Connect with IoT

Microcontrollers Ver.9.0

ROHM GROUP
LAPIS TECHNOLOGY

LAPIS Technology Co.,Ltd.

LAPIS Technology

Microcontrollers

LAPIS Technology's MCU controllers utilize original low power technology cultivated over many years to achieve class-leading* performance. As such they have been widely adopted in a variety of applications, from compact battery-driven devices such as high-performance digital watches to consumer appliances, industrial equipment, and infrastructure, with over 100 million units shipped per year. Going forward, LAPIS Technology will continue to provide MCUs that meet market needs for low power consumption by leveraging the latest technologies.

Feature 1

Broad lineup

<Select according to application>

- 8/16/32bit models offered
- Consumer electronics, industrial equipment, IoT, battery-powered applications
- MCUs with speech playback function available

Feature 2

Multiple peripheral functions and form factors

<Compatible with a wide range of applications>

- LCD drivers suitable for a variety of LCD panels
- Select between package and bare chip form factors to suit application requirements
- High noise immunity against power supply/signal noise
- High fidelity high output voice functionality
- Numerous serial ports
- PWM ideal for IGBT/LED lighting control
- Low-cost, high precision temperature measurement via RC ADC
- Flash memory readable at only 1V

Feature 3

Complete development support system

<Supports software development and Flash programming>

- Reference board available for every product
- Starter kit with emulator, reference board, and software development tools facilitates program development
- Onboard/offboard Flash programmer supports customer program writing during mass production
- Support also provided for program writing during mass production based on customer requirements (i.e. via onboard writing tool, Flash GANG writer)

Feature 4

Low Power consumption high performance original U8/U16 cores

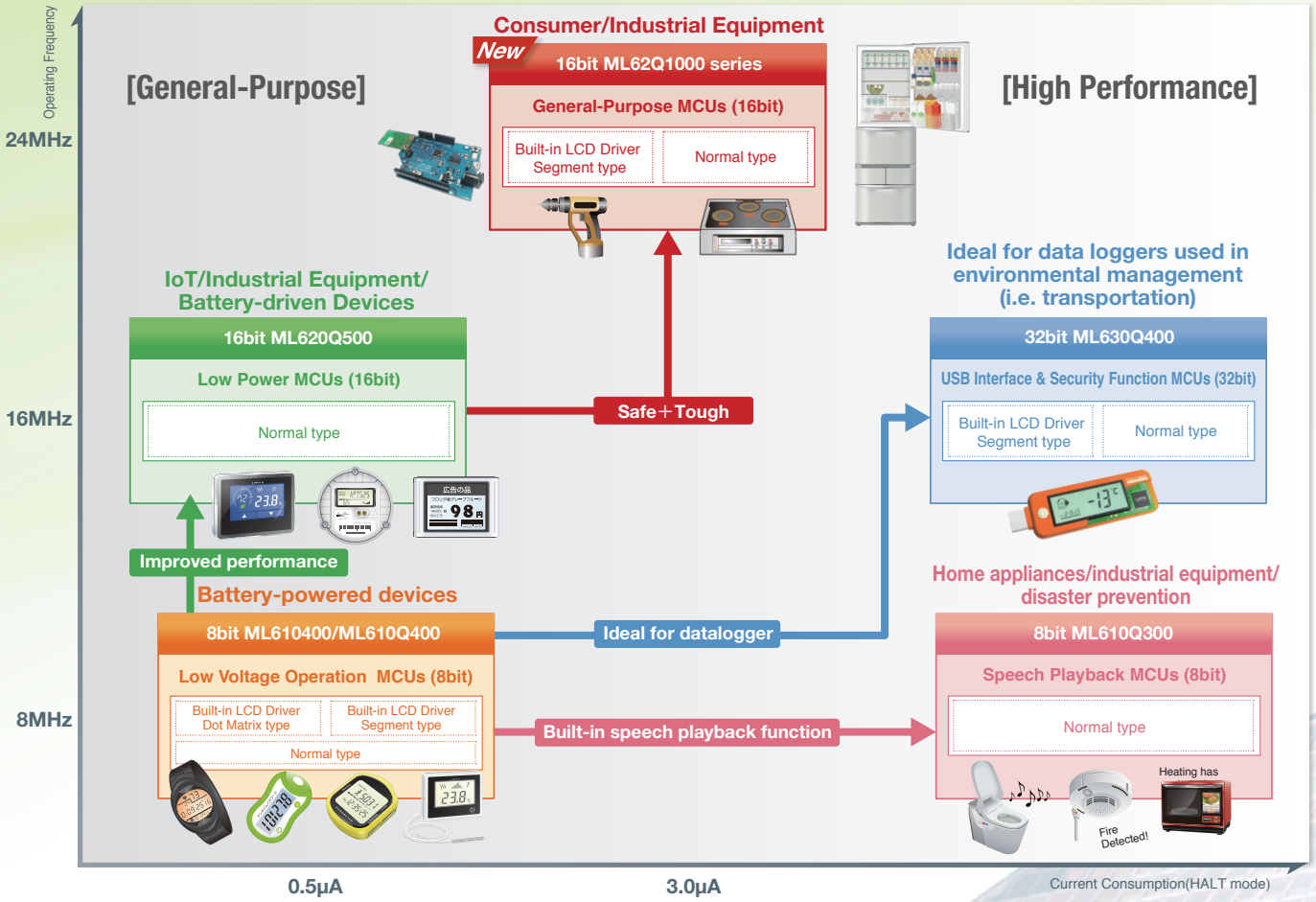
<Easily switch between 8bit and 16bit cores depending on the application>

- Instruction compatibility simplifies program flow
- Built-in multiplication/division co-processor improves computing power

Industry-* Leading
Energy saving・Improved Safety

8bit MCU

16bit MCU



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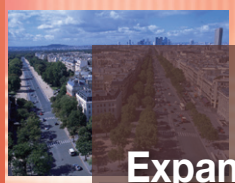
*LAPIS Technology study




General-Purpose MCUs (16bit)

Expanded functionality, 24MHz (Max) operation at up to 105°C

16bit ML62Q1000 series ML62Q1300 group ML62Q1500 group ML62Q1700 group ML62Q1800 group

The ML62Q1000 series are high-performance 16bit CMOS microcontrollers utilizing LAPIS Technology's RISC-type 16bit CPU 'U16' core. Low Power consumption and multiple peripheral functions provide superior processing capability.

Feature 1: Multiple peripherals

A wide array of peripheral circuits are built-in, including numerous serial communication circuits, multifunction timers, a high accuracy analog function, and flash memory that supports background processing during program execution while writing to the data flash.

Feature 2: Broad lineup

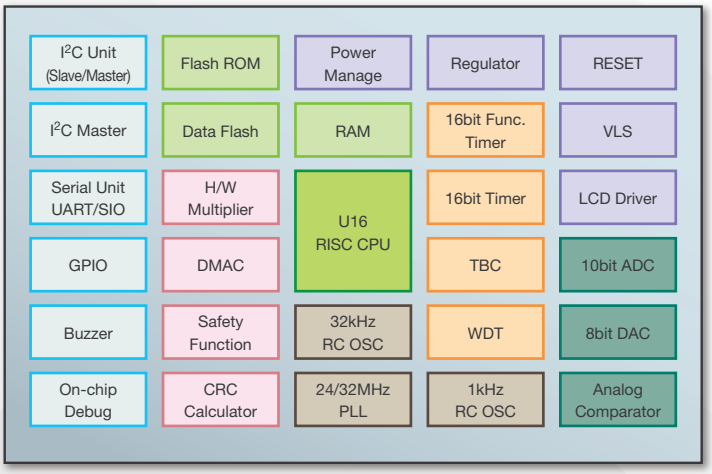
The broad lineup includes several package types, from 16 to 100 pins, in program memory sizes ranging from 16KB to 512KB. Software-compatible peripheral functions are built in. Pin layout is also similar, making it easy to flexibly respond to package and/or program changes.

Feature 3: Safety functions

In addition to functions for preventing crystal oscillation stoppage during inter-terminal leakage and malfunctions at low voltages and/or turn ON, a circuit is added that significantly expands the self-test range.

U16 CORE

ML62Q1000 series
System Block Diagram

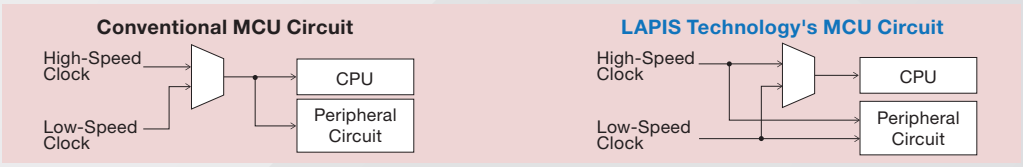


Key Advantage

Full dual clock system delivers flexible clock management with Low Power consumption

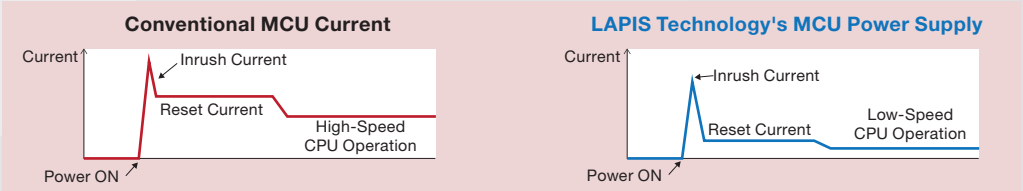
■ Full Dual Clock System

⇒ This system enables selection of low-speed and high-speed clocks for each CPU and peripheral circuit. For example, a high-speed clock is typically selected for the CPU and timer operation, but can be stopped quickly if necessary and a low-speed clock used (i.e. for receiving signals through UART). This provides flexible clock management that can help reduce power consumption considerably.



■ Current Control at Startup

⇒ Controlling the initial current during power ON and utilizing a low-speed clock at MCU startup makes it possible to minimize startup current, allowing for worry-free operation in power supply systems possessing limited current capacity.



Safety Functions

Expanded safety functions

Self-Diagnostic Functions

- Register test
- UART/SSIO/I²C test
- A/D converter test
- Program counter test
- Oscillation frequency test
- WDT test
- GPIO test
- Interrupt test

Peripheral circuit diagnosis detects failures

Error Detection

- Flash memory CRC calculation
- RAM parity error
- ROM unused area access

Detects malfunctions due to memory data errors and invalid memory access

Memory Protection

- RAM guard
- SFR (Special Function Register) guard

SFR/RAM erroneous write prevention

10 software-based self-diagnostic functions

Sample software is offered, including self-diagnostic software for the MCU that complies with the international standard IEC/UL60730 'Automatic electrical controls for household and similar use' as well as software compatible with IEC60730-1 Annex H Software Class B

Strong against noise and compatible with high temperatures

Cleared the highest class (±8kV) during IEC61000-4-2 ESD noise testing (also cleared ±30kV)
Broad operating temperature range: –40°C to +105°C Compatible with high temperatures

Results of ESD Breakdown Evaluation Tests Based on IEC61000-4-2

Test Level	Test Voltage [kV]	ML62Q1000 series	
		Vertical Coupling Plane Test	Horizontal Coupling Plane Test
1	±2	Pass	Pass
2	±4	Pass	Pass
3	±6	Pass	Pass
4	±8	Pass	Pass
Reference	±30	Pass	Pass

