



SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

LA6324N — Monolithic Linear IC LA6324NM — High-Performance Quad Operational Amplifier

Overview

The LA6324 consists of four independent, high-performance, internally phase compensated operational amplifiers that are designed to operate from a single power supply over a wide range of voltages. These four operational amplifiers are packaged in a single package. As in case of conventional general-purpose operational amplifiers, operation from dual power supplies is also possible and the power dissipation is low. It can be applied to various uses in commercial and industrial equipment including all types of transducer amplifiers and DC amplifiers.

Features

- No phase compensation required
- Wide operating voltage range:
3.0 V to 30.0 V (single supply)
 ± 1.5 V to ± 15.0 V (dual supplies)
- Highly resistant to dielectric breakdown
- Input voltage range includes the neighborhood of GND level and output voltage range V_{OUT} is from 0 to $V_{CC} - 1.5$ V.
- Small current dissipation:

$$I_{CC} = 0.6 \text{ mA typ}/V_{CC} = +5 \text{ V}, R_L = \infty$$

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Supply voltage	$V_{CC \text{ max}}$		32	V
Differential input voltage	V_{ID}		32	V
Maximum input voltage	$V_{IN \text{ max}}$		-0.3 to +32	V
Allowable power dissipation	$P_d \text{ max}$	LA6324N	720	mW
		LA6324NM	330	mW
Operating temperature	T_{opr}		-30 to +85	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +125	$^\circ\text{C}$

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LA6324N,6324NM

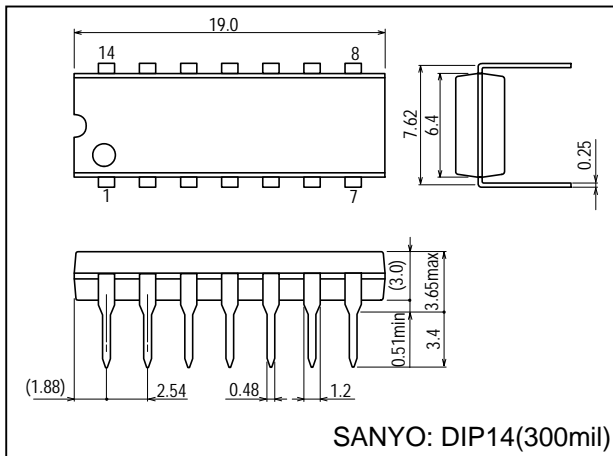
Operating Characteristics at $T_a = 25\text{ }^\circ\text{C}$, $V_{CC} = +5\text{ V}$

Parameter	Symbol	Conditions	Test circuit	Ratings			Unit
				min	typ	max	
Input offset voltage	V_{IO}		1		± 2	± 7	mV
Input offset current	I_{IO}	$I_{IN(+)} / I_{IN(-)}$	2		± 5	± 50	nA
Input bias current	I_B	$I_{IN(+)} / I_{IN(-)}$	3		45	250	nA
Common-mode input voltage range	V_{ICM}		4	0		$V_{CC} - 1.5$	V
Common-mode rejection ratio	CMR		4	65	80		dB
Voltage gain	VG	$V_{CC} = 15\text{ V}$, $R_L \geq 2\text{ k}\Omega$	5	25	100		V/mV
Output voltage range	V_{OUT}			0		$V_{CC} - 1.5$	V
Supply voltage rejection ratio	SVR		6	65	100		dB
Channel separation	CS	$f = 1\text{ k}$ to 20 kHz	7		120		dB
Current drain	I_{CC}		8		0.6	2	mA
	I_{CC}	$V_{CC} = 30\text{ V}$	8		1.5	3	mA
Output current (Source)	$I_{O\text{ source}}$	$V_{IN+} = 1\text{ V}$, $V_{IN-} = 0\text{ V}$	9	20	40		mA
Output current (Sink)	$I_{O\text{ sink}}$	$V_{IN+} = 0\text{ V}$, $V_{IN-} = 1\text{ V}$	10	10	20		mA

