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# ***SmartFusion Evaluation Kit***

## ***User's Guide***

## **Actel Corporation, Mountain View, CA 94043**

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Printed in the United States of America

Part Number: 50200209-1

Release: March 2010

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# Table of Contents

Introduction .....	5
Kit Contents .....	5
Board Description .....	5
<b>1 Installation and Settings.....</b>	<b>7</b>
Software Installation .....	7
Jumpers, Switches, and LED Settings .....	7
Testing the Hardware .....	9
<b>2 Hardware Components.....</b>	<b>11</b>
FPGA Description and Connections .....	11
I/O Pin Connections .....	13
SmartFusion FPGA Hard ARM Cortex-M3 .....	14
Power Sources .....	14
<b>3 Component Descriptions and Connections.....</b>	<b>15</b>
VAREF Connections .....	15
Current Sensing Circuit .....	16
PWM Circuit .....	16
Push-Button System Reset .....	17
Push-Button Switches and User LEDs .....	17
User I/Os .....	18
OLED Display .....	19
SPI Flash .....	20
20 MHz Oscillator .....	20
32.768 KHz (Low-Power) Oscillator .....	21
USB-to-UART Interface .....	21
Ethernet Interface .....	22
RealView Header .....	24
Integrated Low-Cost Programmer (LCP) .....	25
Temperature Diode .....	26
Mixed-Signal Header .....	26
<b>4 Pin List .....</b>	<b>31</b>
<b>5 Board Stackup .....</b>	<b>43</b>
Board Stack-Up .....	43
<b>6 Manufacturing Test .....</b>	<b>45</b>
A2F-EVAL-KIT Board Testing Procedures .....	45
Running the A2F-EVAL-KIT Board Test .....	55
A2F-EVAL-KIT Board Failures .....	71
<b>A List of Changes .....</b>	<b>73</b>

<b>B Product Support</b> .....	75
Customer Service .....	75
Actel Customer Technical Support Center .....	75
Actel Technical Support .....	75
Website .....	75
Contacting the Customer Technical Support Center .....	75
<b>Index</b> .....	77

# Introduction

The RoHS-compliant SmartFusion™ Evaluation Kit (A2F-EVAL-KIT) enables designers to develop applications that involve one or more of the following:

- Microcontroller applications
- Embedded ARM® Cortex™-M3-based systems

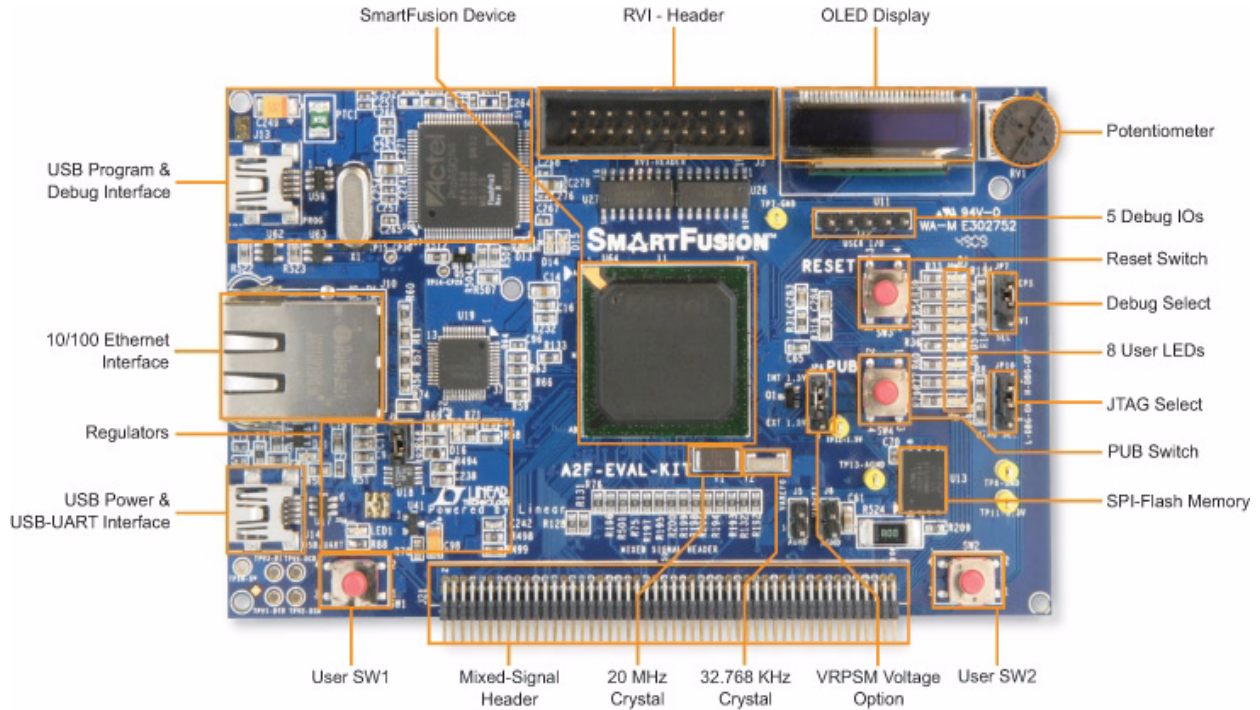


Figure 1 • A2F-EVAL-KIT

## Kit Contents

Table 1 lists the contents of the SmartFusion Evaluation Kit..

Table 1 • A2F-EVAL-KIT Contents

Quantity	Description
1	SmartFusion Evaluation Board with SmartFusion A2F200M3F-FGG484ES device
2	USB 2.0 A to mini-B cable
1	Quickstart card

## Board Description

The SmartFusion Evaluation Kit board is designed to provide a development platform for users to evaluate all the features of the world's only FPGA with a hard ARM Cortex-M3 powered microcontroller subsystem (MSS) along with programmable analog.

The board supports a SmartFusion device in an FG484 package. To enable the MSS, analog, and features for evaluation, the board includes the following:

- Ethernet and USB-to-UART interface for communication with the Ethernet and UART peripherals of the SmartFusion MSS
- SPI flash that interfaces with the SPI peripherals of the SmartFusion MSS
- Organic light-emitting diode (OLED) that interfaces with the I<sup>2</sup>C peripheral of the SmartFusion MSS
- I<sup>2</sup>C Interface
- Current monitoring and temperature monitoring circuits
- RVI header for application programming and debug from either Keil® U-LINK® Or IAR J-Link, integrated integrated low-cost programmer to enable programming and debugging from Actel design tools, FlashPoint and Soft Console

Table 2 describes the SmartFusion Development Kit board components.

**Table 2 • SmartFusion Evaluation Kit Board Components**

Name	Description
A2F200M3F-FGG484ES	Actel SmartFusion FPGA with hard ARM Cortex-M3
OLED DISPLAY	Organic 96x16 pixel blue OLED PMO13701 with option to interface either interfacing with I2C0 port of SmartFusion MSS
SPI FLASH	8 MByte SPI flash Atmel AT25DF641-MWH-T connected to SPI port 0 of the SmartFusion MSS
OSC-20	20 MHz / 20 PPM clock oscillator
OSC-32	32.768 KHz low-power oscillator
USB/UART	USB-to-UART adapter chip CP2102 and connector interfacing with UART port 0 of the SmartFusion MSS
ETHERNET	RJ45 connector (Ethernet jack with magnetics) interfacing with National Semiconductor 10/100 PHY chip DP83848C in RMII mode interfacing with Ethernet port of SmartFusion MSS (on-chip MAC and external PHY)
CURRENT	Current monitoring using thumbwheel POT (RV1)
TEMP	Temperature monitoring with temperature diode
RVI HEADER	RVI header for application programming and debug from Keil U-LINK or IAR J-Link
FP3_PROG	Integrated low-cost programmer
PUSH-BUTTON SWITCHES	Two push-button switches connected to GPIOs, which can be used as test and navigation switches
LEDS	Eight active low LEDs that can be connected to user I/O for debug to power on the board
USER I/Os	Five general purpose user I/Os that can be used for Direct-C signaling, interfacing and debugging purposes
PUSH-BUTTON RESET	Push-button system reset for SmartFusion FPGA System6
MIXED_CONN100	Mixed-signal header

# 1 – Installation and Settings

## Software Installation

Download and install the latest release of Libero<sup>®</sup> Integrated Design Environment (IDE) (v9.0 or later) from the Actel website and register for your free Gold license. For instructions on how to install Libero IDE and SoftConsole, refer to the Libero IDE Installation and Licensing Guide, available on the Actel website: [www.actel.com/documents/install\\_ug.pdf](http://www.actel.com/documents/install_ug.pdf).

## Jumpers, Switches, and LED Settings

The recommended default jumpers, switches, LEDs, and DIP switch settings are defined in Table 1-1 through Table 1-4 on page 1-8. Connect the jumpers with the default settings to enable the pre-programmed demonstration design to function correctly.

The available headers and their usage are detailed in Table 1-5 and Table 1-6 on page 1-9.

**Table 1-1 • SmartFusion Evaluation Kit Jumper Settings**

Jumper	Function	Default Setting	Notes
J6	Jumper to select second 3.3 V (V3P3_F2) power supply for board	Closed	
JP6	Jumper to select either 1.5 V external regulator or SmartFusion 1.5 V internal regulator		
	Pin 1–2 = 1.5 V internal	Closed	
	Pin 2–3 = 1.5 V external	Open	
JP7	Jumper to select between RVI header or LCP header for application debug		
	Pin 1–2 = USB programming and SoftConsole	Closed	
	Pin 2–3 = RVI for Keil U-LINK / IAR J-link	Open	
JP10	Jumper to select JTAGSEL		Allows selection of A2F2 programming or Cortex-M3 debug with integrated low-cost programmer
	Pin 1–2 = FPGA, allows A2F2 programming	Closed	
	Pin 2–3 = M3, allows Cortex-M3 debug	Open	

**Table 1-2 • SmartFusion Evaluation Kit Push-Button Switches**

Push-Button Switch	SmartFusion FPGA Pin	Comment
SW1	G19	Test and navigation switch
SW2	G20	Test and navigation switch
SW3	W7(PU_N)	Push-button switch for PUB. This negative active switch is connected to the PUB pin, which is a digital input to the FPGA. PUB is the connection for the external momentary switch used to turn on the 1.5 V voltage regulator.
SW4	R1 (MSS_SYSRESET)	System Reset for DUT

**Table 1-3 • SmartFusion Evaluation Kit LEDs**

LED	SmartFusion FPGA Pin	Comment
D1	B19	Test LED for user application
D2	B20	Test LED for user application
D3	C19	Test LED for user application
D4	H17	Test LED for user application
D5	H20	Test LED for user application
D6	C21	Test LED for user application
D7	D21	Test LED for user application
D8	G21	Test LED for user application
D11	N/A	UART over USB link indicator LED
D14	N/A	Programmer activity indicator LED
D15	N/A	Programmer ON indicator LED
D16	N/A	SPEED LED. The LED is ON when device is in 100 Mbps mode and OFF when in 10 Mbps mode.
LED1	N/A	USB power supply indicator LED. This GREEN LED is ON when the board is powered on.

**Table 1-4 • Test Points**

Test Point	Comment
TP7, TP8	Digital ground (GND)
TP11	3.3 V supply for SmartFusion
TP12	1.5 V supply for SmartFusion
TP13	Analog ground (AGND)

**Table 1-5 • J22 Header Strip – User I/Os**

Pin	SmartFusion FPGA I/O
1	J19
2	J20
3	J21
4	J22
5	K19



**Table 1-6 • Header for VAREF Monitoring**

J5	Used to monitor VAREF0 driven from VAREFOUT output of A2F
J8	Used to monitor VAREF1 driven from VAREFOUT output of A2F

**Note:** Never put a jumper on these headers. These are provided to measure and monitor VAREF0 and VAREF1

## Testing the Hardware

If the board is shipped directly from Actel, it contains a test program that determines whether the board works properly. If while using the board you suspect that the board is damaged, you can rerun the "[Manufacturing Test](#)" on page 6-45 to verify functionality of the key components of the board.



## 2 – Hardware Components

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### FPGA Description and Connections

The SmartFusion Development Kit Board is populated with a SmartFusion A2F200-FG484, the world's only FPGA with hard ARM Cortex-M3. The key features of SmartFusion are listed below.

Microcontroller subsystem (MSS) consisting of the following:

- 100 MHz 32-bit ARM Cortex-M3
  - 1.25 DMIPS/MHz throughput from zero wait state memory
- Internal memories
  - Embedded flash memory (eNVM), 64 Kbytes to 512 Kbytes
  - Embedded high-speed SRAM (eSRAM), 16 Kbytes to 64 Kbytes, implemented in two physical blocks to enable simultaneous access from two different masters
- Multi-layer AHB communications matrix
  - Provides up to 16 Gbps of on-chip memory bandwidth
- 10/100 Ethernet MAC with RMII interface
- Programmable external memory controller, which supports the following:
  - Asynchronous memories
  - NOR flash, SRAM, PSRAM
  - Synchronous SRAMs
- Two I<sup>2</sup>C peripherals
- Two 16550 compatible UARTs
- Two SPI peripherals
- Two 32-bit timers
- 32-bit watchdog timer
- 8-channel DMA controller
- Clock sources
  - 1.5 MHz to 20 MHz main oscillator
  - Battery-backed 32 KHz low-power oscillator with real-time counter (RTC)
  - 100 MHz embedded RC oscillator 1% accuracy
  - Embedded PLL with 4 output phases
- High-performance FPGA
- Based on Actel's proven ProASIC<sup>®</sup> FPGA fabric
- Analog front-end (AFE)
- Up to three 12-bit SAR analog-to-digital converters (ADCs)
- One first-order  $\Sigma\Delta$  (sigma delta) digital-to-analog converter (DAC) per ADC
- Up to 5 new high-performance analog signal conditioning blocks (SCB) per device
- Two high-speed comparators
- Analog compute engine (ACE)
  - Offloads CPU from analog initialization and processing of ADC, DAC, and SCBs
  - Sample sequencing engine for ADC and DAC parameter setup
  - Post-processing engine (PPE) for functions such as low-pass filtering and linear transformation

**Table 2-1 • A2F200 Key Features**

Feature	Specification
System gates	200,000
Tiles (D-flip-flops)	4,608
RAM blocks (4,608 bits)	8
Flash (Kbytes)	256
SRAM (Kbytes)	64
Cortex-M3 with MPU	1
10/100 Ethernet MAC	Yes
External memory controller (EMC)	26-bit address, 16-bit data
DMA	8 Ch
I <sup>2</sup> C	2
SPI	2
16550 UART	2
32-bit timer	2
PLL	1
32 KHz low-power oscillator	1
100 MHz on-chip RC oscillator	1
Main oscillator	1
ADCs (12-bit SAR)	2
DACs (1-bit sigma-delta)	2
Signal conditioning blocks (SCBs)	4
Comparators*	8
Current monitors*	4
Temperature monitors*	4
HV bipolar voltage monitors*	8
Direct analog inputs to ADC*	18

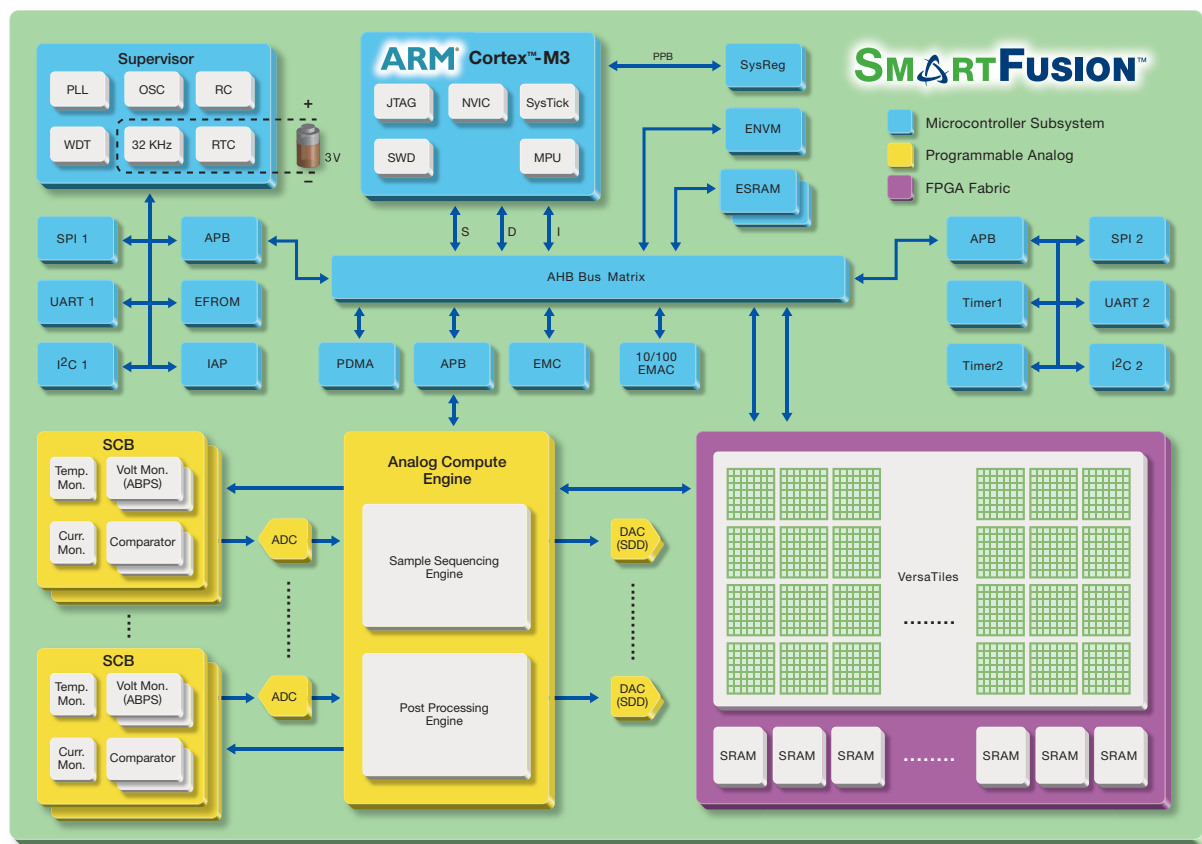
*Note:* \*The maximum available resources have dependencies. For additional information on SmartFusion, refer to the SmartFusion datasheet..

**Table 2-2 • A2F200 I/Os**

I/Os	FG484
Direct analog input	8
Total analog input	24
Total analog output	2
MSS I/Os <sup>1,2</sup>	41
FPGA I/Os	94
Total I/Os	161

**Notes:**

- 16 MSS I/Os are multiplexed and can be used as FPGA I/Os, if not needed for MSS. These I/Os support Schmitt triggers and support only LVTTTL and LVCMOS (1.5 / 1.8 / 2.5, 3.3 V) standards.
- 9 MSS I/Os are primarily for 10/100 Ethernet MAC and are also multiplexed and can be used as FPGA I/Os if Ethernet MAC is not used in a design. These I/Os support Schmitt triggers and support only LVTTTL and LVCMOS (1.5 / 1.8 / 2.5, 3.3 V) standards.


**Figure 2-1 • SmartFusion MSS Block Diagram**

## I/O Pin Connections

The A2F200M3F-FGG484ES pin list is provided in the "Pin List" on page 4-31.

## SmartFusion FPGA Hard ARM Cortex-M3

The SmartFusion FPGA comes with a hard Cortex-M3 advanced processor-based microcontroller subsystem (MSS). The ARM Cortex-M3 microcontroller is a low-power processor that features low gate count, low predictable interrupt latency, and low-cost debug. It is intended for deeply embedded applications that require fast interrupt response features. SmartFusion devices use the R1P1 version of the Cortex-M3 core. Some of the important subsystems are listed below:

- Memory protection unit (MPU)
- Single cycle multiplication, hardware divide
- JTAG debug (4 wire), Serial Wire Debug (SWD – 2 wire) and Serial Wire Viewer (SWV) interfaces

The evaluation board is populated with components to enable development using the microcontroller subsystem (MSS). These components include SPI flash, OLED, and communication interfaces such as Ethernet and USB-to-UART.

