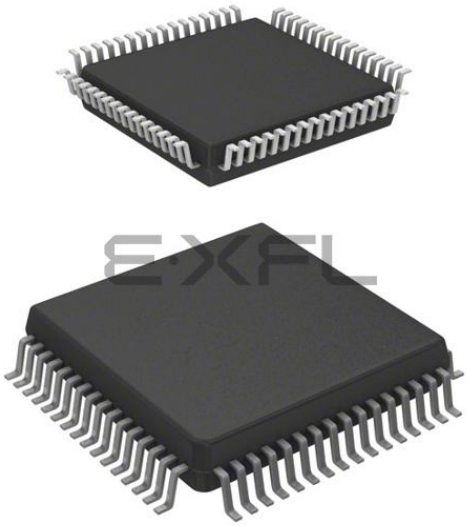
Rohm Semiconductor - ML610Q173-NNNGAZWAX Datasheet



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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	nX-U8/100
Core Size	8-Bit
Speed	8MHz
Connectivity	I²C, SSP, UART/USART
Peripherals	LCD, POR, PWM, WDT
Number of I/O	45
Program Memory Size	128KB (64K x 16)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	4K x 8
Voltage - Supply (Vcc/Vdd)	2.2V ~ 5.5V
Data Converters	A/D 8x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	64-BQFP
Supplier Device Package	64-QFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/rohm-semi/ml610q173-nnngazwax

ICs

Microcontroller

CONTENTS

High Performance & Ultra Low Power MCU

16bit ML620500 Series

Standard Type 16bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features							
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	Co-processor for multiplication and division	port			8bit timer	16bit timer	PWM	
		Low speed	High speed									Input	Output	Input/Output				
☆ML620Q503	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)	16MHz	62.5 ns 30.5μs	0.45μA	−40 to +85	Flash	32K	2K	2K	✓	2	—	36	8 (16bit×4)	4	16bit×4 (use 16bit timer)	
New ML620Q504	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)	16MHz	62.5 ns 30.5μs	0.45μA	−40 to +85	Flash	64K	2K	6K	✓	2	—	36	8 (16bit×4)	4	16bit×4 (use 16bit timer)	
☆ML620Q506	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)	16MHz	62.5 ns 30.5μs	0.45μA	−40 to +85	Flash	128K	2K	12K	✓	2	—	36	8 (16bit×4)	4	16bit×4 (use 16bit timer)	
☆ML620Q546	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)	16MHz	62.5 ns 30.5μs	0.45μA	−40 to +85	Flash	128K	2K	10K	✓	—	—	70	12 (16bit×6)	8	16bit×8 (use 16bit timer) 3 phase motor PWM×1	
☆ML620Q558	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)	16MHz	62.5 ns 30.5μs	0.45μA	−40 to +85	Flash	256K	2K	20K	✓	—	—	90	12 (16bit×6)	8	16bit×8 (use 16bit timer) 3 phase motor PWM×1	

Ultra Low Operating Voltage & Ultra Low Power MCU

8bit ML610400 Series

Standard Type 8bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features								
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			8bit timer	1kHz timer	PWM	Capture	WDT	
		Low speed	High speed								Input	Output	Input/Output						
ML610482	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Mask	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1	
ML610482P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−40 to +85	Mask	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1	
ML610Q482	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1	
ML610Q482P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−40 to +85	Flash	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1	
New ML610Q485	1.25 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.25μs/2μs/ 30.5μs	0.35μA	−20 to +70	Flash	32K	—	2K	4	6	16	6 (16bit× 3)	—	16bit×1	2	1	
New ML610Q485P	1.25 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.25μs/2μs/ 30.5μs	0.35μA	−40 to +85	Flash	32K	—	2K	4	6	16	6 (16bit× 3)	—	16bit×1	2	1	

