

ANALOG ICs

High-performance solutions for precision
signal chain design



HIGH-PERFORMANCE SOLUTIONS FOR
PRECISION SIGNAL CHAIN DESIGN

ANALOG ICs



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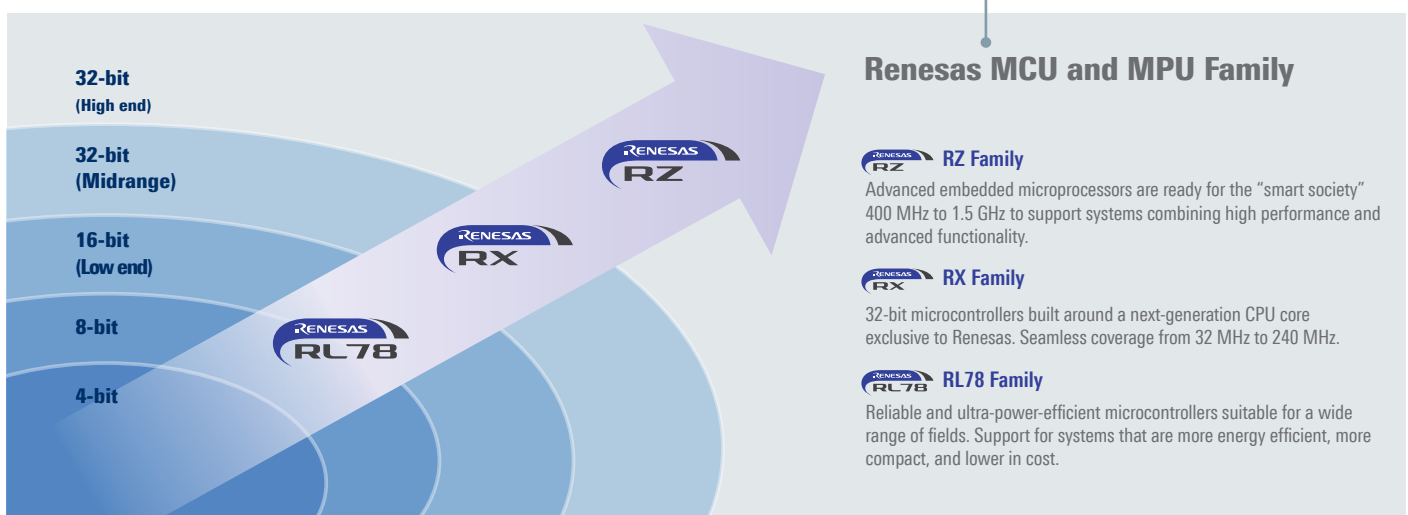
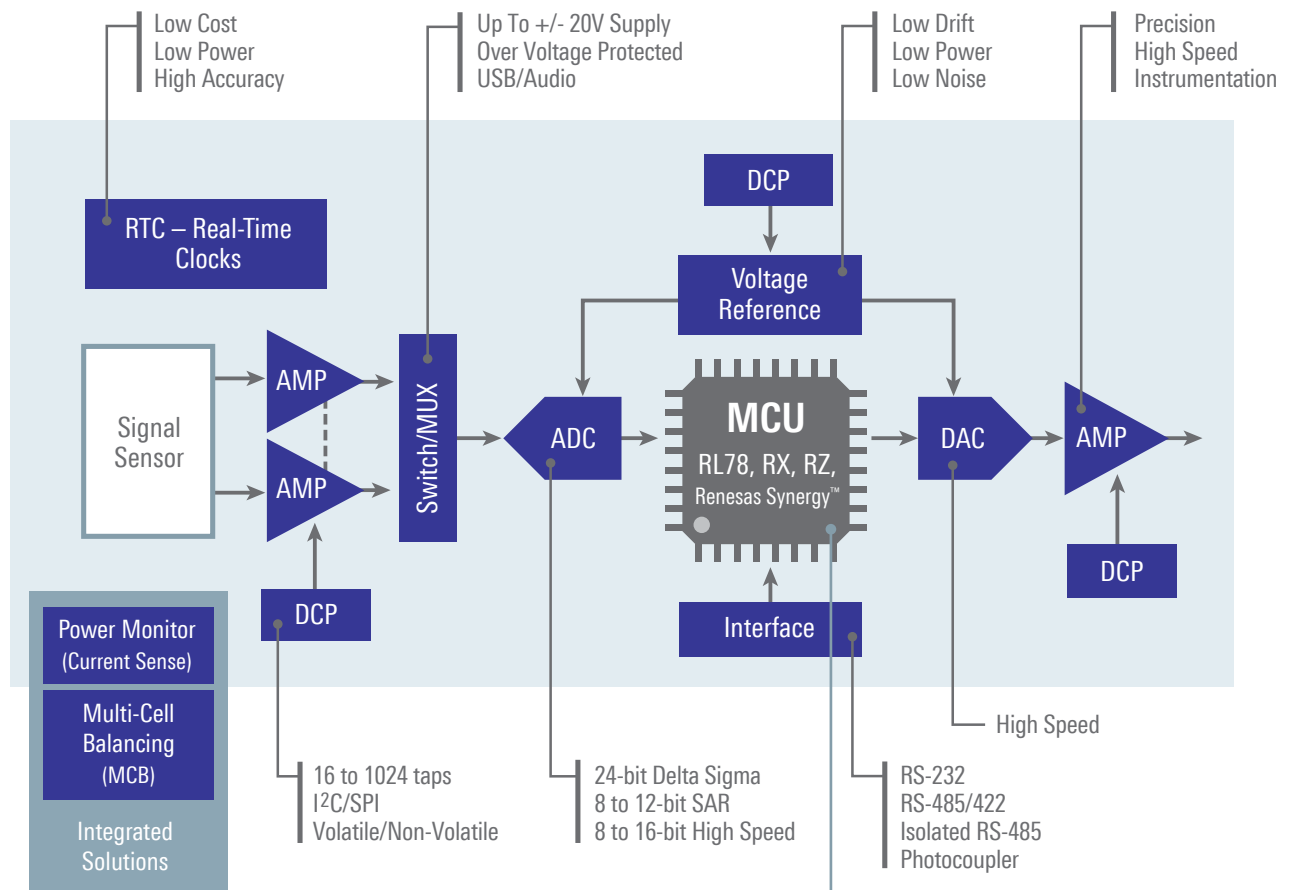
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Complete Signal Chain Solutions

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.



