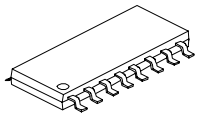
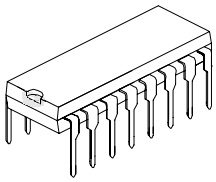
UM604/A

LINEAR INTEGRATED CIRCUIT

QUAD OPERATIONAL AMPLIFIER AND PROGRAMMABLE VOLTAGE REFERENCE



SOP-16



DIP-16

*Pb-free plating product number:
UM604L/UM604AL

■ DESCRIPTION

The UTC **UM604/A** is a monolithic IC that includes four op-amps and an adjustable shunt 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 supply current : 375μA/op.(@ V_{CC}= 5 V)
* Low input bias current : 20nA
* Medium speed : 0.9MHz
* Low input offset voltage : 0.5mV typ for UM604
* Wide power supply range: ±1.5 ~ ±15V

VOLTAGE REFERENCE

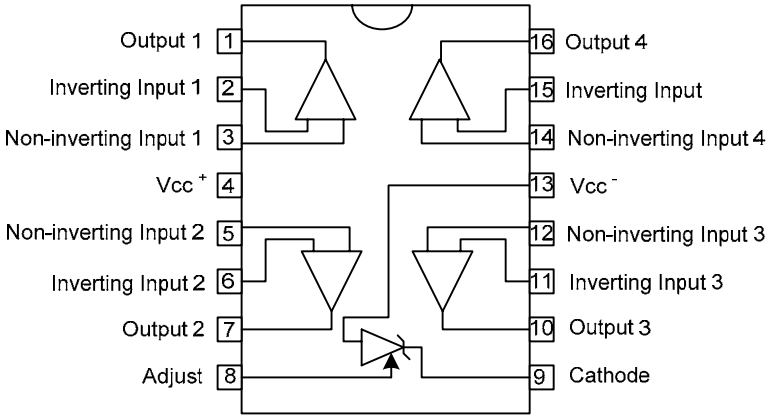
* Adjustable output voltage : V_{REF} to 36V
* 0.4% and 1% voltage precision
* Sink current capability : 1 ~ 100mA
* Typical output impedance : 0.2Ω

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Normal	Lead Free Plating		
UM604-D16-T	UM604L-D16-T	DIP-16	Tube
UM604-S16-R	UM604L-S16-R	SOP-16	Tape Reel
UM604-S16-T	UM604L-S16-T	SOP-16	Tube
UM604A-D16-T	UM604AL-D16-T	DIP-16	Tube
UM604A-S16-R	UM604AL-S16-R	SOP-16	Tape Reel
UM604A-S16-T	UM604AL-S16-T	SOP-16	Tube

UM604L-D16-T (1)Packing Type (2)Package Type (3)Lead Plating	(1)R: Tape Reel, T: Tube (2)D16: DIP-16, S16: SOP-16 (3)L: Lead Free Plating, Blank: Pb/Sn

■ PIN CONFIGURATION



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	36	V
Differential Input Voltage	V_{DIFF}	36	V
Input Voltage	V_{IN}	-0.3 ~ +36	V
Output Short-Circuit Duration	I_D	Infinite	
Junction Temperature	T_J	+150	°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.

■ ELECTRICAL CHARACTERISTICS

V_{CC}^+=5V, V_{CC}^-=0V, Ta=25℃ (unless otherwise specified)

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}<Ta<T_{MAX}	1.4		2.4	mA
		V_{CC}^+=30V, no load, T_{MIN}<Ta<T_{MAX}			4	

