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3	K64F MCU
4	OpenSDA INTERFACE
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7	RMII

FREEDOM K64F

Revisions & Change Log

Rev	Description	Date	Approved
X1	Initial Draft	Oct 18	Chung
X2	Feedbacks Implemented	Oct 22	Chung
X3	Feedbacks from Chung Implemented	Oct 23	Chung
X4	Components changed as per the feedbacks	Oct 24	Chung
X5	RF and Bluetooth headers added	Oct 28	Chung
X6	Arduino connections added	Nov 1	Chung
X7	Net review and fix	Nov 3	Chung
A	Release to production, prototype build	Nov 8	Chung
A1	openSDA reset capacitor fix	Nov 22	del Rey
B	Release to production, production build	Jan 20	Chung
C	Release to production, production build	Feb 06	Chung
D	Fixing I2C swap to headers	Feb 26	Chung
D1	Enhancing USB PWR input filter for robustness	Mar 18	Chung
E	Swapping J2.2 connection to PTC12 Fix Eth Link status when 2 FRDMs are connecter to each other	Jul 11	Chung
E1	Updating J13 Ethernet connector part	Sep 03	Chung
E2	Depopulating J14	Sep 10	Chung
E3	Depopulating C55, populating R75	Oct 14	Chung
E4	Some Net alias renaming Title block update	15-Apr-16	M. Byma

Microcontroller Product Group
6501 William Cannon Drive West
Austin, TX 78735-8598

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ICAP Classification: CP: IUO: X PUBI: X

Designer: Rafael del Rey	Drawing Title: **FRDM-K64F**	
Drawn by: Sudhasha(LnT)	Page Title: **TITLE PAGE**	
Approved: Chung	Size C / Document Number SCH-28163 PDF: SPF-28163	Rev E4
	Date: Friday, April 15, 2016	Sheet 1 of 7

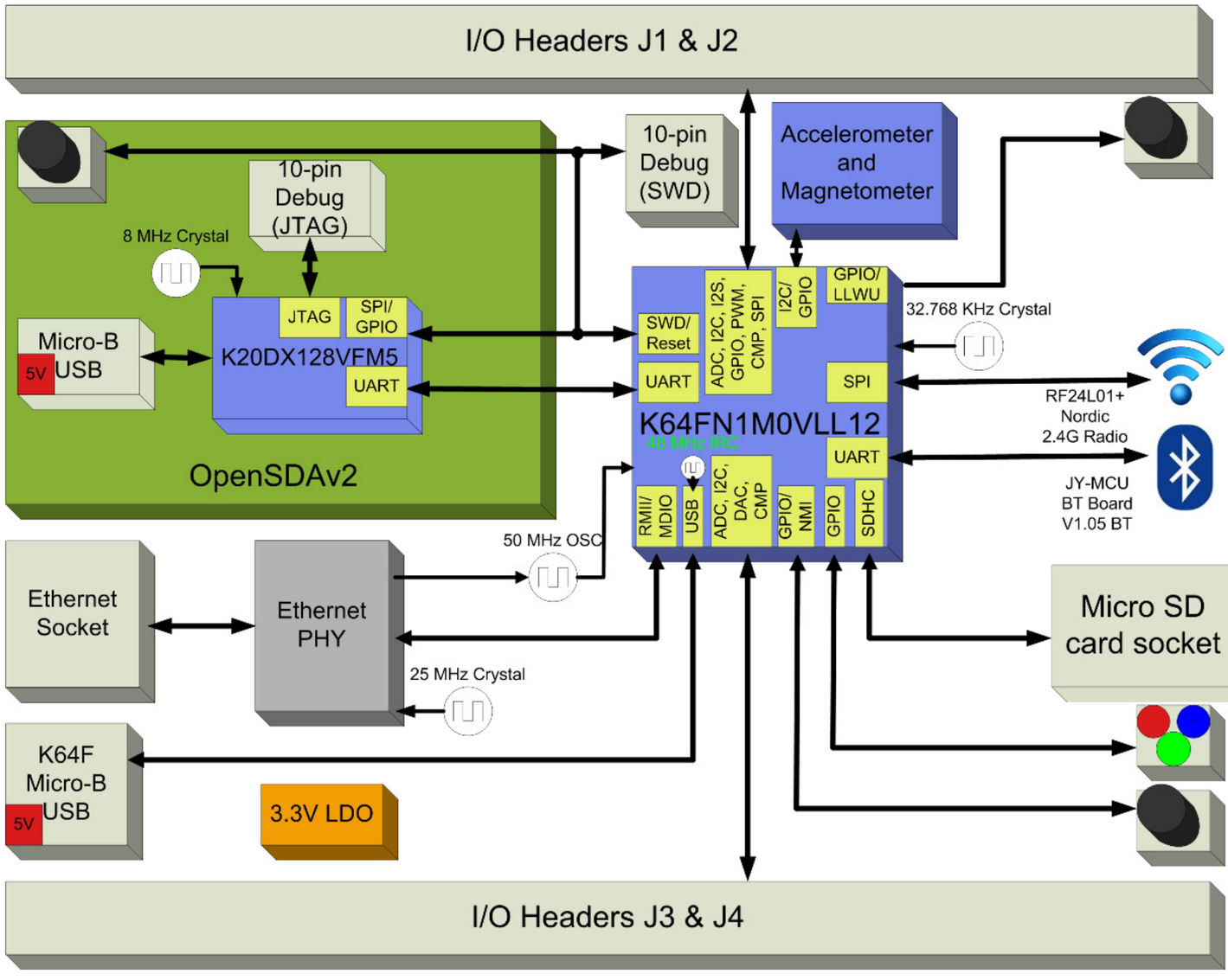
1. Unless Otherwise Specified:
   All resistors are in ohms, most are 1%, 1/10 Watt. Otherwise are 5%, 1/8 Watt.
   All capacitors are in uF, some are 10% or 20%
   All voltages are DC
   All polarized capacitors are tantalum