## Power Sources

### SmartFusion FPGA Power Sources

The evaluation kit board is powered through USB. The USB power will supply power to three voltage rails: 3.3 V, 1.5 V, and 10 V.

- Linear LT1963AES8 (1.5 A), supplies 3.3 V rails
- Linear LT3080 (1.1 A), supplies 1.5 V rails
- Linear LT1615 step-up converter supplies 10 V, 100 mA typical, for driving the OLED

**Note:** The USB can provide a maximum current of 500 mA. If the application requires a daughter board, the user must use an independent power supply source.

## 3 – Component Descriptions and Connections

### VAREF Connections

The SmartFusion device has one external VAREF input pin for each of the ADCs in the device. These are VAREF0 for ADC0 and VAREF1 for ADC1 (Figure 3-1). The internal VAREF is brought out as an output. This is available as the VAREFOUT output pin.

On the A2F-EVAL-KIT board, the VAREF0 and VAREF1 inputs are hardwired to the VAREFOUT output of the SmartFusion device (Figure 3-2). This means the user should not drive these inputs from any external source. Two headers, J5 and J8, are provided to monitor the VAREF0 and VAREF1 for any debug purposes.

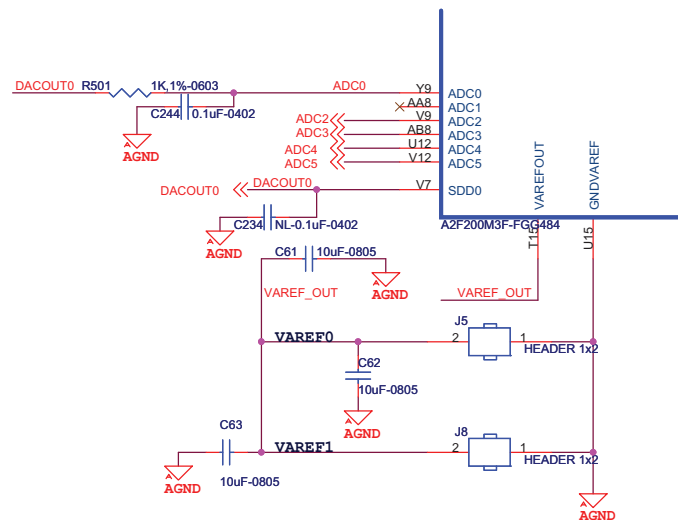


Figure 3-1 • VAREFOUT to VAREF0 and VAREF1



Figure 3-2 • VAREF0 and VAREF1 Inputs of FPGA

## Current Sensing Circuit

A current sensing circuit is provided on the SmartFusion Evaluation Kit board for applications using the embedded current monitor. Current monitoring is performed across the AC0 and AT0 pins. The current sensing circuit is for the 3.3 V voltage rail, as shown in Figure 3-3.

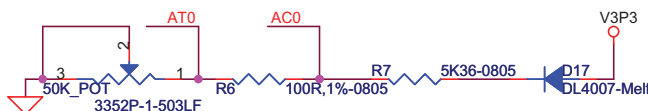


Figure 3-3 • Current Sensing

## PWM Circuit

The PWM RC circuit depicted in Figure 3-4 and Figure 3-5 can be used with Actel CorePWM instantiated in the FPGA fabric to generate various voltage waveforms. These voltage waveforms can be displayed on the OLED or used via the mixed-signal header. In addition, one PWM RC circuit source is routed to the AV input pin of an analog quad. This AV pin can be used to monitor the generated voltage with high accuracy, depending on the ADC resolution configured in the FPGA.

Figure 3-5 shows the A2F200 pins driving PWM and the PWM circuit.

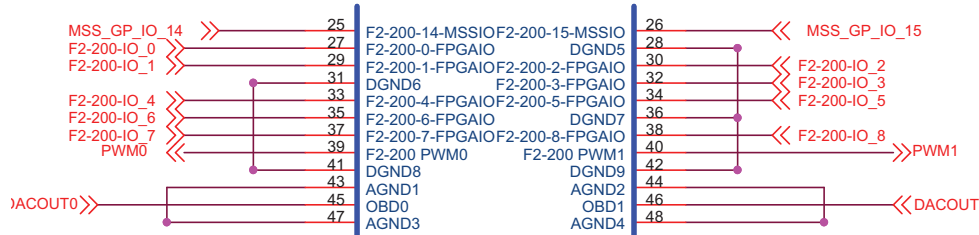


Figure 3-4 • PWM Pins

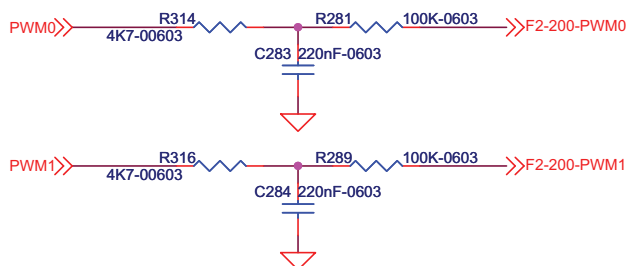


Figure 3-5 • PWM Circuit



## Push-Button System Reset

A push-button system reset switch with a Schmitt trigger is provided on the board (Figure 3-6). The Schmitt trigger reduces noise on the system reset push-button. SmartFusion MSS reset is synchronized with this reset.

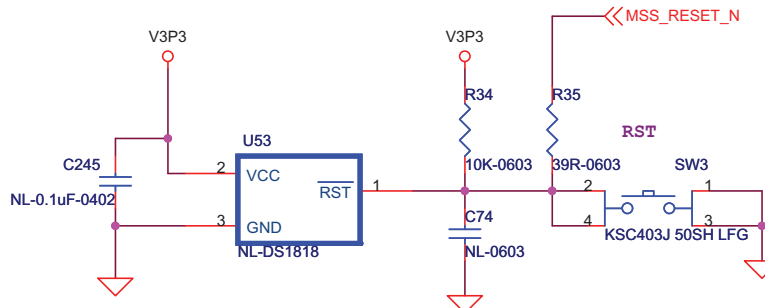


Figure 3-6 • Push-Button System Reset

## Push-Button Switches and User LEDs

Push-button switches and user LEDs (Figure 3-7) can also be used for debug and for various applications, such as gaming.

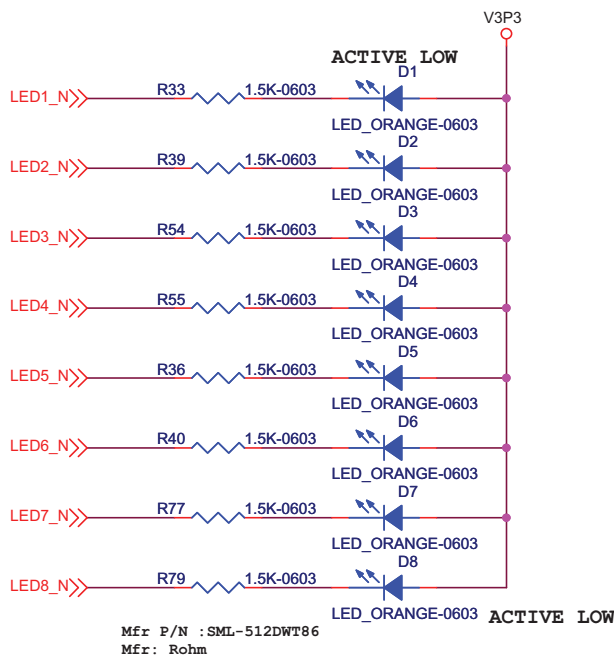


Figure 3-7 • Test LEDs

The board provides users access to eight active Low LEDs (Figure 3-8), which are connected to SmartFusion pins B19, B20, C19, H17, H20, C21, D21, and G21. In addition, the board includes two push-button switches (Figure 3-9) that are connected to pins G19 and G20 of the SmartFusion FPGA.

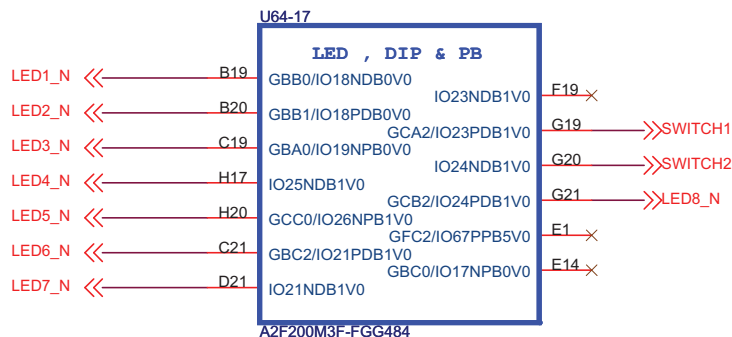


Figure 3-8 • LEDs

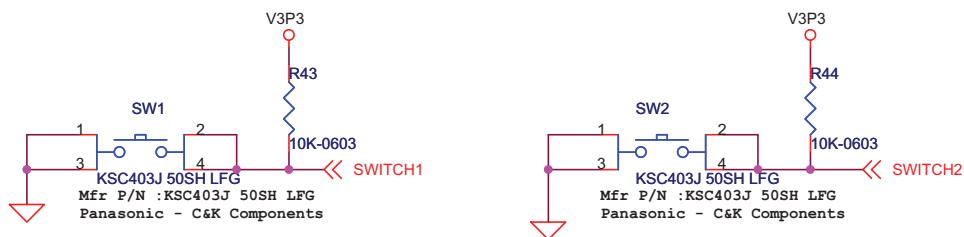


Figure 3-9 • Push-Button Switches

## User I/Os

The board comes with the provision of five user I/Os brought out to jumper J22 (Figure 3-10). These can be used as general purpose user I/Os. One of the potential applications is DirectC signaling where these five pins can be used for JTAG signals (TDI, TDO, TMS, TCK, and TRSTN). Other possible uses are for interfacing with other boards and debugging.

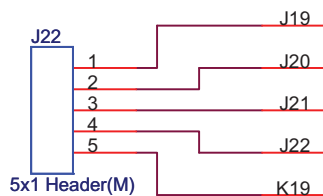


Figure 3-10 • User I/Os

## OLED Display

A 9616-pixel low-power OLED is made available on the board for display (Figure 3-11). This low-power device, BLUE OLED, requires 3.3 V and 10 V power supplies. The OLED is interfaced with the SmartFusion MSS I2C0 port (Figure 3-12).

The OLED displays sharp gaming images or text. For example, the SmartFusion RTC current time or time between two events can be displayed on the OLED. The OLED inputs OLED\_BS1, OLED\_BS2, and OLED\_CSN are tied off and OLED\_D/C# is pulled down as required to work with I<sup>2</sup>C mode.

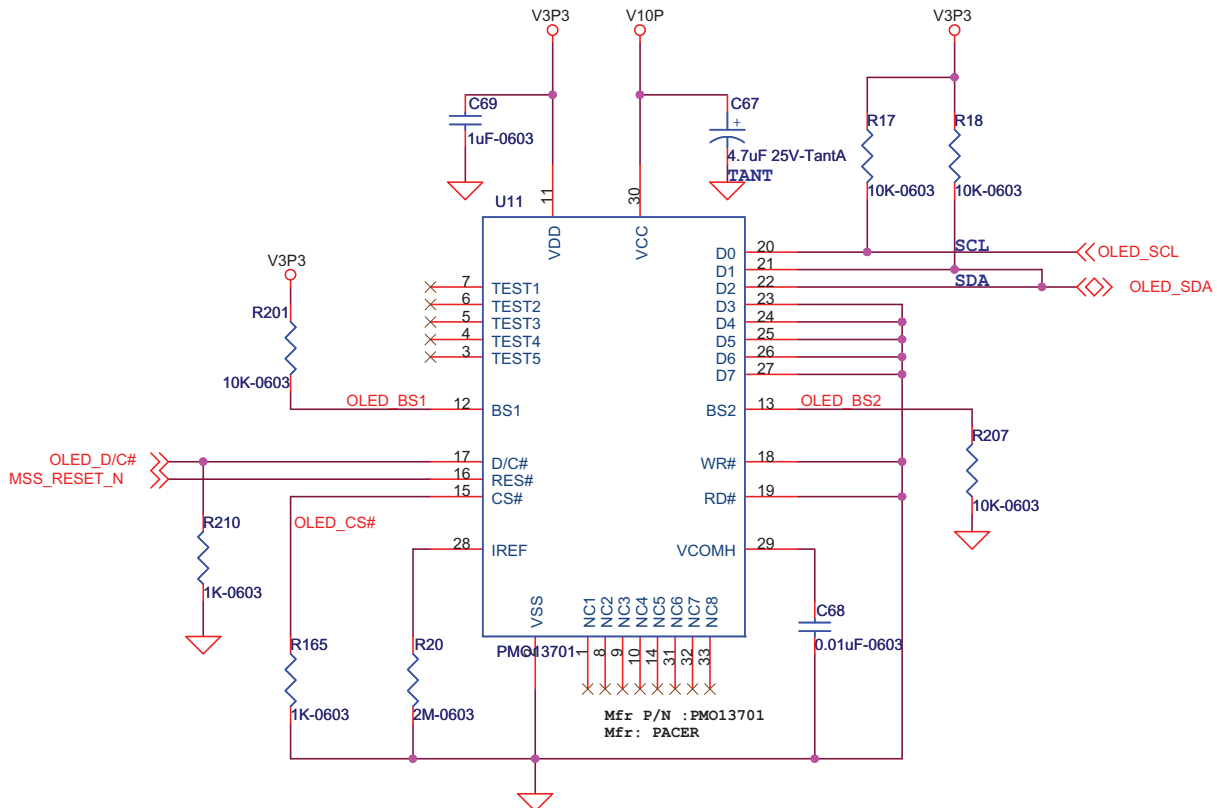


Figure 3-11 • OLED Connections

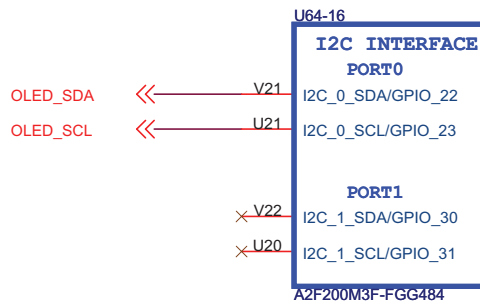


Figure 3-12 • SmartFusion MSS I2C0 Interface

## SPI Flash

One 8 MByte SPI flash Atmel AT25DF641-MWH-T is also offered on the board (Figure 3-13). This is interfaced with the SmartFusion MSS SPI0 port (Figure 3-14). The WP# and HOLD# inputs are pulled High on the board.

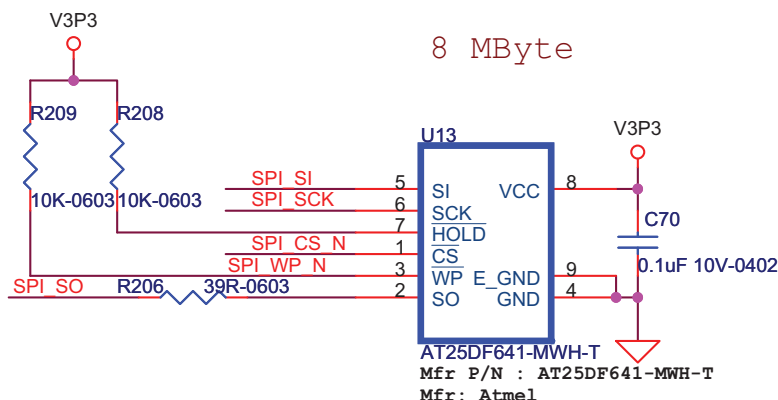


Figure 3-13 • SPI Flash

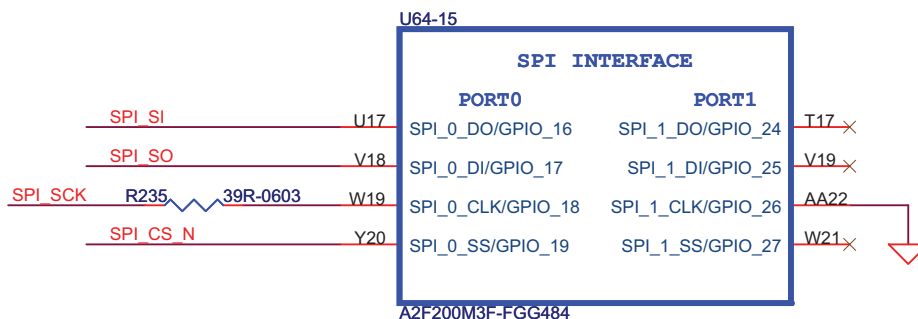


Figure 3-14 • SmartFusion MSS SPI0 Port

## 20 MHz Oscillator

A 20 MHz resonator of 20 PPM is placed across the MAINXIN and MAINXOUT pins of the SmartFusion FPGA with the appropriate 18 PF capacitors (Figure 3-15 on page 3-21). This is used to generate a high precision clock for Ethernet MAC and is also used in real-time counter (RTC) based applications.

## 32.768 KHz (Low-Power) Oscillator

A 32.768 KHz Resonator CM519 is placed across the LPXIN and LPXOUT pins of the SmartFusion FPGA with the appropriate 30 PF capacitors (Figure 3-15). This low-power resonator is useful in real-time counter (RTC) based applications.

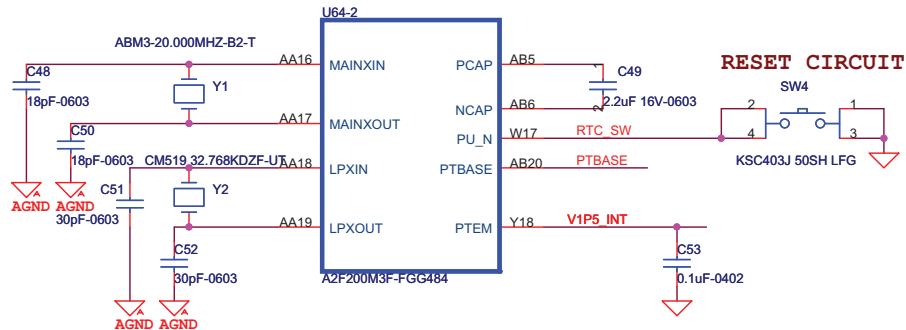


Figure 3-15 • 20 MHz and 32.768 KHz Oscillators

## USB-to-UART Interface

Included on the evaluation board is a USB-to-UART interface with ESD protection (Figure 3-16 on page 3-22). This interface includes an integrated USB-to-UART bridge controller (U16) to provide a standard UART connection with the SmartFusion MSS UART0 port.

One application of the USB-to-UART interface is to allow HyperTerminal on a PC to communicate with the SmartFusion FPGA. HyperTerminal is a serial communications application program that can be installed in the Windows® operating system. A basic HyperTerminal program is usually distributed with Windows. With a USB driver properly installed, and the correct COM port and communication settings selected, you can use the HyperTerminal program to communicate with a design running on the SmartFusion FPGA device.

Table 3-1 lists the supported UART parameters for HyperTerminal applications.

