SHARP

Electronic Components
July 2011

## For Your Creative Products

# ELECTRONIC COMPONENTS


http://sharp-world.com/products/device/

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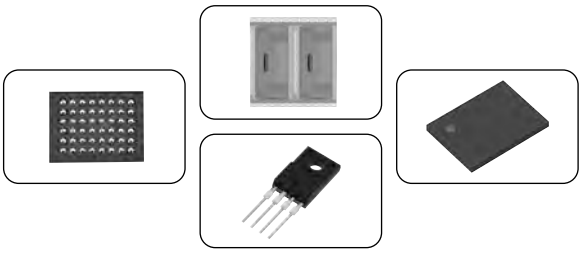
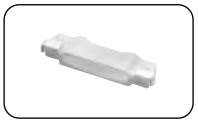
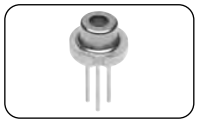




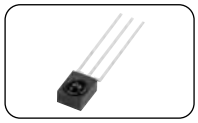


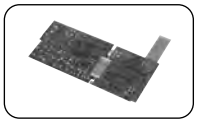












# Sharp Efforts Towards a Green Society

Based on its fiscal 2010 corporate vision of becoming an “Eco-Positive Company,” the entire Sharp Group is working as one towards realizing a green society.

**● Basic Environmental Philosophy ●**

## Creating an Environmentally Conscious Company with Sincerity and Creativity

**● The Sharp Group Charter of Corporate Behavior ●**

## Contribution to Conservation of the Global Environment

The Sharp Group will make efforts to further contribute to global environmental conservation by strengthening our development of proprietary technologies for protecting the global environment, and by carrying out business activities in an environmentally conscious manner.

**● The Sharp Code of Conduct ●**

## Contribution to Conservation of the Global Environment

### 1. To Conserve the Environment:

① We will comply with all applicable environmental laws, regulations, and regional agreements, and make voluntary efforts to practice effective use and saving of resources and energy, in the recognition that global environmental conservation is an essential facet of corporate and individual pursuits.

② We will work aggressively to reduce greenhouse gas emissions in all business activities, in order to contribute to the prevention of global warming.

③ To deal with environmental issues on a global scale, we will promote the sharing and practical application of energy-saving actions and environmental conservation technologies among the Sharp Group companies in each country and work to contribute to reducing environmental load.

④ We recognize that maintaining an eco-system where diverse living organisms coexist brings about a rich environment in which both corporations and individuals can operate and live. To that end, we will work aggressively to conserve biodiversity and for its sustainable use.

⑤ In order to promote communication with local residents and other stakeholders, we will engage in acquiring environmental information at an international level, and providing internal reports thereof.

### 2. To Develop Environmentally Conscious Products and Services, and Conduct Our Business Operations in an Environmentally Conscious Manner:

① We understand the importance of internal company systems and related details in maintaining third-party certification of our ISO environmental management systems, and we will observe relevant internal company rules.

② We will positively engage in the minimization of resource use, reduction in the size and weight of products, use of recycled materials, and the development of products and services that contribute to energy-saving, energy-creating and long life of products.

③ We will work to compile information related to harmful substances that might damage the environment or human health, and will not, as a matter of principle, make use of these harmful substances in our products, services and business activities.

④ We will ensure proper use and control of chemical substances in our business activities, including research, development, and manufacturing, at levels meeting or exceeding those stipulated by laws and regulations.

⑤ We will, as a matter of policy, design recycling-conscious products with structures that are detachable and decomposable and will use recyclable materials wherever possible.

⑥ As to the resources needed for business activities (equipments, raw materials, subsidiary materials, tools, etc.) , to the extent possible, we will work to conduct our business in such a way as to select and purchase such resources that have the least adverse effect on the global environment, the local residents and employees.

⑦ We realize that waste material is a valuable resource, and we will actively take part in maximizing the 3Rs (reduce, reuse, recycle) and minimizing the amount of final waste disposal.

* For more information: http://sharp-world.com/corporate/eco/csr_report/index.html

## Corporate Vision: Eco-Positive Company

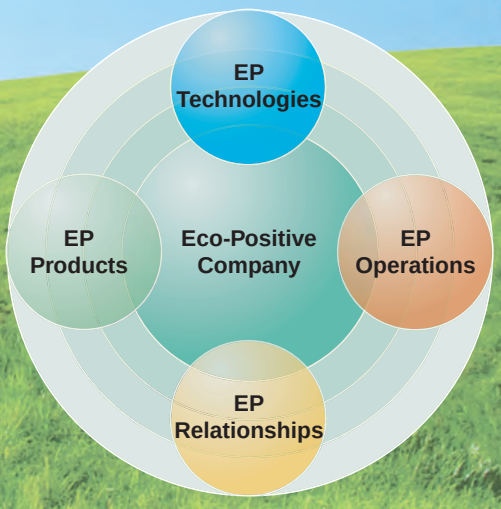
Sharp aims to be an “Eco-Positive Company,” a company that works with all stakeholders in creating solutions that have significantly more positive impact on the environment than negative impact caused by company operations.
To this end, Sharp will use the four aspects of its Eco-Positive Strategy to carry out advanced environmental efforts including spreading the use of solar power, improving the environmental performance of its products and devices, making plants more environmentally conscious, and developing one-of-a-kind environmental technologies.

Environmental burden such as greenhouse gas emissions from company operations
**Negative Impact**

<

**Environmental contribution** such as greenhouse gas emission reductions through products and services
**Positive Impact**

### The Four Aspects of the Eco-Positive Strategy




EP = Eco-Positive

**Eco-Positive Technologies**
Generate new business through one-of-a-kind environmental technologies

**Eco-Positive Products**
Expand contributions to protecting the environment through products and services

**Eco-Positive Operations**
Reduce environmental impacts in product engineering and manufacturing

**Eco-Positive Relationships**
Enhance corporate value through involvement with the community

# Developing Devices with High Environmental Performance

## Developing Green Devices and Super Green Devices

Sharp calls its environmentally conscious devices Green Devices (GD). To define guidelines for development and design based on seven concepts, Sharp established the GD Guidelines, which it began applying at all device design departments in fiscal 2004. The device development process starts with the planning stage, in which Sharp uses the GD Standard Sheet, which was formulated based on the GD Guidelines, to set specific objectives. In the trial manufacture and mass production stages, Sharp determines how well the actual device has met these objectives, with those achieving the standards being certified as GD.
In fiscal 2005, Sharp began certifying devices from among GD with the highest possible levels of environmental performance as Super Green Devices (SGD). GD and SGD have been accounting for an increasing share of Sharp's net sales with each year.

### Green Device Concepts

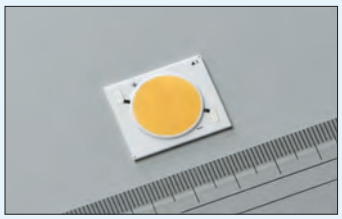
| | |
|---|---|
| Energy Efficiency | **Devices with superior energy efficiency and that consume less energy**<br>Reduce power consumption during operation and in standby mode. |
| Resource Conservation | **Devices designed to conserve resources**<br>Reduce device weight or volume. |
| Recyclability | **Devices designed for recycling**<br>Use standard plastic and/or design devices that are easy to disassemble. |
| Safe Use and Disposal | **Devices that can be used and disposed of safely**<br>Control usage of chemical substances contained in parts and materials. |
| Long Life | **Devices that make products last longer**<br>Extend the life of the product with exchangeable parts and consumables (target: LCD devices). |
| Packaging | **Devices that use packaging with enhanced environmental consciousness**<br>Reduce packaging. |
| Information Disclosure | **Devices that give environmental information**<br>Provide information on chemical substances in devices. |

## Super Green Devices Example

### High-Output, High-Color-Rendering*1 LED Lighting Devices

#### Industry-leading 91 lm/W luminous efficacy*2 in the 25W-class achieved

GW5DMC30M04 is a high-output, high-color-rendering 25W-class LED lighting device that boasts an industry's highest luminous efficacy of 91 lm/W for light sources such as store spotlights. These 25W-class devices have achieved incredibly low energy consumption through the adoption of LED chips and phosphor, which both have excellent high-temperature properties. They provide a high 2 370-lm luminous flux and the industry's highest luminous efficacy of 91 lm/W. In addition, it achieved a high color rendering index (Ra)*3 of 83 by faithfully reproducing the colors of objects. Furthermore, the LED emitting area has been made circular to make designing lighting instruments easy.



GW5DMC30M04

### ■ Main Features

- Industry-leading luminous efficacy of 91 lm/W achieved within the 25W-class
- Faithfully reproduces natural colors, with its high color rendering index (Ra) of 83

*1 Color rendering describes how colors are perceived depending on differences in the illuminating light source. The closer to natural light, the higher the color rendering capability.
*2 The brightness per watt. As of February 9, 2011, for LED lighting devices with an input power of 25 W, a color temperature of 3,000 K, and a color rendering index (Ra) 83 (based on Sharp survey).
*3 A numerical value expressing the level of color distortion compared to a reference light source. The closer the value to 100, the lower the color distortion.

# Raising the Level of Environmental Performance in Factories

## Making More Factories Super Green Factories

Sharp defines factories with a high level of environmental consciousness as Green Factories (GF). The basic policies and operational know-how for achieving GF status have been formulated in line with 10 concepts in the GF Guidelines, which Sharp has been applying at all production bases in Japan since fiscal 1999 and overseas since fiscal 2001.
With construction of the Kameyama Plant, in fiscal 2003 Sharp established assessment criteria for Super Green Factories (SGF)—factories with exceptionally high levels of environmental performance—and launched efforts to award in-house certification. The Kameyama Plant was the first plant to achieve this certification. Sharp started GF certification in fiscal 2004 and overseas as well, and Sharp has achieved its mid-term objective of having all Sharp plants in Japan and overseas certified for GF status and all 10 Sharp Corporation plants in Japan certified for SGF status by fiscal 2007.
In fiscal 2008, Sharp stepped up its SGF efforts with the start of the SGF II initiative at plants certified for SGF status.

### Green Factory Concepts

| | |
|---|---|
| Greenhouse gases | Minimize emission of greenhouse gases |
| Energy | Minimize energy consumption |
| Waste | Minimize discharge of waste |
| Resources | Minimize resource consumption |
| Chemical substances | Minimize risk of environmental pollution and accidents caused by chemical substances |
| Atmosphere, water, soil | Minimize environmental burden on the atmosphere, water, and soil |
| Harmony with nature | Endeavor to preserve nature both on and off site |
| Harmony with the community | Encourage harmony with the local community |
| Environmental consciousness | Foster high environmental awareness among employees |
| Information disclosure | Disclose information on the environment |

## Development of GREEN FRONT SAKAI

In order to become a company that contributes to the environment, Sharp has been developing its business on the two pillars of energy-saving LCDs and energy-creating solar cells. In order to further these efforts, Sharp commenced operations at a new LCD panel plant in October 2009, followed by a new solar cell plant in March 2010, in Sakai, Osaka prefecture. We hope to propel our business forward by having companies in other fields with advanced technology join us, to help us achieve the goal of creating a "green society" suitable to today's environmentally conscious mindset.

GREEN FRONT


**Overview of GREEN FRONT SAKAI**
Location: 1-banchi, Takumi-cho, Sakai-ku, Sakai-shi, Osaka
Site area: 1.27 million m$^2$
(approx. 28 times the size of Tokyo Dome)

**LCD Panel Plant**
Start of operations: October 2009
Mother glass size: 2,880 mm x 3,130 mm (10th generation)
Mother glass input capacity: 72,000 substrates per month

**Solar Cell Plants**
■ Thin-film solar cell plant
Start of operations: March 2010
Production capacity: 160 MW per year (first production development)
Glass substrate size: 1,000 mm x 1,400 mm
■ Single-crystal solar cell plant
Start of operations: March 2011
Production capacity: 200 MW per year (first production development)

☆New product/Under development

## ■ LCD Modules

### <For industrial appliances>

| | Display size | Model No. | Number of pixels (dot) H × V | Pixel pitch (mm) H × V | Display colors | Luminance (cd/m²) | Input video signal | Power consumption (W) | Outline dimensions*1 W × H × D (mm) (TYP.) | Weight (g) | Backlight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TFT | 23.1″ (59cm) | LQ231U1LW32 | 1 600 × RGB × 1 200 | 0.294 × 0.294 | 16.77 M | 500 | LDI 8 bit RGB | 65.5 | 530.0 × 431.5 × 23.9 | Max. 4 500 | LED | Advanced Super V, Built-in LED backlight driver circuit |
| | 19.0″ (48cm) | LQ190E1LX51 | 1 280 × RGB × 1 024 | 0.294 × 0.294 | 16.77 M | 1 000 | 2ch LVDS 8 bit RGB | 75 | 404.2 × 330.0 × 34.0 | Max. 2 600 | LED | Advanced Super V, Built-in LED backlight driver circuit |
| | 15.0″ (38cm) | LQ150X1LG91 | 1 024 × RGB × 768 | 0.297 × 0.297 | 16.19 M | 350 | LVDS 6 bit + FRC | 6.8 | 326.5 × 253.5 × 9.6 | Max. 950 | LED | Long-life LED backlight, Built-in LED backlight driver circuit |
| | 12.1″ (31cm) | LQ121S1LG71 | 800 × RGB × 600 | 0.3075 × 0.3075 | 12 M | 450 | 1ch LVDS 8 bit RGB | 5.1 | 265.0 × 205.0 × 9.5 | Max. 550 | LED | Long-life LED backlight, Built-in LED backlight driver circuit |
| | | LQ121S1LG81 | | | 260 k | | LVDS 6 bit | 5.1 | 276.0 × 209.0 × 8.7 | 600 | | |
| | 10.4″ (26cm) | LQ104V1DG62 | 640 × RGB × 480 | 0.330 × 0.330 | 260 k | 550 | CMOS 6 bit RGB | 5.2 | 246.5 × 179.4 × 12.5 | Max. 580 | LED | Strong LCD2, Long-life LED backlight |
| | | ☆LQ104V1DG81/LG81 | | | | (450) | CMOS 6 bit RGB/ 1ch LVDS 6 bit RGB | T.B.D. | | T.B.D. | LED | Strong LCD2, Long-life LED backlight, Built-in LED backlight driver circuit |
| | 8.4″ (21cm) | ☆LQ084S3LG03 | 800 × RGB × 600 | 0.213 × 0.213 | 16 M | 330 | 1ch LVDS 8 bit RGB | 4.1 | 199.5 × 154.0 × 11.6 | Max. 320 | LED | Long-life LED backlight, Built-in LED backlight driver circuit |
| | | LQ084V3DG02 | 640 × RGB × 480 | 0.270 × 0.270 | 260 k | 400 | CMOS 6 bit RGB | 4.6 | 199.5 × 149.5 × 11.6 | Max. 400 | LED | Long-life LED backlight |
| | 7.0″ (18cm) | ☆LQ070Y3LW01 | 800 × RGB × 480 | 0.1905 × 0.1905 | 16.19 M | 360 | 1ch LVDS 8 bit RGB | 2.6 | 170.0 × 110.0 × 9.0 | 175 | LED | Advanced Super V, Long-life LED backlight |
| | | LQ070Y3DG3A | | | | 350 | CMOS 6 bit + FRC | 2.0 | 163.2 × 104.0 × 3.9 | Max. 150 | | System driver |
| | | LQ070Y3DG3B | | | | 280 | | 2.0 | 163.2 × 104.0 × 7.1 | Max. 185 | | |
| | | LQ070Y3LG4A | | | | 350 | LVDS 6 bit + FRC | 2.1 | 163.2 × 104.0 × 3.9 | Max. 150 | | |
| | 5.7″ (14cm) | LQ057V3DG02 | 640 × RGB × 480 | 0.180 × 0.180 | 260 k | 400 | CMOS 6 bit RGB | 4.5 | 144.0 × 104.6 × 13.0 | Max. 250 | LED | Long-life LED backlight |
| | | LQ057V3LG11 | | | | 350 | 1ch LVDS 6 bit RGB | 2.3 | 144.0 × 104.6 × 12.3 | Max. 190 | | Built-in LED backlight driver circuit |
| | | ☆LQ057Q3DC03 | 320 × RGB × 240 | 0.360 × 0.360 | | (500) | CMOS 6 bit RGB | T.B.D. | (144.0 × 104.6 × T.B.D.) | T.B.D. | | Long-life LED backlight, Built-in LED backlight driver circuit |
| | 4.3″ (12cm) | ☆LQ043T3DW03 | 480 × RGB × 272 | 0.198 × 0.198 | 16.77 M | 400 | CMOS 8 bit RGB | 1.2 | 105.5 × 67.2 × 7.7 | Max. 85 | LED | Advanced Super V, Long-life LED backlight |
| | | LQ043T3DG01 | | | 260 k | 400 | CMOS 6 bit RGB | 0.6 | 105.5 × 67.2 × 5.05 | 65 | | |
| | | LQ043T3DG02 | | | | 480 | | | 105.5 × 67.2 × 3.95 | 55 | | |
| | 3.5″ (9cm) | LQ035Q3DG03 | 320 × RGB × 240 | 0.2205 × 0.2205 | 16 M | 450 | CMOS 8 bit RGB | 1.5 | 76.9 × 63.9 × 4.7 | 42 | | Long-life LED backlight |

*1 Protrusions such as positioning bosses are not included.

★Under development

RoHS



### <For large-size product applications>

| | Display size (cm) [″] | Model No. | Number of pixels*1 | Dot format H × V (dot) | Active area H × V (mm) | Number of colors (color) | Outline dimensions*2 W × H × D (mm) (TYP.) | Backlight | Interface (Input signal) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| TFT | 207.2 [81.6] | LK816D3LA19 | 2 073 600 | 1 080 × 1 920 × RGB | 1 015.7 × 1 805.8 | 1.06B (8-bit + 2FRC) | 1 094.0 × 1 879.0 × (79.9) | CCFL Built-in | 2ch-LVDS*3 (10-bit digital) | Portrait setting, Advanced Super V, High luminance: 1 200 Max. cd/m$^2$, Wide viewing angle: L/R 176°/ U/D 176°, High contrast: 2 000:1, High-speed response [G to G]: 6 ms (Ave.) |
| | 152.5 [60] | ★LK601R3LA19 | 8 294 400 | 3 840 × RGB × 2 160 | 1 330.56 × 748.44 | 1.06B (8-bit + 2FRC) | 1 380.0 × 790.0 × 106.6 | Direct-lit LED (built-in driver) | 8ch-LVDS*3 (10-bit digital) | Ultraviolet-induced Multi-domain Vertical Alignment LCD, High color purity (78% of NTSC), High luminance: 450 cd/m$^2$, Wide viewing angle: L/R 176°/ U/D 176°, High contrast: 4 000:1, High-speed response [G to G]: 6 ms (Ave.) |
| | | ★LK600D3LB14 | 2 073 600 | 1 080 × 1 920 × RGB | 1 329.12 × 747.63 | | | | 2ch-LVDS*3 (10-bit digital) | Ultraviolet-induced Multi-domain Vertical Alignment LCD, Super high luminance: 2 000 cd/m$^2$, Wide viewing angle: L/R 176°/ U/D 176°, High contrast: 5 000:1 or higher, High-speed response [G to G]: 6 ms (Ave.) |

*1 Pixel means a set of each RGB dot.
*2 Excluding FPC for connection and other protruding parts.
*3 LVDS: Low Voltage Differential Signaling
(Note) Please note that the specifications are subject to change without prior notice for product improvement.

# CMOS CAMERA MODULES ROAD MAP

☆New product

## ■ CMOS Camera Modules Road Map

| Image format | 2009 | 2010 | 2011 |
|---|---|---|---|
| 8M (QUXGA) | | | ☆RJ63VC200<br>1/3.2 type 0.42 cc<br>Built-in auto focus function<br>8.52 x 8.52 x 5.8 |
| 5M (QSXGA) | RJ64SC100<br>1/4 type 0.36 cc<br>Built-in auto focus function<br>8.5 x 8.5 x 5.0 | RJ64SC200<br>1/4 type 0.36 cc<br>Built-in auto focus function<br>8.5 x 8.5 x 5.0 | |
| 3M (QXGA) | | RJ64PC800<br>1/4 type 0.37 cc<br>Built-in auto focus function<br>8.5 x 8.5 x 5.1 | |
| VGA | | | ☆RJ6CBA100<br>1/13 type 0.03 cc<br>3.71 x 3.35 x 2.3<br>☆RJ6CBA200<br>1/13 type 0.02 cc<br>3.50 x 3.05 x 2.3 |

**Model No.**

**Optical format & volume**

Outline dimensions (D x W x H) TYP. (mm)

**Notice**
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

☆New product

## ■ CMOS Camera Modules

Module configuration : CMOS image sensor, CDS/AGC/10-bit ADC, timing generator, DSP, lens
Color filter : R, G, B primary color mosaic filters
Operating temperature : –20 to 60°C

| Optical format | Image format | Optical function | Model No. | Features | Output pixels (H x V) MAX. | Lens | | | Output signal | Supply voltage*2 (V) TYP. | Power consumption (mW) TYP. | Package*1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | F No. | Configuration | Horizontal viewing angle (°) | | | | |
| 1/3.2 type | QUXGA | Auto focus function | ☆RJ63VC200 | • QUXGA to SubQCIF<br>• 15 fps at QUXGA/60 fps at 720p<br>• 10.5x electronic zoom at QVGA size (MAX.)<br>• Image inversion function (right and left) | 3 280 x 2 464 | F2.4 | 5 pcs. | 59 | RAW (Mipi) | 2.8/1.8 (I/O: 1.8 or 2.8) | 136 (at 7.5 fps) | FPC type |
| 1/4 type | QSXGA | | RJ64SC100 | • QSXGA to SubQCIF<br>• 5 fps at QSXGA/30 fps at VGA<br>• 8x electronic zoom at QVGA size (MAX.)<br>• Image inversion function (right and left) | 2 592 x 1 944 | F2.8 | 4 pcs. | 54 | UYVY (Parallel) | | 270 (at 4.5 fps) | |
| | | | RJ64SC200 | • QSXGA to SubQCIF<br>• 15 fps at QSXGA/30 fps at 720p<br>• 8x electronic zoom at QVGA size (MAX.)<br>• Image inversion function (right and left) | | | | | UYVY (Mipi) | | 283 (at 4.5 fps) | |
| | QXGA | | RJ64PC800 | • QXGA to SubQCIF<br>• 7.5 fps at QXGA/30 fps at XGA<br>• 6.4x electronic zoom at QVGA size (MAX.)<br>• Image inversion function (right and left) | 2 048 x 1 536 | | 3 pcs. | 54 | UYVY (Parallel) | | 190 (at 7.5 fps) | |
| 1/13 type | VGA | — | ☆RJ6CBA200 | • VGA to SubQCIF<br>• 30 fps at VGA<br>• 2x electronic zoom at QVGA size (MAX.)<br>• Image inversion function (right and left) | 640 x 480 | | 1 pcs. | 53 | UYVY (Parallel) | | 77 (at 30 fps) | 25WL-CSP |
| | | | ☆RJ6CBA100 | | | | | | UYVY (Mipi) | | 76 (at 30 fps) | 21WL-CSP |

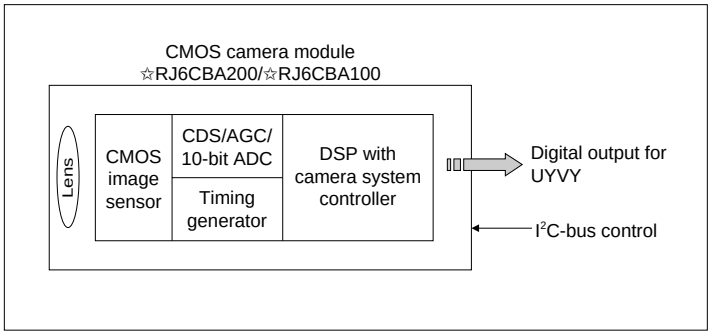
*1 Contact a SHARP sales office regarding FPC type package.
*2 Additional supply voltage of 3.0 V is necessary for RJ64SC100/200 with a built-in AF driver.

### ●Outline Dimensions

| Model No. | Outline dimensions (D x W x H) TYP. (mm) | Package*1 |
|---|---|---|
| ☆RJ63VC200 | 8.52 x 8.52 x 5.8 | FPC type |
| RJ64SC100 | 8.5 x 8.5 x 5.0 | |
| RJ64SC200 | | |
| RJ64PC800 | 8.5 x 8.5 x 5.1 | |
| ☆RJ6CBA200 | 3.50 x 3.05 x 2.3 | 25WL-CSP |
| ☆RJ6CBA100 | 3.71 x 3.35 x 2.3 | 21WL-CSP |

*1 Contact a SHARP sales office regarding FPC type package.

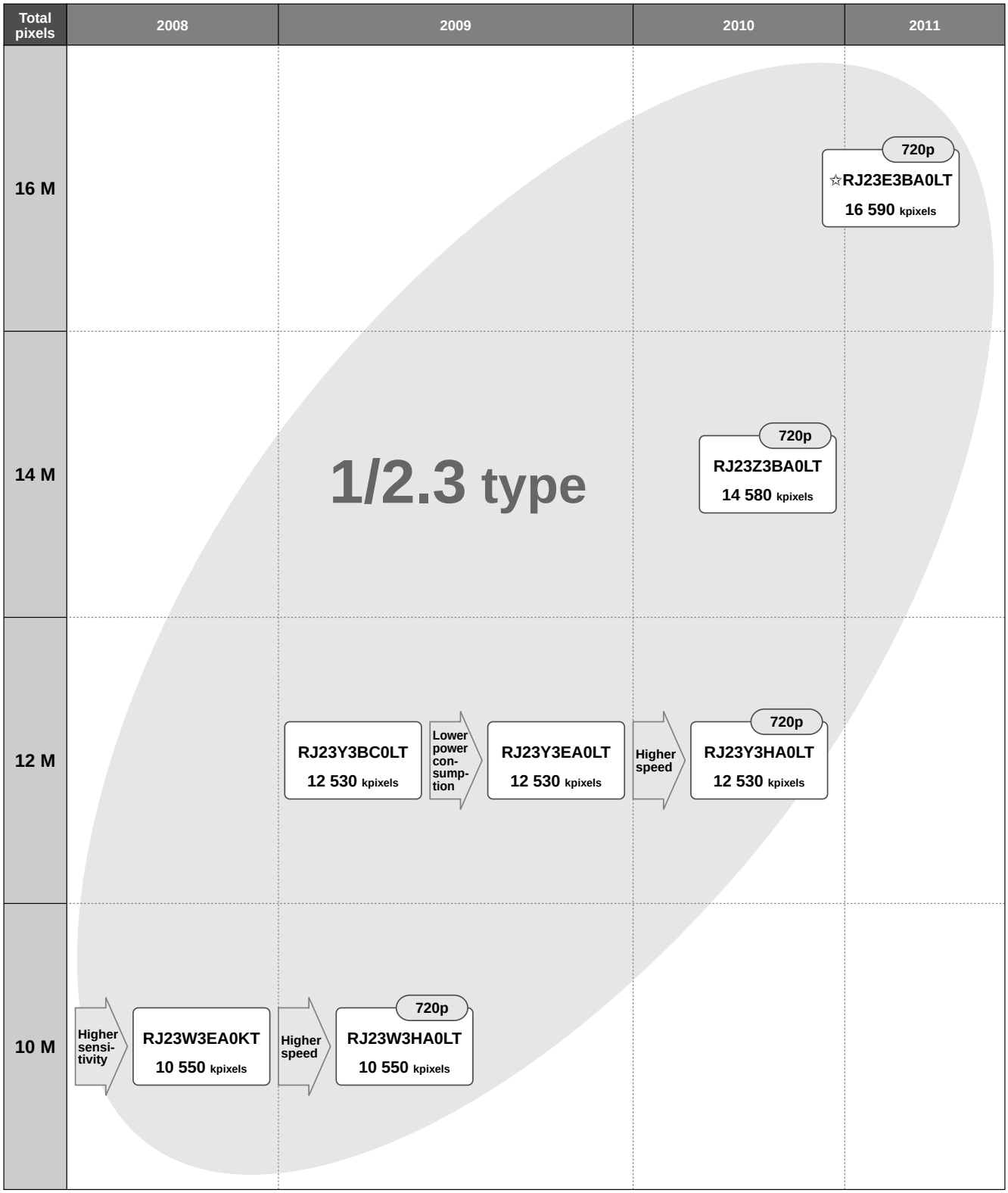
### ●System Configuration Example



# ROAD MAP FOR HIGH-RESOLUTION CCDs FOR DIGITAL CAMERAS

☆New product

## ■ Road Map for High-resolution CCDs for Digital Cameras



# HIGH-RESOLUTION CCDs / 1/3-TYPE CCDs / 1/3.8-TYPE CCD / 1/4-TYPE CCDs

☆New product
★Under development

## ■ High-resolution CCDs

| Optical format | Total pixels | Color filter | Model No. | Movie function | Resolution Image pixels (H x V) | Pixel size H x V (μm²) | Sensitivity (mV) TYP. | Smear ratio (dB) TYP. | Package |
|---|---|---|---|---|---|---|---|---|---|
| 1/2.3 type | 10 550 k | R,G,B primary color mosaic filters | RJ23W3EA0KT | VGA 30 fps | 3 704 x 2 784 | 1.68 x 1.68 | 105 | –87 | N-LCC040-S433A |
| | | | RJ23W3HA0LT | 720p 30 fps | | | | | N-LCC040-R350 |
| | 12 530 k | | RJ23Y3BC0LT | VGA 30 fps | 4 040 x 3 032 | 1.55 x 1.55 | 105 | –86 | |
| | | | RJ23Y3EA0LT | | | | | | |
| | | | RJ23Y3HA0LT | 720p 30 fps | | | | –84 | |
| | 14 580 k | | RJ23Z3BA0LT | 720p 30 fps | 4 360 x 3 272 | 1.43 x 1.43 | 105 | –86 | |
| | 16 590 k | | ☆RJ23E3BA0LT | 720p 30 fps | 4 648 x 3 488 | 1.34 x 1.34 | 105 | –86 | |

## ■ 1/3-type CCDs

| Total pixels | Standard | | Model No. | Resolution Horizontal TV lines | Resolution Image pixels (H x V) | Pixel size H x V (μm²) | Sensitivity (mV) TYP. | Smear ratio (dB) TYP. | Package |
|---|---|---|---|---|---|---|---|---|---|
| 270 k | Color | NTSC | RJ2311DB0PB*1 | 330 | 512 x 492 | 9.6 x 7.5 | 3 200 | –135 | P-DIP016-0450 |
| | | | ☆RJ2315DB0PB*1 | | | | 2 900 | | |
| 320 k | | PAL | RJ2321DB0PB*1 | | 512 x 582 | 9.6 x 6.34 | 3 200 | –135 | |
| | | | ☆RJ2325DB0PB*1 | | | | 2 900 | | |
| 410 k | | NTSC | RJ2351CA0PB*1 | 480 | 768 x 494 | 6.4 x 7.5 | 2 000 | –120 | |
| | | | ☆RJ2355CA0PB*1 | | | | 1 800 | –130 | |
| 470 k | | PAL | RJ2361CA0PB*1 | | 752 x 582 | 6.53 x 6.39 | 2 000 | –120 | |
| | | | ☆RJ2365CA0PB*1 | | | | 1 800 | –130 | |
| 520 k | | NTSC | ★RJ2331AA0PB*1 | 650 | 976 x 494 | 5.0 x 7.4 | 1 800 | –120 | |
| | | | ★RJ3331AA0PB*2 | | | | 1 500 | –110 | |
| 610 k | | PAL | ★RJ2341AA0PB*1 | | 976 x 582 | 5.0 x 6.3 | 1 800 | –120 | |
| | | | ★RJ3341AA0PB*2 | | | | 1 500 | –110 | |

*1 Suitable for intense light exposure.
*2 Progressive scan CCD, suitable for intense light exposure.

## ■ 1/3.8-type CCD

| Total pixels | Standard | | Model No. | Resolution Horizontal TV lines | Resolution Image pixels (H x V) | Pixel size H x V (μm²) | Sensitivity TYP. (mV) | Smear ratio TYP. (dB) | Package |
|---|---|---|---|---|---|---|---|---|---|
| 290 k | Color | NTSC | RJ2411CA0PB* | 330 | 532 x 512 | 7.2 x 5.6 | 1 200 | –120 | P-DIP014-0400A |

* Suitable for intense light exposure.

## ■ 1/4-type CCDs

| Total pixels | Standard | | Model No. | Resolution Horizontal TV lines | Resolution Image pixels (H x V) | Pixel size H x V (μm²) | Sensitivity TYP. (mV) | Smear ratio TYP. (dB) | Package |
|---|---|---|---|---|---|---|---|---|---|
| 270 k | Color | NTSC | RJ2411EA0PB* | 330 | 512 x 492 | 7.2 x 5.6 | 1 200 | –130 | P-DIP014-0400A |
| | | | RJ2411EB0PB | | | | | | |
| | | | RJ2411FA0PB* | | | | 1 800 | | |
| 320 k | | PAL | RJ2421EB0PB | | 512 x 582 | 7.2 x 4.73 | 1 100 | –130 | |
| | | | RJ2421FA0PB* | | | | 1 650 | | |
| 410 k | | NTSC | RJ2451CA0PB* | 480 | 768 x 494 | 4.9 x 5.6 | 900 | –114 | |
| | | | ☆RJ2455CA0PB* | | | | | | |
| 470 k | | PAL | RJ2461CA0PB* | | 752 x 582 | 5.0 x 4.77 | 900 | –114 | |
| | | | ☆RJ2465CA0PB* | | | | | | |

* Suitable for intense light exposure.

RoHS

## ■ CCD Peripheral ICs/LSIs

| Description | Model No. | Features | | Package |
|---|---|---|---|---|
| V driver | LR366851 | Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4,<br>2-level output circuit for electronic shutter | | P-SSOP024-0275 |
| CDS/PGA/ADC | LR36B03A | Low power consumption [81 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit,<br>12-bit ADC (25 MHz), mechanical iris control function, 12-bit digital output | | P-HQFN036-0606 |
| V driver<br>+<br>CDS/PGA/ADC<br>+<br>DSP | LR38653 | For 270-k/320-k/410-k/<br>470-kpixel CCDs | <V driver><br>Vertical pulse driver for CCDs,<br>2-level output x 2, 3-level output x 2,<br>2-level output circuit for electronic shutter<br><CDS/PGA/ADC><br>25 MHz, high-speed S/H circuit,<br>high-gain PGA circuit, 12-bit ADC<br><DSP><br>10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, lens shading correction function,<br>auto white blemish compensation function, mirror image<br>function, YUV digital output, NTSC/PAL analog output | P-LFBGA171-0811 |
| | LR38654 | For 270-k/290-k/320-k/410-k/<br>470-kpixel CCDs | <V driver><br>Vertical pulse driver for CCDs,<br>2-level output x 2, 3-level output x 2,<br>2-level output circuit for electronic shutter<br><CDS/PGA/ADC><br>25 MHz, high-speed S/H circuit,<br>high-gain PGA circuit, 12-bit ADC<br><DSP><br>10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, lens shading correction function,<br>auto white blemish compensation function, mirror image<br>function, electronic optical axis adjustment function*1,<br>YUV digital output, NTSC/PAL analog output | P-LFBGA171-0811 |
| CDS/PGA/ADC<br>+<br>DSP | LR38692 | For 1 310-kpixel CCDs | <CDS/PGA/ADC><br>36 MHz, high-speed S/H circuit,<br>high-gain PGA circuit, 12-bit ADC<br><DSP><br>10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, lens shading correction function,<br>auto white blemish compensation function,<br>mirror image function, mechanical iris control function,<br>privacy masking function, Day/Night control function,<br>color rolling suppression function, high resolution function,<br>motion detection function, auto focus control function,<br>NTSC/PAL analog output, Y/C analog output,<br>UYVY digital output (ITU-R BT656 compatible) | P-LFBGA256-1111 |
| | LR38693 | For 410-k/470-kpixel CCDs | <CDS/PGA/ADC><br>36 MHz, high-speed S/H circuit,<br>high-gain PGA circuit, 12-bit ADC<br><DSP><br>10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, lens shading correction function,<br>auto white blemish compensation function,<br>rotation (vertical invert), mirror image function,<br>mechanical iris control function, privacy masking function,<br>Day/Night control function, color rolling suppression function,<br>high resolution function, line lock function,<br>motion detection function, auto focus control function,<br>OSD function, wide dynamic range function,<br>slow shutter function, NTSC/PAL analog output,<br>Y/C analog output,<br>UYVY digital output (ITU-R BT656 compatible) | |

RoHS

## ■ CCD Peripheral ICs/LSIs (cont'd)

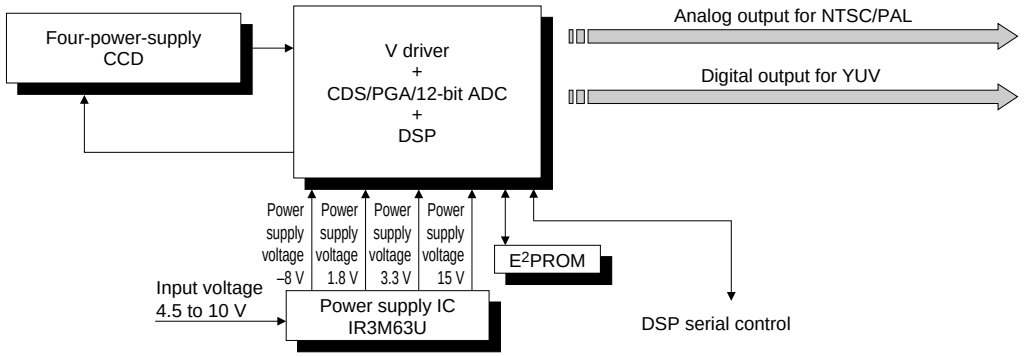
| Description | Model No. | Features | | Package |
|---|---|---|---|---|
| CDS/PGA/ADC + DSP | LR38694 | For 410-k/470-kpixel CCDs | <CDS/PGA/ADC><br>36 MHz, high-speed S/H circuit,<br>high-gain PGA circuit, 12-bit ADC<br><DSP><br>10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, lens shading correction function,<br>auto white blemish compensation function,<br>mirror image function, mechanical iris control function,<br>privacy masking function, Day/Night control function,<br>color rolling suppression function, high resolution function,<br>line lock function, auto focus control function,<br>NTSC/PAL analog output, Y/C analog output,<br>UYVY digital output (ITU-R BT656 compatible) | P-LFBGA256-1111 |
| | LR36B14 | For 270-k/320-k/410-k/<br>470-kpixel CCDs | <CDS/PGA/ADC><br>High-speed S/H circuit, high-gain PGA circuit, 12-bit ADC<br><DSP><br>75-ohm video amplifier, mechanical iris control function,<br>10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, LED light control function,<br>gamma transition function, lens shading correction function,<br>auto white blemish compensation function,<br>mirror image function, NTSC/PAL analog output | P-HQFN064-0909 |
| DSP | LR38627 | For 270-k/320-k/410-k/<br>470-kpixel CCDs | 10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, lens shading correction function,<br>auto white blemish compensation function,<br>mirror image function, YUV digital output,<br>NTSC/PAL analog output | P-TQFP128-1414 |
| | LR38690A | | 10-bit DAC, synchronous signal generation circuit,<br>CCD drive timing generator, AE control function,<br>AWB control function, lens shading correction function,<br>auto white blemish compensation function,<br>mirror image function, mechanical iris control function,<br>privacy masking function, Day/Night control function,<br>color rolling suppression function, high resolution function,<br>NTSC/PAL analog output, Y/C analog output,<br>UYVY digital output (ITU-R BT656 compatible)*2 | P-LQFP100-1414 |
| Power supply IC for CCDs and peripheral ICs/LSIs | IR3M59U | For 270-k/320-kpixel CCDs | Input voltage range: 4.5 to 16 V,<br>PWM control + charge pump system,<br>output voltage: three outputs (15 V/12 V, –8 V/–5 V, 3.3 V),<br>power sequencing circuit, overcurrent protection circuit | P-VQFN032-0505 |
| | IR3M63U | For 270-k/290-k/320-k/410-k/<br>470-kpixel CCDs | Input voltage range: 4.5 to 10 V,<br>PWM control + charge pump system,<br>output voltage: four outputs (15 V, –8 V, 3.3 V, 1.8 V),<br>power sequencing circuit, overcurrent protection circuit | |

*1 Support for only 290-kpixel CCD.
*2 Support for only 410-k/470-kpixel CCDs.

