



## EFM8UB1 Universal Bee STK


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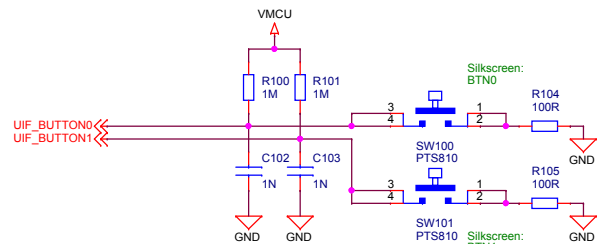
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## Revision History

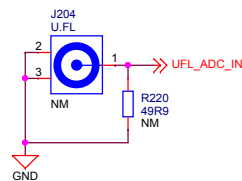
Rev.	Description
A01	Update to new STK platform

 <b>SILICON LABS</b>		Board Name <b>EFM8UB1 Universal Bee STK</b>	
		Page Title <b>Title Page</b>	
Designed <b>ASN</b>	Approved <b>RGU</b>	Board Number <b>BRD5000B</b>	Revision <b>A01</b>
Size <b>A3</b>	Sheet Modified Date <b>Tuesday, July 12, 2022</b>	Copyright Silicon Laboratories Inc. 2022    CONFIDENTIAL – SUBJECT TO TERMS OF USE	
		Sheet <b>1 of 10</b>	

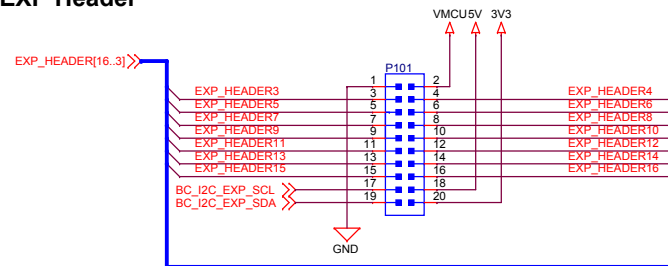
## Push Buttons



## U.FL ADC Connection



## EXP Header



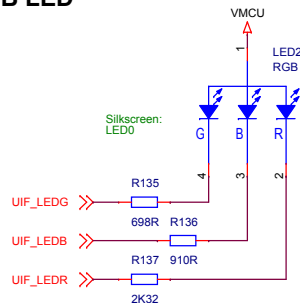
### EXP-Header Functionality

\*\* Indicates potential STK hardware conflicts

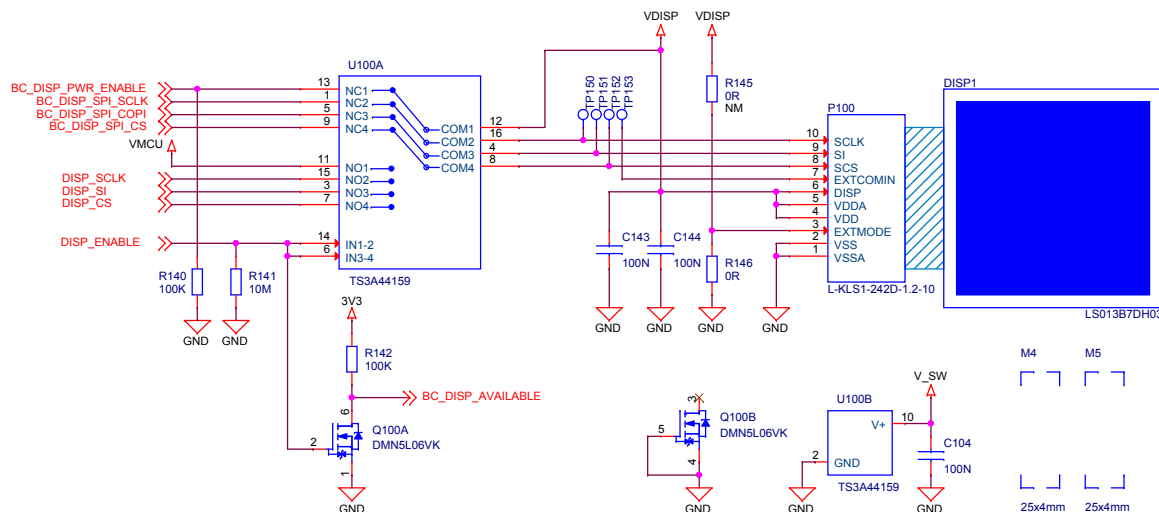
1	GND			
3	P0.0		CMP0.0/ADC0.0	
5	P1.4		CMP1.4/ADC0.12	** STK LED0
7	P1.5		CMP1.5/ADC0.13	** STK LED1
9	P1.6		CMP1.6/ADC0.14	** STK LED2
11	P2.3		CMP1.12/ADC0.23	
13	P3.1			
15	P1.3	I2C0_SCL	CMP1.3/ADC0.11	
17	Reserved for EXP Board Identification			
19	Reserved for EXP Board Identification			

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	P2.1	UART1_TX	CMP1.10/ADC0.21	
14	P2.2	UART1_RX	CMP1.11/ADC0.22	
16	P1.2	I2C0_SDA	CMP1.2/ADC0.10	
18	SV			
20	3V3			

## RGB LED



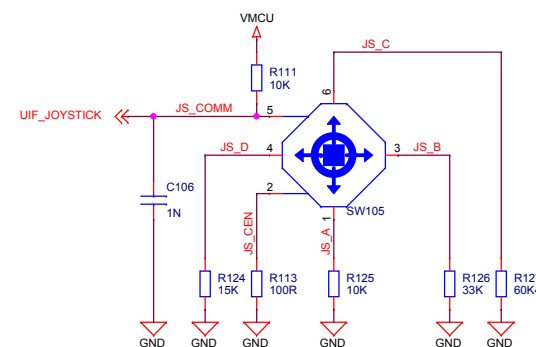
## Memory LCD-TFT Display & Multiplexer




The EFM8 always controls ownership of the display using the DISP\_ENABLE signal.

