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VEGETABLE OIL INK
Catalog No.56V6724E 10.2013

2014 SHORT FORM CATALOG

LAPIS Semiconductor Co.,Ltd.

LAPIS SEMICONDUCTOR

2014 SHORT FORM CATALOG

LAPIS Semiconductor Co.,Ltd.

We appreciate your patronage of our semiconductor devices and other electronic devices.

We appreciate your patronage of our semiconductor devices.
The application field of semiconductors is diversified and varied, demanding higher performance and functionality as well as segmentation and higher density.
We therefore present this comprehensive catalog, which has been compiled for the purpose of selecting optimal varieties for given applications. We will be pleased if you can make use of this catalog. In addition to the catalog, we also provide data sheets, manuals and other information on a per-product basis in response to our customers' requests. If you need any of these, please contact us.

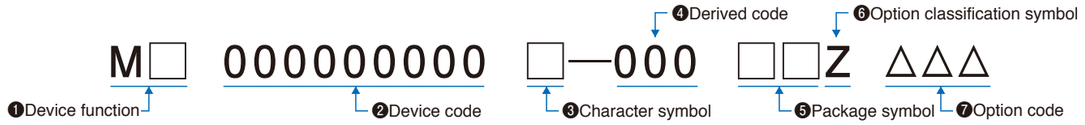
LAPIS Semiconductor Co., Ltd.

2014 SHORT FORM CATALOG

Convention of Product Name Assignment for Semiconductor devices

Product names are assigned to our semiconductor devices using the following convention, starting with the character "M".

Structure of Product Name



Assignment of Symbols

❶Device function
The device functions are classified as follows:
MD: DRAM
MR: P2ROM™, OTPROM
MS: SRAM
MG: Gate array, standard cell
ML: Logic
MK: Module, chip set
MT: Driver

❷Device code
The device code expresses a function specific to a device using a combination of numbers and alphanumeric characters.

❸Character symbol
The character symbol is added to indicate the modification of an existing product, to emphasize a specification that differs from the standard specification of an existing product, or to indicate a design standard.

❹Derived code
The derived code indicates the speed ranking for DRAM products and is used as a derived code for logic products.

❺Package symbol
The package symbol expresses the type and lead bending profile of a package in two digits.

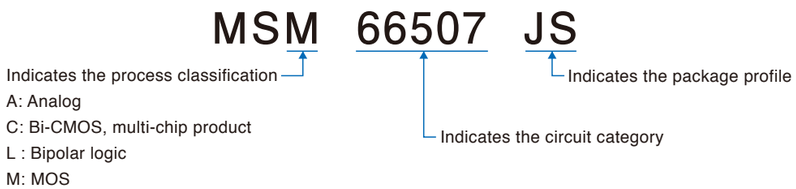
❻Option classification symbol
The option classification symbol is used to distinguish between the option symbol and the package symbol.

❼Option code
The option code indicates a symbol that identifies the specification of a product with an option.

* Items from ❶ "Device function", to ❹, "Derived code", are indicated in this catalog.

The following shows the convention of item name assignment for conventional products.

Product Name of Conventional Products



* The actual package profile is not shown here.

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CONTENTS

Communication LSI

Communication LSI Overview

Product Overview

This is a Communication LSI to connect and to be connected.

- Suitable for a range of applications, from toys and consumer devices to industrial equipment and automotive systems.
- Broad lineup utilizing a number of technologies.
- Offers multiple development tools that provide complete support.

OFDM Technology
・Reception of Digital Terrestrial Broadcasting

CODEC Technology
・VoIP CODEC ・PCM CODEC
・ADPCM CODEC

MODEM Technology
・Tele-control IC

Abundant Market Achievement
Home Electronics/Consumer Electronics/
Car Electronics/Industrial Electronics/Toy…

CMOS-RF Technology
・IEEE 802.15.4
・Specified low power radio
・Bluetooth® Low Energy
・Reception of Digital Terrestrial Broadcasting

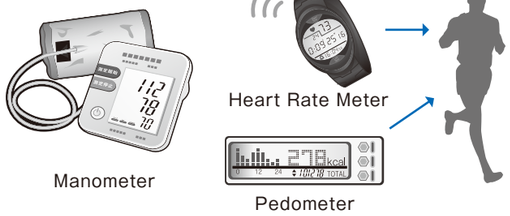
Network Technology
・ZigBee®
・ZigBee®RF4CE
・Simple NWK

Customer Support
・Provide development tools
・Provide advice based on rich experiences

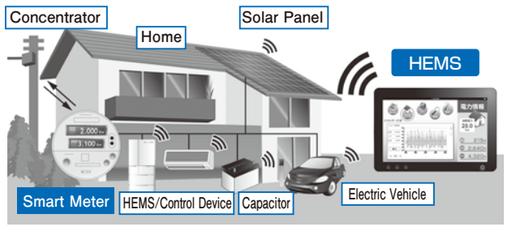
Application Examples

This is a “Communication” LSI to be connected to anyone in any time and anywhere.

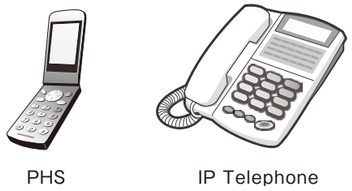
Bluetooth® Low Energy ▶Health care/Fitness Equipment



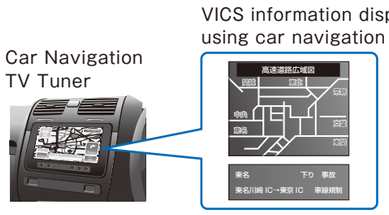
Special low power wireless communication ▶Consumer electronics, housing facilities



VoIP LSI/PHS LSI ▶Communication Devices



Digital Terrestrial Broadcasting Reception LSI/FM Data Broadcasting Reception LSI ▶On-Vehicle Devices



Applied to Digital Terrestrial Broadcasting Reception/Remote Controller/Data Communication/Voice Communication

Product Line-up

A variety of functions provide support for your applications.

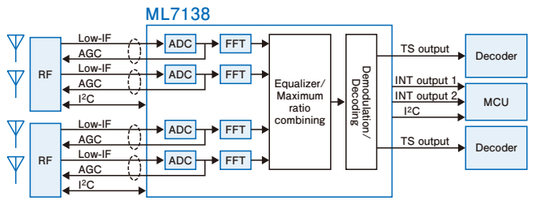
Digital terrestrial broadcasting reception LSI	LSIs for Full-Segment/One-Segment broadcasting reception suitable for potable devices and car devices with superior mobile reception features, and LSIs for Chinese-standard digital terrestrial broadcasting reception with highly stable reception performance and low power consumption.	ML7147 ML7138 ML7109S
Wireless communication LSI	LSIs suitable for various applications including IEEE802.15.4/ZigBee®, Bluetooth® Low Energy and specified low-power radio system. Module products that can be easily integrated into applications are also available.	ML7105-00x ML7386x MK71050-02 ML7275 ML7396x MK72750A-01 ML7344x ML7406
VoIP LSI	This is a multifunctional LSI, suitable for VoIP phones and broadband routers with built-in VoIP functions.	ML7204-003 ML7234-021 ML7304-0x2
Echo Canceller LSI	This product is suitable for hands-free communication in mobile phones and door phones.	ML7037-003 ML7247-001 ML7202-001
PHS LSI Reliable market achievement	The products are limited for the user who has the development experience in the PHS devices. For details, please inquire to the sales (ROHM Co., Ltd.).	

This product list shows main products of communication LSI.

Applied Circuit

4 Diversity/Full Segment OFDM Demodulation LSI

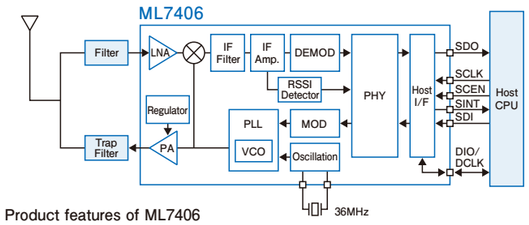
ML7138



Product features of ML7138
- High sensitive reception with 4 diversity reception
- 2 diversity x 2CH reception (2TS output) supported
- Low Power Consumption, small size ●Noise canceller function available

Transceiver LSI for the Smart metering Utility Network

ML7406

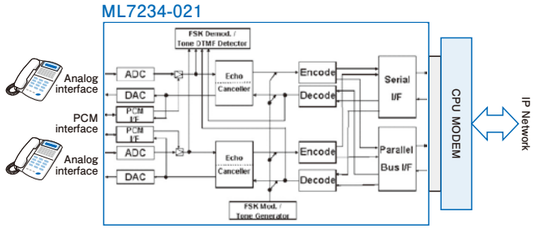


Product features of ML7406
- EN300-220 and EN13575-4:2011(Wireless M-bus) compliant
- Built-in packet handler for Wilrelss M-bus and general purpose
- High-speed carrier checking function

VoIP LSI

Product features of ML7234-021
- Superior sound quality CODEC for 2ch VoIP
- A variety of built-in functions for phones

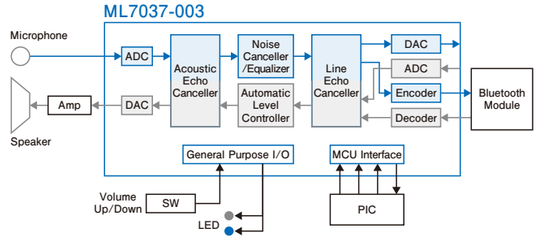
ML7234-021



Echo Canceller LSI

Product features of ML7037-003
- Two systems of echo canceller
- Built-in noise canceller

ML7037-003



Communication LSI

Digital terrestrial broadcasting reception LSI

Japanese System (ISDB-T)

Description	Part Number
RF tuner + OFDM demodulator for 1 segment digital terrestrial broadcasting	ML7147
4 diversity/Full segment OFDM demodulation digital terrestrial broadcasting	ML7138 NEW

Chinese System (DTMB)

Description	Part Number
Demodulator for Chinese digital terrestrial broadcasting	ML7109S

Wireless communication LSI

IEEE802.15.4/ZigBee® LSI

Description	Part Number
USB interface transceiver LSI	ML7246
Serial interface transceiver LSI (NOT support AES function)	ML7265
Serial interface transceiver LSI (Support AES function)	ML7266
Serial interface transceiver LSI (Supports RF4CE)	ML7275

Bluetooth® Low Energy LSI

Description	Part Number
Serial interface transceiver LSI	ML7105-00x NEW

Specified low power radio(Sub-GHz band radio)

Description	Part Number
UHF Transmitter LSI	ML7066
UHF Transmitter LSI	ML7386
	ML7386B
UHF Transmitter LSI	ML7396B
	ML7396A
	ML7396E
	ML7344J NEW
	ML7344C (Under development)
	ML7344E (Under development)
	ML7406 NEW

Digital terrestrial broadcasting reception LSI

Japanese System (ISDB-T)

Part Number	Transmission Standard	Package	Feature	Supply Voltage (V)	Power Consumption	Operating Temperature (℃)
ML7147	ISDB-T	WQFN80	Compliant to One-Seg broadcasting of ISDB-T(ARIB STD-B31) digital terrestrial television broadcasting. RF tuner, OFDM demodulate, error correction function. Serial, parallel TS output.	2.7～3.0 1.5～3.6 1.1～1.3	70mW at 1seg reception, include RF	-40～+90
ML7138 NEW	ISDB-T	TFBGA144	Support for reception of Full-Segment/ One-Segment broadcasting of ISDB-T (ARIB STD-B31) digital terrestrial television broadcasting. 4 diversity × 1CH or 2 diversity × 2CH reception. OFDM demodulate, error correction function, 2TS output function.	3.0～3.6 2.7～3.6 1.1～1.3	234mW 4 diversity full segment reception	-40～+85

Chinese System (DTMB)

2TS output function

Part Number	Transmission Standard	Package	Feature	Supply Voltage (V)	Power Consumption	Operating Temperature (℃)
ML7109S	GB20600-2006	WQFN64	China's national digital terrestrial broadcasting standard GB20600-2006 (DTMB) compliant demodulation. Built-in SDRAM for de-interleave. MPEG-2 serial/parallel TS output.	3.0～3.6 1.1～1.3	270mW (at reception)	-20～+85

Wireless communication LSI

IEEE802.15.4/ZigBee® LSI

Part Number	Support Standard	Package	Frequency Band	Supply Voltage (V)	Modulation Method	Encryption	Control I/F	Transmission Rate	Transmission Output (dBm)	Reception Sensitivity	Operating Temperature (℃)
ML7246	IEEE 802.15.4	WQFN48	2.4GHz ISM Band	3.0～3.6 (Connect USB)	O-QPSK	—	USB2.0	250kbps	0dBm	-92dBm (*1)	-40～+85
ML7265				2.1～3.6			Synchronous serial				
ML7266						AES128			-40 to 0 dBm (4 step)		
ML7275	IEEE802.15.4 ZigBee®RF4CE	WQFN40		1.8～3.6			Synchronous serial or UART		-45 to 0 dBm (3 step)		

*1: PER(Packet Error Rate)<1%

Bluetooth® Low Energy LSI

Part Number	Support Standard	Package	Frequency Band	Supply Voltage (V)	Modulation Method	Encryption	Control I/F	Transmission Rate	Transmission Output (dBm)	Reception Sensitivity	Operating Temperature (℃)
ML7105-00x NEW	Bluetooth® Core Spec v4.0 (Single mode)	WQFN32	2.4GHz ISM band	1.6～3.6	GFSK	AES128	Synchronous serial or UART	1Mbps	0/-6/-12/-18dBm	-86dBm	-20～+70

Specified low power radio(Sub-GHz band radio)

Part Number	Support Standard	Package	Frequency Band	Supply Voltage(V)	Modulation Method	FEC Mode	Control I/F	Transmission Rate	Transmission Output (dBm)	Reception Sensitivity	Operating Temperature (℃)
ML7066	ARIB STD-T67、RCR/STD-30	VQFN48	426MHz band 429MHz band	2.1～3.6	2-FSK	—	Synchronous serial (Control) DI(DATA)	1.2kbps、2.4kbps 4.8kbps [NRZ] (3-step setting function)	1mW/10mW	-116dBm [BER<1%] (*2)	-25～+65
ML7386	—	WQFN28	350～450MHz	1.8～3.6	2-FSK MSK	—	Synchronous serial (Control) DI(DATA)	2.4kbps、4.8kbps [NRZ]	10mW typ.	—	-25～+85
ML7386B									1mW/10mWtyp.		
ML7396B	ARIB STD-T108	WQFN40	750～1000MHz	1.8～3.6	2-(G)FSK (G)MSK	IEEE 802.15.4g compliant	Synchronous serial (Control・DATA) DIO(DATA)	～50kbps 100kbps 150kbps 200kbps 400kbps	1mW/10mW/20mW	-106dBm [100kbps BER=0.1%] (*2)	-40～+85
ML7396A	FCC part15.247/249										
ML7396E	EN300-220										
ML7344J NEW	ARIB STD-T67、RCR/STD-30	WQFN32	168～510MHz	1.8～3.6	2-(G)FSK (G)MSK	—	Synchronous serial (Control) DI(DATA)	1.2kbps to 15kbps	1mW/10mW/20mW/100mW	-117dBm [4.8kbps BER=0.1%] (*2)	-40～+85
ML7344C (Under development)	Q/GDW347.3										
ML7344E (Under development)	EN300-220										
ML7406 NEW	EN300-220 EN13575-4 (Wireless M-bus)	WQFN32	750～1000MHz	1.8～3.6	2-(G)FSK (G)MSK	—	Synchronous serial (Control) DI(DATA)	～500kbps	1mW/10mW/20mW	-106dBm [100kbps BER=0.1%] (*2)	-40～+85

*2: BER means Bit Error Rate.

Communication LSI

Wireless communication module

IEEE802.15.4 ZigBee®

Description	Part Number
2.4GHz wireless communication module	MK72220-01
	MK72660-01
	MK72750A-01

Bluetooth® Low Energy

Description	Part Number
2.4GHz wireless communication module	MK71050-02 (Under development)

VoIP LSI

VoIP CODEC

Description	Part Number
VoIP Codec	ML7074-003
	ML7074-004
	ML7204-003
2ch VoIP Codec	ML7214A-001
4ch VoIP Codec	ML7224A-001
2ch VoIP Codec	ML7234-021

VoIP Processor

Description	Part Number
VoIP Processor	ML7304-0x2

Echo Canceller LSI

Echo Canceller

Description	Part Number
Dual echo canceller + ADPCM transcoder	ML7202-001

Echo Canceller / Noise Canceller

Description	Part Number
Dual echo canceller/ Noise canceller with dual Codec	ML7037-003
Echo canceller/ Noise canceller with dual wide-band codec	ML7247-001 NEW

Wireless communication module

IEEE802.15.4 ZigBee®

Part Number	Support Standard	Size	Frequency Band	Supply Voltage(V)	Transmission Output	Reception Sensitivity	Control I/F	Type	Operating Temperature (℃)	Note
MK72220-01	IEEE802.15.4	21.5×32.8×2.1mm	2.4GHz ISM Band	2.7～3.6	0dBm	-92dBm(*1)	UART	Connector	-20～+60	Built-in LAPIS Semiconductor's original network
MK72660-01	IEEE802.15.4	30.0×32.0×3.1mm		2.1～3.6	0dBm	-92dBm(*1)	Synchronous serial	Connector	-20～+70	—
MK72750A-01	IEEE802.15.4 ZigBee®RF4CE	20.0×31.0×2.7mm		1.8～3.6	0dBm (3steps)	-92dBm(*1)	UART	Connector	-40～+85	Built-in ZigBee® RF4CE network

*1: PER(Packet Error Rate)<1%

Bluetooth® Low Energy

Part Number	Transmission Standard	Size	Frequency Band	Supply Voltage(V)	Transmission Output	Reception Sensitivity	Control I/F	Type	Operating Temperature (℃)	Note
MK71050-02 (Under development)	Bluetooth® Core Spec v4.0 (Single mode)	11x13x1.60mm	2.4GHz ISM Band	1.6～3.6	0/-6/ -12/-18 dBm	-86dBm	Synchronous serial or UART	SMT	-20～+70	Bluetooth® certified Radio Act, CE mark

VoIP LSI

VoIP CODEC

Part Number	Package	Speech Compression Method	Operating Frequency	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (℃)
ML7074-003	QFP64	G.729.A/G.726/G.711	4.096MHz	3.0～3.6	65mA	-20～+60
ML7074-004	QFP64	G.729.A/G.711	4.096MHz	3.0～3.6	65mA	
ML7204-003	QFP64	G.729.A/G.711	12.288MHz	3.0～3.6	65mA	
ML7214A-001	TQFP100	G.711	12.288MHz	3.0～3.6	65mA	
ML7224A-001	LQFP176	G.711	12.288MHz	3.0～3.6	125mA	
ML7234-021	TQFP100	G.711/G.722	12.288MHz	3.0～3.6	120mA	

VoIP Processor

Part Number	Package	Speech Compression Method	Operating Frequency	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (℃)
ML7304-0x2	QFP208	G.729.A/G.711/G.722	12.288MHz	3.0～3.6	210mA	-20～+60

Echo Canceller LSI

Echo Canceller

Part Number	Package	Cancelable Echo Delay Time	Voice Signal Interface	Supply Voltage (V)	Operating Frequency	Notes
ML7202-001	TQFP64	64ms/channel	μ-law, A-law	3.0～3.6	19.2MHz	Tone Gen/Det., VOX, Gain Control, Time Slot Assignment, etc.

