



# BIPOLAR ANALOG INTEGRATED CIRCUITS

# UPC2711TB, UPC2712TB

## 5 V, SUPER MINIMOLD SILICON MMIC WIDEBAND AMPLIFIER

### FEATURES

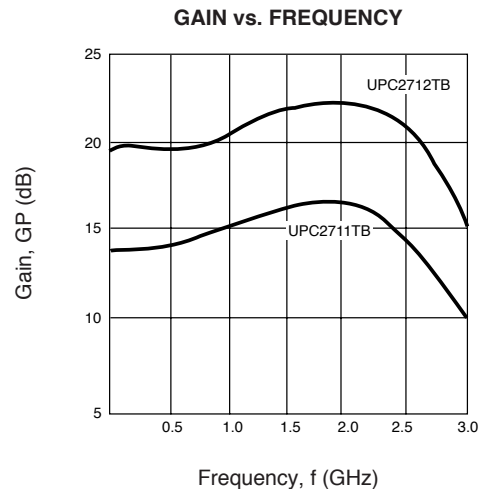
- **HIGH DENSITY SURFACE MOUNTING:**  
6 pin super minimold or SOT-363 package
- **SUPPLY VOLTAGE:**  $V_{CC} = 4.5$  to  $5.5$  V
- **WIDEBAND RESPONSE:**  
UPC2711TB:  $f_u = 2.9$  GHz TYP  
UPC2712TB:  $f_u = 2.6$  GHz TYP
- **POWER GAIN:**  
UPC2711TB:  $G_P = 13$  dB TYP  
UPC2712TB:  $G_P = 20$  dB TYP

### DESCRIPTION

The UPC2711TB and UPC2712TB are Silicon MMIC Wideband Amplifiers manufactured using NEC's 20 GHz  $f_T$  NESAT™ III silicon bipolar process. These devices are designed for use as buffer amps in DBS tuners. The UPC2711/12TB are pin compatible and have comparable performance as the larger UPC2711/12T, so they are suitable for use as a replacement to help reduce system size. These IC's are housed in a 6 pin super minimold or SOT-363 package.

Stringent quality assurance and test procedure ensure the highest reliability and performance.

### TYPICAL PERFORMANCE CURVES



### ELECTRICAL CHARACTERISTICS ( $T_A = +25$ °C, $V_{CC} = 5.0$ V, $Z_L = Z_s = 50$ W)

PART NUMBER PACKAGE OUTLINE			UPC2711TB S06			UPC2712TB S06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
$I_{CC}$	Circuit Current (no signal)	mA	9	12	15	9	12	15
$G_P$	Power Gain, $f = 1$ GHz	dB	11	13	16.5	18	20	23.5
$f_u$	Upper Limit Operating Frequency (The gain at $f_u$ is 3 dB down from the gain at 100 MHz)	GHz	2.7	2.9		2.2	2.6	
$\Delta G_P$	Gain Flatness, $f = 0.1$ GHz to 2.5 GHz	dB		$\pm 0.8$			$\pm 0.8$	
$P_{O(SAT)}$	Maximum Output Level, $f = 1$ GHz, $P_{IN} = 0$ dBm	dBm	-2	+1		0	+3	
NF	Noise Figure, $f = 1$ GHz	dB		5	6.5		4.5	6
$RL_{IN}$	Input Return Loss, $f = 1$ GHz	dB	20	25		9	12	
$RL_{OUT}$	Output Return Loss, $f = 1$ GHz	dB	9	12		10	13	
ISOL	Isolation, $f = 1$ GHz	dB	25	30		28	33	

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>CC</sub>	Supply Voltage	V	6
P <sub>IN</sub>	Input Power	dBm	+10
P <sub>T</sub>	Total Power Dissipation <sup>2</sup>	mW	200
T <sub>OP</sub>	Operating Temperature	°C	-45 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 double sided copper clad 50 x 50 x 1.6 mm epoxy glass PWB (T<sub>A</sub> = +85°C).