Table 3-1 • UART HyperTerminal Settings

Supported HyperTerminal Parameters			
Baud Rates	Data Bits	Parity Types	STOP BIT
110	5,6,7,8	NO/ODD/EVEN/MARK(1)/SPACE(0)	ONE/ONE-HALF/TWO
300			
1200			
2400			
4800			
9600			
19200			
38400			
57600			
115200			
230400			
460800			
921600			



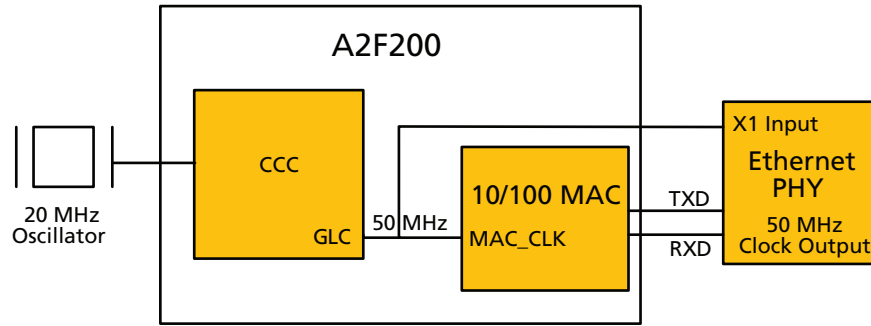


Figure 3-18 • Ethernet Clocking Scheme

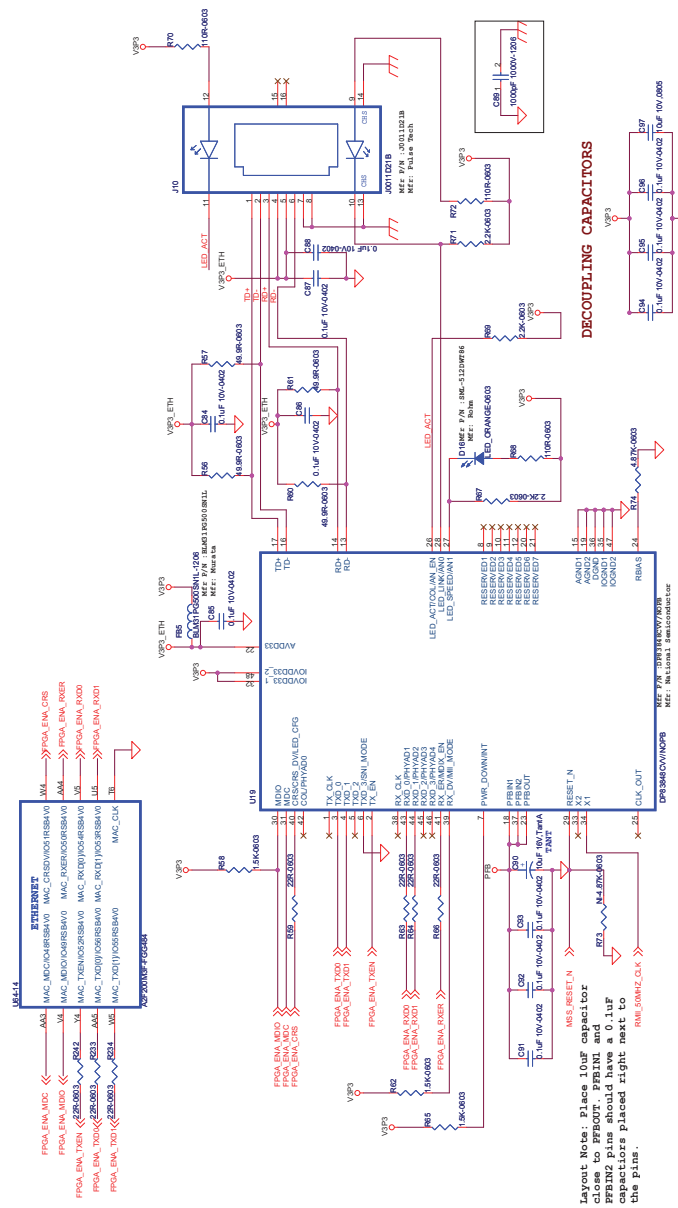


Figure 3-19 • Ethernet Interface

## RealView Header

One 10x2 RealView<sup>®</sup> Header is provided on the board for debugging (Figure 3-20). This header allows plugging with the Keil U-LINK debugger or IAR J-Link debugger to easily debug or configure the hard ARM Cortex-M3 processor during board power-up.

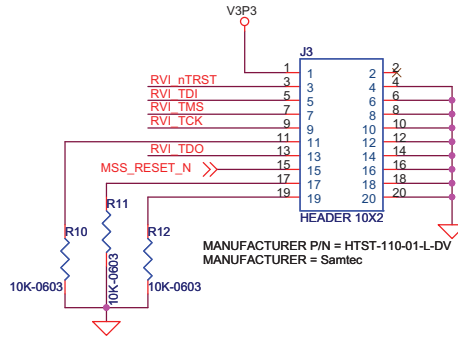


Figure 3-20 • RealView Header

The jumper settings shown in Table 3-2 are needed for debug with Keil U-LINK or IAR J-Link.

Table 3-2 • RVI Header Jumper Settings

To Debug with Keil U-link or IAR J-link			
Jumper	Pin	Pin	Connection Details
JP7	2	3	To select RealView <sup>®</sup> JTAG header
JP10	2	3	To select Cortex-M3 debug



# Integrated Low-Cost Programmer (LCP)

The board comes with a built-in programmer to program the SmartFusion device and debug software with SoftConsole.

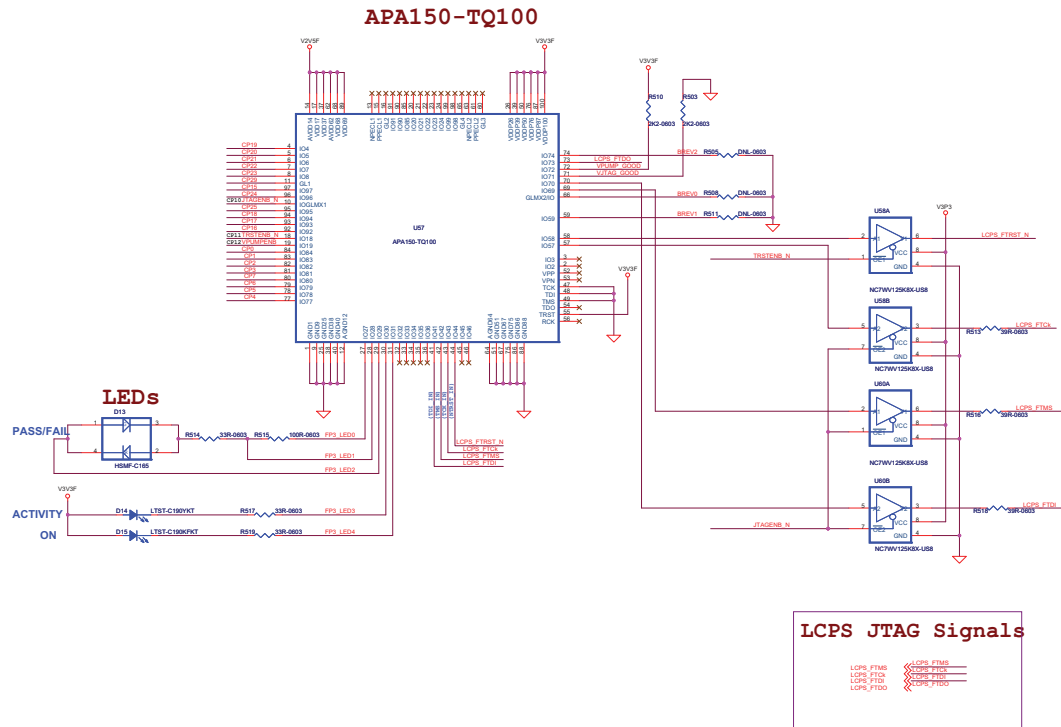


Figure 3-21 • Integrated Low-Cost Programmer

Table 3-3 • Jumper Settings to Debug with SoftConsole

To Debug with SoftConsole			
Jumper	Pin	Pin	Connection Details
JP7	1	2	To select the the integrated low-cost programmer (LCP)
JP10	2	3	To select the Cortex-M3 debug

Table 3-4 • Jumper Settings for A2F200 Programming

To Program with Built-In LCP			
Jumper	Pin	Pin	Connection Details
JP7	1	2	To select the integrated LCP
JP10	1	2	To select the SmartFusion device

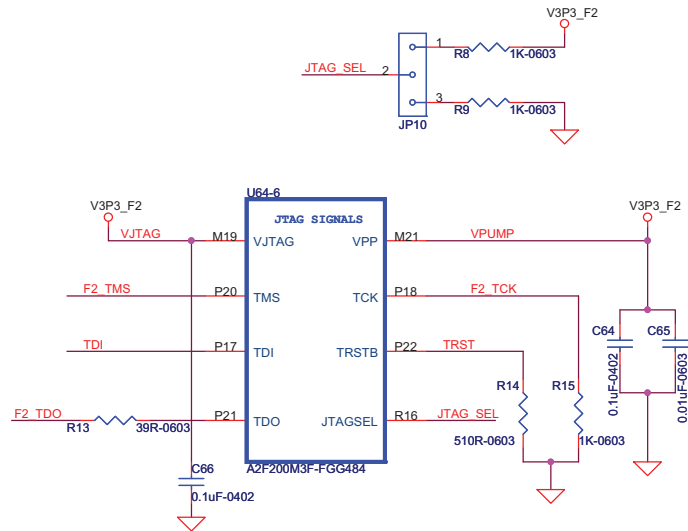


Figure 3-22 • A2F200 JTAG Connections

## Temperature Diode

A temperature diode is provided on the board to measure ambient temperature (Figure 3-23). This is used in battery charging and MPM applications. This diode is connected to the AT1 input of SmartFusion FPGA.

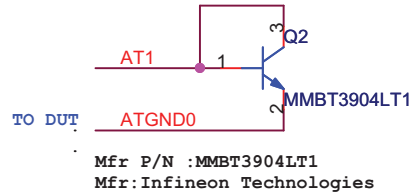


Figure 3-23 • Temperature Diode

## Mixed-Signal Header

The mixed-signal header can be obtained from Samtec, using the following part numbers:

Mother Board Header 2X50 50 mil pitch: Samtec FTSH-150-04-L-D-RA (populated in the evaluation board)

Daughter Board Header 2X50 50 mil pitch: Samtec CLP-150-02-L-DH

The detailed instructions given below must be followed to ensure the correct orientation and insertion into the mother board.

Figure 3-24 (top view) indicates the orientation of the mixed-signal headers on the mother board and daughter board.

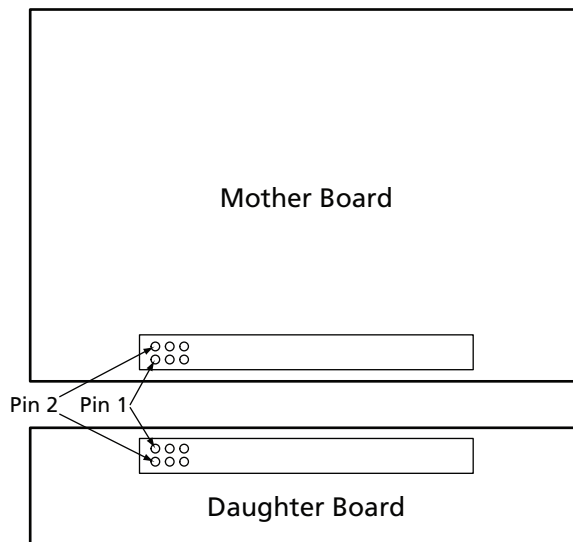
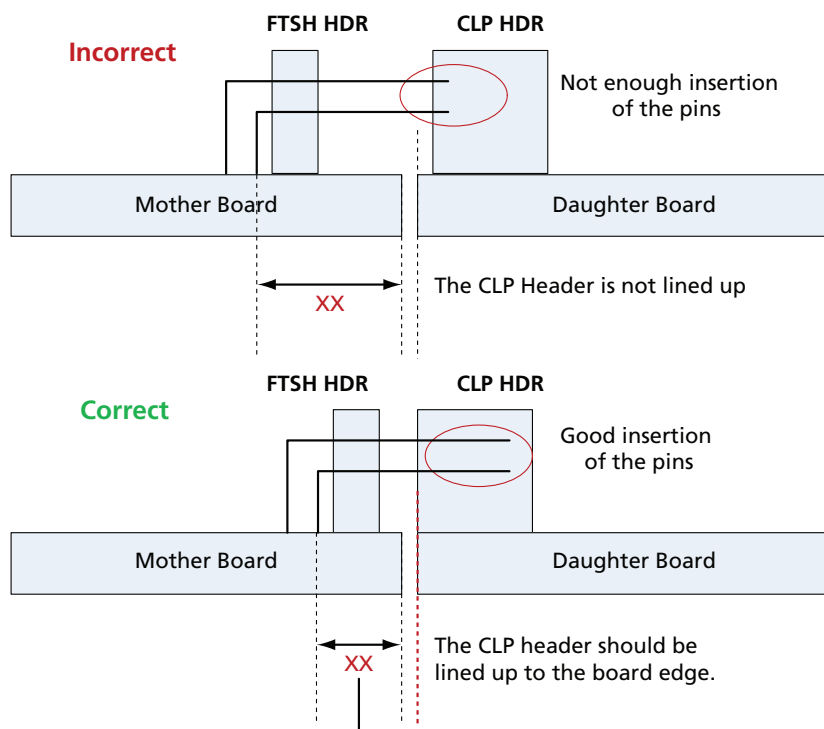


Figure 3-24 • Top View of Mixed-Signal Headers Correct Orientation

Ensure that the header is placed such that a full insertion is possible between the two headers (Figure 3-25).



**Note:** XX is the critical length. Ensure that the connector is placed close enough so there is a good connection with the mating connector. This is applicable when designing the daughter board or the mother board.

Figure 3-25 • Correct Insertion of Daughter Board

When designing a daughter board to plug into an A2F-EVAL-KIT:

- Ensure the CLP header edge is lined up against the edge of the board.
- This will provide maximum insertion into the SmartFusion evaluation board.

When designing a mother board for an existing daughter board (MPM DB, for example):

- Ensure that the length, denoted by XX, is kept less than 150 mils.
- Use the SmartFusion Evaluation Kit PCB files ([http://www.actel.com/download/rsc?f=A2F\\_EVAL\\_KIT\\_BF](http://www.actel.com/download/rsc?f=A2F_EVAL_KIT_BF)).

## Pinout Definition

Table 3-5 provides the pinout definition for the mixed-signal header.

**Table 3-5 • Pinout Definition**

J21-Pin	Net Name	Pin Number	Description	J21-Pin	Net Name	Pin Number	Description
1	5V	Power	Power	2	5V	Power	Power
3	5V	Power	Power	4	5V	Power	Power
5	DGND	DGND	Digital ground	6	DGND	DGND	Digital ground
7	MSS_GP_IO_0	V1	MSS I/Os <sup>1</sup>	8	MSS_GP_IO_1	R3	MSS I/Os <sup>1</sup>
9	MSS_GP_IO_2	W1	MSS I/Os <sup>1</sup>	10	MSS_GP_IO_3	Y1	MSS I/Os <sup>1</sup>
11	MSS_GP_IO_4	AA1	MSS I/Os <sup>1</sup>	12	DGND	DGND	Digital ground
13	MSS_GP_IO_5	U2	MSS I/Os <sup>1</sup>	14	MSS_GP_IO_6	V2	MSS I/Os <sup>1</sup>
15	DGND	DGND	Digital ground	16	MSS_GP_IO_7	W2	MSS I/Os <sup>1</sup>
17	MSS_GP_IO_8	T3	MSS I/Os <sup>1</sup>	18	MSS_GP_IO_9	V3	MSS I/Os <sup>1</sup>
19	MSS_GP_IO_10	U3	MSS I/Os <sup>1</sup>	20	DGND	DGND	Digital ground
21	MSS_GP_IO_11	T4	MSS I/Os <sup>1</sup>	22	MSS_GP_IO_12	AA2	MSS I/Os <sup>1</sup>
23	DGND	DGND	Digital ground	24	MSS_GP_IO_13	AB2	MSS I/Os <sup>1</sup>
25	MSS_GP_IO_14	AB3	MSS I/Os <sup>1</sup>	26	MSS_GP_IO_15	Y3	MSS I/Os <sup>1</sup>
27	F2-200-IO_0	E3	FPGA I/Os <sup>1</sup>	28	DGND	DGND	Digital ground
29	F2-200-IO_1	F3	FPGA I/Os <sup>1</sup>	30	F2-200-IO_2	G4	FPGA I/Os <sup>1</sup>
31	DGND	DGND	Digital ground	32	F2-200-IO_3	H5	FPGA I/Os <sup>1</sup>
33	F2-200-IO_4	H6	FPGA I/Os <sup>1</sup>	34	F2-200-IO_5	J6	FPGA I/Os <sup>1</sup>
35	F2-200-IO_6	B22	FPGA I/Os <sup>1</sup>	36	DGND		Digital ground
37	F2-200-IO_7	C22	FPGA I/Os <sup>1</sup>	38	F2-200-IO_8	F1	FPGA I/Os <sup>1</sup>
39	PWM0	E22	Has External RC* <sup>1</sup>	40	PWM1	F22	Has External RC* <sup>1</sup>
41	DGND	DGND	Digital ground	42	DGND	DGND	Digital ground
43	AGND	AGND	Analog ground	44	AGND	AGND	Analog ground
45	DACOUT0	V7	SDD0 <sup>2</sup>	46	DACOUT1	Y17	SDD1 <sup>2</sup>
47	AGND	AGND	Analog ground	48	AGND	AGND	Analog ground

Notes:

1. Digital signal.
2. Analog signal.

Table 3-5 • Pinout Definition

J21-Pin	Net Name	Pin Number	Description	J21-Pin	Net Name	Pin Number	Description
49	AC2	AB13	CM2 <sup>2</sup>	50	AT2	AB12	TM2 <sup>2</sup>
51	AGND	AGND	Analog ground	52	ATGND1		GNDTM1 <sup>2</sup>
53	AC3	AA11	CM3 <sup>2</sup>	54	AT3	Y12	TM3 <sup>2</sup>
55	AGND	AGND	Analog ground	56	AGND		Analog ground
57	AC4	W13	CM4 <sup>2</sup>	58	AT4	T13	TM4
59	AGND	AGND	Analog ground	60	ATGND2		GNDTM2 <sup>2</sup>
61	AV1_1	W9	ABPS1 <sup>2</sup>	62	AV2_1	AB7	ABPS3 <sup>2</sup>
63	AGND	AGND	Analog ground	64	AGND	AGND	Analog ground
65	AV1_3	W12	ABPS6 <sup>2</sup>	66	AV2_3	Y11	ABPS7 <sup>2</sup>
67	AGND	AGND	Analog ground	68	AGND	AGND	Analog ground
69	AV2_4	W14	ABPS9 <sup>2</sup>	70	AV1_4	Y13	ABPS8 <sup>2</sup>
71	AGND	AGND	Analog ground	72	AGND	AGND	Analog ground
73	ADC2	U12	ADC2 <sup>2</sup>	74	ADC3	V12	ADC3 <sup>2</sup>
75	AGND	AGND	Analog ground	76	AGND	AGND	Analog ground
77	ADC4	Y9	ADC4 <sup>2</sup>	78	ADC5	AA8	ADC5 <sup>2</sup>
79	AGND	AGND	Analog ground	80	AGND	AGND	Analog ground
81	ADC6	V11	ADC6 <sup>2</sup>	82	ADC7	T12	ADC7 <sup>2</sup>
83	AGND	AGND	Analog ground	84	AGND	AGND	Analog ground
85	ADC8	V14	ADC8 <sup>2</sup>	86	ADC9	AA14	ADC9 <sup>2</sup>
87	AGND	AGND	Analog ground	88	AGND	AGND	Analog ground
89	ADC10	AA13	ADC10 <sup>2</sup>	90	ADC11	U14	ADC11 <sup>2</sup>
91	AC1	U9	CM1 <sup>2</sup>	92	AGND	AGND	Analog ground
93	AGND	AGND	Analog ground	94	AGND	AGND	Analog ground
95	DGND	DGND	Digital ground	96	DGND	DGND	Digital ground
97	3.3V	Power	Power	98	3.3V	Power	Power
99	3.3V	Power	Power	100	3.3V	Power	Power

## Notes:

1. Digital signal.
2. Analog signal.



## 4 – Pin List

Below is the pin list applicable to the SmartFusion A2F200M3F-FGG484ES device.

