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CEL

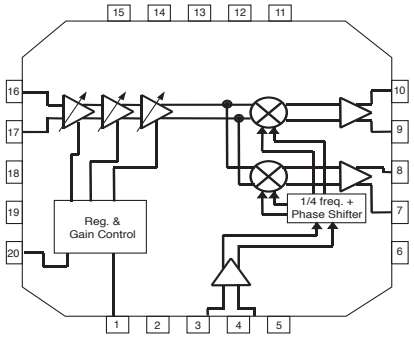
RX-IF SiMMIC FOR W-CDMA AGC + I/Q DEMODULATOR

UPC8194K

FEATURES

- **RX-IF:**
  190 MHz
- **LOW POWER CONSUMPTION:**
  V_{CC} = 3.0 V
- **SMALL 20 PIN QFN PACKAGE:**
  Flat lead style for better performance
- **TAPE AND REEL PACKAGING AVAILABLE**

BLOCK DIAGRAM



DESCRIPTION

NEC's UPC8194K is a Silicon Microwave Monolithic integrated circuit designed as a receiver (RX) section for W-CDMA. The UPC8194K is a RX-IF IC including IF-AGC amplifier and demodulator. This IC is suitable for kit-use for W-CDMA IF section.

This IC was developed using NEC's new ultra high seed silicon bipolar process.

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

APPLICATIONS

- **W-CDMA**

ELECTRICAL CHARACTERISTICS (unless otherwise specified, T_A = 25°C, V_{CC} = 3.0 V, f_{IF} = 192.5 MHz, f_{LO} = 760 MHz, P_{LO} = -15 dBm, $f_{I/Q}$ = 2.5 MHz)

PART NUMBER PACKAGE OUTLINE			UPC8194K QFN-20		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
I_{CC}	Circuit Current, no input signals power saving mode	mA μA	– –	9.3 –	12.6 1
V_G	Voltage Gain, V_{CONT}= 2.5 V V_{CONT}= 0.5 V	dB	70 –	77 –	– -20
IIP3	Input Third Order Intercept Point, Gain= +65 dB,Rs = 600Ω Balanced,Pin = -76 dBm	dBm	-60	-55	–
	Gain= -10 dB, Rs = 600Ω Balanced,Pin = -10 dBm	dBm	0	3	–
LoL	Local Leakage, leakage to I/Q port when local = 760 MHz and output = 30mVp-p balanced	dBc	–	–	20
$BW_{(I/Q)}$	I/Q Bandwidth, 3 dB down	MHz	10	–	–
$V_{OUT(I/Q)}$	I/Q Maximum output swing, balanced ouptut	Vp-p	1	–	–
A_E	I/Q Gain Balance, fI/Q = 2.5 MHz	dB	–	–	Δ0.5
P_E	I/Q Phase Error, fI/Q = 2.5 MHz	Deg	–	–	±3
G_{ACC}	Gain Accuracy, V_{CONT} = 1 to 2 V	dB/V	–	Δ4.6	Δ6
$T_{PS(Rise)}$	Rise time from power-saving mode	us	–	–	20
$V_{PS(Rise)}$	Rising voltage from power-saving mode	V	2.2	–	–
$V_{PS(fall)}$	Falling voltage from power-saving mode	V	–	–	0.5
G_F	Gain Flatness at f_{IF} ±2.5 MHz	dB	–	–	Δ0.5

STANDARD CHARACTERISTICS FOR REFERENCE (unless otherwise specified, T_A = 25°C, V_{CC} = 3.0 V, f_{IF} = 192.5 MHz, f_{LO} = 760 MHz, P_{LO} = -15 dBm, $f_{I/Q}$ = 2.5 MHz)

PART NUMBER PACKAGE OUTLINE			UPC8194K QFN-20		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
NF	Noise Figure, Gain = +65 dB	dB	–	9.5	–
EVM	Error Vector Magnitude, IF = 190 MHz, 3.84 Msps QPSK modulation, Gain is adjusted.	%rms	–	3	–
P1dB	Input Power at 1 dB compression point at Gain = +50 dB	dBm	–	-50	–

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage	V	4.0
V_{PS}, V_{CONT}	Applied Voltage	V	-0.3 to V_{CC}+0.3
T_A	Operating Ambient Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-55 to +150
P_D	Power Dissipation	mW	309

Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.

