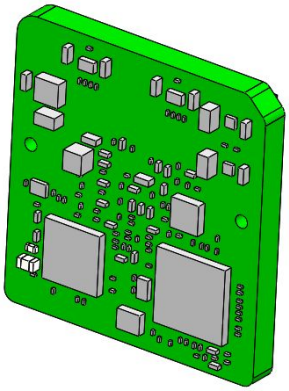
Core Module Datasheet

SteamVR™ Tracking



Features

- MCU, IMU, FPGA for SteamVR™ tracking
- Connections for up to 32 optical sensors
- Radio for wireless tracking applications
- USB connection for wired tracking applications

Applications

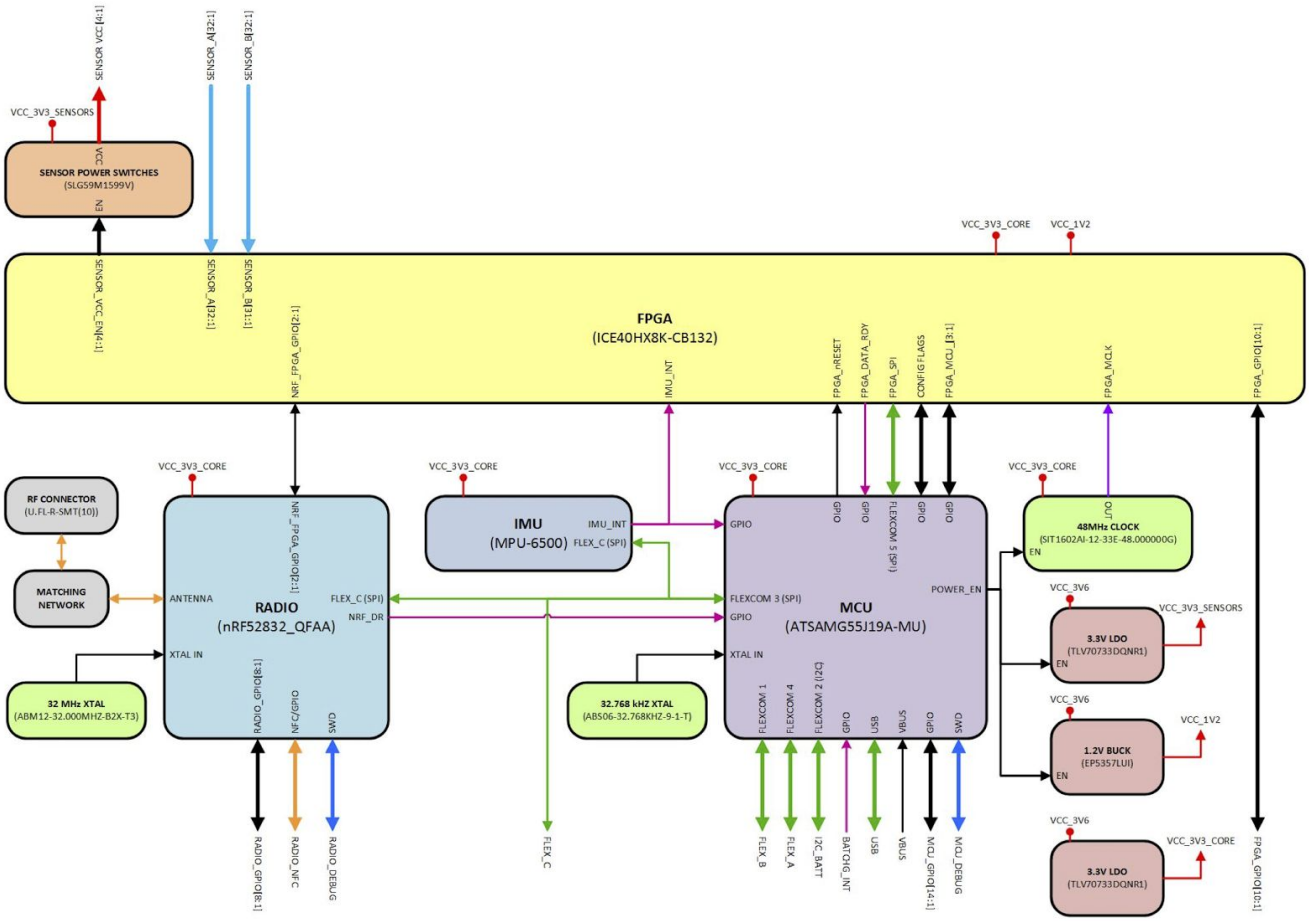
- SteamVR™ tracking HMDs
- SteamVR™ tracking controllers

