

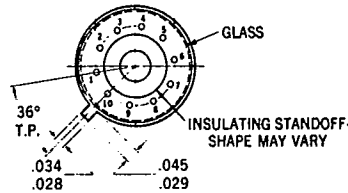
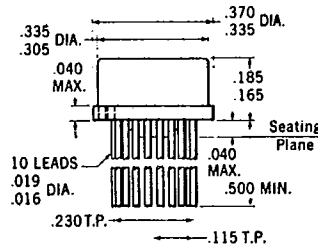
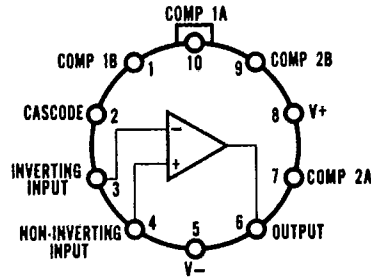


ECG915

HIGH SPEED OPERATIONAL AMPLIFIER

- High Slew Rate.....100 V/μs
- Fast Settling Time300 ns
- Wide Bandwidth65 MHz
- Wide Operating Supply Range
- Wide Input Voltage Ranges

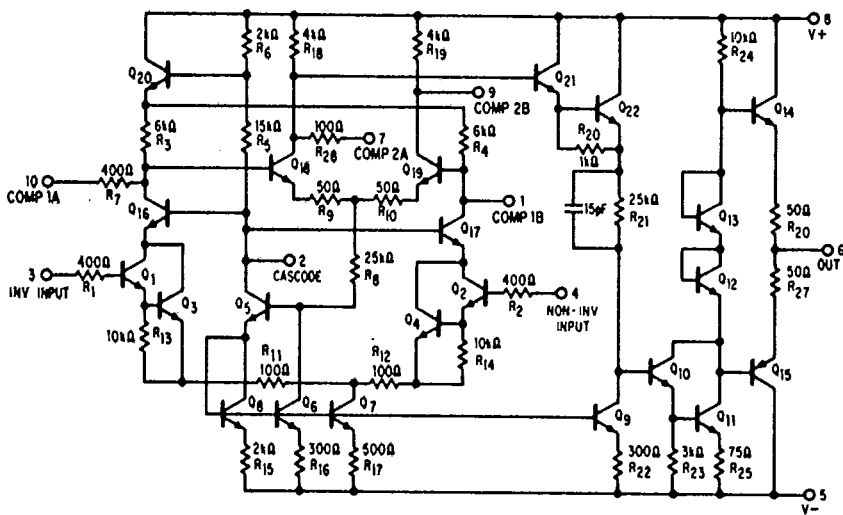
The ECG915 is a high speed, high gain, monolithic operational amplifier constructed on a single silicon chip. It is intended for use in a wide range of applications where fast signal acquisition or wide bandwidth is required. The ECG915 features fast settling time, high slew rate, low offsets, and high output swing for large signal applications. In addition, the device displays excellent temperature stability and will operate over a wide range of supply voltages. The ECG915 is ideally suited for use in A to D and D to A converters, active filters, deflection amplifiers, video amplifiers, phase locked loops, multiplexed analog gates, precision comparators, sample and holds, and general feedback applications requiring DC wide bandwidth operation.



Absolute Maximum Ratings

- Supply Voltage ±18 V
- Internal Power Dissipation (Note 1) 500 mW
- Differential Input Voltage ±15 V
- Input Voltage (Note 2) ±15 V
- Storage Temperature Range .. -65°C to +150°C
- Operating Temperature Range ... 0°C to +70°C
- Lead Temperature (Solder, 60 Seconds) 300°C

EQUIVALENT CIRCUIT



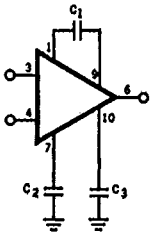
ELECTRICAL CHARACTERISTICS ($V_S = \pm 15 V, T_A = 25^\circ C$ unless otherwise specified)

