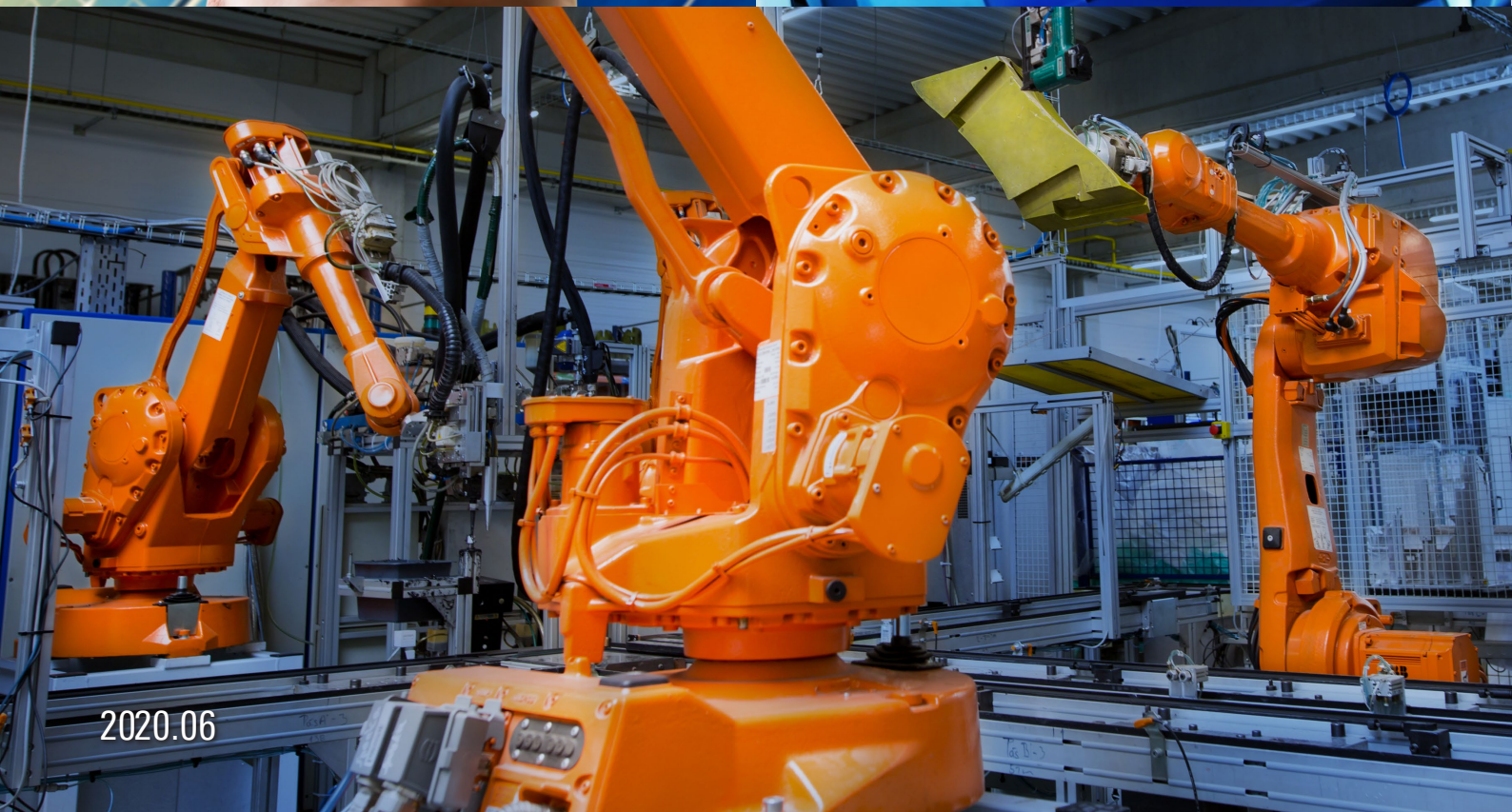
RENESAS

BIG IDEAS FOR EVERY SPACE

ANALOG ICs

High-performance solutions for precision signal chain design



2020.06

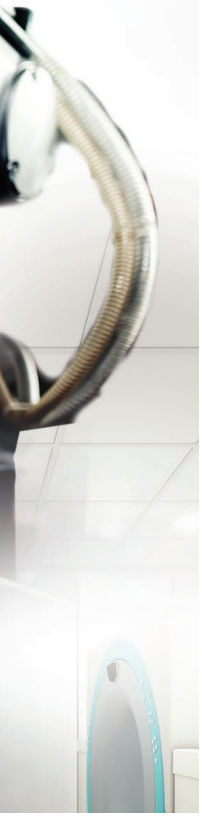
HIGH-PERFORMANCE SOLUTIONS FOR
PRECISION SIGNAL CHAIN DESIGN

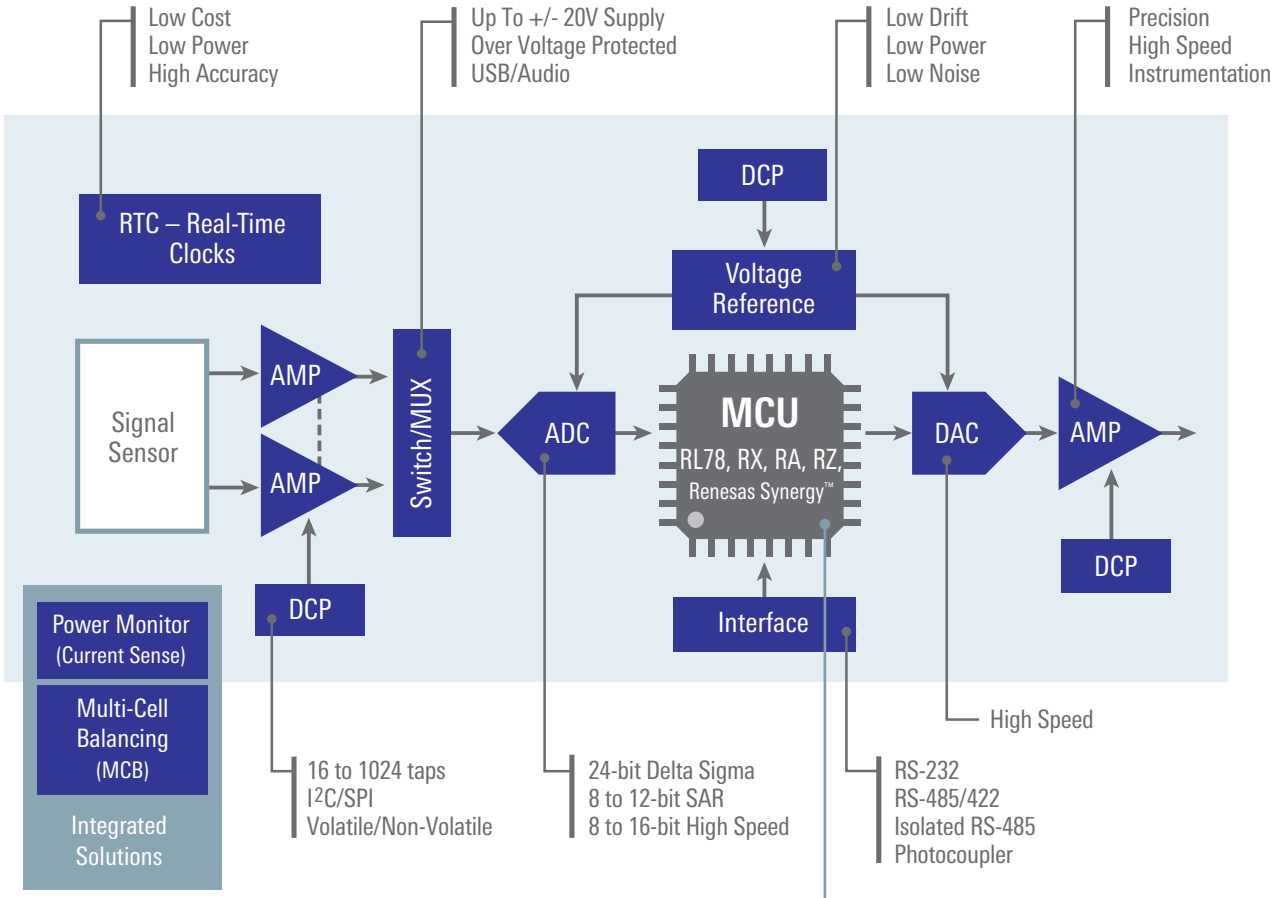
ANALOG ICs

CONTENTS

Complete Signal Chain Solutions

Renesas' broad precision analog portfolio provides a wide range of next-gen precision instrumentation, medical, communication, and industrial process control applications where innovation, reliability, and dependability is central to the analog designs.





8/16bit MCU	32bit MCU			32/64bit MPU
Renesas Core		Arm® Core		
RENESAS RL78	RENESAS RX	RENESAS RA	Renesas Synergy™	RENESAS RZ
Low Power	Power Efficiency	Arm® Ecosystem	Qualified Platform	High Performance
Features: Ultra-low energy Low pin count lineup available	**Features:** Superior power efficiency High-capacity flash memories Broad lineup	**Features:** High efficiency Security	**Features:** Qualified software and tools	**Features:** Multi-core up to 8 cores Linux or RTOS available High-capacity on-chip RAM DRP*1 image processing acceleration Note: 1. DRP: Dynamically Reconfigurable Processor

Design Idea

DAQ ON A STICK

Renesas Industrial Signal Chain Solutions

DAQ on a Stick Signal Solutions are snap-in USB sticks that interface strain, temperature or pressure sensors into Renesas' ultra-low power, precision analog products, which are then linearized by our industry-leading microcontrollers. The complete solution—USB plug in, hardware, and software—is ready to go. Simply plug, click, and start collecting data.

The reference solution design incorporates a low power multiplexer, precision instrumentation amplifier, 24-bit sigma-delta ADC, and a precision digital potentiometer to calibrate the system. The RL78 industry-standard microcontroller runs the stick and interfaces the sensor data into any USB port.

