

# UTC UM603/A LINEAR INTEGRATED CIRCUIT

## DUAL OPERATIONAL AMPLIFIER AND CURRENT CONTROLLER

### DESCRIPTION

The UM603/A 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

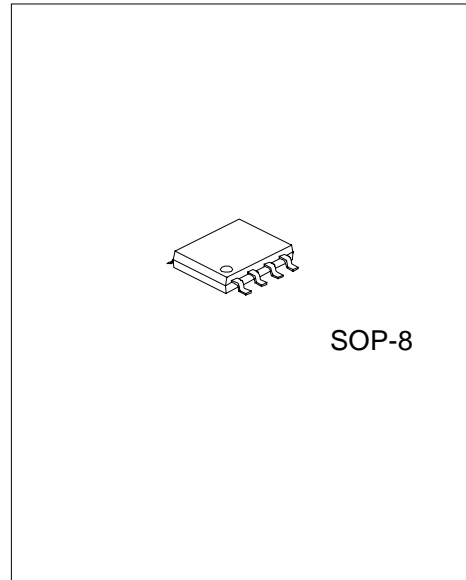
### FEATURES

#### OPERATIONAL AMPLIFIER

- \*Low input offset voltage: 0.5mV typ. for UM603A
- \*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

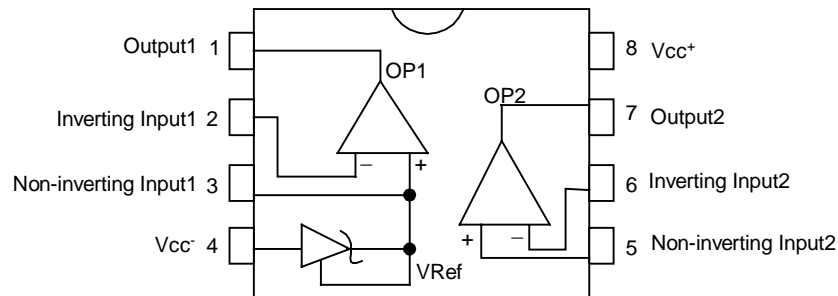
#### VOLTAGE REFERENCE

- \*Fixed output voltage reference 2.5V
- \* $\pm 0.4\%$  and  $\pm 1\%$  voltage precision
- \*Sink current capability : 1 to 100mA
- \*Typical output impedance : 0.2



\*Pb-free plating product number: UM603L/UM603AL

### PIN CONFIGURATION



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## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V <sub>cc</sub>	36	V
Differential Input Voltage	V <sub>id</sub>	36	V
Input Voltage	V <sub>in</sub>	-0.3 to +36	V
Operating Free-air Temperature Range	V <sub>i</sub>	-55 to +125	°C
Maximum Junction Temperature	T <sub>j</sub>	150	°C
Thermal Resistance Junction to Ambient(SO package)	R <sub>thja</sub>	175	°C/W

## 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, 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, 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	UM603A	V <sub>io</sub> T <sub>amb</sub> =25°C T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>		0.5	2 3	mV
	UM603	V <sub>io</sub> T <sub>amb</sub> =25°C T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>		1	4 5	
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	30 50	nA
Input Bias Current	I <sub>ib</sub>	T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>		20	150 200	
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 T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>	50 25	100		V/mV
Supply Voltage Rejection Ratio	SVR	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> <sup>+</sup> )-1.5	V
		T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>	0		(V <sub>cc</sub> <sup>+</sup> )-2	
Common Mode Rejection Ratio	CMR	T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>	70 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, V <sub>cc</sub> =+15V,V <sub>o</sub> =2V	10	20		mA
High Level Output Voltage	V <sub>OH</sub>	V <sub>cc</sub> <sup>+</sup> =30V T <sub>amb</sub> =25 °C,R <sub>L</sub> =10k T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>	27 27	28		V
Low Level Output Voltage	V <sub>OL</sub>	R <sub>L</sub> =10k T <sub>min.</sub> T <sub>amb</sub> T <sub>max.</sub>		5	20 20	mV
Slew Rate at Unity Gain	SR	V <sub>i</sub> =0.5 ~ 3V,V <sub>cc</sub> =15V R <sub>L</sub> =2k,CL=100pF,unity gain	0.2	0.4		V/μs
Gain Bandwidth Product	GBP	V <sub>cc</sub> =30V,R <sub>L</sub> =2K,CL=100pF F=100kHz,V <sub>in</sub> =10mV	0.5	0.9		MHz
Total Harmonic Distortion	THD	f=1kHz A <sub>v</sub> =20dB,R <sub>L</sub> =2k,V <sub>cc</sub> =30V CL=100pF,V <sub>o</sub> =2Vpp		0.02		%

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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  $V_{CC}^+ - 1.5V$ . But either of both inputs can go to +36V without damage.

