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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, EBI/EMI, I ² C, LINbus, SPI, UART/USART
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	152
Program Memory Size	1.0625MB (1.0625M x 8)
Program Memory Type	FLASH
EEPROM Size	64K x 8
RAM Size	136K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 48x12b; D/A 2x8b
Oscillator Type	External
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	176-LQFP
Supplier Device Package	176-LQFP (24x24)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/mb91f526lscpmc-gsk5e1

Product lineup comparison 120 pins

	MB91F522J	MB91F523J	MB91F524J	MB91F525J	MB91F526J
System Clock	On chip PLL Clock multiple method				
Minimum instruction execution time	12.5ns (80MHz)				
Flash Capacity (Program)	(256+64)KB	(384+64)KB	(512+64)KB	(768+64)KB	(1024+64)KB
Flash Capacity (Data)	64KB				
RAM Capacity	(48+8)KB	(64+8)KB	(96+8)KB	(128+8)KB	
External BUS I/F (22address/16data/4cs)	None				
DMA Transfer	16ch				
16-bit Base Timer	2ch				
Free-run Timer	16bit×3ch, 32bit×3ch				
Input capture	16bit×4ch, 32bit×6ch				
Output Compare	16bit×6ch, 32bit×6ch				
16-bit Reload Timer	8ch				
PPG	16bit×38ch				
Up/down Counter	2ch				
Clock Supervisor	Yes				
External Interrupt	8ch×2units				
A/D converter	12bit×26ch (1unit), 12bit×16ch (1unit)				
D/A converter (8bit)	2ch				
Multi-Function Serial Interface	12ch ^{*1}				
CAN	64msg×2ch/128msg×1ch				
Hardware Watchdog Timer	Yes				
CRC Formation	Yes				
Low-voltage detection reset	Yes				
Flash Security	Yes				
ECC Flash/WorkFlash	Yes				
ECC RAM	Yes				
Memory Protection Function (MPU)	Yes				
Floating point arithmetic (FPU)	Yes				
Real Time Clock (RTC)	Yes				
General-purpose port (#GPIOs)	96 ports				
SSCG	Yes				
Sub clock	Yes				
CR oscillator	Yes				
NMI request function	Yes				
OCD (On Chip Debug)	Yes				
TPU (Timing Protection Unit)	Yes				
Key code register	Yes				
Waveform generator	6ch				
Operation guaranteed temperature (T _A)	-40°C to +125°C				
Power supply	2.7V to 5.5V ^{*2}				
Package	LQM120				

*1: Only channel 3 and channel 4 support the I²C (fast mode/standard mode).

Only channel 5, channel 6, channel 7, channel 8 and channel 11 support the I²C (standard mode).

*2: The initial detection voltage of the external low voltage detection is 2.8V±8% (2.576V to 3.024V). This LVD setting and internal LVD cannot be used to reliably generate a reset before voltage dips below minimum guaranteed operation voltage, as these detection levels are below the minimum guaranteed MCU operation voltage. Below the minimum guaranteed MCU operation voltage, MCU operations are not guaranteed with the exception of LVD.

Pin no.						Pin Name	Polarity	I/O circuit types*8	Function*9
64	80	100	120	144	176				
-	-	-	28*1	31	39	P050	-	A	General-purpose I/O port
						A18*5	-		External bus/Address bit18 output
						TRG5_1	-		PPG trigger 5 input (1)
						PPG33_0	-		PPG ch.33 output (0)
-	-	-	-	32	40	P051	-	A	General-purpose I/O port
						A19	-		External bus/Address bit19 output
						TRG9_0	-		PPG trigger 9 input (0)
-	-	-	-	33	41	P052	-	A	General-purpose I/O port
						A20	-		External bus/Address bit20 output
						PPG34_0	-		PPG ch.34 output (0)
						INT14_0	-		INT14 External interrupt input (0)
16*1	19*1	24*1	29*1	34	42	P053	-	B	General-purpose I/O port
						A21*2,*3,*4,*5	-		External bus/Address bit21 output
						AN44	-		ADC analog 44 input
						PPG35_0	-		PPG ch.35 output (0)
						INT14_1	-		INT14 External interrupt input (1)
						SCK0_1	-		Multi-function serial ch.0 clock I/O (1)
-	-	-	-	35	43	P054	-	A	General-purpose I/O port
						SYSCLK	-		External bus/System clock output
						PPG36_0	-		PPG ch.36 output (0)
17*1	22*1	27*1	32*1	38	46	P055	-	G	General-purpose I/O port
						CS2X*2,*3,*4,*5	-		External bus chip select 2 output
						SIN10_0	-		Multi-function serial ch.10 serial data input (0)
						AN43	-		ADC analog 43 input
						PPG37_0	-		PPG ch.37 output (0)
						TIN4_1	-		Reload timer ch.4 event input (1)
-	-	-	-	-	47	P180	-	A	General-purpose I/O port
						PPG40_0	-		PPG ch.40 output (0)
-	-	-	-	-	48	P181	-	A	General-purpose I/O port
						PPG41_0	-		PPG ch.41 output (0)
-	-	-	33*1	39	49	P056	-	A	General-purpose I/O port
						CS3X*5	-		External bus chip select 3 output
						ICU9_0	-		Input capture ch.9 input (0)
						PPG0_1	-		PPG ch.0 output (1)
						ICU0_1	-		Input capture ch.0 input (1)
						TIN5_1	-		Reload timer ch.5 event input (1)
						DTTI_2	-		Waveform generator ch.0-ch.5 input pin (2)