2. Interrupted lines coded with the same letter or letter combinations are electrically connected.

3. Device type number is for reference only. The number varies with the manufacturer.

4. Special signal usage:
   _B Denotes - Active-Low Signal
   <> or [] Denotes - Vectored Signals

5. Interpret diagram in accordance with American National Standards Institute specifications, current revision, with the exception of logic block symbology.



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Drawing Title: **FRDM-K64F**

Page Title: **BLOCK DIAGRAM**

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K64F USB CONNECTOR

J22
MICRO USB AB 5
SHIELD_K64USB
P5V0_USB_CONN_VBUS
USB_CONN_DN
USB_CONN_DP
USB_ID_TP
TP15
L5
330 OHM
P5V_K64_USB
C45
1.0UF
R49 33
R46 33
K64_MICRO_USB_DN pg(2)
K64_MICRO_USB_DP pg(2)
U15 U16 U18
L4
330 OHM

OPTIONAL USB HOST FUNCTIONALITY
P5V_USB
P5V_K64_USB
J21
HDR 1X2
USB_ID_TP
R72 0 DNP

POPULATE THESE PARTS FOR USB HOST FUNCTIONALITY

ELECTRICAL PROTECTION IS NOT PROVIDED. USE IT AT YOUR OWN RISK

P3V3_K64F
R54 0
R52 DNP 1K
VREFH
R53 0 DNP
AREF pg(4)
D4 3.0V DNP

C47 0.1UF
C42 0.1UF
C27 0.1UF
C25 0.1UF
C46 0.1UF
C49 0.1UF
C37 0.1UF
VBAT
HDR 1X2 TH
J23
DNP
C43 0.1UF

RMII_RXCLK
RMII_RXCLK pg(6)

U14

VDD1 8
VDD2 40
VDD3 48
VDD4 67
VDD5 75
VDD6 89
VDDA 22
VBAT 30

pg(3,4,6) PTA[0..5]
PTA0 SWD_CLK 34
PTA1 35
PTA2 36
PTA3 SWD_DIO 37
PTA4 38
PTA5 RMII0_RXER 39
pg(6) PTA[12..17]
PTA12 RMII0_RXD1 42
PTA13 RMII0_RXD0 43
PTA14 RMII0_CRS_DV 44
PTA15 RMII0_TXEN 45
PTA16 RMII0_TXD0 46
PTA17 RMII0_TXD1 47
50
XTAL_K64_MAIN 51

pg(4,6) PTB[0..3]
PTB0 RMII0_MDIO 53
PTB1 RMII0_MDC 54
pg(4) PTB[9..11]
PTB2 55
PTB3 56
PTB9 57
PTB10 58
PTB11 59
pg(3,4) PTB[16..23]
PTB16 62
PTB17 63
PTB18 I2S0_TX_BCLK 64
PTB19 I2S0_TX_FS 65
PTB20 66
PTB21 67
PTB22 68
PTB23 69

pg(4,5) PTC[0..18]
PTC0 USB0_SOF_OUT 70
PTC1 I2S0_TXD0 71
PTC2 72
PTC3 73
PTC4 76
PTC5 I2S0_RXD0 77
PTC6 78
PTC7 I2S0_RX_FS 79
PTC8 I2S0_MCLK 80
PTC9 I2S0_RX_BCLK 81
PTC10 82
PTC11 83
PTC12 84
PTC13 85
PTC14 86
PTC15 87
PTC16 90
PTC17 91
PTC18 92