■ ELECTRICAL CHARACTERISTICS

V_{CC}^+ =5V, V_{CC}^- =Ground, V_{OUT}=1.4V, Ta=25℃ (unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	UM604A	$V_{I(OFF)}$	Ta=25°C		0.5	3	mV
			T_{MIN}≤Ta≤ T_{MAX}			4	
	UM604		Ta=25°C		1	5	
			T_{MIN}≤Ta≤ T_{MAX}			6	
Input Offset Voltage Drift		△$V_{I(OFF)}$			7		μV/°C
Input Offset Current.		$I_{I(OFF)}$	T_{MIN}≤Ta≤ T_{MAX}		2	30	nA
						50	
Input Bias Current		$I_{I(BIAS)}$	T_{MIN}≤Ta≤ T_{MAX}		20	150	nA
						200	
Large Signal Voltage Gain		G_V	V_{CC}=15V, R_L=2k, V_{OUT}=1.4V ~11.4V	50	100		V/mV
			T_{MIN}≤Ta≤ T_{MAX}	25			
Supply Voltage Rejection Ratio		SVR	V_{CC}=5V ~ 30V	65	100		dB
Input Common Mode Voltage Range		$V_{I(CM)}$	V_{CC}=+30V(see note[1])	0		(Vcc+)-1.5	V
			T_{MIN}≤Ta≤ T_{MAX}	0		(Vcc+)-2	
Common Mode Rejection Ratio		CMRR	T_{MIN}≤Ta≤ T_{MAX}	70	85		dB
				60			
Output Current Source		$I_{O(SOUR)}$	V_{OUT}=2V, V_{CC}=+15V, V_{ID}=+1V	20	40		mA
Output Short Circuit to Ground		$I_{O(SC)}$	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}	R_L=10k , V_{CC}^+=30V				V
			Ta=25℃	27	28		
			T_{MIN}≤Ta≤ T_{MAX}	27			
Low Level Output Voltage		V_{OL}	R_L=10k		5	20	mV
			T_{MIN}≤Ta≤ T_{MAX}			20	
Slew Rate at Unity Gain		SR	V_{IN}=0.5 ~ 3V, V_{CC}=15V	0.1	0.3		V/μs
			R_L=2kΩ, C_L=100pF, unity gain				
Gain Bandwidth Product		GBP	Vcc=30V, R_L=2K, C_L=100pF	0.5	0.9		MHz
			f=100kHz, Vin=10mV				

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Total Harmonic Distortion	THD	f=1kHz G_V=20dB, R_L=2, V_{CC}=30V C_L=100pF, Vo=2Vpp		0.02		%
Equivalent Input Noise Voltage	eN	F=1kHz, Vcc=30V, Rs=100Ω		50		$\frac{nV}{\sqrt{Hz}}$
Channel Separation	CS	1kHz<f<20kHz		120		dB

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 Vcc^+-1.5V. But either of both inputs can go to +36V without damage.

