPUT POWER vs. INPUT POWER



TYPICAL PERFORMANCE CURVES (TA = 25°C)



TEST CIRCUIT



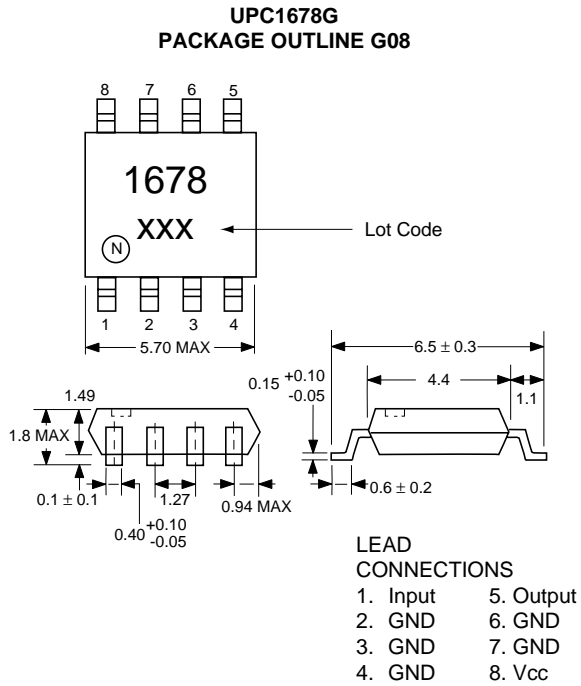
Precautions: 1) These devices are ESD sensitive. Use proper precautionary measures when handling and installing these devices.

TYPICAL SCATTERING PARAMETERS ($T_A = 25^\circ\text{C}$)**UPC1678G****V_{CC} = 5 V, I_{CC} = 51 mA**

| FREQUENCY (GHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | S ₂₁ (dB) |
|--------------------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|------|-------------------------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG | | |
| 0.05 | 0.193 | 143 | 9.9 | 31 | 0.018 | 26 | 0.746 | 91 | 1.45 | 23.5 |
| 0.10 | 0.126 | 151 | 12.6 | 6 | 0.020 | 10 | 0.610 | 44 | 1.43 | 24.1 |
| 0.20 | 0.138 | 136 | 13.6 | -23 | 0.018 | -13 | 0.618 | 6 | 1.47 | 24.8 |
| 0.40 | 0.208 | 88 | 14.4 | -70 | 0.015 | -7 | 0.691 | -44 | 1.35 | 26.4 |
| 0.60 | 0.248 | 43 | 14.0 | -111 | 0.022 | -19 | 0.681 | -85 | 0.97 | 28.1 |
| 0.80 | 0.256 | 2 | 13.1 | -152 | 0.028 | -38 | 0.635 | -121 | 0.89 | 26.7 |
| 1.00 | 0.239 | -35 | 12.5 | 170 | 0.034 | -57 | 0.610 | -155 | 0.83 | 25.6 |
| 1.20 | 0.190 | -72 | 11.9 | 129 | 0.038 | -87 | 0.646 | 167 | 0.77 | 24.9 |
| 1.40 | 0.152 | -115 | 11.9 | 92 | 0.044 | -109 | 0.634 | 136 | 0.75 | 24.4 |
| 1.60 | 0.093 | -173 | 11.4 | 53 | 0.045 | -136 | 0.669 | 98 | 0.73 | 24.0 |
| 1.80 | 0.042 | 81 | 10.0 | 8 | 0.043 | -169 | 0.697 | 53 | 0.80 | 23.6 |
| 2.00 | 0.167 | 37 | 9.1 | -30 | 0.041 | 171 | 0.626 | 9 | 0.98 | 23.4 |
| 2.20 | 0.214 | -7 | 7.4 | -70 | 0.034 | 145 | 0.579 | -35 | 1.46 | 19.4 |
| 2.40 | 0.256 | -38 | 6.1 | -107 | 0.031 | 122 | 0.523 | -77 | 1.99 | 17.2 |
| 2.50 | 0.292 | -53 | 5.5 | -127 | 0.028 | 116 | 0.469 | -98 | 2.49 | 16.1 |

UPC1678G

OUTLINE DIMENSIONS (Units in mm)



ORDERING INFORMATION

| PART NUMBER | QTY |
|-------------|-----------|
| UPC1678G-E1 | 2500/REEL |

Note: Embossed tape, 8 mm wide. Pin 1 is in tape pull-out direction.