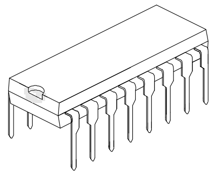
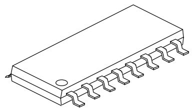
DUAL OPERATIONAL AMPLIFIER-DUAL COMPARATOR AND ADJUSTABLE VOLTAGE REFERENCE



DIP-16



SOP-16

■ DESCRIPTION

The UTC **UM602A** is a monolithic IC that includes two op-amps, two comparators and a precision voltage reference. This device is offering space and cost saving in many applications like power supply management or data acquisition systems.

■ FEATURES

OPERATIONAL AMPLIFIERS

*Low supply current: 200μA/amp
*Medium speed: 2.1MHz
*Low level output voltage close to V_{CC}^{-}:0.1V typ
*Input common mode voltage range includes ground

COMPARATORS

*Low supply current: 200μA/amp. (V_{CC}=5V)
*Input common mode voltage range includes ground
*Low output saturation voltage: 250mV(I_O=4mA)

REFERENCE

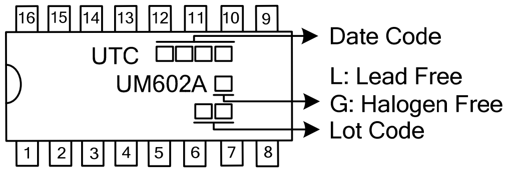
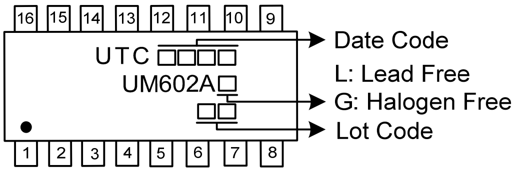
* Adjustable output voltage: V_{REF} to 32V
* Reference voltage tolerance
  UM602A-1: ±0.4%
  UM602A-2: ±1%
* Sink current capability: 1~100mA

■ ORDERING INFORMATION

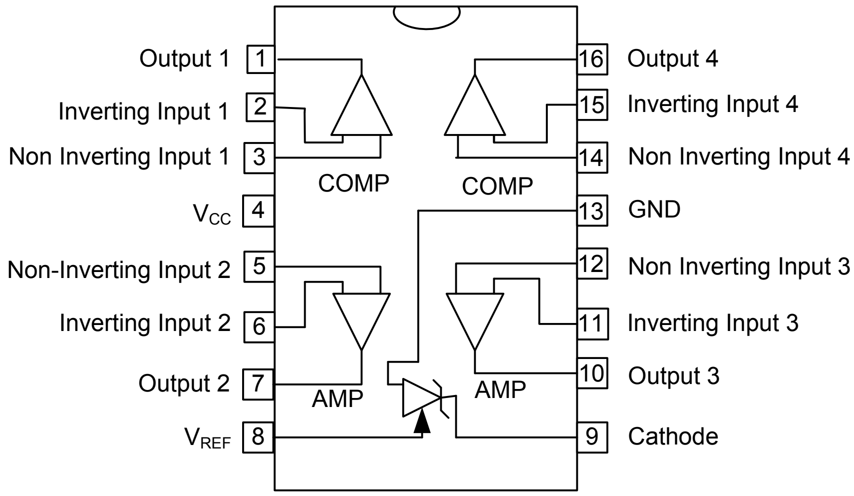
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UM602AL-D16-T	UM602AG-D16-T	DIP-16	Tube
UM602AL-S16-R	UM602AG-S16-R	SOP-16	Tape Reel

UM602AG-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) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

DIP-16	SOP-16
	

■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN	NAME	DESCRIPTION
1	Output1	COMP Output 1
2	Inverting Input 1	COMP Inverting Input 1
3	Non Inverting Input 1	COMP Non-Inverting Input 1
4	V_{CC}	Supply Voltage
5	Non-Inverting Input 2	AMP Non-Inverting Input 2
6	Inverting Input 2	AMP Inverting Input 2
7	Output 2	AMP Output 2
8	V_{REF}	Reference Voltage
9	Cathode	Cathode Voltage
10	Output 3	AMP Output 3
11	Inverting Input 3	AMP Inverting Input 3
12	Non Inverting Input 3	AMP Non-Inverting Input 3
13	GND	Ground
14	Non Inverting Input 4	COMP Non-Inverting Input 4
15	Inverting Input 4	COMP Inverting Input 4
16	Output 4	COMP Output 4

■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
DC Supply Voltage	V_{CC}	36	V
Differential Input Voltage	V_{ID}	36	V
Input Voltage	V_{IN}	-0.3 ~ +36	V
Power Dissipation	P_D	600	mW
Junction Temperature	T_J	150	°C
Operating Temperature Range	T_{OPR}	-40 ~ +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, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Total Supply Current	I_{CC}			0.8	1.5	mA
		$T_{MIN} < T_A < T_{MAX}$			2	mA

