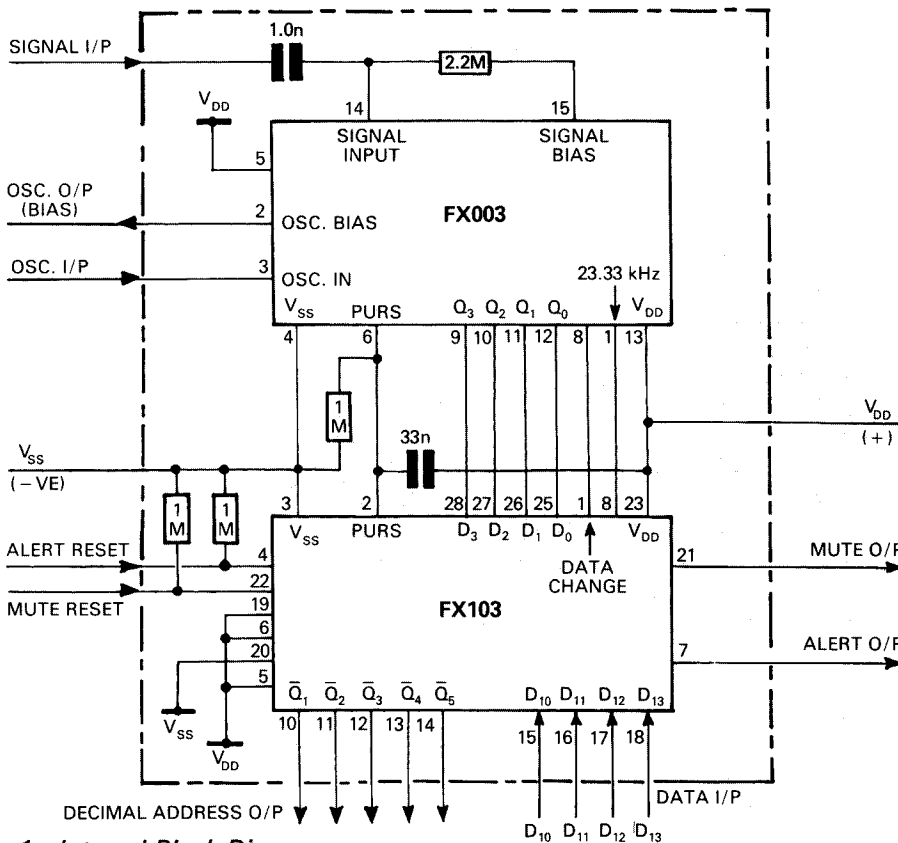


Obsolete Product
- For Information Only -
Publication D/1103/4 July 1987

Features

- Low Power Consumption
- Single-in-Line Hybrid Construction
- FX1103QC Decodes CCIR Toneset
- FX1103QE Decodes EEA Toneset
- FX1103QZ Decodes ZVEI Toneset
- Group Call Decoding
- Dual Address Feature
- Coded Audio Alert Output
- 'Absent Page' Memory



FX1103

Fig.1 Internal Block Diagram

The FX1103 is a SIL 5-tone Selcall decoder using thick-film hybrid techniques. The device includes an FX003 tone decoder tuned to CCIR, EEA or ZVEI tones and an FX103 address decoder. The FX1103 can operate from a three-cell battery and consumes a minimum of power.

The hybrid decodes sequential 5-tone selective calling signals and compares the incoming information with an address stored in an external diode ROM or matrix. The

FX1103 automatically generates an interrupted audio alert signal when it decodes its correct address sequence. A continuous audio alert is generated when the decoder receives its address followed by an additional instruction tone (tone C). Only one decoder is required for dual address pagers. All tone frequencies and internal timings are controlled by a 560kHz reference oscillator comprising an on-chip inverter and external resonator/Xtal. Alternatively, an external clock may be used.

Pin Description

Function

SIL Hybrid
FX1103Q*

*C, E, Z.

1	V_{DD} :	Positive Supply (+VE).
2	Alert Reset I/P:	The audio 'Alert' output can be manually reset by the 'Alert Reset' input. If the audio is not reset within 10 seconds, the hybrid will clear the 'Alert' output and the audio pattern type is then loaded into a memory. Pressing the audio reset button will cause the memory contents to be reloaded into the alert pattern generator. This 'absent page memory' feature stores the last audio alert output which was not manually reset. The audio output can be reset in the normal manner.
3	Alert O/P:	
4	D_{13} } D_{12} } Data D_{11} } Inputs D_{10} }	D_{10} (LSB) to D_{13} (MSB) data inputs are connected to the anodes of the diode matrix for the External Address Memory.
5		
6		
7		
8	$\bar{\rho}_5$ } $\bar{\rho}_4$ } Outputs $\bar{\rho}_3$ } $\bar{\rho}_2$ } $\bar{\rho}_1$ }	\bar{Q}_1 to \bar{Q}_5 Decimal Address Digits Select outputs are taken to the cathodes of the diode matrix for the External Address Memory.
9		
10		
11		
12		
13	OSC I/P:	A 560kHz clock or resonator input. <i>See Figure 2 and Note 4 (Resonator).</i>
14	OSC O/P:	Oscillator output (bias).
15	V_{SS} :	-VE Supply (GND)
16	Signal I/P:	Biasing and a.c. coupling are provided internally.
17	Mute O/P:	The 'Mute' output is switched high when the device decodes an incoming selective call. This can be used to enable the audio amplifier of pagers equipped for 'tone and voice' operation. It remains 'on' until reset by the 'Mute Reset' input. The 'Mute' output can be considered as a call signal in 'tone only' applications. In this case the 'Mute Reset' and 'Alert Reset' inputs can be connected together. <i>See Note 2. (Transmitted Instruction Codes).</i>
18	Mute Reset I/P:	

