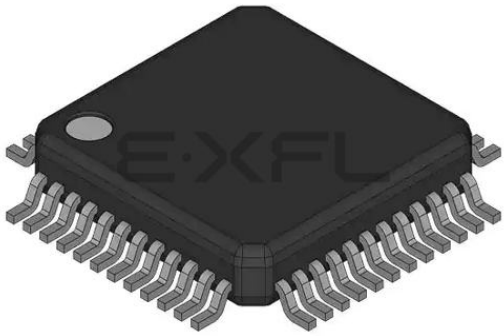

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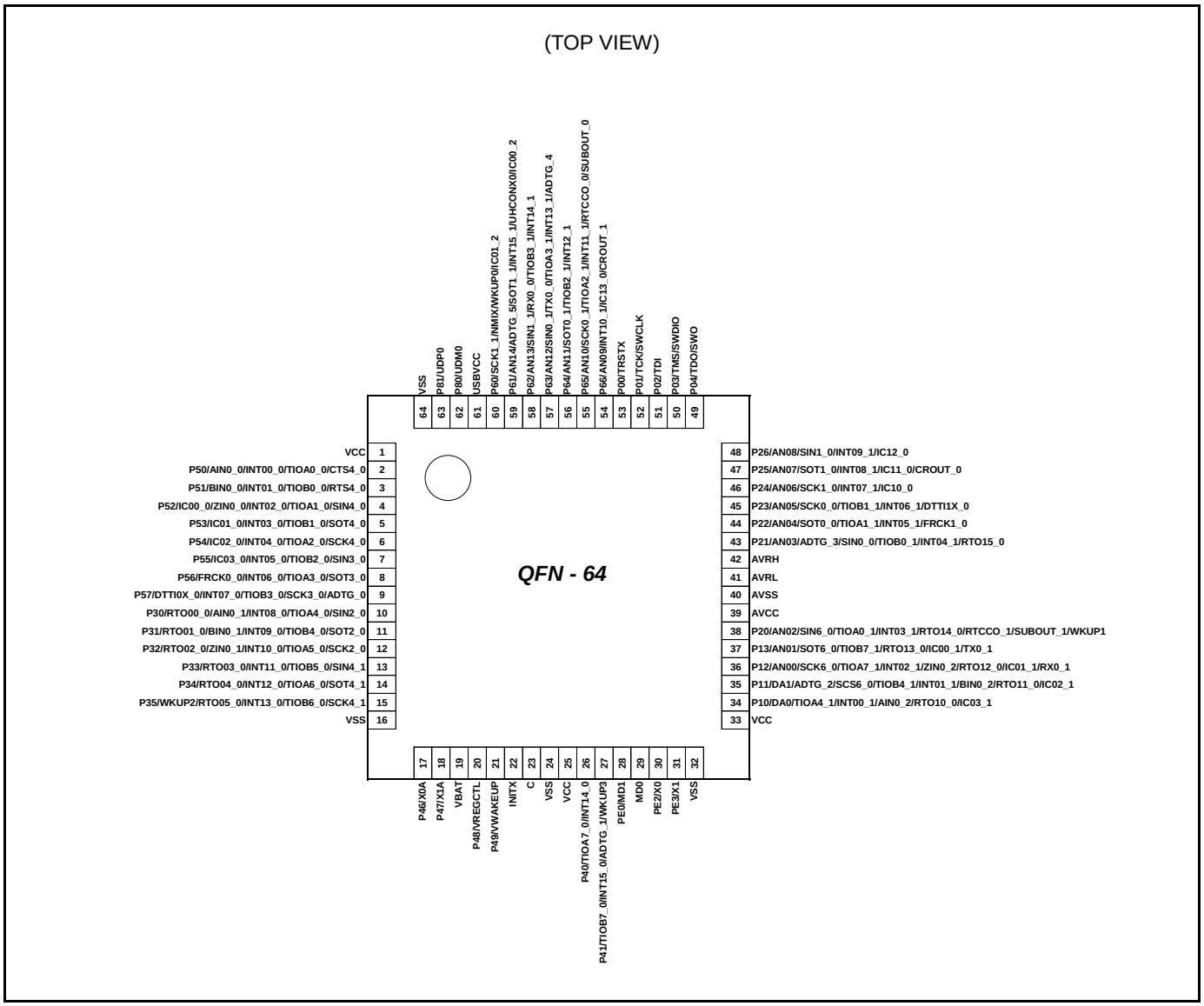
"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" 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	Active
Core Processor	ARM® Cortex®-M4F
Core Size	32-Bit Single-Core
Speed	160MHz
Connectivity	CSIO, I²C, LINbus, UART/USART, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	33
Program Memory Size	544KB (544K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	64K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 8x12b; D/A 2x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Surface Mount
Package / Case	48-LQFP
Supplier Device Package	48-LQFP (7x7)
Purchase URL	https://www.e-xfl.com/product-detail/rochester-electronics/mb9bf366kpmc-g-jne2

LCC-64P-M24



Note:

- *The number after the underscore ("_") in pin names such as XXX_1 and XXX_2 indicates the relocated port number. For these pins, there are multiple pins that provide the same function for the same channel. Use the extended port function register (EPFR) to select the pin.*

Pin No		Pin Name	I/O circuit type	Pin state type
LQFP64 QFN64	LQFP48 QFN48			
36	27	P12	M	M
		AN00		
		SCK6_0		
		TIOA7_1		
		INT02_1		
		ZIN0_2		
		IC01_1		
	-	RTO12_0		
37	28	P13	M	L
		AN01		
		SOT6_0 (SDA6_0)		
		TIOB7_1		
		IC00_1		
	-	RTO13_0		
38	29	P20	F	O
		AN02		
		SIN6_0		
		TIOA0_1		
		INT03_1		
		RTCCO_1		
		SUBOUT_1		
		WKUP1		
	-	RTO14_0		
39	30	AVCC	-	-
40	31	AVSS	-	-
41	32	AVRL	-	-
42	33	AVRH	-	-
43	34	P21	F	M
		AN03		
		ADTG_3		
		SIN0_0		
		TIOB0_1		
		INT04_1		
	-	RTO15_0		
44	35	P22	F	M
		AN04		
		SOT0_0 (SDA0_0)		
		TIOA1_1		
		INT05_1		
	-	FRCK1_0		
45	36	P23	F	M
		AN05		
		SCK0_0 (SCL0_0)		
		TIOB1_1		
		INT06_1		
	-	DTTI1X_0		

