



Helping Customers Innovate, Improve & Grow



Description

The FX-424 is a precision quartz-based frequency translator used to translate an input frequency such as 8 kHz, 1.544 MHz, 2.048 MHz, 19.44 MHz etc. to any specific frequency from 1.544 MHz to 1.0 GHz. The FX-424 can perform either up or down frequency conversion. The FX-424's superior jitter performance is achieved through the use of a precision VCXO or VCSO. With the use of an external multiplexer, up to 4 different input clocks can be translated to a common output frequency.

Features

- Quartz-based PLL for Ultra-Low Jitter
- Frequency Translation up to 850 MHz
- Accepts up to 4 ext.-muxed clock inputs
- CMOS / LVDS / LVPECL Inputs compatible
- Differential LVPECL or LVCMOS Output
- Lock Detect / Loss of Signal Alarms
- Output Disable
- 20.3 x 13.7 x 5.1 mm SMT package
- RoHS/Lead Free Compliant

Applications

- Wireless Infrastructure
- 10 Gigabit FC
- 10GbE LAN / WAN
- OADM and IP Routers
- Test Equipment
- Military Communications

Block Diagram

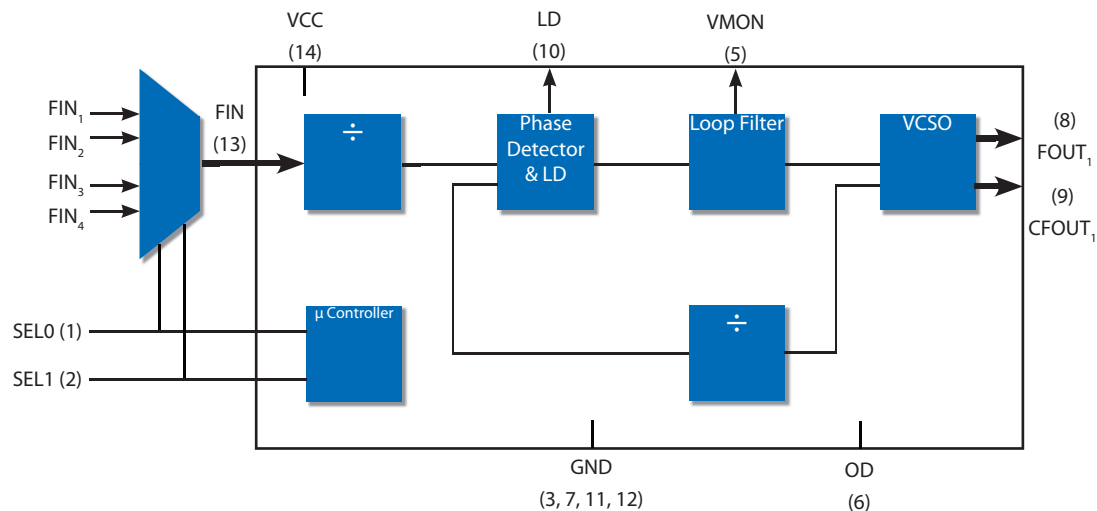


Figure 1. Functional block diagram

Performance Specifications

Table 1. Electrical Performance					
Parameter	Symbol	Min	Typical	Maximum	Units
Frequency ^{1,2,3}					
Input Frequency	F_{IN}	0.008		170	MHz
Capture Range	APR	±40			ppm
Output Frequency	F_{OUT}	1.544		1.0	GHz
Supply					
Voltage ^{2,3}	V_{CC}	3.13	3.3	3.46	V
Current (No Load) ³	I_{CC}		45	60	mA
Input Signal ^{2,3}					
CMOS	F_{IN}	CMOS			
LVPECL	F_{IN}	LVPECL			
LVC MOS Output (Option A) ^{2,3}		LVC MOS			
