EFM8BB1 Busy Bee STK

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Revision History

Rev.	Description
A00	Initial version released for production.
A01	Minor updates to design. Updated sine wave generator and new PCB.
A02	Updated PCB revision.

PCB1

PCB5200

STK

Designed: MRW	Approved: JNO	Schematic Title: EFM8BB1 Busy Bee Starter Kit	
Size: A3	BOM Doc No:	Page Title: Title Page	
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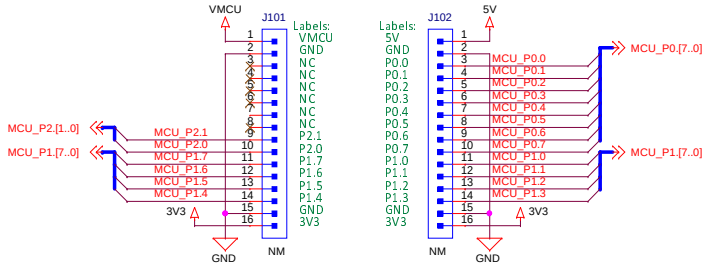
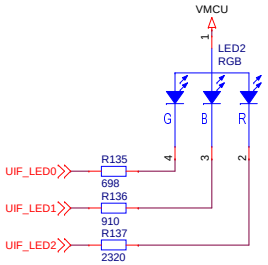
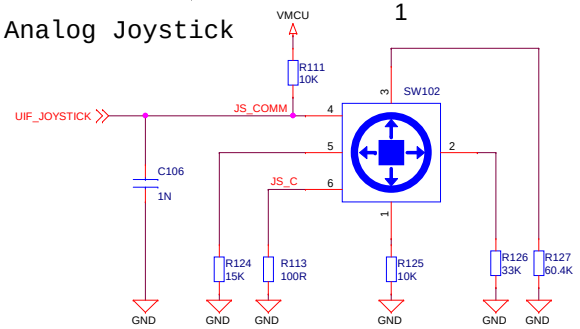
Breakout Connections



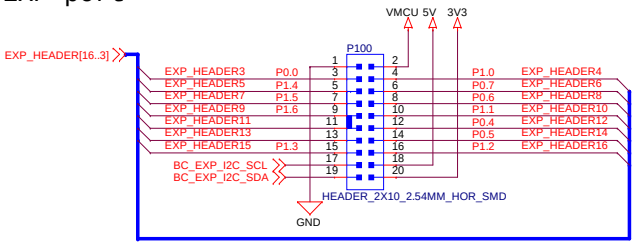
RGB LED



Analog Joystick



EXP port



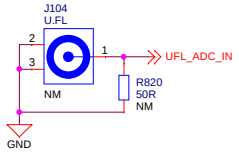
EXP-Header Functionality

** Indicates potential STK hardware conflicts

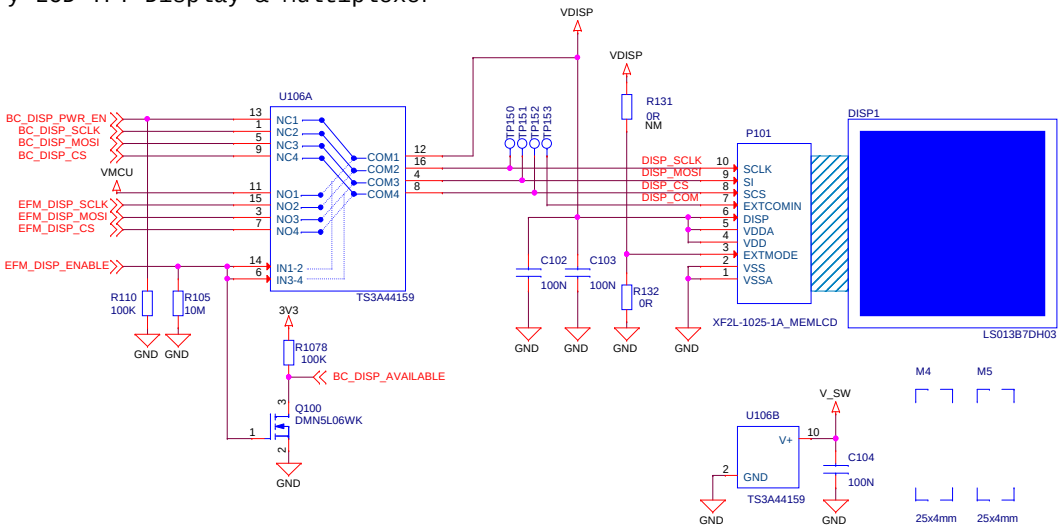
1	GND		
3	P0.0		CMP0.0/ADC0.0
5	P1.4		CMP1.4/ADC0.12 ** STK LED0
7	P1.5		CMP1.5/ADC0.13 ** STK LED1
9	P1.6		CMP1.6/ADC0.14 ** STK LED2
11			
13			
15	P1.3	I2C0_SCL	CMP1.3/ADC0.11
17	Reserved for EXP Board Identification		
19	Reserved for EXP Board Identification		

2	VMCU		
4	P1.0	SPI0_MOSI	CMP1.0/ADC0.8
6	P0.7	SPI0_MISO	CMP0.7/ADC0.7
8	P0.6	SPI0_SCK	CMP0.6/ADC0.6
10	P1.1	SPI0_NSS	CMP1.1/ADC0.9
12	P0.4	UART0_TX	CMP0.4/ADC0.4
14	P0.5	UART0_RX	CMP0.5/ADC0.5
16	P1.2	I2C0_SDA	CMP1.2/ADC0.10
18	5V		
20	3V3		

U.FL ADC Connection



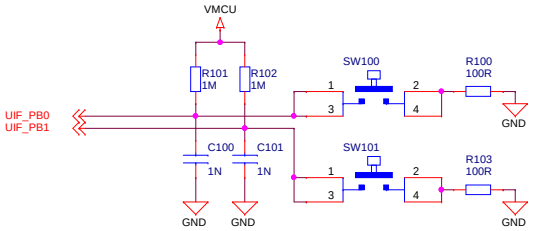
Memory LCD-TFT Display & Multiplexer



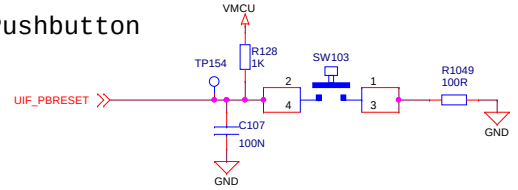
The EFM8 always controls ownership of the display using the EFM_DISP_ENABLE signal.

