16-bit General-Purpose MCUs Equipped with Safety Functions

Class-leading lineup covers a broad range of applications from home appliances to industrial equipment

ROHM Group company LAPIS Semiconductor recently announced the availability of the ML62Q1300/1500/1700 Group of general-purpose microcontrollers featuring an original 16-bit CPU core ideal for consumer and home appliances, alarms, security devices, and small industrial equipment.

Microcontrollers used in home appliances and small industrial equipment in the rapidly growing Asian market require a wide variety of package types and program ROM capacities to satisfy meet the constantly evolving needs of applications that progressively add new features and functions while delivering improved performance. And since many of these devices are used on a daily basis, safety is becoming an increasingly important factor, requiring that MCUs which comprise the core of home appliances include safety functions that can control the system under all conditions.

In response, LAPIS Semiconductor value-tolerant ML62Q1300/1500/1700 Group provides safety features that correspond to 13 industry-leading items (IEC60730 regulations) related to home appliances, including a self-diagnostic function for detecting internal faults. This makes it possible to protect systems from unexpected situations that occur in MCUs used in the consumer electronics field which is becoming more sophisticated as well as the compact industrial equipment sector that requires stable operation even under harsh conditions such as extreme noise and high temperatures.

ROM size	16pin – 20pin	24pin – 32pin	48pin – 52pin	64pin – 100pin
160kB – 512kB			Q1500/Q1700	Q1500/Q1700
96kB – 128kB			Q1500/Q1700	Q1500/Q1700
32kB – 64kB		Q1300	Q1500/Q1700	Q1500/Q1700*
16kB – 32kB	Q1300			: 64 pin only

Broad package lineup, large capacity ROM
Supports everything from simple appliances to sophisticated multifunctional consumer and industrial equipment

A broad lineup comprised of a class-leading 120 models in a number of different package types and program ROM capacities is offered, ensuring support for a wide range of applications. In addition, starter kits are available that make it easy to evaluate LCD operation and capacitive switch on an application level, as well as a reference board that allows users to develop customized application programs.

The starter kits and reference board are compatible with LAPIS Semiconductor's new LEXIDE-U16 development environment (available for download on LAPIS Semiconductor's website) operating under the open source Eclipse platform which features an easy-to-use interface and enhanced functionality, ensuring not only high development efficiency but also seamless compatibility with Eclipse environments from other companies.

The MCUs along with the ML62Q1000 Capacitive Switch Starter Kit and the ML62Q1367 reference board will be sold from March through online distributors, and others will be available in order.

Key Features
1. Supports an industry-leading 13 safety items (IEC60730 regulations) to protect home appliances

Since the microcontroller controls peripheral components, it is possible to detect failures in advance and avoid malfunctions by performing periodic diagnosis. However, the MCU must also be able to detect internal faults and terminate operation before returning to the initial state.

- Covers an unprecedented 13 items related to hardware safety.
- Sample source code software for self-diagnosis provided utilizing the IEC60730-1 Class B Software Library

Safety Functions	8 Self-diagnostic functions	3 Error detection functions	2 Memory protection functions
	・Register test ・Oscillator frequency test ・UART / SSIO / I²C test ・WDT test ・GPIO test ・A/D converter test ・Program counter test ・Interrupt test	・ROM guard ・RAM parity error ・Invalid memory access	・RAM guard ・SFR guard (Special Function Register)
	Detects faults by performing diagnosis of peripheral circuits	Detects malfunctions due to memory data errors and invalid memory access	RAM erroneous write prevention SFR erroneous write prevention

2. Broad 120-model lineup offers unsurpassed compatibility

LAPIS Semiconductor's wide range of MCU available in different package types and program ROM capacities supports the home appliance and compact industrial equipment markets which are becoming increasingly sophisticated and multi-functional, allowing users to select the ideal solution to system requirements (i.e. mounting area, costs).

