

CML Semiconductor Products PRODUCT INFORMATION

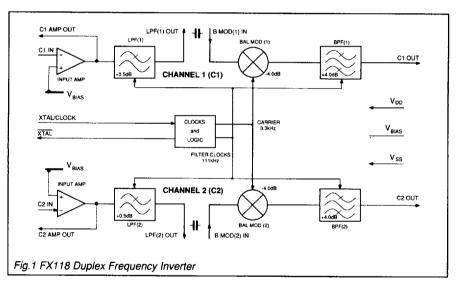
FX118 Duplex Frequency Inverter for Cordless Telephones

Publication D/118/3 July 1994

Features/Applications

- Frequency Inversion Scrambling
- Full-Duplex Operation
- High Baseband and Carrier Rejection
- Audio Lowpass and Bandpass Filtering On-Chip
- Xtal Oscillator Stabilty

- Low Power Requirement (3.0 Volt Minimum)
- Cordless Telephones
- Base and Handheld Applications
- Input Gain Adjustment
- Plastic DIL and S.O.I.C. Package Styles



FX118

Brief Description

The FX118 is a low-power, full-duplex frequency inverter available to provide voice privacy for cordless telephone systems by mixing the incoming audio with an internally produced carrier frequency (3.3kHz).

This chip contains two completely separate audio channels (C1 and C2) each comprising a "component-adjustable" input amplifier, a 10th-order lowpass filter, a balanced modulator and a 14th-order bandpass filter output.

The on-chip modulation process has the properties of high baseband and carrier frequency rejection which when combined with high-order output filtering, produces a high-quality recovered voiceband audio.

The frequency stability of the FX118 is achieved by an on-chip oscillator employing an external 4.433619MHz Xtal or clock input to produce the common carrier frequency and the sampling clocks for the switched capacitor low and bandpass filters.

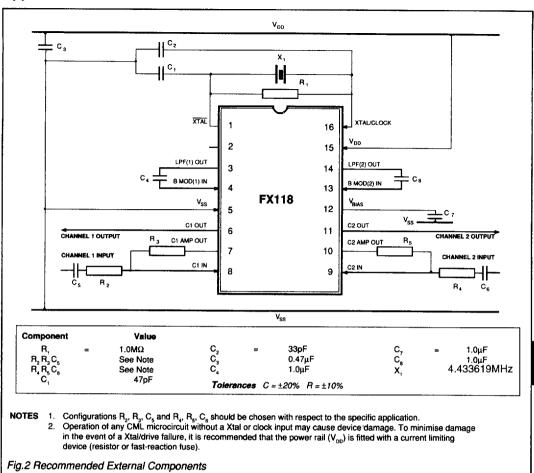
This microcircuit has a low power requirement of 3.0 volts (min.) and is encapsulated in either 16-pin DIL or small outline SMD (S.O.I.C.) plastic packages both of which are of a physical size suitable for either base or handset type telephone instruments as well as battery-portable and mobile communications systems.

