

MC33272A, MC33274A, NCV33272A, NCV33274A



ON Semiconductor®

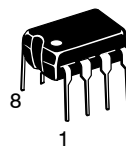
Single Supply, High Slew Rate, Low Input Offset Voltage Operational Amplifiers

The MC33272/74 series of monolithic operational amplifiers are quality fabricated with innovative Bipolar design concepts. This dual and quad operational amplifier series incorporates Bipolar inputs along with a patented Zip-R-Trim element for input offset voltage reduction. The MC33272/74 series of operational amplifiers exhibits low input offset voltage and high gain bandwidth product. Dual-doublet frequency compensation is used to increase the slew rate while maintaining low input noise characteristics. Its all NPN output stage exhibits no deadband crossover distortion, large output voltage swing, and an excellent phase and gain margin. It also provides a low open loop high frequency output impedance with symmetrical source and sink AC frequency performance.

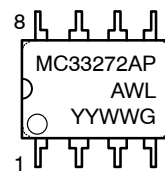
Features

- Input Offset Voltage Trimmed to 100 μ V (Typ)
- Low Input Bias Current: 300 nA
- Low Input Offset Current: 3.0 nA
- High Input Resistance: 16 M Ω
- Low Noise: 18 nV/ $\sqrt{\text{Hz}}$ @ 1.0 kHz
- High Gain Bandwidth Product: 24 MHz @ 100 kHz
- High Slew Rate: 10 V/ μ s
- Power Bandwidth: 160 kHz
- Excellent Frequency Stability
- Unity Gain Stable: w/Capacitance Loads to 500 pF
- Large Output Voltage Swing: +14.1 V/ -14.6 V
- Low Total Harmonic Distortion: 0.003%
- Power Supply Drain Current: 2.15 mA per Amplifier
- Single or Split Supply Operation: +3.0 V to +36 V or ± 1.5 V to ± 18 V
- ESD Diodes Provide Added Protection to the Inputs
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes
- Pb-Free Packages are Available

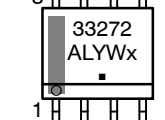
DUAL MARKING DIAGRAMS



PDIP-8
P SUFFIX
CASE 626

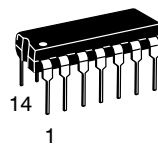


SOIC-8
D SUFFIX
CASE 751

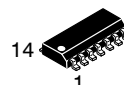
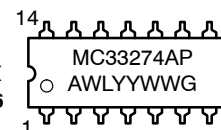


x = A for MC33272AD/DR2
= N for NCV33272ADR2

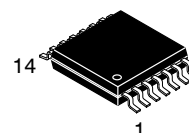
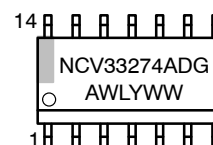
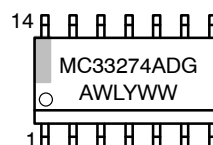
QUAD



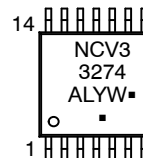
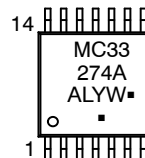
PDIP-14
P SUFFIX
CASE 646



SOIC-14
D SUFFIX
CASE 751A



TSSOP-14
DTB SUFFIX
CASE 948G



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G or ▪ = Pb-Free Package

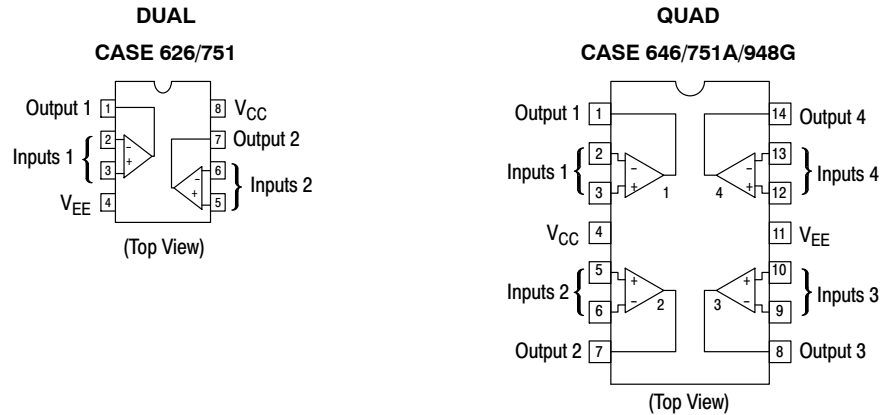
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 11 of this data sheet.

