



ADK-622x3 User's Guide:

Evaluation Board for:

ADK-62203 BC/RT/MT 64K RAM

ADK-62213 BC/RT/MT 4K RAM

Nov 2019

REVISION HISTORY

Revision	Date	Description of Change
AN-62203, Rev. New	5-21-19	Initial Release
AN-62203, Rev. A	11-1-19	Added 4K device and Preprocessor options

Introduction

The Holt HI-62203/62213 Evaluation board demonstrates the broad feature set of Holt's MIL-STD-1553 HI-622x3 family, the board is populated with the:

HI-62203 Remote Terminal, Bus Controller and Monitor device, with 64K word RAM

HI-62213 Remote Terminal, Bus Controller and Monitor device, with 4K word RAM

The H-622x3 family is a set of MIL-STD-1553B bus communication devices containing protocol management and physical bus interface circuitry. The 2-board assembly and C project reference design provides a ready-to-run evaluation platform demonstrating operation of Bus Controller, Bus Monitor and Remote Terminal. For convenience, this kit includes IAR Systems Embedded Workbench® for ARM, and a fully integrated debug interface for the ARM Cortex M3 microcontroller. Note that in this AN-62203 guide, the HI-62203 is used as the reference device because it contains all available features; the HI-62213 is also available, it has a reduced RAM size of 4K.

This guide describes how to set up and run the board. Additional support material and all required project software are found in the included Holt USB drive. A version of the demonstration software is already programmed into the microcontroller flash; the board is operational right out of the box without installing or running the provided software development tools.

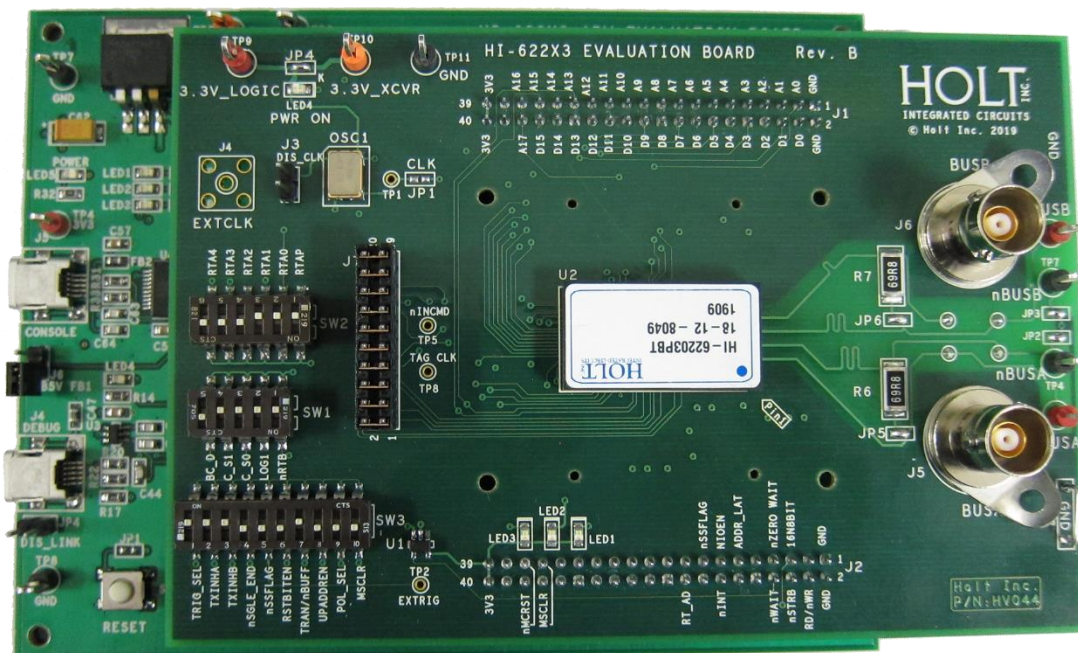


Figure 1. HI-62203 Evaluation Board, mounted on the ARM Cortex MCU Board.

Evaluation Kit Contents

This User Guide.

Holt HI-622x3™ Project Software and Documentation on USB drive.

Installation for IAR Systems Embedded Workbench® for ARM (32KB KickStart.), on USB drive.

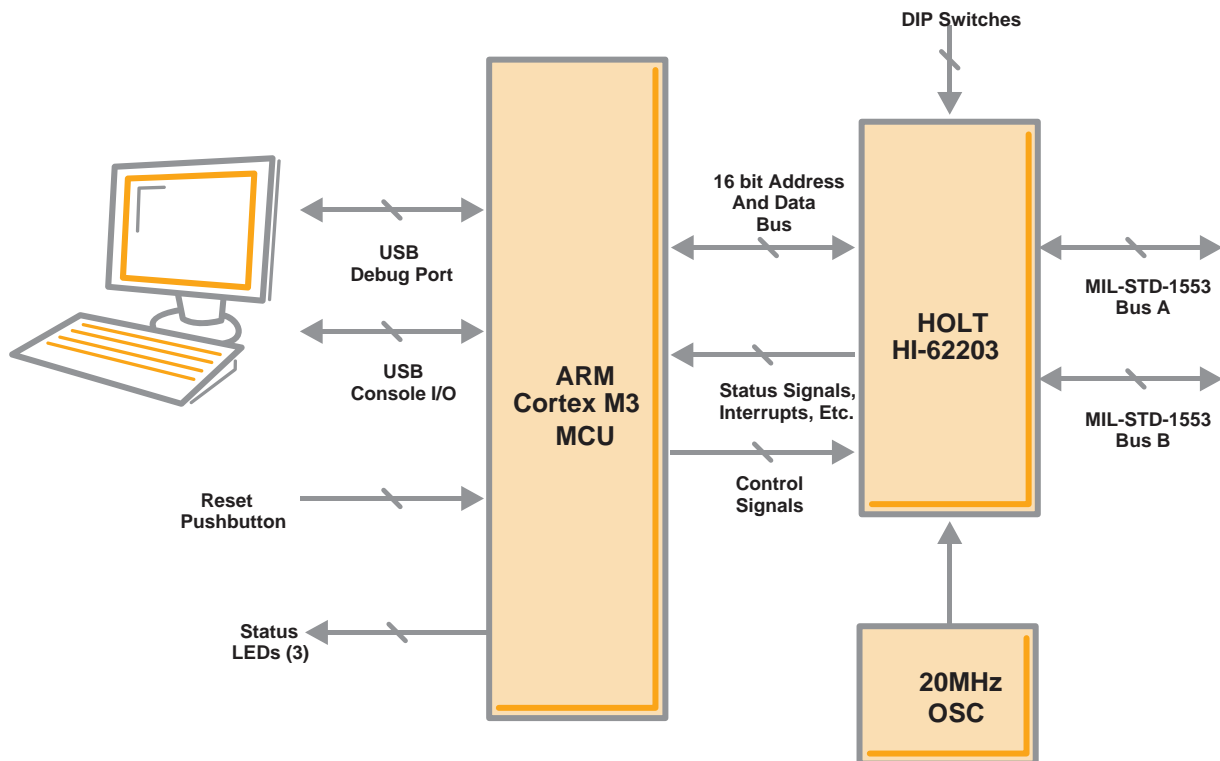
2x USB interface cables.

2-board assembly comprised of:

Upper DUT board with HI-62203™ device and dual transformer-coupled MIL-STD-1553 bus interfaces.
Numerous DIP switches configure board operation.

Lower MCU board with ARM Cortex M3 16-/32-bit microprocessor, debug interface and regulated 3.3VDC power supply.

Hardware Block Diagram



Default Switch Settings (HI-62203 board)

CONFIG 2 (SW1)

SWITCH	DEFAULT	DESCRIPTION
SW1, 1	OFF	nRTB: ON, nRTBOOT pin = 0, 1760 mode in 4K device OFF, A12/nRTBOOT= 1 (open)
SW1, 2	OFF	LOG1: ON, A13/Logic "1" pin = 0 OFF, A13/Logic "1" pin open
SW1, 3	OFF	CS_S0: ON, CLK_SEL_0 pin = 0 OFF, CLK_SEL_0 pin = 1 (open)
SW1, 4	OFF	CS_S1: ON, CLK_SEL_1 pin = 0 OFF, CLK_SEL_1 pin = 1 (open)
SW1, 5	ON	BC_D: ON, BC is not disabled OFF, BC is disabled

RT ADDRESS (SW2)

SWITCH	POSITION	DESCRIPTION
SW2, 6-2	00011 (ON = 0)	Sets the RT address, default is set to 03
SW2, 1	OFF	OFF = RT address parity bit '1', must be odd parity or device will not work

CONFIG 1 (SW3)

SWITCH	DEFAULT	DESCRIPTION
SW3, 1	OFF	TRG_SEL: Not used
SW3, 2	ON	TXINHA: OFF, inhibits transmission on BUSA
SW3, 3	ON	TXINHB: OFF, inhibits transmission on BUSB
SW3, 4	OFF	nSGLE_END: OFF, XCVR uses differential data ON, XCVR uses singled ended data
SW3, 5	OFF	nSSFLAG/EXT_TRIG: OFF, 1553 SSFLAG bit is not set ON, SSFLAG bit is set Note: If External trigger is used SW3,5 should be OFF
SW3, 6	OFF	RSTBITEN: OFF , internal self test enabled on reset ON – Internal self test disabled
SW3, 7	ON	TRAN/nBUFF: OFF sets transparent mode ON sets buffered mode
SW3, 8	OFF	UPADDREN: OFF uses internal register CLK_SEL bits ON – uses CLK_SEL[1:0] pins
SW3, 9	OFF	POL_SEL: OFF , RD/nWR used ON, opposite polarity nRD/WR used
SW3, 10	OFF	MSCLR: ON , Hardware reset

Default Jumper Settings

HI-62203 Board

JUMPER	POSITION	DESCRIPTION
JP1	OFF	Link to send clock to ARM board (not normally used).
JP2	ON	Ground BUSA negative line.
JP3	ON	Ground BUSB negative line.
JP4	ON	Open for separate Logic and XCVR supplies (TP9 &10).
JP5	OFF	Link to connect 70 ohm load resistor for BUSA
JP6	OFF	Link to connect 70 ohm load resistor for BUSB
J3	OFF	Link to disable XTAL Oscillator., an external clock can then be connected to J4
J7	ON	These carry the digital signals for the Transceiver, only disconnect if using an external transceiver.

Test Points

TEST POINT	DESCRIPTION
TP1	HI-62203 input clock
TP2	nSSFLAG output or input for external trigger
TP3	Positive connection for 1553 Bus A
TP4	Negative connection for 1553 Bus A
TP5	nINCMD, a '0' indicates HI-62203 activity (default) nMCRST, mode code 8 reset output (when enabled)
TP6	Positive connection for 1553 Bus B
TP7	Negative connection for 1553 Bus B
TP8	Input for TAG clock
TP9/TP10	3.3V supply for HI-62203 or HI-62213 (supplied from ARM board)
TP11/12	Ground connection

ARM Board

Jumpers

JUMPER	POSITION	DESCRIPTION
JP1	OFF	Link for Mode Code 8 to reset board.
JP2	ON or OPEN	Link for using NonZero Wait type interface Used.
JP3	OFF	Link for using Zero Wait type interface.
JP4	OFF	Not Used.
J1	OFF	Link for external ARM clock.
J6	OFF	Link to enable supply from USB 5V, make sure this is disconnected if using bench supply

LEDs

LED #	DESCRIPTION
LED1	Software defined LED.
LED2	Software defined LED.
LED3	Software defined LED.

Hardware Design Overview

Refer to the end of this guide for separate schematic diagrams and bills of material for the upper DUT board and lower MCU board.

The detachable DUT board can be separated from the provided MCU board for connection to a user-supplied alternate microprocessor or FPGA board. The inter-board headers are located on 0.1" (2.54 mm) grid for compatibility with generic prototyping boards. All host interface signals go through the inter-board headers. Several configuration pins including the Remote Terminal address setting pins are controlled by two DIP switches on the upper DUT board; these signals are not available on the inter-board headers.

The lower ARM Cortex M3 board is based on the flash-programmable Atmel AT91SAM3U-EK microprocessor. A 16 bit data/address bus from the ARM connects to the DUT. A USB serial port provides console I/O. A RESET pushbutton resets the ARM microprocessor, which in turn controls the DUT Master Reset signal.

The ARM Cortex M3 board includes "J-Link On Board" debug interface, licensed from www.segger.com, providing out-of-box readiness without having to buy a costly JTAG debug cable. The kit includes a simple USB cable for connecting the board's debug interface to your computer.

HI-62203 Host Interface

HI-62203 features a 16 bit parallel data bus and has a 64K x 16 word SRAM address space (there is also a version with 4K x 16 bit SRAM). Both are offered in a 312 pin PBGA package.

The HI-62203 has data transfer speeds that depend on which of the four available clock frequencies is selected. The board is supplied with a 20MHz XTAL oscillator module, so by default the software will set up 50MHz operation. However an external clock can be input through SMA connector J4, if this is done jumper J7 should be connected. The device will run on a 20, 16, 12 or 10MHz clock, but the appropriate register setting must be set to register 0x18.

