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April 1st, 2010
Renesas Electronics Corporation

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R2J20701NP 2phase POL EVB2

R2J20701NP Evaluation Board

Introduction

The R2J20701NP 2phase POL EVB2 is an evaluation board for the single-phase DC/DC converter using the all-in-one SiP for POL (point-of-load).

R2J20701NP is including a peak current mode PWM IC, a high-side MOS FET and a low-side MOS FET in a thin small 56-pin QFN package (8mm × 8mm). Besides single-phase operation, it can also compose two-phase and multi-channel operation easily. In case of multi-channel operation, output voltage can make some sequence each other easily.

In this application note, the specifications, operating, and measurement result of the R2J20701NP 2pahse POL EVB2 are described. Diagrams of circuits, list of parts, and patterns of printed boards.

The following materials are available for reference.

- R2J20701NP Data sheet
- R2J20701NP 1phase POL EVB (Rev.2.0) Application note
- R2J20701NP 2channel POL EVB2 Application note

Contents

1. Method of Using Evaluation Board

1.1 Specifications of Evaluation Board

Table 1 Main Specifications of Evaluation Board

Item	Pin Name	Recommended Condition (Initial setting)	Setting Range
Input voltage	VIN & VIN_RTN (for applying) TP-IN & TP-IN_RTN (for measuring)	12 V	8 V to 16 V
Output voltage	TP-OUT & TP-OUT_RTN	1.8 V	0.6 V ~
Output current	VOUT & VOUT_RTN	OCP: around 42.3 A	0 A to 70 A
Operating frequency		450 kHz	200 kHz to 1 MHz

1.2 Functions of Evaluation Board

(1) ON/OFF function
(2) Load transient response test circuit
(3) Soft-start function
(4) OCP function (OCP: Over Current Protection)
(5) External synchronous function

