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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	Obsolete
Core Processor	FR81S
Core Size	32-Bit Single-Core
Speed	80MHz
Connectivity	CANbus, CSIO, I ² C, LINbus, SPI, UART/USART
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	44
Program Memory Size	320KB (320K x 8)
Program Memory Type	FLASH
EEPROM Size	64K x 8
RAM Size	56K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 26x12b; D/A 1x8b
Oscillator Type	External
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	64-LQFP
Supplier Device Package	64-LQFP (10x10)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/mb91f522bsbpmc1-gte1

Pin no.						Pin Name	Polarity	I/O circuit types*8	Function*9
64	80	100	120	144	176				
19 *1	24 *1	29 *1	35 *1	41	51	P057	-	G	General-purpose I/O port
						RDY *2, *3, *4, *5	-		External bus/Ready input (0)
						SCK10_1	-		Multi-function serial ch.10 clock I/O (1)
						AN42	-		ADC analog 42 input
						ICU8_0	-		Input capture ch.8 input (0)
						TRG0_2	-		PPG trigger 0 input (2)
						PPG1_1	-		PPG ch.1 output (1)
						ICU1_1	-		Input capture ch.1 input (1)
						TIN6_1	-		Reload timer ch.6 event input (1)
-	-	-	-	44	54	P142	-	F	General-purpose I/O port
						SCK10_0 / SCL10	-		Multi-function serial ch.10 clock I/O (0)/ I ² C bus serial clock I/O
						PPG38_0	-		PPG ch.38 output (0)
						TIN7_1	-		Reload timer ch.7 event input (1)
-	-	-	-	45	55	P143	-	F	General-purpose I/O port
						SOT10_0 / SDA10	-		Multi-function serial ch.10 serial data output (0)/ I ² C bus serial data I/O
						PPG39_0	-		PPG ch.39 output (0)
						TOT4_1	-		Reload timer ch.4 output (1)
-	-	-	-	-	56	P182	-	A	General-purpose I/O port
						PPG42_0	-		PPG ch.42 output (0)
-	-	32	38	46	57	P060	-	A	General-purpose I/O port
						SCS10_0	-		Serial chip select 10 I/O (0)
						PPG2_1	-		PPG ch.2 output (1)
						ICU2_1	-		Input capture ch.2 input (1)
						TOT5_1	-		Reload timer ch.5 output (1)
						INT13_0	-		INT13 External interrupt input (0)
22	27	33	39	47	58	P061	-	B	General-purpose I/O port
						SOT10_1	-		Multi-function serial ch.10 serial data output (1)
						AN41	-		ADC analog 41 input
						ICU6_0	-		Input capture ch.6 input (0)
						PPG3_1	-		PPG ch.3 output (1)
						ICU3_1	-		Input capture ch.3 input (1)
						TOT6_1	-		Reload timer ch.6 output (1)
						INT13_1	-		INT13 External interrupt input (1)

Address	Address offset value / Register name				Block
	+0	+1	+2	+3	
0001F8 _H	TMRLRA6 [R/W] H XXXXXXXX XXXXXXXX		TMR6 [R] H XXXXXXXX XXXXXXXX		Reload Timer 6
0001FC _H	TMRLRB6 [R/W] H XXXXXXXX XXXXXXXX		TMCSR6 [R/W] B, H,W 00000000 0-000000		
000200 _H to 000238 _H	—	—	—	—	Reserved
00023C _H	DACR0 [R/W] B,H,W -----0	DADR0 [R/W] B,H,W XXXXXXXX	DACR1 [R/W] B,H,W -----0	DADR1 [R/W] B,H,W XXXXXXXX	DA Converter
000240 _H	CPCLR3 [R/W] W 11111111 11111111 11111111 11111111				Free-run Timer 3 32-bit FRT
000244 _H	TCDT3 [R/W] W 00000000 00000000 00000000 00000000				
000248 _H	TCCSH3 [R/W] B,H,W 0-----00	TCCSL3 [R/W] B,H,W -1-00000	—	—	
00024C _H	CPCLR4 [R/W] W 11111111 11111111 11111111 11111111				Free-run Timer 4 32-bit FRT
000250 _H	TCDT4 [R/W] W 00000000 00000000 00000000 00000000				
000254 _H	TCCSH4 [R/W] B,H,W 0-----00	TCCSL4 [R/W] B,H,W -1-00000	—	—	
000258 _H to 0002C0 _H	—	—	—	—	Reserved
0002C4 _H to 0002FC _H	—	—	—	—	Reserved
000300 _H to 00030C _H	—	—	—	—	Reserved
000310 _H	—	—	MPUCR [R/W] H 000000-0 ----0100		MPU [S] (Only CPU core can access this area)
000314 _H	—	—	—	—	
000318 _H	—				
00031C _H	—	—	—		
000320 _H	DPVAR [R] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000324 _H	—	—	DPVSR [R/W] H ----- 00000--0		

