

# PHOTOCOUPLERS

High performance and high functionality photocouplers for motor drive, current and voltage sensing and communication functions in a variety of packages.





# RENESAS PHOTOCOUPPLERS CONTRIBUTE TO THE REALIZATION OF INDUSTRIAL SYSTEMS THAT ARE SAFE, EFFICIENT, AND ENVIRONMENTALLY FRIENDLY.



## CONTENTS

Isolation Amplifiers, Communication Applications	04
New Package	04
IGBT Drive, IPM Drive	05
Application Examples	06
Product Lineup	08





In manufacturing and industrial settings, photocouplers convey control signals while shielding persons and control systems from high voltages. Renesas photocouplers enable isolation of high voltages in solar and wind power generation systems, and in inverters that convert DC power to AC they enable accurate signal transfer and help improve power efficiency. The lineup includes products with integrated functionality for protecting the IGBTs used in inverter circuits. Also available are high-precision isolation amplifiers, for accurate voltage monitoring and motor control, and IC- or transistor-output products, which isolate microcontrollers and control devices while allowing high-speed signal transfer. Renesas photocoupler products deliver improved efficiency in manufacturing and industrial applications while contributing to safe and stable operation.

# Isolation Amplifiers, Communication Applications

## Δ-Σ Modulators, Isolation Amplifiers

### RV1S9353A Δ-Σ Modulator/PS8352A Isolation Amplifier

Contributes to highly precise motor control with high precision and high input resistance.

(Δ-Σ Modulator & Very High Precision Isolation Amplifier)

- Contribution

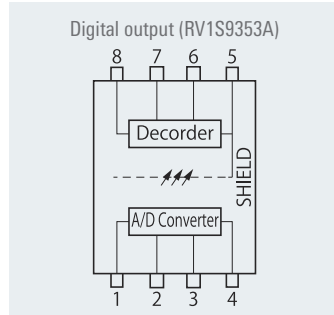
Direct connection to RZ/T and RX72M

- Features

-High precision: Gain  $\pm 0.5\%$  MAX.

-Effective Number of Bit (ENOB)  
13.8 bits TYP.

-Input Offset Voltage Drift vs.  
Temperature 2.5  $\mu\text{V}/^\circ\text{C}$  MAX.



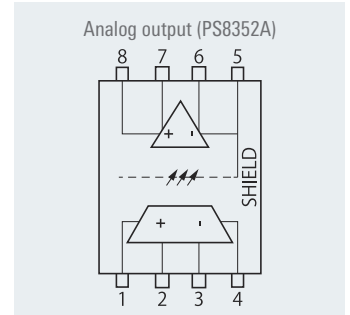
- Contribution

High-precision feedback

- Features

-High precision: Gain  $\pm 1\%$  MAX.

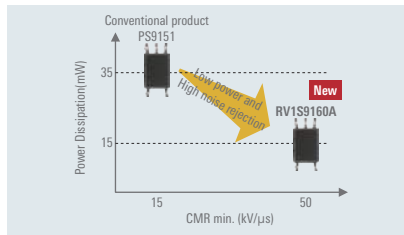
-High input resistance: 450 k $\Omega$



## Low Input current 15 Mbps

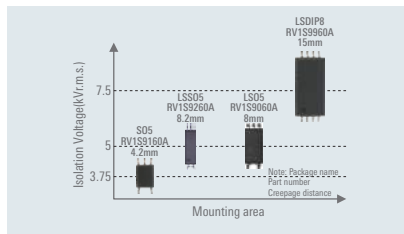
- Suitable for industrial equipment

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



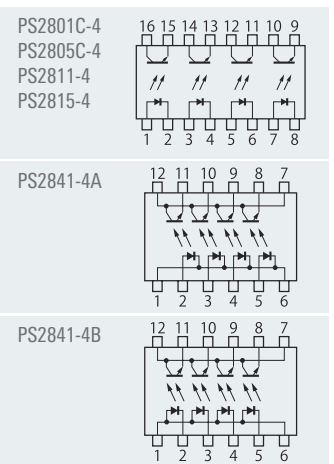
- Advantages

Compact I/O

- Features

Low input

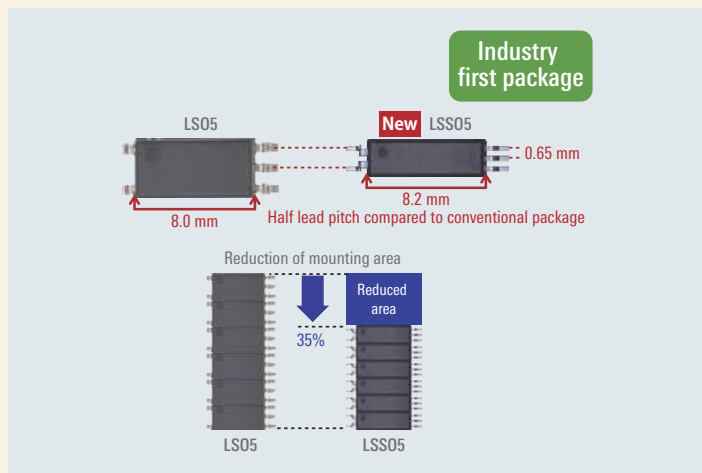
4-channel package (SSOP, common leads)



## New Package

### LSS05(5pin)/LSSOP(4pin)

- Downsizing while maintaining long creepage 8.2 mm (35% reduction in mounting area compared to LS05)
- Lineup: 15 Mbps, IPM drive, IGBT drive, Transistor output



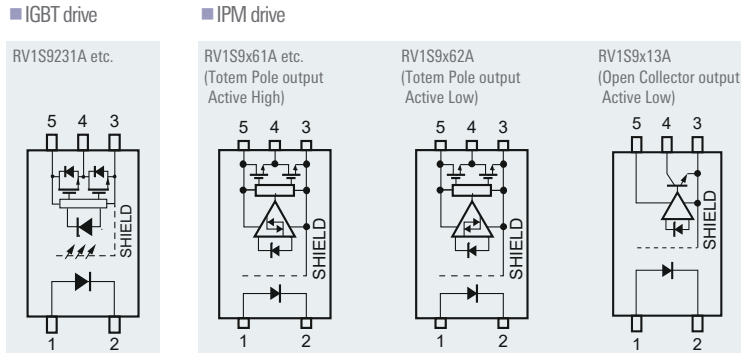


# IGBT Drive, IPM Drive

## IGBT Drive, IPM Drive

Reduced IGBT switching loss contributes to improved inverter efficiency, better real-time performance, and greater compactness.