DISP_ENABLE	Connected	VDISP	BC_DISP_AVAILABLE
1	MCU	VMCU	GND
0	BC	BC_DISP_PWR_ENABLE	3V3

## Analog Joystick



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## D



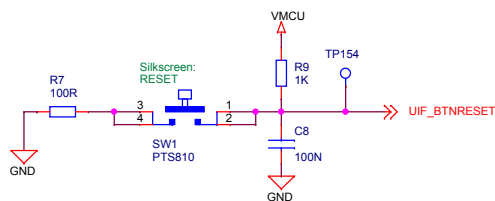
## A



Resistor divider on VBUS,  
as described in the datasheet.

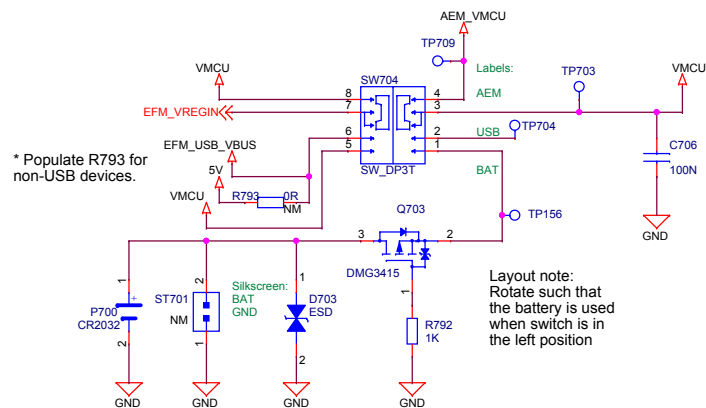
A

## Reset Push Button

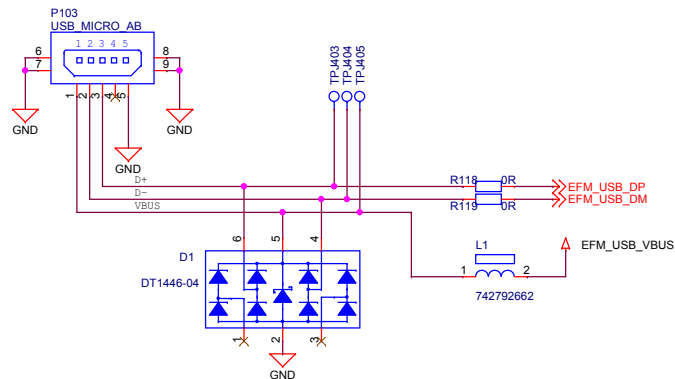


## Power Select Switch: AEM/BAT

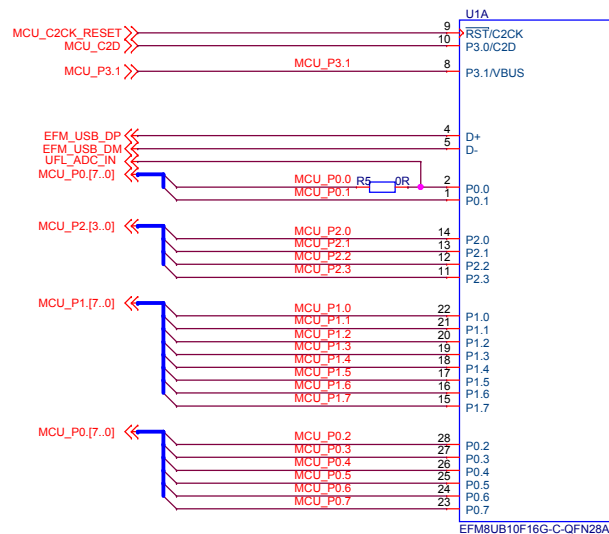
SWITCH POS	MODE DESCRIPTION
AEM	AEM Enabled, VMCU sourced from external 3.3V LDO powered by BC USB 5V supply
USB	AEM Disabled, VMCU sourced from internal 3.3V LDO powered by EFM8 USB 5V
BAT	AEM Disabled, VMCU sourced from external coin-cell battery or external power supply



