



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

UPC8194K

FEATURES

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

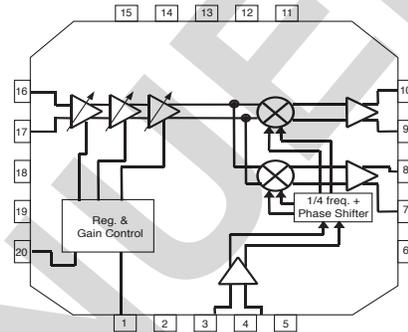
DESCRIPTION

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 performance.

BLOCK DIAGRAM



APPLICATIONS

- **W-CDMA**

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

| 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 | - | 9.3 | 12.6 |
| | | μA | - | - | 1 |
| V _G | Voltage Gain, $V_{CONT} = 2.5\text{ V}$ $V_{CONT} = 0.5\text{ V}$ | dB | 70 | 77 | - |
| IIP ₃ | Gain = +65 dB, $R_s = 600\Omega$ Balanced, $P_{in} = -76\text{ dBm}$ | dBm | -60 | -55 | - |
| | Gain = -10 dB, $R_s = 600\Omega$ Balanced, $P_{in} = -10\text{ dBm}$ | 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 output | Vp-p | 1 | - | - |
| AE | I/Q Gain Balance, $f_{I/Q} = 2.5\text{ MHz}$ | dB | - | - | Δ0.5 |
| PE | I/Q Phase Error, $f_{I/Q} = 2.5\text{ MHz}$ | Deg | - | - | ±3 |
| GACC | Gain Accuracy, $V_{CONT} = 1\text{ to }2\text{ V}$ | 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 |
| GF | Gain Flatness at $f_{IF} \pm 2.5\text{ MHz}$ | dB | - | - | Δ0.5 |

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

| 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 RATINGS¹, ($T_A = 25^\circ\text{C}$)

| 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.

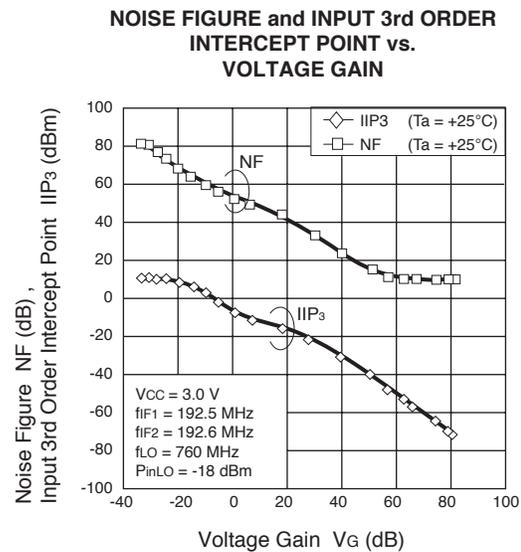
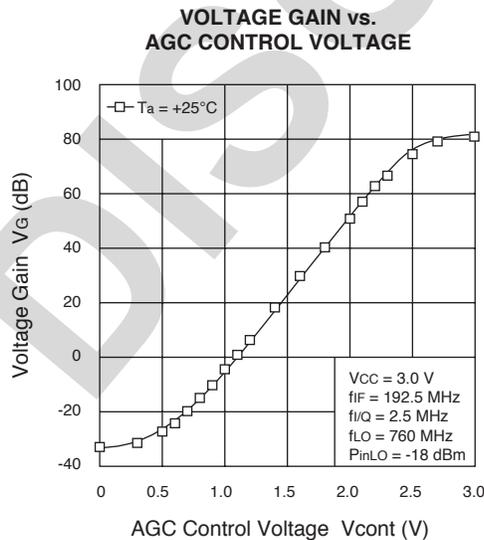
RECOMMENDED OPERATING CONDITIONS

