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AP3105 For 12V 1.5A Adapter Test Report

General Design Specification:

- **AC Input Range 90-264Vac**
- **DC Output 12V, 1.5A**
- **Meet "<100mW"No-Load standby Power Consumption Requirement**
- **Meet "EPA_2.0"Requirement**

Key Performance

Item	Spec	Test Conditions	Test Data	Result
Output Voltage	11.75~12.25V	90~264Vac @ 0~1.5A	**11.95~12.08V**	**Pass**
Ripple	<120mVp-p	90~264Vac @ 0~1.5A	**113mVp-p**	**Pass**
Standby Power	<100mW	230Vac @ 0A	**96mW**	**Pass**
Dynamic	11.45~12.50V	90~264Vac @ 0.0~1. 5~0.0A 5mS 0.1A/uS	**11.60~12.32V**	**Pass**
ESD	Contant:10KV Air:15KV	115,230Vac @ 1.5A	Contant:10KV Air:15KV	**Pass**
EMC	EN55022B	115Vac 230Vac@ 1.5A	**-6dB**	**Pass**

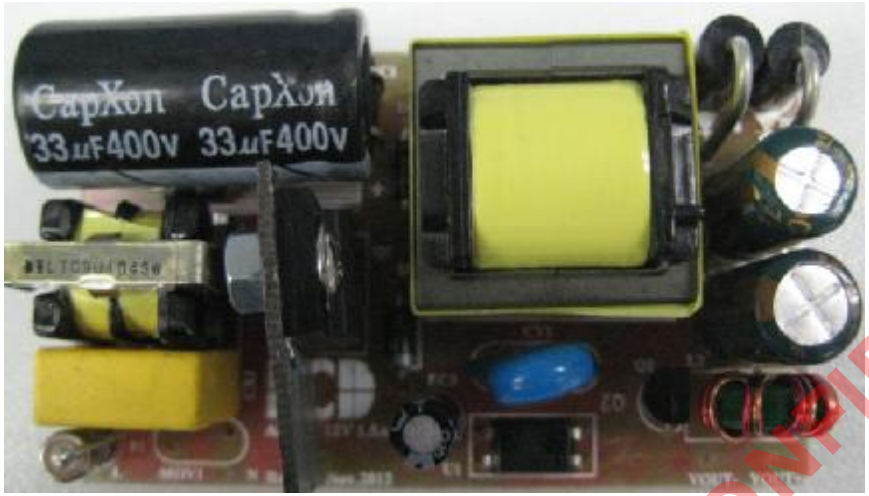
Specification

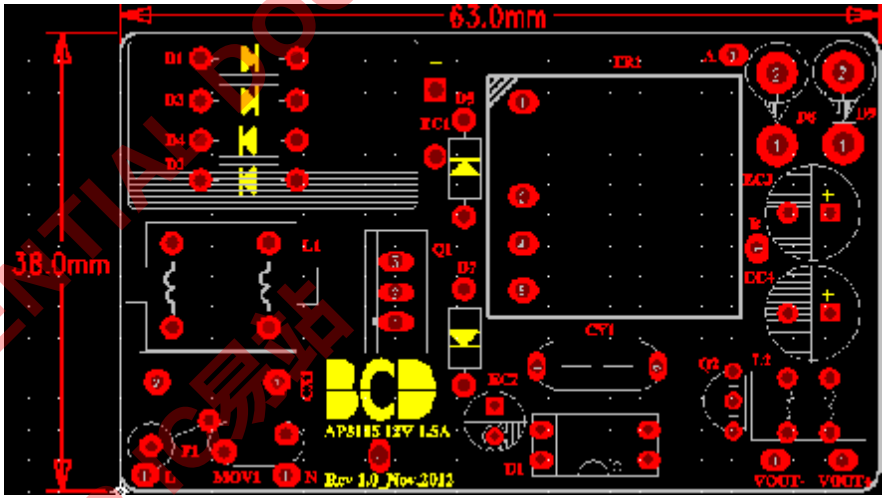
Description	Min	Type	Max	Units	Conditions
Input					
Voltage	90		264	VAC	
Frequency	47	50/60	63	Hz	
No-Load Input Power (230Vac)			100	mW	
Output					
Output Voltage	11.7	12.0	12.3	V	
Output Current	0		1.5	A	
Output Power		18		W	
Output Ripple Voltage			100	mVp-p	Iout =1A @ 25℃, 20MHzbandwidth
Output Over Current Protection	1		2.1		Hiccup, Auto Restart
Ambient Temperature			40	℃	
Efficiency					
Average Efficiency (EPS 2.0)	80.29			%	Measured at end of output DC-Cable, 115Vac &230Vac @ 25℃
EMI	Pass EN55022 Class B with 6dB Margin				

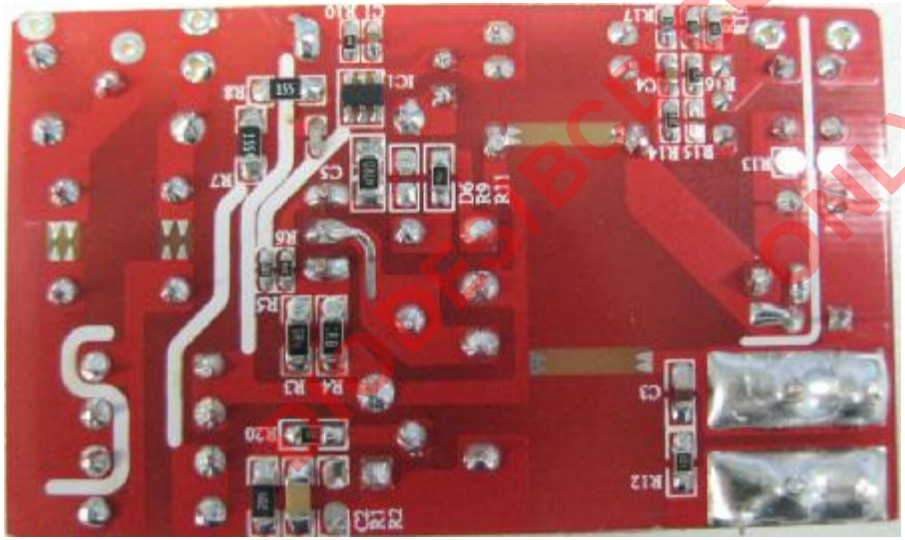
Test Equipment

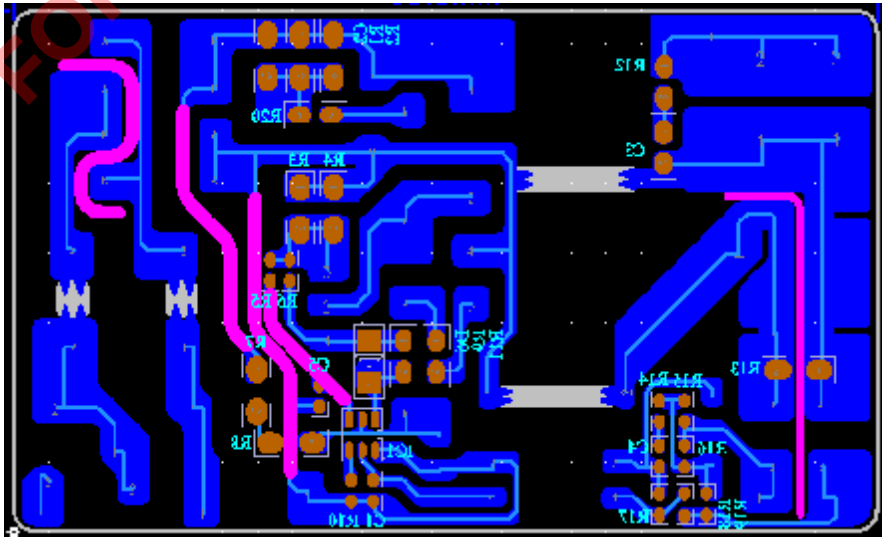
Item	Model
AC Source	Chroma 61602
Power Meter	YOKOGAWA WT210
Electronic Load	Chroma 63100
Oscilloscope	YOKOGAWA DLM2024 2.5GS/s 200MHz
Digit Multimeter	Agilent 34410A
Data Acquisition	Agilent 34970A