Built-in LCD driver Dot Matrix Type 8bit Low power MCU

ML610421	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Mask	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610421P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−40 to +85	Mask	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q421	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q421P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−40 to +85	Flash	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q422	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610Q422P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−40 to +85	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610Q422B	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610Q422PB	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−40 to +85	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610426	1.1 to 3.6	32.768kHz (Crystal oscillation)	1MHz	1μs/ 30.5μs	0.5μA	−20 to +70	Mask	40K	—	2K	5	—	7	4 (16bit×2)	1	16bit×1	—	1	
ML610Q426	1.1 to 3.6	32.768kHz (Crystal oscillation)	1MHz	1μs/ 30.5μs	0.5μA	−20 to +70	Flash	40K	—	2K	5	—	7	4 (16bit×2)	1	16bit×1	—	1	
ML610Q426C	1.1 to 3.6	32.768kHz (Crystal oscillation)	1MHz	1μs/ 30.5μs	0.5μA	−20 to +70	Flash	40K	—	2K	7	—	13	4 (16bit×2)	1	16bit×1	—	1	
ML610Q428	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244μs/0.5μs/ 30.5μs	0.5μA	−20 to +70	Flash	48K	—	4K	6	3	14	2 (16bit×1)	1	16bit×3	—	1	
ML610429	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244μs/0.5μs/ 30.5μs	0.5μA	−20 to +70	Mask	48K	—	4K	10	3	20	2 (16bit×1)	1	16bit×3	—	1	
ML610Q429	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244μs/0.5μs/ 30.5μs	0.5μA	−20 to +70	Flash	48K	—	4K	10	3	20	2 (16bit×1)	1	16bit×3	—	1	
ML610Q431	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	64K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q431A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	64K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q431PA	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−40 to +85	Flash	64K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q432	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	64K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610Q432A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	64K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610Q435	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	96K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q435A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	96K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	
ML610Q436	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	96K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610Q436A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/ 30.5μs	0.5μA	−20 to +70	Flash	96K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	
ML610Q438	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244μs/0.5μs/ 30.5μs	0.5μA	−20 to +70	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1	
ML610Q438P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244μs/0.5μs/ 30.5μs	0.5μA	−40 to +85	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1	
ML610Q439	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244μs/0.5μs/ 30.5μs	0.5μA	−20 to +70	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1	
ML610Q439P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244μs/0.5μs/ 30.5μs	0.5μA	−40 to +85	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1	

(LAPIS Semiconductor products)

	Functions / Features										Industrial Equipment	Notes	Package	Chip Support
	Capture	WDT	ADC (method)	Serial port I²C	Serial port SSIO (SPI)	Serial port UART	Supply voltage detection	LCD driver	External interrupt sources	Others				
	16bit×4 (use 16bit timer)	1	2 (RC type) 12bit×12 (SA type)	2	2	2	VLS×1 LLD×1	—	8	Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP48-0707-0.50	✓
	16bit×4 (use 16bit timer)	1	2 (RC type) 12bit×12 (SA type)	2	2	2	VLS×1 LLD×1	—	8	Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP48-0707-0.50	✓
	16bit×4 (use 16bit timer)	1	2 (RC type) 12bit×12 (SA type)	2	2	2	VLS×1 LLD×1	—	8	Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP48-0707-0.50	✓
	16bit×8 (use 16bit timer)	1	2 (RC type) 10bit×20 (SA type)	2	2	5	VLS×1	—	8	RTC/Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP80-1212-0.50	—
	16bit×8 (use 16bit timer)	1	2 (RC type) 10bit×20 (SA type)	2	2	5	VLS×1	—	8	RTC/Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP100-1414-0.50	—

☆ : Under development

(LAPIS Semiconductor products)

	Functions / Features								Industrial Equipment	Notes	Package	Chip Support
	ADC (method)	Serial port I²C	Serial port SSIO	Serial port UART	Supply voltage detection	LCD driver	External interrupt sources	Others				
	2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	—	—	—	✓
	2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	✓	—	—	✓
	2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	—	—	P-TQFP48-0707-0.50	✓
	2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	✓	—	P-TQFP48-0707-0.50	✓
	—	—	1	1	—	—	12 (include 8bit-OR input)	Low speed frequency correction / Analog comparator / Melody : Buzzer / RTC / RNG (Random Number Generator)	—	—	—	✓
	—	—	1	1	—	—	12 (include 8bit-OR input)	Low speed frequency correction / Analog comparator / Melody : Buzzer / RTC / RNG (Random Number Generator)	✓	—	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	—	—	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	✓	—	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	—	—	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	✓	—	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : enable	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disenable	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : disenable	—	✓
	1 (RC type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/Melody : Buzzer/ EL Driver/External input voltage detecttion	—	—	—	✓
	1 (RC type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/Melody : Buzzer/ EL Driver/External input voltage detection	—	—	—	✓
	1 (RC type)	1	1	1	BLD×1	Max.672dot 42seg.×16com.	8	Low speed frequency correction/Melody : Buzzer/ EL Driver/External input voltage detecttion	—	—	—	✓
	2 (RC type)	1	1	1	BLD×1	Max.1392dot 58seg.×24com.	5	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	TQFP128-P-1414-0.40	✓
	2 (RC type)	1	1	1	BLD×1	Max.512dot 64seg.×8com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	—	✓
	2 (RC type)	1	1	1	BLD×1	Max.512dot 64seg.×8com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disenable	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : disenable	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disenable	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disenable	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	—	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disenable	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1344dot 56seg.×24com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1344dot 56seg.×24com.	9	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	—
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	9	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	✓

