CREEKSIDE CONTROLS

Datasheet
DD-221-0

Stream UX Mini Touch Display Module

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Introduction

This datasheet is intended for designers using the StreamUX Mini module. The StreamUX Mini module enables effortless color display / touchscreen integration into any embedded electronics product. The application's user interface is designed using the StreamUX Builder PC tool, then transferred to the module in binary form. Interaction with the UI is accomplished by using one of the serial interfaces or an API library if using the module as an application host.

Features

- 16bit color TFT interface using 40pin, 0.5mm pitch ZIF style connector.
- Resistive touch integration through LCD ZIF connector.
- 3 interfaces for controlling and interacting with the StreamUX touchscreen
    - UART
    - SPI
    - I2C
- 5Vdc power input
- Optional 128Mbit NOR flash ROM on QSPI interface

StreamUX Mini as a Serial Module

The StreamUX Mini module allows a fully functional touchscreen over a serial interface. Firmware for this configuration is provided by Creekside Controls. Please contact sales@creeksidecontrols.com for more information

When used as a serial module, the following features are supported using serial commands over the chosen interface

- Full display / graphics control using StreamUX
- Audio (also played directly from StreamUX resources)
- Touch interface
- NOR flash is reserved for StreamUX resources

The following tools are available to aid in this development and can be downloaded from www.creeksidecontrols.com:

- Reference Manual DM-220-0 – explains the StreamUX library in detail
- Reference Manual DM-719-0 – explains the serial protocol used with StreamUX packets
- Reference Manual DM-719-1 – explains all StreamUX serial messages
- Software DS-719-1 – is a PC application that sends, receives and logs StreamUX serial messages over a PC COM port. This is a great way to experience how the serial messages and packet protocol function.
- Reference Manual DM-719-2 and Example Project DX-820-0 implements a StreamUX UART driver and demo project using an inexpensive STM32F0 DISCO development board as the display controller.

StreamUX Mini as an Application Host

The StreamUX Mini features an ST STM32F746ZGT6 (Cortex M7) processor with 1Mbyte flash and 320k SRAM memory running at 216MHz. All peripherals, including serial interfaces and IO, Analog expansion connectors are available to the developer when using the module this way.

To get started, request example project DX-221-0 from sales@creeksidecontrols.com. The project includes all peripheral mappings and drivers. The project also includes a free version of the StreamUX library for use with StreamUX Mini hardware. Please note that the StreamUX library is free-to-use ONLY with StreamUX hardware modules purchased from Creekside Controls. The library cannot be used for any other hardware. To purchase a license to use the StreamUX library on any hardware, please contact sales@creeksidecontrols.com.

Connector Locations

Connector pin 1 locations are marked by a white circle on the StreamUX PCB silkscreen.