RECOMMENDED OPERATING CONDITIONS

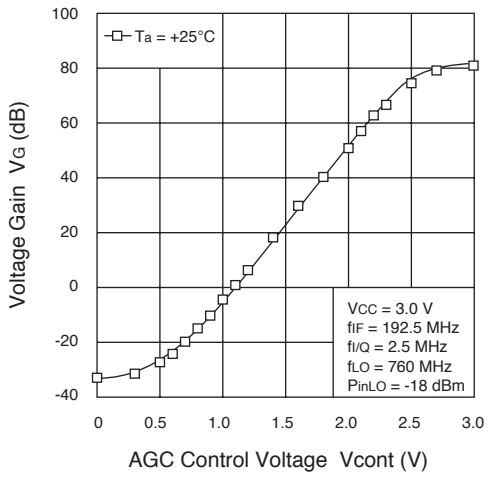
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{CC}	Supply Voltage	V	2.7	3.0	3.3
T_A	Operating Ambient Temperature	°C	-25	+25	+85
f_{IF}	IF Frequency	MHz	–	190	–
f_{LO}	Local Frequency	MHz	–	760	–
P_{LO}	Local input Level	dBm	-18	-15	-12
$Z_{I/Q}$	I/Q load impedance	kΩ	10	20	–
$f_{I/Q}$	I/Q loutput frequency	MHz	–	–	10

ORDERING INFORMATION

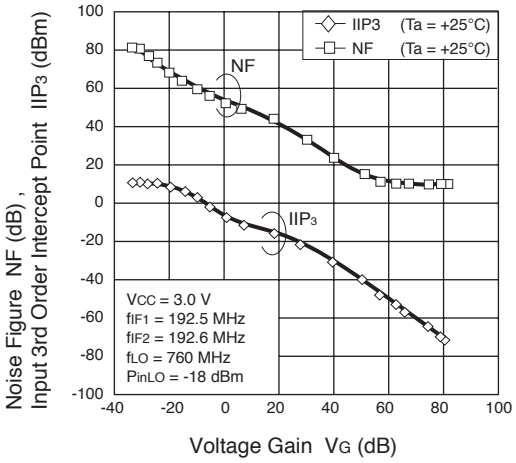
Part Number	Package
UPC8194K-E1-A	20 Pin plastic QFN

TYPICAL PERFORMANCE CURVES (V_{CC} = 3.0 V, V_{PS} = 2.5 V, f_{IF} = 192.5 MHz, f_{LO} = 760 MHz, PLO = -15 dBm, $f_{I/Q}$ = 2.5 MHz, $V_{I/Q}$ = 400 mV_{p-p} balanced)

