EVAL-SDP-CK1Z User Guide

UG-1539

One Technology Way • P.O. Box 9106 • Norwood, MA 02062-9106, U.S.A. • Tel: 781.329.4700 • Fax: 781.461.3113 • www.analog.com

SDP-K1 Controller Board

FEATURES

STM32F469NIH6 Cortex-M4 microcontroller
- **Core performance up to 180 MHz**
- **384 kB of internal random access memory (RAM)**
- **2 MB flash memory**
- **16 MB synchronous dynamic ram (SDRAM)**
  - **Micron MT48LC4M32B2B5-6A XIT:L**

Arduino Uno headers
120-pin small foot print connector
- **Hirose FX8-120P-SV1**

STM32F469NIH6 processor peripherals exposed: SPI, QSPI, I²C, GPIO, timers, UART
Supported in the Arm Mbed compiler

ONLINE RESOURCES

Design and Integration Files
Schematics, layout files, bill of materials

GENERAL DESCRIPTION

This user guide describes the EVAL-SDP-CK1Z (SDP-K1) controller board from Analog Devices, Inc., and provides instructions on the setup of the SDP-K1 board to begin USB communication to a PC.

The SDP-K1 controller board is a part of the evaluation system for many Analog Devices components and reference circuits. The SDP-K1 is a part of the system demonstration platform (SDP), which consists of a series of controller boards, interposer boards, and daughter boards. SDP controller boards provide a means of communicating with the PC from the system under evaluation. Interposer boards route signals between two connectors. Daughter boards are a collection of product evaluation boards and Circuits from the Lab® (CFTL) reference circuit boards.

The SDP-K1 provides USB connectivity through a USB 2.0 high speed connection to the computer, allowing users to evaluate components on this platform from a PC application. The SDP-K1 is based on an STM32F469NIH6 Arm® Cortex®-M4 microcontroller with the peripheral communication lines available to the daughter board through a 120-pin small footprint connector and Arduino® Uno-compatible headers.

The SDP-K1 user guide provides instructions for installing the SDP-K1 hardware and software to a PC. The necessary installation files are provided with the evaluation daughter board package. The Getting Started section provides software and hardware installation procedures, PC system requirements, and basic board information. The Hardware section provides information on the SDP-K1 components.

SDP-K1 CONTROLLER BOARD PHOTOGRAPH

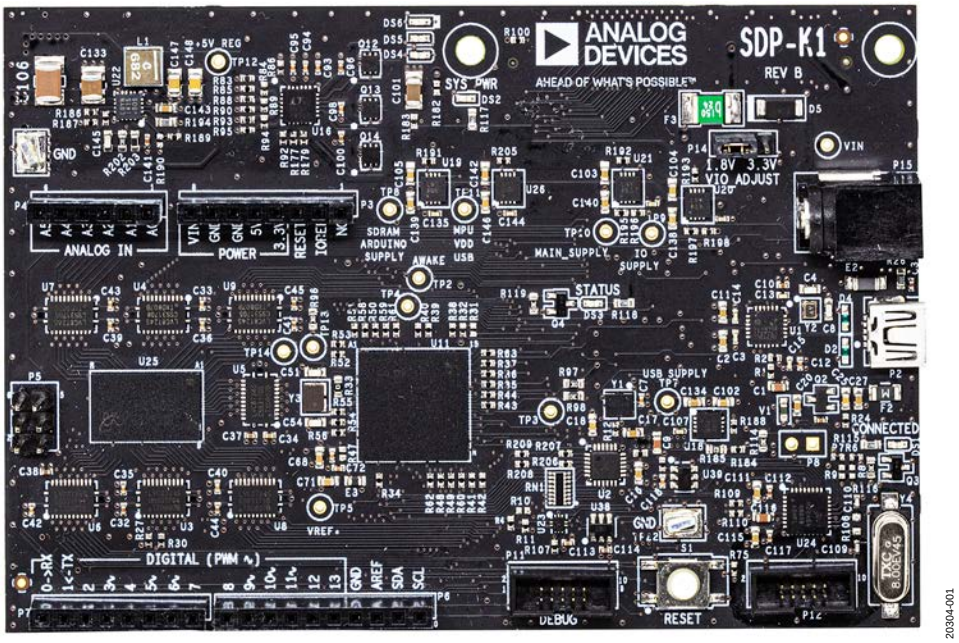

Figure 1.

