

## Advanced Information

# Five Band Graphic Equalizer Filter and Display Driver

## GENERAL INFORMATION

The XR-1094 is a single chip graphic equalizer and display driver containing switched-capacitor band-pass filters, filter multiplexer, data latches and high voltage vacuum fluorescent display driver. The five band-pass filters have two octave spacing from 63Hz up to 16kHz. The high filter can be selected for either 10kHz or 16kHz center frequency. They are followed by five peak detectors, a filter multiplexer, and high voltage driver. A digital peak detector is provided for the maximum signal level (total output) in the band-pass filter frequency range. An on-chip power on reset circuit blanks the display outputs for one second after power up to eliminate power up noise on the display.

The output multiplexer is designed to interface with most vacuum fluorescent display drivers. The display can have up to 13 levels and 5 frequency bands, as well as peak sum. The high voltage P-channel drive transistors can drive up to 45 volts.

The XR-1094 is fabricated in a 3um double polysilicon CMOS process, resulting in accurate filters, tight gain tolerances and low noise. The nominal operating voltage is +/-5VDC. The chip includes a self contained RC oscillator with a nominal frequency of 400kHz. Only an external resistor and capacitor are needed.

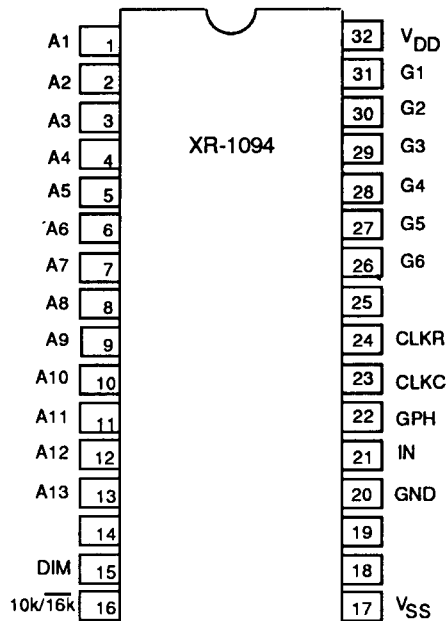
## FEATURES

- Single Chip Equalizer and Display Driver
- Accurate Switched-Capacitor Filters
- 30dB of Gain
- Peak Hold Display Drive
- Simple Resistor and Capacitor Oscillator
- DIM Control for Display Brightness
- Low Noise, Low Power CMOS
- Selectable 10kHz/16kHz Filter

## APPLICATIONS

- Graphic Equalizers
- Tape Recorders
- Receivers
- Portable Systems
- Spectrum Analyzers

## PIN ASSIGNMENT



## ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-1094 CP	32 Pin Plastic SDIP	-30°C to 75°C

## ABSOLUTE MAXIMUM RATINGS

V <sub>DD</sub>	7VDC
V <sub>SS</sub>	-7VDC
V <sub>DS</sub> of High Voltage P-Channel Driving Transistors Relative to V <sub>DD</sub>	- 45 V
Power Dissipations (package limitation)	1W
32 Pin Plastic Package	Derate above 25°C
	9 mW/°C
Storage Temperature	-60 to +150°C

# XR-1094

## ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
VDD	+Supply	4.5	5.0	6.0	VDC	
VSS	-Supply	-4.5	-5.0	-6.0	VDC	
IDD	Supply current		10		mA	VDD=5; VSS=-5
I <sub>il</sub>	Input leakage	-2		2	μA	Digital Inputs Analog Inputs
I <sub>off</sub>	Output off leakage A & G Outputs			10	μA	V <sub>in</sub> =0V; V <sub>D</sub> =-38V
V <sub>ih</sub>	Digital input high voltage threshold		1.6	2.4	VDC	
V <sub>il</sub>	Digital input low voltage threshold	0.8	1.6		VDC	
F <sub>clk</sub>	Clock frequency accuracy	375	400	425	KHz	
f <sub>o</sub>	Filter Center Frequency	-7	0	7	%	
V <sub>OUTG</sub>	All G outputs	-1.0	2.5	5	V	VDD=5V I <sub>GL</sub> =14mA
V <sub>OUTA</sub>	All A outputs	2.5	3.75	5	V	VDD=5V I <sub>AL</sub> =2.5mA
T <sub>D</sub>	Output Decay Time		330		ms	
t <sub>d</sub>	Duty cycle		1/11.4 1/39.5			Dim = 0 Dim = V+
GPH	Display peak hold time		0.5		S	R=100KΩ, C=1μf

## ELECTRICAL CHARACTERISTICS (cont.)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
A1(Note1)	-12dB	7.5	8.4	9.5	mvpk	
A2	-10dB	9.5	11	12	mvpk	
A3	-8dB	12	13	15	mvpk	
A4	-6dB	15	17	19	mvpk	
A5	-4dB	19	21	24	mvpk	
A6	-2dB	24	26.7	29	mvpk	
A7	-0dB	29	34	38	mvpk	
A8	+2dB	38	42	47.5	mvpk	
A9	+4dB	47.5	53	59.8	mvpk	
A10	+6dB	59.8	67	75.3	mvpk	
A11	+8dB	75.3	84	95	mvpk	
A12	+10dB	95	106	119	mvpk	
A13	+12dB	119	134	150	mvpk	

Note 1: Amplified levels are relative to VSS at -5 volts nominal. Levels will vary linearly with voltage on VSS.

