



UM603A

LINEAR INTEGRATED CIRCUIT

DUAL OPERATIONAL AMPLIFIER AND CURRENT CONTROLLER

DESCRIPTION

The UTC **UM603A** 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
- * Reference voltage tolerance
 - UM603A-1: $\pm 0.4\%$
 - UM603A-2: $\pm 1\%$
- *Sink current capability : $1 \sim 100mA$
- *Typical output impedance : 0.2Ω

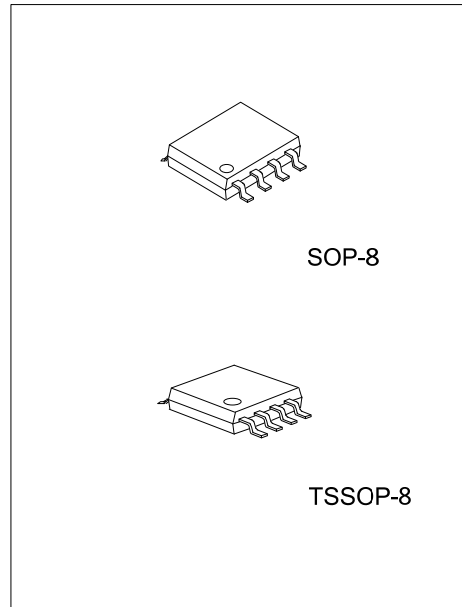
ORDERING INFORMATION

Ordering Number	Package	Packing
UM603AG-S08-R	SOP-8	Tape Reel
UM603AG-P08-R	TSSOP-8	Tape Reel

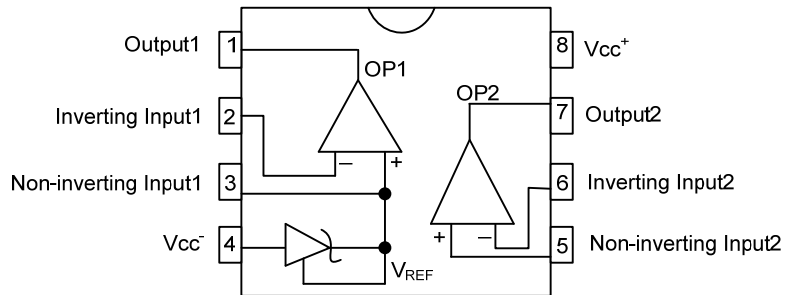
<p>UM603G-S08-R</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel (2) S08: SOP-8, P08: TSSOP-8 (3) G: Halogen Free and Lead Free</p>
---	--

MARKING

SOP-8	TSSOP-8



■ 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
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	

