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BIG IDEAS FOR EVERY SPACE

INDUSTRIAL POWER MANAGEMENT SOLUTIONS

2018.02

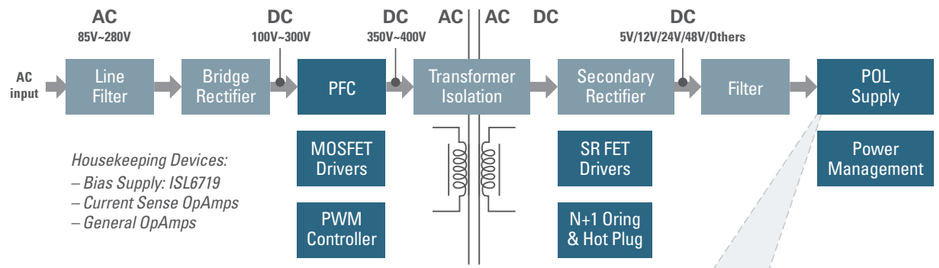
PROVIDING SOLUTIONS FOR TODAY'S
COMPLEX POWER NEEDS

INDUSTRIAL POWER

CONTENTS

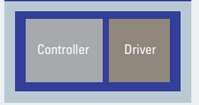
A Complete Power Solution

Renesas offers a complete portfolio of high-performance power solutions for processor, controller, DSP, FPGA, CPLD, DDR memory or other loads in your system. Whether you need standard linear regulators, highly flexible PWM controllers/regulators, or fully integrated power modules, our products are tailored to meet your design challenges.



Featured in this guide:

Analog Controllers



- On-chip MOSFET drivers
- Internal bootstrap diodes
- Integrated compensation
- High voltage/high current

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Switching Regulators

- Integrated HS/LS FETs
- Integrated compensation
- Low-medium voltage/load conditions

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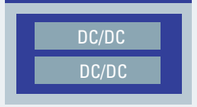
Simple DC/DC



- Built-in step-down FET
- Multi-outputs in single package

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LDOs

- Integrated power FET, differential amplifier

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Battery Management System

- One package solution with MCU and AFE
- Built-in FET driver

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Power Modules

- Integrated controller, power FETs, output inductor and compensation circuitry
- Low-medium voltage/high current

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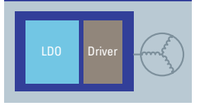
MOSFET Drivers



- Integrated LDO to power system circuits

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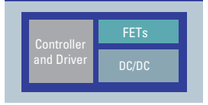
Wireless Charging



- Integrated DC/DC converter
- All functions needed for receiver are intedtrated on one chip

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ANALOG CONTROLLERS

High Voltage/High Current for Today's Power Demands

Benefits and Key Features

Robust, Reliable Performance

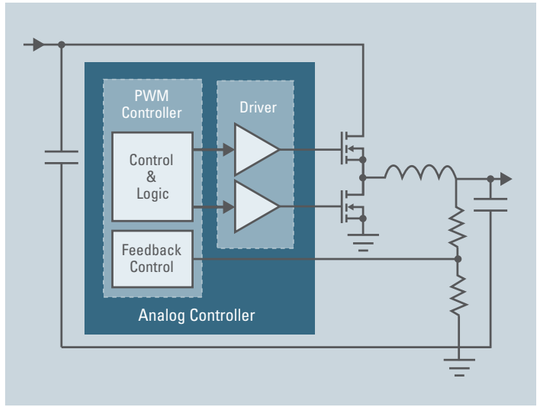
- Extensive protection (OCP, OVP, OTP, SCP)
- Pre-biased startup, external compensation

Large Selection

- Wide input voltages up to 72V
- Several configurations (single output, multi-output, multi-phase)
- Wide frequency (100 kHz to 2.5 MHz)
- Variety of package choices (i.e. DFN, QFN, HTSSOP, QSOP)

High Integration

- On-chip MOSFET drivers
- Internal bootstrap diodes
- Integrated compensation



ISL8117/A — 60V Sync Buck Controller Eliminates Need for Intermediate Power Conversion Stage

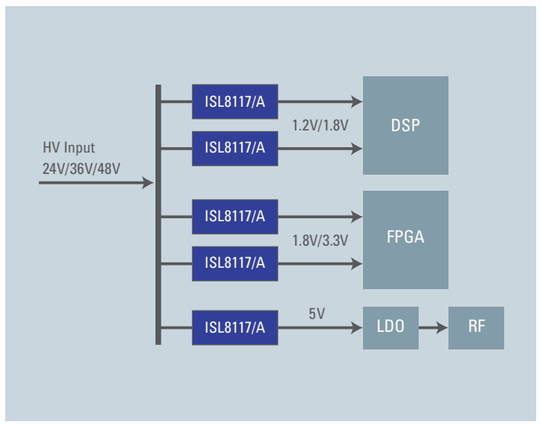
The ISL8117/A is 60V synchronous buck controller able to bypass the intermediate step-down conversion stage typically required.

Reduces Design Time and Solution Cost

- Option of internal or external compensation
- Adjustable frequency up to 2 MHz optimizes power supply cost, size and efficiency

Simplifies Design, Easy-to-Use

- No external compensation required
- Layout friendly pin architecture
- Default design values reduce external components
- Less real estate, higher performance
  - –40% fewer external components than competing devices
  - –Up to 98% efficiency, 1.5% output voltage accuracy



Single-Output Analog Controllers

Input	Part No.	V_{IN} Range (V)	V_{OUT} Range (V)	I_{OUT} (max) (A)	Package	Technical Highlights
12V	ISL8104	1.2 to 12	0.6 to Dmax*V_{IN}	30	16 Ld QFN, 14 Ld SOIC	
	ISL6341/A/B/C	1.5 to 12	0.8 to Dmax*V_{IN}	30	10 Ld DFN	
	ISL6545A	1 to 12	0.6 to Dmax*V_{IN}	25	10 Ld DFN, 8 Ld SOIC	
	ISL8105A/B	4.5 to 14	0.6 to Dmax*V_{IN}	25	10 Ld DFN, 8 Ld SOIC	Simple DC/DC conversion, low pin count
20V	ISL8118	3.3 to 20	0.6 to Dmax*V_{IN}	30	28 Ld QFN	
	ISL6540A	3.3 to 20	0.6 to Dmax*V_{IN}	30	28 Ld QFN	Voltage mode with feed forward, feature rich, popular for POL module
	ISL8106	7 to 25	0.6 to Dmax*V_{IN}	12	16 Ld QFN	
28V	ISL8130	4.5 to 28	0.6 to Dmax*V_{IN}	20	20 Ld QFN, 20 Ld QSOP	Universal controller for buck, boost or SEPIC
	ISL6420B	4.5 to 28	0.6 to Dmax*V_{IN}	20	20 Ld QFN, 20 Ld QSOP	
36V	ISL8115	3.0 to 36	0.6 to Dmax*V_{IN}	40	24 Ld TQFN	Voltage mode with non-linear control, current sharing
60V	ISL8117/A	4.5 to 60	0.6 to Dmax*V_{IN}	20	16 Ld QFN, 16 Ld TSSOP	Current mode, simplified pin-out, low external components
75V	ISL8107	9 to 75	1.2 to Dmax*V_{IN}	10	16 Ld QFN	

Multi-Output Analog Controllers

Output	Part No.	V_{IN} Range (V)	V_{OUT} Range (V)	I_{OUT} (max) (A)	Package	Technical Highlights
Dual	ISL6446A	5.6 to 24	0.6 to Dmax*V_{IN}	25/ch	24 Ld QSOP	2 outputs, voltage mode
Triple	ISL9444	4.5 to 28	0.6 to Dmax*V_{IN}	25/ch	40 Ld QFN	3 outputs, current mode, internal compensation
	ISL9440B	4.5 to 24	0.8 to Dmax*V_{IN}	0.8/ch	32 Ld QFN	3 outputs with programmable soft-start