8bit ML610400 Series

Built-in LCD driver Segments type Low power 8bit MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features							
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			8bit timer	1kHz timer	PWM	Capture	WDT
		Low speed	High speed								Input	Output	Input/Output					
ML610401	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.9μA	−20 to +70	Mask	6K	–	192	4	12	18	2 (16bit×1)	–	–	2	1
ML610401P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.9μA	−40 to +85	Mask	6K	–	192	4	12	18	2 (16bit×1)	–	–	2	1
ML610402	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.9μA	−20 to +70	Mask	6K	–	192	4	8	18	2 (16bit×1)	–	–	2	1
ML610402P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.9μA	−40 to +85	Mask	6K	–	192	4	8	18	2 (16bit×1)	–	–	2	1
ML610403	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.9μA	−20 to +70	Mask	6K	–	192	4	4	18	2 (16bit×1)	–	–	2	1
ML610403P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.9μA	−40 to +85	Mask	6K	–	192	4	4	18	2 (16bit×1)	–	–	2	1
ML610404	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Mask	8K	–	256	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610404P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Mask	8K	–	256	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610405	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Mask	8K	–	256	5	8	22	4 (16bit×2)	–	16bit×1	2	1
ML610405P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Mask	8K	–	256	5	8	22	4 (16bit×2)	–	16bit×1	2	1
ML610406	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Mask	8K	–	256	5	4	22	4 (16bit×2)	–	16bit×1	2	1
ML610406P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Mask	8K	–	256	5	4	22	4 (16bit×2)	–	16bit×1	2	1
ML610407	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Mask	16K	–	1K	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610407P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Mask	16K	–	1K	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q407	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Flash	16K	–	1K	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q407P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Flash	16K	–	1K	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q407A	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Flash	16K	–	1K	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q407PA	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Flash	16K	–	1K	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q407D	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Flash	16K	–	1K	5	12	22	4 (16bit×2)	–	16bit×1	2	1
ML610408	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Mask	16K	–	1K	5	8	22	4 (16bit×2)	–	16bit×1	2	1
ML610408P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Mask	16K	–	1K	5	8	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q408	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Flash	16K	–	1K	5	8	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q408P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Flash	16K	–	1K	5	8	22	4 (16bit×2)	–	16bit×1	2	1
ML610409	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Mask	16K	–	1K	5	4	22	4 (16bit×2)	–	16bit×1	2	1
ML610409P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Mask	16K	–	1K	5	4	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q409	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Flash	16K	–	1K	5	4	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q409P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−40 to +85	Flash	16K	–	1K	5	4	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q409A	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/ 30.5μs	0.9μA	−20 to +70	Flash	16K	–	1K	5	4	22	4 (16bit×2)	–	16bit×1	2	1
ML610Q411	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.5μA	−20 to +70	Flash	16K	–	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q411P	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.5μA	−40 to +85	Flash	16K	–	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q411PA	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.5μA	−40 to +85	Flash	16K	–	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q412	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.5μA	−20 to +70	Flash	16K	–	1K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q412P	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/ 30.5μs	0.5μA	−40 to +85	Flash	16K	–	1K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q419	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/ 2μs/ 30.5μs	0.9μA	−20 to +70	Flash	64K	4K	2K	6	3	18	4 (16bit×2)	–	16bit×1	2	1
ML610Q419P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/ 2μs/ 30.5μs	0.9μA	−40 to +85	Flash	64K	4K	2K	6	3	18	4 (16bit×2)	–	16bit×1	2	1

(LAPIS Semiconductor products)