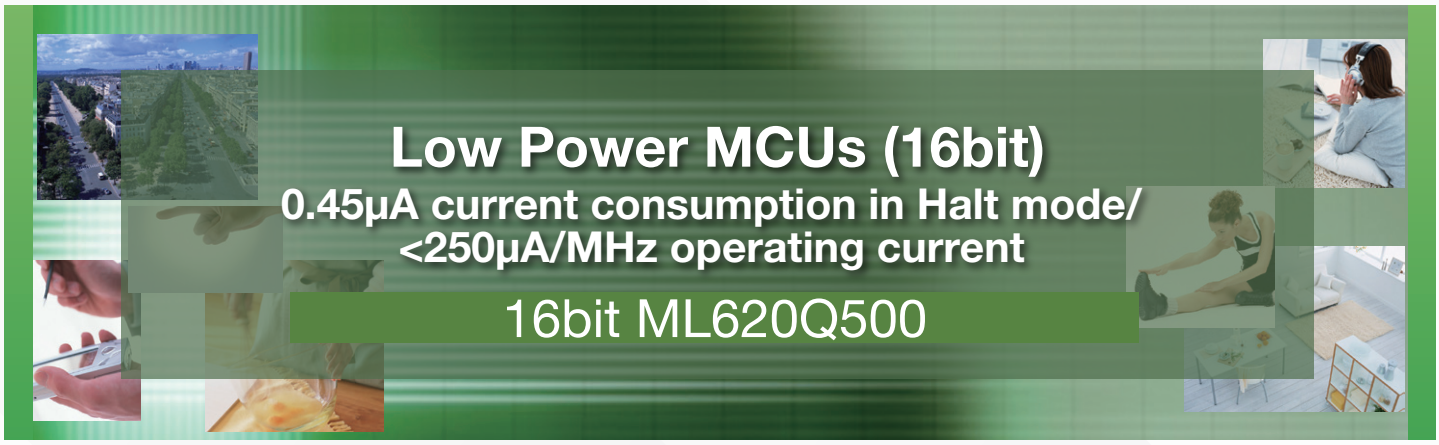
U16 CORE ML62Q1000 series

ROM (Byte)	16pin WQFN16 SSOP16	20pin TSSOP20	24pin WQFN24	32pin WQFN32 TQFP32	48pin TQFP48	52pin TQFP52	64pin QFP64 TQFP64	80pin QFP80	100pin QFP100 TQFP100
512K							ML62Q1729 ML62Q1859	ML62Q1739 ML62Q1869	ML62Q1749 ML62Q1879
384K							ML62Q1728 ML62Q1858	ML62Q1738 ML62Q1868	ML62Q1748 ML62Q1878
256K							ML62Q1727 ML62Q1557	ML62Q1737 ML62Q1567	ML62Q1747 ML62Q1577
192K							ML62Q1726 ML62Q1556	ML62Q1736 ML62Q1566	ML62Q1746 ML62Q1576
160K							ML62Q1725 ML62Q1555	ML62Q1735 ML62Q1565	ML62Q1745 ML62Q1575
128K					ML62Q1704 ML62Q1534	ML62Q1714/C ML62Q1544/C	ML62Q1724/C ML62Q1554/C	ML62Q1734/C ML62Q1564/C	ML62Q1744 ML62Q1574
96K					ML62Q1703 ML62Q1533	ML62Q1713/C ML62Q1543/C	ML62Q1723/C ML62Q1553/C	ML62Q1733/C ML62Q1563/C	ML62Q1743 ML62Q1573
64K			ML62Q1347	ML62Q1367	ML62Q1702 ML62Q1532	ML62Q1712 ML62Q1542	ML62Q1722 ML62Q1552		
48K			ML62Q1346	ML62Q1366	ML62Q1701 ML62Q1531	ML62Q1711 ML62Q1541	ML62Q1721 ML62Q1551		
32K	ML62Q1325	ML62Q1335	ML62Q1345	ML62Q1365	ML62Q1700 ML62Q1530	ML62Q1710 ML62Q1540	ML62Q1720 ML62Q1550		
24K	ML62Q1324	ML62Q1334							
16K	ML62Q1323	ML62Q1333							

ML62Q1700 group: Built-in LCD Driver Type

ML62Q1300 group:
ML62Q1500 group: Normal Type
ML62Q1800 group:

Note: Please refer to the manual for each product regarding individual specifications



Low Power MCUs (16bit)

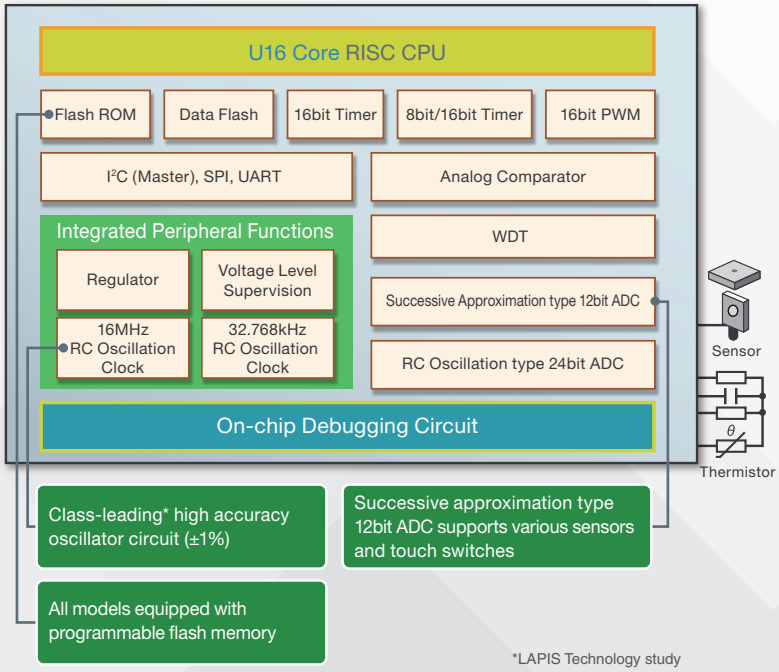
0.45µA current consumption in Halt mode/ <250µA/MHz operating current

16bit ML620Q500

The ML620Q500 CMOS microcontrollers utilize LAPIS Technology's original 16bit RISC U16 Core to achieve superior performance.
The U16 Core is instruction-compatible with the U8 Core and offers parallel processing using a 3-stage pipeline architecture to enable efficient instruction execution with one instruction per clock cycle.
ML620Q500 leverage Low Power technology utilized in 8bit U8 Core MCUs to improve processing power and provide high performance operation (16MHz Max) while maintaining ultra-low current consumption (0.45µA at Halt, <250µA/MHz operation).
Additional features include wide operating voltage (1.8V to 5.5V) and temperature (–40°C to +85°C) ranges, enabling support for a variety of applications.
A number of peripheral circuits and functions are also built in, such as a successive-approximation-type 12bit ADC, RC-oscillator-type 24bit ADC ideal for temperature/humidity measurement, and multiple serial ports (I^2C, UART, SPI).
All models integrate flash memory for onboard programming.

U16 CORE

ML620Q500
System Block Diagram



*LAPIS Technology study

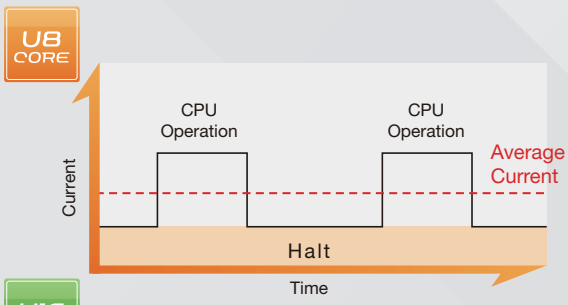
Key Advantage

ML620Q500 16bit MCUs provide low current consumption through optimized output modes

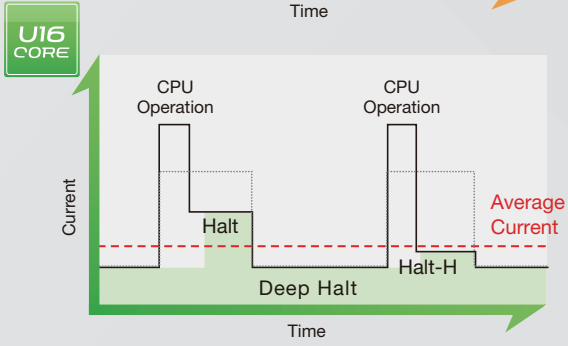
Numerous power modes reduce power consumption

- Optimal combination of multiple power down modes minimize power consumption
- Power down modes added to Flash ROM and regulator

U8 CORE



U16 CORE



[Multiple Power Down Modes]

3 power down modes (Deep Halt, Halt-H, Halt) are used in combination to reduce power consumption - even during high-speed (16MHz) operation.

[Flash ROM and Regulator]

The Flash ROM and regulator have been improved by adding newly developed power down modes, reducing standby power consumption even further.

[Reference]
Standby current reduced by 10%, from 0.5µA to 0.45µA

Feature 1

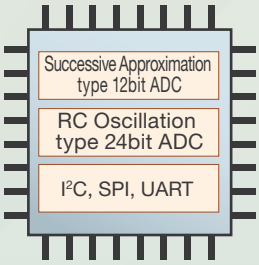
High performance operation with ultra-low current consumption supports a wide range of applications, from battery-driven devices to industrial equipment

- 0.45μA current consumption in Halt mode: <250μA/MHz operating current
- Operating frequency: 16MHz (Max)
- Operating voltage: 1.8V to 5.5V
- Operating temperature: –40°C to +85°C

Feature 2

Multiple peripheral functions support a variety of system requirements

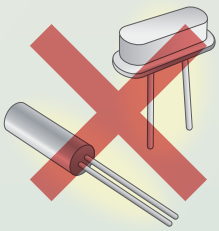
- Successive approximation type 12bit A/D converter
- RC oscillation type 24bit A/D converter
  ⇒ Enables high accuracy temperature and humidity measurement
- I²C, SPI, UART (Full duplex mode), etc.
  ⇒ Compatible with a variety of serial I/F



Feature 3

Internal oscillation circuit reduces component costs while improving system safety

- Low-Speed Clock: 32kHz crystal/internal RC oscillation (Selectable)
- High-Speed Clock: 16MHz crystal/internal RC oscillation (Selectable)
- 32kHz RC oscillation provides backup in case of crystal oscillation failure, ensuring continuous system operation

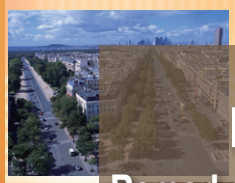


U16 CORE

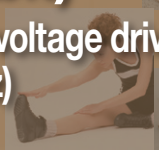
ML620Q500

ROM (Byte)	16pin	32pin	48pin	64pin	80pin	100pin
256K	Normal type				Thermostats	
128K				Electronic Shelf Labels (ESL)		
64K			ML620Q504H		Temperature Loggers Health & Fitness	
32K			ML620Q503H			
16K						

Note: Please refer to the manual for each product regarding individual specifications








Low Voltage Operation MCUs (8bit)

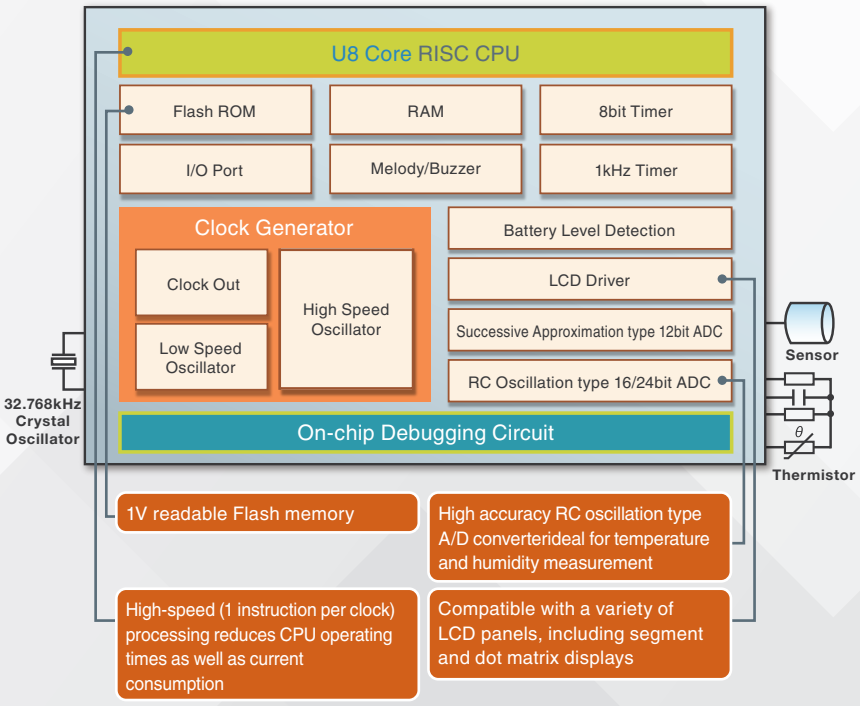
Remarkably low current consumption enables single-battery low-voltage drive (0.5µA Halt current/operating current <5µA/32kHz)

8bit ML610400/ML610Q400

The 8bit ML610400/ML610Q400 of high-performance CMOS microcontrollers integrate LAPIS Technology's original 8bit U8 Core CPU, enabling high efficiency instruction execution(1 instruction/clock) through parallel processing based on a 3-stage pipeline architecture. The clock generator circuit uses a dual clock configuration and features both low-speed mode and Low Power mode operation. These MCUs, which have proven popular in the portable battery-driven and handheld device markets, leverages proprietary Low Power technology and incorporates Flash memory capable of operation at only 1V along with optimized power management functions and a high efficiency RISC CPU to minimize power consumption. In addition, a built-in LCD driver, 2 ADC circuits, on-chip debugger function, and other peripheral circuits make them ideal for portable LCD-equipped devices such as smart watches, activity/heart rate monitors, and thermostats.
MCUs with integrated rewritable Flash memory support shorter development and production times while low current consumption translates to smaller, lighter form factors and extensive peripheral circuits contribute to greater set miniaturization. Also, an expanded temperature range (–40°C to +85°C) enables suitability with industrial equipment such as data loggers used for temperature processing for food and other products.