Differential Output (Options F and P) ^{2,3,4,5}					
Mid Level - LVPECL		$V_{CC}-1.4$	$V_{CC}-1.25$	$V_{CC}-1.0$	V
Swing - LVPECL		450	600	950	mV p-p
Mid Level - LVDS		$V_{CC}-2.4$	$V_{CC}-2.3$	$V_{CC}-2.5$	V
Swing - LVDS		250	410	450	mV p-p
Rise Time	t_R		0.5		ns
Fall Time	t_F		0.5		ns
Symmetry	SYM	45	50	55	%
SSB Phase Noise, $F_{out} = 155.52/622.08$ ^{5,6}					
10Hz Offset	Φ_n		-64/-27		dBc/Hz
100Hz Offset	Φ_n		-95/-55		dBc/Hz
1kHz Offset	Φ_n		-123/-123		dBc/Hz
10kHz Offset	Φ_n		-143/-110		dBc/Hz
100kHz Offset	Φ_n		-146/-130		dBc/Hz
1 MHz Offset	Φ_n		-146/-146		dBc/Hz
10 MHz Offset	Φ_n		-146/-146		dBc/Hz
Jitter Generation ^{5,6}					
155.52 MHz (12kHz - 20MHz BW)	Φ_j		0.30		ps RMS
622.08 MHz (12kHz - 20 MHz BW)	Φ_j		0.12		ps RMS
Operating Temperature (Options C of F) ^{1,3}	T_{OP}	0 to 70 or -40 to 85			°C

1. See Standard Frequencies and Ordering Information.
2. Parameters are tested with production test circuit below (Fig 2).
3. Parameters are tested at ambient temperature with test limits guard-banded for specified operating temperature.
4. Measured from 20% to 80% of a full output swing (Fig 3).
5. Not tested in production, guaranteed by design, verified at qualification.
6. The FX-424 phase noise and jitter performance can be optimized for specific applications. Please consult with Vectron's Application Engineers for more information.

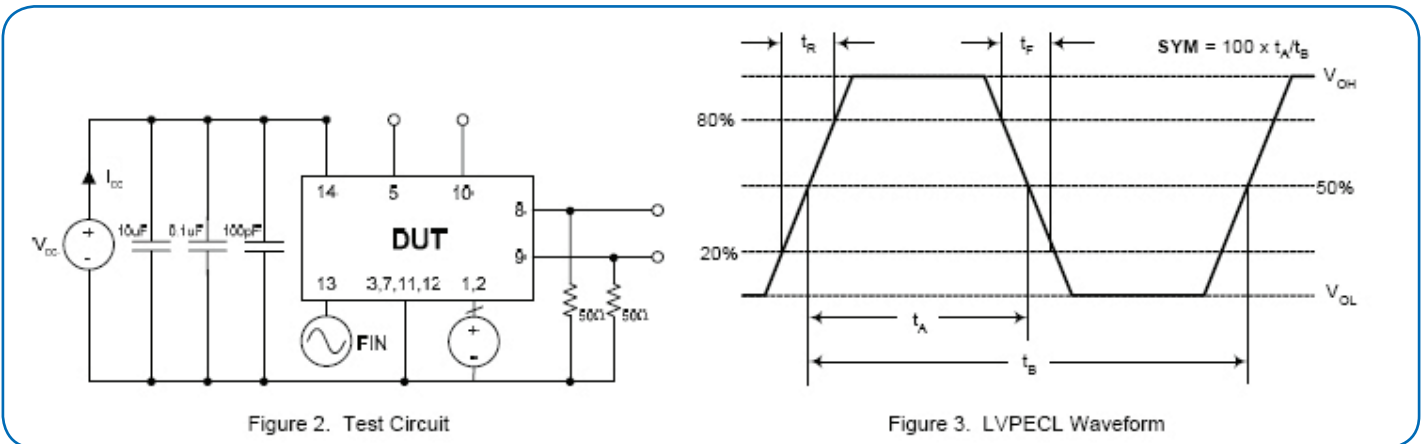


Figure 2. Test Circuit

Figure 3. LVPECL Waveform

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this data sheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability.

