

**Dual, 4.5MHz, BiMOS Operational Amplifier with MOSFET Input/Bipolar Output**

The CA3240A and CA3240 are dual versions of the popular CA3140 series integrated circuit operational amplifiers. They combine the advantages of MOS and bipolar transistors on the same monolithic chip. The gate-protected MOSFET (PMOS) input transistors provide high input impedance and a wide common-mode input voltage range (typically to 0.5V below the negative supply rail). The bipolar output transistors allow a wide output voltage swing and provide a high output current capability.

The CA3240A and CA3240 are compatible with the industry standard 1458 operational amplifiers in similar packages.

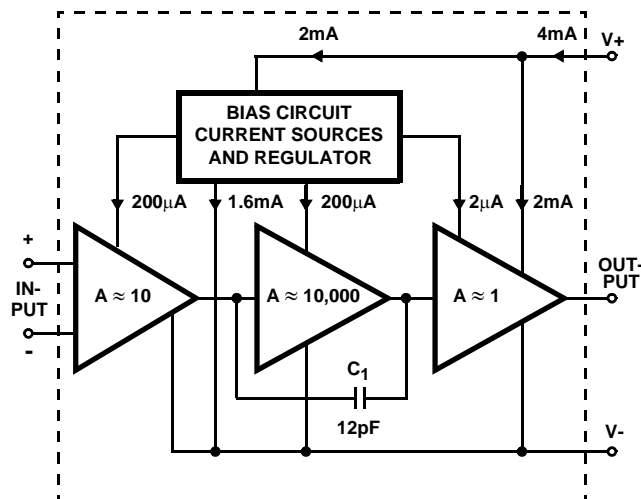
**Ordering Information**

PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. DWG. #
CA3240AE	-40 to 85	8 Ld PDIP	E8.3
CA3240AEZ (See Note)	-40 to 85	8 Ld PDIP (Pb-free)	E8.3
CA3240E	-40 to 85	8 Ld PDIP	E8.3
CA3240EZ (See Note)	-40 to 85	8 Ld PDIP (Pb-free)	E8.3

Pb-free PDIPs can be used for through hole wave solder processing only. They are not intended for use in Reflow solder processing applications.

NOTE: Intersil Pb-free products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which are RoHS compliant and compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.

**Functional Diagram**



**Features**

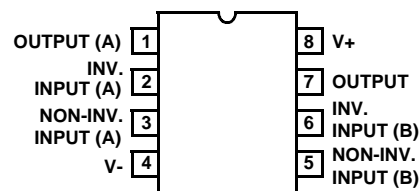
- Dual Version of CA3140
- Internally Compensated
- MOSFET Input Stage
  - Very High Input Impedance ( $Z_{IN}$ ) 1.5TΩ (Typ)
  - Very Low Input Current ( $I_I$ ) 10pA (Typ) at ±15V
  - Wide Common-Mode Input Voltage Range ( $V_{ICR}$ ): Can Be Swung 0.5V Below Negative Supply Voltage Rail
- Directly Replaces Industry Type 741 in Most Applications
- Pb-Free Available (RoHS Compliant)

**Applications**

- Ground Referenced Single Amplifiers in Automobile and Portable Instrumentation
- Sample and Hold Amplifiers
- Long Duration Timers/Multivibrators (Microseconds-Minutes-Hours)
- Photocurrent Instrumentation
- Intrusion Alarm System
- Comparators
- Instrumentation Amplifiers
- Active Filters
- Function Generators
- Power Supplies

**Pinout**

**CA3240, CA3240A (PDIP)**  
TOP VIEW



# CA3240, CA3240A

## Absolute Maximum Ratings

Supply Voltage (Between V+ and V-)	36V
Differential Input Voltage	8V
Input Voltage	(V+ +8V) to (V- -0.5V)
Input Current	1mA
Output Short Circuit Duration (Note 1)	Indefinite

