



# TX-IF SiMMIC FOR W-CDMA AGC + I/Q MODULATOR

## UPC8195K

### FEATURES

- **TX-IF:**  
380 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**

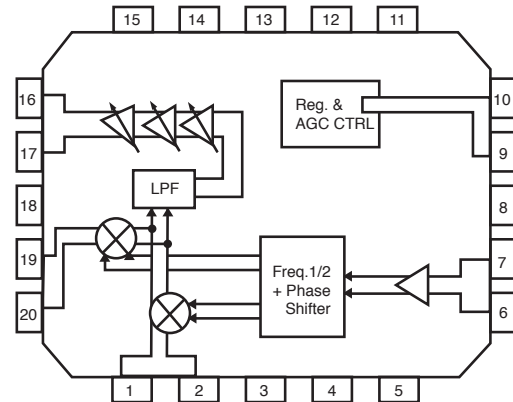
### DESCRIPTION

NEC's UPC8195K is a Silicon Microwave Monolithic Integrated Circuit designed as a transmitter/TX section for W-CDMA. The UPC8195K is a TX-IF IC including IF-AGC amplifier and modulator. 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, $T_A = 25^\circ\text{C}$ , $V_{CC} = 3.0\text{ V}$ , $f_{IF} = 380\text{ MHz}$ , $f_{LO} = 760\text{ MHz}$ , $P_{LO} = -15\text{ dBm}$ , $f_{I/Q} = 10\text{ kHz}$ , $400\text{ mVp-p}$ balanced sine-wave)

| PART NUMBER<br>PACKAGE OUTLINE |  |       | UP8195K<br>QFN-20 |      |     |
|--------------------------------|--|-------|-------------------|------|-----|
| SYMBOLS                        | PARAMETERS AND CONDITIONS  | UNITS | MIN               | TYP  | MAX |
| I <sub>CC</sub>                | Circuit Current, no input signals<br>At power saving mode  | mA    | -                 | 25.5 | 30  |
|                                |  | μA    | -                 | -    | 1   |
| P <sub>OUT</sub>               | Output Power, $V_{CONT} = 2.3\text{ V}$ , I/Q = 400mVp-p balanced<br>$V_{CONT} = 0.3\text{ V}$ , I/Q = 400mVp-p balanced | dBm   | -17               | -13  | -   |
|                                |  |       | -                 | -88  | -83 |
| LoL                            | Local Leakage, $V_{CONT} = 2.3\text{ V}$ , I/Q = 400mVp-p balanced   | dBc   | -                 | -    | -30 |
| I <sub>mR</sub>                | Image Rejection, $V_{CONT} = 2.3\text{ V}$ , I/Q = 400mVp-p balanced   | dBc   | -                 | -    | -30 |
| TPS(Rise)                      | Rise time from power-saving mode   | us    | -                 | -    | 10  |
| VPS(Rise)                      | Rising voltage from power-saving mode  | V     | 2.2               | -    | -   |
| VPS(fall)                      | Falling voltage from power-saving mode   | V     | -                 | -    | 0.5 |

**STANDARD CHARACTERISTICS FOR REFERENCE** (unless otherwise specified,  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 3.0\text{ V}$ ,  $f_{IF} = 380\text{ MHz}$ ,  $f_{LO} = 760\text{ MHz}$ ,  $P_{LO} = -15\text{ dBm}$ ,  $f_{I/Q} = 10\text{ kHz}$ ,  $400\text{ mVp-p}$  balanced sine-wave)