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-ENG22

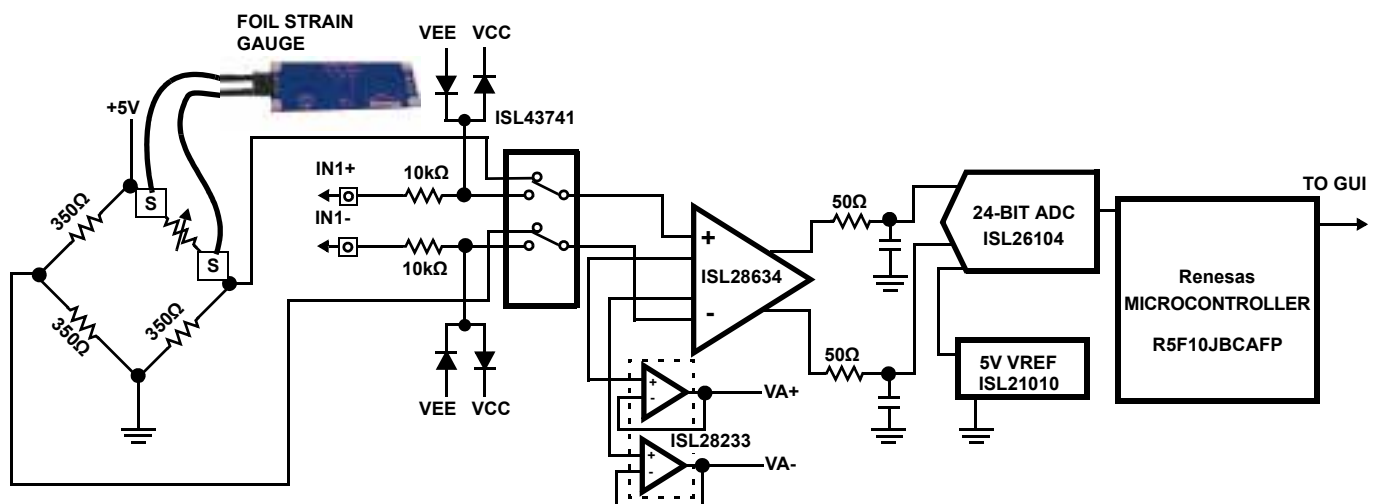


Figure 1. SIMPLIFIED STRAIN GAUGE SCHEMATIC

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



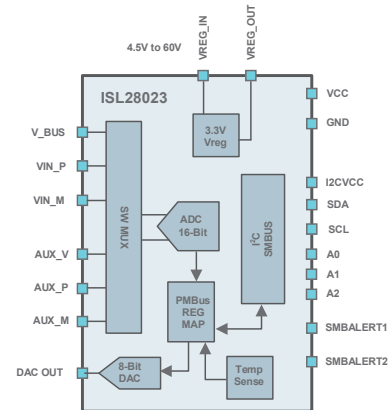
High Voltage Precision Sensing for Current, Voltage, and Power

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
I ² C/SMBus	Yes	Yes	Yes
PMBus	–	Yes	Yes
1.2V I ² C Level Translators	–	Yes	Yes
High Speed (3.4 MHz) I ² C 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

$V_{OS} < 1\text{mV}$ 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 $< 0.5\text{nV}/^\circ\text{C}$) [Figure 1]
- Low drift/reduced offset voltage over time [Figure 2]
- Low offset voltage/reduced offset voltage (typically $< 1\mu\text{V}$) [Figure 3]
- Low offset voltage over the common mode range and power supply (CMRR & PSRR typically $> 125\text{dB}$) [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