EFM_DISP_ENABLE	DISP_CTRL	VDISP
0	BC	BC_DISP_PWR_EN
1	EFM	VMCU

User pushbuttons



RESET Pushbutton



STK

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Schematic Title	EFM8BB1 Busy Bee Starter Kit
Page Title	User Interfaces
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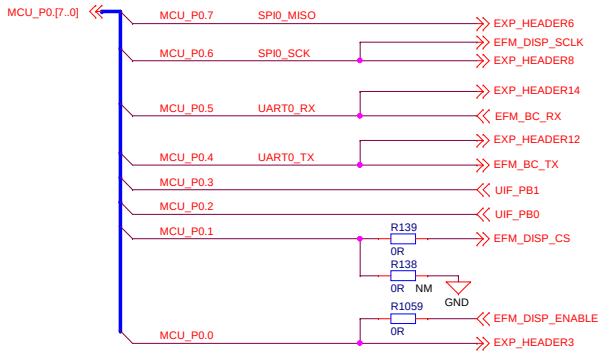
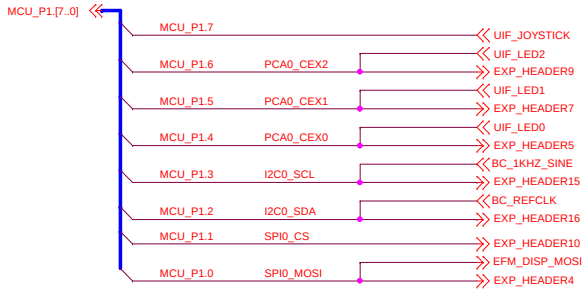
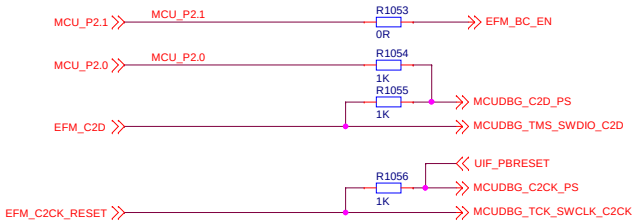
P0 Connections



P1 Connections



P2 & DEBUG Connections



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Design Created Date: Wednesday, December 03, 2008	

Schematic Title

EFM8BB1 Busy Bee Starter Kit

Page Title

Signal Assignments

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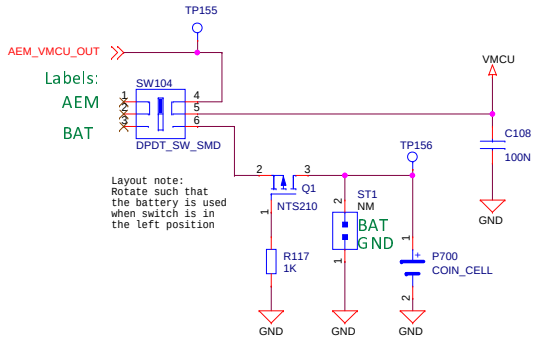
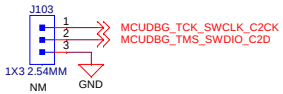
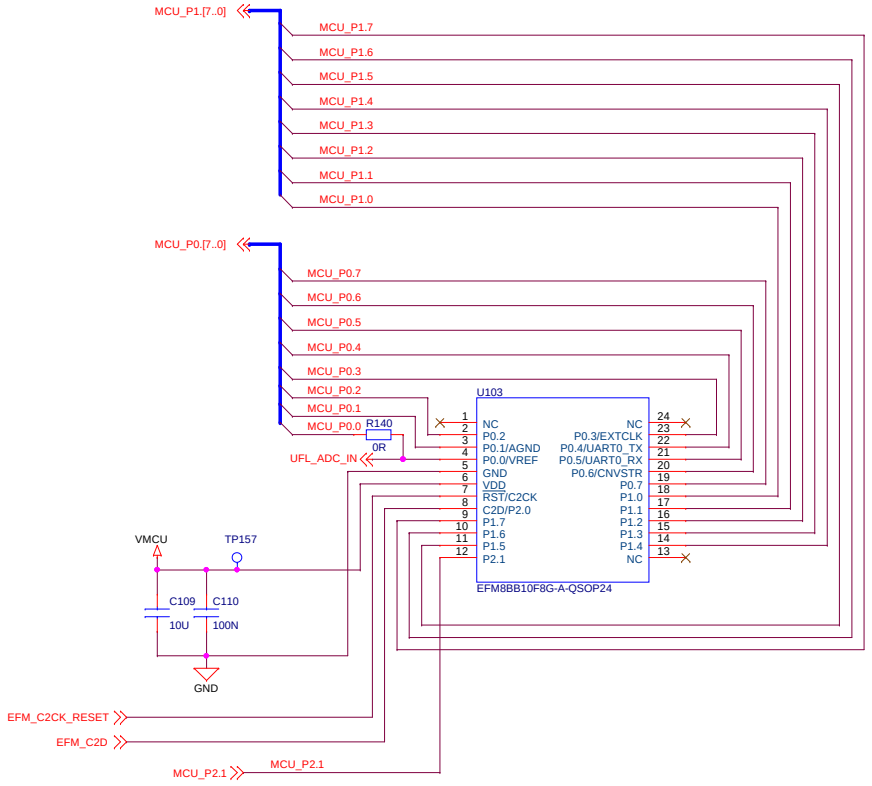
Power Switch

SWITCH POS	MODE DESCRIPTION
AEM	AEM Enabled, VMCU sourced from external 3.3V LDO powered by BC USB 5V supply
BAT	AEM Disabled, VMCU sourced from external coin-cell battery or external power supply



C2 Debug Header





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Size: A3	BOM Doc No: <Cage Code>
Design Created Date: Wednesday, December 03, 2008	

Schematic Title: **EFM8BB1 Busy Bee Starter Kit**

Page Title: **EFM8 I/O**

Document number: BRD5200A		Revision: A02
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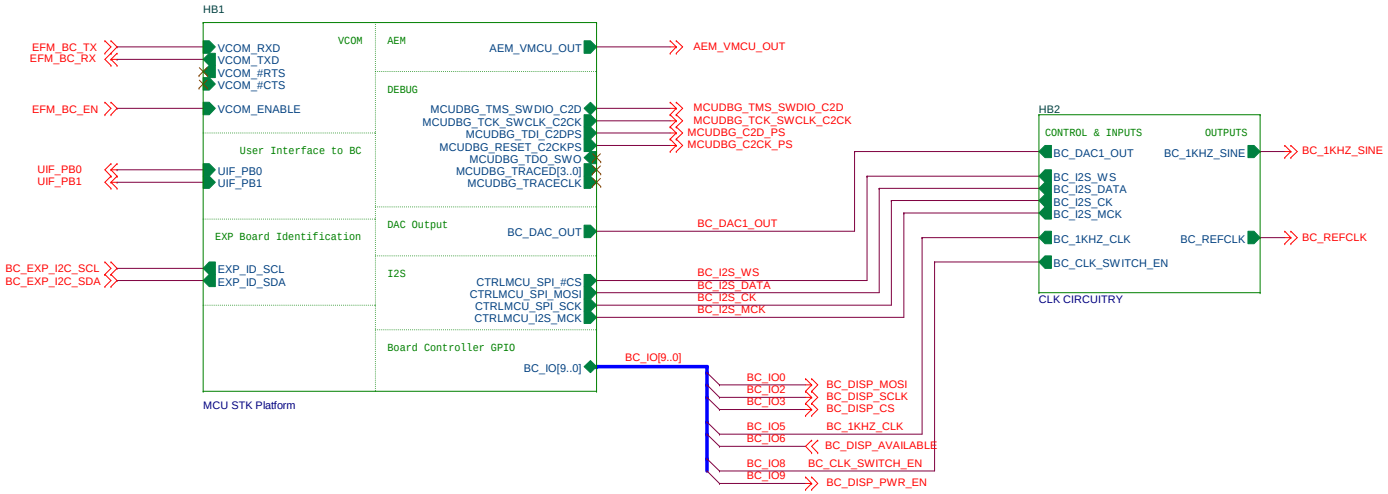

