

iW7027

16-Channel LED Driver for LCD Panel Backlighting

The **iW7027** is a versatile, 16-channel, high precision LED backlight driver for medium to large size LCD display panels.

The LED current sink MOSFETs are external, allowing maximum flexibility for different current and voltage configurations. Built-in safety features include over-temperature shutdown, open and short LED detection.

High Speed SPI daisy-chain interface simplifies the system design when multiple IW7027s are used to support more than 16 LED strings.

Scan mode provide flexible PWM mode to reduce motion blur.

Internal PLL simplifies the system requirement with only V_{SYNC} signal needed.

It uses Dialog's patented 2-pin sensing technology to realize LED short detection.

Features

- 16ch LED driver with external power MOSFET, with 5V and 9-16V(Typ =12V) input supply voltage range
- Patented BroadLED™ adaptive switch mode technology for high current matching at maximum efficiency
 - Channel Current matching accuracy $\pm 3\%$
 - Enables use of cheaper, loosely binned LED arrays for lower BOM cost
- Dynamic external Boost or Buck controller interface to optimize system power efficiency
 - Dual interface controls one or two DC-DC converters
 - Programmable LED channel assignment for individual DC-DC converters
- High speed SPI interface and SPI daisy-chain support
- PWM-generator clock
 - Internal OSC
 - External clock (HSYNC)
 - PLL-synthesized clock from external signal
- Industry only Patented Gate Sensing to detect channel short without external component
- Dimming control
 - 12-bit PWM dimming range from 0% to 99.9%
 - Supports direct PWM dimming control
- Supports Scan Mode
- Supports VSYNC frequency from 50Hz to 480Hz.
- Programmable external MOS driver slew rate
- Integrated OTP with 2 times programmable access
 - With ECC for one bit error
 - Two bit OTP error fault generation
- Programmable burn-in mode and direct PWM mode
- Supports different channel delay in all VSYNC range setting for every channel
- Comprehensive protection features
 - LED open fault detection
 - Programmable LED short level fault detection
 - Over-temperature shutdown
 - Over two OTP bits error shutdown
 - Microcontroller interruption interface

