

FEATURES

- ❑ 83 MHz Data Rate
- ❑ 12-bit Data and Coefficients
- ❑ On-board Memory for 256 Coefficient Sets
- ❑ LF Interface™ Allows All 256 Coefficient Sets to be Updated Within Vertical Blanking
- ❑ Selectable 16-bit Data Output with User-Defined Rounding and Limiting
- ❑ Seven 3K x 12-bit, Programmable Two-Mode Line Buffers
- ❑ Separate Input Port for Odd and Even Field Filtering
- ❑ 8 Filter Taps
- ❑ Cascadable for More Filter Taps
- ❑ Supports Interleaved Data Streams
- ❑ 3.3 Volt Power Supply
- ❑ 5 Volt Tolerant I/O
- ❑ 100 Lead PQFP

DESCRIPTION

The LF3330 filters digital images in the vertical dimension at real-time video rates. The input and coefficient data are both 12 bits and in two's complement format. The output is also in two's complement format and may be rounded to 16 bits.

The 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.

Multiple LF3330s can be cascaded together to create larger vertical filters.

Due to the length of the line buffers, interleaved data can be fed directly into the device and filtered without separating the data into individual

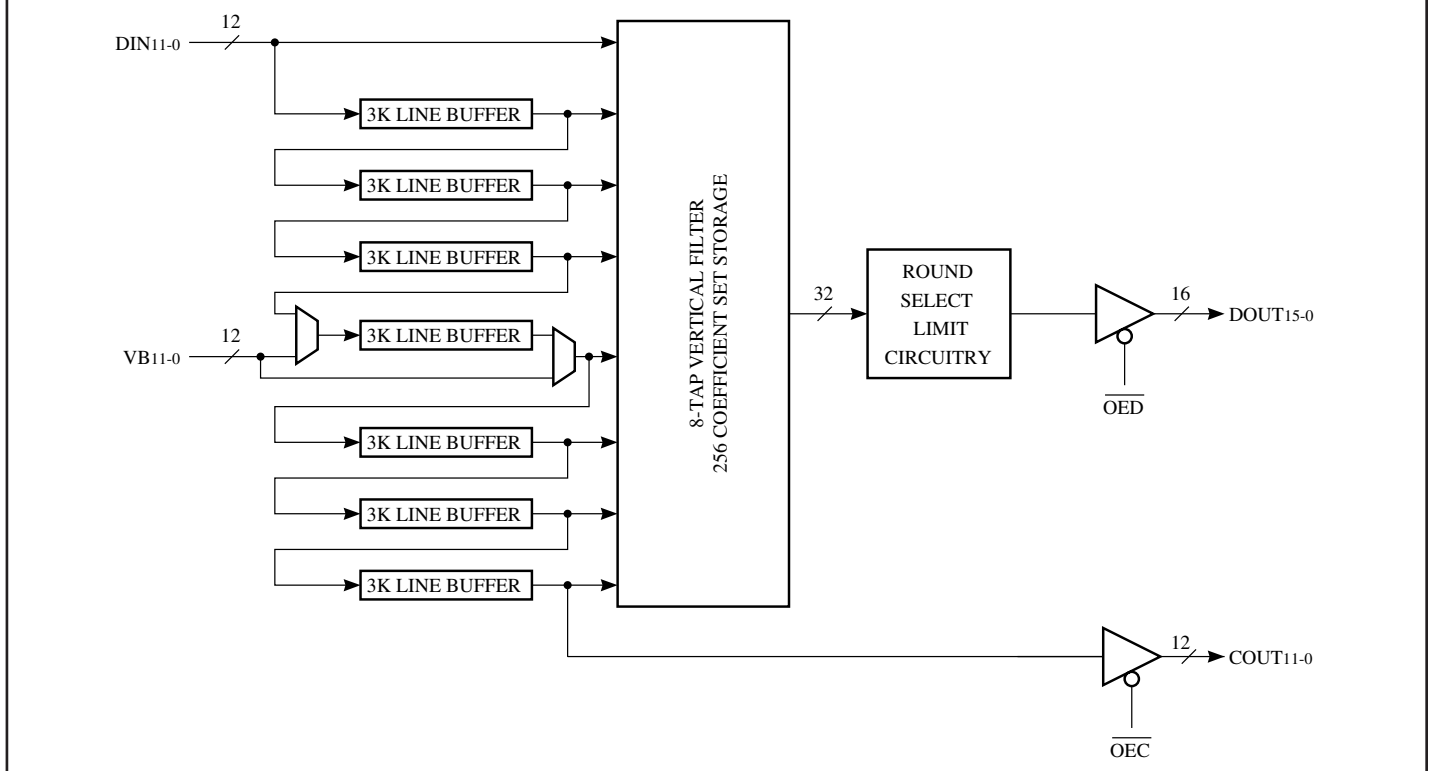
data streams. The number of interleaved data sets that the device can handle is limited only by the length of the on-chip line buffers. If the interleaved video line has 3076 data values or less, the filter can handle it.