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
A1	GND1	GND
A2	NC2	NC
A3	NC5	NC
A4	GND7	GND
A5	EMC_CS0_N/GAB0/IO01NDB0V0	NC
A6	EMC_CS1_N/GAB1/IO01PDB0V0	NC
A7	GND8	GND
A8	EMC_AB[0]/IO04NDB0V0	NC
A9	EMC_AB[1]/IO04PDB0V0	NC
A10	GND2	GND
A11	NC1	NC
A12	EMC_AB[7]/IO07PDB0V0	NC
A13	GND3	GND
A14	EMC_AB[12]/IO10NDB0V0	NC
A15	EMC_AB[13]/IO10PDB0V0	NC
A16	GND4	GND
A19	GND5	GND
A20	NC3	NC
A21	NC4	NC
A22	GND6	GND
AA1	GPIO_4/IO43RSB4V0	MSS_GP_IO_4
AA2	GPIO_12/IO37RSB4V0	MSS_GP_IO_12
AA3	MAC_MDC/IO48RSB4V0	FPGA_ENA_MDC
AA4	MAC_RXER/IO50RSB4V0	FPGA_ENA_RXER
AA5	MAC_TXD[0]/IO56RSB4V0	FPGA_ENA_TXD0
AA6	ABPS0	V10P
AA7	TM1	AT1
AA8	ADC1	NC
AA9	GND15ADC1	AGND
AA10	GND33ADC10	AGND
AA11	CM3	AC3

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
AA12	GNDTM1	ATGND1
AA13	ADC10	NC
AA14	ADC9	NC
AA16	MAINXIN	AGND (Y1,C48)
AA17	MAINXOUT	AGND (Y1,C50)
AA18	LPXIN	AGND (Y2,C51)
AA19	LPXOUT	AGND (Y2,C52)
AA20	NC6	NC
AA21	NC7	NC
AA22	SPI_1_CLK/GPIO_26	GND
AB1	GND9	GND
AB2	GPIO_13/IO36RSB4V0	MSS_GP_IO_13
AB3	GPIO_14/IO35RSB4V0	MSS_GP_IO_14
AB4	GND11	GND
AB5	PCAP	C49
AB6	NCAP	C49
AB7	ABPS3	AV2_1
AB8	ADC3	ADC3
AB9	GND15ADC0	AGND
AB10	VCC33ADC1	V3P3A
AB11	VAREF1	VAREF_OUT
AB12	TM2	AT2
AB13	CM2	AC2
AB14	ABPS4	V3P3
AB15	GNDAQ1	AGND
AB16	GNDMAINXTAL	AGND
AB17	GNDLPXTAL	AGND
AB18	VCCLPXTAL	V3P3A
AB19	VDDBAT	GND
AB20	PTBASE	PTBASE
AB21	NC8	NC
AB22	GND10	GND
B1	EMC_DB[15]/GAA2/IO71PDB5V0	NC
B2	GND12	GND
B5	VCCFPGAIOB0_3	V3P3_F2
B6	EMC_RW_N/GAA1/IO00PDB0V0	NC



A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
B8	VCCFPGAIOB0_4	V3P3_F2
B9	EMC_BYTEN[0]/GAC0/IO02NDB0V0	NC
B10	EMC_AB[2]/IO05NDB0V0	NC
B11	EMC_AB[3]/IO05PDB0V0	NC
B12	EMC_AB[6]/IO07NDB0V0	NC
B13	EMC_AB[14]/IO11NDB0V0	NC
B14	EMC_AB[15]/IO11PDB0V0	NC
B15	VCCFPGAIOB0_1	V3P3_F2
B16	EMC_AB[18]/IO13NDB0V0	NC
B17	EMC_AB[19]/IO13PDB0V0	NC
B18	VCCFPGAIOB0_2	V3P3_F2
B19	GBB0/IO18NDB0V0	LED1_N
B20	GBB1/IO18PDB0V0	LED2_N
B21	GND13	GND
B22	GBA2/IO20PDB1V0	F2-200-IO_6
C1	EMC_DB[14]/GAB2/IO71NDB5V0	NC
C2	NC9	NC
C3	NC11	NC
C6	EMC_CLK/GAA0/IO00NDB0V0	NC
C9	EMC_BYTEN[1]/GAC1/IO02PDB0V0	NC
C10	EMC_OEN1_N/IO03PDB0V0	NC
C11	GND14	GND
C12	VCCFPGAIOB0_5	V3P3_F2
C13	EMC_AB[8]/IO08NDB0V0	NC
C14	EMC_AB[16]/IO12NDB0V0	NC
C15	EMC_AB[17]/IO12PDB0V0	NC
C16	EMC_AB[24]/IO16NDB0V0	NC
C17	EMC_AB[22]/IO15NDB0V0	NC
C18	EMC_AB[23]/IO15PDB0V0	NC
C19	GBA0/IO19NPB0V0	LED3_N
C20	NC10	NC
C21	GBC2/IO21PDB1V0	LED6_N
C22	GBB2/IO20NDB1V0	F2-200-IO_7
D1	GND15	GND
D2	EMC_DB[12]/IO70NDB5V0	NC
D3	EMC_DB[13]/GAC2/IO70PDB5V0	NC

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
D4	NC14	NC
D5	NC15	NC
D6	GND19	GND
D9	GND20	GND
D10	EMC_OEN0_N/IO03NDB0V0	NC
D11	EMC_AB[10]/IO09NDB0V0	NC
D12	EMC_AB[11]/IO09PDB0V0	NC
D13	EMC_AB[9]/IO08PDB0V0	NC
D14	GND16	GND
D15	GBC1/IO17PPB0V0	OLED_D/C#
D16	EMC_AB[25]/IO16PDB0V0	NC
D17	GND17	GND
D18	GBA1/IO19PPB0V0	NC
D19	NC12	NC
D20	NC13	NC
D21	IO21NDB1V0	LED7_N
D22	GND18	GND
E1	GFC2/IO67PPB5V0	NC
E2	VCCFPGAIOB5_1	V3P3_F2
E3	GFA2/IO68PDB5V0	F2-200-IO_0
E4	GND22	GND
E5	NC18	NC
E6	GNDQ1	GND
E7	VCCFPGAIOB0_12	V3P3_F2
E9	NC19	NC
E10	VCCFPGAIOB0_6	V3P3_F2
E11	EMC_AB[4]/IO06NDB0V0	NC
E12	EMC_AB[5]/IO06PDB0V0	NC
E13	VCCFPGAIOB0_13	V3P3_F2
E14	GBC0/IO17NPB0V0	NC
E15	NC16	NC
E16	VCCFPGAIOB0_7	V3P3_F2
E17	VCOMPLA1	NC
E19	GND21	GND
E20	NC17	NC
E21	VCCFPGAIOB1_1	V3P3_F2

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
E22	IO22NDB1V0	F2-200-PWM0
F1	GFB1/IO65PPB5V0	F2-200-IO_8
F2	IO67NPB5V0	RMII_50MHZ_CLK
F3	GFB2/IO68NDB5V0	F2-200-IO_1
F4	EMC_DB[10]/IO69NPB5V0	NC
F5	VCCFPGAIOB5_2	V3P3_F2
F6	VCCPLLA	V1P5_DUT (VCCPLA)
F7	VCOMPLA	GND
F8	NC23	NC
F9	NC24	NC
F10	NC20	NC
F11	NC21	NC
F12	NC22	NC
F13	EMC_AB[20]/IO14NDB0V0	NC
F14	EMC_AB[21]/IO14PDB0V0	NC
F15	GNDQ2	GND
F16	VCCPLA	NC
F18	VCCFPGAIOB1_2	V3P3_F2
F19	IO23NDB1V0	NC
F22	IO22PDB1V0	F2-200-PWM1
G1	GND23	GND
G2	GFB0/IO65NPB5V0	NC
G3	EMC_DB[9]/GEC1/IO63PDB5V0	NC
G4	GFC1/IO66PPB5V0	F2-200-IO_2
G5	EMC_DB[11]/IO69PPB5V0	NC
G6	GNDQ4	GND
G7	NC25	NC
G8	GND28	GND
G9	VCCFPGAIOB0_11	V3P3_F2
G10	GND24	GND
G11	VCCFPGAIOB0_8	V3P3_F2
G12	GND25	GND
G13	VCCFPGAIOB0_9	V3P3_F2
G14	GND26	GND
G15	VCCFPGAIOB0_10	V3P3_F2
G16	GNDQ3	GND

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
G19	GCA2/IO23PDB1V0	SWITCH1
G20	IO24NDB1V0	SWITCH2
G21	GCB2/IO24PDB1V0	LED8_N
G22	GND27	GND
H1	EMC_DB[7]/GEB1/IO62PDB5V0	NC
H2	VCCFPGAIOB5_3	V3P3_F2
H3	EMC_DB[8]/GEC0/IO63NDB5V0	NC
H4	GND33	GND
H5	GFC0/IO66NPB5V0	F2-200-IO_3
H6	GFA1/IO64PDB5V0	F2-200-IO_4
H7	GND34	GND
H8	VCC4	V1P5_DUT
H9	GND35	GND
H10	VCC1	V1P5_DUT
H11	GND29	GND
H12	VCC2	V1P5_DUT
H13	GND30	GND
H14	VCC3	V1P5_DUT
H15	GND31	GND
H16	VCCFPGAIOB1_3	V3P3_F2
H17	IO25NDB1V0	LED4_N
H18	GCC2/IO25PDB1V0	NC
H19	GND32	GND
H20	GCC0/IO26NPB1V0	LED5_N
H21	VCCFPGAIOB1_4	V3P3_F2
H22	GCB0/IO27NDB1V0	NC
J1	EMC_DB[6]/GEB0/IO62NDB5V0	NC
J2	EMC_DB[5]/GEA1/IO61PDB5V0	NC
J3	EMC_DB[4]/GEA0/IO61NDB5V0	NC
J4	EMC_DB[3]/GEC2/IO60PPB5V0	NC
J5	VCCFPGAIOB5_4	V3P3_F2
J6	GFA0/IO64NDB5V0	F2-200-IO_5
J7	VCCFPGAIOB5_5	V3P3_F2
J8	GND40	GND
J9	VCC8	V1P5_DUT
J10	GND36	GND

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
J11	VCC5	V1P5_DUT
J12	GND37	GND
J13	VCC6	V1P5_DUT
J14	GND38	GND
J15	VCC7	V1P5_DUT
J16	GND39	GND
J18	VCCFPGAIOB1_5	V3P3_F2
J19	GCA0/IO28NDB1V0	J22.1
J20	GCA1/IO28PDB1V0	J22.2
J21	GCC1/IO26PPB1V0	J22.3
J22	GCB1/IO27PDB1V0	J22.4
K1	GND41	GND
K2	EMC_DB[0]/GEA2/IO59NDB5V0	NC
K3	EMC_DB[1]/GEB2/IO59PDB5V0	NC
K5	EMC_DB[2]/IO60NPB5V0	NC
K7	GND46	GND
K8	VCC12	V1P5_DUT
K9	GND47	GND
K10	VCC9	V1P5_DUT
K11	GND42	GND
K12	VCC10	V1P5_DUT
K13	GND43	GND
K14	VCC11	V1P5_DUT
K15	GND44	GND
K16	VCCFPGAIOB1_6	V3P3_F2
K18	GDA1/IO31PDB1V0	NC
K19	GDA0/IO31NDB1V0	J22.5
K20	GDC1/IO29PDB1V0	NC
K21	GDC0/IO29NDB1V0	NC
K22	GND45	GND
L4	GND52	GND
L7	VCCFPGAIOB5_10	V3P3_F2
L8	GND53	GND
L9	VCC16	V1P5_DUT
L10	GND48	GND
L11	VCC13	V1P5_DUT

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
L12	GND49	GND
L13	VCC14	V1P5_DUT
L14	GND50	GND
L15	VCC15	V1P5_DUT
L16	GND51	GND
L17	GNDQ5	GND
L18	GDA2/IO33NDB1V0	NC
L19	VCCFPGAIOB1_7	V3P3_F2
L20	GDB1/IO30PDB1V0	NC
L21	GDB0/IO30NDB1V0	NC
L22	GDC2/IO32PDB1V0	NC
M3	VCCFPGAIOB5_6	V3P3_F2
M5	GNDQ6	GND
M7	GND58	GND
M8	VCC20	V1P5_DUT
M9	GND59	GND
M10	VCC17	V1P5_DUT
M11	GND54	GND
M12	VCC18	V1P5_DUT
M13	GND55	GND
M14	VCC19	V1P5_DUT
M15	GND56	GND
M16	VCCFPGAIOB1_8	V3P3_F2
M17	NC26	NC
M18	GDB2/IO33PDB1V0	NC
M19	VJTAG	VJTAG
M20	GND57	GND
M21	VPP	VPUMP
M22	IO32NDB1V0	NC
N1	GND60	GND
N5	VCCFPGAIOB5_7	V3P3_F2
N7	VCCFPGAIOB5_8	V3P3_F2
N8	GND65	GND
N9	VCC24	V1P5_DUT
N10	GND61	GND
N11	VCC21	V1P5_DUT

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
N12	GND62	GND
N13	VCC22	V1P5_DUT
N14	GND63	GND
N15	VCC23	V1P5_DUT
N17	NC27	NC
N18	VCCFPGAIOB1_9	V3P3_F2
N20	GNDENVM	GND
N21	NC28	NC
N22	GND64	GND
P3	GNDRCOSC	GND
P4	GND70	GND
P5	NC29	NC
P6	NC30	NC
P7	GND71	GND
P8	VCC28	V1P5_DUT
P9	GND72	GND
P10	VCC25	V1P5_DUT
P11	GND66	GND
P12	VCC26	V1P5_DUT
P13	GND67	GND
P14	VCC27	V1P5_DUT
P15	GND68	GND
P16	VCCFPGAIOB1_10	V3P3_F2
P17	TDI	TDI
P18	TCK	F2_TCK
P19	GND69	GND
P20	TMS	F2_TMS
P21	TDO	F2_TDO
P22	TRSTB	TRST
R1	MSS_RESET_N	MSS_RESET_N
R2	VCCFPGAIOB5_9	V3P3_F2
R3	GPIO_1/IO46RSB4V0	MSS_GP_IO_1
R4	NC35	NC
R5	NC36	NC
R6	NC37	NC
R7	NC38	NC

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
R8	GND76	GND
R9	VCC32	V1P5_DUT
R10	GND73	GND
R11	VCC29	V1P5_DUT
R12	GND74	GND
R13	VCC30	V1P5_DUT
R14	GND75	GND
R15	VCC31	V1P5_DUT
R16	JTAGSEL	JTAG_SEL
R17	NC31	NC
R18	NC32	NC
R19	NC33	NC
R21	VCCFPGAIOB1_11	V3P3_F2
R22	NC34	NC
T1	GND77	GND
T3	GPIO_8/IO39RSB4V0	MSS_GP_IO_8
T4	GPIO_11/IO57RSB4V0	MSS_GP_IO_11
T5	GND80	GND
T6	MAC_CLK	GND
T8	VCC33SDD0	V3P3A
T9	VCC15A	V1P5A
T10	GNDAQ0	AGND
T11	GND33ADC01	AGND
T12	ADC7	ADC7
T13	AT4	NC
T14	VAREF2	NC
T15	VAREFOUT	VAREF_OUT
T17	SPI_1_DO/GPIO_24	NC
T18	GND78	GND
T22	GND79	GND
U1	GND81	GND
U2	GPIO_5/IO42RSB4V0	MSS_GP_IO_5
U3	GPIO_10/IO58RSB4V0	MSS_GP_IO_10
U5	MAC_RXD[1]/IO53RSB4V0	FPGA_ENA_RXD1
U6	NC39	NC
U7	VCC33AP	V3P3A



A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
U8	VCC33N	AGND
U9	CM1	AC1
U10	VAREF0	VAREF_OUT
U11	GND33ADC11	AGND
U12	ADC4	ADC4
U13	ATGND_02	NC
U14	ADC11	NC
U15	GNDVAREF	AGND
U16	VCC33SDD1	V3P3A
U17	SPI_0_DO/GPIO_16	SPI_SI
U18	UART_0_RXD/GPIO_21	RXD_0_IN
U20	I2C_1_SCL/GPIO_31	NC
U21	I2C_0_SCL/GPIO_23	OLED_SCL
U22	GND82	GND
V1	GPIO_0/IO47RSB4V0	MSS_GP_IO_0
V2	GPIO_6/IO41RSB4V0	MSS_GP_IO_6
V3	GPIO_9/IO38RSB4V0	MSS_GP_IO_9
V4	MAC_MDIO/IO49RSB4V0	FPGA_ENA_MDIO
V5	MAC_RXD[0]/IO54RSB4V0	FPGA_ENA_RXD0
V6	GND84	GND
V7	SDD0	DACOUT0
V8	ABPS1	V1P5
V9	ADC2	ADC2
V10	VCC33ADC0	V3P3A
V11	ADC6	ADC6
V12	ADC5	ADC5
V13	ABPS5	AV2_2
V14	ADC8	NC
V16	NC40	NC
V17	GND83	GND
V18	SPI_0_DI/GPIO_17	SPI_SO
V19	SPI_1_DI/GPIO_25	NC
V20	UART_1_TXD/GPIO_28	NC
V21	I2C_0_SDA/GPIO_22	OLED_SDA
V22	I2C_1_SDA/GPIO_30	NC
W1	GPIO_2/IO45RSB4V0	MSS_GP_IO_2

A2F200 Pin Number	A2F200 Pin Name	Board Signal Name
W2	GPIO_7/IO40RSB4V0	MSS_GP_IO_7
W3	GND86	GND
W4	MAC_CRSDV/IO51RSB4V0	FPGA_ENA_CRS
W5	MAC_TXD[1]/IO55RSB4V0	FPGA_ENA_TXD1
W6	NC41	NC
W7	GND A0	AGND
W8	TM0	AT0
W9	ABPS2	AV1_1
W10	GND33ADC02	AGND
W11	VCC15ADC1	V1P5A
W12	ABPS6	AV1_3
W13	AC4	NC
W14	AV2_4	NC
W16	GND A1	AGND
W17	PU_N	RTC_SW
W18	GND SDD1	AGND
W19	SPI_0_CLK/GPIO_18	SPI_SCK
W20	GND85	GND
W21	SPI_1_SS/GPIO_27	NC
W22	UART_1_RXD/GPIO_29	NC
Y1	GPIO_3/IO44RSB4V0	MSS_GP_IO_3
Y3	GPIO_15/IO34RSB4V0	MSS_GP_IO_15
Y4	MAC_TXEN/IO52RSB4V0	FPGA_ENA_TXEN
Y7	CM0	AC0
Y8	GND TM0	ATGND0
Y9	ADC0	ADC0
Y10	VCC15ADC0	V1P5A
Y11	ABPS7	AV2_3
Y12	TM3	AT3
Y13	AV1_4	NC
Y16	VCC MAIN XTAL	V3P3A
Y17	SDD1	DACOUT1
Y18	PTEM	V1P5_INT
Y19	VCC33A	V3P3A
Y20	SPI_0_SS/GPIO_19	SPI_CS_N
Y22	UART_0_TXD/GPIO_20	TXD_0_OUT

## 5 – Board Stackup

### Board Stack-Up

The SmartFusion Evaluation Kit board is built on a 6-layer printed circuit board (PCB). The silkscreen is provided in [Figure 5-2 on page 5-44](#). The full PCB design layout is provided on the SmartFusion Evaluation Kit page of the Actel website:

[www.actel.com/products/hardware/devkits\\_boards/smartfusion\\_eval.aspx](http://www.actel.com/products/hardware/devkits_boards/smartfusion_eval.aspx)

To view the PCB design layout files, you can use Allegro Free Physical Viewer, which can be downloaded from the Cadence website Allegro Download page:

[www.cadence.com/products/pcb/Pages/Downloads.aspx](http://www.cadence.com/products/pcb/Pages/Downloads.aspx).