RTKA-GAUGE-ENG2Z

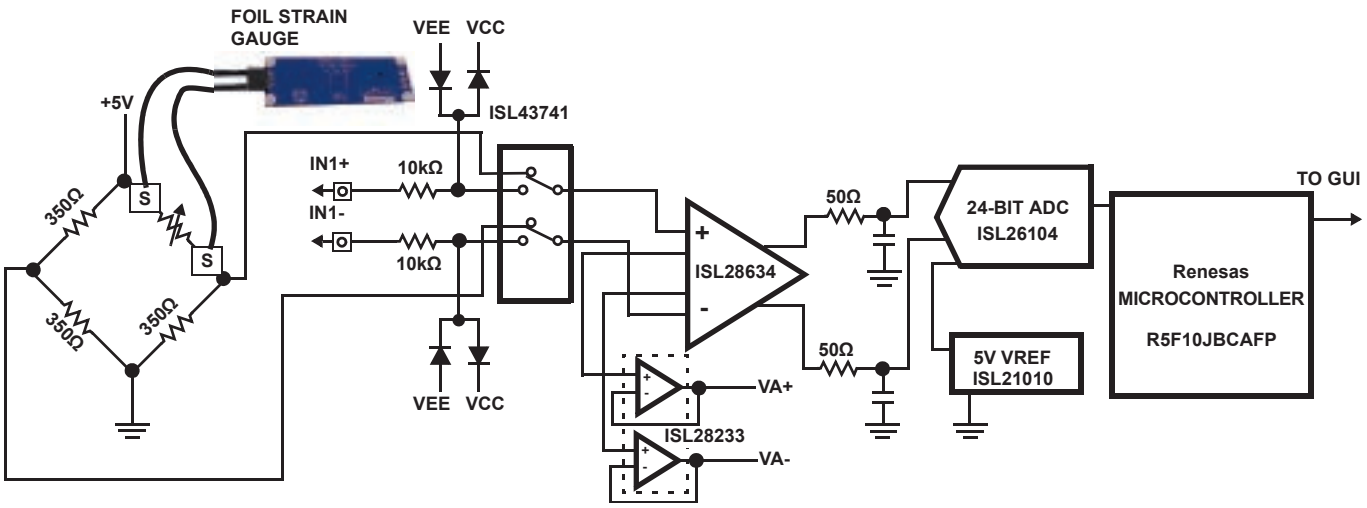


Figure 1. SIMPLIFIED STRAIN GAUGE SCHEMATIC

Key Components

ISL28634	Programmable Gain INAMP
ISL28233	Operational Amplifiers
ISL43741	Differential Mux
ISL21010	4.096 Voltage Reference
ISL26104	24-bit Delta Sigma Converter
R5F10JBCAFP	Integrated USB Controller

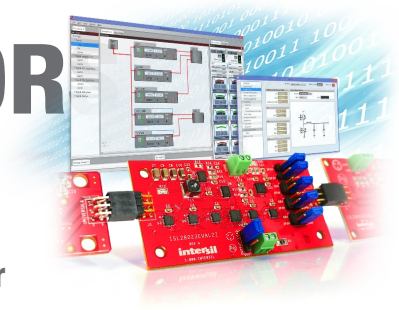
Reference Documents

- App Note "DAQ on a Stick, Strain Gauge with Programmable Chopper Stabilized IN-Amp", AN1853
- ISL28634 Data Sheet "5V Zero-Drift Rail-to-Rail Input/Output Programmable Gain Instrumentation Amplifier"
- ISL28233 Data Sheet "Dual Micropower, Zero-Drift, RRIO Operational Amplifier"
- ISL21010 Data Sheet "Micropower Voltage Reference"
- ISL26104 Data Sheet "Low Noise 24-bit Delta Sigma ADC"
- ISL43741 Data Sheet "Low Voltage, Single and Dual Supply, 8 to 1 Multiplexer and Differential 4 to 1 Multiplexer"
- R5F10JBCAFP Data Sheet

To learn more, visit: renesas.com/daq-on-stick

Integrated Analog Solutions

DIGITAL POWER MONITOR



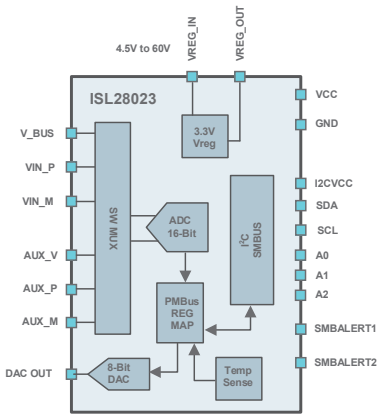
High Voltage Precision Sensing for Current, Voltage, and Power

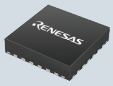
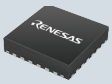
Integrated Analog Front End for High Voltage Monitoring and Bi-directional Current Sensing

ISL28023/25

The ISL28023/25 digital power monitor is a high-side and low-side digital current sense and voltage monitor with serial interface. The "digital power monitor", or DPM, allows monitoring of power supplies, RF systems, and other high voltage applications.

- Input common mode up to 60V
- High accuracy – 0.05% error (16-bit ADC)
- User defined alerts – OV, UV, OC
- Additional features (margin DAC, voltage regulator, internal temp sensor, auxiliary channel)



Precision Digital Power Monitors	Basic	Full Featured	Tiny Package
			
	ISL28022	ISL28023	ISL28025
Input Range	0 to 60V	Opt 1: 0 to 60V Opt 2: 0 to 5.5V	Opt 1: 0 to 60V Opt 2: 0 to 5.5V
Primary Channel	Yes	Yes	Yes
LV Aux Channel	–	Yes	Voltage Only
Internal Temp Sensor	–	Yes	Yes
External Temp Sensor	–	Yes	–
HV Internal Regulator (3.3Vout)	–	Yes	Yes
Fast OC/OV/UV Alert Outputs	–	2	2
Margin DAC	–	Yes	–
Slave Addresses Available	16	55	55
User Select Conversion Mode/Sample Rate	Yes	Yes	Yes
User Select Fixed Period Averaging	–	Yes	Yes
Peak Min/Max Current Registers	–	Yes	Yes
I²C/SMBus	Yes	Yes	Yes
PMBus	–	Yes	Yes
1.2V I²C Level Translators	–	Yes	Yes
High Speed (3.4 MHz) I²C Mode	Yes	Yes	Yes
External Clock Input	Yes	Yes	Yes
Power Shutdown Mode	Yes	Yes	Yes
Package	10 Ld MSOP, 16 Ld QFN	24 Ld QFN	16 Ld WLCSP

Amplifiers

PRECISION OP AMPs

V_{OS} < 1mV Operational Amplifiers

Unmatched Precision When Accuracy Matters

Zero Drift Amplifiers (Low Voltage Precision Op Amps)

ISL28x33, ISL28x34

Chopper-stabilized amplifiers (Zero Drift Amplifiers) offer one of the best solutions, for achieving the lowest offset voltage and drift. These amplifiers achieve high DC precision through a continuously running calibration mechanism that is implemented on-chip.

Key Features

- Low drift/reduced offset voltage over temperature (typically < 0.5nV/ºC) [Figure 1]
- Low drift/reduced offset voltage over time [Figure 2]
- Low offset voltage/reduced offset voltage (typically < 1µV) [Figure 3]
- Low offset voltage over the common mode range and power supply (CMRR & PSRR typically > 125dB) [figure 4]
- Eliminates or no 1/f noise [Figure 5]
- Very high open loop gain

Applications

- Bi-directional current sense
- Temperature measurement
- Medical equipment
- Electronic weigh scales

Low Drift Over Temperature

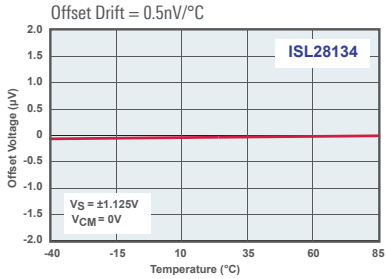


Figure 1. V_{OS} vs Temperature

Low Noise

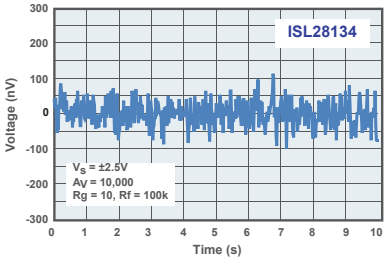


Figure 2. Input Noise Voltage 0.1Hz to 10Hz

Low Offset Voltage

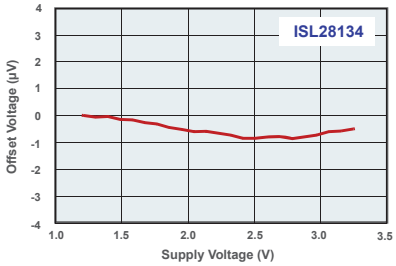


Figure 3. V_{OS} vs Supply Voltage

High CMRR/PSRR

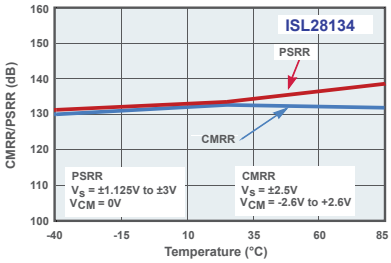


Figure 4. CMRR vs Temperature

No 1/f Noise

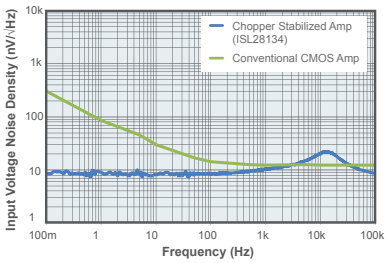
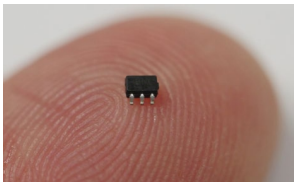