Address	Address offset value / Register name				Block
	+0	+1	+2	+3	
000C4C _H	DDAR4 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				DMA Controller [S]
000C50 _H	DCCR5 [R/W] W 0----000 --00--00 00000000 0-000000				
000C54 _H	DCSR5 [R/W] H 0----- ----000		DTCR5 [R/W] H 00000000 00000000		
000C58 _H	DSAR5 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C5C _H	DDAR5 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C60 _H	DCCR6 [R/W] W 0----000 --00--00 00000000 0-000000				
000C64 _H	DCSR6 [R/W] H 0----- ----000		DTCR6 [R/W] H 00000000 00000000		
000C68 _H	DSAR6 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C6C _H	DDAR6 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C70 _H	DCCR7 [R/W] W 0----000 --00--00 00000000 0-000000				
000C74 _H	DCSR7 [R/W] H 0----- ----000		DTCR7 [R/W] H 00000000 00000000		
000C78 _H	DSAR7 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C7C _H	DDAR7 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C80 _H	DCCR8 [R/W] W 0----000 --00--00 00000000 0-000000				
000C84 _H	DCSR8 [R/W] H 0----- ----000		DTCR8 [R/W] H 00000000 00000000		
000C88 _H	DSAR8 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C8C _H	DDAR8 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C90 _H	DCCR9 [R/W] W 0----000 --00--00 00000000 0-000000				
000C94 _H	DCSR9 [R/W] H 0----- ----000		DTCR9 [R/W] H 00000000 00000000		
000C98 _H	DSAR9 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
000C9C _H	DDAR9 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				

Address	Address offset value / Register name				Block
	+0	+1	+2	+3	
000E3C _H	—	—	—	—	Reserved
000E40 _H	PDDR00 [R] B,H,W XXXXXXXX	PDDR01 [R] B,H,W XXXXXXXX	PDDR02 [R] B,H,W XXXXXXXX	PDDR03 [R] B,H,W XXXXXXXX	Port Direct Read Register
000E44 _H	PDDR04 [R] B,H,W XXXXXXXX	PDDR05 [R] B,H,W XXXXXXXX	PDDR06 [R] B,H,W XXXXXXXX	PDDR07 [R] B,H,W XXXXXXXX	
000E48 _H	PDDR08 [R] B,H,W XXXXXXXX	PDDR09 [R] B,H,W XXXXXXXX	PDDR10 [R] B,H,W XXXXXXXX	PDDR11 [R] B,H,W XXXXXXXX	
000E4C _H	PDDR12 [R] B,H,W XXXXXXXX	PDDR13 [R] B,H,W -XXXXXXX	PDDR14 [R] B,H,W ---XXX--	PDDR15 [R] B,H,W --XXXXXX	
000E50 _H	—	—	—	—	
000E54 _H	—	—	—	—	
000E58 _H	PDDR16 [R] B,H,W XXXXXXXX	PDDR17 [R] B,H,W XXXXXXXX	PDDR18 [R] B,H,W XXXXXXXX	PDDR19 [R] B,H,W XXXXXXXX	
000E5C _H	—	—	—	—	Reserved
000E60 _H	EPFR00 [R/W] B,H,W 00000000	EPFR01 [R/W] B,H,W -0-0-000	EPFR02 [R/W] B,H,W ---0000	EPFR03 [R/W] B,H,W --000-0	Extended Port Function Register
000E64 _H	EPFR04 [R/W] B,H,W ---00-0	EPFR05 [R/W] B,H,W ---0000	EPFR06 [R/W] B,H,W ---000-	EPFR07 [R/W] B,H,W --00000	
000E68 _H	EPFR08 [R/W] B,H,W ---00000	EPFR09 [R/W] B,H,W ----00-	EPFR10 [R/W] B,H,W ---0000	EPFR11 [R/W] B,H,W ----0000	
000E6C _H	EPFR12 [R/W] B,H,W ----0000	EPFR13 [R/W] B,H,W -----00	EPFR14 [R/W] B,H,W -----00	EPFR15 [R/W] B,H,W -----000	
000E70 _H	—	—	—	—	
000E74 _H	—	—	—	—	
000E78 _H	—	—	EPFR26 [R/W] B,H,W 00000000	EPFR27 [R/W] B,H,W ---0----	
000E7C _H	EPFR28 [R/W] B,H,W --000-0-	EPFR29 [R/W] B,H,W 00000000	—	—	
000E80 _H	—	EPFR33 [R/W] B,H,W -----00-	EPFR34 [R/W] B,H,W -----00-	EPFR35 [R/W] B,H,W ---00000	
000E84 _H	EPFR36 [R/W] B,H,W ----000-	—	—	—	
000E88 _H	—	—	EPFR42 [R/W] B,H,W -----00	EPFR43 [R/W] B,H,W 0--0000-	
000E8C _H	EPFR44 [R/W] B,H,W -00---0-	EPFR45 [R/W] B,H,W -0000000	—	—	
000E90 _H	—	—	—	—	