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REVISION HISTORY

8/2019—Revision 0: Initial Version

PRODUCT OVERVIEW

TECHNICAL OR CUSTOMER SUPPORT

For technical or customer support, visit the SDP website or contact a local Analog Devices sales office.

PRODUCT INFORMATION

Product information can be obtained from www.analog.com.

Analog Devices Website

The Analog Devices website, www.analog.com, provides information about a broad range of products: analog integrated circuits, amplifiers, converters, and digital signal processors.

Note that My.Analog.com is a free feature of the Analog Devices website that allows customization of a web page to display only the latest information about products of interest to the user. The user can choose to receive weekly email notifications containing updates to the web pages that meet interests, including documentation errata against all documents. My.Analog.com provides access to resources like books, application notes, data sheets, and code examples.

Visit My.Analog.com to sign up. If a registered user, log on. The user name is the email address of the user.

WARNING

The EVAL-SDP-CK1Z is designed to be used solely in a laboratory environment. The board is not intended for use as a consumer end product or as a portion of a consumer end product. The board is an open system design, which does not include a shielded enclosure and therefore may cause interference to other electrical devices in close proximity. This board should not be used in or near any medical equipment or RF devices. Store unused boards in the protective shipping package.

GETTING STARTED

This section provides specific information to assist the user with using the SDP-K1 board as part of the evaluation system of the user.

PACKAGE CONTENTS

The SDP-K1 board package contains the following:

- SDP-K1 board
- 2 m, USB standard-A to mini-B cable

PC CONFIGURATION

For proper operation of the SDP-K1 board, the PC must have the following minimum configuration:

- Windows® Vista 32-bit/64-bit, Windows 7 32-bit/64-bit, Windows 8 32-bit/64-bit, or Windows 10 32-bit/64-bit
- USB 2.0 port

When removing the SDP-K1 board from the package, handle the board carefully to avoid the discharge of static electricity, which can damage some components.

USB DRIVER INSTALLATION

Prior to connecting an SDP-K1 to a PC, the daughter board evaluation software must be installed. Installation of this software ensures that all the required support files, the .NET Framework version, and USB drivers are installed.

Verifying Driver Installation

Before using the SDP-K1 board, verify that the driver software has installed properly.

Attach the SDP-K1 board to a USB 2.0 port on the computer via the standard-A to mini-B cable provided. Open the **Windows Device Manager** and verify that the SDP-K1 appears under **ADI Development Tools**, as shown in Figure 2.

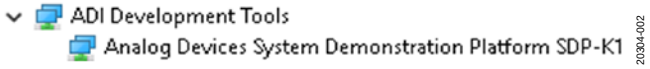

Figure 2. SDP-K1 in Device Manager

POWERING UP/POWERING DOWN THE SDP-K1

The following sections describe how to safely power up and power down the SDP-K1.

Powering Up the SDP-K1 Board

Perform the following steps when powering up the SDP-K1 board and attached daughter boards. Failure to do so can result in damage.

1. Consult the daughter board documentation to determine the input/output voltage requirements and the proper configuration of the VIO_ADJUST header. Ensure that the VIO_ADJUST header is configured properly before power is applied to the system, otherwise, damage can be caused to the SDP-K1 and the daughter board.
2. Connect the daughter board to the SDP-K1 board through either the 120-pin mating connector or the Arduino headers (whichever is applicable).
3. Power-up the daughter board if this is an option (see daughter board documentation for further details).
4. Connect the USB port on the computer to the SDP-K1 board.

Powering Down the SDP-K1 Board

Perform the following steps when powering down the SDP-K1 board and attached daughter boards. Failure to do so can result in damage.

1. Disconnect any daughter board power supplies.
2. Disconnect the USB port on the computer from the SDP-K1 board.
3. Disconnect the daughter board from the SDP-K1 board.

HARDWARE INFORMATION

This section describes the hardware design of the SDP-K1 board.

LEDs

There are six LEDs located on the SDP-K1 board (see Figure 3).

CONNECTED LED (DS1)

This green LED indicates that the Arm® Mbed™ DAPLink is active. This LED blinks off and on during DAPLink activity.

SYS_PWR LED (DS2)

This green LED indicates that the system is powered. This is not an indication of USB connectivity between the SDP-K1 and the PC.

