Infineon Technologies - MB96F635ABPMC-GSE1 Datasheet

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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	F²MC-16FX
Core Size	16-Bit
Speed	32MHz
Connectivity	I²C, LINbus, SCI, UART/USART
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	64
Program Memory Size	160KB (160K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	16K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 21x8/10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Surface Mount
Package / Case	80-LQFP
Supplier Device Package	80-LQFP (12x12)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/mb96f635abpmc-gse1

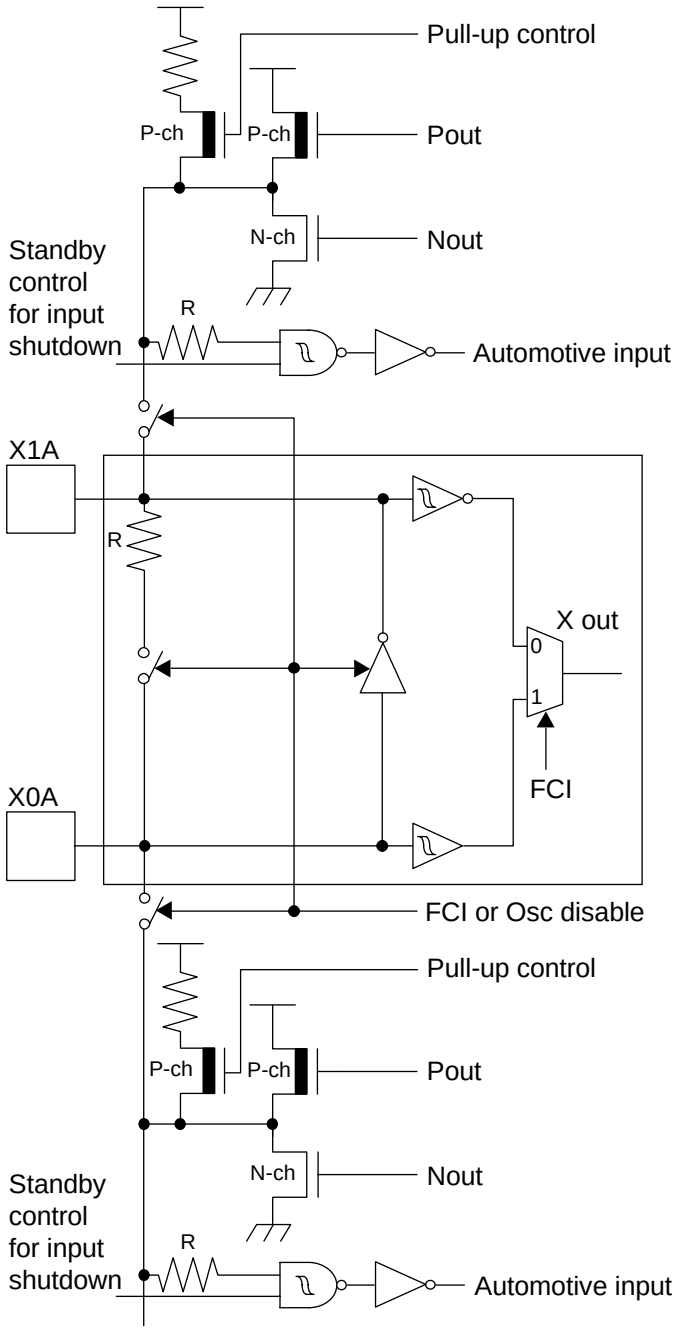
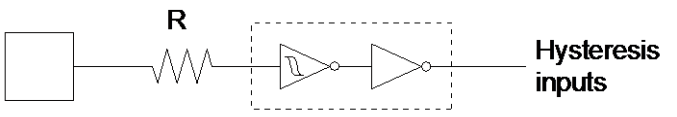
Contents

