

EHRX-0816 8-Input HF Digital Receiver



4DSP PC720



4DSP FMC168

The EHRX-0816 digital receiver is hosted on a 4DSP platform consisting of the PC720 Kintex-7 PCIe card and the FMC168 8-Channel 16-bit ADC board.

Signals presented at the 8 RF inputs can be directed to any of the 64 DDCs present in the digital receiver for multi-channel processing, beam-forming, or any other application requiring multiple RF inputs.

With its 10 MHz reference input, the digital receiver can processing RF signals from 2 MHz to 62 MHz with signal bandwidths from 7 kHz to 1.9 MHz. Boasting an output SNR of at least 115 dB and a typical SFDR of 120 dB, the EHRX-0816 can be used in applications requiring sensitive receivers.

FEATURES

RF Inputs:	8
Digital Downconverters:	64 (decimation 64 to 4096)
NCOs:	16
Environmental:	Convection cooling
Operating Temperature:	0°C to +40°C

APPLICATIONS

- Software defined radio (SDR)
- Beamforming
- Wireless communications
- Test measurement instruments
- Multi-channel digital receivers
- A/D signal processing

SPECIFICATIONS¹

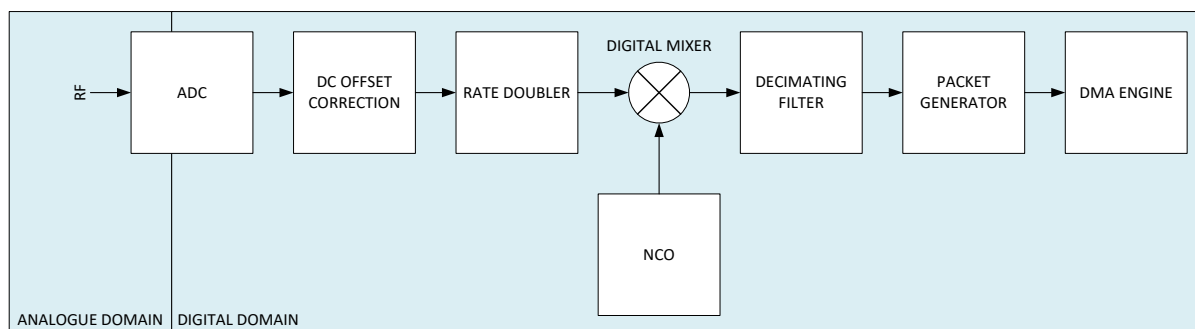
		Model			
		Min	As Configured	Max	Units
Analog Inputs	Number of RF Inputs		8		
	Input Coupling		AC		
	Bandwidth	2		62	MHz
	Max Input Level		+10		dBm
	Input Impedance		50		Ω
	ADC Resolution		16		Bits
	External Clock Reference		10		MHz
	External Clock Level			0	dBm
	Internal Clock, F _{CLK}	30	84	125	MHz
External Trigger Input		LVTTL / LVCMOS			
Digital Outputs	DDCs		64		
	NCOs		16		
	DDC Grouping	4	8	64	per NCO
	DDC Decimation	64	2000	4096	
	Sampling Rate, F _{OUT}	7.324218	42	1953.125	kSamp/sec
Receiver Performance ²	Dynamic Range			108	dB
	Sensitivity		-118		dBm
	SFDR		120		dB
	Noise Figure ³			33.7	dB
	Output SNR		115		dB
	In-Channel IMD3			-97	dBFS
	In-Channel IMD2			-98	dBFS
	Tuning Resolution	0.11	0.31	0.47	Hz
	Passband Ripple			0.025	dB
	Passband Gain		0		dB
	3dB Cutoff		80% x F _{OUT}		kHz
Stopband Attenuation			>140	dB	
Power ⁴	8-Lane PCIe Card			25	W
Connectors	RF Inputs		8 x MMCX		
	Clock Input		1 x MMCX		
	Trigger Input		1 x MMCX		
Environmental	Operating Temperature	0		+40	°C
	Storage Temperature	-50		+125	°C
	Operating Humidity (non-condensing)	0		100	%
	Storage Humidity	0		100	%
	Vibration (10 Hz to 3 kHz)		0.1		g ² /Hz
	Shock			30	G
	Conformal Coat		none		
Physical	Form Factor		Half-length Full-height PCIe		
	Dimensions		205 x 112		mm
	Mass		290		g

¹With typical RF front-end. ²All measurements in 42 kHz complex sampling bandwidth with 84 MHz sampling clock. ³Receiver ADC only with 84 MHz sampling clock. ⁴At full load.

