

## Monolithic PCM Repeater

### GENERAL DESCRIPTION

The XR-C240 is a monolithic repeater circuit for Pulse-Code Modulated (PCM) telephone systems. It is designed to operate as a regenerative repeater at 1.544 Megabits per second (Mbps) data rate on T1-type PCM lines.

The XR-C240 monolithic IC is packaged in a hermetic 16-Pin DIP package, and is designed to operate over a temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . It contains all the basic functional blocks of a regenerative repeater system including Automatic Line Build-Out (ALBO) and equalization, and is insensitive to reflections caused by cable discontinuities.

Compared to conventional repeater designs using discrete components, the XR-C240 monolithic repeater IC offers greatly improved reliability and performance, along with significant savings in power consumption and system cost.

### FEATURES

- Contains all Active Components of PCM Repeater On-Chip ALBO Port
- High-Current Output Drivers
- Low-Power Consumption
- Increased Reliability over Discrete Designs
- 2 Megabit Operation Capability

### APPLICATIONS

- PCM Repeater for T1 Systems
- PCM Repeater for 2 M Bit/s Systems

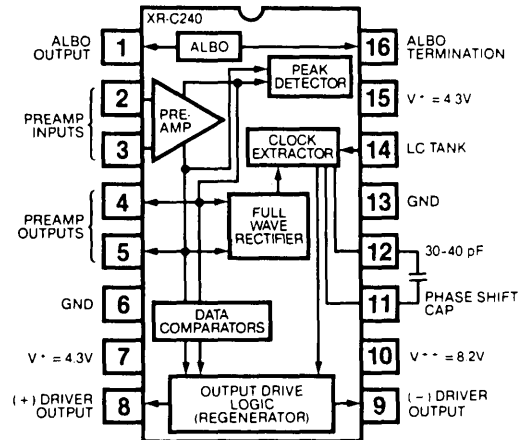
### ABSOLUTE MAXIMUM RATINGS

Storage Temperature	$-65^{\circ}\text{C}$ to $+150^{\circ}\text{C}$
Operating Temperature	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
Supply Voltage	$-0.5$ to $10\text{ V}$
Input Voltage (Except Pin 1,16)	$-0.5$ to $+7\text{ V}$
Input Voltage (Pin 7,16)	$-0.5$ to $+0.5\text{ V}$
Data Output Voltage (Pin 8,9)	$+20\text{ V}$
Voltage Surge (Pin 2,3,8,9) (10 msec only)	$50\text{ V}$

### ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-C240	Ceramic	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$

### FUNCTIONAL BLOCK DIAGRAM



### SYSTEM DESCRIPTION

The XR-C240 contains all the active circuits required to build one side of a T1 or 2 M bit/s PCM repeater. T1 is the most widely used PCM transmission system, operating at 1.544 M bit/s. It can operate on either pulp or plastic insulated twisted pair cables. Although the cable gauge may vary, the total cable loss should not exceed 36 dB at 772 kHz. For a 22 gauge pulp insulated cable and a bit error rate (BER) of less than  $10^{-6}$ , the max allowable repeater to repeater spacing is about 6300 feet.

Bipolar PCM signal is attenuated and dispersed in time as it travels along a transmission cable. This signal, when received, is amplified and reconstructed by the preamplifier automatic line build out (ALBO), clock and data threshold detector circuits contained within the XR-C240. Amplitude equalization and frequency spectrum shaping is achieved through the variable impedance of the ALBO ports and its associated ALBO network.

Incoming pulse stream is full wave rectified and timing information is extracted by the clock threshold detector. Clock recovery is then achieved by driving an injection locked oscillator tuned to 1.544 MHz. The oscillator's sinusoidal waveform is amplified and phase shifted by 90 degrees with the help of a capacitor between Pins 11 and 12.

Data is sampled and stored in the output data latches by an internally generated sampling pulse. Buffer drivers are then enabled to produce precisely timed output pulses whose width and time of occurrence are controlled by the regenerated clock signal.

# XR-C240

## ELECTRICAL CHARACTERISTICS

(Measured at 25°C with V++ = 8.2V, V+ = 4.3V, unless specified otherwise.)

PARAMETERS	LIMITS		UNIT	CONDITIONS
	MIN.	MAX.		
Supply Voltage:				
V++	7.79	8.61	V	Measured at Pin 10
V+	4.085	4.515	V	Measured at Pins 7 and 15
Supply Current:				
I <sub>A</sub>	1.1	2.5	mA	Supply = 8.2V
I <sub>B</sub>	6	11	mA	
Total Current	7.9	13.5	mA	
Preamplifier				
Input Offset Voltage, V <sub>OS</sub>	50	15	mV	
Open Loop Differential Gain, A <sub>O</sub>		54	dB	
Input Bias Current, I <sub>B</sub>	50	4	μA	
Input Offset Current, I <sub>OS</sub>		2	μA	
Input Impedance, R <sub>in</sub>		kΩ		
Comparator Thresholds				
Peak Detector (ALBO) Threshold	±1.3	±1.6	V	Measured Differentially Across Pins 4 and 5
Full-Wave Rectifier Threshold	±0.9	±1.15	V	
Data Threshold	±0.28	±0.48	V	
Clock Extractor Section				
Tank Drive Impedance	50		kΩ	At Pin 14
Tank Drive Current				
"Zero" Signal Current	12	24	μA	
"One" Signal Current	80	220	μA	
Recommended Tank Q	100			
Phase Shifter Offset Voltage	-18	+18	mV	Voltage applied to Pins 7 and 14 to reduce differential voltage across Pins 11 and 12 to zero.
Output Drive Section				
Output Voltage Swing	3.0		V	Voltage levels referenced to Pin 7 R <sub>L</sub> = 100 Ω Referenced to Pin 7, I <sub>L</sub> = 30 mA
Low Output Voltage	0.65	0.95	V	
Output Leakage Current		50	μA	
Output Pulse				
Maximum Pulse Width Error		±30	ns	
Rise and Fall Times		80	ns	