DM369 Camera Starter Kit

User's Guide

Literature Number: SPRUIC9
January 2017

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About This Manual

This document is for the DM369 processor module.

Related Documentation

Information regarding the TMS320DM369 can be found at http://www.ti.com.

Board History

PCB Revision	History
PRDN_REVA	Production

Acronyms

The following is a list of acronyms used in this document.

CCS	Code Composer Studio™
DSP	Digital signal processor
EEPROM	Electrically Erasable Programmable Read-Only Memory
I^2C	Inter-integrated circuit
JTAG	Joint test action group
LED	Light emitting diode
MMC	Multimedia card
UART	Universal asynchronous receiver transmitter
USB	Universal serial bus
XDS100	Texas Instruments emulator

Trademarks

Code Composer Studio, DaVinci, WiLink, PowerTune are trademarks of Texas Instruments.
ARM is a registered trademark of ARM Limited.
Bluetooth is a registered trademark of Bluetooth SIG.
Skype is a trademark of Skype.
Wi-Fi is a trademark of Wi-Fi Alliance.

Connecting to DM369 CSK

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1.1 Connecting TMDSCSK369 Module to CSK Carrier Card

The DM369 camera starter kit (CSK) is based on the DaVinci™ digital media processor, a highly integrated, cost-effective, low-power, programmable platform that leverages TI's DaVinci processor technology to meet the processing needs of HD video conferencing: Skype™ endpoints, IP Netcam, digital signage, media players and adapters, mobile medical imaging, network projectors, home audio and video equipment, and similar devices in SD, HD, and 4K × 2K resolutions.

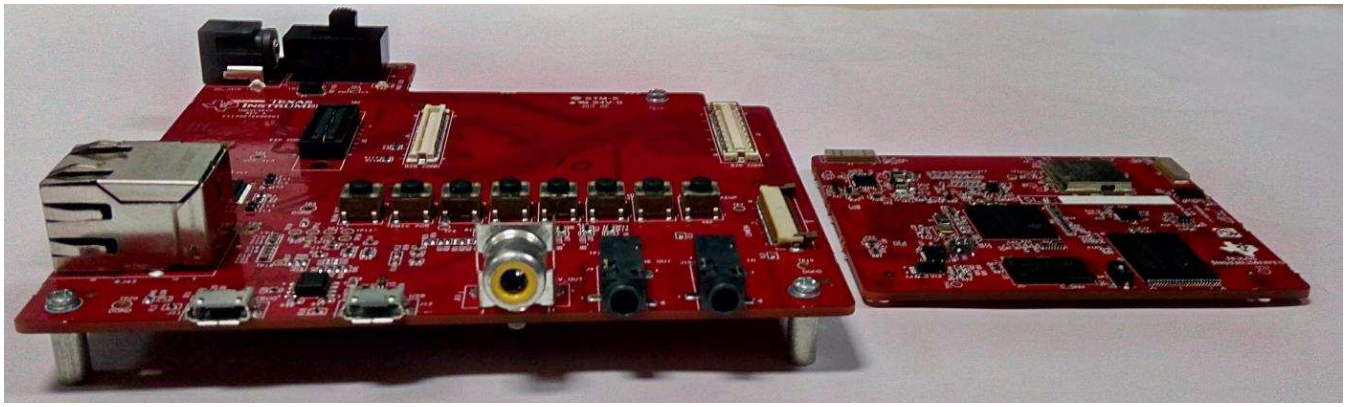
The DM369 CSK is a development platform with a DM369 processor module connected to a CSK carrier card over board-to-board connectors. The features of the DM369 module and CSK carrier card are explained in detail in the following sections of this guide.

DM369 kit contents:

- TMDSCSK369 module
- CSK carrier card
- Camera module LI-CAM-AR0331-324-1.8 with FPC cable

1. Align the CSK carrier card and DM369 module, as shown in Figure 1-1.

Figure 1-1. Align Card



2. Place the DM369 module over the CSK carrier card board-to-board connectors, as shown in Figure 1-2 and Figure 1-3, and press gently.

Figure 1-2. Place Module (1 of 2)

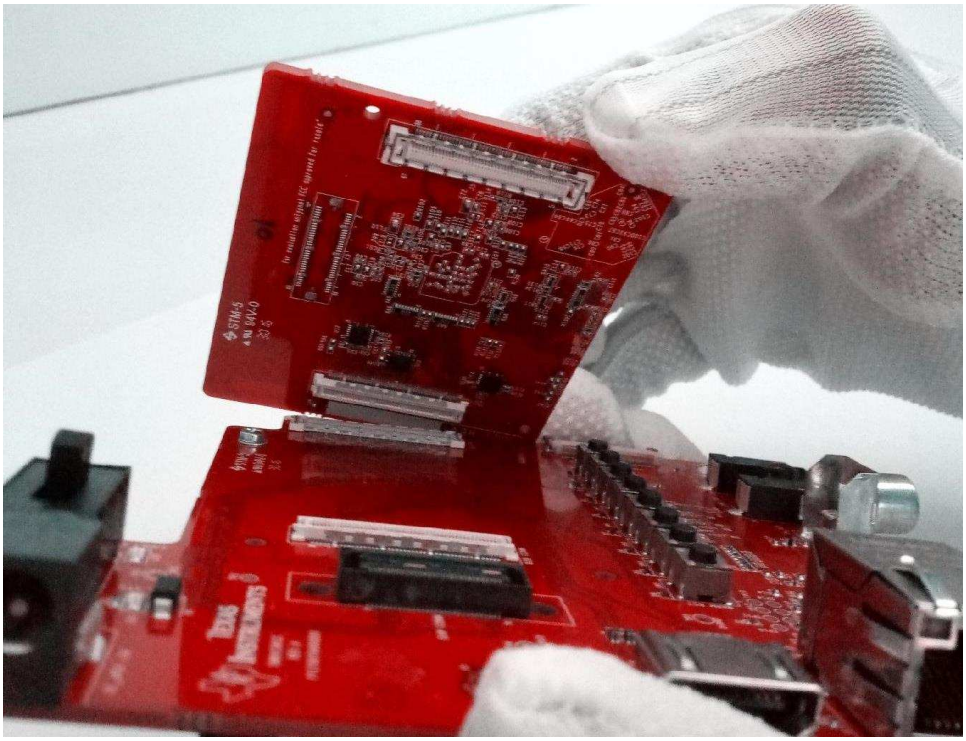
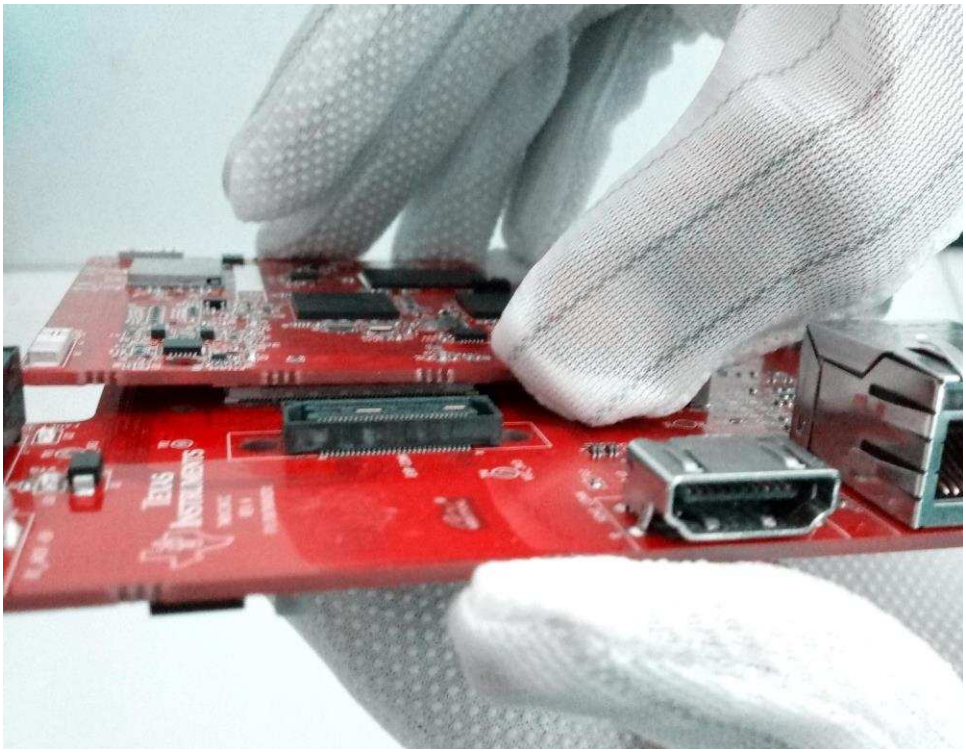


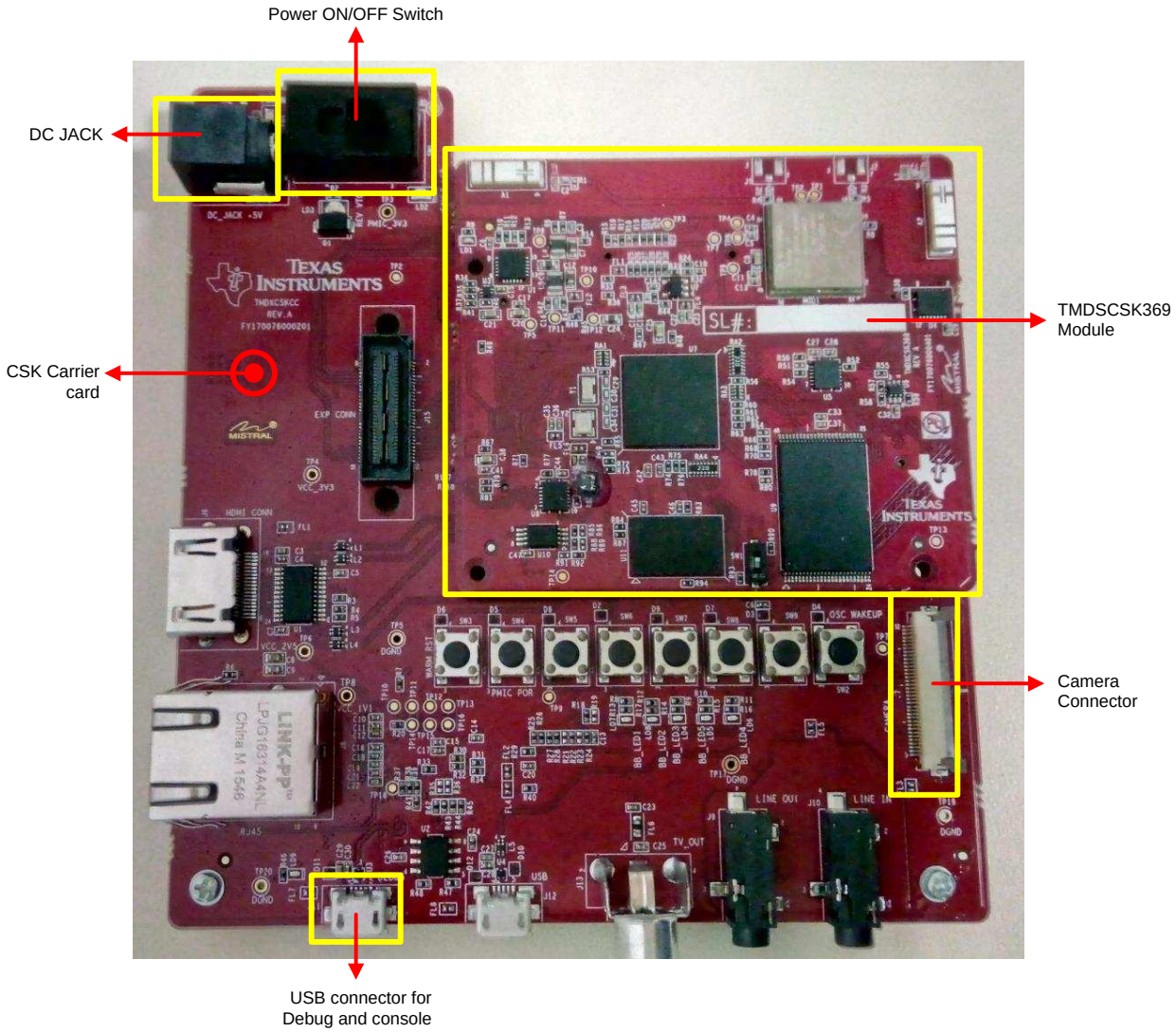
Figure 1-3. Place Module (2 of 2)



1.2 DM369 CSK

Figure 1-4 illustrates the DM369 CSK.

Figure 1-4. 1.2 DM369 CSK



1.3 Connecting the Camera Module to the CSK

1. Lift up the actuator of the camera connector (J7) using a thumb or index finger, as shown in Figure 1-5 and Figure 1-6.

Figure 1-5. Lift Actuator (1 of 2)

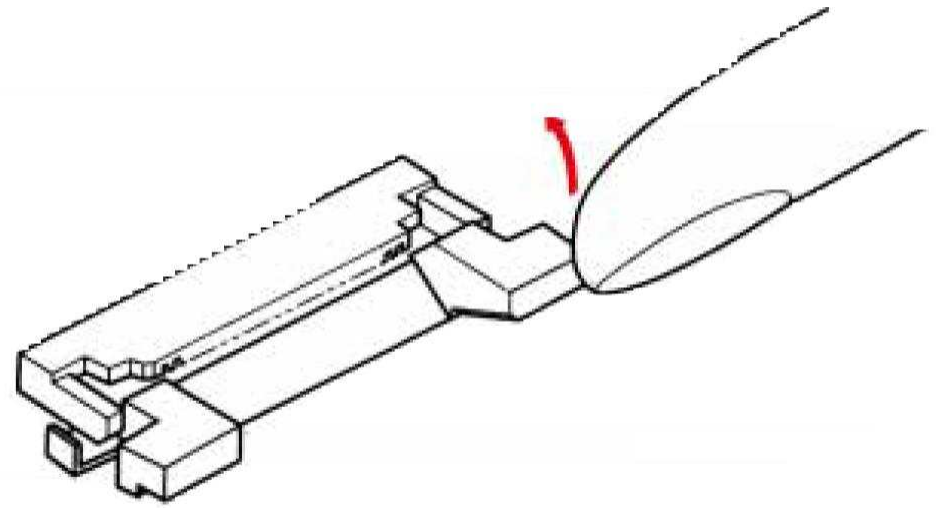
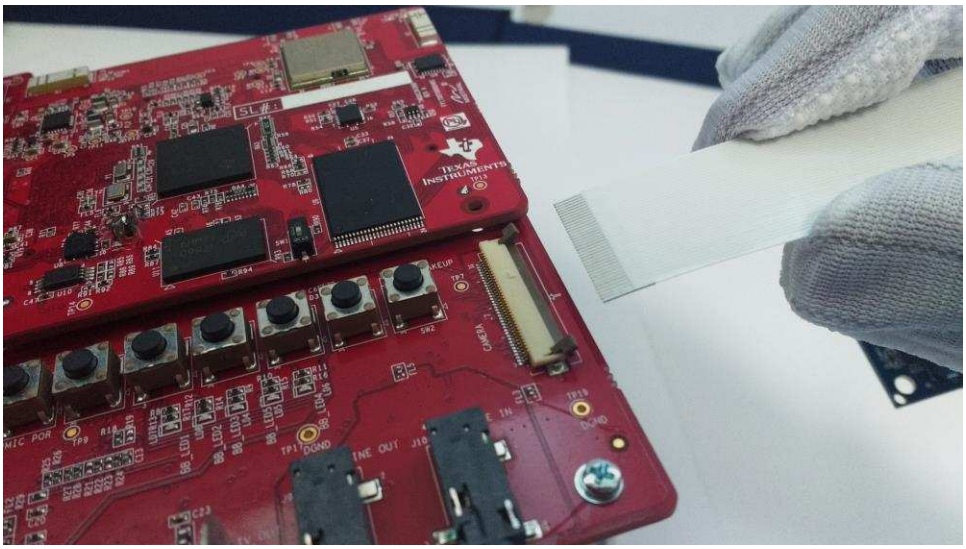


Figure 1-6. Lift Actuator (2 of 2)



2. Fully insert the camera cable parallel to the mounting surface, with the exposed conductive traces facing UP, as shown in Figure 1-7 and Figure 1-8.

Figure 1-7. Insert Camera Cable (1 of 2)

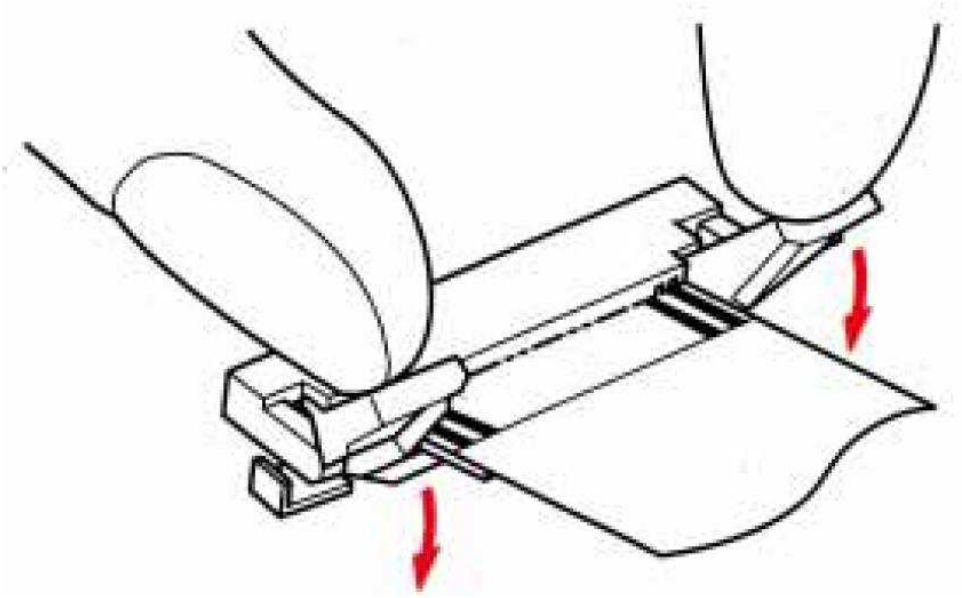
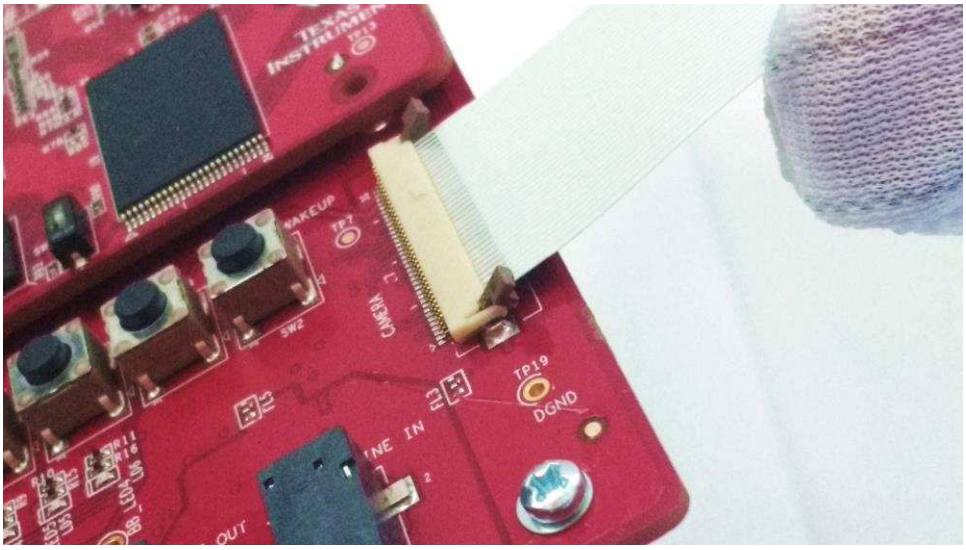


Figure 1-8. Insert Camera Cable (2 of 2)



3. Rotate the actuator down until it is firmly closed, as shown in Figure 1-9 and Figure 1-10.

Figure 1-9. Rotate Actuator Downward (1 of 2)

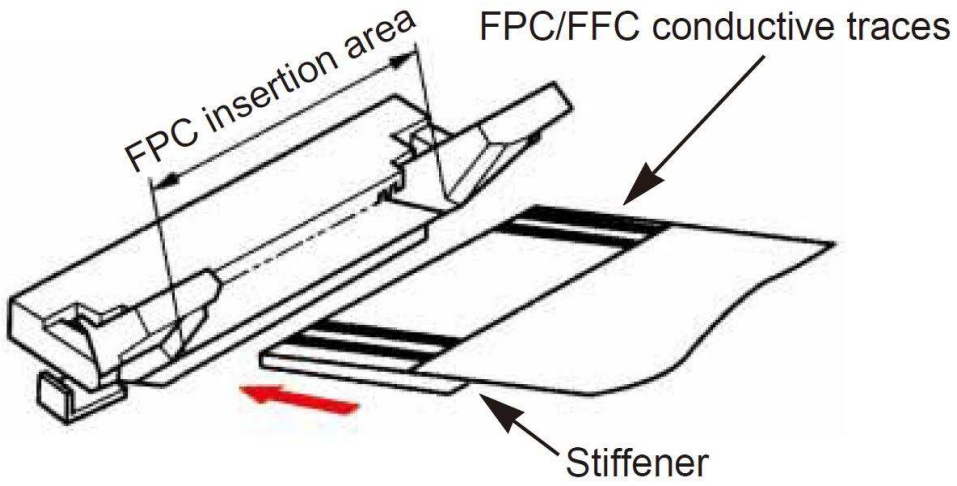
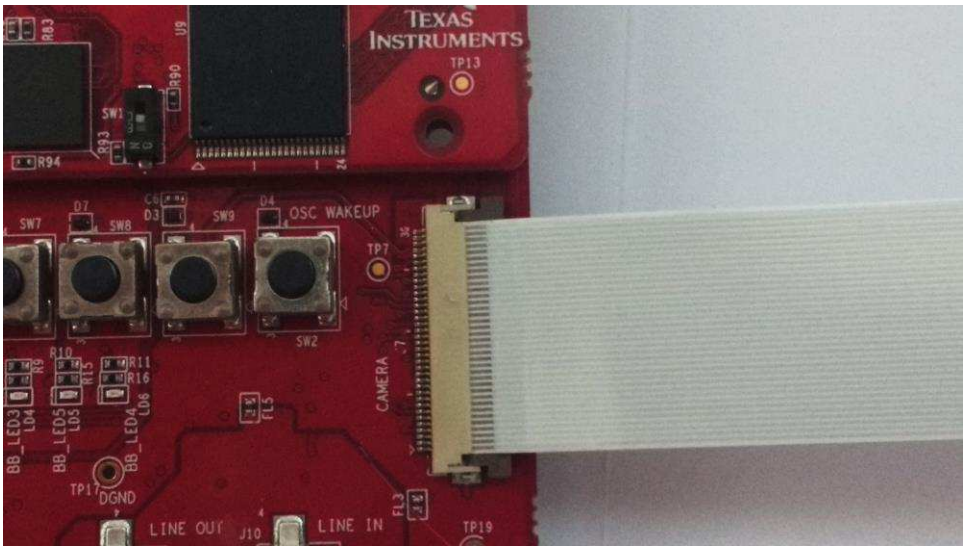


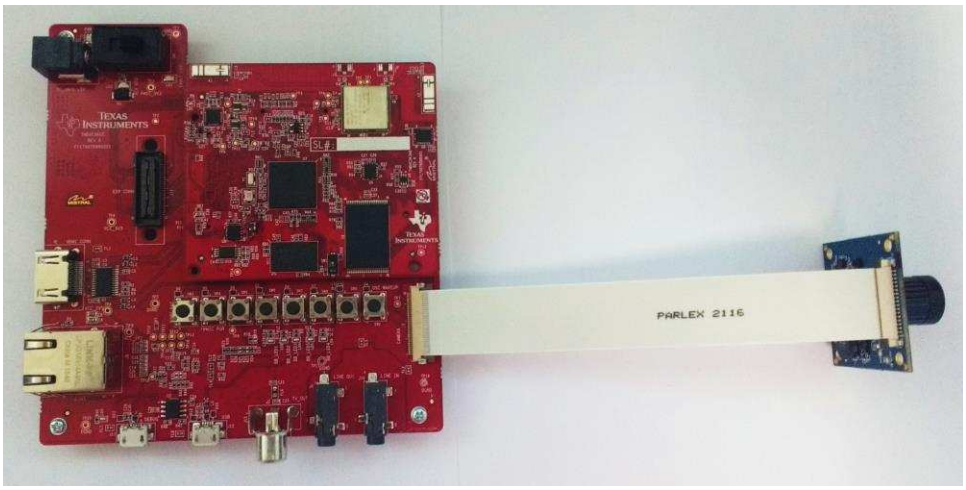
Figure 1-10. Rotate Actuator Downward (2 of 2)



1.4 DM369 CSK With Camera Module Connected

Figure 1-11 shows the DM369 CSK after connecting it to the camera module.