Control Switches

SW2 has six control functions that affect operation of the HI-62203, these are explained in the configuration section, please check they are in the default position before continuing.

RT address set up

The RT terminal address is set using DIP switches, before applying power. The 6-position DIP switch SW2 should already be set with the address value 03, plus odd parity.

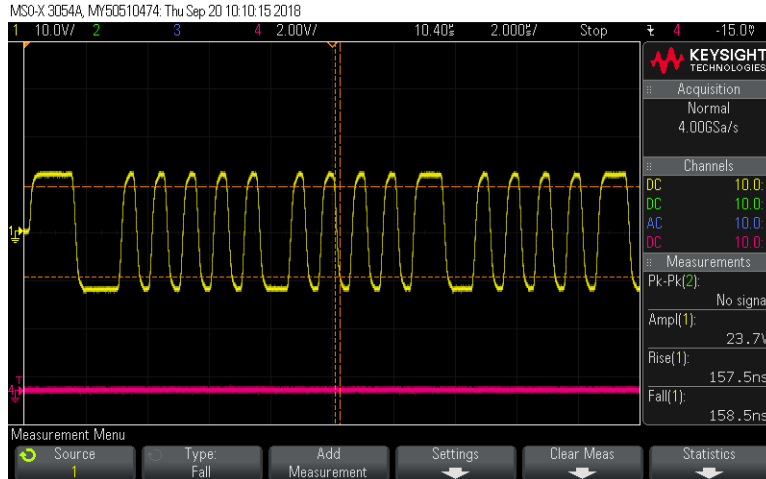
1553 Bus Interface

Note 1: Connecting Bus Negative to ground is strictly a bench test convenience feature. Most performance characteristics of transmitted and received 1553 signals are specified using differential line-to-line measurements at the bus stub, Bus Positive minus Bus Negative. This corresponds to the red and black "BUS" test points adjacent to the transformers on the right side of the upper circuit board. While two oscilloscope probes connected to red and black may be used in conjunction with scope's Ch1-Ch2 math function, a single probe connected to Bus Positive provides the same signal display when Bus Negative is grounded. This frees up scope probes for other purposes. The nINCMD (TP5) signal can be used to trigger the scope as shown in magenta trace on plots from the next page, this signal goes low during 1553 activity.

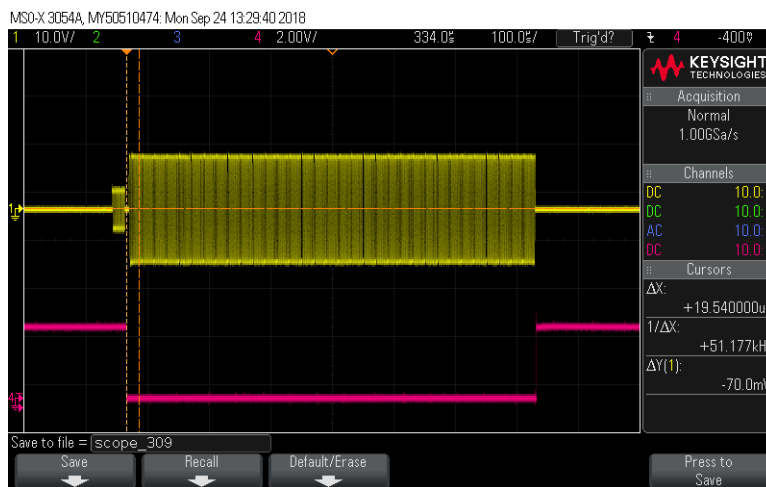
Do not include a provision for grounding Bus Negative in your production design.

Note 2: For stand-alone testing (without connection to a conventional MIL-STD 1553 bus) the hardware provides on-board 70Ω termination resistors. This is strictly a bench test convenience feature that supports demonstration of BC and RT without external 1553 bus connections. When using the RT/MT mode the RT can fully transact messages, with or without the bus monitor.

On-board termination resistors are not used when connecting to a properly terminated MIL-STD-1553 bus. Do not include a provision for termination resistors in your production design.



BusA 1553 output and nINCMD signal, in BC mode generating bus command



BusA 1553 output and nINCMD signal, in RT mode, responding to TxData command

Initial Setting Up

The Holt HI-62203 Application Development Kit is designed to support the HI-62203 and HI-62023 devices in the QFP 80 pin package. The HI-62203 is used as the example, this has 64K of 16 bit SRAM and will operate in all three modes; Remote Terminal (RT), Bus Controller (BC), SMT Bus Monitor (MT).

Windows 7, 10 ...

Install the free open-source terminal emulation program, *TeraTerm 4.71*, by running the provided teraterm-4.71.exe installer program from the Holt CD. Accept the license agreement stating redistribution is permitted provided that copyright notice is retained. The notice can be displayed from the TeraTerm window by clicking **Help** then clicking **About TeraTerm**. Continuing to install...

Accept the default install destination and click **Next**.

At the Select Components screen, unselect all options except Additional Plugin = TTXResizeMenu and click **Next**.

Select the installed language, then click **Next**.

Accept the default Start Menu folder, then click **Next**.

Select any desired shortcuts, then click **Next**.

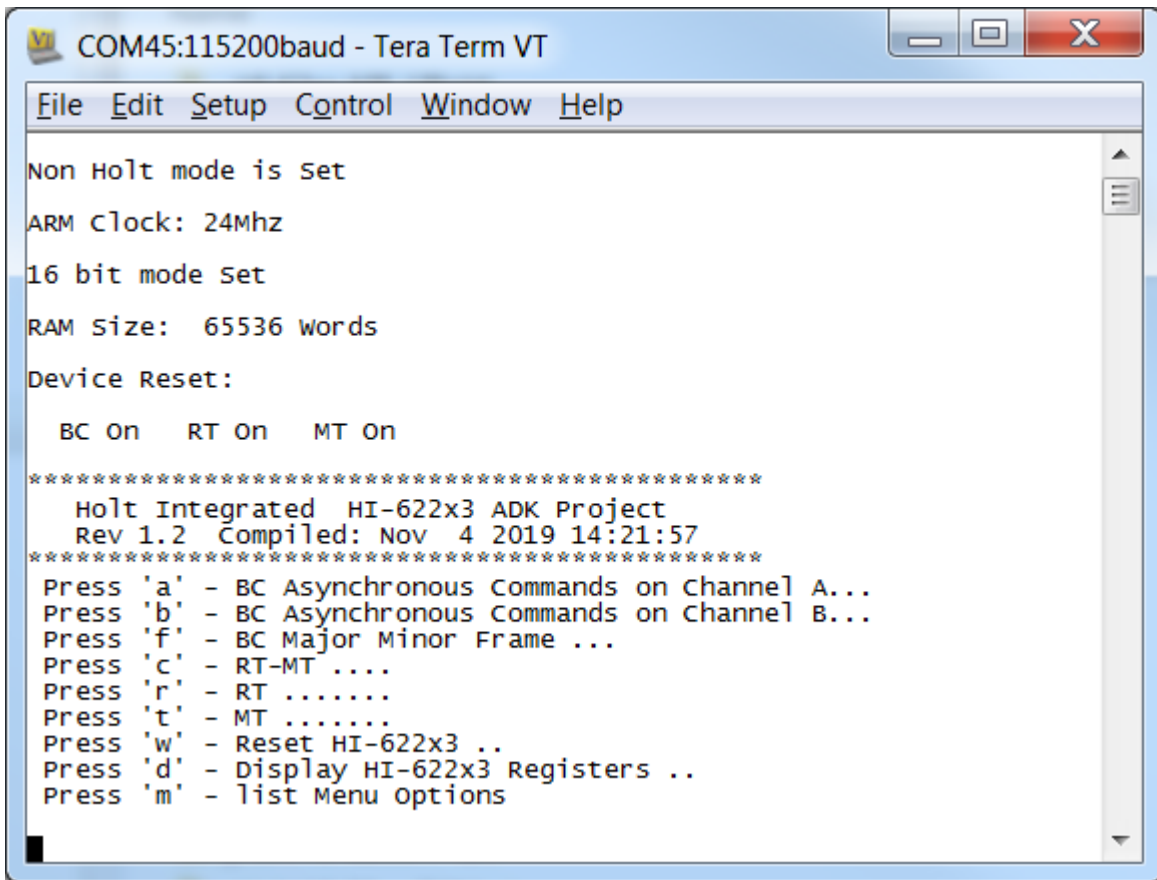
At the Ready to Install screen, click **Install**.

Run the TeraTerm program. At the **New Connection** screen, select **(x)Serial** and choose the selected COM port. Click **Setup** then **Serial Port** to open the serial port setup window. Choose these settings: Baud Rate: 115200, Data: 8 bits, Parity: none, Stop: 1 bit, Flow Control: none.

The board can be powered from both a 5VDC bench power supply or the 5V USB supply, if using the USB supply jumper J6 on the lower ARM board should be closed, note however that on many PCs the USB does not have sufficient power to supply the board when it is transmitting. If using the bench supply make sure J6 is open. If TeraTerm is running and configured correctly, the command menu below should appear in the console window. This menu appears whenever board power is applied, or the RESET pushbutton is pressed. After verifying correct TeraTerm communication with the evaluation board, the terminal set up can be saved by clicking **Setup** then **Save Setup**.

The RT terminal address is set using DIP switch SW2. RT address 3 is utilized by the preprogrammed Bus Controller message repertoire. The 6-position DIP switch should already be set with the address value 03, plus odd parity. The board is supplied with a 20MHz XTAL oscillator and the software is by default set to work at 20MHz. If a different clock frequency is required an external clock and be input through connector J4, before doing this connector J3 should be jumped to disable the on board oscillator.

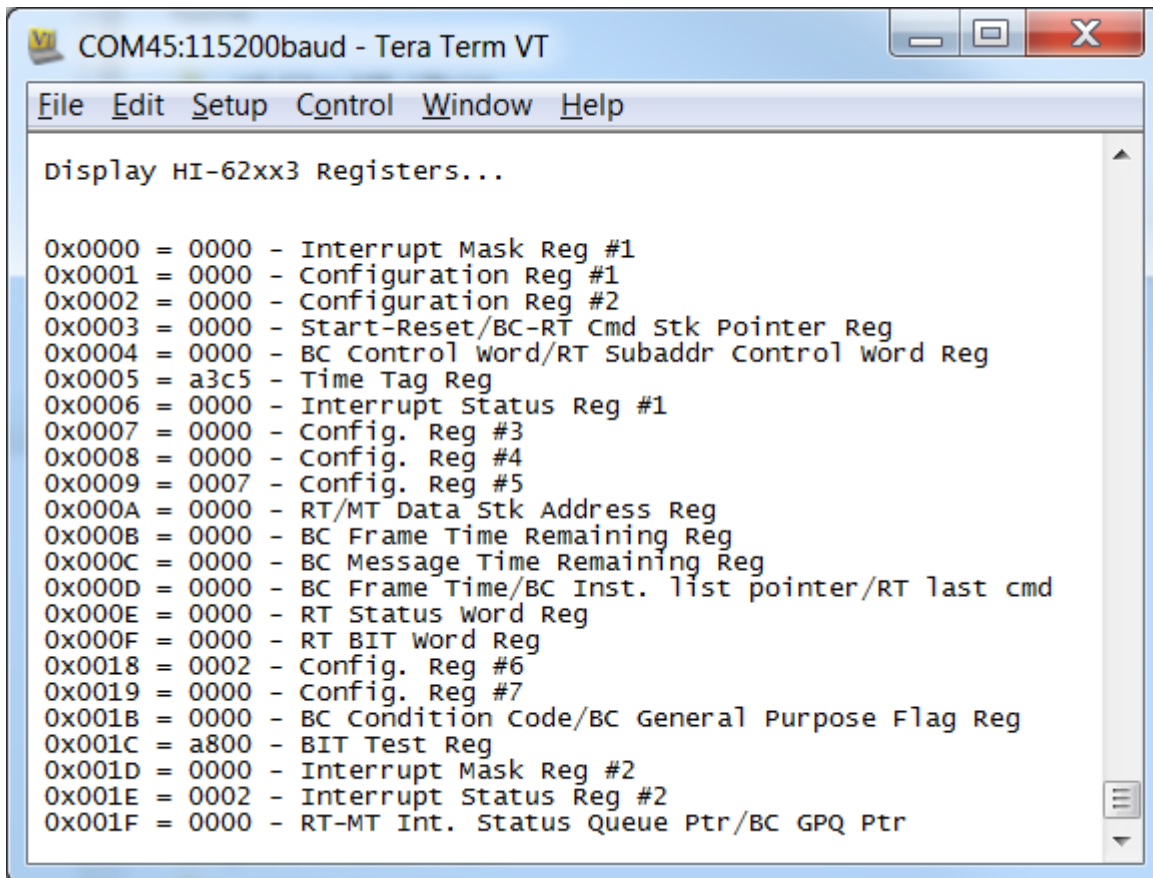
The dates and times shown will differ from the screen captures shown below.



```
COM45:115200baud - Tera Term VT
File Edit Setup Control Window Help
Non holt mode is set
ARM clock: 24Mhz
16 bit mode set
RAM Size: 65536 words
Device Reset:
  BC On  RT On  MT On
*****
  Holt Integrated HI-622x3 ADK Project
  Rev 1.2 Compiled: Nov 4 2019 14:21:57
*****
Press 'a' - BC Asynchronous Commands on Channel A...
Press 'b' - BC Asynchronous Commands on Channel B...
Press 'f' - BC Major Minor Frame ...
Press 'c' - RT-MT ....
Press 'r' - RT .....
Press 't' - MT .....
Press 'w' - Reset HI-622x3 ..
Press 'd' - Display HI-622x3 Registers ..
Press 'm' - list Menu Options
```

The screen reports the ARM clock speed (24MHz) for the parallel interface and the RAM size (64K) of the HI-62203 device. Below that are the HI-622x3 options BC/RT/MT, the software is supplied with these options enabled. All of these are options are selectable in the compiler and are described in more detail later.