- Advantages
  - IGBT on-off operation at high dv/dt
- Features (RV1S9x61A, RV1S9x62A)
  - Small PDD 25 ns max.
  - High CMR: ± 100 kV/μs, min.
  - High-temperature operation: Ta = 125°C max.

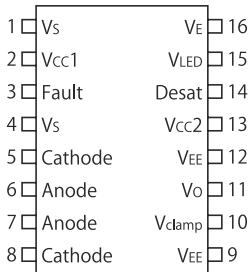


## IGBT Drive with Protection Functions

**PS9402 IGBT drive coupler with protection functions**  
 Integrated peripheral functions for reduced board area (IGBT gate driver with protection functions)

- Advantages
  - Lower design and board costs due to reduced need for external protection circuits and elimination of negative power supply

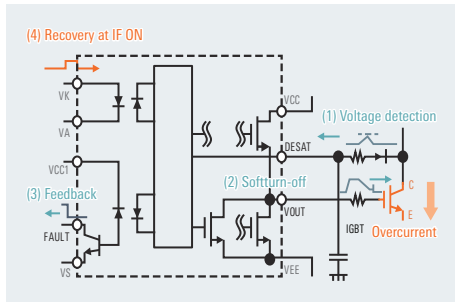
- Features
  - Two on-chip protection functions
  - Desat (desaturation detection)
  - Active Miller clamp



### Desat

Protects the IGBT from damage from overcurrent.

- (1) Detects rise in the collector voltage due to overcurrent.
- (2) Softturn-off of Vout (IGBT gate).
- (3) Fault feedback to the MCU.
- (4) Operation recovery when IF input turns on again.

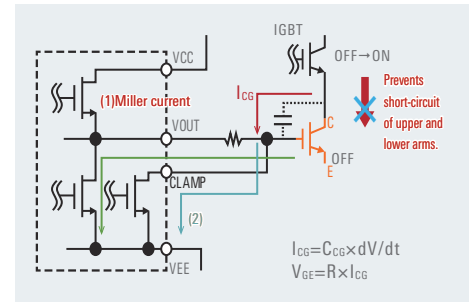


### Active Miller clamp

Prevents short-circuit of upper and lower arms if IGBT turns on erroneously.

The displacement current (Miller current(1) \*) when the upper arm turns on is drawn off by the clamp circuit(2), preventing erroneous on-switching.

\* Current (ICG) that flows to the Miller capacitance between the collector and gate of the IGBT

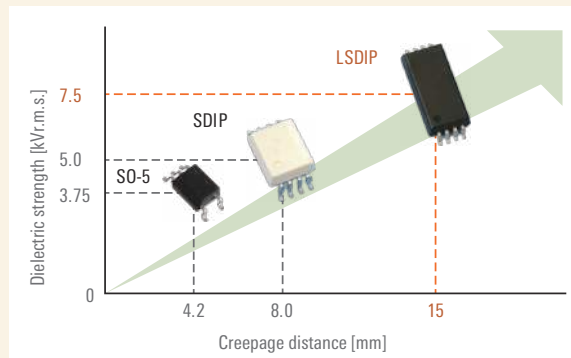


## LSDIP

Advanced package for high-voltage systems  
 (Package with very long creepage of 15 mm)