U8 CORE

8bit ML610400/ML610Q400
System Block Diagram



Key Advantage

ML610Q400 8bit MCUs deliver low voltage, low current operation

	Conventional 8bit Flash Microcontroller	LAPIS Technology Low Power 8bit Flash Microcontroller
Operating Voltage	1.8V to 3.6V	1.1V to 3.6V
Sleep (HALT) Current	2.0µA	0.5µA
Standby (STOP) Current	0.8µA	0.15µA
Operating Current	50µA (32kHz CPU operation) 6mA (4MHz CPU operation)	5µA (32kHz CPU operation) 0.8mA (4MHz CPU operation)

Reduced by up to 86%*
*LAPIS Technology study

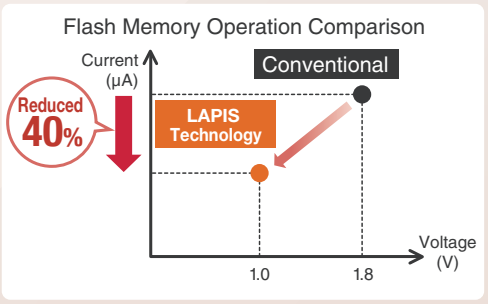
Breakthrough low current consumption enables single-battery operation

Feature 1

Ultra Low Power

Class-Leading **Low Power Consumption**

Flash memory operable at 1V, combined with a sleep (Halt) current of only 0.5µA, make this series suitable for a variety of applications-especially portable battery-driven devices.

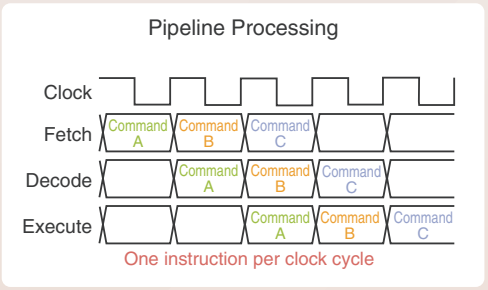


Feature 2

High performance CPU

U8 Core

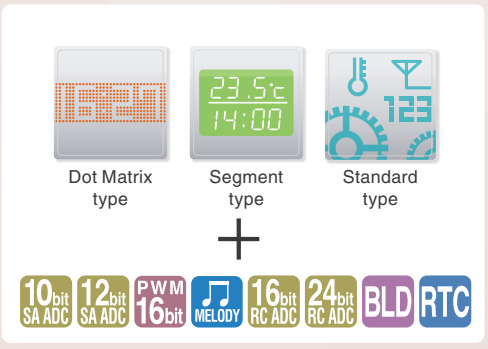
LAPIS Technology's original RISC-type CPU utilizes a 3-stage pipeline architecture to enable 1 instruction per clock cycle. As a result, 16bit performance is achieved via 8bit operation.



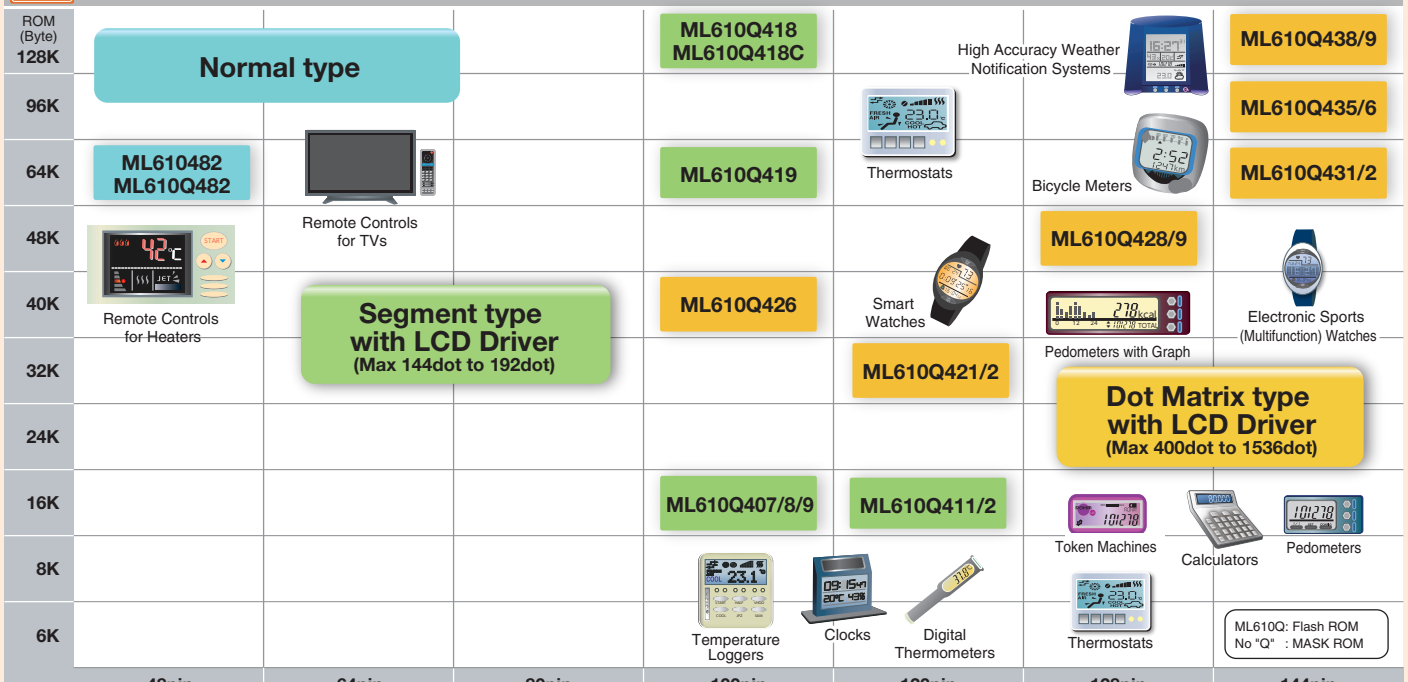
Feature 3

Integrated LCD driver and multiple peripheral functions

In addition to an LCD driver optimized for dot matrix/segment displays, these MCUs integrate an RC oscillator type ADC ideal for temperature measurement as well as a successive approximation type ADC compatible with voltage output sensors, along with a real-time clock, battery level detection circuit, 16bit PWM for backlight dimming, melody output, and more.



U8 CORE ML610400/ML610Q400



Note: Please refer to the manual for each product regarding individual specifications





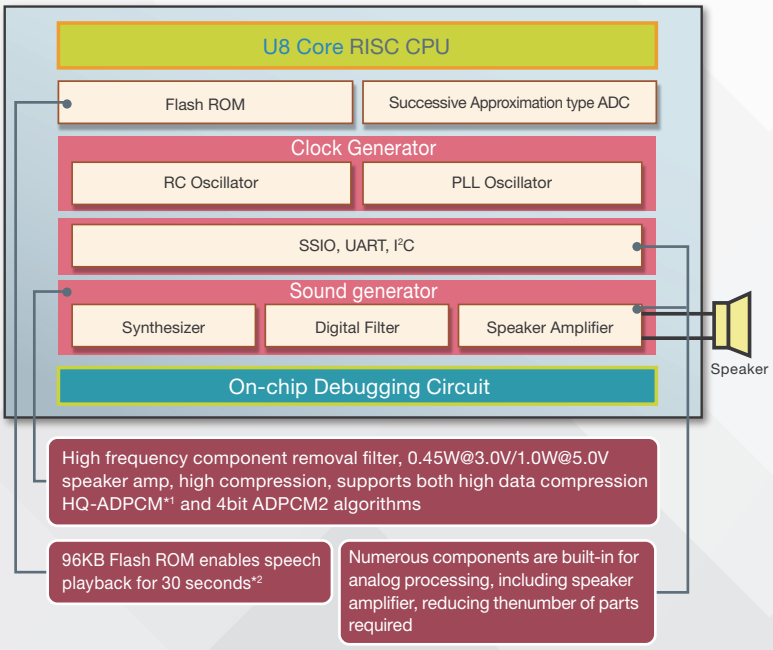

Speech Playback MCUs (8bit)

Sound algorithms HQ-ADPCM*1, 4bit ADPCM2, 8bit PCM(non-linear/straight), 16bit PCM(straight)

8bit ML610Q300

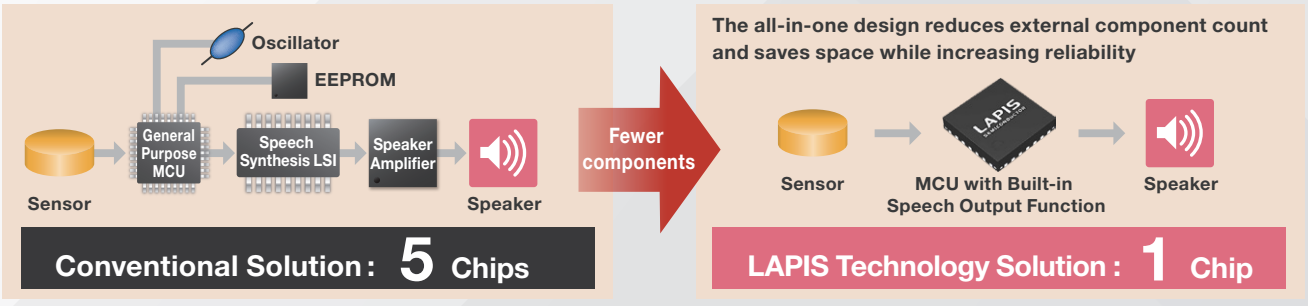
The ML610Q300 of CMOS MCUs with speech output function utilizes a proprietary 8bit U8 core to achieve superior performance. In addition, a hardware-based high fidelity speech playback function and high output speaker amplifier make it possible to provide voice functionality on a single chip, improving audio quality, simplifying control, and maximizing MCU performance.
This superior playback functionality, combined with a low power high performance U8 core,3V/5V compatible power supply and broad peripheral control functions, provide a single-chip solution for both battery- and AC-driven products.

8bit ML610Q300
System Block Diagram



Key Advantage

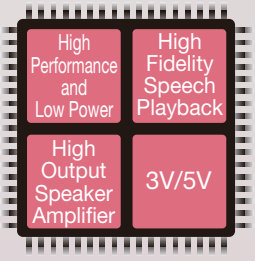
Integrated peripheral components save space and improve reliability



Feature 1

Speech output function on a single chip

- Low-pass filter reduces noise
- Sound algorithms
  HQ-ADPCM*1, 4bit ADPCM2, 8bit PCM (non-linear/straight), 16bit PCM (straight)
- 1W speaker amplifier (@5V)
- Power supply voltage range: 2.0V to 5.5V



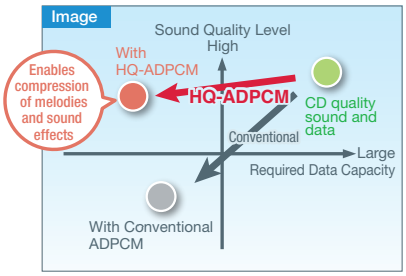
*1: Excluding ML610Q304
*2: Conditions: During 6.4kHz ADPCM2 playback, not including control program capacity

Feature 2

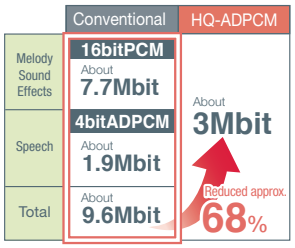
High fidelity, high compression HQ-ADPCM makes it possible to reduce memory capacity

ML610Q305 and ML610Q306 adopt the newly developed high fidelity, high compression sound algorithm HQ-ADPCM that provides a clearer sound and richer audio range while reducing data size compared with conventional ADPCM, providing a more comfortable listening experience. For example, melodies and sound effects that are degraded with ADPCM and cannot be played with uncompressed PCM can be compressed with HQ-ADPCM, ensuring superior sound quality while reducing memory capacity. Up to 80% compression is possible vs. 4bit ADPCM and 20% compared with 16bit ADPCM.

