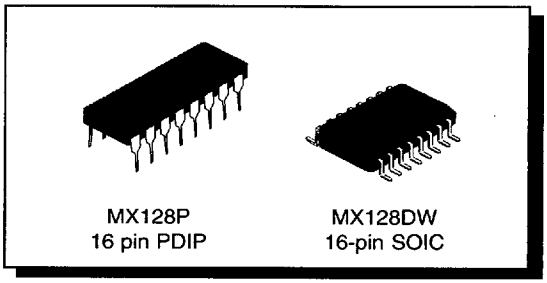
Advance Information

LOW COST CORDLESS TELEPHONE SCRAMBLER

Features

- **MX-COM MiXed Signal CMOS**
- **Full-Duplex Audio Processing**
- **On-Chip Filters**
- **High Baseband and Carrier Rejection**
- **Two Selectable Clock Inputs**
- **Excellent Audio Quality**
- **Low Voltage, 3-Cell Operation**
- **ECPA* Qualified Voice Protection**



MX128P
16 pin PDIP

MX128DW
16-pin SOIC

Applications

- **Battery Powered Portability**
- **Cordless Telephones & Wireless PBXs**

Description

The MX128 is a full-duplex frequency inversion scrambler designed to provide secure conversations for cordless telephone users. The RX and TX audio paths consist of the following:

1) A switched-capacitor balanced modulator with high baseband and carrier rejection.
2) A 3.3 kHz inversion carrier (injection tone).
3) A 3100 Hz lowpass filter.
4) Input op-amps with externally adjustable gain.

The MX128 uses mixed signal CMOS switched-capacitor filter technology and operates from a single supply in the range of 2.7 to 5.5 volts. The inversion carrier's frequency and filter switching clock are generated on-chip using an external 10.24 MHz or 3.58/3.6864 MHz crystal or clock input (selectable).

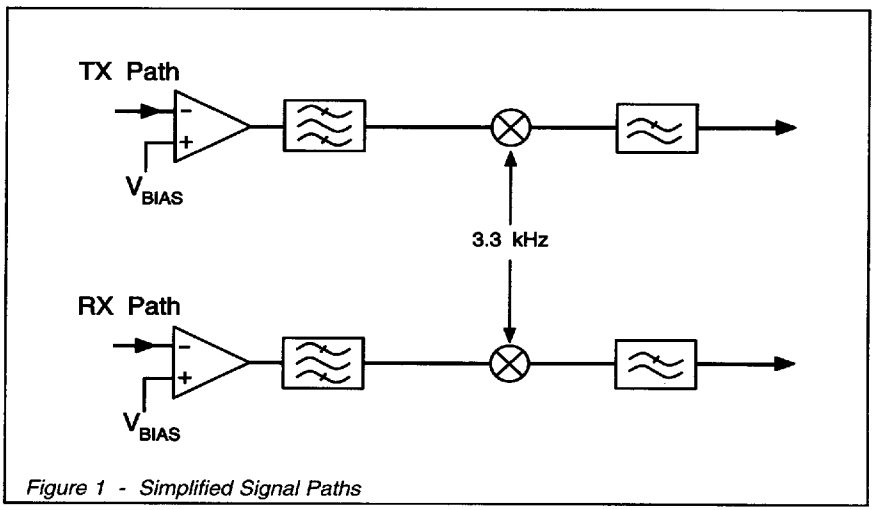


Figure 1 - Simplified Signal Paths

*Electronics Communications Privacy Act (Title 18, US Code 2510 et seq.).