ROM size	16 pin	20 pin	24 pin	32 pin	48 pin	52 pin	64 pin	80 pin	100 pin
	WQFN16 4mm×4mm	SSOP20 6.4mm×6.5mm	WQFN24 4mm×4mm	TQFP32 7mm×7mm	TQFP48 7mm×7mm	TQFP52 10mm×10mm	QFP64 14mm×14mm	QFP80 14mm×14mm	QFP100 14mm×14mm
	SSOP16 4.4mm×6.4mm	TSSOP20 6.5mm×6.4mm	WQFN24 5.3mm×5.3mm	TSSOP32 7.8mm×6.4mm	TQFP52 10mm×10mm				QFP80 14mm×14mm	TQFP100 14mm×14mm
512kB							Q1729 Q1558	Q1739 Q1568	Q1749 Q1578
384kB							Q1728 Q1556	Q1738 Q1566	Q1748 Q1576
256kB							Q1727 Q1557	Q1737 Q1567	Q1747 Q1577
192kB							Q1726 Q1556	Q1736 Q1566	Q1746 Q1576
160kB							Q1725 Q1555	Q1735 Q1565	Q1745 Q1575
128kB				Q1704 Q1534	Q1754 Q1544	Q1713 Q1543	Q1724 Q1554	Q1734 Q1564	Q1744 Q1574
96kB				Q1703 Q1533	Q1753 Q1543	Q1712 Q1542	Q1723 Q1553	Q1733 Q1563	Q1743 Q1573
64kB			Q1347	Q1387	Q1702 Q1532	Q1752 Q1542	Q1711 Q1541	Q1722 Q1552	Online Sales	
48kB			Q1346	Q1366	Q1701 Q1531	Q1711 Q1541	Q1721 Q1551			
32kB	Q1325	Q1335	Q1345	Q1380	Q1700 Q1530	Q1750 Q1540	Q1710 Q1550			
24kB	Q1324	Q1334								
16kB	Q1323	Q1333								

Simple beauty and kitchen electronics | Sophisticated, multifunction consumer and home appliances

Pin Compatibility
Scalability ensured by taking into consideration the layout of the common and general-purpose input/output pins

Common pins such as VDD, GND, RESET, interrupt and external clock

GPIO pins

*Pin pitch may vary depending on the package type

Q17xx: Built-In LCD Driver Type (34 Part Nos./51 Models)
Q15xx: Standard Multi-pin Type (34 Part Nos./51 Models)
Q13xx: Standard Multi-pin Type (12 Part Nos./18 Models)

Function Comparison vs Competitor Products

Item	LAPIS	Company A	Company B
Internal Clock Accuracy (-40°C to +85°C)	1% (Very Good)	1.5% (Good)	5.0% (No Good)
D/A Conversion Bit Length	8-bits	None	None
Low Current Startup	Provided	Non	None
Supply Voltage	1.6V to 5.5V	1.8V to 5.5V	1.8 to 5.0V

ROM Capacity / Package	64-pins	80-pins	100-pins	64-pins	80-pins	100-pins	64-pins	80-pins	100-pins
512 KB	Available	Available	Available	Available	Available	Available			
384KB	Available	Available	Available	Available	Available	Available			
256KB	Available	Available	Available	Available	Available	Available			
192KB	Available	Available	Available						
160KB	Available	Available	Available						
128KB	Available	Available	Available				Available	Available	
96KB	Available	Available	Available				Available	Available	

Development Tools

LAPIS Semiconductor offers starter kits and a reference board for creating application programs that reduce development load.

Product Name	Part Number	Description
ML62Q1000 MCU Starter Kit	SK-BS01-D62Q1577TB	ML62Q1577 reference board EASE1000 V2 emulator, software, etc.
ML62Q1000 LCD Starter Kit	SK-AD02-D62Q1747TB	ML62Q1747 reference board ML62Q1600 LCD board EASE1000 V2 emulator, software, etc.
ML62Q1000 Capacitive Switch Starter Kit	SK-AD01-D62Q1367TB	ML62Q1367 Capacitive Switch application board EASE1000 V2 emulator, software, etc.
ML62Q1000 Reference Board	RB-D62Q1367TB32 RB-D62Q1552GA64 RB-D62Q1722GA64 RB-D62Q1577TB100 RB-D62Q1747TB100	Reference board (with onboard MCU)
On-chip Emulator EASE1000 V2	EASE1000 V2	On-chip emulator

ML62Q1000 MCU Starter Kit | ML62Q1000 LCD Starter Kit | ML62Q1000 Capacitive Switch Starter Kit

Connection Cable | Development Tools | USB Cable | Reference Board | On-Chip Emulator EASE1000 V2

