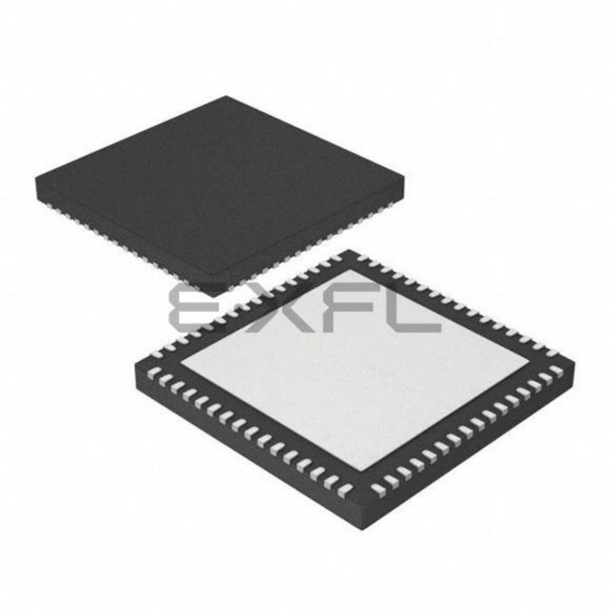


What is "Embedded - Microcontrollers"?

"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	Active
Core Processor	ARM® Cortex®-M0+
Core Size	32-Bit Single-Core
Speed	40MHz
Connectivity	CSIO, I²C, LINbus, SmartCard, UART/USART, USB
Peripherals	I²S, LVD, POR, PWM, WDT
Number of I/O	54
Program Memory Size	128KB (128K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	16K x 8
Voltage - Supply (Vcc/Vdd)	1.65V ~ 3.6V
Data Converters	A/D 8x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	64-WFQFN Exposed Pad
Supplier Device Package	64-QFN (9x9)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/s6e1c32d0agn20000

I2C Slave

- I2C Slave supports the slave function of I2C and wake-up function from Standby mode.

Descriptor System Data Transfer Controller (DSTC) (64 Channels)

- The DSTC can transfer data at high-speed without going via the CPU. The DSTC adopts the Descriptor system and, following the specified contents of the Descriptor that has already been constructed on the memory, can access directly the memory / peripheral device and performs the data transfer operation.
- It supports the software activation, the hardware activation, and the chain activation functions

A/D Converter (Max: 8 Channels)

- 12-bit A/D Converter
  - Successive approximation type
  - Conversion time: 2.0 μs @ 2.7 V to 3.6 V
  - Priority conversion available (2 levels of priority)
  - Scan conversion mode
  - Built-in FIFO for conversion data storage (for scan conversion: 16 steps, for priority conversion: 4 steps)

Base Timer (Max: 8 Channels)

The operation mode of each channel can be selected from one of the following.

- 16-bit PWM timer
- 16-bit PPG timer
- 16/32-bit reload timer
- 16/32-bit PWC timer

General-Purpose I/O Port

This series can use its pin as a general-purpose I/O port when it is not used for an external bus or a peripheral function. All ports can be set to fast general-purpose I/O ports or slow general-purpose I/O ports. In addition, this series has a port relocate function that can set to which I/O port a peripheral function can be allocated.

- All ports are Fast GPIO which can be accessed by 1cycle
- Capable of controlling the pull-up of each pin
- Capable of reading pin level directly
- Port relocate function
- Up to 54 fast general-purpose I/O ports @64-pin package
- Certain ports are 5 V tolerant.
  See 4.List of Pin Functions and 5.I/O Circuit Typefor the corresponding pins.

Dual Timer (32-/16-bit Down Counter)

The Dual Timer consists of two programmable 32-/16-bit down counters. The operation mode of each timer channel can be selected from one of the following.

- Free-running mode
- Periodic mode (= Reload mode)
- One-shot mode

Real-Time Clock

The Real-time Clock counts year/month/day/hour/minute/second/day of the week from year 00 to year 99.

- The RTC can generate an interrupt at a specific time (year/month/day/hour/minute/second/day of the week) and can also generate an interrupt in a specific year, in a specific month, on a specific day, at a specific hour or at a specific minute.
- It has a timer interrupt function generating an interrupt upon a specific time or at specific intervals.
- It can keep counting while rewriting the time.
- It can count leap years automatically.

Watch Counter

The Watch Counter wakes up the microcontroller from the low power consumption mode. The clock source can be selected from the main clock, the sub clock, the built-in high-speed CR clock or the built-in low-speed CR clock.

Interval timer: up to 64 s (sub clock: 32.768 kHz)

External Interrupt Controller Unit

- Up to 12 external interrupt input pins
- Non-maskable interrupt (NMI) input pin: 1

Watchdog Timer (2 Channels)

The watchdog timer generates an interrupt or a reset when the counter reaches a time-out value.

This series consists of two different watchdogs, hardware watchdog and software watchdog.

The hardware watchdog timer is clocked by the built-in low-speed CR oscillator. Therefore, the hardware watchdog is active in any low-power consumption modes except RTC, Stop, Deep standby RTC and Deep standby Stop mode.

CRC (Cyclic Redundancy Check) Accelerator

The CRC accelerator calculates the CRC which has a heavy software processing load, and achieves a reduction of the integrity check processing load for reception data and storage.

- CCITT CRC16 and IEEE-802.3 CRC32 are supported.
  - CCITT CRC16 Generator Polynomial: 0x1021
  - IEEE-802.3 CRC32 Generator Polynomial: 0x04C11DB7

HDMI-CEC/Remote Control Receiver (Up to 2 Channels)

- HDMI-CEC transmitter
  - Header block automatic transmission by judging Signal free
  - Generating status interrupt by detecting Arbitration lost

1. Product Lineup

Memory Size

Product name	S6E1C31B0A/ S6E1C31C0A/ S6E1C31D0A	S6E1C32B0A/ S6E1C32C0A/ S6E1C32D0A
On-chip Flash memory	64 Kbytes	128 Kbytes
On-chip SRAM	12 Kbytes	16 Kbytes