Below the options is the keyboard menu, this has been kept simple and only 9 key presses are available. Press 'w' to reset the device, then press 'd' to display the registers, display should look similar to below:



The screenshot shows a window titled "COM45:115200baud - Tera Term VT". The menu bar includes "File", "Edit", "Setup", "Control", "Window", and "Help". The main text area displays the following register information:

```
Display HI-62xx3 Registers...

0x0000 = 0000 - Interrupt Mask Reg #1
0x0001 = 0000 - Configuration Reg #1
0x0002 = 0000 - Configuration Reg #2
0x0003 = 0000 - Start-Reset/BC-RT Cmd Stk Pointer Reg
0x0004 = 0000 - BC Control word/RT Subaddr Control word Reg
0x0005 = a3c5 - Time Tag Reg
0x0006 = 0000 - Interrupt Status Reg #1
0x0007 = 0000 - Config. Reg #3
0x0008 = 0000 - Config. Reg #4
0x0009 = 0007 - Config. Reg #5
0x000A = 0000 - RT/MT Data Stk Address Reg
0x000B = 0000 - BC Frame Time Remaining Reg
0x000C = 0000 - BC Message Time Remaining Reg
0x000D = 0000 - BC Frame Time/BC Inst. list pointer/RT last cmd
0x000E = 0000 - RT Status word Reg
0x000F = 0000 - RT BIT word Reg
0x0018 = 0002 - Config. Reg #6
0x0019 = 0000 - Config. Reg #7
0x001B = 0000 - BC Condition Code/BC General Purpose Flag Reg
0x001C = a800 - BIT Test Reg
0x001D = 0000 - Interrupt Mask Reg #2
0x001E = 0002 - Interrupt Status Reg #2
0x001F = 0000 - RT-MT Int. Status Queue Ptr/BC GPQ Ptr
```

Reg #5 data is the time tag counter and will continually change, Reg #9 is the RT address register and content 0007 reflects RT address 3 is set. Reg #1C is the self test register and a800 reflects that the protocol test was run on power up and passed. Note the RSBITEN pin has to be high for this test to run on reset.

General Structure of Demo Functions

The Holt API demonstration program is run from the source files in the src (source) folder. The main.c file calls the console.c and executes demo functions in bcdemo.c, bcAsyncDemo.c and rtmtdemo.c. The Holt API runtime library is contained in the library HI-62xxx lib as executable object code. Files xdemo.c

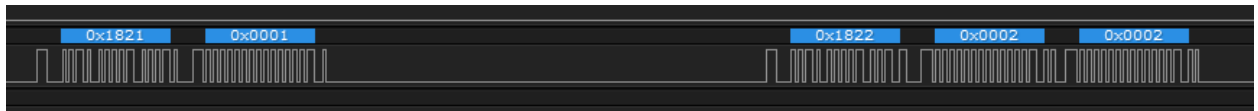
contain the demo initialization API function calls supporting demonstrations executed from the console menu to initialize the BC, RT and monitor terminals. Key presses are detected in console.c

Commands 'a' and 'b' transmit BC async commands onto the A and B bus respectively and can be viewed on an oscilloscope. The 'f' command will transmit a Major/Minor frame. These demos demonstrate how Holt API's are used to generate BC Asynchronous messages, Major/Minor frames, low priority and high priority messages. View these messages with external MIL-STD-1553 test equipment or on an oscilloscope.

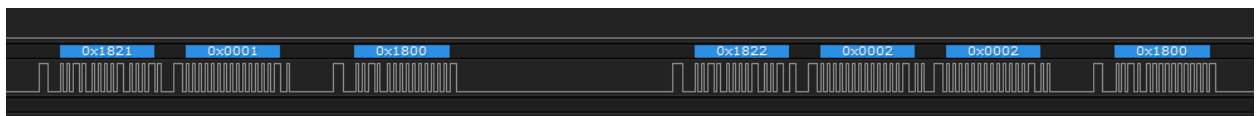
This exercise uses the internal BC to transmit messages, so message traffic data is displayed on the console. If an external BC is already connected to the bus jack though a bus coupler, it is okay to leave it connected, but disable any external BC transmissions that will conflict with the on-chip BC transmissions. A snap shot of the output data is shown below:

BC Mode (using an external RT)

1. Commands 'a' and 'b' transmit BC async commands onto the A and B bus respectively and can be viewed on an oscilloscope, as shown below. These are Receive data commands to an RT address = '3'. A series of four RxData commands are sent with 1 to 4 data words.

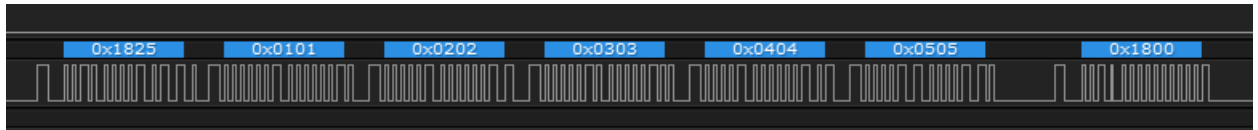


2. Connect an RT to BUSA and set RT address to 3, monitor the Bus with a oscilloscope or monitor, a a response similar to below should be seen, with the RT responding with a clear status word:



3. The 'f' command will transmit a Major/Minor frame. These demos demonstrate how Holt API's are used to generate BC Asynchronous messages, Major/Minor frames, low priority and high priority messages. Below is a snap shot of the major frame sequence containing 4 minor frames, this is continually repeated, the second snap shot shows the first minor frame:





The 0x1800 word is the RT address 3 responding with a clear status.

4. The message data for the Major/Minor frames is contained in the bcdemo.c program and can easily edited. As shipped RT address 3 is used.

RT Mode, using an external BC

Use an external BC tester (such as Ballard USB 1553) to transmit messages to the demo board.

1. When an external BC is connected using conventional 1553 buses, use cables to connect the demo board circular tri-axial bus jacks to bus coupler ports on the A and B bus networks. In this case, the on-board dummy bus load 70 Ω resistors should be disconnected. If bus couplers are not readily available, bench testing can be done by enabling the on-board dummy bus load 70 Ω resistors (R6, R7) and connecting BC tester cables directly to the demo board tri-axial jacks for buses A and B.
2. Press 'w' command to reset device, then 'r' to set RT mode. This configures the HI-62203 into an RT terminal, with the RT address set on DIP switch SW1. The screen below will be displayed.


```

COM45:115200baud - Tera Term VT
File Edit Setup Control Window Help
*****
Holt Integrated HI-622x3 ADK Project
Rev 1.2 Compiled: Nov 4 2019 14:21:57
*****
Press 'a' - BC Asynchronous Commands on Channel A...
Press 'b' - BC Asynchronous Commands on Channel B...
Press 'f' - BC Major Minor Frame ...
Press 'c' - RT-MT ....
Press 'r' - RT .....
Press 't' - MT .....
Press 'w' - Reset HI-622x3 ..
Press 'd' - Display HI-622x3 Registers ..
Press 'm' - list Menu Options

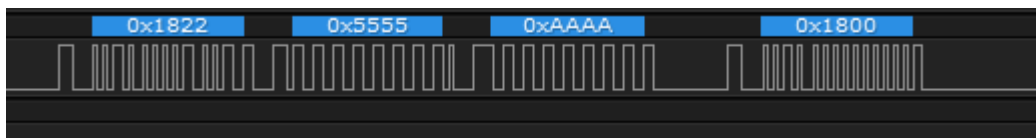
Running RT test...

** Press <ENTER> to stop **

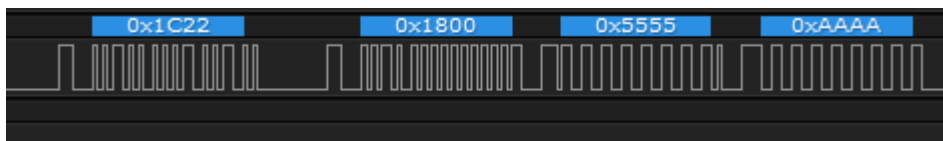
```

3. RT is set to single buffered mode. This RT set up supports data write and read from RT Sub-address 1 and most mode codes, please refer to Holts API software manual for more details.
4. As in example before, use 1553 tester to a 03-T-01-02 Xmt command (0x1822). The Bus data should look similar to below.

Response to receive two data words to SA1



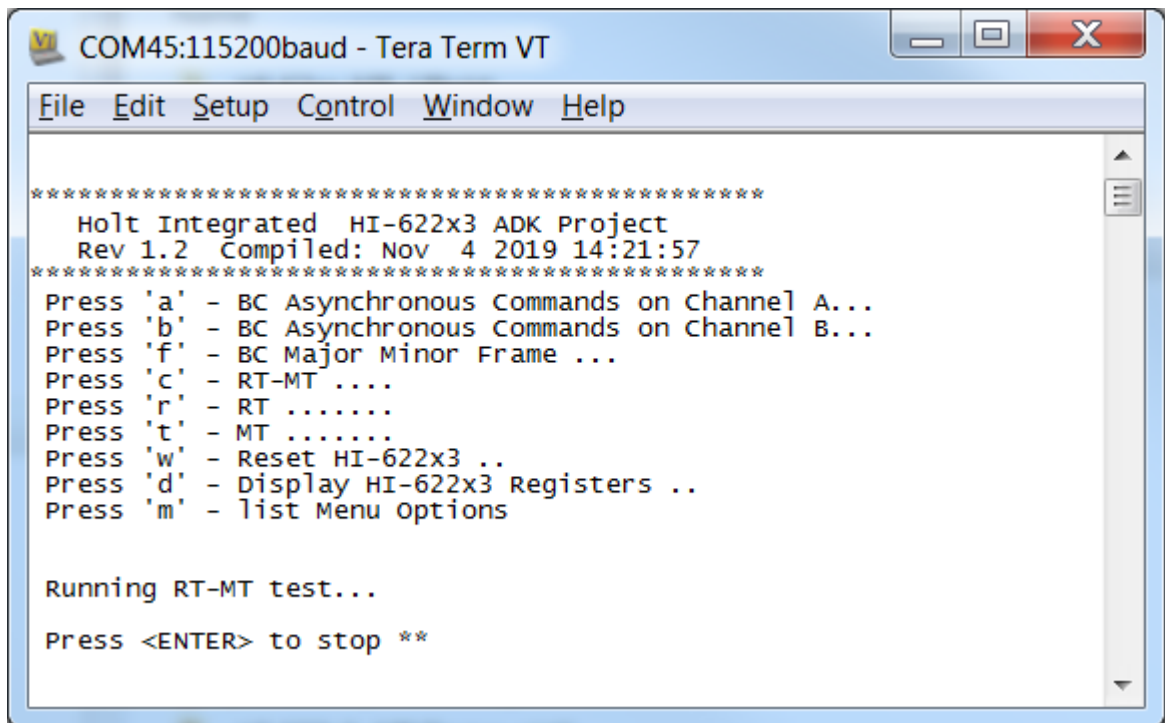
Response to Transmit two words from SA1



RT/MT Mode, using an external BC

Use an external BC tester (such as Ballard USB 1553) to transmit messages to the demo board.