1.3 Method of Connecting Evaluation Board

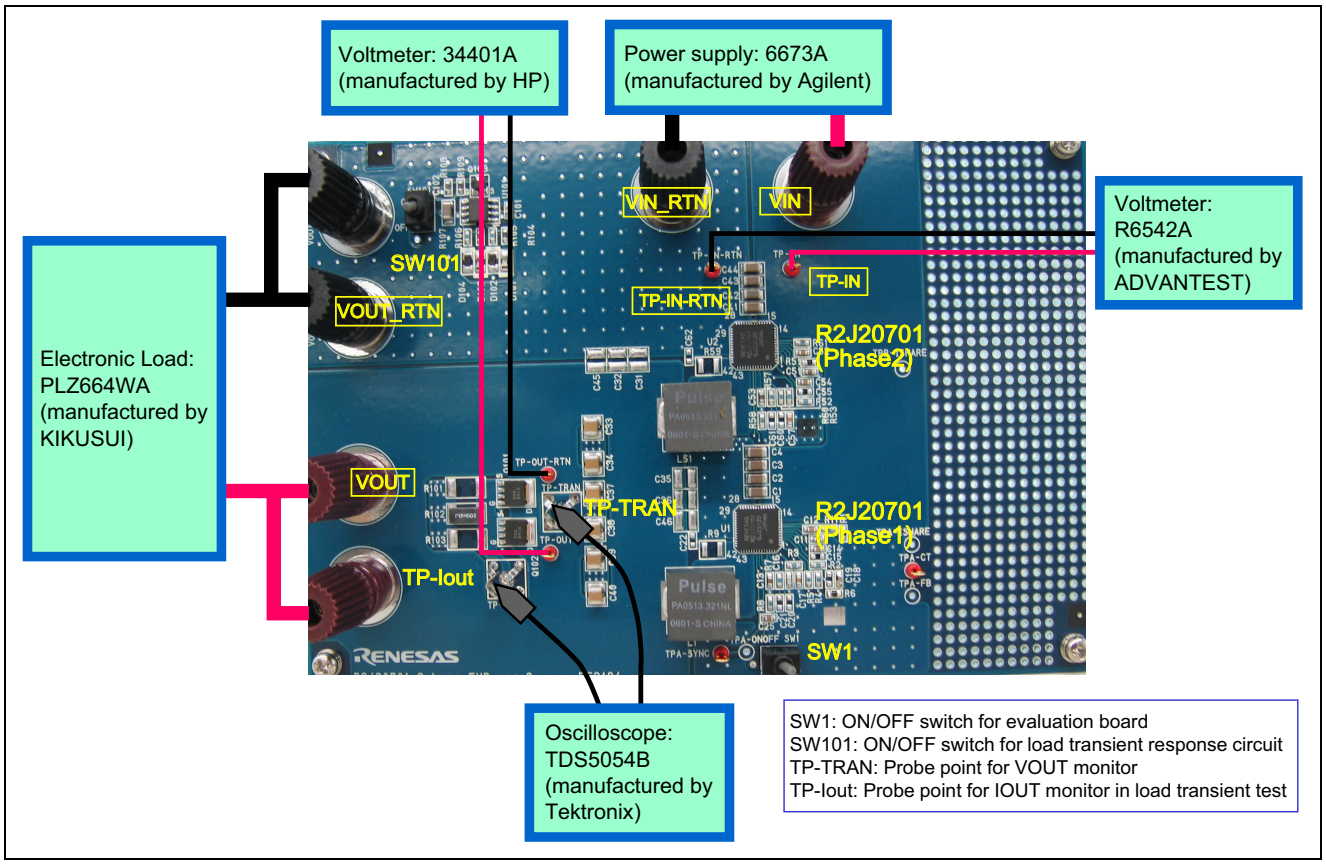

Figure 1 Connection Diagram of Evaluation Board

2. Result of Measurement by Evaluation Board

2.1 Efficiency/Loss/Regulation Data