Operating Notes:

- PURS:** The Power Up Reset components are included in the hybrid. This prevents malfunction when power is applied. A one-second burst of rapid pips is generated at the 'Alert' output as a power on test. The maximum power supply rise time (to 90%) for correct operation is 2ms.
- Transmitted Instruction Codes:** The FX1103 can decode selectively addressed reset instructions using extra tones decoded in addition to those specified by CCIR, EEA and ZVEI. Address suffix tones can be added after a selcall to reset the 'Mute' output and also erase the memory. The Mute is reset when tone D follows a call. Only when this is followed by tone C, will the device erase the memory; any other state (or no transmission) will inhibit the erasure. These transmitted instructions are also valid under group calling instructions.
A voice paging system organised with transmitted reset instructions offers the possibility of hands-free operation at the receiver.
- Group Call:** The hybrid will decode group calls where any one or more digits of the address have been replaced by a group frequency (tone A). Groups ranging from ten units to all the pagers on a network can be simultaneously called. The hybrid will output a distinctive audio alert pattern when a group call is decoded. The additional second address instruction tone is also valid for group calls and causes the circuit to generate a continuous alert.
- Resonator:** The FX1103 requires a 560.0kHz clock which can be derived from a ceramic resonator as shown in figure 2, it may be tuned to the precise frequency by a variable (or select-on-test) capacitor. Wiring should be kept short. The frequency may be monitored at pin 14 by a high impedance counter with low capacitive loading. This single adjustment tunes all the decoder's frequencies.
- External Address Memory:** The selective calling address must be stored in a separate external memory. The memory input and output lines of the FX1103 have been designed to interface directly to fusible link diode matrices. Selcall numbers are programmed into the matrices directly without repeat codes (code E). The circuit automatically recognises where successive address digits are identical and searches for the repeat tone. The code E is used in the memory as a terminator where less than five address digits are used. It is programmed into the external memory after the last digit and instructs the FX1103 to search for address suffix tone codes or the no transmission state.

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	-0.3V to 7.0V
Input voltage at any pin (ref $V_{SS} = 0V$)	-0.3V to ($V_{DD} + 0.3V$)
Output sink/source current (total)	20mA
Maximum device dissipation	100mW
Operating temperature range:	-20°C to +60°C
Storage temperature range:	-40°C to +85°C

Operating Limits

All characteristics measured using a CML standard test circuit with the following test parameters and is valid for all tones unless otherwise stated:

$V_{DD} = +5.0V$, $T_{amb} = 25^{\circ}C$, $f_o = 560kHz$, $\Delta f_o = 0Hz$.

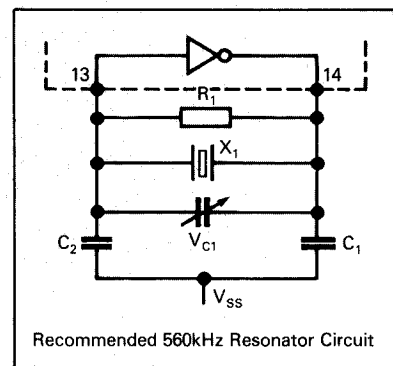
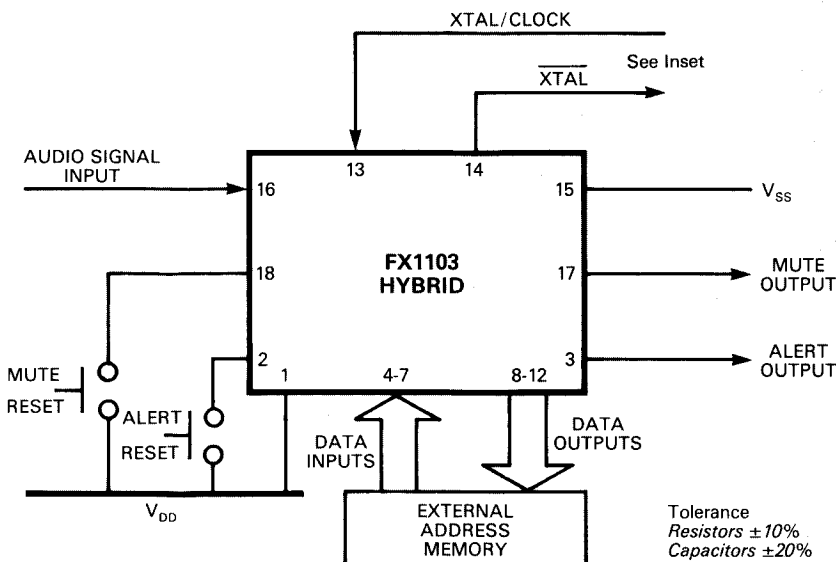
Composite test signal: 0dB ref = 775mVrms.