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Size: A3	BOM Doc No: <Cage Code>
Design Created Date: Wednesday, December 03, 2008	

Schematic Title

EFM8BB1 Busy Bee Starter Kit

Page Title

STK Common Platform

Document number: BRD5200A		Revision: A02
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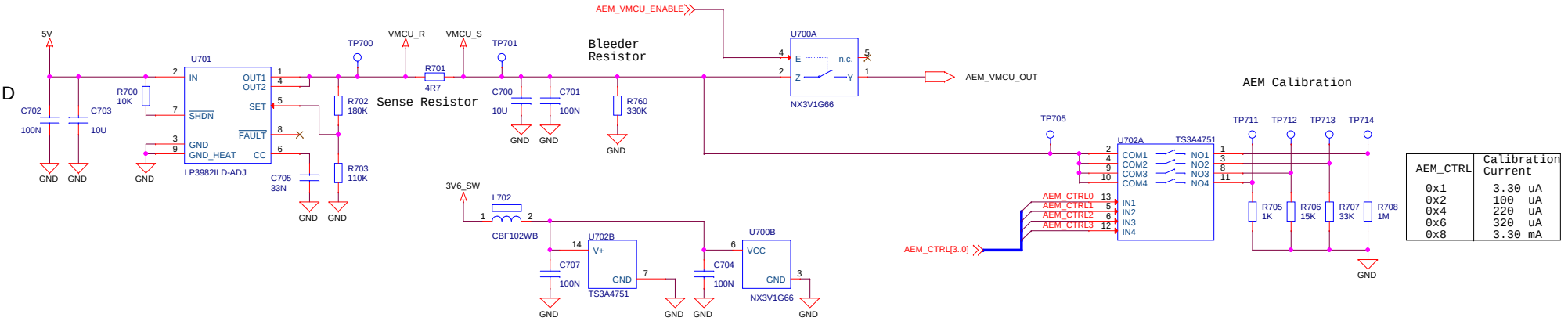
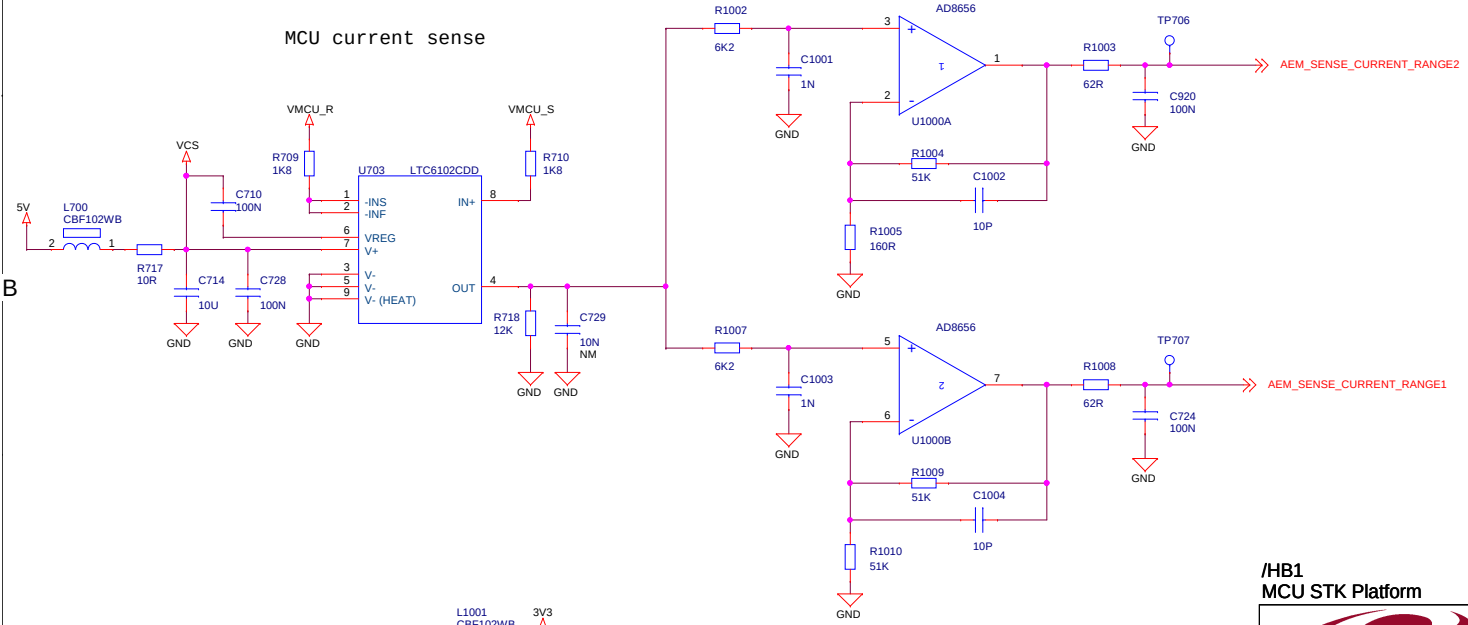
MCU power regulator

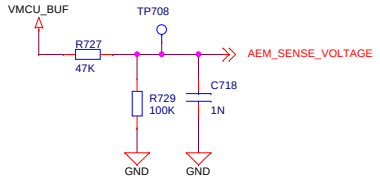


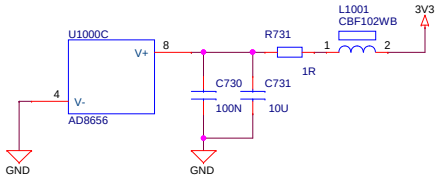
AEM_CTRL	Calibration Current
0x1	3.30 uA
0x2	100 uA
0x4	220 uA
0x6	320 uA
0x8	3.30 mA

MCU current sense



MCU Voltage Sense





/HB1
MCU STK Platform

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Designed: DDB	Approved: JNO
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Schematic Title
EFM8BB1 Busy Bee Starter Kit