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Offset Voltage	$R_S \leq 10 k\Omega$		2.0	7.5	mV
Input Offset Current			70	250	nA
Input Bias Current			0.4	1.5	nA
Input Resistance			1.0		M Ω
Input Voltage Range		± 10	± 12		Volts
Common Mode Rejection Ratio	$R_S \leq 10 k\Omega$	74	92		dB
Supply Voltage Rejection Ratio	$R_S \leq 10 k\Omega$		45	400	$\mu V/V$
Large Signal Voltage Gain	$R_L \geq 2 k\Omega, V_{out} = \pm 10 V$	10,000	30,000		
Output Resistance			75		Ω
Supply Current			5.5	10	mA
Power Consumption			165	300	mW
Acquisition Time (Unity Gain)	$V_{out} = +5 V$		800		ns
Settling Time (Unity Gain)			300		ns
Transient Response (Unity Gain)	$V_{in} = 400 mV$				
Risetime			30	75	ns
Overshoot			25	50	%
Slew Rate	$A_v = 100$		70		V/ μs
	$A_v = 10$		38		V/ μs
	$A_v = 1$ (non-inverting)	10	18		V/ μs
	$A_v = 1$ (inverting)		100		V/ μs
The following apply for $0^\circ C \leq T_A \leq +70^\circ C$:					
Input Offset Voltage	$R_S \leq 10 k\Omega$			10	mV
Input Offset Current	$T_A = +70^\circ C$			250	nA
	$T_A = 0^\circ C$			750	nA
Input Bias Current	$T_A = +70^\circ C$			1.5	μA
	$T_A = 0^\circ C$			7.5	μA
Large Signal Voltage Gain	$R_L \geq 2 k\Omega, V_{out} = \pm 10 V$	8,000			
Output Voltage Swing	$R_L \geq 2 k\Omega$	± 10	± 13		Volts

NOTES:

- (1) Rating applies for ambient temperatures to $+70^\circ C$.
- (2) For supply voltages less than $\pm 15 V$, the absolute maximum input voltage is equal to the supply voltage.

FREQUENCY COMPENSATION CIRCUIT

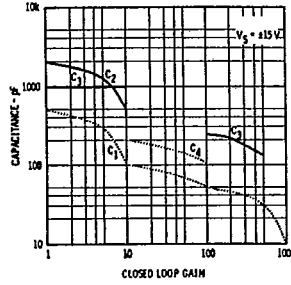


COMPENSATION COMPONENTS VALUES

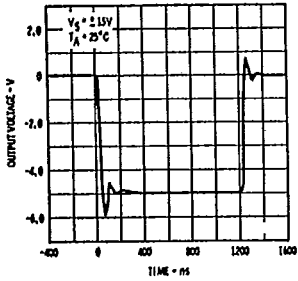
CLOSED LOOP GAIN	C ₁	C ₂	C ₃
1000	10 pF	—	—
100	50 pF	—	250 pF
10	100 pF	500 pF	1000 pF
1	500 pF	2000 pF	1000 pF

*For Gain 10—Compensation may be simplified by removing C₂, C₃ and adding a 200 pF capacitor (C₃) between Pin 7 and 10.

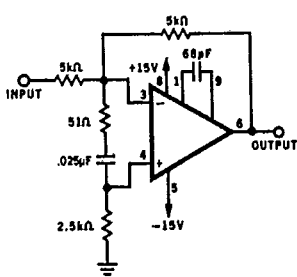
SUGGESTED VALUES OF COMPENSATION CAPACITORS AS A FUNCTION OF THE CLOSED LOOP GAIN



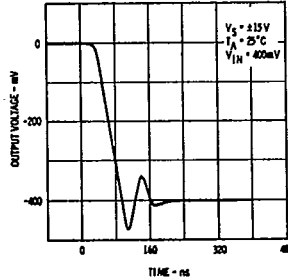
LARGE SIGNAL PULSE RESPONSE INVERTING UNITY GAIN



