



US087 Critical Power Monitoring System

May 2020

Critical Power Monitoring System

■ Overview

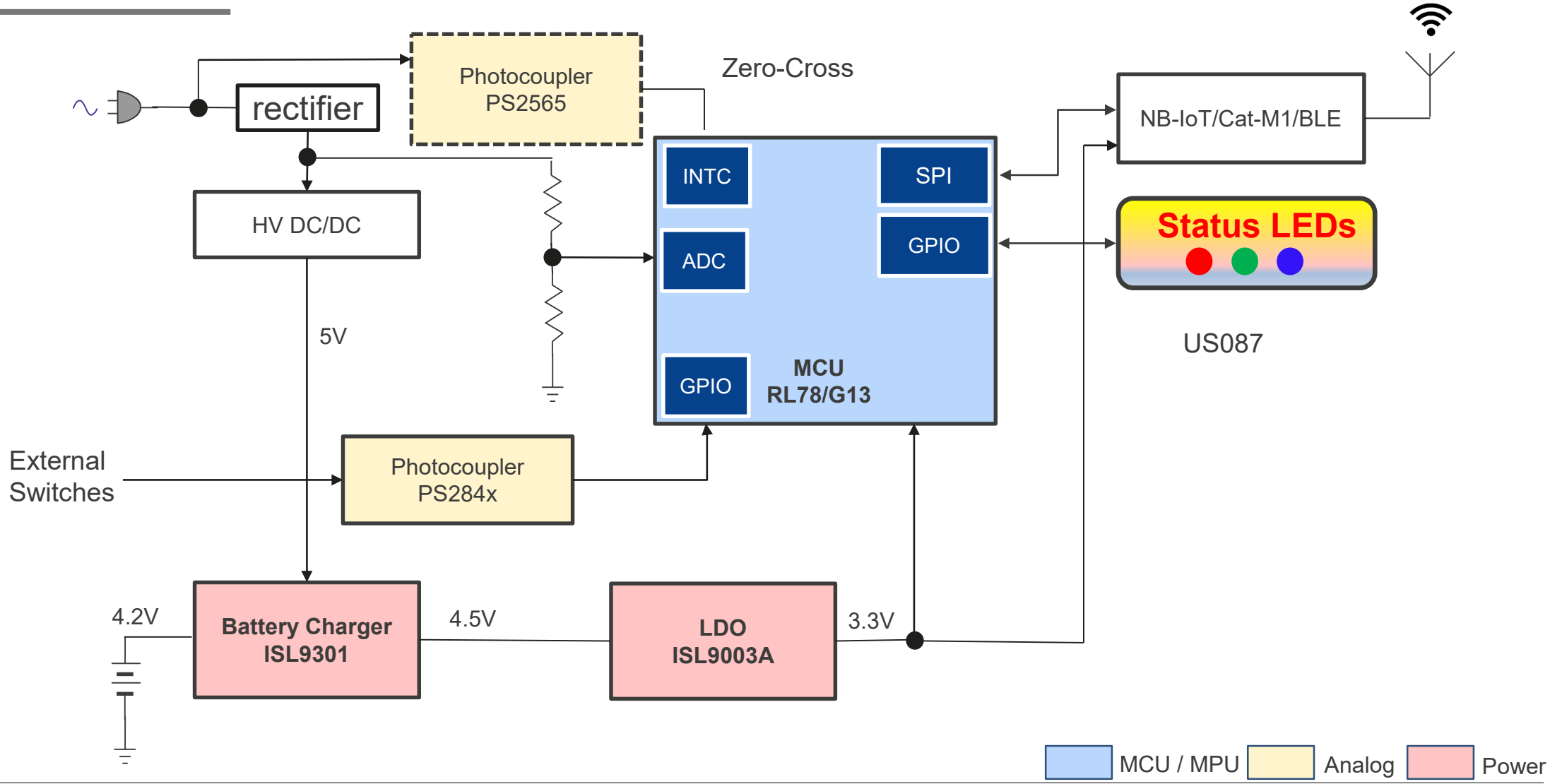
Changes in our society, such as with home health and elderly care, and refrigeration, make it important to know when you have lost power. Many times when the power goes down, Wi-Fi loses connectivity because of a breakdown in infrastructure within the home. Combining NB-IoT/Cat-M1 with rechargeable batteries can solve this issue and notify home/business owners of a main power loss.

