calogic
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Triple 180MHz
CRT Driver

CVA6629S

FEATURES

- **Rise/Fall Time. 2.5ns**
- **Swing . . . . 70V$_{P-P}$**
- **Symmetrical Rise and Fall Time**
- **Excellent Gray Scale Linearity**

APPLICATION

- **CRT Driver for up to 110kHz Monitors with Resolution upto 1600 x 1280 (Non-Interlaced).**

DESCRIPTION

The CVA6629S contains three wideband amplifiers designed specifically to drive high resolution CRTs. It features excellent gray scale linearity and high load capacitance driving capability. This device can drive monitors with resolution of 1600 x 1280 (non-interlaced) with pixel frequency of 350MHz.

The part is housed in 12L Ceramic package with heat sink grounded.

ORDERING INFORMATION

Part	Package	Temperature
CVA6629S	CY12B	-20°C to +100°C

CONNECTION DIAGRAM AND SIMPLIFIED SCHEMATIC

1j-40

CVA6629S

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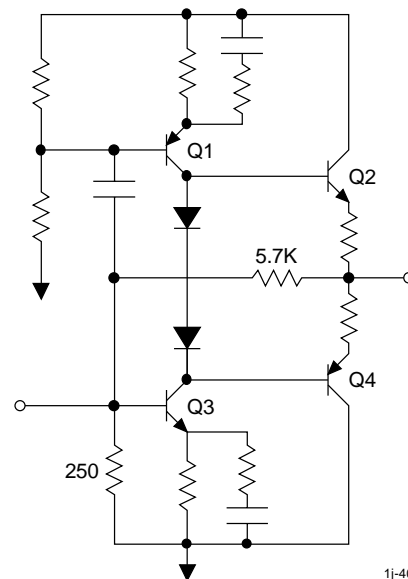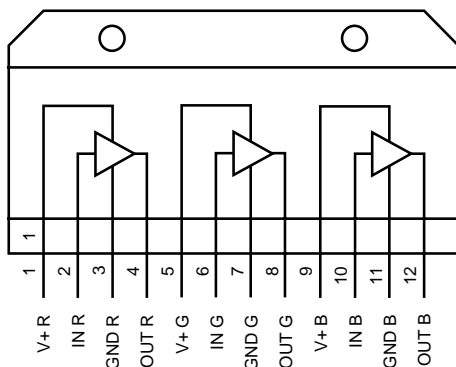
ABSOLUTE MAXIMUM RATINGS

Supply Voltage. . . . . 85V   Operating Temperature . . . . -20°C to +100°C

Storage Temperature. . . . . -25°C to +125°C   Lead Temperature . . . . +300°C
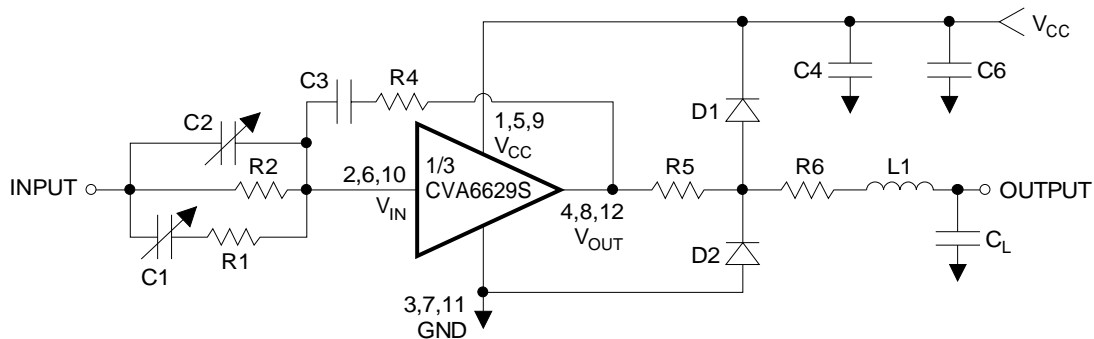
DC ELECTRICAL CHARACTERISTICS V_S = 80V, C_L = 10pF, T_{CASE} = +25°C. See Figure 1.

SYMBOL	CHARACTERISTICS	MIN	TYP	MAX	UNITS
I_{CC}	Supply Current		37	42	mA
$V_{IN\,DC}$	Input DC Level	1.3	1.5	1.7	V
$V_{OUT\,DC}$	Output DC Level	36	40	44	V
A_V	Voltage Gain	10	12	14	V
	Gain Matching		0.2		dB

AC ELECTRICAL CHARACTERISTICS V_S = 80V, C_L = 10pF, V_{OUT} = 50V$_{P-P}$, T_{CASE} = +25°C. See Figure 1.