1. Press 'w' command to reset device, then 'c' to set RT/MT mode. This configures the device into an RT terminal and a Monitor. The screen below will be displayed:



```
COM45:115200baud - Tera Term VT
File Edit Setup Control Window Help
*****
Holt Integrated HI-622x3 ADK Project
Rev 1.2 Compiled: Nov 4 2019 14:21:57
*****
Press 'a' - BC Asynchronous Commands on Channel A...
Press 'b' - BC Asynchronous Commands on Channel B...
Press 'f' - BC Major Minor Frame ...
Press 'c' - RT-MT ....
Press 'r' - RT .....
Press 't' - MT .....
Press 'w' - Reset HI-622x3 ..
Press 'd' - Display HI-622x3 Registers ..
Press 'm' - list Menu Options

Running RT-MT test...

Press <ENTER> to stop **
```

2. RT is set to single buffered mode. The RT is set up as in RT mode above, but additionally it will monitor traffic on the bus and report the data log to the terminal screen. Send a 03-T-01-02 command from the 1553 tester, then send a 03-R-01-02 command. The screen will show a data log similar to below:

```
COM50:115200baud - Tera Term VT
File Edit Setup Control Window Help
-RT Message-
MSG #0002.  TIME = 00078922us    BUS A    TYPE0: BC to RT
CMD1 1822 --> 03-R-01-02
DATA 5555  AAAA

-RT Message-
MSG #0003.  TIME = 00017754us    BUS A    TYPE1: RT to BC
CMD1 1C22 --> 03-T-01-02
DATA 5555  AAAA
```

1st line shows the MSG#, the time stamp, BUS being used, type of message

2nd line shows the command hex code and the subtext abbreviation for the command

3rd line shows the data content of the command in the format:

RT ADD - Tx/Rx Type -Subaddress - Word length

3. Send a Mode code 18 (Transmit last command), the command 03-R-01-02 sent above should be logged as below, note only the hex content (0x1C22) of the message is displayed:

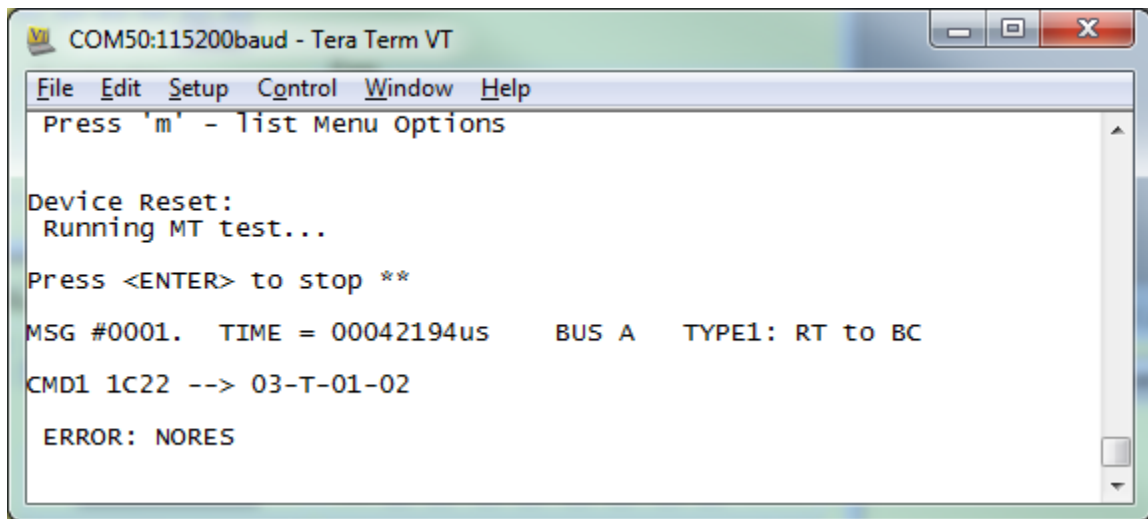
```
COM50:115200baud - Tera Term VT
File Edit Setup Control Window Help
CMD1 1C22 --> 03-T-01-02
DATA 5555  AAAA

-RT Message-
MSG #0004.  TIME = 00053250us    BUS A    TYPE7: Mode Tx Data
CMD1 1FF2 --> 03-T-31-18
DATA 1C22
```

MT Mode, using an external BC

Use an external BC tester (such as Ballard USB 1553) to transmit messages to the demo board.

1. The monitor mode is very similar to RT/MT mode but the RT is not enabled, the monitor functions the same as in RT/MT section above.
2. Press 'w' command to reset device, then 't' to set MT mode. This configures the device into a Monitor only. The screen below will be displayed, additionally if a 03-T-01-02 command is sent a log and response will be shown, with no response this time as the RT is disabled:



```
COM50:115200baud - Tera Term VT
File Edit Setup Control Window Help
Press 'm' - list Menu options

Device Reset:
Running MT test...

Press <ENTER> to stop **
MSG #0001.  TIME = 00042194us    BUS A   TYPE1: RT to BC
CMD1 1C22 --> 03-T-01-02

ERROR: NORES
```

Getting Started with the Holt API demo software project and installing

IAR Systems Embedded Workbench for ARM Compiler

Getting Started with the Holt API demo software project and installing IAR Systems *Embedded Workbench for ARM* Compiler

Installed IAR Systems *Embedded Workbench for ARM (EWARM)* compiler is required BEFORE adding the Holt demo projects so all Atmel board library files and the demo project folder are created in the proper location. Follow the “*Holt HI-622x3 API Demo Project Installation Guide*” found in the Project folder on the Holt USB DRIVE. Before proceeding to the next steps IAR must be installed and the two Holt project folders must be in the proper folder locations, according to that guide. **Instructions beyond this point assume you have completed the above installation tasks.**

Launch IAR *Embedded Workbench* from the Windows Start menu. A blank screen should appear. Open the Holt HI-622x3 API Demo Project from the IAR File pull-down menu, click on File/Open/Workspace and navigate to the project folder location and select “HI-62xx.eww” and click the Open button.

An IAR Workspace window should appear on the left side as shown below. If the Workspace directory pane is missing, select “Workspace” from the View pull-down menu. Make any window adjustments or open any of the folder groups to view included files to suit your preferences.

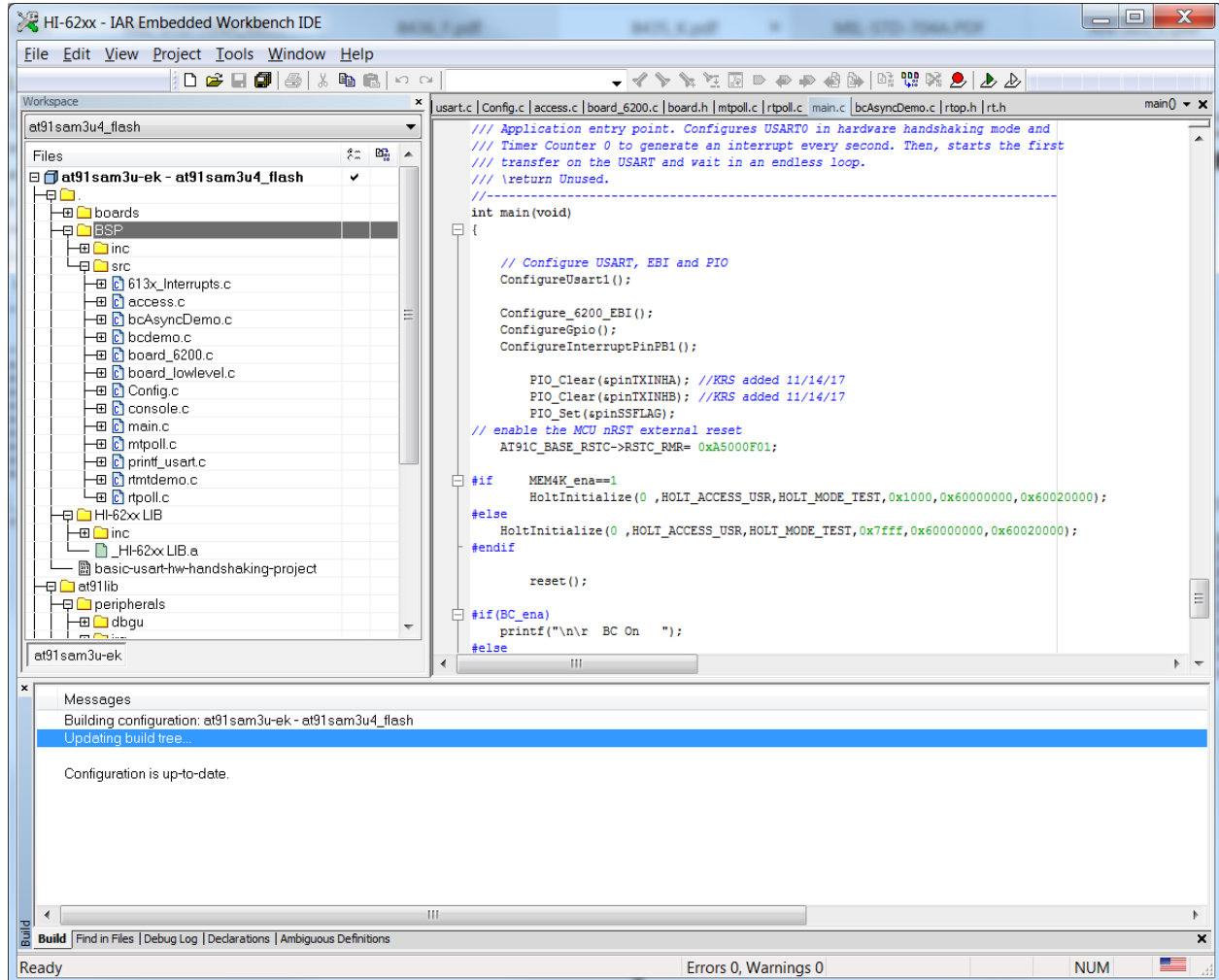
Double click the main.c file, it should appear in the text editor pane, similar to the screen capture below.

The first time a project is unzipped and installed in the appropriated folder a Rebuild All should be performed (from Project pull down menu).

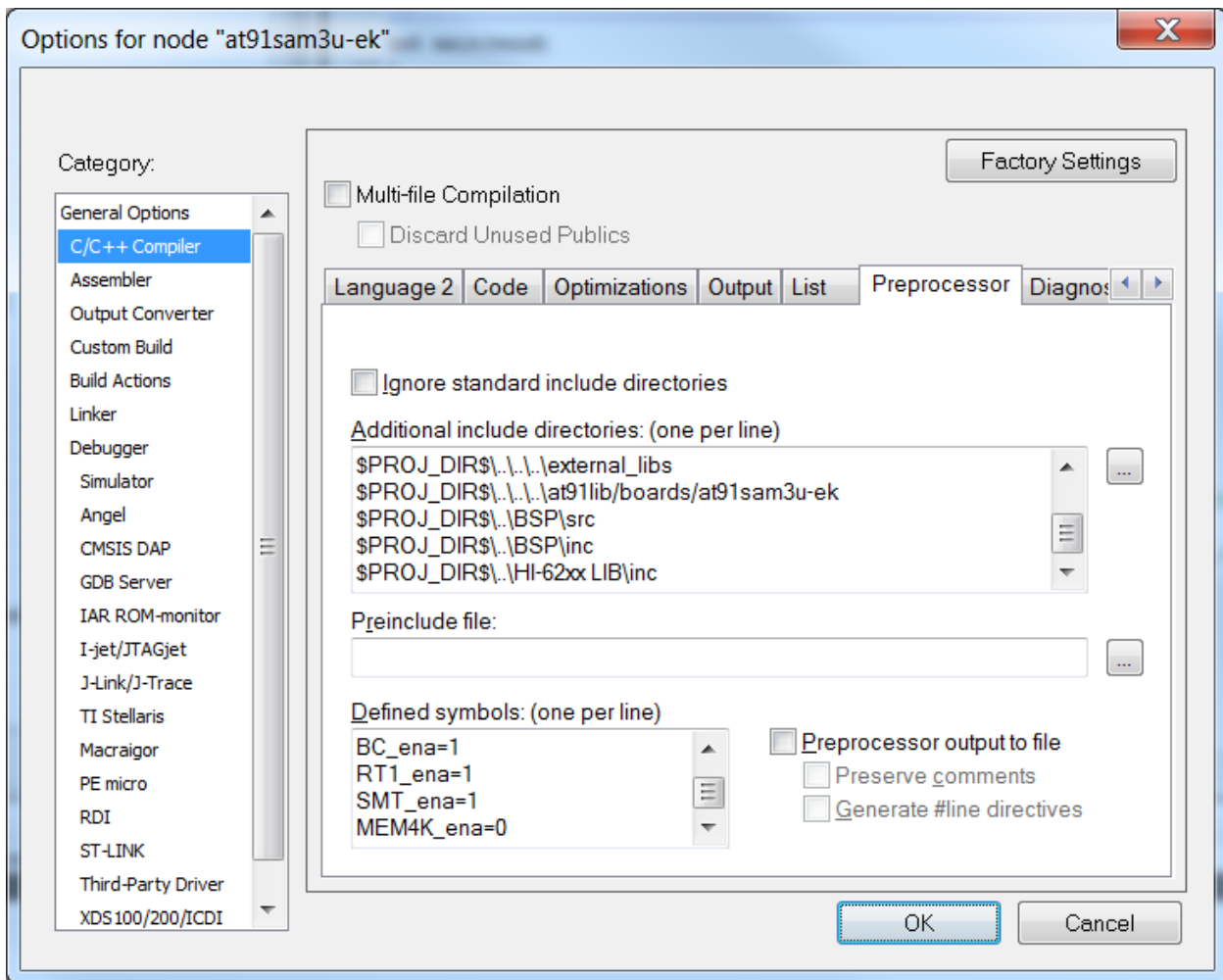
IAR getting started, project management and other guides are available from the IAR Workbench Help pull down menu.

