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OKI
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2010 SHORT FORM CATALOG

2010 SHORT FORM CATALOG

OKI SEMICONDUCTOR CO., LTD.

OKI SEMICONDUCTOR CO., LTD.

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

The application field of electronic devices is diversified and varied,
demanding higher performance and functionality as well as segmen-
tation 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 custom-
ers' requests. If you need any of these, please contact us.

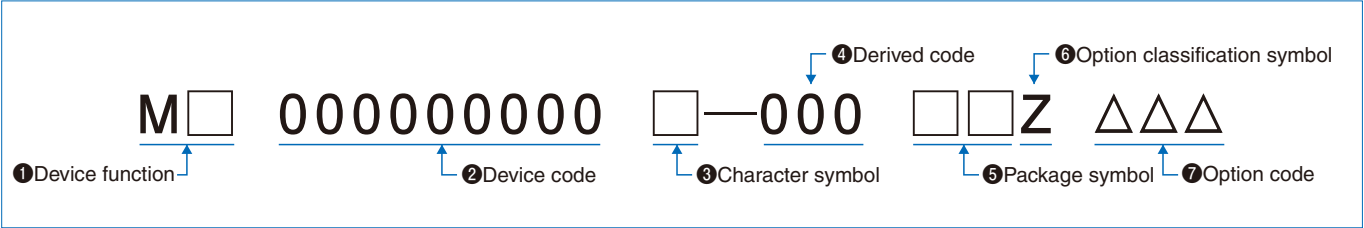
OKI SEMICONDUCTOR CO., LTD.

2010 SHORT FORM CATALOG

Convention of Product Name Assignment for Semiconductor devices

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

Structure of Product Name



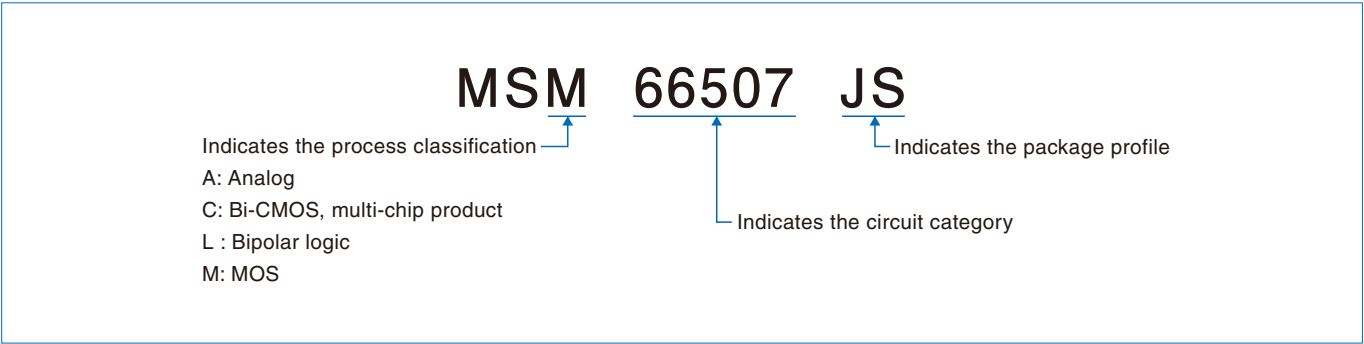
Assignment of Symbols

1 Device function The device functions are classified as follows: MD: DRAM MR: P2ROM, OTPROM MS: SRAM, VRAM, FIFO MG: Gate array, standard cell ML: Logic MK: Module, chip set MT: Driver	2 Device code The device code expresses a function specific to a device using a combination of numbers and alphanumeric characters.	3 Character 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.	4 Derived code The derived code indicates the speed ranking for DRAM products and is used as a derived code for logic products.	5 Package symbol The package symbol expresses the type and lead bending profile of a package in two digits.	6 Option classification symbol The option classification symbol is used to distinguish between the option symbol and the package symbol.	7 Option code The option code indicates a symbol that identifies the specification of a product with an option.
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* Items from 1 "Device function", to 4, "Derived code", are indicated in this catalog.

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

Product Name of Existing Product



* The actual package profile is not shown here.

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Communication LSI

Communication LSI Overview

Product Overview

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

- This product is used in a variety of applications, such as toys, consumer equipment, industrial equipment, and car equipment.
- Based on a variety of communication LSI technology, we offer wide selection of products.
- In addition to offering development tools, we provide advice based on our rich experience to support your development activities.

OFDM Technology

- Reception of Digital Terrestrial Broadcasting

CODEC Technology

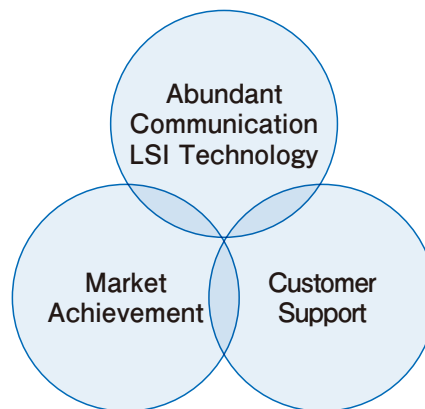
- VoIP CODEC
- PCM CODEC
- ADPCM CODEC

MODEM Technology

- Tele-control IC

Abundant Market Achievement

Home Electronics/Consumer Electronics/
Car Electronics/Industrial Electronics/Toy...



RF-CMOS Technology

- IEEE 802.15.4
- Specified low power radio
- Reception of Digital Terrestrial Broadcasting

Network Technology

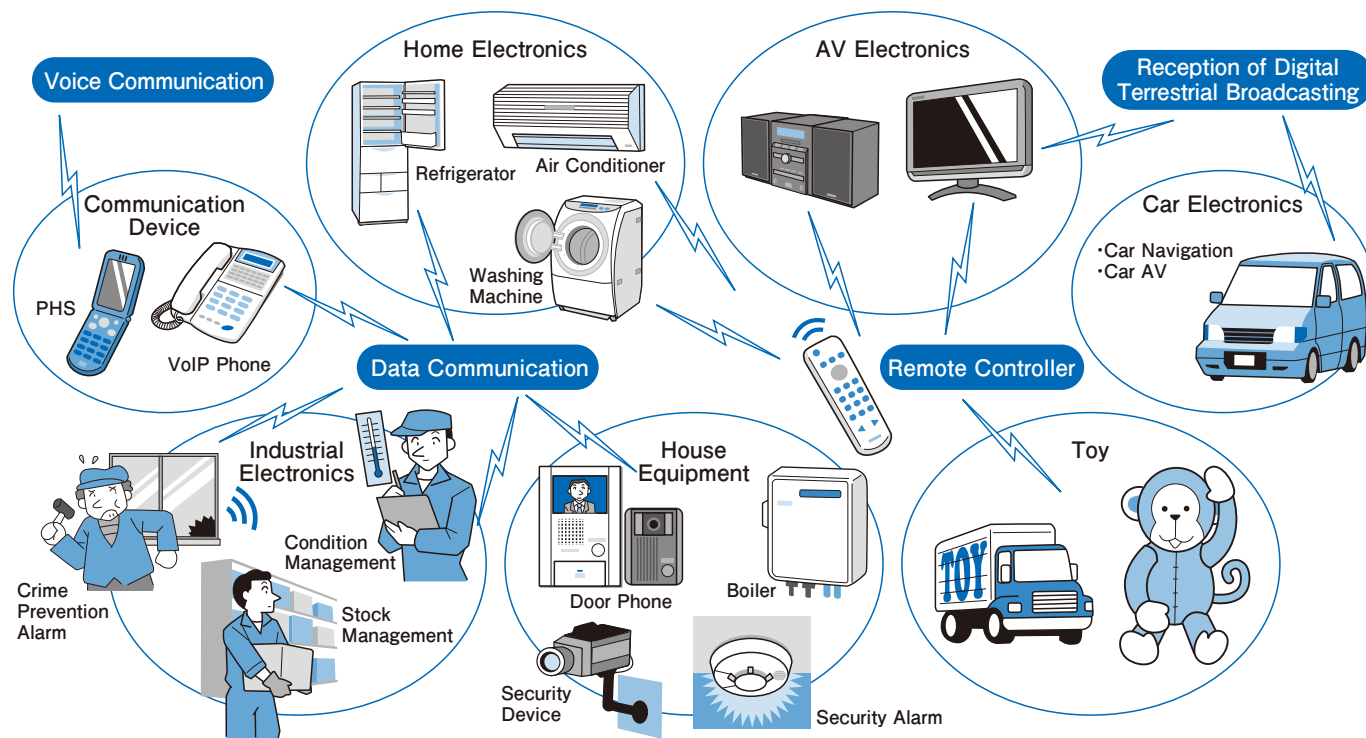
- ZigBee
- RF4CE
- Simple NWK

Customer Support

- Provide development tools
- Provide advice based on rich experiences

Applications

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



This product is used in applications, such as one-seg reception, remote controller, and voice communication.

Product Line-up

A variety of functions provide support for your applications.

Digital terrestrial broadcasting reception LSI

With superior mobile reception features, this product is suitable for one-seg broadcasting reception, portable device, and car device.

ML7107
ML7147

Wireless communication LSI

This product can be used in a variety of applications for products of IEEE 802.15.4/ZigBee and specified low power radio. We also offer it as a module, which can easily be integrated into applications.

ML7222 ML7275
ML7246 ML7066
ML7265 MK72220-01
ML7266 MK72660-01

VoIP LSI

This is a multifunctional LSI, suitable for VoIP phones and broadband routers with built-in VoIP functions.

ML7204-003
ML7234-021
ML7304-0□2

Echo Canceller LSI

This product is suitable for hands-free communication in mobile phones and door phones.

ML7037-003
ML7021
ML7202-001

PHS LSI

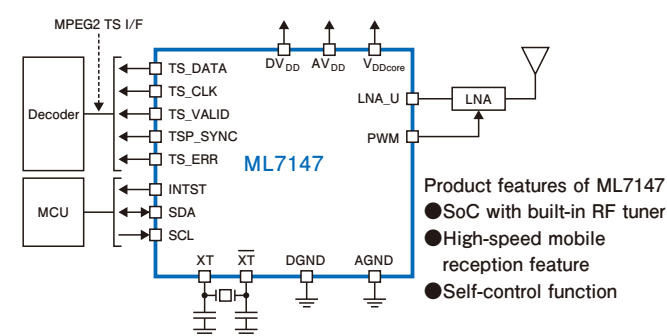
Reliable market achievement

We provide base-band IC for PHS only for the existing PHS manufactures.
For more information, please contact our sales department.

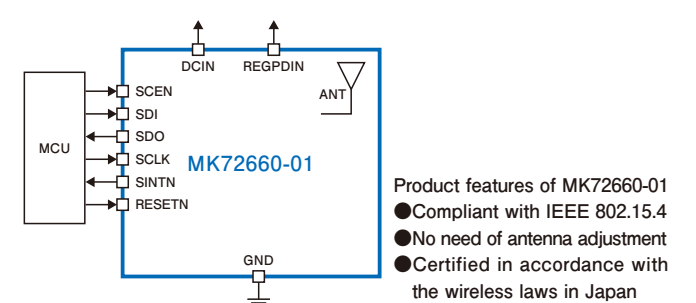
This product list shows only a part of communication LSI.

Applied Circuit

Digital terrestrial broadcasting reception LSI

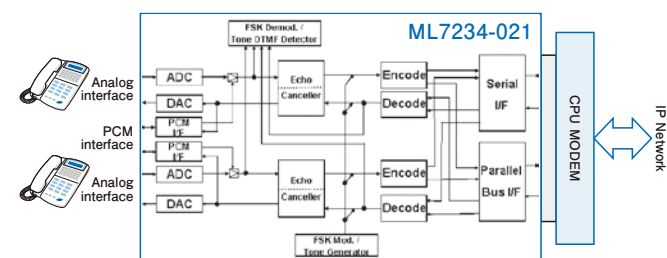


Wireless communication module



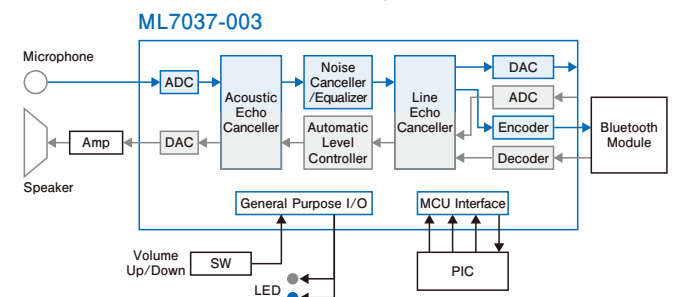
VoIP LSI

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



Echo Canceller LSI

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



Communication LSI

Digital terrestrial broadcasting reception LSI

Description	Part Number
OFDM demodulator for 1/3 segment digital terrestrial broadcasting	ML7107 J
RF tuner + OFDM demodulator for 1 segment digital terrestrial broadcasting	ML7147 J

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

Wireless communication LSI

IEEE802.15.4/ZigBee

Description	Part Number
Single chip LSI with built-in microcontroller	ML7222
USB interface send/receive LSI	ML7246
Serial interface send/receive LSI (NOT support AES function)	ML7265
Serial interface send/receive LSI (Support AES function)	ML7266
Serial interface send/receive LSI (Supports RF4CE)	ML7275 (under development)

Specified low power radio

Description	Part Number
Data send/receive LSI	ML7066 J

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

Wireless communication module

IEEE802.15.4

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

Digital terrestrial broadcasting reception LSI

Part Number	Transmission Standard	Package	Feature	Supply Voltage (V)	Power Consumption	Operating Temperature (°C)
ML7107	ISDB-T ISDB-T _{SB}	53W-CSP	Compliant to One-Seg broadcasting of ISDB-T(ARIB STD-B31) digital terrestrial television broadcasting and ISDB-TSB(ARIB STD-B29) digital terrestrial audio broadcasting. OFDM demodulate, error correction function. Serial, parallel TS output.	2.5~3.3 1.65~3.6 1.35~1.65	18mW (at 1seg reception)	-25~+85
ML7147	ISDB-T	61W-CSP 80WQFN	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.	2.3~3.0 1.5~3.6 1.1~1.3	70mW (at 1seg reception)	-40~+90

Wireless communication LSI

IEEE802.15.4/ZigBee

Part Number	Transmission Standard	Package	Frequency Band Used	Supply Voltage (V)	Modulation Method	Transmission Rate	Transmission Output (dBm)	Reception Sensitivity	Operating Temperature (°C)	
ML7222	IEEE 802.15.4	52VQFN	2.4GHz ISM Band	2.1~3.6	O-QPSK (Offset-QPSK)	250Kbps	-45 to 0 (4 step)	-92dBm [PER<1%] (*1)	-40~+85	
ML7246		48WQFN		3.0~3.6 (Connect USB)			0			
ML7265				2.1~3.6						-45 to 0 (4 step)
ML7266										
ML7275 (under development)		40WQFN		1.8~3.6						

*1: PER means Packet Error Rate.

Specified low power radio

Part Number	Transmission Standard	Package	Frequency Band Used	Supply Voltage (V)	Modulation Method	Transmission Rate	Transmission Output (dBm)	Reception Sensitivity	Operating Temperature (°C)
ML7066	ARIB STD-T67, RCR STD-30	48VQFN	426MHz band 429MHz band	2.1~3.6	BFSK	1.2kbps 2.4kbps 4.8kbps [NRZ] (3-step setting function)	1mW/10mW	-116dBm [BER<1%] (*2)	-25~+65

*2: BER means Bit Error Rate.

Wireless communication module

IEEE802.15.4

Part Number	Transmission Standard	Size	Frequency Band Used	Supply Voltage (V)	HOST I/F	Built-in Antenna	Network Software	Transmission Output (dBm)	Reception Sensitivity	Operating Temperature (°C)
MK72220-01	IEEE 802.15.4	21.5×32.8×2.1mm	2.4GHz ISM Band	2.7~3.6	UART	Chip	Built-in	1mW	-92dBm [PER<1%] (*1)	-20~+60
MK72660-01		30.0×32.0×3.1mm		2.1~3.6	Synchronous serial	Pattern	External control			-20~+70

Communication LSI

VoIP LSI

VoIP CODEC

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

VoIP Processor

Description	Part Number
VoIP Processor	ML7304-0□2

VoIP LSI

VoIP CODEC

Part Number	Package	Speech Compression Method	Operating Frequency	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (°C)
ML7074-003	64QFP	G.729.A/G.726/G.711	4.096MHz	3.0~3.6	65mA	-20~+60
ML7074-004	64QFP	G.729.A/G.711	4.096MHz	3.0~3.6	65mA	
ML7204-003	64QFP	G.729.A/G.711	12.288MHz	3.0~3.6	65mA	
ML7214A-001	100TQFP	G.711	12.288MHz	3.0~3.6	65mA	
ML7224A-001	176LQFP	G.711	12.288MHz	3.0~3.6	125mA	
ML7234-021	100TQFP	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 (°C)
ML7304-0□2	208QFP	G.729.A/G.711/G.722	12.288MHz	3.0~3.6	210mA	-20~+60

Echo Canceller LSI

Echo Canceller

Description	Part Number
Single echo canceller (8ms, μ -law I/F)	ML7021
Dual echo canceller (64ms x 2-ch, μ /A-law I/F)+ ADPCM Transcoder	ML7202-001

Echo Canceller / Noise Canceller

Description	Part Number
Dual echo canceller / noise canceller with dual Codec	ML7037-003

Echo Canceller LSI

Echo Canceller

Part Number	Package	Cancerable Echo Delay Time	Voice Signal Interface	Supply Voltage (V)	Operating Frequency	Notes
ML7021	28SSOP	8ms	μ -law	2.7~5.5	19.2MHz	—
ML7202-001	64TQFP	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	Cancerable Echo Delay Time	Voice Signal Interface	Supply Voltage (V)	Operating Frequency	Notes
ML7037-003	64TQFP	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

CODEC LSI

PCM CODEC

Description	Part Number
5V high integration 2-ch PCM Codec for SLIC	ML7033-01
3V linear PCM Codec (long/short frame sync.)	ML7041
	MSM7732A

ADPCM CODEC

Description	Part Number
G.726 32/24/16k-bps, Multi functions (gain control, sampling freq. control, etc.)	ML7029
G.726 32kbps, Multi functions (gain control, sampling freq. = 8kHz only, etc.)	ML7029C

CODEC LSI

PCM CODEC

Part Number	Package	PCM sign			Number of Channels	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	64QFP	○	○	○	2	4.75~5.25	○	○	3.4Vp-p	20k Ω	×	Best suited to Intersil Corp's RSLIC(TM)-series, 2ch multiplexed time-slot assigned PCM interface, Various tone generators with tone generators, regulators, and I2C I/F
ML7041	48TQFP	○	○	○	1	2.4~3.3	○	○	2.6Vp-p	8 Ω	○	
MSM7732A	48TQFP, 48BGA	○	○	○	1	2.4~3.3	○	○	3.0Vp-p	32 Ω	○	

ADPCM CODEC

Part Number	Package	PCM Interface	Operating Frequency	Supply Voltage (V)	Analog Output	Supply Current (Max.)	Operating Temperature (°C)
ML7029	30SSOP	μ -Law	10.368MHz	2.7~3.6	1.3Vp-p, 20k Ω	12mA	-25~+70
ML7029C							

Communication LSI

Modem LSI

Tele-control IC

Description	Part Number
1200bps, HDX modem, DTMF transceiver, CPT	ML7020

Modem LSI

Tele-control IC

Part Number	Package	Standard	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (°C)
ML7020	32SOP	ITU-T V.23	4.5~5.5	5mA	-40~+85

PHS LSI

Baseband IC for PHS

Description	Part Number
Baseband for PHS	ML7098C-01
	ML7207-01
	ML7338-01
Baseband for PHS supporting W-OAM	ML7257-01

PHS LSI

Baseband IC for PHS

Part Number	Package	CPU Performance	SLOT	Built-in Memory	Supply Voltage (V)
ML7098C-01	208BGA	19.2MHz	2	16KB	3.0V/2.5V
ML7207-01	208BGA		4	128KB	
ML7338-01	176BGA			64KB	3.0V/1.5V
ML7257-01	208BGA	57.6MHz		32KB	

*The products are limited for the user who has the development experience in the PHS devices.
Please inquire to our business charge section for details.

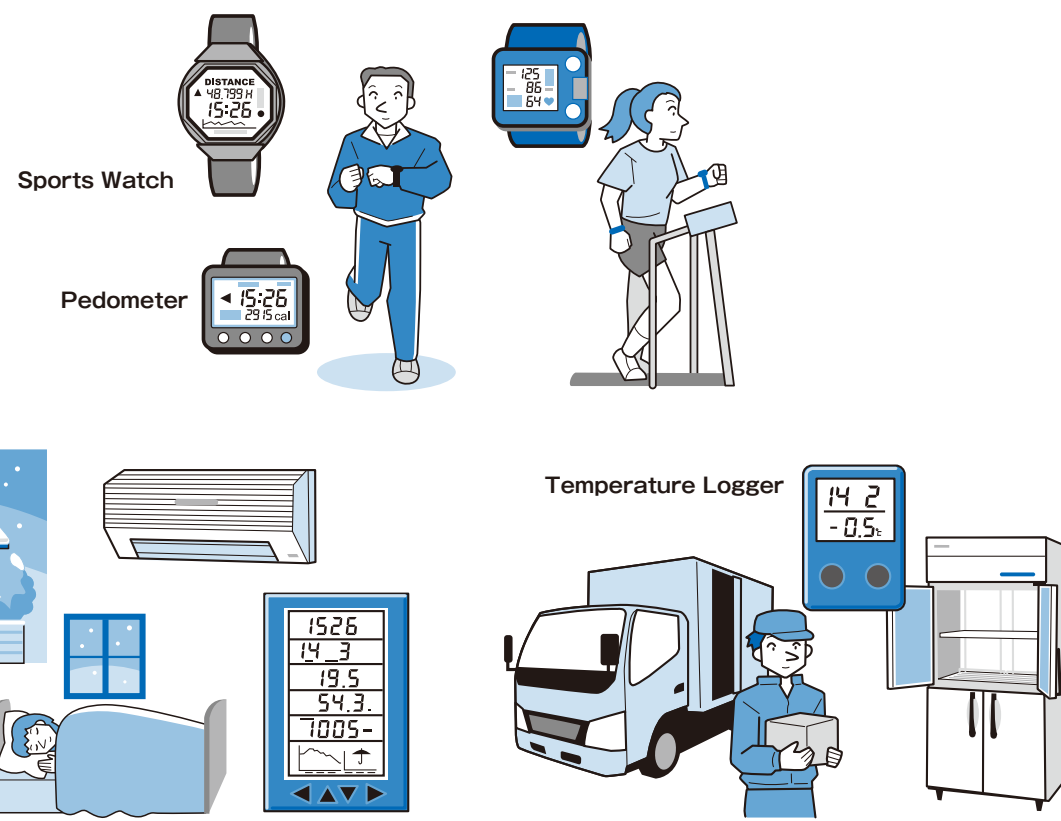
Low Power Microcontroller

ML610Q400 Series Overview

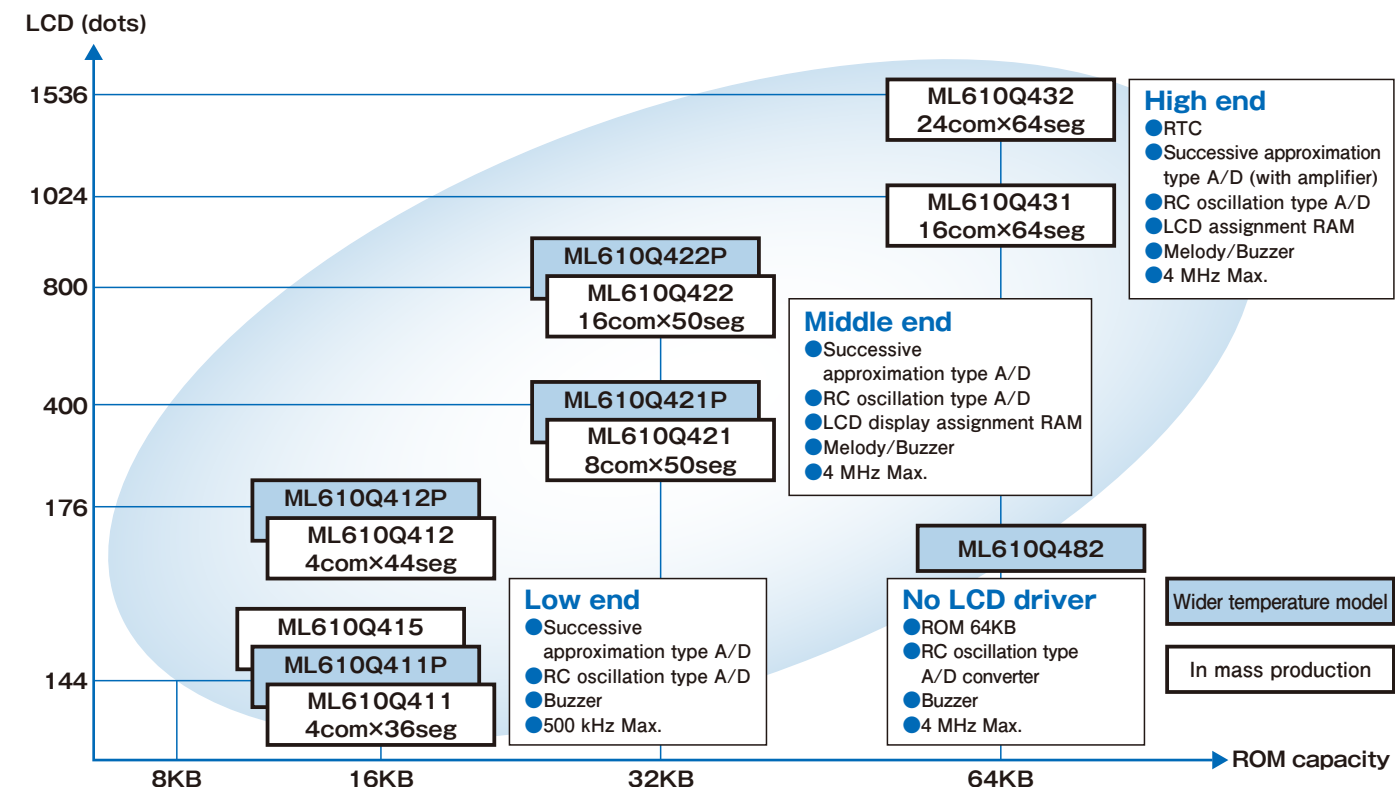
Product Overview

"ML610Q400 Series" is a flash memory which operates at only 1.1V based on our proprietary low power technology. Fine power management, along with a highly-efficient CPU in the RISC architecture, reduces the power consumption. With built-in LCD driver, 2 A/D converters, on-chip debug function, this product is suitable for small portable devices with LCD display, such as wrist watch, pedometer, heart rate monitor, and thermostat. The rewritable flash memory microcontroller shortens the development/production time; the low power feature delivers a smaller/lighter battery; and a variety of built-in peripheral circuits minimize a device size. This product can be operated under wider operating temperatures (-40°C ~ +85°C) so that it can be used in industrial electronics, such as a data logger for food temperature management.

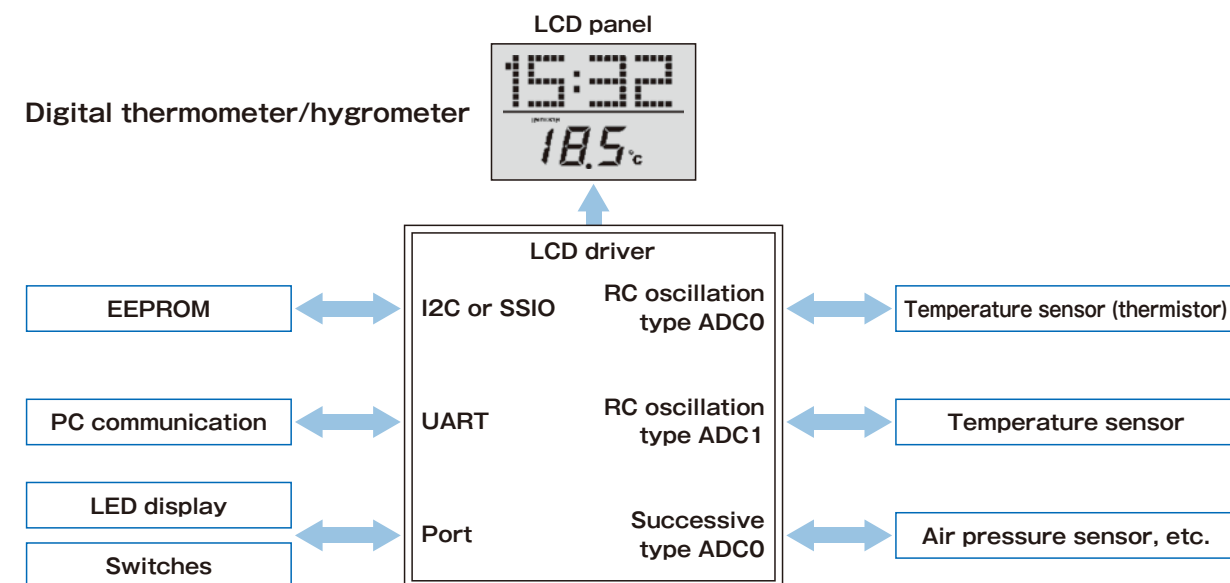
Application Examples



Product Line-up



Applied Circuit



Low Power Microcontroller

ML610Q400 Series

OLMS610K Series (ML610Q4□□)	Multi-dot Type LCD Driver Built-in	ML610Q431 ML610Q432 ML610Q421/ML610Q421P ML610Q422/ML610Q422P
	Small-dot Type LCD Driver Built-in	ML610Q411/ML610Q411P ML610Q412/ML610Q412P ML610Q415
	No LCD Driver	ML610Q482

Part Number	Operating Condition					ROM/RAM		Function / Feature																	Package	Development Tool
	Operating Voltage (V)	Operating (*1) Frequency (Max.)	Minimum Instruction Execution Time	Current (*2) Consumption (Typ.@HALT)	Operating Temperature (°C)	ROM Capacity (Flash) (Byte)	RAM Capacity (Byte)	Port (*3)			8bit Timer	1kHz Timer	PWM	Capture	WDT	ADC (Method)	Serial Ports			Supply Voltage Detection	LCD Driver	Interrupt Sources Internal/External	Additional Functions			
								Input	Output	Input/Output							I2C	SSIO(*6)	UART							
ML610Q431	1.1~3.6	4.096MHz 500kHz 32.768kHz	0.244us 2us 30.5us	0.5μA	-20°C~+70	64K (*7)	3K (*8)	6	3	22	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*4)	1	1	1	Max. 1024dot 64seg.×16com.	20/5	RTC Low speed frequency correction melody/buzzer	Chip 144LQFP	uEASE	
ML610Q432	1.1~3.6	4.096MHz 500kHz 32.768kHz	0.244us 2us 30.5us	0.5μA	-20°C~+70	64K (*7)	3K (*8)	6	3	14	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*4)	1	1	1	Max. 1536dot 64seg.×24com.	20/5	RTC Low speed frequency correction melody/buzzer	Chip 144LQFP	uEASE	
ML610Q421	1.1~3.6	4.096MHz 500kHz 32.768kHz	0.244us 2us 30.5us	0.5μA	-20°C~+70	32K (*7)	2K (*8)	6	3	22	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*4)	1	1	1	Max. 400dot 50seg.×8com.	17/5	Low speed frequency correction melody/buzzer	Chip 120TQFP	uEASE	
ML610Q421P	1.1~3.6	4.096MHz 500kHz 32.768kHz	0.244us 2us 30.5us	0.5μA	-40°C~+85	32K (*7)	2K (*8)	6	3	22	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*4)	1	1	1	Max. 400dot 50seg.×8com.	17/5	Low speed frequency correction melody/buzzer	Chip 120TQFP	uEASE	
ML610Q422	1.1~3.6	4.096MHz 500kHz 32.768kHz	0.244us 2us 30.5us	0.5μA	-20°C~+70	32K (*7)	2K (*8)	6	3	14	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*4)	1	1	1	Max. 800dot 50seg.×16com.	17/5	Low speed frequency correction melody/buzzer	Chip 120TQFP	uEASE	
ML610Q422P	1.1~3.6	4.096MHz 500kHz 32.768kHz	0.244us 2us 30.5us	0.5μA	-40°C~+85	32K (*7)	2K (*8)	6	3	14	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*4)	1	1	1	Max. 800dot 50seg.×16com.	17/5	Low speed frequency correction melody/buzzer	Chip 120TQFP	uEASE	
ML610Q411	1.1~3.6	500kHz 32.768kHz	2us 30.5us	0.5μA	-20°C~+70	16K (*7)	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*5)	1	1	1	Max. 144dot 36seg.×4com.	16/5	Low speed frequency correction buzzer	Chip 120TQFP	uEASE	
ML610Q411P	1.1~3.6	500kHz 32.768kHz	2us 30.5us	0.5μA	-40°C~+85	16K (*7)	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*5)	1	1	1	Max. 144dot 36seg.×4com.	16/5	Low speed frequency correction buzzer	Chip 120TQFP	uEASE	
ML610Q412	1.1~3.6	500kHz 32.768kHz	2us 30.5us	0.5μA	-20°C~+70	16K (*7)	1K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*5)	1	1	1	Max. 176dot 44seg.×4com.	16/5	Low speed frequency correction buzzer	Chip 120TQFP	uEASE	
ML610Q412P	1.1~3.6	500kHz 32.768kHz	2us 30.5us	0.5μA	-40°C~+85	16K (*7)	1K	6	3	14	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*5)	1	1	1	Max. 176dot 44seg.×4com.	16/5	Low speed frequency correction buzzer	Chip 120TQFP	uEASE	
ML610Q415	1.1~3.6	500kHz	2us	5.5μA	-20°C~+70	16K (*7)	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1	2 (RC oscillation) 2 (Successive approximation)	1 (*5)	1	1	1	Max. 176dot 44seg.×4com.	16/5	Low speed frequency correction buzzer	Chip 120TQFP	uEASE	
ML610Q482	1.1~3.6	4.096MHz 500kHz 32.768kHz	0.244us 2us 30.5us	0.5μA	-40°C~+85	64K (*7)	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1	2 (RC oscillation)	1 (*4)	1	1	1	—	16/5	Low speed frequency correction melody/buzzer	Chip 48TQFP	uEASE	

*1: 4MHz supports built-in PLL oscillation/ceramic/crystal oscillation. 500kHz supports RC oscillation. 32KHz supports crystal oscillation.

*2: Current consumption on HALT mode when low speed 32kHz oscillating

*3: Includes secondary function

*4: Only master function can support fast mode (400kbps) / standard mode (100kbps).

*5: Only master function can support standard mode (50kbps).

*6: As SPI compatible of 8bits/16bits, usable chip select signal does not exist.

*7: Includes test area 1kByte.

*8: Includes LCD layout RAM of 1024x8bits.

Low Power Microcontroller

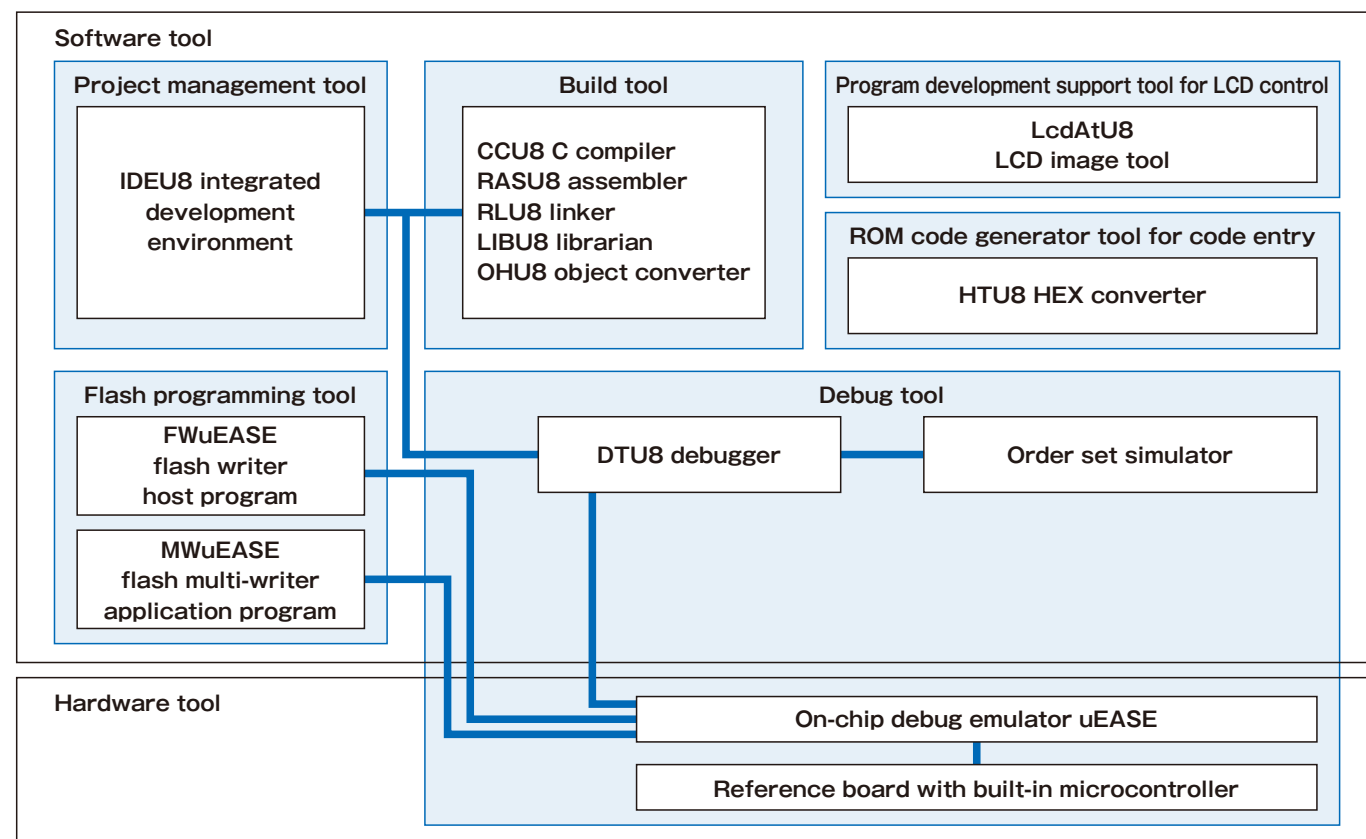
Program Development Support System Overview

Product Overview

We offer the following tools under the U8 software development environment, which helps you to develop and debug programs for ML610Q400 Series.