INVERTING UNITY GAIN HIGH SLEW RATE CIRCUIT

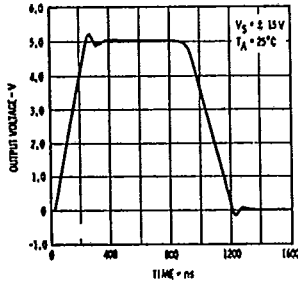


SMALL SIGNAL PULSE RESPONSE INVERTING UNITY GAIN

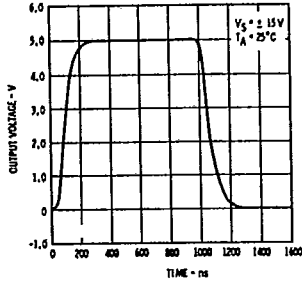


TYPICAL PERFORMANCE CURVES

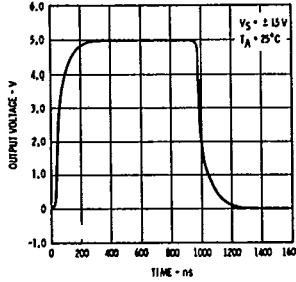
UNITY GAIN LARGE SIGNAL PULSE RESPONSE



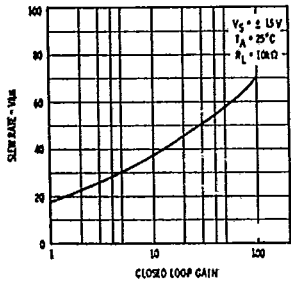
LARGE SIGNAL PULSE RESPONSE FOR GAIN 10



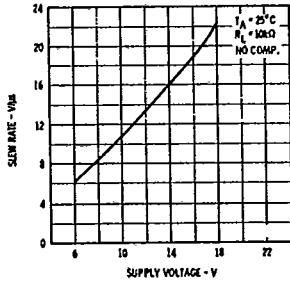
LARGE SIGNAL PULSE RESPONSE FOR GAIN 100



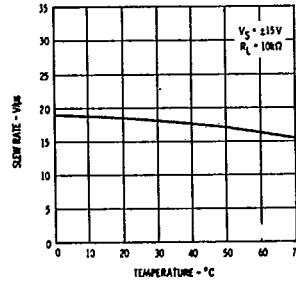
SLEW RATE AS A FUNCTION OF THE CLOSED LOOP GAIN



SLEW RATE AS A FUNCTION OF SUPPLY VOLTAGE

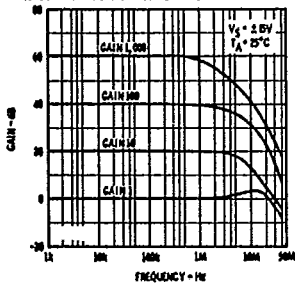


SLEW RATE AS A FUNCTION OF TEMPERATURE

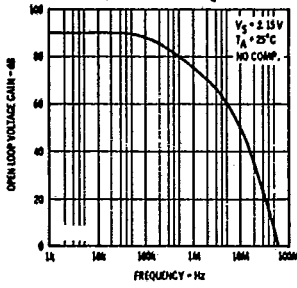


TYPICAL PERFORMANCE CURVES

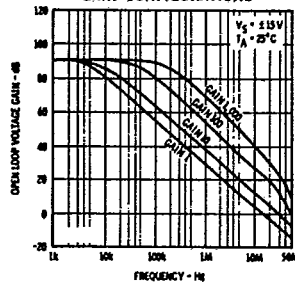
CLOSED LOOP FREQUENCY RESPONSE FOR VARIOUS GAIN CONFIGURATIONS



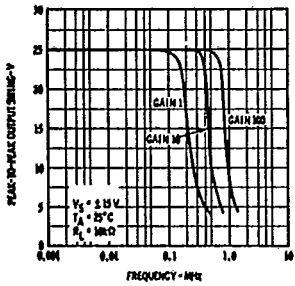
OPEN LOOP GAIN AS A FUNCTION OF FREQUENCY



