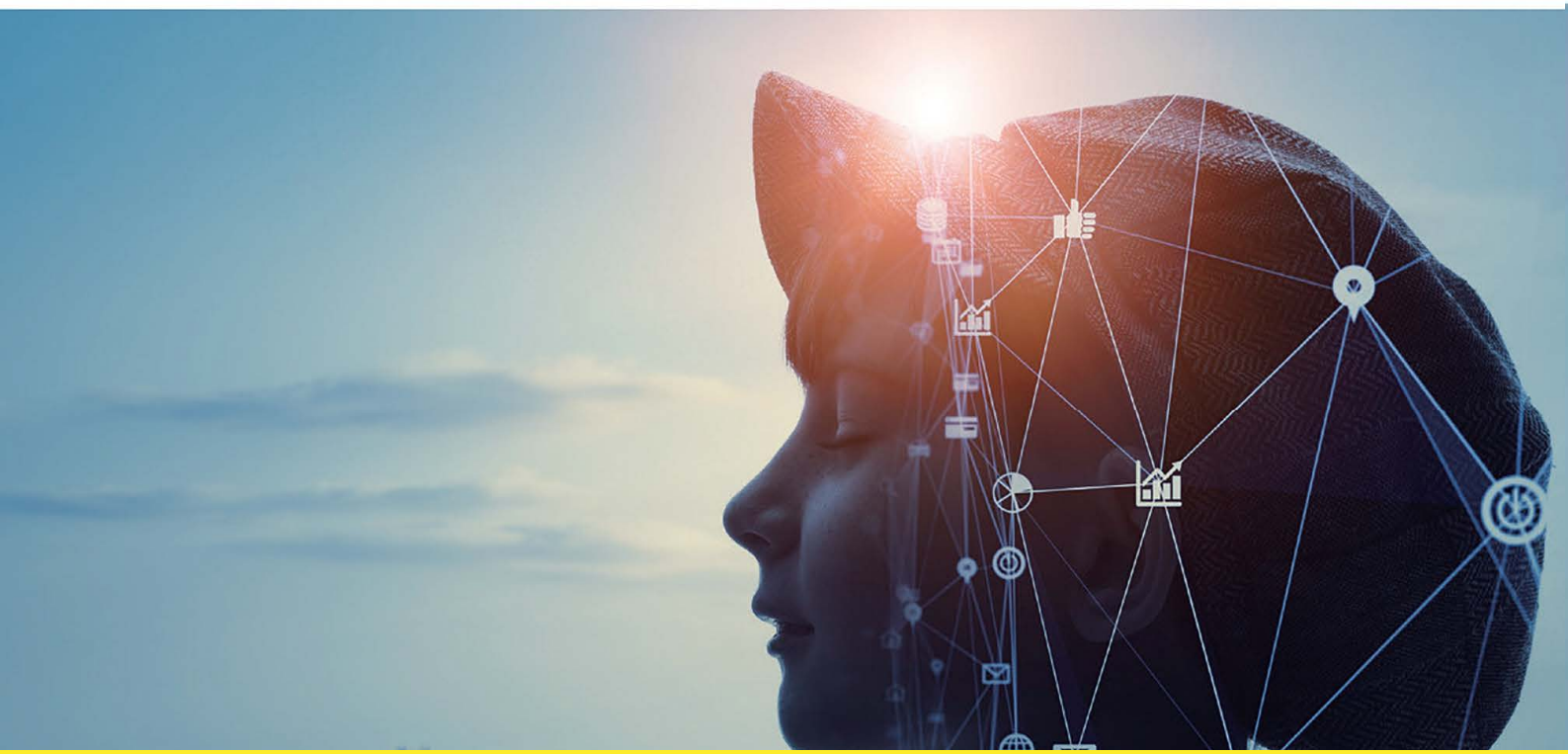
RICOH
imagine. change.

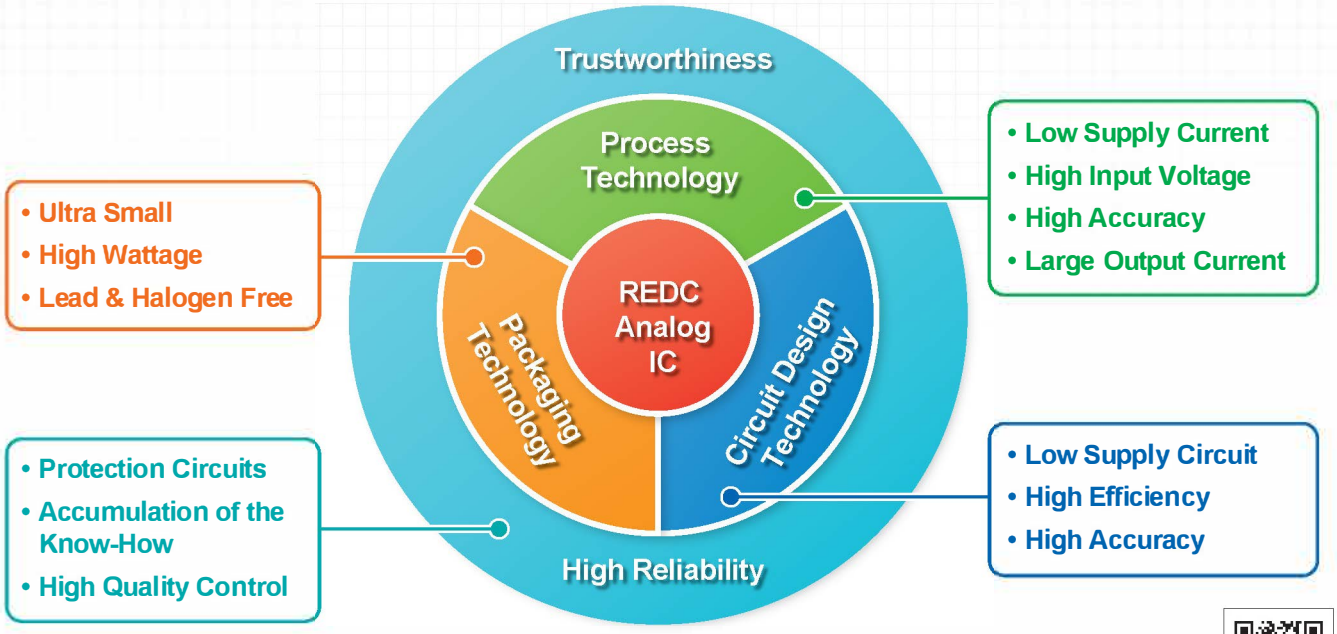
Electronic Device Product Selection Guide 2020



Electronic Devices Selection Guide

Introduction

Ricoh Electronic Devices Co., LTD. (REDC) offers safe and trusted high-performance CMOS analog devices developed by using our unique manufacturing process and circuitry technologies as well as the latest mounting technology. We promise that our devices can contribute to creating power-saving, small-sizing, high-precision and high-reliability products.



RICOH ELECTRONIC DEVICES Official Website:
https://www.n-redc.co.jp/en/

Definition of Marks

These are the definition of marks used in this selection guide.

- : Products Newly Released
- : Products in Development
- H/F : Halogen-free
- Rxxxx : Succeeding Products
- Automatic : Automatic Shift to ECO Mode
- Manual : Manual Shift to ECO Mode
- Manu/Auto : Manual/Automatic Shift to ECO Mode
- Seamless : Seamless Shift to ECO Mode
- Thermal : Thermal Shutdown Circuit
- Constant : Constant Slope Circuit
- Reverse : Reverse Current Protection Circuit
- Soft-Start : Soft-start Circuit
- Inrush : Inrush Current Limit Circuit
- OVLO : Overvoltage Lockout Circuit
- UVLO : Undervoltage Lockout Circuit
- OVP : Overvoltage Protection Circuit
- Shutdown : Shutdown Function
- Discharge : Auto-discharge Function
- Anti-Ringing : Anti-ringing Switch
- Phase : Phase Compensation

- ● : Available in Automotive Products
- ■ : Available in Industrial Products
- ♡ : Products available in PRODUCT LONGEVITY PROGRAM
- ♡xxxx : Products available in PRODUCT LONGEVITY PROGRAM with time limit
- ◆ : Conditions are based on JEDEC STD.
- Sequencing : Start-up Sequencing Control
- Maxduty : Maximum Duty Cycle
- LED Adjust : High-speed LED Adjustment
- Single-Wire : Single Wire Interface
- Diode : Diode Rectification
- Synchro : Synchronous Rectification
- TempCo : Output Voltage Temperature Coefficient
- Ripple : Ripple Rejection, Frequency = 1 kHz
- Load Reg : Load Regulation
- Peak : Peak Voltage, Application Time = 200 ms or less
- SSCG : Spectrum Diffusion Type Oscillator
- PG : Power Good Function
- Tantalum : Tantalum Capacitor
- High Immunity : Enhanced Noise Immunity
- +VD : with Voltage Detector (Reset IC) Function
- +BM : with Battery Monitor Assist Function
- Dual : Dual Channel
- Triple : Triple Channel
- Quadruple : Quadruple Channel

Index

Special Contents on REDC website

Announcement of New Website and URL

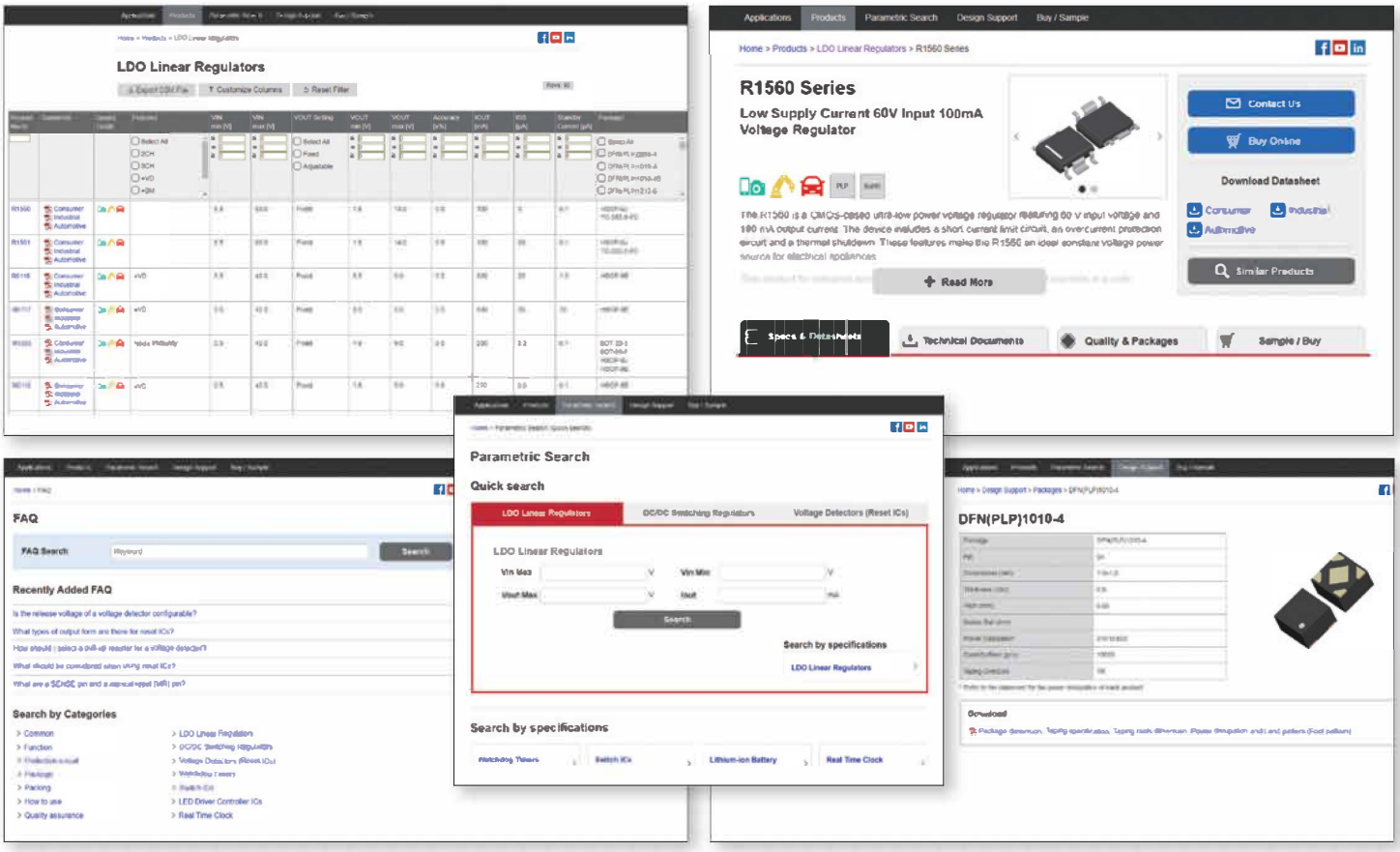
We Ricoh Electronic Devices Co., Ltd. are pleased to inform you that our official website has been renewed since February 12, 2020. We have paid much attention to making the website more visible and more comfortable for customers to use.

Along with the renewal, the URL and addresses have changed.
We would appreciate it if you bookmark the new one instead of the previous one.

Previous URL: https://www.e-devices.co.jp/en/
New URL: https://www.n-redc.co.jp/en/

From now on, we will continue to improve our website and make it more valuable for our customers.

Welcome to new website!



ZOOM

OFFICIAL SNS

Follow us!

You can check it out on YouTube.
Please take a look!

Products for IoT/Energy Harvesting

Products in Development

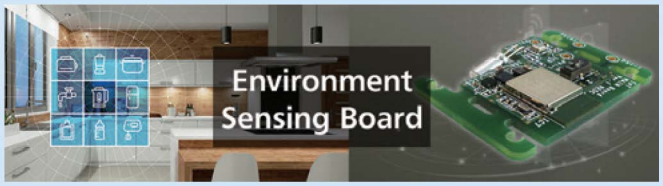
Ricoh Electronic Devices Co., Ltd. (REDC) offers small-size and high-accuracy products designed for IoT and energy harvesting.
See the individual product page for more details.

Ultra-Low Power Consumption	Step-down DCDC	RP511/RP512 (P.21) ·····V_{IN}=2.0V to, **Iq=0.3μA**, I_{OUT}=up to 100mA/ up to 300mA
		RP514/RP515+BM (P.20) ·····V_{IN}=1.8V to, **Iq=0.3μA** (+BM:0.1μA), I_{OUT}=up to 100mA/ up to 300mA
		RP516/RP517 (P.20) ·····V_{IN}=1.8V to, **Iq=0.3μA**, I_{OUT}=up to 100mA/ up to 300mA, V_{OUT}=0.3V to
	Step-Up/Down DCDC	RP604 (P.25) ·····V_{IN}=1.8V to, **Iq=0.3μA**, I_{OUT}=up to 300mA
		RP605+BM (P.25) ·····V_{IN}=1.8V tp, **Iq=0.3μA** (+BM:0.1μA), I_{OUT}=up to 300mA
	LDO	RP118 (P.12) ·····V_{IN}=1.7V to, **Iq=0.2μA**, I_{OUT}=up to 100mA
		RP124+BM (P.12) ·····V_{IN}=1.7V to, **Iq=0.2μA** (+BM:0.1μA), I_{OUT}=up to 100mA
Low Noise	LDO	RP122 (P.14) ·····V_{IN}=1.9V to, Iq=9.5μA, I_{OUT}=up to 400mA, **8μVrms, 90dB@1kHz**
		RP123 (P.14) ·····V_{IN}=1.9V to, Iq=9.5μA, I_{OUT}=up to 250mA, **8μVrms, 90dB@1kHz**
	Negative Voltage LDO	RP117 (P.12) ·····V_{IN}=-10.0V to -2.5V, I_{OUT}=100mA, **16μVms, 80dB@1kHz**, V_{OUT}=-5.5V to -1.0V
Energy Harvesting	Step-Down DCDC for Storage	R1800 (P.22) ·····V_{IN}=2.0V to, **Iq=144nA**, I_{OUT}=1mA, **PST=720nW**
		R1801 (P.22) ·····V_{IN}=2.2V to, **Iq=200nA**, I_{OUT}=1mA, **PST=1000nW**
	Step-Up DCDC for Storage	R1810 (P.24) ·····V_{IN}=0.35V to, **Iq=600nA**, I_{OUT}=1mA, **PST=9μW**

+BM : with Battery Monitor Assist Function

RIoT Environment Sensing Board

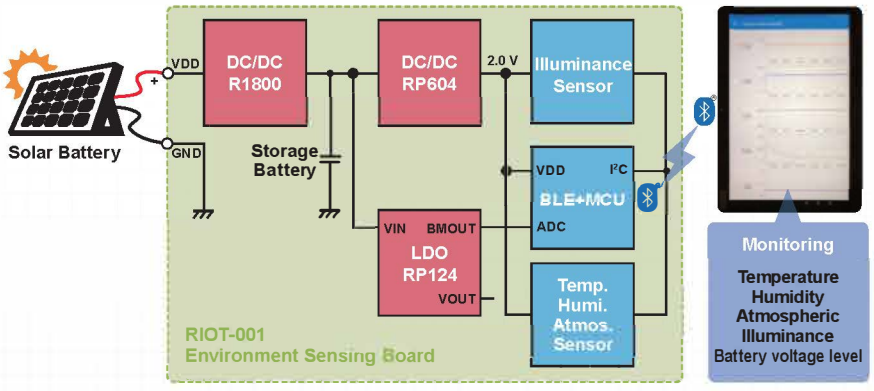
The RIOT-001 is an environment sensing board which monitors ambient temperature, humidity, air pressure, and illuminance. The information it transmits with its Bluetooth Low Energy (BLE) can be displayed on smartphones or tablets where an application programmed for it is installed.



The RIOT-001 contains our ultra-low supply current and low noise power management ICs and achieves independent power generation, prolongation of battery operating time, and high-accuracy sensing, all of which IoT edge devices require. The new sensing board can make it easy to develop new IoT edge devices and contributes to shortening the construction period of those devices.

Features

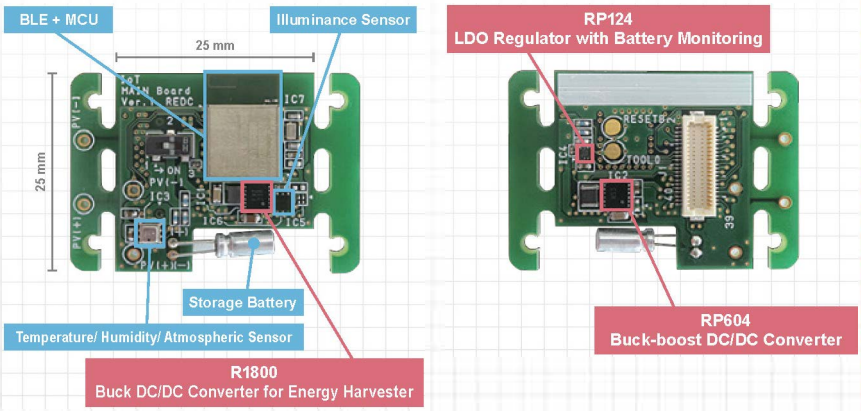
- Charging from Solar Battery to Secondary Battery
- High-efficiency Operation
- Battery Monitoring with Low Power Consumption
- Maintenance-free Operation



RIOT-001: Environment Sensing Board

For more information on hardware, software and mounting products, please visit our website.

https://www.n-redc.co.jp/en/applications/iot-module/environment-sensor/



Special Contents on Industrial Application

3 APPROACHES TO INDUSTRIAL EQUIPMENT FIELD

- LONG-TERM SUPPLY
- FLEXIBLE PURCHASE
- HIGH QUALITY AND RELIABILITY

1 Long term supply

REDC products can be supplied for 10 years. EOL products can also be purchased.

Product Longevity Program

REDC has Product Longevity Program (PLP) that makes our products being supplied for 10 years. By using products under PLP, customers can make a long-term production plan.

For details, please visit WEB.

Partnership with EOL products distributor

Even if REDC products are discontinued, it is possible to purchase our products from Rochester dealing with EOL products.

For details, please visit WEB.

2 Flexible quantity purchase

REDC products can be purchased in unit of one piece.

Electronic parts are usually sold on a reel basis which contains 3,000 pieces or 5,000 pieces parts.
Since 1 reel quantity is way more than the average production quantity of industrial equipment, handing the leftover parts often becomes trouble from time and cost point of view.
REDC is offering choices that customers can purchase the necessary quantity when needed.

Buy Online

Customers can also purchase REDC products from 1 piece.

MOUSER ELECTRONICS　Digi-Key ELECTRONICS　chip 1 stop An Arrow Company

For details, please visit WEB.

PRODUCT LONGEVITY PROGRAM PLP

For long life applications, sudden production end of parts can have a critical impact on the continuity of equipment's production. It also brings costly steps such as investigation/procurement of alternative parts and redesign of the board due to parts change. We are operating PLP (Product Longevity Program) to minimize the risk of customers.
PLP maintains the products supply for at least 10 years.
Customers receive one year advanced notice when PLP product finally becomes EOL after 10 years.
PLP prodcut list is updated in January every year by checking each condition of related product line and material supply.
By using products under PLP, customers can make a long-term production plan.

1. Applicable Products *1	The heart mark, ♡ shows applicable products.
2. Supply Period	We maintain supply of the Applicable Products for ten years from January, 2020.
3. Update	We update the Product List in January every year.
4. EOL	We provide you one year or more advanced notice when Applicable Products be come EOL.

*1 Applicable Products posted on the WEB site. https://www.n-redc.co.jp/en/design-support/plp/

RICOH ELECTRONIC DEVICES 3 approaches to industrial equipment field

- **Investigating of substitute parts and redesign of board circuit caused by electronic parts EOL (End Of Life)**
- **Handling troublesome board design and development with variety of small quantity equipment**
- **Finding available channels for purchasing parts in small quantity**
- **Assuring safety and reliability in long-term operation**
- **Maintaining stable operation under severe temperature environment**

**There are many problems peculiar to industrial equipment with long product life cycle.
Ricoh Electronic Devices Co., Ltd. carries out 3 methods to address the problems in such industrial equipment fields.**

Notes: For details of the Special feature "RICOH's 3 approaches to industrial equipment field", please visit HP.
https://www.n-redc.co.jp/en/applications/industrial-approach/

3 High quality and reliability

REDC products can help stable operation in harsh environments.

Some industrial equipment is used in high temperature environment and some industrial equipment is used in extremely cold area to the contrary.

It is vital, therefore, it functions even under severe temperature environment and REDC guarantees operation with high quality over a wide temperature range.

High temperature / low temperature tolerance products

REDC is offering products with operation temperature at -50°C or 125°C.

For details, please visit WEB.

High quality achievements

REDC decides quality policy based on our mission, offering "reliable, satisfying and exciting" products.
We have achieved a market return rate of 0.1 ppm or less, while billions of power management IC products are shipped annually.

For details, please visit WEB.

Power Management ICs Meeting Industrial Needs

Suitable Power Management ICs to Meet Rising Demands for Industrial Equipment

In order to achieve stable production in automated factories with industrial equipment including robots, a high level of safety, high noise immunity, and improvement of energy efficiency are required for those instruments.
Ricoh Electronic Devices has a wide variety of power management ICs that can meet various needs of customers.
The 2nd industrial special content! Please see here for the detail.
https://www.n-redc.co.jp/en/applications/industrial-safety/

Products Focusing on Functional Safety

LDO	R5116 Series, R5117 Series, R1525 Series
Reset IC	R3152 Series, R3154 Series*1, R3500 Series*1
WDT	R5115 Series

High-voltage Resistant ICs

LDO	R1560 Series, R1561 Series
Reset IC	R3160 Series

*1 Under development, as of March 2020

Products for Industrial

This is a high-reliability semiconductor device for industrial applications (-Y) that has passed both the screening at high temperature and the reliability test with extended hours. These products operate in a wide temperature range from low temperature (-40°C or -50°C) to high temperature (105°C or 125°C) to support harsh environment applications.

Grade

Grade	Rank	Application	Operating Temperature Range	TjMAX	Operating Temperature Range	Reliability Test Time	Product Traceability
Industrial	Y	**Industrial Equipment**	**-40°C to 105°C -50°C to 125°C**	**125°C 150°C**	**25°C, High**	**2,000h**	**Sales*1 Manufacturing*2**
Consumer	—	**General Electronic Products**	**-40°C to 85°C -40°C to 105°C 125°C**	**125°C**	**25°C**	**1,000h**	**Sales*1**
Automotive	R8	Safety-critical Parts (Driving Control System)	-40°C to 110°C 125°C	150°C	Low, 25°C, High	2,000h	Sales*1 Manufacturing*2
	H J K	General Equipment (Body System)	-40°C to 85°C -40°C to 105°C -40°C to 125°C		Low, 25°C, High		
	A	Accessories	-40°C to 85°C 105°C 125°C		25°C, High		

*1 Sales Traceability System is capable of controlling the warehousing and shipping of products, managing the first-in first-out method and tracking a destination of products by using lot numbers.
*2 Manufacturing Traceability System is capable of managing the production history and tracking the source materials and manufacturing devices by using lot numbers.

: Products Newly Released : Products in Development ♡ : Products available in PRODUCT LONGEVITY PROGRAM

LDO Linear Regulators

Product Name	Operating Temperature Range (°C)	Output Current (mA)	Input Voltage Range (Absolute Max. Ratings) (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current (µA) Typ.	Other Features	Package
R1560x-Y ♡	**-50** to **125**	100	5.5 to **60.0** (80.0)	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 7.0, 8.0, 9.0, 10.0, 12.0, 14.0	**±0.8**	1.5	3.0	IOUT=100mA VSET=5.0V	**3**	Peak : 90V Thermal COUT=0.1µF	HSOP-6J TO-252-5-P2
R1561x-Y ♡	**-50** to **125**	100	5.5 to **60.0** (80.0)	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 7.0, 8.0, 9.0, 10.0, 12.0, 14.0	**±0.8**	1.3	2.5	IOUT=100mA VSET=5.0V	20	Peak : 90V Thermal	HSOP-6J TO-252-5-P2
RP130x-Y ♡	-40 to 105	150	1.7 to 6.5 (7.0)	1.2, 1.5, 1.8, 2.5, 2.8, 2.9, 3.0, 3.3, 3.4, 3.6, 4.2, 5.0	±1	0.32	0.51	IOUT=150mA	38	TempCo : ±20ppm/°C Ripple : 80dB Discharge : Ver.D	DFN(PLP)1010-4 SOT-23-5
RP171N-Y ♡	-40 to 105	150	2.6 to 10.0 (12.0)	1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 6.0	±1	0.4	0.6	IOUT=150mA	23	Thermal Discharge : Ver.D Constant Ripple : 70dB	SOT-23-5
R1180x-Y ♡	**-50** to 105	150	1.7 to 6.0 (6.5)	1.2, 1.5, 1.8, 2.3, 2.5, 2.8, 3.0, 3.3, 3.4	±2	0.25	0.40	IOUT=150mA	**1**	COUT=0.1µF	SON1612-6 SOT-23-5
R1514x-Y ♡	-40 to 105	150	4.0 to **36.0** (50.0)	2.5, 2.8, 3.0, 3.4, 5.0, 6.0, 8.0, 8.5, 9.0, 12.0	±2	0.20	0.35	IOUT=20mA VSET=5.0V	**9**	Peak : 60V Thermal	SOT-89-5 HSOP-6J
R5112S-Y +VD ♡	-40 to **125**	200	3.5 to **42.0** (50.0)	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0 Ver.B: 1.6 to 4.8, Ver.D: 2.9 to 4.8, Detector Threshold Range	**±0.6** VD: **±0.6**	0.6	1.2	IOUT=200mA VSET=5.0V	**3.8**	Peak : 60V Thermal COUT=0.1µF	HSOP-8E
R1524x-Y ♡	**-50** to **125**	200	3.5 to **36.0** (50.0)	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 5.5. 6.0, 6.4, 7.0, 8.0, 8.5, 9.0, 10.0, 10.5, 11.0, 12.0	**±0.6**	0.6	1.2	IOUT=200mA VSET=5.0V	**2.2**	Peak : 60V Thermal COUT=0.1µF	DFN(PLP)1820-6 SOT-23-5 SOT-89-5 HSOP-6J HSOP-8E
R1525x-Y ♡	**-50** to **125**	200	3.5 to **42.0** (50.0)	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 5.5, 6.0, 6.4, 8.0, 8.5, 9.0, 10.0, 10.5, 11.0, 12.0	**±0.6**	0.6	1.2	IOUT=200mA VSET=5.0V	**2.2**	Peak : 60V Thermal High Immunity COUT=0.1µF	DFN(PLP)1820-6 SOT-23-5 SOT-89-5 HSOP-6J HSOP-8E
RP170x-Y ♡	**-50** to 105	300	2.6 to 10.0 (12.0)	1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 6.0	±1	0.770	1.185	IOUT=300mA	23	Ripple : 70dB Thermal Constant Discharge : Ver.D	SOT-23-5 SOT-89-5
R1511x-Y ♡	-40 to 105	300	3.5 to **36.0** (50.0)	3.0, 3.3, 3.4, 5.0, 6.0, 8.0, 8.5, 9.0 3.0 to 12.0, Ext.Adjustable	±1 ±30mV	0.64	1.0	IOUT=300mA VSET=5.0V	100	Peak : 60V Thermal	HSOP-6J TO-252-5-P2
R1513S-Y ♡	-40 to **125**	300	3.5 to **36.0** (50.0)	1.2, 1.5, 1.8, 3.3, 3.4, 5.0 1.2 to 18.0, Ext.Adjustable	**±0.8**	0.32	0.60	IOUT=300mA VSET=5.0V	75	Thermal Peak : 60V Ripple : 70dB Discharge : Ver.D	HSOP-6J
R1526S-Y	**-50** to **125**	300	3.5 to **42.0** (50.0)	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 5.5, 6.0, 6.4, 7.5, 8.0, 8.5, 9.0	**±0.6**	0.4	0.75	IOUT=300mA VSET=5.0V	25	Peak : 60V Thermal High Immunity	HSOP-8E
RP154x-Y Dual ♡	-40 to 105	300	1.4 to 5.25 (6.0)	**0.8** to 3.7	±1	0.25	0.32	IOUT=300mA	50*2	Ripple : 75dB Discharge : Ver. B	DFN1216-8 DFN2020-8 SOT-23-6
RP111x-Y ♡	-40 to 105	500	1.4 to 5.25 (6.0)	**0.7**, 1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3, 3.4 **0.7** to 3.6, Ext.Adjustable	**±0.8**	0.23	0.34	IOUT=500mA	80	Load Reg : Typ. 1mV Thermal Inrush Ripple : 75dB TempCo : Typ.±30ppm/°C response accuracy*3: Typ.-75mV/+45mV Discharge : Ver.D	DFN1212-6 SOT-23-5 SOT-89-5

Product Name	Operating Temperature Range (°C)	Output Current (mA)	Input Voltage Range (Absolute Max. Ratings) (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current (µA) Typ.	Other Features	Package
R5116S-Y +VD R5116L-Y +VD	-50 to 125	500	3.5 to 42.0 (50.0)	3.3 to 5.0 UD: 2.5 to 5.0, OV: 3.3 to 5.5, Detector Threshold Range	±0.5 VD: ±0.5	0.9	1.5	IOUT=500mA VSET=5.0V	25	Built-in Window VD Released Hysteresis: 0.7% (Max.) Peak : 60V Thermal	HSOP-8E HQFN0808-28
R5117S-Y +VD R5117L-Y +VD	-50 to 125	500	3.5 to 42.0 (50.0)	3.3 to 5.0 SVD: 2.5 to 5.0, BVD: 3.5 to 12.0. Detector Threshold Range	±0.5 SVD: ±0.5 BVD: ±0.8	0.9	1.5	IOUT=500mA VSET=5.0V	35	Built-in Dual VD SVD Released Hysteresis: 0.7% (Max.) BVD Released Hysteresis: 5.0% (Max.) Peak : 60V Thermal	HSOP-8E HQFN0808-28
RP115x-Y	-40 to 105	1A (500)	1.4 to 5.25 (6.0)	0.9, 1.0, 1.2, 1.5, 1.75, 1.8, 2.5, 2.8, 3.0, 3.3, 3.4	±1	RP115L: 0.13 RP115H: 0.17	RP115L: 0.265 RP115H: 0.255	IOUT=1A	110	Ripple : 80dB (VSET≤1.8V) Thermal Reverse Constant Inrush Load Reg : Typ.1mV TempChar : Typ.±30ppm/°C Discharge : Ver.D	DFN1216-8 SOT-89-5
RP132x-Y	-40 to 105	1A	1.4 to 6.5 (7.0)	0.8, 1.05, 1.2, 1.5, 1.8, 2.5, 3.0, 3.3, 4.0, 5.0 0.8 to 5.5, Ext.Adjustable	±1 ±15mV	0.52	0.72	IOUT=1A VSET=3.0V	65	Load Reg : Typ.5mV Ripple : 70dB Thermal Inrush Discharge : Ver.D	DFN(PLP)1820-6 SOT-89-5 HSOP-6J TO-252-5-P2
RP108J-Y	-40 to 105	3A	1.6 to 5.25 (6.0)	0.8, 1.2, 1.5, 1.8, 2.5, 3.0, 3.3 0.8 to 4.2, Ext.Adjustable	±1	0.51	0.67	IOUT=3A VSET=3.0V	350	Load Reg : Typ.3mV Thermal Reverse Constant Discharge : Ver.D/F	TO-252-5-P2