- Integrated software which facilitates a series of repeated activities during software development, including programming, building (creating objects), and debugging.
- Graphical user interface with user-friendly features
- High-performance optimization C compiler which helps a microcontroller to achieve the highest performance.
- Cost-saving on-chip debug emulator in lightweight and small-size

Components of Tool



Product Line-up

● Under the IDEU8 integrated development environment, the setting and launching of compiler, assembler, debugger, and other software tools. In addition, software development is facilitated by the project management and editor functions.

● HTU8 HEX converter

This tool helps you to create ROM code data to be used for code entry (writing into a flash memory) of your program in our factory.

● LcdAtU8 LCD image tool

When the bitmap file of a LCD panel image and LCD panel layout information are entered, a sample control program and table data for the LCD assignment RAM are automatically created. With the LCD image tool, complicated mapping can be performed much more easily.

The LCD image tool is further divided into 2 parts: LCD image assignment and LCD image check tools.

The LCD image assignment tool helps to map segments between the microcontroller terminal and the LCD panel on the LCD panel image displayed on the PC. The LCD image check tool is a helpful tool for checking the mapping correctness.

● MWuEASE flash multi-writer application program (*1)

This flash writing tool for microcontroller helps to write program files into multiple (up to 32) flash memories of the same type.

● On-chip debug emulator uEASE

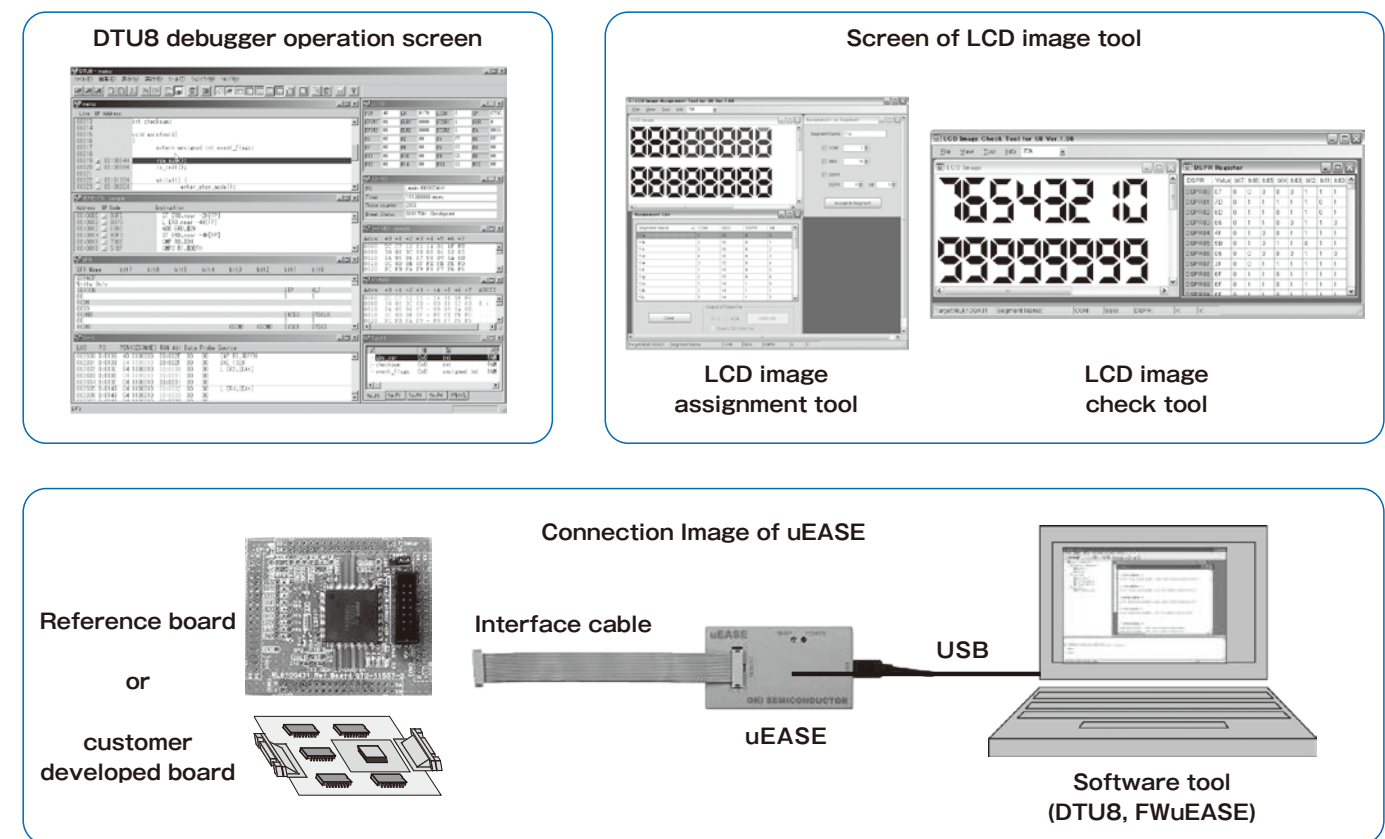
This small and cost-saving emulator supports onboard software debugging and writing to a flash memory when connected to an actual device with on-chip debug functions.

● Reference board

This board has a microcontroller and other essential parts. By connecting to uEASE, you can see how ML610Q400 Series operate. You can also carry out software development and write data into a flash memory.

*1: If you use MWuEASE, you must purchase uEASE for each product.

Example of Tool Screen and Connection



Low Power Microcontroller

Program development support system

Chip	Development tool (hardware)	Software development environment				Reference board
		Code generator tool	Debug tool	Program development support tool for LCD control	Flash multi-writer	
ML610Q431	uEASE (*1)	IDEU8 (*2)	LcdAtU8		MWuEASE (*3)	ML610Q431 reference board
ML610Q432						ML610Q432 reference board
ML610Q421/ML610Q421P						ML610Q421 reference board
ML610Q422/ML610Q422P						ML610Q422 reference board
ML610Q411/ML610Q411P						ML610Q411 reference board
ML610Q412/ML610Q412P						ML610Q412 reference board
ML610Q415						ML610Q415 reference board
ML610Q482			—			ML610Q482 reference board

*1: with uEASE, you can write data into Flash ROM and do debugging.

*2: IDEU8 comprises IDEU8 integrated development environment, CCU8 compiler, RASU8 relocatable assembler, RLU8 linker, LIBU8 librarian, OHU8 object converter, DTU8 debugger, FWuEASE flash writer host program, and HTU8 HEX converter.

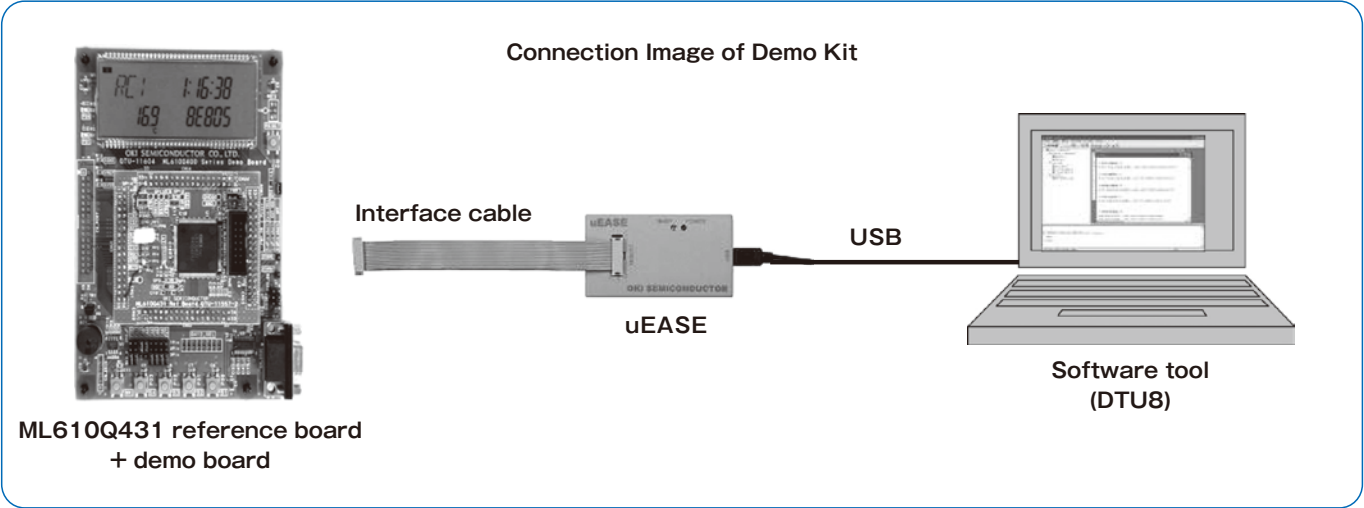
*3: If you use MWuEASE, you must obtain as many uEASE licenses as you need.

●Demo Kit

This kit consists of “ML610Q431 Reference Board”, “Demo Board”, and “Sample Program”. (*4)

With this demo kit, you can “verify” the functions of microcontroller, such as temperature/humidity measurement, stop watch, melody output, UART communication, and LCD display.

By connecting to uEASE, you can verify on the DTU8 debugger how the sample program works.



*4: The “Demo Kit” normally includes “ML610Q431 Reference Board”.

If you want to use a reference board other than “ML610Q431 reference board”, you must buy one additionally.

32-bit Microcontroller

32-bit microcontroller Overview

Product Overview

●De facto standard ARM core

ARM7TDMI™ or ARM946E™ is used for a CPU core. This provides a superior reusability of software.

●Wide selection of products

Based on the customers application, the customer can choose the most suitable microcontroller from wide selection of products.

- ML674001/Q4002/Q4003 ARM7TDMI™, which is suitable for a small system.
- ML675001/Q5002/Q5003 ARM7TDMI™ with 8 Kbyte of unified cache, operating at 60MHz provides high performance.
- ML67Q4060/61/50/51 ARM7TDMI™. These models have a built-in flash memory. The customer can choose from wide selection of packages. WCSP (Wafer level Chip Size Package) delivers the smallest package of ARM microcontroller in the world.
- ML696201/Q6203 ARM946E™ operating at 120MHz, provide high performance, and supports very rich peripherals, such as USB2.0 High Speed Device, ATA, and NAND Flash interface.

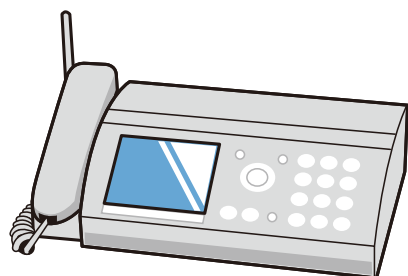
●Software development kit

The customer can start software development and microcontroller evaluation immediately.

Application Examples



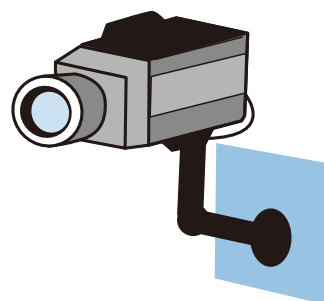
Portable Audio Player



Phone, FAX,
Multifunction Machine



USB Memory,
USB One-Seg Tuner



Surveillance Camera



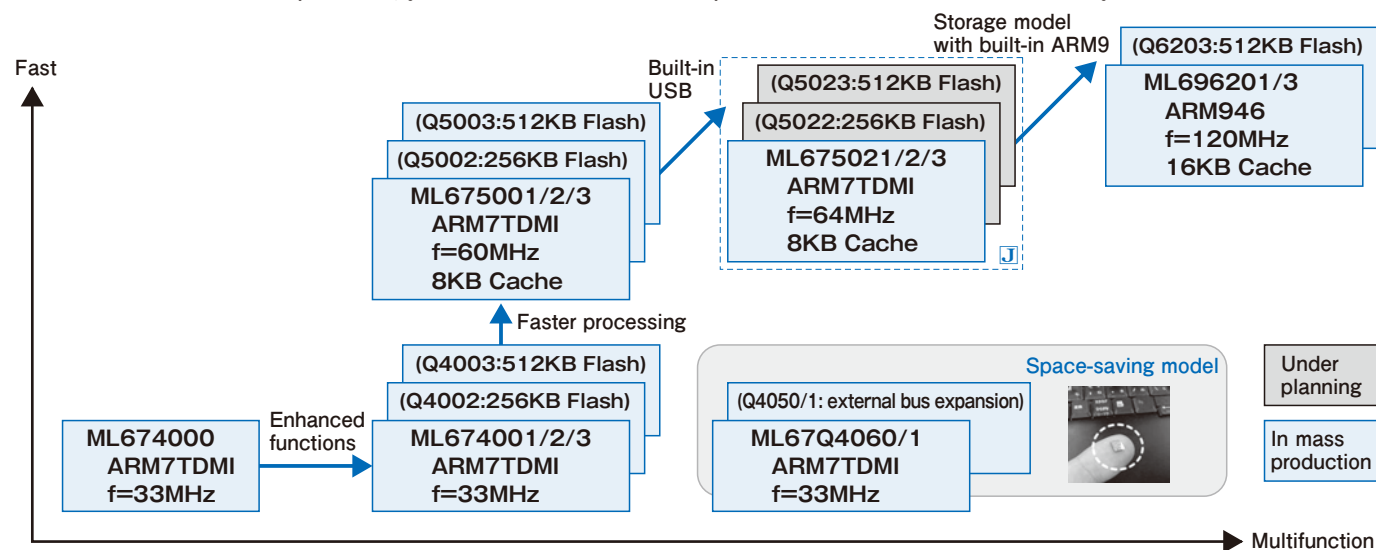
Remote Controller,
Short-Range Communication Device



Mobile Phone,
PHS

Product Line-up

- We offer wide selection of products with a de facto standard ARM chip onboard.
- With the software development kit, you can start software development and LSI evaluation immediately.



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

Development Tool

Chip	Evaluation Board	Software development environment	
		Code generator tool	Debug tool
ML674000	ML674000 CPU Board	RealView® Development Suite (RVDS) (*1) ARM® Developer Suite(ADS) (*1) Third-party tool (*2)	RealView® ICE (RVI) (*1) Third-party tool (*2)
ML674001/Q4002/Q4003	ML67Q4003 CPU Board		
ML675001/Q5002/Q5003	ML67Q5003 CPU Board		
ML67Q4060/Q4061	ML67Q4061 CPU Board		
ML67Q4050/Q4051	ML67Q4051 CPU Board		
ML696201/Q6203	ML69Q6203 CPU Board		
ML675021 J	Not available		

*1: RVDS and RVI are proprietary products of ARM Ltd. For information on proprietary products of ARM Ltd., contact the following companies.

ARM Ltd. <http://www.jp.arm.com/>
Yokogawa Digital Computer Corporation <http://www.yokogawa-digital.com/arm/index.html>

*2: Form information on third-party tools, contact the following companies.

IAR Systems AB	http://www.iarsys.co.jp/	Lauterbach Datentechnik GmbH	http://www.lauterbach.co.jp/
COMPUTEX CO., LTD.	http://www.computex.co.jp/	Advanced Data Controls Corp.	http://www.adac.co.jp/
Sophia Systems Co., Ltd.	http://www.sophia-systems.co.jp/	Mentor Graphics Japan Co., Ltd.	http://www.mentorg.co.jp/embedded/
Yokogawa Digital Computer Corporation	http://www.yokogawa-digital.com/emb/index.html		
GAIO TECHNOLOGY CO., LTD	http://www.gaio.co.jp/home.html		

* For information on "our partner" with which we announces collaboration in our press relief or other publications, contact the following company.

Data Technology Inc. <http://www.datec.co.jp/>
Product offered: middleware "Cente® Middleware Series"

*Described product names are trademark or registered trademark of their respective owners.

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

32-bit Microcontroller

32-bit Microcontroller

Description	Part Number	Built-in Memory			CPU Core	Operating Frequency (Max.)	Operating Condition			Peripherals									Package
		ROM /Flash	RAM	Cash			Supply Voltage (V)	Operating Temperature(°C)	Supply Currence (Typ.)	General-purpose Ports	Timer	PWM	WDT	A/D	Serial Ports	Interrupt Internal/ External	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	128TQFP 144LFBGA	
	ML674001		32KByte						8KByte unified	60MHz				92mA (60MHz, 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
	ML67Q4002	256KByte(Flash)																	
	ML67Q4003	512KByte(Flash)																	
	ML675001	—																	
	ML67Q5002	256KByte(Flash)																	
	ML67Q5003	512KByte(Flash)																	
	ML67Q4050	64KByte	16KByte	—	33MHz	I/O:3.0~3.6 core:2.25~2.75	-40~85	70mA (at 33MHz)	105	7 (6 share the circuit with PWM as multi-functional timer)	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, I2C (send, receive) 1ch STOP mode	144LQFP 144LFBGA		
	ML67Q4051	128KByte				I/O:2.25~3.6 core:2.25~2.75		65mA (at 33MHz)	40					DMA controller 2ch RTC I2C (send, receive) 1ch STOP mode	64TQFP 64WCSP 84LFBGA				
	ML67Q4060	64KByte																	
	ML67Q4061	128KByte																	
ML675021 	—	32KByte (maximum)	8KByte unified	64MHz	I/O:3.0~3.6 core:1.35~1.65	-40~85	92mA (at 64MHz)	62	7 (6 share the circuit with PWM as multi-functional timer)	6 (share the circuit with timer as multi-functional timer)	16bit×1	12bit A/D 8ch	USB2.0 FS/LS Host 1ch (*1) USB2.0 FS Device 1ch (*1) I2C 2ch UART 3ch SPI 2ch	35/7	DMA controller 6ch External memory controller [ROM(Flash), SRAM, SDRAM, IO] LCD controller RTC 1ch	176LQFP			
For USB Storage	ML696201	—	128KByte	I=8KByte D=8KByte	ARM946E	120MHz	I/O:2.7~3.6 core:1.35~1.65	-30~70	95mA (at 120MHz)	87	3	16bit×1	16bit×1	10bit A/D 4ch	USB2.0 HS Device 1ch (*1) UART 1ch SSIO 2ch I2C 1ch	23/4	DMA controller 4ch External memory controller [ROM(Flash), SRAM, SDRAM, IO] RTC NAND Flash controller I2S(send, receive) 1ch IDE controller STOP mode	272LFBGA	
	ML69Q6203	512KByte																	
For Amusement	ML675011	—	64KByte	8KByte unified	ARM7TDMI	60MHz	I/O:3.0~3.6 core:1.35~1.65	0~70	126mA (at 60MHz)	26	7	16bit×2	16bit×1	-	UART 1ch SSIO 1ch	18/4	DMA controller 2ch External memory controller [ROM(Flash), SRAM, DRAM(EDO/SDRAM), IO]	144LQFP	

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

*1: USB2.0 HS means HIGH SPEED (480Mbps).
USB2.0 FS means FULL SPEED (12Mbps).
USB2.0 LS means LOW SPEED (1.5Mbps).

Product Overview

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

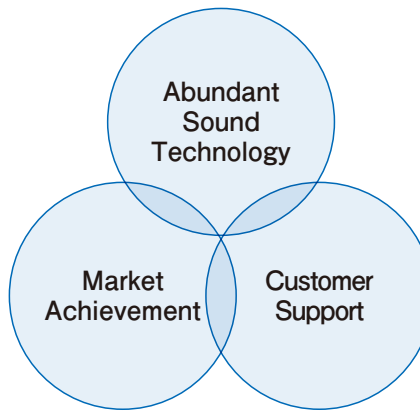
- Abundant Market Achievement: This product has been used in a variety of applications, such as toys and cars, for around 30 years.
- We offer a wide selection of products, focusing on superior sound quality ADPCM method.
- We help the customers to create sound, including recording, sample creation, and sound adjustment.

Peripheral Technology

- Ultra low power
- P2ROM™/Flash/Mask ROM
- High-output SP-Amp Class AB/Class D
- 8bit RISC CPU

Abundant Market Achievement

Home Electronics/Consumer electronics/
Car Electronics/Industrial Electronics/
Toy/Communication Device/Security...



Sound Technology

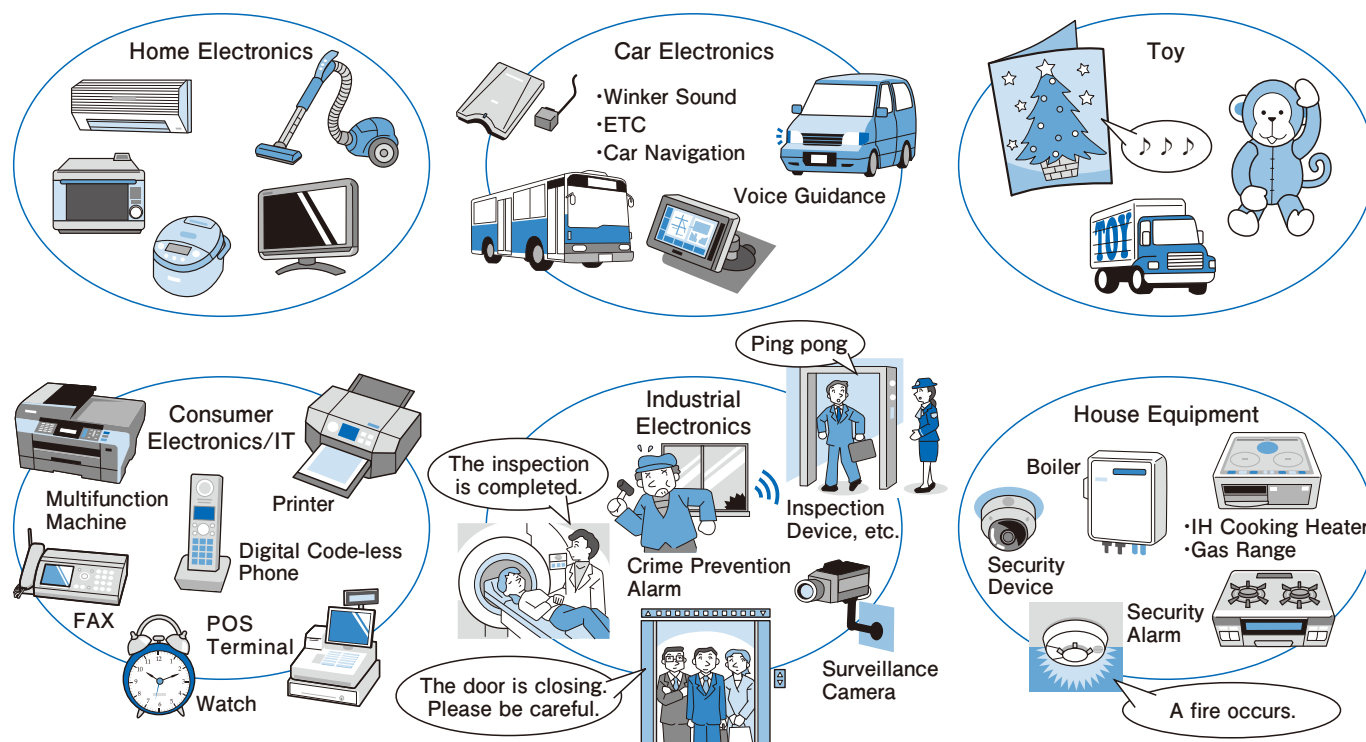
- ADPCM/Non-linear PCM/HQ-ADPCM
- High frequency compensation filter
- Speech speed conversion/
music interval conversion

Customer Support

- Contract Narrator with rich experience in LSI processing
- Recording support/Voice analysis, Editing/
Sound effect creation/Volume adjustment
- TTS service

Used in a wide range of market

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



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.

ML2282□ Series
ML2286□ Series
ML2280□ Series

Speech Synthesis LSI with built-in large capacity P2ROM™ Including speech speed and pitch conversion functions

This is a product for universal design, where a user can change playback speed and pitch freely.

ML2272□ Series
ML2276□ Series

Speech synthesis LSI with external memory Including 4ch simultaneous playback function

Memory of 128M bits with built-in SP-Amp can be connected for long-time playback.

ML22420
ML22460

Small standalone-type speech synthesis LSI with built-in mask ROM

Suitable for battery-driven applications, such as security alarms, toys, and remote controllers.

ML2234□ Series

Low power microcontroller with built-in speech playback function Speech microcontroller

Suitable for security alarms, toys, etc. Simple control and high-quality speech playback functions are integrated on a single chip.

ML61034□ Series

Speech synthesis LSI with built-in mask ROM for cars, with 105 degree operation guaranteed

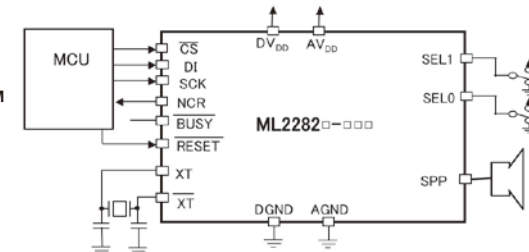
Suitable for car applications, such as winker sound, ETC, and meter panel.

ML2257□ Series
ML225□G Series

The followings are only a part of our products.

Applied Circuit

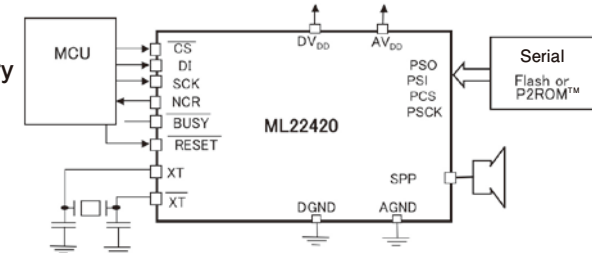
Speech synthesis LSI with built-in large-capacity P2ROM™



Product features of ML2282□-□□□

- Built-in SP-Amp 0.7W (at 5.0V)
- We offer wide selection of products suitable for CPU I/F.
SPI : ML2282□-□□□
I2C : ML2286□-□□□
- Wide selection of P2ROM memory sizes
4 Mbit/8 Mbit/16 Mbit

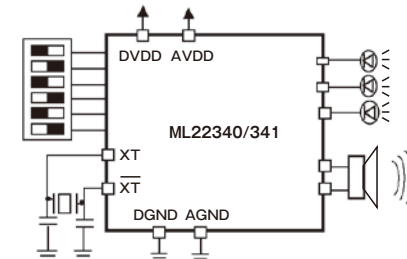
Speech synthesis LSI with external memory and 4ch simultaneous playback function



Product features of ML22420

- Built-in SP-Amp 0.7W (at 5.0V)
- We offer wide selection of products suitable for CPU I/F.
SPI : ML22420
I2C : ML22460
- Long-time playback
~128Mbit serial Flash/P2ROM™ supported

Standalone-type speech synthesis LSI with built-in mask ROM



Product features of ML2234□-□□□

- Built-in SP-Amp 1.0W (at 5.0V)
- We also offer wide selection of products for CPU I/F.
Standalone: ML2234□-□□□
CPU I/F : ML2233□-□□□
- High quality speech playback
Built-in 16bitDAC, built-in HQ-ADPCM

Speech synthesis LSI with built-in P2ROM™/OTP

Description	Part Number
2ch simultaneous playback/ SP-Amp installed speech synthesis LSI with built-in large capacity P2ROM™	ML22823
	ML22824
	ML22825
	ML22863
	ML22864
	ML22865
Speech-speed/pitch conversion function installed/ SP-Amp installed speech synthesis LSI with built-in large capacity P2ROM™	ML22723
	ML22724
	ML22725
	ML22763
	ML22764
	ML22765
Speech synthesis LSI with built-in P2ROM™	ML22802
	ML22804
	ML22808
Speech synthesis LSI with built-in OTP ROM	ML22P802
	ML22P804
	ML22P808

Speech synthesis LSI with built-in P2ROM™/OTP

Part Number	Built-in Memory Size	CPU I/F	Package	Longest Playback Time (sec)	Maximum Number of Phrases	Supply Voltage (V)	Maximum Current Consumption (mA) (*2)	Standby Current Maximum Value (μA)	Operating Temperature (°C)
ML22823	4Mbit	SPI	30SSOP	258 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	-40~+85
ML22824	8Mbit	SPI	30SSOP	520 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22825	16Mbit	SPI	30SSOP	1044 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22863	4Mbit	I2C	30SSOP	258 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22864	8Mbit	I2C	30SSOP	520 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22865	16Mbit	I2C	30SSOP	1044 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22723	4Mbit	SPI	30SSOP	258 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22724	8Mbit	SPI	30SSOP	520 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22725	16Mbit	SPI	30SSOP	1044 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22763	4Mbit	I2C	30SSOP	258 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22764	8Mbit	I2C	30SSOP	520 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22765	16Mbit	I2C	30SSOP	1044 (*1)	4096	2.7~3.6 4.5~5.5	25 (*3) (*5)	30 (*3) (*5)	
ML22802	2Mbit	SPI	30SSOP	131 (*1)	512	2.7~3.6	10 (*4) (*7)	20 (*4) (*7)	-20~+85
ML22804	4Mbit	SPI	30SSOP	262 (*1)	1024	2.7~3.6	10 (*4) (*7)	20 (*4) (*7)	
ML22808	8Mbit	SPI	30SSOP	524 (*1)	1024	2.7~3.6	10 (*4) (*7)	20 (*4) (*7)	
ML22P802	2Mbit	SPI	30SSOP	131 (*1)	512	2.7~3.6	10 (*4) (*7)	20 (*4) (*7)	
ML22P804	4Mbit	SPI	30SSOP	262 (*1)	1024	2.7~3.6	10 (*4) (*7)	20 (*4) (*7)	
ML22P808	8Mbit	SPI	30SSOP	524 (*1)	1024	2.7~3.6	10 (*4) (*7)	20 (*4) (*7)	

Speech synthesis LSI with built-in mask ROM

Description	Part Number
Stand alone type speech synthesis LSI with built-in mask ROM	ML22340
	ML22341
Serial I/F type speech synthesis LSI with built-in mask ROM	ML22330
	ML22331
4ch mixing speech synthesis LSI with built-in mask ROM for in-vehicle use	ML22573
Compact package type speech synthesis LSI with built-in mask ROM	ML2201
Melody function installed speech synthesis LSI with built-in mask ROM	ML2213
	ML2215
2ch mixing speech synthesis LSI with built-in mask ROM	ML2251
	ML2252
	ML2253
	ML2254
	ML2256

Speech synthesis LSI with built-in mask ROM

Part Number	Built-in Memory Size	CPU I/F	Package	Longest Playback Time (sec)	Maximum Number of Phrases	Supply Voltage (V)	Maximum Current Consumption (mA) (*2)	Standby Current Maximum Value (μA)	Operating Temperature (°C)
ML22340	640Kbit	Stand alone	30SSOP	39 (*1)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	-40~+85
ML22341	896Kbit	Stand alone	30SSOP	69 (*20)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML22330	640Kbit	Serial	30SSOP	39 (*1)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML22331	896Kbit	Serial	30SSOP	69 (*20)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML22573	4Mbit	Serial	30SSOP	322 (*20)	1024	2.7~5.5	70 (*18) (*19)	20 (*18)(*19)	-40~+105
ML2201	384Kbit	Serial	8SSOP	12 (*1)	31	2.0~5.5	3.9 (*5) (*9)	50 (*5) (*9)	-40~+85
ML2213	1.5Mbit	SPI	14SSOP 24SOP	97 (*1)	247	2.4~5.5	4 (*5) (*10)	10 (*5) (*10)	
ML2215	3Mbit	SPI	20SSOP 24SOP	195 (*1)	247	2.4~5.5	8 (*5) (*12)	30 (*11) (*12)	
ML2251	512Kbit	SPI 8bit parallel	44QFP	31 (*1)	256	2.7~3.6 4.5~5.5	35 (*5) (*14)	50 (*5) (*14)	
ML2252	1Mbit	SPI 8bit parallel	44QFP	64 (*1)	256	2.7~3.6 4.5~5.5	35 (*5) (*14)	50 (*5) (*14)	
ML2253	3Mbit	SPI 8bit parallel	44QFP WCSP	195 (*1)	256	2.7~3.6 4.5~5.5	35 (*5) (*14)	50 (*5) (*14)	
ML2254	4Mbit	SPI 8bit parallel	44QFP WCSP	261 (*1)	256	2.7~3.6 4.5~5.5	35 (*5) (*14)	50 (*5) (*14)	
ML2256	6Mbit	SPI 8bit parallel	44QFP	392 (*1)	256	2.7~3.6 4.5~5.5	35 (*5) (*14)	50 (*5) (*14)	

*1 Fsam=4kHz(ADPCM1/2)

*2 Fosc=4.096MHz, when no load in output

*3 Vdd=4.5~5.5V

*4 Vdd=2.7~3.3V

*5 Ta=-40~+85°C

*6 Vdd=SPVdd=5.0V

*7 Ta=-20~+85°C

*8 Vdd=SPVdd=2.2~5.5V

*9 Vdd=5.5V

*10 Vdd=3.7~5.5V

*11 Ta=50~+85°C

*12 Vdd=2.4~5.5V

*13 Ta=0~+70°C

*14 Vdd=2.7~3.6V

*15 Ta=-20~+70°C

*16 Fosc=24.576MHz, when no load in output

*17 Ta=+50~+70°C

*18 Ta=-40°C~+105°C

*19 DVdd=SPVdd=4.5~5.5V

*20 Fsam=6.4kHz(HQ-ADPCM)

Speech LSI

Speech synthesis LSI with built-in flash memory

Description	Part Number
Stand alone type Speech synthesis LSI with built-in Flash memory	ML22Q340
	ML22Q341
CPU I/F type Speech synthesis LSI with built-in Flash memory	ML22Q330
	ML22Q331
4ch mixing speech synthesis LSI with built-in Flash memory for in-vehicle use	ML22Q573
2ch mixing speech synthesis LSI with built-in Flash memory	ML22Q54
	ML22Q58

Speech synthesis LSI with built-in flash memory

Part Number	Built-in Memory Size	CPU I/F	Package	Longest Playback Time (sec)	Maximum Number of Phrases	Supply Voltage (V)	Maximum Current Consumption (mA) (*2)	Stayby Current Maximum Value (μA)	Operating Temperature (°C)
ML22Q340	640Kbit	Stand alone	30SSOP	39 (*1)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	-40~+85
ML22Q341	896Kbit	Stand alone	30SSOP	69 (*20)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML22Q330	640Kbit	Serial	30SSOP	39 (*1)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML22Q331	896Kbit	Serial	30SSOP	69 (*20)	30	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML22Q573	4Mbit	Serial	30SSOP	322 (*20)	1024	2.7~5.5	70 (*18) (*19)	20 (*18)(*19)	-40~+105
ML22Q54	4Mbit	SPI 8bit parallel	44QFP	261 (*1)	256	2.7~3.6	35 (*13) (*14)	55 (*13) (*14)	0~+70
ML22Q58	8Mbit	SPI 8bit parallel	44QFP	522 (*1)	256	2.7~3.6 4.5~5.5	35 (*4) (*13)	55 (*4) (*13)	

Speech synthesis LSI with external memory

Description	Part Number
4ch simultaneous playback speech synthesis LSI with external memory	ML22420
	ML22460

Speech synthesis LSI with external memory

Part Number	Built-in Memory Size	CPU I/F	Package	Longest Playback Time (sec)	Maximum Number of Phrases	Supply Voltage (V)	Maximum Current Consumption (mA) (*2)	Stayby Current Maximum Value (μA)	Operating Temperature (°C)
ML22420	—	SPI	30SSOP	139 (min) (*1)	1024	2.7~5.5	25 (*3) (*5)	30 (*3) (*5)	-40~+85
ML22460	—	I2C	30SSOP	139 (min) (*1)	1024	2.7~5.5	25 (*3) (*5)	30 (*3) (*5)	

Record playback LSI

Description	Part Number
Stereo record/playback LSI with buit-in buffer memory	ML2308

Record playback LSI

Part Number	Built-in Memory Size	CPU I/F	Package	Longest Playback Time (sec)	Maximum Number of Phrases	Supply Voltage (V)	Maximum Current Consumption (mA) (*2)	Stayby Current Maximum Value (μA)	Operating Temperature (°C)
ML2308	Built-in buffer memory	SPI 8bit parallel	44QFN	Depends on (*1) external memory	—	2.7~3.6	40 (*14) (*15) (*16)	100 (*14) (*17)	-20~70

Speech microcontroller

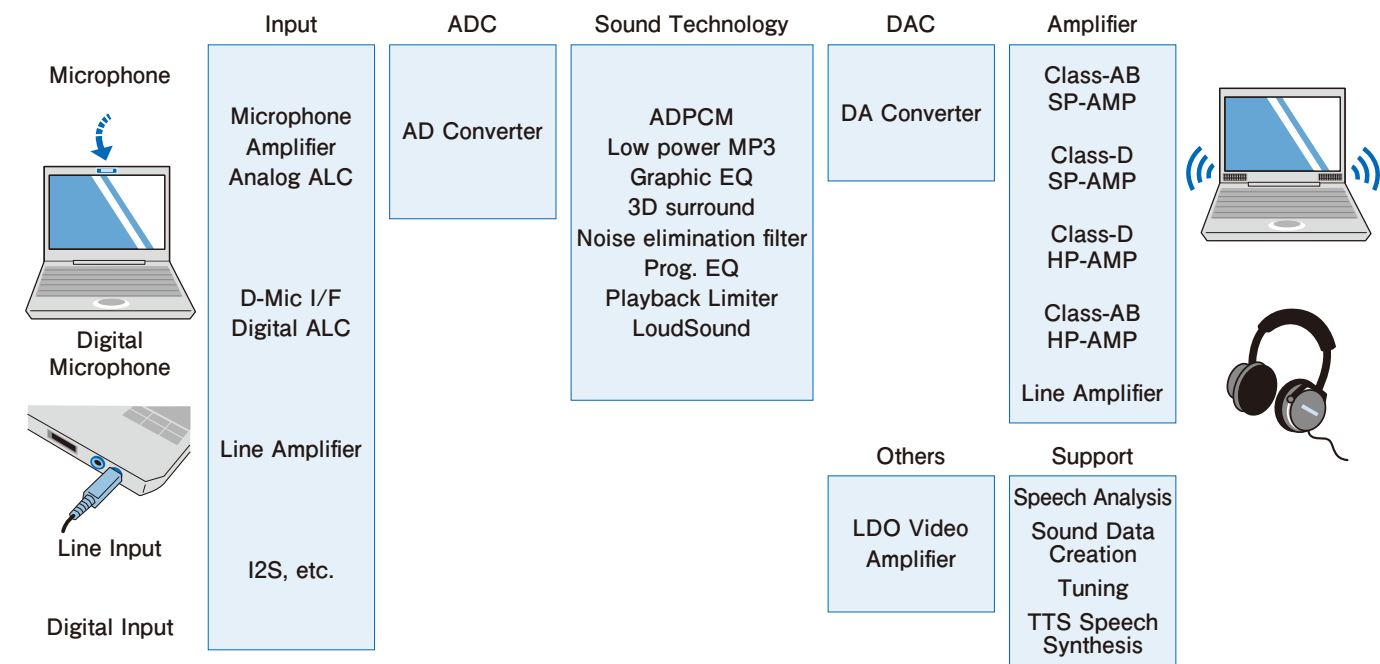
Description	Part Number
Low power microcontroller with speech function and built-in Flash memory	ML610Q340
Low power microcontroller with speech function and built-in OP-Amp, 12bitADC installed Flash memory	ML610Q346
Low power microcontroller with speech function and built-in 12bit ADC installed Flash memory	ML610Q347
Low power microcontroller with speech function and built-in mask ROM	ML610340
Low power microcontroller with speech function and built-in OP-Amp, 12bitADC installed mask ROM	ML610346
Low power microcontroller with speech function and built-in 12bitADC installed mask ROM	ML610347

Speech microcontroller

Part Number	Built-in Memory Size	CPU I/F	Package	Longest Playback Time (sec)	Maximum Number of Phrases	Supply Voltage (V)	Maximum Current Consumption (mA) (*2)	Stayby Current Maximum Value (μA)	Operating Temperature (°C)
ML610Q340	756Kbit	Serial	30SSOP	39 (*1)	—	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	-40~+85
ML610Q346	1Mbit	Serial UART	64TQFP	69 (*20)	—	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML610Q347	1Mbit	Serial UART	64TQFP	69 (*20)	—	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML610340	756Kbit	Serial	30SSOP	39 (*1)	—	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML610346	1Mbit	Serial UART	64TQFP	69 (*20)	—	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	
ML610347	1Mbit	Serial UART	64TQFP	69 (*20)	—	2.3~5.5	16 (*5) (*6)	8 (*5) (*8)	

Product Overview

We offer CODEC and SP-AMP, which mainly aim at portable devices and have sound processing functions to eliminate problems specific to applications regarding noise, volume, sound quality, etc.



