XR-1072

BBE® Sound Enhancement Audio Processor

EXAR

FEATURES

- Recreate Concert Sound Without Initial Encoding
- Individual Channel Definition and Bass Boost Controls for Flexibility of Adjustment
- Fixed or Variable Bass Boost and Definition Control
- Ultra Low Noise: -115dBA typ IEC-A Weighted
- Matched Circuits for Stereo Applications
- Transducer Independent
- No Extra Speakers Needed
- No Undesirable "Pumping" or "Breathing" Effects

APPLICATIONS

- Home Stereo Systems
- Stereo Capable Televisions
- Portable Stereo Systems
- Automobile Stereo Systems
- Multimedia Personal Computers and Powered Speakers

GENERAL DESCRIPTION

The XR-1072 is a matched dual channel audio processor utilizing the BBE® sound enhancement technique. It is designed for use with stereo sound systems to enhance the music to provide more realism to the sound regardless of its source. BBE® sound enhancement is a single pass technique and does not require initial encoding. The XR-1072 provides this enhancement without additional speakers and is compatible with full-sized and headphone transducers for use in a variety of applications.

The XR-1072 is fabricated using bipolar technology to provide very low noise (-115dBA typical), low total harmonic distortion, and low current consumption. It is available in 24-lead plastic DIP and 24-lead Jedec SOIC packages.

ORDERING INFORMATION

Part No.	Package	Operating Temperature Range
XR1072CP	24-LEAD 300 MIL PDIP	-30°C to +75°C
XR1072CD	24-LEAD 300 MIL JEDEC SOIC	-30°C to +75°C

TQM™

BLOCK DIAGRAM

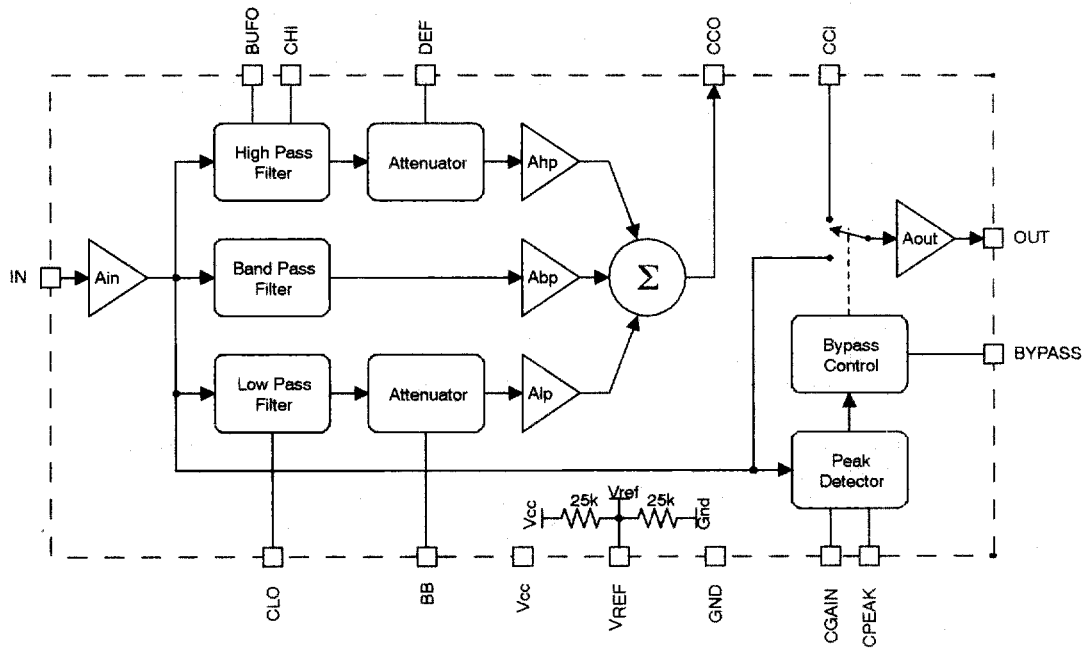
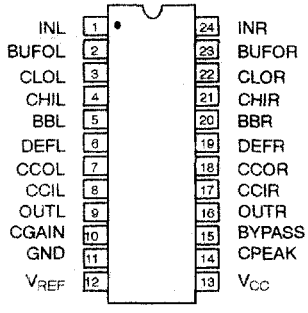
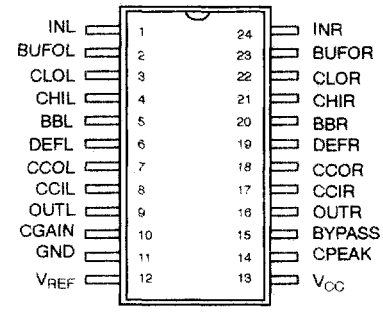


