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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, LCD, LVD, POR, PWM, WDT
Number of I/O	77
Program Memory Size	160KB (160K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	8K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 27x8/10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	100-LQFP
Supplier Device Package	100-LQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/mb96f695abpmc-gse2

- Internal clock divider and prescaler provide exact 1s clock

External Interrupts

- Edge or Level sensitive
- Interrupt mask bit per channel
- Each available CAN channel RX has an external interrupt for wake-up
- Selected USART channels SIN have an external interrupt for wake-up

Non Maskable Interrupt

- Disabled after reset, can be enabled by Boot-ROM depending on ROM configuration block
- Once enabled, cannot be disabled other than by reset
- High or Low level sensitive
- Pin shared with external interrupt 0

I/O Ports

- Most of the external pins can be used as general purpose I/O
- All push-pull outputs(except when used as I^2C SDA/SCL line)
- Bit-wise programmable as input/output or peripheral signal
- Bit-wise programmable input enable
- One input level per GPIO-pin (either Automotive or CMOS hysteresis)
- Bit-wise programmable pull-up resistor

Built-in On Chip Debugger (OCD)

- One-wire debug tool interface
- Break function:
  - Hardware break: 6 points (shared with code event)
  - Software break: 4096 points
- Event function
  - Code event: 6 points (shared with hardware break)
  - Data event: 6 points
  - Event sequencer: 2 levels + reset
- Execution time measurement function
- Trace function: 42 branches
- Security function

Flash Memory

- Dual operation flash allowing reading of one Flash bank while programming or erasing the other bank
- Command sequencer for automatic execution of programming algorithm and for supporting DMA for programming of the Flash Memory
- Supports automatic programming, Embedded Algorithm
- Write/Erase/Erase-Suspend/Resume commands
- A flag indicating completion of the automatic algorithm
- Erase can be performed on each sector individually
- Sector protection
- Flash Security feature to protect the content of the Flash
- Low voltage detection during Flash erase or write

1. Product Lineup

Features		CY96690	Remark
Product Type		Flash Memory Product	
Subclock		Subclock can be set by software	
Dual Operation Flash Memory	RAM	-	
64.5KB + 32KB	8KB	CY96F693R, CY96F693A	Product Options R: MCU with CAN A: MCU without CAN
128.5KB + 32KB	8KB	CY96F695R, CY96F695A	
256.5KB + 32KB	16KB	CY96F696R	
Package		LQFP-100 LQI100	
DMA		4ch	
USART		5ch	LIN-USART 0 to 2/4/5
	with automatic LIN-Header transmission/reception	2ch	LIN-USART 0/1
	with 16 byte RX- and TX-FIFO		
I^2C		1ch	I^2C 0
8/10-bit A/D Converter		27ch	AN 2 to 4/6 to 8/10 to 12/ 14 to 31
	with Data Buffer	No	
	with Range Comparator	Yes	
	with Scan Disable	Yes	
	with ADC Pulse Detection	Yes	
16-bit Reload Timer (RLT)		5ch	RLT 0 to 3/6
16-bit Free-Running Timer (FRT)		2ch	FRT 0/1
16-bit Input Capture Unit (ICU)		6ch (5 channels for LIN-USART)	ICU 0/1/4 to 7 (ICU 0/1/4 to 6 for LIN-USART)
16-bit Output Compare Unit (OCU)		4ch	OCU 0 to 3
8/16-bit Programmable Pulse Generator (PPG)		10ch (16-bit) / 14ch (8-bit)	PPG 0 to 7/14/15
	with Timing point capture	Yes	
	with Start delay	Yes	
	with Ramp	No	
CAN Interface		1ch	CAN 0 32 Message Buffers
Stepping Motor Controller (SMC)		4ch	SMC 0 to 2/4
External Interrupts (INT)		16ch	INT 0 to 15
Non-Maskable Interrupt (NMI)		1ch	
Sound Generator (SG)		2ch	SG 0/1
LCD Controller		4COM × 36SEG	COM 0 to 3 SEG 0 to 4/7/ 11 to 28/30/33/36 to 45
Real Time Clock (RTC)		1ch	
I/O Ports		75 (Dual clock mode) 77 (Single clock mode)	
Clock Calibration Unit (CAL)		1ch	
Clock Output Function		2ch	
Low Voltage Detection Function		Yes	Low voltage detection function can be disabled by software
Hardware Watchdog Timer		Yes	
On-chip RC-oscillator		Yes	
On-chip Debugger		Yes	

Note:

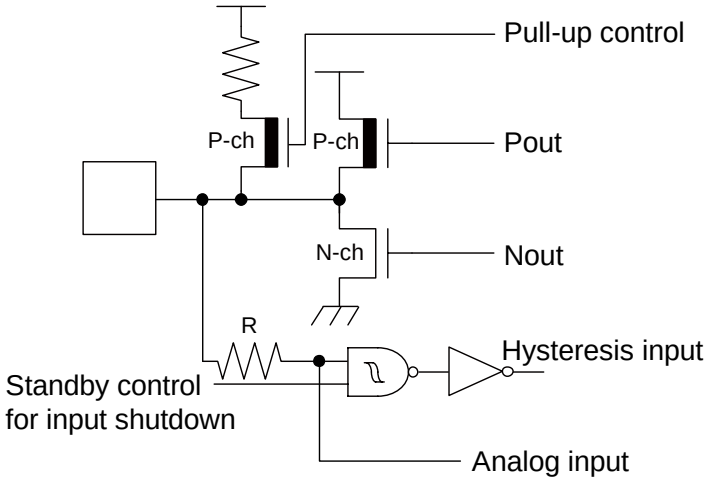
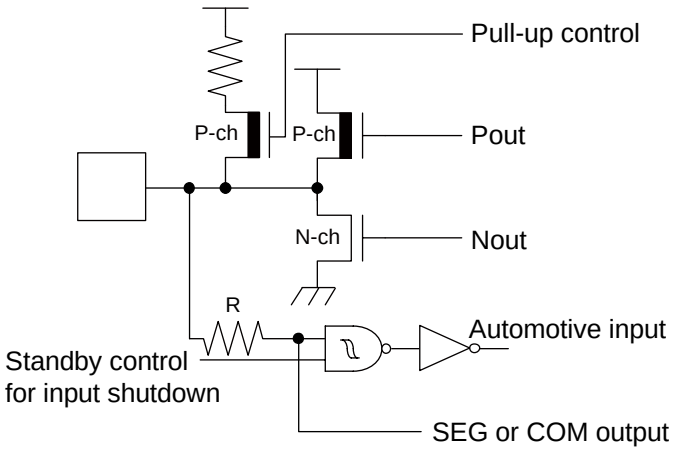
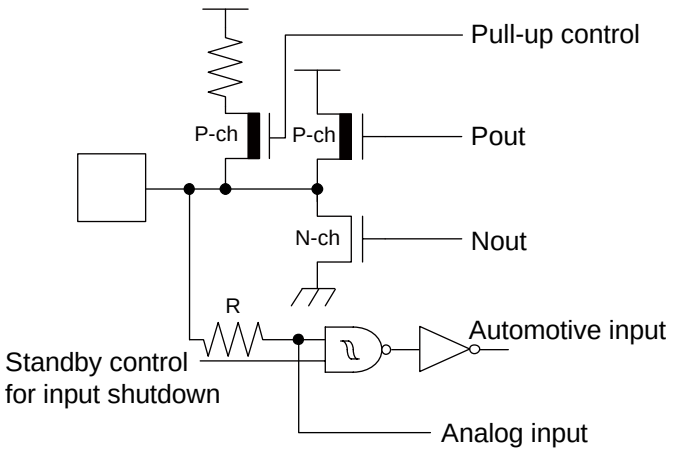
- *All signals of the peripheral function in each product cannot be allocated by limiting the pins of package. It is necessary to use the port relocate function of the general I/O port according to your function use.*

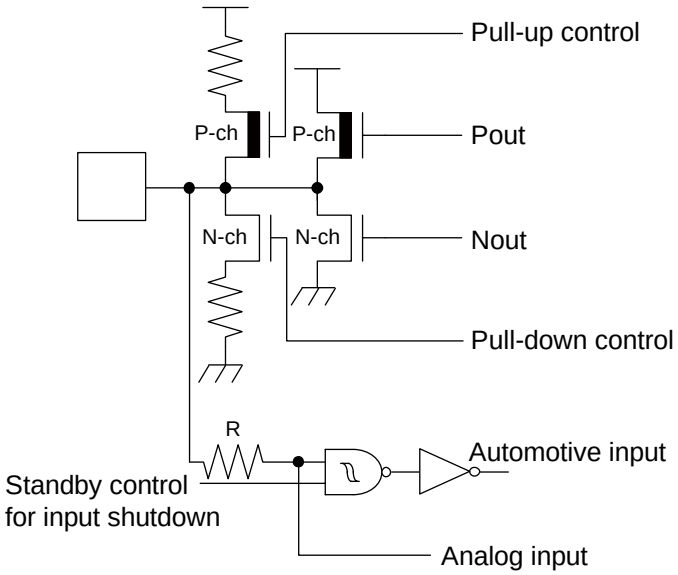
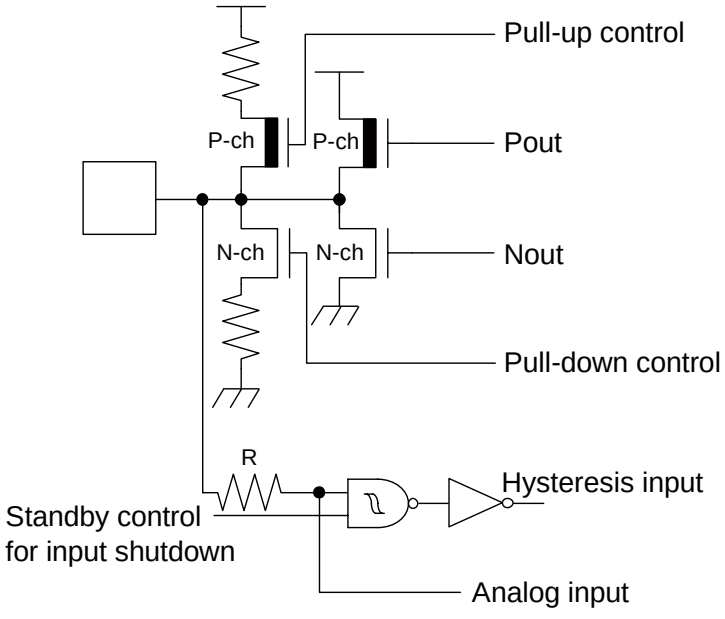
5. Pin Circuit Type

Pin No.	I/O Circuit Type*	Pin Name
1	Supply	Vss
2	F	C
3	P	P03_7 / INT1 / SIN1 / SEG40
4	J	P13_0 / INT2 / SOT1 / SEG41
5	P	P13_1 / INT3 / SCK1 / SEG42
6	J	P13_2 / PPG0 / TIN0 / FRCK1 / SEG43
7	J	P13_3 / PPG1 / TOT0 / WOT / SEG44
8	P	P13_4 / SIN0 / INT6 / SEG45
9	H	P13_5 / SOT0 / ADTG / INT7
10	M	P13_6 / SCK0 / CKOTX0
11	N	P04_4 / PPG3 / SDA0
12	N	P04_5 / PPG4 / SCL0
13	I	P06_2 / AN2 / INT5 / SIN5
14	K	P06_3 / AN3 / FRCK0
15	K	P06_4 / AN4 / IN0 / TTG0 / TTG4
16	K	P06_6 / AN6 / TIN1 / IN4_R
17	K	P06_7 / AN7 / TOT1 / IN5_R
18	Supply	AVcc
19	G	AVRH
20	G	AVRL
21	Supply	AVss
22	K	P05_0 / AN8
23	K	P05_2 / AN10 / OUT2 / SGO1
24	K	P05_3 / AN11 / OUT3 / SGA1
25	Supply	Vcc
26	Supply	Vss
27	K	P05_4 / AN12 / INT2_R / WOT_R
28	K	P05_6 / AN14 / TIN2 / SGO1_R
29	K	P05_7 / AN15 / TOT2 / SGA1_R
30	R	P08_0 / PWM1P0 / AN16
31	R	P08_1 / PWM1M0 / AN17
32	R	P08_2 / PWM2P0 / AN18
33	R	P08_3 / PWM2M0 / AN19
34	R	P08_4 / PWM1P1 / AN20
35	Supply	DVcc
36	Supply	DVss
37	R	P08_5 / PWM1M1 / AN21
38	R	P08_6 / PWM2P1 / AN22 / PPG6_B

