Think GAIA
For Life and the Earth

SANYO

Microcontrollers

2008-6

SANYO Semiconductor Co., Ltd.

SANYO Microcontrollers
- Expanding Human Potential

Ever since the moment when a human first took a tool in hand,
we have pursued a different path from other living creatures.
Tools made it possible for us to do what we otherwise could not, infinitely increasing human potential.
Those who came before us devoted their wisdom and energies to inventing a myriad of new tools.
It is without a doubt only this creativity for tools that has made our history.
One of the most advanced tools that we use today is the microcontroller.
As the mainstay of the rising Information Age, microcontrollers are active in every locus of society.
SANYO offers the high-performance microcontrollers active in our most recent endeavors.
As tools for further exqanding the potential of humanity,
SANYO micocontrollers create an era starting at the location most sensitive to humans.

CONTENTS

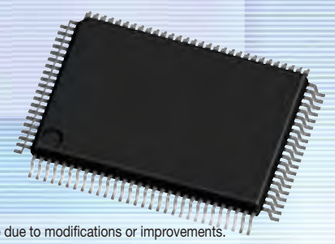
Latest Information on SANYO Microcontrollers

The SANYO Semiconductor homepage features the latest information on SANYO microcontrollers to increase customer awareness of our products and ensure that they are used in the most effective applications. In addition to an introduction to our product lineup, on our homepage you will find the latest data, including documents, manuals, and information on development tool applications.

Web Site

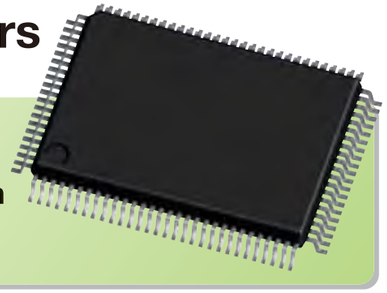
SANYO Semiconductor Web Site
http://www.semic.sanyo.co.jp/index_e.htm

SANYO Microcontroller Web Site
http://www.semiconductor-sanyo.com/micon/



* The outer dimensions in this brochure are only reference values (typical values). They may change without notice due to modifications or improvements. At the time of product design or delivery, be sure to check with the delivery specifications or external dimension drawings of each device.

Single-chip Microcontrollers



Easily constructed software systems
Hardware ideally suited for the application
Powerful development tools

Extensive Microcontroller Lineup

Research and development for SANYO microcontrollers started with the concept of helpful products for daily life. While we focus these efforts on 4-bit and 8-bit single-chip microcontrollers for use in home appliances and AV equipment, SANYO also deploys these technologies in 16-bit and 32-bit high end microcontrollers. Our innovative products that anticipate the needs of the times have won high acclaim. To process large amounts of data quickly in a wide range of areas, SANYO also provides a wide range of flash microcontroller products. SANYO will continue to round out our lineup of attractive products with a sensitive grasp of current demands.

Optimal Support for the Evolving Area of Personal Use Products

Digital technology is increasingly deployed in consumer electronic devices, such as cell phones, DSCs, and videos, and use of the Internet is becoming even more widespread. This has resulted in the frequent appearance of new products that, due to their large numbers of functions and superlative performance, can be said to exceed the framework of earlier "consumer" products. SANYO provides leading-edge technologies to respond to this increasingly high level of functionality and performance in personal use products.

Extensive Display Functions Assembled, a Proven Record of Applications

SANYO offers an extensive lineup of single-chip microcontrollers with on-chip drivers for directly driving a wide range of display elements, including liquid crystal displays (LCDs), vacuum fluorescent displays (VFDs), and lightemitting diodes (LEDs). SANYO also offers single-chip microcontrollers that incorporate OSD functions that support text and graphics display on the TV screen. SANYO is developing and providing a diverse lineup that includes both TV microcontrollers, which feature closed-caption OSD display functions, and USB microcontrollers, which feature on-chip USB support.

Products Featuring Speed and Reliability

SANYO flash microcontrollers are widely respected and have an excellent track record in actual end product applications. SANYO, as a leading company in the field, provides a line of attractive products, such as the industry's first VFD display flash microcontrollers, which feature on-chip VFD drivers.

A Support System Boasting Cutting-Edge Functions

SANYO provides a powerful support system for development, offering the most advanced functions in the industry. As the efficiency of software development grows in importance, this support system promises dramatic improvement for distinctive products with high added value.

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Developments in SANYO Microcontroller Core Products.

8 bit

LC871 Series
USB Microcontrollers

LC872/875 Series
General-purpose Microcontrollers

LC874/863 Series
TV Microcontrollers

LC876 Series
High-withstand voltage Microcontrollers

LC877 Series
LCD Driver Microcontrollers

LC709 Series
Peripheral IC

16 bit

LC885 Series
General-purpose Microcontrollers

LC888 Series
LCD Driver Microcontrollers

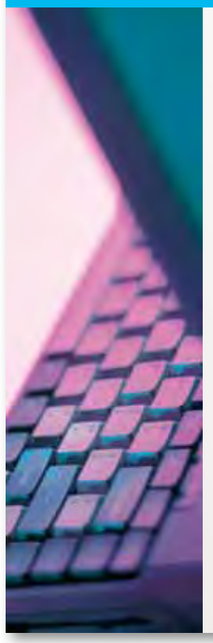
32 bit

LC69 Series (ARM926EJ-S)
System LSI for Moving Image Processing

LC67 Series (ARM7TDMI)
Large On-chip Flash E^2PROM Capacities

Types of SANYO Microcontroller Functions

USB Microcontrollers



These microcontrollers conform to the USB version 1.1 and 2.0 standard, and allow programs to be downloaded over the USB so that software can be reloaded with the microcontroller mounted on the application's printed circuit board. Since they also include a USB regulator and a system clock PLL circuit, they can reduce the number of components required in the end product.

LC871 Series P10, 11

- Supports low-speed USB and Full-speed USB
  Applications in all device classes-healthcare equipment, audio equipment, personal computer controllers, etc.
- USB: Endpoints 3 to 9
- Supports control transfer, bulk transfer, interrupt transfer, and isochronous transfer
- Simple host control function

General-purpose Microcontrollers

The LC87 Series are general-purpose microcontrollers suited to a wide variety of applications, including white goods and specialized equipment.
(ROM variations: 4K to 256KB, pin number variations: 8* to 100 pin)
The low pin number models in particular make optimum use of the specific characteristics of the LC87 Series to achieve excellent cost performance.
The series features on-chip peripheral circuits with a variety of functions. Each model is available in both flash and mask versions.

* In planning

LC872 / LC875 Series P12, 15

- 12bit/8bit AD Converter resolution switching function
- Configured for high-speed operation at low voltages(V_{DD} = 1.8 to 5.5V).
- On-chip reset circuit. Both detection voltage and release voltage levels can be set by optional configuration.
- Supports on-chip debugger

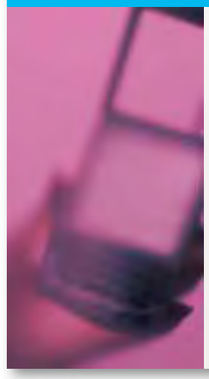
High-withstand-voltage Microcontrollers

SANYO offers a large number of microcontrollers with driver output pins that offer high-withstand-voltage resistance, thereby allowing vacuum fluorescent display (VFD) to be driven directly.

LC876 Series P16, 17

- On-chip automatic VFD driver/controller (up to 54 outputs)
- 16-stage dimmer function

LCD Microcontrollers



Among the many types of displays available, LCD (Liquid Crystal Display) in particular finds the most use in battery-operated portable products, thanks to its low power dissipation. For designs of such products, SANYO provides the following lineup of LCD microcontrollers with on-chip LCD controller/driver circuitry.

LC877 Series P18, 19

- Can display up to 192 segments.
- Segment port and common port can also be used as general-purpose I/O ports.
- On-chip new remote control receiver circuit

TV Microcontrollers

The familiar on-screen displays (OSD) for televisions continue to enjoy increasing practical value. SANYO offers 8-bit microcontrollers with on-chip OSD functions supporting captioning to achieve the television sets with built-in closedcaption decoders that have become mandatory in the U.S.

LC874 Series P20, 21

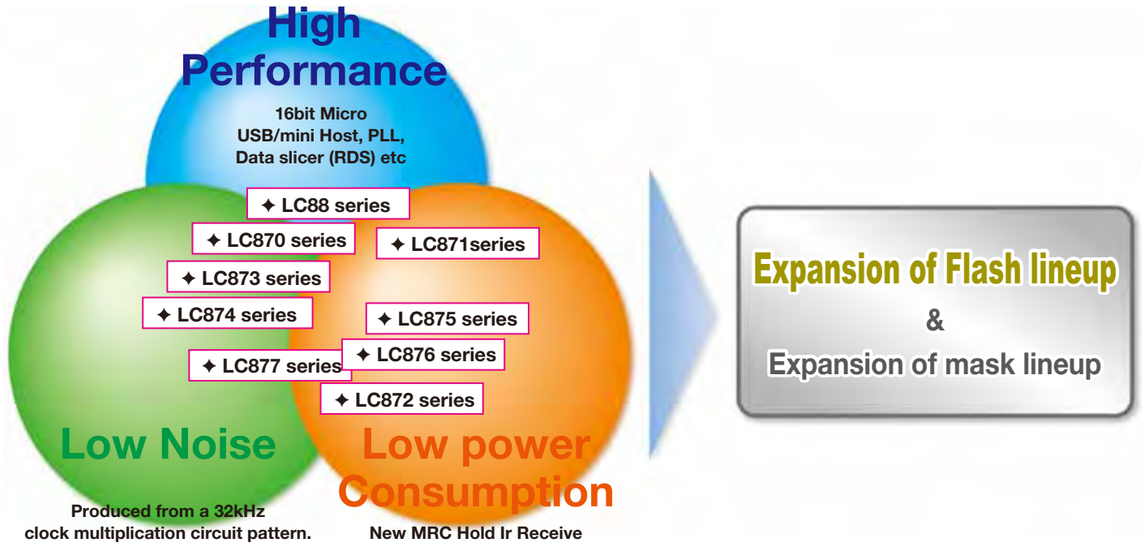
- Data slice function
- Screen display: 36 characters × 16 lines, 4096 colors (LC8740XX)
  : 36 characters × 8 lines, 16 colors (LC8741XX)
- Supports on-chip debugger

LC863 Series P22, 23

- Single-chip design with on-chip data slice function
- Screen display: 36 characters × 8 lines (Display functions implemented in hardware)
- Pseudo-graphics functions

SANYO's Development Orientation

In addition to developing high-performance microcontrollers, including 16-bit and USB simple host microcontrollers, we have realized low-power consumption, and have produced a low-noise design created from a pattern to reduce the effect of internal circuits on oscillation.
With these three technologies as our basis, we have created a lineup centering on flash microcontrollers.
Low-cost mask microcontrollers are also in development.



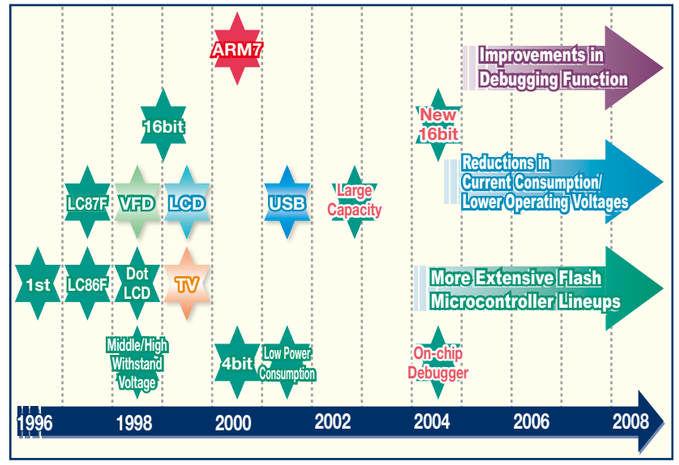
SANYO Flash Microcontroller Features

SANYO flash E²PROM implements the advanced functions of the earlier 2-transistor per cell flash memory with only a single transistor. Furthermore, the unique SANYO developed circuit structures used in this flash memory provide a wide range of features not available with other flash memory cell designs. The combination of this flash E²PROM and the CPU cores used in SANYO flash microcontrollers allows these products to respond to a wide range of user needs.

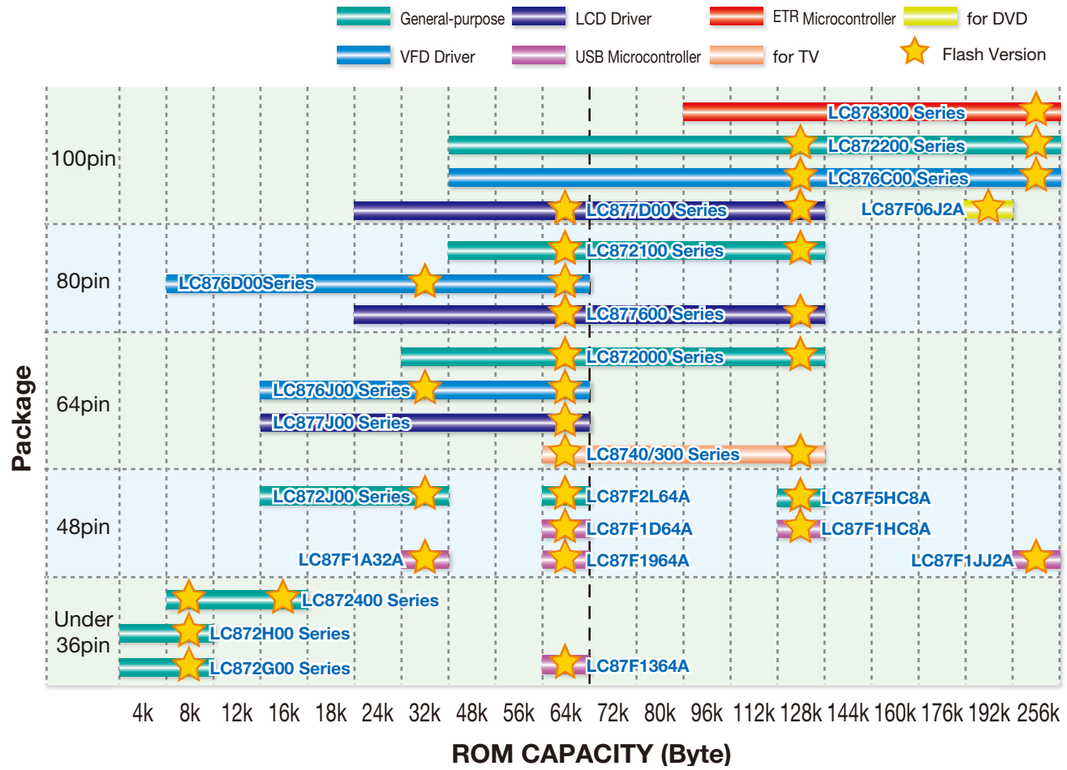
- **Small erase and programming memory unit sizes for greater ease of use**
  All memory areas are divides into small blocks of 128 or 2K bytes
- **Flexible data rewriting**
  Multiple write ports, including parallel and serial ports, are provided for flexibility in user software development.
- **Nonvolatile data storage**
  This memory is also available in SANYO data storage products.
- **Programming speed remains the same even after many write cycles**
  The split gate structure adopted in SANYO flash microcontrollers increases reliability.
- **Short programming times**
  The batch programming time for 1M bit of data is 5 to 10 seconds.
- **Single-voltage power supply operation for rewriting both programs and data**
  Programs can be easily rewritten, even in end products.

History of SANYO Flash Microcontrollers

- **1996: LC86F8208A introduced**
  Number of rewriting times: 10000 times
  Cumulative total of 6 million units have been sold since its market launch. (in a year)
- **1997: First LC87 core model introduced**
  Current basic configuration is established.
- **1998, 1999: Modelsd for different kinds of displays developed**
  Medium- and high-voltage withstanding options are made available in flash microcontrollers.
- **2000: 4-bit and 32-bit products developed**
- **2001: USB capability and low current consumption tackled.**
  Data rewriting through USB connection become made possible.
  Current consumption: 3μA (typ) during clock operation
- **2002, 2003: New models developed, new generation replaces old**
  Current consumption is further reduced, and functions are enhanced.
- **Models with on-chip debugger introduced**
  New 16-bit microcontrollers are unveiled.



LC87 Series Product lineup & Plan



Flash E^{2}PROM Version Microcontroller Series

LC87 Series

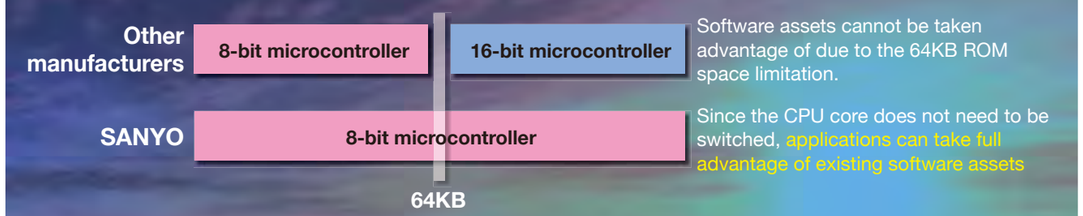
OVERVIEW

The LC87 Series microcontrollers are high-functionality, high-speed CMOS 8-bit single-chip microcontrollers that are based on the L87 core, which provides a 256KB program ROM address space and feature an extensive set of multiply and divide instructions and 16-bit access instructions. Since all the microcontrollers in this series support on-board programming, they can contribute to reduced application system development times.
The LC871/872/874/875 Series microcontrollers are optimal for equipment control applications in which real-time response is important. These microcontrollers integrate, on a single chip, a wide range of functions, including, a high-speed CPU, ROM, RAM, a parallel interface, an 8-bit A/D converter, a 16-bit timer/counter with a capture function, a 16-bit timer/counter that can also be used for PWM generation, a clock time base timer, a watchdog timer, an 8-bit SIO with an automatic transfer function, a synchronous/asynchronous SIO, a 12-bit PWM generator, I/O ports, powerful interrupt functions, and a standby function.
Additionally, SANYO is developing the following three products to create an even more extensive product line: the LC876 Series, which provides a VFD (vacuum fluorescent display) controller/driver, the LC877 Series, and which provides an LCD controller/driver.
These microcontrollers are optimal for personal computer peripherals, audio and video equipment, and home appliances, which require even higher levels of functionality.

