

## 5V, SUPER MINIMOLD SI MMIC WIDEBAND AMPLIFIER

### FEATURES

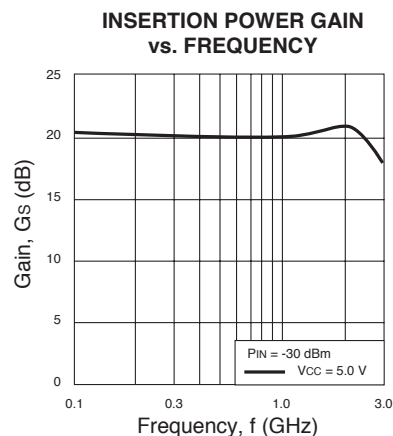
- **WIDEBAND RESPONSE:**  
 $f_u = 2.9$  GHz TYP at 3dB bandwidth
- **NOISE FIGURE:**  
NF = 2.3 dB TYP at  $f = 1.5$  GHz
- **POWER GAIN:**  
GP = 20.5 dB TYP at  $f = 1.5$  GHz
- **SUPPLY VOLTAGE:**  
 $V_{CC} = 4.5$  to  $5.5$  V
- **HIGH DENSITY SURFACE MOUNTING:**  
6-pin super mini-mold package

### DESCRIPTION

The UPC3215TB is a Silicon Monolithic IC designed as a wideband amplifier. The UPC3215TB is suitable for systems requiring wideband operation from HF to L band.

This IC is manufactured using a 30 GHz  $f_{max}$  UHS0 (Ultra High Speed Process) silicon bipolar process. The package is 6-pin super minimold suitable for surface mount.

The UPC3215TB is manufactured according to stringent quality assurance standards to ensure highest reliability and consistent superior performance.



### APPLICATIONS

- Systems requiring wideband operation from HF to L band.
- DBS receivers and tuners

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , $V_{CC} = 5.0$ V, $Z_S = Z_L = 50 \Omega$ )

| PART NUMBER<br>PACKAGE OUTLINE |                                                                                           |       | UPC3215TB<br>S06 |      |      |
|--------------------------------|-------------------------------------------------------------------------------------------|-------|------------------|------|------|
| SYMBOLS                        | PARAMETERS AND CONDITIONS                                                                 | UNITS | MIN              | TYP  | MAX  |
| $I_{CC}$                       | Circuit Current (no signal)                                                               | mA    | 10.5             | 14.0 | 17.5 |
| GP                             | Power Gain, $f = 1.5$ GHz, $P_{IN} = -30$ dBm                                             | dB    | 18.5             | 20.5 | -    |
| NF                             | Noise Figure, $f = 1.5$ GHz                                                               | dB    | -                | 2.3  | 3.0  |
| $f_u$                          | Upper Limit Operating Frequency (The gain at $f_u$ is 3 dB down from the gain at 100 MHz) | GHz   | 2.5              | 2.9  | -    |
| ISOL                           | Isolation, $f = 1.5$ GHz                                                                  | dB    | 39               | 44   | -    |
| RLIN                           | Input Return Loss, $f = 1.5$ GHz                                                          | dB    | 10               | 15   | -    |
| RLOUT                          | Output Return Loss, $f = 1.5$ GHz                                                         | dB    | 6.5              | 9.5  | -    |
| $P_{1dB}$                      | 1 dB Compression Point, $f = 1.5$ GHz                                                     | dBm   | -4               | -1.5 | -    |

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , $V_{CC} = 5.0$ V, $Z_S = Z_L = 50 \Omega$ )

| PART NUMBER<br>PACKAGE OUTLINE |                                                           |     | UPC3215TB<br>S06 |  |
|--------------------------------|-----------------------------------------------------------|-----|------------------|--|
| SYMBOLS                        | STANDARD CHARACTERISTICS                                  |     | REFERENCE VALUES |  |
| $P_{SAT}$                      | Saturated Output Power, $P_{IN} = 0$ dBm                  | dBm | +3.5             |  |
| OIP3                           | Output Intercept Point $f_1 = 1.5$ GHz, $f_2 = 1.501$ GHz | dBm | +10              |  |
| $\Delta GP$                    | Gain Flatness, $f = 0.1$ to $2.15$ GHz                    | dB  | 1.0              |  |

