



DEMO BOARD TEST REPORT

33V1A Solution for Home Appliances using CCM PSR CC/CV Regulator KP23267WG

FEATURES

- 90Vac~265Vac Input
- High Precision 33V Output
- 60kHz CCM-mode Operation for High Efficiency
- Meets EN55022B Conducted and Radiated EMI Requirement
- ASOP-6 Package without Heatsink

INTRODUCTION

The Demo Board of KP23267WG-T01 is typically designed for 33V/1A Home appliance with universal input (90-265Vac,60/50Hz). The temperature rise of KP23267WG is less than 75°C when ambient temperature is about 25 °C because of the special ASOP-6 package. Besides, the demo board passes EN55022 Class B EMI Standard with comprehensive protections.

DEMO BOARD SEPCIFICATION

Description	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{in}	90	-	265	V_{ac}	50/60Hz
Output Voltage	V_{out}	-	33	-	V_{dc}	
Output Current	I_{out}	-	1	1.15	A	
Total Output Power	P_{out}	-	33	-	W	
Ripple & Noise	V_{ripple}	-	-	512	mV _{p-p}	Board End 20MHz Bandwidth
System Average Efficiency	η	86.85			%	@230Vac/50Hz
Standby Power Consumption	P_{st}	-	129	-	mW	@230Vac/50Hz
Startup Time	T_{st}	-	1.4	-	s	Tested at 90Vac/60Hz
Conductive EMI Margin	-	-	6	-	dB	EN55022 Class B
Radiant EMI Margin	-	-	6	-	dB	EN55015CDN
Operating Ambient		0		40	°C	
Operating Humidity		5		95	%R.H.	

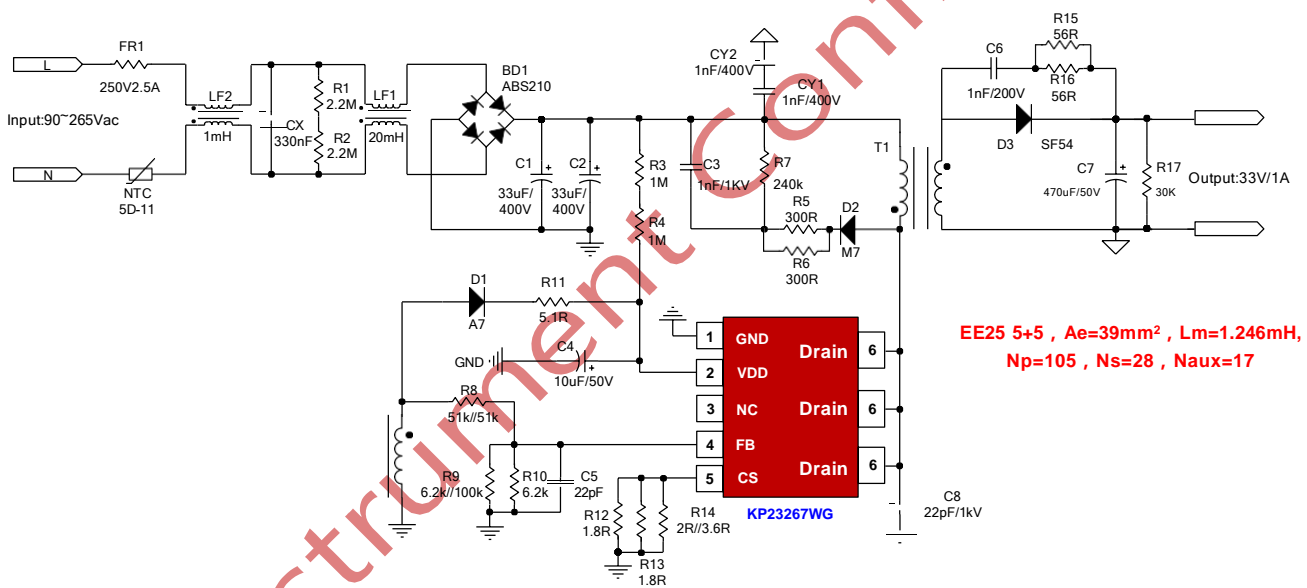
The table above shows the minimum acceptable performance of the design. Actual performance is listed in the results section.

Demo Board of KP23267WG-T01



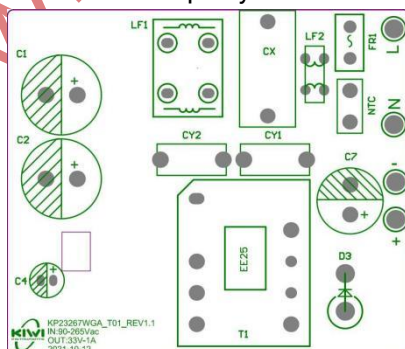
Board Size (in mm): L x W x H= 48mm x 39mm x 26mm

Schematic

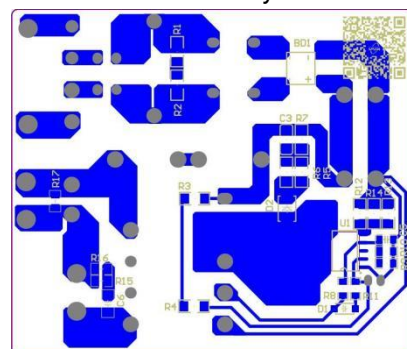


Printed Circuit Board Layout

Top Layer



Bottom Layer





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CCM PSR CC/CV Regulator KP23267WG**

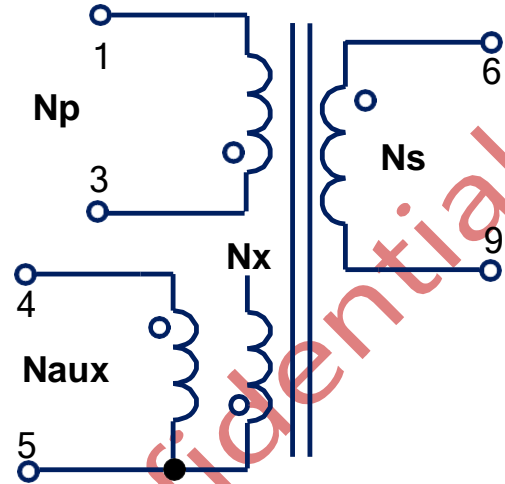
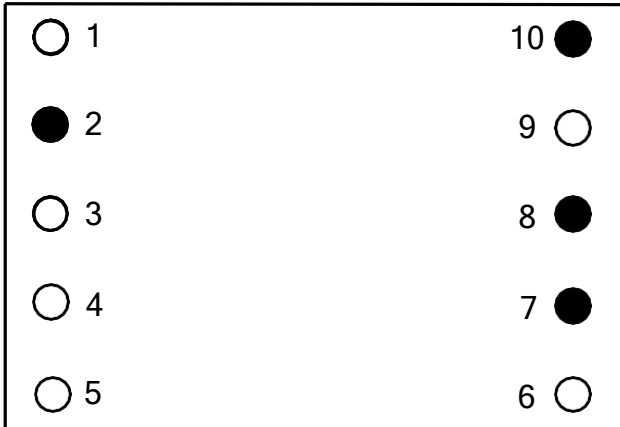
Bill of Material