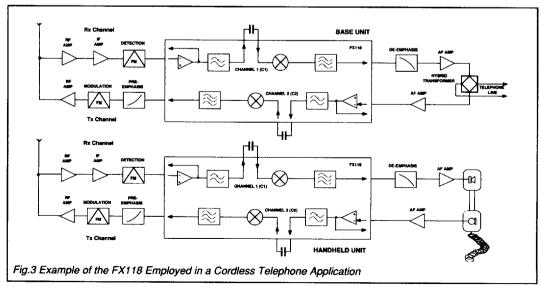
Pin Number

Function

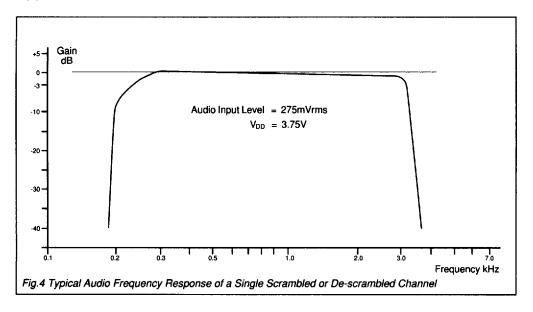
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FX118DW FX118P	
1	Xtal: Output of clock oscillator inverter.
2	No Internal Connection: It is recommended that, to improve noise conditions, this pin is connected to V _{ss} .
3	LPF(1) Out: The output of the Channel 1 Lowpass Filter. It is to be coupled to "B Mod(1) In" via a 1.0μF capacitor – see Figure 2.
4	B Mod(1) In: The input to Channel 1 balanced modulator. Internally biased at V _{po} /2 it is to be coupled to "LPF(1)" via a 1.0μF capacitor – see Figure 2.
5	V _{ss} : Negative supply (GND).
6	C1 Out: The analogue output of Channel 1.
7	C1 Amp Output: Channel 1 amplifier with external components (see Figure 2) can be used to provide gain in the signal path.
8	C1 In: The negative input of Channel 1 Amplifier. Recommended external components are shown in Figure 2.
9	C2 In: The negative input of Channel 2 Amplifier. Recommended external components are shown in Figure 2.
10	C2 Amp Output: Channel 2 amplifier with external components (see Figure 2) can be used to provide gain in the signal path.
11	C2 Out: The analogue output of Channel 2.
12	V_{BIAS} . The internal analogue bias line at $V_{\text{DD}}/2$. It should be decoupled to V_{SS} via a 1.0 μ F or greater capacitor. See Figure 2.
13	B Mod(2) In: The input to Channel 2 balanced modulator. Internally biased at V _{pp} /2 it is to be coupled to "LPF(2)" via a 1.0μF capacitor – see Figure 2.
14	LPF(2) Out: The output of the Channel 2 Lowpass Filter. It is to be coupled to "B Mod(2) In" via a 1.0μF capacitor – see Figure 2.
15	V _{DD} : The positive supply rail. A single positive supply voltage (3.0v - 5.0v) is required. Levels and voltages within the Duplex Frequency Inverter are dependent upon this supply.
16	Xtal/Clock: 4.433619 MHz Xtal or externally derived clock is injected at this pin. See Figure 2. Operation of the FX118 without a Xtal or clock input may cause device damage.

Application Information





Application Information



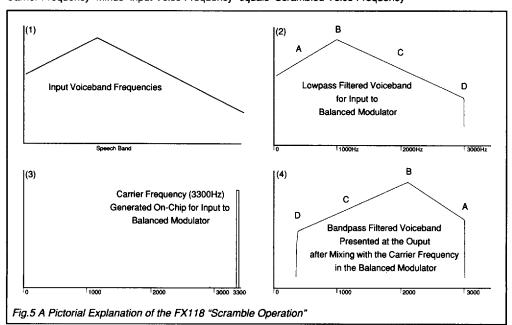
System Gains

When calculating the external components for the operation of the FX118 the following points should be considered:

- (a) The Input Lowpass Filter has a (typical) gain of 0.5dB.
 - (b) The Balanced Modulator has a (typical) attenuation of 4.0dB.
 - (c) The Output Bandpass Filter has a (typical) gain of 4.5dB.

How the Inverter Works

Carrier Frequency minus Input Voice Frequency equals Scrambled Voice Frequency



Specification

Absolute Maximum Ratings

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

 Supply voltage
 -0.3 to 7.0V

 Input voltage at any pin (ref V_{ss} = 0V)
 -0.3 to (V_{po} + 0.3V)

 Sink/source current (supply pins) (other pins)
 +/- 30mA

 Total device dissipation @ T_{AMB} 25°C
 800mW Max.

 Derating
 10mW/°C

Operating temperature range: FX118DW/P -40°C to +85°C
Storage temperature range: FX118DW/P -40°C to +85°C

Operating Limits

Characteristics

All device characteristics are measured under the following conditions unless otherwise specified:

 V_{DD} = 3.75V. T_{AMB} = 25°C. Xtal/Clock f_0 = 4.433619MHz. Audio level 0dB ref: = 388mV rms @ 1.0kHz.