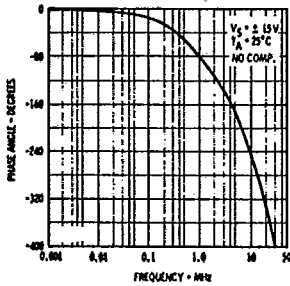
OPEN LOOP RESPONSE WITH COMPENSATION NECESSARY FOR VARIOUS CLOSED LOOP GAIN CONFIGURATIONS



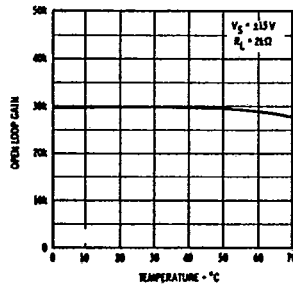
OUTPUT SWING AS A FUNCTION OF FREQUENCY FOR VARIOUS CLOSED LOOP GAIN CONFIGURATIONS



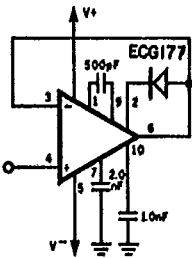
OPEN LOOP PHASE AS A FUNCTION OF FREQUENCY



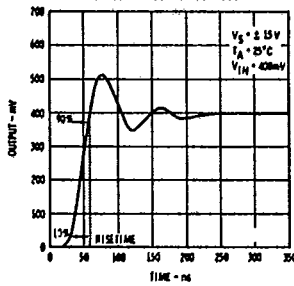
OPEN LOOP GAIN AS A FUNCTION OF AMBIENT TEMPERATURE



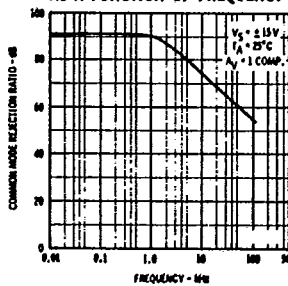
VOLTAGE FOLLOWER



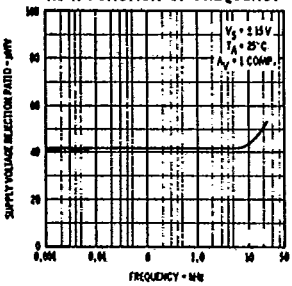
VOLTAGE FOLLOWER TRANSIENT RESPONSE



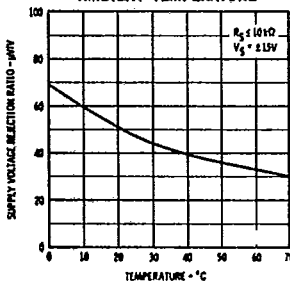
COMMON MODE REJECTION RATIO AS A FUNCTION OF FREQUENCY



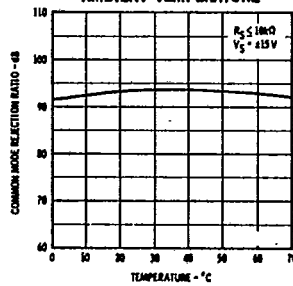
SUPPLY VOLTAGE REJECTION RATIO AS A FUNCTION OF FREQUENCY



SUPPLY VOLTAGE REJECTION RATIO AS A FUNCTION OF AMBIENT TEMPERATURE

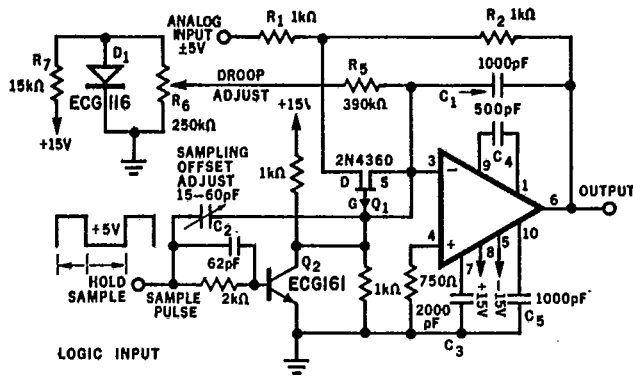


COMMON MODE REJECTION RATIO AS A FUNCTION OF AMBIENT TEMPERATURE

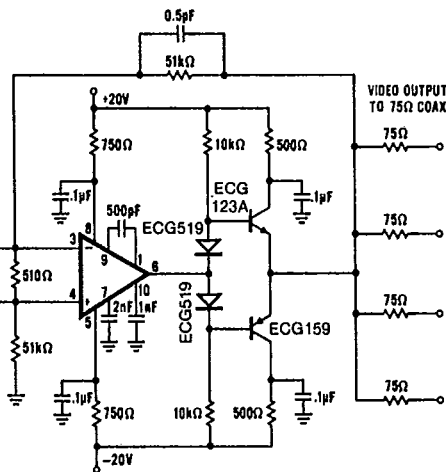