Reference Board/Starter Kit Configuration
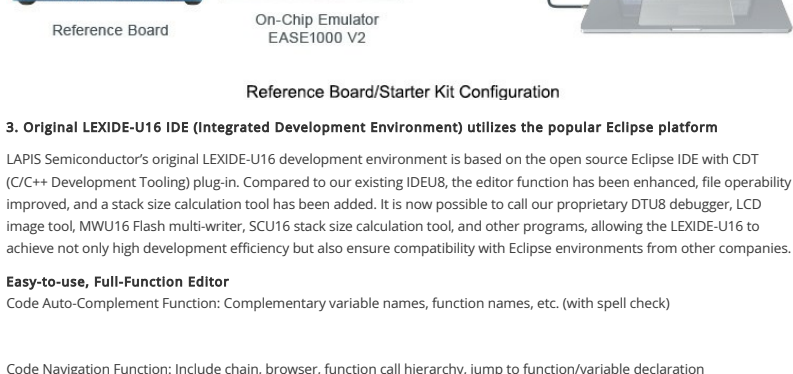
3. Original LEXIDE-U16 IDE (Integrated Development Environment) utilizes the popular Eclipse platform

LAPIS Semiconductor developed a unique LEXIDE-U16 development environment is based on the open source Eclipse IDE with CDT (C/C++ Development Tooling) plug-in. Compared to our existing IDEU8, the editor function has been enhanced, file operability improved, and a stack size calculation tool has been added. It is now possible to call our proprietary DTU8 debugger, LCD image tool, MWU16 Flash multi-writer, SCU16 stack size calculation tool, and other programs, allowing the LEXIDE-U16 to achieve not only high development efficiency but also ensure compatibility with Eclipse environments from other companies.

Easy-to-use, Full-Function Editor
Code Auto-Complement Function: Complementary variable names, function names, etc. (with spell check)

Code Navigation Function: Include chain, browser, function call hierarchy, jump to function/variable declaration
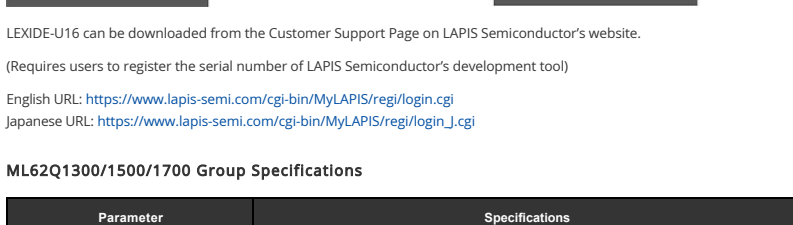
Folding Function: Fold and display functions and structures

Refactoring Function: Bulk change of function name and variable name

Syntactic Color Function: Color-coded grammar, SFR (Special Function Register), condition compilation, etc.

Easily Calculate the Stack Size
Output the maximum stack size and the relevant call tree on the console window of LEXIDE-U16 or as a file format. Makes it easy to port existing IDEU8 integration projects to LEXIDE-U16

Launch LAPIS Semiconductor's proprietary tool from the LAPIS drop-down menu

Maximum stack usage and function call tree | Easy-to-use editor with robust functionality

LEXIDE-U16 can be downloaded from the Customer Support Page on LAPIS Semiconductor's website.
(Requires users to register the serial number of LAPIS Semiconductor's development tool)
English URL: https://www.lapis-semi.com/cgi-bin/MyLAPIS/regi/login.j.cp
Japanese URL: https://www.lapis-semi.com/cgi-bin/MyLAPIS/regi/login.j.cp

ML62Q1300/1500/1700 Group Specifications

Parameter	Specifications
CPU	Original Lapis Semiconductor with High-Performance 16-bit RISC Core
Safety Features	Supports 13 safety functions compliant to IEC60730 regulations
High noise immunity	Above ±30 kV (indirect contact discharge, Lapis_semiconductor investigation)
Flash ROM	16KB-512KB
RAM	2KB-32KB
Data Flash	2KB-8KB
10-bits ADC	6-16ch
Analog comparator	1ch-2ch
8-bits DAC	0-1ch
LCD Driver	3com-8com × 24seg to 60seg (ML62Q1700 groups only)
Operating temperature	-40°C ~ +105°C
Power Supply Voltage	1.6V ~ 5.5V
Number of pins	16, 20, 24, 32, 48, 52, 64, 80, and 100 pins
Package type	WQFN16, SSOP16, TSSOP20, WQFN24, WQFN32, TQFP32, TQFP48, TQFP52, TQFP64, QFP64, QFP80, QFP100, TQFP100

Sales Information

Part No.		ML62Q15xx, ML62Q15xxx, ML62Q17xx
Sales Plans	Mass Production	Now
	Application Examples	Various types of home appliances, personal care, housing equipment, alarm and security equipment, small industrial equipment, consumer electronics equipment, and IoT devices

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