No.	Designator	Value	Description	Package	Manufacturer	Part Number
1	BD1	1kV/2A	Bridge Rectifier	ABS	WORLD	Any
2	C1	33uF/400V	Electrolytic Cap, 400V,12.5*20	TH	AiSHi	Any
3	C2	33uF/400V	Electrolytic Cap,400V,12.5*20	TH	AiSHi	Any
4	C3	1nF/1000V	Ceramic Cap, 1KV X7R	1206	Murata	Any
5	C4	10uF/50V	Electrolytic Cap, 50V, 5*11.5	TH	jianghai	Any
6	C5	22pF/50V	Ceramic Cap, 50V NPO	0805	WE	Any
7	C6	1nF/200V	Ceramic Cap, 200V NPO	0805	WE	Any
8	C7	470uF/50V	Electrolytic Cap,10*16	TH	SAMYOUNG	Any
9	C8	22pF/1000V	Ceramic Cap, 1KV X7R	1206	Murata	Any
10	D1	1KV/1A	Fast Recovery Rectifiers, TRR=130ns(VF=1.1V@IF=1A)	SOD-123S	YEA SHIN	A7
11	D2	1KV/1A	Fast Recovery Rectifiers, TRR=150ns(VF=1.1V@IF=1A)	SMA	YEA SHIN	M7
12	D3	200V/5A	5.0 AMP Super Fast Recovery Rectifiers, TRR=35ns(VF=0.95V@IF=0.15A)	DO-201AD	MDD	SF54
13	FR1	2.5A/250V	Fuse 250V/2.5A	TH	Any	T2.5A250V
14	R1, R2	2.2M	Film Resistor, 5%	1206	Yageo	Any
15	R3, R4	1M	Film Resistor, 5%	1206	Yageo	Any
16	R5, R6	300R	Film Resistor, 5%	1206	Yageo	Any
17	R7	240K	Film Resistor, 5%	1206	Yageo	Any
18	R8	51K//51K	Film Resistor, 5%	0805	Yageo	Any
19	R9	6.2K//100K	Film Resistor, 5%	0805	Yageo	Any
20	R10	6.2K	Film Resistor, 5%	0805	Yageo	Any
21	R11	5.1R	Film Resistor, 1%	0805	Yageo	Any
22	R12, R13	1.8R	Film Resistor, 1%	1206	Yageo	Any
23	R14	2R//3.6R	Film Resistor, 1%	1206	Yageo	Any
24	R15, R16	56R	Film Resistor, 5%	0805	Yageo	Any
25	R17	30K	Film Resistor, 5%	0805	Yageo	Any
26	LF1	20mH	Common Inductor	UU9.8L	Sanci	Any
27	LF2	1mH	Common Inductor	9*5*3	Any	Any
28	NTC	5D-11	RES NTC	Φ13	Any	Any
29	T1	1.25mH	EE25 5+5, L=1.25mH, Np :Ns :Naux=105:28:17	EE25	Any	Any
30	U1	KP23267WG	High Performance Primary Side Regulation CV/CC Power Switch	ASOP-6	Kiwi Instruments	KP23267WG

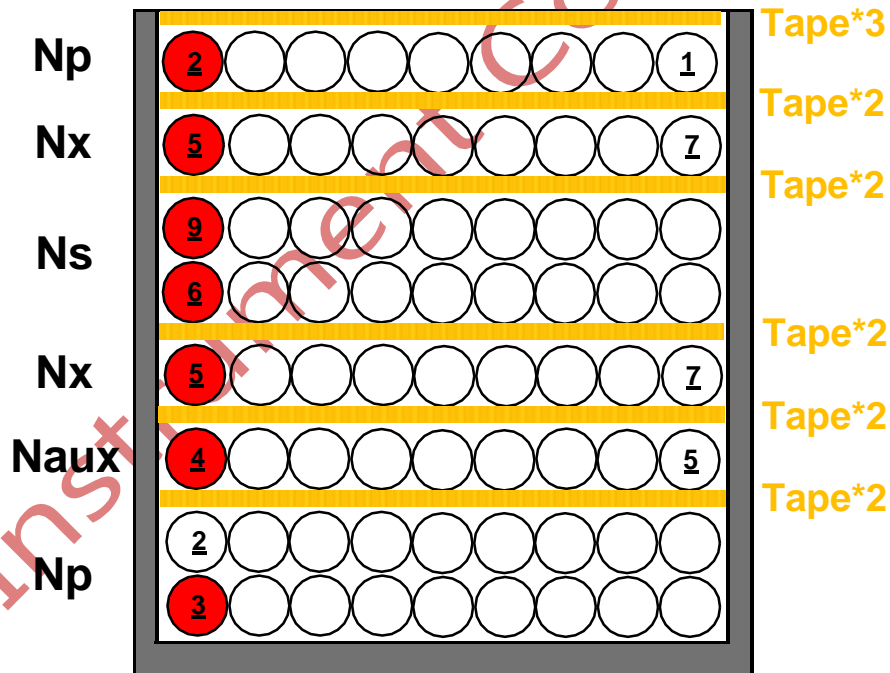
Transformer Manufacture Guide

1. Electrical Diagram

俯视图 (EE25 5+5)



2. Winding Diagram



3. Winding Order

Number	Winding	Layer	Start	End	Wire Size	Turns	Note
1	N _p	Primary	3	1	0.27d*1P	105T	Dense
2	N _{aux}	Primary	4	5	0.15d*2P	17T	Dense
3	N _x	Primary	5	7	0.15d*2P	34T	
4	N _s	Secondary	6	9	0.5d*1P (TEX-E)	28T	Dense Reverse Wound

4. Electrical Specification

Items	Test Condition	Test Pin	Specification
Primary Inductance	Measured at 40kHz, 1.0 VRMS	Pins 3 - 1, all other windings open,	1.246mH± 5%
Primary Leakage Inductance	Measured at 40kHz, 1.0 VRMS	Pins 3 - 1, all other windings shorted,	29uH

5. Transformer BOM

Items	Description
1	Core: EE25, PC40, AE=39mm ²
2	Bobbin: EE25, Horizontal, 5+5 pin
3	Wire: 0.27φ2UEW 130°C
4	Wire: 0.15φ2UEW 130°C
5	Triple Insulation Wire: 0.5φ TEX-E 130°C
6	Tape: W=8.6mm

Test Result

1. Input Characteristics

1.1. No Load Input Power Dissipation

Test Condition: while input 90Vac~265Vac and the output is no load.

Result: Maximum standby power consumption is less than 160mW.