XTAL_K64_MAIN
R74 0
P3V3_K64F
DNP
R86 10.0K
R87 10.0K
DNP

PTA0/JTAG_TCLK/SWD_CLK/EZP_CLK/UART0_CTS/UART0_COL/FTM0_CH5
PTA1/JTAG_TDI/EZP_DI/UART0_RX/FTM0_CH6
PTA2/JTAG_TDO/TRACE_SWO/EZP_DO/UART0_TX/FTM0_CH7
PTA3/JTAG_TMS/SWD_DIO/UART0_RTS/FTM0_CH0
PTA4/LLWU_P3/NMI/EZP_CS/FTM0_CH1
PTA5/USB_CLKIN/FTM0_CH2/RMII0_RXER/MII0_RXER/CMP2_OUT/I2S0_TX_BCLK/JTAG_TRST
PTA12/CMP2_IN0/CAN0_TX/FTM1_CH0/RMII0_RXD1/MII0_RXD1/I2C2_SCL/I2S0_TXD0/FTM1_QD_PHA
PTA13/LLWU_P4/CMP2_IN1/CAN0_RX/FTM1_CH1/RMII0_RXD0/MII0_RXD0/I2C2_SDA/I2S0_TX_FS/FTM1_QD_PHB
PTA14/SPI0_PCS0/UART0_TX/RMII0_CRS_DV/MII0_RXDV/I2C2_SCL/I2S0_RX_BCLK/I2S0_TXD1
PTA15/SPI0_SCK/UART0_RX/RMII0_TXEN/MII0_TXEN/I2S0_RXD0
PTA16/SPI0_SOUT/UART0_CTS/UART0_COL/RMII0_TXD0/MII0_TXD0/I2S0_RX_FS/I2S0_RXD1
PTA17/ADC1_SE17/SPI0_SIN/UART0_RTS/RMII0_TXD1/MII0_TXD1/I2S0_MCLK
PTA18/EXTAL0/FTM0_FLT2/FTM_CLKIN0
PTA19/XTAL0/FTM1_FLT0/FTM_CLKIN1/LPTMR0_ALT1

PTB0/LLWU_P5/ADC0_SE8/ADC1_SE8/I2C0_SCL/FTM1_CH0/RMII0_MDIO/MII0_MDIO/FTM1_QD_PHA
PTB1/ADC0_SE9/ADC1_SE9/I2C0_SDA/FTM1_CH1/RMII0_MDC/MII0_MDC/FTM1_QD_PHB
PTB2/ADC0_SE12/I2C0_SCL/UART0_RTS/ENET0_1588_TMR0/FTM0_FLT3
PTB3/ADC0_SE13/I2C0_SDA/UART0_CTS/UART0_COL/ENET0_1588_TMR1/FTM0_FLT0
PTB9/SPI1_PCS1/UART3_CTS/FB_AD20
PTB10/ADC1_SE14/SPI1_PCS0/UART3_RX/FB_AD19/FTM0_FLT1
PTB11/ADC1_SE15/SPI1_SCK/UART3_TX/FB_AD18/FTM0_FLT2
PTB16/SPI1_SOUT/UART0_RX/FTM_CLKIN0/FB_AD17/EWM_IN
PTB17/SPI1_SIN/UART0_TX/FTM_CLKIN1/FB_AD16/EWM_OUT
PTB18/CAN0_TX/FTM2_CH0/I2S0_TX_BCLK/FB_AD15/FTM2_QD_PHA
PTB19/CAN0_RX/FTM2_CH1/I2S0_TX_FS/FB_OE/FTM2_QD_PHB
PTB20/SPI2_PCS0/FB_AD31/CMP0_OUT
PTB21/SPI2_SCK/FB_AD30/CMP1_OUT
PTB22/SPI2_SOUT/FB_AD29/CMP2_OUT
PTB23/SPI2_SIN/SPI0_PCS5/FB_AD28

PTC0/ADC0_SE14/SPI0_PCS4/PDB0_EXTRG/USB_SOF_OUT/FB_AD14/I2S0_TXD1
PTC1/LLWU_P6/ADC0_SE15/SPI0_PCS3/UART1_RTS/FTM0_CH0/FB_AD13/I2S0_TXD0
PTC2/ADC0_SE4B/CMP1_IN0/SPI0_PCS2/UART1_CTS/FTM0_CH1/FB_AD12/I2S0_TX_FS
PTC3/LLWU_P7/CMP1_IN1/SPI0_PCS1/UART1_RX/FTM0_CH2/CLKOUT/I2S0_TX_BCLK
PTC4/LLWU_P8/SPI0_PCS0/UART1_TX/FTM0_CH3/FB_AD11/CMP1_OUT
PTC5/LLWU_P9/SPI0_SCK/LPTMR0_ALT2/I2S0_RXD0/FB_AD10/CMP0_OUT/FTM0_CH2
PTC6/LLWU_P10/CMP0_IN0/SPI0_SOUT/PDB0_EXTRG/I2S0_RX_BCLK/FB_AD9/I2S0_MCLK
PTC7/CMP0_IN1/SPI0_SIN/USB_SOF_OUT/I2S0_RX_FS/FB_AD8
PTC8/ADC1_SE4B/CMP0_IN2/FTM3_CH4/I2S0_MCLK/FB_AD7
PTC9/ADC1_SE5B/CMP0_IN3/FTM3_CH5/I2S0_RX_BCLK/FB_AD6/FTM2_FLT0
PTC10/ADC1_SE6B/I2C1_SCL/FTM3_CH6/I2S0_RX_FS/FB_AD5
PTC11/LLWU_P11/ADC1_SE7B/I2C1_SDA/FTM3_CH7/I2S0_RXD1/FB_RW
PTC12/UART4_RTS/FB_AD27/FTM3_FLT0
PTC13/UART4_CTS/FB_AD26
PTC14/UART4_RX/FB_AD25
PTC15/UART4_TX/FB_AD24
PTC16/UART3_RX/ENET0_1588_TMR0/FB_CS5/FB_TSIZ1/FB_BE23_16_BLS15_8
PTC17/UART3_TX/ENET0_1588_TMR1/FB_CS4/FB_TSIZ0/FB_BE31_24_BLS7_0
PTC18/UART3_RTS/ENET0_1588_TMR2/FB_TBST/FB_CS2/FB_BE15_8_BLS23_16