Figure 1-11. DM369 CSK With Camera Module Connected



TMDSCSK369 Module

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2.1 Key Features

The TMDSCSK369 module is a system-on module with a TMS320DM369 processor.

The key features of TMDSCSK369 module are:

- TMS320DM369, DM SoC with ARM® 9 processor
- TI's WiLink™ 8 module, WL1837MOD with Wi-Fi and *Bluetooth*® coexistence Wi-Fi™ dual band, 2.4 GHz and 5 GHz with two single-ended PCB antennas
- 512-MBit NAND flash
- 1-GBit DDR2 SDRAM
- Two board-to-board connectors that connect the carrier card peripherals:
  - Parallel camera
  - MII
  - Micro SD Card
  - USB
  - TVOUT
  - McBSP
  - UART
  - I^2C
  - JTAG
  - GPIO
- One board-to-board termination connector for future expansion, which supports:
  - Component video out
  - ADC
  - Power control
  - GPIO
- Boot mode selection switch
- TI's TPS650532 power management IC for various onboard voltages
- TMDSCSK369 module powered with 3.3 V from the carrier card

TMS320DM369 is a high performance digital media system-on-chip (DMSoC):

- 432-MHz ARM926EJ-S clock rate
- Two video image coprocessor (HDVICP, MJCP) engines
- Supports a range of encode, decode, and video quality operations
- Video processing subsystem
  - HW face detect engine
  - Re-size engine from 1/16× to 8×
  - 16-Bit parallel AFE (Analog Front End) interface up to 120 MHz
  - 4:2:2 (8- and 16-bit) interface
  - 3 DACs for HD analog video output
  - Hardware onscreen display (OSD)
- Capable of 1080p 30fps H.264 video processing
- Peripherals include EMAC, USB2.0 (OTG), DDR2 and NAND, 5 SPIs, 2 UARTs, 2 MMCs, 2 SDs, 2 SDIOs, and key scan
- External memory interfaces (EMIFs)
  - DDR2 and mDDR SDRAM 16-bit wide EMIF with 256-MByte address space (1.8-V I/O)
  - Asynchronous 16-/8-bit wide EMIF (AEMIF)
  - Flash memory interfaces:

- NAND (8- and 16-bit wide data)
- 16MB NOR flash, SRAM
- One NAND (16-bit wide data)

- Software-compatible with DM365 devices
- Four 64-bit general-purpose timers (each configurable as two 32-bit)
- 338-Terminal, 13 × 13 mm, 0.65-mm pitch Pb-free plastic ball-grid array (BGA) (ZCE suffix)

2.2 Functional Block Diagram

The functional block diagram of the TMDSCSK369 module is shown in Figure 2-1.

Figure 2-1. TMDSCSK369 Module – Functional Block Diagram

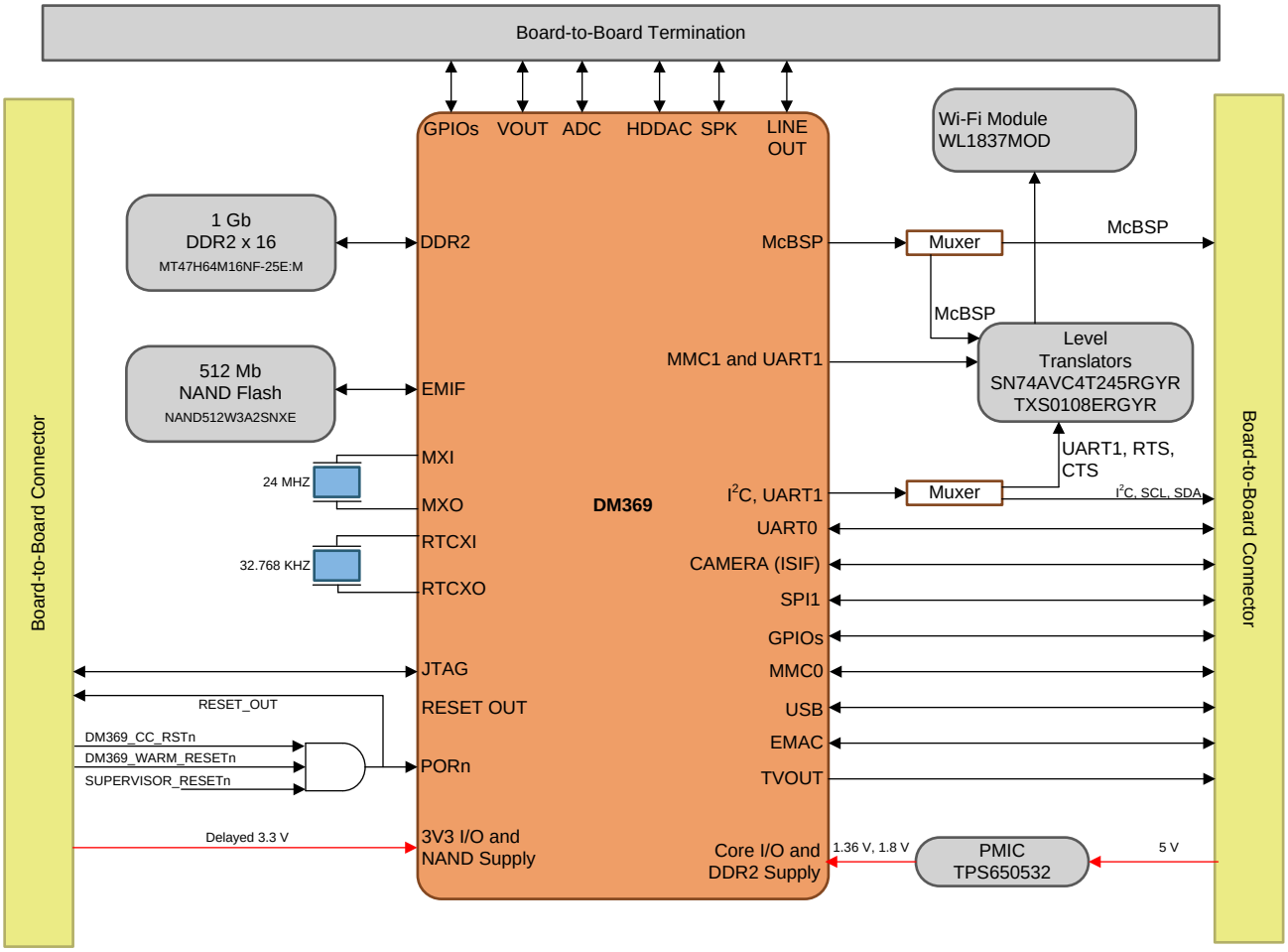


Figure 2-2 and Figure 2-3 show the top and bottom view of the TMDSCK369, respectively.

Figure 2-2. TMDSCSK369 Module (Top)

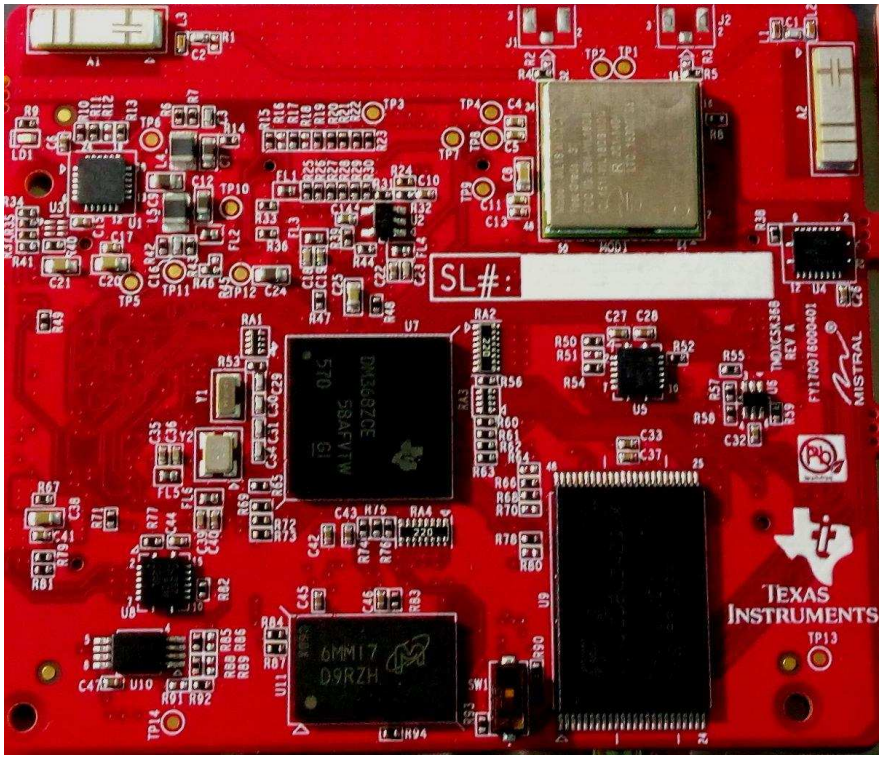
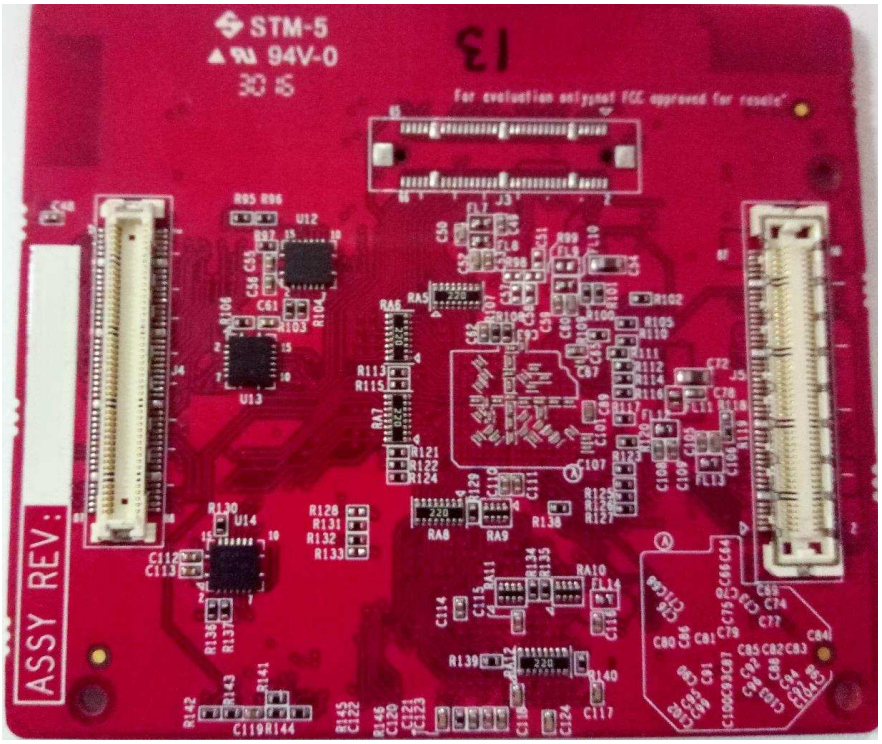


Figure 2-3. TMDSCSK369 Module (Bottom)



2.3 Power Supply

The TMDSCSK369 module is powered by the carrier card through board-to-board connectors. A +5-V and 3.0-A DC external power supply is connected to the DC power jack (J1) in the carrier card. Internally, this +5 V is converted into the required supply voltages by using regulators.

The regulator used in the TMDSCSK369 module is listed in Table 2-1.

Table 2-1. TMDSCSK369 Regulators

Regulator	Purpose
TPS650532RGER (U1)	1V35 generation
	1V8 generation
TLV431ACDBVR (U2)	1V24 generation

The DC-DC buck regulator IC TPS650532RGER (U1) generates various powers to the TMDSCSK369 module:

- Core voltage: VCC_1V35_CORE
- I/O voltage: VCC_1V8_IO
- V_{REF} voltage: HDDAC_VREF

The TPS650532RGER (U1) DC-DC1 is enabled by default to generate 1.35 V when the TMDSCSK369 module is powered by a carrier card. Then, the DC-DC2 on U1 is enabled to generate 1.8 V.

The TLV431ACDBVR (U2) generates 1.24 V by default when the TMDSCSK369 module is powered on through the carrier card.

TMDSCSK369 Module Interface Details

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3.1 Clock Distribution

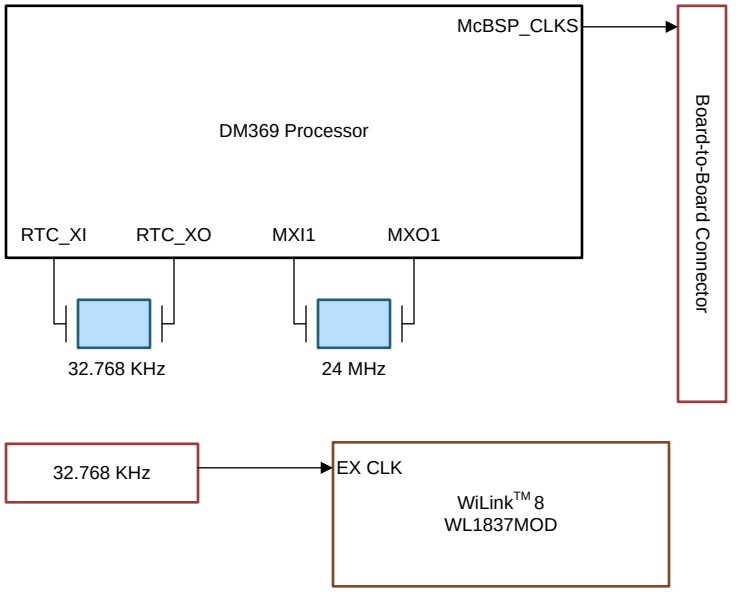
The board clock distribution circuit is shown in Figure 3-1.

The TMDSCSK369 module uses the following clock sources:

- Y1 – 32.768-kHz crystal for the PRTCSS oscillator on the TMDSCSK369
- Y2 – 24-MHz crystal for the system oscillator on the TMDSCSK369

The TMDSCSK369 module provides an external clock for WiLink 8 WL1837MOD Wi-Fi module, through clockout1.

Figure 3-1. Clock Distribution



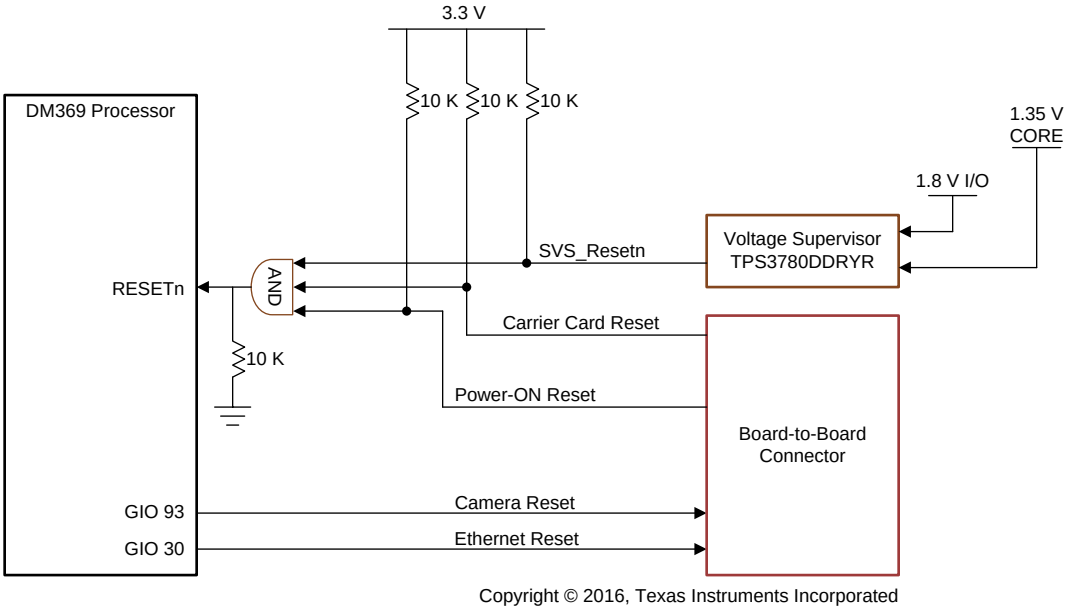
3.2 Reset Circuit and Distribution

The board reset circuit and distribution is as shown in Figure 3-2.

The TMDSCSK369 is reset from the voltage supervisor, which monitors the 1.8-V IO supply, 1.35-V core supply, and from the carrier card. A three-input AND gate is used to implement the reset logic. The processor also is warm reset from the carrier card, through the board-to-board connector.

The parallel camera module connected externally on the carrier card is reset from the TMDSCSK369, through the board-to-board connector.

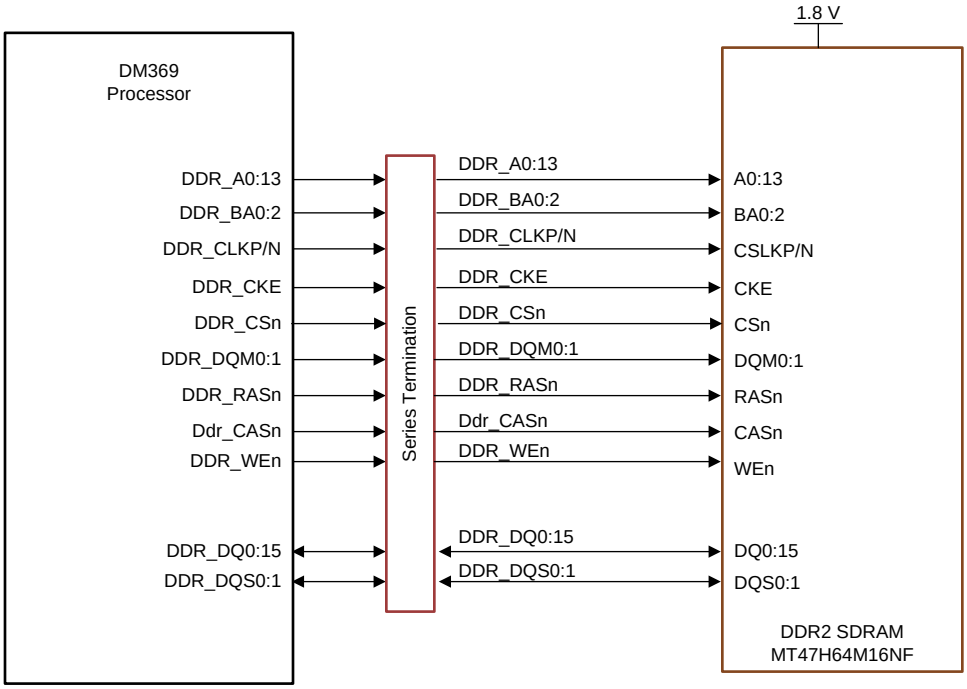
Figure 3-2. Reset Circuit and Distribution



3.3 DDR2 SDRAM Interface

The TMDSCSK369 module supports a 1-Gb DDR2 SDRAM (MT47H64M16NF from Micron Technologies Inc.) that is interfaced to the DM369, shown in Figure 3-3.

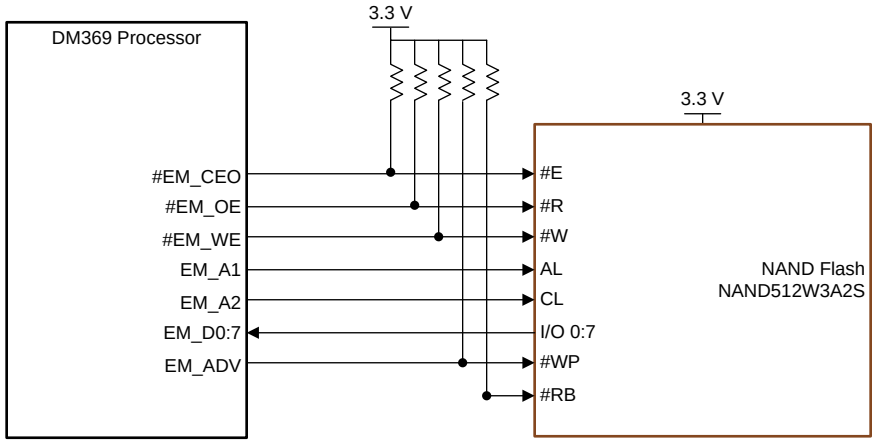
Figure 3-3. DDR2 SDRAM Interface



3.4 NAND Flash Interface

The TMDSCSK369 module supports 512-Mbit NAND flash (NAND512W3A2S from Micron Technologies Inc.), which is interfaced to the DM369, as shown in Figure 3-4. The wait signal is pulled up by default.