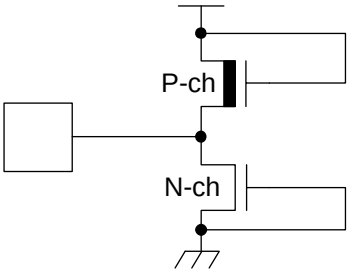
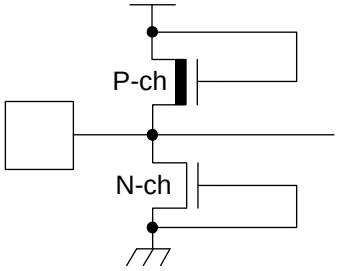
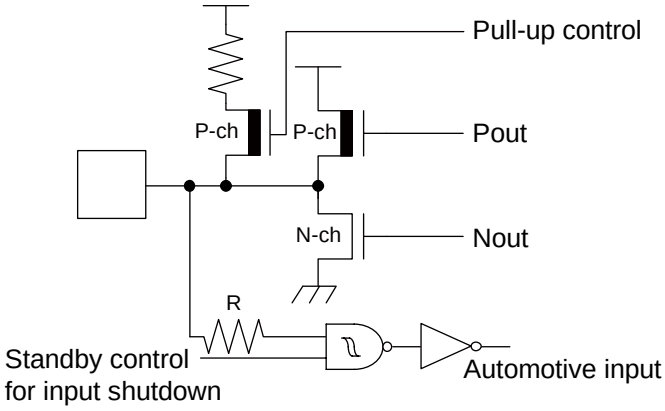
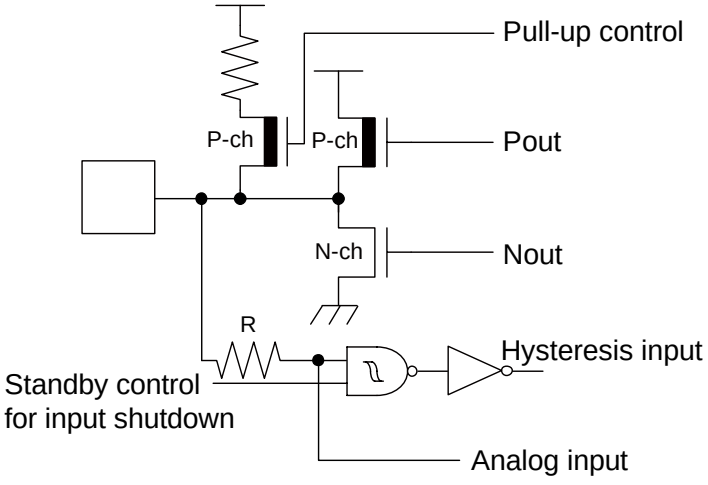
5. Pin Circuit Type

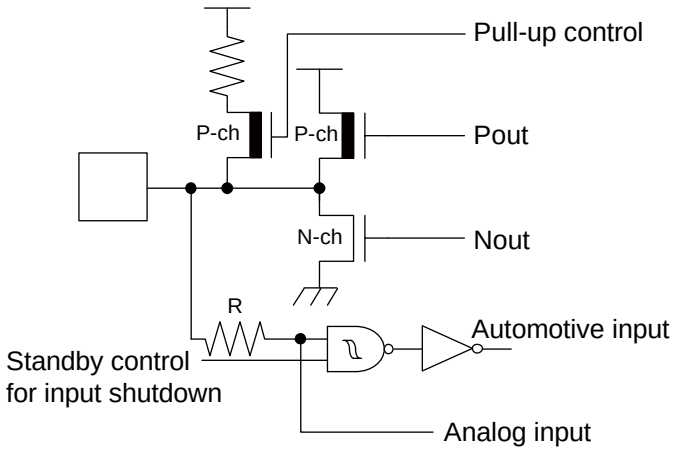
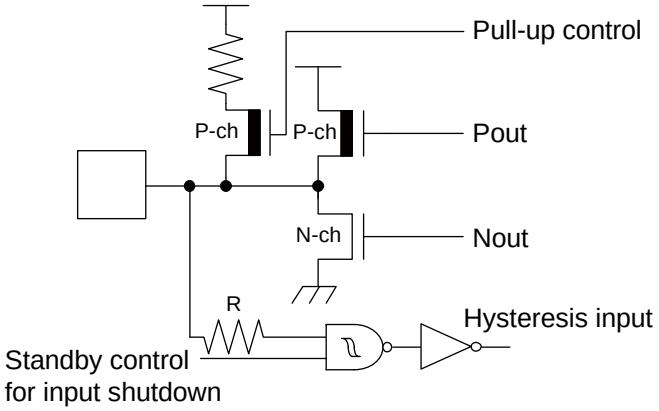
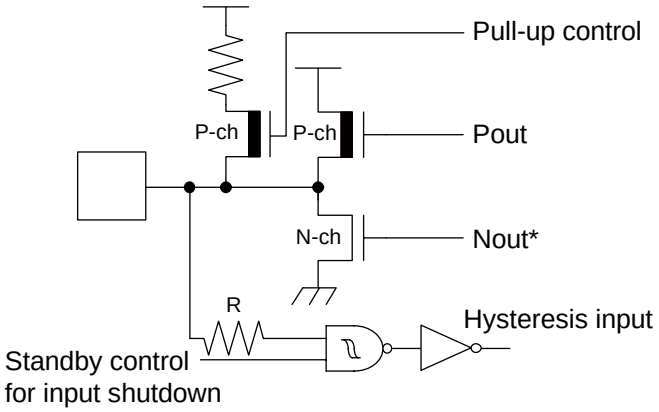
Pin no.	I/O circuit type*	Pin name
1	Supply	V_{SS}
2	F	C
3	H	P13_2 / PPG0 / TIN0 / FRCK1
4	H	P13_3 / PPG1 / TOT0 / WOT
5	M	P13_4 / SIN0 / INT6
6	H	P13_5 / SOT0 / ADTG / INT7
7	M	P13_6 / SCK0 / CKOTX0
8	N	P04_4 / PPG3 / SDA0
9	N	P04_5 / PPG4 / SCL0
10	I	P06_2 / AN2 / INT5 / SIN5
11	K	P06_3 / AN3 / FRCK0
12	K	P06_4 / AN4 / IN0 / TTG0 / TTG4
13	K	P06_6 / AN6 / TIN1 / IN4_R
14	K	P06_7 / AN7 / TOT1 / IN5_R
15	Supply	AV_{CC}
16	G	AVRH
17	Supply	AV_{SS}
18	K	P05_0 / AN8
19	K	P05_2 / AN10 / OUT2
20	K	P05_3 / AN11 / OUT3
21	K	P05_4 / AN12 / INT2_R / WOT_R
22	K	P05_7 / AN15
23	K	P08_0 / AN16
24	K	P08_1 / AN17
25	K	P08_4 / AN20 / OUT6
26	N	P04_6 / SDA1
27	N	P04_7 / SCL1
28	K	P08_5 / AN21 / OUT7
29	K	P08_6 / AN22 / PPG6_B
30	K	P08_7 / AN23 / PPG7_B
31	K	P09_0 / AN24 / PPG8_R
32	K	P09_1 / AN25 / PPG9_R
33	K	P09_2 / AN26 / PPG10_R
34	K	P09_3 / AN27 / PPG11_R
35	H	P17_1 / PPG12_R
36	H	P17_2 / PPG13_R
37	I	P10_0 / SIN2 / AN28 / INT11
38	H	P10_1 / SOT2

