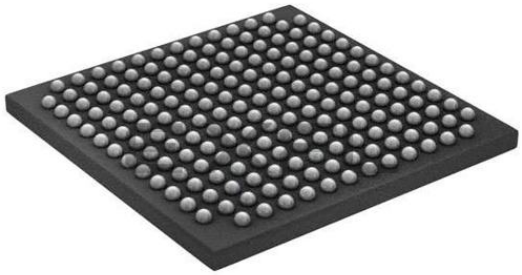

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What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	ARM® Cortex®-M4F
Core Size	32-Bit Single-Core
Speed	200MHz
Connectivity	CSIO, EBI/EMI, I²C, LINbus, SD, SPI, UART/USART, USB
Peripherals	DMA, I²S, LVD, POR, PWM, WDT
Number of I/O	152
Program Memory Size	1MB (1M x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	128K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 32x12b; D/A 2x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Surface Mount
Package / Case	192-LFBGA
Supplier Device Package	192-FBGA (12x12)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/s6e2c38j0agb1000a

Pin Number				Pin Name	I/O Circuit Type	Pin State Type
LQQ216	LQP176	LQS144	LBE192			
125	101	85	J11	P17 AN07 SCK11_0 (SCL11_0) TIOB2_2 ZIN1_2	F	L
126	102	-	J10	PB0 AN16 SCK6_1 (SCL6_1) TIOA9_1	F	L
127	103	-	J9	PB1 AN17 SCS60_1 TIOB9_1 INT08_1	F	M
128	104	-	H10	PB2 AN18 SCS61_1 TIOA10_1 INT09_1	F	M
129	105	-	J14	PB3 AN19 SCS62_1 TIOB10_1	F	L
130	106	86	H9	P18 AN08 SIN2_0 TIOA3_2 INT10_0	F	M
131	107	87	H12	P19 AN09 SOT2_0 (SDA2_0) TIOB3_2 INT24_1 TRACECLK	F	O
132	108	88	H14	P1A AN10 SCK2_0 (SCL2_0) TIOA4_2 TRACED0	F	N
133	109	89	G14	P1B AN11 SIN12_0 TIOB4_2 INT11_0 TRACED1	F	O
134	110	90	H13	P1C AN12 SOT12_0 (SDA12_0) TIOA5_2 TRACED2	F	N

Pin Number				Pin Name	I/O Circuit Type	Pin State Type
LQQ216	LQP176	LQS144	LBE192			
146	120	96	F12	P28 AN26 SOT5_0 (SDA5_0) MAD14_0	F	L
147	121	97	F13	P27 AN27 SIN5_0 INT24_0 MAD15_0	F	M
148	-	-	-	PBC TRACED12	E	N
149	-	-	-	PBD SCK0_1 (SCL0_1) AIN3_2 INT10_2 TRACED13	E	O
150	-	-	-	PBE SOT0_1 (SDA0_1) BIN3_2 TRACED14	E	N
151	-	-	-	PBF SIN0_1 ZIN3_2 INT11_2 TRACED15	E	O
152	122	98	E10	P26 MAD16_0	E	I
153	123	99	E11	P25 AN28 INT25_0 MAD17_0	F	M
154	124	100	E12	P24 AN29 TIOA13_1 MAD18_0	F	L
155	125	101	E13	P23 UHCONX1 AN30 SCK0_0 (SCL0_0) TIOB13_1	F	L
156	126	102	D12	P22 AN31 SOT0_0 (SDA0_0) INT26_0	F	M
157	127	103	D13	P21 ADTG_4 SIN0_0 INT27_0 CROUT_0	I	K

Pin Number				Pin Name	I/O Circuit Type	Pin State Type
LQQ216	LQP176	LQS144	LBE192			
210	170	138	B4	P62 SCK4_0 (SCL4_0) MWEX_0	L	I
211	171	139	C4	P61 UHCONX0 SOT4_0 (SDA4_0) MALE_0 RTCCO_0 SUBOUT_0	L	I
212	172	140	B3	P60 SIN4_0 INT31_0 WKUP3	I	Q
213	173	141	A4	USBVCC0	-	-
214	174	142	A3	P80 UDM0	H	R
215	175	143	A2	P81 UDP0	H	R
216	176	144	B1	VSS	-	-
-	-	-	E1		-	-
-	-	-	G1		-	-
-	-	-	P7		-	-
-	-	-	P11		-	-
-	-	-	L14		-	-
-	-	-	A11		-	-
-	-	-	A5		-	-
-	-	-	N7		-	-
-	-	-	M7		-	-
-	-	-	L7		-	-
-	-	-	K7		-	-
-	-	-	J7		-	-
--	-	-	G7		-	-
-	-	-	H7		-	-
-	-	-	H8		-	-
-	-	-	G8		-	-