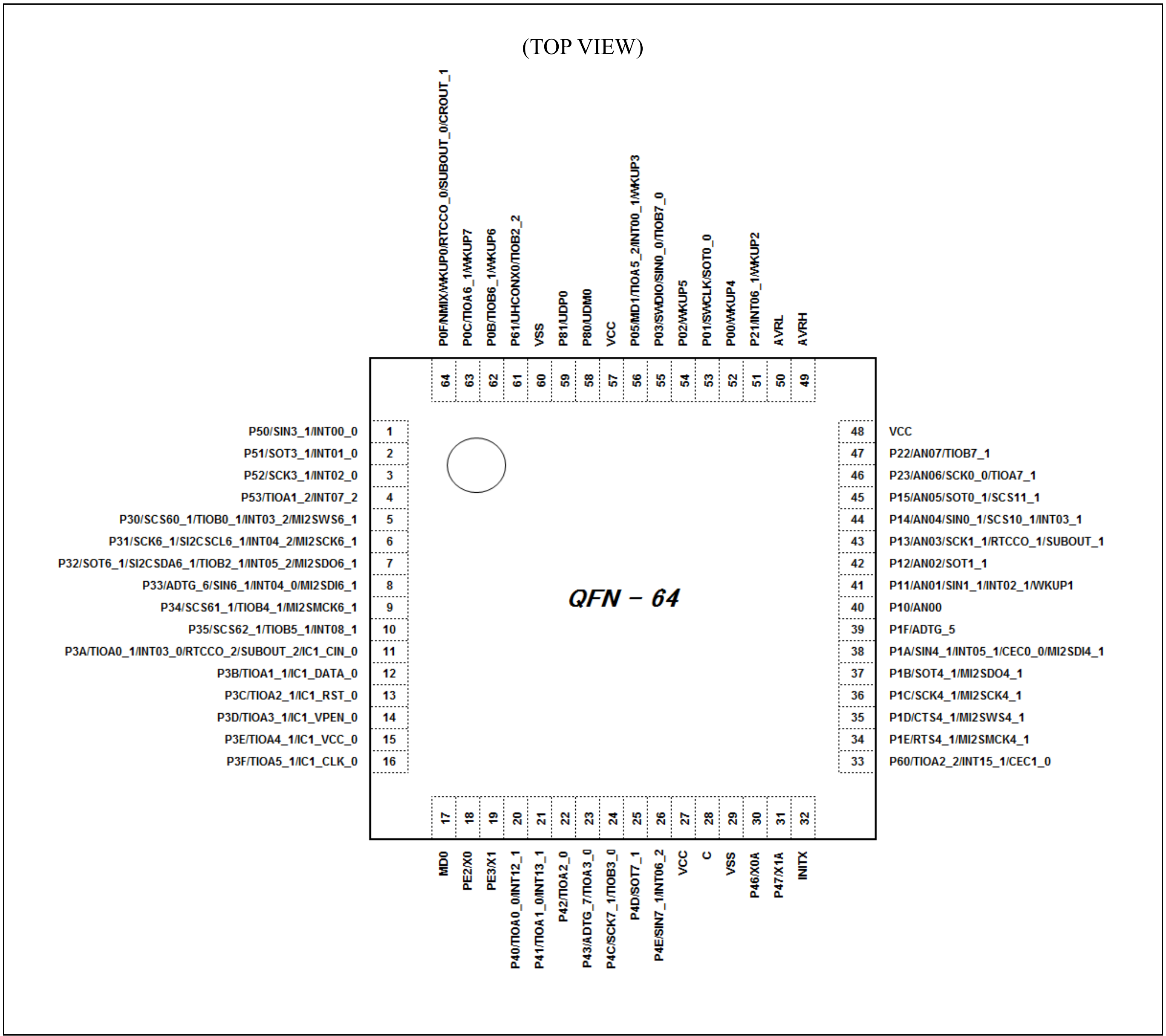
Function

Product name		S6E1C32B0A (WLCSP)	S6E1C32B0A/ S6E1C31B0A	S6E1C32C0A/ S6E1C32C0A	S6E1C31D0A/ S6E1C32D0A
Pin count		TBD	32	48	64
CPU		Cortex-M0+			
	Frequency	40.8 MHz			
Power supply voltage range		1.65 V to 3.6 V			
USB2.0 (Device/Host)		1 unit			
DSTC		64 ch.			
Multi-function Serial Interface (UART/CSIO/I^{2}C/I2S)		2 ch. (Max) Ch.0/3 without FIFO	4 ch. (Max) Ch.0/1/3 without FIFO Ch. 6 with FIFO	6 ch. (Max) Ch.0/1/3 without FIFO Ch.4/6/7 with FIFO	6 ch. (Max) Ch.0/1/3 without FIFO Ch.4/6/7 with FIFO
		I2S : No		I2S : 1 ch (Max) Ch. 6 with FIFO	I2S : 2 ch (Max) Ch. 4/6 with FIFO
Base Timer (PWC/Reload timer/PWM/PPG)		8 ch. (Max)			
Dual Timer		1 unit			
HDMI-CEC/ Remote Control Receiver		1 ch.(Max) Ch.1		2 ch (Max) Ch.0/1	
I2C Slave		No	1 ch (Max)		
Smart Card Interface		No			1 ch (Max)
Real-time Clock		1 unit			
Watch Counter		1 unit			
CRC Accelerator		Yes			
Watchdog timer		1 ch. (SW) + 1 ch. (HW)			
External Interrupt		5 pins (Max), NMI × 1	7 pins (Max), NMI x 1	9 pins (Max), NMI x 1	12 pins (Max), NMI x 1
I/O port		20 pins (Max)	24 pins (Max)	38 pins (Max)	54 pins (Max)
12-bit A/D converter		4 ch (1 unit)	6 ch. (1 unit)	8 ch. (1 unit)	8 ch. (1 unit)
CSV (Clock Supervisor)		Yes			
LVD (Low-voltage Detection)		2 ch.			
Built-in CR	High-speed	8 MHz (Typ)			
	Low-speed	100 kHz (Typ)			
Debug Function		SW-DP			
Unique ID		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 I/O port according to your function use.*
See "11. Electrical Characteristics 11.4 AC Characteristics 11.4.3 Built-in CR Oscillation Characteristics" for accuracy of built-in CR.