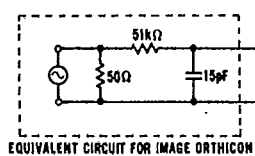
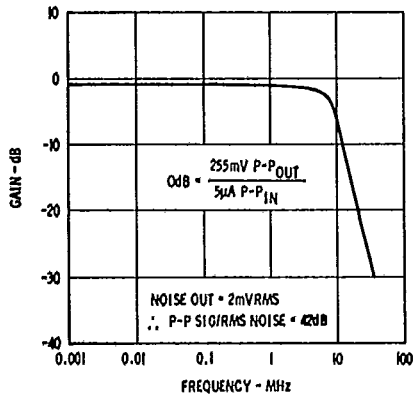


TYPICAL APPLICATIONS

HIGH SPEED SAMPLE AND HOLD



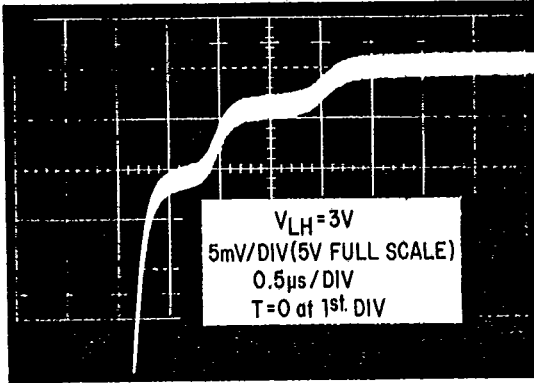
WIDE BAND VIDEO AMPLIFIER WITH 75Ω COAX CABLE DRIVE CAPABILITY



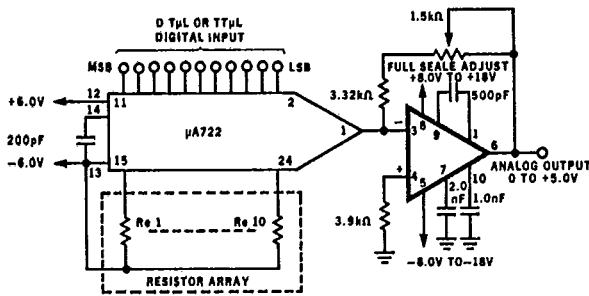
TYPICAL APPLICATIONS

HIGH SPEED 10 BIT DIGITAL TO ANALOG CONVERTER

ANALOG OUTPUT 0 TO +5.0 V

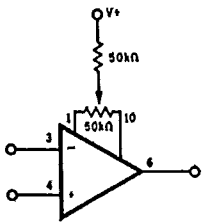


µA722/ ECG915 op amp switching ON, as it should with typical logic voltage on least significant bits. Note complete absence of ringing.

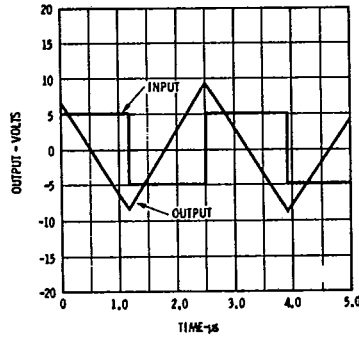
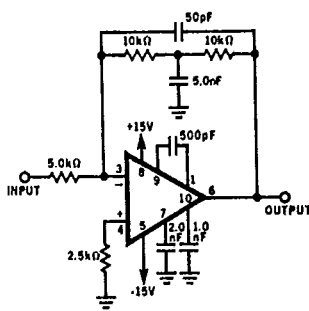


Conversion Rate
 6 bits - 300 ns
 8 bits - 600 ns
 10 bits - 1000 ns

VOLTAGE OFFSET NULL CIRCUIT



HIGH SPEED INTEGRATOR



DEFINITION OF TERMS

INPUT OFFSET VOLTAGE—That voltage which must be applied between the input terminals to obtain zero output voltage. The input offset voltage may also be defined for the case where two equal resistances are inserted in series with the input leads.