ABSOLUTE MAXIMUM RATINGS<sup>1</sup> (T<sub>A</sub> = 25°C)

| SYMBOLS          | PARAMETERS                           | UNITS | RATINGS     |
|------------------|--------------------------------------|-------|-------------|
| V <sub>CC</sub>  | Supply Voltage                       | V     | 6.0         |
| I <sub>CC</sub>  | Total Supply Current                 | mA    | 30          |
| P <sub>IN</sub>  | Input Power                          | dBm   | +10         |
| P <sub>T</sub>   | Total Power Dissipation <sup>2</sup> | mW    | 270         |
| T <sub>OP</sub>  | Operating Temperature                | °C    | -40 to +85  |
| T <sub>STG</sub> | Storage Temperature                  | °C    | -55 to +150 |

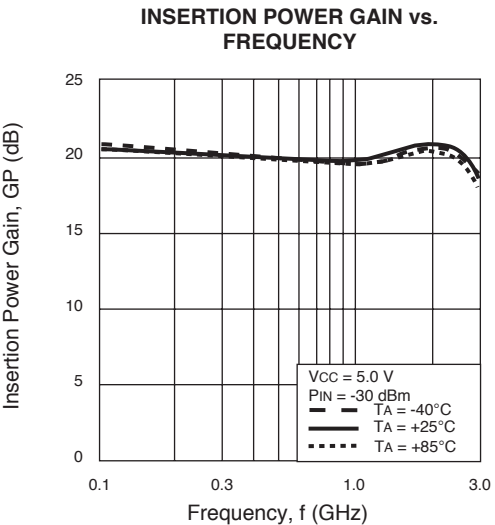
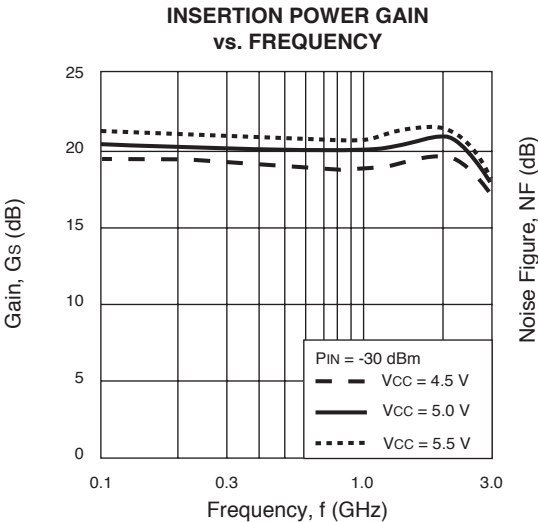
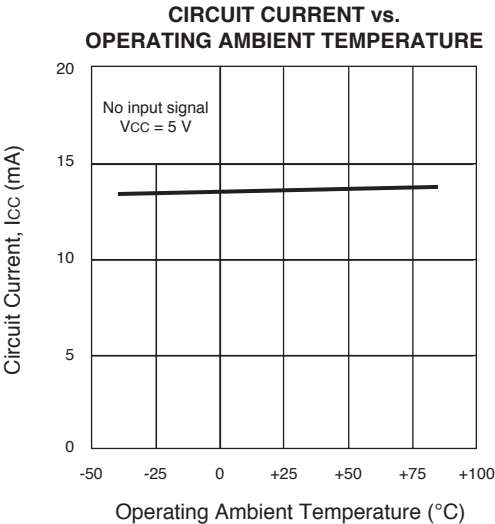
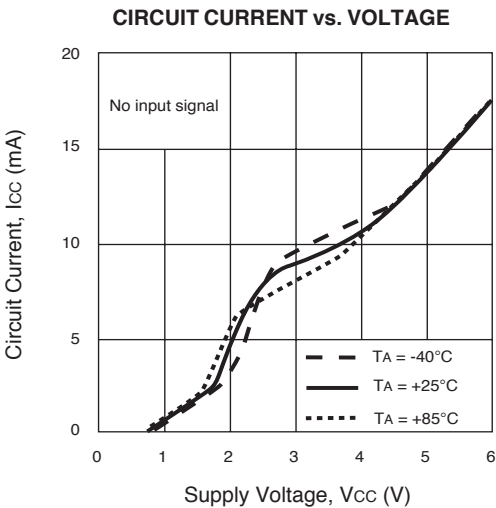
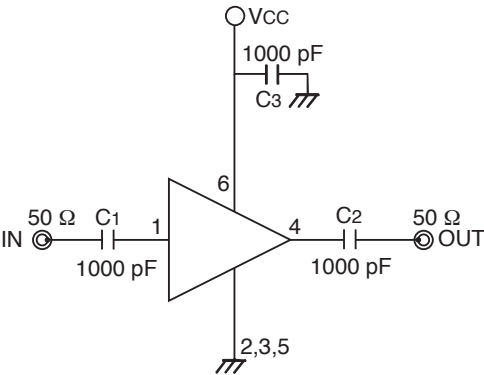
- Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.
  2. Mounted on a 50 X 50 X 1.6 mm epoxy glass PWB, with copper patterning on both sides. (T<sub>A</sub> = 85°C).