| PART NUMBER<br>PACKAGE OUTLINE |   |        | UP8195K<br>QFN-20 |      |      |
|--------------------------------|---|--------|-------------------|------|------|
| SYMBOLS                        | PARAMETERS AND CONDITIONS   | UNITS  | MIN               | TYP  | MAX  |
| NFL1                           | Output Noise Level 1, $P_{out} = -25\text{ dBm}$ , $f_{IF} \pm 20\text{ MHz}$ | dBm/Hz | -                 | -147 | -    |
| NFL2                           | Output Noise Level 2, $P_{out} = -65\text{ dBm}$ , $f_{IF} \pm 20\text{ MHz}$ | dBm/Hz | -                 | -160 | -    |
| GF                             | Gain Flatness, $f_{IF} \pm 2.5\text{ MHz}$                                    | dB     | -                 | -    | 0.25 |
| EVM                            | Error Vector Magnitude, I/Q = 3.84 Msps QPSK                                  | %rms   | -                 | 3    | -    |
| ACPR                           | Adjacent Channel Power Ratio, $f_{IF} \pm 5\text{ MHz}$ , I/Q=3.84 Msps QPSK  | dBc    | -                 | -55  | -    |

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** ( $T_A = 25^\circ\text{C}$ )

| SYMBOLS                             | PARAMETERS                    | UNITS | RATINGS                      |
|-------------------------------------|-------------------------------|-------|------------------------------|
| V <sub>CC</sub>                     | Supply Voltage                | V     | 4.0                          |
| V <sub>PS</sub> , V <sub>CONT</sub> | Applied Voltage               | V     | -0.3 to V <sub>CC</sub> +0.3 |
| T <sub>A</sub>                      | Operating Ambient Temperature | °C    | -40 to +85                   |
| T <sub>STG</sub>                    | Storage Temperature           | °C    | -55 to +150                  |
| P <sub>D</sub>                      | Power Dissipation             | mW    | 309                          |

Notes:

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

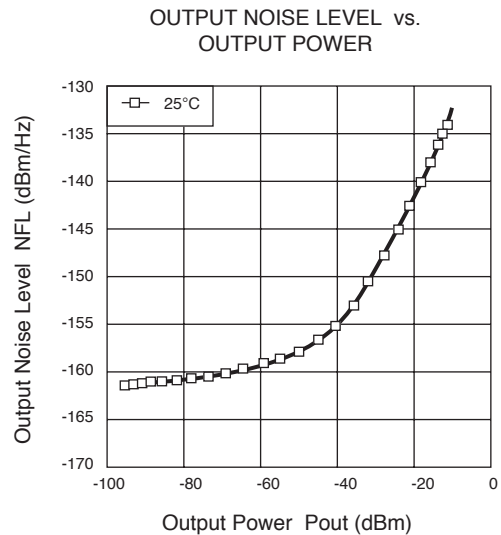
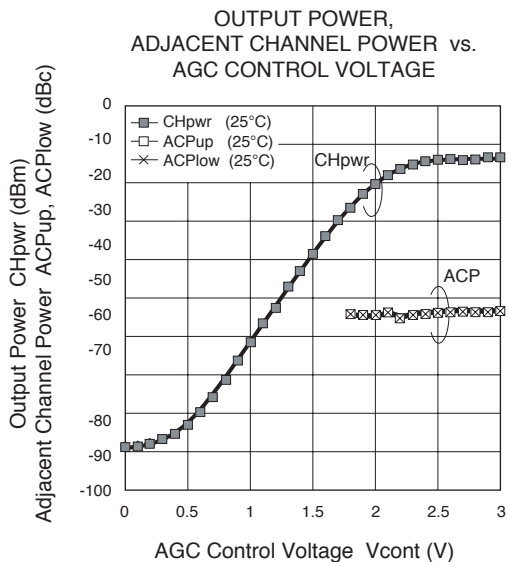
**RECOMMENDED OPERATING CONDITIONS**

| SYMBOLS          | PARAMETERS   | UNITS | MIN | TYP | MAX |
|------------------|--|-------|-----|-----|-----|
| V <sub>CC</sub>  | Supply Voltage   | V     | 2.7 | 3.0 | 3.3 |
| T <sub>A</sub>   | Operating Ambient Temperature                            | °C    | -25 | +25 | +85 |
| f <sub>IF</sub>  | IF Frequency   | MHz   | -   | 380 | -   |
| f <sub>LO</sub>  | Local Frequency  | MHz   | -   | 760 | -   |
| P <sub>LO</sub>  | Local input Level  | dBm   | -18 | -15 | -12 |
| Z <sub>IF</sub>  | IF output impedance, Balanced output internal resistance | kΩ    | -   | 1   | -   |
| V <sub>I/Q</sub> | I/Q Maximum Input Voltage                                | V     | -   | 0.4 | 1   |

