Panasonic

ideas for life

2009 ver.2

Semiconductor Selection Guide

Microcomputers, Bipolar ICs, Discrete Semiconductors

⚠Caution for Safety

⚠DANGER

■ This product contains Gallium Arsenide (GaAs).

GaAs powder and vapor are hazardous to human health if inhaled or ingested. Do not burn, destroy, cut, cleave off, or chemically dissolve the product. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

■ Do not touch or look into the laser beam directly.

The laser beam may cause injury to the eye or skin, or loss of eyesight.

Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

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If you have any inquiries or questions about this book or our semiconductor products, please contact one of our sales offices listed on the back or our sales division.

How to Read This Document

Structure of this document

This document consists of the part number list, application block diagrams, recommended types by classification, package outlines, discontinued types, planned discontinued types, maintenance types, and planned maintenance types. Types are classified according to the ECALS glossary.

ECALS is the general term for all standardization activities, including the distribution of composite components technology information (offering of and searching for information via the internet) about electronic equipment, semiconductors, electronic components, etc. as well as support administration such as the ECALS glossary, etc.

Part numbers

The part numbers used in this document are part numbers for catalog use, and are partially abbreviated Global part number. Numbers indicating ranks, packing specifications, etc. are not listed. Conventional part numbers (C Part No.) are part numbers used prior to the operation of the Global part number in 2000, and are listed only for those part numbers which are drastically different from the Global part number. They may also be listed in parentheses together with the part number.

Package outlines (package)

Recommended products listed in this document are lead-free packages.

Discontinued types, planned discontinued types, maintenance types, and planned maintenance types

We offer a variety of product information at the following URL:

http://panasonic.net/sc/en/common_info

Discontinued Types	:	These types have been discontinued and no further handling can be performed.
Planned Discontinued Types	:	These types are scheduled to be discontinued. Customers who have used these types in the past are hereby notified that sales of these types have ended.
Maintenance Types	:	Because sales of these types are planned to be discontinued, new sales of such types are not possible. Further, existing customers with new applications should switch to replacement types.
Planned Maintenance Types	:	These types are scheduled to become maintenance types. For new applications, please refrain from using these types.

Symbols used for recommended types

○: Under planning
▲: Under development
△: Microcomputers, application-specific standard-product ICs: ES available types; Discrete components, opto electronic devices: Tentative standard
★: Newly listed in this document

Homepage Introduction

We offer a variety of product information on Panasonic semiconductor products.

http://panasonic.net/sc/en

Catalog List

Our company's lineup of catalogs is listed below. Please select the catalog according to your purpose.

Common Catalog

- Semiconductor Selection Guide
- Semiconductor Package
- Lead-free Package

Product Catalog

Microcomputers

- Microcomputer Family AM Series
- Microcomputer AM Series Selection Guide

Image Pickup Devices

- CCD Image Sensor

Application-Specific Standard-Product ICs

- Panasonic Integrated Platform for Digital Appliances Uniphier
- 3D Sound Reproduction Technology Solutions
- IPD for Switching Power Supply Solution Guide

Gallium Arsenide Devices

- GaAs Device for W-LAN Solution Guide

General Purpose Discrete

- Diode Series
- MOS FET Series
- Discrete Semiconductors Selection Guide

Opto Electronic Devices

- Laser / Hologram Unit for Optical Disk
- Surface Mount Chip LEDs

Solution Catalog

- IP Camera Solution (Network Camera Solution)
- Digital Television Solution
- Mobile Phone Solution

* If you would like a printed catalog, please request one at the following URL. Catalog PDFs are available on our company's homepage.

URL: https://www.semicon.panasonic.co.jp/semi-spt/general/?lang=en&

Note: The above catalog lineup is subject to change without notice. Please check for the latest status on our company's homepage.

Precautions on label indication of lead-free products (RoHS compliance)

To conform to RoHS Directive restrictions, the products supplied by our company will be marked in the following two ways on C3 labels on each package unit.

1. On the lead-free label, the “Pb” letter are crossed out with ✕ marking.
   (For compliance with RoHS Directive 2002/95/EC)
2. Date of manufacture will be indicated by the first 8 digits of the 14-digit number at the bottommost left.
   (For compliance with China RoHS)

Example of Label Indication

Please pay attention to the relevant marking and manage products properly to avoid mixing lead-containing products with lead-free products. Note that C3 labels are attached to outer boxes, inner boxes, reels, etc.; please check packaging before opening.

If you have any inquiries or questions about this matter, please contact one of our sales representatives.

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Part Number List

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★: Newly listed in this document ○: Under planning ▲: Under development △: ES available

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★: Newly listed in this document ▲: Under development △: ES available

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	LNJ107W5ARA1			M4
	LNJ107W5PRW			M4
	LNJ115W88RA			M4
	LNJ115W89RA			M4
	LNJ115W8ARA			M4
	LNJ115W8PRA			M4
	LNJ115W8RRA1			M4
	LNJ115W8VRA			M4
	LNJ121W84RA			M4
	LNJ123W8RRA			M4
	LNJ201LPQJA			M10
	LNJ206R5ARA			M2
	LNJ208R82RA			M2
	LNJ208R8ARA			M2
	LNJ210C62RA			M2
	LNJ210C6ARA			M2
	LNJ211R82RA			M2
	LNJ211R8ARA			M2
	LNJ211R8ARU			M2
	LNJ212R8ARA			M2
	LNJ212W82RA1			M2
	LNJ214R82RA			M2
	LNJ214R8ARA			M2
	LNJ216C82RA			M2
	LNJ216C8ARA			M2
	LNJ216C8ARU			M2
	LNJ218C82RA			M2
	LNJ218C8ARA			M2
	LNJ218C8ARU			M2
	LNJ222C44RA1			M2
	LNJ224C44RA1			M2
	LNJ236W82RA			M2
★	LNJ237W82RA			M2
★ ▲	LNJ247W82RA			M2

	Part No.	C Part No.	Package	Page
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	LNJ253W82RA			M2
	LNJ301MPUJA			M10
	LNJ302GPUJA			M10
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	LNJ306G5URA			M2
	LNJ308G83RA			M2
	LNJ308G8PRA			M3
	LNJ308G8TRA			M2
	LNJ310C63RA			M2
	LNJ310C6PRA			M3
	LNJ310M6URA			M2
	LNJ311G83RA			M2
	LNJ311G8PRA			M3
	LNJ311G8TRA			M2
	LNJ311G8TRU			M2
	LNJ312G8TRA			M2
	LNJ312W83RA1			M2
	LNJ314G83RA			M2
	LNJ314G8TRA			M2
	LNJ316C83RA			M2
	LNJ316C83RU			M2
	LNJ316C8PRA			M3
	LNJ316C8TRA			M2
	LNJ316C8TRU			M2
	LNJ318C83RA			M2
	LNJ318C83RU			M2
	LNJ318C8PRA			M3
	LNJ318C8TRA			M2
	LNJ326W83RA1			M2
	LNJ336W83RA			M2
★	LNJ337W83RA			M2
★ ▲	LNJ347W83RA			M2
	LNJ352W83RA			M2
	LNJ353W83RA			M2
	LNJ3B4MPUJA			M10
	LNJ3W0C83RA			M2
	LNJ3W0C85RA			M3
	LNJ401NPYJA			M10
	LNJ406K54RX			M3
	LNJ406K5YRX			M3
	LNJ408K84RA			M3
	LNJ408K8YRA			M3
	LNJ410C64RA			M3
	LNJ410Q6YRA			M3
	LNJ411K84RA			M3
	LNJ411K84RU			M3
	LNJ411K8YRA			M3
	LNJ411K8YRU			M3
	LNJ412K8YRA			M3
	LNJ412W83RA1			M3
	LNJ414K84RA			M3
	LNJ414K8YRA			M3
	LNJ416C84RA			M3
	LNJ416Q8YRA			M3
	LNJ416Q8YRU			M3
	LNJ418C84RA			M3
	LNJ418Q8YRA			M3
	LNJ418Q8YRU			M3
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	LNJ424C46RA1			M3
	LNJ426W83RA1			M3
	LNJ436W82RA			M3
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★ ▲	LNJ447W84RA			M3
	LNJ451C44RA			M3
	LNJ452W82RA			M3
	LNJ453W82RA			M3

	Part No.	C Part No.	Package	Page
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	LNJ611W8WRU			M3
	LNJ612W8CRA1			M3
	LNJ612W8WRA			M3
	LNJ616C8WRA			M3
	LNJ622C4CRA1			M3
	LNJ624C4CRA1			M3
	LNJ626W8CRA			M3
	LNJ717W80RA			M5
	LNJ717W80RA1			M5
	LNJ717W83RAS			M5
	LNJ723W80RAV			M5
	LNJ727W83RAA			M5
	LNJ727W83RAS			M5
	LNJ801LPDJA			M11
	LNJ801TPSJA			M11
	LNJ802RPDJA			M11
	LNJ802SPSJA			M11
	LNJ806K5SRX			M3
	LNJ806R58RX			M3
	LNJ808K87RA			M3
	LNJ808K8SRA			M3
	LNJ808R83RA			M3
	LNJ808R8ERA			M3
	LNJ810C63RA			M3
	LNJ810C67RA			M3
	LNJ810L6DRA			M3
	LNJ810L6SRA			M3
	LNJ811K87RA			M3
	LNJ811K8SRA			M3
	LNJ811R88RA			M3
	LNJ811R8DRA			M3
	LNJ811R8DRU			M3
	LNJ812K8SRA			M3
	LNJ812R8DRA			M3
	LNJ812W83RA1			M3
	LNJ812W86RA1			M3
	LNJ814K87RA			M3
	LNJ814K8SRA			M3
	LNJ814R8DRA			M3
	LNJ814W83RA			M3
	LNJ816C83RA			M3
	LNJ816C87RA			M3
★	LNJ816C88RA			M3
	LNJ816C8DRA			M3
	LNJ816C8DRU			M3
	LNJ816C8SRA			M3
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★ ▲	LNJ847W83RA			M3
★ ▲	LNJ847W86RA			M3
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	LNJ853W83RA			M3
	LNJ853W86RA			M3

★: Newly listed in this document ▲: Under development

Part Number List

	Part No.	C Part No.	Package	Page
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	LNJ911W8BRU			M3
	LNJ912W8BRA			M3
	LNJ912W8CRA1			M3
	LNJ916C8BRA			M3
	LNJ922C4CRA1			M3
	LNJ924C4CRA1			M3
	LNJ926W8CRA			M3
	LNJ936W8CRA			M3
★	LNJ937W8CRA			M3
★ ▲	LNJ947W8CRA			M3
	LNJ952W8CRA1			M3
	LNJ953W8CRA			M3
★	LNJC36X8ARA1			M3
★	LNJC37X8ARA			M3
★ ▲	LNJC47X8ARA			M3
	LNP073024			M14
	LNP075244F			M14
	LNP092014S			M14
	LNP093014S			M14
	LNP120021			M14
	LNP123031			M14
	LNP123071			M14
	LNP125024			M14
	LNP128081			M14
	LNP129041			M14
	LNP143024			M14
	LNP172024			M14
	LNP173014			M14
	LNP173024			M14
	LNP175024			M14
	LNP178011			M14
	LNP178021			M14
	LNP192014			M14
	LNP193024			M14
	LNP720311			M14
	LNP720311W			M14
	LNP720321			M14
	LNP721311			M14
	LNP729311			M14
	LNP773224F			M14
	LNP775224F			M14
	LNP793224			M14
	LNW6B8GYFZ			M11
	LNW997CKB			M11
	LNW998CKBW			M11
	LNW9A8BYBZ			M11
	PNA1101L		3ϕ Ceramic	M17
	PNA1401L	PN101	TO-18	M17
	PNA1401LF		TO-18	M17
	PNA1601M	PN166	Side View	M17
	PNA1606L		Side View	M17
	PNA1801L	PN168	3ϕ Plastic	M17
	PNA1803L		3ϕ Plastic	M17
✪	PNA2W01M	PN207	Double End	M17
	PNA3602L		Side View	M16
	PNA3W01L	PN307	Double End	M16
	PNA4601M			M16
	PNA4602M			M16
	PNA4612M			M16
	PNA4618M			M16
	PNA4701M			M16
	PNA4702M			M16
	PNA4801M			M16
	PNA4802M			M16
	PNA4803M			M16
	PNA4811M			M16
	PNA4812M			M16
	PNA4813M			M16
	PNA4K01F			M16
	PNA4K04F			M16
	PNA4K11F			M16
	PNA4S02M			M16
	PNA4S06M			M16
	PNA4S42M			M16
	PNA4S47M			M16
	PNA4S54F			M17
	PNA4U12F			M17
	PNA4U15F			M17
	PNA4U17F			M17
	PNA4U23F			M17
	PNA4U31F			M17
	PNZ108	PN108	TO-18	M17
	PNZ108CL	PN108CL	TO-18	M17
	PNZ109L	PN109L	TO-18	M17
	PNZ115	PN115	Side View	M17
	PNZ120S	PN120S	3ϕ Ceramic	M17
	PNZ121S	PN121S	3ϕ Ceramic	M17
	PNZ123S	PN123S	3ϕ Ceramic	M17
	PNZ147	PN147	Double End	M17
	PNZ150	PN150	Side View	M17
	PNZ154	PN154	Side View	M17
	PNZ154NC	PN154NC	Side View	M17
	PNZ155	PN155	Side View	M17
	PNZ158	PN158	Side View	M17
✪	PNZ202S	PN202S	3ϕ Ceramic	M17
✪	PNZ263L	PN263L	Side View	M17
	PNZ313	PN313	Side View	M16
	PNZ313B	PN313B	Side View	M16
	PNZ323	PN323	TO-92	M16
	PNZ323B	PN323B	TO-92	M16
	PNZ327	PN327	TO-92	M16
	PNZ330CL	PN330CL	TO-18	M16
	PNZ330CLNC		TO-18	M16
	PNZ334	PN334	5ϕ Plastic	M16
	PNZ335	PN335	Side View	M16

	Part No.	C Part No.	Package	Page
Hologram Units				
	HUL7212			M20
★	HUL7215			M20
	HULT273			M20
★	HULT276			M20
Laser Diodes				
★	LNC415FG			M20
	LNCT12PF			M20
	LNCT16PF			M20
★	LNCT21PU			M20

★: Newly listed in this document ▲: Under development ✪: Darlington

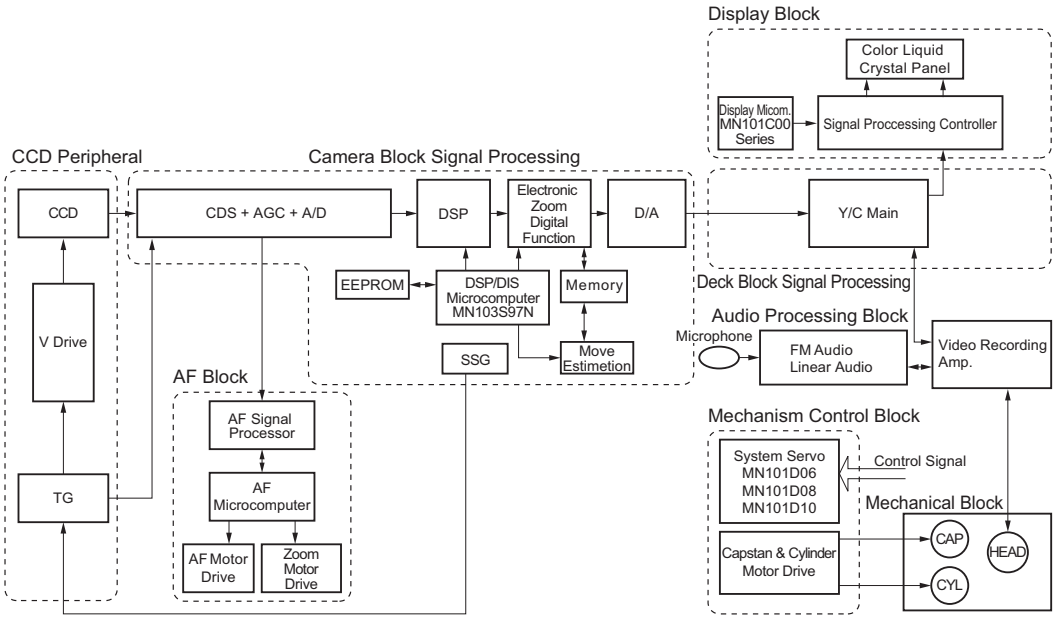
B

Application Block Diagrams

Application Block Diagrams

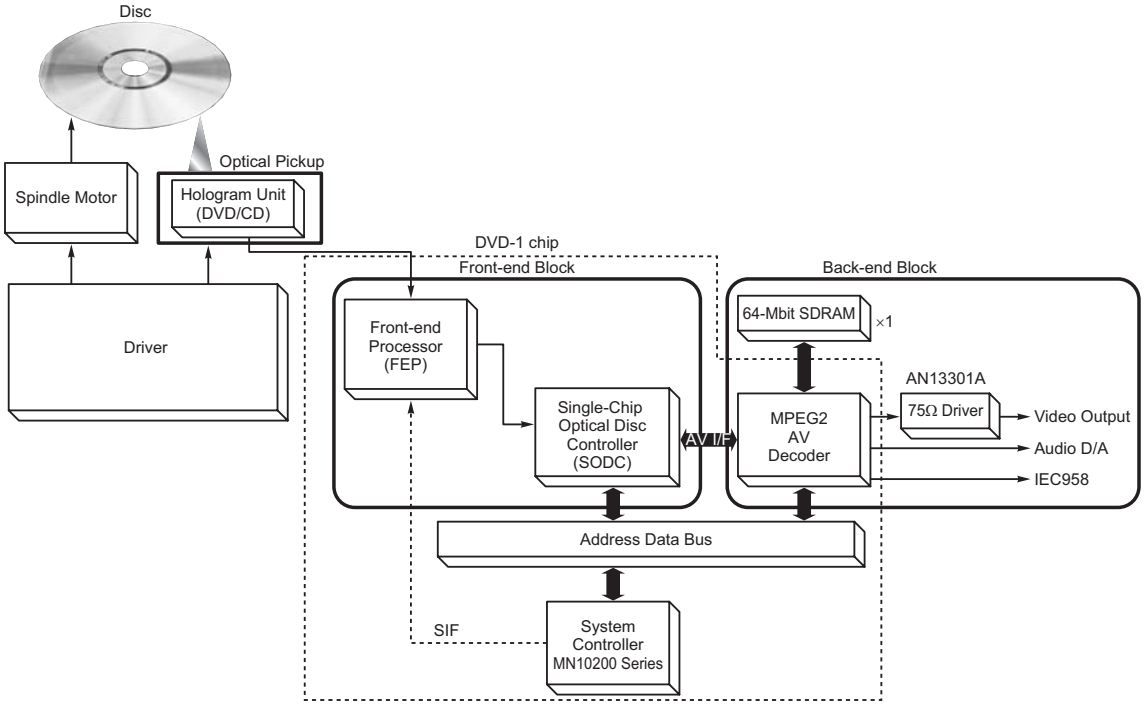
Video Applications

(1) Video Camera System



Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1462G, 2SD2216G, UNR9000G Series, XP Series
Diode: MA2SD・MA27D・MA22D・MA24D・MA2YD・MAZD・MAZW・MAZM Series, MAYS, MALS068XG
Protector Elements: UNHZ Series

(2) DVD Player

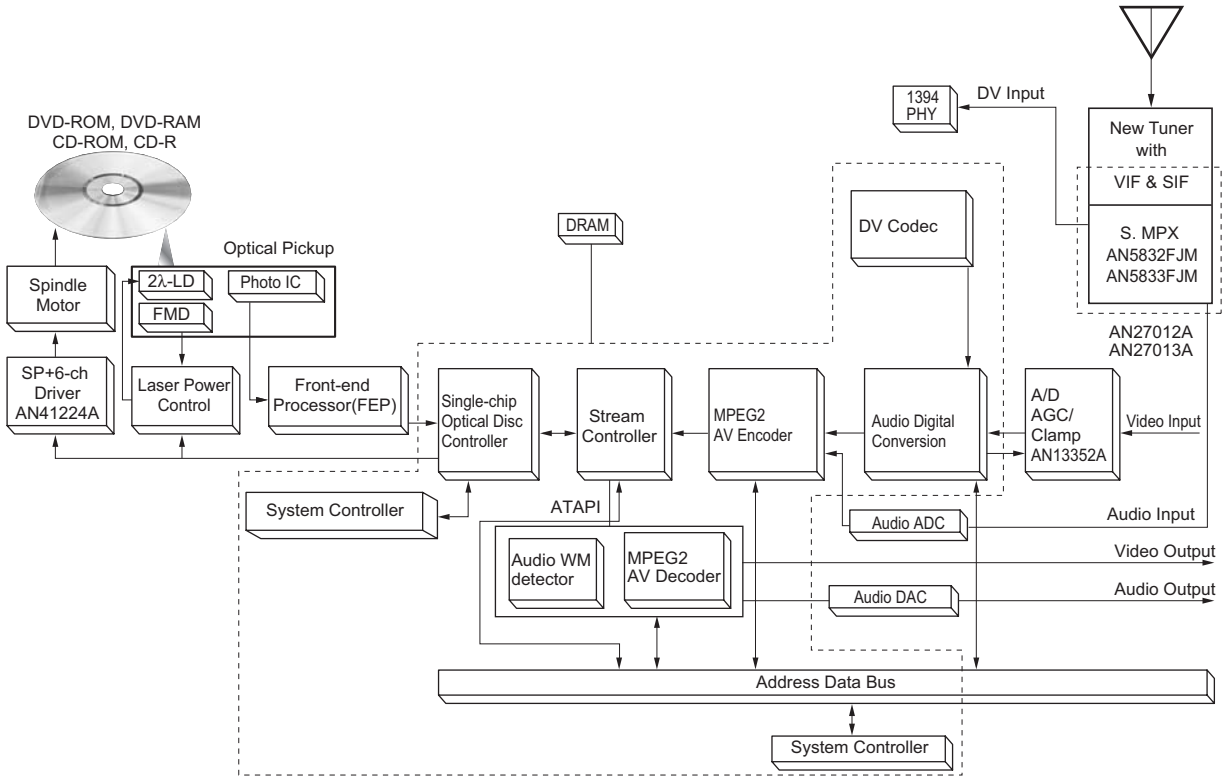


Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1218G, 2SD1819G, UNR5000G Series
Diode: MA2J1110G, MA2J7280G, MAZ8000G Series, MA24D Series
Protector Elements: UNHZ Series

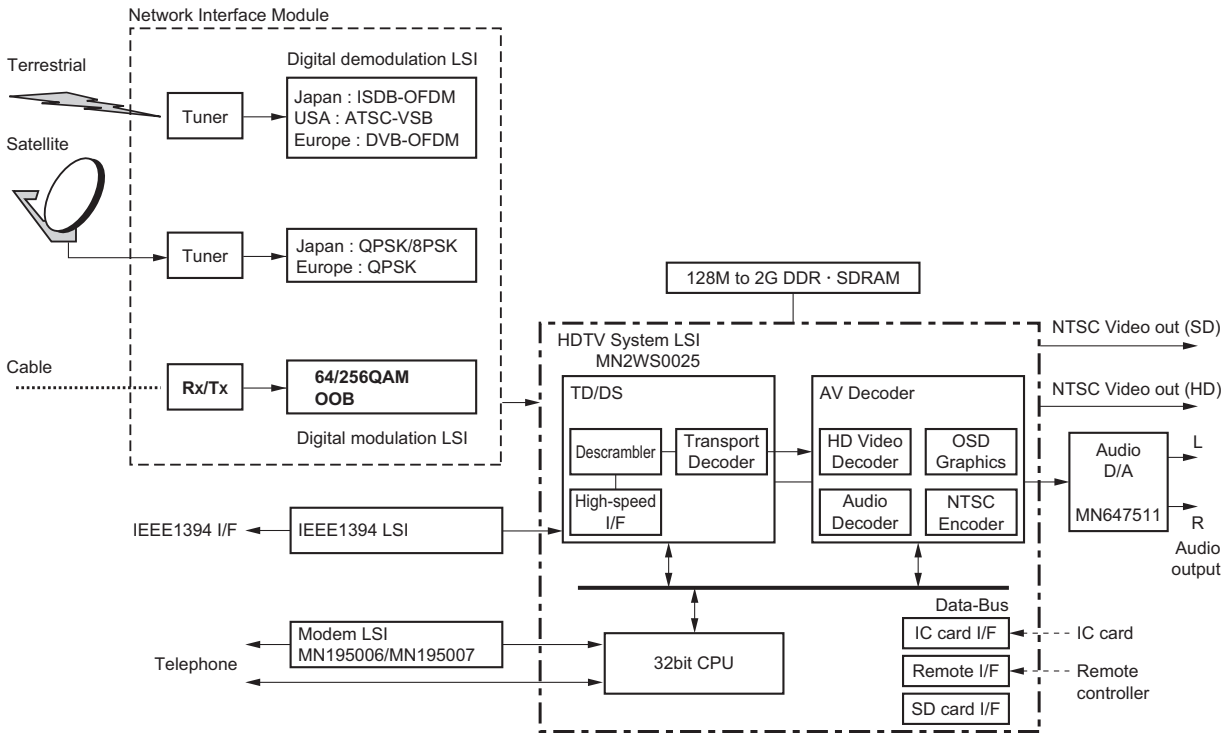
B

Video Applications

(3) DVD Recoder



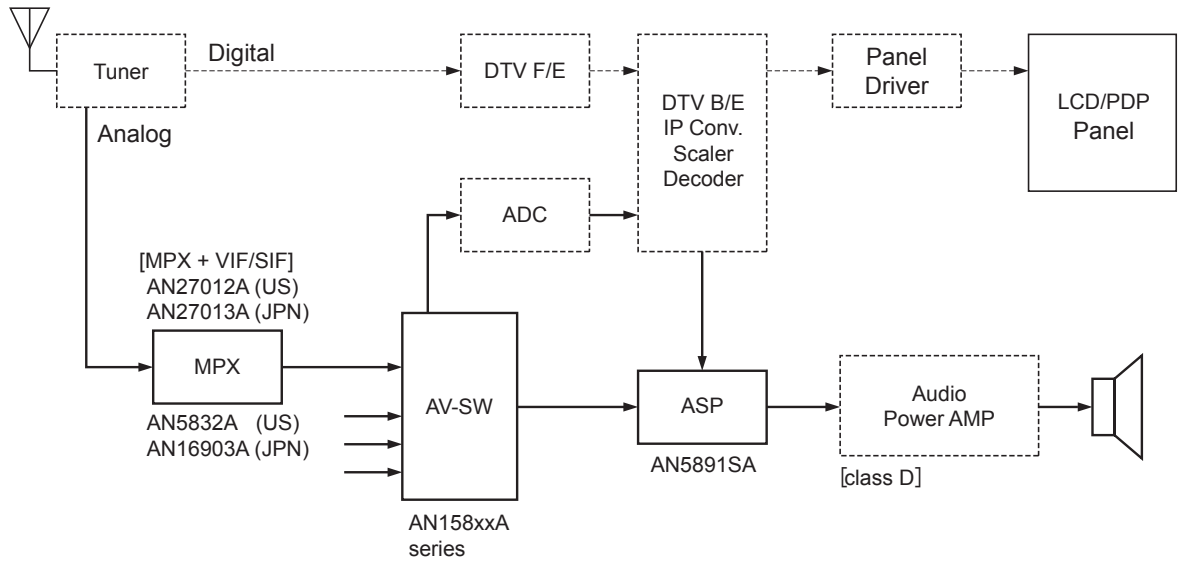
(4) Digital TV Solution



Application Block Diagrams

Video Applications

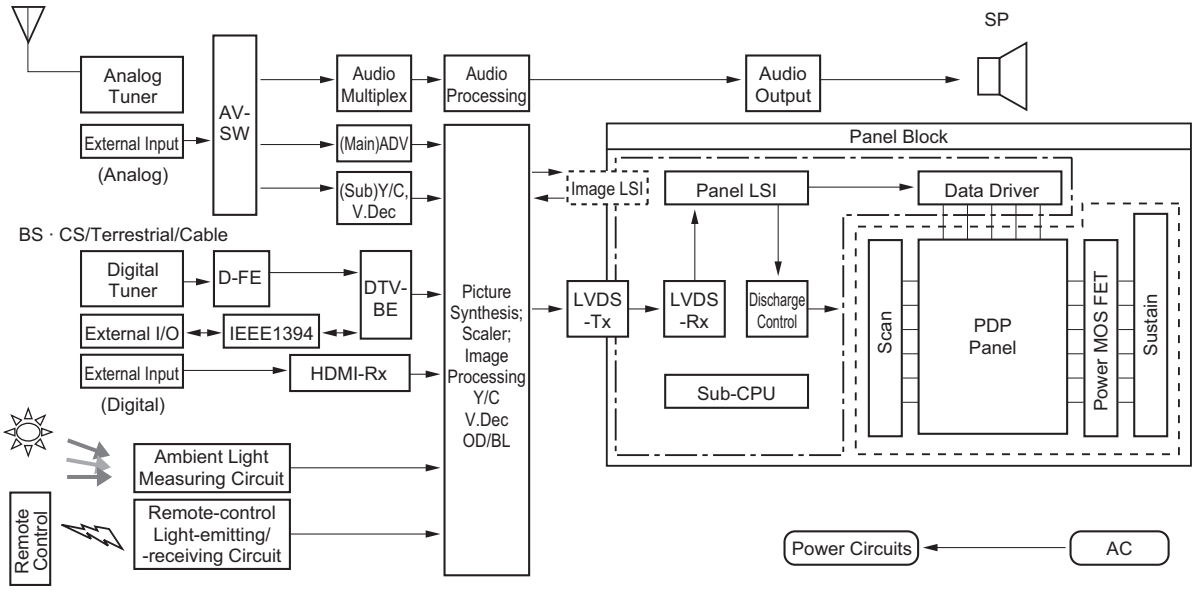
(5) PDP/LCD-TV



Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1218G, 2SD1819G, UNR5000G Series, XP Series
Diode: MA2J1110G, MA2J7290G, MA2YD15, MA2ZD02, MAZ8000G Series, MA22DxxxG Series, MA2SD Series, MA24D Series
Protector Elements: UNHZ Series

Video Applications

(6) PDP-TV

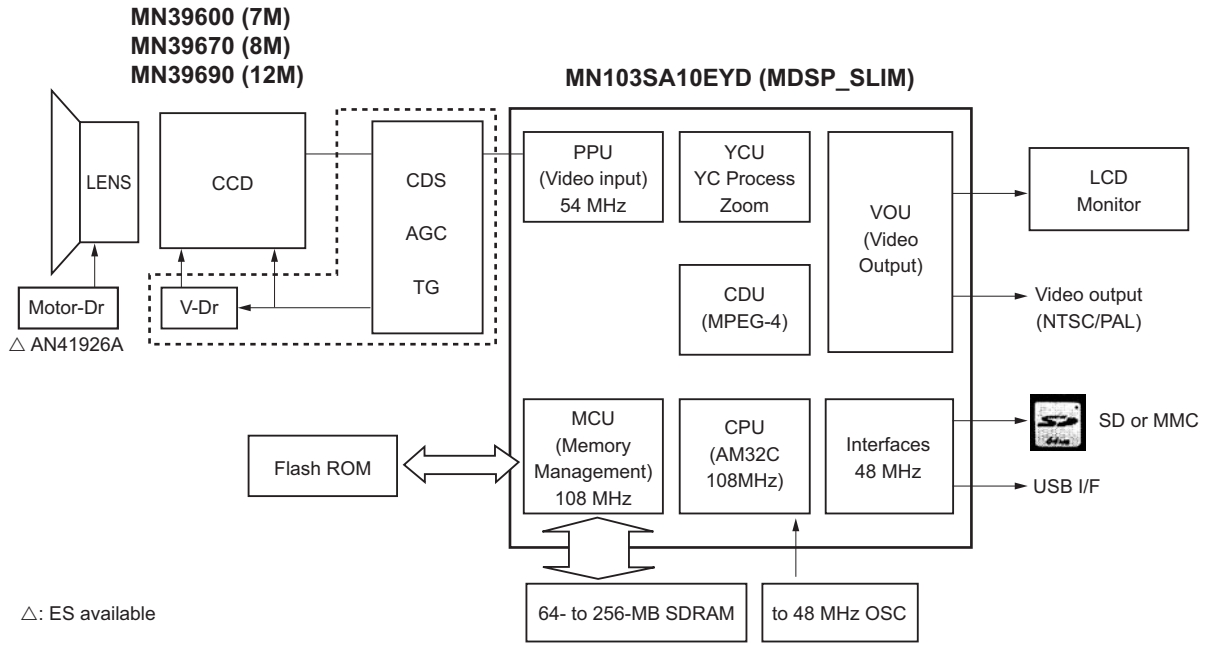


Category	Function/ Component Classification	Discrete Item Examples
Sustain	Power MOS FETs	2SK3995, 2SK4174, 2SK4208
	IGBT	2PG006, 2PG009, 2PG011
Ambient Light Measuring Circuit	Luminance Sensor	PNA4603H
Remote-control Light-emitting/-receiving Circuit	Transmitting Infrared Light Emitting LED	LNA2903L
	Light-receiving Photo IC	PNA46**M
General Circuits	Small Signal Transistors	2SA1309A, 2SC3311A, UNR4000 Series, etc.
	Small Signal Diodes	MA2J1110G, MA2J7**0G, MA3X15* Series, etc.
	Surge Protection	MAZ3000 Series, MAZ8000G Series, MAZYS0750Z, etc.
Power Circuits	Power MOS FETs	2SK3043 to 2SK3048
	Fast Recovery Diodes	MA3D649, MA3D650
	Zener Diodes	MAZ3000 Series, MAZ8000G Series,
	Schottky Barrier Diodes	MA22D**, MA3X*** Series, MA24D** Series
	Output Error Feedback	CNC1S171 (Photo Couplers)
	IPD	MIP2FX Series, etc.

Application Block Diagrams

Video Applications

(7) Digital Still Camera System

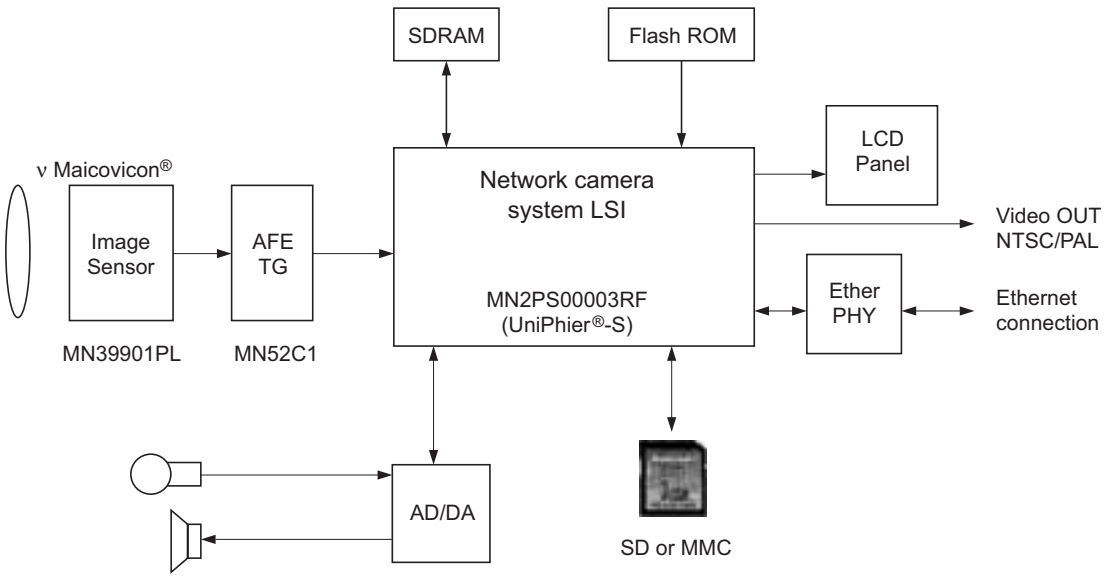


Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1462G, 2SD2216G, 2SA2078G, 2SC5846G
Diode: MA21D・MA22D・MA27D・MA2SD・MA4ZD ・MA24D Series, MAZD・MAZW・MAZM Series, MAYS, MALS068XG, MA2YF800G
Photo Couplers: CNC1S101, CNC1S171, CNA1312K

	CCD	Vdriver	Timing Gen.	CDS/AGC ADC	DSP	DC-DC	Audio
7M	MN39600	—			MN103SA10EYD	AN30216A	AN12909A
8M	MN39670						
12M	MN39690				Pixel Free built-in 32-bit CPU JPEG/MPEG4	Sync.rectif Min.1.51 V supply	QFN28 pin Microphone Amp. ALC, LPF

Video Applications

(8) Network Camera



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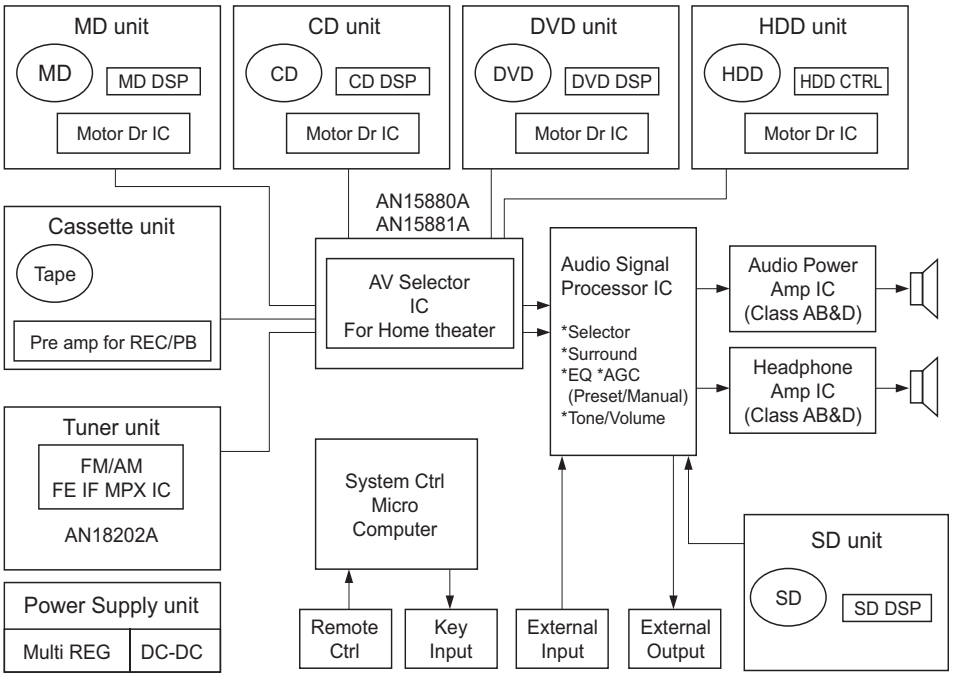
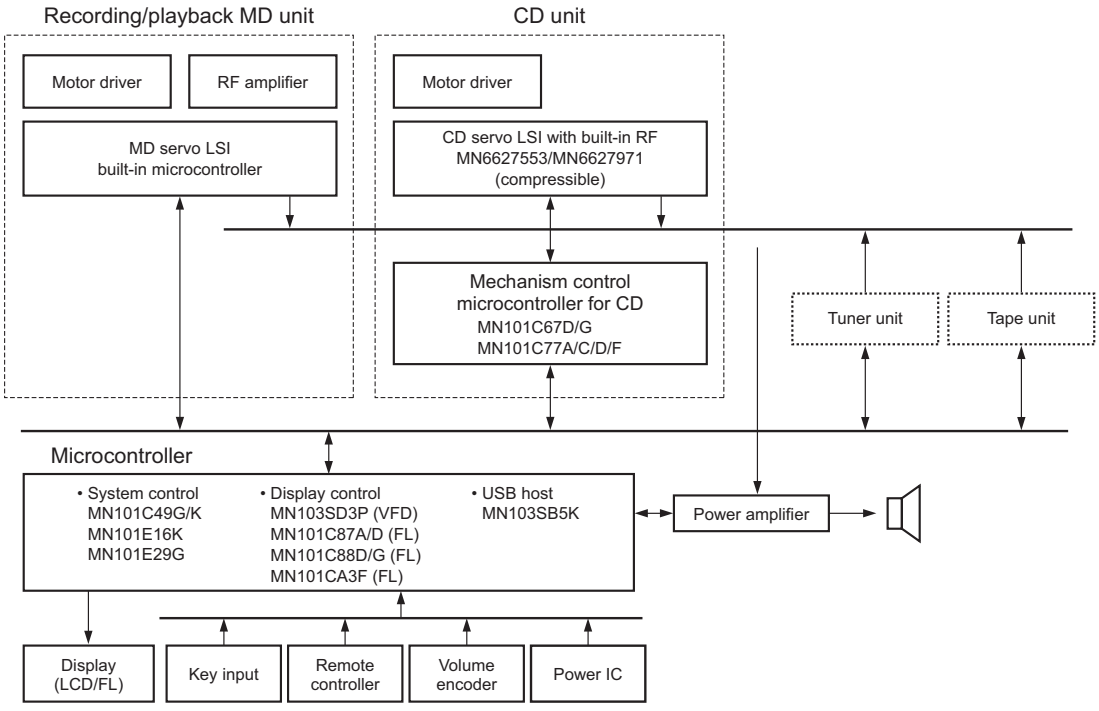
Application Block Diagrams

Audio Applications

(1) Minicomponent Stereo Set-(1)

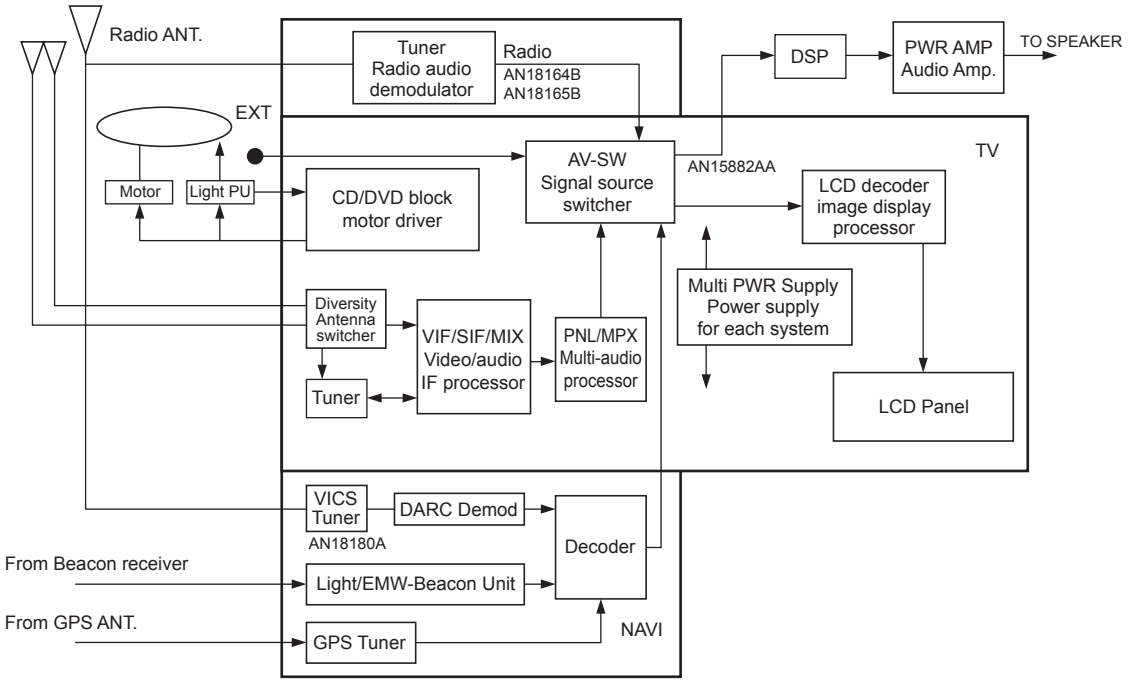


(2) Minicomponent Stereo Set-(2)