Mode Holt Project Configurations

IAR project configurations are used to re configure the demo software using preprocessor macros. Holt uses a common code base for multiple projects. This means there are functions not used in this project but are left in the C and H files. The IAR compiler uses the macros to decide which sections of code to build and link. Some references to HI-6130 or HI-6131 are to be expected. In some cases, functions are simply not used or macros are used inside a function to select appropriate code.



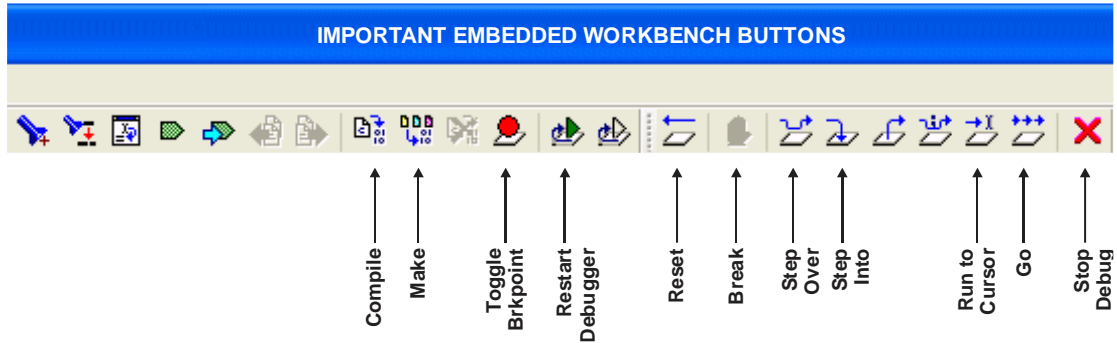
To select the preprocessor options, place mouse over the at91sam--- line at the top left of screen and right click. Select 'options' and C/C++ Compiler options, then 'Preprocessor' as shown in the window below:



Scroll to the 'Defined symbols window and edit the parameter you want to change, to add the option use a '1' to disable use '0'. As shown above BC, RT and SMT are all enabled, 4K is disabled, this means it will be compiled for all BC,RT,MT and 64K RAM size.

The API library source code is not provided in the standard ADK. The standard ADK demos are fully functional otherwise, and API projects can be built without the API C source code.

The IAR embedded workspace provides many of the commonly used tasks as short-cut buttons on the top as shown:



Application Development Kit Notes

HI-62203™ was designed for compatibility with microcontrollers having a 16 or 8 bit data bus interface. The device is split into address space for RAM or register locations, and is selected using the nMEM/REG control pin which is connected to address pin A17. The menu command 'd' will read all register addresses from 0x00 to 0x01F.

When using the ARM debugger, the register address space starts at the ARM address 0x60000000 and the RAM at 0x60020000.

The console I/O option using TeraTerm includes a menu option that reads and displays register content including pending interrupt register status. Remember that Pending Interrupt bits automatically reset after read occurs.

Project File List with Selected Descriptions

Most of the function names are self-explanatory, some functions retain the names from the original HI-6131 or 6130 devices they were written for, don't worry about this they work fine with the HI-622x3 family.

Board_6200.c/h

Handles definitions for HI-622x3 ARM clock rate and interface settings.

board_lowlevel.c/h

Hardware configuration, such as ARM PLL settings .

613x_interrupts.c/h

Interrupt handling routines and configuration settings.

main.c

The primary program entry portal, main() demonstrates initialization sequence used to enable terminals. After initialization is complete, function calls demonstrate powerful addressing methods for all RAM structures used by the enabled terminal modes. Demo initialization and execution uses Holt high-level API in this demo kit.

ConfigureGpio(); initializes ARM MCU general purpose I/O

console.c

Console functions used by all terminal modes:

ConfigureUsart1();

Show_menu();

chk_key_input();

list_all_regs();

Console functions used by Bus Controller (BC) mode:

bcAsync();

MajorMinorframe();

Console functions used by Remote Terminal: rtpoll();

Console functions used by Monitor MT: mtpoll.c

Console functions used by Monitor/Remote Terminal MT/RT:

rtmtdemo.c;

Console functions used by MT bus monitor modes:

Primitive console functions that "printf" redundant char strings to reduce program size:

```
print_null(), print_sp1sp(), print_b1sp(), print_b0sp();  
print_dddn(), print_dd0n(), print_dd1n();  
print_menuprompt(), print_line();
```

DisplayDecodedMsg(); used to display 1553 formatted data to the console when the 't' monitor command is used.

displayRTTraffic(); called from main; calls DisplayDecodedMsg()

Flash.icf - Project Linker File.

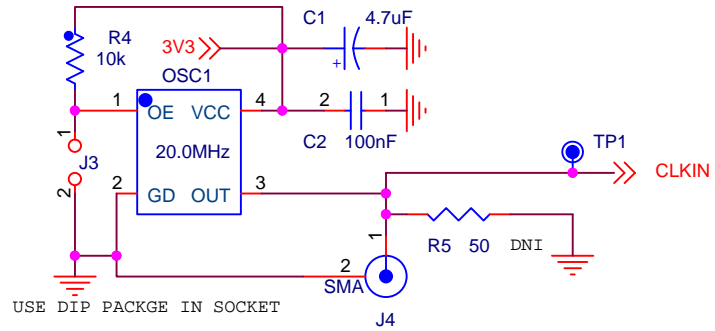
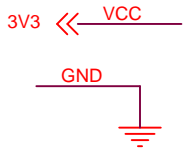
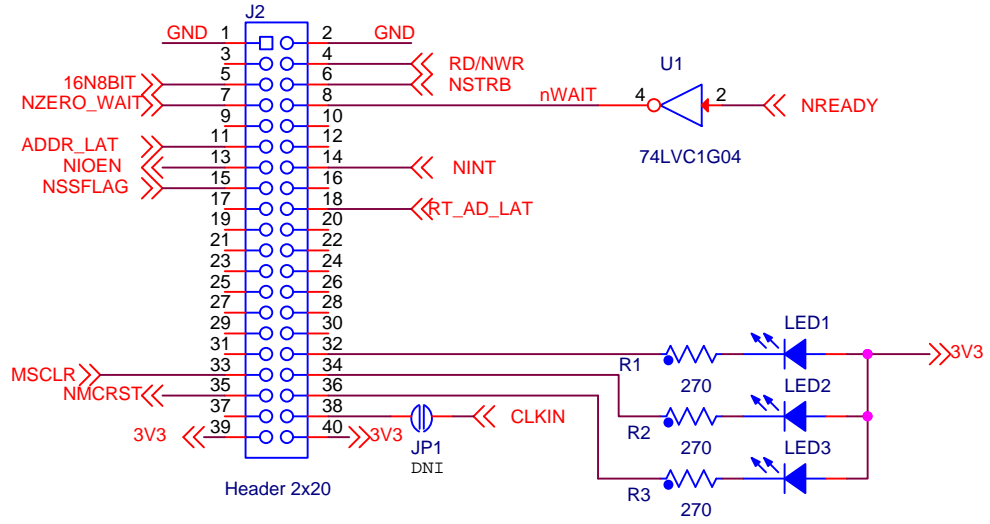
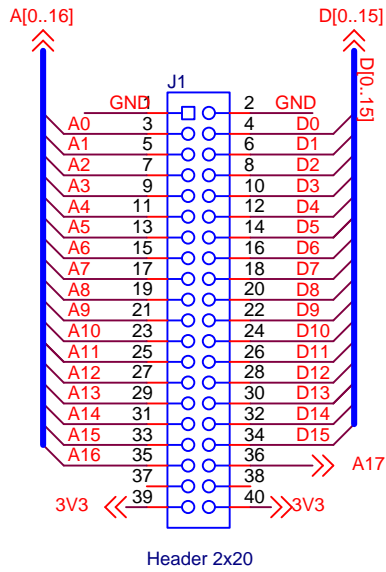
Holt API Library files

_HI-62xxx 1_0 LIB.a – Precompiled Holt API library.

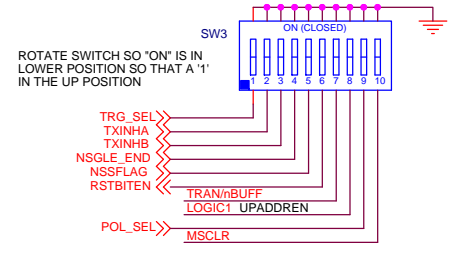
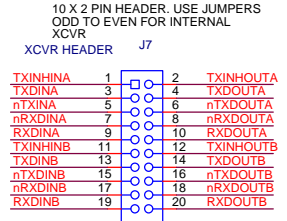
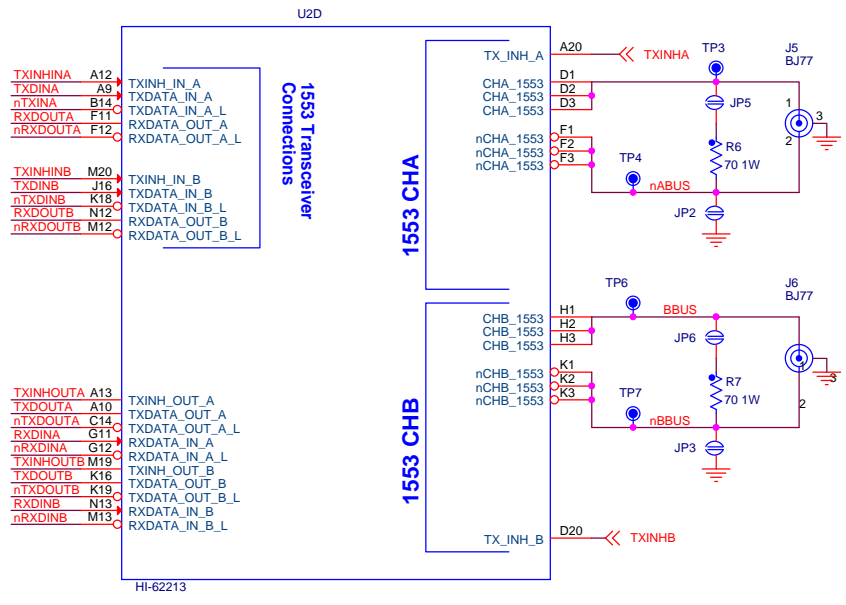
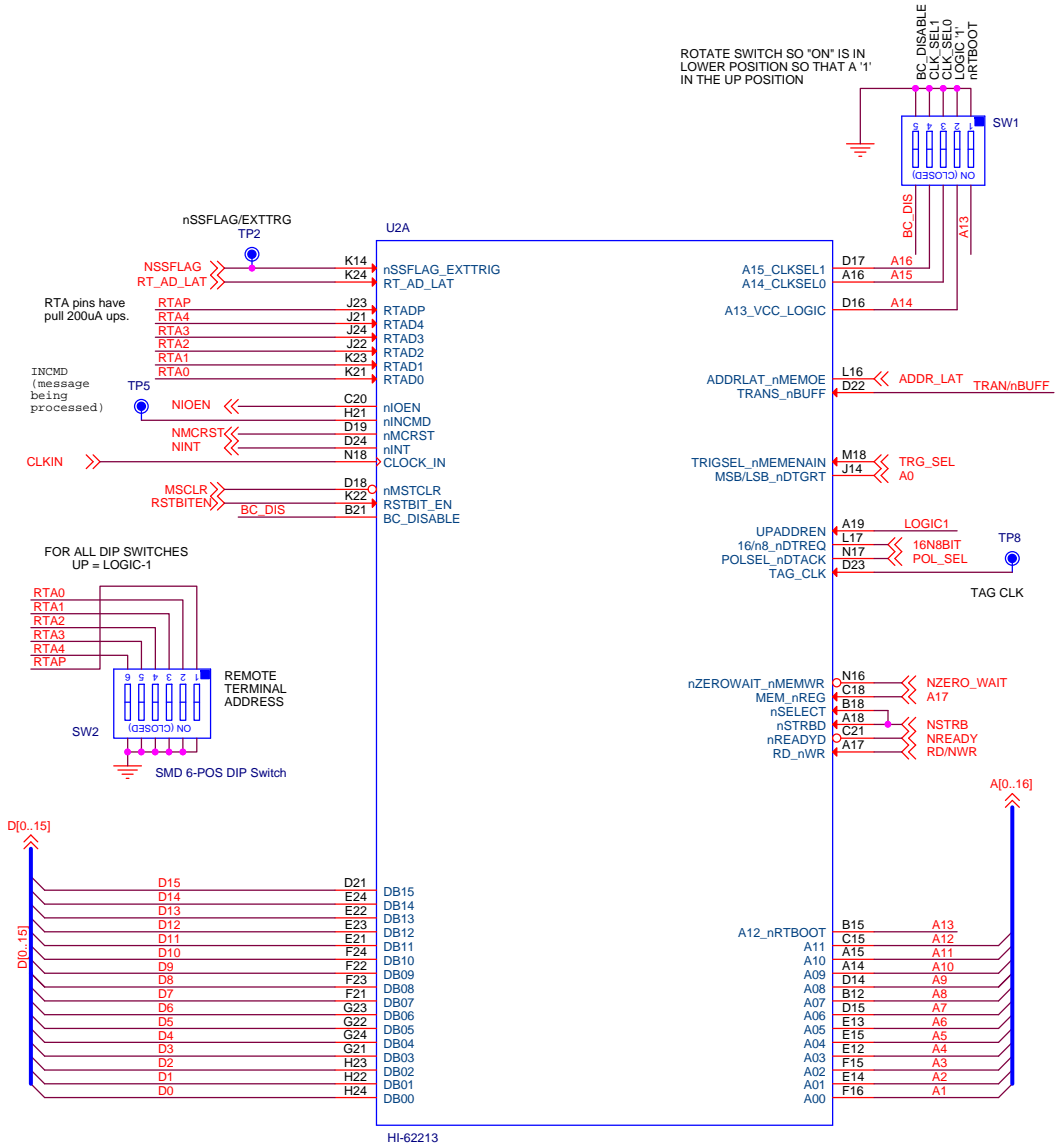
This file, with extension .a, is the precompiled Holt API library file, note: file name could have a later revision number.