Pin no.	I/O circuit type*	Pin name
78	H	P03_5 / TX0
79	H	P03_6 / INT0 / NMI
80	Supply	Vcc

*: See “I/O Circuit Type” for details on the I/O circuit types.

Type	Circuit	Remarks
B		Low-speed oscillation circuit shared with GPIO functionality: • Feedback resistor = approx. 5.0MΩ • GPIO functionality selectable (CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA), Automotive input with input shutdown function and programmable pull-up resistor)
C		CMOS hysteresis input pin

Type	Circuit	Remarks
F		Power supply input protection circuit
G		• A/D converter ref+ (AVRH) power supply input pin with protection circuit • Without protection circuit against V_{CC} for pins AVRH
H		• CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA) • Automotive input with input shutdown function • Programmable pull-up resistor
I		• CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA) • CMOS hysteresis input with input shutdown function • Programmable pull-up resistor • Analog input

Type	Circuit	Remarks
K		• CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA) • Automotive input with input shutdown function • Programmable pull-up resistor • Analog input
M		• CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA) • CMOS hysteresis input with input shutdown function • Programmable pull-up resistor
N		• CMOS level output (I_{OL} = 3mA, I_{OH} = -3mA) • CMOS hysteresis input with input shutdown function • Programmable pull-up resistor *: N-channel transistor has slew rate control according to I^2C spec, irrespective of usage.

10. Serial Programming Communication Interface

USART pins for Flash serial programming (MD = 0, DEBUG I/F = 0, Serial Communication mode)

MB96630		
Pin Number	**USART Number**	**Normal Function**
5	USART0	SIN0
6		SOT0
7		SCK0
37	USART2	SIN2
38		SOT2
39		SCK2
68	USART4	SIN4
69		SOT4
70		SCK4

Vector number	Offset in vector table	Vector name	Cleared by DMA	Index in ICR to program	Description
124	20CH	-	-	124	Reserved
125	208H	-	-	125	Reserved
126	204H	-	-	126	Reserved
127	200H	-	-	127	Reserved
128	1FCH	-	-	128	Reserved
129	1F8H	-	-	129	Reserved
130	1F4H	-	-	130	Reserved
131	1F0H	-	-	131	Reserved
132	1ECH	-	-	132	Reserved
133	1E8H	FLASHA	Yes	133	Flash memory A interrupt
134	1E4H	-	-	134	Reserved
135	1E0H	-	-	135	Reserved
136	1DCH	-	-	136	Reserved
137	1D8H	QPRC0	Yes	137	Quadrature Position/Revolution counter 0
138	1D4H	QPRC1	Yes	138	Quadrature Position/Revolution counter 1
139	1D0H	ADCRC0	No	139	A/D Converter 0 - Range Comparator
140	1CCH	-	-	140	Reserved
141	1C8H	-	-	141	Reserved
142	1C4H	-	-	142	Reserved
143	1C0H	-	-	143	Reserved

13. Handling Devices

Special care is required for the following when handling the device:

- Latch-up prevention
- Unused pins handling
- External clock usage
- Notes on PLL clock mode operation
- Power supply pins (V_{cc}/V_{ss})
- Crystal oscillator and ceramic resonator circuit
- Turn on sequence of power supply to A/D converter and analog inputs
- Pin handling when not using the A/D converter
- Notes on Power-on
- Stabilization of power supply voltage
- Serial communication
- Mode Pin (MD)

13.1 Latch-up prevention

CMOS IC chips may suffer latch-up under the following conditions:

- A voltage higher than V_{CC} or lower than V_{SS} is applied to an input or output pin.
- A voltage higher than the rated voltage is applied between V_{cc} pins and V_{ss} pins.
- The AV_{CC} power supply is applied before the V_{CC} voltage.