STATUS LED (DS3)

The orange status LED is connected to the STM32F469NIH6 and is used as a diagnostic tool for evaluation application developers. When there are two or more identical SDP controller board and daughter board combinations connected to the PC simultaneously, the status LED flashes during the connect routine to help the user identify which board they are communicating with.

Red, Orange, and Green LEDs (DS4, DS5, and DS6)

These red (DS4), orange (DS5), and green (DS6) LEDs are connected to the STM32F469NIH6 and can be used by the processor for whatever purpose required.

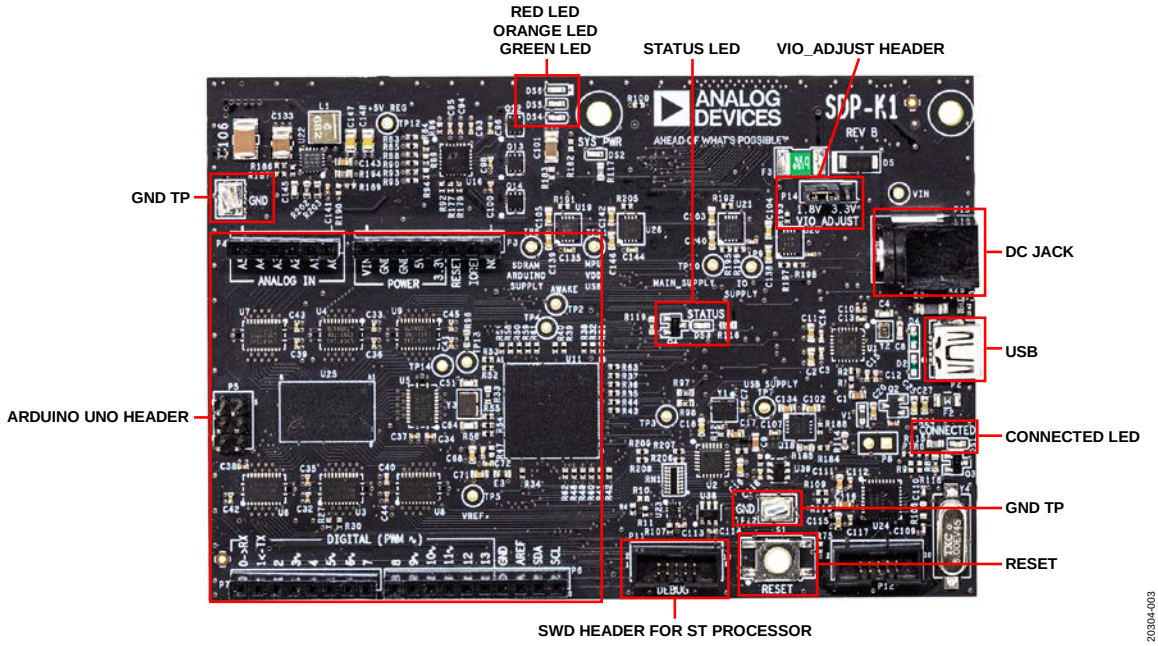

Figure 3. Top Side of SDP-K1 Board

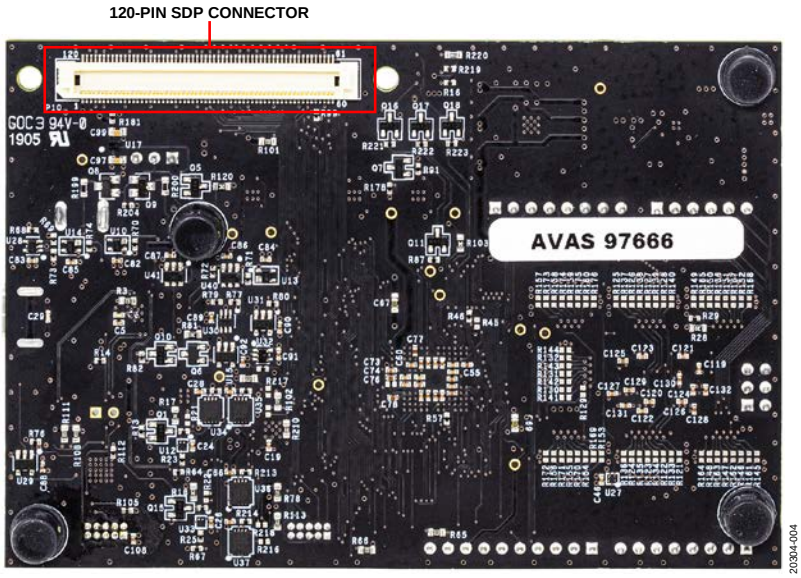

Figure 4. Bottom Side of SDP-K1 Board

DC JACK

A dc power supply can be connected to this jack to supply extra power to the SDP-K1 and attached daughter boards. This power supply must be in the range of 7 V to 12 V and must be capable of supplying a maximum of 3.5 A of current. The jack is center positive. See the Power section for more details.

VIO_ADJUST HEADER

This header is used to set the input/output voltage of the board to either 1.8 V or 3.3 V.

Ensure that this header is configured correctly before power is applied to the system. Otherwise, damage can be caused to the SDP-K1 and the daughter board. Information about the input/output voltage requirements and the proper configuration of the VIO_ADJUST header can be found in the daughter board documentation.

The input/output voltage defaults to 1.8 V when the jumper is not in place. This voltage applies to all input/output pins on the SDP connector and Arduino headers simultaneously.

SWD DEBUG HEADER

An ST ST-LINK/V2 in-circuit debugger and programmer, and Olimex ARM-JTAG-20-10 adapter can be used to debug code running on the STM32F469NIH6 through this header. This header is wired for SWD debugging. Alternatively, the STM32F469NIH6 can be debugged using the CMSIS-DAP debug interface provided by the DAPLink, and accessible via the USB connector.

120-PIN SDP CONNECTOR DETAILS

The SDP-K1 board has a 120-pin SDP connector and Arduino Uno headers.

This section describes the SDP connector. The Arduino headers are described in the Arduino Header Details section.

The peripherals exposed on the 120-pin SDP connector (a Hirose FX8-120P-SV1 120-pin header connector) are the following:

- Serial peripheral interface (SPI)
- Quad-SPI (QSPI)
- I^2C
- General-purpose input/output (GPIO)
- Timers
- Universal asynchronous receiver transmitter (UART)

In addition, included on the connector are input and output power pins, ground pins, and pins reserved for future use. For further details on the peripheral interfaces, including timing diagrams, see the STM32F469NIH6 processor data sheet and the STM32F469NIH6 processor reference manual.

Connector Pin Assignments

The connector pin assignments for the SDP connector have been defined independently of any internal pin sharing that occurs on the STM32F469NIH6 processor. This pin assignment is identical to that found on the SDP-B (EVAL-SDP-CB1Z), the SDP-S (EVAL-SDP-CS1Z), and the SDP-H1 (EVAL-SDP-CH1Z) boards, although not all pins are connected. Table 1 lists the connector pins and identifies the functionality assigned to each connector pin. Each interface provided by the SDP-K1 is available on unique pins of the SDP-K1 120-pin connector. The connector pin numbering scheme is outlined in Figure 5.

Table 1. 120-Pin SDP Connector Pin Assignments

Pin No.	Pin Name	Description
1	VIN	Power to SDP-K1 Board. Requires 300 mA at 5 V. See the Power section for more information.
2	NC	No Connect. Leave this pin unconnected. Do not ground.
3	GND	Connected to ground plane of board.
4	GND	Connected to ground plane of board.
5	USB_VBUS	Connected directly to the USB 5 V supply. See the Power section for more information.
6	GND	Connected to ground plane of board.
7	PAR_D23	Parallel Data Bus Bit 23 (No Connect[1]).
8	PAR_D21	Parallel Data Bus Bit 21 (No Connect[1]).
9	PAR_D19	Parallel Data Bus Bit 19 (No Connect[1]).
10	PAR_D17	Parallel Data Bus Bit 17 (No Connect[1]).
11	GND	Connected to ground plane of board.
12	PAR_D14	Parallel Data Bus Bit 14 (No Connect[1]).
13	PAR_D13	Parallel Data Bus Bit 13 (No Connect[1]).
14	PAR_D11	Parallel Data Bus Bit 11 (No Connect[1]).
15	PAR_D9	Parallel Data Bus Bit 9 (No Connect[1]).
16	PAR_D7	Parallel Data Bus Bit 7 (No Connect[1]).
17	GND	Connected to ground plane of board.
18	PAR_D5	Parallel Data Bus Bit 5 (No Connect[1]).
19	PAR_D3	Parallel Data Bus Bit 3 (No Connect[1]).
20	PAR_D1	Parallel Data Bus Bit 1 (No Connect[1]).
21	PAR_RD_N	Active Low Asynchronous Parallel Read Strobe (No Connect[1]).

