



# 5V, SUPER MINIMOLD SI MMIC WIDEBAND AMPLIFIER

## UPC3215TB

### FEATURES

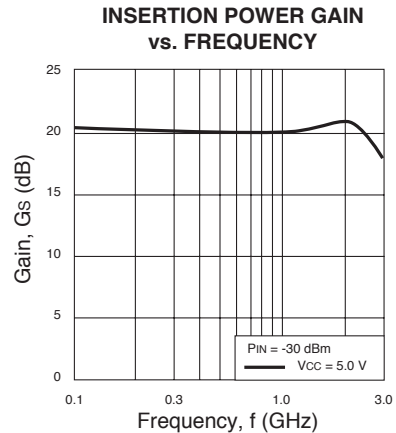
- **WIDEBAND RESPONSE:**  
 $f_u = 2.9$  GHz TYP at 3dB bandwidth
- **NOISE FIGURE:**  
 $NF = 2.3$  dB TYP at  $f = 1.5$  GHz
- **POWER GAIN:**  
 $GP = 20.5$  dB TYP at  $f = 1.5$  GHz
- **SUPPLY VOLTAGE:**  
 $V_{CC} = 4.5$  to  $5.5$  V
- **HIGH DENSITY SURFACE MOUNTING:**  
 6-pin super mini-mold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

### DESCRIPTION

NEC's 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 NEC's 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 NEC's 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 PACKAGE OUTLINE			UPC3215TB S06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
$I_{CC}$	Circuit Current (no signal)	mA	10.5	14.0	17.5
$G_P$	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	-
$RL_{IN}$	Input Return Loss, $f = 1.5$ GHz	dB	10	15	-
$RL_{OUT}$	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 PACKAGE OUTLINE			UPC3215TB S06	
SYMBOLS	STANDARD CHARACTERISTICS		REFERENCE VALUES	
$P_{SAT}$	Saturated Output Power, $P_{IN} = 0$ dBm	dBm	+3.5	
$OIP_3$	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>** (TA = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
VCC	Supply Voltage	V	6.0
ICC	Total Supply Current	mA	30
PIN	Input Power	dBm	+10
PT	Total Power Dissipation <sup>2</sup>	mW	270
TOP	Operating Temperature	°C	-40 to +85
TSTG	Storage Temperature	°C	-55 to +150

Notes:

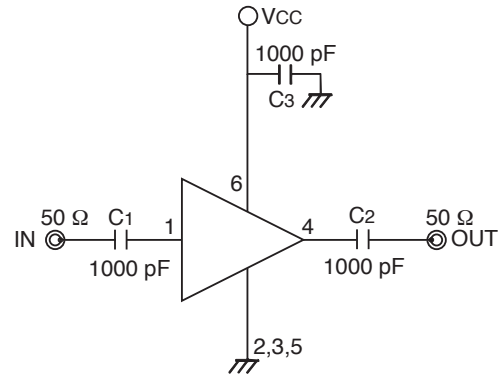
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on a 50 X 50 X 1.6 mm epoxy glass PWB, with copper patterning on both sides. (TA = 85°C).

**RECOMMENDED OPERATING CONDITIONS**

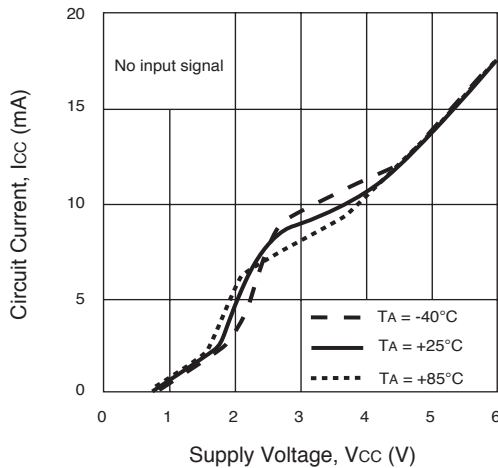
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
VCC	Supply Voltage	V	4.5	5.0	5.5
TA	Operating Ambient Temperature	°C	-40	+25	+85
PIN	Input Power	dBm			0
fIN	Input Frequency	GHz			2.9