■ System Benefits

- Low-power MCU with integrated ADC
- NB-IoT/Cat-M1/BLE certified module
- Light sensor to support filter exchange detection
- Opto-isolator for zero-cross timing and monitoring external signals

US087

Critical Power Monitoring System



Critical Power Monitoring System

Device Category	P/N	Key Features
MCU	RL78/G13 R5F100F/Gx	Built-in communications functions such as SPI, I2C. Various memory options to meets system requirements
Power	ISL9003A	150mA high performance, Low Noise LDO with Low IQ, High PSRR
	ISL9301	Battery Charger - 28V Input, CC/CV Charger for Li-Ion Batteries
Analog	PS2565	Single opto-isolator
	PS284x	Quad opto-isolator

RL78/G13 – Standard Functions MCU

Low Power and Abundant Lineup for General Purpose Applications

High Performance Peripheral Functions

- 43.2 DMIPS(32 MHz)
- On-chip oscillator, data flash, 10-bit A/D converter
- Built-in safety features enable support for the household appliance safety standard (IEC/UL 60730)

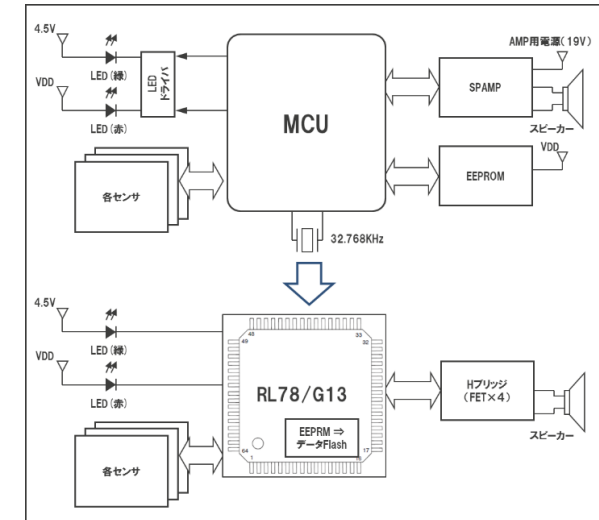
Low Power

- CPU: 66 μ A/MHz, standby (STOP): 230 nA
- 0.57 μ A (RTC_LVD, HALT mode)

Abundant Lineup

- 16-512KB ROM / 2-32KB RAM
- 20-128 pin package

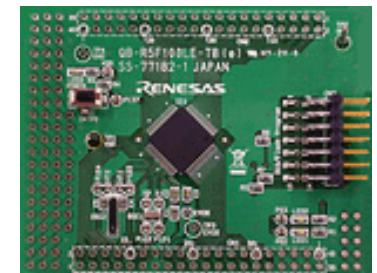
Part #	Flash ROM	RAM	Package(mm)
R5F1006/7/8x R5F1016/7/8x	16 ~ 64 KB	2 ~ 4 KB	20-LSSOP,24-HWQFN(4 x 4),25-WFLGA(3 x 3)
R5F100A/B/Cx R5F101A/B/Cx	16 ~ 128 KB	2 ~ 12 KB	20-LSSOP,32-HWQFN(5 x 5), 36-WFLGA(4 x 4)
R5F100Ex R5F101Ex	16 ~ 192 KB	2 ~ 16 KB	40-HWQFN(6 x 6)
R5F100F/Gx R5F101F/Gx	16 ~ 512 KB	2 ~ 32 KB	44-LQFP(10 x 10), 48-LFQFP(7 x 7), 48-HWQFN(7 x 7)
R5F100J/Lx R5F101J/Lx	32 ~ 512 KB	2 ~ 32 KB	52-LQFP(10 x 10), 64-LQFP(12 x 12), 64-LFQFP(10 x 10), 64-VFBGA(4 x 4),
R5F100M/Px R5F101M/Px	96 ~ 512 KB	8 ~ 32 KB	80-LQFP(14 x 14), 80-LFQFP(12 x 12), 100-LQFP(14 x 20), 100-LFQFP(14 x 14),
R5F100Sx R5F101Sx	192 ~ 512 KB	16 ~ 32 KB	128-LFQFP(14 x 20)