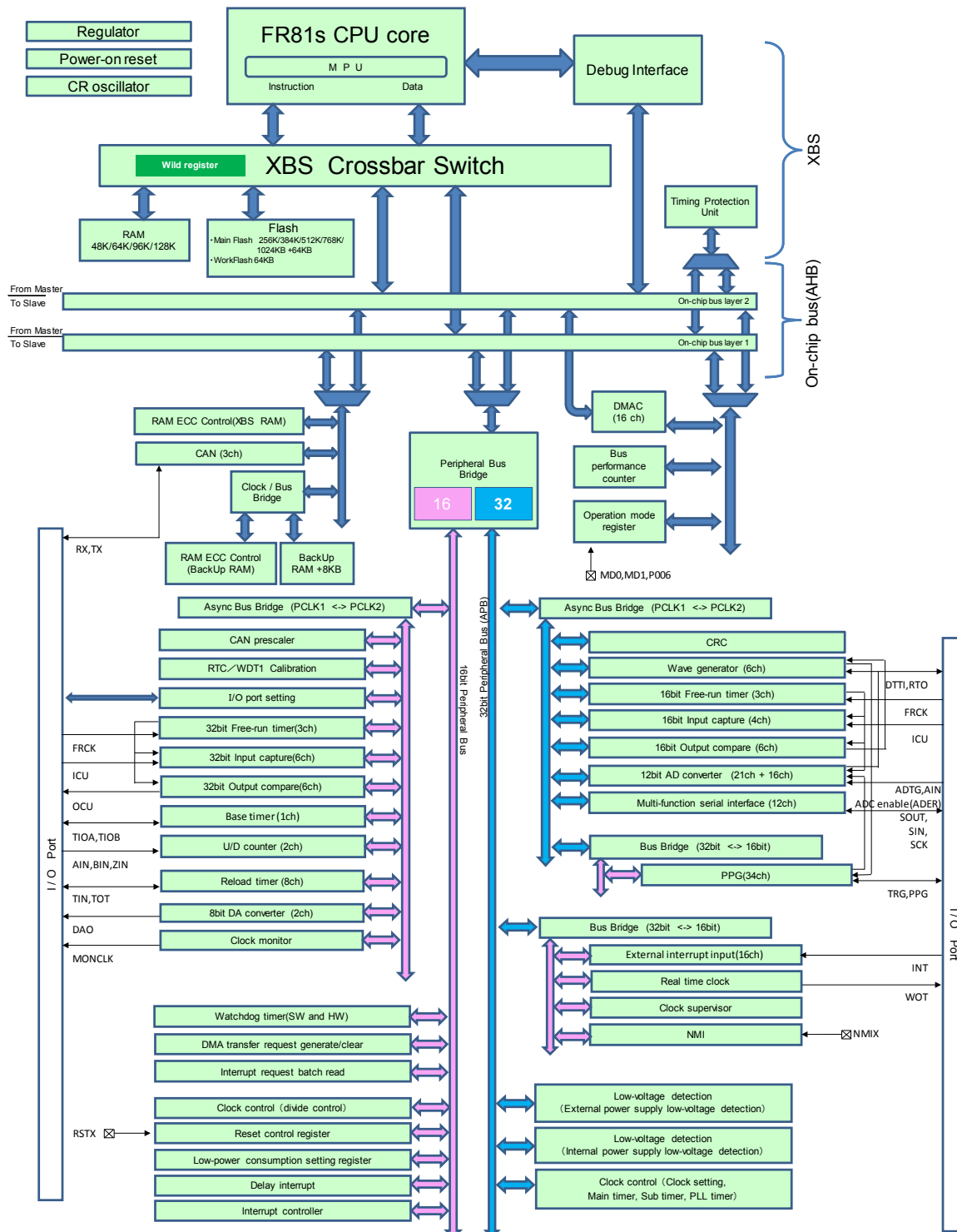
Pin no.						Pin Name	Polarity	I/O circuit types*8	Function*9
64	80	100	120	144	176				
-	-	-	113 *1	133	161	P002	-	F	General-purpose I/O port
						D18 *5	-		External bus data bit18 I/O
						SCK1_0	-		Multi-function serial ch.1 clock I/O (0)
						TIOB0_1	-		TIOB input of Base timer ch.0 (1)
-	76 *1	96 *1	114 *1	134	162	P003	-	F	General-purpose I/O port
						D19 *3, *4, *5	-		External bus data bit19 I/O
						SIN2_0	-		Multi-function serial ch.2 serial data input (0)
						TIOB1_1	-		TIOB input of Base timer ch.1 (1)
						INT3_0	-		INT3 External interrupt input (0)
-	-	-	-	135	163	P004	-	A	General-purpose I/O port
						D20	-		External bus data bit20 I/O (0)
						SOT2_0	-		Multi-function serial ch.2 serial data output (0)
-	-	-	-	-	164	P164	-	A	General-purpose I/O port
						PPG32_1	-		PPG ch.32 output (1)
61 *1	77 *1	97 *1	115 *1	136 *1	165 *1	P005	-	F	General-purpose I/O port
						D21 *2, *3, *4, *5	-		External bus data bit21 I/O (0)
						SCK2_0 *2	-		Multi-function serial ch.2 clock I/O (0)
						ADTG0_1	-		A/D converter external trigger input 0 (1)
						INT7_1	-		INT7 External interrupt input (1)
						RX2(64) *4, *5, *6, *7	-		CAN reception data 2 input
-	-	-	-	-	166	P165	-	A	General-purpose I/O port
						PPG33_1	-		PPG ch.33 output (1)
62 *1	78 *1	98 *1	116 *1	137 *1	167 *1	P006	-	A	General-purpose I/O port
						D22 *2, *3, *4, *5	-		External bus data bit22 I/O (0)
						SCS2_0 *2	-		Serial chip select 2 I/O (0)
						ADTG1_1	-		A/D converter external trigger input 1 (1)
						INT2_1	-		INT2 External interrupt input (1)
						TX2(64) *4, *5, *6, *7	-		CAN transmission data 2 output
-	-	-	117 *1	138	168	P007	-	A	General-purpose I/O port
						D23 *5	-		External bus data bit23 I/O
-	-	-	-	-	169	P166	-	A	General-purpose I/O port
						PPG34_1	-		PPG ch.34 output (1)
-	-	-	118 *1	139	170	P010	-	A	General-purpose I/O port
						D24 *5	-		External bus data bit24 I/O