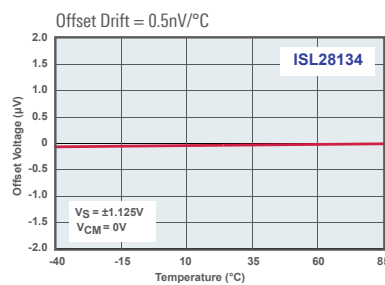


Figure 1. V_{OS} vs Temperature

Low Noise

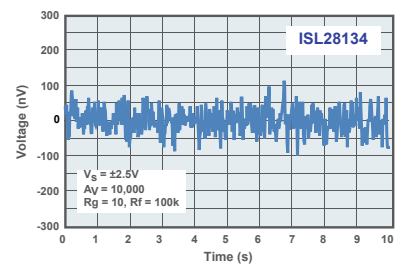


Figure 2. Input Noise Voltage 0.1Hz to 10Hz

Low Offset Voltage

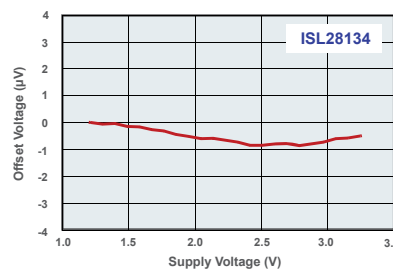


Figure 3. V_{OS} vs Supply Voltage

High CMRR/PSRR

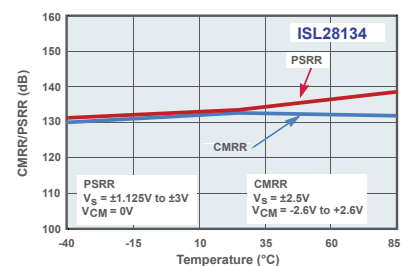


Figure 4. CMRR vs Temperature

No $1/f$ Noise

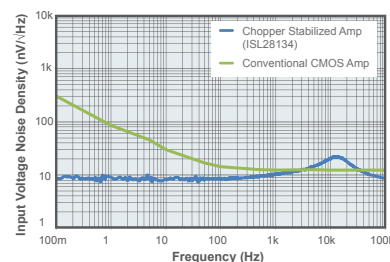


Figure 5. 5V CMOS ISL28134 vs CMOS Amp Noise Voltage Density Comparison

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

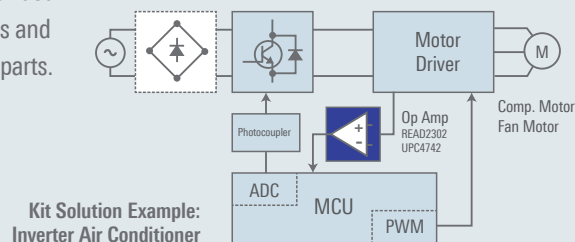
Design Challenge #2

Short Development Time



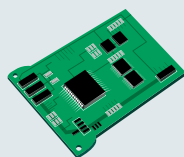
Renesas Op Amp Solution

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.



Design Challenge #3

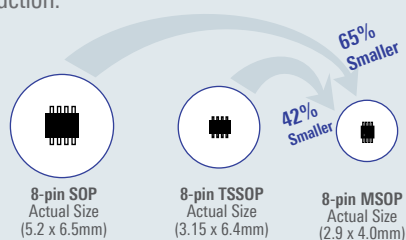
BOM Size

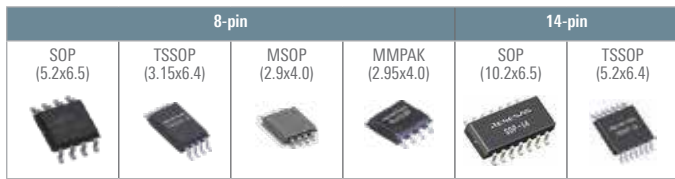


- Complex ecosystem on battery-powered small applications

Renesas Op Amp Solution

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





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	μPC451	—	3 to 30	±7	2	0.3	4	14-pin SOP/TSSOP
	μPC452	μPC3403	3 to 32	±7	7	0.8	4	14-pin SOP
	μPC842	μPC4742	3 to 32	±5	4.5	7	2	8-pin SOP/TSSOP
	μPC844	μPC4744	3 to 32	±5	9	7	4	14-pin SOP/TSSOP
	μPC1251	—	3 to 30	±7	1.2	0.3	2	8-pin SOP/TSSOP
Low noise	μPC258	μPC4558	±4 to ±16	±6	5.7	1	2	8-pin SOP
	μPC259	μPC4560	±4 to ±16	±6	5.7	2.8	2	8-pin SOP
	μPC458	μPC4741	±4 to ±16	±5	7	1	4	14-pin SOP
	—	μPC4570	±4 to ±16	±5	8	7	2	8-pin SOP/TSSOP
	—	μPC4572	±2 to ±7	±5	7	6	2	8-pin SOP
J-FET	—	μPC4574	±4 to ±16	±5	12	6	4	8-pin SOP/TSSOP
	μPC811	—	±5 to ±16	±2.5	3.4	15	1	8-pin SOP/TSSOP
	μPC812	μPC4092	±5 to ±16	±3	6.8	15	2	8-pin SOP/TSSOP
	μPC813	—	±5 to ±16	±2.5	3.5	25	1	8-pin SOP/TSSOP
	μPC814	μPC4094	±5 to ±16	±3	6.8	25	2	8-pin SOP/TSSOP
	μPC822	μPC4072	±5 to ±16	±10	5	13	2	8-pin SOP/TSSOP
	μPC824	μPC4074	±5 to ±16	±10	10	13	4	14-pin SOP/TSSOP
	μPC832	μPC4062	±2 to ±16	±10	0.5	3	2	8-pin SOP/TSSOP
	μPC834	μPC4064	±2 to ±16	±10	1	3	4	14-pin SOP/TSSOP
Low power	μPC835	—	±5 to ±16	±3	2.2	5.5	2	8-pin TSSOP
	μPC802	—	±1 to ±16	±6	≤0.1	≤1.0	1	8-pin SOP
General	μPC251	μPC1458	±7.5 to ±16	±6	5.6	0.5	1	8-pin SOP

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	μPC177	—	2 to 32	±5	2	1.3	4	14-pin SOP/TSSOP
	μPC271	—	5 to 32	±7.5	7.5	0.2	1	8-pin SOP
	μPC272	μPC319	5 to 16	±8	12.5	0.08	2	14-pin SOP
	μPC277	—	2 to 32	±5	1	1.3	2	8-pin SOP/TSSOP

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

Amplifiers

CURRENT SENSE AMPLIFIERS

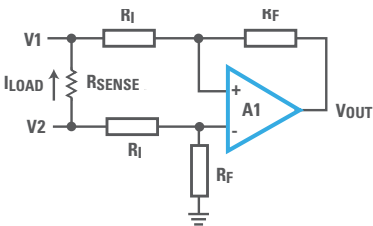
Simplify the Design of Complex Current Monitoring Circuits

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

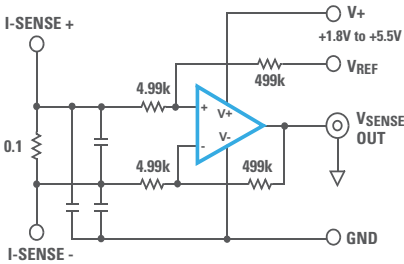
Solution	Vos	Rsense	Rsense Power Loss	Renesas Benefits
Generic	500µV	25mΩ	625mW	—
ISL28x30	40µV	2mΩ	50mW	92% reduction in wasted power
ISL28x34	2.5µV	125µΩ	3mW	99.5% reduction in wasted power