Figure 3-4. NAND FLASH Interface



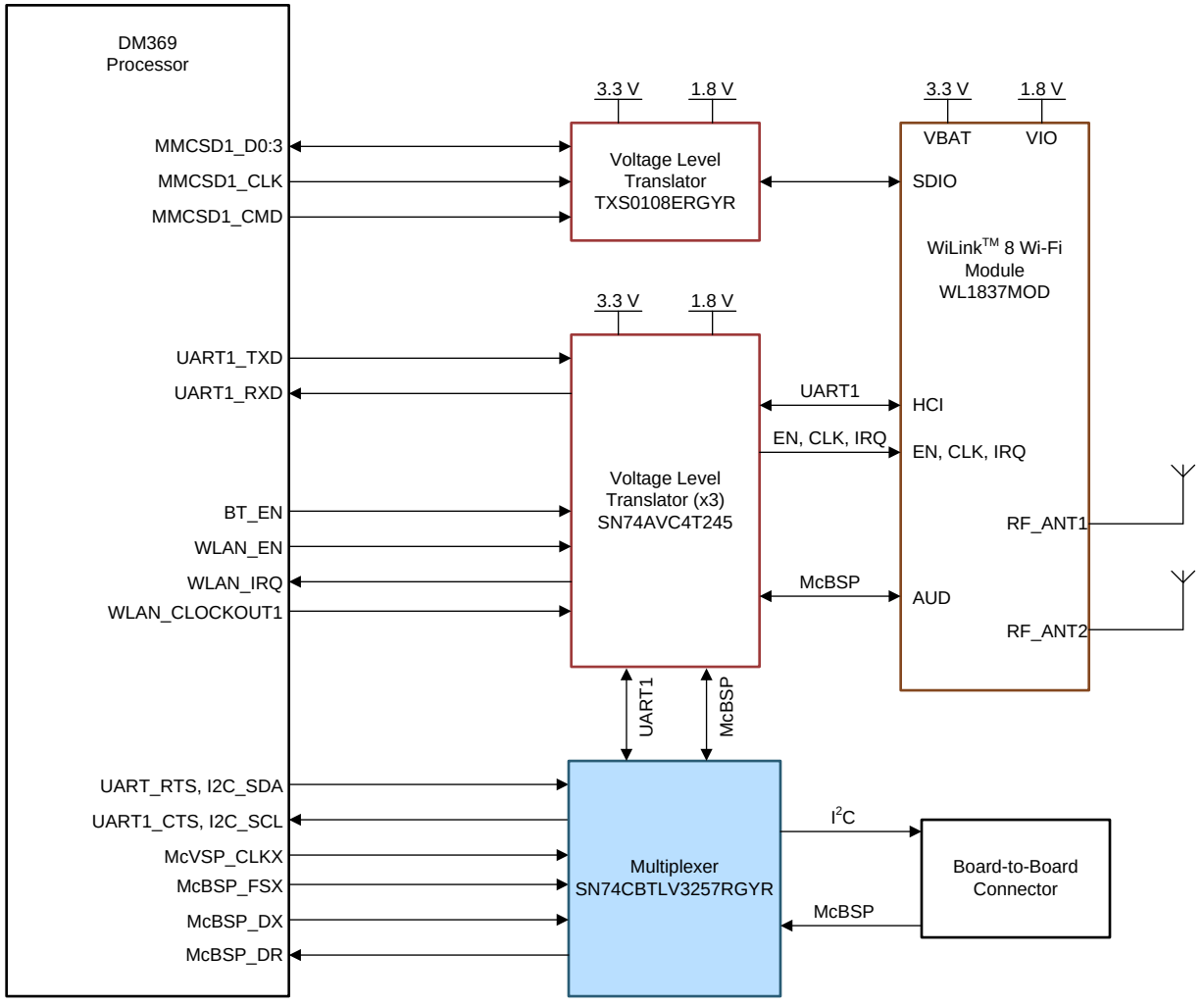
3.5 WiLink 8 Wi-Fi Interface

The WiLink 8 Wi-Fi module is a WLAN baseband processor (see Figure 3-5) and RF transceiver support of IEEE Std 802.11a, 802.11b, 802.11g, and 802.11n.

The module can be configured for 20-MHz or 40-MHz SISO, and 20-MHz 2 × 2 MIMO at 2.4 GHz for high throughput: 80 Mbps (TCP), 100 Mbps (UDP). The module supports 4-Bit SDIO host interface.

The flow control signals of UART1 (RTSn and CTSn) are muxed with the I^2C data and clock signals. Thus, a multiplexer U8 (SN74CBTLV3257RGYR) is used to separate those signals. The UART signals are interfaced with the WiLink 8 Wi-Fi module using the voltage level translators. Four voltage level translators (U4 – TXS0108ERGYR for MMC; U5, U12, and U14 SN74AVC4T245 for McASP, UART, EN, CLK, and IRQ) are used to convert the IO voltage of the DM369 (3.3 V) to the I/O voltage of the Wi-Fi module (1.8 V).

Figure 3-5. WiLink 8 Wi-Fi Interface

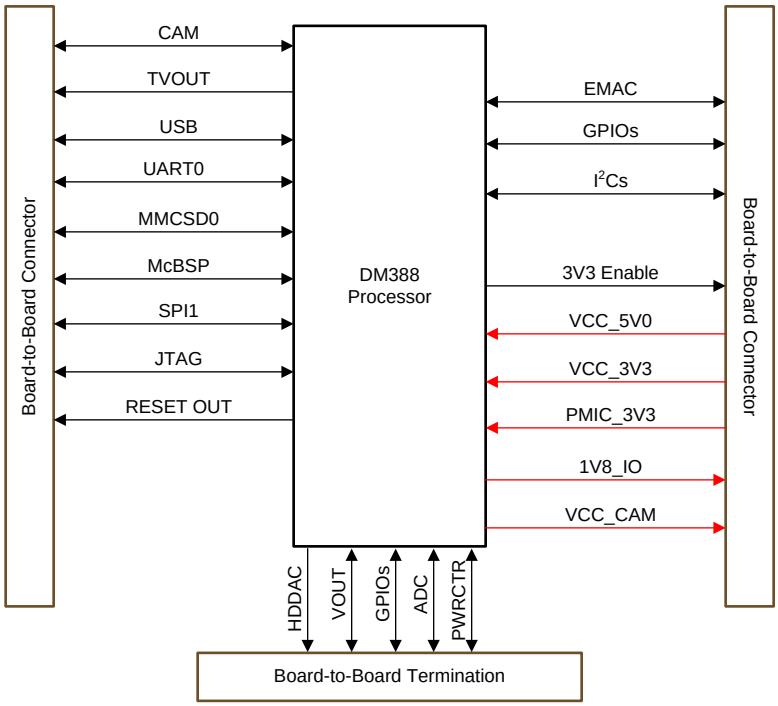


3.6 Board-to-Board Interface

The TMDSCSK369 module supports parallel camera interface, TVOUT, EMAC, McBSP, MMCSD1, USB, UART, SPI, JTAG, I^2C, and GPIO, which are connected to the carrier card over board-to-board connectors (see Figure 3-6). The details of these interfaces are provided in Chapter 6.

A board-to-board termination connector provided in the TMDSCSK369 module supports COMP (Y, Pb, Pr), video out (COUT, YOUT, LCD control signals), GPIO, ADC, and power control. By default, the board-to-board termination connector is not assembled on the TMDSCSK369 module. This can be populated and used with a third-party carrier card.

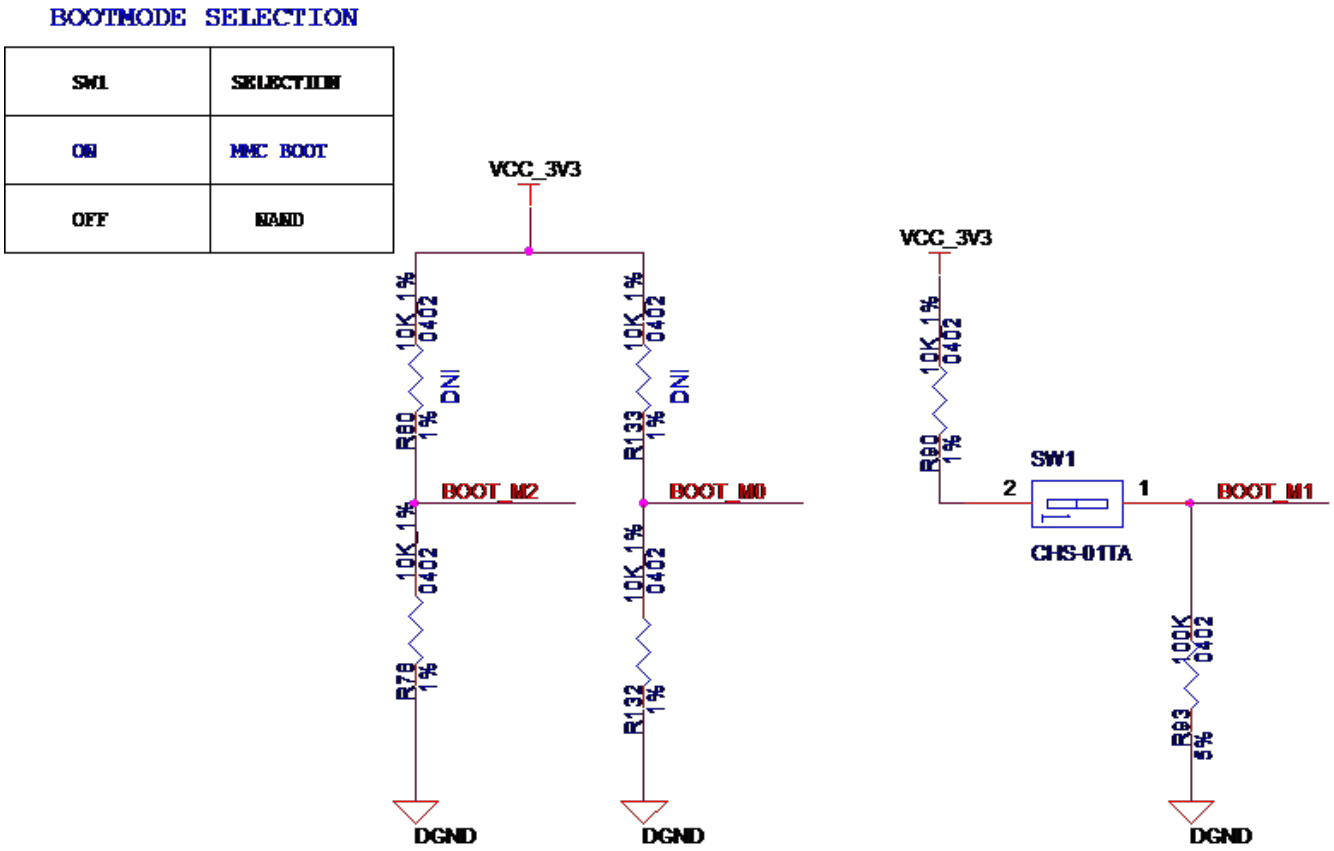
Figure 3-6. Board-to-Board Interface



3.7 Boot-Mode Configuration

The TMDSCSK369 module supports MMCSD and NAND boot-mode configuration (see Figure 3-7). By default, the switch is configured for NAND flash boot mode.

Figure 3-7. Boot-Mode Configuration



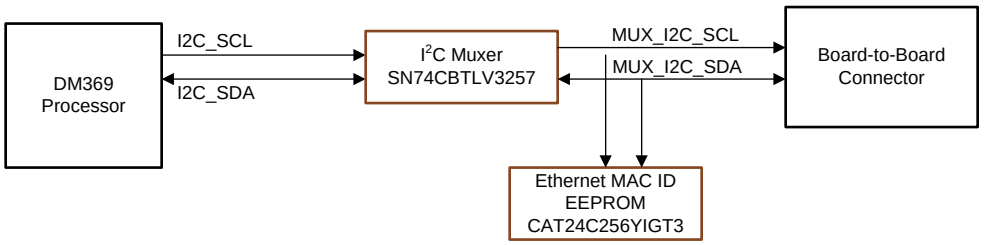
3.8 I²C Interface

The TMDSCSK369 module supports an I²C interface, which is connected to the board-to-board connector, EEPROM (Ethernet MAC ID), as shown in Figure 3-8.

An I²C multiplexer selects the I²C functionality from the processor pins to communicate to slave devices.

See Table 3-1 for the I²C address for each individual device.

Figure 3-8. I²C Interface



3.9 I²C Address Mapping

Table 3-1 shows the address mapping for the I²C interface on the TMDSCSK369 module.

Table 3-1. I²C Address Mapping

Master	Slave Device	Address
TMDSCSK369	EEPROM for Ethernet MAC ID programming	0x50 (7-bit); 0xA0 (8-bit write); 0xA1 (8-bit read)
	Board-to-board connector → audio codec (TLV320AIC3106)	0x18 (7-bit); 0x30 (8-bit write); 0x31 (8-bit read)
	Board-to-board connector → level translator (TCA9517) → camera module	0x20 (7-bit); 0x40 (8-bit write); 0x41 (8-bit read)

3.10 GPIO Mapping

Table 3-2 shows the GPIO mapping for the TMDSCSK369 module.

Table 3-2. GPIO Mapping

Signal Name	GPIO Number	Purpose	I/O[(1)]	Internal or External PU or PD
DM368_EMIF_WPn	GIO55	Write protect for NAND flash	OUT	INTERNAL PD
DM368_SEL_I2C_MUX	GIO35	UART1 and I²C muxer selection	OUT	EXTERNAL PU
DM368_SEL_McBSP_MUX	GIO22	McBSP muxer selection	OUT	INTERNAL PD
DM368_BT_EN	GIO36	Bluetooth enable	OUT	INTERNAL PD
DM368_WLAN_EN	GIO23	WLAN enable	OUT	INTERNAL PD
DM368_WLAN_IRQ	GIO24	WLAN interrupt request	IN	INTERNAL PD
DM368_CAM_RSTn	GIO93	Camera reset	OUT	INTERNAL PD
GIO0	GIO0	Keypad	I/O	INTERNAL PD
GIO31	GIO31	Keypad	I/O	INTERNAL PD
GIO32	GIO32	Keypad	I/O	INTERNAL PD
GIO57	GIO57	Keypad	I/O	INTERNAL PD
GIO68	GIO68	LED	I/O	
GIO69	GIO69	LED	I/O	
GIO70	GIO70	LED	I/O	
GIO71	GIO71	LED	I/O	
GIO72	GIO72	LED	I/O	
GIO50	GIO50	GPIO to board-to-board connector	I/O	
GIO55	GIO55	GPIO to board-to-board connector	I/O	
GIO64	GIO64	GPIO to board-to-board connector	I/O	
GIO65	GIO65	GPIO to board-to-board connector	I/O	
GIO66	GIO66	GPIO to board-to-board connector	I/O	

(1) I/O = in or out; I = in; O = out.

TMDSCSK369 Module – Physical Specifications

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4.1 Board Layout

The TMDSCSK369 module dimensions are 2.856" × 2.48" (72.55 mm × 63 mm). The module is an 8-layer board that is powered through the carrier card. Figure 4-1 and Figure 4-2 show the top and bottom views of the assembly layout.

Figure 4-1. TMDSCSK369 Module Assembly Layout (Top)

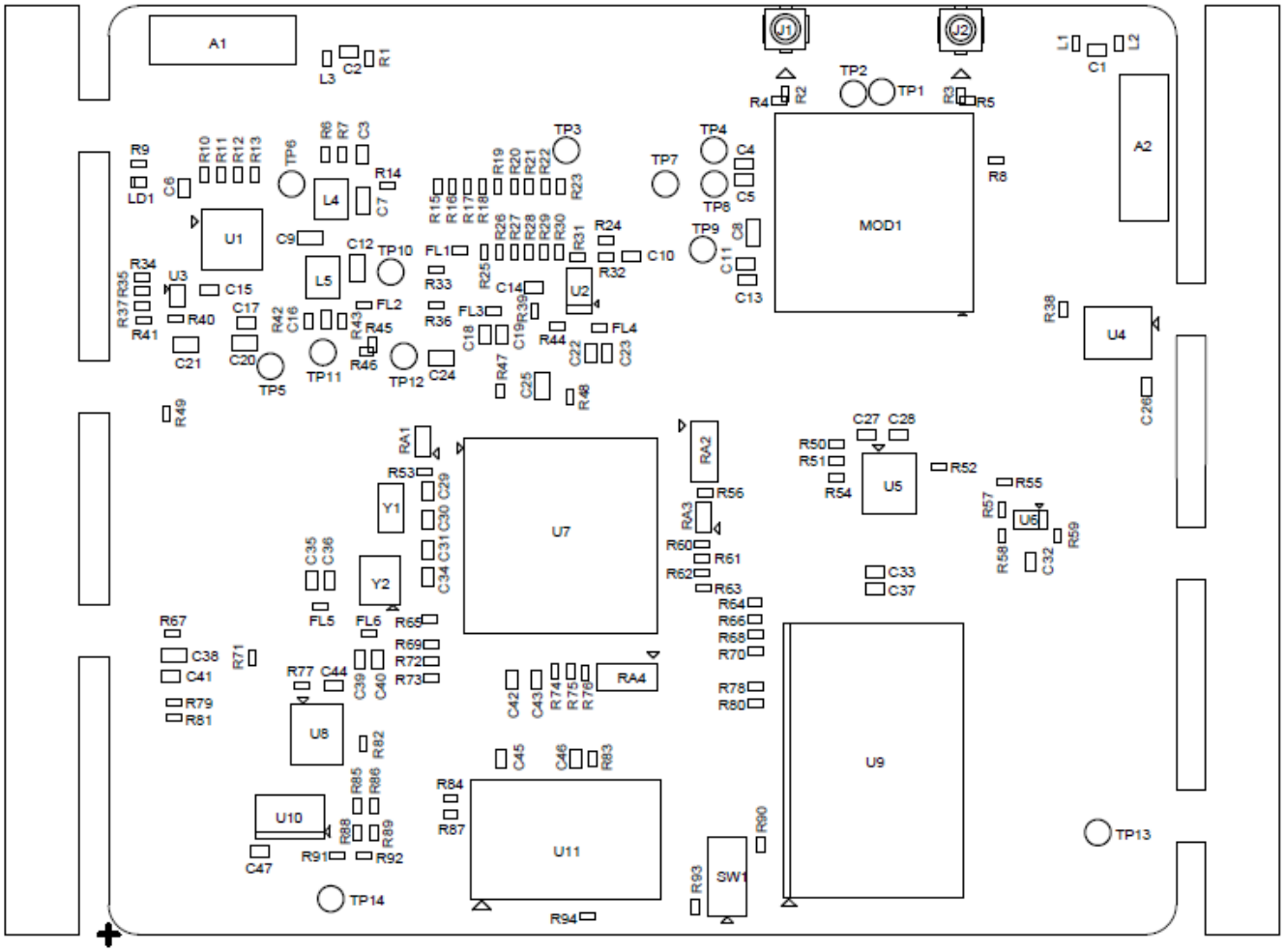
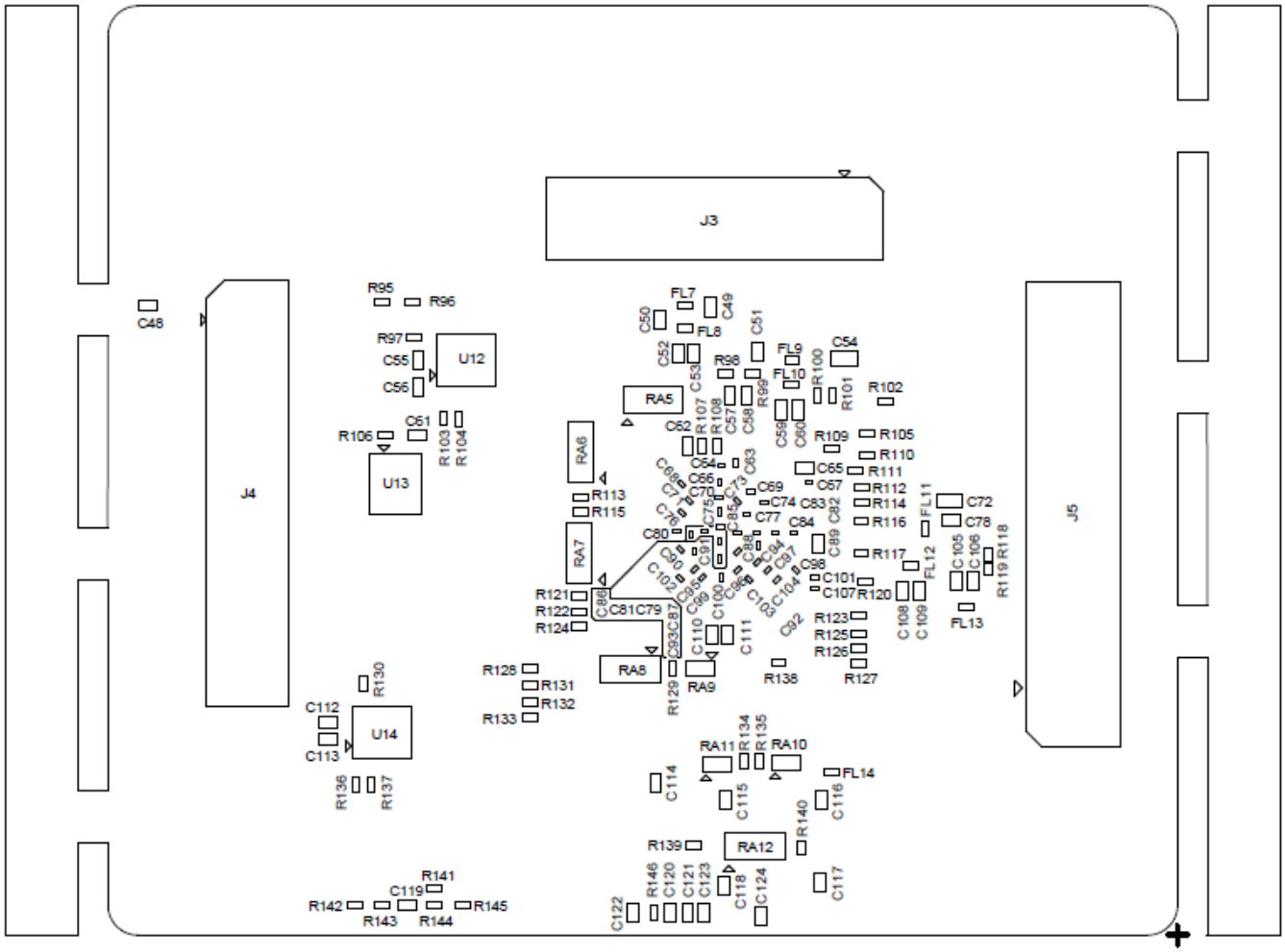


Figure 4-2. TMDSCSK369 Module Assembly Layout (Bottom)



4.2 Connector Index

The TMDSCSK369 module has two board-to-board connectors to provide access to various interfaces on the carrier card (see Table 4-1). In addition, the module has a board-to-board termination connector, where additional signals are tapped into for future expansion. The module has UFL connectors for the Wi-Fi module to test the antenna performance. Figure 4-3 and Figure 4-4 show the top and bottom view of the connectors.