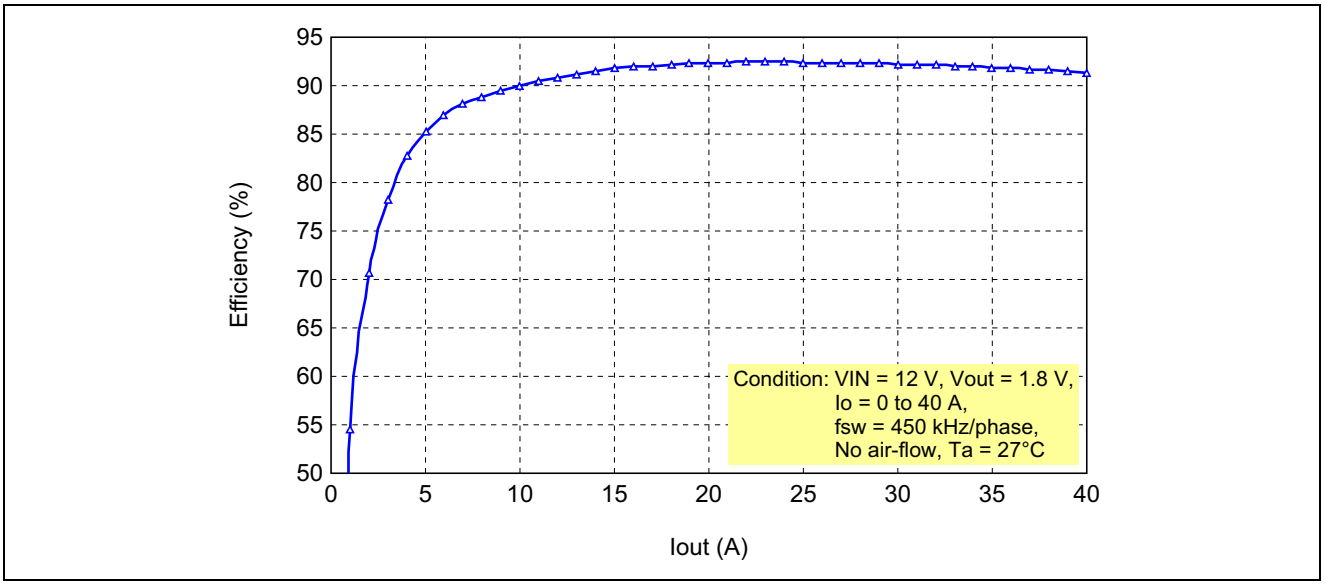

Figure 2 Efficiency vs. Output Current Characteristics

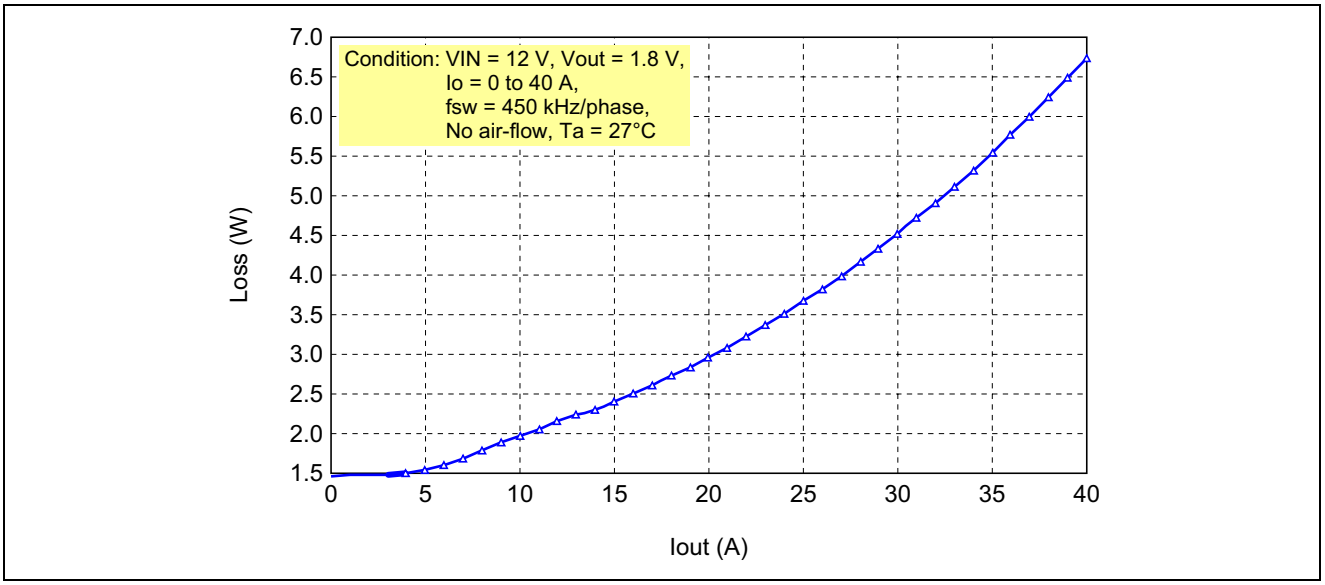

Figure 3 Loss vs. Output Current Characteristics

