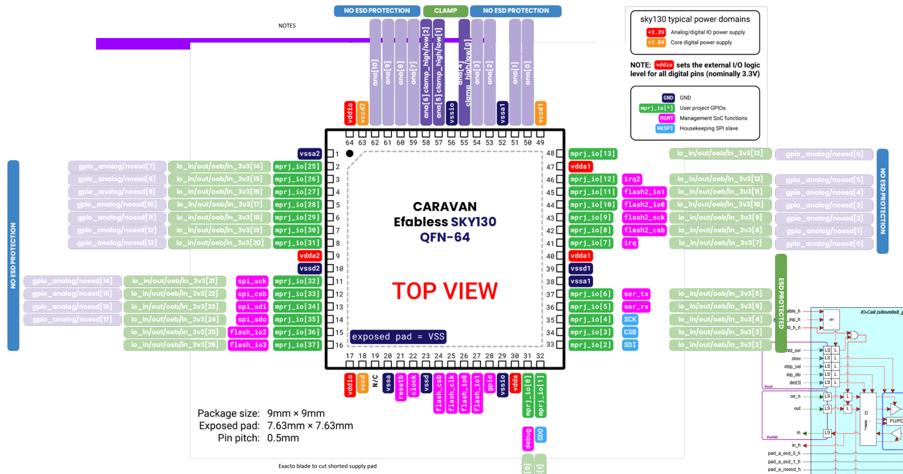
Pad Assign Information

Customer

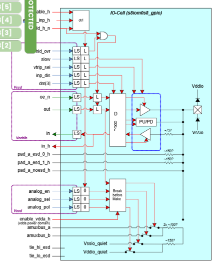
ESD https://skywater-pdk.readthedocs.io/en/main/contents/libraries/sky130_fd_io/docs/user_guide.html

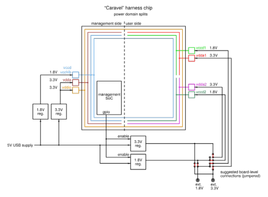
North

PKG Pad	#	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
ESD		NO ESD						CLAMP				NO ESD					
Chip Pad	#																
Pad Choice				NFC-Ana	NFC-Ana	NFC-Ana	NFC-Ana	NFC-Ana	NFC-Ana		NFC-Ana	NFC-Ana	NFC-Ana		NFC-Ana	Wrapper	
efabless I/O pin				mprj_io[24]	mprj_io[23]	mprj_io[22]	mprj_io[21]	mprj_io[20]	mprj_io[19]		mprj_io[18]	mprj_io[17]	mprj_io[16]		mprj_io[15]	mprj_io[14]	
pin type				Analog (out)	Analog (out)	Analog (in)	Analog (in)	Analog (in)	Analog (in)		Analog (out)	Analog (inout)	Analog (inout)		Analog (out)	Analog (in)	
								Clamp High	Clamp High		No						
								Clamp Low	Clamp Low		No						
carvan pin name		vddio	vccd2	io_analog[10]	io_analog[9]	io_analog[8]	io_analog[7]	io_analog[6]	io_analog[5]	vssio	io_analog[4]	io_analog[3]	io_analog[2]	vssa1	io_analog[1]	io_analog[0]	vccd1
Clamp High								clamp_high[2]	clamp_high[1]								
Clamp Low								clamp_low[2]	clamp_low[1]								
NFC Use				NFC_AFE_TDO_EXT (DEMOD, ENC_MTR, ...)	ANA_MUX_OUT_2_EXT	FS_EXT	RESET_EXT	VREF_EXT	VDD_EXT		VRECT_OUT_EXT	ANT_POS_EXT	ANT_NEG_EXT		ANA_MUX_OUT_EXT		
Wrapper Use																clock_uncore	
efabless aux																	
signal choice		vddio	vccd2	_TDO_EXT (DEMOD, ENC_	ANA_MUX_OUT_2_EXT	FS_EXT	RESET_EXT	VREF_EXT	VDD_EXT	vssio	VRECT_OUT_EXT	ANT_POS_EXT	ANT_NEG_EXT	vssa1	ANA_MUX_OUT_EXT	clock_uncore	vccd1
Coordination	X																
	Y																