$V_{IN}(V)$	90	115	230	265
Pin(mW)	75	80	129	156

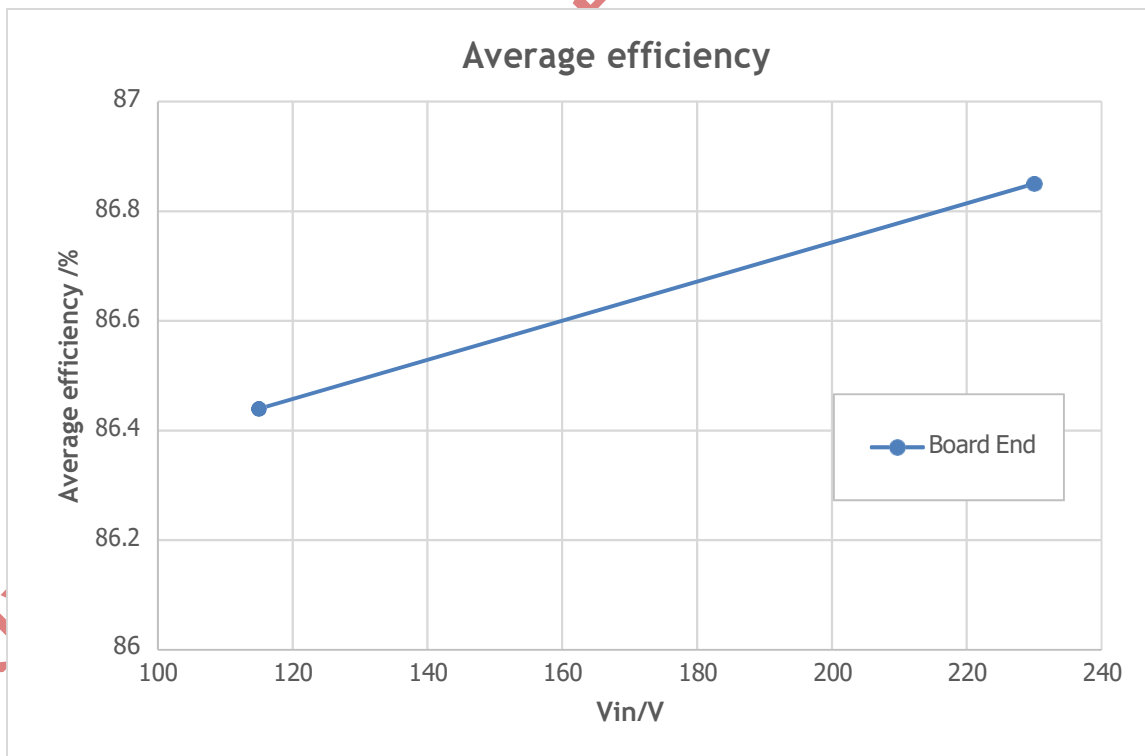
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1.2. Average Efficiency

Test Condition: Board End.

Result: While input 115Vac and 230Vac, the average efficiency is more than 86.4%.

V _{in} (Vac)	F _{line} (Hz)	P _{in} (W)	V _{out} (V)	I _{out} (A)	P _{out} (W)	Eff (%)	Eff_AVG(%)	COC_V5 Tier1(%)
115	60	39.32	33.61	1	33.61	85.48	86.44	86
		28.76	33.31	0.75	24.98	86.87		
		18.74	32.81	0.5	16.41	87.54		
		9.43	32.4	0.25	8.10	85.90		
		3.90	32.14	0.1	3.21	82.41	82.41	76
230	50	37.75	33.43	1	33.43	88.56	86.85	86
		28.33	33.28	0.75	24.96	88.10		
		18.93	32.83	0.5	16.42	86.71		
		9.61	32.3	0.25	8.08	84.03		
		4.12	32.11	0.1	3.21	77.94	77.94	76