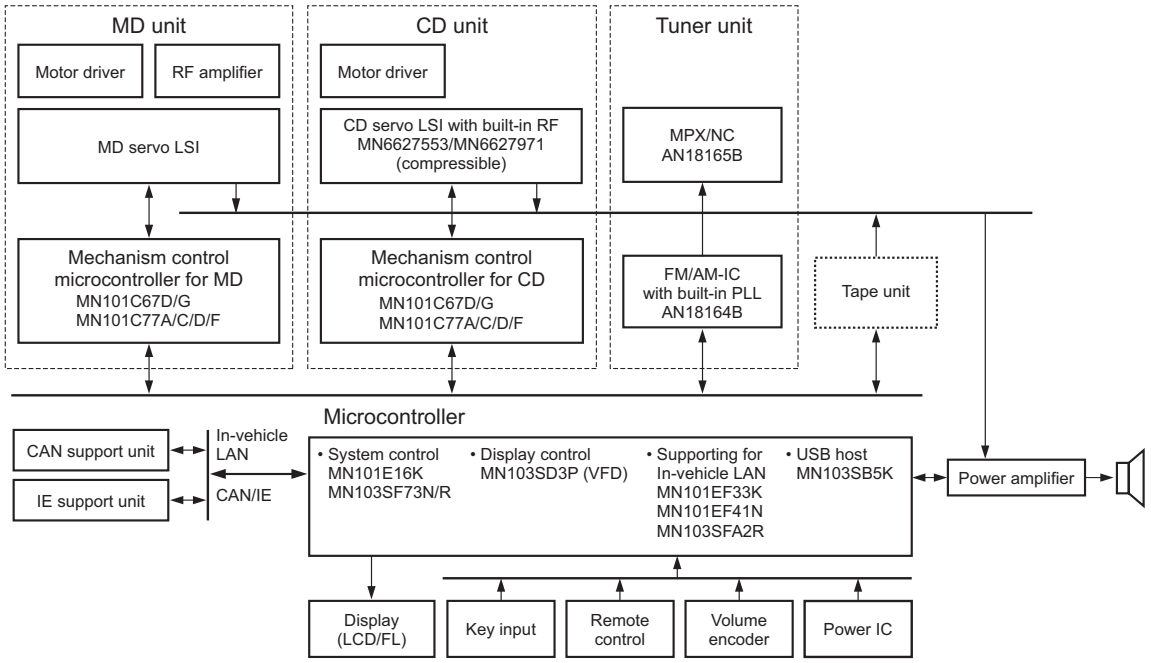


Audio Applications

(3) Car Audio System-(1)



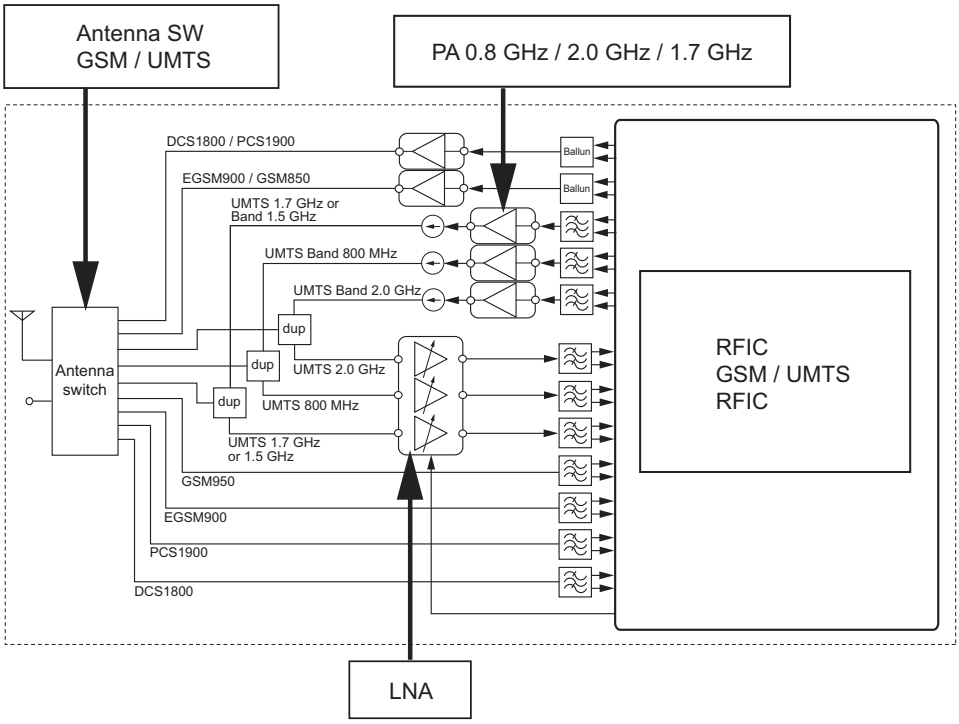
(4) Car Audio System-(2)



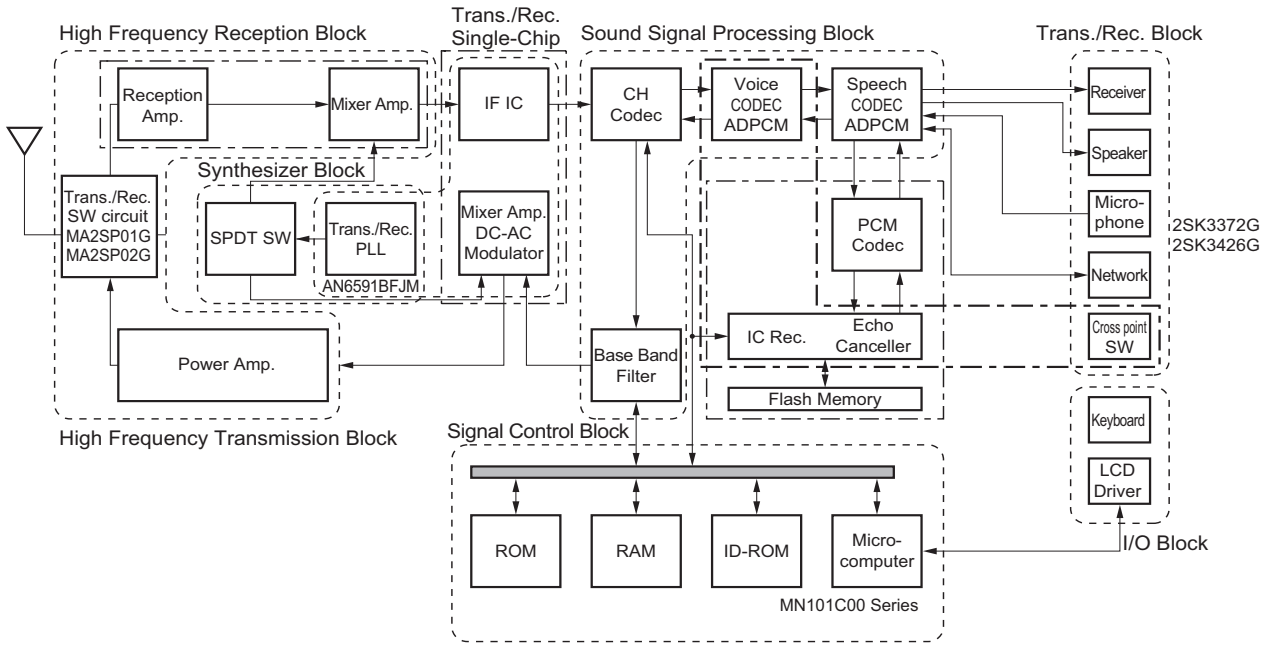
Application Block Diagrams

Communication Applications

(1) WCDMA Cellular Phone (0.8 GHz/1.7 GHz/2.0 GHz for Japanese domestic FOMA use)



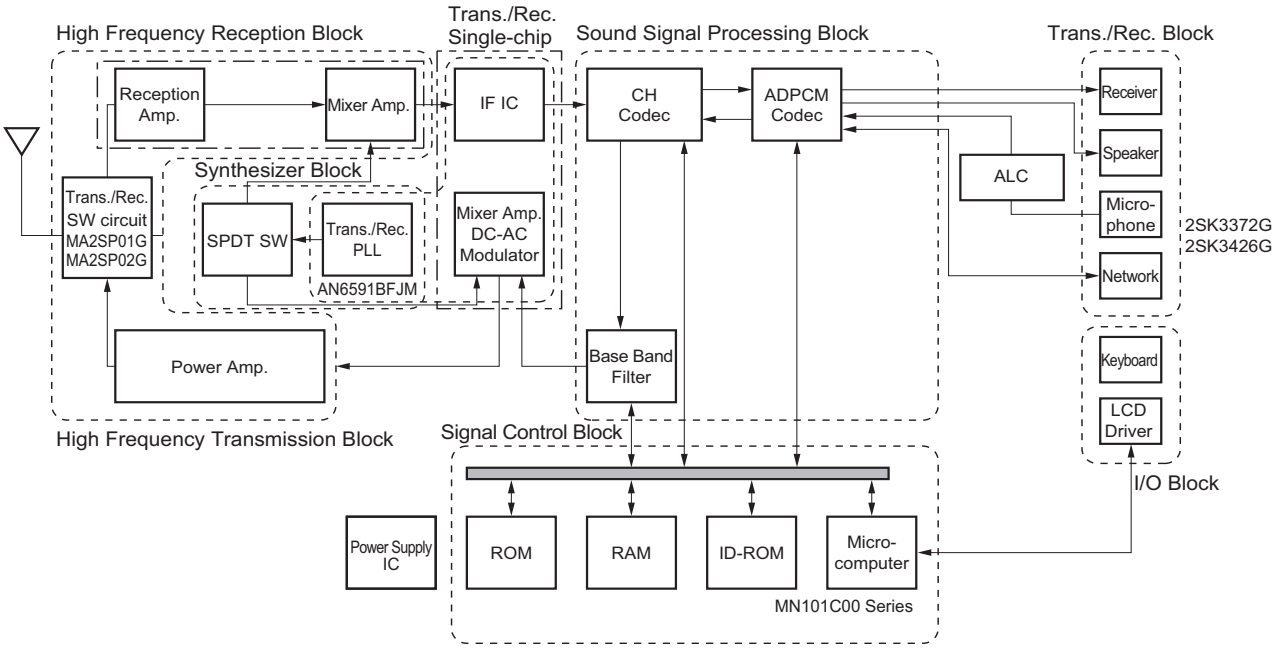
(2) Digital Cordless Telephone with Answering Machine (Base unit)



Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1462G, 2SD2216G, UNR9000G Series, XP Series
Diode: MA22DxxxG Series
MA2S1110G, MA2SD190G, MAZSxxxG Series, MA21DxxxG Series

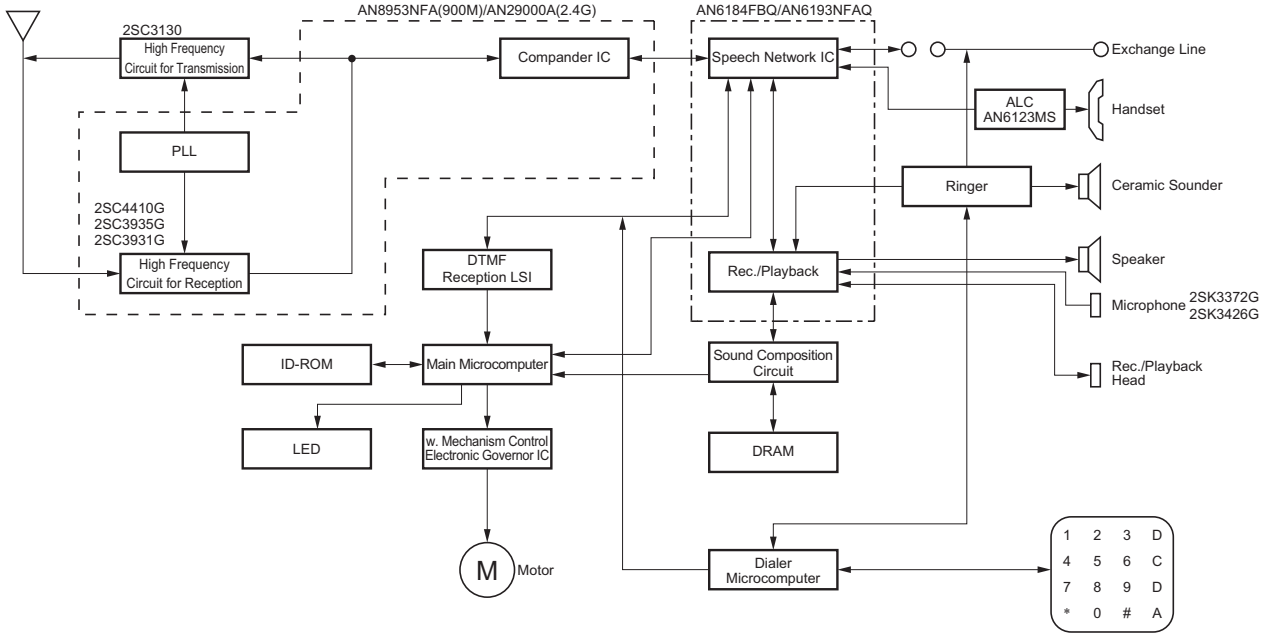
Communication Applications

(3) Digital Cordless Telephone (Handset)



Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1462G, 2SD2216G, UNR9000G Series
Diode: MA22DxxxG Series, MA2J1110G, MAZSxxxG Series, MA21DxxxG Series

(4) Cordless Telephone with Answering Machine (Base unit)

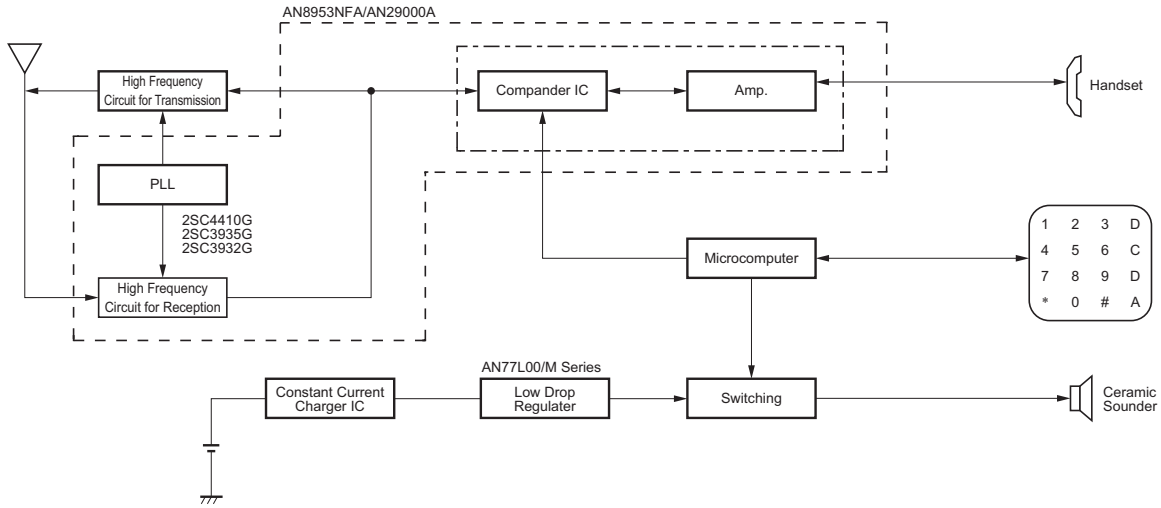


Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1462G, 2SD2216G, UNR9000G Series, XP Series,
Diode: MA2S1110G, MA2SD190G, MAZSxxxG Series, MA21DxxxG, MA22DxxxG Series

Application Block Diagrams

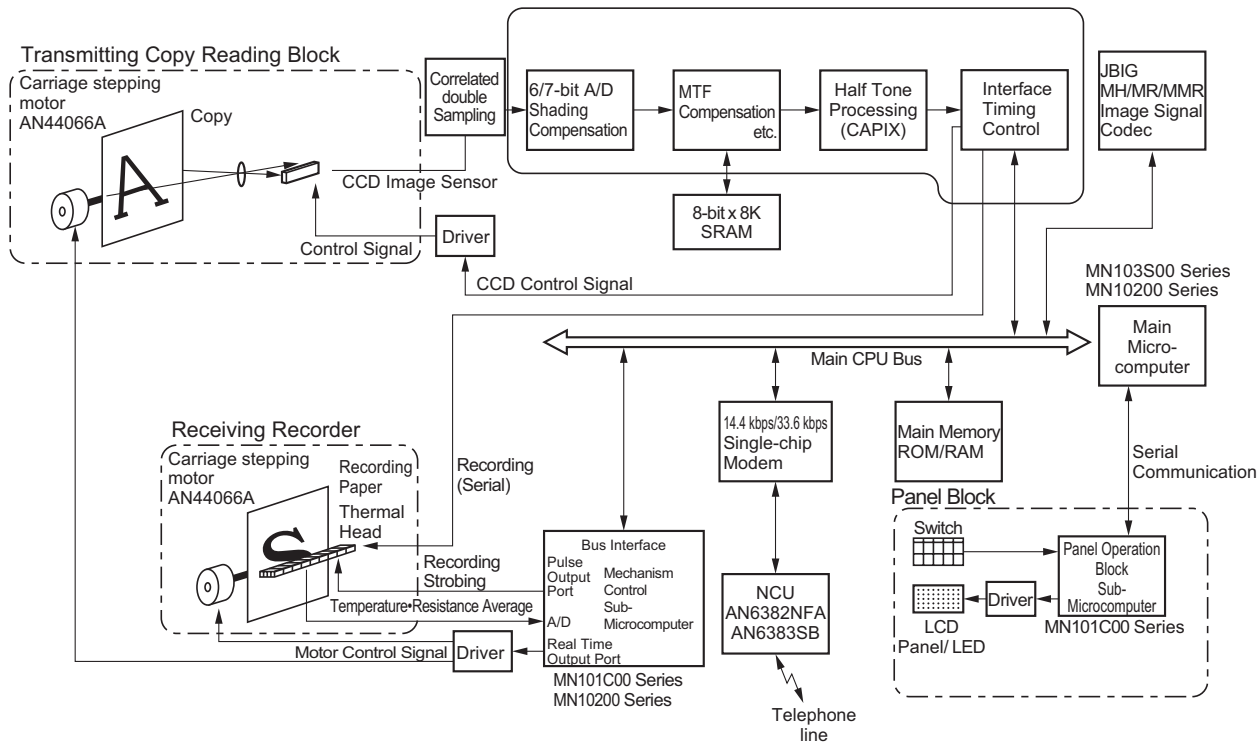
Communication Applications

(5) Cordless Telephone with Answering Machine (Handset)



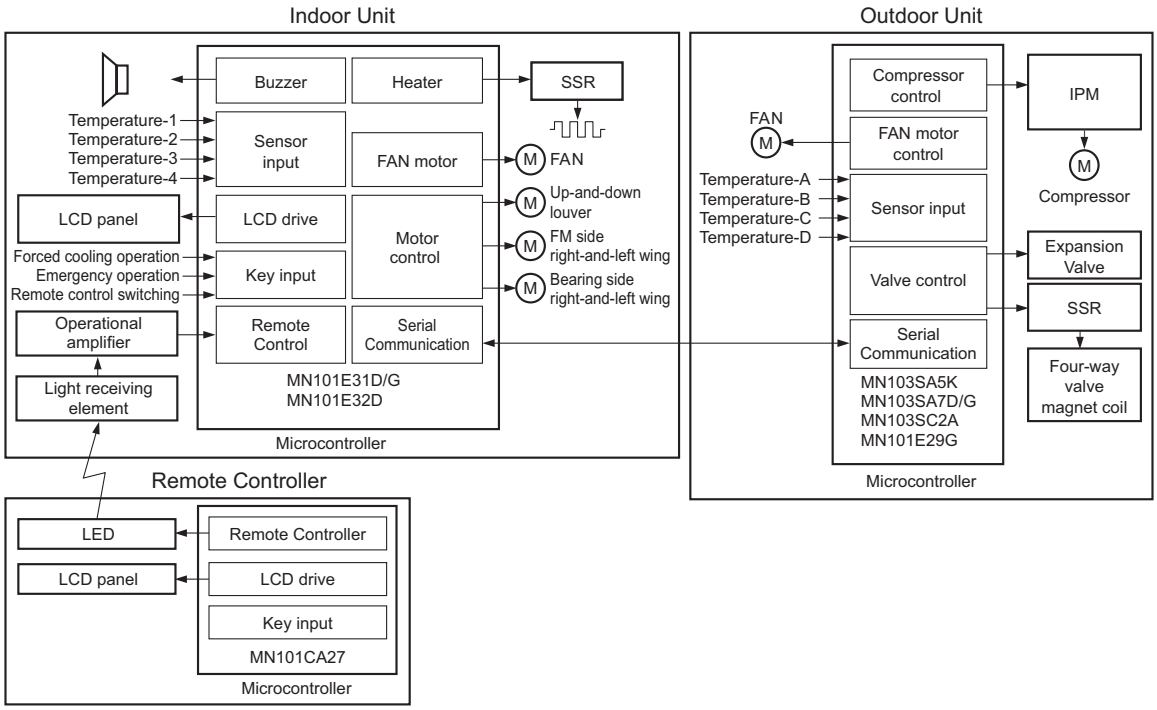
Note) The transistors and diodes listed below can be used for the peripheral circuits in this block diagram.
Transistor: 2SB1462G, 2SD2216G, XP Series
Diode: MA2S1110G, MA2S7280G, MAZSxxxG Series, MA21DxxxG Series, MA22DxxxG Series

(6) Fax

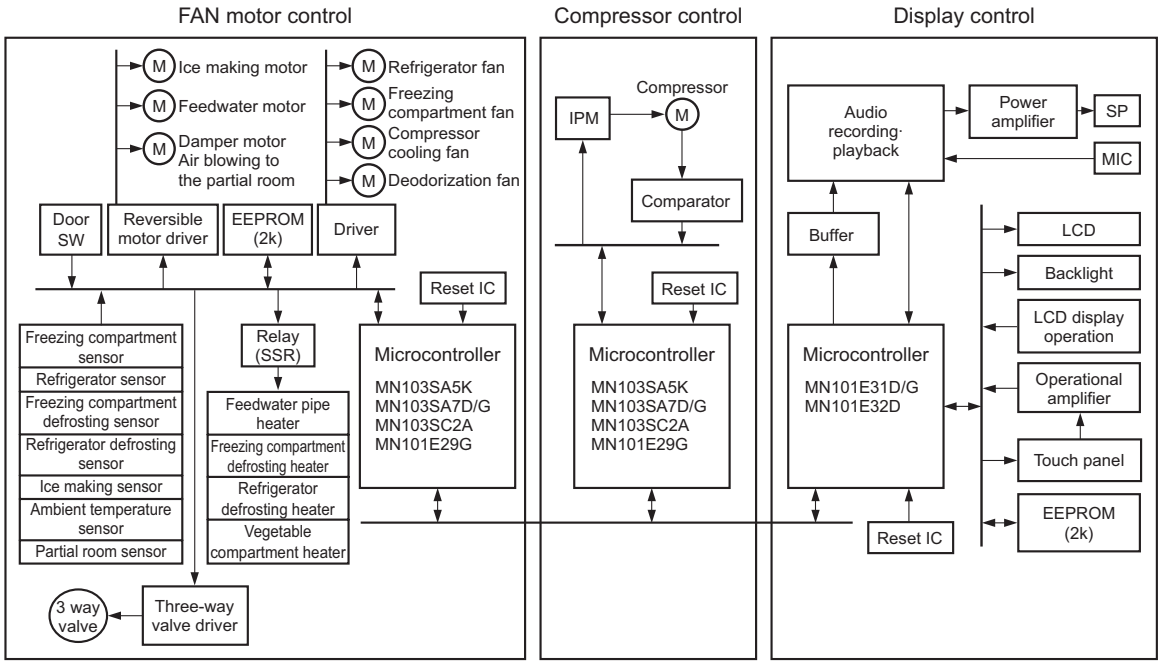


Industrial and Home Applications

(1) Air Conditioner



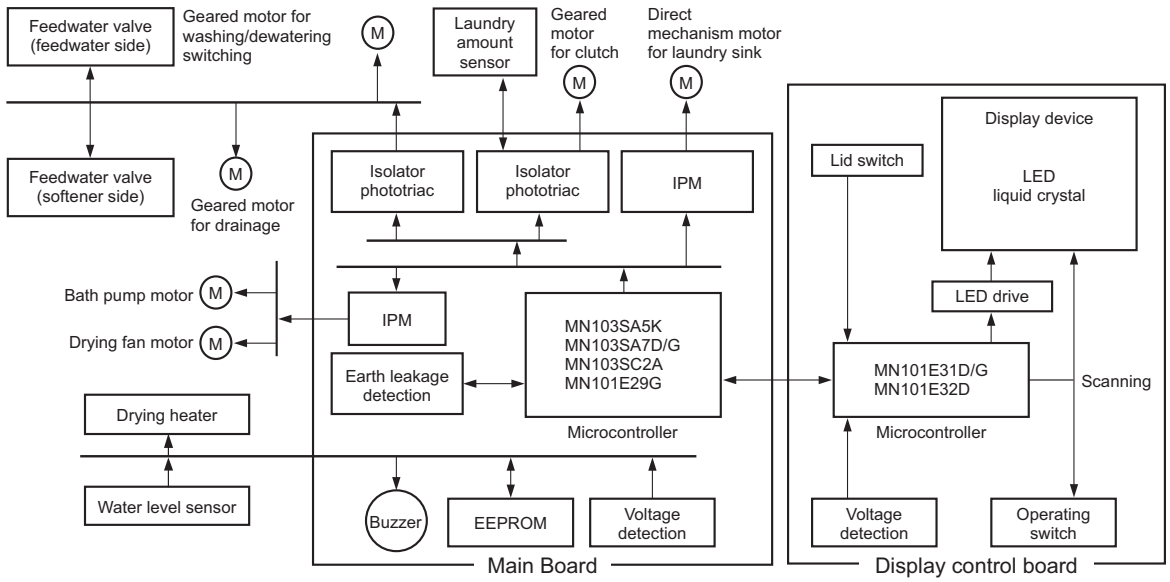
(2) Refrigerator



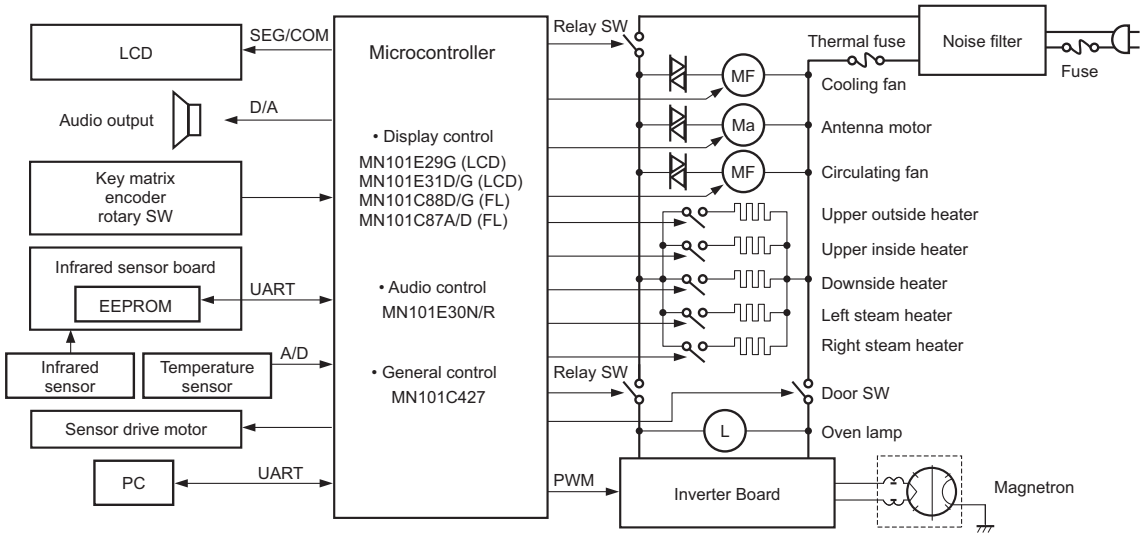
Application Block Diagrams

Industrial and Home Applications

(3) Washer/Dryer



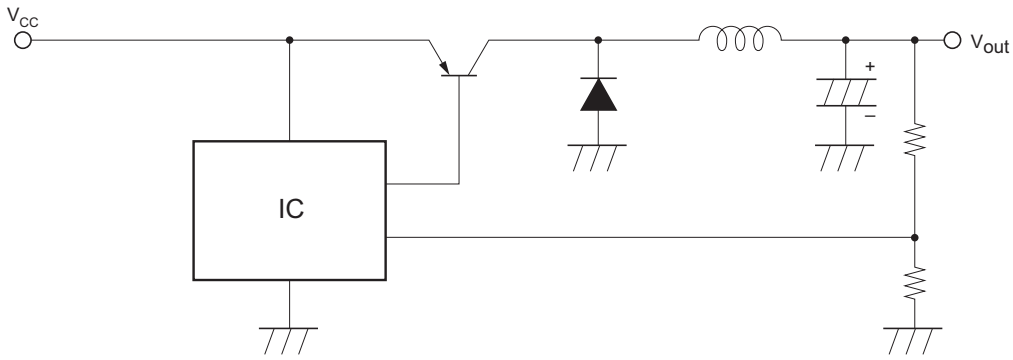
(4) Microwave Oven



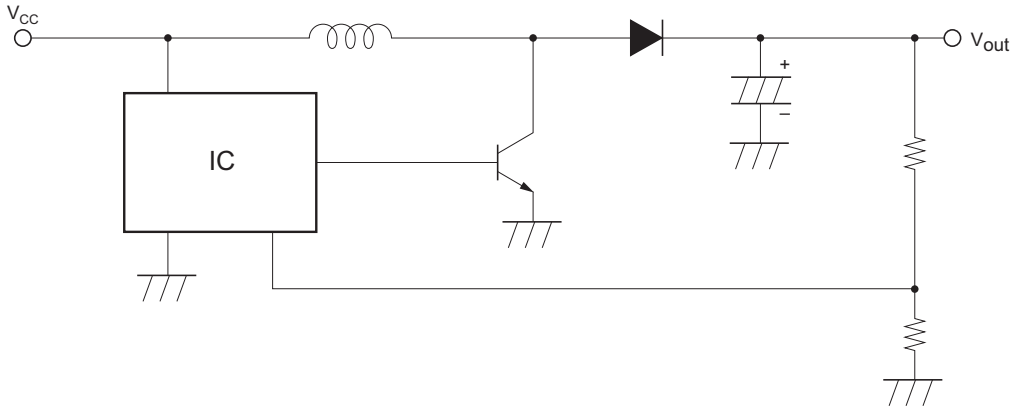
Industrial and Home Applications

(5) For Switching Power Supply DC-DC Converter

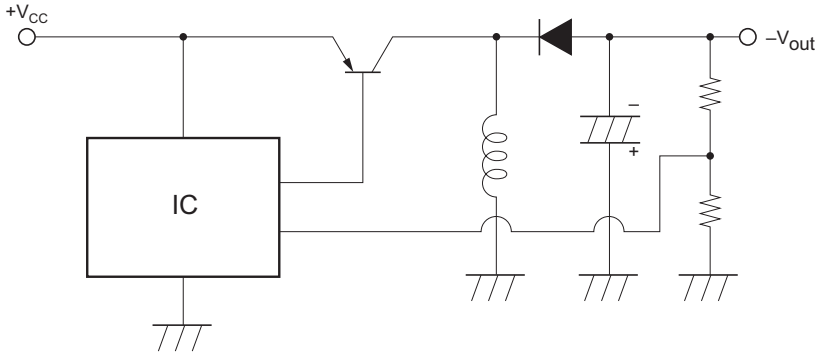
Step down



Step Up



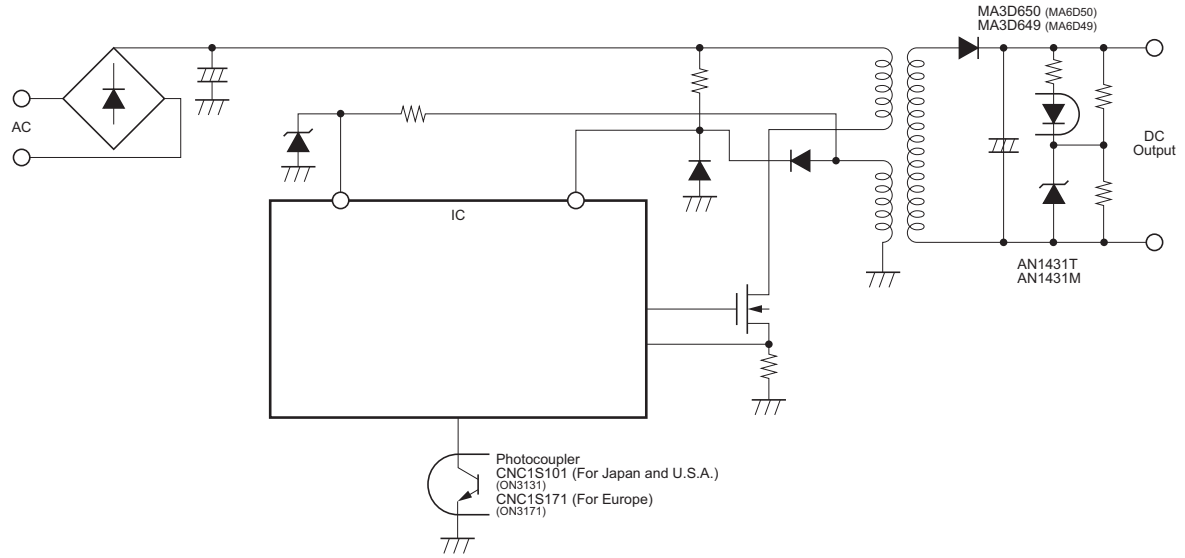
Inversion



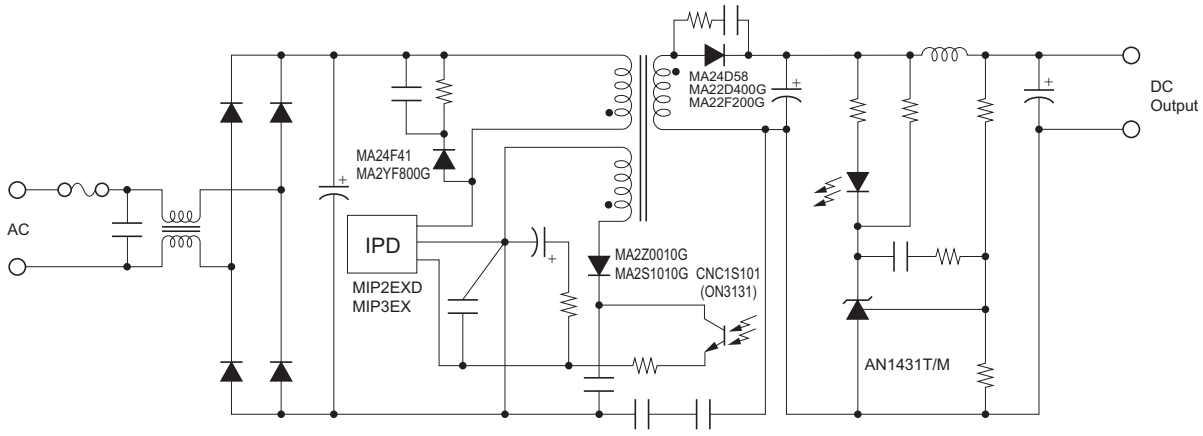
Application Block Diagrams

Industrial and Home Applications

(6) Switching Power Supply (Oscillation of RCC)



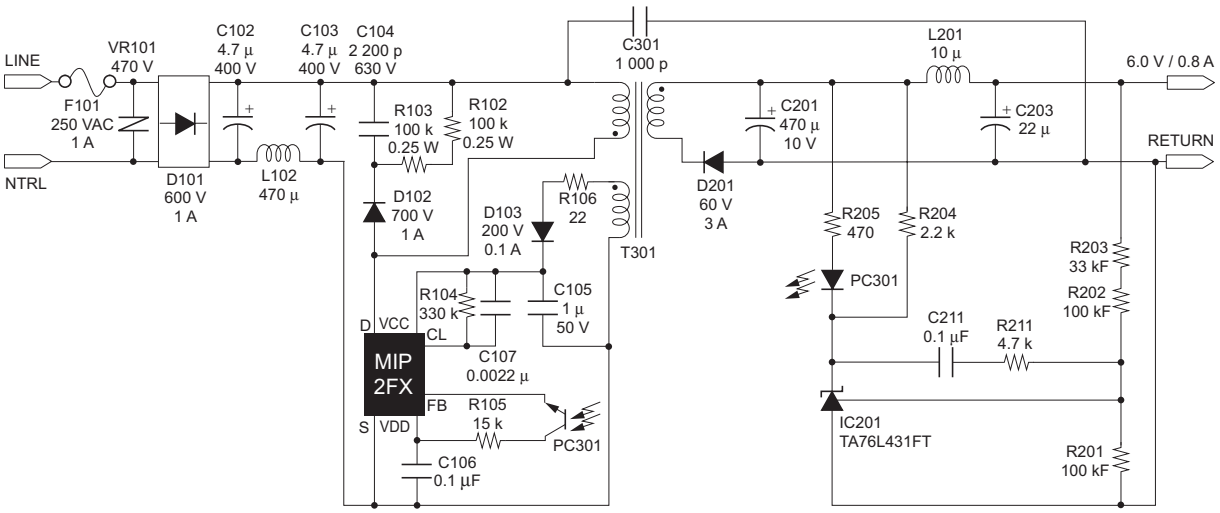
(7) Switching Power Supply (Flyback system)



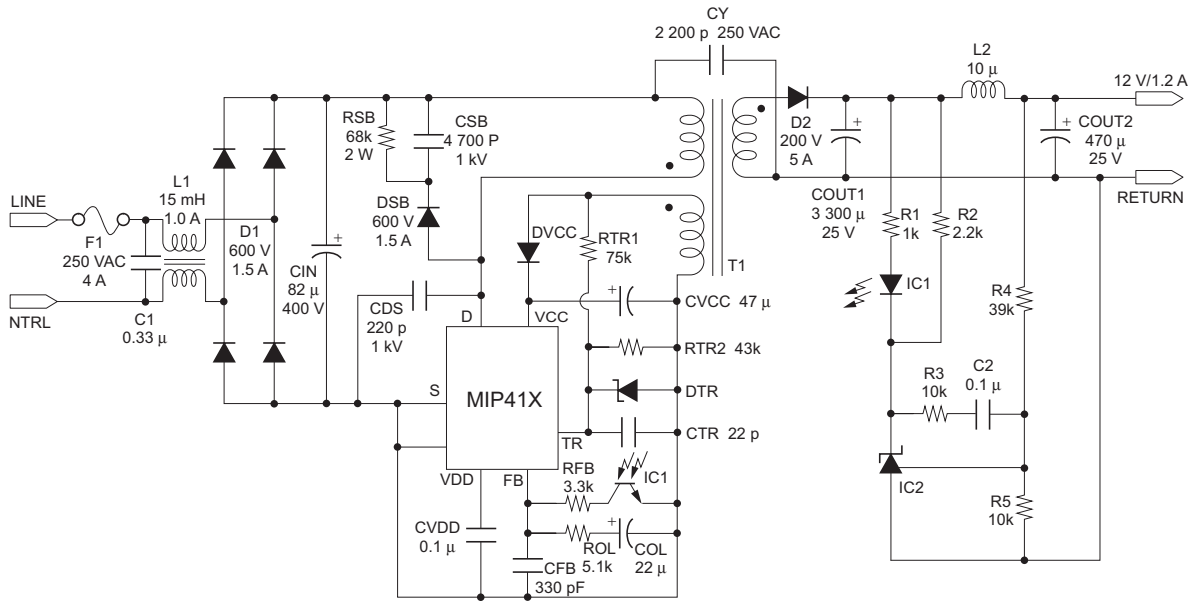
Note) The part numbers in parentheses show the conventional ones.

Industrial and Home Applications

(8) Switching Power Supply (For chargers)



(9) Switching Power Supply (Artificial Resonance Power Source)



Microcomputers

Microcontrollers

8-bit Single-chip Microcontrollers AM1 (MN101) Series

Category	Type	Built-in ROM Type	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time/ Operating Voltage (µs/V)	Package	Number of I/O ports (Pins) [At single chip mode]	Interrupt Sources	8-bit Timer (Pins)	16-bit Timer (Pins)	19-bit Timer (Pins)	Serial Interfaces: Synchronous Type/UART Selectable	Serial Interfaces: Synchronous Type/I²C Selectable	Serial Interfaces: Synchronous Type	Serial Interfaces: UART	Serial Interfaces: I²C	A/D Converter (ch)	D/A Converter (ch)	Display Control Function
ADC Built-in Type	MN101C28A	M	32K	1.5K	0.1/4.5 to 5.5 125/2.0 to 5.5	LQFP080-P-1414A QFP084-P-1818E TQFP080-P-1212D	70	18	5	1	0	1	1	1	0	0	8	—	—
	MN101C28C		48K	2K															
	MN101C28D		64K																
	MN101C28F		96K	4K		LQFP080-P-1414A													
	MN101C28L			10K															
	MN101CP28D	E	64K	2K	0.1/4.5 to 5.5 125/2.3 to 5.5	LQFP080-P-1414A QFP084-P-1818E TQFP080-P-1212D													
	MN101CP28L		96K	10K		LQFP080-P-1414A													
	MN101C309	M	24K	1K	0.1/4.5 to 5.5 125/2.0 to 5.5	LQFP064-P-1414	54	17	5	1	0	1	0	1	0	0	8	—	—
	MN101C30A		32K	1.5K															
	MN101CP30A	E			0.1/4.5 to 5.5 125/2.7 to 5.5														
	MN101C425	M	8K	0.25K	0.1/4.5 to 5.5 0.477/2.0 to 5.5	SDIP042-P-0600C	36	11	3	1	0	1	0	0	0	0	8	—	—
						QFP044-P-1010F	37												
					0.1/4.5 to 5.5 125/2.0 to 5.5	TQFP048-P-0707B	39	12											
	MN101C427		16K	0.5K	0.1/4.5 to 5.5 0.477/2.0 to 5.5	SDIP042-P-0600C	36	11											
						QFP044-P-1010F	37												
					0.1/4.5 to 5.5 125/2.0 to 5.5	TQFP048-P-0707B	39	12											
	MN101CP427	E			0.1/4.5 to 5.5 0.238/2.7 to 5.5	SDIP042-P-0600C	36	11											
						QFP044-P-1010F	37												
						TQFP048-P-0707B	39	12											
	MN101C457	M	16K	0.5K	0.1/4.5 to 5.5	QFP044-P-1010F	37	11	3	1	0	1	0	0	0	0	8	—	—
	MN101CP427	E			0.1/4.5 to 5.5 0.238/2.7 to 5.5														
	MN101C539	M	24K	0.5K	0.1/4.5 to 5.5 62.5/2.0 to 5.5	TQFP048-P-0707B	40	14	3	1	0	1	0	0	0	0	8	—	—
	MN101CP539	E			0.1/4.5 to 5.5 62.5/2.7 to 5.5														
	MN101C61D	M	64K	3K	0.1/2.5 to 3.6 0.2/2.1 to 3.6 125/1.8 to 3.6	TQFP080-P-1212D	68	25	7	1	0	1	1	1	0	0	6	—	—
	MN101C61G		128K	12K															
	MN101CF60G	F			0.1/2.5 to 3.0 0.2/2.2 to 3.0 125/2.2 to 3.0														
	MN101CF61G				0.1/2.7 to 3.6 0.2/2.7 to 3.6 125/2.7 to 3.6														
	MN101C62D	M	64K	2K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	LQFP080-P-1414A	68	25	6	2	0	2	1	0	0	0	8	—	—
	MN101C62F		96K	4K															
	MN101CF62G	F	128K	10K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.5 to 5.5														
	MN101C67D	M	64K	6K	0.1/2.5 to 3.6 0.2/2.1 to 3.6 62.5/1.8 to 3.6	TQFP080-P-1212D	69	26	6	1	0	2	1	1	0	1	7	—	—
	MN101C67G		128K	10K															
	MN101CF67G	F			0.1/2.7 to 3.6														
	MN101CF91D		64K	4K	0.1/2.7 to 3.6 62.5/2.7 to 3.6	TQFP048-P-0707B	37	26	6	2	0	2	1	0	0	0	6	—	—
	MN101C94A	M	32K	1K	0.1/4.5 to 5.5 0.238/2.7 to 5.5 0.477/2.0 to 5.5	QFP044-P-1010F	37	13	5	1	0	1	0	0	0	0	8	—	—
	MN101CF94D	F	64K	2K	0.1/4.5 to 5.5 0.238/2.7 to 5.5 0.477/2.5 to 5.5														
	MN101CF95G		128K	6K	0.1/2.7 to 3.6 62.5/2.7 to 3.6	TQFP080-P-1212D	67	30	7	2	0	3	2	0	0	0	11	—	—
	MN101C97A	M	32K	1K	0.5/1.8 to 3.6 62.5/1.8 to 3.6	QFP044-P-1010F △ TQFP048-P-0707B	38	20	5	1	0	1	1	0	0	0	8	—	—
	MN101C97D		64K																
	MN101CF97D	F																	
	MN101CA7A	M	32K	2K	0.1/2.7 to3.6 62.5/1.8 to 3.6	TQFP048-P-0707B	35	22	5	1	0	1	1	0	0	1	8	—	—
	MN101CFA7D	F	64k			TQFP048-P-0707B ○													

[Internal ROM type] M:Mask ROM , E:EPROM , F:FLASH, —:External
[Package] ○:under planning , ▲:under development , △:ES(Engineering Sample) available (All packages are lead (Pb) free.)