Applications

- LED backlighting for LCD-TV sets and LCD monitors

1. Overview

1.1 Typical Application

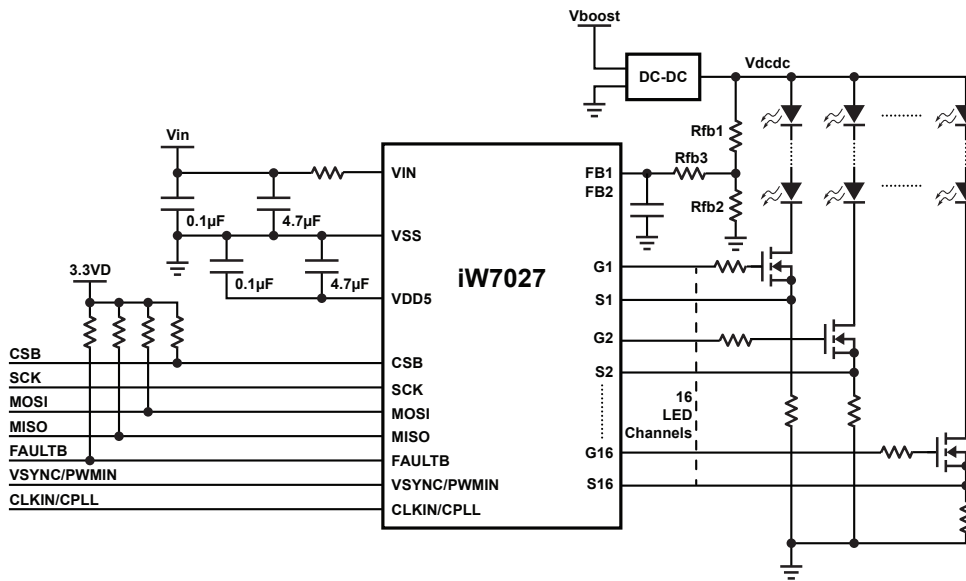


Figure 1. iW7027 Typical Application 1 Boost Diagram

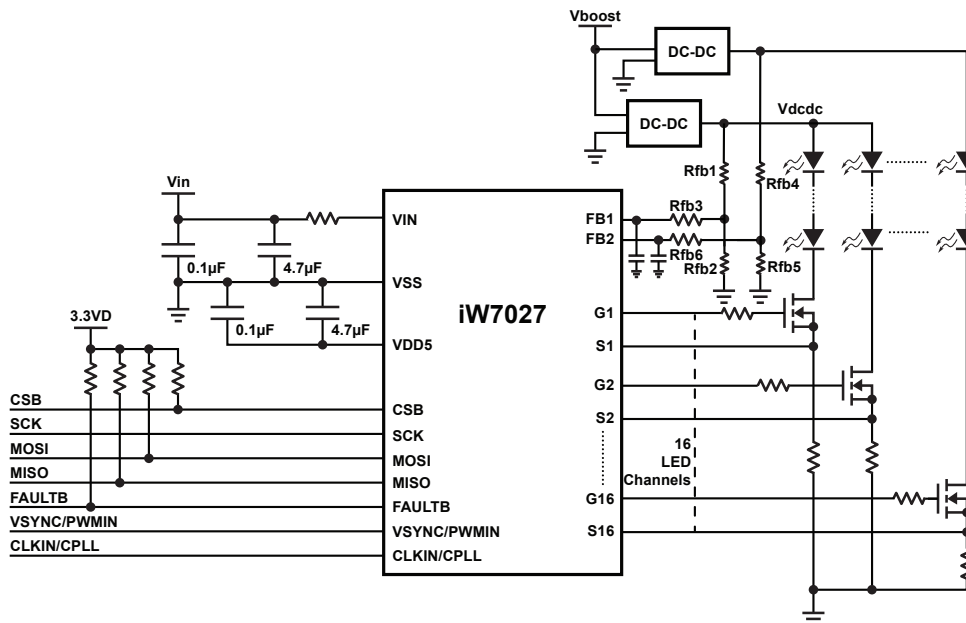


Figure 2. iW7027 Typical Application 2 Boost Diagram

2. Pin Information

2.1 Pin Assignments

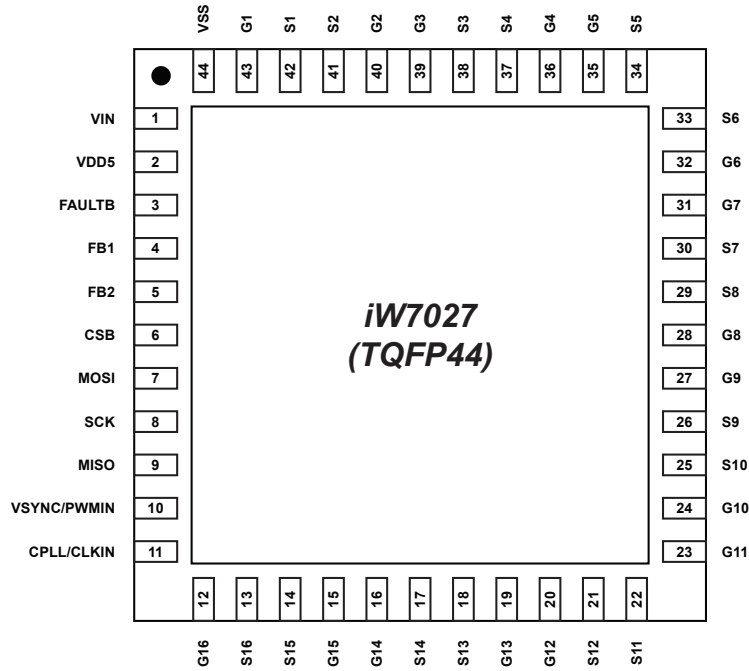


Figure 3. iW7027 Pin Configuration for TQFP44 Package Top View

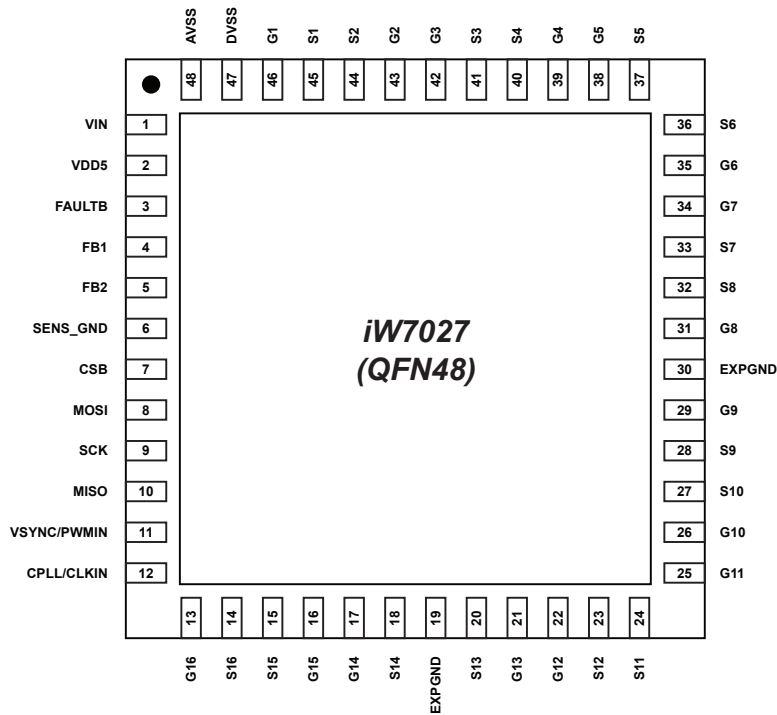


Figure 4. iW7027 Pin Configuration for QFN48 Package Top View

2.2 Pin Description

Pin Number		Pin Name	Type	Description
TQFP44	QFN48			
1	1	VIN	Supply Input	Input voltage to the main supply rail
2	2	VDD5	Analog Output	5V input and LDO Compensation Pin
3	3	FAULTB	Analog Output	Fault status (Active Low) - Open drain. pull-up to 5V with a 100KΩ resistor
4	4	FB1	Analog Output	Analog DAC output interface with external Buck or Boost converter for LED
5	5	FB2	Analog Output	Analog DAC output interface with external Buck or Boost converter for LED
	6	SENS_GND	Sense Ground	Sense ground for ILED, Connect to external R _{SENSE} ground
6	7	CSB	Digital Input	Slave select input for SPI (Chip Select Bar). Active LOW
7	8	MOSI	Digital Input	Master output, slave input for SPI
8	9	SCK	Digital Input	SCK, serial clock input for Serial Peripheral Interface (SPI)/Indirect PWM mode, can be reused as PWM In