Features of the LC87 Series

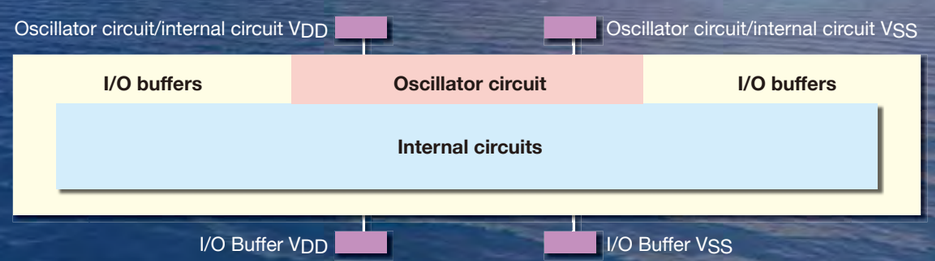
■ Optimal for users with end products that exceed a 64KB ROM capacity

A ROM capacity in excess of 64KB has been achieved in an 8-bit memory space microcontroller. The same microcontroller can still be used when functionality is added, even if the size of the program increases.



■ Low-Noise Design

Complete isolation of the oscillator circuit/internal circuit and I/O buffer power supply systems



Noise Transmission Control

- Noise from internal circuits to the I/O pins ➡ Reduces the influence of internal circuits on the oscillator and reduces EMI.
- Noise from I/O buffers to internal circuits ➡ Prevents incorrect operation and damage to circuits and reduces EMS.

FEATURES

- **Memory space**
  - 256KB program address space
  - 64KB internal data space (1KB flat areas)
  - 16MB external data space
  The current lineup includes products with up to 256KB of ROM and up to 16KB of RAM. In the future, SANYO plans to release products with memory capacities beyond the above limits.
- **Oscillator circuit**
  - RC oscillator circuit (internal): For use as the system clock
  - CF oscillator circuit: For use as the system clock.
  The resistor Rf is included.
  - Crystal oscillator circuit: For use as a low-speed system clock
- **System clock divider function**
  - Enables low current consumption operation.
  - Supports minimum instruction cycle times of 300ns, 600ns, 1.2µs, 2.4µs, 4.8µs, 9.6µs, 19.2µs, 38.4µs, and 76.8µs when using a 10MHz main clock.
- **CPU core processing power**
  - Cycle time: 250ns
  - Provides 20 16-bit access instructions.
- **High-speed multiplication and division instructions**
  - 16bits × 8bits, 16bits ÷ 8bits (Execution time: 5tCYC)
  - 24bits × 16bits, 24bits ÷ 16bits (Execution time: 12tCYC)
- **Interrupt sources**
  - Three-level multi-interrupt control: low level (L), high level (H), and highest level (X)
  - When two or more interrupts for vector addresses occur at the same time, the interrupt with the highest level, or, if the levels are the same, the interrupt with the lower vector address, is given priority.
- **Standby functions**
  - Halt mode: Instruction execution is stopped, peripheral circuit operation continues.
  - Hold mode: Instruction execution is stopped, peripheral circuit operation is stopped.
  - Crystal hold mode: Instruction execution is stopped, peripheral circuits other than the base timer are stopped.
- **Timers**
  - Toggle output function with prescaler
  - Capture function
  - External pulse counter function
  - PWM waveform output generator function
- **One base timer**
- **Built-in watchdog timer** (Uses an external RC circuit)
- **Serial I/O**
  - Serial I/O with automatic transfer function
  - Asynchronous and synchronous serial I/O
  - Bus mode supporting the I^{2}C format
  - Full duplex UART
- **8-bit A/D converter**
- **A/D Converter with 12-/8-bit resolution selector**
- **Remote control receiver circuit with built-in noise rejection circuit** (The noise rejection time constant can be set to 1, 32, or 128tCYC)
- **Low-amplitude signal detection output**
- **PWM: Variable period 12bit PWM channels**
- **Low-noise design**
- **C programming support** (Source line debugging)
- **Internal reset circuit**
  - Low-voltage detection reset function
  - POR
- **High-precision on-chip RC oscillator circuit**

LINEUP

- **Flash microcontrollers: Available for all series**
- **USB 1.1/2.0 standard support: LC871 Series**
- **General-purpose microcontrollers: LC872/875 Series**
- **High-withstand voltage microcontrollers (Built-in VFD display controller/driver): LC876 Series**
- **LCD microcontrollers (Built-in LCD display controller/driver): LC877 Series**
- **TV microcontrollers: LC874/863 Series**

APPLICATIONS

- PC peripherals: Control and display
- Home appliances: Control, display, and remote control
- Communication equipment: Control and display
- Automotive equipment: Control and display
- Audio and visual: Control and display
- TV

LC871 Series

OVERVIEW

The LC871 Series are 8-bit microcontrollers with on-chip flash memory that employ USB (Universal Serial Bus) interfaces, which are rapidly increasing in popularity as I/O interfaces for personal computers.
Flash microcontrollers (microcontrollers with on-chip flash memory) can enable the new product development period to be reduced and mass production to be commenced at an earlier stage, and also display superior maintainability. The usefulness of these microcontrollers is widely recognized, and their market is rapidly expanding.
The USB standard is, on the other hand, presently attracting considerable attention in the market as a superior PC interface system, answering demands for ease of connection, low cost, and higher communication speeds.
Responding to increased market needs, SANYO has brought these technologies together to produce a flash microcontroller with an on-chip USB interface.
LC871 Series is compliant with USB Versions 1.1 and 2.0, and use SANYO's proprietary flash onboard reprogramming system to enable software to be downloaded from a PC via the USB interface and the microcontroller to be reprogrammed while installed in an end product. In addition, a USB regulator and system clock PLL on the same chip make it possible to reduce the number of components used in end products.

FEATURES

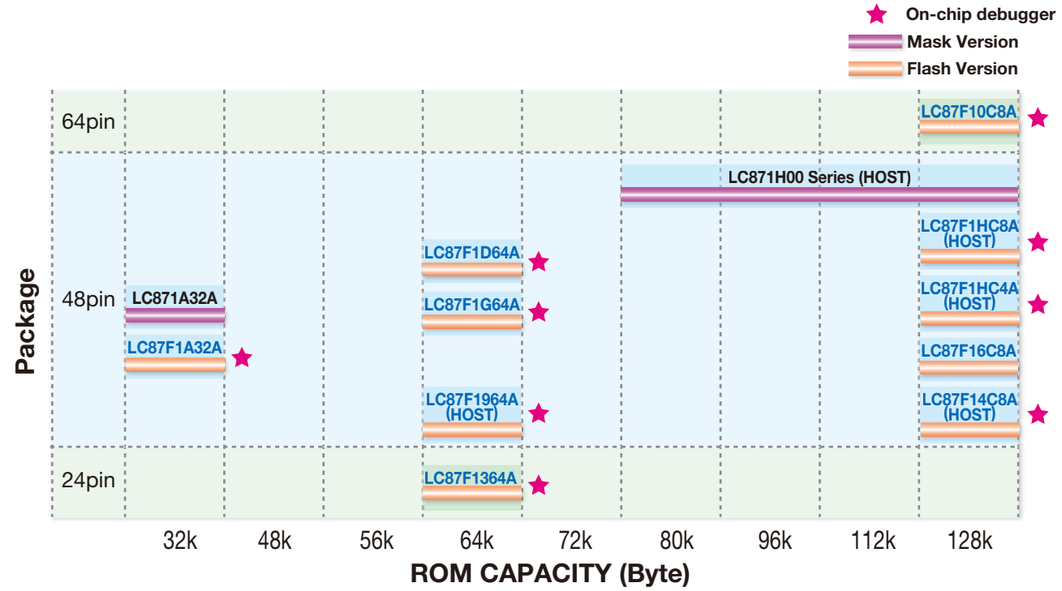
The LC871 Series are compliant with USB Versions 1.1 and 2.0, and is provided with a wide range of features including onboard reprogramming, self-reprogramming in 128-byte units, a 3.3V regulator for USB port voltage, and high-capacity FIFO (max. 16KB).

- **On-chip USB interface engine**
- **On-chip flash program ROM enables program overwrite.**
- **USB interface enables program updates from PC.**
- **Support the USB versions 1.0 and 2.0 (full-speed)**
  - Supports control transfer, bulk transfer, interrupt transfer, and isochronous transfer
- **The data area for USB (FIFO buffer) is mapped onto the RAM microcontroller area.**
- **8-bit A/D converter**
- **PWM ports (2 to 4 ports)**
- **1 or 2 powerful 16-bit timers**
  (can be divided and used as 2 8-bit timers)
- **On-chip clock frequency divider** (External 32k crystal oscillator)
- **Interrupts**
  : 40 interrupt sources (LC87F1HC8A)
  : 36 interrupt sources (LC87F14C8A)
  : 32 interrupt sources (LC87F1964A)
  10-level enhanced interrupt function
- **High speed multiply and divide instructions: 24bits × 16bits 12tCYC.**
- **On-chip noise elimination circuit for remote control signal reception**
- **Watchdog timer** (using an external RC circuit)
- **Infrared rays remote controller reception circuit**
  - Noise rejection function (noise filter time constant selectable)
  - Supports data encoding systems such as PPM (Pulse Position Modulation) and Manchester encoding.
- **Built-in PLL Circuit**

LINEUP

- LC87F10C8A (64 pins)
  - ROM: 128K bytes
  - RAM: 8192×9bits
- LC87F1364A (24 pins)
  - ROM: 64K bytes
  - RAM: 1024×9bits
- LC87F16C8A (48 pins)
  - ROM: 128K bytes
  - RAM: 8192×9bits
- LC87F1A32A (48 pins)
  - ROM: 32K bytes
  - RAM: 2048×9bits
- LC87F1D64A (48 pins)
  - ROM: 64K bytes
  - RAM: 4096×9bits
- LC87F1G64A (48 pins)
  - ROM: 64K bytes
  - RAM: 3072×9bits
- LC87F1HC8A(HOST) (48 pins)
  - ROM: 128K bytes
  - RAM: 16384×9bits
- LC87F1HC4A(HOST) (48 pins)
  - ROM: 128K bytes
  - RAM: 12288×9bits
- LC87F14C8A(HOST) (48 pins)
  - ROM: 128K bytes
  - RAM: 10240×9bits
- LC87F1964A(HOST) (48 pins)
  - ROM: 64K bytes
  - RAM: 5120×9bits

LC871 Series Product Lineup



APPLICATIONS

- Healthcare equipment
- Audio equipment
- Personal computer sub control
- Amusement

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LC872 Series

OVERVIEW

The LC872 Series 8-bit microcontrollers are centered around a CPU core that operates with a minimum bus cycle time of 83ns and integrate an extensive set of peripheral functions on a single chip. These peripheral functions include a high-functionality 16-bit timer/counter that can be divided and used as two 8-bit timers, 8-bit timers with internal prescalers, a clock time base timer, a synchronous SIO circuit that features an automatic transfer function, an asynchronous or synchronous SIO circuit, a 12-bit PWM output circuit, 12/8-bit resolution selection function, a remote control receiver circuit, a high-speed clock counter, a system clock divider, an internal reset circuit, and an extensive set of interrupt sources.

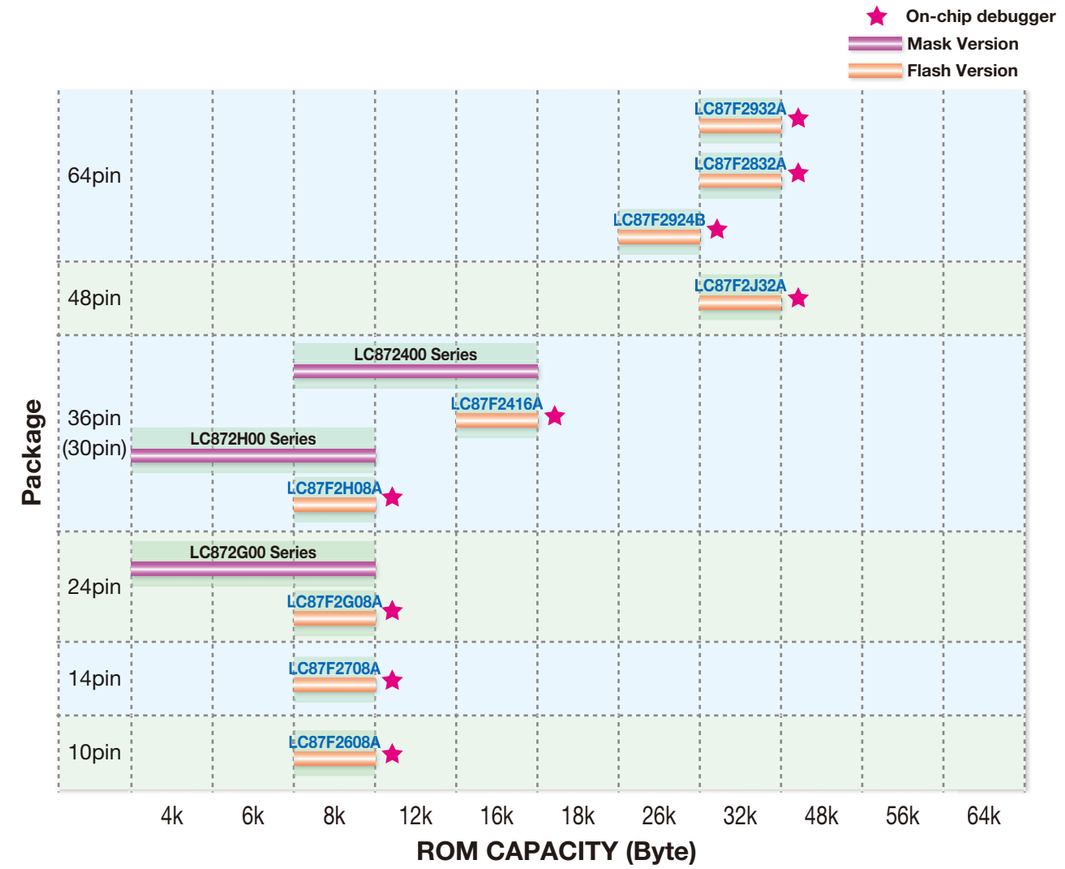
FEATURES

- **Timers**
  - One 16-bit timer/counter with internal capture register that can be divided and used as two 8-bit timers
  - One 16-bit timer/counter that can provide PWM/toggle output and that can be divided and used as two 8-bit timers
  - Four 8-bit timers with internal 6-bit prescalers
  - Clock time base timer
- **High-speed clock counter**
  (Capable of counting a clock with a frequency up to 20MHz when using a 10MHz main clock)
- **Serial I/O**
  - 8-bit SIO channels with internal automatic transfer function
    - Includes two 8-bit baudrate generators
    - Maximum clock: 4/3tCYC
  - One 8-bit synchronous/asynchronous SIO channel
    - Asynchronous: 8 to 2048tCYC
    - Synchronous: 2 to 512tCYC
  - Full duplex UART
- **ADC**: 12/8-bit resolution selection function
- **PWM**: Variable period 12-bit PWM channels
- **Remote control receiver circuit**
- **Watchdog timer** (using an external RC circuit)
- **Interrupts**
  (This interrupt system features 3-level multi-interrupt control with low-level (L), high-level(H), and highest-level (X) interrupts.)
- **High-speed multiply and divide instructions**
  - 16bits × 8bits (Execution time: 5tCYC)
  - 24bits × 16bits (Execution time: 12tCYC)
  - 16bits ÷ 8bits (Execution time: 8tCYC)
  - 24bits ÷ 16bits (Execution time: 12tCYC)
- **System clock divider function**
- **Standby function**
  - HALT mode: Instruction execution is stopped but peripheral function operation continues.
  - HOLD mode: Both instruction execution and peripheral function operation are stopped.
  - X'tal HOLD mode: Instruction execution is stopped, and all peripheral circuits other than the time base timer are stopped.
- **Internal reset circuit**
  - Low-voltage detection reset function
  - POR
- **High-precision on-chip RC oscillator circuit**

LINEUP

- LC8724XX Series (30 pins)
  - ROM: 8K to 16K bytes
  - RAM: 512×9bits
- LC87F2608A (10 pins)
  - ROM: 8K bytes
  - RAM: 512×9bits
- LC87F2G08A (24 pins)
  - ROM: 8K bytes
  - RAM: 256×9bits
- LC872HXX Series (30 pins)
  - ROM: 4K to 8K bytes
  - RAM: 256×9bits
- LC87F2J32A (48 pins)
  - ROM: 32K bytes
  - RAM: 1024×9bits
- LC87F2832A (64 pins)
  - ROM: 32K bytes
  - RAM: 1024×9bits
- LC87F2924B (64 pins)
  - ROM: 26K bytes
  - RAM: 768×9bits
- LC87F2932A (64 pins)
  - ROM: 32K bytes
  - RAM: 2048×9bits

LC872 Series Product Lineup



APPLICATIONS

- Audio equipment
- Home appliances
- Communication equipment
- Personal computer sub control
- Security equipment

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LC875 Series

OVERVIEW

The LC875 Series 8-bit microcontrollers are centered around a CPU core that operates with a minimum bus cycle time of 83ns and integrate an extensive set of peripheral functions on a single chip. These peripheral functions include a high-functionality 16-bit timer/counter that can be divided and used as two 8-bit timers, 8-bit timers with internal prescalers, a clock time base timer, a synchronous SIO circuit that features an automatic transfer function, an asynchronous or synchronous SIO circuit, a 12-bit PWM output circuit, an 8-bit A/D converter, a remote control receiver circuit, a high-speed clock counter, a system clock divider, and an extensive set of interrupt sources.

