Port	Timer 1	EXTIs	Timer 2	EXTIs	Timer1 to Timer 2 signal	Timer 2 to Timer 1 signal	SPI or DIAG0/1	EXTIs	UART A	EXTIs	UART B	EXTIs	CH3/4 Extis
1	TIM1	9,11,13,14	TIM2	0,3,10,11	ITR0	ITR1	SPI2	3,9,14,15	USART1	7,9	UART8	0,1	13,14,10,11
2	TIM3	0,1,4,5	TIM23	0,1,2,3	ITR2	ITR12	SPI4	4,5,6,12	USART3	8,9	USART2	5,6	4,5,2,3
3	TIM8	6,7,8,9	TIM5	3,10,11,12	ITR1	ITR3	SPI3	2,10,11,15	UART5	2,12	USART10	2,3	8,9,11,12
4	TIM4	6,13,14,15	TIM24	11,12,13,14	ITR3	ITR13	SPI5	5,6,8,9	UART9	0,1	UART7	7,8	14,15,13,14

ALL UART B EXTIS are usable when using SPI, a single UART or timers for comms
All Timer 1's have interconnects to Timer 2's (Table 94, Peripheral interconnect matrix details)
All used EXTIs: 0,1,2,3,4,5,6,7,8,9,10,13,14,15
Port 1 and 3 have higher priority UART EXTIs than Port 2 and 4

Scenarios

1. Two large TYPE A cards plugged into ports 1/2 and 3/4.
2. 2x TYPE B cards plugged into port 1 and 3 + 2x TYPE C cards plugged into port 2 and 4
3. 4x TYPE C cards plugged into ports 1-4
4. 4x TYPE D cards plugged into ports 1-4
5. 2x TYPE E cards plugged into ports 2 and 4

Other variations/combinations possible with some signals going to the FPGA instead of the MCU.

TYPE A	1 advanced timer, 1 normal timer, 2x32 bit timers with 4 encoders, 2 SPI + 2 HW NSS, 2 UARTS		
TYPE B	advanced timer, 32 bit timer, 2 encoders, 1 spi, 1 HW NSS, 2 uarts		
TYPE C	normal timer, 32 bit timer, 2 encoders, 1 spi, 1 HW NSS, 2 uarts		
TYPE D	normal timer, 32 bit timer, 2 encoders, 1 spi, 1 HW NSS, 1 uart, 2 exti	2xTMC5160	Encoder signals go to TMC5160
TYPE E	2 uarts, 2 ABN encoders,bit-bash/MDMA 2 pairs of step/dir on spi pins	2xTMC2209	ABN encoder signals on CH1/2/4 or FPGA encoders, use 2nd UART for 2xEXTI (2xDIAG0), FPGA for index.

Remarks

FPGA and MCU share a flash chip. MCU must not drive signals when FPGA boots, SS needs to be correct on boot to tell FPGA how to use the SPI.
Flash is programmed by the MCU.
Flash can be used by the MCU after the FPGA has booted.
Backup FPGA images, configuration data and other stuff can be stored on the flash.
MCU can communicate with FPGA using SPI pins once FPGA is booted, as long as the FPGA implements an SPI peripheral on the same pins.
Need LED on the CDONE signal
Need a second SPI CS pin for the FPGA to be able to address either the flash or the FPGA.
Each card can have a small I2C flash chip for identification purposes.
CDONE used as an input while programming, and as an EXTI afterwards, and can have an LED.