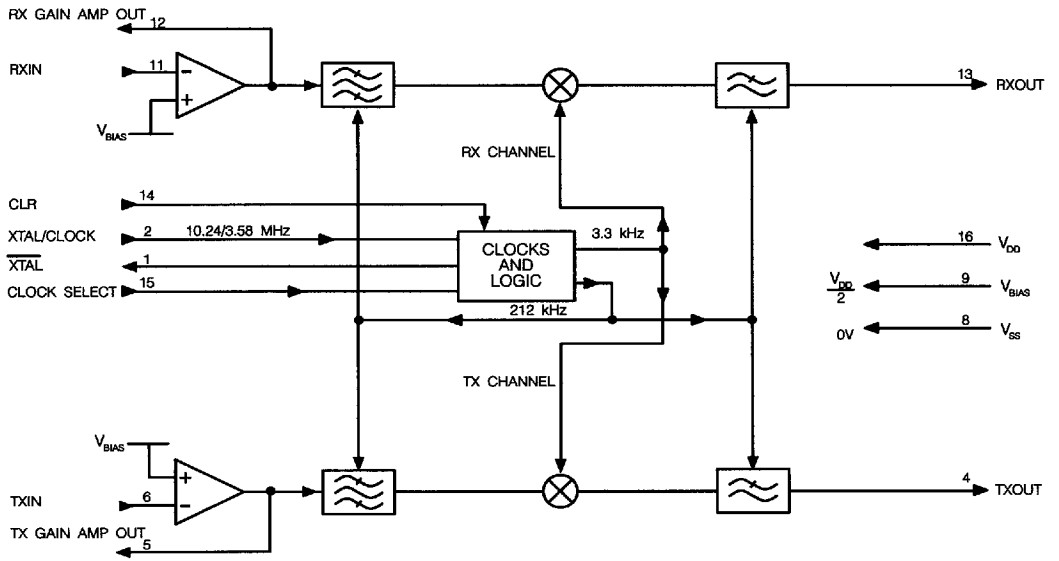
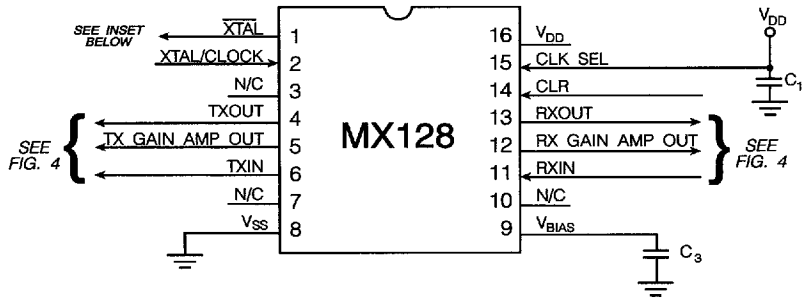
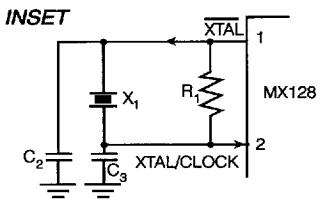


Figure 2 - Schematic Block Diagram





Component	Value	Value
R1	1.0MΩ	1.0MΩ
C1	0.47µF	0.47µF
C2	22.0pF	33.0pF
C3	22.0pF	47.0pF
X1	10.24 MHz	3.58/3.6864 MHz