Address	Address offset value / Register name				Block
	+0	+1	+2	+3	
001AD0 _H	PCN6 [R/W] B,H,W 00000000 000000-0		PCSR6 [W] H,W XXXXXXXXXX XXXXXXXXX		PPG6
001AD4 _H	PDUT6 [W] H,W XXXXXXXXXX XXXXXXXXX		PTMR6 [R] H,W 11111111 11111111		
001AD8 _H	PCN206 [R/W] B,H,W --000000 ----110		PSDR6 [R/W] H,W 00000000 00000000		
001ADC _H	PTPC6 [R/W] H,W 00000000 00000000		—	—	
001AE0 _H	PCN7 [R/W] B,H,W 00000000 000000-0		PCSR7 [W] H,W XXXXXXXXXX XXXXXXXXX		PPG7
001AE4 _H	PDUT7 [W] H,W XXXXXXXXXX XXXXXXXXX		PTMR7 [R] H,W 11111111 11111111		
001AE8 _H	PCN207 [R/W] B,H,W --000000 ----110		PSDR7 [R/W] H,W 00000000 00000000		
001AEC _H	PTPC7 [R/W] H,W 00000000 00000000		—	—	
001AF0 _H	PCN8 [R/W] B,H,W 00000000 000000-0		PCSR8 [W] H,W XXXXXXXXXX XXXXXXXXX		PPG8
001AF4 _H	PDUT8 [W] H,W XXXXXXXXXX XXXXXXXXX		PTMR8 [R] H,W 11111111 11111111		
001AF8 _H	PCN208 [R/W] B,H,W --000000 ----110		PSDR8 [R/W] H,W 00000000 00000000		
001AFC _H	PTPC8 [R/W] H,W 00000000 00000000		—	—	
001B00 _H	PCN9 [R/W] B,H,W 00000000 000000-0		PCSR9 [W] H,W XXXXXXXXXX XXXXXXXXX		PPG9
001B04 _H	PDUT9 [W] H,W XXXXXXXXXX XXXXXXXXX		PTMR9 [R] H,W 11111111 11111111		
001B08 _H	PCN209 [R/W] B,H,W --000000 ----110		PSDR9 [R/W] H,W 00000000 00000000		
001B0C _H	PTPC9 [R/W] H,W 00000000 00000000		—	—	
001B10 _H	PCN10 [R/W] B,H,W 00000000 000000-0		PCSR10 [W] H,W XXXXXXXXXX XXXXXXXXX		PPG10
001B14 _H	PDUT10 [W] H,W XXXXXXXXXX XXXXXXXXX		PTMR10 [R] H,W 11111111 11111111		
001B18 _H	PCN210 [R/W] B,H,W --000000 ----110		PSDR10 [R/W] H,W 00000000 00000000		PPG10
001B1C _H	PTPC10 [R/W] H,W 00000000 00000000		—	—	
001B20 _H	PCN11 [R/W] B,H,W 00000000 000000-0		PCSR11 [W] H,W XXXXXXXXXX XXXXXXXXX		PPG11

Address	Address offset value / Register name				Block
	+0	+1	+2	+3	
003030 _H	TEAR0A[R] B,H,W 000-----000 00000000				RAM/ diagnosis Backup RAM
003034 _H	TEAR1A[R] B,H,W 000-----000 00000000				
003038 _H	TEAR2A[R] B,H,W 000-----000 00000000				
00303C _H	TAEARA[R/W] B,H,W -----111 11111111		TASARA[R/W] B,H,W -----000 00000000		
003040 _H	TFECRA [R/W] B,H,W ---0000	TICRA [R/W] B,H,W ---0000	TTCRA [R/W] B,H,W -----00 00001100		RAM/ diagnosis Backup RAM
003044 _H	TSRCRA [R/W] B,H,W 0-----	—	—	TKCCRA [R/W] B,H,W 00---00	
003048 _H to 0030FC _H	—				Reserved
003100 _H	BUSDIGSR0[R/W] H,W 00000000 0-----00		BUSDIGSR1[R/W] H,W 00000000 0-----00		BUS diagnosis
003104 _H	BUSDIGSR2[R/W] H,W 00000000 0-----00		BUSTSTR0[R/W] H,W 00--0000 00000000		
003108 _H	BUSADR0 [R] W 00000000 00000000 00000000 00000000				
00310C _H	BUSADR1 [R] W 00000000 00000000 00000000 00000000				
003110 _H	BUSADR2 [R] W 00000000 00000000 00000000 00000000				
003114 _H	—	—	BUSDIGSR3[R/W] H,W 00000000 0-----00		
003118 _H	BUSDIGSR4[R/W] H,W 00000000 0-----00		BUSTSTR1[R/W] H,W 00--000- 00000000		
00311C _H	—	—	—	—	
003120 _H	BUSADR3 [R] W 00000000 00000000 00000000 00000000				
003124 _H	BUSADR4 [R] W 00000000 00000000 00000000 00000000				
003128 _H to 003FFC _H	—				Reserved
004000 _H to 005FFC _H	Backup-RAM				Backup RAM area

10. Interrupt Vector Table

This list shows the assignments of interrupt factors and interrupt vectors/interrupt control registers.