Peripheral/IO	Features	Usage	Pins				Pin numbers	Sorted pin numbers
			CH1	CH2	CH3	CH4		
TIM1	Advanced,Encoder,16bit,DMA,4CH	Port 1 Encoder A/B/N + NSS2	PE9	PE11	PE13	PE14	9,11,13,14	9,11,13,14
TIM2	Encoder,32bit,DMA,4CH	Step/Dir/Step/Dir	PA0	PB3(JTDO	PB10	PB11	0,3,10,11	0,3,10,11
TIM3	Encoder,16bit,DMA,4CH	Port 2 Encoder A/B/N + NSS2	PB4(NJTR	PB5	PB0	PB1	4,5,0,1	0,1,4,5
TIM4	Encoder,16bit,DMA,4CH	Port 4 Encoder A/B/N + NSS2	PB6	PD13	PD14	PD15	6,13,14,15	6,13,14,15
TIM5	Encoder,32bit,DMA,4CH	Step/Dir/Step/Dir	PH10	PH11	PH12	PA3	10,11,12,3	3,10,11,12
TIM6	DMA,DAC	DAC	PA4				4	4
TIM7	DMA,DAC	DAC	PA5				5	5
TIM8	Advanced,Encoder,16bit,DMA,4CH	Port 3 Encoder A/B/N + NSS2	PC6	PC7	PC8	PC9	6,7,8,9	6,7,8,9
TIM12	NoDMA,2CH	Embassy to use no support for TIM6/7/13/14/16/17	NONE	NONE	NONE	NONE		
TIM13	NoDMA,1CH	PWM output 1	PA6	NONE	NONE	NONE	6	6
TIM14	NoDMA,1CH	PWM output 2	NONE	NONE	NONE	NONE		
TIM15	DMA,2CH	Use to drive MDMA to generate 16 step/dir signals on SPI pins	NONE	NONE	NONE	NONE		
TIM16	DMA,1CH		PB8	NONE	NONE	NONE	8	8
TIM17	DMA,1CH	Hardware Pin + 6x PWM controlled outputs using DMA stream on GPIO Port G	PF7	NONE	NONE	NONE	7	7
TIM23	Encoder,32bit,DMA,4CH	Step/Dir/Step/Dir	PF0	PF1	PF2	PF3	0,1,2,3	0,1,2,3
TIM24	Encoder,32bit,DMA,4CH	Step/Dir/Step/Dir	PF11	PF12	PF13	PF14	11,12,13,14	11,12,13,14
DAC1	2CH + EXTI		PA4	PA5	PH9			
			SCK	MISO	MOSI	NSS		
SPI2	Port 1		PD3	PB14	PB15	PB9	3,14,15,9	3,9,14,15
SPI3	Port 2		PC10	PC11	PB2	PA15(JTDI	10,11,2,15	2,10,11,15
SPI4	Port 3		PE12	PE5	PE6	PE4	12,5,6,4	4,5,6,12
SPI5	Port 4		PH6	PF8	PF9	PH5	6,8,9,5	5,6,8,9
Used GPIO ports for SPI			A,B,C,D,E,F,H					
			RX	TX				
USART1		Stepper 1	PB7	PA9			7,9	7,9
USART2		Stepper 2	PD6	PD5			6,5	5,6
USART3		Stepper 3	PD9	PD8			9,8	8,9
UART4		Head communication (RS422, no flow control, pins shared with FDCAN1)	#N/A	#N/A				
UART5		Stepper 4	PD2	PC12			2,12	2,12
USART6			#N/A	#N/A				
UART7		Stepper 6	PE7	PE8			7,8	7,8
UART8		Stepper 7	PE0	PE1			0,1	0,1
UART9		Stepper 5	PG0	PG1			0,1	0,1
USART10		Stepper 8	PE2	PE3			2,3	2,3
			RX	TX				
FDCAN1		Head and Port communications	PD0	PH13				
FDCAN2			#N/A	#N/A				
FDCAN3		Feeder communications	PG10	PG9				
			SDA	SCL				
I2C1			#N/A	#N/A				
I2C2			#N/A	#N/A				
I2C3			PH8	PH7				
I2C4			#N/A	#N/A				

			P1_DQS	P1_CLK	P2_NCLK	P2_CLK	P1_IO0	P1_IO1	P1_IO2	P1_IO3	P1_IO4	P1_IO5	P1_IO6	P1_IO7
OCTOSPIM	FPGA	Second communication channel to FPGA, can be memory mapped	#N/A	PF10	#N/A	#N/A	PD11	PD12	PC2	PF6	#N/A	#N/A	#N/A	#N/A
EXTI0		UART8_RX	PE0											
EXTI1		UART8_TX	PE1											
EXTI2		USART10_RX	PE2											
EXTI3		USART10_TX	PE3											
EXTI4		EXTI4_EMERGENCY_STOP	PH4											
EXTI5		USART2_TX	PD5											
EXTI6		USART2_RX	PD6											
EXTI7		UART7_RX	PE7											
EXTI8		UART7_TX	PE8											
EXTI9		EXTI9_DAC	PH9											
EXTI10		EXTI10_STEPPERS	PD10											
EXTI11														
EXTI12														
EXTI13		EXTI13_WIFI	PC13											
EXTI14		EXTI14_FPGA_CDONE	PH14											
EXTI15		EXTI15_FPGA	PE15											
EXTI0,EXTI1,EXTI2,E	0,1,2,3,4,5,6,7,8,9,10,13,14,15													
DIGITAL_IN_1		Drag pin limit	PC0											
DIGITAL_IN_2		Y endstop	PH2											
DIGITAL_IN_3		X endstop	PH3											
DIGITAL_IN_4		Z cam endstop/center	PC3											
ANALOG_IN_1	ADC1_INP0	Spare - Use for Analog MUX output 1	PA1_C											
ANALOG_IN_2	ADC1_INP1	Spare - Use for Analog MUX output 2	PA0_C											
ANALOG_IN_3	ADC3_INP0	Vacuum sense 1	PC2_C											
ANALOG_IN_4	ADC3_INP1	Vacuum sense 2	PC3_C											
PWM_OUT_A1	DMA STREAM 1	Drag pin	PG2											
PWM_OUT_A2	DMA STREAM 1	Head down light	PG3											
PWM_OUT_A3	DMA STREAM 1	Vacuum switch 1	PG4											
PWM_OUT_A4	DMA STREAM 1	Vacuum switch 1	PG5											
PWM_OUT_B1	DMA STREAM 1	Work light	PA6											
PWM_OUT_B2	DMA STREAM 1	Up light	#N/A											
PWM_OUT_C1	TIM13_CH1	Vacuum pump	PF7											
PWM_OUT_D1	TIM17_CH1	Blow pump	PB8											
LED		Can be PWM driven via DMA too	#N/A											
			DM	DP	ID									
USB_OTG_HS			PA11	PA12	PA10									