The layers are arranged in the following order:

Layer1: Top Signal

Layer2: GND1

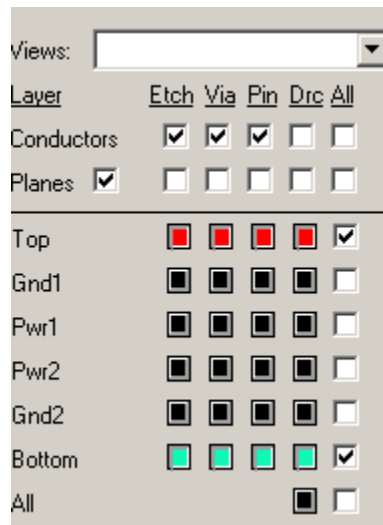
Layer3: PWR1

Layer4: PWR2

Layer5: GND2

Layer6: Bottom Signal

[Figure 5-1](#) shows the stack-up:



**Figure 5-1 • A2F-EVAL-KIT PCB Layer Stack up**



## 6 – Manufacturing Test

### A2F-EVAL-KIT Board Testing Procedures

This chapter defines and describes the specific A2F-EVAL-KIT board testing procedures. Instructions for running the ACTEL A2F-EVAL-KIT board tests are detailed in the following sections. The steps needed to set up the test environment are also outlined. Associated files for this procedure can be downloaded from the Actel website:

[www.actel.com/download/rsc?f=A2F\\_EVAL\\_KIT\\_Mfg\\_PF](http://www.actel.com/download/rsc?f=A2F_EVAL_KIT_Mfg_PF)

#### Jumper Settings for the Board Test

Table 6-1 lists all the jumpers that need to be set on the board for performing the tests. In case any of the tests in the following section do not work as expected, double-check Table 6-1.

**Table 6-1 • Manufacturing Test Jumper Settings**

Jumper	Pin (From)	Pin (To)
JP6	2	3
JP7	1	2
JP10	1	2

#### Installing the A2F-EVAL-KIT Board USB Serial Driver

1. Use WinZip to extract all files stored in the CP210x\_Drivers.zip archive.
2. Double-click on the file named **CP210x\_Drivers.exe**.
3. Choose the Install option in the Install Wizard and select **Yes** for the licensing agreement.
4. Restart the computer on which the driver was installed. After restart, the driver can be used to communicate with A2F-EVAL-KIT board.

#### Hooking up the Board and UART Cable

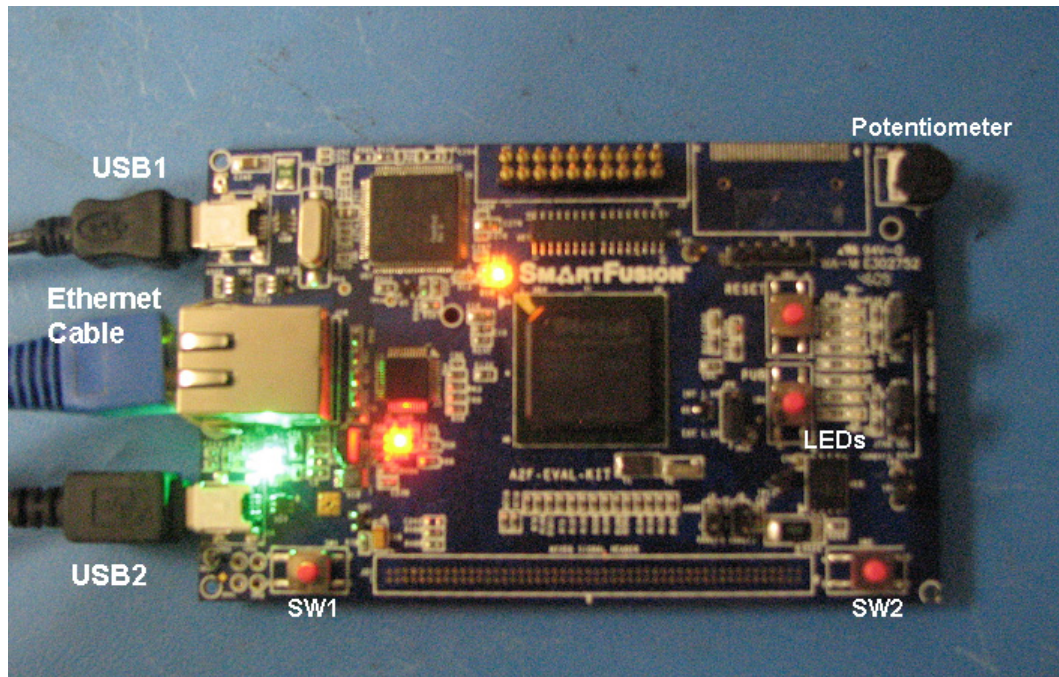
Connect one end of USB mini B cable to the USB connection, J14 (labeled as USB2 in Figure 6-1 on page 6-46) on the A2F-EVAL-KIT board. Connect the other end of the USB cable to the PC you will use for testing.

The board receives power from USB. LED1 lights up, indicating the board is powered up. The D11 LED also lights up, indicating UART link establishment.

#### Hooking Up the Board and Ethernet Cable

Connect an Ethernet cable from the local area network to J10, the A2F-EVAL-KIT Ethernet jack.

**Note:** For the board Ethernet test to pass, the local network must be running a DHCP server that assigns an IP address to the web server on the board. Network firewalls must not block the web server.



**Figure 6-1 • Board Manufacturing Test Setup**

### Hooking up the A2F-EVAL-KIT Board Built-in Programmer to PC

Connect the second mini USB cable to connection J13 on the board (labeled USB1 in Figure 6-1). Plug in the second side of the cable to the PC USB port. This establishes connection to the built-in programming circuit (FlashPro3) on the board, programming the A2F-EVAL-KIT board (SmartFusion device).

1. Open the FlashPro programming software (Figure 6-2).

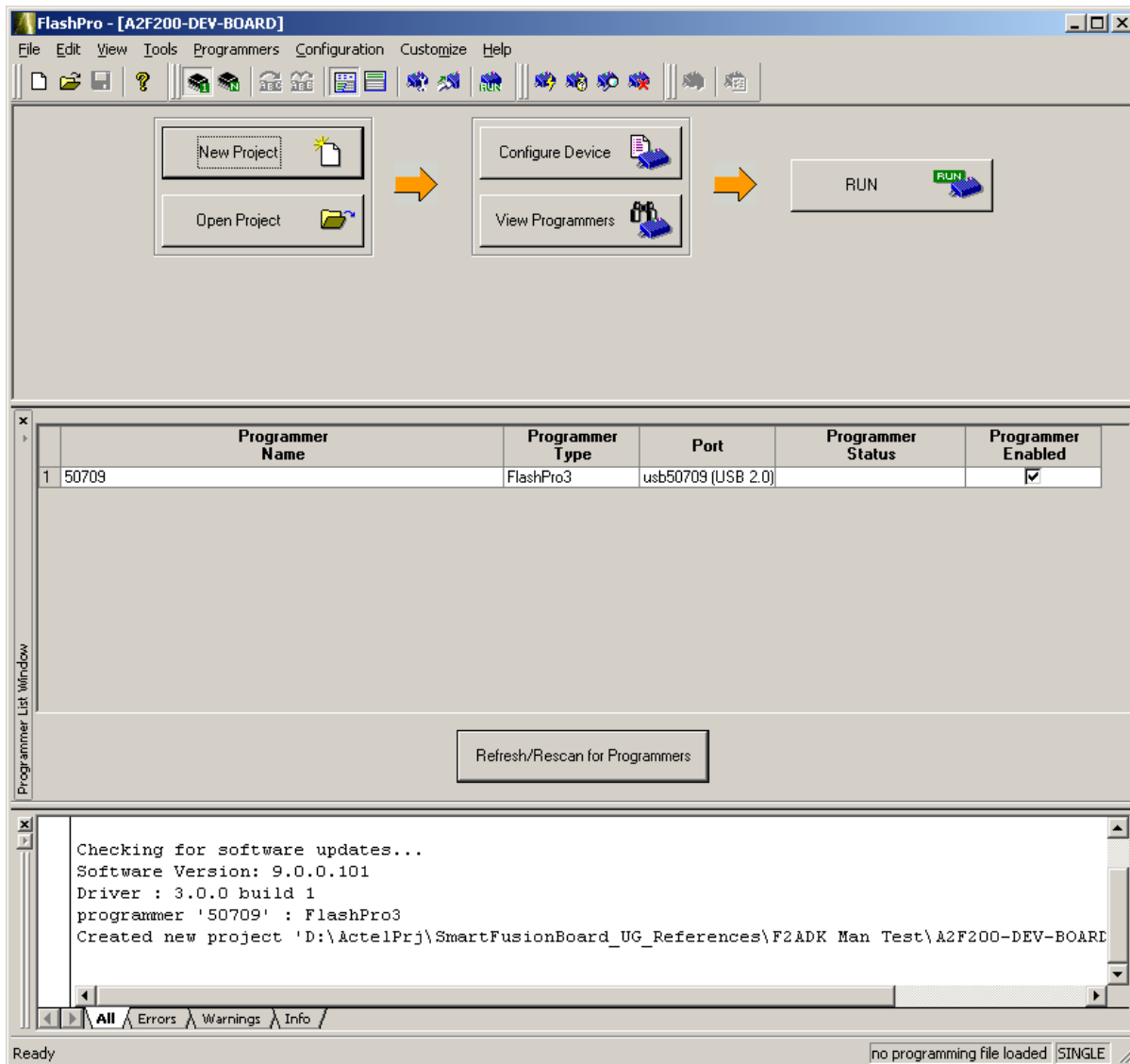
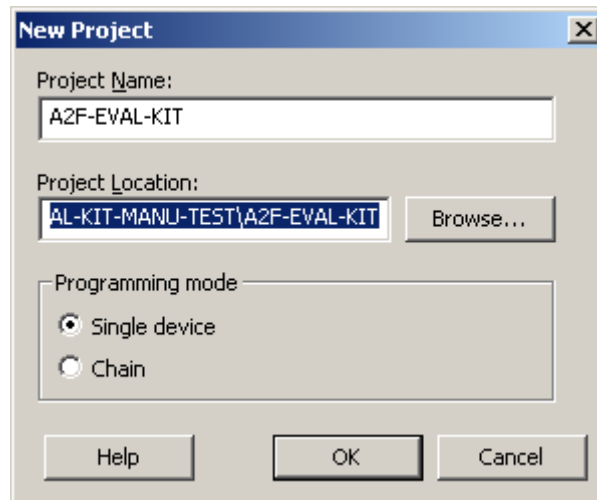


Figure 6-2 • FlashPro New Project Setup

2. Create a new programming project (Figure 6-3).

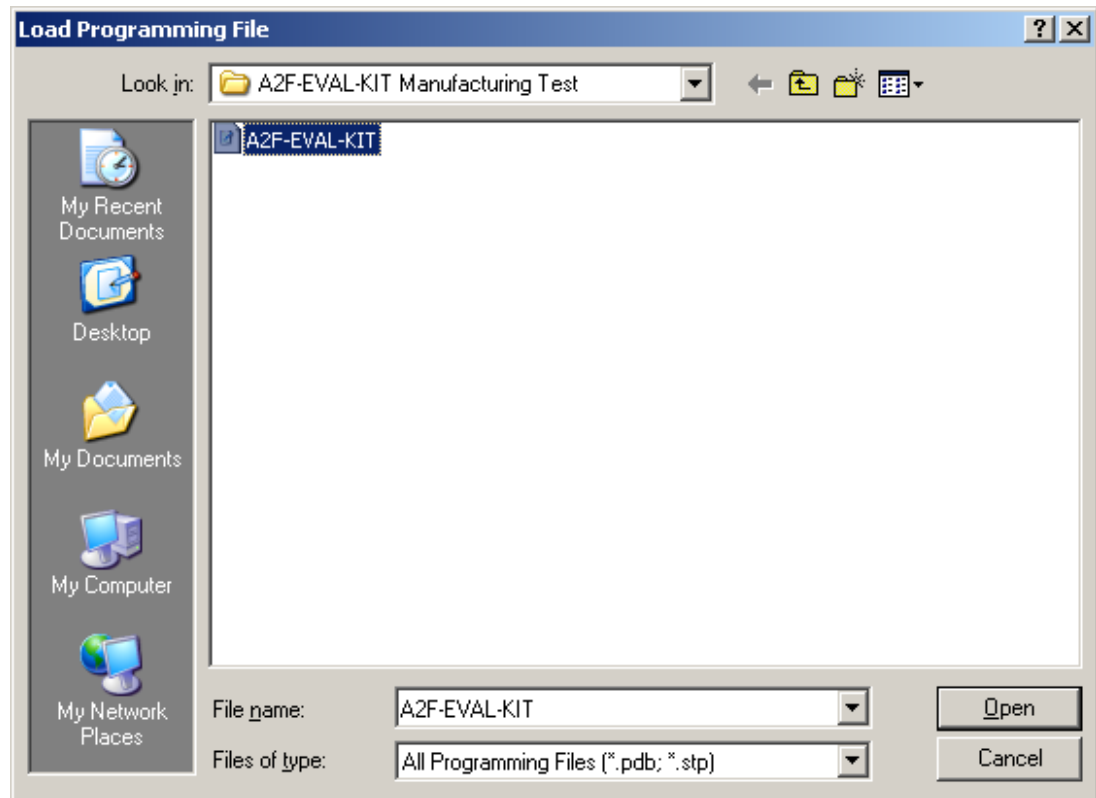


**Figure 6-3 • New Project Creation**

3. Select the option **Single Device** when choosing the programming mode
4. Click the **Configure Programmer** Button. This makes the load existing programming file button available.



5. Browse the PC file system to find the A2F-EVAL-KIT.stp programming file. Click **Open** to select the A2F-EVAL-KIT.stp file (Figure 6-4).



**Figure 6-4 • Selecting Manufacturing Test STAPL File**

6. Click the **Program** button to program the A2F-EVAL-KIT board.

## Setting Up the Test Terminal

1. Open the Windows start menu. Select **All > Programs > Accessories > Communications** and select the HyperTerminal program (Figure 6-5). This opens HyperTerminal.

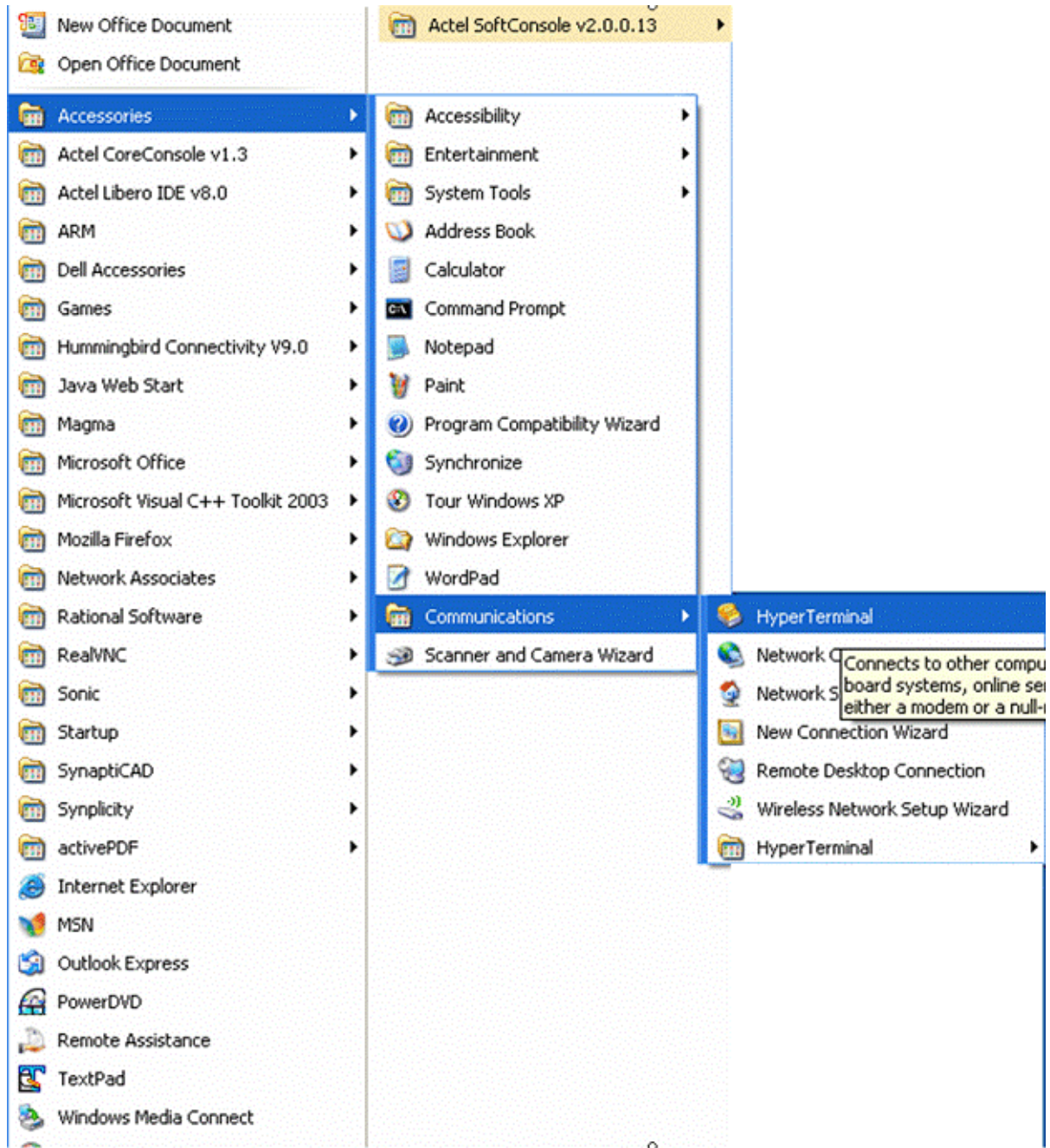


Figure 6-5 • HyperTerminal Program Setup

The Connection Description window will open (Figure 6-6). Type in **A2F-EVAL-KIT** as the name of the new HyperTerminal session and click the **OK** button.



Figure 6-6 • HyperTerminal Setup

2. The Connect To window will open. Select the COM4 serial connection (Figure 6-7).



Figure 6-7 • HyperTerminal Port Selection

- The COM4 Properties window appears. Select the following settings (Figure 6-8):
  - Bits per second = 19200
  - Data bits = 8
  - Parity = None
  - Stop bits = 1
  - Flow Control = None.

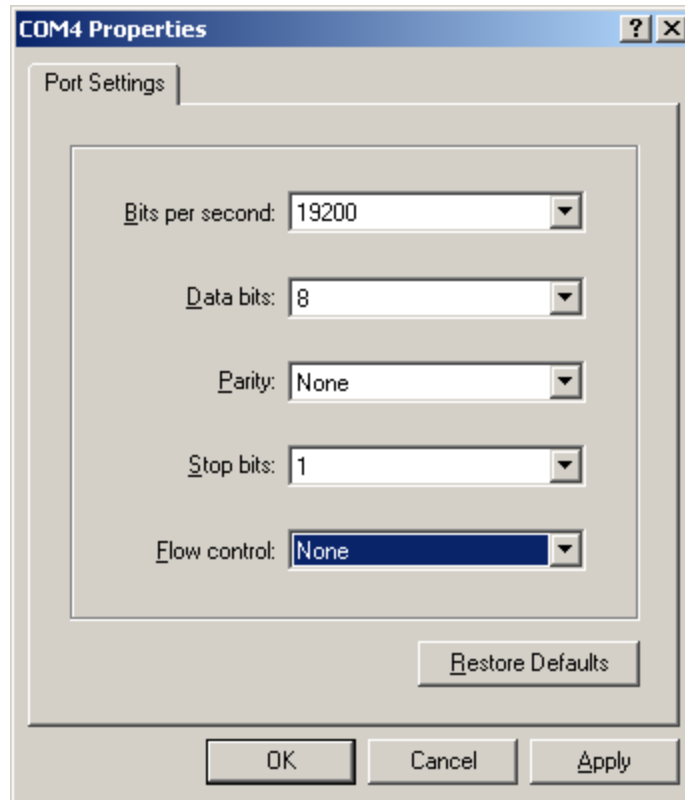


Figure 6-8 • HyperTerminal Port Settings

4. Select **File > Properties** in the HyperTerminal window. Choose the **Settings** tab (Figure 6-9).

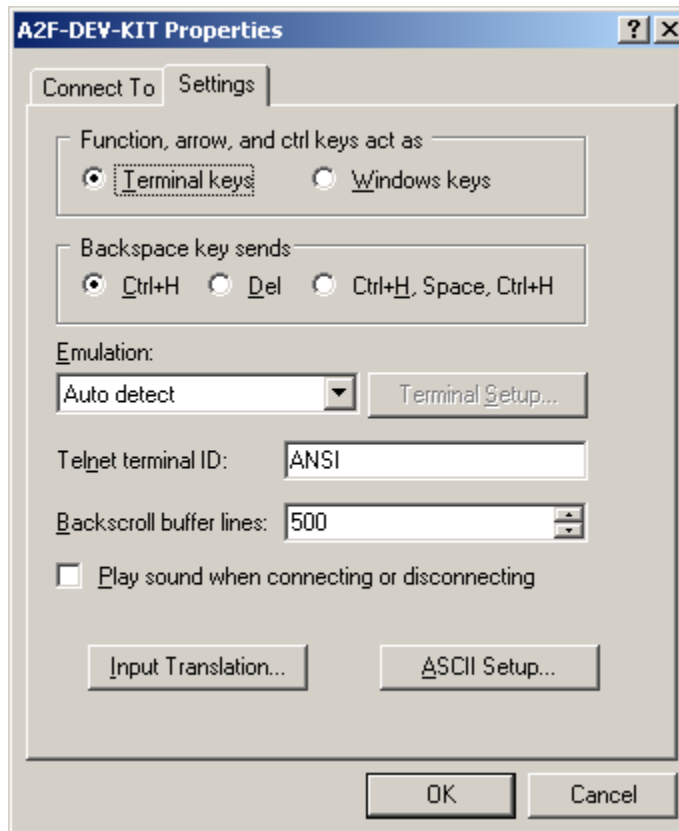


Figure 6-9 • HyperTerminal Properties

5. Click the **ASCII Setup** button. Select the check box labeled **Append line feeds to incoming line ends** (Figure 6-10).

