



UM603/A

LINEAR INTEGRATED CIRCUIT

DUAL OPERATIONAL AMPLIFIER AND CURRENT CONTROLLER

DESCRIPTION

The UTC **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

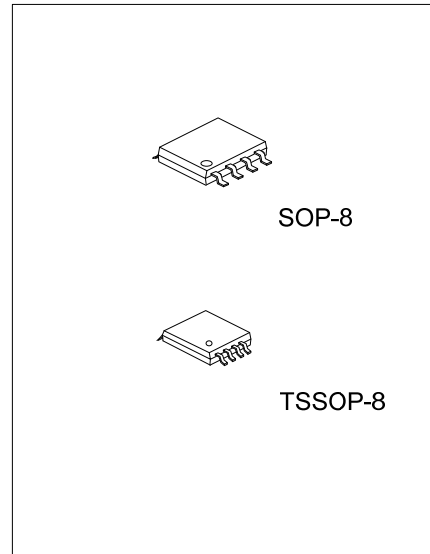
- *Low input offset voltage: 0.5mV typ. for UTC **UM603A**
- *Low supply current: 350uA/op.(@ $V_{CC}=5V$)
- *Medium bandwidth(unity gain): 0.9MHz
- *Large output voltage swing: $0V \sim (V_{CC}-1.5V)$
- *Input common mode voltage range includes ground
- *Wide power supply range: $3V \sim 32V \pm 1.5 \sim \pm 16V$

VOLTAGE REFERENCE

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

ORDERING INFORMATION

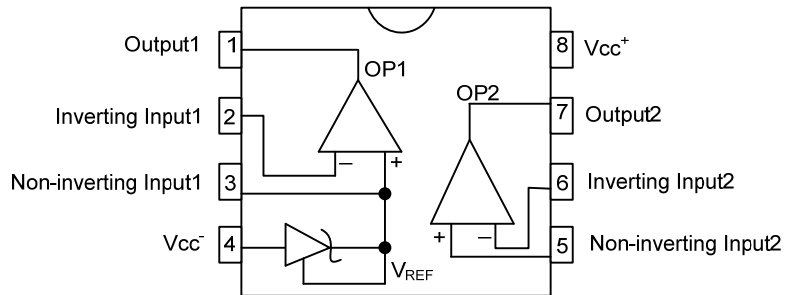
Ordering Number			Package	Packing
Normal	Lead Free	Halogen Free		
UM603-P08-R	UM603L-P08-R	UM603G-P08-R	TSSOP-8	Tape Reel
UM603-S08-R	UM603L-S08-R	UM603G-S08-R	SOP-8	Tape Reel
UM603A-P08-R	UM603AL-P08-R	UM603AG-P08-R	TSSOP-8	Tape Reel
UM603A-S08-R	UM603AL-S08-R	UM603AG-S08-R	SOP-8	Tape Reel



Lead-free: UM603L/UM603AL
 Halogen-free: UM603G/UM603AG

<p>UM603L-P08-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Plating</p>	<p>(1) R: Tape Reel</p> <p>(2) P08: TSSOP-8, S08: SOP-8</p> <p>(3) G: Halogen Free, L: Lead Free, Blank: Pb/Sn</p>
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■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO	PIN NAME	I/O	PIN DESCRIPTION
1	Output 1	O	OP1 output
2	Inverting Input1	I	OP1 inverting input
3	Non-Inverting Input1	O	A 2.5V fixed voltage reference output, wired to OP1 non-inverting input
4	V _{CC-}		
5	Non-Inverting Input2	I	OP2 non-inverting input
6	Inverting Input2	I	OP2 inverting input
7	Output 2	O	OP2 output
8	V _{CC+}		

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	36	V
Differential Input Voltage	$V_{I(DIFF)}$	36	V
Input Voltage	V_{IN}	-0.3 ~ +36	V
Junction Temperature	T_J	+125	°C
Operating Temperature	T_{OPR}	-55 ~ +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.