VSS1 9
VSS2 41
VSS3 49
VSS4 60
VSS5 74
VSS6 88
VSSA 25

MK64FN1M0VLL12

PTD0/LLWU_P12/SPI0_PCS0/UART2_RTS/FTM3_CH0/FB_ALE/FB_CS1/FB_TS 93 PTD0
PTD1/ADC0_SE5B/SPI0_SCK/UART2_CTS/FTM3_CH1/FB_CS0 94 PTD1
PTD2/LLWU_P13/SPI0_SOUT/UART2_RX/FTM3_CH2/FB_AD4/I2C0_SCL 95 PTD2
PTD3/SPI0_SIN/UART2_TX/FTM3_CH3/FB_AD3/I2C0_SDA 96 PTD3
PTD4/LLWU_P14/SPI0_PCS1/UART0_RTS/FTM0_CH4/FB_AD2/EWM_IN/SPI1_PCS0 97 PTD4
PTD5/ADC0_SE6B/SPI0_PCS2/UART0_CTS/UART0_COL/FTM0_CH5/FB_AD1/EWM_OUT/SPI1_SCK 98 PTD5
PTD6/LLWU_P15/ADC0_SE7B/SPI0_PCS3/UART0_RX/FTM0_CH6/FB_AD0/FTM0_FLT0/SPI1_SOUT 99 PTD6
PTD7/CMT_IRO/UART0_TX/FTM0_CH7/FTM0_FLT1/SPI1_SIN 100 PTD7
PTD[0..7] pg(4,5)

PTE0/CLKOUT32K/ADC1_SE4A/SPI1_PCS1/UART1_TX/SDHC0_D1/TRACE_CLKOUT/I2C1_SDA/RTC_CLKOUT 1 SDHC0_D1 PTE0
PTE1/LLWU_P0/ADC1_SE5A/SPI1_SOUT/UART1_RX/SDHC0_D0/TRACE_D3/I2C1_SCL/SPI1_SIN 2 SDHC0_D0 PTE1
PTE2/LLWU_P1/ADC0_DP2/ADC1_SE6A/SPI1_SCK/UART1_CTS/SDHC0_DCLK/TRACE_D2 3 SDHC0_DCLK PTE2
PTE3/ADC0_DM2/ADC1_SE7A/SPI1_SIN/UART1_RTS/SDHC0_CMD/TRACE_D1/SPI1_SOUT 4 SDHC0_CMD PTE3
PTE4/LLWU_P2/SPI1_PCS0/UART3_TX/SDHC0_D3/TRACE_D0 5 SDHC0_D3 PTE4
PTE5/SPI1_PCS2/UART3_RX/SDHC0_D2/FTM3_CH0 6 SDHC0_D2 PTE5
PTE6/SPI1_PCS3/UART3_CTS/I2S0_MCLK/FTM3_CH1/USB_SOF_OUT 7 PTE6
PTE[0..6] pg(5)

PTE24/ADC0_SE17/UART4_TX/I2C0_SCL/EWM_OUT 31 PTE24 pg(4)
PTE25/ADC0_SE18/UART4_RX/I2C0_SDA/EWM_IN 32 PTE25 pg(4)
PTE26/CLKOUT32K/ENET_1588_CLKIN/UART4_CTS/RTC_CLKOUT/USB_CLKIN 33 PTE26 pg(2,4)

ADC0_DM1 15 ADC0_DM1 pg(4)
ADC0_DP1 14 ADC0_DP1 pg(4)
ADC0_DM0/ADC1_DM3 19 ADC0_DM0/ADC1_DM3 pg(4)
ADC0_DP0/ADC1_DP3 18 ADC0_DP0/AD1_DP3 pg(4)
ADC1_DM1 17 ADC1_DM1 pg(4)
ADC1_DP1 16 ADC1_DP1 pg(4)
ADC1_DM0/ADC0_DM3 21 ADC1_DM0/ADC0_DM3 pg(4)
ADC1_DP0/ADC0_DP3 20 ADC1_DP0/ADC0_DP3 pg(4)
VREF_OUT/CMP1_IN5/CMP0_IN5/ADC1_SE18 26 ADC1_SE18 pg(4)
DAC0_OUT/CMP1_IN3/ADC0_SE23 27 DAC0_OUT pg(4)
USB0_DM 11 K64_MICRO_USB_DN pg(2)
USB0_DP 10 K64_MICRO_USB_DP pg(2)