MC33272A, MC33274A, NCV33272A, NCV33274A

PIN CONNECTIONS



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC} to V_{EE}	+36	V
Input Differential Voltage Range	V_{IDR}	Note 1	V
Input Voltage Range	V_{IR}	Note 1	V
Output Short Circuit Duration (Note 2)	t_{SC}	Indefinite	sec
Maximum Junction Temperature	T_J	+150	°C
Storage Temperature	T_{stg}	-60 to +150	°C
ESD Protection at Any Pin	V_{esd}	2000 200	V
	- Human Body Model - Machine Model		
Maximum Power Dissipation	P_D	Note 2	mW
Operating Temperature Range	T_A	-40 to +85 -40 to +125	°C
	MC33272A, MC33274A NCV33272A, NCV33274A		

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Either or both input voltages should not exceed V_{CC} or V_{EE} .
2. Power dissipation must be considered to ensure maximum junction temperature (T_J) is not exceeded (see Figure 2).

MC33272A, MC33274A, NCV33272A, NCV33274A

DC ELECTRICAL CHARACTERISTICS ($V_{CC} = +15\text{ V}$, $V_{EE} = -15\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.)

Characteristics	Figure	Symbol	Min	Typ	Max	Unit
Input Offset Voltage ($R_S = 10\ \Omega$, $V_{CM} = 0\text{ V}$, $V_O = 0\text{ V}$) ($V_{CC} = +15\text{ V}$, $V_{EE} = -15\text{ V}$) $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{ to }+85^\circ\text{C}$ $T_A = -40^\circ\text{ to }+125^\circ\text{C}$ (NCV33272A) $T_A = -40^\circ\text{ to }+125^\circ\text{C}$ (NCV33274A) ($V_{CC} = 5.0\text{ V}$, $V_{EE} = 0\text{ V}$) $T_A = +25^\circ\text{C}$	3	$ V_{IO} $	-	0.1	1.0	mV
Average Temperature Coefficient of Input Offset Voltage $R_S = 10\ \Omega$, $V_{CM} = 0\text{ V}$, $V_O = 0\text{ V}$, $T_A = -40^\circ\text{ to }+125^\circ\text{C}$	3	$\Delta V_{IO}/\Delta T$	-	2.0	-	$\mu\text{V}/^\circ\text{C}$
Input Bias Current ($V_{CM} = 0\text{ V}$, $V_O = 0\text{ V}$) $T_A = +25^\circ\text{C}$ $T_A = T_{low}\text{ to }T_{high}$	4, 5	I_{IB}	-	300	650	nA
Input Offset Current ($V_{CM} = 0\text{ V}$, $V_O = 0\text{ V}$) $T_A = +25^\circ\text{C}$ $T_A = T_{low}\text{ to }T_{high}$		$ I_{IO} $	-	3.0	65	nA
Common Mode Input Voltage Range ($\Delta V_{IO} = 5.0\text{ mV}$, $V_O = 0\text{ V}$) $T_A = +25^\circ\text{C}$	6	V_{ICR}	$V_{EE}\text{ to } (V_{CC} - 1.8)$			V
Large Signal Voltage Gain ($V_O = 0\text{ V to }10\text{ V}$, $R_L = 2.0\text{ k}\Omega$) $T_A = +25^\circ\text{C}$ $T_A = T_{low}\text{ to }T_{high}$	7	A_{VOL}	90 86	100 -	- -	dB
Output Voltage Swing ($V_{ID} = \pm 1.0\text{ V}$) ($V_{CC} = +15\text{ V}$, $V_{EE} = -15\text{ V}$) $R_L = 2.0\text{ k}\Omega$ $R_L = 2.0\text{ k}\Omega$ $R_L = 10\text{ k}\Omega$ $R_L = 10\text{ k}\Omega$ ($V_{CC} = 5.0\text{ V}$, $V_{EE} = 0\text{ V}$) $R_L = 2.0\text{ k}\Omega$ $R_L = 2.0\text{ k}\Omega$	8, 9, 12 10, 11	V_{O+} V_{O-} V_{O+} V_{O-} V_{OL} V_{OH}	13.4 - 13.4 - - 3.7	13.9 -13.9 14 -14.7 - -	- -13.5 - -14.1 0.2 5.0	V
Common Mode Rejection ($V_{in} = +13.2\text{ V to }-15\text{ V}$)	13	CMR	80	100	-	dB
Power Supply Rejection $V_{CC}/V_{EE} = +15\text{ V}/-15\text{ V}$, $+5.0\text{ V}/-15\text{ V}$, $+15\text{ V}/-5.0\text{ V}$	14, 15	PSR	80	105	-	dB
Output Short Circuit Current ($V_{ID} = 1.0\text{ V}$, Output to Ground) Source Sink	16	I_{SC}	+25 -25	+37 -37	- -	mA
Power Supply Current Per Amplifier ($V_O = 0\text{ V}$) ($V_{CC} = +15\text{ V}$, $V_{EE} = -15\text{ V}$) $T_A = +25^\circ\text{C}$ $T_A = T_{low}\text{ to }T_{high}$ ($V_{CC} = 5.0\text{ V}$, $V_{EE} = 0\text{ V}$) $T_A = +25^\circ\text{C}$	17	I_{CC}	-	2.15	2.75	mA
			-	-	3.0	
			-	-	2.75	