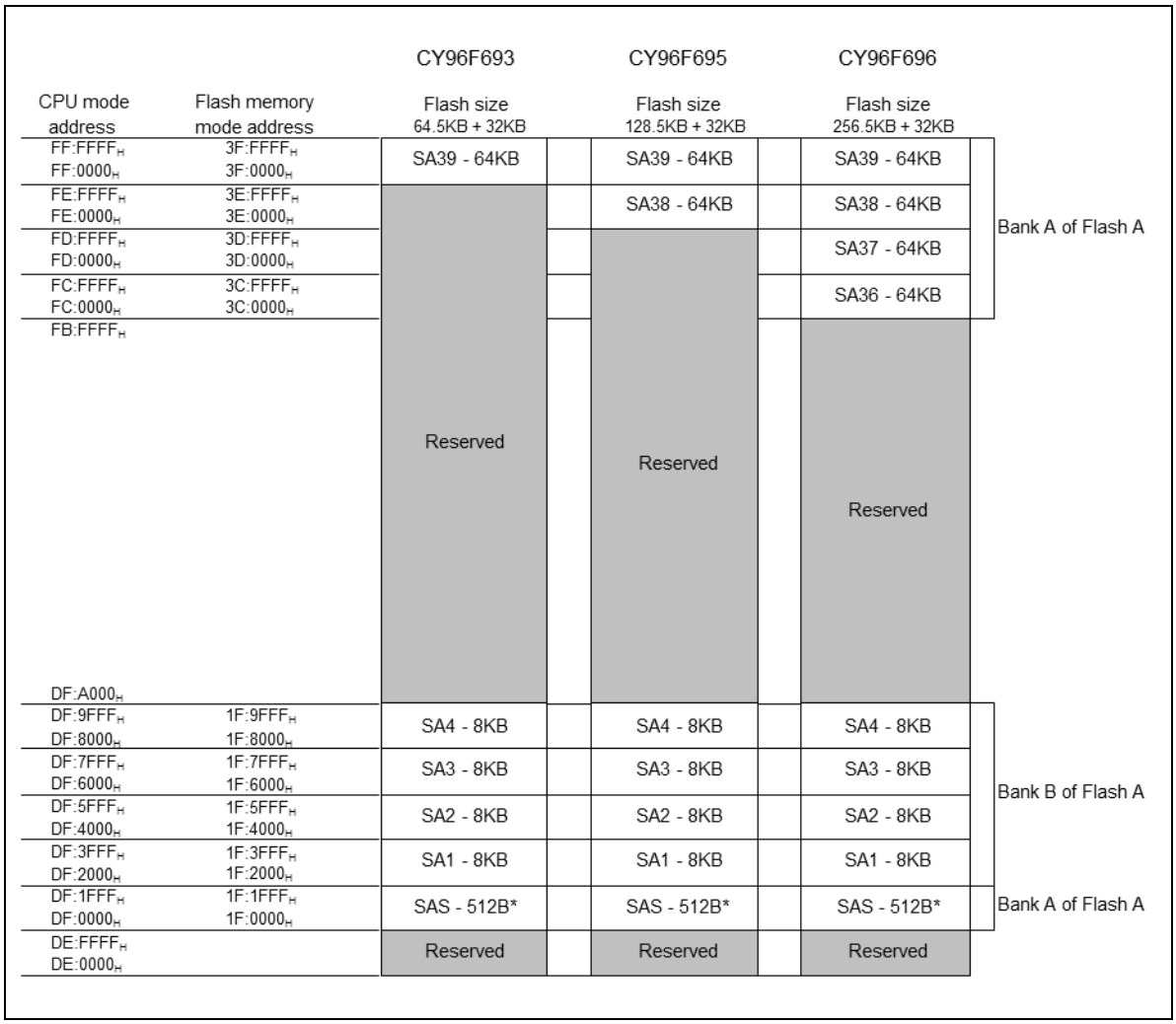
Pin No.	I/O Circuit Type*	Pin Name
78	J	P00_4 / SEG16 / INT7_R
79	J	P00_5 / SEG17 / IN6 / TTG2 / TTG6
80	J	P00_6 / SEG18 / IN7 / TTG3 / TTG7
81	J	P00_7 / SEG19 / SGO0 / INT14
82	J	P01_0 / SEG20 / SGA0
83	J	P01_1 / SEG21 / CKOT1 / OUT0
84	J	P01_2 / SEG22 / CKOTX1 / OUT1 / INT15
85	J	P01_3 / SEG23 / PPG5
86	P	P01_4 / SEG24 / SIN4 / INT8
87	J	P01_5 / SEG25 / SOT4
88	P	P01_6 / SEG26 / SCK4 / TTG12
89	J	P01_7 / SEG27 / CKOTX1_R / INT9 / TTG13
90	J	P02_0 / SEG28 / CKOT1_R / INT10 / TTG14
91	J	P02_2 / SEG30 / IN7_R / CKOT0_R / INT12
92	P	P02_5 / SEG33 / OUT0_R / INT13 / SIN5_R
93	L	P03_0 / V0 / SEG36 / PPG4_B
94	L	P03_1 / V1 / SEG37 / PPG5_B
95	L	P03_2 / V2 / SEG38 / PPG14_B / SOT5_R
96	Q	P03_3 / V3 / SEG39 / PPG15_B / SCK5_R
97	M	P03_4 / RX0 / INT4
98	H	P03_5 / TX0
99	H	P03_6 / INT0 / NMI
100	Supply	V_{cc}