Page Title
Advanced Energy Monitor

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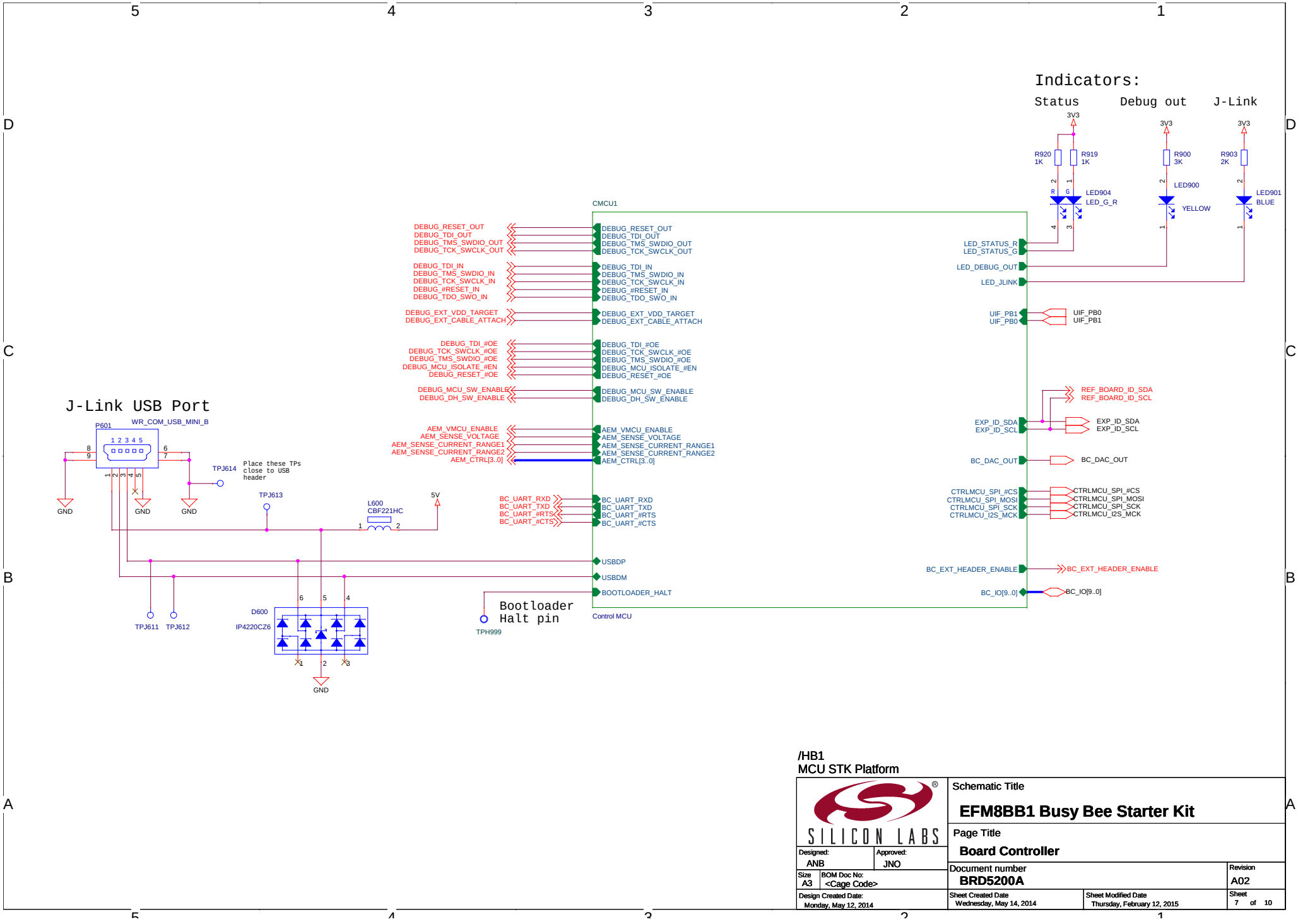

/HB1
MCU STK Platform

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Schematic Title
EFM8BB1 Busy Bee Starter Kit

Page Title
Board Controller

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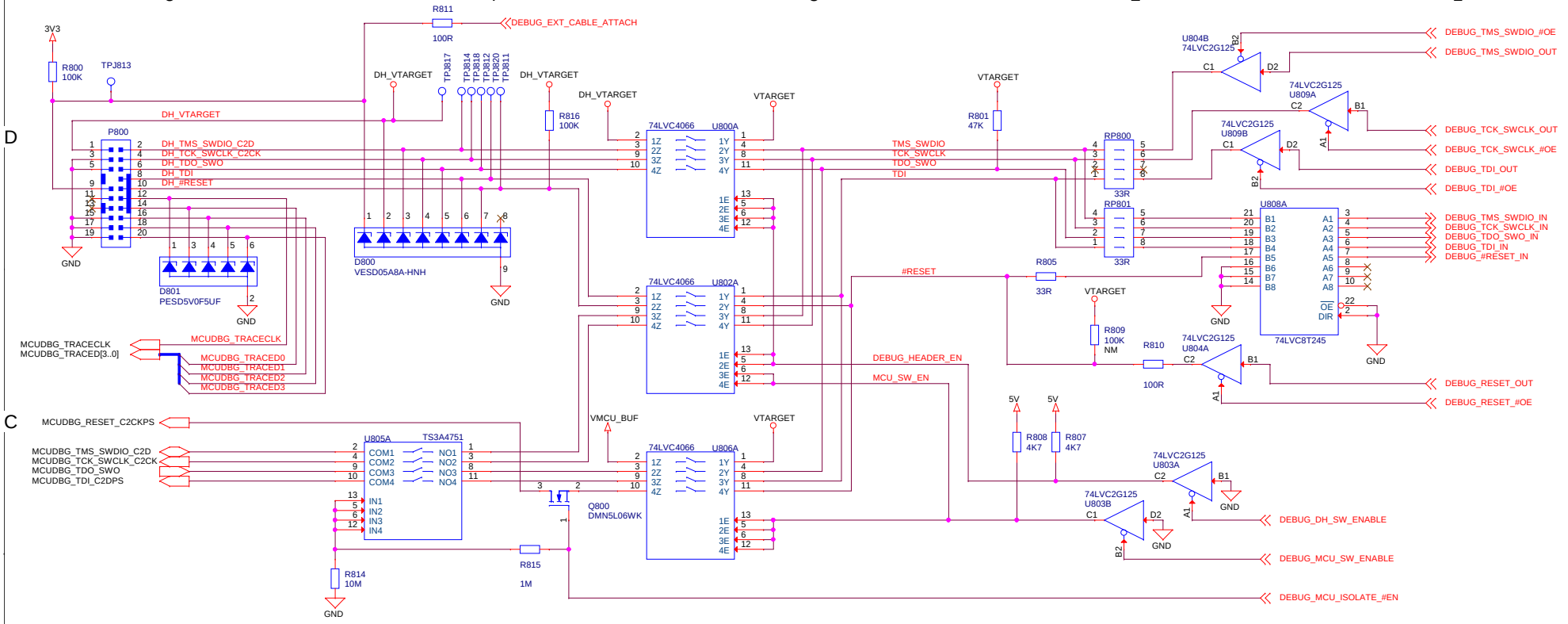
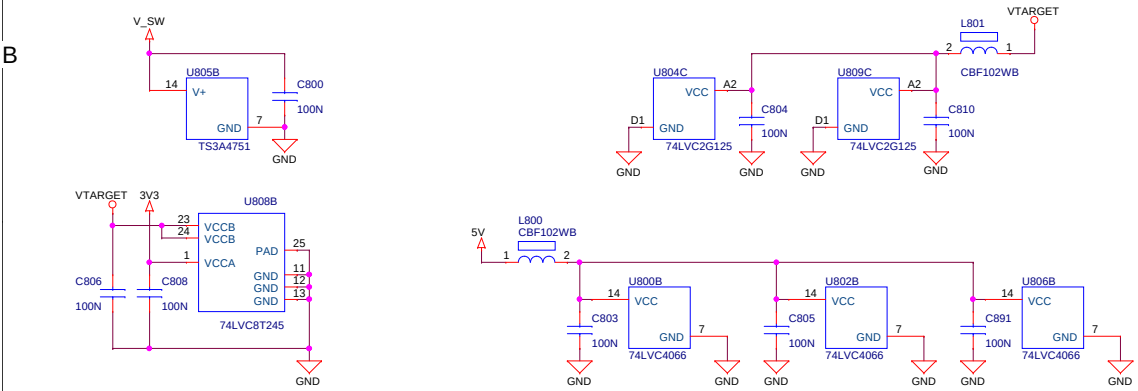
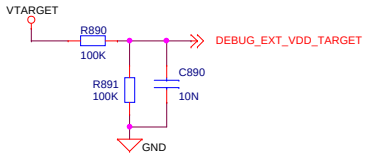