3. MC33272A, MC33274A $T_{low} = -40^\circ\text{C}$ $T_{high} = +85^\circ\text{C}$
 NCV33272A, NCV33274A $T_{low} = -40^\circ\text{C}$ $T_{high} = +125^\circ\text{C}$

MC33272A, MC33274A, NCV33272A, NCV33274A

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = +15\text{ V}$, $V_{EE} = -15\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.)

Characteristics	Figure	Symbol	Min	Typ	Max	Unit
Slew Rate ($V_{in} = -10\text{ V}$ to $+10\text{ V}$, $R_L = 2.0\text{ k}\Omega$, $C_L = 100\text{ pF}$, $A_V = +1.0\text{ V}$)	18, 33	SR	8.0	10	-	$\text{V}/\mu\text{s}$
Gain Bandwidth Product ($f = 100\text{ kHz}$)	19	GBW	17	24	-	MHz
AC Voltage Gain ($R_L = 2.0\text{ k}\Omega$, $V_O = 0\text{ V}$, $f = 20\text{ kHz}$)	20, 21, 22	A_{VO}	-	65	-	dB
Unity Gain Bandwidth (Open Loop)		BW	-	5.5	-	MHz
Gain Margin ($R_L = 2.0\text{ k}\Omega$, $C_L = 0\text{ pF}$)	23, 24, 26	A_m	-	12	-	dB
Phase Margin ($R_L = 2.0\text{ k}\Omega$, $C_L = 0\text{ pF}$)	23, 25, 26	ϕ_m	-	55	-	Deg
Channel Separation ($f = 20\text{ Hz}$ to 20 kHz)	27	CS	-	-120	-	dB
Power Bandwidth ($V_O = 20\text{ V}_{pp}$, $R_L = 2.0\text{ k}\Omega$, $\text{THD} \leq 1.0\%$)		BW_P	-	160	-	kHz
Total Harmonic Distortion ($R_L = 2.0\text{ k}\Omega$, $f = 20\text{ Hz}$ to 20 kHz , $V_O = 3.0\text{ V}_{rms}$, $A_V = +1.0$)	28	THD	-	0.003	-	%
Open Loop Output Impedance ($V_O = 0\text{ V}$, $f = 6.0\text{ MHz}$)	29	$ Z_O $	-	35	-	Ω
Differential Input Resistance ($V_{CM} = 0\text{ V}$)		R_{in}	-	16	-	$\text{M}\Omega$
Differential Input Capacitance ($V_{CM} = 0\text{ V}$)		C_{in}	-	3.0	-	pF
Equivalent Input Noise Voltage ($R_S = 100\ \Omega$, $f = 1.0\text{ kHz}$)	30	e_n	-	18	-	$\text{nV}/\sqrt{\text{Hz}}$
Equivalent Input Noise Current ($f = 1.0\text{ kHz}$)	31	i_n	-	0.5	-	$\text{pA}/\sqrt{\text{Hz}}$