Functions / Features												
	ADC (method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support
		I²C	SSIO	UART								
	2 (RC type)	–	–	1	–	Max.55dot 11seg.×5com.	8 (include 4bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	–	1	–	Max.55dot 11seg.×5com.	8 (include 4bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	–	1	–	Max.75dot 15seg.×5com.	8 (include 4bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	–	1	–	Max.75dot 15seg.×5com.	8 (include 4bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	–	1	–	Max.95dot 19seg.×5com.	8 (include 4bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	–	1	–	Max.95dot 19seg.×5com.	8 (include 4bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.105dot 21seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.105dot 21seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.125dot 25seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.125dot 25seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Low-speed scillation stop detect reset : enable LCD bias : 1/3	P-TQFP100-1414-0.50	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : enable LCD bias : 1/3	P-TQFP100-1414-0.50	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Low-speed scillation stop detect reset : disenable LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : disenable LCD bias : 1/2, 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.145dot 29seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Low-speed scillation stop detect reset : enable LCD bias : 1/2, 1/3	–	✓
	2(RC type)	–	2	1	–	Max.165dot 33seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2(RC type)	–	2	1	–	Max.165dot 33seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.165dot 33seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Low-speed scillation stop detect reset : enable LCD bias : 1/3	P-TQFP100-1414-0.50	✓
	2 (RC type)	–	2	1	–	Max.165dot 33seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : enable LCD bias : 1/3	P-TQFP100-1414-0.50	✓
	2 (RC type)	–	2	1	–	Max.185dot 37seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.185dot 37seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable according to software LCD bias : 1/3	–	✓
	2 (RC type)	–	2	1	–	Max.185dot 37seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Low-speed scillation stop detect reset : enable LCD bias : 1/3	P-TQFP100-1414-0.50	✓
	2 (RC type)	–	2	1	–	Max.185dot 37seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : enable LCD bias : 1/3	P-TQFP100-1414-0.50	✓
	2 (RC type)	–	2	1	–	Max.185dot 37seg.×5com.	13 (include 8bit-OR input)	Low speed frequency correction/ Melody : Buzzer	–	Low-speed scillation stop detect reset : disenable LCD bias : 1/2, 1/3	–	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.144dot 36seg.×4com.	5	Low speed frequency correction/ Buzzer	–	Low-speed scillation stop detect reset : enable	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.144dot 36seg.×4com.	5	Low speed frequency correction/ Buzzer	✓	Low-speed scillation stop detect reset : enable	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.144dot 36seg.×4com.	5	Low speed frequency correction/ Buzzer	✓	Low-speed scillation stop detect reset : disenable	–	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.176dot 44seg.×4com.	5	Low speed frequency correction/ Buzzer	–	–	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.176dot 44seg.×4com.	5	Low speed frequency correction/ Buzzer	✓	–	P-TQFP120-1414-0.40	✓
	2 (RC type) 12bit×4 (SA type)	1	2	1	BLD×1	Max.192dot 48seg.×4com.	5	Low speed frequency correction/ Melody : Buzzer	–	–	P-TQFP100-1414-0.50	✓
	2 (RC type) 12bit×4 (SA type)	1	2	1	BLD×1	Max.192dot 48seg.×4com.	5	Low speed frequency correction/ Melody : Buzzer	✓	–	P-TQFP100-1414-0.50	✓

8bit ML610400 Series

Built-in LCD driver Segments type Low power 8bit MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features							
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			8bit timer	1kHz timer	PWM	Capture	WDT
		Low speed	High speed								Input	Output	Input/Output					
ML610Q419C	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.9µA	−20 to +70	Flash	64K	4K	2K	6	3	26	4 (16bit×2)	–	16bit×1	2	1
ML610Q419PC	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.9µA	−40 to +85	Flash	64K	4K	2K	6	3	26	4 (16bit×2)	–	16bit×1	2	1
ML610Q461	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.9µA	−20 to +70	Flash	16K	–	1K	5	10	14	4 (16bit×2)	–	16bit×1	2	1
ML610Q462	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.9µA	−20 to +70	Flash	16K	–	1K	5	6	14	4 (16bit×2)	–	16bit×1	2	1
ML610Q463	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.9µA	−20 to +70	Flash	16K	–	1K	5	2	14	4 (16bit×2)	–	16bit×1	2	1
ML610471	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−20 to +70	Mask	8K	–	512	4	10	7	2 (16bit×1)	–	–	2	1
ML610Q471	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−20 to +70	Flash	8K	–	512	4	10	7	2 (16bit×1)	–	–	2	1
ML610Q471P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−40 to +85	Flash	8K	–	512	4	10	7	2 (16bit×1)	–	–	2	1
ML610472	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−20 to +70	Mask	8K	–	512	4	6	7	2 (16bit×1)	–	–	2	1
ML610Q472	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−20 to +70	Flash	8K	–	512	4	6	7	2 (16bit×1)	–	–	2	1
ML610Q472P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−40 to +85	Flash	8K	–	512	4	6	7	2 (16bit×1)	–	–	2	1
ML610473	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−20 to +70	Mask	8K	–	512	4	2	7	2 (16bit×1)	–	–	2	1
ML610Q473	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−20 to +70	Flash	8K	–	512	4	2	7	2 (16bit×1)	–	–	2	1
ML610Q473P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	−40 to +85	Flash	8K	–	512	4	2	7	2 (16bit×1)	–	–	2	1
ML610474	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	−20 to +70	Mask	16K	–	1K	4	10	10	6 (16bit×3)	–	–	2	1
ML610Q474	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	−20 to +70	Flash	16K	–	1K	4	10	10	6 (16bit×3)	–	–	2	1
ML610475	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	−20 to +70	Mask	16K	–	1K	4	6	10	6 (16bit×3)	–	–	2	1
ML610Q475	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	−20 to +70	Flash	16K	–	1K	4	6	10	6 (16bit×3)	–	–	2	1
ML610476	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	−20 to +70	Mask	16K	–	1K	4	2	10	6 (16bit×3)	–	–	2	1
ML610Q476	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	−20 to +70	Flash	16K	–	1K	4	2	10	6 (16bit×3)	–	–	2	1
ML610477	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.51µA	−20 to +70	Mask	24K	–	2K	4	10	15	6 (16bit×3)	–	–	2	1
ML610Q477	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	−20 to +70	Flash	24K	–	2K	4	10	15	6 (16bit×3)	–	–	2	1
ML610Q477P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	−40 to +85	Flash	24K	–	2K	4	10	15	6 (16bit×3)	–	–	2	1
ML610478	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.51µA	−20 to +70	Mask	24K	–	2K	4	6	15	6 (16bit×3)	–	–	2	1
ML610Q478	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	−20 to +70	Flash	24K	–	2K	4	6	15	6 (16bit×3)	–	–	2	1
ML610Q478P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	−40 to +85	Flash	24K	–	2K	4	6	15	6 (16bit×3)	–	–	2	1
ML610479	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.51µA	−20 to +70	Mask	24K	–	2K	4	2	15	6 (16bit×3)	–	–	2	1
ML610Q479	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	−20 to +70	Flash	24K	–	2K	4	2	15	6 (16bit×3)	–	–	2	1
ML610Q479P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	−40 to +85	Flash	24K	–	2K	4	2	15	6 (16bit×3)	–	–	2	1