**RECOMMENDED OPERATING CONDITIONS**

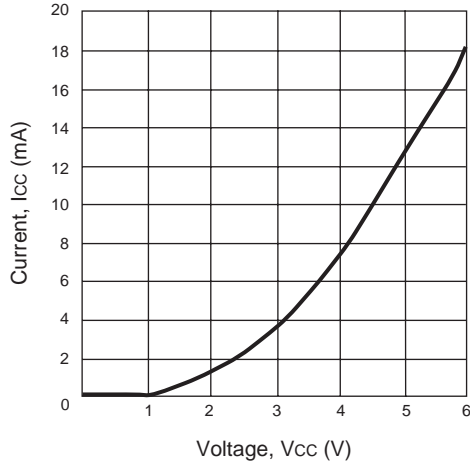
SYMBOL	PARAMETER	UNITS	MIN	TYP	MAX
V <sub>CC</sub>	Supply Voltage	V	4.5	5.0	5.5
T <sub>OP</sub>	Operating Temperature	°C	-40	+25	+85

**PIN DESCRIPTION**

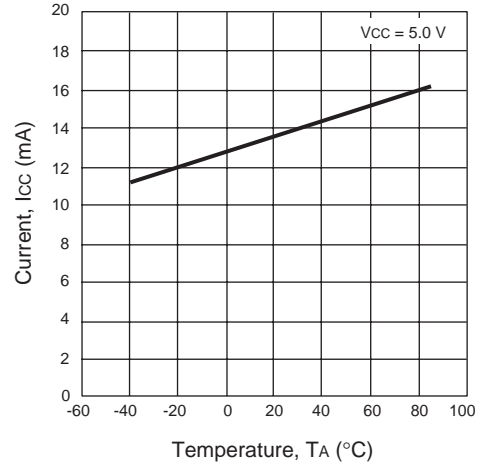
Pin No.	Pin Name	Applied Voltage (V)	Description	Internal Equivalent Circuit
1	Input		Signal input pin. An internal matching circuit, configured with resistors, enables 50 Ω connection over a wide bandwidth. A multi-feedback circuit is designed to cancel the deviations of h <sub>FE</sub> and resistance. This pin must be coupled to the signal source with a blocking capacitor.	
4	Output		Signal output pin. An internal matching circuit, configured with resistors, enables 50 Ω connection over a wide bandwidth. This pin must be coupled to the output load with a blocking capacitor.	
6	V <sub>CC</sub>	4.5 to 5.5	Power supply pin. This pin should be externally equipped with a bypass capacitor to minimize ground impedance.	
2 3 5	GND	0	Ground pin. This pin 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 (TA = 25°C)

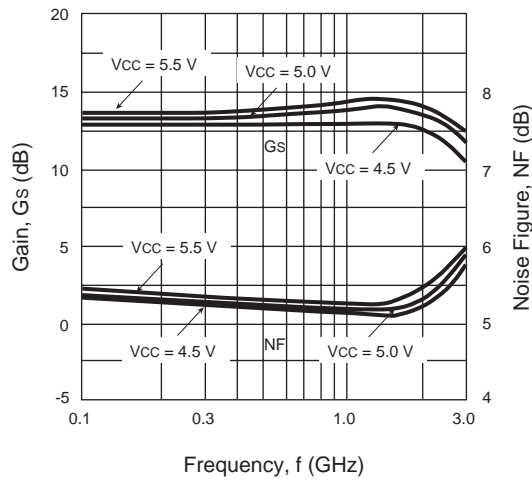
UPC2711TB  
CURRENT vs. VOLTAGE



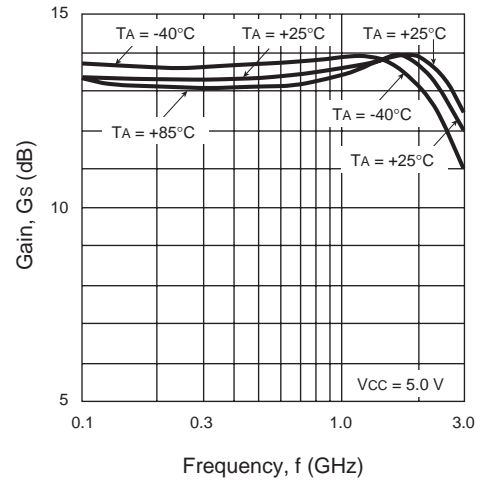
UPC2711TB  
CURRENT vs. TEMPERATURE



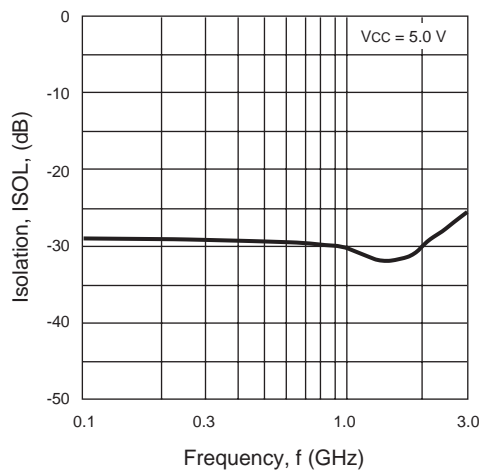
UPC2711TB  
GAIN AND NOISE FIGURE vs.  
FREQUENCY AND VOLTAGE



