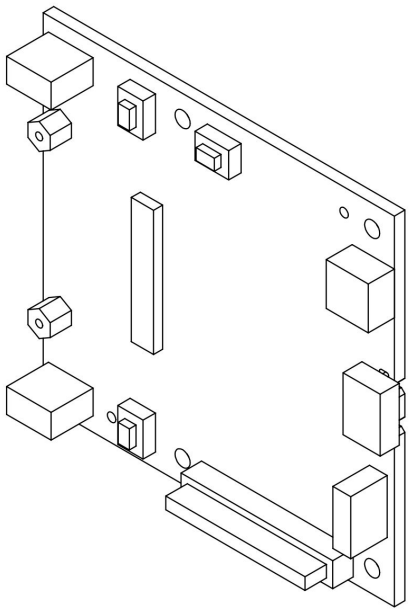
EVM Application Board Datasheet

SteamVR™ Tracking



Features

- Connection for SteamVR Tracking™ Core Module
- Battery charge manager and fuel gauge
- Connections for USB, Debug UART, SWD, and UI hardware
- Serial flash for storing HMD display calibration data

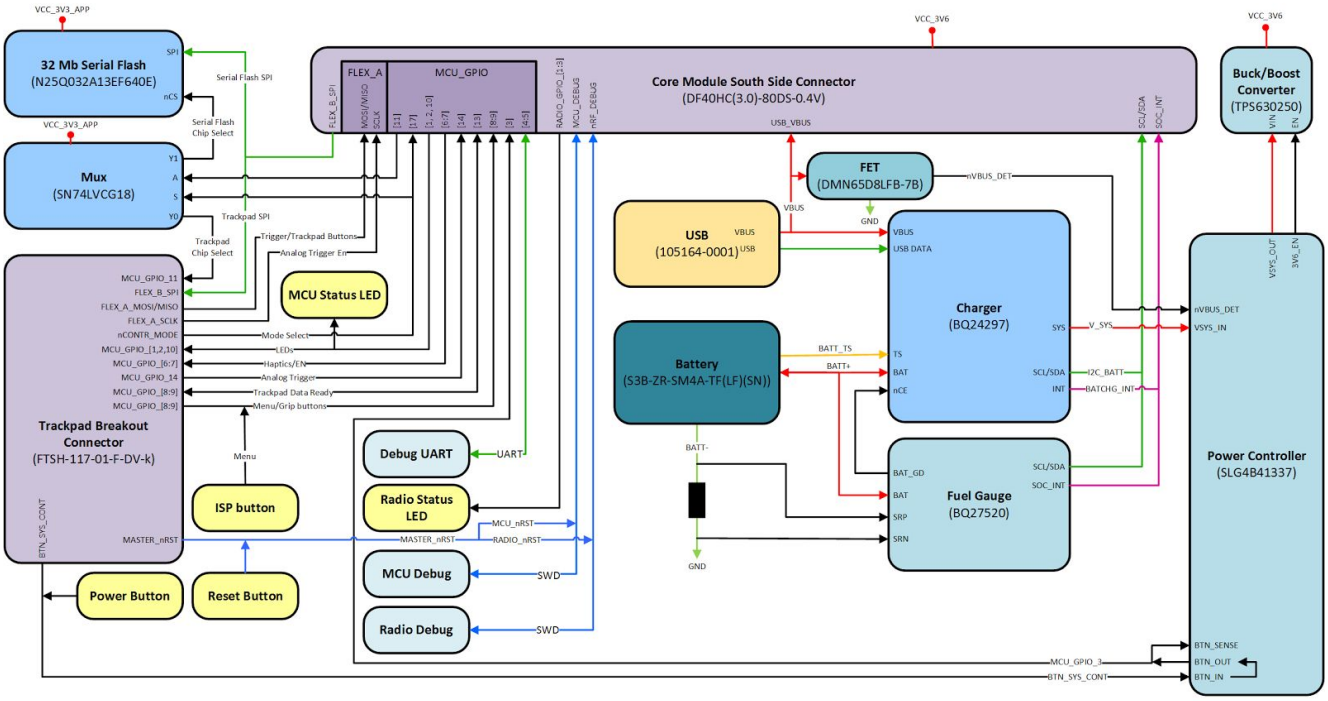
Applications

- SteamVR™ tracking HMDs
- SteamVR™ tracking controllers

Description

The EVM Application Board is meant to couple with the Core Module's south side connector, to host all of the connections and circuitry needed for a SteamVR™ tracking prototype. Circuitry on the EVM Application Board includes power supplies, a battery charger and fuel gauge, flash memory for display calibration data, power and ISP buttons, and radio and MCU status LEDs. Connection headers exist for USB, single wire debug, a console UART, and UI elements such as buttons, LEDs, trackpad, haptics and a Hall Effect sensor.