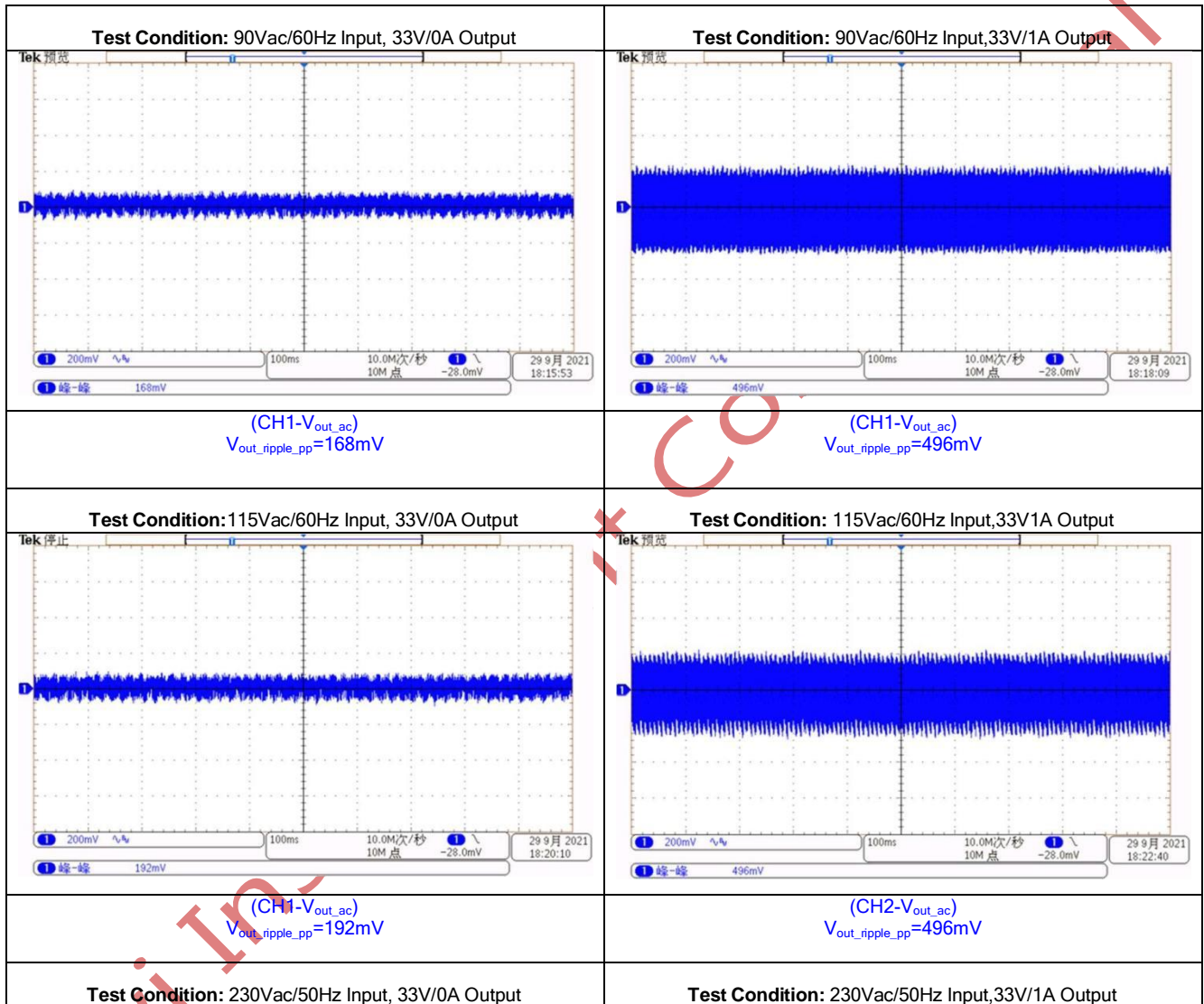


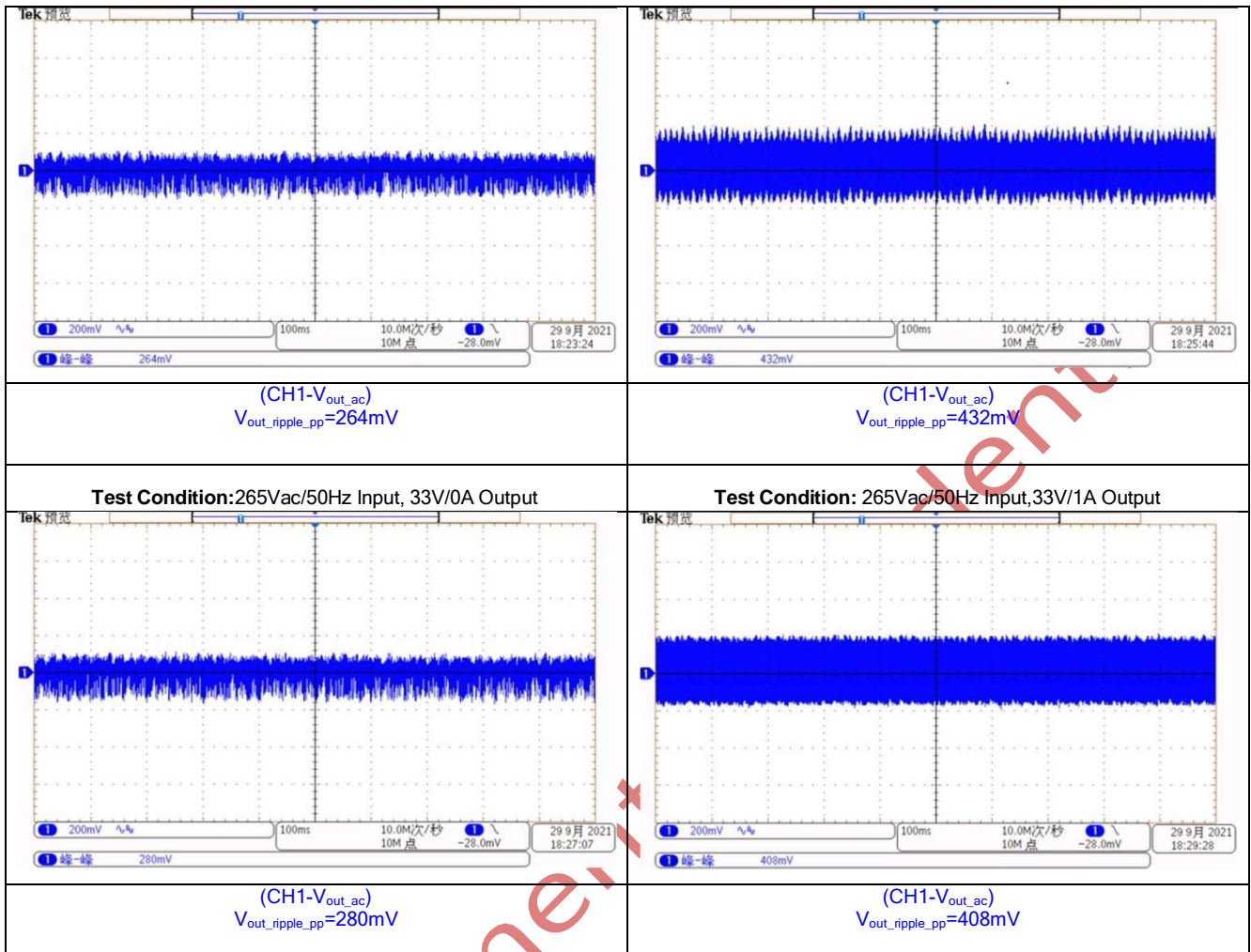
2. Output Characteristics

2.1. Ripple & Noise

Test Condition: under the input voltage 90Vac~265Vac, test at board end.

Result: $V_{ripple_max} < 2\% * V_o$.

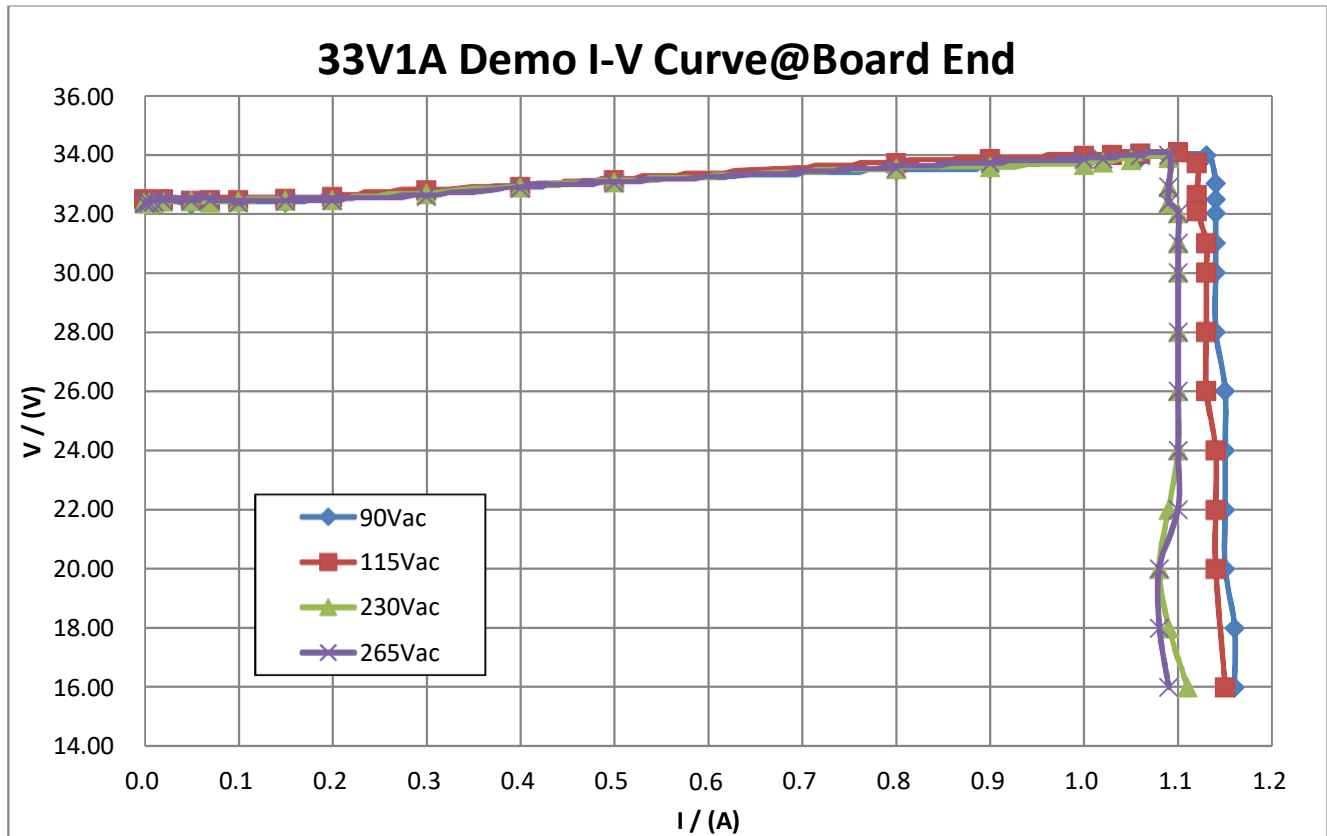




2.2. Output Voltage / Current Characteristics

Test Condition: Board End.