PCB Layout

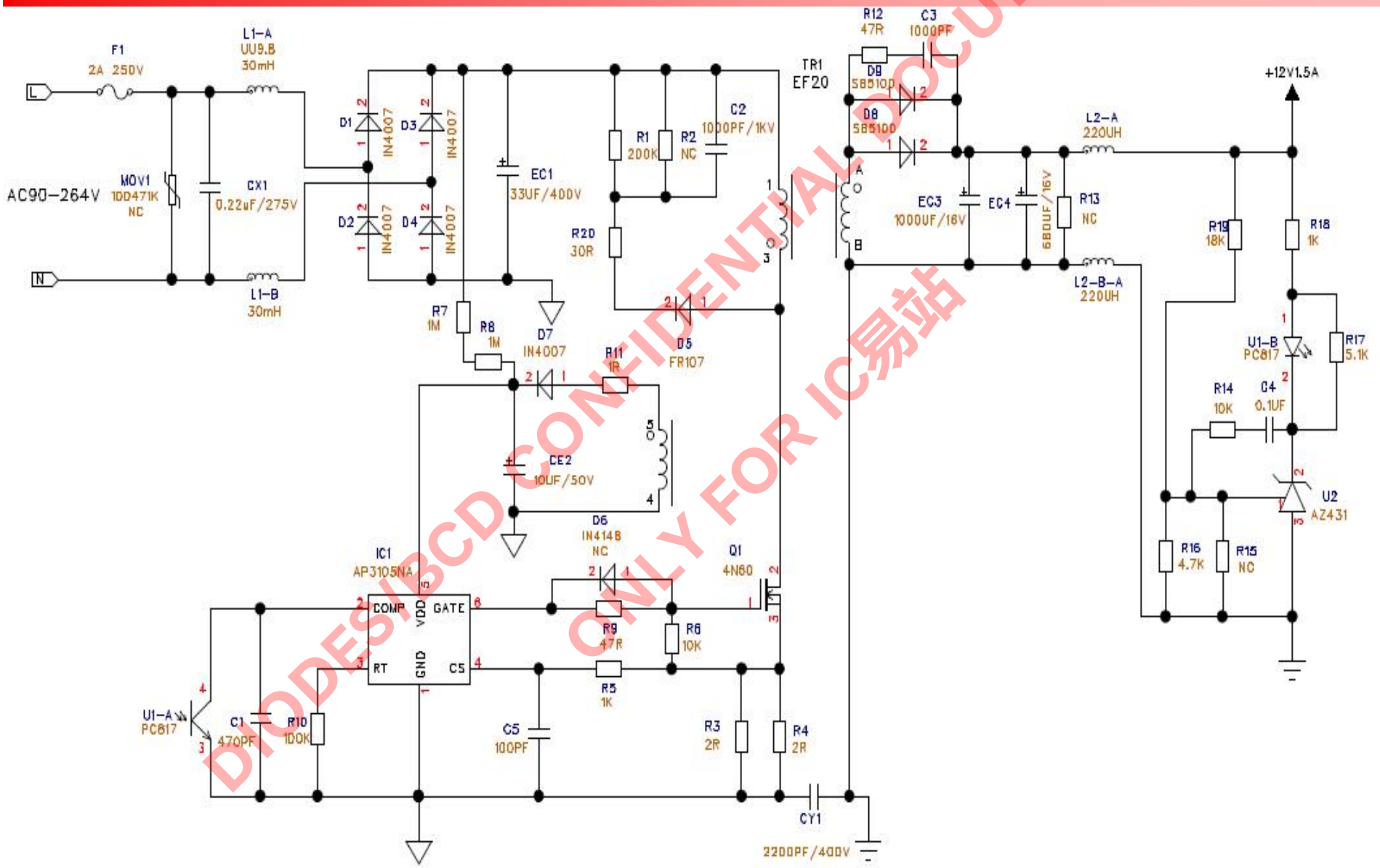








Schematic Circuit

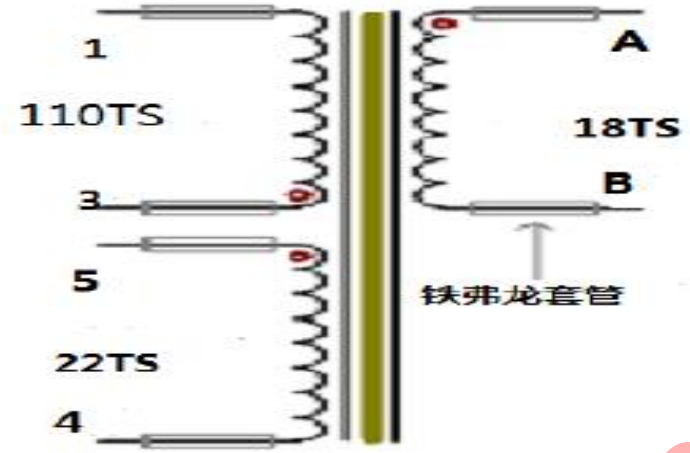


Bill Of Material

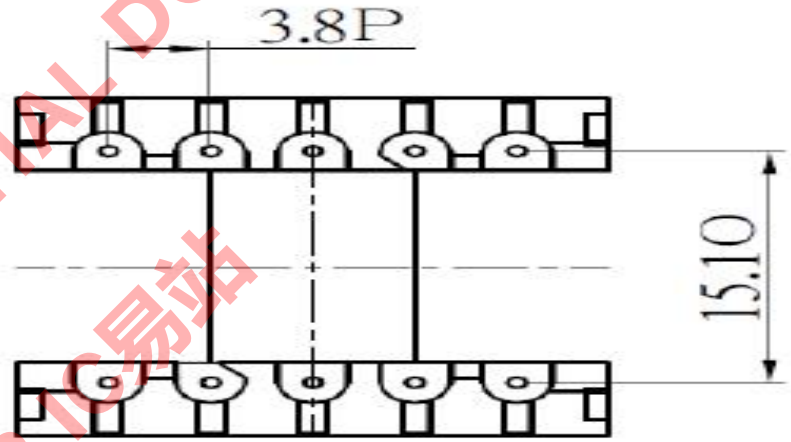
NO.	Spec.	position	NO.	Spec.	position
1	EF-20 卧式骨架(5+5)	TR1	20	30Ω ±5% 0805 1/6W	R20
2	UU9.8 30mH共模电感	L1	21	SB5100： 5A 100V DO-27	D8 ,D9
3	220uH共模电感	L2	22	4N60 :4A 600V TO-220	Q1
4	200KΩ ±5% 1206 1/4W	R1	23	AP3105NA SOT23-6	IC1
5	2Ω ±1% 1206 1/4W	R3,R4	24	AZ431 AZ-AE1 T0-92	Q2
6	100PF/25V ±15% 0603 X7R	C5	25	PC817 A XI1 DIP-4	U1
7	1KΩ ±1% 0603 1/8W	R5 R18	26	33uF 400V 13*21mm Electrolytic	CE1
8	10KΩ ±1% 0603 1/8W	R6	27	1000uF 16V 8*12mm Electrolytic(ESR@40K:27mohm)	CE3
9	1MΩ ±5% 1206 1/4W	R7,R8	28	680uF 16V 8*12mm Electrolytic(ESR@40K:30mohm)	CE4
10	5.1KΩ ±5% 0603 1/8W	R17	29	10uF 50V 5*11mm Electrolytic	CE2
11	47Ω ±1% 1206 1/4W	R9	30	470PF/25V ±15% 0603 X7R	C1
12	100KΩ ±1% 0603 1/8W	R10	31	1000PF/1KV ±15% 1206 X7R	C2
13	1Ω ±5% 0805 1/6W	R11	32	1000PF/100V ±15% 0805 X7R	C3
14	47Ω ±5% 0805 1/6W	R12	33	Fuse 2A 250V	F1
15	10KΩ ±5% 0603 1/8W	R14	34	2200PF /400V Y1	CY1
16	4.7KΩ ±1% 0603 1/8W	R16	35	0.22uF/275V X2	CX1
17	1N4007 1A 1000V DO-41	D1~D4, D7	36	PCB FR-4 61.5*36*1.6mm	PCB
18	FR107 1A 1000V DO-41	D5	37	MOV1,D6,R1,R13,R15	NC
19	18KΩ ±1% 0603 1/8W	R19	38		