■ VOLTAGE REFERENCE

PARAMETER	SYMBOL	RATING	UNIT
Cathode Current	Ik	1 ~ 100	mA

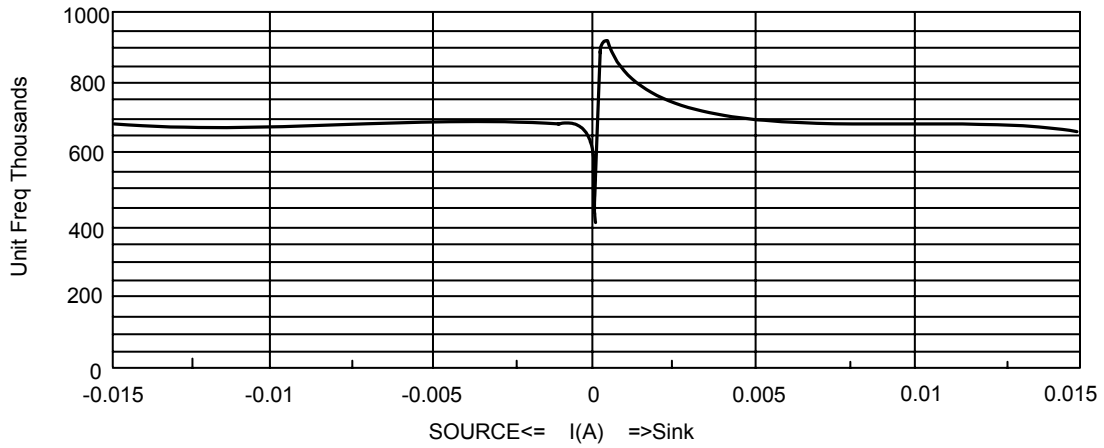
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Input Voltage	UM604A	V_{REF}	±0.4%, Ta=25℃ T_{MIN}≤Ta≤ T_{MAX}	2.49 2.48	2.5	2.51 2.52	V
	UM604		±1%, Ta=25℃ T_{MIN}≤Ta≤ T_{MAX}	2.475 2.45	2.5	2.525 2.55	
Reference Input Voltage Deviation Over Temperature Range		$\triangle V_{REF}$	V_{KA}=V_{REF}; Ik=10mA T_{MIN}≤Ta≤ T_{MAX}		7	30	mV
Ratio of Change in Reference Input Voltage to Charge in Cathode to Anode Voltage		$\frac{\triangle V_{REF}}{\triangle V_{KA}}$	Ik=10mA, $\triangle V_{KA}$=36V ~ 3V	-2	-1.1		MV/V
Reference Input Current		I_{REF}	Ik=10mA T_{MIN}≤Ta≤ T_{MAX}		1.5	2.5 3	μA
Reference Input Current Deviation over T°Range					0.8	1.2	μA
Minimum Cathode Current for Regulation		I_{MIN}	V_{KA}= V_{REF}		0.5	1	mA
Off-State Cathode current		I_{OFF}			180	500	nA
Dynamic Impedance-note[1)]		「ZKA」	V_{KA}= V_{REF}, △Ik=1 ~ 100mA, f<1kHz		0.2	0.5	Ω

1.The dynamic impedance is defined as $「Z_{KA}」 = \frac{\triangle VkA}{\triangle VIk}$

■ OPERATIONAL AMPLIFIERS

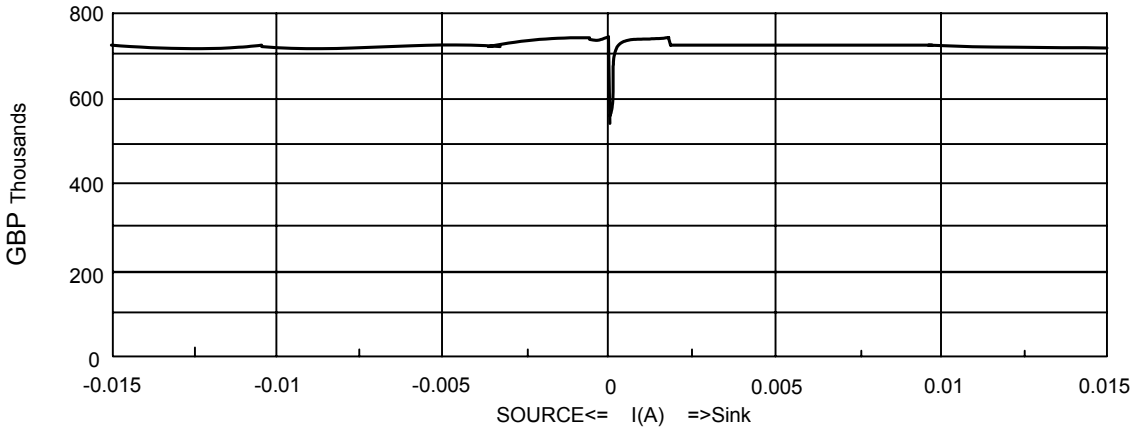
Unit Frequency=F(I)

