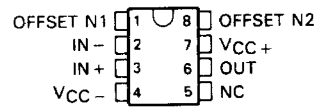
TYPES uA714C, uA714E, uA714L
ULTRA-LOW-OFFSET-VOLTAGE OPERATIONAL AMPLIFIERS

D2789, FEBRUARY 1984

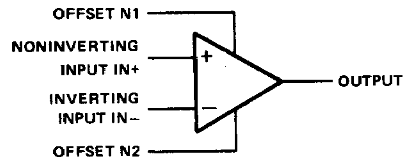
- Ultra-Low Offset Voltage . . . 30 μV Typ (uA714E)
- Ultra-Low Offset Voltage Temperature Coefficient . . . 0.3 μV/°C Typ (uA714E)
- Ultra-Low Noise
- No External Components Required
- Replaces Chopper Amplifiers at a Lower Cost
- Single-Chip Monolithic Fabrication
- Wide Input Voltage Range 0 to ±14 V Typ
- Wide Supply Voltage Range ±3 V to ±18 V
- Essentially Equivalent to PMI OP-07 Series Operational Amplifiers
- Direct Replacements for Fairchild μA714C, μA714E, μA714L

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



NC—No internal connection

symbol

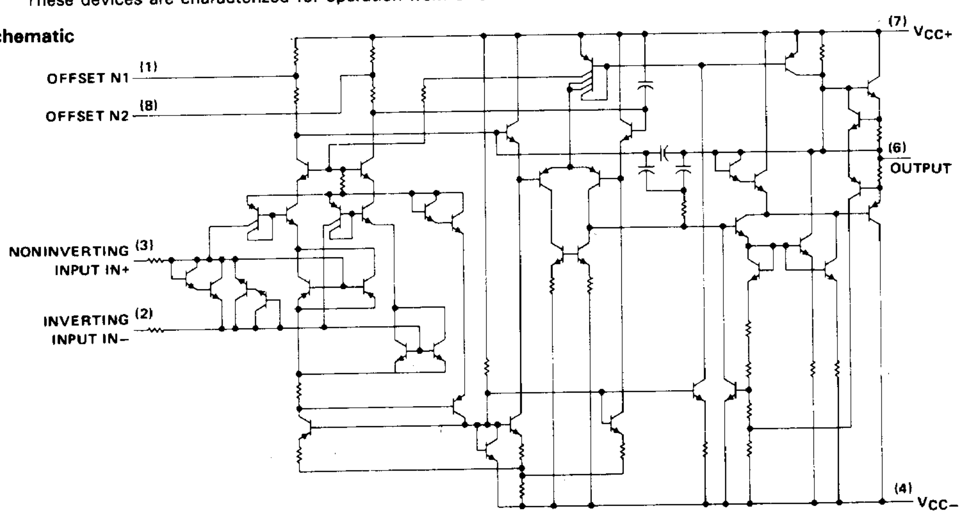


description

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 uA714 is unsurpassed for low-noise, high-accuracy amplification of very-low-level signals.

These devices are characterized for operation from 0°C to 70°C.

schematic



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)	±30 V
Input voltage (either input, see Note 3)	±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.

electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm15$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		uA714C MIN	uA714C TYP	uA714C MAX	uA714E MIN	uA714E TYP	uA714E MAX	uA714L MIN	uA714L TYP	uA714L MAX	UNIT
V_{IO}	Input offset voltage	$V_O = 0$, $R_S = 50\ \Omega$	25°C		60	150		30	75		100	250	μV
			0°C to 70°C		85	250		45	130			400	
α_{VIO}	Temperature coefficient of input offset voltage	$V_O = 0$, $R_S = 50\ \Omega$	0°C to 70°C		0.5	1.8		0.3	1.3		1	3	μV/°C
	Long-term drift of input offset voltage	See Note 6			0.4	2		0.3	1.5		0.5	3	μV/mo
	Offset adjustment range	$R_S = 20\ k\Omega$, See Figure 1	25°C		±4			±4			±4		mV
I_{IO}	Input offset current		25°C		0.8	6		0.5	3.8		5	2.0	nA
			0°C to 70°C		1.6	8		0.9	5.3		8	40	
α_{IIO}	Temperature coefficient of input offset current		0°C to 70°C		12	50		8	35		20	100	pA/°C
I_{IB}	Input bias current		25°C		±1.8	±7		±1.2	±4		±6	±30	nA
			0°C to 70°C		±2.2	±9		±1.5	±5.5		±15	±60	
α_{IIB}	Temperature coefficient of input bias current		0°C to 70°C		18	50		13	35		35	150	pA/°C
V_{ICR}	Common-mode input voltage range		25°C	±13	±14		±13	±14		±13	±14		V
			0°C to 70°C	±13	±13.5		±13	±13.5		±13	±13.5		
V_{OM}	Peak output voltage	$R_L \geq 10\ k\Omega$	25°C	±12	±13		±12.5	±13		±12	±13		V
		$R_L \geq 2\ k\Omega$	25°C	±11.5	±12.8		±12	±12.8		±11	±12.8		
		$R_L \geq 1\ k\Omega$	25°C		±12		±10.5	±12			±12		
		$R_L \geq 2\ k\Omega$	0°C to 70°C	±11	±12.6		±12	±12.6		±10	±12.6		
A_{VD}	Large-signal differential voltage amplification	$V_{CC\pm} = \pm3$ V, $V_O = \pm0.5$ V, $R_L \geq 500\ k\Omega$	25°C	100	400		150	500		50	150		V/mV
		$V_O = \pm10$ V, $R_L = 2\ k\Omega$	25°C	120	400		200	500		100	300		
			0°C to 70°C	100	400		180	450		80	400		
B_1	Unity gain bandwidth		25°C		0.6			0.6			0.6		MHz
r_i	Input resistance		25°C	8	33		15	50		8	33		MΩ
CMRR	Common-mode rejection ratio	$V_{IC} = \pm13$ V, $R_S = 50\ \Omega$	25°C	100	120		106	123		100	120		dB
			0°C to 70°C	97	120		103	123		94	120		
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	$V_{CC\pm} = \pm3$ V to ±18 V, $R_S = 50\ \Omega$	25°C	90	104		94	107		90	104		dB
			0°C to 70°C	86	100		90	104		83	100	32	
P_D	Power dissipation	$V_O = 0$, No load	25°C		80	150		75	120		100	180	mW
		$V_{CC\pm} = \pm3$ V, $V_O = 0$, No load	25°C		4	8		4	6		5	12	

†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.

TEXAS INSTRUMENTS
POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

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

PARAMETER		TEST CONDITIONS†		uA714C MIN	uA714C TYP	uA714C MAX	uA714E MIN	uA714E TYP	uA714E MAX	uA714L MIN	uA714L TYP	uA714L MAX	UNIT
V_n	Equivalent input noise voltage	T_A = 25°C	f = 10 Hz		10.5	20		10.3	18		10.5		nV/√Hz
			f = 100 Hz		10.2	13.5		10	13		10.2		
			f = 1 kHz		9.8	11.5		9.6	11		9.8		
V_{NPP}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10 Hz, T_A = 25°C			0.38	0.65		0.35	0.6				μV
I_n	Equivalent input noise current	T_A = 25°C	f = 10 Hz		0.35	0.9		0.32	0.8		0.35	0.8	pA/√Hz
			f = 100 Hz		0.15	0.27		0.14	0.23		0.15	0.23	
			f = 1 kHz		0.13	0.18		0.12	0.17		0.13	0.17	
I_{NPP}	Peak-to-peak equivalent input noise current	f = 0.1 Hz to 10 Hz, T_A = 25°C			15	35		14	30		15		pA
SR	Slew rate	R_L ≥ 2 kΩ, T_A = 25°C			0.17			0.17			0.17		V/μs

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

TYPICAL APPLICATION DATA

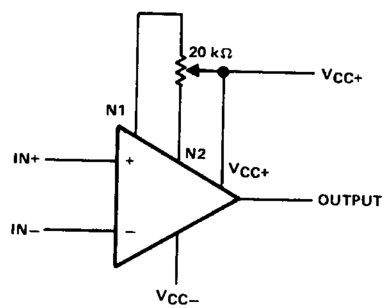


FIGURE 1—INPUT OFFSET VOLTAGE NULL CIRCUIT