Multiphase Analog Controllers

Phase	Part No.	V_{IN} Range (V)	V_{OUT} Range (V)	I_{OUT} (max) (A)	Package	Technical Highlights
Up to 12-phase	ISL8126	3.0 to 26.5	0.6 to Dmax*V_{IN}	60	32 Ld QFN	Current sharing up to 12 phase
2-phase	ISL8121	3.0 to 20	0.6 to Dmax*V_{IN}	60	24 Ld QFN	2-phase, popular for 5V/3.3V module
4-phase	ISL6558	5 ±10%	0.8 to Dmax*V_{IN}	120	20 Ld QFN, 16 Ld SOIC	4-phase controller, $5V_{IN}$ bias

www.intersil.com/analog-power

SWITCHING REGULATORS

Wide V_{IN} Coverage

Benefits and Key Features

Robust & Reliable Performance

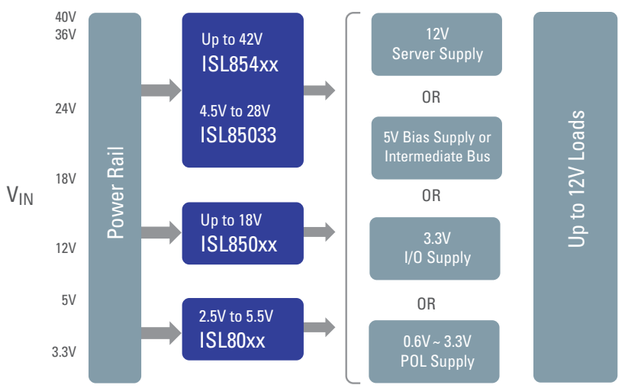
- Pgood, Enable, adj. soft-start
- Extensive protection (OCP, OVP, OTP, SCP)
- External frequency synchronization

High Integration

- Integrated HS/LS FETs
- Internal compensation

Target Applications

- Servers and infrastructure POLs
- Industrial PCs, factory automation, PLCs
- General purpose POLs
- Telecom and networking systems



ISL854xx **40V Sync Buck Regulator Family – Wide V_{IN} Range with Rich Feature Sets**

Adjustable Output Voltage

- 0.6V to 95% of input voltage
- Wide conversion range

Fully Integrated

- Internal compensation
- Integrated HS/LS FETs and bootstrap diode

Selectable PWM or PFM Mode

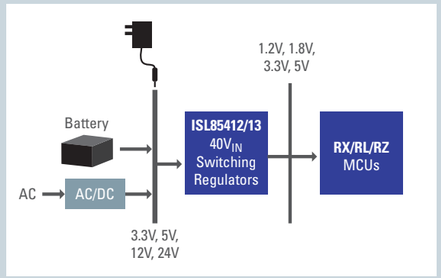
- PFM for high efficiency at light loads

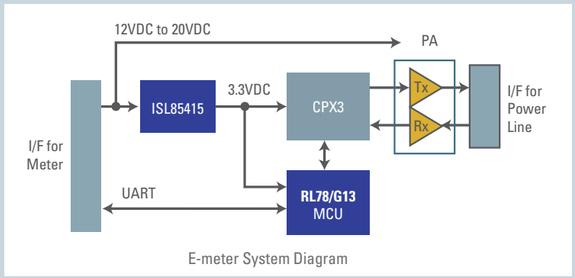
Full Protection

- OC (Pos & Neg), OV, UV, OT protections and UVLO

Part No.	V_{IN} Range	I_{OUT}	Package	
ISL85412	3.5V to 40V	150 mA	3x3 TDFN	
ISL85413	3.5V to 40V	300 mA	3x3 TDFN	
ISL85415	3V to 36V	500 mA	4x3 DFN	
ISL85418	3V to 40V	800 mA	4x3 DFN	
ISL85410	3V to 40V	1 A	4x3 DFN	
ISL854102	3V to 40V	1.2 A	4x3 DFN	

Using 40V Sync Buck Regulator Family to Power MCUs





E-meter System Diagram

2.5V-6V Synchronous Buck Regulators

Part No.	# of Outputs	V_{IN} Range (V)	I_{OUT} (max) (A)	V_{OUT} Range (V)	PFM	Adj SS/ TRK	Ext Comp	Sync	Adj Freq	Adj OCP	Package
ISL8088	Dual	2.75 to 5.5	0.8	0.6 to V_{IN}	Y	N/N	N	Y	N	N	10 Ld 3x3 DFN
ISL80019/A	Single	2.7 to 5.5	1.5	0.6 to V_{IN}	Y	N/N	Y	N	N	N	8 Ld 2x2 TDFN
ISL80015/A	Single	2.7 to 5.5	1.5	0.6 to V_{IN}	N	N/N	N	N	N	N	8 Ld 2x2 TDFN
ISL8022	Dual	2.7 to 5.5	2/1.7	0.6 to V_{IN}	Y	N/N	N	Y	N	N	12 Ld 4x3 DFN
ISL8002/A	Single	2.8 to 5.5	2	0.6 to V_{IN}	Y	N/N	Y	N	N	N	8 Ld 2x2 TDFN
ISL8002B	Single	2.7 to 5.5	2	0.6 to 4	Y	Y/Y	N	N	N	N	8 Ld 2x2 TDFN
ISL80020/A	Single	2.7 to 5.5	2	0.6 to V_{IN}	N	N/N	N	N	N	N	8 Ld 2x2 TDFN
ISL8033/A	Dual	2.85 to 6	3/3	0.8 to V_{IN}	N	N/N	N	Y	N	Y	24 Ld 4x4 QFN
ISL8036/A	Dual	2.85 to 6	3/3	0.8 to V_{IN}	N	Y/N	N	Y	N	N	24 Ld 4x4 QFN
ISL80030/A	Single	2.7 to 5.5	3	0.6 to V_{IN}	N	N/N	N	N	N	N	8 Ld 2x2 DFN
ISL80031/A	Single	2.7 to 5.5	3	0.6 to V_{IN}	Y	N/N	N	N	N	N	8 Ld 2x2 DFN
ISL8023/A	Single	2.7 to 5.5	3	0.6 to V_{IN}	Y	Y/N	Y	Y	Y	N	16 Ld 3x3 TQFN
ISL8024/A	Single	2.7 to 5.5	4	0.6 to V_{IN}	Y	Y/N	Y	Y	Y	N	16 Ld 3x3 TQFN
ISL8025/A	Single	2.7 to 5.5	5	0.6 to V_{IN}	Y	Y/N	Y	Y	Y	N	16 Ld 3x3 TQFN
ISL8026/A	Single	2.5 to 5.5	6	0.6 to V_{IN}	Y	Y/N	Y	Y	Y	N	16 Ld 3x3 TQFN
ISL8016	Single	2.7 to 5.5	6	0.6 to V_{IN}	Y	Y/N	Y	Y	Y	Y	20 Ld 3x4 QFN
ISL8018	Single	2.7 to 5.5	8	0.6 to V_{IN}	Y	Y/N	Y	Y	Y	Y	20 Ld 3x4 QFN