SYMBOL	CHARACTERISTICS	MIN	TYP	MAX	UNITS
t_r	Rise Time		2.8	3.5	ns
t_f	Fall Time		2.7	3.5	ns
BW	Bandwidth		180		MHz
Le	Linearity		5		%
OS	Overshoot		4		%

FIGURE 1. TEST CIRCUIT

R1 = 15Ω
R2 = 430Ω

R4 = 200k
R5 = 22Ω
R6 = 22Ω

C1 = VARIABLE 20 TO 150pF
    TYPICAL 68pF
C2 = VARIABLE 4 to 20pF
    TYPICAL 17pF
C3 = 75pF

C4 = 10μf/160V
C6 = 0.01μf/160V
C_L = 10pF

D1 = DS464
D2 = DS464
L1 = 150nH

1Q-03

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APPLICATION INFORMATION

The CVA6629S is a transimpedance amplifier with two stage feedback configurations. Any change in input current will be reflected as change in output voltage swing. A resistor in series with the input will change the CVA6629S into a voltage amplifier. The output is emitter follower with load(capacitive) driven capability.

With a true Class AB output stage, the rise and fall time is symmetric.

CVA6627S has an internal feedback resistor of 5.7KΩ. In the absence of any input signal, the V_{OUT} DC is set by

$$V_{OUT}(DC) = (1 + \frac{R_F}{R_B}) \, V_{IN}(DC); \ \ RB = 250\Omega.$$

An input resistor RG will set the gain as

$$V_{OUT} = (\frac{R_F}{R_G}) \, V_{IN}; \ \ R_G = \text{gain resistor.}$$

Input and Transfer Characteristics

An input current swing of ±5.2mA causes the output to change by ±25V. A resistor of 390Ω will set the gain to -11. Input pins are internal DC feedback nodes and thus have low impedance. These pins must be fed from a series RC network for high frequency emphasis.

The following section will explain how to overcome some of the problems that are typical.

1) Input drive: CVA6629S gives best results when the amplifier is driven by a fast pulse with proper voltage level. Since all pre-amplifiers have output from 0 to 8V, a level shifter is required. Using CVA4402, buffer plus level shifter, this can be easily realized.

2) Smear: For a box pattern with white background, a shadow after the black is called smear. It is due to the tilt of the white level. It can easily be adjusted by adding an RC feedback network (R4, C3). The value of R4 will affect the gain, for CVA6629S, the typical value is 200K.

3) Streaks and overshoot: For a cross-hatch pattern with white background, a whitish line will appear just after the black line, this is called streak. Looking at the waveform it is due to undershoot of the waveform. For a Box pattern with white background, a dark black area just after white is a sign of overshoot. It is due to overshoot of the waveform. Adjusting the value of C2, R1, C1 will get the optimum result. The value of C2 should be kept at minimum for less overshoot, typical is <20pF. Value of R1 should be less than 47 ohms otherwise rise and fall time will suffer. First adjust the overshoot to minimum, keeping value of C1 and R2 to minimum, then adjust the undershoot (Streak) by adjusting C3 again. Since both need to be adjusted together, this may need a few iteration to get to the optimum result.

It should be noted here that the output peaking with L1 and R3 is only to overcome the affect of stray capacitance. Keep the value of L1 to minimum, typ 150nH and R, to be 820Ω. The value of L1 depends on the associated capacitance with the board and the cable(if any). CVA6629S is specifically designed to handle extra capacitance associated with the cable(typ. 10pF) assuming the driver is not part of the neck board. The value of R3 should be less than 1K to damped the resonant ringing.

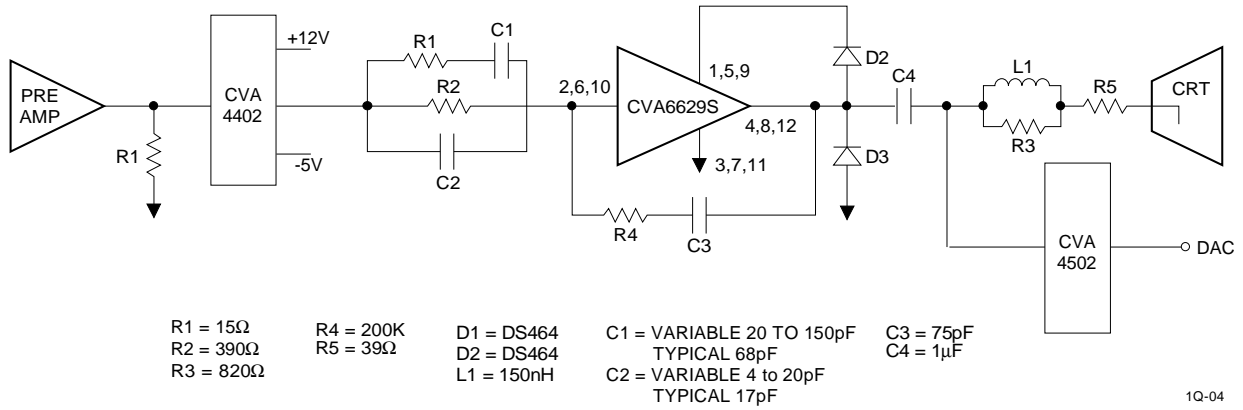The output of CVA6629S is not short circuit proof. Precaution is required.