BOM Cost Reduction Use Case



**Renesas Starter Kit
for RL78/G13**



**QB-R5F100LE-TB
Easy Evaluation Kit**

ISL9003A – Low Noise with LDO Low I_Q , High PSRR

Wide Input Voltage: 2.3V to 6.5V with 150mA Continuous Output

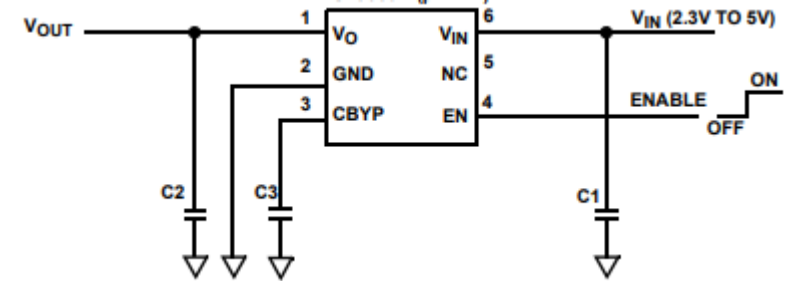
High Performance

- LDO with 150mA continuous output
- Excellent transient response to large current steps
- Excellent load regulation: <0.1% voltage change across full range of load current
- High PSRR: 90dB @ 1kHz
- Wide input voltage capability: 2.3V to 6.5V

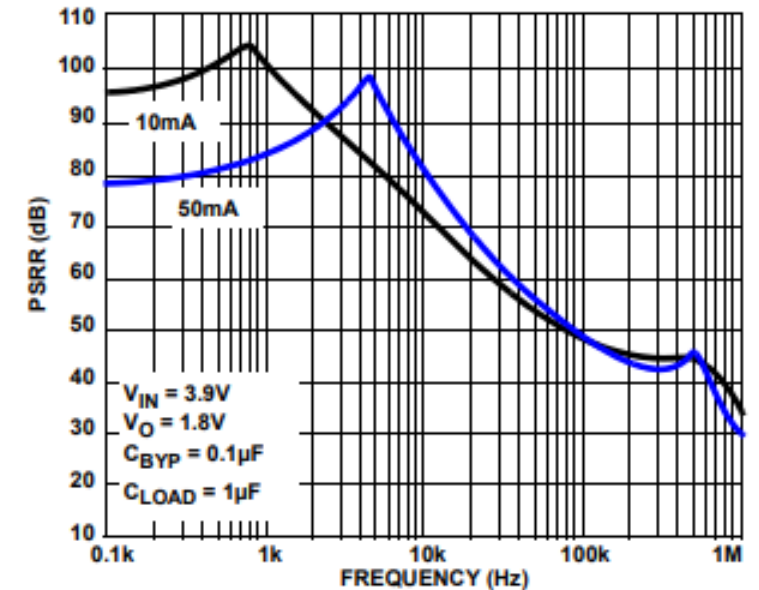
High Efficiency in a Small Package

- Very low quiescent current: 31 μ A
- Low dropout voltage: typically 200mV at 150mA
- Low output noise: typically 20 μ VRMS at 100 μ A (1.5V)
- Tiny 1.6mmx1.6mm 6 Ld uTDFN package

Part #	Output Voltage (V)	Package
ISL9003AIRUNZ-T	3.3	6 Ld 1.6x1.6mm uTDFN
ISL9003AIRUKZ-T	2.85	6 Ld 1.6x1.6mm uTDFN
ISL9003AIRUJZ-T	2.8	6 Ld 1.6x1.6mm uTDFN
ISL9003AIRUFZ-T	2.5	6 Ld 1.6x1.6mm uTDFN
ISL9003AIRUCZ-T	1.8	6 Ld 1.6x1.6mm uTDFN
ISL9003AIRUBZ-T	1.5	6 Ld 1.6x1.6mm uTDFN



Typical Application Circuit



PSRR vs Frequency

ISL9301- Charger for Single-cell Li-ion/Polymer Batteries

High Input Voltage Charger With Power Path Management

Fully Integrated with Power Path Management

- Complete Charger for Single-Cell Li-ion/Polymer Batteries
- Integrated Disconnect Switch to Disconnect the Battery
- Power Path Management Optimize Charge and System Currents