(LAPIS Semiconductor products)

	Functions / Features											
	ADC (method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support
		I²C	SSIO	UART								
	2 (RC type) 12bit×4 (SA type)	1	2	1	BLD×1	Max.160dot 40seg.×4com.	5	Low speed frequency correction/ Melody : Buzzer	–	–	P-TQFP100-1414-0.50	✓
	2 (RC type) 12bit×4 (SA type)	1	2	1	BLD×1	Max.160dot 40seg.×4com.	5	Low speed frequency correction/ Melody : Buzzer	✓	–	P-TQFP100-1414-0.50	✓
	2 (RC type)	–	1	1	–	Max.64dot 16seg.×4com.	5	Low speed frequency correction	–	–	P-TQFP64-1010-0.50	–
	2 (RC type)	–	1	1	–	Max.80dot 20seg.×4com.	5	Low speed frequency correction	–	–	P-TQFP64-1010-0.50	–
	2 (RC type)	–	1	1	–	Max.96dot 24seg.×4com.	5	Low speed frequency correction	–	–	P-TQFP64-1010-0.50	–
	1 (RC type)	–	–	1	–	Max.55dot 11seg.×5com.	4	Low speed frequency correction	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.55dot 11seg.×5com.	4	Low speed frequency correction/ No debugging function	–	–	P-TQFP48-0707-0.50	✓
	1 (RC type)	–	–	1	–	Max.55dot 11seg.×5com.	4	Low speed frequency correction/ No debugging function	✓	–	P-TQFP48-0707-0.50	✓
	1 (RC type)	–	–	1	–	Max.75dot 15seg.×5com.	4	Low speed frequency correction	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.75dot 15seg.×5com.	4	Low speed frequency correction/ No debugging function	–	–	P-TQFP48-0707-0.50	✓
	1 (RC type)	–	–	1	–	Max.75dot 15seg.×5com.	4	Low speed frequency correction/ No debugging function	✓	–	P-TQFP48-0707-0.50	✓
	1 (RC type)	–	–	1	–	Max.95dot 19seg.×5com.	4	Low speed frequency correction	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.95dot 19seg.×5com.	4	Low speed frequency correction/ No debugging function	–	–	P-TQFP48-0707-0.50	✓
	1 (RC type)	–	–	1	–	Max.95dot 19seg.×5com.	4	Low speed frequency correction/ No debugging function	✓	–	P-TQFP48-0707-0.50	✓
	–	–	–	1	–	Max.135dot 27seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	–	Selectable oscillation stop detection reset : function enable according to software	–	✓
	–	–	–	1	–	Max.135dot 27seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	–	Selectable oscillation stop detection reset : function enable according to software	–	✓
	–	–	–	1	–	Max.155dot 31seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	–	Selectable oscillation stop detection reset : function enable according to software	–	✓
	–	–	–	1	–	Max.155dot 31seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	–	Selectable oscillation stop detection reset : function enable according to software	–	✓
	–	–	–	1	–	Max.175dot 35seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	–	Selectable oscillation stop detection reset : function enable according to software	–	✓
	–	–	–	1	–	Max.175dot 35seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	–	Selectable oscillation stop detection reset : function enable according to software	–	✓
	1 (RC type)	–	–	1	–	Max.135dot 27seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.135dot 27seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.135dot 27seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	✓	–	–	✓
	1 (RC type)	–	–	1	–	Max.155dot 31seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.155dot 31seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.155dot 31seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	✓	–	–	✓
	1 (RC type)	–	–	1	–	Max.175dot 35seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.175dot 35seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	–	–	–	✓
	1 (RC type)	–	–	1	–	Max.175dot 35seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	✓	–	–	✓