| 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 |

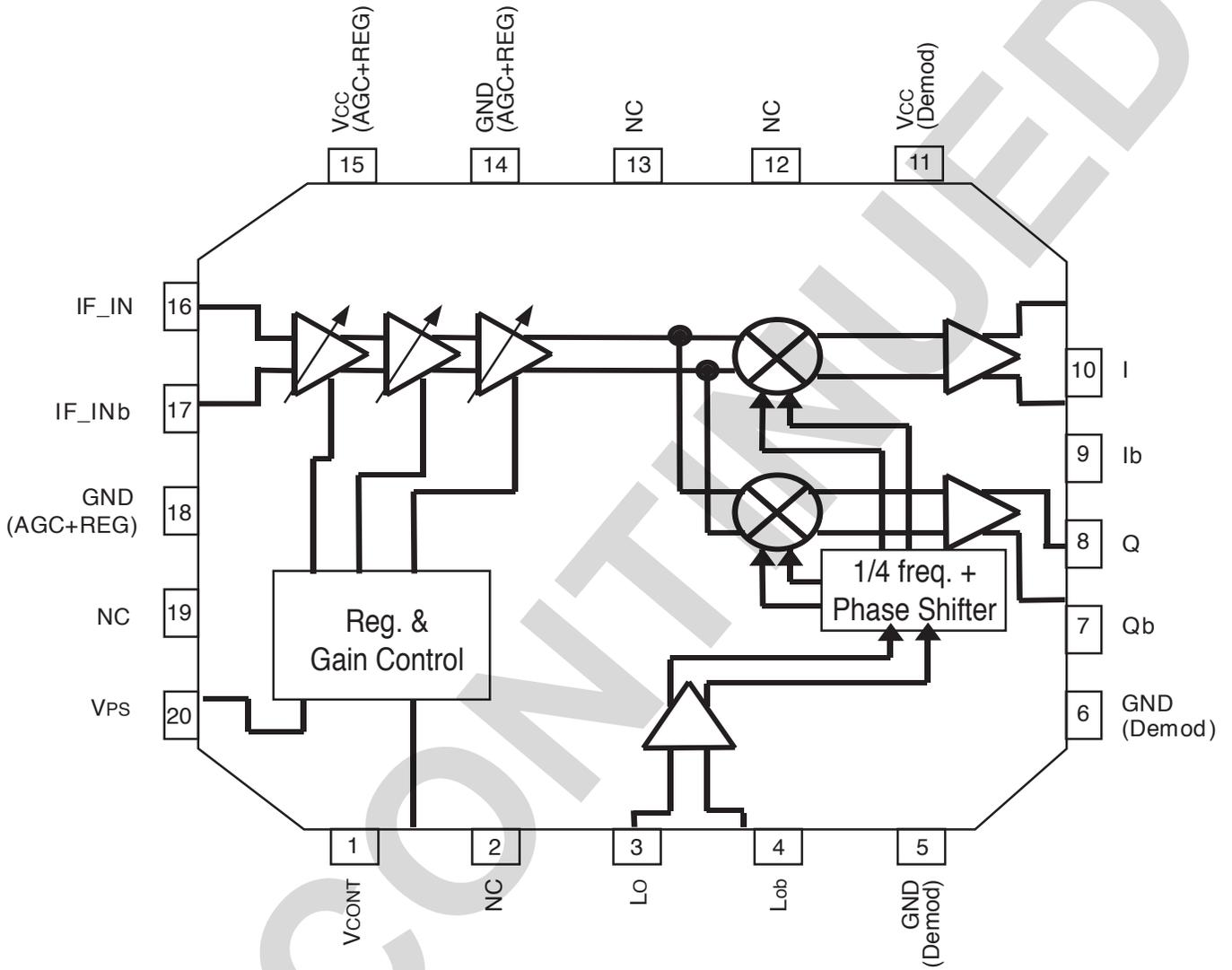
ORDERING INFORMATION

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

TYPICAL PERFORMANCE CURVES ($V_{CC} = 3.0\text{ V}$, $V_{PS} = 2.5\text{ V}$, $f_{IF} = 192.5\text{ MHz}$, $f_{LO} = 760\text{ MHz}$, $P_{LO} = -15\text{ dBm}$, $f_{I/Q} = 2.5\text{ MHz}$, $V_{I/Q} = 400\text{ mV}_{P-P}$ balanced)



BLOCK DIAGRAM (Units in mm)



PIN FUNCTIONS (Pin Voltage is measured at Vcc = 3.0 V)

| Pin No. | Pin Name | Applied Voltage (V) | Pin Voltage (V) | Functions and Applications | Internal Equivalent Circuits |
|----------|-----------------------|---------------------|-----------------|---|------------------------------|
| 1 | Vcont | 0 to Vcc | - | 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 impedance. | - |
| 7 | Qb | - | 1.40 | I/Q/Ib/Qb signal output pins. | |
| 8 | Q | - | 1.40 | Each pin is an emitter follower. | |
| 9 | Ib | - | 1.40 | Each of Ib and Qb is differential output of I and Q. | |
| 10 | I | - | 1.40 | Recommendable load impedance is 10 to 20 kΩ. | |
| 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 | - | TEST pin. In actual use, this pin should be grounded. | - |
| 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. | - |