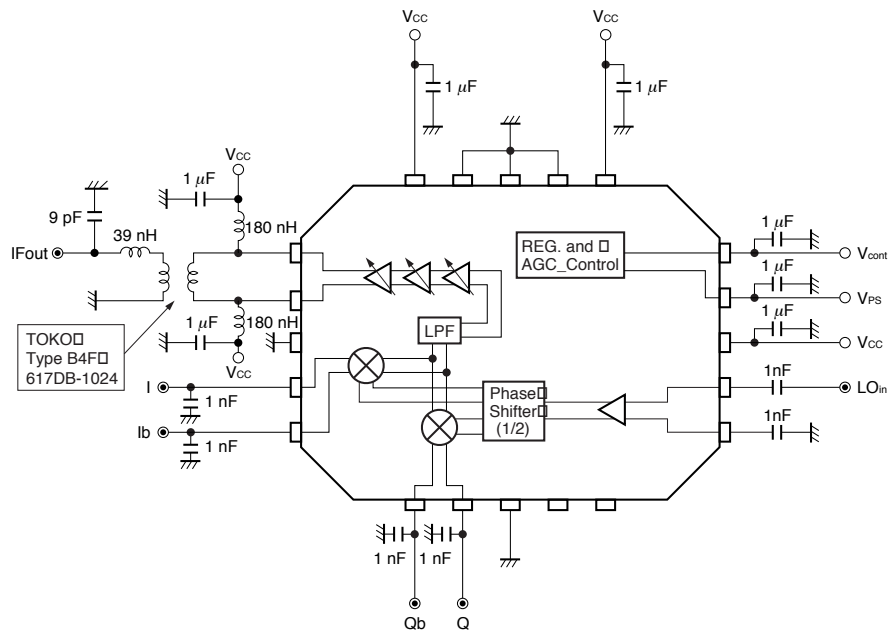
**ORDERING INFORMATION**

| Part Number   | Package            |
|---------------|--------------------|
| UPC8195K-E1-A | 20 Pin plastic QFN |