Pin No.	Pin Name	Description
22	PAR_CS_N	Active Low Asynchronous Parallel Chip Select (No Connect[1]).
23	GND	Connected to ground plane of board.
24	PAR_A3	Parallel Address Bus Bit 3 (No Connect[1]).
25	PAR_A1	Parallel Address Bus Bit 1 (No Connect[1]).
26	PAR_FS3	Synchronous Parallel Peripheral Interface (PPI) Parallel Frame Sync 3 (No Connect[1]).
27	PAR_FS1	Synchronous PPI Parallel Frame Sync 1 (No Connect[1]).
28	GND	Connected to ground plane of board.
29	SPORT_TDV0	SPORT 0 Transmit Data Valid (No Connect[1]).
30	SPORT_TDV1	SPORT 1 Transmit Data Valid (No Connect[1]).
31	SPORT_DR1	SPORT Data Receive 1. Secondary SPORT data into processor (no connect[1]).
32	SPORT_DT1	SPORT Data Transmit 1. Secondary SPORT data from processor (no connect[1]).
33	SPI_D2	Quad SPI Data 2.
34	SPI_D3	Quad SPI Data 3.
35	SERIAL_INT	Serial Interrupt. Used to trigger a nonperiodic SPI or SPORT event.
36	GND	Connected to ground plane of board.
37	SPI_SEL_B_N	Active Low SPI Chip Select B. Use this to control a second device on the SPI bus.
38	SPI_SEL_C_N	Active Low SPI Chip Select C. Use this to control a third device on the SPI bus.
39	SPI_SEL1/SPI_SS_N	Active Low SPI Chip Select 1 or Active Low SPI Slave Select. Used to connect to SPI boot flash if required (this function is not available on the SDP-K1) or used as chip select when STM32F469NIH6 processor is operating as an SPI slave.
40	GND	Connected to ground plane of board.
41	SDA_1	I^2C Data 1 (No Connect[1]).
42	SCL_1	I^2C Data 1 (No Connect[1]).
43	GPIO0	General-Purpose Input/Output 0.
44	GPIO2	General-Purpose Input/Output 1.
45	GPIO4	General-Purpose Input/Output 2.
46	GND	Connected to ground plane of board.
47	GPIO6	General-Purpose Input/Output 3.
48	TMR_A	Timer A Flag Pin. Use as first timer, if required.
49	TMR_C	Timer C Flag Pin (No Connect[1]).
50	NC	No Connect. Leave this pin unconnected. Do not ground.
51	NC	No Connect. Leave this pin unconnected. Do not ground.
52	GND	Connected to ground plane of board.
53	NC	No Connect. Leave this pin unconnected. Do not ground.
54	NC	No Connect. Leave this pin unconnected. Do not ground.
55	NC	No Connect. Leave this pin unconnected. Do not ground.
56	EEPROM_A0	EEPROM A0. Connect to A0 address line of the electronically erasable programmable read-only memory (EEPROM).
57	RESET_OUT_N	Active low reset signal from processor board.
58	GND	Connected to ground plane of board.
59	UART_RX	UART Receive Data.
60	RESET_IN_N	Active low pin to reset controller board.
61	BMODE1	Boot Mode 1. Pull up with 10 kΩ resistor (no connect[1]).
62	UART_TX	UART Transmit Data.
63	GND	Connected to ground plane of board.
64	SLEEP_N	Active low sleep from processor board (no connect[1]).
65	WAKE_N	Active low external wake-up to processor board (no connect[1]).
66	NC	No Connect. Leave this pin unconnected. Do not ground.
67	NC	No Connect. Leave this pin unconnected. Do not ground.
68	NC	No Connect. Leave this pin unconnected. Do not ground.
69	GND	Connected to ground plane of board.
70	NC	No Connect. Leave this pin unconnected. Do not ground.
71	CLKOUT	CLKOUT from Processor (No Connect[1]).
72	TMR_D	Timer D Flag Pin.