Pin	Signal	GPIO Output level	Mode	Pu/Pd	Speed	Fast mode	Label
PA0	TIM2_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PA1	ETH_REF_CLK	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PA1_C	ADC1_INP1	n/a	Analog mode	No pull-up and no pull-down	n/a	n/a	ANALOG_IN_1
PA2	ETH_MDIO	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PA3	TIM5_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PA4	DAC1_OUT1	n/a	Analog mode	No pull-up and no pull-down	n/a	n/a	
PA5	DAC1_OUT2	n/a	Analog mode	No pull-up and no pull-down	n/a	n/a	
PA6	TIM13_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_B1
PA7	ETH_CRS_DV	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PA8	RCC_MCO_1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PA9	USART1_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PA10	USB_OTG_HS_ID	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PA11	USB_OTG_HS_DM	n/a	n/a	n/a	n/a	n/a	
PA12	USB_OTG_HS_DP	n/a	n/a	n/a	n/a	n/a	
PA13(JTMS/SWDIO)	DEBUG_JTMS-SWDIO	n/a	n/a	n/a	n/a	n/a	
PA14(JTCK/SWCLK)	DEBUG_JTCK-SWCLK	n/a	n/a	n/a	n/a	n/a	
PA15(JTDI)	SPI3_NSS	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PA0_C	ADC1_INP0	n/a	Analog mode	No pull-up and no pull-down	n/a	n/a	ANALOG_IN_2
PB0	TIM3_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB1	TIM3_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB2	SPI3_MOSI	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB3(JTDO/TRACESWO)	TIM2_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB4(NJTRST)	TIM3_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB5	TIM3_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB6	TIM4_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	Disable	
PB7	USART1_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	Disable	
PB8	TIM16_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	Disable	PWM_OUT_D1
PB9	SPI2_NSS	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	Disable	
PB10	TIM2_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB11	TIM2_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB12	ETH_TXD0	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PB13	ETH_TXD1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PB14	SPI2_MISO	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PB15	SPI2_MOSI	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC0	n/a	n/a	Input mode	No pull-up and no pull-down	n/a	n/a	DIGITAL_IN_1
PC1	ETH_MDC	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PC2	OCTOSPIM_P1_IO2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Very High	n/a	
PC2_C	ADC3_INP0	n/a	Analog mode	No pull-up and no pull-down	n/a	n/a	ANALOG_IN_3
PC3	n/a	n/a	Input mode	No pull-up and no pull-down	n/a	n/a	DIGITAL_IN_4
PC3_C	ADC3_INP1	n/a	Analog mode	No pull-up and no pull-down	n/a	n/a	ANALOG_IN_4
PC4	ETH_RXD0	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PC5	ETH_RXD1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PC6	TIM8_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC7	TIM8_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC8	TIM8_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC9	TIM8_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC10	SPI3_SCK	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC11	SPI3_MISO	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC12	UART5_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PC13	n/a	n/a	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	n/a	EXTI13_WIFI
PC14-OSC32_IN	RCC_OSC32_IN	n/a	n/a	n/a	n/a	n/a	
PC15-OSC32_OUT	RCC_OSC32_OUT	n/a	n/a	n/a	n/a	n/a	
PD0	FDCAN1_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD1	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	FPGA_CRESET_B
PD2	UART5_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD3	SPI2_SCK	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD4	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	SPI6_FLASH_CS
PD5	USART2_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD6	USART2_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD7	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	SPI6_FPGA_CS
PD8	USART3_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD9	USART3_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD10	n/a	n/a	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	n/a	EXTI10_STEPPERS
PD11	OCTOSPIM_P1_IO0	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Very High	n/a	
PD12	OCTOSPIM_P1_IO1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Very High	n/a	
PD13	TIM4_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD14	TIM4_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PD15	TIM4_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE0	UART8_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE1	UART8_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE2	USART10_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE3	USART10_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE4	SPI4_NSS	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE5	SPI4_MISO	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE6	SPI4_MOSI	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE7	UART7_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE8	UART7_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE9	TIM1_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE10	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	SPI3_NSS_2
PE11	TIM1_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE12	SPI4_SCK	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE13	TIM1_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE14	TIM1_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PE15	n/a	n/a	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	n/a	EXTI15_FPGA
PF0	TIM23_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	n/a	n/a	
PF1	TIM23_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF2	TIM23_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF3	TIM23_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF4	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	SPI2_NSS_2
PF5	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	SPI5_NSS_2
PF6	OCTOSPIM_P1_IO3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Very High	n/a	
PF7	TIM17_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_C1