Target Application

DSC

Mobile Phone

Game Controller

PND (Portable NAVI)

Product Line-up

	Microphone amplifier	ADC	DAC	SP-amp	HP-amp	Programmable EQ	Power supply noise reduction	Graphic EQ	Loud Sound	MP3
ML2612	○	○	○	Class AB		○				
ML26124	○	○	○	Class AB		○	○			
ML26121	○	○ Stereo	○ Stereo	Class AB	○	○			○	
ML2611			○ Stereo	Class AB	Class AB			○		
ML26211			○	Class D		○			○	
ML2620				Class AB		○			○	
ML2650			○ Stereo		Class D					
ML2011			○	○						○

Example of Sound Processing Technology

Power supply noise elimination ratio (PSRR)

Improved power supply noise reduction

Graphic EQ

Programmable EQ

Provides a free filter features

LoudSound

A small speaker plays back loud sound

Power-saving MP3 decoder

(Software based on ARM9 vs ML2011)
The hard-wired MP3 reduces power consumption by 95%

Audio LSI

Speaker amplifier

Input		Description	Part Number
Analog input	Monaural	LoudSound SP-Amp	ML2620
	Stereo	Stereo Audio DAC with Audio enhancement	ML2611
Digital input	Monaural	Class D-Amp with 16bit DAC	ML26211

Speaker amplifier

Part Number	Feature	Operating Temperature (°C)	Package	Supply Voltage (V)
ML2620	LoudSound 800mW Class AB SP-Amp	-20 ~ 85	2.54×2.44mm ² WCSP(T.B.D.) 6.0×6.0mm ² QFN(T.B.D)	Digital : 1.65~3.6 Analog : 2.25~2.75 Speaker Amp. : 2.7~5.5
ML2611	3D surround, Bass emphasis 16bit Audio DAC, Headphone Amp. Stereo speaker Amp. AB class	-20 ~ 75	3.16×2.96mm ² W-CSP 6.0×6.0mm ² QFN	Digital : 2.25~2.75 DAC : 2.25~2.75 Analog : 2.7~3.6 Speaker Amp. : 2.7~4.5
ML26211	LoudSound 16bit DAC 2W Class D-Amp	-20 ~ 85	2.0×2.5mm ² WCSP 4.0×4.0mm ² QFN	IO : 1.65~3.6 Digital, Analog : 2.25~2.75 Speaker Amp. : 2.7~5.5

CODEC

Input	Description	Part Number
Stereo	Stereo CODEC with Audio enhancement	ML26121
Monaural	Small package Monaural CODEC	ML2612
	Power noise reduction Monaural CODEC with Video buffer	ML26124

CODEC

Part Number	Feature	Operating Temperature (°C)	Package	Supply Voltage (V)
ML26121	16bit stereo CODEC 3D surround LoudSound SP-Amp, HP-Amp	-20 ~ 85	2.96×2.96mm ² W-CSP	HVDD : 2.7~3.6 LVDD : 1.65~2.75
ML2612	16bit monaural CODEC SP-Amp	-20 ~ 85	4.0×4.0mm ² QFN 2.0×2.5mm ² W-CSP	HVDD : 2.7~3.6 LVDD : 1.65~2.75
ML26124	16bit monaural CODEC Video Amp. Power supply noise reduction SP-Amp	-20 ~ 85	5×5mm ² QFN 2.56×2.44mm ² W-CSP	2.7~3.6

Long-hour playback HPAMP

Description	Part Number
Low power consumption stereo headphone Amp.	ML2650

Long-hour playback HPAMP

Part Number	Feature	Operating Temperature (°C)	Package	Supply Voltage (V)
ML2650	64K FIFO Class D HP-Amp	-20 ~ 85	2.6×2.7mm ² WCSP 6.0×6.0mm ² QFN	Digital : 1.35~1.65 PLL : 2.7~3.6 IO, Headphone Amp. : 1.65~3.6

MP3 decoder

Description	Part Number
Easy-to-use MP3 decoder with SP-Amp	ML2011

MP3 decoder

Part Number	Feature	Operating Temperature (°C)	Package	Supply Voltage (V)
ML2011	MP3 decoder Stereo DAC, Speaker Amp.	-20 ~ 85	4.17×3.56mm ² W-CSP 5.2×6.2mm ² QFN	Speaker Amp. : 2.7~4.5 Others : 2.7~3.6

Security Authentication LSI

Card payment LSI Overview

Product Overview

●Suitable for card payment terminals

Functions required for payment terminals, such as IC card interface, LCD controller, and USB host & device, are integrated on a single chip. In addition, ARM7TDMI is used for a CPU core, providing a superior recyclability of software.

●Built-in fast encryption engine

This product has a residue calculation accelerator, random number generators (ML675050 and ML675055), and hardware encryption engines, such as AES, DES/TDES, SHA-1, and SHA-256 (only ML675055).

●Advanced security functions required for PCI-PED2.0 (ML675055)

The ML675055 supports advanced security features like various Cipher Engines, Anti-tamper sensors, Memory-Area protection and OKI Semiconductor's proprietary security management module for controlling these security features. The system cost for achieving the required security can be reduced effectively.

Product Line-up

ML675050

Built-in peripherals required for terminals

IC card controller 2ch
Built-in USB host and device (They can be used at the same time.)
A variety of LCD controllers and serials

Fast encryption required for IC card transaction

Embedded modulo accelerator.
(Approximately 20ms for decryption with 1024 bits key)

ML675055

Physical security required for PCI-PED2.0 terminals

Cipher engines against side-channel attack
Anti-tampering sensors
Memory-area protection
Cipher hardware for protecting external memory

Security evaluation report by T-Systems

Reduces the customers' evaluation time.

Application note for payment terminal

Enhanced peripherals

4ch IC card controllers
Built-in NAND flash controller

Security Upgrading

Application Examples

●Applications

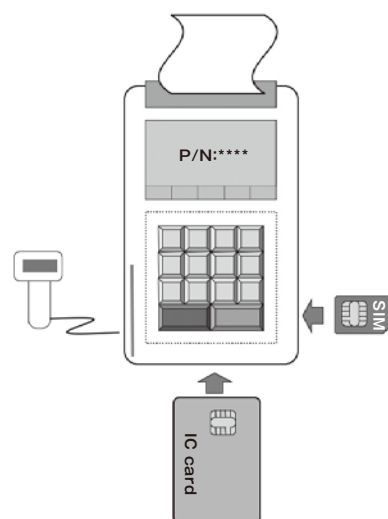
- Payment terminal compliant with EMV/PCI, CAT/PED, etc.
- ID (personal identification) card terminal, etc.

●A variety of peripherals

- USB Host → Connect a B/C scanner, etc.
- USB Device → Connect to a host system, etc.
- LCD Controller → Display authorization information, etc.
- RTC → Obtain a payment time record, etc.
- Serial → Control a magnetic head, etc.
- IC card Controller → ID card/Credit card
- A/D Converter → Control a keypad, etc.

●Application Examples

CAT (Credit Authorization Terminal)
This is a terminal with credit card payment functions.
It executes authentication and credit payment.



Development Tool

Chip	Evaluation kit	Software development environment	
		Code generator tool	Debug tool
ML675050	ML675050 (*3) Software Development Kit	RealView® Development Suite (RVDS) (*1) / ARM® Developer Suite(ADS) (*1) / Third-party tool (*2)	RealView® ICE (RVI) (*1) / Third-party tool (*2)
ML675055	ML675055 (*3) Software Development Kit	RealView® Development Suite (RVDS) (*1)	RealView® ICE (RVI) (*1)

*1: RVDS and RVI are proprietary products of ARM Ltd. For information on proprietary products of ARM Ltd., contact the following companies.
ARM Ltd. <http://www.jp.arm.com/>
Yokogawa Digital Computer Corporation <http://www.yokogawa-digital.com/arm/index.html>

*2: Form information on third-party tools, contact the following companies.

IAR Systems AB <http://www.iarsys.co.jp/>
Lauterbach Datentechnik GmbH <http://www.lauterbach.co.jp/>
COMPUTEX CO., LTD. <http://www.computex.co.jp/>
Advanced Data Controls Corp. <http://www.adac.co.jp/>
Sophia Systems Co., Ltd. <http://www.sophia-systems.co.jp/>
Yokogawa Digital Computer Corporation <http://www.yokogawa-digital.com/emb/index.html>

*3: A peripheral evaluation board is provided for each product (extra-cost option).

* For information on "our partner" with which we announces collaboration in our press relief or other publications, contact the following company.
Data Technology Inc. <http://www.datec.co.jp/> Product offered: middleware "Cente® Middleware Series"

*Described product names are trademark or registered trademark of their respective owners.

Security Authentication LSI

Card payment LSI

Description	Part Number	Operating Conditions			Built-in Memory			Peripheral Functions								Package
		Supply Voltage (V)	Operating Frequency (Max.)	Supply Current (Typ.)	ROM /Flash	RAM	Cache	General-Purpose Ports	Timer	PWM	WDT	A/D	Serial Ports	Interrupt Sources Internal/ External	Other Peripherals	
for IC card terminal application (POS, PED) 32-bit Microcontroller	ML675050	I/O: 2.7~3.6 core: 1.35~1.65	64MHz	92mA (Operating at 64MHz)	—	Work RAM: 16Kbytes (Up to 30Kbytes) Backup RAM: 2Kbytes	8KByte unified	62	7 (6 share the circuit with PWM as multi-functional timer)	6 (share the circuit with timer as multi-functional timer)	16bit×1	12bit A/D 8ch	SIO 1ch USB2.0 FS/LS Host 1ch (*1) USB2.0 FS Device 1ch (*1) I2C 2ch UART 2ch SPI 2ch	37/8	Modulo accelerator Random number generator DMA Controller x 6ch External Memory Controller (ROM (Flash), SRAM, SDRAM, IO) LCD controller Smart card interface x 2ch RTC x 1ch	176LQFP 176LFBGA
PCI-PED/Handy terminal/ Payment terminal applications 32-bit Microcontroller	ML675055	I/O: 2.7~3.6 core: 1.35~1.65	80MHz	194mA (Operating at 80MHz)	—	Work RAM: 16Kbytes (Up to 30Kbytes) Backup RAM: 768bytes	8KByte unified	152	7 (6 share the circuit with PWM as multi-functional timer)	6 (share the circuit with timer as multi-functional timer)	16bit×1	12bit A/D 8ch	SIO 1ch USB2.0 FS/LS Host 1ch (*1) USB2.0 FS Device 1ch (*1) I2C 2ch UART 4ch SPI 2ch	54/7	■Security functions Bus encryption function/Various sensors/ Internal monitor function/Memory protection function/ Encryption accelerator(RSA/AES/SHA etc.) Random number generator ■Others DMA Controller x 6ch External Memory Controller (NAND Flash, ROM(Flash), SRAM, SDRAM, IO) LCD controller Smart card interface x 4ch RTC x 1ch	272LFBGA

*1 : USB2.0 FS means FULL SPEED (12Mbps)

Security Authentication LSI

Fingerprint authentication LSI Overview

Product Overview

●Low System Cost

It has a built-in flash memory for storing fingerprint data, which eliminates external memories.

●Fast fingerprint authentication

Authentication time: 0.8s (1:1)

●High security

Its security functions can efficiently prevent unauthorized access to enrolled fingerprint data.

●Easy to use

Built-in algorithm enables easy to use this LSI without the detailed knowledge on fingerprint authentication.

●Rich development environment

Software development kit (SDK) with demo source programs is available.

●ALL-IN-ONE Module

A stamp-sized All-In-One module is also available for the customer's further easy to use.

Development Tool

Chip	Evaluation kit	Software development environment	
		Code generator tool	Debug tool
ML67Q5250	ML67Q5250 (*2) Software Development Kit	RealView® Development Suite (RVDS) (*1) RealView® Microcontroller Development Kit (RVMDK) (*1) ARM® Developer Suite(ADS) (*1)	RealView® ICE (RVI) (*1) ULINK-ME® (*1)
MK67Q5250	MK67Q5250 Software Development Kit	RealView® Development Suite (RVDS) (*1) RealView® Microcontroller Development Kit (RVMDK) (*1) ARM® Developer Suite(ADS) (*1)	RealView® ICE (RVI) (*1) ULINK-ME® (*1)

*1: RVDS, ADS, RVMDK, RVI, and ULINK-ME are proprietary products of ARM Ltd.
For information on proprietary products of ARM Ltd., contact the following companies.
ARM Ltd. <http://www.jp.arm.com/>
Yokogawa Digital Computer Corporation <http://www.yokogawa-digital.com/arm/index.html>

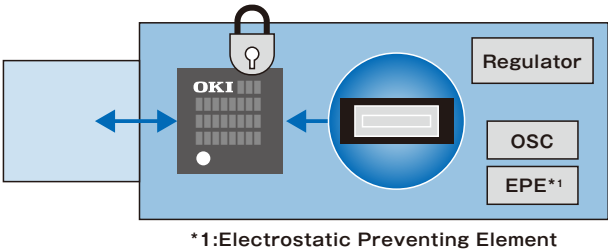
*2: We provide 2 products, each of which has a different sensor.
ML67Q5250-SDK-2510 (AES2510)
ML67Q5250-SDK-1711 (AES1711)

*Described product names are trademark or registered trademark of their respective owners.

Application Examples

- Door Lock
- Room Access Management
- Handy Terminal
- Health equipment
- Locker/Safety Box
- Garage Opener
- POS
- PC/Server
- USB Dongle/Token
- Removable Storage
- OA Equipment
- Access Control

●Application Example: USB Token



Security Authentication LSI

Fingerprint authentication LSI

Description	Part Number	Operating Conditions				Built-in Memory			Peripheral Functions								Package
		Supply Voltage (V)	Operating Frequency (Max.)	Instruction Execution Time	Operating Temperature(°C)	ROM /Flash	RAM	Cache	General-Purpose Ports	Timer	PWM	WDT	A/D	Serial Ports	Interrupt Sources Internal/ External	Other Peripherals	
Adopted DFT based fingerprint authentication algorithm 32bit Microcontrollers for fingerprint authentication	ML67Q5250	I/O: 3.0~3.6 core: 2.25~2.75	32MHz	15.6ns	-40~85 (*2)	128KByte Flash	16KByte	—	43	4 (3 share the circuit with PWM as multi-functional timer)	3 (share the circuit with timer as multi-functional timer)	16bit×1	—	Synchronous SIO 1ch USB2.0 FS Device 1ch (*1) UART 1ch SPI 2ch	18/5	DFT based algorithm-fingerprint authentication accelerator DMA Controller x 2ch External Memory Controller (ROM(Flash), SRAM, SDRAM, IO) Random number generator Smart card interface	144LFBGA
Adopted DFT based fingerprint authentication algorithm Fingerprint authentication module	MK67Q5250	5V or 3.3V single power supply	32MHz	15.6ns	0~50	128KByte Flash	16KByte	—	26	4 (3 share the circuit with PWM as multi-functional timer)	3 (share the circuit with timer as multi-functional timer)	16bit×1	—	USB2.0 FS Device 1ch (*1) UART 1ch SPI 1ch	18/4	DFT based algorithm-fingerprint authentication accelerator DMA Controller x 2ch Random number generator Smart card interface Installed in AuthenTec's AES2510	Module

*1 : USB2.0 FS means FULL SPEED (12Mbps)
*2 : When writing Flash memory : -40°C~70°C

Video LSI

Video LSI Overview

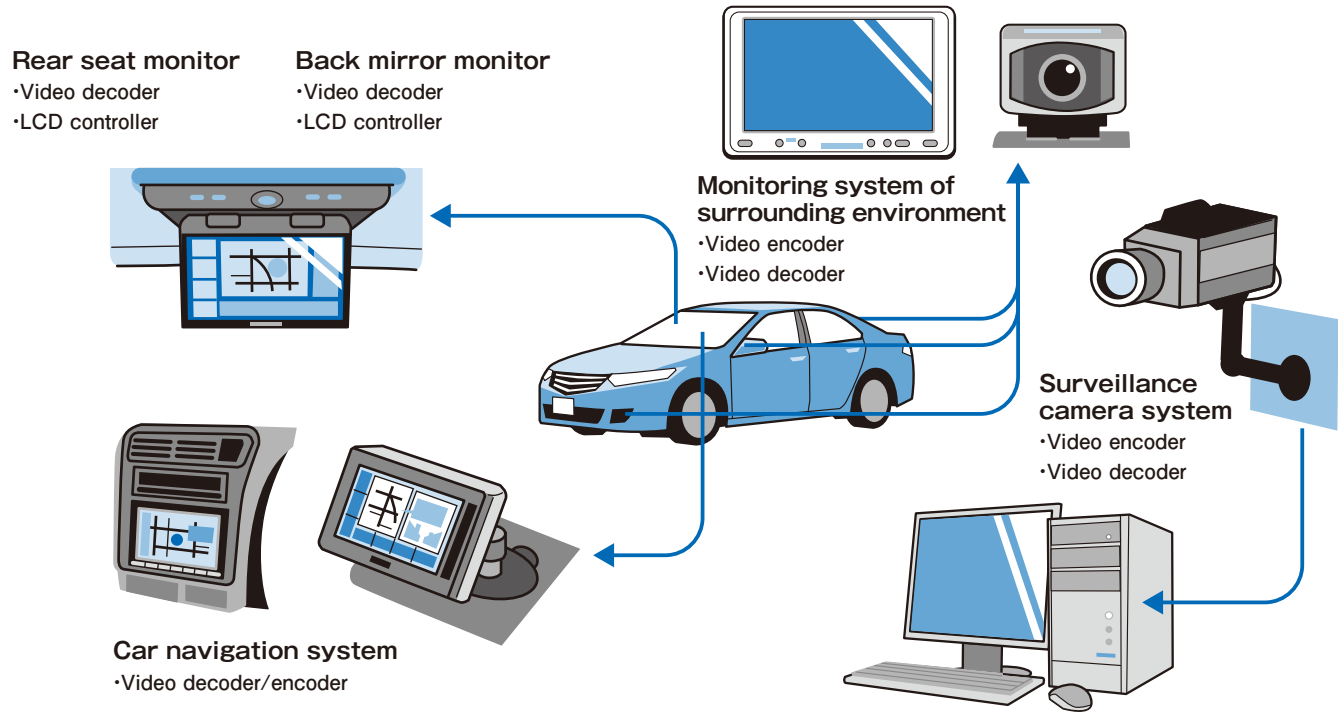
Product Overview

Video LSI is used in a variety of applications, such as car accessories (e.g. navigation system and rear seat monitor), surveillance cameras, and portable game machines. Based on the signal processing technology required for video and display, along with the excellent reliability, we will offer a further selection of products.

Product Line-up

- Digital video decoder
- Digital video encoder
- Image correction LSI with built-in video memory
- MPEG-4 encoder
- LCD controller
- Evaluation board support

Application Examples



Product Line-up

● Digital video decoder

Multi-input	ML86V7666	ML86V7668A	ML86V7672	
Single-input	ML86V7667	ML86V7665	ML86V76651	ML86V76652

● Digital video encoder

MSM7652	MSM7654	ML86V7655 ML86V7656
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● Image correction LSI with built-in video memory

ML87V2103	ML87V2107	ML87V21071	ML87V21072
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● MPEG-4 encoder

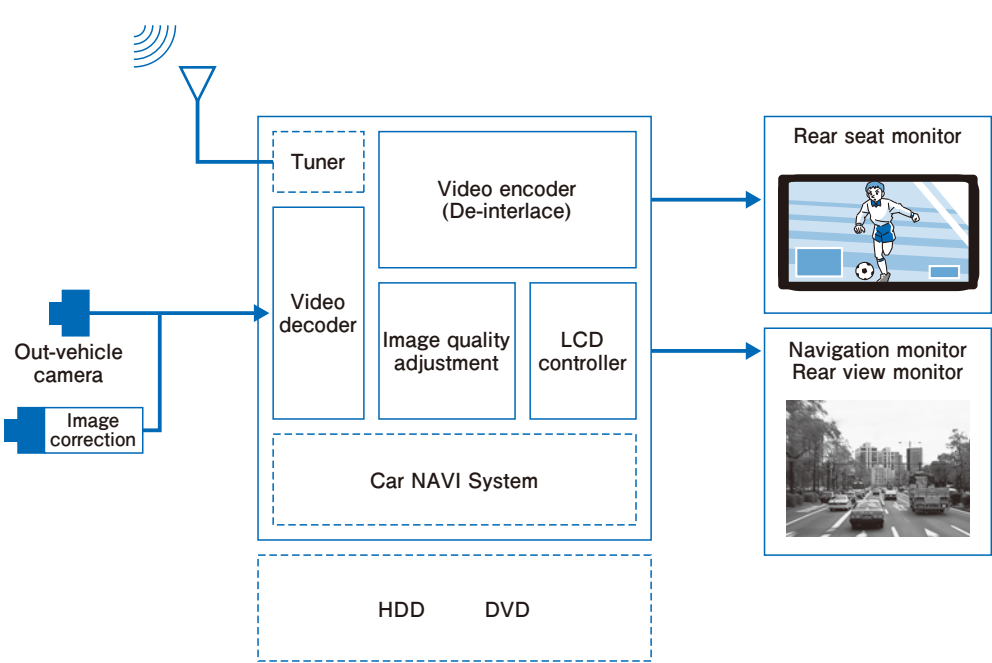
ML86410

● LCD controller

ML86V8208	ML86V8209	ML86V8207	ML86V8101	ML86V8401
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Legend:
[Light Blue Box] : In mass production
[Dark Blue Box] : Under development or planning

Application Examples



Video LSI

Digital video decoder

Input Format	Part Number
CVBS	ML86V7667
	ML86V7665
	ML86V76651
	ML86V76652 (Under development)
CVBS or S-Video	ML86V7666
	ML86V7668A
CVBS S-Video & Component & RGB	ML86V7672 (Under development)

Digital video encoder

Output Format	Part Number
CVBS / S-Video	MSM7652
	MSM7654
CVBS / S-Video / Component or RGB	ML86V7655
	ML86V7656(*1)

Video correction LSI with built-in video memory

Description	Part Number
Field recursive type 3D-NR, IP conversion	ML87V2103
Recursive type 3D-NR, Frame synchronize	ML87V2107
Frame recursive type 3D-NR, Cross color canceler	ML87V21071
Frame recursive Automatic detection of motion or still image 3D-NR, Analog video encoder	ML87V21072

MPEG-4 encoder

Description	Part Number
MPEG-4	ML86410

Digital video decoder

Part Number	Feature	Package	Supply Voltage (V)	Operating Current (Max.)	Operating Temperature (°C)
ML86V7667	NTSC/PAL small sized video decoder 10-bit ADC x1 included Input: CVBS, Output: BT.656 8 bits, Y/CbCr 8 bits multiplexed	64TQFP	3.0~3.6	130mA	-40~85
ML86V7665	NTSC/PAL/SECAM small sized video decoder 10-bit ADC x1 included Input: CVBS, Output: BT.656 8 bits, Y/CbCr 8 bits multiplexed	48TQFP	I/O:3.0~3.6 Core: 1.35~1.65	86mA	-40~85
ML86V76651	NTSC/PAL/SECAM small sized video decoder 10-bit ADC x1 included Input: CVBS, Output: BT.656 8 bits, Y/CbCr 8 bits multiplexed	48TQFP	I/O:1.7~2.0 3.0~3.6 Core:1.7~2.0	65mA (I/O:2.0V) 70mA (I/O:3.6V)	-40~85
ML86V76652 (Under development)	NTSC/PAL/SECAM small sized video decoder 10-bit ADC x1 included Input: CVBS, Output: BT.656 8 bits, Y/CbCr 8 bits multiplexed, Crystal resonator supported	48TQFP 36WQFN 36W-CSP	I/O:1.7~2.0 3.0~3.6 Core:1.7~2.0	62mA (I/O:2.0V) 67mA (I/O:3.6V)	-40~85
ML86V7666	NTSC/PAL video decoder 10-bit ADCx 2 included Input: CVBS or S-Video, Output: BT.656 10 bits, Y/CbCr 10 bits multiplexed, Y/CbCr 20 bits, Y/Cb/Cr 24 bits, R/G/B 24 bits	100TQFP	3.0~3.6	255mA	-40~85
ML86V7668A	NTSC/PAL/SECAM video decoder (the version in which the image synchronization characteristics of the ML86V7668 are improved) 10-bit ADC x2 included, Input: CVBS or S-Video, Output: BT.656 8 bits, Y/CbCr 8 bits multiplexed, Y/CbCr 16 bits, R/G/B 18 bits	100TQFP	I/O:3.0~3.6 Core: 2.25~2.75	200mA	-40~85
ML86V7672 (Under development)	NTSC/PAL video decoder 10-bit ADC x4 included Input: CVBS & Component & RGB, NTSC→WQVGA Scaling Output: BT.601/656, R/G/B 24 bits	100TQFP	I/O:3.0~3.3 Core:1.7~2.0	240mA	-40~85

Digital video encoder

Part Number	Feature	Package	Supply Voltage (V)	Operating Current (Max.)	Operating Temperature (°C)
MSM7652	NTSC/PAL video encoder 10-bit DAC x3 included, ITU-R BT.601 Input: BT.656, Y/CbCr 16 bits Output: CVBS/S-Video or YUV outputs	56QFP	3.0~3.6	140mA	0~70
MSM7654	NTSC/PAL video encoder 10-bit DAC x3 included Input: BT.656, Y/CbCr 16 bits, Y/Cb/Cr 24 bits or R/G/B 24 bits Output: CVBS/S-Video or RGB	64QFP	3.0~3.6	200mA	0~70
ML86V7655	NTSC/PAL video encoder 11-bit DAC x6 included, I/P conversion and P/I conversion functions Input: BT.656 10 bits, Y/CbCr 10 bits, Y/CbCr 20 bits, Y/Cb/Cr 30 bits, RGB 30 bits Output: CVBS/S-Video/Component or RGB simultaneous output	100TQFP	I/O:3.0~3.6 Core: 2.25~2.75	200mA	-40~85
ML86V7656(*1)	NTSC/PAL video encoder 11-bit DAC x6 included, I/P conversion and P/I conversion functions Input: BT.656 10 bits, Y/CbCr 10 bits, Y/CbCr 20 bits, Y/Cb/Cr 30 bits, RGB 30 bits Output: CVBS/S-Video/Component or RGB simultaneous output, Macrovision copyguard	100TQFP	I/O:3.0~3.6 Core: 2.25~2.75	200mA	-40~85

*1 : Products with Macrovision copyguard output. These products, including sample products, can only be sold to the users licensed with Macrovision.

Video correction LSI with built-in video memory

Part Number	Feature	Density	Package	Supply Voltage (V)	Operating Current (Max.)	Operating Temperature (°C)
ML87V2103	Noise reduction function, Progressive conversion function	3.9Mb Field memory	100QFP	3.0~3.6	150mA	0~70
ML87V2107	Noise reduction function .Motion-adaptive 3D noise reduction .Edge-adaptive 2D noise reduction Frame synchronize function	7Mb Frame memory	100TQFP	3.0~3.6	70mA	0~70
ML87V21071	Noise reduction function .Motion-adaptive 3D noise reduction .Edge-adaptive 2D noise reduction Cross color cancel function	7Mb Frame memory	100TQFP	3.0~3.6	90mA	0~70
ML87V21072	Noise reduction function .Motion-adaptive 3D noise reduction .Edge-adaptive 2D noise reduction .Noise Reduction with automatic detection of motion or still image Low illuminance correction function, vertical mirror function, Re-sampling function, digital output data shrink function, Analog video encoder function, 2-2 pull-down output function, Jaggy-less frame output function	7Mb Frame memory	90BGA	3.0~3.6	92mA	-20~75

MPEG-4 encoder

Part Number	Feature	Package	Supply Voltage (V)	Operating Current (Max.)	Operating Temperature (°C)
ML86410	Encoding format: MPEG-4 Simple Profile @L3,MPEG-4 Advanced Simple Profile @L5 Input Video format: QCIF/CIF/QVGA/VGA progressive, NTSC/PAL interface Coding Type: I/II/I/PPP... Encode mode: CBR(Up to 6Mbps)/ VBR Host CPU Interface: 8/16-bit general-purpose data bus (DMA supported) External SDRAM interface: 2MW x 32 bit	144LQFP	I/O: 3.0~3.6 Core: 1.35~1.65	130mA	-20~85

Description	Part Number
Video decoder included	ML86V8208
T-CON, Video decoder included	ML86V8209
	ML86V8207
TCON, image adjustment functions included	ML86V8101
Video decoder, 8051MCU included	ML86V8401 (Under development)

LCD controller

Part Number	Display Size (with limitations)	Feature	Operating Frequency (Max.)	Color Display	Package	Supply Voltage (V)	Operating Current (Max.)	Operating Temperature (°C)
ML86V8208	VGA~ WVGA	Video decoder included (NTSC/PAL/SECAM supported) Analog video input (composite/S-Video/525i/625i) Digital video input, Scaling, Gamma correction, OSD	50MHz	16,770k colors	176LQFP	3.0~3.6 2.25~2.75	Analog 140mA Logic 120mA	-40~85
ML86V8209	QVGA~ XGA	Video decoder included(NTSC/PAL/SECAM supported) Analog video input (composite/S video/525i/625i/525p/625p) Digital video input, Scaling, Gamma correction, OSD 2-screen synthesis, title screen, line overlay function Built-in T-CON for LCD, general-purpose I/O	65MHz	16,770k colors	176LQFP	3.0~3.6 2.25~2.75	Analog 130mA Logic 175mA	-40~85
ML86V8207	QVGA~ WVGA	Video decoder included (NTSC/PAL/SECAM supported) Analog video input (composite/S video/525i/625i/525p/625p) Digital video input, Scaling, Gamma correction, OSD line overlay function, Built-in T-CON for LCD, general-purpose I/O	50MHz	16,770k colors	144LQFP	3.0~3.6 2.25~2.75	Analog 130mA Logic 145mA	-40~85
ML86V8101	QVGA~ QHD	Shared RGB and independent R/B contrast adjustments, Shared RGB and independent R/B brightness adjustments, Independent RGB gamma correction, Multi-gradation color, Built-in T-CON for LCD	50MHz	260k colors	64TQFP	3.0~3.6	180mA	-40~85
ML86V8401 (Under development)	QVGA~ WVGA	Video decoder included (NTSC/PAL/SECAM supported) Analog video input (composite/S video), Digital video input, Scaling, 8051MCU, SSCG, CCFL/LED control, Gamma correction, ADC for Key-Scan, Built-in T-CON for LCD	50MHz	16,770k colors	100TQFP	3.0~3.6 2.25~2.75	TBD	-40~85

Description	Part Number
Video Decoder	ML86V7666 Evaluation Board
	ML86V7667 Evaluation Board
	ML86V7668A Evaluation Board
	ML86V7665 Evaluation Board
Video Encoder	MSM7654 Evaluation Board
	ML86V7655 Evaluation Board
LCD Controllers	ML86V8208 Evaluation Board
	ML86V8209 Evaluation Board
	ML86V8207 Evaluation Board
Image Correction LSIs	ML87V21072 Evaluation Board ①Small-size board with a CCD camera
	ML87V21072 Evaluation Board ②Multifunction board with video input supported
MPEG-4 Encoders	ML86410 Evaluation Board ①USB interface board
	ML86410 Evaluation Board ②LAN interface board

Evaluation board support

Description	Type	Input Signal	Output Signal	Notes
Video Decoder	ML86V7666 Evaluation Board	Analog video signal CVBS S-Video	Digital video data ITU-R BT.656 Y/CbCr 4:2:2 10 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 10 bits multiplexed synchronization separated ITU-R BT.601 Y/CbCr 4:2:2 20 bits synchronization separated Y/Cb/Cr or R/G/B 4:4:4 24 bits synchronization separated	For details, contact the our sales office. When purchasing evaluation boards, purchase a pair of video decoder and encoder boards. The decoder and encoder boards are easily operable. The outputs of the boards are intended to be used for the reference signals in debugging.
	ML86V7667 Evaluation Board	Analog video signal CVBS	Digital video data ITU-R BT.656 Y/CbCr 4:2:2 8 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 8 bits multiplexed synchronization separated	
	ML86V7668A Evaluation Board	Analog video signal CVBS S-Video	Digital video data ITU-R BT.656 Y/CbCr 4:2:2 8 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 8 bits multiplexed synchronization separated ITU-R BT.601 Y/CbCr 4:2:2 16 bits synchronization separated Y/Cb/Cr or R/G/B 4:4:4 18 bits synchronization separated	
	ML86V7665 Evaluation Board	Analog video signal CVBS	Digital video data ITU-R BT.656 Y/CbCr 4:2:2 8 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 8 bits multiplexed synchronization separated	
Video Encoder	MSM7654 Evaluation Board	Digital video data ITU-R BT.656 Y/CbCr 4:2:2 8 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 8 bits multiplexed synchronization separated ITU-R BT.601 Y/CbCr 4:2:2 16 bits synchronization separated R/G/B 4:4:4 24 bits synchronization separated	Analog video signal CVBS S-Video RGB (interlace)	
	ML86V7655 Evaluation Board	Digital video data ITU-R BT.656 Y/CbCr 4:2:2 10 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 10 bits multiplexed synchronization separated ITU-R BT.601 Y/CbCr 4:2:2 20 bits synchronization separated Y/Cb/Cr or R/G/B 4:4:4 30 bits synchronization separated	Analog video signal CVBS S-Video Component (interlace/progressive) RGB (interlace/progressive)	
LCD Controllers	ML86V8208 Evaluation Board	Analog video signal CVBS S-Video Component (D1) Digital video data ITU-R BT.656 Y/CbCr 4:2:2 8 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 8 bits multiplexed synchronization separated ITU-R BT.601 Y/CbCr 4:2:2 16 bits synchronization separated Y/Cb/Cr or R/G/B 4:4:4 24 bits synchronization separated	Digital video data R/G/B 4:4:4 24bit VSYNC/HSYNC	For details, contact the our sales office.
	ML86V8209 Evaluation Board	Analog video signal CVBS S-Video Component (D1, D2) Digital video data ITU-R BT.656 Y/CbCr 4:2:2 8 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 8 bits multiplexed synchronization separated ITU-R BT.601 Y/CbCr 4:2:2 16 bits synchronization separated Y/Cb/Cr or R/G/B 4:4:4 24 bits synchronization separated	Digital video data R/G/B 4:4:4 24bit VSYNC/HSYNC T-CON	
	ML86V8207 Evaluation Board	Analog video signal CVBS S-Video Component (D1, D2) Digital video data ITU-R BT.656 Y/CbCr 4:2:2 8 bits multiplexed ITU-R BT.601 Y/CbCr 4:2:2 8 bits multiplexed synchronization separated ITU-R BT.601 Y/CbCr 4:2:2 16 bits synchronization separated Y/Cb/Cr or R/G/B 4:4:4 24 bits synchronization separated	Digital video data R/G/B 4:4:4 24bit VSYNC/HSYNC T-CON	
Image Correction LSIs	ML87V21072 Evaluation Board ①Small-size board with a CCD camera	CCD camera (already mounted)	Digital BT.656 Analog NTSC/PAL	For details, contact the our sales office.
	ML87V21072 Evaluation Board ②Multifunction board with video input supported	Analog video signal CVBS(NTSC/PAL)	Analog NTSC/PAL	
MPEG-4 Encoders	ML86410 Evaluation Board ①USB interface board	Analog video signal CVBS(NTSC/PAL)	USB	For details, contact the our sales office. Images can be checked on PC using the attached viewer software.
	ML86410 Evaluation Board ②LAN interface board	Analog video signal CVBS(NTSC/PAL)	LAN	

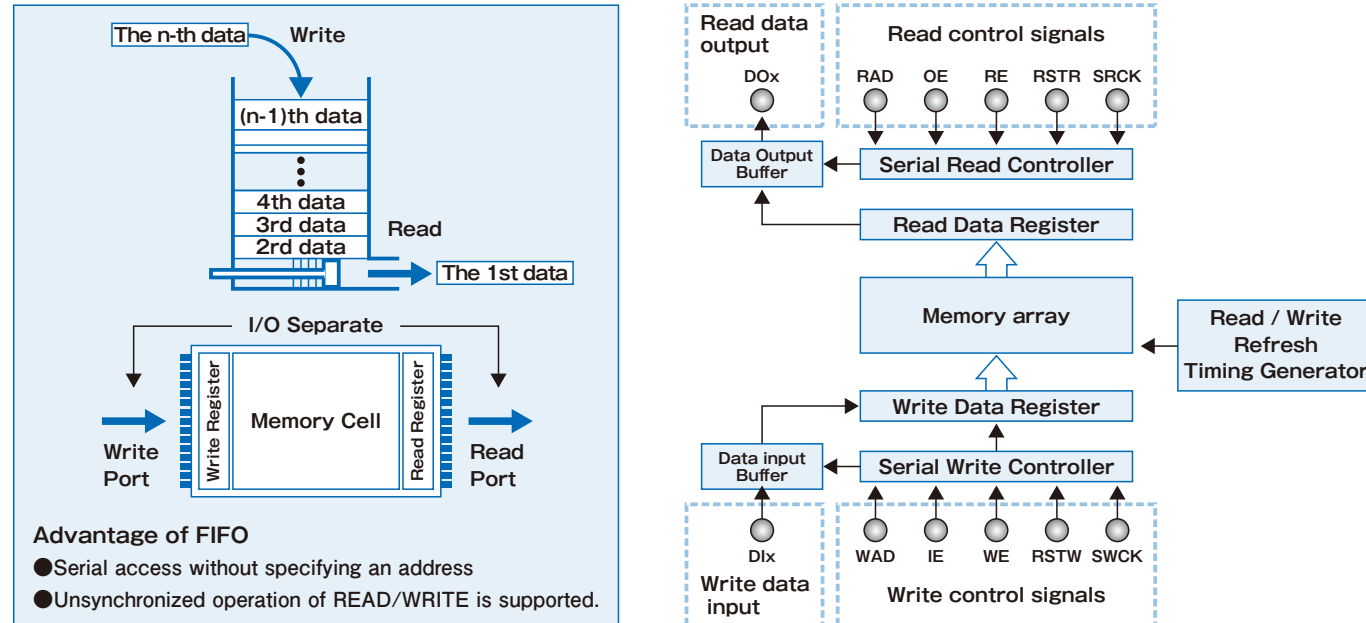
Video Memory

Video Memory Overview

Product Overview

FIFO memory is suitable if frame delay or multi-line delay is required for image processing.

