NXP Semiconductors
User's Guide

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FRDM-K32L3A6 Freedom Development Board

1. Introduction

This guide describes the hardware for the FRDM-K32L3A6 Freedom Development Board. The FRDM-K32L3A6 freedom development board is a small, low-power, and cost-effective evaluation and development board for application prototyping and demonstration of the K32 L3 family of devices. These evaluation boards offer easy-to-use mass-storage-device mode flash programmer, a virtual serial port, and standard programming and run-control capabilities.

The K32L3A6 is an ultra-low power solution for embedded products requiring extended battery life.

Contents

2 Overview and description

The FRDM-K32L3A6 development board is an evaluation environment supporting NXP's K32L3A6 Microcontroller (MCU). The K32L3A6 integrates an ARM Cortex-M4 MCU and an ARM Cortex-M0+ MCU into a single package. NXP supports the K32L3A6 with tools and software that include hardware evaluation and development boards, software development IDE, applications, and drivers,. The FRDM-K32L3A6 development board consists of the K32L3A6 device with a 32-Mbit external serial flash, FXOS8700 Accelerometer/Magnetometer, visible light sensor, SDHC circuit, general purpose LEDs, and general purpose pushbuttons in the popular Freedom board form-factor. The board is a standalone PCB and supports application development with NXP's SDK software package.

2.1 Overview

Figure 1 is a high-level block diagram of the FRDM-K32L3A6 board features:

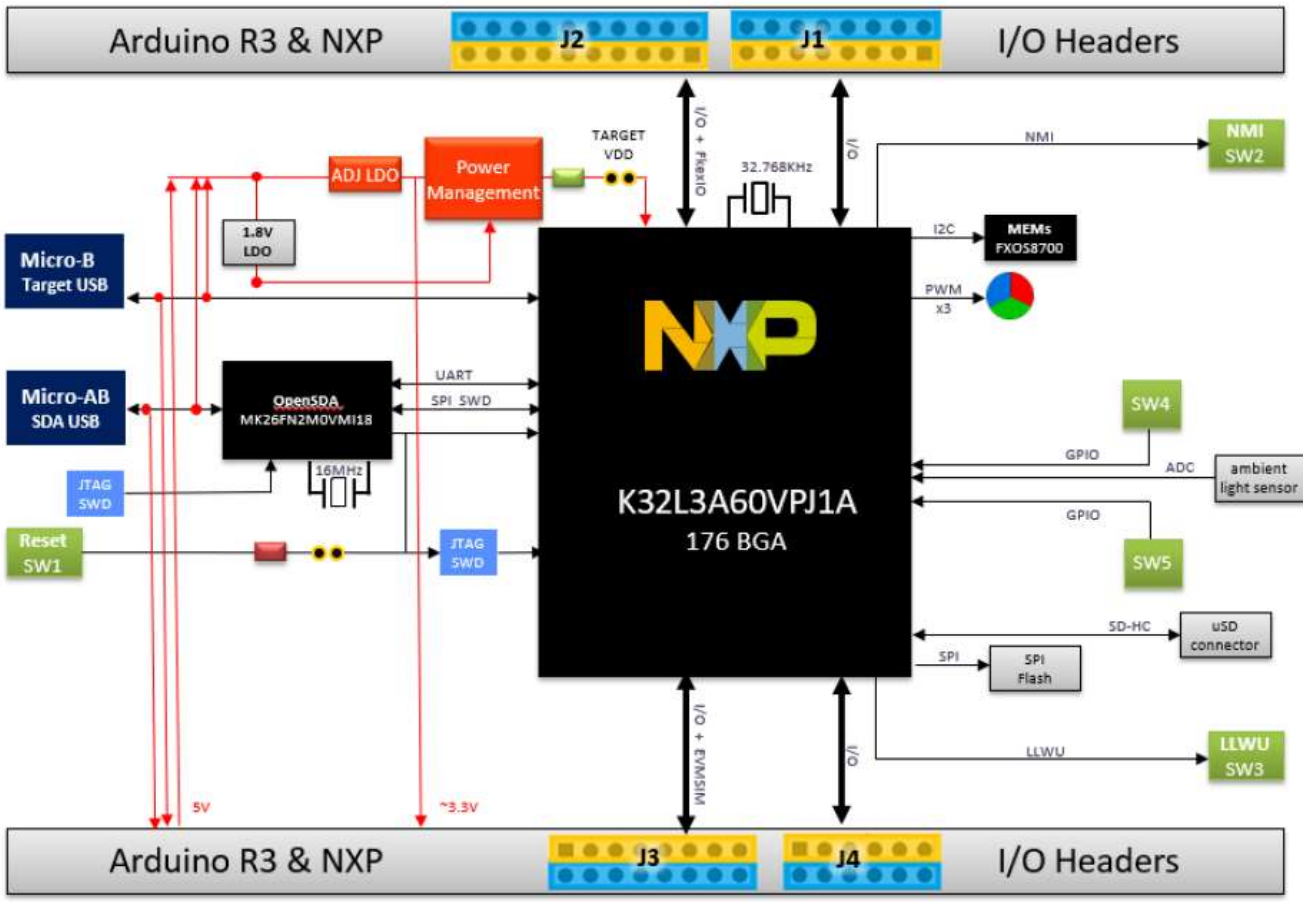

Figure 1. FRDM-K32L3A6 block diagram

2.2 Feature description

The FRDM-K32L3A6 development board is based on NXP Freedom development platform. It is the most diverse reference design containing the K32L3A6 device and all necessary I/O connections for use as a stand-alone board or connected to an application. Figure 2 shows the FRDM-K32L3A6 development board.

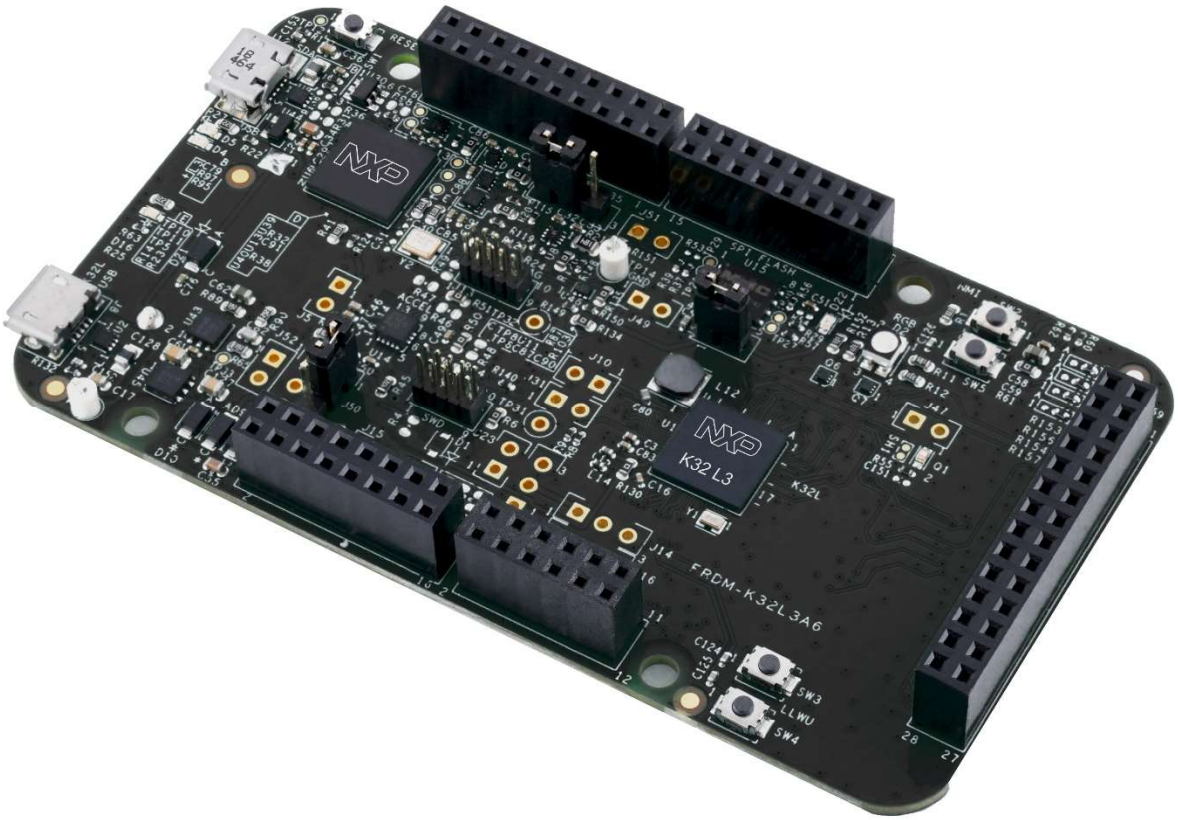

Figure 2. FRDM-K32L3A6 Freedom development board

The FRDM K32L3A6 development board has these features:

- NXP's ultra-low-power K32L3A6 Dual-core MCU
- Selectable power sources
- DC-DC converter with Buck and Bypass operation modes
- 32.768 kHz reference oscillator
- USB device mode interface with micro USB connector
- 32-Mbit (4 MB) external serial flash memory for
- NXP FXOS8700CQ Digital Sensor, 3D Accelerometer (±2g/±4g/±8g) + 3D Magnetometer
- Integrated Open-Standard Serial and Debug Adapter (OpenSDA)
- One RGB LED indicator

- One red LED status indicator
- One green LED power indicator
- One red LED reset indicator
- One amber LED OpenSDA activity indicator
- Four push-button switches

Figure 3 shows the main board features and Input/output headers for the FRDM-K32L3A6 board:

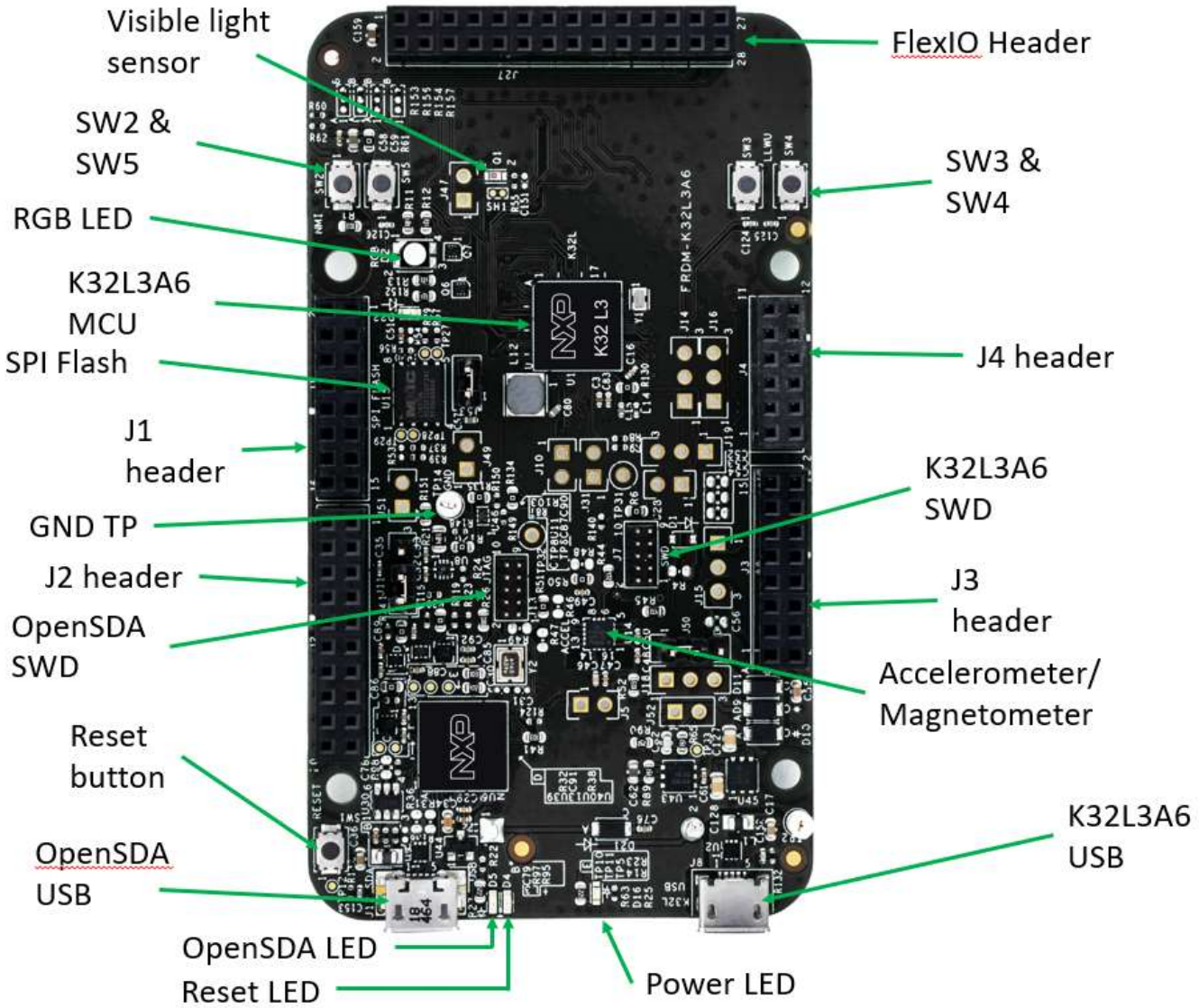

Figure 3. FRDM-K32L3A6 component placement

2.3 OpenSDA serial and debug

The FRDM-K32L3A6 development board includes OpenSDA v3.0-a serial and debug adapter circuit that includes an open-source hardware design, an open-source bootloader, and debug interface software. It bridges serial and debug communications between a USB host and an embedded target processor as shown in Figure 4. The hardware circuit is based on a NXP Kinetis K26 family MCU (MK26FN2M0VMI18) with 2 MB of embedded flash and an integrated USB controller. OpenSDAv3.0 comes preloaded with the DAPLink bootloader - an open-source mass storage device (MSD) bootloader and the Interface firmware, which provides an MSD flash programming interface, a virtual serial port interface, and a CMSIS-DAP debug protocol interface. For more information on the OpenSDAv3.0 software, see mbed.org, https://github.com/mbedmicro/DAPLink.

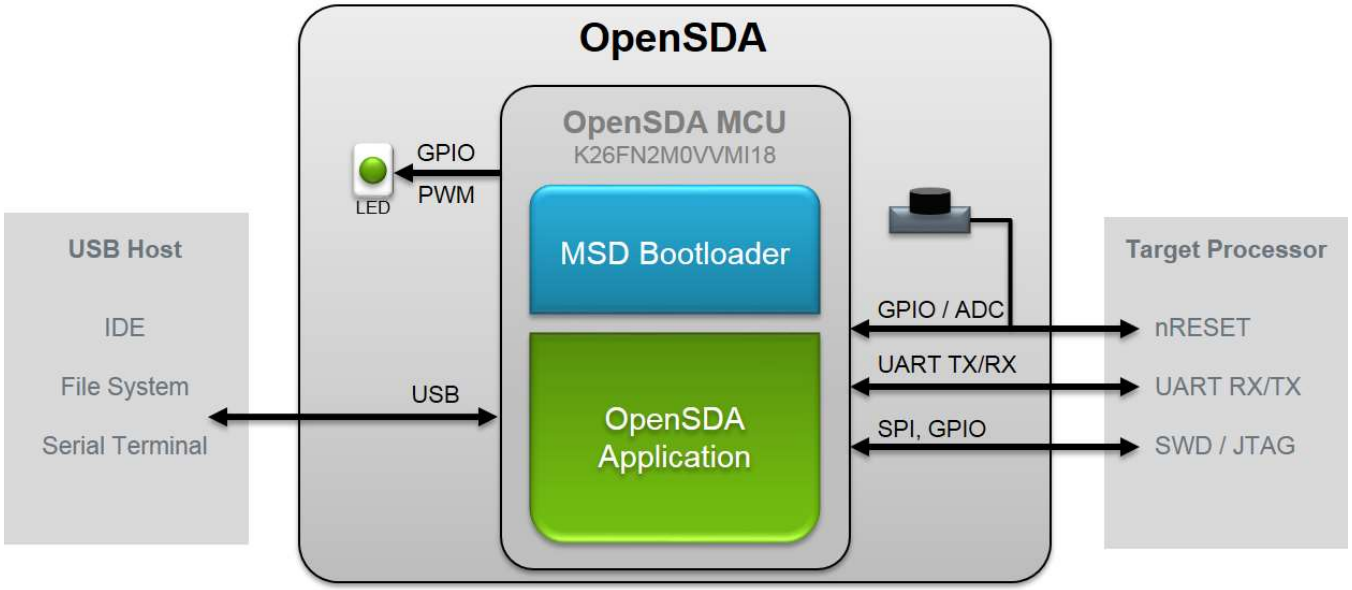

Figure 4. OpenSDAv3.0 high-level block diagram

OpenSDAv3.0 is managed by a Kinetis K26 MCU built on the ARM Cortex-M4 core. The OpenSDAv3.0 circuit includes a status LED (D4) and a pushbutton (SW1). The pushbutton asserts the Reset signal to the K32L3A6 target MCU. It can also be used to place the OpenSDAv3.0 circuit into bootloader mode. UART and GPIO signals provide an interface to either the SWD debug port or the K26. The OpenSDAv3.0 circuit receives power when the USB connector J12 is plugged into a USB host.

