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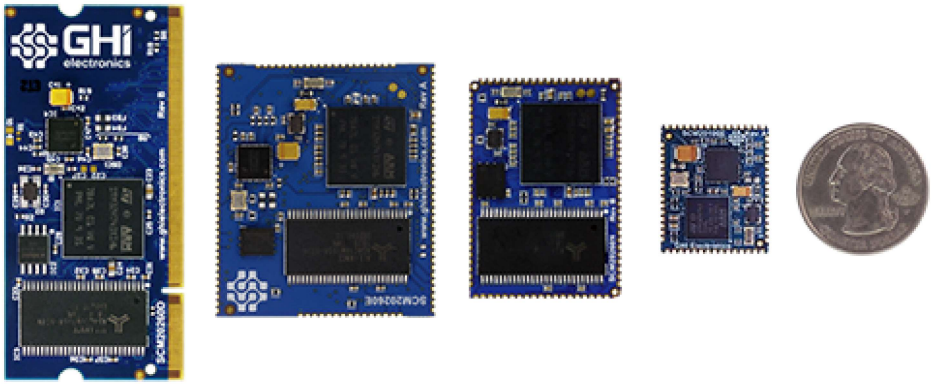
SITCore System on Modules



Overview

The SITCore SoMs provide a low cost way to add .NET computing power to any embedded product. They are available in a 200 pin SO-DIMM format or as surface mount modules. The SITCore SoMs let you design IoT products that are secure, easily integrated with the cloud, and can be easily managed and updated from the cloud for deployments of one to a million or more. The surface mount versions are great for harsh or high vibration environments.

Features:

- Low power modes including three independently controllable power domains
- RTC
- Watchdog
- Threading
- TCP/IP with SSL
  - Full .NET socket interface
  - Ethernet
  - PPP
- Graphics
  - Images
  - Fonts
  - Controls
- File System
  - Full .NET file interface
  - SD cards
  - USB drives
- Signal controls

- Generation
- Capture
- Pulse measurement

Specifications

Spec	All SITCore SoMs
Processor Type	ARM Cortex-M7 32 Bit
Speed	480 MHz
Internal RAM	1 MByte
Internal Flash	2 MByte
Instruction Cache	16 KByte
Data Cache	16 KByte
Temperature Range	-40C to +85C

Note: Resources are shared between your application and the operating system.

Peripherals

Peripheral	SCM20100E	SCM20260N	SCM20260E	SCM20260D
External SDRAM	None	32 MByte	32 MByte	32 MByte
External Flash	None	16 MByte	16 MByte	16 MByte
GPIO	43	79	85	108
SPI	2	3	3	3
I2C	1	1	3	3
UART	4 (2 w/ H.S.)	7 (4 w/ H.S.)	8 (4 w/ H.S.)	8 (4 w/ H.S.)
CAN	1	2	2	2
PWM	12	22	23	28
ADC	6	16	15	20
DAC	2	2	1	2
SD/SDIP/MMC	1	1	1	1
USB Host	1	1	1	1

Peripheral	SCM20100E	SCM20260N	SCM20260E	SCM20260D
USB Client	1	1	1	1
Ethernet	1	0	1	1
LCD TFT	0	1	1	1
Camera	0	1	1	1

Note: As many pins share peripherals, not all peripherals will be available.

Power Consumption

SCM20260D/E

	480MHz	240MHz	w/ Ethernet
Running	205mA	110mA	+90mA
Idle	170mA	97mA	+90mA
Sleep	6.5mA	6.5mA	+18mA
Shutdown	40uA	40uA	+18mA

SCM20260N

	480MHz	240MHz
Running	205mA	110mA
Idle	170mA	97mA
Sleep	6.5mA	6.5mA
Shutdown	40uA	40uA

SCM20100E

	480MHz	240MHz	w/ Ethernet
Running	205mA	110mA	+90mA

	480MHz	240MHz	w/ Ethernet
Idle	170mA	97mA	+90mA
Sleep	6.5mA	6.5mA	+18mA
Shutdown	40uA	40uA	+18mA

See the Power Management tutorial

Using Interrupts (IRQs)

The microcontrollers we use in our SITCore line of products do not support concurrent interrupts with the same pin number, even if the pins are on different ports (the port is denoted by the second letter of the GPIO pin name -- PA1 is pin 1 on port A). Therefore, interrupts are available on only 16 pins at any given time. For example, pins PA1 and PB1 cannot be used as interrupt pins at the same time, but PA1 and PB2 can. PA1 and PA2 can also be used with interrupts simultaneously.