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



**MEASUREMENT CIRCUIT** (Units in mm)



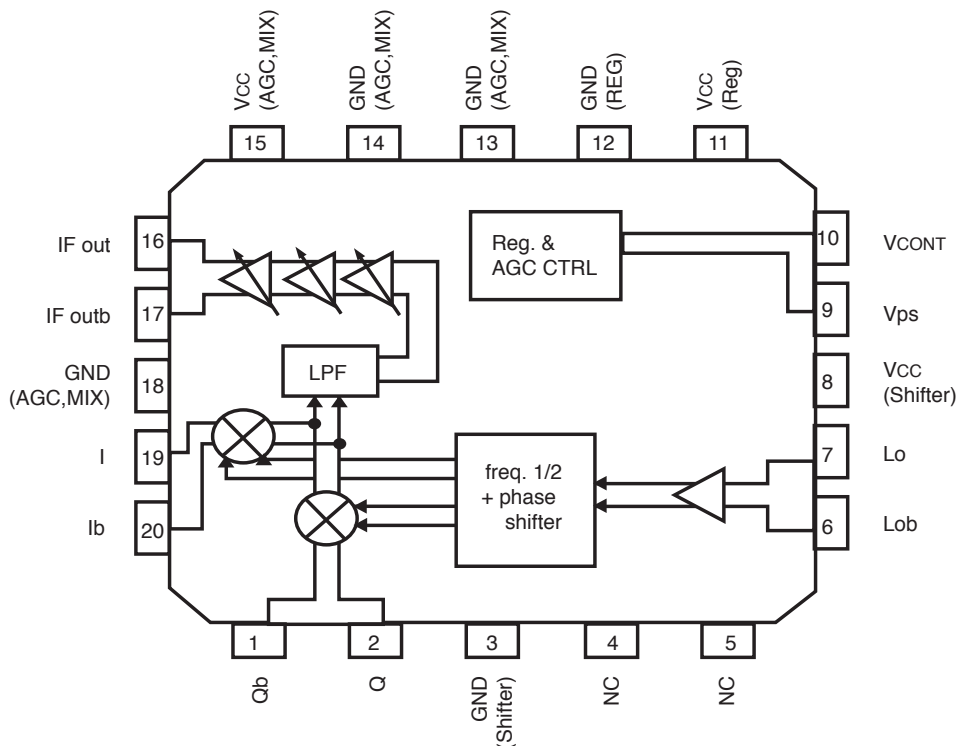
Remarks 1.  $\odot$  : AC connector

$\square$  : DC terminal

2. In the case of ACPR, output noise level, EVM measurement, 1 nF capacitors of I, Ib, Q, Qb are removed.

$\square$

**BLOCK DIAGRAM** (Units in mm)



**PASSW**

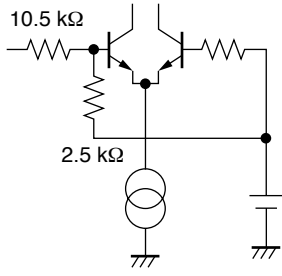
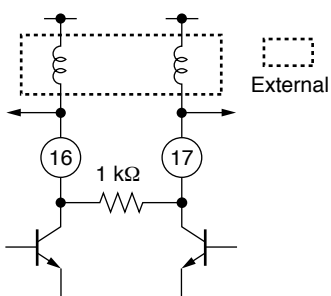

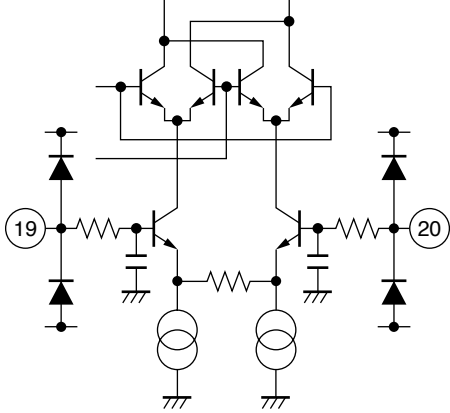
- UPC8191K: Mix = two pieces of Divide-by-2 F/F phase shifter (=3/4). Pin 4, 5 are for external Tank circuit.
- UPC8195K: Only one piece of Divide-by-2 F/F phase shifter (=1/2). Pin 4, 5 are non-connection.