Figure 5. 5V CMOS ISL28134 vs CMOS Amp Noise Voltage Density Comparison

Tiny Package



5 Ld SOT-23 (2.9mmx2.8mm)

Precision Op Amps

									High Precision				Low Power		Low Noise
Type				Part Number			Supply Voltage (V)		Offset Voltage	Offset Voltage	TCV_{OS}	Input Bias Current	Supply Current	Slew Rate	Voltage Noise
Ultra Precision	Low Noise	Low Power	Low Input Bias Current	Single	Dual	Quad	Min	Max	Max @ 25°C	Max Temp	Max	Max @ 25°C	Max Temp	V/µs	@ 1kHz
Low Voltage															
● (Zero-drift)	●		●	ISL28134	–	–	2.25	6	2.5µV	3.4µV	15nV/°C	300pA	1.05mA	1.5	10nV/√Hz
● (Zero-drift)		●	●	ISL28133*	ISL28233	ISL28433	1.8	5.5	6µV	11µV	50nV/°C	180pA	35µA	0.2	65nV/√Hz
●		●	●	ISL28130	ISL28230	ISL28430	1.8	5.5	40µV	55µV	150nV/°C	250pA	35µA	0.2	65nV/√Hz
				ISL28136	ISL28236	–	2.4	5.5	150µV	270µV	–	35nA	1.4mA	1.9	15nV/√Hz
		●	●	ISL28158	–	–	2.4	5.5	300µV	650µV	–	30pA	55µA	0.1	64nV/√Hz
	●			ISL28191	ISL28291	–	3	5.5	630µV	840µV	–	6µA	3.9mA	17	1.7nV/√Hz
	● (Lowest Noise)			–	ISL28290	–	3	5.5	700µV	900µV	–	16µA	13mA	50	1nV/√Hz
			●	–	ISL28288	ISL28488	2.4	5.5	1.5mV	2mV	–	30pA	175µA	0.14	48nV/√Hz
			●	ISL28148	ISL28248	–	2.4	5.5	1.8mV	2mV	–	30pA	1.4mA	4	28nV/√Hz
		● (Nano-Power)	●	ISL28194	–	–	1.8	5.5	2mV	2.5mV	–	80pA	500nA	0.0012	265nV/√Hz*
			●	ISL28113	ISL28213	ISL28413	1.8	5.5	5mV	6mV	10µV/°C	20pA	170µA	1	55nV/√Hz
			●	ISL28114	ISL28214	ISL28414	1.8	5.5	5mV	6mV	10µV/°C	20pA	400µA	2.5	40nV/√Hz
High Voltage (PR40)															
●	●			ISL28117B	ISL28217B	ISL28417B	4.5	40	50µV	110µV	0.6µV/°C	1nA	680µA	0.5	8nV/√Hz
●	●			ISL28127	ISL28227	–	4.5	40	70µV	120µV	0.5µV/°C	10nA	3.7mA	3.6	2.5nV/√Hz
●			●	ISL28107	ISL28207	ISL28407	4.5	40	75µV	140µV	0.65µV/°C	300pA	350µA	0.32	13nV/√Hz
	●			ISL28118	ISL28218	–	3	40	150µV	270µV	1.2µV/°C	575nA	1.4mA	1.2	5.6nV/√Hz
				ISL28108	ISL28208	ISL28408	3	40	150µV	330µV	1.1µV/°C	43nA	1.4mA	0.45	15.8nV/√Hz
	●		● (JFET Input)	ISL28110	ISL28210	–	9	40	300µV	1.3mV	10µV/°C	2pA	3.8mA	20	6nV/√Hz
	●			ISL28177	–	–	4.5	40	150µV	250µV	1.4µV/°C	1nA	–	0.2	9.5nV/√Hz
	●			–	ISL28325	ISL28345	5	40	1mV	-	15µV/°C	5nA	–	0.4	9nV/√Hz

* Check Data Sheet Conditions

Amplifiers

BIPOLAR & CMOS OP AMPs/COMPARATORS

Op Amps to Solve Your Design Challenges

Design Challenge #1

Energy Saving Product

- High demand for developing energy-saving products
- Adoption of energy-saving sensors such as current sensor, pressure sensor, gas sensor

Renesas Op Amp Solution

Renesas provides a full range of input and output CMOS high precision amplifier products to meet the industry-demanding requirements of accurate sensing.

CMOS Operational Amplifiers

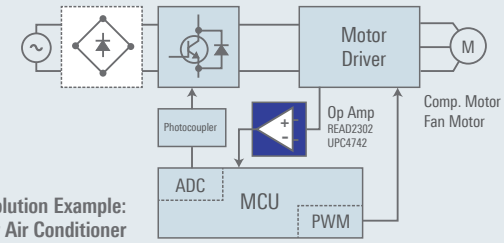
Type	V_{DD}	V_{IO} max.	SR typ.	I_S typ.	Rail-to-Rail	Dual	Quad
Low Power	1.8 to 5.5V	±6mV	0.35V/µs	1mA	Input & Output	READ2351JSP (Industrial/Automotive)	Coming soon
High Slew Rate	2.5 to 5.5V	±6mV	8V/µs	10mA	Input & Output	READ2302GSP (General purpose) READ2352JSP (Industrial/Automotive)	Coming soon

Design Challenge #2

Short Development Time

Renesas Op Amp Solution

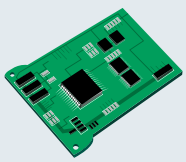
Renesas provides total kit solutions for MCU and op amp products. Simplify the design process and reduce development turnaround time by utilizing the provided circuit diagrams and recommended parts.



Kit Solution Example: Inverter Air Conditioner

Design Challenge #3

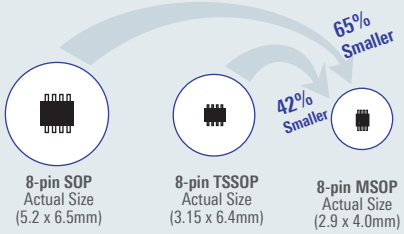
BOM Size



- Complex ecosystem on battery-powered small applications

Renesas Op Amp Solution

Renesas is expanding to include small MSOP package option to achieve mount area reduction.



8-pin				14-pin	
SOP (5.2x6.5)	TSSOP (3.15x6.4)	MSOP (2.9x4.0)	MMPAK (2.95x4.0)	SOP (10.2x6.5)	TSSOP (5.2x6.4)
					

CMOS Operational Amplifiers

Type	Rail-to-Rail	Part Number	Power Supply Voltage (V)	V_{IO} (max) (mV)	I_{DD} (typ) (µA/ch)	SR typ (V/µs)	Channels	Package
Low power	Input/output	READ2351J (Industrial/Automotive)	1.8 to 5.5	±6	40	0.35	2	8-pin TSSOP
High slew rate	Input/output	READ2302G (General purpose)	2.5 to 5.5	±6	750	8	2	8-pin TSSOP
	Input/output	READ2352J (Industrial/Automotive)	2.5 to 5.5	±6	750	8	2	8-pin TSSOP

Bipolar Operational Amplifiers

Type	Part Number		Power Supply Voltage (V)	V_{IO} (max) (mV)	I_{CC} (max) (mA)	SR (typ) (V/µs)	Channels	Package
	Industrial	General Purpose						
Single power supply	uPC451	–	3 to 30	±7	2	0.3	4	14-pin SOP/TSSOP
	uPC452	uPC3403	3 to 32	±7	7	0.8	4	14-pin SOP
	uPC842/A	uPC4742	3 to 32	±5	4.5	7	2	8-pin SOP/TSSOP/MSOP*
	uPC844	uPC4744	3 to 32	±5	9	7	4	14-pin SOP/TSSOP
	uPC1251	–	3 to 30	±7	1.2	0.3	2	8-pin SOP/TSSOP/MSOP
Low noise	uPC258	uPC4558	±4 to ±16	±6	5.7	1	2	8-pin SOP
	uPC259	uPC4560	±4 to ±16	±6	5.7	2.8	2	8-pin SOP
	uPC458	uPC4741	±4 to ±16	±5	7	1	4	14-pin SOP
	–	uPC4570	±4 to ±16	±5	8	7	2	8-pin SOP/TSSOP
	–	uPC4572	±2 to ±7	±5	7	6	2	8-pin SOP
	–	uPC4574	±4 to ±16	±5	12	6	4	14-pin SOP/TSSOP
J-FET	uPC811	–	±5 to ±16	±2.5	3.4	15	1	8-pin SOP/TSSOP
	uPC812	uPC4092	±5 to ±16	±3	6.8	15	2	8-pin SOP/TSSOP
	uPC813	–	±5 to ±16	±2.5	3.5	25	1	8-pin SOP/TSSOP
	uPC814	uPC4094	±5 to ±16	±3	6.8	25	2	8-pin SOP/TSSOP
	uPC822	uPC4072	±5 to ±16	±10	5	13	2	8-pin SOP/TSSOP
	uPC824	uPC4074	±5 to ±16	±10	10	13	4	14-pin SOP/TSSOP
	uPC832	uPC4062	±2 to ±16	±10	0.5	3	2	8-pin SOP/TSSOP
	uPC834	uPC4064	±2 to ±16	±10	1	3	4	14-pin SOP/TSSOP
	uPC835	–	±5 to ±16	±3	2.2	5.5	2	8-pin TSSOP
Low power	uPC802	–	±1 to ±16	±6	≤0.1	≤1.0	1	8-pin SOP
General	uPC251	uPC1458	±7.5 to ±16	±6	5.6	0.5	1	8-pin SOP

* MSOP corresponds to uPC842A only

Bipolar Comparators

Type	Part Number		Power Supply Voltage (V)	V_{IO} (max) (mV)	I_{CC} (max) (mA)	Tr/Tf (typ) (µs)	Channels	Package
	Industrial	General Purpose						
General	uPC177	–	2 to 32	±5	2	1.3	4	14-pin SOP/TSSOP
	uPC271	–	5 to 32	±7.5	7.5	0.2	1	8-pin SOP
	uPC272	uPC319	5 to 16	±8	12.5	0.08	2	14-pin SOP
	uPC277	–	2 to 32	±5	1	1.3	2	8-pin SOP/TSSOP/MSOP

• Industrial: Products with extended temperature tolerances (125°C).

Amplifiers

CURRENT SENSE AMPLIFIERS

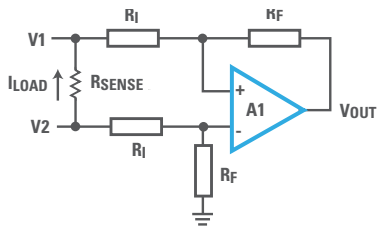
Simplify the Design of Complex Current Monitoring Circuits

Current sense amplifiers (also called current shunt amplifiers) are special-purpose operational amplifiers (op amps) that output a voltage proportional to the current flowing in a power rail. They utilize a "sense resistor" to convert the load current in the power rail to a small voltage, which is then amplified by the current sense amplifier. Renesas offers both discrete and integrated solutions.

Discrete Solution

Precision Op Amps For Current Sensing

A basic current sense amplifier is set up as a differential amplifier. The amp will reject the common mode voltage across V1 and V2, amplifying only the difference across the sense resistor (Eq. 1). Using Ohm's Law, substitute the delta V with the load current times the series resistance in Eq. 2, and solve for the load current (Eq. 3).



- A1 configured as differential amplifier
- Voltage across sense resistor amplified by A1
- Gain = RF/RI
- Amplifier rejects VCM across V1 and V2

Eq. 1: $V_{OUT} = (R_F / R_I) * [V2-V1]$

Eq. 2: $V_{OUT} = (R_F / R_I) * [I_{LOAD} * R_{SENSE}]$

Eq. 3: $I_{LOAD} = (R_I / R_F) * [V_{OUT} * R_{SENSE}]$

Most Common Discrete Solutions

Type	Part Number	TCVOS	VOS Max @ 25°C	Notes
Low Noise	ISL28290	–	700µV	Low cost (low side)
Low Drift	ISL28x30	150nV/°C	40µV	Good – still low cost
Zero Drift	ISL28x33	75nV/°C	8µV	Great
Zero Drift	ISL28x34	15nV/°C	2.5µV	World Class
Standard CMOS	ISL28113/114	2000nV/°C	5mV	
BJT	ISL28136	400nV/°C	150µV	

Generic Solution vs. Renesas High Precision Solution

Low offset voltage op amp in the sensing circuit allows for a much lower sense resistor and less wasted power.