Description

The Core Module contains a majority of the hardware required to create a SteamVR™ tracking device. When connected to an array of optical sensors and a host computer, either wirelessly with the included radio or over USB, it can send all of the information necessary to the host to enable real time 3D position and orientation tracking.

It also has firmware and I/O support for battery charge management and UI elements; including five buttons, RGB LED, touch-sensitive trackpad, and haptic feedback.

Block Diagram



Pinout

J2 (South Side Connector)						
1	RADIO_GPIO_1	Open-drain output for Red Radio Status LED		2	NC	
3	RADIO_GPIO_2	Open-drain output for Green Radio Status LED		4	NC	
5	RADIO_GPIO_3	Open-drain output 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	Active low system button input. Internal pull-up.		34	FPGA_GPIO_1	Direct GPIO connections to iCE40 FPGA. Reserved for future use.
31	MCU_GPIO_1	Open-drain output for red system status LED		36	FPGA_GPIO_2	
33	MCU_GPIO_2	Open-drain output for green system status LED		38	FPGA_GPIO_3	
35	MCU_GPIO_14	Analog trigger input.		40	FPGA_GPIO_4	
37	MCU_GPIO_7	Haptic control output. Active high.		42	FPGA_GPIO_5	
39	MCU_GPIO_12	Controller/HMD select. Pull low to enable controller mode. Internal pull-up. Deprecated in new firmware.		44	FPGA_GPIO_6	
41	MCU_GPIO_6	Haptic rail enable output. Active high.		46	FPGA_GPIO_7	
43	MCU_GPIO_10	Open-drain output for blue system status LED		48	FPGA_GPIO_8	
45	MCU_GPIO_9	Active low grip button input. Internal pull-up		50	FPGA_GPIO_9	
47	MCU_GPIO_8	Active low menu button input. Internal pull-up.		52	FPGA_GPIO_10	
51	FLEX_A_MISO	Active low trackpad button input. Internal pull-up.		56	MCU_GPIO_13	Trackpad Data Ready
53	FLEX_A_MOSI	Active low trigger button input. Internal pull-up.		58	MCU_GPIO_11	Serial flash slave select (HMD mode) or Trackpad Slave Select (controller mode)
55	FLEX_A_SCLK	Analog trigger power rail enable.		60	MCU_nRST	MCU SWD
59	SCL	I2C SCL for battery		62	MCU_SWCLK	

		management				
61	SDA	I2C SDA for battery management		64	MCU_SWDIO	
63	BATCHG_INT	Interrupt line for battery management hardware. Active low.		66	MCU_FPGA_3 (SWO)	
67	USB_DP	USB D+		72	FLEX_B_SCLK	SPI for serial flash (HMD mode) or trackpad (controller mode)
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	
77, 79	VCC_3V6	3.6V rail input		22, 68	VCC_3V3_CORE	3.3V core rail output
71	USB_VBUS	USB VBUS input for USB detection				

J3 (North Side Connector) [1]						
1	SENSOR_A1	Reserved for sensor 0.		4	SENSOR_A2	Reserved for sensor 1.
3	SENSOR_B1	Input for sensor 0.		6	SENSOR_B2	Input for sensor 1.
7	SENSOR_A3	Reserved for sensor 2.		10	SENSOR_A4	Reserved for sensor 3.
9	SENSOR_B3	Input for sensor 2.		12	SENSOR_B4	Input for sensor 3.
13	SENSOR_A5	Reserved for sensor 4.		16	SENSOR_A6	Reserved for sensor 5.
15	SENSOR_B5	Input for sensor 4.		18	SENSOR_B6	Input for sensor 5.
19	SENSOR_A7	Reserved for sensor 6.		22	SENSOR_A8	Reserved for sensor 7.
21	SENSOR_B7	Input for sensor 6.		24	SENSOR_B8	Input for sensor 7.
25	SENSOR_A9	Reserved for sensor 8.		28	SENSOR_A10	Reserved for sensor 9.
27	SENSOR_B9	Input for sensor 8.		30	SENSOR_B10	Input for sensor 9.