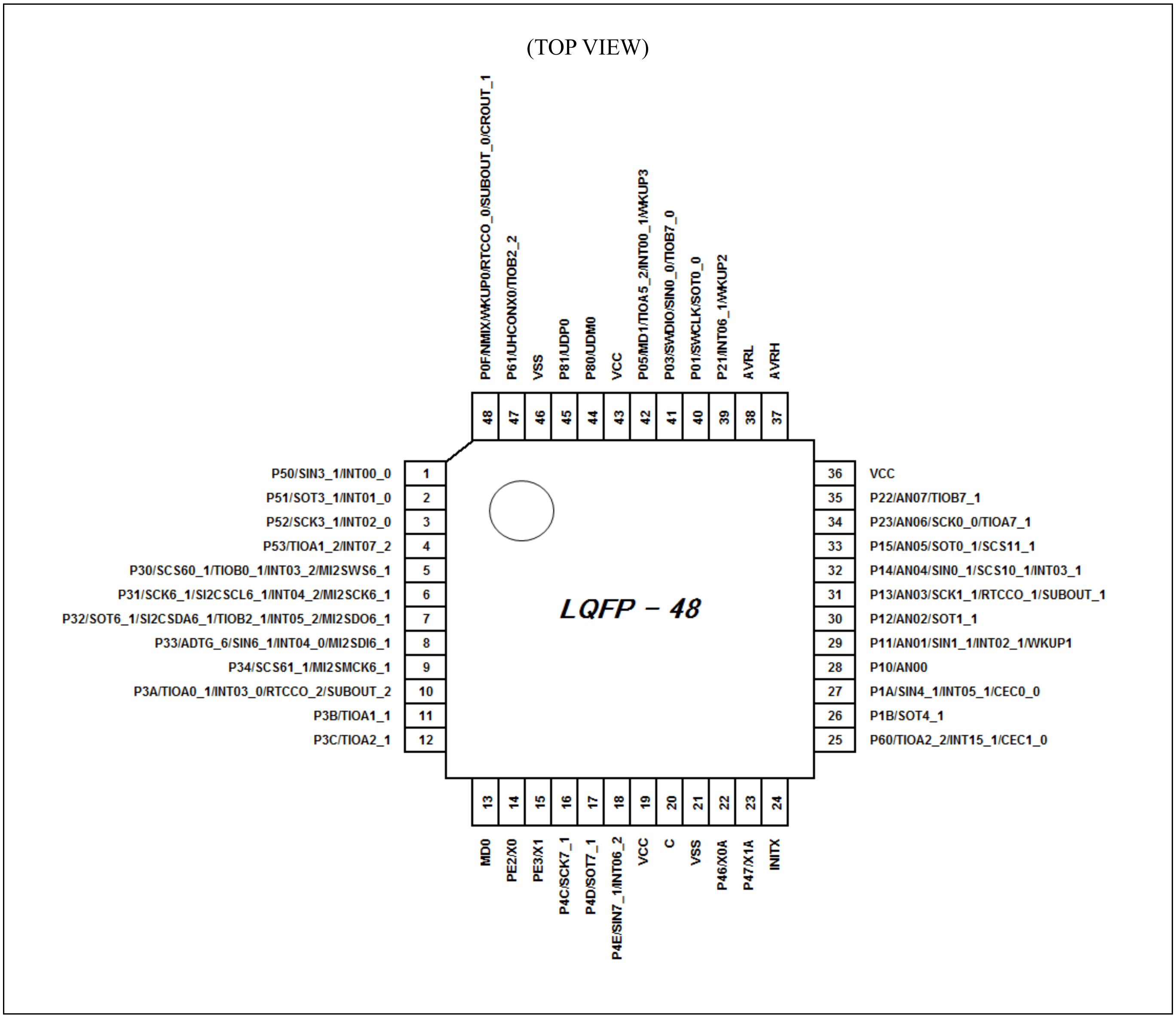
LCC-64P-M25



Note:

– *The number after the underscore ("_") in a pin name such as XXX_1 and XXX_2 indicates the relocated port number. The channel on such pin has multiple functions, each of which has its own pin name. Use the Extended Port Function Register (EPFR) to select the pin to be used.*

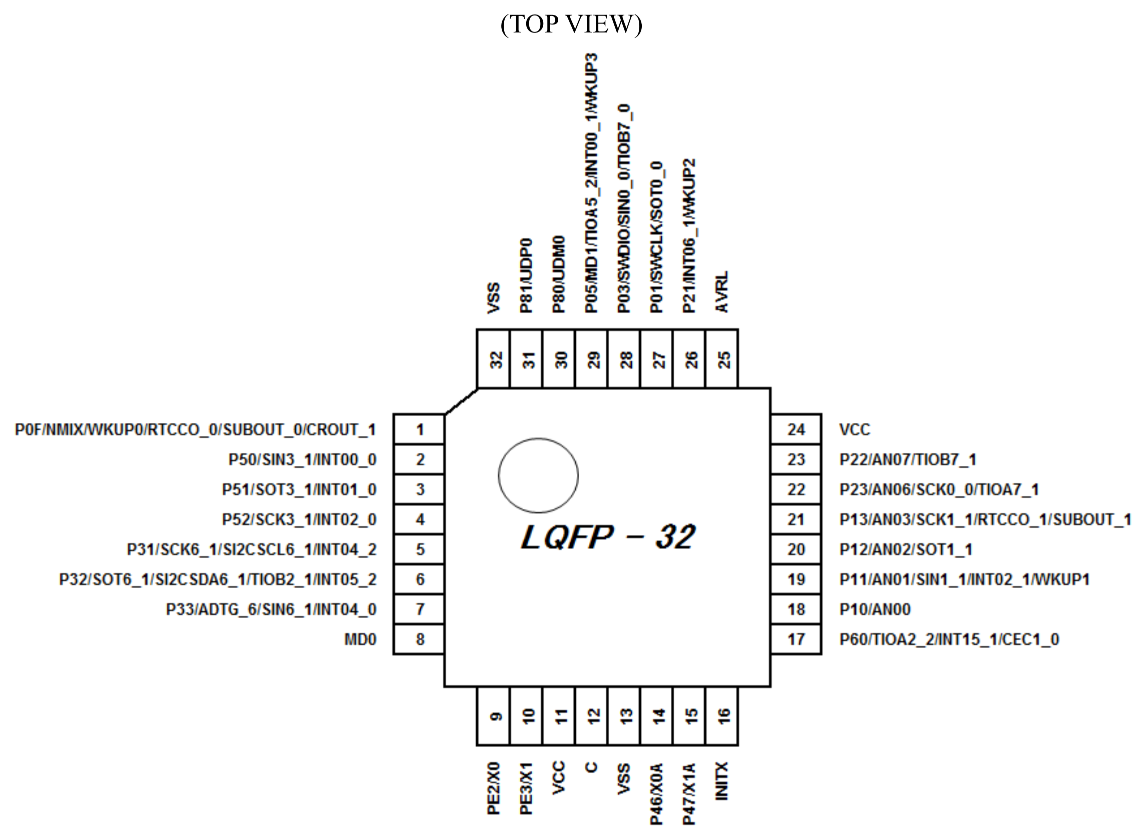
FPT-48P-M49



Note:

– *The number after the underscore ("_") in a pin name such as XXX_1 and XXX_2 indicates the relocated port number. The channel on such pin has multiple functions, each of which has its own pin name. Use the Extended Port Function Register (EPFR) to select the pin to be used.*