Result: Output voltage regulation < 5%, output current regulation < 10%.

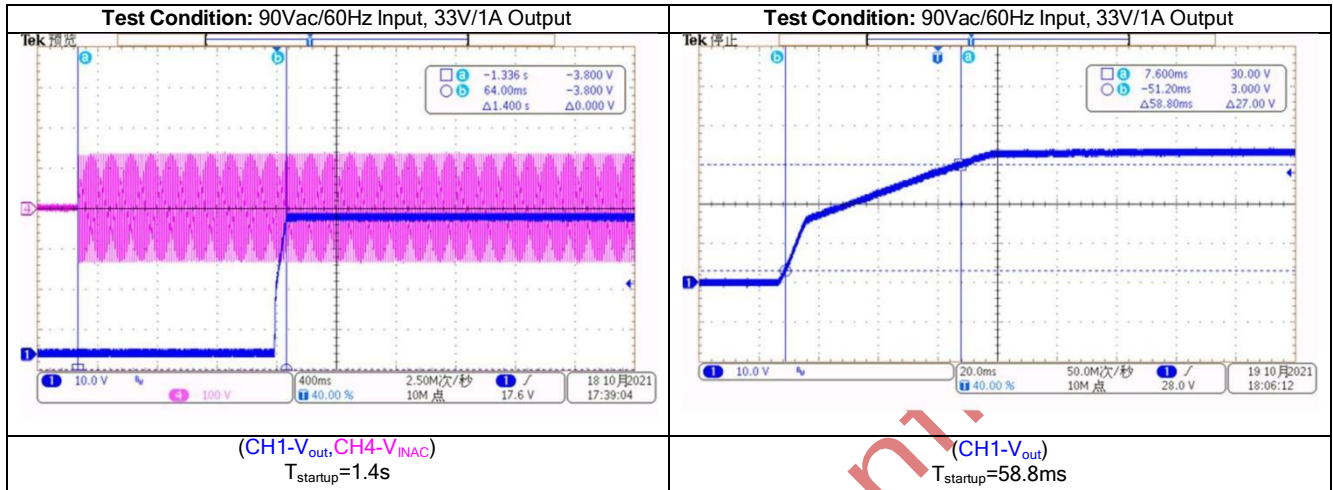


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2.3. Start Time & Rise Time

Test Condition: 90Vac @full load.

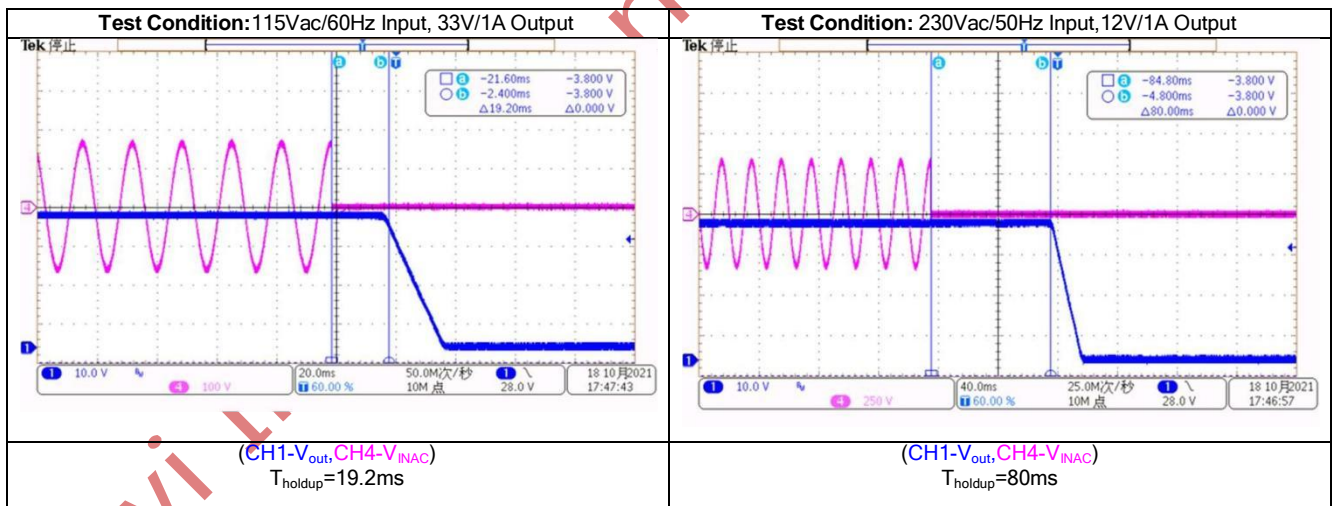
Result: Start time < 3s; Rise time < 60ms.



2.4. Hold-up Time

Test Condition: 115Vac/230Vac input & full load.

Result: More than 10ms.

