Summary - E3xx MIMO XCVR Filter

Names	e3xx_mimo_xcvr_filter, e3xx_mimo_xcvr_filter_proxy
Worker Types	Device and Proxy
Version	v1.4
Release Date	Sep 2018
Component Library	ocpi.bsp.e310.cards
Workers	e3xx_mimo_xcvr_filter.hdl, e3xx_mimo_xcvr_filter_proxy.rcc
Tested Platforms	E310 (Vivado only)

Worker Implementation Details

The E3xx MIMO XCVR Filterworkers are used to configure the analogue filter banks and frontend antenna switches for the Ettus E310 radio. A specific filter bank is selected based on the tuned LO frequency for the desired frontend channel. The frontend mode can be set directly to TX/Full Duplex, RX only, or off. Consult the tables in Reference [1], the E310 User Manual, for full details on driver software operation.

Block Diagrams

Top level

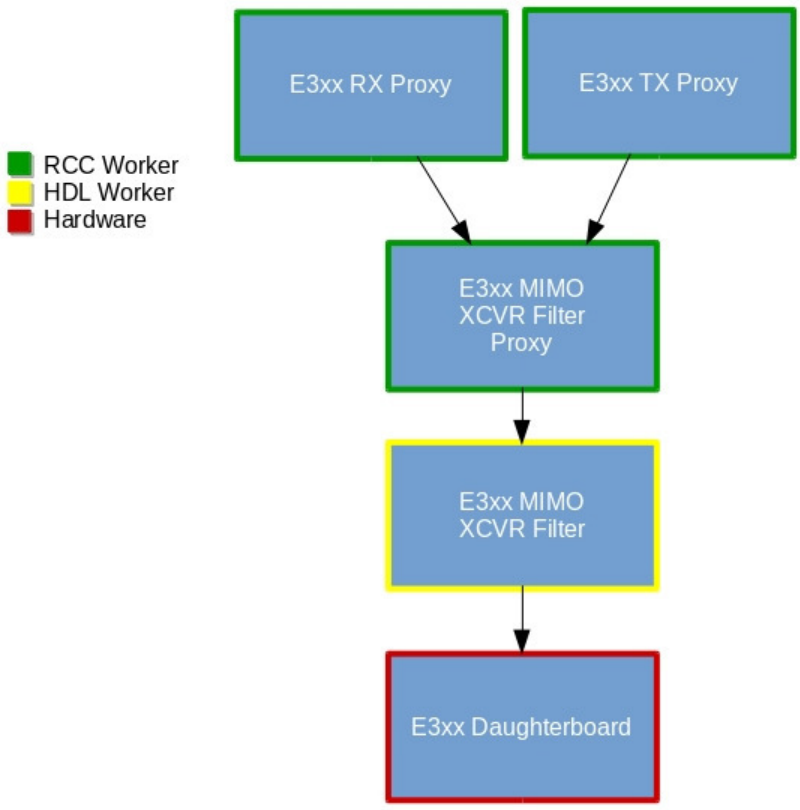

Figure 1: Top level block diagram of where the E3xx MIMO XCVR Filtertypically fit within a design

Consult the E310 schematics in Reference [2] for documentation of the hardware of the E3xx Daugherboard.

Source Dependencies

e3xx_mimo_xcvr_filter.hdl

- hdl/cards/e3xx_mimo_xcvr_filter.hdl/e3xx_mimo_xcvr_filter.vhd

e3xx_mimo_xcvr_filter_proxy.rcc

- hdl/cards/e3xx_mimo_xcvr_filter_proxy.rcc/e3xx_mimo_xcvr_filter_proxy.cc

Component Spec Properties

e3xx_mimo_xcvr_filter.hdl

Name	Type	SequenceLength	ArrayDimensions	Accessibility	Valid Range	Default	Usage
-	-	-	-	-	-	-	-

e3xx_mimo_xcvr_filter_proxy.rcc

Name	Type	SequenceLength	ArrayDimensions	Accessibility	Valid Range	Default	Usage
-	-	-	-	-	-	-	-