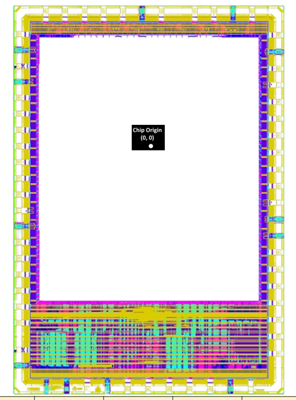
Exacto blade to cut shorted supply pad





West

PKG Pad #	ESD	Chip Pad #	Pad Choice	Pad Choice	pin type	carvan pin name	OEb	NFC Use	Wrapper Use	efabless aux	signal choice	Coordination X	Coordination Y
1	NO ESD RESISTOR. ESD DIODES ONLY		vssa2								vssa2		
2			NFC-Ana	mprj_io[25]	GPIO (in 1v8)	io_in[14]	io_oeb[14]	TRST_EXT			TRST_EXT		
3			NFC-Ana	mprj_io[26]	GPIO (in 1v8)	io_in[15]	io_oeb[15]	TCK_EXT			TCK_EXT		
4			NFC-Ana	mprj_io[27]	GPIO (in 1v8)	io_in[16]	io_oeb[16]	TMS_EXT			TMS_EXT		
5			NFC-Ana	mprj_io[28]	GPIO (in 1v8)	io_in[17]	io_oeb[17]	TDI_EXT			TDI_EXT		
6			NFC-Dig	mprj_io[29]	GPIO (out 3v3)	io_out[18]	io_oeb[18]	tdo			tdo		
7			NFC-Dig	mprj_io[30]	GPIO (in 1v8)	io_in[19]	io_oeb[19]	ext_reset_dig			ext_reset_dig		
8			NFC-Dig	mprj_io[31]	GPIO (in 1v8)	io_in[20]	io_oeb[20]	ext_clk_dig			ext_clk_dig		
9			vdda2								vdda2		
10			vssd2								vssd2		
11			Wrapper	mprj_io[32]	GPIO (out 3v3)	io_out[21]	io_oeb[21]		spi_flash_0_sck	spi_sck	spi_flash_0_sck		
12			Wrapper	mprj_io[33]	GPIO (out 3v3)	io_out[22]	io_oeb[22]		spi_flash_0_cs_0	spi_csb	spi_flash_0_cs_0		
13			Wrapper	mprj_io[34]	GPIO (inout 1v8)	io_in[23]/io_out[23]	io_oeb[23]		spi_flash_0_dq_0	spi_sdi	spi_flash_0_dq_0		
14			Wrapper	mprj_io[35]	GPIO (inout 1v8)	io_in[24]/io_out[24]	io_oeb[24]		spi_flash_0_dq_1	spi_sdo	spi_flash_0_dq_1		
15			Wrapper	mprj_io[36]	GPIO (inout 1v8)	io_in[25]/io_out[25]	io_oeb[25]		spi_flash_0_dq_2	flash_io2	spi_flash_0_dq_2		
16			Wrapper	mprj_io[37]	GPIO (inout 1v8)	io_in[26]/io_out[26]	io_oeb[26]		spi_flash_0_dq_3	flash_io3	spi_flash_0_dq_3		



