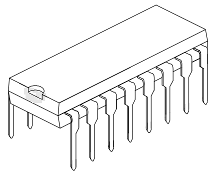
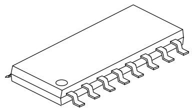
DUAL OPERATIONAL AMPLIFIER-DUAL COMPARATOR AND ADJUSTABLE VOLTAGE REFERENCE



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

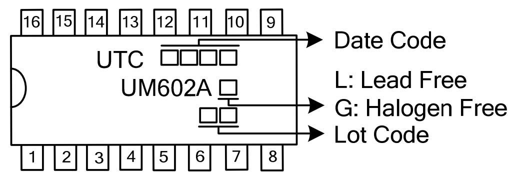
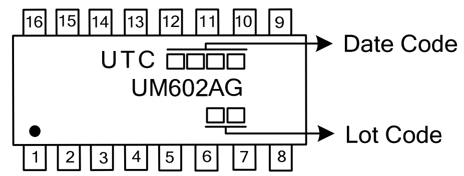
* Adjustable output voltage: V_{REF} to 32V
* Reference voltage tolerance
  UM602A-1: ±0.4%
  UM602A-2: ±1%
* Sink current capability: 1~100mA

■ ORDERING INFORMATION

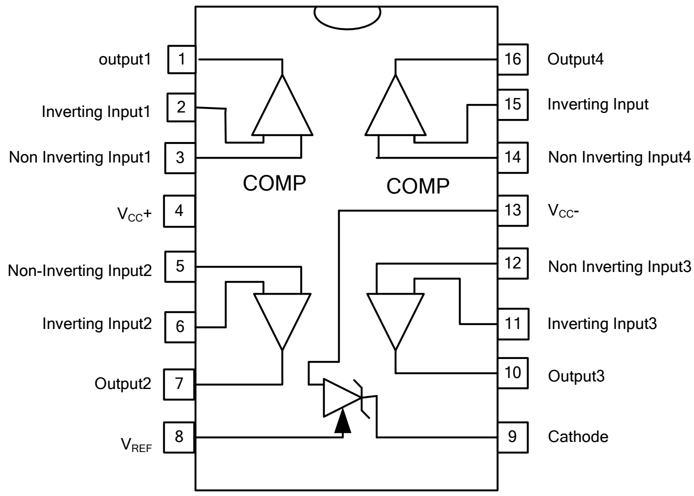
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UM602AL-D16-T	UM602AG-D16-T	DIP-16	Tube
-	UM602AG-S16-R	SOP-16	Tape Reel

UM602AL-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



■ PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1.	V_{REF}	OUTPUT	Voltage Reference Output 1.24V, 10mA max. Do not short circuit
2.	C_{SEN}	INPUT	Current source enable input. This current source can be used to offset the voltage measurement on the sense resistor and therefore to modify the charge current. The current source is enabled when the input volage on pin 2 is lower than 0.8V
3.	C_{RREF}	INPUT	Current Limitation Reference Input
4.	GND	INPUT	Ground
5.	C_{RIN}	INPUT	Current Limitation Loop Input, connected to the sense resistor
6.	OUTPUT	OUTPUT	Output pin common to the voltage regulation and current limitation loops. This output can drive the primary side (LED) of an optocoupler
7.	V_{RIN}	INPUT	Voltage Regulation Loop Input
8.	V_{CC}	INPUT	Power Supply Input (4.5 ~ 32VDC)

■ 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	200	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, V_{CC}^-=GND, 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, V_{CC}^-=0V, R_1 Connected to V_{CC}/2, 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		V_{CC}^-		V_{CC}^+ -1.8	V
		$T_{MIN} \le TA \le T_{MAX}$		V_{CC}^-		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, V_{CC}=Ground, 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
		$T_{MIN} \le T_A \le T_{MAX}$				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	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

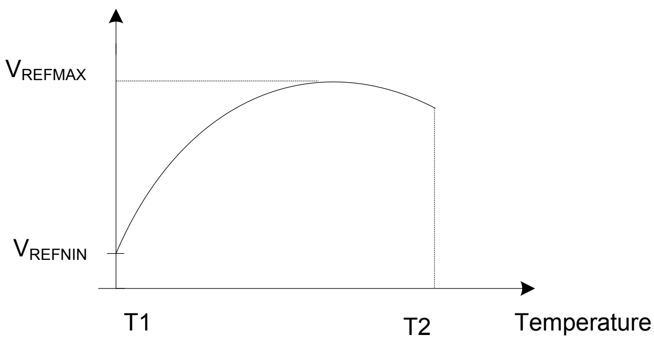
■ VOLTAGE REFERENCE (Cont.)