Block Diagram



Pinout

J8 (Core Module Connector)						
1	RADIO_GPIO_1	Input for Red Radio Status LED		2	NC	
3	RADIO_GPIO_2	Input for Green Radio Status LED		4	NC	
5	RADIO_GPIO_3	Input for Blue Radio Status LED		6	NC	
7	RADIO_GPIO_4	Direct GPIO connections to nRF52 radio. Reserved for future use.		8	NC	
9	RADIO_GPIO_5			10	NC	
11	RADIO_GPIO_6			14	NRF_SWDIO	Radio SWD
13	RADIO_GPIO_7			16	NRF_SWCLK	
15	RADIO_GPIO_8			18	NRF_nRST	
19	NFC1	Connections to nRF52 NFC port. Reserved for future use.		20	NRF_SWO	
21	NFC2			26	FLEX_C_SCLK	IMU/Radio SPI. Reserved for future use.
25	MCU_GPIO_4	Debug UART TX		28	FLEX_C_MOSI	

27	MCU_GPIO_5	Debug UART RX		30	FLEX_C_MISO	
29	MCU_GPIO_3	System button output.		34	FPGA_GPIO_1[(1)]	Connects to TP3
31	MCU_GPIO_1	Input for red system status LED		36	FPGA_GPIO_2[(1)]	Connects to TP4
33	MCU_GPIO_2	Input for green system status LED		38	FPGA_GPIO_3[(1)]	Connects to TP32
35	MCU_GPIO_14	Analog trigger output.		40	FPGA_GPIO_4	Application power enable input. Active low.
37	MCU_GPIO_7	Haptic control input. Active high.		42	FPGA_GPIO_5[(1)]	Connects to TP35
39	MCU_GPIO_12	Controller/HMD select output. Deprecated in new firmware.		44	FPGA_GPIO_6[(1)]	Connects to TP37
41	MCU_GPIO_6	Haptic rail enable input. Active high.		46	FPGA_GPIO_7[(1)]	Connects to TP33
43	MCU_GPIO_10	Input for blue system status LED		48	FPGA_GPIO_8[(1)]	Connects to TP38
45	MCU_GPIO_9	Grip button output.		50	FPGA_GPIO_9[(1)]	Connects to TP34
47	MCU_GPIO_8	Menu button output.		52	FPGA_GPIO_10[(1)]	Connects to TP42
51	FLEX_A_MISO	Trackpad button output.		56	MCU_GPIO_13	Trackpad data ready output.
53	FLEX_A_MOSI	Trigger button output.		58	MCU_GPIO_11	Serial flash slave select input (HMD mode) or Trackpad Slave Select input (controller mode)
55	FLEX_A_SCLK	Analog trigger power rail enable input.		60	MCU_nRST	MCU SWD
59	SCL	I2C SCL for battery management		62	MCU_SWCLK	
61	SDA	I2C SDA for battery management		64	MCU_SWDIO	
63	BATCHG_INT	Interrupt line output for battery management hardware.		66	MCU_FPGA_3 (SWO)	
67	USB_DP	USB D+		72	FLEX_B_SCLK	SPI for serial flash (HMD mode) or trackpad (controller
69	USB_DM	USB D-		74	FLEX_B_MISO	

12, 17, 23, 24, 32, 49, 54, 57, 65, 70, 73, 75, 78, 80	GND	Ground connection.		76	FLEX_B_MOSI	mode)
77, 79	VCC_3V6	3.6V rail input		22, 68	VCC_3V3_CORE	3.3V core rail input
71	USB_VBUS	USB VBUS input for USB detection				

(1) Direct GPIO connections to iCE40 FPGA. Reserved for future use.