RECOMMENDED  
OPERATING CONDITIONS

| SYMBOLS         | PARAMETERS                    | UNITS | MIN | TYP | MAX |
|-----------------|-------------------------------|-------|-----|-----|-----|
| V <sub>CC</sub> | Supply Voltage                | V     | 4.5 | 5.0 | 5.5 |
| T <sub>A</sub>  | Operating Ambient Temperature | °C    | -40 | +25 | +85 |
| P <sub>IN</sub> | Input Power                   | dBm   |     |     | 0   |
| f <sub>IN</sub> | Input Frequency               | GHz   |     |     | 2.9 |

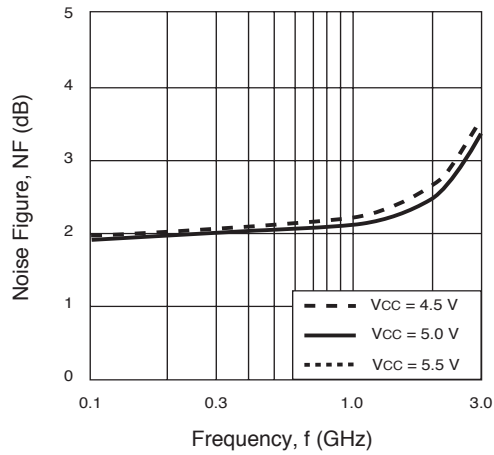
TYPICAL PERFORMANCE CURVES (T<sub>A</sub> = 25°C)

