

# 6-Channel Motor Driver IC for DSC, DVC and Surveillance Cameras

## Overview

The R2A30440NP is a semiconductor integrated circuit that incorporates driver circuits suitable for motors in digital cameras. The terminal arrangements are basically identical to that of R2A30423NP.

## Features

- CMOS process adoption and 1ch-4ch using D class amplifier to achieve low power consumption.
- A small 40-pin QFN package 5mm x 5mm, t=0.80mm (max) is used.
- Built-in autonomous drive circuit controlled by serial settings (self propelled control)
- 1ch/2ch and 3ch/4ch are capable of 2-2 phase stepper drive, 1-2 phase (100%) stepper drive, 1-2 phase (70%) stepper drive and 256/512/1024 resolution micro-steps.
- 3ch/4ch is capable of constant voltage drive.
- 5ch is capable of constant current drive and FLL control.
- 6ch is capable of constant current drive.
- By using exclusive control mode on 5ch and 6ch, it resembles 7ch drive.
- Built-in 3 PI drivers channels
- Built-in 2 comparators and 1 Schmitt buffer.
- Built-in low-voltage malfunction prevention and thermal shutdown circuit.
- Power supplies VCC and VM are internally isolated and include a function to prevent reverse current between the power supplies.

## Application

Motor driver for digital still cameras

## Recommended operating conditions

Power-supply voltage range . . . . . VCC: 2.7V~3.6V

VM: 2.7V~5.5V

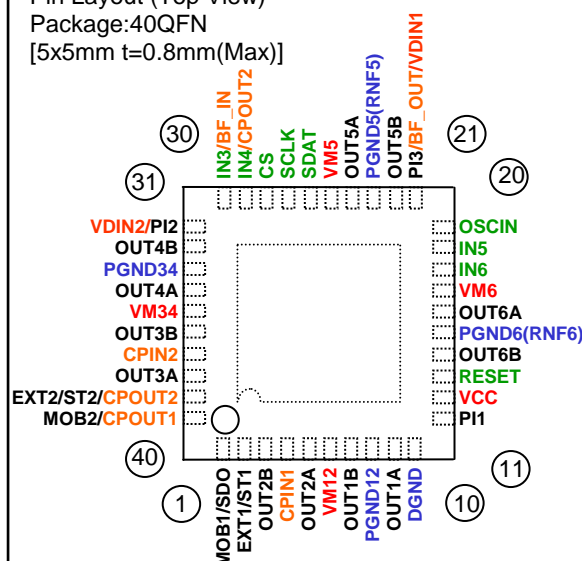
Rated power-supply voltage . . . . . VCC: 3.3V

VM: 5.0V

## Pin Layout (Top View)

Package:40QFN

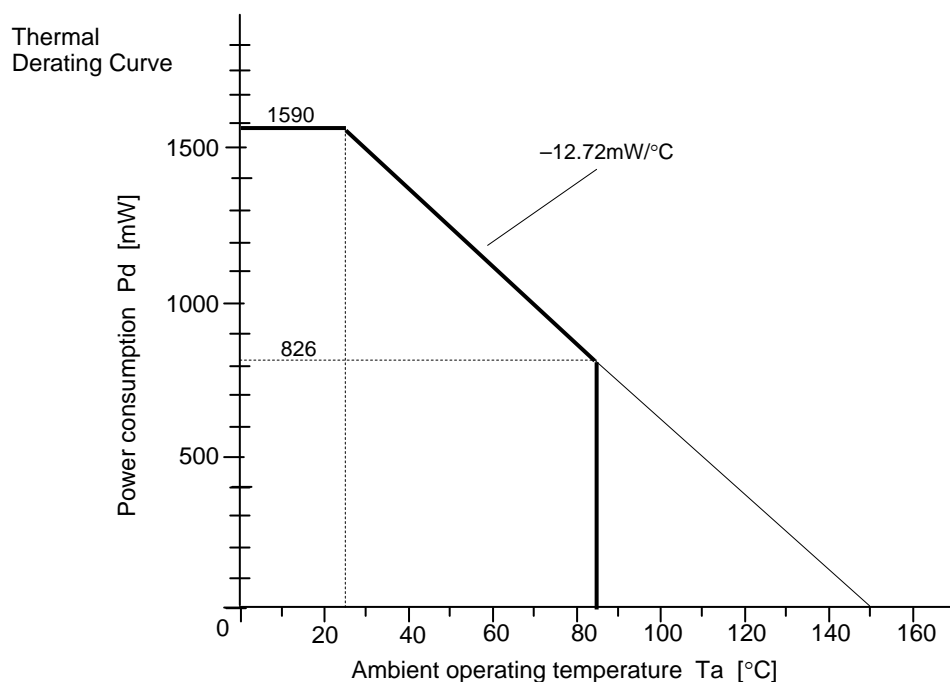
[5x5mm t=0.8mm(Max)]