Power & Decoupling





Mode	DEBUG_MCU_SW_ENABLE	DEBUG_DH_SW_ENABLE	DEBUG_BUF_#OE	ISOLATE_#EN	DH_VTARGET	VTARGET
Debug Out	0	1	0	0	External voltage	External voltage
MCU Debug	1	0	0	1	Disconnected	VMCU
Debug In	1	1	1	1	VMCU	VMCU
Debug Off	1	1	1	0	-	-

/HB1
MCU STK Platform

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EFM8BB1 Busy Bee Starter Kit

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Debug Interface

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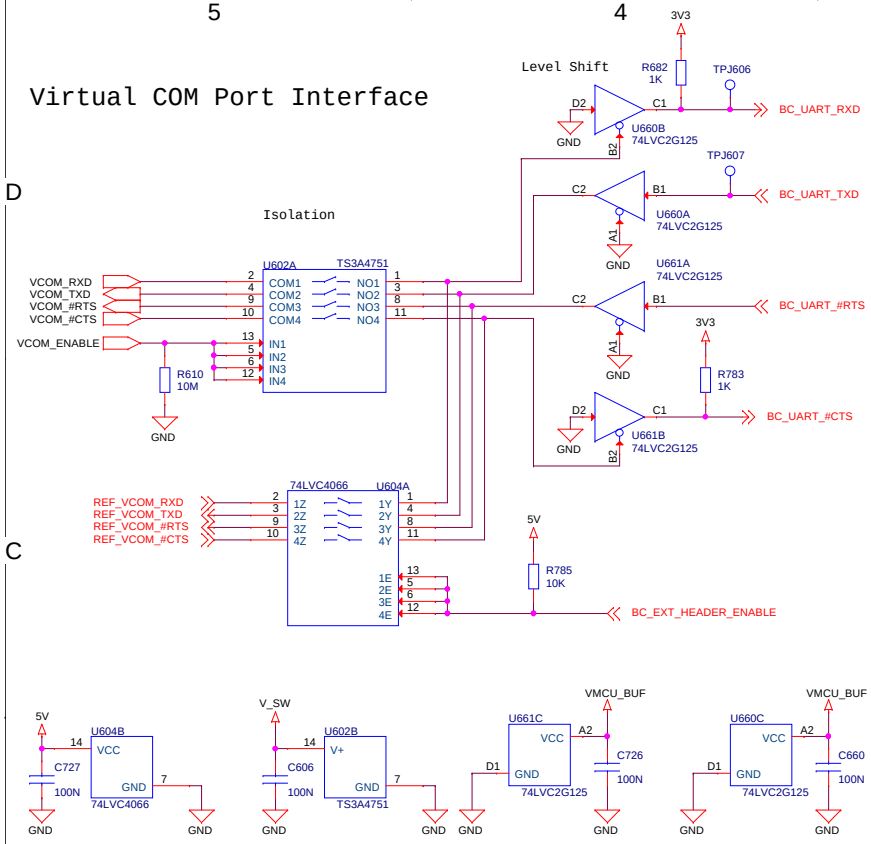
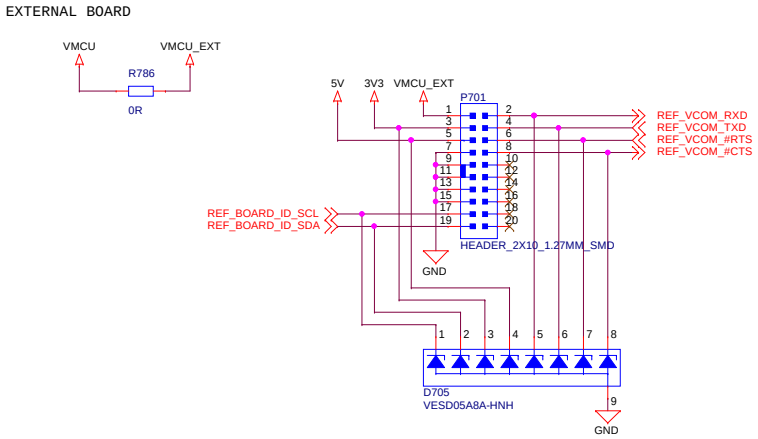
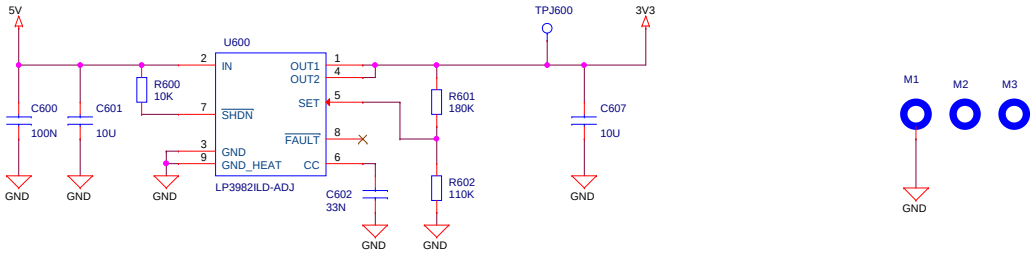
Virtual COM Port Interface



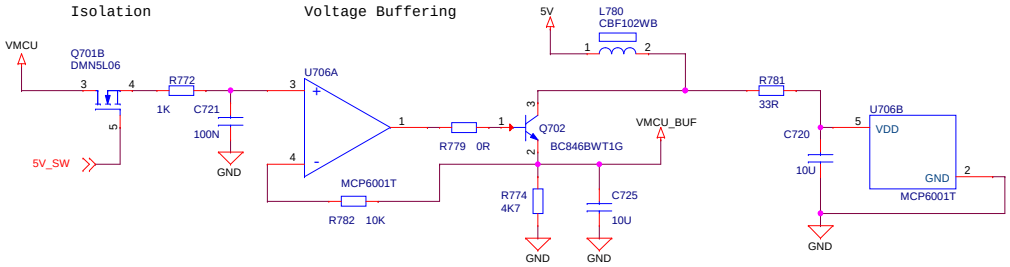
Connector for external reference designs boards



3V3 Regulator



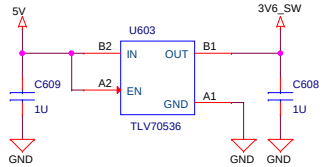
VMCU Voltage Mirror

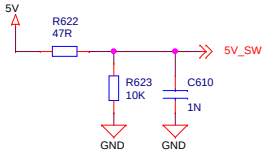


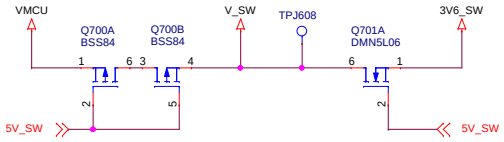
Power Supply for Analog Switches

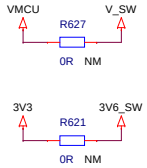
The USB VBUS voltage is used to bias these transistors, turning the P-Channel MOSFETs (Q700) off, and the N-Channel MOSFETs (Q701) on.