What is First In First Out memory?



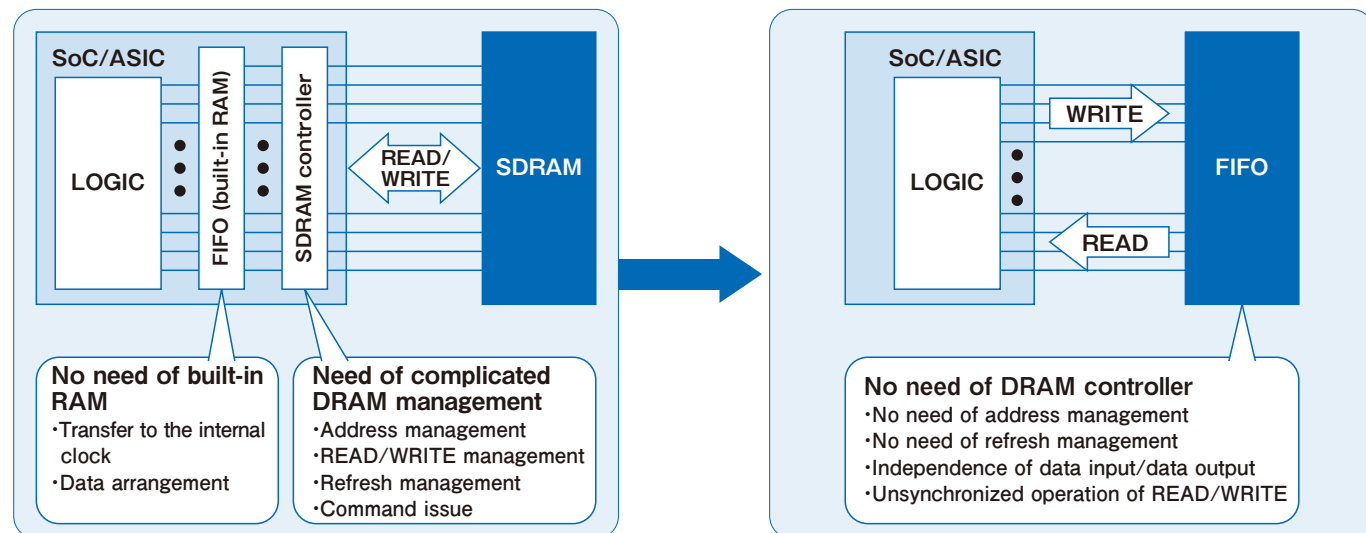
Benefits

① Cost-Saving

- Elimination of SDRAM controller and FIFO (built-in RAM) in the controller (SoC, ASIC, and FPGA) results in a smaller area/size of a circuit.
- With the independent I/O port, the same data transmission rate as DDR SDRAM can be achieved at a lower clock frequency, thus eliminating costly multi-layered board.

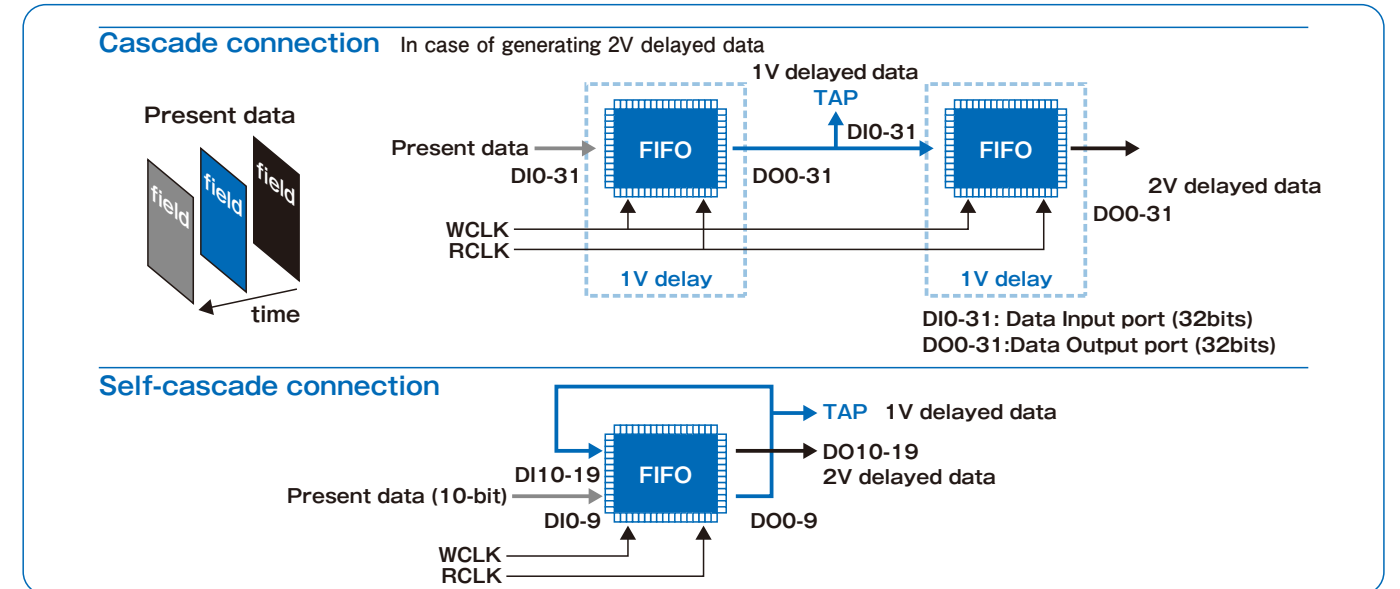
② Shorter Development Time

- No need of time for designing complicated SDRAM controller, such as Read/Write arbitration.
- It can be operated at a clock frequency lower than DDR SDRAM, thus simplifying the board designing and shortening the board designing time.



Example of Usage

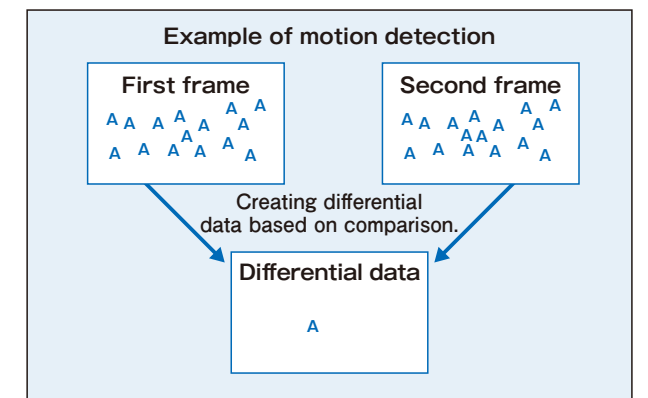
- If delayed data of multi-frame is required, it can be easily obtained by cascade connection.
- If a large-capacity is required, a large-capacity FIFO memory can also be obtained by cascade connection.



Application Examples

The memory provides the following functions for flat-panel display, surveillance camera, video camera, video capture, digital still camera, graphic data transmission system, graphic conversion system, etc.

- 3-D Y/C separation
- Compensation between frames
- LVDS transmission buffer
- Frame synchronizer
- Noise reduction
- Data compression/expansion
- Motion detection
- On-screen display
- IP conversion



Other Video Memory

- LINE BY LINE type
- Multiport DRAM

Video Memory

FIFO type

MSM51822□Series	2Mbit, 5V
MSM51V822□Series	2Mbit, 3.3V
MSM5412222B Series	3Mbit, 5V
MSM54V12222B Series	3Mbit, 3.3V
MS810416□Series	4Mbit, 5V
MS81V0416□Series	4Mbit, 3.3V
MS81V05200 Series	5Mbit, 3.3V
MS81V06160 Series	6Mbit, 3.3V
MS81V10160 Series	10Mbit, 3.3V
MS81V26000 Series	26Mbit, 3.3V
MS81V32322 Series	32Mbit, 3.3V

Supply Voltage: 4.5~5.5V / 3.0~3.6V

Density (bit)	Part Number	Supply Voltage (V)
2M	MSM518221A	4.5~5.5
	MSM518222A	
	MSM51V8221A	3.0~3.6
	MSM51V8222A	
3M	MSM5412222B	4.5~5.5
	MSM54V12222B	3.0~3.6
4M	MS8104160A	4.5~5.5
	MS81V04160A	3.0~3.6
	MS8104166A	4.5~5.5
	MS81V04166A	3.0~3.6
5M	MS81V05200	3.0~3.6
6M	MS81V06160	3.0~3.6
10M	MS81V10160	3.0~3.6
26M	MS81V26000	3.0~3.6
32M	MS81V32322	3.0~3.6

Multiport DRAM

MSM54162□□Series	256K x 16bit, 5V
MSM54V162□□Series	256K x 16bit, 3.3V

Supply Voltage: 4.5~5.5V / 3.0~3.6V

Density (bit)	Part Number	Supply Voltage (V)
4M	MSM5416273	4.5~5.5
	MSM5416282	
	MSM5416283	
	MSM54V16273	3.0~3.6
	MSM54V16283	

FIFO type

Density (bit)	Part Number	Configuration	Max. Access Time (ns)	Max. Cycle Time (ns)	Power Consumption (mW)		Supply Voltage(V)	Package	Notes
					Operating	Standby			
2M	MSM518221A	262,214×8	25/25/30	25/30/40	330/275/220	28	4.5~5.5	28SOJ	Asynchronous serial read/write, Write mask function, Output data control
	MSM518222A								Asynchronous serial read/write, Write mask function, Output data control, Cascading
	MSM51V8221A		30/35	30/40	126/126	10.8	3.0~3.6		Asynchronous serial read/write, Write mask function, Output data control
	MSM51V8222A								Asynchronous serial read/write, Write mask function, Output data control, Cascading
3M	MSM5412222B	262,214×12	23/25	25/30	330	27.5	4.5~5.5	44TSOP	Asynchronous serial read/write, Write mask function, Output data control, Cascading
	MSM54V12222B		18/23	20/25	216	10.8	3.0~3.6		
4M	MS8104160A	(262,214×8)×2	18/23	20/25	935	27.5	4.5~5.5	100TQFP	Asynchronous serial read/write, Write mask function, Output data control, Cascading
	MS81V04160A				288	10.8	3.0~3.6		
	MS8104166A				935	27.5	4.5~5.5		
	MS81V04166A				288	10.8	3.0~3.6		
5M	MS81V05200	583,680×10	14	16	540	21.6	3.0~3.6	70TSOP	Asynchronous serial read/write, Write mask function, Output data control, Cascading
6M	MS81V06160	401,408×16	9/12	12/15	756/612	21.6	3.0~3.6	70TSOP	Asynchronous serial read/write, Write mask function, Output data control, Cascading
10M	MS81V10160	664,320×16	9/12	12/15	756/612	21.6	3.0~3.6	70TSOP	Asynchronous serial read/write, Write mask function, Output data control, Cascading
26M	MS81V26000	1,114,112x24	9	12	720	18	3.0~3.6	100TQFP	Asynchronous serial read/write, Write mask function, Output data control, Cascading, The top address can be specified
32M	MS81V32322	1,114,112x32	6/6.5	6.6/7	576	72	3.0~3.6	128TQFP	Asynchronous serial read/write, Write mask function, Output data control, Cascading, The top address can be specified

Multiport DRAM

Density (bit)	Part Number	Configuration	Max. Access Time (ns)	Power Consumption (mW)		Supply Voltage(V)	Package	Notes
				Operating	Standby			
4M	MSM5416273	262,144×16(RAM) 512×16(SAM)	50/60/70(RAM) 17/18/20(SAM)	770/715/660(RAM) 330/303/275(SAM)	44	4.5~5.5	64SSOP	New extended function, 2-CAS, 8-Column block write
	MSM5416282							2-WE, 8-Column block write
	MSM5416283							New extended function, 2-WE, 8-Column block write
	MSM54V16273		60/70(RAM) 18/20(SAM)	432/396(RAM) 198/198(SAM)	29	3.0~3.6		New extended function, 3.3V, 2-CAS, 8-Column block write
	MSM54V16283							New extended function, 3.3V, 2-WE, 8-Column block write
	MSM54V16283							New extended function, 3.3V, 2-WE, 8-Column block write

P2ROM™ Overview

Features

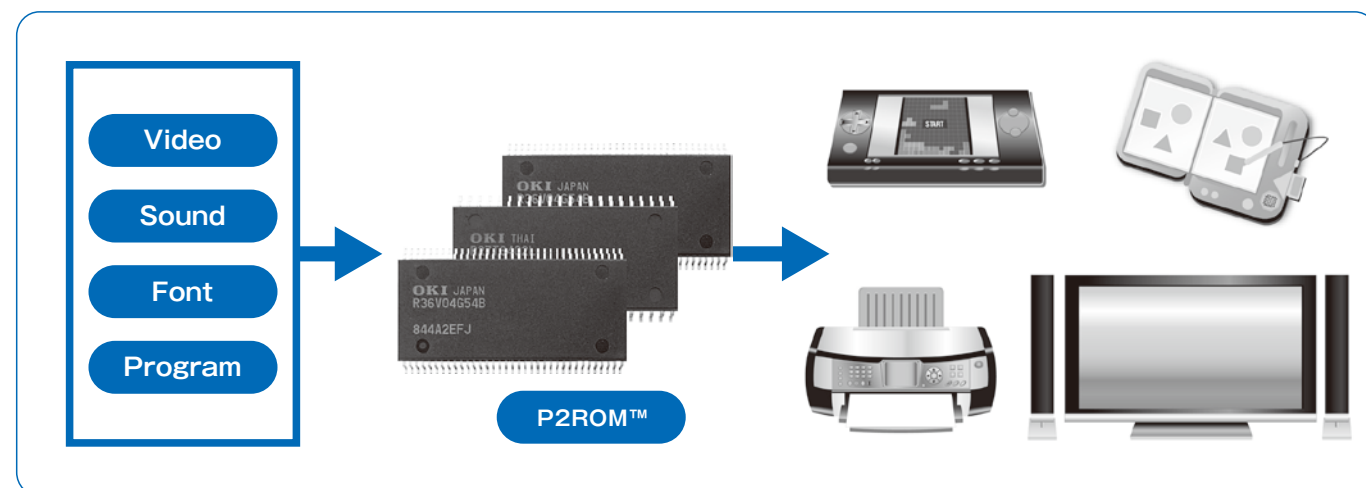
- Short TAT Because a custom code is programmed during the final test process, P2ROMs are definitely more beneficial than mask ROMs in which the code is programmed during preprocessing.
- Stock free for customers Customers are free from keeping unprogrammed memory in stock.
- No need of additional cost for programming ... The writing cost, which is required for OTP or Flash memory, is eliminated.
- Free of mask charge Mask change does not accrue for P2ROM.
- Support for special marking Similar to mask ROM, customer specific marking can be put on the package.
- Compatible with NOR Flash memory Compatible package available, TSOP(I)56 and TSOP(I)48.

Packages

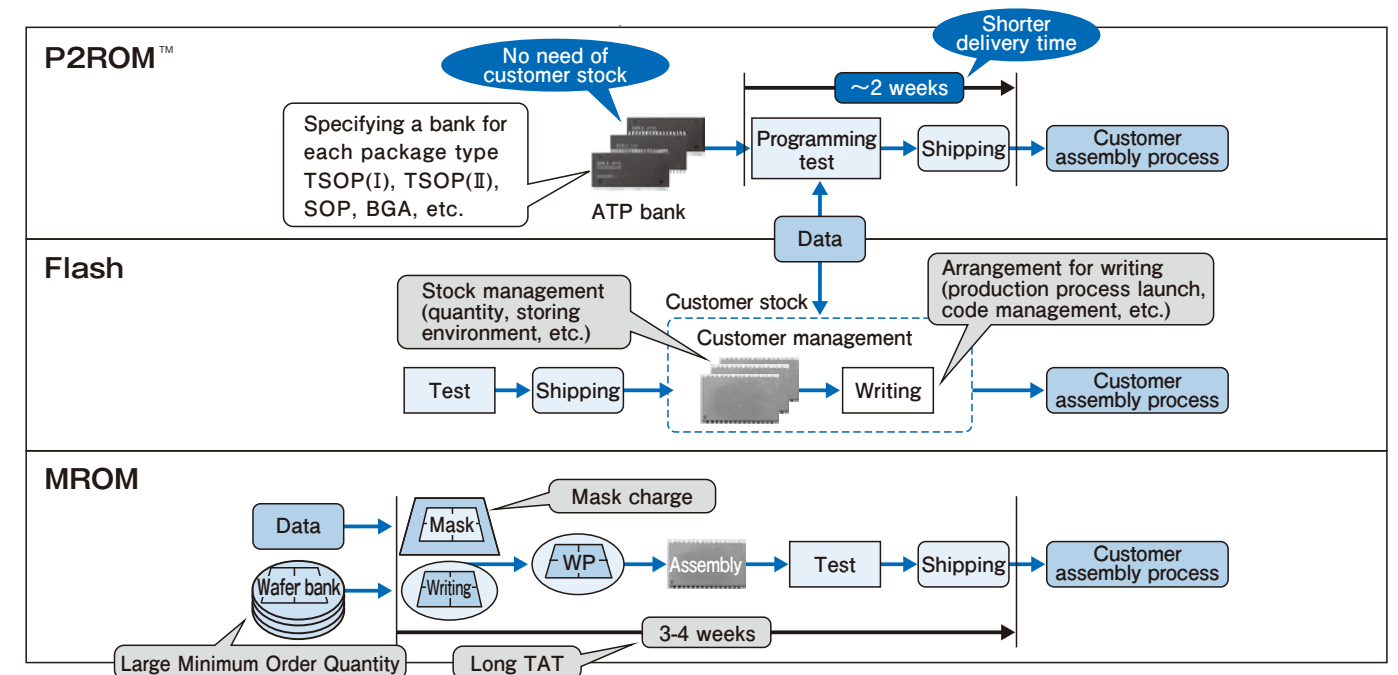
- SOP44
- SOP16
- SSOP70
- TSOP (I)56
- TSOP (I)48
- TSOP(II)50
- BGA48

Applications

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

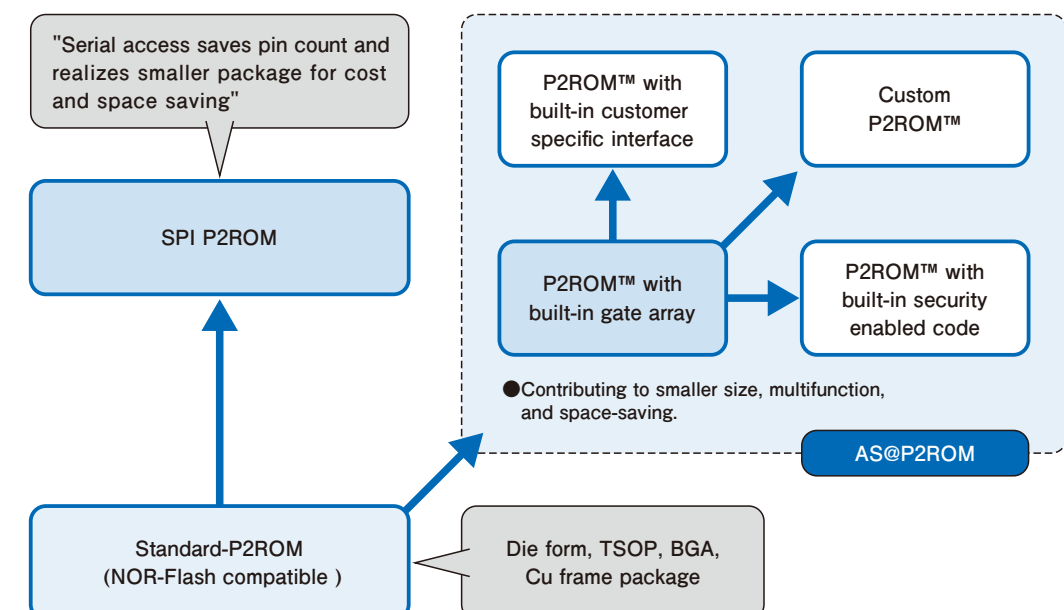


Comparison of Production Processes between P2ROM™ and Flash/MROM



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

MR25T□□□□□□ Series

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

Density (bit)	Part Number	Supply Voltage (V)
128M	MR25T1287□L	2.7~3.6
64M	MR25T647□L	2.7~3.6
16M	MR25T167□L	2.7~3.6
	MR25T1671L	2.7~3.6

AS@P2ROM

Density (bit)	Part Number	Configuration (word×bit)	Supply Voltage (V)	Feature	Access Time(ns)	Standby Current (Max.)	Operating Temperature (℃)	Package
128M	MR25T1287□L	8M×16 16M×8	2.7~3.6	Embedded Gate Array (*1) 26 input & 16 inout	80~100	100μA	0~+70	44SOP/48TSOP(I)
64M	MR25T647□L	4M×16 8M×8	2.7~3.6	Embedded Gate Array (*1) 26 input & 16 inout	80~100	100μA	0~+70	44SOP/48TSOP(I)
16M	MR25T167□L	1M×16 2M×8	2.7~3.6	Embedded Gate Array (*1) 26 input & 16 inout	70~100	100μA	0~+70	44SOP/48TSOP(I)
16M	MR25T1671L	1M×16 2M×8	2.7~3.6	Password authentication	80~90	30μA	0~+70	48TSOP(I)

*1: Has a gate array of 25K Gate (typ.) built in. The design interface supports any of spec, RTL, and Netlist.

P2ROM for wide operating temperature range

MR27T□□□□□□ Series

Supply Voltage : 3.0V~3.6V / 2.7V~3.6V
Operating Temperature : -40℃~+85℃

Density (bit)	Part Number	Supply Voltage (V)
64M	MR27T6402L	3.0~3.6
		2.7~3.6
32M	MR27T3202L	3.0~3.6
		2.7~3.6
16M	MR27T1602L	2.7~3.6

P2ROM for wide operating temperature range

Density (bit)	Part Number	Configuration (word×bit)	Supply Voltage (V)	Access Time (ns)	Current Consumption(Max.)		Operating Temperature (℃)	Package
					Operating	Stanby		
64M	MR27T6402L	4M×16 8M×8	3.0~3.6	80	20mA	10μA	-40~+85	48TSOP(I)
			2.7~3.6	90				
32M	MR27T3202L	2M×16 4M×8	3.0~3.6	80	20mA	10μA	-40~+85	48TSOP(I)
			2.7~3.6	90				
16M	MR27T1602L	1M×16 2M×8	2.7~3.6	70	16mA	10μA	-40~+85	48TSOP(I)

Standard P2ROM

MR26T□□□□□□ Series 512Mbit
MR27T□□□□□□ Series 8M~256Mbit
MR27V□□□□□□ Series 8Mbit

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
		3.0~3.6
	MR27T12802L	2.7~3.6
64M	MR27T6402L	3.0~3.6
		2.7~3.6
32M	MR27T3202L	3.0~3.6
		2.7~3.6
16M	MR27T1602L	2.7~3.6
8M	MR27V802F	3.0~3.6
	MR27T802F	2.7~3.6

Standard P2ROM

Density (bit)	Part Number	Configuration (word×bit)	Supply Voltage (V)	Access Time (ns)	Current Consumption(Max.)		Operating Temperature (℃)	Package
					Operating	Stanby		
512M	MR26T51203L	32M×16 64M×8	3.0~3.6	100	35mA	10μA	0~+70	50TSOP(II)
			2.7~3.6	120				
256M	MR27T25603L	16M×16 32M×8	3.0~3.6	100	35mA	10μA	0~+70	50TSOP(II)
			2.7~3.6	120				
128M	MR27T12800L	8M×16 16M×8	2.7~3.6	90	25mA	10μA	0~+70	48TSOP(I)
			3.0~3.6	80				
	MR27T12802L	8M×16 16M×8	2.7~3.6	90	25mA	10μA	0~+70	56TSOP(I)
64M	MR27T6402L	4M×16 8M×8	3.0~3.6	70	20mA	10μA	0~+70	44SOP/48TSOP(I) 48BGA
			2.7~3.6	90				
32M	MR27T3202L	2M×16 4M×8	3.0~3.6	70~80	20mA	10μA	0~+70	44SOP/48TSOP(I) 48BGA
			2.7~3.6	90				
16M	MR27T1602L	1M×16 2M×8	2.7~3.6	70	16mA	10μA	0~+70	44SOP/48TSOP(I) 48BGA
8M	MR27V802F	512K×16 1M×8	3.0~3.6	70	18mA	5μA	0~+70	44SOP/48TSOP(I)
	MR27T802F	512K×16 1M×8	2.7~3.6	80	18mA	5μA	0~+70	44SOP/48TSOP(I)

Page mode P2ROM

MR36V□□□□□□ Series	1G~4Gbit
MR26V□□□□□□ Series	64Mbit, 512Mbit 1Gbit, 2Gbit
MR27V□□□□□□ Series	16M~256Mbit

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

Density (bit)	Part Number	Supply Voltage(V)
4G	MR36V04G54B	3.0~3.6
3G	MR36V03G54B	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	MR27V25653L	3.0~3.6
128M	MR27V12850L	3.0~3.6
	MR27V12852L	3.0~3.6
64M	MR27V6452L	3.0~3.6
	MR26V6455J	3.0~3.6
32M	MR27V3252J	3.0~3.6
16M	MR27V1652L	3.0~3.6

Page mode P2ROM

Density (bit)	Part Number	Configuration (word×bit)	Page Size	Supply Voltage(V)	Access Time (Address/Page) (ns)	Current Consumption(Max.)		Operating Temperature (℃)	Package
						Operating	Stanby		
4G	MR36V04G54B	128M×32 256M×16	8-doubleword	3.0~3.6	105/25	100mA	85mA	0~+70	70SSOP (*1)
3G	MR36V03G54B	96M×32 192M×16	8-doubleword	3.0~3.6	105/25	100mA	70mA	0~+70	70SSOP (*1)
2G	MR36V02G54B	64M×32 128M×16	8-doubleword	3.0~3.6	105/25	100mA	50mA	0~+70	70SSOP (*1)
	MR26V02G54R	64M×32 128M×16	8-doubleword	3.0~3.6	105/25	100mA	45mA	0~+70	70SSOP (*1)
1G	MR36V01G52B	64M×16 128M×8	8-word	3.0~3.6	110/25	50mA	25mA	0~+70	56TSOP(I)
	MR26V01G53L	64M×16 128M×8	8-word	3.0~3.6	105/35	100mA	10mA	0~+70	70SSOP (*1)
512M	MR26V51252R	32M×16 64M×8	8-word	3.0~3.6	105/25	50mA	4mA	0~+70	56TSOP(I)
	MR26V51253L	32M×16 64M×8	8-word	3.0~3.6	100/35	80mA	5mA	0~+70	70SSOP (*1)
256M	MR27V25653L	16M×16 32M×8	8-word	3.0~3.6	100/35	60mA	5mA	0~+70	70SSOP (*1)
128M	MR27V12850L	8M×16 16M×8	8-word	3.0~3.6	85/30	50mA	10μA	0~+70	48TSOP(I)
	MR27V12852L	8M×16 16M×8	8-word	3.0~3.6	85/30	50mA	10μA	0~+70	56TSOP(I)
64M	MR27V6452L	4M×16 8M×8	8-word	3.0~3.6	90/30	50mA	10μA	0~+70	44SOP/48TSOP(I) 56TSOP(I)
	MR26V6455J	2M×32 4M×16	8-doubleword	3.0~3.6	100/30	100mA	20μA	0~+70	70SSOP
32M	MR27V3252J	2M×16 4M×8	8-word	3.0~3.6	70/25	50mA	10μA	0~+70	44SOP/48TSOP(I)
16M	MR27V1652L	1M×16 2M×8	8-word	3.0~3.6	80/25	60mA	10μA	0~+70	44SOP/48TSOP(I)

*1: For sockets. Package is not suitable for reflow soldering.

SPI P2ROM

MR37V□□□□□□ Series	128Mbit
MR27V□□□□□□ Series	16M~64Mbit

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

Density (bit)	Part Number	Supply Voltage(V)
128M	MR37V12841A	3.0~3.6
64M	MR27V6441L	3.0~3.6
32M	MR27V3241L	3.0~3.6
16M	MR27V1641L	3.0~3.6

SPI P2ROM

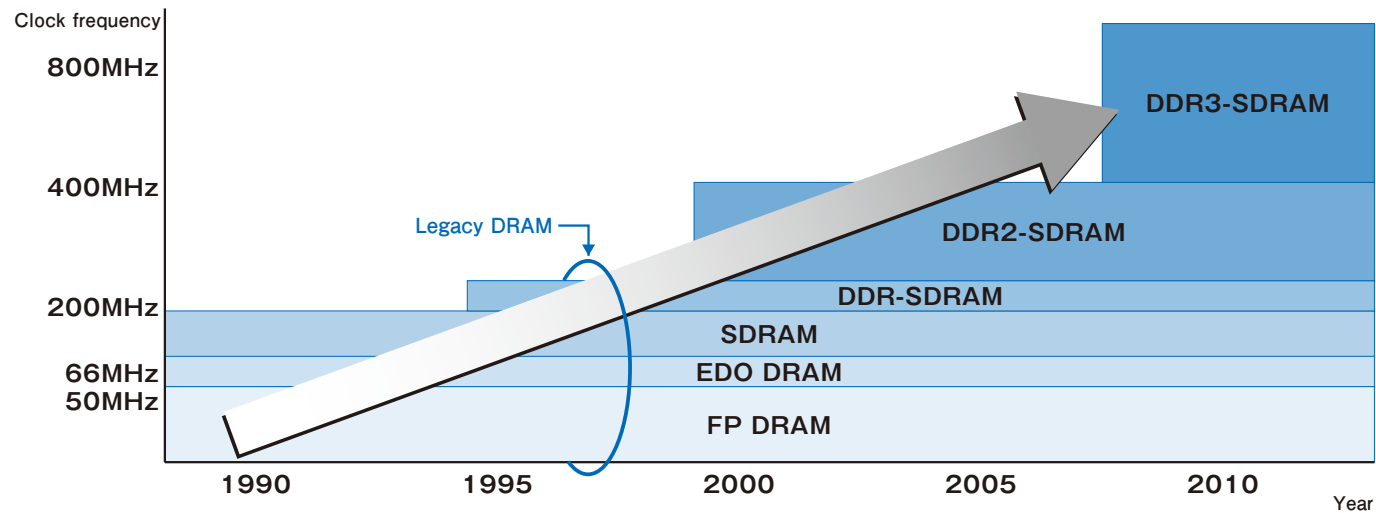
Density (bit)	Part Number	Configuration (word×bit)	Supply Voltage(V)	Operating (*2) Frequency(MHz)	Current Consumption(Max.)		Operating Temperature (℃)	Package
					Operating (*2)	Stanby		
128M	MR37V12841A	128M×1	3.0~3.6	33/20	30mA/20mA	50μA	0~+70	16SOP
64M	MR27V6441L	64M×1	3.0~3.6	33/20	30mA/20mA	50μA	0~+70	16SOP
32M	MR27V3241L	32M×1	3.0~3.6	33/20	40mA/20mA	50μA	0~+70	16SOP
16M	MR27V1641L	16M×1	3.0~3.6	30/20	25mA/20mA	50μA	0~+70	16SOP

*2 : FAST-READ/READ

Types of DRAM

Clock-unsynchronized DRAM ●FP DRAM (Fast Page mode)
●EDO DRAM (Extended Data Out)

Clock-synchronized DRAM ●SDRAM (synchronous DRAM)
●DDR-SDRAM (Double-Data-Rate SDRAM)
●DDR2-SDRAM
●DDR3-SDRAM

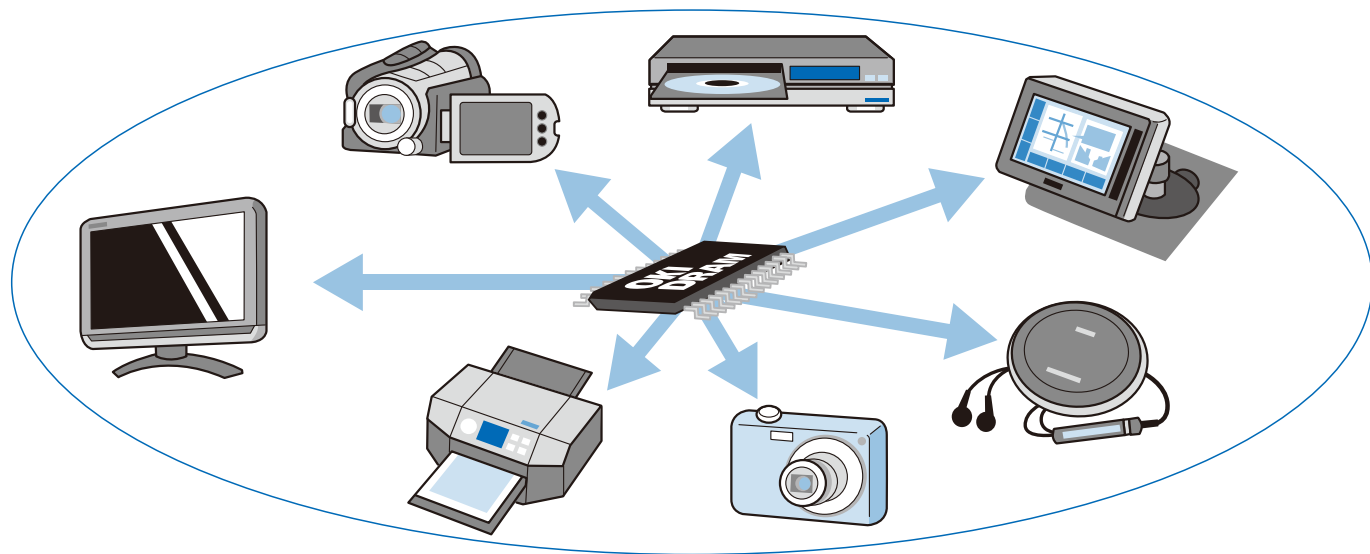


In addition, memories specifically designed for image processing are standardized.

We supply legacy DRAM and SDRAM for SiP on a long-term stable basis.

Application Examples

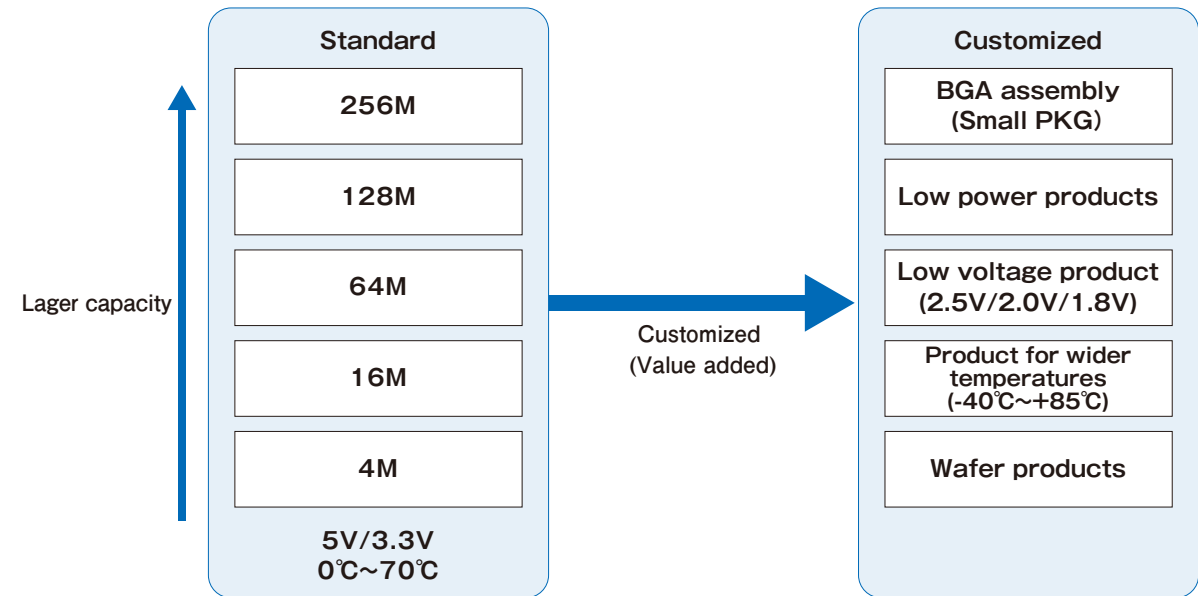
- AV Electronics: LCD TV, DVD player, digital camera, etc.
 - IT Device: printer, hard disk drive, optical disk drive, etc.
 - Car Electronics: car audio and navigation system
 - Communication Device: router, FAX, etc.
- This product is also used in many other applications.



Line-up

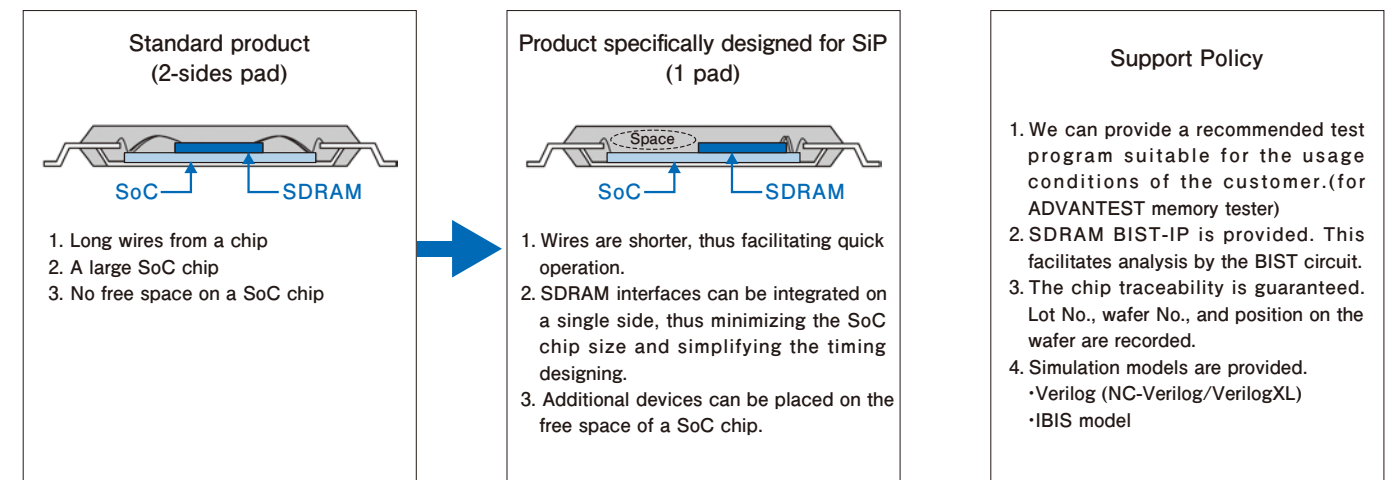
Legacy DRAM

While larger and faster DRAM occupies a larger market share, we provide smaller DRAM, which is difficult to obtain in these days, on a long-term stable basis. We provide not only standard products, which feature a wider range of operating temperatures and a smaller package, but also customized products in accordance with requirements by customers.