☆New product

## ●System Configuration Examples

### <Color Security Camera System with Two-chip Configuration [Low Power Consumption Type]>




* This system shows the configuration example for LR38654 below.

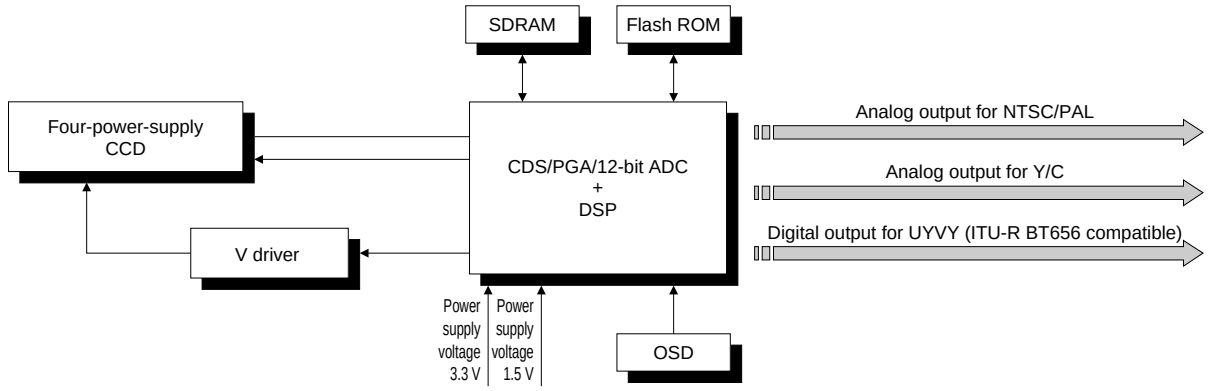
### Four-power-supply CCDs and peripheral IC/LSIs

| CCD | | | V driver + CDS/PGA/ADC + DSP | Power supply IC |
|---|---|---|---|---|
| 1/3 type | 270 kpixels | RJ2311DB0PB | LR38653/LR38654 | — |
| | | ☆RJ2315DB0PB | | |
| | 320 kpixels | RJ2321DB0PB | | |
| | | ☆RJ2325DB0PB | | |
| | 410 kpixels | RJ2351CA0PB | | IR3M63U |
| | | ☆RJ2355CA0PB | | |
| | 470 kpixels | RJ2361CA0PB | | |
| | | ☆RJ2365CA0PB | | |
| 1/3.8 type | 290 kpixels | RJ2411CA0PB | LR38654 | |
| 1/4 type | 270 kpixels | RJ2411EA0PB | LR38653/LR38654 | |
| | | RJ2411EB0PB | | |
| | | RJ2411FA0PB | | |
| | 320 kpixels | RJ2421EB0PB | | |
| | | RJ2421FA0PB | | |
| | 410 kpixels | RJ2451CA0PB | | |
| | | ☆RJ2455CA0PB | | |
| | 470 kpixels | RJ2461CA0PB | | |
| | | ☆RJ2465CA0PB | | |

☆New product

RoHS

**<Color Security Camera System with Three-chip Configuration ( I )>**



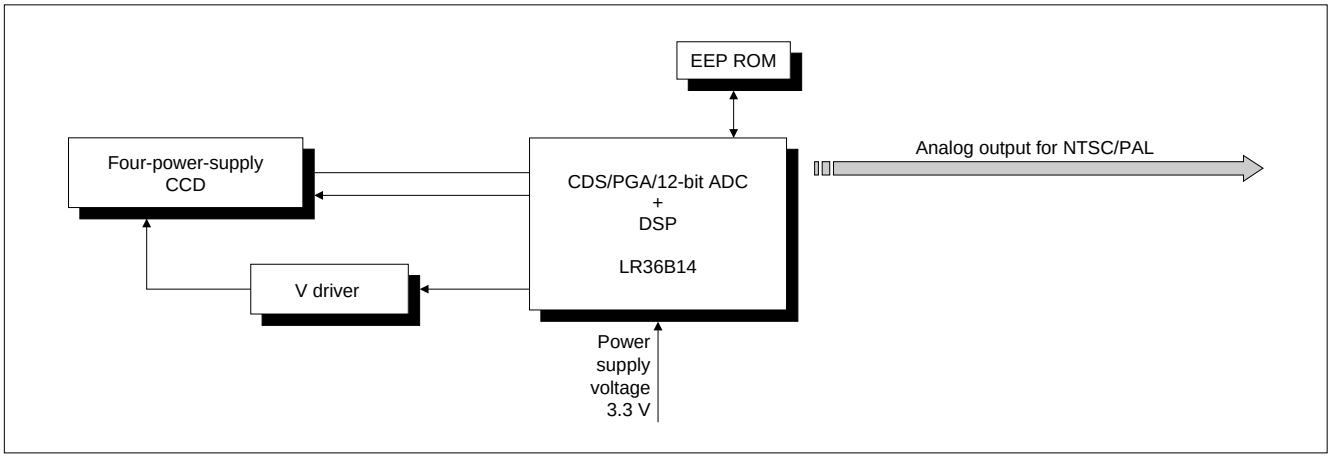

* This system shows the configuration example for LR38693 below.

**Four-power-supply CCDs and peripheral ICs/LSIs**

| CCD | | | CDS/PGA/ADC + DSP |
|---|---|---|---|
| 1/3 type | 410 kpixels | RJ2351CA0PB | LR38693/LR38694 |
| | | ☆RJ2355CA0PB | |
| | 470 kpixels | RJ2361CA0PB | |
| | | ☆RJ2365CA0PB | |
| 1/4 type | 410 kpixels | RJ2451CA0PB | |
| | | ☆RJ2455CA0PB | |
| | 470 kpixels | RJ2461CA0PB | |
| | | ☆RJ2465CA0PB | |

☆New product

### <Color Security Camera System with Three-chip Configuration ( II )>



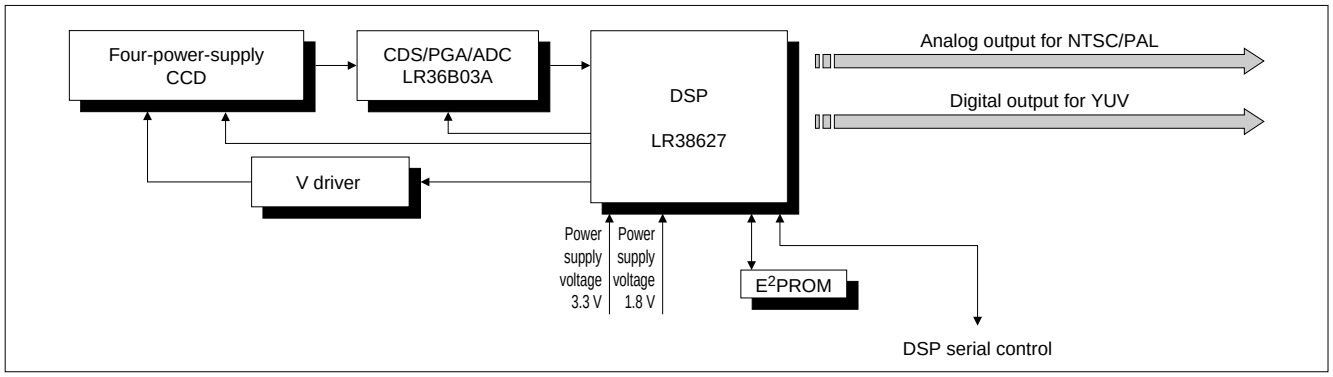

### Four-power-supply CCDs and peripheral ICs/LSIs

| CCD | | | CDS/PGA/ADC + DSP |
|---|---|---|---|
| 1/3 type | 270 kpixels | RJ2311DB0PB | LR36B14 |
| | | ☆RJ2315DB0PB | |
| | 320 kpixels | RJ2321DB0PB | |
| | | ☆RJ2325DB0PB | |
| | 410 kpixels | RJ2351CA0PB | |
| | | ☆RJ2355CA0PB | |
| | 470 kpixels | RJ2361CA0PB | |
| | | ☆RJ2365CA0PB | |
| 1/4 type | 270 kpixels | RJ2411EA0PB | |
| | | RJ2411EB0PB | |
| | | RJ2411FA0PB | |
| | 320 kpixels | RJ2421EB0PB | |
| | | RJ2421FA0PB | |
| | 410 kpixels | RJ2451CA0PB | |
| | | ☆RJ2455CA0PB | |
| | 470 kpixels | RJ2461CA0PB | |
| | | ☆RJ2465CA0PB | |

☆New product

RoHS

**<Color Security Camera System with Four-chip Configuration ( I )>**



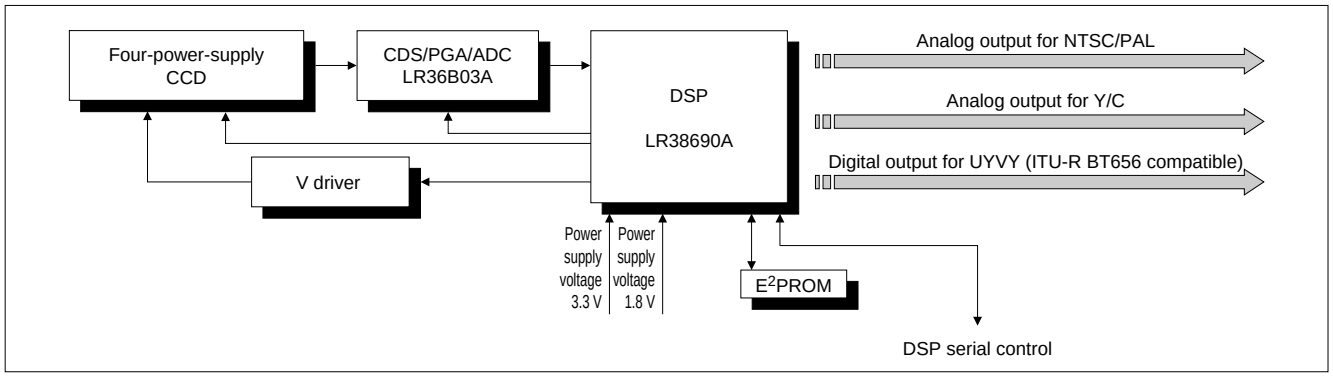

**Four-power-supply CCDs and peripheral ICs/LSIs**

| CCD | | | CDS/PGA/ADC | DSP |
|---|---|---|---|---|
| 1/3 type | 270 kpixels | RJ2311DB0PB | LR36B03A | LR38627 |
| | | ☆RJ2315DB0PB | | |
| | 320 kpixels | RJ2321DB0PB | | |
| | | ☆RJ2325DB0PB | | |
| | 410 kpixels | RJ2351CA0PB | | |
| | | ☆RJ2355CA0PB | | |
| | 470 kpixels | RJ2361CA0PB | | |
| | | ☆RJ2365CA0PB | | |
| 1/4 type | 270 kpixels | RJ2411EA0PB | | |
| | | RJ2411EB0PB | | |
| | | RJ2411FA0PB | | |
| | 320 kpixels | RJ2421EB0PB | | |
| | | RJ2421FA0PB | | |
| | 410 kpixels | RJ2451CA0PB | | |
| | | ☆RJ2455CA0PB | | |
| | 470 kpixels | RJ2461CA0PB | | |
| | | ☆RJ2465CA0PB | | |

☆New product

RoHS

**<Color Security Camera System with Four-chip Configuration (II)>**




**Four-power-supply CCDs and peripheral ICs/LSIs**

| CCD | | | CDS/PGA/ADC | DSP |
|---|---|---|---|---|
| 1/3 type | 270 kpixels | RJ2311DB0PB | LR36B03A | LR38690A |
| | | ☆RJ2315DB0PB | | |
| | 320 kpixels | RJ2321DB0PB | | |
| | | ☆RJ2325DB0PB | | |
| | 410 kpixels | RJ2351CA0PB | | |
| | | ☆RJ2355CA0PB | | |
| | 470 kpixels | RJ2361CA0PB | | |
| | | ☆RJ2365CA0PB | | |
| 1/4 type | 270 kpixels | RJ2411EA0PB | | |
| | | RJ2411EB0PB | | |
| | | RJ2411FA0PB | | |
| | 320 kpixels | RJ2421EB0PB | | |
| | | RJ2421FA0PB | | |
| | 410 kpixels | RJ2451CA0PB | | |
| | | ☆RJ2455CA0PB | | |
| | 470 kpixels | RJ2461CA0PB | | |
| | | ☆RJ2465CA0PB | | |

☆New product

## ■ For Notebook PCs, PC Monitors and LCD TVs

### ●TFT-LCD Drivers

| Drive function | | Model No. | Gray scale | No. of LCD drive outputs | Display voltage (V) MAX. | Clock frequency (MHz) MAX. | Supply voltage (V) | Description | Package |
|---|---|---|---|---|---|---|---|---|---|
| Source driver | Dot inversion drive | LH16DF | 256 levels | 414 | 16.5 | 250 | 2.7 to 3.6 | Low EMI*1 driver using mini-LVDS interface, R-DAC system | SOF |
| | | LH16DD | | 630/642/684/720 | | | | | |
| | | LH16DK | | | | 380 | | | |
| | | LH16DH | | 804/840/912/960 | | 330 | | | |
| | | LH16DE | 1 024 levels | 630/642/684/720 | | 250 | | | |
| Gate driver | | LH163Y | — | 202/242/258/262/272 | 20 to 45 | 200 | 2.1 to 4.2 | Output signal masking function, enables construction of module without printed circuit board | |

*1 EMI: Electro-Magnetic Interference

### ●TFT-LCD Controller

| Model No. | Image size | Input interface | Output interface | Functions | Clock frequency (MHz) MAX. | Supply voltage (V) | | | Package |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Core | Digital | Analog | |
| ☆LR388H3 | 1 366 x 768<br>1 920 x 1 080 | LVDS 4ch 8/10 bits | mini-LVDS 4ch 8/10 bits | • Improves response speed of LCD image by original Quick Shoot technology (with a built-in frame memory)<br>• Register control by external EEPROM (SPI) and I²C I/F<br>• Control gamma correction IC (SPI) | 200 | 0.9 to 1.1 | 3.0 to 3.6 | 2.3 to 2.7 | TFBGA421-1919 |

### ●LED Backlight Controller

| Model No. | LED type | Video input interface | Video output interface | LED output interface | Functions | Frame rate (fps) | Supply voltage (V) | | | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Core | LVDS | IO | |
| ☆LR388H0 | White LEDs | LVDS 2ch 8/10 bits | LVDS 2ch 8/10 bits | SPI | • LED backlight controller using area active technology (MAX. 32 x 16 areas)<br>• Support for 1 920 x 1 080 / 1 366 x 768 LCD panel<br>• Support for wide variety of backlight systems (Direct-type, edge-type, even/odd numbered area division, etc.)<br>• Register control by external EEPROM (SPI) and I²C I/F | 48/50/60 | 1.1 to 1.3 | 2.3 to 2.7/<br>3.0 to 3.6 | 3.0 to 3.6 | TFBGA164-1212 |

☆New product

RoHS

## ■ For Mobile Devices

### ●TFT-LCD Controllers

| Model No. | LCD interface (pixel) MAX. | Display colors MAX. | Display RAM capacity (bit) | Function | CPU interface | Supply voltage (V) | | Package |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Core | Host I/F | |
| ☆LR388J4 | 600 x 1 024 | 16 770 k colors | 44 M (Flexibly meets the requirement depending on the panel size) | • MDDI*1 1.1/1.2 type2-compliant<br>• MIPI*2-compliant<br>• Built-in IrSimple™ and IrDA communications functions<br>• Main/sub LCD controller<br>• Built-in 2D-3D image conversion function<br>• Graphic processing<br>• Built-in SDHC interface<br>• Built-in HDMI 1 080p/24 Hz, 1 080i/60 Hz output interface | MDDI*1 for MSM series/ 80-family (8/16/18-bit parallel) MIPI*2 DSI type4 | 0.8 to 1.32 | 1.65 to 3.3 | P-WFBGA385-0909 |
| LR388G9 | | | 32 M (Flexibly meets the requirement depending on the panel size) | • MDDI*1 1.1/1.2 type2-compliant<br>• MIPI*2-compliant<br>• Built-in IrSimple™ and IrDA communications functions<br>• Main/sub LCD controller<br>• Graphic processing<br>• Built-in SDHC interface<br>• Built-in HDMI 1 080p/24 Hz, 1 080i/60 Hz output interface | | 1.08 to 1.32 | | P-WFBGA261-0808 |
| LR388D8 | 480 x 864 | | 16 M (Flexibly meets the requirement depending on the panel size) | • MDDI*1-compliant<br>• Built-in IrSimple™ and IrDA communications functions<br>• Main/sub LCD controller<br>• Graphic processing<br>• Built-in SDHC interface | MDDI*1 for MSM series/ 80-family (8/9/16/ 18-bit parallel) | | | P-WFBGA205-0808 |
| LR388D1 | 240 x 400 | 262 144 colors | 240 x 400 x 18 | • MDDI*1-compliant<br>• Built-in IrSimple™ and IrDA communications functions<br>• Main/sub LCD controller<br>• Graphic processing | | 1.65 to 1.95 | | P-VFBGA144-0808 |

*1 MDDI (Mobile Display Digital Interface): The serial interface standard developed by QUALCOMM
*2 MIPI: Mobile Industry Processor Interface

IrSimple™ is a trademark of Infrared Data Association.
QUALCOMM and MSM are trademarks of QUALCOMM Incorporated.

## ■ Power Supply ICs for TFT-LCDs

| Model No. | No. of output circuits | Input voltage range (V) | Output voltage (V) | System | Switching frequency (Hz) | Switching transistor | Switching current (mA) [Built-in SW Tr] | Drive capacity (pF) [External SW Tr] | Package |
|---|---|---|---|---|---|---|---|---|---|
| IR3M58M/U | 3 | 4.5 to 28 | External setting | Step-up (MAX. 20 V)/ step-down type PWM | 70 k to 500 k | Built-in (for step-up type PWM) | 400 | 1 000 | P-QFP048-0707/ P-VQFN036-0505 |
| | | | | Step-down type PWM | | External | – | | |
| | | | | Step-down, inverting type PWM | | External | – | | |

## ■ Room Lighting

| Model No. | Function | Features | Supply voltage (V) | Package |
|---|---|---|---|---|
| LR56001 | 3-channel LED controller | • 3-channel driver controller for cool white color LEDs / warm white color LEDs / night light LEDs<br>• Built-in PWM dimming function for each channel<br>• Built-in adjustable color function (available for color adjustment between cool white and warm white color)<br>• PWM dimming frequency range: 200 Hz to 1 kHz<br>• Optimal driving of multiple LED modules with different Vf<br>• Built-in LED open/short detection function and over-temperature detection function<br>• Available for both 3 V and 5 V systems for MCU interface voltage | Core: 5.0±0.5<br>I/O: 3.3±0.3/ 5.0±0.5 | P-QFP048-1010 |

RoHS

## ■ System LSIs

| Model No. | Function | Features | Supply voltage (V) | Package |
|---|---|---|---|---|
| LR35501 | One-chip graphic controller | • Built-in video encoder (NTSC/PAL)<br>• Composite signal output<br>• Analog RGB signal output<br>• Capable of moving picture transmission/play, thanks to real-time image compression and extension technology<br>• Real images, backgrounds and sprites can be superimposed<br>• Built-in sprite graphic processor<br>• Built-in color object detector<br>• Built-in Bluetooth® HCI controller<br>• Built-in sound generator (ADPCM/PSG)<br>• Built-in CMOS camera interface (9 MHz)<br>• CPU: Z80 compatible, 27 MHz<br>• Peripherals (NAND flash I/F, PIO, SIO, UART, ADC, PWM, etc.) | Core: 1.8±0.18<br>I/O: 3.3±0.3 | P-QFP128-1420 |
| LR35503 | One-chip graphic controller | • Digital LCD interface (6-bit RGB), QVGA (320 x 240) compliant<br>• 27 MHz digital YUV video input<br>• Capable of moving picture transmission/play, thanks to real-time image compression and extension technology<br>• Real images, backgrounds and sprites can be superimposed<br>• Built-in sprite graphic processor<br>• Built-in color object detector (Only for CMOS camera input)<br>• Built-in Bluetooth® HCI controller<br>• Built-in sound generator (ADPCM/PSG)<br>• Built-in CMOS camera interface (9 MHz)<br>• CPU: Z80 compatible, 27 MHz<br>• Peripherals (NAND flash I/F, PIO, SIO, UART, ADC, PWM, etc.) | Core: 1.8±0.18<br>I/O: 3.3±0.3 | P-LQFP144-2020 |

Bluetooth is a trademark of Bluetooth SIG, Inc.
Z80 is a trademark of ZiLOG, Inc.

## ■ Graphic Display Module with LCDs

| Model No. | Function | Features | Supply voltage (V) | Outline dimensions (W × D) (mm) |
|---|---|---|---|---|
| LR0G934 | 3.5″ LCD graphic display module (incorporating LR35503) | • LED backlight, QVGA (320 x 240), built-in 3.5″ color TFT LCD<br>• Built-in LR35503 (one-chip graphic controller with built-in 8-bit CPU)<br>• Built-in 64-Mbit NOR flash<br>• Video input (composite NTSC)<br>• Built-in real-time clock (RTC)<br>• External interface<br>Video input, digital input/output (shared 2 ch UART), analog input (4 ch ADC), sound output, battery backup terminal (RTC use) | 5±0.5 | 87.4 × 69.2 |
| LR0G938 | 3.5″ LCD graphic display module with touch panel function (incorporating LR35503) | • LED backlight, QVGA (320 x 240), built-in 3.5″ color TFT LCD<br>• Touch panel function<br>• Built-in LR35503 (one-chip graphic controller with built-in 8-bit CPU)<br>• Built-in 64-Mbit NOR flash<br>• Video input (composite NTSC)<br>• Built-in real-time clock (RTC)<br>• External interface<br>Video input, digital input/output (shared 2 ch UART), analog input (4 ch ADC), sound output, battery backup terminal (RTC use) | 5±0.5 | 87.4 × 69.2 |

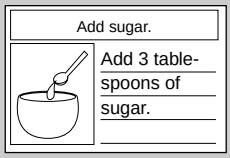
RoHS

## ■ One-chip Graphic Controller <LR35501/LR35503>

LR35501/LR35503 are the system LSIs which enable smooth graphic display by graphic controller with built-in microcomputers and device control and graphic display with one chip due to the microcomputers and various I/Os.

### Common features

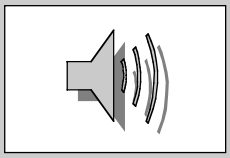
**Built-in versatile graphic functions**




- Smooth imaging using sprite processor
- Capable of moving picture transmission/play, thanks to real-time image compression technology
- Real images, backgrounds and sprites can be superimposed

Graphic expression with smooth movement is possible

**Sound output**



Built-in stereo sound circuit
- ADPCM decoder
- Programmable sound generator

Warning using realistic alarm tone / audio is possible

**CMOS camera interface**

- CIF/QVGA UYVY input

CIF/QVGA CMOS imager can be connected

**Bluetooth®**

- Built-in HCI controller
- SPP, HID compliant

Smooth images transmission achieved by using Bluetooth®

**General purpose I/O built-in PIO/UART/SIO/NAND flash interface/ADC/PWM/SPI, etc.**

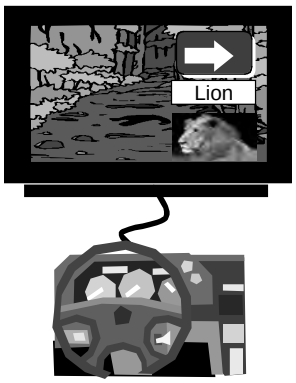
**LR35501 features and functions**

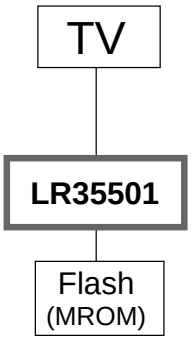
- Built-in video encoder (NTSC/PAL)
- Built-in analog RGB output
- Built-in composite video output

**LR35503 features and functions**

- Built-in digital LCD interface (6-bit RGB QVGA [320 x 240])
- Built-in 27 MHz YUV digital video input

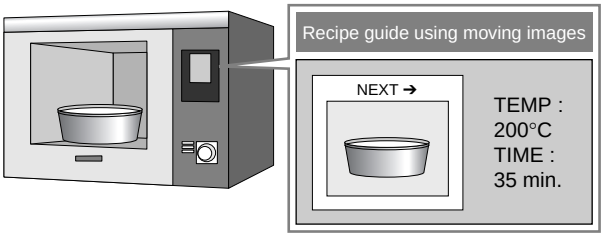
## Intellectual training toy
**(Driving game)**



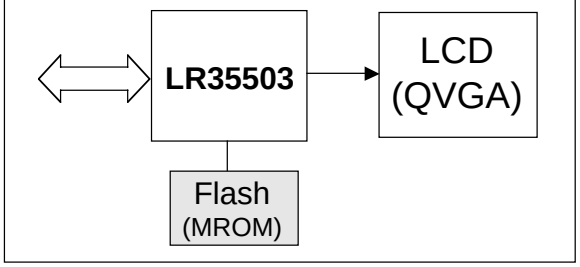




Directly connected to TV (composite) output

## Household electrical appliance




Smooth graphics achieved by simple circuits




Bluetooth is a trademark of Bluetooth SIG, Inc.

☆New product

RoHS

## ■ IrSimple™ Communications Series <☆LR388J4/LR388G9/LR388D8/LR388D1>

IrSimple™ communications is a communications protocol which makes the Ir communication standard employed in mobile terminals such as mobile phones, IrDA protocol, more efficient. Compared with IrDA, since the data transfer time can be significantly reduced to approximately 1/4th to 1/10th, higher volumes of data can be sent and received. In addition, by incorporating a controller for IrSimple™ communications into mobile equipment or digital home appliances, high-quality image data taken with a digital camera or a mobile phone camera can be readily transferred to a TV or a printer at high speed with a simple operation such as with a remote controller. The image data captured from the camera can be enjoyed on full HD-TV, or by printing the data out.

### ●Features

**● ☆LR388J4**
**(MDDI*1/MIPI*2-compliant HXGA 3D LCD controller for IrSimple™)**
The 2D-3D image conversion function is incorporated into LR388G9.
The 3D-LCD system in smart phones or tablet-type devices can be achieved with a single chip.

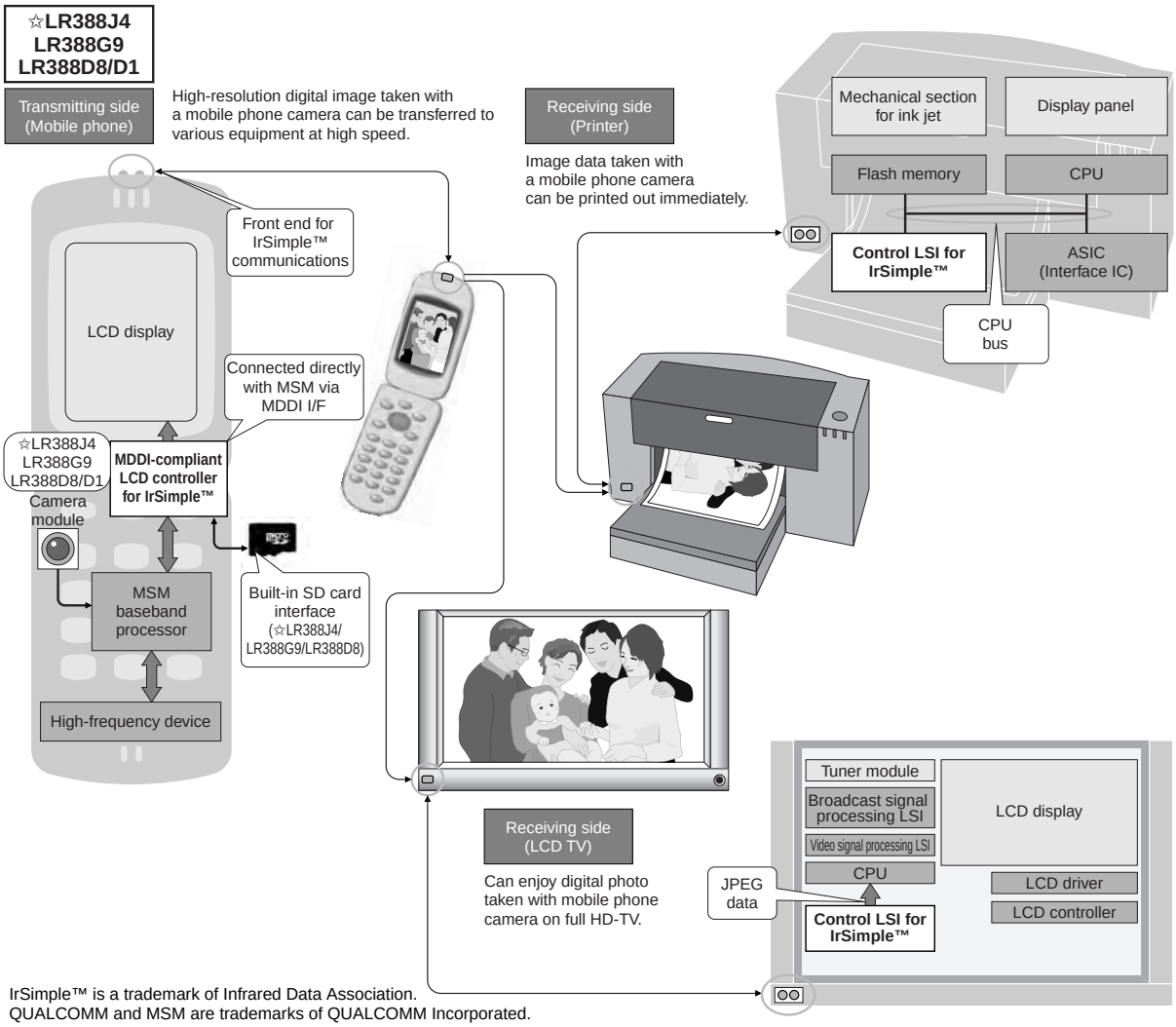
**● LR388G9**
**(MDDI*1/MIPI*2-compliant HXGA LCD controller for IrSimple™)**
The LR388G9 can display on up to HXGA-sized LCD displays. For incorporating 32-Mbit embedded memory, FHD-sized (1 920 x 1 080) external output is available with HDMI. Also, by adding on MIPI*2 interface, the LR388G9 can be used in wide range of application systems.

**● LR388D8**
**(MDDI*1-compliant WVGA LCD controller for IrSimple™)**
The LR388D1 has been made compatible with full-WVGA LCD displays, with internal memory (16 Mbits) that can hold two screens of data (main and sub). High-resolution display and low power consumption have been realized. Furthermore, a built-in SD card interface supports a reduction in the number of chips.

**● LR388D1**
**(MDDI*1-compliant WQVGA LCD controller for IrSimple™)**
Thanks to a built-in IrSimple™ function in the LCD controller, the mounting area of a mobile phone can be decreased; thus it contributes to size reduction in mobile phones. Also, a higher volume of data can be transferred at high speed with 4 fewer signal lines due to the incorporation of an MDDI*1 interface.

*1 MDDI (Mobile Display Digital Interface) : The serial interface standard developed by QUALCOMM
*2 MIPI : Mobile Industry Processor Interface

### ●Application & System Configuration Example



RoHS

## ■ Low Power-Loss Voltage Regulators

### ●TO-220 type

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | | | Electrical characteristics | | | Built-in functions | | | | | | Package | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output current Io (A) | Input voltage Vin (V) | Power dissipation (W) Pd*1 | Power dissipation (W) Pd*2 | Output voltage Vo*3 (V) TYP. | Output voltage precision (%) | Dropout voltage $V_{I-O}$*5 (V) | Overheat protection | Overcurrent protection | ON/OFF control | Low dissipation current at OFF state | Variable output voltage | Lead forming available | | Package shape type*7 |
| PQxxxRDA1SZH series | ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.)) | 1 | 24 | 1.4 | 15 | 3.3, 5, 8, 9, 12 | ±3 | 0.5 | ○ | ○ | ○ | ○ | | | TO-220 | A |
| PQxxxRDA2SZH series | | 2 | 20 | | | 3.3, 5, 9, 12 | ±2.5 | 1.0 | ○ | ○ | ○ | ○ | | | | A |
| PQ070XF01SZH | Minimum operating input voltage: 2.35 V (4 terminals) | 1 | 10 | 1.4 | 15 | 1.5 to 7 | ±2*4 | 0.5 | ○ | ○ | | | ○ | | | A |
| PQ070VK01FZH | Minimum operating input voltage: 2.35 V (5 terminals) | 1 | | | | | | | ○ | ○ | ○ | ○ | ○ | ○ | | E |
| PQ070VK02FZH | | 2 | | | | | | | ○ | ○ | ○ | ○ | ○ | ○ | | E |
| PQ150RWA2SZH | ASO protection function | 2 | 20 | 1.4 | 15 | 3.0 to 15 | ±2.5*4 | 1.0 | ○ | ○ | | | ○ | | | A |
| PQ30RV11J00H | Variable output voltage | 1 | 35 | 1.5 | 15 | 1.5 to 30 | ±2*4 | 0.5 | ○ | ○ | △*6 | | ○ | ○ | | B |
| PQ30RV21J00H | | 2 | | | 18 | | | | ○ | ○ | △*6 | | ○ | ○ | | B |
| PQ30RV31J00H | | 3 | | 2 | 20 | | | | ○ | ○ | △*6 | | ○ | ○ | | B |

*1 At self-cooling
*2 With infinite heat sink attached
*3 The xxx in the model No. refer to the output voltage values of the model (e.g. 050 for 5 V, 120 for 12 V, 015 for 1.5 V).
*4 Reference voltage precision
*5 Current ratings are defined individually.
*6 △ : Available by adding circuit
*7 Refer to page 45

## ■ Surface Mount Type Low Power-Loss Voltage Regulators

### ●SOT-89 type

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | | Electrical characteristics | | | Built-in functions | | | | | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output current Io (A) | Input voltage Vin (V) | Power dissipation Pd*1 (W) | Output voltage Vo*2 (V) TYP. | Output voltage precision (%) | Dropout voltage $V_{I-O}$*3 (V) | Overheat protection | Overcurrent protection | ON/OFF control | Low dissipation current at OFF state | Variable output voltage | |
| PQ1LAxx5MSPQ | Compact, high radiation package, ceramic capacitor compatible | 0.5 | 15 | 0.9 | 1.2, 1.5, 1.8, 2.5, 3.3, 5.0 | ±2.0 | 0.7 | ○ | ○ | ○ | ○ | | SOT-89 |
| PQ1LAX95MSPQ | Ceramic capacitor compatible, variable output voltage | | | | 1.5 to 9.0 | ±2.0*4 | | ○ | ○ | ○ | ○ | ○ | |

*1 When mounted on a board
*2 The xx in the model No. refer to the output voltage values of the model (e.g. 25 for 2.5 V, 50 for 5.0 V).
*3 Current ratings are defined individually.
*4 Reference voltage precision

RoHS

## ●SC-63 type (1) Output voltage fixed type

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | | | | Electrical characteristics | | | Built-in functions | | | | | | Package | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output current Io (A) | | | Input voltage Vin (V) | Power dissipation Pd*1 (W) | Output voltage Vo*2 (V) TYP. | Output voltage precision (%) | Dropout voltage VI-O*4 (V) | Overheat protection | Overcurrent protection | ON/OFF control | Low dissipation current at OFF state | Variable output voltage | Taped package | | Package shape type*5 |
| | | 0.5 | 1 | 1.5 | | | | | | | | | | | | | |
| PQxxxDNA1ZPH series | Ceramic capacitor compatible, ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.)), solder dip compatible lead shape | | ○ | | 24 | 8 | 3.3, 5, 9, 12 | ±2.5 | 0.5 | ○ | ○ | ○ | ○ | – | ○ | SC-63 | G |
| PQxxxENA1ZPH series | Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape | | ○ | | 10 | 8 | 1.5, 1.8, 2.5, 3.3 | ±2.0 | | ○ | ○ | ○ | ○ | – | ○ | | G |
| PQxxxENB1ZPH series | | | ○ | | | 5 | 1.2, 1.5, 1.8, 2.5, 3.3 | | 0.3 | ○ | ○ | ○ | ○ | – | ○ | | G |
| PQxxxENAHZPH series | | | | ○ | | 8 | 1.5, 1.8, 2.5, 3.3 | | 0.9 | ○ | ○ | ○ | ○ | – | ○ | | G |
| PQxxxGN01ZPH series | Minimum operating input voltage: 1.7 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape | | ○ | | 5.5 | | 1.0, 1.2 | ±30 mV | – | ○ | ○ | | | – | ○ | | G |
| PQxxxGN1HZPH series | | | | ○ | | | | | | ○ | ○ | | | – | ○ | | G |

*1 With infinite heat sink attached
*2 The xxx in the model No. refer to the output voltage values of the model (e.g. 033 for 3.3 V, 050 for 5 V, 120 for 12 V).
*3 The value is defined as ±50 mV in some models.
*4 Current ratings are defined individually.
*5 Refer to page 45

## ●SC-63 type (2) Output voltage variable type

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | | | | Electrical characteristics | | | Built-in functions | | | | | | Package | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output current Io (A) | | | Input voltage Vin (V) | Power dissipation Pd*1 (W) | Output voltage Vo (V) TYP. | Output voltage precision (%) | Dropout voltage VI-O*3 (V) | Overheat protection | Overcurrent protection | ON/OFF control | Low dissipation current at OFF state | Variable output voltage | Taped package | | Package shape type*4 |
| | | 0.5 | 1 | 1.5 | | | | | | | | | | | | | |
| PQ070XNA1ZPH | Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape | | ○ | | 10 | 8 | 1.5 to 7 | ±2.0*2 | 0.5 | ○ | ○ | ○ | ○ | ○ | ○ | SC-63 | G |
| PQ070XNAHZPH | | | | ○ | | | | | 0.9 | ○ | ○ | ○ | ○ | ○ | ○ | | G |
| PQ070XNA2ZPH | | | | ○ (2 A) | | | | | 0.5 | ○ | ○ | ○ | ○ | ○ | ○ | | G |
| PQ070XNB1ZPH | | | ○ | | | 5 | 1.2 to 7 | | 0.3 | ○ | ○ | ○ | ○ | ○ | ○ | | G |
| PQ035ZN01ZPH | Reference voltage (Vref): 0.6 V, minimum operating input voltage: 1.7 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape | | ○ | | 5.5 | 8 | 0.8 to 3.5 | ±30 mV | – | ○ | ○ | | | ○ | ○ | | G |
| PQ035ZN1HZPH | | | | ○ | | | | | – | ○ | ○ | | | ○ | ○ | | G |
| PQ200WNA1ZPH | Minimum operating input voltage: 3.5 V, ASO protection function, low dissipation current at OFF state (Iqs: 5 µA (MAX.)), ceramic capacitor compatible, solder dip compatible lead shape | | ○ | | 24 | | 3.0 to 20 | ±2.5*2 | 0.5 | ○ | ○ | ○ | ○ | ○ | ○ | | G |
| PQ200WN3MZPH | Minimum operating input voltage: 5.5 V, low dissipation current at OFF state (Iqs: 5 µA (MAX.)), ceramic capacitor compatible, current limit: 800 mA | ○ (0.3) | | | | 6.8 | 5.0 to 20 | | | ○ | ○ | ○ | ○ | ○ | ○ | | |

*1 With infinite heat sink attached
*2 Reference voltage precision
*3 Current ratings are defined individually.
*4 Refer to page 45

**Notice**
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

## ●TO-263 type

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | | Electrical characteristics | | | Built-in functions | | | | | Taped package | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output current Io (A) | Input voltage Vin (V) | Power dissipation Pd*1 (W) | Output voltage Vo (V) TYP. | Output voltage precision (%) | Dropout voltage $V_{I-O}$*3 (V) | Overheat protection | Overcurrent protection | ON/OFF control | Low dissipation current at OFF state | Variable output voltage | | |
| PQ070XHA2ZPH | 2 A output (minimum operating input voltage: 2.35 V), ceramic capacitor compatible | 2.0 | 10 | 35 | 1.5 to 7 | ±2.0*2 | 0.5 | ○ | ○ | ○ | ○ | ○ | ○ | TO-263 |

*1 With infinite heat sink attached
*2 Reference voltage precision
*3 Current ratings are defined individually.