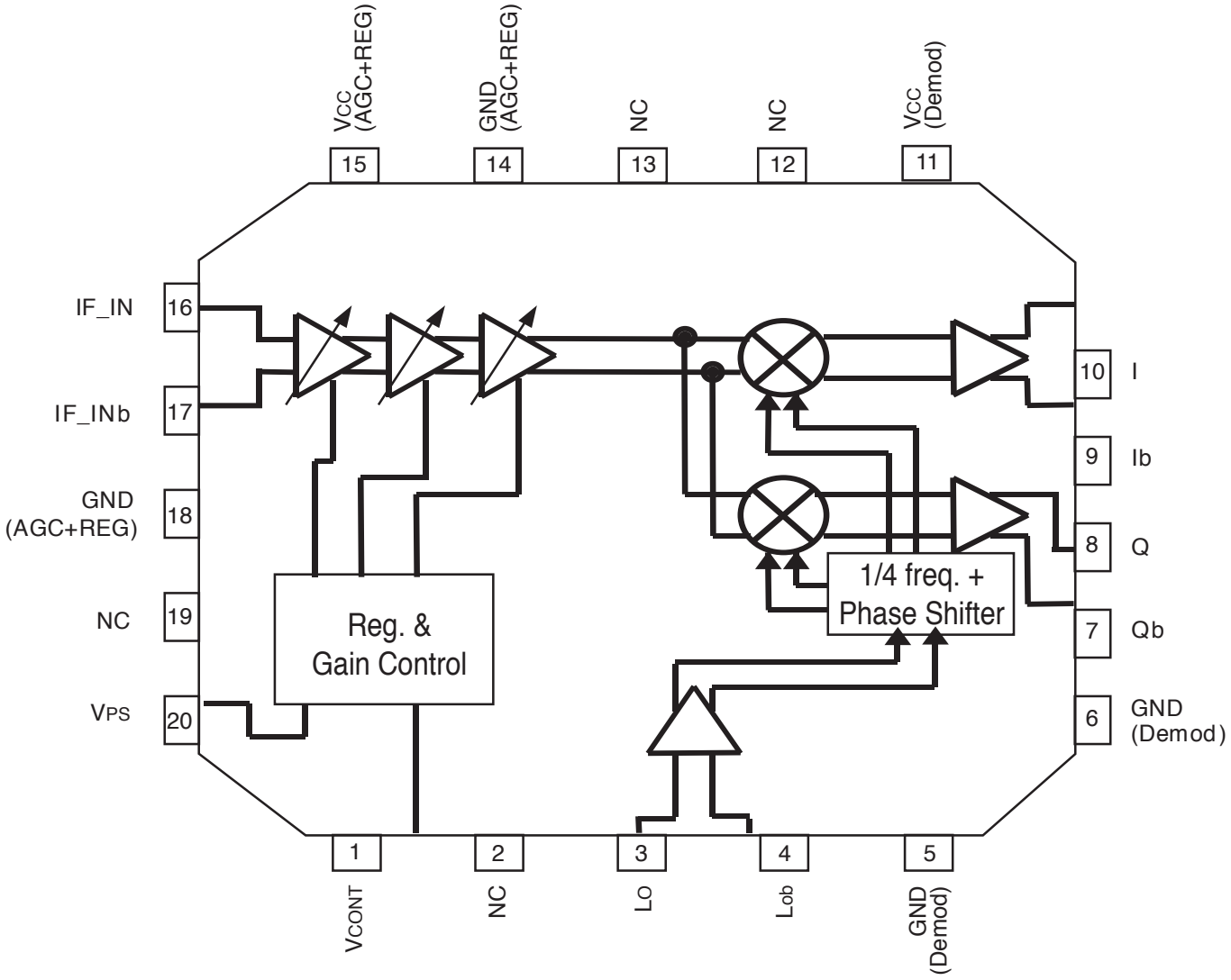
VOLTAGE GAIN vs. AGC CONTROL VOLTAGE



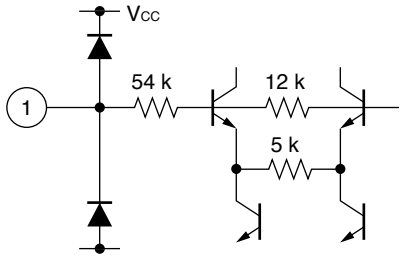
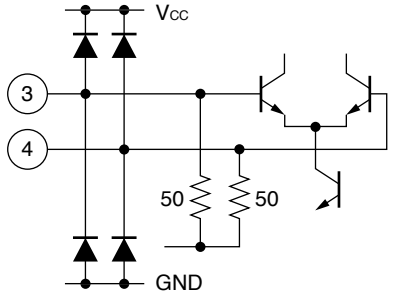
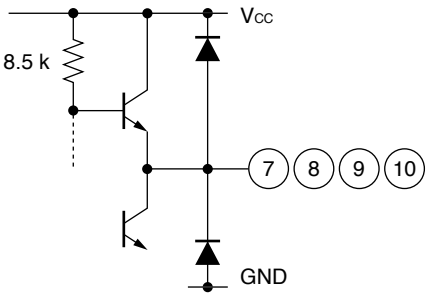
NOISE FIGURE and INPUT 3rd ORDER INTERCEPT POINT vs. VOLTAGE GAIN