RESET 52 RST_TGTMCU_B RST_TGTMCU_B pg(2,3,4,6)
EXTAL32 29 EXTAL32_RTC
XTAL32 28 XTAL32_RTC
VREFH
VREFH 23
VREFL 24
VREGIN 13
VOUT33 12 VOUT33_K64
TP12
C59 2.2uF

R63 0 EXTAL_32.768KHz C48 12PF DNP
R65 1.0M DNP
Y3 32.768KHZ
R62 0 XTAL_32.768KHz C44 12PF DNP

HDR 1X2 TH
J16 DNP
P5V_K64_USB
VREGIN_K64
C33 DNP 10uF

RGB LED FEATURE

TP13
TP17
PTB22 LEDRGB_RED R68 576
P3V3 R88 130
D12
R73 270 LEDRGB_GREEN PTE26 pg(2,4)
R71 270 LEDRGB_BLUE PTB21
TP14
CLV1A-FKB-CJ1M1F1BB7R4S3

SWD CONNECTOR

SHORTING HEADER ON BOTTOM LAYER

Jumper is shorted by a cut-trace on bottom layer. Cutting the trace will effectively isolate the on-board MCU from the OpenSDA debug interface.

pg(3) PTA3 SWD_DIO
P3V3_K64F
J9
TRACE_SWO
R80 0 PTA2 TRACE_SWO
RST_TGTMCU_B pg(2,3,4,6)
HDR 2X5
J11 HDR 1X2 TH DNP
SWD_CLK
PTA0
SWD_CLK_TGTMCU pg(3)