$V_{CC}^+=+5V$, $V_{CC}=Ground$, $T_A=25^\circ C$ (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-1	$V_{I(OFF)}$	$V_{I(CM)}=0V$	$T_A=25^\circ C$	0.5	2	mV
				$T_{MIN} \leq T_A \leq T_{MAX}$		3	
	UM603A-2	$V_{I(OFF)}$	$V_{I(CM)}=0V$	$T_A=25^\circ C$	1	4	mV
				$T_{MIN} \leq T_A \leq T_{MAX}$		5	
Input Offset Voltage Drift	$DV_{I(OFF)}$			7		$\mu V/^\circ C$	
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}	$V_{CC}^+=30V$	$T_A=25^\circ C$, $R_L=10k$	27		V	
			$T_{MIN} \leq T_A \leq T_{MAX}$	27	28		
Low Level Output Voltage	V_{OL}	$R_L=10k$		5	20	mV	
		$T_{MIN} \leq T_A \leq T_{MAX}$		5	20		
Slew Rate at Unity Gain	SR	$V_{IN}=0.5 \sim 3V$, $V_{CC}=15V$ $R_L=2k$, $C_L=100pF$, unity gain	0.2	0.4		V/ μs	
Gain Bandwidth Product	G_{BP}	$V_{CC}=30V$, $R_L=2K$, $C_L=100pF$ $f=100kHz$, $V_{IN}=10mV$	0.5	0.9		MHz	
Total Harmonic Distortion	THD	$f=1kHz$, $C_L=100pF$, $V_{OUT}=2V_{PP}$ $A_v=20dB$, $R_L=2k$, $V_{CC}=30V$		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-1	$V_{I(OFF)}$	$T_A=25^\circ\text{C}$	0.5	2	mV
			$T_{MIN}\leq T_A\leq T_{MAX}$		3	
	UM603A-2		$T_A=25^\circ\text{C}$	1	4	mV
			$T_{MIN}\leq T_A\leq T_{MAX}$		5	
Input Offset Voltage Drift	$DV_{I(OFF)}$		7		$\mu\text{V}/^\circ\text{C}$	
Input Offset Current	$I_{I(OFF)}$	$T_A=25^\circ\text{C}$		2	30	nA
		$T_{MIN}\leq T_A\leq T_{MAX}$			50	
Input Bias Current	$I_{I(BIAS)}$	$T_A=25^\circ\text{C}$		20	150	nA
		$T_{MIN}\leq T_A\leq T_{MAX}$			200	
Large Signal Voltage Gain	A_{VD}	$V_{CC}=15V$, $R_L=2k$, $V_{OUT}=1.4V\sim 11.4V$	50	100		V/mV
		$T_{MIN}\leq T_A\leq T_{MAX}$	25			
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		70	85		dB
		$T_{MIN}\leq T_A\leq T_{MAX}$	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}	$V_{CC+}=30V$	$T_A=25^\circ\text{C}$, $R_L=10k$	27	28	V
			$T_{MIN}\leq T_A\leq T_{MAX}$	27		
Low Level Output Voltage	V_{OL}	$R_L=10k$		5	20	mV
		$T_{MIN}\leq T_A\leq T_{MAX}$		5	20	
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		$\text{V}/\mu\text{s}$
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	$f=1\text{kHz}$, $C_L=100\text{pF}$, $V_{OUT}=2V_{PP}$ $A_v=20\text{dB}$, $R_L=2k$, $V_{CC}=30V$,		0.02		%