*1 Set Output Voltage (VSET) = 2.8 V or close to 2.8 V unless otherwise noted. *2 Supply Current (Iss) per channel. *3 1 mA ⇔ 250 mA

Voltage Tracker

Product Name	Operating Temperature Range (°C)	Output Current (mA)	Input Voltage Range (Absolute Max. Ratings) (V)	Voltage Tracking Range (V)	Voltage Tracking Accuracy (mV)	Dropout Voltage*1 (V) Typ.	Max.	Conditon	Supply Current (µA) Typ.	Other Features	Package
R1540x-Y	-40 to 125	70	3.5 to 42.0 (50.0)	2.2 to 14.0	±15 (Ta=-40 to 125)	1.3	2.1	IOUT=70mA	60	Foldback Proteciton Circuit Peak : 60V Thermal High Immunity	SOT-23-5 HSOP-8E

Voltage Detectors (Reset ICs)

Product Name	Operating Temperature Range (°C)	Operating Voltage Range (V)	Absolute Max. Ratings (V)	Detector Threshold Range (V)	Detector Threshold Accuracy (%)	Reset Signal	SENSE Pin	Adjustable Release Output Delay Time	Output Delay Time Accuracy (%)	Supply Current*1 (µA)	Hysteresis	Package
R3116x-Y	-50 to 105	0.5 to 6.0	7.0	0.7 to 5.0	±0.8	L	N	Ext.Capacitor	±15	0.35	Y	DFN(PLP)1010-4 SOT-23-5
R3117x-Y	-40 to 105	1.0 to 6.0	7.0	0.7 to 5.0	±1.0	L	Y	—	—	0.29	Y	DFN(PLP)1010-4 SOT-23-5
R3119xxxxA-Y	-50 to 105	1.2 to 36.0	50.0	2.3 to 12.0	±1.5	L	N	Ext.Capacitor	-50, +80	3.3	Y	DFN(PLP)1820-6 SOT-23-5
R3119xxxxE-Y		2.1 to 6.0*2	7.0				Y	—	—			
R3150NxxxA-Y	-40 to 105	1.4 to 36.0	50.0	Detector Threshold Range: 5.0 to 10.0, Release Threshold Range: 5.3 to 11.0	Detector Threshold Accuracy: ±1.5, Release Threshold Accuracy: ±1.5	L	N	Ext.Capacitor, Release Output Delay Time and Detector Output Delay Time are Adjustable	Output Delay Time Accuracy: -35, +40, Detector Output Delay Time Accuracy: -35, +40	3.8	Y	SOT-23-6
R3150NxxxB-Y						H						
R3150NxxxE-Y		3.6 to 6.0*2	7.0			L	Y			3.5		
R3150NxxxF-Y						H						
R3121NxxxA/G-Y	-40 to 125	1.4 to 36.0	50.0	3.0 to 12.0	±1.5	L	N	Ext. Capacitor	-40, +80	3.8	Y G: N	SOT-23-6
R3121NxxxE-Y		2.4 to 6.0*2	7.0				Y	Ext. Capacitor		3.5		
R3152NxxxA-Y	-50 to 125	3.0 to 42.0	50.0	OV: 1.1 to 5.9 UV: 1.0 to 4.8	±0.5	L	Y	Ext.Capacitor	-37.5, +100	1.5	Y	SOT-23-6
R3152NxxxB-Y											N	
R3154NxxxA-Y *3	-40 to 125	3.0 to 42.0	50.0	OV: 0.75 to 3.7 UV: 0.55 to 3.3	±0.5	L	Y	Ext. Capacitor	-37.5, +100	2.0	Y	SOT-23-6
R3500SxxxA-Y Quadruple *3	-40 to 125	3.0 to 42.0	50.0	OV: 1.0 to 5.9 UV: 0.9 to 5.0	±0.5	L	Y	Ext. Capacitor	-37.5, +100	10.0	Y	HSOP-18
R3160NxxxA-Y	-50 to 125	2.7 to 60.0	80.0	10.0 to 48.0	±1.0	L	N	Ext.Capacitor	±50	1.8	Y	SOT-23-6
R3160NxxxB-Y						H						

*1 Detector Threshold (-VDET) = 1.5 V, Detection released *2 Input Voltage Range of SENSE Pin: 0 V to 36.0 V *3 Built-in Failure Diagnosis Function

Products for Industrial

Watchdog Timers

● Watchdog Timer (WDT) with VD (Reset IC) and LDO Linear Regulators

Product Name	Operating Temperature Range (°C)	Operating Voltage Range (V)	Absolute Max. Ratings (V)	Voltage Detector Section					Watchdog Timer Section				LDO Regulator Section			Supply Current (µA)	Package
				Detector Threshold Range (V)	Detector Threshold Accuracy (%)	Release Delay Time*1 (ms)			WDT Timeout Period*2 (ms)			Inhibit Pin	Output Voltage Range (V)	Output Voltage Accuracy (%)	Output Current (mA)		
						Min.	Typ.	Max.	Min.	Typ.	Max.					Typ.	
R5111Sxx1A-Y R5111Sxx1B-Y*3	-40 to 105	3.5 to **36.0**	50.0	1.6 to 5.5	±1.8*4	194	242	290	14.4	18	21.6	N	1.8 to 5.0	±1.5*4	300	25	HSOP-8E
R5111Sxx2C-Y R5111Sxx2D-Y*3												Y					HSOP-18
R5111Lxx2C-Y R5111Lxx2D-Y*3												Y					HQFN0808-28
R5114Sxx1x-Y	-40 to **125**	3.5 to **42.0**	50.0	2.5 to 4.8	±1.6*4	184	220	253	14.8	18	21.9	Y	3.3 to 5.0	±1.6*4	250	8.5	HSOP-8E
R5114Sxx2x-Y																	HSOP-18
R5114Lxx2x-Y																	HQFN0808-28
R5115Sxx1x-Y*3	-40 to **125**	3.5 to **42.0**	50.0	2.5 to 4.8	±1.6*4	184	220	253	14.8	18	21.9	Y	3.3 to 5.0	±1.6*4	250	8.5	HSOP-8E
R5115Sxx2x-Y*3																	HSOP-18
R5115Lxx2x-Y*3																	HQFN0808-28

*1 R5111/R5114/R5115: C_D = 0.22 µF *2 R5111/R5114/R5115: C_{TW} = 0.01 µF *3 Window watchdog timer. Window watchdog timer monitors microprocessor activity and asserts a reset signal if the watchdog pulse does not occur within the defined time window (open window) or if the watchdog pulse occurs within the other defined time window (close window).
*4 Detector threshold accuracy in operating temperature range.

● Watchdog Timer (WDT) with VD (Reset IC)

Product Name	Operating Temperature Range (°C)	Operating Voltage Range (V)	Absolute Max. Ratings (V)	Voltage Detector Section			Watchdog Timer Section		Supply Current (µA)	Other Features	Package
				Detector Threshold Range (V)	Detector Threshold Accuracy (%)	Release Delay Time Accuracy (%)	WDT Timeout Period Accuracy (%)	Inhibit Pin	Typ.		
R5106N-Y	-40 to **125**	0.9 to 6.0	7.0	1.5 to 5.5	±1.0	±18	±33	Y	11	CD Pin and CTW Pin are combined.	SOT-23-6
R5107G-Y										MR Pin is included.	SSOP-8G
R5108G-Y		1.5 to 6.0								SENSE Pin is included.	
R5109G-Y		0.9 to 6.0							11.5	2 Clock Input Type	

DC/DC Switching Regulators

● High Voltage Step-down DC/DC Converters

Product Name (Version)	Operating Temperature Range (°C)	Control	Input Voltage Range (Absolute Max. Ratings) (V)	Output Voltage Range (V)	V_{FB} Voltage Accuracy (%)	Switching Frequency (kHz)	Output Current*1 (A)	Protection Circuit Type	Other Features	Package
R1301L-Y R1302L-Y R1303L-Y R1304L-Y	-40 to 85	Forced PWM	4.0 to 28.0 (29.0)	0.7 to 5.3, Ext.Adjustable	0.64V±1	250 to 1000: Ext. Adjustable, Ext. Synchronizable with PLL Circuit	20 15 10 6	Latch or Hiccup (Reset)	Inductor Built-in DC/DC Module Soft-Start PG UVLO Soft-Start : Ext.Adjustable Phase : Ext.	QFN0910-68
R1271x-Y (xx1A/B/C/D)	-40 to 105	Forced PWM	3.6 to 30.0 (42.0)	3.3, 5.0	±1	2000	1	Latch or Hiccup (Reset)	Synchro Soft-Start : Ext. Adjustable SSCG : Ver.xx1C/D PG UVLO OVLO Thermal	DFN3030-12B HSOP-18
R1275S-Y (003A/C)	-40 to 105	Forced PWM	3.6 to 30.0 (36.0)	3.3 to 5.0, Ext.Adjustable	0.64V±1	2000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit (1800 to 2200)	2	Hiccup (Reset)	Synchro SSCG : Ver. 003C PG UVLO Soft-Start : Ext.Adjustable Thermal OVLO Phase : Ext.	HSOP-18
R1278S-Y (003A/C)	-40 to 105	Forced PWM	3.6 to 30.0 (36.0)	3.3 to 5.0 Ext.Adjustable	0.64V±1	2000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit (1800 to 2200)	2	Hiccup (Reset)	Tracking function Synchro SSCG : Ver.003C PG UVLO Soft-Start : Ext.Adjustable Thermal OVLO Phase : Ext.	HSOP-18
R1276S-Y (00xA/C)	-40 to **125**	Forced PWM, PWM/VFM Auto Switching	3.6 to 30.0 (36.0)	0.7 to 6.5, Ext. Adjustable	0.64V±1	250 to 1000: Ext. Adjustable, Ext. Synchronizable with PLL Circuit	3	Hiccup (Reset)	Synchro Soft-Start : Ext. Adjustable SSCG : Ver. xxxC PG UVLO OVLO Thermal Phase : Ext.	HSOP-18
R1270S-Y (001A/B)	-40 to **125**	PWM, PWM/VFM Auto-Switching	3.6 to 34.0 (36.0)	0.8 to 31.6, Ext.Adjustable	0.8V±1	300 to 2400: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	3	001A: Fold-back, Latch 001B: Fold-back	Diode UVLO OVLO Soft-Start : Ext.Adjustable Thermal FLG pin Phase : Ext.	HSOP-18
R1272S-Y (xxxA)	-40 to 105	Forced PWM, PWM/VFM Auto-Switching	4.0 to 34.0 (36.0)	0.7 to 5.3, Ext.Adjustable	0.64V±1	250 to 1000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	External	Latch or Hiccup (Reset)	DC/DC Controller Synchro OVLO : Ver. 03x/13x PG UVLO Soft-Start : Ext.Adjustable Thermal OVP Phase : Ext.	HSOP-18
R1277L-Y (xxxA)	-40 to 105	Forced PWM, PWM/VFM Auto-Switching	4.0 to 34.0 (36.0)	0.7 to 5.3, Ext.Adjustable	0.64V±1	250 to 1000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	8	Latch or Hiccup (Reset)	Soft-Start SSCG : Ver. 03x/13x PG UVLO Soft-Start : Ext.Adjustable Thermal OVLO Phase : Ext.	QFN0505-32B
R1273L-Y (xxxA)	-40 to 105	Forced PWM, PWM/VFM Auto-Switching	4.0 to 34.0 (36.0)	0.7 to 5.3, Ext.Adjustable	0.64V±1	250 to 1000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	14	Latch or Hiccup (Reset)	Synchro SSCG : Ver. 03x/13x PG UVLO Soft-Start : Ext.Adjustable Thermal OVP Phase : Ext.	QFN0505-32B

Product Name (Version)	Operating Temperature Range (°C)	Control	Input Voltage Range (Absolute Max. Ratings) (V)	Output Voltage Range (V)	V_{FB} Voltage Accuracy (%)	Switching Frequency (kHz)	Output Current*1 (A)	Protection Circuit Type	Other Features	Package
R1260S-Y (xx1A/B/C/D)	-40 to 105	Forced PWM, PWM/VFM Auto-Switching	5.0 to **60.0** (80.0)	1.0 to 16.0, Ext.Adjustable	0.8V±1	150 to 600: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	External	Latch or Hiccup (Reset)	DC/DC Controller Synchro, Soft-Start : Ext. Adjustable SSCG : Ver.xxxB/D PG, UVLO, OVP Thermal, Phase : Ext.	HSOP-18

*1 Output Current (I_{OUT}) can be affected by environmental conditions or external components. This is an approximate value.

● Low Voltage Step-down DC/DC Converters

Product Name (Version)	Operating Temperature Range (°C)	Control	MODE Pin	Input Voltage Range (Absolute Max. Ratings) (V)	Output Voltage Range (V)	V_{FB} Voltage Accuracy*1 (mV)	Switching Frequency (kHz)	Output Current*2 (A)	Protection Circuit Type	Other Features	Package
RP506L-Y (xx1G/H/K/L, 001M/N)	-40 to 105	Forced PWM, PWM/VFM Auto Switching	Y	2.5 to 5.5 or 2.5 to 4.5 (6.5)	0.8, 1.0, 1.1, 1.2, 1.3, 1.5, 1.8, 1.85, 3.0, 3.3: G/H/K/L	±1.5%	1200: K/L/M 2300: G/H/N	2	Latch	Synchro Soft-Start : Ext.Adjustable UVLO, Thermal Discharge, PG	DFN3030-12
					0.8 to 4.0: 001N, Ext.Adjustable	0.6V±9					
					0.6 to 4.0: 001M, Ext.Adjustable	0.6V±9					
RP510L-Y (xx1/4G, xx1/4H, 001/4J, 001/4N)	-50 to 105	Forced PWM	N	2.5 to 5.5 (6.5)	0.8, 1.0, 1.1, 1.2, 1.3, 1.5, 1.8, 3.0, 3.3: xxxG/H	±1.0	2300	4	xx1/001: Latch xx4/004: Fold-back	Synchro Soft-Start : Ext.Adjustable UVLO, Thermal Discharge, PG	DFN3030-12
					0.8 to 3.3: 00xJ/N, Ext.Adjustable	0.6V±6					
RP550L-Y Dual (001B)	-40 to 105	Forced PWM, PWM/VFM Auto Switching	Y	2.3 to 5.5 or 2.3 to 4.5 (6.5)	0.6 to 3.3: Ext.Adjustable	0.6V±9	2300	1 per Channel	Latch	Synchro, UVLO Soft-Start, Thermal	DFN3030-12

*1 For the externally adjustable output voltage type, this is a feedback voltage accuracy. *2 Output Current (I_{OUT}) can be affected by environmental conditions or external components. This is an approximate value.

● Step-up DC/DC Converter with Charge Pumps for TFT/LCD

Product Name	Control	Operating Temperature Range (°C)	Input Voltage Range (Absolute Max. Ratings) (V)	Output Voltage Range (V)	Output Voltage Accuracy*1 (mV)	Switching Frequency (kHz)	Output Tr.	Lx Current Limit*2 (A)	Protection Circuit Type	Other Features	Package
R1294L-Y	CH1: PWM, Step-up	-40 to 105	2.0 to 5.5 : 101A 2.5 to 5.5 : 102A 3.3 to 5.5 : 103A (6.5)	CH1: Ext.Adjustable, up to 20.0	1.0V-40, +25	210 to 1400, Ext.Adjustable, 800-10%, +14%*3	Internal	CH1: 2	Latch	The charge pump operates at 1/4th operating frequency. Soft-Start : Ext.Adjustable Sequencing, UVLO, Diode Phase : Ext. Maxduty : Ext.Adjustable	QFN0404-24B
	CH2: Charge pump, Positive			CH2/3: Ext.Adjustable	1.5V-50, +35						
	CH3: Charge pump, Negative				0V±35						

*1 For the externally adjustable output voltage type, this is a feedback voltage accuracy. *2 Lx Current Limit is not Output Current. *3 This specification is guaranteed by design engineering at -40°C to 105°C.

Switch ICs

● USB High-side Switches

Product Name	Operating Temperature Range (°C)	Operating Voltage Range (Absolute Max.) (V)	ON Resistance (mΩ)	Supply Current (μA) Typ.	Current Limit Threshold (mA)	Short Current Limit (mA)	Flag Delay Time (ms) Typ.	UVLO Detect Voltage (V)	Internal FET	EN	Protection	Remarks	Package
R5524x001-Y R5524x002-Y	-40 to 105	2.7 to 5.5 (6.0)	100	110	0.8 (Typ.) 0.98 (Max.)	0.65 (Typ.) 0.8 (Max.)	20	2.4	Nch.	H	Latch-off type Constant current type	Soft-Start, Thermal Reverse, Discharge	DFN(PLP)1820-6 SOT-23-5
R5524N004-Y					1.55 (Typ.) 1.85 (Max.)								

Constant-Current LED Driver Controller

Product Name	Version	Operating Temperature Range (°C)	Input Voltage Range (V)	Absolute Max. Ratings (V)	Max. SOURCE Pin Voltage, Accuracy (mV)	Signal Input Circuit	Dimming Control	Standby Current (μA) Typ.	Supply Current (μA) Typ.	Other Features	Package
R1580N-Y	001A	-40 to 105	3.6 to 34.0	36	400±8	Comparator Input, H=1.3V, L=1.1V	1% to 100%	140	320	Thermal UVLO OVP	SOT-23-6
	002A				800±16	Comparator Input, H=1.3V, L=1.1V	0.5% to 100%	140			
	003A				400±8	Inverter Input, H=1.2V, L=0.4V	1% to 100%	28			

Power Management Multi-channel ICs

Product Name	Package	Operating Temperature Range (°C)	Input Voltage Range (V)	Interface	Main Function					Other Features
					Step-down DC/DC	LDO	VD	WDT	GPIO	
RN5T5610	QFN0707-48-P25	-40 to 105	2.7 to 5.5	I^2C	4	7	4	1	4	Built-in DVS, INTC OTP

LDO Linear Regulators

Grey-out Products : The successors of these products are indicated in Other Features
● : Available in Automotive Products ■ : Available in Industrial Products ♡ : Products available in PRODUCT LONGEVITY PROGRAM
: Products in Development

Maximum Input Voltage and Output Current Chart

Product Type		Max. Input Voltage (V)	Output Current: Up to 150mA Single	Up to 150mA Dual	Up to 200mA	Up to 300mA Single	Up to 300mA Dual	Up to 400mA	Up to 500mA	Up to 800mA	Up to 1A	Up to 3A
High-performance		-10~-2.5	RP117x: Up to 100mA									
		5.25	RP112x			RP102x RP123x: Up to 250mA (Seamless)	RP150K	RP122x (Seamless)	RP111x RP115L*1		RP115x*1	
		6									R1172x R1173x	
		6.5	RP130x									
		36				R1513S						
		42				R1526S						
		60	R1561x: Up to 100mA									
Standard		3.6						RP106x RP116Z				
		5.25	RP109x	RP152x	RP100x RP155Z	RP101x RP114x	RP154x	RP105x				RP108J
		6								R1170x		R1171S: Up to 1.5A R1171J: Up to 2A
		6.5									RP131x RP132x	
		8	R1111N R1121N			R1130H						
		10	RP171x			RP170x						
		16									R1190x	
		24							R1500H		R1501x	
		36	R1516x			R1511x						
		42							R5116S +VD R5116L +VD R5117S +VD R5117L +VD			
Low Supply Current		5.25	RP110x									
		5.5	RP118x: Up to 100mA (Automatic) RP124x +BM: Up to 100mA (Automatic)									
		6	R1180x									
		8	Rx5RW: Up to 80mA									
		10	Rx5RL: Up to 55mA									
		11	RP173x*2									
		24	R1150H +VD R1154x									
		36	R1515x: Up to 50mA R1514x		R1524x				R1517x		R1518x	
		42			R5112S +VD R1525x							
		60	R1560x: Up to 100mA									
ECO Functions	Automatic Mode Shifting	5.25			RP202x							
		6		R5326K								
		24	R1155x									
		36				R1510S +VD						
	Manual/Automatic Mode Shifting	5.25	RP201x			RP200x						
	Seamless	6	R1116x									
	Manual Mode Shifting	6	R1163x		R1160N							
		16				R1191x						
Ext. PNP Tr. Type		10									RN5RF	
Voltage Tracker		42	R1540x: Up to 70mA									

*1 Output Current (I_{OUT}) is switchable between 500 mA and 1 A using the LCON pin of DFN1216-8. *2 RP173x: V_{SET} + 6.5 V ≤ 11.0 V

25 mA to 120 mA LDO Linear Regulators

Product Name	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V)			Supply Current (µA)	RR@1kHz (dB)	Capacitor Capacitance (µF)	Other Features	Package
					Typ.	Max.	Condition	Typ.	Typ.			
Rx5RL ♡	25 to 55	Max.10.0	2.0 to 6.0	±2.5	0.04	0.06	IOUT=1mA	1	—	0.1 to 2.2		SOT-23-5 SOT-89
Rx5RW	35 to 80	Max.8.0	1.5 to 6.0	±2	0.04	0.06	IOUT=1mA	1.5		0.1 to 2		SON1612-6 SC-82AB
R1100D	35 to 100	Max.6.0	0.9 to 4.0	±2	0.025	0.050	IOUT=1mA	1.5		0.1 or more		SON1408-3
RN5RT	25 to 65	Max.8.0	2.0 to 6.0	±2	0.3	0.5	IOUT=40mA	4	—	0.1 to 2.2		SOT-23-5
R1515x ● ♡	50	4.0 to 36.0	2.0 to 12.0	±2	0.20	0.35	IOUT=20mA VSET=5.0V	9	—	0.1 to 10	Operating Temp.: -40 to 105°C Thermal	SOT-89-5 HSOP-6J
RH5RE	40 to 80	Max.10.0	2.0 to 6.0	±2.5	0.5	0.7	IOUT=30mA	1.1	—	0.1 to 2.2		SOT-89
RP117x ♡	100	-2.5 to -10.0	-1.0 to -5.5	±2.0	0.23	0.3	IOUT=100mA VSET=-3V	75	80	2.2 or more	Negative LDO Output noise: 16µVrms Thermal Discharge : Ver.D	DFN(PLP)1212-6 SC-88A
RP118x ♡	100	1.7 to 5.5	1.2 to 3.6	±0.8	0.10	0.16	IOUT=100mA	0.2		1 or more	Automatic Discharge : Ver.D	WLCSP-4-P8 DFN(PLP)1010-4 SOT-23-5
RP124x +BM ♡	100	1.7 to 5.5	1.2, 1.5, 1.8, 2.1, 2.2, 2.3, 2.4, 2.5, 2.7, 2.8, 3.0, 3.1, 3.3, 3.6	±0.8	0.10	0.16	IOUT=100mA	0.2 BM:0.1		1 or more	Automatic Discharge : Ver.D	DFN1212-6 SOT-23-5
R1560x ● ■ ♡	100	5.5 to 60.0	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 7.0, 8.0, 9.0, 10.0, 12.0, 14.0	±0.8	1.5	3.0	IOUT=100mA VSET=5.0V	3	—	0.1 or more	Operating Temp: -40 to 105°C Thermal	HSOP-6J TO-252-5-P2
R1561x ● ■ ♡	100	5.5 to 60.0	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 7.0, 8.0, 9.0, 10.0, 12.0, 14.0	±0.8	1.3	2.5	IOUT=100mA VSET=5.0V	20	—	10 or more	Operating Temp: -40 to 105°C Thermal	HSOP-6J TO-252-5-P2
Rx5RZ	100	Max.8.0	2.0 to 6.0	±2	0.2	0.3	IOUT=60mA	20	55	10 or more	Tantalum	SOT-23-5 SOT-89
R1141Q	120	2.2 to 6.0	1.5 to 4.0	±1.5	0.18	0.28	IOUT=120mA	90	70	1 to 2.2 or more	⇒RP109x Discharge : Ver.D	SC-82AB

*1 Set Output Voltage (VSET) = 2.8 V or close to 2.8 V unless otherwise noted.

150 mA LDO Linear Regulators

Product Name	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V)			Supply Current (µA)	RR@1kHz (dB)	Capacitor Capacitance (µF)	Other Features	Package
					Typ.	Max.	Condition	Typ.	Typ.			
RP103x	150	1.7 to 5.25	1.2 to 3.3	±1	0.21	0.27	IOUT=150mA	36	75	0.47 or more	TempCo :Typ.±30ppm/°C ⇒RP109x Discharge : Ver.D	DFN(PLP)1010-4 SC-82AB SOT-23-5
RP104x ♡	150	1.7 to 5.25	1.2 to 3.3	±0.8	0.24	0.32	IOUT=150mA	1		0.1 or more	TempCo : Typ.±40ppm/°C ⇒RP110x Discharge : Ver.D	DFN(PLP)1010-4 SOT-23-5
RP109x ♡	150	1.4 to 5.25	0.8 to 3.6	±1	0.25	0.35	IOUT=150mA	50	75	0.1 or more	Load Reg : Typ.5mV TempCo : Typ.±30ppm/°C Discharge : Ver.D	DFN(PLP)0808-4 DFN1010-4 SC-88A SOT-23-5
RP110x ♡	150	1.4 to 5.25	0.8 to 3.6	±1	0.28	0.40	IOUT=150mA	1		0.1 or more	Constant Discharge : Ver.D	DFN(PLP)0808-4 DFN1010-4 SC-88A SOT-23-5
RP112x ♡	150	2.0 to 5.25	1.2 to 4.8	±1	0.20	0.28	IOUT=150mA	75	80 65*4	1 or more	Output noise : 10µVrms TempCo : Typ.±30ppm/°C Discharge : Ver.D	DFN(PLP)1010-4 SC-88A SOT-23-5
RP130x ● ■ ♡	150	1.7 to 6.5	1.2 to 5.3	±1	0.32	0.51	IOUT=150mA	38	80	0.47 or more	TempCo : Typ.±20ppm/°C Discharge : Ver.D	DFN(PLP)1010-4 SC-82AB SOT-23-5
RP171x ● ■ ♡	150	2.6 to 10.0	1.2 to 6.5	±1	0.400	0.580	IOUT=150mA	23	70	1 or more	Thermal Discharge : Ver.D Constant	SC-88A SOT-23-5
RP173x ♡	150	2.5 to 11.0*5	1.2 to 5.5	±1	0.90	1.47	IOUT=150mA	2	—	0.1 or more	Reverse Discharge : Ver.D	DFN(PLP)1010-4 SOT-23-5
RP201K	150	1.4 to 5.25	0.8 to 4.0	±1*2	0.12*2	0.18*2	IOUT=150mA	55*2 1.5*3	70*2	1 or more	Manu/Auto Discharge : Ver.D	DFN(PLP)1212-6

LDO Linear Regulators

Product Name	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current (μA) Typ.	RR@1kHz (dB) Typ.	Capacitor Capacitance (μF)	Other Features	Package
R1111N	150	2.0 to 8.0	1.5 to 5.0	±2	0.20	0.30	IOUT=100mA	35	70	1 or more	Tantalum Replaceable with LP2980/2985	SOT-23-5
R1114x	150	2.0 to 6.0	1.5 to 4.0	±2	0.22	0.35	IOUT=150mA	75	70	0.47 to 1 or more	⇒RP109x, RP130x Discharge : Ver.D	SON1612-6 SC-82AB SOT-23-5
R1116x	150	1.8 to 6.0	1.5 to 4.0	±1.5	0.29	0.46	IOUT=150mA	10	70	1 or more	Seamless Discharge : Ver.D	SON1612-6 SOT-23-5
R1121N	150	2.0 to 8.0	1.5 to 5.0	±2	0.20	0.30	IOUT=100mA	35	70	1 or more	Tantalum Replaceable with TK111/112/113	SOT-23-5
R1122N	150	2.0 to 6.0	1.5 to 5.0	±2	0.19	0.26	IOUT=100mA	100	80	2.2 to 4.7 or more	Replaceable with TK111/112/113 ⇒RP112x, RP130x	SOT-23-5
R1150H +VD	150	Max.24.0	2.1 to 14.0 Ver.A: 2.3 to 15.0, Ver.B,C,D: 2.0 to 15.0, Detector Threshold Range	±2 VD: ±2.5	0.30	0.40	IOUT=20mA	7		0.1 or more	Thermal	SOT-89-5
R1154x	150	Max.24.0	2.5 to 12.0 2.5 to 24.0, Ext.Adjustable	±2 ±50mV	0.20	0.40	IOUT=20mA	5	—	0.1 to 2.2	Operating Temp.: -40 to 105°C Thermal	DFN1616-6 SOT-23-5 SOT-89-5
R1155x	150	3.5 to 24.0	2.5 to 12.0 2.5 to 23.0, Ext.Adjustable	±2 ±50mV	0.55*2	1.70*2	IOUT=150mA VSET=5.0V	65*2 7.5*3	60*2	4.7 or more	Operating Temp.: -40 to 105°C Automatic Thermal Reverse	SOT-23-5 SOT-89-5
R1163x	150	2.0 to 6.0	1.5 to 5.0	±1.5*2	0.25*2	0.35*2	IOUT=150mA	70*2 6*3	70*2	0.47 or more	Manual Reverse Discharge : Ver.D	SON-6 SOT-23-5
R1180x	150	1.7 to 6.0	1.2 to 3.6	±2	0.25	0.40	IOUT=150mA	1		0.1 or more		SON1612-6 SC-82AB SOT-23-5
R1514x	150	4.0 to 36.0	2.0 to 12.0	±2	0.20	0.35	IOUT=20mA VSET=5.0V	9	—	0.1 to 10	Operating Temp.: -40 to 105°C Thermal	SOT-89-5 HSOP-6J
R1516x	150	4.0 to 36.0	1.8 to 6.2	±1	—	0.60	IOUT=20mA VSET=5.0V	29		0.1 to 20	Operating Temp.: -40 to 105°C Thermal	SOT-89-5 HSOP-6J

*1 Set Output Voltage (VSET) = 2.8 V or close to 2.8 V unless otherwise noted. *2 Fast Response Mode *3 Low Power Mode *4 RR@f = 100 kHz *5 VSET + 6.5 V ≤ 11.0 V

200 mA to 800 mA LDO Linear Regulators

Product Name	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current (μA) Typ.	RR@1kHz (dB) Typ.	Capacitor Capacitance (μF)	Other Features	Package
RP100x	200	1.7 to 5.25	1.2 to 3.3	±0.6	0.13	0.23	IOUT=150mA	18	75	1 or more	TempCo : Typ.±30ppm/°C Discharge : Ver.D	DFN(PLP)1612-4 SOT-23-5
RP107x	200	1.4 to 5.25	1.0 to 4.2	±1	0.27	0.36	IOUT=200mA	9.5	60	Output Capacitor-less (CIN=0.1 or more)	Constant Discharge : Ver.D	WLCSP-4-P5 DFN(PLP)1212-6 SC-88A
RP202x	200	1.4 to 5.25	0.8 to 4.0	±1*2	0.20*2	0.29*2	IOUT=200mA	50*2 2.5*3	70*2	0.47 or more	Automatic Constant Discharge : Ver.D	DFN(PLP)1010-4 SC-88A SOT-23-5
R1160N	200	1.4 to 6.0	0.8 to 3.3	±2*2	0.14*2	0.2*2 0.25*3	IOUT=200mA	40*2 4.5*3	70*2	2.2 or more	Tantalum Manual	SOT-23-5
RP155Z	200	1.9 to 5.25	1.6 to 3.6	±1	0.085	0.117	IOUT=200mA VSET=2.85V	80	75	1 or more	TempCo : Typ.±30ppm/°C Thermal Inrush Discharge : Ver.B Dual Output voltage switchable.	WLCSP-5-P1
R5112S +VD	200	3.5 to 42.0	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0 Ver.B: 1.6 to 4.8, Ver.D: 2.9 to 4.8, Detector Threshdd Range	±0.6 VD: ±0.6	0.6	1.2	IOUT=200mA VSET=5.0V	3.8		0.1 or more	Operating Temp.: -40 to 105°C Thermal	HSOP-8E
R1524x	200	3.5 to 36.0	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 5.5, 6.0, 6.4, 7.0, 8.0, 8.5, 9.0, 10.0, 10.5, 11.0, 12.0	±0.6	0.6	1.2	IOUT=200mA VSET=5.0V	2.2		0.1 or more	Operating Temp.: -40 to 105°C Thermal	DFN(PLP)1820-6 SOT-23-5 SOT-89-5 HSOP-6J HSOP-8E

