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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 "<u>Embedded -</u> <u>Microcontrollers</u>"

Details

E·XFl

Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/s6e1b36e0agv20000
Supplier Device Package	80-LQFP (12x12)
Package / Case	80-LQFP
Mounting Type	Surface Mount
Operating Temperature	-40°C ~ 105°C (TA)
Oscillator Type	Internal
Data Converters	A/D 16x12b
Voltage - Supply (Vcc/Vdd)	1.65V ~ 3.6V
RAM Size	64K x 8
EEPROM Size	-
Program Memory Type	FLASH
Program Memory Size	560KB (560K x 8)
Number of I/O	65
Peripherals	I ² S, LVD, POR, PWM, WDT
Connectivity	CSIO, I ² C, LINbus, SmartCard, UART/USART, USB
Speed	40MHz
Core Size	32-Bit Single-Core
Core Processor	ARM® Cortex®-M0+
Product Status	Obsolete

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4. List of Pin Functions

List of Pin Numbers

The number after the underscore ("_") in a pin name such as XXX_1 and XXX_2 indicates the relocated port number. The channel on such pin has multiple functions, each of which has its own pin name. Use the Extended Port Function Register (EPFR) to select the pin to be used.

	Pin No.		Dia Mara		Die Oferfe Trees
LQFP-120	LQFP-100	LQFP-80	- Pin Name	I/O Circuit Type	Pin State Type
1	1	1	VCC	-	
			P50		
2	2	2	SIN3_1	1	J
			INT00_0		
			P51		
3	3	3	SOT3_1		J
			INT01_0		
			P52		
4	4	4	SCK3_1	I	J
			INT02_0		
			P53		
_	_	_	SIN6_0		
5	5	5	TIOA1_2	I	J
			INT07_2		
			P54		
6	6	6	SOT6_0	I	
0	Ö	0	TIOB1_2	I	J
			INT18_1		
			P55		
-	7	7	SCK6_0		
7	7	7	ADTG_1	I	J
			INT19_1		
			P56		
			MI2SMCK6_1		
8	8	8	CEC1_1	I	0
0			INT08_2	-	U U
			WKUP9		
	-	-	SIN1_0		
9	-	-	P57	F F	1
Ũ			SOT1_0		
10	-	-	P58	— F	1
-			SCK1_0	-	
11			P59 SIN7_0	F	
11	-	-	INT16_1		J
			P5A		
12	-	-	SOT7_0	F	J
14			INT16_2	- '	l v



	Pin No.		Din Nama		Din State Trme
LQFP-120	LQFP-100	LQFP-80	Pin Name	I/O Circuit Type	Pin State Type
			P70		
51	-	-	TIOA4_2	F	I
			SCS71_1		
			P71		
52			TIOB4_2	F	
52	-	-	SCS72_1	Г	J
			INT13_2		
			P72		
53	_	_	SIN2_0	— F	J
55	_	_	TIOA6_0	I	5
			INT14_2		
			P73		
54	-	_	SOT2_0	— F	J
04		_	TIOB6_0		0
			INT15_2		
55	-	-	P74	— F	1
00			SCK2_0		•
56	46	36	PE0	C	D
	-10		MD1	Ū	
57	47	37	MD0	J	М
58	48	38	PE2	Α	А
50	40	30	X0	~	~
			PE3		
59	49	39	X1	— A	В
60	50	40	VSS		-
61	51	41	VCC	-	-
-	-		P10		
62	52	42	IC1_CLK_1	— н	К
		-	CTS1_1		
			AN00		
			P11		
			IC1_VCC_1		
		_	SIN1_1		
63	53	43	FRCK0_2	н	Р
		_	INT02_1		
		_	WKUP1		
			AN01		
			P12		
			IC1_VPEN_1		
64	54	44	SOT1_1	н	К
		Ļ	IC00_2		
			AN02		
		Ļ	P13		
		Ļ	IC1_RST_1		
05		45	SCK1_1		
65	55	45	RTCCO_1	н	К
		Ļ			
		ŀ	SUBOUT_1		
			AN03		



List of Pin Functions

The number after the underscore ("_") in a pin name such as XXX_1 and XXX_2 indicates the relocated port number. The channel on such pin has multiple functions, each of which has its own pin name. Use the Extended Port Function Register (EPFR) to select the pin to be used.