Pin No.	Pin Name	Description
73	TMR_B	Timer B Flag Pin.
74	GPIO7	General-Purpose Input/Output 7.
75	GND	Connected to ground plane of board.
76	GPIO5	General-Purpose Input/Output 5.
77	GPIO3	General-Purpose Input/Output 3.
78	GPIO1	General-Purpose Input/Output 1.
79	SCL_0	I^2C Clock 0. Daughter board EEPROM must be connected to this bus.
80	SDA_0	I^2C Data 0. Daughter board EEPROM must be connected to this bus.
81	GND	Connected to ground plane of board.
82	SPI_CLK	SPI Clock.
83	SPI_MISO	SPI Master In, Slave Out Data, or Quad SPI Data 1.
84	SPI_MOSI	SPI Master Out, Slave In Data, or Quad SPI Data 0.
85	SPI_SEL_A_N	SPI Chip Select A. Use this to control the first device on the SPI bus.
86	GND	Connected to ground plane of board.
87	SPORT_TSCLK	SPORT Transmit Clock.
88	SPORT_DT0	SPORT Data Transmit 0. Primary SPORT data from processor.
89	SPORT_TFS	SPORT Transmit Frame Sync.
90	SPORT_RFS	SPORT Receive Frame Sync.
91	SPORT_DR0	SPORT Data Receive 0. Primary SPORT data into processor.
92	SPORT_RSCLK	SPORT Receive Clock.
93	GND	Connected to ground plane of board.
94	PAR_CLK	Clock for Synchronous PPI (No Connect[1]).
95	PAR_FS2	Synchronous PPI Parallel Frame Sync 2 (No Connect[1]).
96	PAR_A0	Parallel Address Bus Bit 0 (No Connect[1]).
97	PAR_A2	Parallel Address Bus Bit 2 (No Connect[1]).
98	GND	Connected to ground plane of board.
99	PAR_INT	Parallel Interrupt. Used to trigger a nonperiodic parallel event (no connect[1]).
100	PAR_WR_N	Asynchronous Parallel Write Strobe (No Connect[1]).
101	PAR_D0	Parallel Data Bus Bit 0 (No Connect[1]).
102	PAR_D2	Parallel Data Bus Bit 2 (No Connect[1]).
103	PAR_D4	Parallel Data Bus Bit 4 (No Connect[1]).
104	GND	Connected to ground plane of board.
105	PAR_D6	Parallel Data Bus Bit 6 (No Connect[1]).
106	PAR_D8	Parallel Data Bus Bit 8 (No Connect[1]).
107	PAR_D10	Parallel Data Bus Bit 10 (No Connect[1]).
108	PAR_D12	Parallel Data Bus Bit 12 (No Connect[1]).
109	GND	Connected to ground plane of board.
110	PAR_D15	Parallel Data Bus Bit 15 (No Connect[1]).
111	PAR_D16	Parallel Data Bus Bit 16 (No Connect[1]).
112	PAR_D18	Parallel Data Bus Bit 18 (No Connect[1]).
113	PAR_D20	Parallel Data Bus Bit 20 (No Connect[1]).
114	PAR_D22	Parallel Data Bus Bit 22 (No Connect[1]).
115	GND	Connected to ground plane of board.
116	VIO	3.3 V or 1.8 V Output. 20 mA maximum current available to power input/output voltage on daughter board. See the Power section for more information.
117	GND	Connected to ground plane of board.
118	GND	Connected to ground plane of board.
119	NC	No Connect. Leave this pin unconnected. Do not ground.
120	NC	No Connect. Leave this pin unconnected. Do not ground.

[1] Functionality not implemented on the SDP-K1 board.