**TYPICAL PERFORMANCE CURVES** (TA = 25°C)

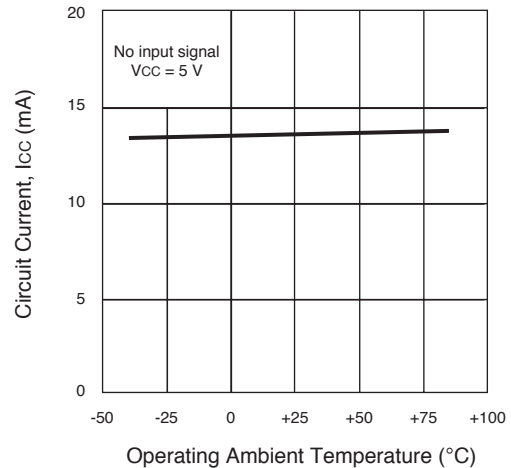
**TEST CIRCUIT**



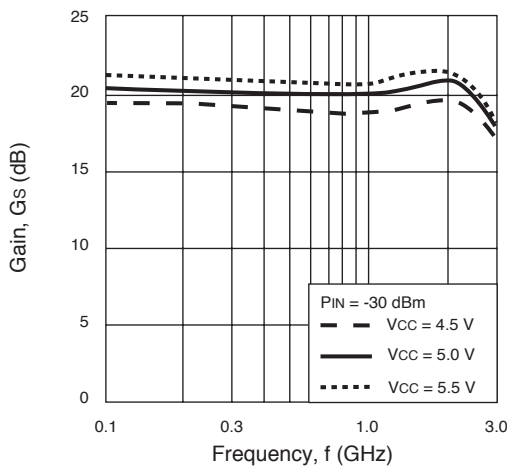
**CIRCUIT CURRENT vs. VOLTAGE**



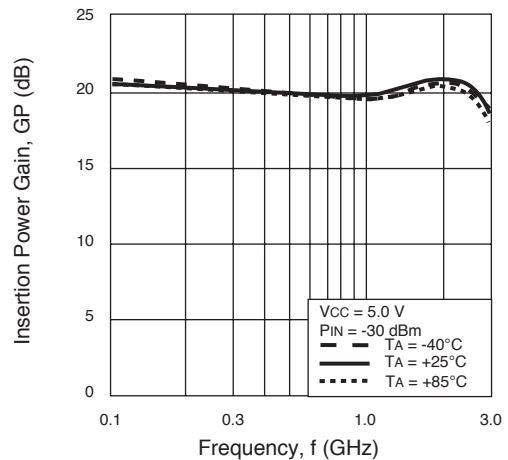
**CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE**



