Programmable Quad Operational Amplifier

GENERAL DESCRIPTION

The XR-4202 is an array of four independent operational amplifiers on a single silicon chip. The operating current of the array is externally controlled by a single resistor or current source, allowing the user to trade-off power dissipation for bandwidth.

FEATURES

Programmable
Micropower Operation
Wide Input Voltage and Common Mode Range
Internal Frequency Compensation
No Latch-Up
Matched Parameters
Short-Circuit Protection

APPLICATIONS

The following approximate relations are useful for design:

Gain-Bandwidth Product	≈	50 I_{SET}	(kHz)
Power Supply Current	≈	30 I_{SET}	(μA)
Slew Rate	≈	20 I_{SET}	(V/ms)

Where: I_{SET} is in μA

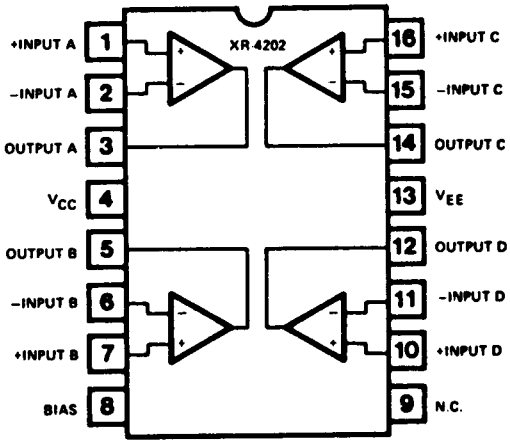
$$I_{SET} = \frac{V_{EE} - V_{BE}}{R_{SET}}$$

WHERE V_{BE} DIODE VOLTAGE ≈ 0.65V

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±18V
Differential Input Voltage	±30V
Power Dissipation	
Ceramic Package:	750 mW
Derate above T_A = +25°C	6 mW/°C
Plastic Package:	625 mW
Derate above T_A = +25°C	5 mW/°C
Common Mode Range	V_{EE} to V_{CC}
Short Circuit Duration	Indefinite
Storage Temperature	−60°C to +150°C

FUNCTIONAL BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-4202N	Ceramic	−40°C to +85°C
XR-4202P	Plastic	−40°C to +85°C

SYSTEM DESCRIPTION

The XR-4202 is a quad independently programmable operational amplifier featuring improved performance over industry standard devices such as the 741. Amplifier bias currents can be "programmed" by a single resistor to Pin 8. Bias currents can range from less than 1μA, thus affording the designer flexibility along the device speed/power consumption trade off curve.

XR-4202

ELECTRICAL CHARACTERISTICS

Test Conditions: High Power Mode (V_S = ±15V, I_{SET} = 75 μA and T_A = +25°C, unless otherwise specified.

PARAMETERS	MIN	TYP	MAX	UNITS	SYMBOL	CONDITIONS
Short Circuit Current	5	17	30	mA	I_{SC}	0°C≤ T_A≤70°C
Supply Current	0.8	1.7	6.0	mA	I_S	Note 3
Input Offset Voltage		0.8	5.0	mV	V_{io}	R_S≤10 KΩ
Input Bias Current		80	500	nA	I_b	
Input Off-set Current		10	200	nA	I_{io}	
Input Resistance	0.1	0.6		MΩ	R_{in}	
Input Common Mode Voltage Range	12	±14		±V	V_{iCM}	
Common Mode Rejection Ratio	70	110		dB	CMRR	
Voltage Supply Rejection Ratio		15	150	μV/V	PSRR	
Large Signal Voltage Gain	74	88		dB	A_{VOL}	R_L = 3 KΩ; ΔV_O = ±10 V
Output Voltage Swing	±10	±13.6		±V	V_{out}	R_L = 3 KΩ
Gain-Bandwidth Product		3.5		MHz	f_1	
Phase Margin		45		Deg.		
Rise Time		70		ns	t_R	ΔV_O = ±20 mV
Overshoot		20		%	t_O	ΔV_O = ±20 mV
Channel Separation		120 105		dB dB		Any amp. pair: freq. = 1 Hz, R_L = 3 KΩ Any amp. pair: freq. = 10 KHz, R_L = 3 KΩ
Slew Rate		1.5		V/μs	dV_{out}/dt	
Input Voltage Noise		25		nV/√Hz	e_n	Bandwidth 100 Hz to 10 KHz

Note: Short circuit may be taken to either supply line or ground on only one amplifier at a time.

