CEL

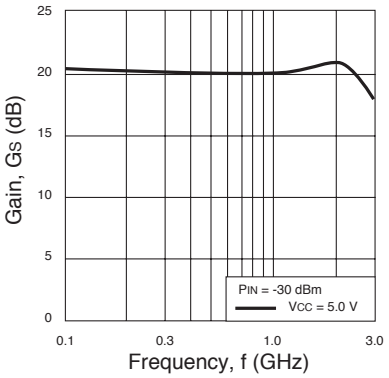
5V, SUPER MINIMOLD SI MMIC WIDEBAND AMPLIFIER

UPC3215TB

FEATURES

- **WIDEBAND RESPONSE:**
  fu = 2.9 GHz TYP at 3dB bandwidth
- **NOISE FIGURE:**
  NF = 2.3 dB TYP at f = 1.5 GHz
- **POWER GAIN:**
  G_P = 20.5 dB TYP at f = 1.5 GHz
- **SUPPLY VOLTAGE:**
  VCC = 4.5 to 5.5 V
- **HIGH DENSITY SURFACE MOUNTING:**
  6-pin super mini-mold package

INSERTION POWER GAIN vs. FREQUENCY



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 fmax 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°C, V_{CC} = 5.0 V, Z_S = Z_L = 50 Ω)

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°C, V_{CC} = 5.0 V, Z_S = Z_L = 50 Ω)

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
ΔG_P	Gain Flatness,	f = 0.1 to 2.15 GHz	dB	1.0

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

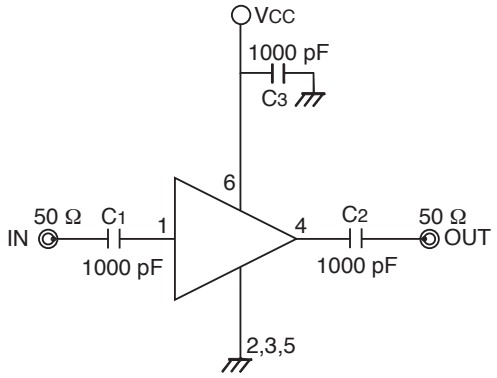
SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage	V	6.0
I_{CC}	Total Supply Current	mA	30
P_{IN}	Input Power	dBm	+10
P_T	Total Power Dissipation[2]	mW	270
T_{OP}	Operating Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-55 to +150

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

RECOMMENDED OPERATING CONDITIONS

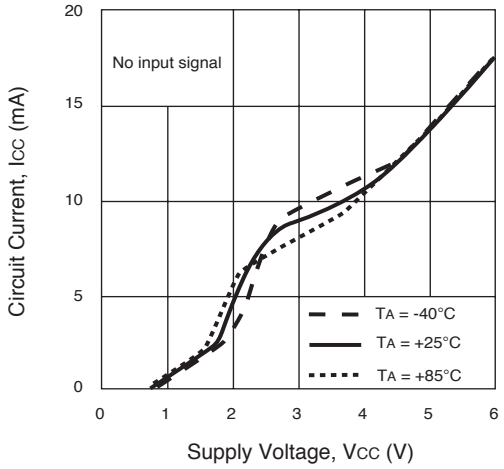
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{CC}	Supply Voltage	V	4.5	5.0	5.5
T_A	Operating Ambient Temperature	°C	-40	+25	+85
P_{IN}	Input Power	dBm			0
f_{IN}	Input Frequency	GHz			2.9

