RT8497A Evaluate Report for Non-isolation Floating Buck LED Driver (Internal T8)

May. 2016

RICHTEK
your power partner.

RT8497A Brief Introduction

RT8497A is a active power factor correction controller, specifically designed for using as a constant current LED driver.

Supporting : Non-isolation(Buck mode)

Applications ➡ AC/DC LED lighting driver

RT8497A Features

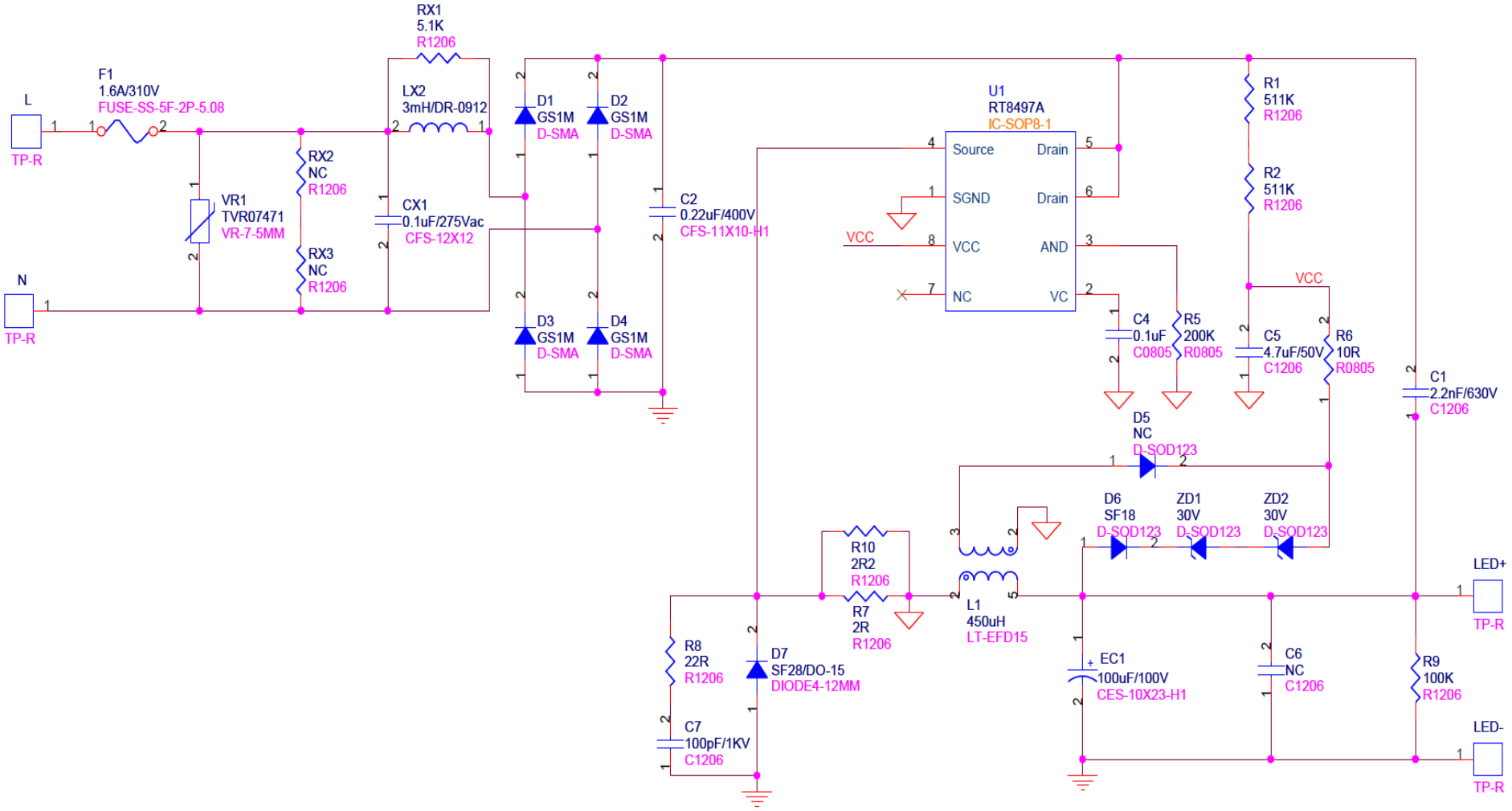
High Efficiency BCM LED Driver Controller for High Power Factor Offline Applications