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

Type	Circuit	Remarks
I		■ CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA) ■ CMOS hysteresis input with input shutdown function ■ Programmable pull-up resistor ■ Analog input
J		■ CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA) ■ Automotive input with input shutdown function ■ Programmable pull-up resistor ■ SEG or COM output
K		■ CMOS level output (I_{OL} = 4mA, I_{OH} = -4mA) ■ Automotive input with input shutdown function ■ Programmable pull-up resistor ■ Analog input

Type	Circuit	Remarks
R		■ CMOS level output (programmable I_{OL} = 4mA, I_{OH} = -4mA and I_{OL} = 30mA, I_{OH} = -30mA) ■ Automotive input with input shutdown function ■ Programmable pull-up / pull-down resistor ■ Analog input
S		■ CMOS level output (programmable I_{OL} = 4mA, I_{OH} = -4mA and I_{OL} = 30mA, I_{OH} = -30mA) ■ CMOS hysteresis input with input shutdown function ■ Programmable pull-up / pull-down resistor ■ Analog input

9. User ROM Memory Map for Flash Devices



CPU mode address	Flash memory mode address	CY96F693 Flash size 64.5KB + 32KB	CY96F695 Flash size 128.5KB + 32KB	CY96F696 Flash size 256.5KB + 32KB	
FF:FFFF$_H$ FF:0000$_H$	3F:FFFF$_H$ 3F:0000$_H$	SA39 - 64KB	SA39 - 64KB	SA39 - 64KB	Bank A of Flash A
FE:FFFF$_H$ FE:0000$_H$	3E:FFFF$_H$ 3E:0000$_H$	Reserved	SA38 - 64KB	SA38 - 64KB	
FD:FFFF$_H$ FD:0000$_H$	3D:FFFF$_H$ 3D:0000$_H$		Reserved	SA37 - 64KB	
FC:FFFF$_H$ FC:0000$_H$	3C:FFFF$_H$ 3C:0000$_H$			SA36 - 64KB	
FB:FFFF$_H$				Reserved	
DF:A000$_H$					
DF:9FFF$_H$ DF:8000$_H$	1F:9FFF$_H$ 1F:8000$_H$	SA4 - 8KB	SA4 - 8KB	SA4 - 8KB	Bank B of Flash A
DF:7FFF$_H$ DF:6000$_H$	1F:7FFF$_H$ 1F:6000$_H$	SA3 - 8KB	SA3 - 8KB	SA3 - 8KB	
DF:5FFF$_H$ DF:4000$_H$	1F:5FFF$_H$ 1F:4000$_H$	SA2 - 8KB	SA2 - 8KB	SA2 - 8KB	
DF:3FFF$_H$ DF:2000$_H$	1F:3FFF$_H$ 1F:2000$_H$	SA1 - 8KB	SA1 - 8KB	SA1 - 8KB	
DF:1FFF$_H$ DF:0000$_H$	1F:1FFF$_H$ 1F:0000$_H$	SAS - 512B*	SAS - 512B*	SAS - 512B*	Bank A of Flash A
DE:FFFF$_H$ DE:0000$_H$		Reserved	Reserved	Reserved	

*: Physical address area of SAS-512B is from DF:0000$_H$ to DF:01FF$_H$.
Others (from DF:0200$_H$ to DF:1FFF$_H$) is mirror area of SAS-512B.
Sector SAS contains the ROM configuration block RCBA at CPU address DF:0000$_H$ -DF:01FF$_H$.
SAS cannot be used for E^{2}PROM emulation.

10. Serial Programming Communication Interface

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

CY96690		
Pin Number	**USART Number**	**Normal Function**
8	USART0	SIN0
9		SOT0
10		SCK0
3	USART1	SIN1
4		SOT1
5		SCK1
46	USART2	SIN2
47		SOT2
48		SCK2
86	USART4	SIN4
87		SOT4
88		SCK4

Vector Number	Offset in Vector Table	Vector Name	Cleared by DMA	Index in ICR to Program	Description
82	$2B4_H$	-	-	82	Reserved
83	$2B0_H$	-	-	83	Reserved
84	$2AC_H$	-	-	84	Reserved
85	$2A8_H$	-	-	85	Reserved
86	$2A4_H$	-	-	86	Reserved
87	$2A0_H$	-	-	87	Reserved
88	$29C_H$	-	-	88	Reserved
89	298_H	FRT0	Yes	89	Free-Running Timer 0
90	294_H	FRT1	Yes	90	Free-Running Timer 1
91	290_H	-	-	91	Reserved
92	$28C_H$	-	-	92	Reserved
93	288_H	RTC0	No	93	Real Time Clock
94	284_H	CAL0	No	94	Clock Calibration Unit
95	280_H	SG0	No	95	Sound Generator 0
96	$27C_H$	IIC0	Yes	96	I^2C interface 0
97	278_H	-	-	97	Reserved
98	274_H	ADC0	Yes	98	A/D Converter 0
99	270_H	-	-	99	Reserved
100	$26C_H$	-	-	100	Reserved
101	268_H	LINR0	Yes	101	LIN USART 0 RX
102	264_H	LINT0	Yes	102	LIN USART 0 TX
103	260_H	LINR1	Yes	103	LIN USART 1 RX
104	$25C_H$	LINT1	Yes	104	LIN USART 1 TX
105	258_H	LINR2	Yes	105	LIN USART 2 RX
106	254_H	LINT2	Yes	106	LIN USART 2 TX
107	250_H	-	-	107	Reserved
108	$24C_H$	-	-	108	Reserved
109	248_H	LINR4	Yes	109	LIN USART 4 RX
110	244_H	LINT4	Yes	110	LIN USART 4 TX
111	240_H	LINR5	Yes	111	LIN USART 5 RX
112	$23C_H$	LINT5	Yes	112	LIN USART 5 TX
113	238_H	-	-	113	Reserved
114	234_H	-	-	114	Reserved
115	230_H	-	-	115	Reserved
116	$22C_H$	-	-	116	Reserved
117	228_H	-	-	117	Reserved
118	224_H	-	-	118	Reserved
119	220_H	-	-	119	Reserved
120	$21C_H$	-	-	120	Reserved
121	218_H	SG1	No	121	Sound Generator 1
122	214_H	-	-	122	Reserved
123	210_H	-	-	123	Reserved

Any semiconductor devices have inherently a certain rate of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

■ Precautions Related to Usage of Devices

Cypress semiconductor devices are intended for use in standard applications (computers, office automation and other office equipment, industrial, communications, and measurement equipment, personal or household devices, etc.).