TEST CIRCUIT

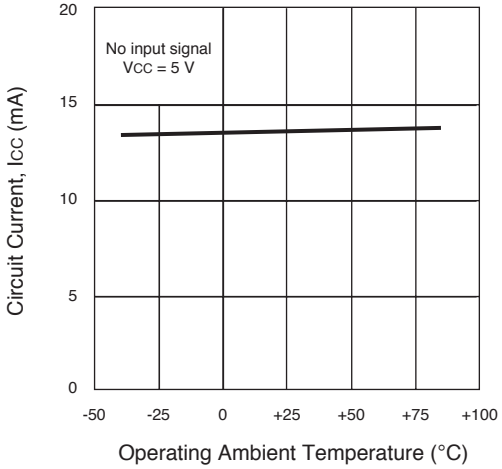


TYPICAL PERFORMANCE CURVES (T_A = 25°C)

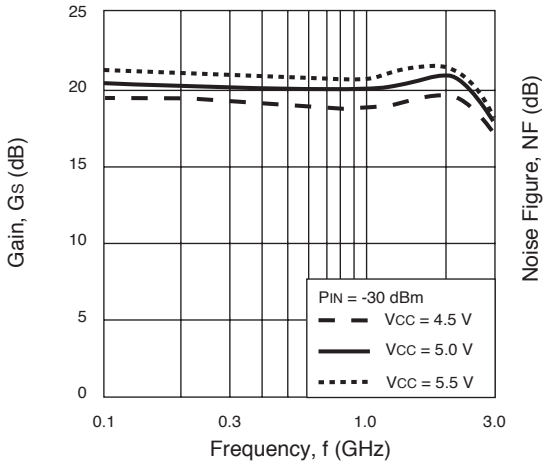
CIRCUIT CURRENT vs. VOLTAGE



CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



INSERTION POWER GAIN vs. FREQUENCY



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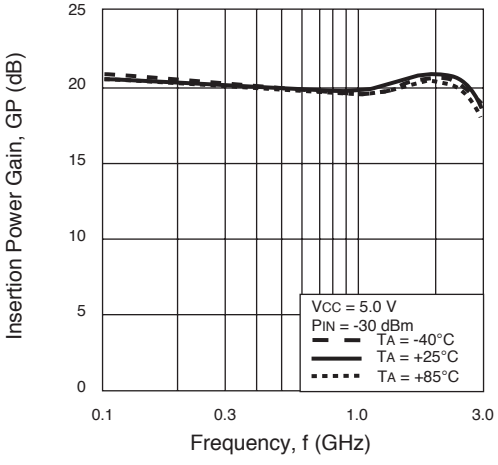
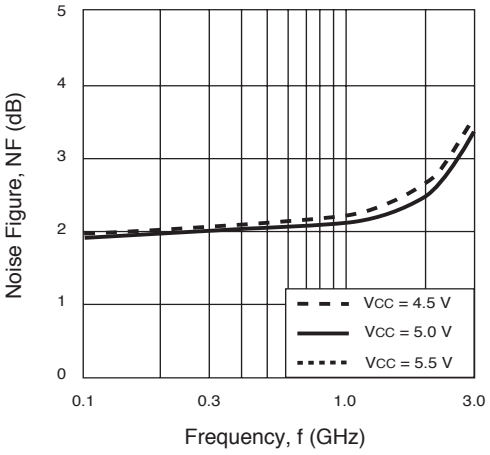
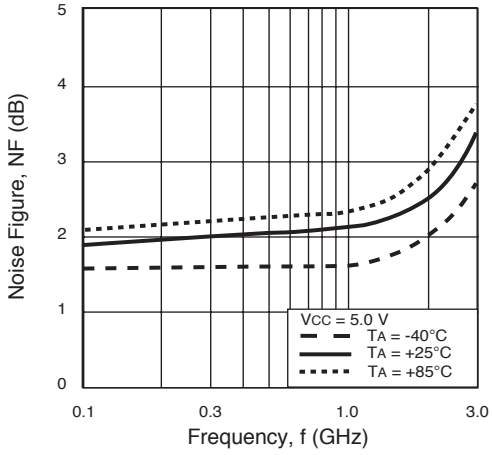


TYPICAL PERFORMANCE CURVES (T_A = 25°)