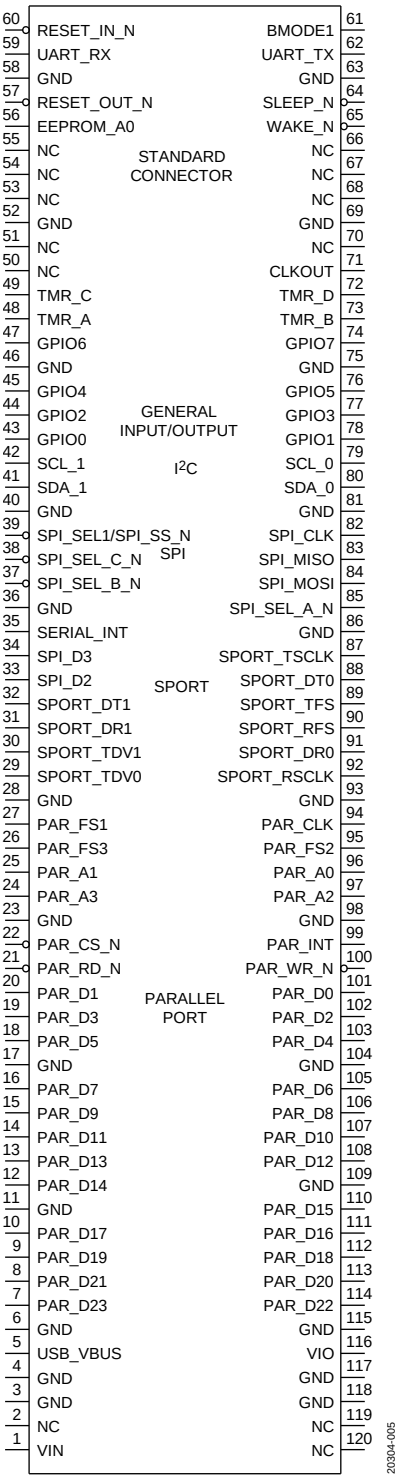

Figure 5. 120-Pin SDP Connector Outline

ARDUINO HEADER DETAILS

This section describes the Arduino Uno header pin assignments. Note that not all third party Arduino daughter boards adhere to this pin definition. Take care if using such boards with the SDP-K1 to ensure damage is not caused to the SDP-K1 and/or the daughter board.

Table 2. Arduino Uno Header Pin Assignments

Pin No.	Pin Name	Description
P3.1	NC	No Connect.
P3.2	IOREF	3.3 V or 1.8 V Output. See the Power section for more information.
P3.3	RESET	System Reset Input/Output.
P3.4	3.3V	Connected directly to the 3.3 V supply. See the Power section for more information.
P3.5	5V	Connected directly to the 5 V supply. See the Power section for more information.
P3.6	GND	Ground.
P3.7	GND	Ground.
P3.8	VIN	Power to SDP-K1 Board. See the Power section for more information.
P4.1	A0	STM32F469NIH6ADC Input. Can also be used for GPIO.
P4.2	A1	STM32F469NIH6 ADC Input. Can also be used for GPIO.
P4.3	A2	STM32F469NIH6 ADC Input. Can also be used for GPIO.
P4.4	A3	STM32F469NIH6 ADC Input. Can also be used for GPIO.
P4.5	A4	STM32F469NIH6 ADC Input. Can also be used for GPIO.
P4.6	A5	STM32F469NIH6 ADC Input. Can also be used for GPIO.
P5.1	12/MISO	GPIO 12 or SPI Master In, Slave Out Data (Connected to P6.5).
P5.2	5V	Connected directly to the 5 V supply. See the Power section for more information.
P5.3	13/SCK	GPIO 13 or SPI SCK (Connected to P6.6).
P5.4	11/PWM5/MOSI	GPIO 11, PWM Output, or SPI Master Out, Slave In (Connected to P6.4).
P5.5	RESET	System Reset Input/Output.
P5.6	GND	Ground.
P7.1	RX + 0	UART Receive Data or GPIO 0.
P7.2	TX + 1	UART Transmit Data or GPIO 1.
P7.3	2	GPIO 2.
P7.4	3/PWM	GPIO 3 or PWM Output.
P7.5	4	GPIO 4.
P7.6	5/PWM	GPIO 5 or PWM Output.
P7.7	6/PWM	GPIO 6 or PWM Output.
P7.8	7	GPIO 7.
P6.1	8	GPIO 8.
P6.2	9/PWM	GPIO 9 or PWM Output.
P6.3	10/PWM/CS	GPIO 10 or PWM Output or SPI Chip Select.
P6.4	11/PWM/MOSI	GPIO 11 or PWM Output or SPI Master Out, Slave In.
P6.5	12/MISO	GPIO 12 or SPI Master In, Slave Out Data.
P6.6	13/SCK	GPIO 13 or SPI SCK.
P6.7	GND	Ground.
P6.8	AREF	ADC Reference Voltage.
P6.9	SDA	I^2C Data. Daughter board EEPROM must be connected to this bus.
P6.10	SCL	I^2C Clock. Daughter board EEPROM must be connected to this bus.