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Thermal Resistance Junction to Ambient	SOP-8	175	°C/W
	TSSOP-8	120	

■ ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Total Supply Current, excluding Current in the Voltage Reference	I_{CC}	$V_{CC}^+=5V$, no load, $T_{MIN} \leq T_a \leq T_{MAX}$	0.7		1.2	mA
		$V_{CC}^+=30V$, no load, $T_{MIN} \leq T_a \leq T_{MAX}$			2	

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OPERATOR1 (op-amp with non-inverting input connected to the internal V_{REF})						
Input Offset Voltage	UM603A	$V_{I(CM)}=0V$ $T_a=25^\circ\text{C}$ $T_{MIN} \leq T_a \leq T_{MAX}$		0.5	2 3	mV
	UM603	$V_{I(CM)}=0V$ $T_a=25^\circ\text{C}$ $T_{MIN} \leq T_a \leq T_{MAX}$		1	4 5	mV
Input Offset Voltage Drift	$DV_{I(OFF)}$			7		$\mu\text{V}/^\circ\text{C}$
Input Bias Current	$I_{I(BIAS)}$	negative input		20		nA
Large Signal Voltage Gain	A_{vd}	$V_{I(CM)}=0V$ $V_{CC}=15V$, $R_L=2k$		100		V/mV
Supply Voltage Rejection Ratio	SVR	$V_{I(CM)}=0V$ $V_{CC}=5V \sim 30V$	65	100		dB
Output Current Source	I_{SOURCE}	$V_{OUT}=2V$ $V_{CC}^+=+15V$, $V_{id}=+1V$	20	40		mA
Short Circuit to Ground	I_{SC}	$V_{CC}^+=+15V$		40	60	mA
Output Current Sink	I_{SINK}	$V_{id}=-1V$, $V_{CC}^+=+15V$, $V_{OUT}=2V$	10	20		mA
High Level Output Voltage	V_{OH}	$V_{CC}^+=30V$ $T_a=25^\circ\text{C}$, $R_L=10k$ $T_{MIN} \leq T_a \leq T_{MAX}$	27 27	28		V
Low Level Output Voltage	V_{OL}	$R_L=10k$ $T_{MIN} \leq T_a \leq T_{MAX}$		5	20 20	mV
Slew Rate at Unity Gain	SR	$V_{IN}=0.5 \sim 3V$, $V_{CC}=15V$ $R_L=2k$, $C_L=100\text{pF}$, unity gain	0.2	0.4		V/ μs
Gain Bandwidth Product	G_{BP}	$V_{CC}=30V$, $R_L=2k$, $C_L=100\text{pF}$ $f=100\text{kHz}$, $V_{IN}=10\text{mV}$	0.5	0.9		MHz
Total Harmonic Distortion	THD	$f=1\text{kHz}$ $A_v=20\text{dB}$, $R_L=2k$, $V_{CC}=30V$ $C_L=100\text{pF}$, $V_{OUT}=2V_{PP}$		0.02		%

■ ELECTRICAL CHARACTERISTICS(Cont.)

