



# M16 MIDI Interface

**Add 16 MIDI I/O to your Core, SPI Slave Interface with up to 16 UARTs(MIDI I/O), based on low-cost FPGA...**

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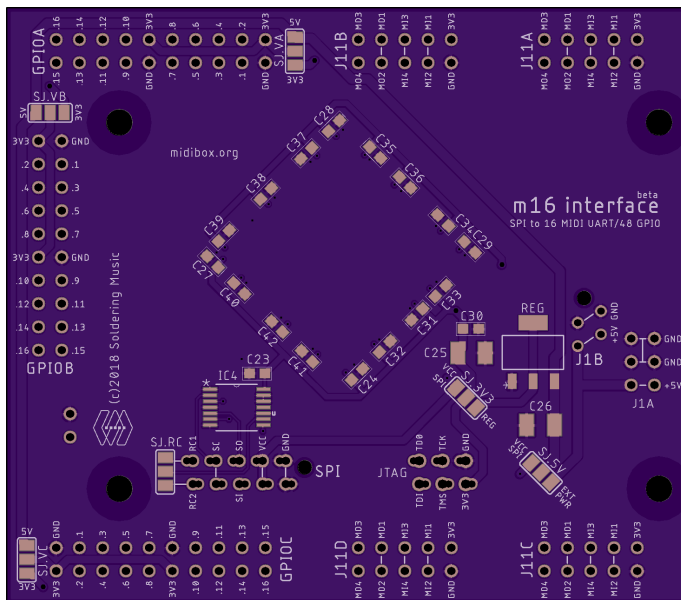
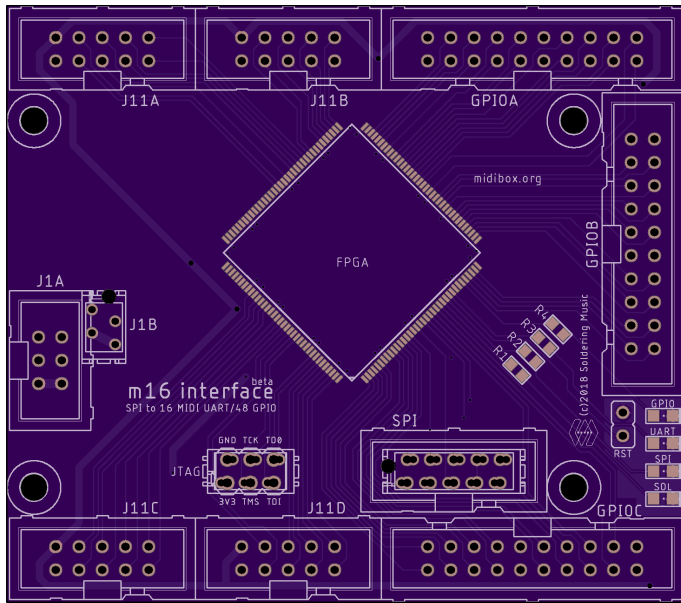
## Features

- The FPGA internal clock works @88.67MHz.
- Fast 4 wires SPI in slave mode to control the board, 10Mb/s, 5V tolerant.
- Uses the default MIOS32\_SPI\_MIDI protocol, MIOS32 is ready-to-use with it.
- 16 UARTs on board, it's 16 MIDI ports.
- Each MIDI output has its own FIFO buffer of 1024 bytes, to queue the incoming MIDI from the SPI.
- Each MIDI output has its independent "Running Status", with Disable/Enable Command from SPI.
- There's a 64 word(32bits) FIFO for out-coming messages from the board.
- 3 independents groups of 16 GPIOs, configurable and settable by SPI Command.
- Can be stacked under a [dipBoardF4 mbhp](#)

# PCB

2 layers PCB design.  
Fits 2 layer mostly common design rules.

- min. drill 10mil
- min. width 6mil



# Dimension



```

2, // 2: two-byte system common messages like MTC, Song Select, etc.
3, // 3: three-byte system common messages like SPP, etc.
3, // 4: SysEx starts or continues
1, // 5: Single-byte system common message or sysex sends with following
single byte
2, // 6: SysEx sends with following two bytes
3, // 7: SysEx sends with following three bytes
3, // 8: Note Off
3, // 9: Note On
3, // a: Poly-Key Press
3, // b: Control Change
2, // c: Program Change
2, // d: Channel Pressure
3, // e: PitchBend Change
1 // f: single byte

};

```

## MIDI messages

Running status is never used, so all the messages are formed of all bytes. But the interface supports it, each MIDI Out can be individually set for that purpose.

### Some examples

#### MIDI clock on port 7 (SPIM0 to SPIM15)

MIDI message is 0xF8, cin = 0x5.

SPI message = 0x0000f875 (Less significant byte first)

```

mios32_midi_package_t package;
package.ALL = 0;
package.cin = 0x5; // Single-byte system common message
package.evnt0 = 0xf8; // MIDI Clock event status
MIOS32_MIDI_SendPackage(SPIM7, package);
// or directly
MIOS32_MIDI_SendClock(SPIM7);

```

#### Note On on port 11

MIDI message is 0x90 0x2A 0x40, cin = 0x9.