31	SENSOR_A11	Reserved for sensor 10.		34	SENSOR_A12	Reserved for sensor 11.
33	SENSOR_B11	Input for sensor 10.		36	SENSOR_B12	Input for sensor 11.
37	SENSOR_A13	Reserved for sensor 12.		40	SENSOR_A14	Reserved for sensor 13.
39	SENSOR_B13	Input for sensor 12.		42	SENSOR_B14	Input for sensor 13.
43	SENSOR_A15	Reserved for sensor 14.		46	SENSOR_A16	Reserved for sensor 15.
45	SENSOR_B15	Input for sensor 14.		48	SENSOR_B16	Input for sensor 15.
49	SENSOR_A17	Reserved for sensor 16.		52	SENSOR_A18	Reserved for sensor 17.
51	SENSOR_B17	Input for sensor 16.		54	SENSOR_B18	Input for sensor 17.
55	SENSOR_A19	Reserved for sensor 18.		58	SENSOR_A20	Reserved for sensor 19.
57	SENSOR_B19	Input for sensor 18.		60	SENSOR_B20	Input for sensor 19.
61	SENSOR_A21	Reserved for sensor 20.		64	SENSOR_A22	Reserved for sensor 21.
63	SENSOR_B21	Input for sensor 20.		66	SENSOR_B22	Input for sensor 21.
67	SENSOR_A23	Reserved for sensor 22.		70	SENSOR_A24	Reserved for sensor 23.
69	SENSOR_B23	Input for sensor 22.		72	SENSOR_B24	Input for sensor 23.
73	SENSOR_A25	Reserved for sensor 24.		76	SENSOR_A26	Reserved for sensor 25.
75	SENSOR_B25	Input for sensor 24.		78	SENSOR_B26	Input for sensor 25.
79	SENSOR_A27	Reserved for sensor 26.		82	SENSOR_A28	Reserved for sensor 27.
81	SENSOR_B27	Input for sensor 26.		84	SENSOR_B28	Input for sensor 27.
85	SENSOR_A29	Reserved for sensor 28.		88	SENSOR_A30	Reserved for sensor 29.
87	SENSOR_B29	Input for sensor 28.		90	SENSOR_B30	Input for sensor 29.
91	SENSOR_A31	Reserved for sensor 30.		94	SENSOR_A32	Reserved for sensor 31.
93	SENSOR_B31	Input for sensor 30.		96	SENSOR_B32	Input for sensor 31.
5, 11,17, 23, 29, 35, 41, 47, 53, 59, 65, 71, 77, 83, 89, 95, 97, 98, 99, 100	GND	Ground connections for sensors.		2, 8, 14, 20	SENSOR_VCC1	Power rail for sensor bank 1.
				26, 32, 38,	SENSOR_VCC2	Power rail for sensor bank 2.