(5) Smoke, Flame

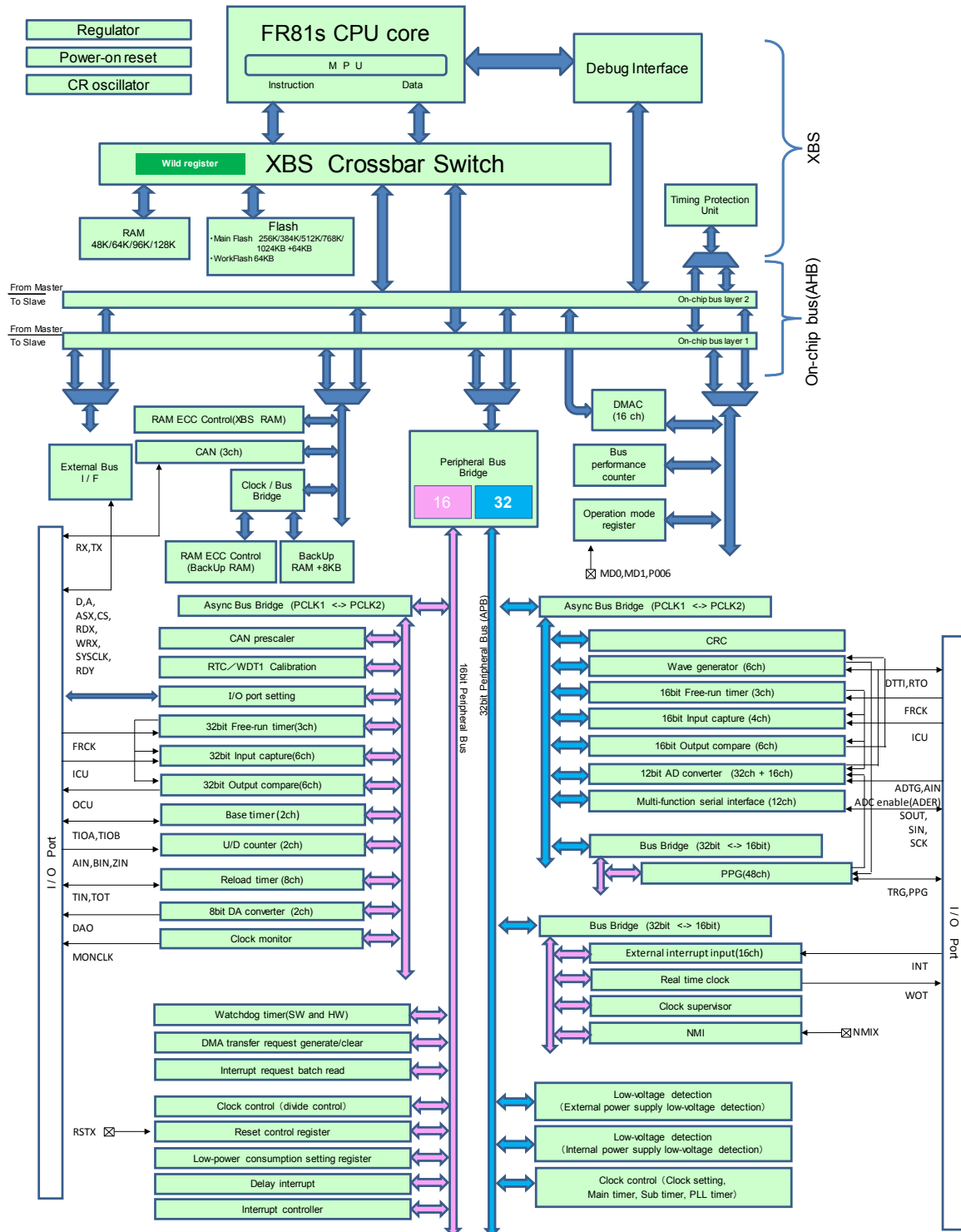
CAUTION: Plastic molded devices are flammable, and therefore should not be used near combustible substances. If devices begin to smoke or burn, there is danger of the release of toxic gases.

Customers considering the use of Cypress products in other special environmental conditions should consult with sales representatives.