9	10	MISO	Digital 3 State Output	Master input, slave output for SPI
10	11	VSYNC/PWMIN	Digital Input	VSYNC clock input in SPI dimming mode
11	12	CPLL/CLKIN	Analog In/Out	PLL compensation output/External Clock In
12	13	G16	Analog Output	Gate of external MOSFET
13	14	S16	Analog Input	Source of external MOSFET
14	15	S15	Analog Input	Source of external MOSFET
15	16	G15	Analog Output	Gate of external MOSFET
16	17	G14	Analog Output	Gate of external MOSFET
17	18	S14	Analog Input	Source of external MOSFET
XXXX	19	EXPGND	Analog Ground	Ground for ILED. Connected to External R _{SENSE} Ground
18	20	S13	Analog Input	Source of external MOSFET
19	21	G13	Analog Output	Gate of external MOSFET
20	22	G12	Analog Output	Gate of external MOSFET
21	23	S12	Analog Input	Source of external MOSFET
22	24	S11	Analog Input	Source of external MOSFET
23	25	G11	Analog Output	Gate of external MOSFET
24	26	G10	Analog Output	Gate of external MOSFET
25	27	S10	Analog Input	Source of external MOSFET
26	28	S9	Analog Input	Source of external MOSFET
27	29	G9	Analog Output	Gate of external MOSFET
XXXX	30	EXPGND	Analog Ground	Ground for ILED, Connect to External R _{sense} Ground
28	31	G8	Analog Output	Gate of external MOSFET
29	32	S8	Analog Input	Source of external MOSFET
30	33	S7	Analog Input	Source of external MOSFET
31	34	G7	Analog Output	Gate of external MOSFET
32	35	G6	Analog Output	Gate of external MOSFET