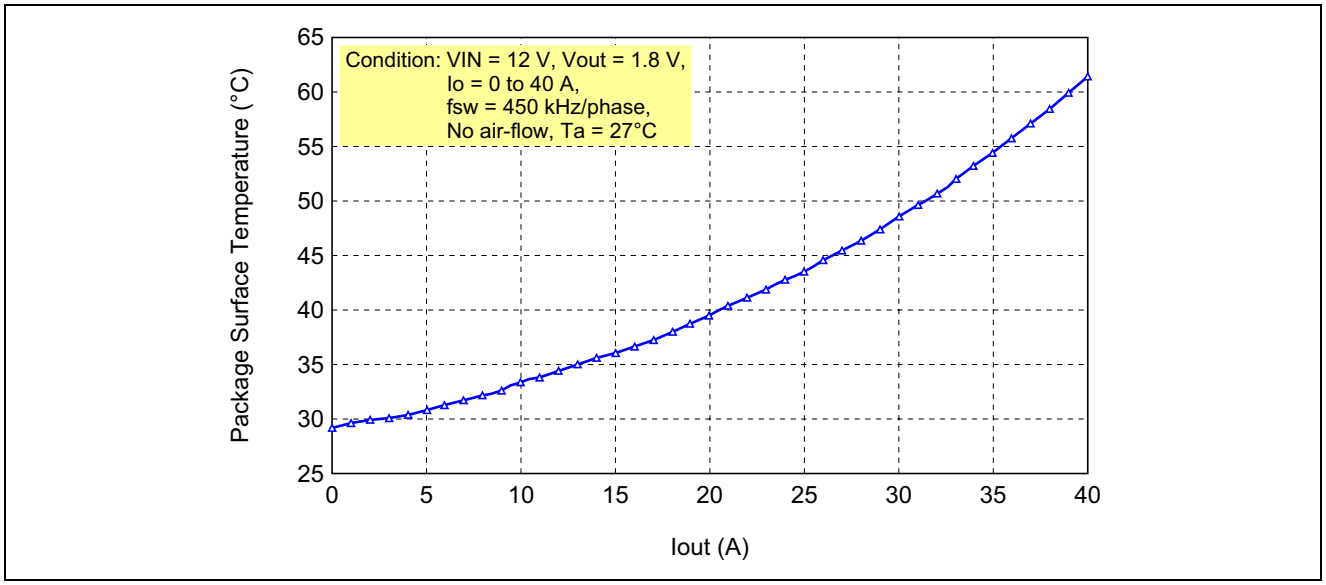

Figure 4 Package Surface Temperature vs. Output Current Characteristics

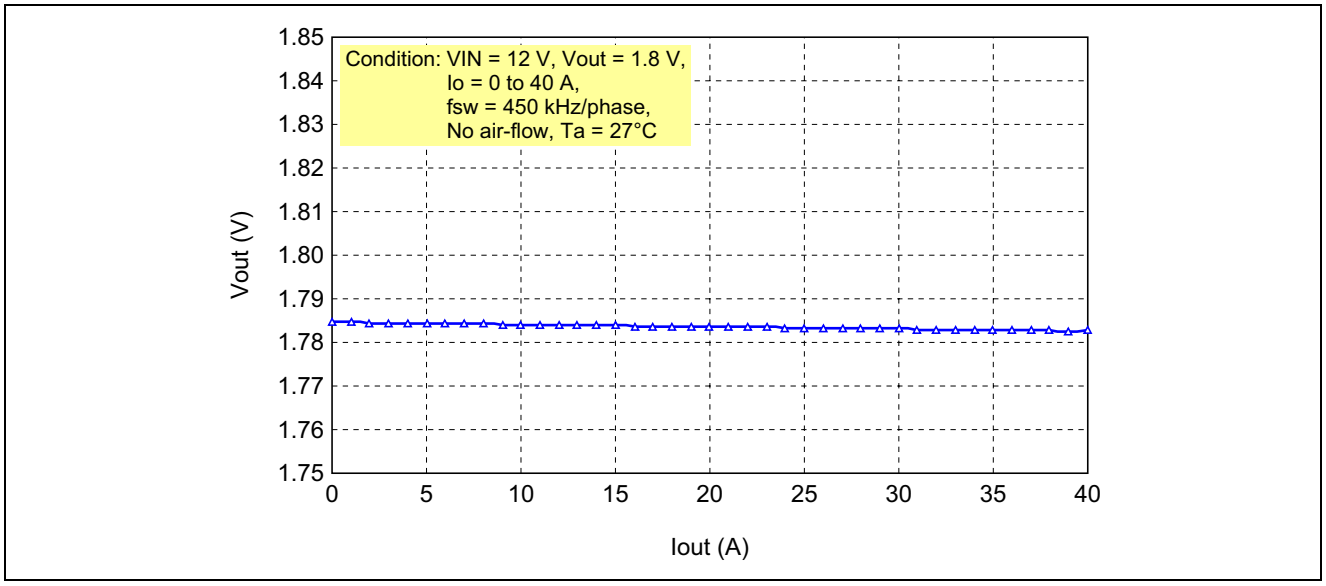

Figure 5 Output Voltage vs. Output Current Characteristics