Module	Pin Name	Function	Pin Number			
			LQQ 216	LQP 176	LQS 144	LBE 192
External interrupt	INT20_0	External interrupt request 20 input pin	91	76	60	K9
	INT20_1		89	74	-	M9
	INT21_0	External interrupt request 21 input pin	96	79	63	L10
	INT21_1		90	75	-	L9
	INT22_0	External interrupt request 22 input pin	99	82	66	N11
	INT22_1		78	63	-	K5
	INT23_0	External interrupt request 23 input pin	56	46	38	N2
	INT23_1		79	64	-	K6
	INT24_0	External interrupt request 24 input pin	147	121	97	F13
	INT24_1		131	107	87	H12
	INT25_0	External interrupt request 25 input pin	153	123	99	E11
	INT25_1		117	97	81	K14
	INT26_0	External interrupt request 26 input pin	156	126	102	D12
	INT26_1		142	116	92	G10
	INT27_0	External interrupt request 27 input pin	157	127	103	D13
	INT27_1		143	117	93	G9
	INT28_0	External interrupt request 28 input pin	190	158	128	A7
	INT28_1		207	167	-	E6
	INT29_0	External interrupt request 29 input pin	198	166	136	D6
	INT29_1		208	168	-	B5
	INT30_0	External interrupt request 30 input pin	209	169	137	C5
	INT30_1		195	163	133	F7
	INT31_0	External interrupt request 31 input pin	212	172	140	B3
	INT31_1		196	164	134	B6
	NMIX	Non-maskable interrupt input pin	158	128	104	C13

Module	Pin Name	Function	Pin Number			
			LQQ 216	LQP 176	LQS 144	LBE 192
GPIO	P00	General-purpose I/O port 0	164	134	110	B13
	P01		165	135	111	A12
	P02		166	136	112	C12
	P03		167	137	113	B12
	P04		168	138	114	B11
	P08		30	21	18	G3
	P09		31	22	19	G4
	P0A		32	23	20	G5
	P10	General-purpose I/O port 1	114	94	78	L11
	P11		115	95	79	K13
	P12		116	96	80	K12
	P13		117	97	81	K14
	P14		118	98	82	K11
	P15		123	99	83	J13
	P16		124	100	84	J12
	P17		125	101	85	J11
	P18		130	106	86	H9
	P19		131	107	87	H12
	P1A		132	108	88	H14
	P1B		133	109	89	G14
	P1C		134	110	90	H13
	P1D		135	111	91	H11
	P1E		142	116	92	G10
	P1F		143	117	93	G9
	P20	General-purpose I/O port 2	158	128	104	C13
	P21		157	127	103	D13
	P22		156	126	102	D12
	P23		155	125	101	E13
	P24		154	124	100	E12
	P25		153	123	99	E11
	P26		152	122	98	E10
	P27		147	121	97	F13
	P28		146	120	96	F12
	P29		145	119	95	F11
	P2A		144	118	94	F10

Module	Pin Name	Function	Pin Number			
			LQQ 216	LQP 176	LQS 144	LBE 192
Multi-Function Serial 5	SIN5_0	Multi-function serial interface ch 5 input pin	147	121	97	F13
	SIN5_1		170	140	-	D11
	SOT5_0 (SDA5_0)	Multi-function serial interface ch 5 output pin. This pin operates as SOT5 when it is used in a UART/CSIO/LIN (operation modes 0 to 3) and as SDA5 when it is used in an I^2C (operation mode 4).	146	120	96	F12
	SOT5_1 (SDA5_1)		171	141	-	B10
	SCK5_0 (SCL5_0)	Multi-function serial interface ch 5 clock I/O pin. This pin operates as SCK5 when it is used in a CSIO (operation mode 2) and as SCL5 when it is used in an I^2C (operation mode 4).	145	119	95	F11
	SCK5_1 (SCL5_1)		172	142	-	C10
	CTS5_0	Multi-function serial interface ch 5 CTS input pin	144	118	94	F10
	CTS5_1		173	143	-	D10
	RTS5_0	Multi-function serial interface ch 5 RTS output pin	143	117	93	G9
	RTS5_1		174	144	-	B9
Multi-Function Serial 6	SIN6_0	Multi-function serial interface ch 6 input pin	96	79	63	L10
	SIN6_1		117	97	81	K14
	SOT6_0 (SDA6_0)	Multi-function serial interface ch 6 output pin. This pin operates as SOT6 when it is used in a UART/CSIO/LIN (operation modes 0 to 3) and as SDA6 when it is used in an I^2C (operation mode 4).	97	80	64	K10
	SOT6_1 (SDA6_1)		118	98	82	K11
	SCK6_0 (SCL6_0)	Multi-function serial interface ch 6 clock I/O pin. This pin operates as SCK6 when it is used in a CSIO (operation mode 2) and as SCL6 when it is used in an I^2C (operation mode 4).	98	81	65	M10
	SCK6_1 (SCL6_1)		126	102	-	J10
	SCS60_0	Multi-function serial interface ch 6 chip select 0 input/output pin	99	82	66	N11
	SCS60_1		127	103	-	J9
	SCS61_0	Multi-function serial interface ch 6 chip select1 input/output pin	100	83	67	M11
	SCS61_1		128	104	-	H10
	SCS62_0	Multi-function serial interface ch 6 chip select2 input/output pin	79	64	-	K6
	SCS62_1		129	105	-	J14
	SCS63_0	Multi-function serial interface ch 6 chip select3 input/output pin	78	63	-	K5
	SCS63_1		119	-	-	-