Module Pinouts

SCM20100E Pinout

Pad	Name	Function			Pad	Name	Function		Pad	Name	Function	
1		Analog GND			22		ETH PHY LED SPEED		43	PA9	UART1 TX	
2		Analog 3.3V			23	PE2	QSPI IO2		44	PA10	UART1 RX	
3		VBAT			24	PD13	QSPI IO3		45		USBC N	
4	PE3	LDR			25	PD12	QSPI IO1		46		USBC P	
5		RESERVED			26	PD11	QSPI IO0		47	PC8	SMDDC1 D0	
6		RESET			27	PB6	QSPI NCS		48	PC9	SDMMC1 D1	
7	PA6	PWM13.1	ADC12. 3		28	PB2	QSPI CLK		49	PC10	SDMMC1 D2	
8	PA4	ADC12.18		DAC1	29	PD7	MOD		50	PC11	SDMMC1 D3	
9	PA5	ADC12.19		DAC2	30	PE11	PWM1.2		51	PC12	SDMMC1 CK	
10	PA0	PWM5.1	ADC1.16	WKUP	31		GND		52	PD2	SDMMC1 CMD	
11	PA3	PMW2.4	ADC12.15		32		3.3V		53	PA13		
12	PE12	SPI4 SCK			33	PD3	UART2 CTS		54	PA14		
13	PE13	SPI4 MISO			34	PD4	UART2 RTS		55	PB7	PWM4.2	APP
14	PE14	SPI4 MOSI			35	PD5	UART2 TX		56	PA15	UART4 RTS	PWM2.1
15	PB0	UART4 CTS	PWM3.3	ADC12.9	36	PD6	UART2 RX		57	PB3	SPI3 SCK	PWM2.2
16		GND			37	PD1	UART4 TX	CAN1 TX	58	PB4	SPI3 MISO	
17		ETH PHY RX-			38	PD0	UART4 RX	CAN1 RX	59	PB5	SPI3 MOSI	
18		ETH PHY RX +			39		USBH N		60	PB8	I2C1 SCL	PWM16.1
19		ETH PHY TX-			40		USBH P		61	PB9	I2C1 SDA	PWM17.1
20		ETH PHY TX+			41	PC6	UART6 TX	PWM3.1				
21		ETH PHY LED LINK			42	PC7	UART6 RX	PWM3.2				

SCM20260N Pinout

Pad	Name	Function			Pad	Name	Function			Pad	Name	Function			Pad	Name	Function		
1		GND	Analog GND	Analog VREF-	23	PC10	SDMMC1 D2	UART3 TX		46		3.3V			69		USBH P		
2		3.3V	Analog 3.3V	Analog VREF+	24	PC9	SDMMC1 D1	UART5 CTS		47	PJ9	UART8 RX	PWM1.3		70	PC2	ADC123.12		
3	PK7	LCD DE			25	PC12	SDMMC1 CK			48	PJ8	UART8 TX			71	PH15	LCD G4		
4	PJ5	LCD R6			26	PC8	SMDDC1 D0	UART5 RTS		49	PA5	ADC12.19	DAC2		72	PJ12	LCD G3		
5	PH14	UART4 RX	CAN1 RX		27		GND			50	PC0	ADC123.10			73	PA0	PWM5.1	ADC1.16	WKUP
6	PC6	UART6 TX	PWM3.1		28	PD2	SDMMC1 CMD			51	PF8	UART7 RTS	PWM13.1	ADC3.7	74	PH4	LCD G5		ADC3.15
7	PC13	TAMPER			29	PB13	CAN2 TX	UART5 TX		52	PF10	ADC3.6			75	PK1	LCD G6		PWM1.1
8	PE3	LDR			30	PB12	CAN2 RX	UART5 RX		53		RESET			76	PI15	LCD G2		
9	PC7	UART6 RX	PWM3.2		31	PF7	UART7 TX	ADC3.3		54	PA15	UART4 RTS	PWM2.1		77	PK2	LCD G7		
10	PH13	UART4 TX	CAN1 TX		32	PF6	UART7 RX	ADC3.8		55	PA4	DC HS	ADC12.18	DAC1	78	PK3	LCD B4		
11	PI3	SPI2 MOSI			33	PH9	DC D0	PWM12.2		56	PA6	DC PIXCLK	PWM13.1	ADC12.3	79	PK5	LCD B6		
12	PD6	UART2 RX			34	PH10	DC D1			57	PG9	DC VS			80	PK6	LCD B7		
13	PI1	SPI2 SCK			35	PG10	DC D2			58	PA8	DC XCLK			81		GND		
14	PB7	PWM4.2	APP		36	PH12	DC D3	PWM5.3		59	PC3	ADC12.13			82	PK4	LCD B5		
15*	PI2	SPI2 MISO	PWM8.4		37	PE4	DC D4			60		VBAT			83	PJ15	LCD B3		
15*	PD3	UART2 CTS (via 330 ohm resistor)			38	PI4	DC D5			61	PB8	I2C1 SCL	PWM16.1		84	PJ2	LCD R3		
16	PD7	MOD			39	PJ11	SPI5 MISO	PWM1.2		62	PF9	UART7 CTS	PWM14.1	ADC3.2	85	PI12	LCD HS		
17	PD4	UART2 RTS			40	PE5	DC D6	PWM15.1		63	PB9	I2C1 SDA	PWM17.1		86	PI14	LCD CLK		
18	PD5	UART2 TX			41	PJ10	SPI5 MOSI			64	PB0	UART4 CTS	PWM3.3	ADC12.9	87	PJ4	LCD RS		
19	PB3	SPI3 SCK	PWM2.2		42	PK0	SPI5 SCK			65	PB1	PWM3.4	ADC12.5		88	PJ6	LCD R7		
20	PB4	SPI3 MISO			43	PE6	DC D7	PWM15.2		66		USBC P			89	PJ3	LCD R4		
21	PB5	SPI3 MOSI			44		RESERVED			67		USBC N			90	PI13	LCD VS		
22	PC11	SDMMC1 D3	UART3 RX		45		GND			68		USBH N			91	PA3	PMW2.4		ADC12.15