High Noise Immunity MCU

8bit ML610100 Series

Standard Type 8bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/Output
ML610Q101	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122μs/ 30.5μs	–	−40 to +85	Flash	4K	–	256	–	–	11
ML610Q102	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122μs/ 30.5μs	–	−40 to +85	Flash	6K	–	256	–	–	11
ML610Q111	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122μs/ 30.5μs	–	−40 to +105	Flash	24K	4K	2K	–	–	15
ML610Q112	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122μs/ 30.5μs	–	−40 to +105	Flash	32K	4K	4K	–	–	25

Built-in LCD driver Segments type Low power 8bit MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/Output
ML610Q172	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.0μA	−40 to +85	Flash	128K	2K	4K	6	2	37
ML610Q173	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.0μA	−40 to +85	Flash	128K	2K	4K	6	2	37
ML610Q174	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.0μA	−40 to +85	Flash	128K	2K	4K	6	6	49
ML610Q178	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.0μA	−40 to +85	Flash	128K	–	4K	7	8	59

16bit ML620100 Series

Standard Type 16bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/Output
☆ML620Q131	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/ 30.5μs	3.5 (T.B.D)	−40 to +105	Flash	8K	4K	2K	–	–	11
☆ML620Q132	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/ 30.5μs	3.5 (T.B.D)	−40 to +105	Flash	16K	4K	2K	–	–	11
☆ML620Q133	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/ 30.5μs	3.5 (T.B.D)	−40 to +105	Flash	20K	4K	2K	–	–	11
☆ML620Q134	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/ 30.5μs	3.5 (T.B.D)	−40 to +105	Flash	16K	4K	2K	–	–	15
☆ML620Q135	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/ 30.5μs	3.5 (T.B.D)	−40 to +105	Flash	20K	4K	2K	–	–	15
New ML620Q151	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	32K	2K	2K	5 (Use crystal oscillation) 6 (Not use crystal oscillation)	4	30 (Use crystal oscillation) 31 (Not use crystal oscillation)
New ML620Q152	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	48K	2K	2K	5 (Use crystal oscillation) 6 (Not use crystal oscillation)	4	30 (Use crystal oscillation) 31 (Not use crystal oscillation)
New ML620Q153	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	64K	2K	2K	5 (Use crystal oscillation) 6 (Not use crystal oscillation)	4	30 (Use crystal oscillation) 31 (Not use crystal oscillation)
New ML620Q154	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	32K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	33 (Use crystal oscillation) 34 (Not use crystal oscillation)
New ML620Q155	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	48K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	33 (Use crystal oscillation) 34 (Not use crystal oscillation)
New ML620Q156	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	64K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	33 (Use crystal oscillation) 34 (Not use crystal oscillation)
New ML620Q157	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	32K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	45 (Use crystal oscillation) 46 (Not use crystal oscillation)
New ML620Q158	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	48K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	45 (Use crystal oscillation) 46 (Not use crystal oscillation)
New ML620Q159	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	−40 to +105	Flash	64K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	45 (Use crystal oscillation) 46 (Not use crystal oscillation)

(LAPIS Semiconductor products)

8bit timer	16bit timer	PWM	WDT	ADC(method)	Serial port: I²C	Serial port: SSIO	Serial port: UART	Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support
6 (16bit×3)	–	16bit×1 (with dead time)	1	10bit×6 (SA type)	–	–	1	VLS×2	–	5	Analog comparator×2	✓	–	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–
6 (16bit×3)	–	16bit×1 (with dead time)	1	10bit×6 (SA type)	–	–	1	VLS×2	–	5	Analog comparator×2	✓	–	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–
6 (16bit×3)	–	16bit×4 (Complementary type)	1	10bit×6 (SA type)	1	1	2	VLS×2	–	7	Analog comparator×2	✓	–	P-TSSOP20-0225-0.65	–
6 (16bit×3)	–	16bit×4 (Complementary type)	1	10bit×8 (SA type)	1	1	2	VLS×2	–	7	Analog comparator×2	✓	–	P-LQFP32-0707-0.80	–
6 (16bit×3)	–	16bit×3 (Supports IGBT control)	1	10bit×12 (SA type)	1	2	2	BLD×1	Max. 96dot 24seg. ×4com.	4	Low speed frequency correction	–	–	QFP64-P-1414-0.80	–
6 (16bit×3)	–	16bit×3 (Supports IGBT control)	1	10bit×8 (SA type)	1	2	2	BLD×1	Max. 96dot 24seg. ×4com.	4	Low speed frequency correction/ Analog comparator	–	–	QFP64-P-1414-0.80	–
6 (16bit×3)	–	16bit×3 (Supports IGBT control)	1	10bit×12 (SA type)	1	2	2	BLD×1	Max. 128dot 32seg. ×4com.	4	Low speed frequency correction/ Analog comparator	–	–	QFP80-P-1420-0.80	–
6 (16bit×3)	–	16bit×2 (Supports IGBT control)	1	10bit×16 (SA type)	1	2	2	BLD×1	Max. 160dot 40seg. ×4com.	5	Low speed frequency correction/ Analog comparator	–	–	P-QFP100-1420-0.65	–