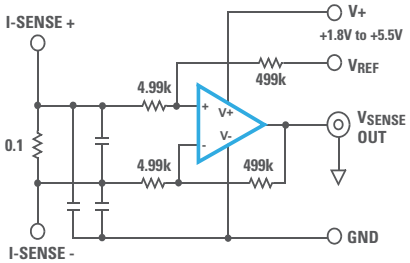
Example – 20mA Resolution, 5A Full Current

Solution	VOS	Rsense	Rsense Power Loss	Renesas Benefits
Generic	500µV	25mΩ	625mW	–
ISL28x30	40µV	2mΩ	50mW	**92%** reduction in wasted power
ISL28x34	2.5µV	125µΩ	3mW	**99.5%** reduction in wasted power

Micropower, Low Drift, RRIO Operational Amplifiers

ISL28x30

- Ideal for low power high-side or low-side current sense applications
- 40µV max offset voltage
- 1.8V to 5.5V supply voltage
- Low quiescent power consumption 20µA (typ)



Bi-Directional Current Sense Amplifier

Integrated Solution

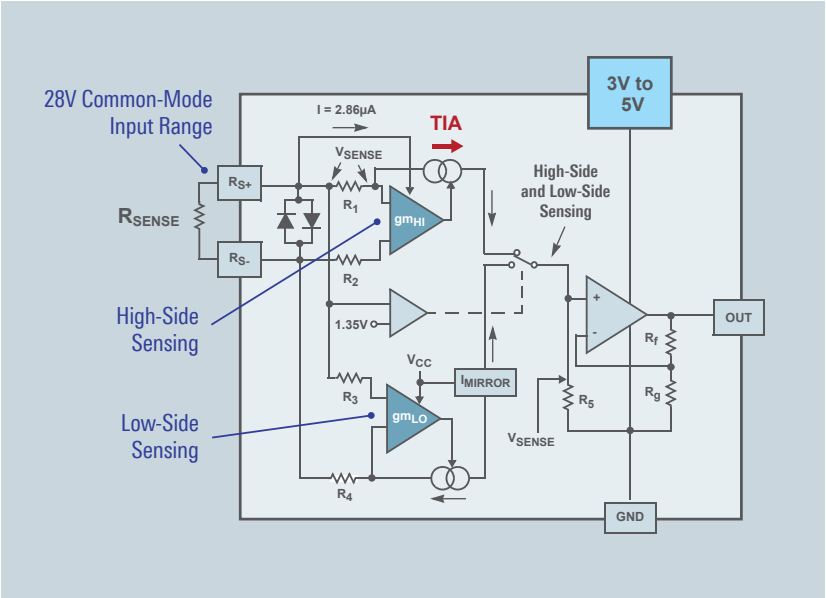
The Simplest Type of Current Sense Amplifiers

The ISL28005 and ISL28006 are ground sensing current sense amplifiers that amplify milli-volt current signals developed across sub-1Ω sense resistors. The simplest type of current sense amplifiers use single-stage op amp circuits that take their power from the same voltage source that generates the current to be measured.

Micropower, Current Sense Amplifier with Voltage Output

ISL28005/6

- High- or low-side uni-direction current sense
- Low power consumption, 50µA (typ)
- TIA Architecture:
  - Input sense voltage converted to current
  - Current fed into 5V TIA for ADC drive
  - Constant 100kHz BW across gain
- Internal fixed gain for high accuracy and low TCV_{OS}



Current Sense Amplifiers

Part Number	Supply Voltage Range	Input Common Mode Range	V_{OS} max @ 25°C	V_{OS} Max Temp	CMRR Min Temp	PSRR Min Temp	Gain Range	Gain Accuracy @ 25°C	Gain Accuracy Temp	Is Max @ 25°C	Is Max Temp	Package
	V	V	µV	µV	dB	dB	V/V	%	%	µA	µA	
ISL28005	2.7 to 28	0 to 28	500	500	105	90	20, 50, 100	2	3	59	59	5 Ld SOT-23
ISL28006	2.7 to 28	0 to 28	250	300	105	90	20, 50, 100, Adj (20-100)	0.7	1	62	62	5 Ld SOT-23, 6 Ld SOT-23

Amplifiers

HIGH SPEED OP AMPs

Renesas' high speed op amp portfolio delivers best-in-class performance-to-power ratio with superior drive and slew rate performance at full bandwidths. This makes our operational amplifiers the perfect choice for video and high speed data transmission, A/D buffering, and high frequency filtering.

Unmatched SFDR-to-Power Ratio

ISL55210, ISL55211

The ISL55210 is a very wide band, voltage feedback, fully differential amplifier (FDA) intended for high dynamic range ADC input interface applications. This voltage feedback FDA design includes an independent output common mode voltage control.

Intended for very high dynamic range ADC interface applications at the lowest quiescent power (115mW), the ISL55210 offers a 4.0GHz gain bandwidth product with a very low input noise of 0.85nV/√(Hz).

In a balanced differential I/O configuration, with $2V_{P-P}$ output into a 200Ω load configured for a gain of 15 dB, the IM3 terms are ≤ 100dBc through 110MHz. With a minimum operating gain of 2V/V (6dB), the ISL55210 supports a wide range of higher gains with minimal BW or SFDR degradation. Its ultra-high differential slew rate of 5,600V/µs ensures clean large signal SFDR performance or a fast settling step response.

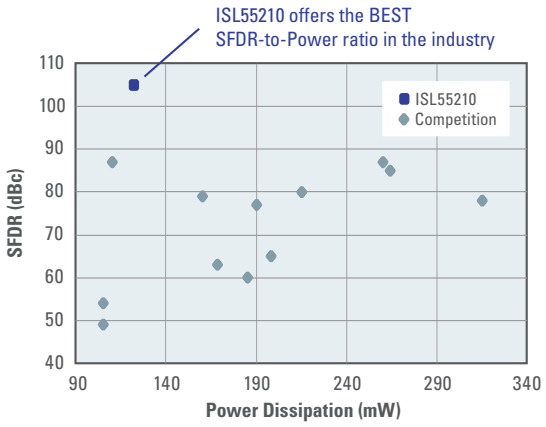
Key Features

- Gain bandwidth product: 4.0GHz
- Input voltage noise: 0.85nV/√(Hz)
- Differential slew rate: 5,600V/µs
- $2V_{P-P}$, 2-tone IM3 (200Ω) 100MHz: -109dBc
- Supply voltage range: 3.0V to 4.2V
- Quiescent power (3.3V supply): 115mW

Applications

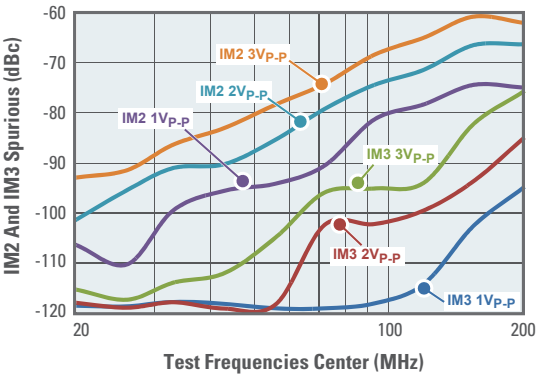
- Low power, high dynamic range ADC interface
- Differential mixer output amplifier
- SAW filter pre/post driver
- Differential comms-DAC output driver

World Best SFDR at Lowest Power



Ultra-low Distortion

Suitable for driving high speed ADCs in first and higher Nyquist zone applications



Fully Differential Amplifiers

Part Number	# of Channels	Topology	V_S Min (V)	V_S Max (V)	BW (MHz)	Gain (V/V)	Slew Rate (V/µsec)	Noise (nV/√Hz)	I_S Max (mA)	I_{OUT} (mA)	V_{OS} Max (mV)	I_B Max (µA)	RR In	RR Out	Headroom (V)	Shutdown
ISL55210	1	FDA	3	4.2	4000	RES	5600	0.85	38.5	30	1.6	140	No	No	1	Yes
ISL55211	1	FDA	3	4.2	1400	2, 4, 5	5600	0.85	38.5	30	1.6	140	No	No	1	Yes

High Speed Op Amps

Part Number				Tech	Supply Voltage (V)		Min Gain	Bandwidth		Slew Rate	Voltage Noise @ 10kHz	V_{OS} Max @ 25°C	I_S Max @ 25°C	Package			
Single	Dual	Triple	Quad		Min	Max		-3dB (MHz)	0.1dB (MHz)	(V/µs)	(nV/√Hz)	(mV)	(mA)	Single	Dual	Triple	Quad
Rail-to-Rail, Voltage Feedback Amplifiers																	
EL8101	EL8201	–	–	VFA	3	5/5.5	1	200	20	200	10	6	2.4	SOIC-8, SOT23-6 SOT23-5	MSOP-10 SOIC-8	–	–
–	–	EL8302*	–	VFA	3	5.5	1	500	35/36	600	12	8/7	6.2	–	–	SOIC-16, QSOP-16	–
Current Feedback Amplifiers																	
EL5160* EL5161	–	–	–	CFA	5	10	1	200	10	1700/ 1300	4	5	0.85	SOIC-8, SOT23-6 SOT23-5	–	–	–
EL5162* EL5163	EL5262* EL5263	EL5362*	EL5462	CFA	5	12	1	500	30	4000/ 2500	3	5	2	SOIC-8, SOT23-6 SC70-5, SOT23-5	MSOP-10 SOIC-8, MSOP-8	SOIC-16, QSOP-16	SOIC-14
EL5164* EL5165	–	EL5364*	–	CFA	5	12	1	600	50	4700	2.1	5	4.2	SOIC-8, SOT23-6 SOT23-5	–	SOIC-16, QSOP-16	–
EL5166* EL5167	–	–	–	CFA	5	12	1	1.4GHz	100	6000	1.7	5	9.3	SOIC-8, SOT23-6 SC70-5, SOT23-5	–	–	–
Slew Enhanced, Voltage Feedback Amplifiers																	
–	EL5202* EL5203	–	–	VFA	3	10	1	400	–	2200	12	5	5.8	–	MSOP-10 SOIC-8, MSOP-8	–	–
EL5104* EL5105	EL5204* EL5205	–	–	VFA	4	13	1	700	–	3000	10	10/18	11	SOIC-8, SOT23-6 SOT23-5	MSOP-10 SOIC-8, MSOP-8	–	–
High Voltage (Up to 30V)																	
ISL55001	ISL55002	–	ISL55004	VFA	5	30	1	200, 220	–	280/300	12	3	9.25	SOIC-8	SOIC-8	–	SOIC-14
Fully Differential Amplifiers																	
ISL55210, ISL55211	–	–	–	FDA	3	4.2	RES/ 2, 4, 5	4GHz, 1.4GHz	–	5600	0.85	1.6	38.5	TQFN-16	–	–	–
Fixed Gain Amplifiers																	
EL5106*	–	EL5306*	–	Gain	5	12	Fixed: +1,+2,-1	350	20	4500	2.8	10	1.82	SOT23-6	–	SOIC-16, QSOP-16	–
–	–	EL5308*	–	Gain	5	12	Fixed: +1,+2,-1	450	40	4500	2	8	4.35	–	–	SOIC-16, QSOP-16	–
–	–	ISL55033*	–	Gain	3	5.5	Fixed: +2, +4	400	40/60	2350/ 2500	35/50	9/10	8.5	–	–	TQFN-12	–
Differential Line Drivers/Receivers																	
Drivers																	
EL5170*	–	–	–	Diff	4.75	11	2	100	12	1100	28	25	8.4	SOIC-8, MSOP-8	–	–	–
EL5171	–	–	–	Diff	4.75	11	2	250	50	700/800	26	25	8.2	SOIC-8	–	–	–
–	–	EL5373*	–	Diff	4.75	11	2	450	60	900/1100	25	30	14	–	–	QSOP-24	–
EL5174	–	–	–	Diff	4.75	11	2	550	120	1100	21	25	14	SOIC-8	–	–	–
EL5177*	–	–	–	Diff	4.75	11	ADJ	550	120	1100	21	25	14	MSOP-10	–	–	–
–	–	EL5378*	–	Diff	4.75	11	2	700	45	850/1000	18	30	14	–	–	QSOP-28	–
Receivers																	
EL5172*	–	–	–	Diff	4.75	11	ADJ	250	25	800	26	25	7	SOIC-8, MSOP-8	–	–	–
EL5175*	–	EL5375*	–	Diff	4.75	11	ADJ	550	60	900	21	30/40	11	SOIC-8, MSOP-8	–	QSOP-24	–
RF Gain Block/Amps																	
ISL55012, ISL55014, ISL55015	–	–	–	Single-ended	3	5.5	18, 17.2, 13.5	2.4, 2.75, 2.9GHz	–	–	–	–	63.5, 63	SC70-6	–	–	–
ISL55016	—	—	—	Diff	4.5	5.5	17.1	2.2GHz	—	—	—	—	104	TDFN-6	—	—	—

