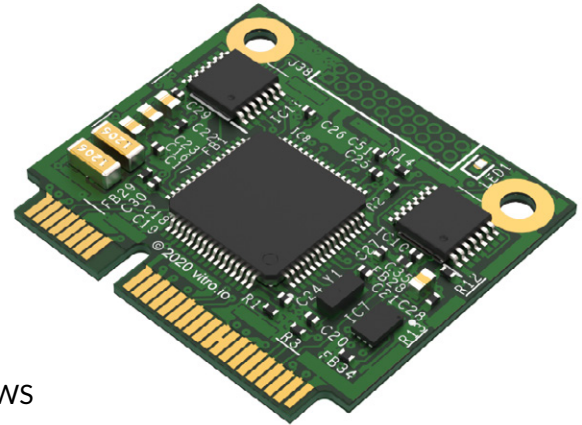


Vitro SHARD

Zero Trust IoT Platform Mini ePCI Card Format

FEATURES

- STM32 ARM Cortex-M4 with 512KB (dual banks) and 128KB SRAM
- Microchip ECC608A secure cryptographic element
- Over-the-air (OTA) update services
- IoT Blocks keep data secret and secure in-motion and at-rest
- Compatible with Vitro Crystal gateway from local CANbus to AWS



DESCRIPTION

Vitro SHARD delivers an edge to cloud hardware and software solution to secure data from sensors, scanners, scales and meters in-transit and at-rest in the cloud. Vitro IoT Block libraries enable rapid development of applications serving authenticated data payloads via Zero Trust policies.

TYPICAL APPLICATION

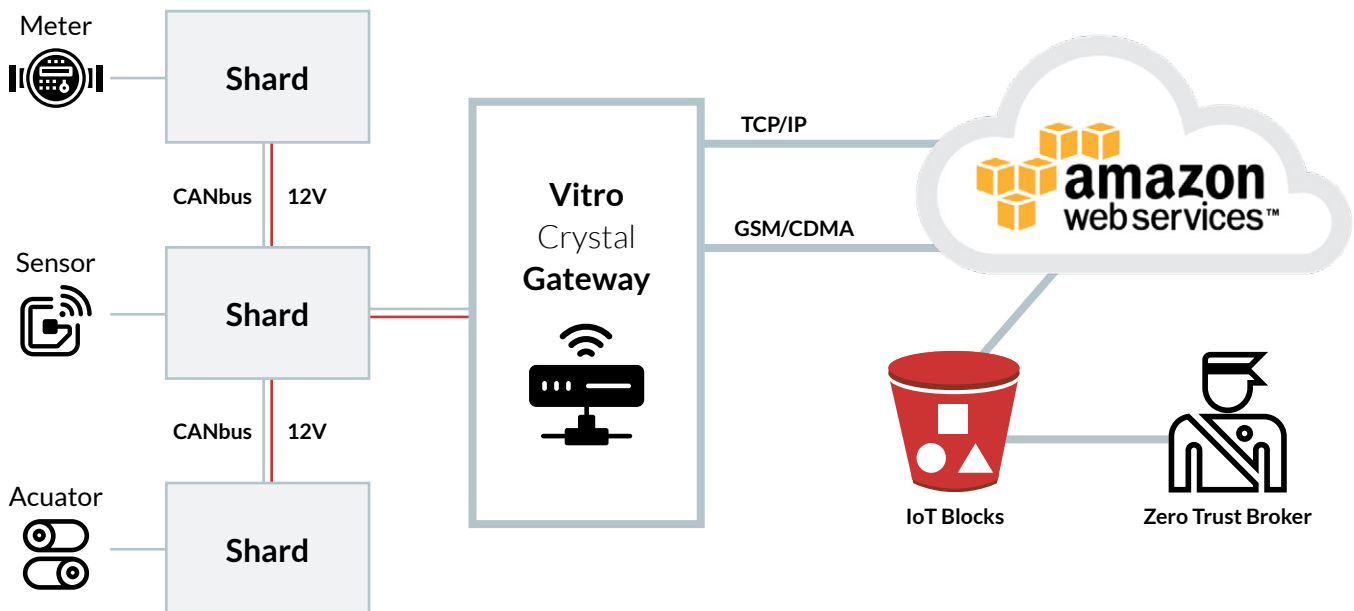


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KEY FEATURES

CPU STM32L486RGT6

Ultra-low-power microcontroller based on the high performance Arm® Cortex®-M4 32-bit RISC operating at a frequency of up to 80 MHz. 1MB flash, 2 banks for remote OTA. 128K SRAM.