Synchronous DRAM for SiP

We provide chips (KGD) as a wafer in the quality the same as the PKG product, so that DRAM for SiP can achieve space- and cost-saving. Although you usually find 2-sides pad array in a small-capacity SDRAM, we offer SDRAM of 1-side pad array, which is suitable for SiP.



DRAM

5V power supply DRAM

MSM514□□□□ Series	4Mbit
MSM5116□□□□ Series	16Mbit, 4K Refresh
MSM5117□□□□ Series	16Mbit, 2K Refresh
MSM511816□□ Series	16Mbit, 1K Refresh

Supply Voltage: 5.0V ± 10%

Density (bit)	Configuration (word×bit)	Refresh Cycle (cycles)	Part Number
4M	1M×4	1K	MSM514400E/EL
	512K×8	1K	MSM514800E/ESL
	256K×16	512	MSM514260E
		512	MSM5416258B
		512	MSM514265E
16M	4M×4	4K	MSM5116400F
		2K	MSM5117400F
		4K	MSM5116405F
		2K	MSM5117405F
		2K	MSM5117410D
		2K	MSM5117415D
	2M×8	2K	MSM5117800F
		2K	MSM5117805F
	1M×16	4K	MSM5116160F
		1K	MSM5118160F
		1K	MSM5118165F

5V power supply DRAM

Supply Voltage(V)	Density (bit)	Configuration (word×bit)	Part Number	Feature	Refresh Cycle (cycles/ms)	Max. Access Time (ns)	Package
5.0 ± 10%	4M	1M×4	MSM514400E/EL	Fast Page Mode	MSM514400E:1024/16 MSM514400EL:1024/128	60/70	26/20SOJ 26/20TSOP
		512K×8	MSM514800E/ESL	Fast Page Mode	MSM514800E:1024/16 MSM514800ESL:1024/128	60/70	28SOJ 28TSOP
		256K×16	MSM514260E	Fast Page Mode	512/8	60/70	40SOJ 44/40TSOP
			MSM5416258B	High-speed EDO	512/16	28/30/35	40SOJ
			MSM514265E	EDO	512/8	60/70	40SOJ 44/40TSOP
	16M	4M×4	MSM5116400F	Fast Page Mode	4096/64	60	26/24SOJ 26/24TSOP
			MSM5117400F		2048/32	50/60	
			MSM5116405F	EDO	4096/64	60	
			MSM5117405F		2048/32	50/60	26SOJ
			MSM5117410D			60	
			MSM5117415D	Quad CAS EDO	2048/32	60	26SOJ
		2M×8	MSM5117800F	Fast Page Mode			
			MSM5117805F	EDO	2048/32	60	28SOJ 28TSOP
		1M×16	MSM5116160F	Fast Page Mode	4096/64	60	42SOJ
			MSM5118160F		1024/16	50/60	42SOJ 50/44TSOP
			MSM5118165F	EDO			

3.3V power supply DRAM

MSM51V4□□□□ Series	4Mbit
MSM51V16□□□□ Series	16Mbit, 4K Refresh
MSM51V17□□□□ Series	16Mbit, 2K Refresh
MSM51V1816□□ Series	16Mbit, 1K Refresh
MD51V65□□□□ Series	64Mbit, 4K Refresh
MD51V64□□□□ Series	64Mbit, 8K Refresh

Supply Voltage: 3.3 ± 0.3 V

Density (bit)	Configuration (word×bit)	Refresh Cycle (cycles)	Part Number
4M	1M×4	1K	MSM51V4400E
	512K×8	1K	MSM51V4800E
	256K×16	512	MSM54V16258B
		512	MSM54V16258BSL
		512	MSM51V4265E
16M	4M×4	4K	MSM51V16400F
		2K	MSM51V17400F
		2K	MSM51V17400J
		4K	MSM51V16405F
		2K	MSM51V17405F
		2K	MSM51V17405J
	2M×8	2K	MSM51V17800F
		2K	MSM51V17805F
	1M×16	4K	MSM51V16160F
		1K	MSM51V18160F
		4K	MSM51V16165F
		1K	MSM51V18165F
	16M×4	4K	MD51V65400E
		8K	MD51V64405E
		4K	MD51V65405E
	8M×8	4K	MD51V65805E
		4K	MD51V65165E
64M	4M×16	8K	MD51V64165E

3.3V power supply DRAM

Supply Voltage(V)	Density (bit)	Configuration (word×bit)	Part Number	Feature	Refresh Cycle (cycles/ms)	Max. Access Time (ns)	Package
3.3 ± 0.3	4M	1M×4	MSM51V4400E	Fast Page Mode	1024/16	70/100	26/20SOJ, 26/20TSOP
		512K×8	MSM51V4800E	Fast Page Mode	1024/16	70	28SOJ
		256K×16	MSM54V16258B	EDO	512/16	40/45/50	40SOJ, 44/40TSOP
			MSM54V16258BSL		512/64		
			MSM51V4265E		512/8	60/70	40SOJ, 44/40TSOP
	16M	4M×4	MSM51V16400F	Fast Page Mode	4096/64	60	26/24SOJ
			MSM51V17400F		2048/32	50/60	26/24SOJ, 26/24TSOP
			MSM51V17400J				26/24TSOP
			MSM51V16405F	EDO	4096/64		26/24TSOP
			MSM51V17405F		2048/32		26/24SOJ, 26/24TSOP
			MSM51V17405J				26/24TSOP
		2M×8	MSM51V17800F	Fast Page Mode	2048/32	60	28TSOP
			MSM51V17805F	EDO			
		1M×16	MSM51V16160F	Fast Page Mode	4096/64	50/60	50/44TSOP
			MSM51V18160F		1024/16		
			MSM51V16165F	EDO	4096/64	60	42SOJ, 50/44TSOP
			MSM51V18165F		1024/16	50/60	
	64M	16M×4	MD51V65400E	Fast Page Mode	4096/64	50/60	32TSOP
			MD51V64405E	EDO	8192/64		
			MD51V65405E		4096/64		
		8M×8	MD51V65805E	EDO	4096/64	50/60	32TSOP
		4M×16	MD51V65165E	EDO	4096/64	50/60	50TSOP
			MD51V64165E		8192/64	60	

DRAM

Synchronous DRAM

MSM56V16800□ Series	16M, x8bit
MSM56V16160 Series	16M, x16bit, TSOP Package
MD56V16160□ Series	16M, x16bit, BGA Package
MD56V62160□ Series	64M, x16bit
MD56V62320□ Series	64M, x32bit
MD56V72160 □ Series	128M, x16bit
MD56V82160 □ Series	256M, x16bit
MD56X62321 Series	64M, x32bit, 1.8V
MD58X62321 Series	64M, x32bit, 1.8V, DDR

Supply Voltage: 3.3 ± 0.3V / 1.8 ± 0.15V

Density (bit)	Configuration (bank×word×bit)	Refresh Cycle (cycles)	Part Number
16M	2×1M×8	4K	MSM56V16800F
	2×512K×16	4K	MSM56V16160F
		4K	MSM56V16160J
		4K	MSM56V16160K*
		4K	MD56V16160F
		4K	MD56V16160J
64M	4×1M×16	4K	MD56V62160E
		4K	MD56V62162J
	4×512K×32	4K	MD56V62320E
		4K	MD56V62320K
128M	4×2M×16	4K	MD56V72160B
256M	4×4M×16	8K	MD56V82160
64M	4×512K×32	4K	MD56X62321*
		4K	MD58X62321*

* Under development

Synchronous DRAM

Supply Voltage(V)	Density (bit)	Configuration (bank×word×bit)	Part Number	Refresh Cycle (cycles/ms)	Min. Cycle Time (ns)	Package	Notes
3.3±0.3	16M	2×1M×8	MSM56V16800F	4096/64	8/10	44TSOP	
		2×512K×16	MSM56V16160F	4096/64	8/10	50TSOP	
			MSM56V16160J		7/7.5/8/10		
			MSM56V16160K*		6/7/7.5/8/10		
			MD56V16160F	4096/64	8/10	60TFBGA	
			MD56V16160J				
	64M	4×1M×16	MD56V62160E	4096/64	10	54TSOP/60TFBGA	
			MD56V62162J		7/7.5/8/10		
		4×512K×32	MD56V62320E	4096/64	8/10	90TFBGA	
			MD56V62320K		6/7/7.5/10	86TSOP	
			MD56V72160B		6	54TSOP	
			MD56V82160		6	54TSOP	
1.8±0.15	64M	4×512K×32	MD56X62321*	4096/64	6/7/7.5/10	86TSOP	
			MD58X62321*		5/6	90TFBGA	Double Data Rate

* Under development

Synchronous DRAM for SiP

MSM56V16160 Series	16M, x16bit
MD56X62321 Series	64M, x32bit, 1.8V
MD58X62321 Series	64M, x32bit, 1.8V, DDR

Supply Voltage: 3.3 ± 0.3V / 1.8 ± 0.15V

Density (bit)	Configuration (bank×word×bit)	Refresh Cycle (cycles)	Part Number
16M	2×512K×16	4K	MSM56V16160J
64M	4×512K×32	4K	MD56X62321*
		4K	MD58X62321*

* Under development

Synchronous DRAM for SiP

Supply Voltage(V)	Density (bit)	Configuration (bank×word×bit)	Part Number	Refresh Cycle (cycles/ms)	Min. Cycle Time (ns)	Notes
3.3±0.3	16M	2×512K×16	MSM56V16160J	4096/64	7.5/8/10	
1.8±0.15	64M	4×512K×32	MD56X62321*	4096/32	6/7/7.5/10	
			MD58X62321*		5/6	Double Data Rate

* Under development

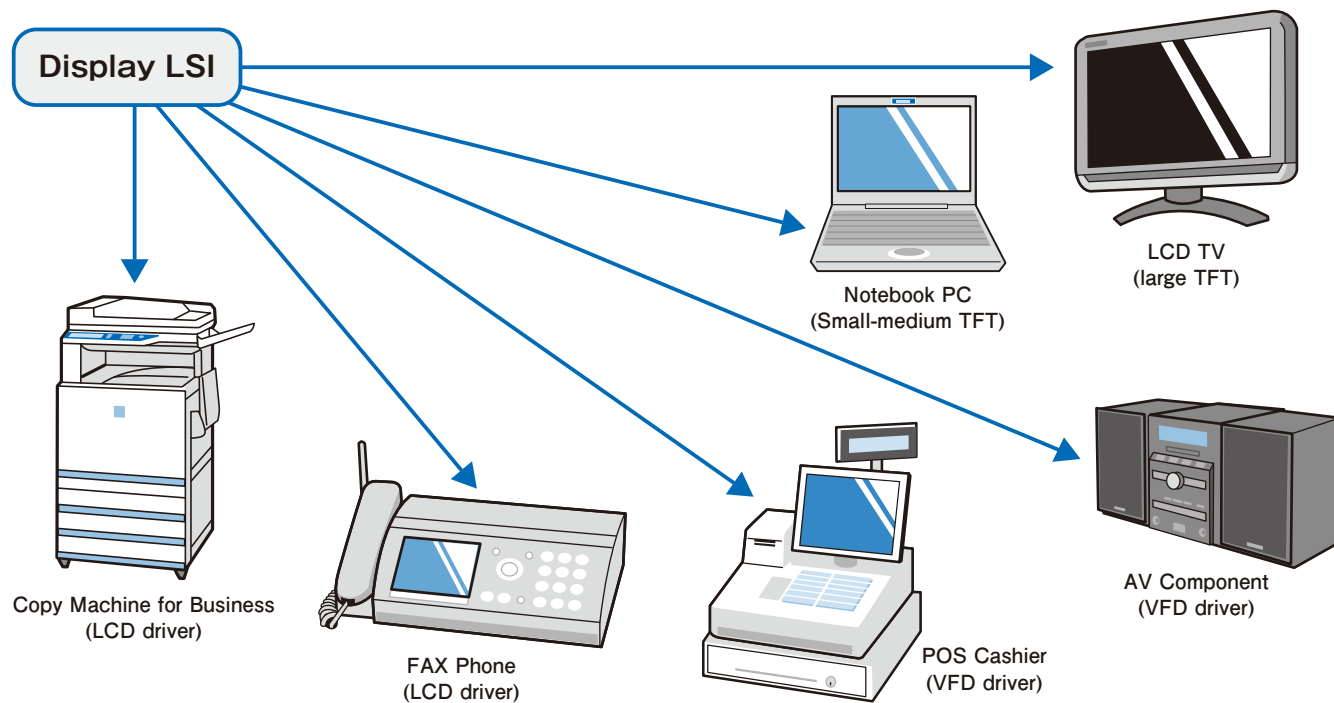
Product Overview

Display LSI is used in a variety of applications, such as large TV, PC monitor, electronic dictionary, calculator, vehicle odometer, industrial machinery monitor. Each application employs a different display panel technology. We respond to your requirements by offering wide selection of products, such as large TFT-LCD, small TFT-LCD, organic EL, and Vacuum Fluorescent Display (VFD).

Product Line-up

- Large TFT-LCD driver
- Small-medium TFT-LCD driver
- LCD driver
- VFD driver
- Organic EL driver
- Car Clock driver

Application Examples



Product Line-up

Small-medium TFT-LCD driver

- Small-medium TFT-LCD source driver : ML986□ Series

LCD driver

- Common/Segment driver for matrix LCD : ML946□ Series
- Controller driver for graphic LCD : ML90□□ Series
- Controller driver for character LCD : ML90□□ Series
- Controller driver for low Duty LCD : ML947□ Series

VFD driver

- Anode/Grid driver for VFD : ML92□□ Series
- Controller driver for character VFD : ML92□□ Series

Organic EL driver

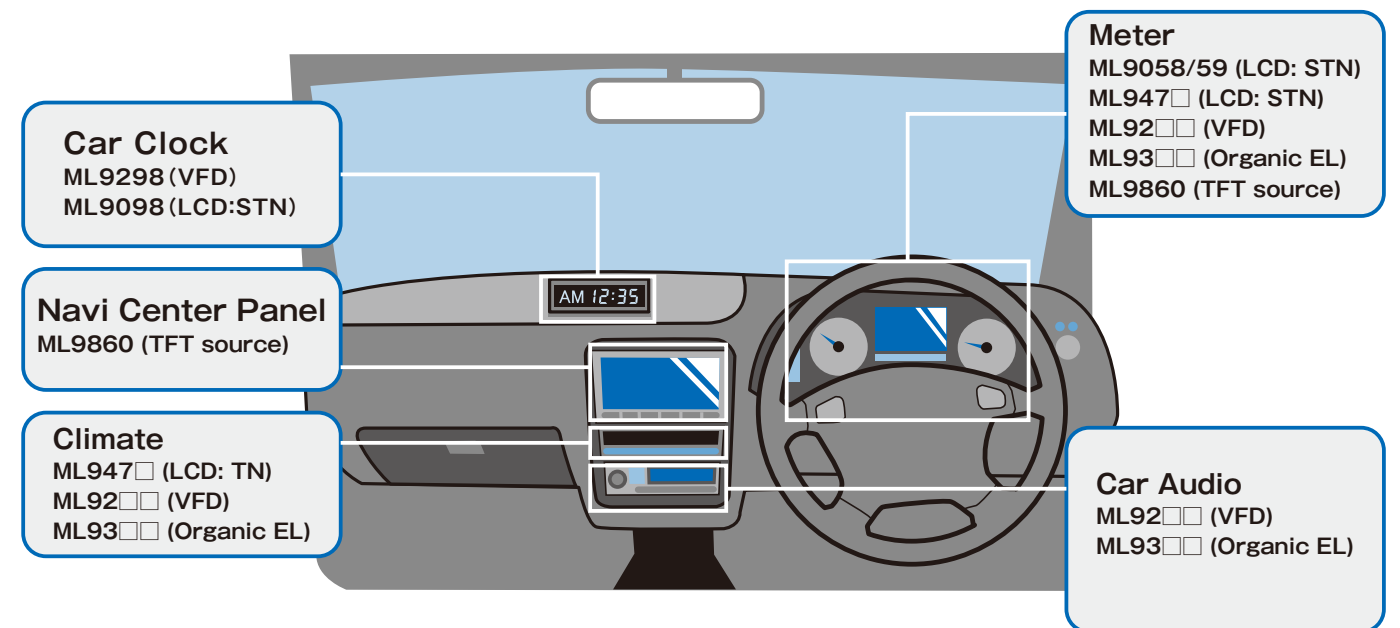
- Controller driver for organic EL : ML93□□ Series

Car Clock driver

- Car Clock driver : ML9298 (VFD), ML9098 (LCD)

Application Examples in a Car

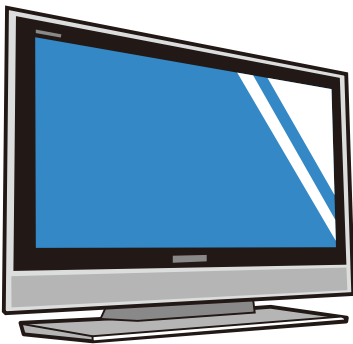
We respond to requirements for every in-vehicle display to be used in Car Clock, meter panel, etc.



Product Overview

We offer wide selection of display driver ICs for large TFT LCD on LCD TVs, notebook PCs, and monitors. These ICs are used in a variety of markets.
We offer a section of TFT drivers. Because this product is often customized, contact us for more information on customization.

Example of Final Products



LCD TV



Notebook PC



Monitor

Large TFT-LCD Driver

Function overview
Source Driver

Function overview
Gate Driver

Large TFT-LCD Driver

Function overview	Gradation (bit)	Number of (*1) outputs	I/F	Logic voltage (V)	LCD voltage (V)	Package
Source Driver	6bit 8bit 10bit	384~420 480~516 576~645 684~720 864~960	CMOS RSDS mini-LVDS	2.3~3.6	12 13.5 16.5 18.5	TCP COF COG

*1: The number of outputs corresponds to a typical value.

Function overview	Output level	Number of (*1) outputs	I/F	Logic voltage (V)	LCD voltage (V)	Package
Gate Driver	2Value, others	200~270 ~300 ~400	CMOS	2.3~3.6V	40 43 45	TCP COF COG

*1: The number of outputs corresponds to a typical value.

Description	Part Number
TFT-LCD driver	ML9860

LCD driver

Common/Segment driver for matrix LCD

Description	Part Number
LCD driver	ML9460
	ML9461B

Controller driver for graphic LCD

Description	Part Number
LCD controller driver	ML9058
	ML9059
	ML9092-01
	ML9092-02 ML9092-03 ML9092-04

Controller driver for character LCD

Description	Part Number
LCD controller driver	ML9042-xx

Controller driver for low Duty LCD

Description	Part Number
LCD controller driver	ML9470-11 ML9470-12
	ML9471
	ML9472
	ML9473

Small-medium TFT-LCD source driver

Part Number	Feature	Package	Logic Supply Voltage(V)	LCD Voltage(V)	Operating Temperature(℃)	Driver Outputs	I/F
ML9860	TFT LCD source driver (480outputs)	Au bump chip	2.1~3.6	10.0~14.6	-40 ~ 95	480	RSDS

Common/Segment driver for matrix LCD

Part Number	Feature	Package	Logic Supply Voltage(V)	LCD Voltage(V)	Operating Temperature(℃)	Driver Outputs	Duty Ratio
ML9460	LCD dot-matrix common driver (240outputs)	Au bump chip TCP(TBD)	2.5~5.5	43(Max)	-30~+75	common 240	~1/240
ML9461B	LCD dot-matrix segment driver (320outputs)	Au bump chip TCP(TBD)	2.5~5.5	2.6~5.5	-30~+75	segment 320	~1/240

Controller driver for graphic LCD

Part Number	Feature	Package	Logic Supply Voltage(V)	LCD Voltage(V)	Operating Temperature(℃)	Driver Outputs (common)	Driver Outputs (segment)	Duty Ratio
ML9058	LCD driver with built-in RAM for LCD dot-matrix display	Au bump chip	3.7~5.5	6~18	-40~+85	65	132	1/65
ML9059		Au bump chip	3.7~5.5	6~18	-40~+85	49	132	1/49
ML9092-01	LCD driver with key scanner and RAM	100TQFP	4.5~5.5	4.5~16.5	-40~+85	10	56	1/8, 1/9, 1/10
ML9092-02 ML9092-03 ML9092-04							60	

Controller driver for character LCD

Part Number	Feature	Package	Logic Supply Voltage(V)	LCD Voltage(V)	Operating Temperature(℃)	Display Type (Character)	General-Purpose Code	Custom Code	No. of Digits	Duty Ratio
ML9042-xx	LCD controller /driver	Au bump chip	2.7~5.5	2.7~5.5	-40~+85	5×8dots	01, 11, 21	Available	20 Characters ×2 lines	1/9, 1/17

Controller driver for low Duty LCD

Part Number	Feature	Package	Logic Supply Voltage(V)	LCD Voltage(V)	Operating Temperature(℃)	Max. No. of Driving Segments	Duty Ratio
ML9470-11 ML9470-12	160-dot LCD driver	100QFP	3.0~5.5	3.0~5.5	-40~+105	80 (static), 160 (1/2duty)	Static, 1/2
ML9471	400-dot LCD driver	100TQFP	3.0~5.5	3.0~5.5	-40~+105	240 (1/3duty), 320 (1/4duty), 400 (1/5duty)	1/3, 1/4, 1/5
ML9472	120-dot LCD driver	80QFP	3.0~5.5	3.0~5.5	-40~+105	60 (static), 120 (1/2duty)	Static, 1/2
ML9473	300-dot LCD driver	80TQFP	3.0~5.5	3.0~5.5	-40~+105	180 (1/3duty), 240 (1/4duty), 300 (1/5duty)	1/3, 1/4, 1/5

VFD driver

Anode/Grid driver for VFD

Description	Part Number
VFD driver	ML9270-xx
	ML9271
	ML9272

Anode/Grid driver for VFD

Part Number	Feature	Package	Type (anode/grid)	Driver Outputs	Display Voltage (V)
ML9270-xx	33-bit VFD grid/anode driver	44QFP	Anode/Grid	33	8~18
ML9271	48-bit VFD grid/anode driver	64QFP	Anode/Grid	48	8~18
ML9272	40-bit VFD grid/anode driver	60SSOP	Anode/Grid	40	10~65

Controller driver for character VFD

Description	Part Number
VFD controller driver	ML9208-xx
	ML9209-xx

Controller driver for character VFD

Part Number	Feature	Package	General-Purpose Code	Custom Code	No. of Digit
ML9208-xx	5×7-dot character×16-digit VFD controller/driver	64QFP, 64SSOP	01	Available	1~16 characters×1 line
ML9209-xx	16-Segment × 1~16-digit VFD controller/driver	44QFP	01	Available	1~16 characters×1 line

Organic EL driver

Controller driver for organic EL

Description	Part Number
Organic EL controller driver	ML9351
	ML9353A

Controller driver for organic EL

Part Number	Feature	Package	Driver Outputs (anode)	Driver Outputs (cathode)	Panel Supply Voltage(V)	Logic Supply Voltage(V)	Operating Temperature(°C)	Internal Memory(RAM)
ML9351	OEL controller/driver (156 (52RGB) × 38dots)	Au bump chip TCP	156	38	12~20	2.7~3.3	-40~+125(Tj)	5,928bit (156×38)
ML9353A	OEL controller/driver (132 × 64dots)	Au bump chip, TCP	132	64	10~24	5.0±0.5	-40~+125(Tj)	33,792bit (132×64×4)

Anode/Cathode driver for organic EL

Description	Part Number
Organic EL driver	ML9362A
	ML9372A

Anode/Cathode driver for organic EL

Part Number	Feature	Package	Driver Outputs (anode)	Driver Outputs (cathode)	Panel Supply Voltage(V)	Logic Supply Voltage(V)	Operating Temperature(°C)	Internal Memory(RAM)
ML9362A	86RGB output OEL anode driver	Au bump chip, TCP	258	-	8~20	2.7~5.5	-40~+125(Tj)	—
ML9372A	64 output OEL cathode driver	Au bump chip, TCP	-	64	8~20	2.7~5.5	-40~+125(Tj)	—

Segment driver for organic EL

Description	Part Number
Organic EL driver	ML9380A

Segment driver for organic EL

Part Number	Feature	Package	Driver Outputs (anode)	Driver Outputs (cathode)	Panel Supply Voltage(V)	Logic Supply Voltage(V)	Operating Temperature(°C)	Internal Memory(RAM)
ML9380A	96 output OEL driver	Au bump chip, Bare chip, TCP	96	1	8~20	3.3~5.5	-40~125(Tj)	—

Car Clock driver

Description	Part Number
Car clock	ML9298
	ML9098

Car Clock driver

Part Number	Feature	Package	Display Duty	Display Voltage(V)	Logic Supply Voltage(V)	Operating Temperature(°C)	Supply Current(Max.)	No. of Digit
ML9298	1/2 duty VFD digital clock, 12H	32SSOP	1/2	4.0~18	No need	-40~+85	0.6mA	4digits×1line and col.
ML9098	Static, 1/2 duty LCD clock, 12H, 24H	48TQFP	Static, 1/2	3.0~5.5	3.0~5.5	-40~+105	0.6mA	4digits×1line and col, AM, PM

Car communication LSI

FM multiplexing demodulate LSI

Description	Part Number
FM multiplexing demodulate for VICS	MSM9564
	MSM9565
	ML9574

FM multiplexing demodulate LSI

Part Number	Feature	Package	Supply Voltage(V)	Operating Temperature(°C)	Supply Current(Max.)
MSM9564	FM multiplexing demodulate LSI for VICS(DARC), built-in BPF & frame memory Supported VICS descrambler, Frames A, B, C and the reception of VICS and D-GPS simultaneously	44QFP	4.5~5.5V	-40~+85°C	34mA
MSM9565	FM multiplexing demodulate LSI for VICS(DARC), built-in BPF & frame memory Supported VICS descrambler, Frames A, B, C and the reception of VICS and D-GPS simultaneously	44QFP	3.0~3.6V	-40~+85°C	28mA
ML9574	FM multiplexing demodulate LSI for VICS(DARC), built-in BPF & frame memory Supported VICS descrambler, Frames A, B, C and 16 bits bus	64TQF	3.0~3.6V	-40~+85°C	35mA

DSRC RF IC

Description	Part Number
DSRC Transceiver	ML9636

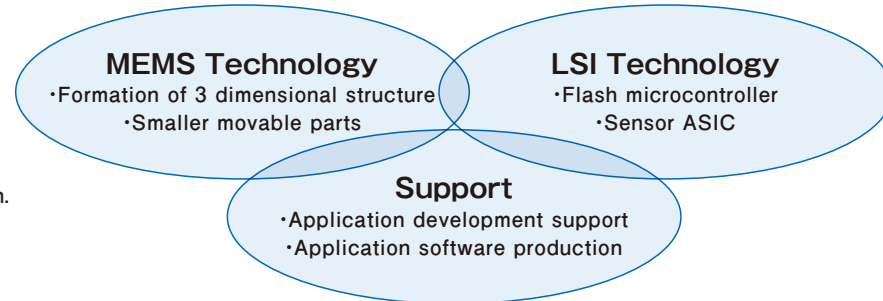
DSRC RF IC

Part Number	Feature	Package	Operating Frequency	Supply Voltage(V)	Supply Current(Max.)	Operating Temperature(°C)
ML9636	DSRC Transceiver (ARIB STD-T75)	48WQFN	5.8GHz band	1.6V typ. 3.3V typ.	115mA max	-30~+85°C

Product Overview

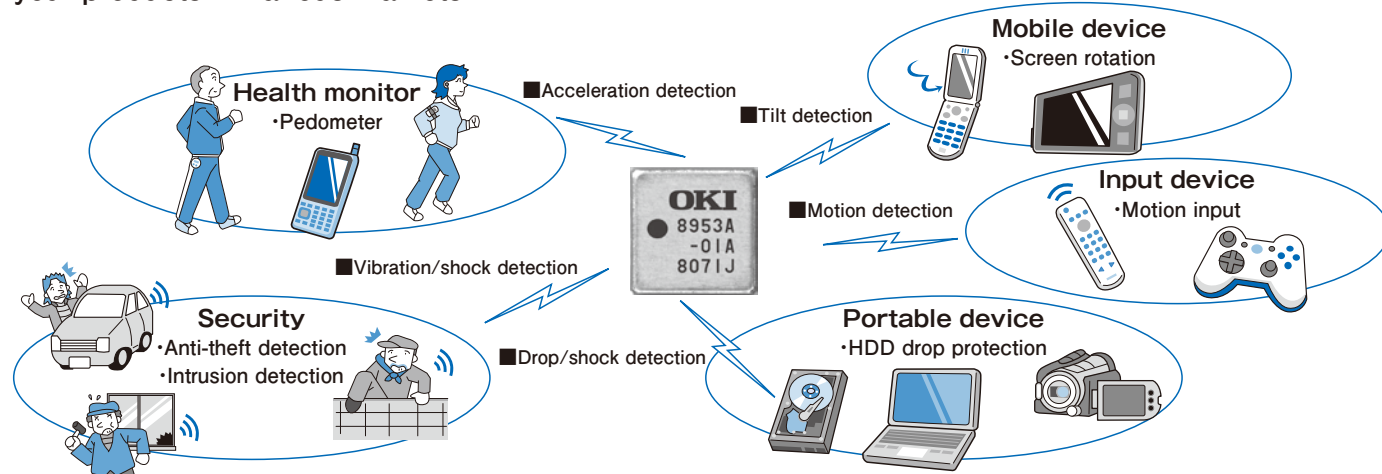
This product can precisely detect the movement and position of every device.

- Provides versatile functions by converging MEMS (Micro-Electro-Mechanical-Systems) and LSI technologies.
- Has a built-in flash microcontroller. Thus, application programs can be installed.
- We help you to create a motion application.



Features

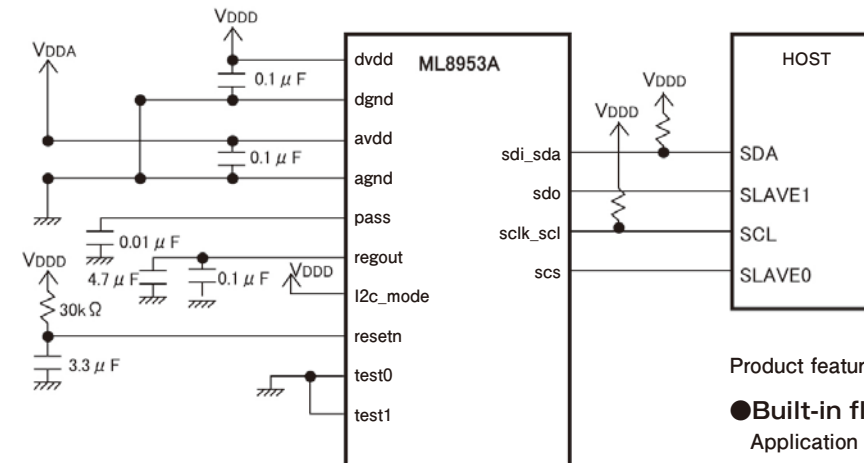
MEMS Acceleration Sensor's versatile functions bring you opportunities for introducing your products in various markets.



Applied Circuit

MEMS Acceleration Sensor

■ Example of I2C mode



Product features of ML8953A

- **Built-in flash microcontroller**
Application software can be installed.
- **Digital I/F (SPI/I2C)**
 - SPI (compatible with 3-line serial/4-line serial)
 - I2C
- **Built-in intelligent functions**
 - 1) A roll angle and pitch angle can be output.
 - 2) The preciseness is improved by average value output.
 - 3) In the auto measurement mode, a drop and shock can be automatically detected, and then notified to the host.

MEMS/Sensor

MEMS Acceleration Sensor

Description	Part Number
3-Axis Accelerometer Equipped with Flash Microcontroller	ML8953A

MEMS Acceleration Sensor

Part Number	Feature	Package	Rated Acceleration	Supply Voltage(V)	Output Type	Temperature Sensor	Impact Resistance	Operating Temperature(°C)
ML8953A	3-Axis Accelerometer Equipped with Flash Microcontroller	C-TQFN18	±3g	Analogue : 2.5~3.6 Digital : 1.74~3.6	SPI, I2C	Built-in	5000g	-20~+70

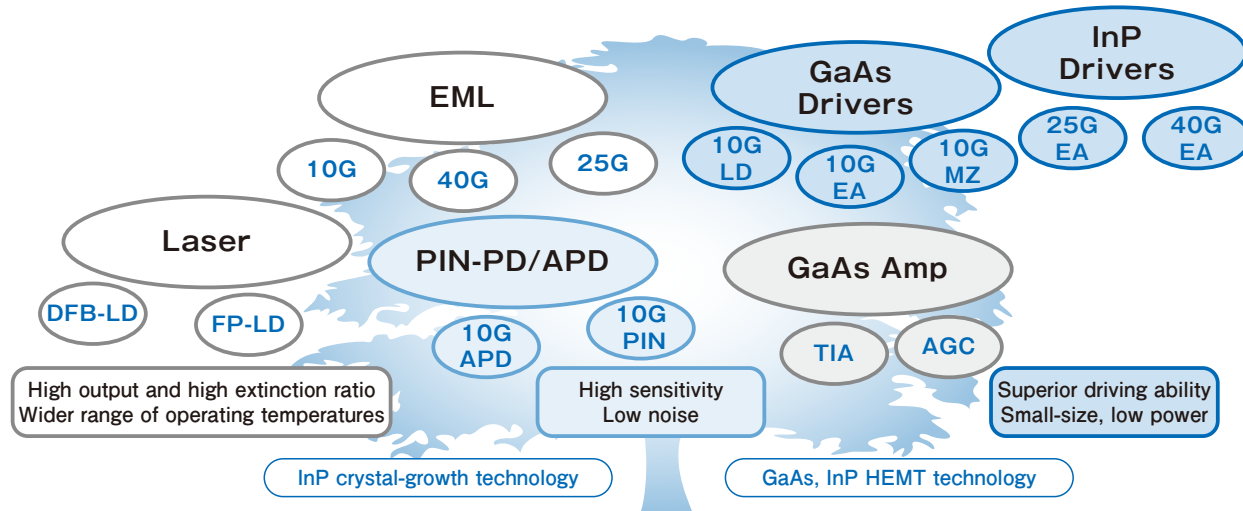
Optical Component

Optical Component Overview

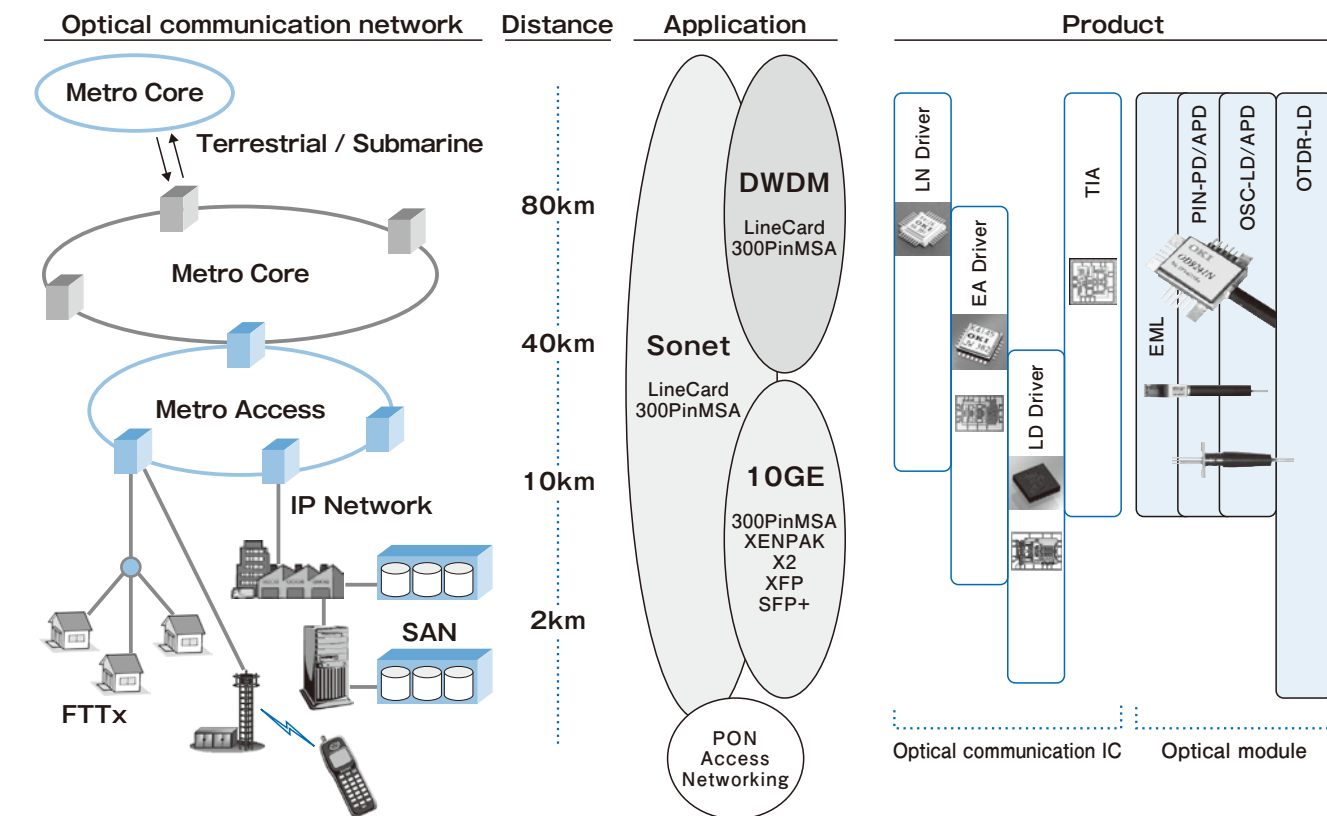
Product Overview

We offer optical modules and ICs to deliver high-quality optical transmission.

- Based on advanced compound semiconductor technology, we offer more reliable, faster, higher-performance products.
- We offer products ranging from slower optical communication to faster optical communication such as 40G and 100G.
- We offer wide selection of products ranging from those for shorter branch lines to those for longer trunk lines.