ICAP Classification:	CP: ___ IUO: PUBI: X
Drawing Title:	FRDM-K64F
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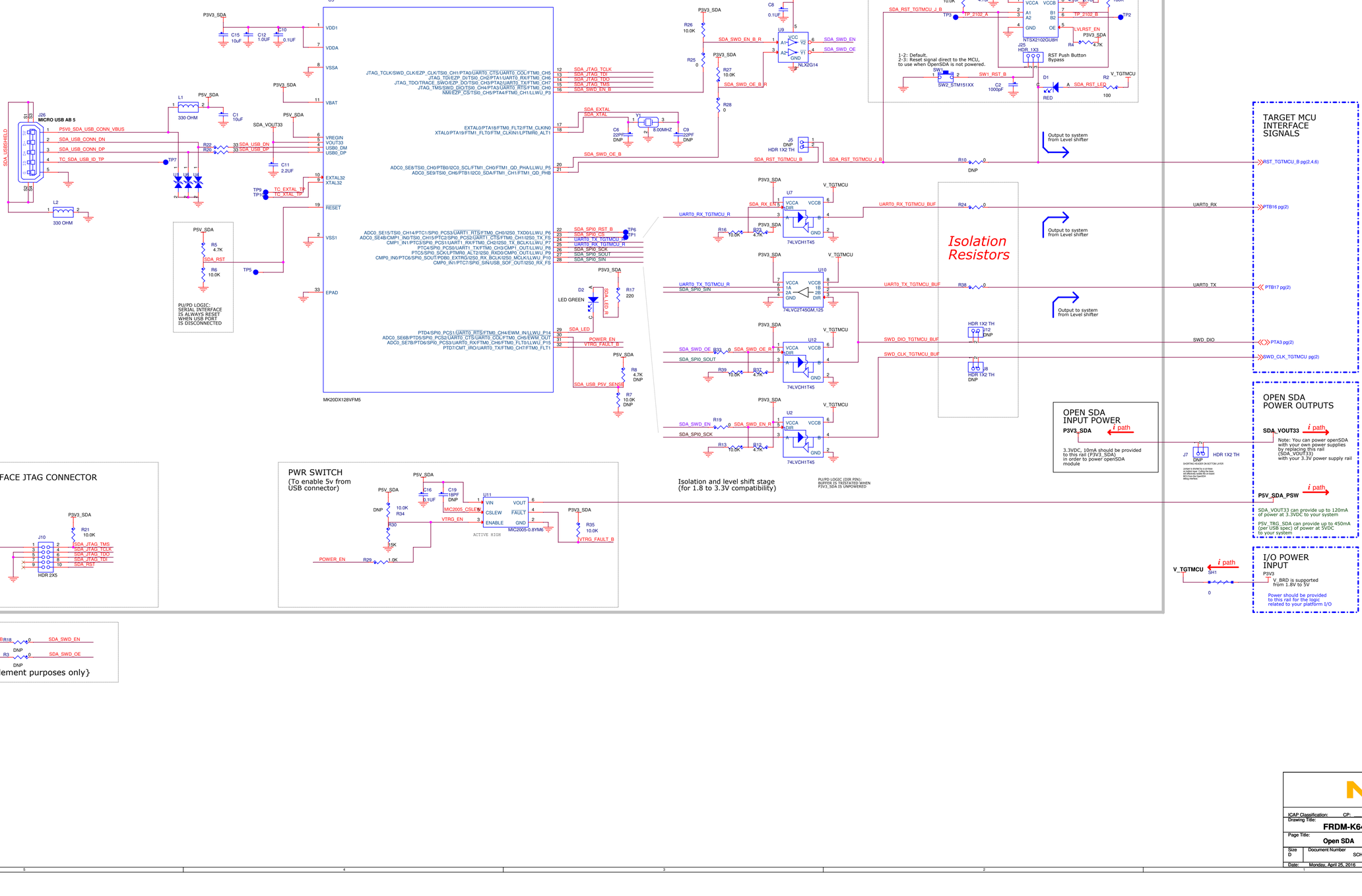
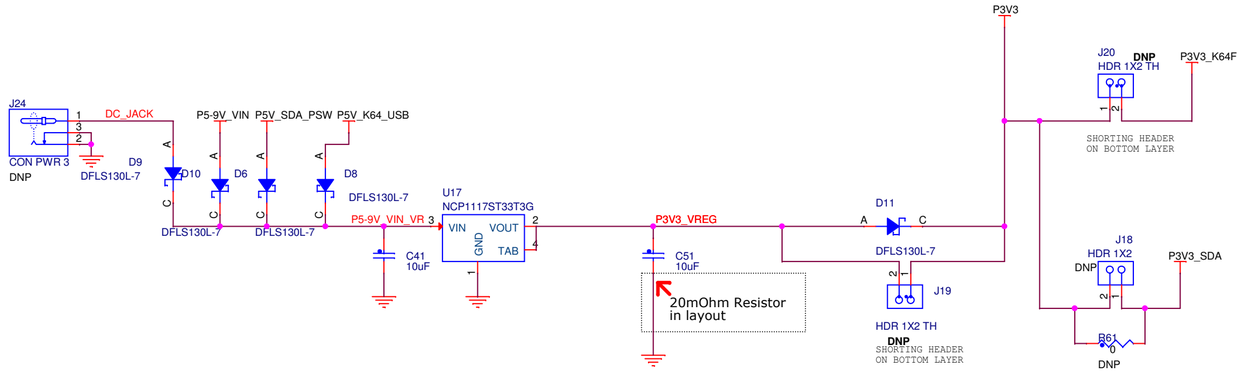
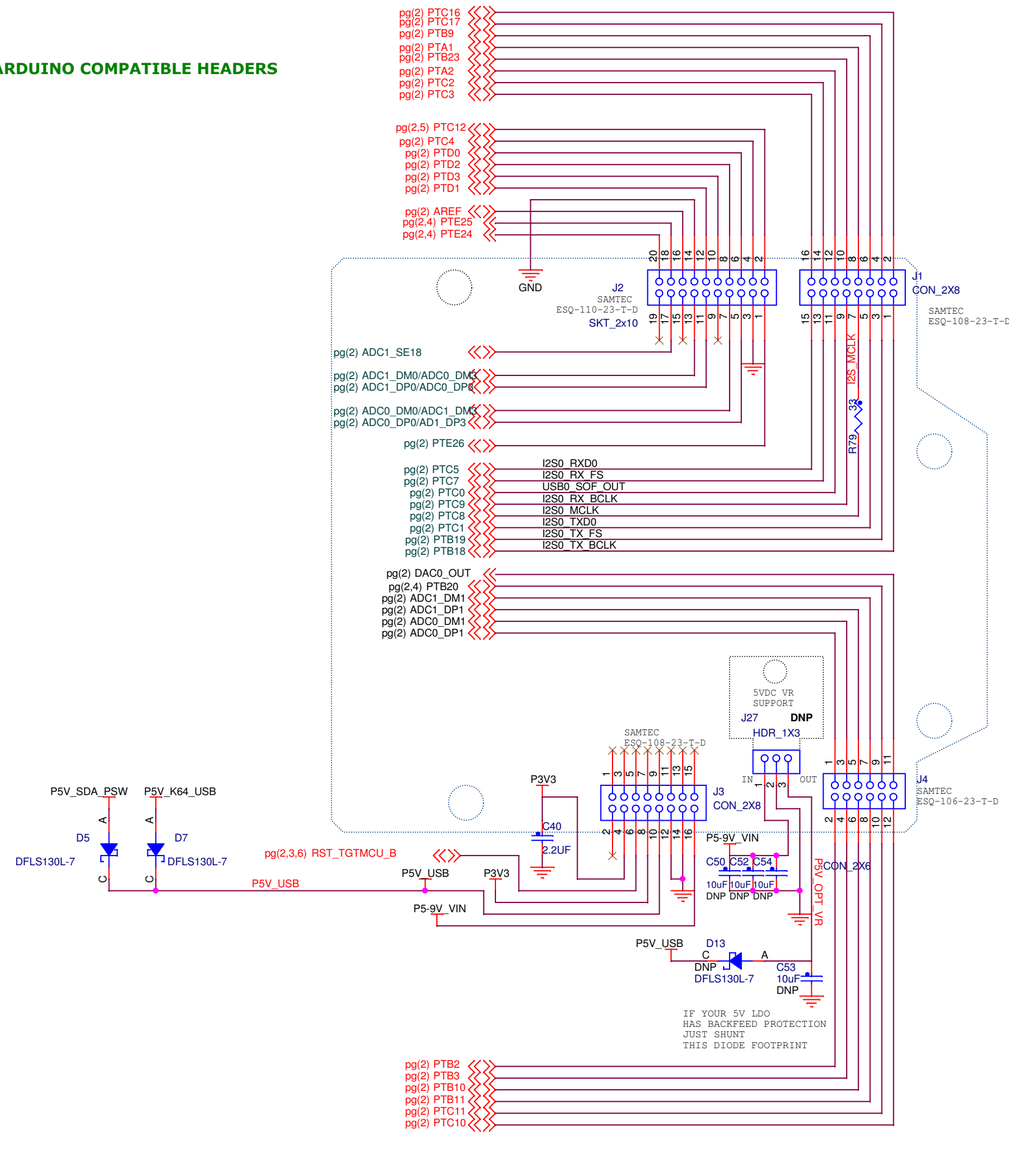
OpenSDA Interface