The Cortex-M4 core features a Floating point unit (FPU) single precision which supports all Arm® single-precision data-processing instructions and data types and implements a full set of DSP instructions and a memory protection unit (MPU) which enhances application security.

Depending on selected power saving mode, different level of power consumption on CPU unit can be achieved, as low as 420 nA Standby mode with RTC.

Cryptographic Co-Processor ATECC608A

Cryptographic Co-Processor with secure, autonomous PKI key generation and storage for up to 16 keys or certificates. Hardware-based signature generation, signature verification, encryption and decryption.

Analog Inputs†

Up to 8x Analog Input channels 12-bit ADC 5 Msps, up to 16-bit with hardware oversampling, 200 µA/Msps.

Digital Inputs†

- 1x CAN (2.0B Active)
- 1x SPI
- 1x USB OTG 2.0 full-speed, LPM and BCD
- 2x I2C
- 3x UART

† Refer to Pinout mapping table for more details

RATINGS

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{DD}	-0.3	4.0	V
FT GPIO Input Voltage	FT GPIO V_{IN}	-0.3	$V_{DD} + 4.0$	V
TT GPIO input Voltage	TT GPIO V_{IN}	-0.3	4.0	V
BOOT0 Pin	$V_{IN\ BOOT0}$	-0.3	9	V
Operating Ambient Temperature	T_{AMB}	-40	85	°C

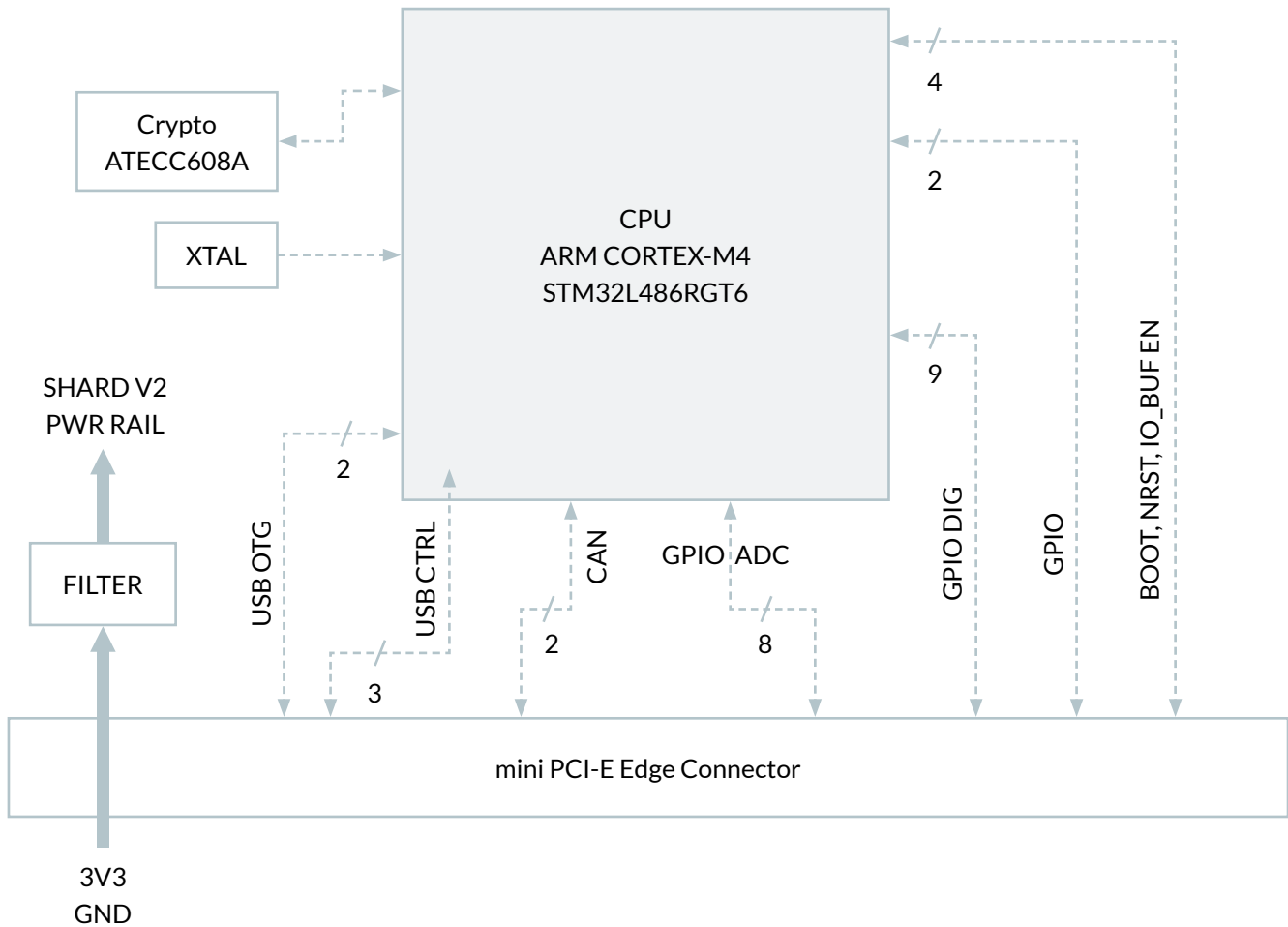
Note: Stresses above the absolute maximum ratings listed above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