8-bit Single-chip Microcontrollers AM1 (MN101) Series (continued)

Category	Type	Built-in ROM Type	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time/ Operating Voltage (µs/V)	Package	Number of I/O ports (Pins) [At single chip mode]	Interrupt Sources	8-bit Timer (Pins)	16-bit Timer (Pins)	19-bit Timer (Pins)	Serial Interfaces: Synchronous Type/UART Selectable	Serial Interfaces: Synchronous Type/I²C Selectable	Serial Interfaces: Synchronous Type	Serial Interfaces: UART	Serial Interfaces: I²C	A/D Converter (ch)	D/A Converter (ch)	Display Control Function
ADC Built-in Type	MN101CB6A	M	32K	1K	0.1/2.7 to 3.6 0.125/1.8 to 3.6 100/1.8 to 3.6	SSOP032-P-0300B	17	15	5	1	0	1	0	0	0	0	5	—	—
	MN101CB6D		64K	2K															
	MN101CB6G		124K																
	MN101CFB6G	F	128K			SSOP032-P-0300B ▲													
	MN101CD0A	M	32K	1K	0.1/2.7 to 3.6 0.125/1.8 to 3.6 100/1.8 to 3.6	SSOP032-P-0300B	23	18	5	1	0	1	0	0	0	0	5	—	—
	MN101CD0D		64K	2K															
	MN101CD0G		124K																
	MN101CFD0G	F	128K			SSOP032-P-0300B ▲													
	MN101E16K	M	256K	12K	0.059/2.7 to 3.6 30.6/2.7 to 3.6	QFP100-P-1818B LQFP100-P-1414	85	27	9	1	0	3	2	0	0	0	8	—	—
	MN101E16Y		384K	20K		QFP100-P-1818B													
	MN101EF16K	F	260K	16K		QFP100-P-1818B LQFP100-P-1414													
	MN101EF16Z		512K	30K		QFP100-P-1818B													
	MN101EF34D		64K+4K	4K	0.042/2.2 to 5.5 62.5/2.2 to 5.5	TQFP048-P-0707B	39	28	6	3		2	1				12		
	MN101EF51A		32K	1K	0.05/2.7 to 5.5 0.125/1.8 to 5.5	QFP044-P-1010F ▲ TQFP048-P-0707B ○	36	20	5	2									
	MN101EF52A					TQFP032-P-0707A ▲ UBGA036-P-0404AE ▲	24	18				1					8		
ADC-DAC Built-in Type	MN101C49G	M	128K	4K	0.1/4.5 to 5.5 62.5/2.0 to 5.5	LQFP100-P-1414 QFP100-P-1818B	88	23	6	1	0	2	1	1	0	0	8	4	—
	MN101C49H		160K	6K															
	MN101C49K		224K	10K															
	MN101CF49K	F			0.1/4.5 to 5.5 0.12/4.5 to 5.5														
	MN101CP49K	E			0.1/4.5 to 5.5 0.25/3.0 to 5.5														
	MN101C77A	M	32K	1.5K	0.1/2.5 to 3.6 0.2/2.1 to 3.6 62.5/1.8 to 3.6	LQFP064-P-1414	53	22	5	1	0	2	1	0	0	1	7	2 *	—
	MN101C77C		48K	3K		LQFP064-P-1414 TQFP064-P-1010C													
	MN101C77D		64K	6K		LQFP064-P-1414													
	MN101C77F		96K																
	MN101CF77G	F	128K		0.1/2.7 to 3.6	LQFP064-P-1414 TQFP064-P-1010C													
	MN101E01J	M	192K	10K	0.0625/3.0 to 3.6 62.5/3.0 to 3.6	QFP100-P-1818B	84	27	7	1	0	3	2	0	0	0	8	1	—
	MN101E01K		256K																
	MN101E01L		320K	14K		LQFP100-P-1414 QFP100-P-1818B													
	MN101E01M		384K	20K															
	MN101EF01M	F		24K	0.0625/3.0 to 3.6														
USB Function	MN101C93K	M	224K	6K	0.125/3.0 to 3.6 62.5/3.0 to 3.6	LQFP100-P-1414	84	26	5	2	0	2	1	0	0	0	12	—	SEG47 COM4
	MN101CF93K	F			0.167/3.0 to 3.6 62.5/3.0 to 3.6														
	MN101E35A	M	32K	4K	0.042/2.2 to 3.6 0.0625/3.0 to 3.6 62.5/2.2 to 3.6	TQFP048-P-0707B	37	29	6	3	0	2	1	0	0	0	8	—	—
	MN101E35D		68K																
	MN101EF35A	F	32K																
	MN101EF35D		64K+4K																
VTR Servo	MN101D06F	M	96K	3K	0.14/4.0 to 5.5 61/2.2 to 5.5	QFP100-P-1818B	77	31	1	6	1	1	0	1	0	1	13	—	—
	MN101D06G		128K	4K														1	
	MN101D06H		160K	5K															
	MN101DF06Z	F	224K	6K	0.14/4.0 to 5.5 61/2.5 to 5.5														
	MN101D07G	M	128K	4K	0.14/4.0 to 5.5 61/2.2 to 5.5	LQFP112-P-2020	87	31	1	6	1	1	0	1	0	1	14	1	—
	MN101D07H		160K	5K															
	MN101DF07Z	F	224K	6K	0.14/4.0 to 5.5 61/2.5 to 5.5														
	MN101D08E	M	80K	2K	0.14/4.0 to 5.5 61/2.5 to 5.5	LQFP080-P-1414A	57	26	2	3	1	0	0	1	0	1	11	—	—
	MN101DF08G	F	128K	4K															

[Internal ROM type] M:Mask ROM , E:EPROM , F:FLASH, —:External
[Package] ○:under planning , ▲:under development , △:ES(Engineering Sample) available (All packages are lead (Pb) free.)
[*] Serves as AD pin, as well

Microcontrollers

8-bit Single-chip Microcontrollers AM1 (MN101) Series (continued)

Category	Type	Built-in ROM Type	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time/ Operating Voltage (µs/V)	Package	Number of I/O ports (Pins) [At single chip mode]	Interrupt Sources	8-bit Timer (Pins)	16-bit Timer (Pins)	19-bit Timer (Pins)	Serial Interfaces: Synchronous Type/UART Selectable	Serial Interfaces: Synchronous Type/I²C Selectable	Serial Interfaces: Synchronous Type	Serial Interfaces: UART	Serial Interfaces: I²C	A/D Converter (ch)	D/A Converter (ch)	Display Control Function
VTR Servo	MN101D09E	M	80K	2K	0.14/4.0 to 5.5 61/2.5 to 5.5	QFP100-P-1818B	57	26	2	3	1	0	0	1	0	1	11	—	—
	MN101DF09G	F	128K	4K															
	MN101D10F	M	96K	2.5K	0.14/4.0 to 5.5 61/2.5 to 5.5	QFP100-P-1818B	77	27	2	3	1	0	0	2	0	1	12	—	—
	MN101D10G		128K	3.5K															
	MN101DF10G	F		4K															
FL Driver Built-in Type	MN101C87A	M	32K	1.5K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	LQFP064-P-1414	52	21	5	1	0	1	1	0	0	0	8	—	SEG 8 to 16 DGT 18 to 10
	MN101C87D		64K	2K															
	MN101CF87G	F	128K	4K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.5 to 5.5														
	MN101C88D	M	64K	2K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	QFP100-P-1818B	88	23	5	1	0	2	1	0	0	0	8	—	SEG 35 to 43 DGT 18 to 10
	MN101C88G		128K	4K															
	MN101CF88G	F		10K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.5 to 5.5														
	MN101CA3F	M	96K	4K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	QFP100-P-1818B	89	30	6	2	0	2	1	0	1	0	8	—	SEG 35 to 43 DGT 18 to 10
	MN101CFA3G	F	128K	10K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.5 to 5.5														
LCD Driver Built-in Type	MN101C38A	M	32K	1.5K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 125/2.0 to 5.5	LQFP100-P-1414 QFP100-P-1818B	57	14	3	1	0	1	0	1	0	0	8	—	SEG52 COM4
	MN101C38C		48K	2K															
	MN101CP38C	E			0.1/4.5 to 5.5 0.25/2.7 to 5.5 125/2.3 to 5.5														
	MN101C39C	M	48K	2K	0.1/4.5 to 5.5 125/2.0 to 5.5	TQFP080-P-1212D	61	14	3	1	0	1	0	1	0	0	8	—	SEG28 COM4
	MN101CP39C	E			0.1/4.5 to 5.5 125/2.3 to 5.5														
	MN101C485	M	8K	0.5K	0.1/4.5 to 5.5 125/2.0 to 5.5	LQFP064-P-1414 TQFP064-P-1010B	47	12	3	1	0	1	0	0	0	0	8	—	SEG25 COM4
	MN101C487		16K																
	MN101CP487	E			0.1/4.5 to 5.5 125/2.3 to 5.5														
	MN101C54A	M	32K	2K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	LQFP080-P-1414A QFP084-P-1818E	65	19	5	2	0	1	0	1	0	0	8	—	SEG32 COM4
	MN101C54C		48K																
	MN101CF54D	F	64K		0.1/4.5 to 5.5 0.25/4.5 to 5.5 62.5/4.5 to 5.5	QFP084-P-1818E													
	MN101CP54C	E	48K		0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.3 to 5.5	LQFP080-P-1414A QFP084-P-1818E													
	MN101C57C	M	48K	2K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	QFP100-P-1818B	83	24	5	2	0	1	0	1	0	0	16	—	SEG47 COM4
	MN101C57D		64K																
	MN101CF57D	F			0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.5 to 5.5														
	MN101C589	M	24K	1.5K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	LQFP064-P-1414	49	18	5	2	0	1	0	0	0	0	8	—	SEG24 COM4
	MN101C58A		32K																
	MN101CF58D	F	64K	2K	0.1/4.5 to 5.5 0.25/4.5 to 5.5 62.5/4.5 to 5.5														
	MN101CP58A	E	32K	1.5K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.3 to 5.5														
	MN101C66D	M	64K	2K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	LQFP080-P-1414A QFP084-P-1818E	65	19	5	2	0	1	0	1	0	0	8	—	SEG32 COM4
	MN101C66G		128K	4K		LQFP080-P-1414A △ QFP084-P-1818E													
	MN101CF66G	F			0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.5 to 5.5	LQFP080-P-1414A QFP084-P-1818E													
	MN101CP66D	E	64K	2K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.3 to 5.5														

[Internal ROM type] M:Mask ROM , E:EPROM , F:FLASH, —:External
[Package] ○:under planning , ▲:under development , △:ES(Engineering Sample) available (All packages are lead (Pb) free.)

8-bit Single-chip Microcontrollers AM1 (MN101) Series (continued)

Category	Type	Built-in ROM Type	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time/ Operating Voltage (µs/V)	Package	Number of I/O ports (Pins) [At single chip mode]	Interrupt Sources	8-bit Timer (Pins)	16-bit Timer (Pins)	19-bit Timer (Pins)	Serial Interfaces: Synchronous Type/UART Selectable	Serial Interfaces: Synchronous Type/I²C Selectable	Serial Interfaces: Synchronous Type	Serial Interfaces: UART	Serial Interfaces: I²C	A/D Converter (ch)	D/A Converter (ch)	Display Control Function
LCD Driver Built-in Type	MN101C70C	M	48K	2K	0.1/3.0 to 3.6 0.235/1.8 to 3.6 62.5/1.8 to 3.6	LQFP080-P-1414A	66	20	6	2	0	1	1	0	0	0	16	—	SEG32 COM4
	MN101CF70D	F	64K	4K	0.25/3.0 to 3.6 0.50/2.2 to 3.6 62.5/2.2 to 3.6	LQFP080-P-1414A ▲													
	MN101C73A	M	32K	1.5K	0.1/3.0 to 3.6 0.235/1.8 to 3.6 62.5/1.8 to 3.6	LQFP064-P-1414 TQFP064-P-1010C	55	24	5	2	0	2	1	0	0	0	12	—	SEG32 COM4
	MN101CF73A	F		2K	0.1/3.0 to 3.6 0.235/2.2 to 3.6 62.5/2.2 to 3.6														
	MN101C74F	M	96K	6K	0.1/3.0 to 3.6 0.235/1.8 to 3.6 62.5/1.8 to 3.6	LQFP100-P-1414 MLGA100-L-1010 QFP100-P-1818B	86	26	5	2	0	2	1	0	0	1	16	—	SEG47 COM4
	MN101C74G		128K																
	MN101CF74G	F			0.1/3.0 to 3.6 0.235/2.2 to 3.6 62.5/2.2 to 3.6														
	MN101C78A	M	32K	1.5K	0.1/3.0 to 3.6 0.118/2.7 to 3.6 0.235/1.8 to 3.6 62.5/1.8 to 3.6	TQFP048-P-0707B	39	22	5	2	0	2	1	0	0	1	7	—	SEG12 COM4
	MN101CF78A	F			0.118/3.0 to 3.6 62.5/2.2 to 3.6														
	MN101C84A	M	32K	1K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.0 to 5.5	LQFP064-P-1414	52	18	5	2	0	1	0	0	0	0	8	—	SEG32 COM4
	MN101CF84D	F	64K	2K	0.1/4.5 to 5.5 0.25/2.7 to 5.5 62.5/2.5 to 5.5														
	MN101CA27	M	16K	0.5K	0.25/2.7 to 3.6 0.50/1.8 to 3.6 62.5/1.8 to 3.6	LQFP064-P-1414	25	8	3	0	0	0	0	0	0	0	—	—	SEG32 COM4
	MN101CFA2D	F	64K	2K															
	MN101E29G	M	128K	6K	0.05/2.2 to 5.5	LQFP100-P-1414 QFP100-P-1818B	90	28	7	3	0	4	1	0	0	1	16	4	SEG55 COM4
	MN101EF29G	F	128K+ 4K																
	MN101E31D	M	64K	4K	0.05/2.2 to 5.5	LQFP080-P-1414A	70	23	7	2	0	3	1	0	0	1	12	—	SEG41 COM4
	MN101E31G		128K	6K															
	MN101EF31D	F	64K+ 8K	4K	0.05/2.7 to 5.5														
	MN101EF31G		128K+ 4K	6K	0.05/2.2 to 5.5														
	MN101EF32D		64K+ 8K	4K	0.05/2.7 to 5.5	LQFP064-P-1414	54	23	7	2	0	2	1	0	0	1	8	—	SEG32 COM4
	MN101E46G	M	128K	4K	0.1/2.2 to3.6 0.125/1.8 to 3.6 61/1.8 to 3.6	TQFP128-P-1414C ▲	67	21	5	2	0	1	1	0	0	0	3	—	SEG64 COM32
	MN101E46N		508K			TQFP128-P-1414C ○													
	MN101E46R		928K	6K															
	MN101EF46R	F		8K		TQFP128-P-1414A △													
	MN101EF56G	F	128K	6K	0.05/2.7 to 5.5 0.1/1.8 to 5.5	LQFP100-P-1414 ○ QFP100-P-1818B ▲	90	34	7	3	0	3	1	0	0	0	24	4	SEG55 COM4
	MN101EF57G					LQFP080-P-1414A ▲ TQFP080-P-1212D ○	70										16	2	SEG41 COM4
	MN101EF58G					LQFP064-P-1414 ○ TQFP064-P-1010C ▲	54										12	—	SEG32 COM4
Voice control	MN101E30N	M	508K	8K	0.05/2.2 to 5.5	QFP100-P-1818B	85	30	7	3	0	4	1	0	0	1	12	5	SEG55 COM4
	MN101E30R		928K																
	MN101EF30R	F																	
	MN101E59R	M	928K	8K	0.05/2.2 to 5.5	QFP100-P-1818B	85	30	7	3	0	4	1	0	0	1	12	5	SEG55 COM4
	MN101EF59R	F																	
In-vehicle networking	MN101EF41N	F	512K	30K	0.05/3.0 to 3.6	QFP100-P-1818B ○	85	29	9	1	0	3	2	0	0	0	8	—	—
	MN101E49K	M	256K	12K	0.05/3.0 to 3.6 30.6/2.7 to 3.6	LQFP100-P-1414 ▲													
	MN101EF49N	F	512K	30K		LQFP100-P-1414													
	MN101EF63G		128K	6K	0.05/2.7 to 5.5	TQFP064-P-1010C ▲	54	34	7	3	0	3	1	0	0	0	12	—	SEG32 COM4

[Internal ROM type] M:Mask ROM , E:EPROM , F:FLASH, —:External
[Package] ○:under planning , ▲:under development , △:ES(Engineering Sample) available (All packages are lead (Pb) free.)

Microcontrollers

16-bit Single-chip Microcontrollers AM2 (MN102) Series

Category	Type	Built-in ROM Type	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time/ Operating Voltage (µs/V)	Package	Number of I/O ports (Pins)	Interrupt Sources	8-bit Timer (Pins)	16-bit Timer (Pins)	19-bit Timer (Pins)	Serial Interfaces: Synchronous Type/UART Selectable	Serial Interfaces: Synchronous Type/UART/ I²C Selectable	Serial Interfaces: Synchronous Type	Serial Interfaces: I²C	A/D Converter (ch)	D/A Converter (ch)
ADC Built-in Type	MN102H460B	—	—	4K	0.05/3.0 to 3.6 0.1/2.0 to 3.6	LQFP128-P-1818C TQFP128-P-1414B	63	54	16	5	1	3	2	0	0	12	—
	MN102H60G	M	128K	4K	0.058/3.0 to 3.6 62.5/3.0 to 3.6	LQFP100-P-1414 MLGA100-L-1010	82	50	10	6	0	0	2	3	0	8	—
	MN102H60K		256K	10K		LQFP100-P-1414											
	MN102HF60G	F	128K	4K		LQFP100-P-1414 MLGA100-L-1010											
	MN102HF60K		256K	10K		LQFP100-P-1414											
	MN102L59D	M	64K	2K	0.1/4.5 to 5.5	LQFP064-P-1414	52	24	9	3	0	2	0	0	0	12	—
	MN102LF59D	F															
ADC-DAC Built-in Type	MN102H730FGT	—	—	10K	0.058/3.0 to 3.6 62.5/3.0 to 3.6	TQFP128-P-1414B	66	50	10	5	0	2	2	0	0	12	4
	MN102H73G	M	128K			TQFP128-P-1414A	105										
	MN102H73K		256K	12K													
	MN102HF73G	F	128K	10K		TQFP128-P-1414B											
	MN102HF73K		256K	12K													
	MN102H950F	—	—	10K	0.058/3.0 to 3.6 62.5/3.0 to 3.6	LQFP100-P-1414	63	47	10	5	0	2	2	0	0	12	4
USB Function	MN102H74D	M	64K	4K	0.0833/3.0 to 3.6 62.5/3.0 to 3.6	LQFP100-P-1414	77	54	10	4	0	2	2	0	0	8	—
	MN102H74G		128K														
	MN102HF74G	F															

[Internal ROM type] M:Mask ROM , E:EPROM , F:FLASH, —:External
[Package] ○:under planning , ▲:under development , △:ES(Engineering Sample) available (All packages are lead (Pb) free.)

32-bit Single-chip Microcontrollers AM3 (MN103) Series

Category	Type	Built-in ROM Type	ROM (Bytes)	RAM (Bytes)	CPU Performance (MIPS/MHz) [Dhrystone2.1]	Minimum Instruction Execution Time/ Operating Voltage (ns/V)	Package	Number of I/O ports (Pins)	Interrupt Sources	8-bit Timer (Pins)	16-bit Timer (Pins)	19-bit Timer (Pins)	PWM for Motor Control	Serial Interfaces: Synchronous Type/UART Selectable	Serial Interfaces: Synchronous Type/UART/ I²C Selectable	Serial Interfaces: I²C	A/D Converter (Pins)	DMA Controller (ch)	Bus Interface
USB HOST	MN103SFB5K	F	256K	8K	38/48	16.7/2.7 to 3.6	LQFP064-P-1414	42	35	4	2	0	0	2	0	1	—	4	—
	MN103SFE5P		624K	32K	48/48	20.83/3.0 to 3.6	LQFP048-P2-0707A	27	48	6	2	0	0	4	0	2	—	5	
	MN103SG20L	—	—				QFP100-P-1818B ▲	44	59					5		3			Data: 16 bits
	MN103SFH7J	F	192K	8K	38/48	16.7/2.7 to 3.6	TQFP064-P-1010C	42	35	4	2	0	0	2	0	1	—	4	—
	MN103SH7J	M																	
AV control applications	MN103LF06N	F	512K	31.5K	38/40	25/2.6 to 3.6	LQFP100-P-1414 ▲ QFP100-P-1818B ▲	81	84	14	6	0	0	6	3	0	15-ch×1	4	Data : 8-bit/16-bit access
	MN103S57G	M	128K	16K	40/40	25/3.0 to 3.6	LQFP100-P-1414A	73	64	10	6	0	0	3	2	0	12-ch×1	4	Data : 8-bit/16-bit access
	MN103SF57G	F																	
	MN103SF73N	F	512K	32K	40/40	25/2.7 to 3.6	QFP100-P-1818B △	82	71	10	6	0	0	2	3	0	8-ch×1	4	Data : 8-bit/16-bit access SDRAM interface supporting
	MN103SF73R		1024K																
	MN103S97N	M	512K	24K	40/40		MBGA255-C-1111A	195	106	16	12	0	0	7	0	1	25-ch×1	4	Data : 8-bit/16-bit/32-bit access
	MN103SF66R	F	1024K	40K															
	MN103SB9N	M	512K	32K	48/60	16.7/2.7 to 3.6	TQFP128-P-1414A	104	68	10	6	0	0	2	3	0	12-ch×1	4	Data : 8-bit/16-bit access SDRAM interface supporting
	MN103SFB9R	F	1024K																
	MN103SD0Q	M	768K	32K	48/60	16.7/2.7 to 3.6	UBGA257-P-1111A	195	116	8	12	0	0	11	0	2	32-ch×1	6	Data : 8-bit/16-bit access
	MN103SFD0R	F	1024K	40K															
	MN103SD3P	M	640K	40K	48/60	16.7/2.7 to 3.6	LQFP100-P-1414	82	82	13	6	0	0	5	3	0	8-ch×1	4	Data : 8-bit/16-bit access
	MN103SFD3R	F	1024K	64K															
Invertor motor control	MN103SC2A	M	32K	4K	48/60	16.7/4.5 to 5.5	QFP044-P-1010F	29	28	4	2	0	1	1	0	0	2unit 8-ch	—	—
	MN103SC2D		64K																
	MN103SFC2D	F																	
	MN103SFC6K		256K	40K	70/70	14.3/3.0 to 5.5	QFP100-P-1818B	81	56	12	6	0	2	3	1	0	3unit 20-ch		
	MN103SE3K	M	256K	8K	48/60	16.7/4.5 to 5.5	QFP100-P-1818B	81	56	12	6	0	2	3	0	0	3unit 20-ch	—	—
	MN103SFE3K	F					QFP100-P-1818B ▲												
	MN103SE4D	M	64K	4K	48/60	16.7/4.5 to 5.5	LQFP080-P-1414A	61	56	12	6	0	2	3	0	0	3unit 16-ch	—	—
	MN103SE4G		128K																
	MN103SE4K		256K	8K															
	MN103SFE4G	F	128K	4K															
	MN103SFE4K		256K	8K															
	MN103SFG5K			12K			LQFP128-P-1818C	112	81	16	9	0	3	3	1	0	3unit 28-ch	—	—
In-vehicle networking	MN103LF03R	F	1024K	63.5K	38/40	25/2.7 to 3.6	LQFP128-P-1818C ▲	109	84	14	6	0	0	6	3	0	15-ch×1	4	Data : 8-bit/16-bit access
							LQFP144-P-2020A ▲	123											
							QFP100-P-1818B ▲	81									8-ch×1		
	MN103LF04R						LQFP128-P-1818C ▲	104	81								15-ch×1		
							LQFP144-P-2020A ▲	118											
	MN103SFA2R			64K	48/60	16.7/2.7 to 3.6	LQFP100-P-1414 ▲	82	84	13				5			8-ch×1		

[Internal ROM type] M:Mask ROM , E:EPROM , F:FLASH, —:External
[Package] ○:under planning , ▲:under development , △:ES(Engineering Sample) available (All packages are lead (Pb) free.)

D

Image Pickup Devices

CCD Area Sensors

CCD Image Sensors

Use	Diagonal Size (Optical Size)	Color or B/W	Part No.	Effective*1 Pixel Count		Transfer System	Scanning Mode	TV System	Sensitivity (F8) typ. (mV)	Saturation Output typ.*2 (mV)	Smear typ. (dB)	Package
				H	V							
Digital Still Camera	6.9 mm (1/2.5 type)	Primary color	MN39600PM	3 096	2 238	IT	IS	—	190	580	–77	WSOP028-P-0450A
	7.2 mm (1/2.5 type)		MN34500PL	3 288	2 472				180	480	–78	WQFN040-C-1111
			MN34550PA	3 672	2 760	—			150	430	—	WQFN042-C-0911
	7.7 mm (1/2.35 type)		MN39670PL	3 360	2 472	IT			190	600	–78	WQFN040-C-1012
	7.8 mm (1/2.33 type)		MN34510PL	3 776	2 776				180	450	–80	WQFN042-C-0911
			MN34540PA	4 112	3 032	—			150	430	—	
	9.1 mm (1/1.76 type)		MN39850PM	3 672	2 760	IT			210	550	–80	WSOP028-P-0600A
	9.2 mm (1/1.72 type)		MN39690PL	4 032	3 024				190	580	–75	WQFN040-C-1012A
Movie	3.0 mm (1/6 type)	Complementary color	MN39168FD	962	654	IT	—	NTSC	—	—	—	WDIP014-P-0350A
			MN39268FD		774			PAL				
Monitoring camera	4.5 mm (1/4 type)	Complementary color	MN39116KT	512	491	IT	—	NTSC	400	700	–74	WDIP014-P-0400G
			MN39216KT		581			PAL	380			
		B/W	MN39116AT		491			EIA	650	900	–82	
			MN39216AT		581			CCIR	560	840		
For broadcast and business	6.0 mm (1/3 type)	B/W (Three-plate type)	MW39461AJ	1 056	583	—	PS	HD	190	490	–96	WDIP016-P-0400A
	11.0 mm (2/3 type)		MW39540AE	966	492	IT	—	EIA	620	1 500	–130	WDIP020-G-0600D
			MW39640AE	954	585			CCIR				
			MW39781AE	1 952	1 108			HD	290	1 600	–125	WDIP032-G-0750C

[Symbol] IT: Interline Transfer system, FIT: Frame Interline Transfer system, IS: Interlace Scan, PS: Progressive Scan

*1: Effective pixel count includes the transient pixels.

*2: The color one denotes carrier saturation.

MOS Sensor

MOS Image Sensor

Use	Diagonal Size (Optical Size)	Color or B/W	Part No.	Effective*1 Pixel Count		Read method	Pixel Siz (μm)	Sensitivity F8(G) typ. (mV)	Saturation Output typ. (mV)	Smear	Package
				H	V						
Monitoring camera/ Network camera	4.9 mm (1/3.6 type)	B/W	MN39901AL	750	500	PS	5.6(H) × 5.6(V)	660	900	Smearless structure	WQFN044-C-1212A
		Color	MN39901PL					300			

[Symbol] PS: Progressive Scan

*1: Effective pixel count includes the transient pixels.

Application-Specific Standard-Product ICs

E

ASSP for Video

For VCR

Category	Part No.	Operating Voltage (V)	Functions	Package
Mechanism/ servo control	MN101D06F	5	On-chip OSD microcomputer servo (ROM 96KB) FLASH: MN101DF06ZAF	QFP100-P-1818B
	MN101D06G		On-chip OSD microcomputer servo (ROM 128KB)	
	MN101D06H		On-chip OSD microcomputer servo (ROM 160KB) FLASH: MN101DF06ZAF	
	MN101D07H			LQFP112-P-2020
	MN101D08E		On-chip OSD microcomputer servo (ROM 80KB) FLASH: MN101DF08GAF	LQFP080-P-1414A
	MN101D09E		On-chip OSD microcomputer servo (ROM 80KB) FLASH: MN101DF09GAF	QFP100-P-1818B
	MN101D10F		On-chip OSD microcomputer servo (ROM 96KB)	
	MN101D10G		On-chip OSD microcomputer servo (ROM 128KB)	

For Video Camera

Category	Part No.	Operating Voltage (V)	Functions	Package
CCD V drive for CCD area image sensor	MN3114	15, 0, –7.5, 3	Multi-power supply (On-chip SUB driver), Output (2-value × 4, 3-value × 4)	SSOP024-P-0300C
AFE+TG V-Dr	NN12077A	AFE/TG: 3.3 V-Dr: CCD/General Purpose	AFE for 10-bit camera + TG (for 960H CCD) + V-Dr (4-ch) Frequency 27 MHz compatible	MLGA092-L2-0808
AFE/TG	AN12073A	AFE/TG: 3.3 V-Dr: CCD/General Purpose	AFE for camera + TG (for 960H CCD) SSG: External or built-in (selectable)	TQFP064-P-1010C
Stepping Motor (lens)	AN41902A	V_{CC} = 2.7 to 3.9 V_M = 3.0 to 5.5	4-channel H bride driver (micro step), three-line bi-directional serial data communication	HQFP048-P-0707
	AN41904A	V_{CC} = 2.7 to 3.6 V_M = 3.0 to 5.5	4-channel H bride driver (256 micro step) Three-line bi-directional serial data communication Built-in iris control	UBGA064-P-0606ACA

For Network Camera

Category	Part No.	Operating Voltage (V)	Functions	Package
Digital signal processing	MN2PS00003RF	3.3, 1.2	For camera processing, JPEG/MPEG-4/H.264, audio processing, network protocol processing UniPhier®-S	UBGA433-P-1313A
AFE+TG	MN52C1	3.3, 5	For image pixel drive AFG+TG	TQFP080-P-1212D
Image Pickup Device	MN39901PL	5	For 1/3.6 type wide VGA ν Maicovicon®	WQFN044-C-1212A

ν Maicovicon® is a registered trademark of Panasonic Corp.
UniPhier® is a registered trademark of Panasonic Corp.

For DSC (For Digital Still Camera)

Category	Part No.	Operating Voltage (V)	Functions	Package
DSC digital signal processer	MN103SA10EYD	3.3	For still pictures (1.3 to 10 M pixels) For high quality animation (1.3 to 6 M pixels) In accordance with JPEG/MPEG4, SD・MMC I/F	MLGA344-C-1313A
CCD V driver for CCD area image sensor	MN3114	15, 0, –7.5, 3	Multi-power supply type (On-chip SUB driver, power input free order, 8-ch output)	SSOP024-P-0300C
	MN3114QFN			QFN028-P-0405B
	AN20117A	Vdr: Refer to CCD specifications.	Vertical driver including level conversion circuit (with built-in SUB driver) 3-value × 12-ch, 2-value × 11-ch (23-ch in total) (6:1 interlace drive, 9-pixel summation drive)	HQFN064-P-0808A
AFE/TG with built-in V-Dr	NN12082A	AFE/TG: 1.8 Vdr: Refer to CCD specifications.	AFE for CCD camera (12 bits) + TG (Full programmable type) + Vdr (23-ch)	UBGA128-P2-0707ACA
	NN12083A		AFE for CCD camera (12 bits) + TG (Full programmable type) + Vdr (19-ch)	
Audio processing	AN12918A	4.5	All I/O audio processing required for DSC are built in. Microphone amplifier, ALC, LPF, EVR, line output and SP output	BGA036-P-0404AE
75Ω driver	AN13206A	3.1	3 V version video 75 Ω driver (clamp, filter and driver), 1-output	XLGA012-L-0303
	AN13208A		Driver for D terminal	ULGA020-L-0404
DC-DC switching power supply	AN30211A	1.51 to 7.2	5 V output used concurrently for 6-ch PWM control and self bias. (1-ch for selection of increasing or decreasing voltage, 1-ch decreasing voltage, 2-ch increasing voltage, 2-ch time-division control inverse/increasing voltage, and 1-ch 5 V for concurrent use for self-biasing and increasing voltage); 2-ch low-output power for synchronized rectification; control pins for each channel; built-in phase-compensation filter	HQFN064-P-0808A
	AN30212A		5 V output used concurrently for 4-ch PWM control and self bias. (1-ch for selection of increasing or decreasing voltage, 1-ch decreasing voltage, 2-ch time-division control inverse/increasing voltage, and 1-ch 5 V for concurrent use for self-bias and increasing voltage); 2-ch low-output power for synchronized rectification; control pins for each channel; built-in phase-compensation filter	QFN044-P-0606C
	AN30213A	1.7 to 5.5	1-ch 3.3 V synchronized rectification increasing/decreasing voltage (used concurrently for self-bias) and 2-ch for time-division control inverse/increasing voltage; control pins for each channel; built-in phase compensation filter	QFN028-P-0405B
	AN30216A	1.5 to 5.5	8-ch output, Built-in Power Tr 5 V, 3.4 V, 3 V, 1.2 V, 1.8 V, –6 V, 12 V, For LED current	HQFN044-P-0606
	AN30219A		8-ch output, Built-in Power Tr, Built-in LED light modulation function 5 V, 3.4 V, 3 V, 1.2 V, 1.8 V, –6 V, 12 V, For LED current	
7-ch driver for lens motor	AN41921A	V_{CC} 2.7 to 3.9	7-ch H bridge driver (driven by micro step) 3-line bi-directional serial data communication	QFN044-P-0606C
High side	AN34070A	2.7 to 3.6	Low-power-consumption load switch (built-in ground protection circuit, soft-start function)	SSMINI-5DA

ASSP for Video

For TV

Category		Part No.	Operating Voltage (V)	Functions	Package
Sound Multiplex Signal Processing Circuits		AN5829S	4.5 to 5.5	Demodulation circuit for US TV sound multiplex system, AGC, sound input switch	SOP024-P-0375C
		AN5832SA		Demodulation circuit for US TV sound multiplex system without adjusment	SSOP032-P-0300B
		AN16903A		Demodulation circuit for Japan TV sound multiplex system without adjusment	SSOP024-P-0300E
		AN5832FJM		Demodulation circuit for US TV sound multiplex system without adjusment	QFN044-P-0606C
		AN27012A		Demodulation circuit for US TV sound multiplex system without adjusment + IF (SIF + VIF)	QFP048-P-0707A
		AN27013A		Demodulation circuit for Japan TV sound multiplex system without adjusment + IF (SIF + VIF)	
Sound Signal Processing		AN5891SA	6.0 to 10.0	AGC, Volume/mute control, Surround	SSOP032-P-0300B
		AN5891K			SDIP024-P-0300
LSIs for Digital Broadcasting	For Terrestrial/ Cable	MN88435	V_{CC1} = 3.3 V_{CC2} = 1.2	For US DTV VSB/64/256QAM demodulation LSI	HQFP144-P-2020
	For Terrestrial/ Satellite	MN884422		OFDM for digital terrestrial in Japan, Demodulation LSI for satellite in Japan	TQFP128-P-1414C
AV Switch		AN15852A	V_{CC}: 8.5 to 9.5 V_{DD} : 4.7 to 5.3	Video 6-input, 3-output, Audio 6-input, 3-output	QFH080-P-1420I
		AN15853AA	8.1 to 9.9	Video 5-input, 1-output, Audio 4-input, 1-output	SSOP036-P-0450C
		AN15856A		Video 9-input, 4-output, Audio 7-input, 2-output	QFH064-P-1414H
		AN15857AB		Video 9-input, 5-output, Audio 6-input, 2-output	
		AN15858A		Video 4-input, 2-output, Audio 4-input, 2-output	SSOP036-P-0450C
		AN15882AA	7.5 to 9.5	Video 7-input, 3-output, Audio 7-input, 3-output	QFH064-P-1414H
		AN15887A		Video 6-input, 2-output, Audio 5-input, 2-output Built-in 75Ω driver output	QFP048-P-1212C
Audio Switch		AN15860A	8.5 to 9.5	Audio 9-input, 4-output	SSOP036-P-0450A
		AN15862A	8.1 to 9.9	Audio 13-input, 5-output	QFP044-P-1010F
Video Switch		AN15865AA	8.5 to 9.5	Video 10-input, 5-output	QFH080-P-1420H
		AN15867A		Video 13-input, 6-output	QFH064-P-1414H
		AN15870A		Video 10-input, 5-output Format detection × 2 (1080p/50, 1080p/60)	QFH080-P-1420H
		AN15876A		Video 19-input, 7-output, built-in 75Ω driver output Compatible with SCART, 100 MHz	QFS100-P-1414A
		AN15880A	4.8 to 5.5	Video 8-input, 3-output, built-in 75Ω driver output	QFH064-P-1414H
		AN15881A		Video 14-input, 4-output, built-in 75Ω driver output	QFH080-P-1420I
		AN15885A	4.5 to 5.5	Video 5-input, 2-output, built-in 75Ω driver output	SSOP032-P-0300B
Anti-aliased Font Engine		MN5572	3.0 to 3.6	Processing to develop the outline font data into the bitmap data of anti-aliased font data	LQFP100-P-1414
LNA for DTV		AN26017A	2.7 to 3.0	ISDB-T (1-seg TV) LNA Frequency: 470 to 770 MHz	SSMINI-5DA
		AN26027A	2.5 to 3.0		ALGA005-W-0609ANA

Others

Part No.	Operating Voltage (V)	Functions	Package
AN13301A	4.8 to 5.2	6-ch Video Driver for D terminal	QFP048-P-1212C
AN13303A		3-ch Video Driver for D terminal	SOP016-P-0225F

For Compact Disc/CD-ROM Player

Category	Part No.	Operating Voltage (V)	Functions	Package
Head amp	AN22004A	2.4 to 5.5	Head amplifier for Digital servo (RW Disc play bakc, EQ built-in)	SSOP032-P-0300B
Driver for optical disk	AN8471SA	4.5 to 5.5 (V_{DD}) 10.8 to 13.2 (V_M)	3-phase full-wave direct, Low oscillation PWM drive, DMOS output Tr built-in, Short/Reverse brake, Current limiting, Reverse prevention, 1 × / 3 × FG output, Thermal protection circuit built-in	SSOP032-P-0300B
	AN41204A	4.5 to 5.5	SP + 5-ch PWM drive Low oscillation PWM drive, 3 sensor, Sinusoidal PWM drive	HQFP048-P-0707
	AN41206A			HQFP048-P-0707A
	AN41250A		Single sensor, Sinusoidal PWM drive (SP + 6-ch)	
	AN41251A			
	AN41224A	TYP:12V		HSOP056-P-0300
	AN41252A	4.5 to 5.5	Single sensor, Sinusoidal PWM drive (SP + 8-ch)	TQFP064-P-0707

E

For DAB

Part No.	Operating Voltage (V)	Functions		Package
MN66721	1.8, 3.3	Consumer product	Base band signal processing for 4th-generation DAB	TQFP080-P-1212D
△ MN66721UB		Car installation guaranteed item		

△: ES available

For FM/AM Tuner

Car Radio

Part No.	Operating Voltage (V)	Functions						Package
		Front End	IF	NC	MPX	AM	PLL	
AN18160A	7.2 to 8.6	●	●			●	●	LQFP048-P-0707A
AN18163B		●	●			●	●	
AN18164B		●	●			●	●	
AN18161A	7.2 to 9.0			●	●			SSOP024-P-0300E
AN18165B				●	●			
AN18180A	7.2 to 8.6	●	●				●	LQFP048-P-0707A

Home Audio Equipment

Part No.	Operating Voltage (V)	Functions	Package
AN18202A	8.0 to 10.0 8.0 to 11.0	AM: RF, mixer, oscillator, PLL, IF detection FM: Mixer, oscillator, PLL, IF detection, MPX	LQFP048-P-0707A
AN18207A	V_{CC1}: 8.0 to 10.0 V_{CC2}: 8.0 to 11.0	AM: RF+MIX+L-OSC FM: IF+DET, FM-MPX, PLL	
AN18208A		AM: RF+MIX+L-OSC FM/AM: IF+DET, FM-MPX, PLL	

ICs for Audio Common Use

3-D Surround

Part No.	Operating Voltage (V)	Functions	Package
MN5B02UC	1.5/3.3	Headphone available, 5.1-channel surround-sound processor	TQFP048-P-0707B

ASSP for Communication

For Telephone

Part No.	Operating Voltage (V)	Functions	Package
AN6184FBQ	4.5 to 5.5	Speech network with built-in cross-point SW for cordless telephone set	QFS064-P-1414C
AN6382NFA		Speech network IC incorporating cross-point switch for facsimile	QFP056-P-1010B
AN6383SB			SSOP036-P-0450C
AN6193NFAQ	3.2 to 3.4	Speech network IC incorporating converter and cross-point switch	QFS080-P-1414D
AN8953NFA	2.7 to 5.5	Receiving IC for 900 M cordless telephone set receiving	QFP056-P-1010B
AN29000A		Receiving IC for 2.4 G cordless telephone set receiving	

For Cellular Phone, PHS Pager, GPS

Part No.	Operating Voltage (V)	Functions	Package
AN29170A	2.6 to 3.3	Receive-send PLL single-chip for PDC 1.5 GHz	QFN044-P-0606A
AN6591BFJM	2.85 to 3.1	Receive-send PLL single-chip for PHS	QFN044-P-0606C
AN1201SM	2.0 to 3.0	For transmission power amplifier, ⊖ voltage generation	SMINI-5DA
AN28720S	2.3 to 3.3	TCXO control IC	Wafer
AN26210A	2.7 to 2.95	WCDMA 800 M/2 GHz dual LNA	XLGA012-L-0303
AN26218A	2.7 to 2.87	WCDMA 800 M/1.7 G/2 GHz triple band LNA	XLGA011-W-1216AKA
AN26260A	2.7 to 3.0	WCDMA 800 M/2 GHz receiving IC	ULGA054-W-5234
AN26261A		WCDMA 800 M/2 GHz sending IC	ULGA031-W-3525
AN18401A		Down converter IC for GPS	QFN028-P-0405B
AN26014A		LNA for GPS	SSMINI-5DB

