



# WIDE BANDWIDTH VIDEO AMPLIFIER SYSTEM

# 621

M.S.KENNEDY CORP.

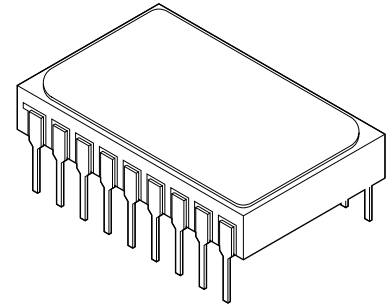
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### FEATURES:

- 230 MHz Video Bandwidth With  $V_{out} = 4V_{pp}$
- Transition Times Less Than 2.0nS With  $V_{out} = 4V_{pp}$
- 0 To 4 Volt High Input Impedance DC Drive Control With  $\pm 3dB$  Range
- 0 To 4 Volt High Input Impedance DC Contrast Control With 40dB Range
- Externally Gated Comparator for Brightness Control
- Simple To Parallel For RGB Color Tracking
- 0.0V to 9.0V Output Voltage Swing Capability
- On Board Accurate Reference Voltage Generator
- Available Fully Qualified to MIL-PRF-38534

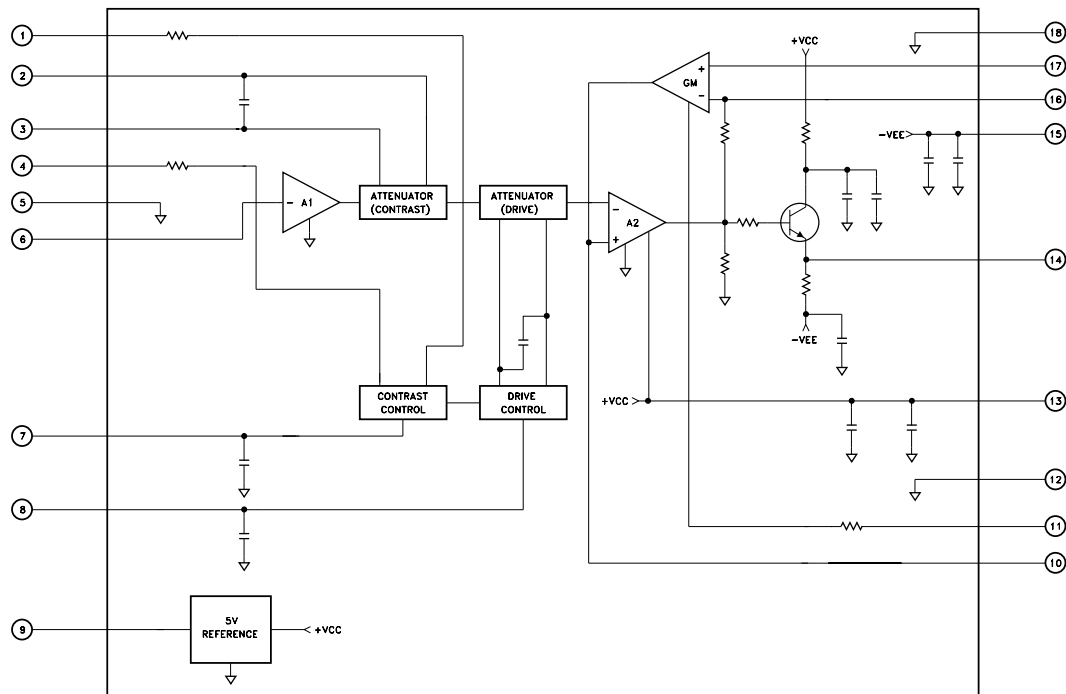
MIL-PRF-38534 CERTIFIED



### DESCRIPTION:

The MSK 621(B) is a very high frequency video amplifier system capable of driving displays with resolutions up to 1664 x 1200. Brightness is controlled with a gated differential input black level clamp comparator. There are also DC inputs available for contrast control and drive control. All DC control inputs operate over a 0V to 4V input range and feature high impedance inputs. In addition to all of the features offered in the MSK 620, the MSK 621 contains an emitter follower buffer output stage which allows the device to easily drive video lines at greater current levels. The MSK 621(B) is packaged in a space efficient hermetically sealed 18 pin dip package.