Product Name	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current (μA) Typ.	RR@1kHz (dB) Typ.	Capacitor Capacitance (μF)	Other Features	Package
R1525x	200	3.5 to **42.0**	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 5.5, 6.0, 6.4, 8.0, 8.5, 9.0, 10.0, 10.5, 11.0, 12.0	**±0.6**	0.6	1.2	I_{OUT}=200mA V_{SET}=5.0V	**2.2**		**0.1 or more**	Operating Temp.: -40 to 105°C Thermal High Immunity	DFN(PLP)1820-6 SOT-23-5 SOT-89-5 HSOP-6J HSOP-8E
RP123x	250	1.9 to 5.5	1.2 to 4.8	**±0.8**	Z:0.090 K:0.105	Z:0.140 K:0.165	I_{OUT}=250mA	**9.5**	**90**	1 or more	Output noise: 8μVrms Seamless Thermal Inrush Discharge : Ver.D	WLCSP-4-P8 DFN(PLP)1010-4
RP101x	300	1.7 to 5.25	1.2 to 3.3	**±0.6**	0.13	0.23	I_{OUT}=150mA	18	**75**	1 or more	TempCo : **Typ.±30ppm/°C** Discharge : Ver.D	DFN(PLP)1612-4 DFN(PLP)1612-4B SOT-23-5
RP102x	300	1.7 to 5.25	1.2 to 3.3	**±0.8**	0.120	0.190	I_{OUT}=300mA	50	**80**	1 or more	TempCo : **Typ.±20ppm/°C** Discharge : Ver.D	WLCSP-4-P2 DFN(PLP)1820-6 SOT-23-5
RP114x	300	1.4 to 5.25	**0.8** to 3.6	±1	0.25	0.30	I_{OUT}=300mA	50	**75**	1 or more	Discharge : Ver.D	DFN(PLP)1010-4 DFN(PLP)1010-4B SC-88A SOT-23-5
RP170x	300	2.6 to 10.0	1.2 to 6.5	±1	0.77	1.08	I_{OUT}=300mA	23	70	1 or more	Thermal Constant Discharge : Ver.D	SOT-23-5 SOT-89-5
RP200x	300	1.4 to 5.25	**0.8** to 4.0	±1*2	0.23*2	0.35*2	I_{OUT}=300mA	55*2 **1.5***3	70*2	1 or more	Manu/Auto Discharge : Ver.D	DFN(PLP)1212-6 SOT-23-5
R1130H	300	2.5 to 8.0	1.5 to 5.0 1.5 to 5.0, Ext. Adjustable	±2 ±36mV	0.25	0.34	I_{OUT}=100mA	50	60	**0.1 or more**		SOT-89-5
R1131N	300	1.4 to 6.0	**0.8** to 3.3	±2	0.23	0.35	I_{OUT}=300mA	60	65	1 or more (V_{SET}≥1.0V)	RP101N Discharge : Ver.D	SOT-23-5
R1131Dxx1	300	1.4 to 6.0	**0.8** to 3.3	±2	0.23	0.35	I_{OUT}=300mA	60	65	1 or more (V_{SET}≥1.0V)	Discharge : Ver.D	SON-6
R1161N	300	1.4 to 6.0	**0.8** to 3.3	±2*2	0.23*2	0.35*2	I_{OUT}=300mA	60*2 **4.5***3	65*2	1 or more (V_{SET}≥1.0V)	Manual Discharge : Ver.D RP200N	SOT-23-5
R1191x	300	3.5 to 16.0 (V_{SET}≥3.0)	2.0 to 15.0	±1.5*2	0.55*2	0.75*2	I_{OUT}=300mA V_{SET}=5.0V	50*2 **6***3	70*2	4.7 or more	Manual Thermal Reverse Discharge : Ver.D	DFN1616-6 SOT-23-5 SOT-89-5
R1510S +VD	300	3.5 to **36.0**	2.5 to 12.0 Ver.A,B,C: 2.3 to 12.0, Ver.D: 2.3 to 10.6, Detector Threshold Range	±1.6 VD: ±1.7	1.0*2	2.0*2	I_{OUT}=300mA V_{SET}=5.0V	110*2 12.5*3		6.8 or more	Operating Temp.: -40 to 105°C Automatic Thermal	HSOP-8E
R1511x	300	3.5 to **36.0**	3.0 to 9.0 3.0 to 12.0, Ext. Adjustable	±1 ±30mV	0.64	1.0	I_{OUT}=300mA V_{SET}=5.0V	100	65	6.8 or more	Operating Temp.: -40 to 105°C Thermal	HSOP-6J TO-252-5-P2
R1513S	300	3.5 to **36.0**	1.2, 1.5, 1.8, 3.3, 3.4, 5.0 1.2 to 18.0, Ext. Adjustable	**±0.8**	0.32	0.60	I_{OUT}=300mA V_{SET}=5.0V	75	70*4	4.7 or more	Operating Temp.: -40 to **125°C** Thermal Discharge : Ver.D	HSOP-6J
R1526S	300	3.5 to **42.0**	1.8, 2.5, 2.8, 3.0, 3.3, 3.4, 5.0, 5.5, 6.0, 6.4, 7.5, 8.0, 8.5, 9.0	**±0.6**	0.4	0.75	I_{OUT}=300mA V_{SET}=5.0V	25		10 or more	Operating temp: -40 to 105°C Thermal High Immunity	HSOP-8E
RP105x	400	2.4 to 5.25 (V_{IN}=from 0.9)	**0.6** to 1.5	±15mV	RP105L: 0.105 RP105K/N 0.180	RP105L*: 0.170 RP105K/N 0.260	I_{OUT}=400mA V_{SET}=1.5V V_{BIAS}=3.6V	28	**80***5	2.2 or more	Dual power supply Discharge : Ver.D/F	DFN1212-5 DFN(PLP)1212-6 SOT-23-5
RP106x	400	1.0 to 3.6	**0.7** to 1.8	**±0.8**	0.22	0.31	I_{OUT}=400mA V_{SET}=1.5V	48	60*6	1 or more	Constant Discharge : Ver.D	WLCSP-4-P5 DFN(PLP)1212-6 SC-88A
RP116Z	400	1.0 to 3.6	**0.7** to 1.8	**±0.8**	0.22	0.31	I_{OUT}=400mA V_{SET}=1.5V	48	60*6	1 or more	Constant Discharge : Ver.D Thinner than RP106Z (t=0.36mm)	WLCSP-4-P7
RP122x	400	1.9 to 5.5	1.2 to 4.8	**±0.8**	Z:0.145 K:0.170	Z:0.225 K:0.265	I_{OUT}=400mA	**9.5**	**90**	1 or more	Output noise: 8μVrms Seamless Thermal Inrush Discharge : Ver.D	WLCSP-4-P8 DFN(PLP)1010-4
RP111x	500	1.4 to 5.25	**0.7** to 3.6 **0.7** to 3.6, Ext. Adjustable	**±0.8**	0.23	0.34	I_{OUT}=500mA	80	**75**	1 or more	Load Reg : Typ.1mV Thermal Inrush TempCo : **Typ.±30ppm/°C** Discharge : Ver.D Load transient response accuracy*7: Typ.-75mV/+45mV	DFN1212-6 SOT-23-5 SOT-89-5
RP115L	500*8	1.4 to 5.25	**0.7** to 4.3	±1	0.065	0.090	I_{OUT}=500mA	110	**80** (V_{SET}≤ 1.8V)	1 or more	Load Reg : Typ.1mV TempCo : **Typ.±30ppm/°C** Thermal Reverse Constant Inrush Discharge : Ver.D	DFN1216-8
R1500H	500	4.0 to **24.0**	3.0 to 12.0	±2	0.115	0.180	I_{OUT}=200mA V_{SET}=5.0V	70	60	10 or more	Operating Temp.: -40 to 105°C Thermal	SOT-89-5

LDO Linear Regulators

Product Name	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current (µA) Typ.	RR@1kHz (dB) Typ.	Capacitor Capacitance (µF)	Other Features	Package
R1517x	500	3.5 to **36.0**	2.5, 3.3, 3.4, 5.0, 8.5 2.5 to 12.0, Ext.Adjustable	**±0.8** ±20mV	0.35	0.62	IOUT=500mA VSET=5.0V	18		**0.1 or more**	Operating Temp.: -40 to 105°C Constant : Ext.Adjustable Thermal Discharge : Ver.D/F	HSOP-6J TO-252-5-P2
R5116S +VD **R5116L** +VD	500	3.5 to **42.0**	3.3 to 5.0 UD: 2.5 to 5.0 OV: 3.3 to 5.5, Detector Threshold Range	**±0.5** VD:**±0.5**	0.9	1.5	IOUT=500mA VSET=5.0V	25	65	10 or more	Operating Temp.: -40 to 105°C Built-in Window VD Released Hysteresis: 0.7% (Max.) Thermal	HSOP-8E HQFN0808-28
R5117S +VD **R5117L** +VD	500	3.5 to **42.0**	3.3 to 5.0 SVD: 2.5 to 5.0 BVD: 3.5 to 12.0, Detector Threshold Range	**±0.5** SVD: **±0.5** BVD: **±0.8**	0.9	1.5	IOUT=500mA VSET=5.0V	35	65	10 or more	Operating Temp.: -40 to 105°C Built-in Dual VD SVD Released Hysteresis: 0.7% (Max.) BVD Released Hysteresis: 5.0% (Max.) Thermal	HSOP-8E HQFN0808-28
R1170x	800	Max.6.0	1.5 to 5.0	±2	0.12	0.18	IOUT=300mA	80	50	10 or more	Thermal	HSON-6 SOT-89-5 HSOP-6J

*1 Set Output Voltage (VSET) = 2.8 V or close to 2.8 V unless otherwise noted. *2 Fast Response Mode *3 Low Power Mode *4 RR@f = 100 Hz *5 VIN = Ripple *6 RR@f = 10 kHz *7 1 mA ⇔ 250 mA
*8 Output Current (IOUT) is switchable between 500 mA or 1 A using the LCON pin of DFN1216-8.

1 A to 3 A LDO Linear Regulators

Product Name	Output Current (A)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current (µA) Typ.	RR@1kHz (dB) Typ.	Capacitor Capacitance (µF)	Other Features	Package
RP115x	1*2	1.4 to 5.25	**0.7** to 4.3	±1	RP115L: 0.13 RP115H: 0.17	RP115L: 0.18 RP115H: 0.24	IOUT=1A	110	**80** (VSET≤ 1.8V)	1 or more	Load Reg : Typ.1mV TempCo : **Typ.±30ppm/°C** Thermal Reverse Constant Inrush Discharge : Ver.D	DFN1216-8 SOT-89-5
RP131x	1	1.6 to 6.5	**0.8** to 5.5	±1	0.500	0.750	IOUT=1A	65	70	2.2 to 4.7 or more	Thermal Inrush Discharge : Ver.D	DFN(PLP)1820-6 SOT-89-5 HSOP-6J TO-252-5-P2
RP132x	1	1.4 to 6.5	**0.8** to 5.5 **0.8** to 5.5, Ext.Adjustable	±1 ±15mV	0.52	0.72	IOUT=1A	65	70	2.2 to 4.7 or more	Load Reg : Typ.5mV Thermal Inrush : Ext.Adjustable Discharge : Ver.D/F	DFN(PLP)1820-6 SOT-89-5 HSOP-6J TO-252-5-P2
R1172x	1	1.4 to 6.0	**0.8** to 5.0	±2	0.05	0.10	IOUT=300mA	60	70	4.7 or more (VSET≥1.0V)	Thermal Inrush Discharge : Ver.D	SOT-23-5 SOT-89-5 HSON-6 HSOP-6J
R1173x	1	1.4 to 6.0	**0.8** to 5.0 1.0 to VIN, Ext.Adjustable	±2 ±30mV	0.05	0.10	IOUT=300mA	60	70	4.7 or more (VSET≥1.0V)	Load Reg : Typ.-3mV Thermal Inrush Discharge : Ver.D	SOT-89-5 HSON-6 HSOP-6J
R1190x	1	3.5 to 16.0	2.0 to 12.0	±1.5	1.1	1.85	IOUT=1A VSET=5.0V	150	60	4.7 or more	Thermal Discharge : Ver.D Inrush : Ext.Adjustable	SOT-89-5 HSOP-6J TO-252-5-P2
R1501x	1	3.0 to **24.0**	3.0 to 18.0	±2	0.575	0.900	IOUT=1A VSET=5.0V	70	60	10 or more	Operating Temp.: -40 to 105°C Thermal	HSOP-6J TO-252-5-P2
R1518x	1	3.5 to **36.0**	2.5, 3.3, 3.4, 5.0, 6.0, 8.5, 9.0 2.5 to 12.0, Ext.Adjustable	**±0.8** ±20mV	0.70	1.30	IOUT=1A VSET=5.0V	18	—	**0.1 or more**	Operating Temp.: -40 to 105°C Constant : Ext.Adjustable Thermal Discharge : Ver.D/F	HSOP-6J TO-252-5-P2
R1171S	1.5	2.1 to 6.0	1.5 to 5.0	±2	0.09	0.18	IOUT=300mA	130	50	4.7 to 10 or more	Thermal	HSOP-6J
R1171J	2		1.8 to 5.0									TO-252-5-P1
RP108J	3	1.6 to 5.25	**0.8** to 4.2 **0.8** to 4.2, Ext.Adjustable	±1	0.51	0.60	IOUT=3A	350	65	10 or more	Load Reg : Typ.3mV Thermal Reverse Constant Discharge : Ver.D/F	TO-252-5-P2
RN5RF	Ext.Tr.	1.8 to 10.0	1.2 to 6.0	±2	0.1*3	0.2	IOUT=100mA	30	60	10 or more	Tantalum	SOT-23-5

*1 Set Output Voltage (VSET) = 2.8 V or close to 2.8 V unless otherwise noted. *2 Output Current (IOUT) is switchable between 500 mA or 1 A using the LCON pin of DFN1216-8.
*3 Dropout Voltage (VDIF) is dependent on the external transistor.

Multi-Channel LDO Linear Regulators

Product Name	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Dropout Voltage*1(V) Typ.	Max.	Condition	Supply Current*2 (µA) Typ.	RR@1kHz (dB) Typ.	Capacitor Capacitance (µF)	Other Features	Package
RP152x Dual	150	1.4 to 5.25	0.8 to 3.6	±1	0.20	0.35	IOUT=150mA	40	70	0.22 or more	Start-up sequence controllable: xxxC Discharge : Ver.B/C	DFN1212-6 SOT-23-6
R5326K Dual ♡	150	1.4 to 6.0	0.8 to 4.2	±1*3	0.19*3	0.27*3	IOUT=150mA	50*3 5.5*4	70*3	1 to 3.3	Automatic Discharge : Ver.B	DFN(PLP)1820-6
RP150K Dual	300	2.5 to 5.25	1.5 to 3.3	±1	0.21	0.34	IOUT=300mA	24	80	1 or more	TempCo : Typ.±30ppm/°C Discharge : Ver.B	DFN(PLP)2020-8
RP154x Dual ● ■ ♡	300	1.4 to 5.25	0.8 to 3.7	±1	0.25	0.30	IOUT=300mA	50	75	1 or more	Dual Input Type available: only DFN Discharge : Ver.B	DFN1216-8 SOT-23-6
R5324K Triple	100	2.0 to 6.0	1.5 to 4.0	±2	0.15	0.25	IOUT=100mA	90	70	1 or more	Discharge : Ver.B	DFN(PLP)2527-10
	150				0.22	0.33	IOUT=150mA					
	200				0.23	0.35	IOUT=200mA					

*1 Set Output Voltage (V_{SET}) = 2.8 V or close to 2.8 V unless otherwise noted. *2 Supply Current (I_{SS}) per channel. *3 Fast Response Mode *4 Low Power Mode

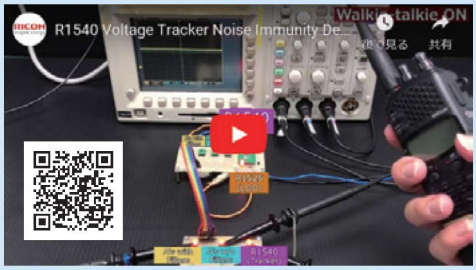
Voltage Tracker

Product Name	Output Current (mA)	Input Voltage Range (V)	Voltage Tracking Range (V)	Voltage Tracking Accuracy (mV)	Dropout Voltage*1 (V) Typ.	Max.	Conditon	Supply Current (µA) Typ.	RR @100 Hz (dB) Typ.	Capacitor Capacitance (µF)	Other Features	Package
R1540x ● ■ ♡	70	3.5 to 42.0	2.2 to 14.0	±15 (Ta=-40 to 105°C)	1.3	2.1	IOUT=70mA	60	80	4.7 or more	Operating Temp.:-40 to 105°C Foldback Proteciton Circuit Thermal High Immunity	SOT-23-5 HSOP-8E

High Noise Immunity 42 V Input / 70 mA Voltage Tracker IC

The R1540 is a voltage tracker featuring input voltage in the range of 3.5 V to 42 V. Highly accurate output voltage which attributes to CE/ADJ pin achieves successful sequence control of the integrated off-board sensor module. R1540 is strong enough and does not require the circuit to avoid external electromagnetic interference (EMI). This feature of R1540 contributes to space saving.

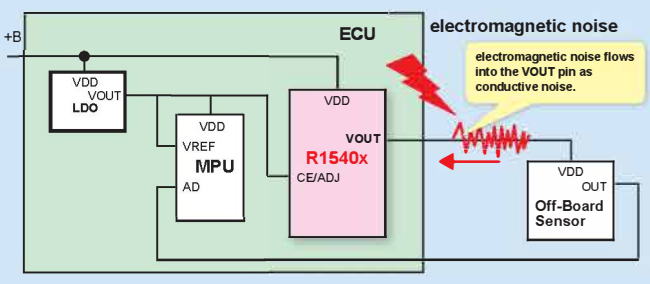
EMI, PSSR and Transient Response



The Open - YouTube
R1540 Noise Immunity Demonstration

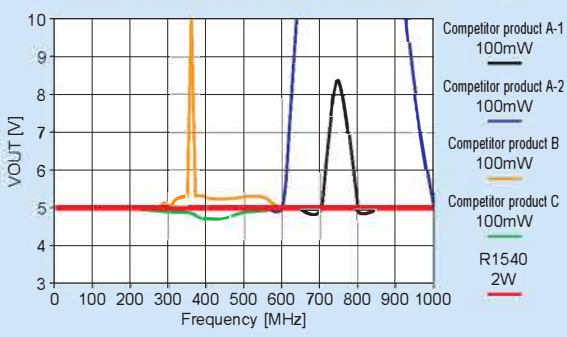
A regulator output voltage may vary due to electromagnetic noise interference (EMI), advanced technology is built-in to prevent such voltage variation. Severe tests performed at our laboratories confirmed that the R1540 has superior immunity to EMI noise over a broad (150 kHz to 1 GHz). Furthermore, it has a high ripple rejection ratio of 80 dB and a fast response to transients on input and load. The R1540 has a stable operation, it is essential to use a ceramic output capacitor with a minimum value of 10 µF.

EMI-resistant components are required for the IC



IC contributes to system safety!

R1540x outputs stable voltage even with 2 W noise applied.



Voltage Detectors (Reset ICs)/Watchdog Timers (WDT)/Reset Timer ICs

● : Available in Automotive Products ■ : Available in Industrial Products
♡ : Products available in PRODUCT LONGEVITY PROGRAM : Products in Development : Products Newly Released
Products available only for automotive and industrial are not listed.

Microcontroller Supervisor Features

Max. Operating Voltage (V)	Release Output Delay Time	Supervisor Configuration : VD Monitors:	VD		VD with WDT		VD with LDO and WDT		VD with LDO		
			VIN	VSENSE	VIN	VSENSE	VOUT	VSENSE	VIN	VOUT	VSENSE
5.5	Y	Int. Counter	RP300x								
6.0	N	—	R3114x	R3117x	—						
	Y	Ext. Capacitor	R3112x R3116x	R3118x	R5106N R5107G R5109G	R5108G					
		Int. Counter	R3130N R3132x R3133D R3134N								
10.0	N	—	R3111x		—						
	Y	Ext. Capacitor	RN5VD				R5101G				
24.0	N	—			—				R1150HxxxA		R1150HxxxB
	Y	Ext. Capacitor							R1150HxxxC	R1150HxxxD	
36.0	N	—		R3119xxxxE	—				R1510SxxxA		R1510SxxxB
	Y	Ext. Capacitor	R3119xxxxA R3121NxxxA/G R3150NxxxA/B	R3150NxxxE/F R3121NxxxE			R5110Sxx1A/B	R5110xxx2C/D	R1510SxxxC	R1510SxxxD	
42.0	Y	Ext. Capacitor		R3152NxxxA/B R3154N R3500S			R5114x R5114L R5115x R5115L		R5117S R5117L	R5112SxxxD	R5112SxxxB R5116S R5116L R5117S R5117L
60.0	Y	Ext. Capacitor	R3160N								

Voltage Detectors (Reset ICs)

Product Name	Operating Voltage Range (V)	Detector Threshold Range (V)	Detector Threshold Accuracy (%)	Reset Signal	SENSE Pin	MR Pin*1	Adjustable Release Output Delay Time	Output Delay Time Accuracy (%)	Supply Current*2 (µA)	Hysteresis	Package
RP300x ♡	0.72 to 5.50	1.1, 2.32, 2.63, 2.7, 2.8, 2.93, 3.08, 4.38, 4.6	±0.8	L	N	Y	Int. Counter	50ms±5 200ms±5	0.95	N	DFN(PLP)1010-4B SOT-23-5
R3114x ♡	0.5 to 6.0	0.7 to 5.0	±0.8	L	N	N	—	—	0.35	Y	DFN(PLP)1010-4 SC-82AB SOT-23-5
R3112x ♡	0.7 to 6.0	0.9 to 5.0	±2.0	L	N	N	Ext. Capacitor	Not specified	0.5	Y	SON1612-6 SC-82AB SOT-23-5
R3116x ● ■ ♡	0.5 to 6.0	0.7 to 5.0	±0.8	L	N	N	Ext. Capacitor	±15	0.35	Y	DFN(PLP)1010-4 SC-82AB SOT-23-5
R3130N	1.0 to 6.0	1.6 to 4.8	±1.5	L	N	N	Int. Counter	50ms±10 240ms±10	1.4	N	SOT-23-3
R3132x	0.75 to 6.0	1.0 to 5.0	±2.0	L	N	Y	Int. Counter	240ms±15	0.8	N	SON1612-6 SC-82AB
R3133D	0.8 to 6.0	1.0 to 5.0	±2.0	H	N	Y	Int. Counter	240ms±15	0.8	N	SON1612-6
R3134N ♡	0.75 to 6.0	1.0 to 5.0	±1.8	L	N	Y	Int. Counter	240ms±15	0.8	N	SOT-23-5
R3117x*5 ● ■ ♡	1.0 to 6.0	0.7 to 5.0	±1.0	L	Y	N	—	—	0.29	Y	DFN(PLP)1010-4 SC-88A SOT-23-5
R3118x ● ♡	1.0 to 6.0	0.6 to 5.0	±1.5	L	Y	N	Ext. Capacitor	±30	0.4	Y	DFN(PLP)1212-6 SC-88A SOT-23-5
R3111x ♡	0.7 to 10.0	0.9 to 6.0	±2.0	L/H*3	N	N	—	—	1.0	Y	SON1612-6 SC-82AB SC-88A SOT-23-3 SOT-23-5 SOT-89
RN5VD ♡	0.7 to 10.0	0.9 to 6.0	±2.5	L	N	N	Ext. Capacitor	Not specified	1.0	Y	SOT-23-5
R3119xxxxA*5 ● ■ ♡	1.2 to **36.0**	2.3 to 12.0	±1.5	L	N	N	Ext. Capacitor	-50, +80	3.3	Y	DFN(PLP)1820-6 SOT-23-5
R3119xxxxE*5 ● ■ ♡	2.1 to 6.0*4				Y		—	—			
R3150NxxxA*5 ● ■ ♡	1.4 to **36.0**	Detector Threshold Range: 5.0 to 10.0, Release Threshold Range: 5.3 to 11.0	Detector Threshold Accuracy: ±1.5, Release Threshold Accuracy: ±1.5	L	N	N	Ext. Capacitor, Detector Output Delay Time and Release Output Delay Time are also adjustable using external capacitors.	Output Delay Time Accuracy: -35, +40, Detector Output Delay Time Accuracy: -35, +40	3.8	Y	SOT-23-6
R3150NxxxB*5 ● ■ ♡				H							
R3150NxxxE*5 ● ■ ♡	3.6 to 6.0*4			L	Y				3.5		
R3150NxxxF*5 ● ■ ♡				H							
R3121NxxxA/G ● ■ ♡	1.4 to **36.0**	3.0 to 12.0	±1.5	L	N	N	Ext. Capacitor	-35, +40	3.8	Y G: N	SOT-23-6
R3121NxxxE ♡	2.4 to 6.0*2				Y		Ext. Capacitor		3.5		
R3152NxxxA*5 ● ■ ♡	3.0 to **42.0**	OV: 1.1 to 5.9 UV: 1.0 to 4.8	±0.5	L	Y	N	Ext. Capacitor	37.5, +100	1.5	Y	SOT-23-6
R3152NxxxB*5 ● ■ ♡										N	

Product Name	Operating Voltage Range (V)	Detector Threshold Range (V)	Detector Threshold Accuracy (%)	Reset Signal	SENSE Pin	MR Pin*1	Adjustable Release Output Delay Time	Output Delay Time Accuracy (%)	Supply Current*2 (µA)	Hysteresis	Package
R3154NxxxA *5*6	3.0 to **42.0**	OV: 0.75 to 3.7 UV: 0.55 to 3.3	±0.5	L	Y	N	Ext. Capacitor	-37.5, +100	2.0	Y	SOT-23-6
R3511SxxxA Quadruple *5*6	3.0 to **42.0**	OV: 1.0 to 5.9 UV: 0.9 to 5.0	±0.5	L	Y	Y	Ext. Capacitor	-37.5, +100	10.0	Y	HSOP-18
R3160N *5	2.7 to **60.0**	10.0 to 48.0	±1.0	H/L	N	N	Ext. Capacitor	±50	1.8	Y	SOT-23-6

*1 Manual Reset Pin *2 Detector Threshold (-V_{DET}) = 1.5 V, Detection released *3 SON1612-6, SC-82AB and SC-88A generates a high reset signal. *4 Input Voltage of SENSE Pin: 0V to 36.0V
*5 Operating Temperature Rang = -40°C to 105°C *6 Built-in Failure Diagnosis Function

Watchdog Timers (WDT)

● Watchdog Timer (WDT) with Voltage Detectors (Reset ICs) and LDO Linear Regulators

Product Name	Operating Voltage Range (V)	Voltage Detector Section					Watchdog Timer Section				LDO Regulator Section			Supply Current (µA)	Package
		Detector Threshold Range (V)	Detector Threshold Accuracy (%)	Output Delay Time*1 (ms)			WDT Timeout Period*2 (ms)			Inhibit Pin	Output Voltage Range (V)	Output Voltage Accuracy (%)	Output Current (mA)	Typ.	
				Min.	Typ.	Max.	Min.	Typ.	Max.						
R5101G	1.5 to 10.0	1.7 to 4.5	±2.5	7	14	35	50	120	250	Y	1.8 to 5.0	±2.5	50	5	SSOP-8G
R5110Sxx1A *5 R5110Sxx1B *3, *5	3.5 to **36.0**	1.6 to 5.5	±1.8*4	194	242	290	14.4	18	21.6	N	1.8 to 5.0	±1.5*4	500	25	HSOP-8E
R5110Sxx2C *5 R5110Sxx2D *3, *5										Y					HSOP-18
R5110Lxx2C *5 R5110Lxx2D *3, *5															HQFN0808-28
R5114Sxx1x *5	3.5 to **42.0**	2.5 to 4.8	±1.6*4	184	220	253	14.8	18	21.9	Y	3.3 to 5.0	±1.6*4	250	8.5	HSOP-8E
R5114Sxx2x *5															HSOP-18
R5114Lxx2x *5															HQFN0808-28
R5115Sxx1x *3, *5	3.5 to **42.0**	2.5 to 4.8	±1.6*4	184	220	253	14.8	18	21.9	Y	3.3 to 5.0	±1.6*4	250	8.5	HSOP-8E
R5115Sxx2x *3, *5															HSOP-18
R5115Lxx2x *3, *5															HQFN0808-28

*1 R5101: C_D = 0.001 µF, R5110/R5114/R5115: C_D = 0.22 µF *2 R5101: C_W = 0.01 µF, R5110/R5114/R5115: C_{TW} = 0.01 µF
*3 Window Watchdog Timer. Window watchdog timer monitors microprocessor activity and asserts a reset signal if the watchdog pulse does not occur witin the defined time window (open window) or if the watchdog pulse occurs within the defined time widown (close window). *4 Detector Threshold Accuracy in all temperature range.
*5 Operating Temperature Rang = -40°C to 105°C

● Watchdog Timer (WDT) with Voltage Detectors (Reset ICs)

Product Name	Operating Voltage Range (V)	Voltage Detector Section			Watchdog Timer Section		Supply Current (µA)	Remarks	Package
		Detector Threshold Range (V)	Detector Threshold Accuracy (%)	Output Delay Time Accuracy (%)	WDT Timeout Period Accuracy (%)	Inhibit Pin	Typ.		
R5106N *1	0.9 to 6.0	1.5 to 5.5	±1.0	±16	±33	Y	11	CD Pin and CTW Pin are combined.	SOT-23-6
R5107G *1								MR Pin is included.	SSOP-8G
R5108G *1	1.5 to 6.0							SENSE Pin is included.	
R5109G *1	0.9 to 6.0						11.5	2 Clock Input Type	

*1 Operating Temperature Rang = -40°C to 105°C

Reset Timer ICs

A reset timer is designed for a mobile equipment, such as a smartphone and a tablet, with a fixed internal battery which cannot be removed to initiate a reset sequence.