Speaker amplifier for cellular phones

Category	Part No.	Operating Voltage (V)	Functions	Package
Speaker amplifier, dynamic	AN12975A	2.7 to 3.3	Speaker amplifier 2-ch (stereo), AGC (digital), I^2C control, Stand-by, Mute	ULGA020-L-0404
	AN12978A	2.7 to 4.5	Speaker amplifier 1-ch, AGC (digital), I^2C control, Stand-by, Mute	UBGA015-W-2020
	AN12979A	2.7 to 3.3	Speaker amplifier 2-ch (stereo), AGC (digital), I^2C control, Stand-by, Mute	ULGA020-L-0404
	▲ AN12960A	3.0 to 4.5	Speaker amplifier 1-ch, AGC (digital), Electronic volume, I^2C control, I^2C switch, Stand-by, Mute, Auto SP save	UBGA015-W-2020
Speaker amplifier, piezoelectric	AN12959A	7.5 to 12.5	Speaker amplifier 2-ch (stereo), AGC (digital), I^2C control, Stand-by, Mute	UBGA021-W-2525AEA
	AN12969A	3.0 to 4.5	Speaker amplifier 2-ch (stereo), AGC (digital), I^2C control, Stand-by, Mute, Built-in DCDC (charge pump)	ULGA031-W-3030AEA

▲: Under development

ASSP for Information Equipment

For LCD panel

Part No.	Operating Voltage (V)	Functions	Package
AN30101A	2.35 to 3.63	Charge pump power supply for LCD, V COM output, control function (3-ch) built-in	QFN044-P-0606A

For Contact-less ICs Card and Tag

Part No.	Reference standard	Frequency (MHz)	Modulation system	Memory capacity (user area)	Anti-collision	Data transfer speed (k-Bit/sec.)	Communication distance (cm)	Remarks
MN101CY727 Series	ISO14443-B	13.56 MHz	Rec. ASK 10% Trns. Load SW	8k-byte	○	Rec. 106/212/424 Trns. 106/212/424	10*1	•JICSAP2.0 • Crypto co-processor
	CJRC*2					Rec. 212 Trns. 212		• CJRC*2 • Crypto co-processor

∗1: Communication distance is subject to antenna size, etc.
∗2: CJRC: Congress Japan Raiway Cybernetics

For Equipment Control Tag (Contact Type)

Part No.	FeRAM capacity	Features	Remarks
MN63Y2006 Series	2 kbit + ECC 1 kbit	Equipped with encryption function; 1-line type I/F	Equipment control using challenge & response method

Speaker amplifier for notebook PC

Part No.	Functions				Package
	Output (at 8 Ω)	H/P Amp.	AGC	Others	
AN12946A	1.0 W × 2 ch	—	—	Mike amplifier, Regulator	HQFP048-P-0707
AN12947A	1.4 W × 2 ch	● (Output condenserless)	● (Analog)		
AN12948A		● (Output condenserless)	● (Digital)		
AN12949A		—	● (Digital)		

ASSP for Power Supply

IPD (Intelligent Power Device)

Category	Part No.	Input Voltage (V)	Output (W) (Reference value)	Characteristics			Package (JEITA, JEDEC)
				V_{DSS} (V)	I_{LIMIT} (A)	f_{OSC} (kHz)	
Three-terminal with low energy consumption during standby for power supplies	MIP2E1DMY	85 to 264	to 7	700	0.375	100	TO-220-A2
	MIP2E1DMS						DIP7-A1
	MIP2E1DMU						U-G2 (SC-63) U-A1 (SC-64)
	MIP2E2DMY		5 to 10		0.50		TO-220-A2
	MIP2E2DMS						DIP7-A1
	MIP2E2DMU						U-G2 (SC-63) U-A1 (SC-64)
	MIP2E3DMY		10 to 20		1.00		TO-220-A2
	MIP2E3DMS						DIP7-A1
	MIP2E3DMU						U-G2 (SC-63) U-A1 (SC-64)
	MIP2E4DMS		15 to 30		1.50		DIP7-A1
	MIP2E4DMY						TO-220-A2
	MIP2E5DMY		20 to 40		2.00		
	MIP2E7DMY		40 to 60		3.00		
	MIP2E9DMY		60 to 90		4.50		
	MIP3E10MS		to 7		0.375		DIP7-A1
	MIP3E30MY		8 to 15		0.80		TO-220-A2
	MIP3E30MS						DIP7-A1
	MIP3E3SMY		10 to 20		1.00		TO-220-A2
	MIP3E3SMS						DIP7-A1
	MIP3E40MY		15 to 30		1.35		TO-220-A2
	MIP3E50MY		20 to 40		1.80		
	MIP3E70MY		40 to 60		2.70		
Multi-function power supplies with low energy consumption during standby	MIP2G40MS	85 to 264	to 20	700	1.0	100	DIP7-A1
	MIP2G40MD		to 30		1.35		TO-220IPD7-A2
	MIP2G50MD		to 40		1.8		
	MIP2G70MD		to 60		2.7		
Artificial resonance power supply	MIP4110MS	85 to 264	3 to 6	700	0.45	—	DIP7-A1
	MIP4120MS		5 to 9		0.60		
	MIP4140MS		10 to 15		1.00		
	MIP414SMS						
	MIP4140MD		10 to 20		1.35		TO-220IPD7-A2
	MIP4150MD		15 to 25		1.80		
	MIP4170MD		30 to 40		2.70		
	MIP4180MD		40 to 50		3.50		
	MIP4190MD		50 to 60		4.20		
Standby power supply	MIP382	85 to 264	to 8	700	0.360	44	DIP7-A1
	MIP384		to 10		0.500		
	MIP289		to 5		0.255		
	MIP290		to 2		0.150		
	MIP291		to 4		0.220		

IPD (Intelligent Power Device) (continued)

Category	Part No.	Input Voltage (V)	Output (W)	Characteristics			Package
				V_{DSS} (V)	I_{LIMIT} (A)	f_{OSC} (kHz)	
Miniature charger adapter	MIP2F10MS	85 to 264	to 4	700	0.25	100	DIP7-A1
	MIP2F20MS		to 7		0.35		
	MIP2F30MS		to 10		0.50		
	MIP2F40MS		to 15		0.70		
	MIP2F50MS		to 20		1.00		

Category	Part No.	Input Voltage (V)	Output (W)	Characteristics				Package
				V_{DDS} (V)	I_{Dpeak} (A)	f_{OSC} (kHz)	R_{on} (Ω)	
LED Lighting Driver	MIP551	80 to 280	10	≥ 700	0.5 (typ.)	44 (typ.)	12 (typ.)	DIP7-A1
	MIP552		30		1.0 (typ.)		6 (typ.)	TO-220IPD7-A2

E

Precautions on the Sales of IPDs

1) The sale and/or the export of IPD products to any customer or customers located in any country other than Japan is expressly prohibited by the Agreement made and executed by and between Power Integrations, Inc. and Panasonic Corporation.
2) IPD products purchased from our company, or its authorized agents, hereinafter referred to as our company, shall be used only for production purposes by those parties who have duly purchased IPD products. Those who have purchased IPD products shall not use such IPD products in unmodified form for re-sale, loan, or sample shipment for evaluation purposes to any other parties.
3) If a party who has duly purchased IPD products subcontracts its production to any other parties, including its subsidiaries or any other third parties inside and/or out of Japan, and the IPD products are consigned to such subcontracting parties thereat, such party is obligated to monitor and control the quantity of IPD products to prevent any of the aforementioned re-sale, loan or sample shipments from taking place.
4) In the event that any actual or threatened breach or violation of any of the above mentioned 1, 2, or 3, has occurred or is about to occur, our company will hold all shipments of IPD products and may request the party alleged to be responsible for such occurrence for necessary.

Note) The products of MIP50□, MIP51□, and MIP7□□ are excluded from above-mentioned precautions, 1) to 3).

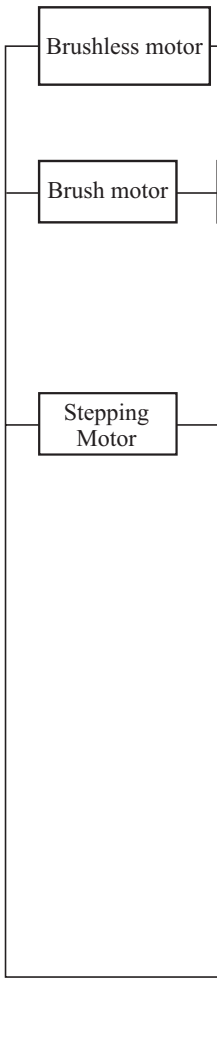
Attached table "IPD availability by customer"

Parts No.			Companies/areas to which products can be sold	Companies/areas to which products cannot be sold	Application
MIP13□ MIP14□ MIP15□ MIP16□	MIP17□ MIP18□ MIP01□□ MIP02□□	MIP2□□□ MIP3□□□ MIP4□□□ MIP9A□□	· Japanese companies in Japan · Japanese companies in Asia (50% or more owned)	· Companies in European and American countries · Asian companies in Asia · Other local companies	· For power supply · For DC-DC converter
MIP10□ MIP11□ MIP803/804/806 MIP9E□□	MIP811/812 MIP814/815/816 MIP82□ MIP55□		· Japanese companies in Japan · Japanese companies in Asia (50% or more owned) · Asian companies in Asia	· Companies in European and American countries · Other local companies	· For power supply · For EL driver · For LED lighting driver
MIP50□ MIP51□	MIP7□□		· No restrictions in terms of contract	· No restrictions in terms of contract	· For lamp driver/ car electronics accessories

Note) If you have any inquiries about sales, contact Corporate Marketing & Sales Division of our company.

ASSP for Motor Drive

Applications of Motor Driver ICs



	Part No.	Package	Features
PWM drive single-chip IC	AN41204A	HQFP048-P-0707	• SP+5-ch
	AN41206A	HQFP048-P-0707	• SP+5-ch Low Speed
	AN41250A	HQFP048-P-0707	• SP+6-ch Low Speed 1 Sensor
	AN41251A	HQFP048-P-0707	• SP+6-ch Low Speed 1 Sensor
	AN41224A	HSOP056-P-0300	• SP+6-ch Low Speed 1 Sensor 12 V
2-channel forwarding/reversing motor driver	AN44070A	HSOP034-P-0400D	• DMOS PWM Drive
1-channel forwarding/reversing motor driver	AN44075A	HSOP034-P-0400D	• DMOS PWM Drive
Stepping Motor Drive	AN44066A	SSOP032-P-0300B	• DMOS PWM Drive
	AN44067A	HSOP034-P-0400D	
	AN44063A	SSOP032-P-0300B	
	AN44065A	HSOP042-P-0400D	
	AN44069A		
4-channel H bride driver	AN41902A	HQFP048-P-0707	• Micro step
4-channel H bride driver	AN41904A	UBGA064-P-0606ACA	• Micro step
7-channel H bride driver	AN41921A	QFN044-P-0606C	• Micro step
Constant current 1.5-channel forwarding/ reversing motor driver	AN41911A	XLGA12	• Constant current control

Motor Control Series

Category	Part No.	Operating Voltage (V)	Peak Current	Functions	Applications	Package
Stepping Motor	AN44063A	16 to 34 (V_M)	0.8 A	W 1-2 phase excitation possible, built-in thermal protection circuit, built-in PWM oscillator (two frequency selectable), two power supplies (5 V and 24 V) or single power supply (24 V) selectable, built-in temperature measurement terminal (Tj monitor)	Printers, fax machines, PPCs, cameras, ATMs, sewing machines, industrial machinery, etc.	SSOP032-P-0300B
		4.5 to 5.5 (V_{CC})				
	AN44066A	10 to 34 (V_M)		W 1-2 phase excitation possible, built-in thermal protection circuit, reducible number of parallel input pins (for 2-phase or 1-2 phase excitation), built-in PWM oscillator (two frequency selectable), single power supply (24 V) drive, built-in temperature measurement terminal (Tj monitor), built-in standby circuit		
		—				
	AN44065A	18 to 28 (V_M)	1.5 A	W 1-2 phase excitation possible, built-in thermal protection circuit, built-in PWM oscillator (two frequency selectable), two power supplies (5 V and 24 V) or single power supply (24 V) selectable, built-in temperature measurement terminal (Tj monitor)		HSOP042-P-0400D
		4.5 to 5.5 (V_{CC})				
	AN44069A	16 to 34 (V_M)				
		4.5 to 5.5 (V_{CC})				
	AN44067A	10 to 34 (V_M)	2.5 A	2W 1-2 phase excitation possible, built-in thermal protection circuit, built-in PWM oscillator (three frequency selectable), single clock input compatible, built-in decay control switching function, built-in standby function, built-in ground protection function, built-in temperature measurement terminal (Tj monitor)		HSOP034-P-0300A
		—				
	AN41902A	3.0 to 5.5 (V_M) 2.7 to 3.9 (V_{CC})	250 mA	4-channel H bride driver (micro step), three-line bi-directional serial data communication	DVC	HQFP048-P-0707
	AN41921A		—	7-channel H bride driver (micro step), three-line bi-directional serial data communication	DSC	QFN044-P-0606C
	AN41904A	3.0 to 5.5 (V_M) 2.7 to 3.6 (V_{CC})	—	4-channel H bride driver (256 micro step), three-line bi-directional serial data communication, built-in iris control	DVC	UBGA064-P-0606ACA
DC Motor Driver	AN44070A	10 to 34 (V_M)	2.5 A (3.5 A at t ≤ 10 ms)	2-channel H bridge driver, built-in thermal protection circuit two power supplies (5 V and 24 V) or single power supply (24 V) selectable, built-in standby function, built-in	Printers, fax machines, PPCs, cameras, ATMs, sewing machines, industrial machinery, etc.	HSOP034-P-0300A
		3.0 to 5.5 (V_{CC})				
	AN44075A	10 to 35 (V_M)	3.0 A (3.5 A at t ≤ 10 ms)	1-channel H bridge driver, built-in thermal protection circuit, single power supply (24 V), built-in current limiting function, built-in standby function, overcurrent protection possible, built-in temperature measurement terminal (Tj monitor)		
		—				
Others	AN41911A	2.6 to 5.5 (V_{CC})	200 mA	Constant current control 1.5-channel driver, built-in high speed brake at changeover between forwarding and reversing	Camera phone	XLGA012-L-0303

E

Storage

IP for SD Host

Part No.	Operating Voltage (V)	Functions	Package
MVCA1Z	—	With CPRM IP, SDIO[Note 1), 2)]	—
MVCA2Z		Without CPRM IP, SDIO[Note 1)]	

Note 1) For using this IP, it is necessary to enter into the SD HALA (Host/Ancillary Product License Agreement) in advance with SD-3C-LLC which is a limited liability company in Delaware in the USA, and with the SD Card Association which is a nonprofit company in California, USA. This function is not available if you have not entered into the SD HALA.

2) For using the CPRM technology of this IP, it is necessary to enter into the 4C CPPM/CPRM License Agreement or CPRM for SD-binding License Agreement in advance with 4C Entity in Delaware, USA. This function is not available if you have not entered into the 4C CPPM/CPRM License Agreement or CPRM for SD-binding License Agreement.

D/A Converter

D/A Converter

Part No.	Operating Voltage (V)	Functions	Package
AN8150FB	AV_{CC} 10 to 11 AV_{EE} −7.7 to −6.8 V_{DD} 4.75 to 5.25	Octal, 13-bit D/A converter	QFP044-P-1010F

Sensors

F

Magnetic field sensors

Hall ICs

Applications	Part No.	Functions	Package
Switch/sensor	AN48820A	Operates on Unidirectional magnetic field independent from polosity Low-power consumption, High sensitivity CMOS Hall IC open drain	MINI-3DRA
	▲ AN48832B	Operates on Unidirectional magnetic field independent from polosity Low-power consumption, High sensitivity CMOS Hall IC CMOS inverter (V_{CC} = 1.65V to 3.3 V)	SMINI-5DA
	▲ AN48842B	Operates on Alternating magnetic field Low-power consumption, High sensitivity CMOS Hall IC CMOS inverter (V_{CC} = 1.65V to 3.3 V)	
	AN48841B	Operates on Alternating magnetic field Low-power consumption, High sensitivity CMOS Hall IC CMOS inverter (V_{CC} = 2.5V to 5.25 V)	

▲: Under development

Gallium Arsenide Devices

G

MMICs

GaAs MMICs

Block	Part No.	Functions	RF Characteristics (typ.)	Applications	Package
Antenna Switch	GN04063N	Low power DPDT-SW Vctl = 0/3 V, f = 1 to 6 GHz	1.0 GHz band • IL = 0.35 dB, ISO = 35 dB 2.5 GHz band • IL = 0.4 dB, ISO = 27 dB 6.0 GHz band • IL = 0.75 dB, ISO = 19 dB	VCO switching W-LAN	ML6-N1
Power Amp	GN05019H	24 GHz power amp V_{CC} = 3.0 V, Pout = 18 dBm	Gain = 28.5 dB I_{CC} = 90 mA	W-LAN (802.11 b/g)	

GaAs Module

GaAs Power Amp Module

Part No.	Frequency (MHz)	Modulation	Supply Voltage V_{CC} (V)	Characteristics (typ.)			Idle current (mA)	Applications	Package
				Efficiency (%)	Output (dBm)	Gain (dB)			
UN0686W	1 920 to 1 980	R.99 HSDPA	3.5	41 43	26.5	29.5	30	WCDMA 2.0 GHz	PAMP09-N1
UN0683W	824 to 849	R.99 HSDPA	3.5 4.0	46 41	26.5	28	40	WCDMA 0.8 GHz	
UN0684W	1 750 to 1 785	R.99 HSDPA	3.5 4.0	47 42	26.5	28	35	WCDMA 1.7 GHz	
UN0871W	1 920 ~ 1 980	R.99 HSDPA	3.5	41.5 43	26.5	28.5	28	WCDMA 2.0 GHz/ 0.8 GHz	PAMP13-N1
	824 ~ 849	R.99 HSDPA	3.5	39.5 41	26.5	28.5	38		
UN0872W	1 920 ~ 1 980	R.99 HSDPA	3.5 4.0	48 43	26.5	28.5	25		
	824 ~ 849	R.99 HSDPA	3.5 4.0	47 41.5	26.5	29	30		

Note) WCDMA modulation signal
R.99: DPCCH:DPDCH = 8:15
HSDPA:DPCCH:DPDCH:HS-DPCCH = 12:15:19.2

Transistors

Small Signal FETs

MOS FETs (For Small Signa)

Application	Polarity	Absolute Maximum Ratings		Electrical Characteristics							Package	
		V_{DSS} V_{DS}*1 (V)	I_D (A)	$R_{DS(on)}$ max. (Ω) V_{GS}= 10V	V_{GS}= 5V	V_{GS}= 4V	V_{GS}= 2.5V	V_{GS}= 1.8V	t_{on} typ. (ns)	t_{off} typ. (ns)	ML3-N2	P_D (mW)
Digital/ analog switching	Pch	−30	−0.1	—	—	18	30	—	300	400		
					75	—	—		100 µs	25 µs		
	Nch	20	0.1	—	—	4	6	13	250	480		
		20*1			50	—	—	—	max. 1.0 µs	max. 1.0 µs		
		30							150	35		
					—	8	12		350	350	2SK3939	100
		50			50	—	—		10	20		
		50*1	0.05		—		50		200	200		
			0.1			12	15					
		80	0.5	4		—	—		15	20		

MOS FETs (For Power Management)

Application	Polarity	Absolute Maximum Ratings			Electrical Characteristics									Package	
		V_{DSS} (V)	V_{GSS} (V)	I_D (A)	$R_{DS(on)}$ max. (mΩ) V_{GS}= 10V	V_{GS}= 5.0V	V_{GS}= 4.5V	V_{GS}= 4.0V	V_{GS}= 2.5V	V_{GS}= 1.8V	Ciss (pF)	t_{on} typ. (ns)	t_{off} typ. (ns)	WSSMini6-F1	P_D (W)
Load S/W	Pch	−12	±8	−4.0	—	—	—	42	55	75	1 200	30	300		
							34	—	41	54	1 400	20	430		
		−20	±10	−3.0			—	55	70	—	1 000	30	250		
DC-DC Converter	Pch	−20	±10	−2.0	—	—	—	130	200	—	400	15	100	MTM86124	0.54
								120	170	230	300	14	112	MTM86127	0.54
			±12	−1.0				420	560	—	80	18	27	△ MTM86128	0.54
	Nch	20	±10	2.2				105	150	300	280	12	50	MTM86227	0.54
Lithium battery protection circuit	Nch	30	±20	18	4.2	—	9.8	—	—	—	6 000	50	820		
				20	2.8		8.0				7 000	70	1 030		
Backlight inverter	Pch	−40	±20	−7.0	25	—	45	—	—	—	2 700	33	300		
	Nch	40		7.0	23	40	—				1 750	26	127		

△: Tentative

Package									
SSSMini3-F2		SSMini3-F3		SMini3-F2		Mini3-G1		MiniP3-F2	
	P_D (mW)		P_D (mW)		P_D (mW)		P_D (mW)		P_D (mW)
2SJ0674G	100								
				2SJ0536G	150				
2SK3973G	100								
				2SK0665G	150				
				2SK3064G	150				
2SK3938G	100								
				2SK0664G	150				
				2SK1374G	150	2SK1228	150		
2SK3547G	100	2SK3546G	125	2SK3539G	150				
								2SK0601G	1 W

Package			
WSMini6-F1		SO8-F1	
	P_D (W)		P_D (W)
MTM76110	0.7		
△ MTM76111	0.7		
MTM76123	0.7		
		MTMF8231	1.0
		△ MTMF8233	1.0
		MTM98140	2.0
		MTM98240	2.0

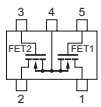
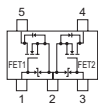
H

Small Signal FETs

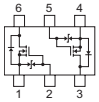
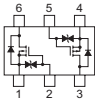
Junction FETs

Application	Polarity	Absolute Maximum Ratings		Electrical Characteristics			Package					
							TSSSMini3-F2		SSSMini3-F2		SSMini3-F3	
		V_{DGO} V_{GDS}*1 (V)	I_D I_{DSO}*2 (mA)	I_{DSS} max. (mA)	GV NF*3 typ. (dB)	NV max. (μA)		P_D (mW)		P_D (mW)		P_D (mW)
Analog switch	Pch	65*1	–20	–6	—	—						
Low-frequency, low-noise amplifier	Nch	30	20	12	—	typ. 60 mV						
Low-frequency amplifier	Nch	55	30	12	2.5*3	—						
				6.5							2SK2593G	150
		–40*1	10	4.7	—							
Capacitor microphone	Nch	20	2*2	0.46	–1.5	4			2SK3372G	100		
				0.47		10			2SK3426G 2SK3585G	100 100		
				0.46	3	4	2SK3862G	100				
				0.31	–3	8	2SK3866G	100				
				0.45	3	10	2SK4206G	100				
						8	2SK3948G	100				
						4	2SK4083G	100				

Composite MOS FETs (For Small Signal)

Application	Absolute Maximum Rating		Electrical Characteristics					Package			
								XN: Mini5-G2 XP: SMini5-G1 UP: SSMini5-F3			
	V_{DSS} (V)	I_D (mA)	$R_{DS\ (on)}$ (Ω)			t_{on} (ns)	t_{off} (ns)	XN		XP•UP	
			V_{GS} = 4.0 V	V_{GS} = 2.5 V	V_{GS} = 1.8 V						
								Nch × 2	P_T (mW)	Nch × 2	P_T (mW)
Switching circuit	20	100	3.0	4.0	6.0	250	480				
	30		8	12		350	350			UP0187BG	125
	–30/30	–100/100	18/8	30/12		300/350	400/350				
	50	100	12	15	—	200	200			XP01878 UP01878G	150 125
	–30/50	–100/100	15/12	25/15		850/200	850/200				
	50	100	50	—		max. 1.0 μs	max. 1.0 μs	XN01872G	300		

Package					
SMini3-F2		Mini3-G1		NS-A1 NS-B1	
	P_D (mW)		P_D (mW)		P_D (mW)
2SJ0364G	150	2SJ0163	150	2SJ0164	300
2SK0662G	150	2SK0198	150		
2SK0663G	150				
		2SK2751	200		

Package				Basic Type	
XP: SMini6-G1 UP: SSMini6-F2					
XP•UP 		XP•UP 			
Nch × 2	P_T (mW)	Pch + Nch	P_T (mW)	Pch	Nch
UP0487CG	125			—	2SK3973
UP0487BG	125			—	2SK3938
		XP0497A UP0497AG	150 125	2SJ0674	2SK3938
XP04878 UP04878G	150 125			—	2SK3539
		UP04979G	125	2SJ0672	2SK3539
				—	2SK0665

Small Signal FETs

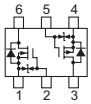
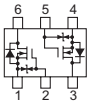
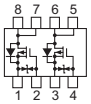
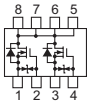
Composite MOS FETs (For Power Management)

Application	Absolute Maximum Rating			Electrical Characteristics								Package	
				$R_{DS\ (on)}$ max. (mΩ)								WSMini6-F1	
	V_{DSS} (V)	V_{GSS} (V)	I_D (A)	V_{GS}= 5.0V	V_{GS}= 4.5V	V_{GS}= 4.0V	V_{GS}= 2.5V	V_{GS}= 1.8V	Ciss (pF)	t_{on} typ. (ns)	t_{off} typ. (ns)	Pch × 2	P_D (W)
Load S/W	−12	±8	−4.8	—	—	42	55	75	1 200	19	320		
				32		—	40	60	1 400	20	430		
	−20	±10	−4.2	—		55	70	—	1 000	50	190		
DC-DC Converter	−20	±10	−1.2	—	—	130	200	280	440	35	100	MTM76420	0.7
	−20/ 20	±10/ ±10	−1.2/ 1.9			130/ 105	200/ 150	—	440/ 280	35/ 12	100/ 50		
	20	±10	2.0			105	150	300	280	13	38		
Lithium battery protection circuit	20	±12	7.0	—	21	—	33	—	1 450	1 030	6 000		

△: Tentative

MOS FET + SBD (For Power Management)

Application	FET Polarity	MOS FET								SBD				Package			
		Absolute Maximum Rating			Electrical Characteristics					Absolute Maximum Rating		Electrical Characteristics		WSSMini6-F1		WSSMini6-F1	
		V_{DSS} (V)	V_{GSS} (V)	I_D (A)	$R_{DS(on)}$ typ. (mΩ)	V_{GS} (V)	Ciss (pF)	t_{on} typ. (ns)	t_{off} typ. (ns)	V_R (V)	I_F (A)	V_F max. (V)	I_R max. (μA)		P_D (W)		P_D (W)
DC-DC Converter	Pch	−20	±10	−2.0	80	−4.0	300	14	112	15	0.7	0.45	250	MTM86627	0.54		
					100	−2.5											
					140	−1.8				20	0.8	0.47	80	MTM86627A	0.54		
			±12	−1.0	300	4.0	80	18	27	15	0.7	0.45	250	MTM86628	0.54		
					420												
	Nch	20	±10	2.2	80	2.5	280	13	38	20	0.8	0.47	80			MTM86727	0.54
					100												

Package							
WSMini6-F1				WMini8-F1			
							
Pch + Nch	P_D (W)	Nch × 2	P_D (W)	Pch × 2	P_D (W)	Nch × 2	P_D (W)
				MTM68410	1.0		
				MTM68411	1.0		
				△ MTM68423	1.0		
MTM76320	0.7						
		MTM76520	0.7				
						MTMC8E2A	1.0

H

Small Signal Bipolar Transistors

Small Signal Transistors (Low-Frequency Amplifiers)

Application	Absolute Maximum Ratings		Electrical Characteristics				Package							
	V_{CEO} (V)	I_C (mA)	$V_{CE(sat)}$ max. (V) NV*1 (mV)	I_C (mA)	h_{FE}	I_C (mA)	ML3-N2	P_C (mW)	SSSMini3-F2	P_C (mW)	SSMini3-F3	P_C (mW)	SMini3-F2	P_C (mW)
General-purpose	50	100	0.5 0.3	100	160 to 460	2			(2SA2021G 2SC5609G (h_{FE}: 180 to 390)	100 100	(2SB1462G 2SD2216G	125 125	(2SB1218G 2SD1819G	150 150
					180 to 390		(2SA2079 2SC5848	100 100	(2SA2078G 2SC5846G	100 100	(2SA2174G 2SC6054G	125 125	(2SA2122G 2SC5950G	150 150
		500	0.6	300	85 to 340	150							(2SB1219G 2SD1820G	150 150
High-h_{FE} (High V_{EBO})	40	50	0.2	10	600 to 2 000	2					2SD2345G	125	2SD1823G	150
	100	20			400 to 1 200				2SD2621G	100	2SD2620G	125	2SD1824G	150
Low freq. low noise amplifier	120	20	130*1	1	180 to 700	2					2SB1722G (V_{CEO} 100 V)	125	2SA2009G	150
	150	50	150*1		130 to 330	10					(2SB1463G 2SD2240G	125 125	2SB1220G	150
	185												2SD1821G	150
Low $V_{CE(sat)}$	10	500	0.3	400	130 to 350	500							2SB1679G	150
	12		0.25	200	270 to 680	10			(2SA2162G 2SC6036G	100 100	(2SA2161G 2SC6037G	125 125		
	20		0.4	500	200 to 800	500							2SD2623G	150
		300	0.1	30	550 to 2 500	4							2SD1979G	150
		1 A		200	160 to 560	100							(2SA2028G 2SC5654G	150 150

(: Complementary pair

Small Signal Transistors (Low-Frequency Amplifiers) (continued)

Application	Absolute Maximum Ratings		Electrical Characteristics				Package			
	V_{CEO} (V)	I_C (mA)	$V_{CE(sat)}$ max. (V) NV (mV)*1 f_T (MHz)*2	I_C I_E*3 (mA)	h_{FE}	I_C (mA)	Mini3-G1	P_C (mW)	NS-A1 NS-B1	P_C (mW)
General-purpose	50	100	0.3	100	160 to 460	2	(2SB0709A 2SD0601A	200 200	(2SA1309A 2SC3311A	300 300
					180 to 390		(2SA2077 2SC5845	200 200		
		500	0.6	300	85 to 340	150	(2SB0710A 2SD0602A	200 200	(2SB1030A 2SD1423A	300 300
		200	0.3	100	85 to 500	2	△2SB1734	200		
High-h_{FE}	40	50	0.2	10	400 to 2 000	2	2SD1030	200		
	100	20			400 to 1 200		2SD1149	200		
Darlington	50	500	2.5	500	4 000 to 20 000	500	2SD1478A	200		
Low freq. low noise amplifier	185	50	150*1	1	130 to 330	10	(2SB0792A 2SD0814A	200 200		
	55	100			180 to 700	2			2SC3312	300
Low $V_{CE(sat)}$	10	500	0.3	400	130 to 350	500	2SB0970	200		
	20		0.4	500	200 to 800		2SD1328	200	2SD1450	300
		300	0.1	30	500 to 2 500	4	2SD1938F	600 1)		
TV Chroma output	300	70	50*2	10*3	30 to 150	5	2SA2084	200		
			30*2		60 to 220		2SC5863	200		

(: Complementary pair
Mini3-G1 1): Measured on a ceramic substrate (15 × 15 × 0.6 mm)
△: Tentative

H

Small Signal Bipolar Transistors

Small Signal Transistors (High-frequency Amplifiers)

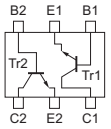
Application		Absolute Maximum Ratings		Electrical Characteristics		Package									
						ML3-N2		SSSMini3-F2		SSMini3-F3		SMini3-F2		Mini3-G1	
		V_{CEO} V_{CES}*1 (V)	I_C (mA)	f_T (Hz) t_S (ns)*2	I_E, I_C*3 (mA)		P_C (mW)		P_C (mW)		P_C (mW)		P_C (mW)		P_C (mW)
AM•FM Amp.		20	30	230 M	1					2SC4655G	125	2SC3936G	150		
				300 M		2SA2163	100	2SA2164G	100	(2SA1790G 2SC4626G)	125 125	(2SA1532G 2SC3930G)	150 150	(2SA1022 2SC2295)	200 200
RF Amp.		50	50	250 M	2					(2SA1791G 2SC4656G)	125 125	(2SA1748G 2SC4562G)	150 150		
Video IF FM RF Amp.		20	15	650 M	1					2SC4627G	125	2SC3931G	150	2SC2404	150
		8	50	1.1 G	15							2SC5632G	150		
VHF	OSC. Amp.	20	50	1.3 G	15			2SC5946G	100			2SC3932G	150	2SC2480	150
UHF	OSC.	10		1.9 G	5	2SC6050	100	2SC5939G	100	2SC4809G	125	2SC3935G	150	2SC3130	150
1V RF Amp.		7	10	4.0 G	1*3	2SC5829	50					2SC4410G	50		
Wide Band Amp. SHF IF Amp.		12	30	4.5 G	10*3							2SC3934G	150		
		10	80	6.0 G	20*3							2SC3937G	150		
					15*3			2SC6045G	100	2SC4808G	125	2SC4835G	150		
			65	8.5 G						2SC5295G	125	2SC4805G	150		
High speed switch		15	50	1.5 G/ 19*2	10	2SA2082	100			2SA1806G	125	2SA1739G	150	2SA1738	200
		40*1	100	450 M/ 10*2						2SC4691G	125	2SC3938G	150	2SC3757	200

(: Complementary pair

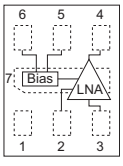
SiGe HBT

Application	Absolute Maximum Ratings		Electrical Characteristics					Package
	V_{CEO} (V)	I_C (mA)	h_{FE}	f_T (GHz)	Cob (pF)	$\|S21e\|^2$ (dB)	NF (dB)	ML3-N2 P_C = 100 mW
High-frquency Amplifiers	6	30	100 to 220	19	0.3	11.0	1.4	MSG43001
		60			0.4	10.5		MSG43002
		100			0.5	10.0		MSG43003
				17	0.6	9.0		MSG43004
				16	0.8	8.0	1.6	MSG430C4
				14	1.0	6.0		MSG430D4

SiGe HBT (Combined Products)

Application	Absolute Maximum Ratings		Electrical Characteristics					Package	Basic Type		Equivalent Circuit
	V_{CEO} (V)	I_C (mA)	h_{FE}	f_T (GHz)	Cob (pF)	$\|S21e\|^2$ (dB)	NF (dB)	SSSMini6-F1 P_T = 125 mW	Tr1 (OSC)	Tr2 (Buffer)	
High-frquency Amplifiers	6	30	100 to 220	19	0.3	11.0	1.4	MSG36E11	MSG33001		
		100			0.5	10.0		MSG36E33	MSG33003		
		100/30			0.5/0.3	10.0/11.0		MSG36E31	MSG33003	MSG33001	
				17/19	0.6/0.3	9.0/11.0		MSG36E41	MSG33004	MSG33001	
		100/60		16/19	0.8/0.4	8.0/10.5	1.6/1.4	MSG36C42	MSG330C4	MSG33002	
				14/19	1.0/0.4	6.0/10.5		MSG36D42	MSG330D4	MSG33002	

SiGe HBT LNA (with built-in bias circuit)

Application	Absolute Maximum Ratings		Electrical Characteristics					Package	Equivalent Circuit
	V_{CC} (V)	I_{CC} (mA)	V_{CC} (V)	I_{CC} (mA)	f (opr) (GHz)	Gp (dB)	NF (dB)	ML6-N6 P_T = 60 mW	
Low-noise high-frequency amplifier (LNA)	3.8	18	2.2 to 3.6✱1	< 18✱2	0.1 to 6✱3	10.5 (f = 5.2 GHz)	1.5 (f = 5.2 GHz)	MSG56BBA	
		9		< 9✱2		11.5 (f = 5.2 GHz)	1.6 (f = 5.2 GHz)	MSG56BBB	

✱1: Recommended voltage range
✱2: Maximum value (adjustable using external resistance)
✱3: Adjustable using input/output adjustment circuit

H

Small Signal Bipolar Transistors

Composite Transistors (NPN × 2 Series)

Application	Absolute Maximum Ratings		Electrical Characteristics	XN: Mini5-G2 XP: SMini5-G1		XN: Mini6-G3 XP: SMini6-G1 UP: SSMini6-F2 NP: SSSMini6-F1					Basic Type	Remarks
	V_{CEO} (V)	I_C (mA)	h_{FE}	XN 	XN 	XN 	XN 		XN 	XN 	NPN	
				XP 	XP 	XP•UP•NP 	XP 	XP 	XP 			
General-use	50	100	160 to 460	XN01501G XP01501	XN02501G XP02501	XN04501G XP04501 UP04501G NP04501	XN05501G XP05501	NP0A501	XN06501G XP06501 △UP06501G		2SD0601A	
		500	85 to 340			XN04502G					2SD0602A	
Low $V_{CE(sat)}$	12	500	270 to 680			UP04532G					2SC6037J	$V_{CE(sat)}$ = 0.25 V max.
	20	300	500 to 2 500			XN04506G XP04506					2SD1938(F)	$V_{CE(sat)}$ = 0.1 V max.
		500	200 to 800			XN04504G					2SD1328	$V_{CE(sat)}$ = 0.4 V max.
				XN01558G							2SD2623	
Low $V_{CE(sat)}$ +General-use	50/20	100/ 500	160 to 460/ 200 to 800			XN04505G					2SD2216J 2SD1328	$V_{CE(sat)}$ = 0.5/ 0.4 V max.
High frequency	10	50	75 to 400	XN01531G XP01531			XN05531G XP05531				2SC3130	f_T = 1.9 GHz
		65	50 to 300						XN06543G XP06543		2SC3904	f_T = 8.5 GHz
	12	30	40 ≤						XN06537G		2SC3934	f_T = 4.5 GHz
	20	15	40 to 260			UP04534G	XP05534		XN06534G XP06534		2SC2404	f_T = 650 MHz
High frequency +General-use	20/50	15/ 100	65 to 260/ 160 to 460			UP04598G					2SC2404 2SD2216J	f_T = 650/ 150 MHz
		50/ 100	25 to 250/ 160 to 460			UP04599G					2SC3932 2SD2216J	f_T = 1 300/ 150 MHz
High-h_{FE}	100	20	400 to 2 000			XN04556G	XN05553G XP05553				2SD1149	h_{FE} = 400 to 2 000
High-speed switching	40	100	60 to 320	XP01554			XP05554			XN0A554G	2SC3757	t_{on} = 17 ns, t_{off} = 17 ns

Mini5P/6P: P_T = 300 mW, SMini5P/6P: P_T = 150 mW, SSMini6P: P_T = 125 mW, SSSMini6P: P_T = 125 mW
△: Tentative

Composite Transistors (PNP × 2 Series)

Function	Absolute Maximum Ratings		Electrical Characteristics	XN: Mini5-G2 XP: SMini5-G1		XN: Mini6-G3 XP: SMini6-G1 UP: SSMini6-F2 NP: SSSMini6-F1			Basic Type	Remarks
	V_{CEO} (V)	I_C (mA)	h_{FE}	XN	XN	XN		XN	PNP	
				XP	XP	XP•UP•NP	NP	XP		
General-use	–50	–100	160 to 460	XN01401G XP01401	XN02401G XP02401	XN04401G XP04401 UP04401G NP04401		XN06401G XP06401	2SB0709A	
		–500	85 to 340			XN04402G			2SB0710A	
Low $V_{CE(sat)}$	–10	–500	100 to 350			XN04404G			2SB0970	$V_{CE(sat)}$ = – 0.3 V max.
High frequency	–20	–30	50 to 220					XN06435G XP06435	2SA1022	f_T = 150 MHz (Min.)
	–15	–50	50 to 150				NP0A456		2SA2082	f_T = 1.5 GHz

Mini5P/6P: P_T = 300 mW, SMini5P/6P: P_T = 150 mW, SSMini6P: P_T = 125 mW, SSSMini6P: P_T = 125 mW

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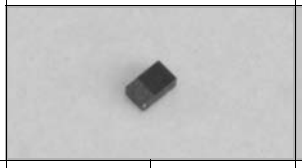
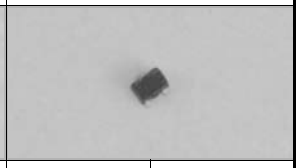
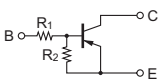
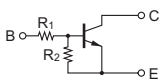
Composite Transistors (PNP + NPN Series)

Function	Absolute Maximum Ratings		Electrical Characteristics	XN: Mini5-G2 XP: SMini5-G1			XN: Mini6-G3 XP: SMini6-G1 UP: SSMini6-F2 NP: SSSMini6-F1		Basic Type		Remarks
	V_{CEO} (V)	I_C (mA)	h_{FE}	XN	XN	XN	XN	XN	PNP	NPN	
				XP	XP	XP	XP•UP•NP	XP			
General-use	–50/ 50	–100/ 100	160 to 460	XN01601G XP01601	XN0B301G XP0B301	XN0C301G XP0C301	XN04601G XP04601 UP04601G NP04601	XN05601G XP05601	2SB0709A	2SD0601A	
		–500/ 500	85 to 340	XN01602G			XN04602G		2SB0710A	2SD0602A	
Low $V_{CE(sat)}$	–10/20	–500/ 500	100 to 350/ 200 to 800				XN04604G		2SB0970	2SD1328	$V_{CE(sat)}$ = – 0.3/0.4 V max.
Low $V_{CE(sat)}$ +General-use	–10/50	–500/ 100	100 to 350/ 160 to 400				XN04608G		2SB0970	2SD0601A	$V_{CE(sat)}$ = – 0.3/0.4 V max.
	–50/20	–100/ 500	160 to 460/ 200 to 800				XN04609G		2SB0709A	2SD1328	
High-speed switching	–15/ 40	–50/100	50 to 150/ 60 to 320				XP04654		2SA1738	2SC3757	t_{on} = 12/17 ns, t_{off} = 20/17 ns

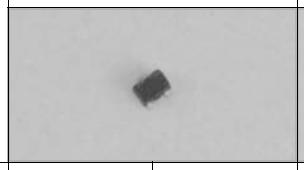
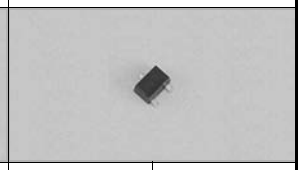
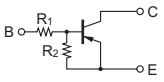
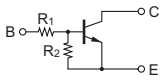
Mini5P/6P: P_T = 300 mW, SMini5P/6P: P_T = 150 mW, SSMini6P: P_T = 125 mW, SSSMini6P: P_T = 125 mW

Transistor with Built-in Resistors

Transistor with Built-in Resistors (I_C = 80 mA Series)

Resistor value (kΩ)		Absolute Maximum Ratings		Electrical Characteristics	Package			
					ML3-N2		SSSMini3-F2	
								
R_1	R_2	V_{CEO} (V)	I_C (mA)	h_{FE}	PNP	NPN	PNP	NPN
0.51	5.1	–50 50	–80 80	20 ≤	—	UNRF2A8	UNR31A8G	UNR32A8G
1	10			30 ≤	UNRF1A9	UNRF2A9	UNR31A9G	UNR32A9G
2.2	2.2			6 to 20	—	UNRF2AV	UNR31AVG	UNR32AVG
	10			30 ≤	UNRF1AH	—	UNR31AHG	—
	47			80 ≤	UNRF1AM	UNRF2AM	UNR31AMG	UNR32AMG
4.7	4.7			20 ≤	UNRF1AL	UNRF2AL	UNR31ALG	UNR32ALG
	10			30 ≤	UNRF1AF	UNRF2AF	UNR31AFG	UNR32AFG
	47			80 to 400	UNRF1AN	UNRF2AN	UNR31ANG	UNR32ANG
	—			160 to 460	UNRF1A6	UNRF2A6	UNR31A6G	UNR32A6G
10	4.7			20 ≤	—	UNRF2AK	—	—
	10			35 ≤	UNRF1A1	UNRF2A1	UNR31A1G	UNR32A1G
	47			80 ≤	UNRF1A4	UNRF2A4	UNR31A4G	UNR32A4G
	—			160 to 460	UNRF1A5	UNRF2A5	UNR31A5G	UNR32A5G
22	22			60 ≤	UNRF1A2	UNRF2A2	UNR31A2G	UNR32A2G
	47			80 to 400	UNRF1AT	UNRF2AT	UNR31ATG	UNR32ATG
	—			160 to 460	UNRF1A7	UNRF2A7	UNR31A7G	UNR32A7G
47	22			60 ≤	—	—	UNR31AEG	UNR32AEG
	47			80 ≤	UNRF1A3	UNRF2A3	UNR31A3G	UNR32A3G
	—			160 to 460	UNRF1A0	UNRF2A0	UNR31A0G	UNR32A0G
100	100			80 ≤	UNRF1AA	—	UNR31AAG	UNR32AAG
Equivalent circuit		(PNP Type) 			(NPN Type) 			