TEST CIRCUIT

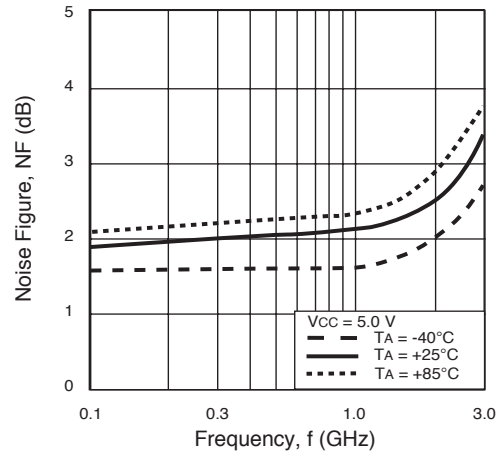


# TYPICAL PERFORMANCE CURVES (T<sub>A</sub> = 25°)

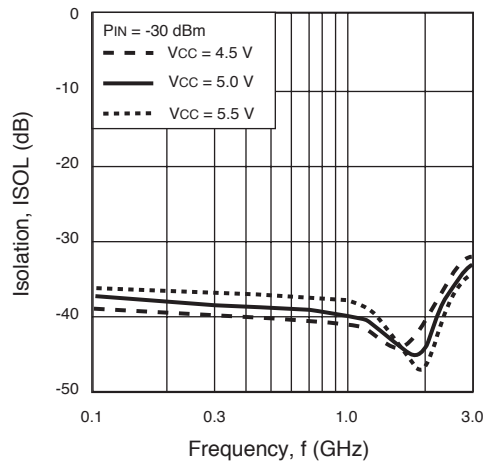
## NOISE FIGURE vs. FREQUENCY



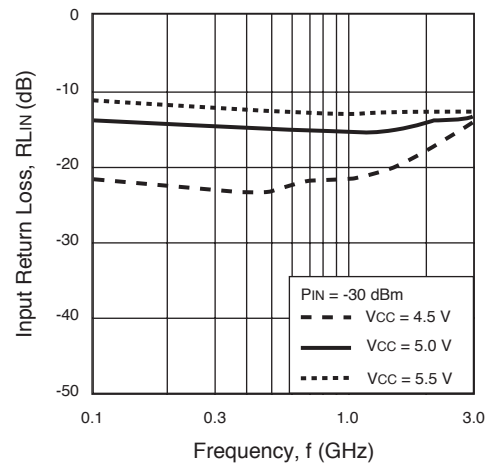
## NOISE FIGURE vs. FREQUENCY



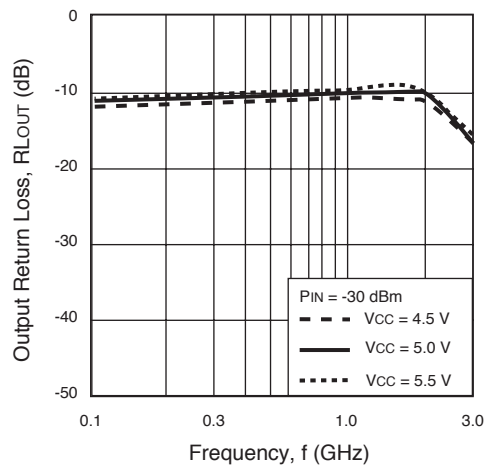