Up to 18V Synchronous Buck Regulators

Part No.	# of Outputs	V_{IN} Range	I_{OUT} (max)	V_{OUT} Range	I_Q (typ)	Package
ISL85003/A	Single	4.5V to 18V	3A	0.8V to Dmax*V_{IN}	3.2 mA	12 Ld 3x4 DFN
ISL85005/A	Single	4.5V to 18V	5A	0.8V to Dmax*V_{IN}	3.2 mA	12 Ld 4x3 DFN
ISL85009	Single	3.8V to 18V	9A	0.6V to Dmax*V_{IN}	3 mA	15 Ld 3.5x3.5 TQFN
ISL85012	Single	3.8V to 18V	12A	0.6V to Dmax*V_{IN}	3 mA	15 Ld 3.5x3.5 TQFN
ISL85014	Single	3.8V to 18V	14A	0.6V to Dmax*V_{IN}	3 mA	15 Ld 3.5x3.5 TQFN

Up to 28V Synchronous Buck Regulators

ISL85033	Dual	4.5V to 28V	3A	0.8V to Dmax*V_{IN}	1.2 mA	28 Ld 4x4 TQFN

Up to 40V Synchronous Buck Regulators

ISL85412	Single	3.5V to 40V	150 mA	0.6V to Dmax*V_{IN}	50 µA	8 Ld 3x3 TDFN
ISL85413	Single	3.5V to 40V	300 mA	0.6V to Dmax*V_{IN}	50 µA	8 Ld 3x3 DFN
ISL85415	Single	3V to 36V	500 mA	0.6V to Dmax*V_{IN}	80 µA	12 Ld 4x3 DFN
ISL85418	Single	3V to 40V	800 mA	0.6V to Dmax*V_{IN}	80 µA	12 Ld 4x3 DFN
ISL85410	Single	3V to 40V	1A	0.6V to Dmax*V_{IN}	80 µA	12 Ld 4x3 DFN
ISL854102	Single	3V to 40V	1.2A	0.6V to Dmax*V_{IN}	80 µA	12 Ld 4x3 DFN
ISL85403 (Buck or Buck-Boost)	Single	3V to 40V	2.5A	0.8V to Dmax*V_{IN}	300 µA	20 Ld 4x4 QFN

www.intersil.com/switching-regulators

SIMPLE DC/DC POWER ICs

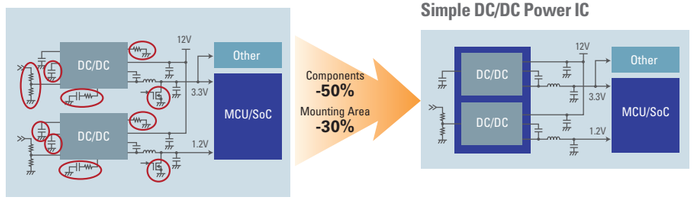
ICs for Microcontroller Power Supply System

Benefits and Key Features

Compact Design

The main power supply circuit elements are integrated. This reduces the number of components and mounting area of the power supply block.

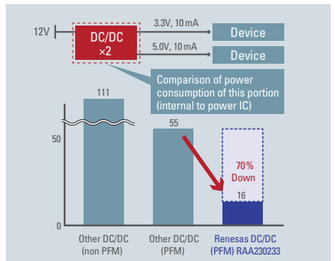
Conventional Product



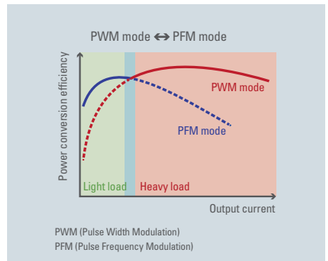
Reduced System Power Consumption

Integrated Auto PFM (Pulse Frequency Modulation) mode. Matches the system's operating current, making it easy to reduce the overall power consumption.

Power Consumption Comparison with 16V 2-Ch Devices



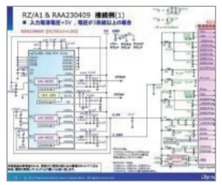
Auto PFM Mode – Automatic Switching to High-efficiency Operation Mode



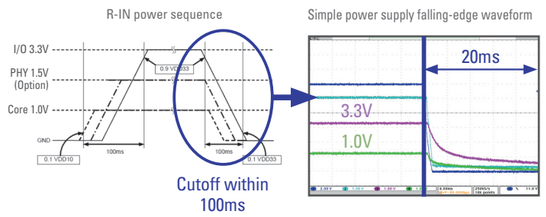
Easy Power Supply Design for Renesas RZ Family MPUs and R-IN Series Multi-Protocol LSI Products

- RZ and R-IN reference boards populated with Simple DC/DC devices are available. Simplify the design process and reduce development turn around time by utilizing the provided circuit diagrams and recommended parts.

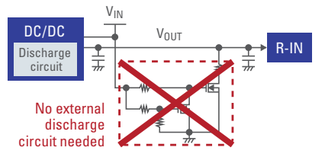
- Board schematics with Renesas MCU, SoC and other suggested devices are available.



- The integrated discharge circuit simplifies R-IN cutoff sequence design.



- There is no need for an external discharge circuit, reducing the total number of parts.



Simple DC/DC Products

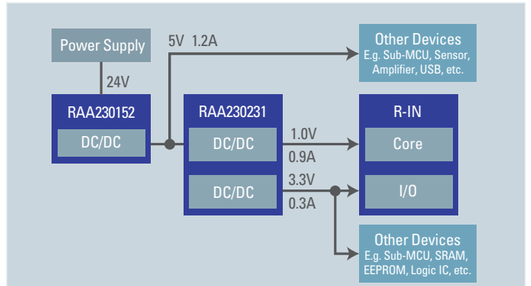
Part No.	Ch	Circuit	VIN (V)	VOUT (V)	IOUT MAX (A)	Package	Sequence	Auto PFM
RAA230231	2	DC/DC x2 (Step-down)	4.5 to 16	ch 1 = 3.3V ch 2 = Adj.*1 Adj: 0.8V to 6.0V	3A	20-pin HTSSOP	Controlled by P-Good	✓
RAA230232				ch 1 = 3.3V ch 2 = 5.0V				
RAA230233				ch 1 = Adj. ch 2 = Adj.*1 Adj: 0.8V to 6.0V				
RAA230131	1	DC/DC (Step-down)	4.5 to 16	3.3V	3A	8-pin HLSOP	–	✓
RAA230132				5.0V				
RAA230133				Adj:*1 0.8V to 6.0V				
RAA230151	1	DC/DC (Step-down)	7.0 to 28	3.3V	3A	8-pin HLSOP	–	✓
RAA230152				5.0V				
RAA230153				Adj:*1 0.8V to 6.0V				

* 1: Adjustable: Voltage can be set using an external resistor.

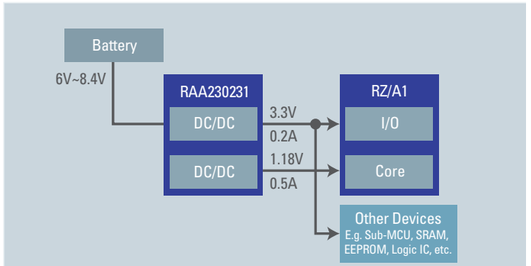
www.renesas.com/simple-power

Simple DC/DC Applications

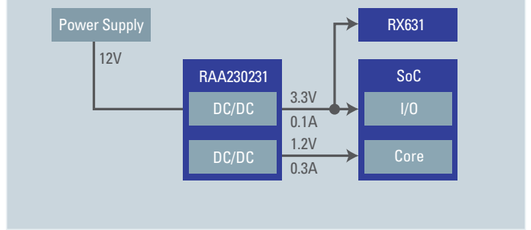
Industrial Equipment (PLCs, etc.)



Handheld Terminals



Smart Grid



LOW DROPOUT REGULATORS (LDO)

High Performance LDOs

ISL80510/05 **Best Dropout and Transient Performance for Sensitive Loads**

These high-performance, single output low-dropout (LDO) voltage regulators offer noise immunity across a wide range of frequencies. The ISL80510 and ISL80505 deliver 1A and 0.5A of continuous output current and ultra-low dropout of 130 mV and 45 mV at full load, respectively.