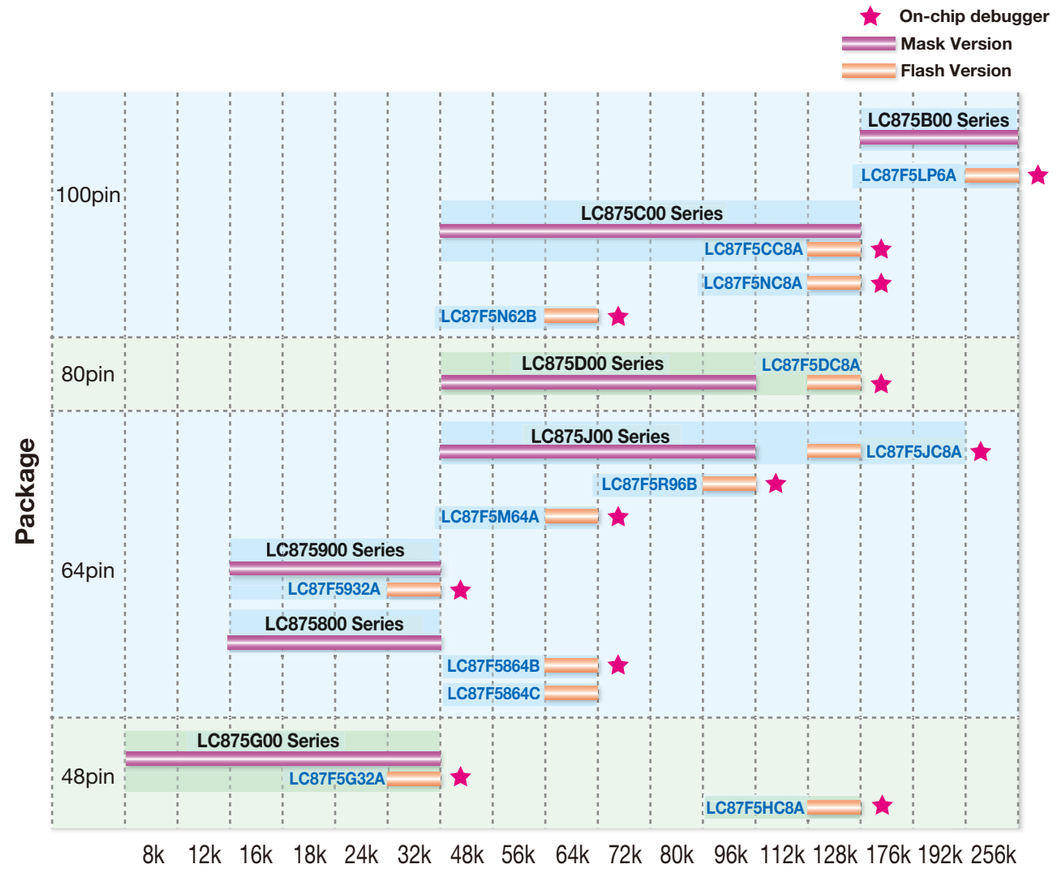
FEATURES

- **Timers**
  - One 16-bit timer/counter with internal capture register that can be divided and used as two 8-bit timers
  - One 16-bit timer/counter that can provide PWM/toggle output and that can be divided and used as two 8-bit timers
  - Four 8-bit timers with internal 6-bit prescalers
  - Clock time base timer
- **High-speed clock counter**
  (Capable of counting a clock with a frequency up to 20MHz when using a 10MHz main clock)
- **Serial I/O**
  - 8-bit SIO channels with internal automatic transfer function
    - Includes two 8-bit baudrate generators
    - Maximum clock: 4/3tCYC
  - One 8-bit synchronous/asynchronous SIO channel
    - Asynchronous: 8 to 2048tCYC
    - Synchronous: 2 to 512tCYC
  - Full duplex UART
- **ADC**: 8-bit resolution function
- **PWM**: Variable period 12-bit PWM channels
- **Remote control receiver circuit**
- **Watchdog timer** (using an external RC circuit)
- **Interrupts**
  (This interrupt system features 3-level multi-interrupt control with low-level (L), high-level(H), and highest-level (X) interrupts.)
- **High-speed multiply and divide instructions**
  - 16bits × 8bits (Execution time: 5tCYC)
  - 24bits × 16bits (Execution time: 12tCYC)
  - 16bits ÷ 8bits (Execution time: 8tCYC)
  - 24bits ÷ 16bits (Execution time: 12tCYC)
- **System clock divider function**
- **Standby function**
  - HALT mode: Instruction execution is stopped but peripheral function operation continues.
  - HOLD mode: Both instruction execution and peripheral function operation are stopped.
  - X'tal HOLD mode: Instruction execution is stopped, and all peripheral circuits other than the time base timer are stopped.

LINEUP

- LC875CXX Series (100 pins)
  - ROM: 48K to 128K bytes
  - RAM: 2048 to 4096×9bits
- LC875BXXX Series (100 pins)
  - ROM: 176K to 256K bytes
  - RAM: 4096 to 6144×9bits
- LC875DXX Series (80 pins)
  - ROM: 48K to 96K bytes
  - RAM: 2048 to 4096×9bits
- LC875JXX Series (64 pins)
  - ROM: 48K to 96K bytes
  - RAM: 2048 to 4096×9bits
- LC8758XX Series (64 pins)
  - ROM: 16K to 32K bytes
  - RAM: 1024×9bits
- LC8759XX Series (64 pins)
  - ROM: 16K to 32K bytes
  - RAM: 1024×9bits
- LC875GXX Series (42/48 pins)
  - ROM: 8K to 32K bytes
  - RAM: 2048×9bits
- LC875MXX Series (64 pins)
  - ROM: 48K to 64K bytes
  - RAM: 2048×9bits
- LC875NXX Series (100 pins)
  - ROM: 48K to 128K bytes
  - RAM: 2048 to 4096×9bits

LC875 Series Product Lineup



APPLICATIONS

- Audio equipment
- Home appliances
- Communication equipment
- Security equipment
- Personal computer peripherals

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LC876 Series

OVERVIEW

The LC876 Series 8-bit microcontrollers are centered around a CPU core that operates with a minimum bus cycle time of 80ns and integrate an extensive set of peripheral functions on a single chip. These peripheral functions include a vacuum fluorescent display (VFD) automatic display controller/driver, a high-functionality 16-bit timer/counter that can be divided and used as two 8-bit timers, a 16-bit timer/PWM circuit that can be divided and used as two 8-bit timers, a clock time base timer, a high-speed clock counter, a system clock divider, a synchronous SIO circuit that features an automatic transfer function, a synchronous/asynchronous SIO circuit, an 8-bit A/D converter, a low-amplitude signal detection circuit, and an extensive set of interrupt sources.

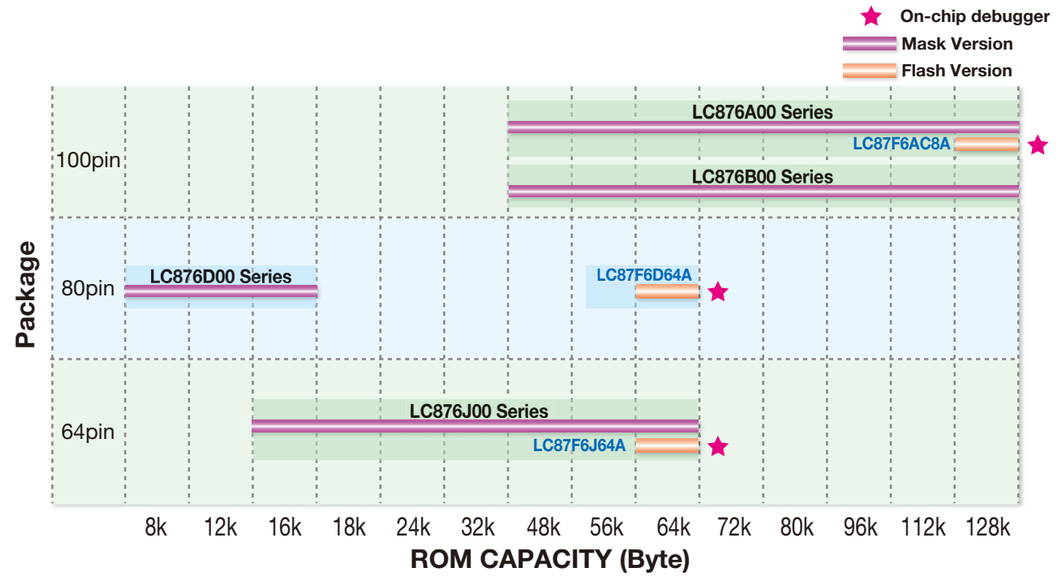
FEATURES

- **Low-amplitude signal detection circuit**
  (for microphone and similar signals) (LC8767/68/69/6A/6B Series)
- **Timers**
  - One 16-bit timer/counter with internal capture register that can be divided and used as two 8-bit timers
  - One 16-bit timer/counter that can provide PWM/toggle output and that can be divided and used as two 8-bit timers
  - Clock time base timer
- **High-speed clock counter** (LC876A/6B Series)
  (Capable of counting a clock with a frequency up to 20MHz when using a 10MHz main clock)
- **Serial I/O**
  - 8-bit synchronous serial interface
  - 8-bit asynchronous/synchronous serial interface
- **A/D converter**
  : 15-channels 8-bit A/D converter (LC876A/6B Series)
- **Remote control receiver circuit**
  (shared with the P73, INT3, and TOIN pins)
- **Watchdog timer** (using an external RC circuit)
- **Interrupts**
  - 26 interrupt sources, 10 vector locations (LC876A Series)
  - 25 interrupt sources, 10 vector locations (LC876B Series)
  - 14 interrupt sources, 10 vector locations (LC876D Series)
  (This interrupt system features 3-level multi-interrupt control with low-level (L), high-level (H), and highest-level (X) interrupts.)
- **High-speed multiply and divide instructions**
  - 16bits × 8bits (Execution time: 5tCYC)
  - 24bits × 16bits (Execution time: 12tCYC)
  - 16bits ÷ 8bits (Execution time: 8tCYC)
  - 24bits ÷ 16bits (Execution time: 12tCYC)
- **System clock divider function**
- **Standby function**
  - HALT mode: Instruction execution is stopped but peripheral function operation continues. (VFD display and certain serial transfer functions are stopped.)
  - HOLD mode: Both Instruction execution and peripheral function operation are stopped.
  - X'tal HOLD mode: Instruction execution is stopped, and all peripheral circuits other than the time base timer are stopped
- **VFD output**
  : 48 outputs (LC876A/6B Series)
  : 54 outputs (LC876D Series)
- **Two dedicated 12-bit PWM output channels** (LC876A Series)

LINEUP

- LC876A/BXX Series (100 pins)
  - ROM: 48K to 96K bytes
  - RAM: 2048/4096×9bits
- LC876DXX Series (80 pins)
  - ROM: 8K to 64K bytes
  - RAM: 2048×9bits
- LC876JXX Series (64 pins)
  - ROM: 16K to 64K bytes
  - RAM: 2048×9bits

LC876 Series Product Lineup



APPLICATIONS

- Audio equipment
- Home appliances, etc.

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LC877 Series

OVERVIEW

The LC877 Series 8-bit microcontrollers are centered around a CPU core that operates with a minimum bus cycle time of 83.3ns and integrate an extensive set of peripheral functions on a single chip. These peripheral functions include 16K to 128KB of ROM, 512/1024/1536/2048/4096 bytes of RAM, an LCD display controller/driver, a 16-bit timer/counter that can be divided and used as two 8-bit timers, a 16-bit timer/PWM that can also be divided and used as two 8-bit circuits, four 8-bit timers with internal prescalers, a clock time base timer, a high-speed clock counter, a system clock divider, a synchronous SIO circuit that features an automatic transfer function, a synchronous/asynchronous SIO circuit, an 8-bit A/D converter, a low-amplitude signal detection circuit, and an extensive set of interrupt sources.

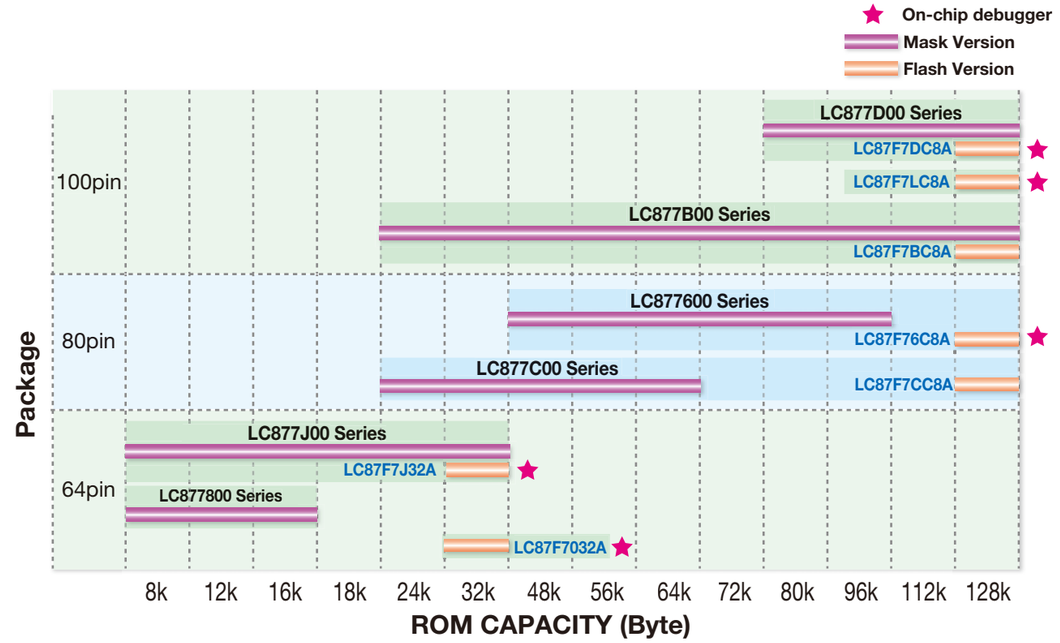
FEATURES

- **LCD display controller/driver**
  - 54 segments × 4 common outputs (LC877D Series)
  - 48 segments × 4 common outputs (LC877B Series, LC87F7LC8A)
  - 32 segments × 4 common outputs (LC877C Series, LC87F76C8A)
  - 24 segments × 4 common outputs (LC87F7032A, LC8778 Series, LC877J Series)
- **Low-amplitude signal detection circuit** (for microphone and similar signals)
- **Timers**
  - One 16-bit timer/counter with internal capture register that can be divided and used as two 8-bit timers
  - One 16-bit timer/counter that can provide PWM/toggle output and that can be divided and used as two 8-bit timers
  - Four 8-bit timers with internal 6-bit prescalers
  - Clock time base timer
- **High-speed clock counter** (Capable of counting a clock with a frequency up to 20MHz when using a 10MHz main clock)
- **Serial I/O**
  - Full duplex UART
  - 8-bit synchronous serial interface
  - 8-bit asynchronous/synchronous serial interface
- **A/D converter**
  - 15-channel 12-bit A/D converter with 12-/8-bit resolution selector (LC877D Series)
  - 12-channel 12-bit A/D converter with 12-/8-bit resolution selector (LC877J Series, LC8776 Series)
  - 15-channels 8-bit A/D converter (LC877B Series, LC87F7LC8A)
  - 12-channels 8-bit A/D converter (LC877C Series)
  - 9-channels 8-bit A/D converter (LC877816A, LC87F7032A)
- **Remote control receiver circuit** (Shared with the P73, INT3, and TOIN pins)
- **Watchdog timer** (using an external RC circuit)
- **Interrupt**
  - : 31 interrupt sources, 10 vector locations (LC877D Series)
  - : 25 interrupt sources, 10 vector locations (LC877J Series)
  - : 22 interrupt sources, 10 vector locations (LC8776 Series)
  - : 20 interrupt sources, 10 vector locations (LC877B Series, LC87F7032A)
  - : 19 interrupt sources, 10 vector locations (LC877C Series) (This interrupt system features 3-level multi-interrupt control with low-level (L), high-level, and highest-level (X) interrupts.)
  - : 17 interrupt sources, 10 vector locations (LC877816A)
  - : 12 interrupt sources, 10 vector locations (LC87F7032A)
- **High-speed multiply and divide instructions**
  - 16bits × 8bits (Execution time: 5tCYC)
  - 24bits × 16bits (Execution time: 12tCYC)
  - 16bits ÷ 8bits (Execution time: 8tCYC)
  - 24bits ÷ 16bits (Execution time: 12tCYC)
- **System clock divider function**
- **Standby function**
  - HALT mode: Instruction execution is stopped but peripheral function operation continues.
  - HOLD mode: Both instruction execution and peripheral function operation are stopped.
  - X'tal HOLD mode: Instruction execution is stopped, and all peripheral circuits other than the time base timer are stopped.