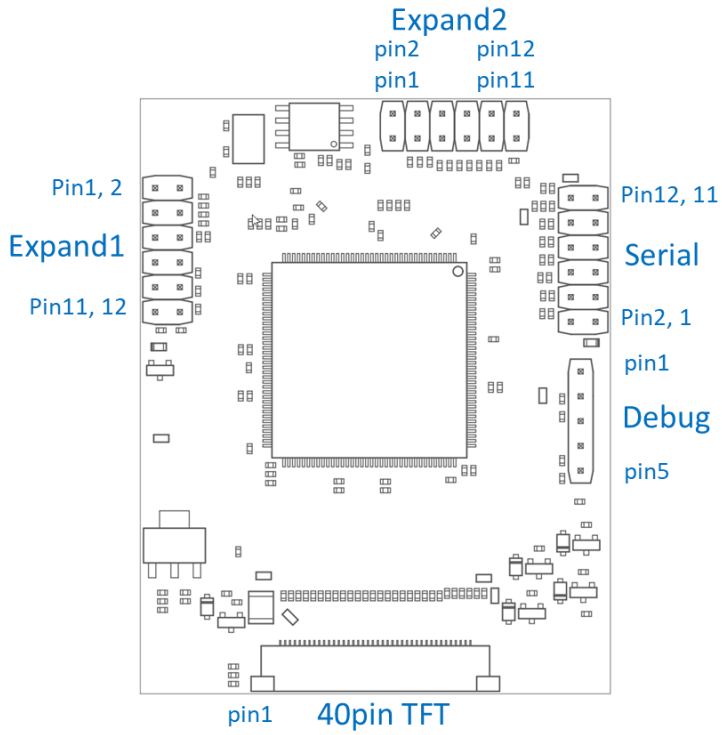

Figure 1 - Connector and pin locations

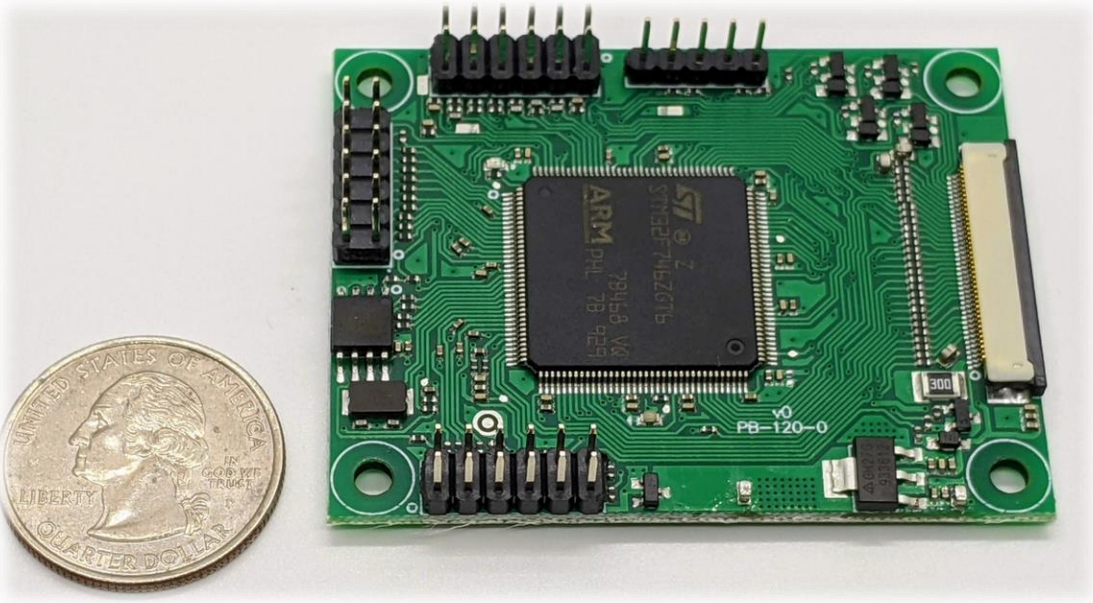

Figure 2 - StreamUX Mini with no display attached

Connector Pinouts

Serial

Connector is 100mil, non-shrouded, 2x12 with gold plating. This

Pin	Function	Direction relative to StreamUX	Description
1	Vin	Power In	5Vdc input supply voltage
2	Ground	Power	The ground should have a direct, non-filtered path to the control ground.
3	Reset’	Input	Used to reset StreamUX Module. Reset is active low. This pin may be left unconnected if not used.
4	Busy / Idle indication	Output	Pin high indicates rendering is idle. Pin low indicates rendering is busy. You can use this pin to measure the time it takes to render any screen
5	SPI Clock	Input or Output	SPI clock
6	SPI MISO	Input or Output	SPI master in, slave out
7	SPI MOSI	Input or Output	SPI master out, slave in
8	I2c Data	Bidirectional	I2c data signal
9	I2c Clock	Bidirectional	I2c clock signal
10	SPI CS’	Input or Output	SPI chip select
11	UART Tx	Output	UART transmit
12	UART Rx	Input	UART receive

Expand1

Connector is 100mil, non-shrouded, 2x12 with gold plating. Note these pins are only available when using the StreamUX as an application host.