J-Link USB Cable	PMOS State	NMOS State	V_SW	VMCU_SENSE
Connected Disconnected	Off ON	ON OFF	3.6V VMCU	VMCU Isolated









/HB1
MCU STK Platform

SILICON LABS

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Page Title	Power & Misc
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Design Created Date:	Monday, May 12, 2014
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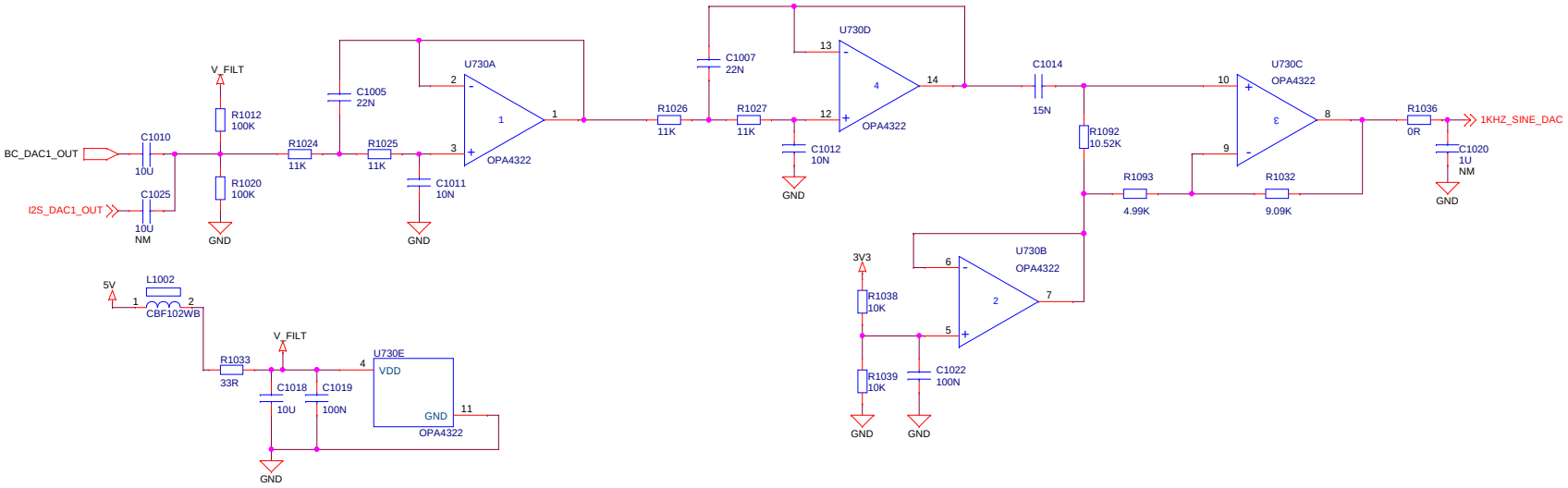
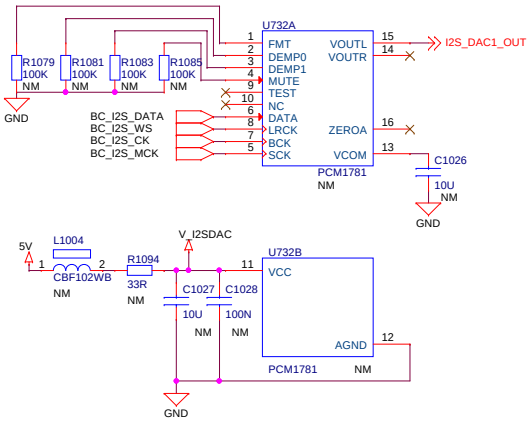
LPF