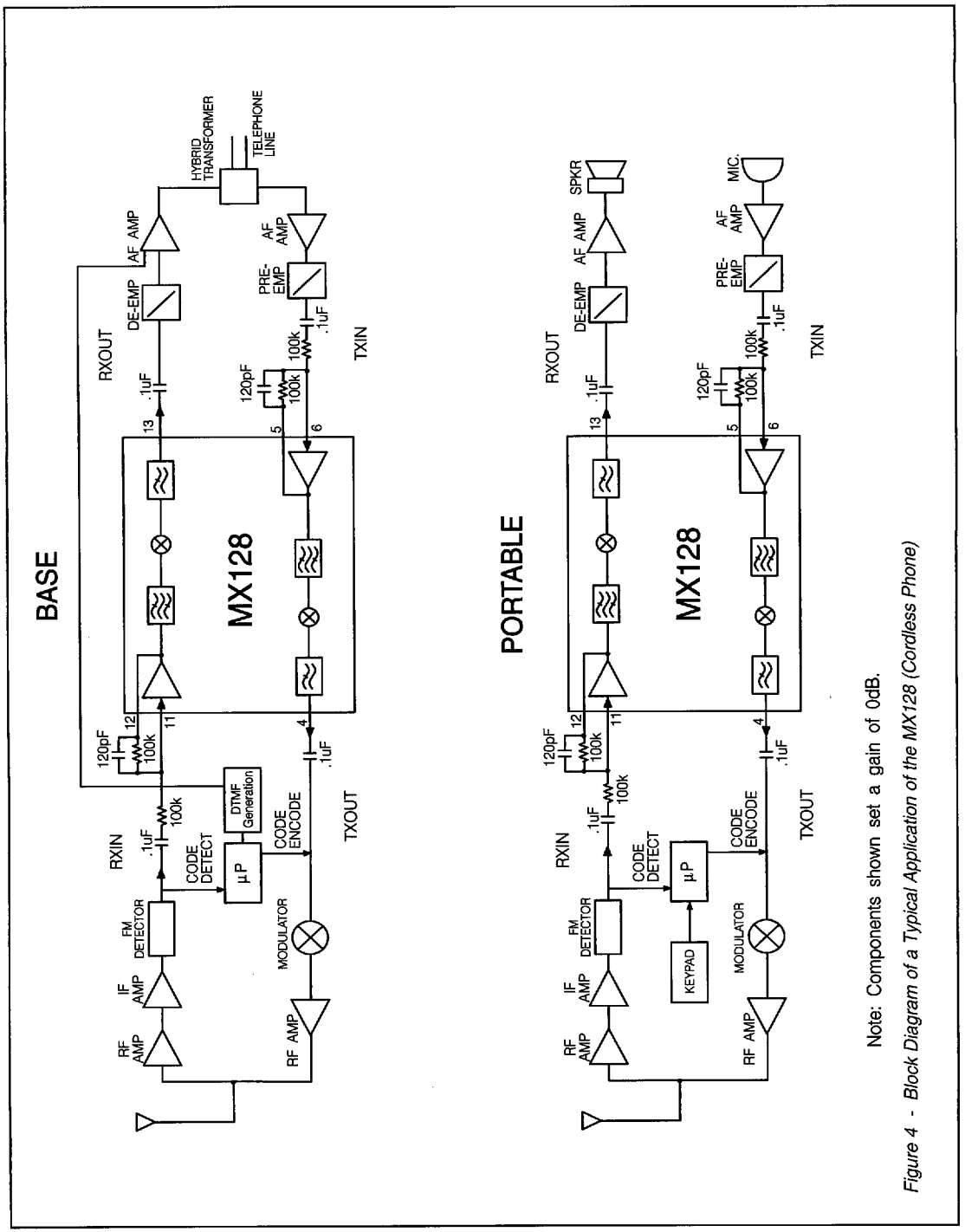
Tolerances: R = ±10%, C = ±20%

Note: *Xtal circuitry shown is in accordance with MX-COM's Application Note on Crystal Oscillators (see Applications Section).*

Figure 3 - Recommended External Components

Pin Function Chart

Pin	Function
1	**$\overline{\text{Xtal}}$:** This is the output of the clock oscillator inverter.
2	**Xtal/Clock:** 10.24 MHZ or 3.58/3.6864 MHz or an externally derived clock is injected at this pin. See Figure 3.
3	No connect.
4	**TX Output:** This is the analog output of the transmit channel. It is internally biased at $V_{DD}/2$.
5	**TX Gain Amp Output:** This is the output pin of the channel 1 gain adjusting op-amp. See Figure 4 for gain setting components.
6	**TX Input:** This is the analog signal input to channel 1. This input is to a gain adjusting op-amp whose gain is set by internal components. See Figure 4.
7	No connect.
8	**V_{SS}:** Negative supply (GND).
9	**V_{BIAS}:** This is the analog bias line at $V_{DD}/2$. It should be coupled to V_{SS} by a 1.0 µF or greater capacitor. See Figure 3.
10	No connect.
11	**RX Input:** This is the analog signal input to the receive channel. This input is to a gain adjusting op-amp whose gain is set by internal components. See Figure 4.
12	**RX Gain Amp Output:** This is the output pin of the receive channel gain adjusting op-amp. See Figure 4 for gain setting components.
13	**RX Output:** This is the analog output of the receive channel. It is internally biased at $V_{DD}/2$.
14	**CLR:** A logic 1 on this input selects the invert mode. A logic 0 selects the bypass mode.
15	**Clock Select:** Selects either 10.24 or 3.58/3.6864 MHz clock frequency. A logic "1" selects 10.24 MHz, and a logic "0" selects 3.58/3.6864 MHz. This input is internally pulled high.
16	**V_{DD}:** Positive supply of 2.7 V to 5.5 V.



Note: Components shown set a gain of 0dB.

Figure 4 - Block Diagram of a Typical Application of the MX128 (Cordless Phone)

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Passband

Figure 5 shows the MX128 overall frequency response of high and low-pass filters followed by a notch centered at the carrier frequency.

