CEL

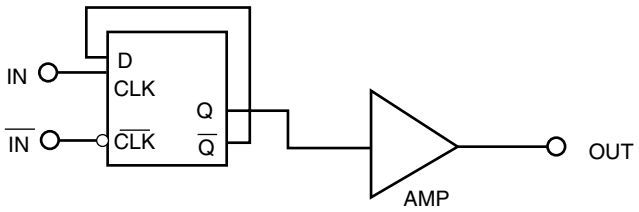
# 3.0 GHz DIVIDE BY 2 PRESCALER

# UPB1508GV

## FEATURES

- **HIGH FREQUENCY OPERATION TO 3 GHz**
- **FIXED DIVIDE RATIO:** ÷2
- **LOW CURRENT CONSUMPTION:** 12 mA at 5 V
- **SMALL PACKAGE:** 8 pin SSOP
- **AVAILABLE IN TAPE AND REEL**

## INTERNAL BLOCK DIAGRAM




## DESCRIPTION

NEC's UPB1508GV is a Silicon RFIC digital prescaler manufactured with the NESAT™ IV silicon bipolar process. It features frequency response to 3 GHz, a divide-by-two ratio, and operates on a 5 volt supply while drawing only 12 mA. The device is housed in a small 8 pin SSOP package that contributes to system miniaturization. The low power consumption and wide frequency operation makes the device well suited for use in a PLL synthesizer for UHF/VHF TV and DBS tuner applications.

## ELECTRICAL CHARACTERISTICS ($T_A$ = -40 to +85°C, $V_{CC}$ = 4.5 to 5.5 V, $Z_S$ = $Z_L$ = 50 Ω)

| PART NUMBER<br>PACKAGE OUTLINE | | | UPB1508GV<br>S08 | | |
|---|---|---|---|---|---|
| **SYMBOLS** | **PARAMETERS AND CONDITIONS** | **UNITS** | **MIN** | **TYP** | **MAX** |
| $I_{CC}$ | Supply Current | mA | 7.6 | 12 | 14.5 |
| $f_{IN\ (U)}$ | Upper Limit Operating Frequency, $P_{IN}$ = -10 to +6 dBm<br>$P_{IN}$ = -15 to +6 dBm | GHz<br>GHz | 3.0<br>2.7 | | |
| $f_{IN\ (L)}$ | Lower Limit Operating Frequency, $P_{IN}$ = -15 to +6 dBm | GHz | | | 0.5 |
| $P_{IN}$ | Input Power, $f_{IN}$ = 2.7 to 3.0 GHz<br>$f_{IN}$ = 0.5 to 2.7 GHz | dBm<br>dBm | -10<br>-15 | | +6<br>+6 |
| $P_{OUT}$ | Output Power, $P_{IN}$ =0 dBm, $f_{IN}$ = 2 GHz | dBm | -12 | -7 | |

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

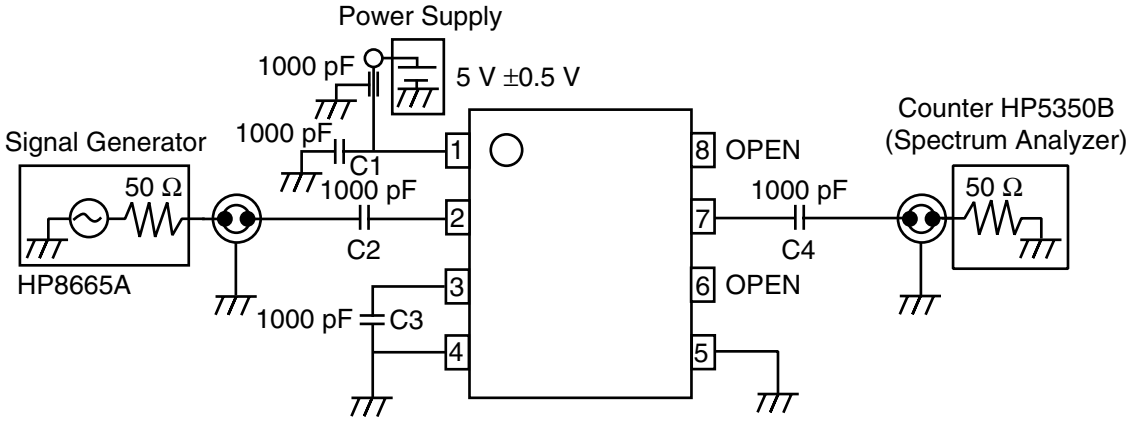
| SYMBOLS | PARAMETERS | UNITS | RATINGS |
|---|---|---|---|
| $V_{CC}$ | Supply Voltage | V | 6.0 |
| $V_{IN}$ | Input Voltage | V | 6.0 |
| $P_T$ | Total Power Dissipation[2] | mW | 250 |
| $T_{OP}$ | Operating Temperature | °C | -40 to +85 |
| $T_{STG}$ | Storage Temperature | °C | -55 to +150 |

Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on a double-sided copper clad 50x50x1.6 mm epoxy glass PWB ($T_A$ = +85°C).

## RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | UNITS | MIN | TYP | MAX |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | V | 4.5 | 5.0 | 5.5 |
| $T_{OP}$ | Operating Temperature | °C | -40 | +25 | +85 |

## TEST CIRCUIT

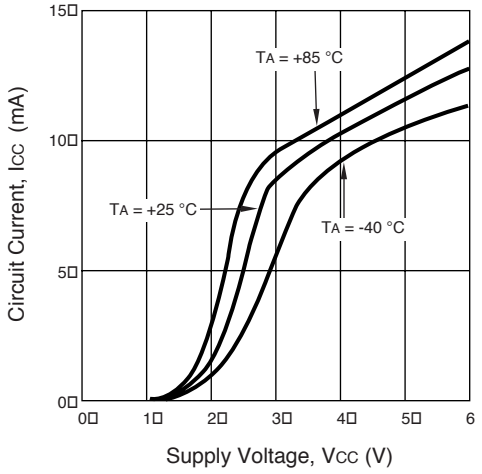



## PIN DESCRIPTIONS

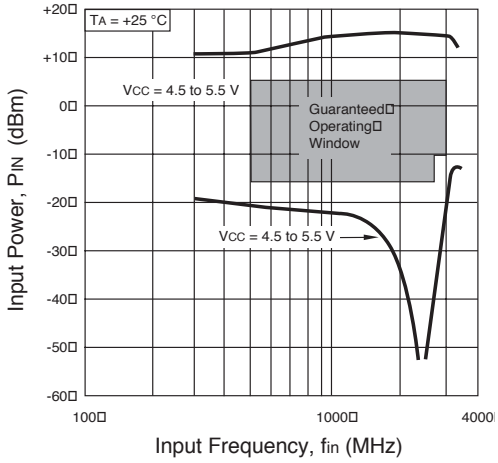
| Pin no. | Symbol | Applied Voltage | Pin Voltage | Description |
|---|---|---|---|---|
| 1 | $V_{CC}$ | 4.5 to 5.5 | | Power supply pin. This pin must be equipped with bypass capacitor (eg 1000 pF) to ground. |
| 2 | IN | | 1.7 to 4.95 | Signal input pin. This pin should be coupled with a capacitor (eg 1000 pF). |
| 3 | $\overline{IN}$ | | 1.7 to 4.95 | Signal input bypass pin. This pin must be equipped with a bypass capacitor (eg 1000 pF) to ground. |
| 4, 5 | GND | 0 | | Ground pin. Ground pattern on the board should be formed as wide as possible to minimize ground impedance. |
| 6 | NC | | | No connection. This pin should be left open. |
| 7 | OUT | | 1.0 to 4.7 | Divided frequency output pin. This pin should be coupled to load device with a capacitor (eg 1000 pF). |
| 8 | NC | | | No connection. This pin should be left open. |

## TYPICAL PERFORMANCE CURVES (Unless otherwise specified, $T_A$ = 25°C)

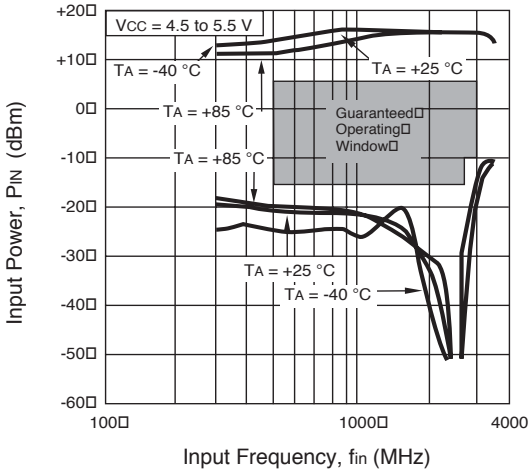
CIRCUIT CURRENT vs.
SUPPLY VOLTAGE and TEMPERATURE