## ●SOP-8 type

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | | Electrical characteristics | | Built-in functions | | Taped package | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Output current Io (A) | Input voltage Vin (V) | Power dissipation Pd*1 (W) | Output voltage Vo (V) TYP. | Output voltage precision*2 (mV) | Overheat protection | Overcurrent protection | | |
| PQ1DX095MZPQ | Built-in sink source function (For DDR II memory) | ±0.8 | 6 | 0.6 | $V_{DD}$ x 1/2 ($V_{DDQ}$: 1.5 V (MIN.)) | ±25 | ○ | ○ | ○ | SOP-8 |
| PQ1DX125MZPQ | Built-in sink source function (For DDR memory) | | | | $V_{DD}$ x 1/2 ($V_{DDQ}$: 2.3 V (MIN.)) | ±35 | ○ | ○ | ○ | |

*1 When mounted on a board
*2 Reference voltage precision

RoHS

## ■ Surface Mount Type Chopper Regulators (DC-DC Converters)

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electrical characteristics | | | | | Package | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Switching current Isw (A) | Power dissipation Pd*1 (W) | Input voltage range Vin (V) | Output voltage*2 Vo (V) | Output type | Oscillation frequency fo (Hz) TYP. | Output saturation voltage Vsat (V) TYP. | | Outline shape type*4 |
| PQ6CU12X2APQ | • High switching voltage: 40 V (MAX.)<br>• For tuner power supply<br>• Variable oscillation frequency<br>• Ceramic capacitor compatible | 0.25 | 0.35 | 3.0 to 5.5 | up to 36 | Step-up | 300 k to 800 k | Ron TYP. 1.7Ω | SOT-23-6W | |
| PQ1CN38M2ZPH | • PWM chopper regulator (high oscillation frequency)<br>• Output ON/OFF control function<br>• Overcurrent/overheat protection circuits<br>• For light load | 0.8 | 8 | 4.5 to 40 | $V_{REF}$*3 to 35 (step-down type)/ $-V_{REF}$ to –30 (inverting type) | Step-down | 300 k | 0.9 | SC-63 | G |
| PQ1CN41H2ZPH | • PWM chopper regulator (high oscillation frequency)<br>• Overcurrent/overheat protection circuits | 1.5 | 8 | | | Step-down | 300 k | 0.9 | | G |
| PQ1CZ21H2ZPH | • PWM chopper regulator<br>• Output ON/OFF control function<br>• Overcurrent/overheat protection circuits<br>• Low dissipation current at OFF state (Standby current <$I_{SD}$>: 1 µA (MAX.)) | | 8 | | | Step-down | 100 k | 0.9 | | F |
| PQ1CX41H2ZPQ | • Bootstrap system for high efficiency (Efficiency 90% (TYP.))<br>• Low voltage output: 0.8 V (MIN.)<br>• Ceramic capacitor compatible | 1.5 | 0.8 When mounted on board | 4.75 to 27 | 0.8 to 20 | Step-down | 400 k | RDSon TYP. 0.45Ω | SOP-8 | |
| PQ1CX53H2MPQ | • Bootstrap system for high efficiency (Efficiency 89% (TYP.))<br>• Low voltage output: 0.8 V (MIN.)<br>• Ceramic capacitor compatible | 3.5 | 2 When mounted on board | 4.75 to 27 | 0.8 to 16 | Step-down | 400 k | RDSon TYP. 0.15Ω | USB-8 | |
| PQ1CX61H1ZPQ | • Bootstrap system for high efficiency (Efficiency 88% (TYP.))<br>• Low voltage output: 1.0 V (MIN.)<br>• Ceramic capacitor compatible | 1.5 | 0.8 When mounted on board | 4.75 to 28 | 1.0 to 18.9 | Step-down | 900 k | RDSon TYP. 0.55Ω | SOP-8 | |
| PQ1CY1032ZPH | • PWM chopper regulator<br>• Output ON/OFF control function<br>• Overheat protection/overcurrent shutdown circuits<br>• High output current type | 3.5 | 35 | 4.5 to 40 | $V_{REF}$*3 to 35 (step-down type)/ $-V_{REF}$ to –30 (inverting type) | Step-down | 150 k | 1.4 | TO-263 | |

*1 With infinite heat sink attached or when mounted on a board listed in the specification sheets.
*2 Output variable range (step-down/inversion).
*3 $V_{REF}$ nearly equal to 1.26 V
*4 Refer to page 45

☆New product

RoHS

## ■ Chopper Regulators (DC-DC Converters)

### ●TO-220 type

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electrical characteristics | | | | | Package | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Switching current Isw (A) | Power dissipation Pd*1 (W) | Input voltage range Vin (V) | Output voltage Vo*2 (V) | Output type | Oscillation frequency fo (kHz) TYP. | Output saturation voltage Vsat (V) TYP. | | Outline shape type*5 |
| PQ1CG38M2FZH | • PWM chopper regulator (high oscillation frequency)<br>• Built-in overcurrent/overheat protection circuits<br>• For light load<br>• Output ON/OFF control function | 0.8*3 | 14 | 40 | $V_{REF}$*4 to 35 (step-down type)/ $-V_{REF}$*4 to –30 (inverting type) | Step-down | 300 | 0.95 | TO-220 | E |
| PQ1CG38M2RZH | | | | | | | | | | D |
| PQ1CG21H2FZH | • PWM chopper regulator<br>• Built-in overcurrent/overheat protection circuits<br>• Output ON/OFF control function | 1.5*3 | | | | | 100 | 1.0 | | E |
| PQ1CG21H2RZH | | | | | | | | | | D |
| PQ1CG41H2FZH | • PWM chopper regulator (high oscillation frequency)<br>• Built-in overcurrent/overheat protection circuits<br>• Output ON/OFF control function | | | | | | 300 | 1.0 | | E |
| PQ1CG41H2RZH | | | | | | | | | | D |
| PQ1CG2032FZH | • PWM chopper regulator<br>• Built-in overcurrent/overheat protection circuits<br>• Output ON/OFF control function | 3.5*3 | | | | | 70 | 1.4 | | E |
| PQ1CG2032RZH | | | | | | | | | | D |
| PQ1CG3032FZH | • PWM chopper regulator (high oscillation frequency)<br>• Built-in overcurrent/overheat protection circuits<br>• Output ON/OFF control function | | | | | | 150 | | | E |
| PQ1CG3032RZH | | | | | | | | | | D |

*1 With infinite heat sink attached
*2 Output voltage variable range
*3 Peak current
*4 $V_{REF}$ nearly equal to 1.26 V (TYP.)
*5 Refer to page 45

## ■ DC-DC Converter Module with Built-in Coil

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electrical characteristics | | | | | Outline dimensions (W x D x H) mm |
|---|---|---|---|---|---|---|---|---|---|
| | | Output current Io (A) | Operating temperature Topr (°C) | Control system | Input voltage range Vin (V) | Oscillation frequency fo TYP. (MHz) | Output voltage Vo*1 (V) | Standby current Isd (μA) TYP. | |
| ☆PQ5CM03 series | • DC-DC converter module with built-in coil for simplified power-supply design<br>• High efficiency thanks to synchronous rectification method (efficiency: 82%) | 3.0 | –10 to +80 | PWM system | 8.5 to 14 | 1.0 | 1.1 to 3.3 | 20 | 9.0 x 6.0 x 2.6 |

*1 Output voltage variable range

RoHS

## ■ Power Supply ICs for CCDs/CCD Camera Modules

| Model No. | No. of output circuits | Input voltage range (V) | Output voltage (V) | System | Switching frequency (Hz) | Switching transistor | Switching current (mA) [Built-in SW Tr] | Drive capacity (pF) [External SW Tr] | Package |
|---|---|---|---|---|---|---|---|---|---|
| IR3M63U | 4 | 4.5 to 10 | 15 | Charge pump | 200 k | – | 12 (DC) | – | P-VQFN032-0505 |
| | | | –8 | Negative charge pump | | | 2.5 (DC) | – | |
| | | | 3.3 | Step-down type PWM + REG | 1 M | Built-in | 120 (DC) | – | |
| | | | 1.8 | Step-down type PWM + REG | | | 50 (DC) | – | |
| IR3M59U | 3 | 4.5 to 16 | 15/12 | Charge pump | 200 k | – | 12/20 (DC) | – | P-VQFN032-0505 |
| | | | –8/–5 | Negative charge pump | | | 2.5/5 (DC) | – | |
| | | | 3.3 | Step-down type PWM + REG | 1 M | Built-in | 150 (DC) | – | |

☆New product

RoHS

## ■ LED Drivers

### ●Built-in step-up circuit (1)

| Model No. | Function | Features | No. of output circuits | Number of LEDs | Booster method | Constant current circuit | Switching transistor | Input voltage range (V) | Output*3 current (mA) MAX. | Oscillation frequency (Hz) TYP. | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PQ6CB11X1CP | White LED driver for backlight (for small panels) | • High voltage CMOS output: 30 V (MAX.)<br>• Output ON/OFF control function<br>• Overvoltage/overcurrent protection circuits<br>• Soft start function | 1 | 6 (Series connection) | PWM | *1 | ○ | 2.7 to 5.5 | 250*2 | 1.2 M | USB-6 |
| PQ7L2020BP | | • High voltage CMOS output: 37 V (MAX.)<br>• Output ON/OFF control function<br>• Overvoltage/overcurrent protection circuits<br>• Soft start function<br>• Possible to use a low-capacity (0.1 µF) output capacitor | 1 | 9 (Series connection) | | *1 | ○ | 2.9 to 5.5 | 500 | 1.0 M | USB-6 |
| PQ7L3010QPF | White LED driver for flashlight | • Automatic-switching (between 1x/2x) charge pump system<br>• Non-external coil<br>• Built-in fail-safe function<br>• Short-circuit LED protection function/overheat protection function/soft start function | 1 | 1 | Charge pump | *1 | – | 2.6 to 4.4 | 800 | 0.9 M | 16QFN |
| IR2E49U/ IR2E49M | White LED driver for backlight | • Capable of driving a maximum of 40 LEDs with 8 LEDs (in series) per channel<br>• Built-in step-up DC-DC controller<br>• Capable of controlling brightness using PWM control<br>• Step-up output control according to LED-Vf | 5 | 40 | PWM | ○ | External | 6 to 28 | 150/ ch*4 | 100 k to 1 M*5 | P-VQFN036-0606/ P-QFP048-0707 |
| ☆IR2E63Yx | LED driver for backlight and call alert display (auto brightness adjustment) | • Capable of driving 9 main-LEDs + 2 sub-LEDs (series) and 6 call alert LEDs (RGB)<br>• Auto brightness adjustment and PWM brightness adjustment<br>• Power supply for EL panel and LCD controller<br>• LDO 4ch<br>• Built-in input terminals for ambient light sensor and proximity sensor<br>• I²C/SPI interface-compatible | 9 | 15 | PWM + charge pump | ○ | ○ | 3 to 4.2 (for drive)/ 1.62 to 3.2 (for control) | Main 25.6/ch Call alert 12.8/ch | 1 M | 63WL-CSP*6 |
| IR2E56U6 | White LED driver for backlight | • Capable of driving a maximum of 72 LEDs with 12 LEDs (in series) per channel<br>• Built-in step-up DC-DC controller<br>• High oscillation frequency (1.5 MHz) makes use of a small coil possible<br>• Capable of controlling brightness using PWM control<br>• Step-up output control according to LED-Vf<br>• Built-in sequential drive mode for output current | 6 | 72 | PWM | ○ | External | 5 to 28 | 25/ch | 200 k to 1.5 M | 32VQFN |
| ☆IR2E58U | | • Capable of driving a maximum of 96 LEDs with 12 LEDs (in series) per channel<br>• Built-in step-up DC-DC converter<br>• High oscillation frequency (1.5 MHz) makes use of a small coil possible<br>• Capable of controlling brightness using PWM control<br>• Step-up output control according to LED-Vf | 8 | 96 | | ○ | ○ | 4.5 to 28 | 40/ch | 500 k to 1.5 M | 24HQFN |

*1 LED constant current value can be set by external resistors.
*2 Peak switching current
*3 Constant current (MAX.)
*4 Use this IC within the range of power dissipation.
*5 Selectable oscillation frequency range
*6 3.57 mm x 3.57 mm x 0.585 mm (TYP.)

☆New product

## ●Built-in step-up circuit (2)

| Model No. | Function | Features | No. of output circuits | Number of LEDs | Booster method | Constant current circuit | Switching transistor | Input voltage range (V) | Output*1 current (mA) MAX. | Oscillation frequency (Hz) TYP. | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IR2E65U | White LED driver for backlight | • Capable of driving a maximum of 120 LEDs with 12 LEDs (in series) per channel<br>• Built-in step-up DC-DC controller<br>• High oscillation frequency (1.5 MHz) makes use of a small coil possible<br>• Wider range of PWM brightness control possible, from simultaneous total output control to local dimming<br>• Step-up output control according to LED-Vf | 10 | 120 | PWM | ○ | External | 10 to 28 | 100/ch | 500 k to 1.5 M | 52HQFN |
| ☆IR2E67M | | • Built-in 10 ch. constant-current control amplifier (external output transistor)<br>• Enables driving LEDs up to external transistor voltage limit<br>• Built-in timing controller for lighting<br>• Wider range of PWM brightness control possible, from simultaneous total output control to local dimming<br>• Step-up output control according to LED-Vf | 10 | *2 | *3 | *4 | – | 4.5 to 5.5 | *5 | – | 80LQFP-1420 |

*1 Constant current (MAX.)
*2 Determined by external transistor voltage limit.
*3 Built-in feedback voltage-generating circuit for external power supply.
*4 Built-in constant-current control amplifier (external output transistor)
*5 Determined by external resistor.

## ●External power supply for LEDs

| Model No. | Function | Features | Supply voltage (V) | Package |
|---|---|---|---|---|
| IR2D20U | 24-dot LED panel driver with constant-current sink outputs | • Output current (constant current sink output): 30 mA (MAX.) (setup by external resistor)<br>• Gradation function (clock cycle setting or external synchronization)<br>• Independent current control for three systems (for RGB LED)<br>• LED drive voltage: 15 V<br>• Rated output voltage: 20 V (MAX.)<br>• $f_{CLK}$: 20 MHz (MAX.)/16.6 MHz (MAX.) (at cascade connection) | 4.5 to 5.5 | P-HQFN052-0707 |
| IR2D071 | 16-dot LED panel driver with constant current sink outputs | • Output current (constant-current sink output): 60 mA (MAX.) (setup by external resistor)<br>• Rated output voltage: 7 V (MAX.)<br>• $f_{CLK}$: 20 MHz (MAX.)/16.6 MHz (MAX.) (at cascade connection) | 3.0 to 5.5 | P-SDIP028-0400 |

★Under development

## ■ AC-DC Conversion Type ICs for LED Lighting

| Model No. | Features | Absolute maximum ratings | | Electrical characteristics | | | | | Package |
|---|---|---|---|---|---|---|---|---|---|
| | | Vcc (V) | Topr (°C) | Drive voltage Vcc (V) MIN. | Dissipation current Icc (mA) TYP. | Low level output current $I_{OL}$ (mA) MIN. | High level output current $I_{OH}$ (mA) MAX. | Switching frequency $F_{SW}$ (kHz) TYP. | |
| PQ1DC15C0P | • Use of forward type allows high (90%) efficiency rate<br>• No electrolytic capacitor | 23 | −30 to +100 | 20 | 3 | 15 | −15 | 68 | SOT-23 |
| PQ1DC15F1P | | | | | | | | | SOP-8 |

## ■ Power Supply Modules for LED Lighting

| Model No. | Features | Absolute maximum ratings | | Electrical characteristics | | | | | | Outline dimensions (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{AC}$ (V) | Topr (°C) | Input voltage $V_{AC}$ (V) TYP. | Output voltage Vout (V) TYP. | Output current Iout (mA) TYP. | Output power Po (W) TYP. | Efficiency η (%) TYP. | Power factor PF TYP. | |
| ★PQ1AS1D01 | • Step-down type<br>• Compatible with existing dimmers<br>• High efficiency | 110 | −10 to +80 | 100 | 31 | 200 | 6.2 | 80 | 0.9 | 23 × 42 × 23.6 |
| ★PQ1AS1D01A | | 132 | | 120 | | | | 82 | 0.8 | |
| ★PQ1AS2D01 | | 253 | | 230 | 62 | 100 | | 85 | 0.8 | |

## ■ Power Amplifiers for Wireless LAN

| Model No. | Application | Supply voltage Vcc (V) TYP. | Control voltage Vbb (V) TYP. | Linear output power*1 (dBm) | Dissipation current (mA) TYP. | Gain (dB) TYP. | Detection circuit | Matching circuit | Package (mm) |
|---|---|---|---|---|---|---|---|---|---|
| IRM068U7 | For 2.4 GHz single-band wireless LAN (IEEE802.11b/g/n) | 3.3 | 2.8 | 18 | 115 | 27 | ○*2 | Built-in (IN) | HQFN6 pin (1.5 × 1.5 × 0.4 mm) |
| QM2A1UA003 | | | | 20 | 150 | 28 | ○ | Built-in (IN) | |
| IRM053U7 | For 5 GHz single-band wireless LAN (IEEE802.11a/n) | | | 18 | 170 | 30 | ○ | Built-in (IN/OUT) | HQFN10 pin (2 × 2 × 0.4 mm) |
| QM2A1UA004 | | | | 20 | 225 | 31 | ○ | Built-in (IN/OUT) | |
| IRM065U7 | For 2.4/5 GHz dual-band wireless LAN (IEEE802.11a/b/g/n) | | | 18 | 130 | 30 | ○ | Built-in (IN/OUT) | HQFN16 pin (3 × 3 × 0.4 mm) |
| | | | | 18 | 160 | 30 | | | |
| IRM067U6 | | | 2.9 | 17 | 100 | 28 | ○*2 | Built-in (IN/OUT) | |
| | | | | 17 | 140 | 30 | | | |

*1 At time of OFDM 64QAM modulating wave input.
*2 Load fluctuation stabilization and detection output type

## ■ Power Amplifier for WiMAX

| Model No. | Operating frequency (GHz) | Output (dBm) | Dissipation current (mA) at 25 dBm | EVM (%) at 25 dBm | Gain (dB) | Detection circuit | Step gain function | On-chip matching circuit | Supply voltage/ control voltage Vcc/Vbb (V) | Package (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| QM2B1UA001 | 2.5 to 2.7 | 25 | 430 | 3 | 31 | ○ | ○ | ○ | 3.3/2.8 | HQFN16 pin (3 × 3 × 0.4) |

☆New product

## ■ Fail Safe ICs

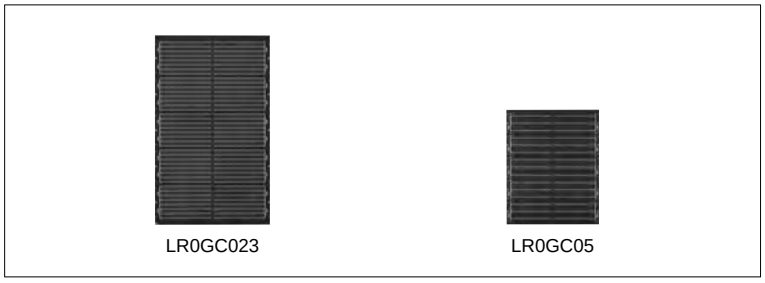
| Model No. | Features | Operating voltage | | | Dissipation current (μA) TYP. | Operating temp. (°C) | Package |
|---|---|---|---|---|---|---|---|
| | | VBAT (V) | VBAC (V) | VIO (V) | | | |
| IR3T46U6 | • Malfunction detection<br>• Built-in 8-bit ADC<br>• Built-in timer circuit<br>• Built-in key detection output OR gate | 3.2 to 4.5 | 3.0 to 3.3 | 2.6 to 3.0 | 10 | –20 to +85 | P-HQFN024-0404 |
| IR3T48Y6 | • Small package<br>• Built-in 3-STATE buffer<br>• Malfunction detection<br>• Built-in 8-bit ADC<br>• Built-in timer circuit<br>• Built-in key detection output OR gate | | | 1.6 to 3.0 | | | 35WL-CSP* |

* 3.0 (W) x 3.0 (D) x 0.975 (H) mm (TYP.)

## ■ Solar Modules for Mobile Devices

| Model No. | Features | Maximum output power* Pmax (mW) TYP. | Maximum output voltage* Vpm (V) TYP. | Maximum output current* Ipm (mA) TYP. | Outline dimensions (mm) |
|---|---|---|---|---|---|
| ☆LR0GC023 | Module thickness: 0.8 mm | 365 | 4.9 | 75 | 67.5 × 41.0 × 0.8 |
| ☆LR0GC05 | Module thickness: 1.0 mm | 160 | 4.6 | 35 | 41.0 × 33.0 × 1.0 |

* Measuring conditions: AM 1.5; irradiance: 1 000 W/m$^2$ ± 50 mW; module temperature: at 25°C



LR0GC023 LR0GC05

RoHS

## ■ CSP

### ●CSP (Chip Size Package)

The FBGA (commonly known as CSP) has an area array terminal structure with solder balls on the bottom, to give it a near chip-size footprint. This high-density, compact and low-profile package technology will greatly help in the design of compact mobile equipment, such as mobile phones and digital cameras.

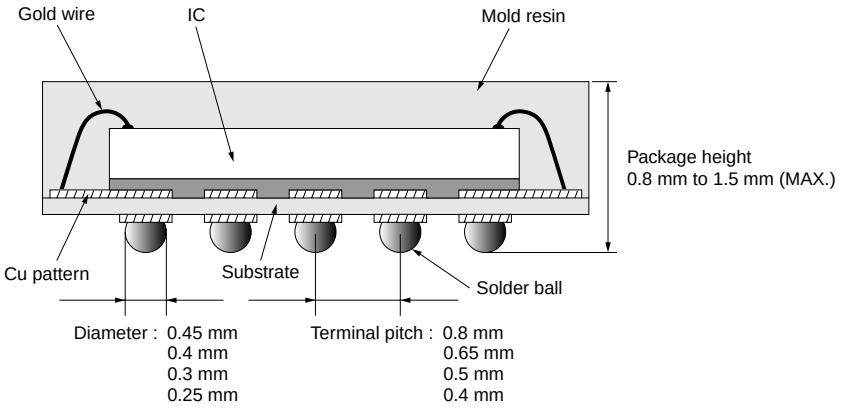
FBGA (CSP)

**Features**

- **Compact and lightweight**
  Ability to create a near-chip size and lighter-weight package in comparison with conventional plastic packages.
- **High reliability**
  Comparable high reliability with that of conventional plastic packages.
- **Mountability**
  Conventional mounting system is available for CSP. SOP and QFP can be mounted together with CSP.

| Terminal pitch | 0.8 mm | 0.65 mm | 0.5 mm | 0.4 mm |
|---|---|---|---|---|
| Maximum terminal counts | 352 (16 mm x 16 mm) | 352 (16 mm x 16 mm) | 372 (16 mm x 16 mm) | 264 (10 mm x 10 mm) |
| Nominal dimensions | 6 mm x 6 mm to 16 mm x 16 mm | | | 5 mm x 5 mm to 10 mm x 10 mm |

**Cross section example**




### ●Wafer-level CSP

The wafer-level CSP (WL-CSP) is a kind of chip-size package which is manufactured by assembling directly onto the finished wafer.

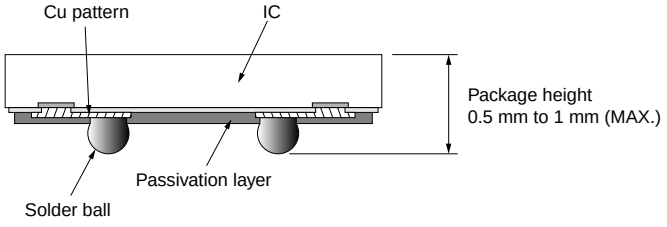
**Features**

- **Compact and thinner size**
  It makes it possible to create an almost IC-size and lighter-weight package.
- **Mountability**
  The conventional CSP mounting system can be also used in that of wafer-level CSP, which facilitates chip mounting more than bare-chip mounting does. It can be mounted together with other existing packages and passive components. (The use of underfill is recommended to improve the reliability of assembly.)

| Chip size* | 4 mm x 4 mm | | 3.5 mm x 3.5 mm | | 3 mm x 3 mm | |
|---|---|---|---|---|---|---|
| Pad pitch | 0.5 mm | 0.4 mm | 0.5 mm | 0.4 mm | 0.5 mm | 0.4 mm |
| Maximum terminal counts | 49 (7 x 7) | 81 (9 x 9) | 36 (6 x 6) | 49 (7 x 7) | 25 (5 x 5) | 36 (6 x 6) |

* Rectangular chip form is also available.

**Cross section example**



## ■ SiP (System in Package)

System in Package is SHARP's original high-density mounting technology that achieves high-density memory capacity and multiple functions by stacking multiple ICs or multiple packages. The System in Package technology means chip-stacked package technology that can achieve up to 5-chip mounting by stacking ICs in a single package. The System in Package technology contributes to higher functionality of applications, such as mobile phones and digital cameras, as well as to reduction in size and weight.

### ●Chip Stacked CSP

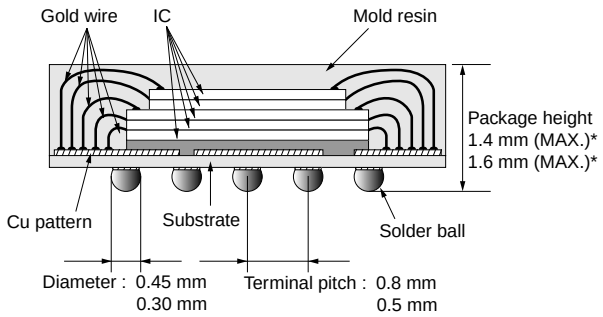
**Features**

- **Wide variety of lineup**
  It is possible to provide a wide lineup of stacked CSPs, including 2-chip, 3-chip, 4-chip and 5-chip stacked CSPs, to respond to customer needs.
- **Compact and thinner size**
  Encapsulating multiple ICs into an existing plastic package contributes to decreasing the mounting area. In addition, SHARP's wafer thinning technology makes it possible to achieve 1.4 mm (MAX.) package height.
- **Multiple functions**
  Multiple ICs of different sizes and functions, such as logic LSIs and memories, can be incorporated in a single package, making possible multiple functions.
- **Same-size IC stacking technology**
  SHARP's stacking technology enables stacking of multiple same-size ICs, contributing to higher memory density.

**(4-chip stacked CSP)**
When using a SHARP four-chip stacked CSP, the mounting area and weight of a package can be decreased by half in comparison with using two 2-chip stacked CSPs, or a 3-chip stacked CSP and a conventional CSP.

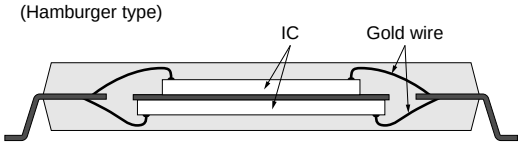
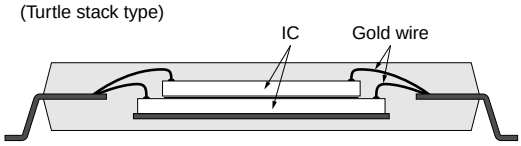
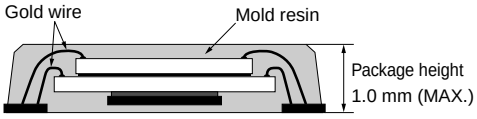
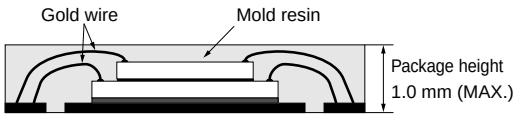
**Cross section example**

(5-chip stacked CSP)




* At 0.8 mm terminal pitch

## ●Chip Stacked TSOP/QFP*/VQFN/HQFN

| | |
|---|---|
| **Features** | ● **Decreased mounting area**<br>By encapsulating two identical or different types of ICs into a single conventional plastic package, the mounting area of the package can be decreased.<br>● **Multiple functions**<br>Thanks to the incorporation of different sizes and functions of multiple ICs, such as logic LSIs and memories, the functionality increases.<br>● **Higher memory density**<br>When incorporating two identical memory ICs into a single package, memory density doubles on the same mounting area. |
| **Cross section example** | (TSOP, QFP*)<br>(Hamburger type)<br>  <br>(Turtle stack type)<br>  <br>(VQFN)<br>  <br>(HQFN)<br>  |

* Including TQFP and LQFP.

RoHS

# ■ SOF

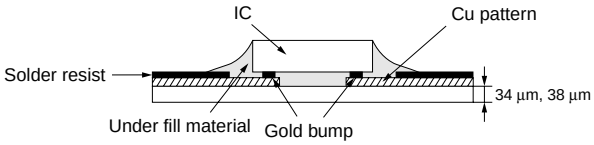
## ●SOF (System On Film)

SOF is a highly flexible thin film package, created from SHARP's TCP technologies.
It can be easily bent, and contributes to thin and compact design of products.
Peripheral circuit components can also be mounted.

**Features**

- **Highly flexible and thin film package**
  By using highly flexible and thin film, SOF contributes to creating thin and compact products.
  It can also achieve finer terminal pitches and multiple outputs easily, and pattern layout on a film under the chip makes it possible to improve the flexibility of the pattern layout.
- **Multiple chip mounting**
  Multiple chip mounting with peripheral chip components contribute to the higher functionality of products.

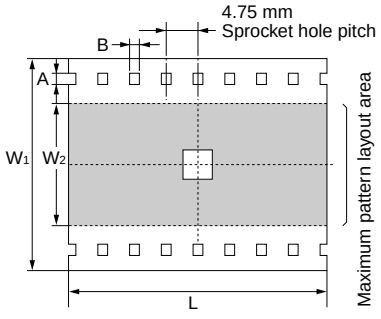
**Cross section example**




Thickness 0.8 mm (MIN.)
1.0 mm (TYP.)

**Film specifications**

| | | | |
|---|---|---|---|
| Film width : $W_1$ | 35 mm super wide | 48 mm super wide | 70 mm wide |
| Maximum pattern layout area : $W_2$ | 28.6 mm | 41.6 mm | 59.0 mm |
| Maximum device pitch : L | 15 sprockets | | |
| Pattern thickness | 8 µm | | |
| Pattern layer | Electro-deposited Cu | | |
| Pattern layer finish | Tin (Sn) | | |
| Minimum pattern pitch | 0.025 mm | | |
| Sprocket hole : A | 1.981 mm (wide) /1.42 mm (super wide) | | |
| Sprocket hole : B | 1.981 mm (wide) /1.42 mm (super wide) | | |



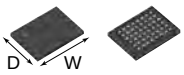

**Other components**

Bare chips and peripheral chip components can be mounted on the film.

RoHS

## ■ Package Lineup

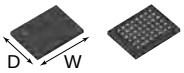
### ●Surface-mount Type

| Package type | Appearance (Package material) | Package code | No. of terminals | Terminal pitch mm | Nominal dimensions mm | Package depth & width (D x W) x (seated height [MAX.]) mm |
|---|---|---|---|---|---|---|
| FBGA (CSP) |   (Plastic) | P-LFBGA048-0606 | 48 | 0.8 | 6 x 6 | 6.0 x 6.0 x (1.4) |
| | | P-TFBGA048-0608 | | | 6 x 8 | 6.0 x 8.0 x (1.2) |
| | | P-TFBGA048-0808 | | | 8 x 8 | 8.0 x 8.0 x (1.2) |
| | | P-TFBGA056-0808 | 56 | | | |
| | | P-TFBGA060-0811 | 60 (48)* | | 8 x 11 | 8.0 x 11.0 x (1.2) |
| | | P-TFBGA064-0811 | 64 | | | |
| | | P-TFBGA072-0811 | 72 (64)* | | | |
| | | P-LFBGA072-0811 | | | | 8.0 x 11.0 x (1.4) / (1.6) |
| | | P-TFBGA081-0808 | 81 | | 8 x 8 | 8.0 x 8.0 x (1.2) |
| | | P-LFBGA085-0811 | 85 | | 8 x 11 | 8.0 x 11.0 x (1.4) / (1.6) |
| | | P-LFBGA087-0811 | 87 | | | |
| | | P-LFBGA088-0811 | 88 | | | |
| | | P-LFBGA088-0912 | | | 9 x 12 | 9.0 x 12.0 x (1.4) / (1.6) |
| | | P-LFBGA090-0811 | 90 | | 8 x 11 | 8.0 x 11.0 x (1.4) / (1.6) |
| | | P-TFBGA096-1010 | 96 | | 10 x 10 | 10.0 x 10.0 x (1.2) |
| | | P-LFBGA107-0912 | 107 | | 9 x 12 | 9.0 x 12.0 x (1.4) / (1.6) |
| | | P-TFBGA111-1010 | 111 | | 10 x 10 | 10.0 x 10.0 x (1.2) |
| | | P-TFBGA112-1010 | 112 | | | |
| | | P-LFBGA115-0914 | 115 | | 9 x 14 | 9.0 x 14.0 x (1.4) / (1.6) |
| | | P-LFBGA116-1010 | 116 | | 10 x 10 | 10.0 x 10.0 x (1.4) / (1.6) |
| | | P-LFBGA130-1013 | 130 | | 10 x 13 | 10.0 x 13.0 x (1.4) / (1.6) |
| | | P-TFBGA144-1111 | 144 | | 11 x 11 | 11.0 x 11.0 x (1.2) |
| | | P-TFBGA160-1212 | 160 | | 12 x 12 | 12.0 x 12.0 x (1.2) |
| | | P-LFBGA168-1212 | 168 | | | 12.0 x 12.0 x (1.4) / (1.6) |
| | | P-TFBGA180-1212 | 180 | | | 12.0 x 12.0 x (1.2) |
| | | P-TFBGA184-1212 | 184 | | | |
| | | P-TFBGA240-1414 | 240 | | 14 x 14 | 14.0 x 14.0 x (1.2) |
| | | P-LFBGA280-1616 | 280 | | 16 x 16 | 16.0 x 16.0 x (1.5) |
| | | P-LFBGA352-1616 | 352 | | | |
| | | P-TFBGA064-0606 | 64 | 0.65 | 6 x 6 | 6.0 x 6.0 x (1.2) |
| | | P-LFBGA140-0909 | 140 | | 9 x 9 | 9.0 x 9.0 x (1.4) |
| | | P-LFBGA160-1010 | 160 | | 10 x 10 | 10.0 x 10.0 x (1.4) / (1.6) |
| | | P-TFBGA180-1313 | 180 | | 13 x 13 | 13.0 x 13.0 x (1.2) |
| | | P-LFBGA192-1010 | 192 | | 10 x 10 | 10.0 x 10.0 x (1.4) / (1.6) |
| | | P-LFBGA208-1212 | 208 | | 12 x 12 | 12.0 x 12.0 x (1.4) / (1.6) |
| | | P-LFBGA224-1313 | 224 | | 13 x 13 | 13.0 x 13.0 x (1.4) / (1.6) |
| | | P-TFBGA260-1313 | 260 | | | 13.0 x 13.0 x (1.2) |

* Figures in brackets indicate available terminal counts.