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

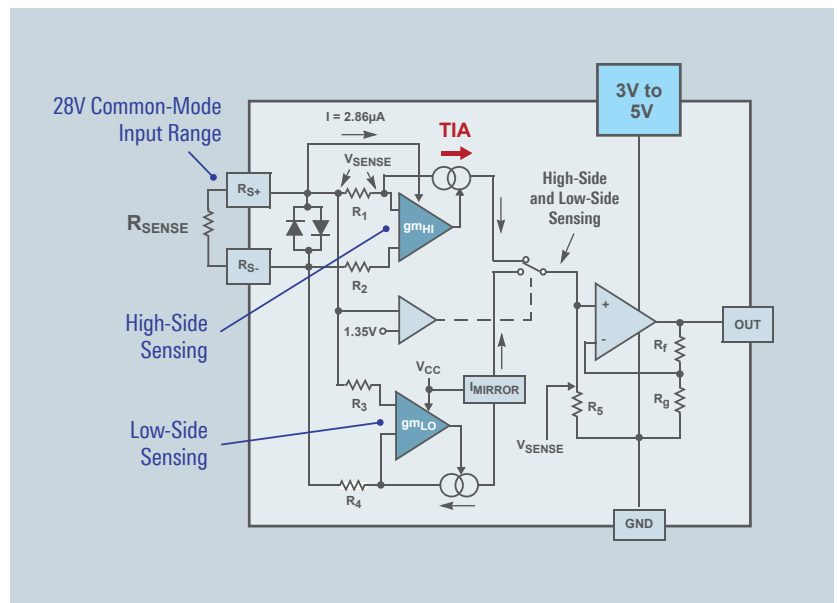
The Simplest Type of Current Sense Amplifiers

The ISL28005 and ISL28006 are ground sensing current sense amplifiers that amplify milli-volt current signals developed across sub-1 Ω 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, 50 μ A (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 TCV₀s



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	μ V	μ V	dB	dB		%	%	μ A	μ A	
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 2Vp-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
- 2Vp-p, 2-tone IM3 (200Ω) 100MHz: -109dBc
- Supply voltage range: 3.0V to 4.2V
- Quiescent power (3.3V supply): 115mW

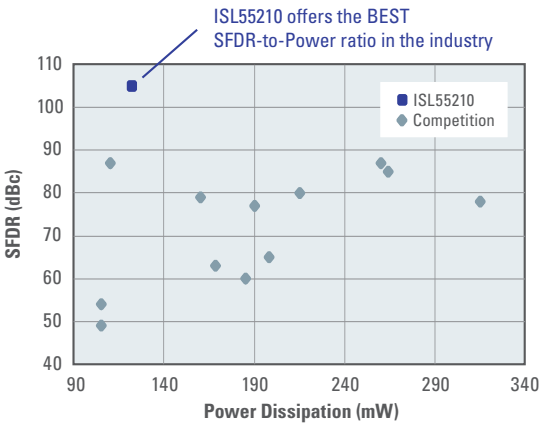
Applications

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

Fully Differential Amplifiers

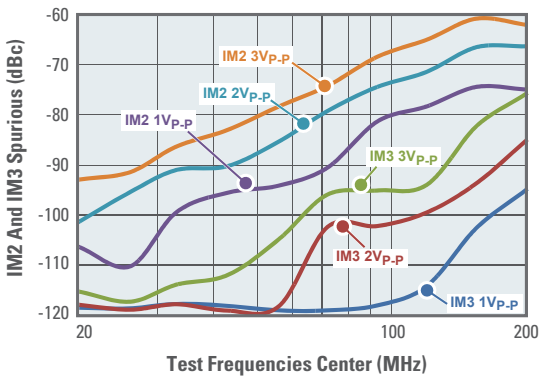
Part Number	# of Channels	Topology	Vs Min (V)	Vs Max (V)	BW (MHz)	Gain (V/V)	Slew Rate (V/μsec)	Noise (nV/√Hz)	Is Max (mA)	IOUT (mA)	Vos Max (mV)	Ib Max (μA)	RR In	RR Out	Headroom (V)	Shutdown
ISL55210	1	FDA	3	4.2	4000	RES	5600	0.85	38.5	30	1.6	140	No	No	1	Yes
ISL55211	1	FDA	3	4.2	1400	2, 4, 5	5600	0.85	38.5	30	1.6	140	No	No	1	Yes

World Best SFDR at Lowest Power



Ultra-low Distortion

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



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)					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