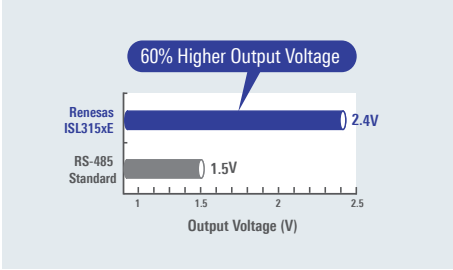
* = With enable pin

Interface

INTERFACE

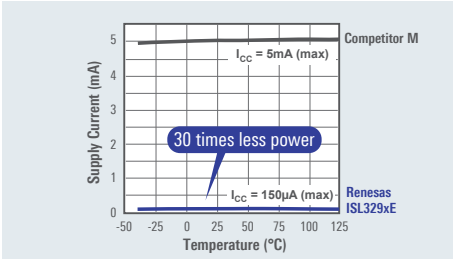
High Noise Immunity

Provides enhanced noise immunity and can drive longer cable lengths or more cable terminations.



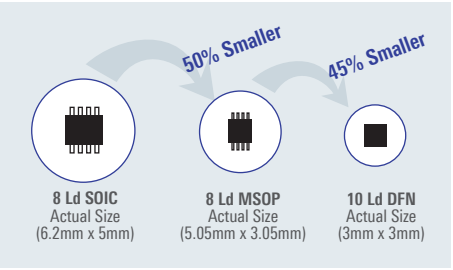
Ultra Low Supply Current

ISL328xE and ISL329xE draw 30 times less power than competitive device.



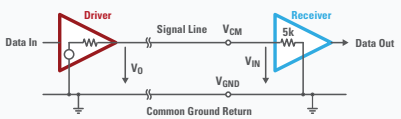
Space-Saving Small Package

Reduced package size enables smaller, more compact products.



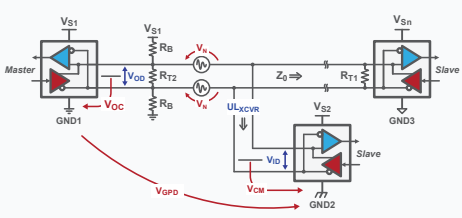
Broad Portfolio to Fit Your Needs

RS-232



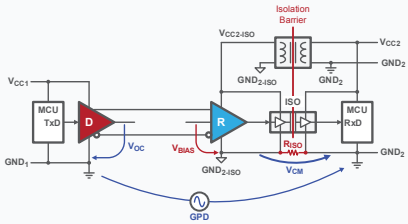
- Single Transceiver (1 Tx/1 Rx)
- Dual Transceivers (2 Tx/2 Rx)
- Dual Transceivers + Extra Receiver (2 Tx/3 Rx)
- Triple Transceivers (3 Tx/3 Rx)
- 8-Channel Transceivers (5 Tx/3 Rx)
- 8-Channel Transceivers (3 Tx/5 Rx)

RS-232/RS-485



- Standard 5V/3V RS-485 Transceivers
- Ultra-Low Power RS-485 Transceivers
  ISL3260XE
- 1.8V to 3.3V, Micro-Power ±15kV ESD
- Overvoltage Protected RS-485 Transceivers
- Dual Protocol Transceivers
  - Programmable
    ISL813xx, ISL413xx, ISL333x
  - Fixed
    ISL333xxE *(See next page)*

Isolated RS-485



- 40Mbps, Ultra-low EMI Isolated RS-485 Transceiver
  ISL32740E/41E
- Industry's Smallest Package Isolated RS-485 Transceiver
  ISL32704E *(See next page)*

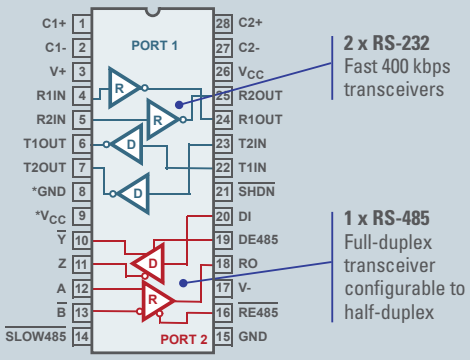
Dual Protocol Transceivers

Two-Port, Dual Protocol Transceivers Allow Designers to Replace Two Chips with a Single Device

ISL3333xE/5xE

- Fixed-port devices
  - Simpler device that is more cost-effective
  - QFN package saves even more board space
- Support dual protocol
  - Two ports, one for RS-232 and one for RS-485
  - Selectable data rate for RS-485

Fixed Dual Protocol Transceivers (ISL33334E)



Dual Protocol RS485/RS-232 (Fixed and Configurable)

Part Number	# of Ports	Port Assignment	V_{CC} (V)	DR (Mbps) RS-485	DR (kbps) RS-232	Package
ISL33334E/37E	2	Fixed	3.3	20, 0.115	400	28 Ld SSOP, 40 Ld QFN
ISL33354E/57E	2	Fixed	5	20, 0.115	460	28 Ld SSOP, 40 Ld QFN
ISL3330E/1E	1	Config.	3.3	20, 0.46, 0.115	400	20 Ld SSOP, 28 Ld SSOP, 40 Ld QFN
ISL3332E/3E	2	Config.	3.3	20, 0.46, 0.115	400	20 Ld SSOP, 28 Ld SSOP, 40 Ld QFN
ISL41334E	2	Config.	5	20, 0.46, 0.115	650	40 Ld QFN
ISL81334E	2	Config.	5	20, 0.46, 0.115	650	28 Ld SSOP, 28 Ld SOIC
ISL41387E	1	Config.	5	20, 0.46, 0.115	650	40 Ld QFN
ISL81387E	1	Config.	5	20, 0.46, 0.115	650	20 Ld SSOP, 20 Ld SOIC

Galvanically Isolated RS-485 Transceiver

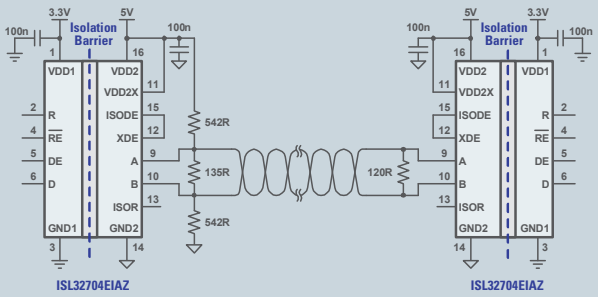
Industry's Smallest Isolated RS-485 Transceiver

ISL32704E

The ISL32704E isolated RS-485 transceiver provides 4Mbps bi-directional data transmission for Industrial Internet of Things (IIoT) networks. The high speed device delivers industry-leading EMI and common-mode transient immunity in a small 4mm x 5mm QSOP package that's **70% smaller** than competing solutions.

- Galvanically isolated using giant magnetoresistance (GMR) technology
- 2.5kVRMS isolation; 600VRMS working voltage (50% higher than the closest competitor)
- Very low EMI, no board level shielding needed
- Supports 3V to 5V power supplies

