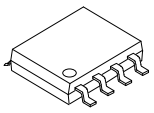
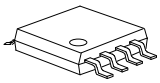
UM603A

LINEAR INTEGRATED CIRCUIT

DUAL OPERATIONAL AMPLIFIER AND CURRENT CONTROLLER



SOP-8



TSSOP-8

■ DESCRIPTION

The UTC **UM603A** is a monolithic IC that includes one independent op-amp and another op-amp for witch 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}= 5 V)
*Medium bandwidth(unity gain): 0.9MHz
*Large output voltage swing: 0 V ~ (V_{CC}-1.5 V)
*Input common mode voltage range includes ground
*Wide power supply range: 3V ~ 32V ±1.5 ~ ±16V

VOLTAGE REFERENCE

*Fixed output voltage reference 2.5V
* Reference voltage tolerance
UM603A-1: ±0.4%
UM603A-2: ±1%
*Sink current capability : 1 ~ 100mA
*Typical output impedance : 0.2Ω

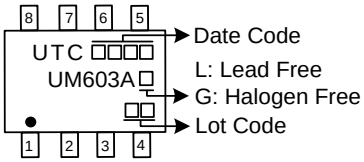
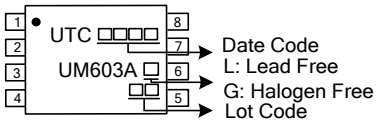
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
UM603AL-S08-R	UM603AG-S08-R	SOP-8	Tape Reel
UM603AL-P08-R	UM603AG-P08-R	TSSOP-8	Tape Reel

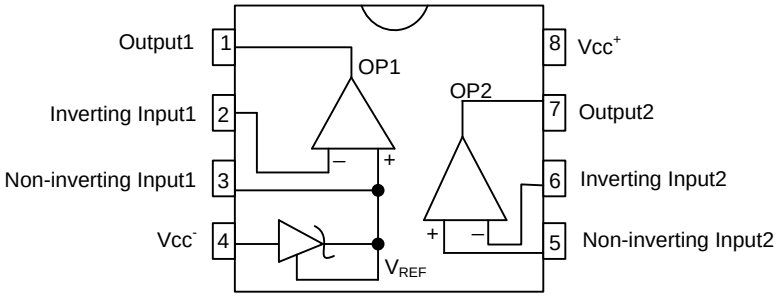
UM603AG-S08-R

(1)Packing Type — (1) R: Tape Reel
(2)Package Type — (2) S08: SOP-8, P08: TSSOP-8
(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

■ 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	θ_{JA}	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, $T_{MIN}\le T_A\le T_{MAX}$	0.7		1.2	mA
		V_{CC}^+=30V, no load, $T_{MIN}\le T_A\le T_{MAX}$			2	

V_{CC}+=+5V, V_{CC}=Ground, T_A=25°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°C		0.5	2	mV
				$T_{MIN} \le T_A \le T_{MAX}$			3	
	UM603A-2		$V_{I(CM)}$=0V	T_A=25°C		1	4	mV
				$T_{MIN} \le T_A \le T_{MAX}$			5	
Input Offset Voltage Drift		$DV_{I(OFF)}$				7		µV/°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 ~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°C, R_L=10k	27			V
				$T_{MIN} \le T_A \le T_{MAX}$	27	28		
Low Level Output Voltage		V_{OL}	R_L=10k			5	20	mV
			$T_{MIN}\le T_A\le T_{MAX}$			5	20	
Slew Rate at Unity Gain		SR	V_{IN}=0.5 ~ 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} Av=20dB, R_L=2k, V_{CC}=30V			0.02		%

■ ELECTRICAL CHARACTERISTICS (Cont.)