Transformer Specification

2.SCHEMATIC DIAGRAM (BOTTOM VIEW)
绕线连接图(底视图)



3.Bobbin Mounting Direction as per the following sketch
BOBBIN 插入方向(如下图)



3.Primary Inductance 原边电感
原边电感量（Pin 1 – Pin 3)： Lp=1.2mH, ±5% (@ 1kHz)，漏感 （50uH。
High voltage 3000VAC 1sec <1mA

4.WINDING DETAILS 详细绕线

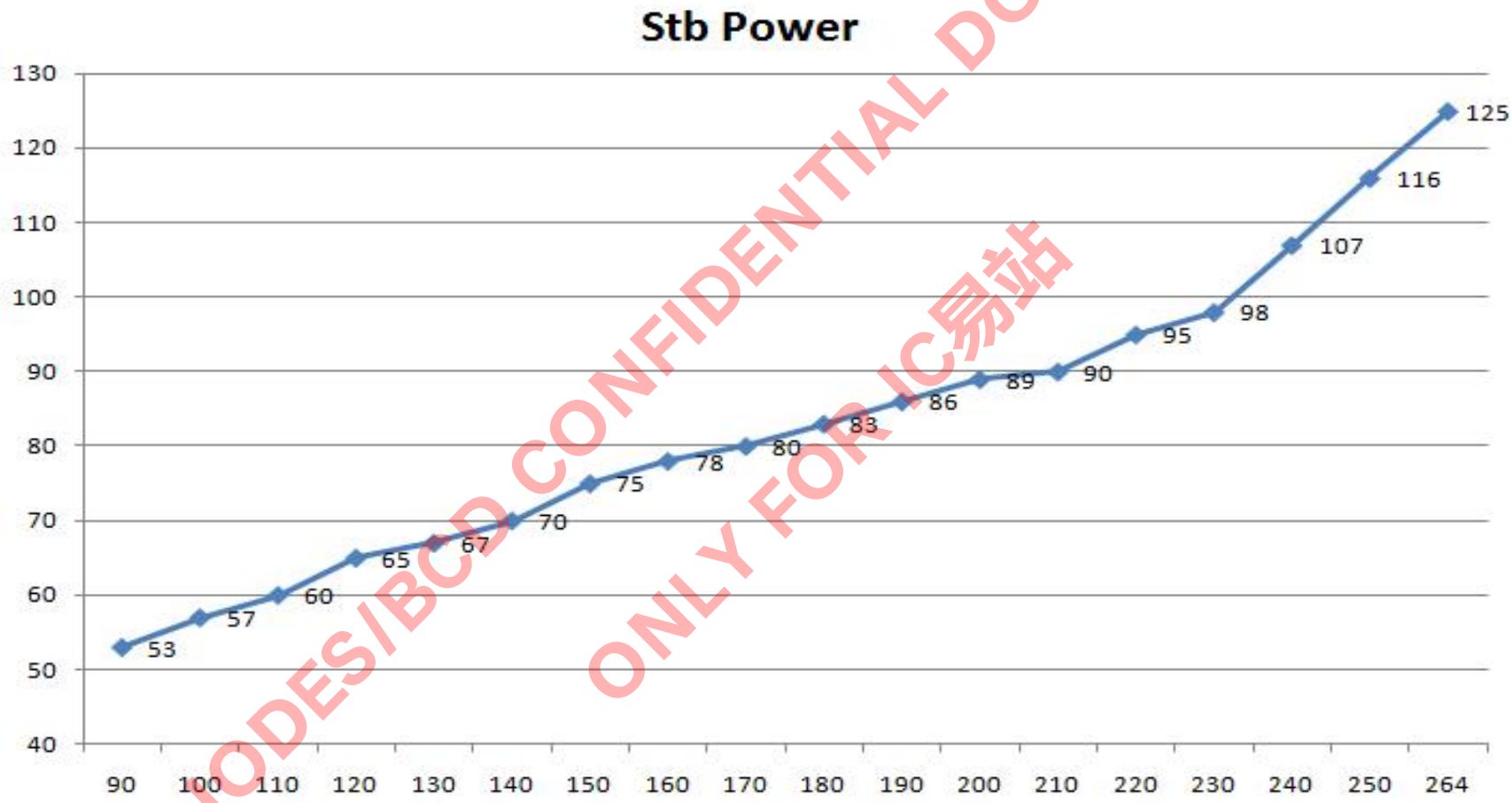
Wdg.No	Start 起线	Finish 收线	Turns 圈数	Wire Dia. 线径	Wdg Type Spread / Even 绕线方法 疏绕/密绕	Wdg Direction 绕线方向	Turns/Layer No. Of Layers
W1	3	2	74T	ϕ0.3mm*1	单线两层一次绕完	RIGHT	2 Layer
1 layers of Polyester Yellow tape, T=0.05 mm							
W2	5	4	22T	ϕ0.23mm*2	二线一层一次绕完	RIGHT	1 Layers
2 layers of Polyester Yellow tape, T=0.05 mm							
W3	A	B	18T	ϕ0.45mm*2 二层绝线	双线二层一次绕完	RIHGT	2 Layer
3 layers of Polyester Yellow tape, T=0.05 mm							
W5	2	1	36T	ϕ0.3mm*1	单线一层一次绕完	RIGHT	1 Layer
3 layer of Polyester Yellow tape, T=0.05mm							
注：变压器引脚加铁弗龙套管							

Regulation, Ripple, OCP and Efficiency

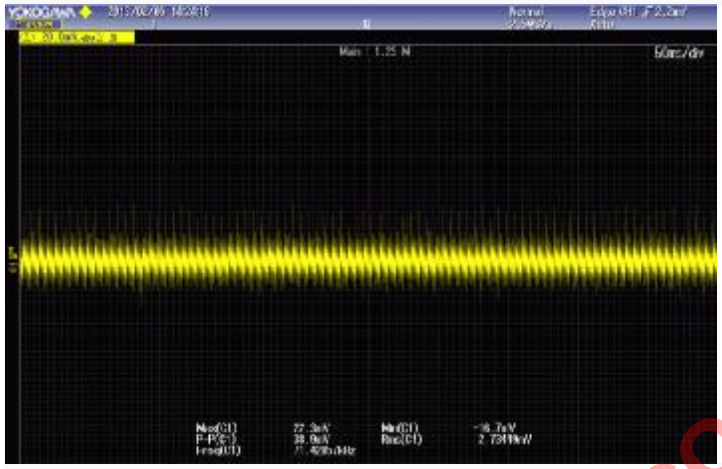
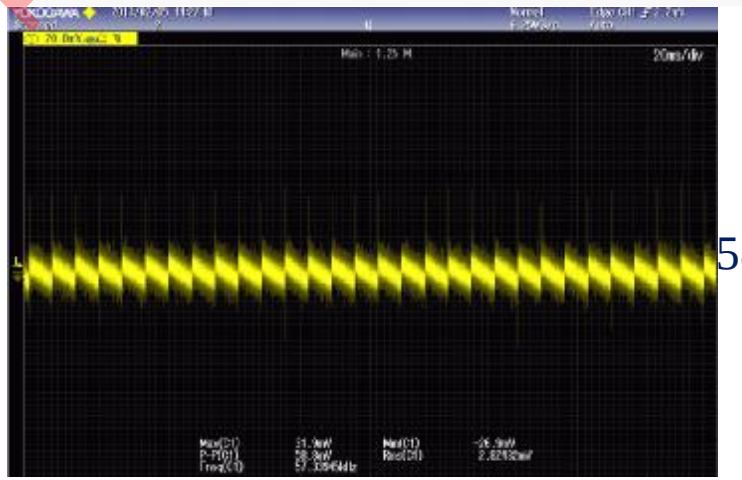
V_{IN}(V)	P_{IN}(W)	V_{OUT}(V)	I_O(A)	Ripple (mV)	P_{OUT}(W)	η	OCP	Average η	SPEC.
90V/60Hz	21.73	12.05	1.500	90.9	18.07	83.17%	2.0	84.74%	EPS2.0 80.29%
	16.06	12.05	1.125	84.6	13.55	84.41%			
	10.59	12.06	0.750	69.6	9.04	85.41%			
	5.26	12.06	0.375	58.4	4.52	85.97%			
115V/60Hz	21.24	12.04	1.500	56.5	18.06	85.02%	2.2	85.93%	
	15.79	12.05	1.125	93.5	13.55	85.85%			
	10.45	12.06	0.750	82.5	9.04	86.55%			
	5.24	12.06	0.375	68.3	4.52	86.30%			
230V/50Hz	20.83	12.04	1.500	65.3	18.06	86.70%	2.3	86.20%	
	15.66	12.05	1.125	93.6	13.55	86.56%			
	10.50	12.06	0.750	87.6	9.04	86.07%			
	5.29	12.06	0.375	79.2	4.52	85.49%			
264V/50Hz	20.96	12.04	1.500	99.0	18.06	86.16%	2.3	85.52%	
	15.82	12.05	1.125	96.6	13.55	85.69%			
	10.58	12.05	0.750	95.8	9.04	85.42%			
	5.33	12.06	0.375	90.4	4.52	84.84%			