**Absolute Maximum Ratings** (Unless specified, the ambient temperature is 25°C)

Item	Symbol	Rated Value	Unit	Remarks
Power-supply voltage 1	VCC	6.5	V	Note1
Power-supply voltage 2	VM	6.5	V	Note1
Direct current (1ch~2ch)	I <sub>od</sub>	±600	mA/ch	Note4 DC
Instantaneous output current (1ch~2ch)	I <sub>op</sub>	±800	mA/ch	Note4 PW < 10ms, Duty ≤ 20%
Direct current (3ch~6ch)	I <sub>od</sub>	±800	mA/ch	Note4 DC
Allowable power consumption	P <sub>d</sub>	1590	mW	Note2 (Ta = 25°C)
Thermal derating ratio	K <sub>θ</sub>	-12.72	mW/°C	Note2 (Ta ≥ 25°C)
Max. junction temperature	T <sub>j</sub>	150	°C	
Applied input voltages	V <sub>in</sub>	-0.3~VCC+0.3	V	Note3
Ambient operating temperature	T <sub>opr</sub>	-30~85	°C	
Storage temperature	T <sub>stg</sub>	-40~150	°C	

- Notes: 1. As a rule, do not apply reverse power-supply voltages.  
2. Glass epoxy board: 76.2mm x 114.5mm x 1.6mm,  
copper-occupancy ratio in a 4-layer board: 20% in layers 1 and 4, 100% in layers 2 and 3.  
Note that the allowable power consumption changes according to the conditions imposed on the board.  
3. As a rule, do not apply voltages above the power-supply voltage or below the GND voltage.  
4. The total output current does not exceed the rated value in usage with multiple channels simultaneously turned on.

**[Remarks]**

The electric power which the power consumption of this IC with the output transistor of 1ch - 6ch becomes dominant.

**Output transistor power consumption formula**

<Full Swing/Constant Voltage>: (output current)<sup>2</sup> x ON resistance    E.g. (500mA)<sup>2</sup> x 2.0ohm=500mW

<Constant current>: output current x {VM - RNF5 - output current x RM}

Note: In constant current control, the on resistance is not included in the calculation

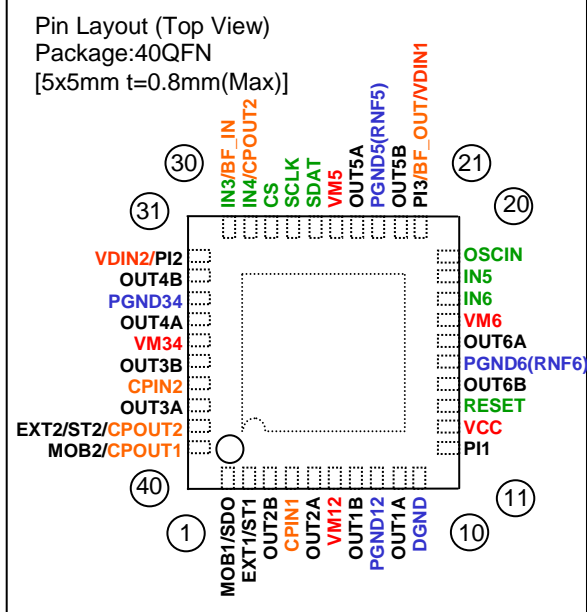
We recommend that you solder to connect the heatsink at the bottom of the package.