Echo Canceller / Noise Canceller

Part Number	Package	Cancelable Echo Delay Time	Voice Signal Interface	Supply Voltage (V)	Operating Frequency	Notes
ML7037-003	TQFP64	Acoustic side 64ms、Line side 20ms	Acoustic side : analog、Line side : analog、16-bit linear、μ-law PCM	3.0～3.6	12.288MHz	Noise cancellation = 6～18dB
ML7247-001 NEW	TQFP64	Acoustic side 64ms	Acoustic side : analog、Line side : analog、16-bit linear	3.0～3.6	12.288MHz	Noise cancellation = 1～45dB Sampling frequency = 8kHz or 16kHz

Communication LSI

CODEC LSI

PCM CODEC

Description	Part Number
Multifunction 2ch PCM CODEC	ML7033-01
3V linear PCM Codec	ML7041
	MSM7732A
3V PCM CODEC	MSM7717-01
3V 2ch PCM CODEC	MSM7704-01
5V PCM CODEC	MSM7578V
5V 2ch PCM CODEC	MSM7533V

ADPCM CODEC

Description	Part Number
ADPCM Codec compliant with G.726	ML7029

Modem LSI

Tele-control IC

Description	Part Number
1200bps, HDX modem,DTMF transceiver, CPT	ML7020
DTMF transceiver	ML7005
2400bps single chip full duplex data modem with protocol	ML7012-06

PHS LSI

Baseband IC for PHS

Description	Part Number
Baseband for PHS	ML7098C-01
	ML7207-01
Baseband for PHS supporting W-OAM	ML7257-01

PHS modem transcoder

Description	Part Number
π/4 shift QPSK modem	MSM7582B
4ch ADPCM transcoder	MSM7581

Car communication LSI

FM data broadcast reception LSI

Description	Part Number
FM data reception tuner	ML7114B J (Under development)
	ML7174 (Under development)
FM multiplexing demodulate for VICS	MSM9565 J
	ML9574 J
FM multiplexing demodulate for DARC	MSM9563

J : This LSI is limited to the market in Japan.

CODEC LSI

PCM CODEC

Part Number	Package	PCM sign			Channel Number	Supply Voltage (V)	PCM Synchronous Type		Analog Output			Notes
		μ-law	A-law	14-bit linear			long	short	full swing	output load	differential	
ML7033-01	QFP64	○	○	○	2	4.75～5.25	○	○	3.4Vpp	20kΩ		
ML7041	TQFP48	○	○	○	1	2.4～3.3	○	○	2.6Vpp	8Ω	○	With tone generators, regulators, and I²C I/F
MSM7732A	TQFP48/ BGA48	○	○	○	1	2.4～3.3	○	○	3.0Vpp	32Ω	○	With tone generators
MSM7717-01	SSOP20	○	○		1	2.7～3.8	○		2.0Vpp	600Ω	○	
MSM7704-01	SOP24	○	○		2	2.7～3.8	○		2.0Vpp	1.2kΩ		
MSM7578V	SOP24/ SSOP20	○	○		1	4.75～5.25	○		2.4Vpp	600Ω		
MSM7533V	SOP24	○	○		2	4.75～5.25	○		3.4Vpp	600Ω		

ADPCM CODEC

Part Number	Package	PCM Interface	Operating Frequency	Supply Voltage (V)	Analog Output	Supply Current (Max.)	Operating Temperature (℃)
ML7029	SSOP30	μ-Law	10.368MHz	2.7～3.6	1.3Vpp、20kΩ	12mA	-25～+70

Modem LSI

Tele-control IC

Part Number	Package	Standard	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (℃)
ML7020	SSOP32	ITU-T V.23	4.5～5.5	5mA	-40～+85
ML7005	SSOP32		2.7～5.5	5mA	-30～+85
ML7012-06	QFP64	ITU-T V.22bis、V.22、V.21	2.7～3.6	35mA	-20～+70

PHS LSI

Baseband IC for PHS

Part Number	Package	CPU Performance	SLOT	Built-in Memory	Supply Voltage (V)
ML7098C-01	BGA208	19.2MHz	2	16KB	3.0V/2.5V
ML7207-01	BGA208		4	128KB	
ML7257-01	BGA208	57.6MHz		32KB	3.0V/1.5V

*The products are limited for the user who has the development experience in the PHS devices. For details, please inquire to the sales (ROHM Co., Ltd.).

PHS modem transcoder

Part Number	Package	Feature	Supply Voltage (V)	Supply Current	Operating Temperature (℃)
MSM7582B	TSOP(I)32	π/4 shift QPSK modem	2.7～3.6	14mA	-25～+70
MSM7581	TQFP100	4ch ADPCM transcoder	2.7～5.5	5mA	-30～+80

FM data broadcast reception LSI

Part Number	Feature	Package	Supply Voltage (V)	Operating Temperature (℃)	Supply Current (Max.)
ML7114B (Under development)	FM VICS®/DARC® tuner	WQFN32	3.0～3.6V	-40～+85℃	TBD
ML7174 (Under development)	FM VICS®/DARC® tuner,FM multiplexing demodulate LSI for VICS®(DARC®), Built-in BPF, frame memory, and VICS® descrambler, Frames A,B,C,SPI slave	WQFN64	3.0～3.6V	-40～+85℃	TBD
MSM9565	FM multiplexing demodulate LSI for VICS®(DARC®),Built-in BPF, frame memory, and VICS® descrambler, Frames A,B,C,8bit bus interface	QFP44	3.0～3.6V	-40～+85℃	28mA
ML9574	FM multiplexing demodulate LSI for VICS®(DARC®),Built-in BPF, frame memory, and VICS® descrambler, Frames A,B,C,16bit bus interface	TQFP64	3.0～3.6V	-40～+85℃	35mA
MSM9563	FM multiplexing demodulate LSI for DARC®, Built-in BPF and frame memory, Frames A,B,C,8bit bus interface	QFP44	3.0～3.6V	-40～+85℃	28mA

Microcontroller

8-bit Microcontroller Overview

Product Overview

LAPIS Semiconductor's 8-bit microcontroller series products with our onboard RISC-based original 8-bit CPU "UA Core" provide industry-leading* low power consumption with special features including Flash memory that enables reading at only 1V and technology that can minimize leakage current in high-temperature operation.
Our 8-bit microcontroller series products include; ML610400 series, which can run for 10 years using a single battery; ML610300 series for audio output applications with its built-in one-chip high-quality sound playback and high-output speaker amplifier functions; ML610100 series for appliances such as rice cookers, LED lighting controller and motor controller applications; and ML610790 family that can provide integrated control for smartphone sensors with low-power consumption. Our wide range of products is suitable for various applications ranging from battery-driven small devices to industrial equipment.

* Based on LAPIS Semiconductor's data

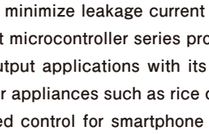
Application Examples

ML610400 Series

Standard type

Electronic Shelf Label

Remote Controller for Lighting



Various Remote Controllers
Controller for TV

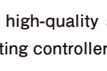
Built-in LCD Driver Dot Matrix Type

Pedometer with graph

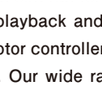
Performance Weather Station

Electronic Sports (Multifunction) Watch

Electronic Wristwatch



Bicycle meter

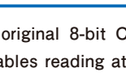


Temperature logger

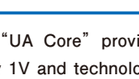
Built-in LCD Driver Segment Type

Clock

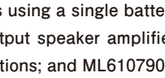
Thermostat



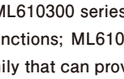
Pedometer



Electronic Shelf Label



Digital Thermometer



Token Machine

ML610300 Series

Speech Output Function Type

Hot-Water Remote Controller

Indoor Fire Alarm

Home Bakery

ML610100 Series

5V Driven Type

Rice Cooker

LED Light

Electric Drill

ML610790 Family

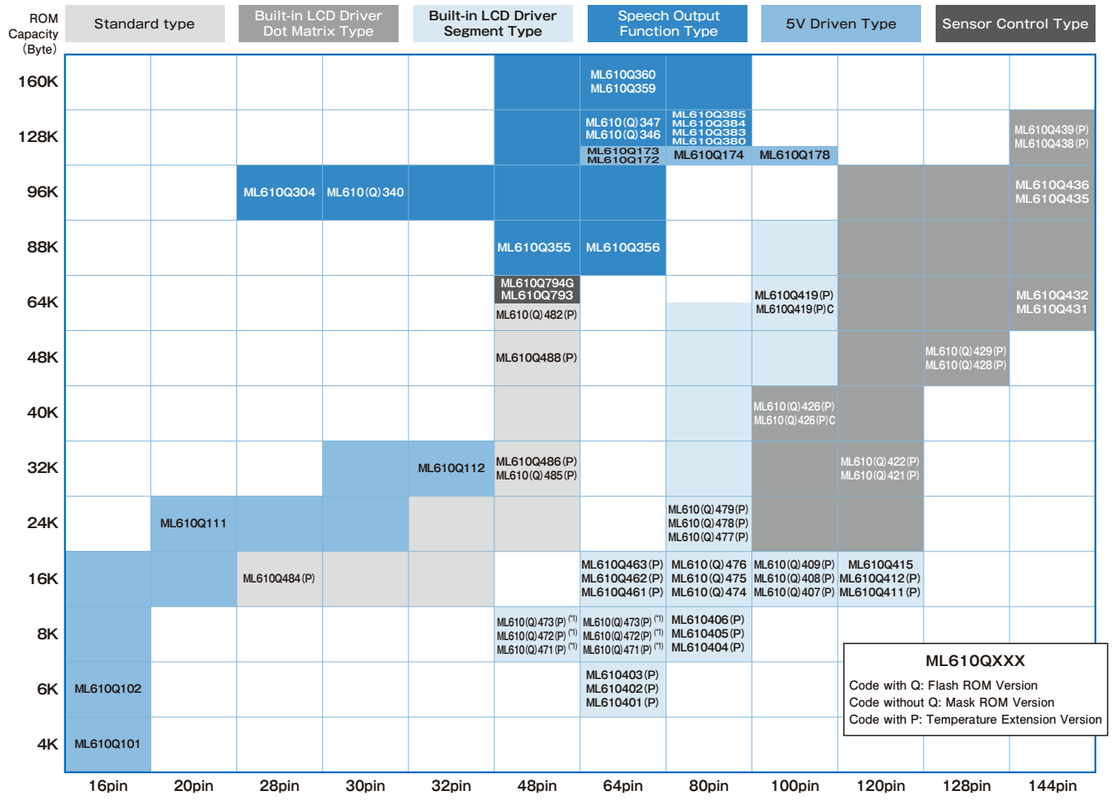
Sensor Control Type

Smartphone

Mobile Phone

Mobile Phone Accessory Sensor Network Module

Product Line-up

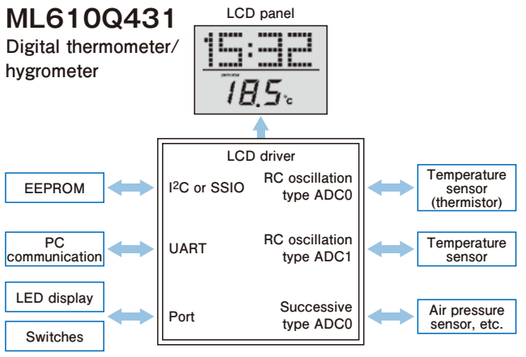


*1: 48pin and 64 pin types are available for ML610(Q)471(P)/ML610(Q)472(P)/ML610(Q)473(P)

Applied Circuit

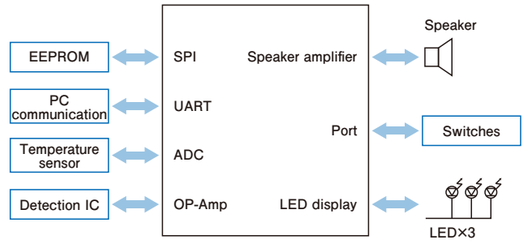
ML610Q431

Digital thermometer/ hygrometer



ML610Q346

Fire alarm



Microcontroller

8-bit Microcontroller with Built-in Original Core Specifications

ML610400 Series

Part Number	Operating Condition					ROM/RAM				Function / Feature													Package	Chip support	Remarks
	Operating Voltage(V)	Operating Frequencty (Max.)	Minimum Instruction Execution Time	Current (*1) Consumption (Typ.@HALT)	Operating Temperature (℃)	ROM Type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port (*2) Input	Port (*2) Output	Port (*2) Input/Output	8bit Timer	1kHz Timer	PWM	Capture	WDT	ADC (Method)	Serial Ports I2C	Serial Ports SSIO(*3)	Serial Ports UART(*4)	Supply Voltage Detection	LCD Driver	Interrupt Sources Internal:External	Additional Functions			
Standard Type * Product name with underline: Application is limited to consumer devices. Product name without underline: For both consumer devices and industrial devices. For applications to industrial devices, please contact ROHM sales representatives in advance.																											
ML610482/ML610482P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70/ -40～+85	Mask	64K (*21)	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1	24bit×2 (RC oscillation)	1 (*11)	1	1	BLD×1	—	15:5	Low speed frequency correction/buzzer	P-TQFP48-0707-0.50	○	—
ML610Q482/ML610Q482P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70/ -40～+85	Flash	64K (*21)	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1	24bit×2 (RC oscillation)	1 (*11)	1	1	BLD×1	—	15:5	Low speed frequency correction/buzzer	P-TQFP48-0707-0.50	○	—
ML610485/ML610485P (Under development)	1.25～3.6	4MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.25μs/2μs 30.5μs	0.25μA (T.B.D.)	-20～+70/ -40～+85	Mask	32K (*21)	—	2K	4	6	16	6 (16bit×3)	—	16bit×1	2	1	—	—	1	1	—	—	17/12 (Include 8 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator/RTC/ Random number generator	P-TQFP48-0707-0.50	○	—
ML610Q485/ML610Q485P (Under development)	1.25～3.6	4MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.25μs/2μs 30.5μs	0.25μA (T.B.D.)	-20～+70/ -40～+85	Flash	32K (*21)	—	2K	4	6	16	6 (16bit×3)	—	16bit×1	2	1	—	—	1	1	—	—	17/12 (Include 8 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator/RTC/ Random number generator	P-TQFP48-0707-0.50	○	—
ML610Q484/ML610Q484P	1.25～3.6	4MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.25μs/2μs 30.5μs	6μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	3	4	13	6 (16bit×3)	—	16bit×2	2	1	24bit×1 (RC oscillation)	—	1	1	—	—	17/7 (Include 4 bit-OR input)	Comparator	P-WQFN28-0404-0.40	○	—
ML610Q486/ML610Q486P NEW	1.6～3.6	500kHz(Internal RC oscillation)	2μs	15μA	-20～+70/ -40～+85	Flash	32K (*21)	—	1K	6	5	21	4 (16bit×2)	—	16bit×1	—	1	12bit×4 (Sequential)	1 (*12)	1	1	BLD×1	—	14:5	—	P-TQFP48-0707-0.50	○	—
ML610Q488/ML610Q488P NEW	1.8～3.6	1MHz(Internal RC oscillation)/38.4kHz(Crystal oscillation)32.768kHz(Crystal oscillation)	1μs/30.5μs	1.4μA	Under normal operation -20～+70/-40～+85 During FLASH ROM write/delete 0～+40	Flash	48K (*21) (Self-rewritable)	—	2K	6	4	23	8 (16bit×4)	—	16bit×2	—	1	10bit×3 (Sequential)	1 (*13)	1	2	—	—	27:6	Low speed frequency correction	P-TQFP48-0707-0.50	○	—
Built-in LCD Driver Dot Matrix Type * Product name with underline: Application is limited to consumer devices. Product name without underline: For both consumer devices and industrial devices. For applications to industrial devices, please contact ROHM sales representatives in advance.																											
ML610421/ML610421P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70/ -40～+85	Mask	32K (*21)	—	2K (*31)	6	3	22	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 400dot 50seg×8com.	17:5	Low speed frequency correction/melody:buzzer	P-TQFP120-1414-0.40	○	ML610421B/ML610421PB: No oscillation stop detection reset function
ML610Q421/ML610Q421P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70/ -40～+85	Flash	32K (*21)	—	2K (*31)	6	3	22	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 800dot 50seg×8com.	17:5	Low speed frequency correction/melody:buzzer	P-TQFP120-1414-0.40	○	ML610Q421B/ML610Q421PB: No oscillation stop detection reset function
ML610422/ML610422P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70/ -40～+85	Mask	32K (*21)	—	2K (*31)	6	3	14	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 800dot 50seg×16com.	17:5	Low speed frequency correction/melody:buzzer	P-TQFP120-1414-0.40	○	ML610422B/ML610422PB: No oscillation stop detection reset function
ML610Q422/ML610Q422P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70/ -40～+85	Flash	32K (*21)	—	2K (*31)	6	3	14	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 800dot 50seg×16com.	17:5	Low speed frequency correction/melody:buzzer	P-TQFP120-1414-0.40	○	ML610Q422B/ML610Q422PB: No oscillation stop detection reset function
ML610426/ML610426P NEW	1.1～3.6	1MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	1μs 30.5μs	0.5μA (T.B.D.)	-20～+70/ -40～+85	Mask	40K (*21)	—	2K	5	—	7	4 (16bit×2)	1	16bit×1	—	1	16bit×1 (RC oscillation)	1 (*15)	1	1	BLD×1	Max. 800dot 50seg×16com.	18:5	Low speed frequency correction/ melody:buzzer/EL driver/ Outside input voltage detection	P-TQFP100-1414-0.50	○	—
ML610426C/ML610426PC NEW	1.1～3.6	1MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	1μs 30.5μs	0.5μA (T.B.D.)	-20～+70/ -40～+85	Mask	40K (*21)	—	2K	7	—	13	4 (16bit×2)	1	16bit×1	—	1	16bit×1 (RC oscillation)	1 (*15)	1	1	BLD×1	Max. 672dot 42seg×16com.	18:8	Low speed frequency correction/ melody:buzzer/EL driver/ Outside input voltage detection	P-TQFP100-1414-0.50	○	—
ML610Q426/ML610Q426P NEW	1.1～3.6	1MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	1μs 30.5μs	0.5μA	-20～+70/ -40～+85	Flash	40K (*21)	—	2K	5	—	7	4 (16bit×2)	1	16bit×1	—	1	16bit×1 (RC oscillation)	1 (*15)	1	1	BLD×1	Max. 800dot 50seg×16com.	18:5	Low speed frequency correction/ melody:buzzer/EL driver/ Outside input voltage detection	P-TQFP100-1414-0.50	○	—
ML610Q426C/ML610Q426PC NEW	1.1～3.6	1MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	1μs 30.5μs	0.5μA	-20～+70/ -40～+85	Flash	40K (*21)	—	2K	7	—	13	4 (16bit×2)	1	16bit×1	—	1	16bit×1 (RC oscillation)	1 (*15)	1	1	BLD×1	Max. 672dot 42seg×16com.	18:8	Low speed frequency correction/ melody:buzzer/EL driver/ Outside input voltage detection	P-TQFP100-1414-0.50	○	—
ML610428/ML610428P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 2MHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 0.5μs/30.5μs	0.5μA	-20～+70/ -40～+85	Mask	48K (*21)	—	4K (*31)	6	3	14	2 (16bit×1)	1	16bit×3	—	1	24bitx2 (RC oscillation)	1 (*11)	1	1	BLD×1	Max. 1392dot 58seg×24com.	20:5	Low speed frequency correction/melody:buzzer	TQFP128-P-1414-0.40	○	Selectable oscillation stop detection reset function enable /disable according to software
ML610Q428/ML610Q428P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 2MHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 0.5μs/30.5μs	0.5μA	-20～+70/ -40～+85	Flash	48K (*21)	—	4K (*31)	6	3	14	2 (16bit×1)	1	16bit×3	—	1	24bit×2 (RC oscillation)	1 (*11)	1	1	BLD×1	Max. 1392dot 58seg×24com.	20:5	Low speed frequency correction/melody:buzzer	TQFP128-P-1414-0.40	○	Selectable oscillation stop detection reset function enable /disable according to software
ML610429/ML610429P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 2MHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 0.5μs/30.5μs	0.5μA	-20～+70/ -40～+85	Mask	48K (*21)	—	4K (*31)	10	3	20	2 (16bit×1)	1	16bit×3	—	1	24bitx2 (RC oscillation)	1 (*11)	1	1	BLD×1	Max. 512dot 64seg×8com.	20:9	Low speed frequency correction/melody:buzzer	TQFP128-P-1414-0.40	○	Selectable oscillation stop detection reset function enable /disable according to software
ML610Q429/ML610Q429P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 2MHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 0.5μs/30.5μs	0.5μA	-20～+70/ -40～+85	Flash	48K (*21)	—	4K (*31)	10	3	20	2 (16bit×1)	1	16bit×3	—	1	24bitx2 (RC oscillation)	1 (*11)	1	1	BLD×1	Max. 512dot 64seg×8com.	20:9	Low speed frequency correction/melody:buzzer	TQFP128-P-1414-0.40	○	Selectable oscillation stop detection reset function enable /disable according to software
ML610Q431	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70	Flash	64K (*21)	—	3K (*31)	6	3	22	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 1024dot 64seg×16com.	20:5	RTC/Low speed frequency correction/melody:buzzer	P-LQFP144-2020-0.50	○	ML610Q431A: No oscillation stop detection reset function
ML610Q432	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70	Flash	64K (*21)	—	3K (*31)	6	3	14	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 1536dot 64seg×24com.	20:5	RTC/Low speed frequency correction/melody:buzzer	P-LQFP144-2020-0.50	○	ML610Q432A: No oscillation stop detection reset function
ML610Q435	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70	Flash	96K (*21)	—	3K (*31)	6	3	22	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 1024dot 64seg×16com.	20:5	RTC/Low speed frequency correction/melody:buzzer	P-LQFP144-2020-0.50	○	ML610Q435A: No oscillation stop detection reset function
ML610Q436	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.5μA	-20～+70	Flash	96K (*21)	—	3K (*31)	6	3	14	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 1536dot 64seg×24com.	20:5	RTC/Low speed frequency correction/melody:buzzer	P-LQFP144-2020-0.50	○	ML610Q436A: No oscillation stop detection reset function
ML610Q438/ML610Q438P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 2MHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 0.5μs/30.5μs	0.5μA	-20～+70/ -40～+85	Flash	128K(*21)	—	7K (*31)	10	3	20	4 (16bit×2)	1	16bit×3	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 1344dot 56seg×24com.	23:9	Low speed frequency correction/melody:buzzer	P-LQFP144-2020-0.50	○	Selectable oscillation stop detection reset function enable /disable according to software
ML610Q439/ML610Q439P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 2MHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 0.5μs/30.5μs	0.5μA	-20～+70/ -40～+85	Flash	128K(*21)	—	7K (*31)	10	3	20	4 (16bit×2)	1	16bit×3	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*11)	1	1	BLD×1	Max. 1024dot 64seg×16com.	23:9	Low speed frequency correction/melody:buzzer	P-LQFP144-2020-0.50	○	Selectable oscillation stop detection reset function enable /disable according to software