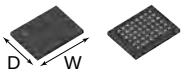
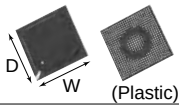
RoHS

## ●Surface-mount Type (cont'd)

| Package type | Appearance (Package material) | Package code | No. of terminals | Terminal pitch mm | Nominal dimensions mm | Package depth & width (D x W) x (seated height [MAX.]) mm |
|---|---|---|---|---|---|---|
| FBGA (CSP) |   (Plastic) | P-VFBGA057-0505 | 57 | 0.5 | 5 x 5 | 5.0 x 5.0 x (0.9) |
| | | P-VFBGA075-0505 | 75 | | | |
| | | P-TFBGA064-0606 | 64 | | 6 x 6 | 6.0 x 6.0 x (1.1) |
| | | P-TFBGA068-0606 | 68 | | | |
| | | P-VFBGA081-0606 | 81 | | | 6.0 x 6.0 x (0.9) |
| | | P-TFBGA084-0606 | 84 | | | 6.0 x 6.0 x (1.1) |
| | | P-VFBGA100-0606 | 100 | | | 6.0 x 6.0 x (0.9) |
| | | P-VFBGA100-0707 | | | 7 x 7 | 7.0 x 7.0 x (0.9) |
| | | P-TFBGA100-0707 | | | | 7.0 x 7.0 x (1.1) |
| | | P-VFBGA108-0707 | 108 | | | 7.0 x 7.0 x (0.9) |
| | | P-TFBGA108-0707 | | | | 7.0 x 7.0 x (1.1) |
| | | P-VFBGA120-0707 | 120 | | | 7.0 x 7.0 x (0.9) |
| | | P-TFBGA120-0707 | | | | 7.0 x 7.0 x (1.1) |
| | | P-TFBGA132-0707 | 132 | | | |
| | | P-TFBGA133-0808 | 133 | | 8 x 8 | 8.0 x 8.0 x (1.1) |
| | | P-VFBGA144-0808 | 144 | | | 8.0 x 8.0 x (0.9) |
| | | P-LFBGA144-0808 | | | | 8.0 x 8.0 x (1.3) / (1.5) |
| | | P-LFBGA144-0811 | | | 8 x 11 | 8.0 x 11.0 x (1.3) |
| | | P-TFBGA152-0808 | 152 | | 8 x 8 | 8.0 x 8.0 x (1.1) |
| | | P-VFBGA171-0811 | 171 | | 8 x 11 | 8.0 x 11.0 x (0.9) |
| | | P-LFBGA171-0811 | | | | 8.0 x 11.0 x (1.3) / (1.5) |
| | | P-VFBGA176-0909 | 176 | | 9 x 9 | 9.0 x 9.0 x (0.9) |
| | | P-TFBGA176-0909 | | | | 9.0 x 9.0 x (1.1) |
| | | P-TFBGA180-0909 | 180 | | | |
| | | P-TFBGA188-0909 | 188 | | | |
| | | P-VFBGA188-1111 | | | 11 x 11 | 11.0 x 11.0 x (0.9) |
| | | P-VFBGA208-1010 | 208 | | 10 x 10 | 10.0 x 10.0 x (0.9) |
| | | P-TFBGA208-1010 | | | | 10.0 x 10.0 x (1.1) |
| | | P-TFBGA245-1010 | 245 | | | |
| | | P-LFBGA245-1010 | | | | 10.0 x 10.0 x (1.3) |
| | | P-FBGA424-1414 | 424 | | 14 x 14 | 14.0 x 14.0 x (1.8) |
| | | P-WFBGA144-0606 | 144 | 0.4 | 6 x 6 | 6.0 x 6.0 x (0.75) |
| | | P-WFBGA121-0606 | 121 | | | 6.0 x 6.0 x (0.8) |
| | | P-WFBGA145-0606 | 145 | | | |
| | | P-TFBGA168-0707 | 168 | | 7 x 7 | 7.0 x 7.0 x (1.0) |
| | | P-TFBGA204-0808 | 204 | | 8 x 8 | 8.0 x 8.0 x (1.0) |
| | | P-WFBGA205-0808 | 205 | | | 8.0 x 8.0 x (0.8) |
| | | P-WFBGA261-0808 | 261 | | | |

RoHS

## ●Surface-mount Type (cont'd)

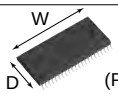
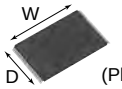
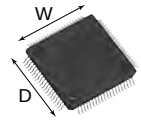
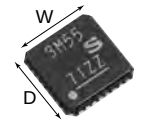
| Package type | Appearance (Package material) | Package code | No. of terminals | Terminal pitch mm | Nominal dimensions mm | Package depth & width (D x W) x (seated height [MAX.]) mm |
|---|---|---|---|---|---|---|
| FBGA (CSP) |  D W | P-TFBGAXXX-0606 | to 36 | 0.8 | 6 x 6 | 6.0 x 6.0 x (1.2) |
| | | P-TFBGAXXX-0707 | to 49 | | 7 x 7 | 7.0 x 7.0 x (1.2) |
| | | P-TFBGAXXX-0808 | to 81 | | 8 x 8 | 8.0 x 8.0 x (1.2) |
| | | P-TFBGAXXX-0909 | to 100 | | 9 x 9 | 9.0 x 9.0 x (1.2) |
| | | P-TFBGAXXX-1010 | to 121 | | 10 x 10 | 10.0 x 10.0 x (1.2) |
| | | P-TFBGAXXX-1111 | to 144 | | 11 x 11 | 11.0 x 11.0 x (1.2) |
| | | P-TFBGAXXX-1212 | to 196 | | 12 x 12 | 12.0 x 12.0 x (1.2) |
| | | P-TFBGAXXX-1313 | to 216 | | 13 x 13 | 13.0 x 13.0 x (1.2) |
| | | P-TFBGAXXX-1414 | to 240 | | 14 x 14 | 14.0 x 14.0 x (1.2) |
| | | P-TFBGAXXX-1515 | | | 15 x 15 | 15.0 x 15.0 x (1.2) |
| | | P-TFBGAXXX-1616 | to 352 | | 16 x 16 | 16.0 x 16.0 x (1.2) |
| | | P-TFBGAXXX-0606 | to 49 | 0.65 | 6 x 6 | 6.0 x 6.0 x (1.2) |
| | | P-TFBGAXXX-0707 | to 81 | | 7 x 7 | 7.0 x 7.0 x (1.2) |
| | | P-TFBGAXXX-0808 | to 121 | | 8 x 8 | 8.0 x 8.0 x (1.2) |
| | | P-TFBGAXXX-0909 | to 144 | | 9 x 9 | 9.0 x 9.0 x (1.2) |
| | | P-TFBGAXXX-1010 | to 196 | | 10 x 10 | 10.0 x 10.0 x (1.2) |
| | | P-TFBGAXXX-1111 | to 224 | | 11 x 11 | 11.0 x 11.0 x (1.2) |
| | | P-TFBGAXXX-1212 | to 256 | | 12 x 12 | 12.0 x 12.0 x (1.2) |
| | | P-TFBGAXXX-1313 | to 272 | | 13 x 13 | 13.0 x 13.0 x (1.2) |
| | | P-TFBGAXXX-1414 | to 304 | | 14 x 14 | 14.0 x 14.0 x (1.2) |
| | | P-TFBGAXXX-1515 | to 320 | | 15 x 15 | 15.0 x 15.0 x (1.2) |
| | | P-TFBGAXXX-1616 | to 352 | | 16 x 16 | 16.0 x 16.0 x (1.2) |
| | | P-TFBGAXXX-0606 | to 100 | 0.5 | 6 x 6 | 6.0 x 6.0 x (1.1) |
| | | P-TFBGAXXX-0707 | to 132 | | 7 x 7 | 7.0 x 7.0 x (1.1) |
| | | P-TFBGAXXX-0808 | to 164 | | 8 x 8 | 8.0 x 8.0 x (1.1) |
| | | P-TFBGAXXX-0909 | to 192 | | 9 x 9 | 9.0 x 9.0 x (1.1) |
| | | P-TFBGAXXX-1010 | to 216 | | 10 x 10 | 10.0 x 10.0 x (1.1) |
| | | P-TFBGAXXX-1111 | to 244 | | 11 x 11 | 11.0 x 11.0 x (1.1) |
| | | P-TFBGAXXX-1212 | to 268 | | 12 x 12 | 12.0 x 12.0 x (1.1) |
| | | P-TFBGAXXX-1313 | to 296 | | 13 x 13 | 13.0 x 13.0 x (1.1) |
| | | P-TFBGAXXX-1414 | to 320 | | 14 x 14 | 14.0 x 14.0 x (1.1) |
| | | P-TFBGAXXX-1515 | to 348 | | 15 x 15 | 15.0 x 15.0 x (1.1) |
| | | P-TFBGAXXX-1616 | to 372 | | 16 x 16 | 16.0 x 16.0 x (1.1) |
| | | P-TFBGAXXX-0505 | to 100 | 0.4 | 5 x 5 | 5.0 x 5.0 x (1.0) |
| | | P-TFBGAXXX-0606 | to 144 | | 6 x 6 | 6.0 x 6.0 x (1.0) |
| | | P-TFBGAXXX-0707 | to 168 | | 7 x 7 | 7.0 x 7.0 x (1.0) |
| | | P-TFBGAXXX-0808 | to 204 | | 8 x 8 | 8.0 x 8.0 x (1.0) |
| | | P-TFBGAXXX-0909 | to 228 | | 9 x 9 | 9.0 x 9.0 x (1.0) |
| | (Plastic) | P-TFBGAXXX-1010 | to 264 | | 10 x 10 | 10.0 x 10.0 x (1.0) |
| PBGA (BGA) |  D W (Plastic) | P-BGA0356-2121 | 356 | 1.0 | 21 x 21 | 21.0 x 21.0 x (2.2) |
| | | P-BGA0476-3535 | 476 | 1.27 | 35 x 35 | 35.0 x 35.0 x (2.63) |
| | | P-BGA0528-3535 | 528 | | | |

XXX: Terminal counts

BGA is a trademark of Motorola Nippon Ltd.

RoHS

## ●Surface-mount Type (cont'd)

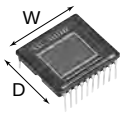
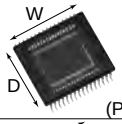
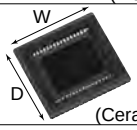
| Package type | Appearance (Package material) | Package code | No. of terminals | Terminal pitch mm (mil) | Nominal dimensions mm (mil) | Package depth & width (D x W) x (seated height [MAX.]) mm | Lead frame material | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Alloy42 | Copper alloy |
| SSOP |  (Plastic) | P-SSOP008-0150 | 8 | 0.65 | 4.5 (150) | 3.0 x 3.0 x (1.1) | – | ○ |
| | | P-SSOP024-0275 | 24 | | 7.0 (275) | 6.0 x 7.8 x (1.27) | – | ○ |
| TSOP |  (Plastic) | P-TSOP040-1020 | 40 | 0.5 | 10 x 20 | 10.0 x 18.4 x (1.2) | ○ | ○ |
| | | P-TSOP048-1220 | 48 | | 12 x 20 | 12.0 x 18.4 x (1.2) | ○ | ○ |
| | | P-TSOP056-1420 | 56 | | 14 x 20 | 14.0 x 18.4 x (1.2) | ○ | ○ |
| QFP |  (Plastic) | P-QFP048-0707 | 48 | 0.5 | 7 x 7 | 7.0 x 7.0 x (1.65) | ○ | ○ |
| | | P-QFP072-1010 | 72 | | 10 x 10 | 10.0 x 10.0 x (1.8) | ○ | – |
| LQFP | | P-LQFP080-1212 | 80 | 0.5 | 12 x 12 | 12.0 x 12.0 x (1.7) | ○ | – |
| | | P-LQFP100-1414 | 100 | | 14 x 14 | 14.0 x 14.0 x (1.7) | ○ | – |
| TQFP | | P-TQFP048-0707 | 48 | 0.5 | 7 x 7 | 7.0 x 7.0 x (1.2) | ○ | – |
| | | P-TQFP100-1414 | 100 | | 14 x 14 | 14.0 x 14.0 x (1.2) | ○ | – |
| | | P-TQFP128-1414 | 128 | 0.4 | | | ○ | – |
| VQFN |  (Plastic) | P-VQFN020-0404 | 20 | 0.5 | 4 x 4 | 4.2 x 4.2 x (1.0) | – | ○ |
| | | P-VQFN024-0404 | 24 | | | | – | ○ |
| | | P-VQFN028-0505 | 28 | | 5 x 5 | 5.2 x 5.2 x (1.0) | – | ○ |
| | | P-VQFN032-0505 | 32 | | | | – | ○ |
| | | P-VQFN036-0606 | 36 | | 6 x 6 | 6.2 x 6.2 x (1.0) | – | ○ |
| | | P-VQFN048-0707 | 48 | | 7 x 7 | 7.2 x 7.2 x (1.0) | – | ○ |
| | | P-VQFN036-0505 | 36 | 0.4 | 5 x 5 | 5.2 x 5.2 x (1.0) | – | ○ |
| | | P-VQFN052-0707 | 52 | | 7 x 7 | 7.2 x 7.2 x (1.0) | – | ○ |
| HQFN* | | P-HQFN020-0404 | 20 | 0.5 | 4 x 4 | 4.0 x 4.0 x (1.0) | – | ○ |
| | | P-HQFN024-0404 | 24 | | | 4.0 x 4.0 x (0.85) | – | ○ |
| | | | | | | 4.2 x 4.2 x (1.0) | – | ○ |
| | | P-HQFN028-0505 | 28 | | 5 x 5 | 5.0 x 5.0 x (1.0) | – | ○ |
| | | P-HQFN052-0707 | 52 | 0.4 | 7 x 7 | 7.2 x 7.2 x (1.0) | – | ○ |

* HQFN is a higher heat dissipation package of VQFN.

100 mil = 2.54 mm

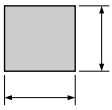
RoHS

## ●For CCDs

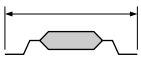
| Package type | Appearance (Package material) | Package code | No. of terminals | Terminal pitch mm | Nominal dimensions mm (mil) | Package depth & width (D x W) x (seated height [TYP.]) mm |
|---|---|---|---|---|---|---|
| DIP |  (Plastic) | P-DIP014-0400A | 14 | 1.27 | 10.16 (400) | 10.0 x 10.0 |
| | | P-DIP016-0450 | 16 | 1.27 | 11.43 (450) | 11.4 x 12.2 |
| | | P-DIP016-0500C | | 1.78 | 12.7 (500) | 12.4 x 14.0 |
| SOP |  (Plastic) | P-SOP028-0400 | 28 | 0.69 | 10.16 (400) | 10.0 x 10.0 x (3.5) |
| | | P-SOP032-0525 | 32 | 0.78 | 13.3 (525) | 12.0 x 13.8 x (3.92) |
| LCC |  (Ceramic) | N-LCC040-R350 | 40 | 0.65 | 8.9 | 8.3 x 8.9 x (1.52) |
| | | N-LCC040-S433A | | 0.80 | 11.0 | 11.0 x 11.0 x (1.62) |

100 mil = 2.54 mm

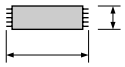
### Nominal dimensions



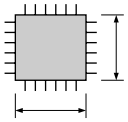
FBGA (CSP)
PBGA (BGA)



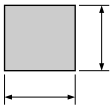
SOP
SSOP
MFP



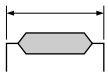
TSOP



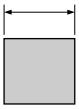
QFP
LQFP
TQFP



VQFN
HQFN



DIP



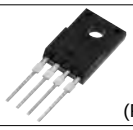
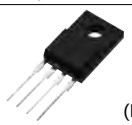
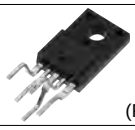
LCC

FBGA : fine-pitch ball grid array package
PBGA : plastic ball grid array package
SOP : small outline package
SSOP : shrink small outline package
MFP : mini flat package
TSOP : thin small outline package
QFP : quad flat package
LQFP : low profile quad flat package
TQFP : thin quad flat package
VQFN : very thin quad flat non-leaded package
HQFN : heat sink quad flat non-leaded package
DIP : dual inline package
LCC : leadless chip carrier

Ball Grid Array and BGA are trademarks of Motorola Nippon Ltd.

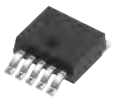
RoHS

## ●Lead-inserting Type Packages [For regulators: PQ series]

| Package type | Appearance (Package material) | No. of terminals | Terminal pitch mm | Outline dimensions (Width x Thickness x Height) mm | Lead frame material |
|---|---|---|---|---|---|
| A TO-220 |  (Plastic) | 4 | 2.54 | 10.2 (MAX.) x 4.5 x 29.1*2 | Cu |
| B TO-220 (Full mold) |  (Plastic) | 4 | 2.54 | 10.2 (MAX.) x 4.5 x 29.1*2 | Cu |
| C TO-220 (Full mold) [Lead forming type] |  (Plastic) | 5 | (1.7)*1 | 10.2 (MAX.) x 4.5 x 24.6*2 | Cu |
| D TO-220 [Lead forming type] |  (Plastic) | 5 | (1.7)*1 | 10.2 (MAX.) x 4.5 x 24.6*2 | Cu |
| E TO-220 [Lead forming type] |  (Plastic) | 5 | (1.7)*1 | 10.2 (MAX.) x 4.5 x 24.6*2 | Cu |

*1 The figure in parentheses indicates reference value.
*2 Including lead length

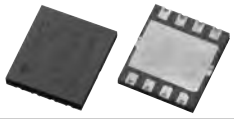
## ●Surface-mount Type Packages [For regulators/LED drivers: PQ series]

| Package type | Appearance (Package material) | No. of terminals | Terminal pitch mm | Outline dimensions (Width x Height x Thickness) mm | Lead frame material |
|---|---|---|---|---|---|
| TO-263 |  (Plastic) | 5 (Heat sink not included) | (1.7)*1 | 10.6 (MAX). x 13.7 (MAX.)*2 x 3.5 | Cu |
| F SC-63 |  (Plastic) | 5 (Heat sink not included) | (1.27)*1 | 6.6 (MAX.) x 9.7 (MAX.)*2 x 2.3 | Cu |
| G SC-63 |  (Plastic) | 5 (Heat sink included) | (1.27)*1 | 6.6 (MAX.) x 9.7 (MAX.)*2 x 2.1 | Cu |
| SOP-8 |  (Plastic) | 8 | 1.27 | 5 x 6.2*2 x 1.55*2 | Cu |
| SOT-89 |  (Plastic) | 6 | 1.5 | 4.5 x 4.3*2 x 1.5 | Cu |

*1 The figure in parentheses indicates reference value.
*2 Including lead length

RoHS

## ●Surface-mount Type Packages [For regulators/LED drivers: PQ series] (cont'd)

| Package type | Appearance (Package material) | No. of terminals | Terminal pitch mm | Outline dimensions (Width x Height x Thickness) mm | Lead frame material |
|---|---|---|---|---|---|
| SOT-23-6 |  (Plastic) | 6 | 0.95 | 2.9 x 2.8*2 x 1.3 | Cu |
| SOT-23-6W |  (Plastic) | 6 | 0.95 | 2.9 x 2.8*2 x 1.3 | Cu |
| SOT-23-L |  (Plastic) | 6 | (0.95)*1 | (3.4)*1 x 3.3*2 x 1.4 (MAX.) | Cu |
| SOT-23-5 |  (Plastic) | 5 | (0.95)*1 | (2.9)*1 x 2.8*2 x 1.3 (MAX.) | Cu |
| USB-6 |  | 6 | 0.5 | 2.0 x 1.8 x 0.8 | Cu (Terminal material)/ Au plating (Terminal finish) |
| USB-8 |  | 9 (Including radiating fin) | 1.0 | 5.0 x 4.5 x 0.75 (MAX.) | Cu |

*1 The figure in parentheses indicates reference value.
*2 Including lead length

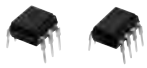
RoHS

## ■ Photocoupler Lineup

### <Phototransistor output type>

| Package type | Output type | Features | | Model No. (series) | Page |
|---|---|---|---|---|---|
| 4-pin SOP<br>Compact, SMT type | Single phototransistor | General purpose,<br>High collector-emitter voltage, etc. | | PC35x series/PC451J00000F | 48 |
|  | Darlington phototransistor | | Low input current | PC367NJ0000F | 48 |
| | | AC input response | | PC354NJ0000F | 48 |
| | | High sensitivity,<br>High collector-emitter voltage | Low input current | PC364NJ0000F | 48 |
| | | | | PC355NJ0000F/PC452J00000F | 48 |
| | | | Low input current | PC365NJ0000F | 48 |
| Compact, Half pitch<br>(lead space), SMT type | Single phototransistor | General purpose,<br>High resistance to noise, etc. | | PC3Hx series | 49 |
|  | Darlington phototransistor | | Reinforced insulation | PC3HU7xYIP0B | 49 |
| | | | Low input current | PC3H71xNIP0F | 49 |
| | | AC input response | | PC3H3J00000F/PC3H4J00000F | 49 |
| | | | Low input current | PC3H41xNIP0F | 49 |
| | | High sensitivity | | PC3H5J00000F | 49 |
| | | | Low input current | PC3H510NIP0F | 49 |
| DIP type (4-pin) | Single phototransistor | Reinforced insulation | | PC123XNNSZ0F | 50 |
| (4-pin, DIP type) | | General purpose,<br>High collector-emitter voltage, etc. | Low input current | PC1231xNSZ0X | 50 |
|  | | | | PC817XNNSZ0F/PC851XNNSZ0F | 50 |
| | | | Low input current | PC8171xNSZ0X | 50 |
| | Darlington phototransistor | High sensitivity,<br>High collector-emitter voltage | | PC815XNNSZ0F/PC852XNNSZ0F/<br>PC853XNNSZ0F | 50 |
| | | | Low input current | PC81510NSZ0X | 50 |
| DIP type (6-pin) | Single phototransistor | General purpose,<br>High collector-emitter voltage, etc. | | PC7xxV0NSZXF | 51 |
|  | Darlington phototransistor | High sensitivity,<br>High collector-emitter voltage, etc. | | PC7x5V0NSZXF | 51 |

### <OPIC output type>

| Package type | Output type | Features | Model No. (series) | Page |
|---|---|---|---|---|
| Compact, SMT type | Digital output | General purpose, High response speed, 2ch, etc. | PC400J00000F/PC456L0NIP0F/<br>PC410S0NIP0F/PC410L0NIP0F/<br>PC4D10SNIP0F | 52 |
|  | Analog/Digital output | High CMR | PC457S0NIP0F/PC457L0NIP0F | 52 |
| DIP type, SMT type | Digital output | General purpose | PC900V0NSZXF | 53 |
|  | Built-in base amplifier | For inverter control, Built-in short-circuit protection circuit | PC925LxNSZ0F/PC942J00000F/<br>PC928J00000F/PC929J00000F | 53 |

RoHS

# ■ Photocouplers

## ◆Phototransistor Output Type <Compact, SMT type>

○: Approved, △: Under application

(Ta = 25°C)

| Output type | Model No. | Internal connection diagram | Features | Approved by safety standards*2 UL | Package | Absolute maximum ratings: Forward current IF (mA) | Absolute maximum ratings: Isolation voltage (AC) Viso (rms) (kV) | Absolute maximum ratings: Collector-emitter voltage VCEO (V) | Electro-optical characteristics: Current transfer ratio CTR (%) MIN. | Current transfer ratio: IF (mA) | Current transfer ratio: VCE (V) | Response time: tr (μs) TYP. | Response time: IC (mA) | Response time: RL (Ω) | Response time: VCE (V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Single phototransistor output | PC357NJ0000F | | General purpose | ○* | Mini-flat 4-pin | 50 | 3.75 | 80 | 50 | 5 | 5 | 4 | 2 | 100 | 2 |
| | PC352NJ0000F | | General purpose, high resistance to noise*1 | ○ | | 50 | 3.75 | 80 | 90 | 5 | 5 | 4 | 2 | 100 | 2 |
| | PC451J00000F | | High collector-emitter voltage | ○* | | 50 | 3.75 | 350 | 40 | 5 | 5 | 4 | 2 | 100 | 2 |
| | PC367NJ0000F | | Low input current, high resistance to noise*1 | ○ | | 10 | 3.75 | 80 | 100 | 0.5 | 5 | 4 | 2 | 100 | 2 |
| | PC354NJ0000F | | AC input response | ○* | | ±50 | 3.75 | 80 | 20 | ±1 | 5 | 4 | 2 | 100 | 2 |
| | PC364NJ0000F | | Low input current, AC input response, high resistance to noise*1 | ○ | | ±10 | 3.75 | 70 | 50 | ±0.5 | 5 | 4 | 2 | 100 | 2 |
| Darlington photo-transistor output | PC355NJ0000F | | High sensitivity | ○* | | 50 | 3.75 | 35 | 600 | 1 | 2 | 60 | 2 | 100 | 2 |
| | PC365NJ0000F | | High sensitivity, low input current | ○ | | 10 | 3.75 | 35 | 600 | 0.5 | 2 | 60 | 2 | 100 | 2 |
| | PC452J00000F | | High collector-emitter voltage | ○* | | 50 | 3.75 | 350 | 1 000 | 1 | 2 | 100 | 20 | 100 | 2 |

*1 CMR: MIN.10 kV/μs
*2 Please refer to Specification Sheets for model numbers approved by safety standards.
* A VDE approved type is optionally available.

PC357NJ0000F
(Mini-flat 4-pin)

RoHS

## ◆Phototransistor Output Type
## <Compact, half pitch (lead space) SMT type>

○: Approved, △: Under application

(Ta = 25°C)

| Output type | Model No. | Internal connection diagram | Features | Approved by safety standards*3 | Package | Absolute maximum ratings | | | Electro-optical characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Current transfer ratio | | | Response time | | | |
| | | | | UL | | Forward current $I_F$ (mA) | Isolation voltage (AC) Viso (rms) (kV) | Collector-emitter voltage $V_{CEO}$ (V) | CTR (%) MIN. | $I_F$ (mA) | $V_{CE}$ (V) | tr (μs) TYP. | $I_C$ (mA) | $R_L$ (Ω) | $V_{CE}$ (V) |
| Single phototransistor output | PC3HU7xYIP0B | | Reinforced insulation (internal insulation distance: MIN. 0.4 mm), low-profile package | ○*4, 5 | Low-profile mini-flat 4-pin | 50 | 3.75 | 80 | 50 | 5 | 5 | 4 | 2 | 100 | 2 |
| | PC3H2J00000F |  | High resistance to noise*1 | ○ | Mini-flat 4-pin | 50 | 2.5 | 80 | 20 | 1 | 5 | 4 | 2 | 100 | 2 |
| | PC3H7J00000F | | Standard | ○ | | 50 | 2.5 | 80 | 20 | 1 | 5 | 4 | 2 | 100 | 2 |
| | PC3H71xNIP0F | | High resistance to noise*1, low input current | ○ | | 10 | 2.5 | 80 | 100 | 0.5 | 5 | 4 | 2 | 100 | 2 |
| | PC3H3J00000F | | AC input response, high resistance to noise*1 | ○ | | ±50 | 2.5 | 80 | 20 | ±1 | 5 | 4 | 2 | 100 | 2 |
| | PC3H4J00000F |  | AC input response | ○*2 | | ±50 | 2.5 | 80 | 20 | ±1 | 5 | 4 | 2 | 100 | 2 |
| | PC3H41xNIP0F | | AC input response, high resistance to noise*1, low input current | ○ | | ±10 | 2.5 | 80 | 50 | ±0.5 | 5 | 4 | 2 | 100 | 2 |
| Darlington photo-transistor output | PC3H5J00000F |  | High sensitivity | ○ | Mini-flat 4-pin | 50 | 2.5 | 35 | 600 | 1 | 2 | 60 | 2 | 100 | 2 |
| | PC3H510NIP0F | | High sensitivity, low input current | ○ | | 10 | 2.5 | 35 | 600 | 0.5 | 2 | 60 | 2 | 100 | 2 |

*1 CMR: MIN.10 kV/μs
*2 A VDE approved type is optionally available.
*3 Please refer to Specification Sheets for model numbers approved by safety standards.
*4 VDE, CSA approved
*5 In conformance with BSI, SEMKO, DEMKO, NEMKO, and FIMKO


PC3HU7xYIP0B


PC3H2J00000F
(Mini-flat 4-pin)

## ◆Phototransistor Output Type
## <DIP type (4-pin)>

○: Approved, △: Under application

(Ta = 25°C)

| Output type | Model No. | Internal connection diagram | Features | Approved by safety standards*8 | | | Package | Absolute maximum ratings | | | Electro-optical characteristics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | UL | VDE *2 | Others *3 | | Forward current $I_F$ (mA) | Isolation voltage (AC) Viso (rms) (kV) | Collector-emitter voltage $V_{CEO}$ (V) | Current transfer ratio CTR (%) MIN. | $I_F$ (mA) | Response time tr (μs) TYP. | $R_L$ (Ω) |
| Single phototransistor output | PC123XNNSZ0F*1, *5, *6, *7 | | High isolation voltage, reinforced insulation | ○ | ○ | ○ | 4-pin DIP | 50 | 5.0 | 70 | 50 | 5 | 4 | 100 |
| | PC1231xNSZ0X*1 |  | High isolation voltage, reinforced insulation, low input current, high resistance to noise*4 | ○ | ○ | ○ | | 10 | 5.0 | 70 | 50 | 0.5 | 4 | 100 |
| | PC817XNNSZ0F*5, *6, *7 | | High isolation voltage | ○ | ○ | – | | 50 | 5.0 | 80 | 50 | 5 | 4 | 100 |
| | PC8171xNSZ0X*5, *6 |  | High isolation voltage, low input current, high resistance to noise*4 | ○ | – | – | | 10 | 5.0 | 80 | 100 | 0.5 | 4 | 100 |
| | PC851XNNSZ0F*5, *6 | | High isolation voltage, high collector-emitter voltage | ○ | – | – | | 50 | 5.0 | 350 | 40 | 5 | 4 | 100 |
| Darlington phototransistor output | PC815XNNSZ0F*5, *6 |  | High isolation voltage, high sensitivity | ○ | – | – | | 50 | 5.0 | 35 | 600 | 1 | 60 | 100 |
| | PC81510NSZ0X |  | High isolation voltage, high sensitivity, low input current | ○ | – | – | | 10 | 5.0 | 35 | 600 | 0.5 | 60 | 100 |
| | PC852XNNSZ0F*5, *6 |  | High isolation voltage, high collector-emitter voltage | ○ | ○ | – | | 50 | 5.0 | 350 | 1 000 | 1 | 100 | 100 |
| | PC853XNNSZ0F*5, *6 | | High isolation voltage, high collector-emitter voltage | ○ | ○ | – | | 50 | 5.0 | 350 | 1 000 | 1 | 100 | 100 |

*1 Wide lead spacing type is also available. Creepage distance: 6.4 mm or more, wide lead spacing type: 8 mm or more.
*2 Optionally available.
*3 BSI, SEMKO, DEMKO, NEMKO, FIMKO, CSA
*4 CMR: 10 kV/μs MIN.
*5 Lead forming type is also available for surface mounting.
*6 Taped package of lead forming type for surface mounting is also available.
*7 Wide lead spacing type is also available. Compatible with wide lead spacing type lead-forming models for surface-mount use. Also compatible with taped packages for wide lead spacing type lead-forming models for surface-mount use.
*8 Please refer to Specification Sheets for model numbers approved by safety standards.

PC817XNNSZ0F
(4-pin DIP)

RoHS

## ◆Phototransistor Output Type
## <DIP type (6-pin)>

○: Approved, △: Under application

(Ta = 25°C)

| Output type | Model No. | Internal connection diagram | Features | Approved by safety standards*2 | | Package | Absolute maximum ratings | | | Electro-optical characteristics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | UL | VDE*1 | | Forward current $I_F$ (mA) | Isolation voltage (AC) Viso (rms) (kV) | Collector-emitter voltage $V_{CEO}$ (V) | Current transfer ratio CTR (%) MIN. | Current transfer ratio $I_F$ (mA) | Response time tr (µs) TYP. | Response time $R_L$ (Ω) |
| Single phototransistor output | PC714V0NSZXF | | High isolation voltage | ○ | ○ | 6-pin DIP | 50 | 5.0 | 80 | 50 | 5 | 4 | 100 |
| | PC724V0NSZXF | | High isolation voltage, large input current | ○ | – | | 150 | 5.0 | 35 | 20 | 100 | 4 | 100 |
| | PC713V0NSZXF | | High isolation voltage, with base terminal | ○ | ○ | | 50 | 5.0 | 80 | 50 | 5 | 4 | 100 |
| Darlington phototransistor output | PC715V0NSZXF | | High isolation voltage, high sensitivity | ○ | ○ | | 50 | 5.0 | 35 | 600 | 1 | 60 | 100 |
| | PC725V0NSZXF | | High isolation voltage, high sensitivity, high collector-emitter voltage, high power | ○ | ○ | | 50 | 5.0 | 300 | 1 000 | 1 | 100 | 100 |

*1 Optionally available.
*2 Please refer to Specification Sheets for model numbers approved by safety standards.

PC713V0NSZXF
(6-pin DIP)

Optoelectronics

## ◆OPIC Output

("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

### <Compact, SMT type> (1-1)

○: Approved, △: Under application

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*2 | | Package | Absolute maximum ratings | | Electro-optical characteristics*1 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Low level output voltage | | | | Threshold input current | | |
| | | | UL | VDE*3 | | Forward current $I_F$ (mA) | Isolation voltage (AC) Viso (rms) (kV) | $V_{OL}$ (V) MAX. | Ta (°C) | $I_{OL}$ (mA) | $I_F$ (mA) | $I_{FHL}$ (mA) MAX. | $I_{FLH}$ (mA) MAX. | $R_L$ (Ω) |
| PC400J00000F |  | Digital output, normal-off operation | ○ | – | Mini-flat 5-pin | 50 | 3.75 | 0.4 | 0 to +70 | 16 | 4 | 2.0 | – | 280 |
| PC456L0NIP0F |  | Built-in preamplifier, high speed transmission (2 Mb/s), for flow soldering | ○ | ○ | | 25 | 3.75 | 0.6 | –40 to +85 | 4.4 | 10 | 5.0 | – | 20 k |
| PC410L0NIP0F |  | High speed (10 Mb/s), High CMR (10 kV/μs), For flow soldering | ○ | ○ | | 20 | 3.75 | 0.6 | –40 to +85 | 13 | 5 | 5.0 | – | 350 |
| PC410S0NIP0F |  | High speed (10 Mb/s), high CMR (10 kV/μs), for flow soldering, Solder heat resistance: 270°C | ○ | ○ | SOP 8-pin | 20 | 3.75 | 0.6 | –40 to +85 | 13 | 5 | 5.0 | – | 350 |
| PC4D10SNIP0F |  | High speed (10 Mb/s), for flow soldering, Solder heat resistance: 270°C 2ch output | ○ | – | SOP 8-pin | 20 | 3.75 | 0.6 | –40 to +85 | 13 | 5 | 5.0 | – | – |

A: Rated voltage circuit
*1 Each item is measured at Vcc=5V. (PC400, PC401)
*2 Please refer to Specification Sheets for model numbers approved by safety standards.
*3 Optionally available.

### <Compact, SMT type> (1-2)

○: Approved, △: Under application

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*1 | | Package | Absolute maximum ratings | | Electro-optical characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Current transfer ratio | | | | Propagation delay time | | | |
| | | | UL | VDE*2 | | Forward current $I_F$ (mA) | Isolation voltage (AC) Viso (rms) (kV) | CTR (%) MIN. | $I_F$ (mA) | $V_O$ (V) | $V_{CC}$ (V) | $t_{PHL}$ (μs) TYP. | $t_{PLH}$ (μs) TYP. | $R_L$ (Ω) | $I_F$ (mA) |
| PC457L0NIP0F |  | High speed (1 Mb/s), high CMR (15 kV/μs), for flow soldering | ○ | ○ | Mini-flat 5-pin | 25 | 3.75 | 19 | 16 | 0.4 | 4.5 | 0.2 | 0.6 | 1 900 | 16 |
| PC457S0NIP0F | | High speed (1 Mb/s), high CMR (15 kV/μs), for flow soldering, Solder heat resistance: 270°C | ○ | ○ | SOP 8-pin | 25 | 3.75 | 19 | 16 | 0.4 | 4.5 | 0.2 | 0.6 | 1 900 | 16 |

*1 Please refer to Specification Sheets for model numbers approved by safety standards.
*2 Optionally available.

PC400J00000F
(Mini-flat 5-pin)

PC410S0NIP0F
(SOP 8-pin)

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RoHS

## ◆OPIC Output ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

### <DIP type, digital output>

○: Approved, △: Under application

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*5 | | Package | Absolute maximum ratings | | Electro-optical characteristics*1 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | UL | VDE *4 | | Forward current $I_F$ (mA) | Isolation voltage (AC) Viso (rms) (kV) | Low level output voltage | | | | Threshold input current | | |
| | | | | | | | | $V_{OL}$ (V) MAX. | Ta (°C) | $I_{OL}$ (mA) | $I_F$ (mA) | $I_{FHL}$ (mA) MAX. | $I_{FLH}$ (mA) MAX. | $R_L$ (Ω) |
| PC900V0NSZXF*2, *3 |  | Digital output, normal-off operation | ○ | ○ | 6-pin DIP | 50 | 5.0 | 0.4 | 0 to +70 | 16 | 4 | 2.0 | – | 280 |

A: Rated voltage circuit
*1 Each item is measured at Vcc=5V.
*2 Lead forming type is also available for surface mounting.
*3 Taped package of lead forming type for surface mounting is also available.
*4 Optionally available.
*5 Please refer to Specification Sheets for model numbers approved by safety standards.