MB91F522F, MB91F523F, MB91F524F, MB91F525F, MB91F526F



MB91F522L, MB91F523L, MB91F524L, MB91F525L, MB91F526L



Address	Address offset value / Register name				Block
	+0	+1	+2	+3	
001A80 _H	PCN202 [R/W] B,H,W --000000 ----110		PSDR2 [R/W] H,W 00000000 00000000		PPG2 * for communication
001A84 _H	PTPC2 [R/W] H,W 00000000 00000000		PCMDWD2 [R/W] B,H,W ----- ----0000		
001A88 _H	PHCSR2 [W] H,W XXXXXXXX XXXXXXXX		PLCSR2 [W] H,W XXXXXXXX XXXXXXXX		
001A8C _H	PHDUT2 [W] H,W XXXXXXXX XXXXXXXX		PLDUT2 [W] H,W XXXXXXXX XXXXXXXX		
001A90 _H	PCMDDT2 [R/W] H,W 00000000 00000000		—	—	
001A94 _H	PCN3 [R/W] B,H,W 00000000 000000-0		PCSR3 [W] H,W XXXXXXXX XXXXXXXX		PPG3 * for communication
001A98 _H	PDUT3 [W] H,W XXXXXXXX XXXXXXXX		PTMR3 [R] H,W 11111111 11111111		
001A9C _H	PCN203 [R/W] B,H,W --000000 ----110		PSDR3 [R/W] H,W 00000000 00000000		
001AA0 _H	PTPC3 [R/W] H,W 00000000 00000000		PCMDWD3 [R/W] B,H,W ----- ----0000		
001AA4 _H	PHCSR3 [W] H,W XXXXXXXX XXXXXXXX		PLCSR3 [W] H,W XXXXXXXX XXXXXXXX		
001AA8 _H	PHDUT3 [W] H,W XXXXXXXX XXXXXXXX		PLDUT3 [W] H,W XXXXXXXX XXXXXXXX		
001AAC _H	PCMDDT3 [R/W] H,W 00000000 00000000		—	—	
001AB0 _H	PCN4 [R/W] B,H,W 00000000 000000-0		PCSR4 [W] H,W XXXXXXXX XXXXXXXX		PPG4
001AB4 _H	PDUT4 [W] H,W XXXXXXXX XXXXXXXX		PTMR4 [R] H,W 11111111 11111111		
001AB8 _H	PCN204 [R/W] B,H,W --000000 ----110		PSDR4 [R/W] H,W 00000000 00000000		
001ABC _H	PTPC4 [R/W] H,W 00000000 00000000		—	—	PPG4
001AC0 _H	PCN5 [R/W] B,H,W 00000000 000000-0		PCSR5 [W] H,W XXXXXXXX XXXXXXXX		PPG5
001AC4 _H	PDUT5 [W] H,W XXXXXXXX XXXXXXXX		PTMR5 [R] H,W 11111111 11111111		
001AC8 _H	PCN205 [R/W] B,H,W --000000 ----110		PSDR5 [R/W] H,W 00000000 00000000		
001ACC _H	PTPC5 [R/W] H,W 00000000 00000000		—	—	

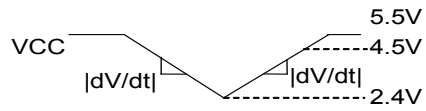
Address	Address offset value / Register name				Block
	+0	+1	+2	+3	
002054 _H	IF2DTB10 [R/W] B,H,W 00000000 00000000		IF2DTB20 [R/W] B,H,W 00000000 00000000		CAN0 (128msb)
002058 _H	—	—	—	—	
00205C _H	—	—	—	—	
002060 _H , 002064 _H	Reserved(IF2 data mirror)				
002068 _H to 00207C _H	—				
002080 _H	TREQR20 [R] B,H,W 00000000 00000000		TREQR10 [R] B,H,W 00000000 00000000		
002084 _H	TREQR40 [R] B,H,W 00000000 00000000		TREQR30 [R] B,H,W 00000000 00000000		
002088 _H	TREQR60 [R] B,H,W 00000000 00000000		TREQR50 [R] B,H,W 00000000 00000000		
00208C _H	TREQR80 [R] B,H,W 00000000 00000000		TREQR70 [R] B,H,W 00000000 00000000		
002090 _H	NEWDT20 [R] B,H,W 00000000 00000000		NEWDT10 [R] B,H,W 00000000 00000000		
002094 _H	NEWDT40 [R] B,H,W 00000000 00000000		NEWDT30 [R] B,H,W 00000000 00000000		
002098 _H	NEWDT60 [R] B,H,W 00000000 00000000		NEWDT50 [R] B,H,W 00000000 00000000		
00209C _H	NEWDT80 [R] B,H,W 00000000 00000000		NEWDT70 [R] B,H,W 00000000 00000000		
0020A0 _H	INTPND20 [R] B,H,W 00000000 00000000		INTPND10 [R] B,H,W 00000000 00000000		
0020A4 _H	INTPND40 [R] B,H,W 00000000 00000000		INTPND30 [R] B,H,W 00000000 00000000		
0020A8 _H	INTPND60 [R] B,H,W 00000000 00000000		INTPND50 [R] B,H,W 00000000 00000000		
0020AC _H	INTPND80 [R] B,H,W 00000000 00000000		INTPND70 [R] B,H,W 00000000 00000000		
0020B0 _H	MSGVAL20 [R] B,H,W 00000000 00000000		MSGVAL10 [R] B,H,W 00000000 00000000		
0020B4 _H	MSGVAL40 [R] B,H,W 00000000 00000000		MSGVAL30 [R] B,H,W 00000000 00000000		
0020B8 _H	MSGVAL60 [R] B,H,W 00000000 00000000		MSGVAL50 [R] B,H,W 00000000 00000000		