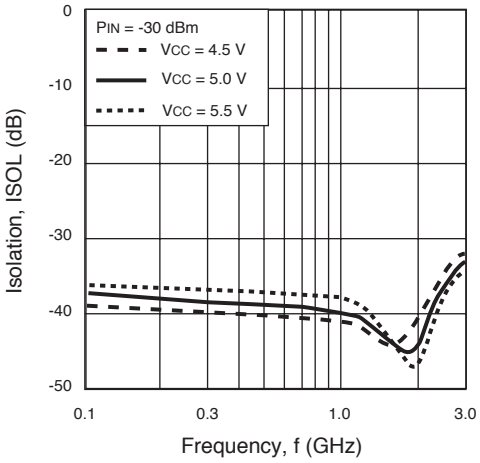
NOISE FIGURE vs. FREQUENCY



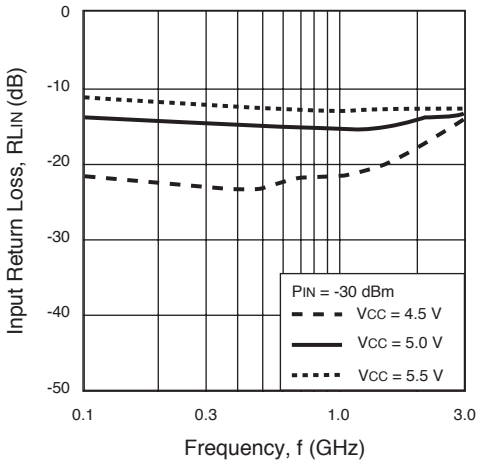
NOISE FIGURE vs. FREQUENCY



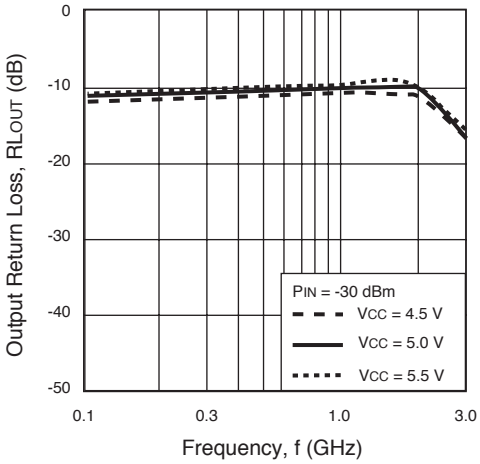
ISOLATION vs. FREQUENCY



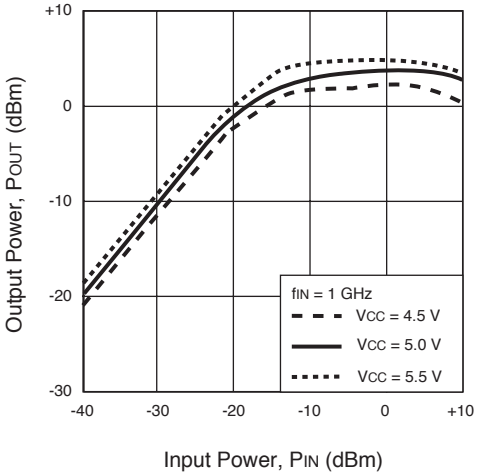
INPUT RETURN LOSS vs. FREQUENCY



OUTPUT RETURN LOSS vs. FREQUENCY

