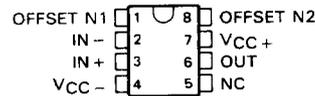


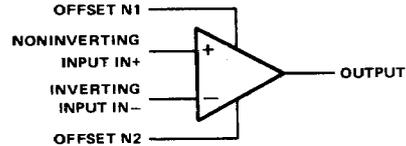
- Ultra-Low Offset Voltage . . . 30  $\mu$ V Typ ( $\mu$ A714E)
- Ultra-Low Offset Voltage Temperature Coefficient . . . 0.3  $\mu$ V/ $^{\circ}$ C Typ ( $\mu$ A714E)
- Ultra-Low Noise
- No External Components Required
- Replaces Chopper Amplifiers at a Lower Cost
- Single-Chip Monolithic Fabrication
- Wide Input Voltage Range  
0 to  $\pm$ 14 V Typ
- Wide Supply Voltage Range  
 $\pm$ 3 V to  $\pm$ 18 V
- Essentially Equivalent to PMI OP-07 Series Operational Amplifiers
- Direct Replacements for Fairchild  $\mu$ A714C,  $\mu$ A714E,  $\mu$ A714L

JG OR P DUAL-IN-LINE PACKAGE  
(TOP VIEW)



NC—No internal connection

symbol

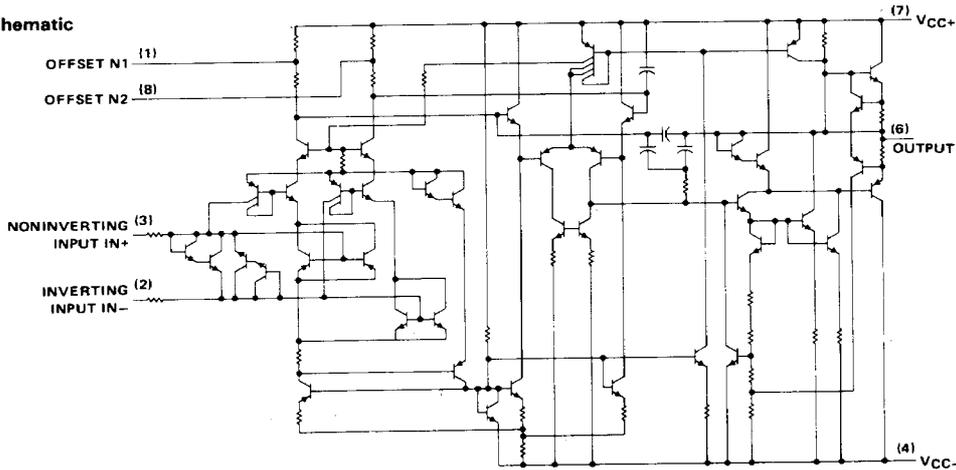


**description**

These devices represent a breakthrough in operational amplifier performance. Low offset and long-term stability are achieved by means of a low-noise, chopperless, bipolar-input-transistor amplifier circuit. For most applications, no external components are required for offset nulling and frequency compensation. The true differential input, with a wide input voltage range and outstanding common-mode rejection, provides maximum flexibility and performance in high-noise environments and in noninverting applications. Low bias currents and extremely high input impedances are maintained over the entire temperature range. The  $\mu$ A714 is unsurpassed for low-noise, high-accuracy amplification of very-low-level signals.

These devices are characterized for operation from 0 $^{\circ}$ C to 70 $^{\circ}$ C.

**schematic**



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**3**

**Operational Amplifiers**

**TYPES uA714C, uA714E, uA714L  
ULTRA-LOW-OFFSET VOLTAGE OPERATIONAL AMPLIFIERS**

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)**

Supply voltage $V_{CC+}$ (see Note 1) .....	22 V
Supply voltage $V_{CC-}$ .....	-22 V
Differential input voltage (see Note 2) .....	$\pm 30$ V
Input voltage (either input, see Note 3) .....	$\pm 22$ V
Duration of output short circuit (see Note 4) .....	unlimited
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 5) .....	500 mW
Operating free-air temperature range .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG package .....	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: P package .....	260°C

- NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between  $V_{CC+}$  and  $V_{CC-}$ .
2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
4. The output may be shorted to ground or either power supply.
5. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in Section 2. In the JG package, these chips are glass mounted.