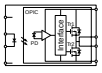
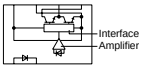
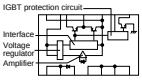
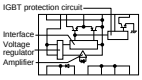
PC900V0NSZXF
(6-pin DIP)

## ◆OPIC Output ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

### <DIP type, Gate drive type>

○: Approved, △: Under application

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*3 | | Package | Absolute maximum ratings | | | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | UL | VDE *2 | | Forward current $I_F$ (mA) | Isolation voltage (AC) Viso (rms) (kV) | Output current $I_{O1}$ (A) | Propagation delay time | | | | | |
| | | | | | | | | | $t_{PHL}$ (µs) TYP. | $t_{PLH}$ (µs) TYP. | $V_{CC}$ (V) | $I_F$ (mA) | $R_{L1}$ (Ω) | $R_{L2}$ (Ω) |
| PC925LxNSZ0F*1 |  | • Built-in drive circuit directly connectable to MOS-FET and IGBT<br>• Peak output current: 2.5 A<br>• Low dissipation current (Icc = TYP. 2.5 mA)<br>• High resistance to noise (CMR: MIN. 15 kV/µs) | ○ | ○ | 8-pin DIP | 25 | 5.0 | 2.5 | MAX. 0.5 | MAX. 0.5 | 15 to 30 | 7 to 16 | $R_G$ = 10 | – |
| PC942J00000F |  | For controlling inverter-controlled air-conditioner | ○ | ○ | | 25 | 5.0 | 0.5 | 2.0 | 2.0 | 6 | 5 | 5 | 10 |
| PC928J00000F |  | For driving inverter IGBT, built-in short protection circuit | ○ | ○ | 14-pin SMT (Half pitch lead) | 25 | 4.0 | 0.1 | 1.0 | 1.0 | 24 | 10 | $R_G$ = 47 | – |
| PC929J00000F |  | For driving inverter IGBT, high speed, built-in short protection circuit | ○ | ○ | | 20 | 4.0 | 0.1 | 0.3 | 0.3 | 24 | 5 | $R_G$ = 47 | – |

*1 Lead forming type is also available for surface mounting. Taped package of lead forming type for surface mounting is also available.
*2 A VDE approved type is optionally available.
*3 Please refer to Specification Sheets for model numbers approved by safety standards.

PC925LENSZ0F, PC942J00000F
(8-pin DIP)

PC928J00000F
(PC929J00000F)

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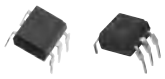
## ■ Phototriac Coupler Lineup

| Package | Applied voltage | ON-state current (rms) | Features | | Model No. | Page |
|---|---|---|---|---|---|---|
| Mini-flat (SMD) | AC 200 V lines ($V_{DRM}$ = 600V) | 0.05 A | General purpose | | S2S3000F*4 / S2S5A00F*4 | 55 |
|  | | | | Built-in zero-cross circuit | S2S4000F*4 | 56 |
| DIP type | AC 200 V lines ($V_{DRM}$ = 600V) | 0.1 A | General purpose | | PC3ST11NSZAX*4 | 55 |
| (4-pin) | | | | Built-in zero-cross circuit | PC3ST21NSZBX*3 | 56 |
|  | | | Reinforced isolation | | PC3SH11YFZAX*4 / PC3SH13YFZAX*4 | 55 |
| | | | | Built-in zero-cross circuit | PC3SH21YFZBX*3 | 56 |
| DIP type | AC 100 V lines ($V_{DRM}$ = 400V) | 0.1 A | General purpose | | PC2SD11NTZAF*4 | 55 |
| (6-pin package, 5th-pin cut) | AC 200 V lines ($V_{DRM}$ = 600V) | 0.1 A | General purpose | | PC3SD12NTZAF*4 / PC3SD11NTZBF*3 / PC3SD11NTZCF*2 | 55 |
|  | | | | Built-in zero-cross circuit | PC3SD21NTZAF*4 / PC3SD21NTZBF*3 / PC3SD21NTZCF*2 / PC3SD21NTZDF*1 / PC3SD23YTZCF*2 | 56 |
| | | | Reinforced isolation | | PC3SF11YVZAF*4 / PC3SF11YVZBF*3 / PC3SF13YVZBF*3 | 55 |
| | | | | Built-in zero-cross circuit | PC3SF21YVZAF*4 / PC3SF21YVZBF*3 / PC3SF23YVZSF*3 | 56 |
| | AC 200 V lines ($V_{DRM}$ = 800V) | 0.1 A | General purpose | | PC4SD11NTZBF*3 / PC4SD11NTZCF*2 | 55 |
| | | | | Built-in zero-cross circuit | PC4SD21NTZCF*2 / PC4SD21NTZDF*1 | 56 |
| | | | Reinforced isolation | | PC4SF11YVZAF*4 / PC4SF11YVZBF*3 | 55 |
| | | | | Built-in zero-cross circuit | PC4SF21YVZBF*3 / PC4SF21YVZCF*2 | 56 |

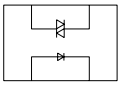
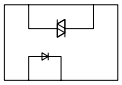
Minimum trigger current: *1 $I_{FT}$ ≦ 3 mA, *2 $I_{FT}$ ≦ 5 mA, *3 $I_{FT}$ ≦ 7 mA, *4 $I_{FT}$ ≦ 10 mA

RoHS

## ■ Phototriac Couplers

○: Approved, △: Under application

(Ta = 25°C)

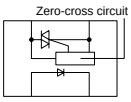
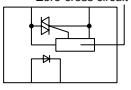
| Model No. | Internal connection diagram | Features | Approved by safety standards*4 | | | Package | Absolute maximum ratings | | | Electro-optical characteristics |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | UL, CSA | VDE | Others | | ON-state current $I_T$ (rms) (A) | Repetitive peak OFF-state voltage $V_{DRM}$ (V) | Isolation voltage (AC) Viso (rms) (kV) | Min. trigger current $I_{FT}$ (mA) MAX. $V_D$ = 6 V, $R_L$ = 100Ω |
| S2S3000F |  | 200 V lines, compact | ○ | ○*6 | – | Mini-flat 4-pin | 0.05 | 600 | 3.75 | 10 |
| S2S5A00F | | 200 V lines, compact | ○ | ○*6 | – | | | | | 10 |
| PC3ST11NSZAX | | 200 V lines, compact | ○ | ○*6 | – | 4-pin DIP | 0.1 | 600 | 5.0 | 10 |
| PC3SH11YFZAX | | 200 V lines, compact, reinforced isolation | ○ | ○ | ○*2 | | | | | 10 |
| PC3SH13YFZAX | | 200 V lines, compact, reinforced isolation, high noise resistance | ○ | ○ | ○*2 | | | | | 10 |
| PC2SD11NTZAF*7 |  | 100 V lines | ○ | – | – | 6-pin DIP*1, 3 | 0.1 | 400 | 5.0 | 10 |
| PC3SD12NTZAF*8 | | 200 V lines | ○ | ○*6 | – | | | 600 | | 10 |
| PC3SD11NTZBF | | 200 V lines | ○ | ○*6 | – | | | | | 7 |
| PC4SD11NTZBF | | 200 V lines, repetitive peak-OFF-state voltage | ○ | ○*6 | – | | | 800 | | 7 |
| PC3SD11NTZCF | | 200 V lines | ○ | ○*6 | – | | | 600 | | 5 |
| PC4SD11NTZCF | | 200 V lines, repetitive peak-OFF-state voltage | ○ | ○*6 | – | | | 800 | | 5 |
| PC3SF11YVZAF | | 200 V lines, reinforced isolation | ○ | ○ | ○*2 | | | 600 | | 10 |
| PC3SF11YVZBF | | 200 V lines, reinforced isolation | ○ | ○ | ○*2 | | | | | 7 |
| PC3SF13YVZBF | | 200 V lines, reinforced isolation, high noise resistance | ○ | ○ | ○*2 | | | | | 7 |
| PC4SF11YVZAF | | 200 V lines, reinforced isolation, repetitive peak-OFF-state voltage | ○ | ○ | ○*2 | | | 800 | | 10 |
| PC4SF11YVZBF | | 200 V lines, reinforced isolation, repetitive peak-OFF-state voltage | ○ | ○ | ○*2 | | | | | 7 |

For the notes *1 to *9, see next page.

RoHS

## ■ Phototriac Couplers
### (Built-in zero-cross circuit type)

○: Approved, △: Under application (Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*4 | | | Package | Absolute maximum ratings | | | Electro-optical characteristics |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | UL, CSA | VDE | Others | | ON-state current IT (rms) (A) | Repetitive peak OFF-state VDRM (V) | Isolation voltage (AC) Viso (rms) (kV) | Min. trigger current IFT (mA) MAX. VD = 4 V, RL = 100Ω |
| S2S4000F |   | 200 V lines, compact | ○ | ○*6 | – | Mini-flat 4-pin | 0.05 | 600 | 3.75 | 10*5 |
| PC3ST21NSZBX | | 200 V lines, compact | ○ | ○*6 | – | 4-pin DIP | 0.1 | 600 | 5.0 | 7 |
| PC3SH21YFZBX | | 200 V lines, compact, reinforced isolation | ○ | ○ | ○*2 | | | | | 7 |
| PC3SD21NTZAF |   | 200 V lines, low zero-cross voltage: MAX. 20 V | ○ | ○*6 | – | 6-pin DIP*1, 3 | 0.1 | 600 | 5.0 | 10 |
| PC3SD21NTZBF | | 200 V lines, low zero-cross voltage: MAX. 20 V | ○ | ○*6 | – | | | | | 7 |
| PC3SD21NTZCF*9 | | 200 V lines, low zero-cross voltage: MAX. 20 V | ○ | ○*6 | – | | | | | 5 |
| PC3SD23YTZCF | | 200 V lines, high pulse/noise resistance (TYP. 2 kV) | ○ | ○ | – | | | | | 5 |
| PC3SD21NTZDF | | 200 V lines, low zero-cross voltage: MAX. 20 V | ○ | ○*6 | – | | | | | 3 |
| PC4SD21NTZCF | | 200 V lines, repetitive peak-OFF-state voltage | ○ | ○*6 | – | | | 800 | | 5 |
| PC4SD21NTZDF | | 200 V lines, repetitive peak-OFF-state voltage | ○ | ○*6 | – | | | | | 3 |
| PC3SF21YVZAF | | 200 V lines, reinforced isolation | ○ | ○ | ○*2 | | | 600 | | 10 |
| PC3SF21YVZBF | | 200 V lines, reinforced isolation | ○ | ○ | ○*2 | | | | | 7 |
| PC3SF23YVZSF | | 200 V lines, reinforced isolation, high pulse/noise resistance (TYP. 2 kV) | ○ | ○ | ○*2 | | | | | 7 |
| PC4SF21YVZBF | | 200 V lines, reinforced isolation, repetitive peak-OFF-state voltage | ○ | ○ | ○*2 | | | 800 | | 7 |
| PC4SF21YVZCF | | 200 V lines, reinforced isolation, repetitive peak-OFF-state voltage | ○ | ○ | ○*2 | | | | | 5 |

*1 Lead forming type for surface mounting is also available.
*2 In conformance with BSI, SEMKO, DEMKO, and FIMKO
*3 These are molded pin No. 5.
*4 Please refer to Specification Sheets for model numbers approved by safety standards.
*5 VD = 6 V, RL = 100Ω
*6 Optionally available
*7 An equivalent model (IFT MAX.: 15 mA) with overseas brand compatibility is also available. (PC1S3021NTZF)
*8 An equivalent model with overseas brand compatibility is also available. (PC1S3052NTZF)
*9 An equivalent model with overseas brand compatibility is also available. (PC1S3063NTZF)


S2S3000F
(Mini-flat 4-pin)


PC2SD series
(PC3SD series, PC4SD series)
(6-pin DIP)


PC3SF series
(PC4SF series)
(6-pin DIP)


PC3ST11NSZAX
(PC3ST21NSZBX)
(4-pin DIP)


PC3SH11YFZAX
PC3SH21YFZBX,
PC3SH13YFZAX
(4-pin DIP)

RoHS

## ■ Solid State Relay Lineup

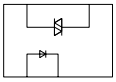
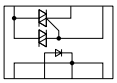
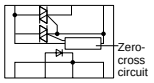
| Package | Applied voltage | ON-state current (rms) | Features | Model No. | Page |
|---|---|---|---|---|---|
| DIP 6-pin | AC 100 V lines | 0.06 A | General purpose | PR22MA11NTZF | 58 |
|  | AC 200 V lines | 0.15 A | General purpose | PR31MA11NTZF / PR32MA11NTZF | 58 |
| DIP 8-pin | AC 100 V lines | 0.3/0.6/0.9 A | General purpose | PR23MF11NSZF / PR26MF series / PR29MF series | 58 |
|  | | 0.6/0.9 A | Built-in zero-cross circuit | PR26MF21NSZF / PR29MF21NSZF | 58 |
| | AC 200 V lines | 0.3/0.6/0.9/1.2 A | General purpose | PR33MF51NSZF / PR36MF series / PR39MF series / PR3BMF51NSKF | 58 |
| | | 0.6/0.9/1.2 A | Built-in zero-cross circuit | PR36MF2 series / PR39MF2 series / PR3BMF21NSZF | 58 |
| SIP 4-pin | AC 100 V lines | 2/8 A<br>3 to 16 A | General purpose | S102T01F / S108T01F / S101S05F / S102S01F / S112S01F / S116S01F | 59 |
|  Low profile | | 2/8 A<br>3 to 16 A | Built-in zero-cross circuit | S102T02F / S108T02F / S101S06F / S102S02F / S116S02F | 59 |
| | | 8 A | Built-in snubber circuit | S102S11F | 59 |
|  | | 3/8 A | Built-in snubber circuit/ zero-cross circuit | S101S16F / S102S12F | 59 |
| | AC 200 V lines | | General purpose | S202T01F / S208T01F / S202S01F / S212S01F / S216S01F | 59 |
| | | 2/8 A<br>3 to 16 A | Built-in zero-cross circuit | S202T02F / S208T02F / S201S06F / S202S02F / S216S02F | 59/60 |
| | | 8/8 A | Built-in snubber circuit | S202S15F / S202S11F | 60 |
| | | 8 A | Built-in snubber circuit/ zero-cross circuit | S202S12F | 60 |

RoHS

## ■ Solid State Relays

### <DIP type>

○: Approved, △: Under application (Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*1 | | | Package | Absolute maximum ratings | | | Electrical characteristics |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | UL | CSA | VDE*2 | | ON-state current IT (rms) (A) | Repetitive peak OFF-state voltage VDRM (V) | Isolation voltage (AC) Viso (rms) (kV) | Min. trigger current IFT (mA) MAX. VD = 6 V, RL = 100Ω |
| PR31MA11NTZF |  | 200 V lines, compact | ○ | ○ | ○ | 6-pin DIP | 0.06 | 600 | 5.0 | 10 |
| PR22MA11NTZF | | 100 V lines, 150 mA model in a small package | ○ | ○ | ○ | | 0.15 | 400 | | 10 |
| PR32MA11NTZF | | 200 V lines, 150 mA model in a small package | ○ | ○ | ○ | | | 600 | | 10 |
| PR23MF11NSZF |  | 100 V lines, compact | ○ | ○ | – | 8-pin DIP | 0.3 | 400 | 4.0 | 10 |
| PR33MF51NSZF | | 200 V lines, compact | ○ | ○ | ○ | | | 600 | | 10 |
| PR26MF11NSZF | | 100 V lines, compact | ○ | ○ | – | | 0.6 | 400 | | 10 |
| PR26MF12NSZF | | 100 V lines, compact, low input current | ○ | ○ | – | | | | | 5 |
| PR29MF11NSZF | | 100 V lines, compact | ○ | ○ | – | | 0.9 | | | 10 |
| PR29MF12NSZF | | 100 V lines, compact, low input current | ○ | ○ | – | | | | | 5 |
| PR36MF51NSZF | | 200 V lines, compact | ○ | ○ | ○ | | 0.6 | 600 | | 10 |
| PR36MF12NSZF | | 200 V lines, compact, low input current | ○ | ○ | ○ | | | | | 5 |
| PR39MF12NSZF | | 200 V lines, compact, low input current | ○ | ○ | ○ | | 0.9 | | | 5 |
| PR39MF51NSZF | | 200 V lines, compact | ○ | ○ | ○ | | | | | 10 |
| PR3BMF51NSKF | | 200 V lines, compact | ○ | ○ | ○ | | 1.2 | | | 10 |
| PR26MF21NSZF |   | 100 V lines, compact (built-in zero-cross circuit) | ○ | ○ | – | | 0.6 | 400 | | 10 |
| PR29MF21NSZF | | 100 V lines, compact (built-in zero-cross circuit) | ○ | ○ | – | | 0.9 | | | 10 |
| PR36MF22NSZF | | 200 V lines, compact (built-in zero-cross circuit), low input current | ○ | ○ | ○ | | 0.6 | 600 | | 5 |
| PR39MF22NSZF | | 200 V lines, compact (built-in zero-cross circuit), low input current | ○ | ○ | ○ | | 0.9 | | | 5 |
| PR36MF21NSZF | | 200 V lines, compact (built-in zero-cross circuit) | ○ | ○ | ○ | | 0.6 | | | 10 |
| PR39MF21NSZF | | 200 V lines, compact (built-in zero-cross circuit) | ○ | ○ | ○ | | 0.9 | | | 10 |
| PR3BMF21NSZF | | 200 V lines, compact (built-in zero-cross circuit) | ○ | ○ | ○ | | 1.2 | | | 10 |

*1 Please refer to Specification Sheets for model numbers approved by safety standards.
*2 Optionally available.

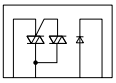
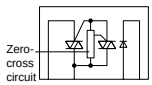
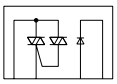
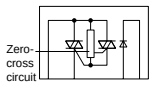
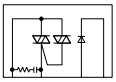
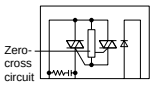
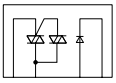
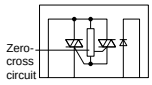
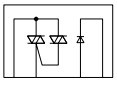

PR22MA11NTZF
(6-pin DIP)


PR26MF21NSZF
(8-pin DIP)

RoHS

## <SIP type> (1)

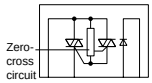
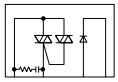
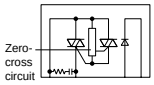
○: Approved, △: Under application (Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*6 | | Package | Absolute maximum ratings | | | Electrical characteristics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | UL | CSA | | ON-state current $I_T$ (rms) (A) | Repetitive peak OFF-state voltage $V_{DRM}$(V) | Isolation voltage (AC) Viso (rms) (kV) | Min. trigger current $I_{FT}$ (mA) MAX. | $V_D$ (V) | $R_L$ (Ω) |
| S102T01F |  | 100 V lines, low profile | ○ | ○ | Low profile 4-pin SIP | 2 | 400 | 3.0 | 8 | 12 | 30 |
| S108T01F | | 100 V lines, low profile | – | – | | 8*2 | | | 8 | 12 | 30 |
| S102T02F |   | 100 V lines, low profile (built-in zero-cross circuit) | ○ | ○ | | 2 | | | 8 | 12 | 30 |
| S108T02F | | 100 V lines, low profile (built-in zero-cross circuit) | – | – | | 8*2 | | | 8 | 12 | 30 |
| S101S05F |  | 100 V lines | ○ | ○ | 4-pin SIP | 3*3 | | | 15 | 12 | 30 |
| S102S01F | | 100 V lines | ○ | ○ | | 8*2 | | 4.0 | 8 | 12 | 30 |
| S112S01F | | 100 V lines | ○ | ○ | | 12*4 | | | 8 | 12 | 30 |
| S116S01F | | 100 V lines | ○ | ○ | | 16*5 | | | 8 | 12 | 30 |
| S101S06F |   | 100 V lines (built-in zero-cross circuit) | ○ | ○ | | 3*3 | | 3.0 | 15 | 6 | 30 |
| S102S02F | | 100 V lines (built-in zero-cross circuit) | ○ | ○ | | 8*2 | | 4.0 | 8 | 6 | 30 |
| S116S02F | | 100 V lines (built-in zero-cross circuit) | ○ | ○ | | 16*5 | | | 8 | 6 | 30 |
| S102S11F |  | 100 V lines (built-in snubber circuit) | ○ | ○ | | 8*1 | | | 8 | 12 | 30 |
| S101S16F |   | 100 V lines (built-in snubber circuit, built-in zero-cross circuit) | ○ | ○ | | 3*3 | | 3.0 | 15 | 6 | 30 |
| S102S12F | | 100 V lines (built-in snubber circuit, built-in zero-cross circuit) | ○ | ○ | | 8*1 | | 4.0 | 8 | 6 | 30 |
| S202T01F |  | 200 V lines, low profile | ○ | ○ | Low profile 4-pin SIP | 2 | 600 | 3.0 | 8 | 12 | 30 |
| S208T01F | | 200 V lines, low profile | – | – | | 8*2 | | | 8 | 12 | 30 |
| S202T02F |   | 200 V lines, low profile (built-in zero-cross circuit) | ○ | ○ | | 2 | | | 8 | 12 | 30 |
| S208T02F | | 200 V lines, low profile (built-in zero-cross circuit) | – | – | | 8*2 | | | 8 | 12 | 30 |
| S202S01F |  | 200 V lines | ○ | ○ | 4-pin SIP | 8*2 | | 4.0 | 8 | 12 | 30 |
| S212S01F | | 200 V lines | – | – | | 12*4 | | | 8 | 12 | 30 |
| S216S01F | | 200 V lines | – | – | | 16*5 | | | 8 | 12 | 30 |

For the notes *1 to *6, see next page.

## <SIP type> (2)

○: Approved, △: Under application (Ta = 25°C)

| Model No. | Internal connection diagram | Features | Approved by safety standards*6 | | Package | Absolute maximum ratings | | | Electrical characteristics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | UL | CSA | | ON-state current $I_T$ (rms) (A) | Repetitive peak OFF-state voltage $V_{DRM}$(V) | Isolation voltage (AC) Viso (rms) (kV) | Min. trigger current $I_{FT}$ (mA) MAX. | $V_D$ (V) | $R_L$ (Ω) |
| S201S06F |   | 200 V lines (built-in zero-cross circuit) | ○ | ○ | 4-pin SIP | 3*3 | 600 | 3.0 | 15 | 6 | 30 |
| S202S02F | | 200 V lines (built-in zero-cross circuit) | ○ | ○ | | 8*2 | | 4.0 | 8 | 6 | 30 |
| S216S02F | | 200 V lines (built-in zero-cross circuit) | – | – | | 16*5 | | | 8 | 6 | 30 |
| S202S15F |  | 200 V lines (built-in snubber circuit) | – | – | | 8*2 | | 3.0 | 15 | 12 | 30 |
| S202S11F | | 200 V lines (built-in snubber circuit) | ○ | ○ | | 8*1 | | 4.0 | 8 | 12 | 30 |
| S202S12F |   | 200 V lines (built-in snubber circuit, built-in zero-cross circuit) | ○ | ○ | | 8*1 | | | 8 | 6 | 30 |

*1 Tc ≦ 88°C *2 Tc ≦ 80°C *3 Tc ≦ 100°C *4 Tc ≦ 70°C *5 Tc ≦ 60°C
*6 Please refer to Specification Sheets for model numbers approved by safety standards.

S102T01F series
(Low profile 4-pin SIP)

S102S02F series
(4-pin SIP)

RoHS

## ■ Photointerrupter Lineup

### <Transmissive type>

| Output type | Package type | Outline | Mounting method | Model No. (series) | Page |
|---|---|---|---|---|---|
| Single phototransistor | Compact | High resolution | PWB mounting type | GP1S396HCP0F/GP1S09xHCZ0F/ GP1S19xHCZ0F | 62 |
| High response speed | | | Surface-mount type/ Soldering reflow | GP1S396HCPSF/GP1S296HCPSF/ GP1S092HCPIF/GP1S19xHCxSF | 62 |
| | Case type | High resolution | PWB mounting type, etc. | GP1S5x series | 63 |
| | | Horizontal slit, High resolution | PWB mounting type | GP1S59J0000F | 63 |
| | With connector | General purpose | Snap-in | GP1S173LCS2F/GP1S74PJ000F/ GP1S273LCS1F | 63 |
| Darlington phototransistor | Case type | General purpose | PWB mounting type, etc. | GP1L5x series | 64 |
| High sensitivity | | Wide gap | PWB mounting type | GP1L57J0000F | 64 |
| Digital output | Compact | High voltage | PWB mounting type | GP1A98HCZ0F | 64 |
| (OPIC output) | | | Surface-mount type | GP1A98HCPSF | 64 |
| | Case type | High resolution | With screw hole/ PWB mounting type | GP1A5x series | 65 |
| | | Wide gap | PWB mounting type | GP1A57HRJ00F | 65 |
| | With connector | General purpose | Screw mounting type/Snap-in | GP1A173LCS2F/GP1A273LCS1F/ GP1A7x series/GP1A07x series | 66 |

### <Reflective type>

| Output type | Package type | Outline | Mounting method | Model No. (series) | Page |
|---|---|---|---|---|---|
| Single phototransistor | Leadless | Long focal distance | Surface-mount type | GP2S700HCP | 66 |
| High response speed | Compact, thin (leadless) | General purpose | Surface-mount type | GP2S60 | 66 |
| OPIC output | With connector | Light modulation type, Sensitivity adjusted | Screw mounting type/ Compact snap-in/ Inverter light countermeasures | GP2A25 series/GP2A28 series/ GP2A200LCS0F/GP2A230LRS0F/ GP2A231LRSAF/GP2A240LCS0F/ GP2A250LCS0F | 67 |

### <Application-specific photointerrupter lineup>

| Detection type | Outline (Output type etc.) | | Mounting method | Model No. (series) | Page |
|---|---|---|---|---|---|
| Transmissive type | Case type With encoder function Digital 2 output (phase A/B) | Resolution: 45 LPI Linear scale slit pitch: 0.56 mm | PWB mounting type | GP1A057SGKLF | 68 |
| | | Resolution: 150 LPI Linear scale slit pitch: 0.17 mm | PWB mounting type/ | GP1A057RBKLF | 68 |
| | | Resolution: 180 LPI Linear scale slit pitch: 0.14 mm | Screw mounting type | GP1A058SCK0F | 68 |
| | | Resolution: 300 LPI Linear scale slit pitch: 0.0847 mm | PWB mounting type | GP1A054RDKLF | 68 |
| | Case type With encoder function Digital 2 output (Multiplying output) | Resolution for reading: 180 LPI Pitch: 0.14 mm Output resolution: 360 LPI | PWB mounting type | GP1A101C2KSF | 68 |
| | For amusement use | | Screw mounting | GP1A204HCS0 | 68 |
| Reflective type | Injection For prism system (Single phototransistor) | | Screw mounting | GP2S29SVJ00F | 68 |
| | For amusement use (Pachinko ball sensor) | | – | GP2A224P0KA | 69 |

☆New product

## ■ Photointerrupters

### <Transmissive type>

### ◆Single phototransistor output

### <Compact type>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current transfer ratio | | | Response time | | | |
| | | | | | CTR (%) MIN. | $I_F$ (mA) | $V_{CE}$ (V) | tr (μs) TYP. | $I_C$ (mA) | $R_L$ (kΩ) | $V_{CE}$ (V) |
| GP1S092HCPIF |  | Wide gap, for soldering reflow, surface mount compatible, with positioning boss (4.5 × 2.6 × 2.9 [height] mm) | 2.0 | 0.3 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S093HCZ0F | | Wide gap (4.5 × 2.6 × 2.9 [height] mm) | 2.0 | 0.3 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S094HCZ0F | | Wide gap, with positioning pin, (5.5 × 2.6 × 4.8 [height] mm) | 3.0 | 0.3 | 0.8 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S096HCZ0F | | Narrow gap (3.5 × 2.6 × 2.9 [height] mm) | 1.0 | 0.3 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S194HCZ0F | | Compact, wide gap, size: 3.6 × 2.0 × 2.7 (height) mm | 1.7 | 0.3 | 3.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S195HCZSF GP1S195HCPSF | | Compact, wide gap, surface mount compatible, size: 3.4 × 2.0 × 2.7 (height) mm | 1.5 | 0.3 | 3.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S196HCZ0F | | Compact, low profile (3.1 × 2.0 × 2.7 [height] mm) | 1.1 | 0.3 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S196HCZSF GP1S196HCPSF | | Surface mount, for soldering reflow, compact, low profile (3.1 × 2.0 × 2.7 [height] mm) | 1.1 | 0.3 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S296HCPSF | | Surface mount, for soldering reflow, compact, low profile (2.5 × 1.8 × 1.9 [height] mm) | 1.0 | 0.2 | 3.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| ☆GP1S396HCP0F | | Straight lead type, compact, low profile (2.26 × 1.4 × 1.6 [height] mm) | 1.2 | 0.12 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| ☆GP1S396HCPSF | | Surface mount, for soldering reflow, compact, low profile (2.26 × 1.4 × 1.6 [height] mm) | 1.2 | 0.12 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |
| GP1S097HCZ0F | | High resolution, wide gap, with mounting hole (4.5 × 2.6 × 4.5 [height] mm) | 2.0 | 0.3 | 2.0 | 5 | 5 | 50 | 0.1 | 1 | 5 |

※ Topr: –25 to +85°C

※※GP1SxxxHCZxF: Sleeve package, GP1SxxxHCPxF: Taped package


GP1S092HCPIF


GP1S093HCZ0F


GP1S094HCZ0F


GP1S096HCZ0F


GP1S194HCZ0F


GP1S195HCPSF/ GP1S195HCZSF


GP1S196HCZ0F


GP1S196HCZSF/ GP1S196HCPSF


GP1S296HCPSF


GP1S396HCPSF

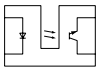

GP1S396HCP0F


GP1S097HCZ0F

RoHS

## <Case type>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current transfer ratio | | | Response time | | | |
| | | | | | CTR (%) MIN. | $I_F$ (mA) | $V_{CE}$ (V) | tr (µs) TYP. | $I_C$ (mA) | $R_L$ (Ω) | $V_{CE}$ (V) |
| GP1S50J0000F |  | High resolution, both-side mounting type | 3.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S51VJ000F | | High resolution, side mounting type | 3.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S52VJ000F | | High resolution, PWB mounting type | 3.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S53VJ000F | | High resolution, PWB mounting type | 5.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S54J0000F | | High resolution, with positioning pin, PWB mounting type | 3.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S56TJ000F | | High resolution, with positioning pin, PWB mounting type | 2.0 | 0.15 | 2.0 | 20 | 5 | 38 | 0.5 | 1 000 | 2 |
| GP1S58VJ000F | | High resolution, with positioning pin, PWB mounting type | 5.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S59J0000F | | High resolution, horizontal slit, with positioning pin, PWB mounting type | 4.2 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |

※ Topr: –25 to +85°C


GP1S50J0000F


GP1S51VJ000F


GP1S52VJ000F


GP1S53VJ000F


GP1S54J0000F


GP1S56TJ000F


GP1S58VJ000F


GP1S59J0000F

## <With connector>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current transfer ratio | | | Response time | | | |
| | | | | | CTR (%) MIN. | $I_F$ (mA) | $V_{CE}$ (V) | tr (µs) TYP. | $I_C$ (mA) | $R_L$ (Ω) | $V_{CE}$ (V) |
| GP1S74PJ000F |  | Snap-in mounting type with connector<br>Applicable to 3 kinds of thickness of mounting boards | 5.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S173LCS2F | | Snap-in mounting integrated connector type<br>Applicable to 3 kinds of thickness of mounting boards | 5.0 | 0.5 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |
| GP1S273LCS1F | | Snap-in mounting integrated connector type<br>Applicable to 3 kinds of thickness of mounting boards<br>Compact (Compatible with 1.5 mm pitch connector) | 5.0 | 0.7 | 2.5 | 20 | 5 | 3 | 2 | 100 | 2 |

※ Topr: –25 to +85°C, –30 to +95°C (GP1S173LCS2F, GP1S273LCS1F)


GP1S74PJ000F


GP1S173LCS2F


GP1S273LCS1F

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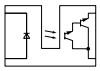
RoHS

## ◆Darlington phototransistor output

### <Case type>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current transfer ratio | | | Response time | | | |
| | | | | | CTR (%) MIN. | $I_F$ (mA) | $V_{CE}$ (V) | tr (μs) TYP. | $I_C$ (mA) | $R_L$ (Ω) | $V_{CE}$ (V) |
| GP1L50J0000F▲ |  | High sensitivity, both-side mounting type | 3.0 | 0.5 | 50 | 1 | 2 | 80 | 2 | 100 | 2 |
| GP1L51J0000F | | High sensitivity, side mounting type | 3.0 | 0.5 | 50 | 1 | 2 | 80 | 2 | 100 | 2 |
| GP1L52VJ000F | | High sensitivity, PWB mounting type | 3.0 | 0.5 | 50 | 1 | 2 | 80 | 2 | 100 | 2 |
| GP1L53VJ000F | | High sensitivity, PWB mounting type | 5.0 | 0.5 | 30 | 1 | 2 | 80 | 2 | 100 | 2 |
| GP1L57J0000F | | High sensitivity, wide gap, PWB mounting type | 10.0 | 1.8 | 70 | 1 | 2 | 130 | 2 | 100 | 2 |

※ Topr: –25 to +85°C
The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.


GP1L50J0000F▲


GP1L51J0000F


GP1L52VJ000F


GP1L53VJ000F

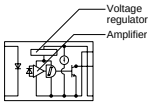

GP1L57J0000F

## ◆OPIC type

("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

### <Compact type>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Threshold input current | | | Propagation delay time | | | | |
| | | | | | $I_{FLH}$ (mA) MAX. | $I_{FHL}$ (mA) MAX. | $V_{CC}$ (V) | $t_{PLH}$ (μs) TYP. | $t_{PHL}$ (μs) TYP. | $I_F$ (mA) | $R_L$ (kΩ) | $V_{CC}$ (V) |
| GP1A98HCZ0F |  | Compact, PWB mounting | 3.2 | 0.5 | 8 | – | 3.3 to 24 | 2.0 | 10.0 | 10 | 3.9 to 20 | 3.3 to 24 |
| GP1A98HCPSF | | Compact, surface mount | 3.2 | 0.5 | 8 | – | 3.3 to 24 | 2.0 | 10.0 | 10 | 3.9 to 20 | 3.3 to 24 |

※ Topr = –25 to +85°C


GP1A98HCZ0F


GP1A98HCPSF

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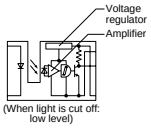
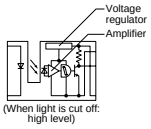
## <Case type>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Threshold input current | | | Propagation delay time | | | | |
| | | | | | $I_{FLH}$ (mA) MAX. | $I_{FHL}$ (mA) MAX. | $V_{CC}$ (V) | $t_{PLH}$ (µs) TYP. | $t_{PHL}$ (µs) TYP. | $I_F$ (mA) | $R_L$ (Ω) | $V_{CC}$ (V) |
| GP1A50HRJ00F |  | Both-side mounting, with screw hole | 3.0 | 0.5 | 5 | – | 5 | 3 | 5 | 5 | 280 | 5 |
| GP1A51HRJ00F | | Side mounting, with screw hole | 3.0 | 0.5 | 5 | – | 5 | 3 | 5 | 5 | 280 | 5 |
| GP1A52HRJ00F | | PWB mounting type | 3.0 | 0.5 | 5 | – | 5 | 3 | 5 | 5 | 280 | 5 |
| GP1A53HRJ00F | | PWB mounting type | 5.0 | 0.5 | 8 | – | 5 | 3 | 5 | 8 | 280 | 5 |
| GP1A57HRJ00F | | PWB mounting type, with positioning pin | 10.0 | 1.8 | 7 | – | 5 | 3 | 5 | 7 | 280 | 5 |
| GP1A58HRJ00F | | PWB mounting type, with positioning pin | 5.0 | 0.5 | 8 | – | 5 | 3 | 5 | 8 | 280 | 5 |
| GP1A52LRJ00F |  | PWB mounting type | 3.0 | 0.5 | – | 5 | 5 | 5 | 3 | 5 | 280 | 5 |

※ Topr = –25 to +85°C

GP1A50HRJ00F

GP1A51HRJ00F

GP1A52LRJ00F
(GP1A52HRJ00F)

GP1A53HRJ00F
{GP1A58HRJ00F with positioning pin}

GP1A57HRJ00F

Optoelectronics

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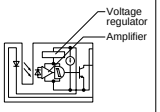
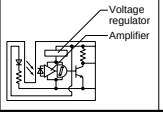
## ◆OPIC type

("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

### <With 3-pin connector terminal>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Supply voltage $V_{CC}$ (V) | | Low level output voltage | | | |
| | | | | | | MIN. | MAX. | $V_{OL}$ (V) MAX. | Light cut-off | $I_{OL}$ (mA) | $V_{CC}$ (V) |
| GP1A173LCS2F |  | with 3-pin connector | Snap-in mounting integrated connector type*1 | 5.0 | 0.5 | 4.5 | 5.5 | 0.35 | No | 4 | 5 |
| GP1A273LCS1F | | | Integrated connector, compatible with 1.5 mm pitch connector, snap-in mounting type*1 | 5.0 | 0.7 | 4.5 | 5.5 | 0.35 | No | 4 | 5 |
| GP1A73AJ000F | | | Compact, snap-in mounting type*1 | 5.0 | 0.5 | 4.5 | 5.5 | 0.35 | No | 4 | 5 |
| GP1A073LCS | | | Compact, snap-in mounting type*1, low voltage operation | 5.0 | 0.5 | 2.7 | 5.5 | 0.35 | No | 4 | 3 |
| GP1A75EJ000F |  | | Either-side mounting type Screw mounting type | 5.0 | 0.5 | 4.5 | 5.5 | 0.35 | Yes | 16 | 5 |

※ Topr: –20 to +75°C, –30 to +95°C (GP1A173LCS2F)
*1 Applicable to 3 kinds of thickness of mounting boards.