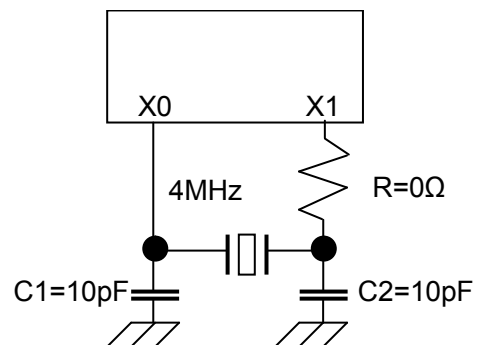
Interrupt vector
64 pins

Interrupt factor	Interrupt number		Interrupt level	Offset	Default address for TBR	RN
	Decimal	Hexa decimal				
Reset	0	0	-	3FC _H	000FFFFC _H	-
System reserved	1	1	-	3F8 _H	000FFFF8 _H	-
System reserved	2	2	-	3F4 _H	000FFFF4 _H	-
System reserved	3	3	-	3F0 _H	000FFFF0 _H	-
System reserved	4	4	-	3EC _H	000FFFE _C	-
FPU exception	5	5	-	3E8 _H	000FFFE8 _H	-
Exception of instruction access protection violation	6	6	-	3E4 _H	000FFFE4 _H	-
Exception of data access protection violation	7	7	-	3E0 _H	000FFFE0 _H	-
Data access error interrupt	8	8	-	3DC _H	000FFFD _C	-
INTE instruction	9	9	-	3D8 _H	000FFFD8 _H	-
Instruction break	10	0A	-	3D4 _H	000FFFD4 _H	-
System reserved	11	0B	-	3D0 _H	000FFFD0 _H	-
System reserved	12	0C	-	3CC _H	000FFFC _C	-
System reserved	13	0D	-	3C8 _H	000FFFC8 _H	-
Exception of invalid instruction	14	0E	-	3C4 _H	000FFFC4 _H	-
NMI request	15	0F	15 (F _H) Fixed	3C0 _H	000FFFC0 _H	-
Error generation during internal bus diagnosis						
XBS RAM double-bit error generation						
Backup RAM double-bit error generation						
TPU violation						
External interrupt 0-7	16	10	ICR00	3BC _H	000FFFB _C	0
External interrupt 8-15	17	11	ICR01	3B8 _H	000FFFB8 _H	1* ⁷
External low-voltage detection interrupt						
Reload timer 0/1/4/5	18	12	ICR02	3B4 _H	000FFFB4 _H	2* ²
Reload timer 3/6/7	19	13	ICR03	3B0 _H	000FFFB0 _H	3* ²
Multi-function serial interface ch.0 (reception completed)	20	14	ICR04	3AC _H	000FFFA _C	4* ¹
Multi-function serial interface ch.0 (status)						
Multi-function serial interface ch.0 (transmission completed)	21	15	ICR05	3A8 _H	000FFFA8 _H	5* ¹
-	22	16	ICR06	3A4 _H	000FFFA4 _H	-* ⁶
-	23	17	ICR07	3A0 _H	000FFFA0 _H	-* ⁶
-	24	18	ICR08	39C _H	000FFF9C _H	-* ⁶
-	25	19	ICR09	398 _H	000FFF98 _H	-* ⁶
Multi-function serial interface ch.3 (reception completed)	26	1A	ICR10	394 _H	000FFF94 _H	10* ¹
Multi-function serial interface ch.3 (status)						
Multi-function serial interface ch.3 (transmission completed)	27	1B	ICR11	390 _H	000FFF90 _H	11

Oscillation clock frequency vs. Internal operation clock frequency

		Internal operation clock frequency							
		Main Clock	PLL clock						
			Multiplied by 1	Multiplied by 2	Multiplied by 3	Multiplied by 4	...	Multiplied by 19	Multiplied by 20
Oscillation clock frequency	4MHz	2MHz	4MHz	8MHz	12MHz	16MHz	...	76MHz	80MHz