Figure 1. Block Diagram - One Channel of XR-1072

PIN CONFIGURATION

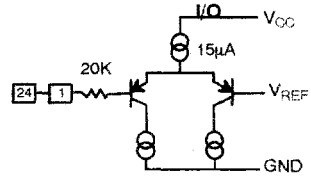
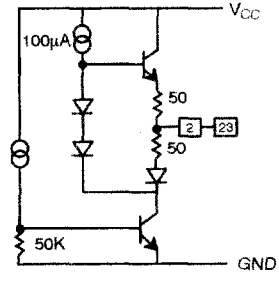
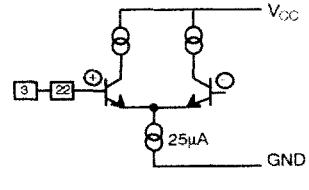


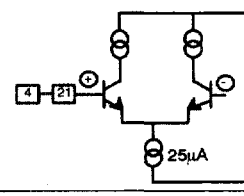
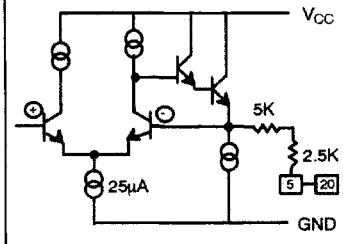
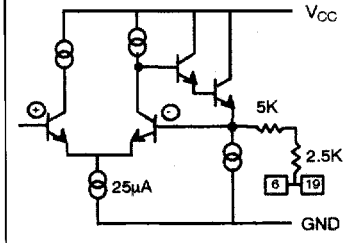
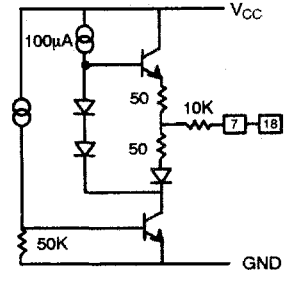
24-Lead PDIP(0.300")

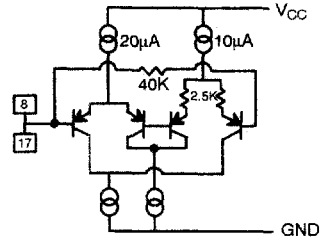
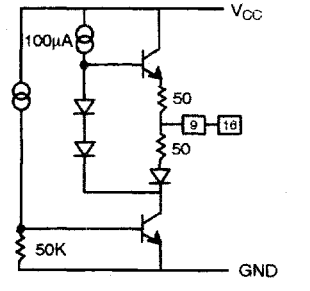
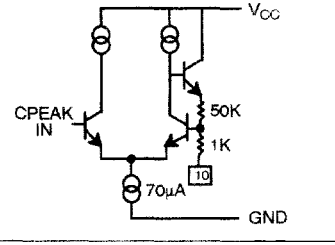
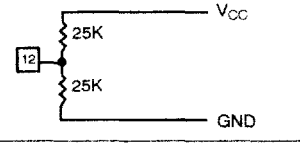


24-Lead SOIC (Jedec, 0.300")

PIN DESCRIPTION

PIN #	SYMBOL		EQUIVALENT CIRCUIT	DESCRIPTION
1 24	INL INR	I I		Left, Right Audio Input
2 23	BUFOL BUFOR	O O		Left, Right Channel Input Buffer's Output
3 22	CLOL CLOR	I I		Left, Right Channel Connection Point for Low Pass Filter Capacitor