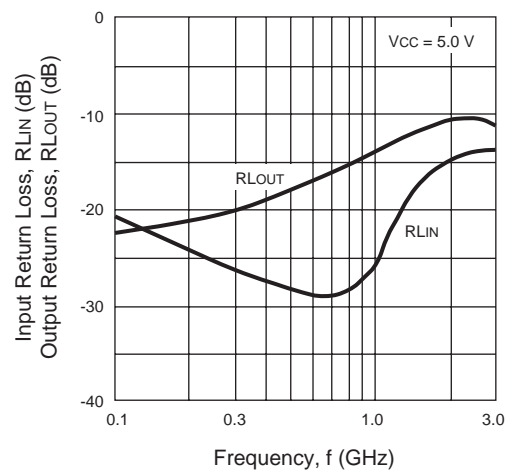
UPC2711TB  
GAIN vs. FREQUENCY AND  
TEMPERATURE



UPC2711TB  
ISOLATION vs. FREQUENCY

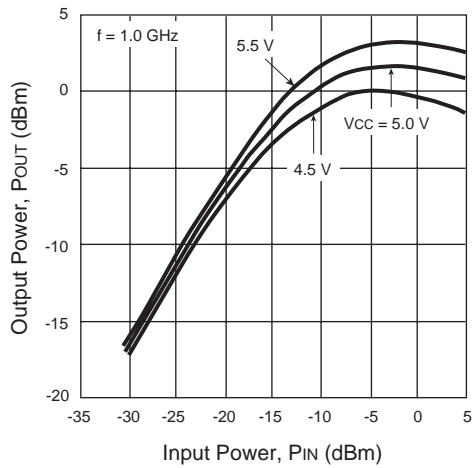


UPC2711TB  
INPUT RETURN LOSS AND  
OUTPUT RETURN LOSS vs. FREQUENCY

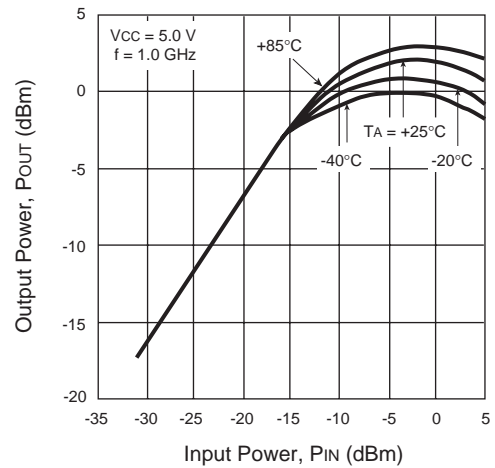


**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )

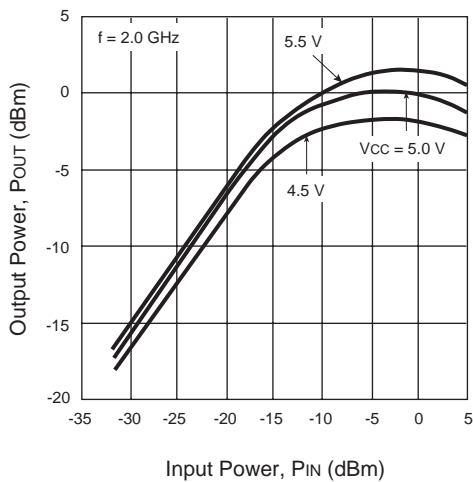
**UPC2711TB**  
**OUTPUT POWER vs.**  
**INPUT POWER VOLTAGE**



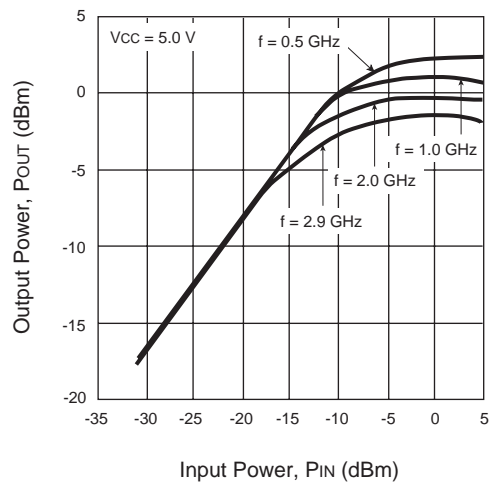
**UPC2711TB**  
**OUTPUT POWER vs.**  
**INPUT POWER AND TEMPERATURE**