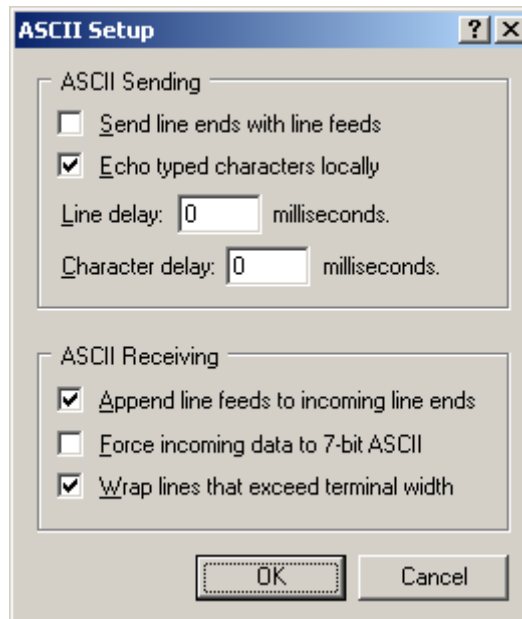
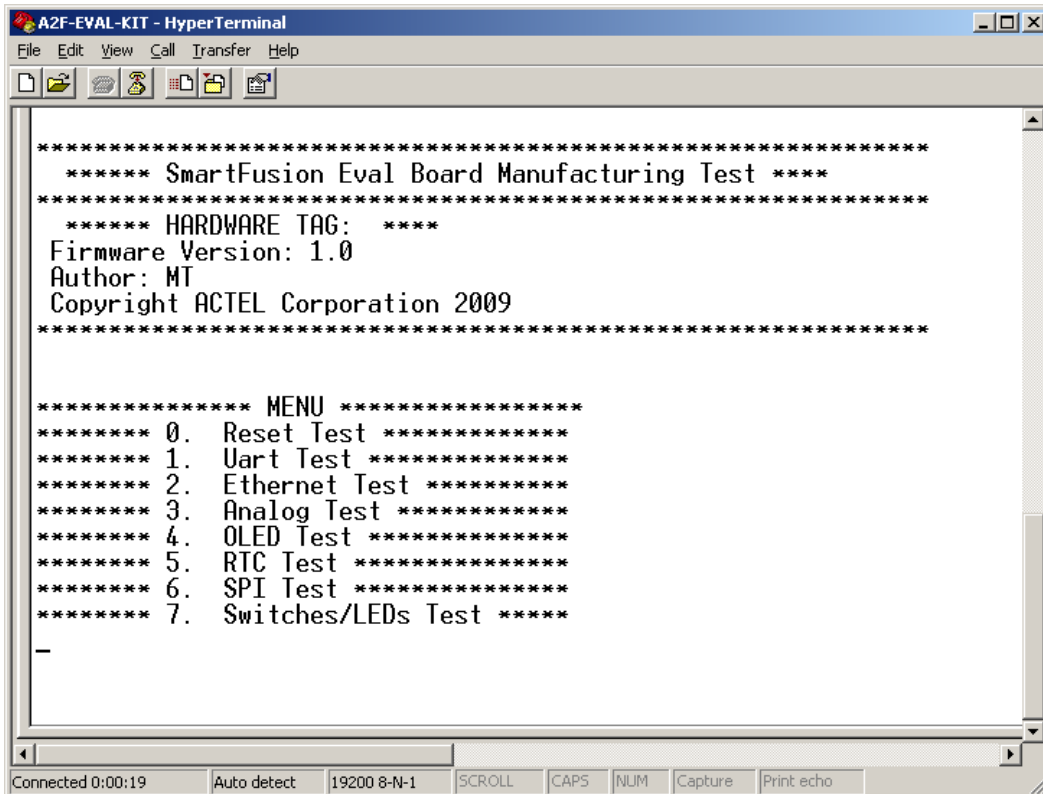


Figure 6-10 • ASCII Character Settings

## Running the A2F-EVAL-KIT Board Test

Press the button labeled **RESET** (SW3) on the A2F-EVAL-KIT board to start the test program.

1. The menu shown in [Figure 6-11](#) will appear on the terminal.



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
*****
***** SmartFusion Eval Board Manufacturing Test *****
*****
***** HARDWARE TAG: *****
Firmware Version: 1.0
Author: MT
Copyright ACTEL Corporation 2009
*****

***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****

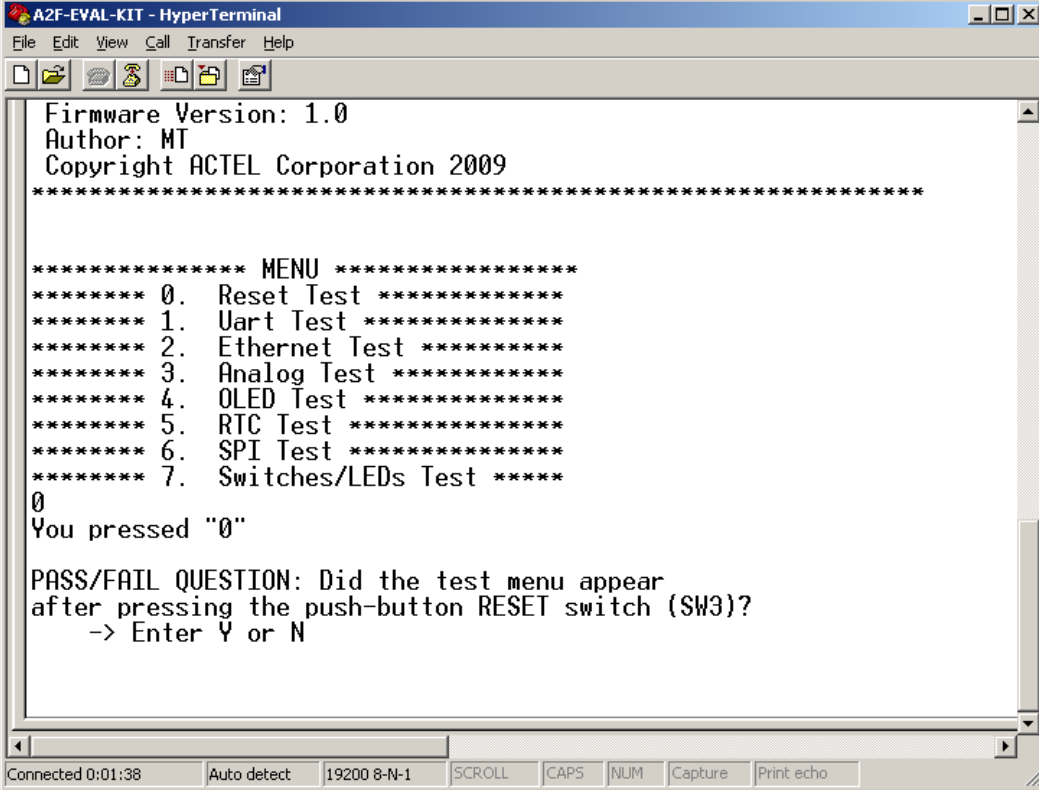
-
Connected 0:00:19 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

**Figure 6-11 • Manufacturing Test Menu**

**Note:** If this message does not appear, try pressing button SW8 again. If the above message still does not appear, refer to the "Setting Up the Test Terminal" section on page 6-50 and check to see that the terminal has been set up correctly.

## RESET Test

1. Enter 0 into the terminal to begin the reset test.  
The resulting display should be similar to Figure 6-12.



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
*****
Firmware Version: 1.0
Author: MT
Copyright ACTEL Corporation 2009
*****

***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
0
You pressed "0"

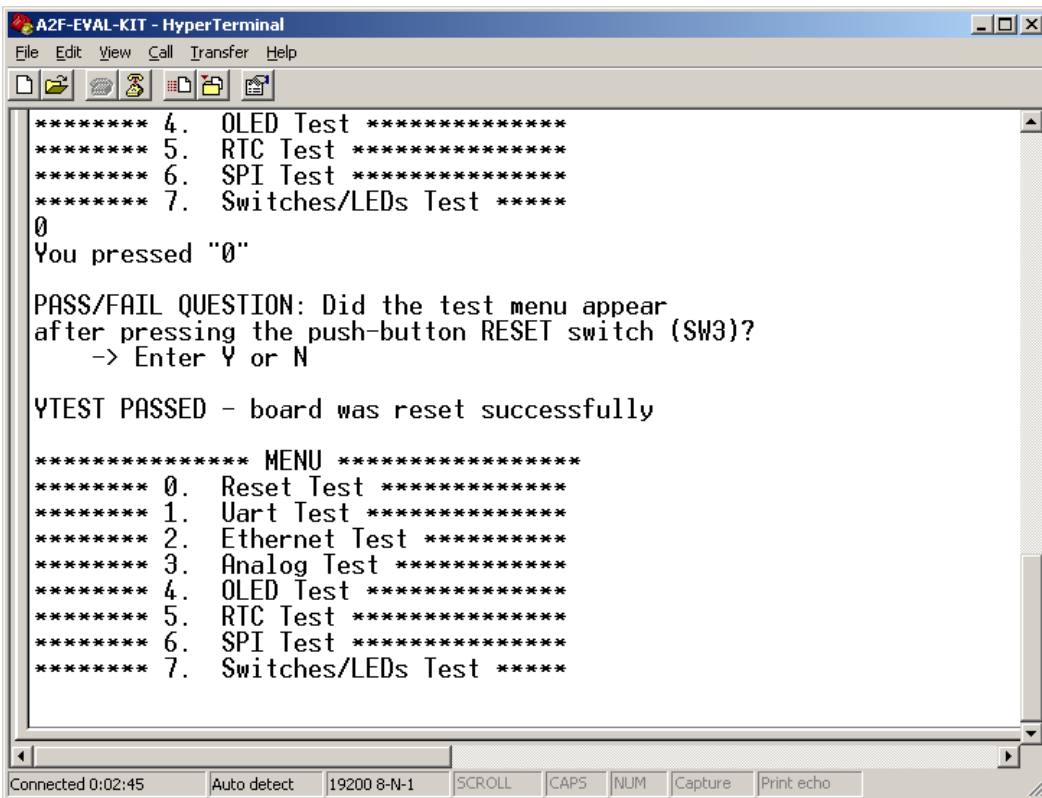
PASS/FAIL QUESTION: Did the test menu appear
after pressing the push-button RESET switch (SW3)?
-> Enter Y or N

Connected 0:01:38 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-12 • Reset Test



2. If the menu appears correct, enter the character Y into the terminal (Figure 6-13).

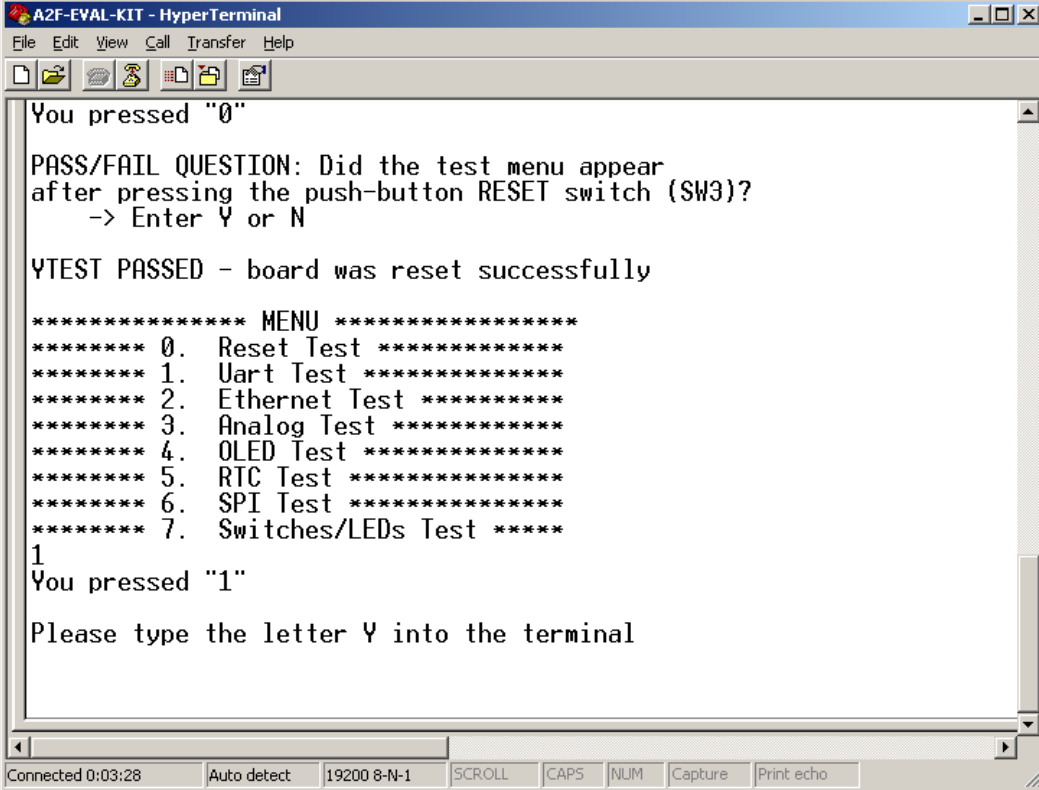


```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
0
You pressed "0"
PASS/FAIL QUESTION: Did the test menu appear
after pressing the push-button RESET switch (SW3)?
-> Enter Y or N
YTEST PASSED - board was reset successfully
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
Connected 0:02:45 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-13 • Reset Test Result

## UART Test

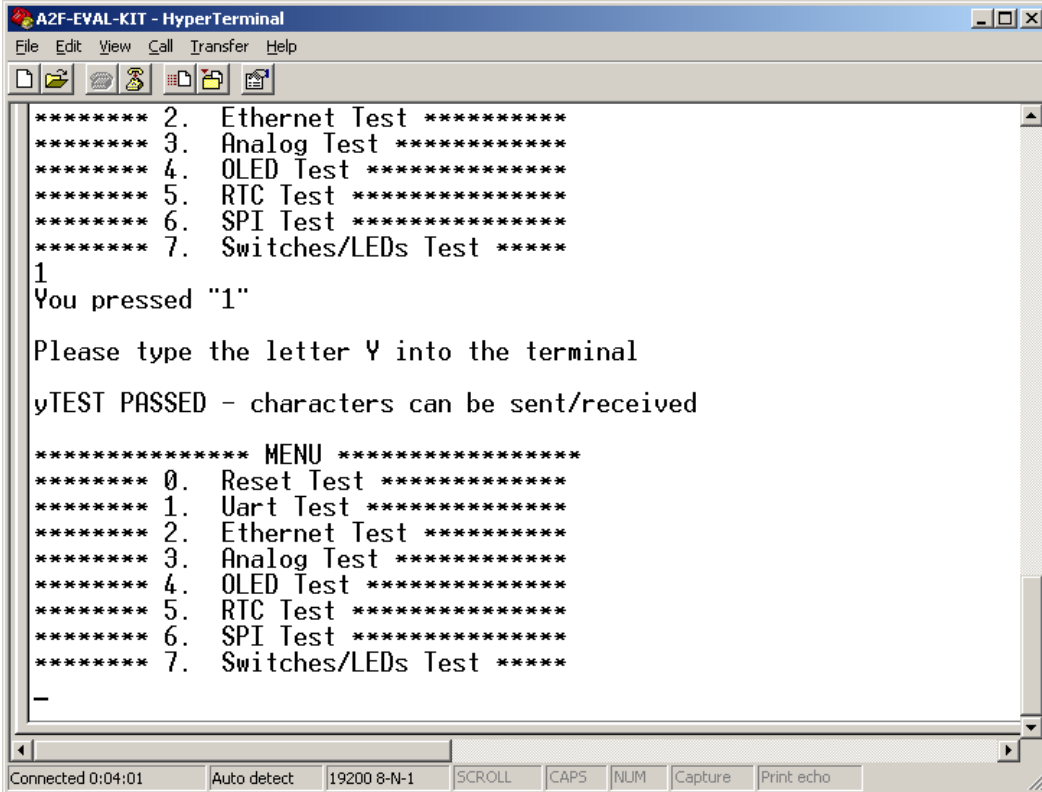
1. Enter 1 into the terminal to begin the UART test (Figure 6-14).



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
You pressed "0"
PASS/FAIL QUESTION: Did the test menu appear
after pressing the push-button RESET switch (SW3)?
-> Enter Y or N
YTEST PASSED - board was reset successfully
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
1
You pressed "1"
Please type the letter Y into the terminal
Connected 0:03:28 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-14 • UART Test

2. Type the character Y into the terminal. The screen shown in Figure 6-15 should appear.

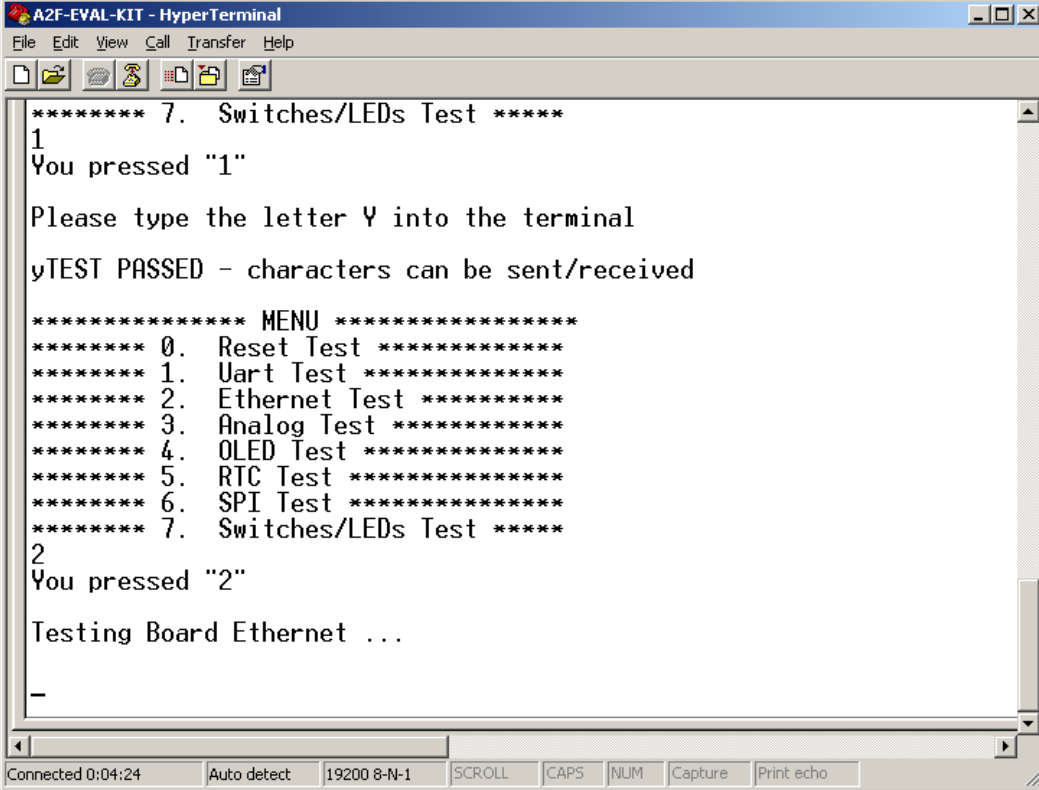