ICAP Classification:	CP: ___	IUO:	PUBI: X
Drawing Title:	FRDM-K64F		
Page Title:	Open SDA		
Size: D	Document Number: SCH-28163 | PDF: SPF-28163		Rev: E4
Date: Monday, April 25, 2016		Sheet 4 of 7	

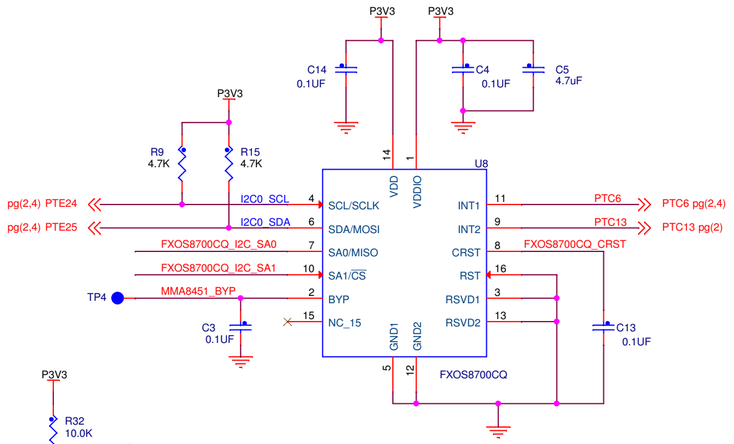


ARDUINO COMPATIBLE HEADERS

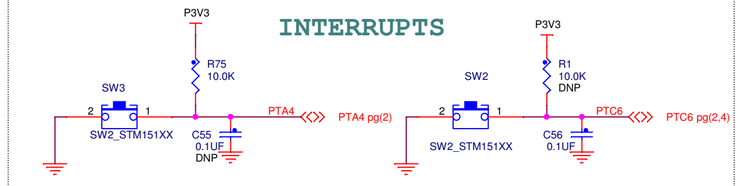


I2C INERTIAL SENSOR

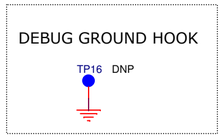
(ACCELEROMETER AND MAGNETOMETER)



INTERRUPTS



DEBUG GROUND HOOK



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Drawing Title:
FRDM-K64F

Page Title:
ARDUINO SHIELDS & COMBO SENSOR

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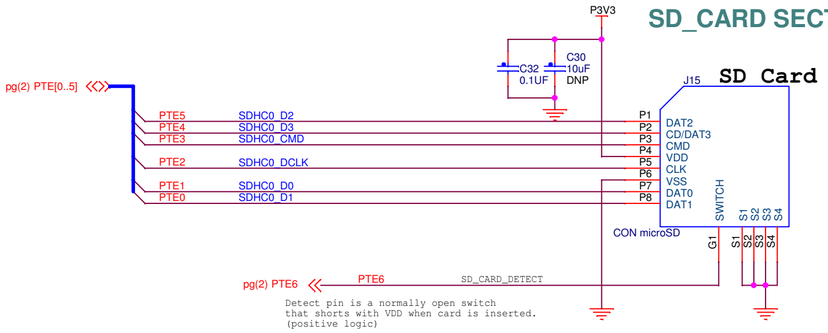
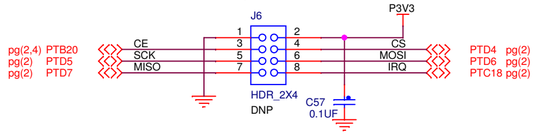
SD_CARD SECTION