J2 (Trackpad Breakout Board Connector)						
1	MCU_GPIO_13	Trackpad data ready input		2	MCU_GPIO_11	Trackpad SPI nCS
17	nCONTR_MODE	Input from HMD/Controller mode switch. Pull down for controller, up for HMD.		4	FLEX_B_SCLK	Trackpad SPI SCLK
19	MCU_GPIO_10	Blue status LED output.		6	FLEX_B_MISO	Trackpad SPI MISO
27	FPGA_GPIO_1	FPGA connection (unused)		8	FLEX_B_MOSI	Trackpad SPI MOSI
3, 5, 7, 9, 11, 13, 15, 21, 23, 25, 29	GND	Ground Connection		10	MCU_GPIO_9	Grip button input.
31,33	VCC_3V3_APP	3.3V application power supply output		12	MCU_GPIO_8	Menu button input.
				14	FLEX_A_MOSI	Trigger button input.
				16	FLEX_A_MISO	Trackpad button input.
				18	BTN_SYS_CONT	System/Power button input.
				20	MCU_GPIO_1	Red status LED

						output.
				22	MCU_GPIO_2	Green status LED output.
				24	MCU_GPIO_14	Analog trigger input.
				26	FLEX_A_SCLK	Analog trigger enable output.
				28	FPGA_GPIO_2	FPGA Connection (unused)
				30	MASTER_nRST	MCU/Radio reset input. Active low.
				32	MCU_GPIO_6	Haptic motor output. Active high.
				34	MCU_GPIO_7	Haptic motor rail enable. Active high.

J3 (Debug UART Connector)	
1	GND
2	UART_TX
3	UART_RX

J1 (Battery Connector)	
1	Batt (+)
2	Thermal sensor input
3	Batt (-)

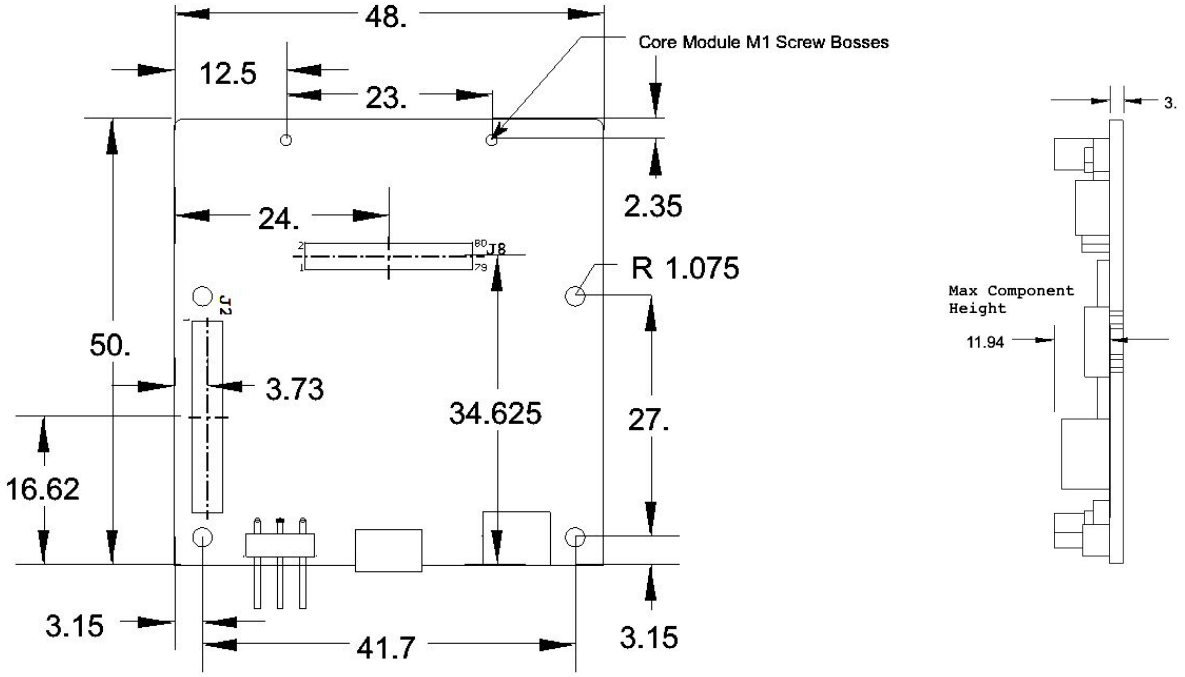
J4 (Radio Debug)				
1	3.3V out		2	SWDIO
3	GND		4	SWCLK
5	GND		6	SWO
7	Key (NC)		8	NC
9	GND		10	nRESET

J11 (MCU Debug)				
1	3.3V out		2	SWDIO
3	GND		4	SWCLK
5	GND		6	SWO
7	Key (NC)		8	NC
9	GND		10	nRESET