SPI message = 0x402A90b9

```

mios32_midi_package_t package;
package.ALL = 0;
package.cin = 0x9; // Single-byte system common message
package.evnt0 = 0x90; // MIDI Note On event, channel 1
package.evnt1 = 0x2A; // Note Number

```

```

package.evnt2 = 0x40; // Velocity
MIOS32_MIDI_SendPackage(SPIM11, package);
// or directly
MIOS32_MIDI_SendNoteOn(SPIM11, Chn1, 0x2A, 0x40)

```

### System Exclusive on port 0

MIDI message is 0xF0 0x01 0x02 0x03 0x04 0x05 0xF7.

The stream will be divided in 3 packages:

SPI messages = 0x0101f004(SYSEX start), 0x05040304(SYSEX continues), 0x0000f705(SYSEX ends with one byte)

```

mios32_midi_package_t package;
package.ALL = 0;
package.cin = 0x4; // Single-byte system common message
package.evnt0 = 0xf0; // Start of Exclusive
package.evnt1 = 0x01; // Data
package.evnt2 = 0x02; // Data
MIOS32_MIDI_SendPackage(SPIM0, package);
package.evnt0 = 0x03; // Data
package.evnt1 = 0x04; // Data
package.evnt2 = 0x05; // Data
MIOS32_MIDI_SendPackage(SPIM0, package);
package.ALL = 0;
package.cin = 0x4; // Single-byte system common message
package.evnt0 = 0xf7; // End of Exclusive
MIOS32_MIDI_SendPackage(SPIM0, package);
// or directly
u8 stream[7]={0xF0, 0x01, 0x02, 0x03, 0x04, 0x05, 0xF7};
MIOS32_MIDI_SendSysex(SPIM0, (u8*)stream, 7);

```

### Special command messages

The **m16** can receive some specifics commands and send back some status messages.

when **CIN=0x1**(local command), the **m16** will parse the message as a command and apply the requested change.

- Port(Cable)value becomes Group Command Code.
- evnt0 is the command number.
- evnt1 and evnt2 are the value bytes.

List of the commands:

byte(0)		byte(1)	byte(2)	byte(3)	Command	Status
GCC(bit7-4)	CIN(bit 3-0)	evnt0(CMD)	evnt1	evnt2		
0x0(system config)	always 0x1 (local command)	0x01	0XXXXX		UART fifo source. 0x0000: SPI is the source else UART(loopback)	
		0x02	0XXXXX		SPI fifo source. 0x0000: UART is the source else SPI(loopback)	
		0x03	0XXXXX		SPI miso send MIDI In Activity status. 0x0000: Off else On	0XXXXX are the 16 status bits(sent on change every poll)
		0x04	0XXXXX		SPI miso send MIDI Out Activity status. 0x0000: Off else On	0XXXXX are the 16 status bits(sent on change every poll)
		0x05	0XXXXX		SPI miso send MIDI Out Overload status. 0x0000: Off else On	0XXXXX are the 16 status bits(sent on change every poll)
0x1(MIDI config)	always 0x1 (local command)	0x01	0XXXXX		MIDI Running Status Enabler(1 bit by MIDI Out port), default is 0xffff(all enabled)	
0xa(GPIOA params)	always 0x1 (local command)	0x01	0XXXXX		GPIOA Mode(default is 0x00). -- 0x00: group is MIDI In Activity -- 0x01: group is MIDI Out Activity -- 0x02: group is MIDI Out Overload -- 0x03: group is 16 General Purpose Outputs -- 0x04: group is 16 General Purpose Inputs	when in mode=0x04(GPI) 0XXXXX are the 16 GPI value bits(sent on change every poll) and inverted depending on Inverter buffer.
		0x02	0XXXXX		Inverter buffer(1 bit for each pin). If 1 value is inverted. Default is 0xffff(all inverted)	
		0x03	0XXXXX		buffer for the 16 General Purpose Outputs when Mode=0x03(GPO)	
0xb(GPIOB params)	always 0x1 (local command)	0x01	0XXXXX		GPIOB Mode(default is 0x01). -- 0x00: group is MIDI In Activity -- 0x01: group is MIDI Out Activity -- 0x02: group is MIDI Out Overload -- 0x03: group is 16 General Purpose Outputs -- 0x04: group is 16 General Purpose Inputs	when in mode=0x04(GPI) 0XXXXX are the 16 GPI value bits(sent on change every poll) and inverted depending on Inverter buffer.
		0x02	0XXXXX		Inverter buffer(1 bit for each pin). If 1 value is inverted. Default is 0xffff(all inverted)	
		0x03	0XXXXX		buffer for the 16 General Purpose Outputs when Mode=0x03(GPO)	
0xc(GPIOC params)	always 0x1 (local command)	0x01	0XXXXX		GPIOC Mode(default is 0x02). -- 0x00: group is MIDI In Activity -- 0x01: group is MIDI Out Activity -- 0x02: group is MIDI Out Overload -- 0x03: group is 16 General Purpose Outputs -- 0x04: group is 16 General Purpose Inputs	when in mode=0x04(GPI) 0XXXXX are the 16 GPI value bits(sent on change every poll) and inverted depending on Inverter buffer.
		0x02	0XXXXX		Inverter buffer(1 bit for each pin). If 1 value is inverted. Default is 0xffff(all inverted)	
		0x03	0XXXXX		buffer for the 16 General Purpose Outputs when Mode=0x03(GPO)	

**ToDo**

Some connection examples\\

In MIOS32

datasheet

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