Module	Pin Name	Function	Pin Number			
			LQQ 216	LQP 176	LQS 144	LBE 192
Multi-Function Timer 1	DTTI1X_0	Input signal controlling waveform generator outputs RTO10 to RTO15 of Multi-Function Timer 1.	70	55	47	L5
	DTTI1X_1		94	-	-	-
	FRCK1_0	16-bit free-run timer ch 1 external clock input pin	71	56	48	M5
	FRCK1_1		78	63	-	K5
	IC10_0	16-bit input capture input pin of Multi-Function Timer 1. ICxx describes channel number.	96	79	63	L10
	IC10_1		95	-	-	-
	IC11_0		97	80	64	K10
	IC11_1		101	-	-	-
	IC12_0		98	81	65	M10
	IC12_1		102	-	-	-
	IC13_0		99	82	66	N11
	IC13_1		103	-	-	-
	RTO10_0 (PPG10_0)	Waveform generator output pin of Multi-Function Timer 1. This pin operates as PPG10 when it is used in PPG1 output modes.	56	46	38	N2
	RTO10_1 (PPG10_1)		85	70	-	N8
	RTO11_0 (PPG10_0)	Waveform generator output pin of Multi-Function Timer 1. This pin operates as PPG10 when it is used in PPG1 output modes.	57	47	39	N3
	RTO11_1 (PPG10_1)		86	71	-	M8
	RTO12_0 (PPG12_0)	Waveform generator output pin of Multi-Function Timer 1. This pin operates as PPG12 when it is used in PPG1 output modes.	58	48	40	M3
	RTO12_1 (PPG12_1)		87	72	-	N9
	RTO13_0 (PPG12_0)	Waveform generator output pin of Multi-Function Timer 1. This pin operates as PPG12 when it is used in PPG1 output modes.	59	49	41	L4
	RTO13_1 (PPG12_1)		88	73	-	P9
	RTO14_0 (PPG14_0)	Waveform generator output pin of Multi-Function Timer 1. This pin operates as PPG14 when it is used in PPG1 output modes.	60	50	42	M4
	RTO14_1 (PPG14_1)		89	74	-	M9
	RTO15_0 (PPG14_0)	Waveform generator output pin of Multi-Function Timer 1. This pin operates as PPG14 when it is used in PPG1 output modes.	61	51	43	N4
	RTO15_1 (PPG14_1)		90	75	-	L9

Module	Pin Name	Function	Pin Number			
			LQQ 216	LQP 176	LQS 144	LBE 192
Multi-Function Timer 2	DTTI2X_0	Input signal controlling waveform generator outputs RTO20 to RTO25 of Multi-Function Timer 1.	8	8	8	D3
	DTTI2X_1		202	-	-	-
	FRCK2_0	16-bit free-run timer ch 2 external clock input pin	17	16	13	F3
	FRCK2_1		197	165	135	C6
	IC20_0	16-bit input capture input pin of Multi-Function Timer 2. ICxx describes channel number.	9	9	9	D4
	IC20_1		201	-	-	-
	IC21_0		14	13	10	E5
	IC21_1		200	-	-	-
	IC22_0		15	14	11	F1
	IC22_1		199	-	-	-
	IC23_0		16	15	12	F2
	IC23_1		198	166	136	D6
	RTO20_0 (PPG20_0)	Waveform generator output pin of Multi-Function Timer 2. This pin operates as PPG20 when it is used in PPG2 output modes.	2	2	2	B2
	RTO20_1 (PPG20_1)		203	-	-	-
	RTO21_0 (PPG20_0)	Waveform generator output pin of Multi-Function Timer 2. This pin operates as PPG20 when it is used in PPG2 output modes.	3	3	3	C2
	RTO21_1 (PPG20_1)		204	-	-	-
	RTO22_0 (PPG22_0)	Waveform generator output pin of Multi-Function Timer 2. This pin operates as PPG22 when it is used in PPG2 output modes.	4	4	4	C3
	RTO22_1 (PPG22_1)		205	-	-	-
	RTO23_0 (PPG22_0)	Waveform generator output pin of Multi-Function Timer 2. This pin operates as PPG22 when it is used in PPG2 output modes.	5	5	5	D5
	RTO23_1 (PPG22_1)		206	-	-	-
	RTO24_0 (PPG24_0)	Waveform generator output pin of Multi-Function Timer 2. This pin operates as PPG24 when it is used in PPG2 output modes.	6	6	6	D2
	RTO24_1 (PPG24_1)		207	167	-	E6
	RTO25_0 (PPG24_0)	Waveform generator output pin of Multi-Function Timer 2. This pin operates as PPG24 when it is used in PPG2 output modes.	7	7	7	D1
	RTO25_1 (PPG24_1)		208	168	-	B5

Module	Pin Name	Function	Pin Number			
			LQQ 216	LQP 176	LQS 144	LBE 192
I²S	I2SMCLK0_0	I²S external clock pin	51	41	-	L2
	I2SDO0_0	I²S serial transition data output pin	52	42	-	L3
	I2SWS0_0	I²S frame synchronization signal pin	53	43	-	M2
	I2SDI0_0	I²S serial received data input pin	34	24	-	G6
	I2SCK0_0	I²S bit clock pin	35	25	-	H4
High-speed quad SPI	Q_SCK_0	SPI clock output pin	173	143	-	D10
	Q_IO0_0	SPI data input/output pin	172	142	-	C10
	Q_IO1_0		171	141	-	B10
	Q_IO2_0		170	140	-	D11
	Q_IO3_0		169	139	-	C11
	Q_CS0_0	SPI chip select output pin	174	144	-	B9
	Q_CS1_0		175	-	-	-
	Q_CS2_0		176	-	-	-