*1 : Low current consumption during Suspended (HALT) Mode via low-speed oscillation
*2 : Including secondary functions
*3 : No compatible chip select signals for 8-/16-bit SPI bus
*4 : Half-duplex communication system is used.
*5 : No resistive/capacitive sensor connecting terminal
*6 : IGBT control is also supported.
*7 : Operating voltage for ADC and sound playback function is 4.5V to 5.5V.
*8 : 1ch is used for P2ROM access
*9 : Flash ROM can be rewritten only by Flash writer.
*10 : Required when using IrDA
*11 : Only the Master function can support Fast mode (400kbps)/Standard mode (100kbps).
*12 : Only the Master function can support Standard mode (50kbps).
*13 : Master: Standard Mode (100kbit/s, 25kbit/s) support, Slave: Standard Mode (100kbit/s) support
*14 : Master - Fast Mode (400kbps)/Standard Mode (100kbps) support, Slave - Standard Mode (100kbit/s) support
*15 : Master - Standard Mode (100kbit/s, 25kbit/s) support
*16 : Slave module for Host communication. Function switchable between I2C and SPI
*17 : UART uses full-duplex communication system. IrDA uses SIR system.
*18 : Operating voltage for ADC and 8.192MHz operation is 2.2V to 5.5V.
*21 : 1K-byte test area included
*22 : 544-byte test area included
*23 : 256-byte test area included
*24 : 32-byte test area included
*31 : 1K-byte LCD RAM allocation included
*32 : 240×9-bit LCD allocation RAM included

Microcontroller

8-bit Microcontroller with Built-in Original Core Specifications

ML610400 Series

Part Number	Operating Condition					ROM/RAM				Function / Feature													Package	Chip support	Remarks
	Operating Voltage(V)	Operating Frequencty (Max.)	Minimum Instruction Execution Time	Current (*1) Consumption (Typ.@HALT)	Operating Temperature (℃)	ROM Type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port (*2) Input	Port (*2) Output	Port (*2) Input/Output	8bit Timer	1kHz Timer	PWM	Capture	WDT	ADC (Method)	Serial Ports I2C	Serial Ports SSIO(*3)	Serial Ports UART(*4)	Supply Voltage Detection	LCD Driver	Interrupt Sources Internal:External	Additional Functions			
Built-in LCD Driver Segment Type * Product name with underline: Application is limited to consumer devices. Product name without underline: For both consumer devices and industrial devices. For applications to industrial devices, please contact ROHM sales representatives in advance.																											
ML610401/ML610401P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	6K (*23)	—	192	4	12	18	2 (16bit×1)	—	—	2	1	16bit×2 (RC oscillation)	—	—	1	—	Max. 55dot 11seg.×5com.	10/8 (Include 4 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP64-1010-0.50	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610402/ML610402P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	6K (*23)	—	192	4	8	18	2 (16bit×1)	—	—	2	1	16bit×2 (RC oscillation)	—	—	1	—	Max. 75dot 15seg.×5com.	10/8 (Include 4 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP64-1010-0.50	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610403/ML610403P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	6K (*23)	—	192	4	4	18	2 (16bit×1)	—	—	2	1	16bit×2 (RC oscillation)	—	—	1	—	Max. 95dot 19seg.×5com.	10/8 (Include 4 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP64-1010-0.50	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610404/ML610404P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	8K (*23)	—	256	5	12	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 105dot 21seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610405/ML610405P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	8K (*23)	—	256	5	8	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 125dot 25seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610406/ML610406P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	8K (*23)	—	256	5	4	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 145dot 29seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610407/ML610407P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	16K (*21)	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 145dot 29seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610Q407/ML610Q407P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 145dot 29seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	ML610Q407A/ML610Q407PA/ ML610Q407D/ML610Q407PD: No oscillation stop detection reset function
ML610408/ML610408P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	16K (*21)	—	1K	5	8	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 165dot 33seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610Q408/ML610Q408P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	5	8	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 165dot 33seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	ML610Q408A/ML610Q408PA/ ML610Q408D/ML610Q408PD: No oscillation stop detection reset function
ML610409/ML610409P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Mask	16K (*21)	—	1K	5	4	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 185dot 37seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610Q409/ML610Q409P	1.25～3.6	2MHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	0.5μs/ 30.5μs	0.9μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	5	4	22	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	2	1	—	Max. 185dot 37seg.×5com.	15/13 (Include 8 bit-OR input)	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	ML610Q409A/ML610Q409PA/ ML610Q409D/ML610Q409PD: No oscillation stop detection reset function
ML610Q411/ML610Q411P	1.1～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs/ 30.5μs	0.5μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*12)	1	1	BLD×1	Max. 144dot 36seg.×4com.	16:5	Low speed frequency correction/buzzer	P-TQFP120-1414-0.40	○	ML610Q411PA/ML610Q411PC: No oscillation stop detection reset function
ML610Q412/ML610Q412P	1.1～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs/ 30.5μs	0.5μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*12)	1	1	BLD×1	Max. 176dot 44seg.×4com.	16:5	Low speed frequency correction/buzzer	P-TQFP120-1414-0.40	○	—
ML610Q415	1.1～3.6	500kHz(Internal RC oscillation)	2μs	5.5μA	-20～+70	Flash	16K (*21)	—	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×2(Sequential)	1 (*12)	1	1	BLD×1	Max. 144dot 36seg.×4com.	16:5	buzzer	P-TQFP120-1414-0.40	○	—
ML610Q419/ML610Q419P	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.9μA	Under normal operation -20～+70/-40～+85 During FLASH ROM write/delete 0～+40	Flash	64K (*21) (Self-rewritable)	4K (Self-rewritable)	2K (*32)	6	3	18	4 (16bit×2)	—	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×4(Sequential)	1 (*11)	2	1	BLD×1	Max. 192dot 48seg.×4com.	17:5	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	—
ML610Q419C/ML610Q419PC	1.1～3.6	4.096MHz(Internal PLL/crystal oscillation/ceramic oscillation) 500kHz(Internal RC oscillation)/32.768kHz(Crystal oscillation)	0.244μs/ 2μs/30.5μs	0.9μA	Under normal operation -20～+70/-40～+85 During FLASH ROM write/delete 0～+40	Flash	64K (*21) (Self-rewritable)	4K (Self-rewritable)	2K (*32)	6	3	26	4 (16bit×2)	—	16bit×1	2	1	24bit×2 (RC oscillation) 12bit×4(Sequential)	1 (*11)	2	1	BLD×1	Max. 160dot 40seg.×4com.	17:5	Low speed frequency correction/melody:buzzer	P-TQFP100-1414-0.50	○	—
ML610Q461/ML610Q461P NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.9μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	5	10	14	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	1	1	—	Max. 64dot 16seg.×4com.	13:5	Low speed frequency correction	P-TQFP64-1010-0.50	○	—
ML610Q462/ML610Q462P NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.9μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	5	6	14	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	1	1	—	Max. 80dot 20seg.×4com.	13:5	Low speed frequency correction	P-TQFP64-1010-0.50	○	—
ML610Q463/ML610Q463P NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.9μA	-20～+70/ -40～+85	Flash	16K (*21)	—	1K	5	2	14	4 (16bit×2)	—	16bit×1	2	1	16bit×2 (RC oscillation)	—	1	1	—	Max. 96dot 24seg.×4com.	13:5	Low speed frequency correction	P-TQFP64-1010-0.50	○	—
ML610471/ML610471P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Mask	8K (*23)	—	512	4	9/10	6/7	2 (16bit×1)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 55dot 11seg.×5com.	9:4	Low speed frequency correction	P-TQFP48-0707-0.50/P-TQFP64-1010-0.50	○	—
ML610Q471/ML610Q471P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Flash	8K (*23)	—	512	4	9/10	6/7	2 (16bit×1)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 55dot 11seg.×5com.	9:4	Low speed frequency correction/ (*9) without debugging function	P-TQFP48-0707-0.50/P-TQFP64-1010-0.50	○	—
ML610472/ML610472P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Mask	8K (*23)	—	512	4	5/6	6/7	2 (16bit×1)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 75dot 15seg.×5com.	9:4	Low speed frequency correction	P-TQFP48-0707-0.50/P-TQFP64-1010-0.50	○	—
ML610Q472/ML610Q472P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Flash	8K (*23)	—	512	4	5/6	6/7	2 (16bit×1)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 75dot 15seg.×5com.	9:4	Low speed frequency correction/ (*9) without debugging function	P-TQFP48-0707-0.50/P-TQFP64-1010-0.50	○	—
ML610473/ML610473P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Mask	8K (*23)	—	512	4	1/2	6/7	2 (16bit×1)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 95dot 19seg.×5com.	9:4	Low speed frequency correction	P-TQFP48-0707-0.50/P-TQFP64-1010-0.50	○	—
ML610Q473/ML610Q473P	1.25～3.6	500kHz(Internal RC oscillation) 32.768kHz(Crystal oscillation)	2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Flash	8K (*23)	—	512	4	1/2	6/7	2 (16bit×1)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 95dot 19seg.×5com.	9:4	Low speed frequency correction/ (*9) without debugging function	P-TQFP48-0707-0.50/P-TQFP64-1010-0.50	○	—
ML610474 NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.25μA	-20～+70	Mask	16K (*21)	—	1K	4	10	10	6 (16bit×3)	—	—	2	1	—	—	—	1	—	Max. 135dot 27seg.×5com.	13/10 (Include 6 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610Q474 NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.25μA	-20～+70	Flash	16K (*21)	—	1K	4	10	10	6 (16bit×3)	—	—	2	1	—	—	—	1	—	Max. 135dot 27seg.×5com.	13/10 (Include 6 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610475 NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.25μA	-20～+70	Mask	16K (*21)	—	1K	4	6	10	6 (16bit×3)	—	—	2	1	—	—	—	1	—	Max. 155dot 31seg.×5com.	13/10 (Include 6 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610Q475 NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.25μA	-20～+70	Flash	16K (*21)	—	1K	4	6	10	6 (16bit×3)	—	—	2	1	—	—	—	1	—	Max. 155dot 31seg.×5com.	13/10 (Include 6 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610476 NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.25μA	-20～+70	Mask	16K (*21)	—	1K	4	2	10	6 (16bit×3)	—	—	2	1	—	—	—	1	—	Max. 175dot 35seg.×5com.	13/10 (Include 6 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610Q476 NEW	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.25μA	-20～+70	Flash	16K (*21)	—	1K	4	2	10	6 (16bit×3)	—	—	2	1	—	—	—	1	—	Max. 175dot 35seg.×5com.	13/10 (Include 6 bit-OR input)	Low speed frequency correction/ melody:buzzer/Comparator	P-TQFP80-1414-0.65	○	Selectable oscillation stop detection reset function enable/ disable according to mask option
ML610477/ML610477P	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.51μA	-20～+70/ -40～+85	Mask	24K (*21)	—	2K	4	10	15	6 (16bit×3)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 135dot 27seg.×5com.	14/12 (Include 8 bit-OR input)	Low speed frequency correction/Comparator	P-TQFP80-1414-0.65	○	—
ML610Q477/ML610Q477P	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Flash	24K (*21)	—	2K	4	10	15	6 (16bit×3)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 135dot 27seg.×5com.	14/12 (Include 8 bit-OR input)	Low speed frequency correction/Comparator	P-TQFP80-1414-0.65	○	—
ML610478/ML610478P	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.51μA	-20～+70/ -40～+85	Mask	24K (*21)	—	2K	4	6	15	6 (16bit×3)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 155dot 31seg.×5com.	14/12 (Include 8 bit-OR input)	Low speed frequency correction/Comparator	P-TQFP80-1414-0.65	○	—
ML610Q478/ML610Q478P	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Flash	24K (*21)	—	2K	4	6	15	6 (16bit×3)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 155dot 31seg.×5com.	14/12 (Include 8 bit-OR input)	Low speed frequency correction/Comparator	P-TQFP80-1414-0.65	○	—
ML610479/ML610479P	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.51μA	-20～+70/ -40～+85	Mask	24K (*21)	—	2K	4	2	15	6 (16bit×3)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 175dot 35seg.×5com.	14/12 (Include 8 bit-OR input)	Low speed frequency correction/Comparator	P-TQFP80-1414-0.65	○	—
ML610Q479/ML610Q479P	1.25～3.6	2MHz(Internal RC oscillation)/500kHz(Internal RC oscillation)32.768kHz(Crystal oscillation)	0.5μs/2μs 30.5μs	0.8μA	-20～+70/ -40～+85	Flash	24K (*21)	—	2K	4	2	15	6 (16bit×3)	—	—	2	1	16bit×1 (*5) (RC oscillation)	—	—	1	—	Max. 175dot 35seg.×5com.	14/12 (Include 8 bit-OR input)	Low speed frequency correction/Comparator	P-TQFP80-1414-0.65	○	—

*1 : Low current consumption during Suspended (HALT) Mode via low-speed oscillation
*2 : Including secondary functions
*3 : No compatible chip select signals for 8-/16-bit SPI bus
*4 : Half-duplex communication system is used.
*5 : No resistive/capacitive sensor connecting terminal
*6 : IGBT control is also supported.
*7 : Operating voltage for ADC and sound playback function is 4.5V to 5.5V.
*8 : 1ch is used for P2ROM access
*9 : Flash ROM can be rewritten only by Flash writer.
*10 : Required when using IrDA
*11 : Only the Master function can support Fast mode (400kbps)/Standard mode (100kbps).
*12 : Only the Master function can support Standard mode (50kbps).
*13 : Master: Standard Mode (100kbit/s, 25kbit/s) support, Slave: Standard Mode (100kbit/s) support
*14 : Master - Fast Mode (400kbps)/Standard Mode (100kbps) support, Slave - Standard Mode (100kbit/s) support
*15 : Master - Standard Mode (100kbit/s, 25kbit/s) support
*16 : Slave module for Host communication. Function switchable between I2C and SPI
*17 : UART uses full-duplex communication system. IrDA uses SIR system.
*18 : Operating voltage for ADC and 8.192MHz operation is 2.2V to 5.5V.
*21 : 1K-byte test area included
*22 : 544-byte test area included
*23 : 256-byte test area included
*24 : 32-byte test area included
*31 : 1K-byte LCD RAM allocation included
*32 : 240×9-bit LCD allocation RAM included