Transistor with Built-in Resistors (I_C = 80 mA Series) (continued)

Resistor value (kΩ)		Absolute Maximum Ratings		Electrical Characteristics	Package			
					SSMini3-F3		SMini3-F2	
								
R_1	R_2	V_{CEO} (V)	I_C (mA)	h_{FE}	PNP	NPN	PNP	NPN
0.51	5.1	–50 50	–80 80	20 ≤	—	UNR92A8G	UNR51A8G	UNR52A8G
1	10			30 ≤	UNR91A9G	UNR92A9G	UNR51A9G	UNR52A9G
2.2	2.2			6 to 20	UNR91AVG	UNR92AVG	UNR51AVG	UNR52AVG
	10			30 ≤	UNR91AHG	—	UNR51AHG	—
	47			80 ≤	UNR91AMG	UNR92AMG	UNR51AMG	UNR52AMG
4.7	4.7			20 ≤	UNR91ALG	UNR92ALG	UNR51ALG	UNR52ALG
	10			30 ≤	UNR91AFG	UNR92AFG	UNR51AFG	UNR52AFG
	47			80 to 400	UNR91ANG	UNR92ANG	UNR51ANG	UNR52ANG
	—			160 to 460	UNR91A6G	UNR92A6G	UNR51A6G	UNR52A6G
10	4.7			20 ≤	—	—	—	—
	10			35 ≤	UNR91A1G	UNR92A1G	UNR51A1G	UNR52A1G
	47			80 ≤	UNR91A4G	UNR92A4G	UNR51A4G	UNR52A4G
	—			160 to 460	UNR91A5G	UNR92A5G	UNR51A5G	UNR52A5G
22	22			60 ≤	UNR91A2G	UNR92A2G	UNR51A2G	UNR52A2G
	47			80 to 400	UNR91ATG	UNR92ATG	UNR51ATG	UNR52ATG
	—			160 to 460	UNR91A7G	UNR92A7G	UNR51A7G	UNR52A7G
47	22			60 ≤	UNR91AEG	UNR92AEG	UNR51AEG	UNR52AEG
	47			80 ≤	UNR91A3G	UNR92A3G	UNR51A3G	UNR52A3G
	—			160 to 460	UNR91A0G	UNR92A0G	UNR51A0G	UNR52A0G
100	100			80 ≤	UNR91AAG	UNR92AAG	UNR51AAG	UNR52AAG
Equivalent circuit		(PNP Type) 				(NPN Type) 		

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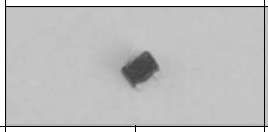
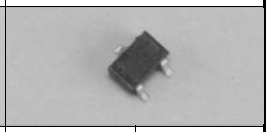
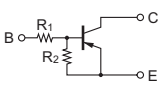
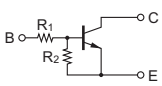
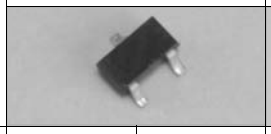
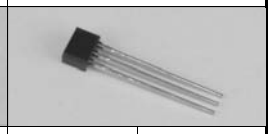
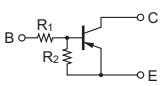
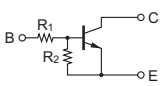
Transistor with Built-in Resistors

Transistor with Built-in Resistors (I_C = 100 mA Series)

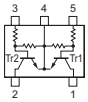
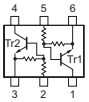
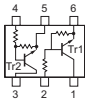
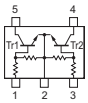
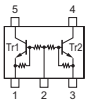
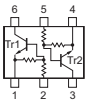
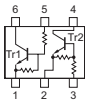
Resistor value (kΩ)		Absolute Maximum Ratings		Electrical Characteristics	Package			
					SSMini3-F3		SMini3-F2	
								
R_1	R_2	V_{CEO} (V)	I_C (mA)	h_{FE}	PNP	NPN	PNP	NPN
0.51	5.1	–50 50	–100 100	20 ≤	UNR9118G	UNR9218G	UNR5118G	UNR5218G
1	10			30 ≤	UNR9119G	UNR9219G	UNR5119G	UNR5219G
2.2	2.2			6 to 20	UNR911VG	UNR921VG	UNR511VG	UNR521VG
	10			30 ≤	UNR911HG	—	UNR511HG	—
	47			80 ≤	UNR911MG	UNR921MG	UNR511MG	UNR521MG
4.7	4.7			20 ≤	UNR911LG	UNR921LG	UNR511LG	UNR521LG
	10			30 ≤	UNR911FG	UNR921FG	UNR511FG	UNR521FG
	22			60 to 200	—	—	UNR511ZG	UNR521ZG
	47			80 to 400	UNR911NG	UNR921NG	UNR511NG	UNR521NG
	—			160 to 460	UNR9116G	UNR9216G	UNR5116G	UNR5216G
10	4.7			20 ≤	—	UNR921KG	—	UNR521KG
	10			35 ≤	UNR9111G	UNR9211G	UNR5111G	UNR5211G
	47			80 ≤	UNR9114G	UNR9214G	UNR5114G	UNR5214G
	—			160 to 460	UNR9115G	UNR9215G	UNR5115G	UNR5215G
22	22			60 ≤	UNR9112G	UNR9212G	UNR5112G	UNR5212G
	47			80 to 400	UNR911TG	UNR921TG	UNR511TG	UNR521TG
	—			160 to 460	UNR9117G	UNR9217G	UNR5117G	UNR5217G
47	10			30 ≤	UNR911DG	UNR921DG	UNR511DG	UNR521DG
	22			60 ≤	UNR911EG	UNR921EG	UNR511EG	UNR521EG
	47			80 ≤	UNR9113G	UNR9213G	UNR5113G	UNR5213G
	—			160 to 460	UNR9110G	UNR9210G	UNR5110G	UNR5210G
100	100			80 ≤	UNR911AG	UNR921AG	—	—
	—			160 to 460	UNR911BG	UNR921BG	—	—
—	47			80 ≤	UNR911CG	UNR921CG	—	—
	100			80 ≤	—	—	—	UNR521WG
0.27	5		–500 500	20 ≤	—	—	—	—
2.2	2.2			40 ≤	—	—	—	—
	10			60 ≤	—	—	—	—
3.1	4.6			50 ≤	—	—	—	—
4.7	4.7			50 ≤	—	—	—	—
10	10			60 ≤	—	—	—	—
	47	–30	–100	80 ≤	—	—	UNR5154G	—
		–50		80 ≤	—	—	UNR5174G	—
4.7	—	20	600	100 to 600	—	—	—	UNR5226G
6.8	6.8			6 to 20	—	—	—	—
10	—			100 to 600	—	—	—	UNR5225G
Equivalent circuit		(PNP Type)  			(NPN Type)  			

Transistor with Built-in Resistors (I_C = 100 mA Series) (continued)

Resistor value (kΩ)		Absolute Maximum Ratings		Electrical Characteristics	Package			
					Mini3-G1		NS-A1 NS-B1	
								
R_1	R_2	V_{CEO} (V)	I_C (mA)	h_{FE}	PNP	NPN	PNP	NPN
0.51	5.1	–50 50	–100 100	20 ≤	UNR2118	UNR2218	UNR4118	UNR4218
1	10			30 ≤	UNR2119	UNR2219	UNR4119	UNR4219
2.2	2.2			6 to 20	UNR211V	UNR221V	—	—
	10			30 ≤	UNR211H	—	UNR411H	—
	47			80 ≤	UNR211M	UNR221M	UNR411M	—
4.7	4.7			20 ≤	UNR211L	UNR221L	UNR411L	UNR421L
	10			30 ≤	UNR211F	UNR221F	UNR411F	UNR421F
	22			60 to 200	UNR211Z	UNR221Z	—	—
	47			80 to 400	UNR211N	UNR221N	UNR411N	—
	—			160 to 460	UNR2116	UNR2216	UNR4116	UNR4216
10	4.7			20 ≤	—	UNR221K	—	UNR421K
	10			35 ≤	UNR2111	UNR2211	UNR4111	UNR4211
	47			80 ≤	UNR2114	UNR2214	UNR4114	UNR4214
	—			160 to 460	UNR2115	UNR2215	UNR4115	UNR4215
22	22			60 ≤	UNR2112	UNR2212	UNR4112	UNR4212
	47			80 to 400	UNR211T	UNR221T	—	—
	—			160 to 460	UNR2117	UNR2217	UNR4117	UNR4217
47	10			30 ≤	UNR211D	UNR221D	UNR411D	UNR421D
	22			60 ≤	UNR211E	UNR221E	UNR411E	UNR421E
	47			80 ≤	UNR2113	UNR2213	UNR4113	UNR4213
	—			160 to 460	UNR2110	UNR2210	UNR4110	UNR4210
100	100			80 ≤	—	—	—	—
	—			160 to 460	—	—	—	—
—	47			80 ≤	—	—	—	—
	100			80 ≤	UNR211W	UNR221W	—	—
0.27	5		–500 500	20 ≤	UNR212X	—	—	—
2.2	2.2			40 ≤	UNR2121	UNR2221	UNR4121	UNR4221
	10			60 ≤	UNR2124	UNR2224	UNR4124	UNR4224
3.1	4.6			50 ≤	UNR212Y	—	—	—
4.7	4.7			50 ≤	UNR2122	UNR2222	UNR4122	UNR4222
10	10			60 ≤	UNR2123	UNR2223	UNR4123	UNR4223
	47	–30	–100	80 ≤	UNR2154	—	—	—
		–50		80 ≤	—	—	—	—
4.7	—	20	600	100 to 600	—	UNR2226	—	—
6.8	6.8			6 to 20	—	UNR2227	—	—
10	—			100 to 600	—	UNR2225	—	—
Equivalent circuit		(PNP Type) 			(NPN Type) 			

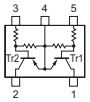
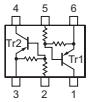
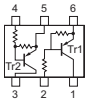
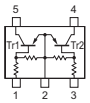
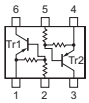
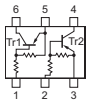
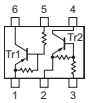
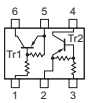
Transistor with Built-in Resistors

Composite Transistor with Built-in Resistors (NPN × 2 Series)

Resistancce (kΩ)		Absolute Maximum Ratings		Electrical Characteristics	XN: Mini5-G2 XP: SMini5-G1 UP: SSMini5-F3		XN: Mini6-G3 XP: SMini6-G1 UP: SSMini6-F2 NP: SSSMini6-F1		Basic Type
R_1	R_2	V_{CEO} (V)	I_C (mA)	h_{FE}	XN 		XN 	XN 	
					XP•UP 	XP 	XP•UP•NP 	XP•NP 	
2.2	47	50	100 80*1	80 ≤	XP0121M UP0121MG		XP0421M		UNR221M
								NP062AM*1	UNR32AM
4.7	4.7			20	XP0121L		XN0421LG		UNR221L
	10			30 ≤			XN0421FG		UNR221F
	47			80 ≤	XP0121N		UP0421NG		UNR221N
				80 to 400				NP062AN*1	UNR32AN
	—			160 to 460	XN01216G XP01216		XN04216G XP04216 UP04216G	XN06216G XP06216	UNR2216
							NP042A6*1		UNR32A6
10	10			35 ≤	XN01211G XP01211 UP01211G	XP02211	XN04211G XP04211 UP04211G	XN06211G XP06211	UNR2211
							NP042A1*1	NP062A1*1	UNR32A1
	47			80 ≤	XN01214G XP01214 UP01214G		XN04214G XP04214 UP04214G	XN06214G XP06214	UNR2214
							NP042A4*1		UNR32A4
	—			160 to 460	XN01215G XP01215	XP02215	XN04215G XP04215 UP04215G	XN06215G XP06215	UNR2215
							NP042A5*1		UNR32A5
22	22			60 ≤	XN01212G XP01212 UP01212G		XN04212G XP04212 UP04212G	XP06212	UNR2212
							NP042A2*1		UNR32A2
	—			160 to 460	XP01217		XP04217 UP04217G		UNR2217
							NP042A7*1		UNR32A7
47	22			60 ≤	XN0121EG XP0121E UP0121EG				UNR221E
	47			80 ≤	XN01213G XP01213 UP01213G		XN04213G XP04213 UP04213G	XN06213G XP06213	UNR2213
							NP042A3*1	NP062A3*1	UNR32A3
	—			160 to 460	XN01210G XP01210	XP02210	XN04210G XP04210 UP04210G	XP06210	UNR2210
							NP042A0*1	NP062A0*1	UNR32A0

Mini5P/6P: P_T = 300 mW, SMini 5P/6P: P_T = 150 mW, SSMini5P/6P: P_T = 125 mW, SSSMini6P: P_T = 125 mW

Composite Transistor with Built-in Resistors (PNP × 2 Series)

Resistancce (kΩ)		Absolute Maximum Ratings		Electrical Characteristics	XN: Mini5-G2 XP: SMini5-G1 UP: SSMini5-F3	XN: Mini6-G3 XP: SMini6-G1 UP: SSMini6-F2 NP: SSSMini6-F1				Basic Type
					XN 	XN 		XN 		
R_1	R_2	V_{CEO} (V)	I_C (mA)	h_{FE}	XP•UP 	XP•UP•NP 	NP 	XP•NP 	NP 	
0.51	5.1	–50	–100 –80*1	20 ≤	XP01118					UNR2118
1	10			30 ≤	XN01119G XP01119					UNR2119
2.2	10				XN0111HG XP0111H					UNR2111
	47			80 ≤				NP061AM*1		UNR31AM
					XN0111MG XP0111M	XP0411M UP0411MG				UNR211M
4.7	10			30 ≤	XN0111FG XP0111F UP0111FG					UNR211F
	47			80 to 400				NP061AN*1		UNR31AN
	—			160 to 460	XN01116G XP01116	XN04116G XP04116 UP04116G		XP06116		UNR2116
						NP041A6*1				UNR31A6
10	10			35 ≤	XN01111G XP01111	XN04111G XP04111 UP04111G		XP06111		UNR2111
						NP041A1*1		NP061A1*1		UNR31A1
	47			80 ≤	XN01114G XP01114	XN04114G XP04114		XP06114		UNR2114
						NP041A4*1				UNR31A4
	—			160 to 460	XN01115G XP01115	XN04115G XP04115		XP06115		UNR2115
						NP041A5*1		NP061A5*1		UNR31A5
22	22			60 ≤	XN01112G XP01112	XN04112G XP04112 UP04112G		XP06112		UNR2112
						NP041A2*1		NP061A2*1		UNR31A2
	47			80 to 400		UP0411TG				UNR211T
	—			160 to 460	XP01117	XP04117 UP04117G				UNR2117
						NP041A7*1				UNR31A7
47	22			60 ≤			NP0G1AE*1			UNR31AE
	47			80 ≤	XN01113G XP01113 UP01113G	XN04113G XP04113 UP04113G		XN06113G XP06113		UNR2113
						NP041A3*1		NP061A3*1	NP0J1A3*1	UNR31A3
	—			160 to 460	XN01110G XP01110					UNR2110
						NP041A0*1				UNR31A0
—	10	–15	–500	80 to 280		XN04130G				—

Mini5P/6P: P_T = 300 mW, SMini 5P/6P: P_T = 150 mW, SSMini5P/6P: P_T = 125 mW, SSSMini6P: P_T = 125 mW

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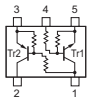
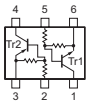
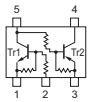
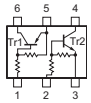
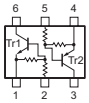
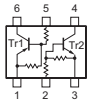
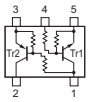
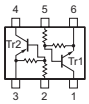
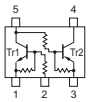
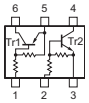
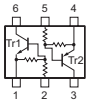
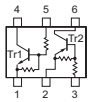
Transistor with Built-in Resistors

Composite Transistor with Built-in Resistors (PNP + NPN Series)

Resistancce (kΩ)		Absolute Maximum Ratings		Electrical Characteristics	XN: Mini5-G2 XP: SMini5-G1 UP: SSMini5-F3	XN: Mini6-G3 XP: SMini6-G1 UP: SSMini6-F2 NP: SSSMini6-F1			Basic Type	
R_1	R_2	V_{CEO} (V)	I_C (mA)	h_{FE}	XN 		XN 		PNP	NPN
					XP•UP 	NP 	XP•UP•NP 	NP 		
2.2	47	50/ –50	500/ –500*2 100/ –100 80/ –80*1	80 ≤			XP0431M UP0431MG		UNR211M	UNR221M
4.7	4.7			50 ≤			XN04322G*2		UNR2122	UNR2222
	47			80 to 400			NP043AN		UNR31AN	UNR32AN
				80 ≤			XP0431N UP0431NG		UNR211N	UNR221N
	—			160 to 460	XP03316		XN04316G XP04316 UP04316G		UNR2116	UNR2216
							NP043A6*1		UNR31A6	UNR32A6
10	10			35 ≤	XN0A311 XP03311 UP03311G		XN04311G XP04311 UP04311G		UNR2111	UNR2211
							NP043A1*1		UNR31A1	UNR32A1
	47			80 ≤			XN04314G XP04314 UP04314G		UNR2114	UNR2214
							NP043A4*1		UNR31A4	UNR32A4
	—			160 to 460			XN04315G XP04315 UP04315G		UNR2115	UNR2215
						NP0G3A5*1	NP043A5*1		UNR31A5	UNR32A5
22	22			60 ≤	XN0A312G XP03312 UP03312G		XN04312G XP04312 UP04312G		UNR2112	UNR2212
							NP043A2*1		UNR31A2	UNR32A2
	47			80 to 400			UP0431TG		UNR211T	UNR221T
47	47			80 ≤			XP04313 UP04313G		UNR2113	UNR2213
						NP0G3A3*1	NP043A3*1	NP0H3A3*1	UNR31A3	UNR32A3
	—			160 to 460		NP0G3A0*1			UNR31A0	UNR32A0

Mini5P/6P: P_T = 300 mW, SMini 5P/6P: P_T = 150 mW, SSMini5P/6P: P_T = 125 mW, SSSMini6P: P_T = 125 mW

Composite Transistor with Built-in Resistors (PNP + NPN Series) (continued)

Resistancce (kΩ)				Absolute Maximum (Tr1/Tr2)		Electrical Characteristics (Tr1/Tr2)	XP: SMini5-G1 UP: SSMini5-F3	XP: SMini6-G1 UP: SSMini6-F2 NP: SSSMini6-F1 XN: Mini6-G3			Basic Type	
Tr1		Tr2		V_{CEO} (V)	I_C (mA)	h_{FE}	XN 		XN 		PNP	NPN
R_1	R_2	R_1	R_2				XP•UP 	NP 	XP•UP•NP 	NP 		
4.7	4.7	1	10	50/ –50	100/ –100	80 to 400/ 30 ≤			XP04286		UNR2119	UNR221N
	47	4.7	—			80 to 400/ 160 to 460	XP03391				UNR211N	UNR2216
10	10	0.51	5.1			35 ≤/ 20 ≤	XP03389				UNR2118	UNR2211
		10	47	50/ –30		35 ≤/ 80 ≤	UP03397G				UNR2154	UNR2211
		22		50/ –50			UP03396G				UNR211T	UNR2211
	—	47	—		80/ –80	160 to 460				NP063D3	UNR31A0	UNR32A5
22	47	4.7	4.7	–50/ 50	–80/ 80	80 to 400/ 20 ≤		NP0G3D2			UNR31AT	UNR32AL
47		0.51	5.1	50/ –50	100/ –100	80 ≤/ 20 ≤	UP03394G				UNR2118	UNR2213
		1	10			80 ≤/ 30 ≤			XP04387 UP04387G		UNR2119	UNR2213
		4.7	4.7	–50/ 50	80/ –80	80 ≤/ 20 ≤		NP0G3D1			UNR31A3	UNR32AL
				50/ –50	100/ –500	80 ≤/ 50 ≤			XN04381G		UNR2122	UNR2213
			10		100/ –100	80 ≤/ 30 ≤	XP03383 UP03383G		UP04383G		UNR211F	UNR2213
		10	47			80 ≤/ 80 ≤	XP03390 UP03390G		UP04390G		UNR2114	UNR2213
					80/ –80				NP04390		UNR31A4	UNR32A3
		22		–50/ 50	–80/ 80			NP0G3D3			UNR31A3	UNR32AT
—	—	4.7		–12/ 50	–500/ 100	270 to 680/ 80 to 400			UP04A8MG		2SA2161	UNR221N
			—	50/ –50	100/ –100	150 to 460/ 20 ≤			XN04A88G		UNR211S	2SD0601A

Mini5P/6P: P_T = 300 mW, SMini 5P/6P: P_T = 150 mW, SSMini5P/6P: P_T = 125 mW, SSSMini6P: P_T = 125 mW

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Bipolar Power Transistors

Low-Frequency Amplifiers

Application	Absolute Maximum Ratings		Electrical Characteristics					Package					
	V_{CEO} (V)	I_C (A)	$V_{CE(sat)}$ (V) f_T*1 (MHz)	I_C I_E*2 (A)	I_B (mA)	h_{FE}	I_C (A)	U-G2	P_C (W)	MiniP3-F2	P_C (W)	MT-2-A1	P_C (W)
General-purpose	40	1.5	1.0	1.5	150	80 to 220	1.0	2SB0968	10				
										(2SB1599G 2SD2457G	1		
	50	1.0	0.4	0.5	50	85 to 340	0.5			(2SB0766G 2SD0874G	1	(2SB1322A 2SD1994A	1
		2.0	0.3	1.0		120 to 340	0.2	2SB1574	10				
										(2SB1440G 2SD2185G	1	(2SB1434 2SD2177	1
		5.0		2.0	100		0.5					2SD2179	1
	60	2.0		1.0	50		0.2					2SD2177A	1
	80	0.5	0.4	0.3	30	90 to 220	0.15			(2SB0767G 2SD0875G	1		
						130 to 330							
		1.0	0.3	0.5	50	120 to 340	0.1			(2SA1890G 2SC5026G	1	(2SA1674 2SC4391	1
	150				25					2SD2459G	1		
High-h_{FE}	20	0.7	0.4	0.5	50	1 000 to 2 500	0.15					2SD2259	1
	60	2.0	1.0	2.0		500 to 2 500	0.5	2SD2453	10				
Low $V_{CE(sat)}$	10	1.0	0.15	0.5	20	200 to 800	0.1					2SD2358	1
	20	0.5	0.4				0.5			2SD2210G	1		
		1.0	0.5	1.0	50	130 to 280				(2SB0956G 2SD1280G	1		
		4.0	1.0	3.0	100	120 to 315	2.0			2SB1073G	1		
	25	3.0				230 to 600	0.5			2SD1119G	1		
Darlington	50	0.5	2.5	0.5	0.5	4 000 to 20 000	0.5					2SD2598	1
		1.0	1.8	1.0	1	4 000 to 40 000	1.0					2SD2258	1
	80									2SD1511G	1		
	100	2.0	1.5									2SD2067	1
High breakdown voltage	120	0.5	0.6	0.5	50	90 to 220	0.15			(2SB0789G 2SD0968G	1		
						130 to 330							
			1.0	0.3	30	90 to 330						2SD2225	1
	400	0.1	1.5	0.05	5	30 ≤	0.03			2SD2413G	1		
		0.5		0.25	50							2SD2565	1
TV Chroma output	300	0.07	50*1	0.01*2	–	30 to 220	0.005					2SC5419	1

(: Complementary pair
P_C: T_C = 25°C

For Power Amplification

Application	Absolute Maximum Ratings		Electrical Characteristics			Package			
						TO-220D-A1			
	V_{CEO} (V)	I_C (A)	$V_{CE(sat)}$ max. (V)	I_C (A)	I_B (mA)	PNP	P_C (W)	NPN	P_C (W)
General-use	80	3	1.2	3	375	2SB1548A	25	2SD2374A	25
	60		0.8			2SB1724	30	2SD2693	25
	80					2SB1724A	30	2SD2693A	25
	180	2	1	0.5	50	2SA2118	25	2SC5935	25
Low $V_{CE(sat)}$	50	10	0.5	5	250	2SA2064	25	2SC5779	25
	60	3		3	375	2SA2057	20	2SC5739	20
	180	1.5		1	100	2SA2140	20	2SC5993	20
High-h_{FE}	60	3	1	2	50			2SD2375	25
		5	0.3	4	100			2SD2528	40
Darlington	60	4	2	3	12	2SB1623	30	2SD2420	30
	80					2SB1623A	30	2SD2420A	30

P_C: T_C = 25°C

H

For Switching

Application	Absolute Maximum Ratings			Electrical Characteristics				Package	
	V_{CBO} (V)	V_{CEO} (V)	I_C (A)	$V_{CE(sat)}$ max. (V)	I_C (A)	I_B (mA)	t_f (µs)	TO-220D-A1	P_C (W)
High-speed switching	500	400	3	1	1.5	300	0.3	2SC4953	30

P_C: T_C = 25°C

For TV and CRT Monitor

Application	Absolute Maximum Ratings		Electrical Characteristics		Package	
	V_{CBO} (V)	I_C (A)	$V_{CE(sat)}$ max. (V)	t_f typ (µs)	TO-220D-A1	P_C (W)
VM circuit	–180	–1.5	– 0.5	0.1	2SA2140	20
	180	1.5	0.5		2SC5993	20

P_C: T_C = 25°C

Power MOS FETs

Power MOS FETs

Absolute Maximum Ratings			P_D (W)	Electrical Characteristics					Package	
V_{DSS} (V)	V_{GSS} (V)	I_D (A)		$R_{DS(on)}$ max. (Ω)	$\|Y_{fs}\|$ typ. (S)	$t_{d(on)}$ typ. (ns)	t_f typ. (ns)	$t_{d(off)}$ typ. (ns)	TO-220C-G1	TO-220D-A1
100	±20	25	50	0.1	11	15	35	65	2SK3269	
110	±25	28	40	0.052	21	30	90	150		2SK4174
200	±30	30	50		22	32	88	170	2SK3995	
			40							2SK4208

IGBT Discrete

IGBT

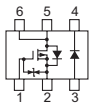
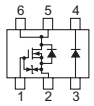
Absolute Maximum Ratings				Electrical Characteristics		Package
V_{CES} (V)	I_C (A)	I_{CP} (A)	P_C (W)	$V_{CE(sat)}$ max. (V)	t_f typ. (ns)	TO-220D-A1
430	40	230	40	2.4	175	2PG006
510				2.5	185	2PG009
540						2PG011

Multi Chip Discrete Devices

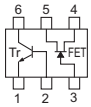
Composite Transistors

Composite Transistors

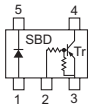
MOS FET + SBD (For Power Management)

Application	FET Polarity	MOS FET								SBD				Package			
		Absolute Maximum Rating			Electrical Characteristics					Absolute Maximum Rating		Electrical Characteristics		WSSMini6-F1		WSSMini6-F1	
		V_{DSS} (V)	V_{GSS} (V)	I_D (A)	$R_{DS(on)}$ typ. (mΩ)	V_{GS} (V)	Ciss (pF)	t_{on} typ. (ns)	t_{off} typ. (ns)	V_R (V)	I_F (A)	V_F max. (V)	I_R max. (μA)		P_D (W)		P_D (W)
DC-DC Converter	Pch	−20	±10	−2.0	80	−4.0	300	14	112	15	0.7	0.45	250	MTM86627	0.54		
					100	−2.5				20	0.8	0.47	80	MTM86627A	0.54		
					140	−1.8											
			±12	−1.0	300	4.0	80	18	27	15	0.7	0.45	250	MTM86628	0.54		
					420												
	Nch	20	±10	2.2	80	2.5	280	13	38	20	0.8	0.47	80			MTM86727	0.54
					100												

TR + load device

Application	Absolute Maximum					Electrical Characteristics			Package	
	TR		CCD load device		P_T (mW)	TR		CCD load device	SSMini6-F2	
	V_{CEO} (V)	I_C (mA)	V_{max} (V)	I_{max} (mA)		f_T typ. (MHz)	h_{FE}	I_P (mA)		
CCD output circuit	20	15	40	10	125	640	65 to 160	3.5 to 5.5	UP05C8BG	
		50				1 000	25 to 250		UP05C8GG	
						1 300	100 to 250	3.8 to 5.2	UP05C8GF	
								5.0 to 7.0	UP05C8PG	

Transistor with built-in resistors + SBD

Application	Absolute Maximum				Electrical Characteristics				Package	
	TR		SBD		TR		SBD		P_T (mW)	SSMini5-F3
	V_{CEO} (V)	I_C (A)	V_R (V)	I_F (A)	$V_{CE(sat)}$ max. (V)	R1/R2 (kΩ)	V_F typ. (V)	I_R typ. (μA)		
Digital circuit	−50	− 0.08	20	0.2	− 0.25	47/47	0.5	0.1	125	UP0KG8DG

Diodes

Switching Diodes

Electrical Characteristics				Surface mounting package							
V_R (V)	I_F (mA)	I_R max. (μA)	t_{rr} max. (ns)	ML2-N1	ML3-N2	USSMini2-F1	SSSMini2-F3	SSSMini3-F2	SSMini2-F4	SSMini3-F3	SSMini4-F1
200	100	1.0	60						MA2S1010G  (V_R = 250 V)		
			—								
	200	0.2	—								
150											
80	100	0.1	10/3								
			10					MAS3132DG 		MA3S132DG 	
			3		MA36132E 			MAS3132EG 		MA3S132EG 	
				MA26111 		MAU2111 	MA271110G 		MA2S1110G 	MA3S132AG 	MA4S111 
										MA3S132KG 	

Surface mounting package							
SMini2-F3	SMini3-F2	SMini4-F2	SMini5-F1	SMini6-F1	Mini3-G1	Mini4-G3	Mini6-G3
MA2Z0010G 	MA3X1000G 				MA3X199 		
					MA3X158 	MA4X1740G 	
MA2J1150G 							MA6X1290G 
MA2J1140G 							
						MA4X1930G 	MA6X1260G 
	MA3J142DG 		MA5J002D 		MA3X152D 		MA6X1220G 
	MA3J142AG 						MA6X1270G 
	MA3J142EG 		MA5J002E 		MA3X152E 		MA6X1230G 
							MA6X1240G 
							MA6X1280G 
MA2J1110G 		MA4Z1590G 		MA6Z121 	MA3X152A 	MA4X159AG 	MA6X1210G 
	MA3J142KG 				MA3X152K 	MA4X160AG 	

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Switching Diodes

Switching Diodes (continued)

Electrical Characteristics				Surface mounting package						
V_R (V)	I_F (mA)	I_R max. (μA)	t_{rr} max. (ns)	SSMini3-F3	SMini2-F3	SMini3-F2	SMini4-F2	Mini3-G1	Mini4-G3	Mini6-G3
80	100	0.1	3	MA3S1370G 		MA3J1470G 		MA3X157A 		
			—	MA3S1330G 		MA3J143AG 		MA3X153A 		
	200	0.05	10		MA2J1130G 		MA4J1130G 			
40	100	0.1	3						MA4X1600G 	
			—			MA3J1430G 		MA3X153 		MA6X1250G 
	200	0.05	10		MA2J1120G 					
	100	0.01	100		MA2J1160G 			MA3X198 	MA4X1940G 	

Band Switch Diodes

Part No.	V_R (V)	I_F max. (mA)	C_D typ. (pF)	V_R (V)	r_f typ. (Ω)	Package
MA2S077G	35	100	0.9	6	0.65	SSMini2-F4
MA27077G						SSSMini2-F3
MA26077						ML3-N2

PIN Diodes

Part No.	V_R (V)	I_F (mA)	C_t max. (pF)	V_R (V)	r_f max. (Ω)	I_F (mA)	Package
MA2JP020G	60	100	0.5	1	2.0	10	SMini2-F3
MA3JP02FG		100 (65)					SMini3-F2 2 elements contained
MA2SP010G		100	0.8		1.0		SSMini2-F4
MA2SP020G			0.5		2.0		
MA2SP050G		50	2.4	0	5.5		
MA2SP060G		100	0.55	1	1.0		SSSMini2-F3
MA27P010G			0.8				
MA27P020G			0.5		2.0		
MA27P060G			0.6		1.2		
MA27P070G			0.35		1.5		
MA27P110G		50	0.8	0			
MA27P120G		100	typ 0.27	1	typ 0.8		
MA26P01			0.8		1.0		ML2-N1
MA26P02			0.5		2.0		
MA26P07			0.35		1.5		

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Schottky Barrier Diodes

For Small Signal (I_F = Less than 1 000 mA)

Application	Electrical Characteristics					Package									
	V_R (V)	I_F (mA)	V_F max. (V)	I_F (mA)	I_R max. (μA)	ML2-N1	USSMini2-F1	SSSMini2-F3	SSSMini3-F2	SSMini2-F4	SSMini3-F3	SSMini4-F1	SMini2-F3	SMini3-F2	SMini4-F2
For high frequency wave detection	20	35	0.41	1	0.2					MA2SE010G	MA3SE010G				
			0.40					MA27E020G			MA3SE020G				
For switching mode wave detection	20	100	0.40	100	20								MA2ZD140G		MA4ZD140G
			0.58		0.3			MA27D270G							
	30	30	0.30	1	30						MA3S7950G		MA2J7320G		
											MA3S795DG				
														MA3J745EG	
									MAS3795EG		MA3S795EG				
			0.35		0.5							MA4SD01			
			0.40		0.3	MA26728	MAU27280G	MA277280G		MA2S7280G	MA3S7810G		MA2J7280G	MA3J7410G	
											MA3S781FG				
					1						MA3S781DG			MA3J741DG	MA4Z7130G
											MA3S781EG			MA3J741EG	
														MA3J7420G	

For Small Signal (I_F = Less than 1 000 mA) (continued)

Application	Electrical Characteristics					Package										
	V_R (V)	I_F (mA)	V_F max. (V)	I_F (mA)	I_R max. (μA)	ML2-N1	USSMini2-F1	SSSMini2-F3	SSSMini3-F2	SSMini2-F4	SSMini3-F3	SSMini4-F1	SSMini5-F3	SMini2-F3	SMini3-F2	SMini4-F2
For switching mode wave detection	30	100	0.42	100	120		MAU2D29	MA27D290G		MA2SD290G	MA3SD29FG		MA5SD29XG			
			0.55		15			MA277840G		MA2S7840G				MA2Z7840G	MA3Z7920G	
															MA3Z792DG	
															MA3Z792EG	
															MA3Z7930G	
			0.58		2		MAU2D30	MA27D300G		MA2SD300G			MA5SD30XG			
	45		0.60		5						MA3SD05FG	MA4SD05X	MA5SD05XG			MA4ZD030G
	50		0.55		30									MA2Z7850G		
For rectification	15	200	0.39	200	50					MA2SD250G						
	20		0.47		15					MA2SD190G						
					20					MA2SD100G		MA4SD10				
			0.55		2									MA2J7040G		
			0.58		1					MA2SD240G						
	30		0.47		200					MA2SD310G						

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Schottky Barrier Diodes

For Small Signal (I_F = Less than 1 000 mA) (continued)

Application	Electrical Characteristics					Package								
	V_R (V)	I_F (mA)	V_F max. (V)	I_F (mA)	I_R max. (μA)	ML2-N1	USSMini2-F1	SSSMini2-F3	SSSMini3-F2	SSMini2-F4	SSMini3-F3	SSMini4-F1	SMini2-F3	SMini3-F2
For rectification	20	300	0.40	300	30								MA2Z7480G 	
		500	0.42	500	200								MA2ZD180G 	
			0.55		10								MA2ZD020G 	MA3J7020G 
		700	0.45	700	200									MA3ZD120G 
	30	200	0.55	200	50								MA2J7290G 	MA3J7440G 
			0.56		5					MA2SD320G 				
	40	500	0.55	500	100								MA2Z7200G 	MA3J7000G 
	50	200		200	200								MA2J7270G 	

For Small Signal (I_F = Less than 1 000 mA) (continued)

Application	Electrical Characteristics					Package				
	V_R (V)	I_F (mA)	V_F max. (V)	I_F (mA)	I_R max. (μA)	SMini6-F1	Mini2-F2	Mini3-G1	Mini4-G3	Mini6-G3
For switching mode wave detection	15	30	0.40	1	0.2			MA3X704 		
	30				0.3			MA3X704A 		
					1	MA6Z718 		MA3X704D 	MA4X7130G 	MA6X7180G 
								MA3X704E 	MA4X7140G 	
								MA3X716 		
			0.30		30			MA3X715 		
								MA3X717 		
								MA3X717E 		
		100	0.55	100	15	MA6J786X 		MA3X786 		
						MA6J786Y 		MA3X786D 		
								MA3X786E 		
								MA3X791 		
	50				30			MA3X787 	MA4X7960G 	

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Schottky Barrier Diodes

For Small Signal (I_F = Less than 1 000 mA) (continued)

Application	Electrical Characteristics					Package				
	V_R (V)	I_F (mA)	V_F max. (V)	I_F (mA)	I_R max. (μA)	SMini6-F1	Mini2-F2	Mini3-G1	Mini4-G3	Mini6-G3
For rectification	20	500	0.50	500	30			MA3X748 		
			0.55		10			MA3X703 		
	30	200		200	50			MA3X721 	MA4X7240G 	
								MA3X721D 	MA4X7260G 	
								MA3X721E 		
								MA3X740 		
		500		500			MA2YD330G 			
		700		700	80			MA3X701 		
	40	500		500	100			MA3X720 		
	50	200		200	200			MA3X727 	MA4X7460G 	
	60		0.65		50			MA3X788 		
		500		500	100			MA3X789 		
		800	0.58	800			MA2YD260G 			
	100	300	0.57	300	200		MA22D170G 			
			0.58				MA2YD170G 			

For Small Signal (I_F = 1 000 mA or more)

Application	Electrical Characteristics					Package						
	V_R (V)	I_F (mA)	V_F max. (V)	I_F (mA)	I_R max. (μA)	SMini6-F1	SMini2-F2★	Mini2-F1★ Mini2-F2	Mini3-G1	Mini4-G3	Mini6-G3	TMiniP2-F1
For rectification	15	1 000	0.40	1 000	1 500			MA2YD210G	MA3XD21			
	20		0.45		200				MA3XD11			
			0.43		100			MA22D150G				
			0.45					MA2YD150G	MA3XD15			
	25		0.53		40			MA22D230G				
			0.55					MA2YD230G				
	30		0.42		100		MA21D380G★					
			0.38		1 200		MA21D340G★					
			0.49		40		MA21D350G★					
		1 500	0.46	1 500	100		MA21D382G★					
								MA22D280G				
		2 000	0.45	2 000	500			MA22D410G				
		3 000	0.37	3 000	2 000							MA24D54
	35	5 000	0.55	5 000	300							MA24D70

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Schottky Barrier Diodes

For Small Signal (I_F = 1 000 mA or more) (continued)

Application	Electrical Characteristics					Package						
	V_R (V)	I_F (mA)	V_F max. (V)	I_F (mA)	I_R max. (μA)	SMini6-F1	SMini2-F2★	Mini2-F1★ Mini2-F2	Mini3-G1	Mini4-G3	Mini6-G3	TMiniP2-F1
For rectification	40	1 570	0.57	1 500	100			MA22D390G				
		2 000	0.48	2 000	200							MA24D60
			0.51		50							MA24D62
		3 000		3 000	200							MA24D50
			0.55					MA2YJ50★				
			0.42		2 000							MA24D51
			0.53		50							MA24D52
	60	1 000	0.58	1 000	30			MA22D400G				
		3 000		3 000	200							MA24D58

For Power

Category	Part No.	Electrical Characteristics				Equivalent Circuit	Package
		V_R (V)	$I_{F(AV)}$ (A)	V_F max. (V)	I_R (mA)		
Cathode-common type	MA3DD82	60	20	0.72	0.2	1 2 3	TO-220D-A1

Fast Recovery Diodes

For Small Signal

Part No.	Electrical Characteristics				Equivalent Circuit	Package
	V_{RRM} (V)	$I_{F(AV)}$ (A)	V_F max. (V)	t_{rr} max. (ns)		
MA2JF210G	200	0.3	1.25	400 (typ.)		SMini2-F3
MA22F200G		1	0.98	35		Mini2-F2
MA24F41	400		1.3	45		TMiniP2-F1
MA24F70	700		1.7			
MA2YF800G	800	0.2	2.5			Mini2-F1

For Power

Category	Part No.	Electrical Characteristics				Equivalent Circuit	Package
		V_{RRM} (V)	$I_{F(AV)}$ (A)	V_F max. (V)	t_{rr} max. (ns)		
Single type	MA2DF22	200	5	1.0	30		TO-220D-B1*
	MA2DF31	300		1.3			
	MA2DF60	600		1.7	25		
	MA2DF62		10	2.5			
	MA3DF30	300	20	1.4	25		TO-220D-A1
	MA3DF40	370			35		
	MA3DF46			1.65	23		
	MA3DF47			1.85	20		
Cathode-common type	MA3U649	200	5	0.98	30		U-G2
	MA3D649						TO-220D-A1
	MA3D650		10				
	MA3D652		20		50		

∗: 2-pin Type

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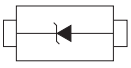
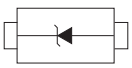
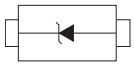
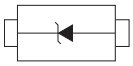
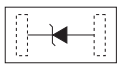
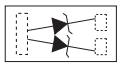
Zener Diodes

Zener Diodes Series

Zener Voltage V_Z (V)	General-Purpose	Low Noise			Surge Absorption		
	MAZ3000✖	MAZ8000G✖	MAZS000G✖	MALH000YG	MAZD000G	MAZQ000	MAZA000
	Mini3-G1	SMini2-F3	SSMini2-F4	SMini4-F2	SSSMini2-F3	USSMini2-F1	ML2-N1
	P_T = 200 mW	P_T = 150 mW	P_T = 150 mW	P_T = 150 mW	P_T = 120 mW	P_T = 120 mW	P_T = 100 mW
							
2.28 to 2.60	MAZ3024	MAZ8024G	MAZS024G	MALH024YG			
2.50 to 2.90	MAZ3027	MAZ8027G	MAZS027G	MALH027YG			
2.80 to 3.20	MAZ3030	MAZ8030G	MAZS030G	MALH030YG			
3.10 to 3.50	MAZ3033	MAZ8033G	MAZS033G	MALH033YG			
3.40 to 3.80	MAZ3036	MAZ8036G	MAZS036G	MALH036YG			
3.70 to 4.10	MAZ3039	MAZ8039G	MAZS039G	MALH039YG			
4.00 to 4.60	MAZ3043	MAZ8043G	MAZS043G	MALH043YG			
4.40 to 5.00	MAZ3047	MAZ8047G	MAZS047G	MALH047YG			
4.80 to 5.40	MAZ3051	MAZ8051G	MAZS051G	MALH051YG	MAZD051G		MAZA051
5.30 to 6.00	MAZ3056	MAZ8056G	MAZS056G	MALH056YG	MAZD056G		MAZA056
5.80 to 6.60	MAZ3062	MAZ8062G	MAZS062G	MALH062YG	MAZD062G	MAZQ062	
6.40 to 7.20	MAZ3068	MAZ8068G	MAZS068G	MALH068YG	MAZD068G	MAZQ068	MAZA068
7.00 to 7.90	MAZ3075	MAZ8075G	MAZS075G	MALH075YG	MAZD075G		
7.70 to 8.70	MAZ3082	MAZ8082G	MAZS082G	MALH082YG	MAZD082G		MAZA082
8.50 to 9.60	MAZ3091	MAZ8091G	MAZS091G	MALH091YG	MAZD091G		
9.40 to 10.60	MAZ3100	MAZ8100G	MAZS100G	MALH100YG	MAZD100G	MAZQ100	
10.40 to 11.60	MAZ3110	MAZ8110G	MAZS110G	MALH110YG	MAZD110G		
11.40 to 12.70	MAZ3120	MAZ8120G	MAZS120G	MALH120YG	MAZD120G		
12.40 to 14.10	MAZ3130	MAZ8130G	MAZS130G	MALH130YG			
13.65 to 14.35	MAZ3140	MAZ8140G					
13.90 to 15.60	MAZ3150	MAZ8150G	MAZS150G	MALH150YG			
15.30 to 17.10	MAZ3160	MAZ8160G	MAZS160G	MALH160YG	MAZD160G		
16.90 to 19.10	MAZ3180	MAZ8180G	MAZS180G	MALH180YG	MAZD180G		
18.80 to 21.20	MAZ3200	MAZ8200G	MAZS200G	MALH200YG	MAZD200G	MAZQ200	
20.80 to 23.30	MAZ3220	MAZ8220G	MAZS220G	MALH220YG	MAZD220G		
22.80 to 25.60	MAZ3240	MAZ8240G	MAZS240G	MALH240YG	MAZD240G		
25.10 to 28.90	MAZ3270	MAZ8270G	MAZS270G	MALH270YG	MAZD270G		
28.00 to 32.00	MAZ3300	MAZ8300G	MAZS300G	MALH300YG	MAZD300G	MAZQ300	
31.00 to 35.00	MAZ3330	MAZ8330G	MAZS330G	MALH330YG			
34.00 to 38.00	MAZ3360	MAZ8360G	MAZS360G	MALH360YG	MAZD360G		
37.00 to 41.00		MAZ8390G	MAZS390G	MALH390YG	MAZD390G		

✖: Rank compatible

Zener Diodes Series (continued)

Zener Voltage V_Z (V)	Surge Absorption						
	MAZ9000H	MAZL000HG	MAZZ000H	MAZT000HG	MAZM000HG	MAZW000HG	MAZP000H
	Mini3-G1	Mini5-G2	SMini5-F1	SSMini3-F3	SSMini5-F3	SSSMini3-F2	ML3-N2
	P_T = 200 mW	P_T = 200 mW	P_T = 200 mW	P_T = 150 mW	P_T = 150 mW	P_T = 150 mW	P_T = 200 mW
							
5.80 to 6.60	MAZ9062H		MAZZ062H	MAZT062HG	MAZM062HG	MAZW062HG	
6.40 to 7.20	MAZ9068H	MAZL068HG	MAZZ068H	MAZT068HG	MAZM068HG	MAZW068HG	MAZP068H
7.00 to 7.90							
7.70 to 8.70		MAZL082HG	MAZZ082H	MAZT082HG	MAZM082HG	MAZW082HG	MAZP082H
8.50 to 9.60							
9.40 to 10.60			MAZZ100H	MAZT100HG	MAZM100HG	MAZW100HG	
10.40 to 11.60							
11.40 to 12.70	MAZ9120H	MAZL120HG	MAZZ120H	MAZT120HG	MAZM120HG	MAZW120HG	

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Zener Diodes

Low C_t Series

Zener Voltage V_Z (V)	Part No.	C_t (pF)	Equivalent Circuit	Package
5.9 to 6.5	MAZC062D	8		Mini3-G1
	MAZE062DG			SMini3-F2
	MAYK062DG			Mini5-G2

Surge Protective Diode

Breakdown Voltage V_{BR} (V)	Part No.	C_t (pF)	ESD (kV)	Equivalent Circuit	Package
7.5	MAYS075GZ	1.5	±12		SSMini2-F4
	MAYS075GY	0.8	±8		

Bidirectional Zener Diode

Zener Voltage V_Z (V)	Part No.	C_t (pF)	ESD (kV)	Equivalent Circuit	Package
6.5 to 7.5	MALS068XG	15	±15		SSMini2-F4
	MALD068XG	25			SSSMini2-F3
14.5 to 17.5	MALS160XG	3.0			SSMini2-F4
17.5 to 20.0	MALS180XG	4			SSMini2-F4

High ESD (30 kV) Protection Device

Breakdown Voltage V_{BR} (V)	Part No	ESD (kV)	Equivalent Circuit	Package
5.8 to 6.6	MALS062G	±30		SSMini2-F4
6.4 to 7.2	MALS068G			
5.8 to 6.6	MALT062HG			SSMini3-F3
	MALM062HG			SSMini5-F3

High Surge Absorption Diode

Breakdown Voltage V_{BR} (V)	Part No	I_{PP}	ESD (KV)	Equivalent Circuit	Package
20 to 30	MANV250GE	9	30		SMini2-F3

Fuses (Circuit Protector Elements)

* Electrical fuses, etc. specified by laws are not applicable.