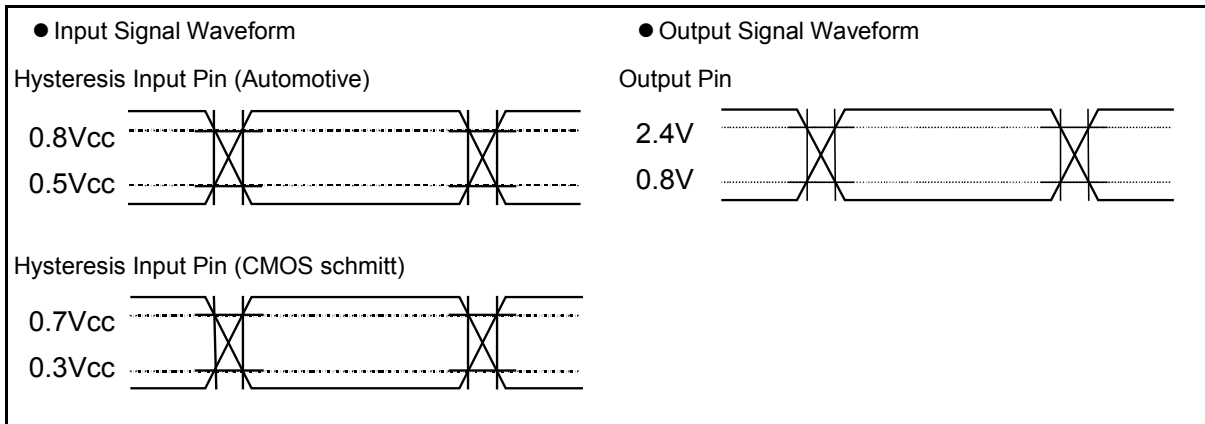
• Example of oscillation circuit



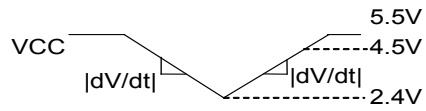
Note: As to the product with its clock supervisor's initial value is "ON", when the oscillator is unable to start within 20ms from the stop state the clock supervisor will detect the oscillation stop. As a result, the CPU moves to the fail safe operation.

Design your print circuit board so that the oscillator can start oscillation within 20ms. Moreover, it is recommended to be designed after the match evaluation of the circuit is requested to the departure pendulum maker when the oscillation circuit is composed.

AC characteristics are specified by the following measurement reference voltage values.



- Maximum ramp rate guaranteed to not generate power-on reset



(4-1-5) Bit setting: SMR:MD2=0, SMR:MD1=1, SMR:MD0=0,

When Serial chip select is used : SCSCR:CSSEN=1,

Serial clock output mark level "H" : SMR,SCSFR:SCINV=0,

Serial chip select Inactive level "H" : SCSCR,SCSFR:CSLVL=1

(T_A: -40°C to +125°C, V_{CC}=AV_{CC}=5.0V±10%/V_{CC}=AV_{CC}=3.3V±0.3V, V_{SS}=AV_{SS}=0.0V)

Parameter	Symbol	Pin name	Conditions	Value		Unit	Remarks
				Min	Max		
SCS↓→SCK↓ setup time	t _{CSSI}	SCK1, SCK2, SCK5 to SCK11 SCS1, SCS2, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11	-	t _{CSSU} -50 *1	t _{CSSU} +0 *1	ns	Internal shift clock mode output pin : C _L =50pF
		SCK3, SCK4 SCS3, SCS40 to SCS43		t _{CSSU} -50 *1	t _{CSSU} +300 *1	ns	
SCK↑→SCS↑ hold time	t _{CSDI}	SCK1, SCK2, SCK5 to SCK11 SCS1, SCS2, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11		t _{CSDH} -10 *2	t _{CSDH} +50 *2	ns	
		SCK3, SCK4 SCS3, SCS40 to SCS43		t _{CSDH} -300 *2	t _{CSDH} +50 *2	ns	
SCS deselect time	t _{CSDI}	SCS1 to SCS3, SCS40 to SCS43, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11		t _{CSDS} -50 *3	t _{CSDS} +50 *3	ns	

Parameter	Symbol	Pin name	Conditions	Value		Unit	Remarks
				Min	Max		
SCS↓→SCK↑ setup time	t_{CSSE}	SCK1 to SCK11 SCS1 to SCS3, SCS40 to SCS43, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11	-	$3t_{CPP}+30$	-	ns	External shift clock mode output pin: $C_L=50pF$
SCK↓→SCS↑ hold time	t_{CSHE}			+0	-	ns	
SCS deselect time	t_{CSDE}	SCS1 to SCS3, SCS40 to SCS43, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11		$3t_{CPP}+30$	-	ns	
SCS↓→SOT delay time	t_{DSE}	SCS1 , SCS2, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11 SOT1 , SOT2, SOT5 to SOT11		-	40	ns	
		SCS3, SCS40 to SCS43 SOT3 , SOT4		-	300	ns	
SCS↑→SOT delay time	t_{DEE}	SCS1 to SCS3, SCS40 to SCS43, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11 SOT1 to SOT11	-	+0	-	ns	External shift clock mode output pin: $C_L=50pF$
SCK↑→SCS↓ clock switch time	t_{SCC}	SCK1 , SCK2, SCK5 to SCK11 SCS1 , SCS2, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11	-	$3t_{CPP}-10$	$3t_{CPP}+50$	ns	Internal shift clock mode Round operation output pin: $C_L=50pF$
		SCK3 , SCK4 SCS3 , SCS40 to SCS43		$3t_{CPP}-300$	$3t_{CPP}+50$	ns	