Giant Magnetoresistance (GMR) Technology to Provide Galvanic Isolation

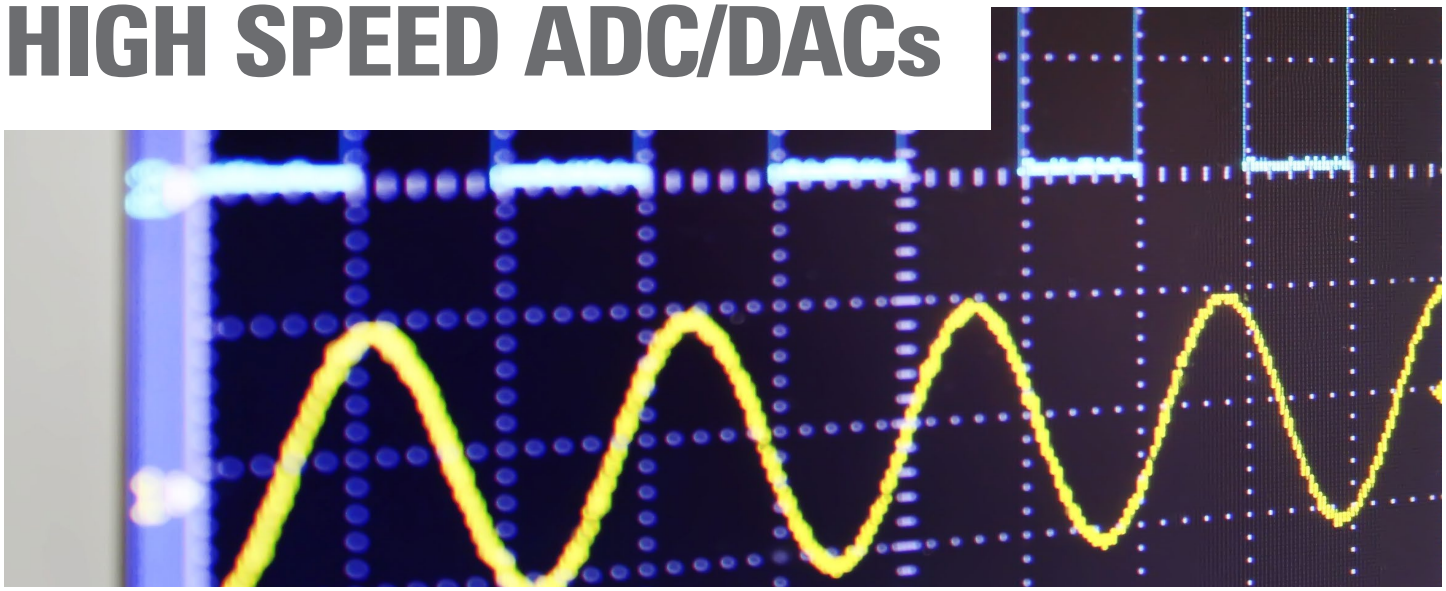


Galvanically Isolated RS-485 Transceiver

Part Number	Data Rate	Duplex	Isolation Rating	Working Voltage	V_{DD1}	V_{DD2}	I_{DD1}	I_{DD2}	Package
ISL32740E	40Mbps	Half	2.5kV	600Vrms	3V to 5.5V	4.5V to 5.5V	3 to 4mA	5mA	16 Ld SOIC
ISL32741E	40Mbps	Half	6kV	1000Vrms	3V to 5.5V	4.5V to 5.5V	3 to 4mA	5mA	16 Ld SOIC
ISL32704E	4Mbps	Half	2.5kV	600Vrms	3V to 5.5V	4.5V to 5.5V	3 to 4mA	5mA	16 Ld QSOP, 16 Ld WSOIC

Data Converters

HIGH SPEED ADC/DACs



High Speed ADCs

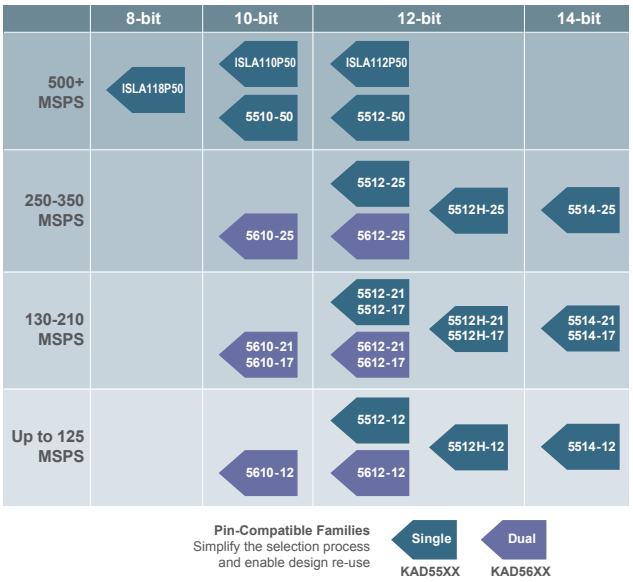
Innovative FemtoCharge® CMOS technology yields ultra-high performance ADCs that consume a fraction of the power of the competition.

Competitive Advantages

- **14-bit:** higher sampling rate (250MSPS), one-third the power (390mW) of the competition
- **12-bit:** same sampling rate (500 MSPS), less than one-fifth the power (432mW) of the competition
- **8/10-bit:** higher sampling rate (500MSPS), almost half the power (428mW) of the competition
- Superior wideband capabilities
- Compact footprint
  - The industry's first dual 12-bit 250MSPS ADC family
  - 500 MSPS option is 2 to 3.6x smaller than the competition

Applications

- Communications
- Networking
- Instrumentation
- Industrial
- Video and imaging



High Speed DACs

Key Features

- Excellent dynamic performance (ISL5957):
  - Nyquist SFDR at 10MHz = 75dBc
  - UMTS ACPR at 19.2MHz = 71dB
- GSM SFDR at 11MHz (20MHz window) = 94dBc
- +3.3V supply, low power 103mW @130MSPS
- Adjustable full-scale output current (2 to 20mA)
- Pin compatible family of single and duals

Applications

- Wireless Communications
- Broadband Microwave Repeaters
- Military and SDR Radios

Resolution	Part Number	Speed
14-bit	ISL5957	260MSPS
	ISL5927	260MSPS, Dual
	ISL5961	210/130MSPS
	ISL5929	210/130MSPS, Dual
12-bit	ISL5857	260MSPS
	ISL5827	260MSPS, Dual
	ISL5861	210/130MSPS
	ISL5829	210/130MSPS, Dual
10-bit	ISL5757	260MSPS
	ISL5727	260MSPS, Dual
	ISL5761	210/130MSPS
	ISL5729	210/130MSPS, Dual
8-bit	ISL5627	260MSPS, Dual
	ISL5629	210/130MSPS, Dual
	HI5660	125/60MSPS

Data Converters

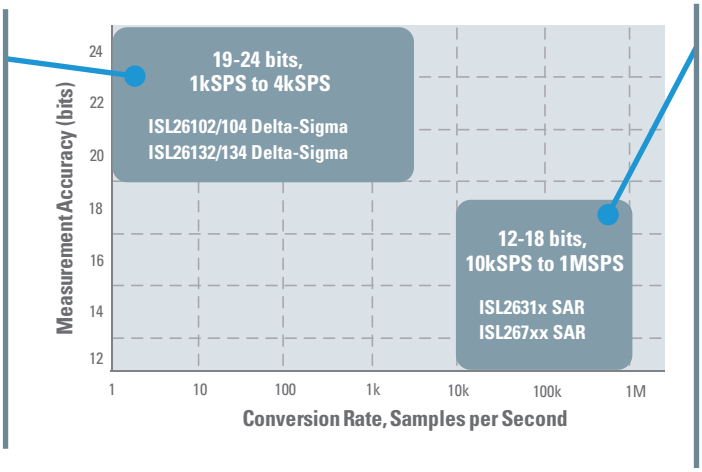
PRECISION DATA CONVERTERS

24-bit Delta-Sigma Converters

- High resolution (24-bit)
- Lower conversion rate

Applications

- Weigh scales
- Dynamic weighing
- Manufacturing systems
- Temperature and load sensors
- Load safety systems
- Scientific instrumentation



Successive Approximation (SAR) ADCs

- Medium to high-resolution ADCs (up to 12-bit)
- High conversion rate
- Low power

Applications

- Process controllers
- Human-machine interface devices
- Pressure and flow sensors
- Switchgear
- Safety monitors

- Robotic controls
- Automotive systems

24-bit Delta-Sigma Converters

Resolution	Max Conv Rate	2-Channel	4-Channel	INL (%FS)	Noise	Power Consumption	Analog Supply Voltage Range	Digital Supply Voltage Range	Package	Technical Highlight
24-bit	4kSPS	ISL26102	ISL26104	0.0002	7nV/√Hz	33.75mW	4.75 - 5.25V	2.7 - 5.25V	24 and 28 Ld TSSOP	Programmable gain amplifier with gains of 1 to 128
	10SPS and 80SPS	ISL26132	ISL26134	0.0002	1.2µV/√Hz	50mW	5V	2.7V	24 and 28 Ld TSSOP	Up to 21.6 Noise-free bits

SAR ADC

Resolution	Max Conv Rate	Single-channel	2-channel	4-channel	8-channel	± INL (Integral Non-Linearity) (LSB)	SFDR	Power Consumption	Analog Supply Voltage (min)	Analog Supply Voltage (max)	Pkg Type	Temp Range (°C)
8-bit	1MSPS	ISL26708	–	–	–	0.03	-68dB	3.75mW	2.7V	5.25V	DFN8, SOT8	-40 to +85
10-bit	1MSPS	ISL267440	–	–	–	0.5	-76dB	2mW	2.7V	5.25V	MSOP8, SOT8	-40 to +85
		ISL26710	–	–	–	0.1	-82dB	3.75mW	2.7V	5.25V	DFN8, SOT8	-40 to +85
12-bit	20kSPS	ISL2671286	–			1	-83dB	1.4mW	4.5V	5.25V	SOIC8	-40 to +85
	125kSPS	–	ISL26312, ISL26313	ISL26314, ISL26315	ISL26319	0.7	96dB	11mW	2.7V	5.25V	SOIC8, TSSOP16	-40 to +125
	200kSPS	ISL267817	–	–	–	1	-85dB	2.15mW	4.75V	5.25V	MSOP8, SOIC8	-40 to +85
	250kSPS	ISL26320, ISL26321 , ISL26322	ISL26323	ISL26325, ISL26324	ISL26329	0.7	96dB	11mW, 15mW	2.7V	5.25V	SOIC8, TSSOP16	-40 to +125
	555kSPS	ISL267452	–	–	–	1	-76dB	3.75mW	2.7V	5.25V	SOT8	-40 to +85
	1MSPS	ISL267450/A	–	–	–	1	-82dB	3.75mW	3V	5.25V	MSOP8, SOIC8	-40 to +85
	1MSPS	ISL26712	–	–	–	0.4	-87dB	3.75mW	2.7V	5.25V	DFN8, SOT8	-40 to +85

Data Converters

VOLTAGE REFERENCES

Renesas offers a wide range of precision voltage references in both FGA™ and Bandgap technology.

Accurate and Stable Voltage Reference with Floating Gate Analog Technology (FGA™)

Renesas' revolutionary Floating Gate Analog (FGA™) voltage reference circuits are not dependent on the voltage produced by a silicon junction. FGA technology produces extraordinarily accurate and stable reference voltages by storing a precise charge on a floating gate cell that is essentially unaffected by external influences such as variation in temperature, input voltage, and time.

The floating gate voltage is buffered with a high quality CMOS amplifier as shown in the simplified diagram in Figure 1.

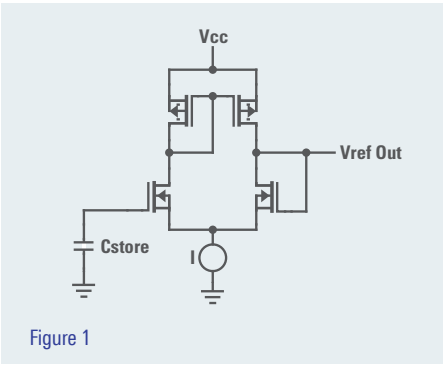


Figure 1

Ultra-Low Noise, Precision Voltage Reference

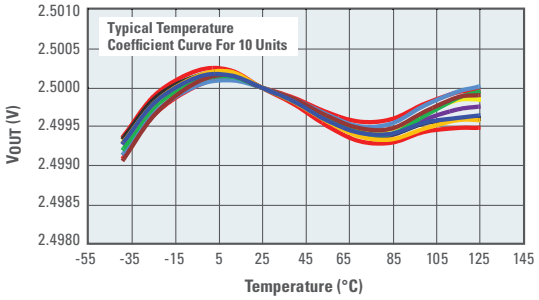
ISL21090

The ISL21090 is an ultra-low noise, high DC accuracy precision voltage reference with a wide input voltage range of 3.7V to 36V. The ISL21090 is ideal for high-end instrumentation, data acquisition, and processing applications requiring high DC precision where low noise performance is critical.