Specifications apply for $-40^{\circ}\text{C} < T_{\text{PCB}} < 85^{\circ}\text{C}$, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.0	3.3	3.6	V
Input Voltage	FT_V _{IN}			5.5	V
	TT_V _{IN}			3.6	V
Voltage Input High	V _{IH}	0.7xV _{DD}			V
Voltage Input Low	V _{IL}			0.39xV _{DD}	V
Output High Voltage	V _{OH}	V _{DD} -0.4			V
Output Low Voltage	V _{OL}			0.4	V

SIMPLIFIED BLOCK DIAGRAM



SHARD MINI PCI-E CONNECTOR PINOUT TABLE

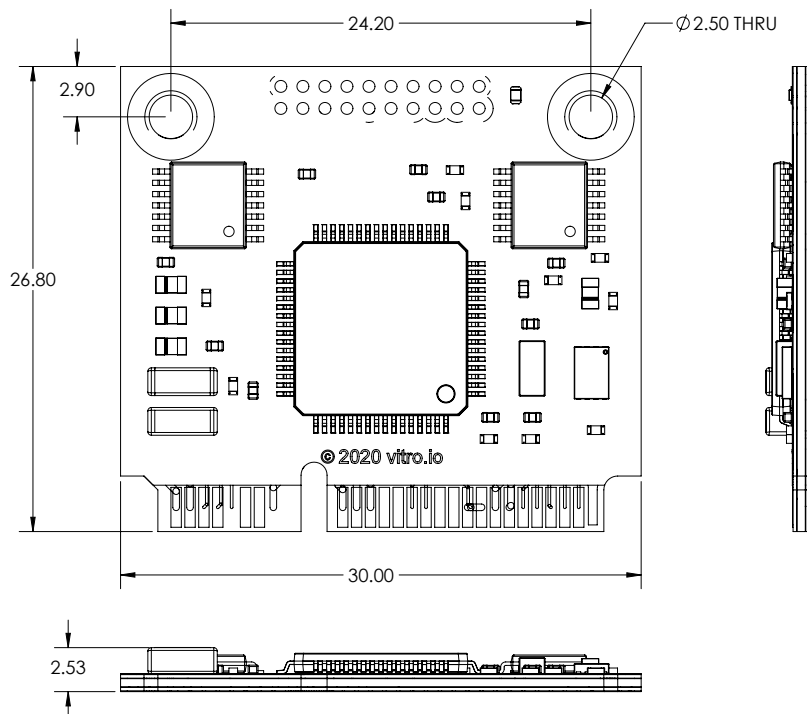
	PIN#	NET NAME	PIN TYPE	STM32 PIN#	STM32 PIN NAME	Alternate Function	IO Voltage GROUP
POWER	2, 24, 39, 41, 52	3V3	PWR				
	4, 9, 18, 26, 34, 35, 37, 40, 50	GND	GND				
NC	11, 13, 16, 23, 25, 31, 33	NOT CONNECTED	NC				
RSVD	22	NRST	RSVD				
	20	BOOT0	RSVD				
	43	IO_BUF_EN	RSVD	2	PC13	OUTPUT/RSVD	FT / 5V Tolerant
	44	IO_BUF_EN HARD_3V3_EN_N_PC3	RSVD	11	PC3	GPIO	FT / 5V Tolerant
IO	36	USB_OTG_FS_DM	USB	45	PA12	GPIO/USB_DM	FT / 5V Tolerant
	38	USB_OTG_FS_DP	USB	44	PA11	GPIO/USB_DP	FT / 5V Tolerant
	42	USB_OTG_FS_VBUS_PA9	USB	42	PA9	GPIO/USB_VBUS	FT / 5V Tolerant
	21	USB_OTG_OVRCCR_BUF	USB	34	PB13	INPUT	FT / 5V Tolerant
	29	USB_OTG_PPWR_BUF	USB	37	PC6	OUTPUT/USB_PWR_EN	FT / 5V Tolerant
	27	USB_OTG_PRDY_BUF	USB	34	PB13	INPUT	FT / 5V Tolerant
	10	CAN_RX_BUF	GPIO	61	PB8	INPUT/CAN_RX	FT / 5V Tolerant
	8	CAN_TX_BUF	GPIO	62	PB9	OUTPUT/CAN_TX	FT / 5V Tolerant
	28	SPI1_MISO/ADC1_IN11	GPIO	22	PA6	GPIO/SPI/ADC	FT / 5V Tolerant
	6	SPI1_MOSI/ADC1_IN12	GPIO	23	PA7	GPIO/SPI/ADC	FT / 5V Tolerant
	46	SPI1_NSS/ADC1_IN9	GPIO	20	PA4	GPIO/SPI/ADC	TT / 3.6V Tolerant
	48	SPI1_SCK/ADC1_IN10	GPIO	21	PA5	GPIO/SPI/ADC	TT / 3.6V Tolerant
	7	UART_DEBUG_RX	GPIO	54	PD2	GPIO/UART	FT / 5V Tolerant
	5	UART_DEBUG_TX	GPIO	53	PC12	GPIO/UART	FT / 5V Tolerant
	12	UART_RS232_RX_BUF	GPIO	17	PA3	INPUT/UART	TT / 3.6V Tolerant
	14	UART_RS232_TX_BUF	GPIO	16	PA2	OUTPUT/UART	FT / 5V Tolerant
	19	UART_RS485_DE	GPIO	27	PB1	GPIO/UART	FT / 5V Tolerant