Worker Properties

e3xx_mimo_xcvr_filter.hdl

Scope	Name	Type	SequenceLength	ArrayDimensions	Accessibility	Valid Range	Default	Usage
Property	TX_ENABLE1A	bool	-	-	Writable	Standard	-	Control Pin for TXA
Property	TX_ENABLE2A	bool	-	-	Writable	Standard	-	Control Pin for TXA
Property	TX_ENABLE1B	bool	-	-	Writable	Standard	-	Control Pin for TXB
Property	TX_ENABLE2B	bool	-	-	Writable	Standard	-	Control Pin for TXB
Property	VCTXRX1_V1	bool	-	-	Writable	Standard	-	Control Pin for TRXA Switch
Property	VCTXRX1_V2	bool	-	-	Writable	Standard	-	Control Pin for TRXA Switch
Property	VCTXRX2_V1	bool	-	-	Writable	Standard	-	Control Pin for TRXB Switch
Property	VCTXRX2_V2	bool	-	-	Writable	Standard	-	Control Pin for TRXB Switch
Property	VCRX1_V1	bool	-	-	Writable	Standard	-	Control Pin for RXA Switch
Property	VCRX1_V2	bool	-	-	Writable	Standard	-	Control Pin for RXA Switch
Property	VCRX2_V1	bool	-	-	Writable	Standard	-	Control Pin for RXB Switch
Property	VCRX2_V2	bool	-	-	Writable	Standard	-	Control Pin for RXB Switch
Property	TX_BANDSEL	uchar	-	-	Writable	Standard	-	Control Pins for TX filter band selection
Property	RX1_BANDSEL	uchar	-	-	Writable	Standard	-	Control Pins for RXA filter band selection
Property	RX1B_BANDSEL	uchar	-	-	Writable	Standard	-	Control Pins for RXA filter band selection
Property	RX1C_BANDSEL	uchar	-	-	Writable	Standard	-	Control Pins for RXA filter band selection
Property	RX2_BANDSEL	uchar	-	-	Writable	Standard	-	Control Pins for RXB filter band selection
Property	RX2B_BANDSEL	uchar	-	-	Writable	Standard	-	Control Pins for RXB filter band selection
Property	RX2C_BANDSEL	uchar	-	-	Writable	Standard	-	Control Pins for RXB filter band selection
Property	LED_TXRX1_TX	bool	-	-	Writable	Standard	-	LED For TRXA in TX mode
Property	LED_TXRX1_RX	bool	-	-	Writable	Standard	-	LED For TRXA in RX mode
Property	LED_RX1_RX	bool	-	-	Writable	Standard	-	LED For RXA
Property	LED_TXRX2_TX	bool	-	-	Writable	Standard	-	LED For TRXB in TX mode
Property	LED_TXRX2_RX	bool	-	-	Writable	Standard	-	LED For TRXB in RX mode
Property	LED_RX2_RX	bool	-	-	Writable	Standard	-	LED For RXB

e3xx_mimo_xcvr_filter_proxy.rcc

Scope	Name	Type	SequenceLength	ArrayDimensions	Accessibility	Valid Range	Default	Usage
Property	`rx_frequency_MHz`	double	-	-	Writable,Readable,WriteSync	0.7-6000	-	The property is written to notify the proxy worker to update the RX filter bank selection
Property	`tx_frequency_MHz`	double	-	-	Writable,Readable,WriteSync	0.7-6000	-	The property is written to notify the proxy worker to update the TX filter bank selection
Property	`trxa_mode`	enum (tx,rx,off)	-	-	Writable,Readable,WriteSync	Standard	-	The property is written to instruct the proxy worker to configure the TRXA frontend antenna for the specified mode
Property	`rx2a_mode`	enum (rx,off)	-	-	Writable,Readable,WriteSync	Standard	-	The property is written to instruct the proxy worker to configure the RX2A frontend antenna for the specified mode
Property	`trxb_mode`	enum (tx,rx,off)	-	-	Writable,Readable,WriteSync	Standard	-	The property is written to instruct the proxy worker to configure the TRXB frontend antenna for the specified mode
Property	`rx2b_mode`	enum (rx,off)	-	-	Writable,Readable,WriteSync	Standard	-	The property is written to instruct the proxy worker to configure the RX2B frontend antenna for the specified mode