**PIN FUNCTIONS** (Pin Voltage is measured at  $V_{CC} = 2.85\text{ V}$ )

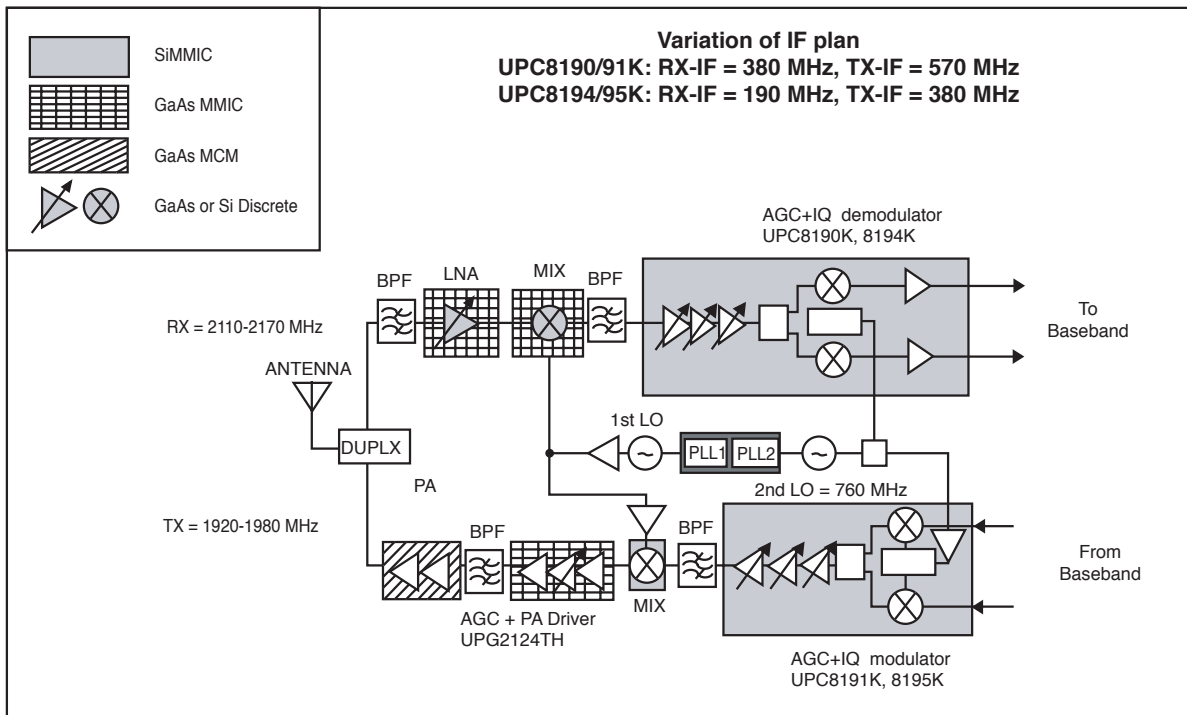
| Pin No. | Pin Name                  | Applied Voltage (V) | Pin Voltage (V) | Functions and Applications  | Internal Equivalent Circuits |
|---------|---------------------------|---------------------|-----------------|---|------------------------------|
| 1       | Qb                        | $V_{CC}/2$          | -               | Q signal input pin.<br>Apply bias voltage externally.<br>Maximum balance input voltage is 1 000 mV <sub>p-p</sub> (balance).  |                              |
| 2       | Q                         | $V_{CC}/2$          | -               |   |                              |
| 3       | GND (Shifter)             | 0                   | -               | Ground pin of I/Q modulator.<br>This pin should be grounded with minimum inductance.<br>Form the ground pattern as widely as possible to minimize ground impedance. | -                            |
| 4<br>5  | N.C.                      | 0                   | -               | No connection<br><br>This pin is not connected to internal circuit<br><br>This pin should be opened or grounded.  | -                            |
| 6       | LOb                       | 0                   | 2.02            | Bypass pin of local signal input for I/Q modulator.<br><br>In the case of single local input, this pin must be decoupled with capacitor ex. 1 000 pF.               | -                            |
| 7       | LO                        | 0                   | 2.02            | Local signal input of I/Q modulator.<br>The DC cut capacitor ex. 1 000 pF must be attached to this pin.   | -                            |
| 8       | V <sub>CC</sub> (Shifter) | 2.7 to 3.3          | -               | Supply voltage pin of I/Q modulator.  | -                            |
| 9       | V <sub>PS</sub>           | 0 to 3.0            | -               | Power saving pin of I/Q modulator + AGC amplifier.<br><br>This pin modulator can control Active/Sleep state with bias as follows.                                   |                              |

| V <sub>PS</sub> (V) | State       |
|---------------------|-------------|
| 0 to 0.5            | Sleep Mode  |
| 2.2 to 3            | Active Mode |