2.3.1 Virtual serial port

A serial port connection is available between the OpenSDAv3.0 MCU and pins PTC7 and PTC8 of the K32L3A6.

NOTE

To enable the Virtual COM features, a driver must be installed. Download the driver at https://developer.mbed.org/handbook/Windows-serial-configuration

3 Functional description

The six-layer board provides the K32L3A6 and power supply with a DC-DC Buck converter, and Bypass modes. The layout for this base-level functionality can be used as a reference layout for your target board.

3.1 Clocks

The FRDM-K32L3A6 board provides a 32.768 kHz to provide an accurate low power time base:

- 32.768 kHz Crystal Oscillator (for accurate low-power time base)
  - A 32.768 kHz crystal Y1 is provided
  - Internal load capacitors provide the entire crystal load capacitance
  - To measure the 32.768 kHz oscillator frequency, enable the RTC_CLKOUT signal to be available on the TAMPER1 pin. This can be observed at J4-3

3.2 Power management

There are several different ways to power and measure current on the FRDM-K32L3A6 board. The FRDM-K32L3A6 power distribution scheme is shown in Figure 5:

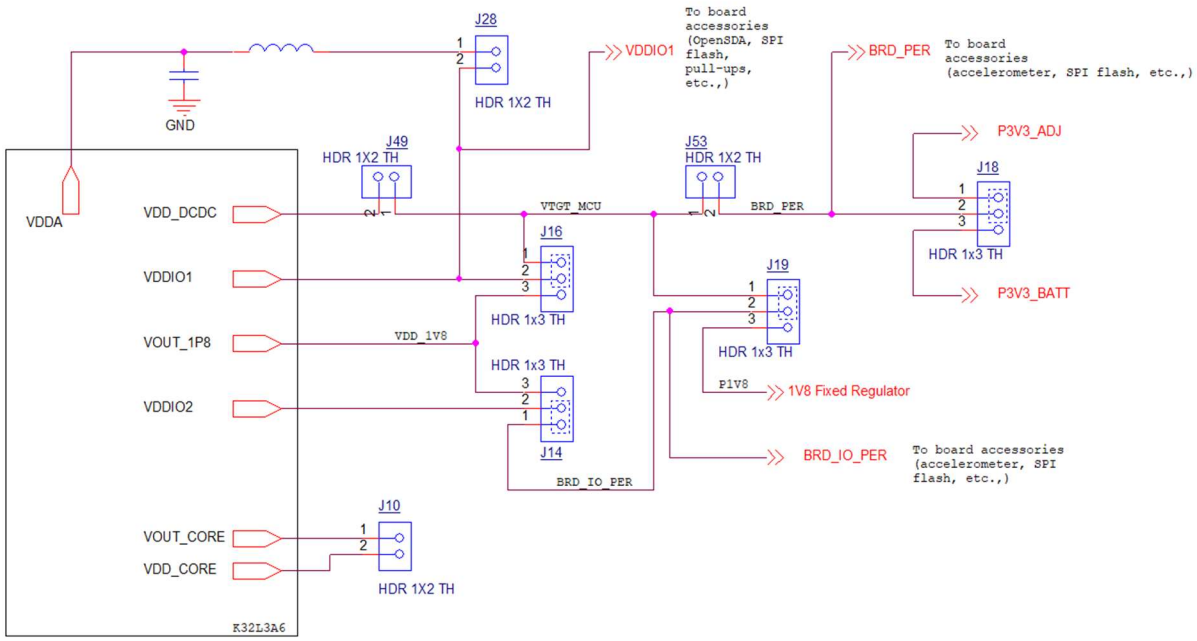

Figure 5. FRDM-K32L3A6 power management circuit

The FRDM-K32L3A6 board will typically be powered by a 5V source by one of the following means:

- OpenSDA micro USB type B connector (J12)
- K32L3A6 micro USB type B connector (J8)
- Through the Freedom development board header J3 pin-10
- Optional 5V regulator populated at J15

The 5V supply then powers an adjustable regulator, U43, and a 1.8V regulator, U45. The adjustable regulator is preset to provide a nominal 3.3V output. The adjustable regulator output can be controlled by connecting an external supply in series with a 3.9k resistor to J52-1. The external supply range of 0.9V to 2.7V will adjust the regulator output from 3.6V to 1.8V.
The K32L3A6 and supporting circuitry can then be powered using the adjustable regulator or a CR2032 coin cell selected by means of J18. The 1.8V regulator provides the ability to run the device with split supplies.
Typical power supply configurations are shown in Table 1

Table 1. **FRDM-K32L3A6 power supply configurations**

Description	J10	J48	J14	J16	J19
Single Supply Operation, IO @ 3.3V	1-2	1-2	1-2	1-2	1-2
Single Supply Operation, RF & IO @ 1.8V	1-2	1-2	2-3	2-3	open
Dual IO, 3.3V and 1.8V	1-2	1-2	1-2	1-2	2-3
Full bypass	open	open	open	open	open

These jumpers provide access to insert ammeters in all the supplies connecting to the K32L3A6 device. They also provide a means of connecting external supplies to any of the K32L power pins.
In the case of using a single supply, an ammeter can be placed across J18 to measure the entire system current. Alternatively, an ammeter can be placed across J53 pins 2 and 3 to measure current with the LEDs and sensor core taken out of the reading. To minimize the current drawn by the other board components and measure the current drawn by just the K32L3A6 device, the following steps are recommended

- Cut the trace under J5 to isolate the power indicator LED (if using J18)
- Cut the trace under J47 to isolate the photo transistor
- Place the SPI flash in ultra-low power mode by writing the command value 0xB9.

3.3 Universal Serial Bus (USB)

The K32L3A6 MCU features a full-speed USB module with device capability and built-in transceiver. The FRDM-K32L3A6 board routes the USB D+ and D- signals from the K32L3A6 MCU directly to the onboard micro USB connector (J8) via the required 33 ohm resistors. Figure 6 shows the complete USB circuit.

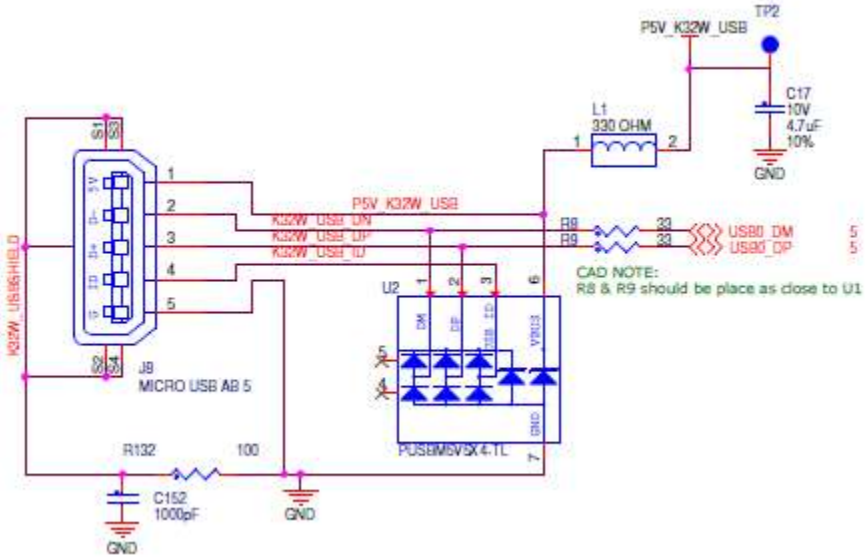

Figure 6. USB connector circuit

3.4 Secure Digital Host Controller (SDHC)

A micro secure digital (SD) card slot is supported on the FRDM-K32L3A6. The SD card detect pin is an open switch that shorts with VDD when the card is inserted. The SD card VDD is supplied by VDDI01 and it must be configured to be at least 2.7V. The SD card connections are shown in Figure 7.