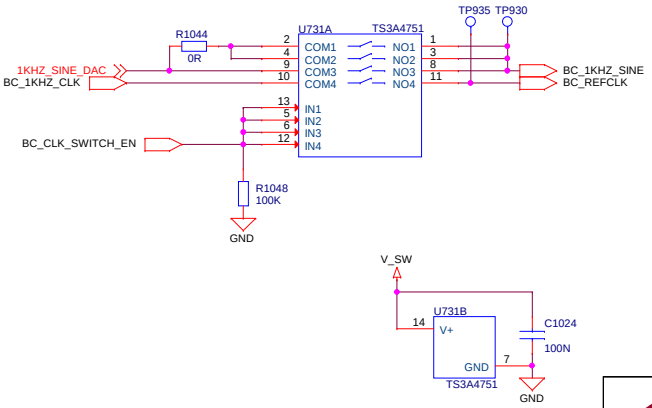


I2S DAC

Layout note: Place All components here + C1025 on secondary sice



Analog Switch



SILICON LABS

Schematic Title	**EFM8BB1 Busy Bee Starter Kit**
Page Title	**Clock & Filter**
Designed: MRW	Approved: JNO
Size: A3	BOM Doc No: <Cage Code>
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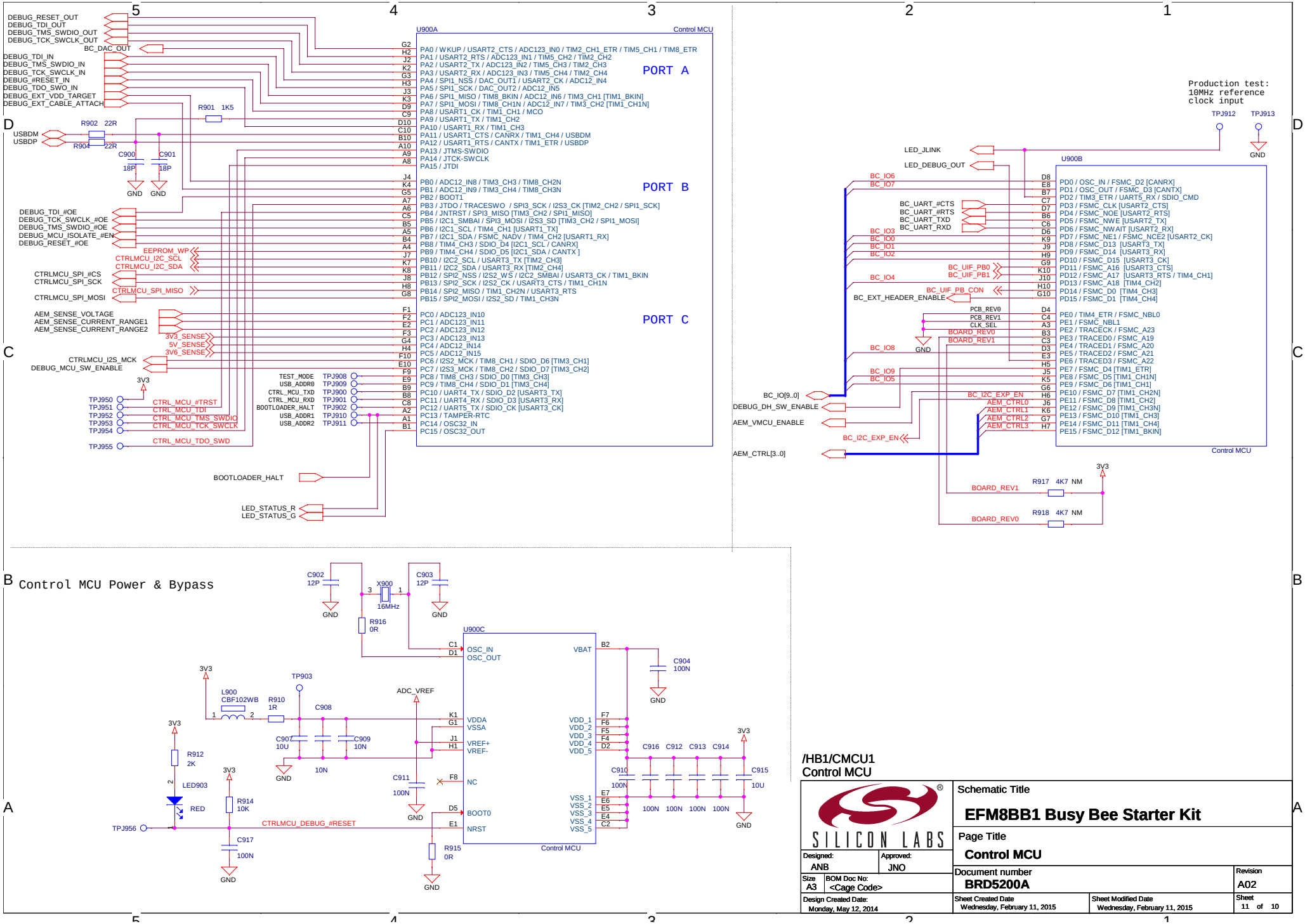
U900A
Control MCU
PORT A
PORT B
PORT C
DEBUG_RESET_OUT
DEBUG_TDI_OUT
DEBUG_TMS_SWDIO_OUT
DEBUG_TCK_SWCLK_OUT
BC_DAC_OUT
DEBUG_TDI_IN
DEBUG_TMS_SWDIO_IN
DEBUG_TCK_SWCLK_IN
DEBUG_#RESET_IN
DEBUG_TDO_SWO_IN
DEBUG_EXT_VDD_TARGET
DEBUG_EXT_CABLE_ATTACH
R901 1K5
R902 22R
R904 22R
USBDM
USBDP
C900 18P
C901 18P
GND
DEBUG_TDI_#OE
DEBUG_TCK_SWCLK_#OE
DEBUG_TMS_SWDIO_#OE
DEBUG_MCU_ISOLATE_#EN
DEBUG_RESET_#OE
EEPROM_WP
CTRLMCU_I2C_SCL
CTRLMCU_I2C_SDA
CTRLMCU_SPI_#CS
CTRLMCU_SPI_SCK
CTRLMCU_SPI_MISO
CTRLMCU_SPI_MOSI
AEM_SENSE_VOLTAGE
AEM_SENSE_CURRENT_RANGE1
AEM_SENSE_CURRENT_RANGE2
3V3_SENSE
5V_SENSE
3V6_SENSE
CTRLMCU_I2S_MCK
DEBUG_MCU_SW_ENABLE
3V3
TPJ950
TPJ951
TPJ952
TPJ953
TPJ954
TPJ955
CTRL_MCU_#TRST
CTRL_MCU_TDI
CTRL_MCU_TMS_SWDIO
CTRL_MCU_TCK_SWCLK
CTRL_MCU_TDO_SWD
TEST_MODE TPJ908
USB_ADDR0 TPJ909
CTRL_MCU_TXD TPJ900
CTRL_MCU_RXD TPJ901
BOOTLOADER_HALT TPJ902
USB_ADDR1 TPJ910
USB_ADDR2 TPJ911
BOOTLOADER_HALT
LED_STATUS_R
LED_STATUS_G
PA0 / WKUP / USART2_CTS / ADC123_IN0 / TIM2_CH1_ETR / TIM5_CH1 / TIM8_ETR
PA1 / USART2_RTS / ADC123_IN1 / TIM5_CH2 / TIM2_CH2
PA2 / USART2_TX / ADC123_IN2 / TIM5_CH3 / TIM2_CH3
PA3 / USART2_RX / ADC123_IN3 / TIM5_CH4 / TIM2_CH4
PA4 / SPI1_NSS / DAC_OUT1 / USART2_CK / ADC12_IN4
PA5 / SPI1_SCK / DAC_OUT2 / ADC12_IN5
PA6 / SPI1_MISO / TIM8_BKIN / ADC12_IN6 / TIM3_CH1 [TIM1_BKIN]
PA7 / SPI1_MOSI / TIM8_CH1N / ADC12_IN7 / TIM3_CH2 [TIM1_CH1N]
PA8 / USART1_CK / TIM1_CH1 / MCO
PA9 / USART1_TX / TIM1_CH2
PA10 / USART1_RX / TIM1_CH3
PA11 / USART1_CTS / CANRX / TIM1_CH4 / USBDM
PA12 / USART1_RTS / CANTX / TIM1_ETR / USBDP
PA13 / JTMS-SWDIO
PA14 / JTCK-SWCLK
PA15 / JTDI
PB0 / ADC12_IN8 / TIM3_CH3 / TIM8_CH2N
PB1 / ADC12_IN9 / TIM3_CH4 / TIM8_CH3N
PB2 / BOOT1
PB3 / JTDO / TRACESWO / SPI3_SCK / I2S3_CK [TIM2_CH2 / SPI1_SCK]
PB4 / JNTRST / SPI3_MISO [TIM3_CH2 / SPI1_MISO]
PB5 / I2C1_SMBAI / SPI3_MOSI / I2S3_SD [TIM3_CH2 / SPI1_MOSI]
PB6 / I2C1_SCL / TIM4_CH1 [USART1_TX]
PB7 / I2C1_SDA / FSMC_NADV / TIM4_CH2 [USART1_RX]
PB8 / TIM4_CH3 / SDIO_D4 [I2C1_SCL / CANRX]
PB9 / TIM4_CH4 / SDIO_D5 [I2C1_SDA / CANTX]
PB10 / I2C2_SCL / USART3_TX [TIM2_CH3]
PB11 / I2C2_SDA / USART3_RX [TIM2_CH4]
PB12 / SPI2_NSS / I2S2_WS / I2C2_SMBAI / USART3_CK / TIM1_BKIN
PB13 / SPI2_SCK / I2S2_CK / USART3_CTS / TIM1_CH1N
PB14 / SPI2_MISO / TIM1_CH2N / USART3_RTS
PB15 / SPI2_MOSI / I2S2_SD / TIM1_CH3N
PC0 / ADC123_IN10
PC1 / ADC123_IN11
PC2 / ADC123_IN12
PC3 / ADC123_IN13
PC4 / ADC12_IN14
PC5 / ADC12_IN15
PC6 / I2S2_MCK / TIM8_CH1 / SDIO_D6 [TIM3_CH1]
PC7 / I2S3_MCK / TIM8_CH2 / SDIO_D7 [TIM3_CH2]
PC8 / TIM8_CH3 / SDIO_D0 [TIM3_CH3]
PC9 / TIM8_CH4 / SDIO_D1 [TIM3_CH4]
PC10 / UART4_TX / SDIO_D2 [USART3_TX]
PC11 / UART4_RX / SDIO_D3 [USART3_RX]
PC12 / UART5_TX / SDIO_CK [USART3_CK]
PC13 / TAMPER-RTC
PC14 / OSC32_IN
PC15 / OSC32_OUT
Production test:
10MHz reference
clock input
TPJ912
TPJ913
GND
U900B
Control MCU
LED_JLINK
LED_DEBUG_OUT
BC_IO6
BC_IO7
BC_UART_#CTS
BC_UART_#RTS
BC_UART_TXD
BC_UART_RXD
BC_IO3
BC_IO0
BC_IO1
BC_IO2
BC_UIF_PB0
BC_UIF_PB1
BC_IO4
BC_UIF_PB_CON
BC_EXT_HEADER_ENABLE
PCB_REV0
PCB_REV1
CLK_SEL
BOARD_REV0
BOARD_REV1
BC_IO8
BC_IO9
BC_IO5
BC_I2C_EXP_EN
AEM_CTRL0
AEM_CTRL1
AEM_CTRL2
AEM_CTRL3
BC_IO[9..0]
DEBUG_DH_SW_ENABLE
AEM_VMCU_ENABLE
AEM_CTRL[3..0]
PD0 / OSC_IN / FSMC_D2 [CANRX]
PD1 / OSC_OUT / FSMC_D3 [CANTX]
PD2 / TIM3_ETR / UART5_RX / SDIO_CMD
PD3 / FSMC_CLK [USART2_CTS]
PD4 / FSMC_NOE [USART2_RTS]
PD5 / FSMC_NWE [USART2_TX]
PD6 / FSMC_NWAIT [USART2_RX]
PD7 / FSMC_NE1 / FSMC_NCE2 [USART2_CK]
PD8 / FSMC_D13 [USART3_TX]
PD9 / FSMC_D14 [USART3_RX]
PD10 / FSMC_D15 [USART3_CK]
PD11 / FSMC_A16 [USART3_CTS]
PD12 / FSMC_A17 [USART3_RTS / TIM4_CH1]
PD13 / FSMC_A18 [TIM4_CH2]
PD14 / FSMC_D0 [TIM4_CH3]
PD15 / FSMC_D1 [TIM4_CH4]
PE0 / TIM4_ETR / FSMC_NBL0
PE1 / FSMC_NBL1
PE2 / TRACECK / FSMC_A23
PE3 / TRACED0 / FSMC_A19
PE4 / TRACED1 / FSMC_A20
PE5 / TRACED2 / FSMC_A21
PE6 / TRACED3 / FSMC_A22
PE7 / FSMC_D4 [TIM1_ETR]
PE8 / FSMC_D5 [TIM1_CH1N]
PE9 / FSMC_D6 [TIM1_CH1]
PE10 / FSMC_D7 [TIM1_CH2N]
PE11 / FSMC_D8 [TIM1_CH2]
PE12 / FSMC_D9 [TIM1_CH3N]
PE13 / FSMC_D10 [TIM1_CH3]
PE14 / FSMC_D11 [TIM1_CH4]
PE15 / FSMC_D12 [TIM1_BKIN]
3V3
R917 4K7 NM
R918 4K7 NM
Control MCU Power & Bypass
C902 12P
C903 12P
X900
16MHz
R916 0R
U900C
OSC_IN
OSC_OUT
VBAT
C904 100N
TP903
L900 CBF102WB
R910 1R
C908
ADC_VREF
C907 10U
C909 10N
VDDA
VSSA
VREF+
VREF-
VDD_1
VDD_2
VDD_3
VDD_4
VDD_5
C916 C912 C913 C914
C910 100N
C915 10U
100N
R912 2K
LED903
RED
R914 10K
TPJ956
CTRLMCU_DEBUG_#RESET
C911 100N
NC
BOOT0
NRST
VSS_1
VSS_2
VSS_3
VSS_4
VSS_5
C917 100N
R915 0R
Control MCU
/HB1/CMCU1
Control MCU
SILICON LABS
Schematic Title
EFM8BB1 Busy Bee Starter Kit
Page Title
Control MCU
Designed: ANB
Approved: JNO
Size A3
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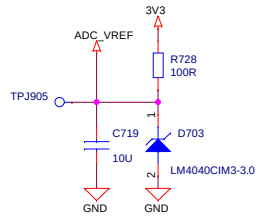
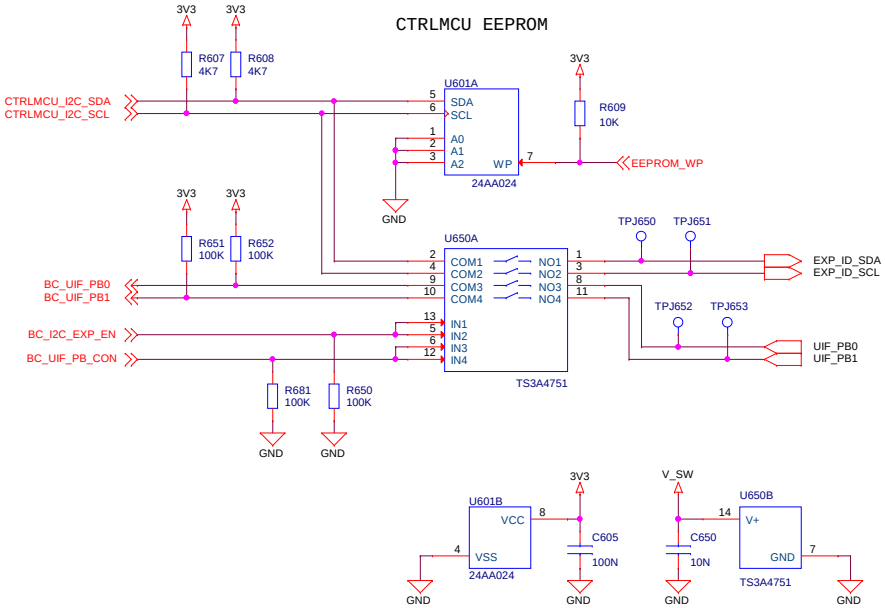
Revision A02
Design Created Date: Monday, May 12, 2014
Sheet Created Date Wednesday, February 11, 2015
Sheet Modified Date Wednesday, February 11, 2015
Sheet 11 of 10