### EQUIVALENT SCHEMATIC



### TYPICAL APPLICATIONS

- Wideband Amplifier With Gain and DC Offset Control
- High Resolution CRT Monitor
- Ultra High Performance Video Processing

### PIN-OUT INFORMATION

1 Control Output (+)	10 Clamp Cap
2 Attn. Input (+)	11 Clamp Gate Input
3 Attn. Input (-)	12 Ground
4 Control Output (-)	13 +Vcc
5 Ground	14 Video Output
6 Video Input	15 -Vee
7 Contrast Control Input	16 Clamp Input (-)
8 Drive Control Input	17 Clamp Input (+)
9 Vref Output	18 Ground

## ABSOLUTE MAXIMUM RATINGS

+V <sub>CC</sub>	Supply Voltage . . . . .	+13.5V	T <sub>ST</sub>	Storage Temperature Range	-65°C to +150°C
-V <sub>EE</sub>	Supply Voltage . . . . .	-8V	T <sub>LD</sub>	Lead Temperature Range	300°C (10 Seconds)
θ <sub>JC</sub>	Thermal Resistance . . . . .	19.0°C/W (Junction to Case)	T <sub>C</sub>	Case Operating Temperature	MSK621 . . . . . -40°C to +85°C
V <sub>IN</sub>	Voltage At Any Input Pin. . . . .	V <sub>CC</sub> ≥ V <sub>IN</sub> ≥ GND	T <sub>J</sub>	Junction Temperature . . . . .	MSK621B . . . . . -55°C to +125°C
I <sub>OUT</sub>	Video Output Current . . . . .	100mA			
I <sub>OUTREF</sub>	Reference Output Current . . . . .	20mA			

## ELECTRICAL SPECIFICATIONS

+V<sub>CC</sub> = +12.0V, -V<sub>EE</sub> = -5V Unless Otherwise Specified

Parameter	Test Conditions ①	Group A Subgroup	MSK 621B			MSK 621			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	
<b>STATIC</b>									
Power Supply Current	R <sub>LOAD</sub> = ∞; +V <sub>CC</sub>	1,2,3	-	96	110	-	105	120	mA
Video Input Bias Voltage	V <sub>IN</sub> = N/C	1,2,3	2.0	2.65	2.9	2.0	2.65	2.9	V
Clamp Gate High Input Voltage	Comparator Off	1,2,3	2.0	-	-	1.8	-	-	V
Clamp Gate Low Input Voltage	Comparator On	1,2,3	-	-	0.8	-	-	1.0	V
<b>DYNAMIC CHARACTERISTICS</b>									
Video Amplifier Gain ⑤		4	16	20	24	16	20	24	V/V
Video Output Low Voltage ⑤	Clamp Cap Voltage = 0V	4	-	-0.2	0.0	-	-0.2	0.0	V
Video Output High Voltage ⑤	Clamp Cap Voltage = 6V	4	9.0	10	-	9.0	10	-	V
Attenuation ②	V <sub>CONTRAST</sub> = 0.5V	-	-	-23	-	-	-23	-	dB
Video Amplifier Input Resistance ②	f <sub>IN</sub> = 12KHz	-	-	20	-	-	20	-	KΩ
Gain Range ⑤	V <sub>DRIVE</sub> = 0V to 4V	4	5	6	-	5	6	-	dB
-3dB Video Amplifier Bandwidth ⑤	V <sub>O</sub> = 4V <sub>PP</sub>	4	200	230	-	190	200	-	MHz
Output Rise Time ⑤	V <sub>O</sub> = 4V <sub>PP</sub>	4	-	1.5	2.0	-	2.0	3.0	nS
Output Fall Time ⑤	V <sub>O</sub> = 4V <sub>PP</sub>	4	-	1.5	2.0	-	2.0	3.0	nS
<b>VOLTAGE REFERENCE</b>									
Output Voltage	I <sub>L</sub> = 0mA Ext	1	4.95	5.00	5.05	4.9	5.0	5.1	V
Line Regulation ②	V <sub>CC</sub> = 11V to 13V	-	-	0.006	0.01	-	0.006	0.01	%/V
Load Regulation ②	I <sub>L</sub> = 0 to 10mA	-	-	0.005	0.01	-	0.005	0.01	%/mA
Output Voltage Change w/Temp.②	-55°C ≤ T <sub>C</sub> ≤ 125°C	-	-	0.18	0.45	-	0.18	0.45	%