- Built-in Power MOSFET
- High Power Factor and THDi
- Constant LED current with Highly Precision Current regulation
- Extremely Low Quiescent Current Consumption.
- True Low System BOM Cost
- Unique Programmable AND pin for ZVS Setting to Achieve Best power Efficiency
- Universal Input Voltage Range with Off-Line Topology

RT8497A Advantage

- Tight LED Current Regulation
- Low BOM Cost
- Protection:
  a. Built-in Over Thermal Protection
  b. Built-in Over Voltage Protection
  c. Output LED String Open protection
  d. Output LED String Short protection
  e. Output LED Over Current protection

Circuit



Electrical Performance

Load: LED Series

Line filter on

Frequency	Vac [V]	Pin [watt]	Vout[V]	Iout[mA]	Pout [watt]	Total Eff. [%]	PF Value	THD [%]
60Hz	90	19.108	78.70	222	17.448	91.31%	0.909	44.88
60Hz	100	19.045	78.60	223	17.496	91.87%	0.932	37.92
60Hz	110	19.023	78.60	223	17.544	92.22%	0.945	33.39
60Hz	132	19.043	78.60	224	17.630	92.58%	0.959	27.03
50Hz	195	19.234	78.50	225	17.647	91.75%	0.961	19.18
50Hz	220	19.299	78.50	225	17.631	91.36%	0.951	18.44
50Hz	230	19.303	78.50	224	17.600	91.18%	0.946	18.41
50Hz	240	19.328	78.50	224	17.592	91.02%	0.939	18.49
50Hz	264	19.415	78.50	224	17.560	90.45%	0.921	19.20