Microcontroller

8-bit Microcontroller with Built-in Original Core Specifications

ML610300 Series

Part Number	Operating Condition					ROM/RAM					Function / Feature															Package	Chip support	Remarks
	Operating Voltage(V)	Operating Frequencty (Max.)	Minimum Instruction Execution Time	Current (*1) Consumption (Typ.@HALT)	Operating Temperature (℃)	ROM Type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	P2ROM™ Capacity (bit)	RAM Capacity (Byte)	Port (*2) Input	Port (*2) Output	Port (*2) Input/Output	8bit Timer	1kHz Timer	PWM	Capture	WDT	ADC (Method)	Serial Ports I2C	Serial Ports SSIO(*3)	Serial Ports UART(*4)	Supply Voltage Detection	LCD Driver	Interrupt Sources Internal:External	Additional Functions			
Speech Output Function Type * Product name with underline: Application is limited to consumer devices. Product name without underline: For both consumer devices and industrial devices. For applications to industrial devices, please contact ROHM sales representatives in advance.																												
ML610Q304 NEW	2.0 (*18) ～5.5	8.192MHz(Internal PLL) 32.768kHz(Internal RC oscillation)	0.122μs/ 30.5μs	1.7μA	-40～+85	Flash	96K (*21)	2K (Self-rewritable)	—	1K	1	3	11	4 (16bit×2)	—	—	—	1	10bit×3 (Sequential)	1	2	1	—	—	17:9	Built-in sound playback/ADPCM decoder/speaker amplifier	P-QFP28-0505-0.50	—	—
ML610340	2.2～5.5	4.096MHz(Crystal oscillation/ ceramic oscillation/external output)	0.25μs/	—	-40～+85	Mask	96K (*21)	—	—	512	4	4	4	2 (16bit×1)	—	—	—	1	—	—	1	—	—	—	9:5	Built-in sound playback/ADPCM decoder/speaker amplifier	P-SSOP30-56-0.65	—	—
ML610Q340	2.2～5.5	4.096MHz(Crystal oscillation/ ceramic oscillation/external output)	0.25μs/	—	-40～+85	Flash	96K (*21)	—	—	512	4	4	4	2 (16bit×1)	—	—	—	1	—	—	1	—	—	—	9:5	Built-in sound playback/ADPCM decoder/speaker amplifier	P-SSOP30-56-0.65	—	—
ML610346	2.2～5.5	4.096MHz(Crystal oscillation/ceramic oscillation/ external output)32kHz(Internal RC oscillation)	0.25μs/ 31.25μs	1.2μA	-40～+85	Mask	128K(*21)	—	—	1K	8	4	16	2 (16bit×1)	—	—	—	1	12bit×3 (Sequential)	—	1	1	—	—	11:9	Built-in sound playback/ ADPCMdecoder/speaker amplifier/ 3-ch OP amplifier	P-TQFP64-1010-0.50	—	—
ML610Q346	2.2～5.5	4.096MHz(Crystal oscillation/ceramic oscillation/ external output)32kHz(Internal RC oscillation)	0.25μs/ 31.25μs	1.5μA	-40～+85	Flash	128K(*21)	—	—	1K	8	4	16	2 (16bit×1)	—	—	—	1	12bit×3 (Sequential)	—	1	1	—	—	11:9	Built-in sound playback/ ADPCMdecoder/speaker amplifier/ 3-ch OP amplifier	P-TQFP64-1010-0.50	—	—
ML610347	2.2～5.5	4.096MHz(Crystal oscillation/ceramic oscillation/ external output)32kHz(Internal RC oscillation)	0.25μs/ 31.25μs	1.2μA	-40～+85	Mask	128K(*21)	—	—	1K	8	4	16	2 (16bit×1)	—	—	—	1	12bit×12 (Sequential)	—	1	1	—	—	11:9	Built-in sound playback/ADPCM decoder/speaker amplifier	P-TQFP64-1010-0.50	—	—
ML610Q347	2.2～5.5	4.096MHz(Crystal oscillation/ceramic oscillation/ external output)32kHz(Internal RC oscillation)	0.25μs/ 31.25μs	1.5μA	-40～+85	Flash	128K(*21)	—	—	1K	8	4	16	2 (16bit×1)	—	—	—	1	12bit×12 (Sequential)	—	1	1	—	—	11:9	Built-in sound playback/ADPCM decoder/speaker amplifier	P-TQFP64-1010-0.50	—	—
ML610Q355	2.2～3.6	8MHz(Internal PLL/external output) 4kHz(Internal RC oscillation)	0.122μs/ 250μs	1.2μA	-40～+85	Flash	88K (*22)	1K (Self-rewritable)	—	1K	4	3	8	4 (16bit×2)	—	—	—	1	12bit×4 (Sequential)	—	2	2	VLS×1	—	16:3	Built-in sound playback/ ADPCMdecoder/speaker amplifier/ 3-ch OP amplifier	P-TQFP48-0707-0.50	—	—
ML610Q356	2.2～3.6	8MHz(Internal PLL/external output) 4kHz(Internal RC oscillation)	0.122μs/ 250μs	1.2μA	-40～+85	Flash	88K (*22)	1K (Self-rewritable)	—	2K	6	3	12	8 (16bit×4)	—	—	—	1	12bit×4 (Sequential)	—	2	2	VLS×1	—	20:5	Built-in sound playback/ ADPCMdecoder/speaker amplifier/ 3-ch OP amplifier	P-TQFP64-1010-0.50	—	—
ML610Q359	2.2～3.6	8.192MHz(Internal PLL/external output) 32.768kHz(Crystal oscillation)	0.122μs/ 30.5μs	1.7μA	-40～+85	Flash	160K(*22)	3K (Self-rewritable)	—	2K	8	3	29	8 (16bit×4)	—	—	—	1	12bit×4 (Sequential)	—	2	2	VLS×1	—	20:7	Built-in sound playback/ADPCM decoder/speaker amplifier	P-TQFP64-1010-0.50	—	—
ML610Q360	2.2～3.6	8.192MHz(Internal PLL/external output) 32.768kHz(Crystal oscillation)	0.122μs/ 30.5μs	1.7μA	-40～+85	Flash	160K(*22)	3K (Self-rewritable)	16M	2K	8	3	29	8 (16bit×4)	—	—	—	1	12bit×4 (Sequential)	—	2	2	VLS×1	—	20:7	Built-in sound playback/ADPCM decoder/speaker amplifier	P-TQFP64-1010-0.50	—	—
ML610Q380	2.2 (*7) ～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	-40～+70	Flash	128K(*21)		—	2K	7	4	34	6 (16bit×3)	—	16bit (*6) ×2	—	1	10bit×8 (Sequential)	1 (*11)	2	2	BLD×1	Max. 96dot 24seg.×4com.	21:5	Built-in sound playback/ADPCM decoder/speaker amplifier	P-QFP80-1414-0.65	—	—
ML610Q383	2.2 (*7) ～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	-40～+70	Flash	128K(*21)		4M	2K	7	4	34	6 (16bit×3)	—	16bit (*6) ×2	—	1	10bit×8 (Sequential)	1 (*11)	2 (*8)	2	BLD×1	Max. 96dot 24seg.×4com.	21:5	Built-in sound playback/ADPCM decoder/speaker amplifier	P-QFP80-1414-0.65	—	—
ML610Q384	2.2 (*7) ～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	-40～+70	Flash	128K(*21)		8M	2K	7	4	34	6 (16bit×3)	—	16bit (*6) ×2	—	1	10bit×8 (Sequential)	1 (*11)	2 (*8)	2	BLD×1	Max. 96dot 24seg.×4com.	21:5	Built-in sound playback/ADPCM decoder/speaker amplifier	P-QFP80-1414-0.65	—	—
ML610Q385	2.2 (*7) ～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	-40～+70	Flash	128K(*21)		16M	2K	7	4	34	6 (16bit×3)	—	16bit (*6) ×2	—	1	10bit×8 (Sequential)	1 (*11)	2 (*8)	2	BLD×1	Max. 96dot 24seg.×4com.	21:5	Built-in sound playback/ADPCM decoder/speaker amplifier	P-QFP80-1414-0.65	—	—

ML610100 Series

Part Number	Operating Condition					ROM/RAM					Function / Feature															Package	Chip support	Remarks
	Operating Voltage(V)	Operating Frequencty (Max.)	Minimum Instruction Execution Time	Current (*1) Consumption (Typ.@HALT)	Operating Temperature (℃)	ROM Type	ROM Capacity (Byte)	Data Flash Capacity (Byte)		RAM Capacity (Byte)	Port (*2) Input	Port (*2) Output	Port (*2) Input/Output	8bit Timer	1kHz Timer	PWM	Capture	WDT	ADC (Method)	Serial Ports I2C	Serial Ports SSIO(*3)	Serial Ports UART(*4)	Supply Voltage Detection	LCD Driver	Interrupt Sources Internal:External	Additional Functions			
5V Driven Type * Product name with underline: Application is limited to consumer devices. Product name without underline: For both consumer devices and industrial devices. For applications to industrial devices, please contact ROHM sales representatives in advance.																												
ML610Q101 NEW	2.7～5.5	8.192MHz(Internal PLL/external output) 32.768kHz(Internal RC oscillation)	0.122μs/ 30.5μs	—	-40～+85	Flash	4K (*24)	—		256	—	—	11	6 (16bit×3)	—	16bit×1	—	1	10bit×6 (Sequential)	—	—	1	VLS×2	—	17:5	Comparator	P-SSOP16-0225-0.65/P-WQFN16-0404-0.50	Under development	—
ML610Q102 NEW	2.7～5.5	8.192MHz(Internal PLL/external output) 32.768kHz(Internal RC oscillation)	0.122μs/ 30.5μs	—	-40～+85	Flash	6K (*24)	—		256	—	—	11	6 (16bit×3)	—	16bit×1	—	1	10bit×6 (Sequential)	—	—	1	VLS×2	—	17:5	Comparator	P-SSOP16-0225-0.65/P-WQFN16-0404-0.50	Under development	—
ML610Q111 NEW	2.7～5.5	8.192MHz(Internal PLL/external output) 32.768kHz(Internal RC oscillation)	0.122μs/ 30.5μs	—	Under normal operation -40～+105/ during FLASH ROM write/delete -20～+85	Flash	24K (*24)	4K (Self-rewritable)		2K	—	—	15	6 (16bit×3)	—	16bit×6	—	1	10bit×6 (Sequential)	1 (*14)	1	2	VLS×2	—	23:7	Comparator	P-TSSOP20-0225-0.65	—	—
ML610Q112 NEW	2.7～5.5	8.192MHz(Internal PLL/external output) 32.768kHz(Internal RC oscillation)	0.122μs/ 30.5μs	—	Under normal operation -40～+105/ during FLASH ROM write/delete -20～+85	Flash	32K (*24)	4K (Self-rewritable)		4K	—	—	25	6 (16bit×3)	—	16bit×6	—	1	10bit×8 (Sequential)	1 (*14)	1	2	VLS×2	—	23:7	Comparator	P-LQFP32-0707-0.80	—	—
ML610Q172 NEW	2.2～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	Under normal operation -40～+85/ during FLASH ROM write/delete 0～+40	Flash	128K (*21) (Self-rewritable)	2K (Self-rewritable)		4K	6	2	37	6 (16bit×3)	—	16bit (*6) ×3	—	1	10bit×12 (Sequential)	1 (*11)	2	2	BLD×1	Max. 96dot 24seg.×4com.	21:4	Low speed frequency correction	QFP64-P-1414-0.80	—	—
ML610Q173 NEW	2.2～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	Under normal operation -40～+85/ during FLASH ROM write/delete 0～+40	Flash	128K (*21) (Self-rewritable)	2K (Self-rewritable)		4K	6	2	37	6 (16bit×3)	—	16bit (*6) ×3	—	1	10bit×8 (Sequential)	1 (*11)	2	2	BLD×1	Max. 96dot 24seg.×4com.	23:4	Low speed frequency correction/Comparator	QFP64-P-1414-0.80	—	—
ML610Q174 NEW	2.2～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	Under normal operation -40～+85/ during FLASH ROM write/delete 0～+40	Flash	128K (*21) (Self-rewritable)	2K (Self-rewritable)		4K	6	6	49	6 (16bit×3)	—	16bit (*6) ×3	—	1	10bit×12 (Sequential)	1 (*11)	2	2	BLD×1	Max. 128dot 32seg.×4com.	23:4	Low speed frequency correction/Comparator	P-QFP80-P-1420-0.80	—	—
ML610Q178	2.2～5.5	8.192MHz(Internal PLL/Crystal oscillation/ ceramic oscillation/external output) 32.768kHz (Internal RC oscillation/Crystal oscillation)	0.122μs/ 30.5μs	2.0μA	-40～+85	Flash	128K(*21)	—		4K	7	8	59	6 (16bit×3)	—	16bit (*6) ×2	—	1	10bit×16 (Sequential)	1 (*11)	2	2	BLD×1	Max. 160dot 40seg.×4com.	20:5	Low speed frequency correction	P-QFP100-1420-0.65	—	—

ML610790 Family

Part Number	Operating Condition					ROM/RAM				Function / Feature														Package	Chip support	Remarks
	Operating Voltage(V)	Operating Frequencty (Max.)	Minimum Instruction Execution Time	Current (*1) Consumption (Typ.@HALT)	Operating Temperature (℃)	ROM Type	ROM Capacity (Byte)	Data Flash Capacity (Byte)	RAM Capacity (Byte)	Port (*2) Input	Port (*2) Output	Port (*2) Input/Output	8bit Timer	1kHz Timer	PWM	Capture	WDT	ADC (Method)	Serial Ports I2C	Serial Ports SSIO(*3)	Serial Ports UART(*4)	Serial Ports I2C/SPI (*16) Host Communication	Serial Ports UART/IrDA (*17)	Interrupt Sources Internal:External	Additional Functions			
Sensor control type * Product name with underline: Application is limited to consumer devices. Product name without underline: For both consumer devices and industrial devices. For applications to industrial devices, please contact ROHM sales representatives in advance.																											
ML610Q793 NEW	VDD:1.7～1.9 AVDD:2.5～3.6	4.096MHz(Internal PLL) 32.768kHz(external output)	0.25μs/ 30.5μs	0.6μA	Under normal operation -30～+85/ during FLASH ROM write/delete -30～+60	Flash	64K (*21) (Self-rewritable)	—	4K	—	—	21	6 (16bit×3)	—	—	—	1	12bit×3 (Sequential)	1 (*11)	1	1	1	1 (IrDA not allowed)	14:16	16-bit multiplication, division, sum-of-product operation, root operation, host interface (SPI/I2C/logging RAM: 8KB)	S-UFLGA48-3.06×2.96-0.40 (WCSP48)	—	—
ML610Q794G NEW	2.5～3.6	4.096MHz(Internal PLL)/3.6864MHz(Crystal (*10) oscillation) 32.768kHz(Crystal oscillation)	0.25μs/0.27μs/ 30.5μs	0.7μA	Under normal operation -30～+85/ during FLASH ROM write/delete -30～+60	Flash	64K (*21) (Self-rewritable)	—	4K	—	—	21	6 (16bit×3)	—	—	—	1	12bit×2 (Sequential)	1 (*11)	1	1	1	1	14:16	16-bit multiplication, division, sum-of-product operation, root operation, host interface (SPI/I2C/logging RAM: 8KB)	TQFP-48-P-0707-0.50	—	—

*1 : Low current consumption during Suspended (HALT) Mode via low-speed oscillation
*2 : Including secondary functions
*3 : No compatible chip select signals for 8-/16-bit SPI bus
*4 : Half-duplex communication system is used.
*5 : No resistive/capacitive sensor connecting terminal
*6 : IGBT control is also supported.
*7 : Operating voltage for ADC and sound playback function is 4.5V to 5.5V.
*8 : 1ch is used for P2ROM access
*9 : Flash ROM can be rewritten only by Flash writer.
*10 : Required when using IrDA
*11 : Only the Master function can support Fast mode (400kbps)/Standard mode (100kbps).
*12 : Only the Master function can support Standard mode (50kbps).
*13 : Master: Standard Mode (100kbit/s, 25kbit/s) support, Slave: Standard Mode (100kbit/s) support
*14 : Master - Fast Mode (400kbps)/Standard Mode (100kbps) support, Slave - Standard Mode (100kbit/s) support
*15 : Master - Standard Mode (100kbit/s, 25kbit/s) support
*16 : Slave module for Host communication. Function switchable between I2C and SPI
*17 : UART uses full-duplex communication system. IrDA uses SIR system.
*18 : Operating voltage for ADC and 8.192MHz operation is 2.2V to 5.5V.
*21 : 1K-byte test area included
*22 : 544-byte test area included
*23 : 256-byte test area included
*24 : 32-byte test area included
*31 : 1K-byte LCD RAM allocation included
*32 : 240×9-bit LCD allocation RAM included

Microcontroller

ARM-Based 32-bit Microcontroller Specifications

Description	Part Number	Built-in Memory			CPU Core	Operating Frequency (Max.)	Operating Condition			Peripherals								Package
		ROM /Flash	RAM	Cash			Supply Voltage (V)	Operating Temperature (℃)	Supply Currency (Typ.)	General-purpose Ports	Timer	PWM	WDT	A/D	Serial Ports	Interrupt Internal/ Enternal	Additional Peripheral Functions	
For General-purpose Applications	ML674000	–	8KByte	–	ARM7TDMI	33MHz	I/O:3.0～3.6 core:2.25～2.75	-40～85	55mA (Operating at 16MHz)	32	7	16bit×2	16bit×1	10bit A/D 8ch	UART 2ch	19/5	DMA controller 2ch External memory controller 〔ROM(Flash)、SRAM、DRAM(EDO/SDRAM)、IO〕 STOP mode	TQFP128 LFBGA144
	ML674001		32KByte						52mA(33MHz, when using external ROM)	42				10bit A/D 4ch	UART 2ch SSIO 2ch I²C 1ch	23/5	DMA controller 2ch/External memory controller 〔ROM(Flash)、SRAM、DRAM(EDO/SDRAM)、IO〕 STOP mode	LQFP144 LFBGA144
	ML675001			8KByte unified		60MHz			92mA(60MHz, when using external ROM)									
For Space Saving Applications	ML67Q4050	64KByte(Flash)	16KByte	–		33MHz	I/O:3.0～3.6 core:2.25～2.75		70mA (Operating at 33MHz)	108	7 (6 share the circuit with PWM as muiti-functional timer)	8 (6 share the circuit with timer as multi-functional timer)	16bit×1	10bit A/D 4ch	UART 3ch I²C 1ch SPI 2ch	35/5	DMA controller 2ch External memory controller 〔ROM(Flash)、SRAM、IO〕 RTC, I²S(send, receive) 1ch STOP mode	LQFP144 LFBGA144
	ML67Q4051	128KByte(Flash)																
	ML67Q4060	64KByte(Flash)					I/O:2.25～3.6 core:2.25～2.75		65mA (Operating at 33MHz)	40						26/5	DMA controller 2ch RTC I²S(send, receive) 1ch STOP mode	TQFP64 WCSP64 LFBGA84
	ML67Q4061	128KByte(Flash)																
For Amusement	ML675011	–	64KByte	8KByte unified	ARM7TDMI	60MHz	I/O:3.0～3.6 core:1.35～1.65	0～70	126mA (60MHz, when using external ROM)	26	7	16bit×2	16bit×1	–	UART 1ch SSIO 1ch	18/5	DMA controller 2ch External memory controller 〔ROM(Flash)、SRAM、DRAM(EDO/SDRAM)、IO〕	LQFP144
	ML675013	–	64KByte	8KByte unified	ARM7TDMI	56MHz	I/O:3.0～3.6 core:1.35～1.65	0～70	160mA (56MHz, Output load is a load of the LSI tester.)	34	7 (6 share the circuit with PWM as muiti-functional timer)	8 (6 share the circuit with timer as multi-functional timer)	16bit×1	–	UART 3ch SPI 2ch I²C 2ch SSIO 1ch SBTX (*1) 6ch	39/5	DMA controller 10ch (2ch compatible with ML675011) External memory controller 〔ROM(Flash)、SRAM、DRAM(SDRAM)、IO〕	LQFP144

*1：SBTX is a serial bus dedicated for output.