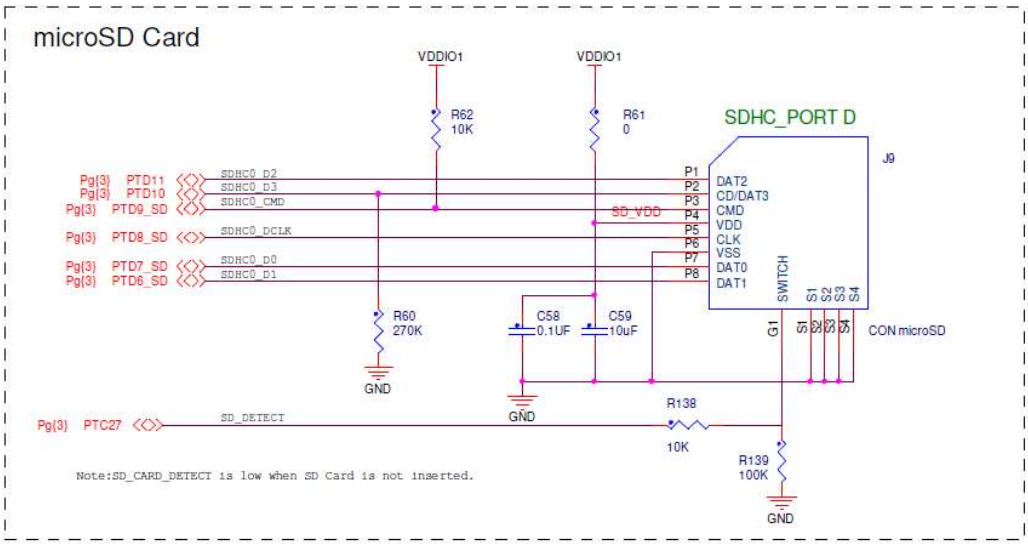

Figure 7. Micro SD card connector circuit

The SDHC interface lines are directly connected to the SDHC connector with the exception of four SDHC lines. These lines are multiplexed with the FlexIO connector via zero ohm resistors. These multiplexed connections are shown in the following figure.

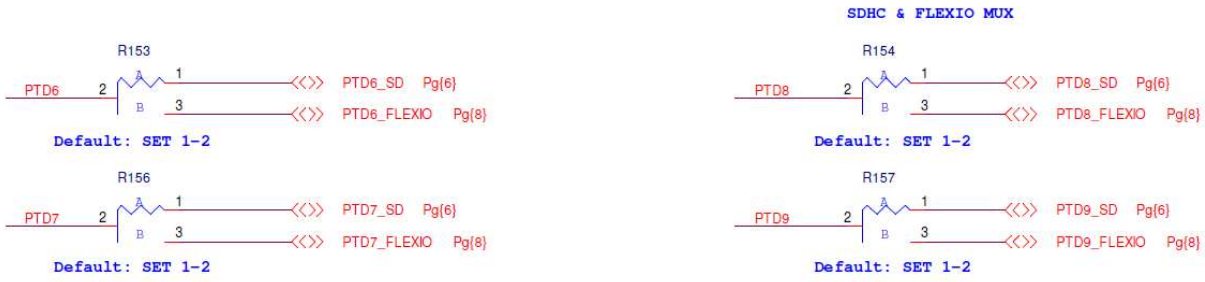

Figure 8. Micro SD card connector circuit

3.5 Serial flash memory

Component U15 is the MX25R3235FZNIL0 32-Mbit (4 MB) serial flash memory with SPI interface. It is intended for storing the non-volatile system data, or parameters.

Figure 9 below shows the memory circuit:

- Memory power supply is VDDIO1
- Discrete pull-up resistors pads are provided for the SPI port
- The memory uses a dedicated SPI port
- The SPI Write Protect and Reset has a discrete pull-up resistor
- Series zero ohm resistors are provided if it is desired to isolate the memory from the K32L3A6 device.

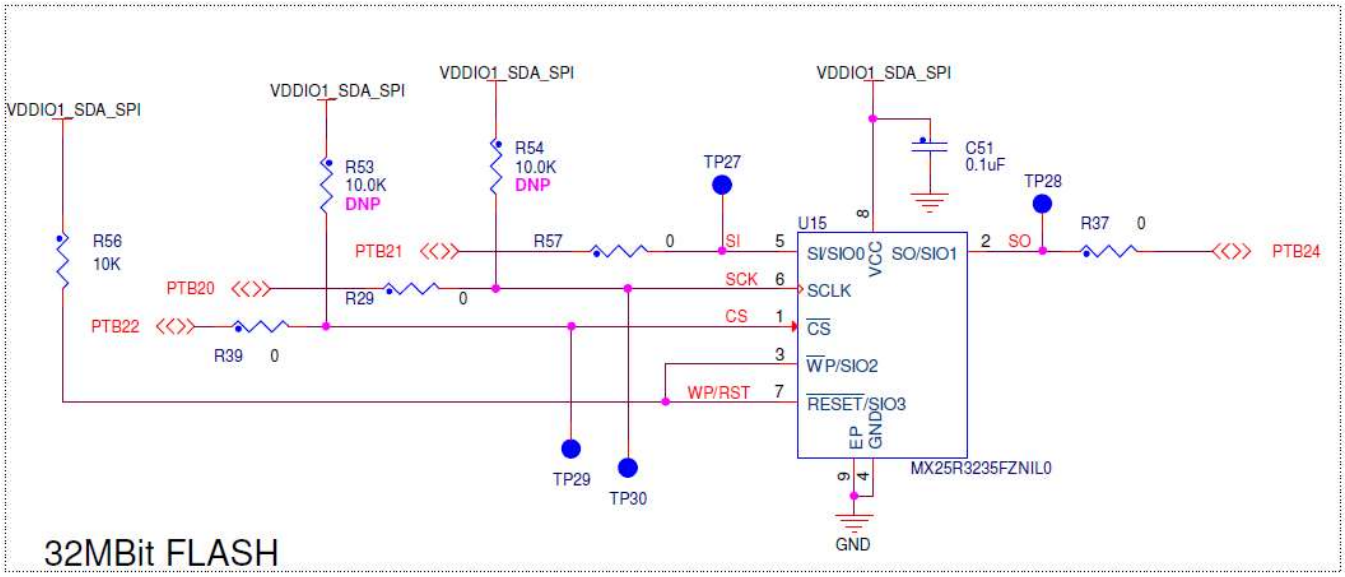

Figure 9. MX25R3235FZNIL0 32-Mbit (4 MB) serial flash memory circuit

3.6 Accelerometer + Magnetometer Combo Sensor

Component U14 is NXP FXOS8700CQ sensor, a six-axis sensor with integrated linear accelerometer and magnetometer with very low power consumption, and selectable I^2C. Figure 10 shows the sensor circuit.

- The sensor core is powered by the BRD_PER rail and the sensor IO is powered by the BRD_IO_PER rail
  - This allows the sensor IO to be operated at a lower voltage than the sensor core supply
- Discrete pull-up resistors for the I^2C bus lines are provided
- Default address is configured as 0x1E:
  - Address can be changed by pull-up/pull-down resistors on SA0 and SA1 lines
- There are two interrupt signals routed
- The I^2C uses dedicated lines for the I2C interface and GPIO connections
- Series zero ohm resistors and shorting links are provided if it is desired to isolate the sensor from the K32L3A6 device.