HQ-ADPCM enables high fidelity audio compression



Comparison of Data Volume Required for 30s Playback



Feature 3

Easy speech playback

- Achieves speech playback functionality by simply setting sound code data in the sound regist
- Integrating 16-byte*1/32-byte*2 FIFO into the sound register makes it possible to extend the interval between sound code data request interrupts

Speech Playback Conditions	Sound Code Data Request Interrupt Time*3
16bit PCM at 16kHz	250µs

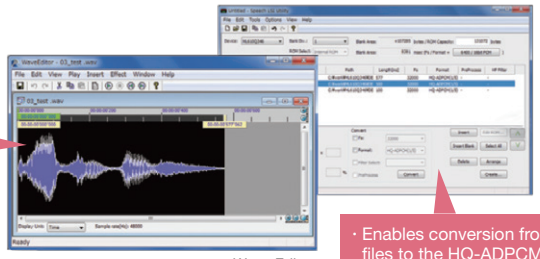
*1: For ML610Q304
*2: For ML610Q305/ML610Q306
*3: Time from full FIFO to empty

■ Speech LSI Tools Facilitate Sound Code Data Creation

Run the 'Speech LSI Tools' program on a PC to create sound code data using a speech playback MCU. Speech LSI Tools include a Wave Editor that makes it easy to change (i.e. fade in/out), cut, and connect original sound data (WAVE files) as well as a Speech LSI Utility capable of editing phrases and converting WAVE files to the HQ-ADPCM and ADPCM2 formats.

Speech LSI Tools

- Sound cut/connection
- Fade In/Out, etc.



Speech LSI Utility

Wave Editor

- Enables conversion from WAVE files to the HQ-ADPCM format
- Phrase editor, etc.

Speech LSI Tools Operating Environment

- Microsoft® Windows
  Windows 7, Windows 8.1, Windows 10
  Note: Compatible with 32bit (x86)/ 64bit (x64) environments
- Processor and memory
  Set up according to OS requirements
- Hard disk space
  1GB usable HDD space
- Audio
  Windows compatible sound card and speakers
- USB port

Note: Program data is developed separately in the LEXIDE-U16 integrated development environment.

ML610Q300

Note: Please refer to the manual for each product regarding individual specifications

[Reference] LAPIS Technology also offers speech synthesis LSIs that can easily be controlled by an MCU

LAPIS Technology Speech Synthesis LSIs Search Click

USB Interface & Security Function MCUs (32bit)

Built-in ARM® Cortex®-M0+, USB2.0 Full Speed Device
Provides high performance with Low Power

32bit ML630Q400

ML630Q400 are high-performance 32bit CMOS MCUs that integrate an ARM® Cortex®-M0+.

Feature 1 — Low Power Consumption

Achieves a low current consumption of 0.8µA at Halt Mode and 250µA/MHz during normal operation, making it ideal for battery power applications

Feature 2 — Multiple Peripherals

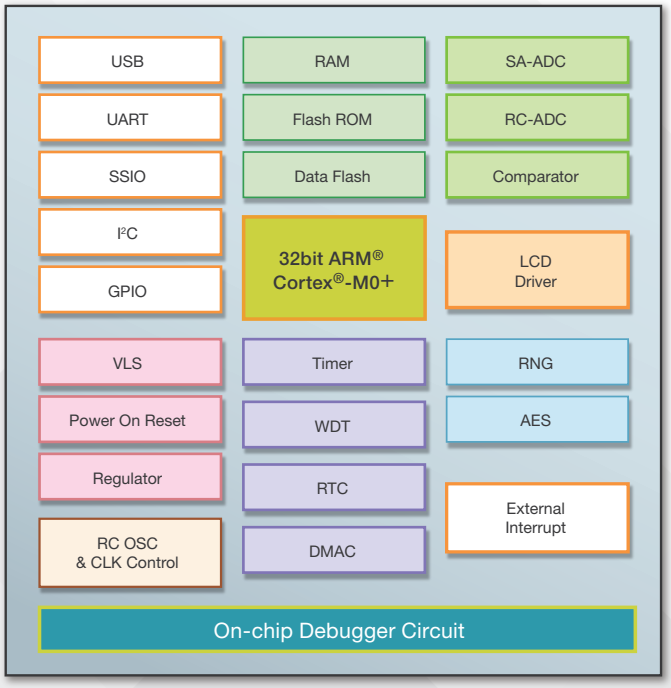
Supports a variety of communication methods, including USB2.0 Full Speed, I²C, UART, and SSIO. 2 types of AD converters are built in (RC and SA), along with an LCD driver, making them ideal for data loggers. Also integrates AES and a random number generator necessary for security applications.

Feature 3 — High Noise Immunity

Clears ±30kV* during IEC 61000-4-2 electrostatic noise testing, ensuring high noise tolerance.

*Measured by indirect discharge using LAPIS Technology's reference board

32bit ML630Q400
System Block Diagram



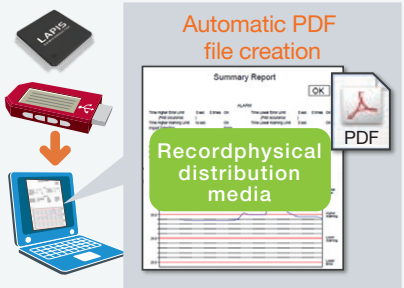
USB PDF Logger Reference Kit

- Software provided for PDF file creation and log data acquisition
- USB mass storage driver makes it possible to access files by connecting to a PC
- Accelerates customer development

[Contents]

- Hardware: ML630Q466 Board
- Hardware Support: Product List, Circuit Diagrams
- Software Support: Source Code (PDF file generation software/USB mass storage device driver/power management driver/RC-ADC driver)

Built-in PDF file generation software



8bit/16bit MCU Development Support System

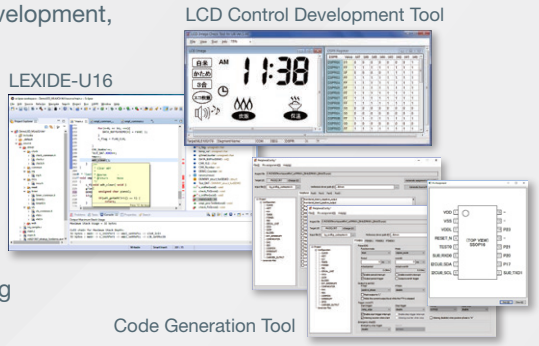
Consistent support from design and coding to evaluation and ROM code writing

Emulator EASE1000 V2/Dr.1000

Reference Board with Built-in Microcontroller and Software Tools

LAPIS Technology's program development support system is comprised of software and hardware tools that support program development.
The software tools feature a user-friendly interface that makes it possible to efficiently perform a series of tasks from program creation to debugging.

- Integrated software simplifies repeated work required during software development, including programming, building (Object creation), and debugging
- User-friendly graphical user interface
- Supports the open-source Eclipse-based integrated development environment
- Includes enhanced support tools for LCD control development and code generation
- Compact, lightweight on-chip emulator EASE1000 V2
- Full-featured ICE Dr.1000 with enhanced debugging functionality including real-time RAM monitoring and trace functions
  (Target products: ML62Q1000 series)



Program Development Support System

LAPIS Technology provides software for building, debugging, and writing programs.
The LEXIDE-U16 integrated development environment controls the startup of LAPIS Technology's original tools, including build tool settings and tools that enable debugging, Flash writing, and LCD control development support.
The LEXIDE-U16 also integrates project management and editor functions to improve software development operability.
Regarding hardware tools, an on-chip emulator is built in that can rewrite to Flash memory and perform debugging when connected to the actual device along with a full-featured ICE capable of checking all RAM areas without stopping trace or program execution.

LAPIS Technology offers an expansive software development support system that facilitates program development

Development Tools

Integrated Development Environment

LEXIDE-U16

On-chip Emulator

EASE1000 V2

Full-Featured ICE

Dr.1000

Build Tools

- CCU8 C Compiler
- RASU8 Assembler
- RLU8 Linker
- OHU8 Converter

Debugging Tools

- LEXIDE-U16 debugging function
- DTU8 debugger
- Simulator

ROM Code Data Generation Tool

- HTU8 HEX Converter

Flash Programmer Tools

MWU16 Flash Multi Writers

Connect up to 32 EASE 1000 V2 units (Free software)

3rd Party Flash Programmer

Standalone Writers

Flash Support Group

AF9201

PC-Connected Writers

MINATO

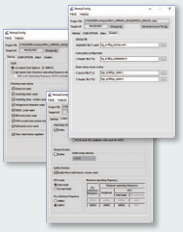
MODEL400e+series

MODEL308

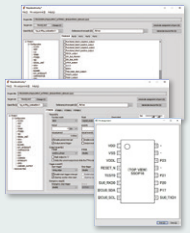
Support Tools

Code Generation Tools

Startup/Peripheral Setting Tools



Startup Setting Tools



Peripheral Setting Tools

LCD Control Development Support Tools

- LcdAtU8
  LCD image tool

Sample Software

- Reference software
- Self-test sample software
  and more...

Materials

- Replacement Guide for Non-LAPIS MCUs
- Code Size Compression Guide
- Software Safety Measures
- Application Notes
  and more...

Online Support Site

- Provides the latest updates

Boards and Kits

Reference Board

Reference Boards for Each MCU

ML62Q1367 Reference Board

ML62Q1552 Reference Board

Online Distributors

Digi-Key ELECTRONICS

MOUSER ELECTRONICS

Starter Kit

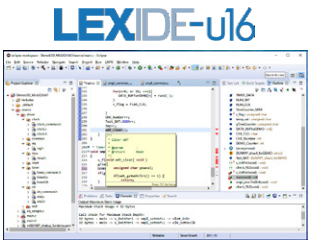
MCU Starter Kit

LCD Starter Kit

Electrostatic SW Starter Kit

Full software tools

LEXIDE-U16 Integrated Development Environment



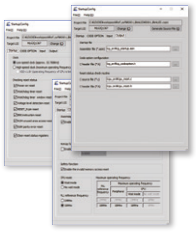
Our integrated development environment based on open-source Eclipse and CDT plug-in enables high efficiency program development.

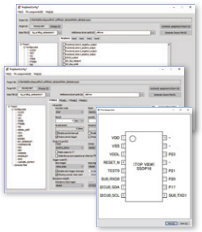
- Easy-to-use editor with robust functionality facilitates program editing
- Launch original LAPIS Technology tools such as those for debugging LCD control development, and stack calculation.
- Easily migrate from the existing IDEU8 integrated development environment to LEXIDE-U16.

Code Generation Tools

The Code Generation Tool generates various codes, including for the MCU operating mode and initial peripheral settings. Simply set the value in the too to generate codes that can be immediately verified, enabling efficient program development.

- The Startup Configuration Tool generates setup codes for customizing the startup routine as well as the code option for ML62Q1000 series MCUs.
- The Peripheral Configuration Tool generates code for initializing the general-purpose ports and peripherals of ML62Q1000 series MCUs.


Startup Configuration Tool


Peripheral Configuration Tool

LCD image tools LCD control software development support tool

- Inputting a bitmap file of an LCD panel image and LCD panel layout information automatically generates table data for LCD allocation RAM along with a sample control program.
- The LCD image tools efficiently performs complicated mapping operation.
- The LCD image tools consist of an LCD image assignment tool*1 and LCD image verification tool*2.

LCD Image Tools


LCD Image Assignment Tool


LCD Image Verification Tool

*1: The LCD image assignment tool supports LCD segment mapping operation with the MCU terminal via an LCD panel image displayed on a PC.
*2: The LCD image verification tool is useful for mapping validation.

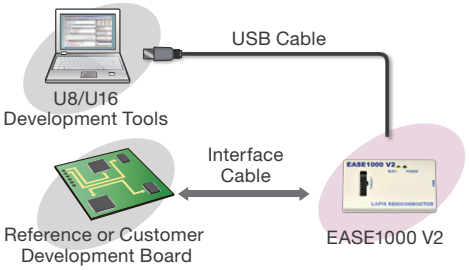
Emulators provided for different applications

EASE1000 V2 On-Chip Emulator

On-chip emulator EASE1000 V2 supports Flash rewriting and onboard software debugging by connecting a target device equipped with LAPIS Technology's MCU integrating 8bit/16bit Flash memory with on-chip debugging function.

