

**UM604A****LINEAR INTEGRATED CIRCUIT****QUAD OPERATIONAL
AMPLIFIER AND
PROGRAMMABLE VOLTAGE
REFERENCE****DESCRIPTION**

The UTC **UM604A** 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 : 375 μ A/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: $\pm 1.5 \sim \pm 15V$

VOLTAGE REFERENCE

- * Adjustable output voltage : V_{REF} to 36V
- * Reference voltage tolerance
 - UM604A-1: $\pm 0.4\%$
 - UM604A-2: $\pm 1\%$
- * Sink current capability : 1 ~ 100mA
- * Typical output impedance : 0.2 Ω

ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
UM604AL-D16-T	UM604AG-D16-T	DIP-16	Tube
-	UM604AG-S16-R	SOP-16	Tape Reel

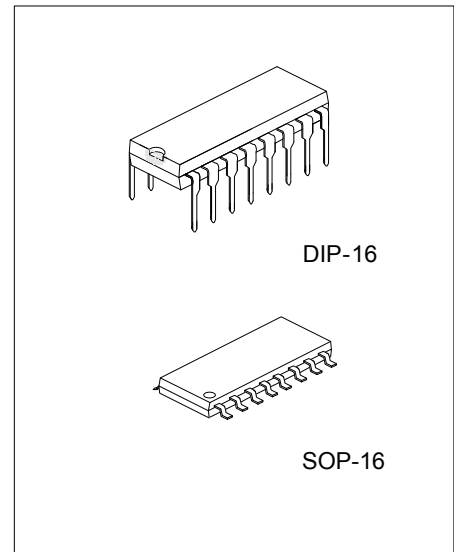
UM604AL-D16-T

- (1) Packing Type
- (2) Package Type
- (3) Green Package

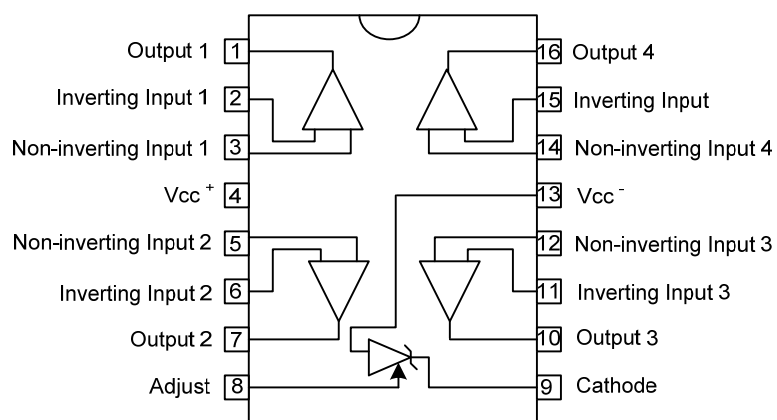
- (1) T: Tube, R: Tape Reel
- (2) D16: DIP-16, S16: SOP-16
- (3) L: Lead Free, G: Halogen Free and Lead Free

MARKING

DIP-16	SOP-16



■ 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

($V_{CC}^+ = 5V$, $V_{CC}^- = 0V$, $T_A = 25^\circ C$ 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, $T_{MIN} < T_A < T_{MAX}$	1.4		2.4	mA
		$V_{CC}^+ = 30V$, no load, $T_{MIN} < T_A < T_{MAX}$			4	mA

■ ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	$V_{I(OFF)}$	$T_A = 25^\circ C$		0.5	3	mV
		$T_{MIN} \leq T_A \leq T_{MAX}$			4	mV
		$T_A = 25^\circ C$		1	5	mV
		$T_{MIN} \leq T_A \leq T_{MAX}$			6	mV
Input Offset Voltage Drift	$\Delta V_{I(OFF)}$			7		$\mu V/^\circ C$
Input Offset Current	$I_{I(OFF)}$	$T_A = 25^\circ C$		2	30	nA
		$T_{MIN} \leq T_A \leq T_{MAX}$			50	nA
Input Bias Current	$I_{I(BIAS)}$	$T_A = 25^\circ C$		20	150	nA
		$T_{MIN} \leq T_A \leq T_{MAX}$			200	nA
Large Signal Voltage Gain	G_V	$V_{CC} = 15V$, $R_L = 2k$, $V_{OUT} = 1.4V \sim 11.4V$	50	100		V/mV
		$T_{MIN} \leq T_A \leq T_{MAX}$	25			V/mV
Supply Voltage Rejection Ratio	SVR	$V_{CC} = 5V \sim 30V$	65	100		dB
Input Common Mode Voltage Range	$V_{I(CM)}$	$V_{CC} = +30V$ (see Note 1)	0		$(V_{CC}^+) - 1.5$	V
		$T_{MIN} \leq T_A \leq T_{MAX}$	0		$(V_{CC}^+) - 2$	V
Common Mode Rejection Ratio	CMRR	$T_A = 25^\circ C$	70	85		dB
		$T_{MIN} \leq T_A \leq T_{MAX}$	60			dB
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}	$R_L = 10k$, $T_A = 25^\circ C$	27	28		V
		$V_{CC}^+ = 30V$, $T_{MIN} \leq T_A \leq T_{MAX}$	27			V
Low Level Output Voltage	V_{OL}	$R_L = 10k$		5	20	mV
		$T_{MIN} \leq T_A \leq T_{MAX}$			20	mV
Slew Rate at Unity Gain	SR	$V_{IN} = 0.5 \sim 3V$, $V_{CC} = 15V$ $R_L = 2k\Omega$, $C_L = 100pF$, unity gain	0.1	0.3		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	$f = 1kHz$ $G_V = 20dB$, $R_L = 2$, $V_{CC} = 30V$ $C_L = 100pF$, $V_O = 2V_{pp}$		0.02		%