Product Name	Operating Voltage Range (V)	Reset Input	Reset Output	Supply Current (µA)	Output Delay Time (s)	Output Release Time (s)	Package	Remarks
R3200x001x	1.65 to 5.5	$\overline{SR0}$, $\overline{SR1}$	xxxA: $\overline{RST}$ xxxB: $\overline{RST}$, RST2	0.28	7.5, 11.25	—	DFN(PLP)2020-8B	
R3200x002x					7.5	0.234	DFN1216-8	
R3200L052B					10	0.313	DFN1216-8	
R3200L053B					10	0.078	DFN1216-8	
R3200L064A					3	0.1875	DFN1216-8	
R3201L001	2.2 to 5.5	RST0, RST1	SRO nSRO DCHGx	0.35: at standby, at shipping mode	8	0.4	QFN014018-10	with shipping mode
R3201L002					10			
R3201L003					12			
R3201L004					16			

DC/DC Switching Regulators

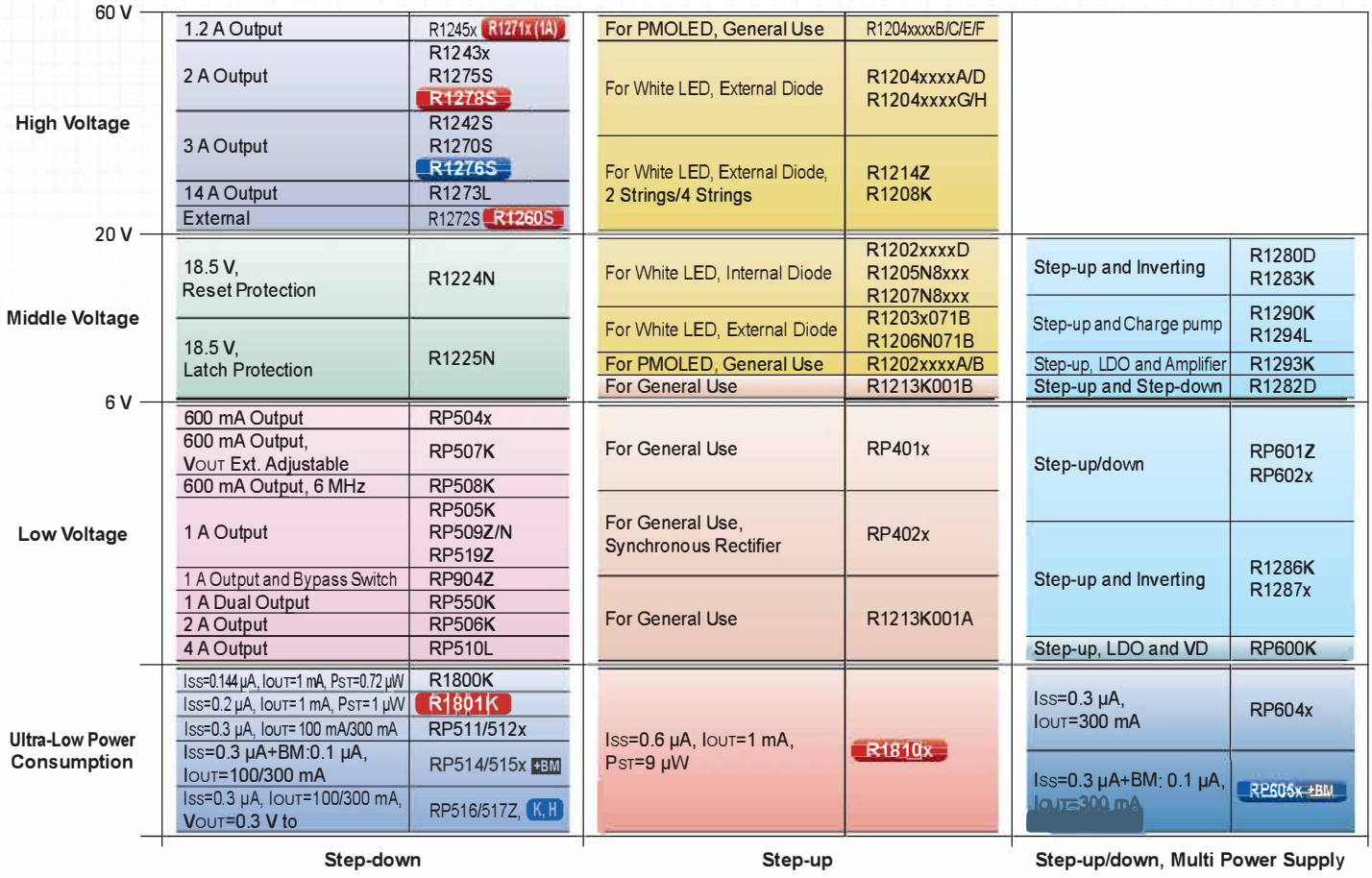
Grey-out Products : The successors of these products are indicated in Product Name.

● : Available in Automotive Products ■ : Available in Industrial Products ♡ : Products available in PRODUCT LONGEVITY PROGRAM

: Products Newly Released : Products in Development

Input Voltage Level and DC/DC Switching Regulators Type Chart

Major products are classified by input voltage and function. This chart does not include all products.



High Voltage Step-down DC/DC Switching Regulators

Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range (V)	VFB Voltage Accuracy (mV)	Switching Frequency (kHz)	Output Current*1 (A)	Protection Circuit Type	Other Features	Package
R1240x	00xA 00xB	PWM	4.5 to 30.0	0.8 to 15.0, Ext.Adjustable	0.8V±12	1250	1.2	Latch Fold-back	Soft-Start Thermal	SOT-23-6W*2 DFN(PLP)2527-10
R1244N	001B	PWM	4.5 to 30.0	0.8 to 15.0, Ext.Adjustable	0.8V±12	1250	1.2	Fold-back	Soft-Start Thermal	SOT-23-6W*2
R1245x ● ♡	00xA/C/E/G 00xB/D/F/H	PWM	4.5 to 30.0	0.8 to 27.6, Ext.Adjustable	0.8V±8	330: xxxA/B, 500: xxxC/D, 1000: xxxE/F, 2400: xxxG/H	1.2	Latch Fold-back	Operating Temp.:-40 to 105°C Soft-Start Thermal	DFN(PLP)2020-8 SOT-23-6W HSOP-8E
R1243x ♡	001A/C 001B/D 001E	PWM	4.5 to 30.0	0.8 to 18.0, Ext.Adjustable	0.5V±7	330: xxxC/D, 1000: xxxA/B/E	2	Latch Fold-back Latch	Soft-Start : Ext. Adjustable Thermal FLG Pin	DFN(PLP)2527-10 HSOP-8E HSOP-8E
R1242S	001A/C/E/G 001B/D/F/H	PWM	5.0 to 30.0	0.8 to 15.0, Ext.Adjustable	0.8V±12	330: xxxC/D, 500: xxxE/F, 1000: xxxG/H, 330 to 1000: xxx A/B, Ext.Adjustable	3	Latch Fold-back	Synchro : with external low side transistor UVLO Soft-Start Thermal	HSOP-8E
R1271x ■	xx1A/B/C/D	Forced PWM	3.6 to 30.0	3.3, 5.0	±1%	2000	1	Latch or Hiccup	Operating temp.: -40 to 105°C Synchro Soft-Start : Ext, Adjustable UVLO OVLO Thermal SSCG : xx1C/D PG	DFN3030-12B HSOP-18
R1275S ● ■ ♡ 2027	003x	Forced PWM	3.6 to 30.0	3.3 to 5.0, Ext.Adjustable	0.64V±1%	2000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit (1800 to 2200)	2	Hiccup	Operating temp.:-40 to 105°C Synchro OVLO : Ver.003C PG UVLO Soft-Start : Ext.Adjustable Thermal OVLO Phase : Ext.	HSOP-18
R1278S ■	003x	Forced PWM	3.6 to 30.0	3.3 to 5.0, Ext.Adjustable	0.64V±1%	2000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit (1800 to 2200)	2	Hiccup	Operating temp.:-40 to 105°C Tracking function Synchro SSCG : Ver.003C PG UVLO Soft-Start : Ext.Adjustable Thermal OVLO Phase : Ext.	HSOP-18

Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range (V)	V_{FB} Voltage Accuracy (mV)	Switching Frequency (kHz)	Output Current*1 (A)	Protection Circuit Type	Other Features	Package
R1275S	00xA/C	Forced PWM, PWM/VFM Auto Switching	3.6 to 30.0	0.7 to 6.5, Ext. Adjustable	0.64V±1%	250 to 1000: Ext. Adjustable, Ext. Synchronizable with PLL Circuit	3	Hiccup	Operating temp.: -40 to 105°C Synchro SSCG : Ver. xxxC PG UVLO Soft-Start : Ext.Adjustable OVLO Thermal Phase : Ext.	HSOP-18
R1270S	001A 001B	PWM, PWM/VFM Auto-Switching	3.6 to 34.0	0.8 to 31.6, Ext.Adjustable	0.8V±8	300 to 2400: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	3	Fold-back Latch Fold-back	Operating Temp.: -40 to 105°C Diode UVLO Soft-Start : Ext.Adjustable Thermal FLG Pin OVLO Phase : Ext.	HSOP-18
R1272S	xxxA	Forced PWM, PWM/VFM Auto-Switching	4.0 to 34.0	0.7 to 5.3, Ext.Adjustable	0.64V±1%	250 to 1000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	External	Latch or Hiccup	DC/DC Controller Operating Temp.: -40 to 105°C Synchro SSCG : Ver.03/13x PG UVLO Soft-Start : Ext.Adjustable Thermal OVP Phase : Ext.	HSOP-18
R1273L	xxxA	Forced PWM, PWM/VFM Auto-Switching	4.0 to 34.0	0.7 to 5.3, Ext.Adjustable	0.64V±1%	250 to 1000: Ext.Adjustable, Ext.Synchronizable with PLL Circuit	14	Latch or Hiccup	Operating Temp.: -40 to 105°C Synchro SSCG : Ver.03/13x PG UVLO Soft-Start : Ext.Adjustable Phase : Ext. Thermal OVP	QFN0505-32B
R1260S	xxxA/B/C/D	Forced PWM, PWM/VFM Auto Switching	5.0 to 60.0	1.0 to 16.0, Ext. Adjustable	0.8V±1%	150 to 600: Ext. Adjustable, Ext. Synchronizable with PLL Circuit	External	Latch or Hiccup	DC/DC Contoller Operating Temp.: -40 to 105°C Synchro Soft-Start : Ext. Adjustable UVLO OVP Thermal SSCG : xxxB/D PG Phase : Ext.	HSOP-18

*1 Output Current (I_{OUT}) can be affected by environmental conditions or external components. This is an approximate value. *2 The pin-layout of R1240N and that of R1244N is upside down.

Middle Voltage Step-down DC/DC Switching Regulators

These products are middle voltage step-down DC/DC controllers with an external output transistor.

Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy*1 (%)	Switching Frequency (kHz)	Output Tr.	Output Current	Protection Circuit Type	Other Features	Package
R1223N	xx2A/B	PWM/VFM Auto Switching	2.3 to 13.2	1.5 to 5.0	±2	300: xxxA/C/E/G, 500: xxxB/D/F/H	External	Depending on external MOSFET	Latch	Diode	SOT-23-5
	xx2C/D	PWM								Soft-Start	
	xx2E/F	PWM/VFM Auto Switching							Reset		
	xx2G/H	PWM									
R1224N	xx2E/F/L	PWM/VFM Auto Switching	2.3 to 18.5	1.2 to 6.0	±2	180: xxxL/M, 300: xxxE/G, 500: xxxF/H	External	Depending on external MOSFET	Reset	Diode	SOT-23-5
	xx2G/H/M	PWM		1.0 to V_{IN}, Ext.Adjustable						Soft-Start	
	102G/H/M									UVLO	
R1225N	xx2C/D/K	PWM	2.3 to 18.5	1.2 to 6.0	±2	180: xxxJ/K, 300: xxxA/C, 500: xxxB/D	External	Depending on external MOSFET	Latch	Diode	SOT-23-6W
	xx2A/B/J	PWM/VFM Auto Switching								Soft-Start	
										UVLO	

*1 For the externally adjustable output voltage type, this is a feedback voltage accuracy.

Low Voltage Step-down DC/DC Switching Regulators

Product Name	Version	Control	MODE Pin	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy*1 (%)	Switching Frequency (MHz)	Output Current*2 (mA)	Protection Circuit Type	Other Features	Package
RP514x +BM	xxxA/B	VFM	N	1.8 to 5.5	1.0 to 4.0	±1.5	1*3	100	—	Ultra-Low Power Consumption: **0.3μA (+BM:0.1μA)** Synchro UVLO Soft-Start Discharge : xxxB	WLCSP-9-P2 DFN(PLP)2527-10
RP515x +BM	xxxC/D	VFM	N	1.8 to 5.5	1.0 to 4.0	±1.5	1*3	300	—	Ultra-Low Power Consumption: **0.3μA (+BM:0.1μA)** Synchro UVLO Soft-Start Discharge : xxxD	WLCSP-9-P2 DFN(PLP)2527-10
RP516Z RP516x	xxxA/B	VFM	N	1.8 to 5.5	**0.3** to 1.2	±18mV	1*3	100	—	Ultra-Low Power Consumption: **0.3μA** Synchro UVLO Soft-Start Discharge : xxxB	WLCSP-8-P1 DFN(PLP)2527-10 SOT-89-5
RP517Z RP517x	xxxC/D	VFM	N	1.8 to 5.5	**0.3** to 1.2	±18mV	1*3	300	—	Ultra-Low Power Consumption: **0.3μA** Synchro UVLO Soft-Start Discharge : xxxD	WLCSP-8-P1 DFN(PLP)2527-10 SOT-89-5

DC/DC Switching Regulators

Product Name	Version	Control	MODE Pin	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy*1 (%)	Switching Frequency (MHz)	Output Current*2 (mA)	Protection Circuit Type	Other Features	Package
RP511x ♡	xx1A/B	VFM	N	2.0 to 5.5	1.0 to 4.0	±1.5	1*3	100	—	Ultra-Low Power Consumption: **0.3µA** Synchro UVLO Soft-Start Discharge : xx1B	WLCSP-8-P1 DFN(PLP)2527-10 SOT-89-5
RP512x ♡	xx1C/D	VFM	N	2.0 to 5.5	1.0 to 4.0	±1.5	1*3	300	—	Ultra-Low Power Consumption: **0.3µA** Synchro UVLO Soft-Start Discharge : xx1D	WLCSP-8-P1 DFN(PLP)2527-10 SOT-89-5
RP500x	xx1A	PWM/VFM Auto Switching	N	2.55 to 5.5	1.1 to 3.3	±1.5	1.2	600	Latch	Synchro UVLO Soft-Start Discharge : xx3A/xx4A	DFN(PLP)1820-6 SOT-23-6W
	xx2A	PWM									
	xx3A	PWM/VFM Auto Switching									
	xx4A	PWM									
RP503x	xx1A	PWM/VFM Auto Switching	N	2.5 to 5.5	0.8 to 2.5	±1.5	2	600	Latch	Synchro UVLO Soft-Start Discharge : xx2A	DFN1616-6 SOT-23-5
	xx2A										
RP507K ♡	001B	PWM/VFM Auto Switching	N	2.3 to 5.5	0.7 to 5.5, Ext.Adjustable	0.6V±9mV	2	600	—	Synchro UVLO Soft-Start Thermal Discharge	DFN(PLP)1616-6D
RP504x	xx1A	Forced PWM, PWM/VFM Auto Switching	Y	2.3 to 5.5 (VOUT≥1.0)	0.8 to 3.3	±1.5	2.25	600	Latch	Synchro UVLO Soft-Start Discharge : xx1D	DFN(PLP)1216-6F DFN1616-6B
	xx1B	PWM/VFM Auto Switching	N								SOT-23-5
	xx1C	Forced PWM									
	xx1D	Forced PWM, PWM/VFM Auto Switching	Y								DFN(PLP)1216-6F DFN1616-6B
RP508K ♡	xx1A	Forced PWM, PWM/VFM Auto Switching	Y	2.3 to 5.5	0.8 to 3.3	±1.5	6	600	—	Synchro UVLO Soft-Start Thermal Discharge : xx1B	DFN(PLP)1212-6F
	xx1B										
RP502x	xx1B	PWM/VFM Auto Switching	N	2.5 to 5.5	0.8 to 3.3	±1.5	3.3	600	Latch	Synchro UVLO Soft-Start Discharge : xx3B/xx4B	WLCSP-6-P2 DFN1616-6
	xx2B	PWM									
	xx3B	PWM/VFM Auto Switching									
	xx4B	PWM									
R1232D	xx1A/B	PWM	N	2.6 to 5.5	0.9 to 3.3	±2	1: xxxA/C, 2.25: xxxB/D	1000	Latch	Synchro UVLO Soft-Start	SON-8
	001C/D				0.8 to VIN, Ext.Adjustable	0.8V±16mV					
RP501K	xx1A	PWM, PWM/VFM Auto Switching	Y	2.5 to 5.5	1.0 to 3.3	±1.5	2.25	1000	Latch	Synchro UVLO Soft-Start Discharge : xx1B	DFN(PLP)2527-10
	xx1B										
RP505K ♡	xx1A	Forced PWM, PWM/VFM Auto Switching	Y	2.3 to 5.5 (VOUT≥0.8)	0.6 to 3.3	±1.5	2.25	1000	Latch	Synchro UVLO Soft-Start Thermal Discharge : xx1B	DFN(PLP)2020-8
	xx1B										
	001C			2.3 to 5.5	0.8 to 3.3, Ext.Adjustable	0.6V±9mV					
RP509x ♡	xxxA/B	Forced PWM, PWM/VFM Auto Switching	Y	2.3 to 5.5	0.6 to 3.3	±1.5 (VOUT≥1.2V)	6	1000 or 500	—	Synchro UVLO Soft-Start Thermal Discharge : xxxB/00xD	WLCSP-6-P6 SOT-23-6
	00xC/D				0.6 to 5.5, Ext.Adjustable	0.6V±9mV					
RP519Z	xxxA/B	Forced PWM, PWM/VFM Auto Switching	Y	2.3 to 5.5	0.6 to 3.3	±1.5 (VOUT≥1.2V)	6	1000 or 500	—	Synchro UVLO Soft-Start Thermal Discharge : xxxB/00xD	WLCSP-6-P8 (t=0.36mm)
	00xC/D				0.6 to 5.5, Ext.Adjustable	0.6V±9mV					
RP904Z	xxxA	PWM/VFM Manual Switching	Y	2.5 to 5.5	1.2 to 3.3 (VSET1)	±2	2	1000	Latch	Synchro UVLO Soft-Start Built-in Bypass switch, Output Voltage selectable from VSET1 or VSET2	WLCSP-11-P2
					1.0 to1.5 (VSET2)	±30mV					
RP506K ● ■ ♡	xx1A/D	Forced PWM, PWM/VFM Auto Switching	Y	2.5 to 5.5 or 2.5 to 4.5	0.8 to 3.3: xx1A/B 0.6 to 3.3: xx1D/E	±1.5	1.2: xxx1D/E/F, 2.25: xxxA/B/C	2000	Latch	Synchro UVLO Soft-Start : Ext.Adjustable Thermal Discharge : xx1B/E PG	DFN(PLP)2527-10
	xx1B/E				0.8 to 4.0, Ext.Adjustable	0.6V±9mV					
	001C				0.6 to 4.0, Ext.Adjustable						
	001F										
RP510L ● ■ ♡	xx1/4G	Forced PWM	N	2.5 to 5.5	0.8, 1.0, 1.1, 1.2, 1.3, 1.5, 1.8, 3.0, 3.3	±1.0	2.3	4000	xx1/001: Latch xx4/004: Fold-back	Synchro UVLO Soft-Start : Ext.Adjustable Discharge : xxxH/N Thermal PG	DFN3030-12
	xx1/4H										
	001/4J				0.8 to 3.3, Ext.Adjustable	0.6V±6mV					
	001/4N										

● Dual Channel

RP550K Dual ● ■ ♡	001A	Forced PWM, PWM/VFM Auto Switching	Y	2.3 to 5.5 (VOUT≥0.8)	0.6 to 3.3, Ext. Adjustable	0.6V±9mV	2.25	1000 per Channel	Latch	Synchro UVLO Soft-Start Thermal	DFN(PLP)2730-12

*1 For the externally adjustable output voltage type, this is a feedback voltage accuracy. *2 Output Current (IOUT) can be affected by environmental conditions or external components. This is an approximate value. *3 Switching frequency is depending on the conditions of Input, Output Voltage, and Output Current.

Energy Harvesting, Step-Down DC/DC for Storage

Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Switching Frequency (MHz)	Output Current*1 (mA)	Supply Current (µA)	Other Features	Package
R1800K ♡	xx1A	VFM	2.0 to 5.5	2.0 to 4.5	±3	*2	1	**0.144**	Reverse Maximum Power Voltage: 2.0V to 5.3V Minimum Starting Power: **0.72µW**	DFN(PLP)2730-12
R1801K	xxxA	VFM	2.2 to 5.5	2.2 to 4.5	±3	*2	1	**0.2**	Reverse PG Maximum Power Voltage: 2.7V to 5.3V Minimum Starting Power: **1µW** Adjustable MPPC/VOUT	DFN(PLP)2730-12

*1 Output Current (I_{OUT}) can be affected by environmental conditions or external components. This is an approximate value. *2 Switching frequency is depending on the conditions of Input, Output Voltage, and Output Current.

Step-up DC/DC Switching Regulators for White LEDs/PMOLEDs/General Use

These products are PWM step-up DC/DC converters, which are optimized to drive white LEDs for background illumination or passive matrix OLED display with constant current. These products include an under-voltage lockout circuit (UVLO), and a soft-start circuit. These products can also be used in a general step-up power supply.

For White LEDs

Diode	Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range*1 (V)	V_{FB} Voltage Accuracy (mV)	Switching Frequency (kHz)	Lx Current Limit*2 (mA)	OVP Voltage (Typ.) (V)	Other Features	Package
Internal	R1202x ♡	3xxD	PWM	1.8 to 5.5	Up to 22.2, Ext.Adjustable	0.2V±10	1200	350	14	UVLO Soft-Start Thermal Shutdown LED Adjust	DFN1616-6B TSOT-23-6
		7xxD						700	23		
	R1205L	8x1B	PWM	1.8 to 5.5	Up to 24.2, Ext.Adjustable	0.2V±10	1200	350	25	UVLO Soft-Start Thermal LED Adjust	DFN1616-6B
		8x1C				0.4V±10		700			
	R1205N ⇒R1207N	8x3B	PWM	1.8 to 5.5	Up to 24.2, Ext.Adjustable	0.2V±10	1200	350 700	25	UVLO Soft-Start Thermal LED Adjust	TSOT-23-6*3
	R1207N	8x3B	PWM	1.8 to 5.5	Up to 24.2, Ext.Adjustable	0.2V±10	1200	350	25	UVLO Soft-Start Thermal LED Adjust	TSOT-23-6*3
		8x3C				0.4V±10		700			
	R1218N	021A	PWM	1.8 to 5.5	Up to 17, Ext.Adjustable	0.2V±10	1200	700	9.5	UVLO Soft-Start	SOT-23-6
		031A							14		
		041A							18.5		
External	R1203L	071B	PWM	1.8 to 5.5	Up to 28.7, Ext.Adjustable	0.2V±10	1200	700	29.5	UVLO Soft-Start LED Adjust	DFN1616-6B
	R1203N ⇒R1206N	071B	PWM	1.8 to 5.5	Up to 28.7, Ext.Adjustable	0.2V±10	1200	700	29.5	UVLO Soft-Start LED Adjust	SOT-23-6*3
	R1206N	071B	PWM	1.8 to 5.5	Up to 28.7, Ext.Adjustable	0.2V±10	1200	700	29.5	UVLO Soft-Start LED Adjust	SOT-23-6*3
	R1204x ♡	11xA/D	PWM	2.3 to 5.5	Up to 40.2, Ext.Adjustable	0.2V±10	1000: xxxA, 750: xxxD	900	23	UVLO Soft-Start Thermal LED Adjust	DFN(PLP)1820-6 TSOT-23-6
		21xA/D							33		
		31xA/D							42		
		11xG/H				0.4V±10	1000: xxxG, 750: xxxH		23		
		21xG/H							33		
		31xG/H							42		
	R1218N	052A	PWM	1.8 to 5.5	Up to 30, Ext.Adjustable	0.2V±10	1200	700	23	UVLO Soft-Start	SOT-23-6
		062A							27.5		
		072A							31.5		

*1 Output voltage is different by version. *2 Lx current limit is different from output current. *3 The pin-layout of R1205N and that of R1207N are different by 180 degrees. Also, the pin-layout of R1203N and that of R1206N are different by 180 degrees.

For 2 or 4 Strings of White LEDs

Diode	Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range*1 (V)	Max LED Current (mA)	LED Current Accuracy (%)	Switching Frequency (kHz)	Lx Current Limit*2 (A)	OVP Voltage (Typ.) (V)	Other Features	Package
External	R1214Z ♡	211A/C	PWM/VFM Auto Switching	2.7 to 5.5	Up to 29, Ext. Adjustable	40x2	±2: xx1A/B, ±1.5: xx1C/D	750: 221A/C, 450: 211A/B/C/D	1.9	35	UVLO Soft-Start Thermal LED Adjust 2 strings	WLCSP-9-P1
		221A/C										
		211B	PWM									
		211D										
	R1208K ♡	112A/B	PWM	2.7 to 22.0	Up to 42, Ext. Adjustable	80x4	±3	750: xxxA, 450: xxxB	2	23	UVLO Soft-Start Thermal LED Adjust 4 strings	DFN(PLP)2730-12
		212A/B								33		
		312A/B								43.5		

*1 Output voltage is different by version. *2 Lx current limit is different from output current.

DC/DC Switching Regulators

For PMOLEDs and General Use

Diode	Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range*1 (V)	VFB Voltage Accuracy (mV)	Switching Frequency (kHz)	Lx Current Limit*2 (mA)	OVP Voltage (Typ.) (V)	Other Features	Package
Internal	R1200x	001x 002x 003x	PWM	2.3 to 5.5	Up to 20, Ext.Adjustable	1.0V±15	1200	700	17 19 21	UVLO Soft-Start Shutdown Discharge : xxxA	DFN1616-6 SOT-23-6
	R1202x ♡	3xxA/B 4xxA/B 5xxA/B 6xxA/B 7xxA/B	PWM	2.3 to 5.5	Up to 22.2, Ext.Adjustable	1.0V±15	1200	350 700	14 17 19 21 23	UVLO Soft-Start Thermal Shutdown Discharge : xxxA	DFN1616-6B TSOT-23-6
	R1205L	8x1A	PWM	2.3 to 5.5	Up to 24.2, Ext.Adjustable	1.0V±15	1200	350 700	25	UVLO Soft-Start Thermal	DFN1616-6B
	R1205N ⇄R1207N	8x3A	PWM	2.3 to 5.5	Up to 24.2, Ext.Adjustable	1.0V±15	1200	350 700	25	UVLO Soft-Start Thermal	TSOT-23-6*3
	R1207N	8x3A	PWM	2.3 to 5.5	Up to 24.2, Ext.Adjustable	1.0V±15	1200	350 700	25	UVLO Soft-Start Thermal	TSOT-23-6*3
External	R1204x ♡	11xB/C/E/F 21xB/C/E/F 31xB/C/E/F	PWM: xxxB/E PWM/VFM Auto Switching: xxxC/F	2.3 to 5.5	Up to 40.2, Ext.Adjustable	1.0V±15	1000: xxxB/C, 750: xxxE/F	900	23 33 42	UVLO Soft-Start Thermal	DFN(PLP)1820-6 TSOT-23-6

*1 Output voltage is different by version. *2 Lx current limit is different from output current. *3 The pin-layout of R1205N and that of R1207N are different by 180 degrees.

Step-up DC/DC Switching Regulators for General Use

Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy*1 (%)	Frequency (kHz)	Output Tr.	Lx Current Limit*2 (A)	Protection Circuit Type	Other Features	Package
RN5RK	xx1x xx2A	VFM	0.75 to 8.0 0.7 to 8.0	2.0 to 5.5	±2.5	Max.100	Internal External	—	—	Diode	SOT-23-5
R1210N	xx1A/C/D xx2C/D	PWM	0.9 to 8.0 0.8 to 8.0	2.2 to 6.0: xxxC/D 2.2 to 3.5: xx1A	±2.5	100: xxxA/C 180: xxxD	Internal External	—	—	Diode xx1A: with frequency change-over circuit Soft-Start*3	SOT-23-5
R1213K ♡	001A 001B	PWM	2.3 to 5.5	3.0 to 6.0, Ext.Adjustable 6.0 to 15.0, Ext.Adjustable	0.8V±8mV	1000	Internal	3	Latch	Diode Phase : Ext. Shutdown : FLAG pin Soft-Start : Ext. Adjustable UVLO Thermal	DFN(PLP)2730-12
RP400x	xx1A xx1B xx1C	PWM/VFM Auto Switching	0.8 to 5.5 0.7 to 5.5 1.2 to 5.5	1.8 to 5.0 or 1.8 to 5.0, Ext.Adjustable : only DFN	±2	700	Internal	0.6*4	—	Diode Soft-Start Anti-Ringing	DFN(PLP)1820-6 SOT-23-5
RP401x	xx1A xx1B xx1C xx1D	PWM, PWM/VFM Auto Switching PWM/VFM Auto Switching PWM	0.6 to 5.5	1.8 to 5.5 1.8 to 5.5 or 1.8 to 5.5, Ext.Adjustable : only DFN	±2	1200	Internal	1*4	Latch — — —	Diode Soft-Start	DFN(PLP)1820-6 DFN(PLP)1820-6 SOT-23-5
RP402x ♡	xx1A/C xx2A xx1B/D xx2B xx1E/G xx1F/H	PWM, PWM/VFM Auto Switching Forced PWM PWM, PWM/VFM Auto Switching Forced PWM PWM/VFM Auto Switching	0.6 to 4.8 or 0.6 to 4.6: 001 0.6 to 4.8	1.8 to 5.5 or 1.8 to 5.5, Ext.Adjustable 1.8 to 5.5	±1.5	1200 1000 1200 1000 1200	Internal	1.5*4	Latch — Latch —	Synchro Soft-Start OVP OVLO Anti-Ringing : xx1/001 Regulation available at VIN>VOUT Reverse current protection at VIN=0V or open Input and output cut off completely at standby: xxxA/B/E/F Input and output bypass at standby: xxxC/D/G/H	DFN(PLP)2020-8 SOT-23-5

*1 For the externally adjustable output voltage type, this is a feedback voltage accuracy. *2 Lx current limit is different from output current. *3 Soft-start includes a function that detects a sudden fluctuation of voltage to prevent overshoot and undershoot. *4 Lx Limit Current fluctuates depending on Duty.

Energy Harvesting, Step-Up DC/DC for Storage

Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range (V)	Output Voltage Accuracy (%)	Switching Frequency (MHz)	Output Current*1 (mA)	Supply Current (µA)	Other Features	Package
R1810x	xx1A	VFM	0.35 to 2.1	2.3 to 4.5	±5	*2	1	0.6	Reverse PG : Output/Input Maximum Power Voltage: 0.2V to 2.1V Minimum Starting Power: 9µW	WLCSP-15-P1 DFN2735-14

*1 Output Current (I_{OUT}) can be affected by environmental conditions or external components. This is an approximate value. *2 Switching frequency is depending on the conditions of Input, Output Voltage, and Output Current.

DC/DC Switching Regulators for LCDs/OLEDs/CCDs

These products are suitable for the power management of LCDs, OLEDs and CCDs. Many variations are available such as step-up DC/DC Switching Regulators, step-up and step-down dual output converter and step-up and positive/negative charge pump triple output converter. These products include an under-voltage lockout circuit (UVLO), and a latch type protection circuit. The products with a built-in sequence control circuit option are able to control a start-up sequence and a shutdown sequence.