*** Note: Output Voltage measured at end of PCB**

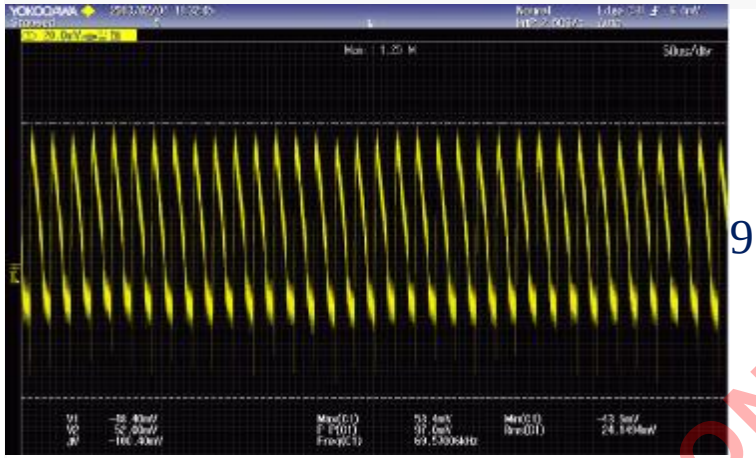
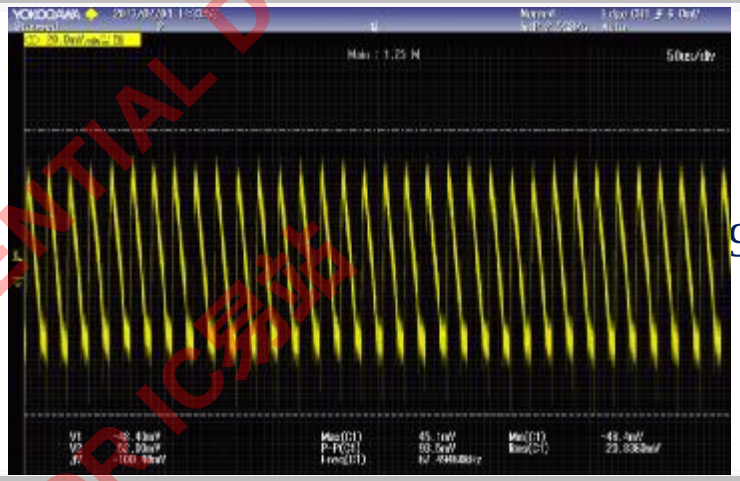
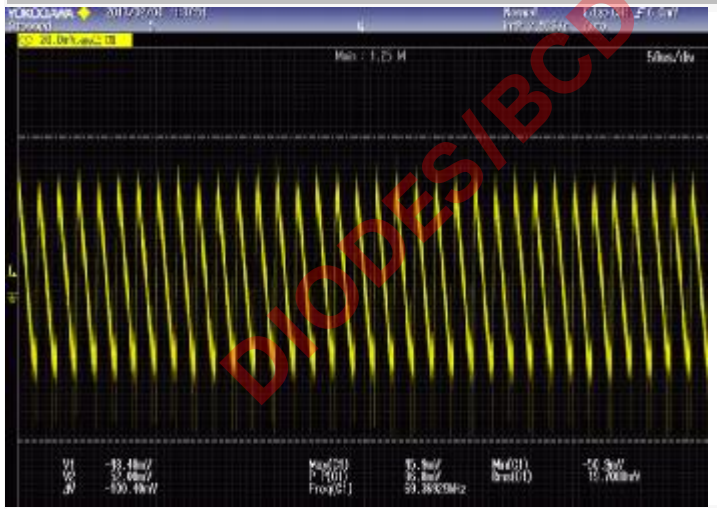
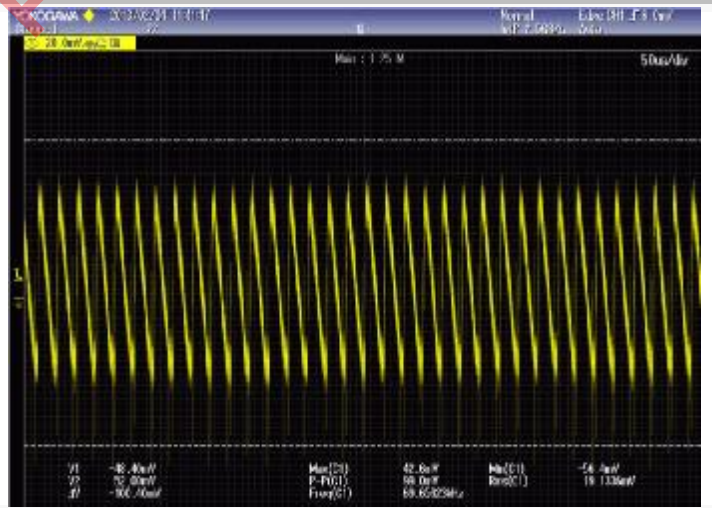
Standby Power



Output Ripple & Noise

90Vac No Load	115Vac No Load
 38.9mV	 39.2mv
230Vac No Load	**264Vac No Load**
 55.6mV	 58.8mV