CAUTION:

Customers considering the use of our products in special applications where failure or abnormal operation may directly affect human lives or cause physical injury or property damage, or where extremely high levels of reliability are demanded (such as aerospace systems, atomic energy controls, sea floor repeaters, vehicle operating controls, medical devices for life support, etc.) are requested to consult with sales representatives before such use. The company will not be responsible for damages arising from such use without prior approval.

12.2 Precautions for Package Mounting

Package mounting may be either lead insertion type or surface mount type. In either case, for heat resistance during soldering, you should only mount under Cypress recommended conditions. For detailed information about mount conditions, contact your sales representative.

■ Lead Insertion Type

Mounting of lead insertion type packages onto printed circuit boards may be done by two methods: direct soldering on the board, or mounting by using a socket.

Direct mounting onto boards normally involves processes for inserting leads into through-holes on the board and using the flow soldering (wave soldering) method of applying liquid solder. In this case, the soldering process usually causes leads to be subjected to thermal stress in excess of the absolute ratings for storage temperature. Mounting processes should conform to Cypress recommended mounting conditions.

If socket mounting is used, differences in surface treatment of the socket contacts and IC lead surfaces can lead to contact deterioration after long periods. For this reason it is recommended that the surface treatment of socket contacts and IC leads be verified before mounting.

■ Surface Mount Type

Surface mount packaging has longer and thinner leads than lead-insertion packaging, and therefore leads are more easily deformed or bent. The use of packages with higher pin counts and narrower pin pitch results in increased susceptibility to open connections caused by deformed pins, or shorting due to solder bridges.

You must use appropriate mounting techniques. Cypress recommends the solder reflow method, and has established a ranking of mounting conditions for each product. Users are advised to mount packages in accordance with Cypress ranking of recommended conditions.

12.3 Precautions for Use Environment

Reliability of semiconductor devices depends on ambient temperature and other conditions as described above.

For reliable performance, do the following:

1. Humidity

Prolonged use in high humidity can lead to leakage in devices as well as printed circuit boards. If high humidity levels are anticipated, consider anti-humidity processing.

2. Discharge of Static Electricity

When high-voltage charges exist close to semiconductor devices, discharges can cause abnormal operation. In such cases, use anti-static measures or processing to prevent discharges.

3. Corrosive Gases, Dust, or Oil

Exposure to corrosive gases or contact with dust or oil may lead to chemical reactions that will adversely affect the device. If you use devices in such conditions, consider ways to prevent such exposure or to protect the devices.

4. Radiation, Including Cosmic Radiation

Most devices are not designed for environments involving exposure to radiation or cosmic radiation. Users should provide shielding as appropriate.

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.

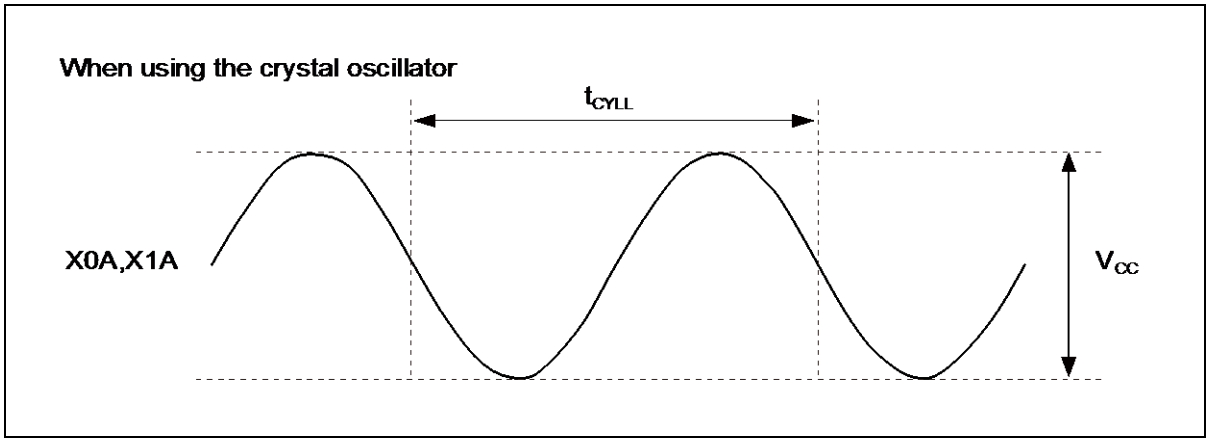
Customers considering the use of Cypress products in other special environmental conditions should consult with sales representatives.