- Reference output voltage options:
  – 1.25V, 2.5V, 5.0V, 7.5V
- Initial accuracy: ±0.003% (1.25V option)
- Output voltage noise: 1µV$_{P-P}$ typ (0.1Hz to 10Hz) (1.25V option)
- Supply current: 750µA typ (1.25V option)
- Tempco: 7ppm/°C max
- Output current capability: 20mA
- Line regulation: 8ppm/V (1.25V option)
- Load regulation: 2.5ppm/mA (1.25V option)

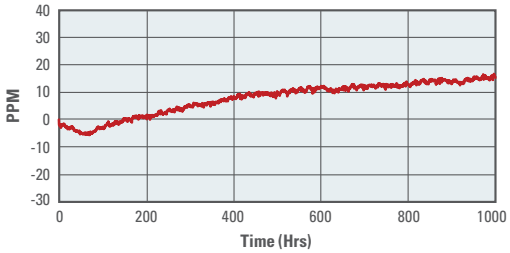
Temperature Drift (Coefficient)

ISL21090 Typical Temperature Coefficient



Long Term Drift

ISL21090 Long Term Drift Data (1000 Hrs)



Precision Voltage References

Type	Part Number	VOUT														Temp Coefficient (max)	IS (typ)	IS (max)	VS (min)	VS (max)	Initial Accuracy (% VOUT @2.5V)	Output Noise (0.1Hz to 10Hz) (typ)	Hysteresis (ppm)	Pkg Type	Temp Range (°C)
		0.9V	1.024V	1.2V	1.25V	1.5V	1.8V	2.048V	2.5V	2.6V	3V	3.3V	4.096V	5V	7.5V										
Low Noise	ISL21090				•				•					•	•	7ppm/°C	750µA (1.25V Option)	1.28mA	3.7V	36V	±0.03% (1.25V Option)	1.0µVPP (1.25V option)	–	SOIC8	-40 to 125
Low Cost	ISL21010		•		•	•		•	•		•	•	•			50ppm/°C	48µA	100µA	2.2V	5.5V	0.2%	58µVPP (2.048V option)	100	SOT3	-40 to 125
	ISL21080	•	•		•	•		•	•		•	•	•	•		50ppm/°C	300nA	1.5µA	2.7V	5.5V	<0.7%	30µVPP	100	SOT3	-40 to 85
NanoPower	ISL60002		•	•	•		•	•	•	•	•	•				20ppm/°C	350nA	900nA	2.7V	5.5V	<0.49%	30µVPP	100	SOT3	-40 to 85
	X60003												•	•		10ppm/°C (B grade)	500nA	900nA	4.5V	9V	<0.1%	30µVPP	150/100	SOT3	-40 to 85
With Comparator	ISL21440	1.182V ±0.5% with Comparator														–	0.46µA	6.5µA	2V	11V	0.5%	–	Programmable	DFN8, MSOP8	-40 to 125

Data Converters

DIGITAL POTENTIOMETERS

Digital potentiometers replace mechanical potentiometers and trim resistors in applications where digital control allows microprocessor interfacing and extended functionality. Compared to mechanical potentiometers, electronic potentiometers are more accurate, easier to adjust, and they reduce manufacturing complexity.

Lowest Voltage

Specification	Renesas DCP	Competition	Renesas Benefit
Analog Voltage	1.7V to 5.5V	1.8V to 5.5V 2.7V to 5.5V	Operational when battery starts draining.
Digital Voltage	1.2V to 5.5V	Same as analog voltage, lowest is 1.8V	Eliminate level shifter for I²C/SPI when µC has low voltage I/O pins.
Low Current Consumption	2.5µA - 1CH 3µA - 2CH 5µA - 4CH	Up to 2x more power consumption	Drains up to 50% less battery power.

Smaller Package

Type	Renesas Part Number	Renesas DCP	Competition	Renesas Benefit
Single	ISL23315, ISL23415, ISL23318, ISL23418	 µTQFN (2.1x1.6mm)	 SC-70 (2x2.1mm)	20% Smaller
Dual	ISL23325, ISL23425, ISL23328, ISL23428	 µTQFN (2.6x1.8mm)	 QFN (4x4mm)	48% Smaller
Quad	ISL23345, ISL23445, ISL23348, ISL23448	 QFN (3x4mm)	 QFN (4x4mm)	25% Smaller

Digital Potentiometer Portfolio

- **Single 16-Tap (4-bits)**
  - X9116 – 10kΩ, Up-Down
- **Single 32-Tap (5-bits)**
  - D X9314 – 10kΩ, Log Taper, Up-Down
  - X9315 – 10kΩ / 50kΩ / 100kΩ, Up-Down
  - D X9511 – 10kΩ, Push Button
- **Single 100-Tap (~6.65-bits)**
  - X9317 – 10kΩ / 50kΩ / 100kΩ, Up-Down
  - X9318 – 10kΩ, Up-Down
  - X9319 – 10kΩ / 50kΩ, Up-Down
  - D X9C102 – 1kΩ, Up-Down
  - D X9C103 – 10kΩ, Up-Down
  - D X9C104 – 100kΩ, Up-Down
  - D X9C503 – 50kΩ, Up-Down
  - D X9C303 – 32kΩ, Log Taper, Up-Down
- **Single 128-Tap (7-bits)**
  - ISL22316 – 10kΩ, I²C
  - ISL22317 – 10kΩ, 1% Tolerance, I²C
  - E ISL95311 – 10kΩ, I²C
  - E ISL95310 – 50kΩ, Up-Down
- **Single 256-Tap (8-bits)**
  - ISL95810 – 10kΩ / 50kΩ, I²C
- **Single 1024-Tap (10-bits)**
  - D X9110 – 100kΩ, SPI
  - X9111 – 100kΩ, SPI
  - D X9118 – 100kΩ, 2-Wire
  - X9119 – 100kΩ, 2-Wire
- **Dual 128-Tap (7-bits)**
  - ISL22326 – 10kΩ, I²C
- **Dual 256-Tap (8-bits)**
  - X95820 – 10kΩ / 50kΩ, I²C
  - D X9268 – 50kΩ / 100kΩ, 2-Wire
  - D ISL22424 – 10kΩ, SPI
- **Quad 64-Tap (6-bits)**
  - D X9408 – 2.5kΩ / 10kΩ, 2-Wire
- **Quad 128-Tap (7-bits)**
  - ISL22346 – 10kΩ / 50kΩ, I²C
- **366Quad 256-Tap (8-bits)**
  - X95840 – 10kΩ / 50kΩ, I²C
  - D X9250 – 50kΩ / 100kΩ, SPI
  - X9251 – 50kΩ, SPI
  - X9252 – 2kΩ / 10kΩ, 2-Wire
  - D X9258 – 50kΩ / 100kΩ, 2-Wire
  - X9259 – 50kΩ, 2-Wire

Special Function DCPs

- **Dual Audio DCP – Integrated Output Buffer Amps and Audio Detect**
  - ISL22102 – 32kΩ, Log Taper, Push Button, 0 to -72dB Dynamic Range
- **Low Voltage 1% Tolerant Precision DCP & Low Temperature Coefficient**
  - ISL22317 – 10kΩ, I²C
- **TFT/LCD Programmable VCOM Calibrator (128 Step)**
  - ISL45041 – I²C
  - ISL45042 – Up-Down
- **Military Temperature (-55°C to 125°C) Non-Volatile DCP**
  - ISL22316WM (Single) – 10kΩ, I²C
  - ISL22326WM (Dual) – 10kΩ, I²C
  - ISL22346WM (Quad) – 10kΩ, I²C

Volatile (No EEPROM Memory)

- **Single 32-Tap (5-bits)**
  - ISL23511 – 10kΩ, Push Button
  - ISL90461 – 10kΩ / 50kΩ / 100kΩ, Up-Down, 2-Pin, Rheostat
  - ISL90462 – 10kΩ / 50kΩ, Up-Down, 2-Pin, Voltage Divider Only
- **Single 128-Tap (7-bits)**
  - ISL90726 – 10kΩ / 50kΩ, I²C, Rheostat
  - ISL90727/28 – 10kΩ / 50kΩ, I²C, Voltage Divide Only
  - ISL23318 – 10kΩ / 50kΩ / 100kΩ, I²C, Low Voltage
  - ISL23418 – 100kΩ, SPI, Low Voltage
- **Single 256-Tap (8-bits)**
  - ISL23315 – 100kΩ, I²C, Low Voltage
  - ISL23415 – 100kΩ, SPI, Low Voltage
- **Dual 32-Tap (5-bits)**
  - ISL22102 – 32kΩ, Log Taper, Audio Detect, Push Button
- **Dual 128-Tap (7-bits)**
  - ISL23328 – 10kΩ / 100kΩ, I²C, Low Voltage
  - ISL23428 – 10kΩ / 100kΩ, SPI, Low Voltage
- **Dual 256-Tap (8-bits)**
  - ISL23325 – 10kΩ / 100kΩ, I²C, Low Voltage
  - ISL23425 – 10kΩ / 100kΩ, SPI, Low Voltage
- **Quad 256-Tap (8-bits)**
  - ISL90841 – 50kΩ, I²C
  - ISL90842 – 10kΩ / 50kΩ, I²C

E Extended positive terminal voltage

D Positive and negative terminal voltage

Timing

REAL-TIME CLOCKS

Pick the Right RTC to Fit Your Design Needs

Basic

- External crystal (no external caps required), minimal features

Low Cost

- External crystal, battery backup, 1 to 8 bytes SRAM

Feature Rich

- External crystal, temperature compensation, ≥ 128 bytes SRAM or EEPROM memory, tamper/event detection, unique ID, etc.