Low-power consumption solar power generator control LSI specifications

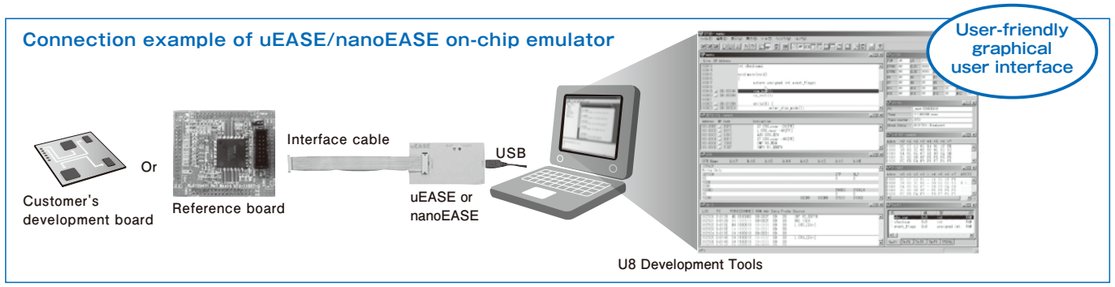
Part Number	Operating Condition				Function/Feature			
	Operating Voltage VBAT(V)	Operating Voltage VSC(V)	Current Consumption (A) at VBAT	Operating Temperature (℃)	VBAT-VDO Output Impedance	VSC-VBAT Secondary Battery Recharge Potential Difference	Overcharge Protection Voltage VLD (V)	Low Voltage Detection Voltage VTBOT (V)
ML9077	0.0～3.2	0.0～3.6	80n	-20～+70	50mV/20mA @VBAT≧1.8V	0.1V/1mA @VSC≧2V	2.6/3.1	1.15/1.8

Part Number	Operating Condition				Function/Feature		
	Operating Voltage VBAT(V)	Operating Voltage VSC(V)	Current Consumption (A) at VBAT	Operating Temperature (℃)	VBAT-VDO Output Impedance	VSC-VDO Input impedance	Regulator voltage (V)
ML9078-001	1.1～3.6	0.0～4.0	80n	-20～+70	150mV/2mA@VBAT≧2V	130mV/2mA@VBAT≧2V	3.3/1.65
ML9078-002	1.1～3.6	0.0～4.0	80n	-20～+70	150mV/2mA@VBAT≧2V	130mV/2mA@VBAT≧2V	3.0/1.5
ML9078-003	1.1～3.6	0.0～4.0	80n	-20～+70	150mV/2mA@VBAT≧2V	130mV/2mA@VBAT≧2V	VBAT

Microcontroller

8-bit Microcontroller Program Development Support System

Development Support System's Tool Screen and Connection Example



On-chip debug emulator uEASE/nanoEASE

This compact, cost-saving emulator supports onboard debugging and writing to Flash memory by utilizing on-chip debugging functions when connected to the actual device.

U8 Development Tools

This software suite consists of project management tools, build tools, debug tools and Flash programming tools and provides effective support for program development. Users can smoothly perform programming to debug process using the package's intuitive graphical user interface.

Reference board with built-in microcomputer

This is a board with a built-in microcomputer and minimum essential components. Users can connect this board to uEASE/nanoEASE to test operation of ML610400/ML610300/ML610100 series products as well as ML610790 family products. Users also can develop software and process Flash writing using this board.

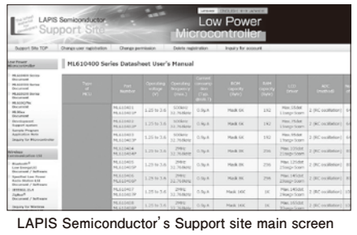
On-chip Emulator uEASE/nanoEASE Specification Overview

	uEASE	nanoEASE
Support device	Microcomputer with on-chip debug functions	Microcomputer with built-in single power Flash memory and on-chip debug functions
Operating voltage	VTref=1.55V～5.5V(Input voltage to VTref signal)	3.3V (Input voltage to VTref signal)
Emulation	Real-time emulation, step emulation Step in/Step out/Step over	
Break	Go to Cursor / Break point Address path count Path count: 1 to 65,536 RAM data match 1 point Conditions: Mask setting - Address and data, Access method – Read, write, Access unit: Byte, Word Establishment conditions: Equal, Not Equal, Path count: 1 to 65,536	
Display/change	Program space/Data space/SFR/Register	
Run time measurement	Unit: 100μS Maximum measurement time: 119 hours (free run)	
Flash writing function	Functions for downloading programs to the Flash memory built in the target microcomputer (when using a microcomputer with a built-in Flash memory)	
Host interface	USB2.0 High-Speed	USB2.0 Full-Speed
Supply voltage	+5V、500mA (Supplied by USB VBUS on the HOST PC)	
Outside dimension	50.0(D)90.0(W)17.0(H)[mm]	50.0(D)60.0(W)7.0(H)[mm]
Weight	50g	15g

About LAPIS Semiconductor's Support on the Web

LAPIS Semiconductor provides latest information on a dedicated Web site for registered users.
Registered users can receive the following benefits:

- Downloading latest data sheets/users manuals including preliminary versions.
- Downloading latest software tools.
- Receiving e-mail regarding product update information from LAPIS Semiconductor



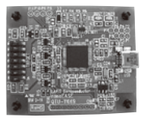
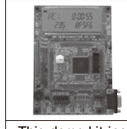
LAPIS Semiconductor's Support site main screen

To access to the support page, users are required to register for obtaining an ID and password. Open the support page from the LAPIS Semiconductor's Web site or enter the following URL and click [New Registration] button.
Support page URL https://www.lapis-semi.com/cgi-bin/MyLAPIS/regi/login.cgi

LAPIS Semiconductor's Web site

Support site login screen

Product Line-up

Product	Main Contents		Support Microcontrollers
uEASE	 On-chip emulator uEASE (main unit)  U8 Development Tools  USB cable  uEASE Interface cable	uEASE main unit uEASE interface cable USB cable U8 Development Tools (*) ·Project management tool ·Build tool ·Debug tool ·Flash programming tool (FWuEASE Flash writer) ·LcdAtU8LCD image tool ·ROM code generation tool for code entry ·Each tool's user's manuals	ML610400/ ML610300/ ML610100 Series, and ML610790 Family
	uEASE is a general on-chip emulator and support all the 8bit Flash microcomputers. "U8 Development Tools" software suit is included. This suit provides program build, debug and Flash writing functions.	<U8 Development Tools operating environment> ·Windows XP, Windows Vista*, Windows 7* *32bit(x86)/64bit(x64) are supported.	
nanoEASE	 On-chip emulator nanoEASE (main unit)  U8 Development Tools  USB cable  nanoEASE Interface cable	nanoEASE main unit nanoEASE interface cable USB cable U8 Development Tools (*) ·Project management tool ·Build tool ·Debug tool ·Flash programming tool (FWuEASE Flash writer) ·LcdAtU8LCD image tool ·ROM code generation tool for code entry ·Each tool's user's manuals	Please contact LAPIS Semiconductor for applicable microcontrollers.
	nanoEASE an on-chip emulator and supports 8-bit Flash microcomputers that is operated with a single power supply (voltage developed internally). "U8 Development Tools" software suit is included. This suit provides program build, debug and Flash writing functions.	<U8 Development Tools operating environment> ·Windows XP, Windows Vista*, Windows 7* *32bit(x86)/64bit(x64) are supported.	
Reference Board	 Reference board with built-in microcomputer	Reference board main unit User's manual (*)	Please contact LAPIS Semiconductor for details.
	This is a board with a built-in microcomputer and minimum essential components. Users can test operation of microcomputers. Users also can develop software and process Flash writing using this board.		
ML610400 Series Demo kit	 ML610Q431 Reference board + ML610400 Series Demo board  Sample Peripheral drivers	ML610Q431 Reference board +ML610400 Series Demo board Sample peripheral drivers (*) API manual, AP note, manuals for each board	ML610400 Series
	This demo kit includes "ML610Q431 Reference Board", which consists of various additional devices including on-board temperature and humidity sensors as a standard component. If you need to use another reference board other than "ML610Q431 Reference Board", please purchase a necessary reference board and components.		
MWuEASE	 MWuEASE Flash multi writer	MWuEASE Flash multi writer (*) ·Flash programming tool ·User's manual	ML610400/ ML610300/ ML610100 Series, and ML610790 Family
	MWuEASE Flash multi writer can write program files to multiple Flash memory units (maximum 32 units) of a single type. If you use MWuEASE, please purchase corresponding number of uEASE units.		
Speech LSI Utility	 Speech synthesis utility tool Speech LSI Utility	Speech LSI Utility (*) ·Speech synthesis utility tool ·User's manual	ML610300 Series
	This tool enables users to convert a WAV format file to LAPIS Semiconductor's original ADPCM2 format and to edit phrases. In addition, users can easily manipulate voice data such as sound clipping/connection and fade-in/fade-out.	<Speech LSI Utility operating environment> ·Windows XP, Windows Vista*, Windows 7* *32bit(x86)/64bit(x64) are supported. ·Windows compatible 16-bit or higher sound card and speaker	

* Software and manuals can be downloaded from member's Web site "LAPIS Semiconductor Low Power Microcontroller Support Page

Speech synthesis LSI

Speech synthesis LSI Overview

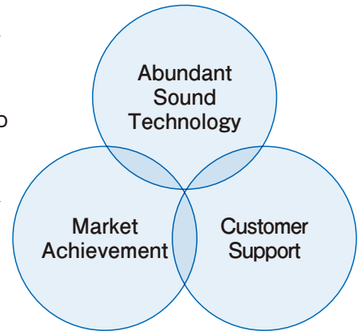
Product Overview

Playbacks "human voice" and "sound effect" in clear sound

- ●Abundant Market Achievement: This product has been used in a variety of applications, such as toys and cars, for around 30 years.
- ●We offer a wide selection of products, focusing on superior sound quality ADPCM method.
- ●We provide a wide range of customer support covering recording and sample creation

Peripheral Technology
- ·Ultra low power
- ·P2ROM™/Flash/Mask ROM
- ·High-output speaker amplifier class AB/class D
- ·8bit RISC CPU

Abundant Market Achievement
Home Electronics/Consumer electronics/
Car Electronics/Industrial Electronics/
Toy/Communication Device/Security…



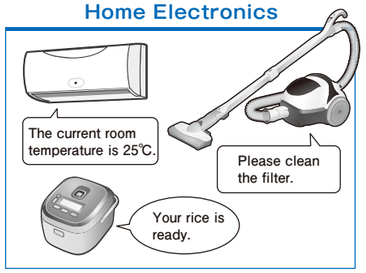
Sound Technology
- ·ADPCM2/Non-linear PCM/HQ-ADPCM
- ·High frequency compensation filter
- ·Speech speed conversion/ pitch conversion

Customer Support
- ·Contract Narrator with rich experience in LSI processing
- ·Recording support/Voice analysis, Editing/ Sound effect creation

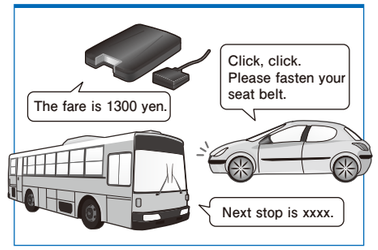
Application Examples

This is a “Speech LSI” which has superior features in reproducing and recording natural sound.

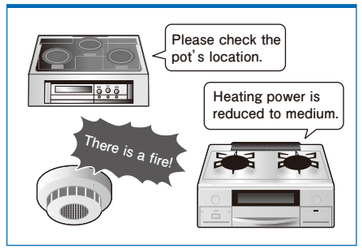
Home Electronics



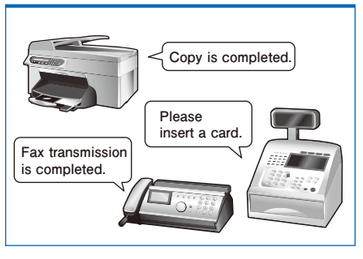
Car Electronics



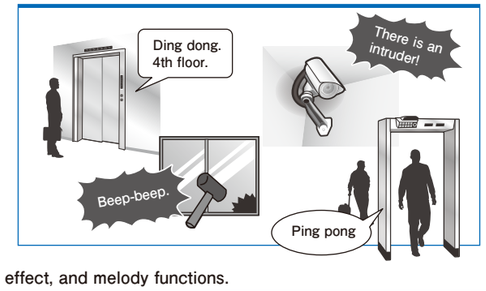
House Equipment



Consumer Electronics/IT



Industrial Electronics



Toy

This product is used in voice guidance, sound effect, and melody functions.

Product Line-up

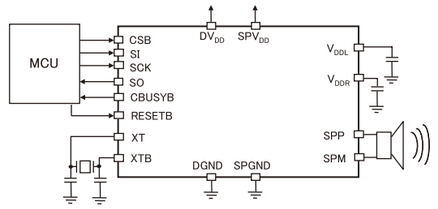
A variety of functions provide support for your applications.
We also offer products for universal design.

Speech synthesis LSI with built-in large-capacity P2ROM™ This product can be used in a variety of applications, including home and industrial electronics.	ML228xxSeries ML227xxSeries
Speech synthesis LSI with built-in medium/small-capacity Flash/Mask ROM Suitable for applications that need short sounds or sound effects, such as security alarms and toys.	ML2256xSeries ML223xxSeries
Speech synthesis LSI for automotive Suitable for in-vehicle applications, such as indicator sound, ETC, and meter panel.	ML2257xSeries ML223xxSeries
8-bit microcontroller with speech function Suitable for security alarms, toys, etc. Simple control and high-quality speech playback functions are integrated on a single chip.	ML61034xSeries ML61035xSeries ML61038xSeries
Speech synthesis LSI with external memory Memory of 128M bits with a built-in speaker amplifier can be connected for long-time playback.	ML224xxSeries

This product list shows main products of speech synthesis LSI.

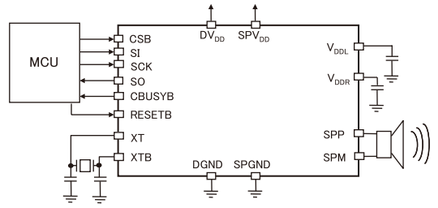
Applied Circuit

Speech synthesis LSI with built-in large-capacity P2ROM™



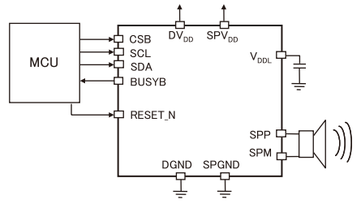
Product features of ML2282x
- ●Built-in speaker amplifier
  0.7W AB-class (at 5.0V)
- ●Various products for different CPU I/Fs
  SPI : ML2282x
  I²C : ML2286x
- ●Wide selection of P2ROM™ memory capacity
  4 Mbit/8 Mbit/16 Mbit

Speech synthesis LSI for automotive



Product features of ML22Q5xx
- ●Built-in speaker amplifier
  1.0W AB-class (at 5.0V)
- ●Rated operating temperature
  -40°C ~ +105°C
- ●High quality speech playback
  Built-in HQ-ADPCM

Speech synthesis LSI with built-in medium/small-capacity Flash ROM



Product features of ML22Q3x4
- ●Built-in speaker amplifier
  1.0W D-class (at 5.0V)
- ●Various products for different CPU I/Fs
  SPI: ML22Q374
  I²C: ML22Q394
- ●Reduced mounting space/parts
  Small pin PKG (SSOP16)/built-in oscillator

Speech synthesis LSI

Speech synthesis LSI with built-in large-capacity P2ROM™

Description	Part Number
I²C interface 2ch simultaneous playback/ speaker amplifier installed	ML22863
	ML22864
	ML22865
I²C interface Speech-speed and pitch conversion function installed/speaker amplifier installed	ML22763
	ML22764
	ML22765
Clock synchronous serial interface 2ch simultaneous playback/ speaker amplifier installed	ML22823
	ML22824
	ML22825
Clock synchronous serial interface Speech-speed and pitch conversion function installed/speaker amplifier installed	ML22723
	ML22724
	ML22725
Clock synchronous serial interface Built-in P2ROM/OTP	ML22802/ML22P802
	ML22804/ML22P804
	ML22808/ML22P808

Speech synthesis LSI with built-in large-capacity P2ROM™

Part Number	Operating Voltage(V)	Operating Frequency	Operating Temperature (℃)	ROM Capacity(bit)	Number of Phrases	Maximum Playback Time(sec)(*1)	CPU I/F	SP Amp Output (W)/Class	Number of Mixing (Internal)	DAC	Others	Package
ML22863	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 4M	4096 (*2)	258	I²C	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22864	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 8M	4096 (*2)	520	I²C	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22865	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 16M	4096 (*2)	1044	I²C	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22763	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 4M	4096 (*2)	258	I²C	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22764	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 8M	4096 (*2)	520	I²C	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22765	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 16M	4096 (*2)	1044	I²C	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22823	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 4M	4096 (*2)	258	Clock synchronous serial	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22824	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 8M	4096 (*2)	520	Clock synchronous serial	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22825	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 16M	4096 (*2)	1044	Clock synchronous serial	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22723	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 4M	4096 (*2)	258	Clock synchronous serial	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22724	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 8M	4096 (*2)	520	Clock synchronous serial	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22725	2.7～3.6 or 4.5～5.5	4.096MHz	-40～+85	P2ROM™ 16M	4096 (*2)	1044	Clock synchronous serial	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22802/ML22P802	2.7～3.6	4.096MHz	-20～+85	P2ROM™ /OTP 2M	512 (*3)	131	Clock synchronous serial	—	1ch	12bit	—	SSOP30
ML22804/ML22P804	2.7～3.6	4.096MHz	-20～+85	P2ROM™ /OTP 4M	1024 (*4)	262	Clock synchronous serial	—	1ch	12bit	—	SSOP30
ML22808/ML22P808	2.7～3.6	4.096MHz	-20～+85	P2ROM™ /OTP 8M	1024 (*4)	524	Clock synchronous serial	—	1ch	12bit	—	SSOP30

*1 : Maximum playback time when the sampling frequency is 4kHz in ADPCM2.
*2: 1024 phrases (1 bank) × 4 banks
*3: 256 phrases (1 bank) × 2 banks
*4: 256 phrases (1 bank) × 4 banks

Speech synthesis LSI with built-in medium/small-capacity Flash/Mask ROM

Description	Part Number
Clock synchronous serial interface type Built-in Mask ROM	ML22562
Clock synchronous serial interface type Built-in Flash/Mask ROM	ML22563/ML22Q563
	ML22331/ML22Q331
	ML22321/ML22Q321
Clock synchronous serial interface type Built-in Flash ROM	ML22Q374
I²C interface type Built-in Flash ROM	ML22Q394
Stand alone type Built-in Flash ROM	ML22341/ML22Q341

Speech synthesis LSI with built-in medium/small-capacity Flash/Mask ROM

Part Number	Operating Voltage(V)	Operating Frequency	Operating Temperature (℃)	ROM Capacity(bit)	Number of Phrases	Maximum Playback Time(sec)	CPU I/F	SP Amp Output (W)/Class	Number of Mixing (Internal)	DAC	Others	Package
ML22562	2.7～5.5	4.096MHz	-40～+85	Mask 2M	1024	98 (*1)	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
ML22563/ML22Q563	2.7～5.5	4.096MHz	-40～+85	Mask/Flash 4M	1024	201 (*1)	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
ML22331/ML22Q331	2.3～5.5	4.096MHz	-40～+85	Mask/Flash 896K	30	43 (*1)	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection Temperature protection circuit	SSOP30
ML22321/ML22Q321	2.3～5.5	4.096MHz	-40～+85	Mask/Flash 896K	62	43 (*1)	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection Temperature protection circuit	SSOP30
ML22Q374	2.0～5.5	4.096MHz (Built-in)	-40～+85	Mask/Flash 692K	30	27 (*2)	Clock synchronization Serial	1.0/ D-class	1ch	—	Disconnection/Short circuit detection Built-in oscillator	SSOP16
ML22Q394	2.0～5.5	4.096MHz (Built-in)	-40～+85	Mask/Flash 692K	30	27 (*2)	I²C	1.0/ D-class	1ch	—	Disconnection/Short circuit detection Built-in oscillator	SSOP16
ML22341/ML22Q341	2.3～5.5	4.096MHz	-40～+85	Mask/Flash 896K	30	43 (*1)	Stand alone	1.0/ AB-class	1ch	16bit	Disconnection detection Temperature protection circuit	SSOP30

*1 : Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.
*2 : Maximum playback time when the sampling frequency is 6.4kHz in ADPCM2.