■ OPERATIONAL AMPLIFIERS (Independent op-amp) (V_{CC}=5V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	T_A=25°C			1	4.5	mV
		$T_{MIN} \le T_A \le T_{MAX}$				6.5	mV
Input Offset Voltage Drift	DV_{IO}				10		μV/°C
Input Bias Current	I_{IB}	T_A=25°C			20	100	nA
		$T_{MIN} \le T_A \le T_{MAX}$				200	nA
Input Offset Current	I_{IO}	T_A=25°C			5	20	nA
		$T_{MIN} \le T_A \le T_{MAX}$				40	nA
Large Signal Voltage Gain	A_{VD}	R1=10k, V_{CC}=30V, V_O=5V~25V		50	100		V/mV
		$T_{MIN} \le T_A \le T_{MAX}$		25			V/mV
Supply Voltage Rejection Ratio	SVR	V_O=5V~30V		80	100		dB
Input Common Mode Voltage Range	V_{ICM}	T_A=25°C		0		V_{CC} -1.8	V
		$T_{MIN} \le T_A \le T_{MAX}$		0		V_{CC} -2.2	V
Common Mode Rejection Ratio	CMR	V_{CC}=30V, V_{ICM}=0V~(V_{CC})-1.8V		70	90		dB
Output Short Circuit Current	I_{SC}	V_{ID}=±1V, V_O=2.5V	Source	3	6		mA
			Sink	3	6		mA
High Level Output Voltage	V_{OH}	V_{CC}=30V	R_L=10kΩ	27	28		V
			$T_{MIN} \le T_A \le T_{MAX}$	26			V
Low Level Output Voltage	V_{OL}	R_L=10kΩ			100	150	mV
		$T_{MIN} \le T_A \le T_{MAX}$				210	mV
Slew Rate	SR	V_{CC}=±15V, V_I=±10V, R_L=10KΩ, C_L=100pF		1.6	2		V/μs
Gain Bandwidth Product	GBP	R_L=10KΩ, C_L=100pF, f=100kHz		1.4	2.1		MHz
Phase Margin	Φm	R_L=10KΩ, C_L=100pF			45		Degrees
Total Harmonic Distortion	THD				0.05		%
Equivalent Input Noise Voltage	en	f=1kHz			29		$\frac{nV}{\sqrt{Hz}}$
Channel Separation	CS				120		dB

■ COMPARATORS (V_{CC}=5V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	T_A=25°C			5	mV
		$T_{MIN} \le T_A \le T_{MAX}$			9	mV
Input Offset Current	I_{IO}	T_A=25°C			50	nA
		$T_{MIN} \le T_A \le T_{MAX}$			150	nA
Input Bias Current	I_{IB}	T_A=25°C			250	nA
		$T_{MIN} \le T_A \le T_{MAX}$			400	nA
High Level Output Voltage	I_{OH}	V_{ID}=1V, V_{CC}=V_O+30V		0.1		nA
		$T_{MIN} \le T_A \le T_{MAX}$			1	μA
Low Level Output Voltage	V_{OL}	V_{ID}=-1V, Lsink=4mA		250	400	mV
		$T_{MIN} \le T_A \le T_{MAX}$			700	
Large Signal Voltage Gain	A_{VD}	R_1=15K, V_{CC}=15V, V_O=1~11V		200		V/mV
Output Sink Current	I_{SINK}	V_{ID}=-1V, V_O=1.5V	6	16		mA
Input Common Mode Voltage Range	V_{ICM}	T_A=25°C	0		V_{CC} -1.5	V
		$T_{MIN} \le T_A \le T_{MAX}$	0		V_{CC} -2	V
Differential Input Voltage	V_{ID}				V_{CC}	V
Response Time (Note1)	t_{RE}	R_1=5.1k~V_{CC}, V_{REF}=1.4V		1.3		μs
Large Signal Response Time (Note2)	t_{REL}	V_{REF}=1.4V, V_I=TTL, R1=5.1k~V_{CC}		300		ns

Notes: 1. The response time specified is for 100mV input step with 5mV overdrive.
2. For larger overdrive signals, 300ns can be obtained.

■ VOLTAGE REFERENCE

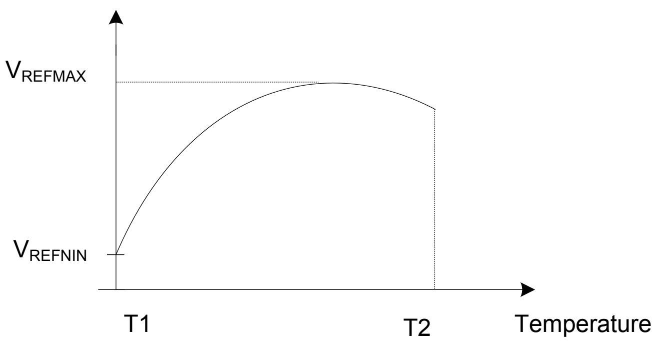
PARAMETER	SYMBOL	VALUE	UNIT
Cathode to Anode Voltage	V_{KA}	V_{REF} ~ 36	V
Cathode Current	I_K	1 to 100	mA

■ VOLTAGE REFERENCE (T_A=25°C, unless otherwise specified)