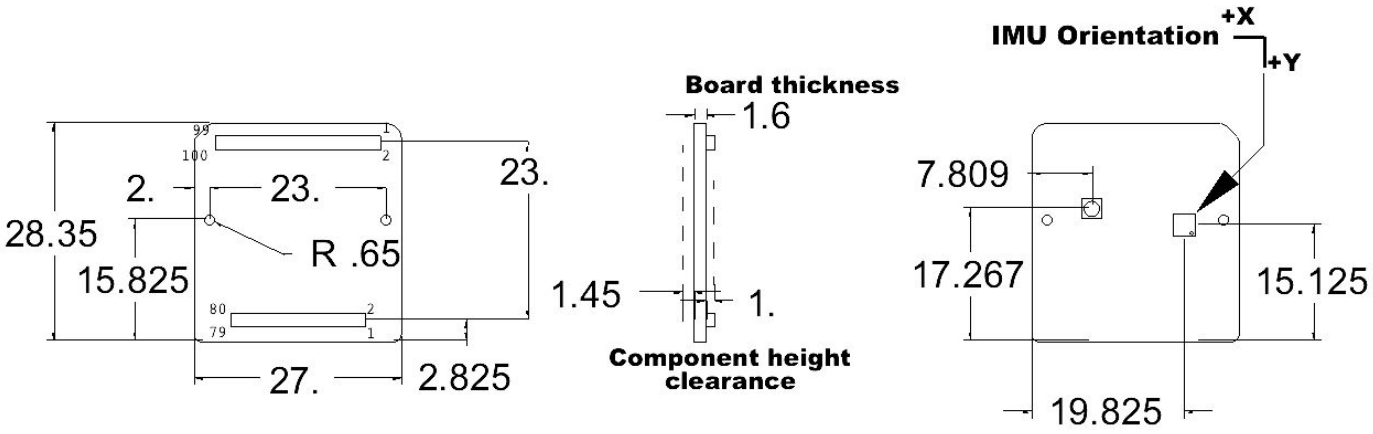
				44		
				50, 56, 62, 68	SENSOR_VCC3	Power rail for sensor bank 3.
				74, 80, 86, 92	SENSOR_VCC4	Power rail for sensor bank 4.

(1) Although PCB and schematic net names for sensor connections are numbered 1-32 (a requirement of Altium's multichannel design feature), numbering of channels in the JSON file range from 0-31.

Mechanical Data

Dimensions

All units mm



Connector information

Core module connector component	Description	Mating component manufacturer	Mating component part number
J2	80 pin south side connector (system functions)	Hirose	DF40HC(3.0)-80DS-0.4V
J3	100 pin north side connector (sensor connections)	Hirose	DF40HC(3.0)-100DS-0.4V

MCU Status LED

LED Status	Core Module Status
Rapid blinking RED	Bootloader
Solid RED	Not connected to SteamVR
Solid GREEN	Connected (USB)
Solid BLUE	Connected (Wireless)
Blinking BLUE	Pairing mode (Wireless)

Electrical Characteristics

Parameter		Notes	Min	Typ	Max	Unit
Supply						
VCC_3V6	Core module system power		3.57	3.6	5.5	V
I_3V6	Supply current	No sensors connected.		39.3		mA
		32 Sensors connected and base station active. VCC_3V6 = 3.635		185.6		mA
Digital I/O						
R_{PULLUP}	Pull Up Resistor	UI Buttons (MCU_GPIO_9, MCU_GPIO_8, FLEX_A_MISO, FLEX_A_MOSI, MCU_GPIO_3)	50	100	150	kΩ
		MCU_nRST, NRF_nRST, SCL, SDA	-	10	-	kΩ
I_{OL_LED}	Status LED sink current	MCU Status (MCU_GPIO_1, MCU_GPIO_2, MCU_GPIO_10)	-	-	2	mA
		Radio Status (RADIO_GPIO_1, RADIO_GPIO_2, RADIO_GPIO_3)	1	2	4	mA
V_{IL_BUTTON}	Button input low level	UI Buttons (MCU_GPIO_9, MCU_GPIO_8, FLEX_A_MISO, FLEX_A_MOSI, MCU_GPIO_3)	-0.3	-	1	V

V_{IH_BUTTON}	Button input high level	UI Buttons (MCU_GPIO_9, MCU_GPIO_8, FLEX_A_MISO, FLEX_A_MOSI, MCU_GPIO_3)	2.31	-	3.6	V
$I_{SENSORS}$	Sensor bank current output	SENSOR_VCC[1,2,3,4] combined.	-	-	200	mA
USB_VBUS	USB Sense Input	High Input	3.63	5	5.66	V
		Low input	-0.47	-	1.57	V
$V_{I\_ANALOG\_TRIGGER}$	Analog trigger input	Full range shown. Useable range limited by JSON configuration.	0	-	3.3	V
Timing information						
f_{Debug}	Debug uart frequency			460800		Baud

Support

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