■ VOLTAGE REFERENCE

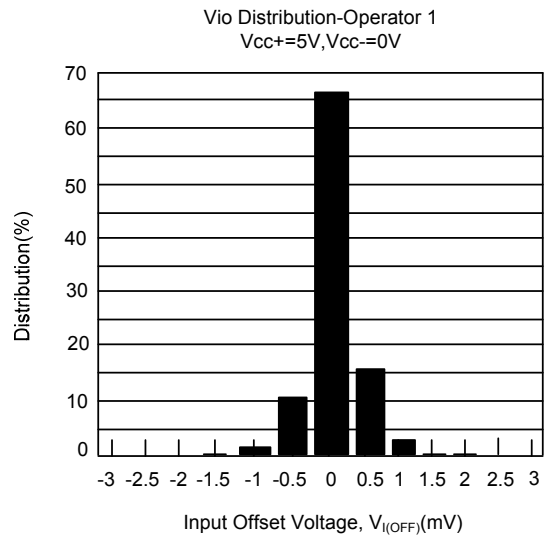
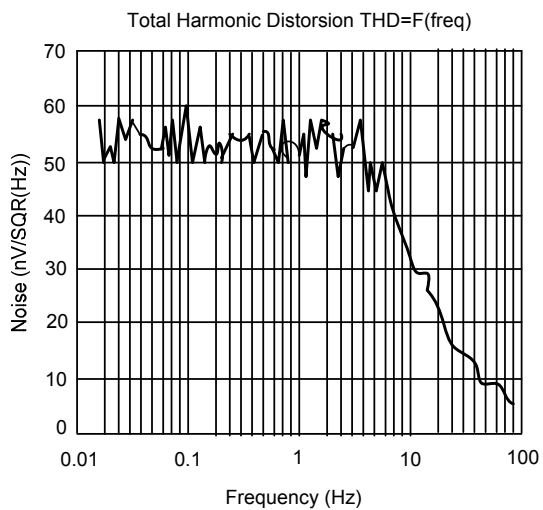
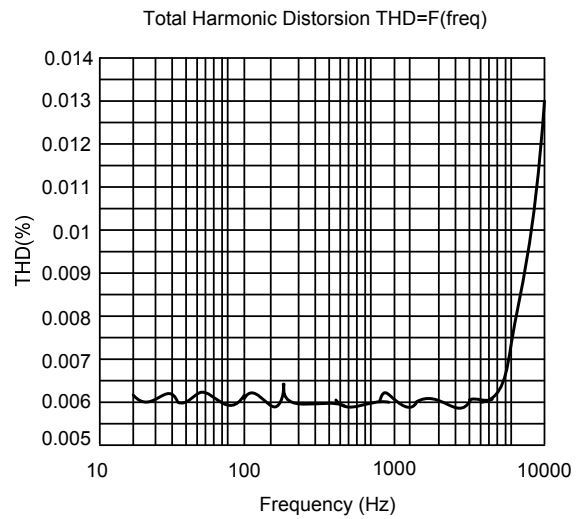
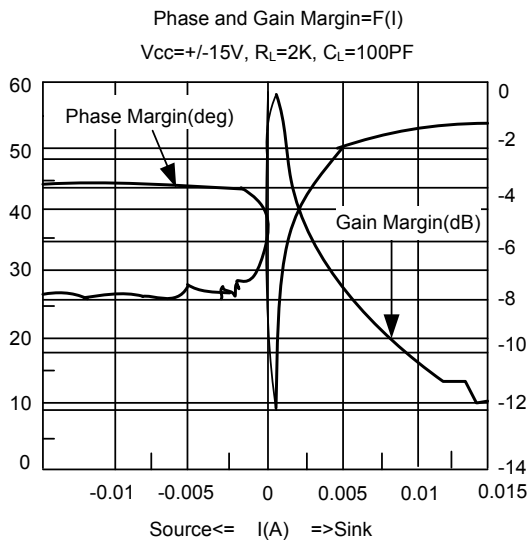
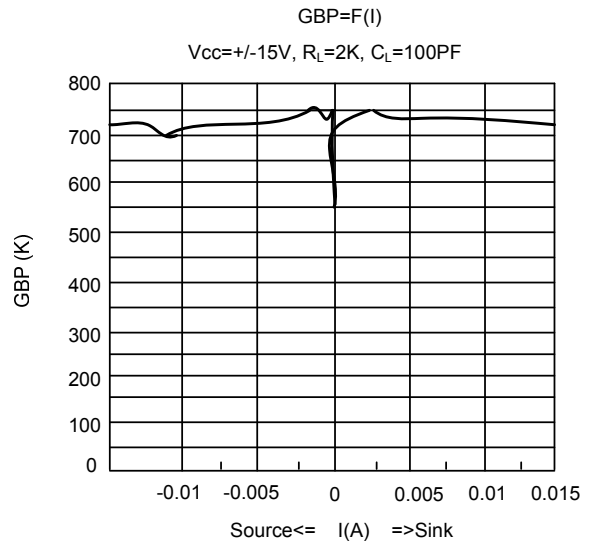
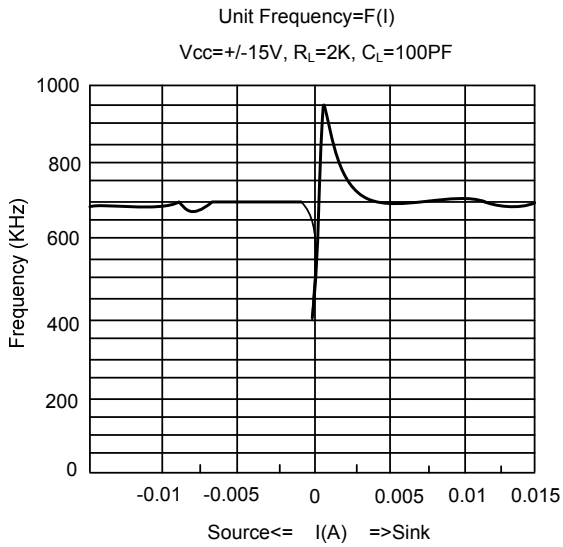
PARAMETER	SYMBOL	Value	UNIT
Cathode Current	I_K	1 ~ 100	mA