Mil-Std-188-141 A/B/C/D Performance		Min. Pass Threshold	Design Objective	Measured Result ^{1,2}	Units	Test Freq. (MHz)
		3kHz BW / 48kHz BW	3kHz BW / 48kHz BW	3kHz BW / 48kHz BW		
Section 5.4.1.1	Image Rejection	80	100	≥101	dB	2.000 & 29.950
Section 5.4.1.2	IF Rejection	80	100	<i>Not applicable</i>	dB	
Section 5.4.1.3	Adjacent Channel Rejection	60	-	≥100 <i>per digital filter shape</i>	dB	2.000 & 29.950
Section 5.4.1.4	Spurious Rejection ±2.5% to ±30% of carrier	65	-	≥87	dB	14.001 (Ref)
	Spurious Rejection >±30% of carrier	80	-	≥102		
Section 5.4.1.5	Receiver Protection	+43	+53	+10 card only <i>without RF front-end</i>	dBm	
Section 5.4.1.6	Desensitization Dynamic Range	100	-	≥100 @ -2dB SINAD ≥110 @ -20dB SINAD	dB	19.131
Section 5.4.1.7	Sensitivity	-111 / -99	-121 / -109	<i>Not tested @3kHz BW / -82 without LNA</i>	dBm	2.050 & 29.950
Section 5.4.1.8	Out-of-Band IMD	-110 / -98	-	<i>Not tested @3kHz BW / -101</i>	dBm	14.160
Section 5.4.1.9	Third-Order Intercept	+10	-	<i>Not applicable</i>	dBm	
Section 5.4.2.1	Overall IMD	-35	-45	≤ -66	dBc	2.000
Section 5.4.2.2	Adjacent Channel IMD	-35 / -23	-	≤ -67 <i>extrapolated</i>	dBm	5.000
Section 5.4.2.3	Audio Frequency THD	-25	-35	≤ -104	dBc	2.000
Section 5.4.2.4	Internally Generated Spurious Outputs 99% Level	-112 / -100	-	<i>Not tested @3kHz BW / 99.6% ≤ -112 100% ≤ -111 Max. Spur: -111 Typ. Spur: -115</i>	dBm	8.001 (Ref)
	Internally Generated Spurious Outputs 99.8% Level	-106 / -96				
Section 5.4.4	Receiver Linearity	10 to 30	10 to 40	<i>Not tested @3kHz BW / -25 to +80 SINAD -10 to +110 Peak</i>	dB	2.000
Section 5.4.5.1	Input VSWR	≤ 2.5:1	-	≤ 1.5:1	-	2 to 30
Section 5.4.5.2	Output Impedance	600	-	<i>Not applicable</i>	Ω	

¹Measurements made without typical RF front-end. ²All measurements in 60 kHz complex sampling bandwidth (48 kHz signal bandwidth) with 84 MHz sampling clock.

ARCHITECTURE



Each RF input of the EHRX-0816 connects to an analogue-to-digital converter (ADC). The ADC generates digital samples of the RF signal. All digital samples are corrected for DC offsets before being sent through a rate doubler and to the digital mixer. The digital mixer directly down-converts the digital samples to base-band with the tuning frequency being set by the numerically-controlled oscillator (NCO); no intermediate frequency (IF) stage is necessary. The rate doubler and subsequent decimating filter take care of aliasing. A packet generator follows the decimating filter. Its purpose is to condition the digital base-band signal for transfer to a host computer via a direct memory access (DMA) engine. The EHRX-0816 contains 16 NCOs and 64 down-converters. Each NCO is shared by a different group of 4 down-converters.