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Power Supply	V_{DD}	6	V
Storage Temperature	T_{STR}	-55 to 125	°C
Soldering Temp/Time	T_{LS}	260/40	°C/sec

Reliability

The FX-424 is capable of meeting the following qualification tests

Table 3. Environmental Compliance

Parameter	Conditions
Mechanical Shock	MIL-STD-883, Method 2002
Mechanical Vibration	MIL-STD-883, Method 2007
Solderability	MIL-STD-883, Method 2003
Gross and Fine Leak	MIL-STD-883, Method 1014
Resistance to Solvents	MIL-STD-883, Method 2016

Handling Precautions

Although ESD protection circuitry has been designed into the the FX-424, proper precautions should be taken when handling and mounting. VI employs a human body model and a charged-device model (CDM) for ESD susceptibility testing and design protection evaluation. ESD thresholds are dependent on the circuit parameters used to define the model. Although no industry wide standard has been adopted for the CDM, a standard HBM of resistance=1.5Kohms and capacitance = 100pF is widely used and therefore can be used for comparison purposes

Table 4. Predicted ESD Ratings

Model	Minimum	Conditions
Human Body Model	500 V	MIL-STD 883, Method 3015
Charged Device Model	500 V	JEDEC, JESD22-C101

Reflow Profile

Table 5. Reflow Profile (IPC/JEDEC J-STD-020C)

Parameter	Symbol	Value
PreHeat Time	t_s	60 sec Min, 180 sec Max
Ramp Up	R_{UP}	3 °C/sec Max
Time Above 217 °C	t_L	60 sec Min, 150 sec Max
Time To Peak Temperature	t_{AMB-P}	480 sec Max
Time At 260 °C	t_p	20 sec Min, 40 sec Max
Ramp Down	R_{DN}	6 °C/sec Max

The FX-424 is qualified to meet the JEDEC standard for Pb-Free assembly. The temperatures and time intervals listed are based on the Pb-Free small body requirements. The temperatures refer to the topside of the package, measured on the package body surface. The FX-427 should not be subjected to a wash process that will immerse it in solvents. NO CLEAN is the recommended procedure. The FX-427 has been designed for pick and place reflow soldering. The FX-427 may be reflowed once and should not be reflowed in the inverted position.

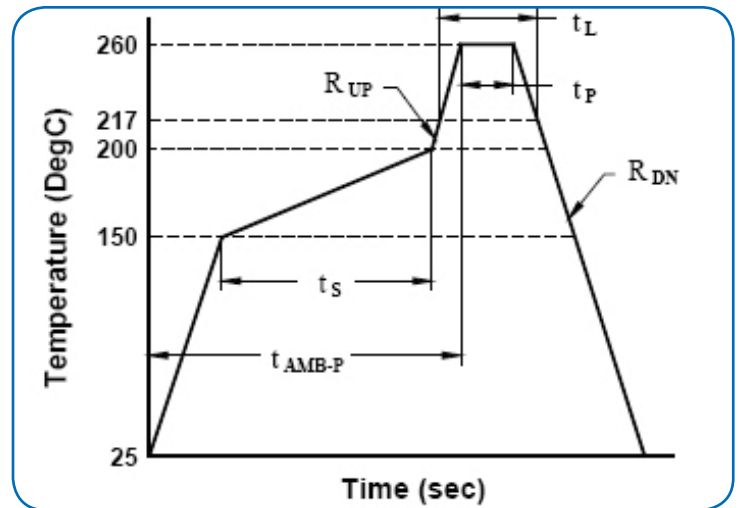


Figure 4. Suggested IR Profile

Tape and Reel

Table 6. Tape and Reel Information

Tape Dimensions (mm)					Reel Dimensions (mm)							
W	F	Do	Po	P1	A	B	C	D	N	W1	W2	#/Reel
44	20.2	1.5	4	20	330	1.5	13	20.2	100	44.4	50.4	200