Peripheral Address Map

Start Address	End Address	Bus	Peripherals
0x4000_0000	0x4000_0FFF	AHB	MainFlash I/F register
0x4000_1000	0x4000_FFFF		Reserved
0x4001_0000	0x4001_0FFF	APB0	Clock/reset control
0x4001_1000	0x4001_1FFF		Hardware watchdog timer
0x4001_2000	0x4001_2FFF		Software watchdog timer
0x4001_3000	0x4001_4FFF		Reserved
0x4001_5000	0x4001_5FFF		Dual-timer
0x4001_6000	0x4001_FFFF		Reserved
0x4002_0000	0x4002_0FFF	APB1	Multi-Function Timer unit 0
0x4002_1000	0x4002_1FFF		Multi-Function Timer unit 1
0x4002_2000	0x4002_2FFF		Multi-Function Timer unit 2
0x4002_3000	0x4002_3FFF		Reserved
0x4002_4000	0x4002_4FFF		PPG
0x4002_5000	0x4002_5FFF		Base timer
0x4002_6000	0x4002_6FFF		Quadrature position/revolution counter
0x4002_7000	0x4002_7FFF		A/D converter
0x4002_8000	0x4002_DFFF		Reserved
0x4002_E000	0x4002_EFFF		Internal CR trimming
0x4002_F000	0x4002_FFFF		Reserved
0x4003_0000	0x4003_0FFF	APB2	External interrupt controller
0x4003_1000	0x4003_1FFF		Interrupt request batch-read function
0x4003_2000	0x4003_2FFF		Reserved
0x4003_3000	0x4003_3FFF		D/A converter
0x4003_4000	0x4003_4FFF		Reserved
0x4003_5000	0x4003_57FF		Low voltage detector
0x4003_5800	0x4003_5FFF		Deep standby mode Controller
0x4003_6000	0x4003_6FFF		USB clock generator
0x4003_7000	0x4003_7FFF		Reserved
0x4003_8000	0x4003_8FFF		Multi-function serial interface
0x4003_9000	0x4003_9FFF		CRC
0x4003_A000	0x4003_AFFF		Watch counter
0x4003_B000	0x4003_BFFF		RTC/port control
0x4003_C000	0x4003_C0FF		Low-speed CR prescaler
0x4003_C100	0x4003_C7FF		Peripheral clock gating
0x4003_C800	0x4003_CFFF		Reserved
0x4003_D000	0x4003_DFFF		I^2S prescaler
0x4003_E000	0x4003_EFFF		Reserved
0x4003_F000	0x4003_FFFF		External memory interface
0x4004_0000	0x4004_FFFF	AHB	USB ch 0
0x4005_0000	0x4005_FFFF		USB ch 1
0x4006_0000	0x4006_0FFF		DMAC register
0x4006_1000	0x4006_1FFF		DSTC register
0x4006_2000	0x4006_BFFF		Reserved
0x4006_C000	0x4006_CFFF		I^2S
0x4006_D000	0x4006_DFFF		Reserved
0x4006_E000	0x4006_EFFF		SD card I/F
0x4006_F000	0x4006_FFFF		GPIO
0x4007_0000	0x4007_FFFF		Reserved
0x4008_0000	0x4008_0FFF		Programmable-CRC
0x4008_1000	0x41FF_FFFF		Reserved
0x200E_0000	0x200E_FFFF		Workflash I/F register
0xD000_0000	0xDFFF_FFFF		High-speed quad SPI control register

List of Pin Behavior by Mode State

Pin Status Type	Function Group	Power-On Reset or Low-Voltage Detection State	INITX Input State	Device Internal Reset State	Run mode or Sleep mode State	Timer mode, RTC mode, or Stop mode State		Deep Standby RTC Mode or Deep Standby Stop mode State		Return from Deep Standby Mode State
		Power Supply Unstable	Power Supply Stable		Power Supply Stable	Power Supply Stable		Power Supply Stable		Power Supply Stable
		-	INITX=0	INITX=1	INITX=1	INITX=1		INITX=1		INITX=1
		-	-	-	-	SPL=0	SPL=1	SPL=0	SPL=1	-
A	GPIO selected	Setting disabled	Setting disabled	Setting disabled	Maintain previous state	Maintain previous state	Hi-Z/internal input fixed at 0	GPIO selected, internal input fixed at 0	Hi-Z/internal input fixed at 0	GPIO selected
	Main crystal oscillator input pin/ external main clock input selected	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input Enabled
B	GPIO selected	Setting disabled	Setting disabled	Setting disabled	Maintain previous state	Maintain previous state	Hi-Z/internal input fixed at 0	GPIO selected, internal input fixed at 0	Hi-Z/internal input fixed at 0	GPIO selected
	External main clock input selected	Setting disabled	Setting disabled	Setting disabled	Maintain previous state	Maintain previous state	Hi-Z/internal input fixed at 0	Maintain previous state	Hi-Z/internal input fixed at 0	Maintain previous State
	Main crystal oscillator output pin	Hi-Z/ internal input fixed at 0/ or input enable	Hi-Z/ internal input fixed at 0	Hi-Z/ internal input fixed at 0	Maintain previous state while oscillator active/ When oscillation stops*1, it will be Hi-Z/ Internal input fixed at 0					
C	INITX input pin	Pull-up/ input enabled	Pull-up/ Input enabled	Pull-up/ Input enabled	Pull-up/ Input enabled	Pull-up/ Input enabled	Pull-up/ Input enabled	Pull-up/ Input enabled	Pull-up/ Input enabled	Pull-up/ Input enabled
D	Mode input pin	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled
E	Mode input pin	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled	Input enabled
	GPIO selected	Setting disabled	Setting disabled	Setting disabled	Maintain previous state	Maintain previous state	Hi-Z/ input enabled	GPIO selected	Hi-Z/ input enabled	GPIO selected