Pin Function	Pin Name	Function Description		Pin No.	
	Fill Name		LQFP-120	LQFP-100	LQFP-80
	ADTG_0		99	84	66
	ADTG_1		7	7	7
	ADTG_2		23	18	13
	ADTG_3	A/D converter external trigger	114	94	74
	ADTG_4	input pin	81	-	-
	ADTG_5		80	70	-
		ADTG_6 17 12		12	
_	ADTG_7			35 30 -	-
	AN00		62	52	42
	AN01		63	53	43
	AN02		64	54	44
	AN03		65	55	45
Γ	AN04		66	56	46
Γ	AN05		67	57	47
ADC	AN06		68	58	48
	AN07		69	59	49
F	AN08		74	64	54
-	AN09		75	65	55
	AN10	A/D converter analog input pin. ANxx describes ADC ch.xx.	76	66	56
	AN11	ANXX describes ADC cn.xx.	77	67	57
	AN12		78	68	-
	AN13		79	69	-
	AN14		80	70	-
	AN15		82	-	-
	AN16		86	71	58
	AN17		87	72	59
	AN18		88	73	60
	AN19		89	74	-
	AN20		97	82	-
	AN21		98	83	-
	AN22		99	84	66
	AN23		100	85	-
	TIOA0_0		32	27	-
	TIOA0_1	Base timer ch.0 TIOA pin	24	19	14
Base Timer 0	TIOA0_2		100	85	-
	TIOB0_0		47	42	32
Γ	TIOB0_1	Base timer ch.0 TIOB pin	14	9	9
Γ	TIOB0_2		101	86	-



Pin Function	Pin Name	Function Description	LQFP-120	Pin No. LQFP-100	LQFP-80
	INT15_0		68	58	48
F	INT15_1	External interrupt request 15 input pin	116	96	76
-	INT15_2	-	54	-	-
	INT16_0		100	85	-
F	INT16_1	External interrupt request 16 input pin	11	-	-
	INT16_2		12	-	-
	INT17_0		101	86	-
L	INT17_1	External interrupt request 17 input pin	85	-	-
	INT17_2		13	-	-
_	INT18_0		103	88	68
F	INT18_1	External interrupt request 18 input pin	6	6	6
-	INT18_2		26	21	16
External	INT19_0 INT19_1	External interrupt request 19 input pin	104 7	89 7	69 7
Interrupt	INT19_1		28	23	18
	INT20_0		105	90	70
F	INT20_1	External interrupt request 20 input pin	117	97	77
	INT20_2		77	67	57
F	INT21_0		106	91	71
	INT21_1	External interrupt request 21 input pin	47	42	32
	INT21_2		78	68	-
	INT22_0		109	-	-
	INT22_1	External interrupt request 22 input pin	48	43	33
	INT22_2		79	69	-
	INT23_0		111	-	-
_	INT23_1	External interrupt request 23 input pin	99	84	66
	INT23_2		80	70	-
	NMIX	Non-Maskable Interrupt input pin	107	92	72
	P00	_	92	77	61
	P01		93	78	62
	P02		94	79	63
	P03		95	80	64
	P04		96	81	65
	P05		97	82	-
GPIO	P06	Conorol purposo I/O port 0	98	83	-
GFIO	P07	General-purpose I/O port 0	99	84	66
Ļ	P08	_	100	85	-
Ļ	P09	_	101	86	-
F	P0A		102	87	67
Ļ	P0B		103	88	68
F	POC		104	89	69 70
F	P0D P0E		105 106	90	70 71
F	POE POF		106	91 92	71



Pin Function	Pin Name	Function Description	LQFP-120	Pin No. LQFP-100	LQFP-80
	P40		32	27	
F	P41		33	28	-
	P42		34	29	-
	P43		35	30	-
	P44		36	31	21
	P45		37	32	22
	P46		42	37	27
	P47	General-purpose I/O port 4	43	38	28
	P48		44	39	29
	P49		45	40	30
	P4A		47	42	32
	P4B		48	43	33
	P4C		49	44	34
	P4D		50	45	35
	P50		2	2	2
	P51		3	3	3
F	P52		4	4	4
	P53		5	5	5
	P54		6	6	6
	P55	General-purpose I/O port 5	7	7	7
	P56		8	8	8
	P57		9	-	-
	P58		10	-	-
GPIO	P59		11	-	-
	P5A		12	-	-
	P5B		13	-	-
	P60		116	96	76
	P61		115	95	75
	P62		114	94	74
	P63		113	93	73
	P64	General-purpose I/O port 6	112	-	-
	P65		111	-	-
L	P66	_	110	-	-
L	P67	_	109	-	-
L	P68		108	-	-
L	P70		51	-	-
Ļ	P71		52	-	-
Ļ	P72	General-purpose I/O port 7	53	-	-
F	P73	_	54	-	-
F	P74		55	- 07	-
-	P80		117	97	77
_	P81	General-purpose I/O port 8	118	98	78
	P82		119	99	79
	PE0*		56	46	36
	PE2	General-purpose I/O port E	58	48	38
	PE3		59	49	39