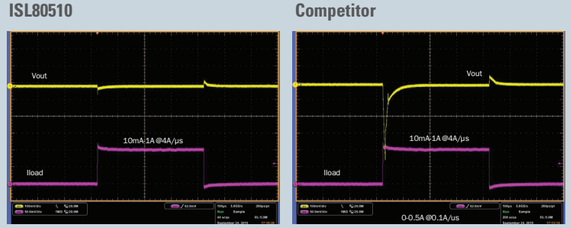
Key Features

- BiCMOS process for very small drop out
- Stable operation with only 4.7 µF capacitor
- Adjustable monotonous soft-start
- Fast transient response
- Enable pin for on/off operation
- Thermally enhanced 8 Ld DFN package
- Over current and over-temperature protection
- Pin-to-pin compatible 0.5A and 1.0A devices
- Full industrial temp. range operation

ISL80510 vs. Competitor: Transient Response

The high transient performance of ISL80510/05 allows minimal variation in output with a small 4.7 µF output ceramic capacitor.

ISL80510 **Competitor**



The ISL80510 has a peak-to-peak excursion that's 9 times lower than the competitor's device under similar conditions.

High-Performance LDOs

Part No.	V_{IN} (V)	V_{OUT} (V)	I_{OUT} max (A)	PSRR@1 kHz (dB)	Split Input	Fixed V_{OUT} Option	Dropout (mV)	Acc. (%)	Iq	Package
ISL80505	1.8 to 6	0.8 to 5.5	0.5	50	No	No	45	1.8	2.2 mA	8 Ld 3x3 DFN
ISL80510	2.2 to 6	0.8 to 5.5	1	48	No	No	130	1.8	2.2 mA	8 Ld 3x3 DFN
ISL80101A	2.2 to 6	0.8 to 5	1	48	No	Yes	90	1.8	3.0 mA	10 Ld 3x3 DFN
ISL80101-Adj.	2.2 to 6	0.8 to 5	1	58	No	Yes	130	1.8	3.0 mA	10 Ld 3x3 DFN
ISL80102	2.2 to 6	0.8 to 5	2	55	No	Yes	81	1.8	7.5 mA	10 Ld 3x3 DFN
ISL80103	2.2 to 6	0.8 to 5	3	55	No	Yes	120	1.8	7.5 mA	10 Ld 3x3 DFN
ISL80111	1 to 3.6	0.8 to 3.3	1	80	Yes	No	27	1.6	3.5 mA	10 Ld 3x3 DFN
ISL80112	1 to 3.6	0.8 to 3.3	2	80	Yes	No	53	1.6	3.5 mA	10 Ld 3x3 DFN
ISL80113	1 to 3.6	0.8 to 3.3	3	80	Yes	No	75	1.6	3.5 mA	10 Ld 3x3 DFN
ISL80136	6 to 40	2.5 to 12	0.05	45	No	No	120	1.0	18 µA	8 Ld EPSOIC
ISL80138	6 to 40	2.5 to 12	0.15	47	No	No	295	1.0	18 µA	14 Ld HTSSOP

www.intersil.com/ldo

SHUNT REGULATORS

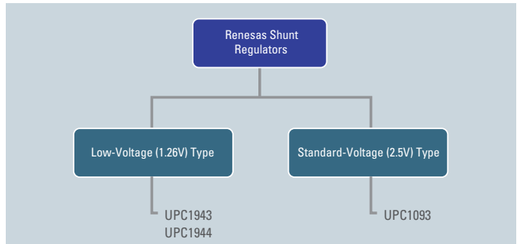
Reference Power Supply ICs

Benefits and Key Features

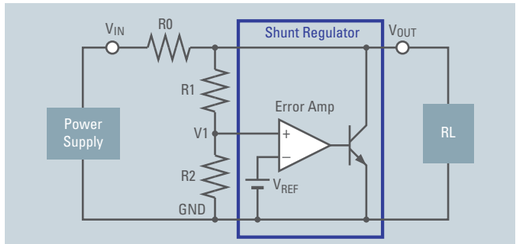
Shunt regulators are the standard reference voltage source widely used by the feedback circuits of switching power supplies and so on. Compared to the Zener diode, which is a discrete product, a shunt regulator has much better voltage precision because voltage control is carried out as an IC. In addition to its use as a reference power source for amplifier circuits, A/D converters, etc., it is also widely used for feedback circuits of switching regulators.

The reference voltage has a product lineup of about 2.5 V of the standard and 1.26 V of the low voltage type.

Shunt Regulators Lineup



Shunt Regulator Application



Shunt Regulators

Item		Low-Voltage (1.26V) Type			Standard-Voltage (2.5V) Type		
		UPC1943T	UPC1944T	UPC1944GR	UPC1093TA	UPC1093T	UPC1093G
Reference voltage	VREF (V)	1.23 (min.) to 1.26 (typ.) to 1.29 (max.)			2.440 (min.) to 2.495 (typ.) to 2.550 (max.)		
Cathode voltage	VKA (V)	24 (max.)			36 (max.)		
Cathode current	IK (mA)	30 (max.)			100 (max.)		
Operating temperature range	TA (°C)	-30 to +85			-20 to +85		
Package	5-pin mini mold (SC-74A)				NC A REF A K		
	3-pin power mini mold (SC-62)	A REF A K	A K A REF			A K A REF	
	8-pin SOP			K NC NC NC REF NC A NC			K NC NC NC REF NC A NC

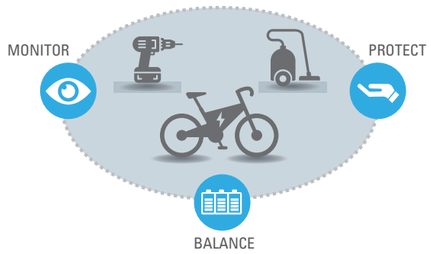
www.renesas.com/shunt-regulators

BATTERY MANAGEMENT

Management and Protection of Lithium-ion Batteries

Protect, Monitor & Balance Rechargeable Battery Packs

Renesas' Li-ion battery pack monitoring, protection and balancing ICs are specifically designed to meet the stringent safety, reliability and performance requirements of portable and battery powered applications such as consumer, industrial & medical products.



Battery Front End (BFE), Battery Management ICs

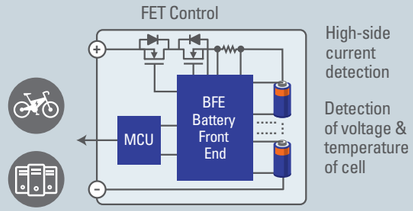
Benefits and Key Features

Protection and Cell Balancing

- Hot plug tolerant
- Over/under voltage
- Charge/discharge current
- FET control when error detected
- Open-wire detection
- Auto-cell balancing

Host Controlled Features

- Current measurement
- Cell voltage measurement
- Pack voltage measurement
- Temperature measurement
- LED indication by GPIO
- Power supply for MCU



BFE Battery Pack System Diagram

ISL94202 Standalone Battery Protection System Accurately Monitors & Balances Rechargeable Battery Packs

- 8-cell voltage monitors support Li-ion CoO_2, Li-ion Mn_2O_4, and Li-ion $FePO_4$ battery chemistries
- Highest level of integration: cell voltage level shift, automatic cell balance, 14-bit ADC, current sense monitor, power FET control, and temperature sensor interface
- Multiple cell voltage protection options up to 4.8V
- Integrated charge/discharge FET drive circuitry with built-in charge pump supports high-side N-channel FETs

www.intersil.com/battery_management

Battery Front End, Multi-Cell Li-Ion Battery Management ICs

Cells		Pack Voltage (V)	Part No.	Interface	Cell Balance	Current Sense	Charge/Discharge FET	Stand-alone capable	Internal ADC	Features	Package
Min.	Max.						Location				
3	8	4 to 36	ISL94202/203	I²C	External	High Side	N-channel, High Side	Yes	Yes	High-side current sense, standalone capable	48TQFN
4	6	8 to 26.4	ISL94208	I²C	Both	Low Side	N-channel, Low Side	No	No	Low-side current sense, internal cell balance	32QFN
6	12	6 to 60	ISL94212	SPI	External	No	N/A	No	Yes	60V pack voltage, daisy-chain	64TQFP

Battery Fuel Gauge ICs (FGIC)

Dedicated 1-package solution with MCU and AFE for Battery Management System provides intelligent battery system by constantly monitoring the battery state.