Vcc=±15V,RL=2K,CL=100PF



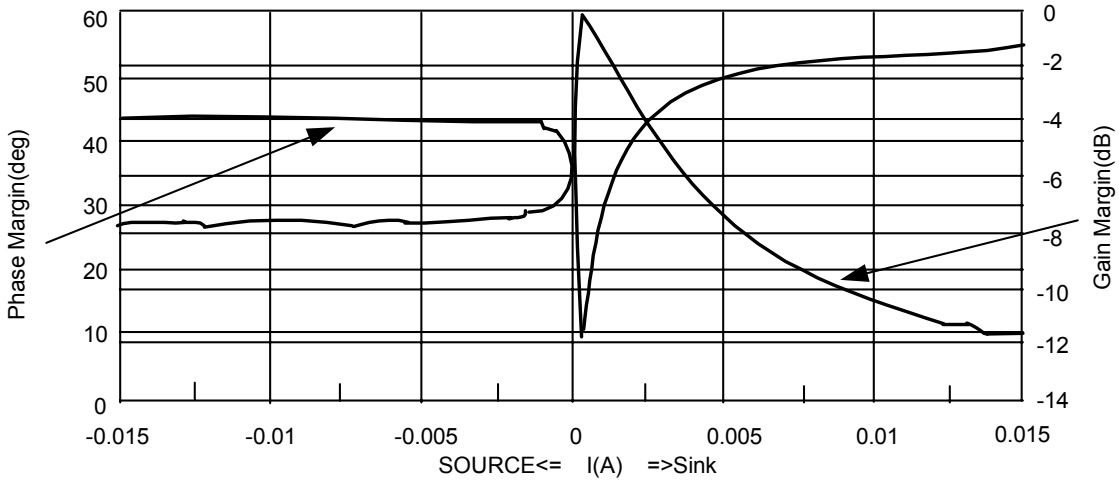
GBP=F(I)