PIN #	SYMBOL	I/O	EQUIVALENT CIRCUIT	DESCRIPTION
4 21	CHIL CHIR	I I		Left, Right Channel Connection Point for High Pass Filter Capacitor
5 20	BBL BBR	O O		Left, Right Channel Connection Point for Resistor/Potentiometer to Control Bass Boost
6 19	DEFL DEFR	O O		Left, Right Channel Connection Point for Resistor/Potentiometer to Control Definition
7 18	CCOL CCOR	O O		Left, Right Channel Output of Summing Amplifier

PIN #	SYMBOL	I/O	EQUIVALENT CIRCUIT	DESCRIPTION
8 17	CCIL CCIR	I I		Left, Right Channel Inverting Input of Subtracting Amplifier
9 16	OUTL OUTR	O O		Left, Right Channel Output
10	CGAIN	I		Feedback Input Connection Point for Peak Detector Capacitor
11	GND	P		Power Ground
12	V_{REF}	P		Voltage Reference of Circuitry
13	V_{CC}	P		Power Supply Voltage

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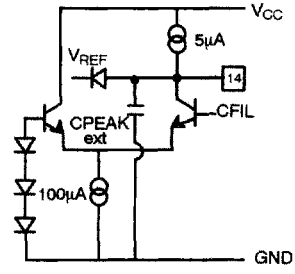
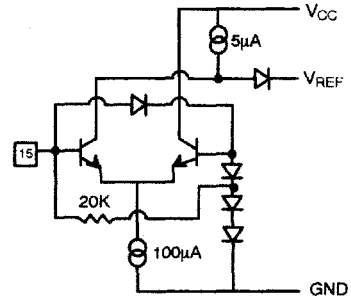
PIN #	SYMBOL	I/O	EQUIVALENT CIRCUIT	DESCRIPTION
14	CPEAK	O		Connection Point for CPEAK Capacitor to Charge and Discharge the Peak Detector
15	BYPASS	I		BBE® ON/OFF Input. BBE® is Off When the Input is Shorted to Ground

ELECTRICAL CHARACTERISTICS

Test Conditions: V_{CC} = 12 VDC, TA = +25 °C, unless otherwise specified.

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
Supply and Reference						
V_{CC}	Supply Voltage	6.0		24.0	V	
I_{CC}	Supply Current			6.0	mA	
VREF	Voltage Reference	5.7		6.3	V	No load
Filter Section Vin = 1 Vrms						
ALBmin	Loband Minimum Gain	-3.3		-0.3	dB	f = 40 Hz
ALBmax	Loband Maximum Gain	9.5		12.5	dB	f = 40 Hz
AMBmin	Midband Minimum Gain	0.5		3.0	dB	f = 700 Hz
AMBmax	Midband Maximum Gain	-3.5		-0.5	dB	f = 700 Hz
AHBmin	Hiband Minimum Gain	-4.2		-1.2	dB	f = 20 kHz
AHBmax	Hiband Maximum Gain	9.5		12.5	dB	f = 20 kHz
AOFF	Gain of BBE Off	-0.5		0.5	dB	f = 40Hz, 700 HZ and 20 kHz
Peak Detector						
I DISC	Cpeak Discharge Current	-8.0		-2.0	µa	$C_{PEAK} = V_{REF}$ - 1V
I CHARGE	Cpeak Charge Current	70		120	µa	$V_{IN} = V_{REF}$ - 0.5 V $C_{PEAK} = V_{REF}$ - 1 V
C PEAK HV	Cpeak Hi Voltage	6.4		7.0	V	IN = 2 mV_{RMS}, f = 1 kHz
C PEAK LV	Cpeak Lo Voltage	1.1		1.5	V	IN = 10 mV_{RMS}, f = 1 kHz
AC Characteristics						
NOISE On	Noise in BBE On Mode		-105		dBA	Input is grounded
NOISE Off	Noise in BBE Off Mode		-107		dBA	Input is grounded
THD BBE On	Total Harmonic Distortion in BBE On Mode		0.05		%	V_{IN} = 245m V_{RMS} @ f = 1kHz
THD BBE Off	Total Harmonic distortion in BBE Off Mode		0.008		%	V_{IN} = 245 mV_{RMS} @ f = 1kHz
CS	Channel Separation	-55	-65		dB	$V_{IN} = 1V_{RMS}$, f = 1 kHz
PSSR	Power Supply Rejection Ratio		67		dB	f = 1 kHz