(LAPIS Semiconductor products)

8bit timer	16bit timer	PWM	WDT	ADC(method)	Serial port: I²C	Serial port: SSIO	Serial port: UART	Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support
8 (16bit×4)	–	16bit×1 (Complementary type)	1	10bit×6 (SA type)	1	1	1	LLD×1 VLS×1	–	5	Analog comparator×2	✓	–	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–
8 (16bit×4)	–	16bit×1 (Complementary type)	1	10bit×6 (SA type)	1	1	1	LLD×1 VLS×1	–	5	Analog comparator×2	✓	–	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–
8 (16bit×4)	–	16bit×1 (Complementary type)	1	10bit×6 (SA type)	1	1	1	LLD×1 VLS×1	–	5	Analog comparator×2	✓	–	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–
8 (16bit×4)	–	16bit×1 (Complementary type)	1	10bit×8 (SA type)	1	1	1	LLD×1 VLS×1	–	5	Analog comparator×2	✓	–	P-TSSOP20-0225-0.65	–
8 (16bit×4)	–	16bit×1 (Complementary type)	1	10bit×8 (SA type)	1	1	1	LLD×1 VLS×1	–	5	Analog comparator×2	✓	–	P-TSSOP20-0225-0.65	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	7	Analog comparator	–	–	P-TQFP48-0707-0.50	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	7	Analog comparator	–	–	P-TQFP48-0707-0.50	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	7	Analog comparator	–	–	P-TQFP48-0707-0.50	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	8	Analog comparator	–	–	P-TQFP52-1010-0.65	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	8	Analog comparator	–	–	P-TQFP52-1010-0.65	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	8	Analog comparator	–	–	P-TQFP52-1010-0.65	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	8	Analog comparator	–	–	P-QFP64-1414-0.80	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	8	Analog comparator	–	–	P-QFP64-1414-0.80	–
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	–	8	Analog comparator	–	–	P-QFP64-1414-0.80	–

☆: Under development

Built-in Speech Output Function MCU

8bit ML610300 Series

Standard Type 8bit Low power MCU

Part No.	Operating Conditions						ROM/RAM					Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	Memory for sound	RAM capacity (Byte)	port		
		Low speed	High speed									Input	Output	Input/Output
New ML610Q304	2.0 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122μs/ 30.5μs	2.7μA	−40 to +85	Flash	96K	2K	Flash ROM	1K	1	3	11
ML610Q359	2.2 to 3.6	32.768kHz (Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	1.7μA	−40 to +85	Flash	160K	3K	Flash ROM	2K	8	3	29
ML610Q360	2.2 to 3.6	32.768kHz (Crystal oscillation)	8.192MHz	0.122μs/ 30.5μs	1.7μA	−40 to +85	Flash P2ROM	160K	3K	P2ROM: 16M bit	2K	8	3	29

Built-in LCD driver Segments type Low power 8bit MCU

Part No.	Operating Conditions						ROM/RAM					Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	Memory for sound	RAM capacity (Byte)	port		
		Low speed	High speed									Input	Output	Input/Output
ML610Q380	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122μs 30.5μs	2.0μA	−40 to +70	Flash	128K	—	Flash ROM	2K	7	4	34

Sensor Hub MCU

8bit ML610790 Family

U8 Core Based Standard Type 8bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/ Output
ML610Q793	VDD:1.7 to 1.9 AVDD:2.5 to 3.6	32.768kHz (External clock)	4.096MHz	0.25μs/ 30.5μs	0.6μA	−30 to +85	Flash	64K	—	4K	—	—	21
ML610Q794G	2.5 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz	0.25μs/ 30.5μs	1.1μA	−30 to +85	Flash	64K	—	4K	—	—	21

32bit ML630790 Family

ARM Cortex-M0 Based Standard Type 32bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@SLEEPDEEP)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/ Output
New ML630Q791	VDD:1.7 to 1.9	32.768kHz (External clock)	32MHz	—	2.5μA	−40 to +85	Flash	128K	—	16K	—	—	7

ARM-Based MCU

32bit MCU ML674xxx/ML675xxx

For General-purpose Applications

Part No.	Built-in Memory			CPU Core	Operating Frequency (Max.)	Operating Condition		
	ROM/Flash	RAM	Cash			Supply Voltage (V)	Operating Temperature (°C)	Supply Currency (Typ.)
ML674001	—	32KByte	—	ARM7TDMI	33MHz	I/O:3.0 to 3.6 core:2.25 to 2.75	−40 to 85	52mA (33MHz, when using external ROM)
ML675001			8KByte unified		60MHz			92mA (60MHz, when using external ROM)

(LAPIS Semiconductor products)