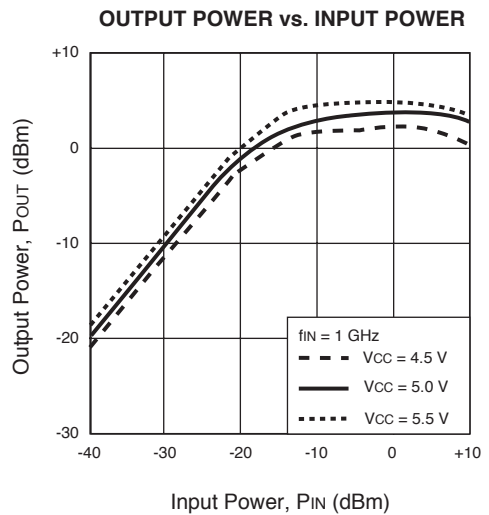
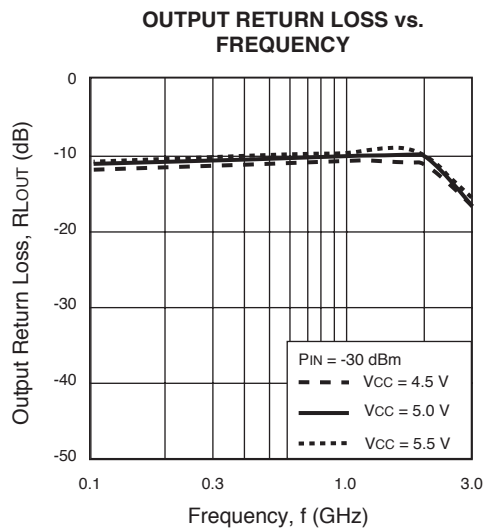
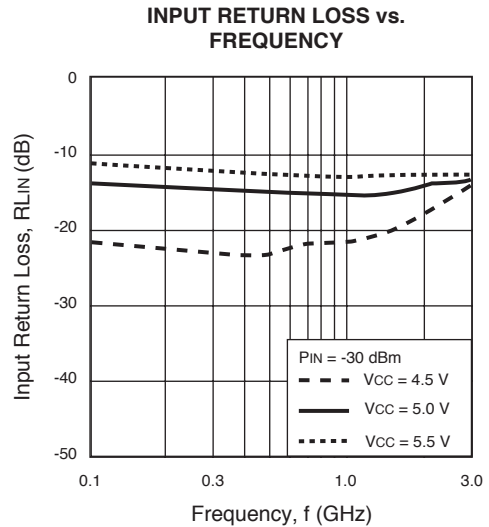
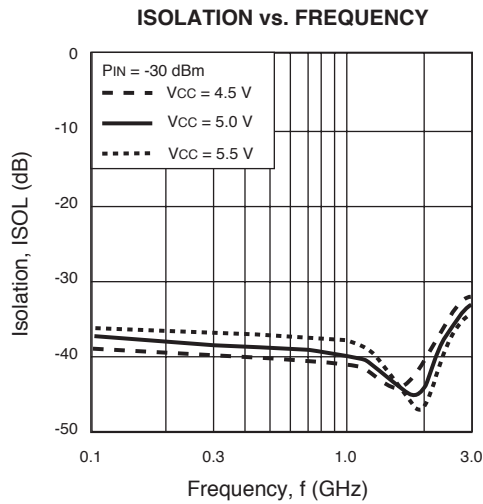
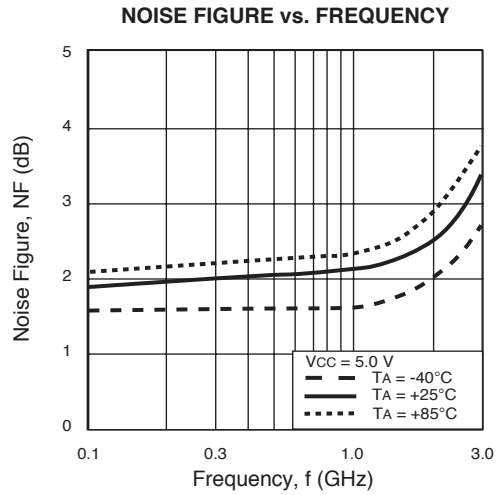
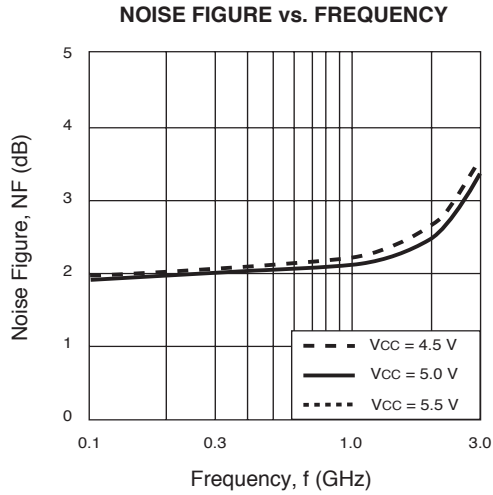
**INSERTION POWER GAIN vs. FREQUENCY**