Speech synthesis LSI with external memory

Description	Part Number
4ch simultaneous playback Serial external memory	ML22460
	ML22420
	ML22594 NEW

Speech synthesis LSI with external memory

Part Number	Operating Frequency	Operating Temperature (℃)	ROM Capacity(bit)	Number of Phrase	Maximum Playback Time	CPU I/F	SP Amp Output (W)/Class	Number of Mixing (Internal)	DAC	Others	Package
ML22460	4.096MHz	-40～+85	External maximum 128M	1024	139min (*1)	I²C	0.7/ AB-class	4ch	16bit	—	SSOP30
ML22420	4.096MHz	-40～+85	External maximum 128M	1024	139min (*1)	Clock synchronization Serial	0.7/ AB-class	4ch	16bit	—	SSOP30
ML22594 NEW	4.096MHz	-40～+105	Mask 6M (*4) External maximum 128M	1024 (*5) (Built-in 512, External 512)	Built-in 303sec (*2) External 109min (*3)	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30

*1 : Maximum playback time when the sampling frequency is 4kHz in ADPCM2.
*2 : Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.
*3 : With an external memory module (Max. 128Mbit). Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.
*4 : Mask's built-in ROM is 6Mbit and an external memory module (Max. 128Mbit) can be connected.
*5 : Total of mask's internal 512 phrases and external memory's 512 phrases.

Speech synthesis LSI

Speech synthesis LSI for automotive

Description	Part Number
Support for 105°C, 4ch simultaneous playback, Built-in Mask ROM+serial external memory	ML22594 NEW
Support for 105°C, 4ch simultaneous playback, Built-in Mask ROM	ML22572
Support for 105°C, 4ch simultaneous playback, built-in Flash/Mask ROM	ML22573/ML22Q573
Support for 105°C, 4ch simultaneous playback, built-in Flash ROM	ML22Q553
Support for 85℃, built-in Flash/Mask ROM	ML22331/ML22Q331
	ML22321/ML22Q321
	ML22341/ML22Q341
Support for 85℃, built-in Flash ROM	ML22Q374
	ML22Q394

Speech synthesis LSI for automotive

Part Number	Operating Voltage(V)	Operating Frequency	Operating Temperature (℃)	ROM Capacity(bit)	Number of Phrases	Maximum Playback Time(sec)	CPU I/F	SP Amp Output (W)/Class	Number of Mixing (Internal)	DAC	Others	Package
ML22594 NEW	4.5～5.5	4.096MHz	-40～+105	Mask 6M (*4) External maximum 128M	1024 (*5) (Built-in 512, External 512)	Built-in 303sec (*1) External 109min (*3)	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30
ML22572	2.7～5.5	4.096MHz	-40～+105	Mask 2M	1024	98 (*1)	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
ML22573/ML22Q573	2.7～5.5	4.096MHz	-40～+105	Mask/Flash 4M	1024	201 (*1)	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
ML22Q553	4.5～5.5	4.096MHz	-40～+105	Flash 4M	1024	201 (*1)	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30
ML22331/ML22Q331	2.3～5.5	4.096MHz	-40～+85	Mask/Flash 896K	30	43 (*1)	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection Temperature protection circuit	SSOP30
ML22321/ML22Q321	2.3～5.5	4.096MHz	-40～+85	Mask/Flash 896K	62	43 (*1)	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection Temperature protection circuit	SSOP30
ML22341/ML22Q341	2.3～5.5	4.096MHz	-40～+85	Mask/Flash 896K	30	43 (*1)	Stand alone	1.0/ AB-class	1ch	16bit	Disconnection detection Temperature protection circuit	SSOP30
ML22Q374	2.0～5.5	4.096MHz (Built-in)	-40～+85	Mask/Flash 692K	30	27 (*2)	Clock synchronization Serial	1.0/ D-class	1ch	—	Built-in disconnection/ short circuit detection oscillation	SSOP16
ML22Q394	2.0～5.5	4.096MHz (Built-in)	-40～+85	Mask/Flash 692K	30	27 (*2)	I2C	1.0/ D-class	1ch	—	Built-in disconnection/ short circuit detection oscillation	SSOP16

*1 : Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.
*2 : Maximum playback time when the sampling frequency is 6.4kHz in ADPCM2.
*3 : With an external memory module (Max. 128Mbit). Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.
*4 : Mask's built-in ROM is 6Mbit and an external memory module (Max. 128Mbit) can be connected.
*5 : Total of mask's internal 512 phrases and external memory's 512 phrases.

8-bit microcontroller with speech function

Description	Part Number
Onboard 10-bit ADC 3ch Built-in Flash ROM	ML610Q304 NEW
Built-in Flash/Mask ROM	ML610340/ML610Q340
OP amplifier and 12-bit ADC 3ch installed Built-in Flash/Mask ROM	ML610346/ML610Q346
12-bit ADC 12ch installed Built-in Flash/Mask ROM	ML610347/ML610Q347
OP amplifier, 12-bit ADC 4ch installed Flash memory, Self-rewritable Built-in Flash memory	ML610Q355
	ML610Q356
12-bit ADC 4ch installed Flash memory, Self-rewritable Built-in Flash memory	ML610Q359
	ML610Q360
10-bit ADC 8ch, onboard LCD Driver Built-in Flash ROM	ML610Q380
	ML610Q383
	ML610Q384
	ML610Q385

◆Speech synthesis method: 4-bit ADPCM2, HQ-ADPCM, 8-bit NL PCM, 8-/16-bit PCM (No onboard HQ-ADPCM on ML610340, Q340, Q355, Q356, Q359, Q360, Q380, Q383, Q384, Q385, Q304)

8-bit microcontroller with speech function

Part Number	Operating Condition				ROM/RAM			Function/Feature							SP Amp Output (W)/ Class	Package
	Operating Voltage(V)	Operating Frequency	Current (*9) Consumption (Typ.@HALT)	Operating Temperature (℃)	ROM Capacity (Byte)	P2ROM Capacity for speech (bit)	RAM Capacity (Byte)	PWM	ADC (Method)	LCD Driver	OP Amplifier	Serial I2C	Serial SSIO(*14)	Serial UART		
ML610Q304 NEW	2.2 (*15) ～5.5	8.192MHz(*5) 32.768kHz(*4)	1.7μA	-40 ～+85	Flash 96K+2K(*10) (Self-rewrite area)	—	1K	—	10bit×3ch (Successive)	—	—	1	2	1	1.0(*16) /D-class	QFP28
ML610340/ML610Q340	2.2 (*1) ～5.5	4.096MHz(*3)	—	-40 ～+85	Mask/Flash(*10) 96K	—	512	—	—	—	—	—	1	—	1.0(*16) /AB-class	SSOP30
ML610346/ML610Q346	2.2 (*1) ～5.5	4.096MHz(*3) 32kHz(*4)	1.2μA/(*17) 1.5μA(*18)	-40 ～+85	Mask/Flash(*10) 128K	—	1K	—	12bit×3ch (Successive)	—	3	—	1	1	1.0(*16) /AB-class	TQFP64
ML610347/ML610Q347	2.2 (*1) ～5.5	4.096MHz(*3) 32kHz(*4)	1.2μA/(*17) 1.5μA(*18)	-40 ～+85	Mask/Flash(*10) 128K	—	1K	—	12bit×12ch (Successive)	—	—	—	1	1	1.0(*16) /AB-class	TQFP64
ML610Q355	2.2 ～3.6	8MHz(*5) 4kHz(*4)	1.2μA	-40 ～+85	Flash 88K+1K(*11) (Self-rewrite area)	—	1K	—	12bit×4ch (Successive)	—	3	—	2	2	0.5(*16) /AB-class	TQFP48
ML610Q356	2.2 ～3.6	8MHz(*5) 4kHz(*4)	1.2μA	-40 ～+85	Flash 88K+1K(*11) (Self-rewrite area)	—	2K	—	12bit×4ch (Successive)	—	3	—	2	2	0.5(*16) /AB-class	TQFP64
ML610Q359	2.2 ～3.6	8.192MHz(*5) 32.768kHz(*6)	1.7μA	-40 ～+85	Flash 160K+3K(*11) (Self-rewrite area)	—	2K	—	12bit×4ch (Successive)	—	—	—	2	2	0.5(*16) /AB-class	TQFP64
ML610Q360	2.2 ～3.6	8.192MHz(*5) 32.768kHz(*6)	1.7μA	-40 ～+85	Flash 160K+3K(*11) (Self-rewrite area)	16M	2K	—	12bit×4ch (Successive)	—	—	—	2	2	0.5(*16) /AB-class	TQFP64
ML610Q380	2.2 (*2) ～5.5	8.192MHz(*7) 32.768kHz(*8)	2.0μA	-40 ～+70	Flash(*10) 128K	—	2K	16bit(*12) ×2	10bit×8 (Successive)	4Com× 24Seg	—	1(*13)	2	2	0.6(*16) /AB-class	QFP80
ML610Q383	2.2 (*2) ～5.5	8.192MHz(*7) 32.768kHz(*8)	2.0μA	-40 ～+70	Flash(*10) 128K	4M	2K	16bit(*12) ×2	10bit×8 (Successive)	4Com× 24Seg	—	1(*13)	1	1	0.6(*16) /AB-class	QFP80
ML610Q384	2.2 (*2) ～5.5	8.192MHz(*7) 32.768kHz(*8)	2.0μA	-40 ～+70	Flash(*10) 128K	8M	2K	16bit(*12) ×2	10bit×8 (Successive)	4Com× 24Seg	—	1(*13)	1	1	0.6(*16) /AB-class	QFP80
ML610Q385	2.2 (*2) ～5.5	8.192MHz(*7) 32.768kHz(*8)	2.0μA	-40 ～+70	Flash(*10) 128K	16M	2K	16bit(*12) ×2	10bit×8 (Successive)	4Com× 24Seg	—	1(*13)	1	1	0.6(*16) /AB-class	QFP80

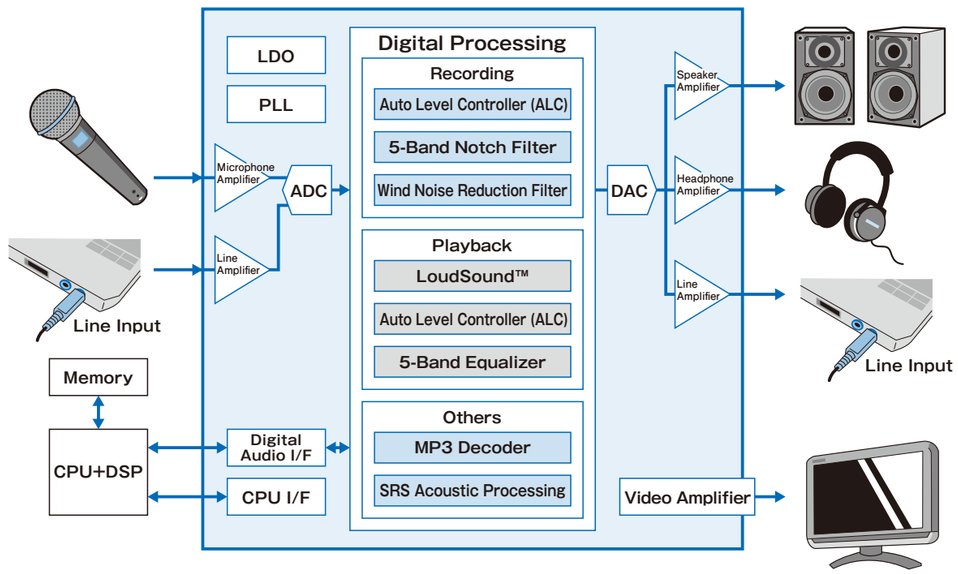
*1: For speech playback function, the operating voltage range is 2.3V to 5.5V.
*2: For ADC and speech playback function, the operating voltage range is 4.5V to 5.5V.
*3: Crystal/ceramic oscillation is supported.
*4: Built-in RC oscillation is supported.
*5: Built-in PLL oscillation is supported.
*6: Crystal oscillation is supported.
*7: Built-in PLL/crystal/ceramic oscillation is supported.
*8: Built-in RC/crystal oscillation is supported.
*9: Current consumption at HALT Mode via low-speed oscillation
*10: 1Kbyte for the testing area is included.
*11: 544Kbyte for the testing area is included.
*12: IGBT control can be supported.
*13: Master function only. Fast mode (400kbps)/standard mode (100kbps) can be supported.
*14: 8-bit/16-bit SPI compatible chip select signal is not available.
*15: The operating voltage range during ADC operation and 8.192 MHz operation is 2.2V to 5.5V.
*16: 304/340/346/347/380/383/384/385: At the operating voltage of 5V, 355/356/359/360: At the operating voltage of 3V.
*17: Built-in Mask ROM
*18: Built-in Flash ROM

Audio LSI for Portable Devices

Audio LSI for Portable Devices Overview

Product Overview

LAPIS Semiconductor's Audio LSI series for portable devices allows audio analog circuits that cannot be mounted on the increasingly high-speed and small-sized CPU and DSP, to all be integrated on a single chip. A range of acoustic technologies suited for your application can also be integrated on a single chip to deliver superior sound quality for your device.



Application Examples

Product Line-up

Part Number	AD/DA Channel	Number of Microphone Inputs	Speaker Output		Effect					Other Function
			Type	Output(W)	Loud Sound™	EQ	Wind Cut	Notch	ALC	
ML26128HB	2/2	6	Monaural Class AB	0.5	○	○	○ (Auto)	○	○ (Fast)	VIDEO、LDO
ML26121AHB	2/2	4	Monaural Class AB	0.5	○	○	○	○	○	—
ML26127HB	1/1	1	Monaural Class AB	0.5	○	○	○ (Auto)	○	○ (Fast)	VIDEO、LDO
ML26125HB	1/1	1	Monaural Class AB	0.5	○	○	○	○	○	VIDEO、LDO
ML26124-00HB	1/1	1	Monaural Class AB	0.5	—	○	○	○	○	VIDEO、LDO
ML26124-02GD	1/1	2	Monaural Class AB	0.5	—	○	○	○	○	VIDEO、LDO
ML2612GD	1/1	1	Monaural Class AB	0.5	—	○	○	○	○	—
ML2614HB	1/1	1	Monaural Class AB	0.5	—	○	○	○	○	—
ML26211EGD	0/1	—	Monaural Class D	2	○	○	—	—	○	—
ML26211DHB	0/1	—	Monaural Class D	2	○	○	—	—	○	—
ML2611GD	0/2	—	Stereo Class AB	0.8	—	○	—	—	—	SRS
ML2611HB	0/2	—	Stereo Class AB	0.8	—	○	—	—	—	SRS
ML2620GD	0/0	—	Monaural Class AB	0.8	○	○	—	—	○	—
ML2620HP	0/0	—	Monaural Class AB	0.8	○	○	—	—	○	—
ML2011GD	0/2	—	Monaural Class AB	0.8	—	—	—	—	—	LowPower MP3 Decoder
ML2011HB	0/2	—	Monaural Class AB	0.8	—	—	—	—	—	LowPower MP3 Decoder

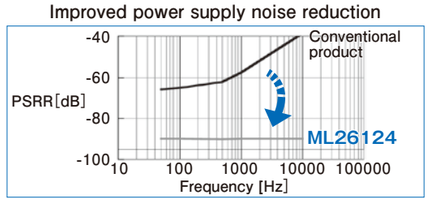
Example of Acoustic Processing Technology

LoudSound™

A small speaker plays back loud sound

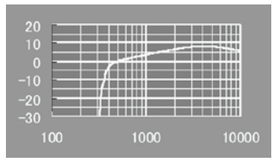
Power supply noise reduction ratio (PSRR)

Improved power supply noise reduction



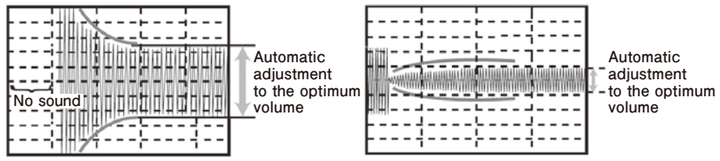
Programmable EQ

Provides a free filter features



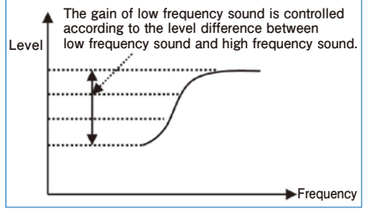
ALC

Loud sound (from a large input signal) / Soft sound (from a small input signal)



Automatic background noise reduction

The gain of low frequency sound is controlled according to the level difference between low frequency sound and high frequency sound.