2.2 Various Waveforms

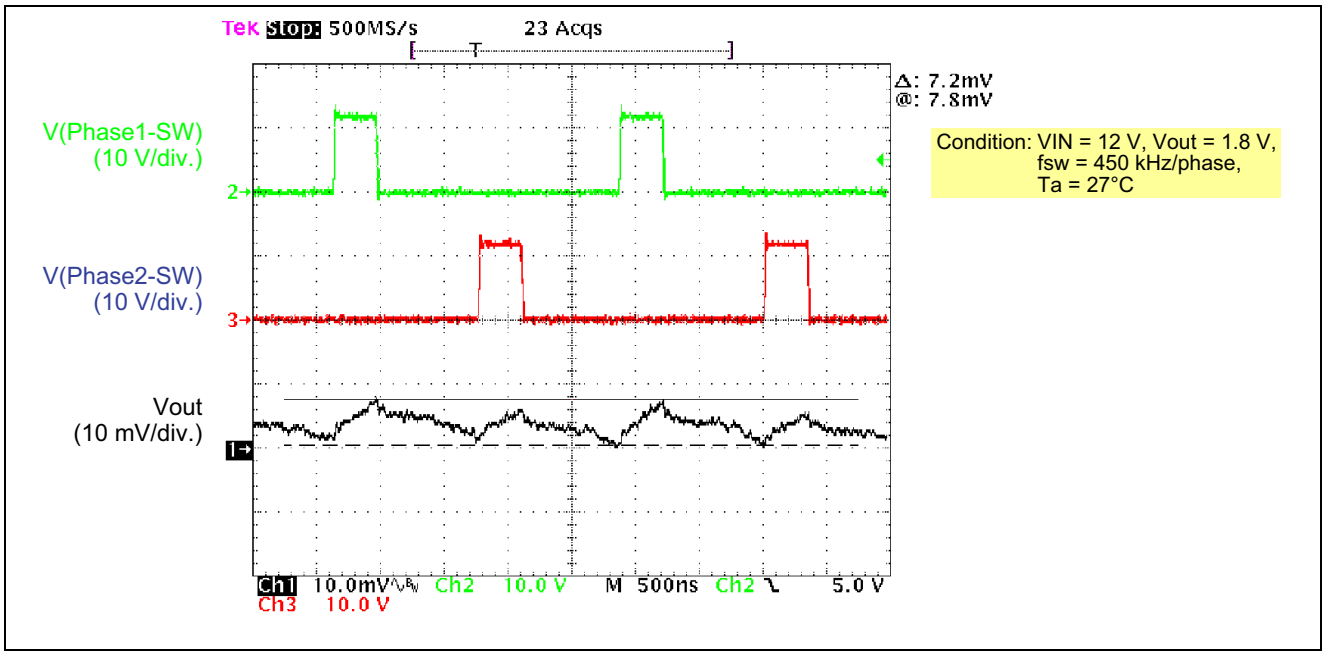

Figure 6 Vout Ripple Waveform (Iout = 0 A)

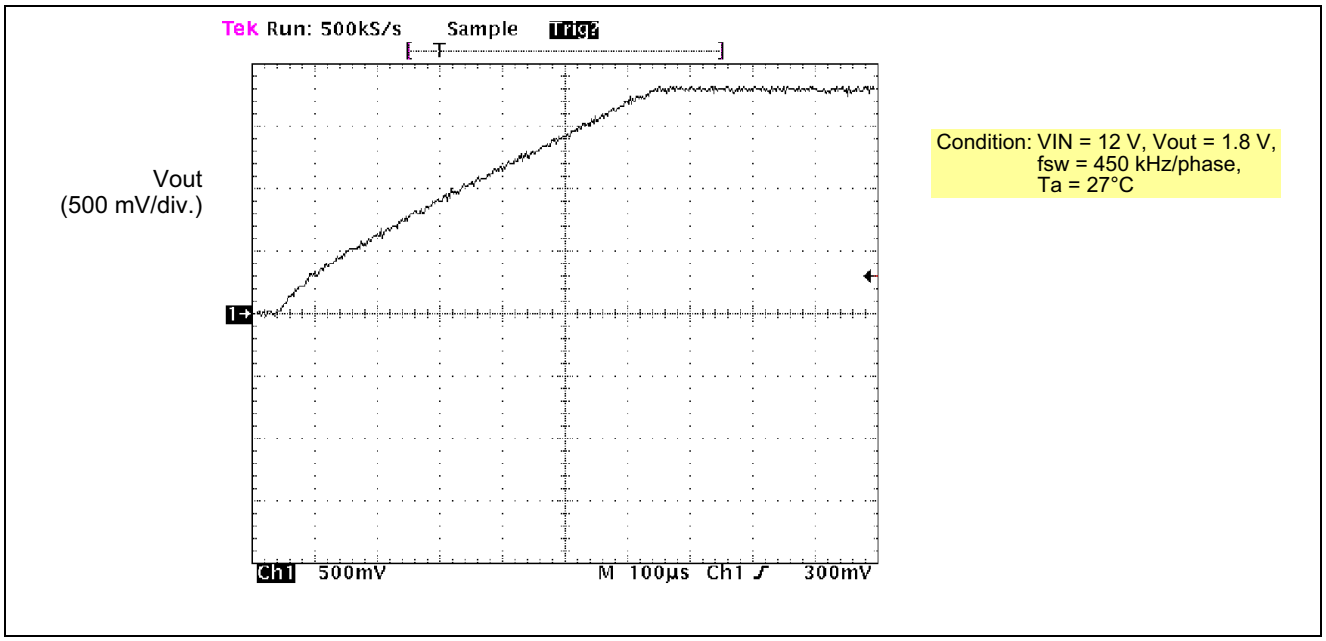

Figure 7 Vout Start-up Waveform (Iout = 0 A)