Package Dimensions

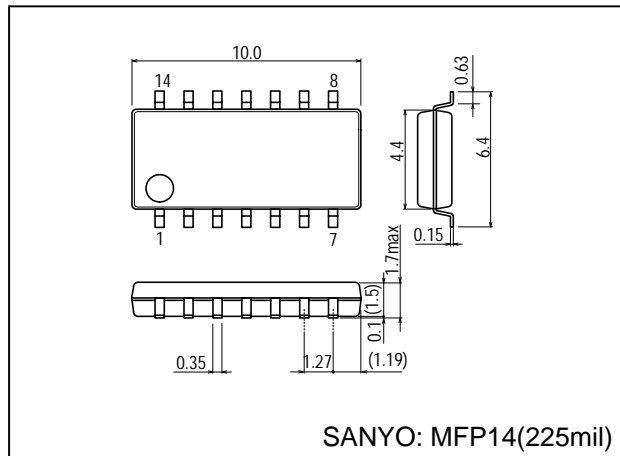
unit : mm

3003B [LA6324N]



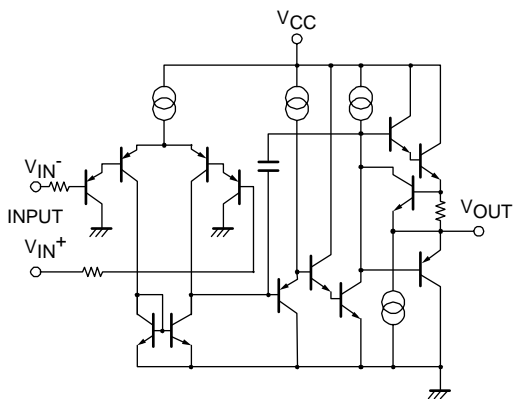
unit : mm

3034B [LA6324NM]



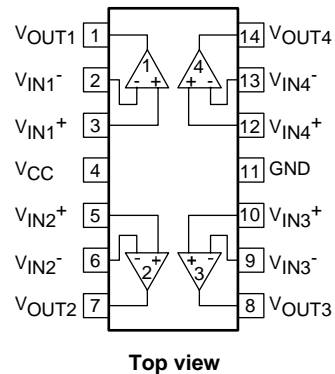
Equivalent Circuit

(1 unit)



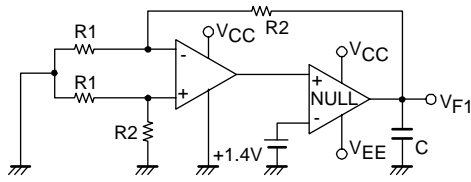
Pin Assignment

(LA6324N, 6324NM)