*Pad 15 is PI2 (with SPI2 and PWM). PD3 can be used if CTS is needed by setting PI2 to input.

SCM20260E Pinout

Pad	Name	Function			Pad	Name	Function			Pad	Name	Function		Pad	Name	Function	
1		3.3V	Analog 3.3V	Analog VREF+	28		VBAT			55	PI13	LCD VSYNC		82	PC11	SDMMC1 D3	UART3 RX
2		GND	Analog GND	Analog VREF-	29		USBH N			56		GND		83	PC10	SDMMC1 D2	UART3 TX
3	PB12	CAN2 RX		UART5 RX	30		USBH P			57		3.3V		84	PC9	SDMMC1 D1	UART5 CTS
4	PB13	CAN2 TX		UART5 TX	31	PC2	ADC123_12			58	PB10	I2C2 SCL		85	PC12	SDMMC1 CK	
5	PA10	UART1 RX			32	PB0	UART4 CTS	PWM3.3	ADC12.9	59	PB9	I2C1 SDA	PWM17.1	86	PC8	SDMMC1 D0	UART5 RTS
6	PA9	UART1 TX			33	PB1	PWM3.4		ADC12.5	60	PB8	I2C1 SCL	PWM16.1	87	PD2	SDMMC1 CMD	
7	PB7	PWM4.2	APP		34		3.3V			61		USBC N		88	PC13	TAMPER	
8	PF9	UART7 CTS	PWM14.1	ADC3.2	35	PA3	PWM2.4		ADC12.15	62		USBC P		89		GND	
9	PF7	UART7 TX	ADC3.3		36	PJ2	LCD R3			63		ETH PHY RX-		90		RESET	
10	PF6	UART7 RX	ADC3.8		37	PJ3	LCD R4			64		ETH PHY RX +		91		GND	
11	PF8	UART7 RTS	PWM13.1	ADC3.7	38	PJ4	LCD R5			65		ETH PHY TX-		92		ETH PHY LED LINK	
12	PA4	DC HS	ADC12.18	DAC1	39	PJ5	LCD R6			66		ETH PHY TX+		93		ETH PHY LED SPEED	
13	PG9	DC VS			40	PJ6	LCD R7			67	PI3	SPI2 MOSI		94	PC6	UART6 TX	PWM3.1
14	PH7	I2C3 SCL			41	PI15	LCD G2			68	PI2	SPI2 MISO	PWM8.4	95	PC7	UART6 RX	PWM3.2
15	PH8	I2C3 SDA			42	PJ12	LCD G3			69	PB11	I2C2 SDA		96	PB3	SPI3 SCK	PWM2.2
16	PH9	DC D0	PWM12.2		43	PH15	LCD G4			70	PI1	SPI2 SCK		97	PA15	UART4 RTS	PWM2.1
17	PH12	DC D3	PWM5.3		44	PH4	LCD G5		ADC3.15	71	PJ9	UART8 RX	PWM1.3	98	PB5	SPI3 MOSI	
18	PE5	DC D6	PWM15.1		45	PK1	LCD G6		PWM1.1	72	PJ8	UART8 TX		99		RESERVED	
19	PH10	DC D1			46	PK2	LCD G7			73	PE3	LDR		100	PB4	SPI3 MISO	
20	PG10	DC D2			47	PJ15	LCD B3			74	PD4	UART2 RTS		101	PH6	PWM12.1	
21	PE4	DC D4			48	PK3	LCD B4			75	PD6	UART2 RX		102	PC0	ADC123_10	
22	PI4	DC D5			49	PK4	LCD B5			76	PC3	ADC12.13		103	PF10	ADC3.6	
23	PH13	UART4 TX		CAN1 TX	50	PK5	LCD B6			77	PD3	UART2 CTS		104	PD7	MOD	
24	PE6	DC D7	PWM15.2		51	PK6	LCD B7			78	PK0	SPI5 SCK		105	PA0	PWM5.1	ADC1.16	WKUP
25	PH14	UART4 RX		CAN1 RX	52	PI14	LCD CLK			79	PJ10	SPI5 MOSI					
26	PA6	DC PIXCLK	PWM13.1	ADC12.3	53	PK7	LCD DE			80	PD5	UART2 TX					
27	PA8	DC XCLK			54	PI12	LCD HSYNC			81	PJ11	SPI5 MISO	PWM1.2				