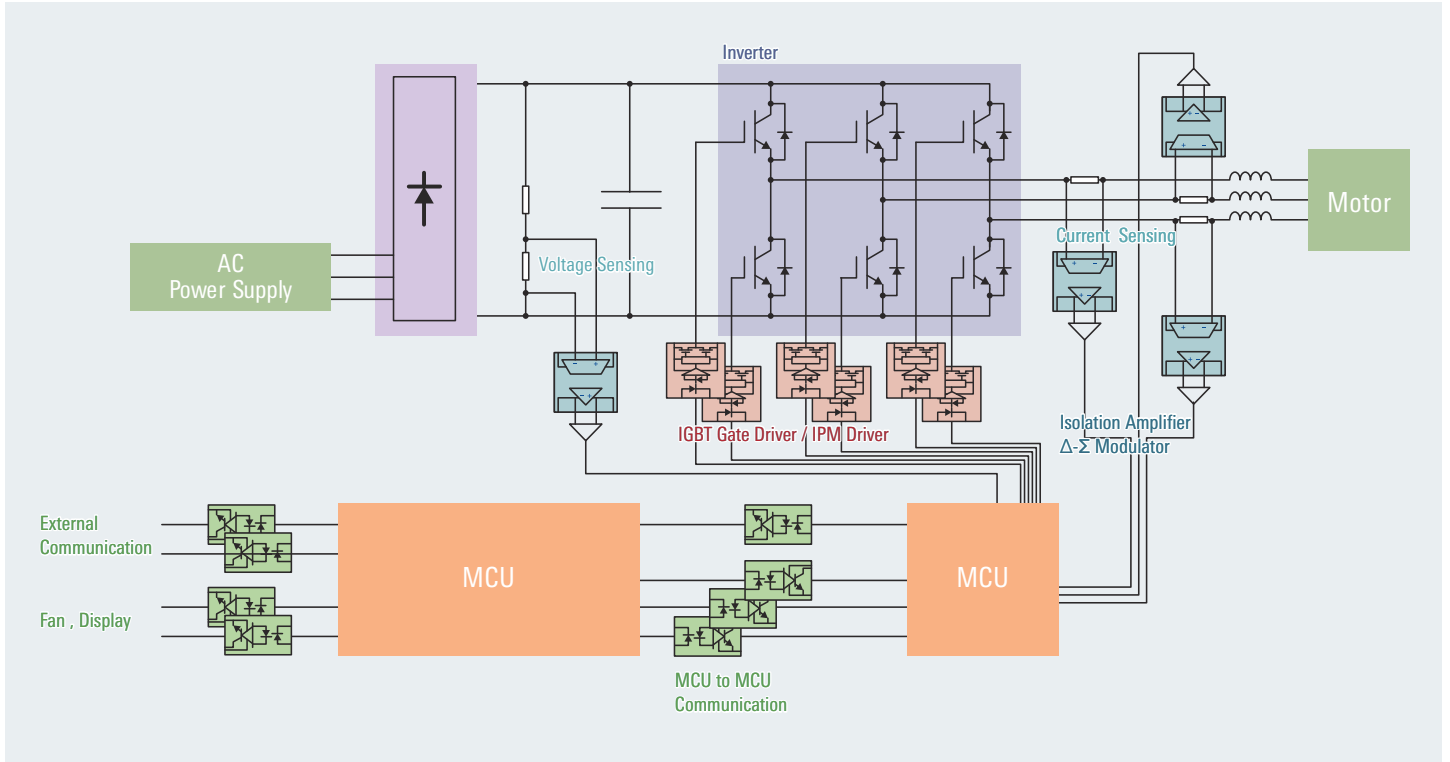
- Features
  - Long creepage of 15 mm
  - High dielectric strength: 7.5 kV r.m.s.
  - High surge resistance: 12 kV allowable transient voltage
- Advantages
  - Less board space is needed to ensure isolation.
  - Enables smaller boards for large-capacity battery control.
  - Simplifies high-voltage feedback.

- Lineup
  - PS9905 for IGBT drive
  - RV1S9960A for 15Mbps high-speed communication
  - PS9924 for 10 Mbps high-speed communication
  - PS8902 for 1 Mbps analog
- Application
  - 1500V Solar inverter
  - 690V Industrial inverter
  - 480V Medical equipment