Pin Function	Pin Name	Function Description	LQFP-120	Pin No. LQFP-100	LQFP-80
	SIN7_0		11		-
-	SIN7_1	Multi-function serial interface ch.7 input pin	48	43	33
-	SIN7_2		117	97	77
-	SOT7_0 (SDA7_0)	Multi-function serial interface ch.7 output pin.	12	-	-
	SOT7_1 (SDA7_1)	This pin operates as SOT7 when used as a UART/CSIO/LIN pin (operation mode 0 to 3)	49	44	34
	SOT7_2 (SDA7_2)	and as SDA7 when used as an I ² C pin (operation mode 4).	118	98	78
Multi-function Serial 7	SCK7_0 (SCL7_0)	Multi-function serial interface ch.7 clock I/O pin.	13	-	- 35
Senar /	SCK7_1 (SCL7_1)	This pin operates as SCK7 when used as a CSIO (operation mode 2) and as SCL7	50	45	35
	SCK7_2 (SCL7_2)	when used as an I ² C pin (operation mode 4).	119	99	79
-	SCS70_1	Multi-function serial interface ch.7 serial chip select 0 input/output pin.	47	42	32
	SCS71_1	Multi-function serial interface ch.7 serial chip select 1 input/output pin.	51	-	-
-	SCS72_1	Multi-function serial interface ch.7 serial chip select 2 input/output pin.	52	-	-
	IC0_VCC_0	Smart card ch.0 power enable output pin	106	91	71
	IC0_VCC_1	Smart card ch.0 power enable output pin	33	28	-
	IC0_VPEN_0	Smart card ch.0 programming output pin	105	90	70
	IC0_VPEN_1	Smart card chilo programming output pin	34	29	-
	IC0_RST_0	Smart card ch.0 reset output pin	114	94	74
Smart Card	IC0_RST_1	Smart card ch.o reset output pin	35	30	-
interface 0	IC0_CIN_0	Smart card ch.0 insert detection input pin	102	87	67
_	IC0_CIN_1		37	32	22
_	IC0_CLK_0	Smart card ch.0 serial interface clock output	107	92	72
	IC0_CLK_1	pin	32	27	-
_	IC0_DATA_0	Smart card ch.0 serial interface data	113	93	73
	IC0_DATA_1	input/output pin	36	31	21
	IC1_VCC_0	Smart card ch.1 power enable output pin	28	23	18
_	IC1_VCC_1		63	53	43
_	IC1_VPEN_0	-Smart card ch.1 programming output pin	27	22	17
_	IC1_VPEN_1		64	54	44
_	IC1_RST_0	Smart card ch.1 reset output pin	26	21	16
Smart Card	IC1_RST_1		65	55	45
interface 1	IC1_CIN_0	Smart card ch.1 insert detection input pin	24	19	14
	IC1_CIN_1		67	57	47
	IC1_CLK_0	Smart card ch.1 serial interface clock output	29	24	19
	IC1_CLK_1	pin	62	52	42
	IC1_DATA_0	Smart card ch.1 serial interface data	25	20	15
	IC1_DATA_1	input/output pin	66	56	46
	UDM0	USB device/host D – pin	103	88	68
USB	UDP0	USB device/host D + pin	104	89	69
	UHCONX0	USB external pull-up control pin	102	87	67



