

# UTC UM603 LINEAR INTEGRATED CIRCUIT

## DUAL OPERATIONAL AMPLIFIER AND CURRENT CONTROLLER

### DESCRIPTION

The UM603 is a monolithic IC that includes one independent op-amp and another op-amp for which the non inverting input is wired to a 2.5V fixed voltage reference. This device is offering space and cost saving in many applications like power supply management or data acquisition systems

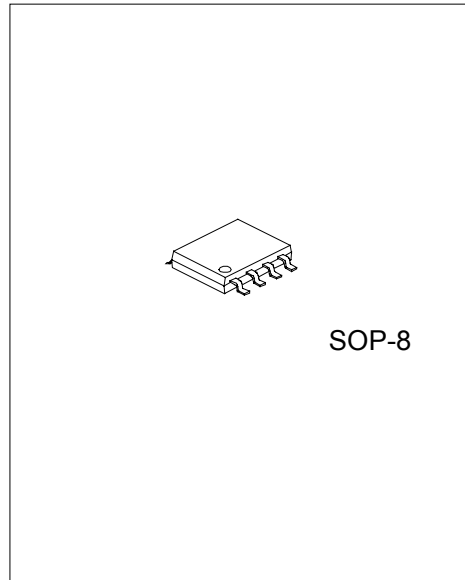
### FEATURES

#### OPERATIONAL AMPLIFIER

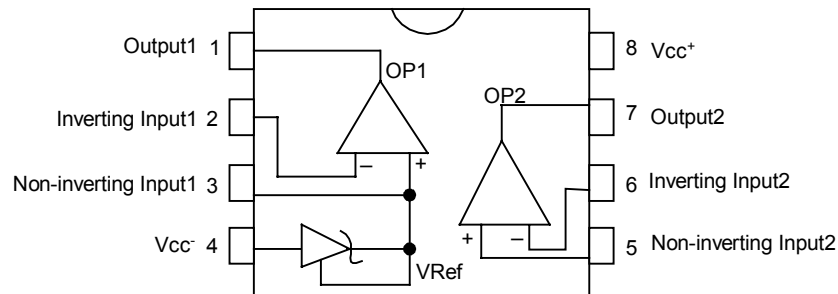
- \*Low input offset voltage: 0.5mV typ.
- \*Low supply current: 350uA/op.(@ Vcc= 5 V)
- \*Medium bandwidth(unity gain): 0.9MHz
- \*Large output voltage swing: 0 V to (Vcc-1.5 V)
- \*Input common mode voltage range includes ground
- \*Wide power supply range: 3V to 32V  
 $\pm 1.5$  TO  $\pm 16$ V

#### VOLTAGE REFERENCE

- \*Fixed output voltage reference 2.5V
- \*Sink current capability : 1 to 100mA
- \*Typical output impedance : 0.2  $\Omega$



### PIN CONFIGURATION



### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                          | SYMBOL | VALUE       | UNIT |
|----------------------------------------------------|--------|-------------|------|
| Supply Voltage                                     | Vcc    | 36          | V    |
| Differential Input Voltage                         | Vid    | 36          | V    |
| Input Voltage                                      | Vin    | -0.3 to +36 | V    |
| Operating Free-air Temperature Range               | Vi     | -55 to +125 | °C   |
| Maximum Junction Temperature                       | Tj     | 150         | °C   |
| Thermal Resistance Junction to Ambient(SO package) | Rthja  | 175         | °C/W |

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## ELECTRICAL CHARACTERISTICS

| PARAMETER                                                       | SYMBOL          | TEST CONDITIONS                                                                                      | MIN | TYP. | MAX | UNIT |
|-----------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| Total Supply Current,excluding Current in the Voltage Reference | I <sub>cc</sub> | V <sub>CC</sub> <sup>+</sup> =5V,no load,<br>T <sub>min.</sub> <T <sub>amb</sub> <T <sub>max.</sub>  | 0.7 |      | 1.2 | mA   |
|                                                                 |                 | V <sub>CC</sub> <sup>+</sup> =30V,no load,<br>T <sub>min.</sub> <T <sub>amb</sub> <T <sub>max.</sub> |     |      | 2   |      |