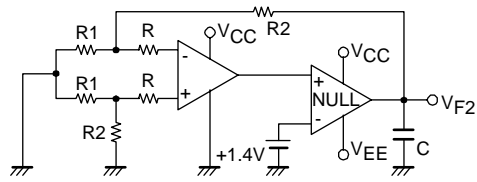
Test Circuit

1. Input offset voltage V_{IO}



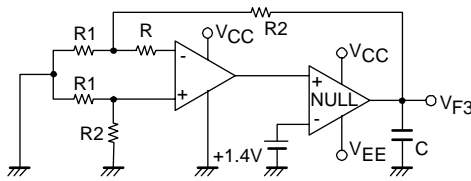
$$V_{IO} = \frac{V_{F1}}{1+R2/R1}$$

2. Input offset current I_{IO}

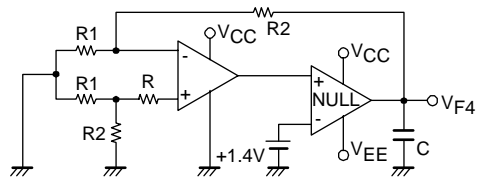


$$I_{IO} = \frac{V_{F2} - V_{F1}}{R(1+R2/R1)}$$

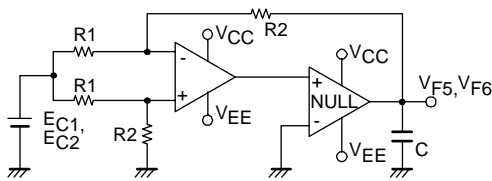
3. Input bias current I_B



$$I_B = \frac{V_{F4} - V_{F3}}{2R(1+R2/R1)}$$

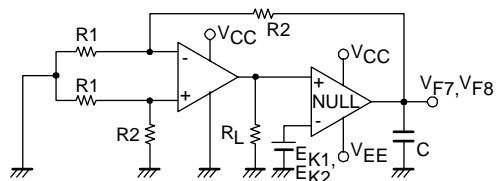


4. Common-mode rejection ratio CMR
Common-mode input voltage range V_{ICM}



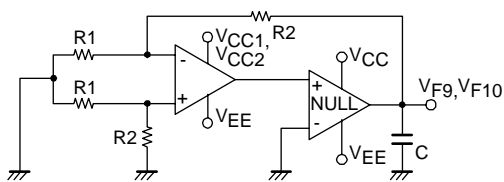
$$CMR = 20 \log \left| \frac{(EC1 - EC2)(1+R2/R1)}{V_{F5} - V_{F6}} \right|$$

5. Voltage gain V_G

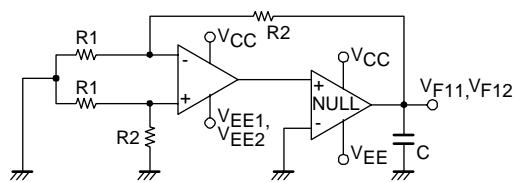


$$V_G = \frac{(EK1 - EK2)(1+R2/R1)}{V_{F8} - V_{F7}}$$

6. Supply voltage rejection ratio SVR

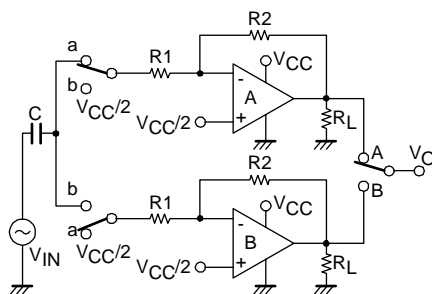


$$SVR (+) = 20 \log \left| \frac{(1+R2/R1)(V_{CC1} - V_{CC2})}{V_{F9} - V_{F10}} \right|$$



$$SVR (-) = 20 \log \left| \frac{(1+R2/R1)(V_{EE1} - V_{EE2})}{V_{F11} - V_{F12}} \right|$$

7. Channel separation CS



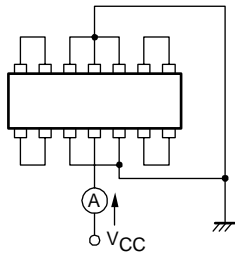
SW: a
CS (A→B) = 20 log $\frac{R2 V_{OA}}{R1 V_{OB}}$

SW: b
CS (B→A) = 20 log $\frac{R2 V_{OB}}{R1 V_{OA}}$

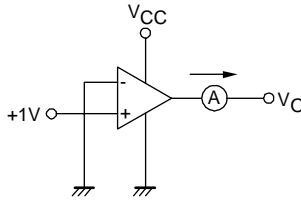
These apply also to other channels.