V_{CC}+=+5V, V_{CC}=Ground, V_{OUT}=1.4V, T_A=25°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°C		0.5	2	mV
			T_{MIN}≤T_A≤T_{MAX}			3	
	UM603A-2		T_A=25°C		1	4	mV
			T_{MIN}≤T_A≤T_{MAX}			5	
Input Offset Voltage Drift		$DV_{I(OFF)}$			7		μV/°C
Input Offset Current		$I_{I(OFF)}$	T_A=25°C		2	30	nA
			T_{MIN}≤T_A≤T_{MAX}			50	
Input Bias Current		$I_{I(BIAS)}$	T_A=25°C		20	150	nA
			T_{MIN}≤T_A≤T_{MAX}			200	
Large Signal Voltage Gain		A_{VD}	V_{CC}=15V, R_L=2k, V_{OUT}=1.4V~11.4V	50	100		V/mV
			T_{MIN}≤T_A≤T_{MAX}	25			
Supply Voltage Rejection Ratio		SVRR	V_{CC}=5V ~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}≤T_A≤T_{MAX}	0		(V_{CC}^+)-2	
Common Mode Rejection Ratio		CMRR		70	85		dB
			T_{MIN}≤T_A≤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°C, R_L=10k	27	28		V
			V_{CC}^+=30V, T_{MIN} ≤ T_A ≤ T_{MAX}	27			
Low Level Output Voltage		V_{OL}	R_L=10k		5	20	mV
			T_{MIN}≤T_A≤T_{MAX}		5	20	
Slew Rate at Unity Gain		SR	V_{IN}=0.5 ~ 3V, V_{CC}=15V R_L=2k, C_L=100pF, unity gain	0.2	0.4		V/μs
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 , C_L=100pF, V_{OUT}=2V_{PP} Av=20dB, R_L=2k, V_{CC}=30V,		0.02		%

■ VOLTAGE REFERENCE

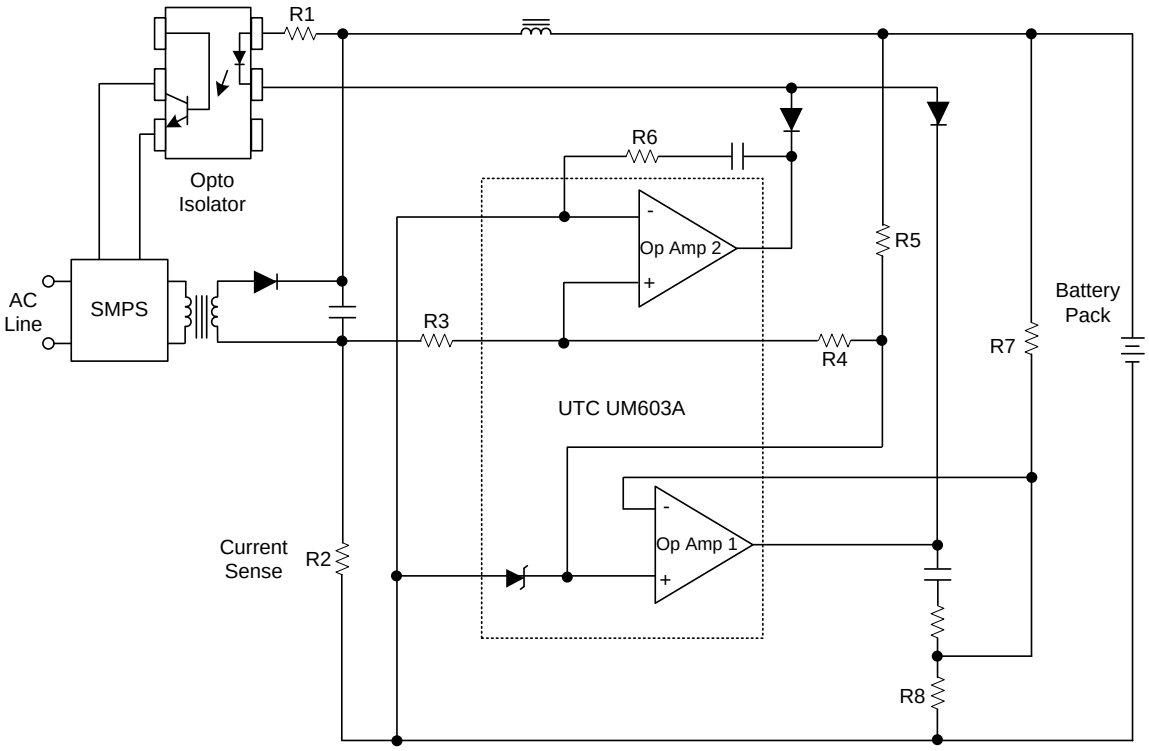
PARAMETER	SYMBOL	Value	UNIT
Cathode Current	I_K	1 ~ 100	mA

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Input Voltage	UM603A-1	V_{REF}	±0.4%, T_A=25°C	2.49	2.5	2.51	V
			T_{MIN}≤T_A≤T_{MAX}, V_{KA}=V_{REF}, I_{KA}=10mA	2.48		2.52	
	UM603A-2		±1%, T_A=25°C	2.475	2.5	2.525	
			T_{MIN}≤T_A≤T_{MAX}, V_{KA}=V_{REF}, I_{KA}=10mA	2.45		2.55	
Reference Input Voltage Deviation Over Temperature Range		Δ V_{REF}	V_{KA}=V_{REF}, I_K=10mA, T_{MIN}≤T_A≤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}, Δ I_K=1~100mA, f<1kHz		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 $|ZKA| = \frac{\Delta V_{KA}}{\Delta I_K}$.