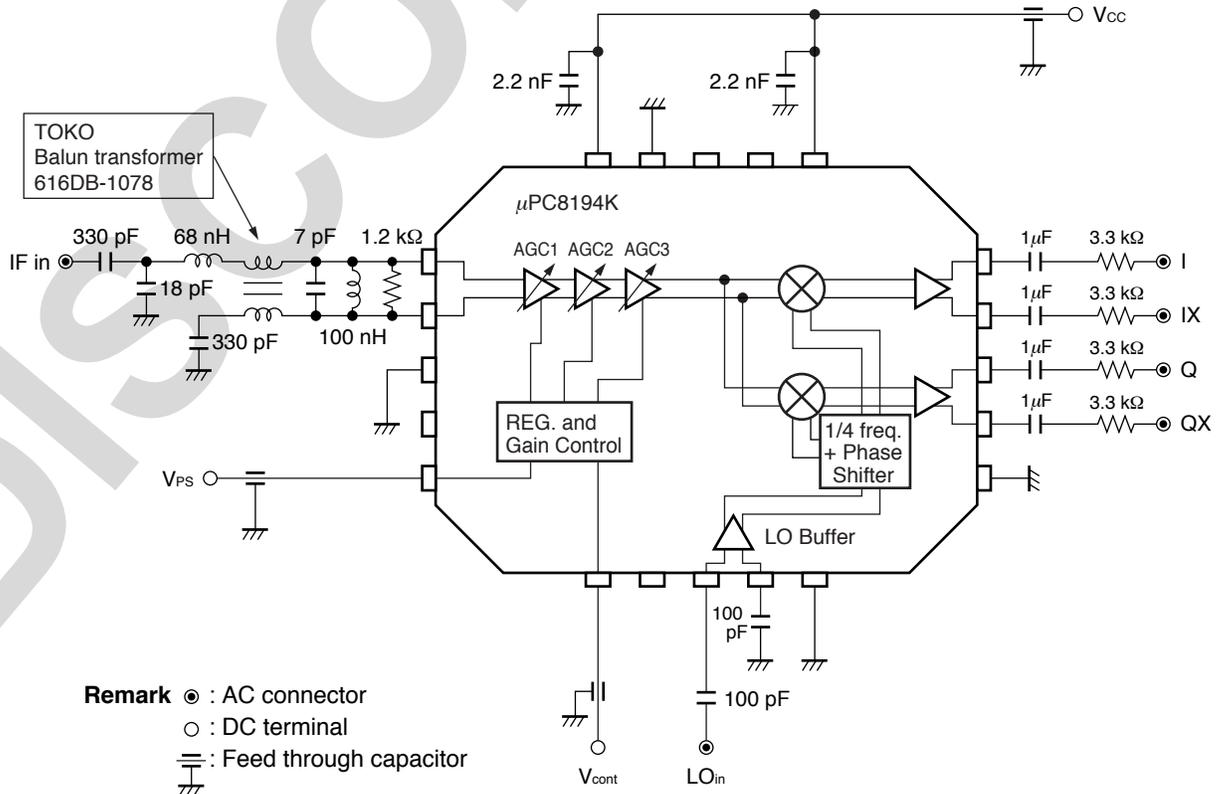
UPC8194K

PIN FUNCTIONS (Pin Voltage is measured at Vcc = 3.0 V)