## ISOLATION vs. FREQUENCY



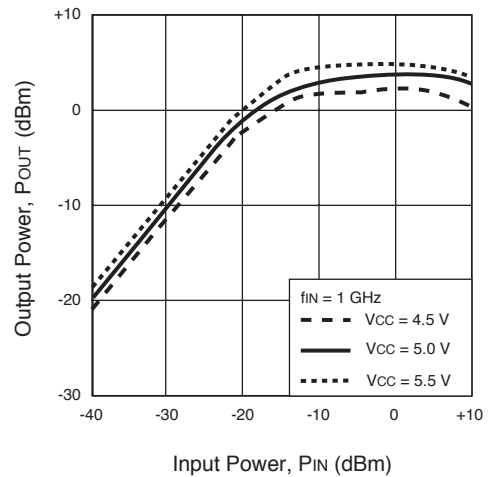
## INPUT RETURN LOSS vs. FREQUENCY

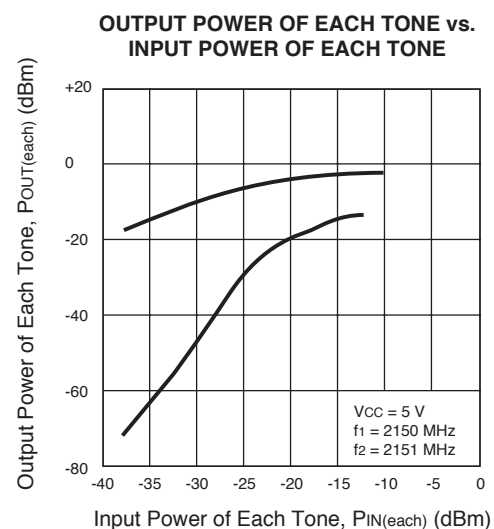
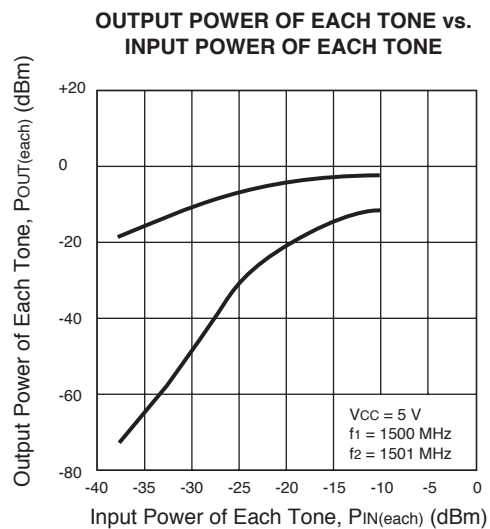
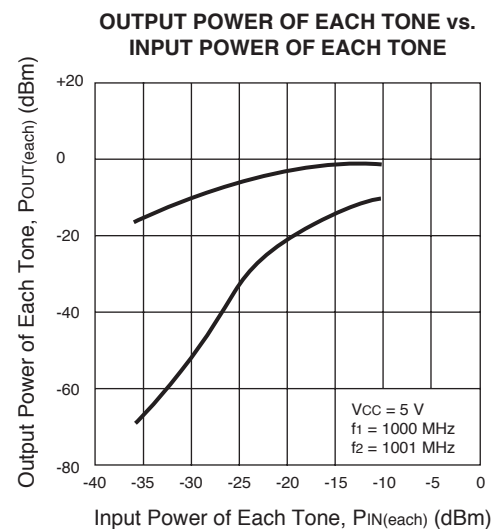
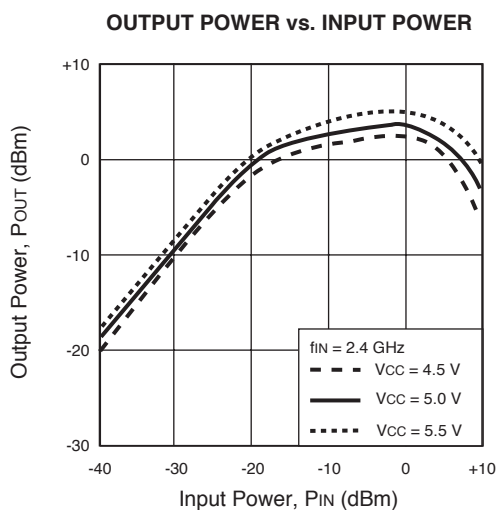
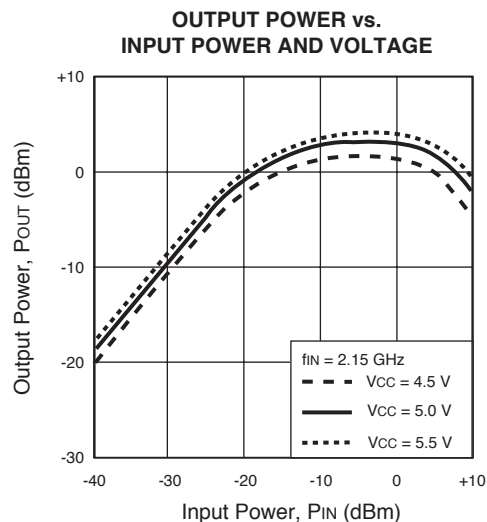
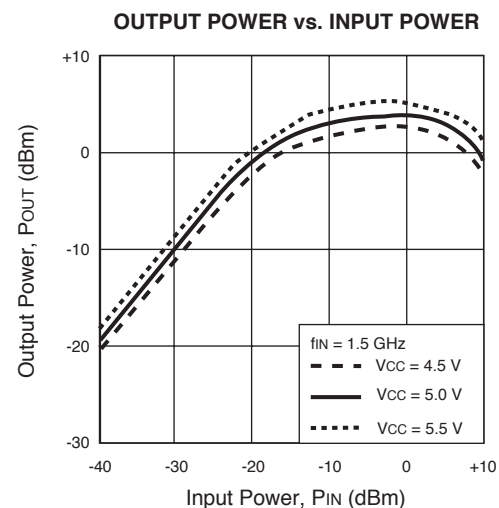