Interrupt factor	Interrupt number		Interrupt level	Offset	Default address for TBR	RN
	Decimal	Hexa decimal				
Clock calibration unit (sub oscillation)	47	2F	ICR31	340 _H	000FFF40 _H	31* ^{1,*4}
Multi-function serial interface ch.9 (reception completed)						
Multi-function serial interface ch.9 (status)						
A/D converter 0/1/7/10/11/14/15/16/17/22/27/28/31	48	30	ICR32	33C _H	000FFF3C _H	32
Clock calibration unit (CR oscillation)	49	31	ICR33	338 _H	000FFF38 _H	33
Multi-function serial interface ch.9 (transmission completed)						
16-bit OCU 0 (match) / 16-bit OCU 1 (match)						
32-bit Free-run timer 4	50	32	ICR34	334 _H	000FFF34 _H	34* ⁵
16-bit OCU 2 (match) / 16-bit OCU 3 (match)						
16-bit OCU 4 (match) / 16-bit OCU 5 (match)						
32-bit ICU6 (fetching/measurement)	51	33	ICR35	330 _H	000FFF30 _H	35
Multi-function serial interface ch.10 (reception completed)						
Multi-function serial interface ch.10 (status)						
Multi-function serial interface ch.10 (transmission completed)	52	34	ICR36	32C _H	000FFF2C _H	36* ¹
32-bit ICU8 (fetching/measurement)	53	35	ICR37	328 _H	000FFF28 _H	37
Multi-function serial interface ch.11 (reception completed)						
Multi-function serial interface ch.11 (status)						
32-bit ICU9 (fetching/measurement)	54	36	ICR38	324 _H	000FFF24 _H	38* ¹
WG dead timer underflow 0 / 1/ 2						
WG dead timer reload 0 / 1/ 2						
WG DTTI 0	55	37	ICR39	320 _H	000FFF20 _H	39
32-bit ICU4 (fetching/measurement)						
Multi-function serial interface ch.11 (transmission completed)						
32-bit ICU5 (fetching/measurement)	56	38	ICR40	31C _H	000FFF1C _H	40
A/D converter 32/34/35/37/38/40/41/42/43/44/45/46/47						
32-bit OCU7/11 (match)						
32-bit OCU8/9 (match)	57	39	ICR41	318 _H	000FFF18 _H	41
-	58	3A	ICR42	314 _H	000FFF14 _H	42
-	59	3B	ICR43	310 _H	000FFF10 _H	43
-	60	3C	ICR44	30C _H	000FFF0C _H	-* ⁶
-	61	3D	ICR45	308 _H	000FFF08 _H	-
-						
-						
DMAC0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15	62	3E	ICR46	304 _H	000FFF04 _H	-
Delay interrupt	63	3F	ICR47	300 _H	000FFF00 _H	-
System reserved (Used for REALOS™*8)	64	40	-	2FC _H	000FFEFC _H	-
System reserved (Used for REALOS)	65	41	-	2F8 _H	000FFE8 _H	-

Interrupt factor	Interrupt number		Interrupt level	Offset	Default address for TBR	RN
	Decimal	Hexadecimal				
Multi-function serial interface ch.3 (transmission completed)	27	1B	ICR11	390 _H	000FFF90 _H	11
Multi-function serial interface ch.4 (reception completed)	28	1C	ICR12	38C _H	000FFF8C _H	12* ¹
Multi-function serial interface ch.4 (status)						
Multi-function serial interface ch.4 (transmission completed)	29	1D	ICR13	388 _H	000FFF88 _H	13
Multi-function serial interface ch.5 (reception completed)	30	1E	ICR14	384 _H	000FFF84 _H	14* ¹
Multi-function serial interface ch.5 (status)						
Multi-function serial interface ch.5 (transmission completed)	31	1F	ICR15	380 _H	000FFF80 _H	15
Multi-function serial interface ch.6 (reception completed)	32	20	ICR16	37C _H	000FFF7C _H	16* ¹
Multi-function serial interface ch.6 (status)						
Multi-function serial interface ch.6 (transmission completed)	33	21	ICR17	378 _H	000FFF78 _H	17
CAN0	34	22	ICR18	374 _H	000FFF74 _H	-
CAN1	35	23	ICR19	370 _H	000FFF70 _H	-
RAM diagnosis end						
RAM initialization completion						
Error generation during RAM diagnosis						
Backup RAM diagnosis end						
Backup RAM initialization completion						
Error generation during Backup RAM diagnosis						
CAN2	36	24	ICR20	36C _H	000FFF6C _H	-
Up/down counter 0						
Up/down counter 1						
Real time clock	37	25	ICR21	368 _H	000FFF68 _H	-
Multi-function serial interface ch.7 (reception completed)	38	26	ICR22	364 _H	000FFF64 _H	22* ¹
Multi-function serial interface ch.7 (status)						
16-bit Free-run timer 0 (0 detection) / (compare clear)	39	27	ICR23	360 _H	000FFF60 _H	23
Multi-function serial interface ch.7 (transmission completed)						
PPG 0/1/10/11/20/21/30/31	40	28	ICR24	35C _H	000FFF5C _H	24* ³
16-bit Free-run timer 1 (0 detection) / (compare clear)						
PPG 2/3/12/13/22/23/32/33/43	41	29	ICR25	358 _H	000FFF58 _H	25* ³
16-bit Free-run timer 2 (0 detection) / (compare clear)						
PPG 4/5/14/15/24/25/35/44	42	2A	ICR26	354 _H	000FFF54 _H	26* ³
PPG 6/7/16/17/26/27/37	43	2B	ICR27	350 _H	000FFF50 _H	27* ³
PPG 8/9/18/19/28/29	44	2C	ICR28	34C _H	000FFF4C _H	28* ³