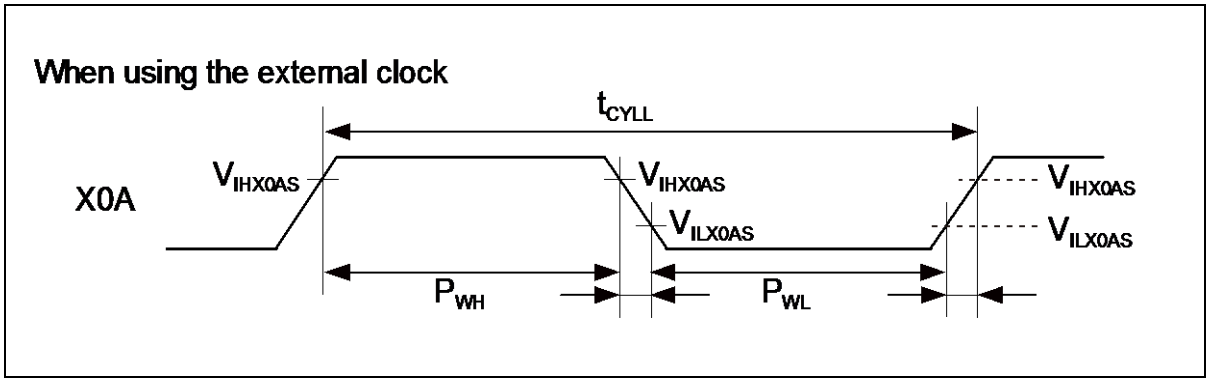
Parameter	Symbol	Pin Name	Conditions	Value			Unit	Remarks
				Min	Typ	Max		
Power supply current in Sleep modes[1]	I_{CCSPLL}	Vcc	PLL Sleep mode with CLKS1/2 = CLKP1/2 = 32MHz (CLKRC and CLKSC stopped)	-	9.5	-	mA	T_A = +25°C
				-	-	15	mA	T_A = +105°C
	$I_{CCSMAIN}$		Main Sleep mode with CLKS1/2 = CLKP1/2 = 4MHz, SMCR:LPMSS = 0 (CLKPLL, CLKRC and CLKSC stopped)	-	1.1	-	mA	T_A = +25°C
				-	-	4.7	mA	T_A = +105°C
	I_{CCSRCH}		RC Sleep mode with CLKS1/2 = CLKP1/2 = CLKRC = 2MHz, SMCR:LPMSS = 0 (CLKMC, CLKPLL and CLKSC stopped)	-	0.6	-	mA	T_A = +25°C
				-	-	4.1	mA	T_A = +105°C
	I_{CCSRCL}		RC Sleep mode with CLKS1/2 = CLKP1/2 = CLKRC = 100kHz (CLKMC, CLKPLL and CLKSC stopped)	-	0.07	-	mA	T_A = +25°C
				-	-	2.9	mA	T_A = +105°C
	I_{CCSSUB}		Sub Sleep mode with CLKS1/2 = CLKP1/2 = 32kHz, (CLKMC, CLKPLL and CLKRC stopped)	-	0.04	-	mA	T_A = +25°C
				-	-	2.7	mA	T_A = +105°C
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
	$I_{CCTMAIN}$		Main Timer mode with CLKMC = 4MHz, SMCR:LPMSS = 0 (CLKPLL, CLKRC and CLKSC stopped)	-	285	330	µA	T_A = +25°C
				-	-	1200	µA	T_A = +105°C
	I_{CCTRCH}		RC Timer mode with CLKRC = 2MHz, SMCR:LPMSS = 0 (CLKPLL, CLKMC and CLKSC stopped)	-	160	215	µA	T_A = +25°C
				-	-	1110	µA	T_A = +105°C
	I_{CCTRCL}		RC Timer mode with CLKRC = 100kHz, (CLKPLL, CLKMC and CLKSC stopped)	-	35	75	µA	T_A = +25°C
				-	-	910	µA	T_A = +105°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

14.4.2 *Sub Clock Input Characteristics*

(V_{CC} = AV_{CC} = DV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = DV_{SS} = 0V, T_A = - 40°C to + 105°C)

Parameter	Symbol	Pin Name	Conditions	Value			Unit	Remarks
				Min	Typ	Max		
Input frequency	f_{CL}	X0A, X1A	-	-	32.768	-	kHz	When using an oscillation circuit
			-	-	-	100	kHz	When using an opposite phase external clock
		X0A	-	-	-	50	kHz	When using a single phase external clock
Input clock cycle	t_{CYLL}	-	-	10	-	-	µs	
Input clock pulse width	-	-	P_{WH}/t_{CYLL}, P_{WL}/t_{CYLL}	30	-	70	%	





16. Ordering Information

MCU with CAN Controller

Part Number	Flash Memory	Package*
CY96F693RBPMC-GS-UJE1	Flash A (96.5KB)	100-pin plastic LQFP (LQI100)
CY96F696RBPMC-GS-UJE1	Flash A (288.5KB)	100-pin plastic LQFP (LQI100)
CY96F696RBPMC-GS-UJE2		

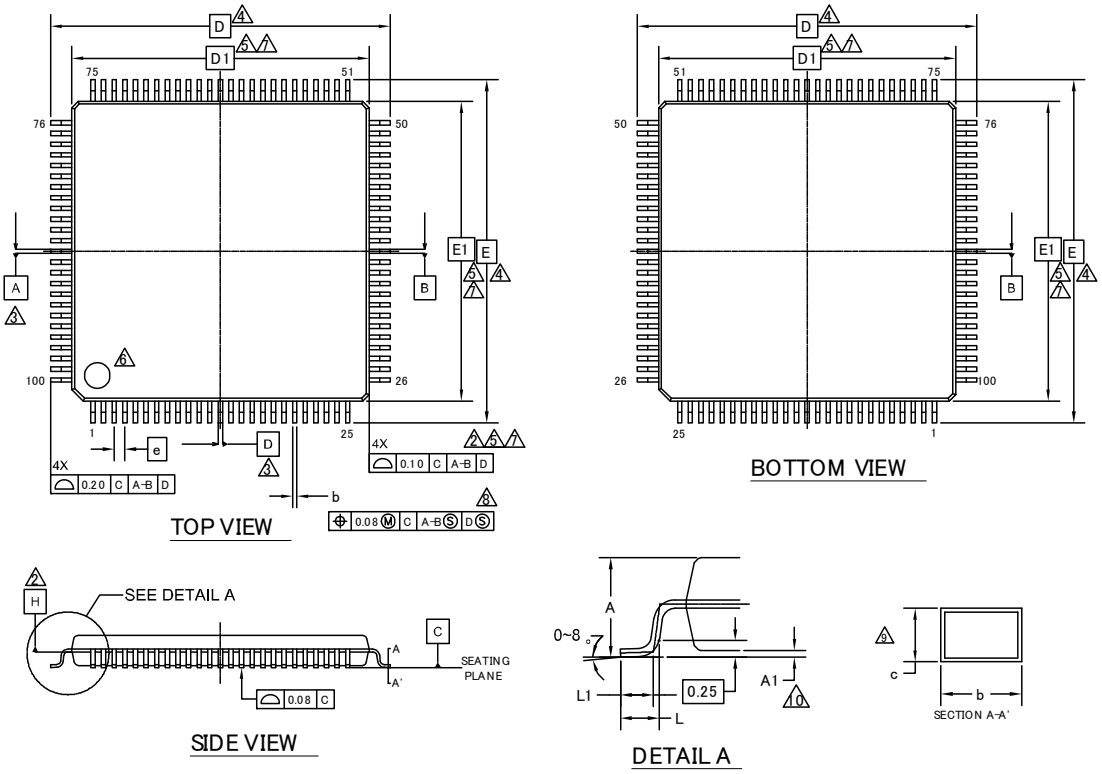
*: For details about package, see "Package Dimension".

