



UM609A

LINEAR INTEGRATED CIRCUIT

DUAL OPERATIONAL AMPLIFIER AND CURRENT CONTROLLER

DESCRIPTION

The UTC **UM609A** is a monolithic IC that includes one independent op-amp and another op-amp for which 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 switching battery chargers.

FEATURES

OPERATIONAL AMPLIFIER

- * Low supply current: 75uA/Per OP AMP.(@ $V_{CC}=5V$)
- * Medium bandwidth(unity gain): 1MHz
- * Large output voltage swing: $0V \sim (V_{CC}-1.5V)$
- * Wide power supply range: 3V~36V

VOLTAGE REFERENCE

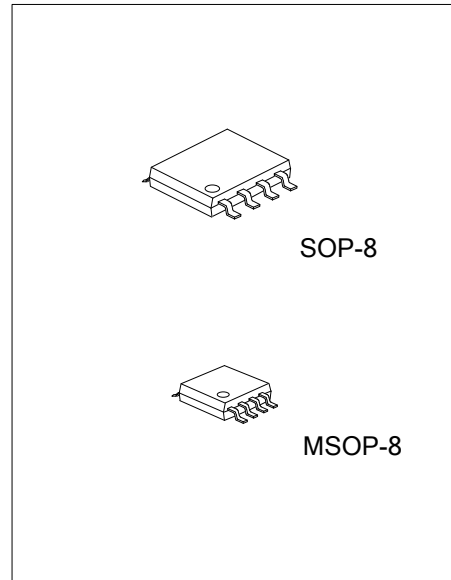
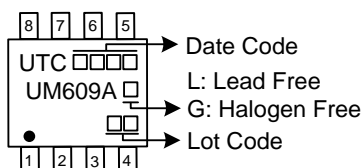
- * Fixed output voltage reference 2.5V
- * Reference voltage tolerance
 - UM609A-1: $\pm 0.4\%$
 - UM609A-2: $\pm 1\%$
- * Sink current capability: 0.05~80mA
- * Typical output impedance: 0.2 Ω

ORDERING INFORMATION

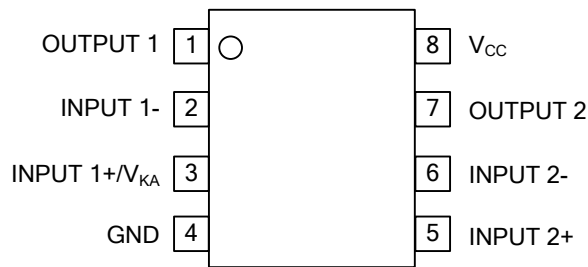
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UM609AL-S08-R	UM609AG-S08-R	SOP-8	Tape Reel
UM609AL-SM1-R	UM609AG-SM1-R	MSOP-8	Tape Reel

<p>UM609AG-S08-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) S08: SOP-8, SM1: MSOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