GP1A73AJ000F, GP1A073LCS


GP1A173LCS2F


GP1A273LCS1F


GP1A75EJ000F

# ■ Photointerrupters

### <Reflective type>

## ◆Single phototransistor output

### <Compact>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Standard detecting distance (mm) | Electro-optical characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Current transfer ratio | | | Response time | | | |
| | | | | CTR (%) MIN. | $I_F$ (mA) | $V_{CE}$ (V) | tr (µs) TYP. | $I_C$ (mA) | $R_L$ (kΩ) | $V_{CE}$ (V) |
| GP2S700HCP |  | Compact (4 × 3 × 2 [height] mm), long focal distance, surface mounting leadless type | 3 | 1.5 | 4 | 2 | 20 | 0.1 | 1 | 2 |
| GP2S60 | | Thin (3.2 × 1.7 × 1.1 [height] mm), surface mounting leadless type | 0.5 | 1.0 | 4 | 2 | 20 | 0.1 | 1 | 2 |

※ Topr: –25 to +85°C


GP2S700HCP


GP2S60

RoHS

## ◆OPIC output

("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

### <With 3-pin connector terminal>

(Ta = 25°C)

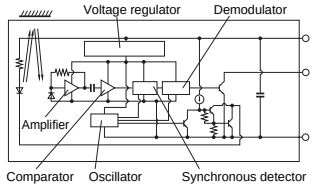
| Model No. | Internal connection diagram | Features | Optimum detecting distance (mm) | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Supply voltage $V_{CC}$ (V) | | Dissipation current | | Low level output voltage | |
| | | | | MIN. | MAX. | $I_{CC}$ (mA) MAX. | $V_{CC}$ (V) | $V_{OL}$ (V) MAX. | $V_{CC}$ (V) |
| GP2A200LCS0F | (Following diagram [A]) | Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted | 5 to 15 | 4.75 | 5.25 | 30*1 | 5 | 0.4 | 5 |
| GP2A240LCS0F | | Improved light-resistance characteristic for inverter lighting, light modulation type, with connector, sensitivity adjusted | 5 to 15 | 4.75 | 5.25 | 30*1 | 5 | 0.4 | 5 |
| GP2A250LCS0F | | Static electricity resistant, improved light-resistance characteristic for inverter lighting, light modulation type, with connector, sensitivity adjusted | 2.5 to 12.5 | 4.75 | 5.25 | 30*1 | 5 | 0.4 | 5 |
| GP2A25J0000F | | Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted | 3 to 7 | 4.75 | 5.25 | 30*1 | 5 | 0.4 | 5 |
| GP2A230LRS0F | (Following diagram [B]) | Compact, hook type (GP2A231LRSAF), multi types of paper detectable, light modulation type, with connector | 3 to 7 | 4.75 | 5.25 | 20*1 | 5 | 0.4 | 5 |
| GP2A231LRSAF | | | | | | | | | |
| GP2A25NJJ00F | (Following diagram [A]) | Multi types of paper detectable, light modulation type, sensitivity adjusted, applicable to inverter fluorescent lamp, built-in visible light cut filter | 3 to 7 | 4.75 | 5.25 | 30*1 | 5 | 0.4 | 5 |
| GP2A25DJ000F | | Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted | 3 to 7 | 4.75 | 5.25 | 30*1 | 5 | 0.4 | 5 |
| GP2A28AJ000F | | Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted, hook type | 3 to 7 | 4.75 | 5.25 | 30*1 | 5 | 0.4 | 5 |

※ Topr: –10 to +60°C (GP2A25J0000F, etc.)
–10 to +70°C (GP2A200LCS0F, GP2A240LCS0F, GP2A250LCS0F, GP2A230LRS0F, GP2A231LRSAF)

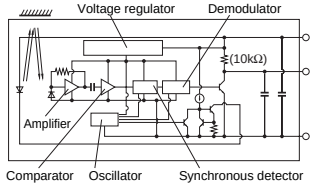
*1 Smoothing value $R_L = \infty$

[Internal connection diagram]

[A]




[B]

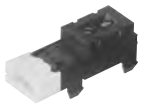



GP2A25J0000F
(GP2A25NJJ00F, GP2A200LCS0F, GP2A240LCS0F)

GP2A250LCS0F

GP2A25DJ000F

GP2A230LRS0F



GP2A231LRSAF

GP2A28AJ000F

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RoHS

## ■ Photointerrupters for Specific Applications

### ◆Transmissive type

### <Case type, with encoder function>

(Ta = 25°C)

| Model No. | Absolute maximum ratings | | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Vcc (V) | Topr (°C) | Operating voltage Vcc (V) TYP. | Output signal | Resolution | Response frequency (kHz) MAX. | Response frequency IF (mA) | Dissipation current (output side) Icc (mA) MAX. |
| GP1A057RBKLF | 6 | –10 to +70 | 3.3 | Digital 2 output (Phase A/B) | Linear scale slit pitch 0.17 (mm) (150LPI) | 60 | 20 | 7 |
| GP1A054RDKLF | 6 | –10 to +70 | 3.3 | | Linear scale slit pitch 0.0847 (mm) (300LPI) | 40 | 20 | 5.5 |
| GP1A057SGKLF | 6 | –10 to +70 | 3.3 | | Linear scale slit pitch 0.56 (mm) (45LPI) | 25 | 20 | 5.5 |
| GP1A058SCK0F | 6 | –10 to +70 | 3.3 | | Linear scale slit pitch 0.14 (mm) (180LPI) | 40 | 20 | 5.5 |
| GP1A101C2KSF | 6.5 | –10 to +70 | 3.3 | Digital 2 output (Multiplying output) | Resolution for reading: 180 LPI (Pitch: 0.14 mm) Output resolution: 360 LPI | 120 | 20 | 20 |

* High precision read and low affection of angle error from vibration thanks to the multi-segment PD system.
Duty ratio: 50±15%, phase difference: 90±45°


GP1A054RDKLF

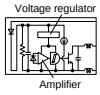

GP1A057RBKLF
(GP1A057SGKLF)


GP1A058SCK0F


GP1A101C2KSF

### <For amusement use>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Detecting and emitting gap (mm) | Slit width (mm) | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Operating voltage Vcc (V) | | Low level output voltage | | | |
| | | | | | MIN. | MAX. | VOL (V) MAX. | Light cut-off | IOL (mA) | VCC (V) |
| GP1A204HCS0 |   | Connector with lock, screw mounting type, high resistant to noise | 4.0 | 0.5 | 10.8 | 24 | 0.4 | Yes | 5 | 10.8 to 24 |


GP1A204HCS0

### ◆Reflective type

### <Case type, phototransistor output>

(Ta = 25°C)

| Model No. | Internal connection diagram | Features | Electro-optical characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Peak photocurrent | | | Response time | | | |
| | | | ICP (mA) | IF (mA) | VCE (V) | tr (µs) TYP. | IC (mA) | RL (kΩ) | VCE (V) |
| GP2S29SVJ00F |  | Long focal distance (with prism system*1), compact, screw mounting type | 0.4 to 3.0*1 | 20 | 5 | 38 | 0.5 | 1 | 2 |

※ Topr: –25 to +85°C *1 Space between prism and sensor is 8 mm.


GP2S29SVJ00F

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### <For amusement use>

(Ta = 25°C)

| Model No. | Features | Electro-optical characteristics | | |
|---|---|---|---|---|
| | | Supply voltage Vcc (V) | Dissipation current Icc (mA) | Response frequency f (Hz) |
| GP2A224P0KA | Reflection-type ball detection sensor, connector (2-wire output) with lock, Disconnection/short-circuit detection when combined with ICs*1 | 7.5 to 24 | MAX. 12 | MAX. 500 |

*1 Shared with interface IC for control (IR3N340)

GP2A224P0KA

## ■ Proximity Sensor

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electro-optical characteristics | | | | |
|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | Topr (°C) | Dissipation current Icc (μA) TYP. | Detecting distance Lon (mm) MIN. | Non-detecting distance Loff (mm) MAX. | Maximum acceptable illuminance Ev (lx) MIN. | Peak emission wavelength λp (nm) |
| GP2AP002S00F | Compact size (4.0 × 2.0 × 1.2 t mm)<br>Disparities in detecting distance results are greatly reduced using a built-in circuit for reduction of light-detecting sensitivity disparities<br>Built-in LEDs for simple optical design and $I^2C$ output | 3.8 | –25 to +85 | 240 | 25 | 150 | 3 000 | 940 |

☆New product

## ■ Proximity Sensor with Integrated Ambient Light Sensor

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electro-optical characteristics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Proximity sensor portion | | | | Ambient light sensor portion | | | |
| | | | | | | | | | | | Output current | |
| | | $V_{CC}$ (V) | Topr (°C) | Dissipation current Icc (μA) TYP. | Detecting distance Lon (mm) MIN. | Non-detecting distance Loff (mm) MAX. | Maximum acceptable illuminance Ev (lx) MIN. | Peak emission wavelength λp (nm) | Recommended illuminance range Ev (lx) MIN. | Peak sensitivity wavelength λp (nm) | $I_{O1}$ (μA) TYP. | $I_{O2}$ (μA) MAX. |
| GP2AP002A00F | LED and ambient light sensor combined in a single package (5.6 × 2.1 × 1.2 t mm)<br>Disparities in detecting distance results are greatly reduced using a built-in circuit for reduction of light-detecting sensitivity disparities<br>Built-in LEDs for simple optical design<br>Proximity sensor: $I^2C$ output<br>Ambient light sensor: logarithmic current output | 3.8 | –25 to +85 | 270 | 25 | 150 | 3 000 | 940 | 3 to 55 000 | 555 | 30 (at Ev = 1 000 lx) | 1 (at Ev = 0 lx) |

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electro-optical characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Proximity sensor portion | | | Ambient light sensor portion | | | |
| | | $V_{CC}$ (V) | Topr (°C) | Dissipation current Icc (μA) TYP. | Detecting distance Lon (mm) MIN. | Non-detecting distance Loff (mm) MAX. | Peak emission wavelength λp (nm) | Recommended illuminance range Ev (lx) | Output resolution (bit) | Peak sensitivity wavelength λp (nm) | ADC conversion time Tint (ms) TYP. |
| ☆GP2AP012A00F | LED and ambient light sensor combined in a single package (4.4 × 2.6 × 1.0 t mm)<br>Built-in LEDs for simple optical design<br>Illuminance output: digital 16-bit output (Minimum detectable illuminance: 0.1 lx)<br>$I^2C$ output compatible (proximity sensor, ambient light sensor) | 3.8 | –40 to +85 | 45 | 25 | 125 | 940 | 0.1 to 130 000 | 16 | 540 | 100 |

GP2AP002S00F

GP2AP002A00F

GP2AP012A00F

RoHS

## ■ Ambient Light Sensors

(Ta = 25°C)

| Model No. | Type | Package | Absolute maximum ratings | | | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{CC}$ (V) | $I_O$ (mA) | Topr (°C) | Recommended supply voltage $V_{CC}$ (V) | Recommended illuminance range Ev (lx) | Dissipation current Icc (μA) TYP. | Peak sensitivity wavelength λp (nm) | Output current $I_{O1}$ (μA) TYP. | Output current $I_{O2}$ (μA) TYP. |
| GA1A2S100SS | Built-in amplification circuit<br>Peak sensitivity characteristic close to human visual sensitivity<br>Output characteristic: Linear current output for illuminance<br>Lead frame (straight) type | Transparent epoxy resin (3 × 4 mm) | 7.0 | 5 | –40 to +85 | 2.7 to 3.6 | 10 to 10 000 | 500 | 555 | 480 (at Ev = 1 000 lx) | 48 (at Ev = 100 lx) |
| GA1A2S100LY | Built-in amplification circuit<br>Peak sensitivity characteristic close to human visual sensitivity<br>Output characteristic: Linear current output for illuminance<br>Lead frame (L bend) type | | 7.0 | 5 | –40 to +85 | 2.7 to 3.6 | 10 to 10 000 | 500 | 555 | 480 (at Ev = 1 000 lx) | 48 (at Ev = 100 lx) |
| GA1A1S202WP | Built-in amplification circuit<br>Peak sensitivity characteristic close to human visual sensitivity<br>Output characteristic: Logarithmic current output for illuminance | Compact SMD (2.0 × 1.6 × 0.6 mm)<br>Leadless | 7.0 | 1 | –40 to +85 | 2.3 to 3.2 | 3 to 55 000 | 70 | 555 | 20 (at Ev = 100 lx) | 30 (at Ev = 1 000 lx) |
| GA1A1S203WP | Built-in amplification circuit<br>Peak sensitivity characteristic close to human visual sensitivity<br>Output characteristic: Logarithmic current output for illuminance<br>Thin type | Compact SMD (2.0 × 1.6 × 0.42 mm)<br>Leadless | 7.0 | 1 | –40 to +85 | 2.3 to 3.2 | 3 to 55 000 | 70 | 555 | 20 (at Ev = 100 lx) | 30 (at Ev = 1 000 lx) |
| GA1A1S204WP | Built-in amplification circuit<br>Peak sensitivity characteristic close to human visual sensitivity<br>Output characteristic: Logarithmic current output for illuminance<br>Back-mount-available type | Compact SMD (3.3 × 2.0 × 0.6 mm)<br>Back-mount available, leadless | 7.0 | 1 | –40 to +85 | 2.3 to 3.2 | 3 to 55 000 | 70 | 555 | 20 (at Ev = 100 lx) | 30 (at Ev = 1 000 lx) |
| GA1A1S100WP | Built-in amplification circuit<br>Peak sensitivity characteristic close to human visual sensitivity<br>Output characteristic: Linear current output for illuminance | Compact SMD (2.0 × 1.6 × 0.6 mm)<br>Leadless | 7.0 | 10 | –40 to +85 | 2.7 to 3.6 | 10 to 5 000 | 1 460 | 555 | 1 420 (at Ev = 1 000 lx) | 142 (at Ev = 100 lx) |


GA1A2S100SS


GA1A2S100LY


GA1A1S202WP
(GA1A1S100WP)


GA1A1S203WP


GA1A1S204WP

Optoelectronics

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## ■ OPIC Light Detectors

( "OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip. )

(Ta = 25°C)

| Model No. | Type | Package | Absolute maximum ratings | | | | Electro-optical characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{CC}$ (V) | P (mW) | $I_O$ (mA) | Topr (°C) | $E_{VLH}$ (lx) MAX. | $E_{VHL}$ (lx) MAX. | $V_{CC}$ (V) | $t_{PLH}$ (µs) TYP. | $t_{PHL}$ (µs) TYP. | $V_{CC}$ (V) | $E_V$ (lx) | $R_L$ (Ω) |
| IS485E | Built-in schmidt trigger circuit, amplifier and voltage regulator | Transparent epoxy resin with condenser (lens) | –0.5 to +17 | 175 | 50 | –25 to +85 | – | 35 | 5 | 5 | 3 | 5 | 50 | 280 |
| IS486E | | | –0.5 to +17 | 175 | 50 | –25 to +85 | 35 | – | 5 | 3 | 5 | 5 | 50 | 280 |

IS485E
(IS486E)

### <Low-voltage operation>

(Ta = 25°C)

| Model No. | Type | Package | Absolute maximum ratings | | | Electro-optical characteristics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | P (mW) | $I_O$ (mA) | Topr (°C) | Operating supply voltage (V) | $E_{VLH}$ (lx) MAX. | $E_{VHL}$ (lx) MAX. | $V_{CC}$ (V) | $t_{PHL}$ (µs) TYP. | $t_{PLH}$ (µs) TYP. | $V_{CC}$ (V) | $E_V$ (lx) | $R_L$ (Ω) |
| IS489E | Built-in Schmidt trigger circuit and amplifier | Transparent epoxy resin with condenser (lens) | 80 | 2 | –25 to +85 | 1.4 to 7.0 | – | 15 | 3 | 1.3 | 8.5 | 3 | 125 | 3 000 |

IS489E

### <Model employing a light modulation system>

(Ta = 25°C)

| Model No. | Type | Package | Absolute maximum ratings | | | | Electro-optical characteristics*2 | | | | | | External disturbing light illuminance $E_{VDX}$(lx) TYP. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{CC}$ (V) | P (mW) | $I_O$ (mA) | Topr (°C) | $V_{OL}$ (V) MAX. | $V_{OH}$ (V) MIN. | $t_{PLH}$ (µs) TYP. | $t_{PHL}$ (µs) TYP. | $V_{CC}$ (V) | $R_L$ (Ω) | |
| IS471FE*1, *3 | Built-in pulse driver circuit at the emitter side, synchronous detector circuit, amplifier circuit and demodulator circuit | Visible light cut-off epoxy resin | –0.5 to +16 | 250 | 50 | –25 to +60 | 0.35 | 4.97 | 400 | 400 | 5 | 280 | 7 000 |

*1 IS471FE is less susceptible to disturbing effects thanks to the light modulation system
*2 Vcc = 5 V
*3 Straight lead type (IS471FSE) is also available.

IS471FE

RoHS

## <For laser beam printers (laser beam origin detection)>

(Ta = 25°C)

| Model No. | Type | Package | Electro-optical characteristics | | | |
|---|---|---|---|---|---|---|
| | | | Recommended supply voltage $V_{CC}$ (V) | $V_{OH}$ (V) MIN. | $V_{OL}$ (V) MAX. | H → L delay time variation $\Delta t_{PHL}$ (ns) MAX. |
| GA220T2L1IZ | 2-PD, differential type | Transparent epoxy resin 18-pin | 4.5 to 5.5 | 4.9 | 0.6 | ±8.5 |

GA220T2L1IZ

RoHS

## ■ Phototransistor Lineup

| Package | Output type | Features | Half sensitivity angle | Model No. | |
|---|---|---|---|---|---|
| | | | | Standard | Visible light cut-off |
| Epoxy resin with lens | Single phototransistor | General purpose/Narrow acceptance | ±13° | PT480E00000F | PT480FE0000F |
| | | Compact, thin | ±35° | PT4800E0000F | PT4800FE000F / PT4850FE000F |
| | Darlington phototransistor | High sensitivity/Narrow acceptance | ±13° | PT481E00000F | PT481FE0000F |
| | | High sensitivity/Narrow acceptance/Long lead | ±13° | — | PT483F1E000F |
| | | High sensitivity/Compact, thin | ±35° | PT4810E0000F▲ | PT4810FJE00F▲ |
| | | High sensitivity/Intermediate acceptance | ±40° | — | PT491FE0000F |
| | | High sensitivity/Intermediate acceptance/Long lead | ±40° | — | PT493FE0000F▲ |
| Surface mounting leadless type | Single phototransistor | Compact (side view/top view mounting possible) | ±15° | PT100MC0MP | PT100MF0MP |
| | Darlington phototransistor | Compact (side view/top view mounting possible) | ±15° | — | PT100MF1MP |

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

RoHS

## ■ Phototransistors

| Type | Model No. | Package | Absolute maximum ratings | | | Ic (mA) | | | | ICEO(A) | | Δθ (°) | λp (nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | VCEO (V) | PC (mW) | Topr (°C) | MIN. | MAX. | VCE (V) | Ee (mW/cm²) | MAX. | VCE (V) | TYP. | TYP. |
| Single | PT100MC0MP | Surface mounting leadless type with lens | 35 | 75 | –30 to +85 | 1.7 | 5.1 | 5 | 1 | $1\times10^{-7}$ | 20 | ±15 | 900 |
| | PT100MF0MP*1 | | 35 | 75 | –30 to +85 | 1.15 | 3.45 | 5 | 1 | $1\times10^{-7}$ | 20 | ±15 | 910 |
| | PT480E00000F | Epoxy resin with lens | 35 | 75 | –25 to +85 | 0.4 | TYP. 1.7 | 5 | 1 | $1\times10^{-7}$ | 20 | ±13 | 800 |
| | PT480FE0000F*1 | | 35 | 75 | –25 to +85 | 0.25 | TYP. 0.8 | 5 | 1 | $1\times10^{-7}$ | 20 | ±13 | 860 |
| | PT4800E0000F | | 35 | 75 | –25 to +85 | 0.12 | TYP. 0.4 | 5 | 1 | $1\times10^{-7}$ | 20 | ±35 | 800 |
| | PT4800FE000F*1 | | 35 | 75 | –25 to +85 | 0.08 | TYP. 0.25 | 5 | 1 | $1\times10^{-7}$ | 20 | ±35 | 860 |
| | PT4850FE000F*1 | | 35 | 75 | –25 to +85 | 0.12 | 0.56 | 5 | 1 | $1\times10^{-7}$ | 20 | ±35 | 860 |
| Darlington | PT481E00000F | Epoxy resin with lens | 35 | 75 | –25 to +85 | 1.5 | 25 | 2 | 0.1 | $1\times10^{-6}$ | 10 | ±13 | 800 |
| | PT481FE0000F*1 | | 35 | 75 | –25 to +85 | 0.9 | 27 | 2 | 0.1 | $1\times10^{-6}$ | 10 | ±13 | 860 |
| | PT4810E0000F▲ | | 35 | 75 | –25 to +85 | 0.45 | 7.0 | 2 | 0.1 | $1\times10^{-6}$ | 10 | ±35 | 800 |
| | PT4810FJE00F*1▲ | | 35 | 75 | –25 to +85 | 0.27 | 6.0 | 2 | 0.1 | $1\times10^{-6}$ | 10 | ±35 | 860 |
| | PT483F1E000F*1 | | 35 | 75 | –25 to +85 | 1.5 | 4.0 | 2 | 0.1 | $1\times10^{-6}$ | 10 | ±13 | 860 |
| | PT491FE0000F*1 | | 35 | 75 | –25 to +85 | 0.2 | 0.8 | 2 | Ev, 2 lx | $1\times10^{-6}$ | 10 | ±40 | 860 |
| | PT493FE0000F*1▲ | | 35 | 75 | –25 to +85 | 0.2 | 0.8 | 2 | Ev, 2 lx | $1\times10^{-6}$ | 10 | ±40 | 860 |
| | PT100MF1MP*1 | Surface mounting leadless type with lens | 35 | 75 | –30 to +85 | 0.2 | 1.2 | 5 | 0.01 | $1\times10^{-6}$ | 10 | ±15 | 860 |

*1 Visible light cut-off type
The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

PT100MF0MP
(PT100MF1MP, PT100MC0MP: Transparent resin)

PT480E00000F
(PT480FE0000F, PT481E00000F, PT481FE0000F)

PT4800E0000F
(PT4800FE000F, PT4810E0000F, PT4810FJ00F▲, PT4810FJE00F▲, PT4850FE000F)

PT483F1E000F

PT491FE0000F

PT493FE0000F▲

Optoelectronics

## ■ PIN Photodiodes

(Ta = 25°C)

| Model No. | Features | Package (Material) | Active area ($mm^2$) | Topr (°C) | Isc (μA) MIN. | Ev (lx) | Id (A) MAX. | $V_R$ (V) | tr, tf (μs) TYP. | $V_R$ (V) | $R_L$ (kΩ) | λp (nm) TYP. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PD410PI2E00F | PIN type | Visible light cut-off epoxy resin with condenser (lens) | 3.31 | –25 to +85 | 2.5 | 100 | $1 \times 10^{-8}$ | 10 | 0.2 | 10 | 1 | 1 000 |
| PD411PI2E00F | | Transparent epoxy resin with condenser (lens) | 3.31 | –25 to +85 | 5.0 | 100 | $1 \times 10^{-8}$ | 10 | 0.2 | 10 | 1 | 960 |
| PD412PI2E00F | | Transparent epoxy resin with condenser (lens) | 3.31 | –25 to +85 | 3.5 | 100 | $1 \times 10^{-8}$ | 10 | 0.25 | 10 | 1 | 800 |
| PD413PI2E00F | PIN type IrDA1.0 | Visible light cut-off epoxy resin with condenser (lens) | 3.31 | –25 to +85 | MIN. 4.5 (TYP. 5.4) | 100 | $1 \times 10^{-8}$ | 10 | 0.2 | 10 | 1 | 960 |
| PD100MC0MP | Surface mounting leadless type | Transparent epoxy resin board with lens | – | –30 to +85 | 0.6 | 100 | $1 \times 10^{-8}$ | 10 | 0.01 | 15 | 0.18 | 820 |
| PD100MF0MP | Surface mounting leadless type | Visible light cut-off epoxy resin board with lens | – | –30 to +85 | 0.4 | 100 | $1 \times 10^{-8}$ | 10 | 0.01 | 15 | 0.18 | 850 |

PD410PI2E00F
{PD411PI2E00F: transparent; PD412PI2E00F: transparent, PD413PI2E00F}

PD100MC0MP
(PD100MF0MP: black)

RoHS

## ■ Infrared Emitting Diode Lineup

| Type | Package | Features | Half intensity angle | Model No. |
|---|---|---|---|---|
| Single-end lead | Epoxy resin with lens | General purpose/Narrow beam angle | ±13° | GL480E00000F |
| (Side view type) | | Compact and thin | ±30° | GL4800E0000F |
| | Flat epoxy resin | Wide beam angle | ±90° | GL4100E0000F▲ |
| Surface mount type | Epoxy resin with lens/ leadless | Compact/Narrow beam angle | ±10° | GL100MN0MP |
| | (Mountable for Top view/ Side view type) | High output type | ±10° | GL100MN1MP |
| | | Compact/Wide beam angle | ±80° | GL100MD1MP1 |

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

## ■ Infrared Emitting Diodes

(Ta = 25°C)

| Model No. | Package, features | Absolute maximum ratings | | | | Radiant flux Φe (mW) | | | $V_F$ (V) | | | Δθ (°) | λp (nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $I_F$ (mA) | $V_R$ (V) | P (mW) | Topr (°C) | MIN. | TYP. | $I_F$ (mA) | TYP. | MAX. | $I_F$ (mA) | TYP. | TYP. |
| GL480E00000F | Epoxy resin with lens | 50 | 6 | 75 | –25 to +85 | 0.7 | – | 20 | 1.2 | 1.4 | 20 | ±13 | 950 |
| GL4800E0000F | | 50 | 6 | 75 | –25 to +85 | 0.7 | 1.6 | 20 | 1.2 | 1.4 | 20 | ±30 | 950 |
| GL4100E0000F▲ | Side-view flat type, epoxy resin | 50 | 6 | 75 | –25 to +85 | 1.0 | – | 20 | 1.2 | 1.4 | 20 | ±90 | 950 |
| GL100MN0MP | Surface mounting leadless type, epoxy resin board with lens | 50 | 6 | 75 | –30 to +85 | 1.0 | 3.0 (MAX.) | 20 | 1.2 | 1.4 | 20 | ±10 | 940 |
| GL100MN1MP | Surface mounting leadless type, epoxy resin board with lens, high output type | 50 | 6 | 75 | –30 to +85 | 2.0 | 6.0 (MAX.) | 20 | 1.2 | 1.5 | 20 | ±10 | 940 |
| GL100MD1MP1 | Surface mounting leadless type, epoxy resin board with lens, wide beam angle | 50 | 6 | 75 | –30 to +85 | – | 6.0 (MAX.) | 20 | – | 1.5 | 20 | ±80 | 940 |

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

GL480E00000F

GL4800E0000F

GL4100E0000F▲

GL100MN0MP
(GL100MN1MP, GL100MD1MP1)

RoHS

## ■ Distance Measuring Sensor Lineup

| Output | Range of distance measuring | Features | Model No. |
|---|---|---|---|
| 1-bit digital output according to distance measuring | 4 to 30 cm | 1-bit digital output (detected distance: 15/13 cm) | GP2D150AJ00F/GP2Y0D413K0F |
| | 10 to 80 cm | 1-bit digital output (detected distance: 24 cm) | GP2Y0D21YK0F |
| | 20 to 150 cm | 1-bit digital output (detected distance: 80 cm) | GP2Y0D02YK0F |
| | | Battery drive compatible, compact, 1-bit digital output (detected distance: 5/10 cm) | GP2Y0D805Z0F/GP2Y0D810Z0F |
| | | Wide operating temperature type (–40 to +85°C) (detected distance: 10 cm) | GP2Y0D810Z1F |
| | | Compact, thin 1-bit digital output (detected distance: 10/40 cm) | GP2Y0D310K/GP2Y0D340K |
| | | Battery drive compatible, compact, 1-bit digital output (detected distance: 1.5 cm) Capable of operation at high temperature (–30 to +105°C) | GP2Y5D91S00F |
| Analog voltage output according to distance measuring | 2 to 15 cm | Analog output | GP2Y0A51SK0F |
| | 4 to 30 cm | Analog output | GP2Y0A41SK0F |
| | 10 to 80 cm | Analog output | GP2Y0A21YK0F |
| | 10 to 150 cm | Compact (22 × 8 × 7.2 [T] mm), Analog output | GP2Y0A60SZ0F/GP2Y0A60SZLF |
| | 20 to 150 cm | Analog output | GP2Y0A02YK0F |
| | 100 to 550 cm | Analog output | GP2Y0A710K0F |

## ■ Wide Angle Sensor Lineup

| Output | Range of distance measuring | Detection angle of view | Model No. |
|---|---|---|---|
| Voltage output according to distance measuring | 4 to 30 cm | 25° (When using 5 beams) | GP2Y3A001K0F |
| | 20 to 150 cm | 25° (When using 5 beams) | GP2Y3A002K0F |
| | 40 to 300 cm | 25° (When using 5 beams) | GP2Y3A003K0F |

## ■ Paper Size Sensor (Using Optical Distance Measuring Method) Lineup

| Output | Features | | Model No. |
|---|---|---|---|
| 1-bit output | 1-beam (detection height: 60 mm) | Thin type (T: 11.5 mm) | GP2Y2D160K0F |
| Analog output relative to measuring distance | 1-beam (detection height: 80 mm) | Thin type (T: 11.5 mm) | GP2Y2A180K0F |
| | 2-beam (detection height: 80 mm) | Thin type (T: 11.5 mm) | GP2Y2A280K0F |

## ■ High-Precision Displacement Sensor

| Output | Range of distance measuring | Features | Model No. |
|---|---|---|---|
| Voltage output according to distance measuring | 4.5 to 6.0 mm | Resolution: 50 µm | GP2Y0AH01K0F |

## ■ Dust Sensor Unit Lineup

| Output | Features | Model No. |
|---|---|---|
| Analog output | Pulse analog output, single-shot detection of house dust, general purpose | GP2Y1010AU0F |

## ■ Color Toner Concentration (Deposition Amount) Sensor Lineup

| Output | Features | Model No. |
|---|---|---|
| Analog output | Employs diffuse reflection system + mirror reflection system | GP2TC2J0000F |
| | Employs diffuse reflection system + mirror reflection system | GP2Y40010K0F |

RoHS

## ■ Distance Measuring Sensors (1)

### ◆Digital output

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electro-optical characteristics*1 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Vcc (V) | Topr (°C) | Detected distance (cm) | Distance measuring range (cm) | $V_{OH}$ (V) MIN. | $V_{OL}$ (V) MAX. | Dissipation current | |
| | | | | | | | | Operating (mA) | Standby (μA) |
| GP2Y0D805Z0F | Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V) | –0.3 to +7 | –10 to +60 | 5 | – | Vcc –0.6 | 0.6 | MAX. 6.5 | MAX. 8 |
| GP2Y0D810Z0F | Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V) | –0.3 to +7 | –10 to +60 | 10 | – | Vcc –0.6 | 0.6 | MAX. 6.5 | MAX. 8 |
| GP2Y0D810Z1F | Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V) | –0.3 to +7 | –40 to +85 | 10 | – | Vcc –0.6 | 0.6 | TYP. 5 | MAX. 8 |
| GP2Y5D91S00F | Light detector, infrared LED and signal processing circuit, short distance measuring type, battery drive compatible (operating power supply: 2.7 to 6.2 V), capable of operation at high temperature | –0.3 to +7 | –30 to +105 | 1.5 | – | Vcc –0.6 | 0.6 | TYP. 7 | – |
| GP2Y0D310K | Digital voltage output according to the measured distance of GP2Y0D340K | –0.3 to +7 | –10 to +60 | 10 | – | Vcc –0.3 | 0.6 | MAX. 35 | – |
| GP2Y0D340K | Compact, thin type (15 x 9.6 x 8.7 mm: sensor part), Light detector, infrared LED and signal processing circuit, digital voltage output according to the measured distance | –0.3 to +7 | –10 to +60 | 40 | – | Vcc –0.3 | 0.6 | MAX. 35 | – |
| GP2Y0D21YK0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, digital voltage output | –0.3 to +7 | –10 to +60 | 24 | 10 to 80 | Vcc –0.3 | 0.6 | MAX. 40 | – |
| GP2D150AJ00F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, digital voltage output | –0.3 to +7 | –10 to +60 | 15 | 4 to 30 | Vcc –0.3 | 0.6 | MAX. 50 | – |
| GP2Y0D413K0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, digital voltage output | –0.3 to +7 | –10 to +60 | 13 | 4 to 30 | Vcc –0.3 | 0.6 | – | – |
| GP2Y0D02YK0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, long distance measuring type (No external control signal required), digital voltage output according to the measured distance | –0.3 to +7 | –10 to +60 | 80 | 20 to 150 | Vcc –0.3 | 0.6 | MAX. 50 | – |

*1 Vcc = 5 V

※ PSD: Position Sensitive Detector

RoHS

## ■ Distance Measuring Sensors (2)

### ◆Analog output

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electro-optical characteristics*1 | | | |
|---|---|---|---|---|---|---|---|
| | | Vcc (V) | Topr (°C) | Distance measuring range (cm) | VOH (V) MIN. | VOL (V) MAX. | Dissipation current Operating (mA) |
| GP2Y0A21YK0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, linear voltage output | –0.3 to +7 | –10 to +60 | 10 to 80 | VO (TYP.) = 0.4 V (at L = 80 cm), ΔVO (TYP.) = 1.9 V (at L: 80 cm → 10 cm) | | MAX. 40 |
| GP2Y0A41SK0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, short measuring cycle (16.5 ms) | –0.3 to +7 | –10 to +60 | 4 to 30 | VO (TYP.) = 0.4 V (at L = 30 cm), ΔVO (TYP.) = 2.25 V (at L = 30 cm → 4 cm) | | MAX. 22 |
| GP2Y0A51SK0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, short measuring cycle (16.5 ms) | –0.3 to +7 | –10 to +60 | 2 to 15 | VO (TYP.) = 0.4 V (at L = 15 cm), ΔVO (TYP.) = 2.25 V (at L = 15 cm → 2 cm) | | TYP. 12 |
| GP2Y0A60SZ0F/ GP2Y0A60SZLF *2 | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, compact type (22 x 8 x 7.2 mm), long distance measuring type (No external control signal required) | –0.3 to +5.5 | –10 to +60 | 10 to 150 | VO (TYP.) = 0.65 V *3 (at L = 150 cm), ΔVO (TYP.) = 3.0 V (at L = 150 cm → 20 cm) | | MAX. 50 |
| GP2Y0A02YK0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, long distance measuring type (No external control signal required) | –0.3 to +7 | –10 to +60 | 20 to 150 | VO (TYP.) = 0.4 V (at L = 150 cm), ΔVO (TYP.) = 2.05 V (at L = 150 cm → 20 cm) | | MAX. 50 |
| GP2Y0A710K0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, long distance measuring type (No external control signal required) | –0.3 to +7 | –10 to +60 | 100 to 550 | VO (TYP.) = 2.5 V (at L = 100 cm), ΔVO (TYP.) = 0.7 V (at L = 100 cm → 200 cm) | | TYP. 30 |

*1 Vcc = 5 V

※ PSD: Position Sensitive Detector

*2 GP2Y0A60SZ0F: Surface mount type
GP2Y0A60SZLF: Board insertion type

*3 When Vcc = 3 V: Vo (TYP.) = 0.35 V (at L = 150 cm); ΔVo (TYP.) = 1.6 V (at L = 150 cm → 20 cm)

GP2Y5D91S00F

GP2Y0D805Z0F
(GP2Y0D810Z0F, GP2Y0D810Z1F)

GP2Y0D340K
(GP2Y0D310K)

GP2Y0A60SZ0F

GP2Y0A60SZLF

GP2Y0A21YK0F
(GP2D150AJ00F, GP2Y0D21YK0F, GP2Y0A41SK0F
GP2Y0D413K: without mounting hole)

GP2Y0A51SK0F

GP2Y0D02YK0F
(GP2Y0A02YK0F)

GP2Y0A710K0F

RoHS

## ■ Wide Angle Sensors

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | Electro-optical characteristics | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Vcc (V) | Topr (°C) | Distance measuring range (cm) | Output terminal voltage (V) | Output voltage difference (V) | Input voltage (V) | |
| | | | | | | | $V_{INH}$ | LEDL |
| GP2Y3A001K0F | Distance measuring sensor united with PSD※, infrared LED and signal processing circuit, distance measuring sensor application product, wide range (field of view) detection using 5 infrared beams | –0.3 to +7 | –10 to +60 | 4 to 30 | TYP. 2.85*1 | TYP. 1.6*4 | MIN. 4.5 | MAX. 0.5 |
| GP2Y3A002K0F | | –0.3 to +7 | –10 to +60 | 20 to 150 | TYP. 2.3*2 | TYP. 1.6*5 | MIN. 4.5 | MAX. 0.5 |
| GP2Y3A003K0F | | –0.3 to +7 | –10 to +60 | 40 to 300 | TYP. 2.3*3 | TYP. 1.2*6 | MIN. 4.5 | MAX. 0.5 |

※ PSD: Position Sensitive Detector
Reflector used: White paper (Gray chart R-27/white surface, made by Kodak Corp., reflectance 90%)
L = Reflector - Sensor distance

*1 L = 4 cm
*2 L = 20 cm
*3 L = 40 cm
*4 Change in output voltage from L = 4 cm to 10 cm
*5 Change in output voltage from L = 20 cm to 80 cm
*6 Change in output voltage from L = 40 cm to 100 cm

GP2Y3A001K0F GP2Y3A002K0F GP2Y3A003K0F

## ■ Paper Size Sensors

(Ta = 25°C)

| Model No. | Features | Operating temperature Topr (°C) | Supply voltage Vcc (V) | Paper detection height H (mm) | LED beam pitch Lp (mm) | Approved value of paper position sliding Δx (mm) | Paper detection density OD | Dissipation current Icc (mA) |
|---|---|---|---|---|---|---|---|---|
| GP2Y2D160K0F | Thin type (T: 11.5 mm), using optical distance measuring method (1-beam), digital output (1-bit) | –10 to +65 | 5 ±0.5 | TYP. 60 | – | MIN. ±7.5 | 0.7 or less*1 | MAX. 40 |
| GP2Y2A180K0F | Thin type (T: 11.5 mm), analog output using optical distance measuring method (1-beam) | –10 to +65 | 5 ±0.5 | TYP. 80 | – | – | – | MAX. 25 |
| GP2Y2A280K0F | Thin type (T: 11.5 mm), analog output using optical distance measuring method (2-beam) | –10 to +65 | 5 ±0.5 | TYP. 80 | TYP. 21 | – | – | MAX. 50 |

※ This table shows the characteristics when configured in the paper size sensor system.
*1 Reflectivity: 18% or more, OD = log (1/T), T: Reflectivity

GP2Y2D160K0F GP2Y2A180K0F GP2Y2A280K0F

## ■ High-Precision Displacement Sensor

(Ta = 25°C)

| Model No. | Features | Topr (°C) | Operating supply voltage (V) | Dissipation current (mA) | Distance measuring range (mm) | Distance characteristic of output |
|---|---|---|---|---|---|---|
| GP2Y0AH01K0F | Resolution: 50 µm | –10 to +60 | 4.5 to 5.5 | TYP. 20 | 4.5 to 6.0 | TYP. 1.70 V Variation in output over range (4.5 to 6.0 mm) |