POWER

USB VBUS

The SDP-K1 can be powered using the USB VBUS supply. This PC supplied 5 V (±10%) supply can provide up to 500 mA maximum (in certain instances, the amount of available current can be reduced). The SDP-K1 consumes up to 300 mA, so if no other power source is available, the amount of current available on the output power pins of either the Arduino headers or the 120-pin connector is reduced below the limits stated in the Arduino Headers section and 120-Pin Connector section.

DC Jack

The SDP-K1 can be powered using an external dc power supply. This supply must be fitted with a 5.5 mm outer diameter and be center positive. The supply must output between 7 V and 12 V and supply a minimum of 300 mA. The SDP-K1 consumes up to 300 mA, so if no other power source is made available, the amount of current available on the output power pins of either the Arduino headers or the 120-pin connector is reduced below the limits stated in the Arduino Headers section and 120-Pin Connector section. If more current is available from the external dc power supply, more current is available for consumption by daughter boards connected to the 120-pin connector or the Arduino headers. The maximum amount of current that can be consumed by the SDP-K1 and all connected daughter boards via the dc jack is 3.5 A.

120-Pin Connector

The 120-pin connector is located on the underside of the SDP-K1. The SDP-K1 requires that any daughter board connected to this connector provide a 5 V supply capable of supplying up to 300 mA to ensure reliable operation of the SDP-K1 in the absence of any other reliable power supply. This supply must be made available on Pin 1 (VIN) of the 120-pin connector.

The SDP-K1 board provides 3.3 V or 1.8 V at 20 mA on Pin 116 (VIO) of the 120-pin connector to the connected daughter board as the VIO voltage for the daughter board. The voltage is determined by the state of the VIO_ADJUST header.

Pin 5 (USB_VBUS) is connected to the 5 V VBUS line of the USB connector, providing 5 V ± 10% as an output of the SDP-K1. If the SDP-K1 is powered by the USB, a limited amount of current is available on this pin (200 mA maximum). If the SDP-K1 is powered via the dc jack or the VIN pin on the Arduino headers, the capabilities of these supplies determine how much current is available on Pin 5.

Arduino Headers

The SDP-K1 requires that any daughter board connected to this connector provide a 7 V to 12 V supply capable of supplying up to 300 mA to ensure reliable operation of the SDP-K1 in the absence of any other reliable power supply. This supply must be made available on the VIN pin of the Arduino headers and is required to power the microcontroller, the memory, and the other components on the SDP-K1 board. The VIN pin is bidirectional, meaning that if another source of power is available, then the VIN pin can also be used to supply power to a daughter board. The maximum current that can flow in either direction through the VIN pin is 1.5 A, limited by a positive temperature coefficient (PTC) fuse.

Table 3 provides details of the power supply capabilities of the Arduino header. As previously stated, the current limits in Table 3 can only be reached if the system is supplied by a power supply capable of sourcing the current required by both the attached daughter board and the SDP-K1.

Table 3. Arduino Headers Power Supply Capabilities

Voltage Supply	Pin	Voltage Range	Maximum Current	Tolerance
IOREF	P3.2	3.3 V or 1.8 V	100 mA	±5%
3.3 V	P3.4	3.3 V	50 mA	±5%
5 V	P3.5	5.0 V	650 mA	±5%
VIN	P3.8	7 V to 12 V	1.5 A	±5%

The IOREF voltage is determined by the state of the VIO_ADJUST header. See the VIO_ADJUST Header section for more details.

MECHANICAL SPECIFICATIONS

The mechanical specifications of the SDP-K1 board are 4.33 in. × 2.95 in. (110 mm × 75 mm). The height of the 120-pin connectors from the underside of the board is approximately 0.152 in. (3.86 mm). The height of the Arduino headers from the topside of the board is approximately 0.335 in. (8.50 mm). The tallest component on the top is the dc power input connector at approximately 0.433 in. (11 mm) and the tallest component on the bottom is the SDP connector (the rubber feet on the bottom of the board are 0.311 in. (7.9 mm) tall).

NOTES

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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