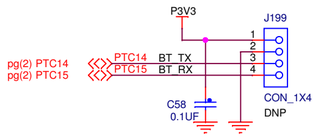


RF/WIFI



Add-on WIFI module: RF24L01+ - Nordic 2.4G Radio

Bluetooth



Add-on BT module: JY-MCU BT BOARD V1.05 BT

ICAP Classification: CP: ___ IUO: PUBI: X

Drawing Title: **FRDM-K64F**

Page Title: **SD CARD / RF - WIFI / BLUETOOTH**

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LAYOUT NOTES:
1. The TRD+/TRD- pairs should be routed with a 100ohm differential impedance and a 50ohm single ended (characteristic) impedance.
2. The trace lengths within a TRD+/TRD- differential pair should be matched.
3. The distance between each TRD+/TRD- differential pair should be 50mils or more.

P3V3
L3
120OHM
DNP
R42
VDDA_ENET
VDDPLL_1.2V
C21 4.7UF
C22 0.1UF
C24 0.1UF
C26 0.1UF
C28 1.0 UF
VDDIO_ENET
C39 0.1UF
J17
HDR 1X2
DNP
R60
0

VDDIO_ENET
R56 1.5K DNP
R55 1.5K DNP
pg(2,6) PTB0
pg(2,6) PTB1
RMII0_MDIO
RMII0_MDC

pg(2,6) PTA13
pg(2,6) PTA12
pg(2,6) PTA14
RMII0_RXD0
RMII0_RXD1
RMII0_CRS_DV
DNP R70 10.0K
DNP R67 10.0K
DNP R69 10.0K

pg(2,6) PTA16
pg(2,6) PTA17
pg(2,6) PTA15
RMII0_TXD0
RMII0_TXD1
RMII0_TXEN

pg(2,6) PTA5
RMII0_RXER

U13
KSZ8081RNACA
VDD_1V2
VDDA_3V3
VDDIO
MDC
MDIO
XI
XO
REF_CLK
RST
LED0/ANEN_SPEED
CRS_RV/PHYAD1/PHYAD0
INTRP
GND1
GND2
TXP
TXM
RXP
RXM
TXD0
TXD1
TXEN
RXD0
RXD1
RXER
LED1/SPEED
CRS_DV
REXT

pg(2) RMII_RXCLK
R57 33 RXCLK
RMII0_MDC
RMII0_MDIO
RMII_XTALI
RMII_XTALO
ENET1_TX+
ENET1_TX-
ENET1_RX+
ENET1_RX-
RMII0_TXD0
RMII0_TXD1
RMII0_TXEN
RMII0_RXD_0
RMII0_RXD_1
RMII0_RXER
RMII0_CRS_DV
PTA16 pg(2,6)
PTA17 pg(2,6)
PTA15 pg(2,6)
RXD0
RXD1
LED1/SPEED
CRS_DV
33
RN1
PTA13 pg(2,6)
PTA12 pg(2,6)
PTA5 pg(2,6)
PTA14 pg(2,6)

VDDIO_ENET
10.0K R50
C34 10UF
RMII0_INT_B
MCU can drive the Pullup required by this signal
BAT54AWT1G
D3
PHY_RST_B

pg(2,3,4) RST_TGTMCU_B
R45
0
PHY_INT_1
J14
HDR 1X2
DNP
RMII0_INT_B
CPU_PER_1_RST_B
R47
0
DNP
PHY_RST_B
PHY_RESET_B must be a GPIO toggeld after CLKIN is active.

REXT
R58 6.49K
C38 100PF
RMII_XTALI
RMII_XTALO
Y2
25MHZ
C35 24PF
C29 24PF

VDDA_ENET
R81 0 DNP
R82 0 DNP
R83 0
J13
1 : 1
TD+_R1
TD-_R2
TCT_R3
RD+_R7
RD-_R8
RCT_R6
NC_4
NC_5
L4
L3
G
Y
L2
L1
S2
S1
RJ45
C1_TX+
C2_TX-
C3_RX+
C6_RX-
75 OHMS
C4
C5
C7
C8
1000pF
R48 49.9 DNP
R44 49.9 DNP
ENET1_1_TX_RDIV
C31 0.1UF DNP
R51 49.9 DNP
R59 49.9 DNP
ENET1_1_RX_RDIV
C36 0.1UF DNP
C61 0.1UF
C60 0.1UF
ENET1_RCT
LED1/SPEED
R36 100
VDDIO_ENET
LED2_LINK
R76 100

CAD NOTE:
PLEASE ROUT TX/RX-+ SIGNALS STRAIGHTFORWARD AND AVOID T-STUBS ON RESISTOR PAD INTERCONNECTION

ICAP Classification: CP: ___ IUO: PUBI: X

Drawing Title: **FRDM-K64F**

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