ELECTRICAL CHARACTERISTICS

Test Conditions: High Power Mode (V_S = ±15V, I_{SET} = 75 μA and T_A = −40° to +85°C)

PARAMETERS	MIN	TYP	MAX	UNITS	SYMBOL	CONDITIONS
Input Offset Voltage		0.8	10	mV	V_{io}	R_S ≤10 KΩ
Input Bias Current		80	1500	nA	I_b	
Input Offset Current		10	200	nA	I_{io}	
Large Signal Voltage Gain	68	88		dB	A_{vol}	R_L 3 KΩ ΔV_O = ±10 V

ELECTRICAL CHARACTERISTICS

Test Conditions: Micropower Mode (I_{SET} = 1 μA, V_S = ±1.5V)

PARAMETERS	MIN	TYP	MAX	UNITS	SYMBOL	CONDITIONS
Supply Current			100	μA	I_S	Note 3
Input Bias Current			200	nA	I_B	
Input Offset Current			20	nA	I_{OS}	
Input Offset Voltage		0.5	5	mV	V_{os}	$R_S \leq$ 10 KΩ
Input Resistance	0.5			MΩ	R_{in}	
Input Common Mode Voltage Range	0.3	±0.8		±V	V_{iCM}	
Common Mode Rejection Ratio	60	100		dB	CMRR	
Voltage Supply Rejection Ratio		20	200	μV/V	PSRR	
Large Signal Voltage Gain	66	80		dB	A_{vol}	$R_L \geq$ 100 KΩ
Gain-Bandwidth Product		50		kHz	GBW	
Phase Margin		75		Deg.		
Slew-Rate		20		V/ms	dV_{out}/dt	
Rise Time		7		μs	t_R	ΔV_O = ±20 mV
Overshoot		0		%	t_O	ΔV_O = ±20 mV
Channel Separation		120 120		dB dB		Freq. = Hz: R_L = 20 KΩ, ΔV_O = ±0.5 V Freq. = 1 KHz: R_L = 10 KΩ, ΔV_O = ±0.5V
Equivalent Input Voltage Noise		200		nV√Hz	e_n	Bandwidth = 100 Hz to 10 KHz

PARAMETER MATCHING (I_{SET} = 75 μA (2))

PARAMETERS	MIN	TYP	MAX	UNITS	SYMBOL	CONDITIONS
Input Offset Voltage		1		±mV	V_{os}	$R_S \leq$ 10 KΩ
Input Bias Current		10		±nA	I_B	
Input Offset Current		2		±nA	I_{os}	
Gain-Bandwidth Product		100		±KHz	f_1	
Slew Rate		0.2		±V/μs	dV_o/dt	

NOTES: 1. All tests refer to a single op amp unless otherwise specified.
2. Tests apply for parameter matching between any op amp pair.
3. Tests apply to four op amps and bias network.