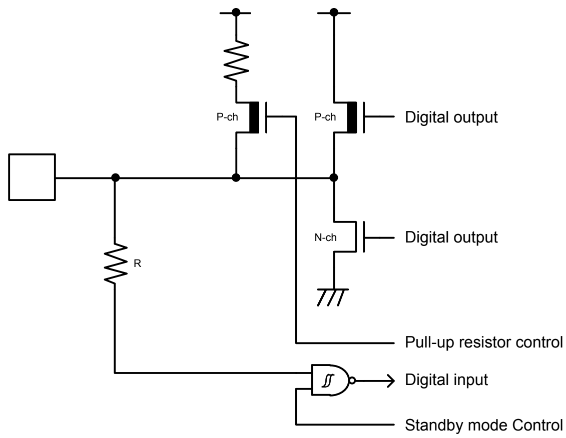
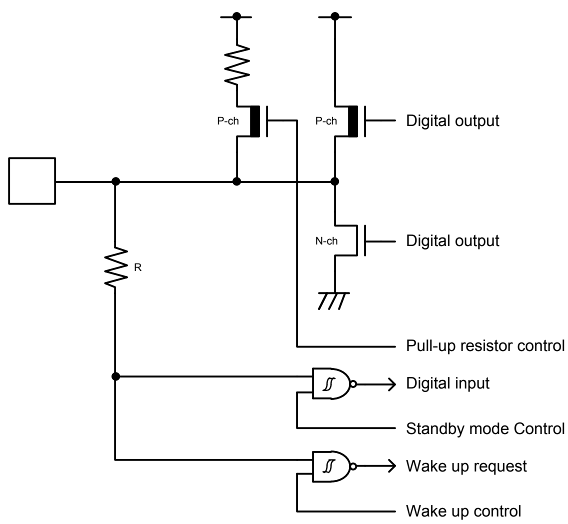
FPT-32P-M30



Note:

– *The number after the underscore ("_") in a pin name such as XXX_1 and XXX_2 indicates the relocated port number. The channel on such pin has multiple functions, each of which has its own pin name. Use the Extended Port Function Register (EPFR) to select the pin to be used.*

Pin function	Pin name	Function description	Pin no.			
			LQFP-64 QFN-64	LQFP-48 QFN-48	LQFP-32 QFN-32	WLCSP (TBD)
I2S(MFS)	MI2SDI4_1	I2S Serial Data Input pin (operation mode 2).	38	-	-	-
	MI2SDO4_1	I2S Serial Data Output pin (operation mode 2).	37	-	-	-
	MI2SCK4_1	I2S Serial Clock Output pin (operation mode 2).	36	-	-	-
	MI2SWS4_1	I2S Word Select Output pin (operation mode 2).	35	-	-	-
	MI2SMCK4_1	I2S Master Clock Input/output pin (operation mode 2).	34	-	-	-
	MI2SDI6_1	I2S Serial Data Input pin (operation mode 2).	8	8	-	-
	MI2SDO6_1	I2S Serial Data Output pin (operation mode 2).	7	7	-	-
	MI2SCK6_1	I2S Serial Clock Output pin (operation mode 2).	6	6	-	-
	MI2SWS6_1	I2S Word Select Output pin (operation mode 2).	5	5	-	-
	MI2SMCK6_1	I2S Master Clock Input/output pin (operation mode 2).	9	9	-	-
Smart Card Interface	IC1_CIN_0	Smart Card insert detection output pin	11	-	-	-
	IC1_CLK_0	Smart Card serial interface clock output pin	16	-	-	-
	IC1_DATA_0	Smart Card serial interface data input pin	12	-	-	-
	IC1_RST_0	Smart Card reset output pin	13	-	-	-
	IC1_VCC_0	Smart Card power enable output pin	15	-	-	-
	IC1_VPEN_0	Smart Card programming output pin	14	-	-	-
USB	UDM0	USB function/host D – pin	58	44	30	-
	UDP0	USB function/host D + pin	59	45	31	-
	UHCONX0	USB external pull-up control pin	61	47	-	-
Real-time Clock	RTCCO_0	0.5 seconds pulse output pin of real-time clock	64	48	1	-
	RTCCO_1		43	31	21	-
	RTCCO_2		11	10	-	-
	SUBOUT_0	Sub clock output pin	64	48	1	-
	SUBOUT_1		43	31	21	-
	SUBOUT_2		11	10	-	-
HDMI-CEC/Remote Control Reception	CEC0_0	HDMI-CEC/Remote Control Reception ch.0 input/output pin	38	27	-	-
	CEC1_0	HDMI-CEC/Remote Control Reception ch.1 input/output pin	33	25	17	-

Type	Circuit	Remarks
D		・CMOS level output ・CMOS level hysteresis input ・With pull-up resistor control ・With standby mode control ・Pull-up resistor : Approximately 33kΩ ・IOH= -4mA, IOL= 4mA ・When this pin is used as an I2C pin, the digital output P-ch transistor is always off
E		・CMOS level output ・CMOS level hysteresis input ・With pull-up resistor control ・With standby mode control ・Pull-up resistor : Approximately 33kΩ ・IOH= -4mA, IOL= 4mA ・When this pin is used as an I2C pin, the digital output P-ch transistor is always off

7. Handling Devices

Power Supply Pins

In products with multiple VCC and VSS pins, respective pins at the same potential are interconnected within the device in order to prevent malfunctions such as latch-up. However, all of these pins should be connected externally to the power supply or ground lines in order to reduce electromagnetic emission levels, to prevent abnormal operation of strobe signals caused by the rise in the ground level, and to conform to the total output current rating.

Moreover, connect the current supply source with each Power supply pin and GND pin of this device at low impedance. It is also advisable that a ceramic capacitor of approximately 0.1 µF be connected as a bypass capacitor between each Power supply pin and GND pin, between AVRH pin and AVRL pin near this device.

Stabilizing Supply Voltage

A malfunction may occur when the power supply voltage fluctuates rapidly even though the fluctuation is within the recommended operating conditions of the VCC power supply voltage. As a rule, with voltage stabilization, suppress the voltage fluctuation so that the fluctuation in VCC ripple (peak-to-peak value) at the commercial frequency (50 Hz/60 Hz) does not exceed 10% of the VCC value in the recommended operating conditions, and the transient fluctuation rate does not exceed 0.1 V/µs when there is a momentary fluctuation on switching the power supply.

Crystal Oscillator Circuit

Noise near the X0/X1 and X0A/X1A pins may cause the device to malfunction. Design the printed circuit board so that X0/X1, X0A/X1A pins, the crystal oscillator, and the bypass capacitor to ground are located as close to the device as possible.

It is strongly recommended that the PC board artwork be designed such that the X0/X1 and X0A/X1A pins are surrounded by ground plane as this is expected to produce stable operation.

Evaluate oscillation of your using crystal oscillator by your mount board.

Sub Crystal Oscillator

This series sub oscillator circuit is low gain to keep the low current consumption. The crystal oscillator to fill the following conditions is recommended for sub crystal oscillator to stabilize the oscillation.