	Functions / Features											Industrial Equipment	Notes	Package	Chip Support
	8bit timer	PWM	WDT	ADC (method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	SP Amp Output(W)/Class	Others				
					I²C	SSIO	UART									
	4 (16bit×2)	—	1	10bit×3 (SA type)	1	2	1	—	—	9	1.0 (@5V) /D class	Speech function/ ADPCM decoder/ Built-in speaker amp	✓	—	P-QFN28-0505-0.50	—
	8 (16bit×4)	—	1	12bit×4 (SA type)	—	2	2	VLS×1	—	7	0.5 (@3V) /AB class	Speech function/ ADPCM decoder/ Built-in speaker amp	✓	—	P-TQFP64-1010-0.50	—
	8 (16bit×4)	—	1	12bit×4 (SA type)	—	2	2	VLS×1	—	7	0.5 (@3V) /AB class	Speech function/ ADPCM decoder/ Built-in speaker amp	✓	—	P-TQFP64-1010-0.50	—
	6 (16bit×3)	16bit×2	1	10bit×8 (SA type)	1	2	2	BLD×1	Max. 96dot 24seg. ×4com.	5	0.6 (@5V) /AB class	Speech function/ ADPCM decoder/ Built-in speaker amp	—	—	P-QFP80-1414-0.65	—

(LAPIS Semiconductor products)

	Functions / Features										Industrial Equipment	Notes	Package	Chip Support
	8bit timer	PWM	WDT	ADC (method)	Serial port				External interrupt sources	Others				
					I²C	SSIO	UART	I²C/SPI (for Host Communication)						
	6 (16bit×3)	—	1	12bit×3 (SA type)	1	1	2	1	16	16bit Square Root, Multiply, Divider, Host I/F (SPI/I²C/Logging RAM:8KB)	—	—	S-UFLGA48-3.06×2.96-0.40 (WCSP48)	—
	6 (16bit×3)	—	1	12bit×2 (SA type)	1	1	2	1	16	16bit Square Root, Multiply, Divider, Host I/F (SPI/I²C/Logging RAM:8KB)	—	—	TQFP-48-P-0707-0.50	—

(LAPIS Semiconductor products)

	Functions / Features										Industrial Equipment	Notes	Package	Chip Support
	8bit timer	PWM	WDT	ADC (method)	Serial port				External interrupt sources	Others				
					I²C	SSIO	UART	I²C/SPI (for Host Communication)						
	8 (16bit×4)	1	1	—	2	—	1	1	7	Square Root, Division operations,Host I/F (Built-in 512 byte communication register)	—	—	(WCSP)	—

(LAPIS Semiconductor products)

	Peripherals								Package
	General-purpose Ports	Timer	PWM	WDT	A/D	Serial Ports	Interrupt Internal/ External	Additional Peripheral Functions	
	42	7	16bit×2	16bit×1	10bit A/D 4ch	UART 2ch SSIO 2ch I²C 1ch	23/5	DMA controller 2ch External memory controller [ROM (Flash), SRAM, DRAM (EDO/SDRAM), IO] STOP mode	LQFP144-P-2020-0.50 P-LFBGA144-1111-0.8

Power-Saving Solar Power Supply Control LSI (LAPIS Semiconductor products)

Secondary battery control LSI

Part No.	Operating Conditions				Functions/Features			
	Operating voltage VBAT (V)	Operating voltage VSC (V)	VBAT side Current consumption (A)	Operating temperature (°C)	VBAT-VDO Output Impedance	VSC-VBAT Input Impedance	OCP (Overcharge prevention) voltage (V)	BOD (Brown out detection) voltage (V)
ML9077	0.0 to 3.2	0.0 to 3.6	80n	−20 to +70	2.5Ω or less/20mA @VBAT ≥1.8V	100Ω or less /1mA @VSC ≥2V	2.6/3.1	1.15/1.8

Primary battery control LSI

Part No.	Operating Conditions				Functions/Features		
	Operating voltage VBAT (V)	Operating voltage VSC (V)	VBAT side Current consumption (A)	Operating temperature (°C)	VBAT-VDO Output Impedance	VSC-VDO Output Impedance	Regulator voltage solar limiter voltage (V)
ML9078-001	1.1 to 3.6	0.0 to 4.0	80n	−20 to +70	75Ω or less/2mA @VBAT ≥2V	65Ω or less/2mA @VBAT ≥2V	3.3/1.65
ML9078-002	1.1 to 3.6	0.0 to 4.0	80n	−20 to +70	75Ω or less/2mA @VBAT ≥2V	65Ω or less/2mA @VBAT ≥2V	3.0/1.5
ML9078-003	1.1 to 3.6	0.0 to 4.0	80n	−20 to +70	75Ω or less/2mA @VBAT ≥2V	65Ω or less/2mA @VBAT ≥2V	VBAT