```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
1
You pressed "1"
Please type the letter Y into the terminal
yTEST PASSED - characters can be sent/received
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
-
Connected 0:04:01 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-15 • UART Test Result

## Ethernet Test

1. Enter **2** into the terminal to begin the Ethernet test. The screens shown in [Figure 6-16](#) and [Figure 6-17](#) on page 6-61 should appear.



```
***** 7. Switches/LEDs Test *****
1
You pressed "1"

Please type the letter Y into the terminal
yTEST PASSED - characters can be sent/received

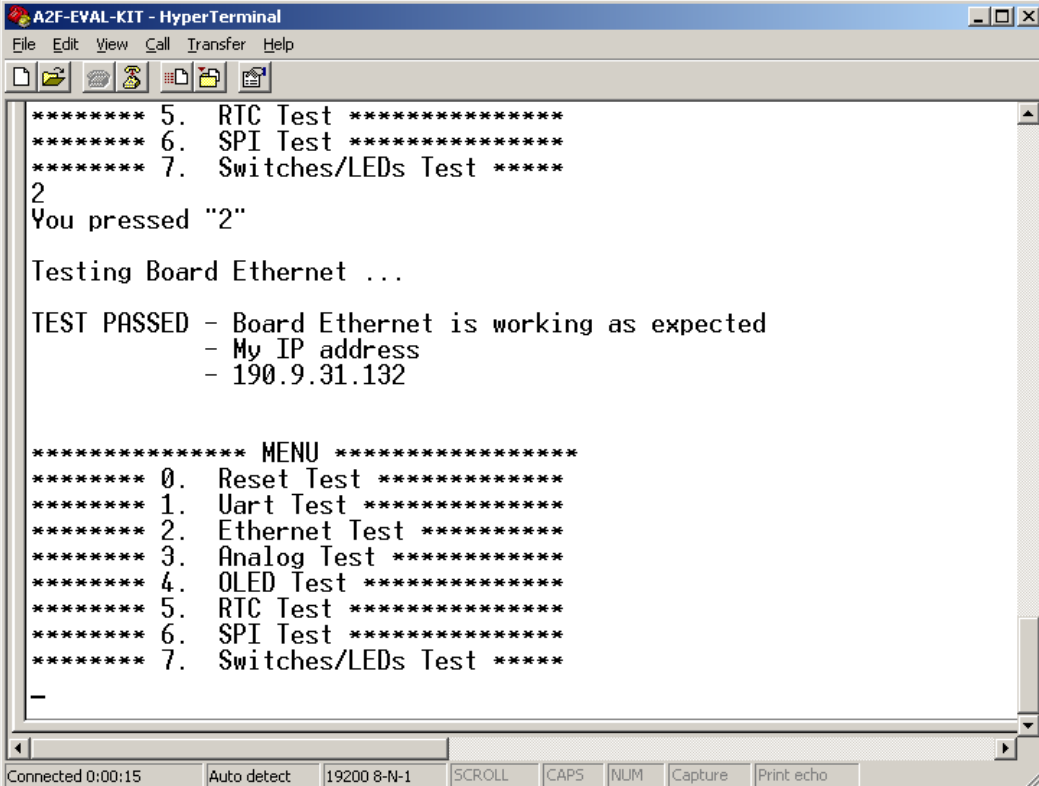
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
2
You pressed "2"

Testing Board Ethernet ...

-

Connected 0:04:24  Auto detect  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

**Figure 6-16 • Ethernet Test**



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
2
You pressed "2"
Testing Board Ethernet ...
TEST PASSED - Board Ethernet is working as expected
              - My IP address
              - 190.9.31.132

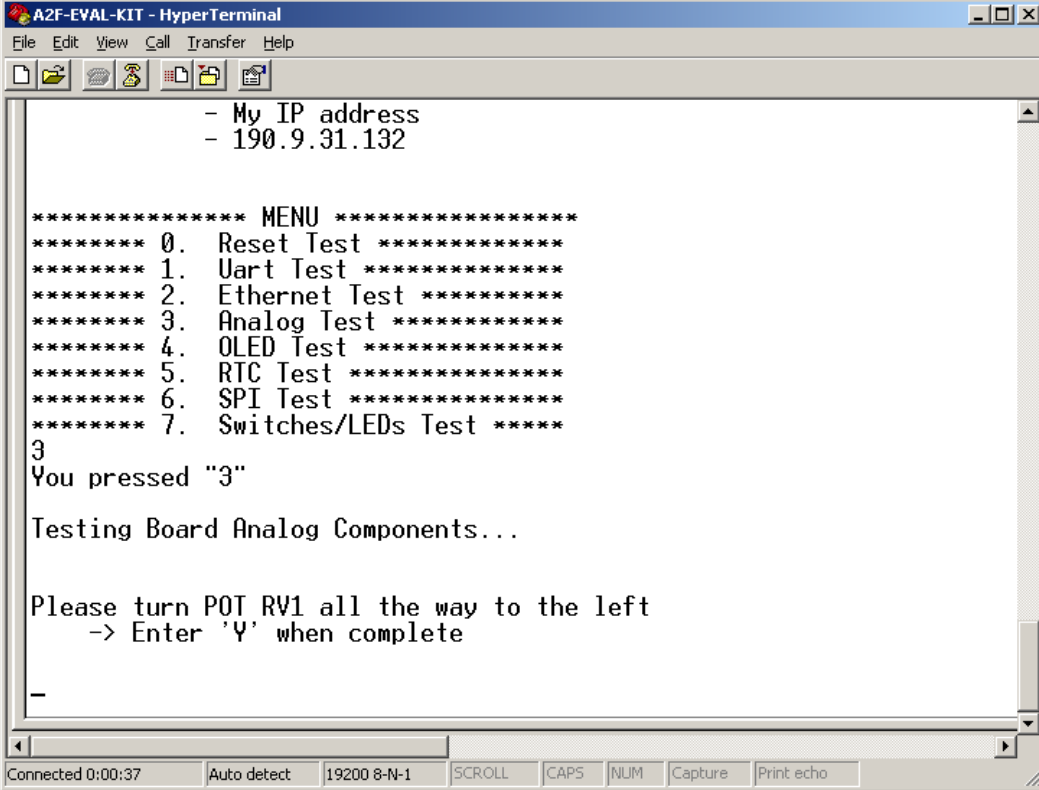
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
-
Connected 0:00:15  Auto detect  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

**Figure 6-17 • Ethernet Test Result**

**Note:** The IP address may vary in the network setup.

## Analog Test

1. Enter **3** into the terminal to begin the Analog test. The screen shown in [Figure 6-18](#) should appear.



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
- My IP address
- 190.9.31.132

***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
3
You pressed "3"

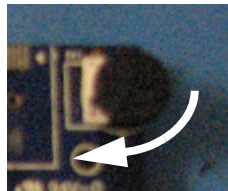
Testing Board Analog Components...

Please turn POT RV1 all the way to the left
-> Enter 'Y' when complete

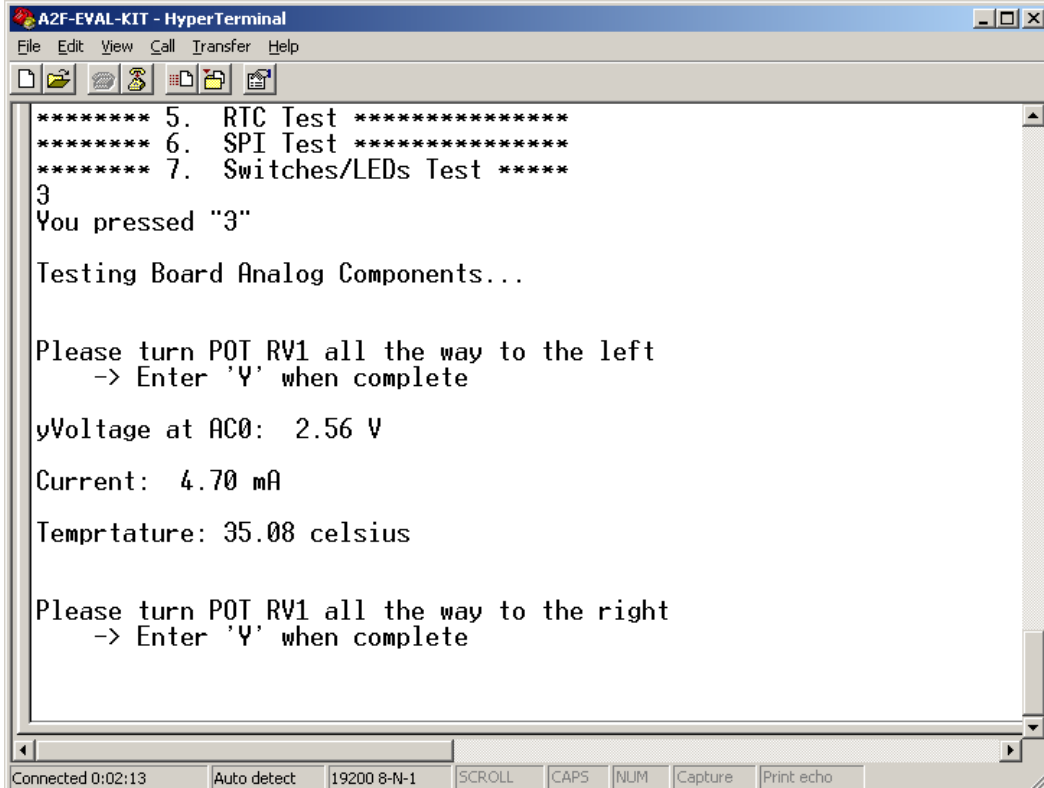
-
Connected 0:00:37 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

**Figure 6-18 • Analog Test**

2. Locate POT RV on the bottom, left hand corner of the board. Turn POT RV1 counter-clockwise all the way to the left, as shown in [Figure 6-19](#).



**Figure 6-19 • POT RV1**



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
3
You pressed "3"

Testing Board Analog Components...

Please turn POT RV1 all the way to the left
-> Enter 'Y' when complete

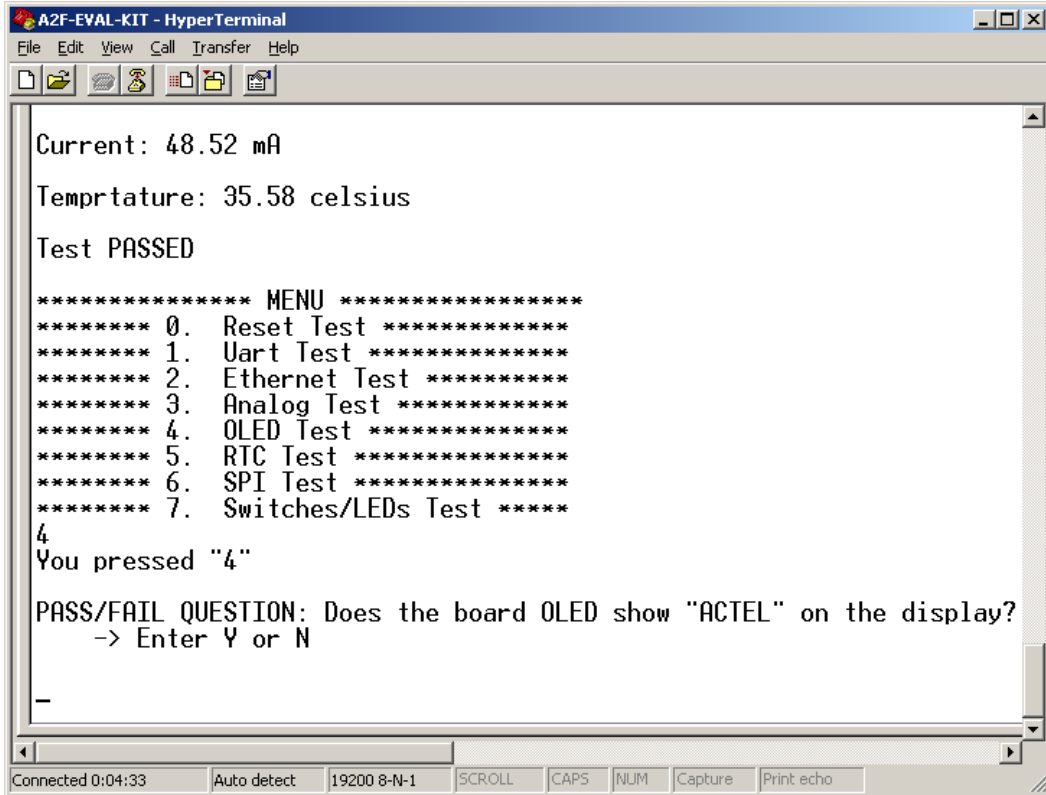
yVoltage at AC0: 2.56 V
Current: 4.70 mA
Temptrature: 35.08 celsius

Please turn POT RV1 all the way to the right
-> Enter 'Y' when complete

Connected 0:02:13 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-20 • Analog Test Starting Results

- Turn POT RV clockwise all the way clockwise to the right. The display on the terminal should be similar to Figure 6-21.



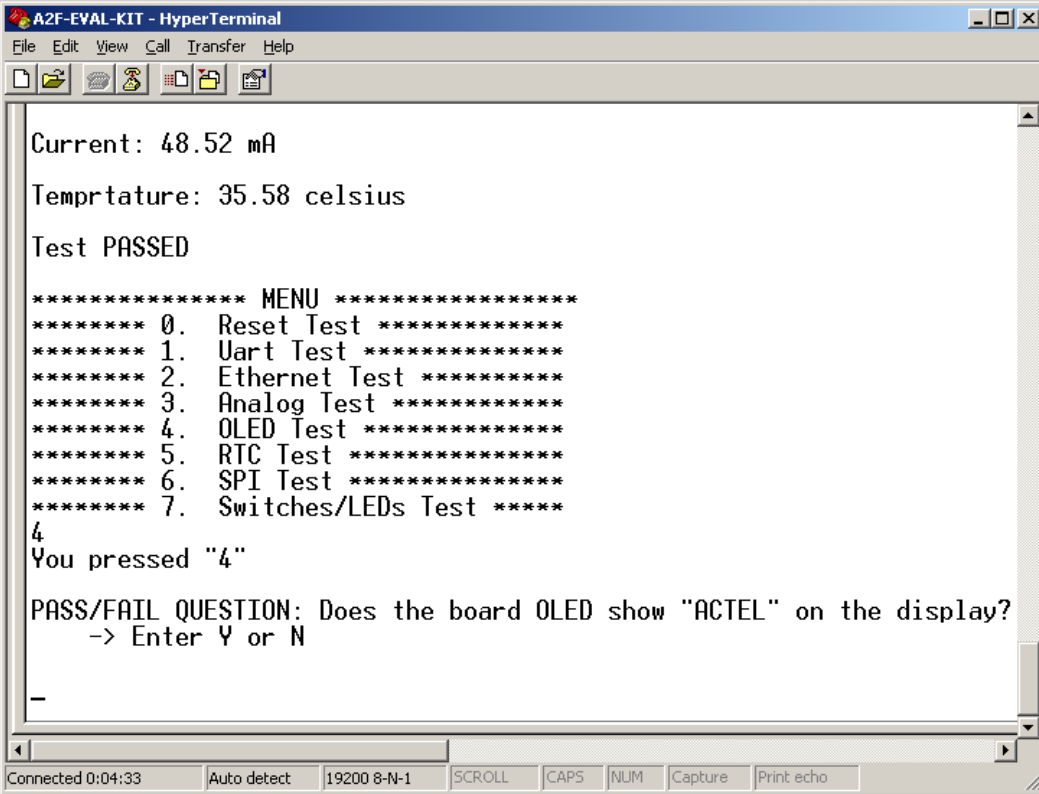
```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
Current: 48.52 mA
Temperture: 35.58 celsius
Test PASSED
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
4
You pressed "4"
PASS/FAIL QUESTION: Does the board OLED show "ACTEL" on the display?
-> Enter Y or N
-
Connected 0:04:33 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-21 • Analog Test Ending Results



## OLED Test

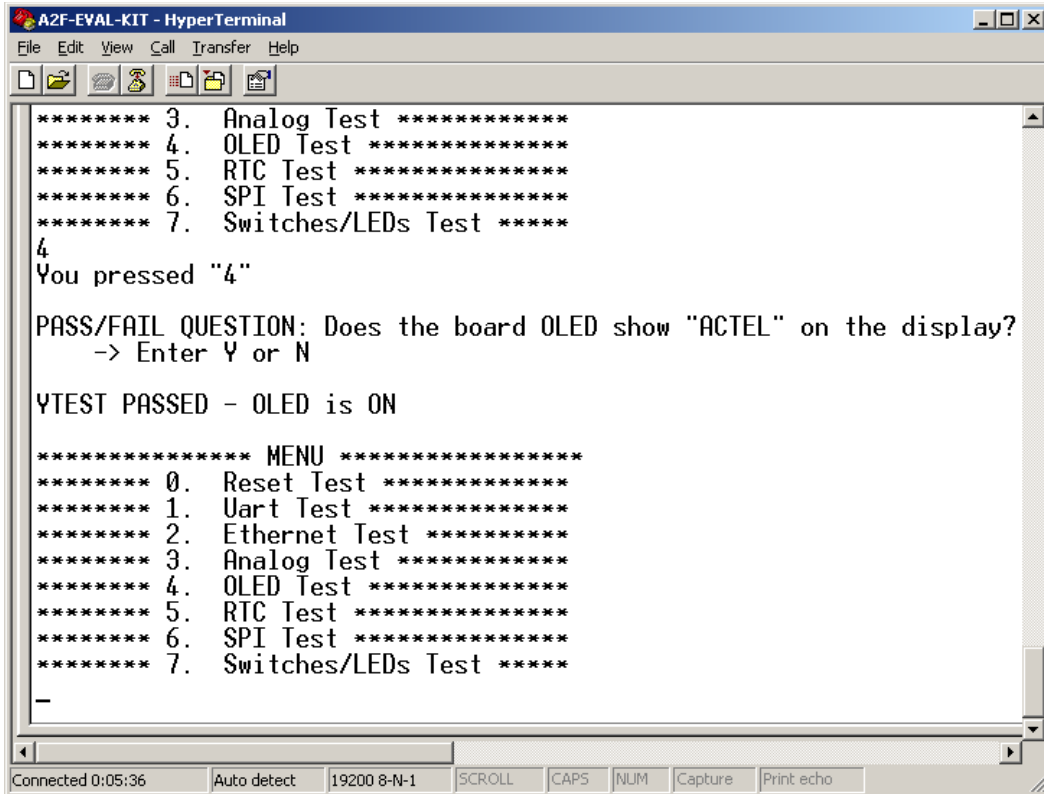
1. Enter **4** into the terminal to begin the OLED test. The screen shown in [Figure 6-22](#) will appear.



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
Current: 48.52 mA
Temperture: 35.58 celsius
Test PASSED
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
4
You pressed "4"
PASS/FAIL QUESTION: Does the board OLED show "ACTEL" on the display?
-> Enter Y or N
-
Connected 0:04:33 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-22 • OLED Test Setup

2. Check the board OLED display. If the characters ACTEL MAN TEST are displayed in the OLED, enter Y in the terminal; otherwise, enter N. If Y was entered, the screen shown in Figure 6-23 will be displayed.