3. Circuit Diagram of Evaluation Board

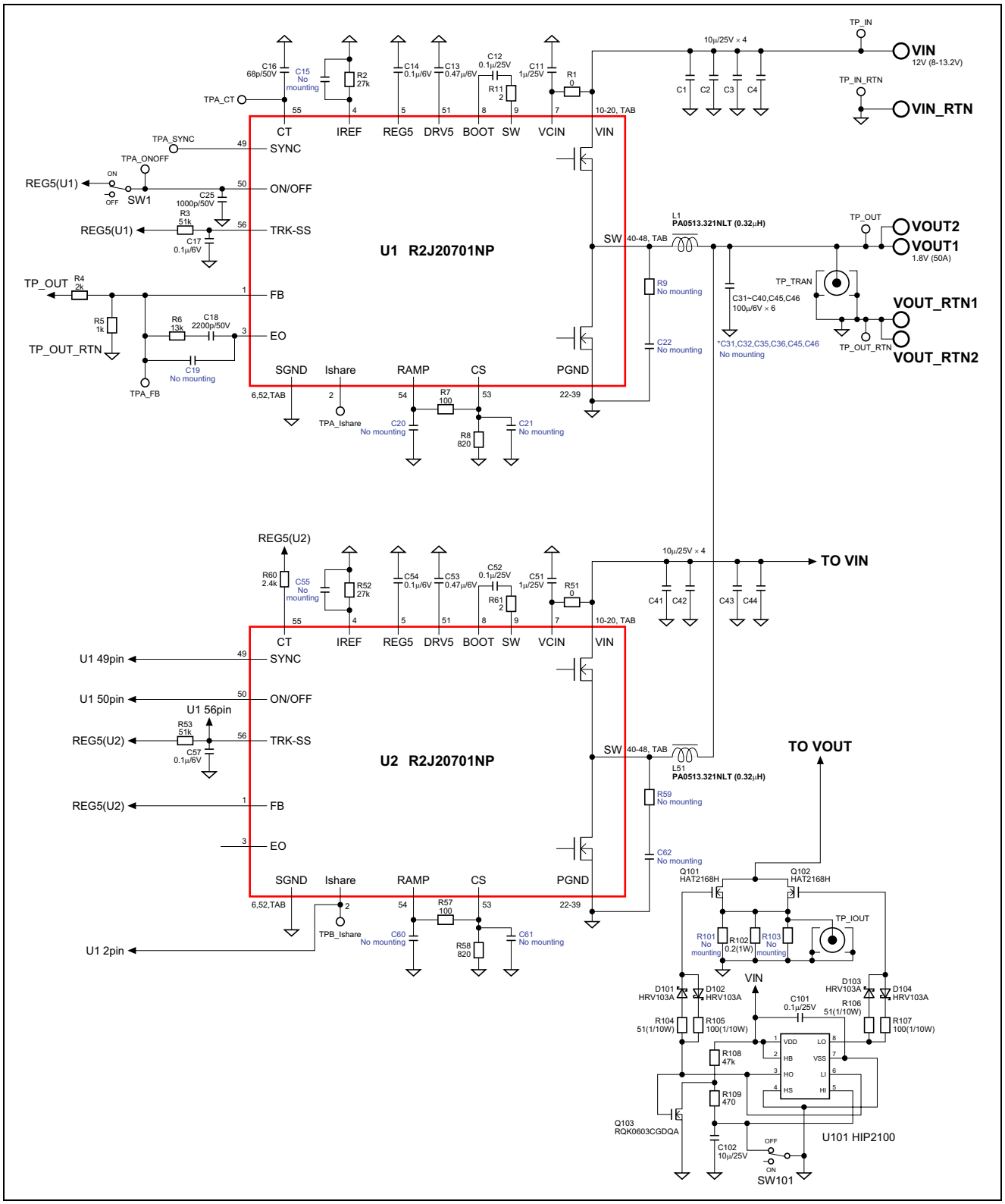

Figure 8 Circuit Diagram of Evaluation Board

4. List of Parts

Reference	Part No.	Vendor	Quantity	Description	Remarks
PCB	FE2184	—	1	—	
U1, U2	R2J20701NP	Renesas	2	QFN56 IC	
L1, L51	PA0513.321NLT	Pulse	2	0.32 μH	
C1, C2, C3, C4, C41, C42, C43, C44, C102	TMK316BJ106KL-T	YUDEN	9	10 μF/25 V/3216	C31, C32, C35, C36, C45, C46 No mounting
C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C45, C46	GRM32EB30J107ME16L	muRata	6	100 μF/6.3 V/3225	
C11, C51	C1608JB1E105KT	TDK	2	1 μF ± 10%/25 V/1608	
C12, C14, C17, C52, C54, C57, C101	C1608JB1E104KT	TDK	7	0.1 μF ± 10%/25 V/1608	
C13, C53	C1608JB1C474KT	TDK	2	0.47 μF ± 10%/16 V/1608	
C15, C25, C55	C1608JB1H102KT	TDK	1	1000 pF ± 10%/50 V/1608	C15, C55 No mounting
C16	C1608CH1H680JT	TDK	1	68 pF ± 5%/50 V/1608	
C19	C1608CH1H101JT	TDK	0	100 pF ± 5%/50 V/1608	No mounting
C20, C60	C1608CH1H100DT	TDK	0	10 pF ± 0.5 pF/50 V/1608	No mounting
C21, C61	C1608CH1H040CT	TDK	0	4 pF ± 0.25 pF/50 V/1608	No mounting
C18, C22, C62	C1608CH1H222JT	TDK	1	2200 pF ± 5%/50 V/1608	C22, C62 No mounting
R1, R51	RK73Z1JTTD	TDK	2	0 Ω/1608	
R2, R52	RK73H1JTTD2702F	KOA	2	27 kΩ ± 1%/1608	
R3, R53	RK73H1JTTD5102F	KOA	2	51 kΩ ± 1%/1608	
R4	RK73H1JTTD2001F	KOA	1	2 kΩ ± 1%/1608	
R5	RK73H1JTTD1001F	KOA	1	1 kΩ ± 1%/1608	
R6	RK73H1JTTD133J	KOA	1	13 kΩ ± 5%/1608	
R7, R57, R105, R107	RK73H1JTTD1000F	KOA	4	100 Ω ± 1%/1608	
R8, R58	RK73H1JTTD821J	KOA	2	820 Ω ± 5%/1608	
R9, R59	R73B2BTTD3R0J	KOA	0	3 Ω/3225/ 1/4 W	No mounting
R11, R61	RK73H1JTTD2R0F	KOA	2	2 Ω ± 1%/1608	
R60	RK73H1JTTD2401F	KOA	1	2.4 kΩ ± 1%/1608	
R101, R102, R103	SL1TTER20J	KOA	1	0.2 Ω/1 W/ 6.3 mm×3.1 mm×1.9 mm	R101, R103 No mounting
R104, R106	RK73B1JTTD510J	KOA	2	51 Ω ± 5%/1608/ 1/10 W	
R108	RK73B1JTTD473J	KOA	1	47 kΩ/1608	
R109	RK73B1JTTD471J	KOA	1	470 Ω/1608	
Q101, Q102	HAT2168H	Renesas	2	FET	
Q103	RQK0603CGDQA	Renesas	1	FET	
D101, D102, D103, D104	HRV103A	Renesas	4	Diode	
U101	HIP2100	Intersil	1	Driver IC	
VIN, VOUT1, VOUT2	T-6530-RED	Sato Parts	3		
VIN_RTN, VOUT_RTN1, VOUT_RTN2	T-6530-BLACK	Sato Parts	3		
TP_IN, TP_IN_RTN, TP_OUT, TP_OUT_RTN	LC-2-G	Mac Eight	4		
SW1, SW101	G-22AP	Nihon Kaiheiki	2		
TP_TRAN, TP_IOUT	131-5031-00	Tektronix	2		