SCM20260D Pinout

Pad	Name	Function	Pad	Name	Function	Pad	Name	Function	Pad	Name	Function
1		Analog GND	51		GND	101	PH11	PWM5.2	151		GND
2		ETH PHY TX-	52		NC	102	PD5	UART2 TX	152	PJ15	LCD B3
3		NC	53		NC	103	PD6	UART2 RX	153	PK3	LCD B4
4		ETH PHY TX+	54		NC	104	PF10	ADC3.6	154	PK4	LCD B5
5		Analog VREF-	55		NC	105	PI0	PWM5.4	155	PK5	LCD B6
6		ETH PHY RX-	56		NC	106		3.3V	156	PK6	LCD B7
7		NC	57	PJ10	SPI5 MOSI	107	PB4	SPI3 MISO	157	PC2	ADC123.12
8		ETH PHY RX+	58	PK0	SPI5 SCK	108	PB5	SPI3 MOSI	158	PC3	ADC12.13
9		NC	59	PJ11	SPI5 MISO PWM1.2	109	PB3	SPI3 SCK PWM2.2	159	PA3	PWM2.4 ADC12.15
10		ETH PHY LED SPEED	60		3.3V	110	PC0	ADC123.10	160		3.3V
11		ETH PHY LED LNK	61	PF6	UART7 RX ADC3.8	111	PB7	PWM4.2 APP	161	PI15	LCD G2
12		NC	62	PF7	UART7 TX ADC3.3	112	PI5	PWM8.1	162	PJ12	LCD G3
13		GND	63	PF8	UART7 RTS PWM13.1 ADC3.7	113		GND	163	PH15	LCD G4
14	PH9	DC D0 PWM12.2	64	PF9	UART7 CTS PWM14.1 ADC3.2	114	PB1	PWM3.4 ADC12.5	164	PH4	LCD G5 ADC3.15
15	PH10	DC D1	65		GND	115	PB9	I2C1 SDA PWM17.1	165	PK1	LCD G6 PWM1.1
16	PG10	DC D2	66	PB10	I2C2 SCL	116	PB8	I2C1 SCL PWM16.1	166	PG7	
17	PH12	DC D3 PWM5.3	67	PB11	I2CS SDA	117	PB12	CAN2 RX UART5 RX	167	PJ9	UART8 RX PWM1.3
18	PE4	DC D4	68	PA9	UART1 TX	118	PB13	CAN2 TX UART5 TX	168	PJ6	LCD R7
19	PI4	DC D5	69	PA10	UART1 RX	119	PA5	ADC12.19 DAC2	169		GND
20		Analog 3.3V	70		NC	120	PD4	UART2 RTS	170	PK2	LCD G7
21	PE5	DC D6 PWM15.1	71		NC	121	PD3	UART2 CTS	171	PJ2	LCD R3
22	PE6	DC D7 PWM15.2	72		3.3V	122	PI9		172	PJ3	LCD R4
23	PG9	DC VS	73		NC	123	PC8	SDMMC1 D0 UART5 RTS	173	PJ4	LCD R5
24	PA4	DC HS ADC12.18 DAC1	74		NC	124		3.3V	174	PJ5	LCD R6
25	PA6	DC PIXCLK PWM13.1 ADC12.3	75		NC	125	PD2	SDMMC1 CMD	175	PI1	SPI2 SCK
26	PA8	DC XCLK	76		NC	126	PC12	SDMC1 CK	176	PI2	SPI2 MISO PWM8.4
27		GND	77		NC	127	PC9	SDMMC1 D1 UART5 CTS	177		NC
28		NC	78		NC	128	PC10	SDMMC1 D2 UART3 TX	178	PI3	SPI2 MOSI
29		NC	79		GND	129	PC11	SDMMC1 D3 UART3 RX	179		NC
30		NC	80		NC	130	PI7	PWM8.3	180		3.3V
31		NC	81		NC	131		GND	181		NC
32		Analog VREF+	82		NC	132	PC13	TAMPER	182		NC
33		NC	83		NC	133	PI6	PWM8.2	183		VBAT
34		NC	84		NC	134	PE3	LDR	184		NC
35		PDR ON	85		NC	135	PD7	MOD	185		GND
36	PA0 C*	ADC12.0	86		NC	136	PI11		186		GND
37	PA1 C*	ADC12.1	87		NC	137	PI8		187		RESET
38	PC2 C*	ADC3.0	88		3.3V	138	PJ13		188		USBH P
39	PC3 C*	ADC3.1	89		NC	139	PG12		189		NC
40		GND	90		NC	140	PC6	UART6 TX PWM3.1	190		USBH N
41		GND	91	PB0	PWM3.3 ADC12.9 UART4 CTS	141	PC7	UART6 RX PWM3.2	191		RESERVED
42		NC	92	PG6		142		3.3V	192		3.3V
43		NC	93	PH7	I2C3 SCL	143	PI13	LCD VS	193		NC
44		NC	94	PH8	I2C3 SDA	144	PI12	LCD HS	194		USBC P
45		NC	95		GND	145	PI14	LCD CLK	195		NC
46		3.3V	96	PA15	PWM2.1 UART4 RTS	146	PK7	LCD DE	196		USBC N
47		NC	97	PA0	PWM5.1 ADC1.16 WKUP	147	PJ0		197	PA14	
48		NC	98	PH13	CAN1 TX UART4 TX	148	PJ1		198		GND
49		NC	99	PH14	CAN1 RX UART4 RX	149	PJ7		199	PA13	
50		NC	100	PH6	PWM12.1	150	PJ14		200	PJ8	UART8 TX

*No GPIO - Analog Input Only

Schematics

- SCM20100E Schematic
- SCM20260N Schematic
- SCM20260E Schematic
- SCM20260D Schematic

3D STEP files

- SCM20100E STEP File
- SCM20260N STEP File
- SCM20260E STEP File
- SCM20260D STEP File