East

PKG Pad #	ESD	Chip Pad #	Pad Choice	efabless I/O pin	pin type	carvan pin name	OEb	NFC Use	Wrapper Use	efabless aux	signal choice	Coordination X	Coordination Y
48	NO ESD RESISTOR. ESD DIODES ONLY		NFC-Dig	mprj_io[13]	GPIO (out 3v3)	io_out[13]	io_oeb[13]	tdo2			tdo2		
47			vdda1								vdda1		
46			Wrapper	mprj_io[12]	GPIO (inout 1v8)	io_in[12]/io_out[12]	io_oeb[12]		i2c_0_scl	irq2	i2c_0_scl		
45			Wrapper	mprj_io[11]	GPIO (inout 1v8)	io_in[11]/io_out[11]	io_oeb[11]		i2c_0_sda	flash2_io1	i2c_0_sda		
44			Wrapper	mprj_io[10]	GPIO (inout 1v8)	io_in[10]/io_out[10]	io_oeb[10]		gpio_1_0	flash2_io0	gpio_1_0		
43			Wrapper	mprj_io[9]	GPIO (inout 1v8)	io_in[9]/io_out[9]	io_oeb[9]		gpio_0_0	flash2_sck	gpio_0_0		
42			Wrapper	mprj_io[8]	GPIO (inout 1v8)	io_in[8]/io_out[8]	io_oeb[8]		reset_io	flash2_csb	reset_io		
41			Wrapper	mprj_io[7]	GPIO (out 3v3)	io_out[7]	io_oeb[7]		spi_0_sck	irq	spi_0_sck		
40	ESD RESISTOR (~150ohm) + ESD DIODE		vdda1								vdda1		
39			vssd1								vssd1		
38			vssa1								vssa1		
37			Wrapper	mprj_io[6]	GPIO (out 3v3)	io_out[6]	io_oeb[6]		spi_0_cs_0	ser_tx	spi_0_cs_0		
36			Wrapper	mprj_io[5]	GPIO (inout 1v8)	io_in[5]/io_out[5]	io_oeb[5]		spi_0_dq_0	ser_rx	spi_0_dq_0		
35			Wrapper	mprj_io[4]	GPIO (inout 1v8)	io_in[4]/io_out[4]	io_oeb[4]		spi_0_dq_1	SCK	spi_0_dq_1		
34			Wrapper	mprj_io[3]	GPIO (out 3v3)	io_out[3]	io_oeb[3]		jtag_TDO	CSB	jtag_TDO		
33			Wrapper	mprj_io[2]	GPIO (in 1v8)	io_in[2]	io_oeb[2]		jtag_TDI	SDI	jtag_TDI		

ESD PROTECTED

South

PKG Pad	#	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
ESD		ESD RESISTOR (~150ohm) + ESD DIODE															
Chip Pad	#																
Pad Choice						Caravan	Caravan		Caravan	Caravan	Caravan	Caravan	Caravan			Wrapper	Wrapper
efabless I/O pin																mprj_io[0]	mprj_io[1]
pin type																GPIO (in 1v8)	GPIO (in 1v8)
carvan pin name		vddio	vccd		vssa	--	--	vssd	--	--	--	--	--	vssio	vdda	io_in[0]	io_in[1]
OEb																io_oeb[0]	io_oeb[1]
NFC Use																	
Wrapper Use																jtag_TCK	jtag_TMS
efabless aux						resetb	clk		flash_csb	flash_clk	flash_io0	flash_io1	gpio			debug	SDO
signal choice		vddio	vccd		vssa	resetb	clk	vssd	flash_csb	flash_clk	flash_io0	flash_io1	gpio	vssio	vdda	jtag_TCK	jtag_TMS
Coordination	X																
	Y																

Please put chip layout data showing top metal layers.