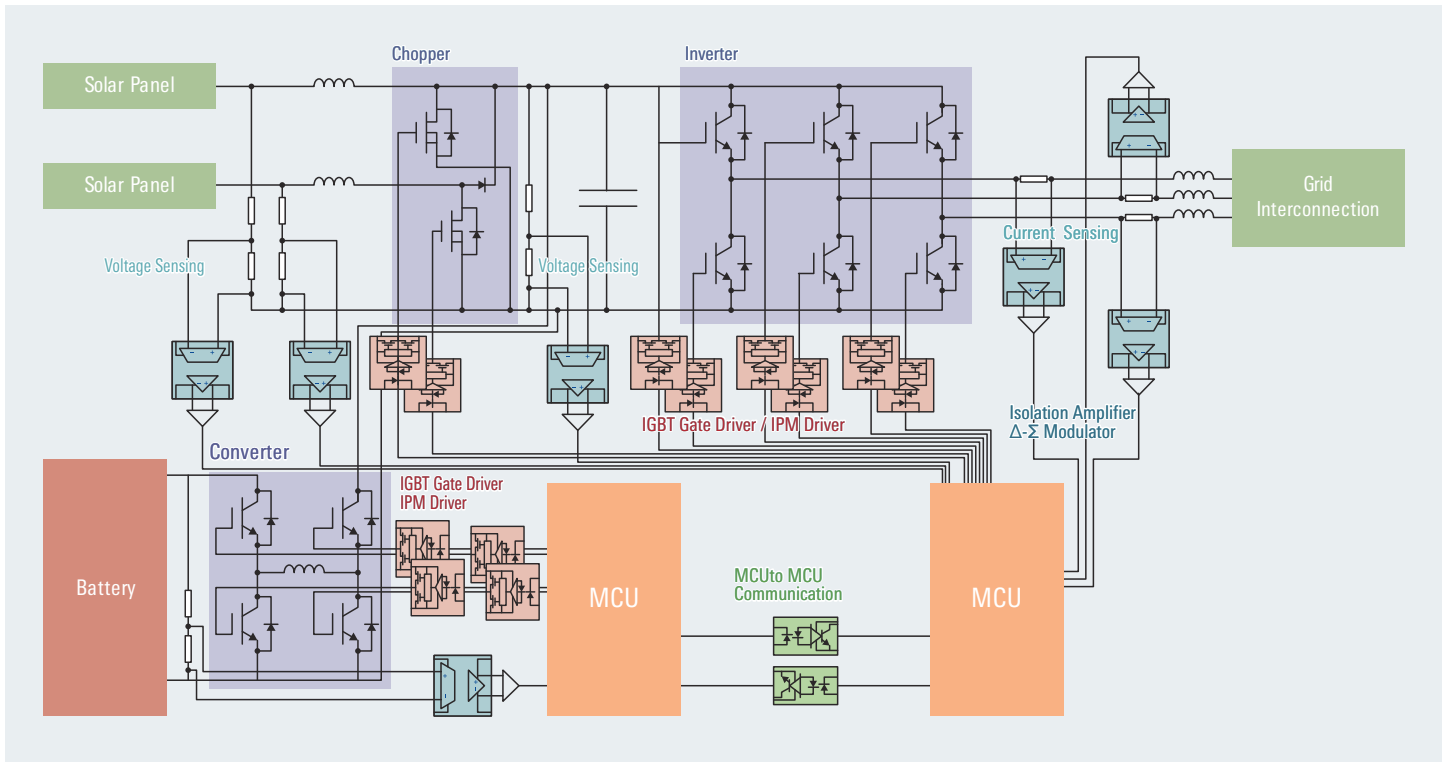


# Application Examples

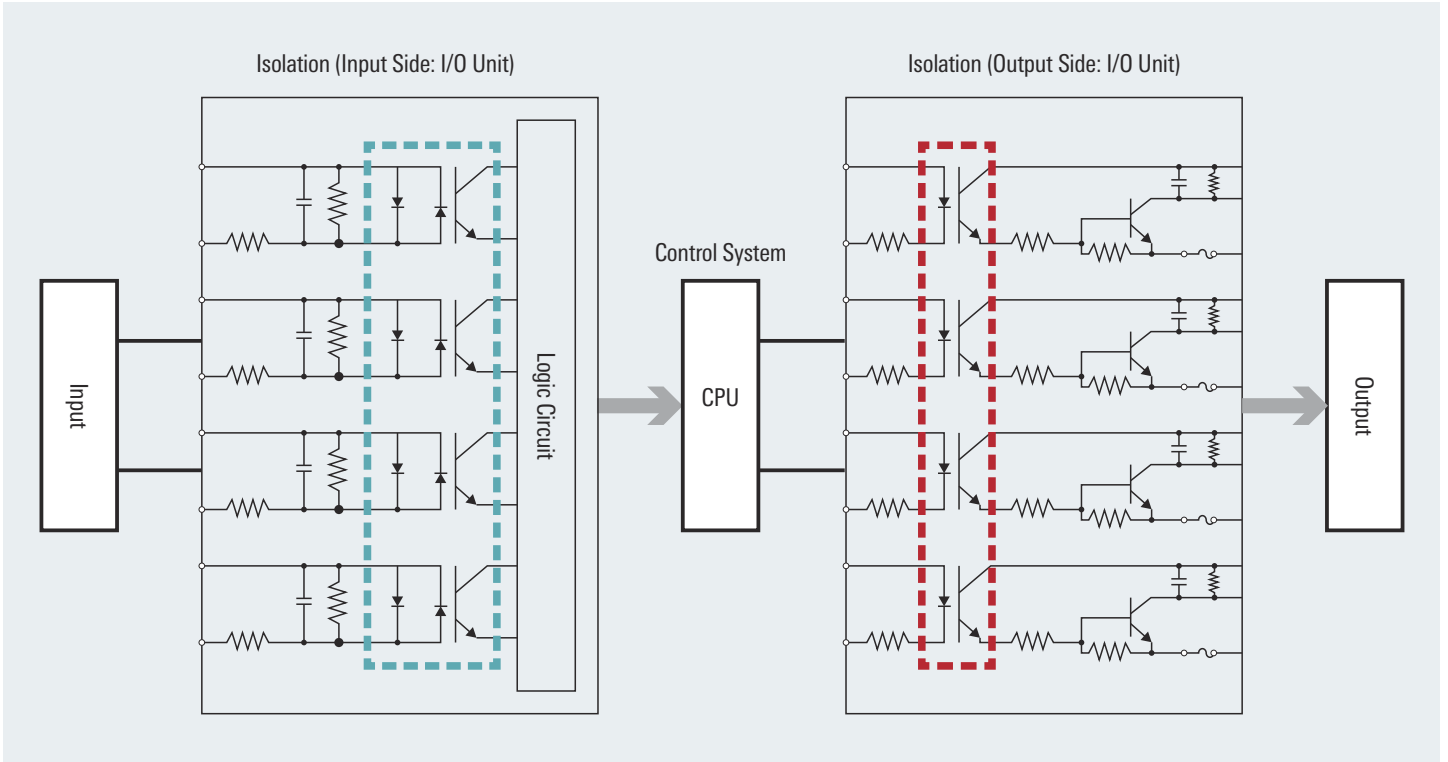
## Motor Solution



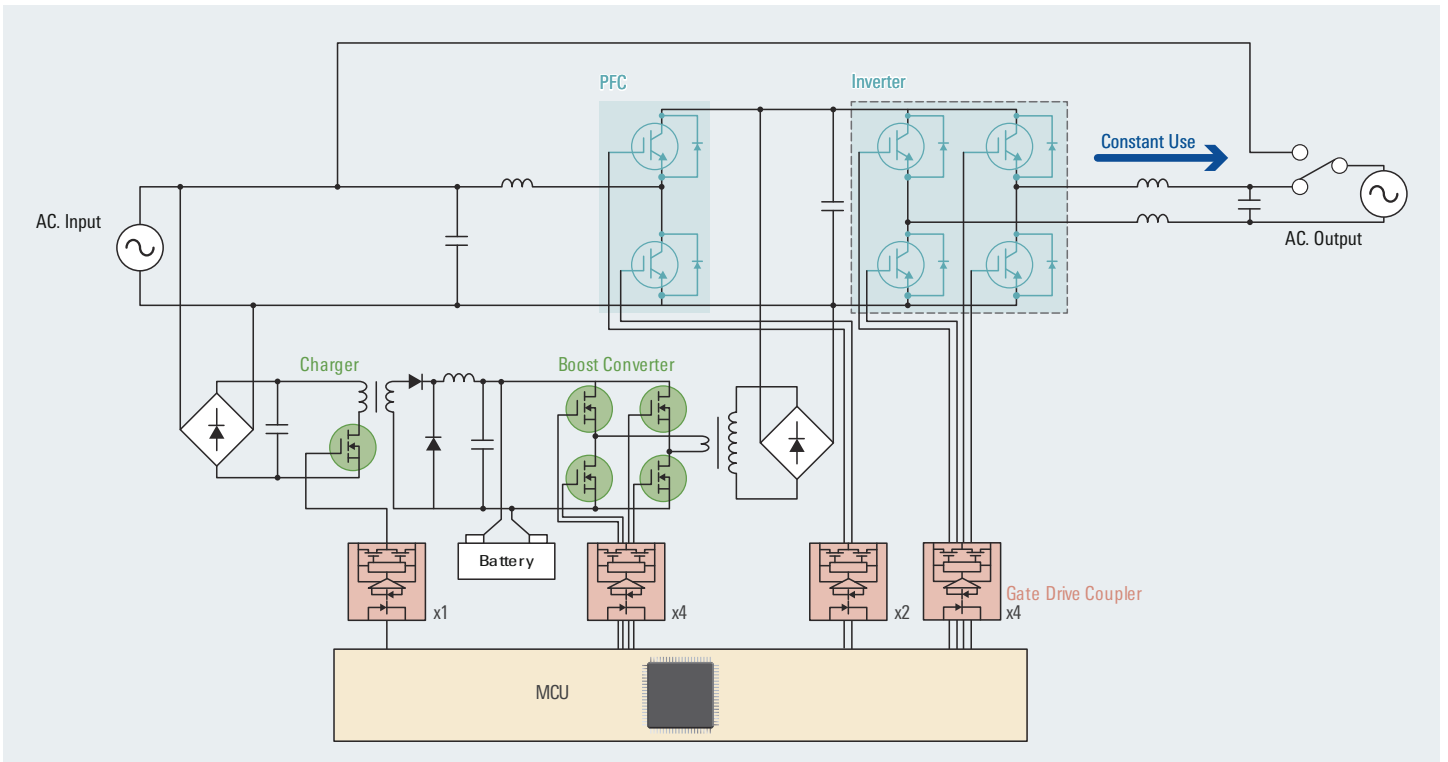
## Power Control + Storage Battery



# PLC



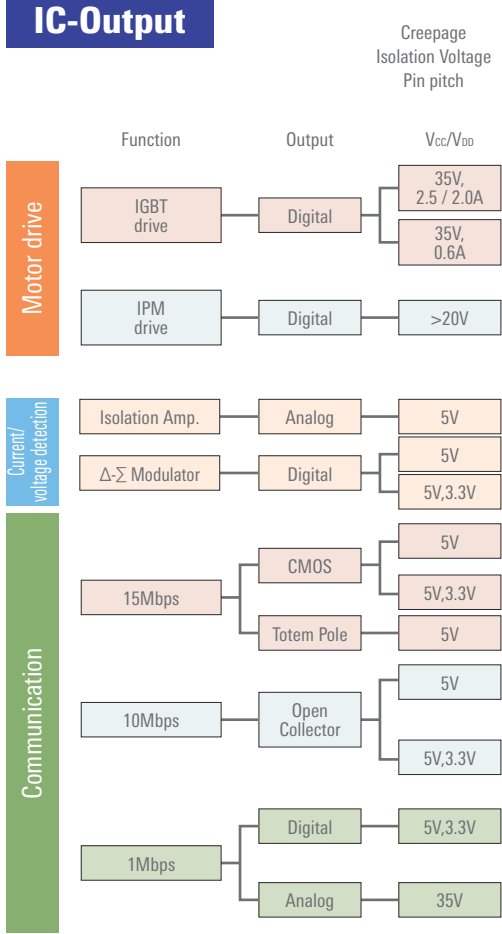
