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R2A20113SP

Critical Conduction Mode PFC Control IC

Description

The R2A20113 controls a boost converter to provide a active power factor correction.

The R2A20113 adopts critical conduction mode for power factor correction and realizes high efficiency and a low switching noise by zero current switching.

Because the zero current is detected by using the GND current, the ZCD Auxiliary winding is unnecessary.

The feedback loop open detection, two mode overvoltage protection, overcurrent protection are built in the R2A20113, and can constitute a power supply system of high reliability with few external parts.
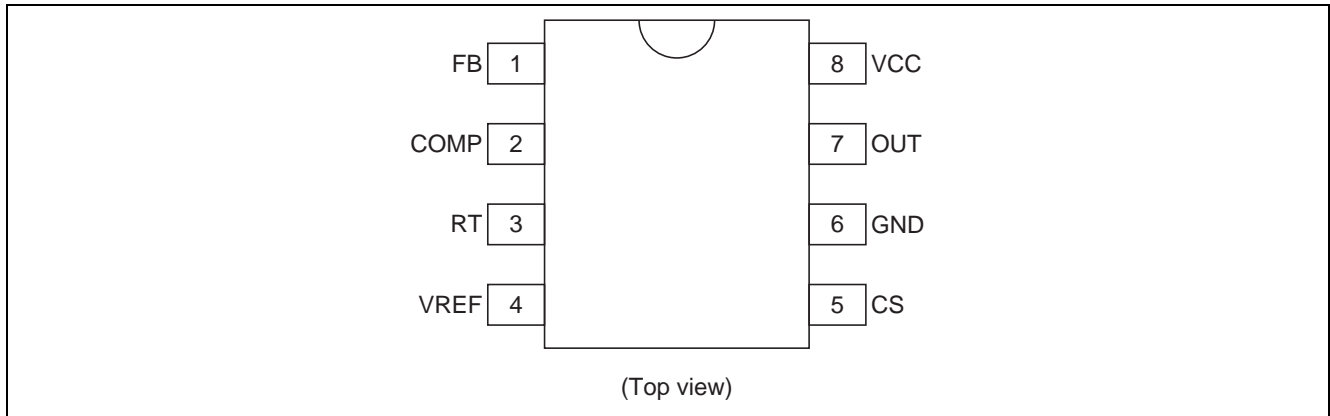
Features

- Absolute Maximum Ratings
  - Supply voltage Vcc: 24 V
  - Operating junction temperature Tjopr: –40 to +150°C
- Electrical characteristics
  - UVLO operation start voltage VH: 12 V ± 0.8 V
  - UVLO operation shutdown voltage VL: 9.2 V ± 0.7 V
  - UVLO hysteresis voltage Hysuvl: 2.8 V ± 0.7 V
- Functions
  - Boost converter control with critical conduction mode
  - Two mode overvoltage protection
    Mode1: Dynamic OVP corresponding to a voltage rise by load change
    Mode2: Static OVP corresponding to overvoltage in stable
  - Feedback loop open detection
  - Overcurrent protection
  - Package: Pb-free SOP-8 (JEDEC)

Ordering Information

Part No.	Package Name	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
R2A20113SPW0	FP-8DCV	PRSP0008DD-C	SP	W (2,500 pcs/reel)

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Pin Arrangement

```
                    ┌────────┐
         FB   1  │        │  8  VCC
                 │        │
       COMP   2  │        │  7  OUT
                 │        │
         RT   3  │        │  6  GND
                 │        │
       VREF   4  │        │  5  CS
                 └────────┘
```

(Top view)

Pin Functions

Pin No.	Pin Name	Input/Output	Function
1	FB	Input	Error amplifier input terminal
2	COMP	Output	Error amplifier output terminal
3	RT	Input/Output	A resistor connection terminal for RAMP current setting
4	VREF	Output	Reference voltage output terminal
5	CS	Input	Zero current detection and overcurrent detection input terminal
6	GND	—	Ground
7	OUT	Output	Power MOSFET drive terminal
8	VCC	Input	Supply voltage terminal