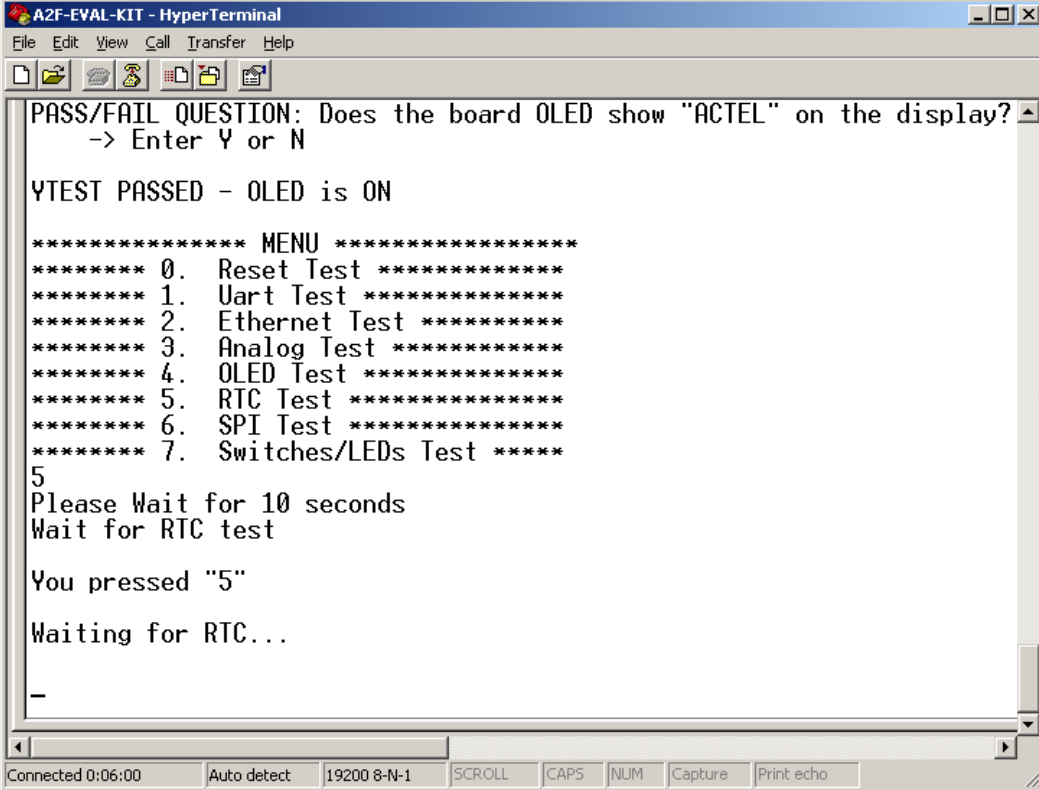


```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
4
You pressed "4"
PASS/FAIL QUESTION: Does the board OLED show "ACTEL" on the display?
-> Enter Y or N
YTEST PASSED - OLED is ON
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
-
Connected 0:05:36 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-23 • OLED Test Results

## RTC Test

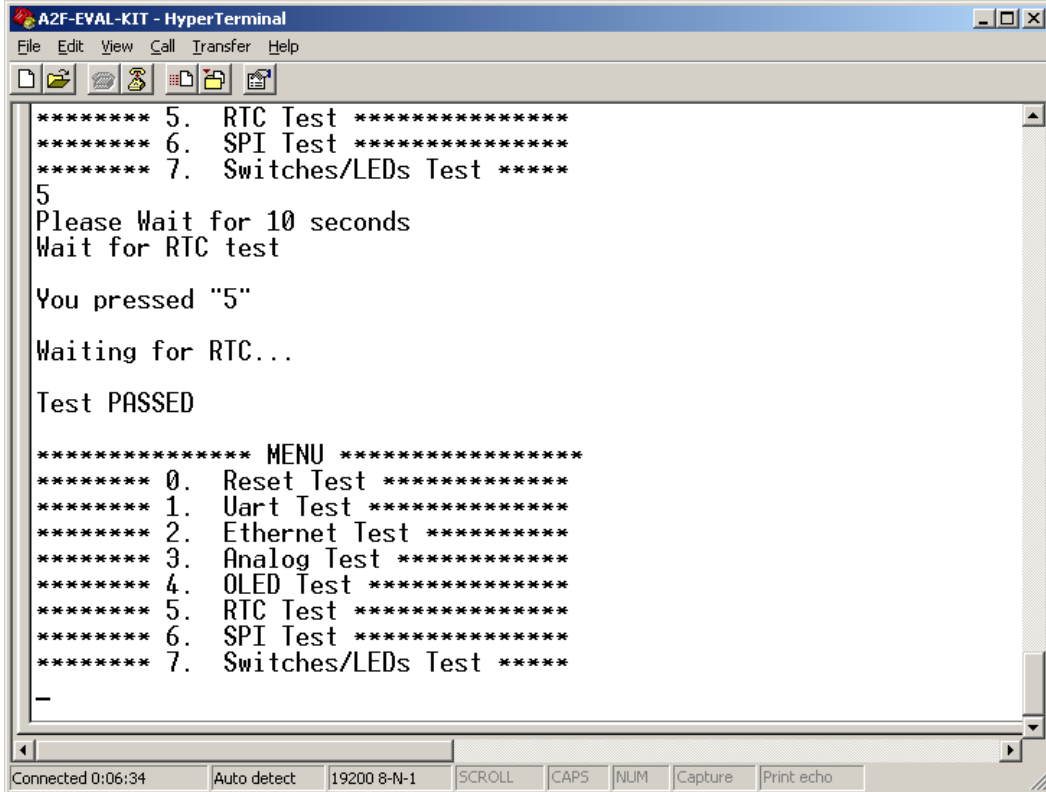
1. Enter **5** into the terminal to begin the RTC test (Figure 6-24).



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
PASS/FAIL QUESTION: Does the board OLED show "ACTEL" on the display?
-> Enter Y or N
YTEST PASSED - OLED is ON
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
5
Please Wait for 10 seconds
Wait for RTC test
You pressed "5"
Waiting for RTC...
-
Connected 0:06:00 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-24 • RTC Test

2. After a few seconds, the screen shown in Figure 6-25 should appear.



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
5
Please Wait for 10 seconds
Wait for RTC test

You pressed "5"
Waiting for RTC...

Test PASSED

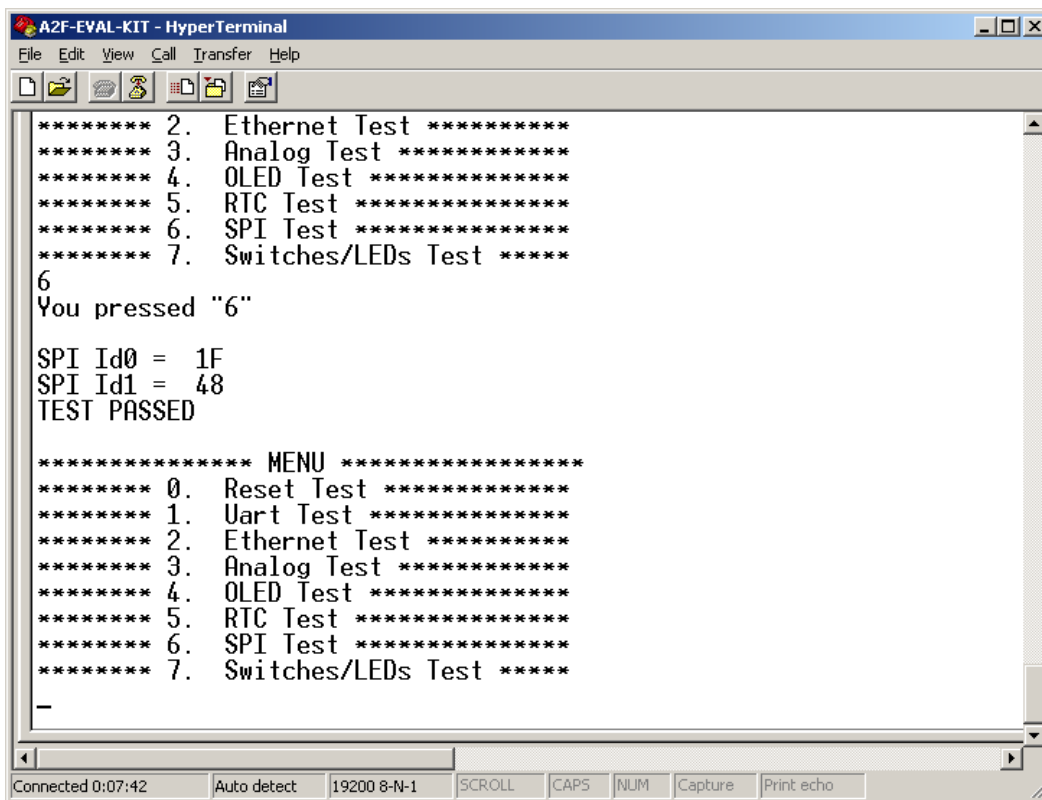
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
-

Connected 0:06:34 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-25 • RTC Test Passed

## SPI Test

Enter **6** into the terminal to begin the SPI test. After several seconds, the screen shown in [Figure 6-26](#) should appear.

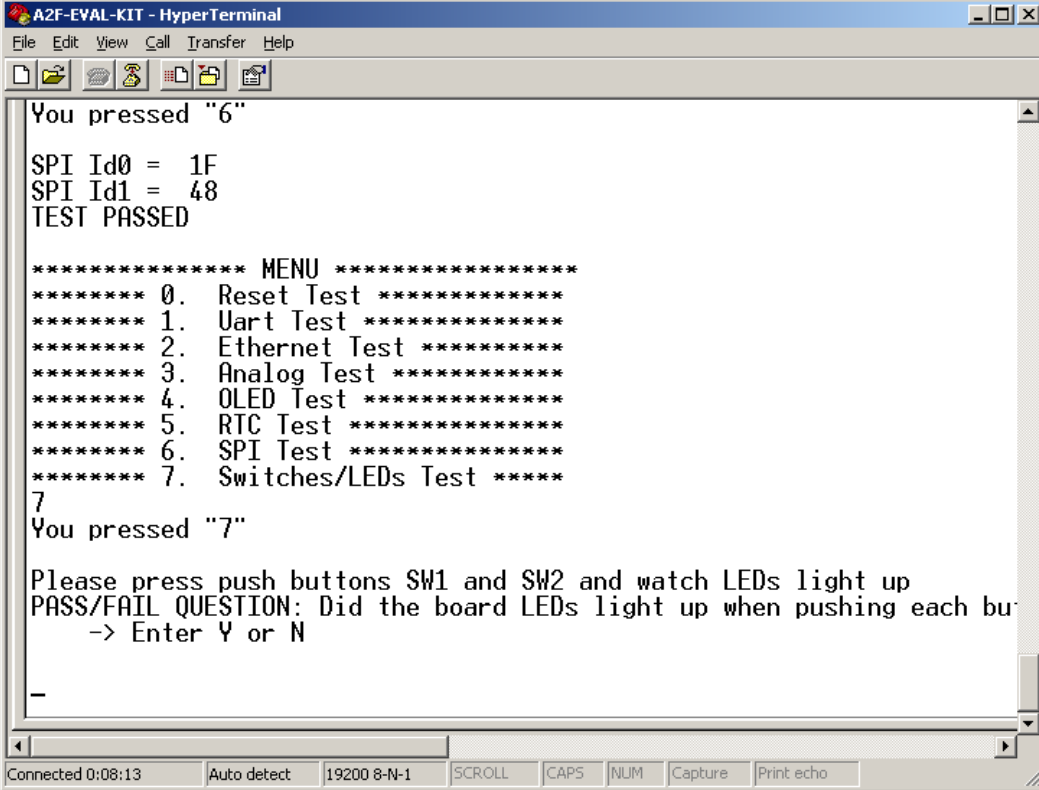


```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
6
You pressed "6"
SPI Id0 = 1F
SPI Id1 = 48
TEST PASSED
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
-
Connected 0:07:42 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-26 • SPI Test

## Switch/LED Test

1. Enter 7 into the terminal to begin the LEDs test. The screen shown in Figure 6-27 will appear.



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
You pressed "6"
SPI Id0 = 1F
SPI Id1 = 48
TEST PASSED

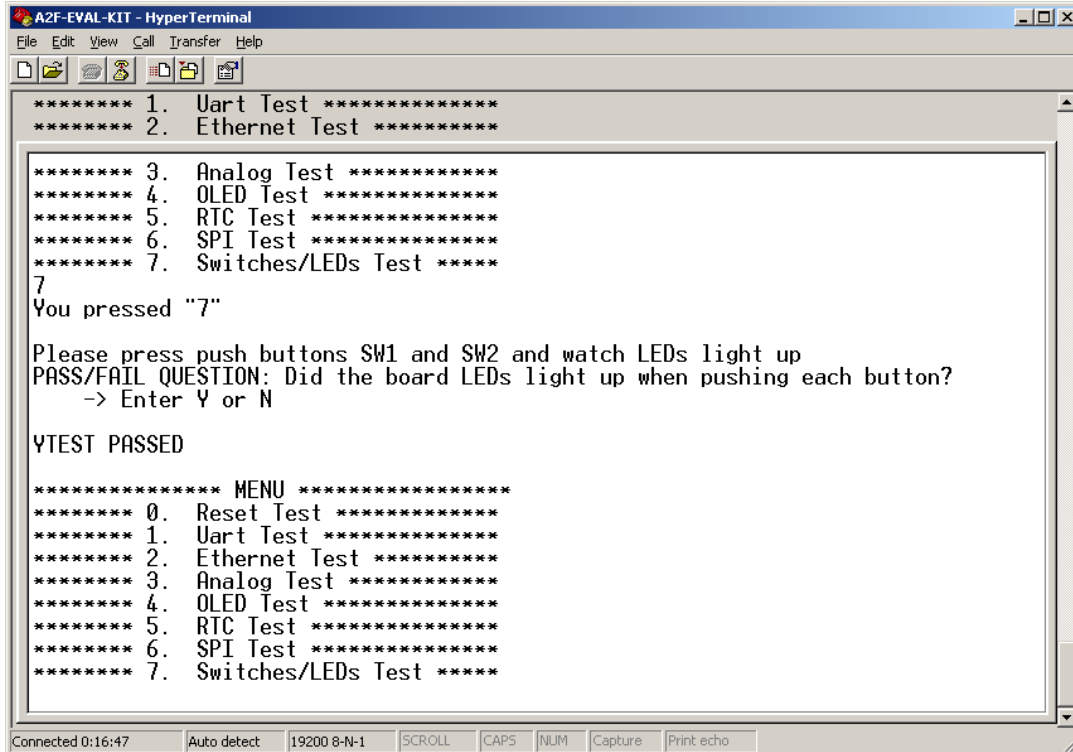
***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
7
You pressed "7"

Please press push buttons SW1 and SW2 and watch LEDs light up
PASS/FAIL QUESTION: Did the board LEDs light up when pushing each bu
-> Enter Y or N

-
Connected 0:08:13 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-27 • LED Test

- Press **SW2** and LEDs D1, D2, D3, D4, D5, D6, D7, and D8 must light up. When this has occurred, press **Y** (Figure 6-28).



```
A2F-EVAL-KIT - HyperTerminal
File Edit View Call Transfer Help
***** 1. Uart Test *****
***** 2. Ethernet Test *****

***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****
7
You pressed "7"

Please press push buttons SW1 and SW2 and watch LEDs light up
PASS/FAIL QUESTION: Did the board LEDs light up when pushing each button?
-> Enter Y or N

YTEST PASSED

***** MENU *****
***** 0. Reset Test *****
***** 1. Uart Test *****
***** 2. Ethernet Test *****
***** 3. Analog Test *****
***** 4. OLED Test *****
***** 5. RTC Test *****
***** 6. SPI Test *****
***** 7. Switches/LEDs Test *****

Connected 0:16:47 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 6-28 • Switch Test

## A2F-EVAL-KIT Board Failures

All Tests outlined in "Running the A2F-EVAL-KIT Board Test" on page 6-55 should result in the words TEST PASSED being printed on the terminal. If this does not happen, or the words TEST FAILED are printed, the test has failed.

If the A2F-EVAL-KIT board fails any of the tests outlined in "Running the A2F-EVAL-KIT Board Test" on page 6-55, the board being tested is not functional. Put this nonfunctional board in an area separate from the boards which have passed testing and those which are yet to be tested. Keep these nonfunctional A2F-EVAL-KIT boards for further investigation.





## A – List of Changes

---

The following table lists critical changes that were made in the current version of the chapter.

Previous Version	Changes in Current Version* (50200209-0)	Page
50200209-0/2.10	The "Mixed-Signal Header" section was added.	3-26

*Note: \*The part number is located on the last page of the document. The digits following the slash indicate the month and year of publication.*



## B – Product Support

---

Actel backs its products with various support services including Customer Service, a Customer Technical Support Center, a web site, an FTP site, electronic mail, and worldwide sales offices. This appendix contains information about contacting Actel and using these support services.

### Customer Service

Contact Customer Service for non-technical product support, such as product pricing, product upgrades, update information, order status, and authorization.

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From Southeast and Southwest U.S.A., call **650.318.4480**

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From Northwest U.S.A., call **650.318.4434**

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From the rest of the world, call **650.318.4743**

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Actel staffs its Customer Technical Support Center with highly skilled engineers who can help answer your hardware, software, and design questions. The Customer Technical Support Center spends a great deal of time creating application notes and answers to FAQs. So, before you contact us, please visit our online resources. It is very likely we have already answered your questions.

### Actel Technical Support

Visit the Actel Customer Support website ([www.actel.com/support/search/default.aspx](http://www.actel.com/support/search/default.aspx)) for more information and support. Many answers available on the searchable web resource include diagrams, illustrations, and links to other resources on the Actel web site.

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#### Email

You can communicate your technical questions to our email address and receive answers back by email, fax, or phone. Also, if you have design problems, you can email your design files to receive assistance. We constantly monitor the email account throughout the day. When sending your request to us, please be sure to include your full name, company name, and your contact information for efficient processing of your request.

The technical support email address is [tech@actel.com](mailto:tech@actel.com).

## Phone

Our Technical Support Center answers all calls. The center retrieves information, such as your name, company name, phone number and your question, and then issues a case number. The Center then forwards the information to a queue where the first available application engineer receives the data and returns your call. The phone hours are from 7:00 a.m. to 6:00 p.m., Pacific Time, Monday through Friday. The Technical Support numbers are:

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800.262.1060

Customers needing assistance outside the US time zones can either contact technical support via email ([tech@actel.com](mailto:tech@actel.com)) or contact a local sales office. Sales office listings can be found at [www.actel.com/company/contact/default.aspx](http://www.actel.com/company/contact/default.aspx).

# Index

---

## A

A2F200  
  features 12  
  I/Os 13  
A2F-DEV-KIT  
  board diagram 5  
A2F-EVAL-KIT board  
  components 6  
  description 5  
Actel  
  electronic mail 75  
  telephone 76  
  web-based technical support 75  
  website 75

## B

block diagram  
  SmartFusion MSS 13  
board stackup 43, 73

## C

contacting Actel  
  customer service 75  
  electronic mail 75  
  telephone 76  
  web-based technical support 75  
Cortex-M3 14  
current sensing 16  
customer service 75

## E

Ethernet interface 22

## F

FPGA description 11

## J

J22 header strip 8  
jumper settings 7

## K

kit contents 5

## L

LEDs 8, 18  
low-cost programmer 25

## M

manufacturing test 45  
mixed-signal header 26

## O

OLED 19  
oscillators 21

## P

pin list 31  
pinout definition 28  
power sources 14  
product support 76  
  customer service 75  
  electronic mail 75  
  technical support 75  
  telephone 76  
  website 75  
push-button reset 17  
push-button switches 8, 17  
PWM circuit 16

## R

RealView header 24  
RMI clk 22

## S

software installation 7  
SPI flash 20

## T

technical support 75  
temperature diode 26  
test  
  manufacturing 45  
test points 8

## U

USB-to-UART 21  
user I/O settings 8  
user I/Os 18

## V

VAREF connections 15  
VAREF monitoring 9

## W

web-based technical support 75

---



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