PRODUCT NAME : LM10 Op-Amp and Voltage Reference

PRICE : Rs 20.00
SKU : RM1970

DESCRIPTION

Features

- Includes a Precision Reference, Reference Buffer and Quality Op-Amp
- Supply Voltage: 1.1V to 40V
- Input Offset Voltage: 2.0 mVt
- Input Offset Current: 0.7 nA
- Input Bias Current: 20 nA
- Reference Regulation: 0.1%

National Semiconductor

May 1998

LM10
Operational Amplifier and Voltage Reference

General Description

The LM10 series are monolithic linear ICs consisting of a precision reference, an adjustable reference buffer and an independent, high quality op amp.

The unit can operate from a total supply voltage as low as 1.1V or as high as 40V, drawing only 270µA. A complementary output stage swings within 15 mV of the supply terminals or will deliver ±20 mA output current with ±0.4V saturation. Reference output can be as low as 200 mV.

The circuit is recommended for portable equipment and is completely specified for operation from a single power cell. In contrast, high output-drive capability, both voltage and current, along with thermal overload protection, suggest it in demanding general-purpose applications.

The device is capable of operating in a floating mode, independent of fixed supplies. It can function as a remote comparator, signal conditioner, SCR controller or transmitter for analog signals, delivering the processed signal on the same line used to supply power. It is also suited for operation in a wide range of voltage- and current-regulator applications, from low voltages to several hundred volts, providing greater precision than existing ICs.

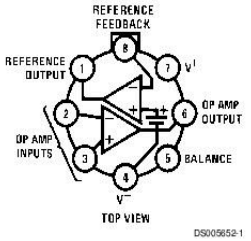
This series is available in the three standard temperature ranges, with the commercial part having relaxed limits. In addition, a low-voltage specification (suffix "L") is available in the limited temperature ranges at a cost savings.

Features

- input offset voltage: 2.0 mV (max)
- input offset current: 0.7 nA (max)
- input bias current: 20 nA (max)
- reference regulation: 0.1% (max)
- offset voltage drift: 2µV/°C
- reference drift: 0.002%/°C

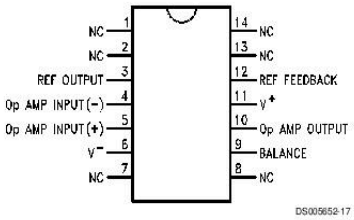
Connection and Functional Diagrams

Metal Can Package (H)



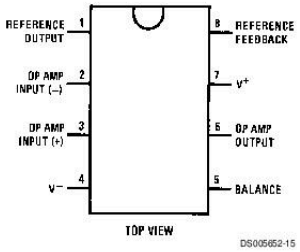
Order Number LM10BH, LM10CH, LM10CLH or LM10H/883
available per SMA# 5962-8760401
See NS Package Number H08A

Small Outline Package (WM)

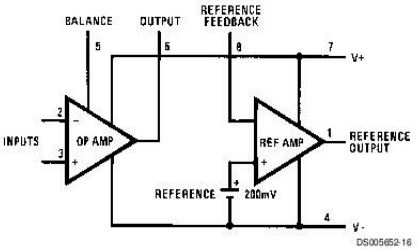


Order Number LM10CWM
See NS Package Number M14B

Dual-In-Line Package (N)



Order Number LM10CN or LM10CLN
See NS Package Number N08E



Absolute Maximum Ratings (Notes 1, 8)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

	LM10/LM10B/ LM10C	LM10BL/ LM10CL
Total Supply Voltage	45V	7V
Differential Input Voltage (Note 2)	±40V	±7V
Power Dissipation (Note 3)	internally limited	
Output Short-circuit Duration (Note 4)	continuous	
Storage-Temp. Range	−55˚C to +150˚C	
Lead Temp. (Soldering, 10 seconds)		
Metal Can	300˚C	
Lead Temp. (Soldering, 10 seconds) DIP	260˚C	
Vapor Phase (60 seconds)	215˚C	
Infrared (15 seconds)	220˚C	

See AN-450 "Surface Mounting Methods and Their Effect on Product Reliability" for other methods of soldering surface mount devices.

ESD rating is to be determined.

Maximum Junction Temperature

LM10	150˚C
LM10B	100˚C
LM10C	85˚C

Operating Ratings

Package Thermal Resistance

θ_{JA}	
H Package	150˚C/W
N Package	87˚C/W
WM Package	90˚C/W
θ_{JC}	
H Package	45˚C/W

Electrical Characteristics

T_J=25˚C, $T_{MIN} \le T_J \le T_{MAX}$ **(Boldface type refers to limits over temperature range)** (Note 5)

Parameter	Conditions	LM10/LM10B			LM10C			Units
		Min	Typ	Max	Min	Typ	Max	
Input offset voltage			0.3	2.0		0.5	4.0	mV
				3.0			**5.0**	mV
Input offset current			0.25	0.7		0.4	2.0	nA
(Note 6)				**1.5**			**3.0**	nA
Input bias current			10	20		12	30	nA
				30			**40**	nA
Input resistance		250	500		150	400		kΩ
		150			**115**			kΩ
Large signal voltage gain	V_S=±20V, I_{OUT}=0	120	400		80	400		V/mV
	V_{OUT}=±19.95V	**80**			**50**			V/mV
	V_S=±20V, V_{OUT}=±19.4V	50	130		25	130		V/mV
	I_{OUT}=±20 mA **(±15 mA)**	**20**			**15**			V/mV
	V_S=±0.6V **(0.65V)**, I_{OUT}=±2 mA	1.5	3.0		1.0	3.0		V/mV
	V_{OUT}=±0.4V **(±0.3V)**, V_{CM}=−0.4V	**0.5**			**0.75**			V/mV
Shunt gain (Note 7)	1.2V **(1.3V)** ≤V_{OUT}≤40V, R_L=1.1 kΩ	14	33		10	33		V/mV
	0.1 mA≤I_{OUT}≤5 mA	**6**			**6**			V/mV
	1.5V≤V^+≤40V, R_L=250Ω	8	25		6	25		V/mV
	0.1 mA≤I_{OUT}≤20 mA	**4**			**4**			V/mV
Common-mode rejection	−20V≤V_{CM}≤19.15V **(19V)**	93	102		90	102		dB
	V_S=±20V	**87**			**87**			dB
Supply-voltage rejection	−0.2V≥V^-≥−39V	90	96		87	96		dB
	V^+=1.0V **(1.1V)**	**84**			**84**			dB
	1.0V **(1.1V)** ≤V^+≤39.8V	96	106		93	106		dB
	V^-=−0.2V	**90**			**90**			dB
Offset voltage drift			2.0			5.0		µV/˚C
Offset current drift			2.0			5.0		pA/˚C
Bias current drift	T_C<100˚C		60			90		pA/˚C
Line regulation	1.2V **(1.3V)** ≤V_S≤40V		0.001	0.003		0.001	0.008	%/V
	0≤I_{REF}≤1.0 mA, V_{REF}=200 mV			**0.006**			**0.01**	%/V