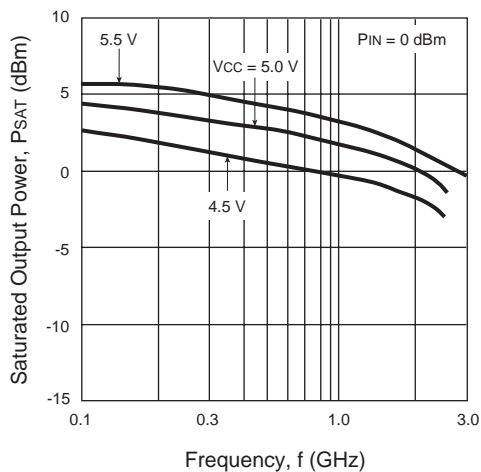
**UPC2711TB**  
**OUTPUT POWER vs.**  
**INPUT POWER AND VOLTAGE**



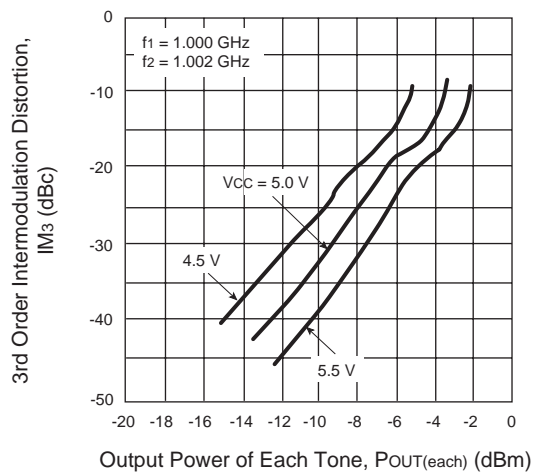
**UPC2711TB**  
**OUTPUT POWER vs.**  
**INPUT POWER AND FREQUENCY**



**UPC2711TB**  
**SATURATED OUTPUT POWER vs.**  
**FREQUENCY AND VOLTAGE**

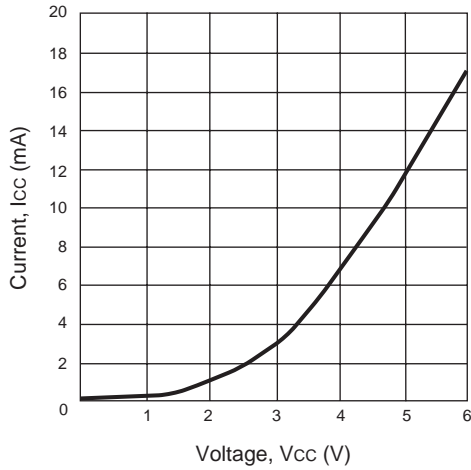


**UPC2711TB**  
**3RD ORDER INTERMODULATION**  
**DISTORTION vs. OUTPUT POWER**  
**AND VOLTAGE**

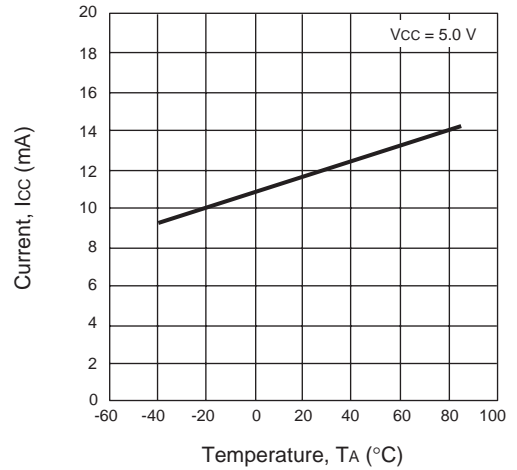


TYPICAL PERFORMANCE CURVES (TA = 25°C)