- Software debugging is possible using emulator and brake functions along with program memory interval/data memory interval/SFR display change functionality
- Connecting to ML62Q1000 series MCUs allows users to carry out real-time watch, branch trace, and stack overshoot/undershoot break functions

Connection Diagram

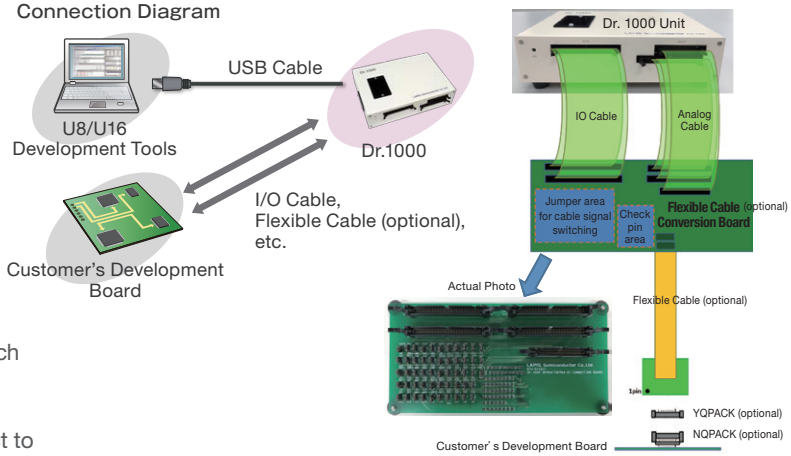


Dr.1000 Full-Featured

The full-featured ICE Dr. 1000 is an emulator for the ML62Q1000 series that supports advanced debugging by including a variety of debugging functions not found in other emulators.

- Efficient debugging is possible using a real-time RAM monitoring function that can verify changes in the entire RAM area without stopping program execution together with a trace function capable of referencing program execution history
- Enables measurement of the execution time for each operating frequency (including standby mode), facilitating low power application development
- Optional flexible cable makes it possible to connect to the mounted IC on the customer's board

Connection Diagram



EASE1000 V2 On-Chip Emulator and Full-Featured ICE Dr.1000 Specifications Overview

	EASE1000 V2		New Dr.1000
Compatible Devices	**ML620Q500/ML610Q400/ML610Q300**	**ML62Q1000**	**ML62Q1000 series (QFP64/TQFP64 or lower package) MCU*2**
Operating Voltage	VDD (input voltage to the VTref signal) 1.6V to 5.5V		Internal: 3.3V, External: 1.8V to 5.5V* Operating voltage switching: internal/external voltage via slide switch
Output Voltage for Target LSI	3.3V(Typ) / 100mA(Max)		—
Operating Clock	—		Low-speed clock: 32.768kHz, High-speed clock: 16MHz/24MHz (code option switchable)
Memory	—		Program memory: 512KB*3, Data memory (data RAM): 32KB*3, Data memory (data Flash): 8KB*3
Real-Time Watchdog Function	—	Real-time watch: 2pts Max	Real-time RAM monitor (full area display of data RAM) Real-time watch: Up to 254pts (SFR: Up to 64pts included)
Branch Trace Function	—	Up to 170 branches	—
Trace Function	—	—	Up to 256K steps Internal: Execution address, RAM address, RAM data, PSW, probe, interrupt transition cycle Start Conditions: Free run, RAM data match, PC match, disable, Stop Conditions: PC match, disable, continue/stop switching after trace pointer overflow
Emulation	Real-time emulation/step emulation step in/step out/step over		
Break	Forced break, software breakpoint break, address break, RAM match break		
	Hardware breakpoint break: Up to 4pts (set/release during emulation)		Hardware breakpoint break: Up to 20pts (set/release during emulation: possible)
	—	Sequential break, stack pointer overflow break, stack pointer underflow break	
	—	Branch trace overflow break, illegal memory access break, RAM parity error break	Trace overflow break, power down break, external break, ROM N area break, RAM N area break
Display/Change	Program memory space/data memory space/SFR		
Execution Time Measurement: Branch Trace	Unit: 100µs Max measurement time: 119hrs (free run)		
Execution Time Measurement: Cycle Counter	—		32bit counter (free run) Cycle counter by operating frequency (free run) Cycle counter between 2 (arbitrary) points (free run)
Coverage Function	—	✓*1	512KB total space
Sync Out (Synchronous Signal Output) Function	—		Up to 5 pts, trigger method
User RESET Input	✓		Reset Enable/Disable switchable
Probe	—		Input probes: 2 (external break), sync out: 1, trace: 5
Host Interface	USB2.0 Full-Speed		
Supply Voltage	+5V, 500mA (supplied from USB VBUS on Host PC side)		+5V, 2A (AC adapter)
External Dimensions W×H×D (mm)	50×17×90		260×78×185

*1: Uses branch trace information *2: The ML62Q1300 family and other models are currently under development
*3: Valid only for the memory space of the set model

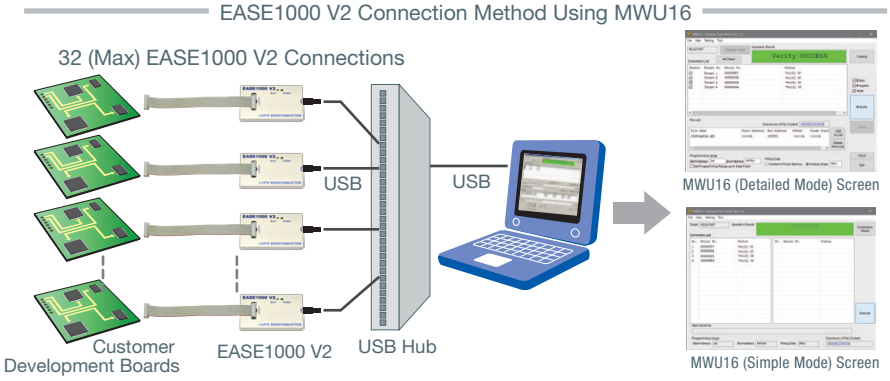
Flash Programmer

MWU16 Flash Multi-Writer*

Supports simultaneous Flash programming of multiple boards of the same type.
It can also be set to 'Simple GUI Mode' to prevent accidental operation.

*The requisite number of EASE1000 V2 units must be purchased to use MWU16.

EASE1000 V2 Connection Method Using MWU16



3rd Party Flash Programmer

Supports onboard/offboard writing to Flash memory.

Supports onboard writing to Flash memory without a PC

TOA ELECTRONICS, Inc.
Flash Support Group Company
AF9201
Flash Support Group
http://www.j-fsg.co.jp/en/

Supports offboard PC-controlled writing

Minato Advanced Technologies Inc.

MODEL400e+series
MODEL404e+
MODEL408e+
MODEL416e+

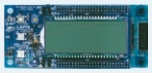
MODEL416e+

MODEL308

MINATO ADVANCED TECHNOLOGIES INC. https://www.minatoat.co.jp/en/

Note: Please contact each manufacturer directly for 3rd Party Flash Programmer

Development Support System Product Lineup

<table>
<tr><th>Product</th><th>Applicable Models</th><th colspan="4">Main Contents</th><th>Notes</th></tr>
<tr><td>EASE1000 V2</td><td>ML62Q1000
ML620Q500
ML610Q400
ML610Q300</td><td colspan="4"> 
On-chip Emulator
EASE1000 V2
 
U8/U16 Development Tools</td><td>EASE1000 V2
EASE1000 V2 Interface Cable
USB Cable
U8/U16 Development Tools*1 *2</td><td>1
1
1
DVD
1</td><td>—</td></tr>
<tr><td>Reference Board</td><td>Please contact LAPIS Technology for applicable models.</td><td colspan="4"> 
Reference Board with build-in MCU</td><td>Reference Board Unit
User's Manual*2</td><td>1 set</td><td>—</td></tr>
<tr><td>ML62Q1000
MCU Starter Kit</td><td>ML62Q1577</td><td colspan="4"> 
ML62Q1577 Reference Board
 
On-chip Emulator
EASE1000 V2
 
U8/U16 Development Tools
Sample Program</td><td>EASE1000 V2
ML62Q1577 Reference Board
EASE1000 V2 Interface Cable
USB Cable
U8/U16 Development Tools*1 *2
Sample Program</td><td>1
1
1
1
DVD
1</td><td>—</td></tr>
<tr><td>ML62Q1000
LCD Starter Kit</td><td>ML62Q1747</td><td colspan="4"> 
ML62Q1747 Reference Board
+
ML62Q1000 LCD Board S1
 
On-chip Emulator
EASE1000 V2
 
U8/U16 Development Tools
Sample Program</td><td>EASE1000 V2
ML62Q1747 Reference Board
ML62Q1000 LCD Board S1
EASE1000 V2 Interface Cable
USB Cable
U8/U16 Development Tools*1 *2
Sample Program</td><td>1
1
1
1
2
DVD
1</td><td>—</td></tr>
<tr><td>ML62Q1000
Capacitive Switch Starter Kit</td><td>ML62Q1367</td><td colspan="4"> 
ML62Q1367 Capacitive Switch Application Board
 
U8/U16 Development Tools
Sample Program
 
On-chip Emulator
EASE1000 V2
 
Speaker</td><td>ML62Q1367 Capacitive Switch Application Board
EASE1000 V2
EASE1000 V2 Interface Cable
USB Cable
Speaker
U8/U16 Development Tools*1 *2
Sample Program</td><td>1
1
1
2
1
DVD
1</td><td>—</td></tr>
<tr><td rowspan="13">New
Dr.1000</td><td rowspan="13">ML62Q1000 series (QFP64/TQFP64 or lower package) MCU

Please contact LAPIS Technology for applicable models.</td><td colspan="4" rowspan="9"> 
Full-Featured ICE Dr.1000
 
U8/U16 Development Tools</td><td>Dr. 1000 Unit
IO Cable
LCD Cable
Analog Cable
Monitor Cable
Probe Cable
USB Cable
AC Power Supply Cable
AC Power Pack
U8/U16 Development Tools*1 *2</td><td>1
1
1
1
1
1
1
1
1
DVD 1</td><td rowspan="9">—</td></tr>
<tr><td rowspan="12">Optional</td><td>Part Name</td><td>Package</td><td>Part No.</td><td>Where to Buy</td></tr>
<tr><td>Flex Cable Conversion Board for QFP64/TQFP64 Packages</td><td>QFP64/TQFP64</td><td>DR1000-FLQ-64</td><td rowspan="3">Please contact to the sales.</td><td>For details, please contact a sales representative.</td></tr>
<tr><td rowspan="2">Flexible Cable (Including Conversion Adapter)</td><td>QFP64</td><td>TEC-064SA-KC</td></tr>
<tr><td>TQFP64</td><td>TEC-064SD-KC</td></tr>
<tr><td rowspan="2">YQPACK</td><td>QFP64</td><td>YQPACK064SA</td><td rowspan="4">Elematec Co., Ltd. (Fukuoka Branch)</td><td rowspan="4">Contact Information:
2-11-3 Mikasagawa, Onojo City, Fukuoka 816-0912
Tel: +81-92-513-9889</td></tr>
<tr><td>TQFP64</td><td>YQPACK064SD</td></tr>
<tr><td rowspan="2">NQPACK</td><td>QFP64</td><td>NQPACK064SA</td></tr>
<tr><td>TQFP64</td><td>NQPACK064SD-ND</td></tr>
<tr><td>Code Generation Tools</td><td>ML62Q1000</td><td colspan="4">Startup Setting Tools
Peripheral Setting Tools</td><td colspan="2">Available for download from LAPIS Technology's support site for low power MCUs.</td></tr>
</table>

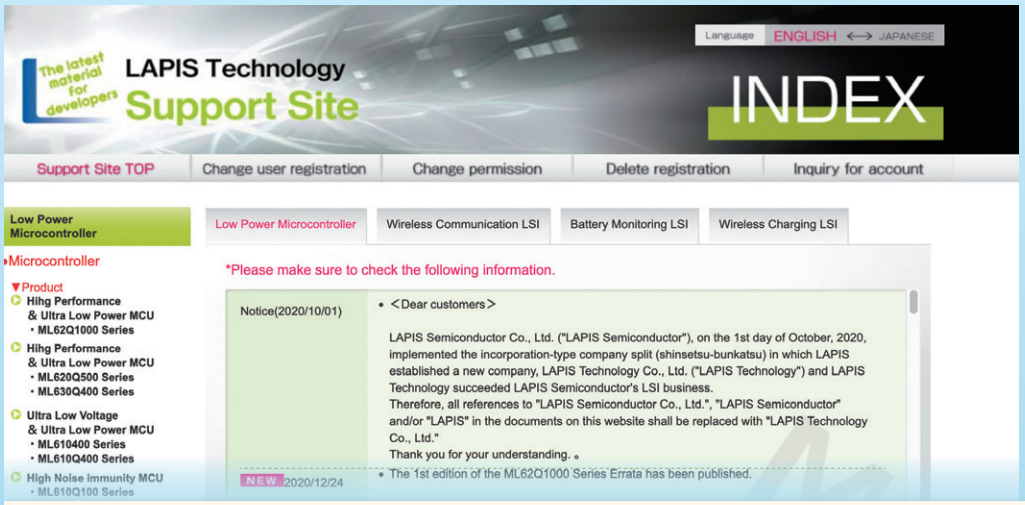
*1 The U8/16 Development Tools package includes the following
- Project management tool
- Build tool
- Debugging tool
- Flash programming tool
- LcdAtU8LCD image tool
- ROM code generating tool for code entry
- User's manual for each tool

*2 Software and manuals can downloaded from our Low Power Microcontroller page (registration required)

U8/U16 Development Tools Operating Environment
Windows®7*, Windows®8.1*, Windows®10*
*Compatible with 32bit (×86)/64bit (×64)

LAPIS Technology Support Site

LAPIS Technology's support site is a special website that gives registered users quick access to the latest versions of the datasheets, user's manuals, and software tools. Users can also opt to receive notifications of updates via E-mail.