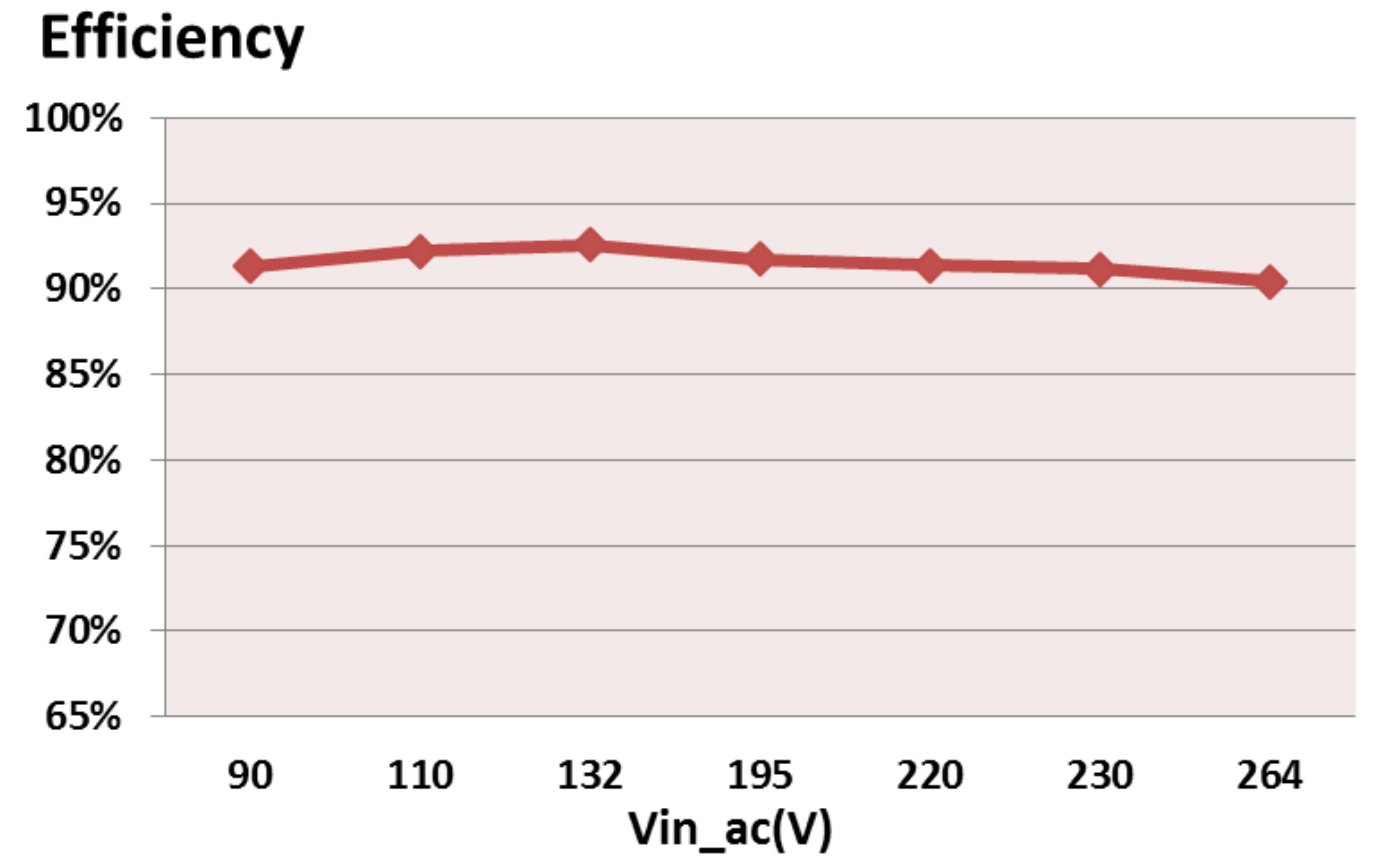
current regulation = 1.38%

△ Effiency = 2.13%

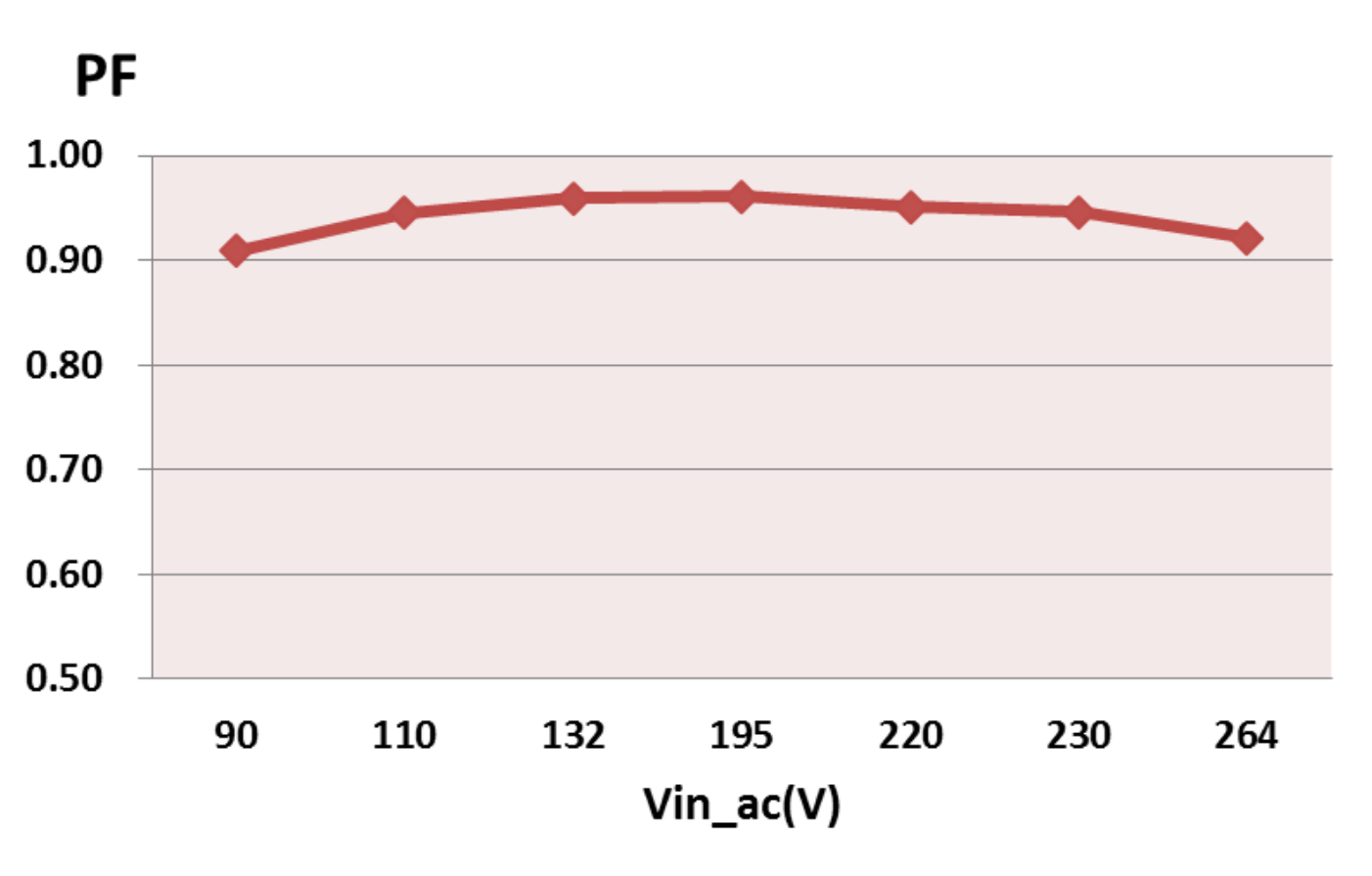
Maximum PFC = 0.961

Minimum PFC = 0.909