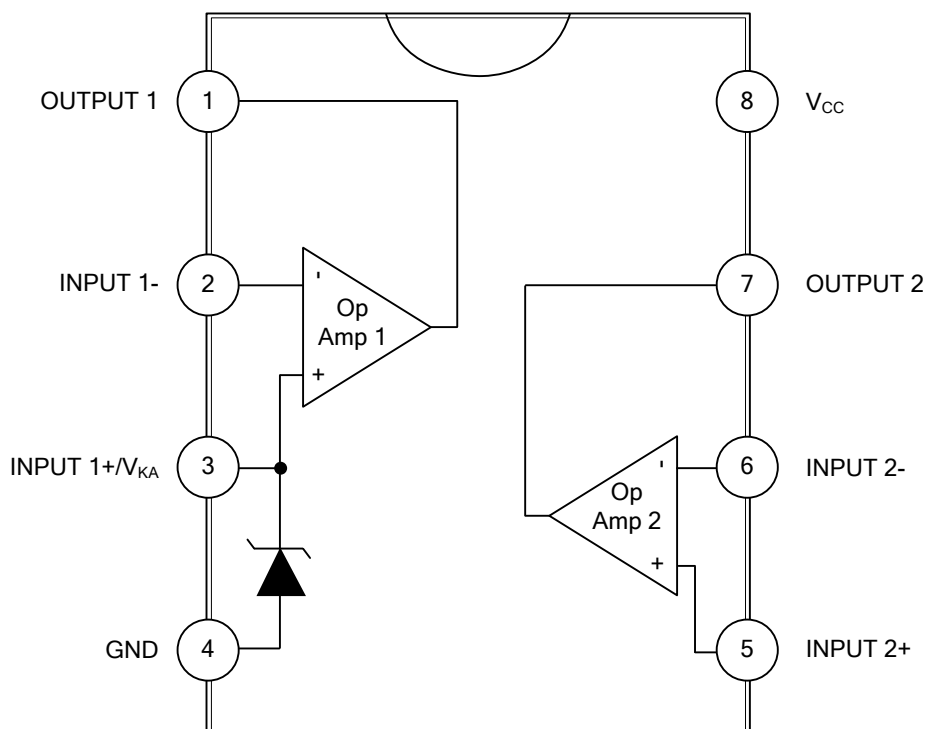
PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUTPUT 1	Output of Channel 1
2	INPUT 1-	Inverting Input of Channel 1
3	INPUT 1+/V _{KA}	Non-Inverting Input of Channel 1 / Cathode of the Zener voltage
4	GND	Ground
5	INPUT 2+	Non-Inverting Input of Channel 2
6	INPUT 2-	Inverting Input of Channel 2
7	OUTPUT 2	Output of Channel 2
8	V _{CC}	Supply Voltage

BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Power Supply Voltage (V_{CC} to GND)	V_{CC}	40	V
Op Amp 1 and 2 Input Voltage Range (Pins 2, 5, 6)	V_{IN}	-0.3~ $V_{CC}+0.3$	V
Op Amp 2 Input Differential Voltage (Pins 5, 6)	V_{ID}	40	V
Voltage Reference Cathode Current (Pin 3)	I_K	100	mA
Power Dissipation ($T_A=25^\circ\text{C}$)	SOP-8	500	mW
	MSOP-8	350	mW
Operating Junction Temperature	T_J	+150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 ~ +150	$^\circ\text{C}$
Lead Temperature (Soldering 10s)	T_{LEAD}	260	$^\circ\text{C}$

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.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	3 ~ 36	V
Ambient Temperature	T_A	-40 ~ +105	$^\circ\text{C}$