Component Ports

e3xx_mimo_xcvr_filter.hdl

Name	Producer	Protocol	Optional	Advanced	Usage
-	-	-	-	-	-

e3xx_mimo_xcvr_filter_proxy.hdl

Name	Producer	Protocol	Optional	Advanced	Usage
-	-	-	-	-	-

Signals

e3xx_mimo_xcvr_filter.hdl

Name	Type	Width	Description
TX_ENABLE1A	Out	1	Control Pin for TXA
TX_ENABLE2A	Out	1	Control Pin for TXA
TX_ENABLE1B	Out	1	Control Pin for TXB
TX_ENABLE2B	Out	1	Control Pin for TXB
VCTXRX1_V1	Out	1	Control Pin for TRXA Switch
VCTXRX1_V2	Out	1	Control Pin for TRXA Switch
VCTXRX2_V1	Out	1	Control Pin for TRXB Switch
VCTXRX2_V2	Out	1	Control Pin for TRXB Switch
VCRX1_V1	Out	1	Control Pin for RXA Switch
VCRX1_V2	Out	1	Control Pin for RXA Switch
VCRX2_V1	Out	1	Control Pin for RXB Switch
VCRX2_V2	Out	1	Control Pin for RXB Switch
TX_BANDSEL	Out	3	Control Pins for TX filter band selection
RX1_BANSEL	Out	3	Control Pins for RXA filter band selection
RX1B_BANDSEL	Out	2	Control Pins for RXA filter band selection
RX1C_BANDSEL	Out	2	Control Pins for RXA filter band selection
RX2_BANSEL	Out	3	Control Pins for RXB filter band selection
RX2B_BANDSEL	Out	2	Control Pins for RXB filter band selection
RX2C_BANDSEL	Out	2	Control Pins for RXB filter band selection
LED_TRX1_TX	Out	1	LED for TRXA in TX mode
LED_TRX1_RX	Out	1	LED for TRXA in RX mode
LED_RX1_RX	Out	1	LED for RXA
LED_TRX2_TX	Out	1	LED for TRXB in TX mode
LED_TRX2_RX	Out	1	LED for TRXB in RX mode
LED_RX2_RX	Out	1	LED for RXB

Control Timing and Signals

The E3xx MIMO XCVR Filter device worker uses the standard Control Plane signals.

Worker Configuration Parameters

e3xx_mimo_xcvr_filter.hdl

Table 1: Table of Worker Configurations for worker: e3xx_mimo_xcvr_filter

Configuration
0

Performance and Resource Utilization

e3xx_mimo_xcvr_filter.hdl

Table 2: Resource Utilization Table for worker: e3xx_mimo_xcvr_filter

Configuration	OCPI Target	Tool	Version	Device	Registers (Typ)	LUTs (Typ)	Fmax (MHz) (Typ)	Memory/Special Functions
0	zynq	Vivado	2017.1	xc7z020clg400-3	66	75	N/A	N/A

Test and Verification

No unit test for this component exists. However, a hardware-in-the-loop application (which is NOT a unit test) exists for testing purposes (see applications/e3xx_mimo_xcvr_filter_proxy_test).

References

[1] E310 User Manual, `https://files.ettus.com/manual/page_usrp_e3x0.html`.

[2] E310 Hardware Schematics, `https://files.ettus.com/schematics/e310/`.