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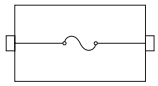
IC Links

Circuit Protector Elements

Part No.	Rated Current (A)	Shut-off Current (typ.) (A) ± 20%	Internal Resistance (typ.) (mΩ)	Rated Voltage (V)	Operating Ambient Temperature (°C)	Storage Temperature (°C)	Package	Equivalent Circuit
UNHZ201	0.7	1.4	93	50	–55 to +125	–55 to +125	SMini2-F1	
UNHZ202	1.0	2.0	59					
UNHZ203	1.2	2.4	46					
UNHZ204	1.5	3.0	35					

(Cautions)

- Applying continuously a current exceeding the rated current causes heating of the package and can be dangerous.
- Please use these elements to circuits in the secondary side only.
- Since these elements do not correspond to current fuses, etc., according to legal regulations, avoid using symbols for these elements in circuit diagrams, that may cause confusion with tubular fuses, etc.

Opto Electronic Devices

M

Light Emitting Diodes

Surface-mount Chip LED

Mono-color Lighting

Series	Size	Package	Type	White	Red	Yellow Green
				Part No.	Part No.	Part No.
1005	1.0 × 0.5 × 0.20	KLTFTN2K4700	High brightness	▲ LNJ047X8ARA	▲ LNJ247W82RA	▲ LNJ347W83RA
ESS II	1.6 × 0.8 × 0.20	KLTFTN2K3700	High brightness	LNJ037X8ARA	LNJ237W82RA	LNJ337W83RA
ESS	1.6 × 0.8 × 0.20	KLTFTN2K3600	High brightness	LNJ036X8ARA	LNJ236W82RA	LNJ336W83RA
UTSS	1.6 × 0.8 × 0.35	KLTFTN2K2600	Standard	LNJ026X8ARA	—	LNJ326W83RA1
			High brightness	LNJ026X8BRA4	—	—
USS	1.6 × 0.8 × 0.40	KLTFTN2K1400	Standard	—	LNJ214R8ARA	LNJ314G8TRA
			High brightness	—	LNJ214R82RA	LNJ314G83RA
Wide Angle	1.6 × 0.8 × 0.55	KLTLTN2KW000	High brightness	—	—	LNJ3W0C83RA
TSS	1.6 × 0.8 × 0.55	KLTFTN2K1200	Standard	—	LNJ212R8ARA	LNJ312G8TRA
			High brightness	LNJ012X8ARA1	LNJ212W82RA1	LNJ312W83RA1
SS	1.6 × 0.8 × 0.80	KLTFTN2K0800	Standard	—	LNJ208R8ARA	LNJ308G8TRA
			High brightness	—	LNJ208R82RA	LNJ308G83RA
S-GW	2.9 × 1.25 × 1.0	LLTFTN2G0600	Standard	—	—	LNJ306G5TR02
		LLTFTN2G0610	High brightness	—	LN1271RALTR	—
S-J	1.7 × 1.25 × 1.0	LLTFTN2J0600	Standard	—	LNJ206R5ARA	LNJ306G5URA
			High brightness	—	—	—
GW	3.0 × 2.2 × 1.8	LLTFTR2G6100	Standard	—	LN1261CTR	LN1361CTR
		LLTFTR2G6110	High brightness	—	LN1261CALTR	—
		LLTFTR2G6100		—	—	—
J	3.0 × 2.0 × 1.4	LLDFTR2G5100	Standard	—	LN1251CTR	LN1351CTR
		LLDFTR2G5110	High brightness	—	LN1251CALTR	—
		LLDFTR2G5100		—	—	—
3216	3.2 × 1.6 × 1.1	KLTFTN2K1100	Standard	—	LNJ211R8ARA	LNJ311G8TRA
			High brightness	—	LNJ211R82RA	LNJ311G83RA
3216 FD	3.2 × 1.6 × 1.1		Standard	—	LNJ211R8ARU	LNJ311G8TRU
			High brightness	—	—	—
Microlens	3.2 × 1.6 × 1.1	KLTLTN2K1600	Standard	—	LNJ216C8ARA	LNJ316C8TRA
			High brightness	—	LNJ216C82RA	LNJ316C83RA
Microlens FD	3.2 × 1.6 × 1.1		Standard	—	LNJ216C8ARU	LNJ316C8TRU
			High brightness	—	—	LNJ316C83RU
Dome-Lens	3.2 × 1.6 × 1.1	KLTLTN2K1800	Standard	—	LNJ218C8ARA	LNJ318C8TRA
			High brightness	—	LNJ218C82RA	LNJ318C83RA
Dome-Lens FD	3.2 × 1.6 × 1.1		Standard	—	LNJ218C8ARU	—
			High brightness	—	—	LNJ318C83RU
SV-0.4	1.7 × 1.1 × 0.4	KLTFSN2K5200	High brightness	LNJ052X8ARA	LNJ252W82RA	LNJ352W83RA
SV-0.5	1.8 × 1.1 × 0.5	KLTFSN2K5300	High brightness	LNJ053X8BRA	LNJ253W82RA	LNJ353W83RA
SV-Case	2.2 × 0.9 × 1.0	LLDFSR2J1000	Standard	—	LNJ210C6ARA	LNJ310M6URA
			High brightness	—	LNJ210C62RA	LNJ310C63RA
2214	2.2 × 1.4 × 1.3	LLDFTR4J2200	High brightness	LNJ022X4ARA1	LNJ222C44RA1	—
3528	3.5 × 2.8 × 1.9	LLDFTR4J2400	High brightness	LNJ024X4ARA1	LNJ224C44RA1	—

SV: Side View FD: Face Down ▲: Under development

Amber	Pure Green	Orange	Soft Orange	Blue	other
Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
▲ LNJ447W84RA	—	▲ LNJ847W83RA	▲ LNJ847W86RA	▲ LNJ947W8CRA	▲ LNJC47X8ARA (Ice Blue)
LNJ437W84RA	—	LNJ837W83RA	LNJ837W86RA	LNJ937W8CRA	LNJC37X8ARA (Ice Blue)
LNJ436W82RA	—	LNJ836W83RA	LNJ836W86RA	LNJ936W8CRA	LNJC36X8ARA1 (Ice Blue)
LNJ426W83RA1	LNJ626W8CRA	LNJ826W83RA	LNJ826W86RA	LNJ926W8CRA	—
—	—	—	—	—	—
LNJ414K8YRA	—	LNJ814R8DRA	LNJ814K8SRA	—	—
LNJ414K84RA	—	LNJ814W83RA	LNJ814K87RA	—	—
—	—	LNJ8W0C83RA	—	—	LNJ3W0C85RA (Lemon Yellow)
LNJ412K8YRA	LNJ612W8WRA	LNJ812R8DRA	LNJ812K8SRA	LNJ912W8BRA	—
LNJ412W83RA1	LNJ612W8CRA1	LNJ812W83RA1	LNJ812W86RA1	LNJ912W8CRA1	—
LNJ408K8YRA	LNJ308G8PRA	LNJ808R8ERA	LNJ808K8SRA	—	—
LNJ408K84RA	—	LNJ808R83RA	LNJ808K87RA	—	—
LN1471YTR	—	—	LN1871Y5TR	—	—
—	—	—	—	—	—
LNJ406K5YRX	—	—	LNJ806K5SRX	—	—
LNJ406K54RX	—	LNJ806R58RX	—	—	—
LN1461CTR	—	LN1861CTR	—	—	—
—	—	—	—	—	—
LNJ461C34RA	—	—	—	—	—
LN1451CTR	—	LN1851CTR	—	—	—
—	—	—	—	—	—
LNJ451C44RA	—	—	—	—	—
LNJ411K8YRA	LNJ311G8PRA	LNJ811R8DRA	LNJ811K8SRA	—	—
LNJ411K84RA	LNJ611W8WRA	LNJ811R88RA	LNJ811K87RA	LNJ911W8BRA	—
LNJ411K8YRU	—	LNJ811R8DRU	—	—	—
LNJ411K84RU	LNJ611W8WRU	—	—	LNJ911W8BRU	—
LNJ416Q8YRA	LNJ316C8PRA	LNJ816C8DRA	LNJ816C8SRA	—	—
LNJ416C84RA	LNJ616C8WRA	LNJ816C83RA LNJ816C88RA	LNJ816C87RA	LNJ916C8BRA	—
LNJ416Q8YRU	—	LNJ816C8DRU	—	—	—
—	—	—	—	—	—
LNJ418Q8YRA	LNJ318C8PRA	LNJ818C8DRA	LNJ818C8SRA	—	—
LNJ418C84RA	—	LNJ818C83RA LNJ818C88RA	LNJ818C87RA	—	—
LNJ418Q8YRU	—	—	LNJ818C8SRU	—	—
—	—	—	—	—	—
LNJ452W82RA	—	LNJ852W83RA	LNJ852W86RA	LNJ952W8CRA1	—
LNJ453W82RA	—	LNJ853W83RA	LNJ853W86RA	LNJ953W8CRA	—
LNJ410Q6YRA	LNJ310C6PRA	LNJ810L6DRA	LNJ810L6SRA	—	—
LNJ410C64RA	—	LNJ810C63RA	LNJ810C67RA	—	—
LNJ422C46RA1	LNJ622C4CRA1	LNJ822C43RA1	—	LNJ922C4CRA1	—
LNJ424C46RA1	LNJ624C4CRA1	LNJ824C43RA1	—	LNJ924C4CRA1	—

Light Emitting Diodes

Bi-color Lighting

Series	Size	Package	Type	Lighting Color	Part No.
TSS-2	1.6 × 1.25 × 0.55	KLTFTN4K1540	Standard	Yellow Green / Orange	LNJ115W8ARA
			Standard	Yellow Green / Red	LNJ115W8PRA
			Standard / High brightness	Yellow Green / Amber	LNJ115W88RA
			Standard / High brightness	Yellow Green / Soft Orange	LNJ115W89RA
			High brightness	Pure Green / Soft Orange	LNJ115W8VRA
			High brightness	Yellow Green / Orange	LNJ115W8RRA1
S-GW-2	1.7 × 2.5 × 1.0	LLTFTN4G0740	Standard	Yellow Green / Red	LNJ107W5PRW
			Standard	Yellow Green / Orange	LNJ107W5ARA1
SV-2	2.5 × 1.0 × 1.0	KLTFSN4K2340	High brightness	Yellow Green / Orange	LNJ123W8RRA
Dome-Lens-2	3.2 × 2.5 × 1.38	KLTLTN3K2130	Standard / High brightness	Yellow Green / Red	LNJ121W84RA

SV: Side View

RGB Lighting

Series	Size	Package	Type	Lighting Color	Part No.
TSS-3	1.6 × 2.1 × 0.55	KLTFTN4K1720	High brightness	Pure Green	LNJ717W80RA
				Soft Orange	
				Blue	
			High brightness	Pure Green	LNJ717W80RA1
				Soft Orange	
				Blue	
		KLTFTN6K1740	High brightness	Pure Green	LNJ717W83RAS
				Orange	
				Blue	
USS-3	1.6 × 2.1 × 0.4	KLTFTN6K2740	High brightness	Pure Green	LNJ727W83RAS
				Orange	
				Blue	
			High brightness	Pure Green	LNJ727W83RAA
				Orange	
				Blue	
SV-3	2.5 × 1.1 × 1.0	KLTFSN4K2320	High brightness	Pure Green	LNJ723W80RAV
				Soft Orange	
				Blue	

SV: Side View

White

Series	Size	Package	Type	Lighting Color	Part No.
Strobe	3.4 × 3.4 × 1.5	LLTLTN4GF100	High brightness	White	LNJ0F1C5FRA1
					LNJ0F1C5FRA2
					LNJ0F1C5FRA4
Strobe PCB	3.0 × 3.0 × 1.1	KLPFTR4KS200	High brightness	White	LNJ0S2F8BRA
CSP	2.04 × 1.64 × 0.7	CLPFTN2N9000	High brightness	White	LNJ0Y0F9KRA4
					▲ LNJ0Y0F9KRA5
					▲ LNJ0Y0F9KRA6
SV-Case-1.0	2.8 × 1.4 × 1.0	LLDFSR2J1100	High brightness	White	LNJ0G0V6BRA
SV-Case-0.8	2.8 × 1.2 × 0.8	LLDFSR2J8000			LNJ080V6BRA
SV-Case-0.6	3.8 × 1.2 × 0.6	LLDFSR2J6000			LNJ060V6BRA

SV: Side View ▲: Under development

M

Light Emitting Diodes

Appearance photo (Surface-mount Chip LED)

KLTFTN2K4700	KLTFTN2K3700	KLTFTN2K3600	KLTFTN2K2600	KLTFTN2K1400	KLTLTN2KW000
					
KLTFTN2K1200	KLTFTN2K0800	LLTFTN2G0610	LLTFTN2G0600	LLTFTN2J0600	LLTFTR2G6100
					
LLTFTR2G6110	LLDFTR2G5100	LLDFTR2G5110	KLTFTN2K1100	KLTLTN2K1600	KLTLTN2K1800
					
KLTFSN2K5200	KLTFSN2K5300	LLDFSR2J1000	LLDFTR4J2200	LLDFTR4J2400	KLTFTN4K1540
					
LLTFTN4G0740	LLDFTR4G6240	KLTFSN4K2340	KLTLTN3K2130	KLTFTN4K1720	KLTFTN6K1740
					
KLTFTN6K2740	KLTFSN4K2320	LLTLTN4GF100	KLPFTR4KS200	CLPFTN2N9000	LLDFTR4GY000
					

LLDFSR2J1100	LLDFSR2J8000	LLDFSR2J6000			
					

M

Light Emitting Diodes

Insertion-type LED lamp

Series	Size	Package	Type	Red	Yellow Green	Amber	Orange
				Part No.	Part No.	Part No.	Part No.
Round Type	ϕ 5.0 mm	LLXLTN2SF010	Standard	LN21RPH	LN31GPH	LN41YPH	LN81RPH
				LN21RCPH	LN31GCPH	LN41YCPH	LN81RCPH
		LLXLTN2SK010		LN21RPX	LN31GPX	LNG401YKX	LNG801RKD
		LLXLTN2SF010		LN21WPH	—	—	—
				LN21CPH	LN31YCPH	—	—
		LLXLTN2SK1L0		LNG21LRKR	LN31GPSLX	LN41YPSLX	LN81RPSLX
		LLXLTN2SN890		—	LNG389CNJ	—	—
	ϕ 4.4 mm	LLXFTN2SK400	Standard	LN240RPX	LN340GPX	LNG440NKY	LN840RPX
	ϕ 4.0 mm	LLXLTN2SK090	Standard	LN29RPX	LN39GPX	LN49YPX	LNG809RKD
				—	—	—	LNG809SKSB
	ϕ 3.2 mm	LLXLTN2SK760	Standard	LN276RPX	LN376GPX	LNG476YKXB	—
				LN276RCPX	LN376GCPX	LNG476NKX	LN876RCPX
				—	LN376GCPXUY	—	—
	ϕ 3.0 mm	LLXLTN2SK080	Standard	LN28RPX	LN38GPX	LN48YPX	LN88RPX
	ϕ 2.6 mm	LLXLTN2SF210	Standard	LN221RPH	LNG321GFG	LNG421YFX	—
		LLXLTN2SK210		LN221RPX	LN321GPX	—	—
	ϕ 2.0 mm	LLXFTN2SF220	Standard	LN222RPH	LN322GPH	LN422YPH	—
		LLXFTN2SK220	Standard	LN222RPX	LN322GPX	LNG422YKY	—
		LLXLTN2SK820		LN282RPX	LN382GPX	LN482YPX	LN882RPX
Square Type	□5.3 mm × 1.8 mm	LLXFTN2SF170	Standard	LN217RPH	LN317GPH	LN417YPH	—
	□5.0 mm × 5.0 mm	LLXFTN2SF500	Standard	LN250RPH	LN350GPH	LN450YPH	—
		LLXFTN2SK730		LNG273RKR	LNG373GKG	LNG473YKX	LN873RPX
	□5.0 mm ×2.0 mm	LLXFTN2SK420	Standard	LN242RPX	LN342GPX	LNG442YKX	LN842RPX
		LLXFTN2SF420		LN242RPH	LN342GPH	LN442YPH	LN842RPH
	□5.0 mm × 1.0 mm	LLXFTN2SF240	Standard	LN224RPH	LN324GPH	LNG424YFX	—
	□4.0 mm × 4.0 mm	LLXFTN2SF520	Standard	—	LNG352GFG	—	—
		LLXFTN2SK520		LN252RPX	LN352GPX	LN452YPX	—
	□4.0 mm × 2.0 mm	LLXFTN2SK510	Standard	LNG251RKR	LNG351GKG	LN451YPX	—
	□3.0 mm × 7.0 mm	LLXFTN2SF160	Standard	LN216RPH	LN316GPH	LNG416YFX	LNG816RFD
	□3.0 mm × 2.0 mm	LLXFTN2SK600	Standard	LN260RPX	LN360GPX	LNG460YKX	—
				LN260RCPX	—	—	—
	□1.75 mm × 7.0 mm	LLXFTN2SF200	Standard	LN220RPH	LN320GPH	LN420YPH	—

Insertion-type LED lamp

Bi-color Lighting

Series	Size	Package	Type	Lighting Color	Part No.
Round Type	ϕ 5.0 mm	LLXLTN3SH012	Standard	Red	LN11WP23
				Yellow Green	
			Standard	Yellow Green	LN11WP34
				Amber	
			Standard	Yellow Green	LN11WP38
				Orange	
	ϕ 4.4 mm	LLXFTN3SH702	Standard	Yellow Green	LN170WP38
				Orange	
	ϕ 3.2 mm		Standard	Yellow Green	LN086WP38
				Orange	
	ϕ 3.0 mm	LLXLTN3SH382	Standard	Yellow Green	LN138WP38
				Orange	
Square Type	□5.0 mm × 2.0 mm	LLXFTN3SH422	Standard	Yellow Green	LN142WP34
				Amber	
			Standard	Yellow Green	LN142WP38
				Orange	

M

Light Emitting Diodes

Insertion-type LED lamp

Series	Size	Package	Type	Red	Yellow Green	Amber
				Part No.	Part No.	Part No.
Mini Bright	□2.2 mm × 3.0 mm	LLDFTR2S2010	Standard	LN01201CQ	LN01301CQ	LN01401CQ
		LLDFTR2S2011	High brightness	LN01201CALU	—	—
Direct Mounting	ϕ 3.2 mm	LLXLTN2SP010	Standard	LNJ201LPQJA	LNJ301MPUJA	LNJ401NPYJA
	ϕ 4.8 mm	LLXLTN2SPB40	High brightness	—	LNJ3B4MPUJA	—
	□5.0 mm × 2.0 mm	LLXFTN2SP020	Standard	—	LNJ302GPUJA	—

Insertion-type LED lamp

Series	Size	Package	Type	White	Red	Amber
				Part No.	Part No.	Part No.
Round Type	ϕ 5.0 mm	LLXLTN2SZ921	High brightness	LNG092CZFZ	—	—
		LLXLTN2SN891		—	LN289CUQ	—
		LLXLTN2SF920		—	—	LNG492CF4
		LLXLTN2SF011		—	LNG201RFC	—
		LLXLTN2SF010		—	—	LNG401CF4
		LLXLTN2SF1L0		—	—	—
	ϕ 3.2 mm	LLXLTN2SK761	High brightness	—	LN276CUQX	—
				—	LN276RCUQX	—
	ϕ 3.0 mm	LLXLTN2SK981	High brightness	—	LNG298CKC	—
		LLXLTN2SK980		—	—	LNG498CK4
		LLXLTN2SK970		—	—	LNG497CK4
Oval Type	ϕ 4.0 mm	LLXLTN2SYB81	High brightness	—	—	—
		LLXLTN2SYA81		LNG0A8CYBZ	—	—

Orange	Soft Orange
Part No.	Part No.
LN01801CQ	—
—	—
LNJ801LPDJA	LNJ801TPSJA
LNJ8B4LPDJA	—
LNJ802RPDJA	LNJ802SPSJA

Pure Green	Orange	Blue
Part No.	Part No.	Part No.
—	—	—
—	—	—
LNG692CF6	—	LNG992CFB
—	—	—
—	LNG801CF8	LNG901CFB
LNG61LCF6	—	LNG91LCFB
—	—	—
—	—	—
—	—	—
—	—	LNW998CKBW
—	LNG897CK8	LNW997CKB
LNW6B8GYFZ	—	—
—	—	LNW9A8BYBZ

Light Emitting Diodes

Appearance photo (Insertion-type LED lamp)

LLXLTN2SF010	LLXLTN2SK010	LLXLTN2SK1L0	LLXLTN2SN890	LLXFTN2SK400	LLXLTN2SK090
					
LLXLTN2SK760	LLXLTN2SK080	LLXLTN2SF210	LLXLTN2SK210	LLXFTN2SF220	LLXFTN2SK220
					
LLXLTN2SK820	LLXFTN2SF170	LLXFTN2SF500	LLXFTN2SK730	LLXFTN2SK420	LLXFTN2SF420
					
LLXFTN2SF240	LLXFTN2SF520	LLXFTN2SK520	LLXFTN2SK510	LLXFTN2SF160	LLXFTN2SK600
					
LLXFTN2SF200	LLDFTR2S2010	LLDFTR2S2011	LLXLTN2SP010	LLXLTN2SPB40	LLXFTN2SP020
					
LLXLTN2SZ921	LLXLTN2SN891	LLXLTN2SF920	LLXLTN2SF011	LLXLTN2SF1L0	LLXLTN2SK761
					

LLXLTN2SK981	LLXLTN2SK980	LLXLTN2SK970	LLXLTN2SYB81	LLXLTN2SYA81	LLXLTN3SH012
					
LLXFTN3SH702	LLXLTN3SH382	LLXFTN3SH422			
					

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Light Emitting Diodes

Panel Display Units

RG

Category	Character size (mm)	Package outline (mm)	Part No.	Dot size	Structure	Brightness Red (cd/m²)	Brightness YG (cd/m²)	Half-power angle (°)	Type
RG	□320	320 × 320	LNP120021	□18	16 × 16	1 000	1 500	120	Outdoor
	□240	240 × 240	LNP129041	□13	16 × 16	1 800	1 000	120	
	□160	160 × 160	LNP128081	ϕ7.5 OVAL	16 × 16	1 500	1 500	70	
	□144	288 × 144	LNP178011	ϕ8	32 × 16	100	120	60	Indoor
			LNP178021			250	250		
	□96	96 × 96	LNP125024	3.2 × 2.5	16 × 16	130	150	160	
			LNP143024		24 × 24	250	200		
		192 × 96	LNP175024		32 × 16	130	150		
			LNP193024		48 × 24	250	200		
	□64	64 × 64	LNP123031	ϕ3	16 × 16	100	100	90	
			LNP123071			400	300	80	
		128 × 64	LNP173014	1.6 × 1.25	32 × 16	150	150	160	
			LNP173024	3.2 × 2.5		350	300		
	□60	120 × 60	LNP192014	1.6 × 1.25	48 × 24	150	150	160	
	□40	40	LNP172024	1.6 × 1.25	32 × 16	200	300	160	

Full Color / White

Category	Character size (mm)	Package outline (mm)	Part No.	Dot pitch (mm)	Dot structure	Brightness White (cd/m²)	Half-power angle (°)	Feature	Type
Full Color	□480	480 × 480	LNP721311	30	16 × 16	5 000	120	Dual side maintenance	Outdoor
	□320	320 × 320	LNP720311	20	16 × 16	5 000	120	Front maintenance	
			LNP720321					Back maintenance	
			LNP720311W	10	32 × 32			Dual side maintenance/ Double scan	
	□240	240 × 240	LNP729311	15	16 × 16	5 000	120	Dual side maintenance	
	□96	192 × 96	LNP793224	4	48 × 24	1 600	170	Back maintenance	Indoor
			LNP775224F	6	32 × 16				
	□64	128 × 64	LNP773224F	4	32 × 16	1 600	170	Back maintenance	
White	□96	192 × 96	LNP093014S	4	48 × 24	1 600	170	Back maintenance	
			LNP075244F	6	32 × 16				
	□72	144 × 72	LNP092014S	3	48 × 24	1 600	170	Back maintenance	
	□64	128 × 64	LNP073024	4	32 × 16	1 200	130	Back maintenance	

Infrared Light Emitting Diodes

Part No.	Package	Type	I_F (mA)	P_D (mW)	P_O I_E*1 min. (mW)	V_F max. (V)	λ_p typ. (nm)	θ typ. (°)
LNA2603F	LETFSN2S0001	Side view	100	160	3	1.6	940	80
LN54	LETLSN2S0001		50	75	2.5	1.5	950	17
LN55	LETLSN2S0002				1.8			35
LN58	LETLSN2S0003							
LN65	LETLSN2S0002		100	160	4.3	1.6		
LN75X				180	6	1.8	880	25
LN78	LETLSN2S0003							40
LN152	MEDLTN2S0001	TO-18 (Small)		160	5	1.6	950	100
LN162S	CEDLTN2S0001	3 ϕ Ceramic	50	75	1.5	1.5		80
LN175	LETFSN2S0001	Side view	100	170	7	1.7	900	120
LNA2W01L	LETLTN2S0001	Double end	50	75	3	1.5	950	18
LNA4401L	MECLTN2S0001	TO-18	100	190	6	1.9	860	6
LNA4905L	LEXLTN2S0001	5 ϕ Plastic Long lead			15	2.1	880	15
LN77L	LEXLTN2S0002	5 ϕ Long lead			10	1.9	860	20
LNA4801L	LEXLTN2S0003	3 ϕ Plastic			12 mW/sr.			22
LN66F	LEXLTN2S0004	5 ϕ Plastic	50	75	13 mV/sr.*1	1.5	950	15
LN66ANC	LEXLTN2S0005		100	160	9 mW/sr.	1.6		20
LNA2802L	LEXLTN2S0003	3 ϕ Plastic	50	75	2.5	1.5		
LN69	LEXLTN2S0006	3 ϕ Long lead			3.5 mV/sr.*1		940	15
LNA2801L		3 ϕ Plastic			6 mW/sr.*1			
LNA2902L	LEXLTN2S0007	5 ϕ Plastic Long lead	100	160	9 mW/sr.	1.6	950	20
LNA2903L	LEXLTN2S0004	5 ϕ Plastic						
LNA2904L					10 mW/sr.			

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Photo Detectors

PIN Photodiodes

Part No.	Package	Type	Reverse Voltage V_R (V)	Dark Current I_D max. (nA)	Photo-current I_L min. (μA)	Peak Emission Wavelength λ_p typ. (nm)	Response Time t_r, t_f typ. (ns)	Half-power Angle θ typ. (°)
PNZ330CL	MPDLTN2S0001	TO-18 (Resin mold)	30	10	7/5	850/900	2	70
PNZ330CLNC								
PNZ334	LPTFTN2S0001	5 ϕ Plastic			5	850		
PNA3602L	LPTLSN2S0001	Side view						45
PNZ335	LPTFSN2S0001							70
PNA3W01L	LPTLTN2S0001	Double end		50		800	50	24
PNZ313	LPTFSN2S0002	Side view (Visible light cut)			35	940		65
PNZ313B		Side view (Responds to IR88)			15	960		
PNZ327	LPXFSN2S0001	TO-92			4.5	900		70
PNZ323		TO-92 (Responds to IR88)			4.5 (SIR)			
PNZ323B					3.2 (SIR)	970		

Photo ICs (Remote-control Receivers)

Part No.	Package	Type	Operating Supply Voltage V_{CC} typ. (V)	Supply Current I_{CC} typ. (mA)	Reception Distance L typ. (m)	Center Frequency f_O typ. (kHz)
PNA4601M	LPTLSN3S0001	Lead	5.0	2.4	10	36.7
PNA4602M						38.0
PNA4618M					18	36.7
PNA4612M						38.0
PNA4701M			3.3	0.8	10	36.7
PNA4702M						38.0
PNA4801M	LPTLSN3S0002			0.2	14	36.7
PNA4802M						38.0
PNA4803M						40.0
PNA4811M					18	36.7
PNA4812M						38.0
PNA4813M						40.0
PNA4S02M	KPTLTM4K0001	SMD	5.0	1.9	15	38.0
PNA4S06M	KPTLTM4K0002		3.3	0.8		
PNA4S42M	KPTLTM4K0003		5.0	1.9	7	
PNA4S47M	KPTLTM4K0004		3.3	0.8		

Luminance Sensor

Part No.	Package	Type	Electrical/optical Characteristics			
			I_{CC} typ. (mA)	V_O (V_{CC} = 3.0 V)		λ_p (nm)
				L = 10 lx (V)	L = 100 lx (μA)	
PNA4K01F	KPTFTN6K0001	SMD	480	4.3	43	560
PNA4K04F	KPTFTN4K0001		456	4.1	41	
PNA4K11F	KPTFTN4K0002		480	4.3	43	

Photo ICs (Front monitor)

Part No.	Package	Features/Package	Supply Voltage (Dark Condition) I_{CC} typ. (mA)	Output Voltage V_O typ. (mV)/ at 100 μW	Output Offset Voltage V_{OFF} typ. (mV)	Response Time t_r, t_f typ. (ns)	Maximum Output Voltage V_{OM} typ. (V)
PNA4S54F	KPTFTN6K0002	For CD COMBO	15	–280	0	5	–2.2
PNA4U12F	KPTFTN6K0003	For COMBO DVD, V_{REF} = 2.5 V	18	–860/–480		—	
PNA4U15F	KPTFTN6K0004	For COMBO DVD, differential output	26	280/440		5	2.2
PNA4U23F		For COMBO DVD, differential output, V_{REF} = 1.65 V					
PNA4U17F	KPTFTN6K0005	For COMBO DVD, differential output, V_{REF} = 1.7 V		196/399			2.1
PNA4U31F				350/500			

Phototransistors

Part No.	Package	Type	Collector-emitter Voltage (Maximum Rating) V_{CEO} (V)	Photocurrent I_L min. (mA)	L (lx)	Collector-emitter Cutoff Current I_{CEO} max. (μA)	Half-power Angle θ typ. (°)
PNA1401L	MPCLTN2S0001	TO-18	30	1.5	100	0.3	10
PNA1401LF	MPCFTN2S0001			0.1			40
PNZ108*	MPCLTN3S0001		20	5		2	10
PNZ108CL*	MPDLTN3S0001			3.5	500		80
PNZ109L*	MPCLTN3S0001	TO-18 (Visible light cut)			100		10
PNZ115*	LPTLSN3S0001	Side view		2			35
PNZ120S	CPDLTN2S0001	3 ϕ Ceramic	30	3 μA	2	0.5	50
PNZ121S			20	0.12	1 000	0.1	30
PNZ123S				0.475			
PNZ147	LPDLTN2S0001	Double end		3 μA	2	0.5	24
PNZ150	LPTLSN2S0002	Side view		1	500	1	35
PNZ154	LPTLSN2S0003					0.2	27
PN8154NC				0.7			
PNZ155	LPTFSN2S0001			0.05	100	1	70
PNZ158	LPTLSN2S0001			1	500		40
PNA1601M	LPTLSN2S0004			0.003 (SIR)	H = 15 μW/cm²	0.2	35
PNA1801L	LPXLTN2S0002	3 ϕ Plastic	30	0.8	500	0.5	30
PNA1803L			20	1.0	1 000	0.5	
PNZ202S✪	CPDLTN2S0001	3 ϕ Ceramic		0.2	2		
PNA2W01M✪	LPDLTN2S0001	Double end		0.5			18
PNZ263L✪	LPTLSN2S0005	Side view		60 μ (SIR)	H = 3.75 μW/cm²		25
PNA1101L	CPDLTN2S0001	3 ϕ Ceramic		1.05	1 000	0.1	30
PNA1606L	LPTLSN2S0003	Side view		1.0	500	0.2	27

∗: With base pin ✪: Darlington transistor

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Photo Interrupters

Transmissive Photosensors (Photo Interrupters)

Part No.	Package	Features	Forward Current I_F (mA)	Collector-emitter Voltage V_{CEO} (V)	Collector Current I_C min. (mA)	Collector-emitter Cutoff Current I_{CEO} max. (nA)	Response Time t_r, t_f typ. (μs)	Collector-emitter Saturation Voltage $V_{CE(sat)}$ max. (V)
CNA1301H	LSMSIN4S0001	Small, PCB drop mounting	50	35	0.1	100	35	0.4
CNA1311K	LSMSIN4S0002	Ultra-small type 1.0 mm gap			0.05		50	
CNA1312K	LSMSIN4S0003	Ultra-small type 2.0 mm gap			0.04			
CNA1303K	LSMSIN4S0004	Small type			0.1		35	
CNA1302K	LSMSIN4S0005				0.04			
CNZ1021	LSSSIR4S0001	Gap width 3 mm		30	0.5	200	5	
CNZ1023	LSSSIR4S0002							
CNA1009H	LSSSIR4S0003	Gap width 5 mm						
CNA1011K	LSSSIR4S0004	High resolution, thin type			0.3		6	0.5
CNA1012K	LSSSIR4S0005	High output			0.7			0.3
CNZ1120	LSSNIR4S0001	Wide gap		20	1.0			0.4
CNA1006N	LSSSIR4S0006	Horizontal sensor with hook		30	0.7		5	
CNA1007H	LSSSIR4S0007	Yellow slit with boss			0.5			

Reflective Photosensors (Photo Reflectors)

Part No.	Package	Features	Forward Current I_F (mA)	Collector-emitter Voltage V_{CEO} (V)	Collector Current I_C min. (mA)	Collector-emitter Cutoff Current I_{CEO} max. (nA)	Response Time t_r, t_f typ. (μs)	Collector-emitter Saturation Voltage $V_{CE(sat)}$ max. (V)
CNZ2153	LSSLRR4S0001	High-speed response	50	30	0.1	0.2	6	0.5
CNZ2253✪	LSSLRR4S0001	High sensitivity		20	3	0.5	150	1.5
CNB1302	LSMFRN4S0001	Visible light cut, small, thin type		30	0.09	0.2	20	0.4
CNB1301	LSSLRR4S0001	Visible light cut, small type			0.8			0.5
CNB1009	LSSLRR4S0002	High-speed response		20	0.1		6	0.3
CNZ2179	LSSLRR4S0003				0.18		20	0.5
CNB2301✪	LSMFRN4S0001	Visible light cut, small, thin type			0.46	1.0	150	1.5
CNB1001*	LSMFRN4G0001			35	0.023	0.1	30/40	0.4
CNB1002*	LSMFRN4G0001							
CNB2001*	LSMFRN4G0001	Video headphone, etc. reel sensor			0.52	1	120/115	1.2
CNB1011	LSMFRN4G0002	Small type visible light cut SMD ultra small type, thin type	30		0.04	100	40/50	0.4
CNB2003✪	LSMFRN4S0002	Visible light cut SMD	50		0.52	10	120/115	1.2

✪: Darlington output *: Surface-mount device

Integrated Photosensors

Part No.	Package	Supply Voltage V_{CC} (V)	Output Voltage: Low Level V_{OL} max. (V)	Output Voltage: High Level I_{OH} max. (μA)	Threshold Input Current I_{Fth} max. (mA)
CNA4302A	LSMS1N5S0001	2.2 to 7	0.4	100	2

Optoisolators

Part No.	Package	Features	Collector-emitter Voltage (P-Tr) V_{CEO} (V)	Isolation Voltage, Input to Output V_{ISO} min. (V_{rms})	AC Current Transfer Ratio CTR (%)	Rise Time t_r typ. (µs)
CNC1S101	LCTXXN4Z0001	High breakdown voltage	80	5 000	100 to 600	2
CNZ3132	LCTXXN8Z0001	High breakdown voltage (2 reams)				
CNZ3133	LCTXXN1Z0001	High breakdown voltage (3 reams)				
CNC1S171	LCTXXN4Z0002	High breakdown voltage			50 to 600	
CNC7S101	LCTXXN4Z0001	High breakdown voltage AC input			20 to 300	4
CNZ3731✪		High breakdown voltage, High V_{CEO}, High output	300/350		1 000 to	40
CNC2S501✪						

✪: Darlington output

IrDA

Part No.	Package	SIR/ FIR	Package size (mm)	Maximum reception distance min. (cm)	Interface voltage V_{IO} min. (V)	Remote control function	Operating power supply voltage V_{CC} (V)	LED drive power supply voltage V_{LEDA} (V)
CND0204A	KMTLSM7K0001	SIR	1.6 × 7.2 × 2.6 (Side view)	20	V_{CC} to 0.3	—	2.4 to 3.3	2.8 to 4.5
CND0224A	KMTLSM7K0002					○		
CND0212A	KMTLSM7K0003			50		—		2.6 to 4.2
CND0213A	KMTLSM7K0004			20	1.5			2.7 to 4.5
CND0215A	KMTLSM7K0005					○	2.8 to 4.5	
CND0208A	KMTLTM7K0001		2.05 × 8.2 × 1.7 (Top view)	50	V_{CC} to 0.3	—	2.4 to 3.3	2.6 to 4.2
CND0209A	KMTLTM7K0002			20		○		2.8 to 4.5
CND0214A	KMTLTM7K0003				1.5	—		2.7 to 4.5
CND0216A	KMTLTM7K0004					○	2.8 to 4.5	
CND0312A	KMTLSM8K0001	FIR	1.45 × 6.7 × 2.15 (Side view)				2.5 to 3.3	2.7 to 4.5
CND0322A	KMTLTM8K0001		1.65 × 8.2 × 1.7 (Top view)					

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Application Products

Hologram Unit

Application	Part No.	V_{CC} (V)	P_O (mW)		λ_p (nm)	I_{op} (mA)
CD player; Portable CD player	HUL7212	5	3.6		800	32
	HUL7215	3			795	
DVD player; Portable DVD player	HULT273	5	DVD	6	667	20
			CD	8	785	
	HULT276		DVD	5	667	50
			CD	6	785	40

Laser Diodes

Laser

Application	Part No.	P_O* max. (mW)		λ_p typ. (nm)	I_{th} typ. (mA)	I_{op} typ. (mA)
Dual-wavelength high-output type for DVD/CD recording/ playback	LNCT12PF	DVD	350	661	55	150
		CD		785		215
	LNCT16PF	DVD	300	661		130
		CD	330	785		215
	LNCT21PU	DVD	300	661	50	130
		CD	400	785	55	215
Blu-ray recording	LNC415FG	320		405	38	90