Getting Started

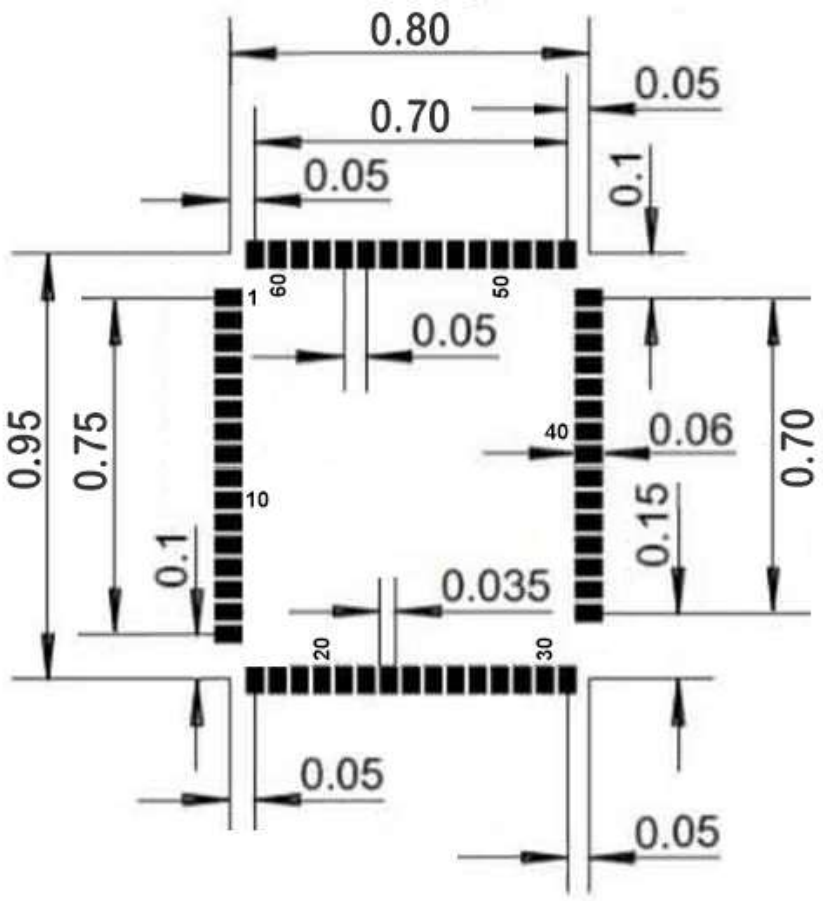
As the SITCore modules are based on the SITCore chipset, please refer to the SITCore SoC page for information on device startup, loading TinyCLR OS firmware, and writing and deploying your application.

