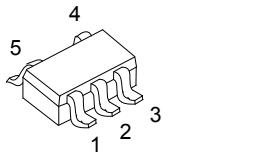
# ULV8691

**CMOS IC**

## LOW COST, CMOS, RRO OPERATIONAL AMPLIFIER




SOT-25

## ■ DESCRIPTION

The UTC **ULV8691** is low cost, single rail-to-rail output, single-supply amplifier featuring low offset and input voltages, low current noise, and wide signal bandwidth. The combination of low offset, low noise, very low input bias currents, and high speed make this amplifier useful in a wide variety of applications. Filters, integrators, photodiode amplifiers, and high impedance sensors all benefit from this combination of performance features. Audio and other ac applications benefit from the wide bandwidth and low distortion of the device.

Applications for the amplifier include power amplifier (PA) controls, laser diode control loops, portable and loop-powered instrumentation, audio amplification for portable devices, and ASIC input and output amplifiers.

## ■ FEATURES

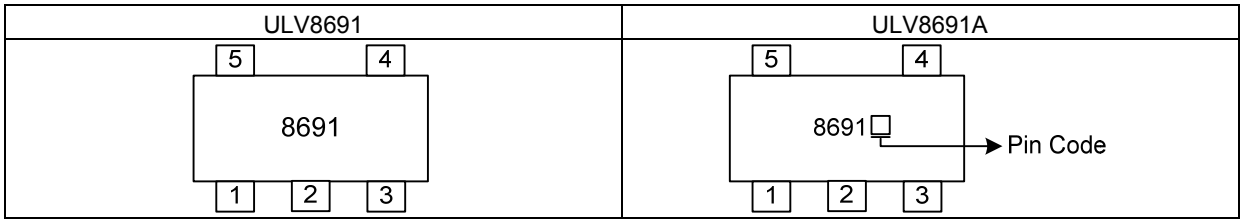
* Supply Voltage:2.7~6V
* Supply Current/Amplifier:1.15 mA (Max)
* Input Offset Voltage:2mV (Max)
* Rail-to-Rail Output
* Slew Rate: 6.4V/μs (Typ.)

## ■ ORDERING INFORMATION

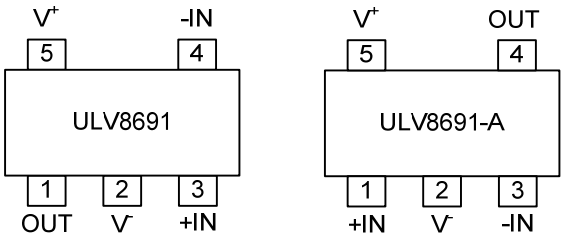
| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| ULV8691L-AF5-x-R | ULV8691G-AF5-x-R | SOT-25 | Tape Reel |

| | |
|---|---|
| ULV8691G-AF5-x-R<br>(1)Packing Type<br>(2)Pin Assignment<br>(3)Package Type<br>(4)Green Package | (1) R: Tape Reel<br>(2) Refer to Pin Assignment<br>(3) AF5: SOT-25<br>(4) G: Halogen Free and Lead Free, L: Lead Free |

