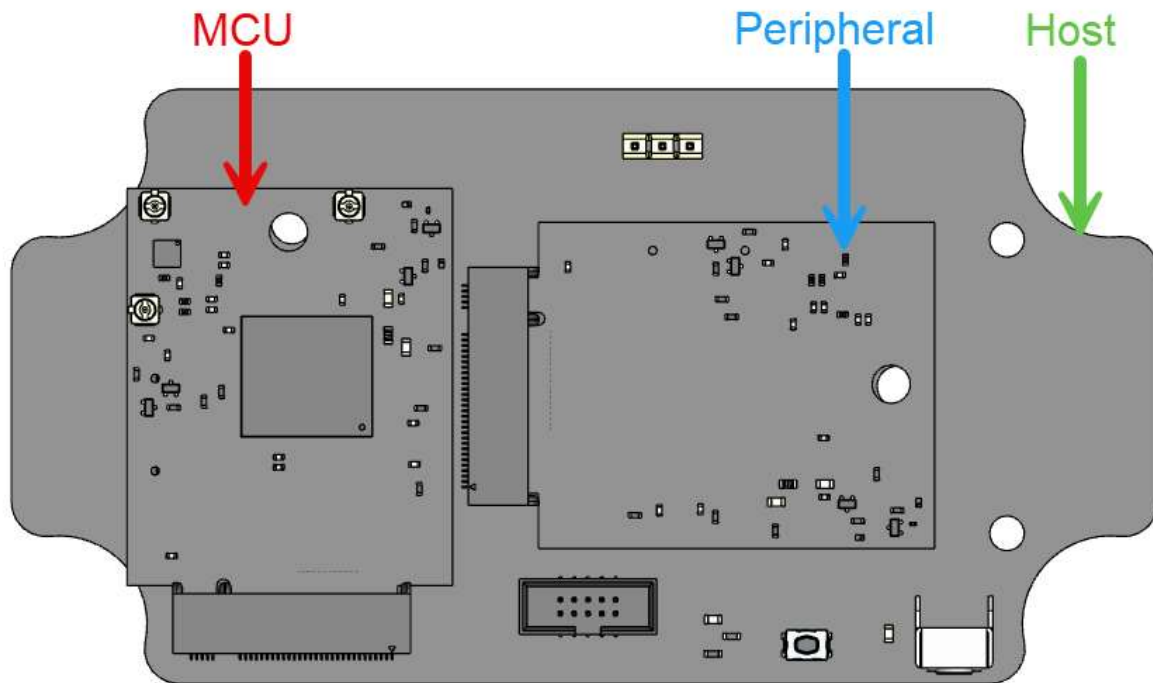# LooUQ MTC.2 Interface

The LooUQ MTC.2 Interface is designed to support peripheral device to host communications for many different types of peripherals. Initially, the MTC.2 interface is being used by LooUQ for connectivity between our MTC.2 compatible modems (LTE communications) and host boards (PCB) for system capabilities including power, user input, indication, and sensors.

This **specification** is really intended to serve as a **convention**, defining known locations for typical inter-connect signals: power, grounds, GPIO and serial communications.

The connection between the master device and the peripheral is via an M.2 type card-edge connector. The peripheral side has card-edge finger contacts; the host has an connector (TE 1-2199230-6).

As shown below, there are 3 possible participants in a system containing MTC.2 interfaces. There are the Host, the MCU, and the Peripheral. Not all these three roles may be as configured below; for example, the MCU function may be resident directly on the Host board.

The fact that an MTC.2 device can be either an MCU, a Peripheral or both (a subsystem. peripheral with an MCU) can complicate the description of signal sources and the direction of the signal. In this document, the term "DEVICE" refers to the PCB plugged into the TE connector (both the MCU and the Peripheral in the drawing below are a DEVICE).

Host — Typically provides power and physical connectivity, can also provide user interaction with displays and/or buttons.

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MCU	The primary system processor, generally the device running the embedded application firmware. It can include other functions like the LooUQ N9151 that has both MCU (processor, memory, etc.) and cellular communications.
Peripheral	An MTC.2 connected board performing the duties of a sub-system. This may be a board with MCU running sub-system firmware. Typical types of smart peripherals (with MCU) could be additional communication stacks, dedicated numeric processing for intensive tasks, or specialized I/O.