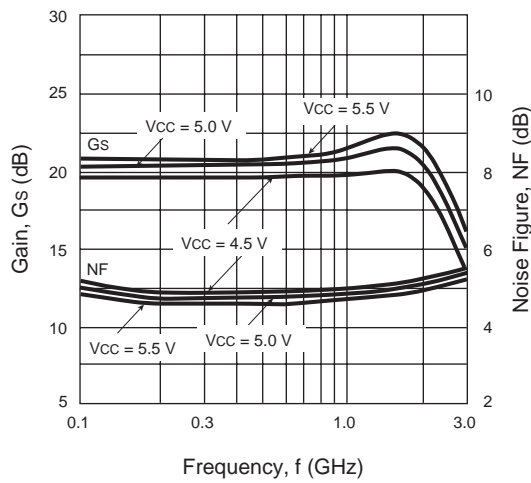
UPC2712TB  
CURRENT vs. VOLTAGE



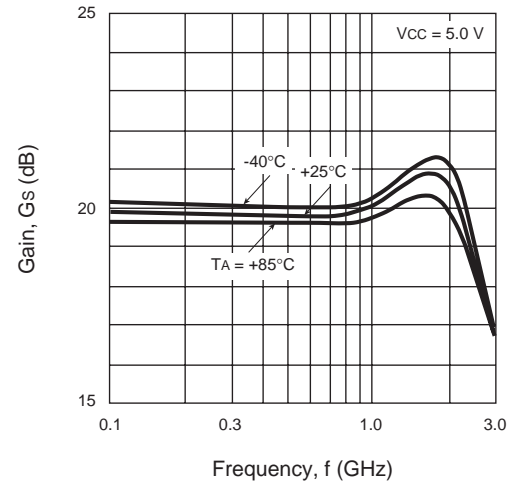
UPC2712TB  
CURRENT vs. TEMPERATURE



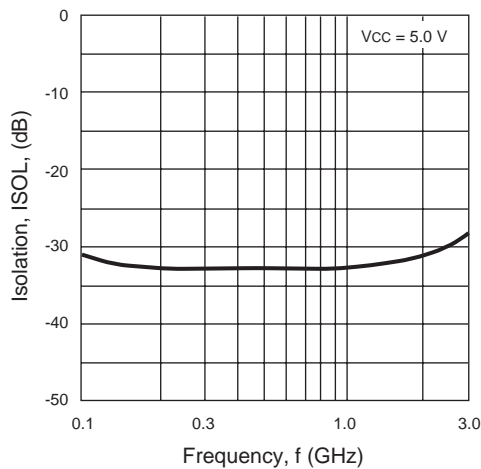
UPC2712TB  
GAIN AND NOISE FIGURE vs.  
FREQUENCY AND VOLTAGE



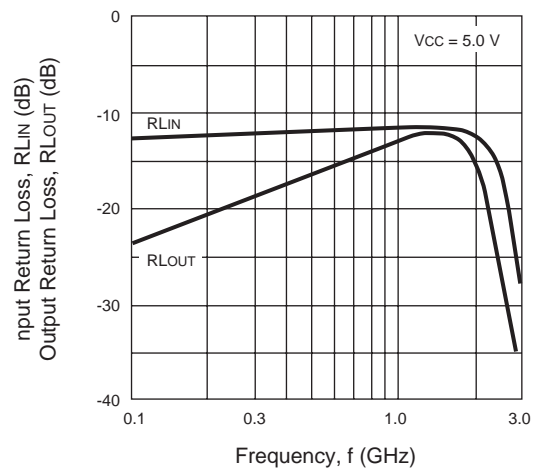
UPC2712TB  
GAIN vs.  
FREQUENCY AND TEMPERATURE



UPC2712TB  
ISOLATION vs. FREQUENCY

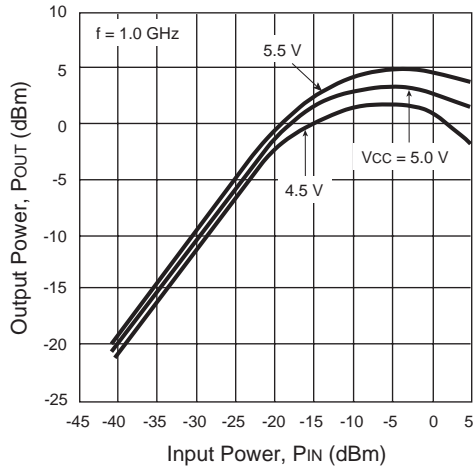


UPC2712TB  
INPUT RETURN LOSS AND OUTPUT  
RETURN LOSS vs. FREQUENCY

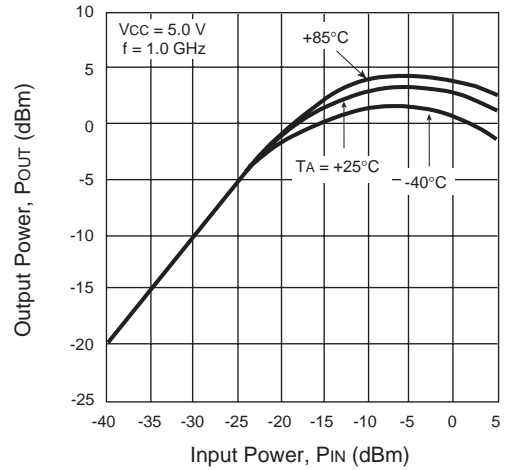


TYPICAL PERFORMANCE CURVES (TA = 25°C)