Specifications are subject to change without notice

ABSOLUTE MAXIMUM RATINGS

Power Dissipation (limitation) @ 25°C .....
- 24-Pin PDIP Package 1W
- Derate Above 25°C ..... 8mW/°C
- 24-Pin SOIC Package 600mW
- Derate Above 25°C ..... 6mW/°C

Power Supply Voltage ..... 24 V_{DC}
Storage Temperature ..... -65°C to +150°C
Maximum Input Voltage ..... V_{CC} + 0.3V
Minimum Input Voltage ..... V_{EE} - 0.3V

LICENSE AGREEMENT

The XR-1072 is manufactured by EXAR under license from BBE® Sound, Inc. BBE® is a registered trademark of BBE® Sound, Inc. A license from BBE® Sound Inc. (telephone 714-897-6766), is required before the XR-1072 can be purchased from EXAR.

EXTERNAL COMPONENT SELECTION
(See *Figure 3.*)

Because of leakage considerations, CC1 and CC2 require tantalum or low leakage electrolythic capacitors. Non-polarized 4.7 µF or 10µF capacitors are recommended for CC1 and CC2.

For CH and CL, elecrolytic capacitors are not recommended. Polypropylene or polystyrene capacitors with ±5% tolerance should be used. CH should be 3.3 nF and CL should be 47 nF.

The CVREF capacitor acts as a filter for the V_{REF} voltage. Its value can be as low as 10µF . At low frequencies some signal leakage may show on the V_{REF} line; this does not affect circuit performance.

The CPEAK capacitor determines attack and decay times of the peak detector. A value of 220 nF is suitable for a variety of applications. Too large a value of CPEAK will cause a "breathing" artifact in the sound. Too small a value could cause audible switching sounds with low level, low frequency signals.

If potentiometers are not used on pins BBL, BBR, DEFL and DEFR, definition and bass boost are at their maximum. For fixed levels of Definition and Bass Boost other than the maximum, resistors may be used within the range of 0KΩ to 100KΩ. For variable levels of definition and bass boost, audio taper potentiometers of 20KΩ to 50KΩ are recommended.

The switch at the BYPASS pin turns the BBE® sound enhancement on and off. The BBE® process is on when the switch is open.