(TA=25°C, unless otherwise specified)

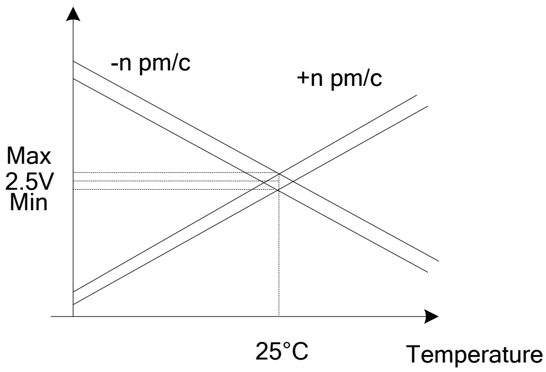
PARAMETER		SYMBOL	CONDITION		MIN	TYP	MAX	UNIT
Reference Input Voltage (T_A=25°C) (Figure 1)	UM602A-1	V_{REF}	$V_{KA}=V_{REF}$, I_K=10mA		2.490	2.500	2.510	V
	UM602A-2				2.475	2.500	2.525	V
Reference Input Voltage Deviation Over Temperature Range (Figure 1, Note 1)		$\triangle V_{REF}$	$V_{KA}=V_{REF}$, I_K=10mA $T_{MIN} \le T_A \le T_{MAX}$			7	30	mV
Temperature Coefficient of Reference Input Voltage (Note 2)		□V_{REF} / □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)		□V_{REF} / □V_{KA}	I_K=10mA, $\triangle V_{KA}$=36~3V			-1.1	-2	mV/V
Reference Input Current (Figure2)		I_{REF}	I_K=10mA, R_1=10kΩ R_2=∞	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-(figure1)		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.



3.The dynamic Impedance is defined as $|Z_{KA}| = \frac{□V_{KA}}{□I_K}$.

■ VOLTAGE REFERENCE (Cont.)

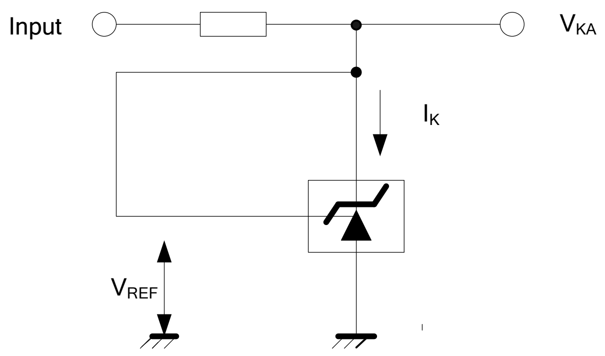


Figure 1: Test Circuit for V_{KA}=V_{REF}

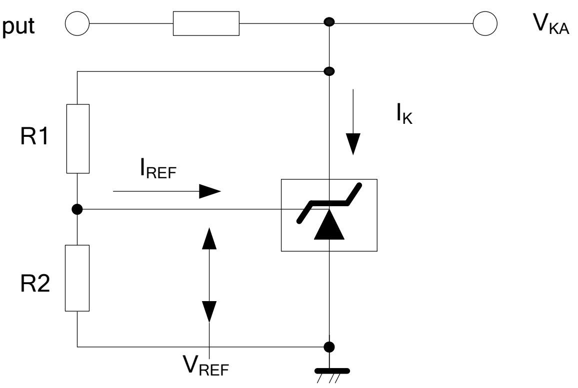


Figure 2: Test Circuit for V_{KA}＞V_{REF}

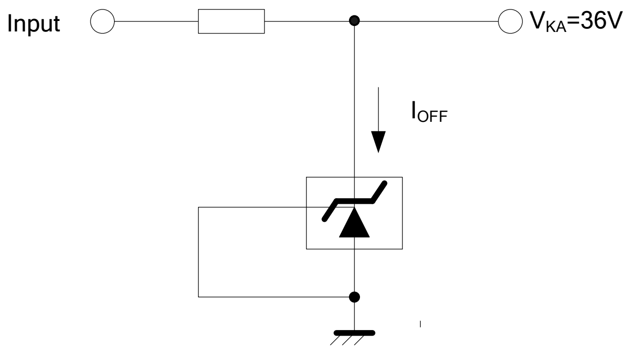


Figure 3: Test Circuit for I_{off}