Output Ripple & Noise

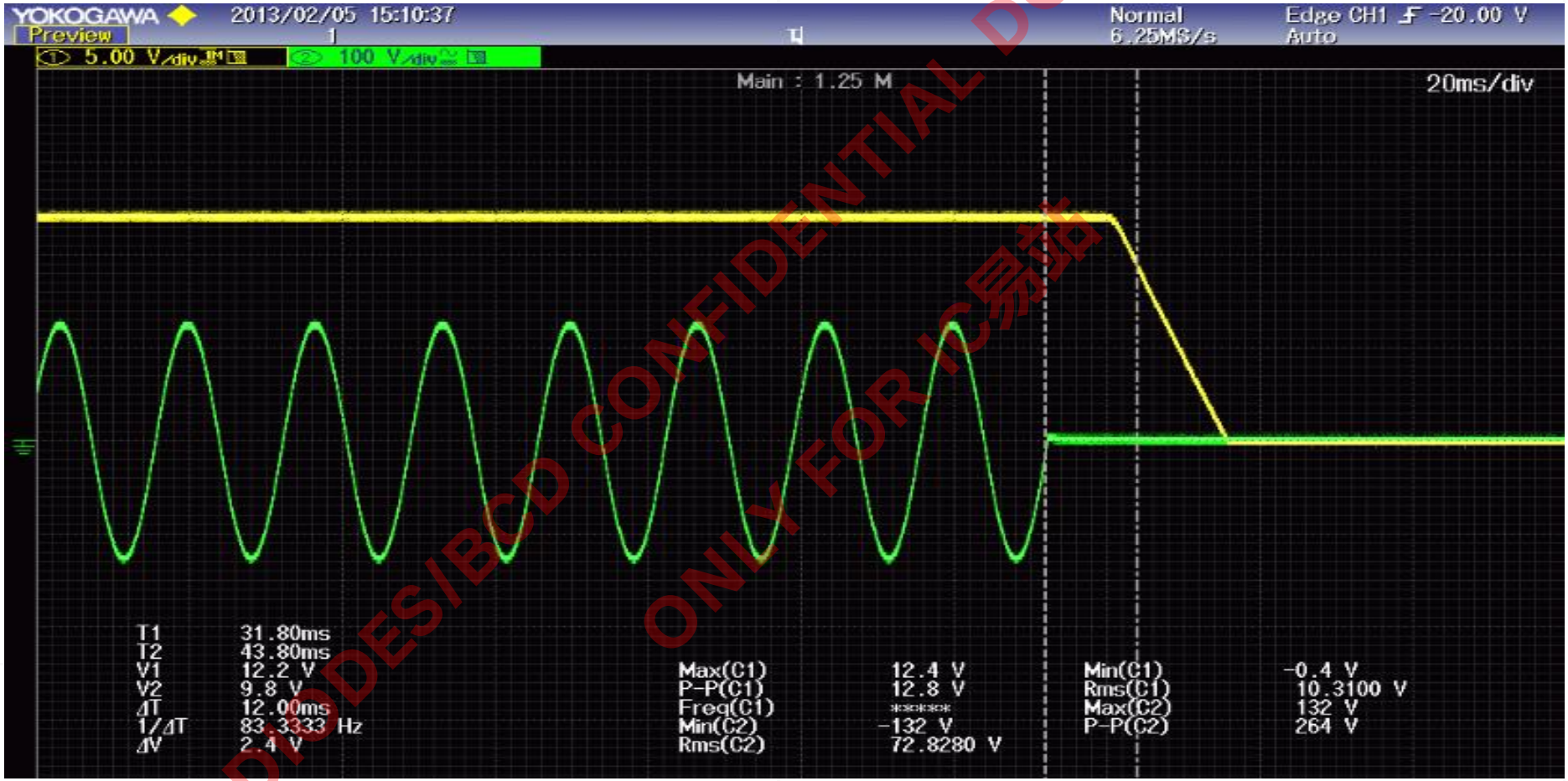
90Vac Full Load	115Vac Full Load
 97.0mV	 93.5mv
230Vac Full Load	**264Vac Full Load**
 96.8mV	 99.0mV

Turn On Delay Time

90Vac No Load	90Vac Full Load
	
T_{DELAY}: 2.36S	T_{DELAY}: 2.69S

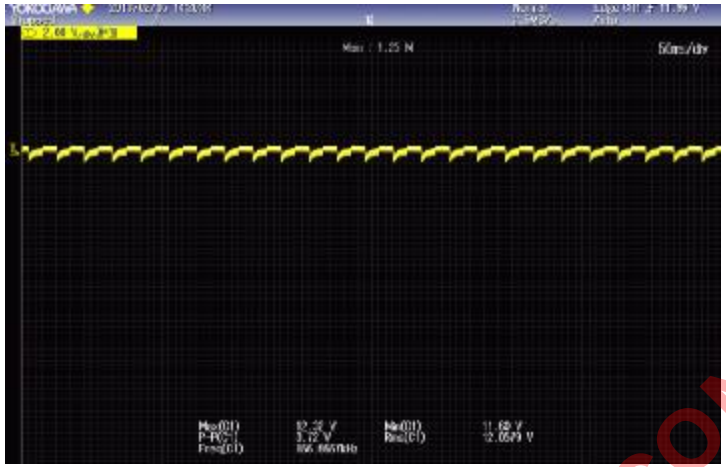
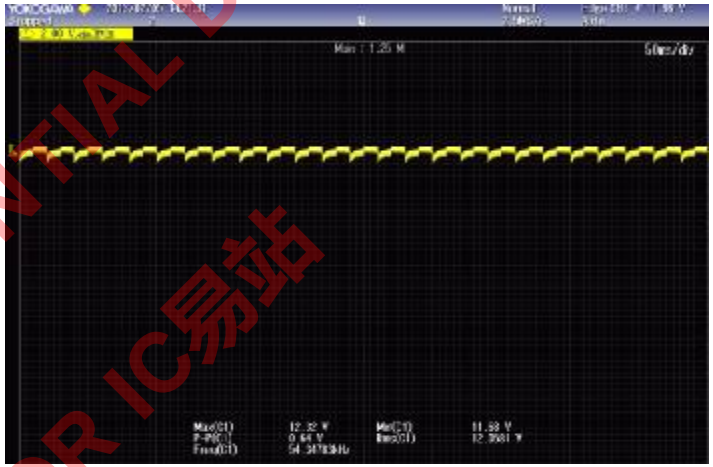
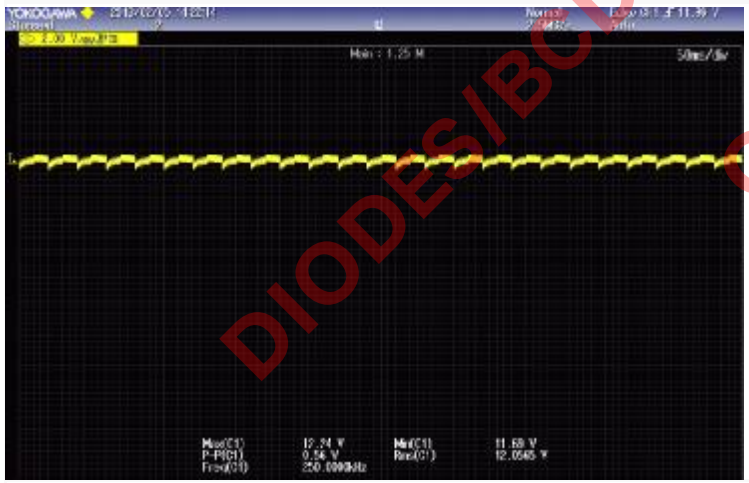
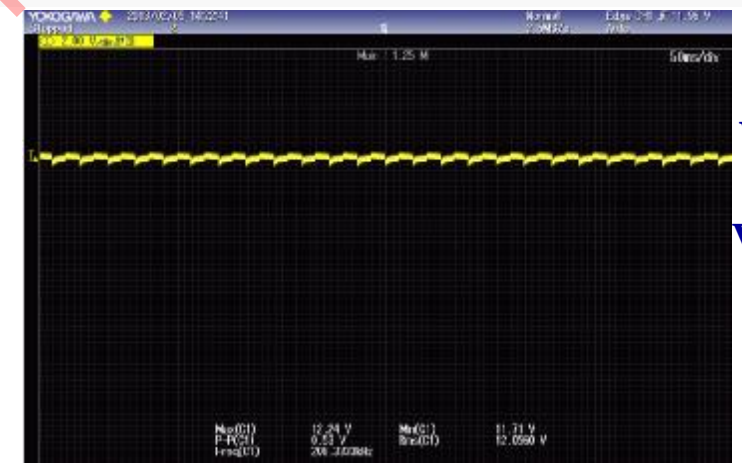
Hold Up Time