Pin Number		Pin Name	Type	Description
TQFP44	QFN48			
33	36	S6	Analog Input	Source of external MOSFET
34	37	S5	Analog Input	Source of external MOSFET
35	38	G5	Analog Output	Gate of external MOSFET
36	39	G4	Analog Output	Gate of external MOSFET
37	40	S4	Analog Input	Source of external MOSFET
38	41	S3	Analog Input	Source of external MOSFET
39	42	G3	Analog Output	Gate of external MOSFET
40	43	G2	Analog Output	Gate of external MOSFET
41	44	S2	Analog Input	Source of external MOSFET
42	45	S1	Analog Input	Source of external MOSFET
43	46	G1	Analog Output	Gate of external MOSFET
44	XXXX	VSS	Ground	Chip ground
	47	DVSS	Ground	Digital Ground
	48	AVSS	Ground	Analog Ground
		EPGND	Ground	Thermal PAD

3. Specifications

3.1 Absolute Maximum Ratings

CAUTION: Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions can adversely impact product reliability and result in failures not covered by warranty.

Parameter	Symbol	Comments	Min	Max	Unit
VDD5 supply voltage	V_{IN}	-0.3 to 7	-0.3	7	V
V_{IN} supply voltage		-0.3 to 20	-0.3	20	V
VSSA		-0.3 to 0.3	-0.3	0.3	V
Logic I/O pins (SCK, SDO, SDI, CSB, & VSYNC)		-0.3 to 7	-0.3	7	V

3.2 ESD Ratings

ESD Model/Test	Symbol	Rating	Unit
Human Body Model (Tested per JS-001-2017)	ESD_{HBM}	± 2000	V
Latch-Up (Tested per JESD78E; Class 2, Level A)	I_{SCR}	>100	mA

3.3 Recommended Operating Conditions

Parameter	Symbol	Comments	Min	Typ	Max	Unit
V_{IN} supply voltage			4.5/9	5/12	5.5/16	V
VDD5 supply voltage			4.5	5	5.5	V
Operate temperature (Co-operate)			-40		90	°C

3.4 Thermal Specifications

Thermal Resistance (Typical)	θ_{JA} (°C/W)	θ_{JC} (°C/W)
TQFP44 package	TBD	TBD
QFN48 package	TBD	TBD

Parameter	Symbol	Minimum	Maximum	Unit
Maximum Junction Temperature	T_J	-40	+150	°C
Maximum Storage Temperature Range	T_{STRG}	-40	+150	°C

4. Package Outline Drawings

The package outline drawings are located at the end of this document and are accessible from the Renesas website. The package information is the most current data available and is subject to change without revision of this document.