4.2 List of Pin Functions

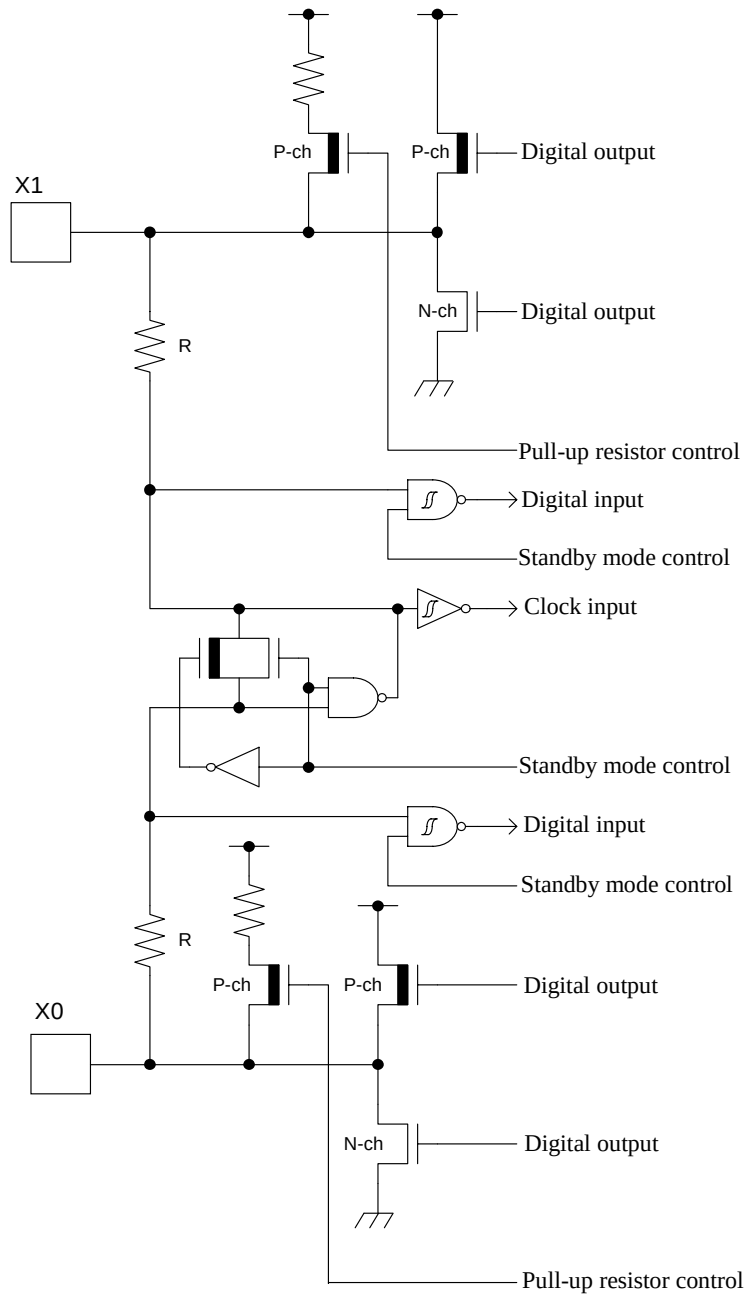
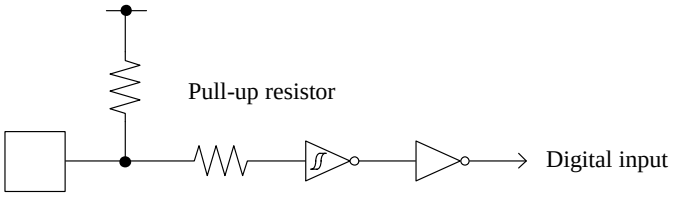
The number after the underscore ("_") in pin names such as XXX_1 and XXX_2 indicates the relocated port number. For these pins, there are multiple pins that provide the same function for the same channel. Use the extended port function register (EPFR) to select the pin.