The LF3330 contains enough on-board memory to store 256 coefficient sets. The LF Interface™ allows all 256 coefficient sets to be updated within vertical blanking.

Selectable 16-bit data output with user-defined rounding and limiting minimizes the constraints put on coefficient sets for various filter implementations.

SIGNAL DEFINITIONS

LF3330 BLOCK DIAGRAM



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 5.5V
Signal applied to high impedance output	-0.5V to 5.5V
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)			240	mA
I _{CC2}	V _{CC} Current, Quiescent	(Note 7)			1	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

SWITCHING CHARACTERISTICS

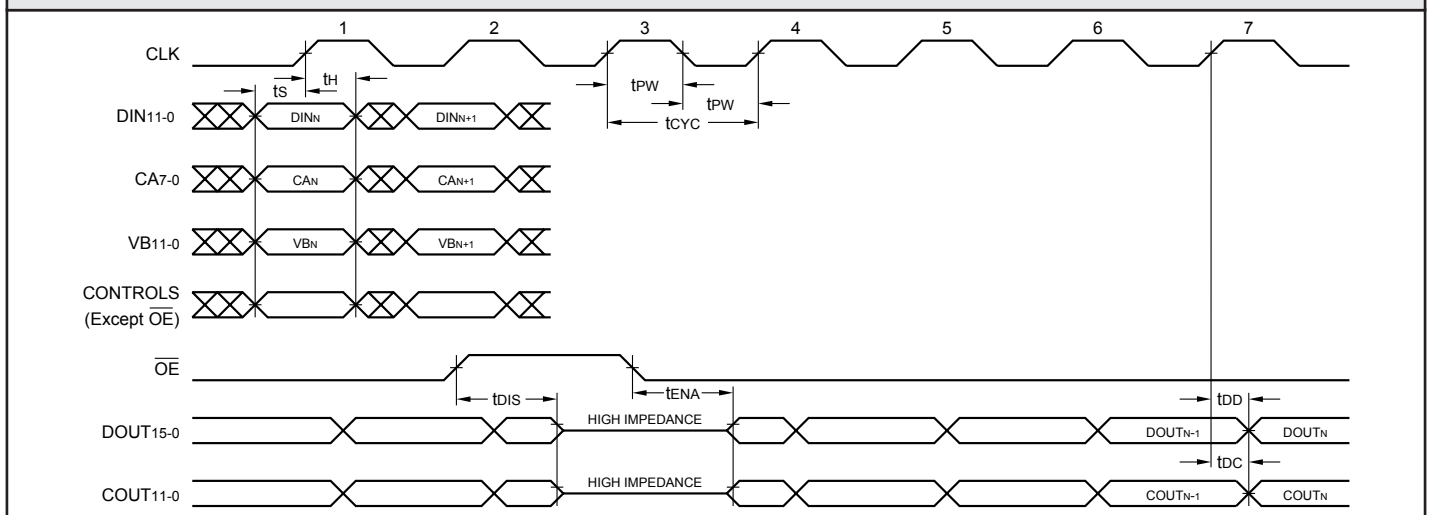
COMMERCIAL OPERATING RANGE (0°C to +70°C) Notes 9, 10 (ns)

