



# 5 V, SUPER MINIMOLD WIDEBAND SI RFIC AMPLIFIER

## UPC2708TB

### FEATURES

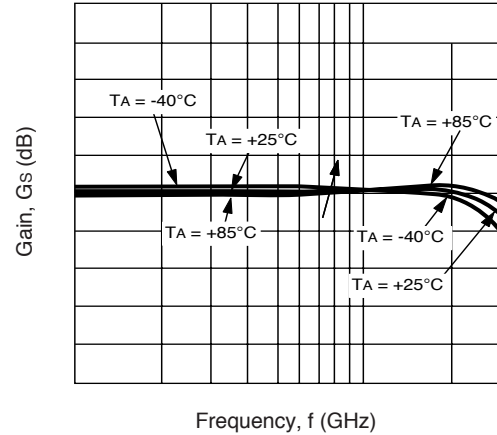
- **HIGH DENSITY SURFACE MOUNTING:**  
6 pin super minimold or SOT-363 package
- **HIGH GAIN:** 15 dB TYP
- **SATURATED OUTPUT POWER:** +10 dBm
- **WIDEBAND RESPONSE:**  $f_u = 2.9$  GHz TYP
- **SUPPLY VOLTAGE:**  $V_{CC} = 4.5$  to  $5.5$  V

### DESCRIPTION

NEC's UPC2708TB is a Silicon RFIC manufactured using the NESAT III process. This device is suitable as buffer amplifier for DBS, PCS and other communication receivers. The UPC2708TB is pin compatible and has comparable performance as the larger UPC2708T, so it is suitable for use as a replacement to help reduce system size. The IC is housed in a 6 pin super minimold or SOT-363 package.

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

**GAIN vs.  
FREQUENCY and TEMPERATURE**



### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , $f = 1$ GHz, $V_{CC} = 5$ V)

PART NUMBER PACKAGE OUTLINE			UPC2708TB S06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
$I_{CC}$	Circuit Current (no signal)	mA	20	26	33
$G_s$	Small Signal Gain	dB	13	15	18.5
$f_u$	Upper Limit Operating Frequency (The gain at $f_u$ is 3 dB down from the gain at 0.1 GHz)	GHz	2.7	2.9	
$\Delta G_s$	Gain Flatness, $f = 0.1 - 2.6$ GHz	dB		$\pm 0.8$	
$P_{SAT}$	Saturated Output Power	dBm	+7.5	+10	
$P_{1dB}$	Output Power at 1 dB Compression Point	dBm		+7.5	
NF	Noise Figure	dB		6.5	8
RLIN	Input Return Loss	dB	8	11	
RLOUT	Output Return Loss	dB	16	20	
ISOL	Isolation	dB	18	23	
$\Delta G_T$	Gain-Temperature Coefficient	dB/ $^\circ\text{C}$		+0.002	
$R_{TH}$	Thermal Resistance (Junction to Ambient)	$^\circ\text{C}/\text{W}$			325

**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>	Power Dissipation <sup>2</sup>	mW	200
T <sub>OP</sub>	Operating Temperature	°C	-40 to +85
T <sub>STG</sub>	Storage Temperature	°C	-55 to +150

Notes:

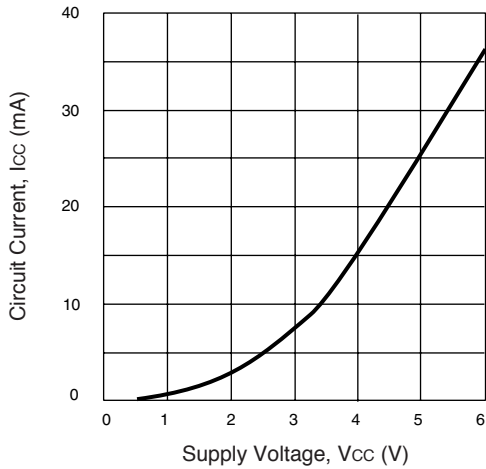
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on 50 x 50 x 1.6 mm epoxy glass PWB (T<sub>A</sub> = +85°C).