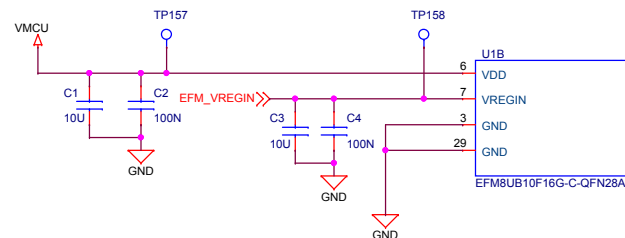
## USB Connection and ESD protection



## EFM8 I/O

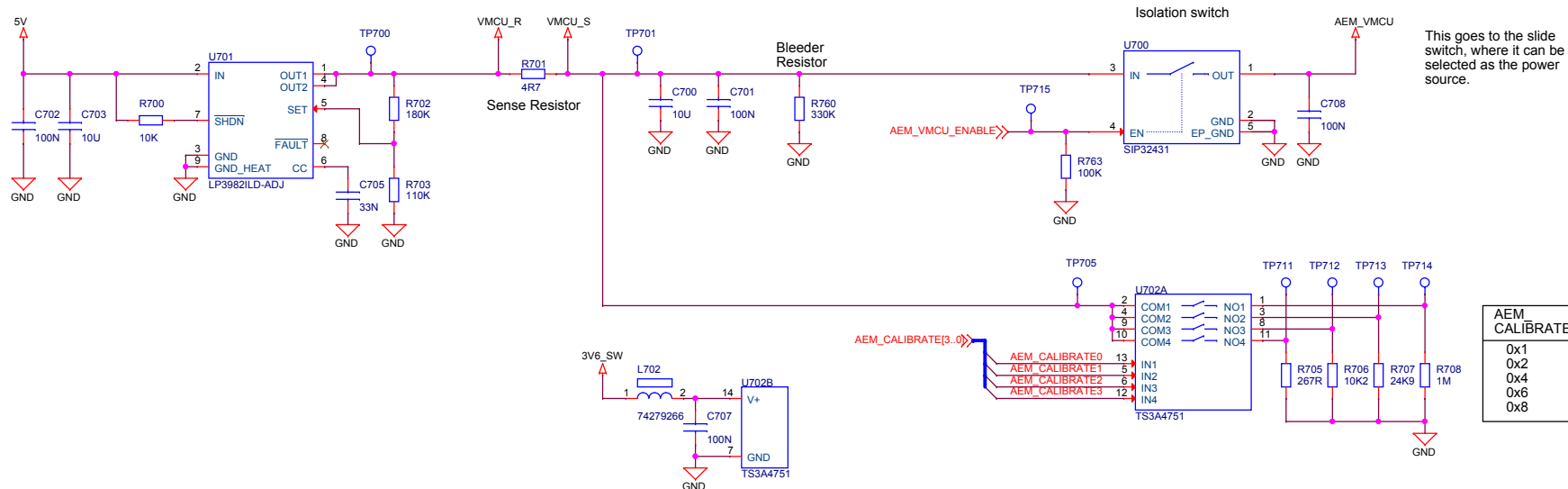


## EFM8 Power & Decoupling



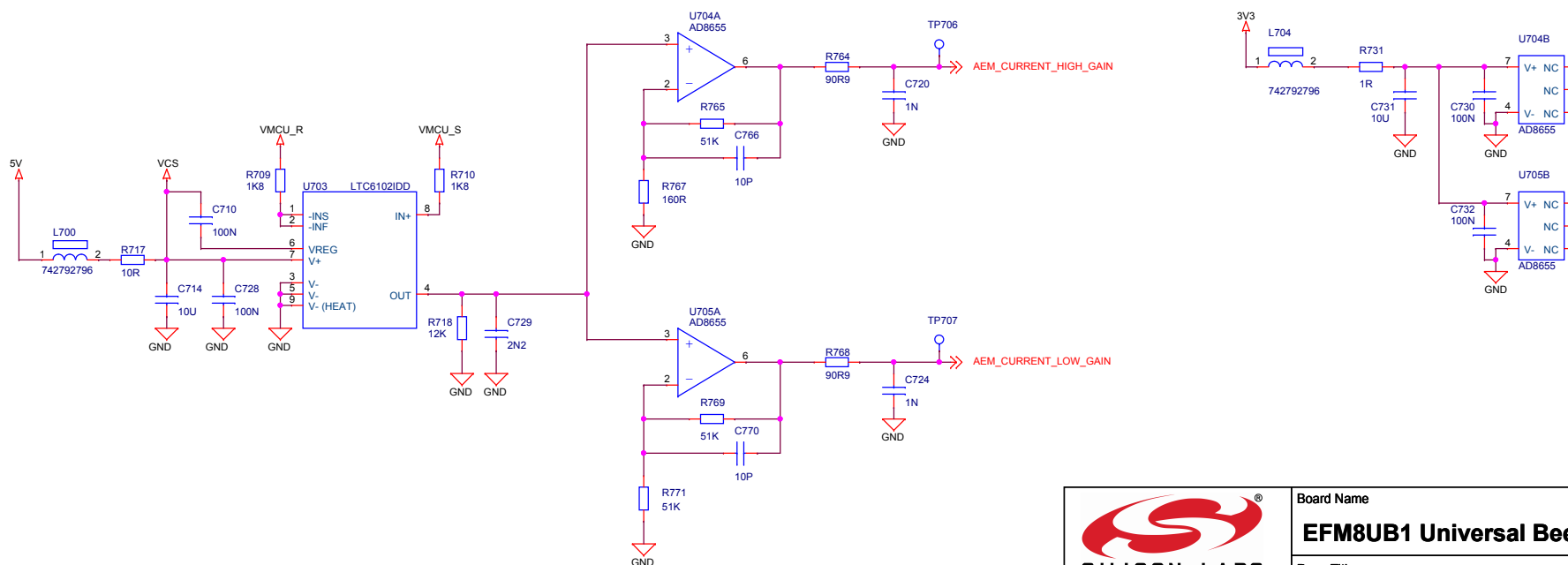
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		EFM8UB1 Universal Bee STK	
Designed ASN		Page Title	
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## MCU Power Regulator



AEM CALIBRATE	Current
0x1	3.30 uA
0x2	132.5 uA
0x4	323.5 uA
0x6	456.1 uA
0x8	12.36 mA