LINEUP

- LC87F7032A(64 pins)
  - ROM: 32K bytes
  - RAM: 1024×9bits
- LC8776XX Series (80 pins)
  - ROM: 48K to 128K bytes
  - RAM: 4096×9bits
- LC877DXX Series (100 pins)
  - ROM: 80K to 128K bytes
  - RAM: 4096×9bits
- LC8778XX Series (64 pins)
  - ROM: 8K to 16K bytes
  - RAM: 512×9bits
- LC877BXX Series (100 pins)
  - ROM: 24K to 128K bytes
  - RAM: 1536 to 4096×9bits
- LC877CXX Series (80 pins)
  - ROM: 24K to 128K bytes
  - RAM: 1536 to 4096×9bits
- LC87F7J32A(64 pins)
  - ROM: 32K bytes
  - RAM: 1024×9bits
- LC877LXX Series (100 pins)
  - ROM: 48K to 128K bytes
  - RAM: 4096×9bits

LC877 Series Product Lineup



APPLICATIONS

- Audio equipment
- Commnication equipment
- Home appliances
- Healthcare equipment, etc.

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LC874 Series

OVERVIEW

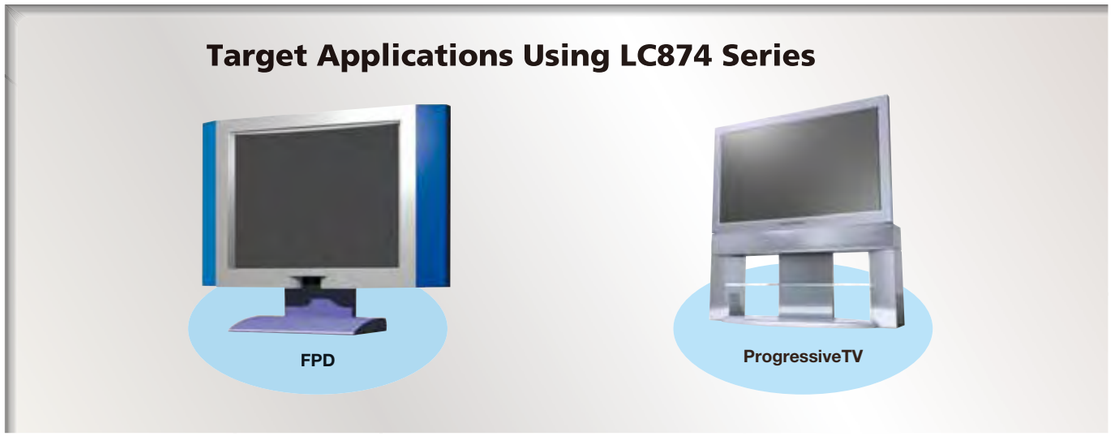
The LC874 Series 8-bit microcontrollers are centered around a CPU core that operaters with a minimum bus cycle time of 71ns and integrate an extensive set of peripheral functions on a single chip. These pheripheral functions include a 64KB or 128KB flash ROM (selectable between program ROM and CGROM sizes), 2048-byte RAM, 1024-byte CGRAM, 352×10-bit or 704×10-bit CRT display RAM, two high-functionality 16-bit timer/counters that can be divided and used as 8-bit timers, two 8-bit timers with internal prescalers, a clock time base timer, a high-speed clock counter, a synchronous SIO circuit that features an auto transfer function, two synchronous or asynchronous SIO channels (bus mode switching), a UART (full duplex), an 8-bit A/D converter, a PWM, a closed caption data slicer and an advanced OSD. The series has been developed as 8-bit microcomputers for closed caption television control.

FEATURES

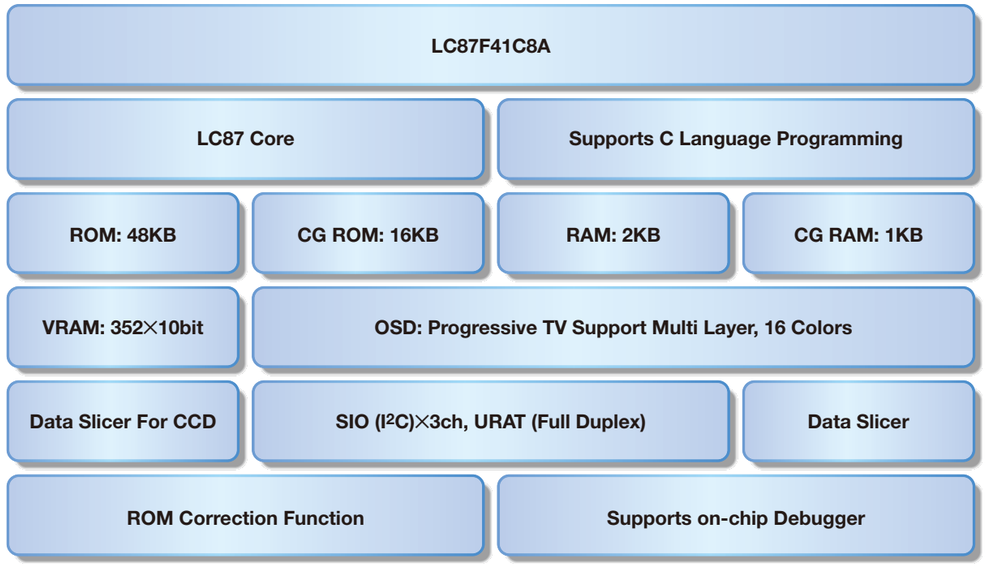
- **Flash ROM**: 128K bytes/64K bytes
  - Program ROM: 95K bytes to 110K bytes (variable)/48K bytes
  - Character ROM: 16Kbytes to 31K bytes (variable)/16K bytes
  - Supports onboard reprogramming using 5V single power source.
  - Supports block reprogramming in 128-byte units
  - Maximum reprogramming cycles: 100
- **Expansion of ROM lineup** (mask version): 96K bytes to 128K bytes/64K bytes
- **Internal RAM**: General-purpose RAM 2K bytes, Character RAM 1K bytes, CRT display RAM: 704×10bits/352×10bits, ROM correction RAM 256 bytes/128K bytes
- **OSD function**
  - Screen size: 36 characters×16 lines, /36 characters×8 lines
  - Display RAM size: 704 words (1word = 10 bits)/ 352 words (1 word = 10bits)
  - Display area: 36 words×16 lines/36 words×8 lines,
  - Control area: 8 words×16 lines/8 words×8 lines
  - Font types: 16×32 fonts 512 types (16CGRAM fonts, including 4 fixed fonts)
  - An arbitary number of characters can be generated as 16×17 or 16×32 or 8×9 font characters, 256 types including 3 fixed fonts
  - Display colors: 4096 colors/16 colors (character text, background, borders and full background can be displayed)
  - Display mode specifiable on a line basis
  - LC87F40C8A(normal mode/pixel map/caption text mode)
  - LC87F4164A(normal mode/pixel map/caption text mode)
  - Superior control capacity in line units (Common)
    1) Vertical and horizontal display position
    2) 16-type of character size *
    3) Character pitch *
    4) Display start or stop lines (shutter function)
    5) Scroll function
  - Cursor display function (LC87F40C8A only, 4/16 pixel colors)
  - Multilayer display fanction (LC87F40C8A only)
  - Full screen display area specifiable (Common)
  - OSD clock selectable (14MHz/28MHz/External input)/(Normal speed mode/ High speed mode/External input)
  - Interlace/progressive scan selectable
- **Data slicer function** (Closed caption format) (Common)
  - Extracts of closed caption data and XDS data
  - NTSC/PAL selectable and line specificable.
- **Two 16-bit timer/counter** (Common)
- **Two 8-bit timer**
- **Clock time base timer**
- **High speed clock counter**
- **Watchdog timer** (using an external RC circuit)
- **8-bit synchronous serial interface**
- **Two 8-bit synchronous/asynchronous serial interface**
- **Supports I^2C communications.**
- **UART** (full duplex)
- **Remote controller signal reception noise rejection circuit**
- **1-channels × 14bits, 3-channels × 8bits PWM output**
- **8-channels 8bits A/D converter**
- **Numerous interrupt functions**
  - 21 interrupt sources, 10 vector locations
  - Three level multiple interrupt control function
- **Standby functions** (HALT/HOLD)
- **High-speed operation**
  - Minimum cycle time 212ns, bus cycle 71ns (14.1MHz)
- **System clock divider fuction**
- **ROM correction function**
- **Supports on-chip debugger** (LC87F40C8A/LC87F4164A)
- **Onboard reprogramming function**
- **Package**: QFP64, DIP64 (Lead free type)

Note *: The supported range varies depending on the active display mode. Refer to the user's guide for detail.

APPLICATIONS



STRUCTURES



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Flash E^{2}PROM Version Microcontroller Series

LC863 Series

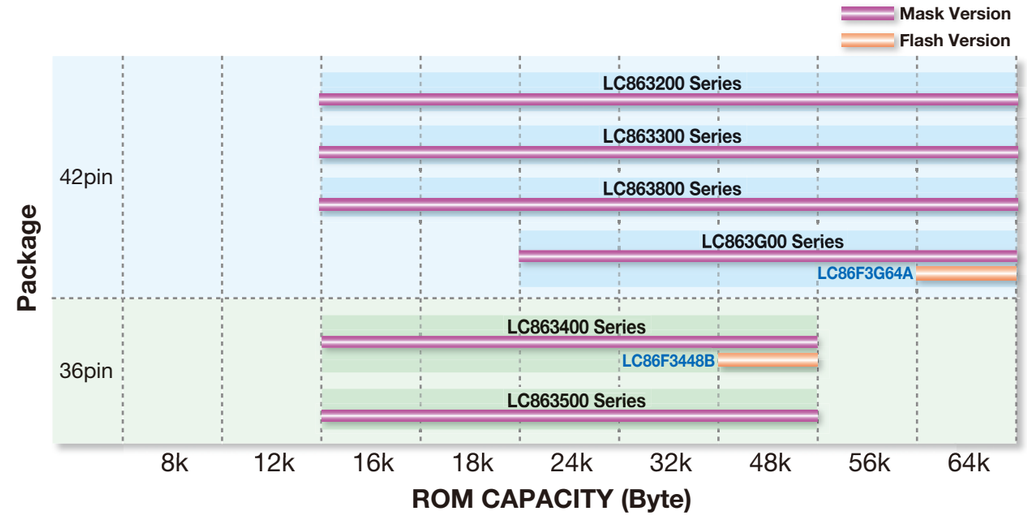
OVERVIEW

The LC863 Series products are multifunction high-speed single-chip CMOS 8-bit microcontrollers that include built-in OSD functionality. Since the erasable EPROM with window and one-time programmable PROM versions are replaced with flash ROM versions in this series, these microcontrollers can easily handle end product development in which specifications change frequently during production startup, or when different specifications are required for different customers.
The LC8638XX, LC8632XX (DIP42, QFP48) and LC8634XX (DIP36, SOP36) products include an on-chip caption data slicer circuit. This allows them to implement end products that provide caption, XDS (Extended Data Service), and Vchip functions with a single chip. Although the LC8633XX and LC8635XX products do not include the caption data slicer circuit, they are otherwise pin and function compatible with the LC8632XX and LC8634XX. Thus they can be used to implement a unified chassis for use in NTSC, PAL, and other systems.
In addition to DIP packages, all the microcontrollers in this series are available in flat package versions to support chassis miniaturization in end products.

FEATURES

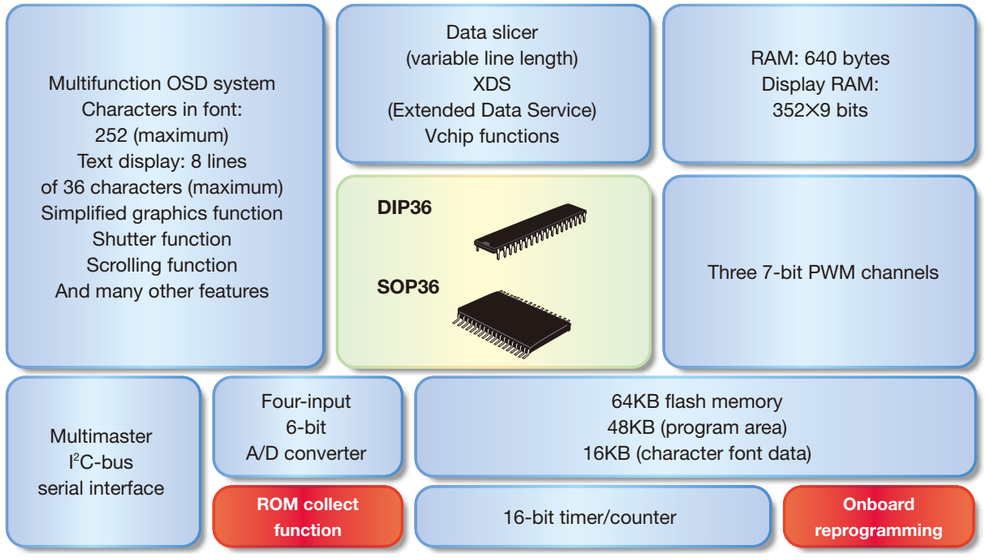
- **16 to 64KB ROM**
  (The 36-pin package versions are limited to a maximum of 48KB.)
- **16KB CGROM**
- **512 to 768-byte RAM** (including ROM collect RAM)
- **352 × 9-bit full-screen display RAM**
  (The LC8635XX products support 176 × 9-bits)
- **16-bit timer/counter**
- **Multiple-use PWM 16-bit timer**
- **Clock time base timer**
- **Watchdog timer** (using an external RC circuit)
- **8-bit synchronous serial interface** (42-pin package versions)
- **I^{2}C serial interface that supports multiple masters**
- **Remote control receiver circuit**
- **3-channel 7-bit PWM outputs**
- **4-charnels 8-bit A/D converter**
  (The 36-pin package versions use a 6-bit converter.)
- **I/O ports**: Up to 29
- **Numerous interrupt functions**
  - 16 interrupt sources, 10 vector locations (LC8632XX)
  - Three-level multiple interrupt control function
- **Standby function** (HALT/HOLD)
- **High-speed operation**
  - Minimum cycle time: 0.848µs (bus cycle: 0.424µs)
- **Symmetrical instruction set common with LC86 Series**
  - 68 instructions
- **OSD function**
  - 36 characters × 8 lines
    (The LC8635XX products (but no others) support 4 lines.)
  - Number of characters 16 × 32 dots: 252 types
    (The number of characters can be increased by using the segmentation function for creating an arbitrary number of characters.)
  - 16 display colors
  - Simplified graphics function
    Graphics are formed from 16 × 16 dot character cells with one of 4 colors.
  - Various line-by-line control settings
    1) Vertical and horizontal display position
    2) 10 types of character sizes (1.5 × horizontal size, 0.5 × horizontal size and 0.5 × vertical size available)
    3) Character pitch
    4) Display start or stop lines (shutter function)
- **Data slicer function** (LC8632XX, LC8634XX and LC8638XX)
  - Extracts closed captions and XDS data
  - NTSC/PAL selectable and line specificable.
- **ROM correction function**

LC863 Series Product Lineup



STRUCTURES

LC86F3448B TV Flash Microcontroller



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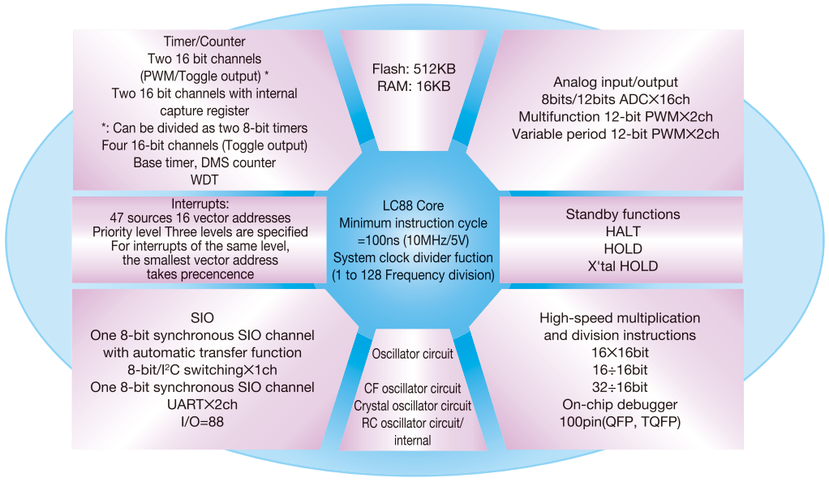
LC88 Series

OVERVIEW

The LC88 Series are single-chip microcomputers with an enhanced architecture (2-byte extension for all instructions, 16-bit general-purpose resistor, 2-byte simultaneous RAM access, etc.) in addition to a variety of other features. The wide range of functions the LC88 Series makes available on one chip include ROM, RAM, an AD/DA converter, a 16-bit timer with prescaler, a 16-bit PWM timer/counter, a clock timer, a watchdog timer, an 8-bit SIO channel with continuous transfer function, a UART, a 12-bit PWM, input/output ports, advanced interrupt functions, a standby function, and a runaway detect function.