**PIN FUNCTIONS** (Pin Voltage is measured at  $V_{cc} = 2.85\text{ V}$ )

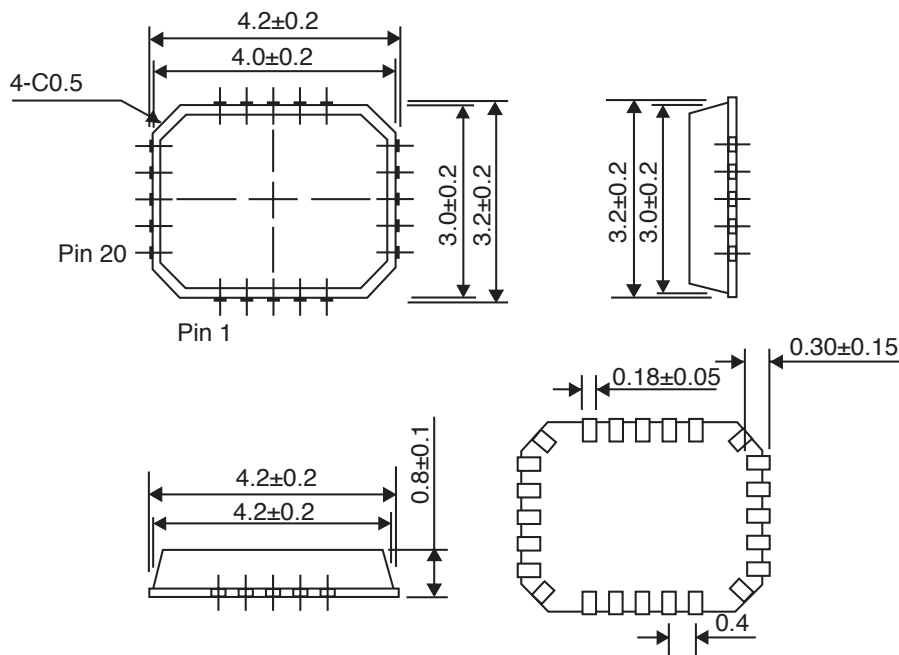
| Pin No.        | Pin Name                   | Applied Voltage (V) | Pin Voltage (V) | Functions and Applications   | Internal Equivalent Circuits  |
|----------------|----------------------------|---------------------|-----------------|--|---|
| 10             | Vcont                      | 0 to 3.0            | -               | Gain control pin of AGC amplifier. Variable gains are available in accordance with applied voltage between 0 to 3.0 V.   |    |
| 11             | V <sub>cc</sub> (REG.)     | 2.7 to 3.3          | -               | Supply voltage pin of internal regulator.  | -   |
| 12             | GND (REG.)                 | 0                   | -               | Ground pin internal regulator. This pin should be grounded with minimum inductance.<br><br>Form the ground pattern as widely as possible to minimize ground impedance.                               | -   |
| 13<br>14<br>18 | GND (AGC, MIX)             | 0                   | -               | Ground pin of AGC amplifier + I/Q Mixer.<br><br>This pin should be grounded with minimum inductance.<br><br>Form the ground pattern as widely as possible to minimize ground impedance.              | -   |
| 15             | V <sub>cc</sub> (AGC, MIX) | 2.7 to 3.3          | -               | Supply voltage pin of AGC amplifier + I/Q Mixer.   | -   |
| 16             | IFout                      | 2.7 to 3.3          | -               | IF output pin.<br><br>The inductor must be attached between V <sub>cc</sub> and output pin due to open collector.<br><br>Output frequency is 570 MHz which is 3/4 of local signal frequency 760 MHz. |  |
| 17             | IFoutb                     | 2.7 to 3.3          | -               | Balance output of IFout pin.<br><br>The inductor must be attached between V <sub>cc</sub> and output pin due to open collector.  |  |
| 19             | I                          | V <sub>cc</sub> /2  | -               | I signal input pin.<br><br>Apply bias voltage externally.<br><br>Maximum balance input voltage is 1 000 mVP-P (balance).   |  |
| 20             | Ib                         | V <sub>cc</sub> /2  | -               |  |   |

**APPLICATION EXAMPLE: W-CDMA**



**OUTLINE DIMENSIONS** (Units in mm)

**Package Outline QFN-20**



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04/15/2002

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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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