## Operating Conditions

Temperature Range	-40°C to 85°C
Voltage Range	4V to 36V or ±2V to ±18V

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### NOTES:

- Short circuit may be applied to ground or to either supply. Temperatures and/or supply voltages must be limited to keep dissipation within maximum rating.
- $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

## Thermal Information

Thermal Resistance (Typical, Note 2)	$\theta_{JA}$ (°C/W)
8 Lead PDIP Package*	100
Maximum Junction Temperature (Plastic Package)	150°C
Maximum Storage Temperature Range	-65°C to 150°C
Maximum Lead Temperature (Soldering 10s)	300°C

\*Pb-free PDIPs can be used for through hole wave solder processing only. They are not intended for use in Reflow solder processing applications.

## Electrical Specifications For Equipment Design, $V_{SUPPLY} = \pm 15V$ , $T_A = 25^\circ C$ , Unless Otherwise Specified

PARAMETER	SYMBOL	CA3240			CA3240A			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	$V_{IO}$	-	5	15	-	2	5	mV
Input Offset Current	$I_{IO}$	-	0.5	30	-	0.5	20	pA
Input Current	$I_I$	-	10	50	-	10	40	pA
Large-Signal Voltage Gain (See Figures 12, 27) (Note 3)	$A_{OL}$	20	100	-	20	100	-	kV/V
		86	100	-	86	100	-	dB
Common Mode Rejection Ratio (See Figure 17)	CMRR	-	32	320	-	32	320	$\mu V/V$
		70	90	-	70	90	-	dB
Common Mode Input Voltage Range (See Figure 24)	$V_{ICR}$	-15	-15.5 to +12.5	11	-15	-15.5 to +12.5	12	V
Power Supply Rejection Ratio (See Figure 19)	PSRR ( $\Delta V_{IO}/\Delta V_{\pm}$ )	-	100	150	-	100	150	$\mu V/V$
		76	80	-	76	80	-	dB
Maximum Output Voltage (Note 4) (See Figures 23, 24)	$V_{OM+}$	12	13	-	12	13	-	V
	$V_{OM-}$	-14	-14.4	-	-14	-14.4	-	V
Maximum Output Voltage (Note 5)	$V_{OM-}$	0.4	0.13	-	0.4	0.13	-	V
Total Supply Current (See Figure 15) For Both Amps	$I+$	-	8	12	-	8	12	mA
Total Device Dissipation	$P_D$	-	240	360	-	240	360	mW

### NOTES:

- At  $V_O = 26V_{P-P}$ , +12V, -14V and  $R_L = 2k\Omega$ .
- At  $R_L = 2k\Omega$ .
- At  $V+ = 5V$ ,  $V- = GND$ ,  $I_{SINK} = 200\mu A$ .

## Electrical Specifications For Equipment Design, $V_{SUPPLY} = \pm 15V$ , $T_A = 25^\circ C$ , Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	TYPICAL VALUES		UNITS
			CA3240A	CA3240	
Input Resistance	$R_I$		1.5	1.5	$T\Omega$
Input Capacitance	$C_I$		4	4	pF
Output Resistance	$R_O$		60	60	$\Omega$
Equivalent Wideband Input Noise Voltage (See Figure 2)	$e_N$	BW = 140kHz, $R_S = 1M\Omega$	48	48	$\mu V$