MCU Without CAN Controller

Part Number	Flash Memory	Package*
CY96F693ABPMC-GS-UJE1	Flash A (96.5KB)	100-pin plastic LQFP (LQI100)
CY96F693ABPMC-GS-UJE2		

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

17. Package Dimension



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	—	—	1.70
A1	0.05	—	0.15
b	0.15	—	0.27
c	0.09	—	0.20
D		16.00 BSC	
D1		14.00 BSC	
e		0.50 BSC	
E		16.00 BSC	
E1		14.00 BSC	
L	0.45	0.60	0.75
L1	0.30	0.50	0.70

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DATUM PLANE H IS LOCATED AT THE BOTTOM OF THE MOLD PARTING LINE COINCIDENT WITH WHERE THE LEAD EXITS THE BODY.
3. DATUMS A-B AND D TO BE DETERMINED AT DATUM PLANE H.
4. TO BE DETERMINED AT SEATING PLANE C.
5. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25mm PRE SIDE. DIMENSIONS D1 AND E1 INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H.
6. DETAILS OF PIN 1 IDENTIFIER ARE OPTIONAL BUT MUST BE LOCATED WITHIN THE ZONE INDICATED.
7. REGARDLESS OF THE RELATIVE SIZE OF THE UPPER AND LOWER BODY SECTIONS. DIMENSIONS D1 AND E1 ARE DETERMINED AT THE LARGEST FEATURE OF THE BODY EXCLUSIVE OF MOLD FLASH AND GATE BURRS. BUT INCLUDING ANY MISMATCH BETWEEN THE UPPER AND LOWER SECTIONS OF THE MOLDER BODY.
8. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. THE DAMBAR PROTRUSION (S) SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED b MAXIMUM BY MORE THAN 0.08mm. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE LEAD FOOT.
9. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm AND 0.25mm FROM THE LEAD TIP.
10. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.

002-11500 *A

PACKAGE OUTLINE, 100 LEAD LQFP
14.0X14.0X1.7 MM LQI100 REV*A

18. Major Changes

Spansion Publication Number: MB96F696-DS704-00011

Page	Section	Change Results
Revision 1.0		
-	-	PRELIMINARY → Data sheet
1	■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
2		Changed the description of “Free-Running Timers” Signals an interrupt on overflow Signals an interrupt on overflow, supports timer clear upon match with Output Compare (0, 4)
2		Changed the description of “LCD Controller” On-chip drivers for internal divider resistors or external divider resistors Internal divider resistors or external divider resistors
3		Changed the description of “External Interrupts” Interrupt mask and pending bit per channel Interrupt mask bit per channel
3		Changed the description of “Built-in On Chip Debugger” - Event sequencer: 2 levels - Event sequencer: 2 levels + reset
6	■PRODUCT LINEUP	Added the Product
		Changed the Remark of RLT RLT 0/1/2/3/6 Only RLT6 can be used as PPG clock source RLT 0 to 3/6
		Changed number of the I/O Ports 77 (Dual clock mode) 79 (Single clock mode) 75 (Dual clock mode) 77 (Single clock mode)
7	■BLOCK DIAGRAM	Deleted the block of RLT6 from PPG block
		Changed the RLT block 4ch 0/1/2/3/6 5ch
9	■PIN DESCRIPTION	Changed the Description of PPGn_B Programmable Pulse Generator n output (8bit) Programmable Pulse Generator n output (16bit/8bit)
13	■PIN CIRCUIT TYPE	Changed the I/O circuit type of Pin no.96 P Q
14	■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)
16		Changed the figure of type G
19		Added the Type Q
21	■MEMORY MAP	Changed the START addresses of Boot-ROM 0F:$E000_H$ 0F:$C000_H$
23	■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.
25	■INTERRUPT VECTOR TABLE	Changed the Description of CALLV0 to CALLV7 Reserved CALLV instruction

Page	Section	Change Results
		Changed the Description of RESET Reserved Reset vector
		Changed the Description of INT9 Reserved INT9 instruction
		Changed the Description of EXCEPTION Reserved Undefined instruction execution
26		Changed the Vector name of Vector number 64 PPGRLT RLT6
		Changed the Description of Vector number 64 Reload Timer 6 can be used as PPG clock source Reload Timer 6
29 to 32	■HANDLING PRECAUTIONS	Added a section
33	■HANDLING DEVICES	Added the description to “3. External clock usage” (3) Opposite phase external clock
35		Changed the description in “7. Turn on sequence of power supply to A/D converter and analog inputs” In this case, the voltage must not exceed AVRH or AV_{CC} In this case, AVRH must not exceed AV_{CC}. Input voltage for ports shared with analog input ports also must not exceed AV_{CC}
35		Changed the description in “11. SMC power supply pins” To avoid this, V_{CC} must always be powered on before DV_{CC}. To avoid this, V_{CC} must always be powered on before DV_{CC}. DVcc/DVss must be applied when using SMC I/O pin as GPIO.
		Added the description “13. Mode Pin (MD)”
36	■ELECTRICAL CHARACTERISTICS 1. Absolute Maximum Ratings	Changed the Symbol of “"L" level average overall output current” $\Sigma I_{OLSMCAV}$ $\Sigma I_{OLAVSMC}$
		Changed the Symbol of “"H" level average overall output current” $\Sigma I_{OHSMCAV}$ $\Sigma I_{OHAVSMC}$
37		Changed the annotation *2 It is required that AV_{CC} does not exceed V_{CC} and that the voltage at the analog inputs does not exceed AV_{CC} when the power is switched on. It is required that AV_{CC} does not exceed V_{CC}, DV_{CC} and that the voltage at the analog inputs does not exceed AV_{CC} when the power is switched on.
		Changed the annotation *3 Input/Output voltages of standard ports depend on V_{CC}. Input/Output voltages of high current ports depend on DV_{CC}. Input/Output voltages of standard ports depend on V_{CC}.
		Changed the annotation *4 Note that if the +B input is applied during power-on, the power supply is provided from the pins and the resulting supply voltage may not be sufficient to operate the Power reset (except devices with persistent low voltage reset in internal vector mode). Note that if the +B input is applied during power-on, the power supply is provided from the pins and the resulting supply voltage may not be sufficient to operate the Power reset.
		Added the annotation *4 The DEBUG I/F pin has only a protective diode against V_{SS}. Hence it is only permitted to input a negative clamping current (4mA). For protection against positive input voltages, use an external clamping diode which limits the input voltage to maximum 6.0V.
38	2. Recommended Operating Conditions	Added the Value and Remarks to “Power supply voltage” Min: 2.0V Typ: - Max: 5.5V Remarks: Maintains RAM data in stop mode