Table 4-1. TMDSCSK369 Module Connectors

Connector	Part number	Pins	Function
J1	U.FL-R-SMT-1(01)	3	RF UFL connector for high-frequency signals (DNI)
J2			
J4	FX11LA-80P/8-SV(71)	80	Board-to-board connector male
J5	FX11LA-80S/8-SV(71)	80	Board-to-board connector female
J3	FX11LA-60P/6-SV(71)	60	Board-to-board termination (DNI)

Figure 4-3. Connectors on the TMDSCSK369 Module (Top)

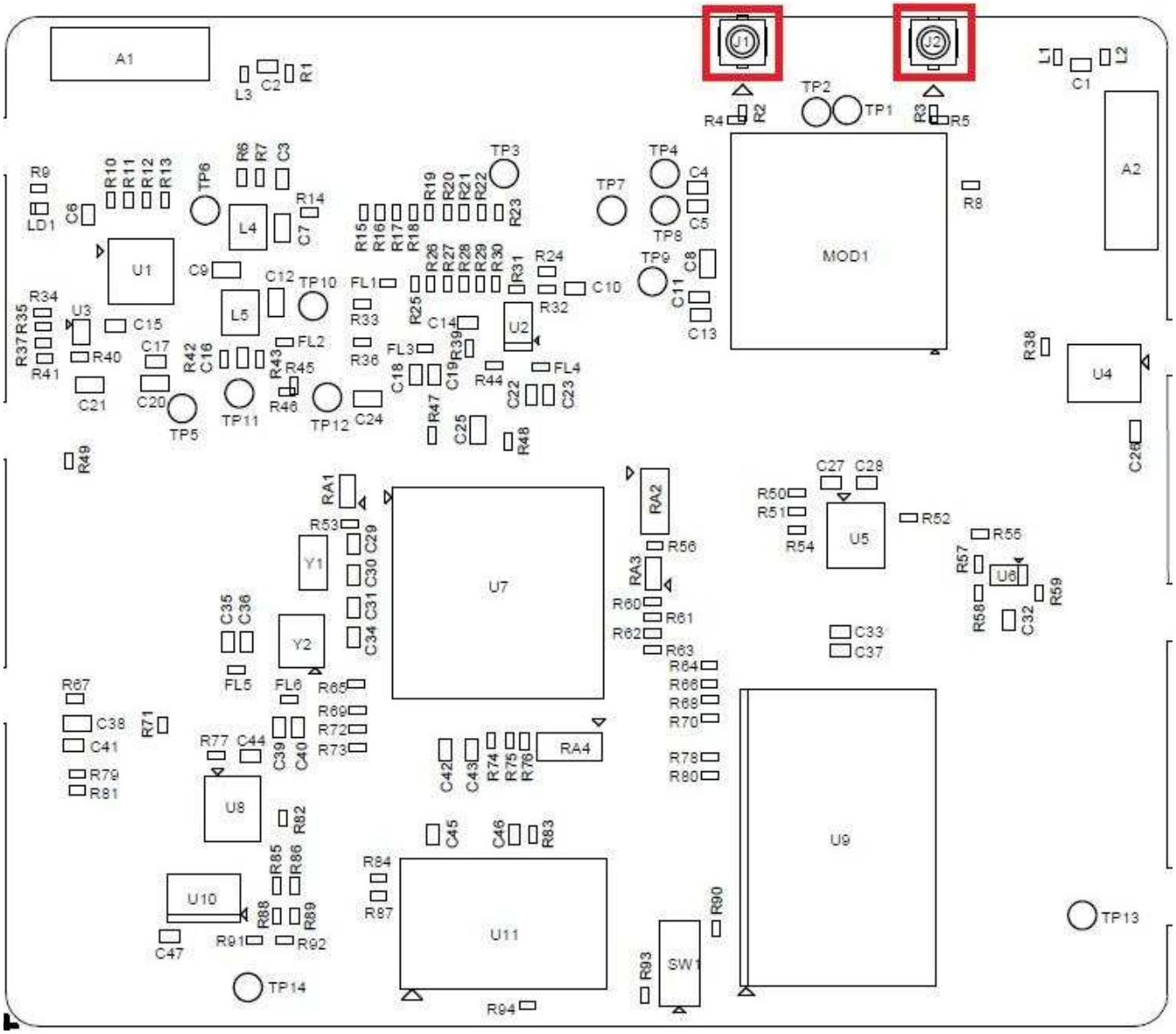


Figure 4-4. Connectors on the TMDSCSK369 Module (Bottom)

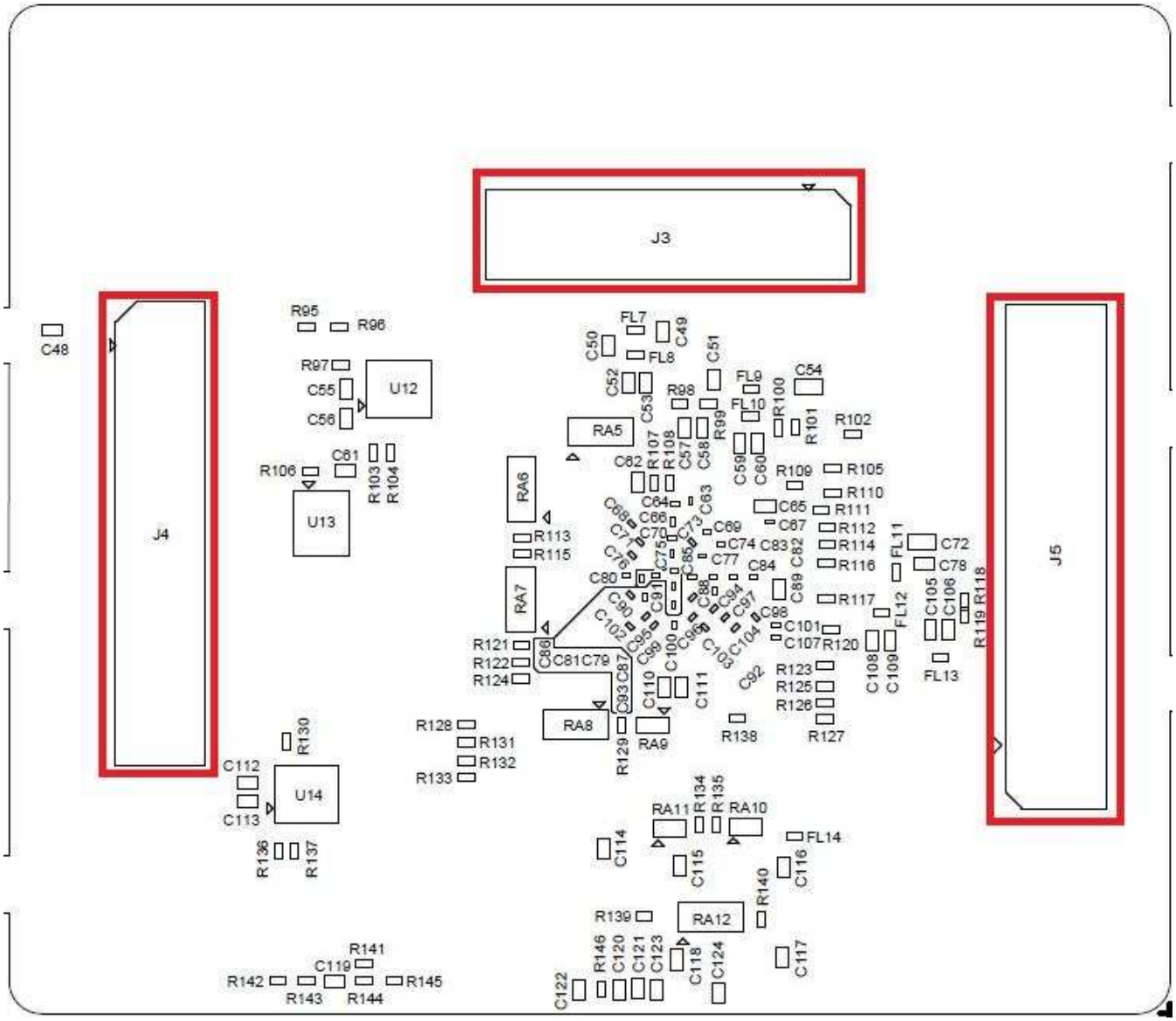


Table 4-2, Table 4-3, Table 4-4, and Table 4-5 list the pins for the connectors.

Table 4-2. UFL Connector (J1, J2)

Pin Number	Pin Description	Remarks
1	RF_ANT1	Signal
2	GND	Ground
3	GND	Ground

Table 4-3. Board-to-Board Connector – Header (J4)

Number	Pin Description	Pin Description in CC (J3)
1	DM368_CAMD0	BB_CAM_DAT0
2	NC	BB_HDMI_CLKN
3	DM368_CAMD1	BB_CAM_DAT1
4	NC	BB_HDMI_CLKP
5	DM368_CAMD2	BB_CAM_DAT2
6	NC	DGND
7	DM368_CAMD3	BB_CAM_DAT3
8	NC	BB_HDMI_D0N
9	DM368_CAMD4	BB_CAM_DAT4
10	NC	BB_HDMI_D0P
11	DGND	DGND
12	DGND	DGND
13	DM368_CAMD5	BB_CAM_DAT5
14	NC	BB_HDMI_D1N
15	DM368_CAMD6	BB_CAM_DAT6
16	NC	BB_HDMI_D1P
17	DM368_CAMD7	BB_CAM_DAT7
18	DGND	DGND
19	DM368_CAMD8	BB_CAM_DAT8
20	NC	BB_HDMI_D2N
21	DM368_CAMD9	BB_CAM_DAT9
22	NC	BB_HDMI_D2P
23	DM368_CAMD10	BB_CAM_DAT10
24	DGND	DGND
25	DM368_CAMD11	BB_CAM_DAT11
26	NC	BB_EXP_UART_TXD
27	DM368_CAMD12	BB_CAM_DAT12
28	NC	BB_EXP_UART_RXD
29	DM368_CAMD13	BB_CAM_DAT13
30	DM368_JTAG_EMU0	BB_EMU0
31	DM368_CAMD14	BB_CAM_DAT14
32	DM368_JTAG_EMU1	BB_EMU1
33	DGND	DGND
34	DGND	DGND
35	DM368_CAMD15	BB_CAM_DAT15
36	DM368_JTAG_TMS	BB_FT2232_TMS
37	DM368_CAM HSYNC	BB_CAM_HS
38	DM368_JTAG_TCK	BB_FT2232_TCK
39	DM368_CAM VSYNC	BB_CAM_VS

Table 4-3. Board-to-Board Connector – Header (J4) (continued)

Number	Pin Description	Pin Description in CC (J3)
40	DM368_JTAG_RTCK	BB_FT2232_RTCK
41	NC	NC
42	DM368_JTAG_TRST	BB_FT2232_TRSTN
43	DM368_CAM PCLK	BB_CAM_PCLK
44	DM368_JTAG_TDI	BB_FT2232_TDI
45	NC	NC
46	DM368_JTAG_TDO	BB_FT2232_TDO
47	DM368_CAM_RSTN	BB_CAM_RESET
48	DM368_WARM_RESETN	BB_WARM_RESET
49	NC	NC
50	DM368_PORZ	BB_RSTOUTn
51	NC	NC
52	DM368_GIO72	BB_LED5
53	DM368_TVOUT	BB_TVOUT0
54	DM368_CC_RSTN	BB_PORn
55	DGND	DGND
56	DGND	DGND
57	NC	NC
58	DM368_USBVBUS	BB_USB0_VBUSIN
59	NC	NC
60	DM368_USB_ID	BB_USB0_ID
61	NC	NC
62	DM368_USB_DM	BB_USB0_DM
63	NC	NC
64	DM368_USB_DP	BB_USB0_DP
65	NC	NC
66	DM368_USBDRVVBUS	BB_USB0_DRVVBUS
67	DGND	DGND
68	DM368_SPI1_SCLK/GIO28	BB_EXP_SPI_SCLK
69	DM368_UART0_TXD	BB_FT2232_UART_RX
70	DM368_SPI1_SCS/GIO29	BB_EXP_SPI_SCS
71	DM368_UART0_RXD	BB_FT2232_UART_TX
72	DM368_SPI1_SIMO/GIO26	BB_EXP_SPI_D0
73	NC	BB_OSC_WAKEUP
74	DM368_SPI1_SOMI/GIO27	BB_EXP_SPI_D1
75	NC	BB_SDCD
76	DM368_MMCSD0_D3	BB_SD0_DAT3
77	DGND	DGND
78	DGND	DGND
79	DM368_MCBSPCLKS	BB_AIC_MCLK
80	DM368_MMCSD0_CLK	BB_SD0_CLK
81	BB_MUX_MCBSP_CLKX	BB_AIC_BCLK
82	DM368_MMCSD0_CMD	BB_SD0_CMD
83	BB_MUX_MCBSP_FSX	BB_AIC_WCLK
84	DM368_MMCSD0_D0	BB_SD0_DAT0
85	BB_MUX_MCBSP_DX	BB_AIC_DIN
86	DM368_MMCSD0_D1	BB_SD0_DAT1

Table 4-3. Board-to-Board Connector – Header (J4) (continued)

Number	Pin Description	Pin Description in CC (J3)
87	BB_MUX_MCBSP_DR	BB_AIC_DOUT
88	DM368_MMCSD0_D2	BB_SD0_DAT2

Table 4-4. Board-to-Board Connector – Receptacle (J5)

Number	Pin Description in SOM	Pin Description in CC (J4)
1	DGND	BB_ETH_TX_D7
2	BB_MUX_I2C_SCL	BB_I2C_SCL
3	DGND	BB_ETH_TX_D6
4	BB_MUX_I2C_SDA	BB_I2C_SDA
5	DGND	BB_ETH_TX_D5
6	NC	BB_HDMI_CEC
7	DGND	BB_ETH_TX_D4
8	NC	BB_HDMI_HPDET
9	DM368_EMAC_TXD3	BB_ETH_TX_D3
10	NC	BB_PMIC_POR
11	DGND	DGND
12	DGND	DGND
13	DM368_EMAC_TXD2	BB_ETH_TX_D2
14	DM368_EMAC_CRS	BB_ETH_CS
15	DM368_EMAC_TXD1	BB_ETH_TX_D1
16	BB_VCC_3V3	VCC_3V3
17	DM368_EMAC_TXD0	BB_ETH_TX_D0
18	BB_VCC3V3	VCC_3V3
19	DM368_EMAC_TX CLK	BB_ETH_TX_CLK
20	BB_VCC3V3	VCC_3V3
21	DM368_GIO55	BB_EXP_GP0[30]
22	VCC_CAM	VCC_CAM
23	DGND	DGND
24	VCC_1V8_IO	VCC_1V8
25	DGND	BB_ETH_GTX_CLK
26	NC	NC
27	DM368_EMAC_TX EN	BB_ETH_TX_EN
28	DGND	DGND
29	BB_MUX_I2C_SCL	BB_HDMI_CODEC_SCL
30	DM368_GIO64	BB_EXP_GP1[26]
31	BB_MUX_I2C_SDA	BB_HDMI_CODEC_SDA
32	DM368_GIO65	BB_EXP_GP0[29]
33	DGND	DGND
34	DGND	DGND
35	DM368_EMAC_MDCLK	BB_ETH_MDC
36	DM368_GIO66	BB_EXP_GP1[25]
37	DM368_EMAC_MDIO	BB_ETH_MDIO
38	NC	BB_EXP_CSI_DX0
39	DM368_EMAC_RX CLK	BB_ETH_RX_CLK
40	NC	BB_EXP_CSI_DY0
41	DM368_EMAC_RX DV	BB_ETH_RX_DV

Table 4-4. Board-to-Board Connector – Receptacle (J5) (continued)

Number	Pin Description in SOM	Pin Description in CC (J4)
42	DGND	DGND
43	DM368_EMAC_RX ER	BB_ETH_RX_ER
44	NC	BB_EXP_CSI_DX1
45	DGND	DGND
46	NC	BB_EXP_CSI_DY1
47	DM368_EMAC_RXD0	BB_ETH_RX_D0
48	DGND	DGND
49	DM368_EMAC_RXD1	BB_ETH_RX_D1
50	NC	BB_EXP_CSI_DX2
51	DM368_EMAC_RXD2	BB_ETH_RX_D2
52	NC	BB_EXP_CSI_DY2
53	DM368_EMAC_RXD3	BB_ETH_RX_D3
54	DM368_EMAC_COL	BB_ETH_COL
55	DGND	DGND
56	DGND	DGND
57	DGND	BB_ETH_RX_D4
58	NC	BB_EXP_CSI_DX3
59	DGND	BB_ETH_RX_D5
60	NC	BB_EXP_CSI_DY3
61	DGND	BB_ETH_RX_D6
62	DGND	DGND
63	DGND	BB_ETH_RX_D7
64	NC	BB_EXP_CSI_DX4
65	DGND	DGND
66	NC	BB_EXP_CSI_DY4
67	DM368_GIO68	BB_LED1
68	DM368_ IO PWR_EN	BB_uPIO_PWR_EN
69	DM368_GIO69	BB_LED2
70	DM368_GIO31	BB_SWITCH1
71	DM368_GIO70	BB_LED3
72	DM368_GIO32	BB_SWITCH2
73	DM368_GIO71	BB_LED4
74	DM368_GIO50	BB_EXP_GP0[31]
75	DM368_GIO44	BB_SWITCH3
76	PMIC_3V3	PMIC_3V3
77	DGND	DGND
78	DGND	DGND
79	DM368_GIO0	BB_SWITCH4
80	PMIC_3V3	PMIC_3V3
81	DM369_ETH_RST	BB_ETH_RESET
82	PMIC_3V3	PMIC_3V3
83	VCC_5V0	DC_VCC5V0
84	PMIC_3V3	PMIC_3V3
85	VCC_5V0	DC_VCC5V0
86	PMIC_3V3	PMIC_3V3
87	VCC_5V0	DC_VCC5V0
88	PMIC_3V3	PMIC_3V3

Table 4-5. Board-to-Board Termination (J3)

Pin Number	Pin Description	Pin Number	Pin Description
1	DM368_PWRCNTON	34	DGND
2	DM368_PWCTRO0	35	DM368_GIO60
3	DM368_PWCTRO1	36	DM368_LINEOUT
4	DM368_PWCTRIO3	37	DM368_GIO63
5	DM368_PWCTRO2	38	DM368_COUT5
6	DM368_PWCTRIO4	39	DM368_GIO59
7	DM368_PWRRST	40	DM368_COUT3
8	AGND	41	DM368_GIO58
9	1V35_BACKUP	42	DM368_YOUT5
10	AGND	43	DM368_GIO62
11	DGND	44	DM368_COUT0
12	DGND	45	DM368_LCD VSYNC
13	DM368_PWCTRIO1	46	DM368_VCLK
14	DM368_ADC_CH4	47	DM368_YOUT4
15	DM368_PWCTRO3	48	DM368_LCD FIELD
16	DM368_ADC_CH0	49	DM368_COUT7
17	DM368_PWCTRIO2	50	DM368_YOUT1
18	DM368_ADC_CH3	51	DM368_COUT1
19	DM368_PWCTRIO6	52	DM368_EXTCLK
20	DM368_ADC_CH1	53	DGND
21	DM368_PWCTRIO5	54	DM368_LCD OE
22	DM368_ADC_CH5	55	DGND
23	DM368_PWCTRIO0	56	DGND
24	DM368_ADC_CH2	57	DM368_COUT6
25	DM368_YOUT6	58	DM368_YOUT0
26	DM368_MICP	59	DM368_YOUT2
27	DM368_COMPPR	60	DM368_COUT4
28	DM368_MICN	61	DM368_COMPPB
29	DM368_GIO61	62	DM368_COUT2
30	DM368_SPKP	63	DM368_YOUT7
31	DM368_GIO57	64	DM368_YOUT3
32	DM368_SPKN	65	DM368_COMPY
33	DGND	66	DM368_LCD HSYNC

4.3 Test Points

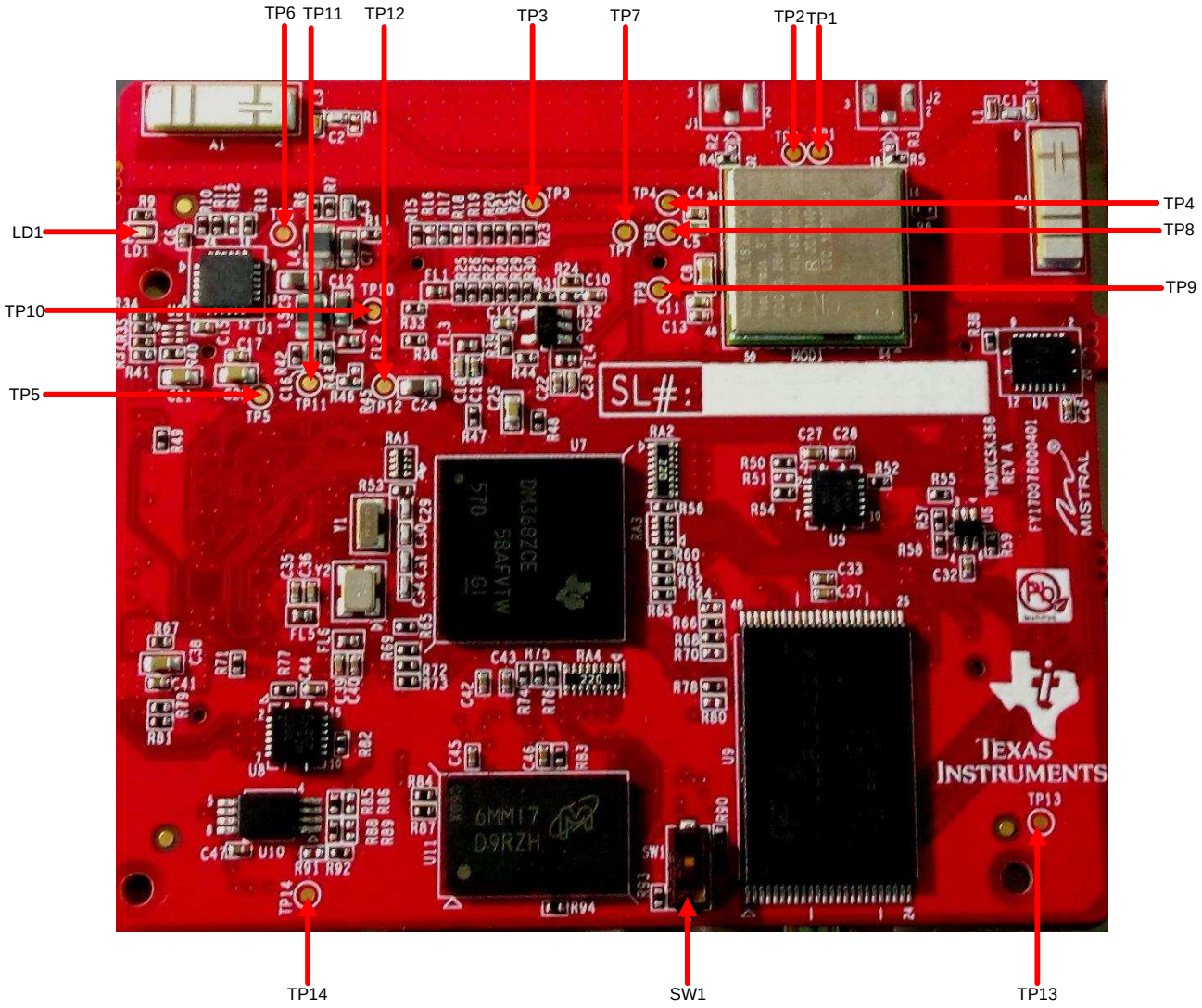
The TMDSCSK369 module has 14 test points. Each test point and corresponding function is provided in Table 4-6.

Table 4-6. TMDSCSK369 Module Test Points

Test Point	Signal
TP1	WIFI MODULE GPIO2
TP2	WIFI MODULE GPIO1
TP3	DM368_COMPPR
TP4	DM368_COMPY
TP5	VCC_5V0
TP6	DGND
TP7	DM368_COMPPB
TP8	WL_UART_DBG
TP9	VCC1V3
TP10	VCC_1V8_IO
TP11	VCC_1V35_CORE
TP12	VCC_3V3
TP13	DGND
TP14	DGND
TP15	PMIC_3V3
TP16	VCC_1V8_DDR
TP17	DM368_DDR_VREF
TP18	VREF

Figure 4-5 shows the location of LEDs, switches, and test points.

Figure 4-5. Position of LEDs, Switches, and Test Points



4.4 System LED

The TMDSCSK369 module has one LED for power indication (see Table 4-7).