Side	Design	Pad #	Assigned Signal	Pad						Type	# of ports	Function	Voltage (V)		Voltage Name	Expected Frequency	Location (X)	Location (Y)	Notes:
				Assigned Port	Connection (Analog GDS)	OEb	Connection	Clamp High	Connection	Clamp Low	Connection				External	Core				
	Top	0																	Need to add in more pins or extra continuous monitor ports if needed. One that is suggested is the output muxes to a digital pin so that we can monitor the AFE output while JTAG is in use by the digital team
WEST	vssa2	1	vssa2										0			DC			
	NFC-Ana	2	TRST_EXT	io_in[14]	TRST_EXT	io_oeb[14]				GPIO (in 1v8)	5	JTAG	3.3	1.8					JTAG's reset
	NFC-Ana	3	TCK_EXT	io_in[15]	TCK_EXT	io_oeb[15]				GPIO (in 1v8)	5	JTAG	3.3	1.8		1MHz			JTAG's clock
	NFC-Ana	4	TMS_EXT	io_in[16]	TMS_EXT	io_oeb[16]				GPIO (in 1v8)	5	JTAG	3.3	1.8					JTAG's Test Mode Select
	NFC-Ana	5	TDI_EXT	io_in[17]	TDI_EXT	io_oeb[17]				GPIO (in 1v8)	5	JTAG	3.3	1.8					JTAG's TDI 1
	NFC-Dig	6	tdo	io_out[18]	TDO_EXT	io_oeb[18]				GPIO (out 3v3)	5	JTAG	3.3	1.8					JTAG's TDO 1
	NFC-Dig	7	ext_reset_dig	io_in[19]		io_oeb[19]				GPIO (in 1v8)			1.8	1.8					External reset signal (for digital)
	NFC-Dig	8	ext_clk_dig	io_in[20]		io_oeb[20]				GPIO (in 1v8)			1.8	1.8		4MHz			External carrier frequency clock (for digital)
	vdda2	9	vdda2										3.3						
	vssd2	10	vssd2										0						
	Wrapper	11	spi_flash_0_sck	io_out[21]		io_oeb[21]				GPIO (out 3v3)	6	SPI FLASH	3.3	1.8		10MHz			Wrapper SPI Flash Clock
	Wrapper	12	spi_flash_0_cs_0	io_out[22]		io_oeb[22]				GPIO (out 3v3)	6	SPI FLASH	3.3	1.8					Wrapper SPI Flash Chip Select
	Wrapper	13	spi_flash_0_dq_0	io_in[23]/io_out[23]		io_oeb[23]				GPIO (inout 1v8)	6	SPI FLASH	3.3	1.8					Wrapper SPI Flash DQ 0
	Wrapper	14	spi_flash_0_dq_1	io_in[24]/io_out[24]		io_oeb[24]				GPIO (inout 1v8)	6	SPI FLASH	3.3	1.8					Wrapper SPI Flash DQ 1
	Wrapper	15	spi_flash_0_dq_2	io_in[25]/io_out[25]		io_oeb[25]				GPIO (inout 1v8)	6	SPI FLASH	3.3	1.8					Wrapper SPI Flash DQ 2
	Wrapper	16	spi_flash_0_dq_3	io_in[26]/io_out[26]		io_oeb[26]				GPIO (inout 1v8)	6	SPI FLASH	3.3	1.8					Wrapper SPI Flash DQ 3
SOUTH	vddio	17	vddio										1.8	1.8					
	vccd	18	vccd										1.8	1.8					
	Caravan	19	NC	NC															
	vssa	20	vssa										0						
	Caravan	21	resetb	--															
	Caravan	22	clk	--									???						
	vssd	23	vssd										0						
	Caravan	24	flash_csb	--									???						
	Caravan	25	flash_clk	--									???						
	Caravan	26	flash_io0	--									???						
	Caravan	27	flash_io1	--									???						
	Caravan	28	gpio	--									???						
	vssio	29	vssio										0						
	vdda	30	vdda										3.3	3.3					
	Wrapper	31	jtag_TCK	io_in[0]		io_oeb[0]				GPIO (in 1v8)		JTAG	3.3	1.8		1MHz			Wrapper JTAG clock
	Wrapper	32	jtag_TMS	io_in[1]		io_oeb[1]				GPIO (in 1v8)		JTAG	3.3	1.8					Wrapper JTAG mode select