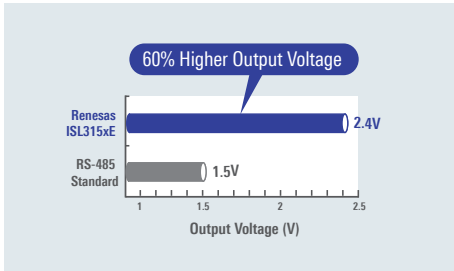
Interface

INTERFACE



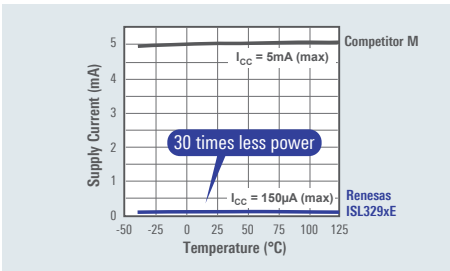
High Noise Immunity

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



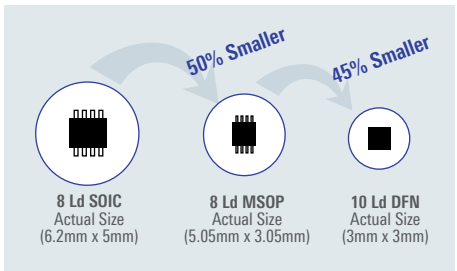
Ultra Low Supply Current

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	RS-232/RS-485	Isolated RS-485
- 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)	- Standard 5V/3V RS-485 Transceivers - Ultra-Low Power RS-485 Transceivers ISL3260XE 1.8V to 3.3V, Micro-Power $\pm 15\text{kV}$ ESD - Overvoltage Protected RS-485 Transceivers - Dual Protocol Transceivers – Programmable ISL813xx, ISL413xx, ISL333x – Fixed ISL333xxE (See next page)	40Mbps, Ultra-low EMI Isolated RS-485 Transceiver ISL32740E/41E - Industry's Smallest Package Isolated RS-485 Transceiver ISL32704E (See next page)

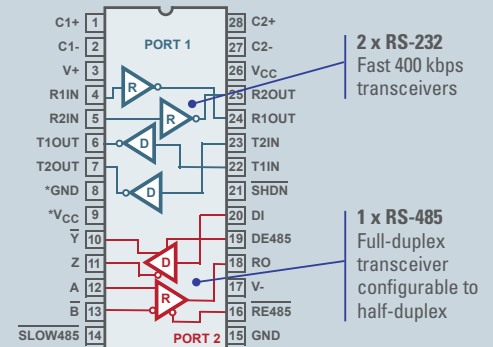
Dual Protocol Transceivers

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

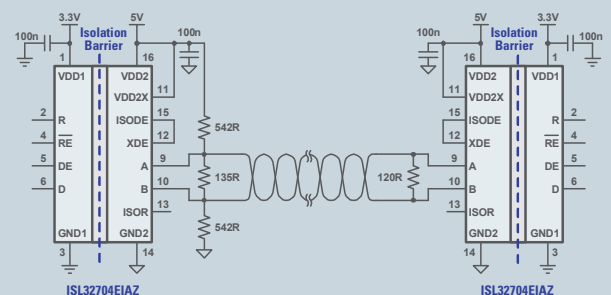
ISL32704E

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

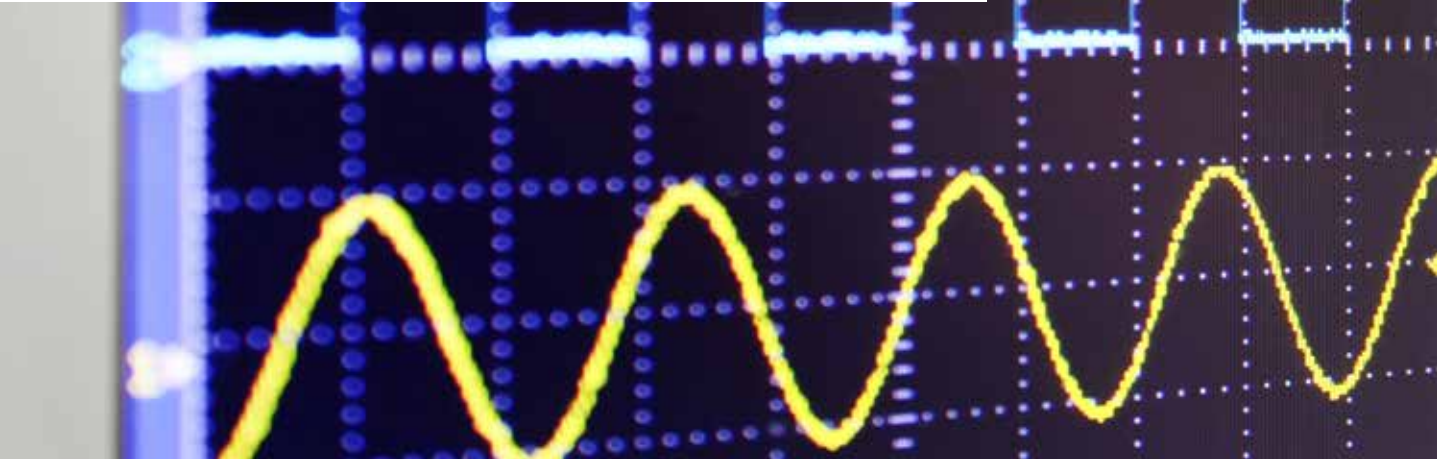


Galvanically Isolated RS-485 Transceiver

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

	8-bit	10-bit	12-bit	14-bit
500+ MSPS	ISLA118P50	ISLA110P50 5510-50	ISLA112P50 5512-50	
250-350 MSPS		5610-25	5512-25 5612-25	5514-25
130-210 MSPS		5610-21 5610-17	5512-21 5512-17 5612-21 5612-17	5514-21 5514-17
Up to 125 MSPS		5610-12	5512-12 5612-12	5514-12

Pin-Compatible Families
Simplify the selection process
and enable design re-use

Single

KAD55XX

Dual

KAD56XX

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

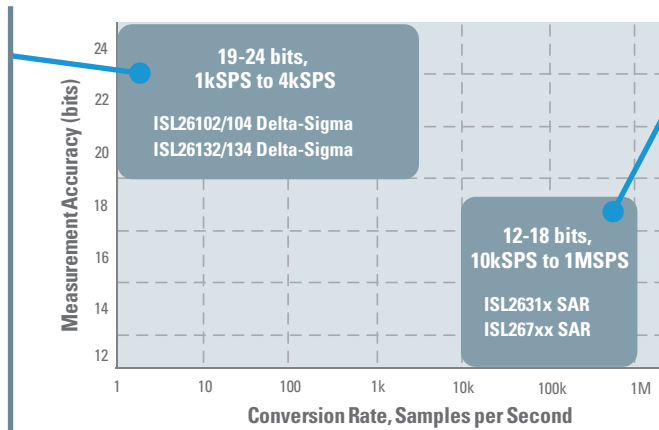
PRECISION DATA CONVERTERS

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

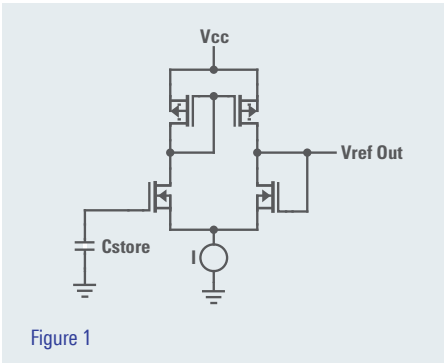
VOLTAGE REFERENCES

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.