Download materials from our dedicated support site

① LSI Datasheets/User's Manuals
Download materials including preliminary datasheets on the newest products

② Development Support Site

◆ Software tools
- Development tools (i.e. integrated development environment, build tools, debuggers, flash programmer, ROM code generation)
- Support tools (code generation, LCD image)
- Sample programs (e.g. reference software/self-test/IAP/starter kit sample software)
- Speech LSI Tools
- Device information files etc.

◆ Hardware tool manuals
- On-chip emulator EASE1000 V2
- MCU reference boards
- Starter kit etc.

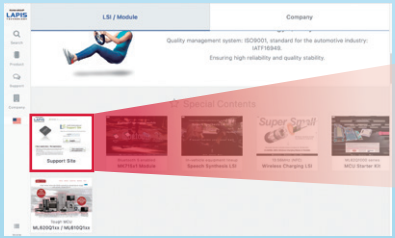
③ Various documents and materials
MCU replacement guide, code size compression guide, software safety measures, application notes, and more...

Note: Registration of the development tool serial number is required to download software tools.

Support Site Registration Method

Registration is required to access the site using an ID and Password.
Navigate to the support page by clicking on a link on LAPIS Technology's home page or by entering the URL in the browser's address bar. Then click on the 'New registration' link.

Support page URL ▶ https://www.lapis-semi.com/cgi-bin/MyLAPIS/regi/login.cgi



LAPIS Technology Website

Support Site Registration/Login Page

【Registration Procedure Flow】
Register by clicking on the 'New registration' button on the Support Site's Login Page.

STEP1
Provisional registration
- Enter your Name, Company Name, and Email Address
- Agree to the Terms and Conditions

STEP2
Registration Confirmation (via email)
- Click on the URL in the email to confirm registration

STEP3
Registration
- Enter customer information
- Input the serial numbers of development tools purchased

STEP4
Registration Completion
- Receive confirmation of registration completion via email

Product Specifications

General-Purpose MCUs (16bit) ML62Q1000 series

Normal type ML62Q1300 Group 16bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	
						Input	Output	Input/Output	Low Speed	High Speed				
New ML62Q1323	1.6 to 5.5	Flash	16K	2K	2K	—	—	12	32.768kHz (Internal RC oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3µA (Internal RC oscillation)	−40 to +105	
New ML62Q1324			24K											
New ML62Q1325			32K											
New ML62Q1333	1.6 to 5.5	Flash	16K	2K	2K	—	—	16	32.768kHz (Internal RC oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3µA (Internal RC oscillation)	−40 to +105	
New ML62Q1334			24K											
New ML62Q1335			32K											
ML62Q1345	1.6 to 5.5	Flash	32K	2K	4K	—	—	20	32.768kHz (Internal RC oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3µA (Internal RC oscillation)	−40 to +105	
ML62Q1346			48K											
ML62Q1347			64K											
ML62Q1365	1.6 to 5.5	Flash	32K	2K	4K	—	—	28	32.768kHz (Internal RC oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3µA (Internal RC oscillation)	−40 to +105	
ML62Q1366			48K											
ML62Q1367			64K											

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

	16bit Timer	16bit Multi Functions Timer	WDT	ADC (method)	DAC	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
						I²C	SSIO	UART									
	4 (8bit×8)	4 (TMR, PWM, IGBT, Capture)	1	10bit×6 (SA type)	–	Master Slave×1 Master×1	UART Full Duplex/ SSIO×2		VLS×1	–	8	Comparator×1, DMA, Multiplier/Divider	–	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–	✓	✓
														P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–	✓	✓
														P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	–	✓	✓
	4 (8bit×8)	4 (TMR, PWM, IGBT, Capture)	1	10bit×8 (SA type)	–	Master Slave×1 Master×1	UART Full Duplex/ SSIO×2		VLS×1	–	8	Comparator×1, DMA, Multiplier/Divider	–	P-TSSOP20-0225-0.65	–	✓	✓
														P-TSSOP20-0225-0.65	–	✓	✓
														P-TSSOP20-0225-0.65	–	✓	✓
	6 (8bit×12)	4 (TMR, PWM, IGBT, Capture)	1	10bit×8 (SA type)	8bit×1	Master Slave×1 Master×1	UART Full Duplex/ SSIO×2		VLS×1	–	8	Comparator×1, DMA, Multiplier/Divider	–	P-WQFN24-0404-0.50	–	✓	✓
														P-WQFN24-0404-0.50	–	✓	✓
														P-WQFN24-0404-0.50	–	✓	✓
	6 (8bit×12)	4 (TMR, PWM, IGBT, Capture)	1	10bit×8 (SA type)	8bit×1	Master Slave×1 Master×1	UART Full Duplex/ SSIO×2		VLS×1	–	8	Comparator×1, DMA, Multiplier/Divider	–	P-TQFP32-0707-0.80 P-WQFN32-0505-0.50	–	✓	✓
														P-TQFP32-0707-0.80 P-WQFN32-0505-0.50	–	✓	✓
														P-TQFP32-0707-0.80 P-WQFN32-0505-0.50	–	✓	✓

ML62Q1000 series Part Number Explanation

M	L	6	2	Q	1	3	6	7	□	-	N	N	N	T	B	x	x	x	x
①		②		③	④				⑤		⑥			⑦		⑧			

Part Number

①**Device type**
ML: Bipolar Logic

②**CPU Core type**
62: 16bit CPU nX-U16/100

③**ROM type**
Q: Flash ROM

⑤**Option Code**
None to x: Set for product

⑥**ROM Code**
NNN: Blank
001 to xxx: Custom Code Number

⑦**Package Code**
GD: WQFN
MB: SSOP
TD: TSSOP
TB: TQFP
GA: QFP

⑧**Company's code in LAPIS Technology**

④**Part Code**

13xx: ML62Q1300 group
2x: 16pin
3x: 20pin
4x: 24pin
6x: 32pin

x3: ROM 16KB
x4: ROM 24KB
x5: ROM 32KB
x6: ROM 48KB
x7: ROM 64KB

15xx: ML62Q1500 group
3x: 48pin
4x: 52pin
5x: 64pin
6x: 80pin
7x: 100pin

x0: ROM 32KB
x1: ROM 48KB
x2: ROM 64KB
x3: ROM 96KB
x4: ROM 128KB
x5: ROM 160KB
x6: ROM 192KB
x7: ROM 256KB

17xx: ML62Q1700 group (Built-in LCD Driver)
0x: 48pin
1x: 52pin
2x: 64pin
3x: 80pin
4x: 100pin

x0: ROM 32KB
x1: ROM 48KB
x2: ROM 64KB
x3: ROM 96KB
x4: ROM 128KB
x5: ROM 160KB
x6: ROM 192KB
x7: ROM 256KB
x8: ROM 384KB
x9: ROM 512KB

18xx: ML62Q1800 group
5x: 64pin
6x: 80pin
7x: 100pin

x8: ROM 384KB
x9: ROM 512KB

Product Specifications

General-Purpose MCUs (16bit) ML62Q1000 series

Normal type ML62Q1500 Group 16bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	
						Input	Output	Input/Output	Low Speed	High Speed				
ML62Q1530	1.6 to 5.5	Flash	32K	4K	8K	2	—	42	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.7/3.0µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1531			48K											
ML62Q1532			64K											
ML62Q1533			96K											
ML62Q1534			128K											
ML62Q1540	1.6 to 5.5	Flash	32K	4K	8K	2	—	46	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.7/3.0µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1541			48K											
ML62Q1542			64K											
ML62Q1543			96K											
ML62Q1544			128K											
ML62Q1550	1.6 to 5.5	Flash	32K	4K	8K	2	—	58	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.7/3.0µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1551			48K											
ML62Q1552			64K											
ML62Q1553			96K											
ML62Q1554			128K											
ML62Q1555			160K		16K	2						5.5/4.5µA (Internal RC oscillation/ Crystal oscillation)		
ML62Q1556			192K											
ML62Q1557			256K											
ML62Q1563	1.6 to 5.5	Flash	96K	4K	16K	2	—	72	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	5.5/4.5µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1564			128K											
ML62Q1565			160K											
ML62Q1566			192K											
ML62Q1567			256K											
ML62Q1573	1.6 to 5.5	Flash	96K	4K	16K	2	—	92	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	5.5/4.5µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1574			128K											
ML62Q1575			160K											
ML62Q1576			192K											
ML62Q1577			256K											
New ML62Q1543C	1.6 to 5.5	Flash	96K	4K	8K	2	—	46	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3/3.0µA (Internal RC oscillation/Crystal oscillation)	−40 to +105	
New ML62Q1544C			128K											
New ML62Q1553C	1.6 to 5.5	Flash	96K	4K	8K	2	—	58	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3/3.0µA (Internal RC oscillation/Crystal oscillation)	−40 to +105	
New ML62Q1554C			128K											
New ML62Q1563C	1.6 to 5.5	Flash	96K	4K	8K	2	—	74	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3/3.0µA (Internal RC oscillation/Crystal oscillation)	−40 to +105	
New ML62Q1564C			128K											

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

16bit Timer	16bit Multi Functions Timer	WDT	ADC (method)	DAC	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
					I²C	SSIO	UART									
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×2		VLS×1	–	10	Comparator×2, DMA, Multiplier/Divider	–	P-TQFP48-0707-0.50	–	✓	✓
													P-TQFP48-0707-0.50	–	✓	✓
													P-TQFP48-0707-0.50	–	✓	✓
													P-TQFP48-0707-0.50	–	✓	✓
													P-TQFP48-0707-0.50	–	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×2		VLS×1	–	10	Comparator×2, DMA, Multiplier/Divider	–	P-TQFP52-1010-0.65	–	✓	✓
													P-TQFP52-1010-0.65	–	✓	✓
													P-TQFP52-1010-0.65	–	✓	✓
													P-TQFP52-1010-0.65	–	✓	✓
													P-TQFP52-1010-0.65	–	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×2		VLS×1	–	10	Comparator×2, DMA, Multiplier/Divider	–	P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
8 (8bit×16)	8 (TMR, PWM, IGBT, Capture)	1	10bit×16 (SA type)	8bit×2	Master Slave×1 Master×2	UART Full Duplex/ SSIO×6		VLS×1	–	12	Comparator×2, DMA, Multiplier/Divider	–	P-QFP80-1414-0.65	–	✓	✓
													P-QFP80-1414-0.65	–	✓	✓
													P-QFP80-1414-0.65	–	✓	✓
													P-QFP80-1414-0.65	–	✓	✓
													P-QFP80-1414-0.65	–	✓	✓
8 (8bit×16)	8 (TMR, PWM, IGBT, Capture)	1	10bit×16 (SA type)	8bit×2	Master Slave×1 Master×2	UART Full Duplex/ SSIO×6		VLS×1	–	12	Comparator×2, DMA, Multiplier/Divider	–	P-QFP100-1420-0.65 P-TQFP100-1414-0.50	–	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	–	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	–	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	–	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	–	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×3		VLS×1	–	10	Comparator×2, DMA, Multiplier/Divider	–	P-TQFP52-1010-0.65	–	✓	✓
													P-TQFP52-1010-0.65	–	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×4		VLS×1	–	10	Comparator×2, DMA, Multiplier/Divider	–	P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	–	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×4		VLS×1	–	12	Comparator×2, DMA, Multiplier/Divider	–	P-QFP80-1414-0.65	–	✓	✓
													P-QFP80-1414-0.65	–	✓	✓