## CA3240, CA3240A

### Electrical Specifications For Equipment Design, $V_{SUPPLY} = \pm 15V$ , $T_A = 25^\circ C$ , Unless Otherwise Specified (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS	TYPICAL VALUES		UNITS	
			CA3240A	CA3240		
Equivalent Input Noise Voltage (See Figure 18)	$e_N$	$f = 1\text{kHz}$ , $R_S = 100\Omega$	40	40	$nV/\sqrt{Hz}$	
		$f = 10\text{kHz}$ , $R_S = 100\Omega$	12	12	$nV/\sqrt{Hz}$	
Short-Circuit Current to Opposite Supply	$I_{OM+}$	Source	40	40	mA	
	$I_{OM-}$	Sink	11	11	mA	
Gain Bandwidth Product (See Figures 13, 27)	$f_T$		4.5	4.5	MHz	
Slew Rate (See Figure 14)	SR		9	9	$V/\mu s$	
Transient Response (See Figure 1)	$t_r$	$R_L = 2\text{k}\Omega$ , $C_L = 100\text{pF}$	Rise Time	0.08	0.08	$\mu s$
	OS	$R_L = 2\text{k}\Omega$ , $C_L = 100\text{pF}$	Overshoot	10	10	%
Settling Time at $10V_{P-P}$ (See Figure 25)	$t_S$	$A_V = +1$ , $R_L = 2\text{k}\Omega$ , $C_L = 100\text{pF}$ , Voltage Follower	To 1mV	4.5	4.5	$\mu s$
			To 10mV	1.4	1.4	$\mu s$
Crosstalk (See Figure 22)		$f = 1\text{kHz}$		120	120	dB

### Electrical Specifications For Equipment Design, at $V_{SUPPLY} = \pm 15V$ , $T_A = -40$ to $85^\circ C$ , Unless Otherwise Specified

PARAMETER	SYMBOL	TYPICAL VALUES		UNITS
		CA3240A	CA3240	
Input Offset Voltage	$ V_{IO} $	3	10	mV
Input Offset Current (Note 8)	$ I_{IO} $	32	32	$\mu A$
Input Current (Note 8)	$I_I$	640	640	$\mu A$
Large Signal Voltage Gain (See Figures 12, 27), (Note 6)	$A_{OL}$	63	63	kV/V
		96	96	dB
Common Mode Rejection Ratio (See Figure 17)	CMRR	32	32	$\mu V/V$
		90	90	dB
Common Mode Input Voltage Range (See Figure 24)	$V_{ICR}$	-15 to +12.3	-15 to +12.3	V
Power Supply Rejection Ratio (See Figure 19)	PSRR ( $\Delta V_{IO}/\Delta V_{\pm}$ )	150	150	$\mu V/V$
		76	76	dB
Maximum Output Voltage (Note 7) (See Figures 23, 24)	$V_{OM+}$	12.4	12.4	V
	$V_{OM-}$	-14.2	-14.2	V
Supply Current (See Figure 15) Total For Both Amps	$I_+$	8.4	8.4	mA
Total Device Dissipation	$P_D$	252	252	mW
Temperature Coefficient of Input Offset Voltage	$\Delta V_{IO}/\Delta T$	15	15	$\mu V/^\circ C$

NOTES:

6. At  $V_O = 26V_{P-P}$ , +12V, -14V and  $R_L = 2\text{k}\Omega$ .
7. At  $R_L = 2\text{k}\Omega$ .
8. At  $T_A = 85^\circ C$ .

### Electrical Specifications For Equipment Design, at $V_+ = 5V$ , $V_- = 0V$ , $T_A = 25^\circ C$ , Unless Otherwise Specified

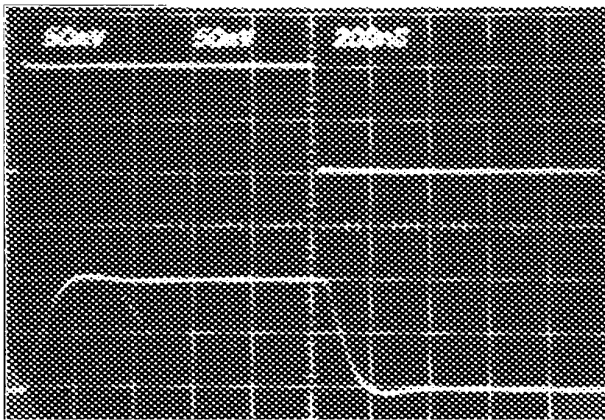
PARAMETER	SYMBOL	TYPICAL VALUES		UNITS
		CA3240A	CA3240	
Input Offset Voltage	$ V_{IO} $	2	5	mV
Input Offset Current	$ I_{IO} $	0.1	0.1	$\mu A$
Input Current	$I_I$	2	2	$\mu A$
Input Resistance	$R_{IN}$	1	1	$T\Omega$
Large Signal Voltage Gain (See Figures 12, 27)	$A_{OL}$	100	100	kV/V
		100	100	dB