# UPS



# Product Lineup

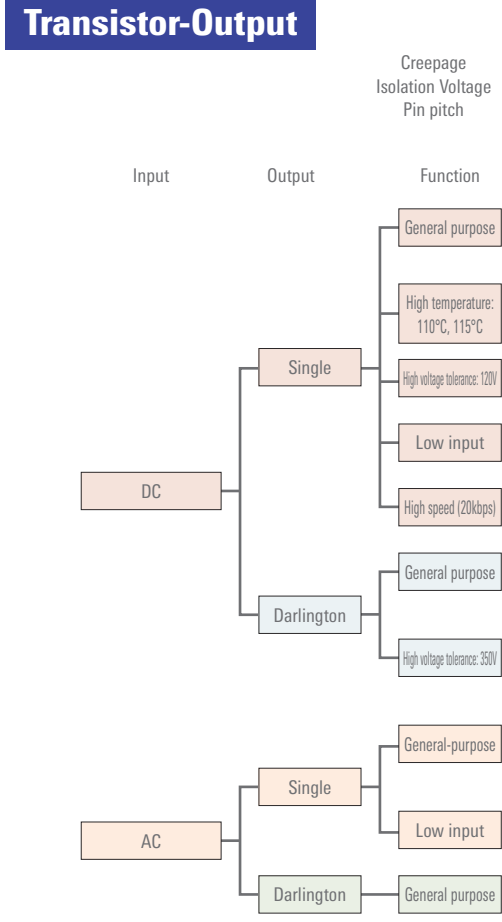
The extensive lineup extends from high-speed products for motor drive of communication applications to general-purpose transistor-output products.