	15	UART_RS485_RX	GPIO	30	PB11	GPIO/UART	FT / 5V Tolerant
	17	UART_RS485_TX	GPIO	29	PB10	GPIO/UART	FT / 5V Tolerant
	3	UART_USER_RX/ADC1_IN6	GPIO	15	PA1	GPIO/UART/ADC	FT / 5V Tolerant
	1	UART_USER_TX/ADC1_IN5	GPIO	14	PA0	GPIO/UART/ADC	FT / 5V Tolerant
	51	GPIO_PC10	GPIO	51	PC10	GPIO	FT / 5V Tolerant
	49	GPIO_PC11	GPIO	52	PC11	GPIO	FT / 5V Tolerant
	30	I2C1_SCL	GPIO	58	PB6	GPIO/I2C	FT / 5V Tolerant
	32	I2C1_SDA	GPIO	59	PB7	GPIO/I2C	FT / 5V Tolerant
	47	I2C3_SCL/ADC1_IN1	GPIO	8	PC0	GPIO/I2C/ADC	FT / 5V Tolerant
45	I2C3_SDA/ADC1_IN2	GPIO	9	PC1	GPIO/I2C/ADC	FT / 5V Tolerant	

PINOUT DETAILS

GPIO pins connected to mini PCI-E edge can work in different mode of operations – all possible modes are described in below table.

GPIO PIN TYPE	AVAILABLE PINS WITHIN THIS GROUP	DESCRIPTION
GPIO	2	General Purpose Input/Output pin – can work either as an output or input
GPIO DIG	9	Pins from this group can work as a regular GPIO or can work as a specific interface lineS (SPI/I2C/UART) – refer to pinout mapping table for Digital interfaces location details
GPIO ADC	8	Pins from this group can wor as a regular GPIO or can work as Analog Input pin to ADC channel on processor – refer to pinout mapping table for ADC input location details
CAN	3	Pins from this group can work as a regular GPIO or can work as a CAN TX/RX interface lines – refer to pinout mapping table for Digital interfaces location details
USB	2	Pins from this group can work as a regular GPIO or can work as a USB DP/DN differential pair – refer to pinout mapping table for location details
USB CTRL	3	Pins from this group can work as a regular GPIO or can work as a USB CTRL lines together with USB differential pair – refer to pinout mapping table for location details
RSVD	4	Internal IO buffer enable, STM32 NRST, STM BOOT lines

DIMENSIONS



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