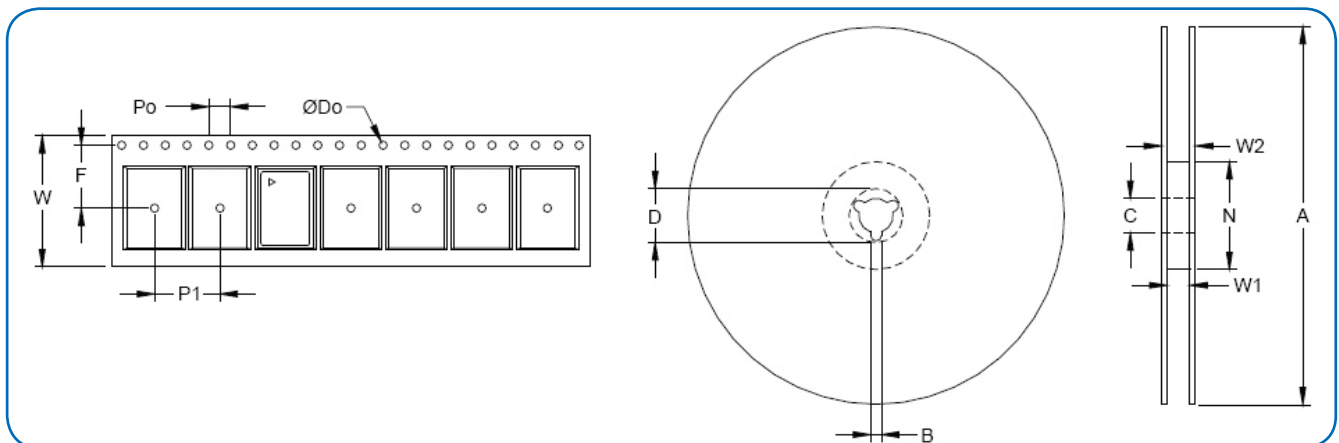


Figure 5. Tape and Reel

Pin Configuration

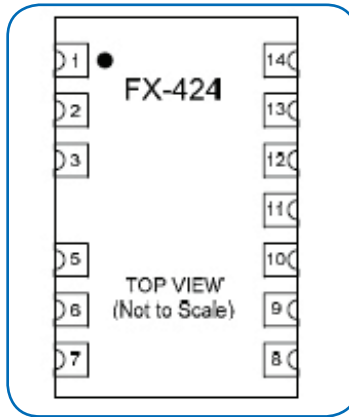


Figure 6. Pin Configuration

Table 7. Pin Functions				
Pin #	Symbol	I/O	Level	Function
1	SEL0	I	LVTTL	Frequency Select *
2	SEL1	I	LVTTL	Frequency Select *
3	GND	GND	Supply	Case and Electrical Ground
4				Not present
5	VMON	O		VCXO Control Voltage Monitor Under locked conditions VMON should be > 0.3V and <3.0V. The input frequency may be out of range if the voltage exceeds these levels
6	OD	I	LVCMOS	Output Disable Disabled = Logic "1" Enabled = Logic "0" or no connect
7	GND	GND	Supply	Case and Electrical Ground
8	FOUT	O	LCPECL, LVDS or LVCMOS	Frequency Output
9	CFOUT	O	LVPECL, LVDS or LVCMOS	Complementary Frequency Output – Note for LVCMOS option this pad will be tied to GND.
10	LD	O	LVCMOS	Lock Detect Locked = Logic "1" Loss of Signal = Logic "0"
11	GND	GND	Supply	Complimentary Divided-Down VCXO/VCXO Output, or Disabled
12	GND	GND	Supply	Case and Electrical Ground
13	FIN	I	LVCMOS or LVPECL	Input Frequency – AC Coupled
14	VCC	VCC	Supply	Power Supply Voltage (3.3 V ±5%)

*For applications requiring two to four input frequencies, Vectron will assign a unique part number and the Input Frequency versus SEL[1:0] settings will be provided in a Specification Control Drawing. For single input configurations it is recommended that SEL0 and SEL1 are tied to ground.