Pin	Function	Direction relative to StreamUX	Description
1	Ground	Power	The ground should have a direct, non-filtered path to the control ground.
2	ADC4	Analog In	Mapped to ADC1,2,3 input10
3	ADC3	Analog In	Mapped to ADC1,2,3 input11
4	ADC2	Analog In	Mapped to ADC1,2,3 input12
5	ADC1	Analog In	Mapped to ADC1,2,3 input13
6	Audio Output	Analog Out	DAC audio output (referenced to Analog Gnd)
7	3.3Vanl	Power Output	3.3V analog voltage reference
8	Analog Ground	Power	Analog ground reference
9	IO4	Bidirectional	Mapped to PortA0
10	IO3	Bidirectional	Mapped to PortA7
11	IO1	Bidirectional	Mapped to PortE9
12	IO2	Bidirectional	Mapped to PortB1

Expand2

Connector is 100mil, non-shrouded, 2x12 with gold plating. Note these pins are only available when using the StreamUX as an application host.

Pin	Function	Direction relative to StreamUX	Description
1	Ground	Power	The ground should have a direct, non-filtered path to the control ground.
2	IO5	Bidirectional	Mapped to PortF5
3	IO7	Bidirectional	Mapped to PortF1
4	IO6	Bidirectional	Mapped to PortF2
5	IO9	Bidirectional	Mapped to PortC15
6	IO8	Bidirectional	Mapped to PortF0
7	IO11	Bidirectional	Mapped to Port13
8	IO10	Bidirectional	Mapped to Port14
9	IO13	Bidirectional	Mapped to PortE5
10	IO12	Bidirectional	Mapped to PortE6
11	IO15	Bidirectional	Mapped to PortE2
12	IO14	Bidirectional	Mapped to PortE4

Single Wire Debug / Program

Connector is 100mil, non-shrouded, 5pins with gold plating. Use 100mil jumper cables to connect to the ST debugger/programmer. Once appropriate connections are made, it is recommended to surround the jumpers with tape so that they stay in place relative to each other.

Pin	Function	Direction relative to StreamUX	Description
1	Ground	Power	The ground should have a direct, non-filtered path to the control ground.
2	Reset	Input	Reset signal from debugger
3	SWCLK	Input	Single wire clock signal
4	SWDIO	Bidirectional	Single wire data IO signal
5	3.3V	Power Out	Target voltage supplied to the debugger

TFT 40 pin Connector

Connector is ZIF, 0.5mm pitch, bottom contacts, gold plating, FCI 62684-401100ALF or equivalent.

Pin	Function	Direction relative to StreamUX	Description
1	LED Backlight -	Power Out	Connection to LED Cathode of backlight
2	LED Backlight +	Power Out	Connection to LED Anode of backlight
3	Ground	Power	
4-6	No Connection		Unconnected
7	LCD MOSI	Output	SPI master out to display controller
8	Pixel Clock	Output	Pixel clock for RGB interface
9	Data Enable	Output	Data Enable for RGB interface
10	Vsync	Output	Vertical sync for RGB interface
11	Hsync	Output	Horizontal sync for RGB interface
12	Display Power	Power Out	3.3V digital power for display
13	Reset	Output	Display reset / enable
14	Ground	Power	
15-20	R7 to R2	Output	Red Data (Pin15 is R7, Pin20 is R2)
21-26	G7 to G2	Output	Green Data (Pin21 is G7, Pin26 is G2)
27-32	B7 to B2	Output	Blue Data (Pin27 is B7, Pin32 is B2)
33	Lcd Rd	Output	Lcd Rd pin (set high with software)
34	Lcd D/C’	Output	Lcd data/command pin (set with software)
35	Lcd SCLK	Output	SPI serial clock to display controller
36	Lcd CS’	Output	SPI chip select to display controller
37	Touch XR	Bidirectional	Resistive touch X right
38	Touch YD	Bidirectional	Resistive touch Y down
39	Touch XL	Bidirectional	Resistive touch X left
40	Touch YU	Bidirectional	Resistive touch Y up