Thermal Characteristics

Under normal operating conditions the CVA6629S will dissipate up to 8W. The maximum allowed case temperature is +100°C. To calculate maximum heatsink thermal resistance use the following equation:

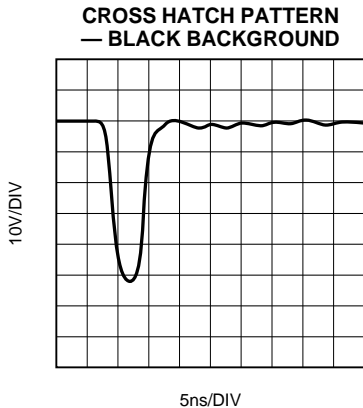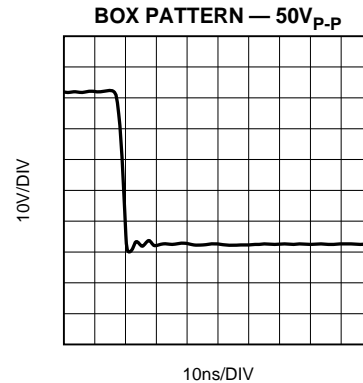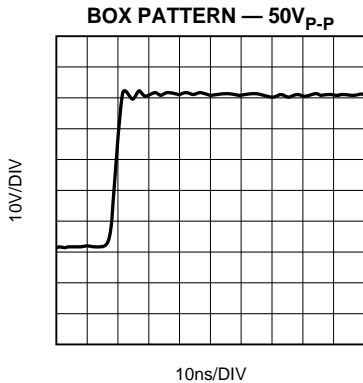$$Rth = \frac{(100 - 50^\circ)}{18W} = 2.8^\circ C/W$$

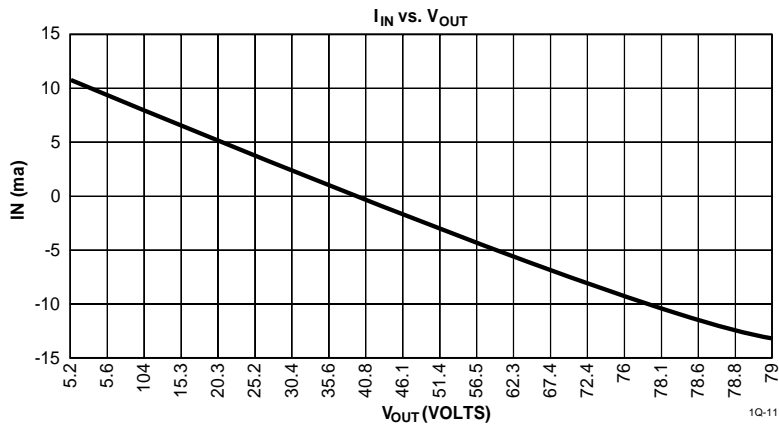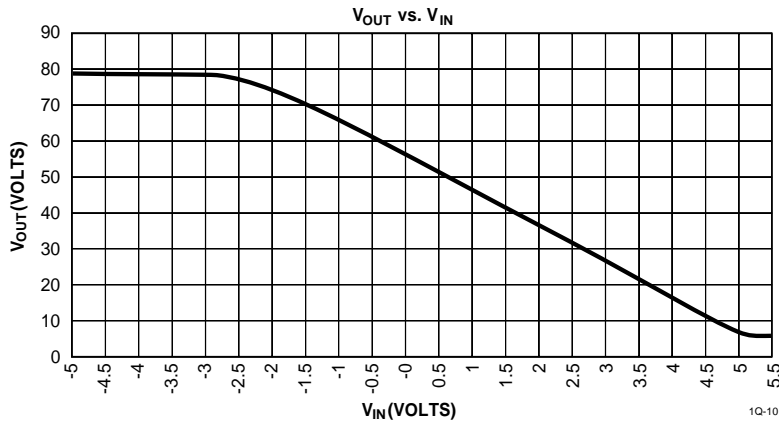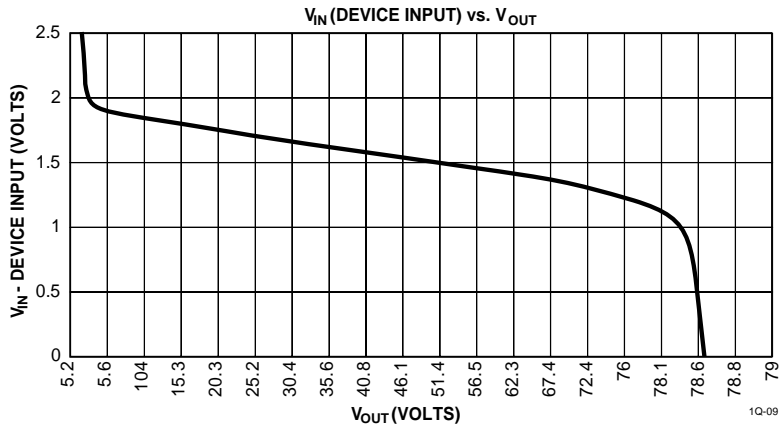The Thermalloy #11699 is one example of a heatsink that meets this requirement.