LA6324N,6324NM

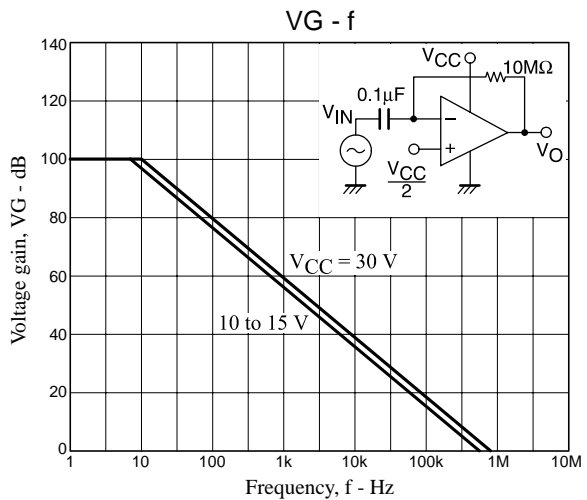
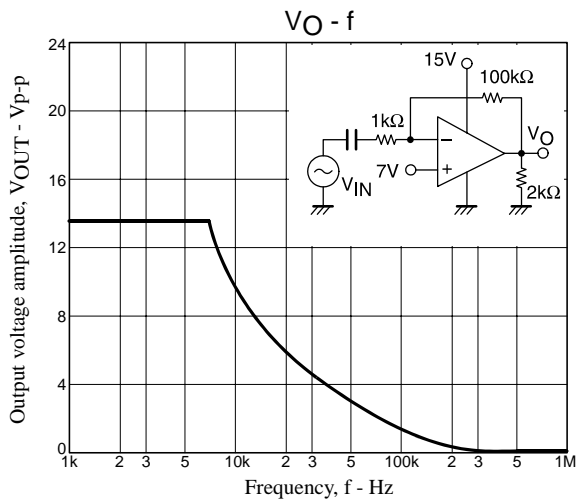
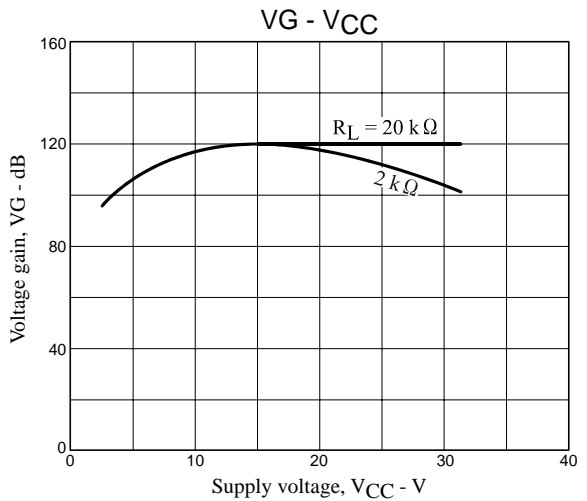
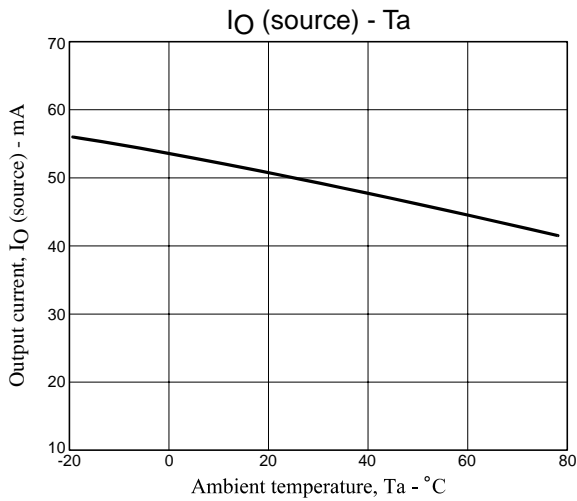
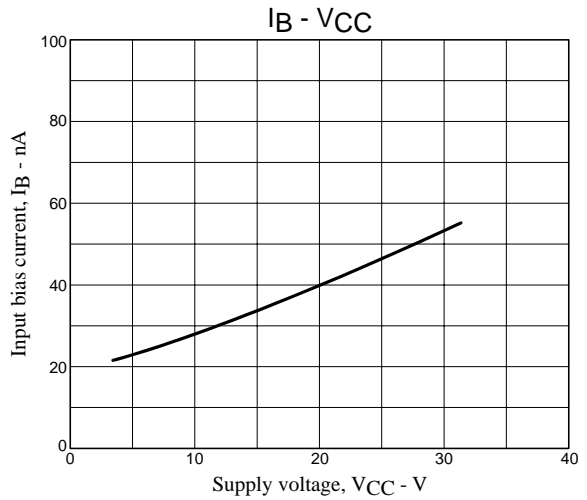
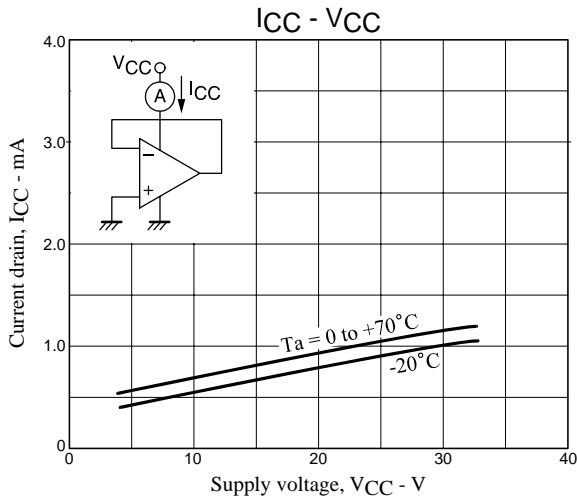
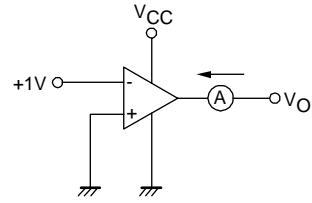
8. Current drain I_{CC}