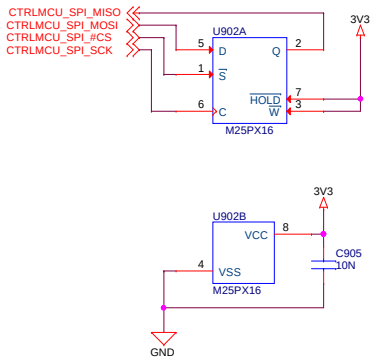
ADC reference voltage



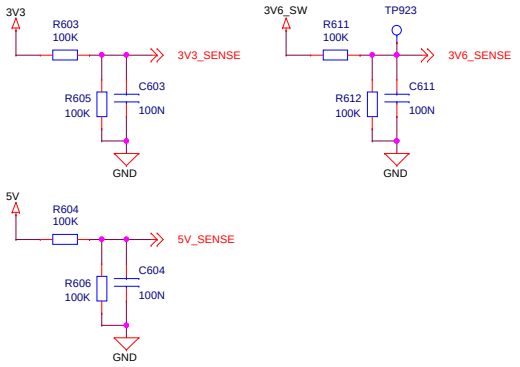
CTRLMCU EEPROM



CTRLMCU SERIAL FLASH



POWER SENSE



/HB1/CMCU1
Control MCU

SILICON LABS

Designed: ANB	Approved: JNO
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Schematic Title
EFM8BB1 Busy Bee Starter Kit

Page Title
Control MCU Misc

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