Market for Optical Communication Applications



Product Line-up

We offer wide selection of products ranging from 10G to an advanced level of 40G/100G as a package in accordance with applications.

Laser module with built-in EA modulator

We offer products suitable for operational speed ranging from 10G to an advance level of 40G. We offer products in different packages suitable for the application, such as one with built-in driver IC and XMD-TOSA.

OL519 □ Series
OL515 □ Series
OL517 □ Series

Photodiode/TIA module

We offer 2 types of photo diode: PINPD and APD. We offer the products as a package in accordance with applications, such as SMT and XMD-ROSA.

OF32 □ Series
OF36 □ Series
OD92 □ Series
OD86 □ Series

Driver IC for driving an optical modulator

We offer products suitable for operational speed ranging from 10G to an advance level of 40G. We offer wide selection of products, such as those for driving an MZ modulator and those for driving a direct modulating laser.

KGL41 □5 Series
KGL41 □6 Series
KGL81 □5 Series
KGA82 □5 Series

Receiving IC

Trans-impedance amplifier, variable gain amplifier, etc. We offer wide selection of high-sensitivity and linearity products.

KGA41 □3 Series
KGL41 □2 Series

The list shows only the typical products of optical components.

Applied Block Diagram

Application example of 10Gbps 300pin MSA

Variable gain amplifier

- Product features of KGL41 □2 Series
Wide gain variable range (KGL4142KD)
Low power 0.3W (KGL4152KD)

Trans-impedance amplifier

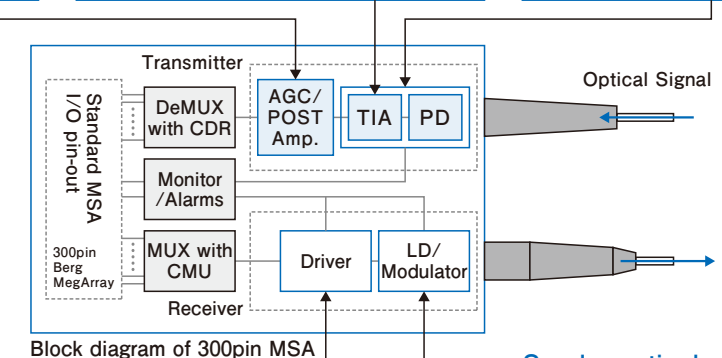
- Product features of KGL41 □3 Series
High sensitivity: -21dBm (KGA4153)
High linearity: AGC (KGA4193) attached

Receiver optical module

- Product features of OF32 □ Series
High sensitivity: -28dBm (OF3242N)
High linearity: (OF3248N)
- Product features of OD92 □ Series
High sensitivity: -20dBm (OD9245N)

Optical modulator driver

- Product features of KGX41 □5 Series
Small/Low power: 4mm sq./0.45W (KGX5115)
Suitable for driving an EA modulator or direct modulating LD
- Product features of KGL41 □6 Series
High output amplitude: 6Vpp - 7Vpp
Suitable for driving an MZ modulator



Sender optical module

- Product features of OL517 □ Series
High extinction ratio: 10dB

Optical Component

Optical module

Laser/Optical modulator module

SUNSTAR微波光电 <http://www.rfoe.net/> TEL:0755-83396822 FAX:0755-83376182 E-MAIL:szss20@163.com

40G EML Modules

Description	Part Number
40G EML Modules	OL5157M
	OL5158M
	OL5191M

40G EA Modules

Description	Part Number
40G EA Modules	OM5653C-30B
	OM5642W-30B

10G EML Modules

Description	Part Number
10G EML Modules	OL5170M
	OL5172M

Coaxial DFB Laser

Description	Part Number
Coaxial DFB Laser	OL345□L-2
	OL545□L-2

Optical Service Channel Laser

Description	Part Number
Optical Service Channel Laser	OL545□L-A
	OL535□L-3-A10
	OL645□L-A
	OL6492N-A
	OL4109L-5
	OL5109L-5A
	OL6109L-5A
	OL6109L-5B

High Output Pulse Laser

Description	Part Number
High Output Pulse Laser	OL3204N-100-P20
	OL5204N-100-P20
	OL5206N-120-P20
	OL6204N-30-AP10
	OL6204N-80-AP10
	OL6204N-100-AP10
	OL6206N-100-AP15
	OL399N-150-P20
	OL495N-80-P20-W90

40G EML Modules

Part Number	Transmission Speed	Application	Wavelength	Optical Output Power (Min.)	Transmission Distance (Max.)	Operating Temperature Range (°C)	Package	Notes	Status
OL5157M	40Gbps	OC-768	1530~1565nm	5dBm (CW)	2Km	0~75	7pin- V connector, SMF	w/ TEC,mPD	MP
OL5158M	40Gbps	OC-768	1530~1565nm	5dBm (CW)	2Km	0~75	7pin- GPPO connector, SMF	w/ TEC,mPD	MP
OL5191M	40Gbps	OC-768	1530~1565nm	1dBm (mod)	2Km	-5~75	XLMD MSA	w/ Driver	ES

40G EA Modules

Part Number	Transmission Speed	Application	DC Loss (Max.)	DC Extinction Ratio(Min.)	Bandwidth (Min.)	Operating Temperature Range (°C)	Package	Notes	Status
OM5653C-30B	40Gbps	OC-768	9dB	17dB	30GHz	0~70	5Pin-V connector, PMF	TEC, Low chirp	ES
OM5642W-30B	40Gbps	Optical Demux	10dB	17dB	30GHz	0~70	5Pin-V connector, SMF	TEC, Low polarization sensitivity	ES

10G EML Modules

Part Number	Transmission Speed	Application	Wavelength	Optical Output Power (Min.)	Transmission Distance (Max.)	Operating Temperature Range (°C)	Package	Notes	Status
OL5170M	10Gbps	OC-192 (XFP)	1530~1565nm	0dBm (average)	40Km	0~75	XMD-TOSA	w/ TEC,mPD	MP
OL5172M	10Gbps	OC-192 (300pin MSA)	1530~1565nm	0dBm (average)	40Km	0~75	TOSA-pigtailed, w/ FPC	w/ TEC,mPD	MP

Coaxial DFB Laser

Part Number	Transmission Speed	Application	Wavelength	Optical Output Power (Min.)	Transmission Distance (Max.)	Operating Temperature Range (°C)	Package	Notes	Status
OL345□L-2	2.5Gbps	OC-48	1263~1360nm	0dBm (average)	40Km	0~70	Coaxial w/ SMF	w/ mPD	MP
OL545□L-2	2.5Gbps	OC-48	1500~1580nm	0dBm (average)	40Km	0~85	Coaxial w/ SMF	w/ mPD	MP

Optical Service Channel Laser

Part Number	Transmission Speed	Application	Wavelength (Typ.)	Optical Output Power (Min.)	LD type	Operating Temperature Range (°C)	Package	Notes	Status
OL545□L-A	155Mbps	supervisory channel	1510nm	2mW(CW)	DFB	0~70	Coaxial w/ SMF	w/ mPD	MP
OL535□L-3-A10	155Mbps	supervisory channel	1510nm	3mW(CW)	DFB	0~70	Coaxial w/ SMF	w/ mPD	MP
OL645□L-A	155Mbps	supervisory channel	1630nm	2mW(CW)	DFB	0~70	Coaxial w/ SMF	w/ mPD	MP
OL6492N-A	155Mbps	supervisory channel	1625nm	1mW(CW)	FP	0~65	Coaxial w/ SMF	w/ mPD	MP
OL4109L-5	155Mbps	supervisory channel	1480nm	5mW(CW)	DFB	-5~70	Butterfly	w/ TEC,mPD	MP
OL5109L-5A	155Mbps	supervisory channel	1510nm	5mW(CW)	DFB	-5~70	Butterfly	w/ TEC,mPD	MP
OL6109L-5A	155Mbps	supervisory channel	1625nm	5mW(CW)	DFB	-5~70	Butterfly	w/ TEC,mPD	MP
OL6109L-5B	155Mbps	supervisory channel	1650nm	5mW(CW)	DFB	-5~70	Butterfly	w/ TEC,mPD	MP

High Output Pulse Laser

Part Number	Application	Wavelength (Typ.)	Pulse Optical Output Power	LD type	Operating Temperature Range (°C)	Package	TEC	Notes	Status
OL3204N-100-P20	OTDR	1310nm	100mW	FP	-20~65	DIL w/ SMF	Cooled	—	MP
OL5204N-100-P20	OTDR	1550nm	100mW	FP	-20~65	DIL w/ SMF	Cooled	—	MP
OL5206N-120-P20	OTDR	1550nm	120mW	FP	10~40	DIL w/ SMF	Uncooled	—	MP
OL6204N-30-AP10	OTDR	1625nm	30mW	FP	-20~65	DIL w/ SMF	Cooled	—	MP
OL6204N-80-AP10	OTDR	1625nm	80mW	FP	-20~65	DIL w/ SMF	Cooled	—	MP
OL6204N-100-AP10	OTDR	1625nm	100mW	FP	-20~65	DIL w/ SMF	Cooled	—	MP
OL6206N-100-AP15	OTDR	1625nm	100mW	FP	10~40	DIL w/ SMF	Uncooled	—	MP
OL399N-150-P20	OTDR	1300nm	150mW	FP	-20~60	Coaxial w/ MMF	Uncooled	MMF	MP
OL495N-80-P20-W90	OTDR	1490nm	80mW	FP	-20~60	Coaxial w/ SMF	Uncooled	—	MP

Optical Component

Optical module

Photoreceptor module

10G APD

Description	Part Number
10G APD	OF3241N
	OF3242N-MS
	OF3249N-MS
	OF3647R

10G APD

Part Number	Transmission Speed	Application	Sensitivity (Typ.)	Overload (Typ.)	Trans impedance (Typ.)	Operating Temperature Range(°C)	Package	Notes	Status
OF3241N	10Gbps	OC-192	-27dBm	-5dBm	4KΩ	-20~85	17pin-MSA, SMF	—	MP
OF3242N-MS	10Gbps	OC-192	-27.5dBm	-5dBm	1.4KΩ	-20~85	17pin-MSA, SMF	—	MP
OF3249N-MS	10Gbps	OC-192	-27dBm	-3dBm	0.2KΩ~7.0KΩ	-20~85	17pin-MSA, SMF	TIA w/AGC	MP
OF3647R	10Gbps	OC-192 (XFP)	-27.5dBm	-3dBm	12KΩ	-5~85	XMD-ROSA	—	MP

10G PIN-PD

Description	Part Number
10G PIN-PD	OD9245N-MS
	OD9249N
	OD8647R

10G PIN-PD

Part Number	Transmission Speed	Application	Sensitivity (Typ.)	Overload (Typ.)	Trans impedance (Typ.)	Operating Temperature Range(°C)	Package	Notes	Status
OD9245N-MS	10Gbps	OC-192	-19.5dBm	+2dBm	1.4KΩ	-10~85	17pin-MSA, SMF	—	MP
OD9249N	10Gbps	OC-192	-19.0dBm	+3dBm	0.2KΩ~7.0KΩ	-20~85	17pin-MSA, SMF	TIA w/AGC	MP
OD8647R	10Gbps	OC-192 (XFP)	-20.0dBm	+2dBm	12KΩ	-5~85	XMD-ROSA	—	MP

155M APD

Description	Part Number
155M APD	OF3500B
	OF3507B

155M APD

Part Number	Transmission Speed	Application	Sensitivity (Typ.)	Overload (Typ.)	Sensitivity (Typ.)	Operating Temperature Range(°C)	Package	Notes	Status
OF3500B	155Mbps	OC-3 supervisory channel	-47.5dBm	-5dBm	0.85 A/W	-40~85	Coaxial w/SMF	different PIN assignment	MP
OF3507B	155Mbps	OC-3 supervisory channel	-47.5dBm	-5dBm	0.85 A/W	-40~85	Coaxial w/SMF	different PIN assignment	MP

Optical Component

Optical communication IC

Optical modulator driver IC

10G Mach-zehnder Modulator Drivers

Description	Part Number
10G Mach-zehnder Modulator Drivers	KGL4146
	KGL4166
	KGL4186KD

10G EA Modulator Drivers

Description	Part Number
10G EA Modulator Drivers	KGA4145
	KGL4145KW
	KGA4195
	KGL4195KD
	KGA5115
	KGL5115KD

10G Direct Modulate Laser Drivers

Description	Part Number
10G Direct Modulate Laser Drivers	KGA4185
	KGL4185KD
	KGA4155
	KGL4155KD

25G EA Modulator Drivers

Description	Part Number
25G EA Modulator Drivers	KGA8105
	KGL8105KW

40G EA Modulator Drivers

Description	Part Number
40G EA Modulator Drivers	KGA8205

10G Mach-zehnder Modulator Drivers

Part Number	Transmission Speed	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Circuit Current (Typ.)	Output Amplitude (Typ.)	Rise/Fall Time (Typ.)	Cross Point (Typ.)	Package	RoHS Compliance
KGL4146	11.3Gbps	OC-192 Tx	0~85	-5.2/+5V	110/180mA	6.0Vpp	23ps	40 to 60%	38pin QFP 10.9 X 8.0mm	Yes
KGL4166	11.3Gbps	OC-192 Tx	-5~85	-5.2/+6V	110/280mA	8.0Vpp	23ps	45 to 55%	38pin QFP 10.9 X 8.0mm	Yes
KGL4186KD	11.3Gbps	OC-192 Tx	-5~85	+3.3/+5V	115/110mA	3.5Vpp (7.0Vpp Diff.)	31ps	40 to 60%	24pin QFN 4mm sq.	Yes

10G EA Modulator Drivers

Part Number	Transmission Speed	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Circuit Current (Typ.)	Output Amplitude (Typ.)	Rise/Fall Time (Typ.)	Cross Point (Typ.)	Package	RoHS Compliance
KGA4145	11.1Gps	OC-192 Tx	-5~90	-5.2V	220mA	2.7Vpp	21ps	35 to 80%	Die 1.8 X 1.3 mm	Yes
KGL4145KW	11.3Gps	OC-192 Tx	0~85						24pin QFN (4mm Sq.)	Yes
KGA4195	11.3Gps	OC-192 Tx	-5~90	+3.3V (*1) +3.3/ +5V (*2)	90/120mA (*1) 90/160mA (*2)	2.6Vpp (*1) 2.7Vpp (*2)	27ps	35 to 80%	Die 1.7 X 1.2 mm	Yes
KGL4195KD	11.3Gps	OC-192 Tx	-40~95						24pin QFN (4mm Sq.)	Yes
KGA5115	11.3Gps	OC-192 Tx	-5~90	+3.3V (*1) +3.3/ +5V (*2)	50/80mA (*1) 50/120mA (*2)	2.3Vpp	28ps	35 to 80%	Die 1.7 X 1.1 mm	Yes
KGL5115KD	11.3Gps	OC-192 Tx	-40~95						24pin QFN (4mm Sq.)	Yes

*1 Output AC Couple, *2 Output DC Couple

10G Direct Modulate Laser Drivers

Part Number	Transmission Speed	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Power Dissipation (Typ.)	Modulation Current (Typ.)	Bias Current (Typ.)	Rise/Fall Time (Typ.)	Package	RoHS Compliance
KGA4185	11.3Gps	OC-192 Tx	-5~90	+3.3V (*1) +3.3/ +5V (*2)	0.65W	20 to 80mApp (@50Ω Diff.)	2 to 85mA	27ps	Die 1.7 X 1.2 mm	Yes
KGL4185KD	11.3Gps	OC-192 Tx	-40~95						24pin QFN (4mm Sq.)	Yes
KGA4155	11.3Gps	OC-192 Tx	-40~85	+3.3	0.4W	25 to 100mApp (@10Ω Diff.)	2 to 85mA	27ps	Die 1.7 X 1.2 mm	Yes
KGL4155KD	11.3Gps	OC-192 Tx	-5~85						24pin QFN (4mm Sq.)	Yes

*1 Output AC Couple, *2 Output DC Couple

25G EA Modulator Drivers

Part Number	Transmission Speed	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Power Dissipation (Typ.)	Output Amplitude (Typ.)	Rise/Fall Time (Typ.)	Cross Point (Typ.)	Package	RoHS Compliance
KGA8105	25.8Gps	100GbE	-5~90	- 5.2V	1.25W	2.5Vpp	12ps	35 to 75%	Die 1.7 X 1.2mm	Yes
KGL8105KW	25.8Gps	100GbE	-5~90	- 5.2V	1.25W	2.5Vpp	TBD	35 to 75%	24pin QFN (4mm Sq.)	Yes

40G EA Modulator Drivers

Part Number	Transmission Speed	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Power Dissipation (Typ.)	Output Amplitude (Typ.)	Rise/Fall Time (Typ.)	Cross Point (Typ.)	Package	RoHS Compliance
KGA8205	43 Gps	OC-768 Tx	-5~75	- 5.2V	1.1W	2.5Vpp	7.5ps	35 to 70%	Die	Yes

Optical Component

Optical communication IC

Optical modulator receiving IC

10G Transimpedance Amplifier

Description	Part Number
10G Transimpedance Amplifier	KGA4133
	KGA4153
	KGA4163
	KGA4183
	KGA4193

10G Transimpedance Amplifier

Part Number	Transmission Speed	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Power Dissipation (Typ.)	Trans impedance (Typ.)	Sensitivity (Typ.)	Frequency Bandwidth (Typ.)	Package	RoHS Compliance
KGA4133	12.5Gbps	OC-192 Rx	0~85	+3.3/-2V	0.2W	0.56k Ω (Single)	-20.5dBm	>10GHz	Die 1.6 X 1.3 mm	Yes
KGA4153	11.3Gps	OC-192 Rx	-10~90	+3.3V	0.2W	4.5k Ω (diff.)	-21.5dBm	10GHz	Die 1.09X 0.8 mm	Yes
KGA4163	11.3Gps	OC-192 Rx	-10~90	+3.3V	0.2W	1.4k Ω (diff.)	-20.5dBm	11GHz	Die 1.09 X 0.8 mm	Yes
KGA4183	11.3Gps	OC-192 Rx	-10~90	+3.3V	0.17W	0.84k Ω (diff.)	-18.5dBm	9.5GHz	Die 0.99 X 0.8 mm	Yes
KGA4193	11.3Gps	OC-192 Rx	-10~90	+3.3V	0.23W	0.2~8k Ω (diff.) AGC	-21.5dBm	9GHz	Die 1.2 X 0.8 mm	Yes

10G Automatic Gain Control Amplifier

Description	Part Number
10G Automatic Gain Control Amplifier	KGL4142KD
	KGL4152KD

10G Automatic Gain Control Amplifier

Part Number	Transmission Speed	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Power Dissipation (Typ.)	Maximum Gain(Typ.)	Minimum Gain(Typ.)	Input Sensitivity (Typ.)	Package	RoHS Compliance
KGL4142KD	11.3Gps	OC-192 Rx	-5~85	+5V	0.6W	28dB	- 10dBm	10mVpp	24pin QFN (4mm Sq.)	Yes
KGL4152KD	11.3Gps	OC-192 Rx	-5~85	+3.3V	0.3W	28dB	0dBm	10mVpp	24pin QFN (4mm Sq.)	Yes

Optical communication IC

Wideband Amplifier IC

Wideband Amplifier

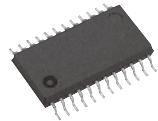
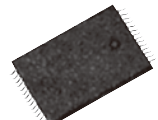
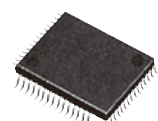
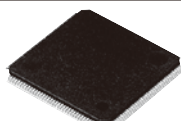
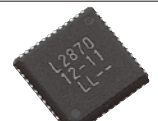
Description	Part Number
Wideband Amplifier	KGA4117N
	KGL4117H
	KGA8011

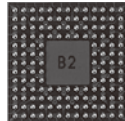
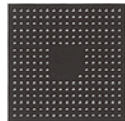
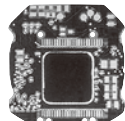
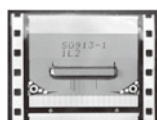
Wideband Amplifier

Part Number	Frequency Bandwidth	Typical Application	Operating Temperature (°C)	Operating Voltage (Typ.)	Power Dissipation (Typ.)	Small Signal Gain(Typ.)	Satulated Output Amplitude (Typ.)	Output Power(Typ.)	Package	RoHS Compliance
KGA4117N	15GHz	OC-192 Rx	0~75	- 5.2V	0.7W	15dB	1Vpp	—	Die	Yes
KGL4117H	15GHz	OC-192 Rx	0~85						32pin QFP (7mm Sq.)	Yes
KGA8011	>40GHz	OC-768 Tx	0~75	+ 3.3V	0.36W	14.0dB	—	14dBm	Die 3.16 X 1.40mm	Yes

LSI Packages

Package type

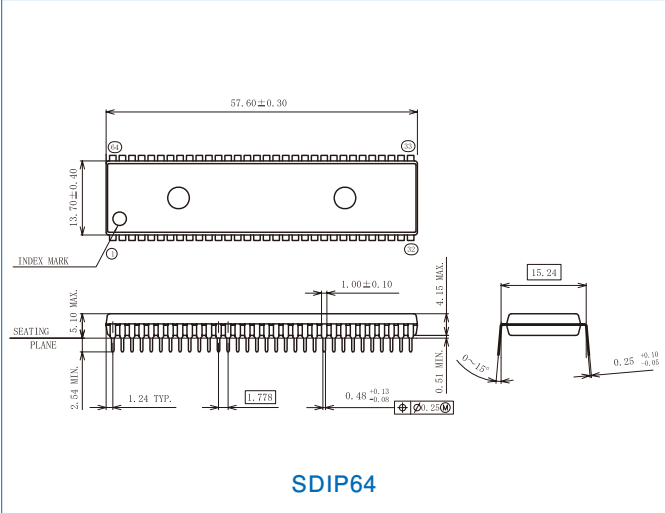
Type	Package Type		Package Symbol		Pin Count
Insertion Type	Shrink DIP *Only ATP foundry	—	RB		64
Surface Mount Type	SOP		MA	GS, MS	16, 24, 44
	SSOP		MB	GS, MS	30, 32, 64, 70
	TSOP (Type I)		TA	TS	32, 48, 56
	TSOP (Type II)				26/20, 26/24, 32, 44/40, 44, 50/44, 50, 70
	TSSOP		TD		16, 56
	QFP		GA	GS	44, 56, 64, 80, 100, 128, 160, 208
	LQFP		TC	GS	144, 176, 216
	TQFP		TB	TS	44, 48, 64, 80, 100, 120, 128
	VQFN				32
	WQFN				12, 16, 20, 24, 28, 32, 36, 40, 48, 52, 56, 64
	WSON	—			8, 10

Type	Package Type		Package Symbol		Pin Count
Surface Mount Type	LFBGA		LA	LS	48, 84, 144, 176, 224
	TFBGA				48, 60, 64, 70, 90, 120, 132, 176, 208
	W-CSP (Wafer-level CSP)		Custom Design		
	COB (Chip On Board)		Custom Design		
Special Package (Examples)	TCP (Tape Carrier Package)		Package for LCD Drivers		
	COF (Chip On Film)				
	Ceramic QFN	—	Package for Sensors		

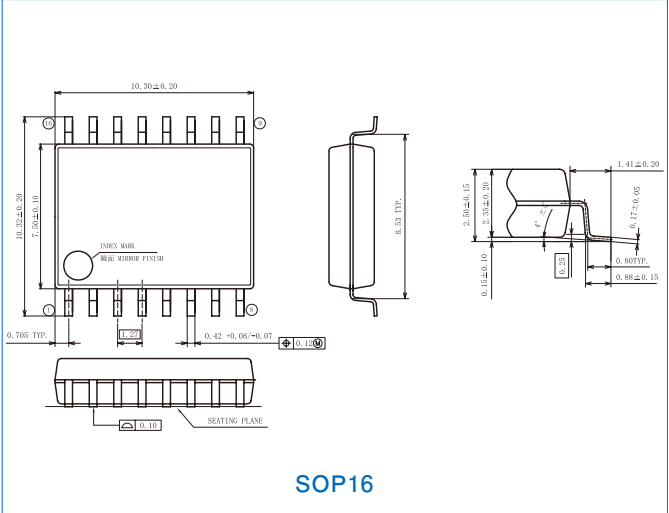
LSI Packages

Package size

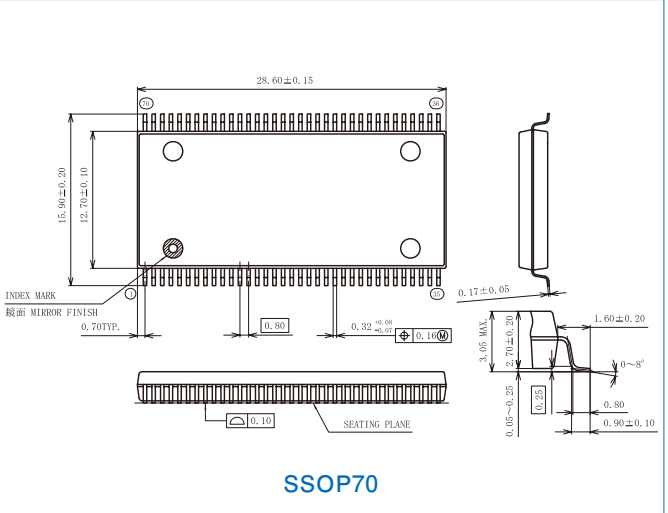
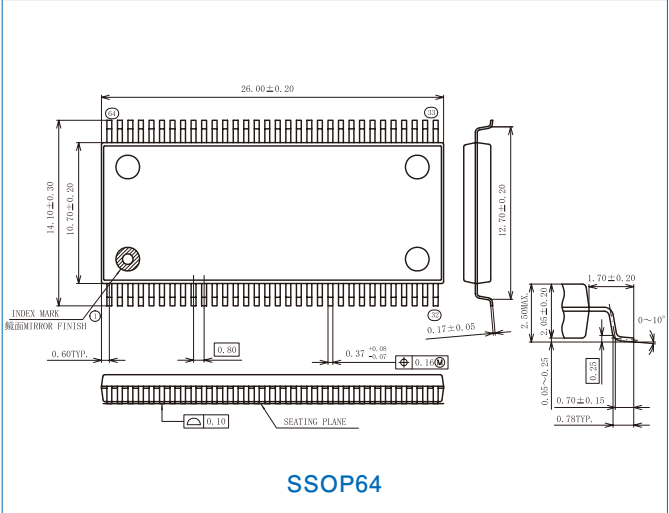
Shrink DIP



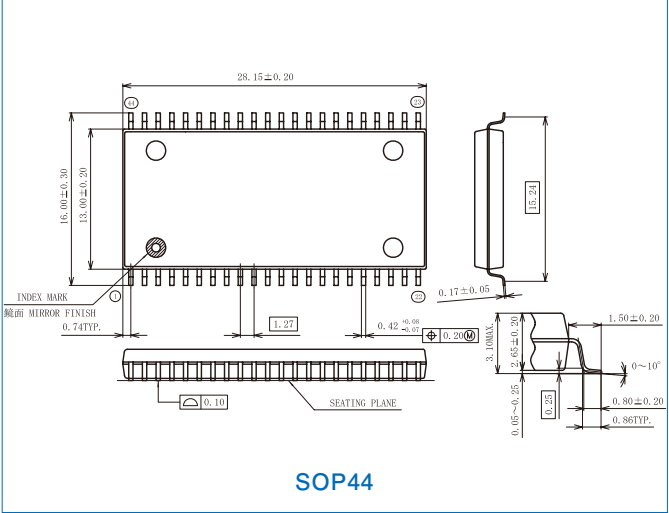
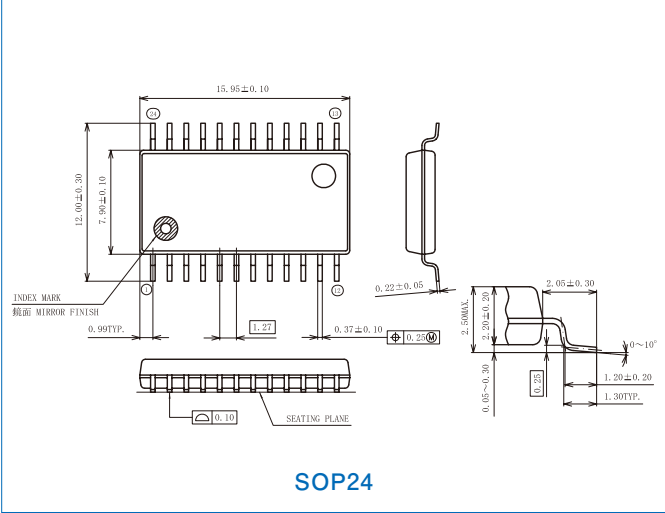
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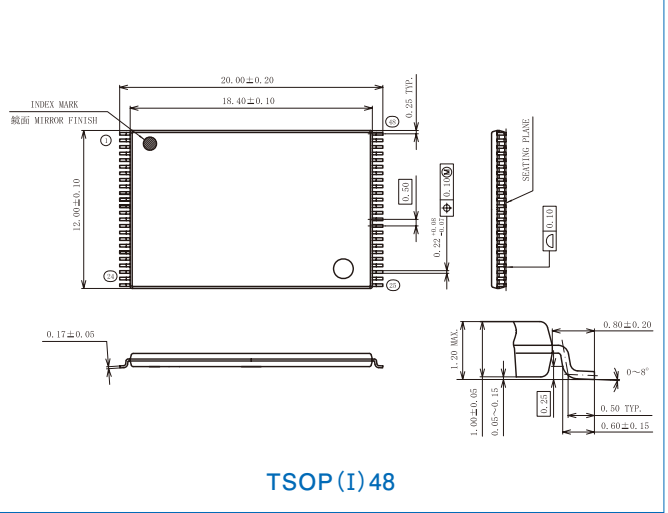
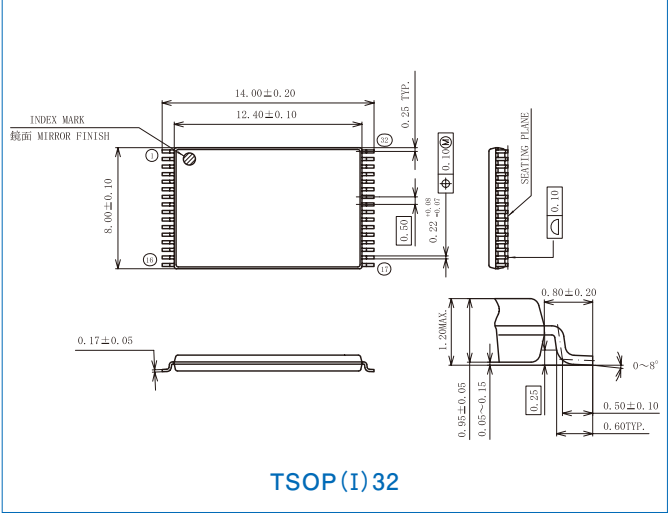
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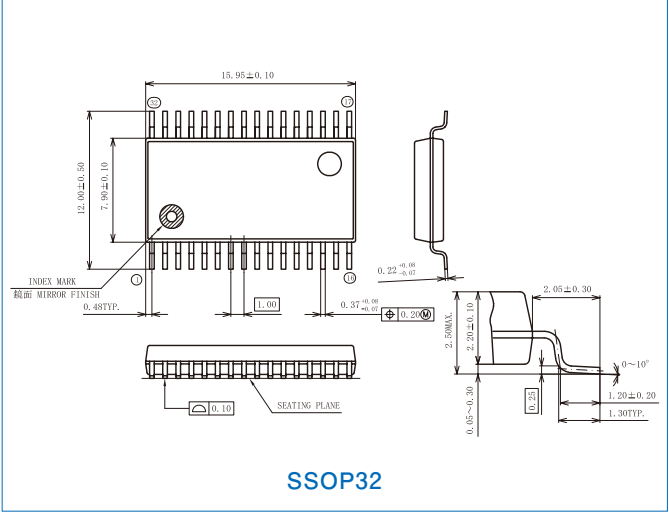
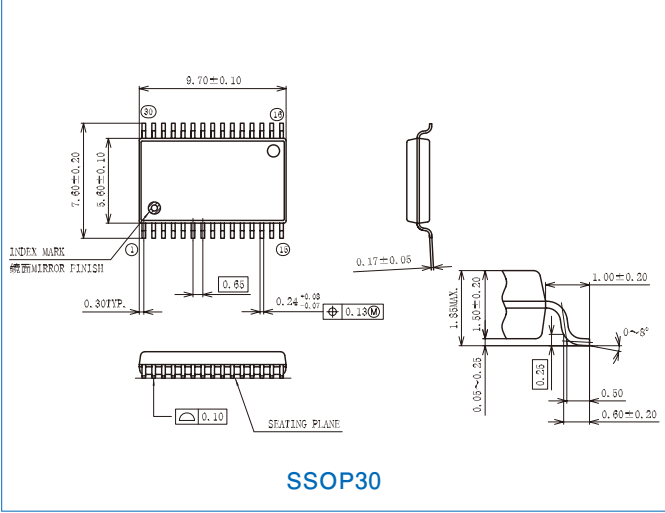
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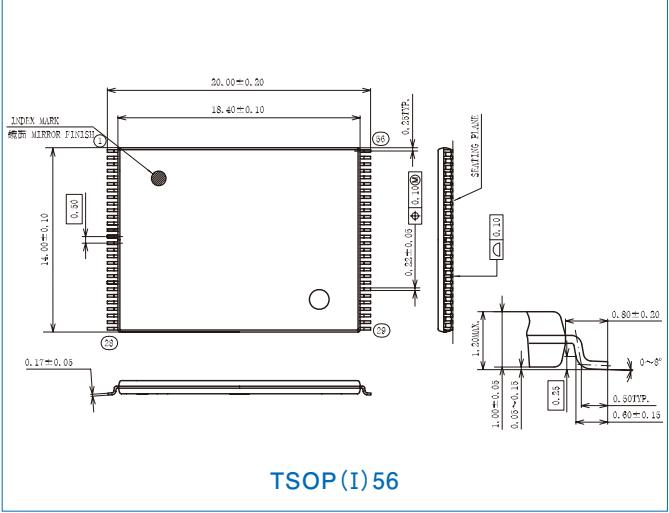
TSOP (Type I)



SSOP



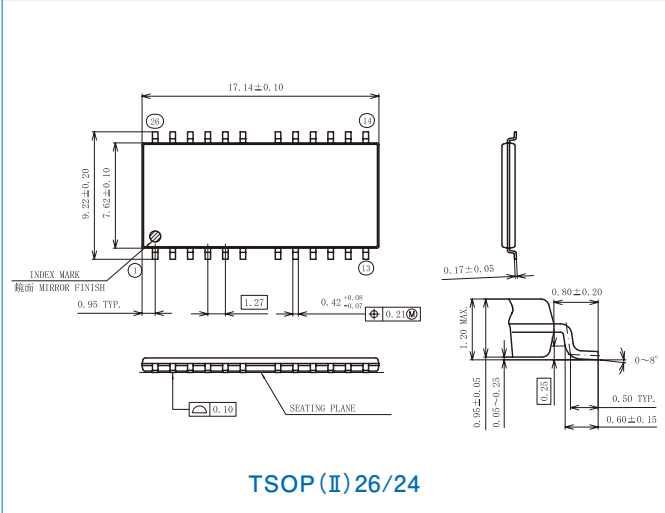
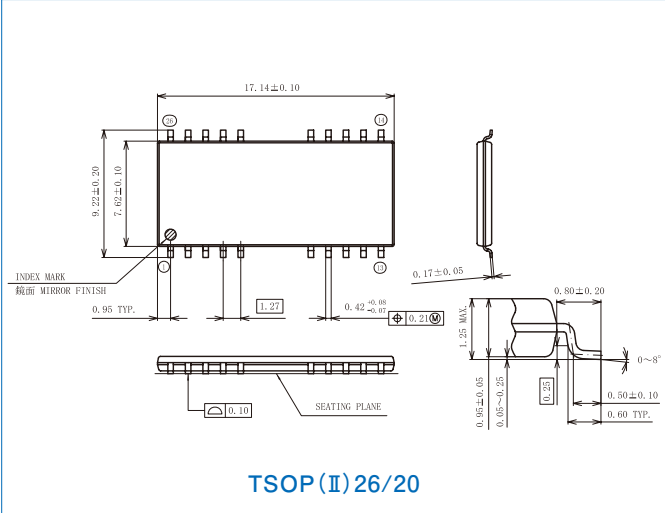
TSOP (Type I)



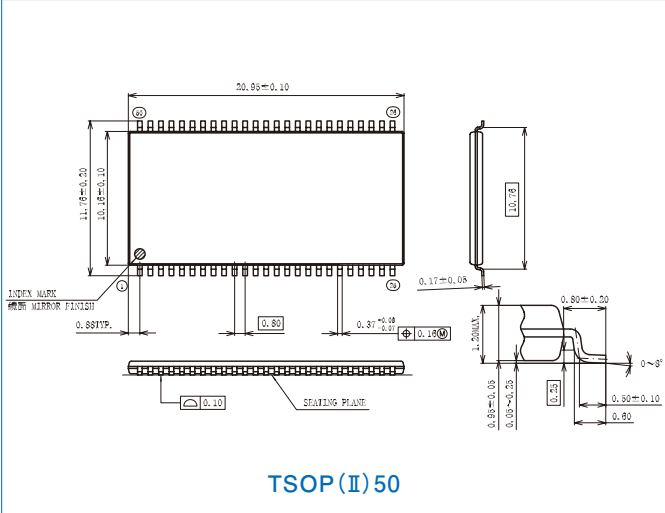
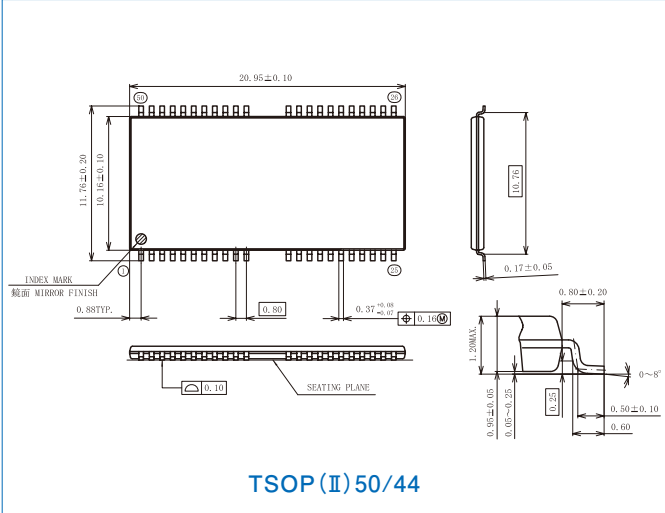
LSI Packages