**RECOMMENDED OPERATING CONDITIONS**

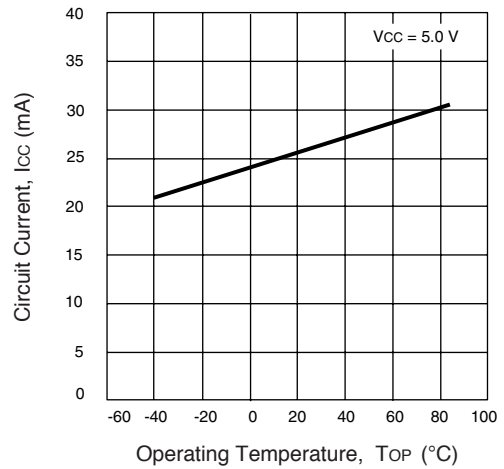
SYMBOL	PARAMETER	UNITS	MIN	TYP	MAX
V <sub>CC</sub>	Supply Voltage	V	4.5	5.0	5.5

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

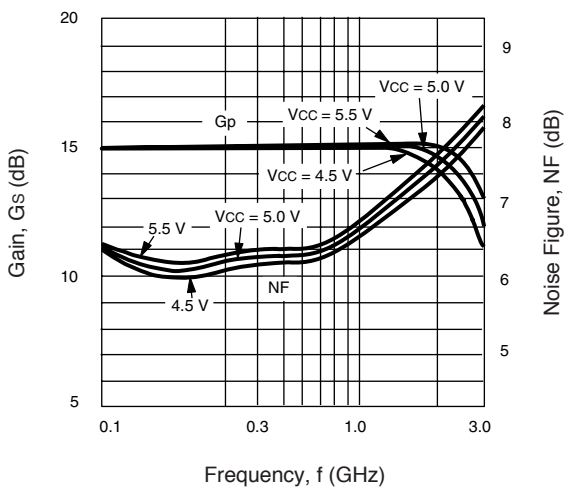
**CIRCUIT CURRENT vs. VOLTAGE**



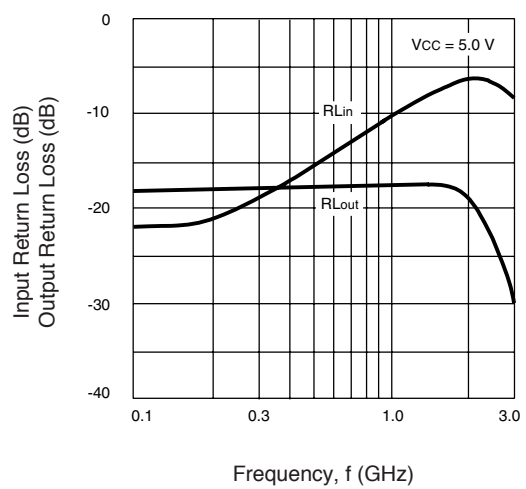