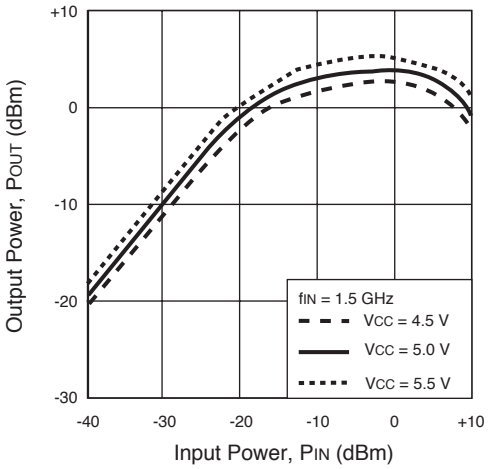


OUTPUT POWER vs. INPUT POWER

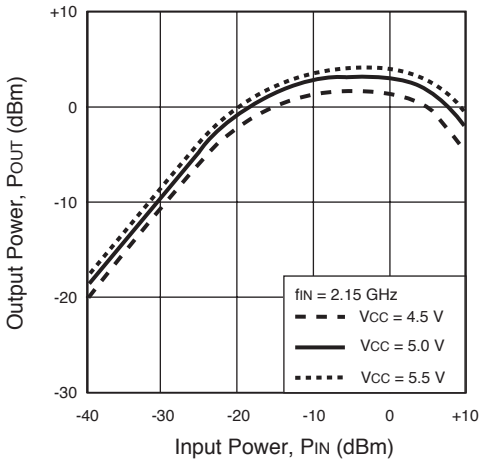


TYPICAL PERFORMANCE CURVES (T_A = 25°)

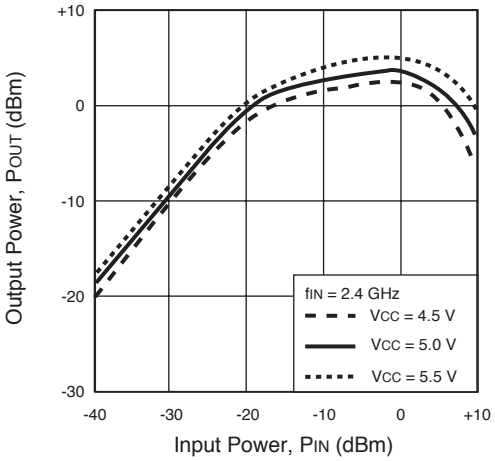
OUTPUT POWER vs. INPUT POWER



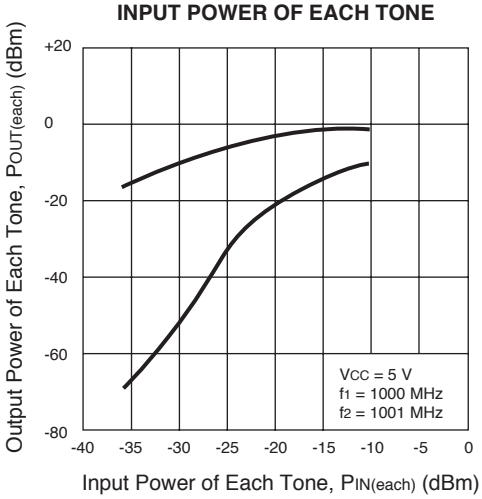
**OUTPUT POWER vs.
INPUT POWER AND VOLTAGE**