(To fix it to a potential, please connect with pin 10: DGND)

When the ambient temperature is 25°C or more, refer to the above figure in selecting the required heat sink.

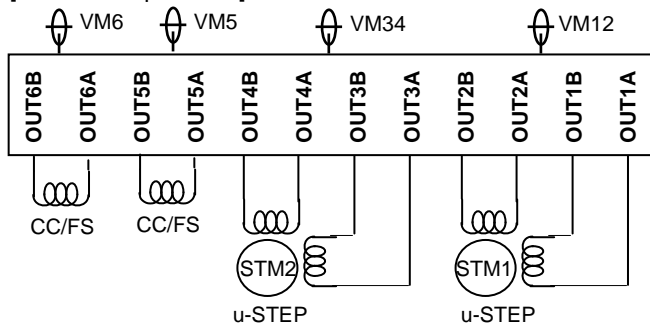
## Terminal Function Explanation

Pin No.	Pin Name	I/O	Pin Function
1	MOB1/SDO	O	MOB1/SDO output
2	EXT1/ST1	O	EXT1/ST1 output
3	OUT2B	O	Channel 2 B output
4	CPIN1	I	Comparator 1 input
5	OUT2A	O	Channel 2 A output
6	VM12	Power supply	Motor power supply for channels 1, 2
7	OUT1B	O	Channel 1 B output
8	PGND12	GND	Motor power GND for channels 1, 2
9	OUT1A	O	Channel 1 A output
10	DGND	GND	Control GND
11	PI1	O	PI driver output
12	VCC	Power supply	Control power supply
13	RESET	I	Internal logic reset
14	OUT6B	O	Channel 6 B output
15	PGND6(RNF6)	GND	Motor power GND for channel 6
16	OUT6A	O	Channel 6 A output
17	VM6	Power supply	Motor power supply for channel 6
18	IN6	I	Channels 5, 6 control
19	IN4	I/O	Channels 4, 5, 6 control /Comparator 2 output
20	OSCIN	I	Clock
21	PI3/BF_OUT /VDIN1	I/O	PI driver output/Buffer Output /VD signal input 1
22	OUT5B	O	Channel 5 B output
23	PGND5(RNF5)	GND	Motor power GND for channel 5
24	OUT5A	O	Channel 5 A output
25	VM5	Power supply	Motor power supply for channel 5
26	SDAT	I	Serial control signal
27	SCLK	I	Serial control signal
28	CS	I	Serial control signal
29	IN4	I	Channels 3, 4, 5, 6 control
30	IN3/BF_IN	I	Channels 3, 5 control/Buffer input
31	PI2/VDIN2	I/O	PI driver output/ VD signal input 2
32	OUT4B	O	Channel 4 B output
33	PGND34	GND	Motor power GND for channels 3, 4
34	OUT4A	O	Channel 4 A output
35	VM34	Power supply	Motor power supply for channels 3, 4
36	OUT3B	O	Channel 3 B output
37	CPIN2	I	Comparator 2 input
38	OUT3A	O	Channel 3 A output
39	EXT2/ST2 /CPOUT2	O	EXT2/ST2 output /Comparator 2 output
40	MOB2 /CPOUT1	O	MOB2 output /Comparator 1 output



## Actuator connection pattern(1)

[Connection pattern 1]

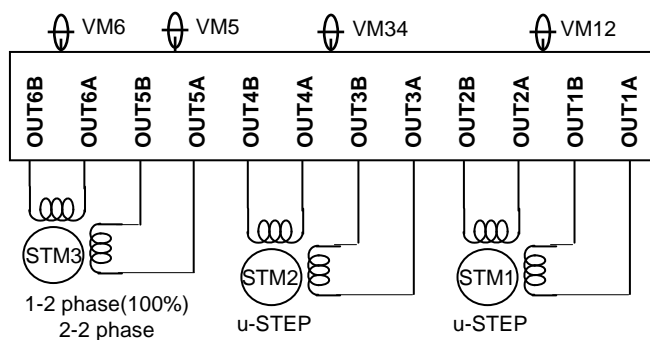


1ch	2ch	3ch	4ch	5ch	6ch
STM1	STM2	CC/FS		CC/FS	
Serial autonomous control	Serial autonomous control	1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or Serial or serial (automatic PWM) or 1line control (IN3or IN4 or IN5) FLL control serial+1line (IN3 or IN4 or IN5)		1line control (IN6) or 2line control (IN5/IN6)	

The control method of each CH is set through serial.