Latch-up may increase the power supply current dramatically, causing thermal damages to the device.

For the same reason, extra care is required to not let the analog power-supply voltage (AV_{CC}, AVRH) exceed the digital power-supply voltage.

13.2 Unused pins handling

Unused input pins can be left open when the input is disabled (corresponding bit of Port Input Enable register PIER = 0).

Leaving unused input pins open when the input is enabled may result in misbehavior and possible permanent damage of the device. To prevent latch-up, they must therefore be pulled up or pulled down through resistors which should be more than 2kΩ.

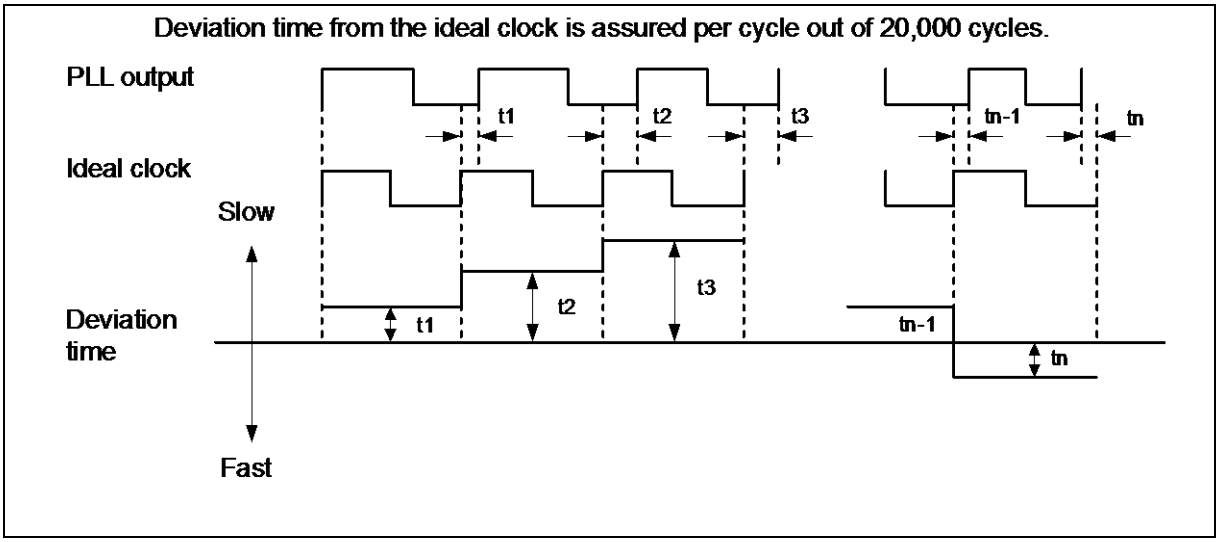
Unused bidirectional pins can be set either to the output state and be then left open, or to the input state with either input disabled or external pull-up/pull-down resistor as described above.

Parameter	Symbol	Pin name	Conditions	Value			Unit	Remarks
				Min	Typ	Max		
Power supply current in Timer modes[*2]	I_{CCTPLL}	Vcc	PLL Timer mode with CLKPLL = 32MHz (CLKRC and CLKSC stopped)	-	1800	2250	µA	T_A = +25°C
				-	-	3220	µA	T_A = +105°C
				-	-	4205	µA	T_A = +125°C
	$I_{CCTMAIN}$		Main Timer mode with CLKMC = 4MHz, SMCR:LPMSS = 0 (CLKPLL, CLKRC and CLKSC stopped)	-	285	330	µA	T_A = +25°C
				-	-	1195	µA	T_A = +105°C
				-	-	2165	µA	T_A = +125°C
	I_{CCTRCH}		RC Timer mode with CLKRC = 2MHz, SMCR:LPMSS = 0 (CLKPLL, CLKMC and CLKSC stopped)	-	160	215	µA	T_A = +25°C
				-	-	1095	µA	T_A = +105°C
				-	-	2075	µA	T_A = +125°C
	I_{CCTRCL}		RC Timer mode with CLKRC = 100kHz (CLKPLL, CLKMC and CLKSC stopped)	-	35	75	µA	T_A = +25°C
				-	-	905	µA	T_A = +105°C
				-	-	1880	µA	T_A = +125°C
	I_{CCTSUB}		Sub Timer mode with CLKSC = 32kHz (CLKMC, CLKPLL and CLKRC stopped)	-	25	65	µA	T_A = +25°C
				-	-	885	µA	T_A = +105°C
				-	-	1850	µA	T_A = +125°C

14.4.5 Operating Conditions of PLL

(V_{CC} = AV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = 0V, T_A = - 40°C to + 125°C)