Table 4-7. TMDSCSK369 Module LED

LED	Color	Description
LD1	Green	Board Power LED

TMDSCSK369 Module Power Requirements

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5.2 Power Supply Calculation **43**
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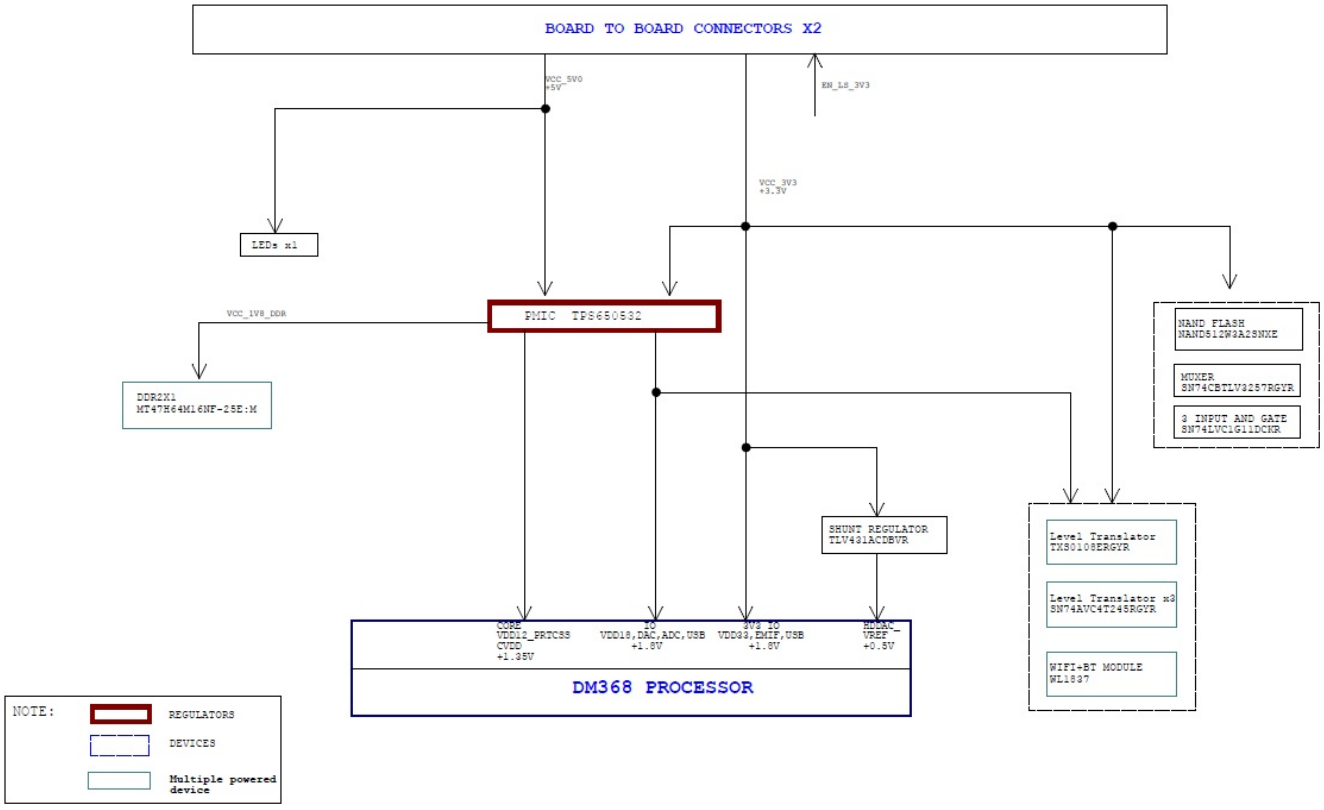
5.1 Power Distribution Diagram

Figure 5-1 shows the power distribution diagram.

Figure 5-1. Power Distribution



5.2 Power Supply Calculation

Figure 5-2 and Table 5-1 show the power supply calculations of the TMDSCSK369.

Figure 5-2. DM369 Processor Power Calculation

CVDD	Device Type	DVDD18	DVDD33	Case Temp	CLKIN	ARM Freq	Modules Freq
1.35 V	ZCE	1.8	3.3	25	24	432	340

Modules		Frequency	Status	%Utilization	%Writes	Bits	%Switch	Other	Trace (In.)
ARM		432	Typical Activity						
HDVICP		340	Enabled						
	Enc/DecType		H264(720P-30 fps)						
	Dec/Enc		Encoder						
MJCP		340	Enabled						
	Enc/DecType		MPEG4(1080P-30 fps)						
	Dec/Enc		Encoder						
VPSS			Enabled						
VPFE		30	Enabled						4
	RESIZER		Active						
	LDC		Active						
	FD		Active						
VPBE		74.25 MHz	Enabled					4	12
ADC			Enabled	0					
PRTCSS			Enabled						
HPI			Enabled	0	0	8	0		5
EMAC		100	Enabled	100			40		12
KEY SCAN			Enabled						3
Voice Codec			Enabled	0				Record	1
AEMIF			Enabled	0	0	16	0		6
DDR		340	Enabled	50	50	16	50		3
MMC			Enabled	0	0	1	0		12
SD			Enabled	0	0	4	0		12
EDMA			Enabled	0					
USB			Enabled	0				FS Receive	3
Timer0			Enabled	50					
Timer1			Enabled	0					
Timer2			Enabled	0					
Timer3			Enabled	0					
WDT				0					
UART1		4.000	Enabled	0			0		11
UART0		0.000	Enabled	0			0		11
SPI0		0	Enabled	0			0		10
SPI1		0	Enabled	0			0		19
SPI2		0	Enabled	0			0		13
SPI3		0	Enabled	0			0		14
SPI4		1	Enabled	0			0		6
I2C		0	Enabled	0			0		25
McBSP		0	Enabled	0			0		5
PWM0		0	Enabled	0					5
PWM1		0	Enabled	0					5
PWM2		0	Enabled	0					5
PWM3		0	Enabled	0					5
RTO0			Enabled	0					
RTO1			Enabled	0					
RTO2			Enabled	0					
RTO3			Enabled	0					
GPIO		2	Enabled	0			No.of GPIOs	0	6.57

	Core mW	IO18 mW	IO33 mW	Total mW
ARM	81	-	-	81
HDVICP	312	-	-	312
		-	-	
		-	-	
MJCP	0	-	-	0
		-	-	
		-	-	
VPSS		-	-	
VPFE	192	-	28	220
VPBE	61	-	0	61
ADC		-	-	0
PRTCSS		-	-	
HPI	16	-	1	17
EMAC	20	-	28	48
KEY SCAN	4	-	-	4
Voice Code	-	0	0	0
AEMIF	3	-	53	55
DDR	10	40	-	50
MMC	1	-	0	1
SD	1	-	0	1
EDMA		-	-	0
USB	1	0	0	1
Timer0	2	-	-	2
Timer1	0	-	-	0
Timer2	0	-	-	0
Timer3	0	-	-	0
WDT	0	-	-	0
UART1	0	-	0	0
UART0	0	-	0	0
SPI0	2	-	0	2
SPI1	2	-	0	2
SPI2	2	-	0	2
SPI3	2	-	0	2
SPI4	0	-	0	0
I2C	0	-	0	0
McBSP	2	-	0	2
PWM0	0	-	0	0
PWM1	0	-	0	0
PWM2	0	-	0	0
PWM3	0	-	0	0
RTO0	0	-	0	0
RTO1	0	-	0	0
RTO2	0	-	0	0
RTO3	0	-	0	0
GPIO	0	0	-	0
Activity	715	41	111	867
Baseline	242	11	0	253
Total	957	51	111	1119 mW
PLL1	118	5		122
PLL2	48	6		54
Leakage	76			76

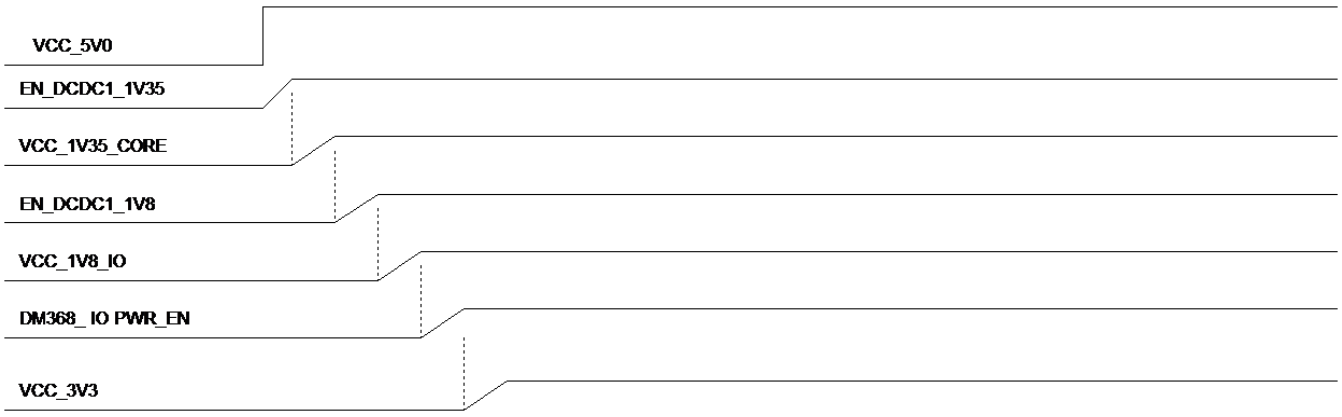
Table 5-1. Power Supply Calculation

Part Number	Quantity	VCC_1V35_CORE DCDC1, 1000 mA	VCC_1V8_IO DCDC2, 1000 mA	VCC_3V3
TMS320DM368ZCE	1	708	28	33
MT47H64M16NF-25E:M	1		260	
NAND512W3A2SNXE	1			20
WL1837MODGIMOCT	1			910
SN74CBTLV3257RYGYR	1			0.3
Total (mA)		708	288	963.3
Input voltage		5	5	5
Efficiency		0.9	0.9	0.85
Quiescent current (mA)		0.04	0.04	0.04
Output voltage		1.2	1.8	3.3
Current drawn		188.8106667	115.216	748.0051765
Current drawn from VCC_5V0 (mA)	1052.03			

5.3 Power-Up Sequence

The power-up sequence required for the processor is shown in Figure 5-3.

Figure 5-3. Power-up Sequence



Overview of CSK Carrier Card

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6.1 Key Features

The camera starter kit carrier card is a standalone development platform that enables users to exhibit the video processing capabilities of the TMS320DM388, TMS320DM8127, and TMS320DM369 processors and their peripherals. The CSK carrier card interfaces to processor modules such as the TMDSCSK388, TMDSCSK8127, and TMDSCSK369.

The key features of CSK carrier card are:

- Board-to-board connectors for the DMX processor module
- Micro SD card slot
- Audio codec (TLV320AIC3104IRHBR)
- Micro USB connector
- Four user keys and five LEDs
- Two reset switches and one oscillator wake-up switch
- Onboard XDS100 JTAG emulator
- FTDI chip (FT2232HL) for JTAG and UART over micro USB connector
- Audio line in (MIC) and headphone out
- Powered through 5-V DC jack

The key features of the LI-CAM-AR0331-324-1.8 WDR HD camera module are:

- 1/3-inch, 3.1-megapixel CMOS high-definition digital imager
- Active imaging pixels: 2052H × 1536V
- Pixel size: 2.2 μm × 2.2 μm
- 12-bit digital output with line and frame synchronization
- Support for 1080p at 60fps
- Simple two-wire serial interface
- Max dynamic range: up to 100 dB
- Low noise CMOS imaging technology that achieves CCD image quality
- Direct interface to TI IP-Camera

6.2 Functional Block Diagram

The functional block diagram of the CSK carrier card is shown in Figure 6-1.

Figure 6-1. CSK Carrier Card Functional Block Diagram

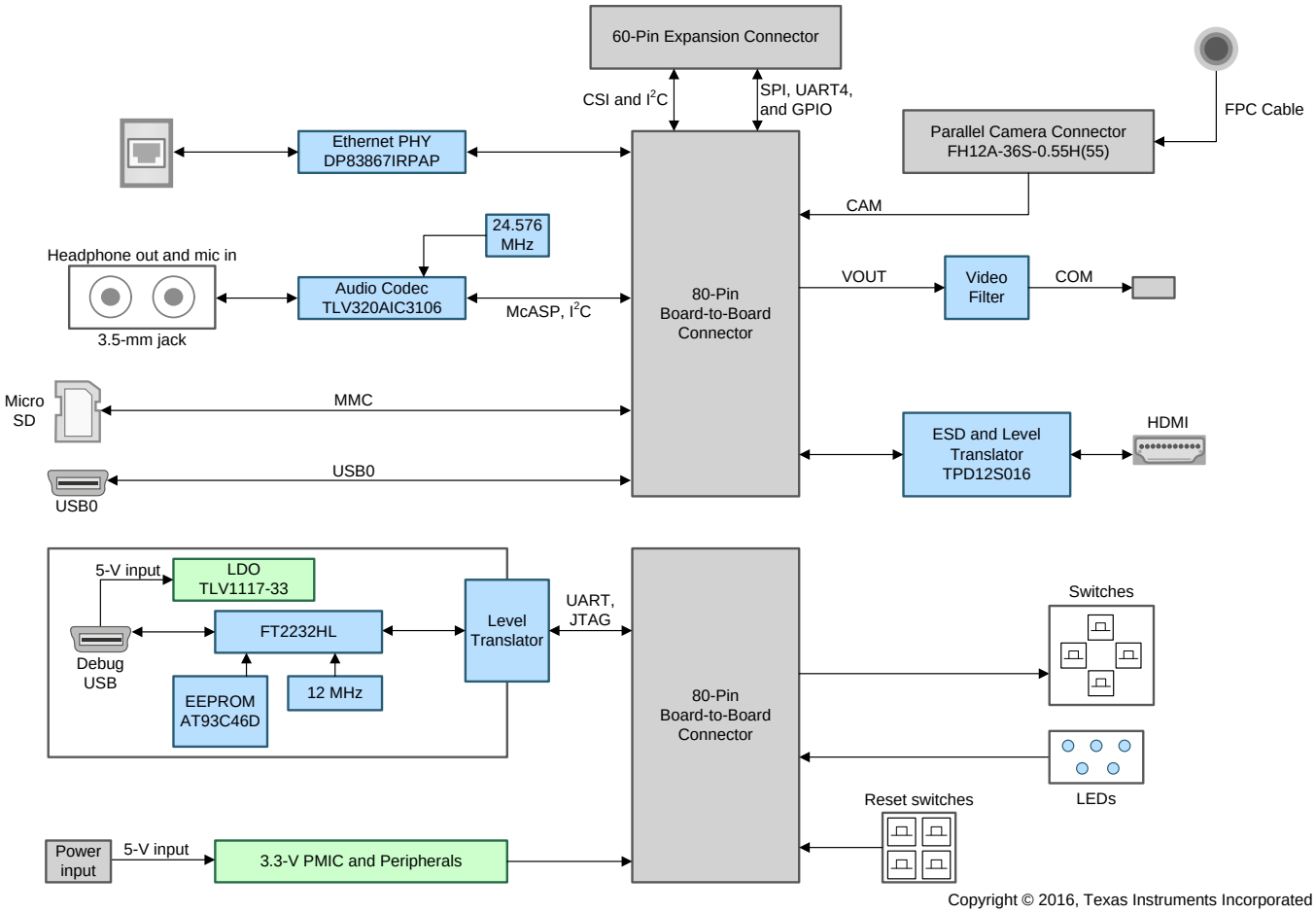


Figure 6-2 and Figure 6-3 show the top and bottom views of the CSK carrier card, respectively.

Figure 6-2. CSK Carrier Card (Top)

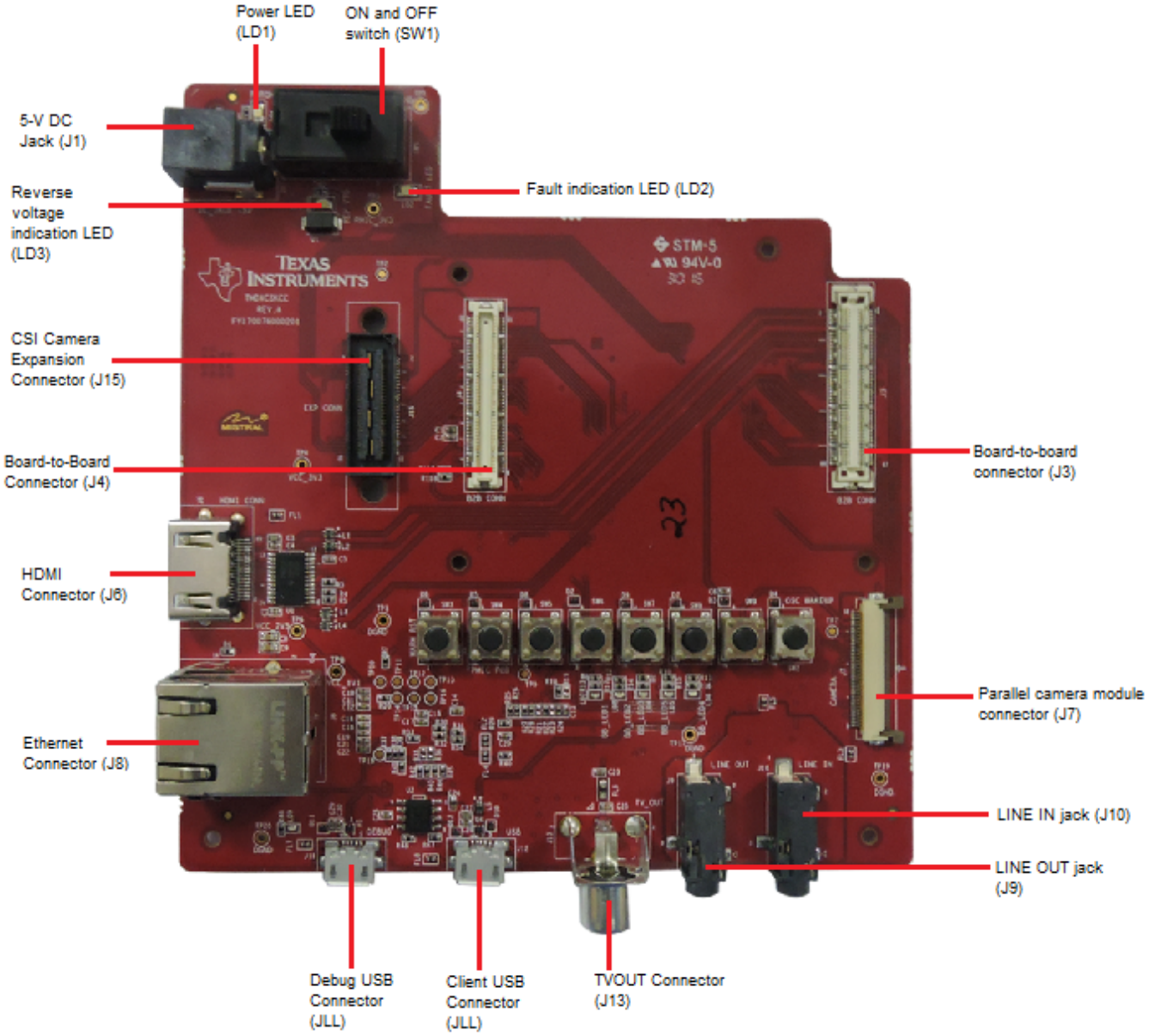
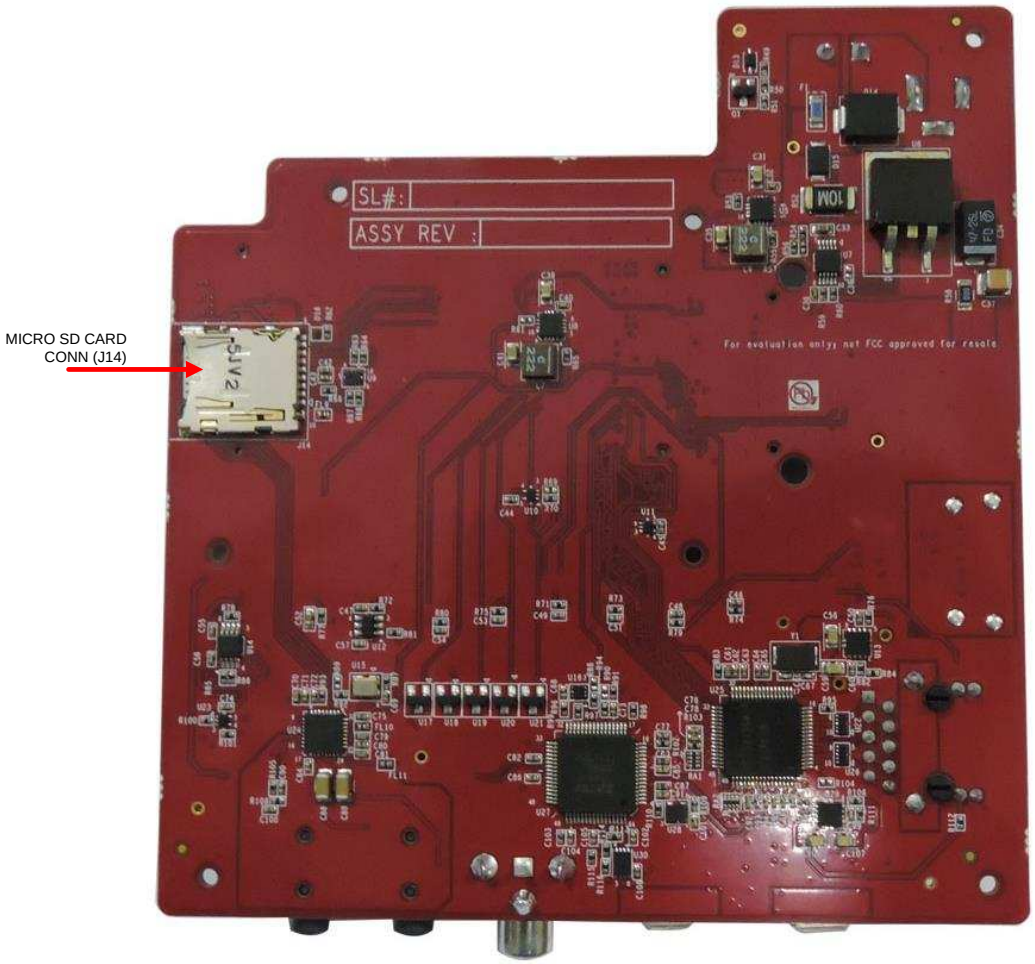


Figure 6-3. CSK Carrier Card (Bottom)



6.3 Power Supply

The CSK carrier card is powered through a +5-V DC jack. The power enable from the board-to-board connector is used to enable +3.3 V. This +3.3-V input is in turn converted into the required supply voltages using a regulator.

The regulators used in the CSK carrier card are listed in Table 6-1.

Table 6-1. CSK Carrier Card Regulators

Regulator	Purpose
TPS62142RGTT (U5)	3V3 generation
TPS62142RGTT (U8)	3V3 generation
TPS7A8101DRBT (U29)	2V5 generation
TPS7A8101DRBT (U13)	1V1 generation

Processor module power: PMIC_3V3

I/O voltage: VCC_3V3

The TPS62142RGTT (U5) is enabled by default to generate 3.3 V when SW1 is turned ON. This 3.3 V is used to power on the DMx processor module.

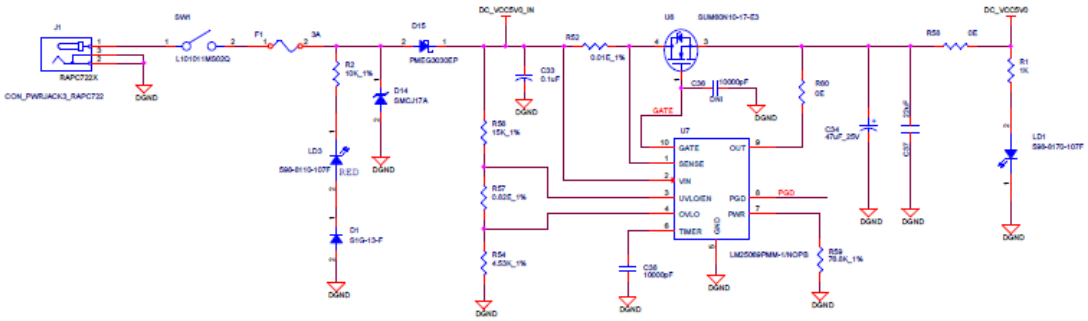
Another TPS62142RGTT (U8) is enabled by GPIO, which is driven by the DMx processor to generate the 3.3-V I/O voltage for the CSK carrier card.