5

## PIN DESCRIPTION

PIN#	SYMBOL	DESCRIPTION
1-13	A1-A13	Display levels 1-13, indicating signal strength on G1-G6
26-31	G6-G1	Time allocation for display function G1 63Hz G2 250Hz G3 1kHz G4 4kHz G5 10kHz/16kHz G6 Total Output
15	DIM	DIM Display: This pin, when high, reduces the brightness of the display by adjusting the on-time of the segments
16	10k/ $\overline{16k}$	10kHz/ $\overline{16k}$ Hz filter select input. Logic "0" (low) will select the 16kHz filter and logic "1" (high) will select the 10kHz filter
17	VSS	Minus supply, nominally -5VDC
20	GND	Analog input reference
21	IN	Audio input
22	GPH	Filter amplitude display duration control resistor and a timing capacitor from this pin to VSS will control the duration of peak hold for all six outputs
23	CLKC	Oscillator timing capacitor between this pin and VSS
24	CLKR	Oscillator timing resistor between this pin and CLKC pin
32	VDD	Plus supply, nominally 5VDC

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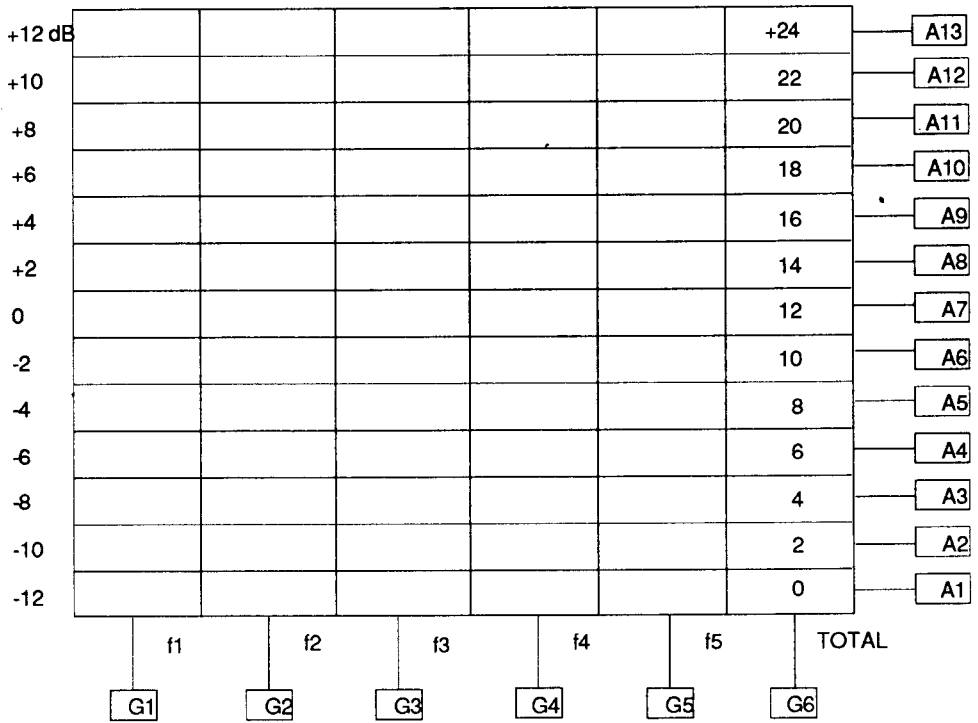
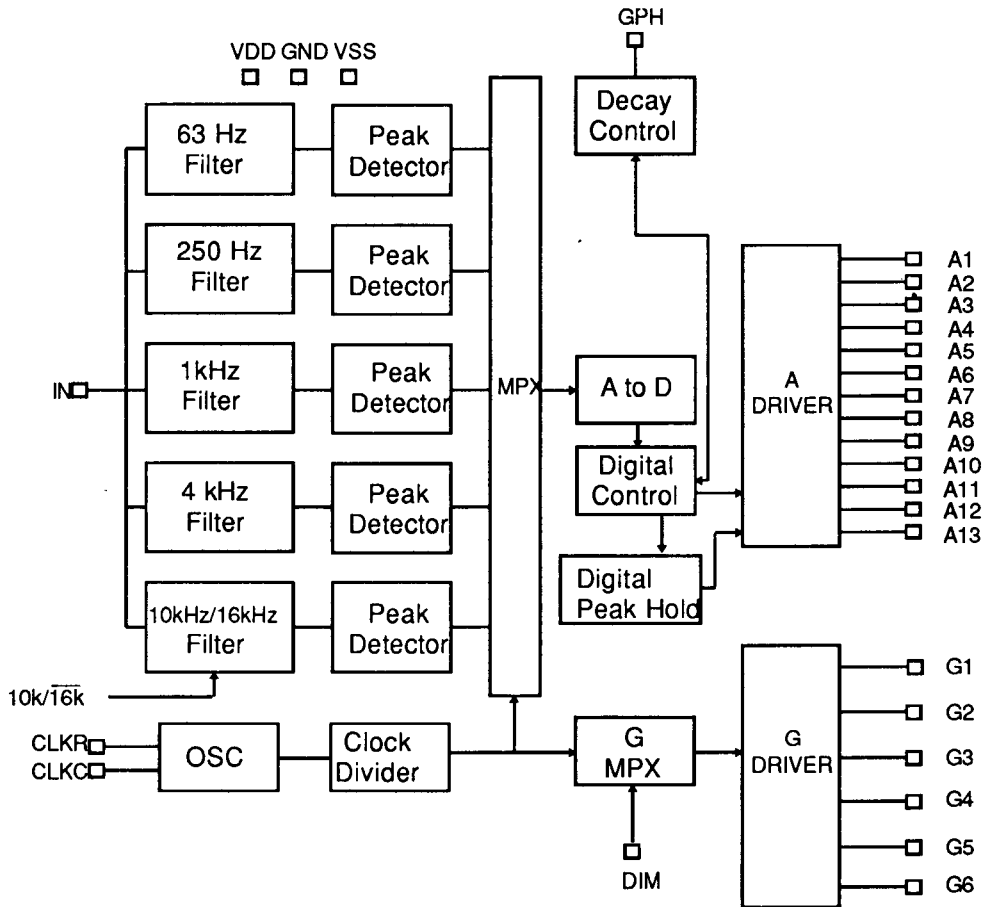


