

FEATURES

- ❑ 83 MHz Data Rate
- ❑ 12-bit Data and Coefficients
- ❑ On-board Memory for 256 Horizontal and Vertical Coefficient Sets
- ❑ LF Interface™ Allows All 512 Coefficient Sets to be Updated Within Vertical Blanking
- ❑ Selectable 12-bit Data Output with User-Defined Rounding and Limiting
- ❑ Seven 3K x 12-bit, Programmable Two-Mode Line Buffers
- ❑ 16 Horizontal Filter Taps
- ❑ 8 Vertical Filter Taps
- ❑ Two Operating Modes: Dimensionally Separate and Orthogonal
- ❑ Supports Interleaved Data Streams
- ❑ Horizontal Filter Supports Decimation up to 16:1 for Increasing Number of Filter Taps
- ❑ 3.3 Volt Power Supply
- ❑ 5 Volt Tolerant I/O
- ❑ 144 Lead PQFP

DESCRIPTION

The **LF3310** is a two-dimensional digital image filter capable of filtering data at real-time video rates. The device contains both a horizontal and a vertical filter which may be cascaded or used concurrently for two-dimensional filtering. The input, coefficient, and output data are all 12-bits and in two's complement format.

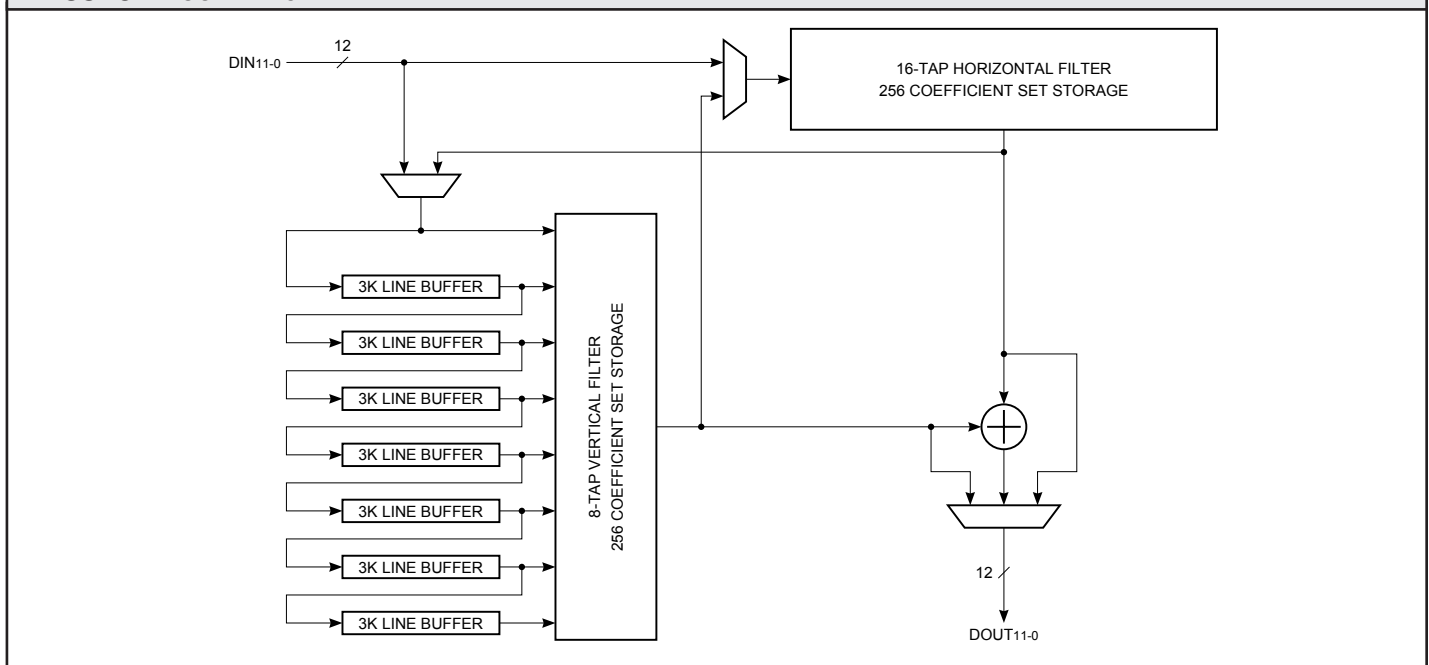
The horizontal filter is designed to take advantage of symmetric coefficient sets. When symmetric coefficient sets are used, the horizontal filter can be configured as a 16-tap FIR filter. When asymmetric coefficient sets are used, it can be configured as an 8-tap FIR filter. The vertical filter is an 8-tap FIR filter with all required line buffers contained on-chip. The line buffers can store video lines with lengths from 4 to 3076 pixels.