Symbol		Parameter		LF3330-							
				25*		18*		15		12	
				Min	Max	Min	Max	Min	Max	Min	Max
t _{CYC}	Clock Cycle Time	25		18		15		12			
t _{PW}	Clock Pulse Width	10		8		7		5			
t _S	Input Setup Time	8		6		5		4			
t _H	Input Hold Time	0.5		0.5		0.5		0.5			
t _{DD}	Data Output Delay		13		9		10		8		
t _{DC}	Cascade Data Output Delay		13		9		10		9		
t _{DIS}	Three-State Output Disable Delay (Note 11)		15		11		12		10		
t _{ENA}	Three-State Output Enable Delay (Note 11)		15		11		12		10		

MILITARY OPERATING RANGE (-55°C to +125°C) Notes 9, 10 (ns)

Symbol		Parameter		LF3330-					
				25*		18*		15*	
				Min	Max	Min	Max	Min	Max
t _{CYC}	Clock Cycle Time	25		18		15			
t _{PW}	Clock Pulse Width	10		8		7			
t _S	Input Setup Time	8		6		5			
t _H	Input Hold Time	0.5		0.5		0.5			
t _{DD}	Data Output Delay		13		9		10		
t _{DC}	Cascade Data Output Delay		13		9		10		
t _{DIS}	Three-State Output Disable Delay (Note 11)		15		11		12		
t _{ENA}	Three-State Output Enable Delay (Note 11)		15		11		12		

SWITCHING WAVEFORMS: DATA I/O

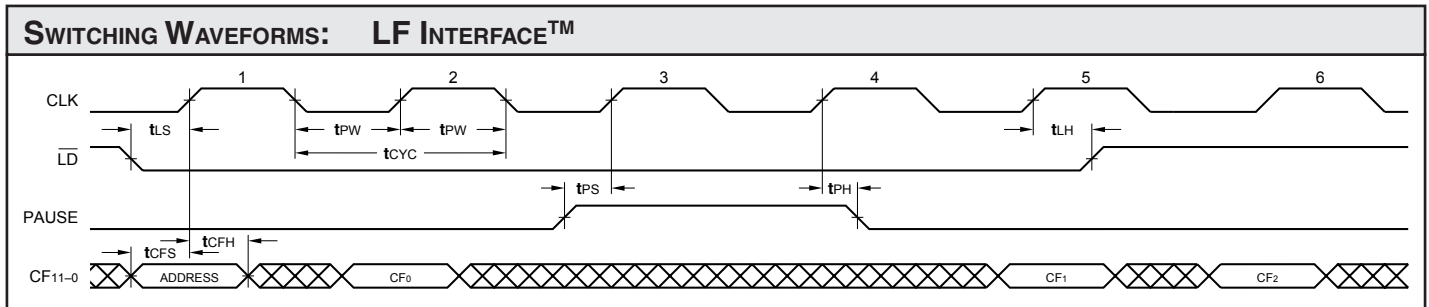


*DISCONTINUED SPEED GRADE

Vertical Digital Image Filter

COMMERCIAL OPERATING RANGE (0°C to +70°C)									
Symbol Parameter		LF3330-							
		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	0		0		0		0	
tLS	Load Setup Time	8		7		6		4	
tLH	Load Hold Time	0		0		0		0	
tPS	PAUSE Setup Time	8		6		5		4	
tPH	PAUSE Hold Time	0.5		0.5		0.5		0.5	

MILITARY OPERATING RANGE (-55°C to +125°C)									
Symbol Parameter		LF3330-							
		25*		18*		15*			
		Min	Max	Min	Max	Min	Max	Min	Max
tCFS	Coefficient Input Setup Time	8		6		5			
tCFH	Coefficient Input Hold Time	0		0		0			
tLS	Load Setup Time	8		7		6			
tLH	Load Hold Time	0		0		0			
tPS	PAUSE Setup Time	8		6		5			
tPH	PAUSE Hold Time	0.5		0.5		0.5			



***DISCONTINUED SPEED GRADE**