Ultra-Low Noise, Precision Voltage Reference

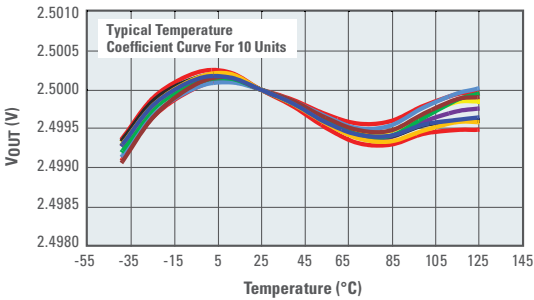
ISL21090

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)

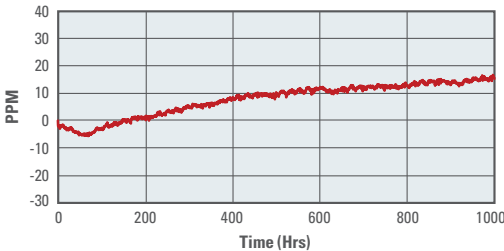
Temperature Drift (Coefficient)

ISL21090 Typical Temperature Coefficient



Long Term Drift

ISL21090 Long Term Drift Data (1000 Hrs)



Precision Voltage References

Type	Part Number	V _{OUT}													Temp Coefficient (max)	I _S (typ)	I _S (max)	V _S (min)	V _S (max)	Initial Accuracy (% V _{OUT} @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										
Low Noise	ISL21090				●				●				●	●	7ppm/°C	750μA (1.25V Option)	1.28mA	3.7V	36V	±0.03% (1.25V Option)	1.0μV _{PP} (1.25V option)	—	SOIC8	-40 to 125
Low Cost	ISL21010		●		●	●		●	●		●	●	●		50ppm/°C	48μA	100μA	2.2V	5.5V	0.2%	58μV _{PP} (2.048V option)	100	SOT3	-40 to 125
	ISL21080	●	●		●	●		●	●		●	●	●	●	50ppm/°C	300nA	1.5μA	2.7V	5.5V	<0.7%	30μV _{PP}	100	SOT3	-40 to 85
NanoPower	ISL60002		●	●	●		●	●	●	●	●				20ppm/°C	350nA	900nA	2.7V	5.5V	<0.49%	30μV _{PP}	100	SOT3	-40 to 85
	X60003												●	●	10ppm/°C (B grade)	500nA	900nA	4.5V	9V	<0.1%	30μV _{PP}	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 I ² C/SPI when μ C has low voltage I/O pins.
Low Current Consumption	2.5 μ A - 1CH 3 μ A - 2CH 5 μ A - 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	 μ TQFN (2.1x1.6mm)	 SC-70 (2x2.1mm)	20% Smaller
Dual	ISL23325, ISL23425, ISL23328, ISL23428	 μ TQFN (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 – 10k Ω , Up-Down
- **Single 32-Tap (5-bits)**
D X9314 – 10k Ω , Log Taper, Up-Down
X9315 – 10k Ω / 50k Ω / 100k Ω , Up-Down
D X9511 – 10k Ω , Push Button
- **Single 100-Tap (~6.65-bits)**
X9317 – 10k Ω / 50k Ω / 100k Ω , Up-Down
X9318 – 10k Ω , Up-Down
X9319 – 10k Ω / 50k Ω , Up-Down
D X9C102 – 1k Ω , Up-Down
D X9C103 – 10k Ω , Up-Down
D X9C104 – 100k Ω , Up-Down
D X9C503 – 50k Ω , Up-Down
D X9C303 – 32k Ω , Log Taper, Up-Down
- **Single 128-Tap (7-bits)**
ISL22316 – 10k Ω , I²C
ISL22317 – 10k Ω , 1% Tolerance, I²C
E ISL95311 – 10k Ω , I²C
E ISL95310 – 50k Ω , Up-Down
- **Single 256-Tap (8-bits)**
ISL95810 – 10k Ω / 50k Ω , I²C
- **Single 1024-Tap (10-bits)**
D X9110 – 100k Ω , SPI
X9111 – 100k Ω , SPI
D X9118 – 100k Ω , 2-Wire
X9119 – 100k Ω , 2-Wire

- **Dual 128-Tap (7-bits)**
ISL22326 – 10k Ω , I²C
- **Dual 256-Tap (8-bits)**
X95820 – 10k Ω / 50k Ω , I²C
D X9268 – 50k Ω / 100k Ω , 2-Wire
D ISL22424 – 10k Ω , SPI

- **Quad 64-Tap (6-bits)**
D X9408 – 2.5k Ω / 10k Ω , 2-Wire
- **Quad 128-Tap (7-bits)**
ISL22346 – 10k Ω / 50k Ω , I²C
- **366Quad 256-Tap (8-bits)**
X95840 – 10k Ω / 50k Ω , I²C
D X9250 – 50k Ω / 100k Ω , SPI
X9251 – 50k Ω , SPI
X9252 – 2k Ω / 10k Ω , 2-Wire
D X9258 – 50k Ω / 100k Ω , 2-Wire
X9259 – 50k Ω , 2-Wire