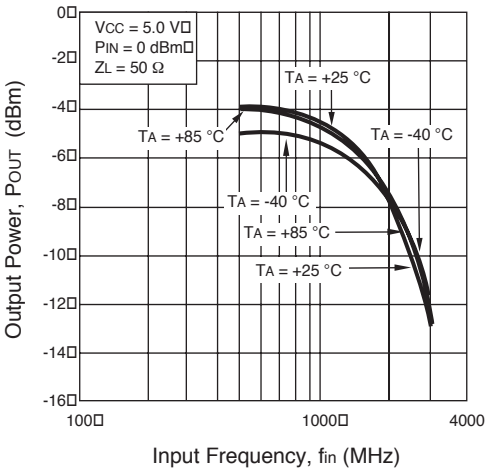

INPUT POWER vs.
INPUT FREQUENCY and VOLTAGE



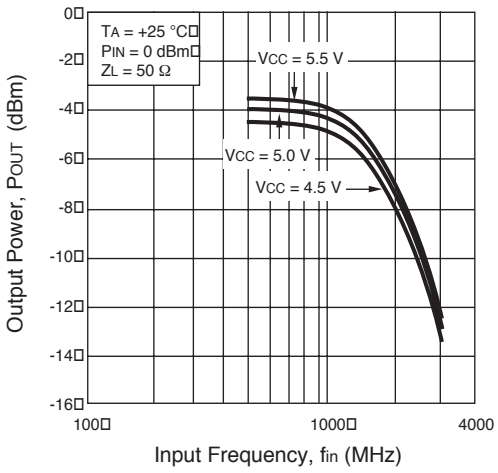

INPUT POWER vs.
INPUT FREQUENCY and TEMPERATURE



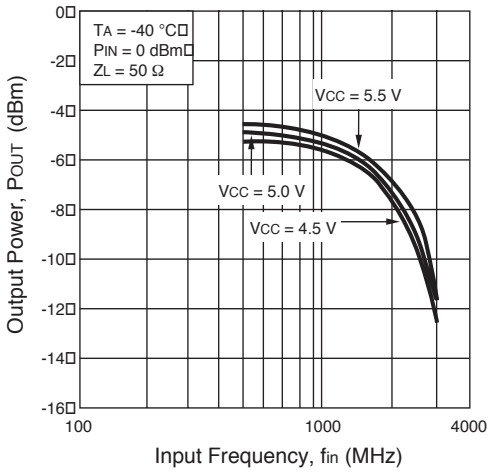

OUTPUT POWER vs.
INPUT FREQUENCY and VOLTAGE




OUTPUT POWER vs.
INPUT FREQUENCY and VOLTAGE

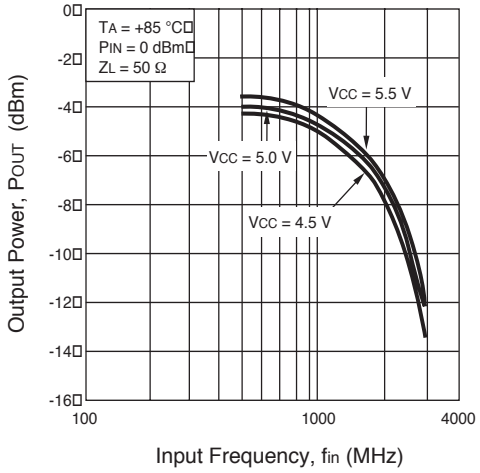



OUTPUT POWER vs.
INPUT FREQUENCY and VOLTAGE



## TYPICAL PERFORMANCE CURVES (Unless otherwise specified, $T_A$ = 25 °C)

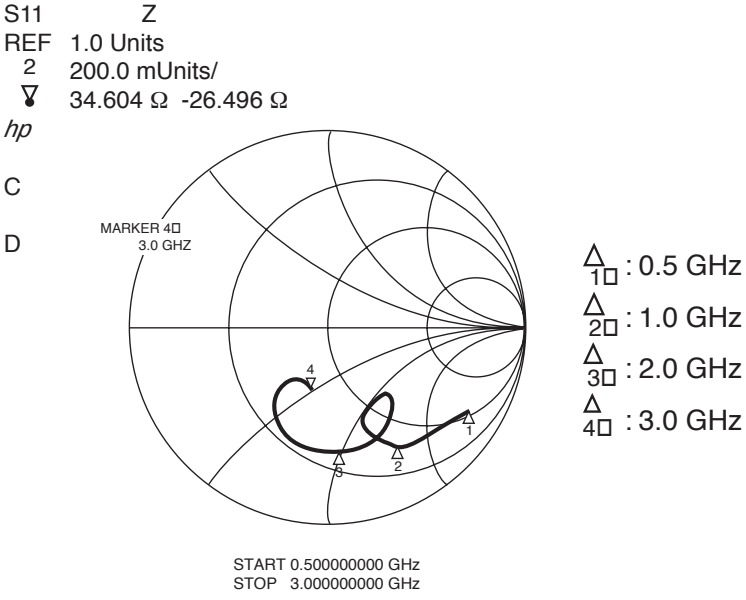
**OUTPUT POWER vs. INPUT FREQUENCY and VOLTAGE**




## TYPICAL SCATTERING PARAMETERS ($T_A$ = 25 °C)

**$S_{11}$ vs. INPUT FREQUENCY**

**$V_{CC}$ = 5.0 V**

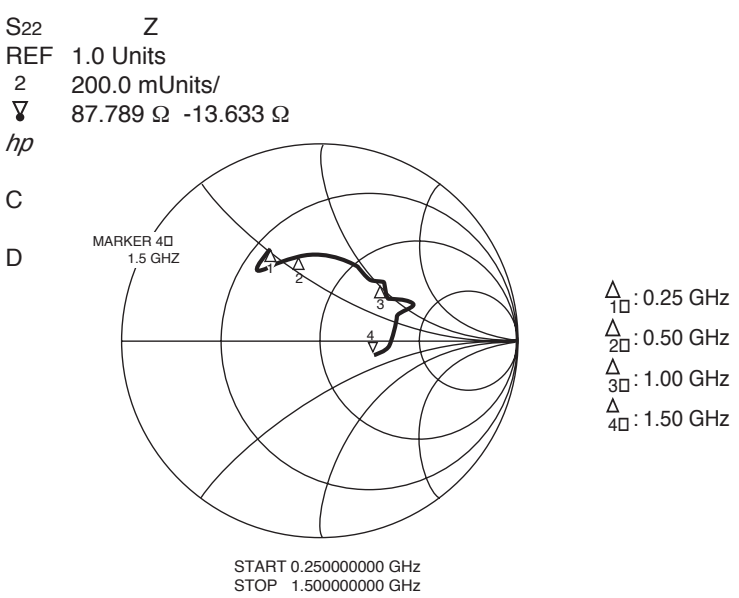