**CIRCUIT CURRENT vs. TEMPERATURE**



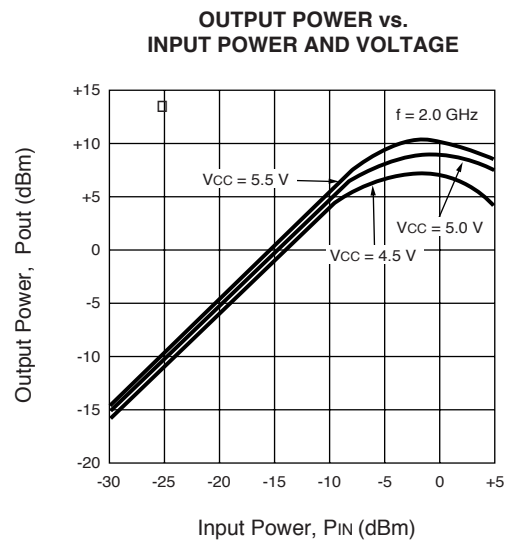
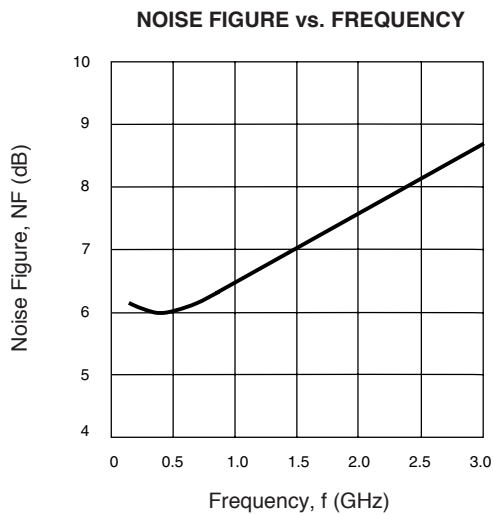
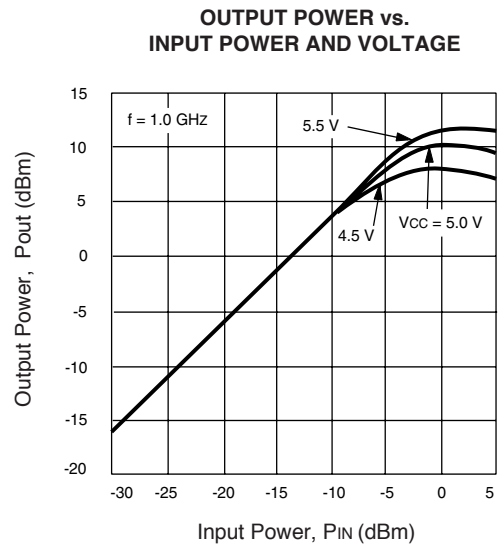
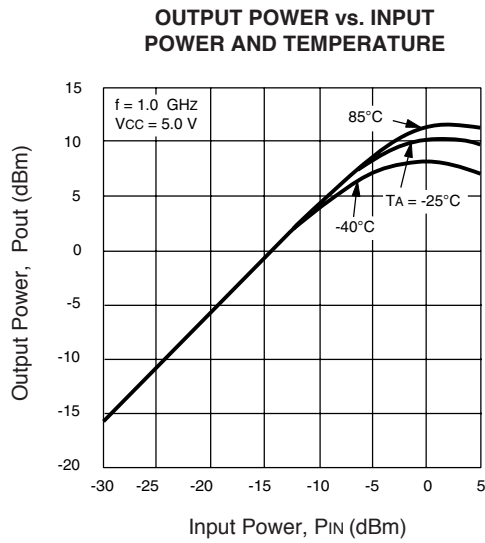
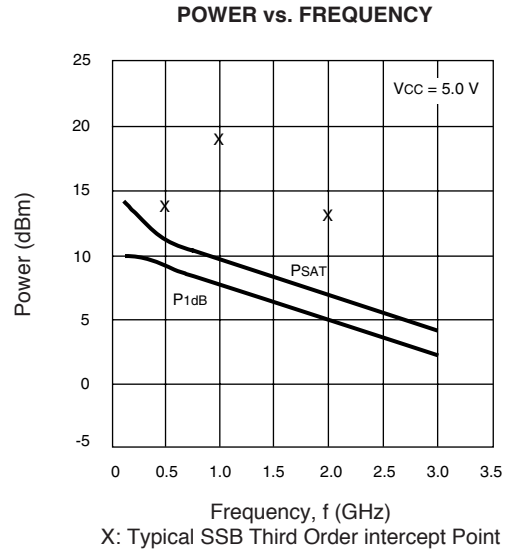
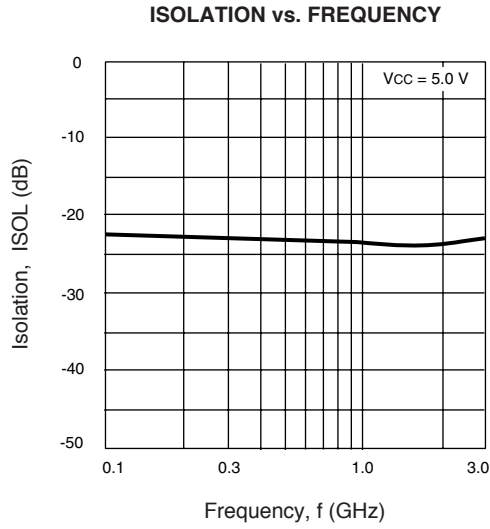
**GAIN AND NOISE FIGURE vs. FREQUENCY AND VOLTAGE**



