



# UM601A

## LINEAR INTEGRATED CIRCUIT

### VOLTAGE AND CURRENT CONTROLLER

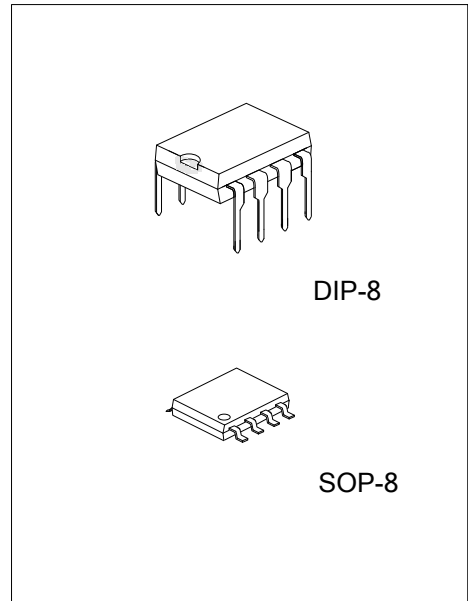
■ DESCRIPTION

The UTC **UM601A** integrated circuit incorporates a high stability series band gap voltage reference, two ORed operational amplifiers and a current source.

This IC compares the DC voltage and the current level at the output of a switching power supply to an internal reference. It provides a feedback through an optocoupler to the PWM controller IC in the primary side.

The controlled current generator can be used to modify the level of current limitation by offsetting the information coming from the current sensing resistor.

It can be used in voltage supervisors, every types of application requiring a precision voltage regulation and current limitation, over voltage protection, battery charger with a constant voltage and a limited output current.



■ FEATURES

- \* 1.24V Series Voltage Reference with 10mA Output Current and 1% Precision (**UM601A**)
- \* Two Operational Amplifiers with ORed Output and 1MHz Gain Bandwidth Product
- \* Built-In Current Generator with Enable / Disable Function
- \* 4.5 ~ 32V Supply Voltage Range

■ ORDERING INFORMATION

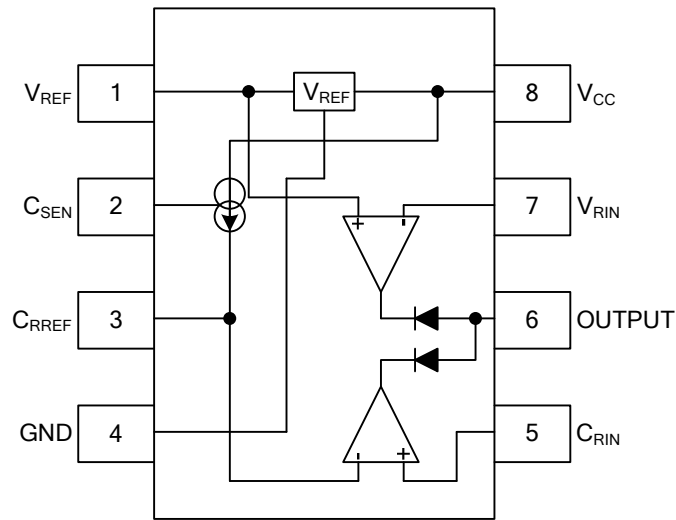
| Ordering Number |               | Package | Packing   |
|-----------------|---------------|---------|-----------|
| Lead Free       | Halogen Free  |         |           |
| UM601AL-D08-T   | UM601AG-D08-T | DIP-8   | Tube      |
| UM601AL-S08-R   | UM601AG-S08-R | SOP-8   | Tape Reel |

|   |   |
|---|---|
| <p>UM601AG-D08-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> | <p>(1) T: Tube, R: Tape Reel</p> <p>(2) D08: DIP-8, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|---|---|