Special Function DCPs

- **Dual Audio DCP – Integrated Output Buffer Amps and Audio Detect**
ISL22102 – 32k Ω , Log Taper, Push Button, 0 to -72dB Dynamic Range
- **Low Voltage 1% Tolerant Precision DCP & Low Temperature Coefficient**
ISL22317 – 10k Ω , 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) – 10k Ω , I²C
ISL22326WM (Dual) – 10k Ω , I²C
ISL22346WM (Quad) – 10k Ω , I²C

Volatile (No EEPROM Memory)

- **Single 32-Tap (5-bits)**
ISL23511 – 10k Ω , Push Button
ISL90461 – 10k Ω / 50k Ω / 100k Ω , Up-Down, 2-Pin, Rheostat
ISL90462 – 10k Ω / 50k Ω , Up-Down, 2-Pin, Voltage Divider Only
- **Single 128-Tap (7-bits)**
ISL90726 – 10k Ω / 50k Ω , I²C, Rheostat
ISL90727/28 – 10k Ω / 50k Ω , I²C, Voltage Divide Only
ISL23318 – 10k Ω / 50k Ω / 100k Ω , I²C, Low Voltage
ISL23418 – 100k Ω , SPI, Low Voltage
- **Single 256-Tap (8-bits)**
ISL23315 – 100k Ω , I²C, Low Voltage
ISL23415 – 100k Ω , SPI, Low Voltage

- **Dual 32-Tap (5-bits)**
ISL22102 – 32k Ω , Log Taper, Audio Detect, Push Button
- **Dual 128-Tap (7-bits)**
ISL23328 – 10k Ω / 100k Ω , I²C, Low Voltage
ISL23428 – 10k Ω / 100k Ω , SPI, Low Voltage
- **Dual 256-Tap (8-bits)**
ISL23325 – 10k Ω / 100k Ω , I²C, Low Voltage
ISL23425 – 10k Ω / 100k Ω , SPI, Low Voltage

- **Quad 256-Tap (8-bits)**
ISL90841 – 50k Ω , I²C
ISL90842 – 10k Ω / 50k Ω , 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

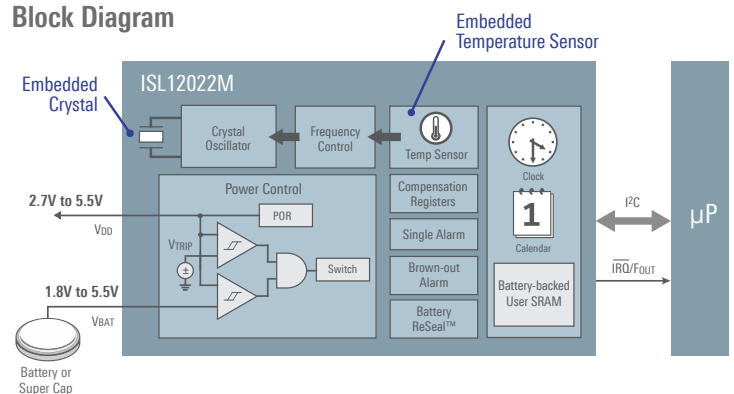
- Integrated crystal and temperature compensation

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

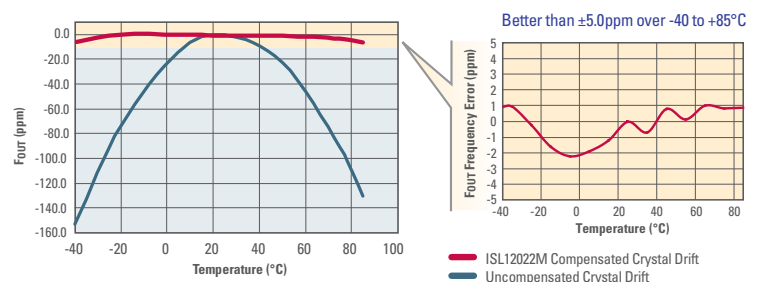
ISL12022M

- ± 5 ppm accuracy (-40°C to $+85^{\circ}\text{C}$)
 - 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