Pin Function	Pin Name	Function Description	LQFP-120	Pin No. LQFP-100	LQFP-80
	DTTI0X_0	Input signal of waveform generator	23	18	13
	DTTI0X_1	controlling RTO00 to RTO05 outputs of	79	69	-
	DTTI0X_2	Multi-function Timer 0.	115	95	75
	FRCK0_0		18	13	-
-	FRCK0_1	16-bit free-run timer ch.0 external clock	80	70	-
-	FRCK0_2		63	53	43
	IC00_0		22	17	-
	IC00_1		75	65	55
	IC00_2		64	54	44
	IC01_0		21	16	-
	IC01_1	40 bit input contum input pin of	76	66	56
	IC01_2	 16-bit input capture input pin of Multi-function 	65	55	45
	IC02_0	timer 0. ICxx describes channel number.	20	15	-
	IC02_1	- ICXX describes channel number.	77	67	57
F	IC02_2		66	56	46
	IC03_0		19	14	-
	IC03_1		78	68	-
	IC03_2		67	57	47
Multi-function	RTO00_0 (PPG00_0)	Waveform generator output pin of Multi-function timer 0.	24	19	14
Timer 0	RTO00_1 (PPG00_1)	This pin operates as PPG00 when it is used in PPG0 output mode.	86	71	58
	RTO01_0 (PPG00_0)	Waveform generator output pin of Multi-function timer 0.	25	20	15
	RTO01_1 (PPG00_1)	This pin operates as PPG00 when it is used in PPG0 output mode.	85	-	-
	RTO02_0 (PPG02_0)	Waveform generator output pin of Multi-function timer 0.	26	21	16
_	RTO02_1 (PPG02_1)	This pin operates as PPG02 when it is used in PPG0 output mode.	84	-	-
	RTO03_0 (PPG02_0)	Waveform generator output pin of Multi-function timer 0.	27	22	17
_	RTO03_1 (PPG02_1)	This pin operates as PPG02 when it is used in PPG0 output mode.	83	-	-
_	RTO04_0 (PPG04_0)	Waveform generator output pin of Multi-function timer 0.	28	23	18
-	RTO04_1 (PPG04_1)	This pin operates as PPG04 when it is used in PPG0 output mode.	82	-	-
	RTO05_0 (PPG04_0)	Waveform generator output pin of Multi-function timer 0.	29	24	19
	RTO05_1 (PPG04_1)	This pin operates as PPG04 when it is used in PPG0 output mode.	81	-	-
	IGTRG0_0	PPG IGBT mode external trigger input pin	48	43	33
	IGTRG0_1	- · · · · · · · · · · · · · · · · · · ·	116	96	76



Pin Function	Pin Name	Function Description	LQFP-120	Pin No. LQFP-100	LQFP-80
	RTCCO_0		107	92	72
F	RTCCO_1	0.5-seconds pulse output pin of Real-time	65	55	45
Real-time	RTCCO_2		24	19	14
Clock	SUBOUT_0		107	92	72
-	 SUBOUT_1	Sub clock output pin	65	55	45
-	SUBOUT_2	-	24	19	14
HDMI-CEC/	CEC0_0	HDMI-CEC/Remote Control Reception ch.0	49	44	34
Remote	CEC0_1	input/output pin	102	87	67
Control	CEC1_0	HDMI-CEC/Remote Control Reception ch.1	116	96	76
Reception	CEC1_1	input/output pin	8	8	8
	WKUP0		107	92	72
	WKUP1		63	53	43
	WKUP2		88	73	60
	WKUP3		116	96	76
Low-	WKUP4		14	9	9
Power	WKUP5	Doop standby mode return signal input pin	102	87	67
Consumption	WKUP6	Deep standby mode return signal input pin	50	45	35
Mode	WKUP7		48	43	33
_	WKUP8		28	23	18
-	WKUP9		8	8	8
-	WKUP10	-	97	82	-
-	WKUP11	-	20	15	-
	LVDI	Input pin to monitor the external voltage.	37	32	22
VBAT	VWAKEUP	The return signal input pin from a	45	40	30
	VREGCTL	hibernation state On-board regulator control pin	44	39	29
		External Reset Input pin.			
Reset	INITX	A reset is valid when INITX="L".	41	36	26
Mode -	MD0	Mode 0 pin. During normal operation, input MD0="L". During serial programming to Flash memory, input MD0="H".	57	47	37
	MD1	Mode 1 pin. During normal operation, input is not needed. During serial programming to Flash memory, MD1 = "L" must be input.	56	46	36
			1	1	1
			31	26	-
Power	VCC	Power supply pin	40	35	25
			61	51	41
			91	76	-
VBAT Power	VBAT	VBAT power supply pin Backup power supply (battery etc.) and system power supply	46	41	31