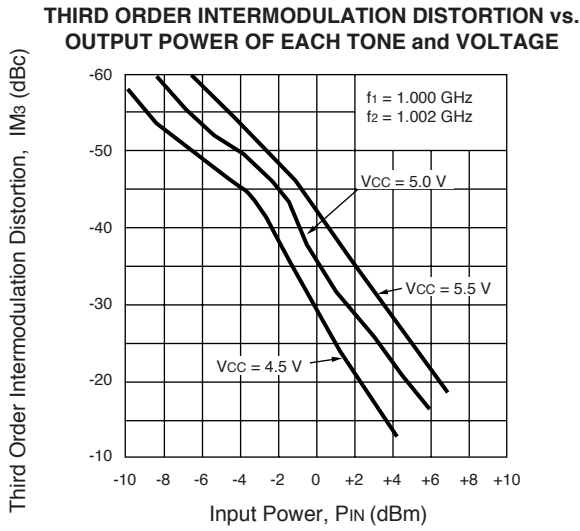
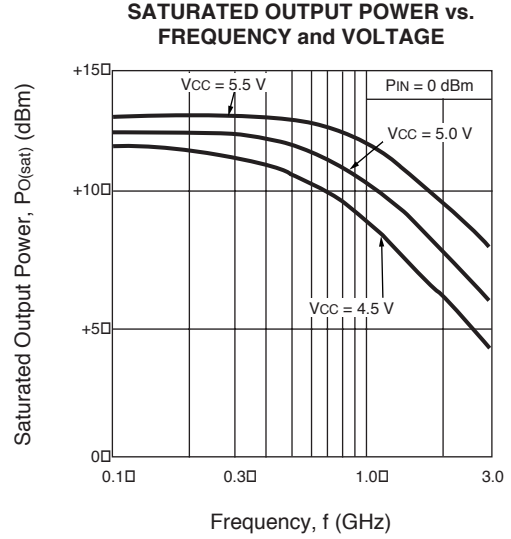
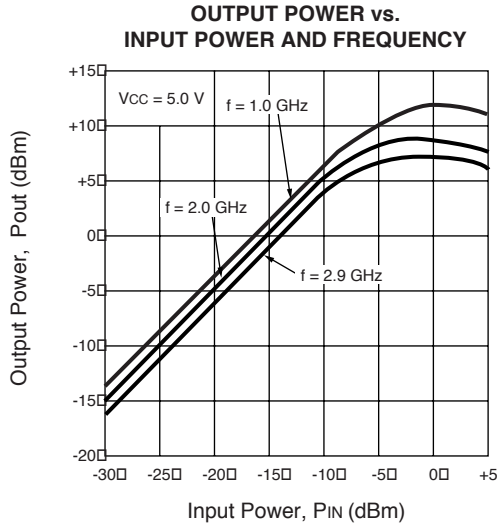
**INPUT RETURN LOSS, OUTPUT RETURN LOSS vs. FREQUENCY**



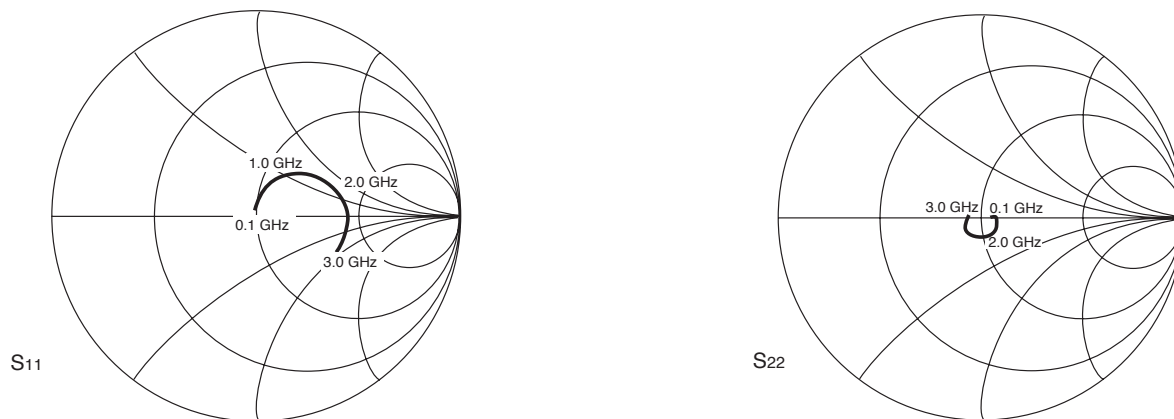
**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )



