9963

DATA AND SPECIFICATIONS
DESCRIPTION AND INSTRUCTIONS

Optical Electronics Incorporated

FET LINEAR VOLTAGE FOLLOWER AND CURRENT BOOSTER

FEATURES

- SLEW RATE: ±3000V/μsec
- BANDWIDTH: 200 MHz
- OUTPUT: ±10V, ±200mA
- BIAS CURRENT: ±100pA

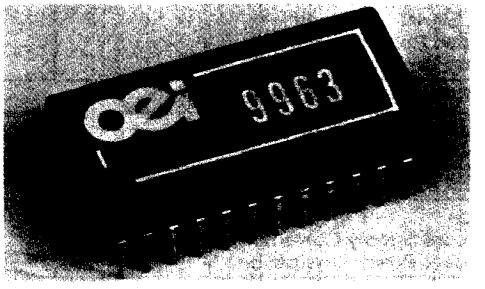
APPLICATIONS

- VIDEO LINE DRIVER
- CURRENT BOOSTER
- VOLTAGE FOLLOWER
- SAMPLE AND HOLD

DESCRIPTION

The 9963 Linear Voltage Follower is one of two devices with similar application areas and with only some of their parameters different. The 9911 Linear Voltage Follower is pin for pin compatible with the 9963. The major differences are found in their front end construction, their slew rate, drive capability, and offset. The 9963 has an FET front end and, therefore, sports a bias current of a mere ±100pA. Even its drive capability of ±200mA is impressive as is the ±3000V/μs slew rate. The 9963 is especially useful for sample and hold, as well as the peak sense and old circuits at video rates, because of the high slewing rate and settling time characteristics this device affords. The designer could use the 9911 with its very impressive slew rate as a first stage to charge the hold capacitor and then could employ the 9963 to sample the voltage on the capacitor. The input resistance of 100G ohm will only minimally load the capacitor and thus give excellent error performance figures.

The impressive small signal bandwidth of DC to 100MHz and a settling time of 50ns (to 0.1% of the intended value) make this device applicable in any of a number of high speed areas. Video line drivers for single or multiple lines can be realized. Other applications include sonar devices for medical use and certain radar circuits. Any area that needs a fast device and a reasonable drive capability can benefit from the excellent performance characteristics of the 9963.



Another area of use for this unit is inside the feedback loop of an operational amplifier to increase the overall current drive capability of the circuit, Here, the rapid settling time can be of advantage, as well as the 200mA drive capability. If used in this manner, care should be taken to prevent interaction of poles, which could double rolloff characteristics. More details on this can be found in the applications section.

The 24 pin DIP package allows for only a limited amount of heat dissipation. Also, the quiescent temperature rise is approximately 32°C above ambient. Therefore, it is advisable to provide adequate air flow and, if possible, also additional heat sinking, particularly at high drive currents. Some heat sinking is provided by use of two pins for each of the power supply rails and the output (pins 11, 12; 23, 24; and 17 and 18 respectively). However, this precaution may not be sufficient.

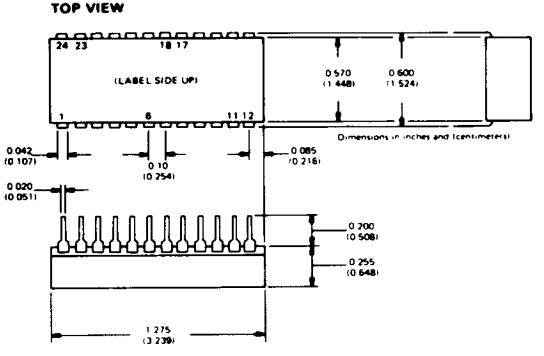
SPECIFICATIONS

ELECTRICAL

Specifications at T_A = +25° C, V_{CC} = ±15VDC unless otherwise noted.

MODEL	9963			
PARAMETER	**MIN**	**TYP**	**MAX**	**UNITS**
VOLTAGE GAIN	0.92	0.96		V/V
INPUT				
Resistance		100		GΩ
Voltage		±12		V
Bias Current		±100		pA
Offset Voltage			±50	mV
Offset Voltage Drift			±400	μV/° C
OUTPUT				
Voltage Swing	±10			V
Minimum Load Resistance	50			Ω
Maximum Load Current	±200			mA
Output Resistance			3	Ω
Maximum Load Capacitance			10	nF
FREQUENCY RESPONSE				
Slewing Rate	±3000			V/μsec
Maximum Full Output Frequency	50			MHz
Small Signal Bandwidth	200			MHz
Overload Recovery Time		100		ns
Settling Time to 0.1%		50		ns
TEMPERATURE ENVIRONMENT				
Thermal Resistance of Package		30		°C/W
Quiescent Temperature Rise		32		°C
POWER REQUIREMENTS				
Voltage	±6	±15	±18	V
Quiescent Supply Current		±35		mA
Quiescent Power Dissipation		1050		mW