The TPS7A8101DRBT (U13 and U29) regulators are used to generate 1.1 V and 2.5 V, respectively, for Ethernet PHY.

6.4 Overvoltage Protection Circuit

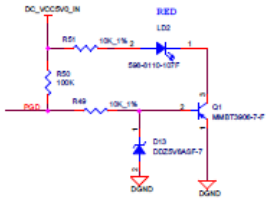
The voltage protection circuit on the CSK carrier card protects the board from overvoltage, undervoltage, transient voltage, and reverse voltage input cases (see Figure 6-4). The safe operation input voltage range is 4.5 V to 5.25 V. Any voltage not in this range is considered as fault, and the voltage protection circuit isolates the board from this input. The LED LD2 indicates if the DC input applied to board is in a safe input range.

Figure 6-4. Overvoltage Protection Circuit



Condition	LED Status(LD3)
Reverse Voltage	ON

Fault Indication



Condition	LED Status(LD2)
DC_VCC5V0_IN between 4.5 to 5.25V	OFF
DC_VCC5V0_IN above 5.25V or below 4.5V	ON

Note:-

When fault is indicated ,set to proper voltage and power cycle the board.

CSK Carrier Card Interface Details

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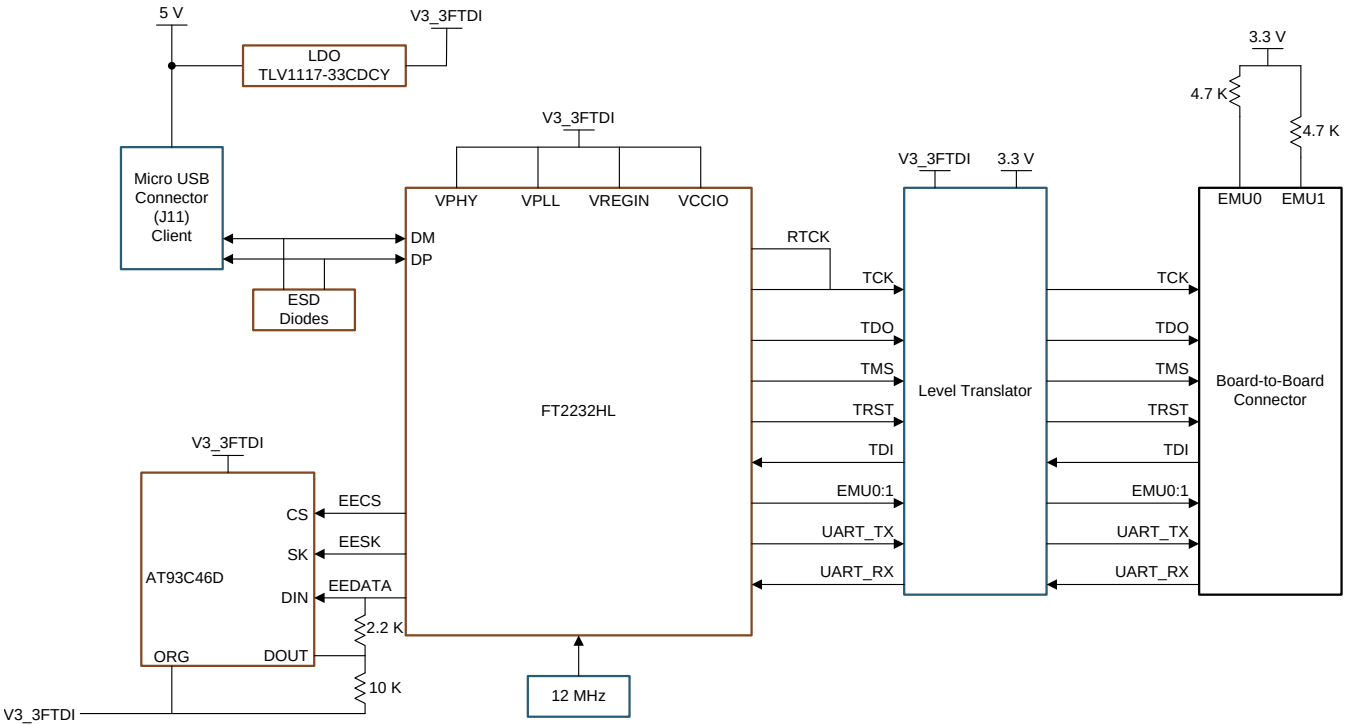
7.1 XDS100 Onboard Emulator Interface

The CSK carrier card contains an onboard XDS100 USB emulator with a FT2232HL chip (see Figure 7-1). One FT2232HL port is configured for UART and JTAG.

All of the JTAG lines are connected to the board-to-board connector using voltage level translators (SN74AVC2T244, SN74AVC4T245, and SN74AVC2T245) because the FT2232HL is powered by the TLV1117-33CDCY LDO (5.0 V to 3.3 V) through a micro USB connector (J11). EEPROM (AT93C46D, 1Kb) is interfaced to FT2232 to store configuration data.

Figure 7-1. XDS100 Onboard Emulator Interface

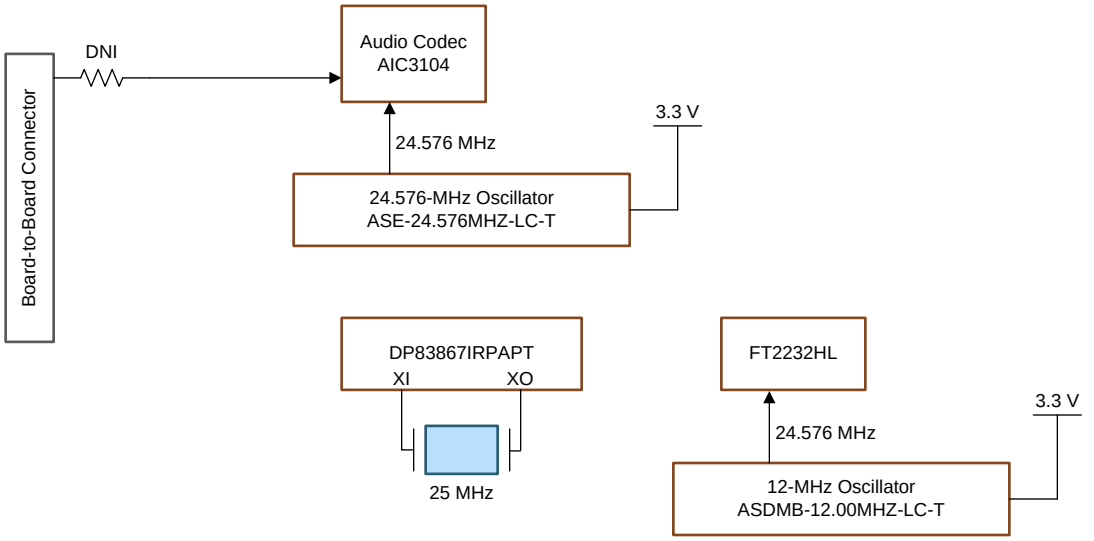


7.2 Clock Distribution

The board clock distribution circuit is shown in Figure 7-2.

One 12-MHz oscillator is connected to the UART to USB converter (FT2232HL), and one 24.576-MHz oscillator is connected to the audio codec (AIC3104) used in the CSK carrier card. In this configuration, the audio codec is configured as the McASP and McBSP master, and the DMx processor as a McASP and McBSP slave.

Figure 7-2. Clock Distribution



7.3 Reset Circuit and Distribution

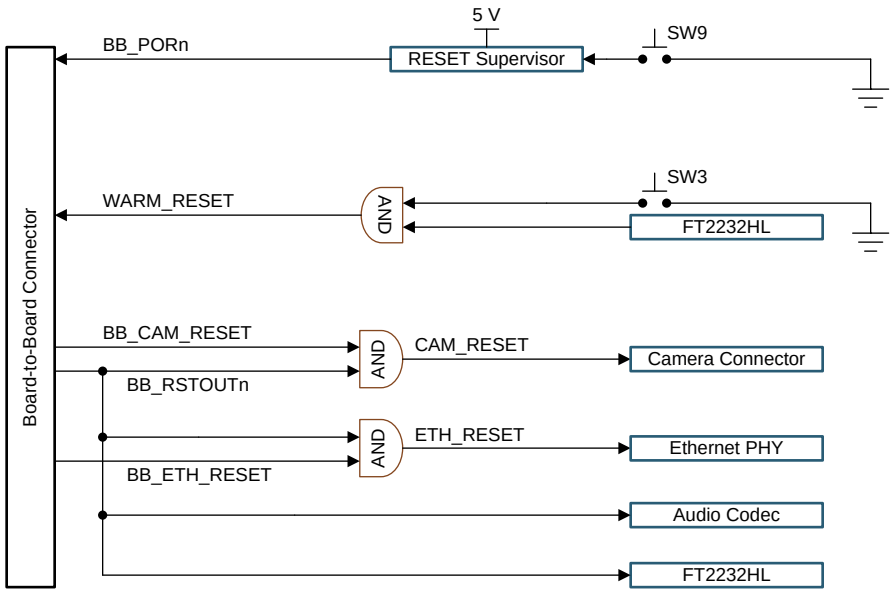
The board reset circuit and distribution is shown in Figure 7-3.

The DMx processor is reset either from SW9 (power on-reset), from SW3 (warm reset), or from system reset (FT2232HL).

The DMx processor provides reset out to the camera, Ethernet PHY, audio codec, and FT2232HL. The camera module is reset from an AND operation of reset out from the DMx processor and camera reset GPIO. The Ethernet PHY is reset from an AND operation of reset out from the DMx processor and an Ethernet reset GPIO.

Refer to Table 3-2 to configure the GPIOs for camera and ethernet reset functionality.

Figure 7-3. Reset Circuit and Distribution



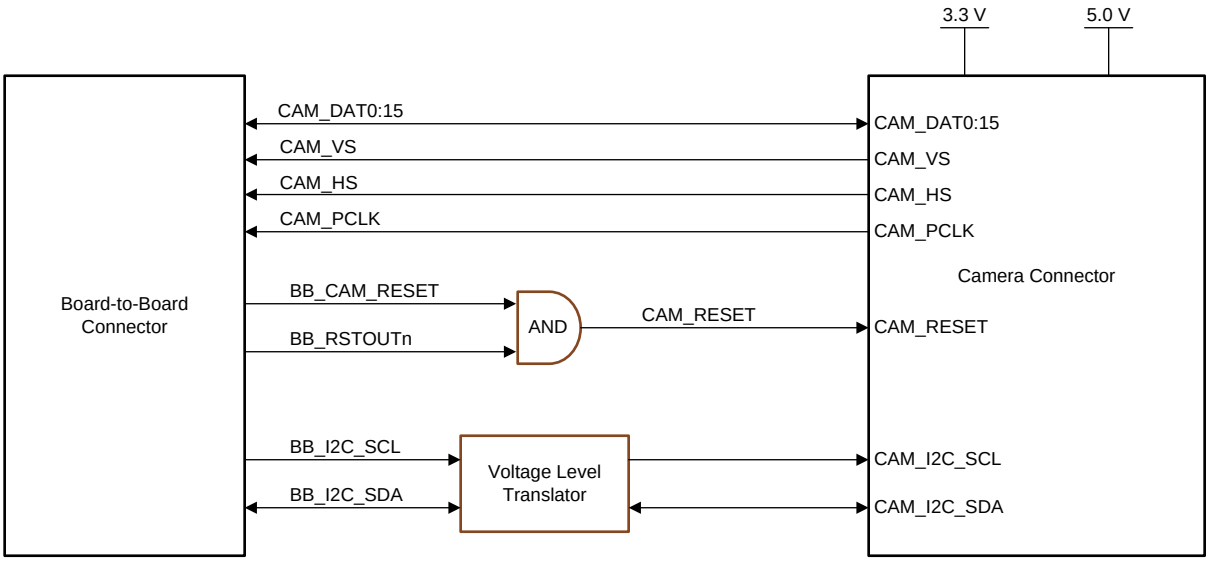
7.4 Camera Interface

The CSK carrier card supports a parallel camera interface, as shown in Figure 7-4. The Leopard Imaging camera module LI-CAM-AR0331-324-1.8 interfaces with the CSK carrier card with a standard 36-pin ZIP connector. The LI-CAM-AR0331-324-1.8 is a high-resolution wide dynamic range digital camera module.

The module incorporates an Aptina 1/3- inch 3.1M CMOS WDR digital image sensor AR0331, with an active imaging pixel array of 2052H × 1536V. The LI-CAM-AR0331 WDR camera module produces extraordinarily clear, sharp digital pictures, and is capable of capturing both continuous video and single frame, which makes it ideal for the surveillance industry with high dynamic range video. The module supports 1080p at 30 fps H.264 streaming on the TI DM385 IPNC platform.

The CSK carrier card also supports the 3.3-V and 1.8-V I^2C and RESET camera modules.

Figure 7-4. Camera Interface

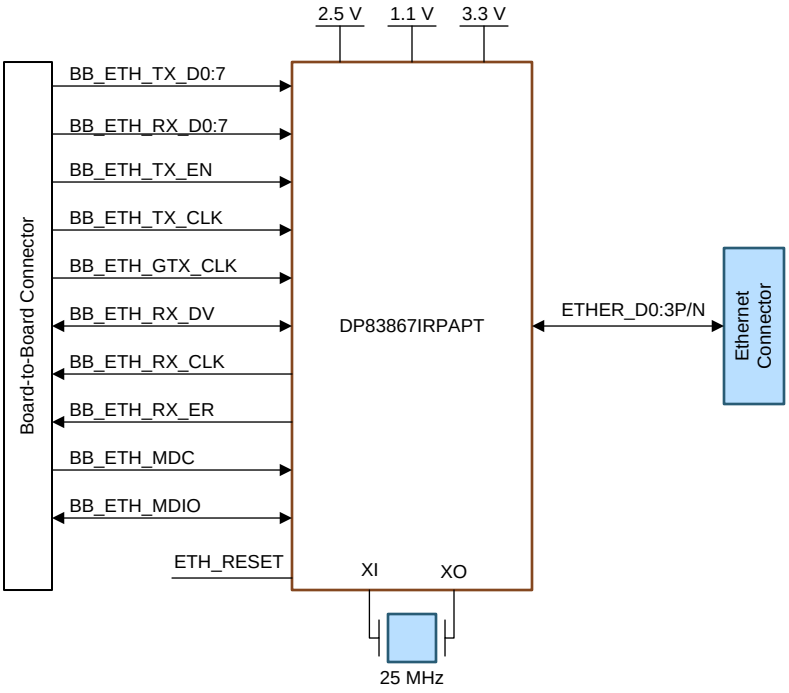


7.5 Ethernet Interface

The CSK carrier card supports GMII and MII interfaces, as shown in Figure 7-5. The DP83867 is a robust, low-power, fully featured physical layer transceiver with integrated PMD sublayers to support 10BASE-Te, 100BASE-TX, and 1000BASE-T Ethernet protocols. Optimized for ESD protection, the DP83867 exceeds 8-kV IEC 61000-4-2 (direct contact). This device interfaces directly to the MAC layer through the IEEE 802.3 standard media independent interface (MII), the IEEE 802.3 gigabit media independent interface (GMII), or reduced GMII (RGMII).

The DP83867 Ethernet PHY can be configured for GMII (TMDSCSK388 and TMDSCSK8127) and MII (TMDSCSK369) through register configuration. The PHY address of DP83867 is 0x19(h).

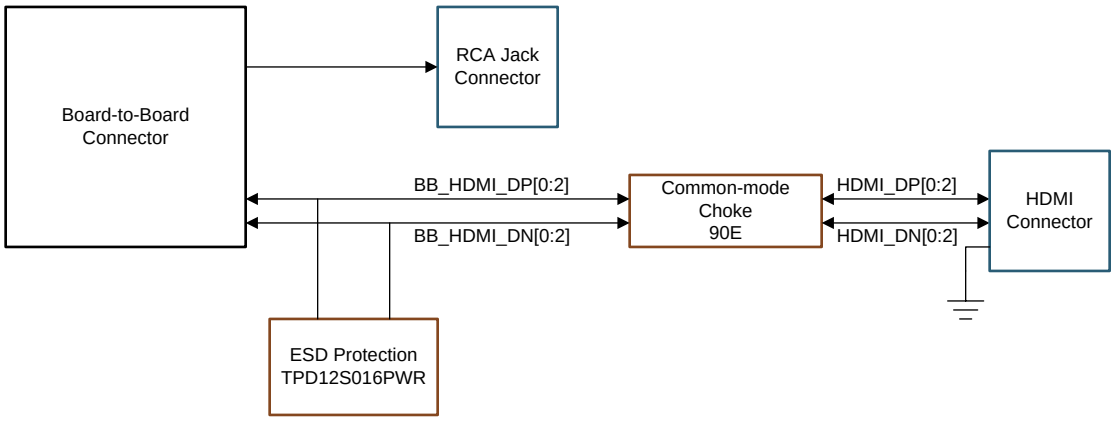
Figure 7-5. Ethernet Interface



7.6 HDMI and TVOUT Interface

The CSK carrier card supports an HDMI interface, as shown in Figure 7-6.

Figure 7-6. HDMI and TVOUT Interface

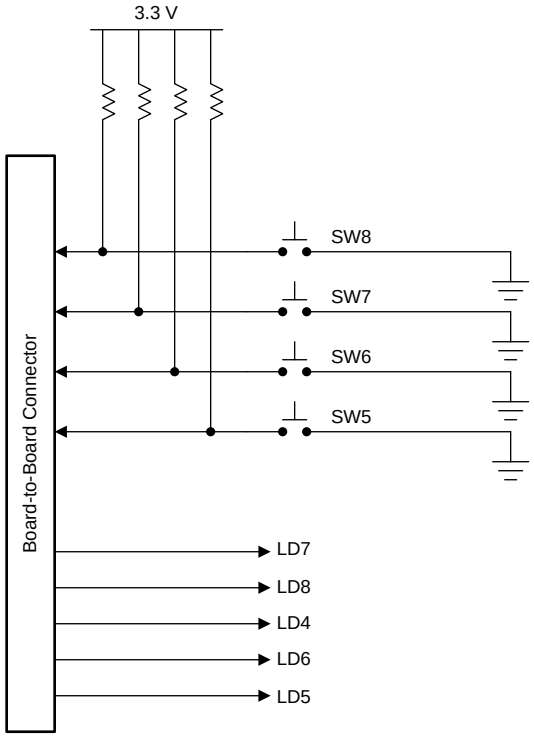


NOTE: The TMDSCSK369 processor module does not support the HDMI interface. Only the TMDSCSK8127 and TMDSCSK388 processor modules support the HDMI interface.

7.7 LED and Switch Interface

Four push-buttons and five green color LEDs are provided for user input and status, as shown in Figure 7-7.

Figure 7-7. Switch and LED Connection



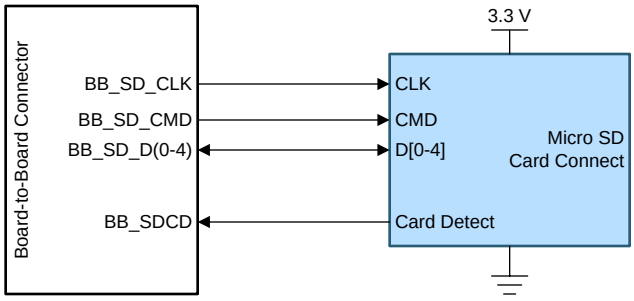
Refer to Table 3-2 to configure GPIOs for switch and LED functionality.

7.8 Micro SD Card Interface

The micro SD card connector is connected to the SD interface of the board-to-board connector, as shown in Figure 7-8.

The card detect pin from the SD card connector is connected to GPIO, to ensure the presence of the SD card.

Figure 7-8. Micro SD Card Interface



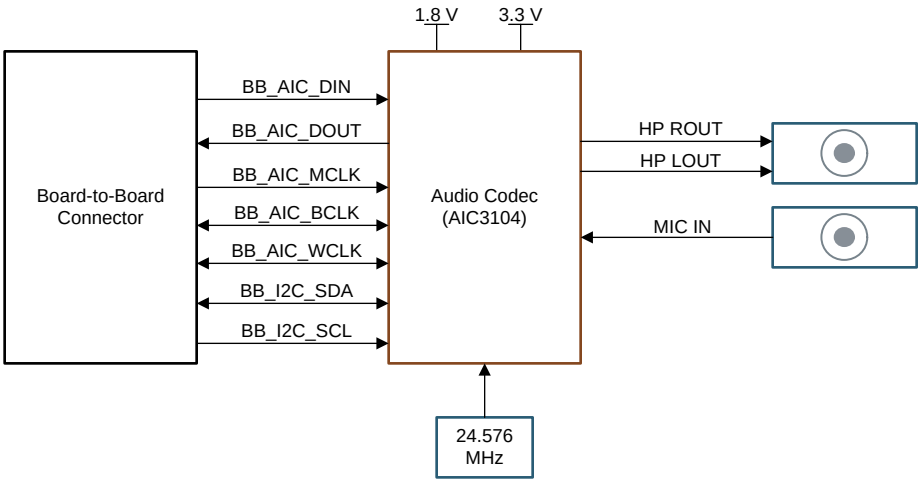
Refer to Section 7.13 for SD-Card connection details, and Table 3-2 to configure GPIO for SD card detect.

7.9 Audio Codec Interface

The audio codec TLV320AIC3104 is a flexible, low-power, low-voltage, stereo audio codec with programmable input and outputs, PowerTune™ capabilities, fixed predefined and parameterizable signal processing blocks, integrated PLL, and flexible digital interfaces.

This audio codec is interfaced to the I2S2 port and the I^2C of the TMS320DMx processor modules. The codec supports both McASP and McBSP configurations. A 24.576-MHz optional oscillator is provided for master clock generation. The audio line in and line out is provided through 3.5-mm audio jacks, as shown in Figure 7-9.

Figure 7-9. Audio Codec Interface



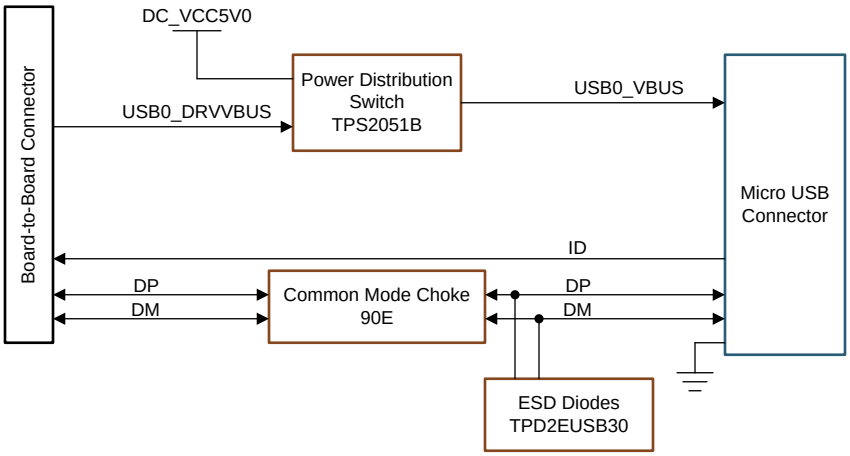
7.10 USB Interface

The TMS320DMx processor module supports a USB host and device controller, which provides a low-cost connectivity solution for consumer portable devices by providing a mechanism for data transfer to a USB host up to 480 Mbps. The USB controller complies with the USB 2.0 standard high-speed and full-speed functions.