## ■ MARKING



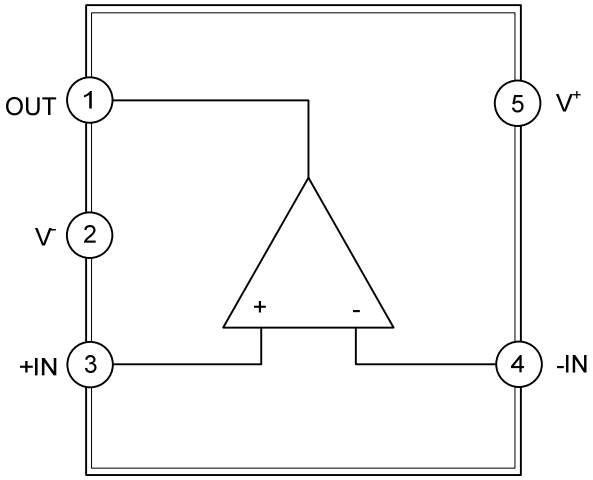

## ■ PIN CONFIGURATION




## ■ PIN DESCRIPTION

| PIN NO. | PIN NAME | DESCRIPTION |
|---|---|---|
| 1 | OUT | Output |
| 2 | $V^-$ | Negative power supply |
| 3 | +IN | Non-inverting Input |
| 4 | -IN | Inverting Input |
| 5 | $V^+$ | Positive power supply |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING ($T_A$=25°C, unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | | 6 | V |
| Input Voltage | | $V^-$ - 0.3 ~ $V^+$+ 0.3 | V |
| Differential Input Voltage | $V_{ID}$ | Supply Voltage | V |
| Junction Temperature Range | $T_J$ | +150 | °C |
| Storage Temperature Range | $T_{STG}$ | -65~ +150 | °C |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ RECOMMENDED OPERATING CONDITIONS

over operating free-air temperature range (unless otherwise specified.)

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Supply Voltage | $V^+$ - $V^-$ | 2.7 | | 6 | V |
| Operating Free-Air Temperature | $T_{OPR}$ | -40 | | 125 | °C |

## ■ THERMAL DATA

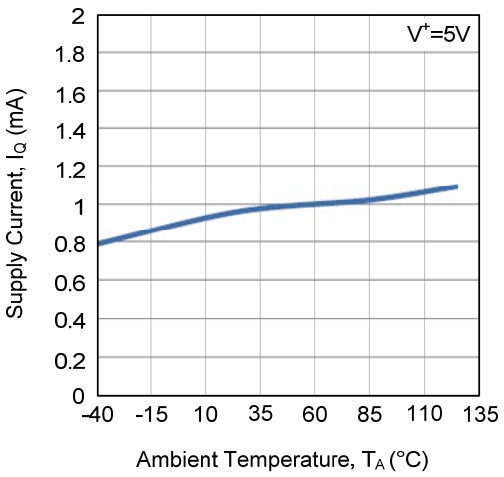
| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Junction to Ambient | $\theta_{JA}$ | 230 | °C/W |

## ■ ELECTRICAL CHARACTERISTICS ($V^+$=2.7~5V, $V_{CM}$= $V^+$/2, $T_A$=25°C, unless otherwise specified.)

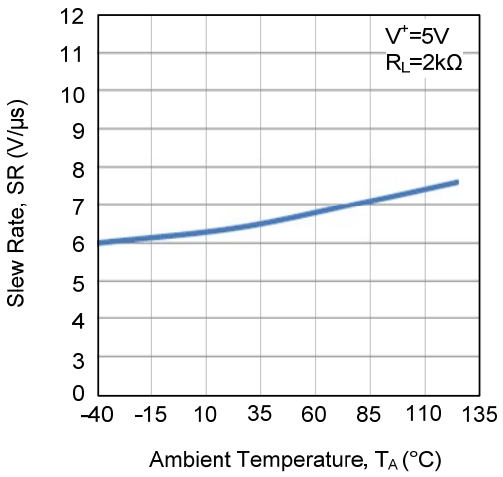
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Supply Current/Amplifier | $I_Q$ | $V_O$ = 0V | | | 0.95 | 1.15 | mA |
| Power Supply Rejection Ratio | PSRR | $V^+$ = 2.7V ~ 5.5V | | 80 | 110 | | dB |
| Input Offset Voltage | $V_{OS}$ | $V_{CM}$ = -0.3V ~ $V^+$-1.1V | | | 0.3 | 2 | mV |
| Input Offset Voltage Drift | $\Delta V_{OS}/\Delta T$ | | | | 3 | | μV/°C |
| Input Bias Current | $I_B$ | | | | 1 | | pA |
| Input Offset Current | $I_{OS}$ | | | | 1 | | pA |
| Common-Mode Voltage Range | $V_{CM}$ | | | -0.3 | | $V^+$-1.1 | V |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$ =-0.3V ~ $V^+$-1.1V | | 68 | 105 | | dB |
| Large Signal Voltage Gain | $A_V$ | $V_O$= 0.5V ~ 4.5V, $R_L$ =2kΩ, | | 80 | 98 | | dB |
| Output Voltage | $V_O$ | $I_L$ = 1mA | $V_{OH}$ | $V^+$-0.06 | $V^+$-0.03 | | V |
| | | | $V_{OL}$ | | 0.02 | 0.04 | V |
| | | $I_L$ = 10mA | $V_{OH}$ | 4.7 | 4.76 | | V |
| | | | $V_{OL}$ | | 0.15 | 0.21 | V |
| Short-Circuit Current | $I_{SC}$ | Sourcing | | | 37 | | mA |
| | | Sinking | | | 59 | | mA |
| Slew Rate | SR | $R_L$ =2kΩ | | | 6.4 | | V/μs |
| Gain-Bandwidth Product | GBW | | | | 8 | | MHz |
| Input-Referred Voltage Noise | $e_n$ | f = 1kHz | | | 10 | | nV/$\sqrt{Hz}$ |
| Input-Referred Current Noise | $i_n$ | f = 1kHz | | | 0.07 | | pA/$\sqrt{Hz}$ |