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OPERATOR2 (independent op-amp)(Note 1)						
Input Offset Voltage	UM603A	$V_{I(OFF)}$	$T_a=25^\circ\text{C}$ $T_{MIN}\leq T_a\leq T_{MAX}$	0.5	2	mV
	UM603			1	3	
Input Offset Voltage Drift	$DV_{I(OFF)}$			7		$\mu\text{V}/^\circ\text{C}$
Input Offset Current	$I_{I(OFF)}$	$T_{MIN}\leq T_a\leq T_{MAX}$		2	30 50	nA
Input Bias Current	$I_{I(BIAS)}$	$T_{MIN}\leq T_a\leq T_{MAX}$		20	150 200	nA
Large Signal Voltage Gain	A_{vd}	$V_{CC}=15V$, $R_L=2k$, $V_{OUT}=1.4V\sim 11.4V$ $T_{MIN}\leq T_a\leq T_{MAX}$	50 25	100		V/mV
Supply Voltage Rejection Ratio	SVRR	$V_{CC}=5V\sim 30V$	65	100		dB
Input Common Mode Voltage Range	$V_{I(CM)}$	$V_{CC}=+30V$ (Note 1)	0		$(V_{CC+})-1.5$	V
		$T_{MIN}\leq T_a\leq T_{MAX}$	0		$(V_{CC+})-2$	
Common Mode Rejection Ratio	CMRR	$T_{MIN}\leq T_a\leq T_{MAX}$	70	85		dB
			60			
Output Current Source	$I_{O(SOURCE)}$	$V_{CC}=+15V$, $V_{OUT}=2V$, $V_{jd}=+1V$	20	40		mA
Short Circuit to Ground	I_{SC}	$V_{CC}=+15V$		40	60	mA
Output Current Sink	$I_{O(SINK)}$	$V_{id}=-1V$, $V_{CC}=+15V$, $V_{OUT}=2V$	10	20		mA
High Level Output Voltage	V_{OH}	$V_{CC+}=30V$ $T_a=25^\circ\text{C}$, $R_L=10k$ $T_{MIN}\leq T_a\leq T_{MAX}$	27 27	28		V
Low Level Output Voltage	V_{OL}	$R_L=10k$ $T_{MIN}\leq T_a\leq T_{MAX}$		5	20 20	mV
Slew Rate at Unity Gain	SR	$V_{IN}=0.5\sim 3V$, $V_{CC}=15V$ $R_L=2k$, $C_L=100\text{pF}$, unity gain	0.2	0.4		V/ μs
Gain Bandwidth Product	GBP	$V_{CC}=30V$, $R_L=2K$, $C_L=100\text{pF}$ $f=100\text{kHz}$, $V_{IN}=10\text{mV}$	0.5	0.9		MHz
Total Harmonic Distortion	THD	$f=1\text{kHz}$ $A_v=20\text{dB}$, $R_L=2k$, $V_{CC}=30V$, $C_L=100\text{pF}$, $V_{OUT}=2V_{pp}$		0.02		%