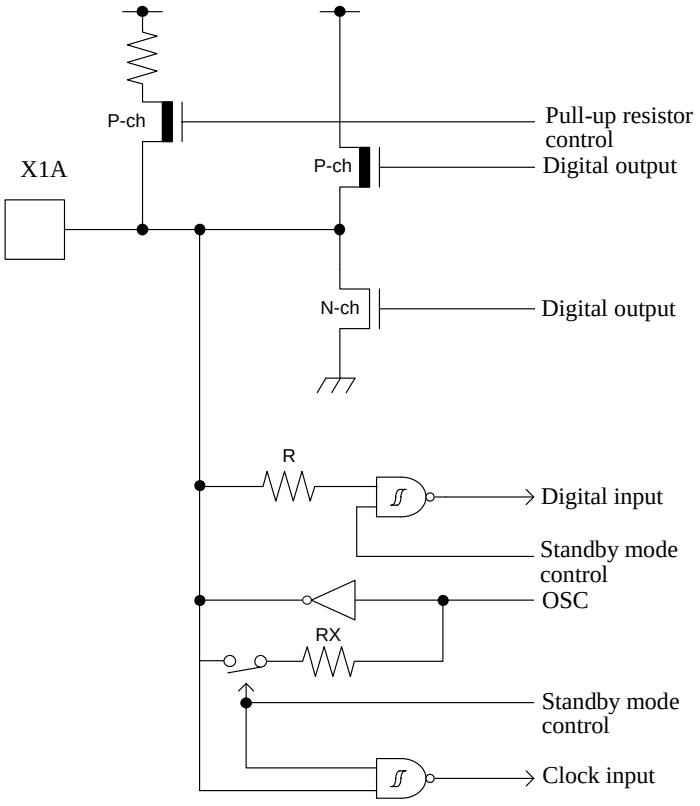
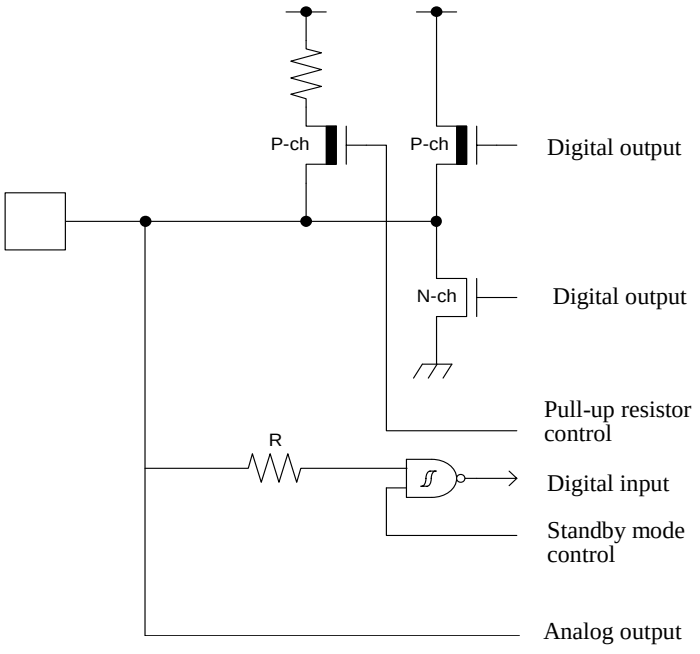
Pin function	Pin name	Function description	Pin No	
			LQFP64 QFN64	LQFP48 QFN48
ADC	ADTG_0	A/D converter external trigger input pin	9	5
	ADTG_1		27	-
	ADTG_2		35	26
	ADTG_3		43	34
	ADTG_4		57	-
	ADTG_5		59	43
	AN00	A/D converter analog input pin. ANxx describes ADC ch.xx.	36	27
	AN01		37	28
	AN02		38	29
	AN03		43	34
	AN04		44	35
	AN05		45	36
	AN06		46	-
	AN07		47	-
	AN08		48	-
	AN09		54	42
	AN10		55	-
	AN11		56	-
	AN12		57	-
	AN13		58	-
	AN14		59	43
Base Timer 0	TIOA0_0	Base timer ch.0 TIOA pin	2	-
	TIOA0_1		38	29
	TIOB0_0	Base timer ch.0 TIOB pin	3	-
	TIOB0_1		43	34
Base Timer 1	TIOA1_0	Base timer ch.1 TIOA pin	4	-
	TIOA1_1		44	35
	TIOB1_0	Base timer ch.1 TIOB pin	5	-
	TIOB1_1		45	36
Base Timer 2	TIOA2_0	Base timer ch.2 TIOA pin	6	2
	TIOA2_1		55	-
	TIOB2_0	Base timer ch.2 TIOB pin	7	3
	TIOB2_1		56	-
Base Timer 3	TIOA3_0	Base timer ch.3 TIOA pin	8	4
	TIOA3_1		57	-
	TIOB3_0	Base timer ch.3 TIOB pin	9	5
	TIOB3_1		58	-
Base Timer 4	TIOA4_0	Base timer ch.4 TIOA pin	10	6
	TIOA4_1		34	25
	TIOB4_0	Base timer ch.4 TIOB pin	11	7
	TIOB4_1		35	26
Base Timer 5	TIOA5_0	Base timer ch.5 TIOA pin	12	8
	TIOB5_0	Base timer ch.5 TIOB pin	13	9

Pin function	Pin name	Function description	Pin No	
			LQFP64 QFN64	LQFP48 QFN48
Multi-function Timer 1	DTTI1X_0	Input signal controlling wave form generator outputs RTO10 to RTO15 of Multi-function timer 1.	45	-
	FRCK1_0	16-bit free-run timer ch.1 external clock input pin	44	-
	IC10_0	16-bit input capture ch.1 input pin of Multi-function timer 1. ICxx describes channel number.	46	-
	IC11_0		47	-
	IC12_0		48	-
	IC13_0		54	-
	RTO10_0 (PPG10_0)	Wave form generator output pin of Multi-function timer 1. This pin operates as PPG10 when it is used in PPG1 output modes.	34	-
	RTO11_0 (PPG10_0)	Wave form generator output pin of Multi-function timer 1. This pin operates as PPG10 when it is used in PPG1 output modes.	35	-
	RTO12_0 (PPG12_0)	Wave form generator output pin of Multi-function timer 1. This pin operates as PPG12 when it is used in PPG1 output modes.	36	-
	RTO13_0 (PPG12_0)	Wave form generator output pin of Multi-function timer 1. This pin operates as PPG12 when it is used in PPG1 output modes.	37	-
	RTO14_0 (PPG14_0)	Wave form generator output pin of Multi-function timer 1. This pin operates as PPG14 when it is used in PPG1 output modes.	38	-
	RTO15_0 (PPG14_0)	Wave form generator output pin of Multi-function timer 1. This pin operates as PPG14 when it is used in PPG1 output modes.	43	-
Quadrature Position/ Revolution Counter 0	AIN0_0	QPRC ch.0 AIN input pin	2	-
	AIN0_1		10	6
	AIN0_2		34	25
	BIN0_0	QPRC ch.0 BIN input pin	3	-
	BIN0_1		11	7
	BIN0_2		35	26
	ZIN0_0	QPRC ch.0 ZIN input pin	4	-
	ZIN0_1		12	8
	ZIN0_2		36	36