*1: t_{CSSU} =SCSTR:CSSU7-0×Serial chip select timing operating clock

*2: t_{CSHD} =SCSTR:CSHD7-0×Serial chip select timing operating clock

*3: t_{CSDS} =SCSTR:CSDS15-0×Serial chip select timing operating clock

Regardless of the deselect time setting, once after the serial chip select pin becomes inactive, it will take at least five peripheral bus clock cycles to be active again

Please see the hardware manual for details of above-mentioned *1,*2, and *3

Parameter	Symbol	Pin name	Conditions	Value		Unit	Remarks
				Min	Max		
SCS \uparrow →SCK \downarrow setup time	t_{CSSE}	SCK1 to SCK11 SCS1 to SCS3, SCS40 to SCS43, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11	-	$3t_{CPP}+3$ 0	-	ns	External shift clock mode output pin: $C_L=50pF$
SCK \uparrow →SCS \downarrow hold time	t_{CSHE}			+0	-	ns	
SCS deselect time	t_{CSDE}	SCS1 to SCS3, SCS40 to SCS43, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11		$3t_{CPP}+3$ 0	-	ns	
SCS \uparrow →SOT delay time	t_{DSE}	SCS1, SCS2, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11 SOT1, SOT2, SOT5 to SOT11		-	40	ns	
		SCS3, SCS40 to SCS43 SOT3, SOT4		-	300	ns	
SCS \downarrow →SOT delay time	t_{DEE}	SCS1 to ~SCS3, SCS40 to SCS43, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11 SOT1 to SOT11	-	+0	-	ns	External shift clock mode output pin: $C_L=50pF$
SCK \downarrow →SCS \uparrow clock switch time	t_{SCC}	SCK1, SCK2, SCK5 to SCK11 SCS1, SCS2, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11	-	$3t_{CPP}-10$	$3t_{CPP}+5$ 0	ns	Internal shift clock mode Round operation output pin: $C_L=50pF$
		SCK3, SCK4 SCS3, SCS40 to SCS43		$3t_{CPP}-30$ 0	$3t_{CPP}+5$ 0	ns	

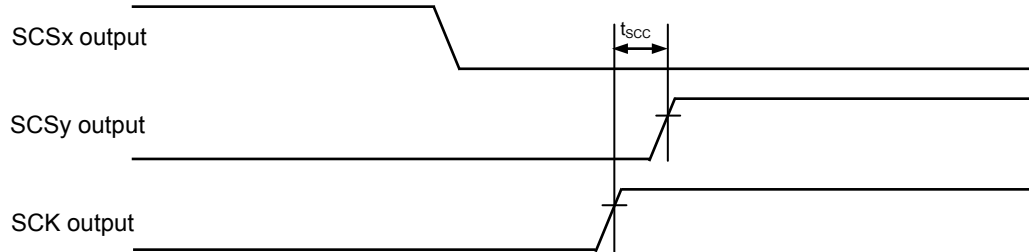
*1: t_{CSSU} = SCSTR:CSSU7-0×Serial chip select timing operating clock

*2: t_{CSHD} = SCSTR:CSHD7-0×Serial chip select timing operating clock

*3: t_{CSDS} = SCSTR:CSDS15-0×Serial chip select timing operating clock

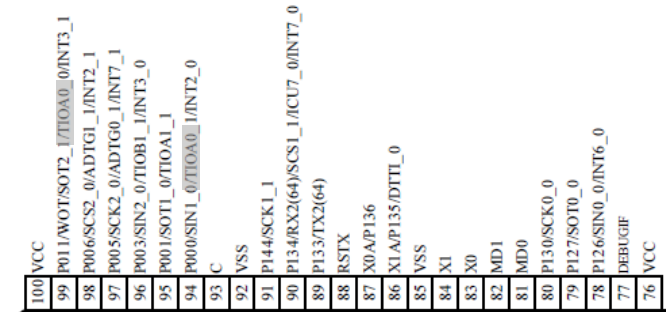
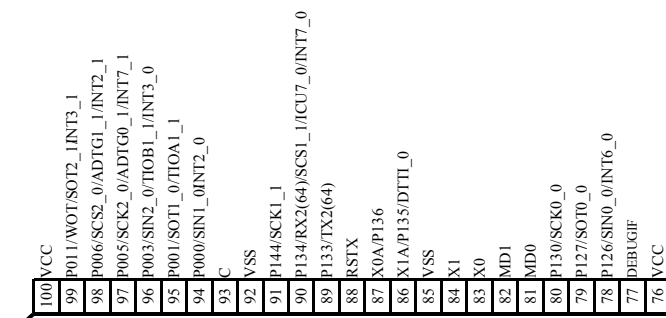
Regardless of the deselect time setting, once after the serial chip select pin becomes inactive, it will take at least five peripheral bus clock cycles to be active again

Please see the hardware manual for details of above-mentioned *1, *2, and *3.