■ MARKING

| DIP-8 | SOP-8 |
|-------|-------|
|       |       |

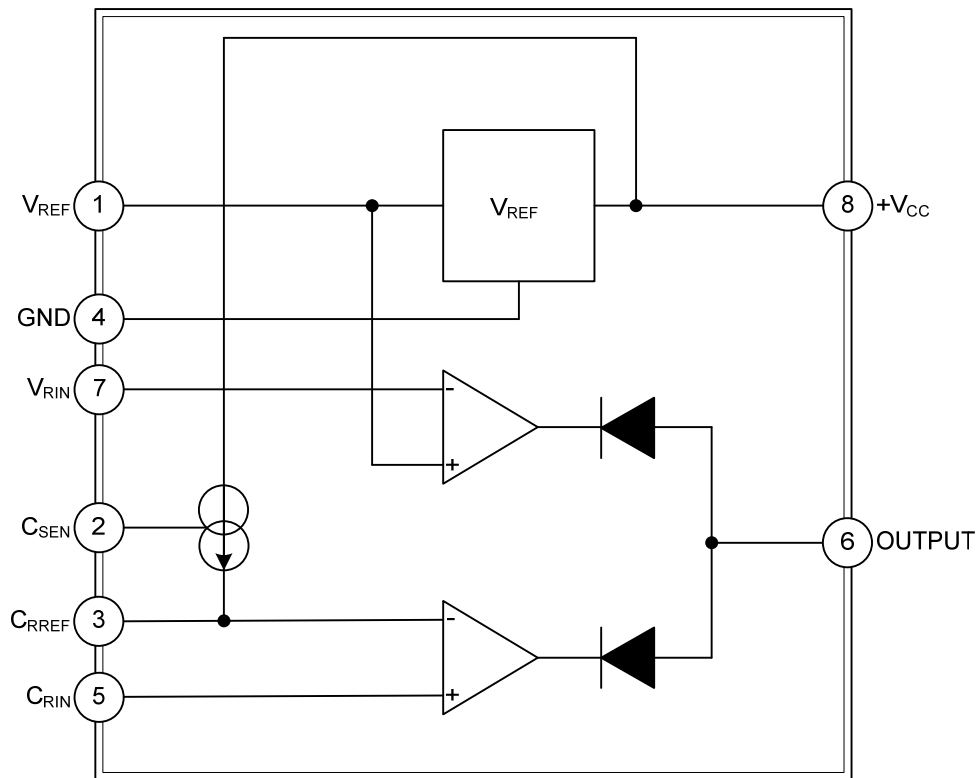
## ■ PIN CONFIGURATION



## ■ PIN DESCRIPTION

| PIN | NAME       | TYPE   | FUNCTION   |
|-----|------------|--------|--|
| 1.  | $V_{REF}$  | OUTPUT | Voltage Reference Output 1.24V, 10mA max. Do not short circuit   |
| 2.  | $C_{SEN}$  | INPUT  | Current source enable input. This current source can be used to offset the voltage measurement on the sense resistor and therefore to modify the charge current. The current source is enabled when the input volage on pin 2 is lower than 0.8V |
| 3.  | $C_{RREF}$ | INPUT  | Current Limitation Reference Input   |
| 4.  | GND        | INPUT  | Ground   |
| 5.  | $C_{RIN}$  | INPUT  | Current Limitation Loop Input, connected to the sense resistor   |
| 6.  | OUTPUT     | OUTPUT | Output pin common to the voltage regulation and current limitation loops. This output can drive the primary side (LED) of an optocoupler   |
| 7.  | $V_{RIN}$  | INPUT  | Voltage Regulation Loop Input  |
| 8.  | $V_{CC}$   | INPUT  | Power Supply Input (4.5 ~ 32VDC)   |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER            | SYMBOL    | RATINGS             | UNIT |
|----------------------|-----------|---------------------|------|
| DC Supply Voltage    | $V_{CC}$  | 36                  | V    |
| Output Current       | $I_{OUT}$ | 20                  | mA   |
| Input Voltage        | $V_{IN}$  | -0.3 ~ $V_{CC}-1.5$ | V    |
| Input Current        | $I_{IN}$  | ±1                  | mA   |
| Power Dissipation    | $P_D$     | 200                 | mW   |
| Junction Temperature | $T_J$     | +150                | °C   |
| Storage Temperature  | $T_{STG}$ | -40 ~ +125          | °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.

## ■ OPERATING CONDITIONS

| PARAMETER                     | SYMBOL    | RATINGS   | UNIT |
|-------------------------------|-----------|-----------|------|
| Supply Voltage                | $V_{CC}$  | 4.5 ~ 32  | V    |
| Ambient Operating Temperature | $T_{OPR}$ | -20 ~ +80 | °C   |

## ■ THERMAL DATA

| PARAMETER           | SYMBOL        | RATINGS   | UNIT |
|---------------------|---------------|-----------|------|
| Junction to Ambient | $\theta_{JA}$ | 130 ~ 200 | °C/W |