Pin function	Pin name	Function description	Pin No	
			LQFP64 QFN64	LQFP48 QFN48
Real-time clock	RTCCO_0	0.5 seconds pulse output pin of Real-time clock	55	-
	RTCCO_1	Sub clock output pin	38	29
	SUBOUT_0	Sub clock output pin	55	-
	SUBOUT_1		38	29
USB	UDM0	USB function/host D – pin	62	46
	UDP0	USB function/host D + pin	63	47
	UHCONX0	USB external pull-up control pin	59	43
Low-Power Consumption Mode	WKUP0	Deep standby mode return signal input pin 0	60	44
	WKUP1	Deep standby mode return signal input pin 1	38	29
	WKUP2	Deep standby mode return signal input pin 2	15	11
	WKUP3	Deep standby mode return signal input pin 3	27	-
DAC	DA0	D/A converter ch.0 analog output pin	34	25
	DA1	D/A converter ch.1 analog output pin	35	26
VBAT	VREGCTL	On-board regulator control pin	20	-
	VWAKEUP	The return signal input pin from a hibernation state	21	-
Reset	INITX	External Reset Input pin. A reset is valid when INITX="L".	22	16
Mode	MD1	Mode 1 pin. During serial programming to Flash memory, MD1="L" must be input.	28	20
	MD0	Mode 0 pin. During normal operation, MD0="L" must be input. During serial programming to Flash memory, MD0="H" must be input.	29	21
Power	VCC	Power supply Pin	1	1
			25	19
			33	-
	USBVCC	3.3V Power supply port for USB I/O	61	45
GND	VSS	GND Pin	16	12
			24	18
			32	24
			64	48
Clock	X0	Main clock (oscillation) input pin	30	22
	X1	Main clock (oscillation) I/O pin	31	23
	X0A	Sub clock (oscillation) input pin	17	13
	X1A	Sub clock (oscillation) I/O pin	18	14
	CROUT_0	Built-in high-speed CR-osc clock output port	47	-
	CROUT_1		54	42
Analog Power	AVCC	A/D converter and D/A converter analog power supply pin	39	30
	AVRH	A/D converter analog reference voltage input pin	42	33
VBAT Power	VBAT	VBAT power supply pin. Backup power supply (battery etc.) and system power supply.	19	15
Analog GND	AVSS	A/D converter and D/A converter GND pin	40	31
	AVRL	A/D converter analog reference voltage input pin	41	32
C pin	C	Power supply stabilization capacity pin	23	17

5. I/O Circuit Type

Type	Circuit	Remarks
A		It is possible to select the main oscillation / GPIO function When the main oscillation is selected. • Oscillation feedback resistor : Approximately 1 MΩ • With Standby mode control When the GPIO is selected. • CMOS level output. • CMOS level hysteresis input • With pull-up resistor control • With standby mode control • Pull-up resistor : Approximately 50 kΩ • I_{OH} = -4 mA, I_{OL} = 4 mA
B		• CMOS level hysteresis input • Pull-up resistor : Approximately 50 kΩ

Type	Circuit	Remarks
Q		It is possible to select the sub oscillation / GPIO function When the sub oscillation is selected. • Oscillation feedback resistor : Approximately 10 MΩ • With Standby mode control When the GPIO is selected. • CMOS level output. • CMOS level hysteresis input • With pull-up resistor control • With standby mode control • Pull-up resistor : Approximately 50 kΩ • I_{OH} = -4 mA, I_{OL} = 4 mA • For I/O setting, refer to VBAT Domain in the Peripheral Manual
R		• CMOS level output • CMOS level hysteresis input • With input control • Analog output • With pull-up resistor control • With standby mode control • Pull-up resistor : Approximately 50 kΩ • I_{OH} = -12 mA, I_{OL} = 12 mA (4.5 V to 5.5 V) • I_{OH} = -8 mA, I_{OL} = 8 mA (2.7 V to 4.5 V)

Static Electricity

Because semiconductor devices are particularly susceptible to damage by static electricity, you must take the following precautions:

1. Maintain relative humidity in the working environment between 40% and 70%. Use of an apparatus for ion generation may be needed to remove electricity.
2. Electrically ground all conveyors, solder vessels, soldering irons and peripheral equipment.
3. Eliminate static body electricity by the use of rings or bracelets connected to ground through high resistance (on the level of 1 MΩ).
   Wearing of conductive clothing and shoes, use of conductive floor mats and other measures to minimize shock loads is recommended.
4. Ground all fixtures and instruments, or protect with anti-static measures.
5. Avoid the use of Styrofoam or other highly static-prone materials for storage of completed board assemblies.

6.3 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.

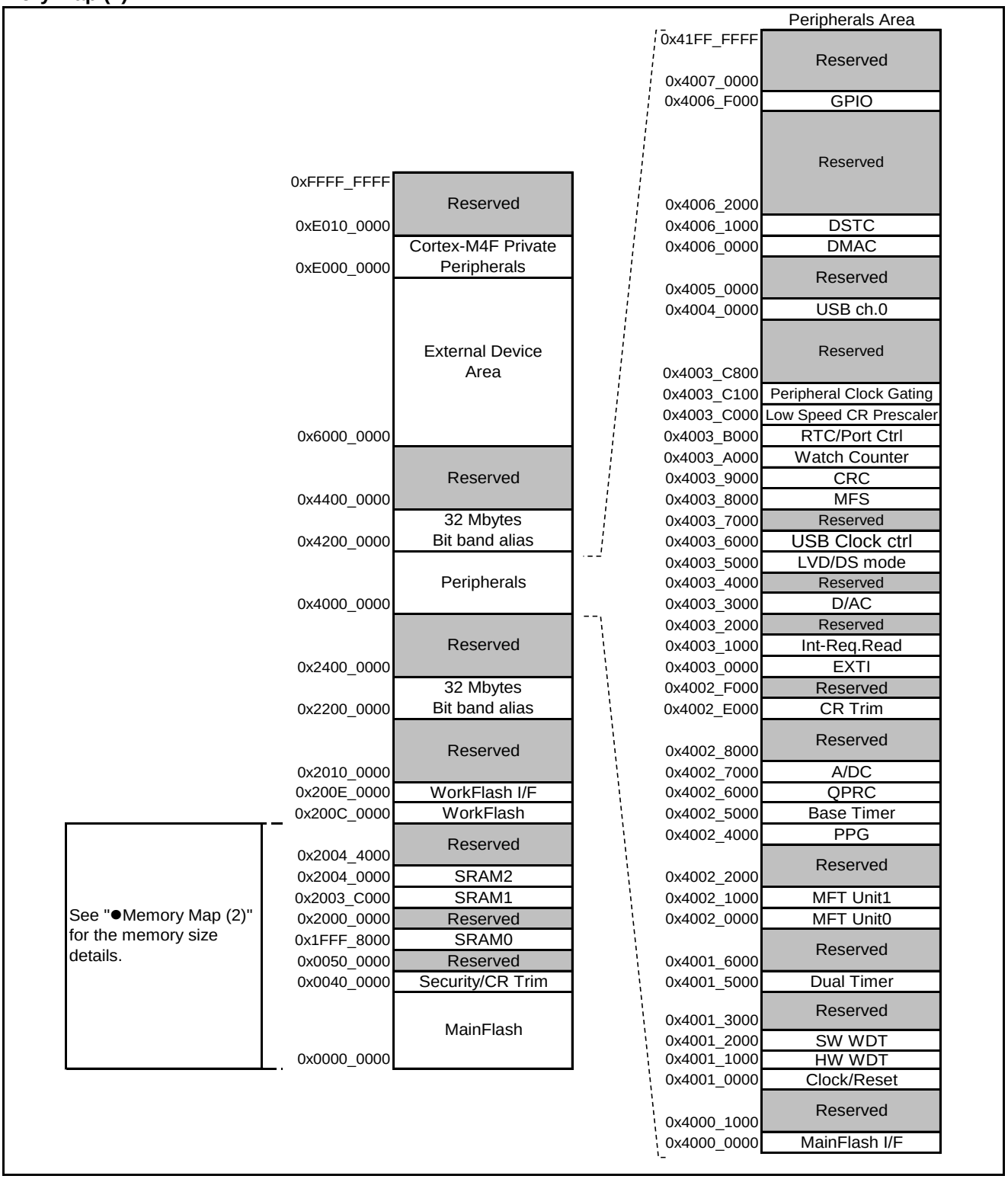
Customers considering the use of Cypress products in other special environmental conditions should consult with sales representatives.