FEATURES

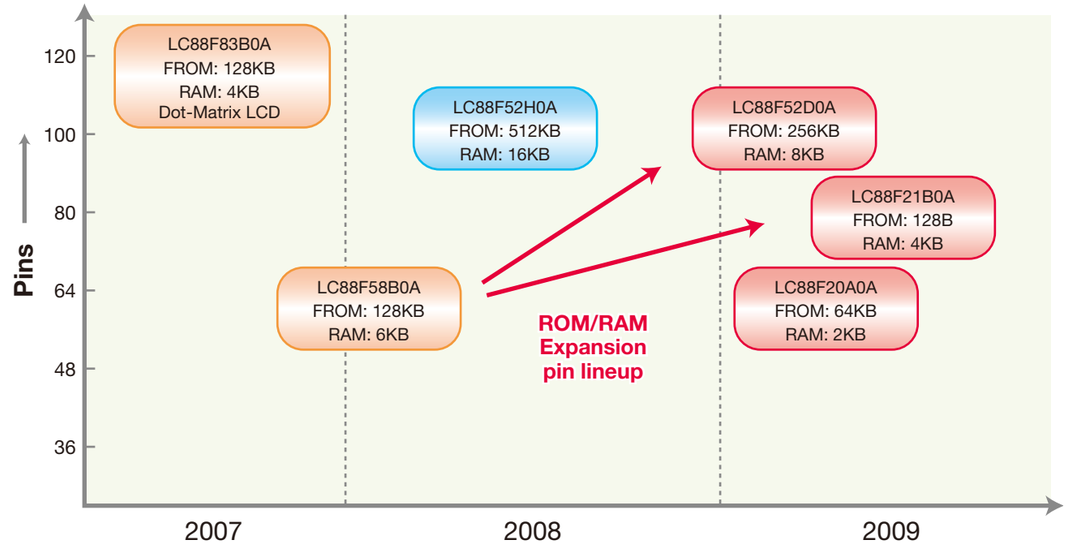
Overview of LC88F52H0A



Comparison of 16-bit microcontrollers/cores

Functions/Series	SANYO 8-bit Microcontrollers LC87 Series	**SANYO 16-bit Microcontrollers LC88 Series**	Company A 16-bit Microcontrollers	Company B 32-bit Microcontrollers
10MHz Frequency/ Minimum instruction execution time	10MHz/300ns	**10MHz/100ns**	10MHz/100ns	48MHz/21ns
Address space	ROM: 256KB RAM: 64KB Expansion: 4MB	**4G bytes**	16M bytes	16M bytes
General-purpose register	A, B, C(8bit)	**16bits×16**	16bits×4×2banks 24bits×4×2banks	32 bits×32
Multiplication and division instructions	16×8: 1.5µs, 16÷8: 2.1µs, 24÷16: 3.6µs	**16×16: 1.8µs, 16÷16, 32÷16: 1.8 to 1.9µs**	32÷16: 2.4µs On-chip multiplier 16×16: 0.6µs	32×32→64: 200 to 250ns 32×32+32→32: 300ns 16×16→32: 50 to 100ns 16×16+32→32: 150ns
Average instruction execution cycle	2.03 cycle (Instructions 68)	**2.25 cycle (Instructions 68)**	3 cycle (Instructions 106)	Approx. 3 cycles (Instructions 80)
Development environment	High performance ICEC compiler	**Integrated builder/ debugger environment (C/C++compiler) Realtime OS**	Integrated development environment TM (C language, assembly, structured descriptive languages) µITRON-compatible realtime OS	Integrated development environment (Compiler, Assembler) Realtime OS
On-chip debugger	○	◎	○	○
Operating supply current	Operating supply voltage Differs depending on frequency	**Operating supply voltage Differs depending on frequency**	Operating supply voltage Differs depending on frequency	Operating supply voltage Differs depending on frequency

LC88 Series Road Map/Flash



APPLICATIONS

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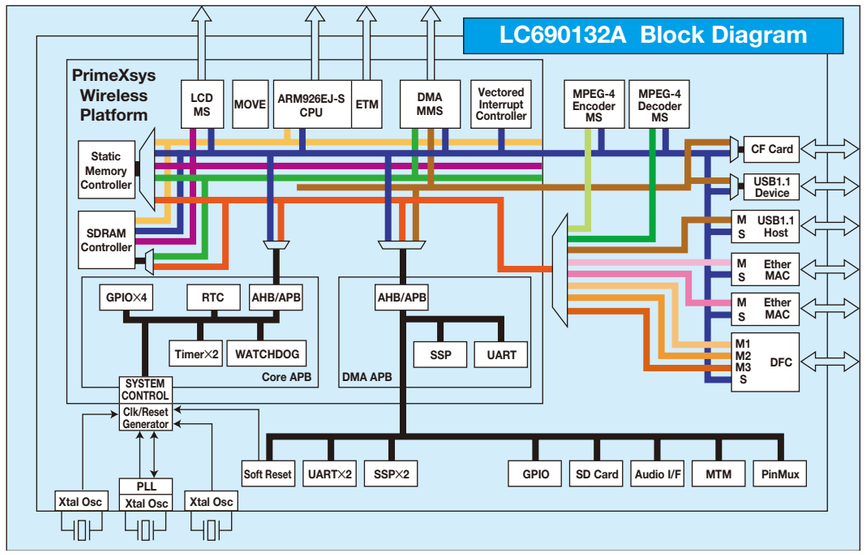
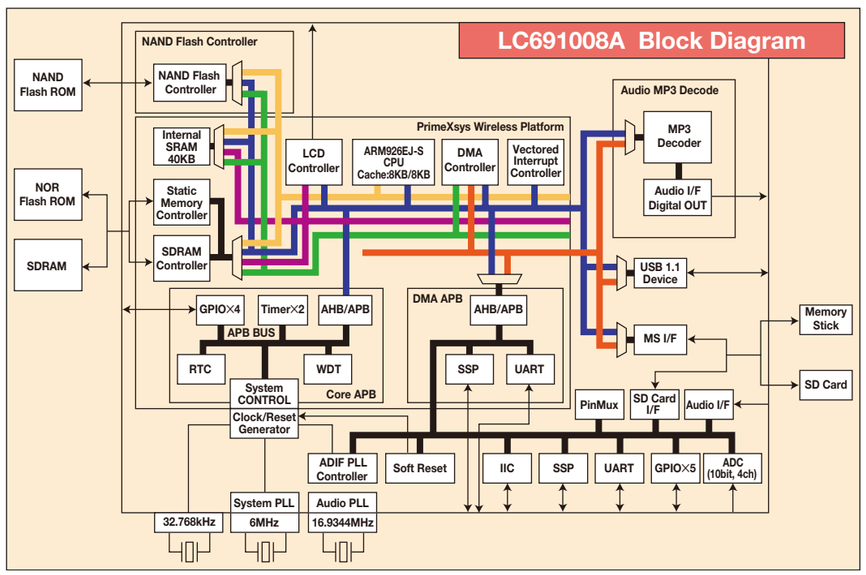
System LSI for Moving Image Processing

LC69 Series

OVERVIEW

The LC69 Series are system LSIs developed for mobile device control, with the ARM926EJ-S™ CPU, manufactured by Britain's ARM, as their core. The LC690132A features a low power consumption hardwired MPEG-4 encoder/decoder on a PWP (PrimeXsys™ Wireless Platform). The LC691008A features an MP3 decoder. On-chip cache memory (instructions/data) and TCM (instructions/data) enable high-speed processing of instructions and data in image processing applications, etc. In addition, the use of a wide range of IP including SDRAM controllers, static memory controllers, LCD controllers, USB, Ethernet, CF/SD memory card interfaces and audio interfaces, has enabled the realization of one-chip control for devices with moving image processing functions, on electronic dictionaries, portable players and a variety of other devices.





FEATURES

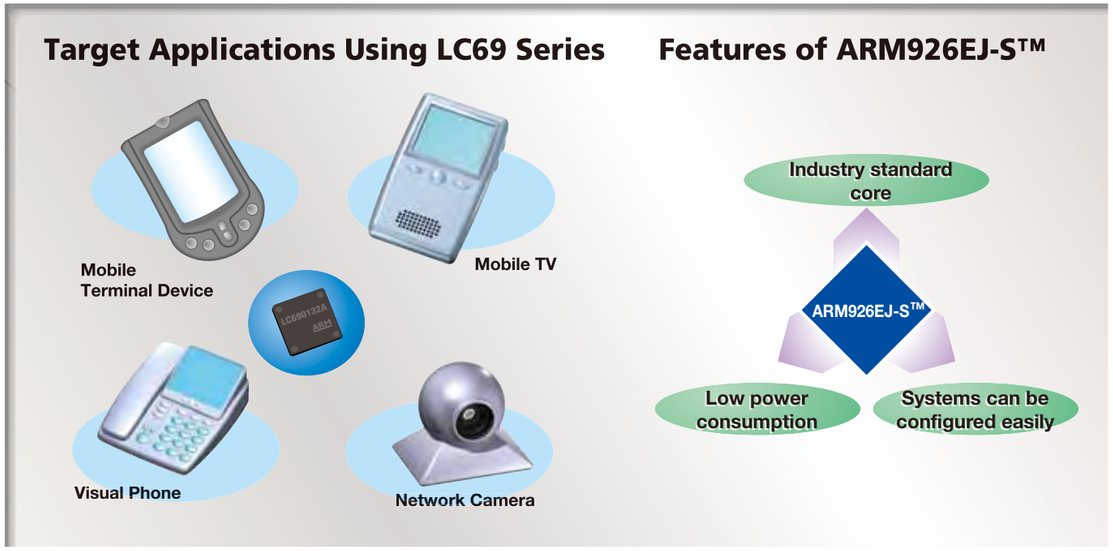
■ LC690132A

- **CPU Core**: ARM926EJ-S™ (32bit RISC) 0.13µm process
- **Maximum operating frequencies**
  - CPU: 192MHz, Peripheral: 96MHz
  - Oscillators
    - Internal PLL: 384MHz
    - External Xtal: 48MHz/32.768kHz
    - Audio dedicated external Xtal: 11 to 19MHz
- **Embedded memory**
  - Cashe (32K byte for instruction/32K byte for data)
  - Tightly coupled memory
  - (16K byte for instruction/16K byte for data)
- **Operating supply voltage**: 1.1V to 1.3V (I/O 3.0V to 3.6V)
- **Operating temperature**: 0 to +70°C

■ LC691008A

- **CPU Core**: ARM926EJ-S™ (32bit RISC)
- **Maximum operating frequencies**
  - CPU: 132MHz, Peripheral: 132MHz
  - Oscillators
    - System PLL: 264MHz
    - External Xtal: 6MHz/32.768kHz
    - Audio PLL dedicated external Xtal: Only available for 16.9344MHz
- **Embedded memory**
  - Cashe (8K byte for instruction/8K byte for data)
- **Operating supply voltage**: 1.62V to 1.98V (I/O, AD 3.0V to 3.6V)
- **Operating temperature**: -10 to +70°C

APPLICATIONS



SUPPORT SOFTWARE

Development Environment

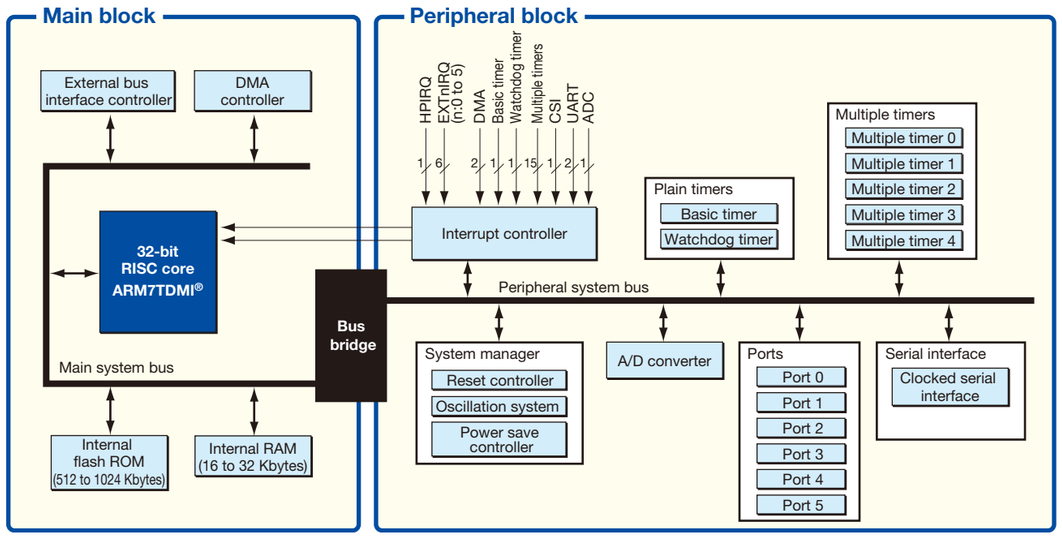
- LC690132A Reference board
- LC690132A SANYO SDK for axLinux™
- LC690132A µITRON Platform

Large On-chip Flash E²PROM Capacities

LC67 Series

OVERVIEW

The LC67 Series microcontrollers are high-functionality high-speed 32-bit single-chip CMOS microcontrollers based on the ARM7TDMI® de facto industry standard CPU core. They integrate up to 8Mbits of flash ROM and 256Kbits of SRAM on the same chip.
These microcontrollers allocate the last 16KB of flash ROM as a dedicated boot area to support onboard programming when installed in an end product. The LC67 Series microcontrollers are appropriate for control of PC peripherals such as CD-R/RW drives and hard disk drives since they integrate a wide range of advanced peripheral functions on the same chip. These include DMA controller, interrupt controller, serial interface, UART, 8-bit A/D converter, high-functionality timer, watchdog timer, and power saving functions. They also provide an external memory space that consists of four areas of 16MB each. These areas can be controlled independently with chip select signals.



FEATURES

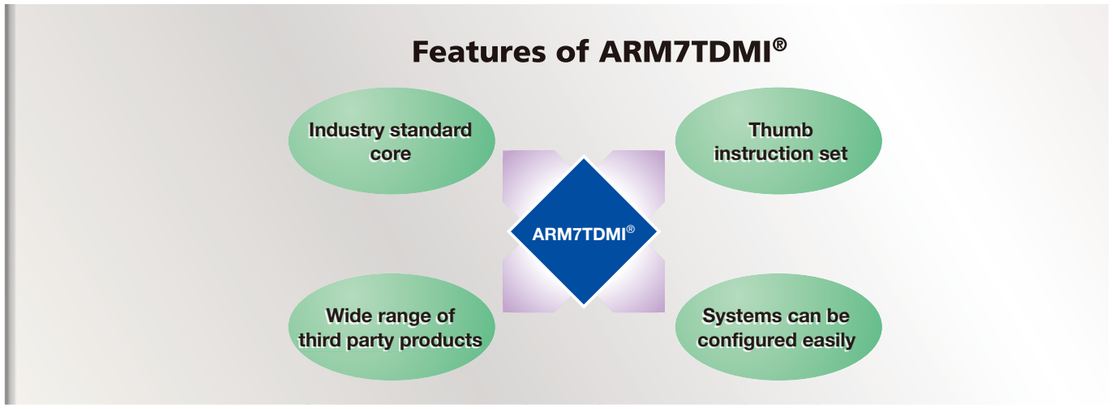
■ LC67F5006A

- **CPU Core**: ARM7TDMI® (32-bit RISC)
- **Maximum operating frequencies**
  Oscillators
  When the CF or external clock is applied: 18MHz
  Internal RC Oscillation: 1MHz (typ)
- **Operating supply voltage**: 2.25V to 2.75V (I/O, ADC 3.0V to 3.6V)
- **Operating temperature**: 0 to +75°C
- **Flash ROM**: 6M bit internal (Up to 1000 write cycles)
- **SRAM**: 256k bit internal
- **Flash write protect area**:
  16KB (in the final address of the 6M bit space)
  This area can only be overwritten in Flash ROM mode; cannot be overwritten in CPU operating mode.

■ LC67F5104A

- **CPU Core**: ARM7TDMI® (32-bit RISC)
- **Maximum operating frequencies**
  Oscillators
  When the CF or external clock is applied: 18MHz
  Internal RC Oscillation: 1MHz (typ)
- **Operating supply voltage**: 2.25V to 2.75V (I/O, ADC 3.0V to 3.6V)
- **Operating temperature**: 0 to +75°C
- **Flash ROM**: 4M bit internal (Up to 1000 write cycles)
- **SRAM**: 128k bit internal
- **Flash write protect area**:
  16KB (in the final address of the 4M bit space)
  This area can only be overwritten in Flash ROM mode; cannot be overwritten in CPU operating mode.

APPLICATIONS



SUPPORT SOFTWARE

Development Environment

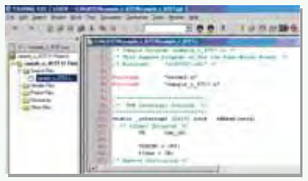
- Flash writers: Ando AF-9708, AF-9709, AF-9709B
- Emulators: Yokogawa Digital Computers ADVICE (PW920)
  Sophia Systems Co., Ltd. UniSTAC

Composition of Development Support System

SANYO provides a development environment that offers excellent cost performance tailored to each stage and is easy to use.