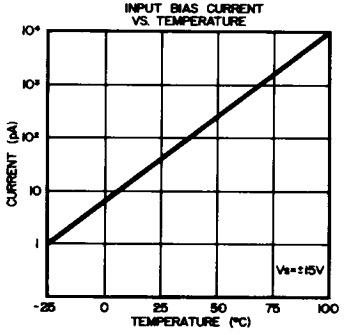
MECHANICAL DESCRIPTION: The 9963 is a standard 24-pin DIP. Its pins are compatible with standard 0.6-inch dual in-line sockets. The case is glass-fiber-filled diallyl-phthalate and is filled with an epoxy encapsulant.

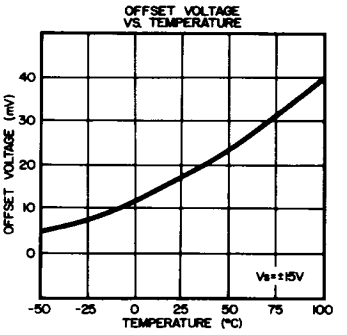


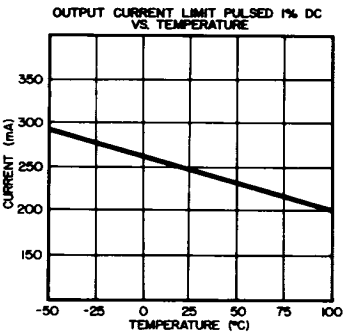
PIN CONNECTIONS
1 OFFSET
6 INPUT
11 -V
12 -V
17 OUTPUT
18 OUTPUT
23 +V
24 +V

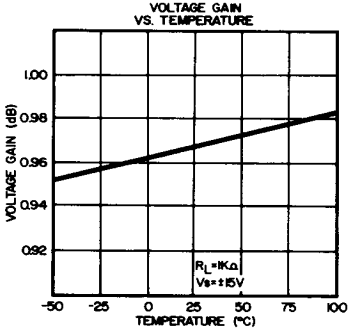
9963
TYPICAL PERFORMANCE CURVES

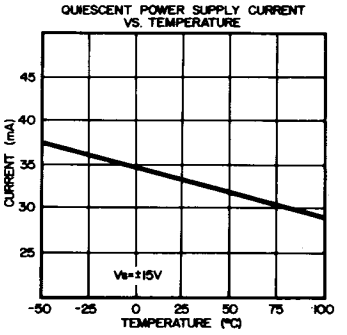
(T_A = +25°C, V_{CC} = ±15VDC unless otherwise noted)

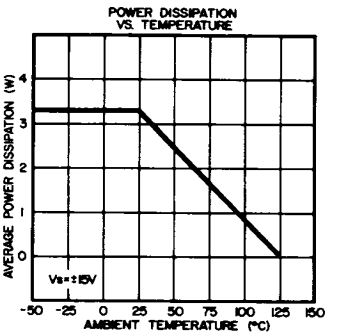


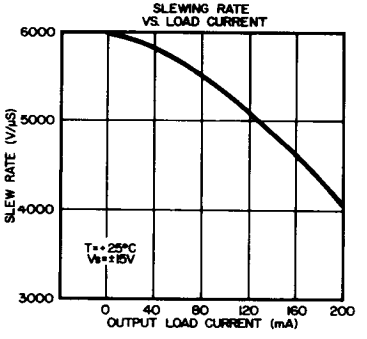


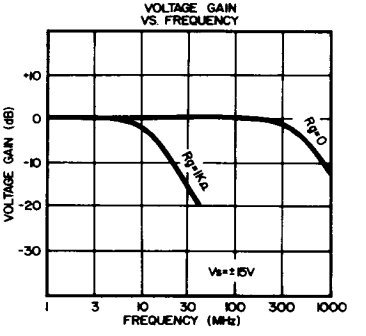












APPLICATIONS

GENERAL

The 9963 High Current Linear Voltage Follower is set up for unity gain and is designed for high current output. It is related in function and is pin for pin compatible with the 9911, both being available in a standard 24 pin DIP.

BASIC CONNECTIONS

The basic connections for this device are shown in figure 1. From the figure it is apparent that external compensation is needed on both power supply rails. If medium or high frequency noise is still present, additional capacitors with values of 0.1μF and 330pF can be paralleled to the ones shown.