9. Memory Size

See Memory size in 1. Product Lineup to confirm the memory size.

10. Memory Map

Memory Map (1)



11. Pin Status in Each CPU State

The terms used for pin status have the following meanings.

■INITX=0
This is the period when the INITX pin is the L level.

■INITX=1
This is the period when the INITX pin is the H level.

■SPL=0
This is the status that the standby pin level setting bit (SPL) in the standby mode control register (STB_CTL) is set to 0.

■SPL=1
This is the status that the standby pin level setting bit (SPL) in the standby mode control register (STB_CTL) is set to 1.

■Input enabled
Indicates that the input function can be used.

■Internal input fixed at 0
This is the status that the input function cannot be used. Internal input is fixed at L.

■Hi-Z
Indicates that the pin drive transistor is disabled and the pin is put in the Hi-Z state.

■Setting disabled
Indicates that the setting is disabled.

■Maintain previous state
Maintains the state that was immediately prior to entering the current mode.
If a built-in peripheral function is operating, the output follows the peripheral function.
If the pin is being used as a port, that output is maintained.

■Analog input is enabled
Indicates that the analog input is enabled.

■Trace output
Indicates that the trace function can be used.

■GPIO selected
In Deep standby mode, pins switch to the general-purpose I/O port.

■Setting prohibition
Prohibition of a setting by specification limitation.

Pin status Type	Function Group	Power-on Reset or Low-voltage Detection State	INITX Input State	Device Internal Reset State	Run Mode or Sleep Mode State	Timer Mode, RTC Mode, or Stop Mode State		Deep Standby RTC Mode or Deep Standby Stop Mode State		Return from Deep Standby Mode State
		Power Supply Unstable	Power Supply Stable		Power Supply Stable	Power Supply Stable		Power Supply Stable		Power Supply Stable
		-	INITX=0	INITX=1	INITX=1	INITX=1		INITX=1		INITX=1
		-	-	-	-	SPL=0	SPL=1	SPL=0	SPL=1	-
O	Analog input selected	Hi-Z	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled
	WKUP enabled	Setting disabled	Setting disabled	Setting disabled	Maintain previous state	Maintain previous state	Maintain previous state	WKUP input enabled	WKUP input enabled	GPIO selected
	External interrupt enabled selected							GPIO selected Internal input fixed at 0	Hi-Z / Internal input fixed at 0	
	Resource other than above selected	Hi-Z	Hi-Z Input enabled	Hi-Z Input enabled			Hi-Z / Internal input fixed at 0			
	GPIO selected									
P	Analog input selected	Hi-Z	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled	Hi-Z / Internal input fixed at 0 / Analog input enabled
	WKUP enabled	Setting disabled	Setting disabled	Setting disabled	Maintain previous state	Maintain previous state	Maintain previous state	WKUP input enabled	Hi-Z / WKUP input enabled	GPIO selected
	Resource other than above selected						Hi-Z / Internal input fixed at 0	GPIO selected Internal input fixed at 0	Hi-Z / Internal input fixed at 0	
	GPIO selected									

12.4.7 Reset Input Characteristics

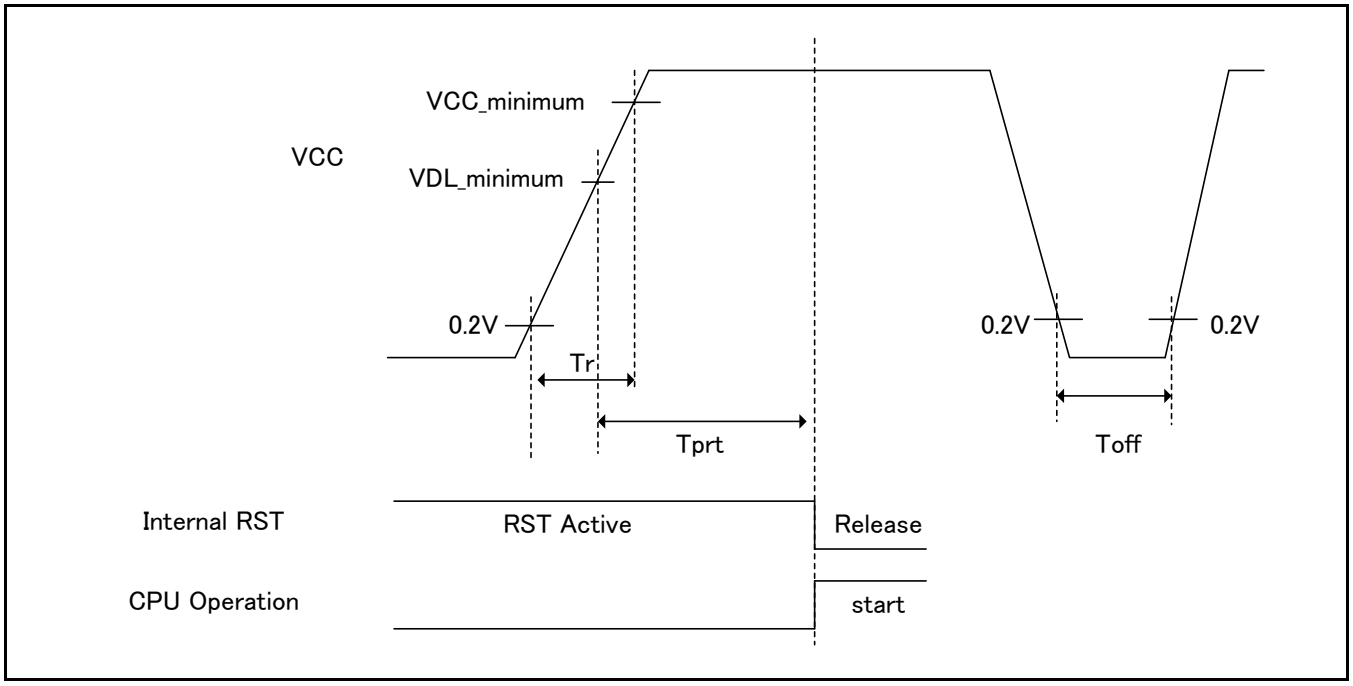
(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Pin Name	Condition	Value		Unit	Remarks
				Min	Max		
Reset input time	t_{INITX}	INITX	-	500	-	ns	