Interrupt factor	Interrupt number		Interrupt level	Offset	Default address for TBR	RN
	Decimal	Hexadecimal				
Multi-function serial interface ch.3 (transmission completed)	27	1B	ICR11	390 _H	000FFF90 _H	11
Multi-function serial interface ch.4 (reception completed)	28	1C	ICR12	38C _H	000FFF8C _H	12* ¹
Multi-function serial interface ch.4 (status)						
Multi-function serial interface ch.4 (transmission completed)	29	1D	ICR13	388 _H	000FFF88 _H	13
Multi-function serial interface ch.5 (reception completed)	30	1E	ICR14	384 _H	000FFF84 _H	14* ¹
Multi-function serial interface ch.5 (status)						
Multi-function serial interface ch.5 (transmission completed)	31	1F	ICR15	380 _H	000FFF80 _H	15
Multi-function serial interface ch.6 (reception completed)	32	20	ICR16	37C _H	000FFF7C _H	16* ¹
Multi-function serial interface ch.6 (status)						
Multi-function serial interface ch.6 (transmission completed)	33	21	ICR17	378 _H	000FFF78 _H	17
CAN0	34	22	ICR18	374 _H	000FFF74 _H	-
CAN1	35	23	ICR19	370 _H	000FFF70 _H	-
RAM diagnosis end						
RAM initialization completion						
Error generation during RAM diagnosis						
Backup RAM diagnosis end						
Backup RAM initialization completion						
Error generation during Backup RAM diagnosis						
CAN2	36	24	ICR20	36C _H	000FFF6C _H	-
Up/down counter 0						
Up/down counter 1						
Real time clock	37	25	ICR21	368 _H	000FFF68 _H	-
Multi-function serial interface ch.7 (reception completed)	38	26	ICR22	364 _H	000FFF64 _H	22* ¹
Multi-function serial interface ch.7 (status)						
16-bit Free-run timer 0 (0 detection) / (compare clear)	39	27	ICR23	360 _H	000FFF60 _H	23
Multi-function serial interface ch.7 (transmission completed)						
PPG 0/1/10/11/20/21/30/31/40/41	40	28	ICR24	35C _H	000FFF5C _H	24* ³
16-bit Free-run timer 1 (0 detection) / (compare clear)						
PPG 2/3/12/13/22/23/32/33/43	41	29	ICR25	358 _H	000FFF58 _H	25* ³
16-bit Free-run timer 2 (0 detection) / (compare clear)						
PPG 4/5/14/15/24/25/34/35/44/45	42	2A	ICR26	354 _H	000FFF54 _H	26* ³
PPG 6/7/16/17/26/27/36/37/46/47	43	2B	ICR27	350 _H	000FFF50 _H	27* ³
PPG 8/9/18/19/28/29/38/39	44	2C	ICR28	34C _H	000FFF4C _H	28* ³

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



(4-1-2) Bit setting: SMR: MD2=0, SMR: MD1=1, SMR : MD0=0, SMR: SCINV=1, SCR:SPI=0

(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		
Serial clock cycle time	t _{SCYC}	SCK0 to SCK11	-	4t _{CPP}	-	ns	Internal shift mode clock output pin : C _L =50pF
SCK ↑ → SOT delay time	t _{SHOVI}	SCK0 to SCK2, SCK5 to SCK11 SOT0 to SOT2, SOT5 to SOT11		-30	30	ns	
		SCK3 , SCK4 SOT3 , SOT4		-300	300	ns	
Valid SIN → SCK ↓ setup time	t _{IVSLI}	SCK0 to SCK2, SCK5 to SCK11 SIN0 to SIN2, SIN5 to SIN11		34	-	ns	
		SCK3 , SCK4 SIN3, SIN4		300	-	ns	
SCK ↓ → Valid SIN hold time	t _{SLIXI}	SCK0 to SCK11 SIN0 to SIN11		0	-	ns	
Serial clock "H"pulse width	t _{SHSL}	SCK0 to SCK11	-	t _{CPP} +10	-	ns	External shift mode clock output pin: C _L =50pF
Serial clock "L" pulse width	t _{SLSH}			2t _{CPP} -1 0	-	ns	
SCK ↑ → SOT delay time	t _{SHOVE}	SCK0 to SCK2, SCK5 to SCK11 SOT0 to SOT2, SOT5 to SOT11		-	33	ns	
		SCK3 , SCK4 SOT3 , SOT4		-	300	ns	
Valid SIN → SCK ↓ setup time	t _{IVSLE}	SCK0 to SCK11 SIN0 to SIN11		10	-	ns	
SCK ↓ → Valid SIN hold time	t _{SLIXE}			20	-	ns	
SCK fall time	t _F			SCK0 to SCK11	-	5	ns
SCK rise time	t _R	SCK0 to SCK11		-	5	ns	

Notes:

AC characteristic in CLK synchronized mode.

C_L is the load capacitance applied to pins during testing.

The maximum baud rate is limited by internal operation clock used and other parameters. Please use ch.3 and ch.4 with maximum baud rate 400kbps or less.

See Hardware Manual for details.