## Advanced Energy Monitoring

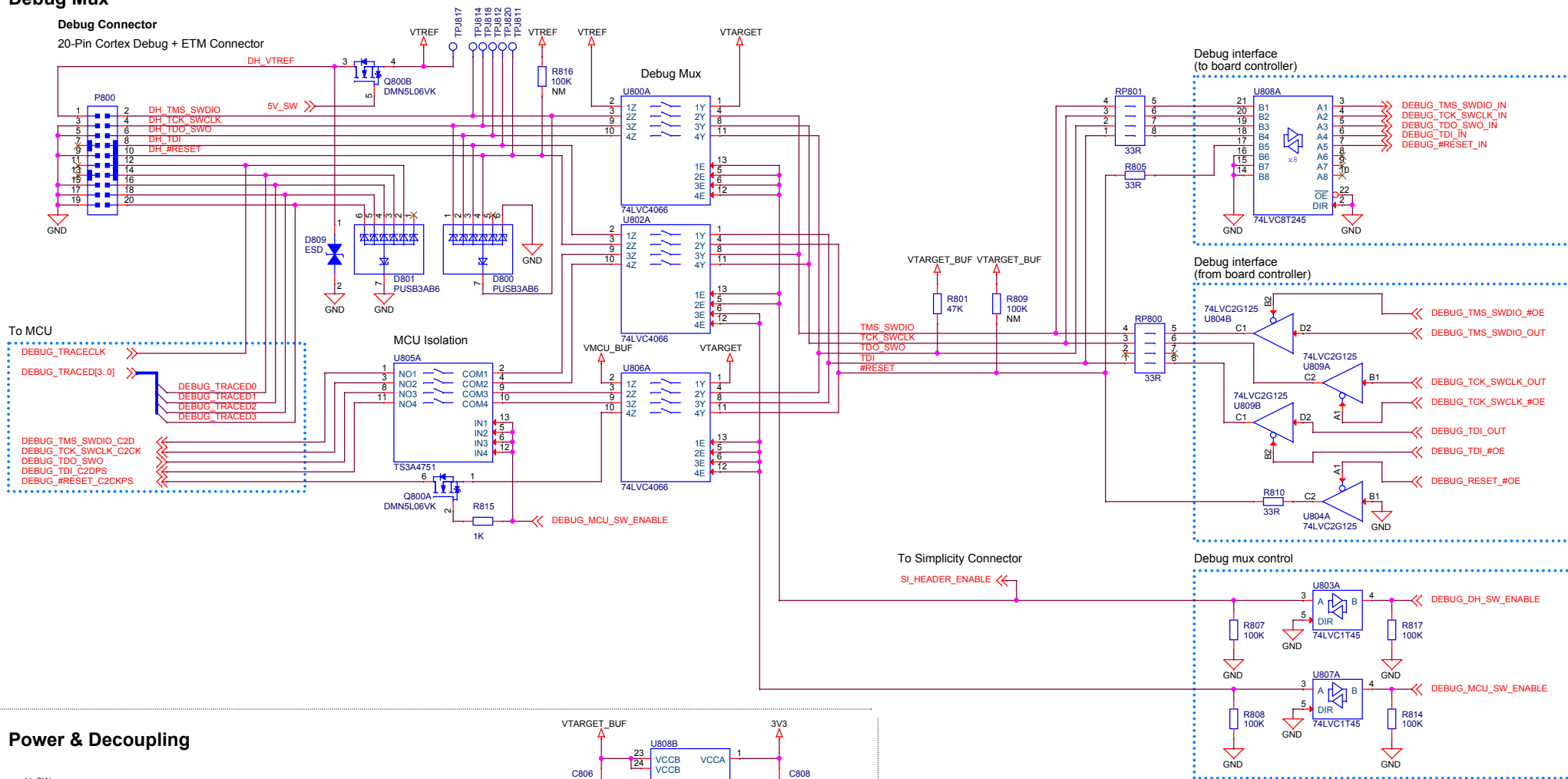


 <b>SILICON LABS</b>		Board Name	
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Designed		Page Title	
ASN		<b>Target Voltage Supply &amp; AEM</b>	
Approved		Board Number	
RGU		<b>BRD5000B</b>	
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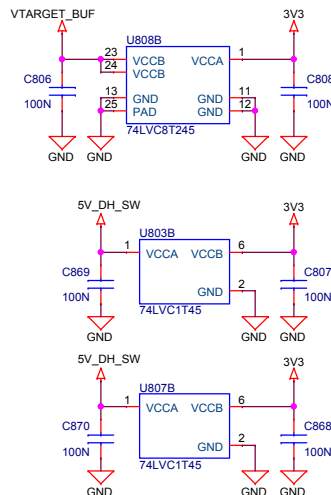
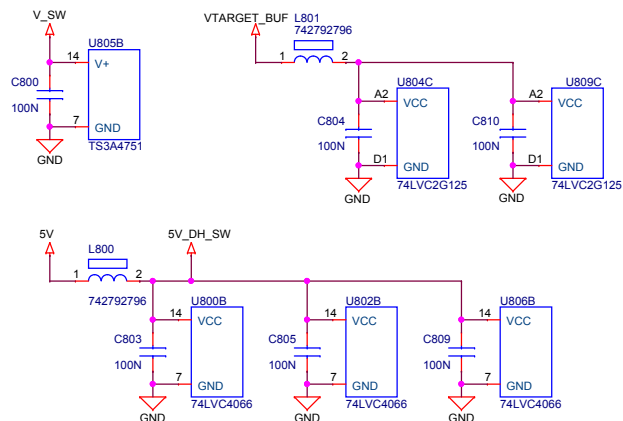
## Debug Mux