Input signal; Tone @ -15dB with -21dB band limited 6kHz gaussian white noise.

Characteristics	See Note	Min.	Typ.	Max.	Unit
Static Values					
Supply voltage		3.3	5.0	5.5	V
Supply current (decoding)		—	600	—	μA
Analogue Input Impedance		—	2	—	$M\Omega$
Alert Output Impedance		—	5	—	$k\Omega$
Input logic '1'		3.5	—	—	V
Input logic '0'		—	—	1.5	V
Output logic '1'		4.5	—	—	V
Output logic '0'		—	—	0.5	V
Dynamic Values					
Signal Input Level		35	—	V_{DD}	mVrms
Input Tone Period (each tone)					
CCIR		20	100	—	ms
EEA		20	40	—	ms
ZVEI		20	70	—	ms
Decoder Bandwidth					
CCIR	1	± 1	—	—	%
EEA	1	± 1	—	—	%
ZVEI	1	± 2	—	—	%
Signal to Noise Ratio Performance	1	0	—	—	dB
Not-decode Bandwidth					
CCIR	2	—	—	± 3	%
EEA	2	—	—	± 3	%
ZVEI	2	—	—	± 4.5	%
False Decode Probability from Noise (5 tone address)					
CCIR	3, 4	—	2.5×10^{-31}	—	per hour
EEA	3, 4	—	2.5×10^{-31}	—	per hour
ZVEI	3, 4	—	4.8×10^{-25}	—	per hour
Alert Output Frequency		—	2.121	—	kHz
Alert Output Duration		—	—	10	s

Notes: 1. Decode probability > 0.975 (5 tone sequence).
2. Decode probability < 0.025 (5 tone sequence).

3. Including group and second address calls.
4. Measured with 100mVrms, 6kHz white noise.



Component References	
Component	Unit Value
R_1	1M
V_{C1}	5-65p
C_1	47p
C_2	47p
X_1	560kHz

Fig. 2 External Component Connections

Tolerance
Resistors $\pm 10\%$
Capacitors $\pm 20\%$

Examples of Call Decoding Character Tone Table

Tone	Tone Frequencies (fo) in Hz		
	FX1103QC (CCIR)	FX1103QE (EEA)	FX1103QZ (ZVEI)
0	1981	1981	2400
1	1124	1124	1060
2	1197	1197	1160
3	1275	1275	1270
4	1358	1358	1400
5	1446	1446	1530
6	1540	1540	1670
7	1640	1640	1830
8	1747	1747	2000
9	1860	1860	2200
A	2400	1055	2800
B	930	930	810
C	2247	2247	970
D	991	991	886
E	2110	2110	2660

Example Tone Sequences

12345 Interrupted alert output — Mute high
 12345C Continuous alert output — Mute high
 12A45 Group pattern alert output — Mute high
 AEAEA All call — Group pattern alert output on all units — Mute high
 12345D No alert output — Reset Mute (i.e. low)
 12345DC No alert output — Reset Mute (i.e. low) clear memory
 AEAEAD Mute all units — No outputs

NOTE: Where A is the Group Frequency E is the repeat Frequency.
 C & D are additional signalling tones.

(Example Address 12345)

Handling Precautions

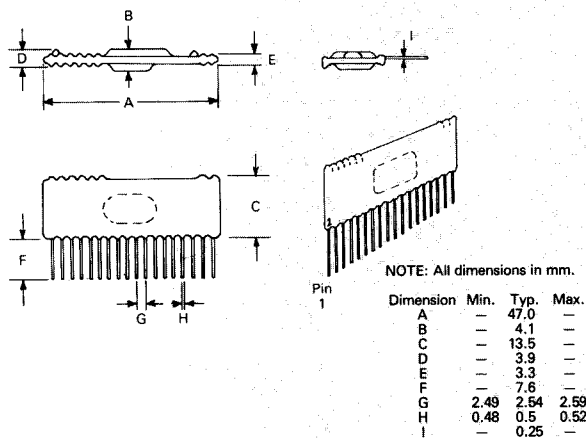
The FX1103 contains CMOS LSI circuits which include input protection. However, precautions should be taken to prevent static discharges which can cause damage to the circuitry.

Package Outline

The Single-In-Line (SIL) plastic encapsulated hybrid package of the FX1103 is shown in *Figure 3*.

The pins number from left to right starting from pin 1.

Fig. 3 FX1103 SIL Package



Ordering Information

FX1103* 18-pin SIL Thick-Film Hybrid

*Toneset Versions

QC : CCIR

QE : EEA

QZ : ZVEI