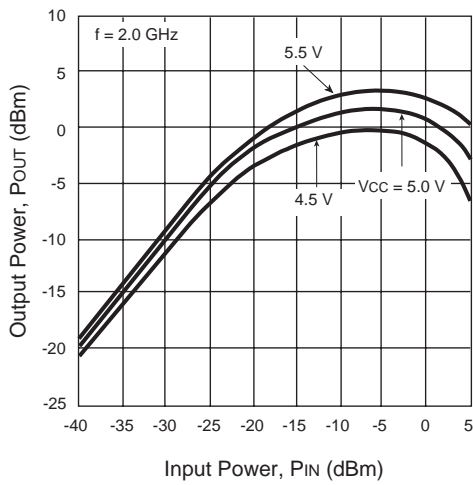
UPC2712TB  
OUTPUT POWER vs.  
INPUT POWER VOLTAGE



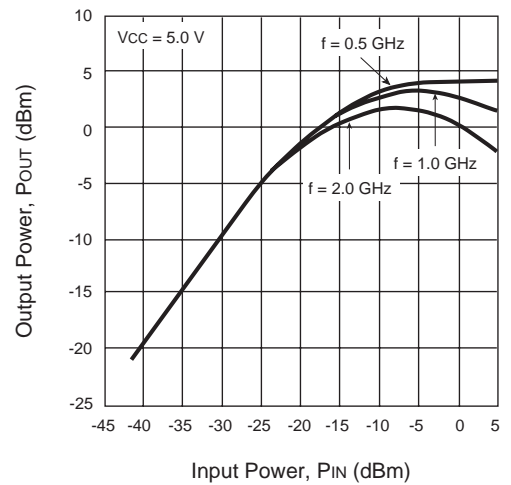
UPC2712TB  
OUTPUT POWER vs.  
INPUT POWER AND TEMPERATURE



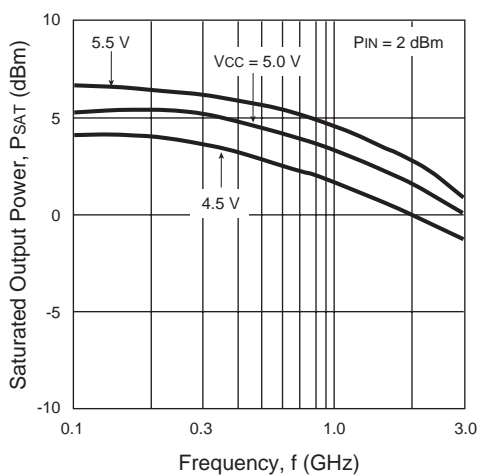
UPC2712TB  
OUTPUT POWER vs.  
INPUT POWER AND VOLTAGE



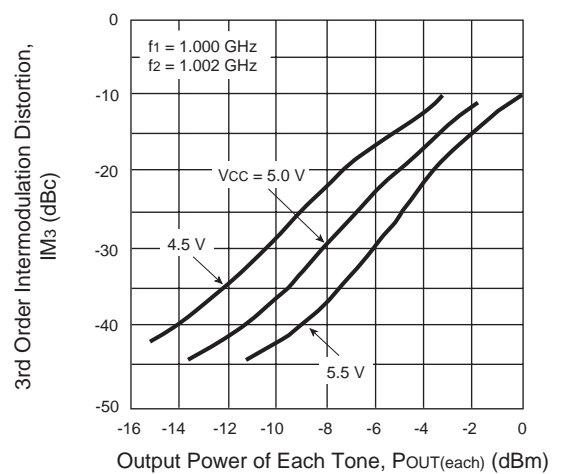
UPC2712TB  
OUTPUT POWER vs.  
INPUT POWER AND FREQUENCY