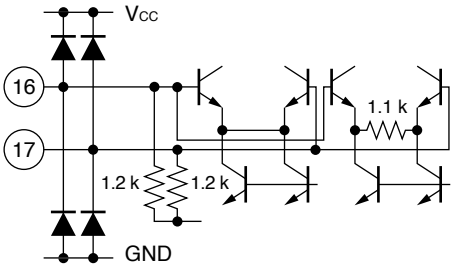
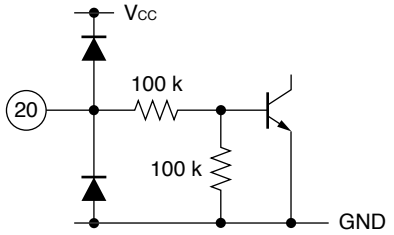
BLOCK DIAGRAM (Units in mm)



PIN FUNCTIONS (Pin Voltage is measured at V_{CC} = 3.0 V)

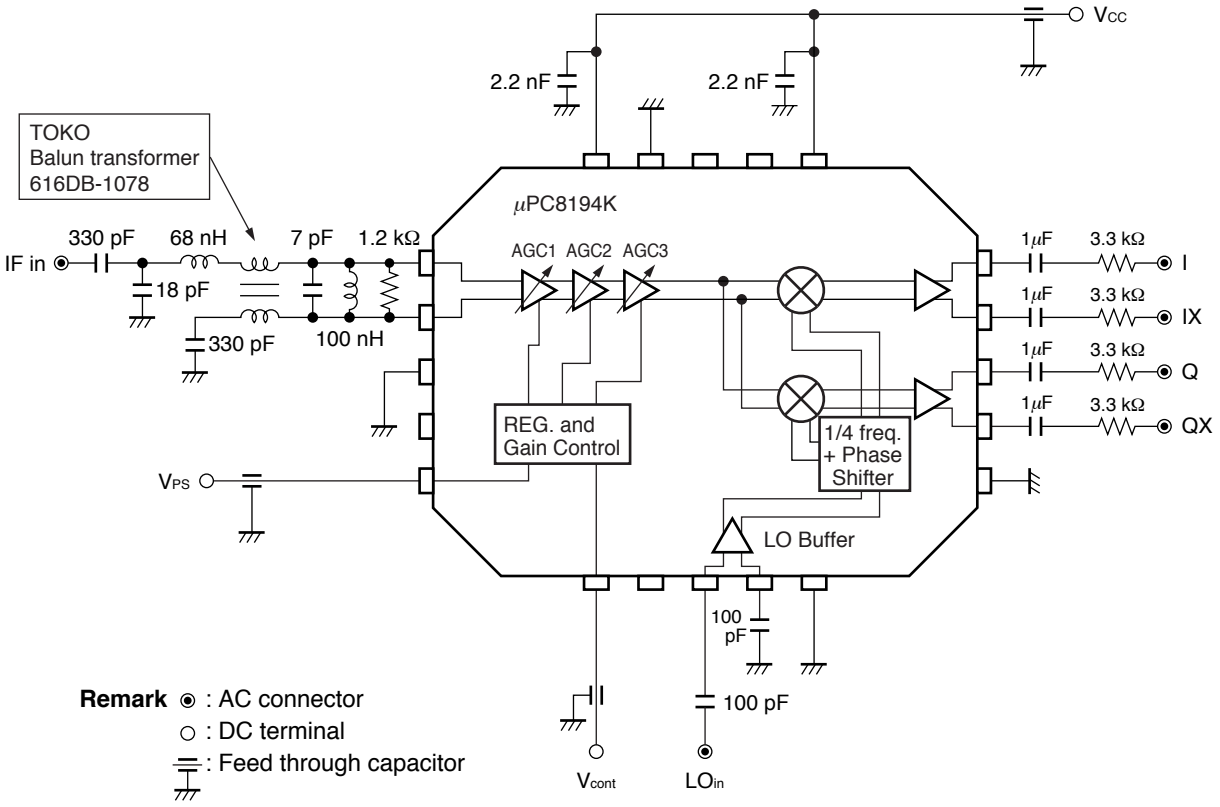
Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (V)	Functions and Applications	Internal Equivalent Circuits
1	Vcont	0 to V_{CC}	-	Gain control pin of AGC amplifier. Variable gains are available in accordance with applied voltage.	
2 19	N.C.	-	-	No connection. This pin is not connected to internal circuit. This pin should be opened or grounded.	—
3	LO	-	1.96	Local signal input pin of I/Q demodulator. Input frequency is 760 MHz.	
4	LOb	-	1.96	Bypass pin of local signal input for I/Q demodulator. In the case of single local input, this pin must be decoupled with capacitor ex. 100 to 1 000 pF.	
5 6	GND (Demod.)	0	-	Ground pin of I/Q demodulator. This pin should be grounded with minimum inductance. Form the ground pattern as widely as possible to minimize ground impeadance.	
7	Qb	-	1.40	I/Q/Ib/Qb signal output pins. Each pin is an emitter follower. Each of Ib and Qb is differential output of I and Q. Recommendable load impedance is 10 to 20 kΩ.	
8	Q	-	1.40		
9	Ib	-	1.40		
10	I	-	1.40		
11	VCC (Demod.)	2.7 to 3.3	-	Supply voltage pin of I/Q demodulator (phase shifter + I/Q Mixer).	—
12	TEST 1	0	-	TEST pin. In actual use, this pin should be grounded.	—
13	TEST 2	0	-		
14 18	GND (AGC, REG.)	0	-	Ground pin of AGC amplifier and internal regulator. This pin should be grounded with minimum inductance. Form the ground pattern as widely as possible to minimize ground impedance.	—