Package size

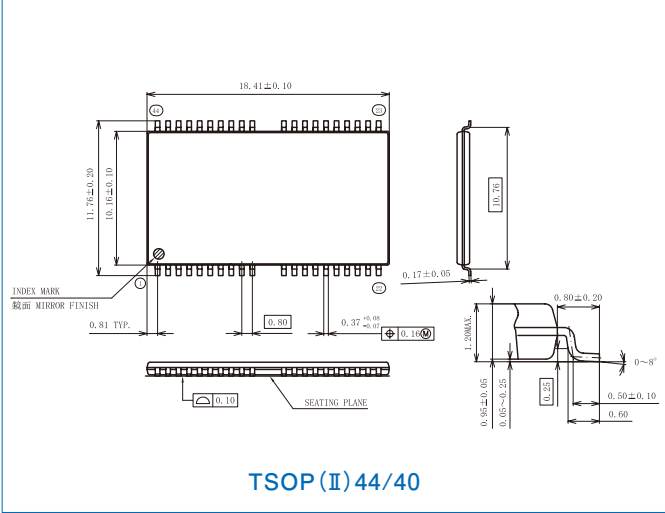
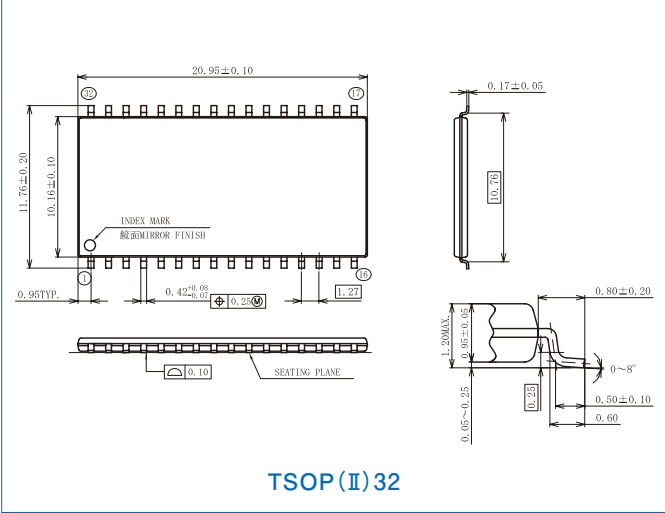
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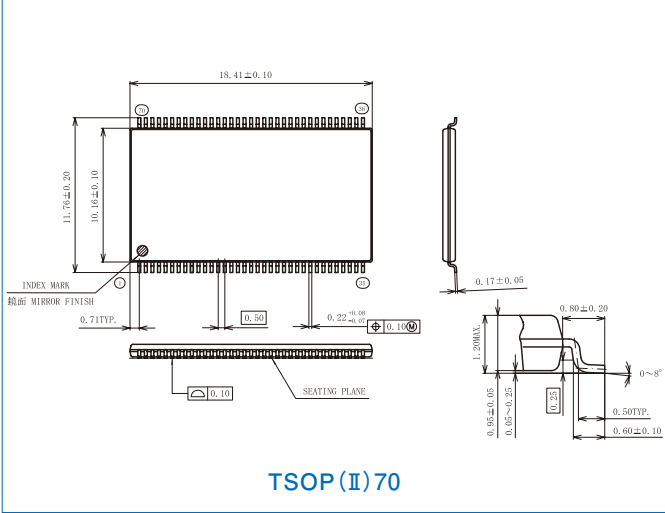
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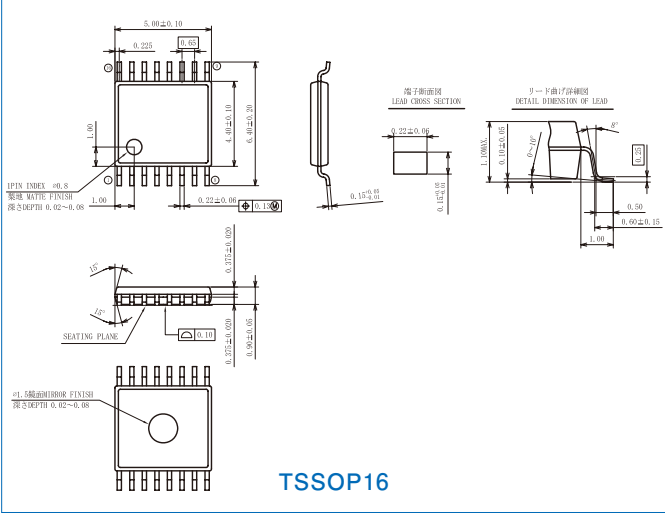
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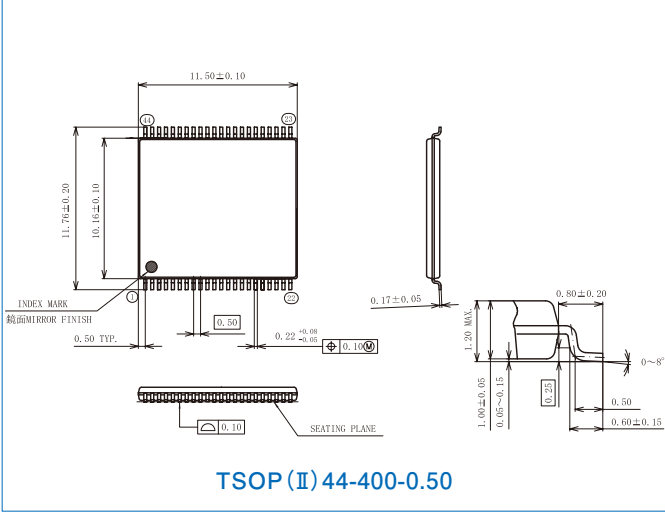
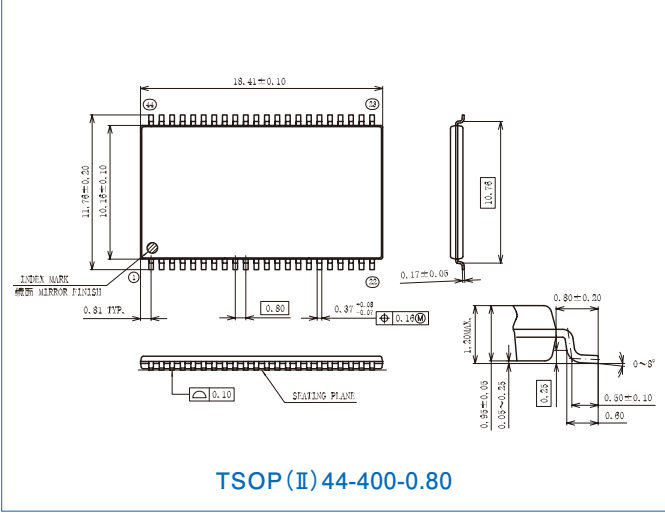
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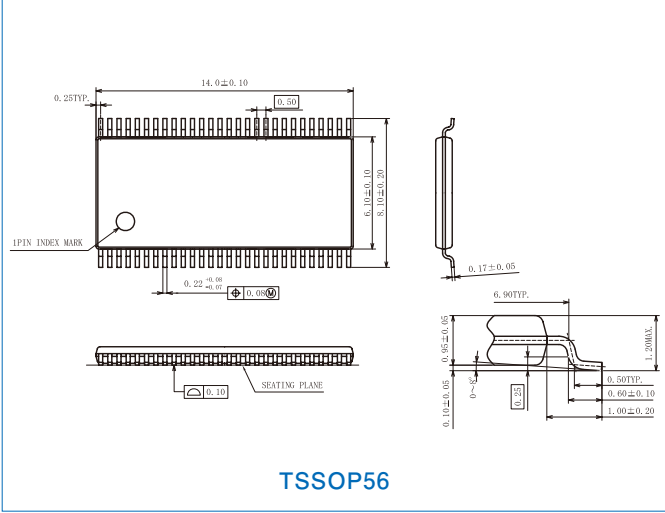
TSSOP



TSOP (Type II)



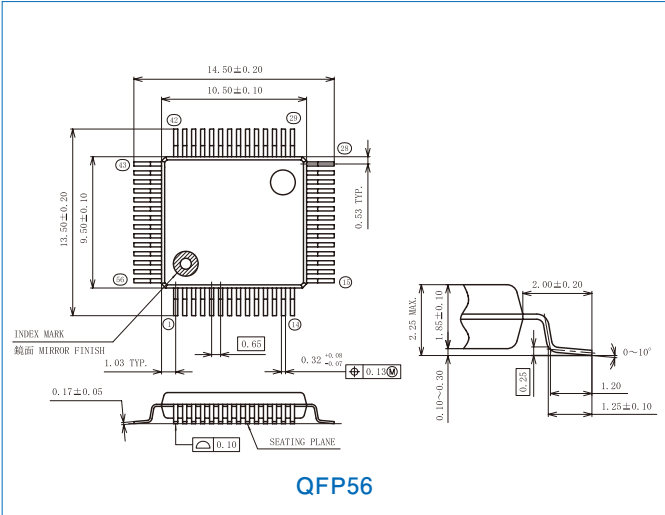
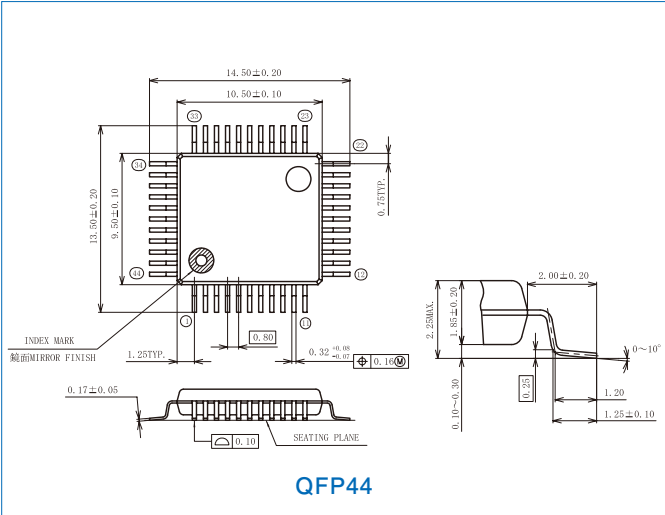
TSSOP



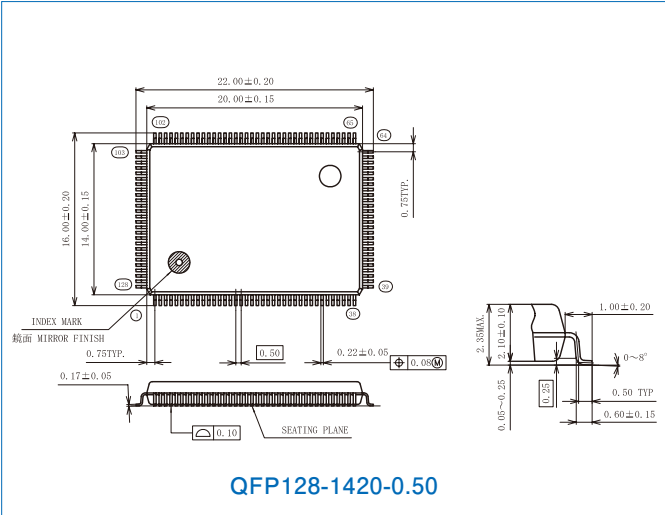
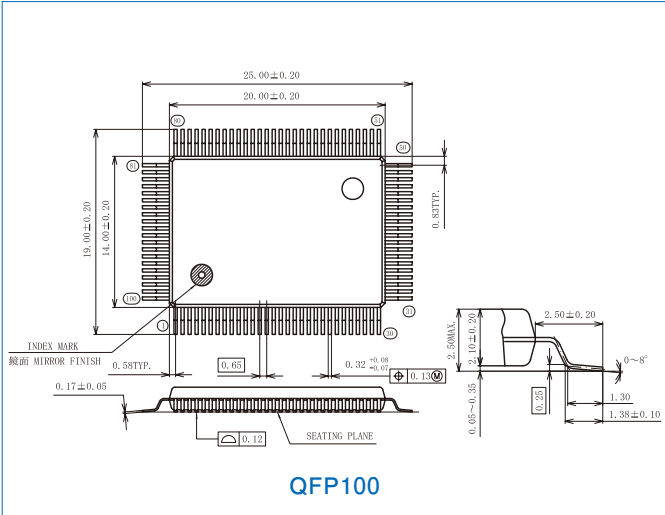
LSI Packages

Package size

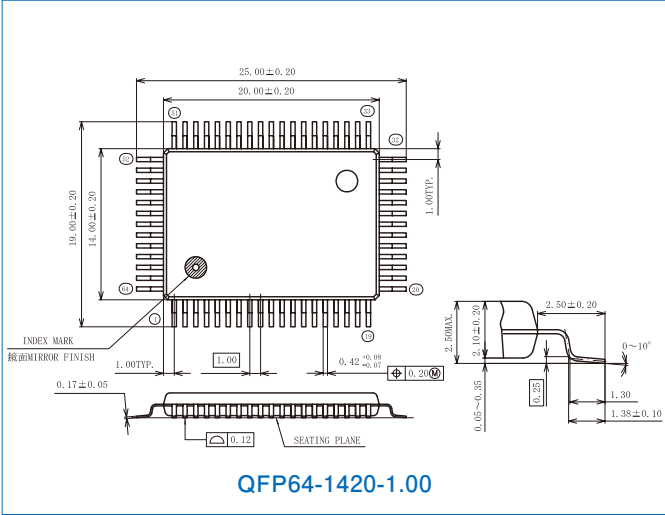
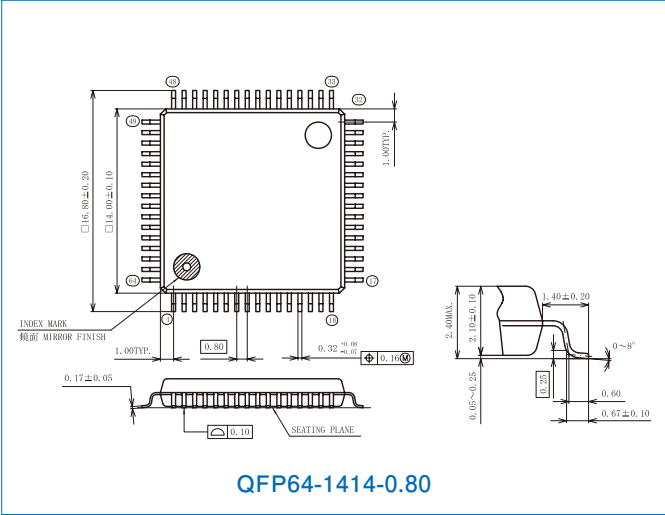
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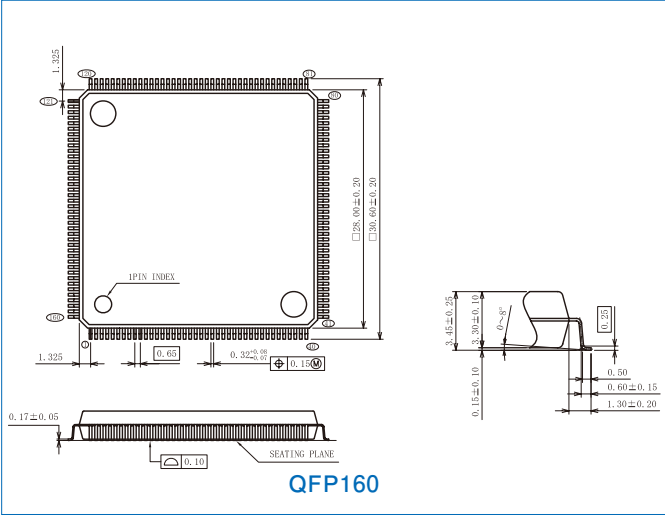
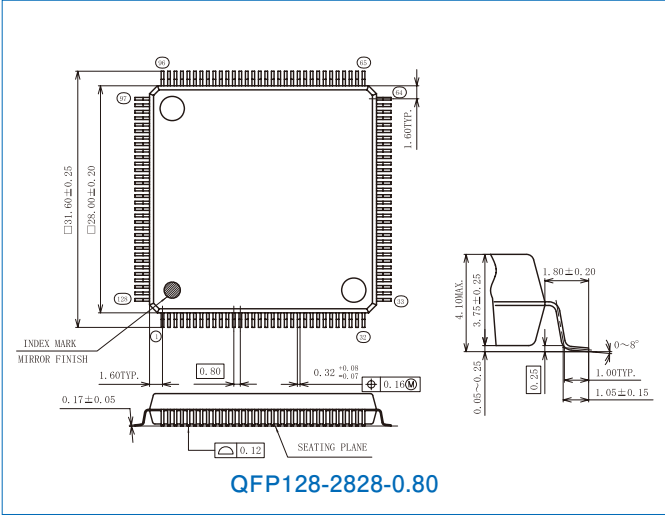
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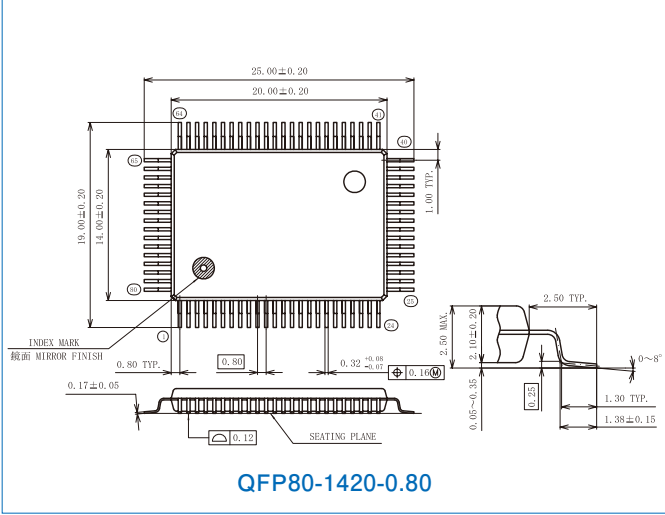
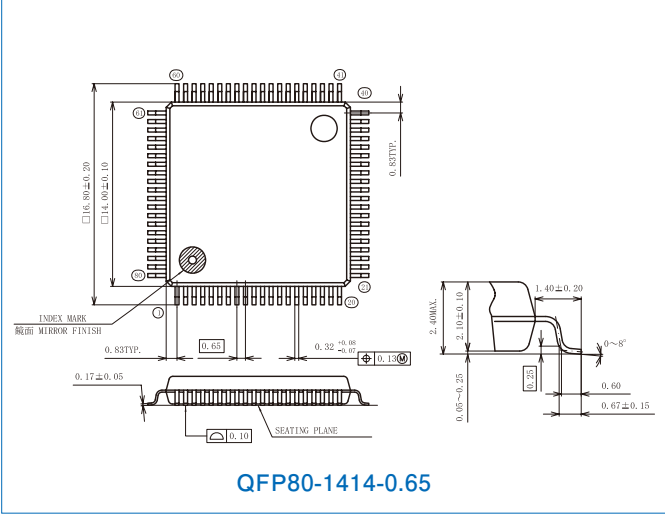
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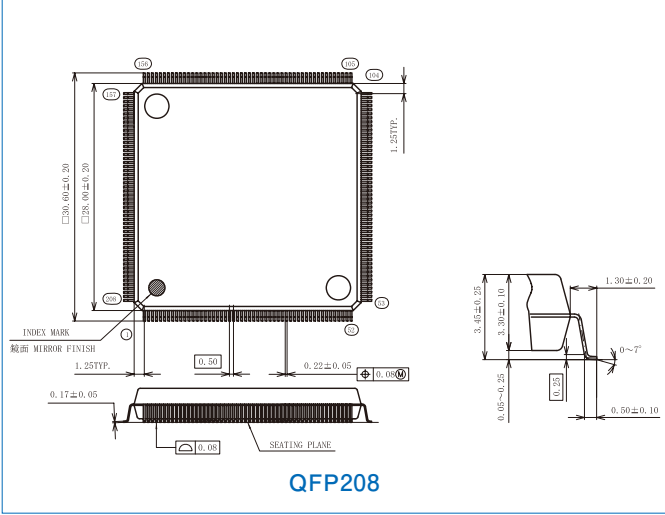
QFP



QFP



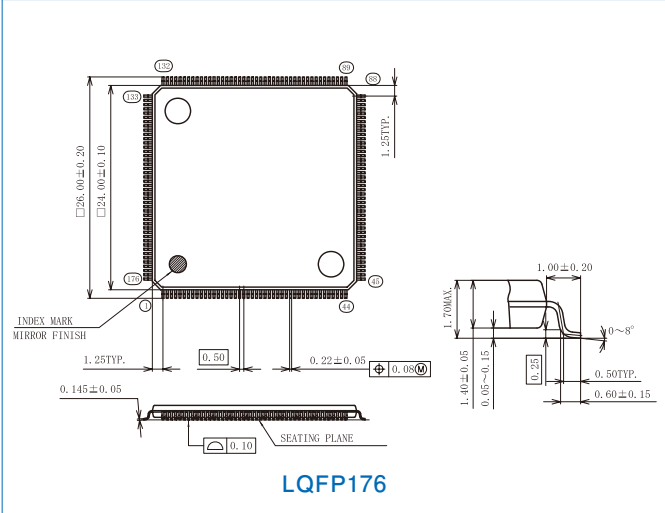
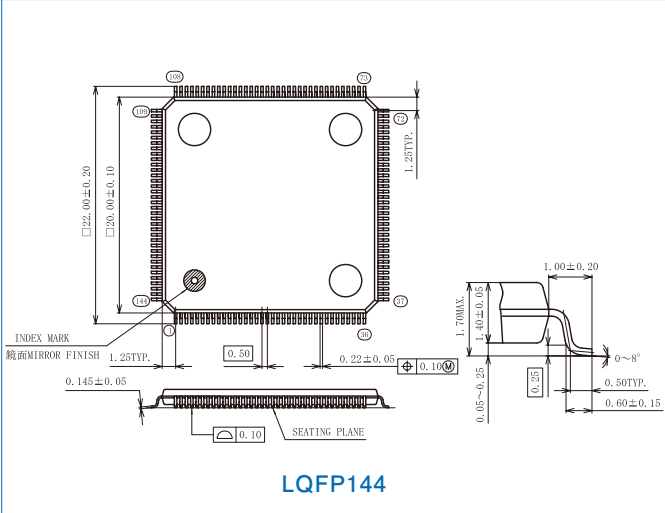
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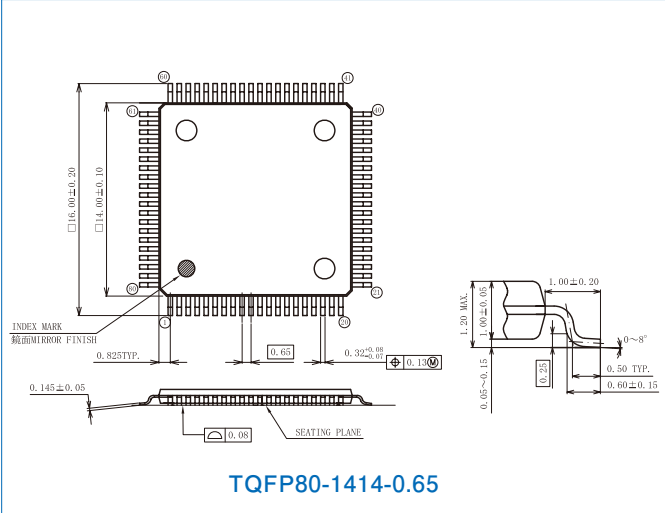
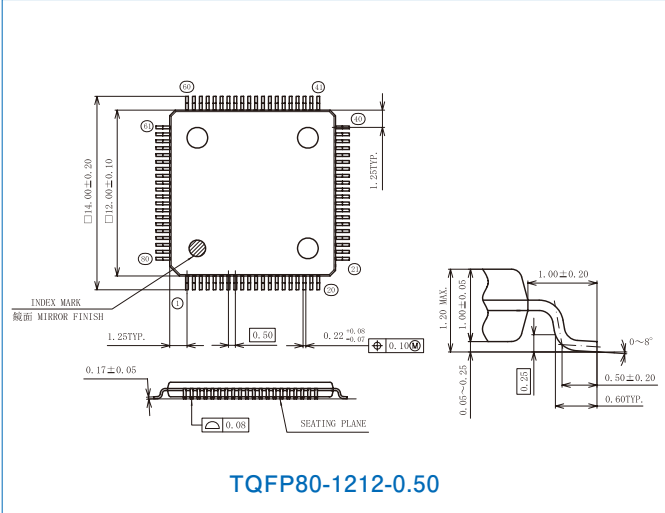
LSI Packages

Package size

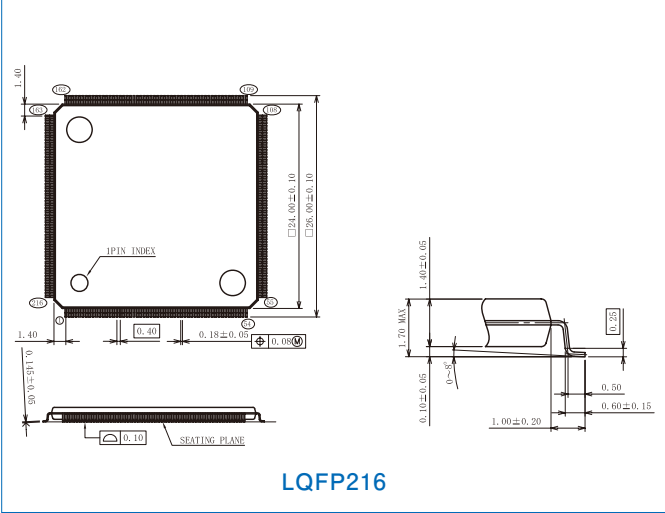
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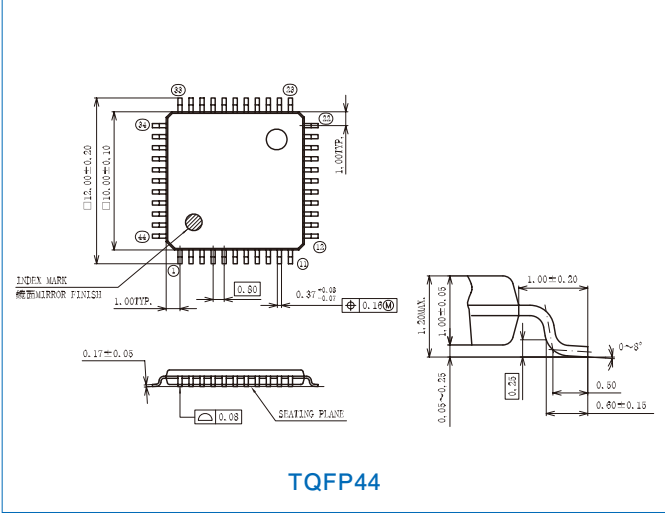
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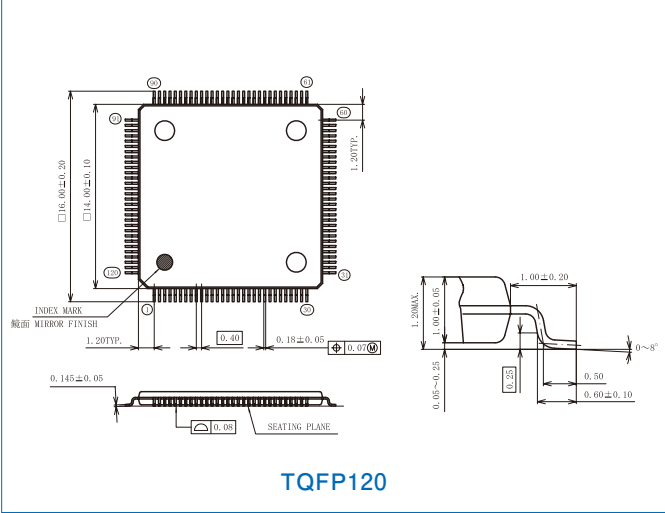
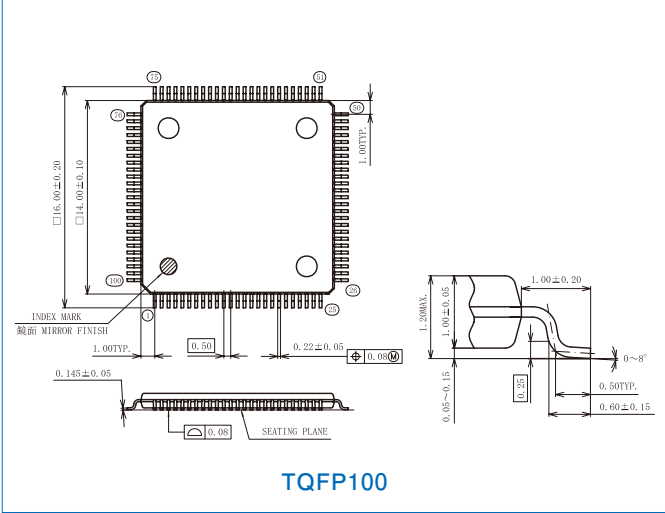
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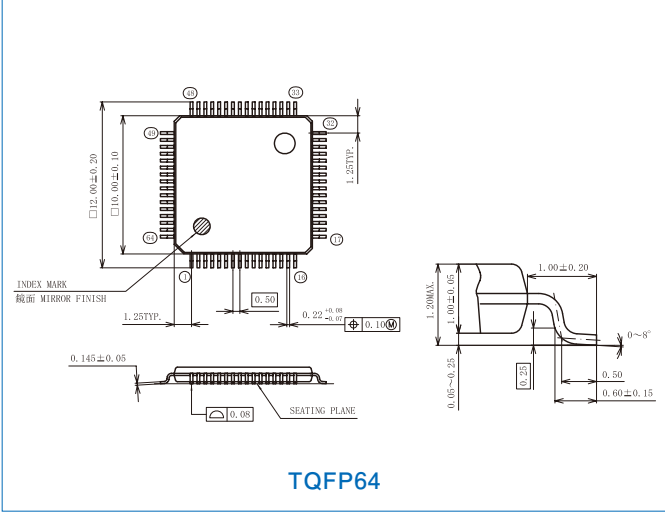
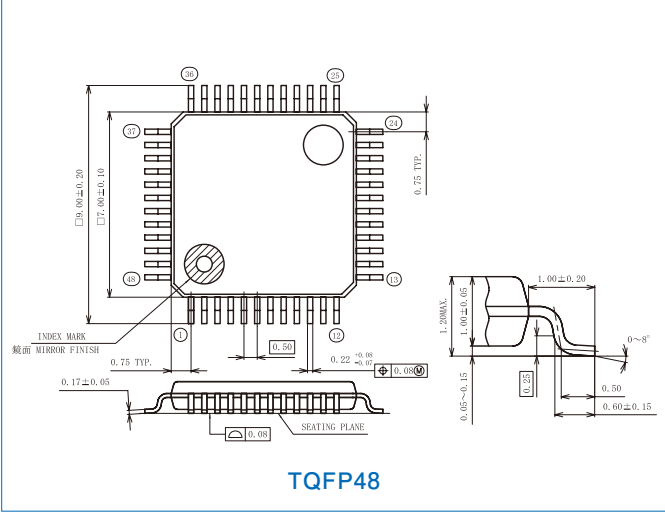
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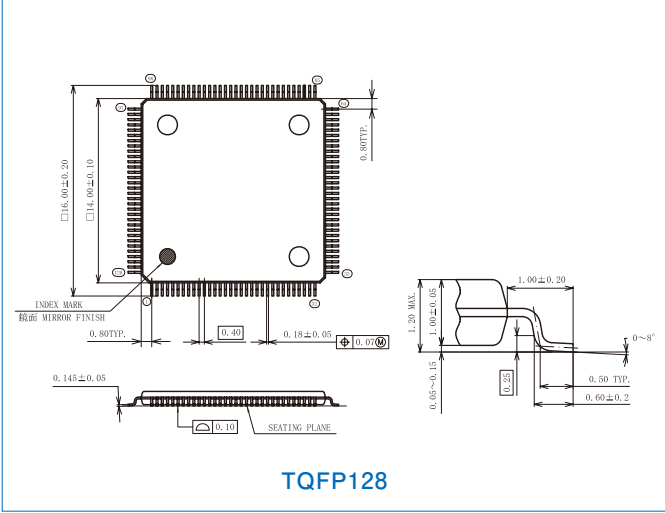
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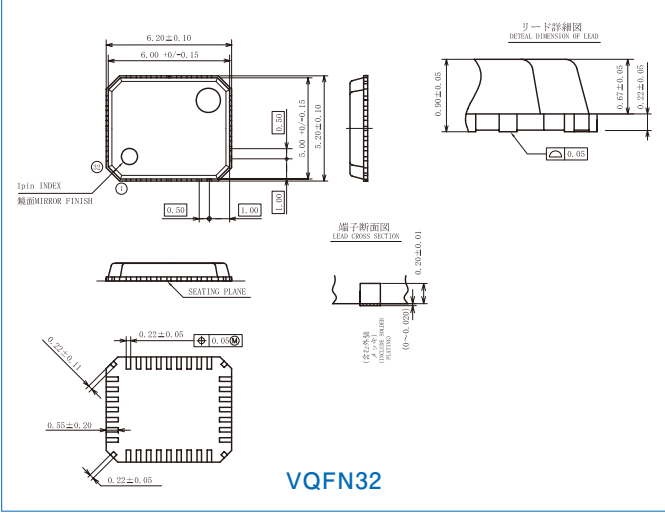
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TQFP



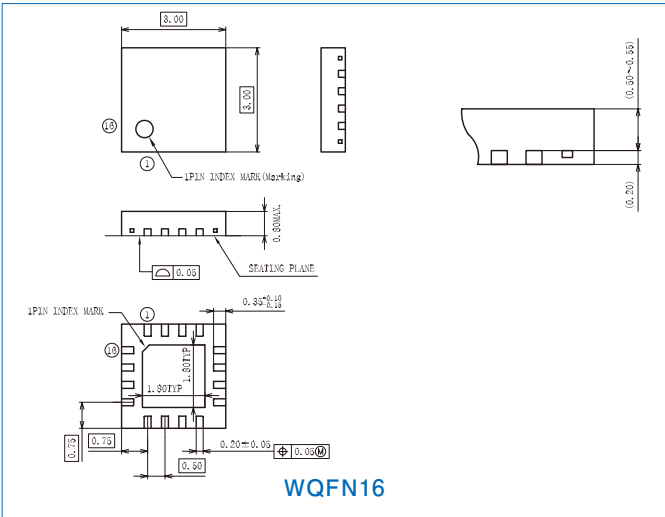
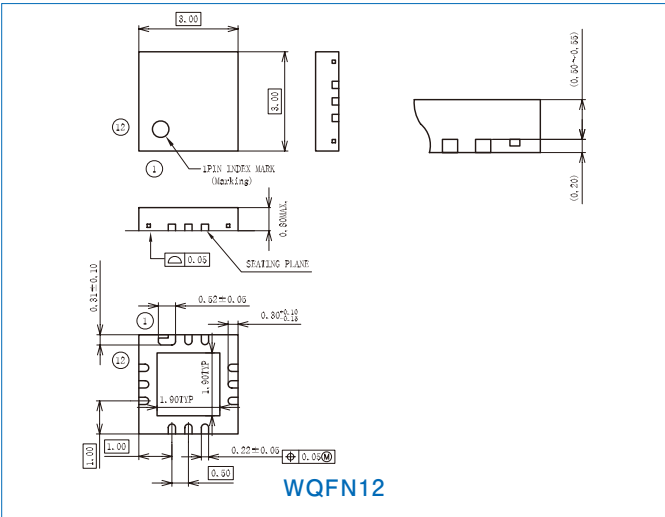
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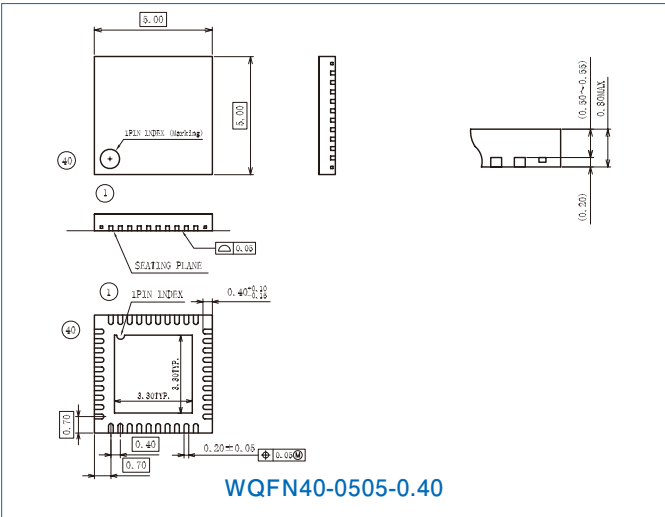
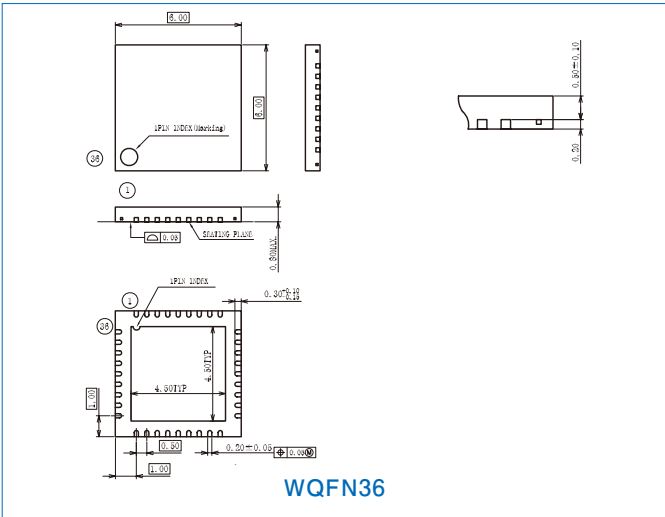
LSI Packages