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Equivalent Input Noise Voltage	eN	F=1kHz, V _{CC} =30V, R _S =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 V_{CC}+1.5V. But either of both inputs can go to +36V without damage.

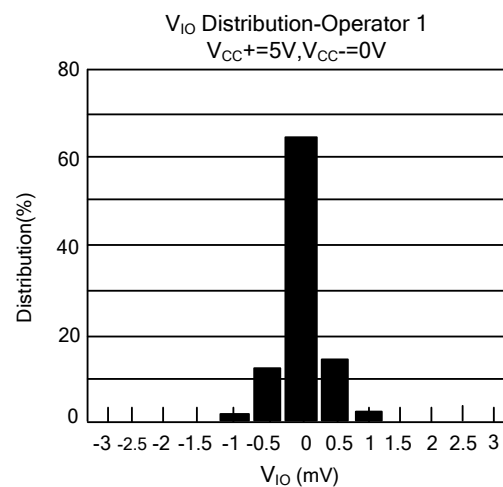
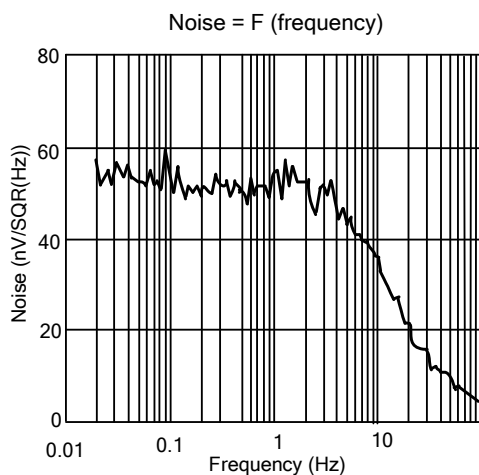
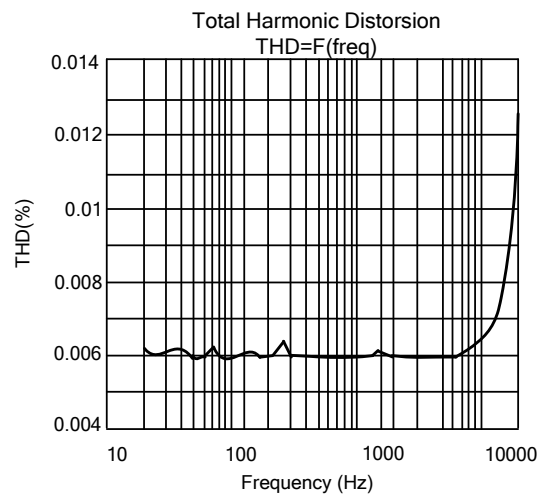
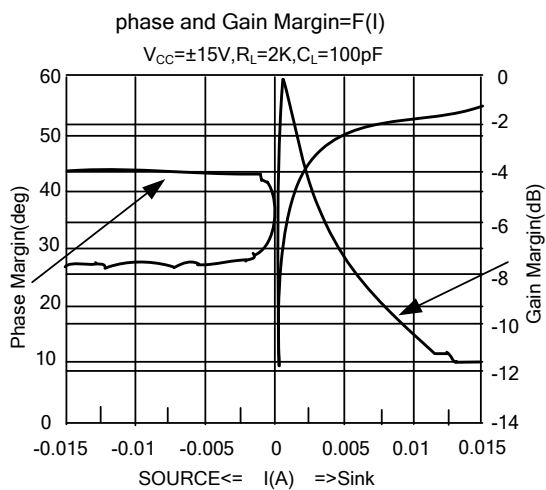
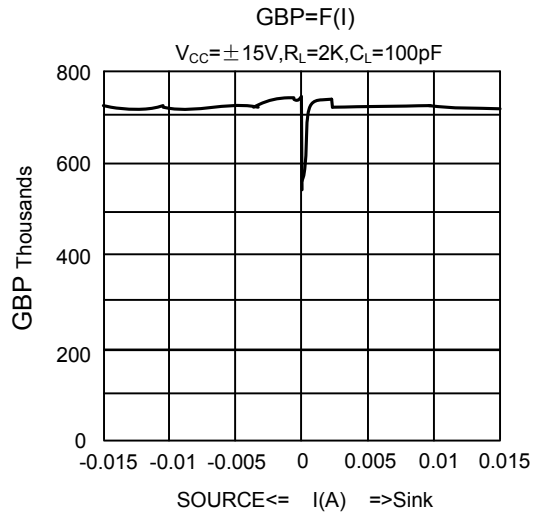
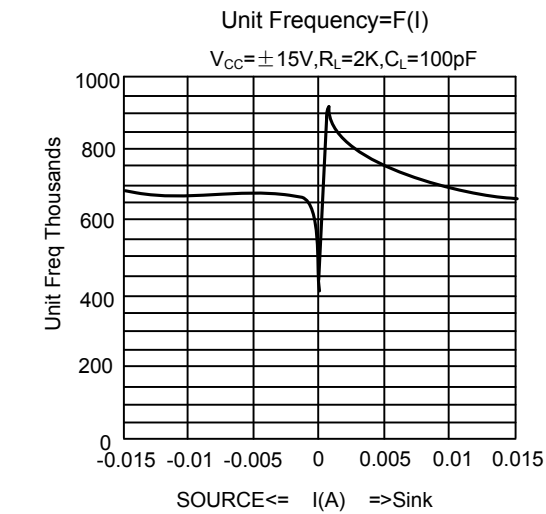
■ VOLTAGE REFERENCE