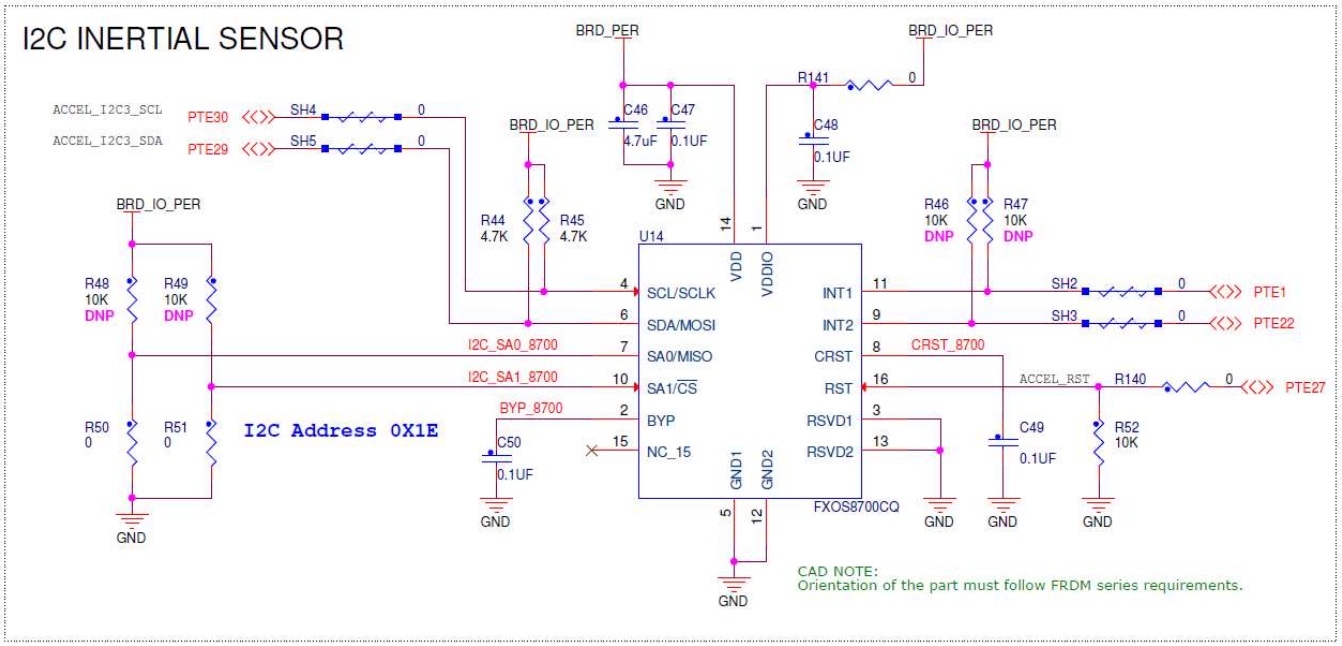

Figure 10. FXOS8700CQ combo sensor circuit

3.7 Visible light sensor

One phototransistor (Q1) is connected to ADC input channel SE3 of the K32L3A6 for evaluating the ADC module as shown in Figure 11.

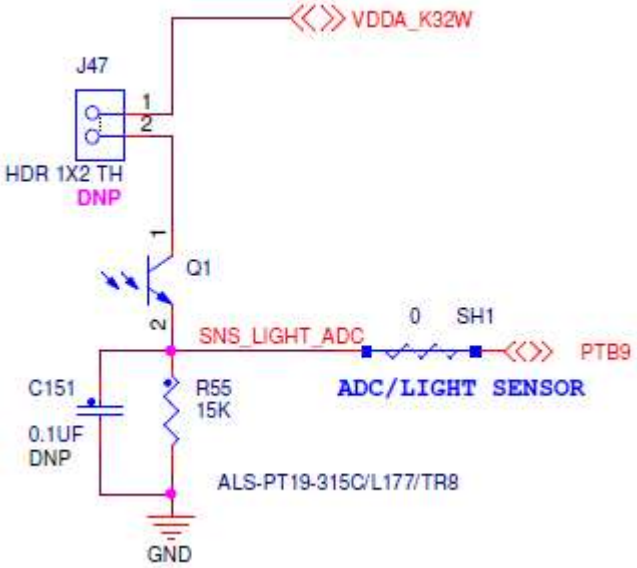

Figure 11. Visible Light Sensor circuit

The light sensor Output is shared with J4-6. The light sensor maybe isolated from the K32L3A6 device, and J4-6, by cutting the shorting link SH1. The light sensor is powered by VDDA_K32L so if VREFH is

configured to be less than VDDA_K32L, the maximum voltage the ADC can convert will be that of VREFH.
With no light reaching the light sensor, there will be a small current drawn from VDDA_K32L. If it is desired to measure the lowest MCU current then the trace under J47 will need to be cut.

3.8 User application LEDs

The FRDM-K32L3A6 provides an RGB LED for user applications. A single red LED, D22, is provided as a general status indicator. Figure 12 shows the circuitry for the LEDs.

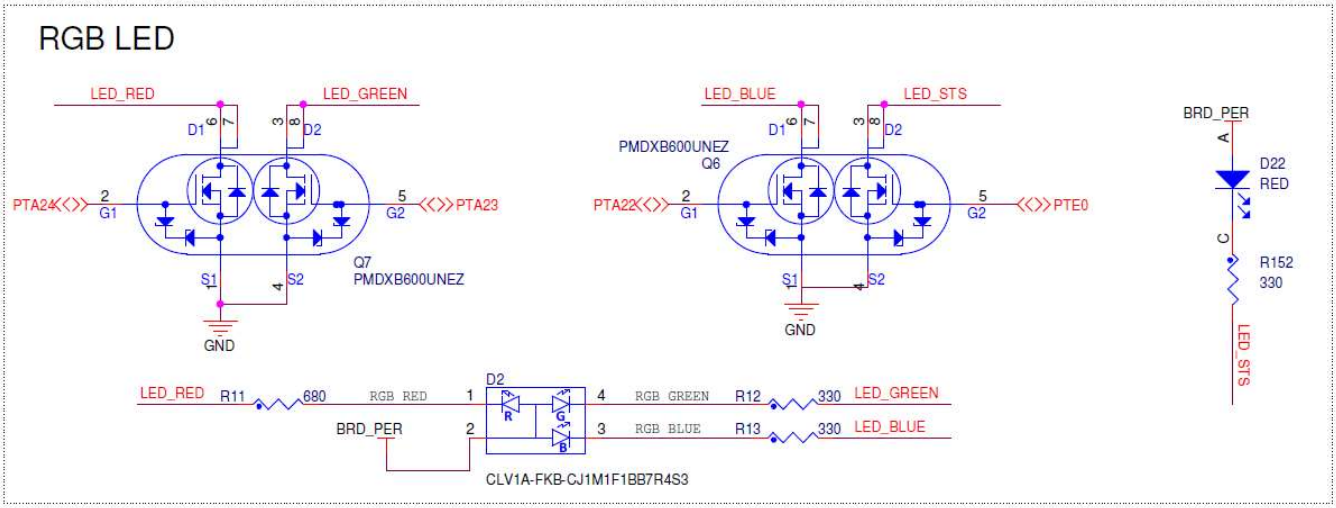

Figure 12. FRDM-K32L3A6 RGB LED circuit

The LEDs are powered by the BRD_PER rail and controlled by Q6 and Q7. This allows the LEDs to operate while being controlled by GPIO that are powered at a voltage less than BRD_PER. The Blue and Green LED in the RGB LED will not illuminate when BRD_PER is sourced by less than approximately 3.2V.

3.9 User buttons

Four tactile buttons are populated on the FRDM-K32L3A6 for Human Machine Interaction (HMI). Figure 13 shows the circuit for the tactile buttons.

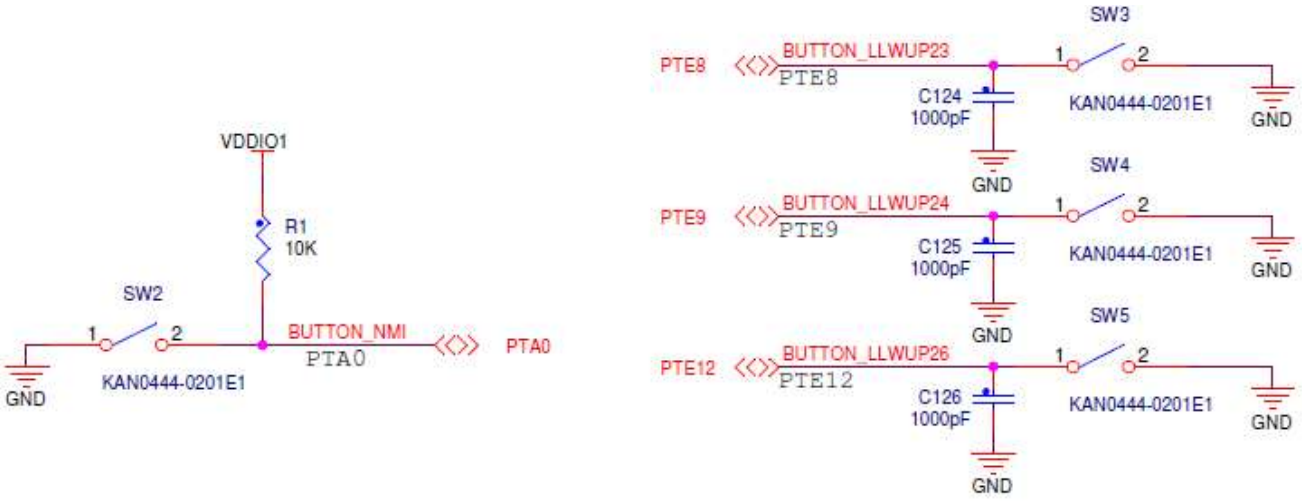

Figure 13. FRDM-K32L3A6 HMI circuit.