- Surface mount type

    Size: More than 3.2 mm × 1.5 mm

    Load capacitance: Approximately 6 pF to 7 pF

- Lead type

    Load capacitance: Approximately 6 pF to 7 pF

11.2 Recommended Operating Conditions

(V_{SS}= 0.0 V)

Parameter	Symbol	Conditions	Value		Unit	Remarks
			Min	Max		
Power supply voltage	V_{CC}	-	1.65 *3	3.6	V	
			3.0	3.6	V	*1
Analog reference voltage	AVRH	-	2.7	V_{CC}	V	$V_{CC} \geq 2.7$ V
			V_{CC}	V_{CC}	V	$V_{CC} < 2.7$ V
	AVRL	-	VSS	VSS	V	
Smoothing capacitor	C_S	-	1	10	μF	For regulator*2
Operating temperature	Ta	-	- 40	+ 105	°C	

*1: When P81/UDP0 and P80/UDM0 pins are used as USB (UDP0, UDM0).

*2: See "C Pin" in "7. Handling Devices" for the connection of the smoothing capacitor.

*3: In between less than the minimum power supply voltage reset / interrupt detection voltage or more, instruction execution and low voltage detection function by built-in High-speed CR (including Main PLL is used) or built-in Low-speed CR is possible to operate only.

<WARNING>

1. *The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.*
2. *Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure.*
3. *No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet.*
4. *Users considering application outside the listed conditions are advised to contact their representatives beforehand.*

Parameter	Symbol (Pin Name)	Conditions			Value		Unit	Remarks
					Typ	Max		
Power supply current	I_{CCHD} (VCC)	Deep standby Stop mode	RAM off	Ta=25°C Vcc=3.3 V	0.58	1.85	μA	*1, *2
				Ta=25°C Vcc=1.65 V	0.56	1.83	μA	*1, *2
				Ta=105°C Vcc=3.6 V	-	46	μA	*1, *2
			RAM on	Ta=25°C Vcc=3.3 V	0.78	6.6	μA	*1, *2
				Ta=25°C Vcc=1.65 V	0.76	6.6	μA	*1, *2
				Ta=105°C Vcc=3.6 V	-	88	μA	*1, *2
	I_{CCRD} (VCC)	Deep standby RTC mode	RAM off	Ta=25°C Vcc=3.3 V	1.16	2.4	μA	*1, *2
				Ta=25°C Vcc=1.65 V	1.15	2.4	μA	*1, *2
				Ta=105°C Vcc=3.6 V	-	46	μA	*1, *2
			RAM on	Ta=25°C Vcc=3.3 V	1.37	7.2	μA	*1, *2
				Ta=25°C Vcc=1.65 V	1.35	7.2	μA	*1, *2
				Ta=105°C Vcc=3.6 V	-	88	μA	*1, *2

*1: All ports are fixed. LVD off.

*2: When CALDONE bit(CAL_CTL:CALDONE) is “1”. In case of “0”, Bipolar Vref current is added.

LVD Current

(V_{CC}=1.65 V to 3.6 V, V_{SS}= 0 V, T_A=- 40°C to +105°C)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Typ	Max		
Low-Voltage detection circuit (LVD) power supply current	I_{CCLVD}	VCC	At operation	0.15	0.3	μA	For occurrence of reset
				0.10	0.3	μA	For occurrence of interrupt

Bipolar Vref Current

(V_{CC}=1.65 V to 3.6 V, V_{SS}= 0 V, T_A=- 40°C to +105°C)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Typ	Max		
Bipolar Vref Current	I_{CCBGR}	VCC	At operation	100	200	μA	

Flash Memory Current

(V_{CC}=1.65 V to 3.6 V, V_{SS}= 0 V, T_A=- 40°C to +105°C)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Typ	Max		
Flash memory write/erase current	$I_{CCFLASH}$	VCC	At Write/Erase	4.4	5.6	mA	

A/D converter Current

(V_{CC}=1.65 V to 3.6 V, V_{SS}= 0 V, T_A=- 40°C to +105°C)

Parameter	Symbol	Pin Name	Conditions	Value		Unit	Remarks
				Typ	Max		
Power supply current	I_{CCAD}	VCC	At operation	0.5	0.75	mA	
Reference power supply current (AVRH)	I_{CCAVRH}	AVRH	At operation	0.69	1.3	mA	AVRH=3.6 V
			At stop	0.1	1.3	μA	

Peripheral Current Dissipation

(V_{CC}=1.65 V to 3.6 V, V_{SS}=0 V, T_A=- 40°C to +105°C)

Clock System	Peripheral	Conditions	Frequency (MHz)			Unit	Remarks
			8	20	40		
HCLK	GPIO	At all ports operation	0.05	0.12	0.23	mA	
	DSTC	At 2ch operation	0.02	0.06	0.10		
	USB	At 1ch operation	0.13	0.13	0.13	mA	*1
PCLK1	Base timer	At 4ch operation	0.02	0.05	0.10	mA	
	ADC	At 1 unit operation	0.04	0.10	0.21		
	Multi-function serial	At 1ch operation	0.01	0.03	0.06		
	MFS-I2S	At 1ch operation	0.02	0.05	0.08		
	Smart Card I/F	At 1ch operation	0.04	0.08	0.18		

*1 USB itself uses 48MHz clock

– *For the main PLL source clock, input the high-speed CR clock (CLKHC) whose frequency and temperature have been trimmed. When setting PLL multiple rate, please take the accuracy of the built-in High-speed CR clock into account and prevent the master clock from exceeding the maximum frequency.*