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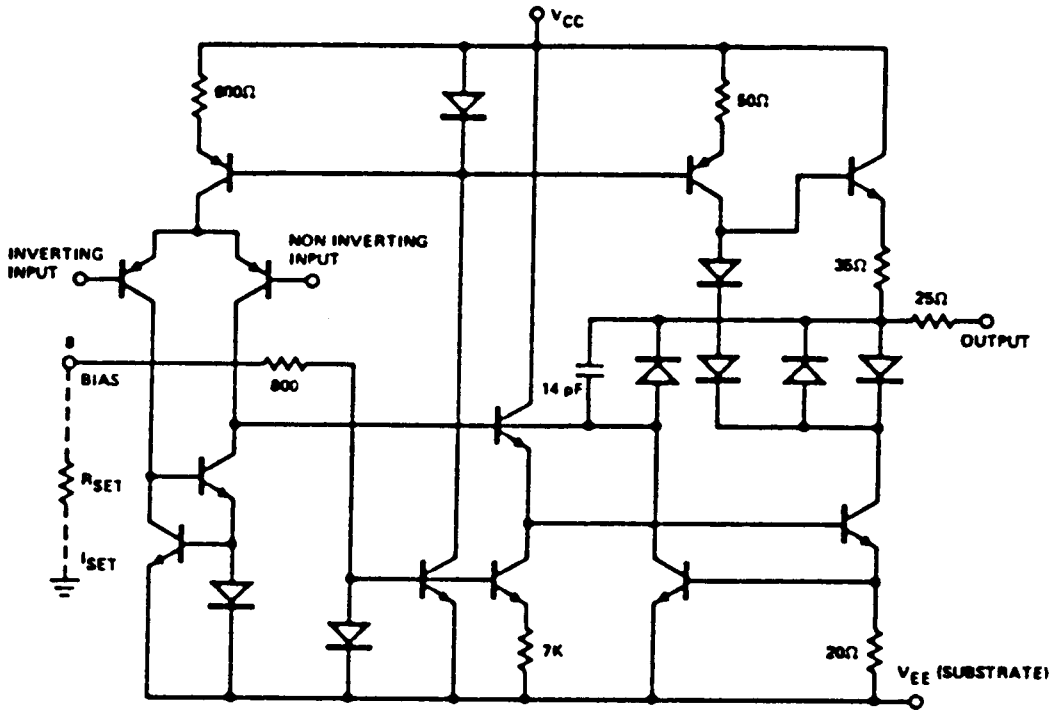


EQUIVALENT SCHEMATIC DIAGRAM

EXAR

XR-1488/1489A

Quad Line Driver/Receiver

GENERAL DESCRIPTION

The XR-1488 is a monolithic quad line driver designed to interface data terminal equipment with data communications equipment in conformance with the specifications of EIA Standard No. RS232C. This extremely versatile integrated circuit can be used to perform a wide range of applications. Features such as output current limiting, independent positive and negative power supply driving elements, and compatibility with all DTL and TTL logic families greatly enhance the versatility of the circuit.

The XR-1489A is a monolithic quad line receiver designed to interface data terminal equipment with data communications equipment. the XR-1489A quad receiver along with its companion circuit, the XR-1488 quad driver, provide a complete interface system between DTL or TTL logic levels and the RS232C defined voltage and impedance levels.

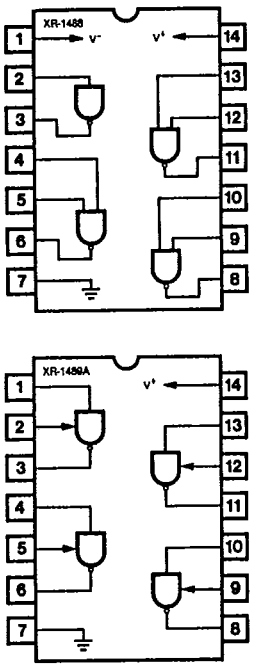
ABSOLUTE MAXIMUM RATINGS

Power Supply	
XR-1488	±15 Vdc
XR-1489A	+10 Vdc
Power Dissipation	
Ceramic Package	1000 mW
Derate above +25°C	6.7 mW/°C
Plastic Package	650 mW/°C
Derate above +25°C	5 mW/°C

ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-1488N	Ceramic	0°C to +70°C
XR-1488P	Plastic	0°C to +70°C
XR-1489AN	Ceramic	0°C to +70°C
XR-1489AP	Plastic	0°C to +70°C

FUNCTIONAL BLOCK DIAGRAMS



SYSTEM DESCRIPTION

The XR-1488 and XR-1489A are a matched set of quad line drivers and line receivers designed for interfacing between TTL/DTL and RS232C data communication lines.

The XR-1488 contains four independent split supply line drivers, each with a ±10 mA current limited output. For RS232C applications, the slew rate can be reduced to the 30 V/μS limit by shunting the output to ground with a 410 pF capacitor. The XR-1489A contains four independent line receivers, designed for interfacing RS232C to TTL/DTL. Each receiver features independently programmable switching thresholds with hysteresis, and input protection to ±30 V. The output can typically source 3 mA and sink 20 mA.