(4-1-7) Bit setting: SMR:MD2=0, SMR:MD1=1, SMR:MD0=0,

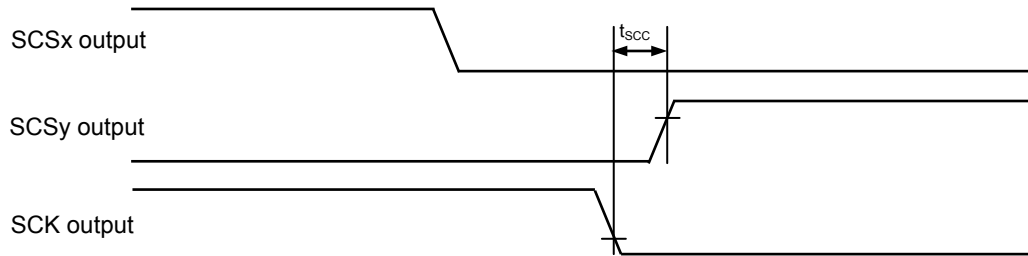
When Serial chip select is used : SCSCR:CSSEN=1,

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

Serial chip select Inactive level "L" : SCSCR,SCSFR:CSLVL=0

(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} +30 0 *1	ns	
SCK↑→SCS↓ hold time	t _{CSHI}	SCK1 to SCK2, SCK5 to SCK11 SCS1, SCS2, SCS50 to SCS53, SCS60 to SCS63, SCS70 to SCS73, SCS8 to SCS11		t _{CSHD} -10 *2	t _{CSHD} +50 *2	ns	
		SCK3, SCK4 SCS3, SCS40 to SCS43		t _{CSHD} -300 *2	t _{CSHD} +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	



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

A/D Converter

(1) 12-bit A/D Converter Electrical Characteristics

 (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	Value			Unit	Remarks
			Min	Typ	Max		
Resolution	-	-	-	-	12	bit	
Total error	-	-	-	-	±12	LSB	
Linearity error	-	-	-	-	± 4.0	LSB	
Differential linearity error	-	-	-	-	± 1.9	LSB	
Zero transition voltage	V _{OT}	AN0 to AN47	AVRL-11.5LSB	-	AVRL+12.5LSB	V	1LSB= (V _{FST} -V _{OT})/4094
Full-scale transition voltage	V _{FST}	AN0 to AN47	AVRH-13.5LSB	-	AVRH+10.5LSB	V	
Sampling time	t _{SMP}	-	0.7	-	-	μs	*1
Compare time	t _{CMP}	-	0.7	-	-	μs	*1
A/D conversion time	t _{CNV}	-	1.4	-	-	μs	*1
Analog port input current	I _{AIN}	AN0 to AN47	-1.0	-	+1.0	μA	V _{AVSS} ≤ V _{AIN} ≤ V _{AVCC}
Analog input voltage	V _{AIN}	AN0 to AN47	AVRL	-	AVRH	V	
Reference voltage	AVRH	AVRH	3.0	-	5.5	V	
	AVRL	AVSS/AVRL	-	0.0	-	V	
Power supply current	I _A	AVCC*3	-	0.47	0.63	mA	Per unit T _A : +105°C
			-	0.47	0.7	mA	Per unit T _A : +125°C
	I _{AH}	AVRH	-	-	2.5	μA	*2
	I _R		-	1	1.96	mA	Per unit
	I _{RH}		-	-	1.6	μA	*2
Variation between channels	-	AN0 to AN47	-	-	4	LSB	

*1: Time for each channel.

 *2: Power supply current (V_{CC} = AV_{CC} = 5.0 V) is specified if A/D converter is not operating and CPU is stopped.

*3: The power supply current described only current value on A/D converter.

 The total AV_{CC} current value must be calculated the power supply current for A/D converter and D/A converter.

(Note) Please use the clock of 0.5MHz-20MHz for the output clock of A/D converter to guarantee accuracy.

Flash memory
(1) Electrical Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time	–	200	800	ms	8 Kbytes sector* ¹ , excluding internal preprogramming time
	–	300	1100	ms	8 Kbytes sector* ¹ , including internal preprogramming time
	–	400	2000	ms	64 Kbytes sector* ¹ , excluding internal preprogramming time
	–	700	3700	ms	64 Kbytes sector* ¹ , including internal preprogramming time
8-bit writing time	–	9	288	μs	Exclusive of overhead time at system level* ¹
16-bit writing time	–	12	384	μs	Exclusive of overhead time at system level* ¹
ECC writing time	–	9	288	μs	Exclusive of overhead time at system level* ¹
Erase cycle* ² / Data retain time	1,000 cycles/ 20 years, 10,000 cycles/ 10 years, 100,000 cycles/ 5 years	–	–	–	Average T _A =+85°C* ³

*1: The guaranteed value for erasure up to 100,000 cycles.

*2: Number of erase cycles for each sector.

*3: This value comes from the technology qualification (using Arrhenius equation to translate high temperature measurements into normalized value at + 85°C).

(2) Notes

While the Flash memory is written or erased, shutdown of the external power (V_{CC}) is prohibited.

In the application system where V_{CC} might be shut down while writing or erasing, be sure to turn the power off by using an external voltage detection function.

To put it concretely, after the external power supply voltage falls below the detection voltage (V_{DL}*), hold V_{CC} at 2.7V or more within the duration calculated by the following expression:

$$T_d^*[\mu s] + (\text{period of PCLK}[\mu s] \times 257) + 50[\mu s]$$

*: See "4.AC Characteristics (8) Low-voltage detection (External low-voltage detection) "