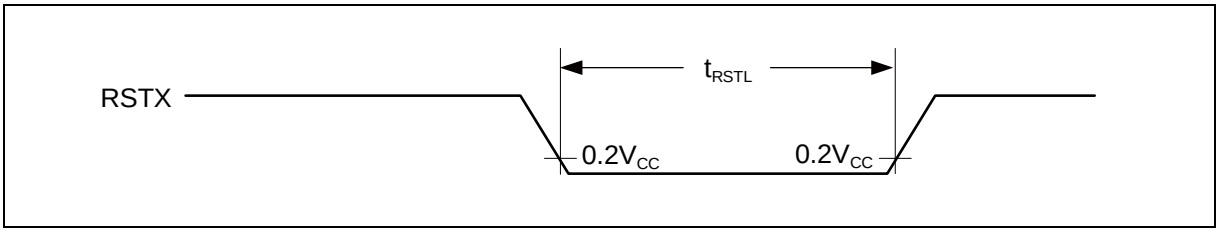
Parameter	Symbol	Value			Unit	Remarks
		Min	Typ	Max		
PLL oscillation stabilization wait time	t_{LOCK}	1	-	4	ms	For CLKMC = 4MHz
PLL input clock frequency	f_{PLLI}	4	-	8	MHz	
PLL oscillation clock frequency	f_{CLKVCO}	56	-	108	MHz	Permitted VCO output frequency of PLL (CLKVCO)
PLL phase jitter	t_{PSKEW}	-5	-	+5	ns	For CLKMC (PLL input clock) ≥ 4MHz



14.4.6 Reset Input

(V_{CC} = AV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = 0V, T_A = - 40°C to + 125°C)

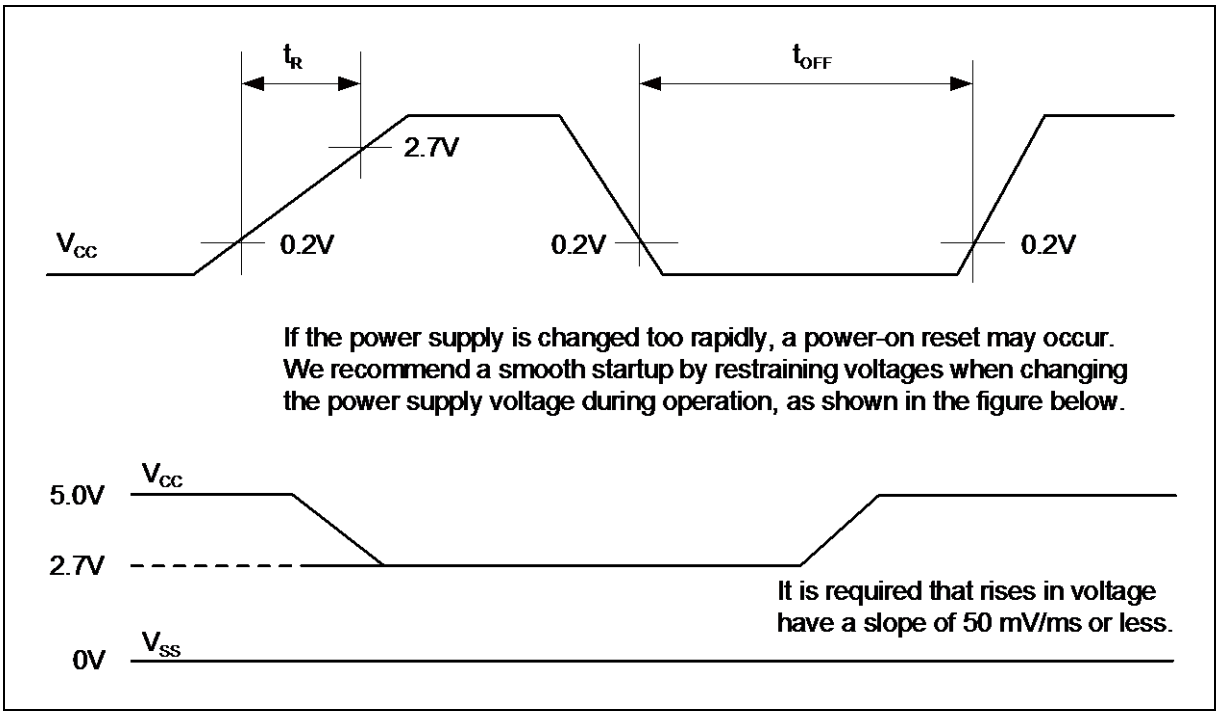
Parameter	Symbol	Pin name	Value		Unit
			Min	Max	
Reset input time	t_{RSTL}	RSTX	10	-	µs
Rejection of reset input time			1	-	µs