11.4.6 Reset Input Characteristics

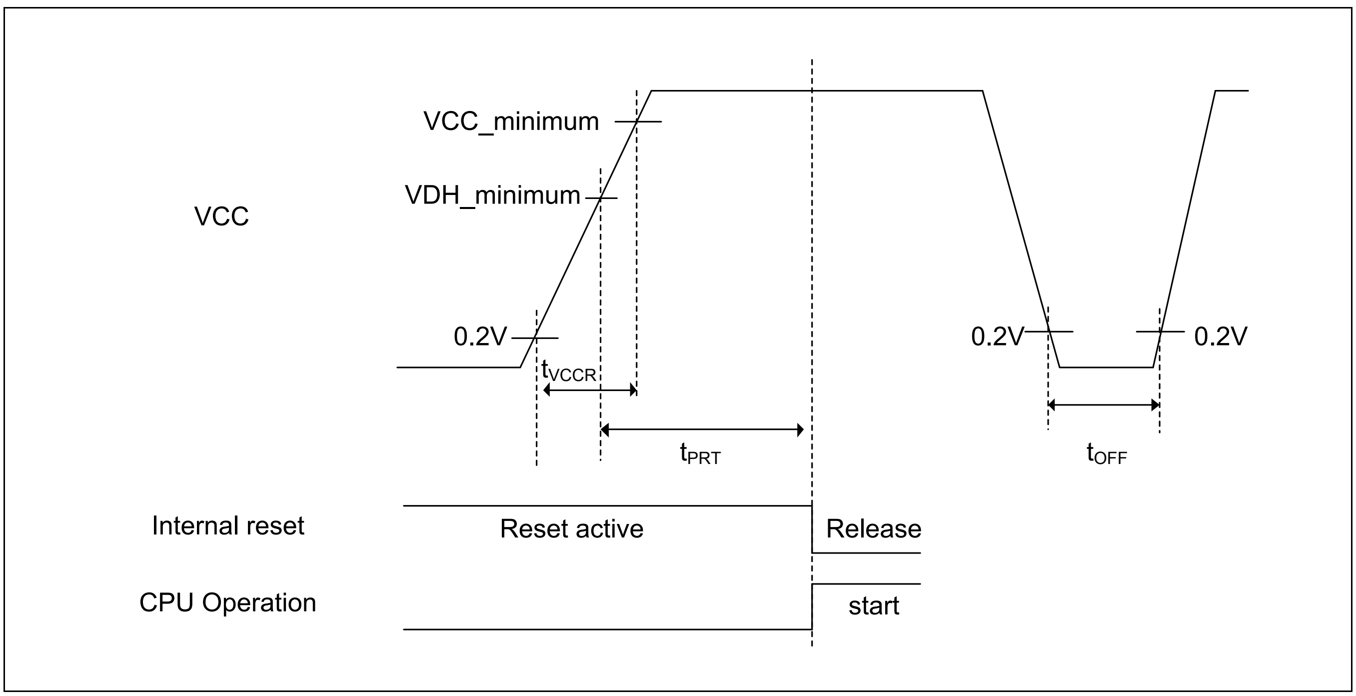
(V_{CC} = 1.65 V to 3.6 V, V_{SS}= 0 V, T_A=- 40°C to +105°C)

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

11.4.7 Power-on Reset Timing

(V_{CC}= 1.65 V to 3.6 V, V_{SS}= 0 V, T_A=- 40°C to +105°C)

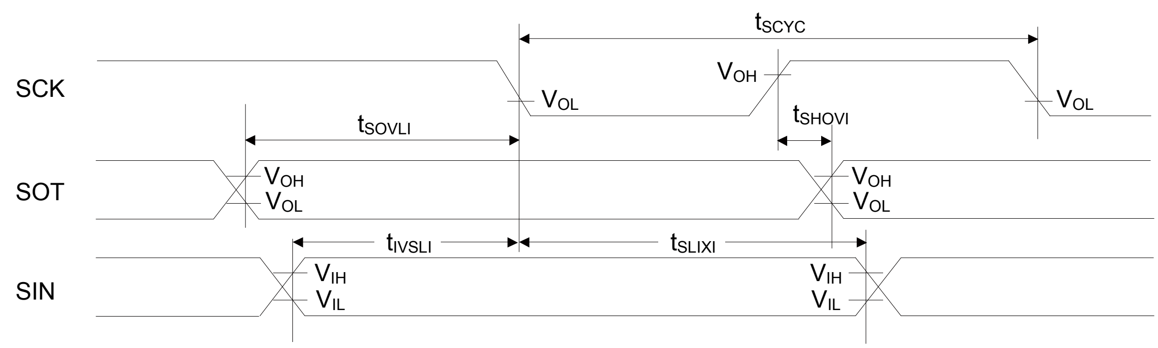
Parameter	Symbol	Pin Name	Value		Unit	Remarks
			Min	Max		
Power supply rising time	t_{VCCR}	VCC	0	-	ms	
Power supply shut down time	t_{OFF}		1	-	ms	
Time until releasing Power-on reset	t_{PRT}		0.43	3.4	ms	



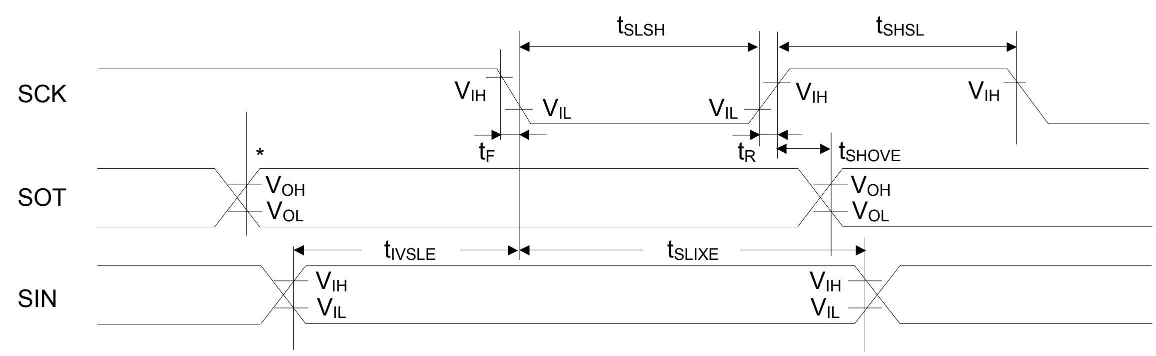
Glossary

- VCC_minimum : Minimum V_{CC} of recommended operating conditions.
- VDH_minimum : Minimum detection voltage of Low-Voltage detection reset.

See "11.7 Low-Voltage Detection Characteristics".



Master mode



Slave mode

*: Changes when writing to TDR register

When Using CSIO/SPI Chip Select (SCINV=1, CSLVL=0)

(V_{CC}= 1.65 V to 3.6 V, V_{SS}= 0 V, T_A=- 40°C to +105°C)

Parameter	Symbol	Conditions	V_{CC} < 2.7 V		V_{CC} ≥ 2.7 V		Unit
			Min	Max	Min	Max	
SCS↑→SCK↑ setup time	t_{CSSI}	Master mode	(*1)-50	(*1)+0	(*1)-50	(*1)+0	ns
SCK↓→SCS↓ hold time	t_{CSHI}		(*2)+0	(*2)+50	(*2)+0	(*2)+50	ns
SCS deselect time	t_{CSDI}		(*3)-50	(*3)+50	(*3)-50	(*3)+50	ns
SCS↑→SCK↑ setup time	t_{CSSE}	Slave mode	$3t_{CYCP}$+30	-	$3t_{CYCP}$+30	-	ns
SCK↓→SCS↓ hold time	t_{CSHE}		0	-	0	-	ns
SCS deselect time	t_{CSDE}		$3t_{CYCP}$+30	-	$3t_{CYCP}$+30	-	ns
SCS↑→SOT delay time	t_{DSE}		-	55	-	40	ns
SCS↓→SOT delay time	t_{DEE}		0	-	0	-	ns

*1: CSSU bit value × serial chip select timing operating clock cycle.

*2: CSHD bit value × serial chip select timing operating clock cycle.

*3: CSDS bit value × serial chip select timing operating clock cycle.
Irrespective of CSDS bit setting, $5t_{CYCP}$ or more are required for the period the time when the serial chip select pin becomes inactive to the time when the serial chip select pin becomes active again.