EAST	Wrapper	33	jtag_TDI	io_in[2]		io_oeb[2]				GPIO (in 1v8)		JTAG	3.3	1.8					Wrapper JTAG TDI
	Wrapper	34	jtag_TDO	io_out[3]		io_oeb[3]				GPIO (out 3v3)		JTAG	3.3	1.8					Wrapper JTAG TDO
	Wrapper	35	spi_0_dq_1	io_in[4]/io_out[4]		io_oeb[4]				GPIO (inout 1v8)		SPI	3.3	1.8					Wrapper SPI Communication Port 0
	Wrapper	36	spi_0_dq_0	io_in[5]/io_out[5]		io_oeb[5]				GPIO (inout 1v8)		SPI	3.3	1.8					Wrapper SPI Communication Port 0
	Wrapper	37	spi_0_cs_0	io_out[6]		io_oeb[6]				GPIO (out 3v3)		SPI	3.3	1.8					Wrapper Chip Select
	vssa1	38	vssa1																
	vssd1	39	vssd1																
	vdda1	40	vdda1		VDDA1														
	Wrapper	41	spi_0_sck	io_out[7]		io_oeb[7]				GPIO (out 3v3)		SPI	3.3	1.8					Wapperr Spi Clock
	Wrapper	42	reset_io	io_in[8]/io_out[8]		io_oeb[8]				GPIO (inout 1v8)		SYS RESET	3.3	1.8					Wrapper Reset
	Wrapper	43	gpio_0_0	io_in[9]/io_out[9]		io_oeb[9]				GPIO (inout 1v8)		SERIAL COM / GPIO	3.3	1.8					GPIO
	Wrapper	44	gpio_1_0	io_in[10]/io_out[10]		io_oeb[10]				GPIO (inout 1v8)		SERIAL COM / GPIO	3.3	1.8					GPIO
	Wrapper	45	i2c_0_sda	io_in[11]/io_out[11]		io_oeb[11]				GPIO (inout 1v8)		I2C	3.3	1.8					I2C
	Wrapper	46	i2c_0_scl	io_in[12]/io_out[12]		io_oeb[12]				GPIO (inout 1v8)		I2C	3.3	1.8					I2C
	vdda1	47	vdda1										3.3	3.3					
	NFC-Dig	48	tdo2	io_out[13]		io_oeb[13]				GPIO (out 3v3)			3.3	1.8					Monitor the state machine state
NORTH	vccd1	49	vccd1		VCCD1								1.8	1.8					
	Wrapper	50	clock_uncore	io_analog[0]						Analog (in)			1.8	1.8		80MHz			Rocketchip clock
	NFC-Ana	51	ANA_MUX_OUT_EXT	io_analog[1]	ANA_MUX_OUT_EXT					Analog (out)									Analog mux output
	vssa1	52	vssa1																
	NFC-Ana	53	ANT_NEG_EXT	io_analog[2]	ANT_NEG_EXT					Analog (inout)									Antenna minus terminal
	NFC-Ana	54	ANT_POS_EXT	io_analog[3]	ANT_POS_EXT					Analog (inout)									Antenna plus terminal
	NFC-Ana	**55**	VRECT_OUT_EXT	io_analog[4]	VRECT_OUT_EXT					Analog (out)									Output of the rectifier for monitoring
	vssio	56	vssio																
	NFC-Ana	57	VDD_EXT	io_analog[5]	VDD_EXT			clamp_high[1]		clamp_low[1]		Analog (in)							External VDD supply
	NFC-Ana	58	VREF_EXT	io_analog[6]	VREF_EXT			clamp_high[2]		clamp_low[2]		Analog (in)			**3.3**					External reference voltage signal to feed into LDO
	NFC-Ana	59	RESET_EXT	io_analog[7]	RESET_EXT							Analog (in)							External reset signal (separate from the explicit digital reset signal)
	NFC-Ana	60	FS_EXT	io_analog[8]	FS_EXT							Analog (in)				847kHz			External subcarrier frequency clock (for AFE)
	NFC-Ana	61	ANA_MUX_OUT_2_EXT	io_analog[9]	ANA_MUX_OUT_2_EXT							Analog (out)							Additional Analog Mux
	NFC-Ana	62	AFE_TDO_EXT (DEMOD, ENC_MTF	io_analog[10]	NFC_AFE_TDO_EXT							Analog (out)				Varies			Additional TDO for AFE
	vccd2	63	vccd2																
	vddio	64	vddio																