The standard API kit does not include the Holt API source files although the API header files are included and grouped in the workspace Holt_API/src sub-folder.

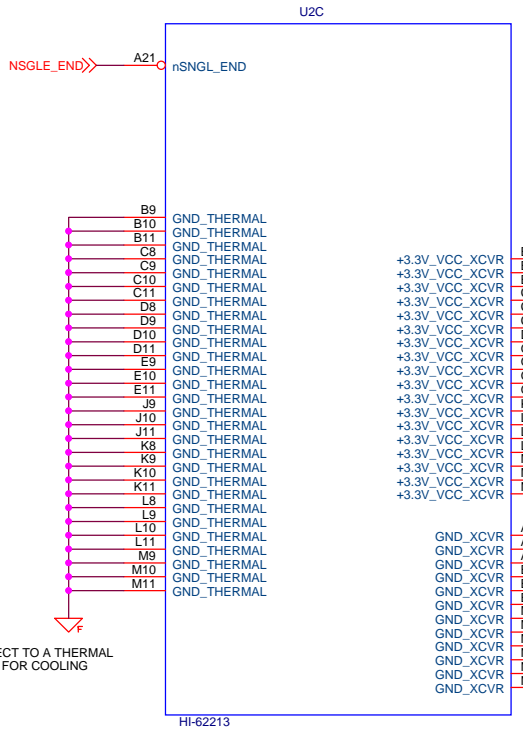
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1	1	PCB, Bare, Evaluation Board	N/A		Newtek PCB #13913
2	11	Capacitor, Cer 0.1uF 20% 50V Z5U 0805	C2,C3,C4,C5,C6,C7,C8,C11,C12,C13,C14	445-15929-1-ND	TDK C2012X7R1H104K125AE
3	1	Capacitor 4.7uF,20%, 16V Tant SMD 3216	C1	399-3699-1-ND	Kemet T491A475M016AT
4	2	Capacitor 47uF,20%, 16V Tant SMD 6032	C9,C15	399-9739-1-ND	Kemet T491C476M016AT
5	2	Capacitor 68uF,20%, 16V Tant SMD 6032	C10,C16	399-8399-1-ND	Kemet T491D686M016AT
6	2	Conn Header .100" Dual Straight 40 Pos	J1,J2	S2012EC-20-ND	PREC020DAAN-RC
7	1	Conn Header .100" Dual Straight 20 Pos	J7	S2012EC-10-ND	PREC010DAAN-RC
8	1	Conn Shunt .1" 20Pos Gold	J7	609-5644-ND	Ampphenol 69145-220LF
9	4	LED Green SMD 0805	LED1,LED2,LED3,LED4	160-1179-1-ND	LiteOn LTST-C170GKT
10	0	Res 49.9, 1/8W 1% 0805 SMD	R5 (Do not install)	P49.9DCCT-ND	Panasonic ERA-2AEB49R9X
11	2	Res 69.8, 1W 1% 2512 SMD	R6,R7	RHM69.8BBCT-ND	Rohm MCR100JZHF69R8
12	4	Res 270, 1/8W 5% 0805 SMD	R1,R2,R3,R18	P270ACT-ND	Panasonic ERJ-6GEYJ270V
13	1	Res 10K, 1/8W 5% 0805 SMD	R4	P10KACT-ND	Panasonic ERJ-6GEYJ103V
14	1	Xtal Osc XO 20.00Mhz 5x7mm SMD	Osc	535-9316-1-ND	Abracon ASV-20.000MHZ-EJ-T
15	2	Connector 3-Lug Concentric Triax Bayonet Jack, Panel Front Mount TRB (BJ77)	J5,J6	1097-1030-ND	Cinch BJ77
16	3	Test Point, Red Insulator, 0.062"	TP3 (ABUS),TP6 (BBUS), TP9 (3V3_LOGIC)	36-5010-ND	Keystone 5010
17	2	Test Point, Orange Insulator, 0.062"	TP5,TP10 (3.3V_XCVR),	36-5013-ND	Keystone 5013
18	3	Test Point, Black Insulator, 0.062"	TP4,TP7 (GND)	36-5011-ND	Keystone 5011
19	0	Test Point, White Insulator, 0.040"	TP8 (Tag_Clk),TP1(CLK),TP2 (nSSFLAG) - DNI	36-5002-ND	Keystone 5002
20	0	Conn SMA Jack Str Str 50 Ohm PCB	J4 - Optional	A97594-ND	TE 5-1814832-1
21	1	Switch Slide Dip 5-SPST 100MA 20V	SW1	CT2195MST-ND	CTS 219-5MST
22	1	Switch Slide Dip 5-SPST 100MA 20V	SW2	CT2196MST-ND	CTS 219-6MST
23	1	Switch Slide Dip 10-SPST 100MA 20V	SW3	CT21910MST-ND	CTS 219-10MST
24	1	IC Single Inverter-Gate SOT-23-5	U1	296-11599-1-ND	TI SN74LVC1G04DBVR
25	1	HI-62203 312-BGA Package	U2 - for 64K board	Holt	Holt HI-62203
25	1	HI-62203 312-BGA Package	U2 - for 4K board	Holt	Holt HI-62213
26	4	Hookup Solid wire - 20AWG - Black - 4" Long per Board	For J5 and J6	C2028B-XX-ND	General Cable C2028A.12.01



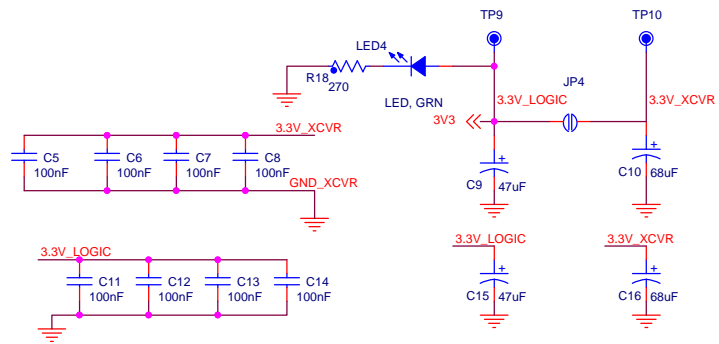
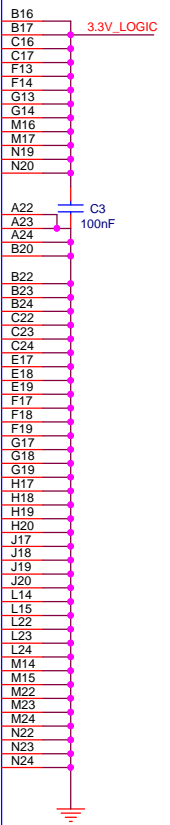
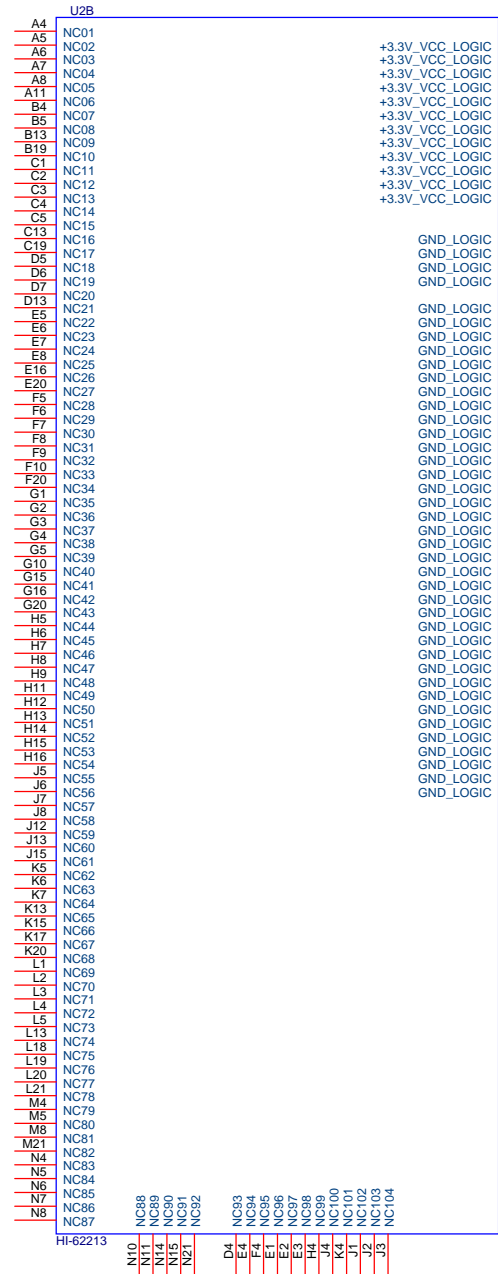
HOLT INTEGRATED CIRCUITS		
Title		
HI-622X3 BOARD M3 CONNECTIONS		
Size	Document Number	Rev
Custom	HI-6213 Carrier.DSN	B
Date:	Monday, November 04, 2019	Sheet 1 of 3



Title		
HI-622X3 BOARD1553 Rev B		
Size	Document Number	Rev
B	HI-622X3 Carrier.DSN	B
Date:	Monday, November 04, 2019	Sheet 2 of 3



ALL NO-CONNECTS

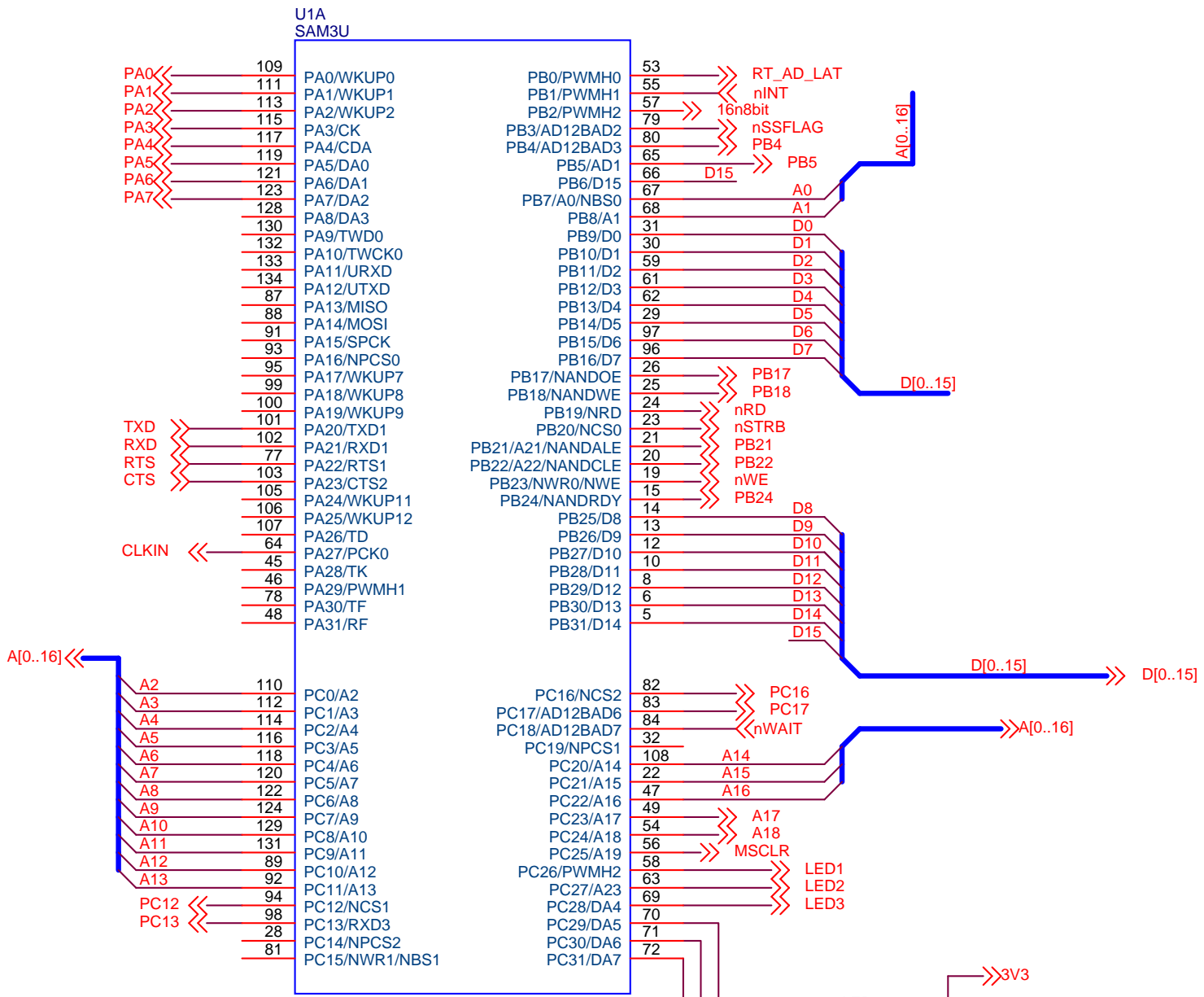


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HI-622X3 SUPPLY CONNECTIONS		
Size	Document Number	Rev
B	HI-62203 Carrier.DSN	B
Date:	Monday, November 04, 2019	Sheet 3 of 3