FIGURE 2. APLICATION CIRCUIT

R1 = 15Ω
R2 = 390Ω
R3 = 820Ω

R4 = 200K
R5 = 39Ω

D1 = DS464
D2 = DS464
L1 = 150nH

C1 = VARIABLE 20 TO 150pF
    TYPICAL 68pF
C2 = VARIABLE 4 to 20pF
    TYPICAL 17pF

C3 = 75pF
C4 = 1μF

1Q-04

ELECTRICAL CHARACTERISTICS

BOX PATTERN — 50V$_{P-P}$

10V/DIV

10ns/DIV

1Q-05

BOX PATTERN — 50V$_{P-P}$

10V/DIV

10ns/DIV

1Q-07

**CROSS HATCH PATTERN
— BLACK BACKGROUND**

10V/DIV

5ns/DIV

1Q-06

**CROSS HATCH PATTERN
— WHITE BACKGROUND**

10V/DIV

5ns/DIV

1Q-08

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ELECTRICAL CHARACTERISTICS (continued)

V$_{IN}$ (DEVICE INPUT) vs. V$_{OUT}$

1Q-09

V$_{OUT}$ vs. V$_{IN}$

1Q-10

I$_{IN}$ vs. V$_{OUT}$

1Q-11

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PACKAGE DIMENSIONS

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Both intput and output stage has separate by pass capacitor. Emitter capacitor is included to improve the dynamic performance for large voltage swing. With true Class AB output stage, the rise and fall time is symmetric.

CVA6627S has an internal feedback resistor of 5.7KΩ. In the absencs of any input signal, the vout DC is set by

$$V_{out}(DC) = (1 + \frac{R_F}{R_b}) \, V_{in}(DC); \quad RB = 250\Omega$$

An input resistor RG will set the gain as

$$V_{out} = (\frac{R_F}{R_g}) \, V_{in}; \quad R_g = \text{gain resistor}$$

Input and Transfer characteristics

An input current swing of ±4, 4ma causes the output to change by ±25V. A resistor of 430 will set the gain to -13. Input pins are internal dc feedback nodes and thus have low impedance. These pins must be fed from a series RC network for high frequency emphasis.

Following section will explain how to overcome some of the problems that are typical.

1) Input drive: CVA6627 gives best results when the amplifer is driven by a fast pulse with proper voltage level. Since all pre-amplieriers have output from 0 to 8V, a level shifter is requried, also most pre-amplifiers cannot drive large capacitive load to drive a buffer is requried. A simple transistor like 25C4693 and a zener with -5V supply can do the job with little affect on the response.

2) Smear: On the monitor for a box pattern with white background a shado after the black is called smear. It is due to tilt of the white level. It can easily be adjusted by adding RC feedback network (R1, C1). The value of R1 will affect the gain, for CVA6627S the typical value is 200K. The value of C1 will be adjusted to get optimum ringing.

3) Streks and overshoot: For a cross-hatch pattern with white backgorund, a whitish line will appear just after the black line, this is called streak. Looking at the wave form it is due to undershoot of the waveform. For a Box pattern with white background a dark black area just after white is a sign of overshoot. It is due to overshoot of the waveform. Adusting the value of C2, R2, C3 will get the optimum result. The value of C2 should be kept at minimum for less overshoot, typical is <20pF. Value of R2 shold be less than 47 ohms otherwise rise and fall time will suffer. First adjust the overhoot to minimum, keeping value of C2 and R2 minimum, then adjust the undershoot(Streak) by adususting C3 again. Since both need to be adjusted together, this may need few iteration to get to the optimum result.

It should be noted here that the output peaking with L and R3 is only to overcome the affect of stray capacitance. Keep the value of L to minimum, typ 150 150nH and R to be 820Ω. The value of L depends on the associated capacitance with the board and the cable(if any). CVA6627S is specifically designed to handle extra capacitance associated with the cable(typ. 10pF) assuming the driver is not part of the neck board. The value of R should be less than 1K to damped the resonant ringing.

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