Software Development | Debugging/ Verification | Writing

■ C Compiler/Assembler



■ Software Development Environment CD*

*: Included on this CD are:
- Inst87
  (information on microcontroller models)
- SU (options setup program)

■ On-chip Debugger

TCB87-Type B ▶ P31
(On-chip debugger software included)

■ Display Panel Emulation Tool

Panel Design ▶ P33

■ Flash Writing System

- Flash ROM WRITER ▶ P34
  SKK-Type B

- ON BOARD WRITER
  SKK-DBG

- Flash Support Group, Inc. products
  Flash ROM WRITER
  Single programmer
  : AF9708/09/09B/09C
  (Including product of
  Ando Electric Co., Ltd)
  Gang programmer
  : AF9723/23B (main body)
  : AF9833 (unit)
  (Including product of
  Ando Electric Co., Ltd)
  Onboard Programmer
  : AF9101/03 (main body)
  +SIB87 (SANYO)

On-chip Debugger

The on-chip debugger is a debugging tool that uses the emulation control, break and trace functions incorporated in the CPU (flash microcontroller). Because the on-chip debugger can use the full resources of the target system while debugging, it displays excellent electrical transparency, and is the optimal solution for debugging high-speed CPUs.
The SANYO on-chip debugger is a low-cost development tool that offers a level of performance equivalent to more sophisticated debugging tools. Users who have previously been reluctant to use on-chip debugging will find it more than satisfies their requirements.

■ Features

1) Low cost
Because the debugging function is embedded in the microcontroller itself, the debugger cost is equal to only the interface board, making it extremely inexpensive compared to conventional development tools.

2) High-speed device support
Because the debugging function is embedded in the microcontroller itself, there is no longer a difference in processing speed between the microcontroller and debugger.

3) Supports debugging with the CPU installed in an actual unit
The hardware on-chip debugger eliminates the requirement for the debugging monitor to reside in the internal flash memory, and occupies no work RAM space.

4) Easier to connect and requires less development space (See Fig. 1)
As Fig. 1 shows, the debugger is extremely simple, consisting only of a USB/serial communication conversion interface board. This eliminates the possibility of connection mistakes.
In addition, while conventional systems have required a considerable amount of space during development (debugging), the on-chip debugger reduces space requirements to the minimum. The USB connection also eliminates the requirement to use a specific PC or OS.

5) Integrated development environment (IDE)
An integrated development environment (IDE) can be used to facilitate easier compilation, assembly, and link-ups, etc. Besides offering advantages for project management, IDE allows link-ups with various tools such as the SU (option setting program) and CGR (font creation program).

6) Can be reprogrammed when installed in the unit.
Reprogrammable when installed, including the loader program area.

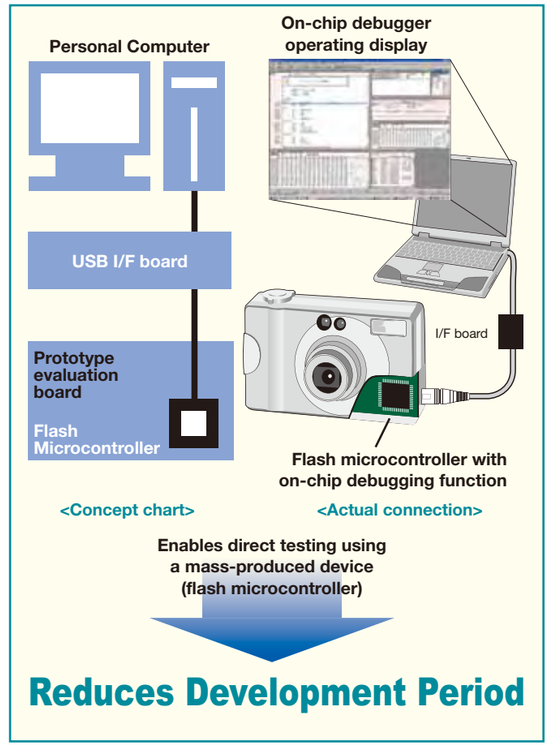


Fig. 1 Configuration of on-chip debugger

Development Support System

■ Functions

1) Break functions
- Software break: Max. 20 adresses
- Hardware break: 3 types (SFR/RAM/PC)

2) Supports both assembler and C language programming.

3) Enables paperless debugging (See Fig. 2)
- All windows can be displayed on one screen.

4) Trace functions differ between models.
- 2-instruction trace
- 8-instruction trace
- 16-branch trace

5) Real time monitoring function: Depend on the microcontroller model
- Memory contents can be monitored while the programs are executing,subject to 1 register address/1 RAM address.

■ Applicable microcontrollers

- LC871 series/LC872 series/LC874 series
- LC875 series/LC876 series/LC877 series

At present, some models do not support this function.

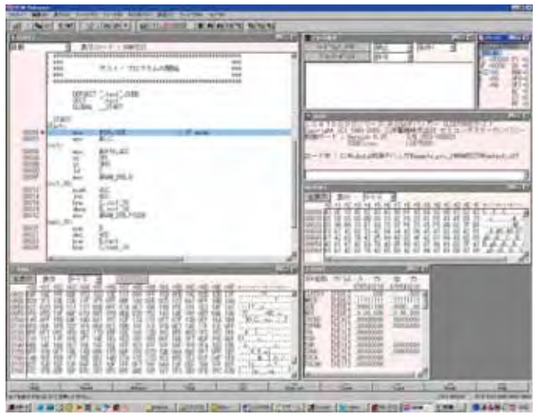


Fig. 2 ROM Debugger Operating display (image)

I/F board (TCB87-TypeB)

■ System Configuration

Item	Debugging tool	Host system and OS	CPU	Memory	OS	Models
8 bit Microcontrollers on-chip debugger	TCB87+ Flash microcontrollers supported on-chip debugger	A port that supports USB Ver. 1.1 or Ver. 2.0 (full-speed) must be provided.	The recommended OS specifications must be met	At least the recommended memory for the OS, at least 10MB of free disk space	Windows98/98SE/ ME/2000/XP/Vista	LC87 Series microcontrollers employing on-chip debugger

Windows and MS-DOS are trademarks of Microsoft Corporation.

■ Accessory

- Installer CD (inst87, LC87TOOL)

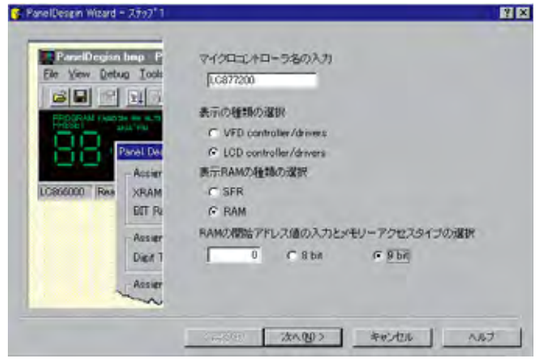
Display Panel Emulation Tool

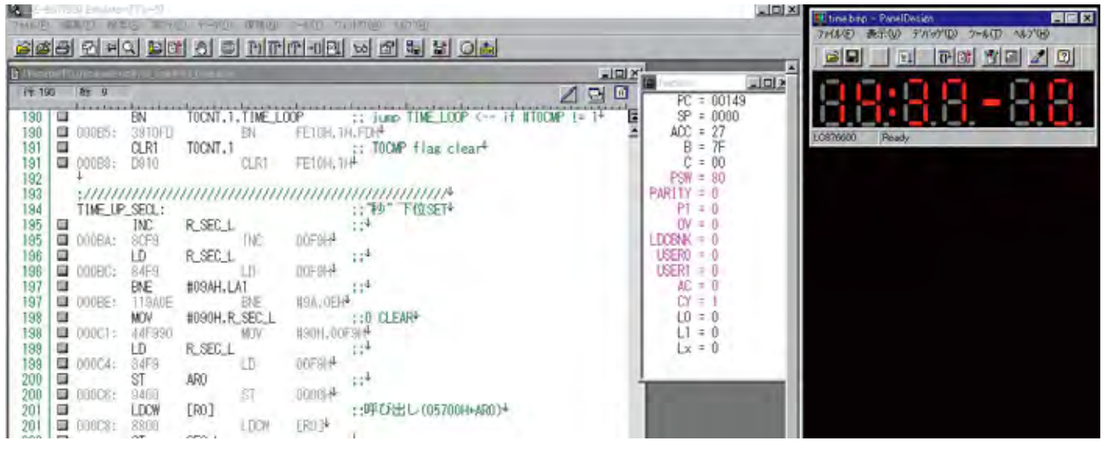
Panel Design

Panel Design is a tool that loads the LCD/VFD display RAM in the CPU block and creates the same image under Windows as would be displayed on an actual panel. Since the values in display RAM are received as data from the edicated debugger for the corresponding CPU, it cannot operate independently. Since this tool supports multiple CPU models, it can emulate display RAM for many different CPUs with the same operations. Thus this tool can contribute to improved development efficiency in terms of functionality as well.

■ Features

1) Single-click operation from the tool bar
2) Simple operations using double clicks and shortcut menus
3) Panel designs are faithfully reproduced.
4) Creation of environment setup files for each CPU type
5) The loaded panel design can be freely set up, verified, and modified.
6) The size of a loaded panel design can be changed.
7) The color settings can be changed.
8) The settings made in a workspace can be saved to a file.
9) Handles both VFD and LCD displays in the same manner.





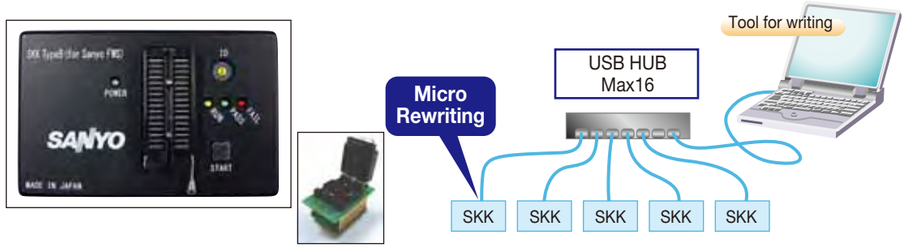
Development Support System

Flash Writing System

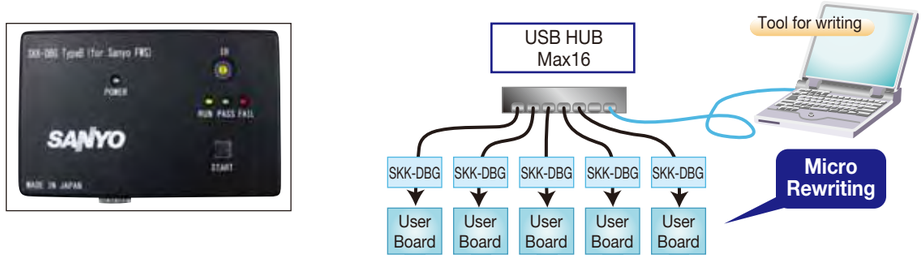
SKK/SKK-DBG

SKK/SKK-DBG are proprietary flash memory programming tools developed by SANYO.
SKK is a tool for programming the flash microcontroller itself. (Each microcontroller model requires a dedicated adapter).
SKK-DBG is a tool enabling direct reprogramming of a flash microcontroller installed on an application board (onboard reprogramming).
Both these tools enable flash microcontrollers to be programmed from a PC via the USB interface.
Using a USB hub enables a maximum of 16 units to be connected. (16 units can be programmed simultaneously.)

SKK **Writing System**



SKK-DBG **On-board Rewriting System**



Flash Programmers Available from Flash Support Group, Inc.

Various useful writing tools (including ones that offer full standalone support) can now be obtained from Flash Support Group, Inc.

For further details, please visit the Flash Support Group home page at http://www.j-fsg.co.jp/en/

Single programmer
(AF9708/09/09B/09C)

Gang programmer
(AF9723/23B+AF9833)

Onboard programmer
(AF9101/03+SIB87)

SANYO Microcontroller Trial Kit

Easy_Micon Trial Kit

A user-friendly initial introduction tool used with SANYO's microcontrollers. Easy_Micon offers hands-on experience of SANYO's microcontrollers (Easy_Micon) and an opportunity to evaluate them.

Configuration of Easy_Micon Trial Kit

■ Overall configuration

Program development can be started simply by connecting the Easy_Micon trial kit to a personal computer.

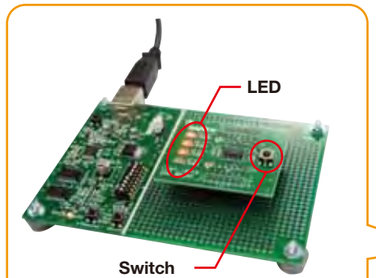
■ Hardware and software that configure the trial kit

1) Hardware
- Easy_Micon board, version with no CPU installed (main PCB)
- Sub PCB (choice of 14-pin, 24-pin, 36-pin, or 48-pin board)
- USB cable

2) Software
- Easy_Micon development environment CD

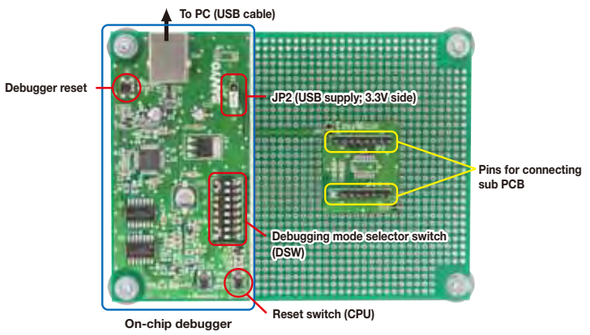
Features of Easy_Micon Trial Kit

The main feature of the Easy_Micon trial kit is the incorporation of the on-chip debugger, which enables users to establish a development environment with consummate ease despite its attractively low price tag.
The development environment CD provided with the trial kit contains a number of sample programs, which can be used as a frame of reference when creating programs, and allow easy program development.
The sub PCB contains the LED displays and switches, and if the programs involved are uncomplicated, hands-on Easy_Micon development experience can be gained without having to rework or modify the PCB.
Even when peripheral circuits are required, there is still no need to add PCBs, provided there is a universal PCB on the main PCB and that the peripheral circuits are not complex.
Four different sub PCB models are available, enabling users to choose the one best suited for their specifications.

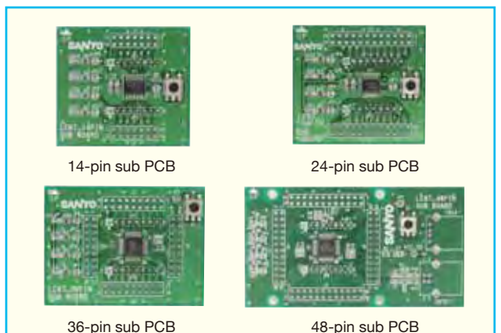


How it is connected

Development environment CD



Main PCB



Sub PCB

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Product Lineup

32-bit Mobile Device Control

●: New Product, ⁜: Development

Category	Pins	Package	Type No.	Cash [byte]	TCM [byte]	Maximum operation frequency max [MHz]	Operation guaranteed temperature [°C]	Power management function		Card interface	External interface	Operating supply voltage range V_{DD} [V]	Features
Mobile Device Control	288	FBGA288(15×15)	● **LC691008A**	8K(Order) 8K(Data)	None	132(CPU block), 132(peripheral block)	-10 to +70	Sleep mode, module standby		SD Memory Card, Memory Stick	USB1.1 Device, Audio Interface, Serial Interface(SSP)×2ch, UART×2ch, I^2C×1ch GPIO 72(Function using combinedly)	1.62 to 1.98(CPU), 3.0 to 3.6(I/O)	• Including ARM926EJ-S™ core • MP3 Decoder • External display controlling color LCD controller • NAND flash interface
	449	FBGA449(21×21)	**LC690132A**	32K(Order) 32K(Data)	16K(Order) 16K(Data)	192(CPU block), 96(peripheral block)	0 to +70	Sleep mode, module standby 32kHz/48MHz/PLL (max. 192MHz) selectable		SD Memory Card, Compact Flash Card	USB1.1 Host/Device, Ethernet (MAC)×2ch, Audio Interface, Video Interface, Serial Interface(SSP)×3ch, UART×3ch, GPIO 40	1.1 to 1.3(CPU), 3.0 to 3.6(I/O)	• Including ARM926EJ-S™ core • Moving image processing MPEG-4 Enc/Dec CIF 30fps • External display controlling color LCD controller (TFT panel compatible)

32-bit for DVD, CD-R/RW, Hard Disk Drive Control

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts (internal)	Interrupts (external)	Ports: Number of pins: Total		Maximum number of timers	Serial I/O	A/D converter	Operating supply voltage range V_{DD} [V]	Features
For DVD, CD-R/RW, Hard Disk Drive Control	100	TQFP100(14×14)	**LC67F5006A**	768K×8(Flash)	32K×8	56(With an 18MHz Oscillator)	23	7	76		Five 16-bit multiple timers, One 16-bit basic timer	Synchronous: One 16-bit channel, Asynchronous: One 16-bit channel	8 bits×8	2.25 to 2.75(CPU), 3.0 to 3.6(I/O)	• Uses the ARM7TDMI® CPU core • Includes DMAC, UART (full deplex), A/D converter and other function on chip • On-chip large-capacity flash E²PROM version (Support up to 1000 rewrite operations)
	100	TQFP100(14×14)	**LC67F5104A**	512K×8(Flash)	16K×8	56(With an 18MHz Oscillator)	23	7	76		Five 16-bit multiple timers, One 16-bit basic timer	Synchronous: One 16-bit channel, Asynchronous: One 16-bit channel	8 bits×8	2.25 to 2.75(CPU), 3.0 to 3.6(I/O)	