## ■ TYPICAL CHARACTERISTICS

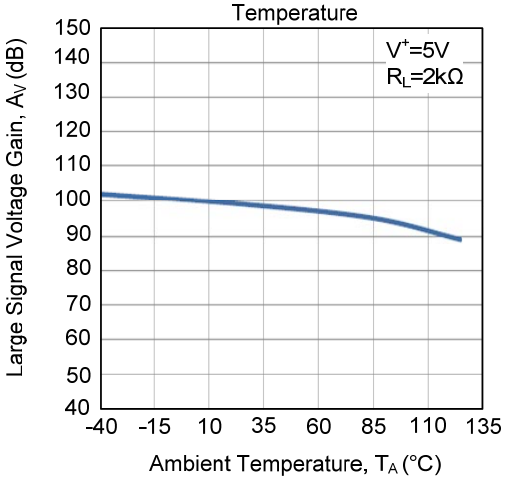
Supply Current vs. Temperature



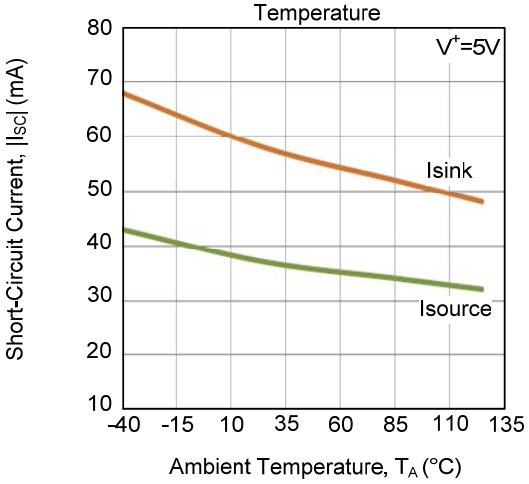

Slew Rate vs. Temperature



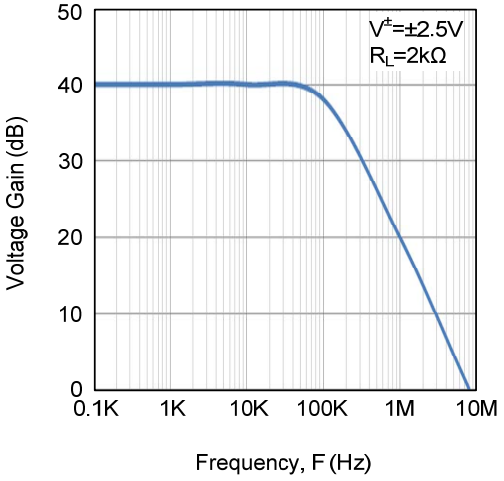

Large Signal Voltage Gain vs. Temperature




Output Short Circuit Current vs. Temperature




Voltage Gain vs. Frequency




Phase Shift vs. Frequency