XR-1091

Graphic Equalizer
Display Filter

...the analog plus company™

September 1996-4

FEATURES

- Internal R/C Oscillator
- Provides seven filters in one 16 pin package
- Dual Inputs for summing Left and Right Channels
- Provides 30 dB of Gain
- Low Noise CMOS
- Electro-Static Discharge (ESD) Protection

APPLICATIONS

- Graphic Equalizers
- Tape Recorders
- Receivers
- Portable Systems

GENERAL DESCRIPTION

The XR-1091 is an eight output switched-capacitor band pass filter dedicated for use in audio applications. Seven of the outputs are from bandpass filters spaced 1 1/2 octaves apart starting at 63 Hz. The eighth output is the peak of the seven outputs. All of the outputs provide a peak hold for use with most display circuits. The two inputs allow the left and right channels to be summed. This reduces the display space and prevents redundant audio information from being displayed.

The XR-1091 is available in a 16 pin plastic DIP. The XR-1091 is fabricated in 2 µm double polysilicon CMOS for low noise and low clock feedthrough. The nominal operating voltages are ±5 VDC to ±6 VDC. The self contained oscillator is designed to operate at 400 kHz with an external resistor and capacitor.

ORDERING INFORMATION

Part No.	Package	Operating Temperature Range
XR-1091ECP	16 Lead 300 Mil PDIP	–30°C to +75°C

EXAR Corporation, 48720 Kato Road, Fremont, CA 94538 ◆ (510) 668-7000 ◆ FAX (510) 668-7017

BLOCK DIAGRAM

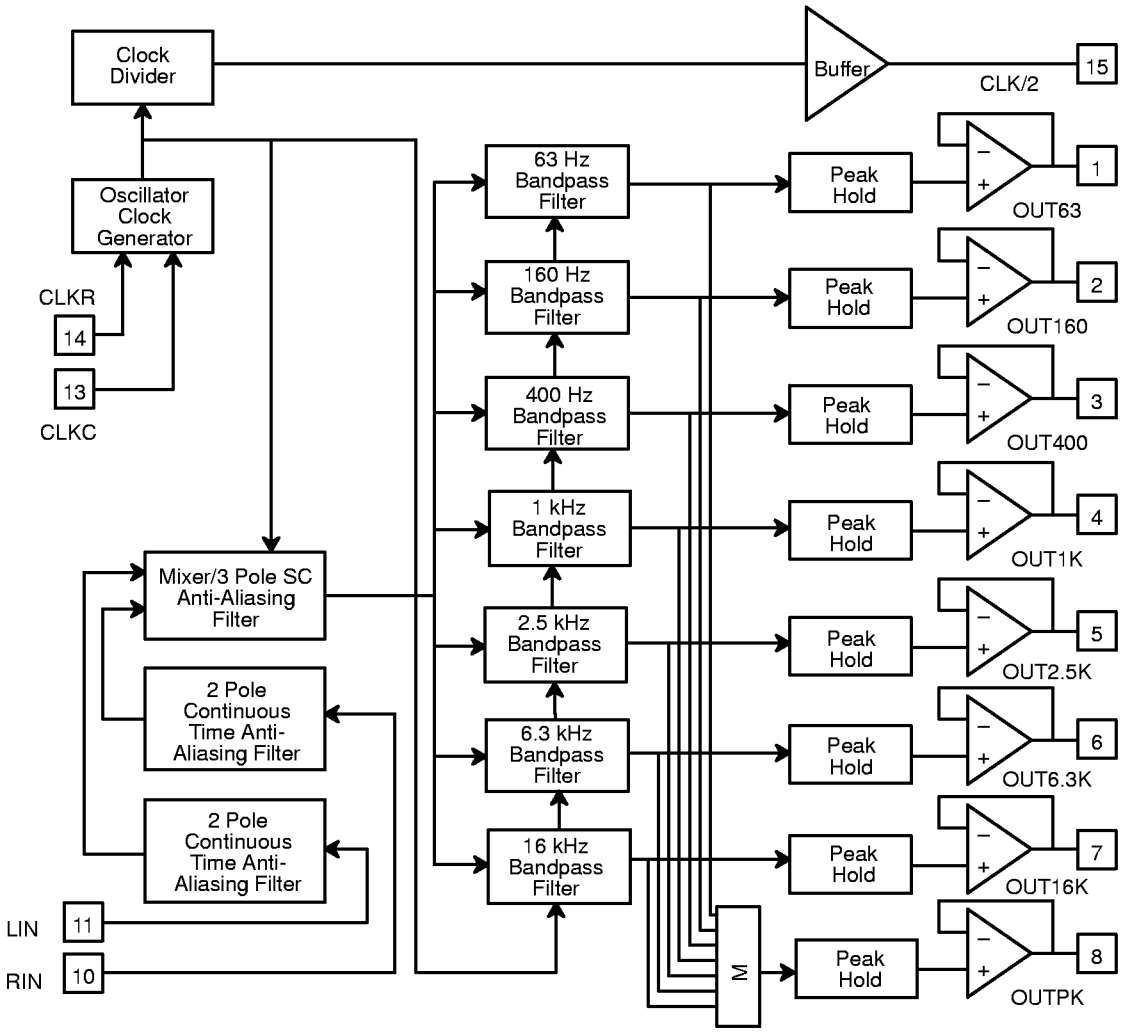
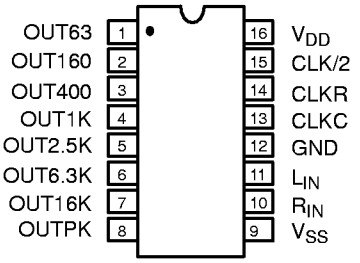