5. Evaluation Board Patterns

Board structure: Copper foil (70 μm) × 4 layers, 1.6 mmt

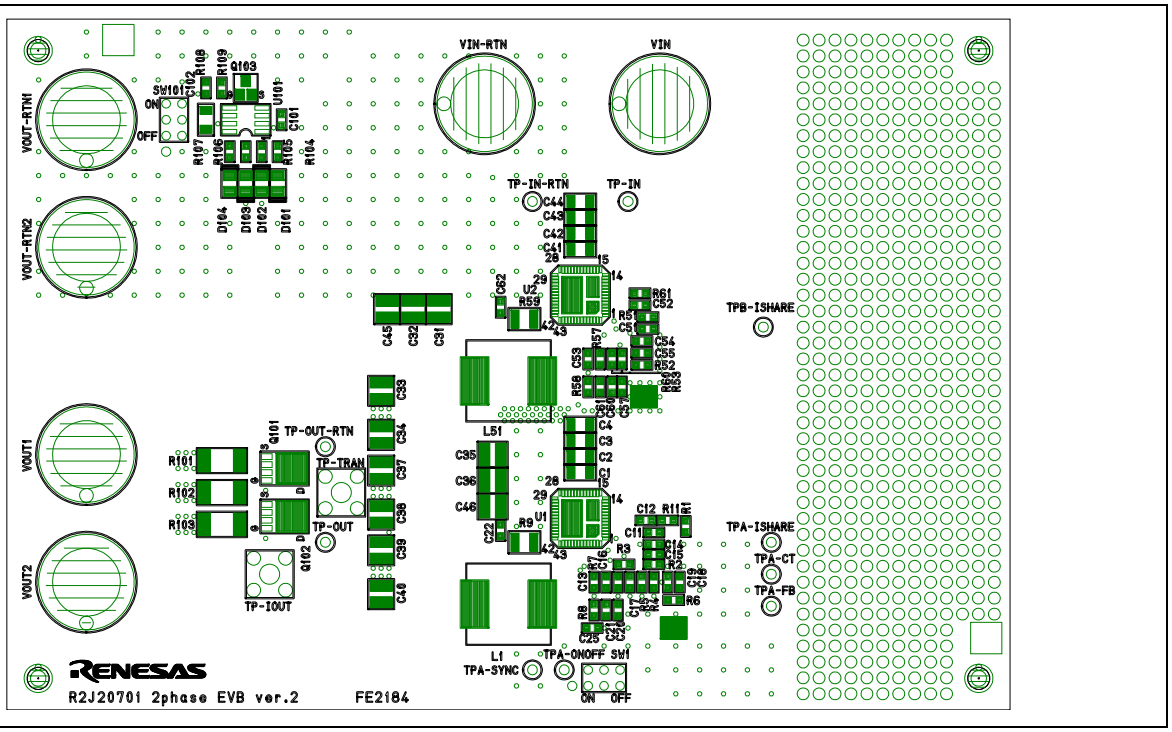

Figure 9 Top Silk Screen Pattern

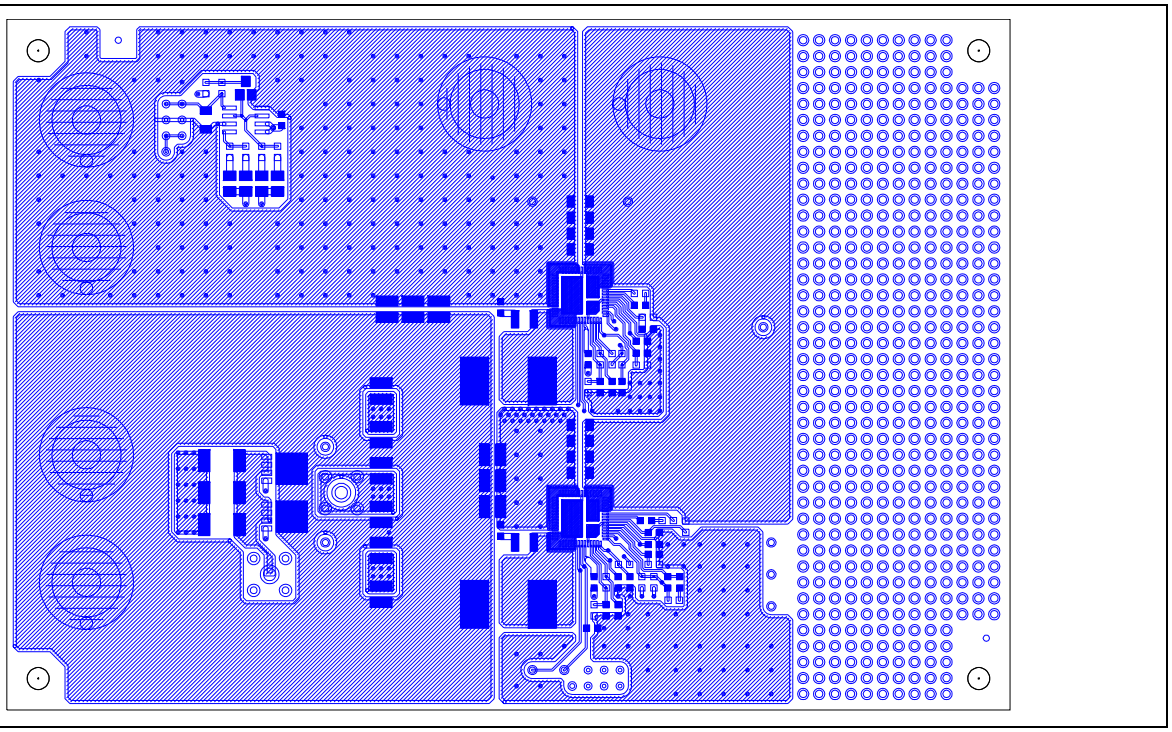

Figure 10 First Layer Pattern

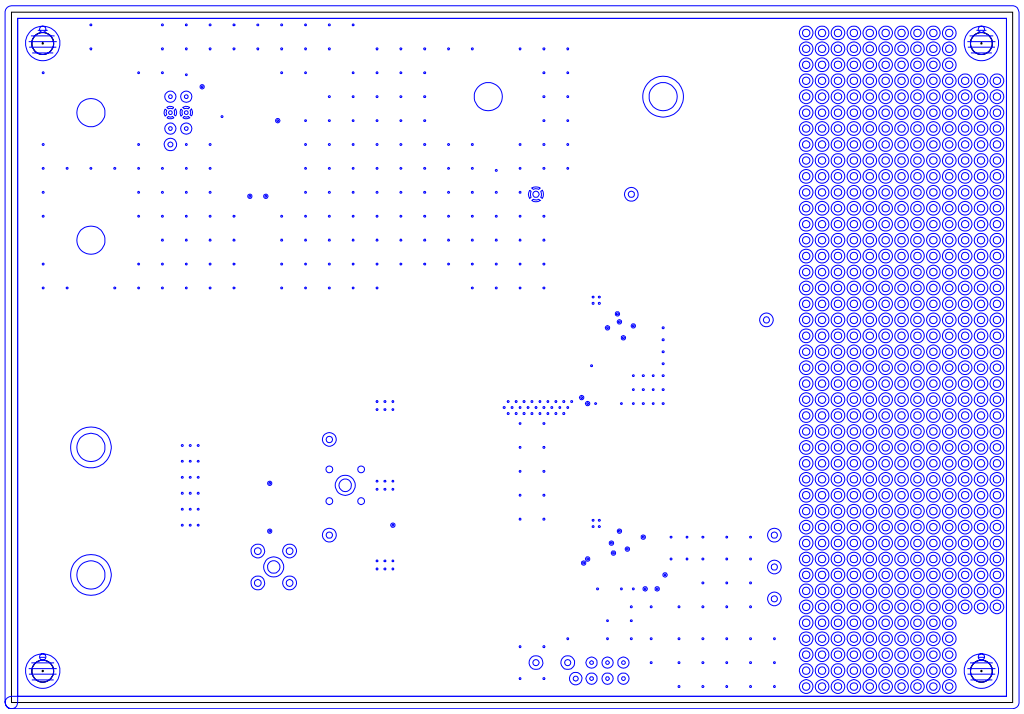