90Vac Full Load	



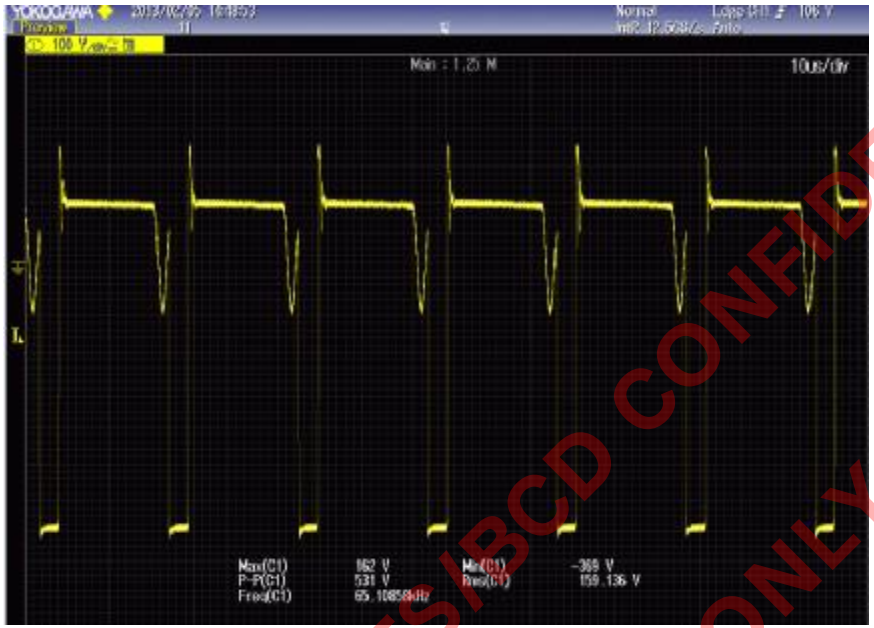
Thold:12ms

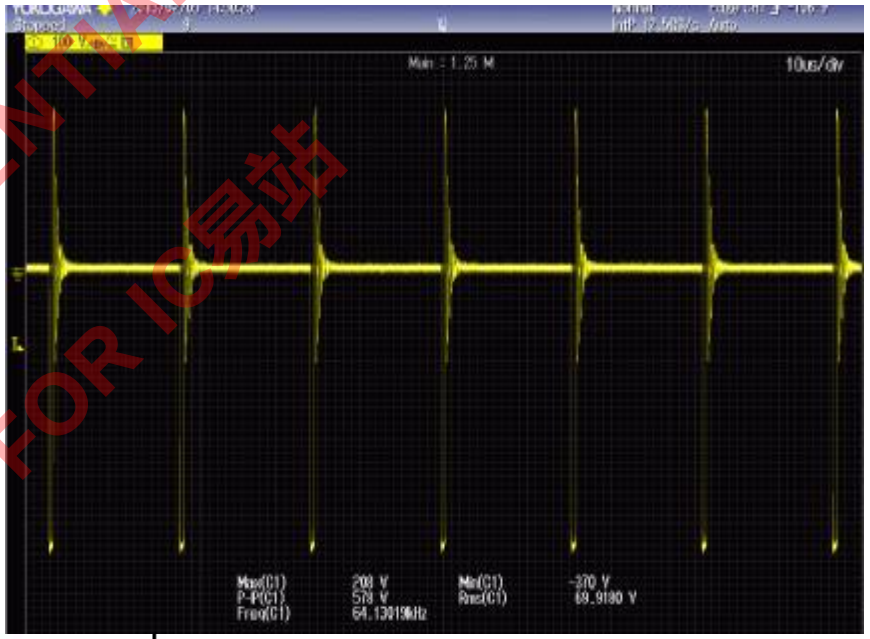
Dynamic

90Vac 0%~100%10mS 0.1A/uS	115Vac 0%~100%10mS 0.1A/uS
 Vomin 11.60 Vomax 12.32	 Vomin 11.68 Vomax 12.32
230Vac 0%~100%10mS 0.1A/uS	264Vac 0%~100%10mS 0.1A/uS
 Vomin 11.69 Vomax 12.24	 Vomin 11.71 Vomax 12.24

MOS Voltage Stress

264Vac Full Load	264Vac Short
V_{MAX}: 531	V_{MAX}: 578V



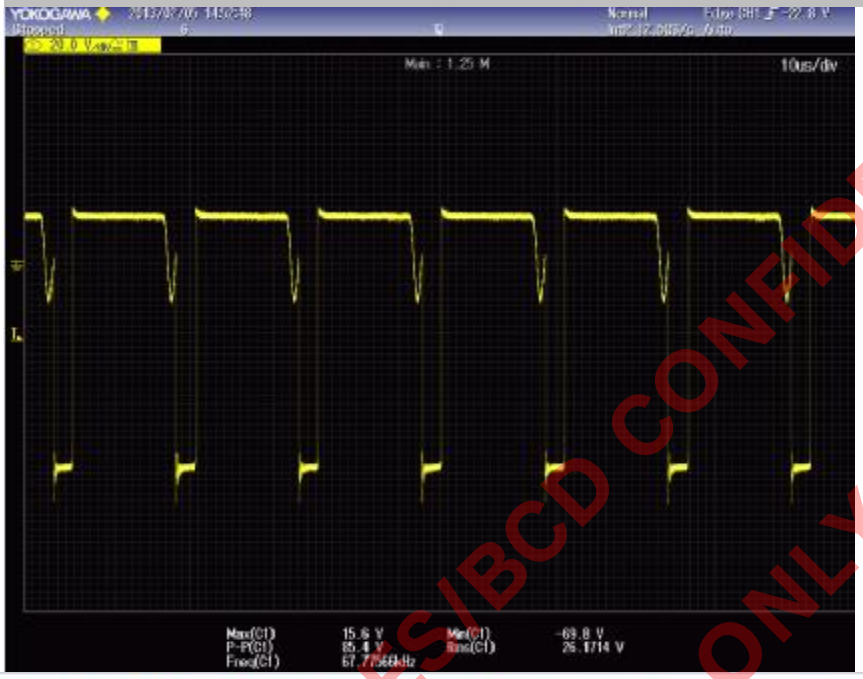


Absolute (Tc= 25℃ unless otherwise specified):

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current	4	A
	Continuous Drain Current T_C = 100 °C	2.9	A