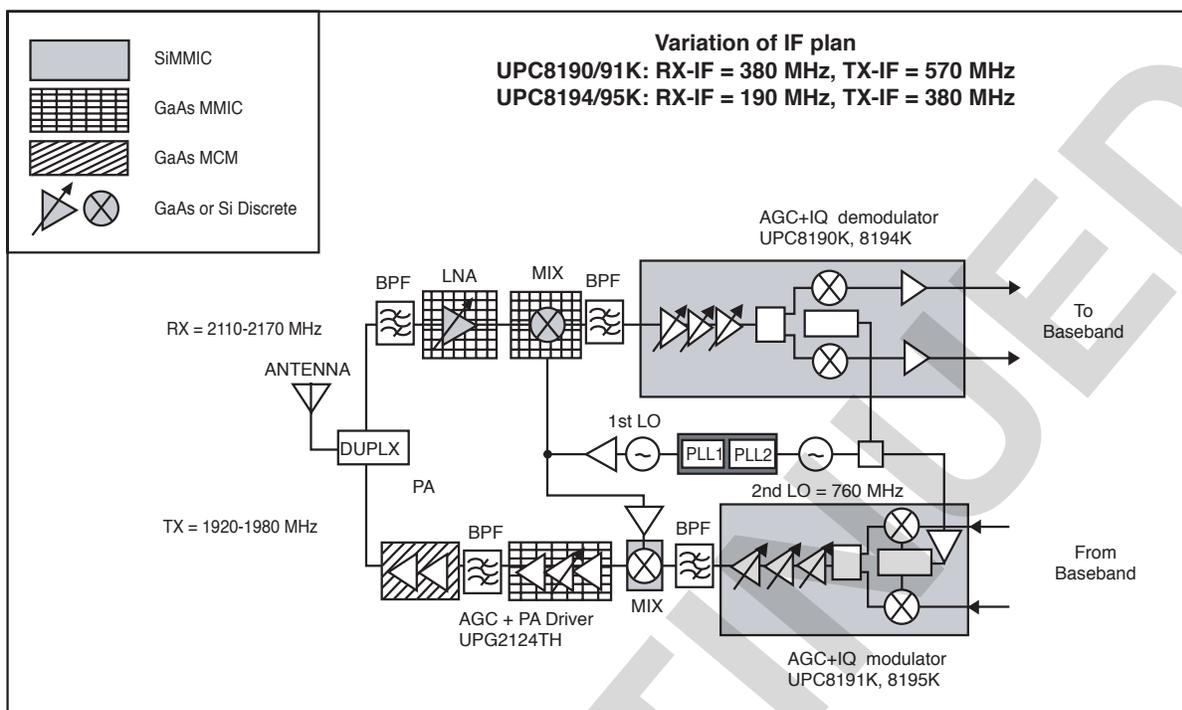
| Pin No. | Pin Name | Applied Voltage (V) | Pin Voltage (V) | Functions and Applications | Internal Equivalent Circuits |
|---------|-----------------|---------------------------------------|-----------------|---|------------------------------|
| 15 | VCC (AGC, REG.) | 2.7 to 3.3 | - | Supply voltage 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 | Vps | High: 2.2 to Vcc Low: 0 to 0.5 | - | Power saving pin. This pin modulator can control Active/Sleep state with bias as follows. | |

| Vps (V) | State |
|----------|-------------|
| 0 to 0.5 | Sleep Mode |
| 2.2 to 3 | Active Mode |

MEASUREMENT CIRCUIT (Units in mm)

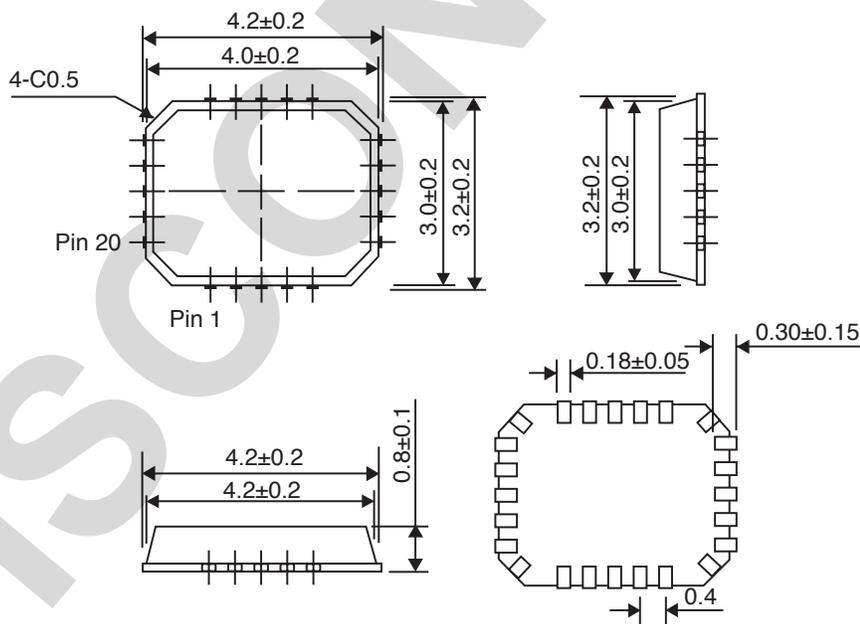


APPLICATION EXAMPLE: W-CDMA



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.

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

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.

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