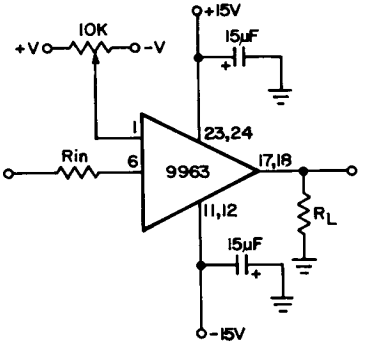


FIGURE 1: BASIC CONNECTIONS

Grounding is an important consideration for the 9963. A common ground point is advisable. Also important is the layout of the components. Particularly, the input and output lines must be laid out properly to ensure smallest possible load capacitances. This is to assure, the full use of the ±3000V/μs slew rate and the DC to 200MHz bandwidth capability of the device are realized.

The resistor in the input line also helps dampen some of the possible overshoot or other signal disturbances. It should be chosen to be no larger than 1k ohm. The output resistor can be as low as 50 ohms, thus, with a full 10V output, allowing a 200mA drive. With these high currents it is advisable to allow for ample cooling, perhaps even a heatsink should be installed.

CURRENT LIMITING

Because of the high current capability of the 9963, short circuit protection may be desirable. Figure 2 shows a method to limit the current drawn by the device. Two paris of complementary transistors are used as current sources. Q_1 through Q_4 are high current transistors with a 600mA collector current capability.

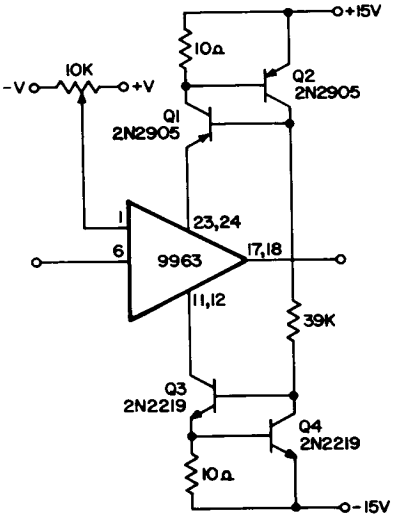


FIGURE 2: CURRENT LIMITING

The emitter resistors of Q_1 and Q_3 can be altered to allow for more or less current into the 9963. The resistor between Q_2 and Q_4 is a biasing resistor and does not contribute to the current setting. The 10k ohm linear potentiometer is used for the offset adjustment.

VIDEO LINE DRIVER

An application for which the 9963 is an excellent candidate is shown in figure 3. Here, the device is used in the feedback loop of another operational amplifier to improve its current drive capability. Also, since the gain of the 9963 is not quite unity, this combination gives the designer both gain and current driver performance. In this case, the 9963 is connected to the output of a 9916.

Another advantage of this combination is the elimination of crossover distortion which is possible with high load currents. Oscillations that might occur at low gain settings of the 9916 are prevented by the lead/lag network, connected between the inverting and non-inverting inputs of the operational amplifier. The resistor be-

tween the input to the voltage follower and the output of the operational amplifier tends to equalize additional irregularities between the two, and is used if oscillations should develop. The oscillations should be observable on a good quality oscilloscope. The load resistor determines the current load on the overall circuit. R_{in} and R_f determine, as in other operational amplifier circuits, the gain of the system. The 1k ohm resistor in the negative power supply leg is used for the current set which adjusts offset. It should be noted that the bandwidth of the operational amplifier should be narrower than the one of the voltage follower. This will prevent interaction of poles, and thus, accelerated rolloff.

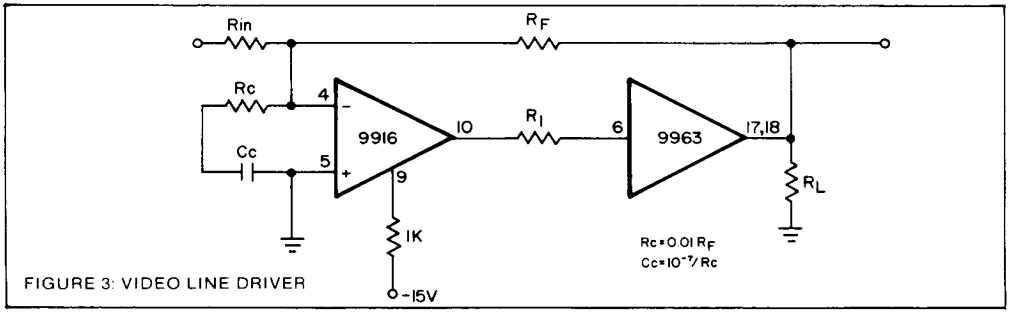


FIGURE 3: VIDEO LINE DRIVER

COAXIAL LINE DRIVER

Test equipment and other similar application areas often use coaxial lines in a 50 or 75 ohm system. The 9963 is a perfectly well suited device to drive such lines, as is shown in figure 4.

The voltage follower is capable of driving long cables and, thus, large capacitances without instabilities. It should be remembered that the 9963 does not provide more than .96 gain and, this gain can drop to .90 when the device is heavily loaded.