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



**TYPICAL SCATTERING PARAMETERS** ( $T_A = 25^\circ\text{C}$ ,  $V_{CC} = V_{OUT} = 5.0\text{ V}$ )



**UPC2708TB**

$V_{CC} = V_{OUT} = 5\text{ V}$ ,  $I_{CC} = 27\text{ mA}$

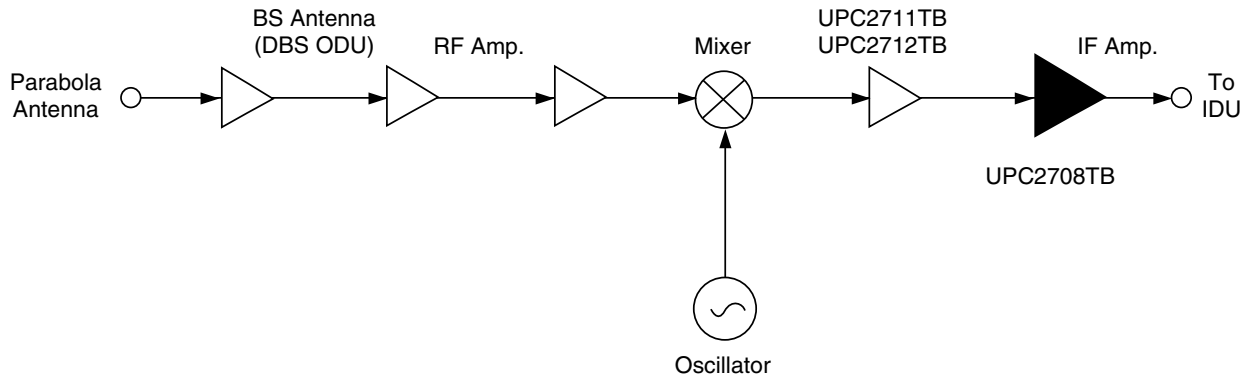
FREQUENCY GHz	S11		S21		S12		S22		K
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
0.1	0.039	138.9	5.815	-4.8	0.077	-0.8	0.051	0.9	1.34
0.2	0.053	119.7	5.822	-9.8	0.075	-1.5	0.048	1.4	1.36
0.3	0.069	106.7	5.815	-14.3	0.074	-0.6	0.049	5.9	1.38
0.4	0.088	97.2	5.813	-18.8	0.074	-0.5	0.054	8.9	1.36
0.5	0.105	91.6	5.794	-23.8	0.072	-1.1	0.054	8.8	1.39
0.6	0.123	84.9	5.823	-28.4	0.071	-0.6	0.056	10.4	1.40
0.7	0.144	79.7	5.871	-33.0	0.070	0.1	0.060	11.5	1.40
0.8	0.164	74.7	5.890	-38.2	0.071	0.5	0.065	11.6	1.37
0.9	0.186	70.7	5.938	-42.8	0.073	2.3	0.072	11.1	1.34
1.0	0.205	66.1	5.960	-47.6	0.070	4.4	0.082	5.6	1.31
1.1	0.226	61.7	6.072	-52.7	0.069	5.0	0.091	-4.6	1.28
1.2	0.245	57.7	6.097	-57.5	0.070	4.4	0.082	5.6	1.31
1.3	0.263	53.7	6.174	-63.0	0.067	2.5	0.085	0.6	1.33
1.4	0.286	48.6	6.275	-68.4	0.069	5.0	0.091	-4.6	1.28
1.5	0.308	44.3	6.371	-74.3	0.070	5.4	0.092	-8.2	1.24
1.6	0.328	40.7	6.419	-79.8	0.066	7.1	0.097	-12.6	1.26
1.7	0.344	36.2	6.470	-85.9	0.067	5.6	0.096	-19.6	1.23
1.8	0.364	31.0	6.555	-92.1	0.069	8.2	0.100	-23.9	1.18
1.9	0.382	26.0	6.542	-98.3	0.070	8.4	0.092	-8.2	1.24
2.0	0.395	21.2	6.570	-104.7	0.070	8.7	0.101	-38.9	1.13
2.1	0.405	16.8	6.528	-111.3	0.070	10.1	0.100	-47.2	1.12
2.2	0.417	11.8	6.527	-118.5	0.071	9.4	0.096	-57.2	1.09
2.3	0.427	6.6	6.438	-124.7	0.072	9.5	0.098	-66.1	1.09
2.4	0.431	2.2	6.336	-131.3	0.071	10.7	0.095	-76.5	1.09
2.5	0.431	-3.0	6.247	-138.1	0.072	12.8	0.098	-86.1	1.09
2.6	0.434	-8.2	6.127	-145.0	0.071	15.4	0.094	-99.9	1.10
2.7	0.423	-12.3	5.952	-151.7	0.071	14.5	0.088	-116.7	1.14
2.8	0.419	-17.1	5.816	-158.2	0.070	16.1	0.081	-134.4	1.18
2.9	0.408	-21.5	5.619	-165.0	0.073	15.3	0.074	-149.7	1.19
3.0	0.400	-26.2	5.354	-171.5	0.074	17.1	0.065	-170.3	1.24
3.1	0.386	-29.3	5.134	-177.4	0.075	17.1	0.053	172.8	1.28