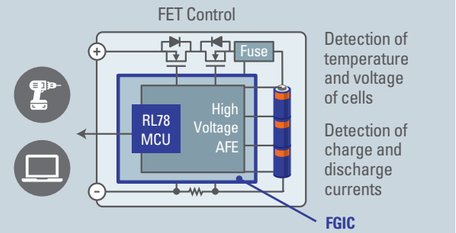
Benefits and Key Features

Safety and Protection Control

- Over/under voltage
- Charge/discharge current
- FET control when error detected
- Chemical fuse control
- Cell balancing

Remaining Capacity Management

- Current/voltage detection
- Precise coulomb counter
- Deterioration detection
- Calculation and learning of battery capacity
- Fault detection/history management



FGIC Battery Pack System Diagram

FGIC Block Diagram

Voltage and Current Measurement by Independent A/D Converters

- Current detection: 153 µA/LSB resolution (18-bit ΔΣ 5 mΩ shunt resistor), support for continuous measurement
- Voltage/temperature measurement: 15-bit ΔΣ ADC

High Reliability & High Integration

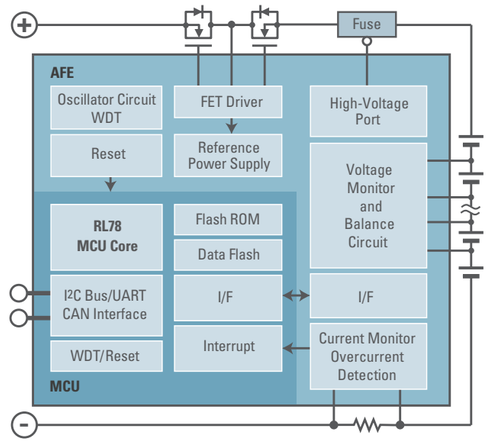
- Built-in FET protection for overcurrent or short circuit conditions
- Redundant fault detection by both MCU and AFE
- Ability to set lifecycle related limits and maintain battery parameter and operation history using data flash guaranteed for 100,000 erase/write cycles
- Integrated CAN interface and RTC (Real Time Clock) circuit for industrial apps, ICs can manage date and time in a single device (RAJ240090 and RAJ240100)

Few Parts, Low System Cost

- Supports large-current discharge with N-channel FET drivers
- Integrated pull-up resistors for thermistor

Extended Battery Life

- Low power mode with consumption of 25 µA or less and cell balance circuit to maximize battery capacity (RAJ240090 and RAJ240100)



Internal Block Diagram of FGIC

www.renesas.com/battery-management

Battery Fuel Gauge ICs

Cells		Pack Voltage (V)	Part No.	Flash ROM	RAM	ADC Port	Serial I/F	I/O	Features	Package
Min.	Max.									
2	4	4 to 25	RAJ240045	64 KB	4.0 KB	2-ch	I²C, UART	12	Compact package (4mm×4mm)	32QFN
2	5	4 to 25	RAJ240075	64 KB	4.0 KB	3-ch	I²C, UART	11	Compact package (4mm×4mm) 5 cell support	32QFN
2	5	4 to 28	RAJ240080	64 KB	5.5 KB	3-ch	I²C, UART	22	GPIO: I/O×18, input×2, NOD×2	48LQFP
3	8	4 to 50	RAJ240090	128 KB	7 KB	4-ch	I²C, UART, CAN	31	High voltage tolerance, on-chip CAN, low power consumption (25 µA)	64LQFP
3	10	4 to 50	RAJ240100	128 KB	7 KB	4-ch	I²C, UART, CAN	31	High voltage tolerance, on-chip CAN, low power consumption (25 µA)	64LQFP

* Specifications are subject to change without notice

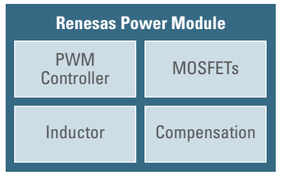
POWER MODULES

Complete Power System in an Encapsulated Module

Benefits and Key Features

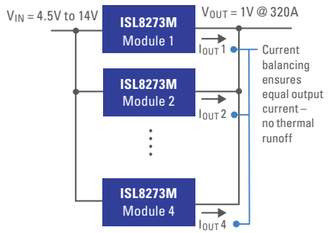
Easy to Use

- Full integration means less complexity and more ease of design



Full Featured

- Versatile features such as soft-start, fault protection and parallel module multi-phasing



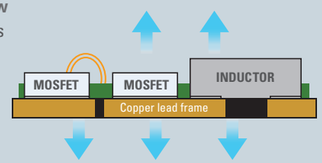
Highest Power Density

- Power output up to **250W** POL in a single package

Thermally Enhanced Package Technology

- Thermal molding compound allows for even heat distribution
- Large copper pads transfer heat efficiently
- Operates at full load across wide temperature range
- Leaded package allows pin access

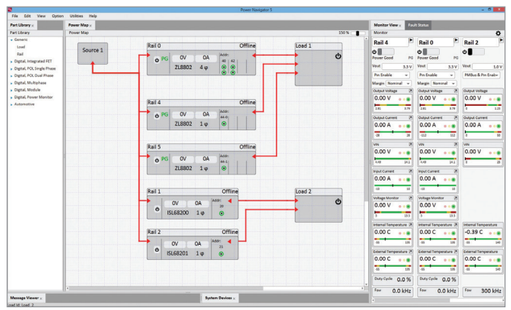
No Heatsink – No airflow
Copper leadframe allows direct heat transfer.



Real-Time Telemetry—Dynamic Configuration (Available in Digital Power Modules)

PowerNavigator™ GUI

Allows simple configuration and monitoring of multiple Digital-DC devices using a PC with a USB interface.