The CSK carrier card USB signals are terminated at the micro USB B-type connector (J12), as shown in Figure 7-10. ESD diodes are provided for the USB signals. A USB ID pin on the connector is connected to a USB ID pin of the TMS320DMx processors for host and device configuration.

The drive bus signal (USB0_DRVVBUS) from the TMS320DMx processor controls the power distribution switch (TPS2051B), which supplies VBUS (+5 V) from the CSK carrier card to the USB device connected on the micro USB connector. By default, the power distribution switch is disabled (pulled low). The DMx processor should drive the USB0_DRVVBUS signal high to enable the power distribution switch. The TPS2051B supports a maximum current of 500 mA at 5 V from the CSK carrier card.

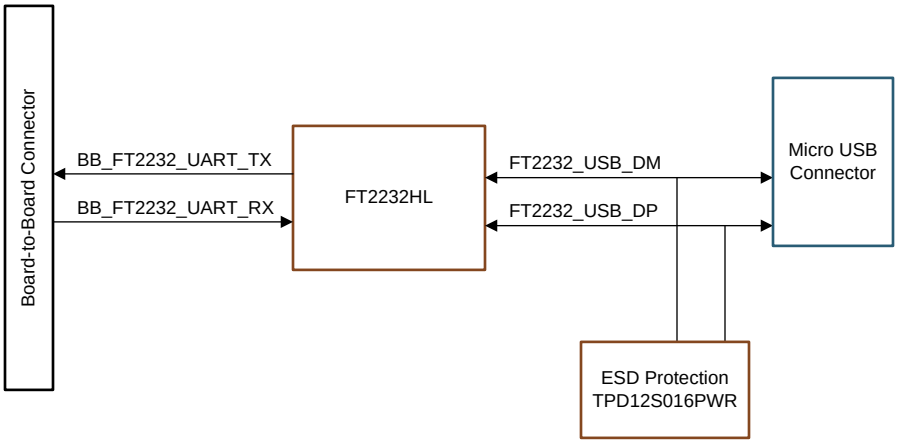
Figure 7-10. USB Interface



7.11 UART Interface

The UART interface of the board-to-board connector is connected to the FT2232 chip (for UART-to-USB functionality), as shown in Figure 7-11.

Figure 7-11. UART Interface

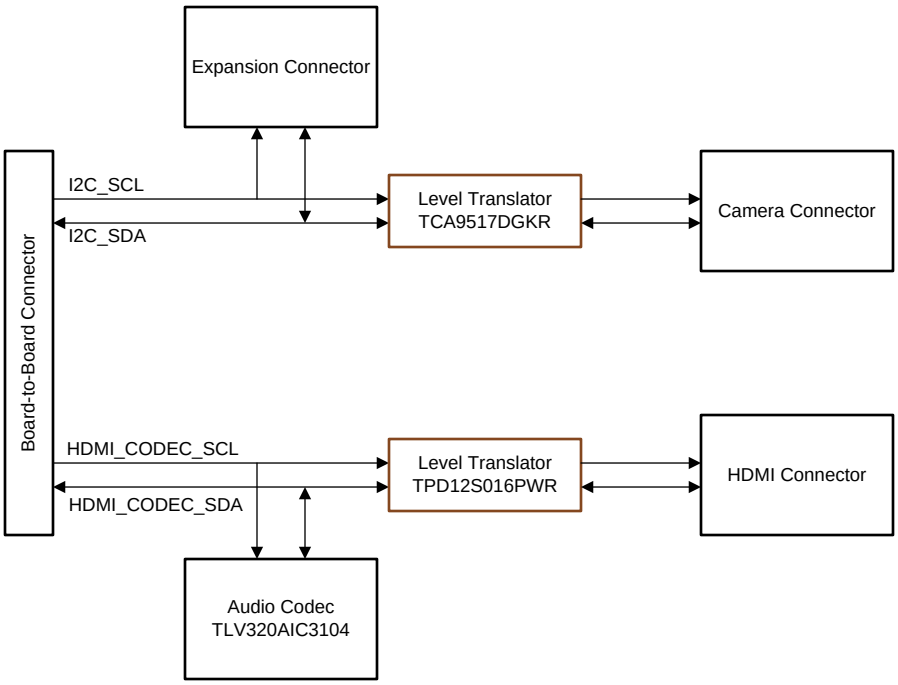


7.12 I²C Interface

The CSK carrier card supports a I²C interface connected to the expansion connector and the camera connector using a level translator (TCA9517DGKR) and the board-to-board connector, as shown in Figure 7-12.

Another I²C interface from the board-to-board connector is connected to the audio codec and HDMI connector from the level translator (TPD12S016PWR).

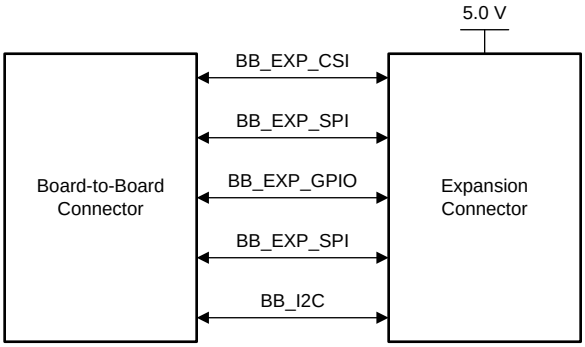
Figure 7-12. I²C Interface



7.13 Connection Between Expansion Connector and CSK Carrier Card

The CSK carrier card supports CSI, SPI, I^2C, UART, and GPIO interfaces, which are connected to the expansion connector from the board-to-board connector, as shown in Figure 7-13.

Figure 7-13. Expansion Connector Interface



NOTE: The TMDSCSK369 processor module does not support the CSI and UART interfaces mentioned in Figure 7-13. Only the TMDSCSK8127 and TMDSCSK388 processor modules support the CSI and UART interfaces from the board-to-board connector to the expansion connector.

CSK Carrier Board Physical Specifications

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8.2 Connector Index **67**
8.3 Push Buttons **76**
8.4 Test Points **76**
8.5 System LEDs **77**

8.1 Board Layout

The CSK carrier card dimension is 4.4" × 4.724" (116 mm × 37.94 mm). The card is a 6-layer board and powered through connector J1, as shown in Figure 8-1 and Figure 8-2.

Figure 8-1. CSK Carrier Card Assembly Layout (Top)

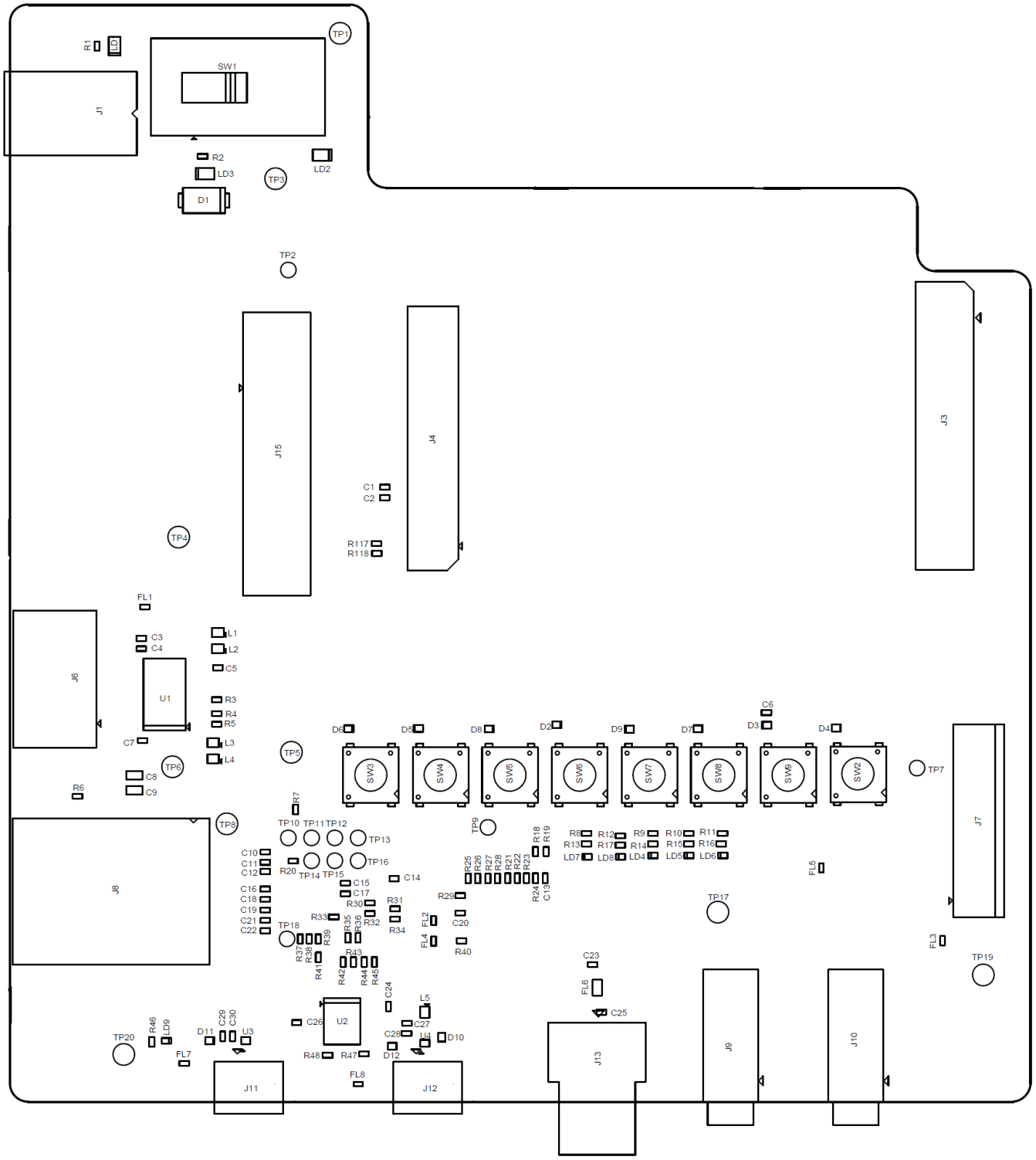
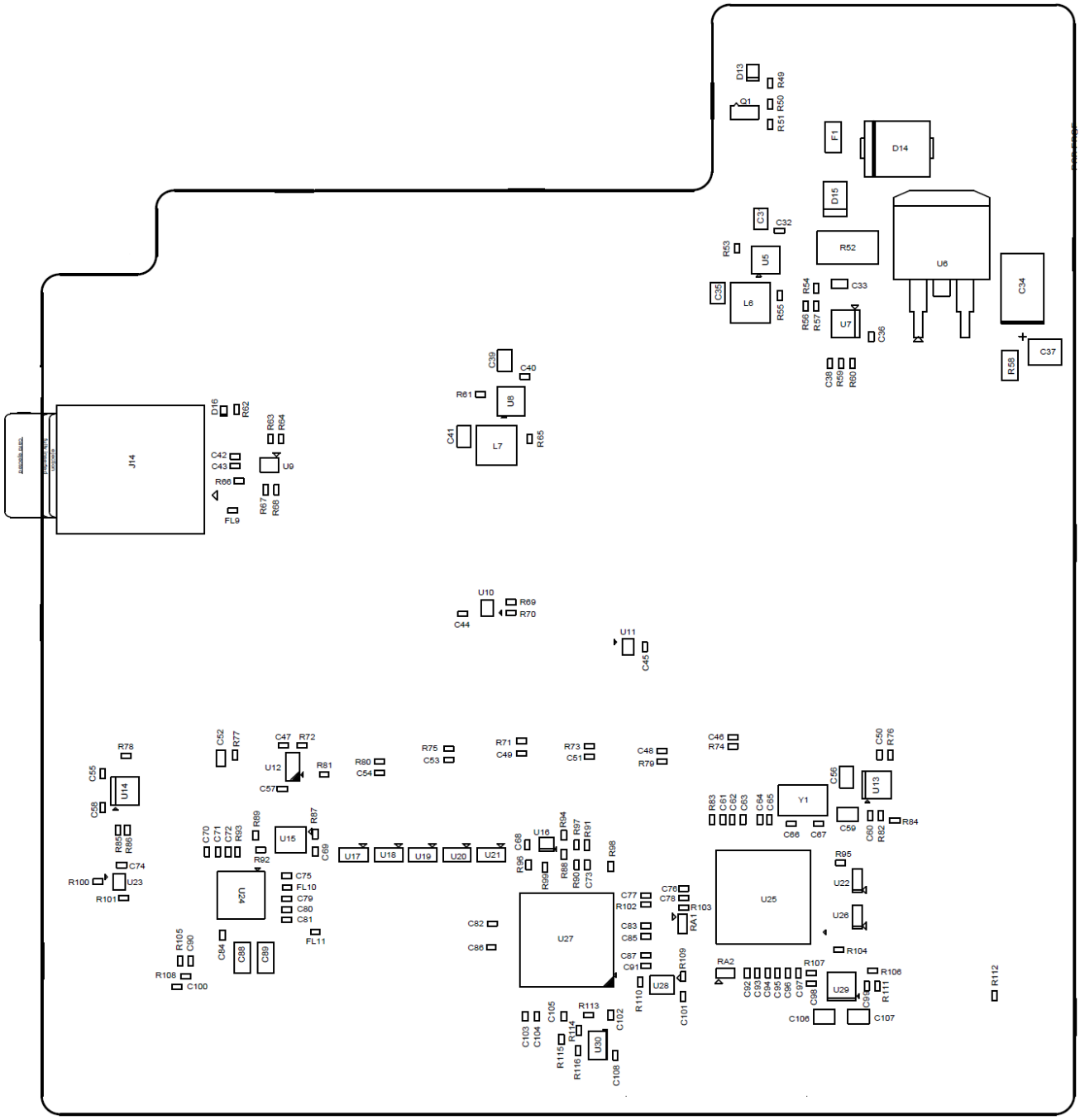


Figure 8-2. CSK Carrier Card Assembly Layout (Bottom)



8.2 Connector Index

The CSK carrier card has several connectors to provide access to various interfaces on the board, as listed in Table 8-1. Figure 8-3 and Table 8-1 show the connectors on the card.

Table 8-1. CSK Carrier Card Connectors

Connector	Part Number	Pins	Function
J1	RAPC722X	3	DC Power Jack
J3	FX11LA-80S/8-SV(71)	88	Board-to-board connector
J4	FX11LA-80P/8-SV(71)	88	Board-to-board connector
J15	QSH-030-01-L-D-A	64	Expansion connector
J6	10029449-001RLF	23	HDMI out type-A connector
J7	FH12A-36S-0.5SH(55)	36	Camera FPC connector
J8	LPJG16314A4NL	16	RJ45 connector
J9	STX-3500-4NTR	4	Stereo lock
J10			
J11	ZX62-AB-5PA(31)	5	Micro USB connector
J12			
J13	RCJ-014	4	Composite video out RCA connector
J14	DM3AT-SF-PEJM5	14	Micro SD card connector

Figure 8-3. Connectors on the CSK Carrier Card (Top)

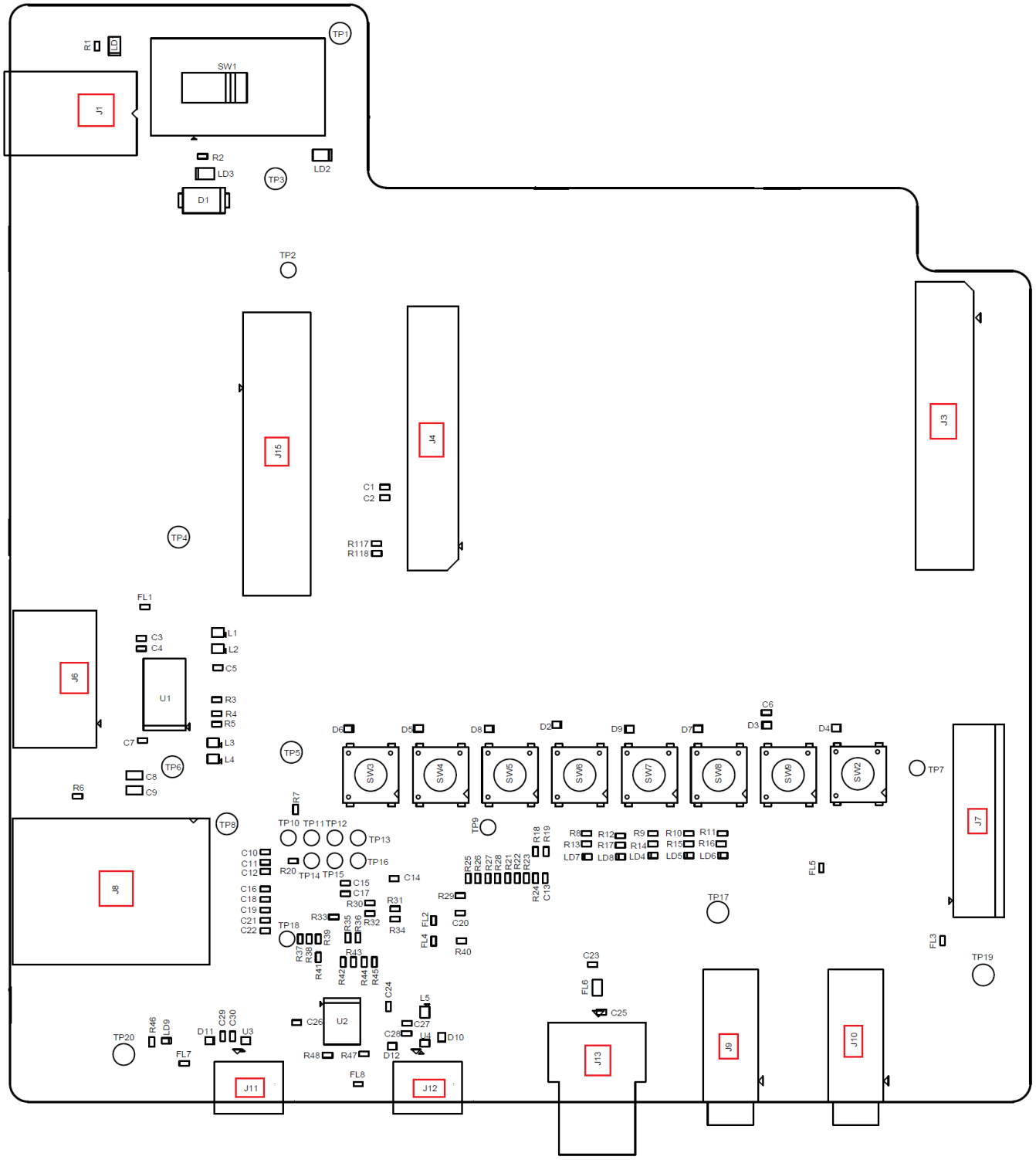


Figure 8-4. Connectors on the CSK Carrier Card (Bottom)

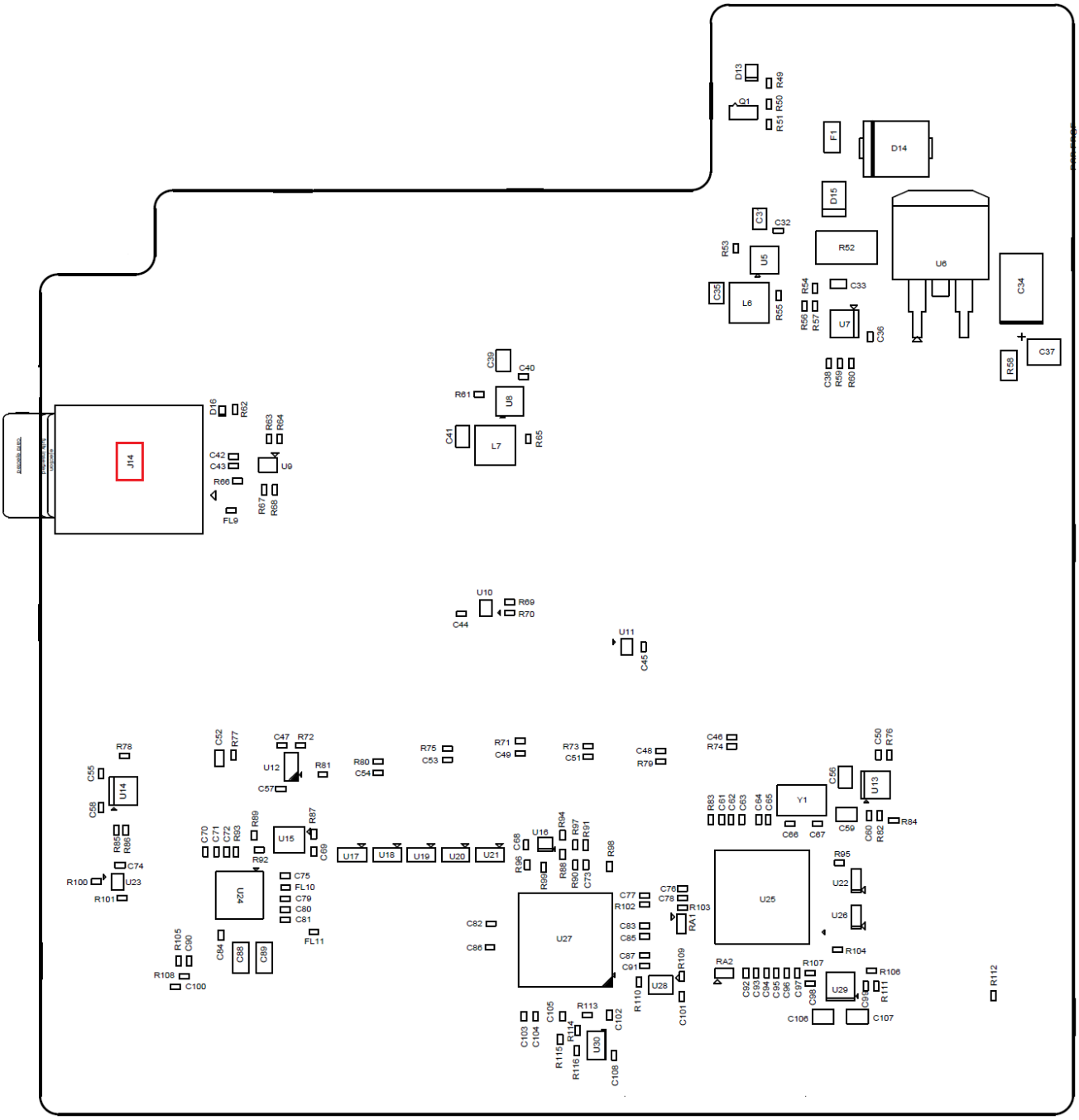


Table 8-2 through Table 8-13 show the pins and descriptions for each connector.