UPC2712TB  
SATURATED OUTPUT POWER vs.  
FREQUENCY AND VOLTAGE



UPC2712TB  
3RD ORDER INTERMODULATION  
DISTORTION vs. OUTPUT POWER  
AND VOLTAGE



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

**UPC2711TB**

V<sub>CC</sub> = 5 V, I<sub>CC</sub> = 13.8 mA

FREQUENCY (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	0.085	-22.40	4.447	-14.90	0.035	-12.70	0.113	-3.10	3.18
200.00	0.086	-25.00	4.468	-30.10	0.035	-23.00	0.119	1.20	3.21
300.00	0.098	-29.20	4.491	-44.90	0.034	-32.10	0.136	1.60	3.23
400.00	0.081	-29.40	4.510	-60.30	0.033	-42.50	0.142	6.50	3.34
500.00	0.066	-33.90	4.540	-74.90	0.033	-50.10	0.156	10.10	3.32
600.00	0.041	-54.50	4.572	-90.20	0.033	-59.60	0.161	12.70	3.34
700.00	0.053	-104.30	4.624	-105.30	0.032	-69.30	0.161	8.80	3.33
800.00	0.070	-119.70	4.664	-120.70	0.031	-78.40	0.176	6.20	3.36
900.00	0.098	-121.90	4.729	-136.10	0.032	-86.60	0.192	1.90	3.27
1000.00	0.101	-112.50	4.781	-152.00	0.031	-94.90	0.228	0.10	3.29
1100.00	0.090	-108.50	4.843	-167.90	0.031	-103.90	0.256	-0.60	3.15
1200.00	0.060	-95.60	4.945	175.80	0.029	-111.00	0.290	-1.10	3.24
1300.00	0.019	-79.20	4.999	159.50	0.029	-120.20	0.308	-0.30	3.16
1400.00	0.023	54.80	5.062	143.00	0.028	-128.90	0.322	-1.40	3.18
1500.00	0.062	80.70	5.114	126.40	0.029	-133.10	0.327	-2.20	3.08
1600.00	0.087	80.40	5.142	109.50	0.029	-140.90	0.333	-4.80	3.07
1700.00	0.113	78.70	5.160	92.70	0.029	-146.20	0.344	-7.00	3.02
1800.00	0.126	72.00	5.146	75.40	0.030	-151.40	0.356	-9.70	2.88
1900.00	0.154	63.50	5.123	58.00	0.032	-159.70	0.371	-11.10	2.70
2000.00	0.178	59.00	5.113	41.30	0.035	-168.30	0.378	-12.00	2.51
2100.00	0.212	54.20	5.063	24.00	0.036	-175.70	0.383	-12.80	2.39
2200.00	0.232	55.20	5.006	6.90	0.038	175.20	0.378	-13.60	2.27
2300.00	0.246	53.80	4.954	-10.40	0.041	165.20	0.367	-16.10	2.13
2400.00	0.248	53.60	4.865	-27.70	0.045	155.30	0.359	-18.00	1.99
2500.00	0.240	49.20	4.783	-45.00	0.048	143.60	0.356	-21.10	1.88
2600.00	0.238	43.70	4.664	-62.30	0.049	131.20	0.359	-23.60	1.85
2700.00	0.240	36.20	4.529	-79.60	0.052	119.80	0.366	-26.20	1.76
2800.00	0.262	31.70	4.384	-96.60	0.054	108.70	0.374	-28.60	1.72
2900.00	0.285	28.80	4.255	-113.10	0.056	95.50	0.372	-31.10	1.68
3000.00	0.316	29.70	4.117	-129.60	0.057	83.60	0.361	-35.00	1.69