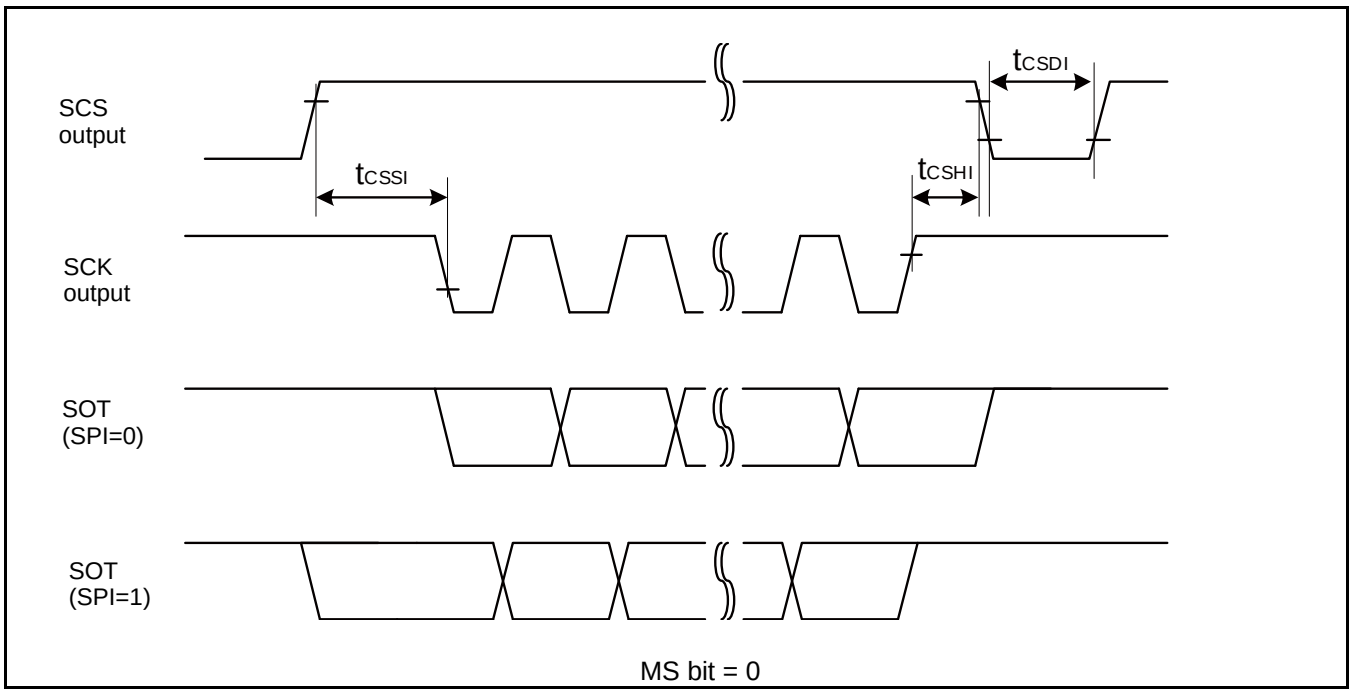
Pin Status Type	Function Group	Power-On Reset or Low-Voltage Detection State	INITX Input State	Device Internal Reset State	Run mode or Sleep mode State	Timer mode, RTC mode, or Stop mode State		Deep Standby RTC Mode or Deep Standby Stop mode State		Return from Deep Standby Mode State
		Power Supply Unstable	Power Supply Stable		Power Supply Stable	Power Supply Stable		Power Supply Stable		Power Supply Stable
		-	INITX=0	INITX=1	INITX=1	INITX=1		INITX=1		INITX=1
		-	-	-	-	SPL=0	SPL=1	SPL=0	SPL=1	-
Q	WKUP enabled	Setting disabled	Setting disabled	Setting disabled	Maintain previous state	Maintain previous state	Maintain previous state	WKUP input enabled	Hi-Z/ WKUP input enabled	WKUP input enabled
	External interrupt enable selected							GPIO selected, internal input fixed at 0	Hi-Z/internal input fixed at 0	GPIO selected
	Resource other than above selected	Hi-Z	Hi-Z/ input enabled	Hi-Z/ input enabled			Hi-Z/internal input fixed at 0			
	GPIO selected									
R	GPIO selected	Hi-Z	Hi-Z/ input enabled	Hi-Z/ input enabled	Maintain previous state	Maintain previous state	Hi-Z/internal input fixed at 0	GPIO selected, internal input fixed at 0	Hi-Z/internal input fixed at 0	GPIO selected
	USB I/O pin	Setting disabled	Setting disabled	Setting disabled	Hi-Z at trans-mission/ input enabled/ internal input fixed at 0 at reception	Hi-Z at trans-mission/ input enabled/ internal input fixed at 0 at reception	Hi-Z at trans-mission/ input enabled/ internal input fixed at 0 at reception	Hi-Z/ input enabled	Hi-Z/ input enabled	Hi-Z/ input enabled

*1: Oscillation is stopped at sub Timer mode, sub CR Timer mode, RTC mode, Stop mode, Deep Standby RTC mode, and Deep Standby Stop mode.