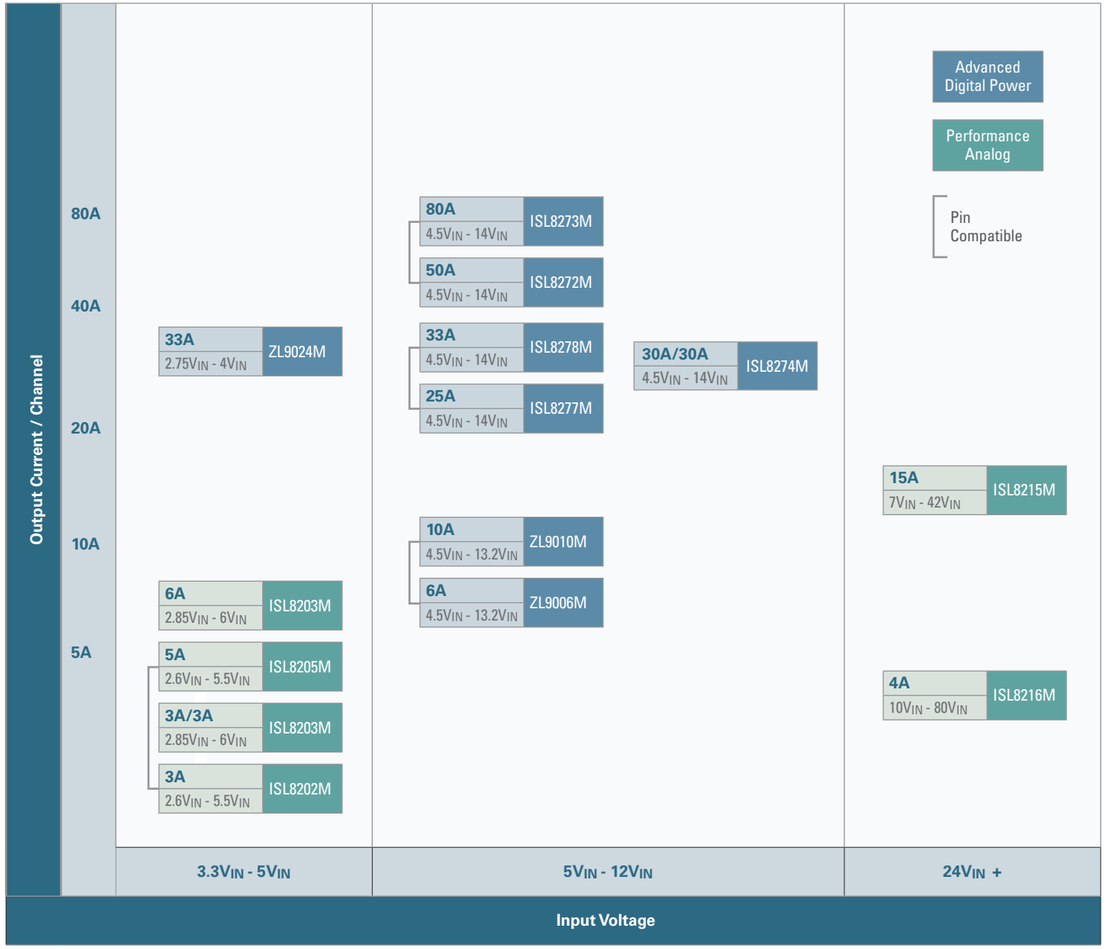
Analog Modules

A simple, effective DC/DC power supply solution that integrates necessary power elements in a single package.

Digital Modules

A high-performance DC/DC power supply solution that integrates all power elements in a single package and supports digital communication and configurability for advanced power management techniques. Digitally design with PowerNavigator GUI software.

Analog & Digital Power Module Lineup



www.intersil.com/powermodule

MOSFET DRIVERS

Industry Leading Bridge Drivers

HIP2103/04 Family of 60V Bridge Drivers for BLDC and Similar Loads

Optimized for Battery Powered Applications from 5V to 60V

- 60V max rating is suitable for 36V battery applications
- 4.5 UVLO allows operation as low as 5V
- Proprietary sleep mode activation eliminates the need for additional I/O control pins
- Very low I_Q (<10 µA) eliminates the need for a disconnect switch to maintain idle battery life

Integrated Linear Regulators (HIP2104) for External Loads

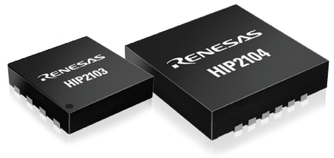
- Reduces external components for lower BOM cost and smaller solution footprint
- 12V output provides gate drive bias
- 3.3V output provides digital controller bias

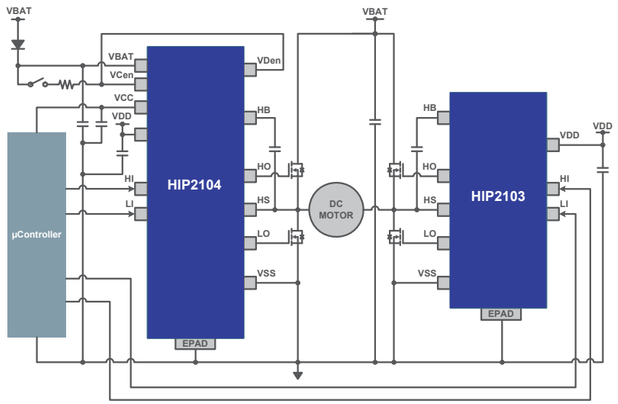
1A Sourcing, 2A Sinking MOSFET Drivers

- Enough drive strength for high speed switching applications
- Enough drive strength for very high MOSFET gate charge

Easy to Configure Half-Bridge, Full-Bridge, and 3-phase

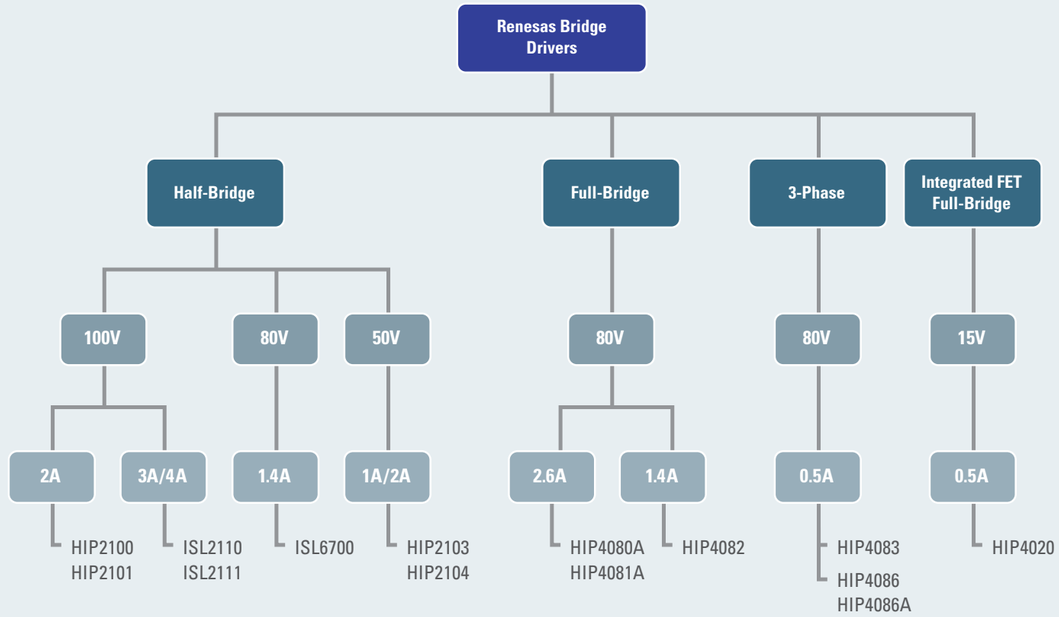
- Small packages allow drivers to be placed next to the bridge FETs





Typical Full-Bridge Application

Bridge Drivers Lineup



www.intersil.com/power_drivers

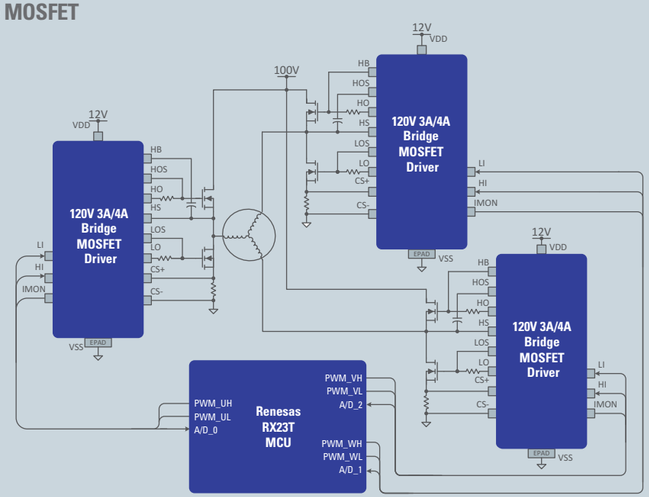
100V BLDC Motor Control—Using High Voltage MOSFET Drivers with Renesas MCUs