# CA3240, CA3240A

**Electrical Specifications** For Equipment Design, at  $V_+ = 5V$ ,  $V_- = 0V$ ,  $T_A = 25^\circ C$ , Unless Otherwise Specified **(Continued)**

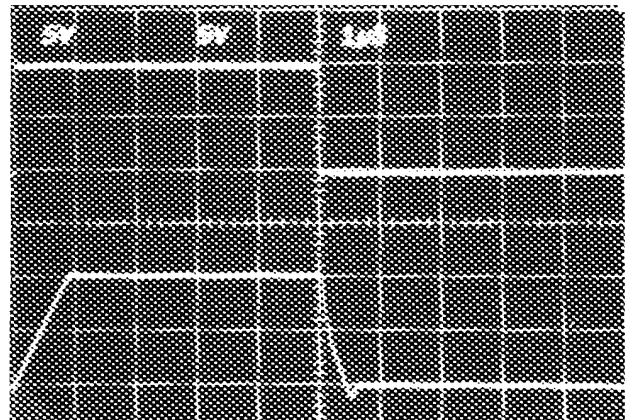
PARAMETER	SYMBOL	TYPICAL VALUES		UNITS	
		CA3240A	CA3240		
Common-Mode Rejection Ratio	CMRR	32	32	$\mu V/V$	
		90	90	dB	
Common-Mode Input Voltage Range (See Figure 24)	$V_{ICR}$	-0.5	-0.5	V	
		2.6	2.6	V	
Power Supply Rejection Ratio	PSRR	31.6	31.6	$\mu V/V$	
		90	90	dB	
Maximum Output Voltage (See Figures 23, 24)	$V_{OM+}$	3	3	V	
	$V_{OM-}$	0.3	0.3	V	
Maximum Output Current	Source	$I_{OM+}$	20	20	mA
	Sink	$I_{OM-}$	1	1	mA
Slew Rate (See Figure 14)	SR	7	7	V/ $\mu s$	
Gain Bandwidth Product (See Figure 13)	$f_T$	4.5	4.5	MHz	
Supply Current (See Figure 15)	$I_+$	4	4	mA	
Device Dissipation	$P_D$	20	20	mW	

## Test Circuits and Waveforms



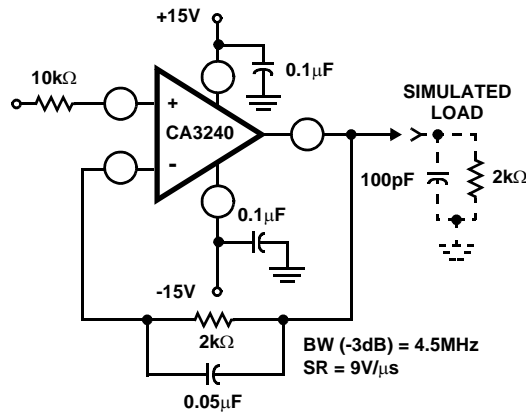
50mV/Div., 200ns/Div.  
Top Trace: Input, Bottom Trace: Output

**FIGURE 1A. SMALL SIGNAL RESPONSE**



5V/Div., 1 $\mu s$ /Div.  
Top Trace: Input, Bottom Trace: Output

**FIGURE 1B. LARGE SIGNAL RESPONSE**



**FIGURE 1C. TEST CIRCUIT**

**FIGURE 1. SPLIT-SUPPLY VOLTAGE FOLLOWER TEST CIRCUIT AND ASSOCIATED WAVEFORMS**