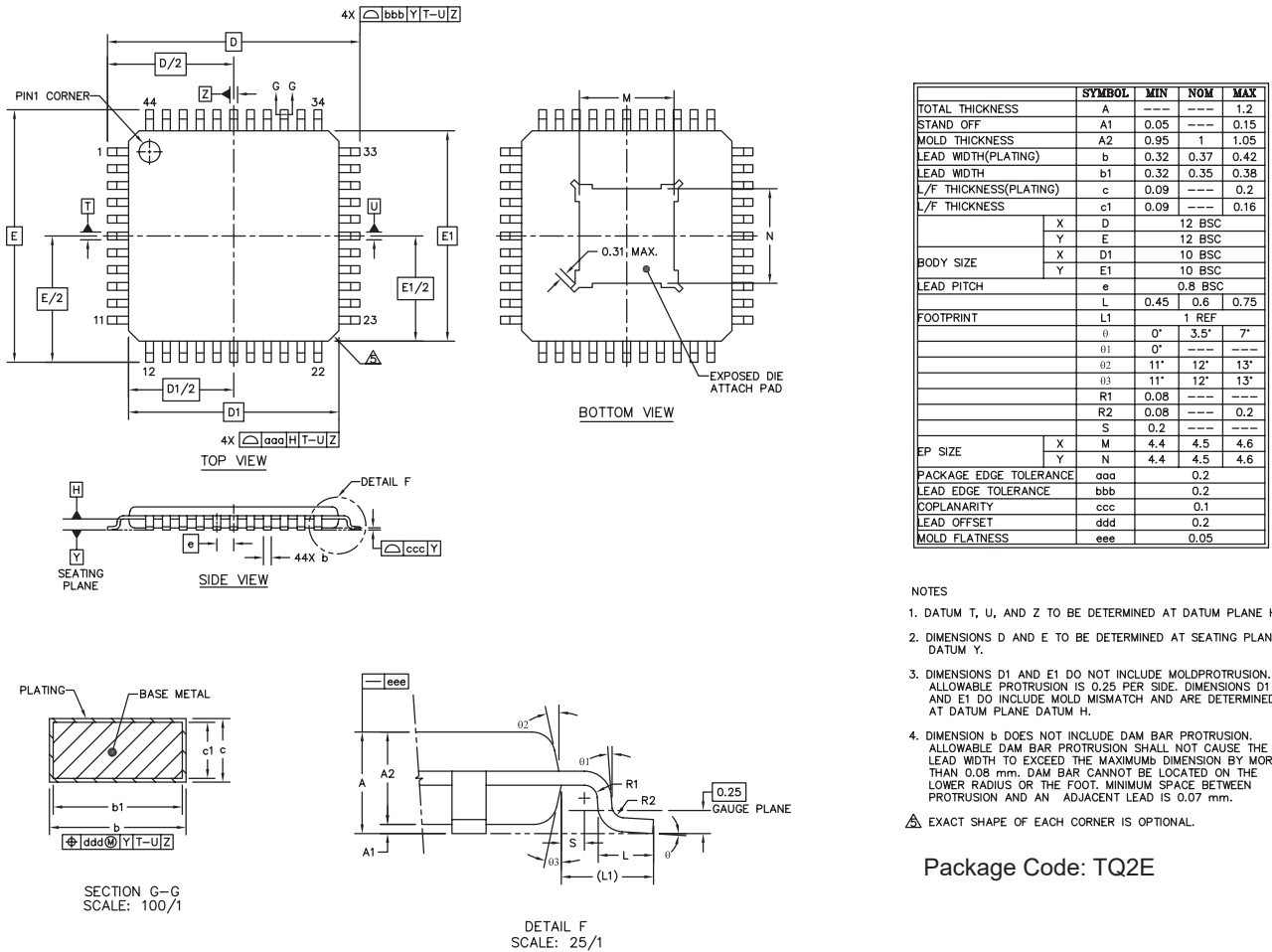


Figure 5. TQFP-44 Package Outline Drawing

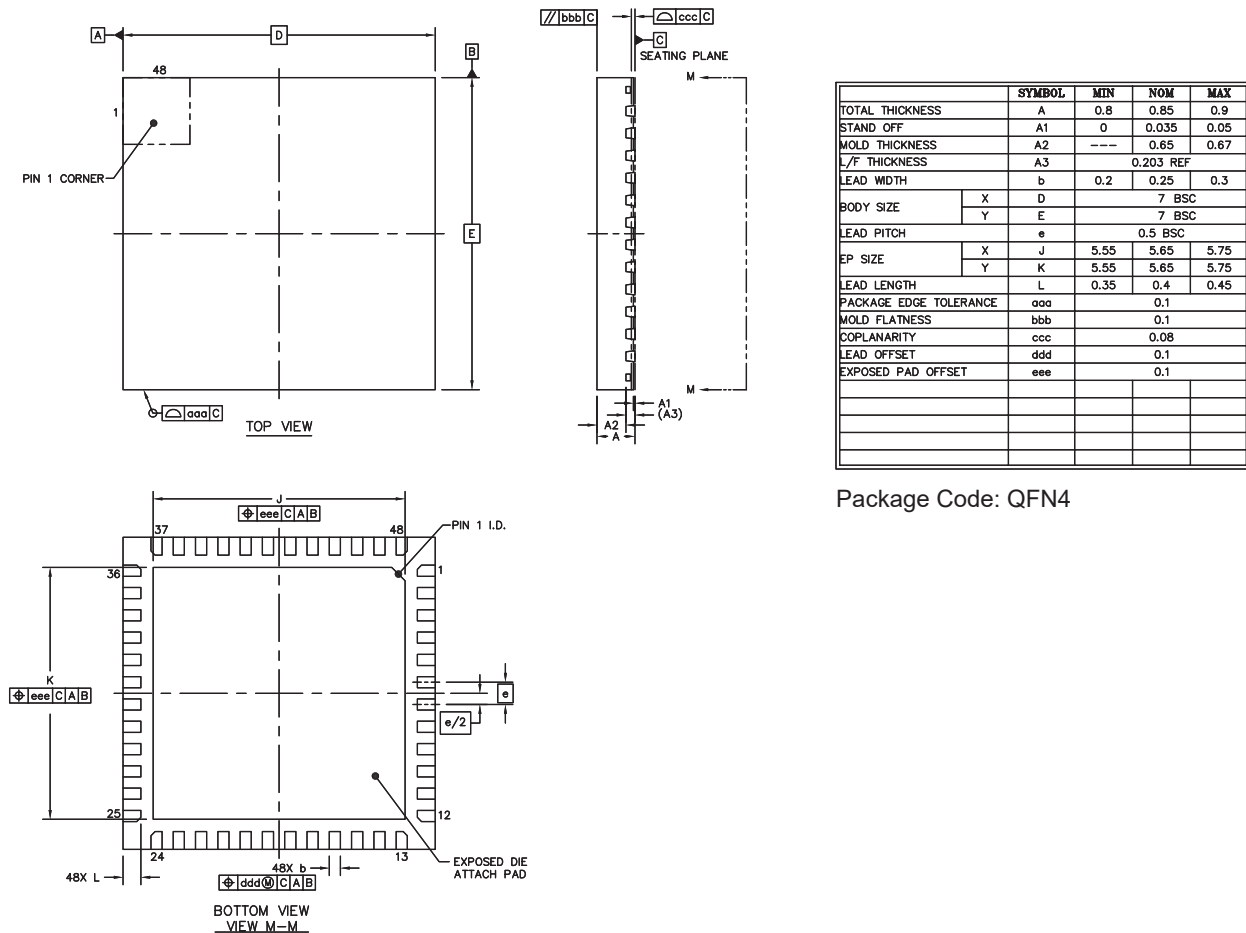


Figure 6. QFN-48 Package Outline Drawing

5. Ordering Information

Part Number	Package	Description
iW7027-00-QFN4	QFN-7m-48L	Tape & Reel ¹
iW7027-00-TQ2E	TQFPEP-10m-44L	Tray ²
iW7027-00-TQ2E-1	TQFPEP-10m-44L	Tape & Reel ³

1. Tape & Reel packing quantity is 4,000/reel. Minimum packing quantity is 4,000.
2. Tray packing quantity is 1,600 units in 10 trays/box. Minimum ordering quantity is 1,600 units.
3. Tape & Reel packing quantity is 1,250/reel. Minimum ordering quantity is 1,250.

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

© 2024 Renesas Electronics Corporation. All rights reserved.

(Disclaimer Rev.1.01 Jan 2024)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit: www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.