PF8	SPI5_MISO	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF9	SPI5_MOSI	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF10	OCTOSPIM_P1_CLK	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Very High	n/a	
PF11	TIM24_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	n/a	n/a	
PF12	TIM24_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF13	TIM24_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF14	TIM24_CH4	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PF15	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	SPI4_NSS_2
PG0	UART9_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PG1	UART9_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PG2	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_A1
PG3	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_A2
PG4	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_A3
PG5	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_A4
PG6	OCTOSPIM_P1_NCS	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Very High	n/a	
PG7	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_A5
PG8	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	PWM_OUT_A6
PG9	FDCAN3_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PG10	FDCAN3_RX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PG11	ETH_TX_EN	n/a	Alternate Function Push Pull	No pull-up and no pull-down	High	n/a	
PG12	SPI6_MISO	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PG13	SPI6_SCK	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PG14	SPI6_MOSI	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PG15	n/a	Low	Output Push Pull	No pull-up and no pull-down	Low	n/a	SPI6_WIFI_CS
PH0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	n/a	n/a	
PH1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	n/a	n/a	
PH2	n/a	n/a	Input mode	No pull-up and no pull-down	n/a	n/a	DIGITAL_IN_2
PH3	n/a	n/a	Input mode	No pull-up and no pull-down	n/a	n/a	DIGITAL_IN_3
PH4	n/a	n/a	Input mode	No pull-up and no pull-down	n/a	n/a	EXTI4_EMERGENCY_STOP
PH5	SPI5_NSS	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PH6	SPI5_SCK	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PH7	I2C3_SCL	n/a	Alternate Function Open Drain	No pull-up and no pull-down	Low	n/a	
PH8	I2C3_SDA	n/a	Alternate Function Open Drain	No pull-up and no pull-down	Low	n/a	
PH9	n/a	n/a	Input mode	No pull-up and no pull-down	n/a	n/a	EXTI9_DAC
PH10	TIM5_CH1	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PH11	TIM5_CH2	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PH12	TIM5_CH3	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PH13	FDCAN1_TX	n/a	Alternate Function Push Pull	No pull-up and no pull-down	Low	n/a	
PH14	n/a	n/a	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	n/a	EXTI14_FPGA_CDONE
PH15	n/a	n/a	Input mode	No pull-up and no pull-down	n/a	n/a	

References

PCI-E Connector pinout, with handy card diagrams	https://pinoutguide.com/Slots/pci_express_pinout.shtml
Wikipedia page	https://en.wikipedia.org/wiki/PCI_Express

PRESENT_1 should be routed to PRESENT_2 on the card itself - to check for proper insertion before using the card.
Each card has SWO/SWD/RESET signals for programming via the FPGA, or for 3x GPIOs

A=Solder(Bottom) B=Component Side(Top)