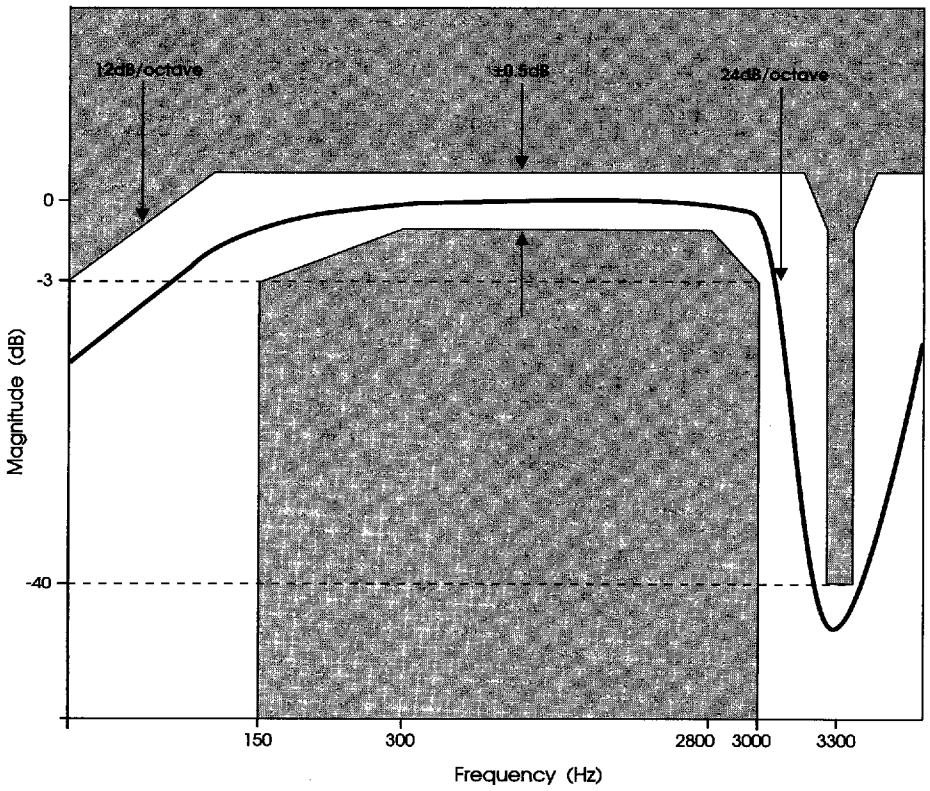

Figure 5 - Overall Frequency Response of the MX128

Specifications

Absolute Maximum Ratings

Exceeding the maximum rating can result in device damage. Operation of the device outside the operating limits is not suggested.

Supply Voltage	-0.3 to 7.0 V
Input Voltage at any pin (Ref. V_{SS} = 0V)	-0.3V to (V_{DD} + 0.3V)
Output sink/source current	
supply pins	±30mA
other pins	±20mA
Total Device Dissipation @ 25°C	800mW max.
Derating	10mW/°C
Operating Temperature	-10°C to +60°C
Storage Temperature	-40°C to +85°C

Operating Limits

All devices were measured under the following conditions unless otherwise noted.

V_{DD} = 3.3 V

T_{AMB} = 25°C

Clock = 10.24 MHz

Audio Level 0dB Ref. = 250 mVrms @ 1 kHz

Characteristics	See Note	Min.	Typ.	Max.	Unit
Static Values					
Supply Voltage		2.7	-	5.5	V
Supply Current		-	4.0	6.0	mA
Input Impedance					
Digital		100	-	-	kΩ
Amplifiers		1.0	10.0	-	MΩ
Output Impedance (RXOUT, TXOUT)		-	1.0	-	kΩ
Input Logic 1 Voltage		70%	-	-	V_{DD}
Input Logic 0 Voltage		-	-	30%	V_{DD}
Dynamic Values					
Analog Signal Input Levels		-16.0	-	3	dB
Unwanted Modulation Products	1,2	-	-40.0	-	dB
Carrier Breakthrough	1,2	-	-55.0	-	dB
Baseband Breakthrough	1,2	-	-40.0	-	dB
Carrier Frequency		-	3299	-	Hz
Analog Output Noise	3	-	1.59	-	mVrms
Cut-off Frequency (-3dB)		-	3000	-	Hz
Passband Ripple (300 to 3000 Hz)		-1.5	-	+1.5	dB
Filter Attenuation at 3.3 kHz		-	30.0	-	dB
Filter Attenuation at 3.6 kHz		-	45.0	-	dB
Passband Gain		-2.0	-	3.0	dB
Passband Frequency		300	-	3000	Hz
Low Frequency Roll-off (<200 Hz)		12	-	-	dB/oct.
Switched-Capacitor Filter Sampling Frequency		-	211.169	-	kHz
Overall Modulated or De-Modulated Channel Response					
Passband Frequencies		300	-	3000	Hz
Passband Ripple		-3	-	2.0	dB
Low Frequency Roll-off (<150 Hz)		12	-	-	dB/oct.
Passband Gain	4	-	0	-	dB
Distortion	1	-	-	2.5	%

SPECIFICATION NOTES

1. Measured with Input Level 0 dB.
2. Single Modulated Channel.
3. Short circuit input, any analog output, in 30 kHz bandwidth.
4. Op Amp gain 0 dB.