Step-up DC/DC Controllers

Product Name	Control	Input Voltage Range (V)	Output Voltage Range (V)	Voltage Accuracy*1 (mV)	Switching Frequency (kHz)	Output Tr.	Lx Current Limit*2 (A)	Protection Circuit Type	Other Features	Package
R1211x	PWM	2.5 to 6.0	Ext.Adjustable	1.0V±15	700: xxxA/B 300: xxxxC/D	External	N	Latch	Soft-Start UVLO Diode Phase : Ext., xxxA/C Phase : Int., xxxB/D, with stand-by	SON-6 SOT-23-6W
R1212D	PWM	2.2 to 5.5	Ext.Adjustable	1.0V±15	300: xxxC 700: xxxA 1400: xxxB	External	N	Latch	Soft-Start : Ext.Adjustable UVLO Diode Phase : Ext. Maxduty : Ext.Adjustable	SON-8
R1215D	PWM	1.8 to 5.5	Ext.Adjustable	1.0V±15	700: xxxA/E 1400: xxxB/F	External	N	Latch	Soft-Start : Ext.Adjustable UVLO Diode Phase : Ext. Maxduty : Ext.Adjustable	SON-8

Step-up and Inverting DC/DC Converters

Product Name	Control	Input Voltage Range (V)	Output Voltage Range (V)	Voltage Accuracy*1 (mV)	Switching Frequency (kHz)	Output Tr.	Lx Current Limit*2 (A)	Protection Circuit Type	Timer Latch Delay Time (ms)	Other Features	Package
R1280D	CH1: PWM, Step-up CH2: PWM, Inverting	2.5 to 5.5	Ext.Adjustable	1.0V±15	200: xxxC, 700: xxxA/B	External	—	Latch	100	Soft-Start : Ext.Adjustable UVLO Diode Phase : Ext., xxxA/C Phase : Int., xxxB, with stand-by	SON-10
R1283K	CH1: PWM, Step-up CH2: PWM, Inverting	2.5 to 5.5	Up to 20.0, Ext.Adjustable Up to V_{DD}-20.0, Ext.Adjustable	1.0V±15 0V±25	300: xxxA, 700: xxxB, 1400: xxxC	Internal	1.5 1.5	Latch	50	Soft-Start UVLO Discharge : Inverting output only Sequencing Diode	DFN(PLP)2730-12
R1286K	CH1: PWM, Step-up CH2: PWM, Inverting	2.3 to 5.5	4.6 to 5.8: xxxA/C to G 4.6 to 5.8, Ext.Adjustable, 001B -2.0 to -6.0: xxxA/C to G -2.0 to -6.0, Ext.Adjustable, 001B	±0.9% 1.0V±15 ±70 0V±25	1750	Internal	1.0: 0xxx, 1.1: 1xxx 1.5: 0xxx, 1.8: 1xxx	Latch	16: 0xxx/001B, 40: 1xxx	Synchro Soft-Start UVLO Sequencing Discharge Thermal Single-Wire : xxxA/C to G, Inverting output can be dynamically changed by S-wire control.	DFN(PLP)2730-12
R1287x CH1: Step-up / CH2: Inverting	PWM/VFM Auto Switching: xxxB/F, PWM: xxxC/D/G/H	2.5 to 5.5	4.5 to 5.8: xxx 4.5 to 5.8: Ext.Adjustable, 001 -4.5 to -5.8: xxx -4.5 to -6.0: Ext.Adjustable, 001	±0.9% 1.0V±15 ±1.0% 0V±30	900: xxxB/F, 300: xxxC/G, 1000: xxxD/H 1100: xxxB/F, 300: xxxC/G, 1000: xxxD/H	Internal	1.1 1.5	Latch	30	Synchro Soft-Start UVLO Sequencing Discharge Thermal	WLCSP-12-P1 DFN3030-12

Step-up and Step-down Type DC/DC Controller

Product Name	Control	Input Voltage Range (V)	Output Voltage Range (V)	Voltage Accuracy*1 (mV)	Switching Frequency (kHz)	Output Tr.	Protection Circuit Type	Other Features	Package
R1282D	CH1: PWM, Step-up CH2: PWM, Step-down	2.5 to 5.5	Ext.Adjustable	1.0V±15	700	External	Latch	UVLO Diode Soft-Start : Ext.Adjustable Phase : Ext.	SON-10

Step-up and Charge Pump Type DC/DC Converters

Product Name	Control	Input Voltage Range (V)	Output Voltage Range (V)	Voltage Accuracy*1 (mV)	Switching Frequency (kHz)	Output Tr.	Lx Current Limit*2 (A)	Protection Circuit Type	Other Features	Package
R1293K	PWM, Step-up	2.2 to 5.5	Up to 16.0, Ext.Adjustable	1.0V±15	300 to 1000, Ext.Adjustable	Internal	2	Latch	DC/DC output with noise reduction function, VCOM amplifier 1 channel, GAMMA amplifier 6 channel Thermal Diode UVLO Soft-Start : Ext.Adjustable Phase : Ext. Maxduty : Ext.Adjustable	QFN(PLP)0404-32
	LDO		1.8 to 2.5	±1%		Internal	I_{OUT}= 350mA			
	Amplifier	5.0 to 16.0	—	—		—	—			

DC/DC Switching Regulators

Product Name	Control	Input Voltage Range (V)	Output Voltage Range (V)	Voltage Accuracy*1 (mV)	Switching Frequency (kHz)	Output Tr.	Lx Current Limit*2 (A)	Protection Circuit Type	Other Features	Package
R1290K	CH1: PWM, Step-up CH2: Charge pump, Positive CH3: Charge pump, Negative	2.0 to 5.5 : 101A 2.5 to 5.5 : 102A 3.3 to 5.5 : 103A	CH1: Up to 20.0, Ext.Adjustable CH2/3: Ext.Adjustable	1.0V±15 1.5V±25 0V±30	180 to 1400, Ext.Adjustable	Internal	CH1: 2	Latch	The charge pump operates at 1/4th operating frequency. Soft-Start : Ext.Adjustable Sequencing UVLO Diode Phase : Ext. Maxduty : Ext.Adjustable	QFN0404-24
R1294L	CH1: PWM, Step-up CH2: Charge pump, Positive CH3: Charge pump, Negative	2.0 to 5.5 : 101A 2.5 to 5.5 : 102A 3.3 to 5.5 : 103A	CH1: Up to 20.0, Ext.Adjustable CH2/3: Ext.Adjustable	1.0V±15 1.5V±25 0V±30	210 to 1400, Ext.Adjustable, 800±8%	Internal	CH1: 2	Latch	The charge pump operates at 1/4th operating frequency. Soft-Start : Ext.Adjustable Sequencing UVLO Diode Phase : Ext. Maxduty : Ext.Adjustable	QFN0404-24B

*1 For the externally adjustable output voltage type, this is a feedback voltage accuracy. *2 Lx current limit is different from output current.

Step-up DC/DC Switching Regulators with Voltage Detectors (Reset ICs) and LDO Linear Regulators

Product Name	DC/DC Converter Part							Other Features	Package
	Control	Input Voltage Range (V)	Output Voltage Range*1 (V)	CE	Switching Frequency (MHz)	Output Tr.	Lx Current Limit*2 (A)		
RP600K0xxA	PWM, PWM/VFM Auto Switching	0.8 to 5.5	2.3 to 5.5, Accuracy: ±2%	CE	1.2	Internal	1.4	Diode Soft-Start Thermal : Except xxC Sequencing	DFN(PLP)2527-10
RP600K0xxB				CE1					
RP600K2xxC				CE					
RP600K1xxD			2.3 to 5.5, Ext.Adjustable, Accuracy: ±12mV	CE					

Product Name	LDO Linear Regulators Part						Voltage Detector Part			
	Output Current (mA)	Input Voltage Range (V)	Output Voltage Range (V)	CE	ECO Function	Input	Operating Voltage Range (V)	Detector Threshold Range (V)	Output Delay Time	Hysteresis Range (%)
RP600K0xxA	500	2.0 to 5.5	1.5 to 5.0, Accuracy: ±1%	CE	Fast Response Mode	DC/DC output	0.8 to 5.5	1.0 to 4.5, Accuracy: ±2%, Monitor VSENSE	Y	5
RP600K0xxB	300			CE2	DC/DC Enabled: Fast Response Mode DC/DC Disabled: Automatic/Manual Shift Mode	VIN			Y	5
RP600K2xxC	150			—		DC/DC output			N	30 to 80, 10% steps
RP600K1xxD	500			CE	Fast Response Mode				Y	5

*1 For the externally adjustable output voltage type, this is a feedback voltage accuracy. *2 Lx current limit is different from output current.

Step-down DC/DC Switching Regulators with Voltage Detectors (Reset ICs) and LDO Linear Regulators

Product Name	Control	Input Voltage Range (V)	Output Voltage Range (V)	Voltage Accuracy (%)	Switching Frequency (MHz)	Output Tr.	Output Current *1 (mA)	Protection Circuit Type	Other Features	Package
R5220K	PWM	2.8 to 5.5	1.0 to 3.3	±2	1.2	Internal	400: DC/DC, 50: LDO	Latch	Synchro Soft-Start UVLO Built-in DC/DC and LDO Alternative Circuit	DFN(PLP)2514-6
RP901K	PWM, PWM/VFM Auto Switching	4.5 to 5.5	1.2 to 1.8: DC/DC	±2	1.2	Internal	800: xxxA/B/C, 900: xxxD	Reset	Synchro Soft-Start UVLO Thermal Sequencing Built-in VD and LDO, for DVD drive	DFN(PLP)2527-10
			2.5 to 3.3: LDO	±1			600			
			2.0 to 3.0: VD, xxxA 3.0 to 5.0: VD, xxxB/C/D	±2			—			

*1 Output Current (IOUT) can be affected by environmental conditions or external components. This is an approximate value.

Step-up/down DC/DC Switching Regulators

Product Name	Version	Control	Input Voltage Range (V)	Output Voltage Range (V)	Voltage Accuracy (%)	Switching Frequency (MHz)	Output Tr.	Output Current *1 (A)	Protection Circuit Type	Other Features	Package
RP604x	xx1A/B	VFM	1.8 to 5.5	1.6 to 5.2	±1.5	*2	Internal	0.3	—	Ultra-Low Power Consumption : **0.3µA** Synchro UVLO OVP Thermal Soft-Start Discharge : xxxB	WLCSP-20-P2 DFN(PLP)2730-12
RP605x +BM	xxxA/B	VFM	1.8 to 5.5	1.6 to 5.2	±1.5	*2	Internal	0.3	—	Ultra-Low Power Consumption: **0.3µA (+BM:0.1µA)** Synchro UVLO OVP Thermal Soft-Start Discharge : xxxB	WLCSP-20-P3 DFN(PLP)2730-12
RP601Z	xxxA/B	Forced PWM, PWM/VFM Auto Switching	2.3 to 5.5	2.75 to 4.2	±2	2.4	Internal	1	—	Synchro UVLO Soft-Start Discharge : B Thermal PG Single-Wire : Dynamic Control of Output Voltage Using S-Wire, Forced Bypass Mode, DVS: 50mV	WLCSP-16-P1
RP602x	xxxA/B/C/D xxxE/F/G/H	Forced PWM, PWM/VFM Auto Switching	2.3 to 5.5	2.7 to 4.2	±1.5	2.6	Internal	1.5	Latch or Reset	Synchro OVP UVLO Soft-Start Discharge : A/C/E/G Thermal	WLCSP-20-P1 DFN(PLP)2730-12

*1 Output Current (IOUT) can be affected by environmental conditions or external components. This is an approximate value. *2 Switching frequency is depending on the conditions of Input, Output Voltage, and Output Current.

● : Available in Automotive Products ■ : Available in Industrial Products ♡ : Products available in PRODUCT LONGEVITY PROGRAM

Introduction

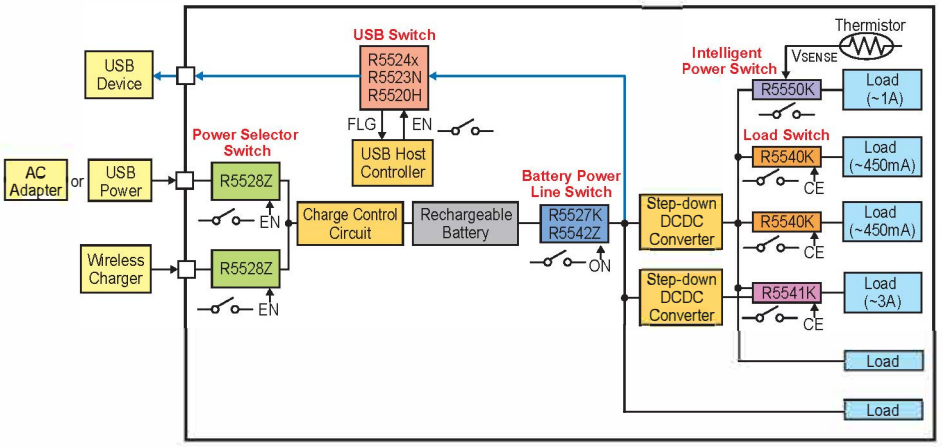
In order to save energy, not only battery-operated devices but all electronic devices are required to consume less power. To save energy, instead of using LDO, switch IC for each circuit block is used after DCDC converter. Simple MOSFET can play role as a switch, but load switch IC can include protection circuits, discharge function at off state, and a slew rate control circuit. As a result, saving space and intensive function realization are possible. REDC provides wide variety lineup of switch ICs with low on-resistance MOSFET and protection circuits in one chip.

■ Switch IC Features

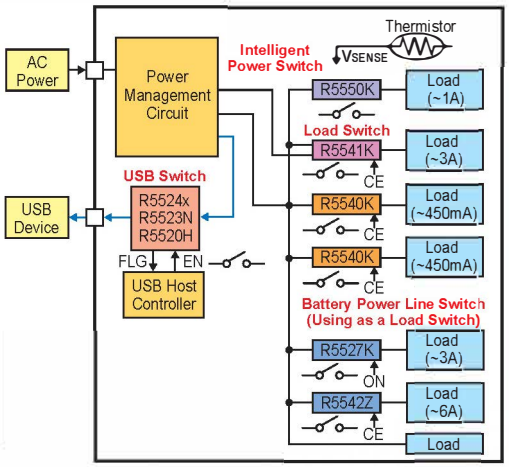
Product Category	Product Description	Typical Applications	Product Name
USB Switch IC	USB Power Line Protection USB Power Line ON/OFF Control	USB Powered Application: PCs, PC Peripherals, Digital TVs, STBs, Printers, Smartphones	R5520H R5523N R5524x
Rectifier Switch IC	Output Rectifier Regardless of Input Polarity	Toy and Healthcare Product Powered by Dry Cell	R5590D/N
Load Switch IC	Power Line ON/OFF Control and Distribution; Secondary Power Supply Switch	Power-saving Required Equipment during Standby/Sleep Mode: Portable Communication Equipment, DSCs, DSVCs, PCs, MFPs	R5527K R5540K R5541K
Battery Line Switch IC	Battery Line Protection; Primary Power Supply Switch or Load Switch	Secondary Battery Powered Equipment: Smartphones, Tablet PCs, PNDs, Notebook PCs It can be used as a load switch for any electronic equipment.	R5527K R5542Z
Intelligent Power Switch IC	Power Line's Systematic Protection; Secondary Power Supply Switch	Power-saving with High Protection Required Equipment during Standby/Sleep Mode: Portable Communication Equipment, DSCs, DSVCs, PCs, MFPs	R5550K
External Power Switch IC	Several Power Line Switchover Control	Power Selection Required Equipment: AC Adapters, USB Chargers, Wireless Charger	R5528Z
OVP Switch IC	Overvoltage Protection for Input Pin	Charger Protection for Secondary Battery-Powered Equipment	R5560Z R5528Z
Power Switch for PC Card and Express Card IC	ON/OFF Control of PC Card Power Line ON/OFF Control of Express Card Power Line	PC Card Bus Slot, PC Card Reader Writer Express Card Slot	R5533V R5538D

■ Typical Application

For Portable Equipment



For Non-Portable Equipment



■ USB Switch IC

There are two main roles of USB. Recently, USB switch IC is used as a load switch with protections.

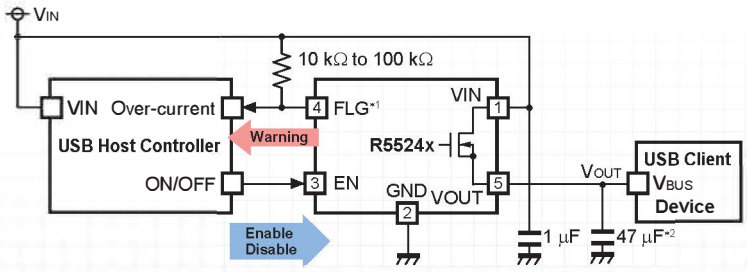
1. USB Power Line's ON/OFF Control

By the enable signal from another device such as a USB Host Controller, the USB switch turn on the USB power line with suppressing inrush current with soft-start function. On the contrary, by the disable signal, the USB switch cut off the power line with or without auto-discharge function (Option).

2. USB Power Line Protection

There is protection capability against the abnormal heating in the USB switch, and if preset over-current is detected, output current is limited or power is cut off and latched for protection.

R5524x Typical Application



*1 FLG pin has N-channel open drain output, therefore pull-up resistance is necessary when it is used. The output of FLG pin becomes "L" when the thermal shutdown or over-current limit-function works.

*2 According to the USB standard, 120 uF or more capacitor attachment is recommended, however, as an IC, changing capacitor is acceptable considering other usage.

■ USB Switch IC Lineup

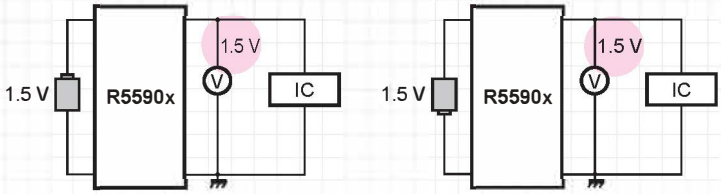
Product Name	ON Resistance (mΩ)	Supply Current (µA)	Operating Voltage Range (V)	UVLO Detect Voltage (V)	Current Limit Threshold (mA)		Short Current Limit (mA)		Internal FET	EN	Protection Type	Other Features	Package
		Typ.		Typ.	Min.	Typ.	Min.	Typ.					
R5520H	100	20	4.0 to 5.5	2.2	—	1200	500	750	Pch	H/L	Constant Current	Thermal Soft-Start UVLO FLG	SOT-89-5
R5523N ●♡	130	20	2.2 to 5.5	1.8	—	1000	500	750	Pch	H/L	Constant Current	Thermal Soft-Start UVLO FLG	SOT-23-5
R5524x001A/B ●■♡	100	110	2.7 to 5.5	2.4	650	800	550	650	Nch	H	Latch-Off/ Constant Current	Thermal Soft-Start UVLO FLG Reverse : OFF	DFN(PLP)1820-6
R5524x002A/B ●■♡													SOT-23-5
R5524N004A ●■♡					1250	1550					Constant Current	Discharge : xxxA	SOT-23-5

Switch ICs

Rectifier Switch IC

Protection against reverse insertion of a dry cell, generally, mechanically or using diode method is common. These methods limit operation if reverse insertion happens. REDC offers direction free insertion of a dry cell with the R5590. The R5590 reduces the energy loss of Vf by a diode and rectifies and realizes dry cell direction free insertion.

R5590x Typical Application



The R5590x allows batteries to be placed in any direction without regard to positive or negative polarity.

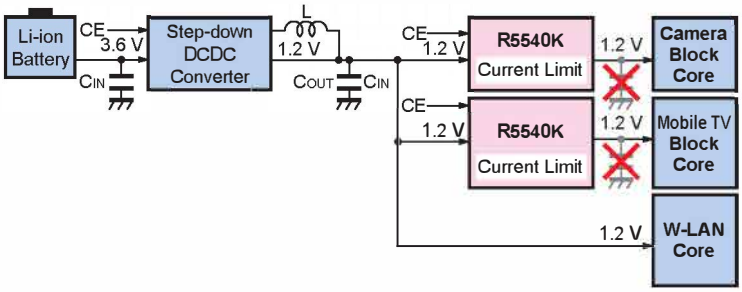
Rectifier Switch IC Lineup

Product Name	ON Resistance (Ω) Typ.	Supply Current (μA) Typ.	Operating Voltage Range (V)	Package
R5590D R5590N	0.4: SON1612-6, V_{IN}=1.5 V 0.5: SOT-23-5, V_{IN}=1.5 V	0.05: V_{IN}=1.5 V	0.9 to 5.25	SON1612-6 SOT-23-5

Load Switch IC

Same voltage is necessary for different function blocks. In that case, to make a power tree, a higher than required voltage is generated by DCDC converter and distributed the appropriate voltage to each function block via LDO. In another case, the same voltage is generated by DCDC converter directly, and distributed the voltage via load switch. In using LDO method, a certain dropout voltage between input and output is necessary, therefore, power loss should be bigger than using load switch method. Not only that, to secure the phase compensation of an LDO, external capacitors are often necessary, therefore more space is required. On the other hand, load switches do not have the regulation function, however, internal output transistor's on-resistance is very small, therefore dropout voltage can be minimized and suppression of the power loss is possible. External capacitors are unnecessary.

R5540K Typical Application



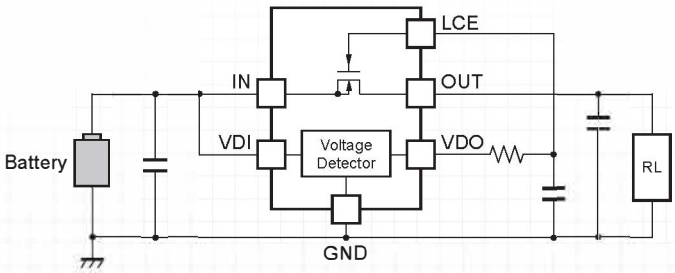
Load Switch IC Lineup

Product Name	ON Resistance (mΩ)	Supply Current (μA) Typ.	Operating Voltage Range (V)	Output Current (mA)	Current Limit Threshold (mA) Typ.	Current Limit Threshold (mA) Max.	Internal FET	CE	Other Features	Package
R5540K002 ♡	120	9	0.75 to 3.6	200	350	500	Nch	H/L	Discharge : xxxC/D Soft-Start Reverse : OFF	DFN(PLP)1010-4F
R5540K004 ♡			0.8 to 3.6	450	700	1000				
R5541K ♡	18	25	V_{IN}: 0.6 to 4.8 V_{BIAS}: 2.5 to 5.5	3000	—	—	Nch	H	Thermal UVLO Reverse : OFF Discharge : xxxD Soft-Start : Ext.Adjustable	DFN(PLP)1216-6G

Battery Line Switch IC

Battery line switch IC can suppress inrush current at start-up by its soft-start circuit. Due to the reverse current protection function during off state or for always, unlike a simple MOSFET, space saving is possible to realize intensive functions. They are used as load switches. To use a battery line switch as a load switch, discharge function can be selected as an option. Further, the R5542 Series have another voltage detector inside.

R5542Z Typical Application



The R5542Z detects a voltage drop of battery and cuts the switch off.

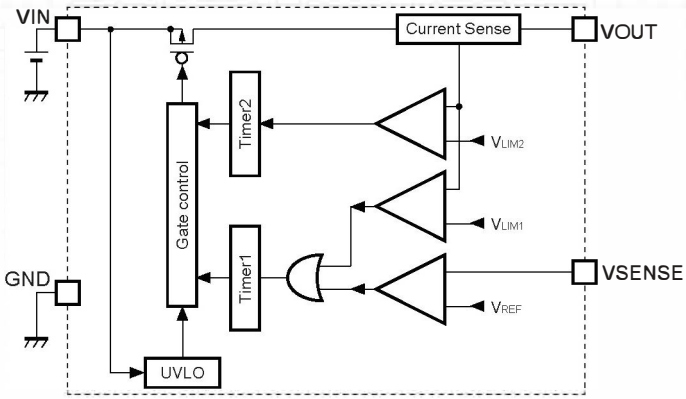
Battery Line Switch IC Lineup

Product Name	ON Resistance (mΩ)	Supply Current (μA) Typ.	Operating Voltage Range (V)	Output Current (A)	Internal FET	ON/CE	Other Features	Package
R5527K ♡	45	40	1.8 to 5.5	3	Nch	H/L	Reverse : ON/OFF Soft-Start Discharge : xxxC/D	DFN(PLP)1612-4D
R5542Z ♡	9	Switch: 10 VD: 1	Switch: 2.3 to 5.5 VD: 1.2 to 5.5	6	Nch	H	Soft-Start UVLO Reverse : OFF Built-in Voltage Detector (CMOS Output) Detector Threshold: 2.0 V to 5.0 V Detector Threshold Accuracy: ±2.0%	WLCSP-12-P3

■ Intelligent Power Switch IC

Intelligent power switch protects a battery line. For example, each IC of the R5550K series has two steps abnormal current detectors and an abnormal voltage detector. In the R5550KxxxA, the first step abnormal current detector for lower current, detecting counter delay is set long, but second step abnormal current detector for higher current, the counter delay is set short.
Therefore, recognition of the momentum permissible current is possible. Furthermore, if the preset detector delay time has passed, the switch turns off. However, after a certain time, IC automatically resumed and starts to check the current again and the same operation repeats until the abnormal cause is removed.

R5550K Block Diagram



■ Intelligent Power Switch IC Lineup

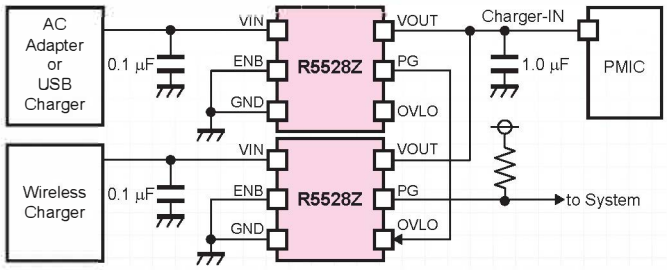
Product Name	ON Resistance (mΩ)	Supply Current (μA)	Operating Voltage Range (V)	UVLO Detect Voltage (V)	Output Current (A)	Current Limit Threshold (mA)			Output Current Limit (mA)			Internal FET
		Typ.		Typ.		Min.	Typ.	Max.	Min.	Typ.	Max.	
R5550K001A	180	2.6	2.3 to 5.25	1.9	1	300	460	624	1130	1470	1790	Pch

Product Name	Detector Threshold (V)	Current Limit/Under Voltage Detection (ms)			Output Current Limit (ms)			Protection	Package
	Typ.	Delay Time	OFF Time	ON Time	Delay Time	OFF Time	ON Time		
R5550K001A	0.5	10	80	2.5	1.33	80	1.33	Auto Release	DFN(PLP)1010-4F

■ OVP Switch IC / External Power Switch IC

Handheld equipment such as smartphones and tablet PCs, charging via AC adapter or USB cable, wireless charging is also possible. Therefore selector switch is necessary. Further, if abnormal voltage adapter is connected, over voltage must be detected to prevent from destruction of the system. The switch is called an OVP switch. The R5528 has both of the functions, switch-over and OVP. The R5560 does not have the function of switch-over, however, OVLO voltage can be set by user with divider resisteors.
The circuit shown below is an example of input voltage switch-over circuit.
In this example, when the AC Adapter or USB Charger input is in the appropriate range, PG pin becomes "L", then Wireless Charger side switch turns off by the OVLO pin, as a result, input power source can be switched over. In this example, the AC Adapter or USB Charger side becomes primary input.

R5528Z Typical Application



■ OVP Switch IC / External Power Switch IC Lineup

Product Name	ON Resistance (mΩ)	Supply Current (μA)	Operating Voltage Range (V)	OVLO Detect Voltage (V)	UVLO Detect Voltage (V)	Output Current (A)	Internal FET	EN	Other Features	Package
		Typ.		Typ.	Typ.		FET			
R5528Z001A ♡	54	50	2.3 to 36.0	6.8 ±3%	1.9	3	Nch	L	Thermal Soft-Start OVLO Reverse : OFF UVLO PG Debounce Time Delay Circuit	WLCSP-9-P1
R5560Zxx1A ♡	38	19	2.5 to 28.0	6.8 ±3%	—	4.5	Nch	—	Thermal Soft-Start Adjustable OVLO Threshold Surge Clamp Circuit: 80 V Debounce Time Delay Circuit PG	WLCSP-12-P2

■ Power Switch for PC Card and Express Card IC Lineup

Product Name	Function	Feature	Package
R5533V	Single Slot Power Switch for PC Card	Corresponding to Standard-type PCMCIA Power Controller, Nch MOSFET	SSOP-16
R5538D	Power Switch for Express Card	For Total Power Management for Express Card	QFN0404-20

REDC offers power management ICs for LED lighting in 'Smart Society' that help our customers to add a new value to their products.

● : Available in Automotive Products ■ : Available in Industrial Products ♡ : Products available in PRODUCT LONGEVITY PROGRAM

Constant Current LED Driver Controller

The LED driver controller enables constructing LED lighting that shines gently to the eyes.
FA equipment and LED lighting for facilities directly powered by DC voltage, stage lighting or amusement lighting systems which require large current and wide dimming range, and image recognition lighting for FA where removing flickers is essential at photographing, can be constructed with our LED driver.
Of course, it can be used as a general constant current driver in any type of device that requires a constant current source.

Product Name	Version	Input Voltage Range (V)	Absolute Max. Ratings (V)	Max. SOURCE Pin Voltage Accuracy (mV)	Signal Input Circuit	Dimming Control (%)	Standby Current (μA) Typ.	Supply Current (μA) Typ.	Other Features	Package
R1580N ● ■ ♡	001A	3.6 to 34.0	36	400±8	Comparator Input, H=1.3 V, L=1.1 V	1 to 100	140	320	Thermal UVLO OVP	SOT-23-6
	002A			800±16	Comparator Input, H=1.3 V, L=1.1 V	0.5 to 100	140			
	003A			400±8	Inverter Input, H=1.2 V, L=0.4 V	1 to 100	28			

PFC/LED Driver Controller with Variable Output Current and Voltage

To improve power factor of LED lighting and consumer equipment, our zero voltage switching (ZVS) PFC/LED driver controller, featuring variable output current and voltage, is a suitable IC.
The buck-boost (inverting) topology makes it possible to arbitrarily configure the output voltage regardless of its PFC feature.
Also, flicker-free lighting equipment can be easily constructed by combining with the R1580, our constant current LED driver controller.

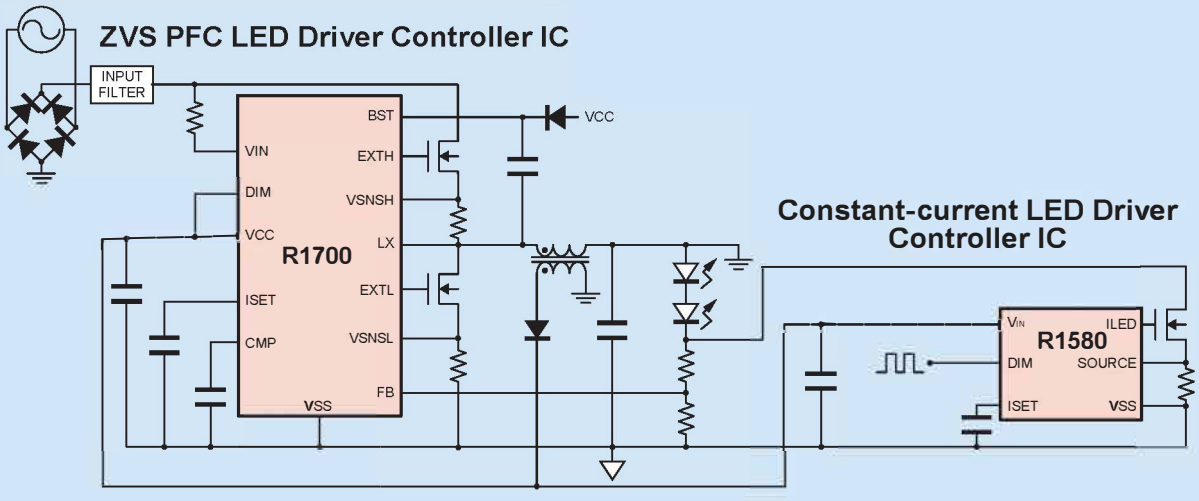
Product Name	Version	Input Voltage Range (V)	Dimming Control (%)	Optional functions: Latch-type Protection	Optional functions: FB Pin UVD	Optional functions: FB Pin OVP Voltage	Corresponding Topologies	Other Features	Package
R1700V	001A	8 to 650	5 to 100	Y	N	Typ. 1.2V (Rising)	·Buck-boost (Inverting) PFC ·Variable Output Current PFC, Linear Dimmable ·Variable Output Voltage PFC ·Boost PFC ·Buck PFC	Thermal UVLO : BST/VCC Pin OVLO : VCC Pin Overcurrent Protection	SSOP-16
	001B			N					
	001C			Y	Y	Typ. 3.65V (Rising)			
	001D			N					

Functions & Benefits

The horizontal lines across the captured digital images or moving images are caused by flickering in LEDs. REDC's R1700V offers a flicker-free operation by integrating it with R1580N, which is equipped with a linear dimming control circuit using a PWM input signal [1].

[1] It controls the DC current proportional to the duty ratio of a PWM input signal.

TYPICAL APPLICATION CIRCUIT (R1700V + R1580N)



Power Management Multi-channel ICs

■ : Available in Industrial Products ■ : Products in Development H/F : Halogen Free ♡ : Products available in PRODUCT LONGEVITY PROGRAM

Power Management Multi-channel ICs Products

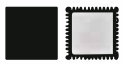
REDC's Power Management Multi-channel ICs are highly integrated power management system ICs with a 20-year history and proven track record. Sequence control and flexible setting of output voltage are ideal when precise control functions are required as multiple core application processors. For applications that use single Li-ion battery, products (RN5T618 and RC5T619) with a Charger Function and Battery-Gauge Function are best.