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

$V_{CC}^+ = +5V, V_{CC} = \text{Ground}, T_{amb} = 1.4V, T_{amb} = 25^\circ C$  (unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Input Offset Voltage	UM603A	$V_{icm}=0V$ $T_{amb}=25^\circ C$ $T_{min.} \quad T_{amb} \quad T_{max.}$		0.5	2 3	mV
	UM603	$V_{icm}=0V$ $T_{amb}=25^\circ C$ $T_{min.} \quad T_{amb} \quad T_{max.}$		1	4 5	mV
Input Offset Voltage Drift	DVio			7		$\mu V/^\circ C$
Input Bias Current	Iib	negative input		20		nA
Large Signal Voltage Gain	Avd	$V_{icm}=0V$ $V_{CC}=15V, R_L=2k$		100		V/mV
Supply Voltage Rejection Ratio	SVR	$V_{icm}=0V$ $V_{CC}=5V \sim 30V$	65	100		dB
Output Current Source	Isource	$V_o=2V$ $V_{CC}=+15V, V_{id}=+1V$	20	40		mA
Short Circuit to Ground	Io	$V_{CC}=+15V$		40	60	mA
Output Current Sink	Isink	$V_{id}=-1V,$ $V_{CC}=+15V, V_o=2V$	10	20		mA
High Level Output Voltage	VOH	$V_{CC}^+=30V$ $T_{amb}=25^\circ C, R_L=10k$ $T_{min.} \quad T_{amb} \quad T_{max.}$	27 27	28		V
Low Level Output Voltage	VOL	$R_L=10k$ $T_{min.} \quad T_{amb} \quad T_{max.}$		5	20 20	mV
Slew Rate at Unity Gain	SR	$V_i=0.5 \sim 3V, V_{CC}=15V$ $R_L=2k, C_L=100pF, \text{unity gain}$	0.2	0.4		$V/\mu s$
Gain Bandwidth Product	GBP	$V_{CC}=30V, R_L=2K, C_L=100pF$ $F=100kHz, V_{in}=10mV$	0.5	0.9		MHz
Total Harmonic Distortion	THD	$f=1kHz$ $A_v=20dB, R_L=2k, V_{CC}=30V$ $C_L=100pF, V_o=2V_{pp}$		0.02		%

## VOLTAGE REFERENCE:

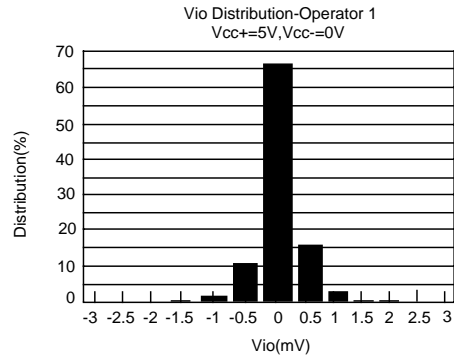
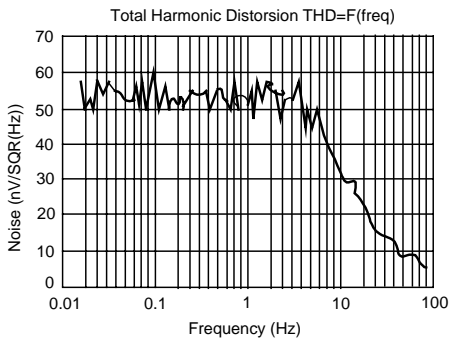
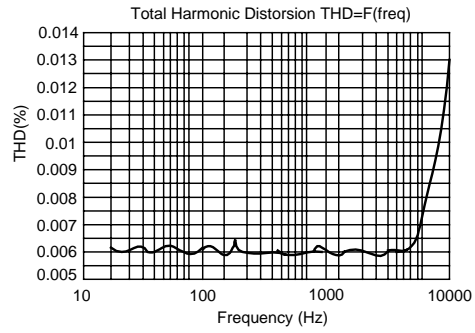
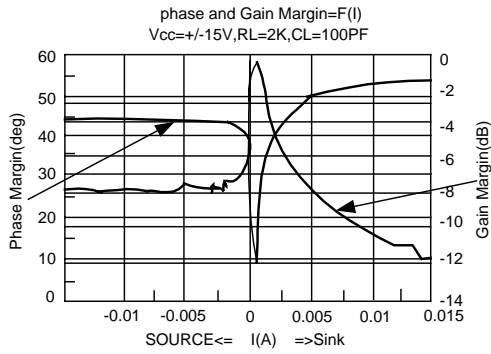
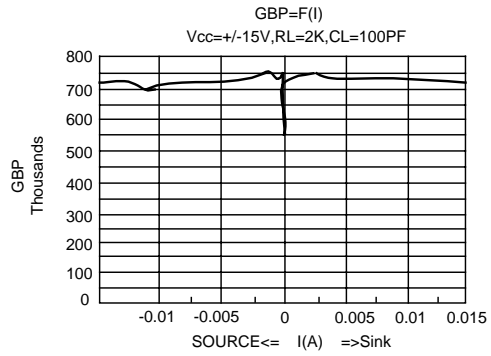
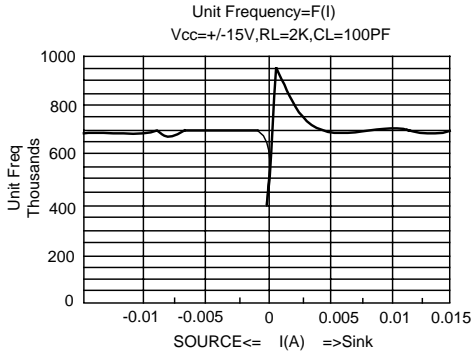
PARAMETER	SYMBOL	Value	UNIT
Cathode Current	I <sub>k</sub>	1 ~ 100	mA