**PIN DESCRIPTIONS**

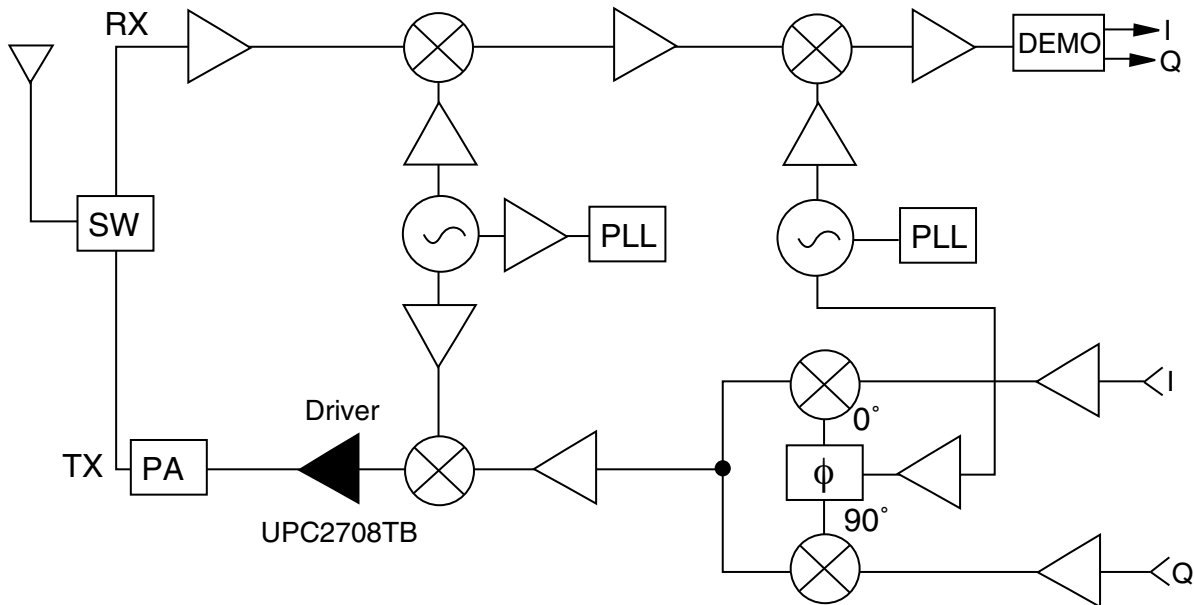
Pin No.	Symbol	Applied Voltage (V)	Pin Voltage (V)	Description	Internal Equivalent Circuit
1	Input	–	1.16	Signal input pin. An internal matching circuit, configured with resistors, enables 50 Ω connection over a wide bandwidth. A multi-feedback circuit is designed to cancel the deviations of hFE and resistance. This pin must be coupled to the signal source with a blocking capacitor.	
4	Output	–	–	Signal output pin. Connect an inductor between this pin and Vcc to supply current to the internal output transistors.	
6	Vcc	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 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.	