Horizontal filter Interleave/Decimation Registers (I/D Registers) and the vertical filter line buffers allow interleaved data to be fed directly into the device and filtered

without separating the data into individual data streams. The horizontal filter can handle a maximum of sixteen data sets interleaved together. The vertical filter can handle interleaved video lines which contain 3076 or less data values. The I/D Registers and horizontal accumulator facilitate using decimation to increase the number of filter taps in the horizontal filter. Decimation of up to 16:1 is supported.

The device has on-chip storage for 256 horizontal coefficient sets and 256 vertical coefficient sets. Each filter's coefficients are loaded independently of each other allowing one filter's coefficients to be updated without affecting the other filter's coefficients. In addition, a horizontal or vertical coefficient set can be updated independently from the other coefficient sets in the same filter.

LF3310 BLOCK DIAGRAM



Horizontal / Vertical Digital Image Filter

MAXIMUM RATINGS *Above which useful life may be impaired (Notes 1, 2, 3, 8)*

Storage temperature	-65°C to +150°C
Operating ambient temperature	-55°C to +125°C
V _{CC} supply voltage with respect to ground	-0.5V to +4.5V
Input signal with respect to ground	-0.5V to 5.5 V
Signal applied to high impedance output	-0.5V to 5.5 V
Output current into low outputs	25 mA
Latchup current	> 400 mA
ESD Classification (MIL-STD-883E METHOD 3015.7)	Class 3

OPERATING CONDITIONS *To meet specified electrical and switching characteristics*

Mode	Temperature Range (Ambient)	Supply Voltage
Active Operation, Commercial	0°C to +70°C	3.00V ≤ V _{CC} ≤ 3.60V
Active Operation, Military	-55°C to +125°C	3.00V ≤ V _{CC} ≤ 3.60V

ELECTRICAL CHARACTERISTICS *Over Operating Conditions (Note 4)*

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _{OH}	Output High Voltage	V _{CC} = Min., I _{OH} = -4 mA	2.4			V
V _{OL}	Output Low Voltage	V _{CC} = Min., I _{OL} = 8.0 mA			0.4	V
V _{IH}	Input High Voltage		2.0		5.5	V
V _{IL}	Input Low Voltage	(Note 3)	0.0		0.8	V
I _{Ix}	Input Current	Ground ≤ V _{IN} ≤ V _{CC} (Note 12)			±10	µA
I _{oZ}	Output Leakage Current	Ground ≤ V _{OUT} ≤ V _{CC} (Note 12)			±10	µA
I _{CC1}	V _{CC} Current, Dynamic	(Notes 5, 6)			250	mA
I _{CC2}	V _{CC} Current, Quiescent	(Note 7)			2	mA
C _{IN}	Input Capacitance	T _A = 25°C, f = 1 MHz			10	pF
C _{OUT}	Output Capacitance	T _A = 25°C, f = 1 MHz			10	pF

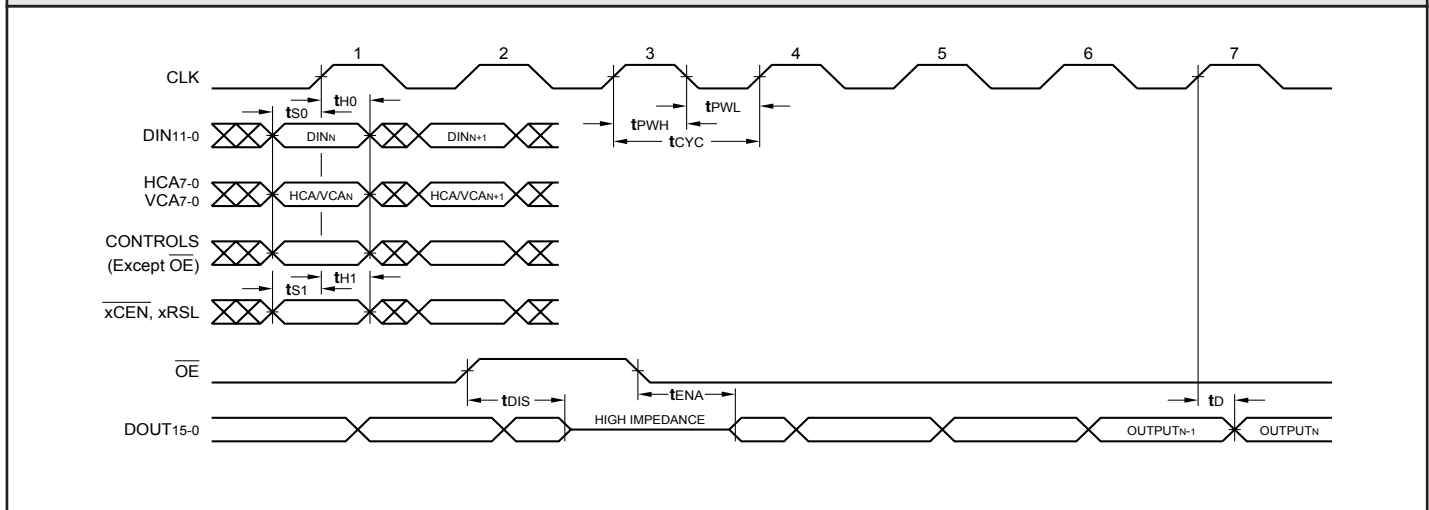
Horizontal / Vertical Digital Image Filter