### NOTES:

- ① R<sub>IN</sub> = 30Ω, C<sub>IN</sub> = 10μF, R<sub>L</sub> = 499Ω, unless otherwise specified. Clamp Gate Input = 0V, V<sub>CONTRAST</sub> = V<sub>DRIVE</sub> = V<sub>BRIGHTNESS</sub> = 4V.
- ② Guaranteed by design but not tested. Typical parameters are representative of actual device performance but are for reference only.
- ③ Industrial grade devices shall be tested to subgroups 1 and 4 unless otherwise specified.
- ④ Military grade devices ('B' suffix) shall be 100% tested to subgroups 1,2,3 and 4.
- ⑤ Subgroup 5 and 6 testing available upon request.
- ⑥ Subgroup 1,4 T<sub>A</sub> = T<sub>C</sub> = +25°C  
Subgroup 2,5 T<sub>A</sub> = T<sub>C</sub> = +125°C  
Subgroup 3,6 T<sub>A</sub> = T<sub>C</sub> = -55°C

## APPLICATION NOTES

### VIDEO INPUT

Pin 6 is the video input pin. The video input signal is coupled to this point through a 30Ω, 10μF 'RC' filter as shown in figure two. The MSK 621 is designed to receive input voltages as high as ±13.5V.

### OUTPUT

The distinguishing characteristic of the MSK 621 which separates it from the MSK 620 is its output configuration. The MSK 620 contains a push pull output capable of delivering approximately 25mA of load current. The MSK 621 has the same output as the MSK 620 except it is followed by an emitter follower buffer stage. This buffer stage increases the load current capability to 100mA making the MSK 621 capable of driving a coax cable. The output buffer stage also allows the output voltage to swing through zero volts.

### POWER SUPPLY CONNECTIONS

Pin 13 is the positive power supply pin, and Pin 15 is the negative power supply pin. Convenient internal power supply decoupling consists of a parallel combination of three capacitors ranging from 0.01μF to 0.47μF. The user is advised to connect at least 4.7μF tantalum decoupling capacitors as close to the power supply pins as possible.

### Vref OUTPUT

Pin 9 is the Vref output pin. This pin connects to the output of an ultra stable 5.0VDC reference voltage generator internal to the MSK 621. This reference is used as a voltage source for the contrast, drive and clamp inputs. (See figure one).

### CONTRAST CONTROL

To achieve contrast control, pin 1 is shorted to pin 2 and pin 3 is shorted to pin 4. The voltages at pins 1 and 4 are controlled by the input voltage at pin seven. As the voltage at pin 7 increases, the voltages at pins 1 and 4 become offset. With pin 7 at zero volts and pin 8 at +4.0 volts, pins 1 and 4 are at minimum offset and the contrast is set to the minimum value of -38dB typical. With pin 7 at 4V, pins 1 and 4 are at maximum offset and contrast is maximized to +26dB. Pin 7 is internally decoupled to ground with a 0.1μF capacitor.

### DRIVE CONTROL

Pin 8 is the drive control input. This pin accepts a DC voltage to control overall gain. Pin 8 is internally decoupled to ground with a 0.1μF capacitor. With 0V at pin 8, the gain is minimum (-6dB). With 4V at pin 8, the gain is maximum (0dB). Drive control is approximated by the following formula:

$$\text{ATTENUATION (dB)} = (1.5) \times (\text{DRIVE VOLTAGE}) - (6\text{dB})$$

See graph of Attenuation vs. Drive Control Voltage

### CLAMP CAP

Pin 10 is the clamp comparator output pin. A capacitance of approximately 0.1μF is connected from this pin to ground. During the "back porch" portion of the clamp signal, the clamp capacitor is either charged or discharged to match the voltage set on the non-inverting input of the clamp comparator (pin 16). During the video portion of the input signal, the clamp comparator is disabled and the clamp cap holds the proper DC bias in the video amplifier.