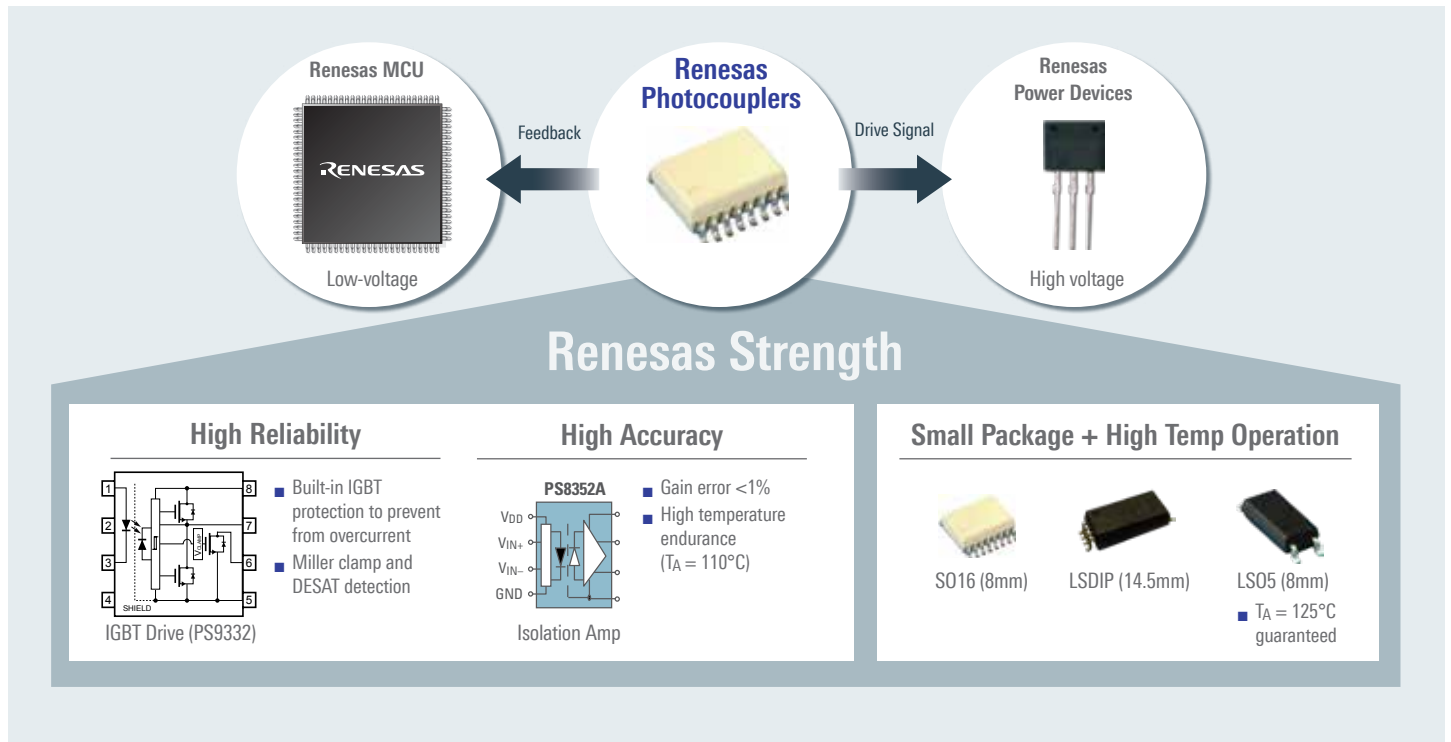


Real-Time Clocks

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

PHOTOCOUPLERS

Providing Highly Reliable, High Accuracy Small Footprint Solutions



Featured Products

IGBT Drive Photocouplers

- A gate drive coupler drives the gate of an IGBT device. Available output currents are 0.6A and 2.5A
- The package lineup includes LS05 and SDIP, ensuring 8mm creepage distance, as well as a 14.5mm creepage type, LSDIP.

LSDIP (creepage distance 14.5mm)

Isolation Voltage: 7.5kVr.m.s.



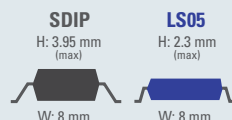
Industry's First Package

- Reduces the power loss of customer systems at higher voltages
- Substantially reduces the customer's cost in comparison with conventional package

LS05 (height: 2.3mm max.)

$T_A = 125^\circ\text{C}$ Guaranteed

- 8mm creepage to support 400V-class equipment
- $T_A = 125^\circ\text{C}$ for greater heat dispersion design margin
- Smaller mounting area than conventional SDIP package
 - Smaller footprint and lower BOM cost

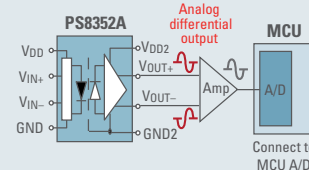
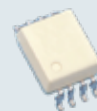


Analog or Digital Isolation Amplifiers

- Isolation amplifiers (analog output) enable accurate current and voltage monitoring
- Delta-sigma modulator (digital output) are optically coupled one-bit data stream output isolators.

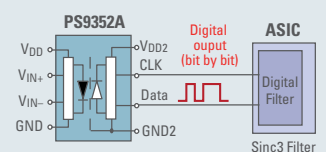
PS8352A (analog output)

Isolation amplifier produces differential output at eight times the voltage of the input analog voltage.



PS9352A (digital output)

Delta-sigma modulator converts the input analog voltage to bit-by-bit digital data.



IC Output Photocouplers

Category	Function	Output	V _{CC} /V _{DD}	DIP8 7mm/8mm	SDIP6/8 7mm/8mm	LSDIP8 14.5mm	LS05 8mm	S05 4.2mm	S016 8mm
									
Motor Drive	IGBT Drive	Digital	35V 2.5/2.0A	PS9531	PS9331 PS9332	PS9905	PS9031	—	PS9402
			35V 0.6A	PS9506	PS9307A	—	—	—	—
	IPM Drive	Digital	>20V	PS9513	PS9313 PS9303 PS9309	—	PS9013 PS9009	PS9113	—
Current/Voltage Detection	Isolation Amplifier	Analog	5V	PS8551A	PS8352A	—	—	—	S08 4mm 
	$\Delta\Sigma$ Modulator	Digital	5V	PS9551A	PS9352A	—	—	—	—
Communication	15Mbps	CMOS	5V	—	PS9351	—	—	PS9151	PS9851-1 PS9851-2
		Totem Pole	5V	—	—	—	—	PS9123	—
	10Mbps	Open Collector	5V	PS9587	PS9317	—	PS9001	PS9117A	PS9817A-1 PS9817A-2
			3.3V/5V	—	PS9324	PS9924	—	PS9124	PS9821-1 PS9821-2
	1Mbps	Digital	3.3V/5V	—	—	—	—	PS9122	PS9822-1 PS9822-2
		Analog	35V	PS8501 PS8502	PS8302	PS8902	—	PS8101	—

Transistor Output Photocouplers

Input	Output	Function	DIP4 7mm	LSOP 8mm	SSOP 5mm	SSOP 4mm	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	PS2861B-1	—	—
		High Voltage (120V)	—	—	PS2703-1	—	—	—
		Low Input	—	—	PS2711-1	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	PS2805C-1 PS2805C-4	—	—
		Low Input	—	—	PS2715-1	PS2815-1 PS2815-4	PS2845-4A	PS2915-1
	Darlington	General Purpose	PS2506-1	—	PS2706-1	—	—	—

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