Expansion	Signal	Offset	Side	Routed to	Notes	Usage 1	Usage 2	Usage 3	On FPGA signal list
1	PRESENT_1	1	A	FPGA					YES
2	24v	1	B		Main power pins				N/A
3	24v	2	A		Main power pins				N/A
4	24v	2	B		Main power pins				N/A
5	24v	3	A		Main power pins				N/A
6	24v	3	B		Main power pins				N/A
7	GND	4	A						N/A
8	GND	4	B						N/A
9	USB+	5	A	USB_HUB	Differential pair				N/A
10	SWO	5	B	FPGA		Programming	GPIO		YES
11	USB-	6	A	USB_HUB	Differential pair				N/A
12	SWD	6	B	FPGA		Programming	GPIO		YES
13	CAN+	7	A	CAN_TRANCEIVER	Differential pair				N/A
14	GND	7	B						N/A
15	CAN-	8	A	CAN_TRANCEIVER	Differential pair				N/A
16	3v3	8	B						N/A
17	3v3	9	A						N/A
18	PROG_RESET	9	B	FPGA, for NRESET on any MCU on the card		Programming	GPIO		YES
19	3v3	10	A						N/A
20	3v3	10	B						N/A
21	MCU_NRESET	11	A	MCU					N/A
22	WAKE	11	B	FPGA		MCU on card to signal FPGA			YES
23	GND	12	A						N/A
24	CLK	12	B	MCU MCO					N/A
25	ANALOG_MUX_IN_1	13	A	TMUX1309_S0B					N/A
26	ANALOG_MUX_IN_2	13	B	TMUX1309_S1B					N/A
27	ANALOG_MUX_IN_3	14	A	TMUX1309_S2B					N/A
28	ANALOG_MUX_IN_4	14	B	TMUX1309_S3B					N/A
29	I2C_SCL	15	A	MCU, via I2C 4:1 I2C Bus Switch		Small I2C flash for identification	Other I2C devices		N/A
30	GND	15	B						N/A
31	I2C_SDA	16	A	MCU, via I2C 4:1 I2C Bus Switch		Small I2C flash for identification	Other I2C devices		N/A
32	SPI_HW_NSS_1	16	B	MCU		SPI	GPIO		N/A
33	SPI_SW_NSS_2	17	A	MCU		SPI	STEP_1		N/A
34	GND	17	B						N/A
35	SPI_MISO	18	A	MCU		SPI	DIR_1		N/A
36	SPI_SCK	18	B	MCU		SPI	DIR_2		N/A
37	SPI_MOSI	19	A	MCU		SPI	STEP_2		N/A
38	UART_1_RX	19	B			UART RX			N/A
39	GND	20	A						N/A
40	UART_1_TX	20	B	MCU		UART TX			N/A
41	UART_2_RX	21	A	MCU		UART RX	EXTI		N/A
42	GND	21	B	MCU					N/A
43	UART_2_TX	22	A	MCU		UART TX	EXTI		N/A
44	TIMER1_CH1	22	B	MCU via FPGA MUX		16bit Timer CH1	ENCODER1_A	GPIO	YES
45	TIMER2_CH1	23	A	MCU via FPGA MUX		32bit Timer CH1	ENCODER2_A	GPIO	YES
46	TIMER1_CH2	23	B	MCU via FPGA MUX		16bit Timer CH2	ENCODER1_B	GPIO	YES
47	TIMER2_CH2	24	A	MCU via FPGA MUX		32bit Timer CH2	ENCODER2_B	GPIO	YES
48	TIMER1_CH3	24	B	MCU via FPGA MUX		16bit Timer CH3	ENCODER1_N	GPIO	YES
49	TIMER2_CH3	25	A	MCU via FPGA MUX		32bit Timer CH3	ENCODER2_N	GPIO	YES
50	TIMER1_CH4	25	B	MCU via FPGA MUX		16bit Timer CH4		GPIO	YES
51	TIMER2_CH4	26	A	MCU via FPGA MUX		32bit Timer CH4		GPIO	YES
52	GND	26	B						N/A
53	DIAG_0_A	27	A	FPGA		STEPPER 1 DIAG0			YES
54	DIAG_1_A	27	B	FPGA		STEPPER 1 DIAG1	STEPPER 1 INDEX		YES
55	DIAG_0_B	28	A	FPGA		STEPPER 2 DIAG0			YES
56	DIAG_1_B	28	B	FPGA		STEPPER 2 DIAG1	STEPPER 2 INDEX		YES
57	GND	29	A						N/A
58	ENCODER1_A	29	B	FPGA		Encoder 1	GPIO	EXTI	YES
59	ENCODER2_A	30	A	FPGA		Encoder 2	GPIO	EXTI	YES
60	ENCODER1_B	30	B	FPGA		Encoder 1	GPIO	EXTI	YES
61	ENCODER2_B	31	A	FPGA		Encoder 2	GPIO	EXTI	YES
62	ENCODER1_N	31	B	FPGA		Encoder 1	GPIO	EXTI	YES
63	ENCODER2_N	32	A	FPGA		Encoder 2	GPIO	EXTI	YES
64	PRESENT_2	32	B	FPGA					YES