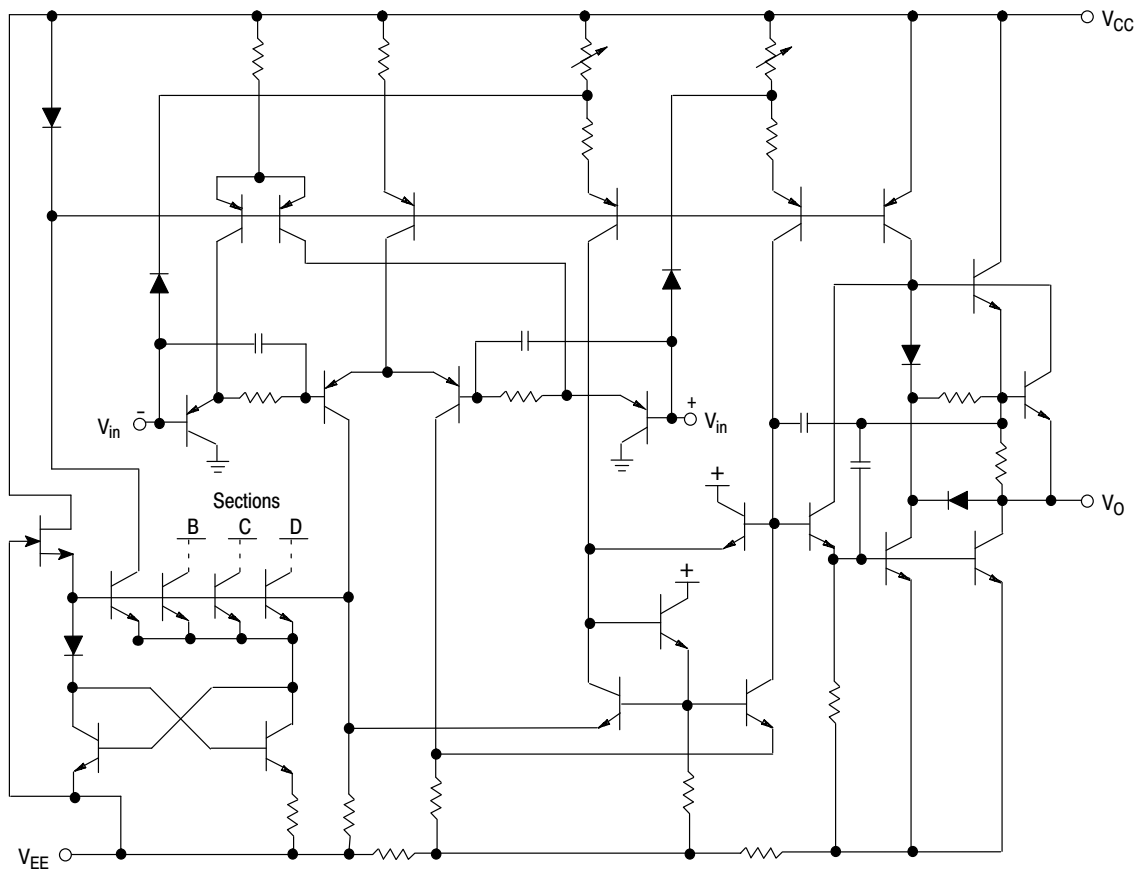


Figure 1. Equivalent Circuit Schematic
(Each Amplifier)