Figure 1. Typical Display



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Figure 2. Block Diagram

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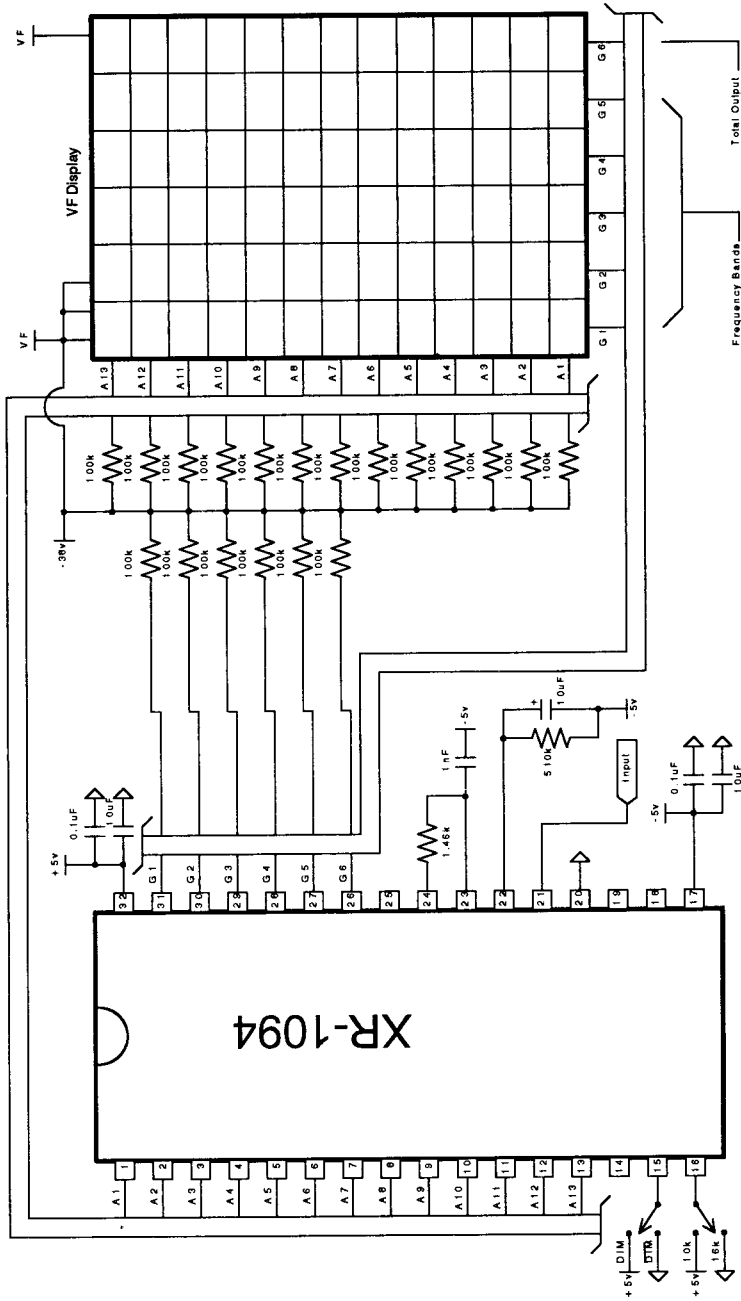


Figure 3. Typical Application Schematic