5ch FLL control/ automatic PWM control is only valid after FS mode is selected.

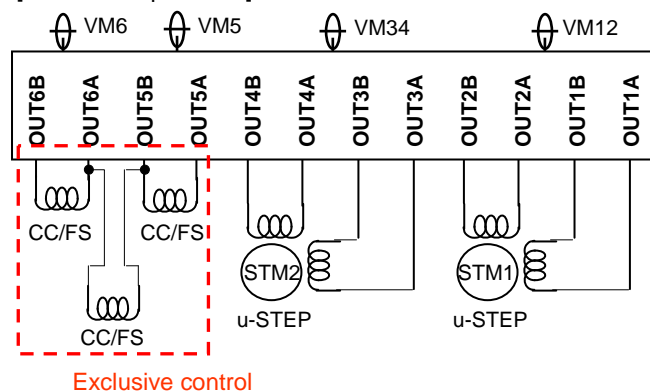
[Connection pattern 2]



1ch	2ch	3ch	4ch	5ch	6ch
STM1	STM2	STM3		CC/FS	
Serial autonomous control	Serial autonomous control	3line control (IN4/IN5/IN6) or (IN3/IN5/IN6)			

The control method of each CH is set through serial.

[Connection pattern 3]



Exclusive control

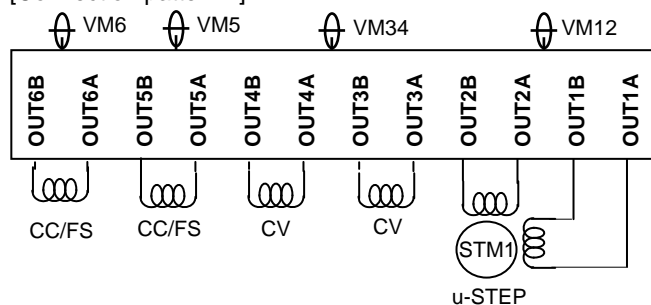
1ch	2ch	3ch	4ch	5ch	6ch	7ch
STM1	STM2	CC/FS		CC/FS		CC/FS
Serial autonomous control	Serial autonomous control	1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or serial or serial (automatic PWM) or 1line control (IN3or IN4 or IN5) FLL control serial+1line (IN3 or IN4 or IN5)		1line control (IN6) or 2line control (IN5/IN6)		Serial

The control method of each CH is set through serial.  
5ch FLL control/ automatic PWM control is only valid after FS mode is selected.

Exclusive Control  
5ch,6ch,7ch cannot be simultaneously operated.  
Only one channel is operated at a time.

## Actuator connection pattern(2)

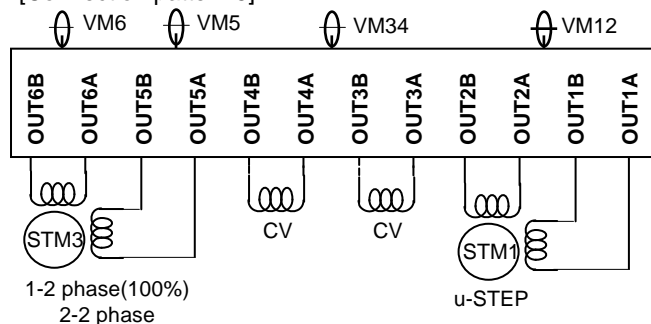
[Connection pattern 4]



1ch	2ch	3ch	4ch	5ch	6ch
STM1	CV	CV	CC/FS	CC/FS	
Serial autonomous control	1line control (IN3 or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or serial (automatic PWM) or 1 line control (IN3 or IN4 or IN5) or FLL control serial +1line (IN3 or IN4 or IN5)	1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or serial (automatic PWM) or 1 line control (IN3 or IN4 or IN5) or FLL control serial +1line (IN3 or IN4 or IN5)	1line control (IN6) or 2 line control (IN5/IN6)

The control method of each CH is set through serial.  
5ch FLL/automatic PWM control is only valid after FS mode is selected.  
For CH3 & CH4 CV, the output is from a D-class amplifier and therefore the output is full swing PWM.