12.4.8 Power-on Reset Timing

(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Pin Name	Value		Unit	Remarks
			Min	Max		
Power supply rising time	Tr	VCC	0	-	ms	
Power supply shut down time	Toff		1	-	ms	
Time until releasing Power-on reset	Tprt		0.33	0.60	ms	



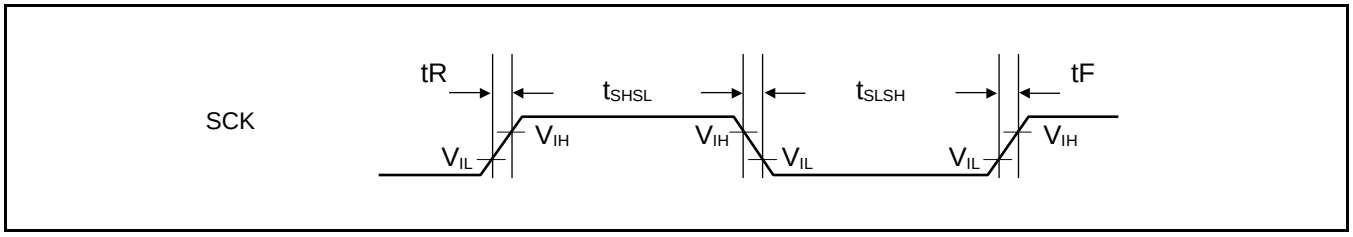
Glossary

- VCC_minimum: Minimum V_{CC} of recommended operating conditions.
- VDL_minimum: Minimum detection voltage of Low-Voltage detection reset.
  See 12.8. Low-Voltage Detection Characteristics.

External Clock (EXT = 1): when in Asynchronous Mode Only

(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Condition	Value		Unit	Remarks
			Min	Max		
Serial clock "L" pulse width	t_{SLSH}	C_L = 30 pF	t_{CYCP} + 10	-	ns	
Serial clock "H" pulse width	t_{SHSL}		t_{CYCP} + 10	-	ns	
SCK falling time	tF		-	5	ns	
SCK rising time	tR		-	5	ns	

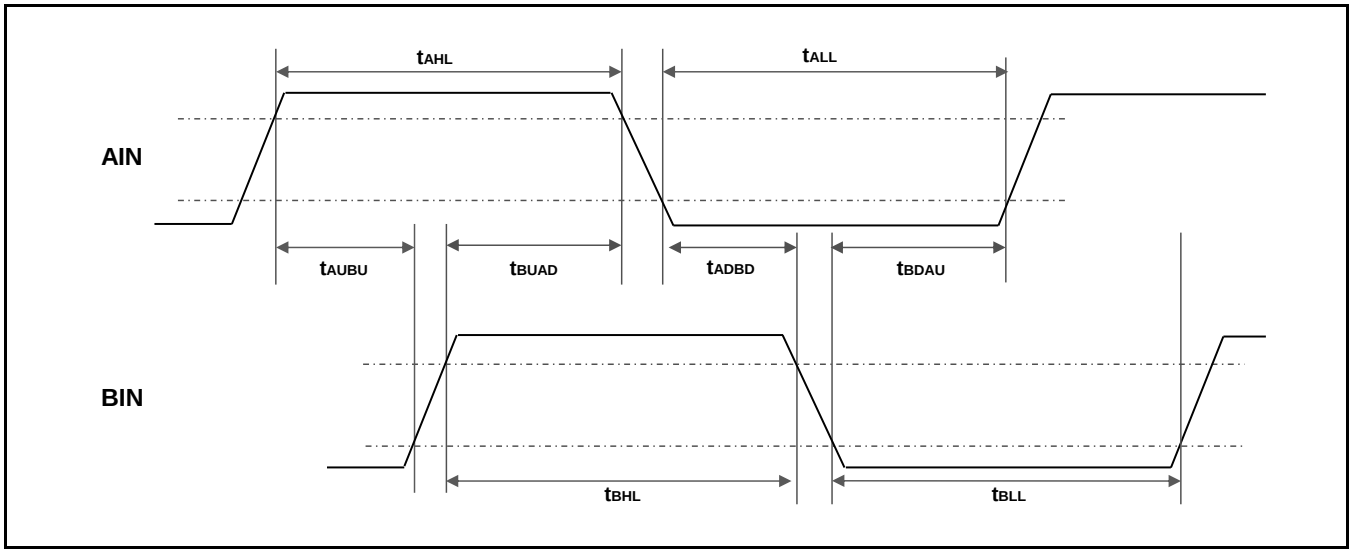


12.4.13 Quadrature Position/Revolution Counter Timing

(V_{CC} = 2.7V to 5.5V, V_{SS} = 0V)