## OPERATOR2(independent op-amp)

V<sub>CC</sub><sup>+</sup>=+5V,V<sub>CC</sub>=Ground,V<sub>O</sub>=1.4V,T<sub>amb</sub>=25°C(unless otherwise specified)

| PARAMETER                       | SYMBOL              | TEST CONDITIONS                                                                                                                  | MIN      | TYP.     | MAX                    | UNIT   |
|---------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------|----------|----------|------------------------|--------|
| Input Offset Voltage            | V <sub>io</sub>     | V <sub>icm</sub> =0V<br>T <sub>amb</sub> =25°C<br>T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                         |          | 1        | 4<br>5                 | mV     |
| Input Offset Voltage Drift      | DV <sub>io</sub>    |                                                                                                                                  |          | 7        |                        | μV/°C  |
| Input Offset Current            | I <sub>io</sub>     | T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                                                                           |          | 2        | 75<br>150              | nA     |
| Input Bias Current              | I <sub>ib</sub>     | T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                                                                           |          | 20       | 150<br>200             | nA     |
| Large Signal Voltage Gain       | A <sub>vd</sub>     | V <sub>CC</sub> =15V,R <sub>L</sub> =2k,V <sub>O</sub> =1.4V~11.4V<br>T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>     | 50<br>25 | 100      |                        | V/mV   |
| Supply Voltage Rejection Ratio  | SVR                 | V <sub>icm</sub> =0V,V <sub>CC</sub> =5V~30V                                                                                     | 65       | 100      |                        | dB     |
| Input Common Mode Voltage Range | V <sub>icm</sub>    | V <sub>CC</sub> =+30V-see note <sup>1</sup> )                                                                                    | 0        |          | (V <sub>CC</sub> )-1.5 | V      |
|                                 |                     | T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                                                                           | 0        |          | (V <sub>CC</sub> )-2   |        |
| Common Mode Rejection Ratio     | CMR                 | T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                                                                           | 70<br>60 | 85       |                        | dB     |
|                                 |                     |                                                                                                                                  |          |          |                        |        |
| Output Current Source           | I <sub>source</sub> | V <sub>CC</sub> =+15V,V <sub>O</sub> =2V,V <sub>jd</sub> =+1V                                                                    | 20       | 40       |                        | mA     |
| Short Circuit to Ground         | I <sub>o</sub>      | V <sub>CC</sub> =+15V                                                                                                            |          | 40       | 60                     | mA     |
| Output Current Sink             | I <sub>sink</sub>   | V <sub>id</sub> =-1V,<br>V <sub>CC</sub> =+15V,V <sub>O</sub> =2V                                                                | 10<br>12 | 20<br>50 |                        | V      |
|                                 |                     | V <sub>CC</sub> =+15V,V <sub>O</sub> =0.2V                                                                                       |          |          |                        |        |
| High Level Output Voltage       | V <sub>OH</sub>     | V <sub>CC</sub> <sup>+</sup> =30V<br>T <sub>amb</sub> =25°C,R <sub>L</sub> =10k                                                  | 26       | 27       |                        | V      |
|                                 |                     | T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                                                                           | 26       |          |                        |        |
|                                 |                     | T <sub>amb</sub> =25°C,R <sub>L</sub> =10k                                                                                       | 27       | 28       |                        |        |
|                                 |                     | T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                                                                           | 27       |          |                        |        |
| Low Level Output Voltage        | V <sub>OL</sub>     | R <sub>L</sub> =10k<br>T <sub>min.</sub> ≤T <sub>amb</sub> ≤T <sub>max.</sub>                                                    |          | 5        | 20<br>20               | mV     |
| Slew Rate at Unity Gain         | SR                  | V <sub>i</sub> =0.5~3V,V <sub>CC</sub> =15V<br>R <sub>L</sub> =2k,C <sub>L</sub> =100pF,unity gain                               | 0.2      | 0.4      |                        | V/μs   |
| Gain Bandwidth Product          | GBP                 | V <sub>CC</sub> =30V,R <sub>L</sub> =2k,C <sub>L</sub> =100pF<br>F=100kHz,V <sub>in</sub> =10mV                                  | 0.5      | 0.9      |                        | MHz    |
| Total Harmonic Distortion       | THD                 | f=1kHz<br>A <sub>v</sub> =20dB,R <sub>L</sub> =2k,V <sub>CC</sub> =30V<br>C <sub>L</sub> =100pF,V <sub>O</sub> =2V <sub>pp</sub> |          | 0.02     |                        | %      |
| Equivalent Input Noise Voltage  | e <sub>n</sub>      | f=1kHz,R <sub>s</sub> =100Ω,V <sub>CC</sub> =30V                                                                                 |          | 50       |                        | nV/√Hz |

1.The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V<sub>CC</sub><sup>+</sup>-1.5V. Both can go to V<sub>CC</sub>+0.3V without damage.