MC33272A, MC33274A, NCV33272A, NCV33274A

ORDERING INFORMATION

Device	Package	Shipping†
MC33272AD	SOIC-8	98 Units / Rail
MC33272ADG	SOIC-8 (Pb-Free)	
MC33272ADR2	SOIC-8	2500 / Tape & Reel
MC33272ADR2G	SOIC-8 (Pb-Free)	
MC33272AP	PDIP-8	50 Units / Rail
MC33272APG	PDIP-8 (Pb-Free)	
NCV33272ADR2*	SOIC-8	2500 / Tape & Reel
NCV33272ADR2G*	SOIC-8 (Pb-Free)	
MC33274AD	SOIC-14	55 Units / Rail
MC33274ADG	SOIC-14 (Pb-Free)	
MC33274ADR2	SOIC-14	2500 / Tape & Reel
MC33274ADR2G	SOIC-14 (Pb-Free)	
MC33274ADTBR2G	TSSOP-14 (Pb-Free)	
MC33274AP	PDIP-14	25 Units / Rail
MC33274APG	PDIP-14 (Pb-Free)	
NCV33274AD*	SOIC-14	55 Units / Rail
NCV33274ADG*	SOIC-14 (Pb-Free)	
NCV33274ADR2*	SOIC-14	2500 / Tape & Reel
NCV33274ADR2G*	SOIC-14 (Pb-Free)	
NCV33274ADTBR2G*	TSSOP-14 (Pb-Free)	

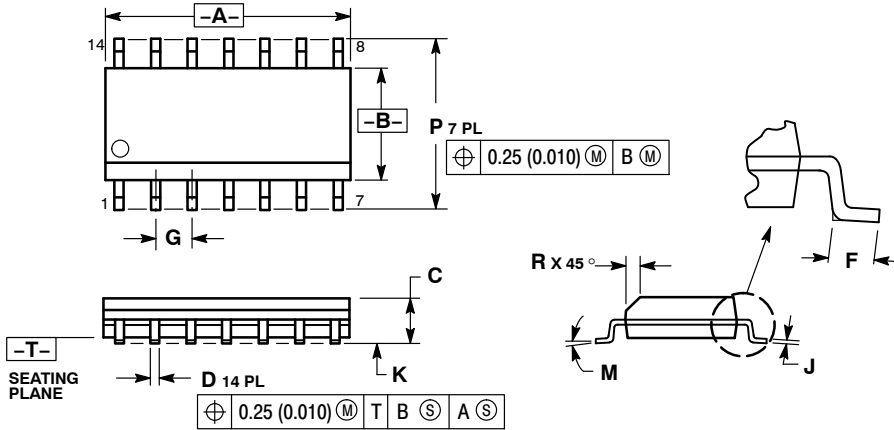
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV prefix for automotive and other applications requiring site and control changes.

MC33272A, MC33274A, NCV33272A, NCV33274A

PACKAGE DIMENSIONS

SOIC-14
CASE 751A-03
ISSUE H

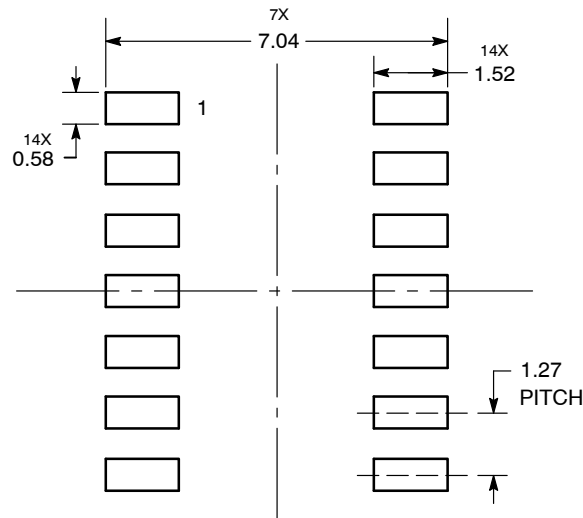


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.