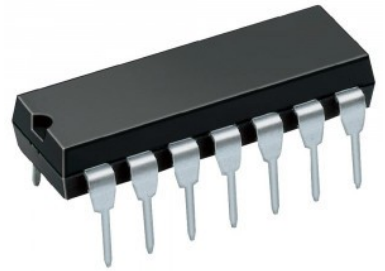




PRODUCT NAME : LMC660 CMOS Quad Operational Amplifier

PRICE : Rs 49.00

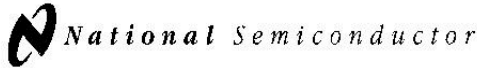
SKU : RM1991



DESCRIPTION

Features

- CMOS Quad Op-Amps with Very Low Bias Currents and Single Supply Operation
- Input Offset Voltage: 3 mV
- Input Offset Current: 1 pA
- Input Bias Current: 2 pA
- Rail-to-Rail Output Swing
- Large DC Voltage Gain: 126 dB
- Supply Voltage Range: 5V to 15V



April 1998

LMC660 CMOS Quad Operational Amplifier

General Description

The LMC660 CMOS Quad operational amplifier is ideal for operation from a single supply. It operates from +5V to +15V and features rail-to-rail output swing in addition to an input common-mode range that includes ground. Performance limitations that have plagued CMOS amplifiers in the past are not a problem with this design. Input V_{OS} , drift, and broadband noise as well as voltage gain into realistic loads (2 k Ω and 600 Ω) are all equal to or better than widely accepted bipolar equivalents.

This chip is built with National's advanced Double-Poly Silicon-Gate CMOS process.

See the LMC662 datasheet for a dual CMOS operational amplifier with these same features.

Features

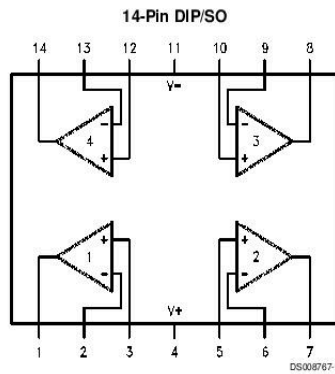
- Rail-to-rail output swing
- Specified for 2 k Ω and 600 Ω loads
- High voltage gain: 126 dB
- Low input offset voltage: 3 mV
- Low offset voltage drift: 1.3 μ V/ $^{\circ}$ C

- Ultra low input bias current: 2 fA
- Input common-mode range includes V^-
- Operating range from +5V to +15V supply
- $I_{SS} = 375 \mu$ A/amplifier; independent of V^+
- Low distortion: 0.01% at 10 kHz
- Slew rate: 1.1 V/ μ s
- Available in extended temperature range (-40° C to $+125^{\circ}$ C); ideal for automotive applications
- Available to Standard Military Drawing specification

Applications

- High-impedance buffer or preamplifier
- Precision current-to-voltage converter
- Long-term integrator
- Sample-and-Hold circuit
- Peak detector
- Medical instrumentation
- Industrial controls
- Automotive sensors

Connection Diagram



Absolute Maximum Ratings (Note 3)		Operating Ratings						
<p>If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.</p>		<p>Temperature Range LMC660AMJ/883, LMC660AMD $-55^{\circ}\text{C} \leq T_J \leq +125^{\circ}\text{C}$ LMC660AI $-40^{\circ}\text{C} \leq T_J \leq +85^{\circ}\text{C}$ LMC660C $0^{\circ}\text{C} \leq T_J \leq +70^{\circ}\text{C}$ LMC660E $-40^{\circ}\text{C} \leq T_J \leq +125^{\circ}\text{C}$</p>						
Differential Input Voltage	\pm Supply Voltage	Supply Voltage Range	4.75V to 15.5V					
Supply Voltage	16V	Power Dissipation	(Note 10)					
Output Short Circuit to V ⁺	(Note 12)	Thermal Resistance (θ_{JA}) (Note 11)						
Output Short Circuit to V ⁻	(Note 1)	14-Pin Ceramic DIP	90°C/W					
Lead Temperature		14-Pin Molded DIP	85°C/W					
(Soldering, 10 sec.)	260°C	14-Pin SO	115°C/W					
Storage Temp. Range	-65°C to $+150^{\circ}\text{C}$	14-Pin Side Brazed Ceramic DIP	90°C/W					
Voltage at Input/Output Pins	(V ⁺) + 0.3V, (V ⁻) - 0.3V							
Current at Output Pin	\pm 18 mA							
Current at Input Pin	\pm 5 mA							
Current at Power Supply Pin	35 mA							
Power Dissipation	(Note 2)							
Junction Temperature	150°C							
ESD tolerance (Note 8)	1000V							
DC Electrical Characteristics								
<p>Unless otherwise specified, all limits guaranteed for T_J = 25°C. Boldface limits apply at the temperature extremes. V⁺ = 5V, V⁻ = 0V, V_{CM} = 1.5V, V_O = 2.5V and R_L > 1M unless otherwise specified.</p>								
Parameter	Conditions	Typ (Note 4)	LMC660AMD	LMC660AI	LMC660C	LMC660E	Units	
			LMC660AMJ/883	Limit (Note 4)	Limit (Note 4)	Limit (Note 4)		
Input Offset Voltage		1	3 3.5	3 3.3	6 6.3	6 6.5	mV max	
Input Offset Voltage Average Drift		1.3					$\mu\text{V}/^{\circ}\text{C}$	
Input Bias Current		0.002	20 100	4 4	2 2	60 60	pA max	
Input Offset Current		0.001	20 100	2 2	1 1	60 60	pA max	
Input Resistance		>1					Tera Ω	
Common Mode Rejection Ratio	0V \leq V _{CM} \leq 12.0V V ⁺ = 15V	83	70 68	70 68	63 62	63 60	dB min	
Positive Power Supply Rejection Ratio	5V \leq V ⁺ \leq 15V V _O = 2.5V	83	70 68	70 68	63 62	63 60	dB min	
Negative Power Supply Rejection Ratio	0V \leq V ⁻ \leq -10V	94	84 82	84 83	74 73	74 70	dB min	
Input Common-Mode Voltage Range	V ⁺ = 5V & 15V For CMRR \geq 50 dB	-0.4	-0.1 0	-0.1 0	-0.1 0	-0.1 0	V max	
		V ⁺ - 1.9	V ⁺ - 2.3 V⁺ - 2.6	V ⁺ - 2.3 V⁺ - 2.5	V ⁺ - 2.3 V⁺ - 2.4	V ⁺ - 2.3 V⁺ - 2.6	V min	
Large Signal Voltage Gain	R _L = 2 k Ω (Note 5)	Sourcing	400 300	440 400	300 200	200 100	V/mV min	
		Sinking	180 70	180 120	90 80	90 40	V/mV min	
	R _L = 600 Ω (Note 5)	Sourcing	1000 150	200 200	220 100	150 100	100 75	V/mV min
		Sinking	250 35	100 60	100 40	50 40	50 20	V/mV min