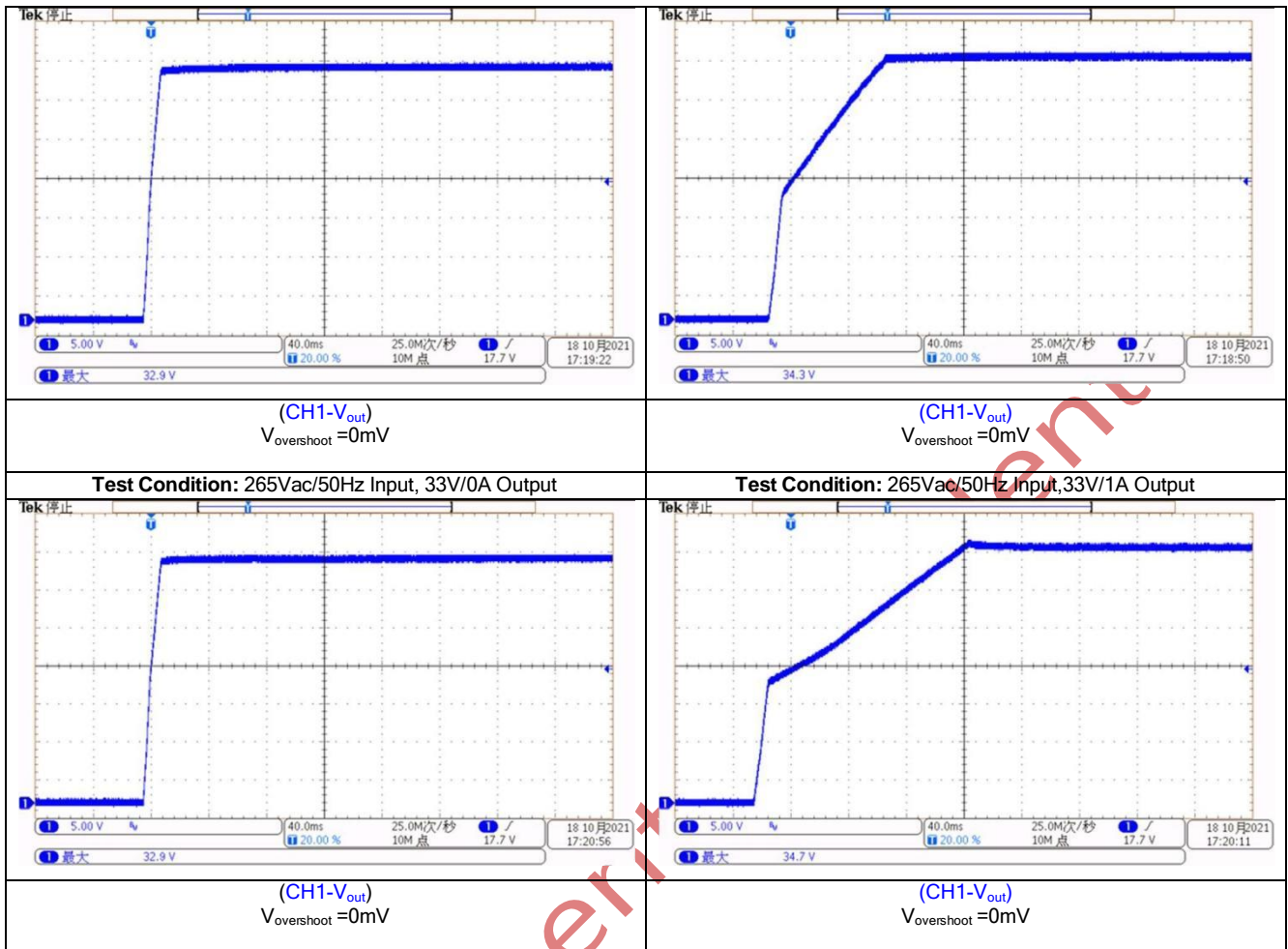


2.5. Output Overshoot

Test Condition: 90Vac/265Vac input @ no&full load.

Result: Output overshoot < 5%.

Test Condition: 90Vac/60Hz Input, 33V/0A Output	Test Condition: 90Vac/60Hz Input, 33V/1A Output
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3. Protection Requirements

3.1. Over Current Protection

Test Condition: 20V/30V CV Load.

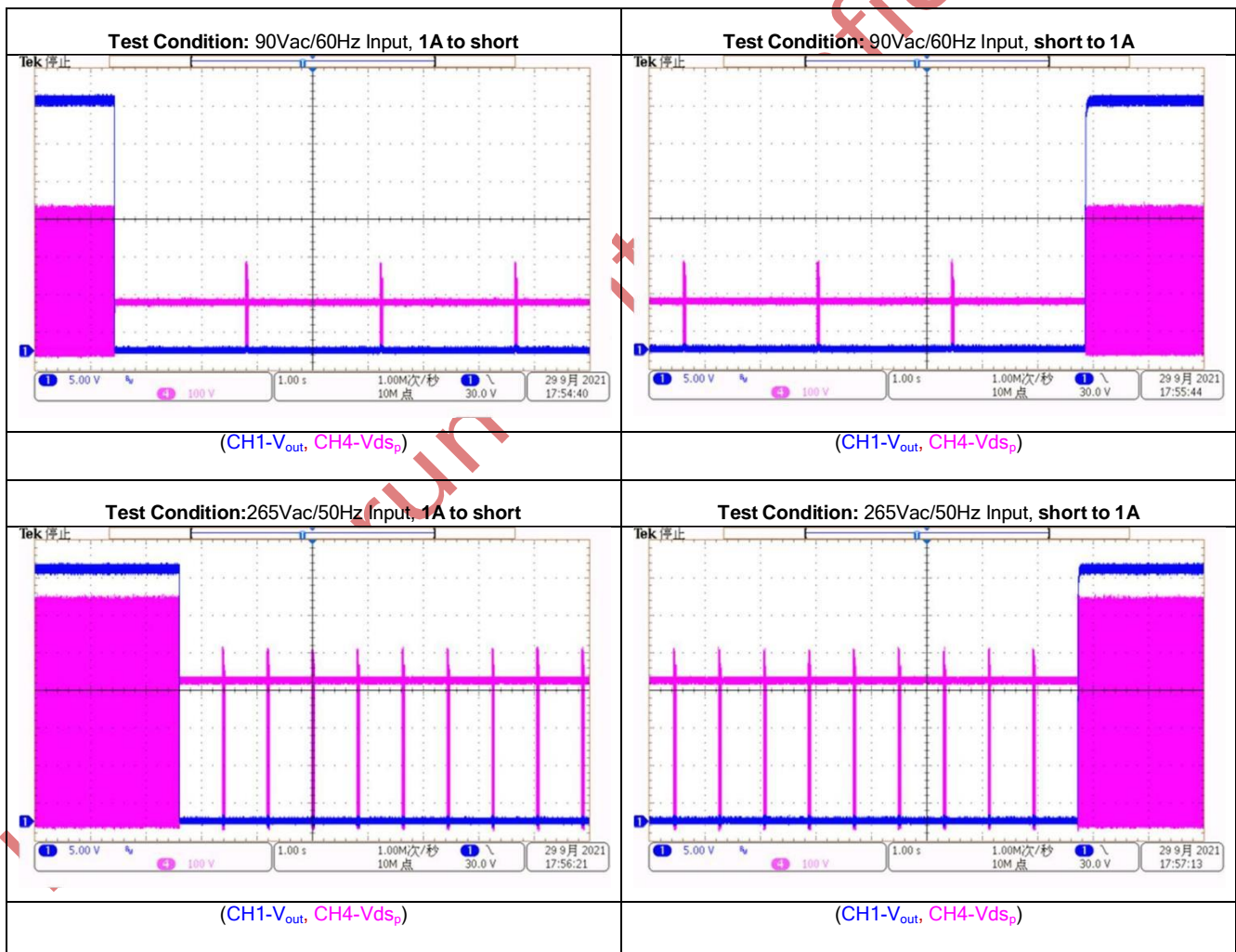
Result: OCP point is between 1.05A~1.15A

V _{out}	90V	115V	230V	265V
30V	1.13A	1.12A	1.1A	1.09A
20V	1.15A	1.14A	1.08A	1.07A

3.2. Short Circuit Protection

Test Condition: Short and Remove.

Result: Normal operation without damage or any safety hazard.