## OPERATOR1(op-amp with ono-inverting input connected to the internal Vref)

UTC UNISONIC TECHNOLOGIES CO., LTD.

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QW-R121-003,A

# UTC UM603 LINEAR INTEGRATED CIRCUIT

Vcc<sup>+</sup>=+5V, Vcc=Ground, Tamb=1.4V, Tamb=25°C (unless otherwise specified)

| PARAMETER                      | SYMBOL  | TEST CONDITIONS                                                                                                 | MIN                  | TYP.     | MAX      | UNIT  |
|--------------------------------|---------|-----------------------------------------------------------------------------------------------------------------|----------------------|----------|----------|-------|
| Input Offset Voltage           | Vio     | V <sub>icm</sub> =0V<br>Tamb=25°C<br>Tmin. ≤ Tamb ≤ Tmax.                                                       |                      | 1        | 4<br>5   | mV    |
| Input Offset Voltage Drift     | DVio    |                                                                                                                 |                      | 7        |          | μV/°C |
| Input Bias Current             | Iib     | negative input                                                                                                  |                      | 20       |          | nA    |
| Large Signal Voltage Gain      | Avd     | Vicm=0V<br>Vcc=15V, RL=2k                                                                                       |                      | 100      |          | V/mV  |
| Supply Voltage Rejection Ratio | SVR     | Vicm=0V, Vcc=5V ~30V                                                                                            | 65                   | 100      |          | dB    |
| Output Current Source          | Isource | Vcc=+15V, Vo=2V, Vjd=+1V                                                                                        | 20                   | 40       |          | mA    |
| Short Circuit to Ground        | Io      | Vcc=+15V                                                                                                        |                      | 40       | 60       | mA    |
| Output Current Sink            | Isink   | Vid=-1V,<br>Vcc=+15V, Vo=2V<br>Vcc=+15V, Vo=0.2V                                                                | 10<br>12             | 20<br>50 |          | V     |
| High Level Output Voltage      | VOH     | Vcc <sup>+</sup> =30V<br>Tamb=25°C, RL=10k<br>Tmin. ≤ Tamb ≤ Tmax.<br>Tamb=25°C, RL=10k<br>Tmin. ≤ Tamb ≤ Tmax. | 26<br>26<br>27<br>27 | 27<br>28 |          | V     |
| Low Level Output Voltage       | VOL     | RL=10k<br>Tmin. ≤ Tamb ≤ Tmax.                                                                                  |                      | 5        | 20<br>20 | mV    |
| Slew Rate at Unity Gain        | SR      | Vi=0.5 ~ 3V, Vcc=15V<br>RL=2k, CL=100pF, unity gain                                                             | 0.2                  | 0.4      |          | V/μs  |
| Gain Bandwidth Product         | GBP     | Vcc=30V, RL=2K, CL=100pF<br>F=100kHz, Vin=10mV                                                                  | 0.5                  | 0.9      |          | MHz   |
| Total Harmonic Distortion      | THD     | f=1kHz<br>Av=20dB, RL=2k, Vcc=30V<br>CL=100pF, Vo=2Vpp                                                          |                      | 0.02     |          | %     |

## VOLTAGE REFERENCE:

| PARAMETER       | SYMBOL         | Value   | UNIT |
|-----------------|----------------|---------|------|
| Cathode Current | I <sub>k</sub> | 1 ~ 100 | mA   |

| PARAMETER                                                | SYMBOL | TEST CONDITIONS                           | MIN            | TYP. | MAX            | UNIT |
|----------------------------------------------------------|--------|-------------------------------------------|----------------|------|----------------|------|
| Input Offset Voltage                                     | Vref   | ± 0.7%, Tamb=25°C<br>Tmin. ≤ Tamb ≤ Tmax. | 2.482<br>2.465 | 2.5  | 2.518<br>2.535 | V    |
| Reference Input Voltage Deviation Over Temperature Range | ΔVref  | VKA=Vref, Ik=10mA<br>Tmin. ≤ Tamb ≤ Tmax. |                | 7    | 30             | mV   |
| Minimum Cathode Current for Regulation                   | Imin   | VKA=Vref                                  |                | 0.5  | 1              | mA   |
| Dynamic Impedance-note <sup>1)</sup>                     | ZKA    | VKA=Vref,<br>ΔIk=1~100mA, f<1kHz          |                | 0.2  | 0.5            | Ω    |

1. The dynamic impedance is defined as  $|ZKA| = \Delta V_{KA} / \Delta I_K$

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## OPERATIONAL AMPLIFIERS