PIN FUNCTIONS (Pin Voltage is measured at V_{CC} = 3.0 V)

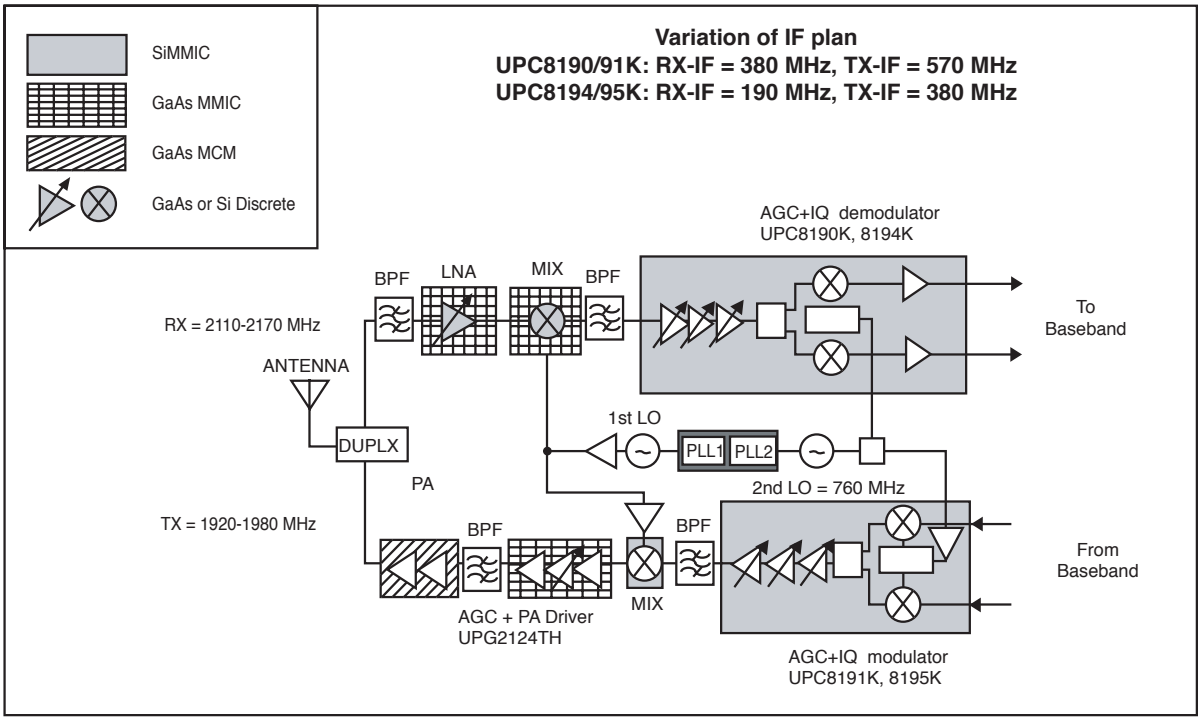
Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (V)	Functions and Applications	Internal Equivalent Circuits
15	VCC (AGC, REG.)	2.7 to 3.3	-	Supply voltage pin of AGC amplifier and internal regulator.	—
16	IF_IN	-	2.75	IF signal input pin. This pin is input of AGC amplifier. Balance input between 16, 17 pin. Input frequency is 190 MHz.	
17	IF_INb	-	2.75	IF signal input pin. In the case of signal local input, this pin must be decoupled with capacitor.	
20	V_{PS}	High: 2.2 to V_{CC} Low: 0 to 0.5	-	Power saving pin. This pin modulator can control Active/Sleep state with bias as follows.	

V_{PS} (V)	State
0 to 0.5	Sleep Mode
2.2 to 3	Active Mode

MEASUREMENT CIRCUIT (Units in mm)

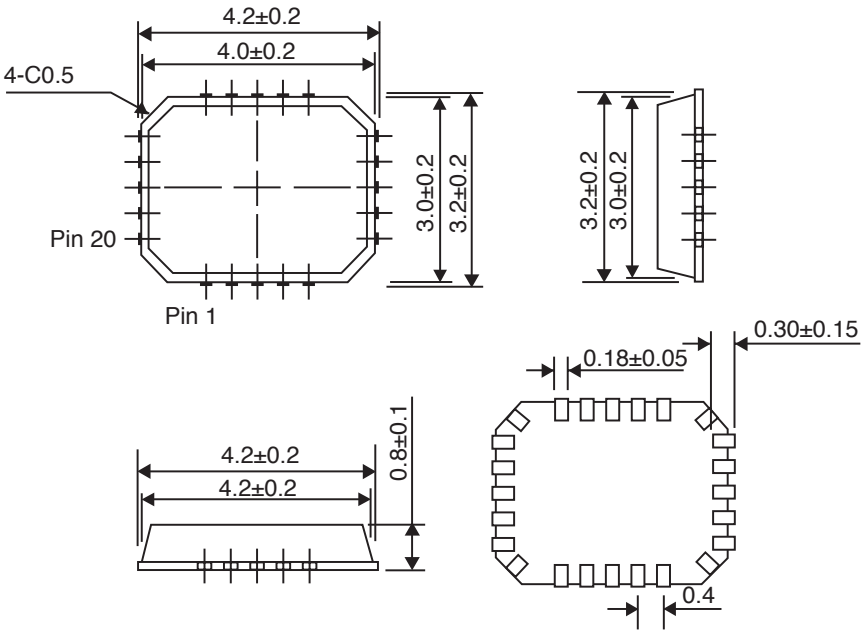


APPPLICATION EXAMPLE: W-CDMA



OUTLINE DIMENSIONS (Units in mm)

Package Outline QFN-20



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.