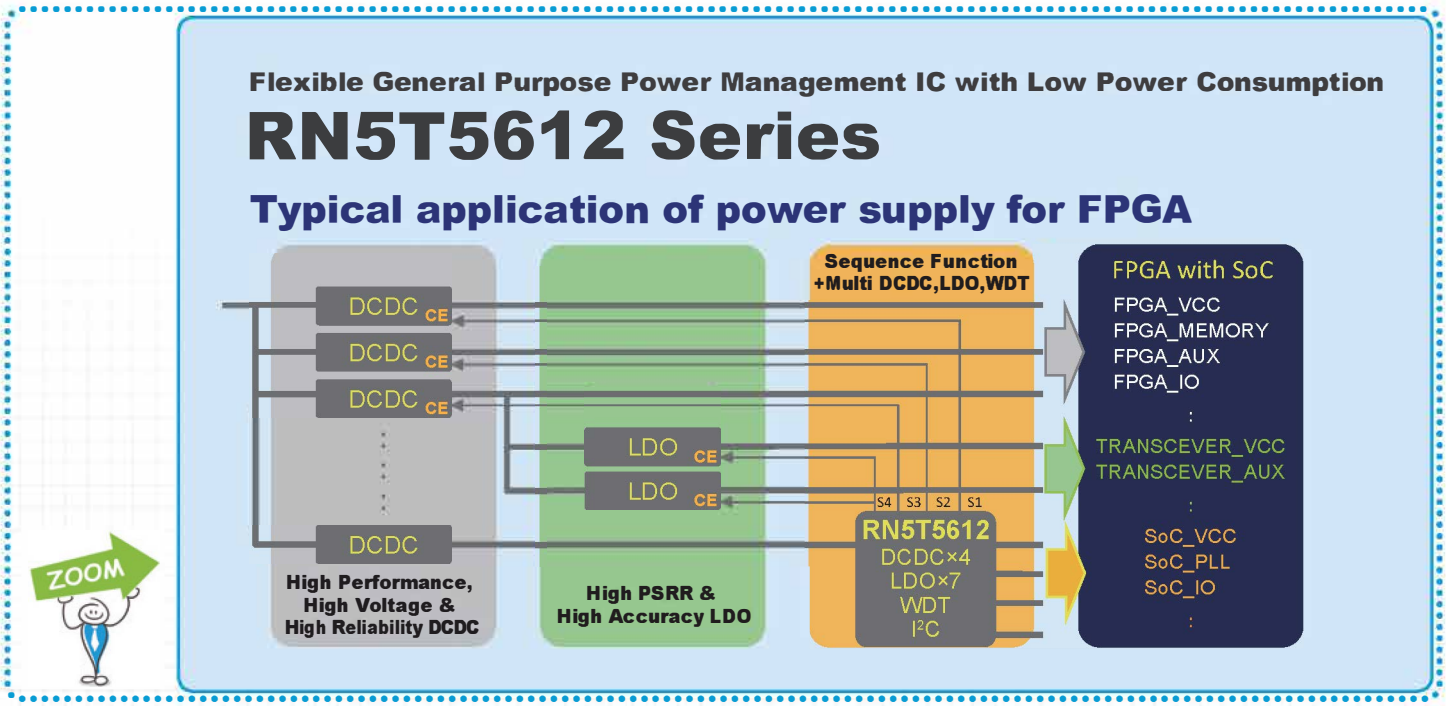
■ Power Management Multi-channel ICs Products Lineup

Product Name	Package	Operating Temperature Range (°C)	Input Voltage Range (V)	Interface	Main Function								
					Step-down DCDC	LDO	VD	Charger	Battery-Gauge (Fuel-Gauge)	WDT	ADC	RTC	GPIO
RN5T566 ♡	QFN0606-36	-40 to 85	2.7 to 5.5	PIN	2	5	2	—	—	—	—	—	—
RN5T567 ♡	QFN0606-48-P14	-40 to 85	2.7 to 5.5	I²C	4 DVS*1	7	4	—	—	1	—	—	4
RN5T568 ♡	QFN0707-48-P25	-40 to 85	2.7 to 5.5	I²C	4 DVS*1	7	4	—	—	1	—	—	4
RN5T5610 *2 ■	QFN0707-48-P25	-40 to 105	2.7 to 5.5	I²C	4 DVS*1	7	4	—	—	1	—	—	4
RN5T5612 *3	QFN0707-48-P25	-40 to 85	2.7 to 5.5	I²C	4 DVS*1	7	4	—	—	1	—	—	4
RN5T614	QFN0606-48-P14	-40 to 85	3.1 to 5.5	I²C	3 DVS*1	8	2	Wall USB	—	—	—	—	—
RN5T618 ♡	QFN0606-48-P22	-40 to 85	2.7 to 5.5	I²C	3 DVS*1	7	4	Wall USB	1	1	1	—	4
RC5T619	CSP0606-85	-40 to 85	2.7 to 5.5	I²C	5 DVS*1	12	4	Wall USB	1	1	1	1	5
RC5T619x	CSP0608-80												

*1 DVS (Dynamic Voltage Scaling) allows the output voltages to be programmed through I²C. *2 Industrial grade product.
*3 Consumer grade product for industrial use.

Power Management Multi-channel ICs Package Information

Pin	Symbol	Package	Actual Size	Bottom view	Halogen Free	Dimensions (Unit: mm)			Taping Direction	Quantity /Reel	Product Name
						Body Size	Thickness	Pitch			
36	N	QFN0606-36			H/F	6.0×6.0	0.9	0.5	E4	5,000	RN5T566
48	N	QFN0606-48-P14			H/F	6.0×6.0	0.9	0.4	E4	2,000	RN5T567 RN5T614
		QFN0606-48-P22								5,000	RN5T618
		QFN0707-48-P25			H/F	7.0×7.0	0.9	0.5	E4	2,000	RN5T568 RN5T5610 RN5T5612
80	C	CSP0608-80			H/F	8.0×6.0	1.2	0.65	E4	2,000	RC5T619x
85	C	CSP0606-85			H/F	6.0×6.0	1.07	0.5	E4	2,000	RC5T619



Li-ion Battery Protection ICs

REDC's Li-ion/polymer battery protection ICs and Li-ion/polymer battery second protection ICs have been released to the market since 1995, when the Li-ion rechargeable batteries became available. REDC has over 20 years of experience developing these products. These protection ICs protect batteries provide features like over-charge/discharge voltage, excess charge/discharge current and short circuit. REDC has a wide product portfolio of 1-cell protection ICs for smartphones and tablets, 2-cell protection ICs for DSLR and portable DVD players, multi-cell protection ICs for electrical power tools and E-bike and second protection ICs for notebook PCs and electrical power tools.

: Products Newly Released : Products in Development ♡ : Products available in PRODUCT LONGEVITY PROGRAM

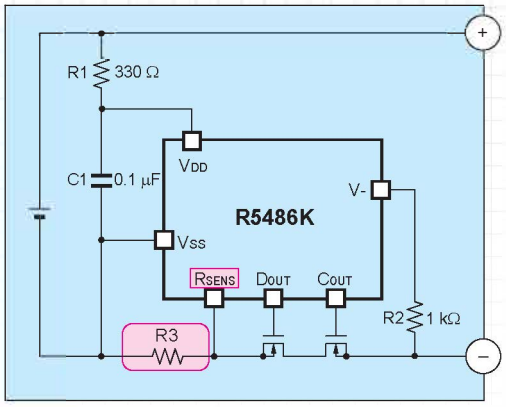
1-Cell Li-ion Battery Protection ICs

REDC's 1-cell Li-ion/polymer battery protection ICs are high accuracy devices. RSENS type products have a highly accurate detection of ±3 mV in low voltage while having an extremely low voltage range of the excess discharge current detection. Due to using external sensing resistance solution, RSENS type can detect more precise excess charge/discharge current than conventional solution of using FET's on resistance. FET's on resistance is unstable depending on the condition such as gate voltage, temperature, and FET part number. Besides, the R5471 Series (FET sensing type) or the R5441 Series (RSENS type) have high accuracy over-charge voltage detector with ±10 mV accuracy in the temperature range from 0°C to 50°C.

Product Name		R540xx	R5471L	R5478N	R5487L R5497L	R5492N	R5442x	R5499Z	R5480x
Sensing Type		FET	FET	FET	FET	FET	FET	FET	RSENS
Supply Current (µA)	Typ.	3.5 or 4.0	4.0	3.0	3.0	4.0	3.0	4.0	4.0
Standby Current (µA)	Max.	0.1 or 2.0	0.1	0.1 or 2.0	0.1 or 0.5	0.5	0.1	0.1	0.1
Overcharge (OVP)									
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		4.0 to 4.5, ±25	4.1 to 4.5, ±10*1	4.2 to 4.5, 3.65 or 3.9, ±25	4.2 to 4.6, ±20	4.0 to 4.5, ±20	4.1 to 4.6, ±20	4.3 to 4.6, ±12*1	4.1 to 4.5, ±20
Output Delay Time (s)	Typ.	0.250 or 0.275 or 1.0 or 1.1	1	1	1	1	1	1	1
Protection Circuit Type		Latch or Auto Release	Latch	Latch or Auto Release	Latch or Auto Release	Auto Release	Auto Release	Latch	Latch
Overdischarge (UVP)									
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		2.0 to 3.0, ±2.5%	2.0 to 3.0, ±2.5%	1.9 to 3.0, ±2.5%	2.0 to 3.0, ±35	2.0 to 3.0, ±2.5%	2.1 to 3.0, ±1.5%	2.0 to 3.0, ±2.5%	2.1 to 3.0, ±35
Output Delay Time (ms)	Typ.	20	20	20	20	20	20	32	20 or 132
Protection Circuit Type		Latch or Auto Release	Latch	Latch or Auto Release	Latch or Auto Release	Auto Release	Auto Release	Latch	Latch
Excess Discharge Current									
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		0.05 to 0.20, ±15	0.05 to 0.13, ±10	0.05 to 0.20, ±15	0.025 to 0.15, ±10, ±10% or ±5	0.05 to 0.20, ±15	0.020 to 0.160, ±5 or ±10	0.030 to 0.080, ±5	0.030 to 0.048, ±15%
Output Delay Time (ms)	Typ.	6, 12 or 18	36	6 or 12	12, 128	12	12	128	12
Excess Charge Current									
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		-0.2 to -0.05, ±30	-0.17 to -0.05, ±20	—	-0.150 to -0.020, ±10% or ±5	-0.20 to -0.05, ±15	-0.120 to -0.020, ±5 or ±10	-0.100 to -0.050, ±15	-0.030 to -0.020, ±15%
Output Delay Time (ms)	Typ.	8 or 16	16	—	8	8	8	8	8 or 16
Short Protection									
Detector Threshold (V)	Typ.	0.8 or 1.3	0.35	0.75	0.15 to 0.40	0.8	0.120 to 0.500	0.150 or 0.230	0.18 or 0.5
Output Delay Time (µs)	Typ.	200, 300 or 400	600	200 or 300	250	300	300	250	250
0V charge		Selectable	Selectable	Selectable	Selectable	Acceptable	Selectable	Acceptable	Prohibited
Other Features			High Precision: ±10mV						
Package		DFN(PLP)1616-6 DFN1814-6 SOT-23-5 SOT-23-6	DFN1814-6	SOT-23-6	R5487L: DFN1814-6B DFN1414-6B R5497L: DFN1414-6B	SOT-23-6	DFN1814-6B SOT-23-6	WLCSP-6-P4	DFN(PLP)1414-6 DFN1814-6C

■ Typical Application

Battery Pack



RSENS: Over-current detector input pin
As a result of adopting external resistance R3, RSENS type IC can detect more precise excess charge/discharge current than conventional solution which is using FET's on-resistance. FET's on-resistance is unstable depending on the condition such as gate voltage, temperature, and FET part number.
Excess current threshold of R5610/R5611 are ±3 mV accuracy. (Detection voltage = 15 mV)

	R5486K	R5494L	R5610L R5611L	R5612L R5613L	R5441Z	R5443Z	R5445Z	R5448Z	R5449Z
	RSENS	RSENS	RSENS	RSENS	RSENS	RSENS	RSENS	RSENS	RSENS
	4.0	3.0	3.0	2.0	3.5	2.5	5.0	3.0	5.0
	0.1	0.5	0.5	0.2	0.04	0.04	0.04	0.04	0.04
Overcharge (OVP)									
	4.1 to 4.5, ±20	4.1 to 4.5, ±20	4.2 to 4.7, ±20	4.2 to 4.7, ±20	4.2 to 4.6, ±10*1	4.2 to 4.6, ±10*1	4.2 to 4.6, ±10*1	4.2 to 4.6, ±10*1	4.2 to 4.6, ±10*1
	1	1	1	1	1	1	1, 2, 3 or 4	1, 2 or 4	1, 2, 3or 4
	Latch	Auto Release	Auto Release	Latch or Auto Release	Latch	Latch	Latch	Latch	Latch
Overdischarge (UVP)									
	2.1 to 3.0, ±35	2.1 to 3.0, ±35	2.1 to 3.0, ±55	2.1 to 3.2, ±35	2.0 to 3.4, ±2.0%	2.0 to 3.4, ±2.0%	2.0 to 3.4, ±2.0%	2.0 to 3.4, ±35	2.0 to 3.4, ±35
	20	128	64	20, 32, 64 or 128	16 or 32 or 128	16, 32 or 128	16, 32 or 128	16, 32 or 128	16, 32 or 128
	Latch	Auto Release	Auto Release	Latch or Auto Release	Latch	Latch	Latch	Latch	Latch
Excess Discharge Current									
	VD3-1: 0.015 to 0.046, ±8% or ±3.1, VD3-2: 0.030 to 0.080, ±8% or ±3.1	0.030 to 0.048, ±15%	0.015 to 0.043, ±3	VD3-1: 0.0070 to 0.0300, VD3-2: 0.011 to 0.060, VD3-1: ±1 VD3-2: ±2	0.015 to 0.150, ±3, ±10% or ±5	0.015 to 0.150, ±3, ±10% or ±5	0.015 to 0.150, ±3, ±10% or ±5	0.010 to 0.080, ±2, ±5% or ±3	0.012 to 0.150, ±2, ±5% or ±3
	tVD3-1: 3s, 4s or 5s tVD3-2: 12	8	4096	tVD3-1: 12, 512, 3. 5s, 4s or 5s tVD3-2: 12 or 16	8, 16, 32, 128, 256, 512, 1s or 3s	8, 16, 32, 128 or 512	32, 128, 256, 512 or 1s	16, 32, 128, 256, 512 or 1024	32, 128, 256, 512 or 1024
Excess Charge Current									
	-0.060 to -0.015, ±15% or ±3	-0.035 to -0.020, ±15%	-0.043 to -0.017, ±3	-0.0300 to -0.0070, ±1	-0.150 to -0.015, ±4, ±20% or ±8	-0.150 to -0.015, ±4, ±20%, ±8	-0.150 to -0.015, ±4, ±20% or ±8	-0.010 to -0.080, ±2, ±5% or ±3	-0.012 to -0.150, ±2, ±5% or ±3
	16	9	8.5	9 or 17	8	8	8	8, 16	8
Short Protection									
	0.15 to 0.3	VDET3×3 or VDET3×4	0.050 to 0.200	0.030 to 0.200	0.040 to 0.280	0.040 to 0.300	0.040 to 0.200	0.025 to 0.125	0.032 to 0.200
	250	200	280	280	280	280	280	280	280
	Prohibited	Selectable	Acceptable	Selectable	Selectable	Selectable	Prohibited	Selectable	Prohibited
	Excess discharging sensing by two-steps detection of VD3.		VD3 is a two-steps detection. Low-resistance RSENS is available. Excess discharge current is detectable with high accuracy. R5611: with Reset Function	VD3 is a two-step detection. (selectable) Low-resistance RSENS is available. Excess discharge current is detectable with high accuracy. R5613: with Reset	Temperature Protection Function: External NTC detects high temperature of charge/discharge.		RSENS High-side, Temperature Protection Function: External NTC detects high temperature of charge/discharge.	Shipping Mode, UVP Output, Temperature Protection Function: External NTC detects high temperature of charge/discharge.	Shipping Mode, RSENS High-side, Temperature Protection Function: External NTC detects high temperature of charge/discharge.
	DFN(PLP)1414-6	DFN1814-6C	R5610L: DFN1816-6 R5611L: DFN1616-8	R5612L: DFN1814-6C R5613L: DFN1616-8B	WLCSP-8-P2	WLCSP-6-P7	WLCSP-8-P4	WLCSP-8-P9	WLCSP-8-P8

*1 Topt=0°C to 50°C, Considering of variation in parameters. We compensate for these characteristics related to temperature by laser-trimming, however, this specifications is guaranteed by design.

Li-ion Battery Protection ICs

2-Cell Li-ion Battery Protection ICs

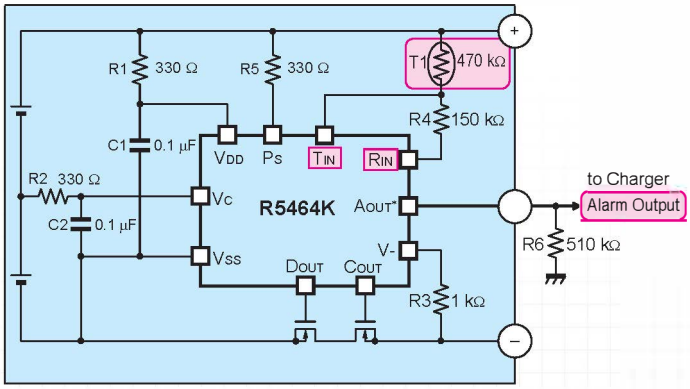
REDC's 2-cell Li-ion/polymer battery protection ICs have a high accuracy. Especially R5462 Series have a high accuracy over-charge detection of ±10 mV in a temperature range from 0°C to 50°C.

Product Name		R5460x	R5461K	R5462K	R5463K	R5464K	R5466K
Supply Current (µA)	Typ.	4.0	4.0 or 5.0	4.0	4.0	5.0 or 6.0	5.0
Standby Current (µA)	Max.	0.1 or 2.0	0.1	0.1 or 2.0	0.1	0.1	0.1
Overcharge (OVP)							
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		4.1 to 4.5 or 3.5 to 4.0, ±25	3.60 to 4.35, +10*1 -15*1	3.65 to 4.32, ±10*1	3.65 to 4.32, ±20	3.6 to 4.5, +10*1 -15*1	4.0 to 4.3, +20 -25
Output Delay Time (s)	Typ.	1	1	1	1	1	1
Protection Circuit Type		Auto Release	Auto Release	Auto Release	Auto Release	Auto Release	Auto Release
Overdischarge (UVP)							
Detector Threshold Range (V) Detector Threshold Accuracy (%)		2.0 to 3.0, ±2.5	2.0 to 3.0, ±2.5	2.0 to 3.2, ±1	2.0 to 3.2, ±1	2.0 to 3.0, ±2.5	2.0 to 3.0, ±2.5
Output Delay Time (ms)	Typ.	128	128	128	128	128	128
Protection Circuit Type		Latch or Auto Release	Latch	Latch or Auto Release	Latch	Latch	Latch
Excess Discharge Current							
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		0.05 to 0.20, ±15	0.05 to 0.24, ±15	0.05 to 0.20, ±10	0.05 to 0.20, ±10 or 0.20 to 0.40, ±10%	0.05 to 0.24, ±15	0.05 to 0.24, ±15
Output Delay Time (ms)	Typ.	12	12 or 24	12	12	12 or 16	16
Excess Charge Current							
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		-0.1, -0.2, -0.4 ±30, ±30, ±40	-0.22 to -0.1, ±30	-0.2 to -0.1, ±20	-0.2 to -0.1, ±20	-0.22 to -0.1, ±20	-0.22 to -0.1, ±20
Output Delay Time (ms)	Typ.	8	8	8	8	8	8
Short Protection							
Detector Threshold (V)	Typ.	1.1 or 0.5	1	1	1	1	1
Output Delay Time (µs)	Typ.	300	300	300	300	300	300
0V Charge		Acceptable	Selectable	Selectable	Prohibited	Selectable	Acceptable
Other Features			with Alarm Function	High Precision		with Alarm Function	with Alarm Function
Package		DFN(PLP)1820-6 SOT-23-6	DFN(PLP)2527-10	DFN(PLP)1820-6B	DFN(PLP)1820-6B	DFN(PLP)2527-10	DFN(PLP)2527-10

*1 Topt=0°C to 50°C, Considering of variation in parameters. We compensate for these characteristics related to temperature by laser-trimming, however, this specifications is guaranteed by design.

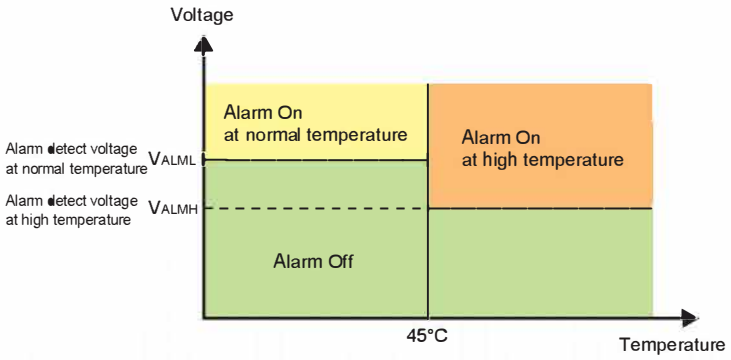
■ Typical Application

Battery Pack



TIN: External thermistor connection pin.
RIN: External resistor connection pin.
PS: P-channel source pin for over-charge alarm output*
* Alarm output pin (AOUT) is a P-channel open drain output.
In the R5464K, the source of AOUT is Ps pin, not VDD pin. Therefore, the external pull-down resistor, R6 does not have an impact on the drop out between a plus terminal of a battery pack and a VDD pin.
Thus, R6 value range is wide enough to choose.
* Products built-in the Alarm output pin (AOUT): R5461, R5464, R5466

■ Alarm Function



When 1-cell voltage or 2-cell voltage exceeds the alarm threshold voltage (VALML), an alarm signal will be present at the AOUT pin. If the detection temperature of thermistor exceeds 45°C, the alarm detect voltage threshold changes to VALMH. (The detection temperature can be changed.)

Products with alarm output controlled by an external thermistor: R5461, R5464, R5466

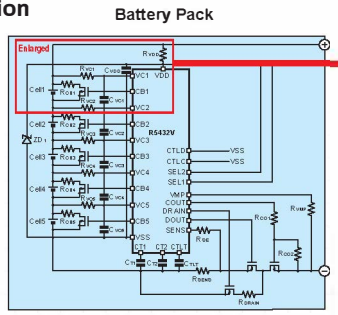
Multi-Cell Li-ion Battery Protection ICs

REDC's multi-cell Li-ion/polymer ICs battery protection have several advanced features such as Cell Balance Function, Cascade Connection and Breaking Wire Detection.

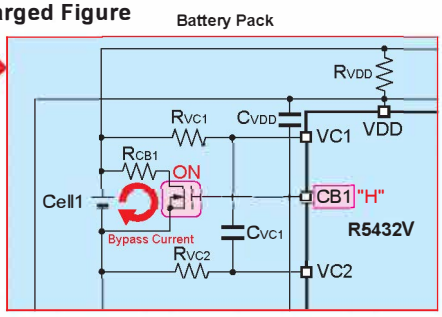
Product Name		R5432V ♡	R5433V ♡	R5436T	R5650T ♡	R5657T	R5651T
Supply Current (μA)	Typ.	12.0	6.0	12.0	12.0	9.0	15
Standby Current (μA)	Typ.	—	—	6.0	5.0	0.1	6.0
Overcharge (OVP)							
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		3.6 to 4.5, ±25	3.6 to 4.5, ±25	3.6 to 4.5, ±25	3.6 to 4.5, ±25	3.6 to 4.6, ±20	3.6 to 4.5, ±25
Output Delay Time (s)	Typ.	1	1	1	1	1, 2 or 4	1
Protection Circuit Type		Auto Release	Auto Release	Auto Release	Auto Release	Auto Release	Auto Release
Overdischarge (UVP)							
Detector Threshold Range (V) Detector Threshold Accuracy (%)		2.0 to 3.0, ±2.5	2.0 to 3.0, ±2.5	2.0 to 3.2, ±2.5	2.0 to 3.2, ±50mV	2.0 to 3.0, ±2	2.0 to 3.2, ±50mV
Output Delay Time (s)	Typ.	Settable by C_{T1}	Settable by C_{T1}	Settable by C_{T1}	Settable by C_{T1}	128ms, 512ms or 1	Settable by C_{T1}
Protection Circuit Type		Auto Release	Auto Release	Latch or Auto Release	Auto Release	Auto Release	Latch or Auto Release
Excess Discharge Current							
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		V_{D3-1} 0.1 to 0.3, ±20 V_{D3-2} BA: 0.45 or 0.60, ±100 BB/BC: 0.25 to 0.40, ±70 BD: 0.25 or 0.30, ±55 ($V_{D3-2} \geq V_{D3-1}$ + 0.1V)	—	V_{D3-1}: 0.05 to 0.25, ±20 V_{D3-2}: 3×V_{D3-1}, ±50	V_{D3-1}: 0.03 to 0.05, ±5, 0.05 to 0.1, ±10% V_{D3-2}: 2, 2.5 or 3×V_{D3-1}, 0.06 to 0.10, ±12.5, 0.10 to 0.30, ±12.5%	—	V_{D3-1}: 0.01 to 0.03, ±3, 0.35 to 0.15, ±10% V_{D3-2}: 0.03 to 0.08, ±8, 0.09 to 0.45, ±10%
Output Delay Time (ms)	Typ.	t_{VD3-1}: Settable by C_{T2} t_{VD3-2}: t_{VD3-1}×1/100 or 1/6	—	t_{VD3-1}: Settable by C_{T2} t_{VD3-2}: t_{VD3-1}×1/100 or 1/6	t_{VD3-1}: Settable by C_{T2} t_{VD3-2}: Settable by C_{T3}	—	t_{VD3-1}: Settable by C_{T2} t_{VD3-2}: Settable by C_{T2}
Excess Charge Current							
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		-0.05, -0.1, -0.2, -0.4 ±30, ±30, ±30, ±40	—	-0.05, -0.1, -0.2 ±30, ±30, ±30	-0.015 to -0.025, ±5, -0.030 to -0.050, ±20%, or disable	—	-0.008 to -0.03, ±3, -0.035 to -0.090 ±10%, or disable
Output Delay Time (ms)	Typ.	8	—	8	Ax: 256 or Bx: 8	—	512, 1024, 2560
Short Protection							
Detector Threshold (V)	Typ.	BA: 1.0 BB/BC: 0.75 BD: V_{D3-2}×1.67	—	0.25 to 1.0	0.1 to 0.6	—	0.1 to 0.7
Output Delay Time (μs)	Typ.	300	—	330	500	—	330
0V charge		Selectable	Acceptable	Acceptable	Selectable	Acceptable	Prohibited(1.1/1.3V)
Number of Cells		3 to 5-cells*1	3 to 5-cells	3 to 5-cells*1	3 to 5-cells	3 to 5-cells	3 to 5-cells
Other Features		Built-in Cell Balance Function, Built-in Breaking Wire Detection	Over-charge/-discharge is controlled by sending a signal to MCU from the COUT/DOUT pin, Signal Output Type, Built-in Breaking Wire Detection	Built-in Cell Balance Function, Built-in Breaking Wire Detection*2, Temperature Protection Function: External NTC, Charge/Discharge Over Temperature	Temperature Protection Function: External NTC, Charge Over/Under Temperature, Discharge Over Temperature	Built-in Breaking Wire Detection	Built-in Breaking Wire Detection, Temperature Protection Function: External NTC, Charge Over/Under Temperature, Discharge Over Temperature
Package		SSOP-24	SSOP-16	TSSOP-28	TSSOP-20	TSSOP-10	TSSOP-24

*1 Cascadable for 6-cell or more cells protection. *2 The breaking wire detection function can be selected.

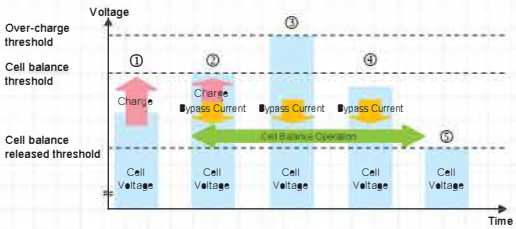
Typical Application



Enlarged Figure



Cell Balance Operation



① When a cell voltage is lower than the cell balance threshold, a cell is charged.
② When a cell voltage becomes higher than the cell balance threshold, CB1 pin becomes "H" and N-channel transistor turns on, and then the cell balance operation starts. Then a bypass current flows to the direction of a arrow and a charge current becomes suppressed by the bypass current.
③ When a cell voltage reaches to the over-charge threshold, cell charging stops after the output delay time.
④ If charging to a cell stops, the cell balance operation continues until a cell voltage becomes lower than the cell balance released threshold. The bypass current continues to flow decreasing the cell voltage.
⑤ When a cell voltage reaches to the cell balance released voltage, CB1 pin becomes "L" and N-channel transistor turns off, and then cell balance operation stops.

Breaking Wire Detection

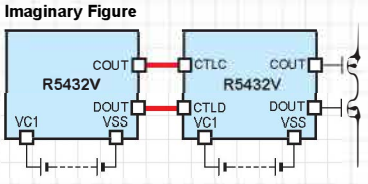
In case of using a battery pack in electric power tools exposed to heavy vibrations, there is a risk that the protection circuit fails due to a breaking wire condition between battery cells and protection circuit board.

The Breaking Wire Detection Circuit checks the connection between the cell and the IC at the specified cycle. When an abnormality is detected, it is judged a breaking wire. R5432 prohibits charge and R5436 prohibits charge and discharge.

Cascade Connection

Multi cell Li-ion/polymer battery protection ICs can protect over 6 cells by cascade connection.

Imaginary Figure



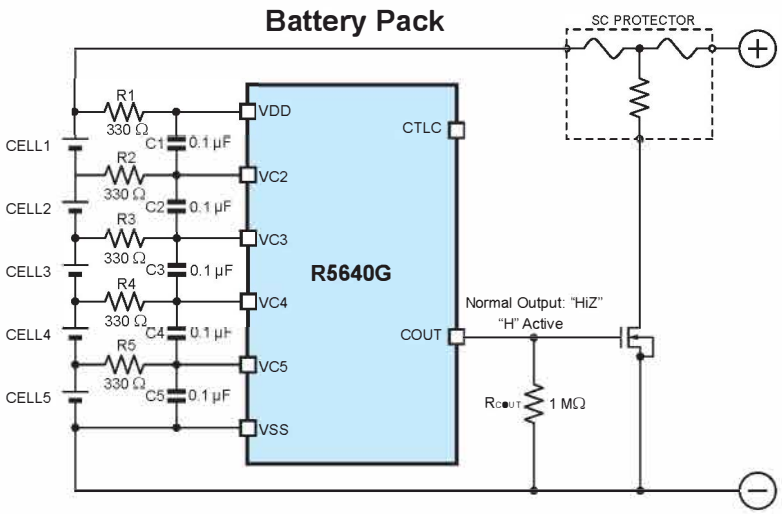
Li-ion Battery Protection ICs

Li-ion Battery Second Protection ICs

REDC's Li-ion/polymer battery second protection ICs support over-charge voltage protection only. These are suitable from 1-cell to 5-cell battery packs.

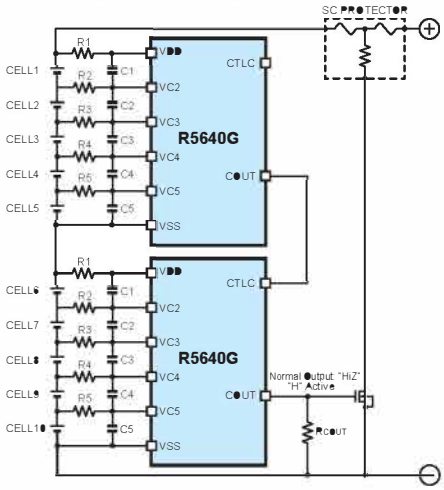
Product Name		R5434D ♡	R5435x	R5437L ♡ R5438L ♡	R5439K ♡	R5458L	R5640G ♡	R5641L ♡
Supply Current (μA)	Typ.	3.0	3.0	0.85	4.0: V_{CELLn}=4.15V (n=1, 2, 3, 4) 2.5: V_{CELLn}=3.1V (n=1, 2, 3, 4)	1.5	2.5	2.8
Standby Current (μA)	Max.	—	0.1	0.1	0.2	0.5	0.2	0.2
Overcharge (OVP)								
Detector Threshold Range (V) Detector Threshold Accuracy (mV)		3.6 to 4.6, ±25	4.10 to 4.55, ±20	4.10 to 4.60, ±20	4.20 to 4.60, ±20	4.00 to 4.70, ±20	2.9 to 4.6 ±16	4.1 to 4.6 ±16
Output Delay Time (s)	Typ.	1.5	2, 4 or 6	2, 4 or 6	1.5, 2, 4 or 6	2	2, 4, 6, 10 or 16	2, 4 or 6
C_{OUT} Output "H" Voltage (V)	Typ.	3.7	4.7	4.7	4.7	VDD	4.7	4.7
Shutdown Detector Threshold (V)	Typ.	—	3.5	3.5	Shutdown1 detector threshold: 3.8, Shutdown2 detector threshold: 2.3 to 2.8	—	2.1, 2.5 or 3.7	2.5 or 3.7
Number of Cells		2 to 5-cells	2 to 3-cells	1 to 3-cells	2 to 4-cells	1-cell	2 to 5-cells	2 to 4-cells
Other Features					Voltage Regulator Function: 2.9V to 3.7V		Cascadable for 6-cell or more cells protection.	Temperature Protection Function: External PTC
Package		SON-8	DFN(PLP)1616-6B TSOT-23-6	DFN1814-6C, The pin-layout of R5437L and that of R5438L is different.	DFN(PLP)2020-8	DFN1814-6C	MSOP-8	DFN2020-8C

■ Typical Application



■ Cascade Connection

Cascading the R5640G of 2 or more is adaptable to the battery pack of 6 or more cells and results in a reduction of external parts.