## OUTPUT RETURN LOSS vs. FREQUENCY

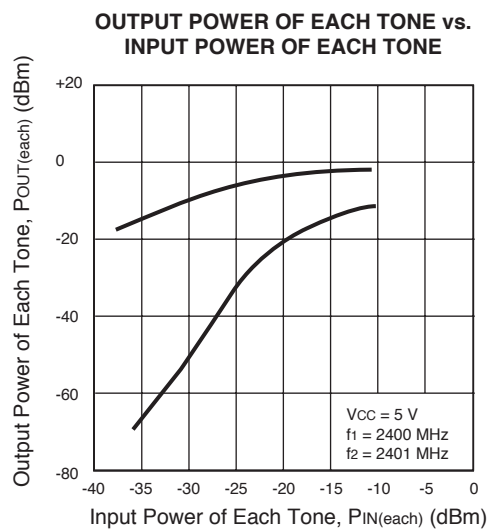


## OUTPUT POWER vs. INPUT POWER

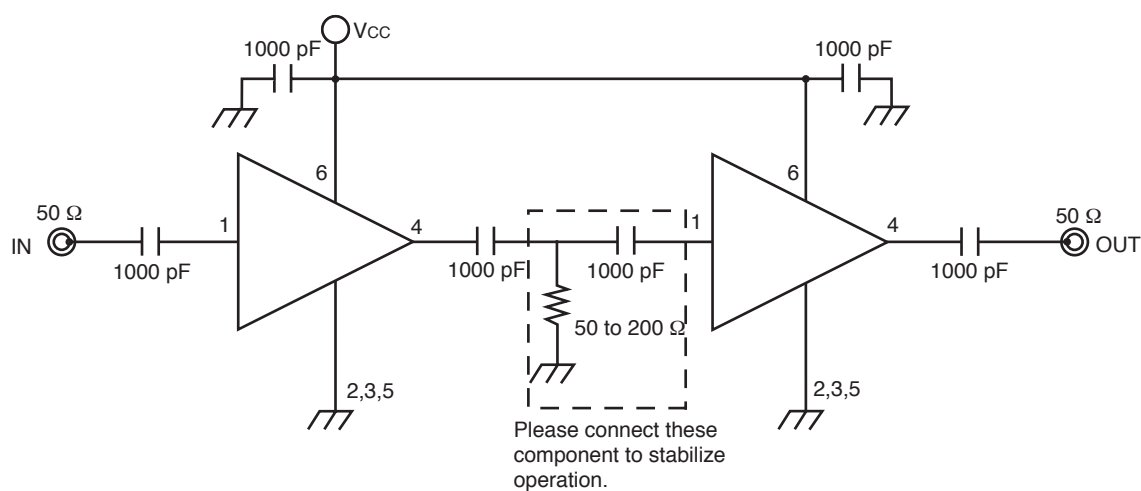


TYPICAL PERFORMANCE CURVES ( $T_A = 25^\circ$ )

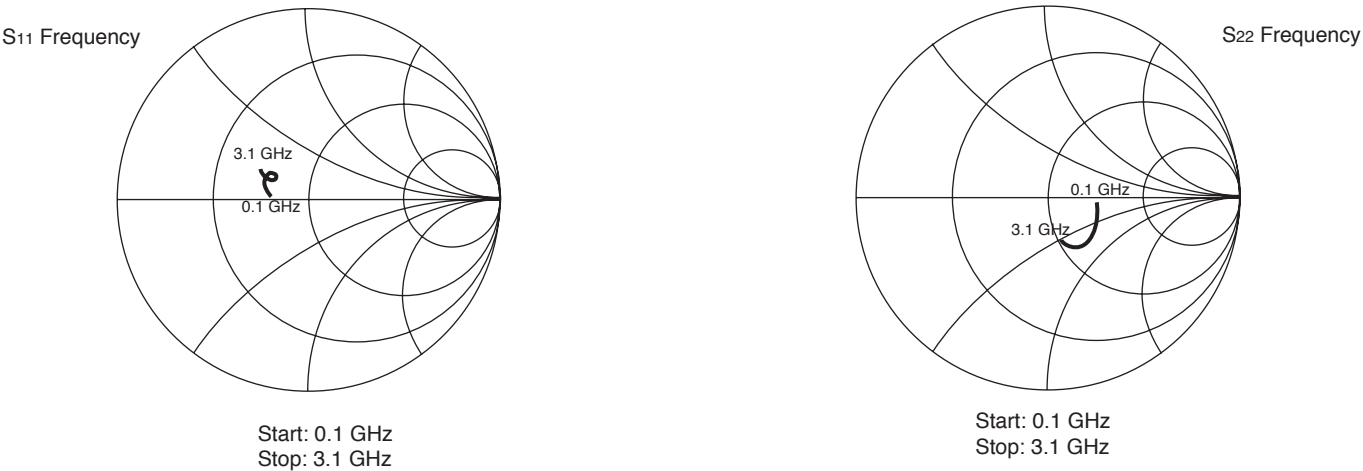
## TYPICAL PERFORMANCE CURVES ( $T_A = 25^\circ$ )