Design Considerations

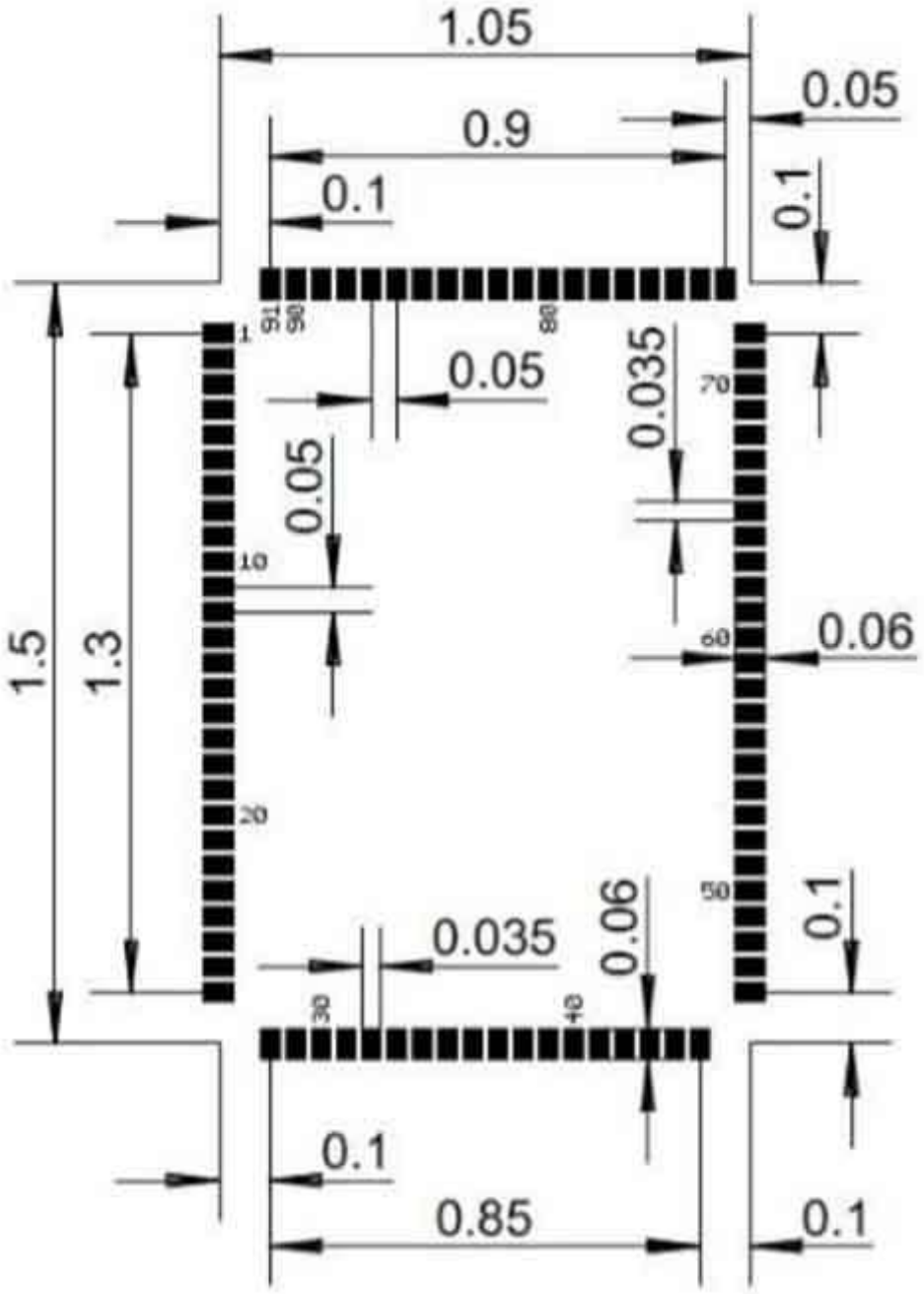
Footprints

We recommend no traces or vias under the module. Dimensions are in inches.

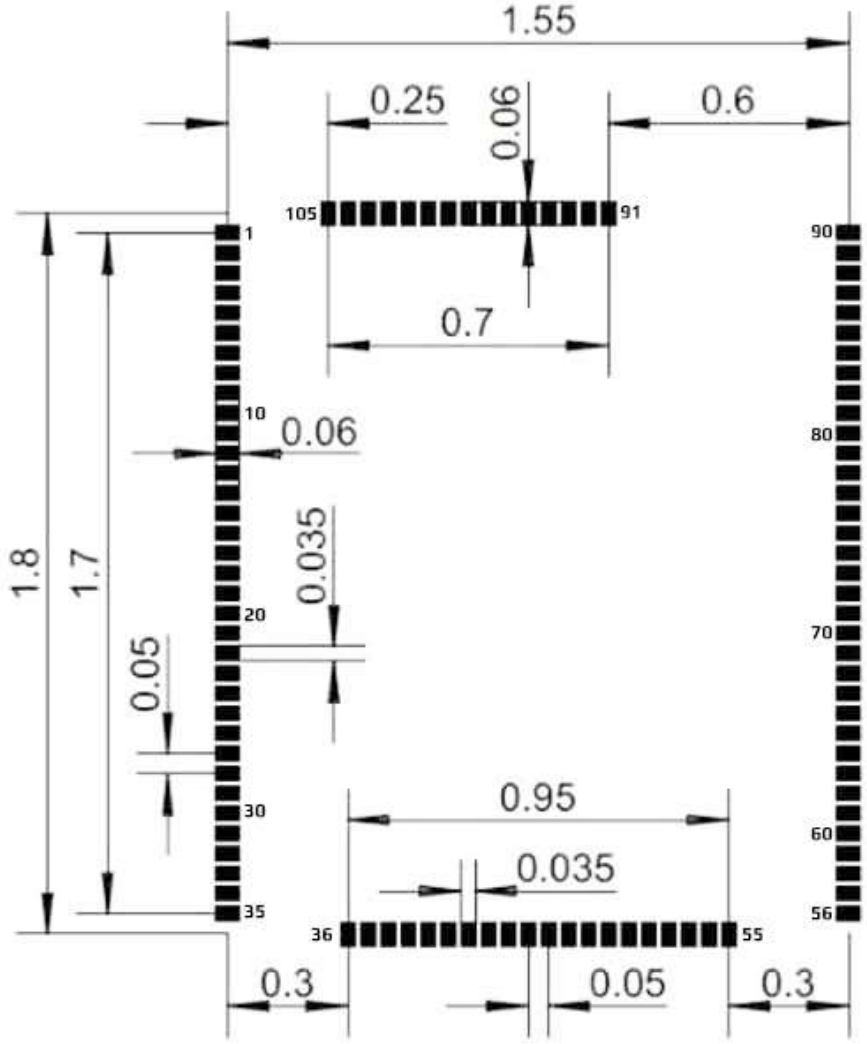
SCM20100E Recommended Footprint



SCM20260N Recommended Footprint



SCM20260E Recommended Footprint



SCM20260D SO-DIMM Socket

The SCM20260D uses the same 200 pin SO-DIMM socket that was originally made for DDR2 memory modules. You can make a custom SO-DIMM SITCore circuit board by adding the appropriate SO-DIMM socket to your circuit board.

TIP

Make sure to expose the required pins in your design. Specific pins are needed for device programming, updates, recovery, and WiFi firmware updates. See the **Special Pins** page and the device specifications for details.