Signal #	FPGA signals	Routed To	Port	Function	Column1	Column2	Column3
1	WAKE_PORT1	WAKE	PORT1	Peripheral Interrupt Signal			
2	WAKE_PORT2	WAKE	PORT2	Peripheral Interrupt Signal			
3	WAKE_PORT3	WAKE	PORT3	Peripheral Interrupt Signal			
4	WAKE_PORT4	WAKE	PORT4	Peripheral Interrupt Signal			
5	ENCODER1_A_PORT1	ENCODER1_A	PORT1	Encoder 1			
6	ENCODER1_B_PORT1	ENCODER1_B	PORT1	Encoder 1			
7	ENCODER1_N_PORT1	ENCODER1_N	PORT1	Encoder 1			
8	ENCODER2_A_PORT1	ENCODER2_A	PORT1	Encoder 2			
9	ENCODER2_B_PORT1	ENCODER2_B	PORT1	Encoder 2			
10	ENCODER2_N_PORT1	ENCODER2_N	PORT1	Encoder 2			
11	ENCODER1_A_PORT2	ENCODER1_A	PORT2	Encoder 3			
12	ENCODER1_B_PORT2	ENCODER1_B	PORT2	Encoder 3			
13	ENCODER1_N_PORT2	ENCODER1_N	PORT2	Encoder 3			
14	ENCODER2_A_PORT2	ENCODER2_A	PORT2	Encoder 4			
15	ENCODER2_B_PORT2	ENCODER2_B	PORT2	Encoder 4			
16	ENCODER2_N_PORT2	ENCODER2_N	PORT2	Encoder 4			
17	ENCODER1_A_PORT3	ENCODER1_A	PORT3	Encoder 5			
18	ENCODER1_B_PORT3	ENCODER1_B	PORT3	Encoder 5			
19	ENCODER1_N_PORT3	ENCODER1_N	PORT3	Encoder 5			
20	ENCODER2_A_PORT3	ENCODER2_A	PORT3	Encoder 6			
21	ENCODER2_B_PORT3	ENCODER2_B	PORT3	Encoder 6			
22	ENCODER2_N_PORT3	ENCODER2_N	PORT3	Encoder 6			
23	ENCODER1_A_PORT4	ENCODER1_A	PORT4	Encoder 7			
24	ENCODER1_B_PORT4	ENCODER1_B	PORT4	Encoder 7			
25	ENCODER1_N_PORT4	ENCODER1_N	PORT4	Encoder 7			
26	ENCODER2_A_PORT4	ENCODER2_A	PORT4	Encoder 8			
27	ENCODER2_B_PORT4	ENCODER2_B	PORT4	Encoder 8			
28	ENCODER2_N_PORT4	ENCODER2_N	PORT4	Encoder 8			
29	TIMER1_CH1_IN_PORT1	TIMER1_CH1_IN	PORT1	GPIO Mux	MUX Input 0		
30	TIMER1_CH1_OUT_PORT1	TIMER1_CH1_OUT	PORT1	GPIO Mux	MUX Output 0		
31	TIMER1_CH2_IN_PORT1	TIMER1_CH2_IN	PORT1	GPIO Mux	MUX Input 1		
32	TIMER1_CH2_OUT_PORT1	TIMER1_CH2_OUT	PORT1	GPIO Mux	MUX Output 1		
33	TIMER1_CH2_IN_PORT1	TIMER1_CH2_IN	PORT1	GPIO Mux	MUX Input 2		
34	TIMER1_CH2_OUT_PORT1	TIMER1_CH2_OUT	PORT1	GPIO Mux	MUX Output 2		
35	TIMER1_CH2_IN_PORT1	TIMER1_CH2_IN	PORT1	GPIO Mux	MUX Input 3		
36	TIMER1_CH2_OUT_PORT1	TIMER1_CH2_OUT	PORT1	GPIO Mux	MUX Output 3		
37	TIMER2_CH1_IN_PORT1	TIMER2_CH1_IN	PORT1	GPIO Mux	MUX Input 4		
38	TIMER2_CH1_OUT_PORT1	TIMER2_CH1_OUT	PORT1	GPIO Mux	MUX Output 4		
39	TIMER2_CH2_IN_PORT1	TIMER2_CH2_IN	PORT1	GPIO Mux	MUX Input 5		
40	TIMER2_CH2_OUT_PORT1	TIMER2_CH2_OUT	PORT1	GPIO Mux	MUX Output 5		
41	TIMER2_CH2_IN_PORT1	TIMER2_CH2_IN	PORT1	GPIO Mux	MUX Input 6		
42	TIMER2_CH2_OUT_PORT1	TIMER2_CH2_OUT	PORT1	GPIO Mux	MUX Output 6		
43	TIMER2_CH2_IN_PORT1	TIMER2_CH2_IN	PORT1	GPIO Mux	MUX Input 7		
44	TIMER2_CH2_OUT_PORT1	TIMER2_CH2_OUT	PORT1	GPIO Mux	MUX Output 7		
45	TIMER1_CH1_IN_PORT2	TIMER1_CH1_IN	PORT2	GPIO Mux	MUX Input 8		
46	TIMER1_CH1_OUT_PORT2	TIMER1_CH1_OUT	PORT2	GPIO Mux	MUX Output 8		
47	TIMER1_CH2_IN_PORT2	TIMER1_CH2_IN	PORT2	GPIO Mux	MUX Input 9		
48	TIMER1_CH2_OUT_PORT2	TIMER1_CH2_OUT	PORT2	GPIO Mux	MUX Output 9		
49	TIMER1_CH2_IN_PORT2	TIMER1_CH2_IN	PORT2	GPIO Mux	MUX Input 10		
50	TIMER1_CH2_OUT_PORT2	TIMER1_CH2_OUT	PORT2	GPIO Mux	MUX Output 10		
51	TIMER1_CH2_IN_PORT2	TIMER1_CH2_IN	PORT2	GPIO Mux	MUX Input 11		
52	TIMER1_CH2_OUT_PORT2	TIMER1_CH2_OUT	PORT2	GPIO Mux	MUX Output 11		
53	TIMER2_CH1_IN_PORT2	TIMER2_CH1_IN	PORT2	GPIO Mux	MUX Input 12		
54	TIMER2_CH1_OUT_PORT2	TIMER2_CH1_OUT	PORT2	GPIO Mux	MUX Output 12		
55	TIMER2_CH2_IN_PORT2	TIMER2_CH2_IN	PORT2	GPIO Mux	MUX Input 13		
56	TIMER2_CH2_OUT_PORT2	TIMER2_CH2_OUT	PORT2	GPIO Mux	MUX Output 13		
57	TIMER2_CH2_IN_PORT2	TIMER2_CH2_IN	PORT2	GPIO Mux	MUX Input 14		
58	TIMER2_CH2_OUT_PORT2	TIMER2_CH2_OUT	PORT2	GPIO Mux	MUX Output 14		
59	TIMER2_CH2_IN_PORT2	TIMER2_CH2_IN	PORT2	GPIO Mux	MUX Input 15		
60	TIMER2_CH2_OUT_PORT2	TIMER2_CH2_OUT	PORT2	GPIO Mux	MUX Output 15		
61	TIMER1_CH1_IN_PORT3	TIMER1_CH1_IN	PORT3	GPIO Mux	MUX Input 16		
62	TIMER1_CH1_OUT_PORT3	TIMER1_CH1_OUT	PORT3	GPIO Mux	MUX Output 16		
63	TIMER1_CH2_IN_PORT3	TIMER1_CH2_IN	PORT3	GPIO Mux	MUX Input 17		