Vcc=±15V,RL=2K,CL=100PF

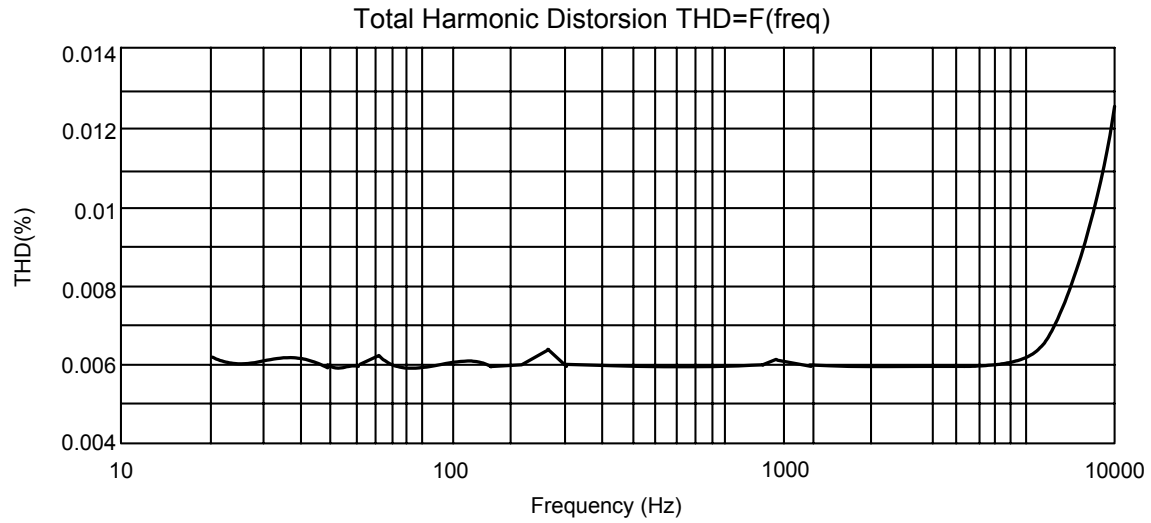


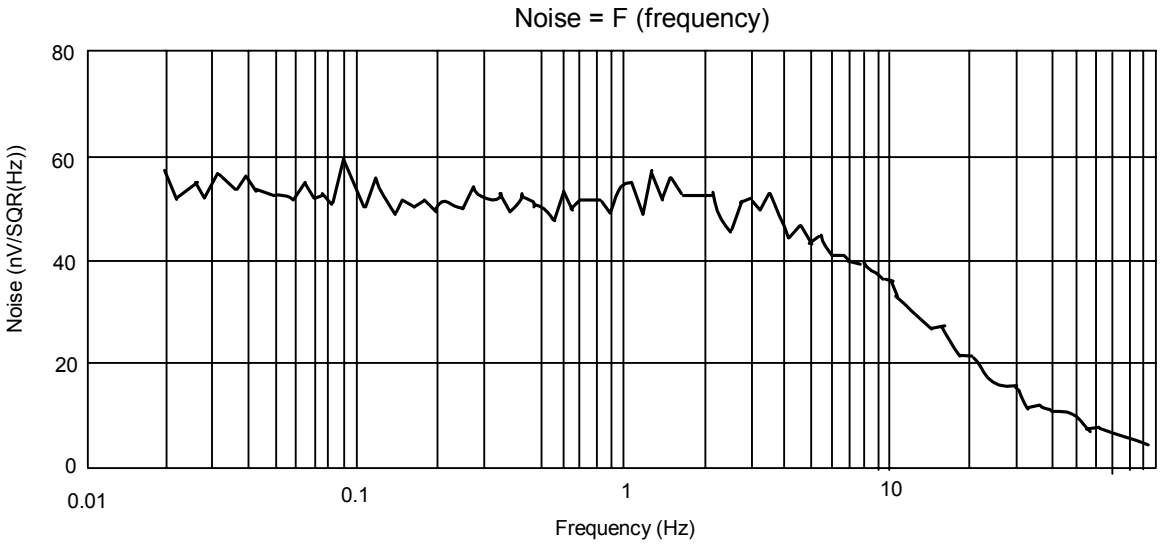
phase and Gain Margin=F(I)

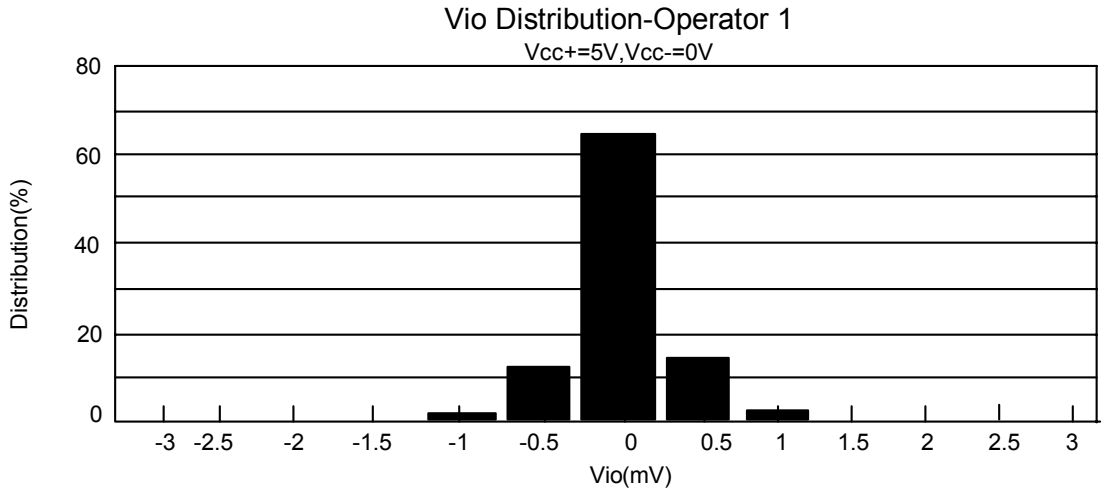
Vcc=±15V,RL=2K,CL=100PF



■ OPERATIONAL AMPLIFIERS(Cont.)







■ OPERATIONAL AMPLIFIERS(Cont.)