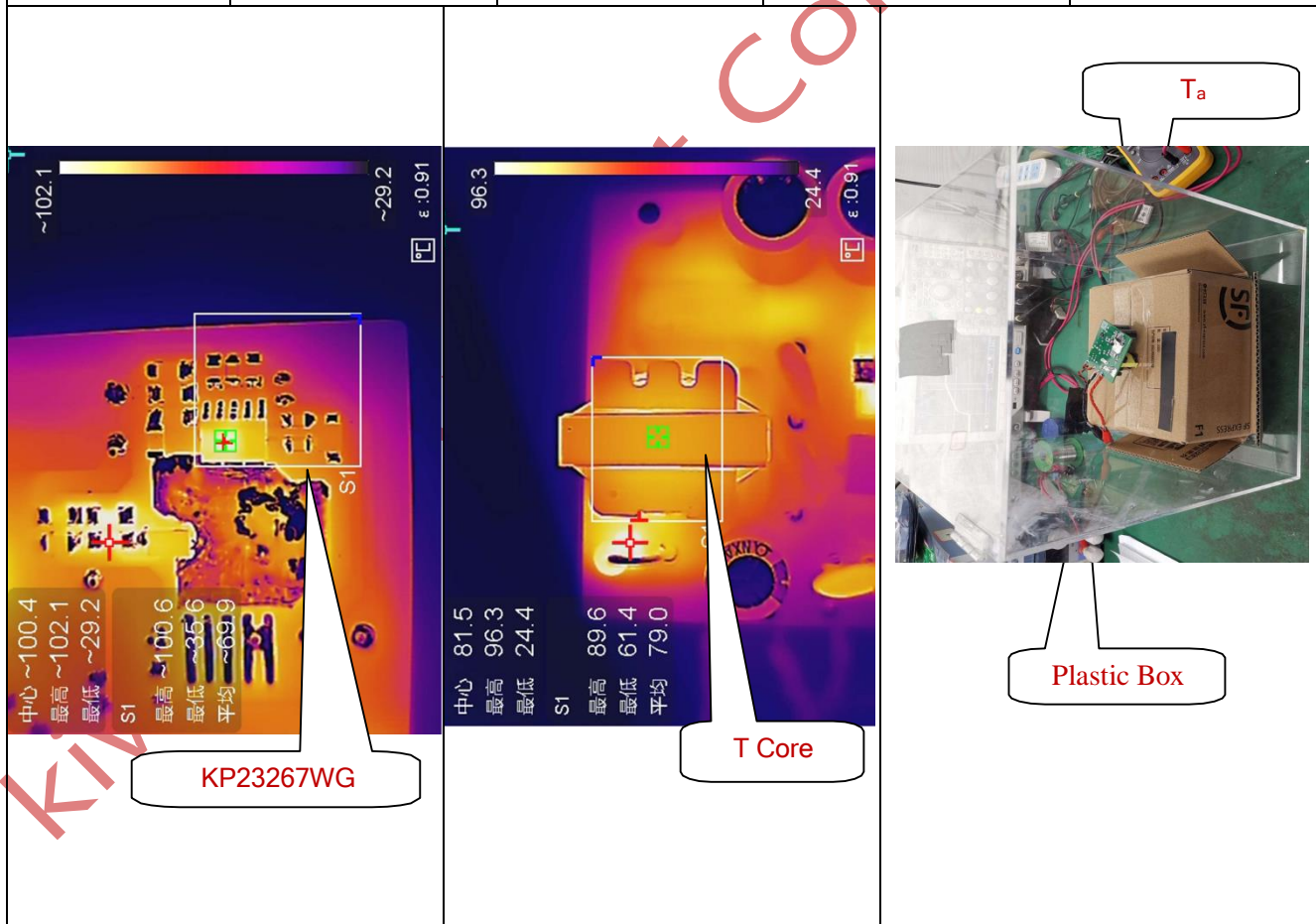
4. Reliability Requirements

4.1. Thermal Test

Test Condition: Ambient Temperature: 25°C and steady environment with no airflow, T_a is the temperature inside the plastic box.

Result: IC : $\Delta T < 75^\circ\text{C}$. Transformer: $\Delta T < 70^\circ\text{C}$.

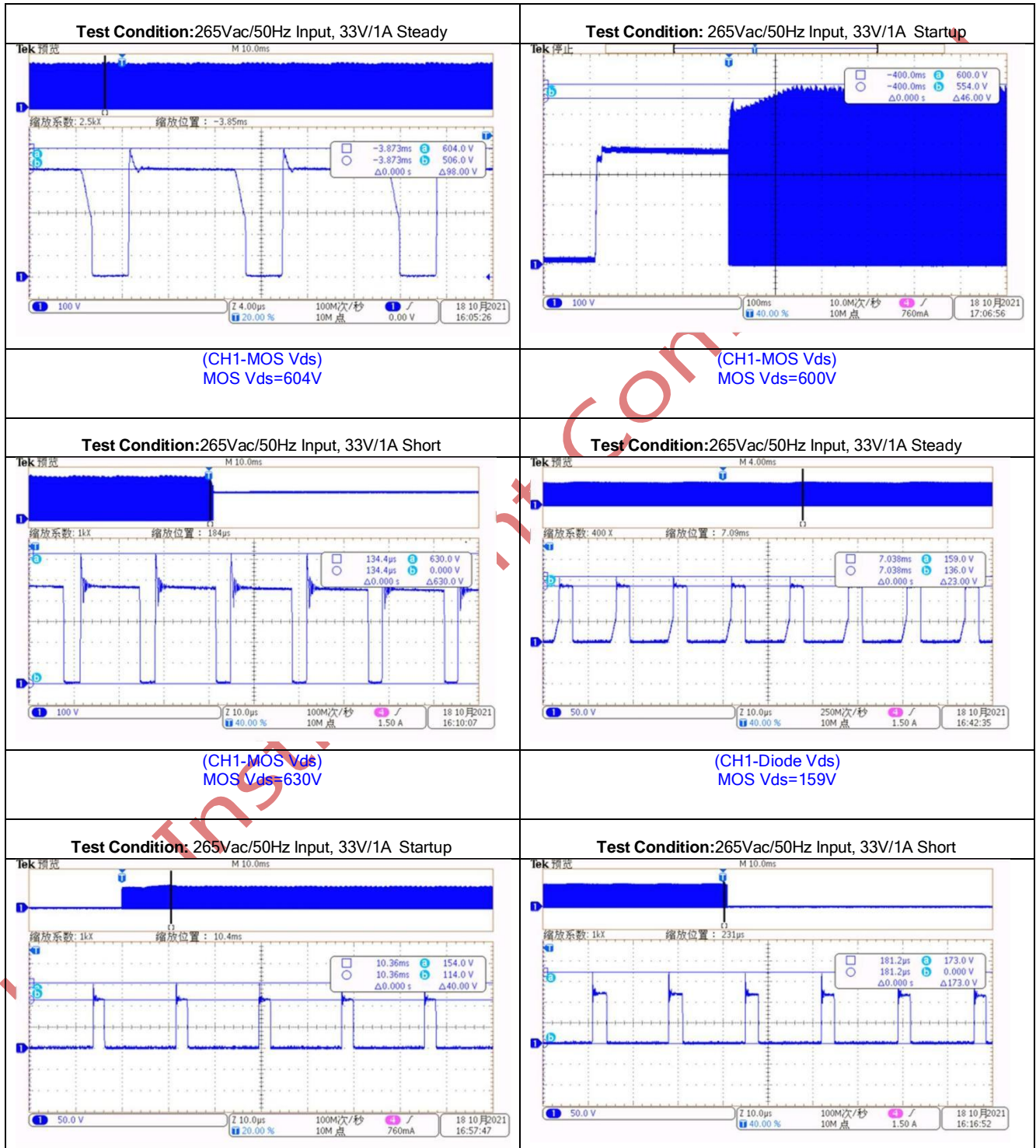
Component	90Vac		265Vac	
	$T_a = 27.2^\circ\text{C}$		$T_a = 26.3^\circ\text{C}$	
	$T_c(^{\circ}\text{C})$	$T_{\text{rise}}(^{\circ}\text{C})$	$T_c(^{\circ}\text{C})$	$T_{\text{rise}}(^{\circ}\text{C})$
KP23267WG	100.6	73.4	71.1	44.8
SF54	101.2	74	96.4	70.4
T Core	81.5	54.3	74.9	48.6
T Windings	95.1	67.9	85.6	59.3



4.2. Device Maximum Rating

Test Condition: Steady State; Startup; Short.