### Debug Connector


20-Pin Cortex Debug + ETM Connector



## Power & Decoupling



Debug Mode	DH_SW_ENABLE	MCU_SW_ENABLE	Debug Mode	VTARGET Source	VTREF Source
MCU	0	1	MCU	VMCU	None
Debug Out	1	0	Debug Out	VTREF (EXT)	External
Debug In	1	1	Debug In	VMCU	VMCU_BUF
Debug Off	0	0	Debug Off	None	None



**SILICON LABS**

Designed MAH  
Size A3

Approved RGU  
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Board Name

**EFM8UB1 Universal Bee STK**

Page Title

**Debug Interface**

Board Number

**BRD5000B**

Revision

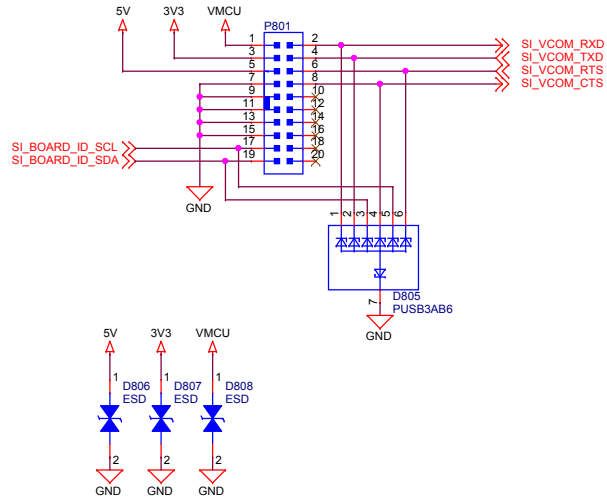
**A01**

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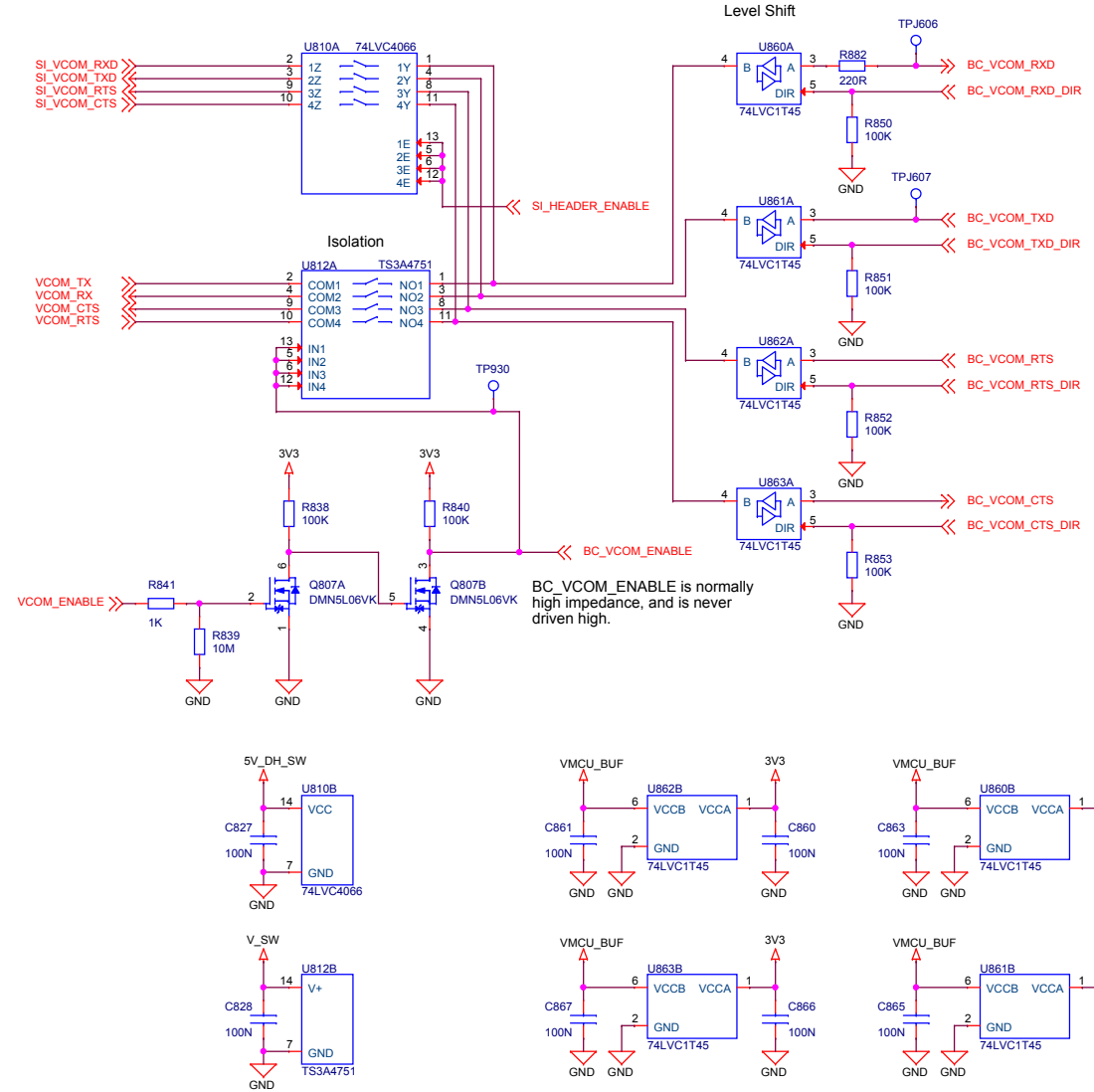
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## Simplicity Connector