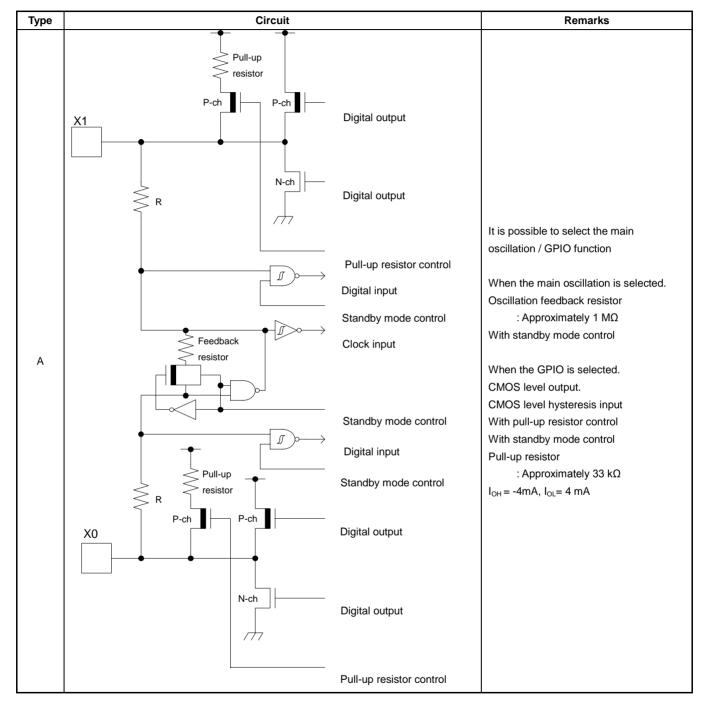


Pin Function	Pin Name	Function Description		Pin No.	
FIIIT direction	Fininame	I directori Description	LQFP-120	LQFP-100	LQFP-80
			30	25	20
			39	34	24
GND	VSS	GND pin	60	50	40
			90	75	-
			120	100	80
	X0	Main clock (oscillation) input pin	58	48	38
	X0A	Sub clock (oscillation) input pin	42	37	27
	X1	Main clock (oscillation) I/O pin	59	49	39
Clock	X1A	Sub clock (oscillation) I/O pin	43	38	28
	CROUT_0	Built-in high-speed CR oscillation clock output port	89	74	-
	CROUT_1	Built-in high-speed CR oscillation clock output port	107	92	72
Analog	AVCC	A/D converter analog power supply pin	70	60	50
Power	AVRH	A/D converter analog reference voltage input pin	73	63	53
Analog GND	AVSS	A/D converter analog reference voltage input pin	71	61	51
C pin	С	Power supply stabilization capacitance pin	38	33	23

*: PE0 is an open drain pin, cannot output high.



5. I/O Circuit Type







Туре	Circuit	Remarks
J	Mode input	CMOS level hysteresis input
к	GPIO Digital output GPIO Digital input/output direction GPIO Digital input GPIO Digital input circuit control UDP output UDPO/POC UDP input Differential input UDPO/POC UDP input UDP input UDPO/POC UDP input UDP input UDM output UDM output GPIO Digital input/output direction GPIO Digital input/output direction GPIO Digital input/output direction GPIO Digital input/output direction GPIO Digital input/output direction	It is possible to select the USB I/O / GPIO function. When the USB I/O is selected. • Full-speed, Low-speed control When the GPIO is selected. • CMOS level output • CMOS level hysteresis input • With standby mode control



6. Handling Precautions

Any semiconductor devices have inherently a certain rate of failure. The possibility of failure is greatly affected by the conditions in which they are used (circuit conditions, environmental conditions, etc.). This page describes precautions that must be observed to minimize the chance of failure and to obtain higher reliability from your Spansion semiconductor devices.

6.1 Precautions for Product Design

This section describes precautions when designing electronic equipment using semiconductor devices.

Absolute Maximum Ratings

Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of certain established limits, called absolute maximum ratings. Do not exceed these ratings.

Recommended Operating Conditions

Recommended operating conditions are normal operating ranges for the semiconductor device. All the device's electrical characteristics are warranted when operated within these ranges.

Always use semiconductor devices within the recommended operating conditions. Operation outside these ranges may adversely affect reliability and could result in device failure.

No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their sales representative beforehand.

Processing and Protection of Pins

These precautions must be followed when handling the pins which connect semiconductor devices to power supply and input/output functions.

(1) Preventing Over-Voltage and Over-Current Conditions

Exposure to voltage or current levels in excess of maximum ratings at any pin is likely to cause deterioration within the device, and in extreme cases leads to permanent damage of the device. Try to prevent such overvoltage or over-current conditions at the design stage.

(2) Protection of Output Pins

Shorting of output pins to supply pins or other output pins, or connection to large capacitance can cause large current flows. Such conditions if present for extended periods of time can damage the device.

Therefore, avoid this type of connection.

(3) Handling of Unused Input Pins

Unconnected input pins with very high impedance levels can adversely affect stability of operation. Such pins should be connected through an appropriate resistance to a power supply pin or ground pin.



Notes on Power-on

Turn power on/off in the following order or at the same time.