64	TIMER1_CH2_OUT_PORT3	TIMER1_CH2_OUT	PORT3	GPIO Mux	MUX Output 17
65	TIMER1_CH2_IN_PORT3	TIMER1_CH2_IN	PORT3	GPIO Mux	MUX Input 18
66	TIMER1_CH2_OUT_PORT3	TIMER1_CH2_OUT	PORT3	GPIO Mux	MUX Output 18
67	TIMER1_CH2_IN_PORT3	TIMER1_CH2_IN	PORT3	GPIO Mux	MUX Input 19
68	TIMER1_CH2_OUT_PORT3	TIMER1_CH2_OUT	PORT3	GPIO Mux	MUX Output 19
69	TIMER2_CH1_IN_PORT3	TIMER2_CH1_IN	PORT3	GPIO Mux	MUX Input 20
70	TIMER2_CH1_OUT_PORT3	TIMER2_CH1_OUT	PORT3	GPIO Mux	MUX Output 20
71	TIMER2_CH2_IN_PORT3	TIMER2_CH2_IN	PORT3	GPIO Mux	MUX Input 21
72	TIMER2_CH2_OUT_PORT3	TIMER2_CH2_OUT	PORT3	GPIO Mux	MUX Output 21
73	TIMER2_CH2_IN_PORT3	TIMER2_CH2_IN	PORT3	GPIO Mux	MUX Input 22
74	TIMER2_CH2_OUT_PORT3	TIMER2_CH2_OUT	PORT3	GPIO Mux	MUX Output 22
75	TIMER2_CH2_IN_PORT3	TIMER2_CH2_IN	PORT3	GPIO Mux	MUX Input 23
76	TIMER2_CH2_OUT_PORT3	TIMER2_CH2_OUT	PORT3	GPIO Mux	MUX Output 23
77	TIMER1_CH1_IN_PORT4	TIMER1_CH1_IN	PORT4	GPIO Mux	MUX Input 24
78	TIMER1_CH1_OUT_PORT4	TIMER1_CH1_OUT	PORT4	GPIO Mux	MUX Output 24
79	TIMER1_CH2_IN_PORT4	TIMER1_CH2_IN	PORT4	GPIO Mux	MUX Input 25
80	TIMER1_CH2_OUT_PORT4	TIMER1_CH2_OUT	PORT4	GPIO Mux	MUX Output 25
81	TIMER1_CH2_IN_PORT4	TIMER1_CH2_IN	PORT4	GPIO Mux	MUX Input 26
82	TIMER1_CH2_OUT_PORT4	TIMER1_CH2_OUT	PORT4	GPIO Mux	MUX Output 26
83	TIMER1_CH2_IN_PORT4	TIMER1_CH2_IN	PORT4	GPIO Mux	MUX Input 27
84	TIMER1_CH2_OUT_PORT4	TIMER1_CH2_OUT	PORT4	GPIO Mux	MUX Output 27
85	TIMER2_CH1_IN_PORT4	TIMER2_CH1_IN	PORT4	GPIO Mux	MUX Input 28
86	TIMER2_CH1_OUT_PORT4	TIMER2_CH1_OUT	PORT4	GPIO Mux	MUX Output 28
87	TIMER2_CH2_IN_PORT4	TIMER2_CH2_IN	PORT4	GPIO Mux	MUX Input 29
88	TIMER2_CH2_OUT_PORT4	TIMER2_CH2_OUT	PORT4	GPIO Mux	MUX Output 29
89	TIMER2_CH2_IN_PORT4	TIMER2_CH2_IN	PORT4	GPIO Mux	MUX Input 30
90	TIMER2_CH2_OUT_PORT4	TIMER2_CH2_OUT	PORT4	GPIO Mux	MUX Output 30
91	TIMER2_CH2_IN_PORT4	TIMER2_CH2_IN	PORT4	GPIO Mux	MUX Input 31
92	TIMER2_CH2_OUT_PORT4	TIMER2_CH2_OUT	PORT4	GPIO Mux	MUX Output 31
93	PRESENT_1_PORT1	PRESENT_1	PORT1	Card detect 1	
94	PRESENT_2_PORT1	PRESENT_2	PORT1	Card detect 1	
95	PRESENT_1_PORT2	PRESENT_1	PORT2	Card detect 2	
96	PRESENT_2_PORT2	PRESENT_2	PORT2	Card detect 2	
97	PRESENT_1_PORT3	PRESENT_1	PORT3	Card detect 3	
98	PRESENT_2_PORT3	PRESENT_2	PORT3	Card detect 3	
99	PRESENT_1_PORT4	PRESENT_1	PORT4	Card detect 4	
100	PRESENT_2_PORT4	PRESENT_2	PORT4	Card detect 5	
101	SWO_PORT1	SWO	PORT1		
102	SWD_PORT1	SWD	PORT1		
103	SWO_PORT2	SWO	PORT2		
104	SWD_PORT2	SWD	PORT2		
105	SWO_PORT3	SWO	PORT3		
106	SWD_PORT3	SWD	PORT3		
107	SWO_PORT4	SWO	PORT4		
108	SWD_PORT4	SWD	PORT4		
109	DIAG_0_PORT1	DIAG_0	PORT1		
110	DIAG_1_PORT1	DIAG_1	PORT1		
111	DIAG_0_PORT2	DIAG_0	PORT2		
112	DIAG_1_PORT2	DIAG_1	PORT2		
113	DIAG_0_PORT3	DIAG_0	PORT3		
114	DIAG_1_PORT3	DIAG_1	PORT3		
115	DIAG_0_PORT4	DIAG_0	PORT4		
116	DIAG_1_PORT4	DIAG_1	PORT4		
117	PROG_RESET_PORT1	PROG_RESET	PORT1		
118	PROG_RESET_PORT2	PROG_RESET	PORT2		
119	PROG_RESET_PORT3	PROG_RESET	PORT3		
120	PROG_RESET_PORT4	PROG_RESET	PORT4		
121	PWM_FAN_OUT_1	PWM_FAN_OUT_1	PWM Fan 1		
122	PWM_FAN_OUT_2	PWM_FAN_OUT_2	PWM Fan 2		
123	PWM_FAN_OUT_3	PWM_FAN_OUT_3	PWM Fan 3		
124	PWM_FAN_OUT_4	PWM_FAN_OUT_4	PWM Fan 4		
125	RPM_IN_1	RPM_IN_1	PWM Fan 1		
126	RPM_IN_2	RPM_IN_2	PWM Fan 2		
127	RPM_IN_3	RPM_IN_3	PWM Fan 3		