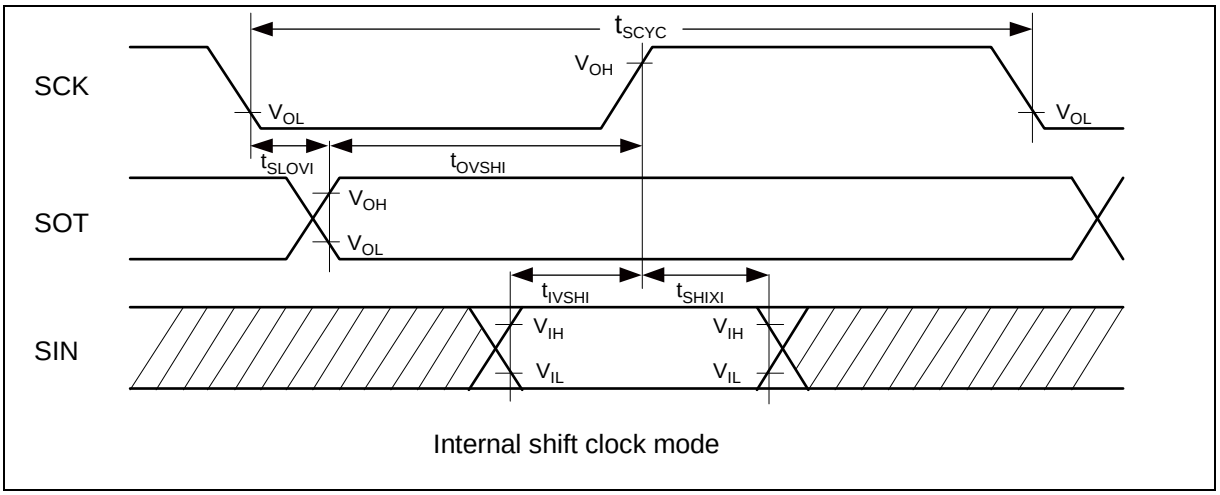


14.4.7 Power-on Reset Timing

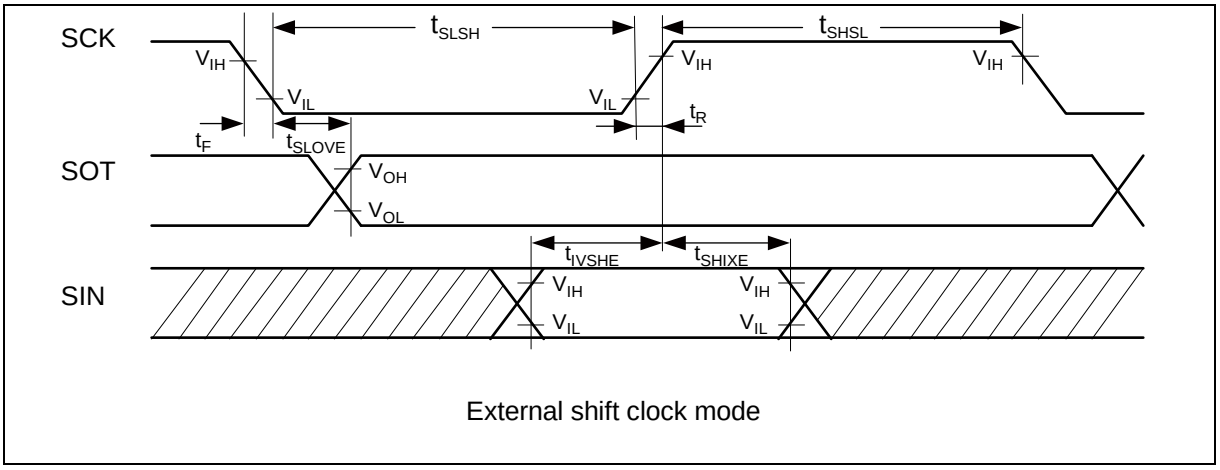
(V_{CC} = AV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = 0V, T_A = - 40°C to + 125°C)

Parameter	Symbol	Pin name	Value			Unit
			Min	Typ	Max	
Power on rise time	t_R	Vcc	0.05	-	30	ms
Power off time	t_{OFF}	Vcc	1	-	-	ms