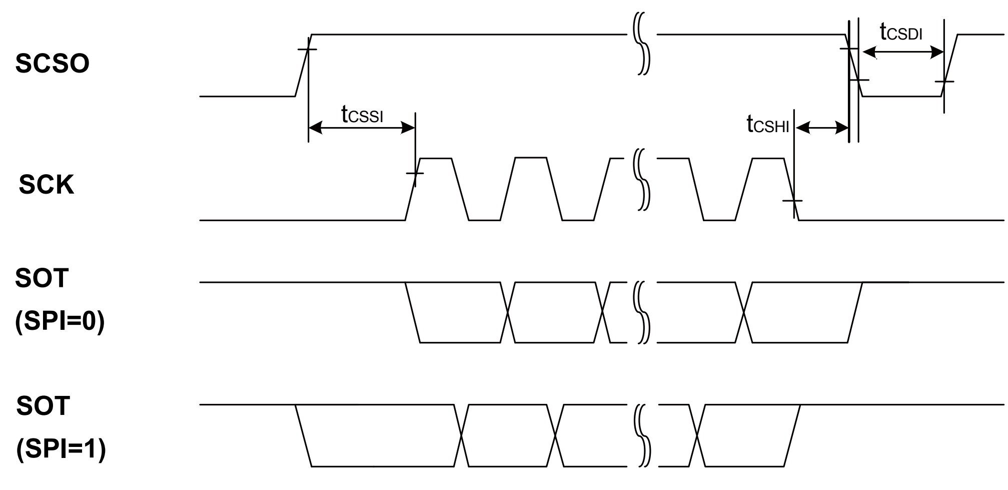
Notes:

− *t_{CYCP} indicates the APB bus clock cycle time.*
For information about the APB bus number which Multi-function Serial is connected to, see "8. Block Diagram".

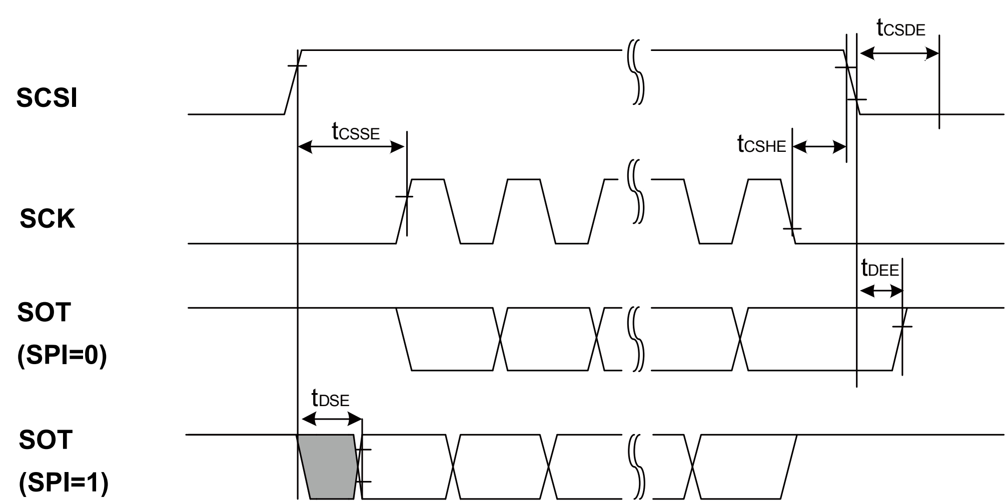
− *For information about CSSU, CSHD, CSDS, serial chip select timing operating clock, see "FM0+ Family Peripheral Manual".*

− *These characteristics only guarantee the same relocate port number.*
For example, the combination of SCKx_0 and SCSIx_1 is not guaranteed.

− *When the external load capacitance C_L=30 pF.*



Master mode



Slave mode

11.8 Flash Memory Write/Erase Characteristics

(V_{CC}=1.65 V to 3.6 V, T_A=- 40°C to +105°C)

Parameter		Value			Unit	Remarks
		Min	Typ	Max		
Sector erase time	Large sector	-	1.1	2.7	s	The sector erase time includes the time of writing prior to internal erase.
	Small sector	-	0.3	0.9		
Halfword (16-bit) write time		-	30	528	μs	The halfword (16-bit) write time excludes the system-level overhead.
Chip erase time		-	4.5	11.7	s	The chip erase time includes the time of writing prior to internal erase.

*: The typical value is immediately after shipment, the maximum value is guarantee value under 10,000 cycle of erase/write.

Write/Erase Cycle and Data Hold Time

Write/Erase Cycle	Data Hold Time (Year)	Remarks
1,000	20*	
10,000	10*	

*: This value comes from the technology qualification (using Arrhenius equation to translate high temperature acceleration test result into average temperature value at + 85°C).

11.9 Return Time from Low-Power Consumption Mode

11.9.1 Return Factor: Interrupt/WKUP

The return time from Low-Power consumption mode is indicated as follows. It is from receiving the return factor to starting the program operation.

Return Count Time

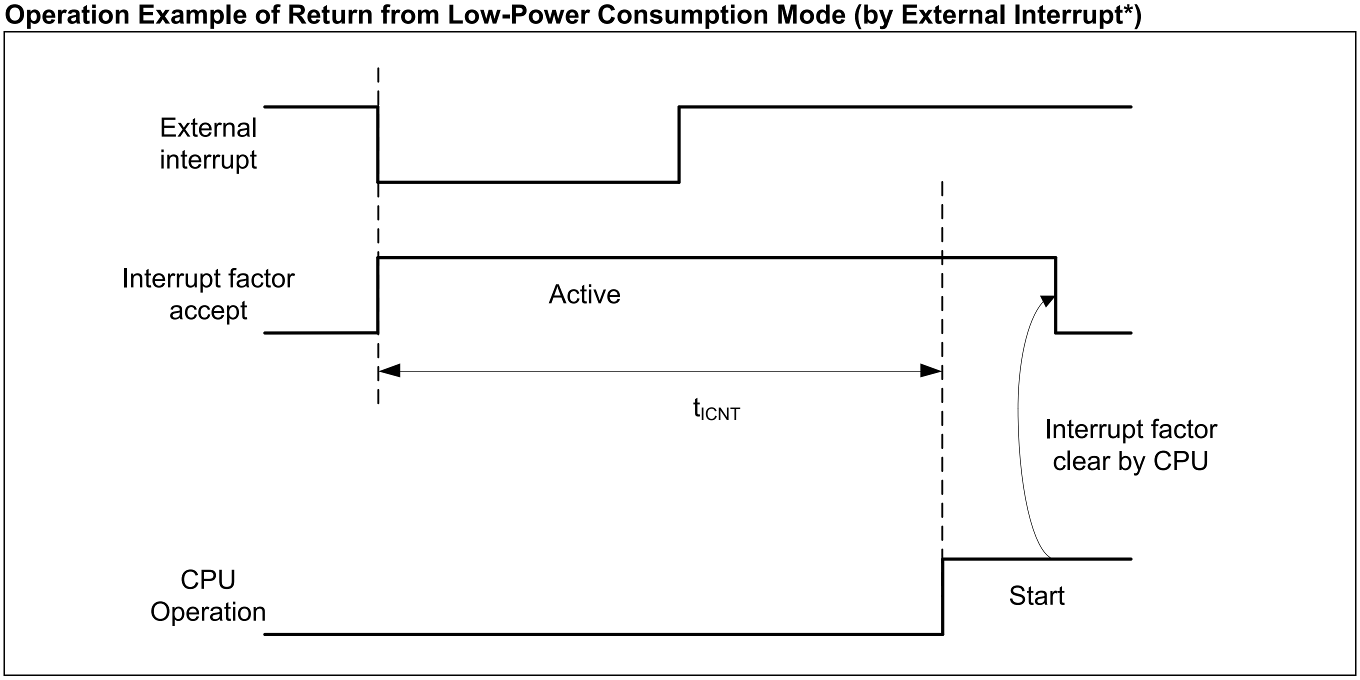
(V_{CC}=1.65 V to 3.6 V, T_A=-40°C to +105°C)