**SYSTEM APPLICATION EXAMPLE**

**EXAMPLE OF DBS CONVERTERS**

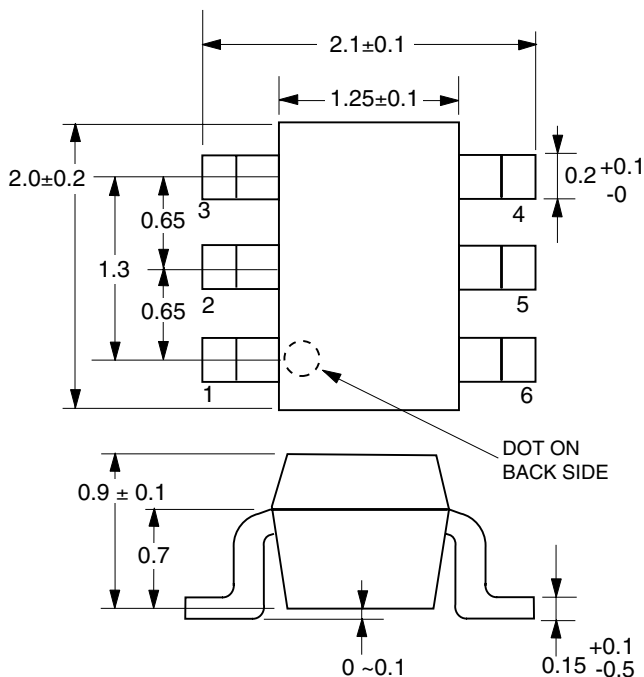


**EXAMPLE OF 2.4 GHz BAND RECEIVER**



**OUTLINE DIMENSIONS** (Units in mm)

**PACKAGE OUTLINE S06**  
(Top View)

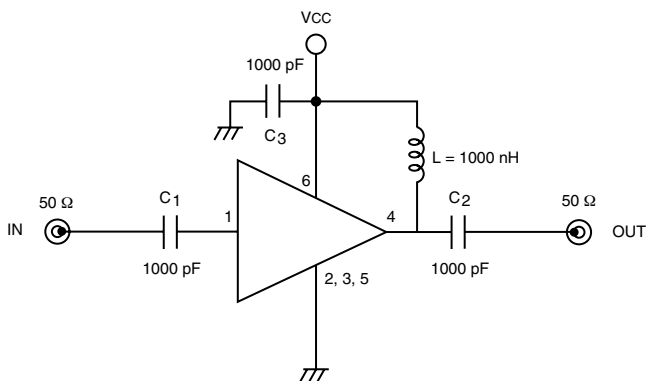


**ORDERING INFORMATION**

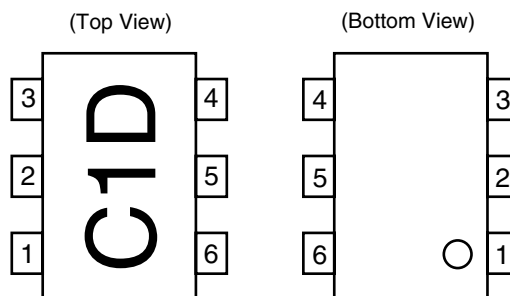
PART NUMBER	MARKING	QTY
UPC2708TB-E3-A	C1D	3K/Reel

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

**TEST CIRCUIT**



**PIN CONNECTIONS**



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

Life Support Applications

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09/21/2000

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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