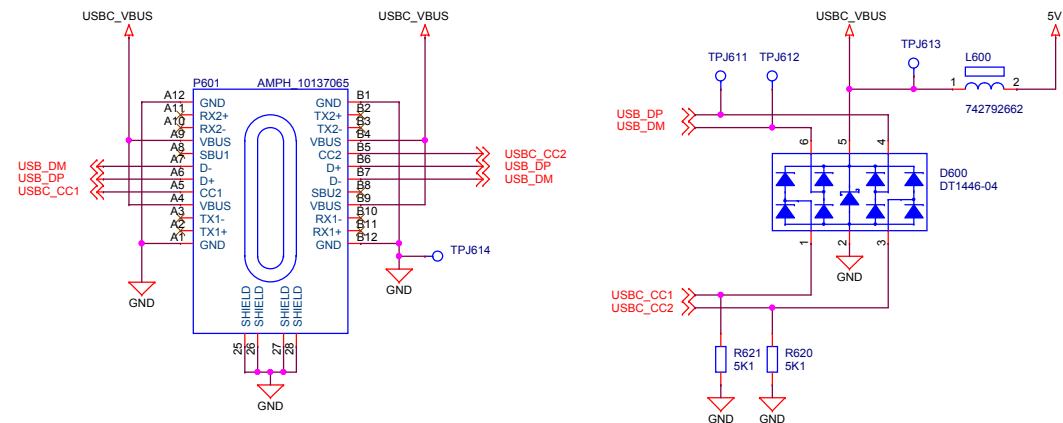


## VCOM Interface

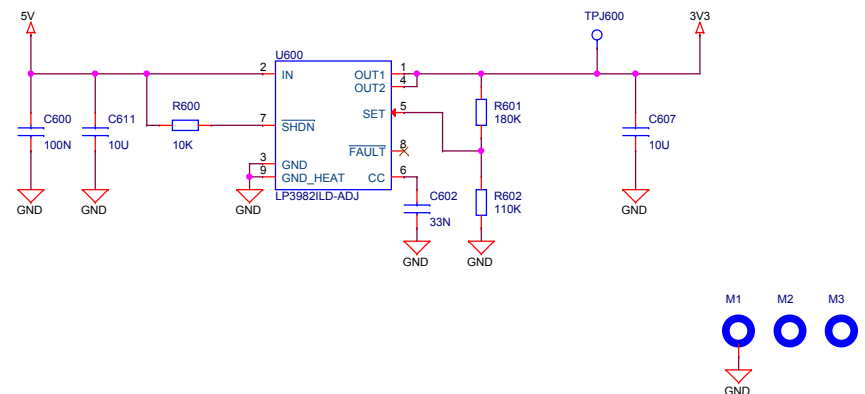


 <b>SILICON LABS</b>		Board Name	
		<b>EFM8UB1 Universal Bee STK</b>	
Designed MAH		Page Title	
Size A3		<b>Simplicity &amp; VCOM</b>	
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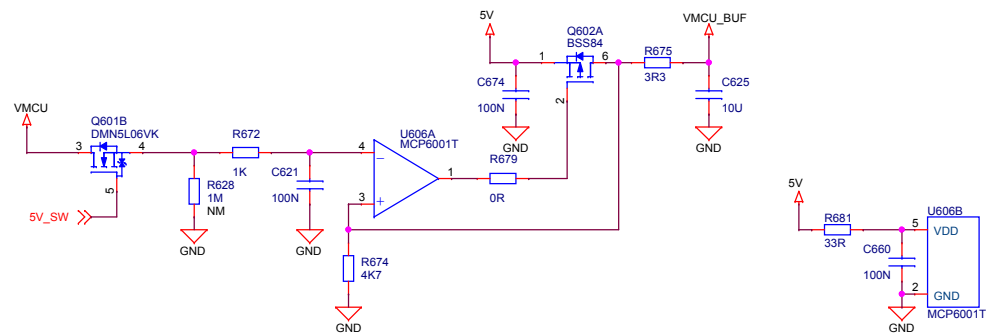
### J-Link USB Port