## EXAMPLE OF APPLICATION CIRCUIT



TYPICAL SCATTERING PARAMETERS (TA = 25°C)

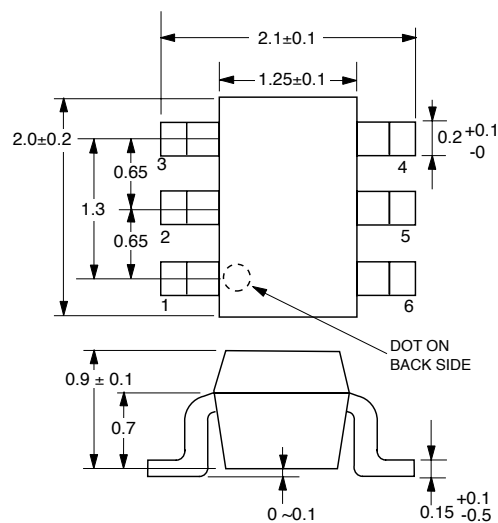


VCC = VOUT = 5.0 V, ICC = 16 mA

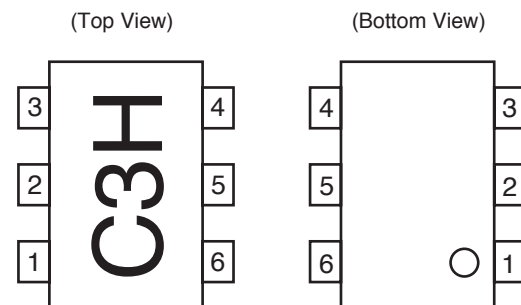
| FREQUENCY<br>GHz | S11   |       | S21    |        | S12   |       | S22   |       | K     |
|------------------|-------|-------|--------|--------|-------|-------|-------|-------|-------|
|                  | MAG   | ANG   | MAG    | ANG    | MAG   | ANG   | MAG   | ANG   |       |
| 0.1              | 0.207 | 174.1 | 10.788 | -4.6   | 0.013 | 6.3   | 0.285 | -3.3  | 3.38  |
| 0.2              | 0.190 | 173.1 | 10.714 | -9.8   | 0.013 | -0.5  | 0.282 | -3.7  | 3.39  |
| 0.3              | 0.186 | 174.3 | 10.565 | -14.3  | 0.013 | 2.7   | 0.283 | -4.6  | 3.37  |
| 0.4              | 0.192 | 173.8 | 10.359 | -18.3  | 0.014 | 4.7   | 0.285 | -6.2  | 3.92  |
| 0.5              | 0.200 | 174.5 | 10.225 | -21.7  | 0.013 | 5.3   | 0.286 | -7.6  | 3.96  |
| 0.6              | 0.201 | 173.0 | 10.116 | -24.9  | 0.013 | 2.1   | 0.286 | -8.8  | 3.69  |
| 0.7              | 0.204 | 173.0 | 10.116 | -28.0  | 0.011 | 1.6   | 0.288 | -10.4 | 3.91  |
| 0.8              | 0.206 | 172.4 | 10.122 | -31.1  | 0.011 | 12.9  | 0.289 | -11.7 | 4.17  |
| 0.9              | 0.210 | 172.7 | 10.186 | -34.5  | 0.011 | 5.1   | 0.290 | -13.5 | 3.99  |
| 1.0              | 0.212 | 171.4 | 10.182 | -37.7  | 0.009 | 4.1   | 0.285 | -14.9 | 4.28  |
| 1.1              | 0.218 | 169.4 | 10.208 | -14.6  | 0.011 | 4.9   | 0.299 | -16.8 | 4.19  |
| 1.2              | 0.217 | 168.4 | 10.296 | -45.6  | 0.009 | 11.0  | 0.300 | -18.0 | 4.65  |
| 1.3              | 0.221 | 165.9 | 10.248 | -49.7  | 0.006 | 20.5  | 0.299 | -20.2 | 5.78  |
| 1.4              | 0.228 | 164.7 | 10.438 | -53.9  | 0.008 | 1.6   | 0.307 | -23.1 | 6.97  |
| 1.5              | 0.233 | 162.3 | 10.369 | -58.0  | 0.006 | 20.5  | 0.299 | -16.8 | 4.19  |
| 1.6              | 0.238 | 159.5 | 10.554 | -62.7  | 0.005 | 31.6  | 0.316 | -27.5 | 11.54 |
| 1.7              | 0.244 | 157.2 | 10.492 | -67.2  | 0.004 | 48.5  | 0.317 | -30.5 | 11.75 |
| 1.8              | 0.246 | 153.9 | 10.483 | -72.2  | 0.003 | 87.2  | 0.318 | -33.3 | 13.52 |
| 1.9              | 0.248 | 150.6 | 10.408 | -76.9  | 0.004 | 93.4  | 0.323 | -36.9 | 8.46  |
| 2.0              | 0.246 | 147.4 | 10.405 | -82.2  | 0.007 | 114.5 | 0.323 | -40.6 | 7.46  |
| 2.1              | 0.241 | 144.9 | 10.267 | -87.2  | 0.008 | 115.4 | 0.319 | -44.9 | 6.20  |
| 2.2              | 0.236 | 142.2 | 10.039 | -92.7  | 0.011 | 124.0 | 0.312 | -48.9 | 4.50  |
| 2.3              | 0.229 | 142.2 | 9.896  | -97.7  | 0.012 | 121.6 | 0.306 | -52.6 | 4.12  |
| 2.4              | 0.219 | 143.5 | 9.684  | -102.4 | 0.014 | 124.9 | 0.292 | -56.3 | 3.40  |
| 2.5              | 0.215 | 145.7 | -9.348 | -107.5 | 0.015 | 117.8 | 0.279 | -59.3 | 3.42  |
| 2.6              | 0.213 | 149.3 | 9.068  | -112.0 | 0.018 | 117.3 | 0.270 | -61.7 | 3.02  |
| 2.7              | 0.221 | 150.1 | 8.673  | -116.6 | 0.017 | 114.4 | 0.256 | -63.7 | 3.17  |
| 2.8              | 0.234 | 151.3 | 8.437  | -121.1 | 0.020 | 114.0 | 0.248 | -65.1 | 2.85  |
| 2.9              | 0.253 | 152.1 | 8.080  | -124.9 | 0.021 | 111.6 | 0.237 | -67.3 | 2.98  |
| 3.0              | 0.264 | 150.7 | 7.791  | -129.4 | 0.020 | 112.5 | 0.232 | -68.0 | 2.90  |
| 3.1              | 0.283 | 148.7 | 7.458  | -132.7 | 0.022 | 113.7 | 0.229 | -70.2 | 3.02  |