PARAMETER	SYMBOL	RATING	UNIT
Cathode Current	I _K	1 ~ 100	mA

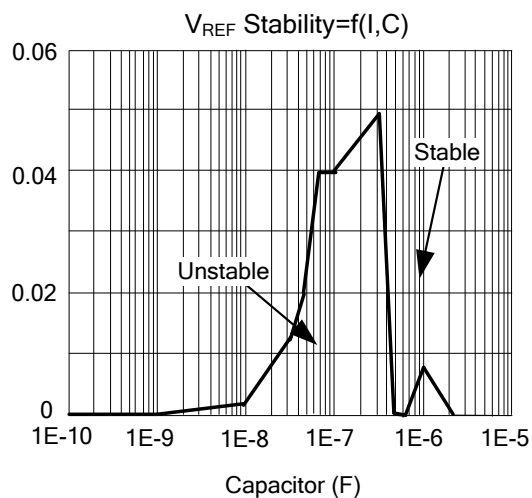
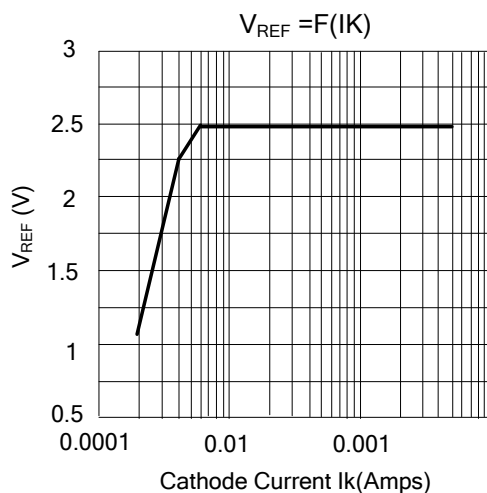
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Input Voltage	V _{REF}	±0.4%, T _A =25°C	2.49	2.5	2.51	V
		T _{MIN} ≤T _A ≤T _{MAX}	2.48		2.52	V
		±1%, T _A =25°C	2.475	2.5	2.525	V
		T _{MIN} ≤T _A ≤T _{MAX}	2.45		2.55	V
Reference Input Voltage Deviation Over Temperature Range	ΔV _{REF}	V _{KA} =V _{REF} ; I _K =10mA, T _{MIN} ≤T _A ≤T _{MAX}		7	30	mV
Ratio of Change in Reference Input Voltage to Change in Cathode to Anode Voltage	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I _K =10mA, ΔV _{KA} =36V ~ 3V	-2	-1.1		MV/V
Reference Input Current	I _{REF}	I _K =10mA		1.5	2.5	μA
		T _{MIN} ≤T _A ≤T _{MAX}			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⁾	[Z _{KA}]	V _{KA} =V _{REF} , ΔI _K =1 ~ 100mA, f<1kHz		0.2	0.5	Ω

Note: The dynamic impedance is defined as $[Z_{KA}] = \frac{\Delta V_{KA}}{\Delta I_K}$.

■ OPERATIONAL AMPLIFIERS



■ OPERATIONAL AMPLIFIERS(Cont.)



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