Figure 1. 7-Band Graphic Equalizer Display Filter

PIN CONFIGURATION



16 Pin PDIP (0.300")

PIN DESCRIPTION

Pin #	Symbol	Description
1	OUT63	**Peak held output of the 63 Hz filter.** This output can drive a 10 KΩ load.
2	OUT160	**Peak held output of the 160 Hz bandpass filter.**
3	OUT400	**Peak held output of the 400 Hz bandpass filter.**
4	OUT1 K	**Peak held output of the 1 kHz bandpass filter.**
5	OUT2.5 K	**Peak held output of the 2.5 kHz bandpass filter.**
6	OUT6.3 K	**Peak held output of the 6.3 kHz bandpass filter.**
7	OUT16 K	**Peak held output of the 16 kHz bandpass filter.**
8	OUT	**Peak output of the above also peak held.**
9	V_{SS}	**Nominally -6 VDC.** This should be decoupled with at least a 0.47µF capacitor to ground located as close as possible to this pin.
10	R_{IN}	**Right Channel Input.** The input impedance of this pin is greater than 1 x $10^{12}\Omega$.
11	L_{IN}	**Left Channel Input.** The input impedance of this pin is greater than 1 x$10^{12}\Omega$.
12	GND	**Ground for both digital and analog.**
13	CLKC	**Clock Capacitor.** The timing capacitor should be tied from this pin to ground.
14	CLKR	**Clock Resistor.** The timing resistor would be tied from this pin to pin 13 CLKC.
15	CLK/2	**This output is at 200 kHz in normal operation.** The clock swings from V_{SS} to V_{DD}.
16	V_{DD}	**Nominally tied to +6 VDC.** This pin should be decoupled with a 0.47 µF capacitor to ground located as close as possible to this pin.

ELECTRICAL CHARACTERISTICS

Test Conditions: V_{DD} = +6 VDC, V_{SS} = -6 VDC, T_A = 25°C, S1 open, S2, S3 to ground, unless otherwise specified.

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
$I_{DD}5$	Supply Current		10.0		mA	V_{DD} = 5 VDC, V_{SS} = -5 VDC
$I_{DD}6$	Supply Current		10.7	18.0	mA	V_{DD} = +6 VDC, V_{SS} = -6 VDC
I_{IL}	Input Leakage	-10		+10	µA	
TCLKRP (R-C)	Clock Freq	385	400	415	kHz	R = 1.46 KΩ, C = 1 nF
TCLK2P (R-C)	Clock/2 Freq	185	200	215	kHz	R_L = 100 KΩ, CL = 100 pF
ECLKR	External Clock Voltage	5			Vpp	V_{CLK} IN = ± 2.5 Vpk
ECLK2	Clock/2 External Source	190	200	210	kHz	RL = 100KΩ, CL = 100 pF
V_{OS}	Output Offset	0	125	200	mV	S1 to Pins 1 thru 8 sequentially
V_{OUT} 6.3KR	6.3 kHz Output, R_{IN}	3.33	3.95	4.7	V	S3 to signal source = 125 mVpk f_{IN}=6.3 kHz, S1 to Pin 6
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 6.3 kHz
V_{OUT}63	63 Hz Output, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 63 Hz, S1 to Pin 1
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 63 Hz
V_{OUT}160	160 Hz Output, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 160 Hz, S1 to Pin 2
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 160 Hz
V_{OUT}400	400 Hz Output, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 400 Hz, S1 to Pin 3
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 400 Hz
V_{OUT}1K	1 kHz Output, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 1 kHz, S1 to Pin 4
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 1 kHz
V_{OUT}2.5K	2.5 kHz Output, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 2.5 kHz, S1 to Pin 5
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 2.5 kHz
V_{OUT}6.3K	6.3 kHz Output, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 6.3 kHz, S1 to Pin 6
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 6.3 kHz