| FREQUENCY | $S_{11}$ | |
|---|---|---|
| GHz | MAG | ANG |
| 0.5 | 0.850 | -30.2 |
| 0.6 | 0.796 | -37.8 |
| 0.7 | 0.790 | -39.2 |
| 0.8 | 0.754 | -45.2 |
| 0.9 | 0.766 | -53.7 |
| 1.0 | 0.701 | -57.6 |
| 1.1 | 0.660 | -62.3 |
| 1.2 | 0.606 | -67.2 |
| 1.3 | 0.571 | -70.3 |
| 1.4 | 0.521 | -70.6 |
| 1.5 | 0.495 | -68.3 |
| 1.6 | 0.441 | -60.6 |
| 1.7 | 0.479 | -45.1 |
| 1.8 | 0.602 | -62.3 |
| 1.9 | 0.595 | -74.2 |
| 2.0 | 0.608 | -82.9 |
| 2.1 | 0.603 | -89.8 |
| 2.2 | 0.599 | -97.3 |
| 2.3 | 0.588 | -107.7 |
| 2.4 | 0.532 | -122.0 |
| 2.5 | 0.396 | -132.0 |
| 2.6 | 0.325 | -127.1 |
| 2.7 | 0.270 | -123.6 |
| 2.8 | 0.232 | -122.7 |
| 2.9 | 0.258 | -105.8 |
| 3.0 | 0.351 | -103.7 |