### CLAMP CONNECTIONS

Pin 16 is the (-) clamp input pin. This pin is the inverting input to the clamp comparator. When the clamp comparator is enabled, the voltage at pin 16 is compared to the voltage at pin 17, which is the non-inverting input of the clamp comparator. A source or sink current is generated at pin 10 to charge or discharge the clamp cap and supply DC bias to the video amplifier. The DC voltage at pin 17 is user adjustable through a 100KΩ potentiometer voltage divider to Vref (see figure 2). In DC coupled cathode drive applications, brightness can be varied by varying the DC voltage at pin 17. Pin 16 is internally fed back to the output prior to the buffer stage.

### DC RESTORATION

Pin 11 is the clamp gate input pin and is driven by a TTL back porch clamp signal. A voltage level of +1.3V or less is a "low level" and a voltage level of +1.5V or greater is a "high level". An active low level at this pin enables the clamp comparator section so that DC restoration can be accomplished. This pin should be held at a "high" logic level when a back porch clamp signal is not used.

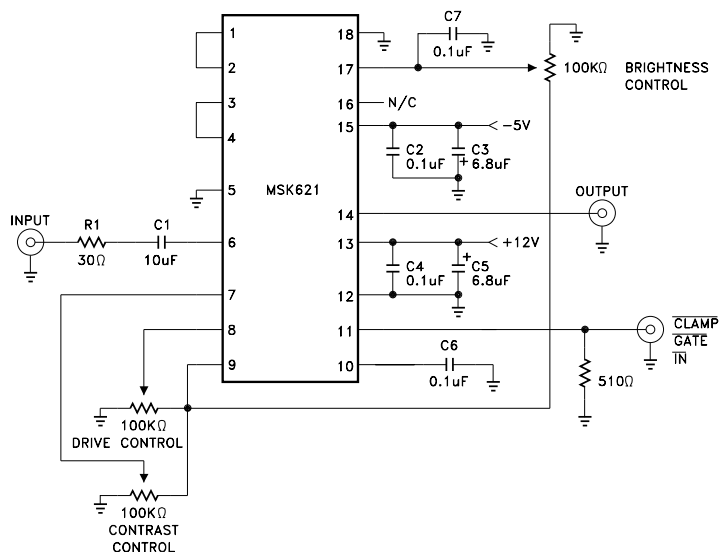
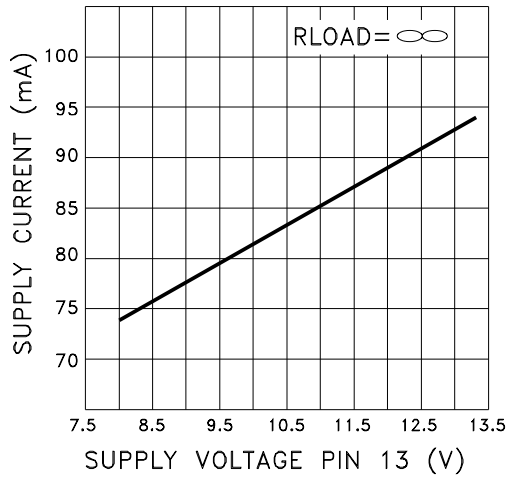


FIGURE 1

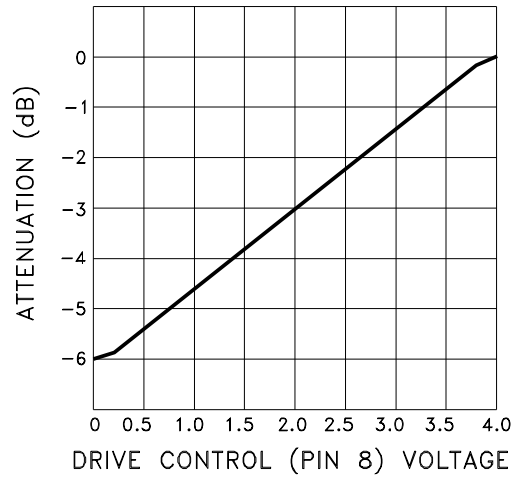
A typical single video channel connection diagram for the MSK 621 is shown in figure one above. The DC voltage at pin 6 is internally fixed at +2.6V and the video signal is AC coupled to the input. An internal reference voltage generator supplies a +5.0VDC level at pin 9 for use with the contrast, drive and brightness control potentiometers. With pin 7 at 0V, minimum gain is realized. With pin 7 at 4V, maximum gain is realized. The clamp gate input at pin 11 accepts a TTL level clamp signal for DC restoration during the back porch segment of the video signal. Pin 17 is the brightness control input pin and accepts a zero to four volt DC level. This level sets the black level of the signal. If pin 17 = +1VDC the signal black level will be +1VDC.