Product Specifications

General-Purpose MCUs (16bit) ML62Q1000 series

Built-in LCD Driver Segments type ML62Q1700 Group 16bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	
						Input	Output	Input/Output	Low Speed	High Speed				
ML62Q1700	1.6 to 5.5	Flash	32K	4K	8K	2	—	37	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.9/3.3µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1701			48K											
ML62Q1702			64K											
ML62Q1703			96K											
ML62Q1704			128K											
ML62Q1710	1.6 to 5.5	Flash	32K	4K	8K	2	—	41	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.9/3.3µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1711			48K											
ML62Q1712			64K											
ML62Q1713			96K											
ML62Q1714			128K											
ML62Q1720	1.6 to 5.5	Flash	32K	4K	8K	2	—	53	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.9/3.3µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1721			48K											
ML62Q1722			64K											
ML62Q1723			96K											
ML62Q1724			128K											
ML62Q1725			160K		16K							5.7/4.5µA (Internal RC oscillation/ Crystal oscillation)		
ML62Q1726			192K											
ML62Q1727			256K											
ML62Q1728			384K	8K	32K							6.0/4.5µA (Internal RC oscillation/ Crystal oscillation)		
ML62Q1729			512K											
ML62Q1733	1.6 to 5.5	Flash	96K	4K	16K	2	—	67	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	5.7/4.5µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1734			128K											
ML62Q1735			160K											
ML62Q1736			192K											
ML62Q1737			256K											
ML62Q1738			384K	8K	32K							6.0/4.5µA (Internal RC oscillation/ Crystal oscillation)		
ML62Q1739			512K											
ML62Q1743	1.6 to 5.5	Flash	96K	4K	16K	2	—	87	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	5.7/4.5µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
ML62Q1744			128K											
ML62Q1745			160K											
ML62Q1746			192K											
ML62Q1747			256K											
ML62Q1748			384K	8K	32K							6.0/4.5µA (Internal RC oscillation/ Crystal oscillation)		
ML62Q1749			512K											
New ML62Q1713C	1.6 to 5.5	Flash	96K	4K	8K	2	—	41	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3/3.0µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
New ML62Q1714C			128K											
New ML62Q1723C	1.6 to 5.5	Flash	96K	4K	8K	2	—	53	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3/3.0µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
New ML62Q1724C			128K											
New ML62Q1733C	1.6 to 5.5	Flash	96K	4K	8K	2	—	69	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	4.3/3.0µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
New ML62Q1734C			128K											

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

Normal type ML62Q1800 Group 16bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	
						Input	Output	Input/Output	Low Speed	High Speed				
New ML62Q1858	1.6 to 5.5	Flash	384K	8K	32K	2	—	58	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	6.0/4.5µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
New ML62Q1859			512K											
New ML62Q1868	1.6 to 5.5	Flash	384K	8K	32K	2	—	72	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	6.0/4.5µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
New ML62Q1869			512K											
New ML62Q1878	1.6 to 5.5	Flash	384K	8K	32K	2	—	92	32.768kHz (Internal RC oscillation/ Crystal oscillation)	24MHz (PLL oscillation)	41ns 30.5µs	6.0/4.5µA (Internal RC oscillation/ Crystal oscillation)	−40 to +105	
New ML62Q1879			512K											

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

16bit Timer	16bit Multi Functions Timer	WDT	ADC (method)	DAC	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
					I²C	SSIO	UART									
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×2		VLS×1	Max 192dot 24seg× 8com	10	Comparator×2, DMA, Multiplier/Divider	—	P-TQFP48-0707-0.50	—	✓	✓
													P-TQFP48-0707-0.50	—	✓	✓
													P-TQFP48-0707-0.50	—	✓	✓
													P-TQFP48-0707-0.50	—	✓	✓
													P-TQFP48-0707-0.50	—	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×2		VLS×1	Max 216dot 27seg× 8com	10	Comparator×2, DMA, Multiplier/Divider	—	P-TQFP52-1010-0.65	—	✓	✓
													P-TQFP52-1010-0.65	—	✓	✓
													P-TQFP52-1010-0.65	—	✓	✓
													P-TQFP52-1010-0.65	—	✓	✓
													P-TQFP52-1010-0.65	—	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×2		VLS×1	Max 280dot 35seg× 8com	10	Comparator×2, DMA, Multiplier/Divider	—	P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
8 (8bit×16)	8 (TMR, PWM, IGBT, Capture)	1	10bit×16 (SA type)	8bit×2	Master Slave×1 Master×2	UART Full Duplex/ SSIO×6		VLS×1	Max 360dot 45seg× 8com	12	Comparator×2, DMA, Multiplier/Divider	—	P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓
8 (8bit×16)	8 (TMR, PWM, IGBT, Capture)	1	10bit×16 (SA type)	8bit×2	Master Slave×1 Master×2	UART Full Duplex/ SSIO×6		VLS×1	Max 480dot 60seg× 8com	12	Comparator×2, DMA, Multiplier/Divider	—	P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×3		VLS×1	Max 216dot 27seg× 8com	10	Comparator×2, DMA, Multiplier/Divider	—	P-TQFP52-1010-0.65	—	✓	✓
													P-TQFP52-1010-0.65	—	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×4		VLS×1	Max 280dot 35seg× 8com	10	Comparator×2, DMA, Multiplier/Divider	—	P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×4		VLS×1	Max 360dot 45seg× 8com	12	Comparator×2, DMA, Multiplier/Divider	—	P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓

16bit Timer	16bit Multi Functions Timer	WDT	ADC (method)	DAC	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
					I²C	SSIO	UART									
6 (8bit×12)	6 (TMR, PWM, IGBT, Capture)	1	10bit×12 (SA type)	8bit×1	Master Slave×1 Master×2	UART Full Duplex/ SSIO×2		VLS×1	—	10	Comparator×2, DMA, Multiplier/Divider	—	P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
													P-QFP64-1414-0.80 P-TQFP64-1010-0.50	—	✓	✓
8 (8bit×16)	8 (TMR, PWM, IGBT, Capture)	1	10bit×16 (SA type)	8bit×2	Master Slave×1 Master×2	UART Full Duplex/ SSIO×6		VLS×1	—	12	Comparator×2, DMA, Multiplier/Divider	—	P-QFP80-1414-0.65	—	✓	✓
													P-QFP80-1414-0.65	—	✓	✓
8 (8bit×16)	8 (TMR, PWM, IGBT, Capture)	1	10bit×16 (SA type)	8bit×2	Master Slave×1 Master×2	UART Full Duplex/ SSIO×6		VLS×1	—	12	Comparator×2, DMA, Multiplier/Divider	—	P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓
													P-QFP100-1420-0.65 P-TQFP100-1414-0.50	—	✓	✓

Product Specifications

Low Power MCUs (16bit) ML620Q500

Normal type 16bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	Co-processor for Multiplication and Division	8bit Timer	16bit Multi Functions Timer	
						Input	Output	Input/ Output	Low Speed	High Speed							
ML620Q503H	1.8 to 5.5	Flash	32K	2K	2K	2	—	36	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)	16MHz (Internal RC oscillation/ Crystal oscillation/ External input)	62.5ns 30.5µs	0.45µA (Crystal oscillation)	−40 to +85	✓	8 (16bit×4)	4	
ML620Q504H			64K		6K												

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

	PWM	Capture	WDT	ADC (method)	Serial Port				Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
					I²C	SSIO (SPI)	UART	USB									
	16bit×4 (use 16bit Timer)	16bit×4 (use 16bit Timer)	1	24bit×2 (RC type) 12bit×12 (SA type)	Master ×2	2	Full Duplex ×2	–	VLS×1 LLD×1	–	8	Low speed frequency correction/ Analog comparator×2/ Melody: Buzzer	–	P-TQFP48-0707-0.50	✓	✓	✓
														P-TQFP48-0707-0.50	✓	✓	✓

Product Specifications

Low Voltage Operation MCUs (8bit) ML610400/ML610Q400

Normal type 8bit MCU

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	8bit Timer	1kHz Timer	PWM	Capture	WDT
						Input	Output	Input/Output	Low Speed	High Speed								
ML610482	1.1 to 3.6	Mask	64K	—	4K	6	4	22	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.5µA	−20 to +70	4 (16bit×2)	—	16bit×1	—	1
ML610Q482		Flash																

Normal type 8bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	8bit Timer	1kHz Timer	PWM	Capture	WDT
						Input	Output	Input/Output	Low Speed	High Speed								
ML610482P	1.1 to 3.6	Mask	64K	—	4K	6	4	22	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.5µA	−40 to +85	4 (16bit×2)	—	16bit×1	—	1
ML610Q482P		Flash																

Built-in LCD Driver Dot Matrix type 8bit MCU

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	8bit Timer	1kHz Timer	PWM	Capture	WDT
						Input	Output	Input/Output	Low Speed	High Speed								
ML610Q421	1.1 to 3.6	Flash	32K	—	2K	6	3	22	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.5µA	−20 to +70	4 (16bit×2)	1	16bit×1	2	1
ML610Q422								14	32.768kHz (Crystal oscillation)									
ML610Q426	1.1 to 3.6	Flash	40K	—	2K	5	—	7	32.768kHz (Crystal oscillation)	1MHz	1µs/ 30.5µs	0.5µA	−20 to +70	4 (16bit×2)	1	16bit×1	—	1
ML610Q426C						7		13										
ML610Q428	1.1 to 3.6	Flash	48K	—	4K	6	3	14	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/ 0.5µs/ 30.5µs	0.5µA	−20 to +70	2 (16bit×1)	1	16bit×3	—	1
ML610Q429						10		20	32.768kHz (Crystal oscillation)									
ML610Q431	1.1 to 3.6	Flash	64K	—	3K	6	3	22	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.5µA	−20 to +70	4 (16bit×2)	1	16bit×1	2	1
ML610Q431A																		
ML610Q432								14										
ML610Q432A																		
ML610Q435	1.1 to 3.6	Flash	96K	—	3K	6	3	22	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.5µA	−20 to +70	4 (16bit×2)	1	16bit×1	2	1
ML610Q435A																		
ML610Q436								14										
ML610Q436A																		
ML610Q438	1.1 to 3.6	Flash	128K	—	7K	10	3	20	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/ 0.5µs/ 30.5µs	0.5µA	−20 to +70	4 (16bit×2)	1	16bit×3	2	1
ML610Q439																		

Built-in LCD Driver Dot Matrix type 8bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	8bit Timer	1kHz Timer	PWM	Capture	WDT
						Input	Output	Input/Output	Low Speed	High Speed								
ML610Q421P	1.1 to 3.6	Flash	32K	—	2K	6	3	22	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.5µA	−40 to +85	4 (16bit×2)	1	16bit×1	2	1
ML610Q422P								14										
ML610Q439P			128K		7K	10		20		4.096MHz 2MHz	0.244µs/ 0.5µs/ 30.5µs					16bit×3		

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

	ADC (method)	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade
		I²C	SSIO	UART									
	24bit×2 (RC type)	Master ×1	1	Half Duplex ×1	BLD×1	–	5	Low speed frequency correction/ Buzzer	–	–	✓	✓	–
										P-TQFP48-0707-0.50	✓	✓	–

	ADC (method)	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
		I²C	SSIO	UART									
	24bit×2 (RC type)	Master ×1	1	Half Duplex ×1	BLD×1	–	5	Low speed frequency correction/ Buzzer	–	–	✓	✓	✓
										P-TQFP48-0707-0.50	✓	✓	✓

	ADC (method)	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade
		I²C	SSIO	UART									
	24bit×2 (RC type) 12bit×2 (SA type)	Master ×1	1	Half Duplex ×1	BLD×1	Max 400dot 50seg×8com	5	Low speed frequency correction/ Melody: Buzzer	–	P-TQFP120-1414-0.40	✓	✓	–
						Max 800dot 50seg×16com			Low-speed scillation stop detect reset: enable	P-TQFP120-1414-0.40	✓	✓	–
	16bit×1 (RC type)	Master ×1	1	Half Duplex ×1	BLD×1	Max 800dot 50seg×16com	5	Low speed frequency correction/ Melody: Buzzer/ EL Driver/ External input voltage detecttion	–	–	✓	✓	–
						Max 672dot 42seg×16com	8			–	✓	✓	–
	24bit×2 (RC type)	Master ×1	1	Half Duplex ×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	✓	✓	–
						Max 512dot 64seg×8com	9			TQFP128-P-1414-0.40	✓	✓	–
	24bit×2 (RC type) 12bit×2 (SA type)	Master ×1	1	Half Duplex ×1	BLD×1	Max 1024dot 64seg×16com	5	RTC/ Low speed frequency correction/ Melody: Buzzer	Low-speed oscillation stop detect reset: enabele	P-LQFP144-2020-0.50	✓	✓	–
									Low-speed oscillation stop detect reset: disable	–	✓	✓	–
						Max 1536dot 64seg×24com			Low-speed oscillation stop detect reset: enabele	P-LQFP144-2020-0.50	✓	✓	–
									Low-speed oscillation stop detect reset: disable	P-LQFP144-2020-0.50	✓	✓	–
	24bit×2 (RC type) 12bit×2 (SA type)	Master ×1	1	Half Duplex ×1	BLD×1	Max 1024dot 64seg×16com	5	RTC/ Low speed frequency correction/ Melody: Buzzer	Low-speed oscillation stop detect reset: enabele	–	✓	✓	–
									Low-speed oscillation stop detect reset: disable	P-LQFP144-2020-0.50	✓	✓	–
						Max 1536dot 64seg×24com			Low-speed oscillation stop detect reset: enabele	–	✓	✓	–
									Low-speed oscillation stop detect reset: disable	P-LQFP144-2020-0.50	✓	✓	–
	24bit×2 (RC type) 12bit×2 (SA type)	Master ×1	1	Half Duplex ×1	BLD×1	Max 1344dot 56seg×24com	9	Low speed frequency correction/ Melody: Buzzer	Selectable oscillation stop detection reset: function enable/ disable according to software	P-LQFP144-2020-0.50	✓	✓	–
						Max 1024dot 64seg×16com				–	✓	✓	–