Benefits

- Smaller solution size
- Better system efficiency through higher driver current and lower I_Q
- Adaptive dead-time eliminates the need for leading edge delays for shoot-thru prevention, reducing the programming complexity for the controller
- BOM cost saving with integrated current monitor

Applications

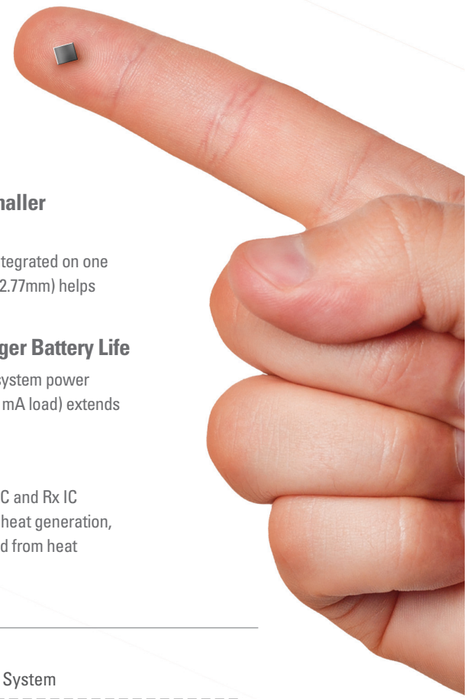
- Telecom bricks and power supplies
- High power motor control
- Robotics



WIRELESS CHARGING

Ultra-small One-chip Solution for Receiver Integration

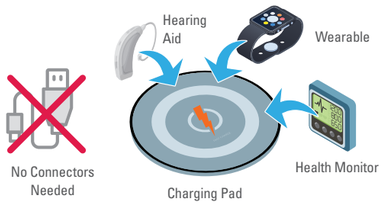
Fully functional receiver in a single chip—Wireless Power Transmission (WPT) control, Li-ion/polymer battery charger, protection and DC/DC.



Benefits and Key Features

Eliminates the need to Change Batteries or Connect a Power Cable

Wireless charging enables device design with no need for connection ports
– Waterproof / dustproof
– Washable
– Smaller and thinner



Single-chip Rx IC Enables Smaller Applications

- All functions needed for receiver integrated on one chip. The ultra-small size (3.22mm×2.77mm) helps make smaller applications

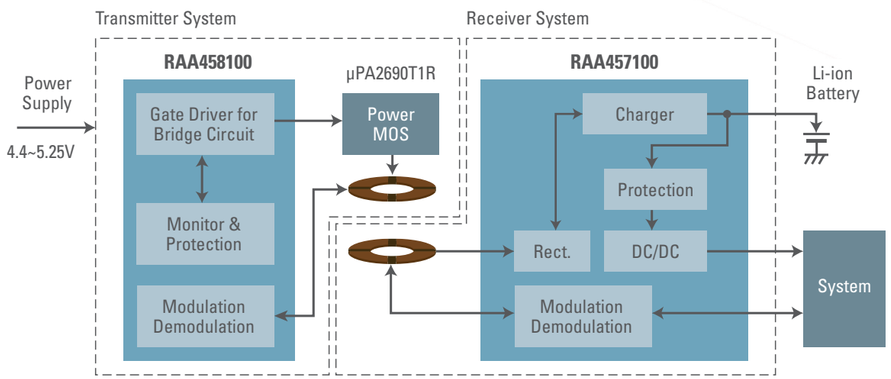
High-Efficiency DC/DC—Longer Battery Life

- Integrating DC/DC converter for a system power supply. High-efficiency of 85% (at 1 mA load) extends battery life

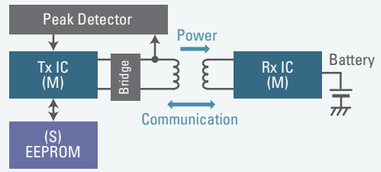
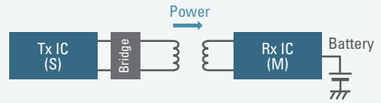
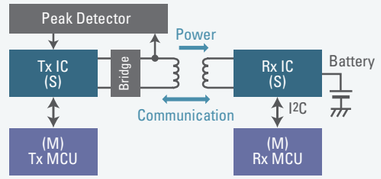
Minimizing Heat Generation

- Proper power control between Tx IC and Rx IC (at ATPC mode) enables minimized heat generation, a Li-ion/polymer battery is protected from heat

Wireless Charging System Diagram



Selectable Operation Modes

Operation Mode	System Configuration (M = Master, S = Slave)	Features
ATPC Mode (automatic power control)		■ Transmitting power: Automatically controlled based on load ■ Battery charging: Automatically controlled ■ WPT communication: Active (between Tx and Rx) ■ Other features – Stable and safe operation by precise power control of transmitting IC which monitors receiving IC's condition – Minimizing heat generation by proper power control ■ Renesas recommends this mode
Standalone Mode (fixed-power transfer)		■ Transmitting power: Fixed power is set by terminals ■ Battery charging: Automatically controlled ■ WPT communication: Not in use ■ Usable even at weak coupling between Tx coil and Rx coil
MCU Control Mode (controlled by MCU)		■ Transmitting power: Controlled by external MCU ■ Battery charging: Automatically controlled ■ WPT communication: Active (between Tx and Rx) ■ Useable for system debugging – Use PC software instead of MCU

Wireless Charging System ICs

Type	Part. No	Advantage	Functions	Operating Ambient Temperature	Package
Power Transmitter IC	RAA458100	• 5V single power source (usable power bank) • Safety (built-in bridge circuit over current protection and 2 systems of external overheat protection) • Integrated functions such as gate driver, monitor & protection and I²C interface	• Selectable half bridge/full bridge • Transmission power control • 2 wire serial interface • Bridge circuit over current protection • 2 systems of external overheat protection • Input voltage: 4.4V to 5.25V	-20 to +60°C	40-pin UQFN (5.0mm x 5.0mm x 0.65mm thin, 0.4mm pitch)
Power Receiver IC	RAA457100	• All functions in a small package (rectifier, modulation, demodulation, battery protection and li-Ion battery charger) • Top level of power-efficiency DC/DC converter for long-life battery	• Synchronous rectification • Lithium-ion second battery charge control (selectable charge termination voltage from 4.05V, 4.2V and 4.35V, rapid-charge current setting: Max. 70 mA) • Power supply control to application • Battery protection • 12-bit A/D converter for monitor • DC/DC converter (selectable from 1.2V, 1.5V, 1.8V and 3.0V) • 2 wire serial interface	-20 to +50°C	41-pin WLBGA (3.22mm x 2.77mm x 0.70mm thin, 0.4mm pitch)

Reference coils are available. Renesas confirmed that they suit for our system. Contact us for more information.

www.renesas.com/wireless-charging

RESOURCES

FPGA POWER SOLUTIONS

Complete Power Delivery Solutions for FPGAs

Renesas offers a complete portfolio of high performance power solutions for FPGAs and other loads in your system. These products, which range from standard linear regulators to highly flexible PWM controller and driver options to plug-in fully integrated power modules, are tailored to meet your design challenges.