ELECTRICAL CHARACTERISTICS (CONT'D)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
V_{OUT}16K	16 kHz Output, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 16 kHz, S1 to Pin 7
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 16 kHz
V_{OUT} PEAK	PEAK OUT, L_{IN}	3.33	3.95	4.7	V	S2 to signal source = 125 mVpk f_{IN} = 1 kHz, S1 to Pin 8
		28.5	30.0	31.5	dB	
		4.65	5.2	6.0	V	200 mVpk, 1 kHz

Notes:
Recommended power on sequence: V_{SS} first, followed by V_{DD}. When only 1 channel input is used, then the other input has to be grounded.

Specifications are subject to change without notice

ABSOLUTE MAXIMUM RATINGS

V_{DD} ..... +7 VDC
V_{SS} ..... -7 VDC

Power Dissipation .....
16 Pin Plastic Dip ..... 650 mW
Derate above 25°C ..... 5 mW/°C
Storage Temperature ..... -60°C to +150°C

SYSTEM DESCRIPTION

The XR-1091 unlike most switched-capacitor filters does not require an external clock source in order to provide the sampling clocks. This allows the designer to place the XR-1091 in any application where an active filter design is in place. The XR-1091 provides bandpass filters with center frequencies at 63 Hz, 160 Hz, 400 Hz, 1 kHz, 2.5 kHz, 6.3 kHz, and 16 kHz. These frequencies are standards in the consumer audio market. The peak detector outputs referenced to 0V can be used to drive a variety of display decoders.

The XR-1091 contains a continuous time anti-aliasing filter with a corner frequency of 80 kHz. This prevents most signals from affecting the performance of the filters. If two separate displays are desired, then two XR-1091's could be used with the unused inputs grounded.