Table 8-2. DC Power Jack (J1)

Pin Number	Pin Description
1	+5 V
2	GND
3	GND

Table 8-3. Board-to-Board Connector (J3)

Pin Number	Pin Description in CC	Pin Number	Pin Description in CC
1	BB_CAM_DAT0	45	NC
2	BB_HDMI_CLKN	46	BB_FT2232_TDO
3	BB_CAM_DAT1	47	BB_CAM_RESET
4	BB_HDMI_CLKP	48	BB_WARM_RESET
5	BB_CAM_DAT2	49	NC
6	DGND	50	BB_RSTOUTn
7	BB_CAM_DAT3	51	NC
8	BB_HDMI_D0N	52	BB_LED5
9	BB_CAM_DAT4	53	BB_TVOUT0
10	BB_HDMI_D0P	54	BB_PORn
11	DGND	55	DGND
12	DGND	56	DGND
13	BB_CAM_DAT5	57	NC
14	BB_HDMI_D1N	58	BB_USB0_VBUSIN
15	BB_CAM_DAT6	59	NC
16	BB_HDMI_D1P	60	BB_USB0_ID
17	BB_CAM_DAT7	61	NC
18	DGND	62	BB_USB0_DM
19	BB_CAM_DAT8	63	NC
20	BB_HDMI_D2N	64	BB_USB0_DP
21	BB_CAM_DAT9	65	NC
22	BB_HDMI_D2P	66	BB_USB0_DRVVBUS
23	BB_CAM_DAT10	67	DGND
24	DGND	68	BB_EXP_SPI_SCLK
25	BB_CAM_DAT11	69	BB_FT2232_UART_RX
26	BB_EXP_UART_TXD	70	BB_EXP_SPI_SCS
27	BB_CAM_DAT12	71	BB_FT2232_UART_TX
28	BB_EXP_UART_RXD	72	BB_EXP_SPI_D0
29	BB_CAM_DAT13	73	BB_OSC_WAKEUP
30	BB_EMU0	74	BB_EXP_SPI_D1
31	BB_CAM_DAT14	75	BB_SDCD
32	BB_EMU1	76	BB_SD0_DAT3
33	DGND	77	DGND
34	DGND	78	DGND
35	BB_CAM_DAT15	79	BB_AIC_MCLK
36	BB_FT2232_TMS	80	BB_SD0_CLK
37	BB_CAM_HS	81	BB_AIC_BCLK
38	BB_FT2232_TCK	82	BB_SD0_CMD
39	BB_CAM_VS	83	BB_AIC_WCLK

Table 8-3. Board-to-Board Connector (J3) (continued)

Pin Number	Pin Description in CC	Pin Number	Pin Description in CC
40	BB_FT2232_RTCK	84	BB_SD0_DAT0
41	NC	85	BB_AIC_DIN
42	BB_FT2232_TRSTN	86	BB_SD0_DAT1
43	BB_CAM_PCLK	87	BB_AIC_DOUT
44	BB_FT2232_TDI	88	BB_SD0_DAT2

Table 8-4. Board-to-Board Connector (J4)

Pin Number	Pin Description in CC	Pin Number	Pin Description in CC
1	BB_ETH_TX_D7	45	DGND
2	BB_I2C_SCL	46	BB_EXP_CSI_DY1
3	BB_ETH_TX_D6	47	BB_ETH_RX_D0
4	BB_I2C_SDA	48	DGND
5	BB_ETH_TX_D5	49	BB_ETH_RX_D1
6	BB_HDMI_CEC	50	BB_EXP_CSI_DX2
7	BB_ETH_TX_D4	51	BB_ETH_RX_D2
8	BB_HDMI_HPDET	52	BB_EXP_CSI_DY2
9	BB_ETH_TX_D3	53	BB_ETH_RX_D3
10	BB_PMIC_POR	54	BB_ETH_COL
11	DGND	55	DGND
12	DGND	56	DGND
13	BB_ETH_TX_D2	57	BB_ETH_RX_D4
14	BB_ETH_CS	58	BB_EXP_CSI_DX3
15	BB_ETH_TX_D1	59	BB_ETH_RX_D5
16	VCC_3V3	60	BB_EXP_CSI_DY3
17	BB_ETH_TX_D0	61	BB_ETH_RX_D6
18	VCC_3V3	62	DGND
19	BB_ETH_TX_CLK	63	BB_ETH_RX_D7
20	VCC_3V3	64	BB_EXP_CSI_DX4
21	BB_EXP_GP0[30]	65	DGND
22	VCC_CAM	66	BB_EXP_CSI_DY4
23	DGND	67	BB_LED1
24	VCC_1V8	68	BB_uPIO_PWR_EN
25	BB_ETH_GTX_CLK	69	BB_LED2
26	NC	70	BB_SWITCH1
27	BB_ETH_TX_EN	71	BB_LED3
28	DGND	72	BB_SWITCH2
29	BB_HDMI_CODEC_SCL	73	BB_LED4
30	BB_EXP_GP1[26]	74	BB_EXP_GP0[31]
31	BB_HDMI_CODEC_SDA	75	BB_SWITCH3
32	BB_EXP_GP0[29]	76	PMIC_3V3
33	DGND	77	DGND
34	DGND	78	DGND
35	BB_ETH_MDC	79	BB_SWITCH4
36	BB_EXP_GP1[25]	80	PMIC_3V3
37	BB_ETH_MDIO	81	BB_ETH_RESET
38	BB_EXP_CSI_DX0	82	PMIC_3V3

Table 8-4. Board-to-Board Connector (J4) (continued)

Pin Number	Pin Description in CC	Pin Number	Pin Description in CC
39	BB_ETH_RX_CLK	83	DC_VCC5V0
40	BB_EXP_CSI_DY0	84	PMIC_3V3
41	BB_ETH_RX_DV	85	DC_VCC5V0
42	DGND	86	PMIC_3V3
43	BB_ETH_RX_ER	87	DC_VCC5V0
44	BB_EXP_CSI_DX1	88	PMIC_3V3

Table 8-5. Expansion Connector (J15)

Pin Number	Pin Description	Pin Number	Pin Description
1	DC_VCC5V0	33	NC
2	DC_VCC5V0	34	BB_EXP_CSI_DX4
3	DC_VCC5V0	35	NC
4	NC	36	DGND
5	NC	37	NC
6	NC	38	BB_EXP_CSI_DY3
7	BB_EXP_SPI_SCS	39	NC
8	NC	40	BB_EXP_CSI_DX3
9	BB_EXP_SPI_SCLK	41	NC
10	BB_EXP_GP1[25]	42	DGND
11	BB_EXP_SPI_D0	43	NC
12	BB_EXP_SPI_D1	44	BB_EXP_CSI_DY2
13	BB_EXP_GP0[30]	45	NC
14	BB_EXP_GP1[26]	46	BB_EXP_CSI_DX2
15	NC	47	NC
16	BB_EXP_GP0[29]	48	DGND
17	NC	49	NC
18	DGND	50	BB_EXP_CSI_DY1
19	NC	51	BB_I2C_SDA
20	NC	52	BB_EXP_CSI_DX1
21	NC	53	BB_I2C_SCL
22	NC	54	DGND
23	NC	55	BB_EXP_UART_TXD
24	DGND	56	BB_EXP_CSI_DY0
25	NC	57	BB_EXP_UART_RXD
26	NC	58	BB_EXP_CSI_DX0
27	NC	59	BB_EXP_GP0[31]
28	NC	60	DGND
29	NC	61	DGND
30	DGND	62	DGND
31	NC	63	DGND
32	BB_EXP_CSI_DY4	64	DGND

NOTE: The TMDSCSK369 processor module does not support the CSI interface. Only the TMDSCSK8127 and TMDSCSK388 processor modules support the CSI interface.

Table 8-6. HDMI OUT Type A Connector (J6)

Pin Number	Pin Description	Pin Number	Pin Description
1	FLT_HDMI_D2P	13	CE_REMOTE_OUT
2	DGND	14	NC
3	FLT_HDMI_D2N	15	DDC_CLK
4	FLT_HDMI_D1P	16	DDC_DAT
5	DGND	17	DGND
6	FLT_HDMI_D1N	18	5V_OUT_HDMI
7	FLT_HDMI_D0P	19	HDMI_HP_OUT
8	DGND	20	Shield GND
9	FLT_HDMI_D0N	21	Shield GND
10	FLT_HDMI_D0N	22	Shield GND
11	DGND	23	Shield GND
12	FLT_HDMI_CLKN		

NOTE: The TMDSCSK369 processor module does not support the HDMI interface. Only the TMDSCSK8127 and TMDSCSK388 processor modules support the HDMI interface.

Table 8-7. Camera FPC Connector (J7)

Pin Number	Pin Description	Pin Number	Pin Description
1	BB_CAM_DAT15	19	BB_CAM_DAT8
2	BB_CAM_DAT14	20	BB_CAM_DAT9
3	NC	21	BB_CAM_DAT10
4	CAM_RESET	22	BB_CAM_DAT11
5	NC	23	BB_CAM_DAT12
6	NC	24	BB_CAM_DAT13
7	CAM_I2C_SDA	25	BB_CAM_HS
8	CAM_I2C_SCL	26	BB_CAM_VS
9	BB_CAM_DAT0	27	DGND
10	BB_CAM_DAT1	28	BB_CAM_PCLK
11	DGND	29	DGND
12	DGND	30	TP7
13	BB_CAM_DAT2	31	DGND
14	BB_CAM_DAT3	32	DC_VCC5V0
15	BB_CAM_DAT4	33	DC_VCC5V0
16	BB_CAM_DAT5	34	VCC_3V3
17	BB_CAM_DAT6	35	VCC_3V3
18	BB_CAM_DAT7	36	VCC_3V3

Table 8-8. RJ45 Connector (J8)

Pin Number	Pin Description
1	DGND
2	NC
3	ETHER0_D3P
4	ETHER0_D3N
5	ETHER0_D2P
6	ETHER0_D2N
7	ETHER0_D1P
8	ETHER0_D1N
9	ETHER0_D0P
10	ETHER0_D0N
11	RIGHT LED
12	RIGHT LED
13	LEFT LED
14	LEFT LED
15	SHIELD GND
16	SHIELD GND

The CSK carrier card has two 3.5-mm female stereo jacks connected to the AIC3104 audio codec:

- HP OUT – For connecting to headphones
- MIC IN – For connecting to MIC input

Table 8-9. HP OUT

Pin Number	Description
1	GND
2	LEFT_OUT
3	RIGHT_OUT
4	NC

Table 8-10. MIC IN

Pin Number	Description
1	GND
2	LEFT_OUT
3	RIGHT_OUT
4	NC

The CSK carrier card has two micro USB connectors with the pin outs listed in Table 8-11. The J11 micro USB connector provides access to the XDS100V2 onboard emulator. The DMx USB host and device port is available over the J12 USB connector.

Table 8-11. Micro USB Connector (J11, J12)

Pin Number	Description
1	VDD
2	D-
3	D+
4	ID
5	GND
6	USB0_GND
7	USB0_GND
8	USB0_GND
9	USB0_GND

Table 8-12. Composite Video OUT RCA Connector (J13)

Pin Number	Pin Description
1	Video OUT
2	DGND
3	DGND
4	DGND

The micro SD card holder is located on the bottom side of the board, and used to provide an interface to micro SD cards. The holder has 14 pins. The pinout detail is provided in Table 8-13.

Table 8-13. Micro SD Card Connector (J14)

Pin Number	Pin Description
1	DAT2
2	CD/DAT3
3	CMD
4	VDD
5	CLOCK
6	VSS
7	DAT0
8	DAT1
9	CD1
10	SDCD_GND
11	SDCD_GND
12	CD2
13	SDCD_GND
14	SDCD_GND

8.3 Push Buttons

The CSK carrier card has nine switches, four of which are for general purposes. Refer to Section 3.10 to configure switch functionality. Table 8-14 lists the functionality of each switch.

Table 8-14. CSK Carrier Card Switches

Button	Description
SW1	Power On/OFF switch
SW2	Oscillator wakeup
SW3	Warm reset
SW4	PMIC reset
SW5	General purpose
SW6	General purpose
SW7	General purpose
SW8	General purpose
SW9	Power on reset

8.4 Test Points

The CSK carrier card has 23 test points. Each test point and its function is given in Table 8-15.

Table 8-15. CSK Carrier Card Test Points

Test Point	Signal
TP1	DGND
TP5	
TP17	
TP19	
TP20	
TP2	PMIC 3V3 PGOOD
TP3	PMIC 3V3
TP4	VCC 3V3
TP6	VCCA_2V5
TP7	CAMERA CLOCKOUT
TP8	VCC_1V1
TP9	VCC_3V3 PGOOD
TP10	VDDA1P8
TP11	ETHERNET CLOCKOUT
TP12	ETHERNET JTAG TDO
TP13	ETHERNET JTAG TMS
TP14	ETHERNET_JTAG_RESET
TP15	ETHERNET_JTAG_TCLK
TP16	ETHERNET_JTAG_TDI
TP18	ETHERNET SPEED
TP21	VCC 5V0
TP22	VCC CAM
TP23	VCC 1V8

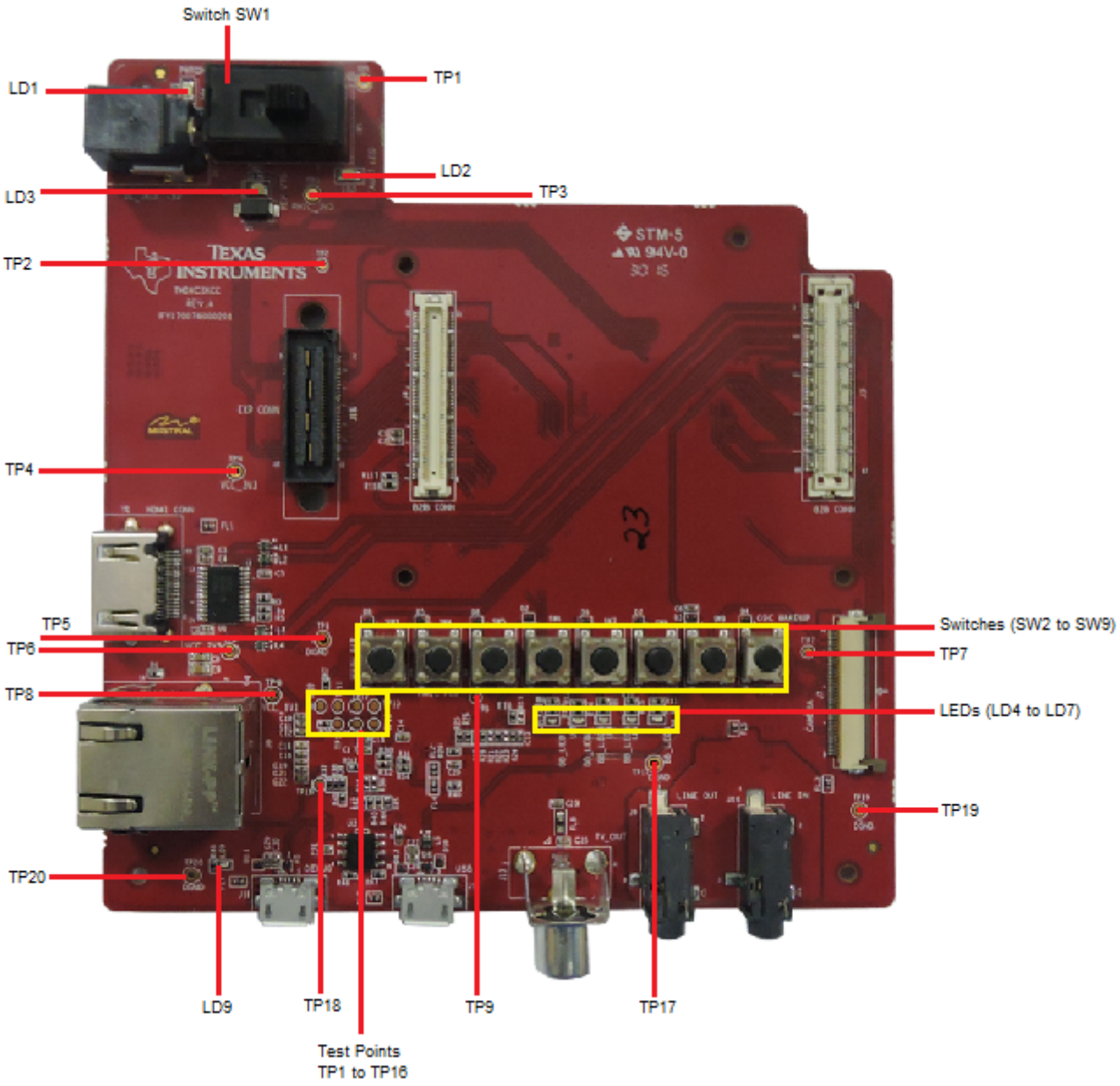
8.5 System LEDs

The CSK carrier card has three LEDs, listed in Table 8-16 and shown in Figure 8-5. Refer to Section 3.10 to configure LED functionality for LED1, LED2, and LED3.

Table 8-16. CSK Carrier Card LEDs

LED	Color	Description
LD1	Green	LED1
LD2		LED2
LD3		LED3
LD4		Board power LED
LD5		FT2232 power enable LED

Figure 8-5. Position of LEDs, Test Points, and Push Buttons



CSK Carrier Card Power Requirements

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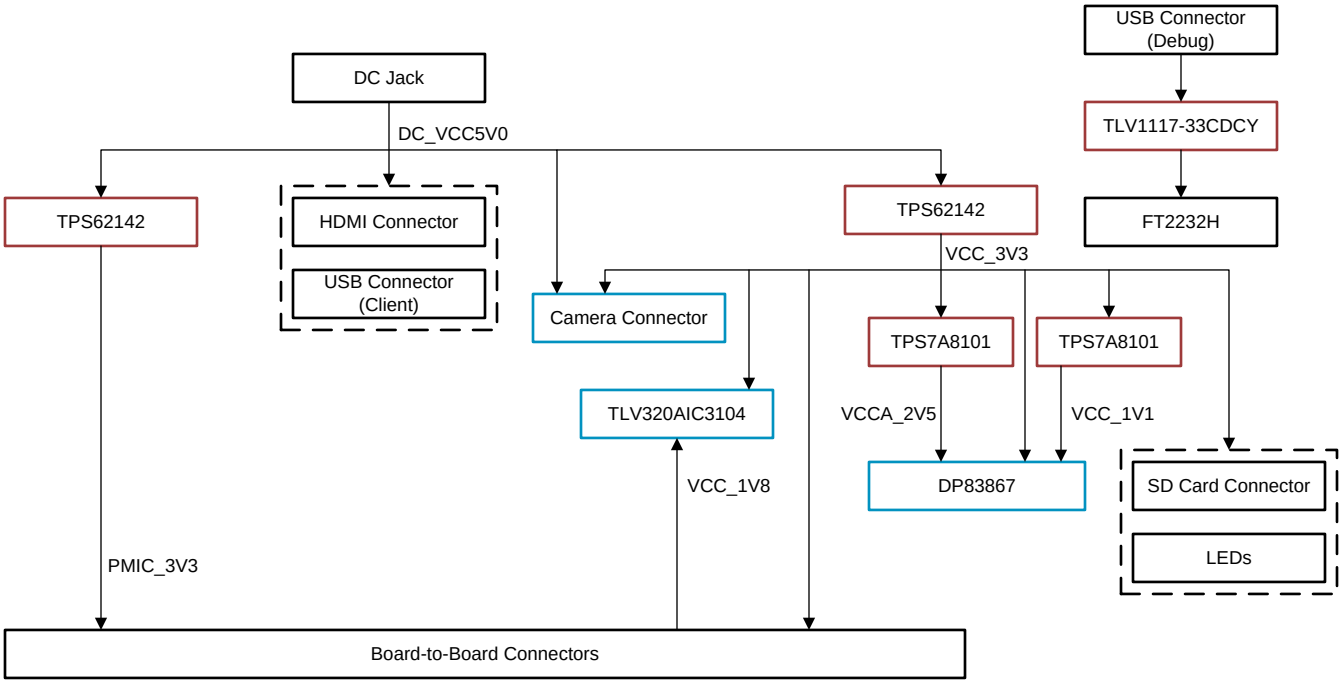
9.1 Power Distribution Diagram

Figure 9-1 shows the power distribution diagram.

Figure 9-1. Power Distribution



9.2 Power Supply Calculation

Table 9-1 provides the power supply calculation information.

Table 9-1. Power Supply Calculation

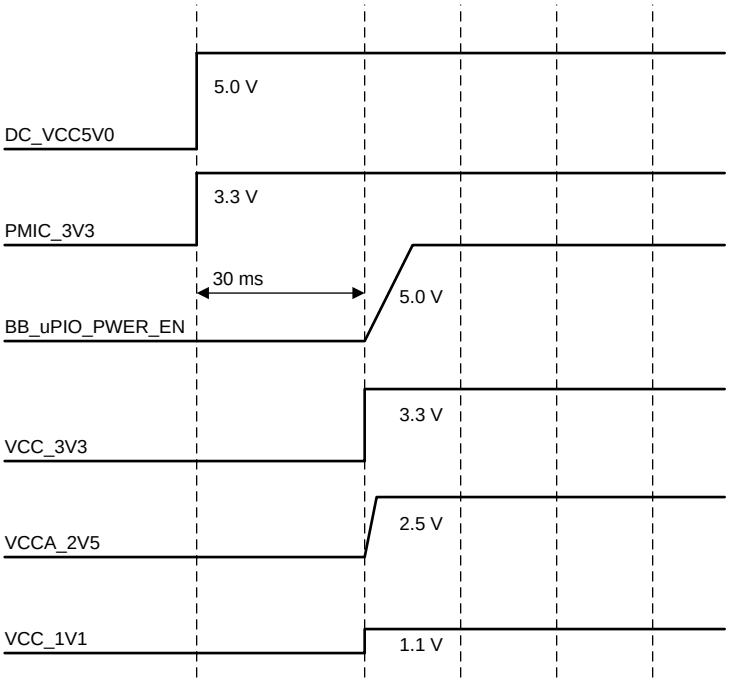
Input Supply (V)		5				PMIC3V3	VCC_3V3	
Regulatory Efficiency						0.9	0.86	
Input Voltage		**Board-to-Board Connect**	3.3	3.3	5	5	5	
Output Voltage		1.8	2.5	1.1		3.3	3.3	
Regulator Name		TPS6216DSGT	TPS7A8101	TPS7A8101		TPS62142RGTT (U5)	TPS62142RGTT (U8)	5-V DC IN
		Active	**Active**	**Active**		**Active**	**Active**	**Active**
Description	Part Number							
Ethernet PHY external regulator	TPS7A8101 (2.5 V)						141	108.2093023
	TPS7A8101 (1.1 V)						125	95.93023256
Audio codec	TLV320AIC3104	2.5					170	130.4651163
Camera module	LI-CAM-AR0331-324-1.8				800		300	–
Ethernet PHY	DP83867IRPAPT		141	125			22	16.88372093
Expansion connector (CSI camera)								0
Micro SD card							80	61.39534884
LED × 5							10	7.674418605
24.576-MHz oscillator							15	11.51162791
Current Consumption[1]						0	863	1232.069767
Power Consumption (mW)						0	2847.9	6160.348837
								5-V DC IN
		Active		TMDSCSK388				2210.73
Current Consumption on 5-V power input[1]		1232.069767		TMDSCSK8127				2660.863
Power Consumption on 5-V power input (mW)		6160.348837		TMDSCSK369				1052.032
USB Bus-Powered Devices							3.3	5
							TLV1117-33CDCY	5-V USB
USB to JTAG or UART	FT2232HL						130	130
EEPROM	AT93C46DY6-YH-T						2	2

(1) All current ratings are in mA.

9.3 Power-Up Sequence

Figure 9-2 shows the power sequencing.

Figure 9-2. Power Sequencing



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