Page	Section	Change Results
		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 = +105°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.
42	3. DC Characteristics (2) Pin Characteristics	Added the Symbol for DEBUG I/F pin V_{OLD}
43		Changed the Pin name of “Input capacitance” Other than Vcc, Vss, AVcc, AVss, AVRH, AVRL, P08_m, P09_m, P10_m Other than C, Vcc, Vss, DVcc, DVss, AVcc, AVss, AVRH, AVRL, P08_m, P09_m, P10_m
		Deleted the annotation “I_{OH} and I_{OL} are target value.”
		Added the annotation “In the case of driving stepping motor directly or high current outputs, set "1" to the bit in the Port High Drive Register (PHDRnn:HDx="1").”
46	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
47	4. AC Characteristics (2) Sub Clock Input Characteristics	Added the figure (t_{CYLL}) when using the crystal oscillator clock
48	4. AC Characteristics (3) Built-in RC Oscillation Characteristics	Added “RC clock stabilization time”
49	4. AC Characteristics (5) Operating Conditions of PLL	Changed the Value of “PLL input clock frequency” Max: 16MHz → 8MHz
		Changed the Symbol of “PLL macro oscillation clock frequency” f_{PLLO} → f_{CLKVCO}

Page	Section	Change Results
		Added Remarks to “PLL oscillation clock frequency”
		Added “ PLL phase jitter” and the figure
	4. AC Characteristics (6) Reset Input	Added the figure for reset input time (t_{RSTL})
51	4. AC Characteristics (8) USART Timing	Changed the condition (V_{CC} = AV_{CC} = DV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = DV_{SS} = 0V, T_A = - 40°C to + 105°C) (V_{CC} = AV_{CC} = DV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = DV_{SS} = 0V, T_A = - 40°C to + 105°C, C_L = 50pF)
		Changed the HARDWARE MANUAL “MB96690 series HARDWARE MANUAL” “MB96600 series HARDWARE MANUAL”
52		Changed the figure for “Internal shift clock mode”
54	4. AC Characteristics (10) I^2C timing	Added parameter, “Noise filter” and an annotation *5 for it
		Added t_{SP} to the figure
55	5. A/D Converter (1) Electrical Characteristics for the A/D Converter	Added “Analog impedance”
		Added “Variation between channels”
		Added the annotation
56	5. A/D Converter (2) Accuracy and Setting of the A/D Converter Sampling Time	Deleted the unit “[Min]” from approximation formula of Sampling time
57	5. A/D Converter (3) Definition of A/D Converter Terms	Changed the Description and the figure “Linearity” → “Nonlinearity” “Differential linearity error” “Differential nonlinearity error”
		Changed the Description Linearity error: Deviation of the line between the zero-transition point (0b0000000000←→0b0000000001) and the full-scale transition point (0b1111111110←→0b1111111111) from the actual conversion characteristics. Nonlinearity error: Deviation of the actual conversion characteristics from a straight line that connects the zero transition point (0b0000000000 ←→ 0b0000000001) to the full-scale transition point (0b1111111110 ←→ 0b1111111111).
		Added the Description “Zero transition voltage” “Full scale transition voltage”
59	6. High Current Output Slew Rate	Changed the condition (V_{CC} = AV_{CC} = 2.7V to 5.5V, DV_{CC} = 4.5V to 5.5V, V_{SS} = AV_{SS} = DV_{SS} = 0V, T_A = - 40°C to + 105°C) (V_{CC} = AV_{CC} = DV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = DV_{SS} = 0V, T_A = - 40°C to + 105°C)
		Changed the Symbol and figure t_{R2}, t_{F2}, V_{OL2} t_{R30}, t_{F30}, V_{OL30}
59	7. Low Voltage Detection Function Characteristics	Added the Value of “ Power supply voltage change rate” Max: +0.004 V/µs
		Added “Hysteresis width” (V_{HYS})
		Added “Stabilization time” ($T_{LVDSTAB}$)
		Added “Detection delay time” (t_d)
		Deleted the Remarks
		Added the annotation *1, *2
59	7. Low Voltage Detection Function Characteristics	Added the figure for “Hysteresis width”
		Added the figure for “Stabilization time”

Document History

Document Title: CY96690 Series F²MC-16FX 16-Bit Proprietary Microcontroller
Document Number: 002-04717

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	–	TORS	01/31/2014	Migrated to Cypress and assigned document number 002-04717. No change to document contents or format.
*A	5148388	TORS	09/22/2016	Updated to Cypress template
*B	6006770	MIYH	12/28/2017	Revised the following items: Marketing Part Numbers changed from an MB prefix to a CY prefix. 1. Product Lineup 3. Pin Assignment 16. Ordering Information 17. Package Dimension For details, please see 18. Major Changes.