High Performance

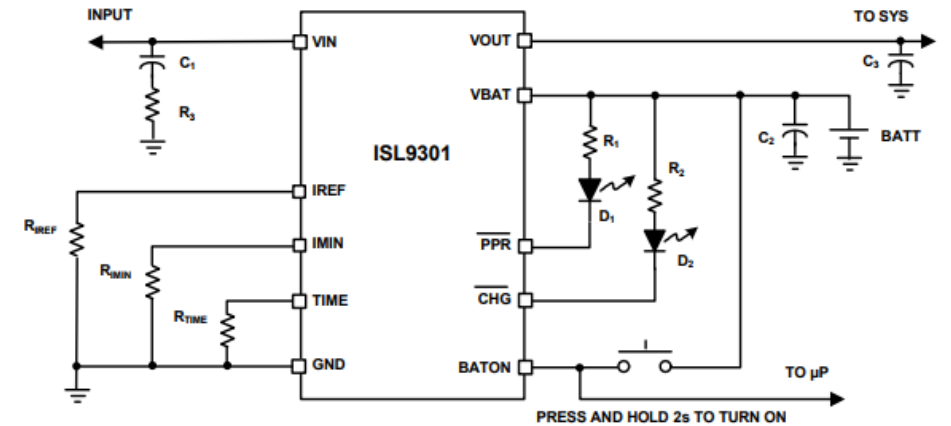
- 1% Charger Output Voltage Accuracy
- 28V Maximum Voltage at VIN pin

Programmable/Easy Control

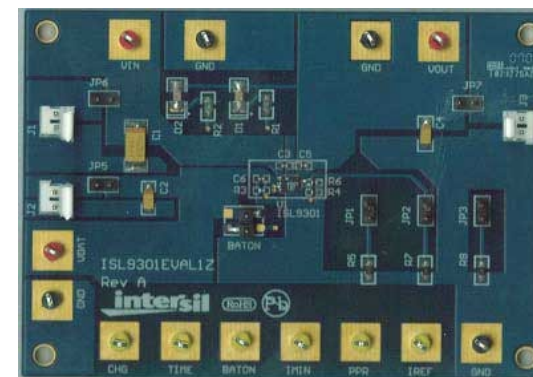
- Programmable Charge Current & End-of-Charge Current
- Power Presence and Charge Indications

Safety & Battery Protection

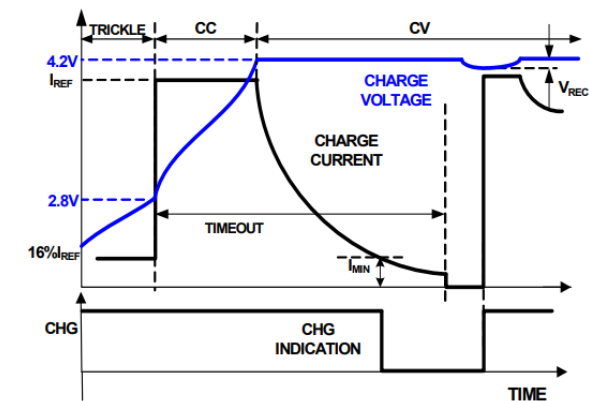
- Charge Current Thermal Foldback for Thermal Protection
- Trickle Charge for Fully Discharged Batteries
- Intelligent Timeout Interval Based on Actual Charge Current



Typical Application Circuit



ISL9301EVAL1Z: evaluation tool for single-cell Li-ion battery



Typical Charger Cycle

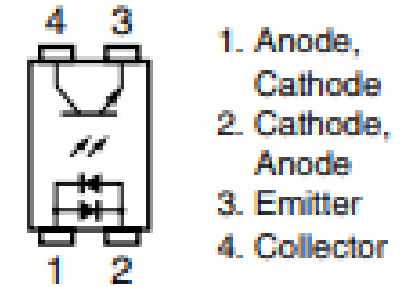
Part #	Temp Range (°C)	Package
ISL9301IRZ	-40 to +85	10 Ld 3x3 DFN
ISL9301IRZ-T	-40 to +85	10 Ld 3x3 DFN