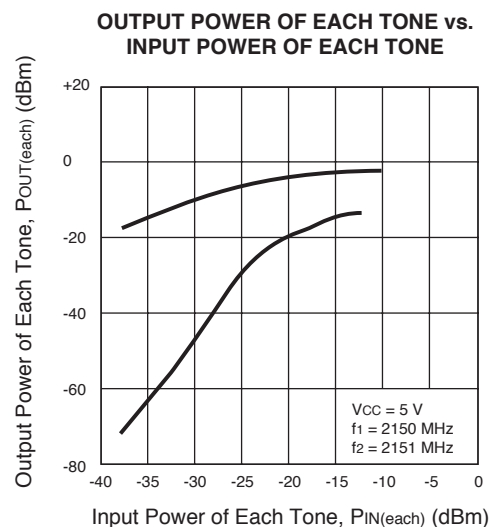
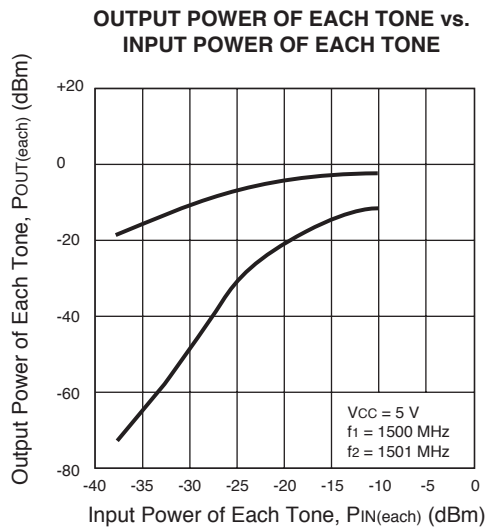
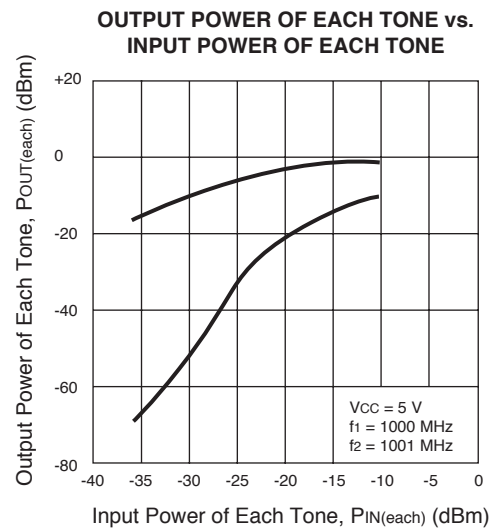
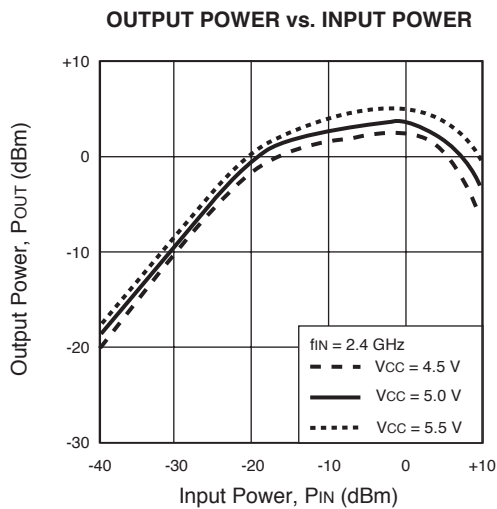
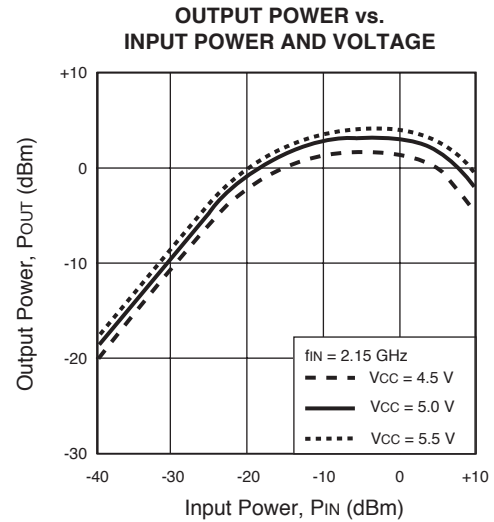
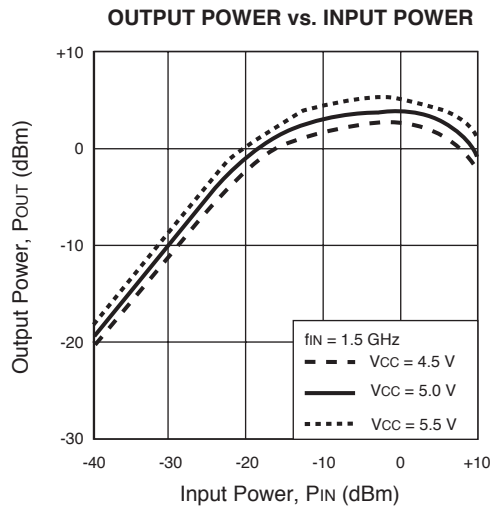
**INSERTION POWER GAIN vs. FREQUENCY**