16-bit On-Chip Dot-Matrix LCD Driver

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D converter	Number of port segment outputs	Number of port common outputs	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Features
On-chip Dot-Matrix LCD Driver	111	TQFP120(14×14) CHIP	● **LC88F83B0A**	128K×8	4256×8	0.25(4MHz)	13 sources, 8 vector addresses	36	Six 8-bit timers, One clock time base timer		Synchronous: One 8-bit channels, full duplex UART×1	12 bits×8	72 or 64	8 or 16	0	2.3 to 5.5	• On-chip dot matrix LCD driver (64-segment×18-common/72-segment×8-common) • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)

8-bit General-Purpose Microcontroller

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Features
General-Purpose Microcontrollers	24	MFP24S(300mil) SSOP24(225mil) ✦ VCT24(3.5×3.5)	● **LC87F2G08A**	8K×8(Flash)	256×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.7 to 5.5V)	18 sources, 10 vector addresses	21	Six 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	12/8 bits×8	0	1.8 to 5.5	• High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • With built-in reset circuit • 12-bit 9-channel AD converter with a 12-/8-bit resolution selector
	30	QFP36(7×7) ✦ VQLP32(4×4)	● **LC87F2H08A**	8K×8(Flash)	256×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.7 to 5.5V)	20 sources, 10 vector addresses	26	Six 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	12/8 bits×9	2	1.8 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • With built-in reset circuit • 12-bit 10-channel AD converter with a 12-/8-bit resolution selector
	30	QFP36(7×7)	**LC872408A**	8K×8	512×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.7 to 5.5V)	20 sources, 10 vector addresses	26	Six 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	12/8 bits×10	2	1.8 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • With built-in reset circuit • On-chip flash E²PROM version (Supports onboard reprogramming)(**LC87F2416A**)
			LC872412A	12K×8									2	1.8 to 5.5	
			LC872416A	16K×8									2	1.8 to 5.5	
			LC87F2416A	16K×8(Flash)									2	1.8 to 5.5	
	48	QIP48E(14×14) SQFP48E(7×7) ✦ FLGA49J(5×5)	⁜ **LC87F2J32A**	32K×8	1024×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.7 to 5.5V)	23 sources, 10 vector addresses	41	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	12/8 bits×14	2	1.8 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Infrared rays remote controller reception circuit • High-speed clock counter • System clock divider circuit • With built-in reset circuit • 12-bit 14-channel AD converter with a 12-/8-bit resolution selector
	64	TQFP64J(7×7) FLGA64(5×5) FLGA68K(6×6)	**LC87F2832A**	32K×8(Flash)	1024×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=3.0 to 5.5V)	26 sources, 10 vector addresses	59	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×11	2	2.2 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
	64	TQFP64J(7×7) FLGA64(5×5) FLGA68K(6×6)	● **LC87F2924B**	26K×8(Flash)	768×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=3.0 to 5.5V)	26 sources, 10 vector addresses	57 61	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×13	2	2.2 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • Day-Minute-Second counter • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)

✦: This product is built to order

* This product is licensed from Silicon Storage Technology, Inc. (USA), and manufactured and sold by SANYO Semiconductor Co., Ltd.

8-bit General-Purpose Microcontroller ●: New Product, ⁜: Development

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Features
General-Purpose Microcontrollers	64	TQFP64J(7×7) FLGA64(5×5) FLGA68K(6×6)	⁜ **LC87F2932A**	32K×8(Flash)	2048×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=3.0 to 5.5V)	26 sources, 10 vector addresses	57 61	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×13	2	2.2 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • Day-Minute-Second counter • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
	48	QIP48E(14×14) SQFP48(7×7) CHIP	**LC875G07B**	8K×8	512×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=3.0 to 5.5V)	22 sources, 10 vector addresses	39	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.2 to 5.5	• High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • Two 12-bit PWM channels
	48	QIP48E(14×14) SQFP48(7×7)	**LC875G08A**	8K×8	1024×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=3.0 to 5.5V)	22 sources, 10 vector addresses	39	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.2 to 5.5	• High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • Two 12-bit PWM channels • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F5G32A**)
			LC875G16A	16K×8											
			LC875G24A	24K×8											
			LC875G32A	32K×8											
			LC87F5G32A	32K×8(Flash)											
	48	QIP48E(14×14) SQFP48(7×7)	**LC87F5HC8A**	128K×8(Flash)	4096×9	0.3(10MHz) bus cycle=0.1µs	22 sources, 10 vector addresses	39	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.5 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
	64	QIP64E(14×14) TQFP64J(7×7) TQFP64(10×10) TQFP64J(10×10) VQFN64(10×10)	**LC875816A**	16K×8	1024×9	0.3(10MHz) bus cycle=0.1µs	22 sources, 10 vector addresses	55	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×11	2	2.2 to 3.6	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • ROM correct function (Mask version only) • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F5864B**)
			LC875824A	24K×8											
			LC875832A	32K×8											
			LC87F5864B	64K×8(Flash)	2048×9										
	64	TQFP64J(7×7) VQFN64(10×10)	**LC87F5864C**	64K×8(Flash)	2048×9	0.3(10MHz) bus cycle=0.1µs	23 sources, 10 vector addresses	55	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×11	2	2.2 to 3.6	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version
	64	QIP64E(14×14) TQFP64J(7×7) FLGA68K(6×6)	⁜ **LC875916A**	16K×8	1024×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=3.0 to 5.5V)	23 sources, 10 vector addresses	55	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×11	2	2.2 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • ROM correct function (Mask version only) • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F5932A**)
			LC875924A	24K×8											
			LC875932A	32K×8											
	64	QIP64E(14×14) TQFP64J(7×7) TQFP64J(10×10) FLGA64(5×5) FLGA68K(6×6)	**LC87F5932A**	32K×8(Flash)											
	64	QIP64E(14×14) TQFP64J(10×10)	**LC875J48C**	48K×8	2048×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=3.0 to 5.5V)	26 sources, 10 vector addresses	55	Ten 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×11	2	2.2 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • ROM correct function (Mask version only) • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F5JC8A**)
			LC875J56C	56K×8											
			LC875J64C	64K×8											
			LC875J72B	72K×8	4096×9										
			LC875J80B	80K×8											
			LC875J96B	96K×8											
			LC87F5JC8A	128K×8(Flash)											
	64	QIP64E(14×14)	● **LC87F5M64A**	64K×8(Flash)	2048×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.8 to 5.5V)	27 sources, 10 vector addresses	55	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	8 bits×11	2	2.2 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version (on-chip debugger function)
	64	QIP64E(14×14)	● **LC87F5R96B**	96K×8(Flash)	4096×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.8 to 5.5V)	27 sources, 10 vector addresses	55	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	8 bits×11	2	2.2 to 5.5	• Two 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version (on-chip debugger function)
	80	QIP80E(14×20) TQFP80J(12×12)	**LC875D48C**	48K×8	2048×9	0.25(12MHz) bus cycle=0.083µs	29 sources, 10 vector addresses	71	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	8 bits×15	4	2.2 to 5.5	• Four 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F5DC8A**)
			LC875D56C	56K×8											
			LC875D64C	64K×8											
			LC875D72B	72K×8	4096×9										
			LC875D80B	80K×8											
			LC875D96B	96K×8											
			LC87F5DC8A	128K×8(Flash)											
	100	QIP100E(14×20) TQFP100(14×14)	**LC875BH4A**	176K×8	4096×9	0.3(10MHz) bus cycle=0.1µs	27 sources, 10 vector addresses	89	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	8 bits×12	4	2.2 to 5.5	• Four 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit
			LC875BJ0A	192K×8											
			LC875BM2A	224K×8											
			LC875BP4A	256K×8											

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8-bit General-Purpose Microcontroller ●: New Product, ⁜: Development

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Features
General-Purpose Microcontrollers	100	QIP100E(14×20) TQFP100(14×14)	**LC87F5KP6A**	256K×8(Flash)	6144×9	0.3(10MHz) bus cycle=0.1µs	29 sources, 10 vector addresses	89	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	8 bits×15	4	2.5 to 5.5	• Four 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
			LC87F5LP6A		8192×9	0.25(12MHz) bus cycle=0.833µs									
	100	QIP100E(14×20) TQFP100(14×14)	**LC875C48C**	48K×8	2048×9	0.25(12MHz) bus cycle=0.083µs	29 sources, 10 vector addresses	89	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel, full duplex UART×2	8 bits×15	4	2.2 to 5.5	• On-chip UART • Four 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F5CC8A**)
			LC875C56C	56K×8											
			LC875C64C	64K×8											
			LC875C72B	72K×8	4096×9										
			LC875C80B	80K×8											
			LC875C96B	96K×8											
			LC875CB2A	112K×8											
			LC875CC8A	128K×8											
			LC87F5CC8A	128K×8(Flash)											
	100	QIP100E(14×20)	● **LC87F5N62B**	66K×8(Flash)	2048×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.8 to 5.5V)	29 sources, 10 vector addresses	89	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel, full duplex UART×2	8 bits×15	4	2.2 to 5.5	• On-chip UART • Four 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit
	100	QIP100E(14×20)	● **LC87F5NC8A**	128K×8(Flash)	4096×9	0.25(12MHz) bus cycle=0.083µs (V_{DD}=2.8 to 5.5V)	29 sources, 10 vector addresses	89	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel, full duplex UART×2	8 bits×15	4	2.2 to 5.5	• On-chip UART • Four 12-bit PWM channels • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • High-speed clock counter • System clock divider circuit

8bit USB Microcontroller

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D Converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	USB specification	Number of endpoints	Features
USB	24	MFP24S(300mil)	**LC87F1364A**	64K×8(Flash)	1024×9	0.5 (6MHz) bus cycle=0.166µs	29 sources, 10 vector addresses	19	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×9	2	2.5 to 5.5	USB.2.0	3	• USB version 2.0 specifications • End pointers: 2 • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
	48	QIP48E(14×14) TQFP48J(7×7) TQFP64J(10×10)	**LC87F16C8A**	128K×8(Flash)	8192×9	0.25(12MHz) bus cycle=0.083µs	29 sources, 10 vector addresses	39	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.7 to 3.6	USB.2.0 (Full-Speed)	7	• Support the full-speed USB version 2.0 specifications • End pointers: 6 • On-chip flash E²PROM version (Supports onboard reprogramming)
	48	SQFP48(7×7)	● **LC871A32A**	32K×8	2048×9	0.25(12MHz) bus cycle=0.083µs	28 sources, 10 vector addresses	39	Six 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8/12 bits×12	2	2.7 to 5.5	USB.2.0 (Full-Speed)	5	• Support the full-speed USB version 2.0 specifications • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F1A32A**)
			● **LC87F1A32A**	32K×8(Flash)													
	48	TQFP48J(7×7)	⁜ **LC87F1D64A**	64K×8(Flash)	4096×9	0.188(16MHz) bus cycle=0.0625µs	30 sources, 10 vector addresses	39	Six 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	12/8 bits×8	2	2.7 to 5.5	USB.2.0 (Full-Speed)	5	• Support the full-speed USB version 2.0 specifications • End pointers: 4 • On-chip flash E²PROM version (Supports onboard reprogramming)
	48	QIP48E(14×14) TQFP48J(7×7) TQFP64J(10×10)	**LC87F1G64A**	64K×8(Flash)	3072×9	0.25(12MHz) bus cycle=0.083µs	31 sources, 10 vector addresses	39	Eight 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.7 to 5.5	USB.2.0 (Full-Speed)	9	• Support the full-speed USB version 2.0 specifications • End pointers: 8 • On-chip flash E²PROM version (Supports onboard reprogramming)
	64	TQFP64J(10×10) QIP64E(14×14)	**LC87F10C8A**	128K×8(Flash)	8192×9	0.25(12MHz) bus cycle=0.083µs	35 sources, 10 vector addresses	55	Eight 8-bit timers, One clock time base timer		Synchronous: Three 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	8 bits×12	2	2.7 to 3.6	USB.2.0 (Full-Speed)	9	• Support the full-speed USB version 2.0 specifications • End pointers: 8 • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
	48	QIP48E(14×14) TQFP48J(7×7)	**LC87F14C8A(HOST)**	128K×8(Flash)	10240×9	0.25(12MHz) bus cycle=0.083µs	34 sources, 10 vector addresses	37	Eight 8-bit timers, One clock time base timer		Synchronous: Three 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.7 to 5.5	USB.2.0 (Full-Speed)	-	• Support the full-speed USB version 2.0 specifications • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
	48	QIP48E(14×14) SQFP48(7×7)	**LC87F1964A(HOST)**	64K×8(Flash)	5120×9	0.25(12MHz) bus cycle=0.083µs	32 sources, 10 vector addresses	39	Six 8-bit timers, One clock time base timer		Synchronous: Three 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.7 to 5.5	USB.2.0 (Full-Speed)	-	• Support the full-speed USB version 2.0 specifications • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)
	48	SQFP48(7×7)	● **LC871H92A(HOST)**	96K×8	12288×9	0.25(12MHz) bus cycle=0.083µs	38 sources, 10 vector addresses	37	Eight 8-bit timers, One clock time base timer		Synchronous: Three 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.7 to 5.5	USB.2.0 (Full-Speed)	-	• Support the full-speed USB version 2.0 specifications • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F1HC4A**)
			● **LC871HC4A(HOST)**	128K×8													
			● **LC87F1HC4A(HOST)**	128K×8(Flash)													
	48	SQFP48(7×7)	● **LC871H96A(HOST)**	96K×8	16384×9	0.25(12MHz) bus cycle=0.083µs	38 sources, 10 vector addresses	37	Eight 8-bit timers, One clock time base timer		Synchronous: Three 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×1	8 bits×12	2	2.7 to 5.5	USB.2.0 (Full-Speed)	-	• Support the full-speed USB version 2.0 specifications • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F1HC8A**)
			● **LC871HC8A(HOST)**	128K×8													
			● **LC87F1HC8A(HOST)**	128K×8(Flash)													

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8-bit High withstand Voltage Microcontroller

●: New Product

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D Converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Number of VFD drivers	Features
Highwithstand Voltage Microcontrollers	80	QFP80(14×14)	● **LC876D08A**	8K×8	2048×9	0.25(12MHz) bus cycle=0.08µs (V_{DD}=2.5 to 5.5V)	15 sources, 10 vector addresses	72	Four 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support	8 bits×8	-	2.5 to 5.5	54	• Automatic VFD display controller/driver • Synchronous SIO circuit with 32-byte automatic transfer function • Infrared rays remote controller reception circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • System clock divider circuit
			● **LC876D16A**	16K×8												
			● **LC876D08PA**	8K×8												
			● **LC876D16PA**	16K×8												
			● **LC87F6D64A**	64K×8(Flash)												
			● **LC87F6D64SA**													
	100	QIP100E(14×20)	**LC876A48C**	48K×8	2048×9	0.25(12MHz) bus cycle=0.08µs (V_{DD}=2.8 to 5.5V)	27 sources, 10 vector addresses	90	Ten 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support	8 bits×15	2	2.5 to 5.5	48	• Synchronous SIO circuit with 32-byte automatic transfer function • Remote controller reception circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • System clock divider circuit • On-chip flash E²PROM version (Supports onboard reprogramming, on-chip debugger function)(**LC87F6AC8A**)
			LC876A56C	56K×8												
			LC876A64C	64K×8												
			LC876A72A	72K×8	4096×9											
			LC876A80A	80K×8												
			LC876A96A	96K×8												
			LC876AB2D	112K×8												
			LC876AC8D	128K×8												
			LC87F6AC8A	128K×8(Flash)							Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support					
	100	QIP100E(14×20)	**LC876B48C**	48K×8	2048×9	0.25(12MHz) bus cycle=0.08µs (V_{DD}=2.8 to 5.5V)	26 sources, 10 vector addresses	90	Ten 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support	8 bits×15	2	2.5 to 5.5	48	• Synchronous SIO circuit with 32-byte automatic transfer function • Remote controller reception circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • System clock divider circuit
			LC876B56C	56K×8												
			LC876B64C	64K×8												
			LC876B72A	72K×8	4096×9						Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support					
			LC876B80A	80K×8												
			LC876B96A	96K×8												
			LC876BB2D	112K×8							Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support					
			LC876BC8D	128K×8												