13. Ordering Information MB91F52xxxB*¹

Part number	Sub clock	CSV Initial value	LVD Initial value	Package* ²
MB91F526LWBPMC	Yes	ON	ON	LQP • 176 pin, Plastic
MB91F526LYBPMC			OFF	
MB91F526LJBPMC		OFF	ON	
MB91F526LLBPMC			OFF	
MB91F525LWBPMC		ON	ON	
MB91F525LYBPMC			OFF	
MB91F525LJBPMC		OFF	ON	
MB91F525LLBPMC			OFF	
MB91F524LWBPMC		ON	ON	
MB91F524LYBPMC			OFF	
MB91F524LJBPMC		OFF	ON	
MB91F524LLBPMC			OFF	
MB91F523LWBPMC		ON	ON	
MB91F523LYBPMC			OFF	
MB91F523LJBPMC		OFF	ON	
MB91F523LLBPMC			OFF	
MB91F522LWBPMC		ON	ON	
MB91F522LYBPMC			OFF	
MB91F522LJBPMC		OFF	ON	
MB91F522LLBPMC			OFF	
MB91F526LSBPMC	None	ON	ON	
MB91F526LUBPMC			OFF	
MB91F526LHBPMC		OFF	ON	
MB91F526LKBPMC			OFF	
MB91F525LSBPMC		ON	ON	
MB91F525LUBPMC			OFF	
MB91F525LHBPMC		OFF	ON	
MB91F525LKBPMC			OFF	
MB91F524LSBPMC		ON	ON	
MB91F524LUBPMC			OFF	
MB91F524LHBPMC		OFF	ON	
MB91F524LKBPMC			OFF	
MB91F523LSBPMC		ON	ON	
MB91F523LUBPMC			OFF	
MB91F523LHBPMC		OFF	ON	
MB91F523LKBPMC			OFF	
MB91F522LSBPMC		ON	ON	
MB91F522LUBPMC			OFF	
MB91F522LHBPMC		OFF	ON	
MB91F522LKBPMC			OFF	

Page	Section	Change Results				
8	■Product Lineup	Corrected the following description for Product lineup comparison(100 pin). <table><tr><td>Multi-Function Serial Interface</td><td>12ch</td></tr></table> ↓ <table><tr><td>Multi-Function Serial Interface</td><td>12ch*1</td></tr></table>	Multi-Function Serial Interface	12ch	Multi-Function Serial Interface	12ch*1
Multi-Function Serial Interface	12ch					
Multi-Function Serial Interface	12ch*1					
8	■Product Lineup	Added the following sentences under Product lineup comparison(100 pin) *1: Only channel 5, channel 6, channel 7, channel 8 and channel 11 support the I ² C (standard mode).				
9	■Product Lineup	Corrected the following description for Product lineup comparison(120 pin). <table><tr><td>Multi-Function Serial Interface</td><td>12ch</td></tr></table> ↓ <table><tr><td>Multi-Function Serial Interface</td><td>12ch*1</td></tr></table>	Multi-Function Serial Interface	12ch	Multi-Function Serial Interface	12ch*1
Multi-Function Serial Interface	12ch					
Multi-Function Serial Interface	12ch*1					
9	■Product Lineup	Added the following sentences under Product lineup comparison(120 pin) *1: Only channel 3 and channel 4 support the I ² C (high-speed mode/standard mode). Only channel 5, channel 6, channel 7, channel 8 and channel 11 support the I ² C (standard mode).				
10	■Product Lineup	Corrected the following description for Product lineup comparison(144 pin). <table><tr><td>Multi-Function Serial Interface</td><td>12ch</td></tr></table> ↓ <table><tr><td>Multi-Function Serial Interface</td><td>12ch*1</td></tr></table>	Multi-Function Serial Interface	12ch	Multi-Function Serial Interface	12ch*1
Multi-Function Serial Interface	12ch					
Multi-Function Serial Interface	12ch*1					
10	■Product Lineup	Added the following sentences under Product lineup comparison(144 pin) *1: Only channel 3 and channel 4 support the I ² C (high-speed mode/standard mode). Only channel 5, channel 6, channel 7, channel 8, channel 10 and channel 11 support the I ² C (standard mode).				
11	■Product Lineup	Corrected the following description for Product lineup comparison(176 pin). <table><tr><td>Multi-Function Serial Interface</td><td>12ch</td></tr></table> ↓ <table><tr><td>Multi-Function Serial Interface</td><td>12ch*1</td></tr></table>	Multi-Function Serial Interface	12ch	Multi-Function Serial Interface	12ch*1
Multi-Function Serial Interface	12ch					
Multi-Function Serial Interface	12ch*1					
11	■Product Lineup	Added the following sentences under Product lineup comparison(176 pin) *1: Only channel 3 and channel 4 support the I ² C (high-speed mode/standard mode). Only channel 5, channel 6, channel 7, channel 8, channel 10 and channel 11 support the I ² C (standard mode).				

Revision	ECN	Orig. of Change	Submission Date	Description of Change
				Package ↓ Package*² Added the following description. *¹: It is only supported for customers who have already adopted it now. We do not recommend adopting new products. Corrected the following description. For details of the package, see "■ PACKAGE DIMENSIONS". ↓ *²: For details of the package, see "■ PACKAGE DIMENSIONS". Added the following description. • ORDERING INFORMATION MB91F52xxxC Company name and layout design change
*A	4999456	JHMU	11/13/2015	Updated to Cypress template. Added the following note to the remarks of ""L" level average output current" and ""H" level average output current" in "Absolute Maximum Ratings" of "ELECTRICAL CHARACTERISTICS". *⁹: Corresponding pins: General-purpose ports other than those of P103, P104, P105 and P106. *¹⁰: Corresponding pins: General-purpose ports of P103, P104, P105 and P106. Added Errata section.
*B	5112138	KUME	01/28/2016	Fixed some clerical errors. For details, please see the chapter 18. Major Changes.
*C	5196285	KUME	04/28/2016	For details, please see the chapter 19. Major Changes.
*D	5318862	KUME	06/23/2016	For details, please see the chapter 19. Major Changes.