Internal shift clock mode



External shift clock mode

■Used setting

Mode	Selected Source Clock	Clock/Regulator and FLASH Settings
Run mode	PLL	CLKS1 = CLKS2 = CLKB = CLKP1 = CLKP2 = 32MHz
	Main osc.	CLKS1 = CLKS2 = CLKB = CLKP1 = CLKP2 = 4MHz
	RC clock fast	CLKS1 = CLKS2 = CLKB = CLKP1 = CLKP2 = 2MHz
	RC clock slow	CLKS1 = CLKS2 = CLKB = CLKP1 = CLKP2 = 100kHz
	Sub osc.	CLKS1 = CLKS2 = CLKB = CLKP1 = CLKP2 = 32kHz
Sleep mode	PLL	CLKS1 = CLKS2 = CLKP1 = CLKP2 = 32MHz Regulator in High Power Mode, (CLKB is stopped in this mode)
	Main osc.	CLKS1 = CLKS2 = CLKP1 = CLKP2 = 4MHz Regulator in High Power Mode, (CLKB is stopped in this mode)
	RC clock fast	CLKS1 = CLKS2 = CLKP1 = CLKP2 = 2MHz Regulator in High Power Mode, (CLKB is stopped in this mode)
	RC clock slow	CLKS1 = CLKS2 = CLKP1 = CLKP2 = 100kHz Regulator in Low Power Mode, (CLKB is stopped in this mode)
	Sub osc.	CLKS1 = CLKS2 = CLKP1 = CLKP2 = 32kHz Regulator in Low Power Mode, (CLKB is stopped in this mode)
Timer mode	PLL	CLKMC = 4MHz, CLKPLL = 32MHz (System clocks are stopped in this mode) Regulator in High Power Mode, FLASH in Power-down / reset mode
	Main osc.	CLKMC = 4MHz (System clocks are stopped in this mode) Regulator in High Power Mode, FLASH in Power-down / reset mode
	RC clock fast	CLKMC = 2MHz (System clocks are stopped in this mode) Regulator in High Power Mode, FLASH in Power-down / reset mode
	RC clock slow	CLKMC = 100kHz (System clocks are stopped in this mode) Regulator in Low Power Mode, FLASH in Power-down / reset mode
	Sub osc.	CLKMC = 32 kHz (System clocks are stopped in this mode) Regulator in Low Power Mode, FLASH in Power-down / reset mode
Stop mode	stopped	(All clocks are stopped in this mode) Regulator in Low Power Mode, FLASH in Power-down / reset mode

16. Ordering Information

MCU with CAN controller

Part number	Flash memory	Package*
MB96F633RBPMC-GSE1	Flash A (96.5KB)	80-pin plastic LQFP (FPT-80P-M21)
MB96F633RBPMC-GSE2		
MB96F635RBPMC-GSE1	Flash A (160.5KB)	80-pin plastic LQFP (FPT-80P-M21)
MB96F635RBPMC-GSE2		
MB96F636RBPMC-GSE1	Flash A (288.5KB)	80-pin plastic LQFP (FPT-80P-M21)
MB96F636RBPMC-GSE2		
MB96F637RBPMC-GSE1	Flash A (416.5KB)	80-pin plastic LQFP (FPT-80P-M21)
MB96F637RBPMC-GSE2		

*: For details about package, see "Package Dimension".

MCU without CAN controller

Part number	Flash memory	Package*
MB96F633ABPMC-GSE1	Flash A (96.5KB)	80-pin plastic LQFP (FPT-80P-M21)
MB96F633ABPMC-GSE2		
MB96F635ABPMC-GSE1	Flash A (160.5KB)	80-pin plastic LQFP (FPT-80P-M21)
MB96F635ABPMC-GSE2		

*: For details about package, see "Package Dimension".

18. Major Changes

Spansion Publication Number: MB96F636-DS704-00012

Page	Section	Change Results
Revision 1.0		
-	-	PRELIMINARY → Data sheet
2	Features	Changed the description of “System clock” Up to 16 MHz external clock for devices with fast clock input feature → Up to 8 MHz external clock for devices with fast clock input feature
4		Changed the description of “External Interrupts” Interrupt mask and pending bit per channel → Interrupt mask bit per channel
		Changed the description of “Built-in On Chip Debugger” - Event sequencer: 2 levels → - Event sequencer: 2 levels + reset
5	Product Lineup	Added the Product
		Changed the Remark of RLT RLT 0/1/6 Only RLT6 can be used as PPG clock source → RLT 0/1/6
6	Block Diagram	Deleted the block of RLT6 from PPG block
		Changed the RLT block 2ch → 0/1/6 3ch
8	Pin Description	Changed the Description of PPGn_B Programmable Pulse Generator n output (8bit) → Programmable Pulse Generator n output (16bit/8bit)
13	I/O Circuit Type	Changed the figure of type B
		Changed the Remarks of type B (CMOS hysteresis input with input shutdown function, I_{OL} = 4mA, I_{OH} = -4mA, Programmable pull-up resister) → (CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA), Automotive input with input shutdown function and programmable pull-up resistor)
14		Changed the figure of type G
17	Memory Map	Changed the START addresses of Boot-ROM $0F:E000_H$ → $0F:C000_H$
19	User Rom Memory Map For Flash Devices	Changed the annotation Others (from $DF:0200_H$ to $DF:1FFF_H$) are all mirror area of SAS-512B. → Others (from $DF:0200_H$ to $DF:1FFF_H$) is mirror area of SAS-512B.