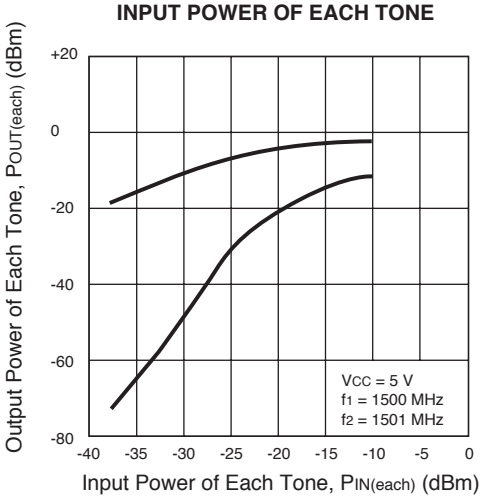
OUTPUT POWER vs. INPUT POWER



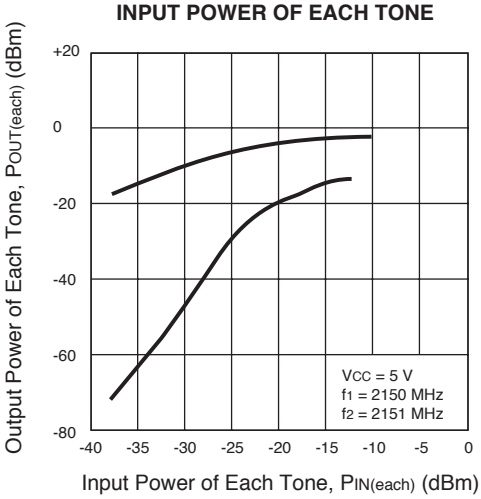
**OUTPUT POWER OF EACH TONE vs.
INPUT POWER OF EACH TONE**



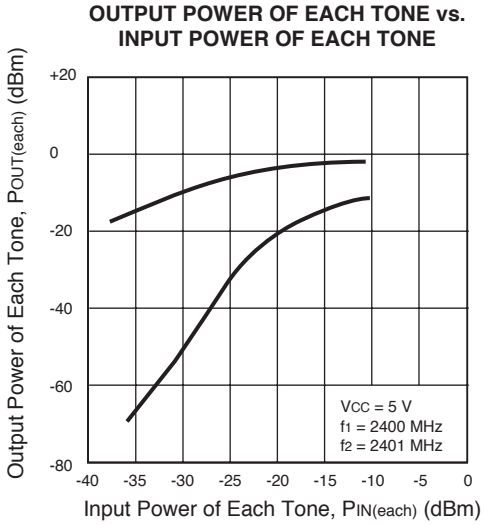
**OUTPUT POWER OF EACH TONE vs.
INPUT POWER OF EACH TONE**



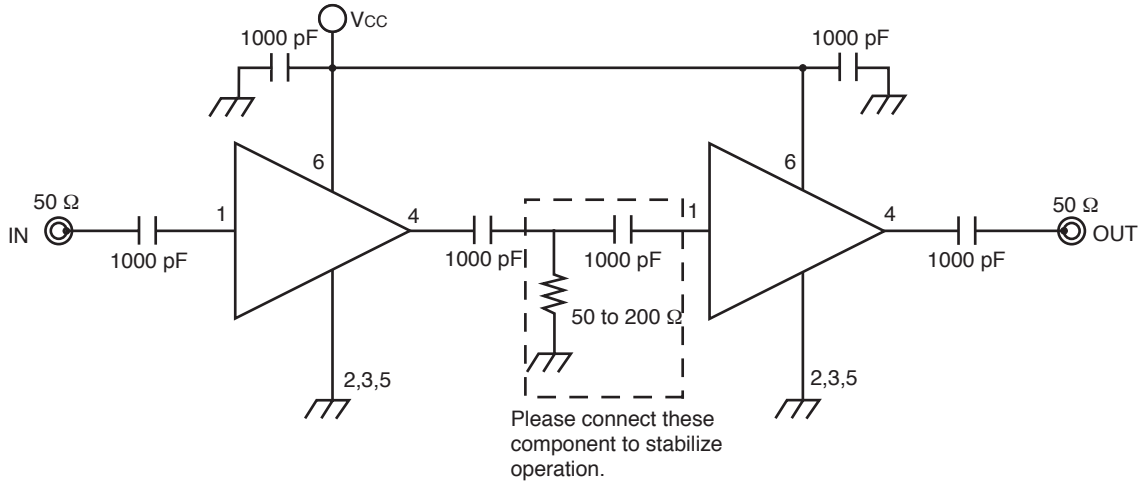
**OUTPUT POWER OF EACH TONE vs.
INPUT POWER OF EACH TONE**



TYPICAL PERFORMANCE CURVES (T_A = 25°)