■ VOLTAGE REFERENCE

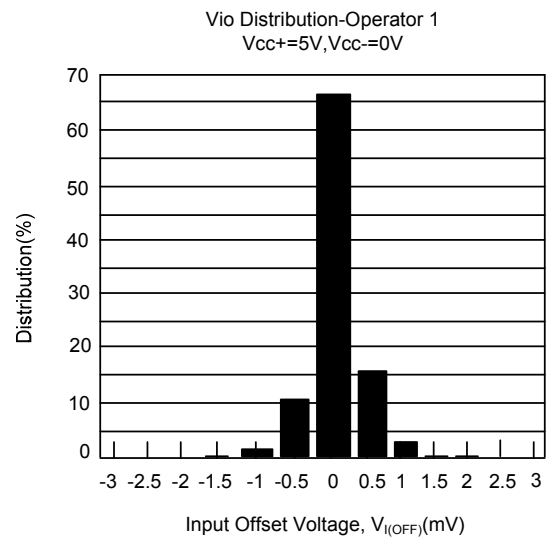
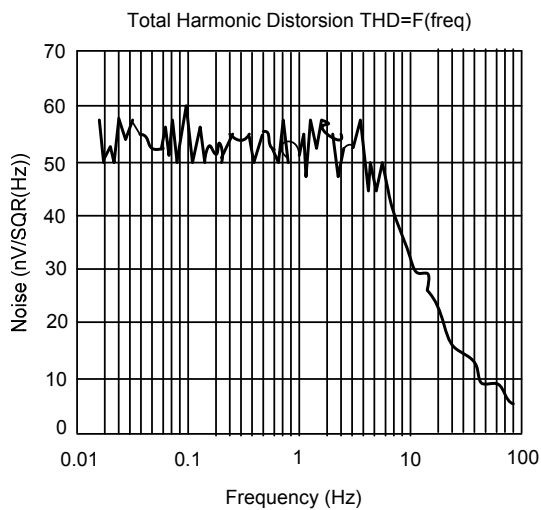
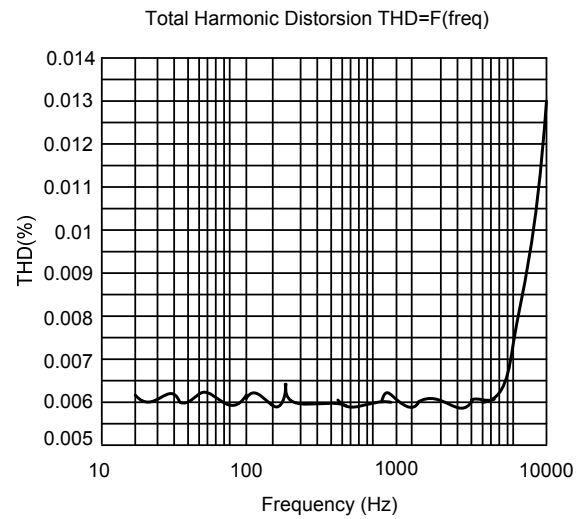
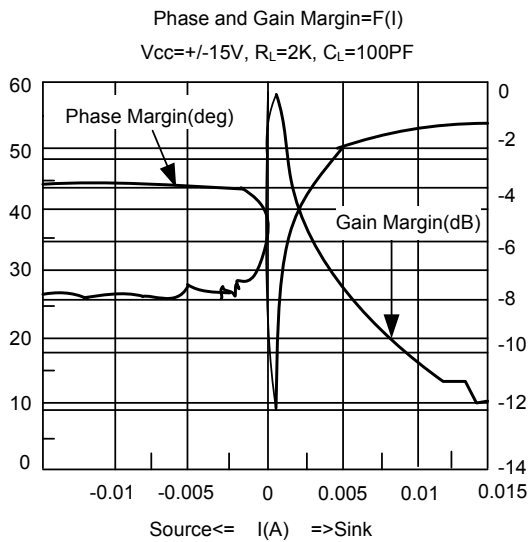
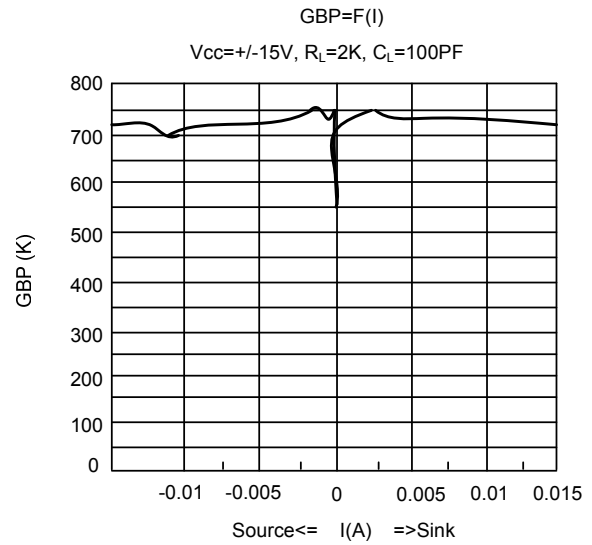
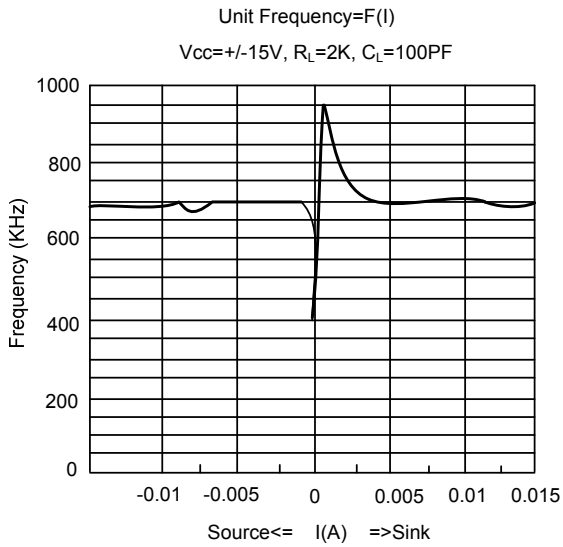
PARAMETER	SYMBOL	Value	UNIT
Cathode Current	I_k	1 ~ 100	mA