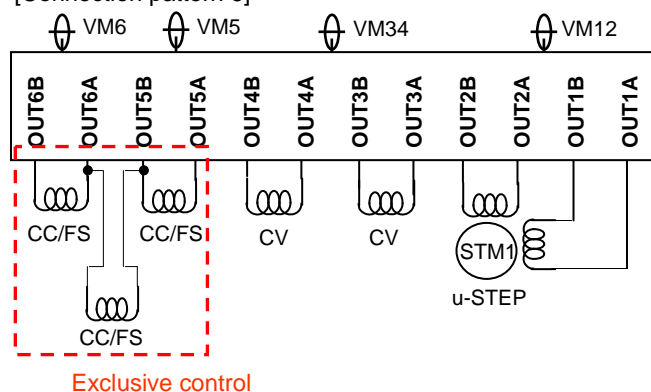
[Connection pattern 5]



1ch	2ch	3ch	4ch	5ch	6ch
STM1	CV	CV	STM3 CC/FS		
Serial autonomous control	1line control (IN3 or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or serial	3line control (IN4/IN5/IN6) or (IN3/IN5/IN6)		

The control method of each CH is set through serial.  
For CH3 & CH4 CV, the output is from a D-class amplifier and therefore the output is full swing PWM.

[Connection pattern 6]