	ADC (method)	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
		I²C	SSIO	UART									
	24bit×2 (RC type) 12bit×2 (SA type)	Master ×1	1	Half Duplex ×1	BLD×1	Max 400dot 50seg×8com	5	Low speed frequency correction/ Melody: Buzzer	–	P-TQFP120-1414-0.40	✓	✓	✓
						Max 800dot 50seg×16com			Low-speed scillation stop detect reset: enable	P-TQFP120-1414-0.40	✓	✓	✓
						Max 1024dot 64seg×16com	9		Selectable oscillation stop detection reset: function enable/ disable according to software	P-LQFP144-2020-0.50	–	✓	✓

Product Specifications

Low Voltage Operation MCUs (8bit) ML610400/ML610Q400

Built-in LCD Driver Segments type 8bit MCU

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	8bit Timer	1kHz Timer	PWM	Capture	WDT	
						Input	Output	Input/Output	Low Speed	High Speed									
ML610Q407	1.25 to 3.6	Flash	16K	—	1K	5	12	22	32.768kHz (Crystal oscillation)	2MHz	0.5µs/ 30.5µs	0.9µA	−20 to +70	4 (16bit×2)	—	16bit×1	2	1	
ML610Q407A																			
ML610Q407D																			
ML610Q408	1.25 to 3.6	Flash	16K	—	1K	5	8	22	32.768kHz (Crystal oscillation)	2MHz	0.5µs/ 30.5µs	0.9µA	−20 to +70	4 (16bit×2)	—	16bit×1	2	1	
ML610Q409	1.25 to 3.6	Flash	16K	—	1K	5	4	22	32.768kHz (Crystal oscillation)	2MHz	0.5µs/ 30.5µs	0.9µA	−20 to +70	4 (16bit×2)	—	16bit×1	2	1	
ML610Q409A																			
ML610Q411	1.1 to 3.6	Flash	16K	—	1K	6	3	22	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.5µA	−20 to +70	4 (16bit×2)	1	16bit×1	2	1	
ML610Q412								14											
ML610Q418	1.1 to 3.6	Flash	128K	4K	4K	6	3	18	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	1.1µA	−20 to +70	4 (16bit×2)	—	16bit×1	2	1	
ML610Q418C								26											
ML610Q419	1.1 to 3.6	Flash	64K	4K	2K	6	3	18	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.9µA	−20 to +70	4 (16bit×2)	—	16bit×1	2	1	
ML610Q419C								26											

Built-in LCD Driver Segments type 8bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	8bit Timer	1kHz Timer	PWM	Capture	WDT	
						Input	Output	Input/Output	Low Speed	High Speed									
ML610Q407P	1.25 to 3.6	Flash	16K	—	1K	5	12	22	32.768kHz (Crystal oscillation)	2MHz	0.5µs/ 30.5µs	0.9µA	−40 to +85	4 (16bit×2)	—	16bit×1	2	1	
ML610Q407PA																			
ML610Q408P	1.25 to 3.6	Flash	16K	—	1K	5	8	22	32.768kHz (Crystal oscillation)	2MHz	0.5µs/ 30.5µs	0.9µA	−40 to +85	4 (16bit×2)	—	16bit×1	2	1	
ML610Q409P	1.25 to 3.6	Flash	16K	—	1K	5	4	22	32.768kHz (Crystal oscillation)	2MHz	0.5µs/ 30.5µs	0.9µA	−40 to +85	4 (16bit×2)	—	16bit×1	2	1	
ML610Q411P	1.1 to 3.6	Flash	16K	—	1K	6	3	22	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.5µA	−40 to +85	4 (16bit×2)	1	16bit×1	2	1	
ML610Q411PA																			
ML610Q412P								14											

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

	ADC (method)	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade
		I²C	SSIO	UART									
	16bit×2 (RC type)	–	2	Half Duplex ×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	✓	✓	–
									Low-speed scillation stop detect reset: disenable LCD bias: 1/2, 1/3	–	✓	✓	–
									Low-speed scillation stop detect reset: enable LCD bias: 1/2, 1/3	–	✓	✓	–
	16bit×2 (RC type)	–	2	Half Duplex ×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	✓	✓	–
	16bit×2 (RC type)	–	2	Half Duplex ×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	✓	✓	–
									Low-speed scillation stop detect reset: disenable LCD bias: 1/2, 1/3	–	✓	✓	–
	24bit×2 (RC type) 12bit×2 (SA type)	Master ×1	1	Half Duplex ×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	✓	✓	–
						Max 176dot 44seg×4com			–	P-TQFP120-1414-0.40	✓	✓	–
	24bit×2 (RC type) 12bit×2 (SA type)	Master ×1	2	Half Duplex ×1	BLD×1	Max 192dot 48seg×4com	5	Low speed frequency correction/ Melody: Buzzer	–	P-TQFP100-1414-0.50	✓	✓	–
						Max 160dot 40seg×4com				P-TQFP100-1414-0.50	✓	✓	–
	24bit×2 (RC type) 12bit×4 (SA type)	Master ×1	2	Half Duplex ×1	BLD×1	Max 192dot 48seg×4com	5	Low speed frequency correction/ Melody: Buzzer	–	P-TQFP100-1414-0.50	✓	✓	–
						Max 160dot 40seg×4com				P-TQFP100-1414-0.50	✓	✓	–

	ADC (method)	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
		I²C	SSIO	UART									
	16bit×2 (RC type)	–	2	Half Duplex ×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	✓	✓	✓
					–				Low-speed scillation stop detect reset: disenable LCD bias: 1/2, 1/3	–	✓	✓	✓
	16bit×2 (RC type)	–	2	Half Duplex ×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	✓	✓	✓
	16bit×2 (RC type)	–	2	Half Duplex ×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	✓	✓	✓
	24bit×2 (RC type) 12bit×4 (SA type)	Master ×1	1	Half Duplex ×1	BLD×1	Max 144dot 36seg×4com	5	Low speed frequency correction/ Buzzer	Low-speed oscillation stop detect reset: enabele	P-TQFP120-1414-0.40	✓	✓	✓
									Low-speed oscillation stop detect reset: disable	P-TQFP120-1414-0.40	✓	✓	✓
						Max 176dot 44seg×4com			–	P-TQFP120-1414-0.40	✓	✓	✓

Product Specifications

Speech Playback MCUs (8bit) ML610Q300

Normal type 8bit MCU (industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	Memory for Sound	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	
							Input	Output	Input/ Output	Low Speed	High Speed				
ML610Q304	2.0 to 5.5	Flash	96K	2K	Flash ROM	1K	1	3	11	32.768kHz (Internal RC oscillation)	8.192MHz	0.122µs/ 30.5µs	2.7µA	−40 to +85	
☆ML610Q305									12				(TBD)		
☆ML610Q306									15						

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

USB Interface & Security Function MCUs (32bit) ML630Q400 (ARM Cortex®-M0+)

Built-in LCD Driver Dot Matrix type 32bit MCU (Industrial Grade)

Part No.	Operating Voltage (V)	ROM type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port			Operating Frequency (Max)		Minimum Instruction Execution Time	Current Consumption (Typ@HALT)	Operating Temperature (°C)	Co-processor for Multiplication and Division	8bit Timer	16bit Multi Functions Timer	
						Input	Output	Input/ Output	Low Speed	High Speed							
ML630Q464	1.8 to 3.6	Flash	64K	2K	8K	—	—	38	32.768kHz (Internal RC oscillation/ Crystal oscillation)	16MHz (Internal RC oscillation) 24MHz (PLL)	41.7ns 30.5µs	0.8µA (Crystal oscillation)	−40 to +85	32bit multiplier	8 (16bit×4)	4	
ML630Q466			128K		16K												

*1 A check mark of halogen free support means that we will be able to ship out the halogen free products. For details, please inquire to the sales.
*2 For use of industrial equipment, please inquire to the sales.

ML610/ML610Q/ML620Q/ML630Q Part Number Explanation

M	L	6	1	0	Q	4	1	9	C	-	N	N	N	T	B	x	x	x	x
①		②			③	④			⑤		⑥			⑦		⑧			

Part Number

①**Device type**
ML: Bipolar Logic

②**CPU Core type**
610: 8bit CPU nX-U8/100
620: 16bit CPU nX-U16/100
630: 32bit CPU ARM® Cortex® M0+

③**ROM type**
None: Mask ROM
Q: Flash ROM

④**Part Code**
3xx: Speech Playback
4xx: Low Power or Low Voltage Operation
5xx: Low Power

⑤**Operation Code**
None to x: Set for product

⑥**ROM Code**
NNN: Blank
001 to xxx: Custom Code Number

⑦**Package Code**
GD: VQFN, WQFN
MB: SSOP
TD: TSSOP
TB: TQFP
GA: QFP
WA: Chip

⑧**Company's Code in LAPIS Technology**

	8bit Timer	PWM	WDT	ADC (method)	Serial Port			Supply Voltage Detection	LCD Driver	External Interrupt Sources	SP Amp Output (W)/ Class	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
					I²C	SSIO	UART										
	4 (16bit×2)	–	1	10bit×3 (SA type)	Master/ Slave x1	2	Half Duplex ×1	–	–	9	1.0 (@5V)/ D class	Speech function/ ADPCM2 decoder/ Built-in speaker Amplifier	–	P-VQFN28-0505-0.50 P-SSOP30-56-0.65 P-WQFN32-0505-0.50	–	✓	✓
								LLD×1				Speech function/ ADPCM2 HQ-ADPCM decoder/ Built-in speaker Amplifier	–	P-WQFN32-0505-0.50 P-TQFP32-0707-0.80	–	✓	✓
				10bit×4 (SA type)										P-WQFN36-0606-0.50	–	✓	✓

☆: Under Development

	PWM	Capture	WDT	ADC (method)	Serial Port				Supply Voltage Detection	LCD Driver	External Interrupt Sources	Others	Notes	Package	Chip Support	Halogen Free Support*1	Industrial Grade*2
					I²C	SSIO (SPI)	UART	USB									
	16bit×4 (use 16bit Timer)	16bit×4 (use 16bit Timer)	1	24bit×2 (RC type) 12bit×12 (SA type)	Master/ Slave ×2	2	Full Duplex ×2	1	VLS×1 LLD×1	Max 400dot 50seg× 8com	8	AES/Random generator/DMA/ RTC/Analog comparator×2/ 1kHz Timer	–	P-TQFP100-1414-0.50	–	✓	✓
														P-TQFP100-1414-0.50	–	✓	✓

●U8 Core is LAPIS Technology's original RISC-type 8bit CPU. ●U16 Core is LAPIS Technology's original RISC-type 16bit CPU. ●IDE8 and LEXIDE-U16 are LAPIS Technology's project management tools used for program development. ●CCU8 is LAPIS Technology's C compiler used for program development. ●RASU8 is LAPIS Technology's assembler used for program development. ●RLU8 is LAPIS Technology's linker used for program development. ●LIBU8 is LAPIS Technology's librarian (library generation tool) used for program development. ●OHU8 is LAPIS Technology's object converter used for program development. ●LcdAtU8 is LAPIS Technology's program development support tool for LCD control. ●MWU16 is LAPIS Technology's Flash writing tool. ●HTU8 is LAPIS Technology's ROM code generation tool used for code entry (Flash writing). ●DTU8 is LAPIS Technology's debugger used for program development. ●Code Generation Tools are proprietary tools used for LAPIS Technology products. ●EASE1000 V2 is LAPIS Technology's on-chip debug emulators. ●HQ-ADPCM is a high quality audio compression technology developed by Ky's. Ky's is a registered trademark of Kyushu Institute of Technology. *Windows®, Windows® Vista, Windows® XP, Windows® 7, Windows® 8.1, and Windows® 10 are registered trademarks of Microsoft Corp. in the US and other countries. ●Intel® Pentium is a registered trademark of Intel Corporation in the US and other countries. *ARM® and Cortex® are registered trademarks of ARM Limited.

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