INPUT OFFSET CURRENT—The difference in the currents into the two input terminals with the output at zero volts.

INPUT RESISTANCE—The resistance looking into either input terminal with the other grounded.

INPUT BIAS CURRENT—The average of the two input currents.

INPUT VOLTAGE RANGE—The range of voltage which, if exceeded on either input terminal, could cause the amplifier to cease functioning properly.

INPUT COMMON MODE REJECTION RATIO—The ratio of the input voltage range to the maximum change in input offset voltage over this range.

SUPPLY VOLTAGE REJECTION RATIO—The ratio of the change in input offset voltage to the change in supply voltage producing it.

LARGE-SIGNAL VOLTAGE GAIN—The ratio of the maximum output voltage swing with load to the change in input voltage required to drive the output from zero to this voltage.

OUTPUT VOLTAGE SWING—The peak output swing, referred to zero, that can be obtained without clipping.

OUTPUT RESISTANCE—The resistance seen looking into the output terminal with the output at null. This parameter is defined only under small signal conditions at frequencies above a few hundred cycles to eliminate the influence of drift and thermal feedback.

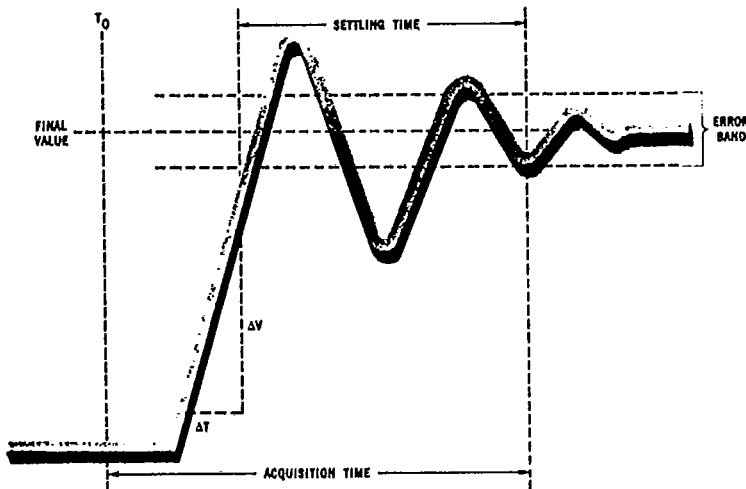
POWER CONSUMPTION—The DC power required to operate the amplifier with the output at zero and with no load current.

TRANSIENT RESPONSE—The closed-loop step-function response of the amplifier under small-signal conditions.

ACQUISITION TIME—The time from change of input until last time output exceeds specified percent of final value.

SLEW RATE—The maximum rate of change of output under large signal condition.

SETTLING TIME—The time from output first reaching final value until last time output exceeds specified percent of final value.

**HELPFUL HINTS**

LAYOUT—The layout should be such that stray capacitance is minimal.

SUPPLIES—The supplies should be adequately bypassed. Use of 0.1 μF high quality ceramic capacitors is recommended.

RINGING—Excessive ringing (long acquisition time) may occur with large capacitive loads. This may be reduced by isolating the capacitive load with a resistance of 100 Ω . Large source resistances may also give rise to the same problem and this may be decreased by the addition of a capacitance across the feedback resistance. A value of around 50 pF for unity gain configuration and around 3.0 pF for gain 10 should be adequate.

LATCH UP—This may occur when the amplifier is used as a voltage follower. The inclusion of a diode between pins 6 and 2 with the cathode towards pin 2 is the recommended preventive.