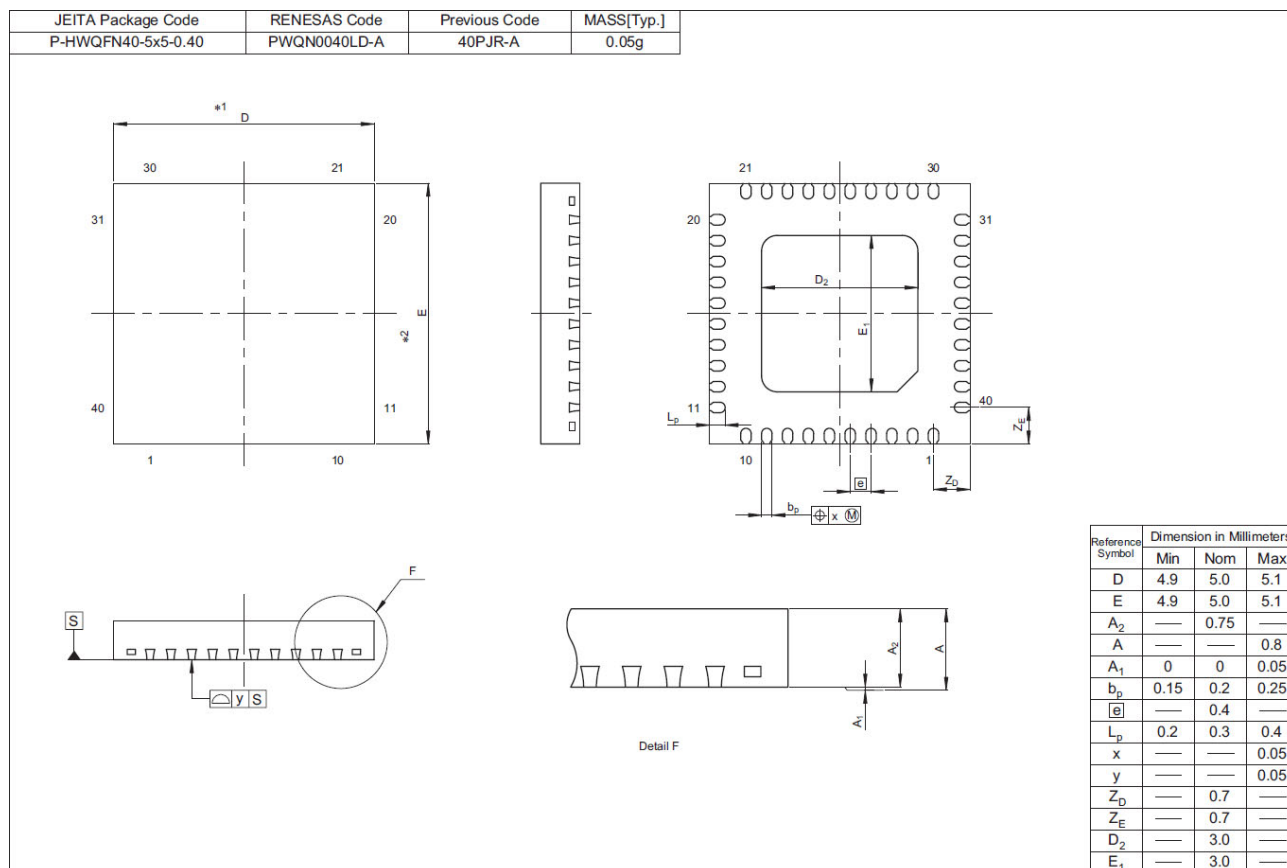


1ch	2ch	3ch	4ch	5ch	6ch	7ch
STM1	CV	CV	CC/FS	CC/FS	CC/FS	CC/FS
Serial autonomous control	1line control (IN3 or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or serial (automatic PWM) or 1 line control (IN3 or IN4 or IN5) or FLL control serial +1line (IN3 or IN4 or IN5)	1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or serial (automatic PWM) or 1 line control (IN3 or IN4 or IN5) or FLL control serial +1line (IN3 or IN4 or IN5)	1line control (IN6) or 2line control (IN5/IN6)	Serial

The control method of each CH is set through serial.  
5ch FLL/automatic PWM control is only valid after FS mode is selected.  
For CH3 & CH4 CV, the output is from a D-class amplifier and therefore the output is full swing PWM.

Exclusive Control  
5ch,6ch,7ch cannot be simultaneously operated.  
Only one channel is operated at a time.

## Package Dimensions



## Ordering Information

Orderable Part No.	Package Code	Quantity
R2A30440NP#W0	PWQN0040LD-A	5000 pcs
R2A30440NP#U0	PWQN0040LD-A	1 pc

## Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
  2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
  3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
  4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
  5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.

Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
  6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
  7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
  8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
  9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
  10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
  11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
  12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.
- (Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.
- (Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.



### SALES OFFICES

### Renesas Electronics Corporation

<http://www.renesas.com>

Refer to "<http://www.renesas.com/>" for the latest and detailed information.

**Renesas Electronics America Inc.**  
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.  
Tel: +1-408-588-6000, Fax: +1-408-588-6130

**Renesas Electronics Canada Limited**  
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada  
Tel: +1-905-898-5441, Fax: +1-905-898-3220

**Renesas Electronics Europe Limited**  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K  
Tel: +44-1628-651-700, Fax: +44-1628-651-804

**Renesas Electronics Europe GmbH**  
Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-65030, Fax: +49-211-6503-1327

**Renesas Electronics (China) Co., Ltd.**  
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

**Renesas Electronics (Shanghai) Co., Ltd.**  
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China  
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

**Renesas Electronics Hong Kong Limited**  
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong  
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

**Renesas Electronics Taiwan Co., Ltd.**  
13F, No. 363, Fu Shing North Road, Taipei, Taiwan  
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

**Renesas Electronics Singapore Pte. Ltd.**  
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre Singapore 339949  
Tel: +65-6213-0200, Fax: +65-6213-0300

**Renesas Electronics Malaysia Sdn.Bhd.**  
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia  
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

**Renesas Electronics Korea Co., Ltd.**  
11F., Samik Laved' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea  
Tel: +82-2-558-3737, Fax: +82-2-558-5141