FX-424 Outline Diagram and Pad Layout

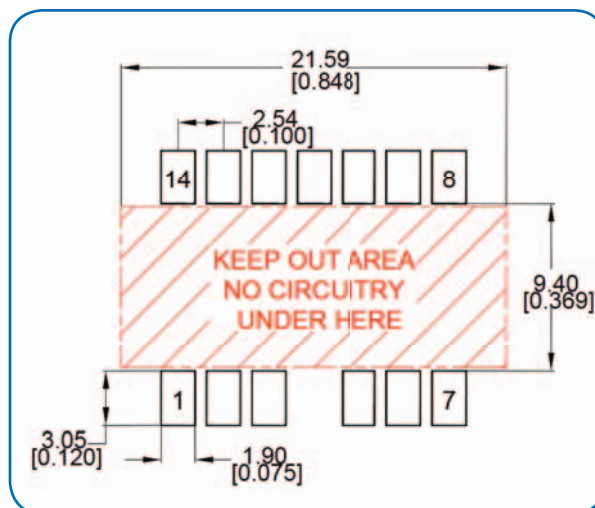
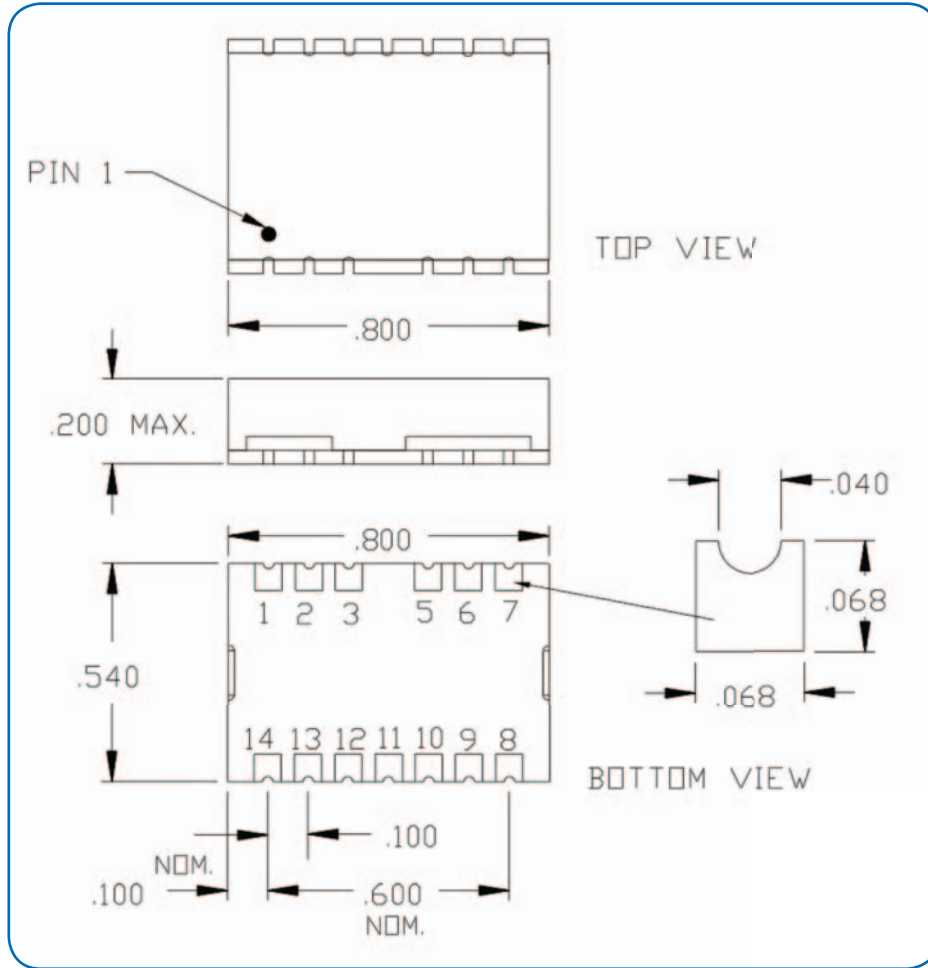