High Accuracy Modules

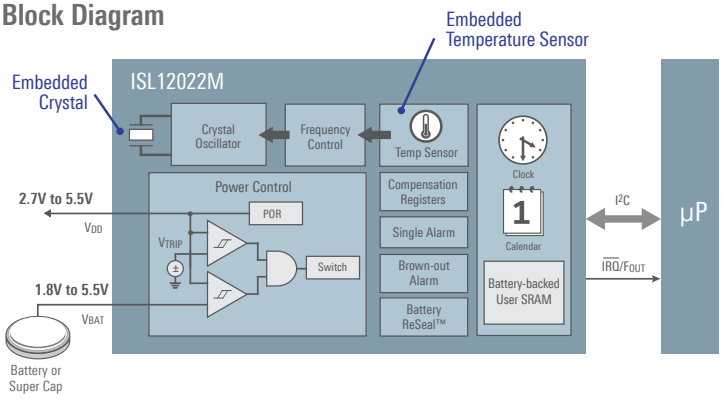
- Integrated crystal and temperature compensation

High Accuracy 3-in-1 RTC Module (RTC + Embedded Crystal + Temp Sensor)

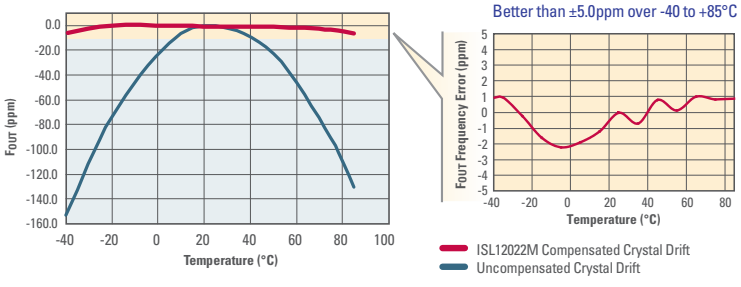
ISL12022M

- ±5ppm accuracy (-40°C to +85°C)
  - Factory programmed RTC for optimal accuracy
  - On-board temperature sensor
  - Embedded crystal
  - Reliable timekeeping and power management
  - Backup battery management
  - V_{DD} and battery status monitors and switchover time stamp
  - Battery Reseal™ function extends battery shelf life
- User programmability
  - I²C interface
  - 128 bytes battery-backed user SRAM
- Solution for industrial applications
  - Provides low-drift time source for patient event time stamp
  - Reliable clock solution for patient monitoring (ECG)

Block Diagram



High Accuracy Even in Extreme Temperature Conditions



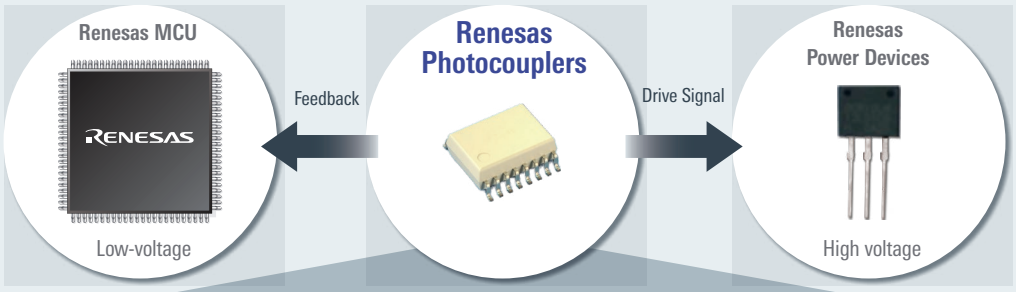
Real-Time Clocks

Category/Special Features		Part Number	Other Functions									Memory	Package
			Event Detection	Time Stamp	Batt Sw Timestamp	Auto DST Adjust	Temp Comp	Power Monitor	Unique ID	Integrated Crystal	Crystal Capacitor		
High Accuracy RTC Module	With Embedded Crystal & Temp Compensation	ISL12020M			•	•	•	•		•		128 Bytes SRAM	20 Ld DFN
		ISL12022M			•	•	•	•		•		128 Bytes SRAM	20 Ld SOIC
Feature Rich RTC	With On-Chip Temp Sensor	ISL12022			•	•	•	•				128 Bytes SRAM	20 Ld SOIC
	With Embedded Unique ID	ISL12024							•			512x8-Bit EEPROM	8 Ld SOIC, 8 Ld TSSOP
		ISL12025							•			512x8-Bit EEPROM	8 Ld SOIC
	With Integrated EEPROM & CPU Supervisory Function	ISL12026A										512x8-Bit EEPROM	8 Ld SOIC, 8 Ld TSSOP
		ISL12027A										512x8-Bit EEPROM	8 Ld TSSOP
		ISL12028										512x8-Bit EEPROM	14 Ld SOIC, 14 Ld TSSOP
Low Cost	With Battery Backup	ISL12008											8 Ld SOIC
		ISL12082											8 Ld SOIC
	With Battery-Backed SRAM	ISL1208										2 Bytes SRAM	8 Ld MSOP, 8 Ld SOIC, 8 Ld TDFN
		ISL1218										8 Bytes SRAM	8 Ld MSOP, 8 Ld SOIC
		ISL1220										8 Bytes SRAM	10 Ld MSOP
	With Battery-Backed SRAM, Event Detection	ISL1209	•									2 Bytes SRAM	10 Ld MSOP
		ISL1219	•	•								2 Bytes SRAM	10 Ld MSOP
		ISL1221	•	•								2 Bytes SRAM	10 Ld MSOP
Basic	With IRQ, Alarm, Timers	ISL12057									•		8 Ld MSOP, 8 Ld SOIC
		ISL12058											8 Ld MSOP, 8 Ld SOIC, 8 Ld µTDFN

Optoelectronics

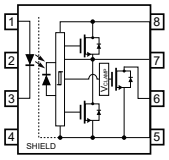
PHOTOCOUPLERS

Providing Highly Reliable, High Accuracy Small Footprint Solutions



Renesas Strength

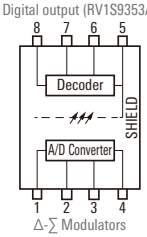
High Reliability



IGBT Drive (PS9332)

- Built-in IGBT protection to prevent from overcurrent
- Miller clamp and DESAT detection

High Accuracy



- Contribution
  Direct connection to RZ/T
- Features
  - High precision: Gain ±0.5% MAX.
  - Effective Number of Bit (ENOB) 13.8 bits TYP.
  - Input Offset Voltage Drift vs. Temperature 2.5 μV/℃ MAX.

Small Package + High Temp Operation

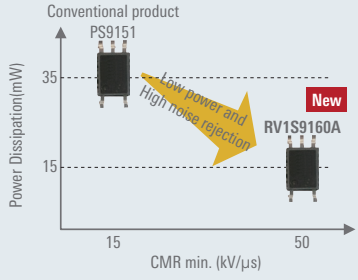
SO16 (8mm) | LSDIP (14.5mm) | LSO5 (8mm)

- T_A = 125°C guaranteed

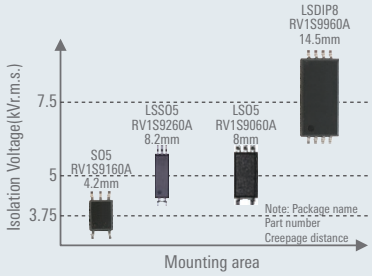
Featured Products

Low Input Current 15 Mbps

- Suitable for industrial equipment due to the balance of low power,high speed 15 Mbps and high noise rejection

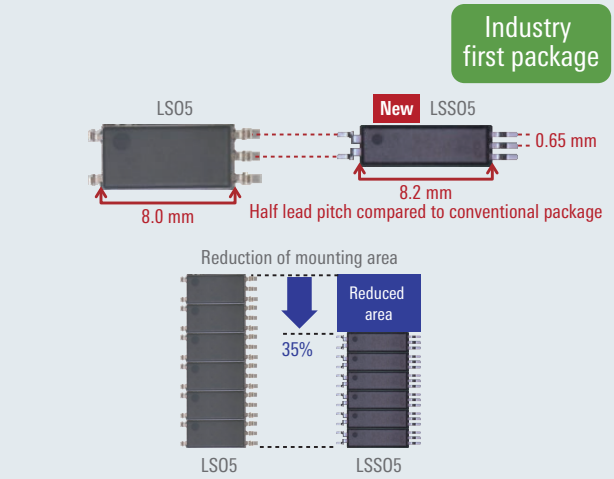


- The best package for each application can be selected from various lineup



LSSO5(5pin)/LSSOP(4pin)

- Downsizing while maintaining long creepage (35% reduction in mounting area compared to LSO5)
- Lineup: 15 Mbps, IPM drive, Transistor output



IC Output Photocouplers

Upper: Package name
Lower: Creepage distance

				DIP8 7 / 8 mm	SDIP6/8 7 / 8 mm	LSDIP8 14.5 mm	LSO5 8 mm	SO5 4.2 mm	LSSO5 8.2 mm	SO16 8 mm
Motor Drive	IGBT Gate Driver	Digital	35V, ≥2.0A	PS9531	PS9331	PS9905	PS9031			
			35V,0.6A	PS9506	PS9307A					
			with Protection Function		PS9332					PS9402
	IPM Driver	Digital	>20V	PS9513	PS9313 PS9303 PS9309		PS9013 PS9009	PS9113	RV1S9213	
Current /Voltage Sensing	Isolation Amplifier	Analog	5V	PS8551A	PS8352A					SO8 4 mm
	Δ-∑ Modulator	Digital	5V	PS9551A	PS9352A RV1S9353A					
High Speed Communication	15 Mbps	CMOS	5V		PS9351	RV1S9960A	RV1S9060A	PS9151 RV1S9160A	RV1S9260A	PS9851-1 PS9851-2
		Totem Pole	5V					PS9123		
	10 Mbps	Open Collector	5V	PS9587	PS9317		PS9001	PS9117A		PS9817A-1 PS9817A-2
			3.3V/5V		PS9324	PS9924		PS9124		PS9821-1 PS9821-2
	1 Mbps	Digital	3.3V, 5V					PS9122		PS9822-1 PS9822-2
		Analog	35V	PS8501 PS8502	PS8302	PS8902		PS8101		

Transistor Output Photocouplers

			DIP4 7 / 8mm	LSOP 8mm	SOP 5mm	LSSOP 8.2mm	SSOP 1ch/4ch 4.5 / 5mm	SSOP Common Lead 4mm	Flat Lead 4mm
DC	Single	General Purpose			PS2701A-1		PS2801C-1 PS2801C-4		
		High Temp. (110, 115°C)	PS2561D-1 PS2561F-1	PS2381-1	PS2761B-1	RV1S2281A	PS2861B-1		
		High Voltage (120V)			PS2703-1				
		Low Input			PS2711-1	RV1S2211A	PS2811-1 PS2811-4	PS2841-4A PS2841-4B	PS2911-1 PS2913-1
		High Speed (20kbps)	PS2514-1						
	Darlington	General Purpose	PS2562-1		PS2702-1		PS2802-1 PS2802-4		
		High Voltage (350V)	PS2533-1 PS2535-1		PS2733-1		PS2833-1 PS2833-4		
AC	Single	General Purpose	PS2565-1		PS2705A-1	RV1S2285A	PS2805C-1 PS2805C-4		
		Low Input			PS2715-1		PS2815-1 PS2815-4	PS2845-4A	PS2915-1
	Darlington	General Purpose	PS2506-1		PS2706-1				

RENESAS

BIG IDEAS FOR EVERY SPACE

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