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Block Diagram
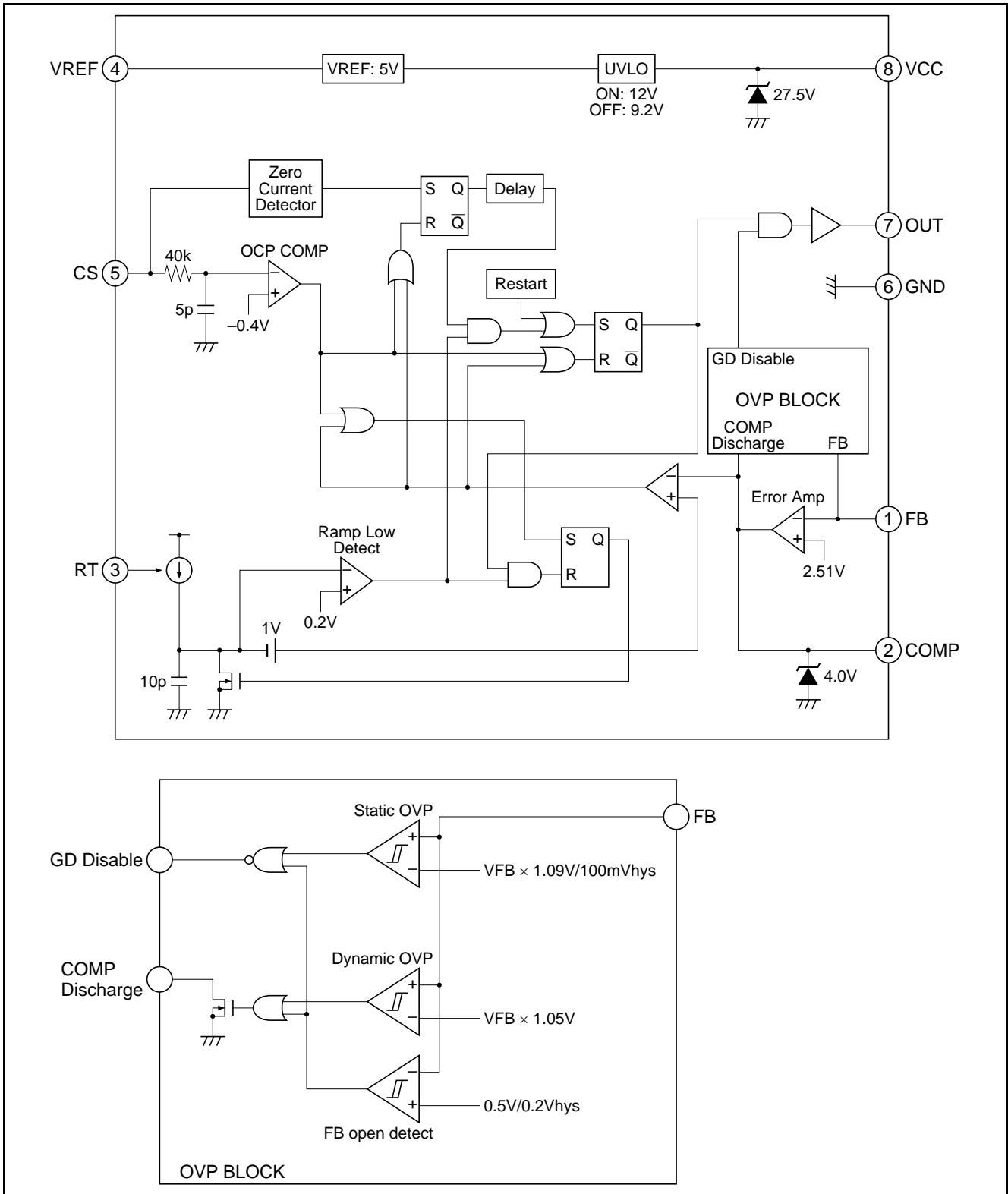
Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit	Note
Supply voltage	Vcc	−0.3 to 24	V	
OUT peak current	Ipk-out	±0.9	A	3
OUT DC current	Idc-out	±100	mA	
COMP terminal current	Icomp	±1	mA	
RT terminal current	Irt	−50	μA	
Vref terminal current	Iref	−5	mA	
Vref terminal voltage	Vt-ref	−0.3 to Vref + 0.3	V	
FB terminal voltage	Vt-fb	−0.3 to +5	V	
CS terminal voltage	Vcs	−1.5 to +0.3	V	
Power dissipation	Pt	0.68	W	4
Operating junction temperature	Tj-opr	−40 to +150	°C	
Storage temperature	Tstg	−55 to +150	°C	

Notes: 1. Rated voltages are with reference to the GND terminal.

2. For rated currents, inflow to the IC is indicated by (+), and outflow by (−).

3. Shows the transient current when driving a capacitive load.

4. θja = 120°C/W
   This value is a thing mounting on $40 \times 40 \times 1.6$ [mm], a glass epoxy board of wiring density 10%.