## IC-Output



DIP8 7/8 mm 5 kV 2.54 mm	SDIP 7/8 mm 5 kV 1.27 mm	LSDIP8 15 mm 7.5 kV 1.27 mm	LS05 8 mm 5 kV 1.27 mm	S05 4.2 mm 3.75 kV 1.27 mm	LSS05 8.2 mm 5 kV 0.65 mm	S08 4 mm 2.5 kV 1.27 mm	S016 8 mm 5 kV 1.27 mm
PS9531	PS9331 PS9332	PS9905	PS9031		RV1S9231A		PS9402
PS9506	PS9307A				RV1S9207A		
PS9513	PS9313		PS9013 RV1S9062A	PS9113 RV1S9162A	RV1S9213A RV1S9262A		
	PS9303 PS9309		PS9009 RV1S9061A	RV1S9161A	RV1S9209A RV1S9261A		
PS8551A	PS8352A						
PS9551A							
	RV1S9353A						
	PS9351			PS9151		PS9851-1 PS9851-2	
		RV1S9960A	RV1S9060A	RV1S9160A	RV1S9260A		
				PS9123			
PS9587	PS9317		PS9001	PS9117A		PS9817A-1 PS9817A-2	
	PS9324	PS9924		PS9124		PS9821-1 PS9821-2	
						PS9822-1 PS9822-2	
PS8501 PS8502	PS8302	PS8902		PS8101		PS8802-1 PS8802-2	

## Transistor-Output



DIP4 7/8 mm 5 kV 2.54 mm	LSOP 8 mm 5 kV 2.54 mm	SOP 5 mm 3.75 kV 2.54 mm	LSSOP 8.2 mm 5 kV 1.3 mm	SSOP 4/4.5/5 mm 1.5/2.5/3.75 kV 0.8/1.27 mm	Flat lead 4 mm 2.5 kV 1.27 mm
		PS2701A-1		PS2801C-1/4	
PS2561D-1 PS2561F-1	PS2381-1	PS2761B-1	RV1S2281A	PS2861B-1	
		PS2703-1			
		PS2711-1	RV1S2211A	PS2811-1/4 PS2841-4A/4B	PS2911-1 PS2913-1
PS2514-1					
PS2562-1		PS2702-1		PS2802-1/4	
PS2533-1 PS2535-1		PS2733-1		PS2833-1/4	
PS2565-1		PS2705A-1	RV1S2285A	PS2805C-1/4	
		PS2715-1		PS2815-1/4 PS2845-4A	PS2915-1
PS2506-1		PS2706-1			



## IGBT Drive

Function	Part No.	Output Peak Current [A]	Power Supply Voltage [V]	Package		Isolation Voltage [Vr.m.s.]	Ta max. [°C]	Electrical Characteristics					Protection Functions		
				Configuration	Creepage Distance [mm]			DC	SW			Protection			
									IFLH max. [mA]	tpHL,LH max. [ns]	PWD max. [ns]	PDD [ns]	CMR min. [kV/μs]	UVLO	Clamp
IGBT Drive	PS9307A	0.6	10 to 30	SDIP6	L:7 L2:8	5000	125	5.0	150	50	-80 to 80	50	○	–	–
	RV1S9207A			LSS05	8.2	5000	125	5.0	150	50	-80 to 80	50	○	–	–
	PS9506			DIP8	-/L3:7 L1/L2:8	5000	110	7.0	400	250	-300 to 300	25	–	–	–
	PS9031	2.5	15 to 30	LS05	8	5000	125	4.0	175	75	-90 to 90	50	○	–	–
	RV1S9231A			LSS05	8.2	5000	125	5.2	175	75	-90 to 90	50	○	–	–
	PS9331			SDIP6	L:7 L2:8	5000	125	4.0	175	75	-90 to 90	50	○	–	–
	PS9531			DIP8	-/L3:7 L1/L2:8	5000	125	4.0	175	75	-90 to 90	50	○	–	–
	PS9905			LSDIP8	15	7500	110	6.0	150	75	-100 to 100	25	○	–	–
	PS9332	2	15 to 30	SDIP8	L:7 L2:8	5000	125	4.0	200	75	-90 to 90	50	○	○	–
	PS9402	2.5	15 to 30	SO16	8	5000	110	5.0	200	100	-100 to 100	25	○	○	○

## IPM Drive

Function	Part No.	Output Type	Logic	Package		Recommended Operating Conditions	Absolute Maximum Ratings		Electrical Characteristics					
				Configuration	Creepage Distance [mm]		Power Supply Voltage [V]	Isolation Voltage [Vr.m.s.]	Ta max. [°C]	DC	SW			CMR min. [kV/μs]
											IFHL/LH max. [mA]	tpHL/LH max. [ns]	PWD max. [ns]	
IPM Drive	RV1S9161A	Totem Pole	Active High	S05	4.2	4.5 to 30	3750	125	3.0	60	20	25	100	
	PS9009			LSS05	8	4.5 to 20	5000	125	3.0	200	80	100	50	
	RV1S9061A				4.5 to 30	5000	125	4.5	60	20	25	100		
	RV1S9209A			LSS05	8.2	4.5 to 20	5000	125	3.8	200	80	100	50	
	RV1S9261A				4.5 to 30	5000	125	4.0	60	20	25	100		
	PS9309			SDIP6	L:7 L2:8	4.5 to 20	5000	110	3.0	200	80	80	15	
	PS9303			SDIP6	L:7 L2:8	4.5 to 20	5000	100	5.0	500	350	–	15	
	RV1S9162A			S05	4.2	4.5 to 30	3750	125	3.0	60	20	25	100	
	RV1S9062A			LSS05	8	4.5 to 30	5000	125	4.1	60	20	25	100	
	RV1S9262A			LSS05	8.2	4.5 to 30	5000	125	4.0	60	20	25	100	
	PS9513	Open Collector	Active Low	DIP8	-/L3:7 L1/L2:8	4.5 to 20	5000	100	5.0	500 750	650	650	15	
	PS9013			LS05	8	4.5 to 25	5000	125	5.0	500 750	650	650	50	
	RV1S9213A			LSS05	8.2	4.5 to 25	5000	125	5.0	500/750	650	650	50	
	PS9313			SDIP6	L:7 L2:8	4.5 to 20	5000	110	5.0	500 750	650	650	15	
	PS9113			S05	4.2	4.5 to 20	3750	100	5.0	500 750	650	650	15	