PS2565 – Single Input/Output Photocouplers

High Isolation Voltage AC Input Response Type

High Performance and Small Package

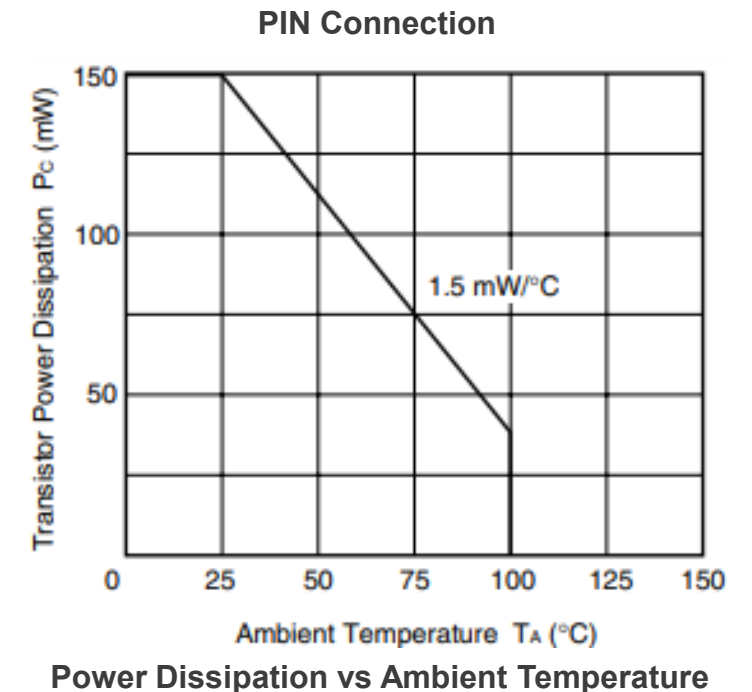
- AC Input Response
- High isolation voltage (BV = 5000 Vr.m.s.)
- High collector to emitter voltage (VCEO = 80 V)
- High current transfer ratio (CTR = 200% TYP.)
- High-speed switching (tr = 3 μs TYP., tf = 5 μs TYP.)



Safety Standards

- UL approved: No. E72422
- CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
- BSI approved: No. 7112/7420

Part #	Forward Current(mA)	Package	Package
PS2565L-1Y-V-F3-A	80	Tape-2000pcs	4-PIN Lead Bend
PS2565L-1Y-V-A	80	Magazine-100pcs	4-PIN Lead Bend
PS2565L-1Y-F3-A	80	Tape-2000pcs	4-PIN Lead Bend
PS2565L-1Y-A	80	Magazine-100pcs	4-PIN Lead Bend



PS2841 – World’s Smallest Class Photocoupler

Four Channels 12-Pin Ultra Shrink SOP Photocoupler

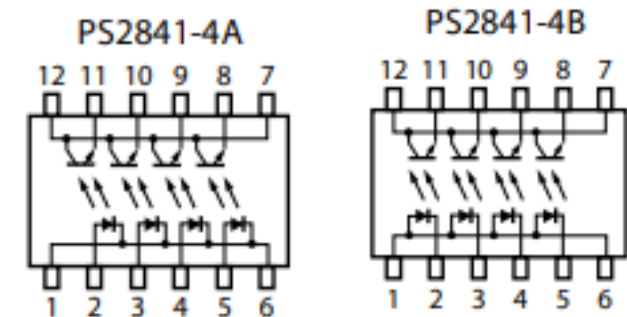
High Performance and Small Package

- High current transfer ratio (CTR = 200% TYP. @ $I_F = 1\text{mA}$)
- High isolation voltage (BV = 1500 Vr.m.s.)
- Common lead PS2841-4A: cathode, collector common
PS2841-4B: anode, collector common

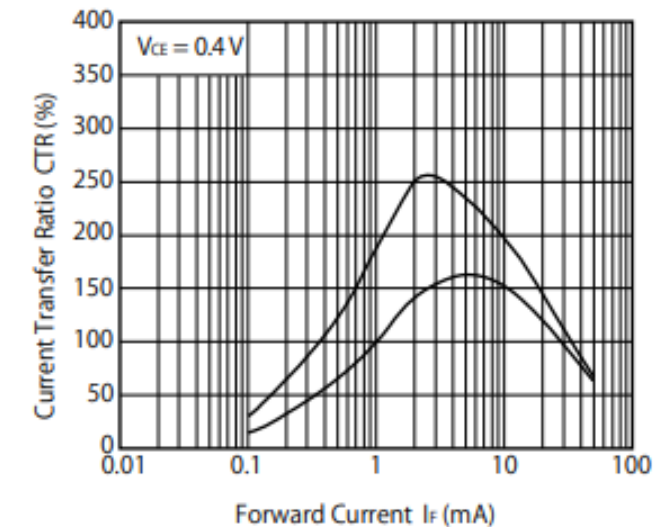
Safety Standards

- UL approved: UL1577, Single protection
- Ultra small and thin package - (12-pin ultra shrink SOP, Pin pitch 0.8 mm, 4.4 (L) × 5.6 (W) × 2.5 (H))

Part #	Forward Current(mA)	Safety Standard	Package
PS2841-4A-F3-AX	20/ch	UL	4-PIN SSOP
PS2841-4B-F3-AX	20/ch	UL	4-PIN SSOP



PIN Connection



Current Transfer Ratio vs Forward Current

[Renesas.com](https://www.renesas.com)