## ■ ELECTRICAL CHARACTERISTICS ( $V_{CC}=15V$ , $T_A=25^\circ C$ , unless otherwise specified)

| PARAMETER                      | SYMBOL     | TEST CONDITIONS   | MIN                     | TYP   | MAX          | UNIT    |    |
|--------------------------------|------------|---|-------------------------|-------|--------------|---------|----|
| Total Supply Current           | $I_{CC}$   | $V_{CC}=15V$  |                         |       | 2            | mA      |    |
| Input Voltage                  | $V_I$      |   | 0                       |       | $V_{CC}-1.5$ | V       |    |
| Input Offset Voltage           | $V_{IO}$   | $T_A=25^\circ C$  | -5                      | 1     | 5            | mV      |    |
|                                |            | $T_{MIN.}<T_{AMB.}<T_{MAX.}$  | -7                      |       | 7            | mV      |    |
| Input Bias Current             | $I_{IB}$   | $V_{IN}=1.2V$ on pin 7<br>and $V_{IN}=0V$ on pin5                           | $25^\circ C$            | -700  | -300         | 0       | nA |
|                                |            |   | $T_{MIN.}<T_A<T_{MAX.}$ | -1000 |              | 0       | nA |
| Output Sink Current            | $I_{SINK}$ | $V_{OL}=2.5 V$  | $25^\circ C$            |       | 15           |         | mA |
|                                |            |   | $T_{MIN.}<T_A<T_{MAX.}$ | 8     |              |         | mA |
| Large Signal Voltage Gain      | $A_{VO}$   | $R_L=2k\Omega$ , $T_{MIN.}<T_{AMB.}<T_{MAX.}$                               | 15                      |       |              | V/mV    |    |
| Supply Voltage Rejection Ratio | SVR        | $T_{MIN.}<T_{AMB.}<T_{MAX.}$  | 65                      | 90    |              | dB      |    |
| Common Mode Rejection Ratio    | CMR        | $T_{MIN.}<T_{AMB.}<T_{MAX.}$  |                         | 80    |              | dB      |    |
| Gain Bandwidth Product         | GBP        | $V_{CC}=15V$ , $F=100kHz$ , $V_{IN}=10mV$ ,<br>$R_L=2k\Omega$ , $C_L=100pF$ |                         | 1     |              | MHz     |    |
| Output Leakage Current         | $I_{OH}$   | $T_A=25^\circ C$  |                         |       | 2            | $\mu A$ |    |
|                                |            | $T_{MIN.}<T_{AMB.}<T_{MAX.}$  |                         |       | 7            | $\mu A$ |    |

## VOLTAGE REFERENCE

|                       |          |                              |                                      |       |       |       |        |
|-----------------------|----------|------------------------------|--------------------------------------|-------|-------|-------|--------|
| Reference Voltage     | UM601A-1 | $V_{REF}$                    | $I_{OUT}=1mA$ , $T_{AMB}=25^\circ C$ | 1.227 | 1.240 | 1.252 | V      |
|                       | UM601A-2 |                              |                                      | 1.21  | 1.24  | 1.27  | V      |
| Temperature Stability | $K_{VT}$ | $T_{MIN.}<T_{AMB.}<T_{MAX.}$ |                                      | 30    | 100   |       | ppm/°C |
| Load Regulation       | Reglo    | $1mA < I_{OUT} < 10mA$       |                                      | 5     | 15    |       | mV     |
| Line Regulation       | Regli    | $5V < V_{IN} < 32V$          |                                      | 3.5   | 10    |       | mV     |

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

| PARAMETER                                     | SYMBOL       | TEST CONDITIONS                             | MIN | TYP   | MAX   | UNIT   |
|---|--------------|---|-----|-------|-------|--------|
| <b>CURRENT GENERATOR</b>                      |              |   |     |       |       |        |
| Current Source                                | $I_o$        |   |     | 1.4   |       | mA     |
| Temperature Stability                         | $K_{CGT}$    | $T_{MIN.} < T_{AMB.} < T_{MAX.}$            |     | 500   |       | ppm/°C |
| Line Regulation                               | $C_{gliR}$   | $4.5V < V_{CC} < 32V$                       |     | 0.003 | 0.030 | mV     |
| Voltage at the enable pin to have $I_o=1.4mA$ | $V_{CSEN}$   | $T_{MIN.} < T_{AMB.} < T_{MAX.}$            |     |       | 0.6   | V      |
| Voltage at the enable pin to have $I_o=0mA$   | $V_{CSDIS}$  | $T_{MIN.} < T_{AMB.} < T_{MAX.}$            | 2   |       |       | V      |
| Input Current on the Csen pin                 | $I_{CSEN}$   | $T_{MIN.} < T_{AMB.} < T_{MAX.}$            |     |       | 30    | μA     |
| Leakage Current                               | $I_{CSLEAK}$ | $V_{CS}=2V, T_{MIN.} < T_{AMB.} < T_{MAX.}$ |     | 0.5   | 2     | μA     |

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