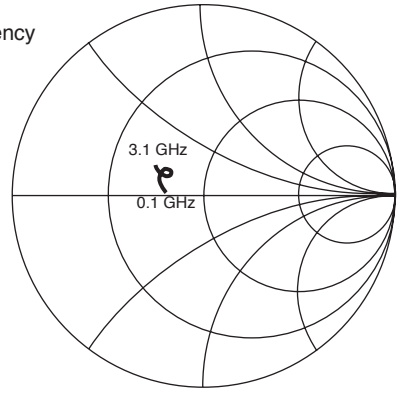


EXAMPLE OF APPLICATION CIRCUIT



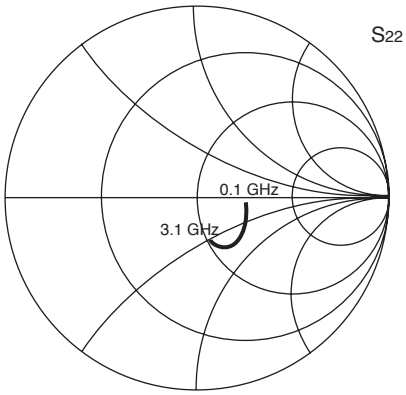
TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

S_{11} Frequency



Start: 0.1 GHz
Stop: 3.1 GHz

S_{22} Frequency



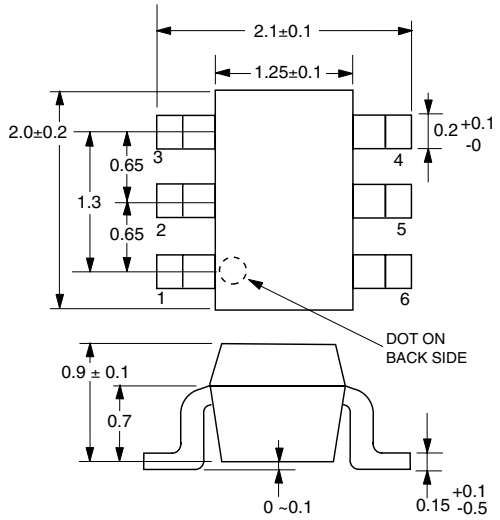
Start: 0.1 GHz
Stop: 3.1 GHz

V_{CC} = V_{OUT} = 5.0 V, I_{CC} = 16 mA

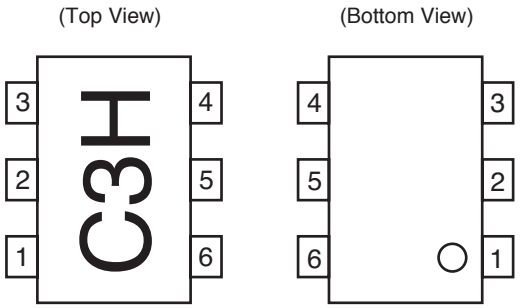
FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
0.1	0.207	174.1	10.788	-4.6	0.013	6.3	0.285	-3.3	3.38
0.2	0.190	173.1	10.714	-9.8	0.013	-0.5	0.282	-3.7	3.39
0.3	0.186	174.3	10.565	-14.3	0.013	2.7	0.283	-4.6	3.37
0.4	0.192	173.8	10.359	-18.3	0.014	4.7	0.285	-6.2	3.92
0.5	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

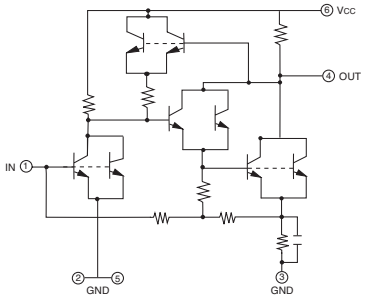


LEAD CONNECTIONS



1. INPUT
2. GND
3. GND
4. OUTPUT
5. GND
6. V_{CC}

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 h_{FE} 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.

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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	
Lead (Pb)	< 1000 PPM	-A	-AZ
		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.

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