For more information, visit: www.intersil.com/en/applications/fpga-power-solutions.html

Use PowerCompass to find your FPGA Power Solution

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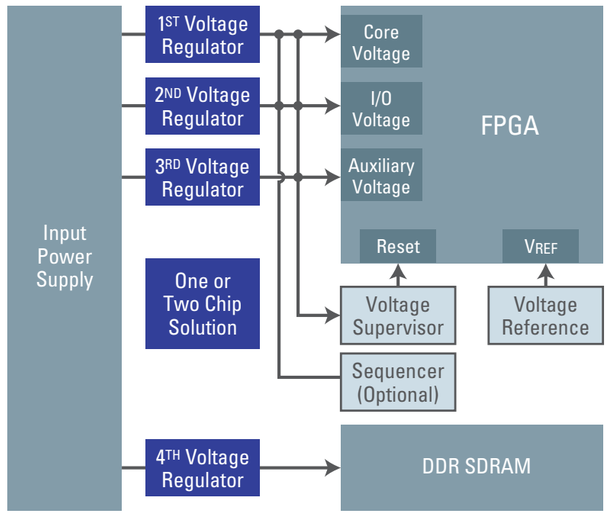
- Over 250 templates covering popular FPGA platforms
- Xilinx and Intel (Altera) FPGA power estimator import function to jump start



Renesas Power Management ICs offer Solutions for Industry-Leading FPGA Products

Xilinx
- Spartan Series
- Virtex Series
- Kintex Series
- Artix Series
- Zynq Series

Intel (Altera)
- Stratix Series
- Arria Series
- Cyclone Series
- MAX 10 Series

Lattice
- ECP Family
- iCE Family
- CrossLink Family
- Mach Family

Microsemi
- PolarFire FPGA Family
- IGLOO2 Low Density FPGAs
- RTG4 Radiation-Tolerant FPGAs
- SmartFusion2 SoC FPGA

POWERCOMPASS™ TOOL

Simplify Your Power Design with the PowerCompass Multi-load Configurator

The PowerCompass™ tool makes product selection easy—quickly find Renesas parts that match your requirements, set up multiple rails if needed, perform high-level system analysis and generate reference design files.

- Upfront design time reduced by 92%
- Multiple solution options highlight design tradeoffs for BOM count, design size and price
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Start Your Project Now

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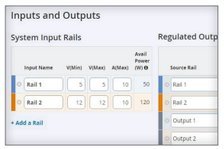
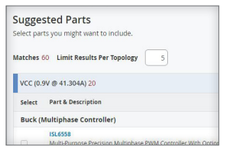
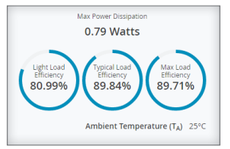
1 Define Your Power Requirements



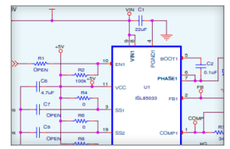
2 Select Parts



3 Summary Analysis



4 Generate Reference Designs



DESIGN TOOLS AND SUPPORT

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EDA Data

Renesas Electronics prepares the EDA symbols and simulation models for the development TAT shortening. Please utilize your application development.
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RENESAS Lab. VP
Renesas Virtual Power Laboratory

Renesas Electronics prepares the web simulation tool for the development TAT shortening. Please utilize your application development.
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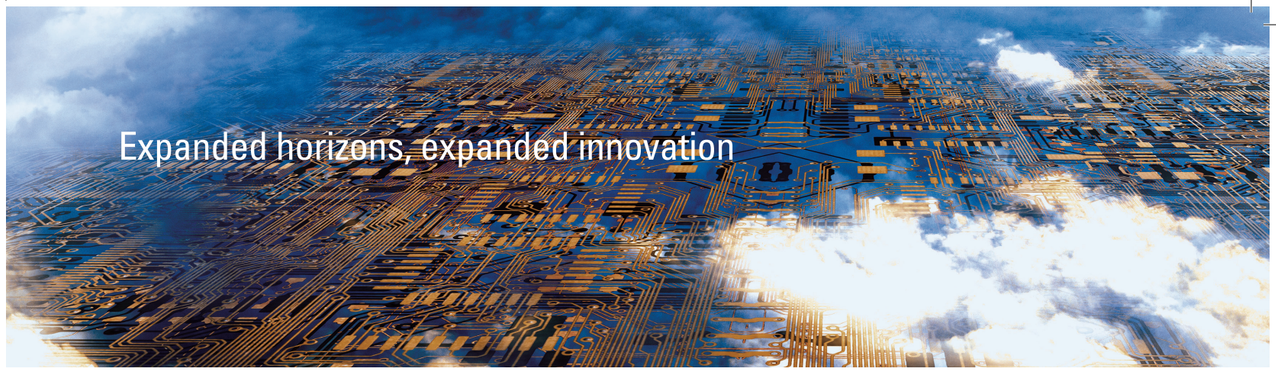


Effective January 1, 2018, Renesas and Intersil are operating as one unified enterprise, bringing about a significant expansion to the intrinsic capabilities of semiconductors.

This combination unites the widely acclaimed Renesas MCU and SoC technologies with Intersil's market-leading expertise in high performance power management and precision analog devices. In turn, this brings organic growth in the automotive, industrial and broadbased sectors, allowing the new enterprise to respond with greater speed to customers' systems needs.

The union of Renesas with Intersil began with the completion of the acquisition on February 24, 2017, and the unified "One Global Renesas" went into operation across all markets the following July—bringing together the strengths of both organizations in anticipation of customer requirements in a rapidly changing market environment. This truly global organization offers a vast synergistic effect.

Join Renesas as it strengthens its leading position in the global semiconductor market.

About Renesas

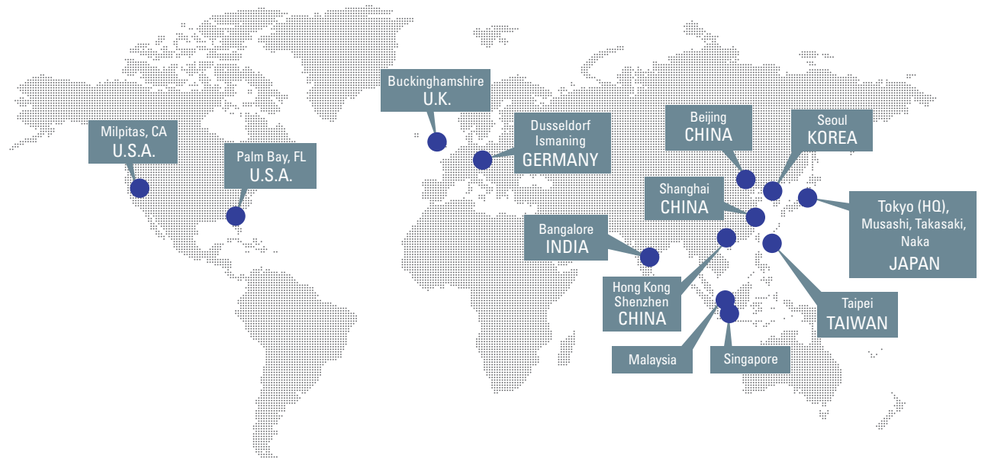
Renesas Electronics delivers trusted embedded design innovation with complete semiconductor solutions that enable billions of connected, intelligent devices to enhance the way people work and live—securely and safely.

The number one global supplier of microcontrollers, and a leader in Analog & Power and SoC products, Renesas provides the expertise, quality, and comprehensive solutions for a broad range of Automotive, Industrial, Home Electronics (HE), Office Automation (OA) and Information Communication Technology (ICT) applications to help shape a limitless future.

Global Network

Responding rapidly to customer needs through strong global operations.

Renesas Main Offices



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(Rev.4.0-1 November 2017)

SALES OFFICES

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