When Serial chip select is used , Serial clock output mark level "L",
Serial chip select Inactive level "L"
Master mode, Example of switching clock by round operation (x,y=0,1,2,3)

Page	Section	Change Results
184	■ELECTRICAL CHARACTERISTICS 5.A/D Converter (1) 12-bit A/D Converter Electrical Characteristics	Added the following description. Parameter : Power supply current $I_{A\text{AVCC}}^{*3}$ *3 : The power supply current described only current value on A/D converter. The total AVcc current value must be calculated the power supply current for A/D converter and D/A converter.
188	■ELECTRICAL CHARACTERISTICS 7.D/A Converter	Added the following description. Parameter : Power supply current *1 *1 : The power supply current described only current value on D/A converter. The total Avcc current value must be calculated the power supply current for D/A converter and A/D converter.
187	■ELECTRICAL CHARACTERISTICS 6.Flash memory	Parameter: Erase cycle *2 /Data retain time Deleted the following description. Remarks : "Temperature at writing/erasing $T_j < +105^{\circ}\text{C}$ "
188	■ELECTRICAL CHARACTERISTICS 7.D/A Converter	Corrected the following description. Parameter : Power supply current Symbol IA Pin name AV _{CC} Symbol IAH Pin name AV _{CC} ↓ Symbol IA Pin name AVCC Symbol IAH Pin name AVCC
190	■EXAMPLE CHARACTERISTICS	Corrected the following description. Watch mode
192	■ORDERING INFORMATION	Corrected the following description. ■ORDERING INFORMATION ↓ ■ORDERING INFORMATION MB91F52xxxB *1 Package ↓ Package *2
198	■ORDERING INFORMATION	Added the following description. *1 : It is only supported for customers who have already adopted it now. We do not recommend adopting new products.
198	■ORDERING INFORMATION	Corrected the following description. For details of the package, see "■ PACKAGE DIMENSIONS". ↓ *2 : For details of the package, see "■ PACKAGE DIMENSIONS".
199 to 205	■ORDERING INFORMATION	Added the following description. ■ORDERING INFORMATION MB91F52xxxC
-	-	Company name and layout design change

Page	Section	Change Results				
15	■Pin Assignment MB91F52xF	<div><div>- Top</div><div></div><div>↓</div><div></div></div>				
15	■Pin Assignment MB91F52xF	The following note added on the bottom left of Figure. * In a single clock product, pin 86 and pin 87 are the general-purpose ports.				
16	■Pin Assignment MB91F52xJ	The following note added on the bottom left of Figure. * In a single clock product, pin 102 and pin 103 are the general-purpose ports.				
17	■Pin Assignment MB91F52xK	The following note added on the bottom left of Figure. * In a single clock product, pin 121 and pin 122 are the general-purpose ports.				
18	■Pin Assignment MB91F52xL	The following note added on the bottom left of Figure. * In a single clock product, pin 149 and pin 150 are the general-purpose ports.				
19 to 35	■PIN Description	<div>A List of "Pin Description" modified.</div> <div><table><tr><td>I/O Circuit types^{*1}</td><td>Function^{*2}</td></tr></table><div>↓</div><table><tr><td>I/O Circuit types^{*8}</td><td>Function^{*9}</td></tr></table></div>	I/O Circuit types ^{*1}	Function ^{*2}	I/O Circuit types ^{*8}	Function ^{*9}
I/O Circuit types ^{*1}	Function ^{*2}					
I/O Circuit types ^{*8}	Function ^{*9}					