■ TYPICAL APPLICATION CIRCUIT



$$V_{OUT} = V_{REF} \times \frac{R_7 + R_8}{R_8}$$

$$V_{SENSE} = V_{REF} \times \frac{R_3}{R_3 + R_4} (Pin\ 5)$$

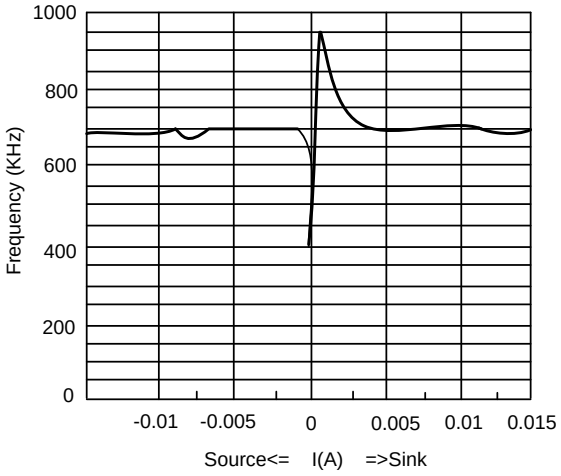
$$\text{Current Limie} = \frac{V_{SENSE}}{R_2}$$

Application of UTC UM603A in a Constant Current and Constant Voltage Charger

■ TYPICAL CHARACTERISTICS

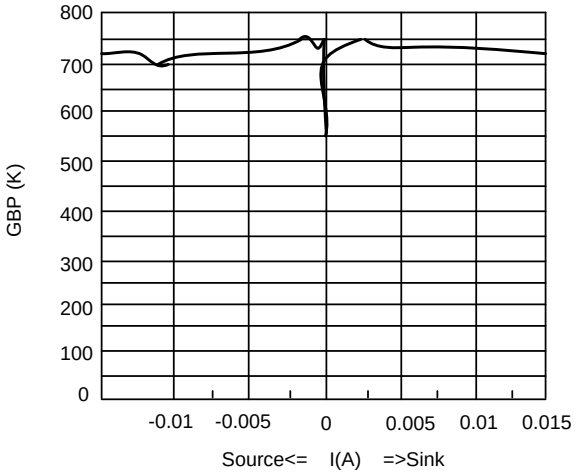
Unit Frequency=F(I)

Vcc=+/-15V, R_L=2K, C_L=100PF



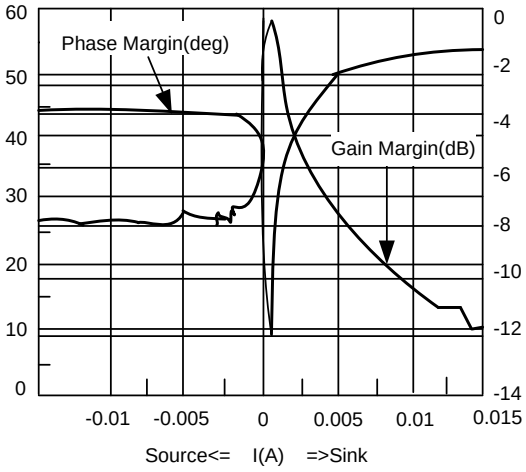
GBP=F(I)

Vcc=+/-15V, R_L=2K, C_L=100PF

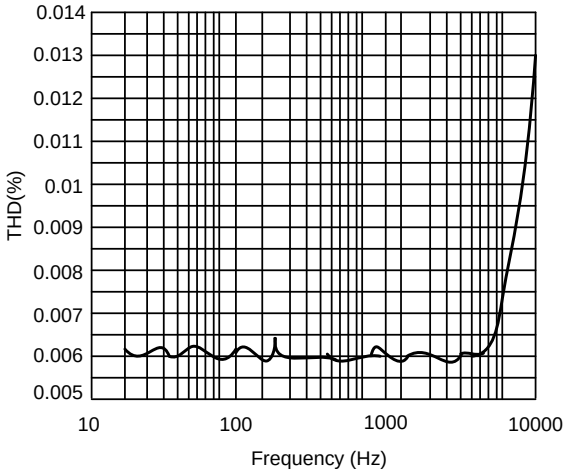


Phase and Gain Margin=F(I)