# TYPICAL PERFORMANCE CURVES

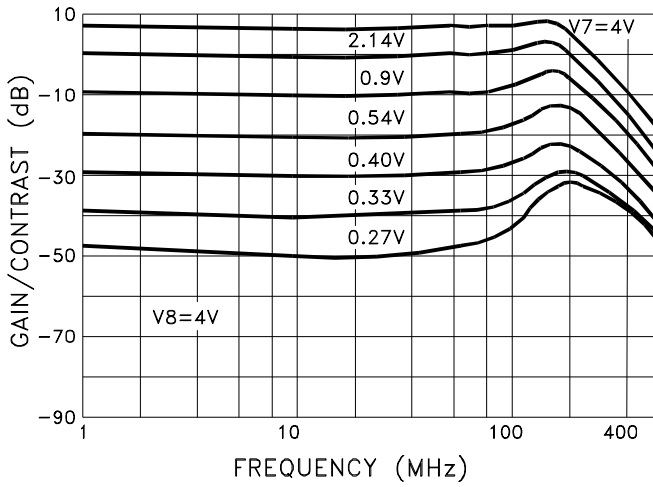
QUIESCENT SUPPLY CURRENT vs SUPPLY VOLTAGE



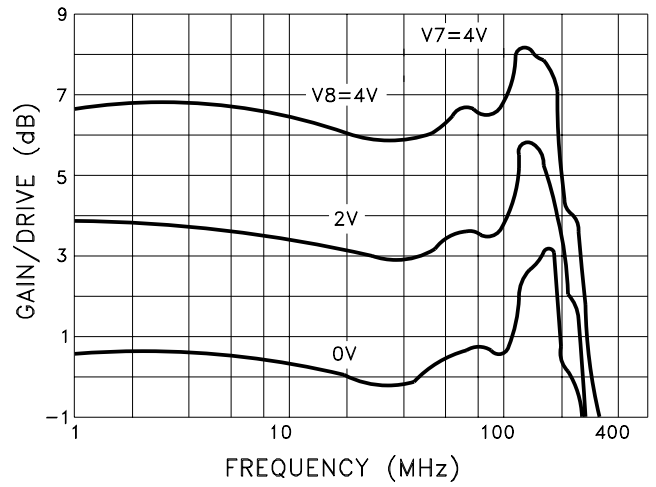
ATTENUATION vs DRIVE CONTROL VOLTAGE



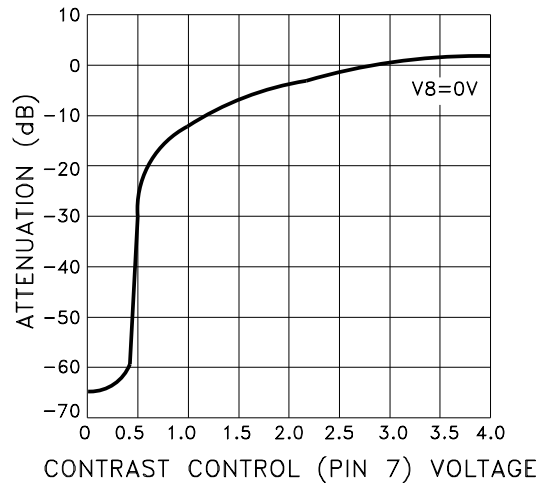
CONTRAST vs FREQUENCY



DRIVE vs FREQUENCY



ATTENUATION vs CONTRAST CONTROL VOLTAGE



# COMPLETE RGB VIDEO SYSTEM

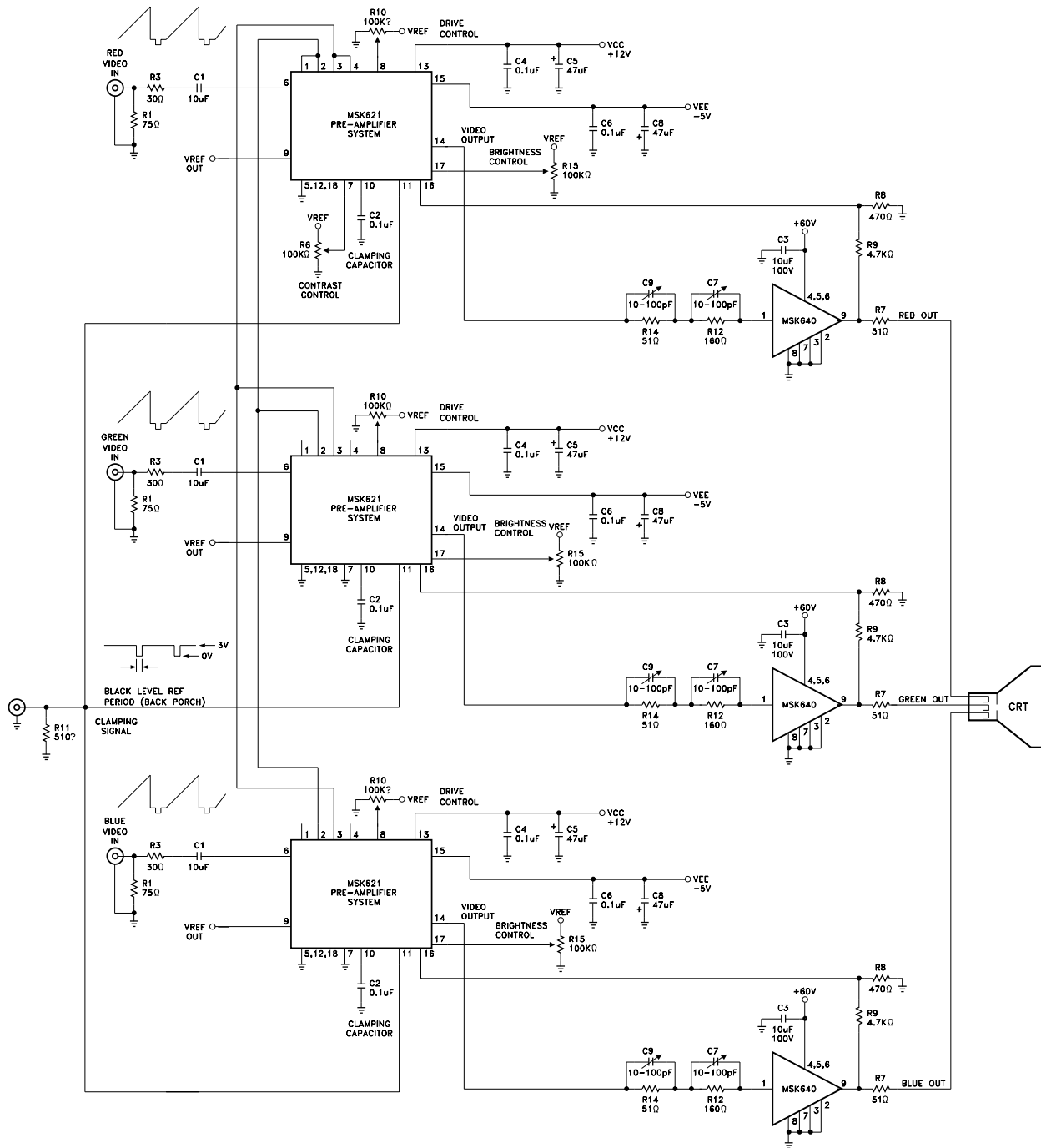
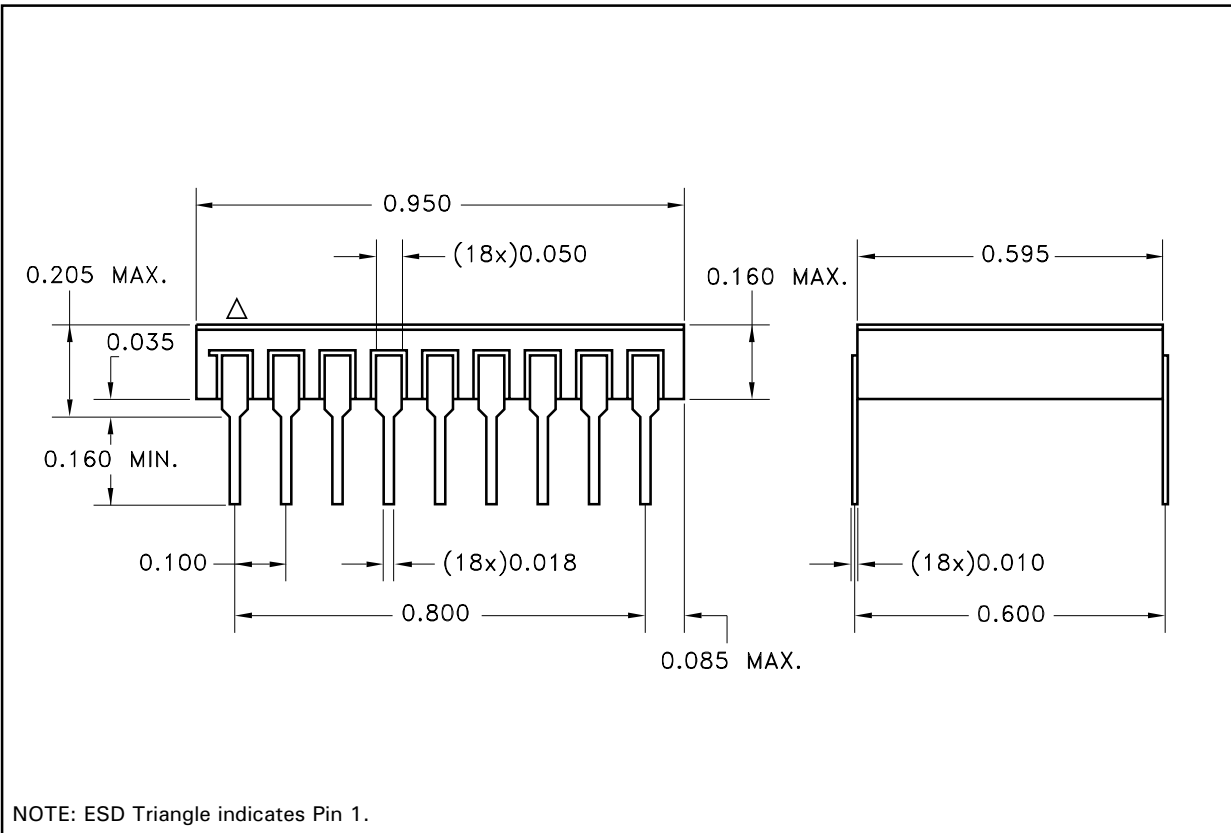


FIGURE 2

A typical connection diagram for a red, green, blue video amplifier system is shown in Figure 2. To achieve optimum contrast tracking, a master slave contrast connection is utilized. This is accomplished by connecting pins 2 and 3 of all three preamplifiers together and using the contrast control of one channel to vary the contrast of all three channels simultaneously. White balance is achieved through individual drive controls. Black level can also be adjusted for each channel by adjusting the voltage at pin 17. If the cathode is AC coupled, the video signal is DC restored at the cathode. In that case black level clamping can be accomplished by biasing pin 17 to the desired black level. Black level control is accomplished with R8 and R9 sampling the output and feeding it back to the clamping section of the MSK 621. This scheme provides black level control superior to locally sampling the MSK 621 output and feeding that back to the clamping section.

## MECHANICAL SPECIFICATIONS



ALL DIMENSIONS ARE  $\pm 0.010$  INCHES UNLESS OTHERWISE LABELED

## ORDERING INFORMATION

Part Number	Screening Level
MSK621	Industrial
MSK621B	Military-Mil-PRF-38534

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