 $\begin{array}{ll} \mbox{Turning on}: & \mbox{VBAT} \rightarrow \mbox{VCC} \\ & \mbox{VCC} \rightarrow \mbox{AVCC} \rightarrow \mbox{AVRH} \\ \mbox{Turning off}: & \mbox{VCC} \rightarrow \mbox{VBAT} \\ & \mbox{AVRH} \rightarrow \mbox{AVCC} \rightarrow \mbox{VCC} \\ \end{array}$

Serial Communication

There is a possibility to receive wrong data due to the noise or other causes on the serial communication.

Therefore, design a printed circuit board so as to avoid noise.

Consider the case of receiving wrong data due to noise; perform error detection such as by applying a checksum of data at the end. If an error is detected, retransmit the data.

Differences in Features Among the Products with Different Memory Sizes and Between Flash Memory Products and MASK Products

The electric characteristics including power consumption, ESD, latch-up, noise characteristics, and oscillation characteristics among the products with different memory sizes and between Flash memory products and MASK products are different because chip layout and memory structures are different.

If you are switching to use a different product of the same series, please make sure to evaluate the electric characteristics.

Pull-Up Function of 5 V Tolerant I/O

Please do not input the signal more than VCC voltage at the time of Pull-Up function use of 5 V tolerant I/O.

Handling when Using Debug Pins

When debug pins (SWDIO/SWCLK) are set to GPIO or other peripheral functions, set them as output only; do not set them as input.



9. Memory Map

Memory Map (1)

0xFFFF_FFFF Reserved Reserved 0xF600_8000 OP(single cycle IO) 0x4006_2000 0x4006_2000 0xF000_1000 MTB_DVTF 0x4006_2000 0x4006_2000 0xF000_0000 MTB_DVTF 0x4005_1000 DSTC 0xF000_0000 MTB_DVTF 0x4005_2000 Reserved 0xF000_0000 MTB/SFR/h 0x4003_CR00 Reserved 0x4003_CR00 Reserved 0x4003_CR00 Reserved 0x4003_CR00 Reserved 0x4003_CR00 Reserved 0x4003_C000 Reserved 0x4003_CR00 Reserved 0x4003_0000 Reserved 0x4003_CR00 Reserved <			(0x41FF_FFFF	
OxFFF_FF_FFF Reserved 0x4000_2000 OP(single cycle IC) 0xF800_2000 OP(single cycle IC) 0x4006_2000 DSTC 0xF000_1000 Reserved 0x4006_1000 DSTC 0xF000_0000 MTB_DWT 0x4006_0000 Reserved 0xF000_0000 MTB_SFR} 0x4003_000 USB ch.0 0xF000_0000 Peripherals 0x4003_C800 FS_Clock Generator 0x4003_000 Reserved 0x4003_C100 Low Speed CR Prescaler 0x4000_0000 Reserved 0x4003_000 Watch Courter 0x4000_0000 Peripherals 0x4003_000 RCC 0x4000_0000 Peripherals 0x4003_000 RCC 0x4000_0000 Reserved 0x4000_000 Reserved 0x4000_0000 Reserved 0x4000_000					
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0x4002_1000 Reserved Flash 0x4002_0000 MFT unit0 0x0000_0000 MFT unit0 Reserved 0x4001_6000 0x4001_5000 Dual Timer 0x4001_3000 Reserved 0x4001_2000 0x4001_2000 SW WDT 0x4001_1000 0x4001_1000 HW WDT 0x4001_0000 See "Memory map (2)" for Image: Clock/Reset Image: Clock/Reset	0,0008 0000	Reserved		0x4002_4000	PPG
Flash 0x4002_0000 MFT unit0 0x0000_0000 Flash Reserved 0x4001_5000 Dual Timer 0x4001_3000 Reserved 0x4001_2000 SW WDT 0x4001_1000 HW WDT 0x4001_0000 Clock/Reset	0.0000_0000			0x4002 1000	Reserved
0x0000_0000 0x0000_0000 0x0000_0000 0x4001_5000 0x4001_3000 0x4001_2000 0x4001_2000 0x4001_2000 SW WDT 0x4001_1000 HW WDT 0x4001_0000 Clock/Reset See "Memory map (2)" for					MFT unit0
0x0000_0000 0x0000_0000 0x0000_0000 0x4001_5000 0x4001_3000 0x4001_2000 0x4001_2000 0x4001_1000 HW WDT 0x4001_0000 Clock/Reset 0x4001_0000 Clock/Reset					
0x0000_0000 0x4001_5000 0x4001_3000 0x4001_2000 0x4001_2000 0x4001_1000 HW WDT 0x4001_1000 HW WDT 0x4001_0000 Clock/Reset		Flash	ļ	0	Reserved
0x0000_0000 0x4001_3000 0x4001_2000 0x4001_2000 0x4001_1000 0x4001_0000 See "Memory map (2)" for					Dual Timer
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See "Memory map (2)" for					Clock/Reset
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Ithe memory size details and the second s				0	Reserved
0x4000_1000 0x4000_0000 Flash VF	,		Ì		Elech I/E