## Isolation Amplifiers

Function	Part No.	Output	Package		Absolute Maximum Ratings		Electrical Characteristics							
			Configuration	Creepage Distance [mm]	Isolation Voltage [Vr.m.s.]	Ta max. [°C]	Input Voltage Linearity Range [mV]	Gain typ. [V/V]	Gain Error Max. [%]	NL typ. [%]	VDD2 [V]	CMR min. [kV/μs]	fc typ. [kHz]	Output Type
Isolation amplifier	PS8551A	Analog	DIP8	8	5000	105	-200 to 200	8	1	0.014	5	10	100	Differential
	PS8352A		SDIP8	8	5000	110	-200 to 200	8	1	0.014	5	10	100	Differential

## Δ-Σ Modulators

Function	Part No.	Output	Package		Absolute Maximum Ratings		Electrical Characteristics						
			Configuration	Creepage Distance [mm]	Isolation Voltage [Vr.m.s.]	Ta max. [°C]	Input Voltage Linearity Range [mV]	Gain Error Max. [%]	INL typ. [LSB]	VDD2 [V]	ENOB typ. [bits]	CMR min. [kV/μs]	fCLK typ. [MHz]
Δ-Σ Modulators	PS9551A	Digital	DIP8	8	5000	105	-200 to 200	1	3	5	12	15	10
	RV1S9353A		SDIP8	8	5000	110	-200 to 200	0.5	3	3.3/5	13.8	15	10

## High-Speed Communication (Analog)

Function	Part No.	Speed [bps]	Output Type	Absolute Maximum Rated Power Supply Voltage [V]	Package		Isolation Voltage [Vr.m.s.]	Ta max. [°C]	Electrical Characteristics										
					Configuration	Creepage Distance [mm]			Detector				Coupled						
									IOH @Vcc30V max. [μA]	VOL max. [V]	ICCL typ. [μA]	ICCH max. [μA]	CTR@ IF 16mA Vcc 4.5V Vo 0.4V [%]	tpHL/LH max. [ns]	CMR min. [kV/μs]				
High-Speed Communication (Analog)	PS8101	1M	Open Collector	35	S05	4.2	3750	100	100	0.4	50	2	15 to 35	800/1200	15				
	PS8802-1/-2								S08	4.0	2500	100	100	0.4	100/200	2/4	15 and Over	800/1200	15
	PS8302								SDIP6	L:7 L2:8	5000	110	100	0.4	150	1	15 and Over	800/800	15
	PS8501								DIP8	-L3:7 L1/L2:8	5000	100	100	0.4	150	1	15 and Over	800/800	-
	PS8502												100	0.4	150	1	15 and Over	800/800	15
	PS8902								LSDIP8	15	7500	110	100	0.4	50	2	15 to 35	800/1200	15

## High-Speed Communication (Digital)

Function	Part No.	Speed [bps]	Output Type	Power Supply Voltage [V]	Package		Isolation Voltage [Vr.m.s.]	Ta max. [°C]	DC				AC			
					Configuration	Creepage Distance [mm]			VOL max. [V]	VOH min. [V]	ICCL/H max. [mA]	IFHL max. [mA]	tpHL/LH max. [ns]	PWD max. [ns]	tpsk max. [ns]	CMR min. [kV/μs]
High-Speed Communication (Digital)	PS9122	1M	Open Collector	N 2.7~3.6, L 4.5~5.5	S05	4.2	3750	100	0.6	-	3.5/2.5	5.0	500/700	200	-	15
	PS9822-1/-2				S08	4.0	2500	100	0.6	-	3.5/2.5	5.0	500/700	200	-	-
	PS9124	10M	Open Collector	2.7~3.6 & 4.5~5.5	S05	4.2	3750	110	0.6	-	10/7	3.0	100/100	35	40	10
	PS9324				SDIP6	L:7 L2:8	5000	110	0.6	-	10/7	3.0	100/100	35	40	15
	PS9924				LSDIP8	15	7500	110	0.6	-	10/7	5.0	100/100	35	40	15
	PS9821-1/-2				S08	4.0	2500	85	0.6	-	10/7	5.0	100/100	35	40	15
	PS9587				DIP8	-L3:7 L1/L2:8	5000	85	0.6	-	11/8	5.0	100/100	50	60	15
	PS9317				SDIP6	L:7 L2:8	5000	85	0.6	-	10/7	5.0	75/75	35	40	15
	PS9001				LS05	8.0	5000	125	0.6	-	2/2	4.0	100/100	50	60	50
	PS9117A				S05	4.2	3750	85	0.6	-	10/7	5.0	100/100	35	40	15
	PS9817A-1/-2				S08	4.0	2500	85	0.6	-	10/7	5.0	100/100	35	40	15
	PS9123				15M	Totem Pole	4.5~5.5	S05	4.2	3750	100	0.6	2.4	10/7	5.0	60/60
	PS9151	S05	4.2	3750				100	0.1	4.0	5/5	5.0	60/60	30	40	15
	RV1S9160A	CMOS	4.5~5.5	S05		4.2	3750	125	0.1	VDD-0.1	2/2	2	60/60	20	25	50
	PS9851			S08		4.0	2500	100	0.1	4.0	5/5	6.0	60/60	30	40	10
	RV1S9060A			LS05		8	5000	125	0.1	VDD-0.1	2/2	2.2	60/60	20	25	50
RV1S9260A	LSS05			8.2		5000	125	0.1	VDD-0.1	2/2	2.6	60/60	20	25	50	
PS9351	SDIP6			L:7 L2:8		5000	100	0.1	4.0	5/5	5.0	60/60	30	40	15	
RV1S9960A	LSDIP8			15		7500	110	0.1	VDD-0.1	2/2	3.8	60/60	20	25	50	