Audio LSI for Portable Devices

High performance audio CODEC

Description	Part Number
Stereo CODEC WCSP type with automatic wind noise reduction filter and LoudSound™	ML26128HB
Ultra compact stereo CODEC WCSP type	ML26121AHB
Monaural CODEC WCSP type with automatic wind noise reduction filter and LoudSound™	ML26127HB
Monaural CODEC WCSP type with noise tolerance/LoudSound™	ML26125HB
Monaural CODEC WCSP type with noise tolerance	ML26124-00HB
Monaural CODEC with noise tolerance	ML26124-02GD
Ultra compact monaural CODEC	ML2612GD
Ultra compact monaural CODEC WCSP type	ML2614HB

High performance audio CODEC

Part Number	Supply Voltage (V)	ADC		DAC		Full/ Half Duplex	Microphone Input		Speaker Output		Maximum Output	Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect					Other Function	Operating Temperature (°C)	Package	Size (mm×mm)
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural /Stereo						Loud Sound™	EQ	Wind Cut	Notch	ALC			
ML26128HB	2.7-3.6	2	92	2	95	Full	Single Differencial	6	Class AB	Monaural	500mW	Stereo	Stereo	I2C/ SPI	I2S、DSP、LJ、RJ、a-low、μ-low	○	○	○ (Auto)	○	○ (Fast)	VIDEO LDO	-20 ~ +85	WCSP34	2.96 × 2.96
ML26121AHB	HVDD 2.7-3.6 LVDD 1.65-2.75	2	92	2	95	Full	Single Differencial	4	Class AB	Monaural	500mW	Stereo	Stereo	I2C/ SPI	I2S、DSP、LJ、RJ、a-low、μ-low	○	○	○	○	○	—	-20 ~ +85	WCSP34	2.96 × 2.96
ML26127HB	2.7-3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I2S、DSP、LJ、RJ、a-low、μ-low	○	○	○ (Auto)	○	○ (Fast)	VIDEO LDO	-20 ~ +85	WCSP34	2.48 × 2.48
ML26125HB	2.7-3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I2S、DSP、LJ、RJ、a-low、μ-low	○	○	○	○	○	VIDEO LDO	-20 ~ +85	WCSP25	2.58 × 2.48
ML26124-00HB	2.7-3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I2S、DSP、LJ、RJ、a-low、μ-low	—	○	○	○	○	VIDEO LDO	-20 ~ +85	WCSP25	2.56 × 2.46
ML26124-02GD	2.7-3.6	1	92	1	95	Full	Single Differencial Digital	2	Class AB	Monaural	500mW	Monaural	—	I2C/ SPI	I2S、DSP、LJ、RJ、a-low、μ-low	—	○	○	○	○	VIDEO LDO	-20 ~ +85	WQFN32	5.0 × 5.0
ML2612GD	HVDD 2.7-3.6 LVDD 1.65-2.75	1	92	1	95	Half	Single Differencial	1	Class AB	Monaural	500mW	—	—	I2C/ SPI	I2S、DSP、LJ、RJ	—	○	○	○	○	—	-20 ~ +85	WQFN24	4.0 × 4.0
ML2614HB	HVDD 2.7-3.6 LVDD 1.65-2.75	1	92	1	95	Half	Single	1	Class AB	Monaural	500mW	—	—	SPI	I2S、DSP、LJ、RJ	—	○	○	○	○	—	-20 ~ +85	WCSP20	2.46 × 1.96

Audio DAC/Speaker amplifier

Description	Part Number
DAC + filterless class D monaural speaker amplifier	ML26211EGD
DAC + filterless class D monaural speaker amplifier WCSP type	ML26211DHB
DAC + class AB stereo speaker amplifier with SRS acoustic processing	ML2611GD
DAC + class AB stereo speaker amplifier WCSP type with SRS acoustic processing	ML2611HB
Class AB monaural speaker amplifier with LoudSound™	ML2620GD
Class AB monaural speaker amplifier with LoudSound™, WCSP type	ML2620HP

Audio DAC/Speaker amplifier

Part Number	Supply Voltage (V)	ADC		DAC		Full/ Half Duplex	Microphone Input		Speaker Output		Maximum Output	Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect				Other Function	Operating Temperature (°C)	Package	Size (mm×mm)
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural /Stereo						Loud Sound™	EQ	Notch	ALC				
ML26211EGD	SPVDD 2.7-5.5 IOVDD 1.65-3.6 Other 2.25-2.75	—	—	1	95	—	—	—	Class D	Monaural	2W	—	—	I2C/ SPI	I2S、DSP、LJ、RJ	○	○	—	○	—	-20 ~ +85	WQFN24	4.0 × 4.0
ML26211DHB	SPVDD 2.7-5.5 IOVDD 1.65-3.6 Other 2.25-2.75	—	—	1	95	—	—	—	Class D	Monaural	2W	—	—	I2C	I2S、DSP、LJ、RJ	○	○	—	○	—	-20 ~ +85	WCSP20	2.46 × 1.96
ML2611GD	SPVDD 2.7-4.5 HVDD 2.7-3.6 LVDD 2.25-2.75	—	—	2	90	—	—	—	Class AB	Stereo	800mW	Stereo	Stereo	I2C	I2S、DSP、LJ、RJ	—	○	—	—	SRS	-20 ~ +75	WQFN36	6.0 × 6.0
ML2611HB	SPVDD 2.7-4.5 HVDD 2.7-3.6 LVDD 2.25-2.75	—	—	2	90	—	—	—	Class AB	Stereo	800mW	Stereo	Stereo	I2C	I2S、DSP、LJ、RJ	—	○	—	—	SRS	-20 ~ +75	WCSP36	3.16 × 2.96
ML2620GD	SPVDD 2.7-5.5 IOVDD 1.65-3.6 Other 2.25-2.75	—	—	—	—	—	—	—	Class AB	Monaural	800mW	—	—	I2C/ SPI	—	○	○	—	○	—	-20 ~ +85	WQFN20	4.0 × 4.0
ML2620HP	SPVDD 2.7-5.5 IOVDD 1.65-3.6 Other 2.25-2.75	—	—	—	—	—	—	—	Class AB	Monaural	800mW	—	—	I2C/ SPI	—	○	○	—	○	—	-20 ~ +85	WCSP20	2.42 × 2.54

Audio MP3 decoder

Description	Part Number
Low power MP3 decoder	ML2011GD
Low power MP3 decoder WCSP type	ML2011HB

Audio MP3 decoder

Part Number	Supply Voltage (V)	ADC		DAC		Full/ Half Duplex	Microphone Input		Speaker Output		Maximum Output	Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect				Other Function	Operating Temperature (°C)	Package	Size (mm×mm)
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural /Stereo						Loud Sound™	EQ	Notch	ALC				
ML2011GD	SPVDD 2.7-4.5 Other 2.7-3.6	—	—	2	90	—	—	—	Class AB	Monaural	800mW	Stereo	—	SPI/ 8bit	—	—	—	—	—	Low power 2KB FIFO	-20 ~ +85	WQFN32	5.0 × 6.0
ML2011HB	SPVDD 2.7-4.5 Other 2.7-3.6	—	—	2	90	—	—	—	Class AB	Monaural	800mW	Stereo	—	SPI/ 8bit	—	—	—	—	—	Low power 2KB FIFO	-20 ~ +85	WCSP35	3.56 × 4.17

Video LSI

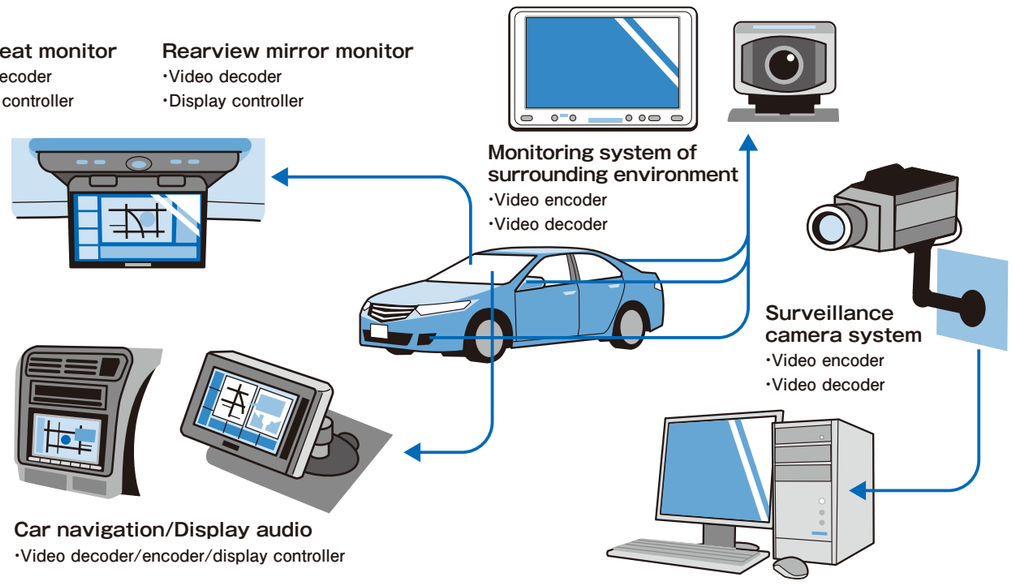
Video LSI Overview

Product Overview

Video LSI is used in a variety of applications including on-vehicle accessory products such as car navigation system, display audio and rear-seat monitor as well as surveillance camera and portable gaming consoles. Based on the signal processing technology for video and display, along with the excellent reliability, we will offer a further selection of products.

- Video Decoder Series
- Video Encoder Series
- Video Interface Series
- Display Controller Series for Small to Medium-Sized TFT LCD
- Evaluation board support

Application Examples



Product Line-up

Video Decoder Series

Composite supported	ML86V76655	ML86V76652/3
Composite/S-video/ supported	ML86101A	ML86V7668A
Composite/S-video/ Component supported	ML86V7675	

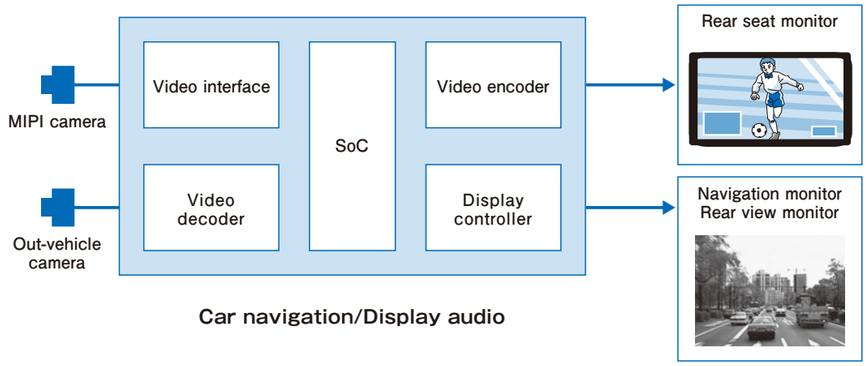
Video Encoder Series: ML86V76580, ML86V7655

Video Interface Series: ML86790 (NEW)

Display Controller Series for Small to Medium-Sized TFT LCD

ML86V8101, ML86V8102, ML86V8201, ML86V8202C, ML86V8207, ML86V8209, ML86V8401

Application Examples



Car navigation/Display audio

Video LSI

Video Decoder Series

Input Format	Part Number
CVBS	ML86V76655
	ML86V76652
	ML86V76653
CVBS or S-video	ML86101A
	ML86V7668A
CVBS&S-video&Component&RGB	ML86V7675

Video Decoder Series

Part Number	Supply Voltage(V)	Operating Temperature (℃)	Input Format	Video Format	Output Format	Pixel Frequency	Sampling Frequency	Crystal Oscillator supported	Feature	Package
ML86V76655	I/O 3.3 or 1.8 Core 1.8	-40～+85	CVBS×2	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8bit	13.5MHz、12.272727MHz、14.75MHz、14.318182MHz	27MHz、24.545454MHz、29.5MHz、28.6363MHz	—	CVBS detection function Dither	WCSP36
ML86V76652	I/O 3.3 or 1.8 Core 1.8	-40～+85	CVBS×2	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8bit	13.5MHz、12.272727MHz、14.75MHz	27MHz、24.545454MHz、29.5MHx	○	Small Low power consumption	WCSP36
ML86V76653	I/O 3.3 or 1.8 Core 1.8	-40～+85	CVBS×2	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8bit	13.5MHz、12.272727MHz、14.75MHz、14.318182MHz	27MHz、24.545454MHz、29.5MHz、28.6363MHz	○	Dither	TQFP48
ML86101A	I/O 3.3 Core 1.5	-40～+85	CVBS×4 or CVBS×2 +S-video×1 or S-video×2	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8bit	13.5MHz、12.272727MHz、14.75MHz、14.318182MHz	27MHz、24.545454MHz、29.5MHz、28.6363MHz	○	Dither AEC-Q100 supported	TQFP48
ML86V7668A	I/O 3.3 Core 2.5	-40～+85	CVBS×4 or CVBS×1 +S-video×3	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8/16bit or RGB 18bit	13.5MHz、12.272727MHz	27MHz、24.545454MHz、	—	RGB output	TQFP100
ML86V7675	I/O 3.3 Core 1.5	-40～+85	CVBS×4+ Component×2 or CVBS×4+S-video×1 +Component×1	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8bit	7.99300MHz ～ 33.333MHz	7.99300MHz ～ 33.333MHz	○	WVGA sampling component input	TQFP64

Video Encoder Series

Output Format	Part Number
CVBS	ML86V76580
CVBS/S-video/Component or RGB	ML86V7655

Video Encoder Series

Part Number	Supply Voltage(V)	Operating Temperature (℃)	Input Format	Video Format	Output Format	Pixel Frequency	Sampling Frequency	Crystal Oscillator supported	Feature	Package
ML86V76580	I/O 3.3 or 1.8 Core 1.8	-40～+85	ITU-R.BT.656 or YCbCr 8bit	NTSC PAL	CVBS	13.5MHz、12.272727MHz、14.75MHz、14.318182MHz	27MHz、24.545454MHz、29.5MHz、28.6363MHz	—	No need of LPF	TQFP48 WCSP25
ML86V7655	I/O 3.3 Core 2.5	-40～+85	ITU-R.BT.656 or YCbCr 8/16/24bit or RGB 24bit	NTSC PAL	CVBS+ S-video+ Component	13.5MHz、12.272727MHz、14.75MHz、14.318182MHz、18MHz	27MHz、24.545454MHz、29.5MHz、28.6363MHz、36MHz	—	I/P、P/I conversion	TQFP100

Video Interface Series

Description	Part Number
MIPI→MIPI/LVTTL Video Interface	ML86790

Video Interface Series

Part Number	Supply Voltage(V)	Operating Temperature (℃)	Input Format	Output Format(LVTTL)	Output Format(MIPI)	Feature	Package
ML86790	I/O 3.3 or 1.8 Core 1.5	-20～+85	MIPI/CSI-2 (2Lane) YUV422 8bit、JPEG 650Mbps/Lane max	YCbCr 16bit (4:2:2) 81MHz (typ)	MIPI/CSI-2 (2Lane) YUV422 8bit、JPEG 650Mbps/Lane max	MIPI/CSI-2 receiver/ transmitter、MIPI to LVTTL translate	WCSP63

Video LSI

Display Controller Series for Small to Medium-Sized TFT LCD

Description	Part Number
TCON, Image adjustment functions included	ML86V8101
	ML86V8102
T-CON, Video decoder included	ML86V8201
	ML86V8202C
	ML86V8207
	ML86V8209
Built-in video decoder and microcomputer	ML86V8401

Display Controller Series for Small to Medium-Sized TFT LCD

Part Number	Supply Voltage (V)		Analog Video Input		Digital Video Input	Digital Video Output	Resolution	OSD	MCU	Feature	Package
			Terminal	Type							
ML86V8101	3.3	-40～+85	—	—	RGB 18bit	RGB 18bit	QVGA ～QHD	—	—	Built-in image quality adjustment function (digital input only)	TQFP64
ML86V8102	3.3	-40～+85	—	—	RGB 18/24bit	RGB 18/24bit	QVGA ～QHD	—	—	RGB 24 bits supported image quality adjustment function	TQFP80
ML86V8201	I/O 3.3 Core 1.5	-40～+85	CVBS×2 or S-video×1	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8/16/24bit or RGB 18/24bit	(ITU-R BT.656 or YCbCr 8bit) +RGB 18/24bit	QVGA ～WVGA	Line	—	Rear camera supported	TQFP100
ML86V8202C	I/O 3.3 Core 1.8	-40～+85	CVBS×2 + Component×2 or CVBS×2 + S-video×1 + Component×1	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8/16/24bit or RGB 18/24bit	ITU-R BT.656 style or YCbCr 8/16/24bit or RGB 18/24bit	QVGA ～WVGA	—	—	Component input supported	TQFP100
ML86V8207	I/O 3.3 Core 2.5	-40～+85	CVBS×4 or CVBS×3+(Component or S-video)×1 or CVBS×2 + S-video×1 +(Component or S-video)×1	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8/16/24bit or RGB 18/24bit	RGB 18/24bit	QVGA ～WVGA	Text Line	—	Built-in OSD function, such as text and icon	LQFP144
ML86V8209	I/O 3.3 Core 2.5	-40～+85	CVBS×4 or CVBS×3+(Comp or S-video)×1 or CVBS×2 + S-video×1 +(Comp or S-video)×1 or CVBS×1 + S-video×2 +(Comp or S-video)×1	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8/16/24bit or RGB 18/24bit	RGB 18/24bit	QVGA ～XGA	Text Line	—	Built-in Picture In Picture function for video synthesis	LQFP176
ML86V8401	I/O 3.3 Core 1.8	-40～+85	CVBS×3 or CVBS×2 + S-video×1	NTSC PAL SECAM	ITU-R BT.656 or YCbCr 8/16/24bit or RGB 18/24bit	ITU-R BT.656 or YCbCr 8/16bit or RGB 18/24bit	QVGA ～WVGA	Text	8051 (8bit)	System control MCU installed	TQFP100

Video LSI

Evaluation board support

Description	Part Number	Contents	Notes
Video Decoder	ML86V76655 Evaluation Board ML86V76652/3 Evaluation Board ML86101A Evaluation Board ML86V7668A Evaluation Board ML86V7675 Evaluation Board	・Evaluation board x 1 ・Power cable x 1 ・Serial cable x 1 ・CD-ROM x 1 (VAStudio (LSI control software), evaluation board manual, evaluation board circuit diagram)	Lending Please contact the sales. (ROHM Co., Ltd.).
Video Encoder	ML86V76580 Evaluation Board ML86V7655 Evaluation Board	・Evaluation board x 1 ・CD-ROM x 1 (Evaluation board manual, evaluation board circuit diagram)	
Display Controller	ML86V8101 Evaluation Board ML86V8102 Evaluation Board ML86V8201 Evaluation Board ML86V8202C Evaluation Board ML86V8207 Evaluation Board ML86V8209 Evaluation Board ML86V8401 Evaluation Board	・Evaluation board x 1 ・AC adapter x 1 ・USB cable x 1 ・CD-ROM x 1 (VAStudio (LSI control software), OSDBuilder (OSD data development support tool) (ML86V8401 only) Evaluation board manual, evaluation board circuit diagram)	

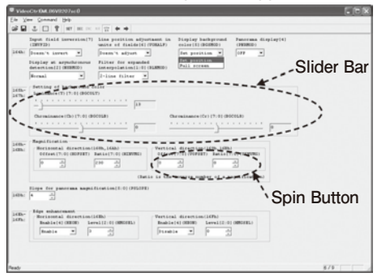
Evaluation Board Example (ML86V8401 Evaluation Board)

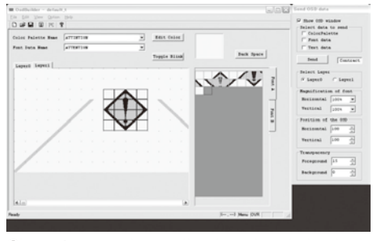
Features:

- ML86V8401 evaluation board is an evaluation board for the display controller ML86V8401.
- Video signals can be displayed on the LCD panel via the ML86V8401.
- Video signal inputs can be applied to NTSC/PAL composite or S-video and digital video signals.
- The function to display still images from the external FLASH memory and data input/output to the SPI-FLASH memory is enabled.
- Functions of the LED backlight control in the external LCD panel can be checked.
- The panel interface provides two types of connecters for 50 pins and 40 pins.
- The interface has connecters for SPI, I^2C, and UART.
- A PC can be used to change registers in the ML86V8401 on the development support software screen.
- The OSD (On-Screen Display) can be easily generated using the development support software.