■ ELECTRICAL CHARACTERISTICS

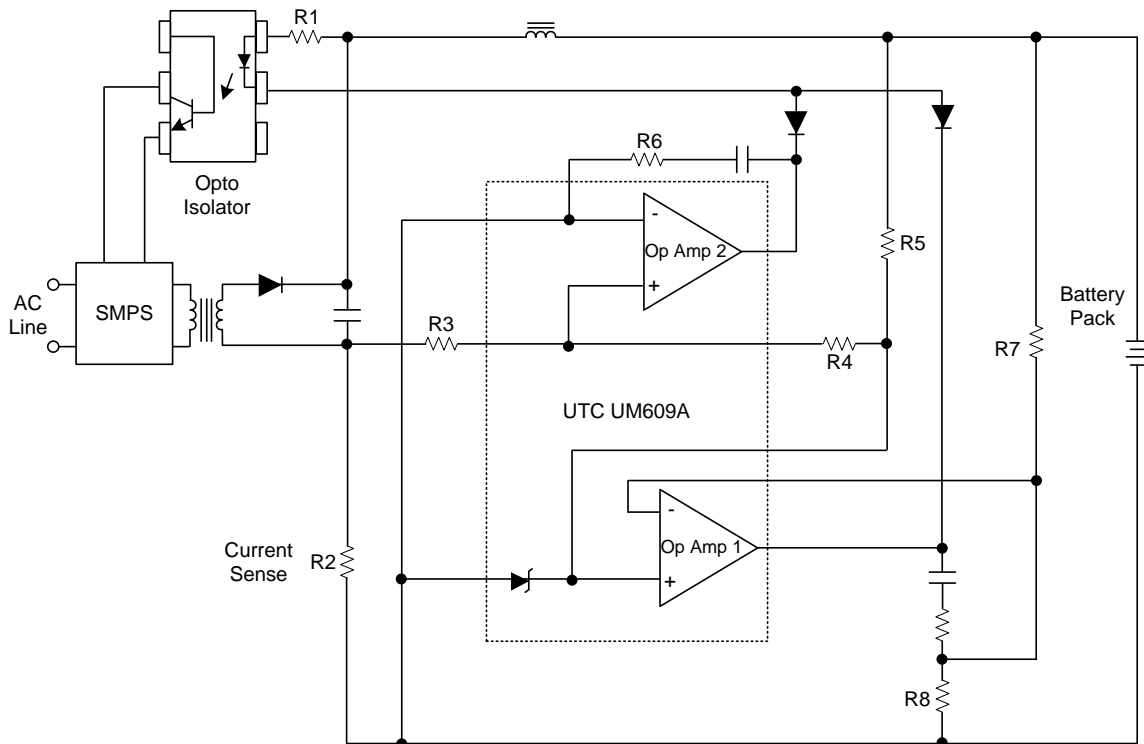
(Operating Conditions: $V_{CC}=+5\text{V}$, $T_A=25^\circ\text{C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT		
Total Supply Current, Excluding Current in Voltage Reference	I_{CC}	$V_{CC}=5\text{V}$, no load, $-40^\circ\text{C}\leq T_A\leq 105^\circ\text{C}$		0.17	0.25	mA		
		$V_{CC}=30\text{V}$, no load, $-40^\circ\text{C}\leq T_A\leq 105^\circ\text{C}$		0.24	0.30	mA		
Voltage Reference Section								
Reference voltage tolerance	UM609A-1	V_{REF}	$I_K=10\text{mA}$	$T_A=25^\circ\text{C}$	2.49	2.50	2.51	V
				$-40^\circ\text{C}\leq T_A\leq 105^\circ\text{C}$	2.48	2.50	2.52	V
	UM609A-2	$T_A=25^\circ\text{C}$	2.475	2.50	2.525	V		
		$-40^\circ\text{C}\leq T_A\leq 105^\circ\text{C}$	2.45	2.50	2.55	V		
Reference Voltage Deviation Over Full Temperature Range		$I_K=10\text{mA}$, $T_A=-40\sim 105^\circ\text{C}$		5	24	mV		
Minimum Cathode Current for Regulation				0.01	0.05	mA		
Dynamic Impedance		$I_K=1.0\sim 80\text{mA}$, $f<1\text{kHz}$		0.2	0.5	Ω		
Op Amp 1 Section ($V_{CC}=5\text{V}$, $V_O=1.4\text{V}$, $T_A=25^\circ\text{C}$, unless otherwise noted)								
Input Offset Voltage	$V_{i(OFF)}$	$T_A=25^\circ\text{C}$		0.5	3	mV		
		$T_A=-40\sim 105^\circ\text{C}$			5	mV		
Input Offset Voltage Temperature Drift	$DV_{i(OFF)}$	$T_A=-40\sim 105^\circ\text{C}$		7		$\mu\text{V}/^\circ\text{C}$		
Input Bias Current (Inverting Input Only)	$I_{I(BIAS)}$	$T_A=25^\circ\text{C}$		20	150	nA		
Large Signal Voltage Gain	A_{VD}	$V_{CC}=15\text{V}$, $R_L=2\text{k}\Omega$, $V_O=1.4\sim 11.4\text{V}$	85	100		dB		
Power Supply Rejection Ratio	PSRR	$V_{CC}=5\sim 30\text{V}$	70	95		dB		
Output Current	Source	I_{SOURCE}	$V_{CC}=15\text{V}$, $V_{ID}=1\text{V}$, $V_O=2\text{V}$	20	28	mA		
	Sink	I_{SINK}	$V_{CC}=15\text{V}$, $V_{ID}=-1\text{V}$, $V_O=2\text{V}$	7	12	mA		
Output Voltage Swing (High)	V_{OH}	$V_{CC}=30\text{V}$, $R_L=10\text{k}\Omega$, $V_{ID}=1\text{V}$	27	28		V		
Output Voltage Swing (Low)	V_{OL}	$V_{CC}=30\text{V}$, $R_L=10\text{k}\Omega$, $V_{ID}=-1\text{V}$		17	100	mV		
Slew Rate	SR	$V_{CC}=18\text{V}$, $R_L=2\text{k}\Omega$, $A_v=1$, $V_{IN}=0.5\sim 2\text{V}$, $C_L=100\text{pF}$	0.2	1.0		$\text{V}/\mu\text{s}$		
Unity Gain Bandwidth	GBP	$V_{CC}=30\text{V}$, $R_L=2\text{k}\Omega$, $C_L=100\text{pF}$	0.7	1.0		MHz		