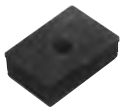
GP2Y0AH01K0F

RoHS

## ■ Dust Sensor Unit

(Ta = 25°C)

| Model No. | Features | Topr (°C) | Electro-optical characteristics | | | | |
|---|---|---|---|---|---|---|---|
| | | | Operating supply voltage (V) | Dissipation current (mA) | Detection sensitivity V/(0.1 mg/m$^3$) | Output voltage at no dust Voc (V) | Output voltage range $V_{OH}$ (V) |
| GP2Y1010AU0F | Built-in infrared emitting diode, photodiode and signal processing circuit, compact, single-shot detection of house dust | –10 to +65 | 4.5 to 5.5 | TYP. 11 | TYP. 0.5 | TYP. 0.9 | MIN. 3.4 |



GP2Y1010AU0F

## ■ Color Toner Concentration (Deposition Amount) Sensors

(Ta = 25°C)

| Model No. | Features | Topr (°C) | Electro-optical characteristics | | |
|---|---|---|---|---|---|
| | | | Dissipation current*1 (mA) | Output voltage*2 $V_{O1}$ (V) | Output voltage*2 $V_{O2}$ (V) |
| GP2TC2J0000F | Employs diffuse reflection system + mirror reflection system, high-precision detection of toner concentration on photo-sensitive drum, 2-line analog output (2-PD) | 0 to +60 | TYP. 4 | TYP. 1.17 | TYP. 2.81 |
| GP2Y40010K0F | Employs diffuse reflection system + mirror reflection system, high-precision detection of toner concentration on transfer belt, 2-line analog output (2-PD) | 0 to +60 | TYP. 4 | TYP. 1.27 | MAX. 3.5<br>TYP. 2.87 |

*1 Dissipation current with LED current of $I_{FM}$ = 0 mA
*2 With reflection object A (Reflectance: 15.6%)

GP2TC2J0000F

GP2Y40010K0F

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RoHS

## ■ Fiber Optics Lineup for Audio Equipment

| Connector type | Type | Outline | Features | | High speed signal transmission | Model No. | |
|---|---|---|---|---|---|---|---|
| | | | | | | Supply voltage 3 to 5 V | Supply voltage 5 V |
| Square connector | Fiber optic transmitter | Without mounting hole | With shutter | Horizontal mounting type | MAX. 13.2 Mb/s | | GP1FMV51TK0F |
| (EIAJ RC-5720B) | | | | | MAX. 15.5 Mb/s | GP1FMV31TK0F | |
| | | With mounting hole | With shutter | Horizontal mounting type | MAX. 13.2 Mb/s | | GP1FAV51TK0F*1 |
| | | | | | MAX. 15.5 Mb/s | GP1FAV31TK0F | |
| | | | | | MAX. 50 Mb/s | | GP1FAV55TK0F |
| | | | | Vertical mounting type | MAX. 13.2 Mb/s | | GP1FSV51TK0F |
| | | | | | MAX. 15.5 Mb/s | GP1FSV31TK0F (mounting height: 15 mm) GP1FSB31TK0F (mounting height: 8.5 mm) | |
| | | | With protection cap | Horizontal mounting type | MAX. 13.2 Mb/s | | GP1FAV50TK0F*1 |
| | | | | | MAX. 15.5 Mb/s | GP1FAV30TK0F | |
| | Fiber optic receiver | Without mounting hole | With shutter | Horizontal mounting type | MAX. 13.2 Mb/s | | GP1FMV51RK0F |
| | | | | | MAX. 15.5 Mb/s | GP1FMV31RK0F | |
| | | With mounting hole | With shutter | Horizontal mounting type | MAX. 13.2 Mb/s | | GP1FAV51RK0F |
| | | | | | MAX. 15.5 Mb/s | GP1FAV31RK0F | |
| | | | With protection cap | Horizontal mounting type | MAX. 13.2 Mb/s | | GP1FAV50RK0F |
| | | | | | MAX. 15.5 Mb/s | GP1FAV30RK0F | |

*1 TTL drive compatible

| Connector type | Type | Outline | Features | High speed signal transmission | Model No. |
|---|---|---|---|---|---|
| | | | | | Supply voltage 3 V |
| Optical mini-jack ø3.5 mm | Fiber optic transmitter | Thin type (t: 4.2 mm) | Capable of detection/transmission of optical/electrical signals | MAX. 25 Mb/s | GP1FD320TP0F |
| (JIS C 6650) | | | | | |

GP1FMV31 series
(GP1FMV51 series)

GP1FAV50TK0F
{GP1FAV50RK0F, GP1FAV30TK0F, GP1FAV30RK0F}

GP1FAV51TK0F
{GP1FAV31TK0F, GP1FAV55TK0F, GP1FAV51RK0F, GP1FAV31RK0F}

GP1FSB31TK0F

GP1FSV31TK0F
(GP1FSV51TK0F)

GP1FD320TP0F

Optoelectronics

RoHS

## ■ Fiber Optic Transmitters (Square Connector)

(Ta = 25°C)

| Model No. | Appearance | | Features | Absolute maximum ratings | | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mounting hole | Shutter | | Vcc (V) | Topr (°C) | Supply voltage (V) | Propagation delay time $t_{PLH}$ (ns) MAX. | Propagation delay time $t_{PHL}$ (ns) MAX. | Dissipation current Icc (mA) MAX. | Pulse width distortion Δtw (ns) | Transmission speed T (Mb/s) MAX. |
| GP1FMV31TK0F | No | Yes | Compact | –0.5 to +7 | –20 to +70 | 2.7 to 5.25 | 180 | 180 | 12 | ±15 | 15.5 |
| GP1FMV51TK0F | No | Yes | Compact | –0.5 to +7 | –20 to +70 | 4.75 to 5.25 | 180 | 180 | 13 | ±15 | 13.2 |
| GP1FAV30TK0F | Yes | No | Low voltage drive, with protection cap | –0.5 to +7 | –20 to +70 | 2.7 to 5.25 | 180 | 180 | 12 | ±15 | 15.5 |
| GP1FAV50TK0F | Yes | No | TTL drive compatible, with protection cap | –0.5 to +7 | –20 to +70 | 4.75 to 5.25 Input voltage: MIN. 2.0 V | 180 | 180 | 13 | ±15 | 13.2 |
| GP1FAV51TK0F | Yes | Yes | TTL drive compatible | –0.5 to +7 | –20 to +70 | 4.75 to 5.25 | 180 | 180 | 13 | ±15 | 13.2 |
| GP1FSV51TK0F | No | Yes | Vertical mounting (mounting height: 15 mm) | –0.5 to +7 | –20 to +70 | 4.75 to 5.25 | 180 | 180 | 13 | ±15 | 13.2 |
| GP1FAV31TK0F | Yes | Yes | Low voltage drive | –0.5 to +7 | –20 to +70 | 2.7 to 5.25 | 180 | 180 | 12 | ±15 | 15.5 |
| GP1FSV31TK0F | No | Yes | Vertical mounting (mounting height: 15 mm) | –0.5 to +7 | –20 to +70 | 2.7 to 5.25 | 180 | 180 | 13 | ±15 | 15.5 |
| GP1FAV55TK0F | Yes | Yes | High response speed | –0.5 to +7 | –20 to +70 | 4.75 to 5.25 | 180 | 180 | 13 | ±15 | 50 |
| GP1FSB31TK0F | No | Yes | Vertical mounting (mounting height: 8.5 mm) | –0.5 to +7 | –20 to +70 | 2.7 to 5.25 | 180 | 180 | 13 | ±15 | 15.5 |

## ■ Fiber Optic Transmitters (ø3.5 mm Optical Mini-jack)

(Ta = 25°C)

| Model No. | Features | Absolute maximum ratings | | | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Vcc (V) | Vin (V) | Topr (°C) | Supply voltage (V) | Propagation delay time $t_{PLH}$ (ns) MAX. | Propagation delay time $t_{PHL}$ (ns) MAX. | Dissipation current Icc (mA) MAX. | Pulse width distortion Δtw (ns) | Transmission speed T (Mb/s) MAX. |
| GP1FD320TP0F | Compact, thin type (t: 4.2 mm), high speed, optical mini-jack (low voltage type) | –0.5 to +7 | –0.5 to Vcc + 0.5 | –20 to +70 | 2.3 to 5.5 | 180 | 180 | 12 | ±11 | 25 |

## ■ Fiber Optic Receivers (Square Connector)

(Ta = 25°C)

| Model No. | Appearance | | Features | Absolute maximum ratings | | | Electro-optical characteristics | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mounting hole | Shutter | | Vcc (V) | $I_{OL}$ (mA) | Topr (°C) | Supply voltage (V) | Propagation delay time $t_{PLH}$ (ns) MAX. | Propagation delay time $t_{PHL}$ (ns) MAX. | Dissipation current Icc (mA) MAX. | Pulse width distortion Δtw (ns) | Transmission speed T (Mb/s) MAX. |
| GP1FMV31RK0F | No | Yes | Compact, low voltage drive | –0.5 to +7 | 10 | –20 to +70 | 2.7 to 3.6 | 180 | 180 | 15 | ±20 | 15.5 |
| GP1FMV51RK0F | No | Yes | Compact | –0.5 to +7 | 10 | –20 to +70 | 4.75 to 5.25 | 180 | 180 | 25 | ±20 | 13.2 |
| GP1FAV30RK0F | Yes | No | Low voltage drive, with protection cap | –0.5 to +7 | 10 | –20 to +70 | 2.7 to 3.6 | 180 | 180 | 15 | ±20 | 15.5 |
| GP1FAV50RK0F | Yes | No | With protection cap | –0.5 to +7 | 10 | –20 to +70 | 4.75 to 5.25 | 180 | 180 | 25 | ±20 | 13.2 |
| GP1FAV51RK0F | Yes | Yes | | –0.5 to +7 | 10 | –20 to +70 | 4.75 to 5.25 | 180 | 180 | 25 | ±20 | 13.2 |
| GP1FAV31RK0F | Yes | Yes | Low voltage drive | –0.5 to +7 | 10 | –20 to +70 | 2.7 to 3.6 | 180 | 180 | 15 | ±20 | 15.5 |

RoHS

## ■ High-Luminosity (AlGaInP) Surface Mount LEDs (Taped Models Only)

($I_F$ = 20 mA, Tc = 25°C)

| Outline dimensions (mm) | Resin type: Colored diffusion | Colored transparency | Colorless transparency | Milky diffusion | J E Yellow-green | Luminous intensity (mcd) TYP. | Z V J V Amber | Luminous intensity (mcd) TYP. | J S Sunset orange | Luminous intensity (mcd) TYP. | J J Orange | Luminous intensity (mcd) TYP. | Z R J R Red | Luminous intensity (mcd) TYP. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.6 × 0.8 (t = 0.35) | | | ● | | GM1JE35200AE*1 | 13 | GM1JV35200AE*1 | 18.8 | GM1JS35200AE*1 | 19 | GM1JJ35200AE*1 | 19 | GM1JR35200AE*1 | 13 |
| 1.6 × 0.8 (t = 0.55) | | | ● | | GM1JE55200AE | 13 | GM1JV55200AE*1 | 16.8 | GM1JS55200AE | 20.9 | GM1JJ55200AE | 19 | GM1JR55200AE | 15 |
| 3.2 × 2.8 (t = 1.9) | | | ● | | – | – | GM5ZV96270A | 600 | – | – | – | – | GM5ZR96270A | 600 |

*1 GM1JV35200AE series, GM1JV55200AE series: $I_F$ = 5 mA

## ■ High-Luminosity (InGaN) Surface Mount LEDs (Taped Models Only)

($I_F$ = 20 mA, Ta = 25°C*2)

| Outline dimensions (mm) | Resin type: Colored diffusion | Colored transparency | Colorless transparency | Milky diffusion | B C Blue | Luminous intensity (mcd) TYP. | G C Green | Luminous intensity (mcd) TYP. |
|---|---|---|---|---|---|---|---|---|
| 1.6 × 0.8 (t = 0.35) | | | | ● | GM1BC35372AC*1 | 35 | GM1GC35370AC*1 | 80 |
| 3.2 × 2.8 (t = 1.9) | | | ● | | GM5BC96270A | 500 | GM5GC96270A | 1 300 |

*1 GM1BC35372AC series: $I_F$ = 5 mA
*2 GM5BC96270A series: Tc= 25°C

## ■ Surface Mount LEDs (Taped Models Only)

($I_F$ = 20 mA, Ta = 25°C)

| Outline dimensions (mm) | Resin type: Colored diffusion | Colored transparency | Colorless transparency | Milky diffusion | E G Yellow-green | Luminous intensity (mcd) TYP. | H Y Yellow | Luminous intensity (mcd) TYP. | H S Sunset orange | Luminous intensity (mcd) TYP. | H D Red | Luminous intensity (mcd) TYP. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.6 × 0.8 (t = 0.55) | | | ● | | GM1EG55200A | 19 | GM1HY55200A | 11.5 | GM1HS55200A | 11.4 | GM1HD55200A | 12.5 |

GM1EG55200A series
GM1JV55200AE series

GM1JV35200AE series
GM1BC35372AC
GM1GC35370AC

GM5ZV96270A series
GM5BC96270A series

LEDs

# HIGH-LUMINOSITY WHITE SURFACE MOUNT LEDs / HIGH-LUMINOSITY SURFACE MOUNT LEDs (RGB 3-COLOR)

☆New product

## ■ High-Luminosity White Surface Mount LEDs (Taped Models Only)

(Ta = 25°C*5)

| Outline dimensions (mm) | Color coordinates (x, y) TYP. | BW White | | | BN High rendering color | | |
|---|---|---|---|---|---|---|---|
| | | | Luminous intensity (mcd) TYP. | Color temperature (K) TYP. | | Luminous intensity (mcd) TYP. | Color temperature (K) TYP. |
| 2.8 × 1.2 (t = 0.8) Side view type | (0.30, 0.29) | GM4BW853A0A*1 | 1 900 | – | – | – | – |
| | | GM4BW853B0A*1 | 2 200 | – | – | – | – |
| 3.85 × 1.0 (t = 0.6) Side view type | (0.30, 0.29) | GM4BW653A0A*1 | 1 900 | – | – | – | – |
| | | GM4BW653B0A*1 | 2 200 | – | – | – | – |
| | (0.29, 0.28) | – | – | – | GM4BN653C0A*1, 4 | 1 700 | – |
| 3.2 × 2.8 (t = 1.9) | (0.31, 0.31) | GM5BW96382A*1 | 2 300 | – | – | – | – |
| | (0.34, 0.36) | GM5BW96385A | 2 600 | – | – | – | – |
| | (0.29, 0.28) | GM5BW96387A | 2 000 | – | – | – | – |
| | (0.338, 0.365) | GM5BW97330A*2 | 6 400 | 5 300 | – | – | – |
| | (0.312, 0.311) | GM5BW97332A*2 | 5 800 | 6 700 | – | – | – |
| | (0.283, 0.262) | GM5BW97333A*2 | 5 100 | 11 500 | – | – | – |
| | (0.3398, 0.3472) | – | – | – | GM5BN97330A*2, 4 | 6 000 | 5 200 |
| 3.2 × 2.8 (t = 1.4) | (0.32, 0.33) | GM5BW94370A*3 | 5 200 | – | – | – | – |

*1 GM4BW853A0A series, GM4BW653A0A series, GM4BN653C0A, GM5BW96382A: $I_F$ = 20 mA
*2 GM5BW97330A series, GM5BN97330A: $I_F$ = 20 mA/chip
*3 GM5BW94370A: $I_F$ = 25 mA/chip
*4 GM4BN653C0A and GM5BN97330A are high-NTSC-ratio products.
*5 GM5BW96382A, GM5BW96385A, GM5BW96387A, GM5BW97330A series, GM5BW94370A, GM5BN97330A: Tc = 25°C

GM5BW96382A
GM5BW96385A
GM5BW96387A

GM5BW97330A series
GM5BN97330A

GM4BW853A0A series

GM4BW653A0A series
GM4BN653C0A

## ■ High-Luminosity Surface Mount LEDs (RGB 3-color) (Taped Models Only)

(Tc = 25°C)

| Outline dimensions (mm) | Resin type: Colored diffusion | Colored transparency | Colorless transparency | Milky diffusion | WA Red + Green + Blue | Luminous intensity (mcd) TYP. |
|---|---|---|---|---|---|---|
| 1.6 × 1.6 (t = 0.55) | | | | ● | GM1WA55311A*1 | 20/70/23 |
| 3.2 × 2.8 (t = 1.4) | | | | ● | ☆GM5WA94320A*2 | (2 300) [Mixed color] |
| 5.0 × 2.5 (t = 2.5) | | | | ● | GM4WA25300A*3 | 2 200 [Mixed color] |

*1 GM1WA55311A: $I_F$ = 5 mA (Red, Green, Blue)
*2 GM5WA94320A: $I_F$ = 20 mA (Red), $I_F$ = 20 mA (Green), $I_F$ = 7 mA (Blue)
*3 GM4WA25300A: $I_F$ = 21 mA (Red), $I_F$ = 25 mA (Green), $I_F$ = 7 mA (Blue)

GM1WA55311A

GM5WA94320A

GM4WA25300A

☆New product

## ■ ZENIGATA LEDs for Lighting

(**ZENIGATA** is a registered trademark or a trademark of Sharp Corporation in Japan, the United States and/or other countries.)

### <4W class>

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color temperature (K) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Total luminous flux (lm) TYP. | Average color rendering index Ra TYP. |
|---|---|---|---|---|---|---|
| 15.0 × 12.0 (t = 1.6) | GW5BQC27K03 | 2 700 | 9.9 | 400 | 290 | 80 |
| | GW5BQC30K03 | 3 025 | | | 300 | 83 |
| | GW5BQC35K03 | 3 450 | | | 310 | 84 |
| | GW5BQC40KH3 | 4 080 | | | 310 | 84 |
| | GW5BQC50K03 | 5 000 | | | 320 | 85 |
| | GW5BQC65K03 | 6 500 | | | 320 | 84 |

### <7W class>

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color temperature (K) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Total luminous flux (lm) TYP. | Average color rendering index Ra TYP. |
|---|---|---|---|---|---|---|
| 15.0 × 12.0 (t = 1.6) | GW5BQF27K03 | 2 700 | 13.1 | 520 | 510 | 80 |
| | GW5BQF30K03 | 3 025 | | | 525 | 83 |
| | GW5BQF35K03 | 3 450 | | | 545 | 84 |
| | GW5BQF40KH3 | 4 080 | | | 545 | 84 |
| | GW5BQF50K03 | 5 000 | | | 560 | 85 |
| | GW5BQF65K03 | 6 500 | | | 560 | 84 |

### <10W class>

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color temperature (K) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Total luminous flux (lm) TYP. | Average color rendering index Ra TYP. |
|---|---|---|---|---|---|---|
| 15.0 × 12.0 (t = 1.6) | GW5BTJ27K03 | 2 700 | 19.6 | 480 | 610 | 85 |
| | GW5BTJ30K03 | 3 025 | | | 630 | 87 |
| | GW5BTJ35K03 | 3 450 | | | 650 | 87 |
| | GW5BTJ40K03 | 4 080 | | | 670 | 87 |
| | GW5BTJ50K03 | 5 000 | | | 690 | 87 |
| | GW5BTJ65K03 | 6 500 | | | 690 | 85 |

### <15W class>

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color temperature (K) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Total luminous flux (lm) TYP. | Average color rendering index Ra TYP. |
|---|---|---|---|---|---|---|
| 24.0 × 20.0 (t = 1.8) | ☆GW5DMA27M04 | 2 700 | 37 | 400 | 1 350 | 83 |
| | ☆GW5DMA30M04 | 3 025 | | | 1 400 | |
| | ☆GW5DLA40M04 | 4 050 | | | 1 520 | 82 |
| | ☆GW5DLA50M04 | 5 000 | | | 1 550 | |
| | ☆GW5DGA27M04 | 2 700 | | | 1 150 | 93 |
| | ☆GW5DGA30M04 | 3 025 | | | 1 170 | |
| | ☆GW5DGA40M04 | 4 050 | | | 1 230 | 92 |
| | ☆GW5DGA50M04 | 5 000 | | | 1 250 | 90 |

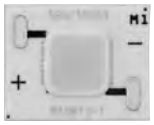
☆New product

RoHS

### <25W class>

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color temperature (K) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Total luminous flux (lm) TYP. | Average color rendering index Ra TYP. |
|---|---|---|---|---|---|---|
| 24.0 × 20.0 (t = 1.8) | ☆GW5DMC27M04 | 2 700 | 37 | 700 | 2 300 | 83 |
| | ☆GW5DMC30M04 | 3 025 | | | 2 370 | |
| | ☆GW5DLC40M04 | 4 050 | | | 2 550 | 82 |
| | ☆GW5DLC50M04 | 5 000 | | | 2 600 | |
| | ☆GW5DGC27M04 | 2 700 | | | 1 910 | 93 |
| | ☆GW5DGC30M04 | 3 025 | | | 1 950 | |
| | ☆GW5DGC40M04 | 4 050 | | | 2 050 | 92 |
| | ☆GW5DGC50M04 | 5 000 | | | 2 080 | 90 |




GW5BQC27K03 series


GW5BQF27K03 series


GW5BTJ27K03 series

GW5DMA27M04 series
GW5DGA27M04 series

GW5DMC27M04 series
GW5DGC27M04 series

## ■ Surface Mount LEDs for Lighting (Taped Models Only)

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color temperature (K) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Total luminous flux (lm) TYP. | Average color rendering index Ra TYP. |
|---|---|---|---|---|---|---|
| 2.8 × 2.8 (t = 1.9) | GM2BB27BMAC | 2 725 | 3.25 | 100 | 22 | 85 |
| | GM2BB30BMAC | 3 045 | | | 23 | |
| | GM2BB35BMAC | 3 465 | | | 24 | |
| | GM2BB40BMAC | 3 985 | | | 24 | |
| | GM2BB45BMAC | 4 503 | | | 25 | |
| | GM2BB50BMAC | 5 028 | | | 26 | |
| | GM2BB57BMAC | 5 665 | | | 25 | |
| | GM2BB65BMAC | 6 530 | | | 24 | |
| | ☆GM2BB30QKAC | (3 000) | 3.05 | 100 | 27.5 | 83 |
| | ☆GM2BB35QKAC | (3 500) | | | 29.0 | |
| | ☆GM2BB40QKAC | (4 000) | | | 30.0 | |
| | ☆GM2BB50QKAC | (5 000) | | | 31.5 | |
| | ☆GM2BB65QKAC | (6 500) | | | 30.0 | |
| | GM2BB27BM0C | 2 725 | 3.25 | 150 | 34 | 85 |
| | GM2BB30BM0C | 3 045 | | | 35 | |
| | GM2BB35BM0C | 3 465 | | | 36 | |
| | GM2BB40BM0C | 3 985 | | | 37 | |
| | GM2BB45BM0C | 4 503 | | | 38 | |
| | GM2BB50BM0C | 5 028 | | | 39 | |
| | GM2BB57BM0C | 5 665 | | | 38 | |
| | GM2BB65BM0C | 6 530 | | | 37 | |
| | ☆GM2BB30QK0C | (3 000) | 3.05 | 150 | 41.0 | 83 |
| | ☆GM2BB35QK0C | (3 500) | | | 43.0 | |
| | ☆GM2BB40QK0C | (4 000) | | | 44.5 | |
| | ☆GM2BB50QK0C | (5 000) | | | 47.0 | |
| | ☆GM2BB65QK0C | (6 500) | | | 44.0 | |

★Under development

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color temperature (K) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Luminous intensity (mcd) TYP. | Average color rendering index Ra TYP. |
|---|---|---|---|---|---|---|
| 3.2 × 2.8 (t = 1.9) | GM5SAE27P0A | 2 700 | 3.2 | 20 | 2 000 | 85 |
| | GM5SAE30P0A | 3 000 | | | 1 900 | 85 |
| | GM5SAE35P0A | 3 500 | | | 2 100 | 83 |
| | GM5SAE40P0A | 4 000 | | | 2 100 | 83 |
| | GM5SAE45P0A | 4 500 | | | 2 200 | 83 |
| | GM5SAE50P0A | 5 000 | | | 2 200 | 83 |
| | GM5SAE57P0A | 5 700 | | | 2 200 | 80 |
| | GM5SAE65P0A | 6 500 | | | 2 200 | 80 |

## ■ Surface Mount LEDs for Lighting (RGB 3-color) (Taped Models Only)

($I_F$ = 20 mA/chip, Tc = 25°C)

| Outline dimensions (mm) | Model No. | Radiation color | Luminous intensity (mcd) TYP. |
|---|---|---|---|
| 3.2 × 2.8 (t = 1.4) | GM5WA94315A | Red | 680 |
| | | Green | 1 500 |
| | | Blue | 450 |

GM2BB27BM0C series
GM2BB30QKAC series
GM2BB27BMAC series
GM2BB30QK0C series

GM5SAE27P0A series

GM5WA94315A

## ■ LEDs for LCD Backlight

(Tc = 25°C)

| Outline dimensions (mm) | Model No. | Color coordinates (x, y) TYP. | Forward voltage (V) TYP. | Forward current (mA) TYP. | Total luminous flux (lm) TYP. |
|---|---|---|---|---|---|
| 2.8 × 2.8 (t = 1.9) | ★GM2BB0CD30E | (0.268, 0.238) | 10.65 | 60 | 45 |
| | ★GM2BB0CF20E | (0.268, 0.238) | 7.35 | 75 | 36 |
| | ★GM2BB0CF20C | (0.264, 0.235) | 3.55 | 120 | 30 |

GM2BB0CD30E
GM2BB0CF20E
GM2BB0CF20C

**Notice**
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

★Under development

## ■ Laser Diodes

### ◆Model Configurations

#### • For applications other than optical discs

| Wavelength (nm) | Absolute maximum ratings (mW)*1 | Package | |
|---|---|---|---|
| | |  ø5.6 mm Metal type |  ø3.3 mm Metal type |
| 660 band | 10 | ★GH06510F2B | GH06510F4A |
| 785 band | 15 | ★GH07815D2K | – |
| | 25 | GH07825D2K | – |
| | 25 | GH3S225D2B | – |

*1 The absolute maximum ratings are the limits that are not to be exceeded under any condition whatsoever, whether in testing or in actual use.

#### • For optical disc use*3

| Wavelength (nm) | Absolute maximum ratings (mW)*1 | Package | | |
|---|---|---|---|---|
| | |  ø5.6 mm Metal type |  ø3.3 mm Metal type |  1.8 mm t Resin type |
| 405 band | 20 | GH04020A2G | GH04020A4G | – |
| | 250*2 | GH04P25A2G | GH04P25A4G | – |
| | 320*2 | GH04P32A2G | GH04P32A4G | – |
| 660 band | 250*2 | GH06P25A1C | – | – |
| | 350*2 | – | – | GH16P35A8C |
| 785 band | 280*2 | ★GH07P28F1C | GH07P28F4C | – |

*1 The absolute maximum ratings are the limits that are not to be exceeded under any condition whatsoever, whether in testing or in actual use.
*2 Optical power output MAX. (mW)
*3 New models for optical disc use are introduced frequently, and it is possible the model you wish to order may no longer be in production. Sample sales may not be available, either. We ask for your understanding in this matter.

### ◆Specifications

#### • Laser diodes lineup for applications other than optical discs

(Tc = 25°C)

| Model No. | Wave-length (nm) | Absolute maximum ratings*1 CW (Continuous wave) | Features | Applications | Terminal connec-tions |
|---|---|---|---|---|---|
| GH06510F4A | 660 band | 10 | ø3.3 mm CAN package, operating temperature: 70°C MAX., with built-in monitor PD | Bar code reader, laser displacement gauge, etc. | A |
| ★GH06510F2B | | 10 | ø3.3 mm CAN package, operating temperature: 70°C MAX., with built-in monitor PD | Bar code reader, laser displacement gauge, etc. | A |
| ★GH07815D2K | 785 band | 15 | ø5.6 mm CAN package, operating temperature: 60°C MAX., with built-in monitor PD | Printer, copier, complex machine | D |
| GH07825D2K | | 25 | ø5.6 mm CAN package, operating temperature: 60°C MAX., with built-in monitor PD | Printer, copier, complex machine | |
| GH3S225D2B | | 25 | ø5.6 mm CAN package, operating temperature: 60°C MAX., with built-in monitor PD | Printer, copier, complex machine | F |

★Under development

## • Laser diodes lineup for optical disc use*2

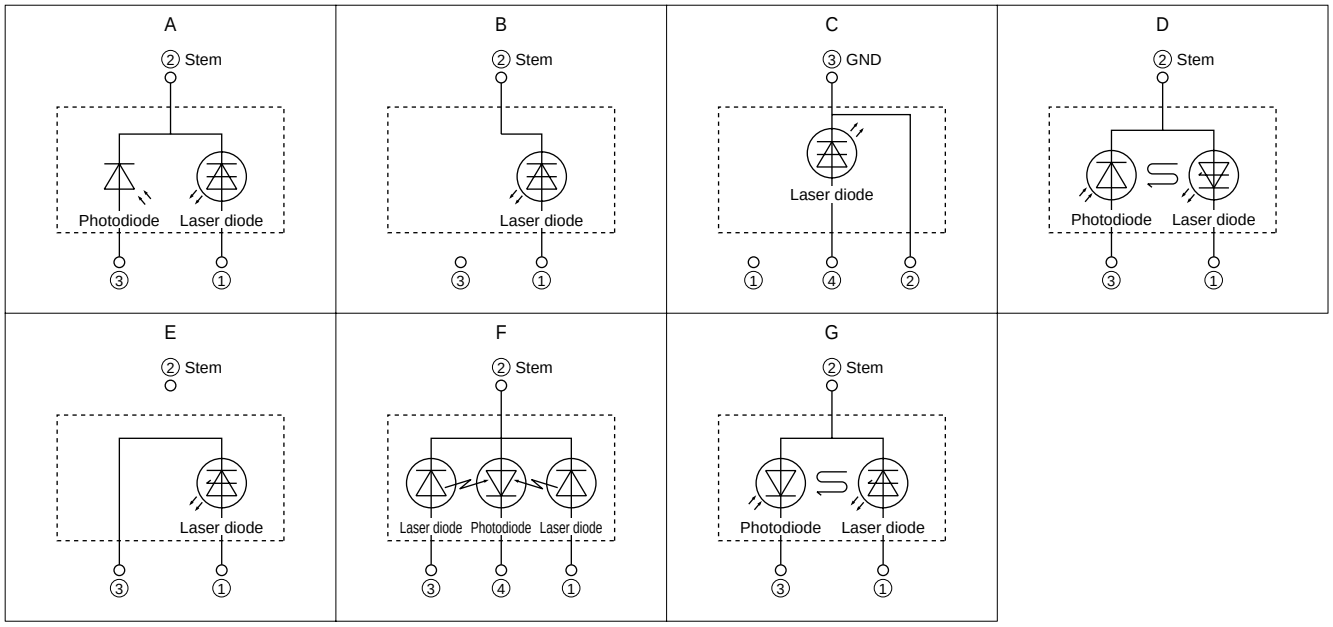
(Tc = 25°C)

| Model No. | Wave-length (nm) | Absolute maximum ratings*1 | | Features | Applications | Terminal connec-tions |
|---|---|---|---|---|---|---|
| | | CW (Continu-ous wave) | Pulse | | | |
| GH04020A2G | 405 band | 20 | — | ø5.6 mm CAN package, operating temperature: 70°C MAX. | Blu-ray disc playback | E |
| GH04020A4G | | 20 | — | ø3.3 mm CAN package, operating temperature: 70°C MAX. | Blu-ray disc playback | E |
| GH04P25A2G | | 125 | 250 | ø5.6 mm CAN package, operating temperature: 80°C MAX. (pulse drive) | Blu-ray disc recording | E |
| GH04P25A4G | | 125 | 250 | ø3.3 mm CAN package, operating temperature: 80°C MAX. (pulse drive) | Blu-ray disc recording | E |
| GH04P32A2G | | 160 | 320 | ø5.6 mm CAN package, operating temperature: 80°C MAX. (pulse drive) | Blu-ray disc recording | E |
| GH04P32A4G | | 160 | 320 | ø3.3 mm CAN package, operating temperature: 80°C MAX. (pulse drive) | Blu-ray disc recording | E |
| GH06P25A1C | 660 band | 100 | 250 | ø5.6 mm CAN package, operating temperature: 75°C MAX. (pulse drive) | Double-layer DVD 4× writing | B |
| GH16P35A8C | | 125 | 350 | 1.8 mm frame package, operating temperature: 80°C MAX. (pulse drive) | Double-layer DVD 8× to 16× recording | C |
| ★GH07P28F1C | 785 band | 150 | 280 | ø5.6 mm CAN package, operating temperature: 80°C MAX. (pulse drive) | CD-R/RW (MAX. 48× to 52× writing) | B |
| GH07P28F4C | | 150 | 280 | ø3.3 mm CAN package, operating temperature: 80°C MAX. (pulse drive) | CD-R/RW (H/H, slim dual-purpose) (MAX. 48× to 52× writing) | |

*1 The absolute maximum ratings are the limits that are not to be exceeded under any condition whatsoever, whether in testing or in actual use. For recommended optical power output, consult the specification sheet or data sheet for each model.

*2 New models for optical disc use are introduced frequently, and it is possible the model you wish to order may no longer be in production. Sample sales may not be available, either. We ask for your understanding in this matter.

## • Terminal Connections



RoHS

## ■ Europe: LNBs for Satellite Broadcast

### ◆ Features

(1) Wide band type receiving all broadcasting channels (analog & digital) in Europe. [Universal LNB]
(2) Originally developed feed-horn waveguide makes the wide-band, low-noise characteristics possible.
(3) One of the industry's most compact and lightweight package
(4) Low dissipation current design for energy saving [80 mA (TYP.): BS1K0EL150A]

### ◆ Specifications

| | | | | | |
|---|---|---|---|---|---|
| Destination | | Europe, Astra/Eutelsat Satellite etc. | | | |
| Receiving polarization | | Horizontal/Vertical polarization | | | |
| Model No.<br><Type> | | BS1R8EL500A<br><4 output> | BS1R8EL400A<br><4 output> | BS1K0EL250A<br><2 output> | BS1K0EL150A<br><1 output> |
| Input frequency (GHz) | | 10.7 to 11.7 [Low band], 11.7 to 12.75 [High band] | | | |
| Output frequency (MHz) | | 950 to 1 950 [Low band], 1 100 to 2 150 [High band] | | | |
| Local oscillation frequency (GHz) | | 9.75 [Low band], 10.6 [High band] | | | |
| NF (dB) | | 0.7 (TYP.) | | 0.4 (TYP.) | |
| Conversion gain (dB) | | 56 (TYP.) | | | 58 (TYP.) |
| Phase noise | | –55 dBc/Hz at 1 kHz (TYP.) | | | |
| Cross-polar discrimination (dB) | | 25 (TYP.) | | | |
| Supply voltage (V DC)<br>(Polarization switching) | Vertical polarization | 11.5 to 14.0 (0/22 kHz) | | | |
| | Horizontal polarization | 16.0 to 19.0 (0/22 kHz) | | | |
| Dissipation current (mA) | | 210 (TYP.)/250 (MAX.) | 310 (TYP.)/350 (MAX.) | 190 (TYP.)/250 (MAX.) | 80 (TYP.)/120 (MAX.) |
| Waveguide | | Feed-horn (F/D = 0.6) | | | |
| Output impedance (Ω) | | 75 | | | |
| Output connector (F-type) | | 4-output<br>(H/H, H/L, V/H, V/L) | 4-output<br>(H/V, High and low switching) | 2-output<br>(H/V, High and low switching) | 1-output<br>(H/V, High and low switching) |
| Outline dimensions (W) × (D) × (H) (mm) | | 133.0 × 103.6 × 60.0 | 133.0 × 103.6 × 60.0 | 135.0 × 90.0 × 58.0 | 103.0 × 60.0 × 60.0 |
| Weight (g) | | Approx. 255 | Approx. 256 | Approx. 245 | Approx. 90 |


BS1R8EL500A


BS1R8EL400A


BS1K0EL250A


BS1K0EL150A

RoHS

## ■ Japan/Asia/Australia: LNBs for CS Digital Satellite Broadcast

### ◆ Specifications

| | | |
|---|---|---|
| Destination | | Japan, Asia, Australia, CS Satellite |
| Receiving polarization | | Horizontal/Vertical polarization |
| Model No. <Type> | | BS1R8AR100A |
| Input frequency (GHz) | | 11.70 to 12.75 |
| Output frequency (MHz) | | 1 000 to 2 050 |
| Local oscillation frequency (GHz) | | 10.7 |
| NF (dB) | | 0.7 (TYP.) / 0.9 (MAX.) |
| Conversion gain (dB) | | 55 to 64 |
| Phase noise | | –75 dBc/Hz at 1 kHz (TYP.) |
| Cross-polar discrimination (dB) | | 25 (TYP.) |
| Supply voltage (V DC) (Polarization switching) | Vertical polarization | 11.5 to 14.0 |
| | Horizontal polarization | 16.0 to 19.0 |
| Dissipation current (mA) | | 80 (TYP.)/120 (MAX.) |
| Waveguide | | Feed-horn (F/D = 0.6) |
| Output impedance (Ω) | | 75 |
| Output connector (F-type) | | 1-output (H/V switching) |
| Outline dimensions (mm) | | 107.3 (W) × 60 (D) × 60 (H) |
| Weight (g) | | Approx. 110 |

BS1R8AR100A

## ■ Japan: LNBs for BS/CS 110° Satellite Broadcast

### ◆ Features

(1) Can receive 2 satellite broadcasts of 110° BS/CS digital
[Employs wide-band (1 GHz) circular' linear polarization conversion technology (septum waveguide structure)]

(2) Outstanding noise figure (NF) characteristics enabling compact design of antenna diameter. [NF: 0.45 dB (TYP.)/BS1F6JU300A]

(3) Low dissipation current design for improved energy saving. [80 mA (TYP.)]

### ◆ Standard Specifications

| | | | | |
|---|---|---|---|---|
| Destination | | Japan BS/CS 110° Satellite | | |
| Receiving polarization | | Right circular polarization | | Right/Left circular polarization |
| Model No. | | BS1F9JU300A | BS1F6JU300A | BS1F6JP100A |
| Input frequency (GHz) | | 11.71023 to 12.751 | | |
| Output frequency (MHz) | | 1 032.23 to 2 073 | | |
| Local oscillation frequency (GHz) | | 10.678 | | |
| NF (dB) | | 0.45 (TYP.) / 0.6 (MAX.) | | 0.7 (TYP.) / 1.1 (MAX.) |
| Conversion gain (dB) | | 48 to 58 | | |
| Phase noise | | –65 dBc/Hz at 1 kHz (TYP.) | | |
| Cross-polar discrimination (dB) | | 25 (TYP.)/20 (MIN.) | | |
| Supply voltage (V DC) (Polarization switching) | Right circular polarization | 9.5 to 18.0 | | 13.5 to 16.5 |
| | Left circular polarization | — | | 9.5 to 12.0 |
| Dissipation current (mA) | | 80 (TYP.)/110 (MAX.) | | |
| Waveguide | | Feed-horn (F/D = 0.5) | | |
| Output impedance (Ω) | | 75 | | |
| Output connector (F-type) | | 1-output | | 1-output (R/L switching) |
| Outline dimensions (mm) | | 96 (W) × 47 (D) × 71 (H) | | 96 (W) × 53.07 (D) × 71 (H) |
| Weight* (g) | | Approx. 100 | | Approx. 130 |

* Not including outer cabinet

BS1F9JU300A

* Outer cabinet is made upon request.