Schematics of Connections

Serial

Figure 3 shows StreamUX schematic of the Serial connector pins. The sheet ports for all IO pins connect directly to the microprocessor pins. The reset pin has some additional circuitry to help protect the micro that is not shown here.

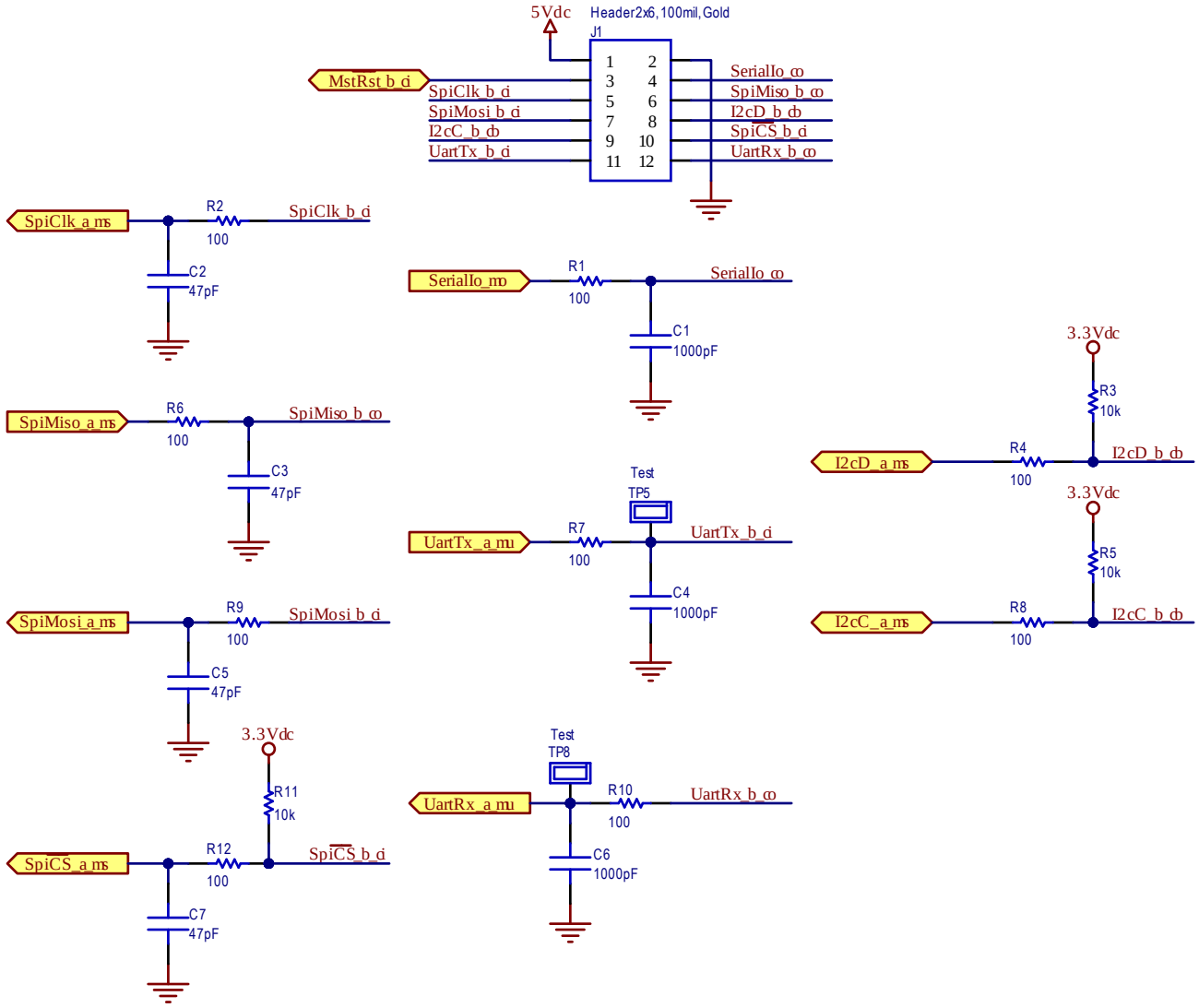