Schottky Voltage Stress

264Vac Full Load	264Vac Short
V_{MAX}: 85.4V	V_{MAX}: 73.1V



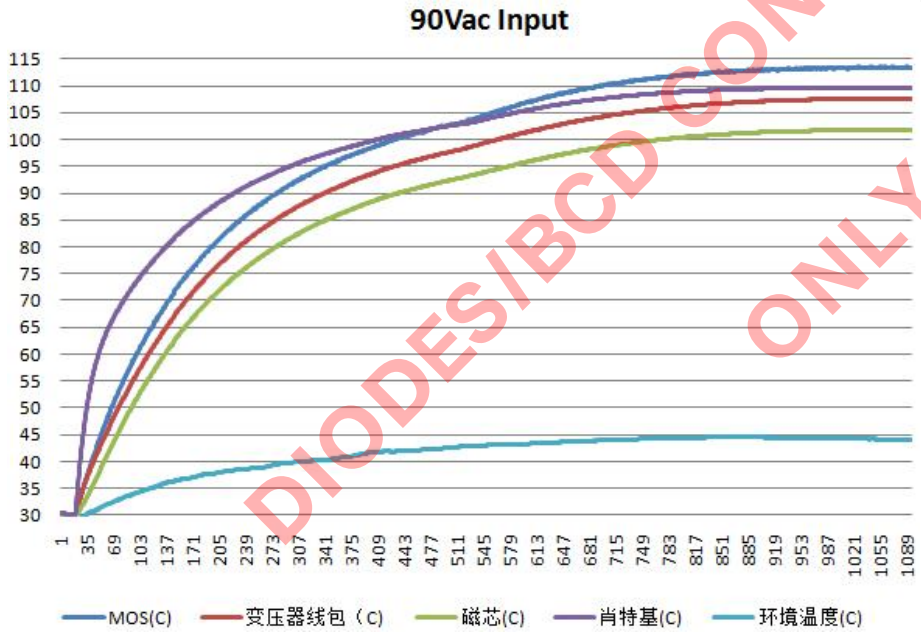
Absolute Maximum Ratings*

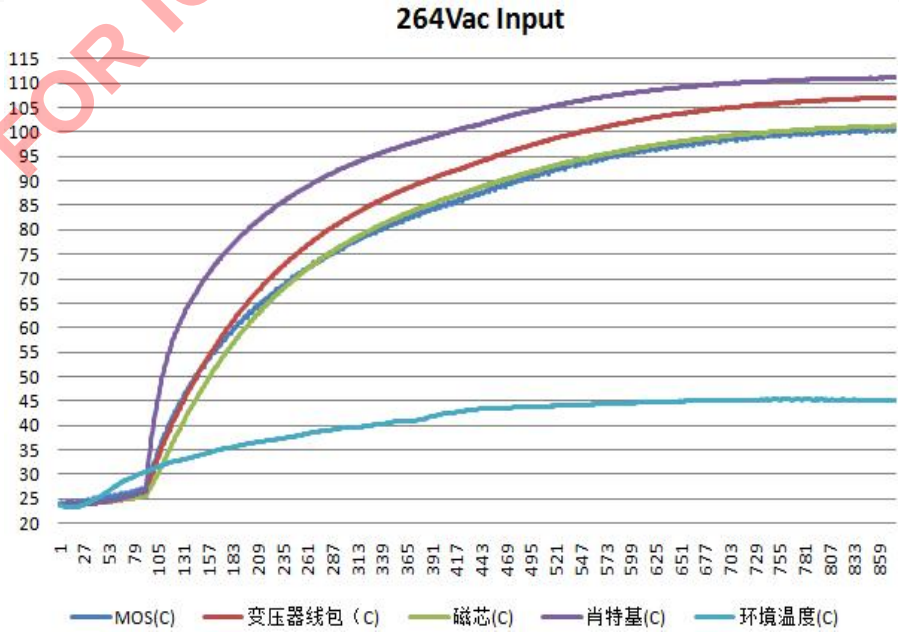
T_A = 25°C unless otherwise noted

Symbol	Parameter	Value							Units
		520	530	540	550	560	580	5100	
V_{RRM}	Maximum Repetitive Reverse Voltage	20	30	40	50	60	80	100	V
$I_{F(AV)}$	Average Rectified Forward Current .375 " lead length @ T_A = 75°C	5.0							A

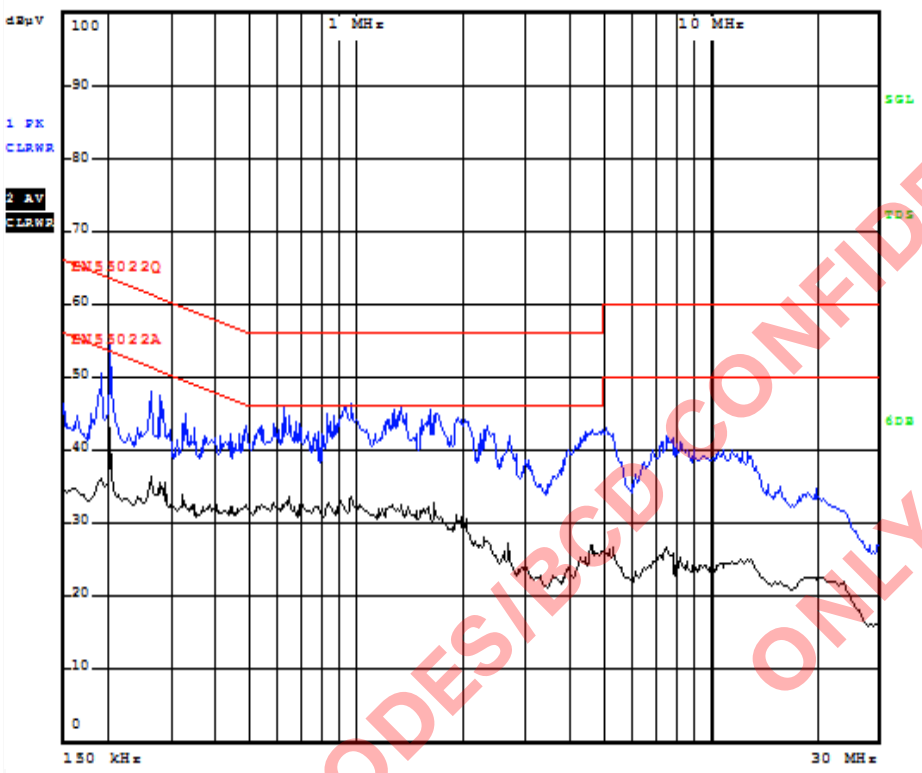
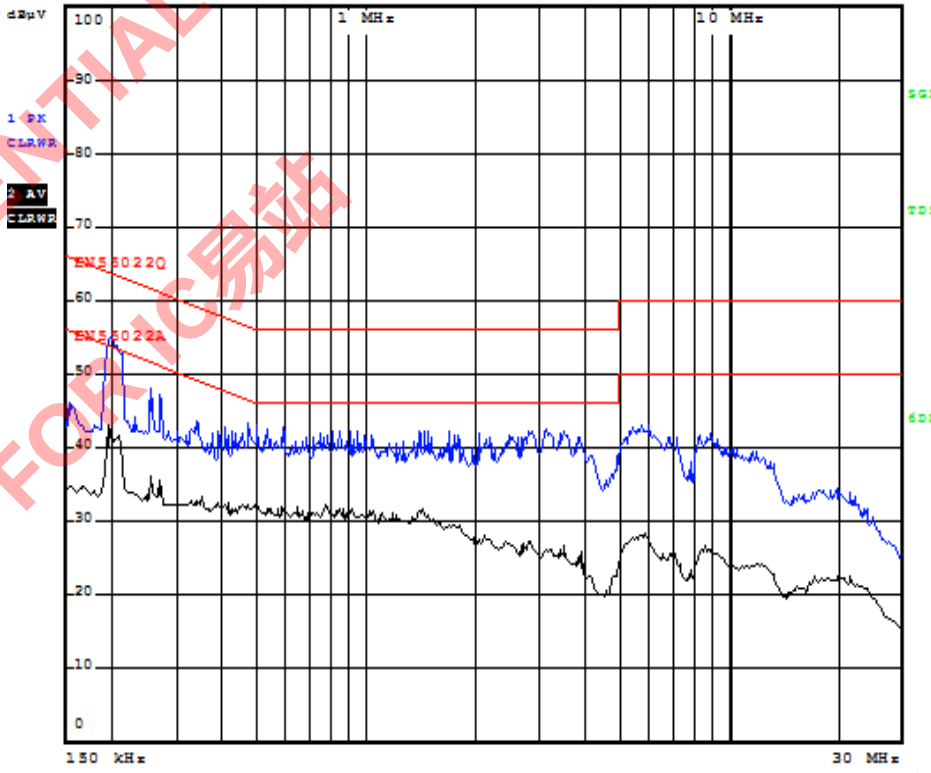
Temperature Rise

Location	Rated temp (℃)	90V/AC (℃)	264V/AC (℃)	T_{MAX} (℃)	Utilization ratio
MOS(4N60)	150	113.55	100.86	113.55	75.70%
Coil	130	107.65	107.11	107.65	82.80%
Core	130	101.83	101.29	101.83	78.33%
Schottky (SB5100)	150	109.65	111.09	111.09	74.06%
Ambient temperature		44.53	45.3	44.53	