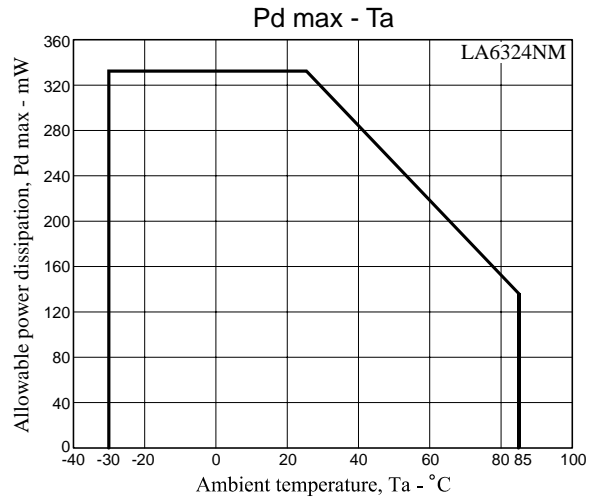
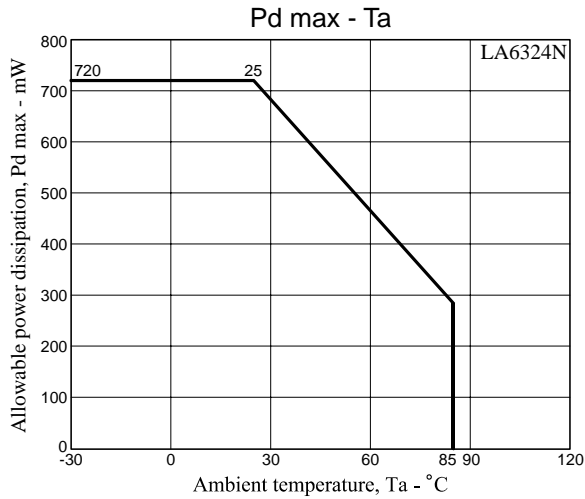
9. Output current I_O source



10. Output current I_O sink

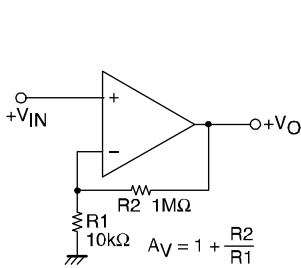


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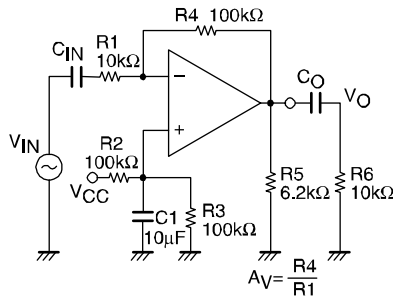


Sample Application Circuits

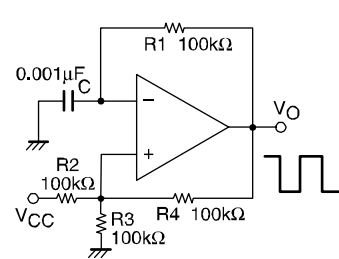
Noninverting DC amplifier



Rectangular wave oscillator



Inverting AC amplifier



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