Package size

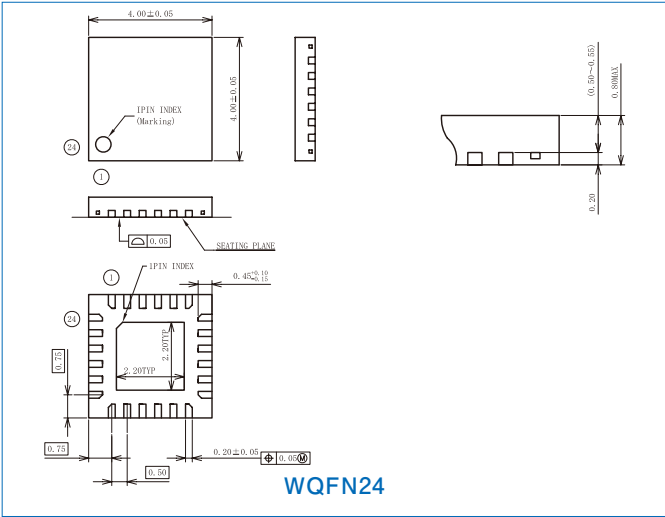
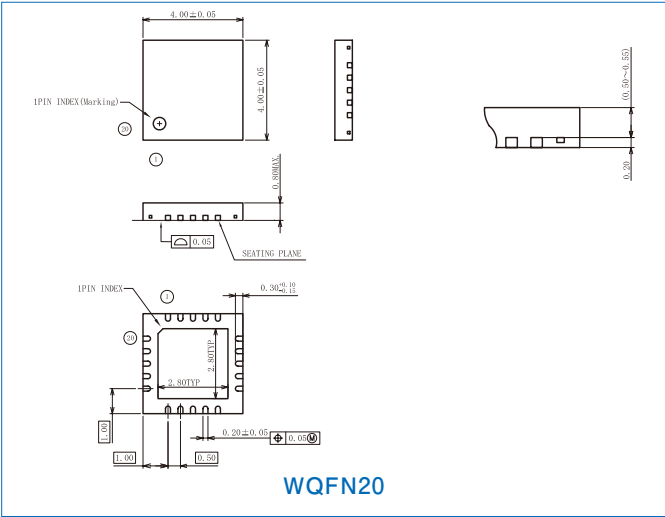
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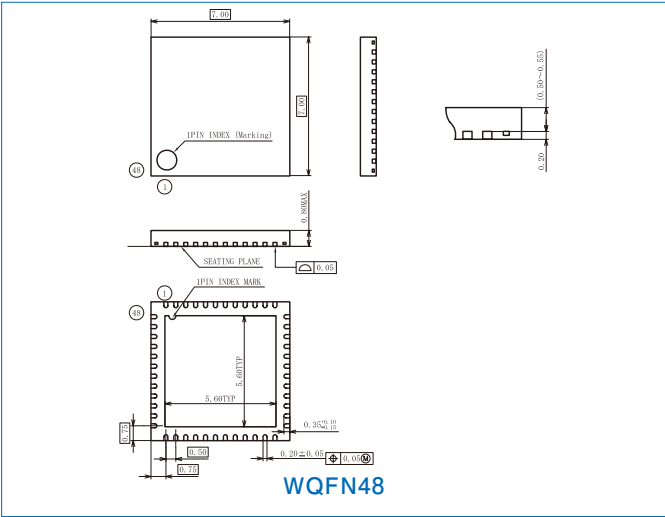
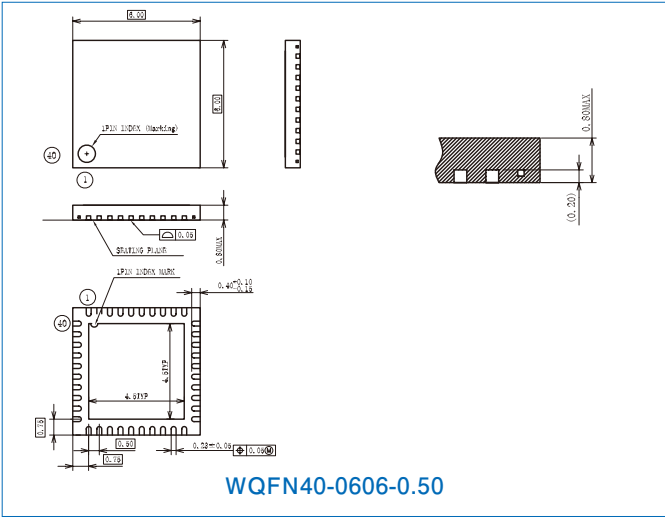
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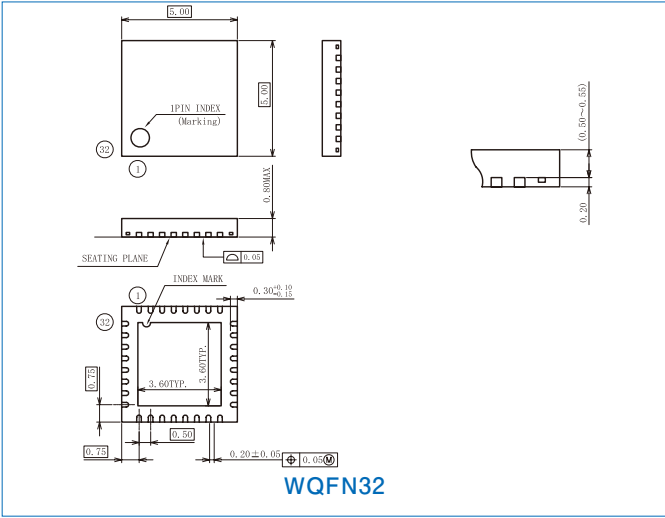
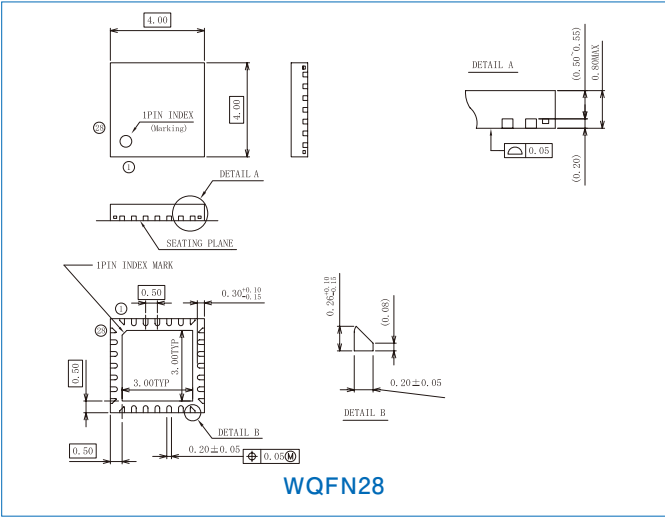
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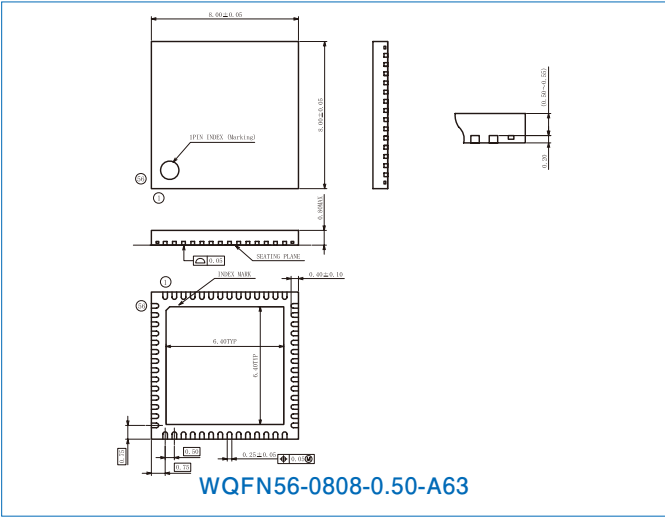
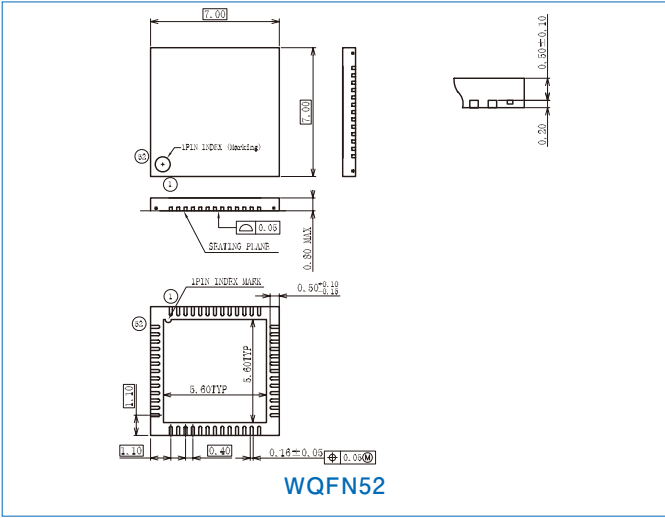
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WQFN



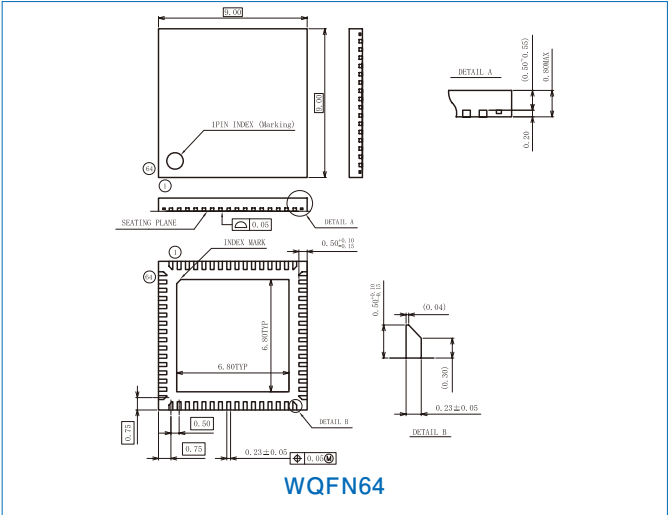
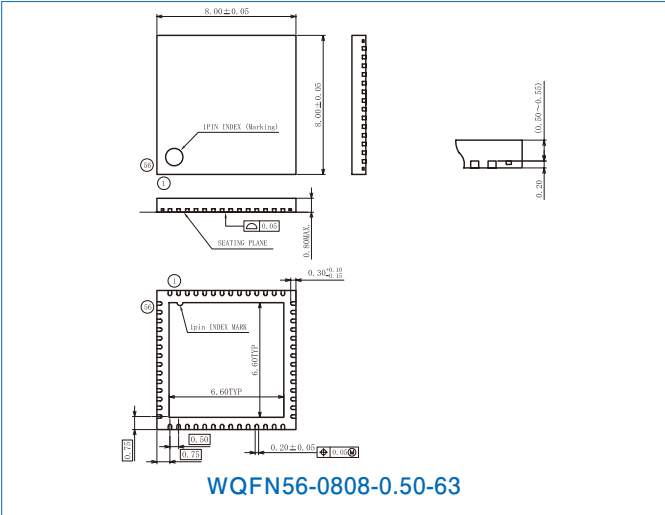
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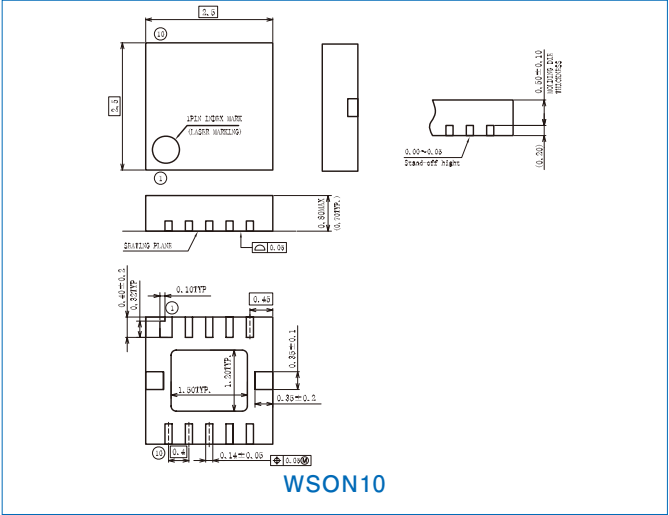
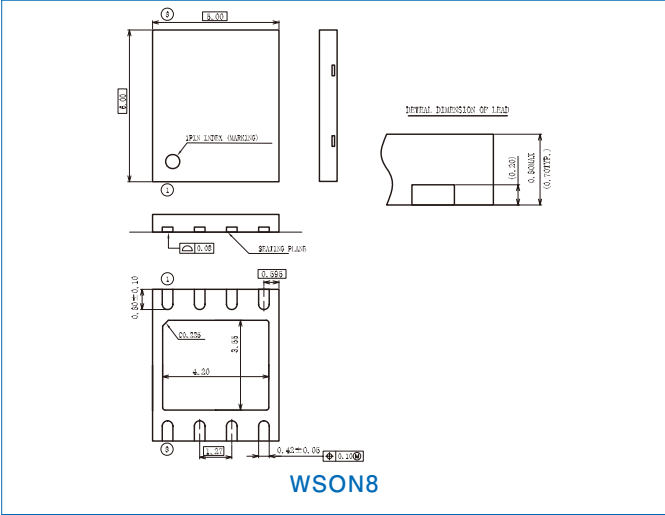
LSI Packages

Package size

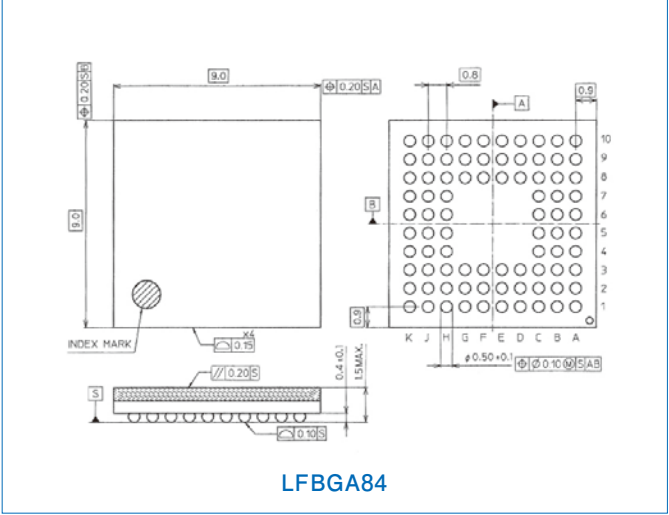
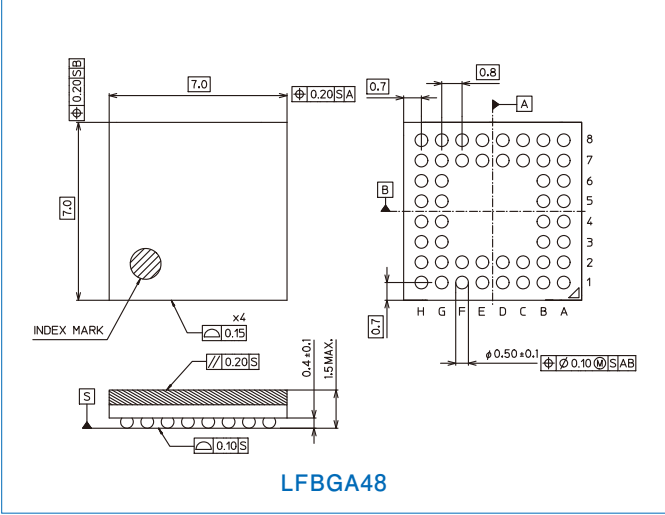
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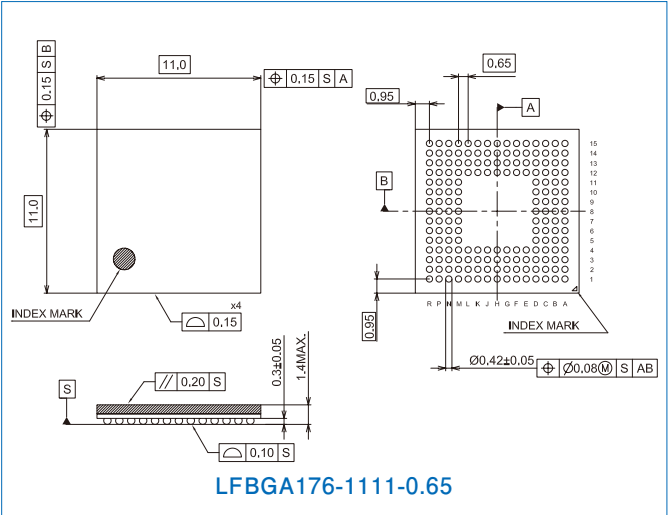
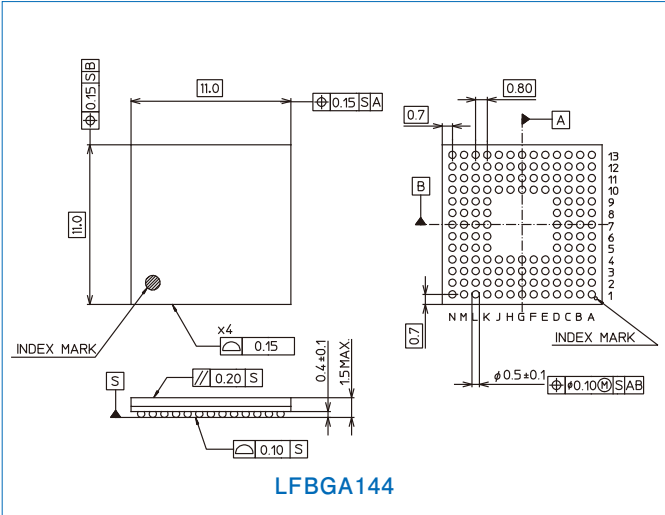
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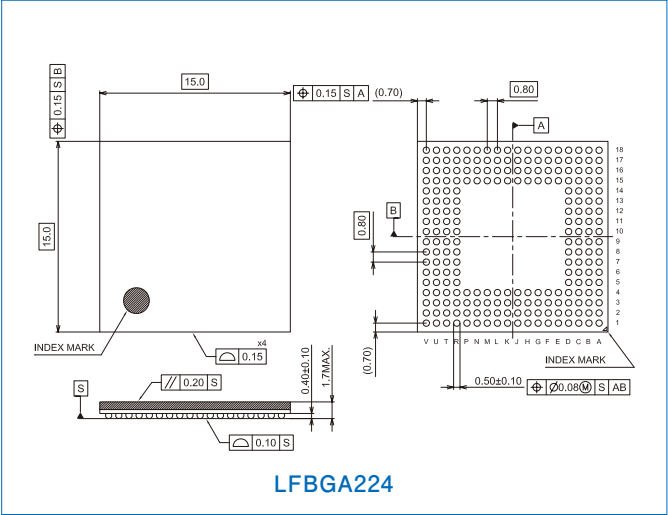
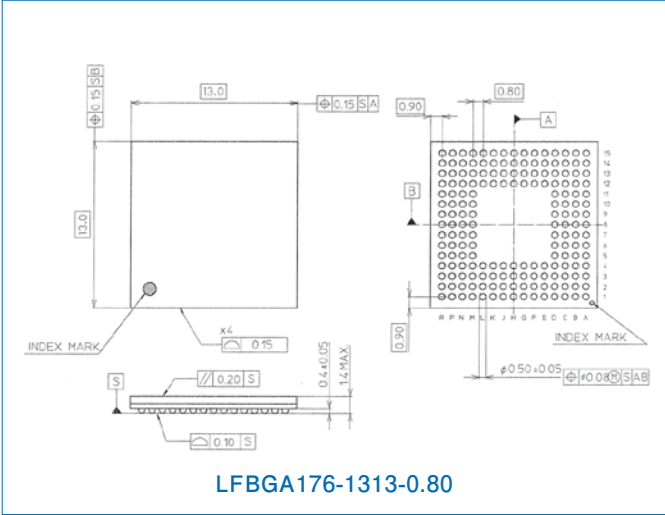
LFBGA



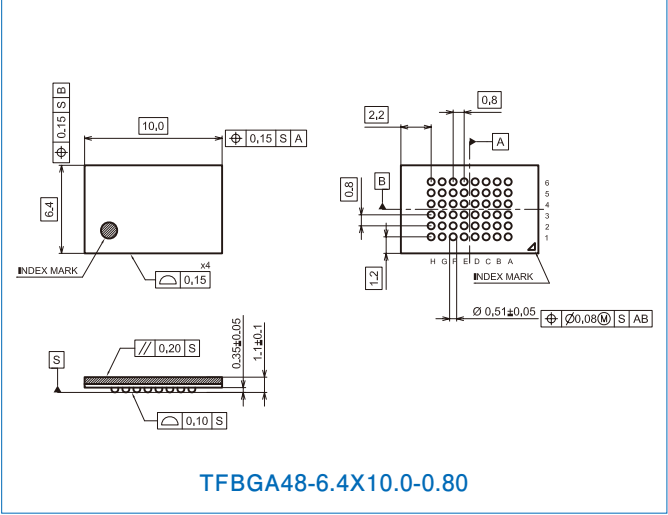
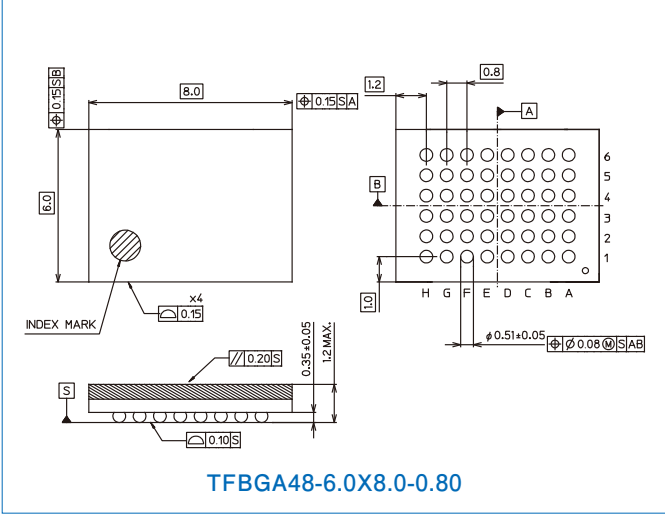
LFBGA



LFBGA



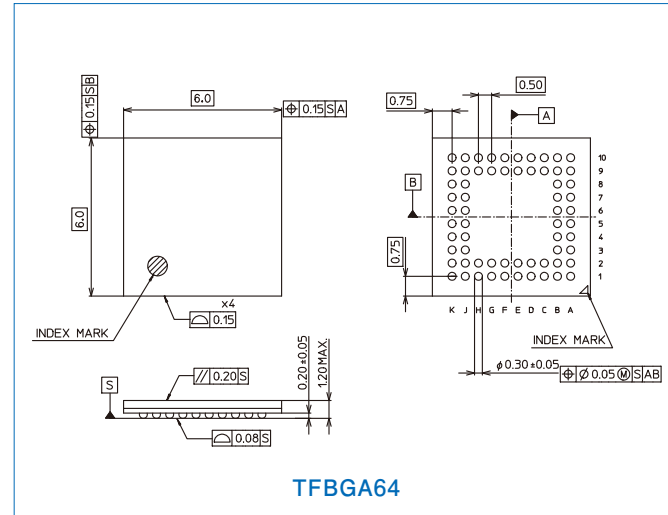
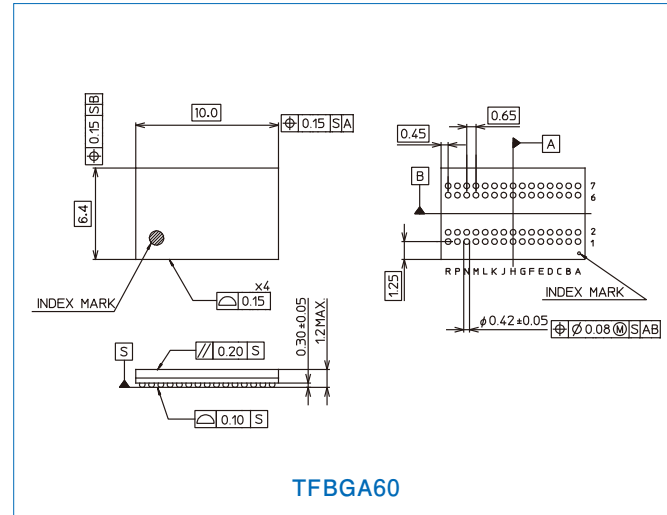
TFBGA



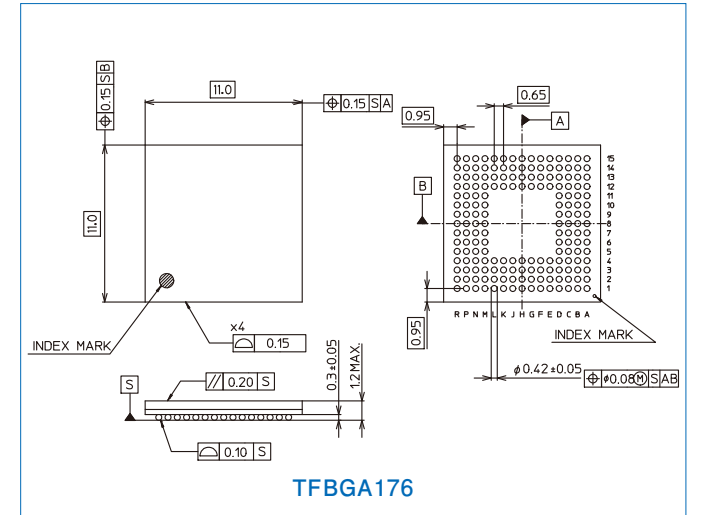
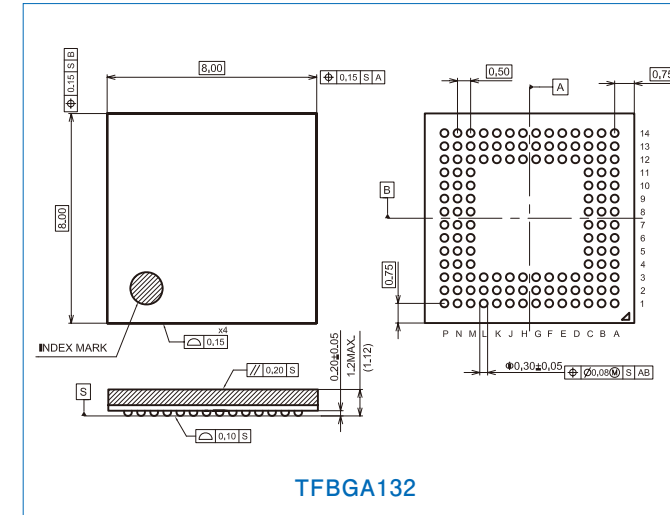
LSI Packages

Package size

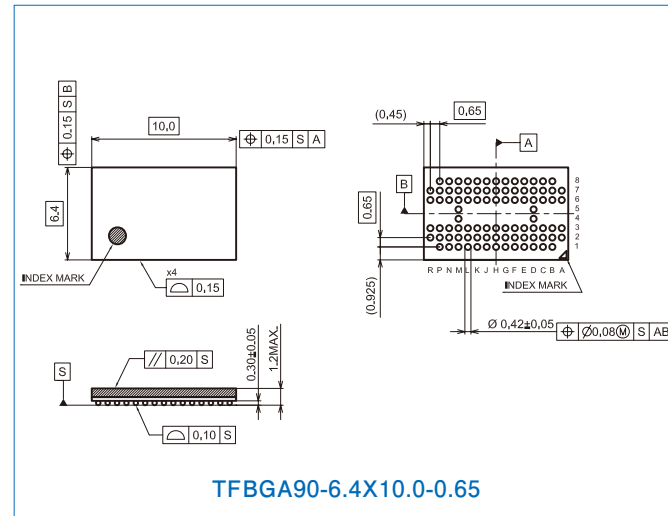
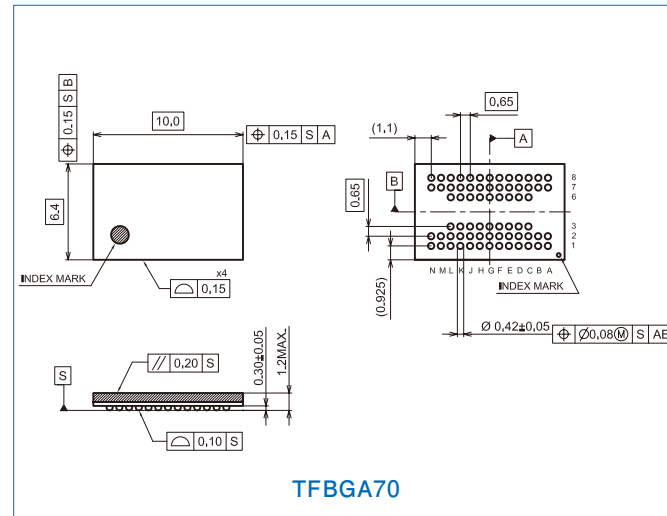
TFBGA



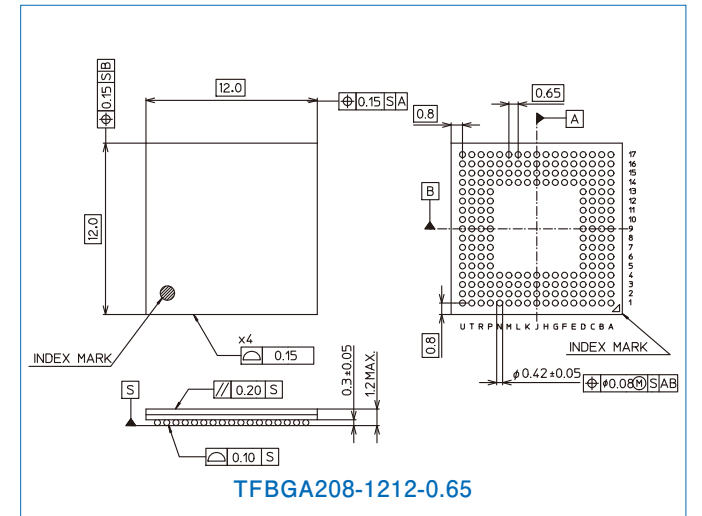
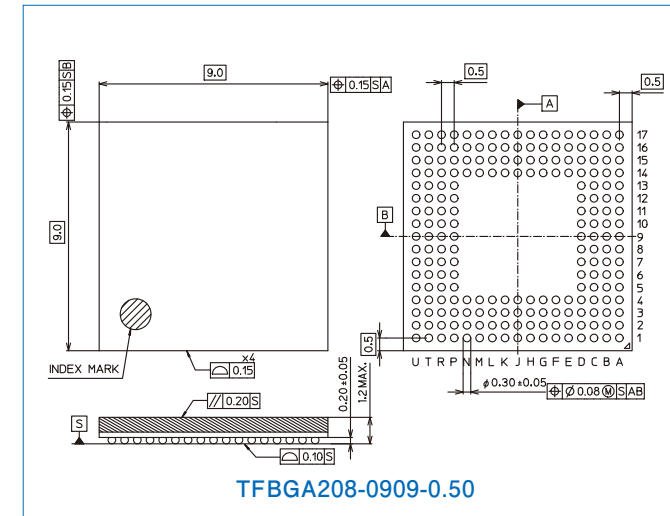
TFBGA



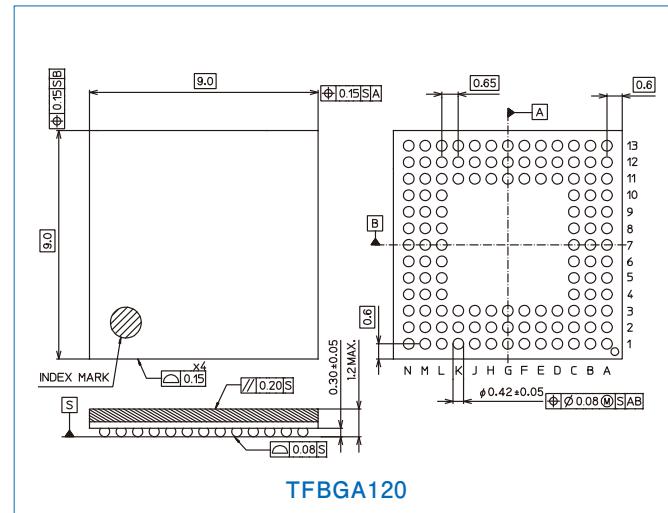
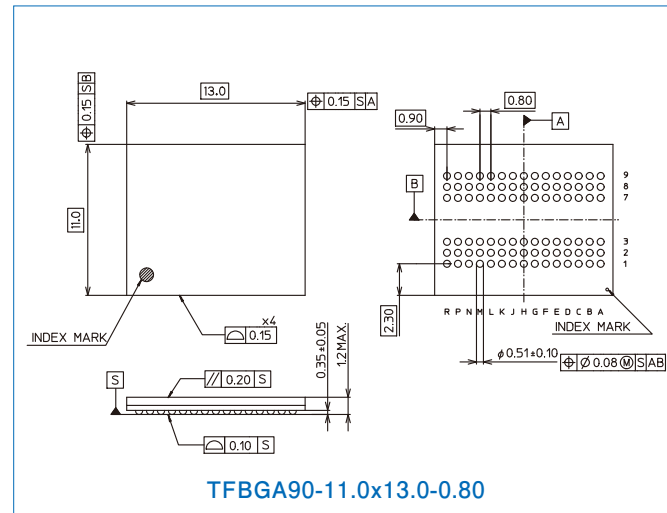
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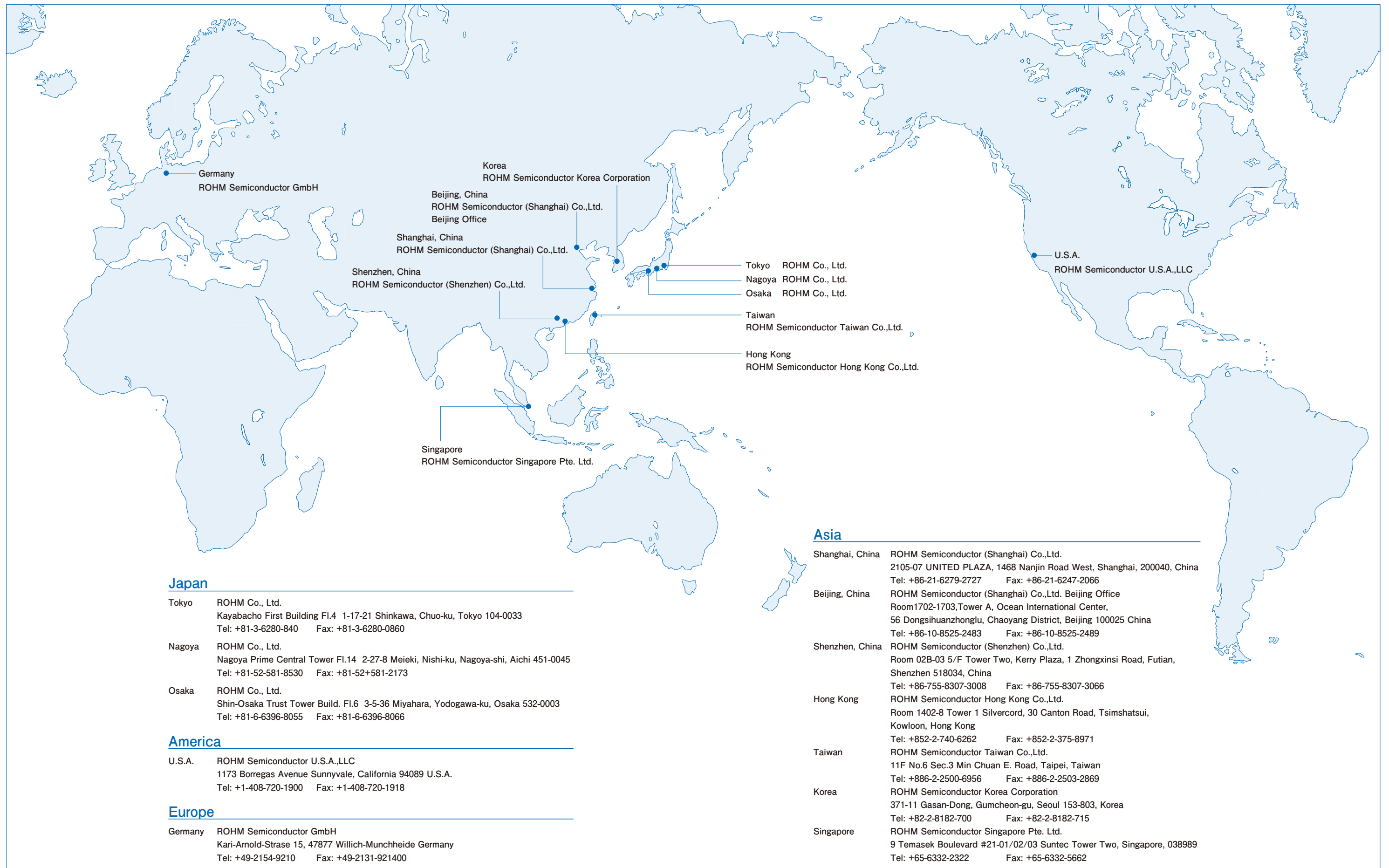
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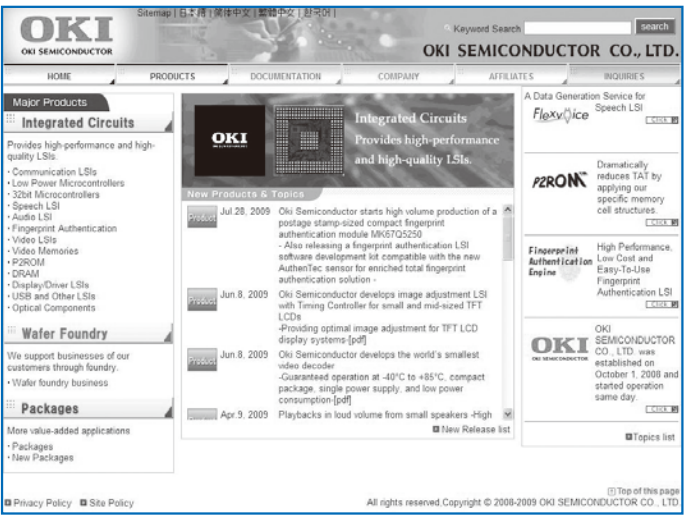
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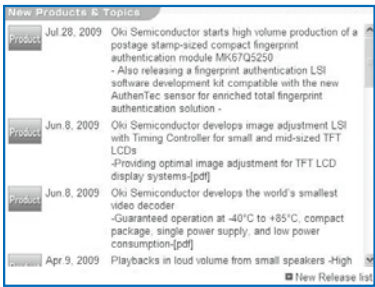
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www.okisemi.com/en/

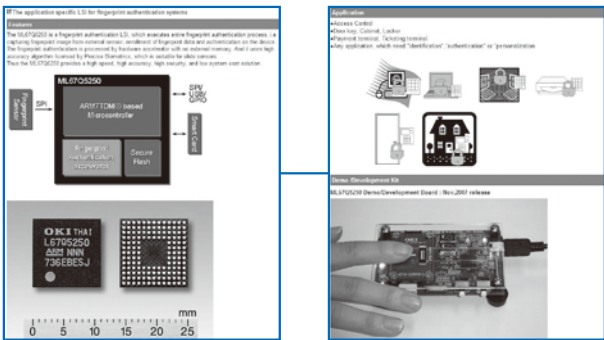


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You can find information on our new products and technologies at a glance.

Easy to Learn about Products



You can understand our new products, including LSIs, modules, and development kits.

Technical sheets available

Standard P2ROM				
Capacity	Part Number	Configuration	Supply Voltage (V)	Access Time (ns)
512M	MR26T51203L Datasheet(PDF)	32M X 16 64M X 8	3.0 to 3.6	100
512M	MR26T51203L Datasheet(PDF)	32M X 16 64M X 8	2.7 to 3.6	120
256M	MR27T26603L Datasheet(PDF)	16M X 16 32M X 8	3.0 to 3.6	100

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