SW2 provides an external pull up device. It is connected to the K32L3A6 NMI pin. This provides the option of using this switch as an NMI/wake up source, ROM bootloader boot option source or as a general-purpose input with interrupt capability.

SW3, SW4 and SW5 all provide general purpose inputs with interrupt and wake up capability. The internal pull up device for each pin must be enabled when these are being used.

4 Headers and jumpers

4.1 Arduino compatible I/O headers

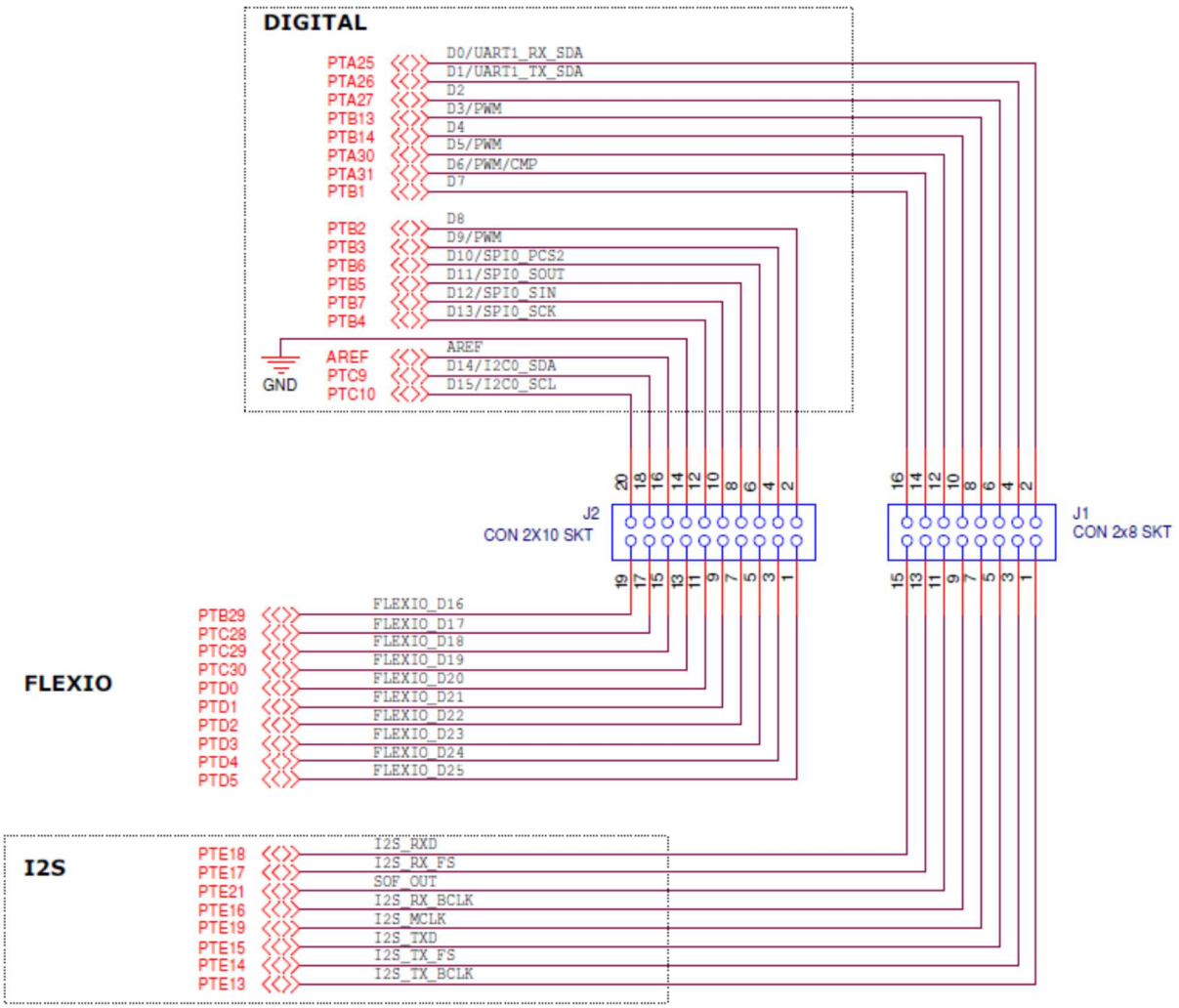

Figure 14. FRDM-K32L3A6 I/O header pinout

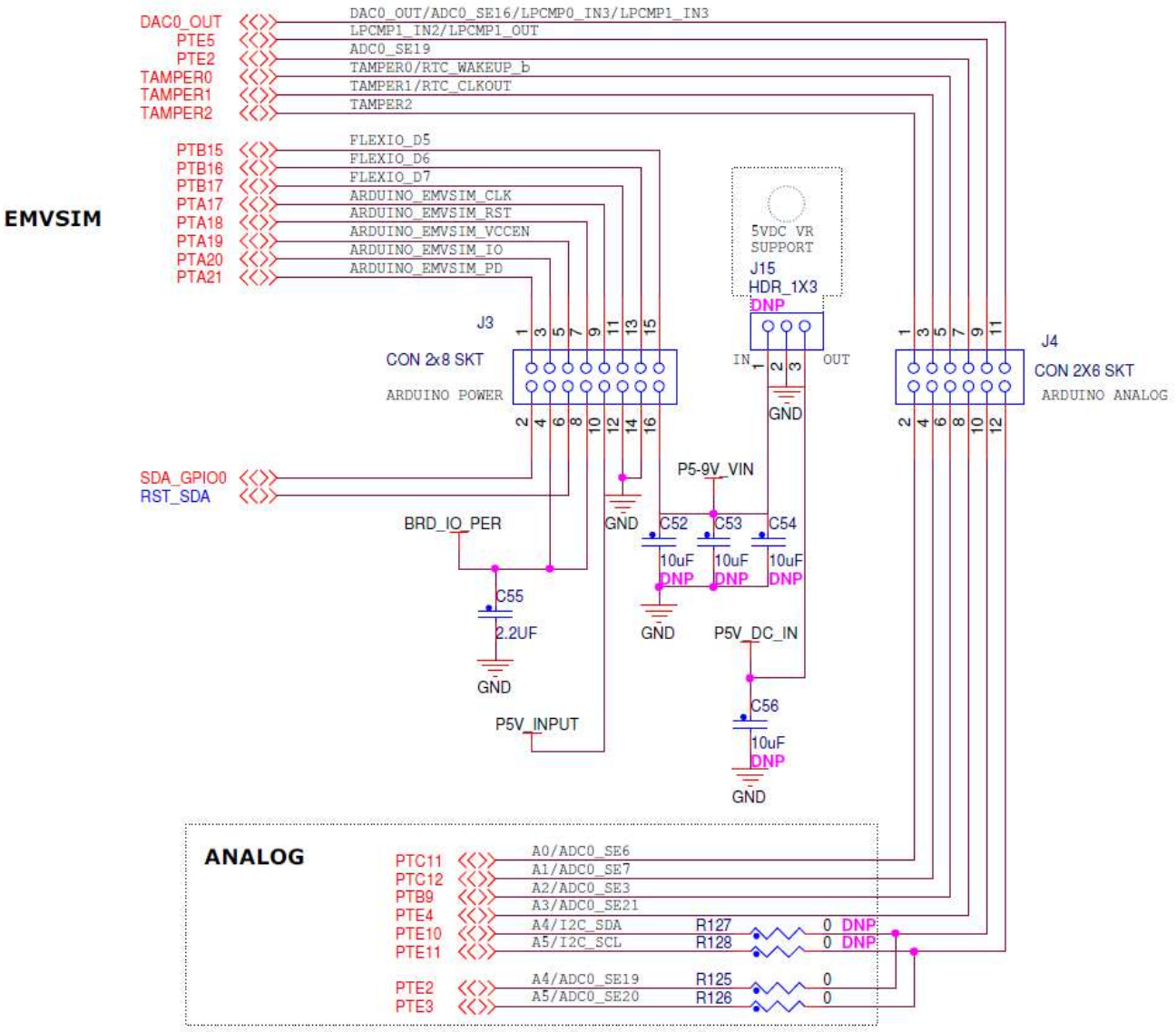

Figure 15. FRDM-K32L3A6 I/O header pinout

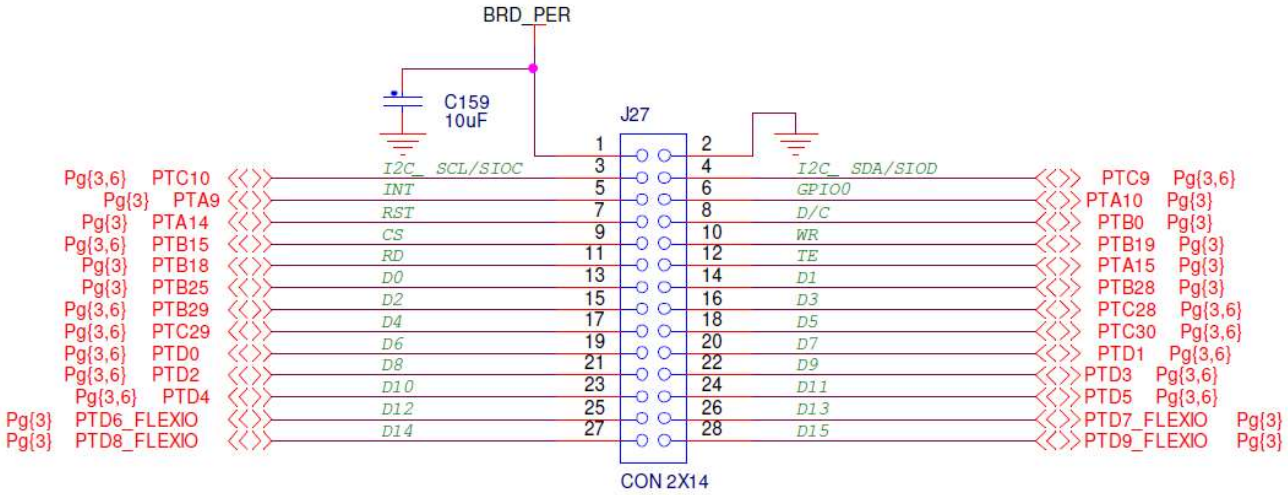

Figure 16. FRDM-K32L3A6 I/O header pinout

Table 2 shows the signals that can be multiplexed to each pin.

Table 2. **Arduino compatible header/connector pinout (J1 and J2)**

Header	Pin No	Name	Type / K32L Pin	GPIO	Functions
J1	1		Freedom Proprietary	PTE13	TPM3_CH0 / LPI2C3_SCLS / I2S0_BCLK / FXIO0_D3
			K32L (Pin N17)		
	2	D0	Arduino Uno R3	PTA25	LPUART1_RS / LPI2C2_SCLS / LPSPI3_SOUT
			K32L (Pin B5)		
	3		Freedom Proprietary	PTE14	TPM3_CH1 / LPI2C3_HREQ / I2S0_TX_FS / FXIO0_D4
			K32L (Pin L16)		
	4	D1	Arduino Uno R3	PTA26	LPUART1_TX / LPI2C2_SCLS / LPSPI3_PCS2
			K32L (Pin A5)		
	5		Freedom Proprietary	PTE15	TPM3_CLKIN / I2S0_TXD / FXIO0_D5
			K32L (Pin L17)		
	6	D2	Arduino Uno R3	PTA27	LPUART1_CTS / LPSPI3_SIN

			K32L (Pin A3)		
	7		Freedom Proprietary	PTE19	TPM2_CH3 / I2S0_MCLK / FXIO_D9
			K32L (Pin K16)		
	8	D3	Arduino Uno R3	PTB13	TPM3_CH0 / LPUART2_CTS / LPI2C1_SDA / LPI2C0_SDAS / FXIO0_D3
			K32L (Pin G3)		
	9		Freedom Proprietary	PTE16	TPM2_CH0 / I2S0_RX_BCLK / FXIO0_D6
			K32L (Pin L14)		
	10	D4	Arduino Uno R3	PTB14	LPUART2_RTS / LPI2C1_SCL / LPI2C0_SCLS / TPM3_CH1 / FXIO0_D4
			K32L (Pin G2)		
	11		Freedom Proprietary	PTE21	TPM2_CH4 / I2S0_TXD1 / USB0_SOF_OUT / FXIO0_D10
			K32L (Pin J17)		
	12	D5	Arduino Uno R3	PTA30	LLWU_P3 / LPUART2_CTS / LPSPI1_SOUT / TPM1_CH0
			K32L (Pin A1)		
	13		Freedom Proprietary	PTE17	TPM2_CH1 / I2S0_RX_FS / FXIO_D7