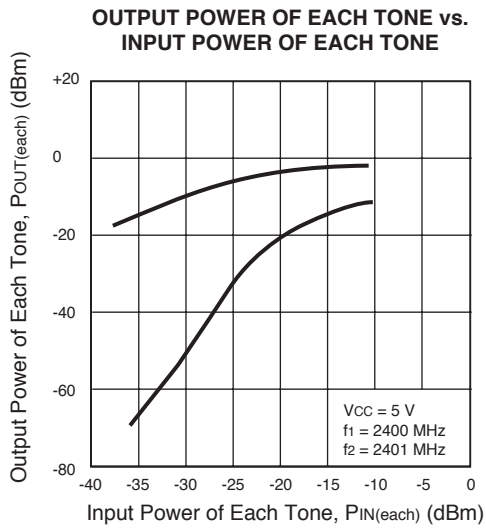
TYPICAL PERFORMANCE CURVES (TA = 25°)



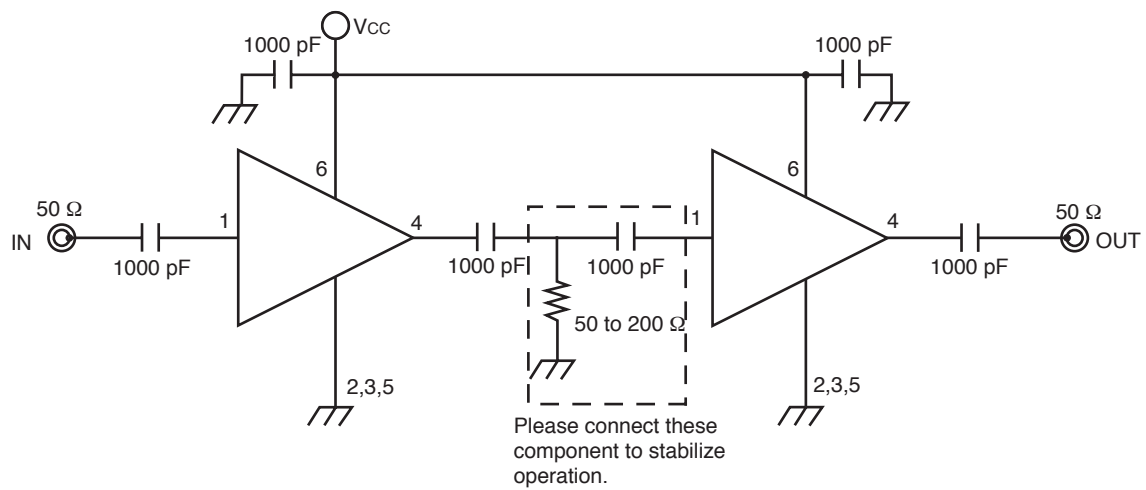
TYPICAL PERFORMANCE CURVES (TA = 25°)