128	RPM_IN_4	RPM_IN_4	PWM Fan 4	
129	ENCODERX_A	ENCODERX_A	Encoder 9	For CHMT harness
130	ENCODERX_B	ENCODERX_B	Encoder 9	For CHMT harness
131	ENCODERX_Z	ENCODERX_Z	Encoder 9	For CHMT harness
132	ENCODERX_A	ENCODERX_A	Encoder 10	For CHMT harness
133	ENCODERX_B	ENCODERX_B	Encoder 10	For CHMT harness
134	ENCODERX_Z	ENCODERX_Z	Encoder 10	For CHMT harness
135	DIGITAL_IN_5	DIGITAL_IN_5		CHMT Compatibility/Unused
136	DIGITAL_IN_6	DIGITAL_IN_6		CHMT Compatibility/Unused
137	DIGITAL_IN_7	DIGITAL_IN_7		CHMT Compatibility/Unused
138	DIGITAL_IN_8	DIGITAL_IN_8		CHMT Compatibility/Unused
139	OPTO_OUT_1	OPTO_OUT_1		CHMT Compatibility/Unused
140	OPTO_OUT_2	OPTO_OUT_2		CHMT Compatibility/Unused
141	OPTO_IN_1	OPTO_IN_1		CHMT Compatibility/Unused
142	OPTO_IN_2	OPTO_IN_2		CHMT Compatibility/Unused
143	EXTI15_FPGA	EXTI15_FPGA	MCU Interrupt Signal 1	
144	EXTI10_STEPPERS	EXTI10_STEPPERS	MCU Interrupt Signal 2 - Stepper	
145	EXTI9_DAC	EXTI9_DAC	MCU Interrupt Signal 3 - DAC Trigger	
146	FLASH_SPI_CS		FPGA flash CS	MCU/FLASH/FPGA
147	FPGA_SPI_CS	FPGA_SPI_CS	MCU SPI Interface	MCU/FPGA
148	FPGA_SPI_SCK	FPGA_SPI_SCK	MCU SPI Interface	MCU/FLASH/FPGA
149	FPGA_SPI_MISO	FPGA_SPI_MISO	MCU SPI Interface	MCU/FLASH/FPGA
150	FPGA_SPI_MOSI	FPGA_SPI_MOSI	MCU SPI Interface	MCU/FLASH/FPGA
151	TMUX1309_A0	TMUX1309	Analog Mux Select	
152	TMUX1309_A1	TMUX1309	Analog Mux Select	
153	MCU_PGOOD	MCU Switching Reg	Status	