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

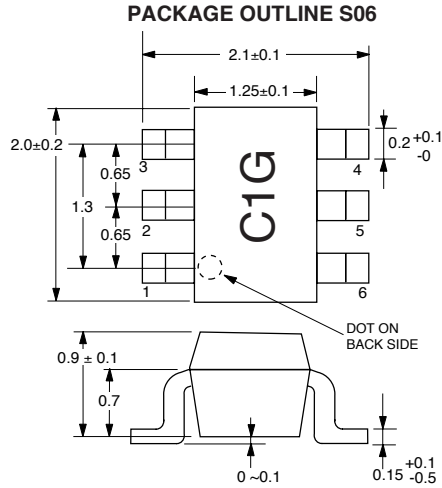
**UPC2712TB**

V<sub>CC</sub> = 5 V, I<sub>CC</sub> = 13.9 mA

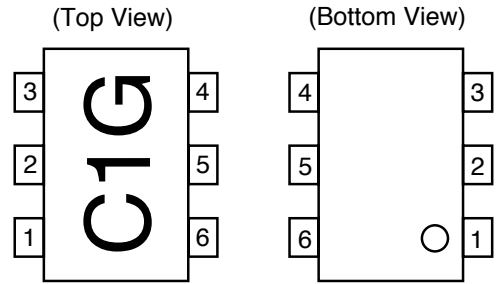
FREQUENCY (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	0.303	-8.10	8.864	-16.70	0.023	-11.40	0.043	2.30	2.32
200.00	0.291	-10.10	8.827	-33.50	0.023	-19.20	0.055	11.50	2.35
300.00	0.295	-11.80	8.936	-49.50	0.022	-25.50	0.078	8.50	2.38
400.00	0.276	-11.30	9.044	-67.60	0.023	-34.60	0.095	13.40	2.33
500.00	0.265	-11.00	9.051	-82.20	0.023	-42.80	0.112	13.60	2.37
600.00	0.243	-12.30	9.096	-98.80	0.023	-50.00	0.120	11.10	2.35
700.00	0.222	-20.30	9.089	-115.20	0.023	-59.80	0.120	1.70	2.37
800.00	0.219	-25.40	9.080	-131.50	0.023	-66.20	0.136	-6.00	2.38
900.00	0.230	-33.90	9.096	-147.60	0.023	-73.00	0.155	-14.40	2.39
1000.00	0.267	-35.50	9.044	-164.20	0.024	-82.90	0.189	-17.50	2.26
1100.00	0.290	-35.50	9.197	179.50	0.024	-89.50	0.212	-19.90	2.12
1200.00	0.316	-33.20	9.421	162.40	0.024	-98.40	0.240	-21.40	2.02
1300.00	0.317	-30.60	9.524	144.90	0.024	-107.00	0.245	-23.20	1.94
1400.00	0.314	-29.40	9.512	126.60	0.026	-115.70	0.248	-27.10	1.82
1500.00	0.296	-28.10	9.574	109.10	0.026	-122.30	0.236	-31.80	1.78
1600.00	0.290	-29.40	9.598	91.10	0.027	-133.20	0.231	-38.00	1.74
1700.00	0.278	-31.10	9.480	72.90	0.028	-139.40	0.221	-43.80	1.72
1800.00	0.282	-34.90	9.372	54.30	0.029	-148.10	0.215	-49.80	1.69
1900.00	0.284	-35.50	9.193	35.60	0.030	-157.60	0.199	-53.00	1.70
2000.00	0.280	-36.60	9.198	18.40	0.031	-167.40	0.170	-55.30	1.69
2100.00	0.273	-36.00	9.011	0.10	0.033	-175.10	0.134	-56.20	1.68
2200.00	0.244	-38.20	8.784	-17.90	0.033	176.50	0.090	-55.20	1.74
2300.00	0.222	-40.00	8.717	-35.10	0.034	164.80	0.050	-53.70	1.74
2400.00	0.189	-45.70	8.388	-52.90	0.036	154.80	0.025	1.80	1.75
2500.00	0.177	-52.90	8.217	-70.10	0.037	143.50	0.039	33.40	1.74
2600.00	0.164	-57.40	7.890	-87.40	0.039	133.30	0.071	39.30	1.72
2700.00	0.158	-59.60	7.597	-104.60	0.041	123.80	0.099	34.30	1.70
2800.00	0.143	-53.90	7.313	-121.40	0.041	114.00	0.131	26.00	1.72
2900.00	0.128	-44.30	7.078	-138.40	0.043	101.40	0.149	22.80	1.70
3000.00	0.111	-22.20	6.086	-154.90	0.046	90.20	0.157	19.40	1.70



**OUTLINE DIMENSIONS** (Units in mm)



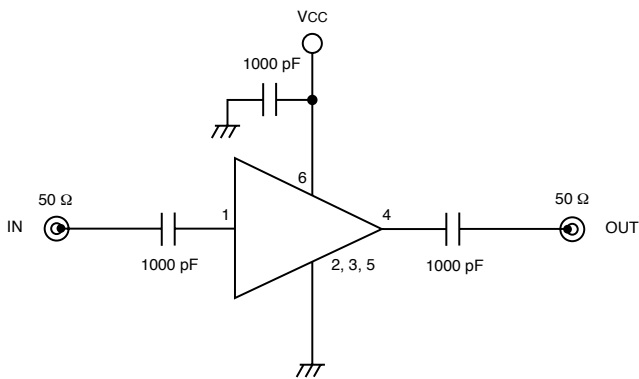
**PIN CONNECTIONS**



Marking is an example of UPC2711TB

- 1. Input    4. Output
- 2. GND    5. GND
- 3. GND    6. Vcc

**TEST CIRCUIT**



**ORDERING INFORMATION (Solder Contains Lead)**

PART NUMBER	MARKING	QTY
UPC2711TB-E3	C1G	3K/reel
UPC2712TB-E3	C1H	3K/reel

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

**ORDERING INFORMATION (Pb-Free)**

PART NUMBER	MARKING	QTY
UPC2711TB-E3-A	C1G	3K/reel
UPC2712TB-E3-A	C1H	3K/reel

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