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

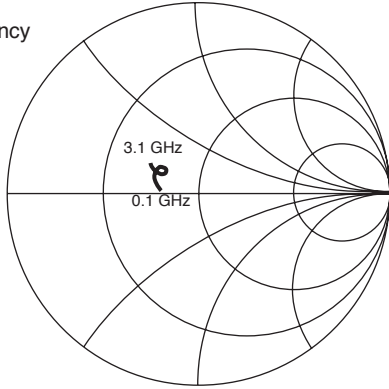


**EXAMPLE OF APPLICATION CIRCUIT**



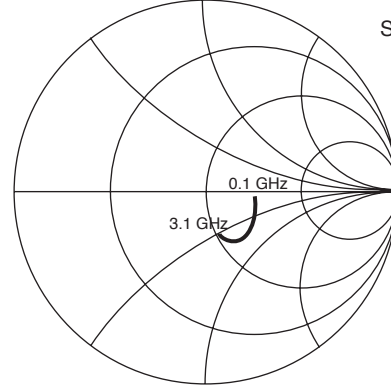
TYPICAL SCATTERING PARAMETERS (TA = 25°C)

S11 Frequency



Start: 0.1 GHz  
Stop: 3.1 GHz

S22 Frequency



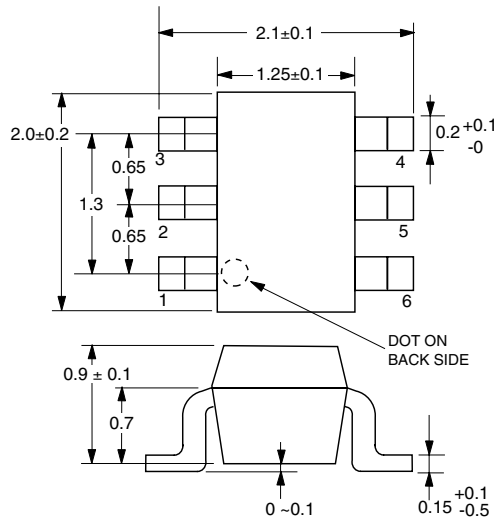
Start: 0.1 GHz  
Stop: 3.1 GHz

VCC = VOUT = 5.0 V, ICC = 16 mA

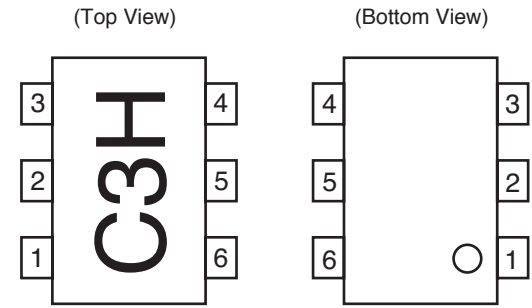
FREQUENCY GHz	S11		S21		S12		S22		K
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
0.1	0.207	174.1	10.788	-4.6	0.013	6.3	0.285	-3.3	3.38
0.2	0.190	173.1	10.714	-9.8	0.013	-0.5	0.282	-3.7	3.39
0.3	0.186	174.3	10.565	-14.3	0.013	2.7	0.283	-4.6	3.37
0.4	0.192	173.8	10.359	-18.3	0.014	4.7	0.285	-6.2	3.92
0.5	0.200	174.5	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 Circuit	Internal Equivalent
1	Input	—	0.82	Signal input pin. An internal matching circuit, configured with resistors, enables 50 Ω connection over a wide band. A multi-feedback circuit is designed to cancel the deviations of hFE and resistance. This pin must be coupled to the signal source with capacitor for DC cut.	
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 decrease impedance difference.	
4	Output	—	3.8	Signal output pin. An internal matching circuit, configured with resistors, enables 50 Ω 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.

**Life Support Applications**

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

EXCLUSIVE NORTH AMERICAN AGENT FOR NEC RF, MICROWAVE & OPTOELECTRONIC SEMICONDUCTORS

**CEL CALIFORNIA EASTERN LABORATORIES** • Headquarters • 4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • Telex 34-6393 • FAX (408) 988-0279  
DATA SUBJECT TO CHANGE WITHOUT NOTICE

Internet: <http://WWW.CEL.COM>

09/04/2001

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	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

Important Information and Disclaimer: Information provided by CEL on its website or in other communications concerning the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall CEL’s liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

See CEL Terms and Conditions for additional clarification of warranties and liability.