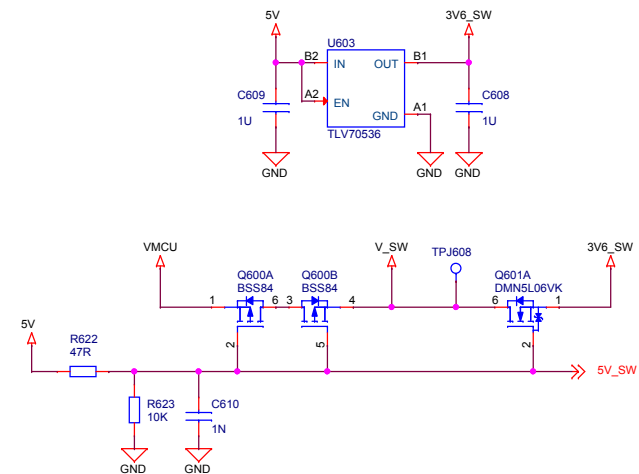
### 3V3 Regulator



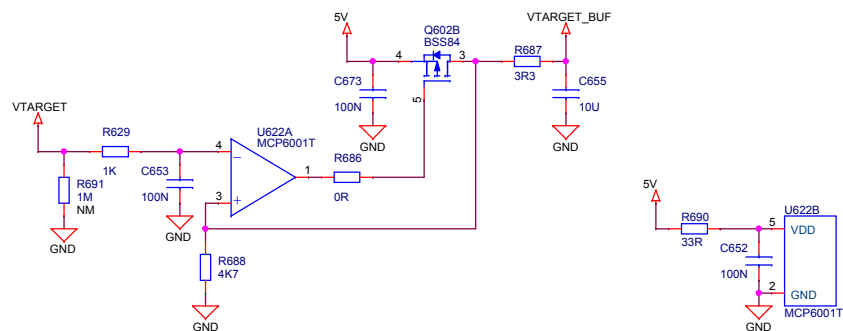
### VMCU Voltage Mirror



## Power Supply for Analog Switches



### VTARGET Voltage Mirror



J-Link USB Cable	Q600 State	Q601A State	V_SW	VMCU_SENSE
Connected	OFF	ON	3.6V	VMCU
Disconnected	ON	OFF	VMCU	Isolated

Isolation switches are powered by 3V6\_SW when the USB cable is connected, otherwise by VMCU.



Board Name
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## EFM8UB1 Universal Bee STK

Page Title

## Power

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**Board Controller**

The diagram illustrates the Board Controller architecture, featuring three microcontroller units (U900A, U900B, U900C) and their interconnections. The components and connections are as follows:

- U900A (EFM32GG12B410F1024GL120-A):**
  - Debug Pins:** C2, C1, D2, D1, E3, E2, E1, L3, M3, M4, N5, M5, M6, B1, F1, F2, F3, G1, G2, H1, H2, M1, L8, L9, N6, N7, N9, N10, D3.
  - Power Pins:** PA0, PA1, PA2, PA3, PA4, PA5, PA6, PA7, PA8, PA9, PA10, PA11, PA12, PA13, PA14, PA15, PB0, PB1, PB2, PB3, PB4, PB5, PB6, PB7, PB8, PB9, PB10, PB11, PB12, PB13, PB14, PB15.
  - Functionality:** DEBUG\_TMS\_SWIDIO\_OUT, DEBUG\_TCK\_SWCLK\_OUT, DEBUG\_TMS\_SWIDIO\_OE, DEBUG\_RESET\_OE, DEBUG\_TDO\_SWO\_IN, DEBUG\_TDI\_OUT, DEBUG\_TDI\_OE, DEBUG\_TMS\_SWIDIO\_IN, DEBUG\_TCK\_SWCLK\_IN, DEBUG\_TDI\_IN, DEBUG\_RESET\_IN, BOARD\_VER0, BOARD\_VER1, DEBUG\_TCK\_SWCLK\_OE, DEBUG\_DH\_SW\_ENABLE, BC\_VCOM\_ENABLE, BC\_DISP\_AVAILABLE, DEBUG\_MCU\_SW\_ENABLE, BC\_BUTTON\_ENABLE, BC\_VCOM\_RXD\_DIR, BC\_VCOM\_TXD\_DIR, AEM\_CURRENT\_LOW\_GAIN, BC\_DAC\_OUT.
- U900B (EFM32GG12B410F1024GL120-A):**
  - Debug Pins:** K1, K2, L1, L2, M2, N2, J12, H13, F13, E13, D12, PC12, PC13, C12, C13, L10, L11, M12, L12, N13, M13, K13, A5, B6, B5, J1, J2.
  - Power Pins:** PC0, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PD0, PD1, PD2, PD3, PD4, PD5, PD6, PD7, PD8, PD9, PD10, PD11, PD12, PD13, PD14, PD15.
  - Functionality:** BC\_VCOM\_RTS, BC\_VCOM\_CTS, BC\_VCOM\_TXD, BC\_VCOM\_RXD, BC\_VCOM\_RTS\_DIR, BC\_VCOM\_CTS\_DIR, BOARD\_ID\_SDA, BOARD\_ID\_SCL, BOARD\_ID\_WP, LED\_STATUS\_R, BC\_DISP\_PWR\_ENABLE, LED\_STATUS\_G, BC\_DISP\_SPI\_CS, BC\_DISP\_SPI\_SCLK, AEM\_5V\_ENABLE, AEM\_SWITCH\_POS, AEM\_CURRENT\_HIGH\_GAIN, AEM\_SENSE\_SELECT, AEM\_VMCU\_ENABLE, BC\_ADC\_SPI\_COPI, BC\_ADC\_SPI\_CPOI, BC\_ADC\_SPI\_SCLK, BC\_ADC\_SPI\_CS, BC\_I2C\_EXP\_ENABLE.
- U900C (EFM32GG12B410F1024GL120-A):**
  - Debug Pins:** G11, G12, H12, G13, C11, D11, E11, F11, B4, A4, C3, B3, A3, B2, A2, A1, C10, B10, A10, B9, A9, A8, B8, A7, B7, C7, B13, A13, B11.
  - Power Pins:** PE0, PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9, PE10, PE11, PE12, PE13, PE14, PE15, PF0, PF1, PF2, PF3, PF4, PF5, PF6, PF7, PF8, PF9, PF10, PF11, PF12.
  - Functionality:** AEM\_CALIBRATE0, AEM\_CALIBRATE1, AEM\_CALIBRATE2, AEM\_CALIBRATE3, TEST\_USB\_ADDR0, TEST\_USB\_ADDR1, TEST\_USB\_ADDR2, BC\_UIF\_BUTTON0, BC\_UIF\_BUTTON1, BC\_SPI\_COPI, BC\_SPI\_CPOI, BC\_SPI\_SCLK, BC\_SPI\_CS, TEST\_BC\_TXD, TEST\_BC\_RXD, BC\_DBG\_TCK\_SWCLK, BC\_DBG\_TMS\_SWIDIO, BC\_DBG\_TDO\_SWO, BC\_TRACED3, TEST\_MODE, BOOTLOADER\_HALT, BC\_DISP\_SPI\_COPI, LED\_LINK, USB\_DM, USB\_DP, BC\_TRACECLK, BC\_TRACED0, R902 33R, R904 33R, EFM32GG12B410F1024GL120-A.