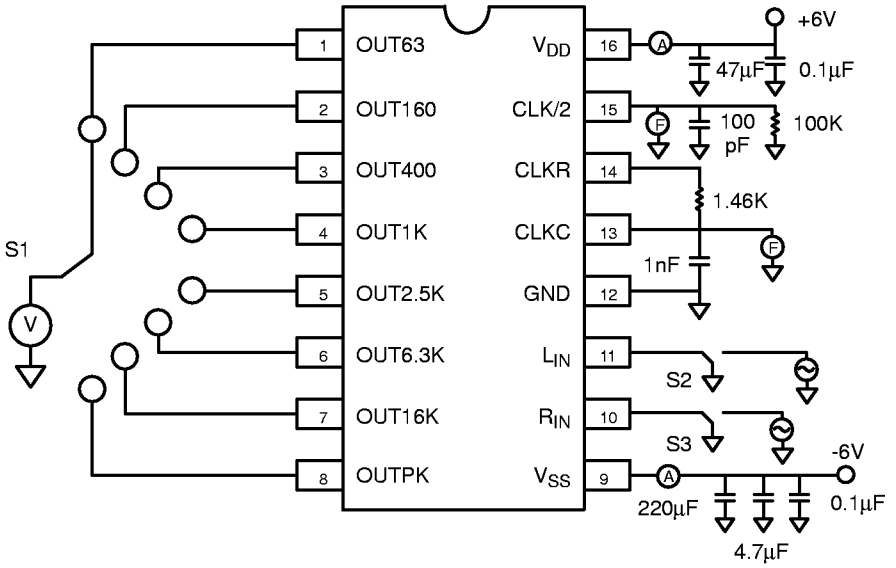


Figure 2. Test Circuit

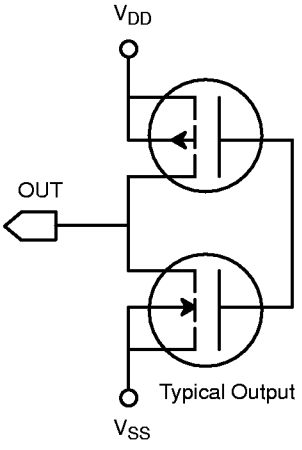


Figure 3. Typical Output

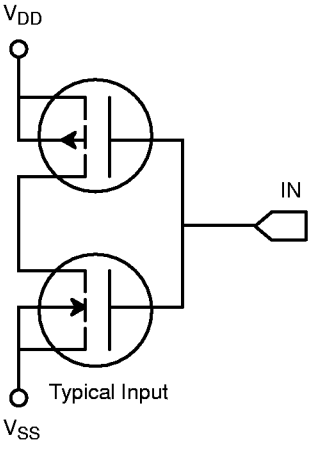


Figure 4. Typical Input

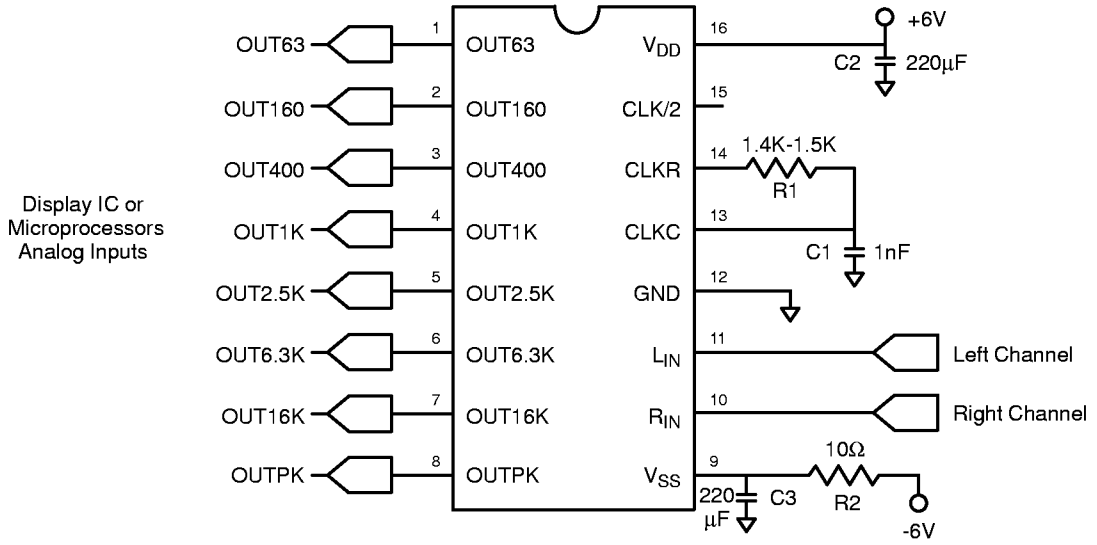
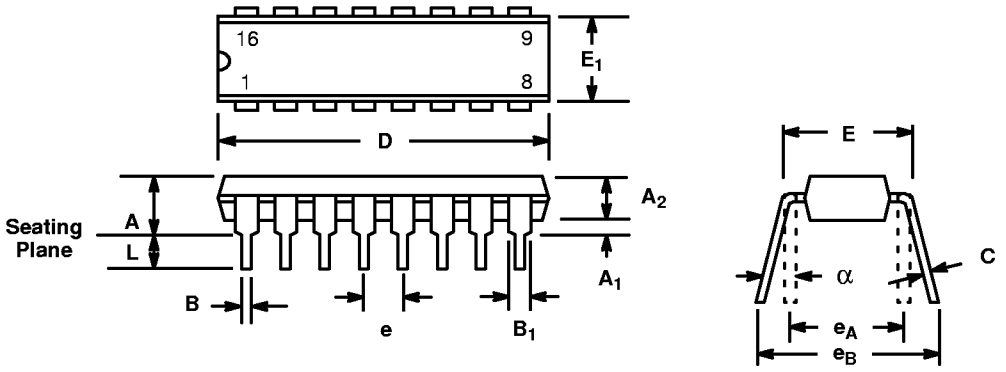


Figure 5. Typical Applications Circuit

16 LEAD PLASTIC DUAL-IN-LINE (300 MIL PDIP)

Rev. 1.00



SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.145	0.210	3.68	5.33
A_1	0.015	0.070	0.38	1.78
A_2	0.115	0.195	2.92	4.95
B	0.014	0.024	0.36	0.56
B_1	0.030	0.070	0.76	1.78
C	0.008	0.014	0.20	0.38
D	0.745	0.840	18.92	21.34
E	0.300	0.325	7.62	8.26
E_1	0.240	0.280	6.10	7.11
e	0.100 BSC		2.54 BSC	
e_A	0.300 BSC		7.62 BSC	
e_B	0.310	0.430	7.87	10.92
L	0.115	0.160	2.92	4.06
α	0°	15°	0°	15°

Note: The control dimension is the inch column