			K32L (Pin L15)		
	14	D6	Arduino Uno R3	PTA31	TPM1_CH1 / LPUART2_RTS / LPSPI1_PCS2
			K32L (Pin AC4)		
	15		Freedom Proprietary	PTE18	TPM2_CH2 / I2S0_RXD / FXIO0_D8
			K32L (Pin K13)		
	16	D7	Arduino Uno R3	PTB1	LPUART2_RX / LPSPI1_PCS0 / I2S0_TXD1
			K32L (Pin J12)		
J2	1		Freedom Proprietary	PTD5	ADC0_S38 / SDHC0_D4 / EMVSIM0_VCCEN / FXIO0_D25

			K32L (Pin n10)		
	2	D8	Arduino Uno R3	PTB2	TPM0_CH0 / LPUART2_RX / LPSPI0_PCS1 / I2S0_TXD0
			K32L (Pin D12)		
	3		Freedom Proprietary	PTD4	LPSPI2_PCS1 / SDHC0_D5 / EMVSIM0_RST / FXIO0_D24
			K32L (Pin N8)		
	4	D9	Arduino Uno R3	PTB3	TPM0_CH1 / LPUART1_TX LPSPI0_PCS3 / I2S0_TX_FS
			K32L (Pin C1)		
	5		Freedom Proprietary	PTD3	TPM2_CLKIN / LPSPI0_PCS0 / SDHC0_D6 / EMVSIM0_CLK / FXIO0_D23
			K32L (Pin T8)		
	6	D10	Arduino Uno R3	PTB6	TPM0_CH4 / LPI2C1_SDA / LPSPI0_PCS2 / I2S0_RX_BCLK
			K32L (Pin E1)		
	7		Freedom Proprietary	PTD2	LPSPI0_SIN / SDHC0_D7 / FXIO0_D22
			K32L (Pin U7)		
	8	D11	Arduino Uno R3	PTB5	TPM0_CH3 / LPUART1_RTS / LPSPI0_SOUT / I2S0_MCLK
			K32L (Pin D2)		
	9		Freedom Proprietary	PTD1	LPUART1_RTS / LPSPI0_PCS2 / FXIO0_D21
			K32L (Pin P7)		
	10	D12	Arduino Uno R3	PTB7	TPM0_CH5 / LPI2C1_SDAS / LPSPI0_SIN / I2S0_RX_FS
			K32L (Pin E2)		
	11		Freedom Proprietary	PTD0	TPM0_CH0 / LPUART1_CTS / LPSPI0_SOUT / FXIO0_D20
			K32L (Pin T7)		
	12	D13	Arduino Uno R3	PTB4	TPM0_CH2 / LPUART1_CTS / LPSPI0_SCK / I2S0_TX_BCLK
			K32L (Pin C2)		

	13		Freedom Proprietary	PTC30	TPM0_CH1 / LPUART1_TX / LPSPI0_SCK / FXIO0_D19
			K32L (Pin R7)		
	14	GND	Arduino Uno R3		
	15		Freedom Proprietary	PTC29	TPM0_CH2 / LPUART1_RX / LPSPI0_PCS3 / FXIO0_D18
			K32L (Pin N6)		
	16	AREF	Arduino Uno R3		
	17		Freedom Proprietary	PTC28	TPM0_CH3 / LPSPI0_PCS1 / FXIO0_D17
			K32L (Pin U5)		
	18	D14	Arduino Uno R3	PTC9	LLWU_P16 / TPM0_CH2 / LPUART0_CTS / LPI2C0_SDA / LPSPI0_SOUT
			K32L (Pin R1)		
	19		Freedom Proprietary	PTB29	LPUART3_TX / I2S0_TX_FS / FXIO0_D16
			K32L (Pin l3)		
	20	D15	Arduino Uno R3	PTC10	TPM0_CH3 / LPUART0_RTS / LPI2C0_SCL / LPSPI0_PCS2
			K32L (Pin R2)		