Electrical Characteristics

(Ta = 25°C, Vcc = 12 V, CS = GND, FB = COMP, RRT = 200 kΩ)

Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Supply	UVLO turn-on threshold	Vuvlh	11.2	12	12.8	V	
	UVLO turn-off threshold	Vuvll	8.5	9.2	9.9	V	
	UVLO hysteresis	Hysuvl	2.1	2.8	3.5	V	
	Standby current	Istby	—	95	180	μA	Vcc = Vuvlh − 0.2 V
	Operating current	Icc	—	2.6	4	mA	
VREF	Reference voltage	Vref	4.85	5.00	5.15	V	Isource = 0 mA
	Line regulation	Vref-line	—	5	20	mV	Isource = 0 mA, Vcc = 10 V to 24 V
	Load regulation	Vref-load	—	5	20	mV	Isource = 0 mA to −5 mA
	Temperature stability	dVref	—	±80	—	ppm/°C	Ta = −40 to 125°C *[1]
Error amplifier	Feedback voltage	Vfb	2.41	2.51	2.61	V	FB-COMP short
	Input bias current	Ifb	0.1	0.25	0.75	μA	Measured pin: FB
	Open loop gain	Av	—	55	—	dB	*[1]
	Upper clamp voltage	Vclamp-comp	3.75	4.0	4.25	V	FB = 2.0 V, COMP: Open
	Low voltage	Vl-comp	—	0.1	0.3	V	FB = 3.0 V, COMP: Open
	Source current	Isrc-comp	−185	−120	−40	μA	FB = 1 V, COMP = 2.5 V
	Sink current 1	Isnkcomp1	—	120	—	μA	*[1]
	Sink current 2	Isnkcomp2	180	300	450	μA	FB = 3.5 V, COMP = 2.5 V
	Transconductance	gm	90	150	220	μS	FB = 2.5 V, COMP = 2.5 V
RT	RAMP offset voltage	Voff-ramp	—	1.0	—	V	*[1]
	RT voltage	V-rt	1.8	2.0	2.2	V	RT = 200 kΩ
Zero current detector	ZCD threshold voltage	Vzcd	−8	−2	0	mV	
	Input bias current	Ics	−80	−47	−20	μA	Vcs = 0 V
Restart	Restart time delay	Tstart	65	130	280	μs	FB = 2.0 V, COMP = 2.5 V
OUT	Rise time	tr-out	—	30	100	ns	CL = 1000 pF, FB = 2.0 V, COMP = 2.5 V
	Fall time	tf-out	—	30	100	ns	CL = 1000 pF, FB = 2.0 V, COMP = 2.5 V
	OUT low voltage	Vol1-out	—	0.08	0.2	V	Isink = 20 mA
		Vol2-out	—	0.05	0.7	V	Isink = 10 mA, Vcc = 5 V
	OUT high voltage	Voh-out	11.5	11.9	—	V	Isource = −20 mA *[1]
Over current protection	OCP threshold voltage	Vocp	−0.44	−0.4	−0.36	V	
Over voltage protection	Dynamic OVP threshold voltage	Vdovp	VFB× 1.035	VFB× 1.050	VFB× 1.065	V	
	Static OVP threshold voltage	Vsovp	VFB× 1.075	VFB× 1.090	VFB× 1.105	V	COMP = Open
	Static OVP hysteresis	Hys-sovp	50	100	150	mV	COMP = Open
	FB open detect threshold voltage	Vfbopen	0.45	0.50	0.55	V	COMP = Open
	FB open detect hysteresis	Hysfbopen	0.16	0.20	0.24	V	COMP = Open

Note: 1. Design spec.

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Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-3.95x4.9-1.27	PRSP0008DD-C	FP-8DCV	0.085g

NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.
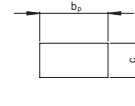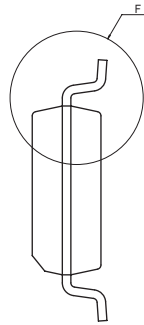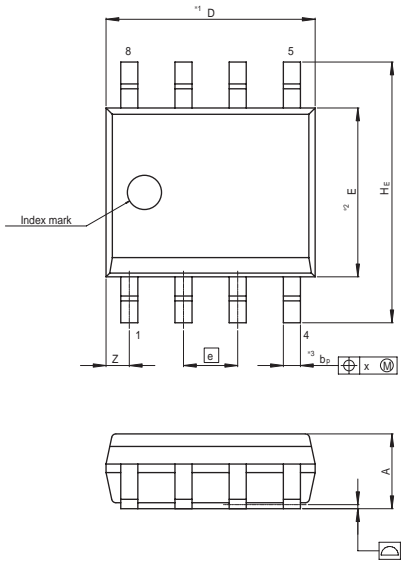
Terminal cross section
(Ni/Pd/Au plating)

Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	——	4.90	5.30
E	——	3.95	——
A_2	——	——	——
A_1	0.10	0.14	0.25
A	——	——	1.75
b_p	0.34	0.40	0.46
b_1	——	——	——
c	0.15	0.20	0.25
c_1	——	——	——
θ	0°	——	8°
H_E	5.80	6.10	6.20
e	——	1.27	——
x	——	——	0.25
y	——	——	0.10
Z	——	——	0.75
L	0.40	0.60	1.27
L_1	——	1.08	——

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http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

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