Figure 3 - Serial schematic

Expand1

Figure 4 shows schematic of Expand1 connector. All sheet ports connect directly to the microprocessor pins.

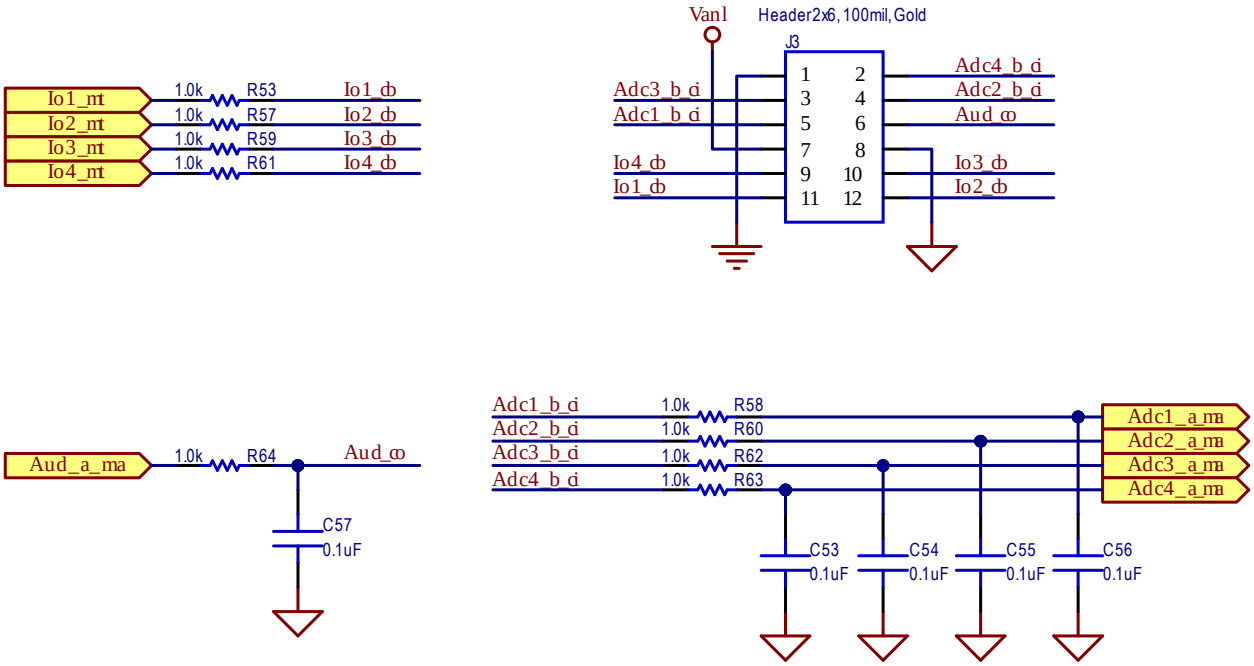

Figure 4 – Expand1 schematic

Expand2

Figure 5 shows schematic of Expand2 connector. All sheet ports connect directly to the microprocessor pins.