Table 3. **Arduino compatible header/connector pinout (J3 and J4)**

Header	Pin No	Name	Type / K32L Pin	GPIO	Functions
J3	1		Freedom Proprietary		
			K32L (Pin B7)	PTA21	TPM2_CH3 / LPSPI2_SOUT / EMVSIM0_PD
	2	N.C.			
	3		Freedom Proprietary		

			K32L (Pin C7)	PTA20	TPM2_CH4 / LPSPI2_SCK / LPSPI1_PCS1 / EMVSIM0_IO
	4	3V3	Arduino Uno R3		
	5		Freedom Proprietary		
			K32L (Pin D7)	PTA19	TPM2_CH5 / LPSPI2_PCS3 / LPSPI3_SCK / EMVSIM0_VCCEN
	6	RESET	Arduino Uno R3		
	7		Freedom Proprietary		
			K32L (Pin D8)	PTA18	LPSPI2_PCS1 / LPSPI3_PCS3 / EMVSIM0_RST
	8	3V3	Arduino Uno R3		
	9		Freedom Proprietary		
			K32L (Pin F7)	PTA17	LPI2C2_HREQ / LPSPI3_PCS1 / EMVSIM0_CLK
	10	5V	Arduino Uno R3		
	11		Freedom Proprietary		
			K32L (Pin K5)	PTB17	LPUART3_RTS / LPI2C3_SCLS / FXIO0_D7
	12	GND	Arduino Uno R3		
	13		Freedom Proprietary		
			K32L (Pin H5)	PTB16	LPUART3_CTS / LPI2C3_SDA / FXIO0_D6
	14	GND	Arduino Uno R3		
	15		Freedom Proprietary		
			K32L (Pin G1)	PTB15	TPM0_CLKIN / LPI2C1_HREQ / LPI2C3_SCL / FXIO0_D5

	16	Vin	Arduino Uno R3		
J4	1		Freedom Proprietary		
			K32L (Pin G12)	TAMPER2	
	2	A0	Arduino Uno R3		
			K32L (Pin T1)	PTC11	LLWU_P17 / TPM0_CH4 / LPI2C1_SDA / LPI2C0_SDAS / LPSPI0_SIN
	3		Freedom Proprietary		
			K32L (Pin F13)	TAMPER1	
	4	A1	Arduino Uno R3		
			K32L (Pin R3)	PTC12	LLWU_P18 / TPM0_CH5 / LPI2C1_SCL / LPI2C0_SCLS / LPSPI0_PCS0
	5		Freedom Proprietary		
			K32L (Pin F14)	TAMPER0	
	6	A2	Arduino Uno R3		
			K32L (Pin F4)	PTB9	ADC0_SE3 / LPI2C1_SCL / LPSPI0_PCS1 / I2S0_RXD1 / FXIO0_D0
	7		Freedom Proprietary		
			K32L (Pin P12)	PTE2	ADC0_SE19 / LPI2C0_SCLS / LPSPI3_PCS3 / SDHC0_D0
	8	A3	Arduino Uno R3		
			K32L (Pin M11)	PTE4	ADC0_SE21 / TPM1_CLKIN / LPI2C0_SCL / LPSPI3_SOUT / SDHC0_D6
	9		Freedom Proprietary		
			K32L (Pin R17)	PTE5	LPI2C0_HREQ / LPSPI3_PCS2 / SDHC_DCLK

	10	A4	Arduino Uno R3 (Pin M13)	PTE10	LLWU_P25 / TPM3_CH0 / LPUART3_CTS / LPI2C3_SCLK / SDHC0_D4
			K32L (Pin P12)	PTE2	ADC0_SE19 / LPI2C0_SCLS / LPSPI3_PCS3 / SDHC0_D0
	11		Freedom Proprietary		
			K32L (Pin T17)	DAC0_OUT	
	12	A5	Arduino Uno R3 (Pin M14)	PTE11	TPM3_CH1 / LPUART3_RTS / LPI2C3_SCL / SDHC0_D3 / FXIO0_D2
			K32L (Pin N12)	PTE3	LLWU_P22 / ADC0_SE20 / TPM0_CLKIN / LPI2C0_SDA / SDHC0_D7

Table 4. **FlexIO/LCD socket pinout (J27)**

Header	Pin No	Name	K32L Pin	GPIO	Functions
J27	1	BRD_PER			
	2	GND			
	3	I2C_SCL/ SIOC	R2	PTC10	I2C SCL
	4	I2C_SDA/ SIOD	R1	PTC9	I2C SDA
	5	INT	E10	PTA9	Interrupt pin
	6	GPIO0	A9	PTA10	General purpose I/O pin
	7	RST	E8	PTA14	LCD reset pin
	8	D/C	B3	PTB0	LCD clock pin

	9	CS	G1	PTB15	LCD interface chip select pin
	10	WR	K4	PTB19	
	11	RD	H2	PTB18	
	12	TE	B8	PTA15	
	13	D0	L6	PTB25	Data line
	14	D1	M4	PTB28	Data line
	15	D2	L3	PTB29	Data line
	16	D3	U5	PTC28	Data line
	17	D4	N6	PTC29	Data line
	18	D5	R7	PTC30	Data line
	19	D6	T7	PTD0	Data line
	20	D7	P7	PTD1	Data line
	21	D8	U7	PTD2	Data line
	22	D9	T8	PTD3	Data line
	23	D10	N8	PTD4	Data line
	24	D11	N10	PTD5	Data line
	25	D12	U9	PTD6	Data line

	26	D13	P10	PTD7	Data line
	27	D14	T9	PTD8	Data line
	28	D15	U11	PTD9	Data line

4.2 Jumper table

Table 5 describes the jumper settings on the FRDM-K32L3A6. * denote jumper selection is shorted on board by default. Bold text indicates default selection.

Table 5. **FRDM-K32L3A6 jumper table**

Signal	Jumper designator	Option	Setting
VDD_CORE	J10	***1-2**	**VDD_CORE to VOUT_CORE**
		Open	Core power bypassed / off
VBAT	J50	**1-2**	**VBAT powered by 3V3 LDO**
		2-3	VBAT powered by coin cell battery
BRD_PER	J18	***1-2**	**Non-MCU circuitry powered by 3V3 LDO**
		2-3	Non-MCU circuitry powered by external coin cell battery
BRD_IO_PER	J19	***1-2**	**IO power for peripheral board components powered by VTGT_MCU**
		2-3	IO power for peripheral board components powered by 1V8 LDO
VDDIO1_MCU	J16	***1-2**	**VDDIO1 powered by VTGT_MCU**
		2-3	VDDIO1 powered by VDD_1V8
VDDIO2	J14	***1-2**	**VDDIO2 powered from BRD_IO_PER**
		2-3	VDDIO2 powered from VDD_1V8
VDD_DCDC	J49	***1-2**	**VDD_DCDC powered by VTGT_MCU**
		Open	VDD_DCDC unpowered.

VDDA_K32L	J28	***1-2**	**VDDA_K32L powered by VDDIO1_MCU**
		Open	VDDA_K32L unpowered.

VREGIN	J31	***1-2**	**VREGIN powered by P5V_INPUT**
		Open	VREGIN unpowered.

OpenSDA Level Shifter Power	J51	***1-2**	**VDDIO1_SDA and VDDIO1_SDA_SPI powered by VDDIO1.**
		Open	VDDIO1_SDA and VDDIO1_SDA_SPI unpowered and isolated.

Visible Light Sensor	J47	***1-2**	**Visible light sensor powered by VDDA_K32L.**
		Open	Visible light sensor unpowered.

Power LED	J5	***1-2**	**Power LED powered by BRD_PER.**
		Open	Power LED unpowered.

SDA Voltage Sense	J52	**1-2**	**OpenSDA VDD sense circuit is connected to R65, supply adjustment resistor.**
		Open	OpenSDA VDD sense circuit disconnected.

5 References

- FRDM-K32L3A6: Quick Start Guide (document: TBD)
- FRDM-K32L3A6-SCH: Schematics (document: TBD)
- FRDM-K32L3A6-PWA: Design Package (document: TBD)
- K32P176M125SF0RM: Reference Manual (document: TBD)
- K32P176M125SF0: Datasheet (document: TBD)

6 Appendix A

7 Revision history

Rev.	Date	Substantive change(s)
0	10/2018	Initial release
1	09/2019	Updated Power Management circuit figure (figure 5) and miscellaneous figure references.

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