11.2 Recommended Operating Conditions

Parameter	Symbol	Conditions	Value		Unit	Remarks
Farameter			Min	Max	Unit	Remarks
Rower oursely voltage	V	-	1.65 * ³	3.6	V	
Power supply voltage	V _{cc}		3.0	3.6	V	*1
Sub Oscillation frequency	Fin	-	-	-	kHz	Typical is 32.768 kHz
Analog power supply voltage	AV _{CC}	-	1.65	3.6	V	AV _{CC} =V _{CC}
Analog reference voltage	AVRH	-	2.7	AV _{CC}	V	AV _{CC} ≥ 2.7 V
			AV _{CC}	AV _{CC}	V	$AV_{CC} < 2.7 V$
	AVRL	-	AV _{SS}	AV _{SS}	V	
Smoothing capacitor	Cs	-	1	10	μF	For regulator*2
Operating temperature	T _A	-	- 40	+ 105	°C	

*1: When P0C/UDP0 and P0B/UDM0 pins are used as USB (UDP0, UDM0).

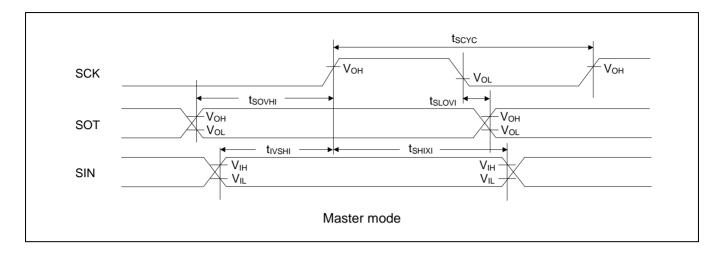
*2: See "C Pin" in "7. Handling Devices" for the connection of the smoothing capacitor.

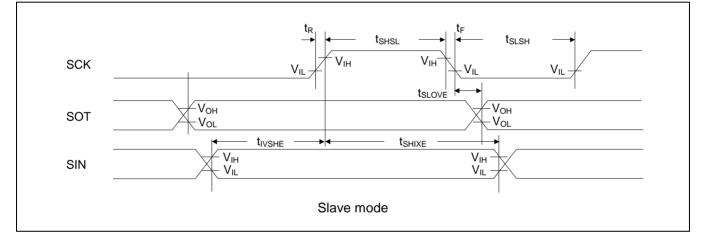
*3: In between less than the minimum power supply voltage reset / interrupt detection voltage or more, instruction execution and low voltage detection function by built-in High-speed CR (including Main PLL is used) or built-in Low-speed CR is possible to operate only.

<WARNING>

- 1. The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.
- 2. Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure.
- 3. No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet.
- 4. Users considering application outside the listed conditions are advised to contact their representatives beforehand.









When Using CSIO/SPI Chip Select (SCINV=1, CSLVL=1)

(V_{CC}=AV_{CC}=1.65 V to 3.6 V, V_{SS}=AV_{SS}=0 V, T_A=- 40°C to +105°C)

Parameter	Symbol	Conditions	V_{CC} < 2.7 V		$V_{CC} \ge 2.7 V$		Unit
	Symbol		Min	Max	Min	Max	Unit
SCS↓→SCK↑ setup time	t _{CSSI}		(*1)-50	(*1)+0	(*1)-50	(*1)+0	ns
SCK↓→SCS↑ hold time	t _{сsнi}	Master mode	(*2)+0	(*2)+50	(*2)+0	(*2)+50	ns
SCS deselect time	t _{CSDI}		(*3)-50	(*3)+50	(*3)-50	(*3)+50	ns
SCS↓→SCK↑ setup time	t _{CSSE}		3t _{CYCP} +30	-	3t _{CYCP} +30	-	ns
SCK↓→SCS↑ hold time	t _{CSHE}		0	-	0	-	ns
SCS deselect time	t _{CSDE}	Slave mode	3t _{CYCP} +30	-	3t _{CYCP} +30	-	ns
SCS↓→SOT delay time	t _{DSE}	1	-	55	-	43	ns
SCS↑→SOT delay time	t _{DEE}	1	0	-	0	-	ns

*1: CSSU bit value × serial chip select timing operating clock cycle.