**Production test: 10MHz reference clock input**

## Power & Decoupling

The schematic diagram illustrates the power and decoupling circuit for the EFM32GG12B410F1024GL120-A microcontroller. The circuit is powered by a 3V3 supply. Key components and connections include:

- Power Supply:** 3V3 supply connected to the microcontroller's AVDD, DVDD, and IOVDD1 pins.
- Decoupling Network:** A series of decoupling capacitors (C901-C927) connected to ground to filter noise and provide a stable power supply. The capacitors include:
  - C901: 1uF
  - C902: 4uF
  - C903: 10uF
  - C904: 10nF
  - C905: 10nF
  - C906: 10nF
  - C907: 4uF
  - C908: 100nF
  - C909: 100nF
  - C910: 100nF
  - C911: 100nF
  - C924: 100nF
  - C925: 100nF
  - C926: 100nF
  - C927: 100nF
- Microcontroller (U900D):** The EFM32GG12B410F1024GL120-A microcontroller is shown with its internal decoupling network and various pins connected to the power supply and ground.
- Other Components:**
  - R912: 2K15 resistor connected to the 3V3 supply.
  - LED903: RED LED connected to the 3V3 supply.
  - TPJ956: Trace connected to the 3V3 supply.
  - BC\_DBG\_#RESET: Reset signal connected to the microcontroller's RESETn pin.
  - DBG\_VREGO: Debug voltage regulator output connected to the microcontroller's USB\_VREGO pin.

## Board ID & Button Isolation

### BC Serial Flash

The diagram shows two U902A and U902B chips connected to a BC\_SPI\_CPIPO signal. The U902A chip is connected to the BC\_SPI\_CPIPO signal via a 10K resistor (R906) and a 100nF capacitor (C914). The U902B chip is connected to the BC\_SPI\_CPIPO signal via a 100nF capacitor (C914). The BC\_SPI\_CPIPO signal is also connected to the BC\_SPI\_CPIPO pin of the U902A chip. The BC\_SPI\_CPIPO signal is also connected to the BC\_SPI\_CPIPO pin of the U902B chip. The BC\_SPI\_CPIPO signal is also connected to the BC\_SPI\_CPIPO pin of the U902B chip. The BC\_SPI\_CPIPO signal is also connected to the BC\_SPI\_CPIPO pin of the U902B chip.

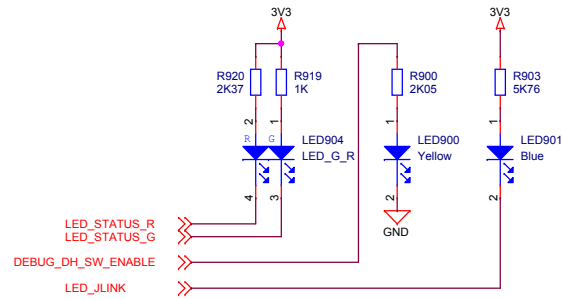
BOARD\_VER0  
BOARD\_VER1

R831  
1K

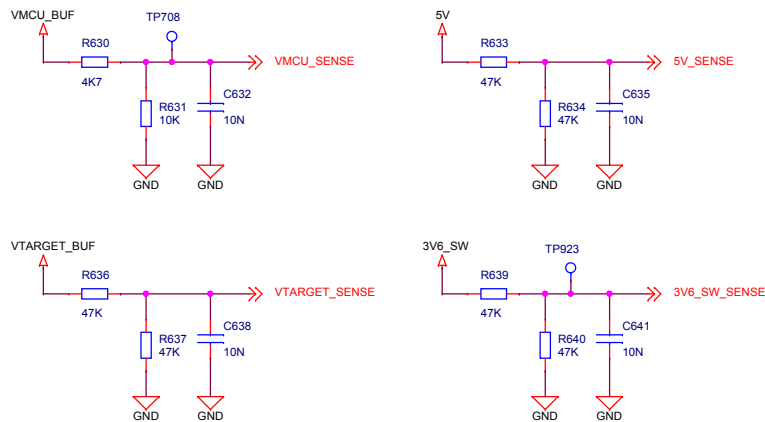
R930  
1K

GND GND

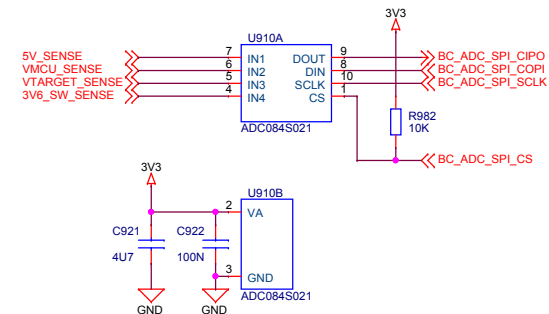
## Indicator LEDs




## BC Voltage Sense



## BC Voltage Sense ADC



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