SWITCHING CHARACTERISTICS

COMMERCIAL OPERATING RANGE (0°C to +70°C) Notes 9, 10 (ns)

Symbol		Parameter		LF3310-							
				25*		18*		15		12	
				Min	Max	Min	Max	Min	Max	Min	Max
t _{CYC}	Cycle Time	25		18		15		12			
t _{PWL}	Clock Pulse Width Low	10		8		7		5			
t _{PWH}	Clock Pulse Width High	10		8		7		5			
t _{S0}	Input Setup Time	8		6		5		4			
t _{S1}	Input Setup Time (xCEN, xRSL)*	8		6		5		4			
t _{H0}	Input Hold Time	1		1		1		1			
t _{H1}	Input Hold Time (xCEN, xRSL)*	1.5		1.5		1.5		1.5			
t _D	Output Delay		13		11		10		8		
t _{DIS}	Three-State Output Disable Delay (Note 11)		15		13		12		10		
t _{ENA}	Three-State Output Enable Delay (Note 11)		15		13		12		10		

SWITCHING WAVEFORMS: DATA I/O

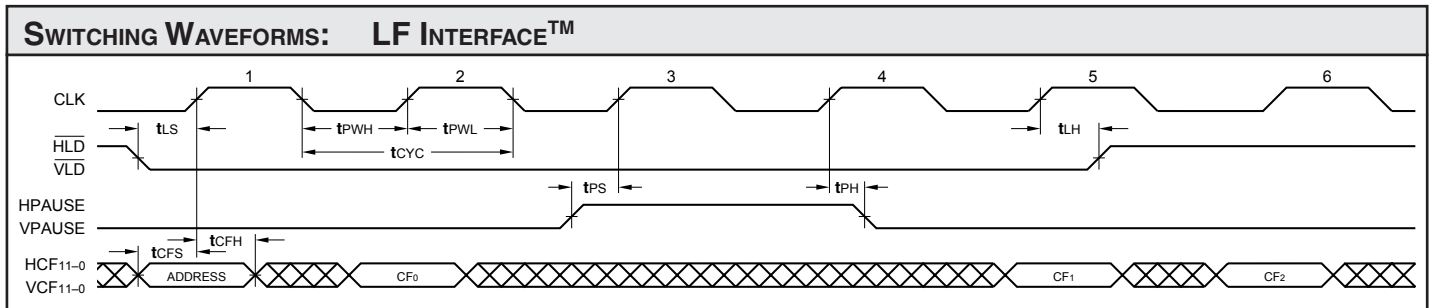


* The 'x' represents both horizontal and vertical signals for each case.

***DISCONTINUED SPEED GRADE**

Horizontal / Vertical Digital Image Filter

COMMERCIAL OPERATING RANGE (0°C to +70°C) Notes 9, 10 (ns)									
Symbol Parameter		LF3310-							
		25*		18*		15		12	
		Min	Max	Min	Max	Min	Max	Min	Max
tCFS	Coefficient Input Setup Time	8		6		5		5	
tCFH	Coefficient Input Hold Time	1		1		1		1.5	
tLS	Load Setup Time	8		6		5		4	
tLH	Load Hold Time	1		1		1		1.5	
tPS	PAUSE Setup Time	8		6		5		4	
tPH	PAUSE Hold Time	1.5		1.5		1.5		1.5	



***DISCONTINUED SPEED GRADE**