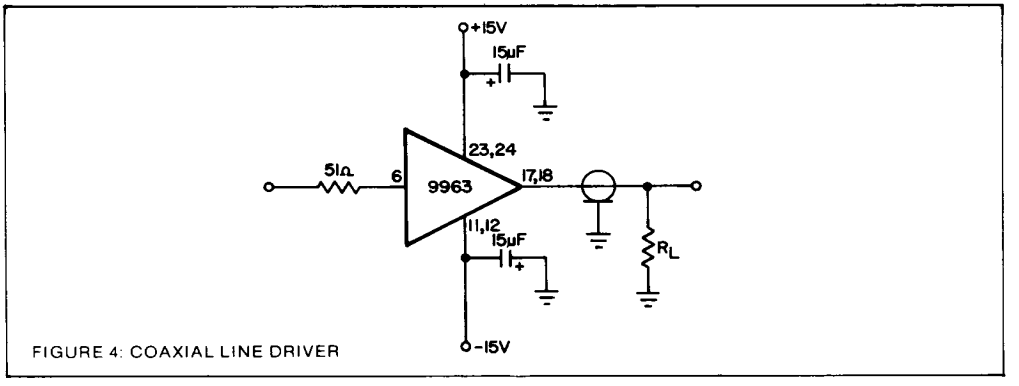


FIGURE 4: COAXIAL LINE DRIVER

HIGH SPEED SAMPLE AND HOLD

The FET front end of the 9963 with its input resistance of 100 Gohm makes it an excellent candidate for sample and hold circuits, particularly where very high speed and rapid settling times are necessary. The ±3000V/μs slew rate and the 50ns settling time allow for the acquisition of very fast signals. In the circuit shown in Figure 5, an AH0605 operational amplifier is used in a unity gain follower connection for signal acquisition, and to provide the necessary current to charge the storage capacitor Cx.

A DG181 analog switch (Siliconix) is used to select the exact time for the sample to be taken. The 9963 is connected to take the sampled signal on the charge capacitor and present it to the output of the system. In addition, the 9963 will provide drive capability of up to ±200mA. The resistor between the charge capacitor and the 9963 provides a buffer between the two devices and also supplies the necessary RC time constant. The 50 to 100 ohms shown are an example, and other values are, of course, possible.

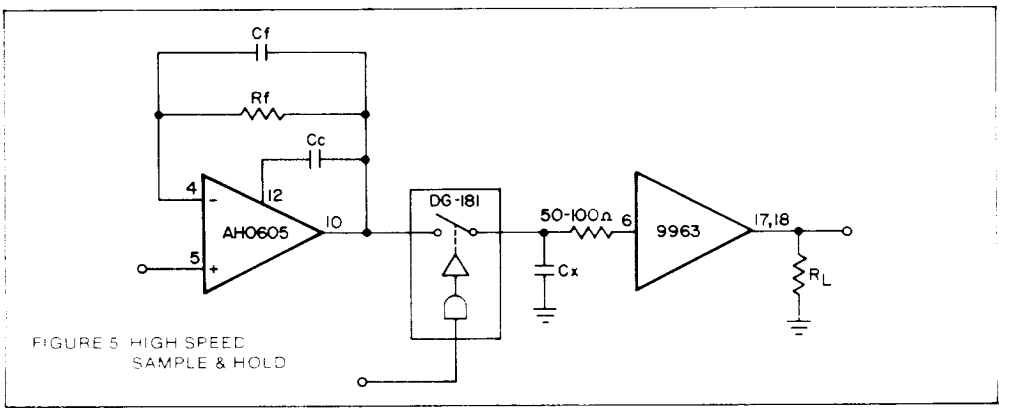


FIGURE 5 HIGH SPEED SAMPLE & HOLD

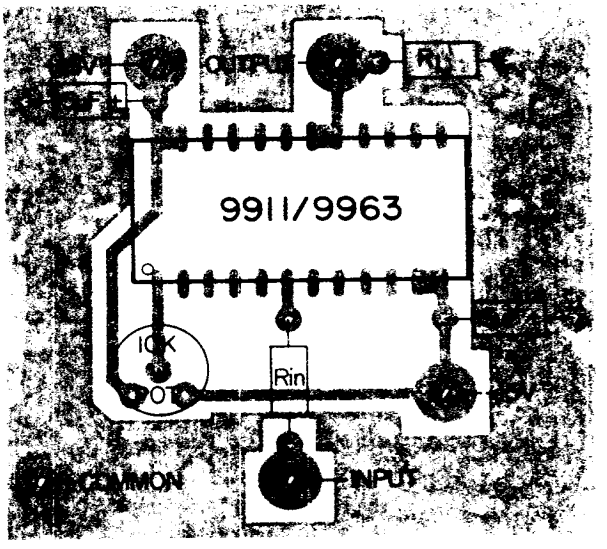


FIGURE 6 TYPICAL BOARD LAYOUT

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