Figure 7. Outline and Pad Layout

Suggested Output Load Configurations

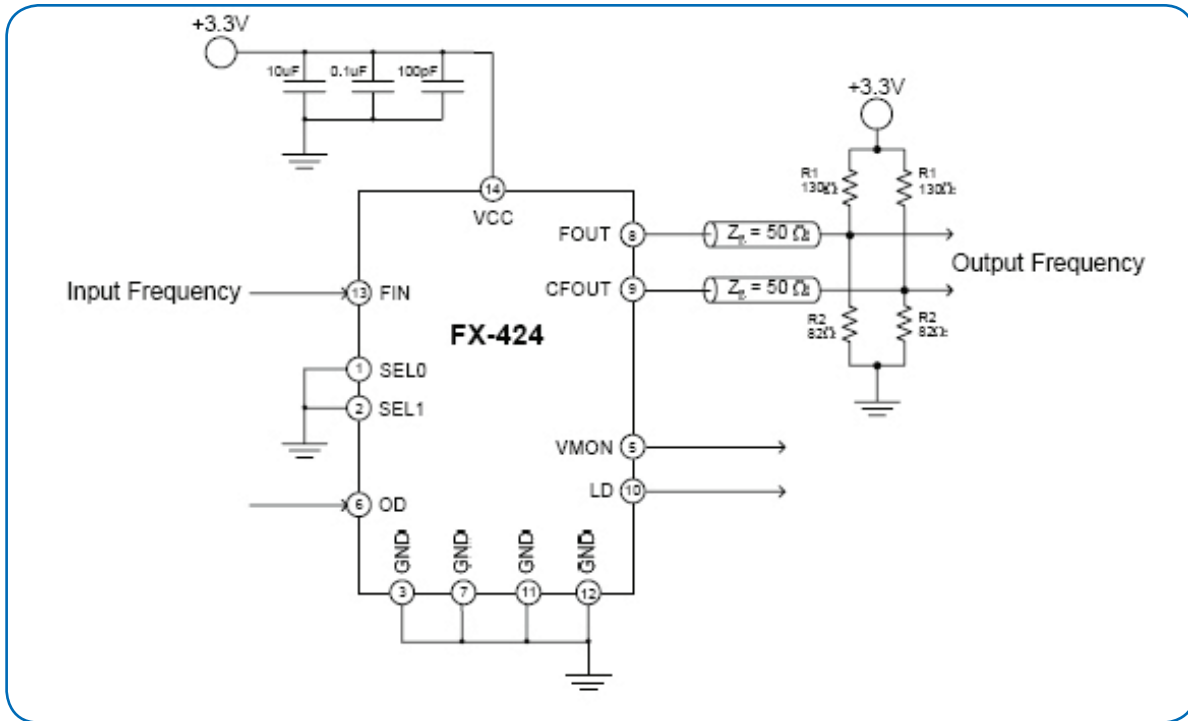


Figure 8. Single Input Frequency Translation - LVPECL Termination

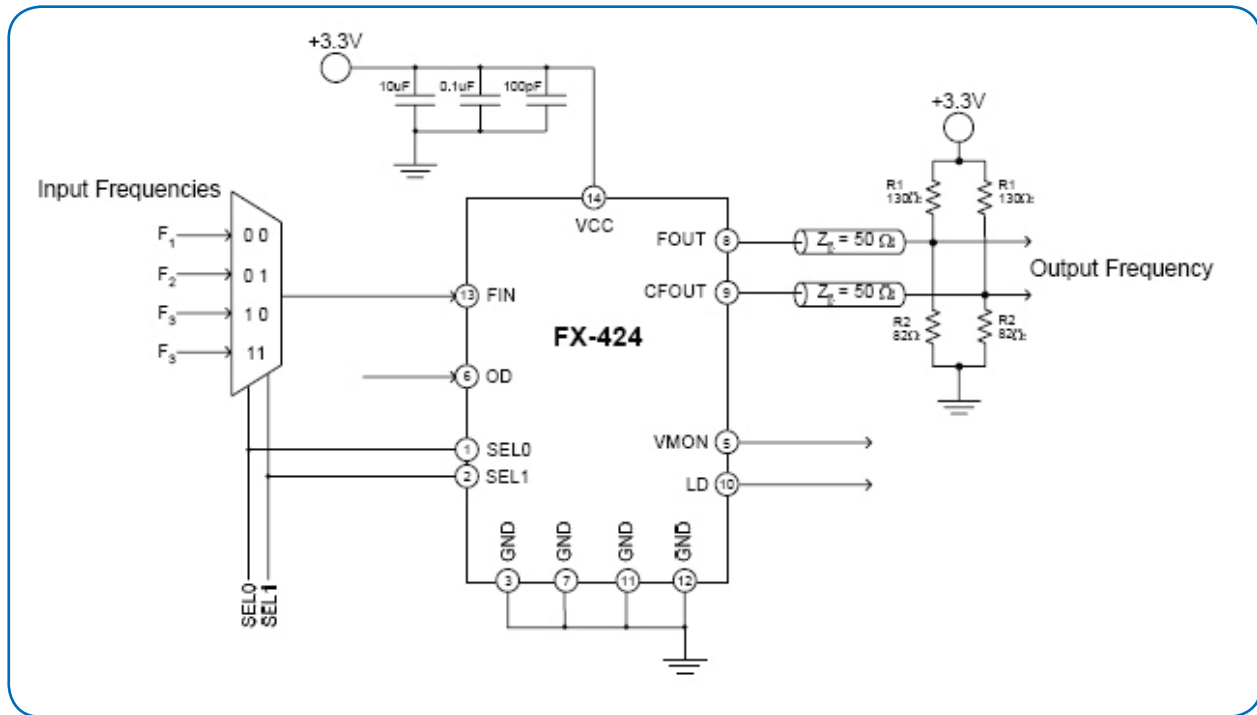


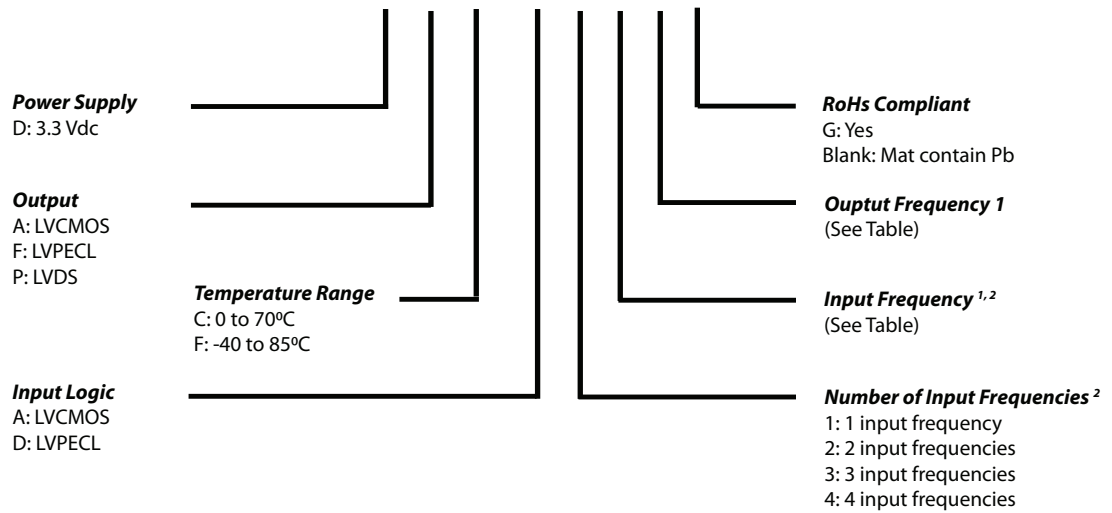
Figure 8. Four Input Frequencies Translated to Common Output Frequency - LVPECL Termination

Ordering Information

Table 8. Standard Frequencies

8.00 kHz	C	26.00 MHz	T	622.08 MHz	8
16.00 kHz	D	27.00 MHz	W	666.5143 MHz	9
64.00 kHz	E	38.88 MHz	X		
1.024 MHz	F	44.736 MHz	Y		
1.544 MHz	H	51.84 MHz	0		
2.048 MHz	J	614.44 MHz	1		
4.096 MHz	K	77.76 MHz	2		
8.192 MHz	L	82.944 MHz	3		
13.000 MHz	M	112.00 MHz	4		
16.384 MHz	N	139.264 MHz	5		
19.440 MHz	P	155.520 MHz	6		
20.480 MHz	R	166.6286 MHz	7	Special SCD	S

FX-424-XXX-XXXXX



1. For non-listed frequencies and/or multiple input frequencies a unique part number will be assigned with the following format FX-424-XXX-SNNNN. "SNNNN" is the SCD number.

2. To request initial samples for an FX-424 with more than one input frequency, please use the following format FX-424-XXX-XNSX followed by the input frequencies. For example, to request samples for a translator with an operating temperature of -40 to +85°C, input frequencies of 8 kHz, 1.544 MHz, 19.44 MHz, 77.76 MHz and an output frequency of 622.08 MHz, the part number would be FX-424-DFD-A4S8, S = 8 kHz, 1.544 MHz, 19.44 MHz, 77.76 MHz.

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