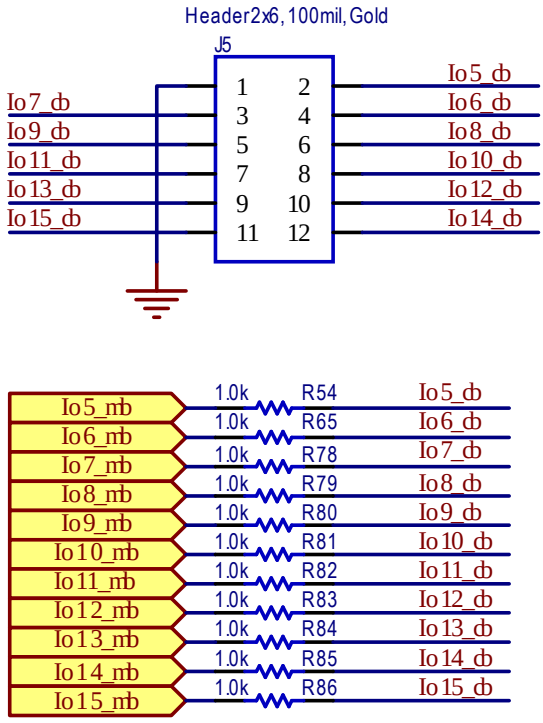

Figure 5 – Expand2 schematic

Onboard LED Indication

StreamUX Mini has 2 onboard LEDs to aid in troubleshooting and development.

Heartbeat

This LED shows that the power and CPU are healthy. It also shows whether the bootloader or application is currently running. Sometimes CPU execution might be held up, for instance when StreamUX resources are loaded. In this case, the LED heartbeat will be paused until normal CPU execution is restored.

State	Description
Dark	Power is not present, CPU is in reset or the CPU clock has stopped for some reason
Blinks 1 time per second	Power is present and application is running normally
Blinks 5 times per second	Power is present and bootloader is running normally

Rx Data

When StreamUX Mini is used as a serial display, this LED shows when a serial packet is received over one of the serial interfaces.

State	Description
Dark	No serial packet received over any of the serial interfaces
Brief flash on	Serial packet was received over any of the serial interfaces

Location

Figure 6 - LED location

Electrical Characteristics

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{IN}	DC Supply Voltage	0 to 10V	V
T_{STO}	Storage Temperature Range	-30 to +80	°C
V_{IO}	IO Pin Voltage Range	-0.5 to 5.2	V

Recommended Operating Conditions

(@ temperature 25°C unless otherwise specified)

Symbol	Parameter	Min	Max	Unit
V_{IN}	DC Supply Voltage	4.85	5.15	V
T_{OP}	Operating Temperature Range	-20	70	°C

Electrical Specifications

(@ T_{OP} = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
Voltage					
V_{ANL}	3.3V Analog reference on Analog Connector	3.23	3.3	3.37	V
V_{OL}	Output Voltage Low Level (all digital IO pins)		0	0.4	V
V_{OH}	Output Voltage High Level (all digital IO pins)	3.23	3.3	3.37	V
V_{IH}	Input Voltage High Level (all digital IO pins)	2.24			V
V_{IHYS}	Input Voltage Hysteresis (all digital IO pins)	0.33			V
V_{LED}	LED Backlight Voltage	4.85	5	5.15	V
Current					
I_{5Vdc}	5V DC current draw (without display) *(Note1)*		135		mA
I_{ANL}	3.3V Analog reference on Analog Connector			50	mA
I_{IO}	Output Source/Sink Current (all digital IO pins)			5	mA
I_{IOlkg}	Input Leakage Current (all digital IO pins)			5	µA
$I_{LED2.4}$	LED backlight current for 2.4” screen		80		mA
$I_{LED2.8}$	LED backlight current for 2.8” screen		100		mA
$I_{LED3.5}$	LED backlight current for 3.5” screen		120		mA

- *Note1 – Includes typical operating current for all components on the PCB except for the display.*

Revision History

Rev	Date	Changes
0	2/19/2021	Initial Release

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