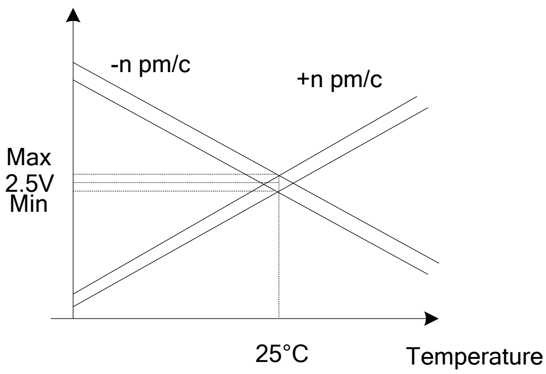
PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Reference Input Voltage (Figure 1)	UM602A-1	V_{REF}	$V_{KA}=V_{REF}, I_K=10mA$		2.490	2.500	2.510	V
	UM602A-2				2.475	2.500	2.525	V
Reference Input Voltage Deviation Over Temperature Range (Figure 1, Note 1)		$\triangle V_{REF}$	$V_{KA}=V_{REF}, I_K=10mA$ $T_{MIN} \le T_A \le T_{MAX}$			7	30	mV
Temperature Coefficient of Reference Input Voltage (Note 2)		$\frac{\Delta V_{REF}}{\Delta_T}$	$V_{KA}=V_{REF}, I_K=10mA$ $T_{MIN} \le T_A \le T_{MAX}$			±22	±100	ppm/°C
Ratio of Change in Reference Input Voltage to Change in Cathode to Anode Voltage (Figure2)		$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I_K=10mA, $\triangle V_{KA}$=36~3V			-1.1	-2	mV/V
Reference Input Current (Figure 2)		I_{REF}	$I_K=10mA, R_1=10k\Omega R_2=\infty$	T_A=25°C		1.5	2.5	µA
				$T_{MIN} \le T_A \le T_{MAX}$			3	µA
Reference Input Current Deviation Over Temperature Range (Figure 2)		$\triangle I_{REF}$	I_K=10mA, R1=10kΩ, R2=∞, $T_{MIN} \le T_A \le T_{MAX}$			0.5	1	µA
Minimum Cathode Current for Regulation (Figure 1)		I_{MIN}	$V_{KA}=V_{REF}$			0.5	1	mA
Off-State Cathode Current (Figure 3)		I_{OFF}				180	500	nA

Notes: 1. $\triangle V_{REF}$ is defined as the difference between the maximum and minimum values obtained over the full temperature range.

$V_{REF}=V_{REFMAX} - V_{REFMIN}$



2. The temperature coefficient is defined as the slopes (positive and negative) of the voltage vs temperature limits whithin which the reference voltage is guaranteed.



■ VOLTAGE REFERENCE (Cont.)

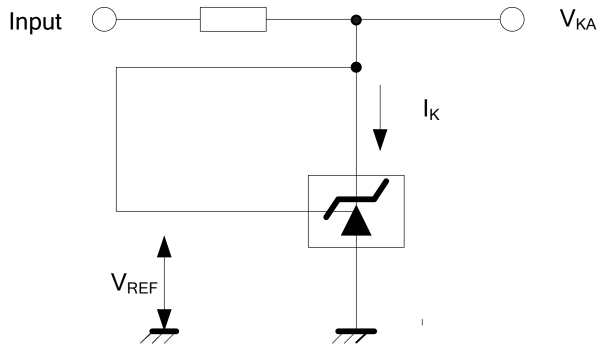


Figure 1: Test Circuit for V_{KA}=V_{REF}

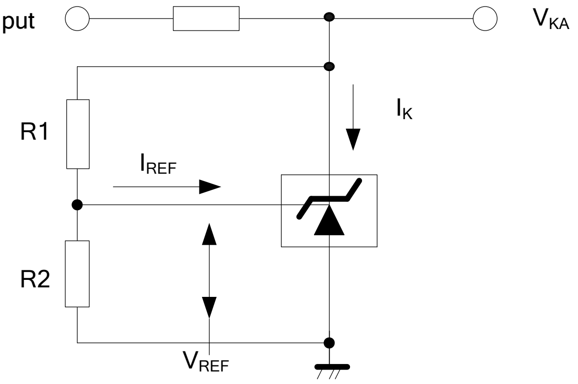


Figure 2: Test Circuit for V_{KA} ＞ V_{REF}

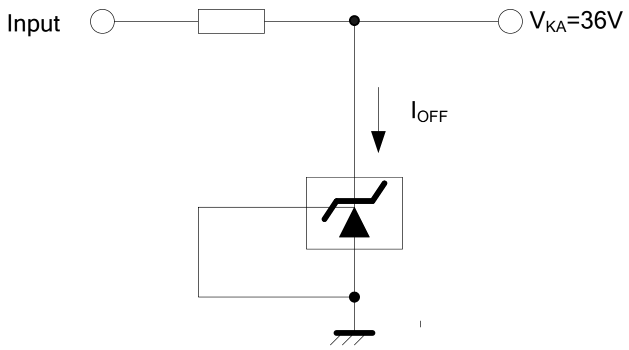


Figure 3: Test Circuit for I_{OFF}