∗: P_O is the maximum pulsed output power

Package Outlines

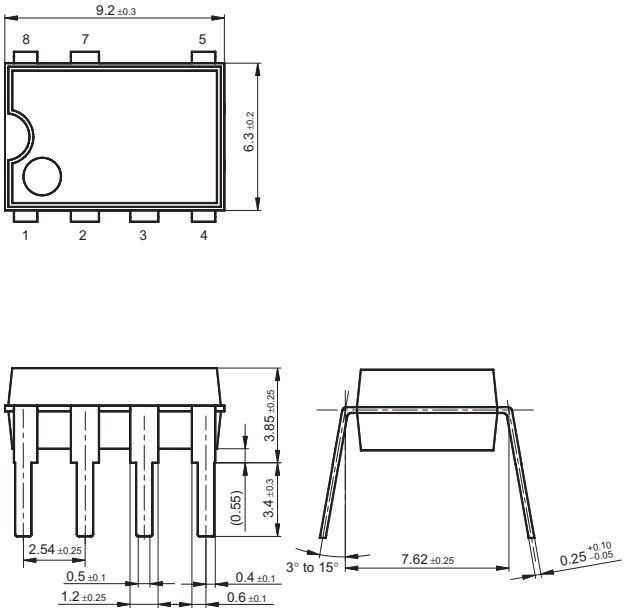
Information regarding package outlines not shown in this catalog can be obtained at the following URL

http://panasonic.net/sc/en/common_info/package

Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

DIP7-A1



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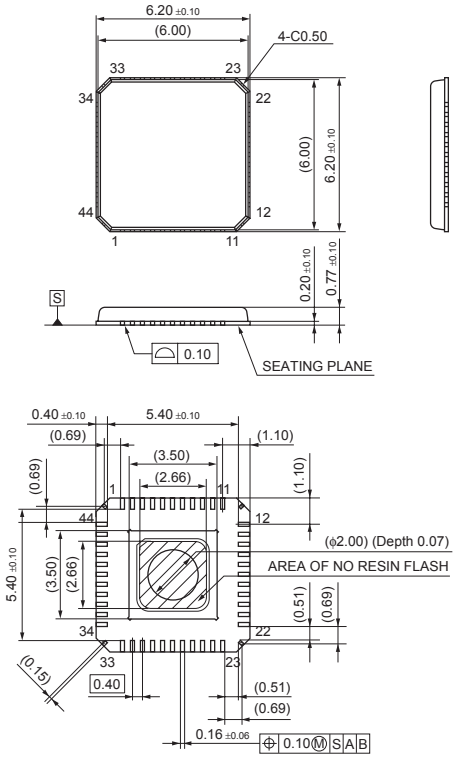

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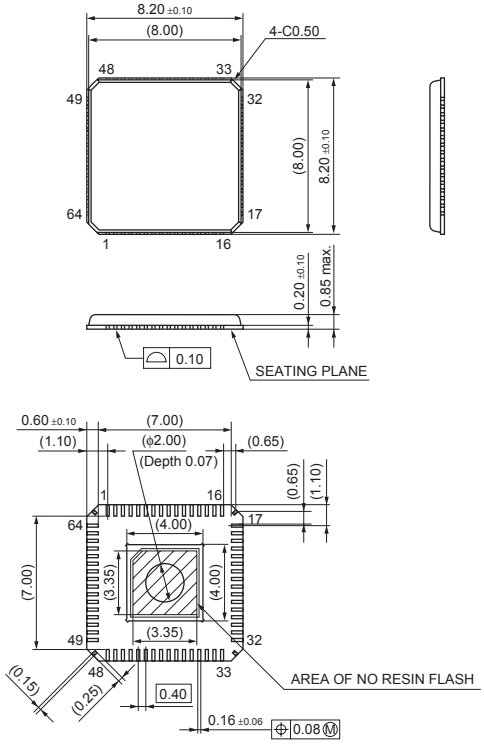

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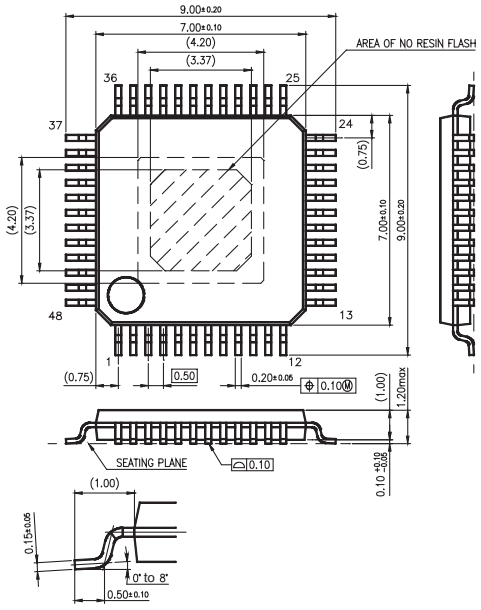

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Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

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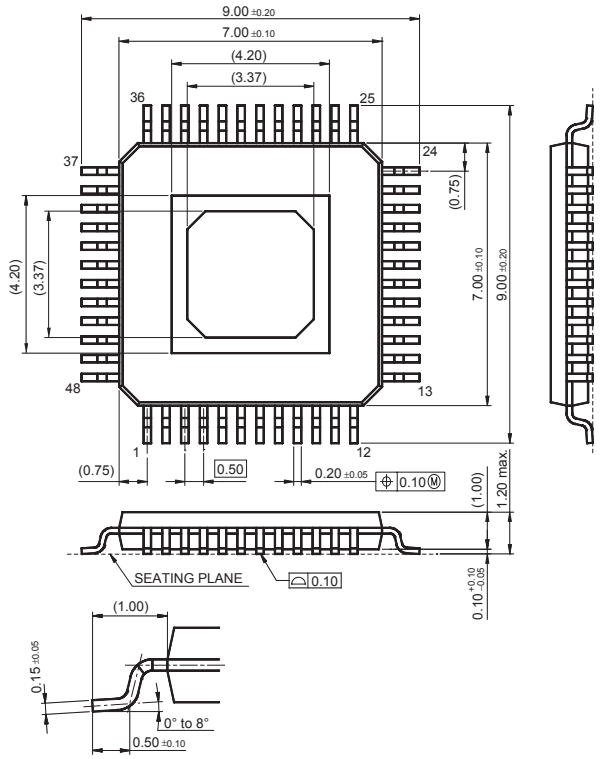

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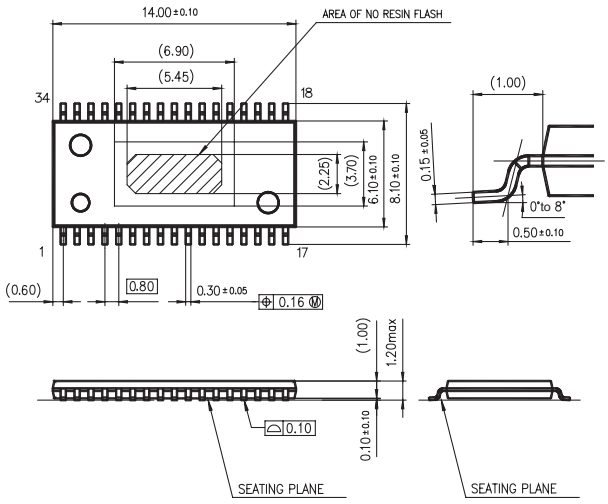

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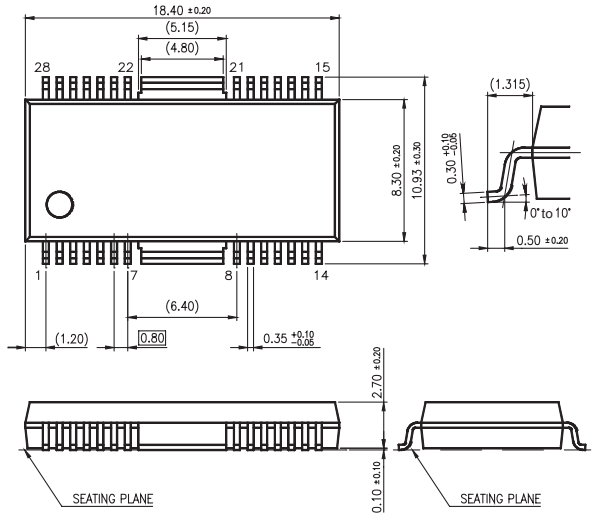

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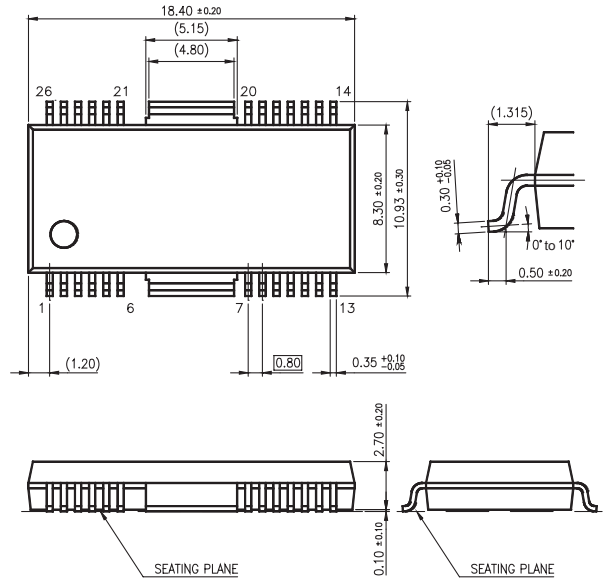
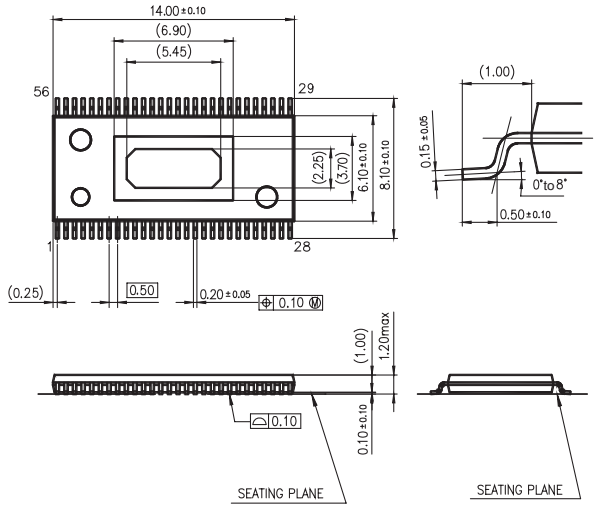


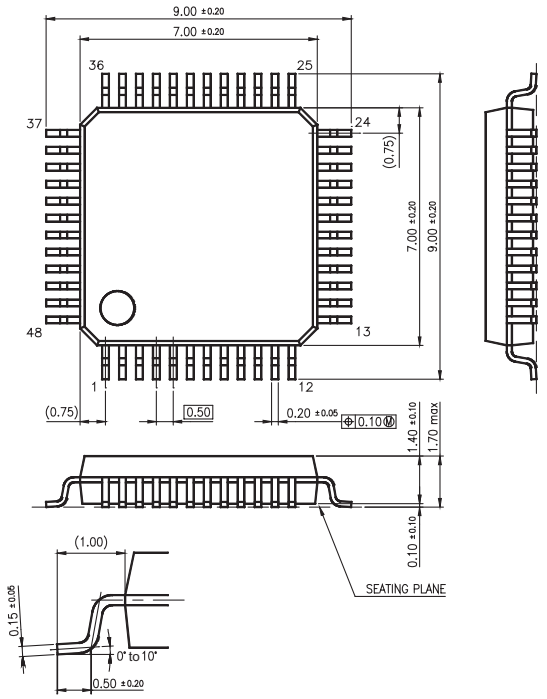
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

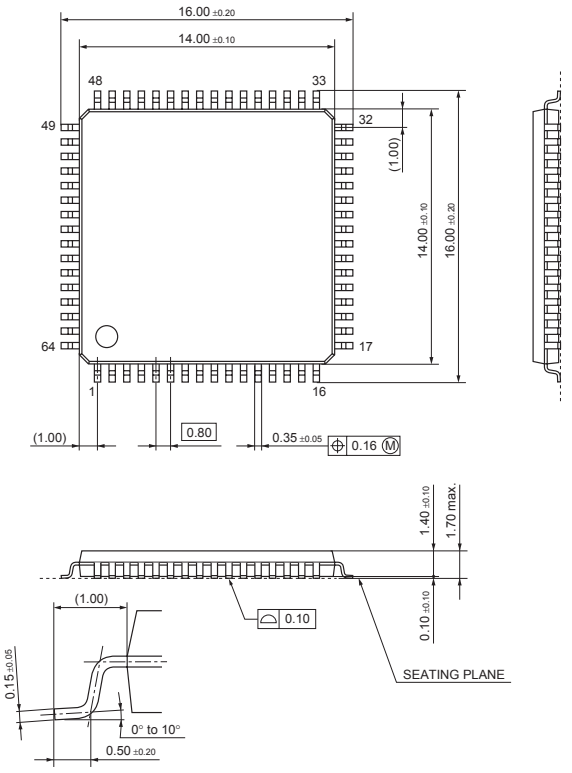
HSOP056-P-0300



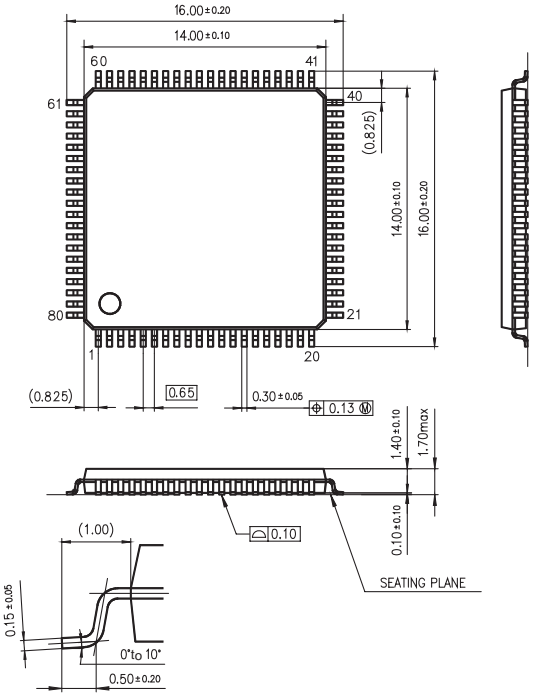
LQFP048-P-0707A



LQFP064-P-1414



LQFP080-P-1414A

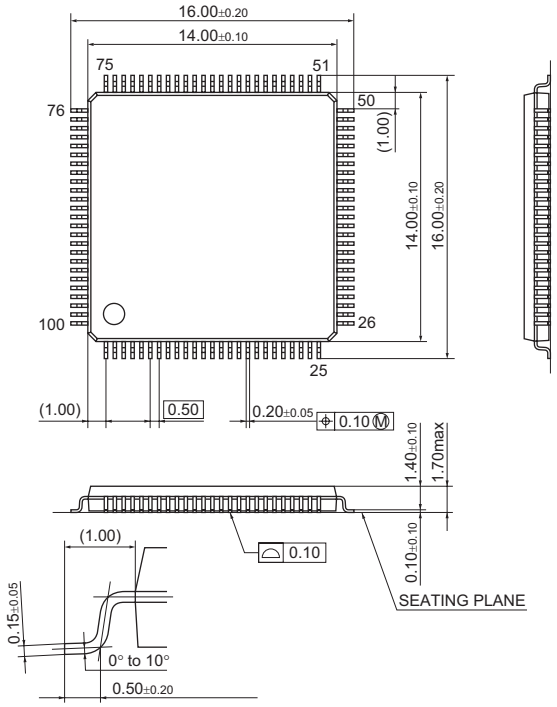


N

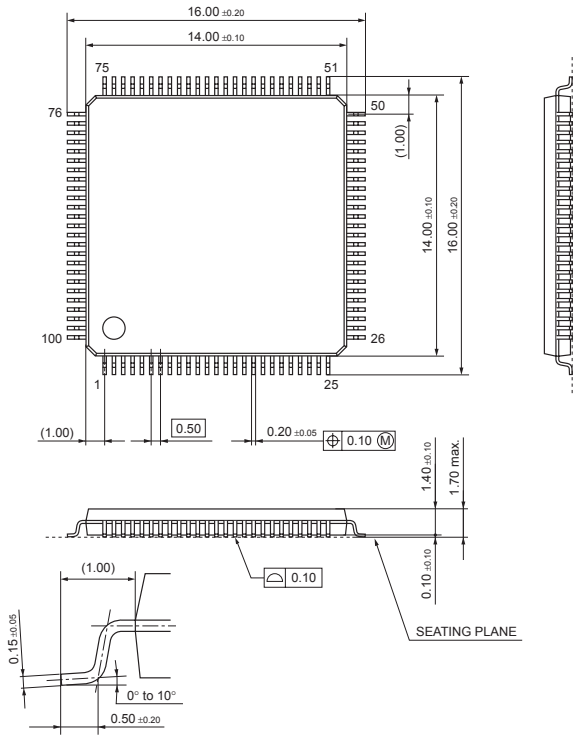
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

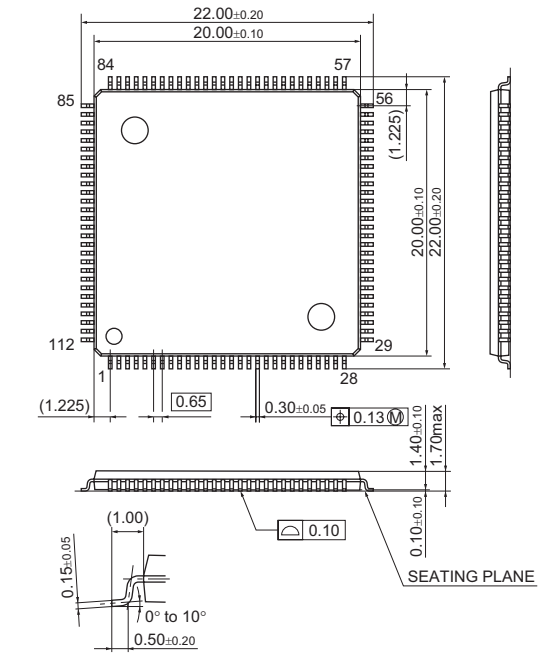
LQFP100-P-1414



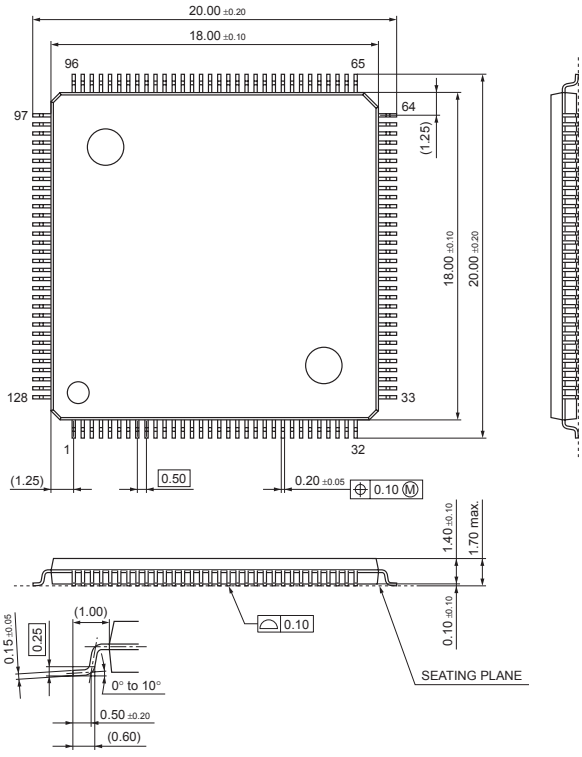
LQFP100-P-1414A



LQFP112-P-2020



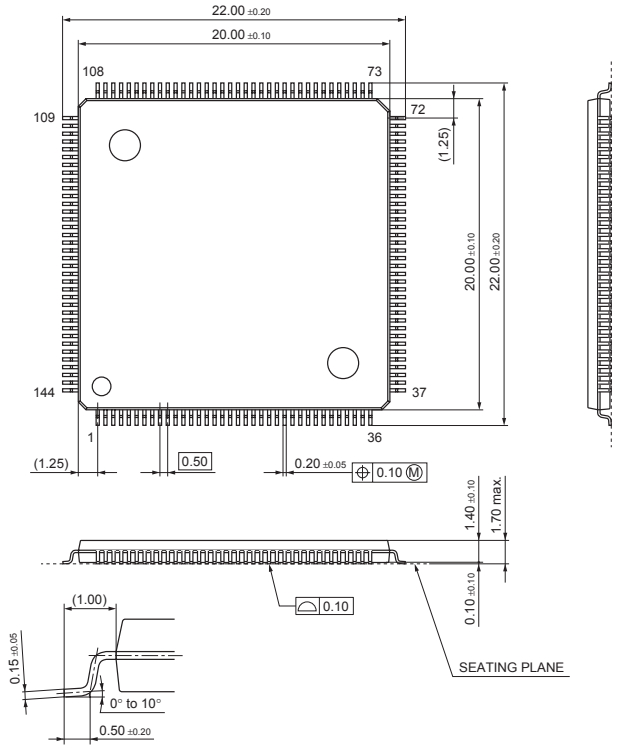
LQFP128-P-1818C



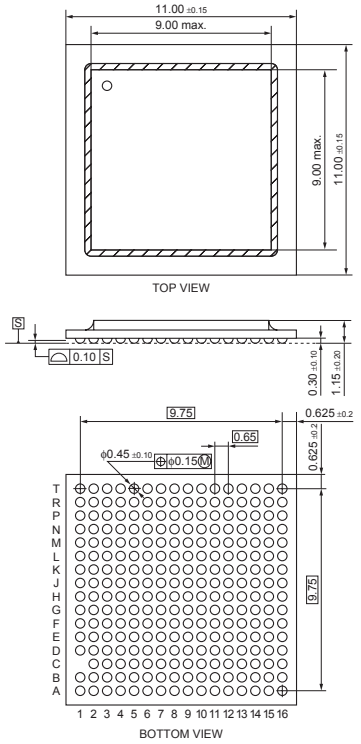
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

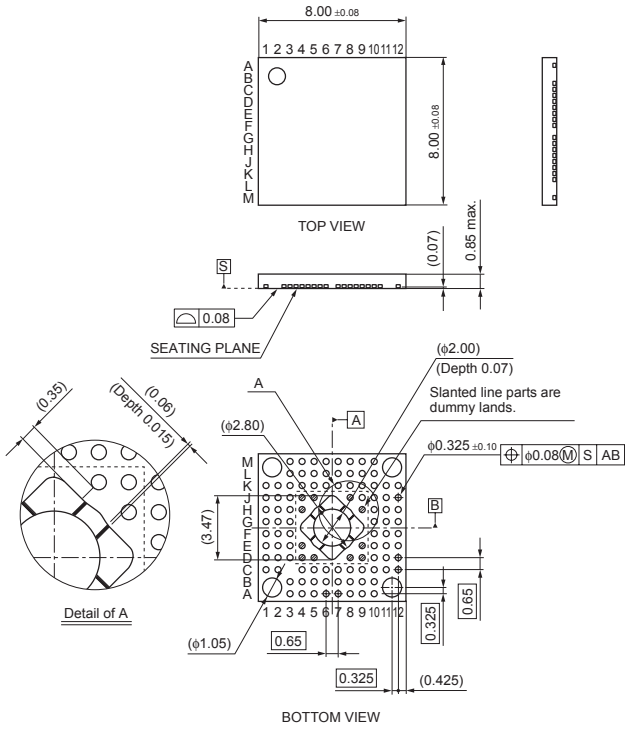
LQFP144-P-2020A



MBGA255-C-1111A

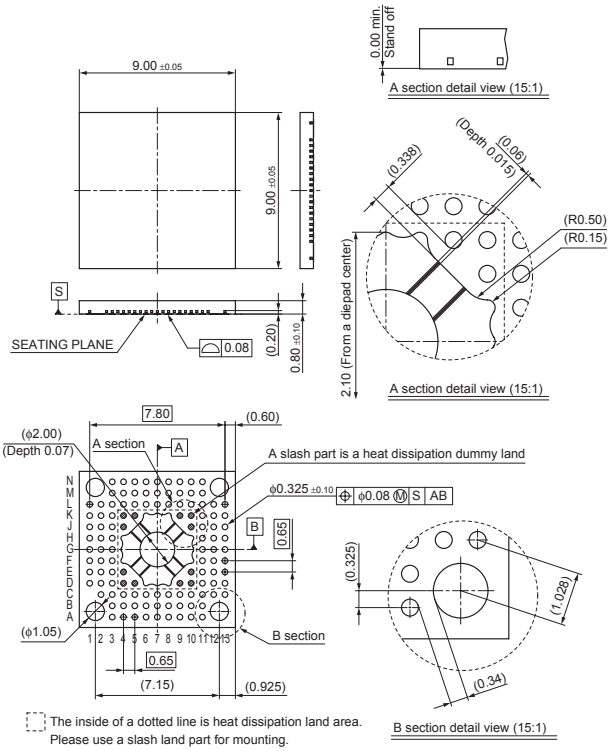


MLGA092-L2-0808



Lands of inside area shown with broken line flame are thermel ones.

MLGA107-L2-0909



The inside of a dotted line is heat dissipation land area.
Please use a slash land part for mounting.
(Diepad exposure part and a slash land are these potential.)

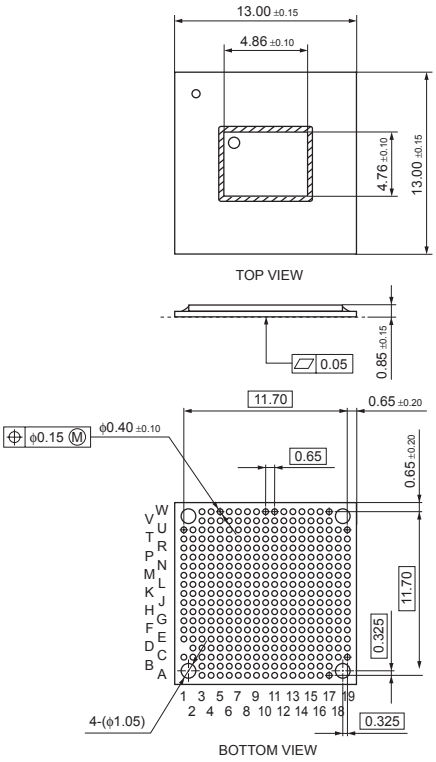
( ) Inside is a reference value.

N

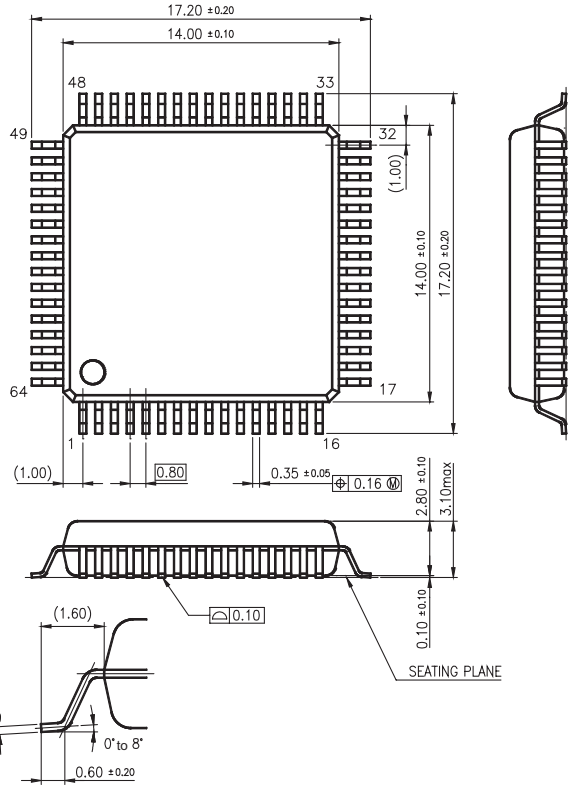
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

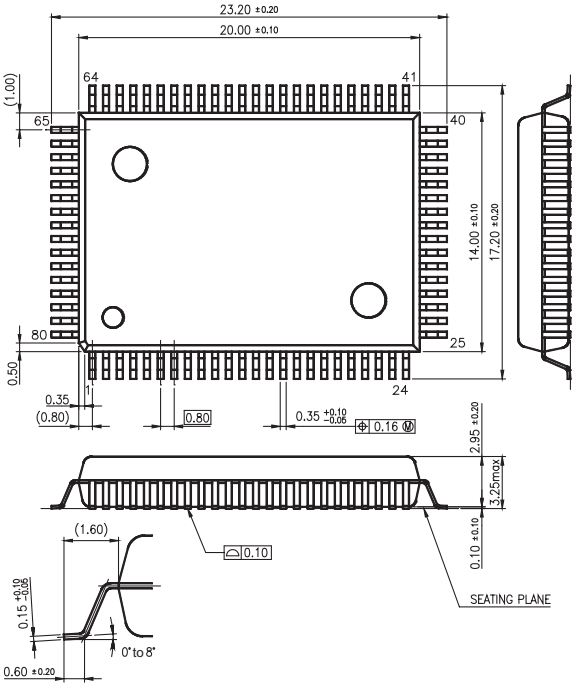
MLGA344-C-1313A



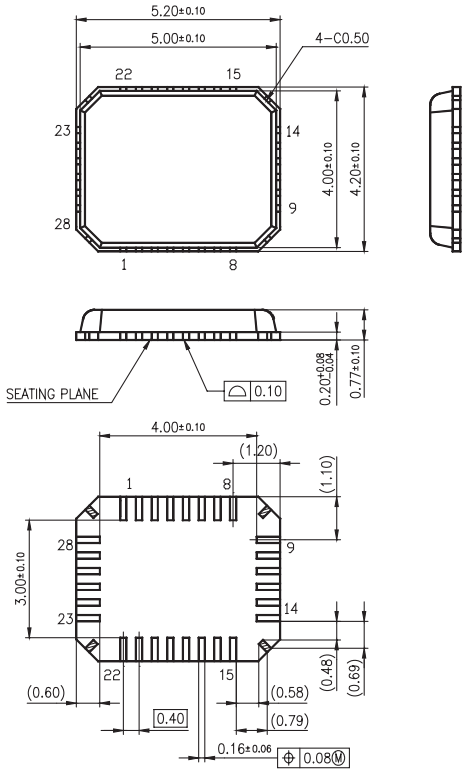
QFH064-P-1414H



QFH080-P-1420H



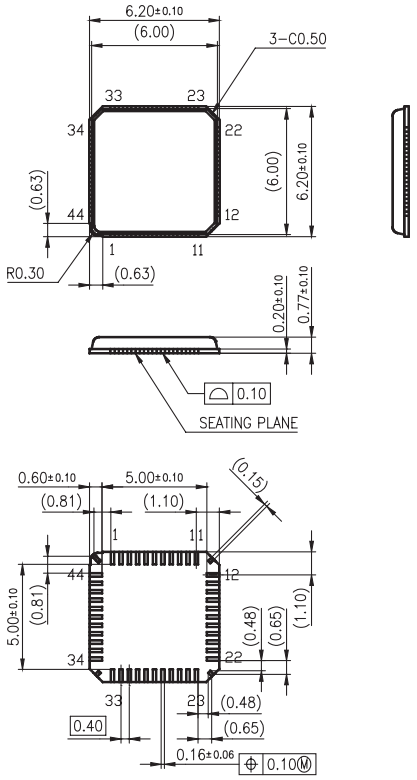
QFN028-P-0405B



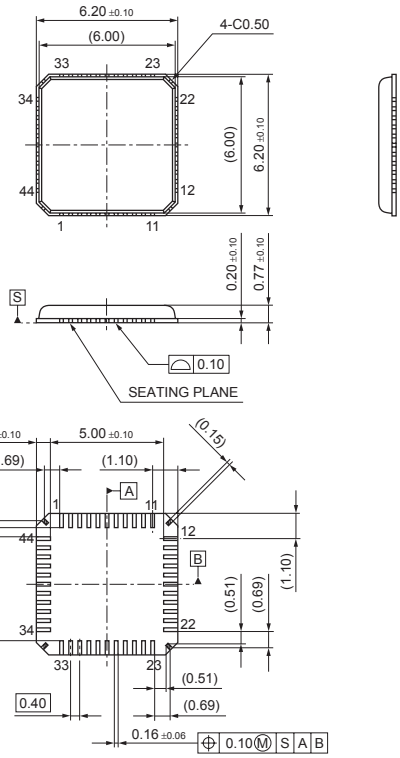
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

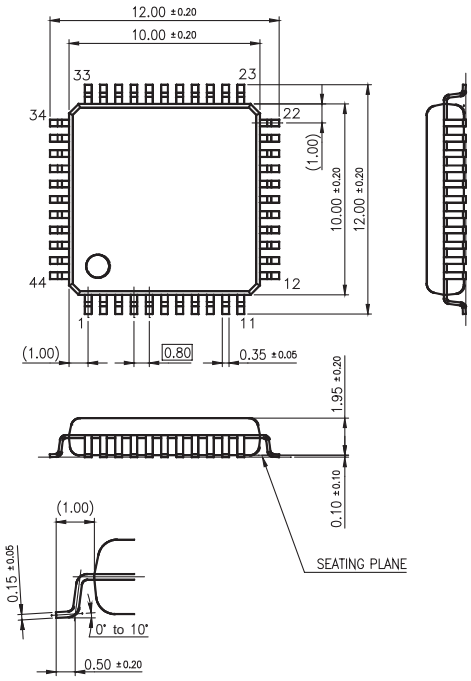
QFN044-P-0606A



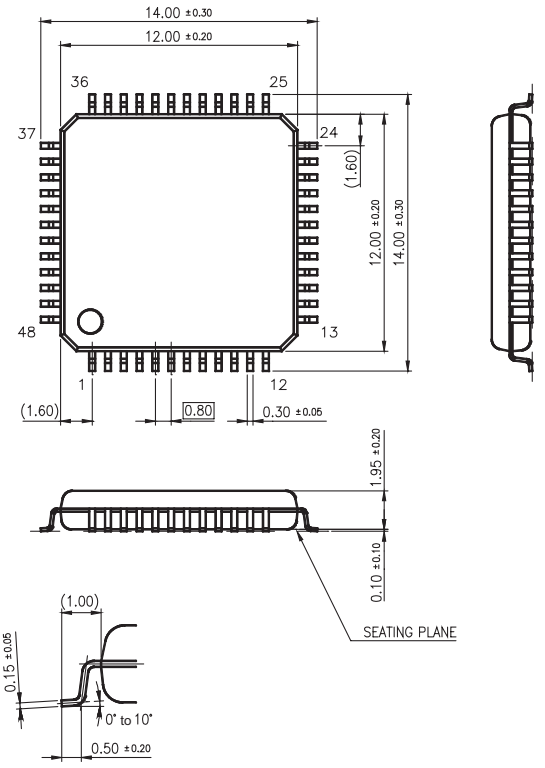
QFN044-P-0606C



QFP044-P-1010F



QFP048-P-1212C



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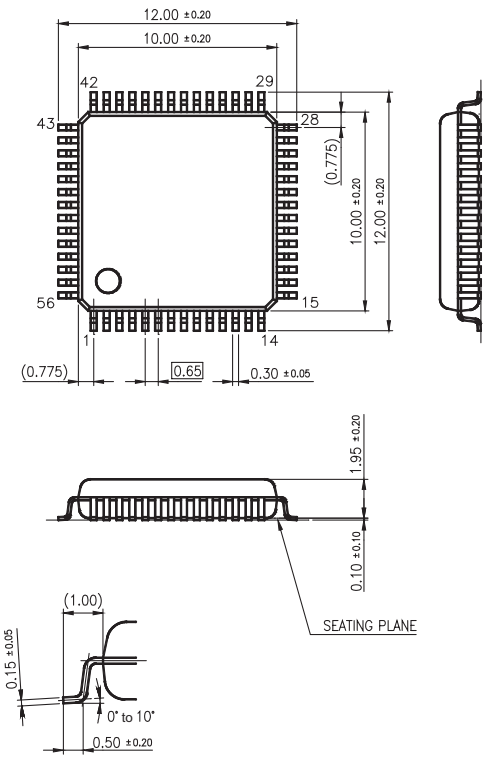
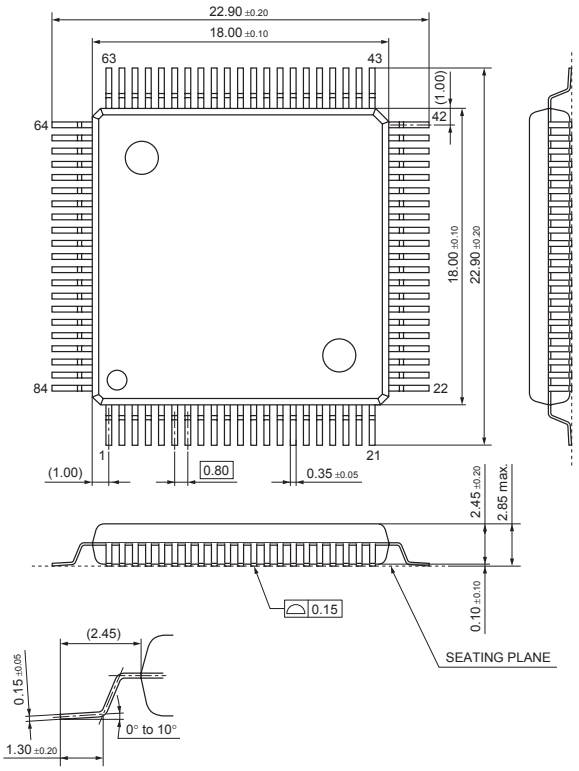
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

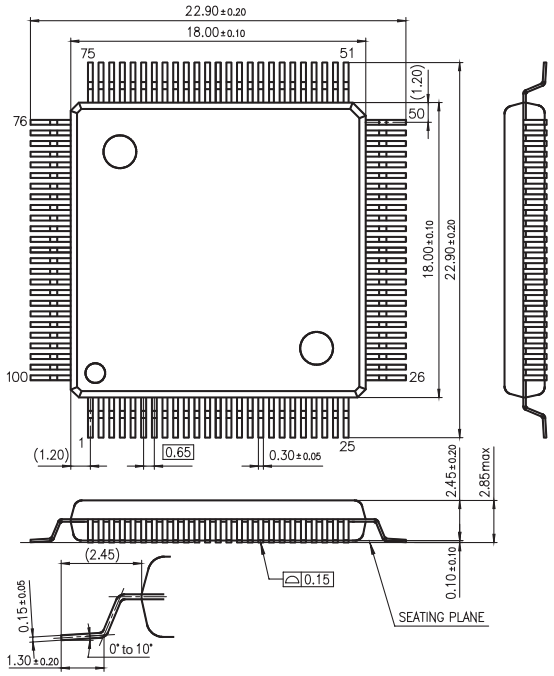
QFP056-P-1010B



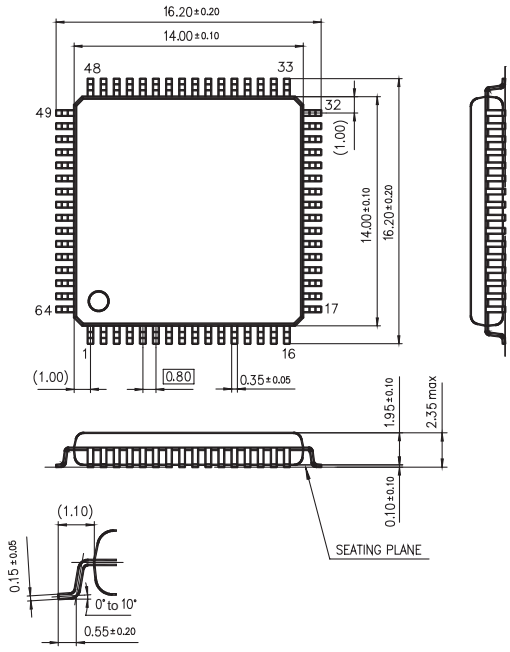
QFP084-P-1818E



QFP100-P-1818B



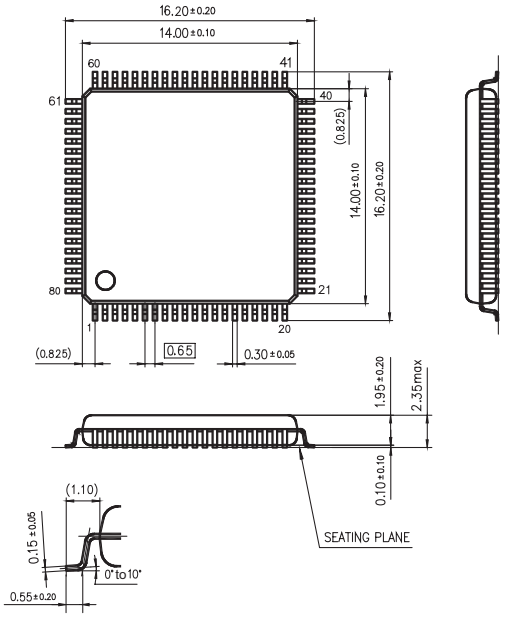
QFS064-P-1414C



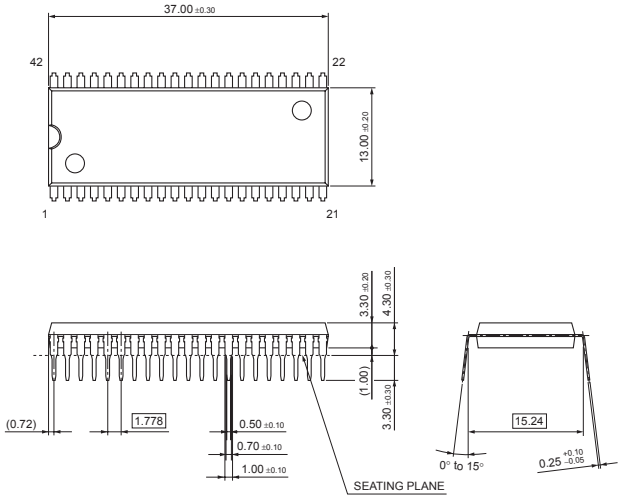
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