= The Pioneer Says... =

Key person column **Will Li-ion Battery Protection ICs Never Perish?**

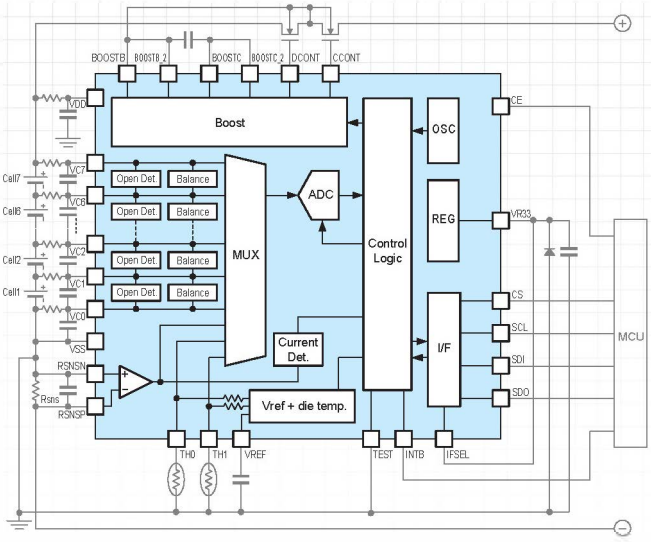
"Adopting an IC in your battery?" A battery manufacturer asked us to develop a new IC for battery protection. It was in 1991, when Ni-Cd batteries had been widely used. Ni-MH batteries appeared on the market in the same period of time when Li-ion batteries had their market debut. The concept of "battery pack" was not common thing in that time, so I did not have a clear image of batteries which include an IC..... Read More >

Analog Front-End ICs

Analog Front-ends		R5601T ♡	R5602L
Supply Current (μA)	Typ.	36	150
Low Supply Current Mode (μA)	Typ.	6.5	-
Standby Current (μA)	Max.	2.0	1.0
Voltage Monitoring Accuracy (mV)		Input-referred Voltage Error: ±9	±30*1
Current Monitoring Gain Accuracy H		AA: 40±2.0% AC: 10±1.0%	2.5±1% 10±1% 20±1%
Current Monitoring Gain Accuracy L		AA: 10±1.0% AC: 5±0.8%	
External Reference Voltage (V)		3.0000±0.0035	-
Voltage Regulator Output Voltage (V)		3.3±1.0%	3.4±5%
Voltage Regulator Output Current (mA)		30	10
Communication		I²C	I²C/SPI with/without CRC8
ADC		—	12bit ADC
Number of Cells		3 to 5-cells	4 to 7-cells
Other Features		Wakeup Function Short-circuit Current Detection Internal Cell balance Switch	Monitoring Speed: less than 1ms / 1monitor Die Temp./External 2NTC monitoring Overcurrent Ditection: Over Charge, Over Discharge, Short-current High Side FET Control Built-in Open Wire Detection Switch Built-in Cell Balance Switch Cell Connection Sequence Free
Package		TSSOP-16	QFN0505-32C

*1 This value is the accuracy including the error of ADC and Vref., and it is at -20 to 85°C.

■ R5602 Block Diagram



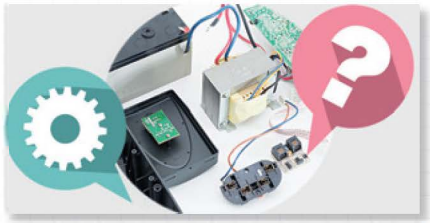
Enhancing "Safety and Security"
with REDC Li-ion Battery Protection ICs

What are the points and merits of making Li-ion battery protection ICs highly accurate?
What are the features and advantages of each protection?
What is "Bits of Knowledge"?
Features and Benefits are here.
-→https://www.n-redc.co.jp/en/products/lithium-ion-battery-protection/introduction/

1. Industry-Leading Characteristics

High Accuracy & Low Current Consumption

Our ICs achieve highly accurate and low-supply-current characteristics by CMOS analog technology. Small and highly accurate protection ICs will make your products safer than ever.



2. Various Protections Available

Externally Settable Protections

We have a wide lineup of battery protection ICs that include various protections such as Short Current Protection, Temperature Protection, Alarm Function, Open-Wire Detection, and so on. These protections are externally settable, which enables IC to be highly flexible and meets various customer needs.

3. Appropriate for Smaller & Lighter Products

Ultra-Small & Extremely-Thin Packages

R5499Z adopts a WL-CSP (Body: 1.10 mm × 0.83 mm, Pitch: 0.40 mm). The world's smallest and thinnest class packages can reduce not only the mounting area but also the size and weight of portable devices and battery packs.

Package Information

For more details, please refer to the Package Information on the REDC web site.

: Products Newly Released : Products in Development H/F : Halogen Free ◆ : Conditions are based on JEDEC STD.

WLCSP Package

Pin	Symbol	Package	Halogen Free	Actual Size	Bottom View	Dimensions (mm)					Power Dissipation (mW) Standard Condition High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness Including the Solder Ball	Pitch	Solder Ball ϕ	Tjmax=125°C	Tjmax=150°C*1		
4	Z	WLCSP-4-P2	H/F			0.79×0.79	0.79×0.79	0.48	0.5	0.16	530	662	TR	5,000
4	Z	WLCSP-4-P5	H/F			0.69×0.69	0.69×0.69	0.48	0.4	0.16	278	348	TR	5,000
4	Z	WLCSP-4-P7	H/F			0.69×0.69	0.69×0.69	0.36	0.4	0.16	278		TR	5,000
4	Z	WLCSP-4-P8	H/F			0.64×0.64	0.64×0.64	0.36	0.35	0.2	340 to 520 ◆		TR	5,000
5	Z	WLCSP-5-P1	H/F			1.346×0.98	1.346×0.98	0.56	X=0.433 Y=0.5	0.25	550 ◆	690 ◆	E2	5,000
6	Z	WLCSP-6-P2	H/F			1.29×0.87	1.29×0.87	0.48	0.5	0.16	650		E2	5,000
6	Z	WLCSP-6-P4	H/F			1.10×0.83	1.10×0.83	0.48	X=0.4 Y=0.5	0.16			E2	5,000
6	Z	WLCSP-6-P6	H/F			1.28×0.88	1.28×0.88	0.64	0.4	0.26	590 to 910 ◆	740 ◆	E2	5,000
6	Z	WLCSP-6-P7	H/F			1.25×0.84	1.25×0.84	0.36	X=0.4 Y=0.5	0.16	540 ◆	680 ◆	E2	5,000
6	Z	WLCSP-6-P8	H/F			1.28×0.88	1.28×0.88	0.36	0.4	0.23	520 to 880 ◆	650 ◆	E2	5,000
8	Z	WLCSP-8-P1	H/F			1.45×1.48	1.45×1.48	0.36	0.4	0.245	840 to 1140 ◆	1050 ◆	TR	5,000
8	Z	WLCSP-8-P2	H/F			1.51×0.92	1.51×0.92	0.36	X=0.4 Y=0.58	0.16	800 ◆		E2	5,000
8	Z	WLCSP-8-P4	H/F			1.50×1.08	1.50×1.08	0.36	X=0.40 Y=0.79	0.16	670 ◆	830 ◆	E2	5,000
8	Z	WLCSP-8-P8	H/F			1.50×1.08	1.50×1.08	0.34	0.4	0.16			E2	5,000
8	Z	WLCSP-8-P9	H/F			1.55×0.92	1.55×0.92	0.36	0.4	0.16			E2	5,000
9	Z	WLCSP-9-P1	H/F			1.27×1.27	1.27×1.27	0.64	0.4	0.26	1190 ◆		E2	5,000
9	Z	WLCSP-9-P2	H/F			1.45×1.48	1.45×1.48	0.36	0.4	0.245	800 to 1090 ◆	1000~1370 ◆	TR	5,000
11	Z	WLCSP-11-P2	H/F			2.37×1.47	2.37×1.47	0.78	0.5	0.16	1000		E2	4,000
12	Z	WLCSP-12-P1	H/F			1.97×1.47	1.97×1.47	0.81	0.4	0.26	720 to 760 ◆	900 ◆	E2	4,000
12	Z	WLCSP-12-P2	H/F			1.288×1.828	1.288×1.828	0.64	0.4	0.27	760 ◆		TL	5,000
12	Z	WLCSP-12-P3	H/F			1.68×1.28	1.68×1.28	0.65	0.4	0.26	1000 ◆		E2	4,000
15	Z	WLCSP-15-P1	H/F			2.88×1.68	2.88×1.68	0.36	0.5	0.25	1190 ◆	1480 ◆	E2	
16	Z	WLCSP-16-P1	H/F			1.95×1.95	1.95×1.95	0.64	0.4	0.26	1400 ◆		E2	5,000
20	Z	WLCSP-20-P1	H/F			2.305×1.70	2.305×1.70	0.54	0.4	0.265	1400 ◆		E2	5,000
20	Z	WLCSP-20-P2	H/F			2.315×1.71	2.315×1.71	0.36	0.4	0.245	1490 ◆		E2	5,000
20	Z	WLCSP-20-P3	H/F			2.315×1.71	2.315×1.71	0.36	0.4	0.245	1210 ◆	1520 ◆	E2	5,000

DFN(PLP) Package

Pin	Symbol	Package	Halogen Free	Actual Size	Bottom View	Dimensions (mm)				Power Dissipation (mW) Standard Condition High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness (Max.)	Pitch	Tjmax=125°C	Tjmax=150°C*1		
4	K	DFN(PLP)0808-4	H/F			0.8×0.8	0.8×0.8	0.4	0.48	286	350	TR	10,000
4	K	DFN(PLP)1010-4	H/F			1.0×1.0	1.0×1.0	0.6	0.65	510 to 800 ◆	640 to 1000 ◆	TR	10,000
4	K	DFN(PLP)1010-4B	H/F			1.0×1.0	1.0×1.0	0.6	0.65	800 ◆	1000 ◆	TR	10,000
4	K	DFN(PLP)1010-4F	H/F			1.0×1.0	1.0×1.0	0.4	0.5	300		TR	10,000
4	K	DFN(PLP)1612-4	H/F			1.2×1.6	1.2×1.6	0.6	0.6	1810 ◆	2270 ◆	TR	5,000
4	K	DFN(PLP)1612-4B	H/F			1.2×1.6	1.2×1.6	0.4	0.6	1810 ◆	2270 ◆	TR	5,000
4	K	DFN(PLP)1612-4D	H/F			1.2×1.6	1.2×1.6	0.6	0.5	830 ◆	1040 ◆	TR	5,000
4	K	DFN(PLP)2114-4B	H/F			1.4×2.1	1.4×2.1	0.6	0.65	714		TR	5,000

Pin	Symbol	Package	Halogen Free	Actual Size	Bottom View	Dimensions (mm)				Power Dissipation (mW) Standard Condition High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness (Max.)	Pitch	Tjmax=125°C	Tjmax=150°C*1		
6	K	DFN(PLP)1212-6	H/F			1.2×1.2	1.2×1.2	0.4	0.4	450 ◆	570 ◆	TR	5,000
6	K	DFN(PLP)1212-6F	H/F			1.2×1.2	1.2×1.2	0.4	0.4	666 ◆		TR	5,000
6	K	DFN(PLP)1216-6F	H/F			1.6×1.2	1.6×1.2	0.4	0.5	385		E2	5,000
6	K	DFN(PLP)1216-6G	H/F			1.6×1.2	1.6×1.2	0.4	0.6	714 ◆		E2	5,000
6	K	DFN(PLP)1414-6	H/F			1.4×1.4	1.4×1.4	0.4	0.5	600 ◆	750 ◆	TR	5,000
6	K	DFN(PLP)1616-6	H/F			1.6×1.6	1.6×1.6	0.6	0.5	1810 ◆	2270 ◆	TR	5,000
6	K	DFN(PLP)1616-6B	H/F			1.6×1.6	1.6×1.6	0.6	0.5	1610 ◆	2010 ◆	TR	5,000
6	K	DFN(PLP)1616-6D	H/F			1.6×1.6	1.6×1.6	0.6	0.5	1530 ◆	1920 ◆	TR	5,000
6	K	DFN(PLP)1820-6	H/F			1.8×2.0	1.8×2.0	0.6	0.5	2200 ◆	2700 ◆	TR	5,000
6	K	DFN(PLP)1820-6B	H/F			1.8×2.0	1.8×2.0	0.6	0.55	2200 ◆	2700 ◆	TR	5,000
6	K	DFN(PLP)2514-6	H/F			1.4×2.5	1.4×2.5	0.6	0.5	2500 ◆	3200 ◆	TR	5,000
8	K	DFN(PLP)2020-8	H/F			2.0×2.0	2.0×2.0	0.6	0.5	1800 to 2200 ◆	2300 to 2700 ◆	TR	5,000
8	K	DFN(PLP)2020-8B	H/F			2.0×2.0	2.0×2.0	0.6	0.5	1050 ◆	1350 ◆	TR	5,000
10	K	DFN(PLP)2527-10	H/F			2.7×2.5	2.7×2.5	0.6	0.5	2500 to 2800 ◆	3200 to 3500 ◆	TR	5,000
12	K	DFN(PLP)2730-12	H/F			3.0×2.7	3.0×2.7	0.6	0.5	3100 ◆	3900 ◆	TR	5,000

DFN Package

Pin	Symbol	Package	Halogen Free	Actual Size	Bottom View	Dimensions (mm)				Power Dissipation (mW) Standard Condition High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness (Max.)	Pitch	Tjmax=125°C	Tjmax=150°C*1		
4	L	DFN1010-4	H/F			1.0×1.0	1.0×1.0	0.4	0.65	510 to 1000 ◆	640 to 1250 ◆	TR	10,000
5	L	DFN1212-5	H/F			1.2×1.2	1.2×1.2	0.4	0.8	560 ◆	700 ◆	TR	5,000
6	L	DFN1212-6	H/F			1.2×1.2	1.2×1.2	0.4	0.4	850 to 1500 ◆	1050 to 1900 ◆	TR	5,000
6	L	DFN1414-6B	H/F			1.4×1.4	1.4×1.4	0.6	0.5			TR	5,000
6	L	DFN1616-6	H/F			1.6×1.6	1.6×1.6	0.4	0.5	2400 ◆	3000 ◆	TR	5,000
6	L	DFN1616-6B	H/F			1.6×1.6	1.6×1.6	0.4	0.5	2400 ◆	3000 ◆	TR	5,000
6	L	DFN1816-6	H/F			1.6×1.8	1.6×1.8	0.4	0.5			TR	5,000
6	L	DFN1814-6	H/F			1.4×1.8	1.4×1.8	0.4	0.5			TR	5,000
6	L	DFN1814-6B	H/F			1.4×1.8	1.4×1.8	0.4	0.5			TR	5,000
6	L	DFN1814-6C	H/F			1.4×1.8	1.4×1.8	0.4	0.5	360 ◆	460 ◆	TR	5,000
8	L	DFN1216-8	H/F			1.6×1.2	1.6×1.2	0.4	0.4	1700 ◆	2200 ◆	E2	5,000
8	L	DFN1616-8	H/F			1.6×1.6	1.6×1.6	0.6	0.4	1160 ◆	1450 ◆	TR	5,000
8	L	DFN1616-8B	H/F			1.6×1.6	1.6×1.6	0.4	0.4	1160 ◆	1450 ◆	TR	5,000
8	L	DFN2020-8C	H/F			2.0×2.0	2.0×2.0	0.6	0.5	1400 ◆	1700 ◆	TR	3,000
12	L	DFN3030-12	H/F			3.0×3.0	3.0×3.0	0.8	0.5	3400 ◆	4300 ◆	TR	3,000
12	L	DFN3030-12B	H/F			3.0×3.0	3.0×3.0	0.8	0.5			TR	3,000
14	L	DFN2735-14	H/F			3.5×2.7	3.5×2.7	0.6	0.5	4100 ◆	5200 ◆	E2	5,000

SC Package

Pin	Symbol	Package	Halogen Free	Actual Size	Top View	Dimensions (mm)				Power Dissipation (mW) Standard Condition Ultra High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness	Pitch	Tjmax=125°C	Tjmax=150°C*1		
4	Q	SC-82AB	H/F			2.0×1.25	2.0×2.1	0.9	1.3	380	470	TR	3,000
5	Q	SC-88A	H/F			2.0×1.25	2.0×2.1	0.9	0.65	380	475	TR	3,000

Package Information

SOT Package

Pin	Symbol	Package	Halogen Free	Actual Size	Top View	Dimensions (mm)				Power Dissipation (mW) Standard Condition / Ultra High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness	Pitch	Tjmax=125°C	Tjmax=150°C*1		
3	N	SOT-23-3 (SC-59A)	H/F			2.9×1.6	2.9×2.8	1.1	0.95	420		TR	3,000
5	N	SOT-23-5 (SC-74A)	H/F			2.9×1.6	2.9×2.8	1.1	0.95	660 ◆	830 ◆	TR	3,000
6	N	SOT-23-6 (SC-74)	H/F			2.9×1.6	2.9×2.8	1.1	0.95	660 to 892 ◆	830 ◆	TR	3,000
6	N	SOT-23-6W	H/F			2.9×1.8	2.9×2.8	1.1	0.95	430		TR	3,000
6	N	TSOT-23-6	H/F			2.9×1.6	2.9×2.8	0.85	0.95	460		TR	3,000
3	H	SOT-89 (SC-62)	H/F			4.5×2.5	4.5×4.0	1.5	1.5	900		T1	1,000
5	H	SOT-89-5	H/F			4.5×2.5	4.5×4.35	1.5	1.5	2600 ◆	3200 ◆	T1	1,000

SON Package

Pin	Symbol	Package	Halogen Free	Actual Size	Top View	Dimensions (mm)				Power Dissipation (mW) Standard Condition / Ultra High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness	Pitch	Tjmax=125°C	Tjmax=150°C*1		
3	D	SON1408-3	H/F			1.4×0.8	1.4×1.2	0.6*2	0.45	250		TR	9,000
6	D	SON1612-6	H/F			1.6×1.2	1.6×1.6	0.6*2	0.5	500		TR	4,000
6	D	SON-6	H/F			1.6×2.6	1.6×3.0	0.85*2	0.5	500	625	TR	3,000
6	D	HSON-6	H/F			2.9×2.8	2.9×3.0	0.9*2	0.95	3000 ◆	3700 ◆	TR	3,000
8	D	SON-8	H/F			2.9×2.8	2.9×3.0	0.9*2	0.65	480		TR	3,000
10	D	SON-10	H/F			2.9×2.8	2.9×3.0	0.9*2	0.5	480		TR	3,000

SOP/TO Package

Pin	Symbol	Package	Halogen Free	Actual Size	Top View	Dimensions (mm)				Power Dissipation (mW) Standard Condition / Ultra High Wattage Condition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness	Pitch	Tjmax=125°C	Tjmax=150°C*1		
8	G	SSOP-8G	H/F			2.9×2.8	2.9×4.0	1.1	0.65	380	475	TR	3,000
8	G	MSOP-8	H/F			3.0×3.0	3.0×4.9	0.85	0.65	960 ◆	1200 ◆	E2	3,000
16	V	SSOP-16	H/F			5.1×4.4	5.1×6.4	1.15	0.65	685		E2	2,000
24	V	SSOP-24	H/F			7.9×5.6	7.9×7.6	1.15	0.65	770		E2	3,000
6	S	HSOP-6J	H/F			5.02×3.9	5.02×6.0	1.5	3.81	2700 ◆	3400 ◆	E2	1,000
8	S	HSOP-8E	H/F			5.2×4.4	5.2×6.2	1.45	1.27	2900 ◆	3600 ◆	E2	1,000
18	S	HSOP-18	H/F			5.2×4.4	5.2×6.2	1.45	0.5	3100 ◆	3900 ◆	E2	1,000
10	T	TSSOP-10	H/F			2.9×2.8	2.9×4.0	0.75	0.50			E2	2,000
16	T	TSSOP-16	H/F			5.0×4.4	5.0×6.4	0.9	0.65	850 ◆		E2	2,500
20	T	TSSOP-20	H/F			6.5×4.4	6.5×6.4	0.9	0.65	1380 ◆	1730 ◆	E2	3,000
24	T	TSSOP-24	H/F			7.8×4.4	7.8×6.4	0.9	0.65				
28	T	TSSOP-28	H/F			9.7×4.4	9.7×6.4	1.2*2	0.65	1250 ◆		E2	3,000
5	J	TO-252-5-P1	—			6.54×6.04	6.54×9.68	2.29	1.27	1900 3800	2350 4800	T1	3,000
5	J	TO-252-5-P2	H/F			6.6×6.1	6.6×9.9	2.3	1.27	3800 ◆	4800 ◆	T1	3,000

QFN/HQFN Package

Pin	Symbol	Package	Halogen Free	Actual Size	Bottom View	Dimensions (mm)				Power Dissipation (mW) Standard Condition / High Wattage Con dition		Taping Direction	Quantity/ Reel (pcs)
						Body	Mount Area	Thickness	Pitch	Tjmax=125°C	Tjmax=150°C*1		
10	L	QFN014018-10	H/F			1.8×1.4	1.8×1.4	0.4*2	0.4	625 ◆	780 ◆	E2	5,000
20	D	QFN0404-20	H/F			4.0×4.0	4.0×4.0	0.7	0.5			TR	2,000
24	K	QFN0404-24	H/F			4.0×4.0	4.0×4.0	0.75	0.5	670 1500	830 1860	E2	1,000
24	L	QFN0404-24B	H/F			4.0×4.0	4.0×4.0	0.75*2	0.5	3400 ◆	4300 ◆	E2	1,000
32	K	QFN(PLP)0404-32	H/F			4.0×4.0	4.0×4.0	0.6*2	0.4	670 1500	830 1860	E2	2,000
32	L	QFN0505-32B	H/F			5.0×5.0	5.0×5.0	0.85*2	0.5	2300 ◆	2900 ◆	E2	1,000
32	L	QFN0505-32C	H/F			5.0×5.0	5.0×5.0	0.8*2	0.5	2300 ◆	2900 ◆		
28	L	HQFN0808-28	H/F			8.0×8.0	8.8×8.8	0.95	0.8	4600 ◆	5800 ◆	TR	2,000
68	L	QFN0910-68	H/F			10.0×9.0	10.0×9.0	4.7*2	0.5				

*1 Tjmax = 150°C does not apply to all products. *2 A maximum value.

Support your design
FAQ : Package

What must be taken into account to lay out PCB? ▶

Where is the information on the recommended landing patterns? ▶

What must be taken care of when mounting your ICs? ▶

What is junction temperature? ▶

What measures are you taking for Pb-free and halogen-free? ▶

What is thermal resistance? ▶

What do the squared values or characters in the outline drawings of packages mean? ▶

What do the characters on the surface of a package represent? ▶

How should the tab on the bottom surface of DFN (PLP) packages be connected? ▶

How can I calculate the power dissipation of an LDO regulator? ▶

Ricoh Electronic Devices offers a rich package lineup meeting various needs of customers.

Scan the QR code!

Real Time Clock (RTC)

♡ : Products available in PRODUCT LONGEVITY PROGRAM

4-wire Serial Interface (SPI Bus)

Product Name	Package	Time Keeping Current Typ. (µA)	Time Keeping Voltage (V)	Alarm Function	Perodic Interupt Function	32kHz Clock Output	Battery Checker (V)	Clock Adjust Function	OSC Halt Sensing	Back-up Battery Switch-over Circuit	VD with Delay Function	Other Features
R2043x ♡	QFN023023-16 TSSOP10G	0.45, at 3V	Typ. 0.66 to 5.50 Worst. 1.0 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	Nch Open Drain Output, Controllable by Command	1.6 or 1.3	Y	Y	N	N	
R2045S ♡	SOP14	0.48, at 3V	1.15 to 5.50	2 Sets, W/H/M, H/M	0.5s to 1Month	Nch Open Drain Output, Controllable by Command	2.1 or 1.3	Y	Y	N	N	Built-in Crystal Unit, Frequency Deviation: 0±5ppm
Rx5C348A	SSOP10 SSOP10G	0.35, at 3V	1.45 to 5.50	2 Sets, W/H/M, H/M	0.5s to 1Month	Nch Open Drain Output, Controllable by Command	2.1 or 1.6	Y	Y	N	N	
RV5C348B	SSOP10G	0.55, at 3V				Nch Open Drain Output, Keeping Output Enable						

3-wire Serial Interface

Product Name	Package	Time Keeping Current Typ. (µA)	Time Keeping Voltage (V)	Alarm Function	Perodic Interupt Function	32kHz Clock Output	Battery Checker (V)	Clock Adjust Function	OSC Halt Sensing	Back-up Battery Switch-over Circuit	VD with Delay Function	Switch-over/ Detector Threshold
R2033x ♡	QFN023023-16 TSSOP10G	0.45, at 3V	Typ. 0.66 to 5.50 Worst. 1.0 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS Output with Control Pin	1.6 or 1.3	Y	Y	N	N	
R2061x ♡	QFN023023-16 SSOP16	0.4, at 3V	Typ. 0.75 to 5.50 Worst. 1.0 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	—	2.10 or 1.35	Y	Y	Y	Y	1.7V, 2.8V 2.4V
R2062L	QFN023023-16	0.4, at 3V	Typ. 0.75 to 5.50 Worst. 1.0 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS Output with Level Shifter	2.10 or 1.35	Y	Y	Y*1	Y	2.7V, 2.9V
R2262x	QFN0202-18 TSSOP10G	0.3, at 3V	Typ. 0.6 to 5.5 Worst. 0.9 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS Output with Level Shifter	1.35	Y	Y	Y*2	Y	2.7V
Rx5C338A	SSOP10 SSOP10G	0.35, at 3V	1.45 to 5.50	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS Output with Control Pin	2.1 or 1.6	Y	Y	N	N	

2-wire Serial Interface (I^2C Bus)

Product Name	Package	Time Keeping Current Typ. (µA)	Time Keeping Voltage (V)	Alarm Function	Perodic Interupt Function	32kHz Clock Output	Battery Checker (V)	Clock Adjust Function	OSC Halt Sensing	Back-up Battery Switch-over Circuit	VD with Delay Function	Others Switch-over/ Detector Threshold
R2023x ♡	QFN023023-16 TSSOP10G	0.45, at 3V	Typ. 0.66 to 5.50 Worst. 1.0 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS output with control pin	1.6 or 1.3	Y	Y	N	N	
R2025x ♡	SOP14 SON22	0.48, at 3V	1.15 to 5.50	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS output with control pin	2.1 or 1.3	Y	Y	N	N	Built-in crystal unit. Frequency Deviation : 0±5ppm
R2051x ♡	QFN023023-16 SSOP16 TSSOP10G	0.4, at 3V	Typ. 0.75 to 5.50 Worst.1.0 to 5.5	2set W/H/M, H/M Register only, No INTR pin	0.5s to 1Month Register only, No INTR pin	CMOS output with level shifter	2.10 or 1.35	Y	Y	Y	Y — —	2.4V, 2.8V 2.4V, 2.8V, 4.0V 2.4V
R2221x ♡	QFN018018-12 TSSOP10G	0.3*3, at 3V	Typ. 0.6 to 5.5 Worst. 0.9 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS output with control pin	1.35	Y	Y	N	N	ECO mode is set by ECO Pin.
R2223x ♡	QFN018018-12 TSSOP10G	0.3*3, at 3V	Typ. 0.6 to 5.5 Worst. 0.9 to 5.5	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS output with control pin	1.35	Y	Y	N	N	ECO Mode is set by a Register.
RS5C372A ♡ RS5C372B	SSOP8	0.5, at 3V	1.3 to 6.0 1.45 to 6.00	2 Sets, W/H/M×2	0.5s to 1Month	Nch open drain output (Controllable by command) CMOS output (Controllable by command)	—	Y	Y	N	N	32768Hz/32000Hz Crystal is Selectable
RV5C386A	SSOP10G	0.35, at 3V	1.45 to 5.50	2 Sets, W/H/M, H/M	0.5s to 1Month	CMOS output with control pin	2.1 or 1.6	Y	Y	N	N	
RV5C387A	SSOP10G	0.35, at 3V	1.45 to 5.50	2 Sets, W/H/M, H/M	0.5s to 1Month	Nch open drain output (Controllable by command)	2.1 or 1.6	Y	Y	N	N	

*1 For secondary battery or capacitor *2 For secondary battery or capacitor, built-in VR for charger *3 Time keeping current can be reduced in ECO mode.

RTC Glossary / Lineup / Functional Map

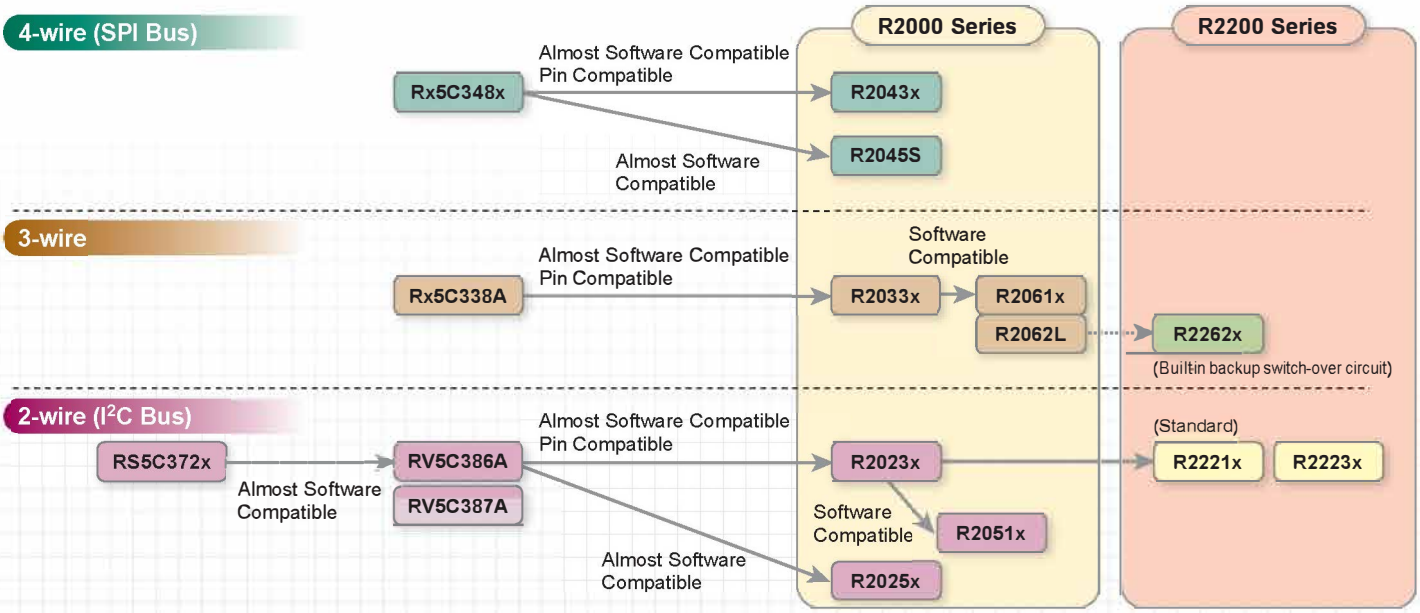
Glossary

Time Keeping Current	The consumption current which operates only clock and calendar without accessing CPU.
Time Keeping Voltage	The voltage which operates only clock and calendar without accessing CPU. The operating voltage to access CPU is specified in the other specification.
Alarm Function	The function which outputs the interrupt signal at the setting time.
Periodic Interrupt Function	The interrupt function which outputs at constant period such as every second, every minute, every hour and every month. It is useful when indicating clock and calendar by using the RTC clock data.
32 kHz Clock Output	It is possible to output same clocks of crystal frequency which is used in RTC. There are four types of selectable outputs such as Open drain controllable by pin, Open drain keeping output enable, CMOS controllable by pin, and CMOS with level shifter. It is suitable for CPU sub-clock.
Clock Adjustment Circuit	The circuit which adjusts time gain or loss by the software. It is useful to compensate the crystal frequency deviation.
OSC Halt Sensing Circuit	The circuit which records past oscillation halt to internal register. It can be used to judge the validity of internal data in such events as power-on.
Battery Checker	It records them as Flag when detecting voltage threshold of backup battery. It is useful as checker of the output voltage for backup battery.
32768 Hz/32000 Hz Crystal Selectable	RTC generally use 32768 Hz crystal oscillator. But RS5C372A/B can select 32000 Hz crystal oscillator as well as 32768 Hz crystal oscillator. 32KOUT pin outputs 32000 Hz clock pulses when 32000 Hz crystal oscillator is used.
Battery Backup Switch-over Function	R2051x, R2061x, R2062L, R2262x, incorporate the automatic switch-over circuit which can switch between a main power supply and a backup battery. Primary battery, secondary battery, electric double layered capacitor or aluminum electrolytic capacitor are selectable as backup battery in R2051x, R2061x. Secondary battery, electric double layered capacitor or aluminum electrolytic capacitor are selectable as backup battery in R2062L and R2262x. R2262x includes VR for charger.
Frequency Deviation (0±5 ppm)	R2025S/D and R2045S incorporates 32768 Hz crystal unit. The oscillation frequency is adjusted to high precision (0±5 ppm: at 25°C). The deviation corresponds to ±13 seconds per month. By using the clock adjustment circuit, time deviation also can be calibrated to 3 or 6 or 9±5 ppm.
ECO Mode	In the case that equivalent series resistance of crystal oscillator is low, (approximately equal or less than 45 kΩ) time keeping current can be reduced, if ECO mode is active. There are a register setting type such as R2223x and a pin setting type such as R2221x and in the setting ECO mode.