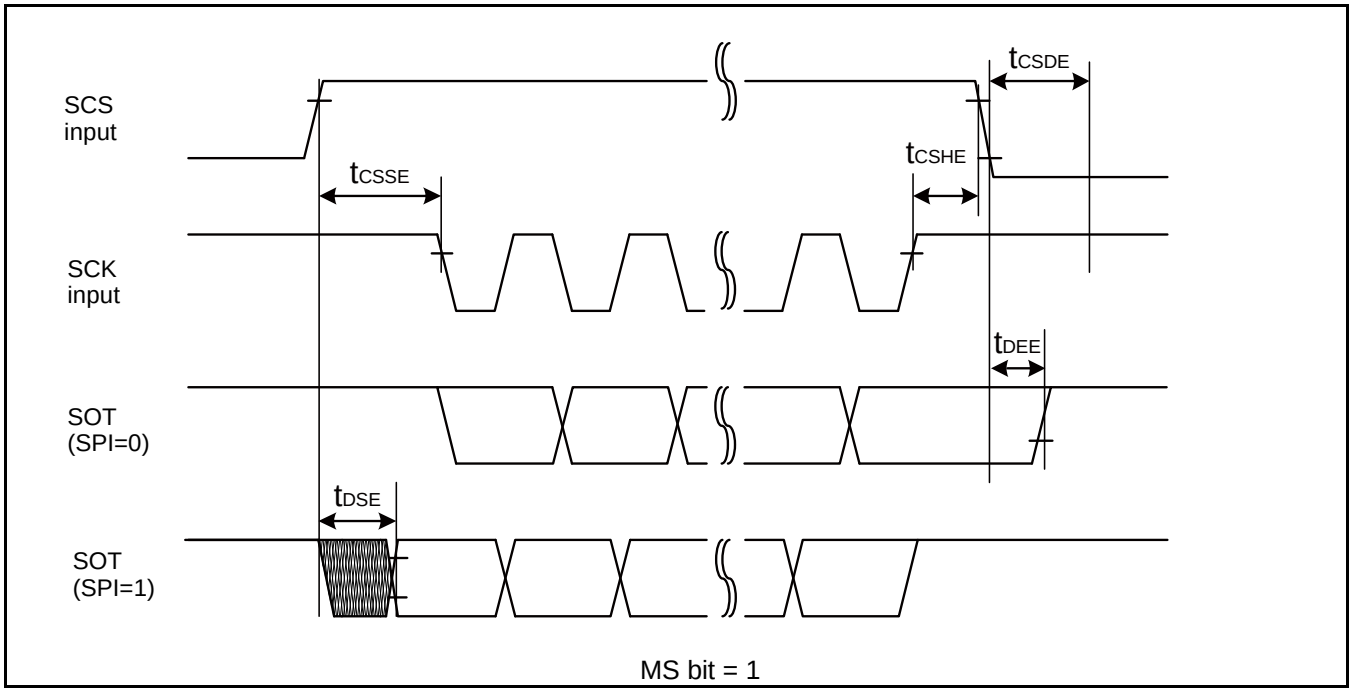
*2: Maintain previous state at Timer mode. GPIO selected internal input fixed at 0 at RTC mode, Stop mode.

*3: Maintain previous state at Timer mode. Hi-Z/internal input fixed at 0 at RTC mode, Stop mode.

*4: It shows the case selected by EPFR14.E_SPLC register.



MS bit = 0



MS bit = 1

12.4.13 External Input Timing

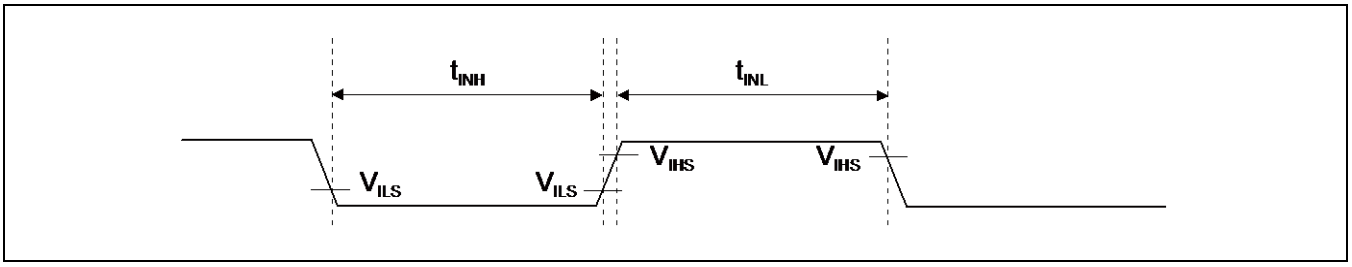
(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Min	Max		
Input pulse width	t_{INH}, t_{INL}	ADTGx	-	$2t_{CYCP}$*1	-	ns	A/D converter trigger input
		FRCKx					Free-run timer input clock
		ICxx					Input capture
		DTTIxX	-	$2t_{CYCP}$*1	-	ns	Waveform generator
		INT00 to INT31, NMIX	-	$2t_{CYCP}$ + 100*1	-	ns	External interrupt, NMI
				500*2	-	ns	
		WKUPx	-	500*3	-	ns	Deep standby wake up

1: t_{CYCP} indicates the APB bus clock cycle time except stop when in Stop mode, in Timer mode. For more information about the APB bus number to which the A/D converter, multi-function timer, and external interrupt are connected, see 8. Block Diagram in this data sheet.