Figure 11 Second Layer Pattern

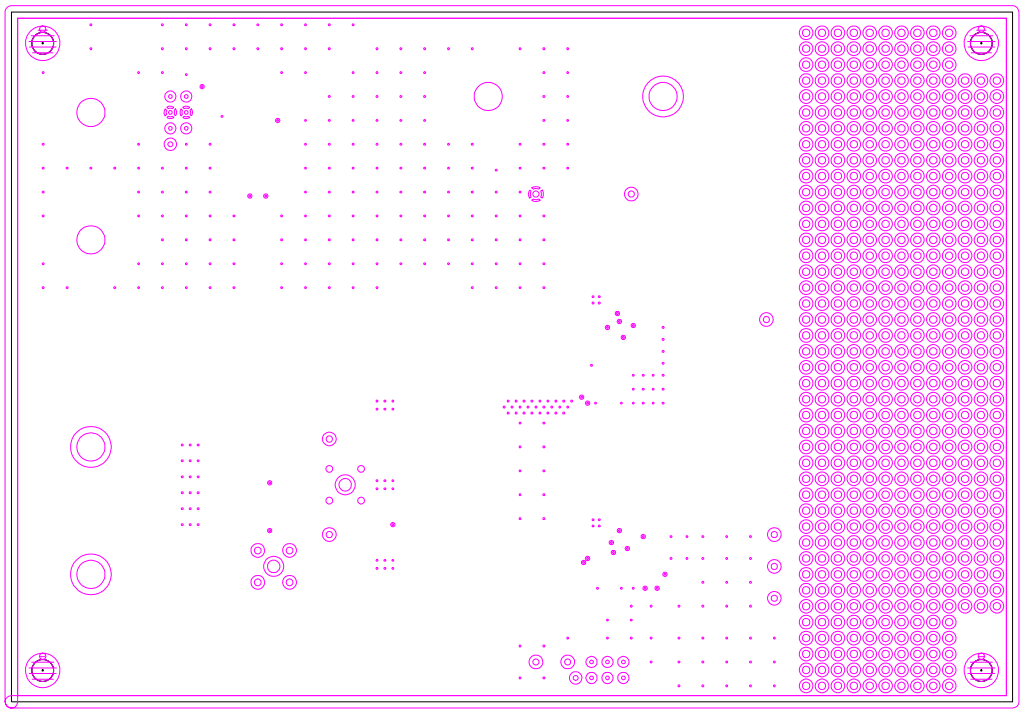

Figure 12 Third Layer Pattern

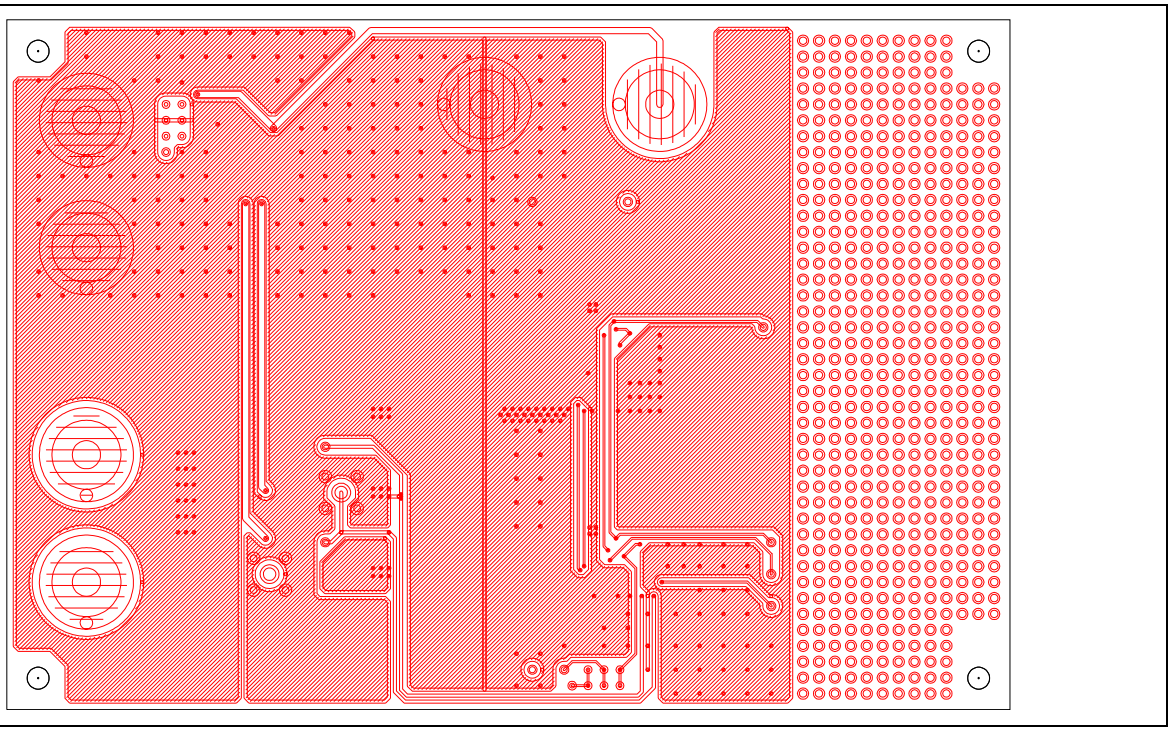

Figure 13 Fourth Layer Pattern

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Revision Record

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