MTC2-N9151

- Devices like the MTC2-N9151 can act as either master or slave for serial peripherals like SPI and I2C; for these two serial functions, the direction is in relation to the MASTER configured device.

For UART applications the Zephyr UART by default acts like in the DTE (data terminal equipment) role, which sources the TX and RTS signals. If your application requires it to be set up as a DCE, you will need to adjust the device tree (for Zephyr) or host wiring much like a null-modem cable.

MTC.2 Signals

Top Edge of MTC.2 Card

Signal Name	M.2 Pin	Direction	Comments	N9151
Ground	1		Power	
Ground	3			
Power Toggle/ON	5	Input to MCU	Logic signal to turn on or in some cases toggle power state of the MCU	
N.C.	7			
Wake	9	Input to MCU	Logic signal to wake MCU from sleep state	P0.27
N.C.	11			
SPI-MOSI	13	From SPI Master		P0.10
SPI-MISO	15	To SPI Master		P0.09
SPI-CLK	17	From SPI Master		P0.08
SPI-CS	19	From SPI Master	This is the default CS, preconfigured for CS on SPI for the N9151	P0.07
UART0-TX	21	From DEVICE	Data output from UART	P0.05
UART0-RX	23	To DEVICE	Data input to UART	P0.04
UART0-RTS	25	From DEVICE	Asserted when sending, listening to CTS	P0.03
UART0-CTS	27	To DEVICE	Asserted when able to receive	P0.02
I2C-SDA	29	Bi-directional	Shared across all I2C bus devices as SDA and SCL	P0.01
I2C-SCL	31			P0.00
N.C.	33			
User-Defined	35			

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Signal Name	M.2 Pin	Direction	Comments	N9151
	37		User-defined signals. LooUQ will not assign to any function in our commercial designs.	
	39			
	41			
	43			
	45			
	47			
Power Good	49	Input to MCU	Input to MCU from Host indicating power source is good/operational	P0.06
VBus (5.0v)	51	To MTC.2 Device	Usually supplied by the Host board to both MCU and Peripheral devices.	
	53			
	55			
	57			
Key Slot				
VBatt	67	To MTC.2 Device	Usually supplied by the Host board to both MCU and Peripheral devices.	
	69			
	71			
	73			
Ground	75			

Bottom Edge of MTC.2 Card

Signal Name	M.2 Pin	Direction	Comments	N9151
Ground	2		System Ground	
Status-ON/OFF	4			
N.C.	6			
N.C.	8			
N.C.	10			
nReset	12	To MTC.2 Device	Reset MCU or Peripheral (Active Low)	
nSrvcRqst	14	To MCU	Service Request (Active Low) Assigned to IRQ	P0.12
nSrvcPend	16	To MCU	Service Pending (Active Low) Held low until request serviced	P0.11
GPIO	18		Trace Data[3]	P0.25
GPIO	20		Trace Data[2]	P0.24
GPIO	22		Trace Data[1]	P0.23
GPIO	24		Trace Data[0]	P0.22
GPIO	26		Trace Clock	P0.21
GPIO	28		ADC7	P0.20
GPIO	30		ADC6	P0.19
GPIO	32		ADC5	P0.18
GPIO	34		ADC4	P0.17
GPIO	36		ADC3	P0.16
GPIO	38		ADC2	P0.15
GPIO	40		ADC1	P0.14
GPIO	42		ADC0	P0.13

GPIO/HX-CS1	44		GPIO designated for HX alternate CS	P0.26
SWD-IO	46	To MCU with SWD connector on host	SWD debugger interface	
SWD-CLK	48			
HX-MOSI	50	From SPI Master	The HX (host extension) interface is intended to assist with multiple MTC.2 peripheral systems and use of external multiplexor components.	P0.31
HX-MISO	52	To SPI Master		P0.30
HX-CLK	54	From SPI Master		P0.29
HX-CS0	56	From SPI Master		P0.28
Ground	58	System Ground		
Key Slot				
VHost	68	Supply that is usually provided by the Host board. This supply sets the logic voltage for all devices in a system. Range supported 1.8v to 3.3v.		
	70			
	72			
	74			

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