Parameter		Symbol	Value		Unit	Remarks
Current Mode	**Mode to return**		**Typ**	**Max** *1		
Sleep mode	each Run Modes	t_{ICNT}	4*HCLK		μs	When High-speed CR is enabled
Timer mode	High-speed CR Run mode Main Run mode PLL Run mode		12*HCLK	13*HCLK	μs	When High-speed CR is enabled
	Low-speed CR Run mode Sub Run mode		34+12*HCLK	72+13*HCLK	μs	
Stop Mode	High-speed CR Run mode Low-speed CR Run mode		34+12*HCLK	72+13*HCLK	μs	
	Main Run mode Sub Run mode PLL Run mode		34+12*HCLK +t_{OSCWT}	72+13*HCLK +t_{OSCWT}	μs	*2
RTC mode	High-speed CR Run mode Low-speed CR Run mode Sub Run mode		34+12*HCLK	72+13*HCLK	μs	
	Main Run mode PLL Run mode		34+12*HCLK +t_{OSCWT}	72+13*HCLK +t_{OSCWT}	μs	*2
Deep Standby RTC mode Deep Standby Stop mode	High-speed CR Run mode		43	281	μs	

*1: The maximum value depends on the condition of environment.

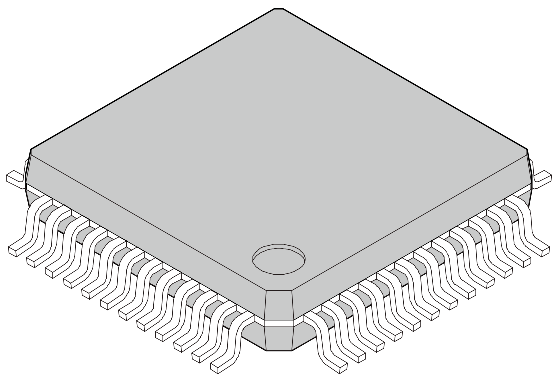
*2: t_{OSCWT} : Oscillator stabilization time.

Operation Example of Return from Low-Power Consumption Mode (by External Interrupt*)



*: External interrupt is set to detecting fall edge.

48-pin plastic LQFP

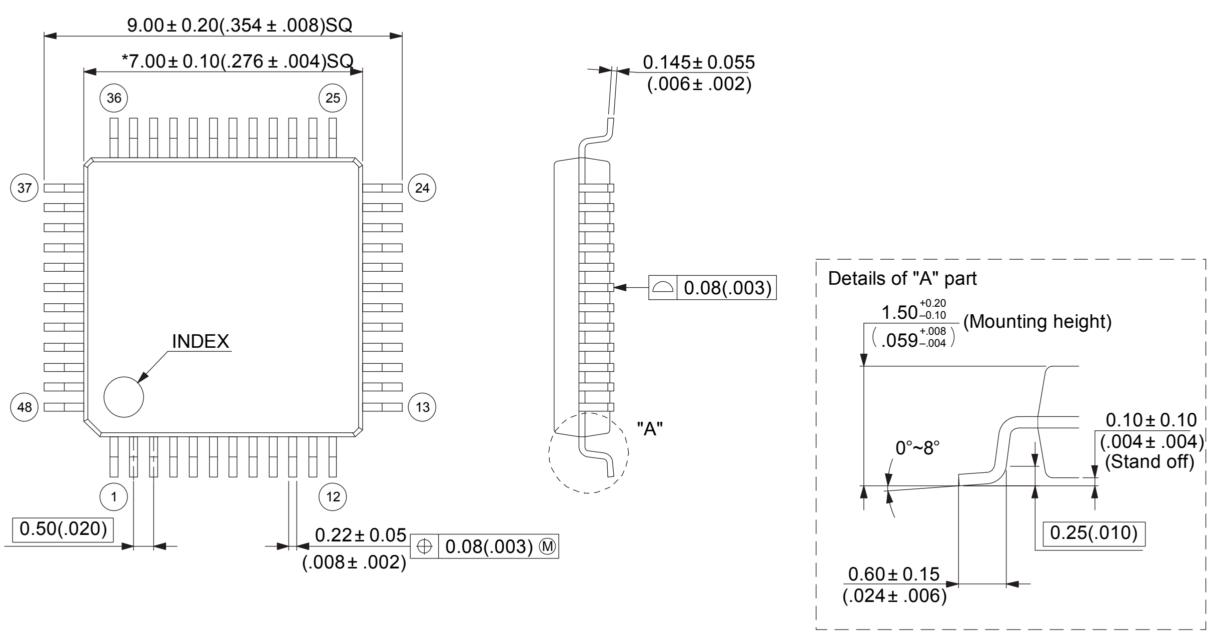


(FPT-48P-M49)

Lead pitch	0.50 mm
Package width × package length	7.00 mm × 7.00 mm
Lead shape	Gullwing
Lead bend direction	Normal bend
Sealing method	Plastic mold
Mounting height	1.70 mm MAX
Weight	0.17 g

48-pin plastic LQFP
(FPT-48P-M49)

Note 1) * : These dimensions do not include resin protrusion.
Note 2) Pins width and pins thickness include plating thickness.
Note 3) Pins width do not include tie bar cutting remainder.



Dimensions in mm (inches).
Note: The values in parentheses are reference values.

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	4896074	TEKA	08/31/2015	New Spec.
*A	4955136	TEKA	10/9/2015	AC/DC characteristics updated. Typo fixed in “List of Pin Functions”.