2: When in Stop mode, in Timer mode

3: When in Deep Standby RTC mode, in Deep Standby Stop mode



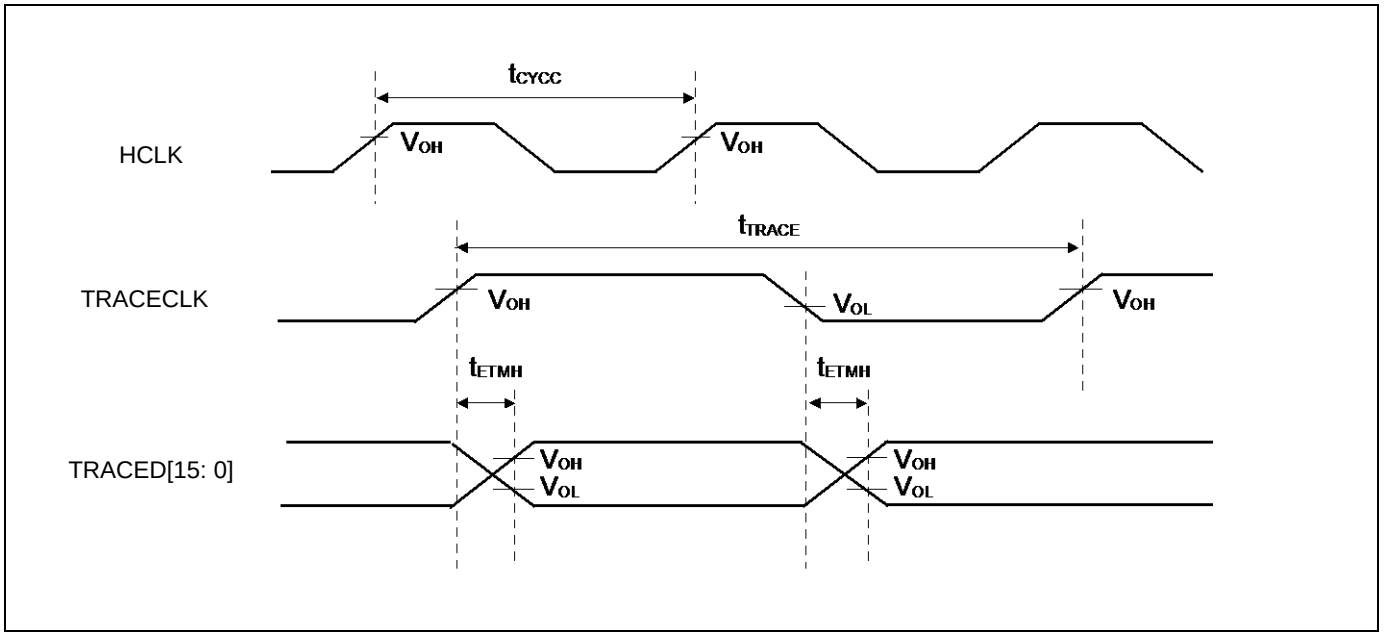
12.4.17 ETM/ HTM Timing

(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Min	Max		
Data hold	t_{ETMH}	TRACECLK, TRACED[15: 0]	$V_{CC} \geq 4.5$ V	2	9	ns	
			$V_{CC} < 4.5$ V	2	15		
TRACECLK frequency	$1/t_{TRACE}$	TRACECLK	$V_{CC} \geq 4.5$ V		50	MHz	
			$V_{CC} < 4.5$ V		32	MHz	
TRACECLK clock cycle	t_{TRACE}		$V_{CC} \geq 4.5$ V	20	-	ns	
			$V_{CC} < 4.5$ V	31.25	-	ns	

Note:

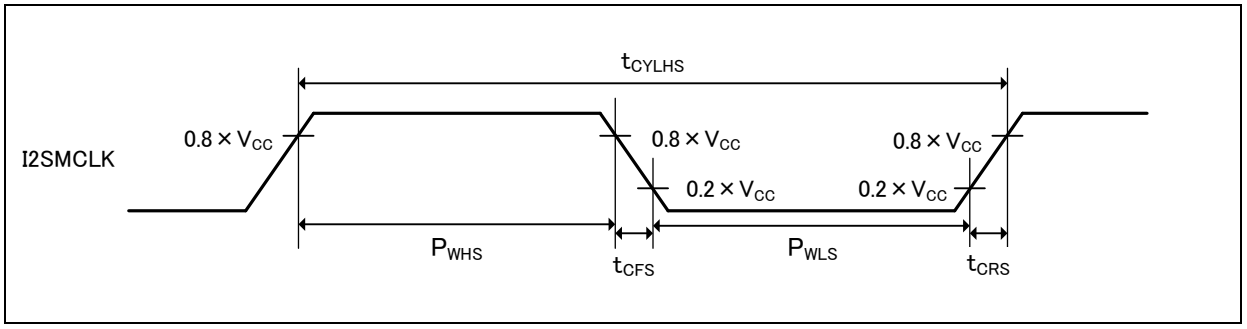
- *When the external load capacitance C_L = 30 pF.*



I2SMCLK Input Characteristics

(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Min	Max		
Input frequency	f_{CHS}	I2SMCK	-	-	25	MHz	
Input clock cycle	t_{CYLHS}	-	-	40	-	ns	
Input clock pulse width	-	-	P_{WHS}/t_{CYLHS} P_{WLS}/t_{CYLHS}	45	55	%	When using external clock
Input clock rise time and fall time	t_{CFS} t_{CRS}	-	-	-	5	ns	When using external clock



I2SMCLK Output Characteristics

(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Min	Max		
Output frequency	f_{CHS}	I2SMCK	-	-	12.288	MHz	