## OUTLINE DIMENSIONS (Units in mm)

UPC3215TB  
PACKAGE OUTLINE S06



## LEAD CONNECTIONS



1. INPUT
2. GND
3. GND
4. OUTPUT
5. GND
6. VCC

## PIN DESCRIPTION

| Pin No.     | Pin Name (V) | Applied Voltage | Pin Voltage | Description<br>Circuit                                                                                                                                                                                                                                                                         | Internal Equivalent |
|-------------|--------------|-----------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1           | Input        | —               | 0.82        | Signal input pin. An internal matching circuit, configured with resistors, enables 50 $\Omega$ connection over a wide band. 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 capacitor for DC cut. |                     |
| 2<br>3<br>5 | 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 decrease impedance difference.                              |                     |
| 4           | Output       | —               | 3.8         | Signal output pin. An internal matching circuit, configured with resistors, enables 50 $\Omega$ connection over a wide band. This pin must be coupled to next stage with capacitor for DC cut.                                                                                                 |                     |
| 6           | VCC          | 4.5 to 5.5      | —           | Power supply pin. This pin should be externally equipped with a bypass capacitor to minimize ground impedance.                                                                                                                                                                                 |                     |

## ORDERING INFORMATION

| PART NUMBER    | QTY     |
|----------------|---------|
| UPC3215TB-E3-A | 3K/Reel |

Note: Embossed Tape, 8 mm wide. Pins 1, 2 and 3 face perforated side of tape.

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