**3**

**Operational Amplifiers**

**TYPES uA714C, uA714E, uA714L**  
**ULTRA-LOW-OFFSET VOLTAGE OPERATIONAL AMPLIFIERS**

electrical characteristics at specified free-air temperature,  $V_{CC} \pm = \pm 15\text{ V}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	uA714C			uA714E			uA714L			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{IO}$ Input offset voltage	$V_O = 0$ , $R_S = 50\ \Omega$ 25°C 0°C to 70°C	60	150	75	30	75	100	250	400	$\mu\text{V}$	
Temperature coefficient of input offset voltage	$V_O = 0$ , $R_S = 50\ \Omega$ 0°C to 70°C	0.5	1.8	1.3	0.3	1.3	1	3		$\mu\text{V}/^\circ\text{C}$	
Long-term drift of input offset voltage	See Note 6	0.4	2	1.5	0.3	1.5	0.5	3		$\mu\text{V}/\text{mo}$	
Offset adjustment range	$R_S = 20\ \text{k}\Omega$ . See Figure 1	$\pm 4$			$\pm 4$		$\pm 4$			mV	
$I_{IO}$ Input offset current		0.8	6	3.8	0.5	3.8	5	2.0		nA	
Temperature coefficient of input offset current	0°C to 70°C	1.6	8	5.3	0.9	5.3	8	40		nA	
$I_{IB}$ Input bias current	0°C to 70°C	12	50	35	8	35	20	100		$\mu\text{A}/^\circ\text{C}$	
Temperature coefficient of input bias current	25°C	$\pm 1.8$	$\pm 7$	$\pm 4$	$\pm 1.2$	$\pm 4$	$\pm 6$	$\pm 30$		nA	
$I_{IB}$ Input bias current	0°C to 70°C	$\pm 2.2$	$\pm 9$	$\pm 5.5$	$\pm 1.5$	$\pm 5.5$	$\pm 15$	$\pm 60$		$\mu\text{A}/^\circ\text{C}$	
Temperature coefficient of input bias current	0°C to 70°C	18	50	35	13	35	35	150		$\mu\text{A}/^\circ\text{C}$	
$V_{ICR}$ Common-mode input voltage range		$\pm 13$	$\pm 14$		$\pm 13$	$\pm 14$	$\pm 13$	$\pm 14$		V	
V <sub>OM</sub> Peak output voltage	$R_L \geq 10\ \text{k}\Omega$	$\pm 13$	$\pm 13.5$		$\pm 13$	$\pm 13.5$	$\pm 13$	$\pm 13.5$		V	
	$R_L \geq 2\ \text{k}\Omega$	$\pm 12$	$\pm 13$		$\pm 12.5$	$\pm 13$	$\pm 12$	$\pm 13$		V	
	$R_L \geq 1\ \text{k}\Omega$	$\pm 11.5$	$\pm 12.8$		$\pm 12$	$\pm 12.8$	$\pm 11$	$\pm 12.8$		V	
	$R_L \geq 2\ \text{k}\Omega$	$\pm 12$	$\pm 12$		$\pm 10.5$	$\pm 12$	$\pm 11$	$\pm 12$		V	
A <sub>VD</sub> Large-signal differential voltage amplification	$V_{CC} \pm = \pm 3\text{ V}$ , $V_O = \pm 0.5\text{ V}$ , $R_L \geq 500\ \text{k}\Omega$	$\pm 11$	$\pm 12.6$		$\pm 12$	$\pm 12.6$	$\pm 10$	$\pm 12.6$		V/mV	
	$V_O = \pm 10\text{ V}$ , $R_L = 2\ \text{k}\Omega$	100	400	500	150	500	50	150		V/mV	
B <sub>1</sub> Unity gain bandwidth	25°C	120	400		200	500	100	300		MHz	
	0°C to 70°C	100	400		180	450	80	400		MHz	
f <sub>i</sub> Input resistance		0.6		0.6			0.6			M $\Omega$	
CMRR Common-mode rejection ratio	25°C	8	33		15	50	8	33		dB	
	0°C to 70°C	100	120	123	106	123	100	120		dB	
k <sub>SVR</sub> Supply voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )	25°C	97	120	103	103	123	94	104		dB	
	0°C to 70°C	86	104	107	94	107	83	104		dB	
P <sub>D</sub> Power dissipation	$V_O = 0$ , No load	80	150	120	75	120	100	180		mW	
	$V_{CC} \pm = \pm 3\text{ V}$ , $V_O = 0$ , No load	4	8	6	4	6	5	12		mW	

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise noted.  
NOTE 6: Since long-term drift cannot be measured on the individual devices prior to shipment, this specification is not intended to be a guarantee or warranty. It is an engineering estimate of the averaged trend line of drift versus time over extended periods after the first thirty days of operation.



**Operational Amplifiers**

# TYPES $\mu$ A714C, $\mu$ A714E, $\mu$ A714L

## ULTRA-LOW-OFFSET VOLTAGE OPERATIONAL AMPLIFIERS

operating characteristics at specified free-air temperature,  $V_{CC} \pm = \pm 15$  V (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	$\mu$ A714C		$\mu$ A714E		$\mu$ A714L			UNIT		
		MIN	TYP	MAX	MIN	TYP	MAX	MIN		TYP	MAX
$V_n$ Equivalent input noise voltage	$T_A = 25^\circ\text{C}$	$f = 10$ Hz	10.5	20	10.3	18	10.5			$\text{nV}/\sqrt{\text{Hz}}$	
		$f = 100$ Hz	10.2	13.5	10		10.2				
		$f = 1$ kHz	9.8	11.5	9.6		11				
$V_{NPP}$ Peak-to-peak equivalent input noise voltage	$f = 0.1$ Hz to 10 Hz, $T_A = 25^\circ\text{C}$	0.38	0.65	0.35	0.6				$\mu\text{V}$		
$i_n$ Equivalent input noise current	$T_A = 25^\circ\text{C}$	$f = 10$ Hz	0.35	0.9	0.32	0.8	0.35			$\text{pA}/\sqrt{\text{Hz}}$	
		$f = 100$ Hz	0.15	0.27	0.14		0.23		0.15		
		$f = 1$ kHz	0.13	0.18	0.12		0.17		0.13		
$I_{NPP}$ Peak-to-peak equivalent input noise current	$f = 0.1$ Hz to 10 Hz, $T_A = 25^\circ\text{C}$	15	35	14	30	15			pA		
SR Slew rate	$R_L \geq 2$ k $\Omega$ , $T_A = 25^\circ\text{C}$	0.17		0.17		0.17			$\text{V}/\mu\text{s}$		

†All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified.

3

Operational Amplifiers

### TYPICAL APPLICATION DATA

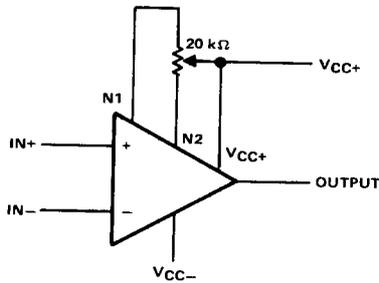


FIGURE 1—INPUT OFFSET VOLTAGE NULL CIRCUIT