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Reference Input Voltage	UM603A	V_{REF}	$\pm 0.4\%$, $T_a=25^\circ\text{C}$ $T_{MIN}\leq T_a\leq T_{MAX}$, $V_{KA}=V_{REF}$, $I_{KA}=10\text{mA}$	2.49	2.5	2.51	V
	UM603			2.48		2.52	
Reference Input Voltage Deviation Over Temperature Range	ΔV_{REF}	$V_{KA}=V_{REF}$; $I_k=10\text{mA}$ $T_{MIN}\leq T_a\leq T_{MAX}$		2.475	2.5	2.525	mV
				2.45		2.55	
Minimum Cathode Current for Regulation	I_{MIN}	$V_{KA}=V_{REF}$		0.5	1	mA	
Dynamic Impedance(Note 2)	Z_{KA}	$V_{KA}=V_{REF}$, $\Delta I_k=1\sim 100\text{mA}$, $f<1\text{kHz}$		0.2	0.5	Ω	

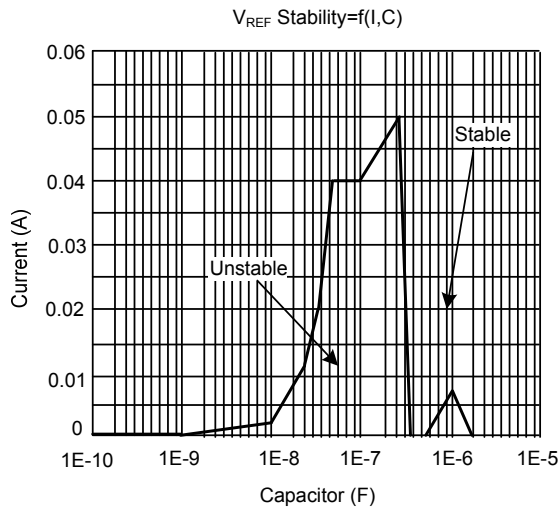
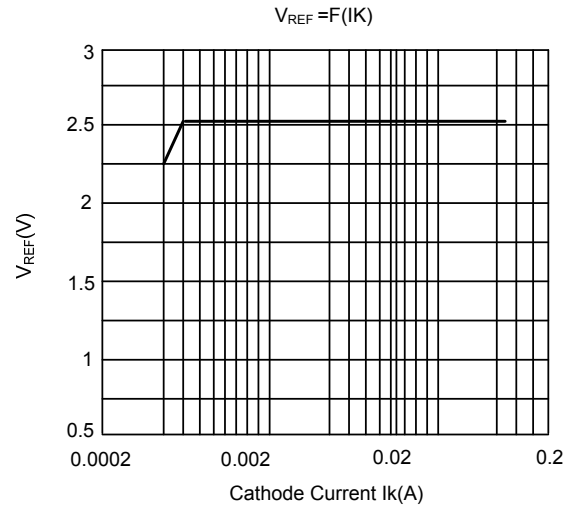
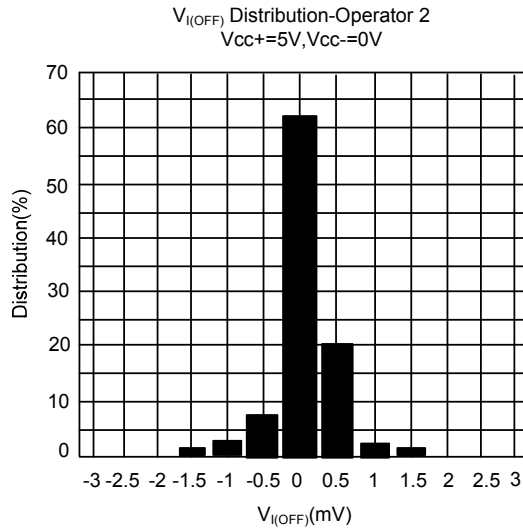
Note: 1. The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is $V_{CC+} - 1.5V$. But either of both inputs can goto +36V without damage.

2. The dynamic impedance is defined as $[Z_{KA}] = \Delta V_{KA} / \Delta I_k$

TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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