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Reference Input Voltage	UM603A-1	V_{REF}	$\pm 0.4\%$, $T_A=25^\circ\text{C}$	2.49	2.5	2.51	V
			$T_{MIN}\leq T_A\leq T_{MAX}$, $V_{KA}=V_{REF}$, $I_{KA}=10\text{mA}$	2.48		2.52	
	UM603A-2		$\pm 1\%$, $T_A=25^\circ\text{C}$	2.475	2.5	2.525	
			$T_{MIN}\leq T_A\leq T_{MAX}$, $V_{KA}=V_{REF}$, $I_{KA}=10\text{mA}$	2.45		2.55	
Reference Input Voltage Deviation Over Temperature Range	ΔV_{REF}	$V_{KA}=V_{REF}$, $I_K=10\text{mA}$, $T_{MIN}\leq T_A\leq T_{MAX}$		7	30	mV	
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	

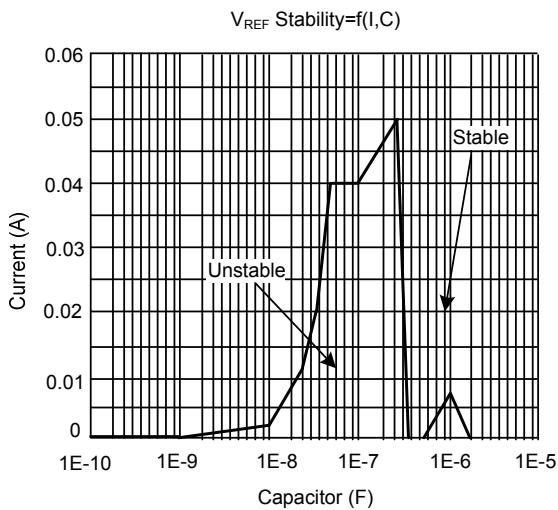
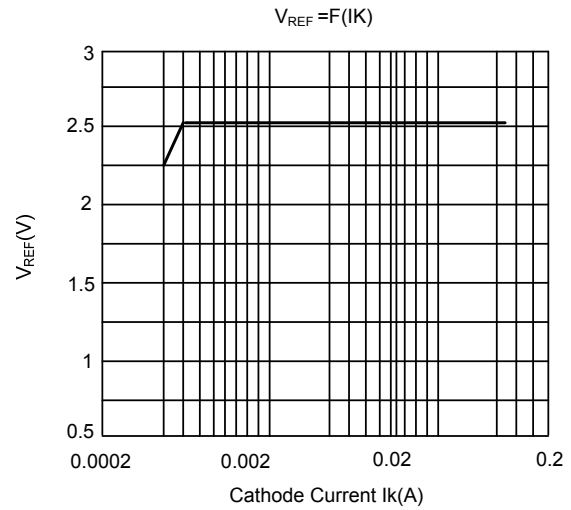
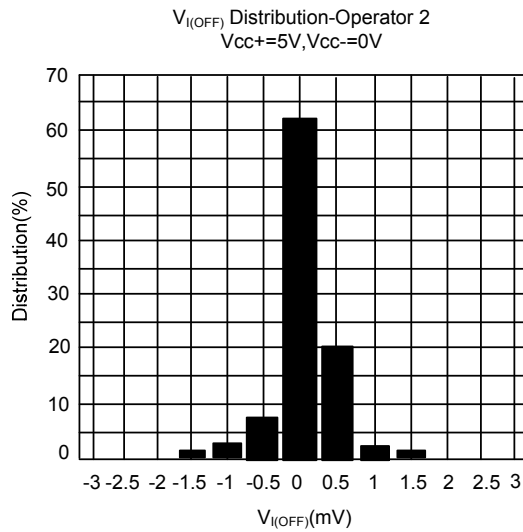
Notes: 1. The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is $V_{CC+} - 1.5V$. But either of both inputs can go to +36V without damage.

2. The dynamic impedance is defined as $Z_{KA} = \frac{\Delta V_{KA}}{\Delta I_K}$.

TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.