SO-DIMM stands for Small Outline Dual Inline Memory Module. There are two different 200 pin SO-DIMM sockets, those made for DDR memory and those made for DDR2 memory. They are identical except for the orientation notch which is in a slightly different position. These sockets are not interchangeable. There is also a 204 pin SO-DIMM socket for DDR3 memory with the notch positioned closer to the center of the module.

NOTE

Our UCMs are only compatible with DDR2 type 200 pin SO-DIMM sockets.

Here is a link to the manufacturer's web page for the connector we use on our boards: EMBOSS ASSY DDR2 SODIMM SOCKET 200P 5.2

Required Pins

Exposing the following pins is required in every design to enable device programming, updates, and recovery:

- RESET
- LDR
- APP
- MOD (if required to select a debug interface)
- Desired debug interface(s)

For information on these and other important pins, please refer to the Special Pins page.

Power Supply

A clean power source, suitable for digital circuitry, is needed to power SITCore SoMs. Voltages should be regulated to within 10% or better of the specified voltage. Additionally, a large capacitor, typically 47 uF, should be placed near the SoM if the power supply is more than few inches away.

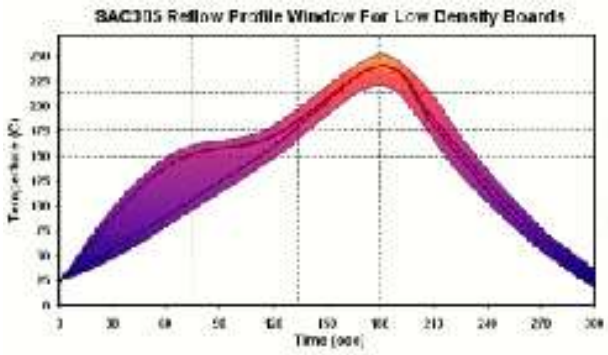
Analog Considerations

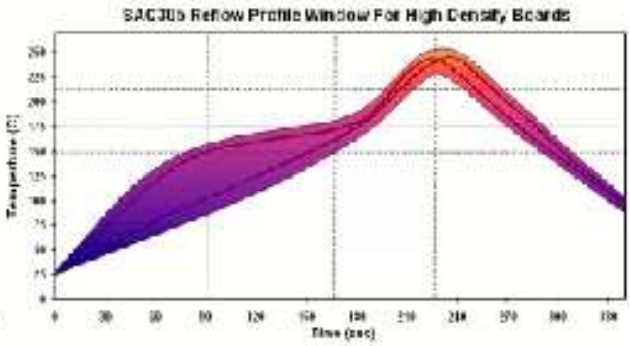
Where these pins are provided, using a separate filtered supply for `Analog 3.3V` and `Analog VREF+` may help to improve ADC accuracy by reducing analog supply noise. For the same reason, you may want to provide a separate and clean analog ground for the `Analog GND` and `Analog VREF-`, if these pads are provided on the SoM you are using.

Oven Reflow Profile

SITCore SoMs are not sealed for moisture. Baking modules before reflow is recommended and required in a humid environment. The process of reflow can damage the SoM if the temperature is too high or exposure is too long.

The lead-free reflow profiles used by GHI Electronics are shown below. The profiles are based on AIM SAC 305 solder (3% silver, 0.5% copper). The thermal mass of the assembled board and the sensitivity of the components on it affect the total dwell time. Differences in the two profiles are where they reach their respective peak temperatures as well as the time above liquids (TAL). The shorter profile applies to smaller assemblies, whereas the longer profile applies to larger assemblies such as back-planes or high-density boards. The process window is described by the shaded area. These profiles are only starting-points and general guidance. The particulars of the oven and the assembly will determine the final process.





RATE OF RISE 2°C/ SECMAX	RAMP TO 150°C (302°F)	PROGRESS THROUGH 150°C-175°C (302°F-347°F)	TO PEAK TEMP 230°C-245°C (445°F-473°F)	TIME ABOVE 217°C (423°F)	COOLABILITY <4°C/SEC	PROFILE LENGTH AMBIENT TO COOL DOWN
Short Profiles	≤ 75 Sec	30-60 Sec	45-75 Sec	30-60 Sec	45-135 Sec	2.75-3.5 Min
Long Profiles	≤ 90 Sec	60-90 Sec	45-75 Sec	60-90 Sec	45-135 Sec	4.5-5.0 Min

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