Lineup

	Standard	Built-in Backup Battery Switch-over Circuit	Built-in Crystal, Real Time Clock Module
4-Wire (SPI Bus)	**R2043x** Rx5C348x	–	**R2045S**
3-Wire	**R2033x** Rx5C338A	**R2262x** **R2061x** **R2062L**	–
2-Wire (I^2C Bus)	**R2221x** **R2223x** **R2023x** RS5C372x RV5C386A RV5C387A	**R2051x**	**R2025x**

Functional Map



RTC Application Note

Merits of Using a Real Time Clock

1. Low Power Consumption

Clock functions often have a backup power circuit, so they can continue to keep time while the primary source of power is off or unavailable. Although keeping time can be done without an RTC, using RTC has benefits of reducing the size and the cost of developing a backup circuit board since it only requires extremely low consumption current and very low input voltage.

Back-up Time Measurement **(R2051S01)**

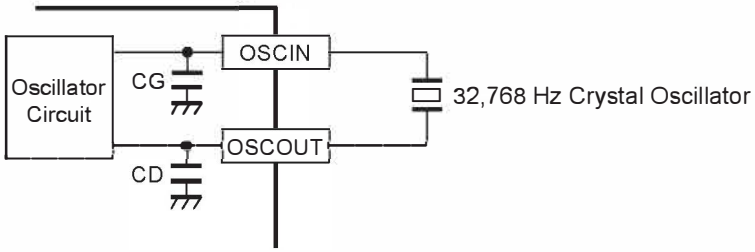
Backup Device	Backup Time	
	Backup Starting Voltage: 5 V	Backup Starting Voltage: 3 V
Coin Cell Primary Battery (CR2032)	–	10 Years or more (Calculated Value)
Electric Double Layered Capacitor (1 F)	130 Days	116 Days
Electric Double Layered Capacitor (0.1 F)	21 Days	15 Days
Aluminum Electrolytic Capacitor (4700 µF)	20 Hrs	12 Hrs 30 Min
Aluminum Electrolytic Capacitor (470 µF)	2 Hrs	1 Hr 15 Min
Aluminum Electrolytic Capacitor (47 µF)	12 Min	7 Min 30 Sec

2. Facilitates a Software Development

RTCs are specifically designed for keeping track of the current time and calendar. The clock function of RTCs tracks hours, minutes and seconds. The calendar function of RTCs tracks year, month, date, day-of-the-week and is accurate through 2099, with automatic leap year/long month/short month correction. By integrating RTCs, the need of developing a complicated software for tracking time and calendar can be omitted.

3. Facilitates a Oscillation Circuit Design

RTCs have peripheral components for the oscillator circuit built in, so an oscillator circuit can be easily configured by only adding a crystal resonator as an external component. Using RTCs can facilitate a layout design of oscillator circuit which is susceptible to noises.



1. Key Features of REDC Real Time Clocks

1. Oscillation Adjustment

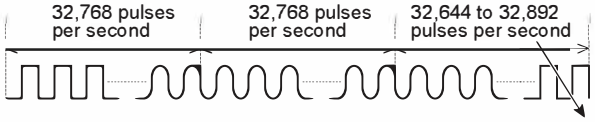
REDC RTCs have an oscillation adjustment from −189 ppm to +189 ppm or −63 ppm to +63 ppm.

The crystal oscillator used in REDC RTCs provides 32,644 to 32,892 pulses per 20 seconds or 60 seconds while a normal crystal oscillator provides exactly 32,768 pulses per second.

Tuning fork crystal provides highly stable natural oscillation frequency; however, environmental changes of temperature, humidity, pressure, vibration or a capacitance formed on a substrate can change the resonant frequency of a crystal oscillator.

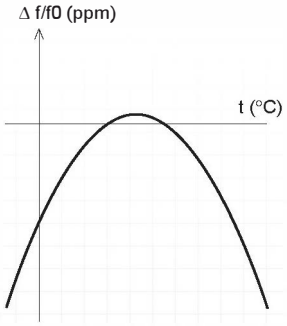
When performing a capacitor matching evaluation using a PCB for mass production, those influences need to be considered. REDC RTCs have a programmable time register to adjust a timekeeping glitch without the need of additional capacitors, which makes the capacitor matching evaluation easier.

A tuning fork crystal is usually cut such that its frequency over temperature is a parabolic curve centered around 25°C. REDC's oscillation adjustment circuit have an external temperature sensor to compensate this deviation.

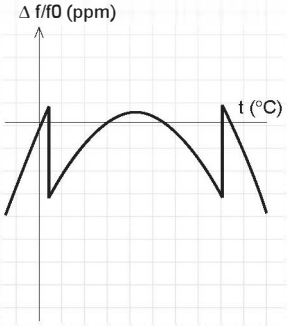


REDC RTCs perform this oscillation adjustment every 20 or 60 seconds.
Notes: R2025x/R2045S performs oscillation adjustment evey 20 seconds.

Uncompensated Crystal Drift



REDC RTCs Compensated Crystal Drift



2. Key Features of REDC Real Time Clocks

1. Clock Data Validation

4-Wire (SPI Bus): R2043x
3-Wire: R2033x/R2061x/R2062L/R2262x
2-Wire (I^2C Bus): R2023x/R2051x/R2221x/R2223x

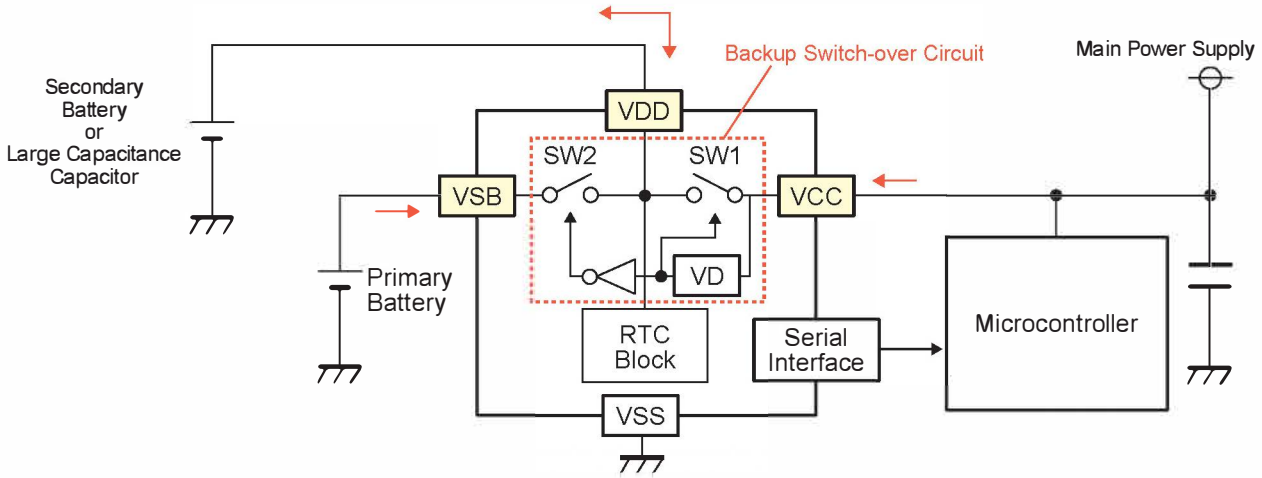
These RTCs provide a power-on reset function, an oscillation halt sensing function and a supply voltage monitoring function. These functions can be applied to judge a clock data validity.

- **Power-on Reset Function**
  Power-on reset circuit is configured to reset a control register and store the status as a flag after initial power on from 0 V without backup battery.
- **Oscillation Halt Sensing Function**
  Oscillation halt sensing circuit is equipped with internal registers configured to record any past oscillation halt as a flag.
- **Supply Voltage Monitoring Function**
  Supply voltage monitoring circuit is configured to record a drop in supply voltage below supply voltage monitoring thresholds.

2. Battery Backup Switch-over Circuit

3-Wire: R2061x/R2062L/R2262x
2-Wire (I^2C Bus): R2051x

These RTCs have a backup battery switch-over circuit which detects power failures and automatically switches to the battery supply when a power failure occurs. They are also equipped with two or three power supply pins so there is no need of adding a diode.



Notes: R2062L does not have the SW2 switch or the VSB pin. R2262x has the SW2 switch and the BAT pin instead of the VSB pin. The SW2 switch is constantly turned on unless it is turned off by a register setting.

3. High-precision Real Time Clock Module

4-Wire (SPI Bus): R2045S
2-Wire (I^2C Bus): R2025x

These RTCs have a built-in crystal oscillator that is adjusted to 0±5 ppm at 25°C at the time of factory shipping. This means ±13 seconds per month at 25°C.

RTC Package Information

H/F : Halogen-free

Pin	Symbol	Package	Halogen Free	Actual Size	Top View/ Bottom View	Dimensions (mm)				Taping Direction	Quantity/Reel	Product Name
						Body Size	Mount Area	Thickness	Pitch			
8	S	SSOP8	H/F			3.5×4.4	3.5×6.4	1.15	0.65	E2	2,000	RS5C372A RS5C372B
10	S	SSOP10	H/F			3.5×4.4	3.5×6.4	1.15	0.5	E2	2,000	RS5C338A RS5C348A
10	V	SSOP10G	H/F			2.9×2.8	2.9×4.0	1.1	0.5	E2	2,000	RV5C338A RV5C348A RV5C348B RV5C386A RV5C387A
10	T	TSSOP10G	H/F			2.9×2.8	2.9×4.0	0.75	0.5	E2	2,000	R2023T R2033T R2043T R2051T R2221T R2223T R2262T
12	L	QFN018018-12	H/F			1.8×1.8	1.8×1.8	0.43*1	0.4	E2	3,000	R2221L R2223L
16	L	QFN023023-16	H/F			2.3×2.3	2.3×2.3	0.43*1	0.4	E2	3,000	R2023L R2033L R2043L R2051L R2061L R2062L
18	L	QFN0202-18	H/F			2.0×2.0	2.0×2.0	0.43*1	0.4	E2	3,000	R2262L
14	S	SOP14 (RTC Module)	H/F			10.1×5.0	10.1×7.4	3.1	1.27	E2	1,000	R2025S R2045S
16	S	SSOP16	H/F			5.0×4.4	5.0×6.4	1.15	0.65	E2	2,000	R2051S R2061S
22	D	SON22 (RTC Module)	H/F			6.1×4.7	6.1×5.0	1.3	0.5	E2	1,000	R2025D

*1 A maximum value.

Lead (Pb) Free/Halogen Free Information

RICOH Electronic Devices is committed to reduce the environmental loading materials in electrical devices in order to contribute to protection of human health and the environment. RICOH Electronic Devices has been providing RoHS compliant products since April 1, 2006 and Halogen-free & Antimony-free products since April 1, 2012.

Definition of Halogen-free According to "IEC 61249-2-21" Standard
- 900 ppm of chlorine or
- 900 ppm of bromine or
- a combined total of 1,500 ppm of chlorine and bromine

Definition of Antimony-free
- 1,000 ppm of antimony trioxide

The performance and reliability of the Ricoh's halogen-free products are comparable to conventional products. Please contact our sales representatives for details.

: Products Newly Released H/F : Halogen Free ♡ : Products available in PRODUCT LONGEVITY PROGRAM

LD Driver ICs

This LD driver IC achieves highly accurate printing. It is offered in a cathode type or an anode type. It provides a small package solution.

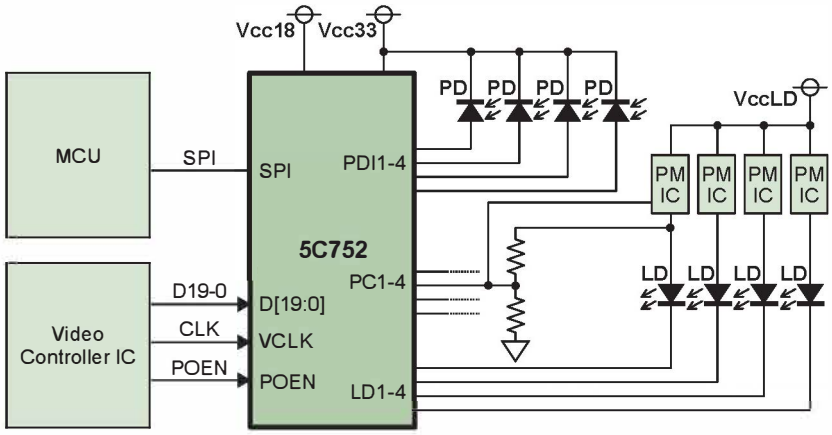
Product Name	LD	CH	Supply Voltage (V)	Max. Operating Frequency (MHz)	LED Current Min. Pulse Width (ns)	Drive Current Setting (mA)			Package (Unit:mm)	Halogen Free	Other
						Threshold Current	LED Current	Operating Current			
RN5C713	Cathode	2CH	5.0	400	1.25	50	50	70	QFN0606-48 (6.0×6.0, t=0.9)	H/F	Need no VR, Digital method
RN5C711 ♡	Cathode	2CH	3.3 or 5.0	200	2.5	—	—	70	QFN0505-36 (5.0×5.0, t=0.9)	H/F	Include APC (Automatic Power Control), LVDS (Low Voltage Differential Signal) format data
RN5C716 ♡	Anode	1CH	3.3 or 5.0	200	2.5	—	—	80	QFN0303-20 (3.0×3.0, t=0.75)	H/F	

LD Driver ICs for Display

REDC provides LD drivers for display by using MFP / LP driver technology.
This LD driver IC for display contributes to high image quality and space saving.

Product Name	CH	Supply Voltage (V)	Maximum Output Rate Per 1 Channel (Mdots/sec)	Rising/Falling Time (ns)	Maximum Operating Current (mA)		Protection Circuit	Package (Unit:mm)	Halogen Free
					LD1	LD2/3/4			
RN5C752	4CH	1.8 & 3.3	200	1.0	800	400	LD Over Current Detection LD Pin Short Circuit Detection PDI Current Error Detection Thermal Shutdown	QFN0808-56 (8.0×8.0, t=0.8)	H/F

RN5C752 TYPICAL APPLICATIONS



Key Specifications

- RGGB 4 Channel Current Output (Sink)
- High Gradation Output by 10-Bit Color DAC
- 20-Bit Parallel Input Video I/F, 200 MHz
- 10-Bit Parallel Input Video I/F, 225 MHz
- 10-V LD Pin Corresponding to High Forward Voltage (VF) LD
- APC Function
- Pulse-Off Function
- Dimming Function
- QFN0808-56 package with Wettable Flank
- Operating Temperature Range : 0°C to 70°C

Applications

- HUD
- Pico Projector

USB Power Delivery Controller IC

H/F : Halogen-free

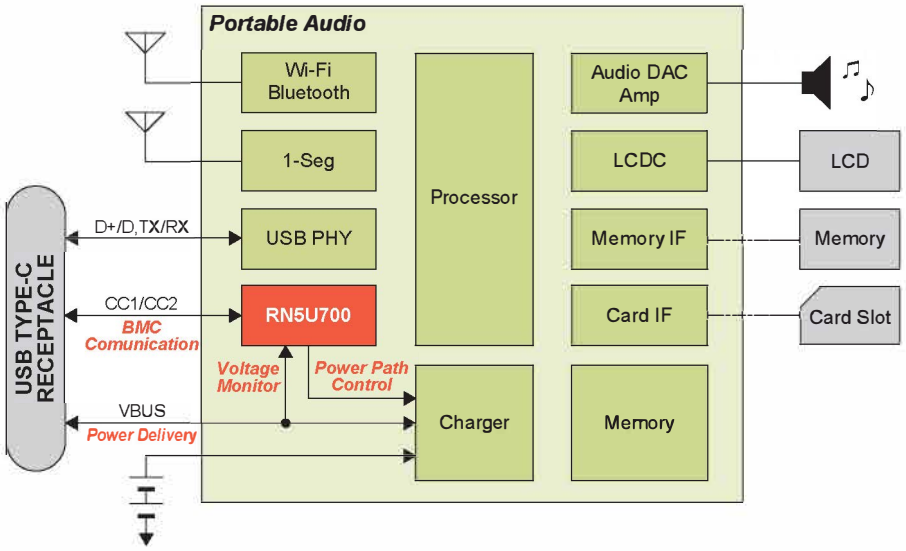
USB Power Delivery Controller IC (USB PD Controller IC)

The USB PD controller ICs can meet the USB Type-C Connector and the USB Power Delivery Standards.
Our ICs for USB PD include oscillators, high-voltage LDO regulators, detections/protections against overvoltage, overcurrent and thermal abnormality, etc., and therefore enable constructing USB power delivery systems with a few external components.
Thanks to the logic circuits for electric negotiation of USB power delivery, our devices can efficiently supply and receive power meeting the USB Power Delivery Standards in a stand-alone state without an MCU.

Product Name	Standby Current (μA)	Power Role	Data Role	Protection Circuit	VBUS Input Voltage (V)	CC1/2 Pin Input Voltage (V)	VBUS Controls	Operating Temperature Range (℃)	Package (Unit:mm)	Halogen Free	Other
RN5U700	2.8 (Deep-Sleep)	DRP Source Sink	DRD DFP UFP	VBUS OVP/OCP CC Pin OVP OTP	4.5 to 24	Up to 24	Nch.FET	-20 to 70	QFN0404-24-P12 (4.0×4.0, t=0.75)	H/F	Supports Dead Battery operation, I²C Interface: Up to 1MHz (FM+)
							Pch.FET Switch IC	-20 to 85			

RN5U700

Typical Application of Control IC Supporting USB Type-C and USB PD



Applications

Digital Camera, Audio Player, Smart Speaker, Smart Projector, Electronic instrument, OA, Cleaner, Desk Lamp, Fan, USB HDD, POS, etc.

Product Index

Non-Promotion/ Limited/ Discontinued Products

■ Non-Promotion Products: These products will be discontinued in the future. New adoption is not recommended.
■ Limited Products: These products are already discontinued. Providing only for the customer under present adoption with stock.
■ Discontinued Products: These products are already discontinued.

The lists below do not include some of our old products. The alternative products are not fully compatible with the non-promotion/ limited/ discontinued products. The function of alternative products are similar to these products, but the electrical characteristics and the pin-layout may differ.

Category	Product Name	Sub Category	Package	Status	Termination Date	Alternative Product			
						Same Spec with Different Package	Package	Succeeding Product	Package
LDO Regulators	RN5RG	External transisitor type	SOT-23-5	Discontinued	Already				
	R1110N	Low supply current type	SOT-23-5	Discontinued	Already				
	R1112N	High-performance type	SOT-23-5	Discontinued	Already				
	R1113Z	High-performance type	WLCSP-4-P1	Limited		R1122N	SOT-23-5	RP112N	SOT-23-5
	R1115Z	Standard type	WLCSP-4-P4	Discontinued	Already				
	R1118K R1118N	With ECO function	DFN(PLP)1612-4B SOT-23-5	Discontinued	Already				
	R1120N	Standard type	SOT-23-5	Discontinued	Already				
	R1124N	Standard type	SOT-23-5	Discontinued	Already				
	R1126N	With ECO function	SOT-23-5	Discontinued	Already				
	R1130D	Standard type	HSON-6	Discontinued	Already				
	R1131Dxx2	Standard type	HSON-6	Discontinued	Already				
	R1140Q	Standard type	SC-82AB	Discontinued	Already				
	R1151N	External transisitor type+VD	SOT-23-6	Discontinued	Already				
	R1152N	External transisitor type	SOT-23-5	Discontinued	Already				
	R1160D	With ECO function	SON-6	Discontinued	Already				
	R1161Dxx1 R1161Dxx2	With ECO function	SON-6 HSON-6	Discontinued	Already				
	R1162D R1162N	With ECO function	SON1612-6 SOT-23-5	Discontinued	Already				
	R1163K	With ECO function	DFN(PLP)1616-6	Non-promotion		R1163D R1163N	SON-6 SOT-23-6	–	–
	R1182K R1182N	With ECO function	DFN(PLP)1616-6 SOT-23-5	Discontinued	Already				
	R1183Z	Low supply current type	WLCSP-4-P2	Discontinued	Already				
	R1500J	Standard type	TO-252-5-P2	Discontinued	Already				
	RP103Qxx2	Standard type	SC-88A	Discontinued	Already				
	RP104Q	Low supply current type	SC-82AB	Discontinued	Already				
	RP105Q	Ultra low voltage	SC-88A	Discontinued	Already				
	RP106N	Standard type	SOT-23-5	Non-promotion	Already				
	RP107N	Standard type	SOT-23-5	Discontinued	Already				
	RP113Q	Standard type	SC-88A	Discontinued	Already				
	RP170Q	Standard type	SC-88A	Discontinued	Already				
	RP131L	Standard type	DFN1616-6B	Non-promotion		RP131K RP131H RP131S RP131J	DFN(PLP)1820-6 SOT-89-5 HSOP-6J TO-252-5-P2	–	–
	RP173Q	Low supply current type	SC-88A	Non-promotion		RP173K RP173N	DFN(PLP)1010-4 SOT-23-5	–	–
	RP200Z	With ECO function	WLCSP-4-P5	Limited	2021/3	RP200K RP200N	DFN(PLP)1212-6 SOT-23-5	–	–
	RP200Q		SC-88A	Discontinued	Already				
	RP201Z	With ECO function	WLCSP-4-P5	Limited	2021/3	RP201K	DFN(PLP)1212-6	–	–
	RP201N		SOT-23-5	Discontinued	Already				
	RP201Q		SC-88A						
LDO Regulators: Multiple Output	R5320D R5320G	3ch.	SON-8 SSOP-8G	Discontinued	Already				
	R5321D	2ch.	SON-8	Discontinued	Already				
	R5322N	2ch.	SOT-23-6W	Discontinued	Already				
	R5323Z R5323N R5323K	2ch.	WLCSP-6-P1 SOT-23-6 DFN(PLP)1820-6	Discontinued	Already				
	R5324D	3ch.	SON-8	Discontinued	Already				
	R5325K R5325N	2ch., With ECO function	DFN(PLP)1820-6 SOT-23-6	Discontinued	Already				
	R5326Z R5326N	2ch., With ECO function	WLCSP-6-P1 SOT-23-6	Discontinued	Already				
	R5328K	2ch., With ECO function	DFN(PLP)2020-8	Limited		–	–	–	–
	RP151K	2ch.+VD	DFN(PLP)2020-8	Discontinued	Already				
	RP153L	2ch.	DFN1216-8	Discontinued	Already				
Reset ICs (VD)	R3111E	Normal type	TO-92	Discontinued	Already				
	R3112Qxx2	With delay function (External capacitor type)	SC-88A	Discontinued	Already				
	R3113D	Normal type	SON1408-3	Discontinued	Already				
	R3115Z	With delay function (External capacitor type)	WLCSP-4-P2	Discontinued	Already				
	R3131N	With delay function (Internal counter type)	SOT-23-3	Discontinued	Already				
	R3133Q	With delay function (Internal counter type)	SC-82AB	Discontinued	Already				
	R3134K R3134Q	With delay function (Internal counter type)	DFN(PLP)1212-6 SC-88A	Discontinued	Already				

Category	Product Name	Sub Category	Package	Status	Termination Date	Alternative Product			
						Same Spec with Different Package	Package	Succeeding Product	Package
Watchdog Timers, Switch Ics	R5102V	WDT with Dual output VR	SSOP-10	Discontinued	Already				
	R5521V	For pay on-demand	SSOP-16	Discontinued	Already				
	R5522V	For pay on-demand	SSOP-20	Discontinued	Already				
	R5531V	For PCMCIA 1slot	SSOP-16	Discontinued	Already				
	R5532V	For PCMCIA 2slot	SSOP-28	Discontinued	Already				
	R5534V	For PCMCIA 2slot	SSOP-20	Discontinued	Already				
	R5535V	For Express Card	SSOP-20	Discontinued	Already				
DCDC Converters	RN5RYxx1/202	Step-up	SOT-23-5	Discontinued	Already				
	R1200Z	For PMOLED and general step-up use	WLCSP-6-P1	Discontinued	Already	R1200L R1200N	DFN1616-6 SOT-23-6	–	–
	R1200K		DFN(PLP)1820-6	Non-promotion					
	R1201L	For white LED backlight	DFN1616-6	Discontinued	Already				
	R1201N		SOT-23-6						
	R1218K	For white LED backlight	DFN(PLP)1820-6	Limited	2021/3	R1218N	SOT-23-6	R1202LxxxD R1202NxxxD R1204KxxxA/D R1204NxxxA/D	DFN1616-6B TSOT-23-6 DFN(PLP)1820-6 TSOT-23-6
	R1221N	Step-down with VD (Middle voltage)	SOT-23-6W	Discontinued	Already				
	R1230D	Step-down (Low voltage)	SON-8	Discontinued	Already				
	R1234D	Step-down (Low voltage)	SON-8	Discontinued	Already				
	R1250V	Charge pump inverting	TSOP-8	Discontinued	Already				
	R1283Z	Step-up/Inverting	WLCSP-11-P2	Discontinued	Already				
	R1285L	Step-up/Inverting	DFN2730-12	Discontinued	Already				
	RP500Z	Step-down (Low voltage)	WLCSP-6-P2	Discontinued	Already	RP500K RP500N	DFN(PLP)1820-6 SOT-23-6W	RP504K RP504L RP504N	DFN(PLP)1216-6F DFN1616-6B SOT-23-5
	RP500L		DFN1616-6	Non-promotion					
	RP503Z	Step-down (Low voltage)	WLCSP-6-P2	Discontinued	Already				
Li-ion/ Polymer Battery Protection	R5400D	For 1cell battery	SON1612-6	Discontinued	Already				
	R5401K	For 1cell battery	DFN(PLP)1820-6	Discontinued	Already				
	R5401N		SOT-23-5						
	R5403K	For 1cell battery	DFN(PLP)1820-6	Discontinued	Already				
	R5404K	For 1cell battery	DFN(PLP)1616-6	Discontinued	Already				
	R5406K	For 1cell battery	DFN(PLP)1616-6B	Discontinued	Already				
	R5407K	For 1cell battery	DFN(PLP)1820-6B	Discontinued	Already				
	R5407N		SOT-23-5						
	R5408L	For 1cell battery	DFN1414-6	Non-promotion	Already				
	R5408K		DFN(PLP)1616-6						
	R5408D		SON1612-6						
	R5409K	For 1cell battery	DFN(PLP)2114-4	Discontinued	Already				
	R5421N	For 1cell battery	SOT-23-6	Discontinued	Already				
	R5425N	For 1cell battery	SOT-23-6	Discontinued	Already				
	R5426D	For 1cell battery	SON-6	Non-promotion		–	–	R5405N	SOT-23-6
	R5426N		SOT-23-6	Discontinued	Already				
	R5429K	For 1cell battery	DFN(PLP)1820-6	Discontinued	Already				
	R5429D		SON-6						
	R5429N		SOT-23-6						
	R5431V	For Multi-cell battery	SSOP-16	Discontinued	Already				
	R5450N	For 1cell battery	SOT-23-5	Discontinued	Already				
	R5451K	For 1cell battery	DFN(PLP)1616-6B	Discontinued	Already				
	R5454K	For 1cell battery	DFN(PLP)1820-6B	Discontinued	Already				
	R5455K	For 1cell battery	DFN(PLP)2114-4	Discontinued	Already				
	R5456K	For 1cell battery	DFN(PLP)1616-6	Discontinued	Already				
	R5470K	For 1cell battery	DFN(PLP)2114-4B	Discontinued	Already				
	R5471K		DFN(PLP)1616-6B						
	R5472K	For 1cell battery	DFN(PLP)1414-6	Limited	2021/3	–	–	R5480K R5480L	DFN(PLP)1414-6 DFN1814-6C
	R5472L		DFN1414-6						
	R5475N	For 1cell battery	SOT-23-5	Discontinued	Already				
	R5476K	For 1cell battery	DFN(PLP)1616-6B	Discontinued	Already				
Multi Power Supply	R5210D	For optical disk drive	HSON-6	Discontinued	Already				
	R5210N		SOT-23-6W						
	R5212D	For optical disk drive	HSON-6	Discontinued	Already				
	R5220D	For general use	SON-6	Discontinued	Already				
	R5310L	For mobile phone	LQFP0505-32	Discontinued	Already				
	R5312L	For mobile phone	LQFP0505-32	Discontinued	Already				
	R5314D	For mobile phone	QFN0404-20	Discontinued	Already				
	R5315B	Wireless Modules for M2M	CSP0605-49	Limited	Already				
	R5510H	For optical disk drive	SOT-89-5	Limited		–	–	RP901K	DFN(PLP)2527-10
	R5511D	For optical disk drive	SON-6	Discontinued	Already				
	R5511N		SOT-23-5						
	R5511H		SOT-89-5						
	RP902K	For optical disk drive	QFN0404-20	Discontinued	Already				
Real Time Clocks	R2045D	4-wire Serial Interface	SON22	Limited		R2045S	SOP14	–	–
	RS5C313	3-wire Serial Interface	SSOP8	Non-promotion		–	–	R2033L R2033T R2061L R2061S R2062L	QFN023023-16 TSSOP10G QFN023023-16 SSOP16 QFN023023-16
	RS5C316A/B	3-wire Serial Interface	SSOP8	Non-promotion		–	–	–	–

1. The products and the product specifications described in this catalog are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore,before deciding to use the products, please refer to Ricoh sales representatives for the latest information thereon.
2. The materials in this catalog may not be copied or otherwise reproduced in whole or in part without prior written consent of Ricoh.
3. Please be sure to take any necessary formalities under relevant laws or regulations before exporting or otherwise taking out of your country the products or the technical information described herein.
4. The technical information described in this catalog shows typical characteristics of and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under Ricoh's or any third party's intellectual property rights or any other rights.
5. The products listed in this catalog are intended and designed for use as general electronic components in standard applications (office equipment, telecommunication equipment,measuring instruments, consumer electronic products, amusement equipment etc.). Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death (aircraft, spacevehicle, nuclear reactor control system,traffic control system, automotive and transportation equipment, combustion equipment, safety devices, life support system etc.) should first contact us.
6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, firecontainment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. Anti-radiation design is not implemented in the products described in this catalog.
8. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
9. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
10. There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact Ricoh sales or our distributor before attempting to use AOI.
11. Please contact Ricoh sales representatives should you have any questions or comments concerning the products or the technical information.

RoHS Compliant
Halogen Free

Ricoh is committed to reducing the environmental loading materials in electrical devices with a view to contributing to the protection of human health and the environment.
Ricoh has been providing RoHS compliant products since April 1, 2006 and Halogen-free products since April 1, 2012.

RICOH
imagine. change.

RICOH ELECTRONIC DEVICES CO., LTD.

Official website
https://www.n-redc.co.jp/en/

Contact us
https://www.n-redc.co.jp/en/buy/