Parameter	Symbol	Conditions	Value		Unit
			Min	Max	
AIN pin H width	t_{AHL}	-	$2t_{CYCP}$*	-	ns
AIN pin L width	t_{ALL}	-			
BIN pin H width	t_{BHL}	-			
BIN pin L width	t_{BLL}	-			
BIN rising time from AIN pin H level	t_{AUBU}	PC_Mode2 or PC_Mode3			
AIN falling time from BIN pin H level	t_{BUAD}	PC_Mode2 or PC_Mode3			
BIN falling time from AIN pin L level	t_{ADBD}	PC_Mode2 or PC_Mode3			
AIN rising time from BIN pin L level	t_{BDAU}	PC_Mode2 or PC_Mode3			
AIN rising time from BIN pin H level	t_{BUAU}	PC_Mode2 or PC_Mode3			
BIN falling time from AIN pin H level	t_{AUBD}	PC_Mode2 or PC_Mode3			
AIN falling time from BIN pin L level	t_{BDAD}	PC_Mode2 or PC_Mode3			
BIN rising time from AIN pin L level	t_{ADBU}	PC_Mode2 or PC_Mode3			
ZIN pin H width	t_{ZHL}	QCR:CGSC = 0			
ZIN pin L width	t_{ZLL}	QCR:CGSC = 0			
AIN/BIN rising and falling time from determined ZIN level	t_{ZABE}	QCR:CGSC = 1			
Determined ZIN level from AIN/BIN rising and falling time	t_{ABEZ}	QCR:CGSC = 1			

*: t_{CYCP} indicates the APB bus clock cycle time except stop when in Stop mode, in timer mode.
About the APB bus number which Quadrature Position/Revolution Counter is connected to, see 8. Block Diagram in this data sheet.



12.5 12-bit A/D Converter

Electrical Characteristics for the A/D Converter

(V_{CC} = AV_{CC} = 2.7V to 5.5V, V_{SS} = AV_{SS} = AVRL = 0V)

Parameter	Symbol	Pin Name	Value			Unit	Remarks
			Min	Typ	Max		
Resolution	-	-	-	-	12	bit	
Integral Nonlinearity	-	-	-4.5	-	+4.5	LSB	AVRH = 2.7 V to 5.5 V
Differential Nonlinearity	-	-	-2.5	-	+2.5	LSB	
Zero transition voltage	V_{ZT}	AN00 to AN14	-15	-	+15	mV	
Full-scale transition voltage	V_{FST}	AN00 to AN14	AVRH - 15	-	AVRH + 15	mV	
Conversion time	-	-	0.5*1	-	-	µs	AV_{CC} ≥ 4.5V
Sampling time	Ts	-	*2	-	10	µs	AV_{CC} ≥ 4.5V
			*2	-			AV_{CC} < 4.5V
Compare clock cycle*3	Tcck	-	25	-	1000	ns	AV_{CC} ≥ 4.5V
			50	-	1000		AV_{CC} < 4.5V
State transition time to operation permission	Tstt	-	1.0	-	-	µs	
Power supply current (analog + digital)	-	AVCC	-	0.69	0.92	mA	A/D 1 unit operation
			-	0.3	12	µA	When A/D stop
Reference power supply current (between AVRH and AVSS)	-	AVRH	-	1.1	1.97	mA	A/D 1unit operation AVRH=5.5 V
				0.2	4.2	µA	When A/D stop
Analog input capacity	C_{AIN}	-	-	-	10	pF	
Analog input resistance	R_{AIN}	-	-	-	1.2	kΩ	AV_{CC} ≥ 4.5 V
					1.8		AV_{CC} < 4.5 V
Interchannel disparity	-	-	-	-	4	LSB	
Analog port input current	-	AN00 to AN14	-	-	5	µA	
Analog input voltage	-	AN00 to AN14	AV_{SS}	-	AVRH	V	
Reference voltage	-	AVRH	4.5	-	AV_{CC}	V	Tcck < 50 ns
			2.7	-	AV_{CC}		Tcck ≥ 50 ns

*1: The conversion time is the value of sampling time (Ts) + compare time (Tc).
The condition of the minimum conversion time is when the value of sampling time: 150 ns, the value of compare time: 350 ns (AV_{CC} ≥ 4.5 V). Ensure that it satisfies the value of sampling time (Ts) and compare clock cycle (Tcck). For setting*4 of sampling time and compare clock cycle, see CHAPTER 1-1: A/D Converter in FM4 Family Peripheral Manual Analog macro part (002-04860). The register setting of the A/D Converter is reflected by the peripheral clock timing. The sampling and compare clock are set at Base clock (HCLK).

*2: A necessary sampling time changes by external impedance. Ensure that it set the sampling time to satisfy (Equation 1).

*3: The compare time (Tc) is the value of (Equation 2).

*4: The register setting of the A/D Converter is reflected by the timing of the APB bus clock. The sampling clock and compare clock are set in base clock (HCLK). About the APB bus number which the A/D Converter is connected to, see 8. Block Diagram in this data sheet.

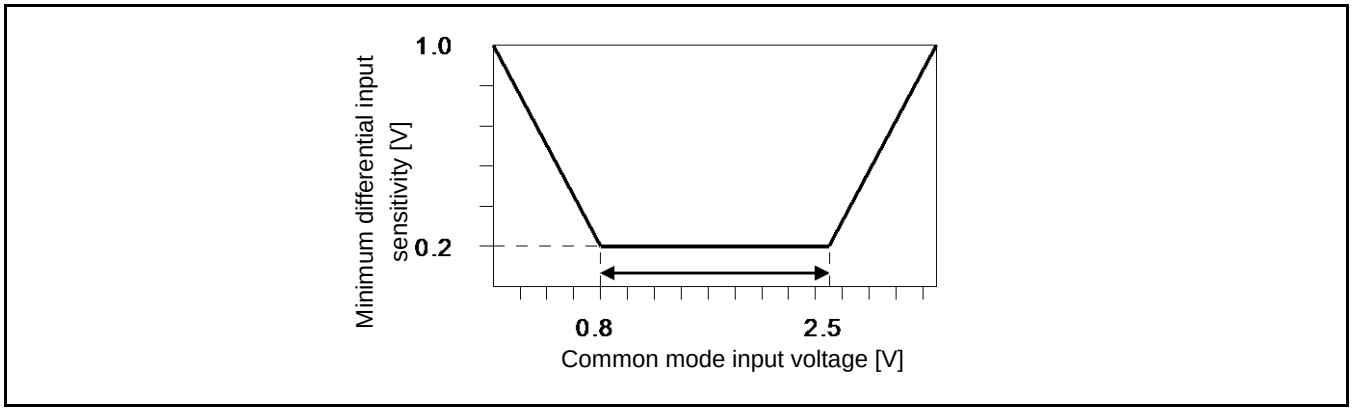
12.7 USB Characteristics

(V_{CC} = 2.7V to 5.5V, $USBV_{CC}$ = 3.0V to 3.6V, V_{SS} = 0V)