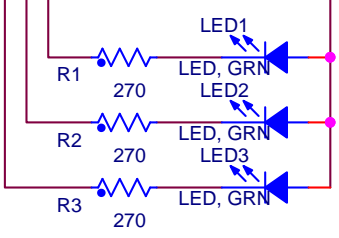
LOCATE ALL CAPS ON BOTTOM OF BOARD CLOSE TO THE DEVICE SUPPLY PADS

Item	Qty	Description	Reference	Digikey P/N	Mfg P/N
1	1	PCB, Bare, Evaluation Board	N/A		Jet Tech 62974
2	37	Capacitor, Cer 0.1uF 10% 50V X7R 0805	C2,C4-C11,C13,C15-C20,C22, C24,C26,C28,C29,C33,C34,C36- C43,C47,C52,C55,C56,C60,C61	445-15929-1-ND	TDK C2012X7R1H104K125AE
3	4	Capacitor, Cer 0.01uF 10% 50V X7R 0805	C1,C51,C54,C57	399-5107-1-ND	Kemet C0805F103K5RACTU
4	1	Capacitor, Cer .001uF 50V X7R 0805	C50	399-1147-1-ND	Kemet C0805C102K5RACTU
5	3	Capacitor, Cer 10pF 50V 5% NP0 0805	C23,C48,C49	399-1108-1-ND	Kemet C0805C100J5GACTU
6	2	Capacitor, Cer 15pF 50V 5% NP0 0805	C45,C46	399-1111-1-ND	Kemet C0805C150J5GACTU
7	4	Capacitor, Cer 20pF 50V 5% NP0 0805	C14,C21,C25,C27	399-8033-1-ND	Kemet C0805C200J5GACTU
8	1	Capacitor, Cer 33pF 50V 5% NP0 0805	C44	399-14587-1-ND	Kemet C0805C330G5GAC7800
9	2	Capacitor, Cer 47pF 50V 5% NP0 0805	C63,C64	399-14601-1-ND	Kemet C0805C470G5GAC7800
10	3	Capacitor 4.7uF,20%, 16V Tant SMD 3216	C31,C32,C35	399-3699-1-ND	Kemet T491A475M016AT
11	5	Capacitor 10uF,20%, 16V Tant SMD 3216	C3,C12,C30,C53,C58	399-3687-1-ND	Kemet T491A106M016AT
12	1	Capacitor 47uF,20%, 16V Tant SMD 6032	C62	399-9739-1-ND	Kemet T491C476M016AT
13	1	Capacitor 68uF,20%, 16V Tant SMD 6032	C59	399-8399-1-ND	Kemet T491D686M016AT
14	2	Ferrite 330 Ohm@100MHz 0805	FB1,FB2	490-5988-1-ND	Murata BLM21PG331SN1D
15	2	Ferrite 220 Ohm, 2A @100 MHz 0805	L1,L2	490-1054-1-ND	Murata BLM21PG221SN1D
16	2	Conn Recept. Female 2x20, 0.1" Pitch	J2,J3	S6104-ND	Sullins PPTC202LFBN-RC
17	2	Conn Header .100 Sgl Straight 2 Pos	J6,JP4 (Dis_Link)	S1012E-02-ND	Sullins PEC02SAAN
18	1	Conn Header .100 Sgl Straight 2 Pos	J1	S1112E-02-ND	Sullins PEC02SBAN
19	2	Conn Receptacle Mini USB2.0 5 Pos	J4,J5	H2959CT-ND	Hirose UX60-MB-5ST
20	5	LED Green SMD 0805	LED1-LED5	160-1179-1-ND	LiteOn LTST-C170GKT
21	0	Resistor, Prov 1/8W 0805	R4	DO NOT STUFF	
22	3	Solder Jumper	JP1,JP2,JP3	SOLDER OPEN	
23	2	Res 0, 1/8W 5% 0805 SMD	R13,R15	P0.0ACT-ND	Panasonic ERJ-6GEY0R00V
24	2	Res 1 Ohm, 1/8W 5% 0805 SMD	R11,R12	P1.0ACT-ND	Panasonic ERJ-6GEYJ1R0V
25	4	Res 27, 1/8W 5% 0805 SMD	R20,R22,R31,R33	P27ACT-ND	Panasonic ERJ-6GEYJ270V
26	2	Res 39, 1/8W 5% 0805 SMD	R7,R8	P39ACT-ND	Panasonic ERJ-6GEYJ390V
27	4	Res 100, 1/8W 5% 0805 SMD	R18,R19,R21,R23	P100ACT-ND	Panasonic ERJ-6GEYJ101V
28	1	Res 150, 1/8W 5% 0805 SMD	R32	P150ACT-ND	Panasonic ERJ-6GEYJ151V
29	1	Res 220, 1/8W 5% 0805 SMD	R14	P220ACT-ND	Panasonic ERJ-6GEYJ221V
30	3	Res 270, 1/8W 5% 0805 SMD	R1,R2,R3	P270ACT-ND	Panasonic ERJ-6GEYJ271V
31	1	Res 300, 1/8W 5% 0805 SMD	R24	P300ACT-ND	Panasonic ERJ-6GEYJ301V
32	2	Res 1.5K, 1/8W 5% 0805 SMD	R17,R25	P1.5KACT-ND	Panasonic ERJ-6GEYJ152V
33	1	Res 4.7K, 1/8W 5% 0805 SMD	R5	P4.7KACT-ND	Panasonic ERJ-6GEYJ472V
34	1	Res 6.8K, 1/8W 1% 0805 SMD	R10	P6.8KACT-ND	Panasonic ERJ-6GEYJ682V
35	1	Res 47K 5% 1/8W 0805	R16	P47KACT-ND	Panasonic ERJ-6GEYJ473V
36	6	Res 100K, 1/8W 5% 0805 SMD	R6,R26,R27,R28,R29,R30	P100KACT-ND	Panasonic ERJ-6GEYJ104V
37	1	Switch Tactile SPST-NO 0.02A 15V	SW1 (Reset)	P12943SCT-ND	Panasonic EVQ-Q2K03W
38	1	Crystal 18.432MHz, 30ppm 10pF, 3.2x2.5 mm	Y3	535-10909-1-ND	Abra ABM8G-18.432MHZ-4Y-T3
39	1	Crystal 12.00MHz, 50ppm 20pF, HC-49/US	Y1	631-1013-1-ND	Fox FC4SDCBMF12.0
40	1	Crystal, 32768 Hz 12.5pF Cylinder	Y2	535-9033-1-ND	Abra AB26TRB-32.768KHZ-T

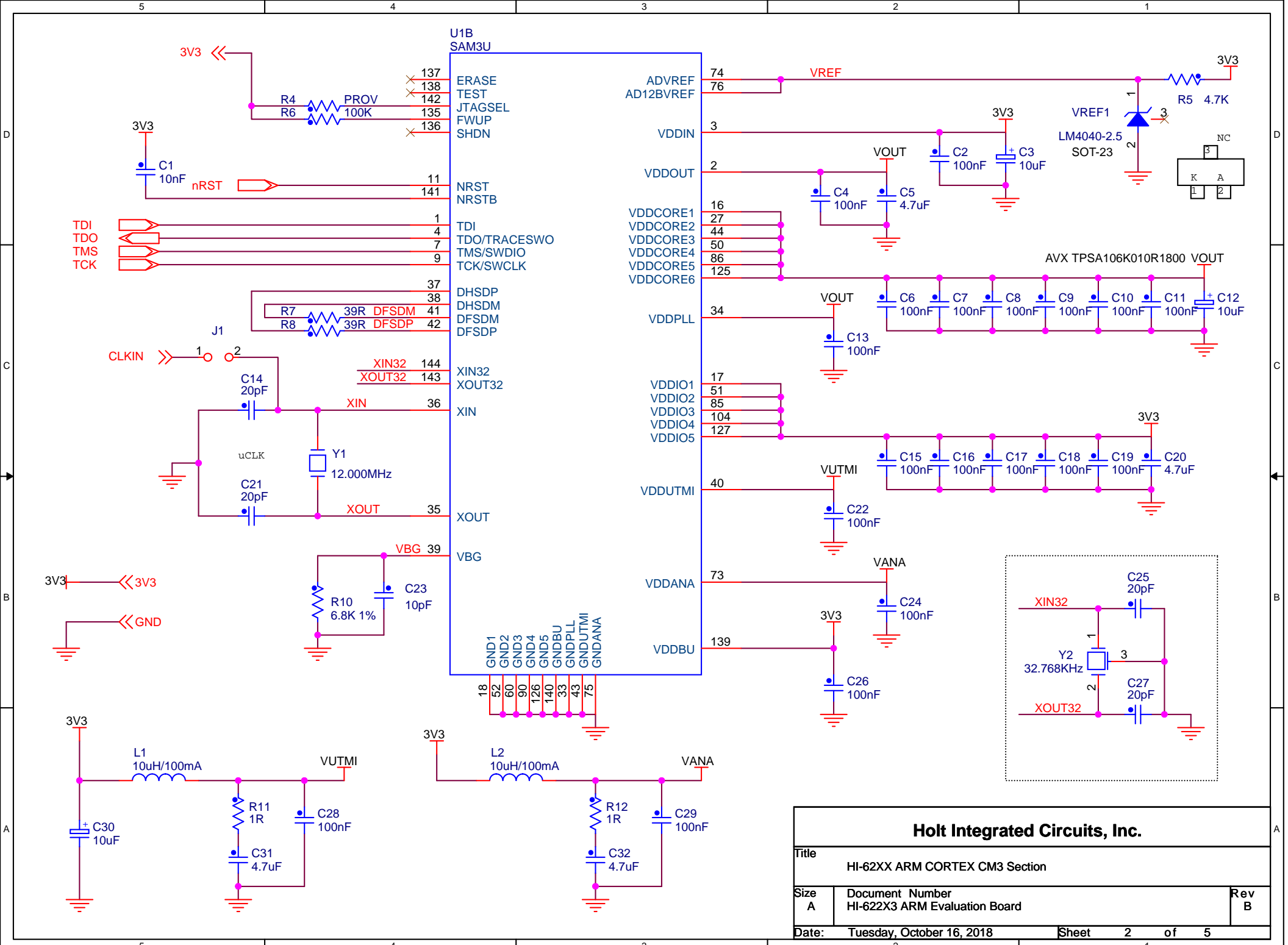
41	1	Test Point, Orange Insulator, 0.062"	TP5 (5V0)	36-5013-ND	Keystone 5013
42	3	Test Point, Black Insulator, 0.062"	TP6,TP7,TP8 (GND)	36-5011-ND	Keystone 5011
43	1	Test Point, Red Insulator, 0.062"	TP4 (3V3)	36-5010-ND	Keystone 5010
44	2	Test Point, White Insulator, 0.040"	TP2 (nINT),TP3 (Nssflag) DNI	36-5002-ND	Keystone 5002
45	1	4-Ch TVS ESD Protection SOT23-6	U3	296-28203-1-ND	TI TPD4E001DBVR
46	1	IC Voltage Ref 2.5V 1% Micropower SOT-23	VREF1	576-1047-1-ND	Micro LM4040DYM3-2.5-TR
47	1	IC USB Serial Full UART 20 SSOP	U4	768-1129-1-ND	FTD FT231XS-R
48	1	IC, MCU 32-Bit 256KB Flash, 144-LQFP	U1	ATSAM3U4EA-AU-ND	Atmel ATSAM3U4EA-AU
49	1	Program IC AT91SAM7S64 64-PQFP to be provided by HOLT	U2	AT91SAM7S64C-AU-ND	Atmel AT91SAM7S64C-AU
50	1	IC Voltage Regulator 3.3V 3A LDO, DDPAK	U5	LM1085ISX-3.3/NC	TI LM1085ISX-3.3/NOPB
51	4	Rubber Foot, Bumpon Black, .312 X.200 H	Place at the mounting holes	SJ5746-0-ND	3M SJ61A1
52					