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Op Amp 2 Section ($V_{CC}=5V$, $V_O=1.4V$, $T_A=25^\circ C$, unless otherwise noted)						
Input Offset Voltage	$V_{I(OFF)}$	$T_A=25^\circ C$		0.5	3	mV
		$T_A=-40\sim 105^\circ C$			5	mV
Input Offset Voltage Temperature Drift	$DV_{I(OFF)}$	$T_A=-40\sim 105^\circ C$		7		$\mu V/^\circ C$
Input Offset Current	$I_{I(OFF)}$	$T_A=25^\circ C$		2	30	nA
Input Bias Current	$I_{I(BIAS)}$	$T_A=25^\circ C$		20	150	nA
Input Voltage Range	V_I	$V_{CC}=0\sim 36V$	0		$V_{CC}-1.5$	V
Common Mode Rejection Ratio	CMRR	$T_A=25^\circ C$, $V_{CM}=0\sim 3.5V$	70	85		dB
Large Signal Voltage Gain	AVD	$V_{CC}=15V$, $R_L=2k\Omega$, $V_O=1.4\sim 11.4V$	85	100		dB
Power Supply Rejection Ratio	PSRR	$V_{CC}=5\sim 30V$	70	95		dB
Output Current	Source	I_{SOURCE}	$V_{CC}=15V$, $V_{ID}=1V$, $V_O=2V$	20	28	mA
	Sink	I_{SINK}	$V_{CC}=15V$, $V_{ID}=-1V$, $V_O=2V$	7	12	mA
Output Voltage Swing (High)	V_{OH}	$V_{CC}=30V$, $R_L=10k\Omega$, $V_{ID}=1V$	27	28		V
Output Voltage Swing (Low)	V_{OL}	$V_{CC}=30V$, $R_L=10k\Omega$, $V_{ID}=-1V$		17	100	mV
Slew Rate	SR	$V_{CC}=18V$, $R_L=2k\Omega$, $A_V=1$, $V_{IN}=0.5\sim 2V$, $C_L=100pF$	0.2	1.0		$V/\mu s$
Unity Gain Bandwidth	GBP	$V_{CC}=30V$, $R_L=2k\Omega$, $C_L=100pF$	0.7	1.0		MHz