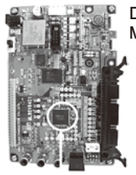
ML86V8401 Evaluation Board Configuration

Main Screen of Development Support Software

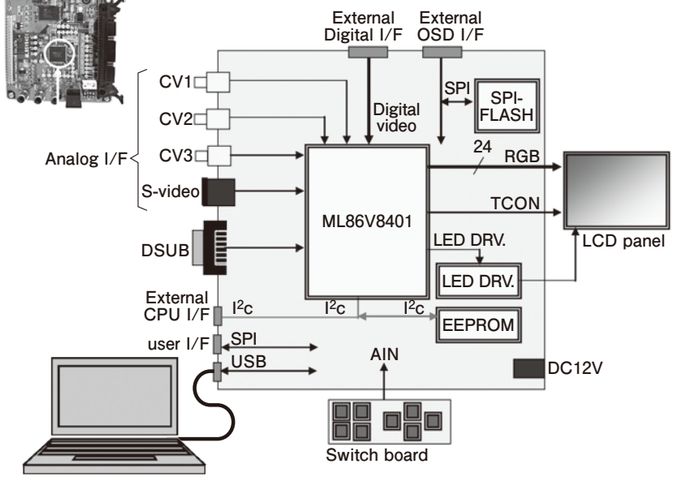




Characters can be easily placed and checked.



Display controller ML86V8401



P2ROM™ Overview

Features

- ●Short lead time ····· Minimizes lead time from code programming to product shipment.
- ●Stock free for customers ····· The customer does not need to store the unprogrammed memory.
- ●No additional programming costs ····· Programming costs - required for OTP and Flash memory - are eliminated.
- ●No mask charging ····· No mask charging for P2ROM™.
- ●Support special markings ····· Similar to mask ROM, special markings can be placed on the package.
- ●Compatible with NOR Fash memory ····· Compatible package available,TSOP(I)56 and TSOP(I)48.

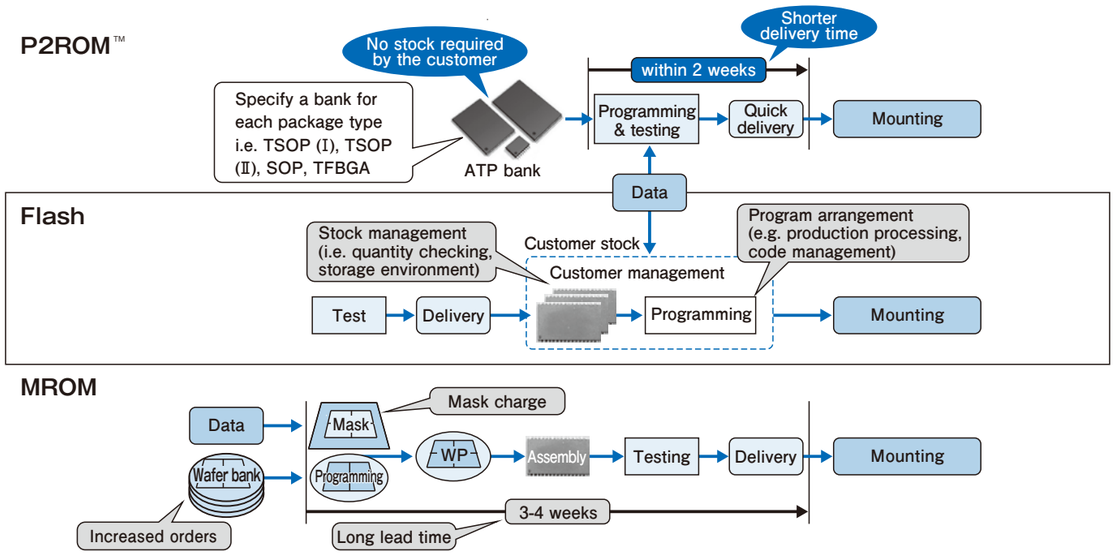
Packages

●SOP44
●SOP16
●SSOP70
●TSOP(I)56
●TSOP(I)48
●TSOP(II)50
●TFBGA48
●LGA140

Applications

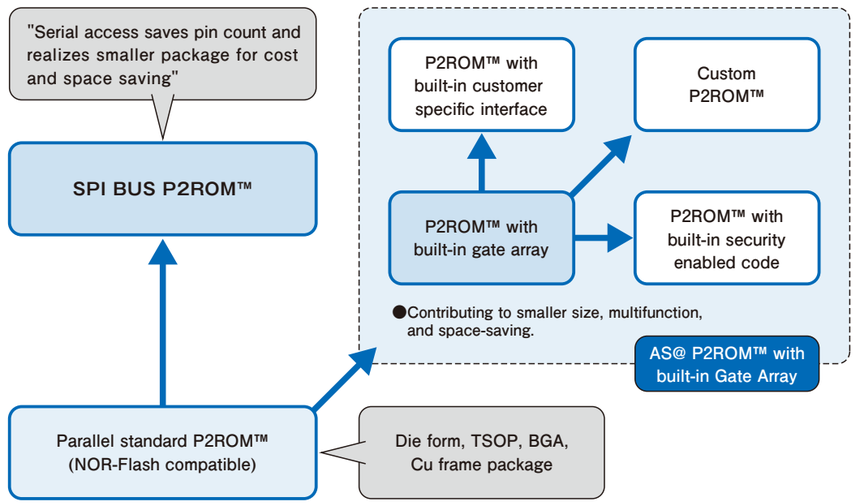
●Consumer Electronics (Game, Toy, Educational Toy, Amusement, Electric Musical Instrument, TV, STB, etc.)
●Information equipment (Printer, etc.)

Comparison of Production Processes between P2ROM™ and Flash/MROM



Product Series of P2ROM™

Based on technology of large capacity and high speed, we provide space-saving and multifunction products on a constant basis.



AS@ P2ROM™ Series with built-in Gate Array

MR35V□□□□□□ 256M~1Gbit
MR25T□□□□□□ 16M~128Mbps

Equipped with Gate Array of 30K/25K gate typ.
Supply Voltage : 3.0V~3.6V / 2.7V~3.6V
Operating Temperature : 0℃~+70℃

Density (bit)	Part Number	Supply Voltage (V)
1G	MR35V01G7xB	3.0~3.6
512M	MR35V5127xB	3.0~3.6
256M	MR35V2567xB	3.0~3.6
128M	MR25T1287xL	2.7~3.6
64M	MR25T647xL	2.7~3.6
16M	MR25T167xL	2.7~3.6
	MR25T1671L	2.7~3.6

AS@ P2ROM™ Series with built-in Gate Array

Density (bit)	Part Number	Configuration (word×bit)	Supply Voltage (V)	Feature	Access Time Random/ Page (ns)	Standby current consumption (Max.)	Operating Temperature (℃)	Package
1G	MR35V01G7xB	128M×8	3.0~3.6	Embedded Gate Array of 30K Gate typ.(*1) 3 input & 8 inout	920/320	10μA	0~+70	TSOP(I)48
512M	MR35V5127xB	64M×8	3.0~3.6	Embedded Gate Array of 30K Gate typ.(*1) 26 input & 8 inout	240/25	10μA	0~+70	TSOP(Ⅱ)44
256M	MR35V2567xB	32M×8	3.0~3.6	Embedded Gate Array of 30K Gate typ.(*1) 3 input & 8 inout	920/320	50μA	0~+70	TSOP(Ⅱ)44
128M	MR25T1287xL	8M×16 16M×8	2.7~3.6	Embedded Gate Array of 30K Gate typ.(*1) 26 input & 16 inout	80~100/25	10μA	0~+70	TSOP(I)48 TSOP(Ⅱ)44
64M	MR25T647xL	4M×16 8M×8	2.7~3.6	Embedded Gate Array of 30K Gate typ.(*1) 26 input & 16 inout	80~100/25	10μA	0~+70	TSOP(I)48 TSOP(Ⅱ)44
16M	MR25T167xL	1M×16 2M×8	2.7~3.6	Embedded Gate Array of 30K Gate typ.(*1) 26 input & 16 inout	70~100/25	50μA	0~+70	TSOP(I)48 TSOP(Ⅱ)44
	MR25T1671L	1M×16 2M×8	2.7~3.6	Password authentication	70/25	50μA	0~+70	TSOP(I)48

*1: The design interface of gate array supports any of spec., RTL, and Netlist.

Parallel Standard P2ROM™ Series

MR26T□□□□□□ 512Mbit
MR37T□□□□□□ 256Mbit
MR27T□□□□□□ 8M~256Mbit
MR27V□□□□□□ 8M~128Mbit

Supply Voltage : 3.0V~3.6V / 2.7V~3.6V
Operating Temperature : 0℃~+70℃

Density (bit)	Part Number	Supply Voltage (V)
512M	MR26T51203L	3.0~3.6
		2.7~3.6
256M	MR27T25603L	3.0~3.6
		2.7~3.6
128M	MR27T12800L	2.7~3.6
	MR27T12802L	3.0~3.6
		2.7~3.6
	MR27V12800L	3.0~3.6
64M	MR27T6402L	3.0~3.6
		2.7~3.6
	MR27V6402L	3.0~3.6
32M	MR27T3202L	3.0~3.6
		2.7~3.6
	MR27V3202L	3.0~3.6
16M	MR27T1602L	2.7~3.6
	MR27V1602L	3.0~3.6
8M	MR27T802F	2.7~3.6
	MR27V802F	3.0~3.6

Parallel Standard P2ROM™ Series

Density (bit)	Part Number	Configuration (word×bit)	Supply Voltage (V)	Access Time (ns)	Current Consumption (Max.) Operating	Current Consumption (Max.) Standby	Operating Temperature (℃)	Package	Socket mounting package	Package Frame
512M	MR26T51203L	32M×16/ 64M×8	3.0~3.6	100	35mA	10μA	0~+70	TSOP(Ⅱ)50	—	—
			2.7~3.6	120						
256M	MR27T25603L	16M×16/ 32M×8	3.0~3.6	100	35mA	10μA	0~+70	TSOP(Ⅱ)50	—	—
			2.7~3.6	120						
128M	MR27T12800L	8M×16/ 16M×8	2.7~3.6	90	25mA	10μA	0~+70	TSOP(I)48	—	—
	MR27T12802L	8M×16/ 16M×8	3.0~3.6	80	25mA	10μA	0~+70	TSOP(Ⅱ)56	—	—
			2.7~3.6	90						
	MR27V12800L	8M×16/ 16M×8	3.0~3.6	85	25mA	10μA	0~+70	Chip	—	—
64M	MR27T6402L	4M×16/ 8M×8	3.0~3.6	70	20mA	10μA	0~+70	SOP44/TSOP(I)48/ TFBGA48	CG/ SOP44	Cu/ TSOP(I)48
			2.7~3.6	90						
			3.0~3.6	80	20mA	10μA	-40~+85	TSOP(I)48		
			2.7~3.6	90						
	MR27V6402L	4M×16/ 8M×8	3.0~3.6	70	20mA	10μA	0~+70	Chip	—	—
32M	MR27T3202L	2M×16/ 4M×8	3.0~3.6	70	20mA	10μA	0~+70	SOP44/TSOP(I)48/ TFBGA48	CG/ SOP44	—
			2.7~3.6	90						
			3.0~3.6	80	20mA	10μA	-40~+85	TSOP(I)48		
			2.7~3.6	90						
	MR27V3202L	2M×16/ 4M×8	3.0~3.6	80	20mA	10μA	0~+70	Chip	—	—
16M	MR27T1602L	1M×16/ 2M×8	2.7~3.6	70	16mA	10μA	0~+70	SOP44/TSOP(I)48/ TFBGA48	CG/ SOP44	Cu/ TSOP(I)48
							-40~+85	TSOP(I)48		
	MR27V1602L	1M×16/ 2M×8	3.0~3.6	70	16mA	10μA	0~+70	Chip	—	—
8M	MR27T802F	512K×16/ 1M×8	2.7~3.6	80	18mA	5μA	0~+70	SOP44/TSOP(I)48	—	—
	MR27V802F	512K×16/ 1M×8	3.0~3.6	70	18mA	5μA	0~+70	SOP44/TSOP(I)48	—	—
				90	18mA	5μA	0~+70	Chip	—	—

Parallel Page Mode P2ROM™ Series

MR36V□□□□□□ 1G~8Gbit
MR37V□□□□□□ 64Mbit~256Mbit
MR26V□□□□□□ 64M~2Gbit
MR27V□□□□□□ 16M~256Mbit

Page Size : 8-word×16 / 8-word×32
Supply Voltage : 3.0V~3.6V
Operating Temperature : 0℃~+70℃

Density (bit)	Part Number	Supply Voltage (V)
16G	MR36V16G56C	3.0~3.6
8G	MR36V08G57C	3.0~3.6
	MR36V08G87C	3.0~3.6
4G	MR36V04G54B	3.0~3.6
	MR36V04G54S	3.0~3.6
2G	MR36V02G54B	3.0~3.6
	MR26V02G54R	3.0~3.6
1G	MR36V01G52B	3.0~3.6
	MR26V01G53L	3.0~3.6
512M	MR26V51252R	3.0~3.6
	MR26V51253L	3.0~3.6
256M	MR37V25653T	3.0~3.6
	MR37V25652T	3.0~3.6
	MR27V25653L	3.0~3.6
128M	MR37V12852B	3.0~3.6
	MR27V12852L	3.0~3.6
	MR27V12852R (Under development)	3.0~3.6
	MR27V12850L	3.0~3.6
64M	MR37V6452B	3.0~3.6
	MR27V6452L	3.0~3.6
	MR27V6452R	3.0~3.6
	MR26V6455J	3.0~3.6
32M	MR27V3252J	3.0~3.6
	MR27V3252R (Under development)	3.0~3.6
16M	MR27V1652L	3.0~3.6

Parallel Page Mode P2ROM™ Series

Density (bit)	Part Number	Configuration (word×bit)	Mode	Page Size	Supply Voltage(V)	Access Time (Address/Page) (ns)	Current Consumption (Max.) Operating	Current Consumption (Max.) Standby	Operating Temperature (℃)	Package	Socket mounting package	Package Frame
16G	MR36V16G56C	256M×64	LVN	endless	3.0~3.6	1000/40	360mA	85mA	0~+70	LGA140 (*1)	CG/ LGA140	—
8G	MR36V08G57C	256M×32	LVN	endless	3.0~3.6	1000/40	180mA	60mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
	MR36V08G87C	256M×32 (*2)	LVN	endless	3.0~3.6	1000/40	180mA	40mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
			NOR	16-word×32		450/40	150mA					
4G	MR36V04G54B	128M×32/ 256M×16	NOR	8-word×32	3.0~3.6	105/25	100mA	85mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
	MR36V04G54S	128M×32/ 256M×16	NOR	8-word×32	3.0~3.6	130/25	100mA	85mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
2G	MR36V02G54B	64M×32/ 128M×16	NOR	8-word×32	3.0~3.6	105/25	100mA	50mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
	MR26V02G54R	64M×32/ 128M×16	NOR	8-word×32	3.0~3.6	105/25	100mA	45mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
1G	MR36V01G52B	64M×16/ 128M×8	NOR	8-word×16	3.0~3.6	105/25	100mA	25mA	0~+70	TSOP(I)56	—	—
	MR26V01G53L	64M×16/ 128M×8	NOR	8-word×16	3.0~3.6	105/25	100mA	10mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
512M	MR26V51252R	32M×16/ 64M×8	NOR	8-word×16	3.0~3.6	105/25	50mA	4mA	0~+70	TSOP(I)56	—	—
	MR26V51253L	32M×16/ 64M×8	NOR	8-word×16	3.0~3.6	100/35	80mA	5mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
256M	MR37V25653T	16M×16/ 32M×8	NOR	8-word×16	3.0~3.6	100/25	35mA	5mA	0~+70	SSOP70 (*1)	CG/ SSOP70	—
	MR37V25652T	16M×16/ 32M×8	NOR	8-word×16	3.0~3.6	100/25	35mA	20μA	0~+70	TSOP(I)56	—	—
	MR27V25653L	16M×16/ 32M×8	NOR	8-word×16	3.0~3.6	100/35	60mA	5mA	0~+70	SSOP70/ (*1) Chip	CG/ SSOP70	—
128M	MR37V12852B	8M×16/ 16M×8	NOR	8-word×16	3.0~3.6	90/30	50mA	10μA	0~+70	TSOP(I)56	—	—
	MR27V12852L	8M×16/ 16M×8	NOR	8-word×16	3.0~3.6	85/30	50mA	10μA	0~+70	TSOP(I)56	—	—
	MR27V12852R (Under development)	8M×16/ 16M×8	NOR	8-word×16	3.0~3.6	80/25	40mA	10μA	-40~+85	TSOP(I)56	—	—
	MR27V12850L	8M×16/ 16M×8	NOR	8-word×16	3.0~3.6	85/30	50mA	10μA	0~+70	TSOP(I)48/ Chip	—	—
64M	MR37V6452B	4M×16/ 8M×8	NOR	8-word×16	3.0~3.6	90/30	50mA	10μA	0~+70	TSOP(I)48/ TSOP(I)56	—	—
	MR27V6452L	4M×16/ 8M×8	NOR	8-word×16	3.0~3.6	90/30	50mA	10μA	0~+70	SOP44/TSOP(I)48/ TSOP(I)56/Chip	CG/ SOP44	—
	MR27V6452R	4M×16/ 8M×8	NOR	8-word×16	3.0~3.6	80/25	40mA	10μA	-40~+85	TSOP(I)48/ TSOP(I)56	—	—
	MR26V6455J	4M×16/ 8M×8	NOR	8-word×32	3.0~3.6	100/30	100mA	20μA	0~+70	SSOP70	—	—
32M	MR27V3252J	2M×16/ 4M×8	NOR	8-word×16	3.0~3.6	70/25	50mA	10μA	0~+70	SOP44/TSOP(I)48	CG/ SOP44	—
	MR27V3252R (Under development)	2M×16/ 4M×8	NOR	8-word×16	3.0~3.6	80/25	40mA	10μA	-40~+85	TSOP(I)48	—	—
16M	MR27V1652L	1M×16/ 2M×8	NOR	8-word×16	3.0~3.6	80/25	60mA	10μA	0~+70	SOP44/TSOP(I)48/ Chip	CG/ SOP44	—

*1: For sockets. Package is not suitable for reflow soldering. *2: Boot-ROM space (128-page×16-word×32-bit) is included.