## TYPICAL SCATTERING PARAMETERS ($T_A$ = 25 °C)

**$S_{22}$ vs. OUTPUT FREQUENCY**

**$V_{CC}$ = 5.0 V, $f_{in}$ = 498 MHz**

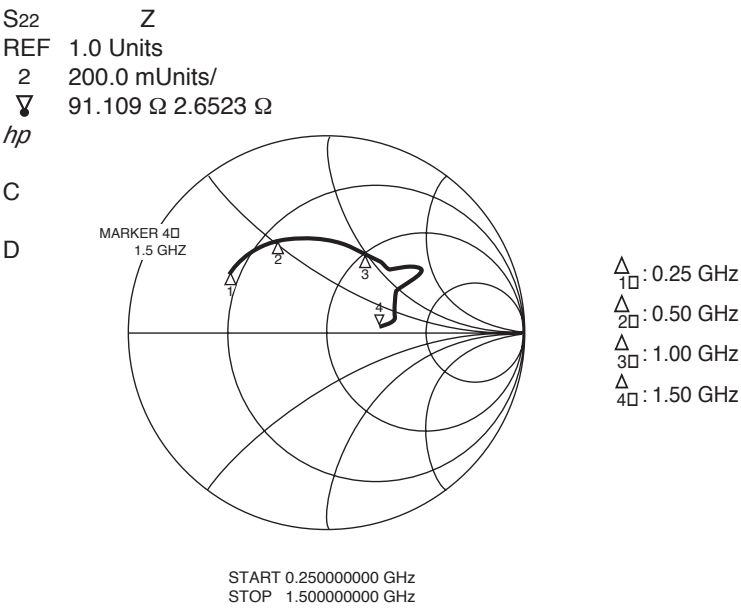



△1: 0.25 GHz
△2: 0.50 GHz
△3: 1.00 GHz
△4: 1.50 GHz

| FREQUENCY | $S_{22}$ | |
|---|---|---|
| GHz | MAG | ANG |
| 0.25 | 0.526 | 118.9 |
| 0.30 | 0.463 | 131.2 |
| 0.35 | 0.466 | 124.7 |
| 0.40 | 0.460 | 117.1 |
| 0.45 | 0.441 | 110.2 |
| 0.50 | 0.456 | 103.0 |
| 0.55 | 0.353 | 94.8 |
| 0.60 | 0.438 | 91.1 |
| 0.65 | 0.444 | 83.9 |
| 0.70 | 0.436 | 78.3 |
| 0.75 | 0.435 | 71.8 |
| 0.80 | 0.431 | 65.9 |
| 0.85 | 0.431 | 60.3 |
| 0.90 | 0.431 | 53.7 |
| 0.95 | 0.408 | 49.2 |
| 1.00 | 0.445 | 44.9 |
| 1.05 | 0.428 | 41.0 |
| 1.10 | 0.429 | 33.7 |
| 1.15 | 0.355 | 42.7 |
| 1.20 | 0.418 | 20.0 |
| 1.25 | 0.403 | 17.1 |
| 1.30 | 0.392 | 9.6 |
| 1.35 | 0.368 | 3.3 |
| 1.40 | 0.343 | -3.4 |
| 1.45 | 0.319 | -9.2 |
| 1.50 | 0.289 | -14.1 |

**$S_{22}$ vs. OUTPUT FREQUENCY**

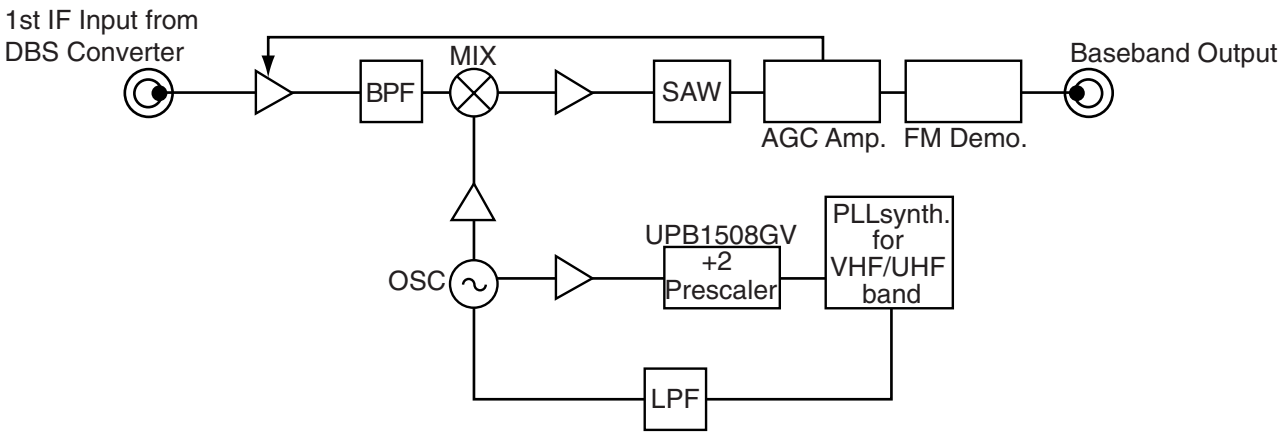
**$V_{CC}$ = 5.0 V, $f_{in}$ = 3002 MHz**