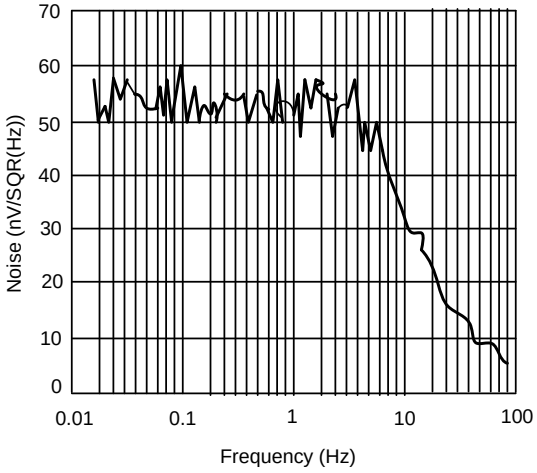
Vcc=+/-15V, R_L=2K, C_L=100PF



Total Harmonic Distorsion THD=F(freq)

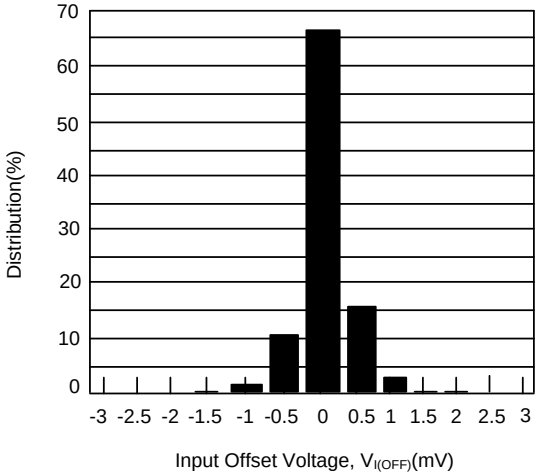


Total Harmonic Distorsion THD=F(freq)



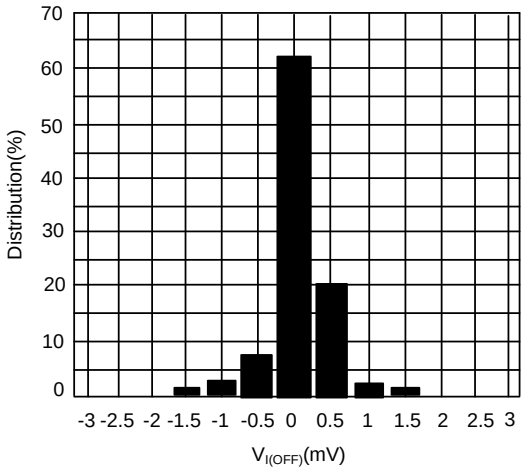
Vio Distribution-Operator 1

Vcc+=5V,Vcc-=0V

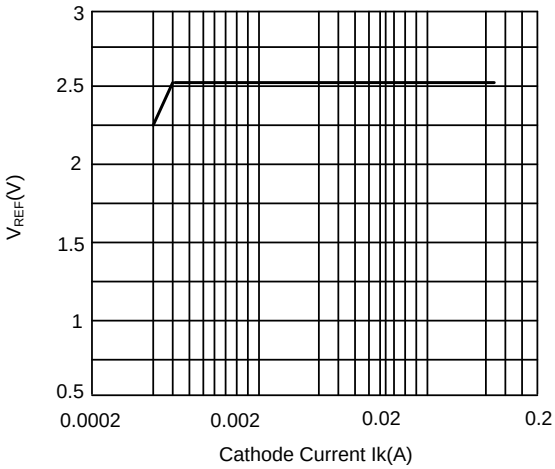


■ TYPICAL CHARACTERISTICS(Cont.)

$V_{I(OFF)}$ Distribution-Operator 2
Vcc+=5V,Vcc-=0V



V_{REF} =F(IK)



V_{REF} Stability=f(I,C)