*2: CSHD bit value × serial chip select timing operating clock cycle.

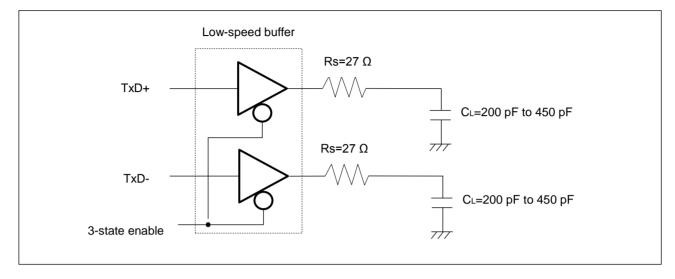
*3: CSDS bit value x serial chip select timing operating clock cycle. Irrespective of CSDS bit setting, 5t_{CYCP} or more are required for the period the time when the serial chip select pin becomes inactive to the time when the serial chip select pin becomes active again.

Notes:

- t_{CYCP} indicates the APB bus clock cycle time.
 For information about the APB bus number which Multi-function Serial is connected to, see "8. Block Diagram ".
- For information about CSSU, CSHD, CSDS, serial chip select timing operating clock, see "FM0+ Family Peripheral Manual".
- These characteristics only guarantee the same relocate port number.
 For example, the combination of SCKx_0 and SCSIx_1 is not guaranteed.
- When the external load capacitance $C_L=30$ pF.



Low-Speed Load (Compliance Load)





11.8 Flash Memory Write/Erase Characteristics

(V_{CC}=1.65 V to 3.6 V, T_A=- 40°C to +105°C)

Parameter		Value			Unit	Remarks		
		Min	Typ*	Max*	Unit	Remarks		
	Large sector	-	1.1	2.7		The sector erase time includes the time of		
Sector erase time	Small sector	-	0.3	0.9	s	writing prior to internal erase.		
Halfword (16-bit) write time		-	30	528	μs	The halfword (16-bit) write time excludes the system-level overhead.		
Chip erase time		-	11.2	28.8	s	The chip erase time includes the time of writing prior to internal erase.		

*: The typical value is immediately after shipment, the maximum value is guarantee value under 10,000 cycle of erase/write.

Write/Erase Cycle and Data Hold Time (Target Value)

Write/Erase Cycle	Data Hold Time (Year)	Remarks		
1,000	20*			
10,000	10*			

*: At average + 85°C





11.9 Return Time from Low-Power Consumption Mode

11.9.1 Return Factor: Interrupt/WKUP

The return time from Low-Power consumption mode is indicated as follows. It is from receiving the return factor to starting the program operation.

Return Count Time

(V_{CC}=1.65 V to 3.6 V, T_A=-40°C to +105°C)

Parameter	Symphol	Value			Remarks
	Symbol	Тур	Max	Unit	Remarks
Sleep mode		6*HCLK	7*HCLK	μs	
High-speed CR Timer mode, Main Timer mode, PLL Timer mode		12*HCLK	13*HCLK	μs	
Low-speed CR Timer mode		20+12*HCLK	42+13*HCLK	μs	
Sub Timer mode	t _{ICNT}	20+12*HCLK	42+13*HCLK	μs	
RTC mode, Stop mode		38 ^(*3) 38+t _{OSCWT} ^(*2*4)	71 71+t _{OSCWT} ^(*2*4)	μs	The count time is different in different clock mode
Deep RTC mode, Deep Stop mode		45	80	μs	

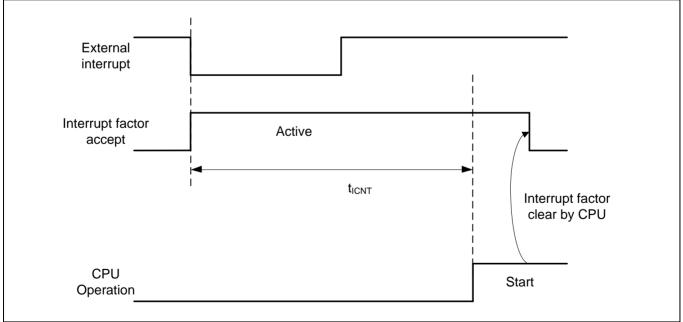
*1: The maximum value depends on the condition of environment.

*2: toscwr: Oscillator stabilization time.

*3: It is for HCR mode.

*4: For clock mode except HCR mode.

Operation Example of Return from Low-Power Consumption Mode (by External Interrupt*)



*: External interrupt is set to detecting fall edge.