△1: 0.25 GHz
△2: 0.50 GHz
△3: 1.00 GHz
△4: 1.50 GHz

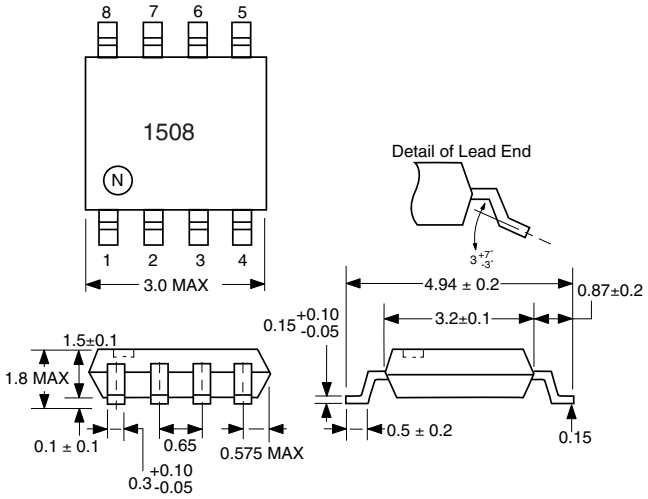
| FREQUENCY | $S_{22}$ | |
|---|---|---|
| GHz | MAG | ANG |
| 0.25 | 0.555 | 146.6 |
| 0.30 | 0.545 | 139.9 |
| 0.35 | 0.571 | 136.1 |
| 0.40 | 0.529 | 127.9 |
| 0.45 | 0.521 | 122.4 |
| 0.50 | 0.515 | 116.9 |
| 0.55 | 0.510 | 104.5 |
| 0.60 | 0.492 | 106.6 |
| 0.65 | 0.487 | 100.9 |
| 0.70 | 0.482 | 95.3 |
| 0.75 | 0.473 | 89.9 |
| 0.80 | 0.461 | 83.8 |
| 0.85 | 0.454 | 78.4 |
| 0.90 | 0.449 | 72.3 |
| 0.95 | 0.430 | 69.6 |
| 1.00 | 0.443 | 64.3 |
| 1.10 | 0.440 | 52.3 |
| 1.15 | 0.438 | 46.0 |
| 1.20 | 0.501 | 37.5 |
| 1.25 | 0.408 | 32.9 |
| 1.30 | 0.388 | 25.1 |
| 1.35 | 0.359 | 16.3 |
| 1.40 | 0.335 | 9.7 |
| 1.45 | 0.304 | 3.1 |
| 1.50 | 0.285 | 4.6 |

## SYSTEM APPLICATION EXAMPLE

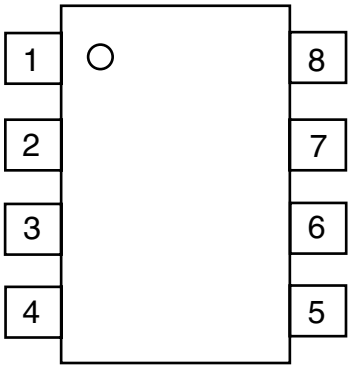



## OUTLINE DIMENSIONS (Units in mm)

**PACKAGE OUTLINE S08**




## PIN CONNECTION




PIN CONNECTIONS

| | |
|---|---|
| 1. $V_{CC}$ | 5. GND |
| 2. IN | 6. NC |
| 3. $\overline{IN}$ | 7. OUT |
| 4. GND | 8. NC |

## ORDERING INFORMATION

| PART NUMBER | QUANTITY |
|---|---|
| UPB1508GV-E1-A | 1000/Reel |

Note:
1. Embossed tape 8 mm wide.
   Pin 1 is in the tape pull-out direction.

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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.