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Reference Input Voltage	UM603A	$\pm 0.4\%, T_{amb}=25^\circ C$ $T_{min.} \quad T_{amb} \quad T_{max.}$	2.49 2.48	2.5	2.51 2.52	V
	UM603	$\pm 1\%, T_{amb}=25^\circ C$ $T_{min.} \quad T_{amb} \quad T_{max.}$	2.475 2.45	2.5	2.525 2.55	
Reference Input Voltage Deviation Over Temperature Range	Vref	$V_{KA}=V_{ref}; I_k=10mA$ $T_{min.} \quad T_{amb} \quad T_{max.}$		7	30	mV
Minimum Cathode Current for Regulation	I <sub>min</sub>	$V_{KA}=V_{ref}$		0.5	1	mA
Dynamic Impedance-note <sup>1)</sup>	Z <sub>KA</sub>	$V_{KA}=V_{ref},$ $I_k=1 \sim 100mA, f < 1kHz$		0.2	0.5	

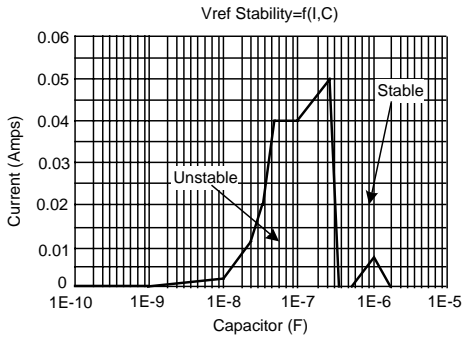
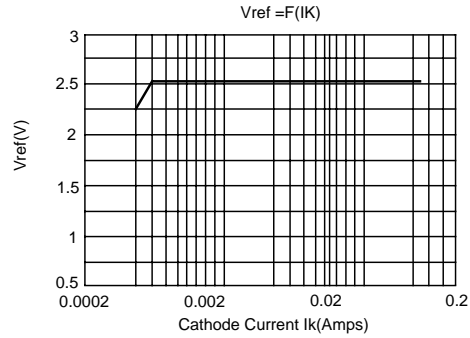
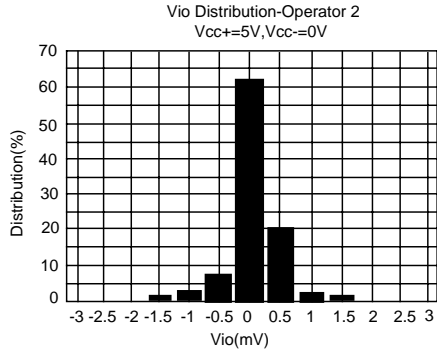
1. The dynamic impedance is defined as  $Z_{KA} = \frac{V_{KA}}{I_k}$

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## OPERATIONAL AMPLIFIERS



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