■ TYPICAL APPLICATION CIRCUIT



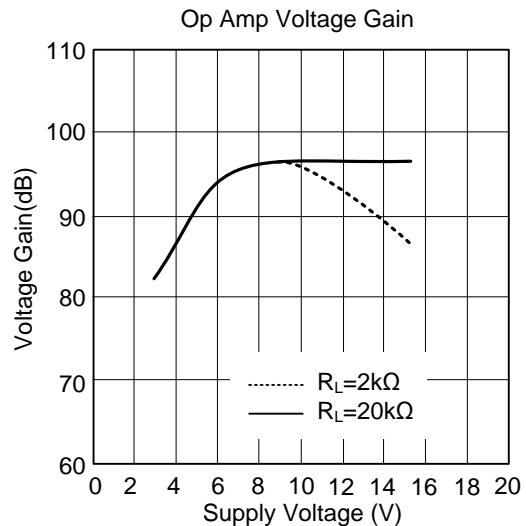
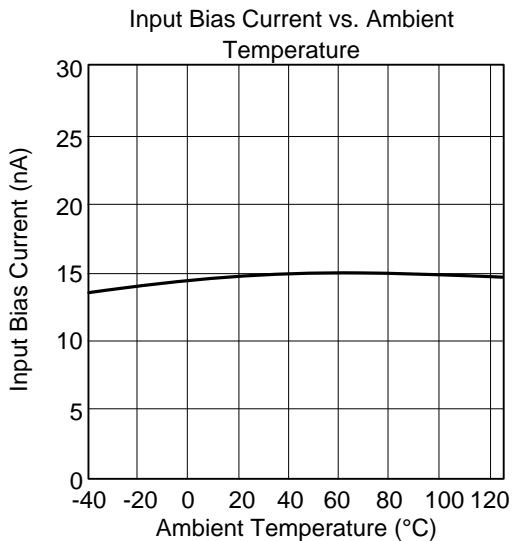
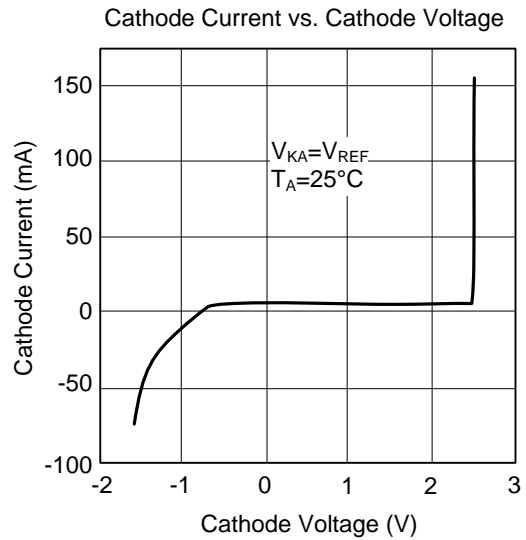
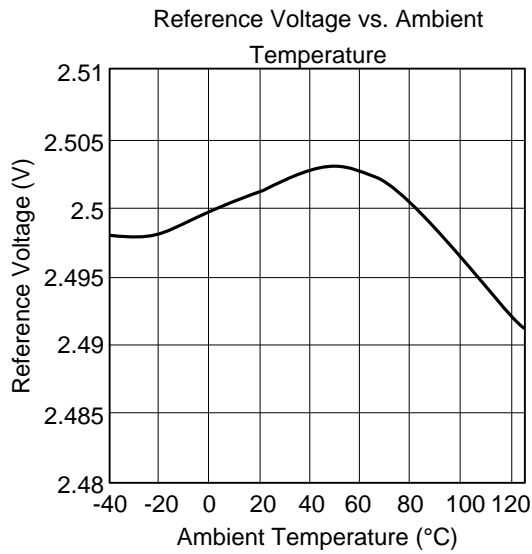
$$V_{OUT} = V_{REF} \times \frac{R_7 + R_8}{R_8}$$

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

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

Application of UTC UM609A in a Constant Current and Constant Voltage Charger

■ TYPICAL CHARACTERISTICS



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