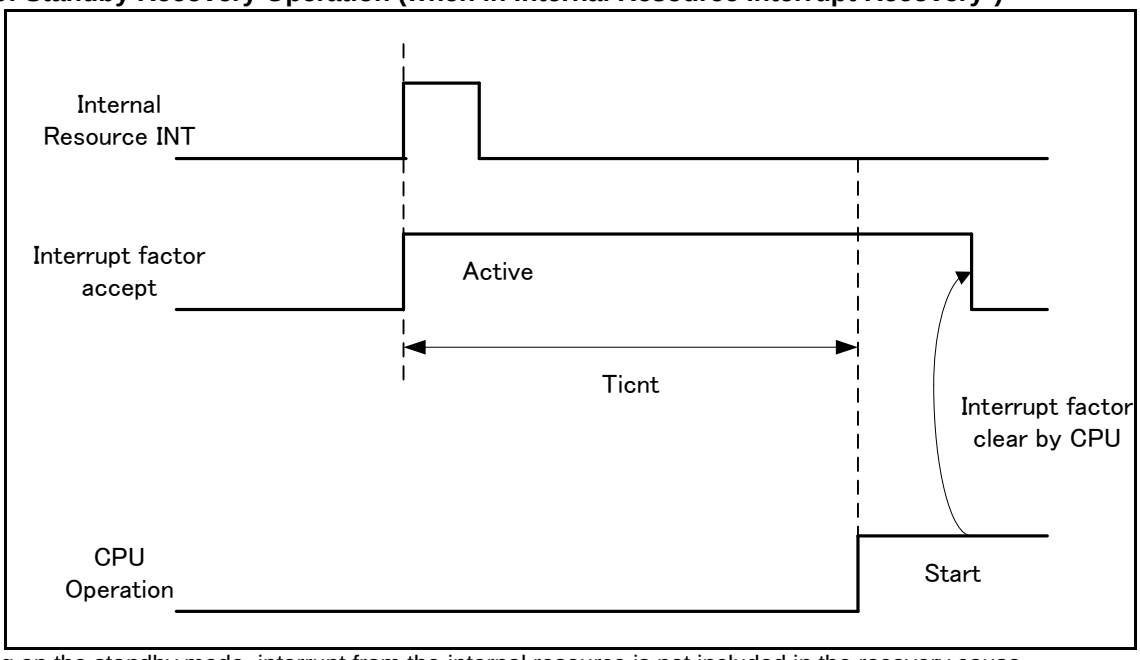
Parameter		Symbol	Pin Name	Conditions	Value		Unit	Remarks
					Min	Max		
Input character -istics	Input H level voltage	V_{IH}	UDP0,UDM0	-	2.0	$USBV_{CC}$ + 0.3	V	*1
	Input L level voltage	V_{IL}		-	V_{SS} - 0.3	0.8	V	*1
	Differential input sensitivity	V_{DI}		-	0.2	-	V	*2
	Different common mode range	V_{CM}		-	0.8	2.5	V	*2
Output character -istics	Output "H" level voltage	V_{OH}		External pull-down resistance = 15 kΩ	2.8	3.6	V	*3
	Output "L" level voltage	V_{OL}		External pull-up resistance = 1.5 kΩ	0.0	0.3	V	*3
	Crossover voltage	V_{CRS}		-	1.3	2.0	V	*4
	Rising time	t_{FR}		Full-Speed	4	20	ns	*5
	Falling time	t_{FF}		Full-Speed	4	20	ns	*5
	Rising/falling time matching	t_{FRFM}		Full-Speed	90	111.11	%	*5
	Output impedance	Z_{DRV}		Full-Speed	28	44	Ω	*6
	Rising time	t_{LR}		Low-Speed	75	300	ns	*7
	Falling time	t_{LF}		Low-Speed	75	300	ns	*7
	Rising/falling time matching	t_{LRFM}		Low-Speed	80	125	%	*7

*1: The switching threshold voltage of Single-End-Receiver of USB I/O buffer is set as within V_{IL} (Max) = 0.8 V, V_{IH} (Min) = 2.0 V (TTL input standard).
There are some hysteresises to lower noise sensitivity.

*2: Use differential-Receiver to receive USB differential data signal.
Differential-Receiver has 200 mV of differential input sensitivity when the differential data input is within 0.8 V to 2.5 V to the local ground reference level.
Above voltage range is the common mode input voltage range.



Example of Standby Recovery Operation (when in Internal Resource Interrupt Recovery*)



*: Depending on the standby mode, interrupt from the internal resource is not included in the recovery cause.

Notes:

- *The return factor is different in each Low-Power consumption modes.*
  See CHAPTER 6: Low Power Consumption Mode and Operations of Standby Modes in FM4 Family Peripheral Manual Main part (002-04856).
- *When interrupt recoveries, the operation mode that CPU recoveries depend on the state before the Low-Power consumption mode transition. See CHAPTER 6: Low Power Consumption Mode in FM4 Family Peripheral Manual Main part (002-04856).*

Page	Section	Change Results
116	■ELECTRICAL CHARACTERISTICS 11. Standby Recovery Time (1) Recovery cause: Interrupt/WKUP	• Revised the value of TBD • Revised the table of Recovery count time
118	■ELECTRICAL CHARACTERISTICS 11. Standby Recovery Time (2) Recovery cause:Reset	• Revised the value of TBD • Revised the table of Recovery count time

NOTE: Please see “Document History” about later revised information.

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	-	AKIH	12/25/2013	Migrated to Cypress and assigned document number 002-04930. No change to document contents or format.
*A	5273878	AKIH	05/12/2016	Updated to Cypress format.

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