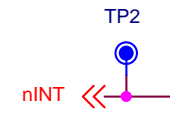
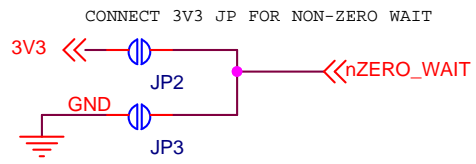
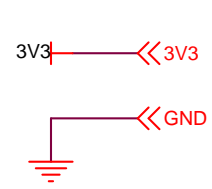
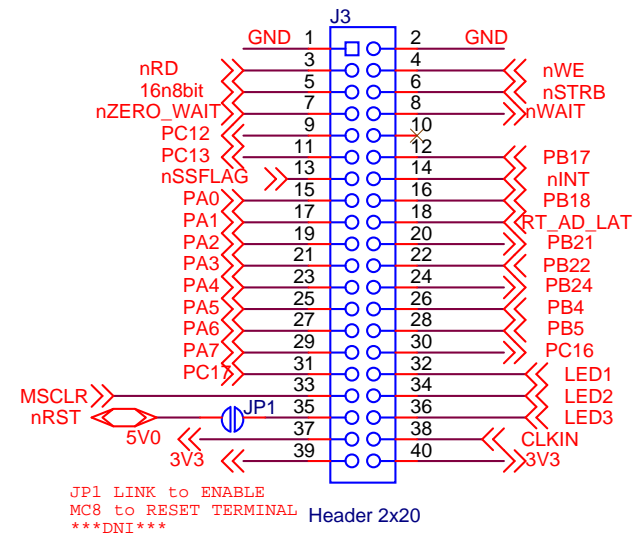
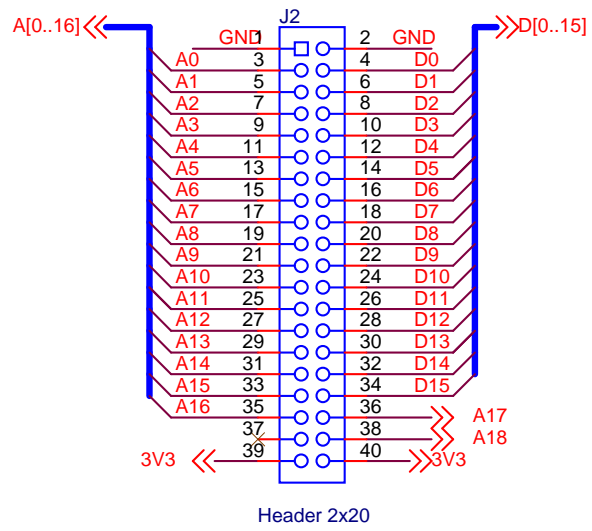
ARM CORTEX M3 PIO



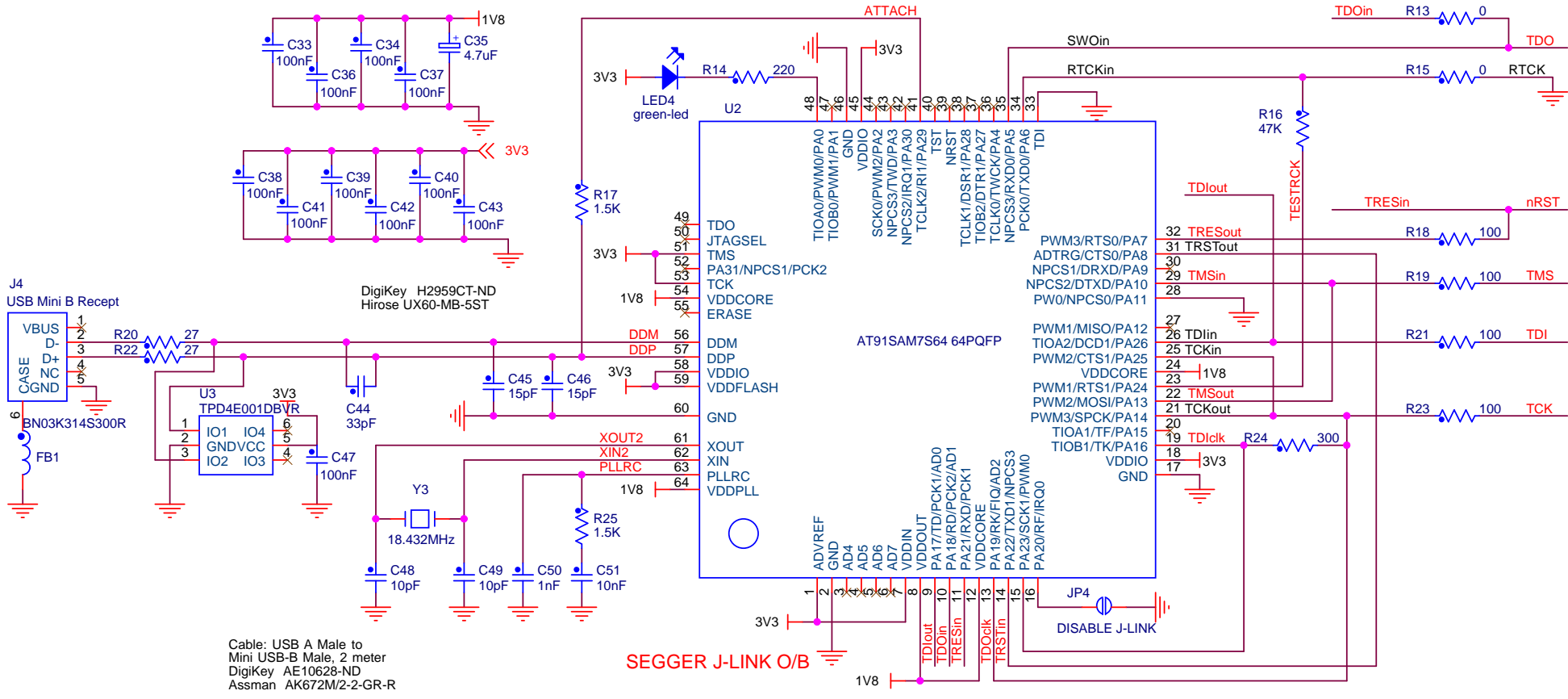
Holt Integrated Circuits, Inc.		
Title		
HI-62XX CM3 Buffered Section		
Size	Document Number	Rev
A	HI-622X3 ARM Evaluation Board	B
Date:	Thursday, September 27, 2018	Sheet 1 of 5



Holt Integrated Circuits, Inc.		
Title HI-62XX ARM CORTEX CM3 Section		
Size A	Document Number HI-622X3 ARM Evaluation Board	Rev B
Date: Tuesday, October 16, 2018	Sheet 2 of 5	



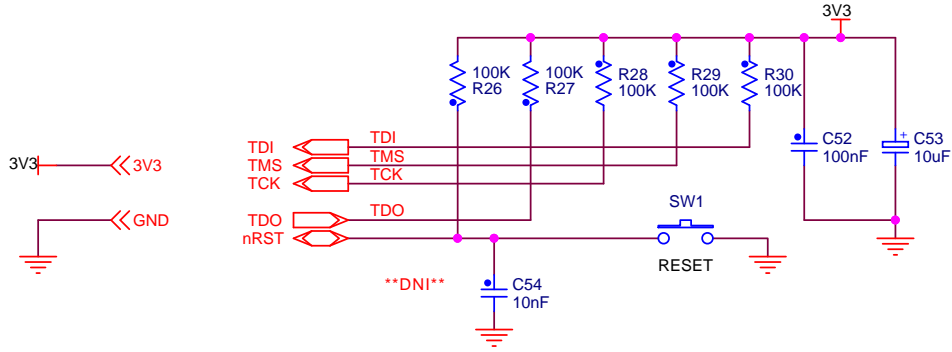
Holt Integrated Circuits, Inc.		
Title CORTEX CM3 ADK Board Connections Section		
Size A	Document Number HI-622X3 ARM Evaluation Board	Rev B
Date:	Tuesday, October 16, 2018	Sheet 3 of 5



Cable: USB A Male to Mini USB-B Male, 2 meter
 DigiKey AE10628-ND
 Assman AK672M/2-2-GR-R

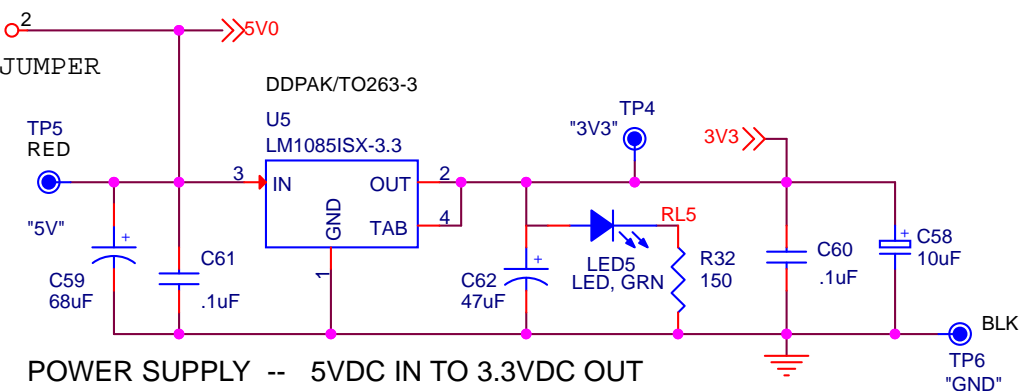
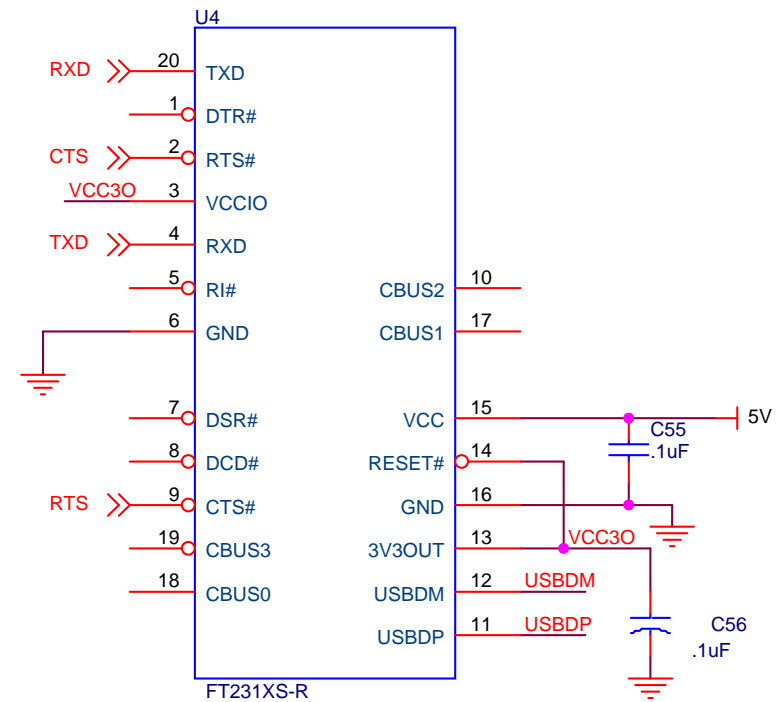
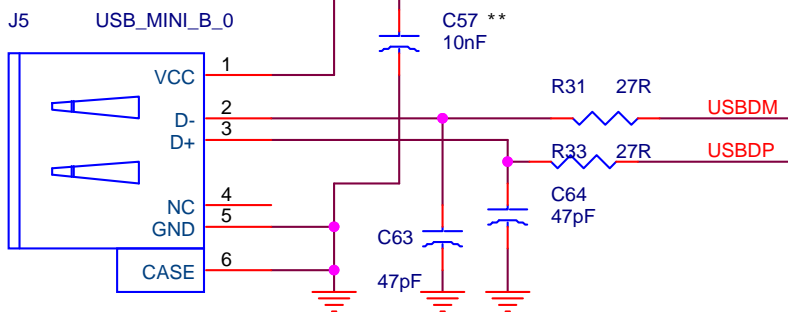
SEGGER J-LINK O/B

DEBUGGER INTERFACE COPIED FROM ATMEL ARM CORTEX M3
 USE THIS TO CONNECT J-LINK IF ABOVE CIRCUITRY IS NOT POPULATED OR WHEN IT IS DISABLED BY JUMPER JP2.



Holt Integrated Circuits, Inc.		
Title CORTEX CM3 DEBUG I/F Section		
Size Custom	Document Number HI-622X3 ARM Evaluation Board	Rev B
Date: Thursday, September 27, 2018	Sheet 4	of 5

MINI-USB



Holt Integrated Circuits, Inc.		
Title ADK USB Section		
Size A	Document Number HI-622X3 ARM Evaluation Board	Rev B
Date: Tuesday, October 16, 2018	Sheet 5 of 5	