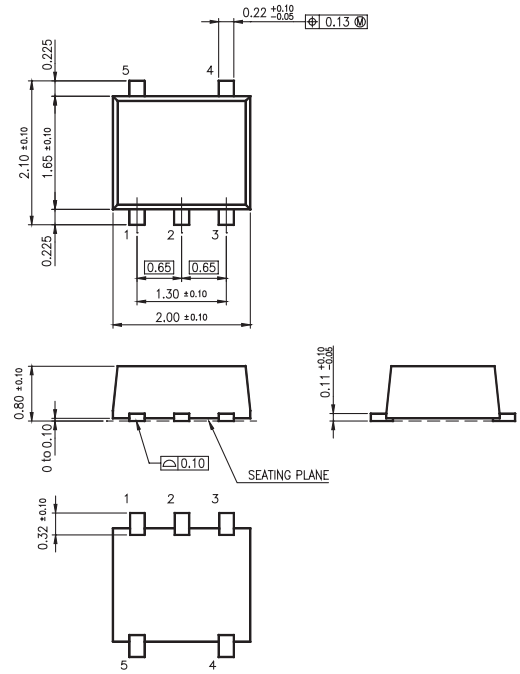
QFS080-P-1414D



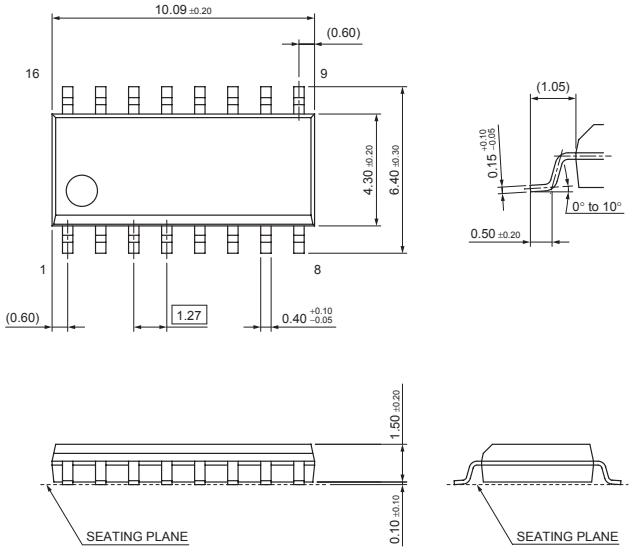
SDIP042-P-0600C



SMINI-5DA



SOP016-P-0225F



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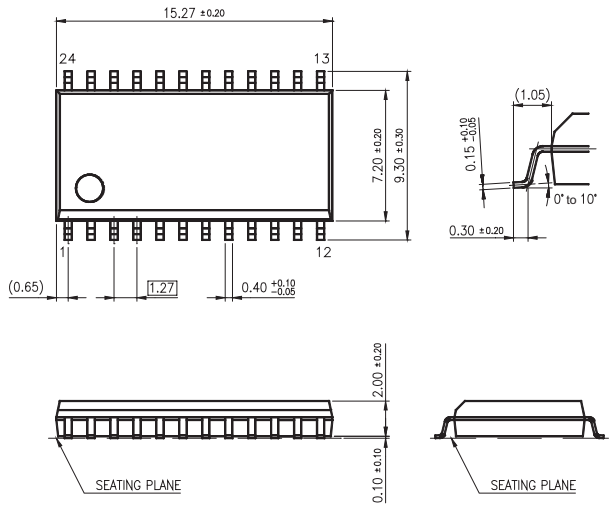
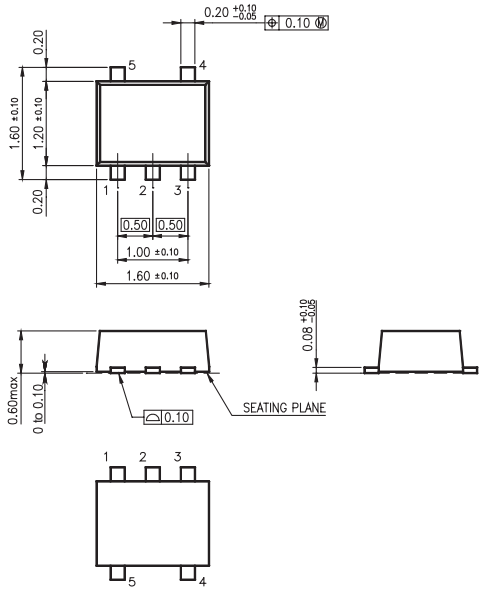
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

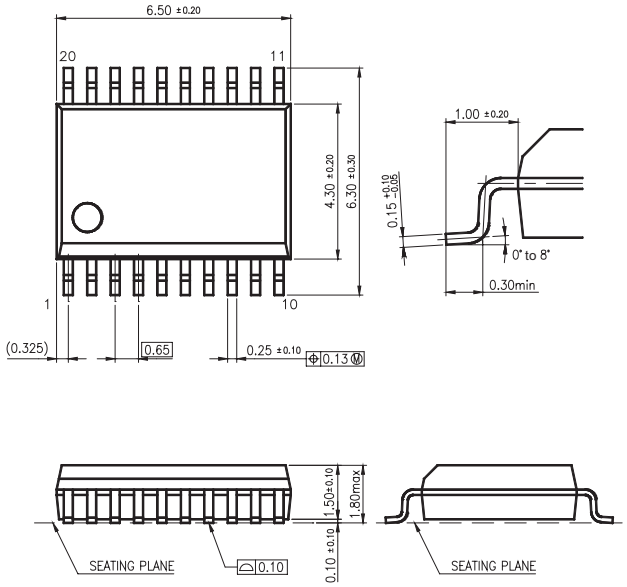
SOP024-P-0375C



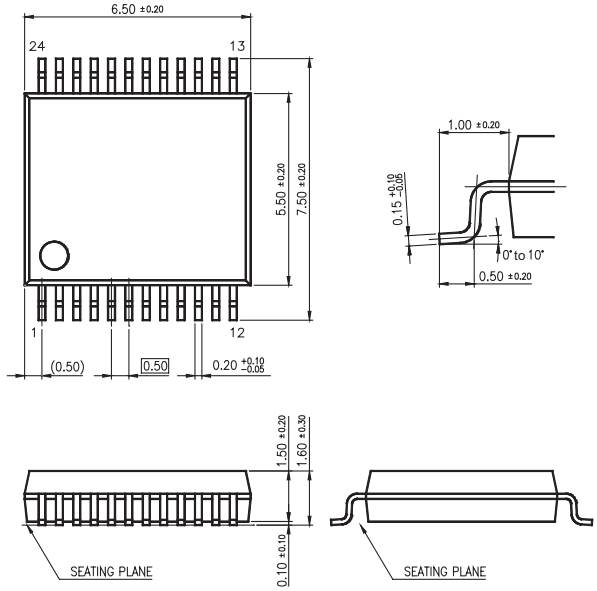
SSMINI-5DA



SSOP020-P-0225C



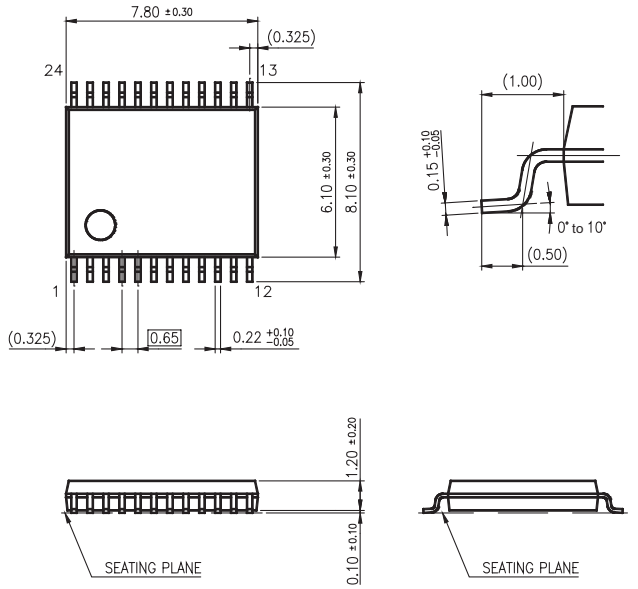
SSOP024-P-0300C



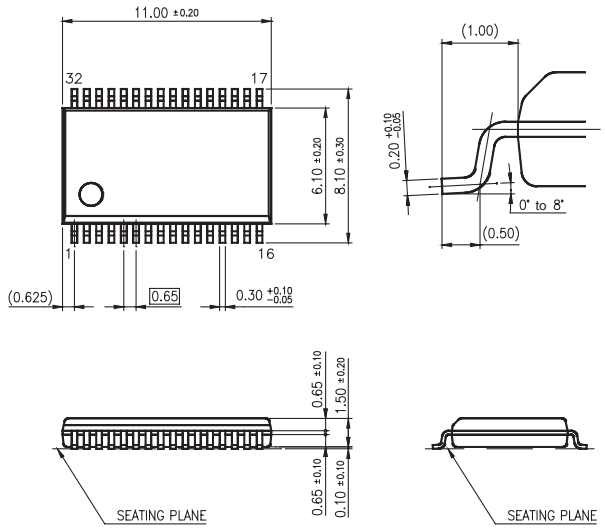
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

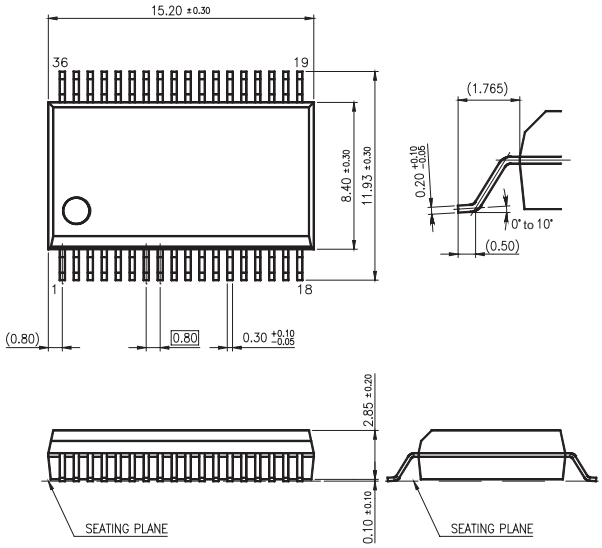
SSOP024-P-0300E



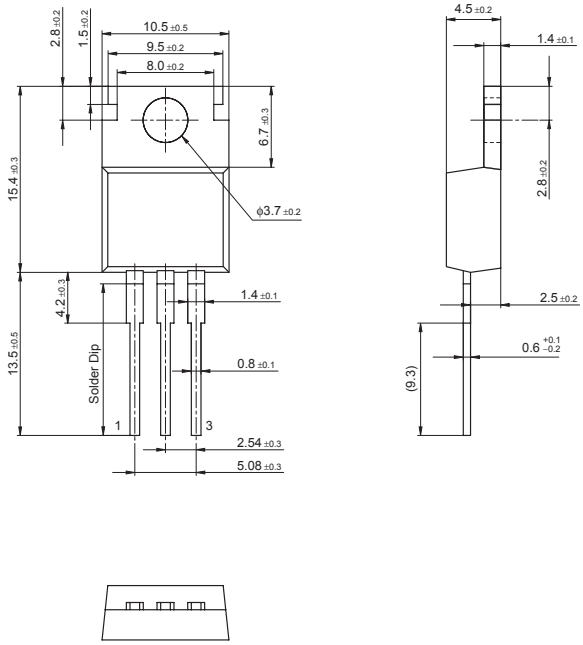
SSOP032-P-0300B



SSOP036-P-0450C



TO-220-A2

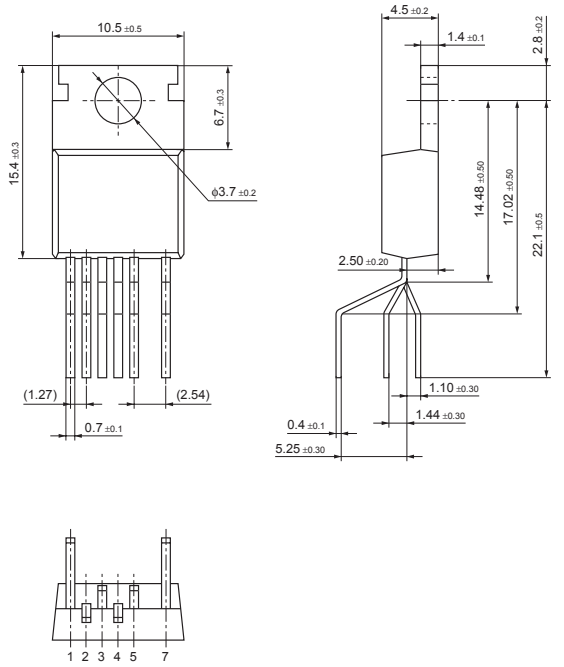


N

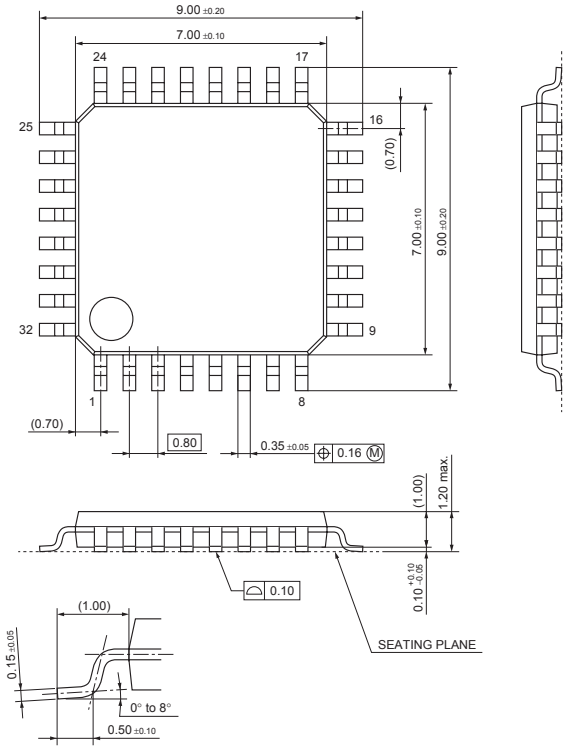
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

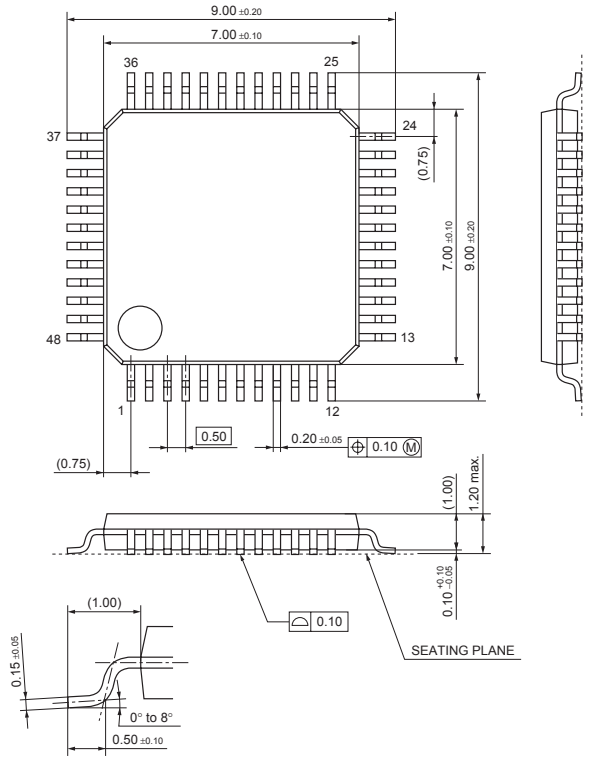
TO-220IPD7-A2



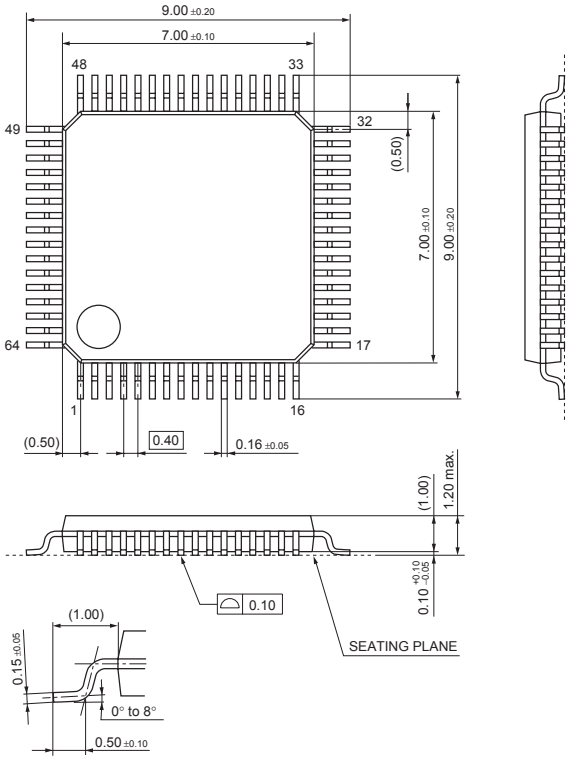
TQFP032-P-0707A



TQFP048-P-0707B



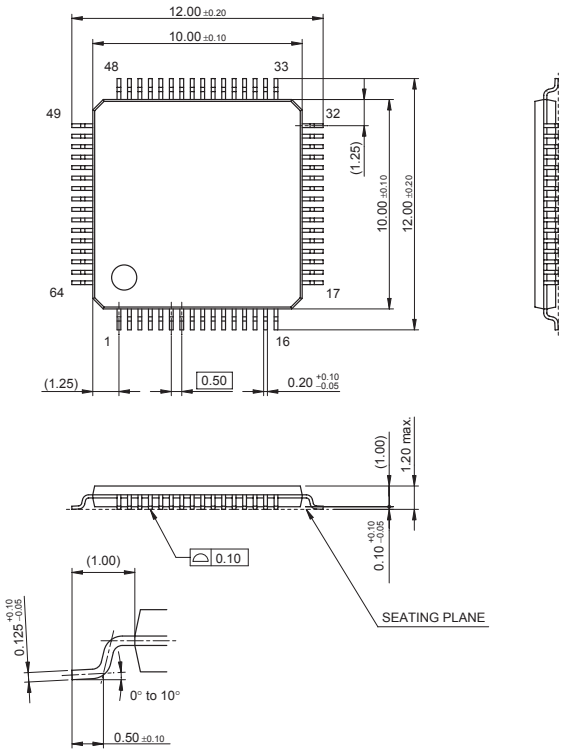
TQFP064-P-0707



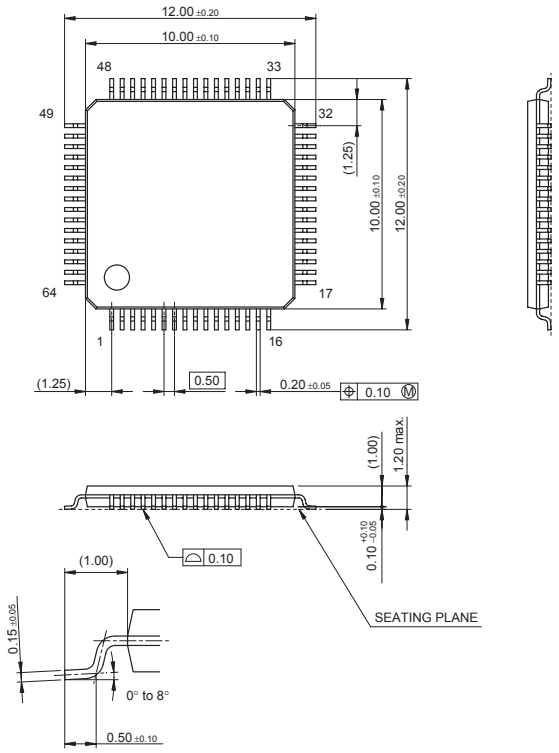
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

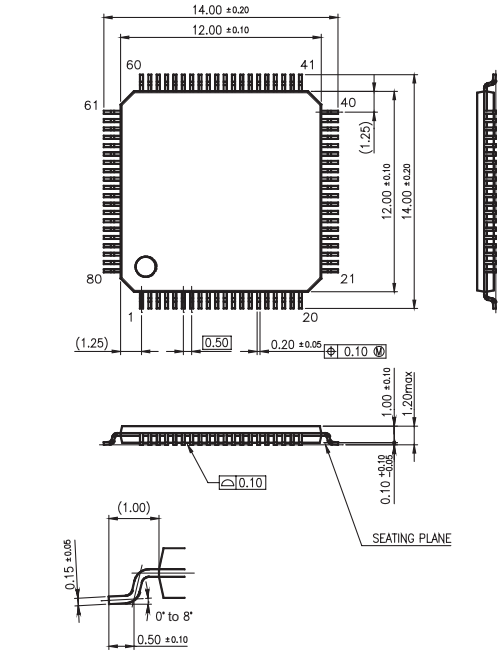
TQFP064-P-1010B



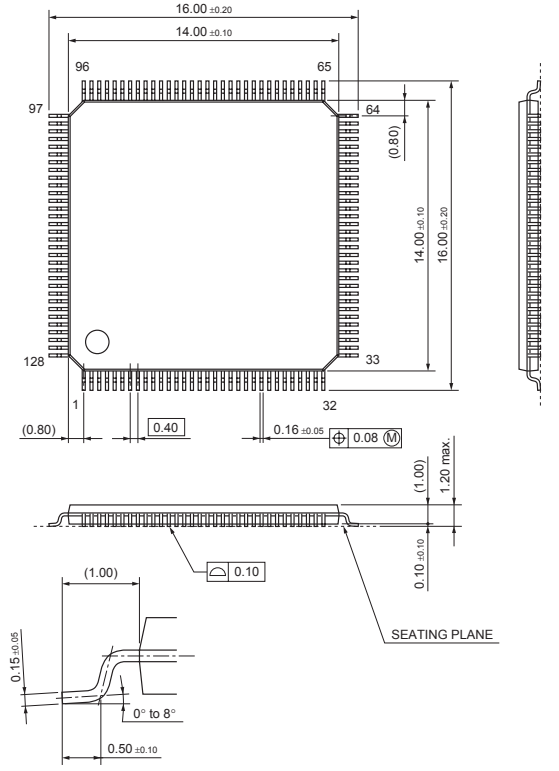
TQFP064-P-1010C



TQFP080-P-1212D



TQFP128-P-1414A

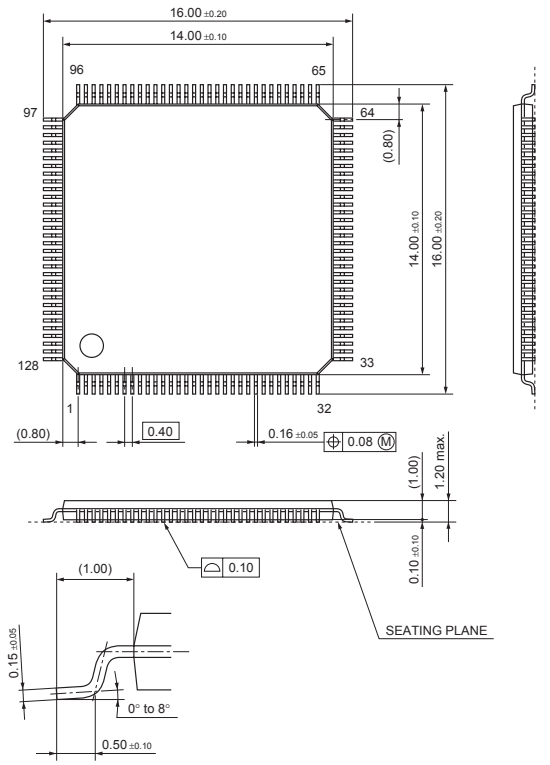


N

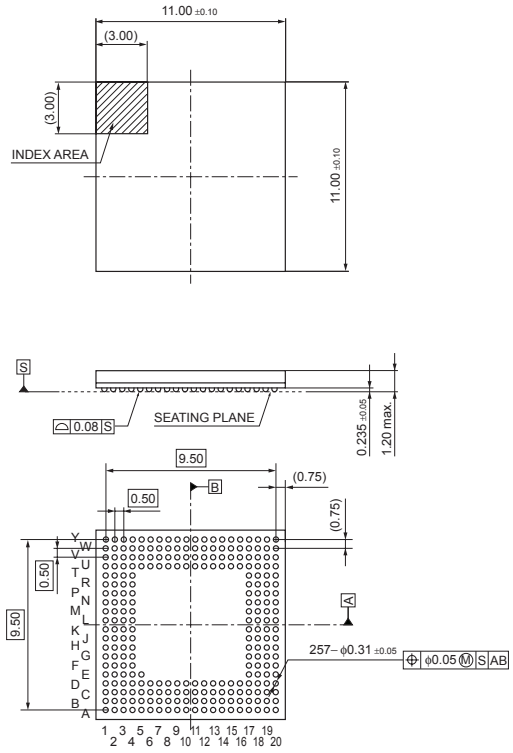
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

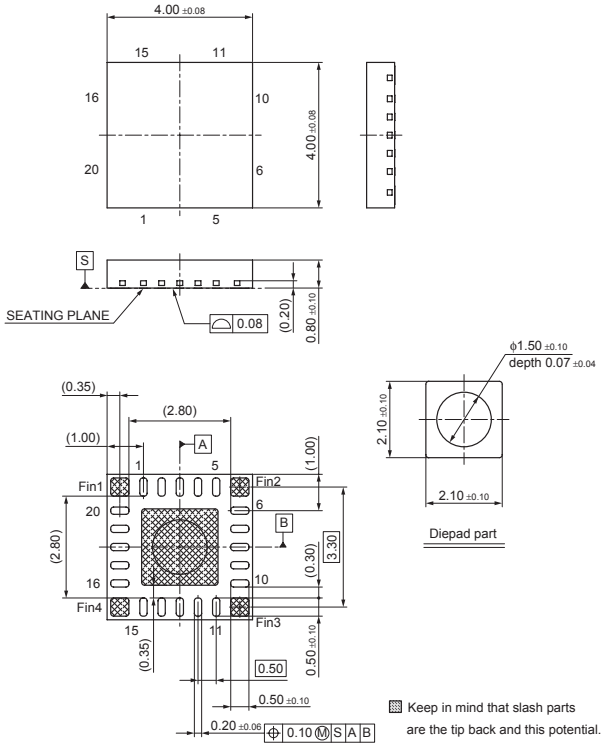
TQFP128-P-1414C



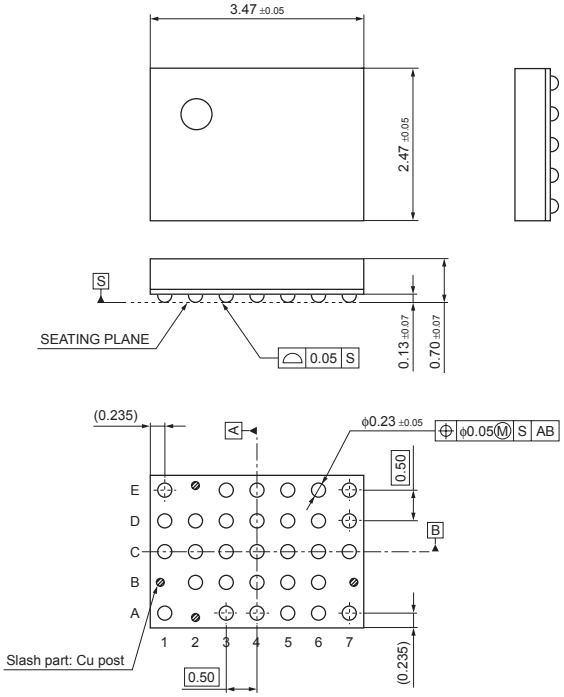
UBGA257-P-1111A



ULGA020-L-0404



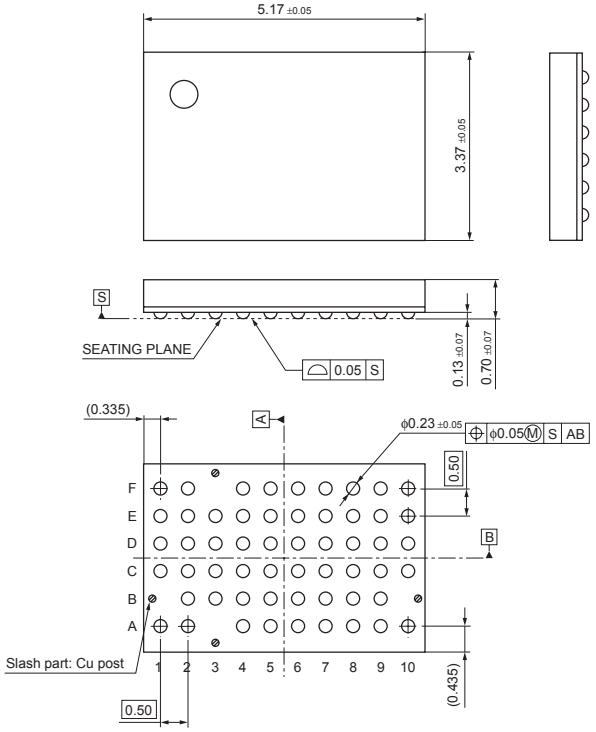
ULGA031-W-3525



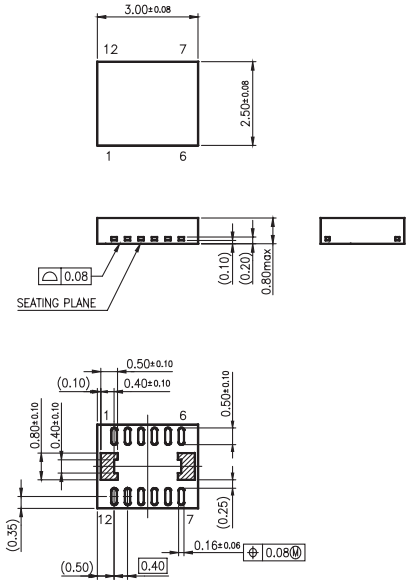
Package Outlines (Application-Specific Standard-Product ICs)

Unit: mm

ULGA054-W-5234



XLGA012-L-0303

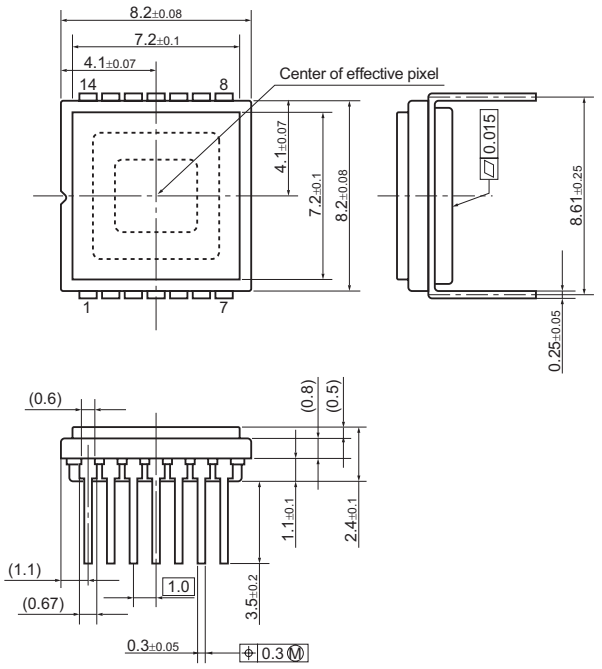


N

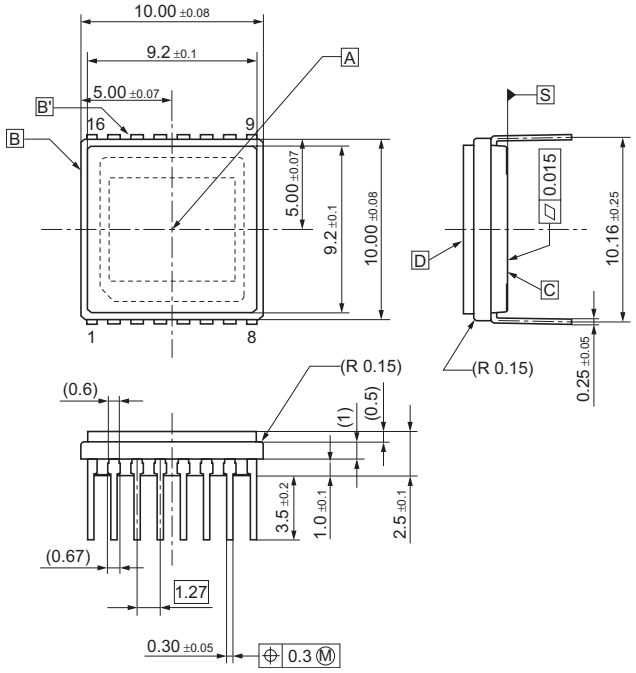
Package Outlines (Image Pickup Devices)

Unit: mm

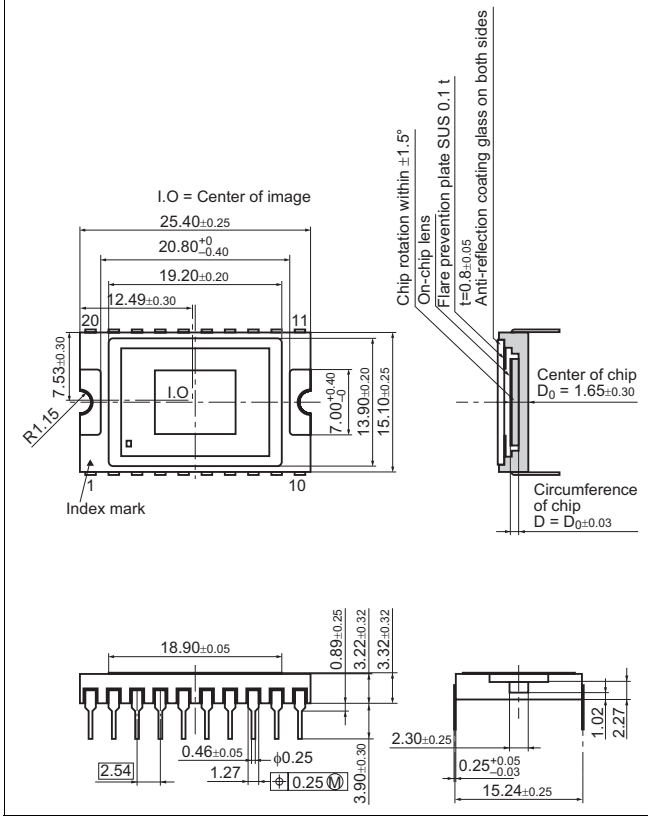
WDIP014-P-0350A



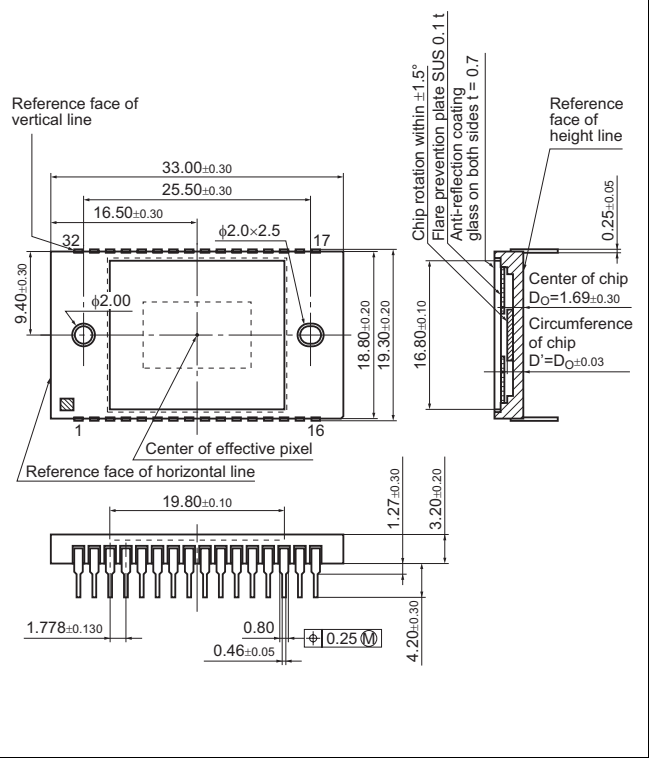
WDIP016-P-0400A



WDIP020-G-0600D



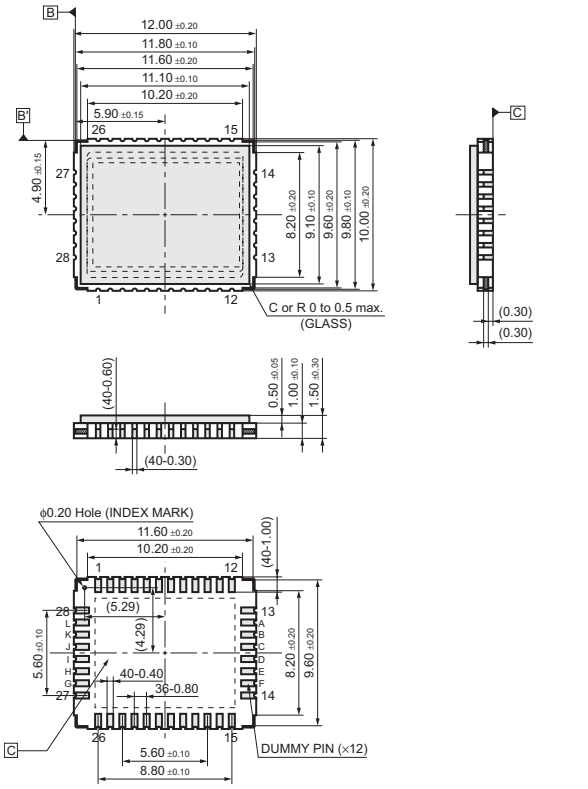
WDIP032-G-0750C



Package Outlines (Image Pickup Devices)

Unit: mm

WQFN040-C-1012



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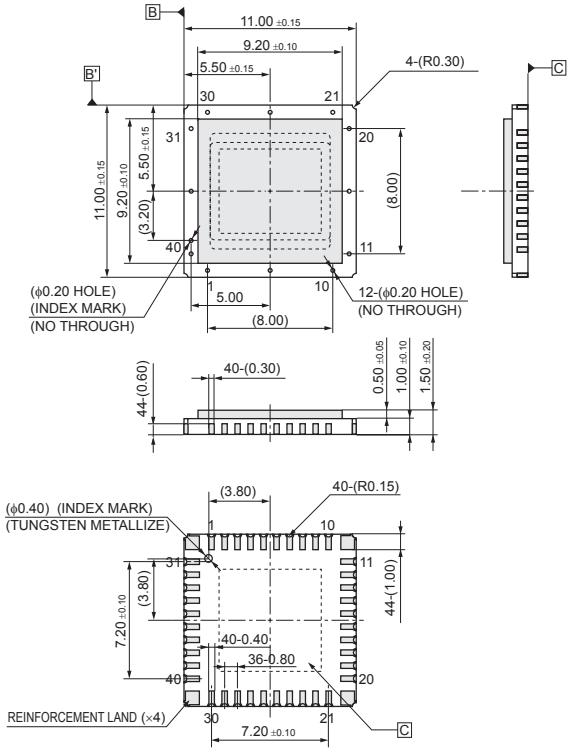

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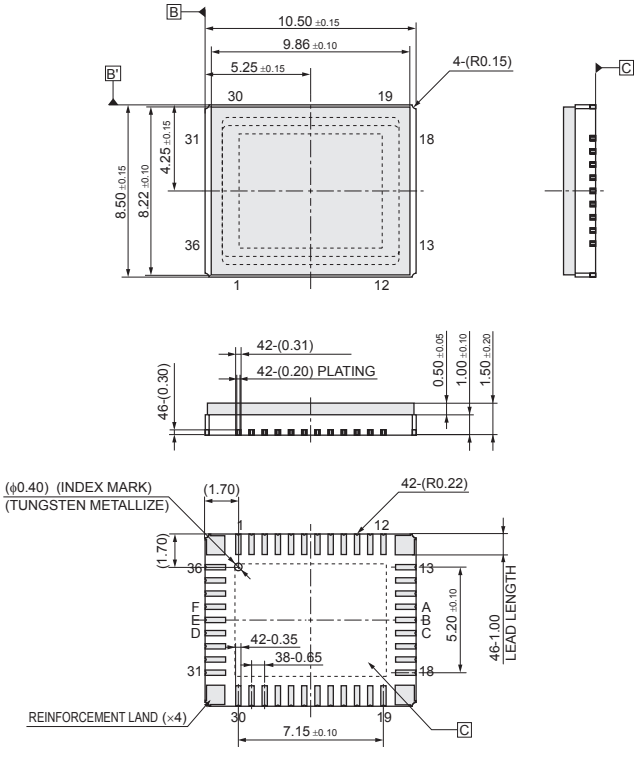

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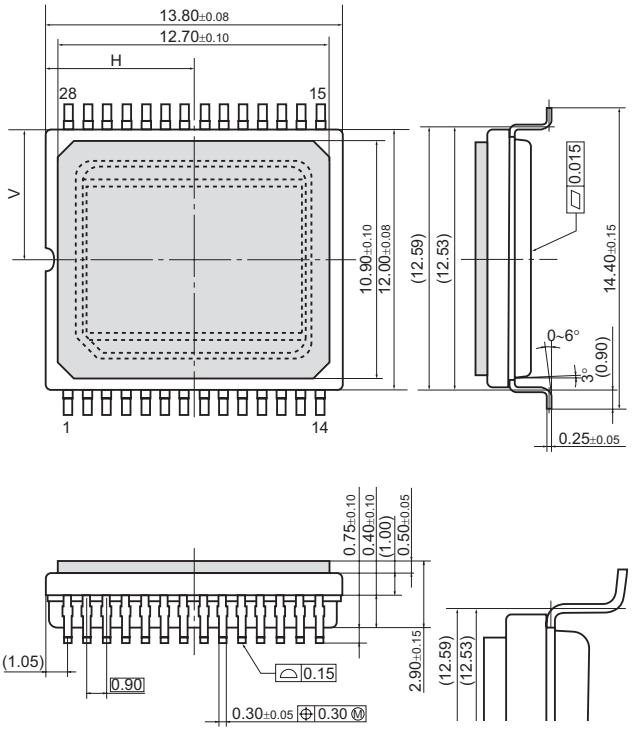
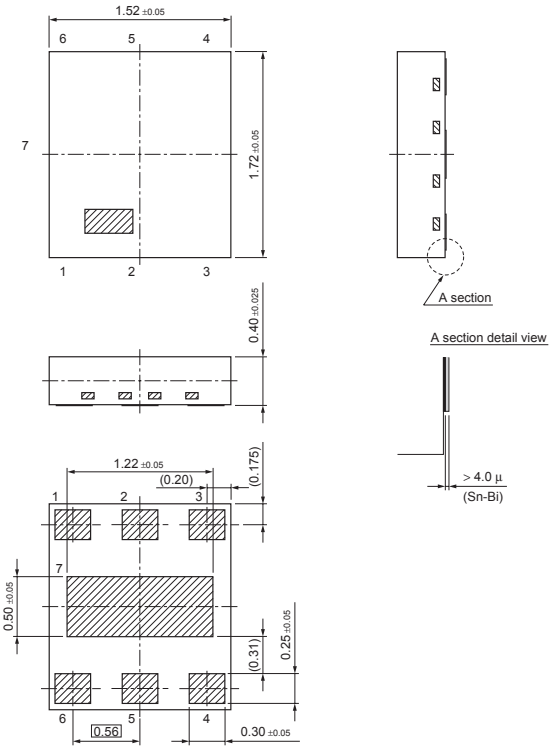


N

Package Outlines (GaAs)

( ): Reference Value Unit: mm

ML6-N1



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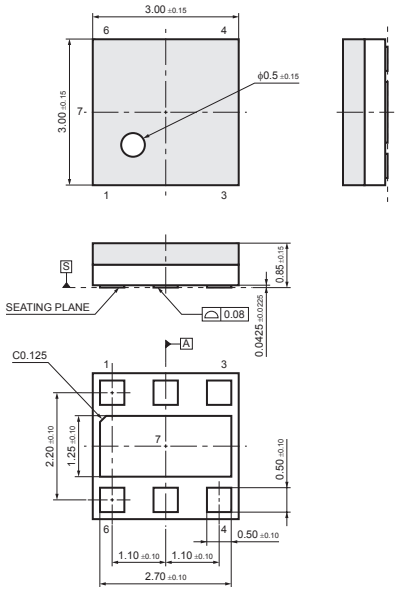

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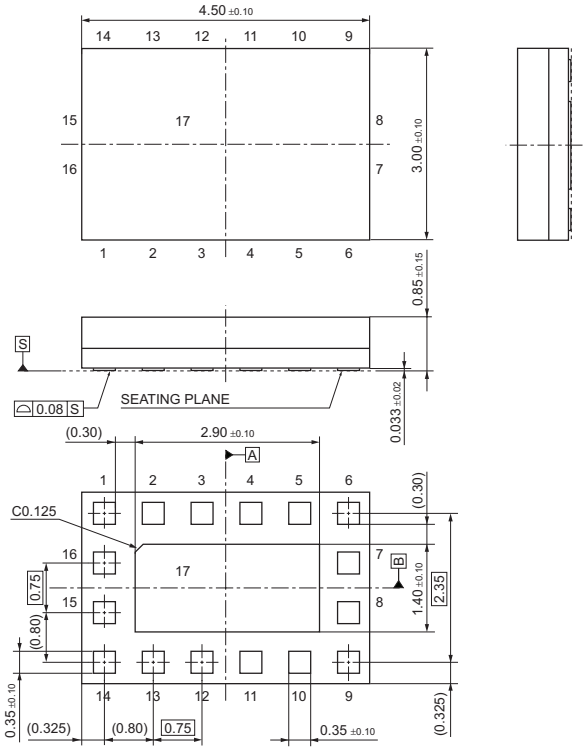

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