8-bit LCD Driver Microcontroller

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D Converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Number of port segment outputs	Number of common port outputs	Features
LCD Driver Microcontrollers	64	QIP64E(14×14) TQFP64J(7x7)	**LC87F7032A**	32K×8	1024×9	0.75(4MHz)	20 sources, 10 vector addresses	56	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support	8 bits×9	1	2.4 to 3.6	24	4	• Automatic LCD display controller/driver • Remote controller reception circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Low current drain
	64	QIP64E(14×14) TQFP64J(7x7)	**LC877808A**	8K×8	512×9	0.25(4MHz)	17 sources, 10 vector addresses	28	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support	8 bits×9	0	2.4 to 3.6	24	4	• Automatic LCD display controller/driver • Remote controller reception circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Low current drain
			LC877812A	12K×8													
			LC877816A	16K×8													
	64	QIP64E(14×14) TQFP64J(10×10)	● **LC87F7J32A**	32K×8(Flash)	1024×9	0.25(12MHz)	25 sources, 10 vector addresses	54	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, UART(full duplex)	12/8 bits×12	2	2.2 to 5.5	24	4	• Automatic LCD display controller/driver • Infrared rays remote controller reception circuit • Reset function • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Variable-frequency RC oscillator
	80	QFP80(14×14) TQFP80J(12×12)	● **LC877648B**	48K×8	4096×9	0.25(12MHz)	22 sources, 10 vector addresses	71	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, UART(full duplex)	8 bits×12	2	2.2 to 5.5	32	4	• Automatic LCD display controller/driver • Infrared rays remote controller reception circuit • Low-amplitude signal detection circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Variable-frequency RC oscillator • System clock multiplier function • ROM correct function
			● **LC877664B**	64K×8								12 bits×12					
			● **LC877680B**	80K×8													
			● **LC877696B**	96K×8													
			● **LC87F76C8A**	128K×8(Flash)													
	80	QFP80(14×14) TQFP80J(12×12)	**LC877C24C**	24K×8	1536×9	0.25(12MHz)	19 sources, 10 vector addresses	91	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support	8 bits×12	2	2.2 to 5.5	32	4	• Automatic LCD display controller/driver • Shared-function PWM output for tuner applications • Remote controller reception circuit • Low-amplitude signal detection circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Variable-frequency RC oscillator
			LC877C32C	32K×8													
			LC877C40C	40K×8													
			LC877C48C	48K×8													
			LC877C56C	56K×8	2048×9												
			LC877C64C	64K×8													
			LC87F7CC8A	128K×8(Flash)	4096×9												

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8-bit LCD Driver Microcontroller　●: New Product, ⁜: Development

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D Converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Number of port segment outputs	Number of common port outputs	Features
LCD Driver Microcontrollers	100	QIP100E(14×20) TQFP100(14×14)	**LC877B24A**	24K×8	1536×9	0.25(12MHz)	20 sources, 10 vector addresses	91	Eight 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support	8 bits×15	2	2.2 to 5.5	48	4	• Automatic LCD display controller/driver • Shared-function PWM output for tuner applications • Remote controller reception circuit • Low-amplitude signal detection circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Variable-frequency RC oscillator
			LC877B32A	32K×8													
			LC877B40A	40K×8													
			LC877B48A	48K×8													
			LC877B56A	56K×8	2048×9												
			LC877B64A	64K×8													
			LC877B72A	72K×8													
			LC877B78A	80K×8													
			LC877B80A	80K×8	4096×9												
			LC877B96A	96K×8													
			LC877BB2A	112K×8													
			LC877BC8A	128K×8													
			LC87F7BC8A	128K×8(Flash)				71				8 bits×12			32		
	100	QIP100E(14×20) TQFP100(14×14)	● **LC87F7LC8A**	128K×8(Flash)	4096×9	0.25(12MHz)	28 sources, 10 vector addresses	91	Ten 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, UART(full duplex)	8 bits×15	2	2.2 to 5.5	48	4	• Automatic LCD display controller/driver • Infrared rays remote controller reception circuit • Low-amplitude signal detection circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Variable-frequency RC oscillator
	100	QIP100E(14×20)	⁜ **LC877D80A**	80K×8	4096×9	0.25(12MHz)	31 sources, 10 vector addresses	91	Ten 8-bit timers, One clock time base timer		Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, full duplex UART×2	12 bits×15	2	2.2 to 5.5	54	4	• Automatic LCD display controller/driver • Infrared rays remote controller reception circuit • Low-amplitude signal detection circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Variable-frequency RC oscillator • With built-in reset circuit
			⁜ **LC877D96A**	96K×8													
			⁜ **LC877DB2A**	112K×8													
			⁜ **LC877DC8A**	128K×8													
			⁜ **LC87F7DC8A**	128K×8(Flash)													

8-bit DVD Recorder Timer Microcontroller

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts	Ports: Number of pins: Total	Maximum number of timers		Serial I/O	A/D Converter	Number of PWM outputs	Operating supply voltage range V_{DD} [V]	Features
DVD Recorder Timer Microcontrollers	100	QIP100E(14×20)	**LC87F05J2A**	192K×8	8192×9	0.20(15MHz)	35 sources, 10 vector addresses	84	Ten 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, Synchronous: Two 8-bit channels	8 bits×16	4	2.7 to 5.5	• VPS/PDC, XDS, EPG-J data slicer • Remote controller reception circuit • Low-amplitude signal detection circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Low current drain
	100	QIP100E(14×20)	**LC87F06J2A**	192K×8	8192×9	0.20(15MHz)	36 sources, 10 vector addresses	84	Ten 8-bit timers, One clock time base timer		Synchronous: Two 8-bit channels with automatic transfer support, Asynchronous/synchronous: One 8-bit channel with bus support, Synchronous: Two 8-bit channels	8 bits×16	4	2.7 to 5.5	• VPS/PDC/PAL-WSS, XDS, EPG-J, VBID(Video-ID) data slicer • Remote controller reception circuit • Low-amplitude signal detection circuit • Multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • High-speed clock counter • System clock divider circuit • Low current drain

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8-bit TV Set Microcontroller

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts (internal)	Interrupts (external)		Ports: Number of pins: Total	Maximum number of timers	Serial I/O	A/D Converter	Operating supply voltage range V_{DD} [V]	Features
TV Set Microcontrollers	36	DIP36S(400mil) MFP36SDJ(375mil)	**LC863416C**	16K×8	382×8(Data) 352×9(Display)	0.848(14.15MHz) bus cycle=0.424µs	3	6		23	3	I²C-bus interface	6 bits×4	4.5 to 5.5	• OSD controller: Number of characters: 252 (Splitting function allows the number of characters to be increased if needed), Simplified graphics functions: Number of colors to be displayed; 8 • Multimaster I²C-bus serial interface • PWM output channels (7 bits×3 and 16 bits×1 (Also used by timer)) • Remote controller reception circuit • ROM correct function • On-chip flash E²PROM version (Supports onboard reprogramming) (**LC86F3448B**)
			LC863420C	20K×8											
			LC863424C	24K×8											
			LC863428C	28K×8											
			LC863432C	32K×8											
			LC863440C	40K×8	512×8(Data) 352×9(Display)										
			LC863448C	48K×8											
			LC86F3448B	48K×8	640×8(Data) 352×9(Display)	0.848(14.16MHz) bus cycle=0.424µs	6								
	36	DIP36S(400mil) MFP36SDJ(375mil)	**LC863516C**	16K×8	382×8(Data) 352×9(Display)	0.848(14.15MHz) bus cycle=0.424µs	7	6		24	5	I²C-bus interface	6 bits×4	4.5 to 5.5	• OSD controller: Number of characters: 252 (Splitting function allows the number of characters to be increased if needed), Simplified graphics functions: Number of colors to be displayed; 8 • Multimaster I²C-bus serial interface • PWM output channels (7 bits×3 and 16 bits×1 (Also used by timer)) • Remote controller reception circuit • ROM correct function
			LC863520C	20K×8											
			LC863524C	24K×8											
			LC863528C	28K×8											
			LC863532C	32K×8											
			LC863540C	40K×8	512×8(Data) 352×9(Display)										
			LC863548C	48K×8											
	42	DIP42S(600mil) QIP48E(14×14)	**LC863216C**	16K×8	512×8(Data) 352×9(Display)	0.848(14.15MHz) bus cycle=0.424µs	8	8		28	5	I²C-bus interface One 8-bit serial I/O channel	8 bits×4	4.5 to 5.5	• OSD controller: Number of characters: 252 (Splitting function allows the number of characters to be increased if needed), Simplified graphics functions: Number of colors to be displayed; 16 • Built-in caption data slicer circuit (Supports the XDS automatic time synchronization function) • Multimaster I²C-bus serial interface • PWM output channels (7 bits×3 and 16 bits×1 (Also used by timer)) • Remote controller reception circuit • ROM correct function
	48														
	42		**LC863220C**	20K×8											
	48														
	42		**LC863224C**	24K×8											
	48														
	42		**LC863228C**	28K×8											
	48														
	42		**LC863232C**	32K×8											
	48														
	42		**LC863240C**	40K×8	640×8(Data) 352×9(Display)										
	48														
	42		**LC863248C**	48K×8											
	48														
	42		**LC863256C**	56K×8											
	48														
	42		**LC863264C**	64K×8											
	48														
	42	DIP42S(600mil) QIP48E(14×14)	**LC863316C**	16K×8	512×8(Data) 352×9(Display)	0.848(14.15MHz) bus cycle=0.424µs	8	7		29	5	I²C-bus interface One 8-bit serial I/O channel	8 bits×5	4.5 to 5.5	• OSD controller: Number of characters: 252 (Splitting function allows the number of characters to be increased if needed), Simplified graphics functions: Number of colors to be displayed; 16 • Multimaster I²C-bus serial interface • PWM output channels (7 bits×3 and 16 bits×1 (Also used by timer)) • Remote controller reception circuit • ROM correct function
	48														
	42		**LC863320C**	20K×8											
	48														
	42		**LC863324C**	24K×8											
	48														
	42		**LC863328C**	28K×8											
	48														
	42		**LC863332C**	32K×8											
	48														
	42		**LC863340C**	40K×8	640×8(Data) 352×9(Display)										
	48														
	42		**LC863348C**	48K×8											
	48														
	42		**LC863356C**	56K×8											
	48														
	42		**LC863364C**	64K×8											
	48														
	42	DIP42S(600mil) QIP48E(14×14)	**LC863816B**	16K×8	640×8(Data) 352×9(Display)	0.848(14.15MHz) bus cycle=0.424µs	9	7		28	5	I²C-bus interface One 8-bit serial I/O channel	8 bits×4	4.5 to 5.5	• OSD controller: Number of characters: 252 (Splitting function allows the number of characters to be increased if needed), Simplified graphics functions: Number of colors to be displayed; 16 • Multimaster I²C-bus serial interface • PWM output channels (7 bits×3 and 16 bits×1 (Also used by timer)) • Remote controller reception circuit • ROM correct function
	48														
	42		**LC863820B**	20K×8											
	48														
	42		**LC863824B**	24K×8											
	48														
	42		**LC863828B**	28K×8											
	48														
	42		**LC863832B**	32K×8											
	48														
	42		**LC863840B**	40K×8											
	48														
	42		**LC863848B**	48K×8											
	48														
	42		**LC863856B**	56K×8											
	48														
	42		**LC863864B**	64K×8											
	48														

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8-bit TV Set Microcontroller

Category	Pins	Package	Type No.	ROM [bits]	RAM [bits]	Minimum cycle time [µs]	Interrupts (internal)	Interrupts (external)		Ports: Number of pins: Total	Maximum number of timers	Serial I/O	A/D Converter	Operating supply voltage range V_{DD} [V]	Features
TV Set Microcontrollers	42	DIP42S(600mil) QIP48E(14×14)	**LC863G24A**	24K×8	640×8(Data) 352×9(Display)	0.848(14.16MHz) bus cycle=0.424µs	11	7		28	5	I^2C-bus interface One 8-bit serial I/O channel	8 bits×4	4.5 to 5.5	• OSD controller: Number of characters: 252 (Splitting function allows the number of characters to be increased if needed), Simplified graphics functions: Number of colors to be displayed; 16 • Multimaster I^2C-bus serial interface • PWM output channels (7 bits×3 and 16 bits×1 (Also used by timer)) • Remote controller reception circuit • ROM correct function • On-chip flash E^2PROM version (Supports onboard reprogramming) (**LC86F3G64A**)
	48														
	42		**LC863G28A**	28K×8											
	48														
	42		**LC863G32A**	32K×8											
	48														
	42		**LC863G40A**	40K×8											
	48														
	42		**LC863G48A**	48K×8											
	48														
	42		**LC863G56A**	56K×8											
	48														
	42		**LC863G64A**	64K×8											
	48														
	42		**LC86F3G64A**	64K×8											
	48														
	64	DIP64S(600mil) QIP64E(14×14)	**LC874096A**	96K×8	2048×9(Data) 704×10(Display) 1024×8(CGR)	212ns(14.15MHz) bus cycle=71ns	13	8		49	7	Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: Two 8-bit channels with bus support, full duplex UART×1	8 bits×8	4.5 to 5.5	• OSD controller functions: Progressive TV support multi layer, Cursor display function: Simplified graphics functions: Number of colors to be displayed; 8 (digital), 4096 (analog), Maximum number of characters: 512 • Built-in caption data slicer circuit (Supports the XDS automatic time synchronization function), Data slicer supports NTSC/PAL switching and line specification • 8-bit synchronous SIO circuit with 32-byte automatic transfer function • Two 8-bit asynchronous/synchronous serial I/O (bus mode selectable, I^2C bus supported) • UARTs (full duplex) • Eight 8-bit A/D converter channels • PWM output channels (14 bits×1), PWM output channels (8 bits × 3) • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • ROM correct function
			LC8740B2A	112K×8											
			LC8740C8A	128K×8											
			LC87F40C8A	128K×8(Flash)											• OSD controller functions: Progressive TV support multi layer, Cursor display function: Simplified graphics functions: Number of colors to be displayed; 8 (digital), 4096 (analog), Maximum number of characters: 512 • Built-in caption data slicer circuit (Supports the XDS automatic time synchronization function), Data slicer supports NTSC/PAL switching and line specification • 8-bit synchronous SIO circuit with 32-byte automatic transfer function • Two 8-bit asynchronous/synchronous serial I/O (bus mode selectable, I^2C bus supported) • UARTs (full duplex) • Eight 8-bit A/D converter channels • PWM output channels (14 bits×1), PWM output channels (8 bits × 3) • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • ROM correct function • On-chip flash E^2PROM version (Supports onboard reprogramming, on-chip debugger function)
	64	QIP64E(14×14)	**LC874164A**	64K×8 64K×8(Flash)	2048×9(Data) 352×10(Display) 1024×8(CGR)	212ns(14.15MHz) bus cycle=71ns	13	8		49	7	Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: Two 8-bit channels with bus support, full duplex UART×1	8 bits×8	4.5 to 5.5	• OSD controller functions: Progressive TV support multi layer, Number of colors to be displayed; 16, Maximum number of characters: 256 • Built-in caption data slicer circuit (Supports the XDS automatic time synchronization function), Data slicer supports NTSC/PAL switching and line specification • 8-bit synchronous SIO circuit with 32-byte automatic transfer function • Two 8-bit asynchronous/synchronous serial I/O (bus mode selectable, I^2C bus supported) • UARTs (full duplex) • Eight 8-bit A/D converter channels • PWM output channels (14 bits×1), PWM output channels (8 bits × 3) • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • ROM correct function
	64	QIP64E(14×14)	**LC87F4164A**	64K×8 64K×8(Flash)	2048×9(Data) 352×10(Display) 1024×8(CGR)	212ns(14.15MHz) bus cycle=71ns	13	8		49	7	Synchronous: One 8-bit channel with automatic transfer support, Asynchronous/synchronous: Two 8-bit channels with bus support, full duplex UART×1	8 bits×8	4.5 to 5.5	• OSD controller functions: Progressive TV support multi layer, Number of colors to be displayed; 16, Maximum number of characters: 256 • Built-in caption data slicer circuit (Supports the XDS automatic time synchronization function), Data slicer supports NTSC/PAL switching and line specification • 8-bit synchronous SIO circuit with 32-byte automatic transfer function • Two 8-bit asynchronous/synchronous serial I/O (bus mode selectable, I^2C bus supported) • UARTs (full duplex) • Eight 8-bit A/D converter channels • PWM output channels (14 bits×1), PWM output channels (8 bits × 3) • High-speed multiplier/devider circuit: 24×16, 24÷16, 16×8, 16÷8 • Remote controller reception circuit • ROM correct function • On-chip flash E^2PROM version (Supports onboard reprogramming, on-chip debugger function)

I/O Expander

Category	Pins	Package	Type No.	Ports: Number of pins: I	Ports: Number of pins: O	Ports: Number of pins: I/O	Ports: Number of pins: Total		Serial I/O	Operating supply voltage range V_{DD} [V]	Application	Features
I/O Expander	24	MFP24S(300mil)	**LC709004A**	1	1	16	18		4-wire/5-wire synchronous serial communications/ 16-bit parallel input/output	2.0 to 6.0	I/O Expander	4-/5-wire synchronous serial transmission/reception and 16-bit parallel I/O. It can receive input data and transmit output data in parallel. Ports expandable in 16 bits × n increments (n: the number of ICs)
	24	MFP24S(300mil)	**LC709024A**	1	1	16	18		2-wire/3-wire synchronous serial communications/ 16-bit parallel input/output	2.0 to 6.0	I/O Expander	2-/3-wire synchronous serial transmission/reception and 16-bit parallel I/O. It can receive input data and transmit output data in parallel. Ports expandable in 16 bits × n increments (n: the number of ICs)
	36	MFP36SDJ(300mil)	**LC709006A**	1	1	24	26		4-wire/5-wire synchronous serial communications/ 24-bit parallel input/output	2.0 to 6.0	I/O Expander	4-/5-wire synchronous serial transmission/reception and 24-bit parallel I/O. It can receive input data and transmit output data in parallel. Ports expandable in 24 bits × n increments (n: the number of ICs)

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