12.4.20 High-Speed Quad SPI Timing

(V_{CC} = 2.7V to 3.6V, V_{SS} = 0V)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Min	Max		
Serial clock frequency	t_{SCYCM}	Q_SCK_0	C_L = 15 pF, V_{CC} = 3.0 to 3.6V	-	66	MHz	*1
			C_L = 30 pF	-	50	MHz	*2
Enabled CS→ CLK Starting Time (mode0/mode2)	$t_{OSLSK02}$	Q_SCK_0, Q_CS0_0, Q_CS1_0, Q_CS2_0	C_L = 30 pF	1.5 × t_{SCYCM} - 5	-	ns	
Enabled CS→ CLK Starting Time (mode1/mode3)	$t_{OSLSK13}$			t_{SCYCM} - 5	-	ns	
CLK Last→ Disabled CS Time (mode0/mode2)	$t_{OSKSL02}$			t_{SCYCM}	-	ns	
CLK Last→ Disabled CS Time (mode1/mode3)	$t_{OSKSL13}$			1.5 × t_{SCYCM}	-	ns	
SIO Data output time	t_{OSDAT}	Q_SCK_0, Q_IO0_0, Q_IO1_0, Q_IO2_0, Q_IO3_0	C_L = 15 pF, V_{CC} = 3.0 to 3.6V	0	5	ns	
			C_L = 30 pF	0	5		
SIO Setup	t_{DSSET}		C_L = 30 pF	3	-	ns	*1
				10	-		*2
SIO Hold	t_{SDHOLD}		C_L = 30 pF	0.5 × t_{SCYCM}	-	ns	

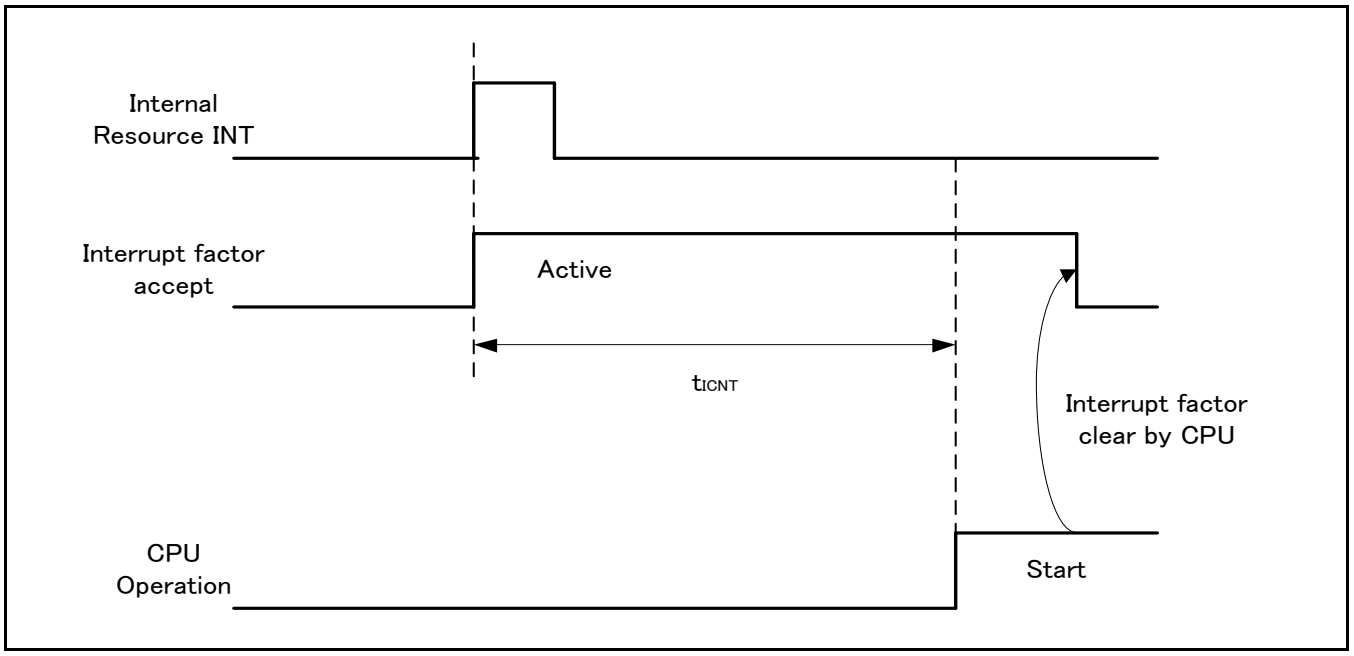
*1: When RTM = 1 and mode = 0, 1, 3

*2: When RTM = 1 and mode = 2 or RTM = 0 and mode = 0, 1, 2, 3

Notes:

- *See Chapter8-3: High-Speed Quad SPI controller in FM4 Family Peripheral Manual Communication Macro Part (002-04862) for the detail of RTM mode.*
- *When using High-Speed Quad SPI, please set PDSR register to set the pin drive capability for V_{CC} = 3V. See Chapter12: I/O Port in FM4 Family Peripheral Manual Main Part (002-04856) for the details.*

Example of Standby Recovery Operation (when in Internal Resource Interrupt Recovery*)



*: Depending on the standby mode, interrupt from the internal resource is not included in the recovery cause.

Notes:

- *The return factor is different in each low-power consumption mode. See Chapter 6: Low Power Consumption Mode and Operations of Standby Modes in FM4 Family Peripheral Manual Main Part (002-04856).*
- *The recovery process is unique for each operating mode. See Chapter 6: Low Power Consumption Mode in FM4 Family Peripheral Manual Main Part (002-04856).*

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