## Transistor-Output (DC Input) Single

Function	Part No.	Output Type	Package		Absolute Maximum Ratings				Electrical Characteristics				
			Configuration	Creepage Distance [mm]	VCEO max. [V]	IC max. [mA]	Isolation Voltage [Vr.m.s.]	Ta max. [°C]	DC		SW		
									CTR %	tr typ. [μs]	tf typ. [μs]	ton typ. [μs]	toff typ. [μs]
Transistor-Output (DC Input)	PS2561D-1	Single	DIP4	-/L:7 L1/L2:8	80	50	5000	110	50 to 400	3	5	–	–
	PS2561F-1		DIP4	7	80	50	5000	110	300 to 600	5	7	–	–
	PS2514-1		DIP4	7	40	20	5000	100	50 to 200	–	–	15	15
	PS2381-1		LSOP4	8	80	50	5000	115	50 to 400	4	5	–	–
	RV1S2281A		LSSOP	8.2	80	30	5000	115	50 to 400	4	5	–	–
	PS2701A-1		SOP4	5	70	30	3750	100	50 to 300	5	7	8	10
	PS2761B-1		SOP4	5	70	50	3750	110	50 to 400	4	5	8	5
	PS2703-1		SOP4	5	120	30	3750	100	50 to 400	10	10	13	11
	PS2711-1		SOP4	5	40	40	3750	100	100 to 400	4	5	–	–
	PS2801C-1		SSOP4	4.5	80	30	2500	100	50 to 400	5	7	10	7
	PS2801C-4		SSOP16	4.5	80	30	2500	100	50 to 400	5	7	10	7
	PS2861B-1		SSOP4	5	70	50	3750	110	50 to 300	4	5	5	5
	PS2811-1		SOP4	4.5	40	40	2500	100	100 to 400	4	5	7	5
	PS2811-4		SSOP16	4.5	40	40	2500	100	100 to 400	4	5	7	5
	RV1S2211A		LSSOP	8.2	40	40	5000	115	100 to 400	4	5	–	–
	PS2841-4A		SSOP Common Leads	4	70	20	1500	100	100 to 400	–	–	20	110
	PS2841-4B		SSOP Common Leads	4	70	20	1500	100	100 to 400	–	–	20	110
	PS2911-1		Flat Leads	4	40	40	2500	100	100 to 400	5	10	40	120
PS2913-1	Flat Leads	4	120	30	2500	100	50 to 200	10	10	80	50		

## Transistor-Output (DC Input) Darlington

Function	Part No.	Output Type	Absolute Maximum Ratings		Package		Isolation Voltage [Vr.m.s.]	Ta max. [°C]	Electrical Characteristics						
			VCEO [V]	IC [mA/ch]	Configuration	Creepage Distance [mm]			DC		SW				
									CTR min. [%]	CTR max. [%]	VCE SAT [V]	tr typ. [μs]	tf typ. [μs]	ton typ. [μs]	toff typ. [μs]
Transistor-Output (DC Input)	PS2802-1	Darlington	40	90	SSOP4	4.5	2500	100	200	–	1.0	200	200	–	–
	PS2802-4			100	SSOP16	4.5	2500	100	200	–	1.0	200	200	–	–
	PS2562-1			200	DIP4	7	5000	100	200	–	1.0	100	100	–	–
	PS2702-1			200	SOP4	5	3750	100	200	–	1.0	70	60	90	60
	PS2833-1		350	60	SSOP4	4.5	2500	100	400	4500	1.0	20	5	–	–
	PS2833-4			60	SSOP16	4.5	2500	100	400	4500	1.0	20	5	–	–
	PS2535-1			120	DIP4	7	5000	100	400	5500	1.0	18	5	–	–
	PS2533-1			150	DIP4	7	5000	100	1500	6500	1.0	100	100	–	–
	PS2733-1			150	SOP4	5	2500	100	1500	–	1.0	100	100	–	–

## Transistor-Output (AC Input)

Function	Part No.	Output Type	Package		Absolute Maximum Ratings				Electrical Characteristics					
			Configuration	Creepage Distance [mm]	VCEO max. [V]	IC max. [mA]	Isolation Voltage [Vr.m.s.]	Ta max. [°C]	DC		SW			
									CTR %	tr typ. [μs]	tf typ. [μs]	ton typ. [μs]	toff typ. [μs]	
Transistor-Output (AC Input)	PS2565-1	Single	DIP4	7	80	50	5000	100	80 to 400	3	5	–	–	
	PS2705A-1		SOP4	5	70	30	3750	100	50 to 300	5	7	8	10	
	PS2715-1		SOP4	5	40	40	3750	100	100 to 400	4	5	–	–	
	PS2805C-1		SSOP4	4.5	80	30	2500	100	50 to 400	5	7	10	7	
	PS2805C-4		SSOP16	4.5	80	30	2500	100	50 to 400	5	7	10	7	
	PS2815-1		SSOP4	4.5	40	40	2500	100	100 to 400	4	5	7	5	
	PS2815-4		SSOP16	4.5	40	40	2500	100	100 to 400	4	5	7	5	
	RV1S2285A		LSSOP	8.2	80	30	5000	115	50 to 400	4	5	–	–	
	PS2845-4A		SSOP Common Leads	4	70	20	1500	100	100 to 400	–	–	20	110	
	PS2915-1		Flat Leads	4	40	40	2500	100	100 to 400	5	10	40	120	
	PS2506-1		Darlington	DIP4	7	40	200	5000	100	200 min.	100	100	–	–
	PS2706-1			SOP4	5	40	200	3750	100	200 min.	200	200	–	–

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