Page	Section	Change Results
36	3. DC Characteristics (1) Current Rating	Deleted “(Target value)” from Remarks
		Added the Symbol to “Power supply current in Run modes” I_{CCRCH}, I_{CCRCL}
		Changed the Conditions of I_{CCPLL}, I_{CCMAIN}, I_{CCSUB} in “Power supply current in Run modes” “Flash 0 wait” is added
		Changed the Value of “Power supply current in Run modes” I_{CCPLL} Max: 37.5mA → 37mA (T_A = +105°C) Max: 39mA → 38.5mA (T_A = +125°C) I_{CCMAIN} Max: 9mA → 8mA (T_A = +105°C) Max: 10.5mA → 9.5mA (T_A = +125°C) I_{CCSUB} Max: 6mA → 3.3mA (T_A = +105°C) Max: 7.5mA → 4.8mA (T_A = +125°C)
37		Added the Symbol to “Power supply current in Sleep modes” I_{CCSRCH}, I_{CCSRCL}
		Changed the Conditions of $I_{CCSMAIN}$ in “Power supply current in Sleep modes” “SMCR:LPMSS=0” is added
		Changed the Value of “Power supply current in Sleep modes” I_{CCSPLL} Typ: 10mA → 8.5mA (T_A = +25°C) Max : 15mA → 14mA (T_A = +105°C) Max : 16.5mA → 15.5mA (T_A = +125°C) $I_{CCSMAIN}$ Max: 7mA → 4.5m A (T_A = +105°C) Max : 8.5mA → 6mA (T_A = +125°C) I_{CCSSUB} Typ: 0.08mA → 0.04m A (T_A = +25°C) Max: 4mA → 2.5m A (T_A = +105°C) Max : 5.5mA → 4mA (T_A = +125°C)
38		Added the Symbol to “Power supply current in Timer modes” I_{CCTPLL}
		Changed the Conditions of $I_{CCTMAIN}$, I_{CCTRCH} in “Power supply current in Timer modes” “SMCR:LPMSS=0” is added
		Changed the Value of “Power supply current in Timer modes” $I_{CCTMAIN}$ Max: 355µA → 330µA (T_A = +25°C) Max: 1300µA → 1195µA (T_A = +105°C) Max: 2310µA → 2165µA (T_A = +125°C) I_{CCTRCH} Max: 245µA → 215µA (T_A = +25°C) Max: 1215µA → 1095µA (T_A = +105°C) Max: 2215µA → 2075µA (T_A = +125°C) I_{CCTRCL} Max: 105µA → 75µA (T_A = +25°C) Max: 1010µA → 905µA (T_A = +105°C) Max: 2015µA → 1880µA (T_A = +125°C) I_{CCTSUB} Max: 90µA → 65µA (T_A = +25°C) Max: 985µA → 885µA (T_A = +105°C) Max: 1990µA → 1850µA (T_A = +125°C)

Page	Section	Change Results
39	3. DC Characteristics (1) Current Rating	Changed the Value of “Power supply current in Stop modes” I_{CCH} Max: 90µA → 60µA (T_A = +25°C) Max: 985µA → 880µA (T_A = +105°C) Max: 1985µA → 1845µA (T_A = +125°C)
		Added the Symbol $I_{CCFLASHPD}$
		Changed the Value and condition of “Power supply current for active Low Voltage detector” I_{CCLVD} Typ: 5µA, Max: 15µA, Remarks: nothing → Typ: 5µA, Max: -, Remarks: T_A = +25°C Typ: -, Max: 12.5µA, Remarks: T_A = +125°C
		Changed the condition of “Flash Write/Erase current” $I_{CCFLASH}$ Typ: 12.5mA, Max: 20mA, Remarks: nothing → Typ: 12.5mA, Max: -, Remarks: T_A = +25°C Typ: -, Max: 20mA, Remarks: T_A = +125°C
		Changed the annotation *2 The power supply current is measured with a 4MHz external clock connected to the Main oscillator and a 32kHz external clock connected to the Sub oscillator. → When Flash is not in Power-down / reset mode, $I_{CCFLASHPD}$ must be added to the Power supply current. The power supply current is measured with a 4MHz external clock connected to the Main oscillator and a 32kHz external clock connected to the Sub oscillator. The current for "On Chip Debugger" part is not included.
40	3. DC Characteristics (2) Pin Characteristics	Added the Symbol for DEBUG I/F pin V_{OLD}
41		Changed the Pin name of “Input capacitance” Other than Vcc, Vss, AVcc, AVss, AVRH → Other than C, Vcc, Vss, AVcc, AVss, AVRH
		Deleted the annotation “I_{OH} and I_{OL} are target value.”
42	4. AC Characteristics (1) Main Clock Input Characteristics	Changed MAX frequency for f_{FCI} in all conditions 16→8 Changed MIN frequency for t_{CYLH} 62.5→125 Changed MIN, MAX and Unit for P_{WH} , P_{WL} MIN: 30→55 MAX: 70→- Unit: %→ns
		Added the figure (t_{CYLH}) when using the external clock
43	4. AC Characteristics (2) Sub Clock Input Characteristics	Added the figure (t_{CYLL}) when using the crystal oscillator clock

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