Result: Steady State <95% V_{rm} ; Dynamic State <100% V_{rm} .



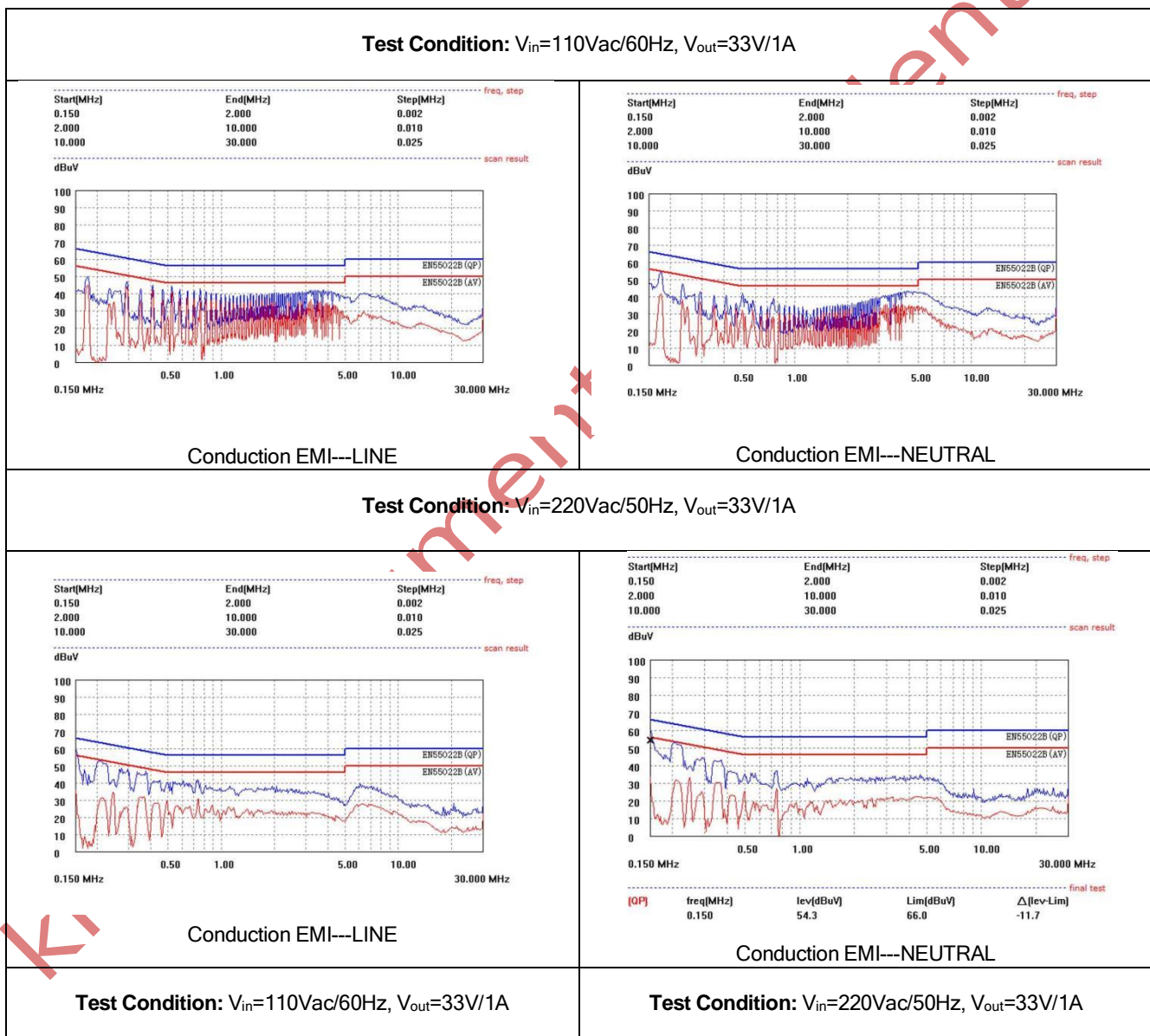
(CH1-Diode Vds) MOS Vds=154V	(CH1-Diode Vds) MOS Vds=173V
Test Condition:90Vac/60Hz, Input 32V/1.13A Steady	Test Condition: 90Vac/60Hz, Input 33V/1A Steady
(CH2-Vcs) Vcs=636mV, Bmax=0.356T	(CH2-Vcs) Vcs=574mV, Bmax=0.321T

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5. EM/EMS

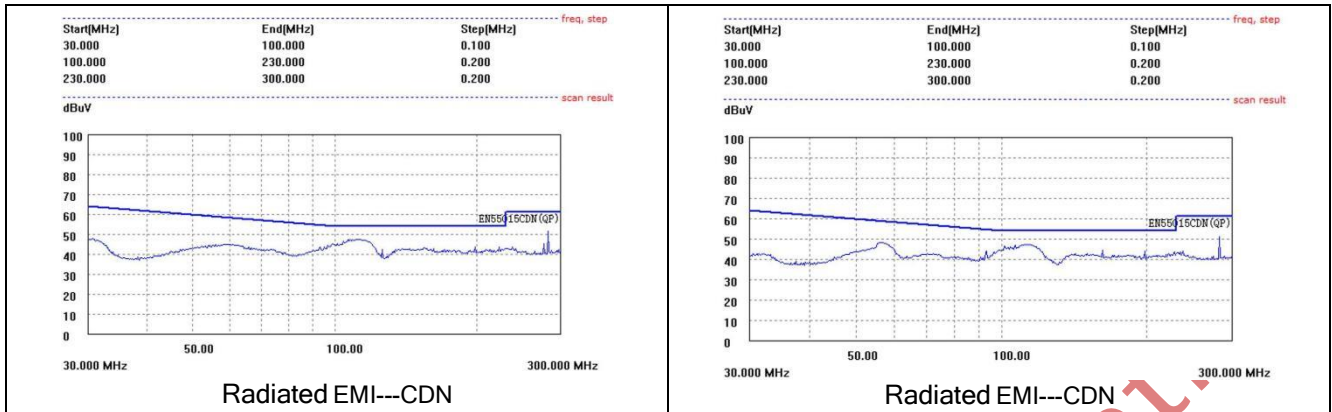
5.1. EMI Standards

standard	EN55022B/55015CDN
content	CE & RE
requirement	6dB margin
Result	PASS





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Revision History

DATE	REV	DESCRIPTION
2021/10/19	1.0	First Release

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