RF Components

RoHS

## ■ Digital DBS Front-End Units

### ◆ Features

(1) Equipped with a direct conversion IC developed by Sharp. Reliability is improved by reducing power consumption and component counts.

(2) Wide-band reception design also covering CS broadcast band. [Reception frequency: 950 to 2 150 MHz]

(3) Wide product line-up of LINK integrated types for contributing to set development time reduction. [Compatible with DVB-S/DVB-S2/ISDB-S/ABS-S demodulation]

(4) User support tools can be provided. [Sample/evaluation boards and software are available.]

### ◆ Standard Specifications <IQ output type>

| Destination | Global (DVB-S) | Global (ISDB-S/DVB-S2/ABS-S) | | |
|---|---|---|---|---|
| Input type | 1-input/1-loop through output | | 1-input | 1-input/2-output |
| Model No. | BS2S7HZ0502A | BS2S7HZ7803A | BS2S7HZ6801 | BS2S7HZ5811 |
| Input frequency (MHz) | 950 to 2 150 | | | |
| Input signal level (dBm) | –65 to –25 | | | |
| The 1st intermediate frequency (MHz) | Zero-IF (Direct conversion) | | | |
| Base band frequency bandwidth (MHz) | 10 to 30, 2.0 MHz step (BB LPF) | | | |
| RF input local leak (dBm) | –70 and below | –68 and below | | |
| Output type | I/Q | | | |
| Channel selection system | PLL (I²C-bus)*1 | | | |
| Noise figure (dB) | 8 (TYP.) | | | |
| Tuning voltage (V DC) | Shared with a 3.3 V power source | | | |
| Supply voltage (V DC) | 3.3 | | | |
| LNB power supply | DC 25 V, 400 mA (MAX.) | | | |
| Input impedance (Ω) | 75 | | | |
| Outline dimensions (mm) | 29.6 (W) × 29.4 (D) × 13.0 (H) | | 30.6 (W) × 25.0 (D) × 13.0 (H) | 23.5 (W) × 57.0 (D) × 5.5 (H) |

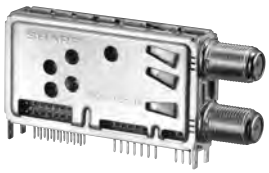
BS2S7HZ0502A/BS2S7HZ7803A

BS2S7HZ6801

※ Contact SHARP for custom design product.
*1 I²C-bus is a trademark of Philips Corporation.

### ◆ Standard Specifications <NIM type>

| Destination | Global (DVB-S) | Europe (DVB-S2) | |
|---|---|---|---|
| Input type | 1-input, 1-loop through output | | 1-input |
| Model No. | BS2F7VZ7395 | BS2F7VZ7702 | BS2F7HZ1266 |
| Input frequency (MHz) | 950 to 2 150 | | |
| Input signal level (dB m) | –65 to –25 | | |
| The 1st intermediate frequency (MHz) | Zero-IF (Direct conversion) | | |
| Base band frequency bandwidth (MHz) | 10 to 30, 2.0 MHz step (BB LPF) | | |
| RF input local leak (dB m) | –70 and below | | |
| Output type | Transport stream (parallel/serial) | | |
| Symbol rate (M baud) | 45 (MAX.) | | |
| Channel selection system | PLL (I²C-bus)*1 | | |
| Noise figure (dB) | 8 (TYP.) | | 5 (TYP.) |
| Tuning voltage (V DC) | Shared with a 3.3 V power source | | |
| Supply voltage (V DC) | 3.3, 2.5 | 3.3, 1.2 | 3.3, 1.0 |
| LNB power supply | 25 V DC, 400 mA (MAX.) | | |
| Input impedance (Ω) | 75 | | |
| Outline dimensions (mm) | 57.5 (W) × 29.6 (D) × 13.2 (H) | | 56.0 (W) × 34.9 (D) × 10.0 (H) |



BS2F7VZ7395/BS2F7VZ7702

BS2F7HZ1266

※ Contact SHARP for custom design product.
*1 I²C-bus is a trademark of Philips Corporation.

RoHS

## ■ Combination Front-End Units for Digital Terrestrial, Analog Terrestrial and Digital Satellite Broadcasting

### ◆ Features

(1) Enables simultaneous reception of digital terrestrial and digital satellite broadcasting.

(2) Contributes to making LCD TVs and other devices thinner.

### ◆ Standard Specifications

| Destination | Japan (ISDB-T/S/NTSC) | | | | | |
|---|---|---|---|---|---|---|
| Model No. | VA4A6JC5030 | | | VA4A6JC5094 | | |
| | Digital terrestrial | Analog terrestrial | Digital satellite | Digital terrestrial | Analog terrestrial | Digital satellite |
| Number of tuners | 1 | 1 | 1 | 2 | 1 | 2 |
| Input frequency (MHz) | 93 to 767 | | 950 to 2 150 | 93 to 767 | | 950 to 2 150 |
| Output type | Low-IF | CVBS/SIF | I , Q | Low-IF | CVBS/SIF | I , Q |
| Noise figure (dB) | 6 (TYP.) | | | | | |
| Phase noise (dBc/Hz) | –90 (TYP.) at 10 kHz offset | | –85 (TYP.) at 10 kHz offset | –90 (TYP.) at 10 kHz offset | | –85 (TYP.) at 10 kHz offset |
| Channel selection system | PLL ($I^2C$-bus)*2 | | | | | |
| Supply voltage (V DC) | 1.8, 3.3 | | 3.3 | 1.8, 3.3 | | 3.3 |
| Power consumption (W) | 1 | | 0.55 | 2.3 | | 1.1 |
| Outline dimensions (mm) | 50 (W) × 45 (D) × 5 (H) | | | 80 (W) × 45 (D) × 5 (H) | | |

*1 It conforms to the ARIB standard.
*2 $I^2C$-bus is a trademark of Philips Corporation.

VA4A6JC5030

VA4A6JC5094

RoHS

## ■ Front-End Units for ISDB-T/DVB-T/CTTB/CATV and Digital Satellite

### ◆ Features

(1) Low phase noise characteristics, high elimination of adjacent channel interference.

(2) Compact, low power consumption.

(3) Other types are available with various chassis forms (vertical or horizontal type).

### ◆ Standard Specifications

| Destination | Japan (ISDB-T/S) | | | |
|---|---|---|---|---|
| Model No. | VA4A5JC2092 | | VA4M6JC2093 | |
| | Digital terrestrial | Digital satellite | Digital terrestrial | Digital satellite |
| Number of tuners | 1 | 1 | 2 | 2 |
| Input frequency (MHz) | 93 to 767 | 950 to 2 150 | 93 to 767 | 950 to 2 150 |
| Output type | Low-IF | I , Q | Low-IF | I , Q |
| Noise figure (dB) | 6 (TYP.) | | | |
| Phase noise (dBc/Hz) | –90 (TYP.) at 10 kHz offset | –85 (TYP.) at 10 kHz offset | –90 (TYP.) at 10 kHz offset | –85 (TYP.) at 10 kHz offset |
| Channel selection system | PLL ($I^2C$-bus)*1 | | | |
| Supply voltage (V DC) | 1.8, 3.3 | 3.3 | 1.8, 3.3 | 3.3 |
| Power consumption (W) | 1 | 0.55 | 1 | 1.1 |
| Outline dimensions (mm) | 50 (W) × 45 (D) × 5 (H) | | | |

*1 $I^2C$-bus is a trademark of Philips Corporation.

VA4A5JC2092

RoHS

## ■ Front-End Units for ISDB-T/DVB-T/CTTB/CATV

### ◆ Features

(1) Low phase noise characteristics, high elimination of adjacent channel interference.

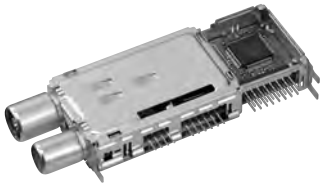
(2) Compact, low power consumption.

(3) Other types are available with various chassis forms (vertical or horizontal type) and input connectors (F or DIN type), etc.

### ◆ Standard Specifications

| Destination | Europe/Asia (DVB-T/T2) | China (CTTB) | Europe/China/India (DVB-C) |
|---|---|---|---|
| Model No. | VA1K5ED5459 | VA1T1EF2096 | VA1N6CD5631 |
| | Digital terrestrial | Digital terrestrial | CATV |
| Input frequency (MHz) | 146 to 862 | 47 to 862 | |
| Output type | Transport stream (Parallel/Serial) | Direct IF | |
| IF frequency/IF bandwidth (MHz) | 36/6 | 36/8 | |
| Noise figure (dB) | 6 (TYP.) | | |
| Phase noise (dBc/Hz) | –90 (TYP.) at 10 kHz offset | –87 (TYP.) at 10 kHz offset | –85 (TYP.) at 10 kHz offset |
| Channel selection system | PLL ($I^2C$-bus)*1 | | |
| Power consumption (W) | 1.3 | 0.75 | 1 |
| Supply voltage (V DC) | 5, 3.3, 1.2 (Built-in DC-DC converter) | 5 | 3.3 |
| Outline dimensions (mm) | 70 (W) × 29.65 (D) × 13.2 (H) | 68.2 (W) × 35.9 (D) × 14.1 (H) | 29 (W) × 29.6 (D) × 10 (H) |

*1 $I^2C$-bus is a trademark of Philips Corporation.



VA1K5ED5459

VA1T1EF2096

RoHS

## ■ Front-End Units for Digital Terrestrial and Analog Terrestrial Broadcasting

### ◆ Features

Contributing to the development of thinner LCD TVs and similar products by combining compatibility with digital and analog terrestrial broadcasts into a single unit.

### ◆ Standard Specifications

| Destination | | Brazil*1 | China |
|---|---|---|---|
| Model No. | | VA4A1BC5038 | VA1P1CD8402 |
| Input frequency (MHz) | | 47 to 866 | 47 to 870 |
| Analog intermediate frequency (MHz) | Video | 45.75 | 38.0 |
| | Audio | 41.25 | D/K: 31.5, I: 32.0, B/G: 32.5, M/N: 33.5 |
| Digital intermediate frequency (MHz) | | 44 | 36 |
| Digital IF bandwidth (MHz) | | 6 | 8 |
| Phase noise (dBc/Hz) | | –90 (TYP.) at 10 kHz offset | –85 (TYP.) at 10 kHz offset |
| Supply voltage (V DC) | | 1.8, 3.3 | 5.0 |
| Noise figure (dB) | | 6 (TYP.) | |
| Channel selection system | | PLL ($I^2C$-bus)*2 | |
| Outline dimensions (W) × (D) × (H) (mm) | | 40 × 36.6 × 5 | 70.0 × 37.0 × 10.0 |

*1 Transport stream output front-end units with built-in OFDM demodulation IC
*2 $I^2C$-bus is a trademark of Philips Corporation.

VA4A1BC5038

# FRONT-END UNITS FOR DIGITAL TERRESTRIAL AND ANALOG TERRESTRIAL BROADCASTING / FULL-SEG TUNER MODULE FOR DIVERSITY RECEPTION

RoHS

## ■ Front-End Units for Digital Terrestrial and Analog Terrestrial Broadcasting

### ◆ Features

Universal specifications compatible with various broadcasting systems all over the world

Digital: DVB-T/T2, DVB-C, ATSC, ISDB-T, CTTB

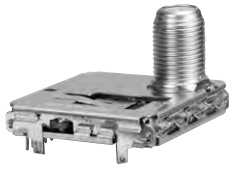
Analog: NTSC-M/N, PAL-B/G/I/DK, SECAM-L, L'

### ◆ Standard Specifications

| | | |
|---|---|---|
| Destination | | Global |
| Model No. | | VA4A1FB5042 |
| Input frequency (MHz) | | 45 to 868 |
| Output type | Digital terrestrial | IF: Low-IF, 36/44/57 MHz<br>(Bandwidth: 6/7/8 MHz)<br>Selectable by applications |
| | Analog terrestrial | CVBS / SIF |
| Noise figure (dB) | | 6 (MAX.) |
| Phase noise (dBc/Hz) | | –90 (TYP.) |
| Channel selection system | | I²C-bus*1 |
| Supply voltage (V) | | 3.3, 1.8 |
| Power consumption (W) | Digital terrestrial | 0.93 (TYP.) Analog standby |
| | Analog terrestrial | 0.99 (TYP.) |
| Outline dimensions (W) × (D) × (H) (mm) | | 30.0 × 30.0 × 5.6 |

※ Contact SHARP for custom design product.
(For connector shape or facing side, analog output format, etc.)

*1 I²C-bus is a trademark of Philips Corporation.



VA4A1FB5042

## ■ Full-Seg Tuner Module for Diversity Reception

### ◆ Features

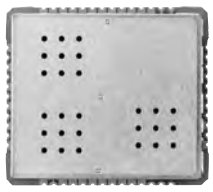
Compact package, enabling 4-diversity reception (35.0 × 31.0 × 2.95 mm)

### ◆ Standard Specifications

| | | |
|---|---|---|
| Destination | | Japan |
| Model No. | | VA3D5JZ705 |
| Type | | Built-in diversity demodulator for four signal reception |
| Input frequency (MHz) | | 470 to 770 |
| IF frequency (MHz) | | 4 |
| Output type | | Transport stream |
| Input sensitivity (dBm) | During diversity reception | –88 (TYP.) (64QAM, CR = 3/4) |
| | During single reception | –82 (TYP.) (64QAM, CR = 3/4) |
| Supply voltage (V) | | Vcc1: 1.2, Vcc2: 3.3<br>(IO: 3.3) |
| Power consumption (W) | | 1.24 (TYP.) |
| Operating temperature (°C) | | –40 to 85 |
| Control interface | | I²C-bus*1 |
| Outline dimensions (W) × (D) × (H) (mm) | | 35.0 × 31.0 × 2.95 |

Diversity demodulator for two signal reception is also available.

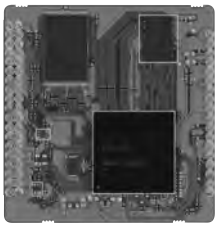
*1 I²C-bus is a trademark of Philips Corporation.



VA3D5JZ705

RoHS

## ■ MPEG Module



DU6N4JZ0xxx

### ◆ Features

(1) An OFDM demodulator, MPEG decoder and video encoder circuit are combined into a single package for reception of ISDB-T.

(2) Comes with built-in standard reception software, with a simple EPG included, based on the ARIB standard.
Compatible with Ministry of Internal Affairs and Communications specifications for a “simple tuner.”
Compatible also with full HD output.

(3) The tuner (RF) section is separate, making it possible to select between digital/analog and digital tuners.

Recommended tuner { Digital terrestrial: VA1T1JF2031
Analog terrestrial/Digital terrestrial: VA1W2JF2008
Digital terrestrial (4-diversity): VA3D5JZ705

### ◆ Standard Specifications

| Type | For analog/digital terrestrial | For three digital wavelengths (terrestrial/BS/CS) | For digital terrestrial Compatible with diversity reception | For digital terrestrial only Integrated RF |
|---|---|---|---|---|
| Model No. | DU6N4JZxxxx | DU6T4JZxxxx | DU6U4JZxxxx | DU6F4JZxxxx |
| Circuit configuration | [RF (separate body) +] OFDM + MPEG | | | |
| CATV (pass-through) | ○ | | – | ○ |
| Video output | Component (Full HD)* | | | |
| Audio output | Analog stereo (L/R) | | | |
| B-CAS | Built-in control software | | | |
| EPG | Built-in simple EPG | | | |
| ES (Engineering service) | ○ | | | |
| Firm ware upgrades | ○ | | | |
| Supply voltage (V) | 3.3/1.8/1.0 | | | |
| Power consumption (W) | 1.1 (TYP.) | | | 1.5 (TYP.) |
| Outline dimensions (mm) | 58 (W) × 60 (D) × 7 (H) | 60 (W) × 70 (D) × 7 (H) | | 78 (W) × 55.5 (D) × 7 (H) |

* Switchable between S-Video (Y/C) and component (SD or HD).

# ONE-SEG TUNER MODULE / EMBEDDED WIRELESS LAN-BLUETOOTH COMBO MODULE

## ■ One-Seg Tuner Module

### ◆ Features

(1) High sensitivity: -100 dBm (13 seg, QPSK CR: 2/3)
(2) Compact and thin design: 5.4 × 5.4 × 1.0 mm
(3) Low power consumption: 41 mW (with software power control)
(4) Output interface: TS serial output

VA3A5JZ967

### ◆ Standard Specifications

| Destination | Japan |
|---|---|
| Model No. | VA3A5JZ967 |
| Input frequency (MHz) | 470 to 770 (UHF: 13 to 62) |
| Input signal level (dBm) | –100 (13 seg, QPSK CR: 2/3) |
| Outline dimensions (mm) | 5.4 (W) × 5.4 (D) × 1.0 (H) |
| Supply voltage (V DC) | 1.2 (RF)<br>1.2 (OFDM Core)<br>1.62 to 3.6 (I/O) |
| Power consumption (mW) | 41 (TYP.) |
| Operating temperature (degree C) | –20 to 65 |
| Control I/F | I²C-bus*1 |

*1 I²C-bus is a trademark of Philips Corporation.

## ■ Embedded Wireless LAN-Bluetooth Combo Module

### ◆ Features

(1) A two-in-one module compliant with the latest Bluetooth standard (v2.1)
Wireless LAN: 11b/g, Bluetooth: v2.1+EDR* (3 Mbps)
(2) Compatible with IEEE802.15.2 standard compliant wireless LAN and Bluetooth coexistence functions.
(3) Thin, compact configuration—the smallest class in the industry.
9.0 x 9.0 x 1.25 mm

*EDR: Enhanced Data Rate

DC2K1DZ172

### ◆ Standard Specifications

| Model No. | DC2K1DZ172 | |
|---|---|---|
| Wireless communication standard | WLAN (IEEE802.11b/g) | Bluetooth v2.1+EDR |
| Outline dimensions (mm) | 9.0 (W) × 9.0 (D) × 1.25 (H) (LTCC) | |
| Frequency (MHz) | 2 400 to 2 483.5 | 2 402 to 2 480 |
| Data rate (Mbps) | 1/2/5.5/11 & 6/9/12/18/24/36/48/54 | 1/2/3 |
| Number of channels | 13 | 79 |
| Transmission output (dBm) | 11g: +14/11b: +18 | Class 2 |
| Receiving sensitivity (dBm) | TYP.: –84 (11 Mbps, PER 8%)<br>TYP.: –71 (54 Mbps, PER 10%) | TYP.: –70 (1 Mbps, BER 0.1%)<br>TYP.: –70 (2 Mbps, BER 0.01%)<br>TYP.: –70 (3 Mbps, BER 0.01%) |
| Security | WEP TKIP AES | by driver software |
| Interface | SPI/SDIO | PCM (64 kbps), SPI/UART |

Consult separately regarding driver software.

RoHS

## ■ Infrared Data Communication Device Lineup

| Communication system | Transmission speed | Transmission distance | Features | Operating supply voltage | Model No. |
|---|---|---|---|---|---|
| IrDA data | FIR 4 Mb/s (Receiver only) | 250 cm | | 3.0 to 3.6 V | GP2W4020XPMF |
| (IrDA 1.x) | | 150 cm | | 3.0 to 3.6 V | GP2W4010YP0F |
| | FIR 4 Mb/s (Integrated receiver and transmitter type) | 100/20 cm | LP/MP/HP mode switching function | 2.7 to 5.5 V | GP2W1001YP0F▲ |
| | | 35/21 cm | LP/HP mode switching function, remote control transmission function, thin (height: 1.5 mm) | 2.6 to 3.6 V | GP2W3152YP0F |
| | | | LP/HP mode switching function, remote control transmission function, top view type (height: 1.75 mm) | 2.6 to 3.6 V | GP2W3176XP0F |
| | | | LP/HP mode switching and remote control transmission functions | 2.6 to 3.6 V | GP2W3120YP0F |
| | | 20 cm | LP/HP mode switching function | 2.6 to 3.6 V | GP2W1320YP0F |
| | | 70/21 cm | LP/MP/HP mode switching and remote control transmission functions | 2.6 to 3.3 V | GP2W3106YP0F |
| | SIR 115.2 kb/s (Integrated receiver and transmitter type) | 100 cm | Compact, low dissipation current | 2.4 to 5.5 V | GP2W0004YP0F▲/ GP2W0004XP0F▲ |
| | SIR LP 115.2 kb/s (Integrated receiver and transmitter type) | 21 cm | Built-in LED constant current circuit, 3-state output | 2.0 to 3.6 V<br>1.7 to 2.5 V | GP2W0110VY<br>GP2W0112VY |

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

RoHS

## ■ Infrared Data Communication Devices

### ◆FIR Compliant Devices (Receiver Only)

| Model No. | Communication system | Transmission speed | Description | Maximum reception distance*1 (cm) | Supply voltage (V DC) | Outline dimensions (mm) |
|---|---|---|---|---|---|---|
| GP2W4020XPMF | Uni-directional communication (receiving only) | 4 Mb/s | IrSS™-compliant, receiving-only type | 250 | 3 to 3.6 | 20.96 × 6.68 × 7.1 |
| GP2W4010YP0F | Uni-directional communication (receiving only) | 9.6 k to 4 Mb/s | IrSS™-compliant, receiving-only type | 150 | 3 to 3.6 | 10 × 3.93 × 4.53 |

*1 Radiant intensity at transmitting side: 100 mW/sr

GP2W4020XPMF

GP2W4010YP0F

### ◆FIR Compliant Devices (Integrated Receiver and Transmitter Type)

| Model No. | Communication system | Transmission speed | Description | Transmission distance (cm) | Supply voltage (V DC) | Outline dimensions (mm) |
|---|---|---|---|---|---|---|
| GP2W3152YP0F | Bi-directional (half-duplex) communication | 9.6 k to 4 Mb/s | With remote control transmission function, LP/HP mode switching function | 21/35 | 2.6 to 3.6 | 7.88 × 2.76 × 1.5 |
| GP2W3176XP0F | Bi-directional (half-duplex) communication | 9.6 k to 4 Mb/s | With remote control transmission function, top-view, LP/HP mode switching function | 21/35 | 2.6 to 3.6 | 8.76 × 2.53 × 1.75 |
| GP2W3120YP0F | Bi-directional (half-duplex) communication | 9.6 k to 4 Mb/s | With remote control transmission function, LP/HP mode switching function | 21/35 | 2.6 to 3.6 | 7.16 × 2.73 × 1.82 |
| GP2W1001YP0F▲ | Bi-directional (half-duplex) communication | 9.6 k to 4 Mb/s | LP/MP/HP mode switching function | 20/100 | 2.7 to 5.5 | 10.01 × 4.38 × 3.53 |
| GP2W1320YP0F | Bi-directional (half-duplex) communication | 9.6 k to 4 Mb/s | Compact, thin, low dissipation current (Icc: TYP. 0.45 mA) | 21 | 2.6 to 3.6 | 7.16 × 2.73 × 1.82 |
| GP2W3106YP0F | Bi-directional (half-duplex) communication | 9.6 k to 4 Mb/s | With remote control transmission function, LP/MP/HP mode switching function | 21/70 | 2.6 to 3.3 | 7.9 × 2.85 × 2.5 |

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

GP2W3152YP0F

GP2W3176XP0F

GP2W3120YP0F

GP2W3106YP0F

GP2W1001YP0F▲

GP2W1320YP0F

RoHS

## ◆SIR Compliant Devices (Integrated Receiver and Transmitter Type)

| Model No. | Communication system | Transmission speed | Description | Transmission distance (cm) | Supply voltage (V DC) | Outline dimensions (mm) |
|---|---|---|---|---|---|---|
| GP2W0004YP0F▲ | Bi-directional (half-duplex) communication | 9.6 k to 115.2 kb/s | Low dissipation current (Icc: 130 µA MAX.) | 100 | 2.4 to 5.5 | 9.21 × 3.76 × 2.71 |
| GP2W0004XP0F▲ | Bi-directional (half-duplex) communication | 9.6 k to 115.2 kb/s | Low dissipation current (Icc: 130 µA MAX.), top-view | 100 | 2.4 to 5.5 | 9.21 × 3.35 × 3.8 |

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

GP2W0004YP0F▲

GP2W0004XP0F▲

## ◆SIR LP Compliant Devices (Integrated Receiver and Transmitter Type)

| Model No. | Communication system | Transmission speed | Description | Transmission distance (cm) | Supply voltage (V DC) | Outline dimensions (mm) |
|---|---|---|---|---|---|---|
| GP2W0110VY | Bi-directional (half-duplex) communication | 2.4 k to 115.2 kb/s | Low dissipation current (Icc: 120 µA MAX.) | 21 | 2.0 to 3.6 | 6.8 × 2.35 × 2.1 |
| GP2W0112VY | Bi-directional (half-duplex) communication | 2.4 k to 115.2 kb/s | Low dissipation current (Icc: 120 µA MAX.) | 21 | 1.7 to 2.5 | 6.8 × 2.35 × 2.1 |

GP2W0110VY
(GP2W0112VY)

**Notice**
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

RoHS

## ■ IR Detecting Unit for Remote Control Lineup (Classified by Form)

| Type | Package | | Features | Model No. |
|---|---|---|---|---|
| | Form | Detection position*5 (from PCB) | | Operating voltage: 3 to 5 V |
| IR detecting unit for remote control | Compact, thin type SMD (4.5 × 5.0 × 1.35 t mm) | | | GP1USC3xXP series |
| | Compact type SMD (6.8 × 2.1 × 2.35 t mm) | | | GP1UF31 series |
| | Lead L bend with shield case (holder) | 16.0 mm*1 | Compact size | GP1UE28xXKC4 series |
| | | | Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type) | GP1UE28xRKC4 series |
| | | 12.0 mm*2 | Compact size | GP1UE27xXKC4 series |
| | | | Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type) | GP1UE27xRKC4 series |
| | | 6.8 mm*3 | Compact size | GP1UE26xXKC4 series |
| | | | Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type) | GP1UE26xRKC4 series |
| | Lead straight with shield case (holder) | 19.0 mm | Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type) | GP1UE29xQKC4 series |
| | | 9.6 mm | Compact size | GP1UE28xYKC4 series |
| | | | Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type) | GP1UE28xQKC4 series |
| | Holderless | Lead straight 6.0 mm | | GP1UXC4xQS series |
| | | Lead L bend*4 5.3 mm | | GP1UXC4xRK series |

*1 Mesh type (strengthened resistance to electromagnetic induction noise): 16.4 mm
*2 Mesh type: 12.4 mm
*3 Mesh type: 7.2 mm
*4 Mesh type: 5.3 mm
*5 Lead straight: Distance from lens center to mounting board upper surface
No mesh lead L bend: Distance from tip of lens to mounting board upper surface
Mesh-type lead L bend: Distance from tip of mesh to mounting board upper surface


GP1UE26xXKC4


GP1UE27xXKC4


GP1UE28xXKC4


GP1UE28xYKC4


GP1UE26xRKC4


GP1UE27xRKC4


GP1UE28xRKC4


GP1UE28xQKC4


GP1UE29xQKC4


GP1UXC4xQS


GP1UF31xXP0F
(GP1UF31xYP0F)


GP1USC3xXP

IR Devices

☆New product

RoHS

## ■ IR Detecting Units for Remote Control

(Ta = 25°C)

| Type | Series No. | Absolute maximum ratings | | Operating voltage (V) | Electrical characteristics | | | | Size (mm) | Terminal layout |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Vcc (V) | Topr (°C) | | Icc (mA) *1 MAX. | $V_{OH}$ (V) MIN. | $V_{OL}$ (V) MAX. | fo (kHz) TYP. | | |
| Surface-mount type, Reflow soldering compatible | GP1UF31xXP0F/ *5 GP1UF31xYP0F | 0 to 6.0 | –30 to +85 | 2.7 to 5.5 | 0.4 | Vcc–0.5 | 0.45 | *4 | 6.8 × 2.1 × 2.35 | – |
| | ☆GP1USC3xXP | 0 to 6.0 | –30 to +85 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5 × 4.5 × 1.3 | – |
| With shield case (holder), 3 to 5 V drive | GP1UE26xXKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 9.6 × 6.8 | Center Vcc |
| | GP1UE27xXKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 9.6 × 12.0 | |
| | GP1UE28xXKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 9.6 × 16.0 | |
| | GP1UE28xYKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 8.6 × 12.5(9.6)*2 | |
| With shield case (holder), 3 to 5 V drive, Strengthened resistance to electromagnetic induction noise | GP1UE26xRKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 9.6 × 7.2 | |
| | GP1UE27xRKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 9.6 × 12.4 | |
| | GP1UE28xRKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 9.6 × 16.4 | |
| | GP1UE28xQKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 9.0 × 12.5(9.6)*2 | |
| | GP1UE29xQKC4 | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.6 × 16.2 × 21.9(19)*2 | |
| Holderless, 3 to 5 V drive, Strengthened resistance to electromagnetic induction noise | GP1UXC4xQS | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.5 × 5.3 × 7.5 | Center GND |
| | GP1UXC4xRK | 0 to 6.0 | –10 to +70 | 2.7 to 5.5 | 0.6 | Vcc–0.5 | 0.45 | *3 | 5.5 × 5.3 × 7.5 | |

* A voltage regulator circuit is built-in but may be affected by the usage environment. Install with an externally mounted C and R as a power supply filter.
*1 When no signal is input (during input light).
*2 Figures in parentheses indicate the distance to the light detection center.
*3 fo = 32.75/36/36.7/38/40 kHz
*4 fo = 36/36.7/38/40 kHz
*5 GP1UF31xXP0F: Top view taped package,
GP1UF31xYP0F: Side view taped package

RoHS

## ■ Advanced Flex Printed Circuit Boards <Multilayer FPC specifications>

The advanced flex printed circuit board is a multilayered wiring board comprising of flexible printed circuits (FPC) laminated into a multilayer configuration. The PWBs and FPCs are connected to each other via copper-plated through holes. It is ideal for compact, lightweight equipment design.

### ◆ Features

(1) For selecting optimal specifications to suit specific applications, special specifications such as for mobile phones are also available.
- Minimum thickness in multi-layer part: 0.19 mm (4-layer), 0.33 mm (6-layer)
- Minimum pattern width/pitch: 0.06/0.07 mm
- Flexibility of single/double sided FPC part (dedicated for hinge): More than 200 000 times 180-degree bending of radius 3 mm

(2) Capable of board-to-board connection without connectors, which enables space-saving and 3-dimensional equipment assembly.

(3) Through hole plating connection of multi-layer (3 to 8) part to flexible part significantly improves reliability.

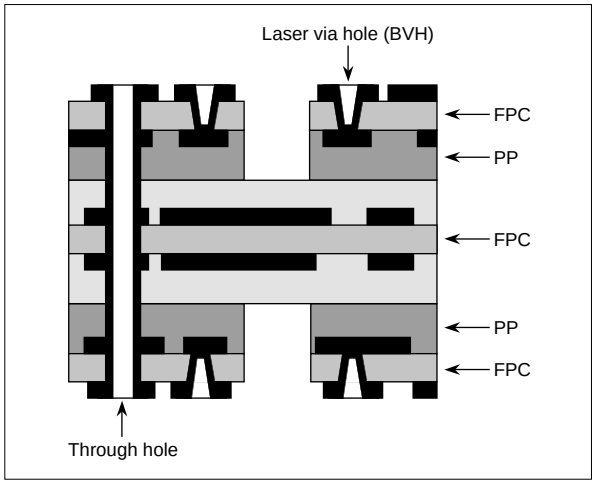
(4) Blind Via Hole (BVH) forming with laser via drilling of small diameter.

(5) Sheet design provides excellent mountability, equivalent to that of PWB.

### ◆ Outline Specifications

| Type | | Folding type/Flying tail type |
|---|---|---|
| Min. base thickness (mm) | | 0.19 (4-layer), 0.33 (6-layer), 0.40 (8-layer) |
| Min. line width/spacing (mm) | | 0.05/0.05 |
| Min. through hole diameter (mm) | | ø0.25 |
| Min. via hole land diameter | Through hole (mm) | Outer layer: ø0.5, Inner layer: ø0.5 |
| | Blind via hole (mm) | ø0.09 |
| | Inner via hole (mm) | ø0.30 |
| Solder resist | | Multi layer: Liquid photo solder resist, FPC: Film cover ray |
| Surface finish | | Heat-resistant preflux, Ni-Au plating (Ni-Au plating for flying tail) |

### ■ Construction of Advanced Flex Board (example of 6-layer BVH)



RoHS

## ■ Advanced Flex Printed Circuit Boards <Flex-rigid specifications>

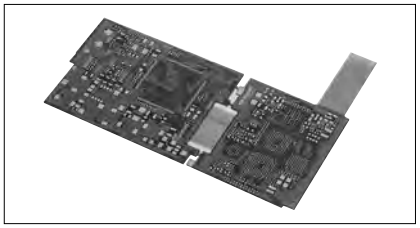
With rigid materials used for the build-up multilayer, this board can handle finer mounting patterns and achieve connectorless between-board connections using an inner layer flexible printed circuit (FPC). This facilitates greater equipment design flexibility and ultra-compact designs.

### ◆ Features

(1) Multiple build-up layers are connected internally with an FPC, thereby improving connection reliability between multilayer boards and reducing both connection space and connector weight.

(2) Enables narrow pitch (0.4 mm) CSP and bare chip mounting, and thus greater equipment compactness through ultra-high density mounting.

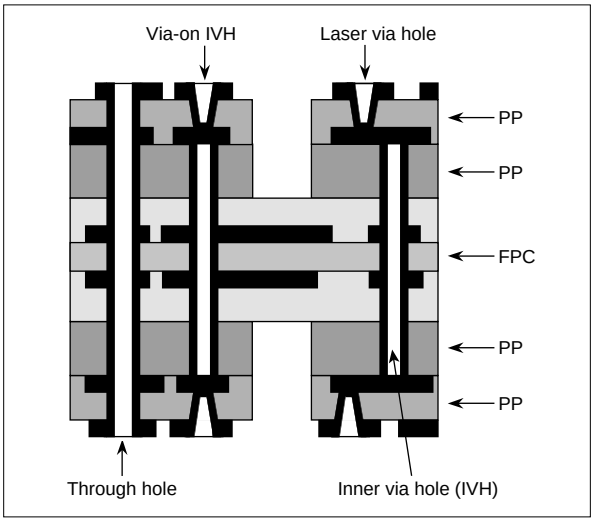
(3) Enables via-on-IVH (inner-via-hole) configurations and stacked-via-hole configurations, and makes it possible to achieve ultra-high-density wiring designs. (Facilitates a diverse range of designs for greater compactness and thinness.)



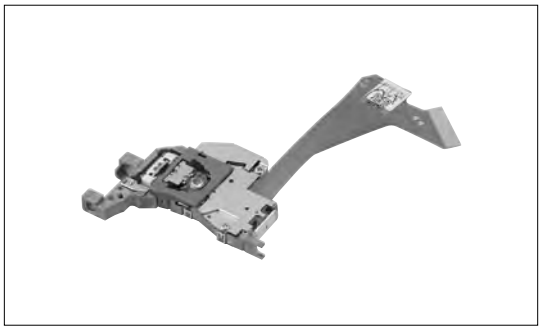
### ◆ Outline Specifications

| | | |
|---|---|---|
| Type | | 6- to 8-layer, flex-rigid |
| FPC core layer configuration | | 2 to 6 layers (Polyimide) |
| No. of build-up layers | | 1 to 2 layers for each side of core layer |
| Min. board thickness (mm) | | 0.4 (6-layer), 0.53 (8-layer) |
| Min. via hole diameter/ Land hole diameter | Conformal via hole (mm) | Hole: ø0.09 / Land: ø0.25 |
| | Stacked via hole (mm) | Hole: ø0.09 / Land: ø0.25 |
| Min. inner via hole diameter (mm) | | Hole: ø0.09 / Land: ø0.25 |
| Via-on IVH | | Available |
| Min. line width/spacing (mm) | | 0.05/0.05 |
| CSP mountable pitch (mm) | | 0.4 |

### ■ Construction of Advanced Flex Board (example of 6-layer IVH)



## ■ DVD Pickup for Automotive Use <HPD-61>



### ◆ Features

- Compact, thin (7.3 mm) pickup
- Playable disk: DVD-ROM, CD-ROM
- Operating temperature: –20 to +80°C
- Outline dimensions: W 30.2 × H 7.3 × D 48.7 (mm)
- Weight: Approx. 13.5 g

# INDEX

## GP1



## GP2



## GW

# INDEX

## VA

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| Katsuragi Works | EC99J2006 | June 25, 1996 | Development, design and production of photovoltaic cells and electronic devices |
| Electronic Components and Devices Group (Fukuyama) | EC99J2016 | September 24, 1996 | The manufacture of IC (Memory, Logic, etc.) |
| Advanced Development and Planning Center | EC99J2038 | December 3, 1996 | Research and development, production engineering development and promotion, design and manufacture of electronic devices<br>The manufacture of compact LCD panels |
| Mie Plant | EC99J2051 | January 28, 1997 | Development, design and manufacture of LCDs |
| Kameyama Plant | EC04J0284 | October 12, 2004 | Production and development of Large LCD TVs |
| Electronic Components and Devices Group (Mihara) | 20002660 UM | November 17, 2003 | Design, development and manufacture of laser diodes, hologram laser and LED devices and printed wiring board, design of optical pick-up units |

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| Liquid Crystal Display Group | JQA-QMA11778 | 1) Design, development and manufacture of LCD panels<br>2) Design and development of LCD modules |
| General Manager, Display Device Business*2 | JQA-QM3776 | Design, development, and manufacture of LCD panels and modules |

*1 This Group designates Sharp Takaya Electronics Industry Co., Ltd. (JQA-AU0212) as an ISO/TS16949: 2009 management system registered facility with regard to design, development and manufacture of camera units for vehicle use, with registration as a management system support division.
*2 The Group name has been changed from Liquid Crystal Display Group as of April 1, 2011.

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