Page	Section	Change Results						
22, 23	■PIN Description	(Continued) (Correct)						
		Pin no.						Pin Name
		64	80	100	120	144	176	
		-	-	-	-	-	28	P175
								TRG9_1
								P040
								A10 ^{*2, *3, *4, *5}
		11 ^{*1}	13 ^{*1}	17 ^{*1}	20 ^{*1}	23	29	PPG23_1
								TOT7_0
								AIN1_0
								SIN0_1
								P041
								A11 ^{*2, *3, *4, *5}
		12 ^{*1}	14 ^{*1}	18 ^{*1}	21 ^{*1}	24	30	SIN9_0
								ICU9_1
								BIN1_0
								INT12_0
								P042
								A12 ^{*2, *3, *4, *5}
		13 ^{*1}	15 ^{*1}	19 ^{*1}	22 ^{*1}	25	31	SOT9_0
								AN47
								ICU8_1
								TRG0_1
								ZIN1_0
								P043
		-	-	20 ^{*1}	23 ^{*1}	26	32	A13 ^{*4, *5}
								ICU7_1
								TRG1_1
								P044
								A14 ^{*3, *4, *5}
		-	16 ^{*1}	21 ^{*1}	24 ^{*1}	27	33	SCS9_0
								ICU6_1
								TRG2_1
								P045
								A15 ^{*2, *3, *4, *5}
		14 ^{*1}	17 ^{*1}	22 ^{*1}	25 ^{*1}	28	34	SCK9_0
								AN46
								ICU5_1
								TRG3_1
								TOT1_2
								P046
								A16 ^{*5}
		-	-	-	26 ^{*1}	29	35	ICU4_1
								TRG4_1
		-	-	-	-	-	36	P176
								TRG10_0

Page	Section	Change Results						
34, 35	■PIN Description	(Continued) (Correct)						
		Pin no.						Pin Name
		64	80	100	120	144	176	
		-	-	-	113 ^{*1}	133	161	P002
								D18 ^{*5}
								SCK1_0
								TIOB0_1
		-	76 ^{*1}	96 ^{*1}	114 ^{*1}	134	162	P003
								D19 ^{*3, *4, *5}
								SIN2_0
								TIOB1_1
								INT3_0
		-	-	-	-	135	163	P004
								D20
								SOT2_0
		-	-	-	-	-	164	P164
								PPG32_1
		61 ^{*1}	77 ^{*1}	97 ^{*1}	115 ^{*1}	136 ^{*1}	165 ^{*1}	P005
								D21 ^{*2, *3, *4, *5}
								SCK2_0 ^{*2}
								ADTG0_1
								INT7_1
								RX2(64) ^{*4, *5, *6, *7}
		-	-	-	-	-	166	P165
								PPG33_1
		62 ^{*1}	78 ^{*1}	98 ^{*1}	116 ^{*1}	137 ^{*1}	167 ^{*1}	P006
								D22 ^{*2, *3, *4, *5}
								SCS2_0 ^{*2}
								ADTG1_1
								INT2_1
								TX2(64) ^{*4, *5, *6, *7}
		-	-	-	117 ^{*1}	138	168	P007
								D23 ^{*5}
		-	-	-	-	-	169	P166
								PPG34_1
		-	-	-	118 ^{*1}	139	170	P010
						D24 ^{*5}		
63 ^{*1}	79 ^{*1}	99 ^{*1}	119 ^{*1}	140	171	P011		
						WOT		
						D25 ^{*2, *3, *4, *5}		
						SOT2_1 ^{*2}		
						TIOA0_0 ^{*2, *3, *4}		
						INT3_1		

Revision	ECN	Orig. of Change	Submission Date	Description of Change
				<p>(1) 12-bit A/D Converter Electrical Characteristics:</p> <p>Added the value of "Total error". Total error value Min – Typ – Max ± 12 LSB</p> <p>Corrected the value of "Zero transition voltage". Min AVRL+0.5LSB-20mV Max AVRL+0.5LSB+20mV ↓ Min AVRL-11.5LSB Max AVRL+12.5LSB</p> <p>Corrected the value of "Full-scale transition voltage". Min AVRH-1.5LSB-20mV Max AVRH-1.5LSB+20mV ↓ Min AVRH-13.5LSB Max AVRH+10.5LSB</p> <p>Added the following description. Parameter : Power supply current I_AAVCC*3 *3: The power supply current described only current value on A/D converter. The total AVCC current value must be calculated the power supply current for A/D converter and D/A converter.</p> <p>Electrical Characteristics 7.D/A Converter: Added the following description. Parameter : Power supply current *1 *1: The power supply current described only current value on D/A converter. The total Avcc current value must be calculated the power supply current for D/A converter and A/D converter.</p> <p>Electrical Characteristics 6.Flash memory: Parameter: Erase cycle*2/Data retain time Deleted the following description. Remarks : "Temperature at writing/erasing $T_j < +105^\circ\text{C}$"</p> <p>Electrical Characteristics 7.D/A Converter: Corrected the following description. Parameter : Power supply current Symbol I_A Pin name AV_{CC} Symbol I_{AH} Pin name AV_{CC} ↓ Symbol I_A Pin name AVCC Symbol I_{AH} Pin name AVCC</p> <p>Example Characteristics Corrected the following description. Watch mode</p> <p>Ordering Information Corrected the following description. • ORDERING INFORMATION ↓ • ORDERING INFORMATION MB91F52xxB*1</p>

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