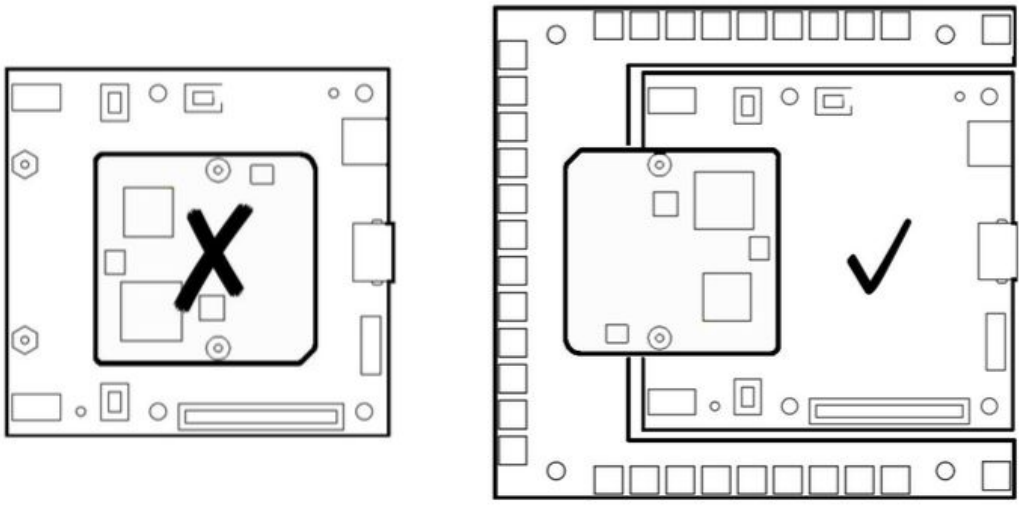
Mechanical Data

Dimensions

All units mm



Interfacing application board with core module and sensor breakout boards



Connector information

Core module connector component	Description	Mating component manufacturer	Mating component part number
J8	80 pin core module connector	Hirose	DF40C-80DP-0.4(51)
J2	34 pin 0.050” header for trackpad breakout board connection	N/A	N/A

Electrical Characteristics

Parameter		Notes	Min	Typ	Max	Unit
Supply						
VCC_3V6	Output Voltage		3.67	3.73	3.78	V
USB_VBUS	USB Supply Voltage		4.38	-	5.25	V
I_USB_VBUS	USB Charge current	Connected to 1A USB charger	-	-	1000	mA
I_APP	3V3_APP current output	Under battery power.	-	-	1000	mA

Mode select switch

The Application board comes with an input on the trackpad breakout board reserved for a “mode select switch”. This switch is intended for prototype hardware only, and allows the operator to select between HMD and controller configurations as illustrated in the following table:

Mode Select Status	Mode	Description
High	HMD Mode	Serial flash is connected to FLEX_B_SPI. MCU configures the IMU to operate in 1000Hz mode.
Low	Controller mode	Trackpad is connected to FLEX_B_SPI. MCU configures the IMU to operate in 250Hz mode.

Toggling the mode select switch performs a hardware reset. This electrical connection should be hard-wired and the switch removed when shipping consumer hardware. Future versions of the firmware will determine the device configuration setting from flags in the JSON file on the device. This will deprecate this pin and leave it open for use as a general purpose I/O.

Power/Charging

The EVM Application Board is designed to charge its battery over a standard micro USB connection. This can be connected to a host PC where it will negotiate for 500mA of charge current, or through a dedicated charge port such as a phone charger where it will charge at up to 1000mA. Even with a completely dead battery, the Application Board will function normally. There is no need for a “trickle charge” period.

When no battery is connected, the Application Board will continue to operate unimpeded entirely off USB power provided the port has at least 500mA available.

U3 (SLG4B41337) is responsible for power-on sequencing of the Application Board including on/off behavior as well as managing certain delays to allow the power rails to rise cleanly. When USB is connected, it will power on the board immediately and will not allow the user to power it off. When on battery power, the board can be powered on by holding the System button for two seconds and powered off by holding it for four seconds.

Battery

The EVM Application Board was designed to work with a Honcell HCP902248NFC 900mAh 3.7V lithium polymer battery. The onboard BQ27520 fuel gauge has been calibrated to operate with this battery. Should your application require a different battery, please contact Texas Instruments for help generating a calibrated fuel gauge image. New fuel gauge images can be flashed to the fuel gauge using a core module and lighthouse_watchman_update.

Support

For software and hardware support, visit the forums at: http://steamcommunity.com/app/507090/discussions/