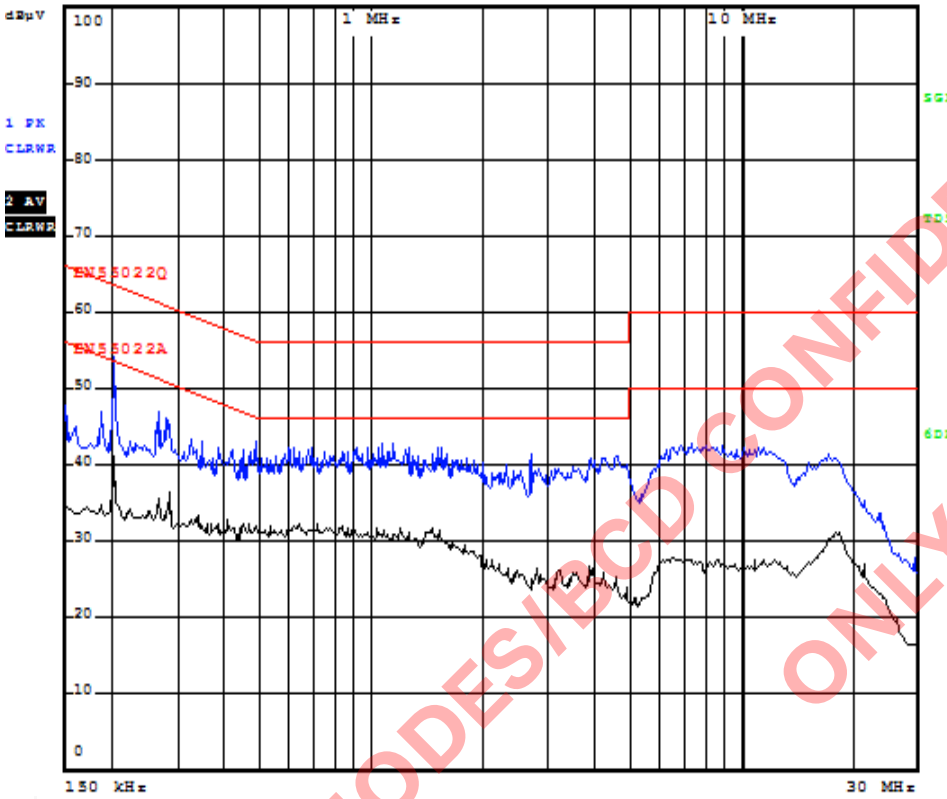


Conduction

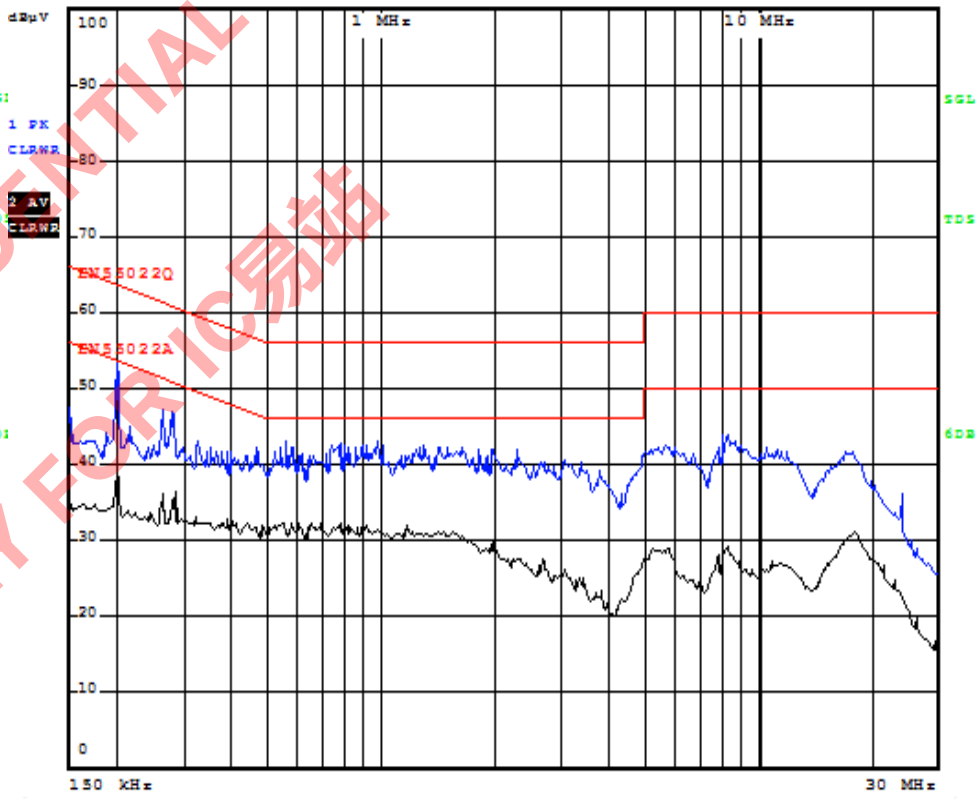
230Vac Full Load Line	230Vac Full Load Neutral
	
Margin: >6dB	Margin: >6dB

Conduction

230Vac Full Load L-GND	230Vac Full Load N-GND



Margin: >6dB



Margin: >6dB

Radiation

230Vac Full Load H

Site 966 Polarization: Horizontal Temperature: 26
Limit: EN55022 Class B RE 3M Power: AC 230V/50Hz Humidity: 55 %

1		83.3500	40.82	-10.73	30.09	40.00	-9.91	peak
2	*	116.3300	36.57	-5.32	31.25	40.00	-8.75	peak
3		157.0700	36.91	-6.75	30.16	40.00	-9.84	peak
4		269.5900	31.95	-4.38	27.57	47.00	-19.43	peak
5		807.9400	23.22	6.78	30.00	47.00	-17.00	peak

Margin: >6dB

230Vac Full Load V

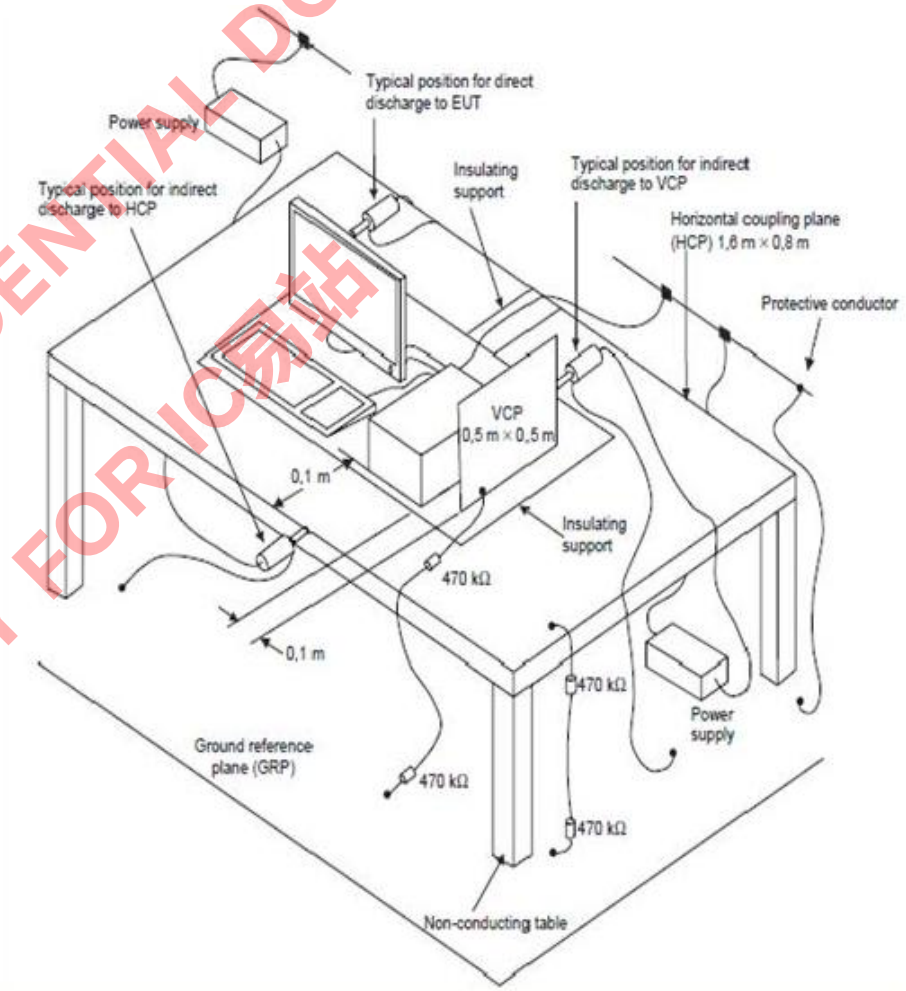
Site 966 Polarization: Vertical Temperature: 26
Limit: EN55022 Class B RE 3M Power: AC 230V/50Hz Humidity: 55 %

1	*	45.5200	46.81	-11.43	35.38	40.00	-4.62	peak
2		144.4600	33.62	-4.67	28.95	40.00	-11.05	peak
3		210.4200	34.45	-5.72	28.73	40.00	-11.27	peak
4		256.9800	31.91	-4.17	27.74	47.00	-19.26	peak
5		395.6900	23.20	0.76	23.96	47.00	-23.04	peak

Margin: >4dB

ESD

Air Discharged		No Load Result	Full Load Result
230Vac No Load and Full Load			
15kV	+	Pass	Pass
	-	Pass	Pass
16kV	+	Pass	Pass
	-	Pass	Pass
17kV	+	Pass	Pass
	-	Pass	Pass
18kV	+	Pass	Pass
	-	Pass	Pass
19kV	+	Pass	Pass
	-	Pass	Pass
20kV	+	Pass	Pass
	-	Pass	Pass



Thank You!!!