See Note

Min.

Тур.

Max.

Unit

Static Values				
Supply Voltage	;	3.0 3.7	75 5.5	V
Supply Current		- 4.		mA
Input Impedance (Amplifiers)	1	1.0 10		MΩ
Output Impedance (LP Filters)		- 2.	0 -	kΩ
Output Impedance (C1, C2)		- 20	00 -	Ω
Output Impedance (C1, C2 Amps)		- 10	.0 –	kΩ
On-Chip Xtal Oscillator				
R _{IN}	1	0.0	<u> </u>	MΩ
R _{OUT}		- 10	.0	kΩ
mverter Gain		- 10	.0 –	V/V
Gain/Bandwidth Product		- 10	.0 -	MHz
Dynamic Values				
Analogue Signal Input Levels	-1	6.0 -	4.0	dB
SINAD	6	- 30	.0 -	dB
	1, 2	40	.0 –	dB
	1, 2	55	.0 -	dB
Baseband Breakthrough 1	1, 2	40	.0	dB
Carrier Frequency		- 329	99 –	Hz
Analogue Output Noise	3	42	.0 –	dB
Analogue Output Noise	5	46	.0 –	dBp
Filters				
Input Lowpass Filter	1			
Cut-Off Frequency (-3dB)		- 310	00 –	Hz
Passband Ripple (300Hz - 3kHz)	,	- ±1.	.0	dB
Attenuation at 3.3kHz		- 30.	.0 -	₫B
Attenuation at 3.6kHz		- 45.	0 –	dB
Passband Gain		- 0.5	5 -	d₿
	, 4			
Passband Frequencies	3	00 -	3000	Hz
Passband Ripple		- ±1.		dB
Low Freq. Roll-Off <200Hz	12	2.0 –		dB/oct.
High Freq. – Attenuation at 3.4kHz		- 48.	0 –	dB
Passband Gain		.5 4.5	5.5	dB
Overall Modulated and De-Modulated Channel Response	onse			QD.
Passband Frequencies (Tx and Rx Channel)	30	00	3000	Hz
Passband Ripple	-3	3.0 –	2.0	ď₿
Low Freq. Roll-Off <250Hz	18	3.0		dB/oct.
High Freq Attenuation at 3.4kHz		- 48.	0 -	dB/00t.
Passband Gain	4 -	- 0.5		dB
Distortion	1 -	- 3.0		%

Notes:

- 1. Measured with an audio input level of -3.0dB.
- 2. With respect to a single modulated (scrambling) channel.
- 3. Measured with a short circuit input, at any analogue output, in a 30.0kHz bandwidth.
- With Input Amplifier gain at 0dB.
- 5. Measured psophometrically weighted, at any analogue output.
- Measured in a 30kHz bandwidth.

Package Outlines

The FX118 is available in the package styles outlined below. Mechanical package diagrams and specifications are detailed in Section 10 of this document. Pin 1 identification marking is shown on the relevant diagram and pins on all package styles number anti-clockwise when viewed from the top.

Handling Precautions

The FX118 is a CMOS LSI circuit which includes input protection. However precautions should be taken to prevent static discharges which may cause damage.

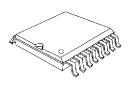
FX118DW 16-pin S.O.I.C.

(D4)

FX118P 16-pin plastic DIL

(P3)

NOT TO SCALE



Max. Body Length Max. Body Width 7.59mm

Max. Body Length Max. Body Width 19.24mm 6.41mm

Ordering Information

FX118DW 16-pin S.O.I.C. (D4)

FX118P 16-pin plastic DIL (P3)

CML does not assume any responsibility for the use of any circuitry described. No circuit patent licences are implied and CML reserves the right at any time without notice to change the said circuitry.