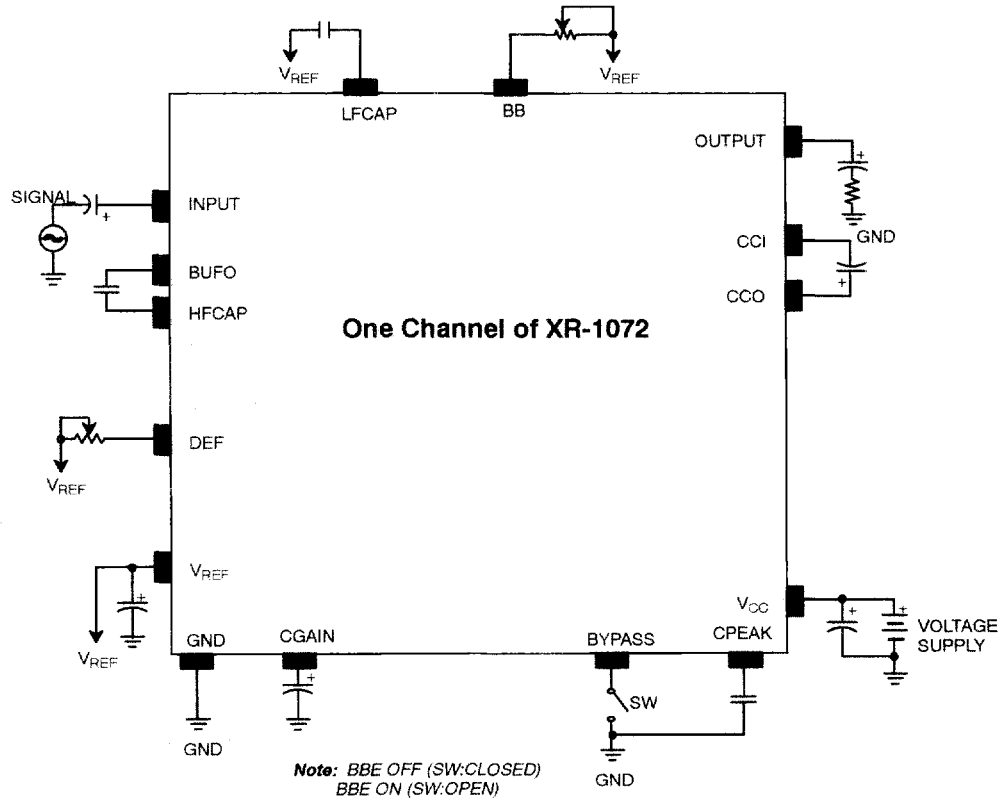


Figure 2. Single Supply Application Diagram

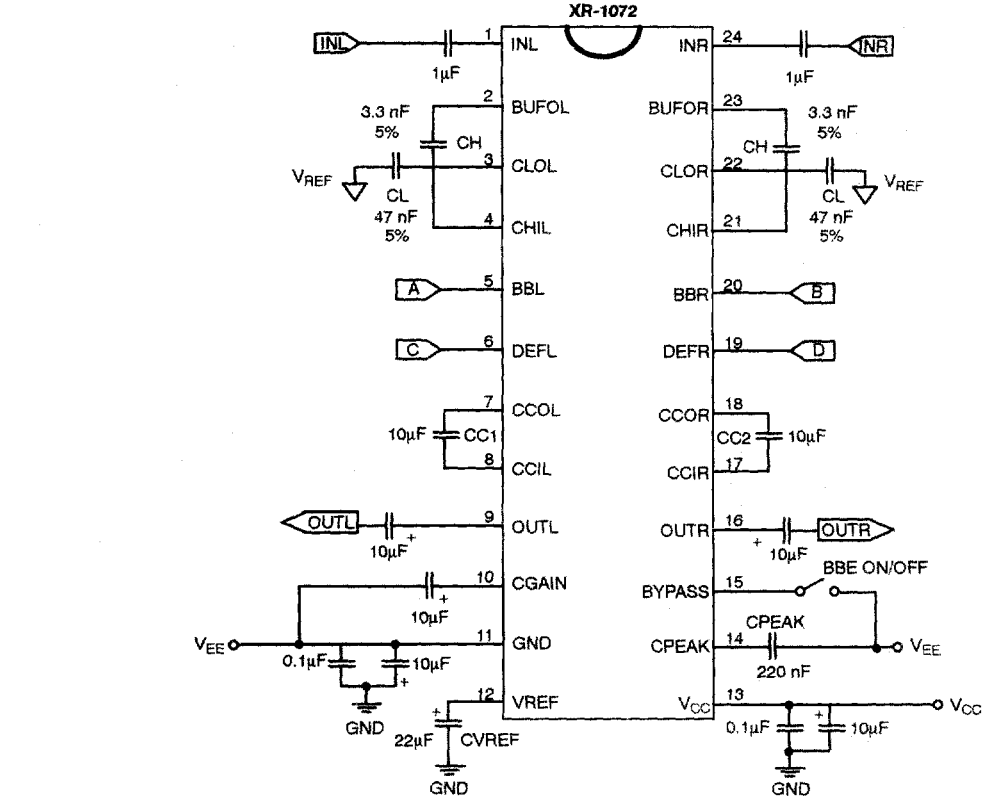


Figure 3. Dual Supply Application Diagram