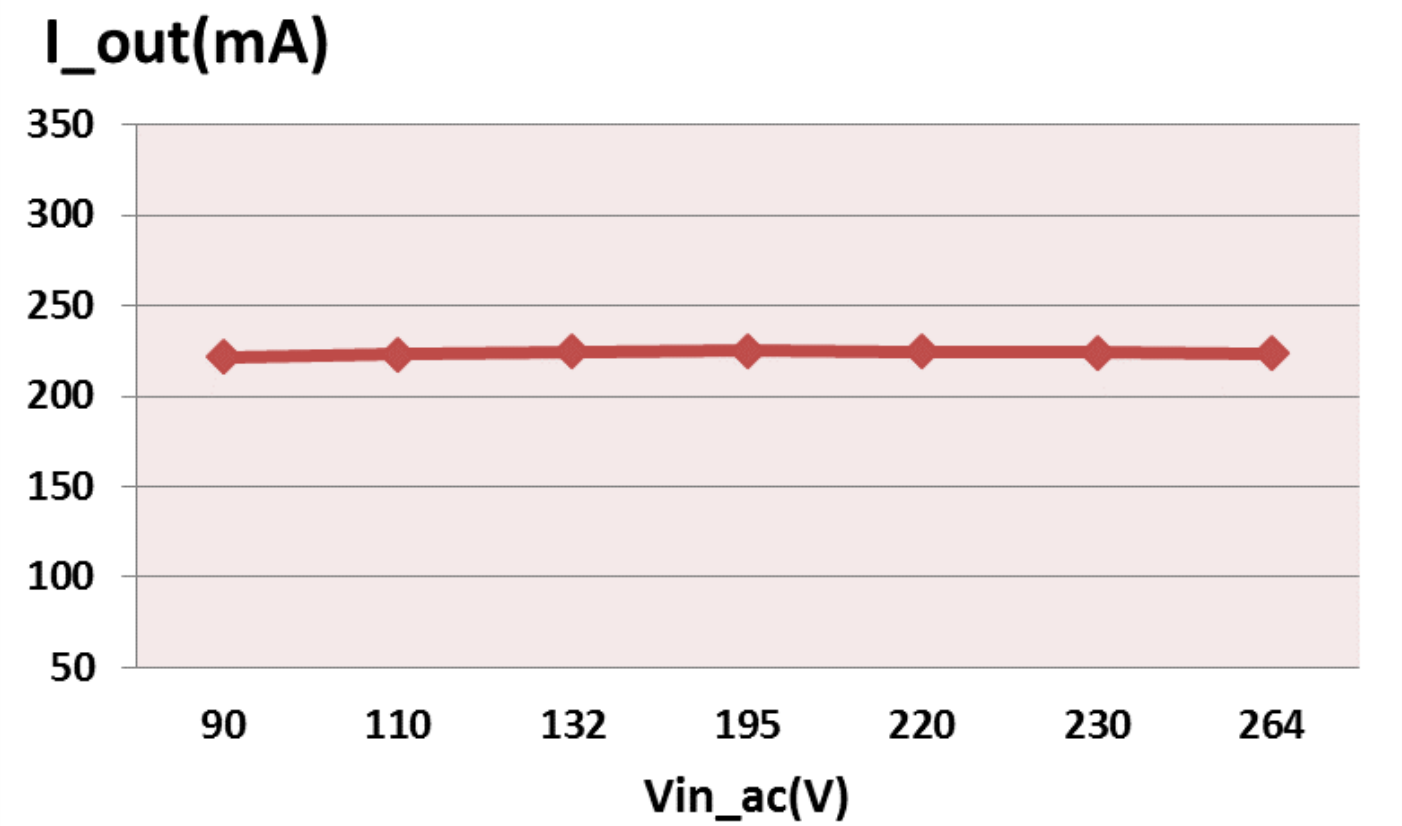
Efficiency



Power Factor



Current Regulation



Temperature (Test Condition: Burn-in 30min. @ Ta=25 ℃)

90Vac/60Hz input

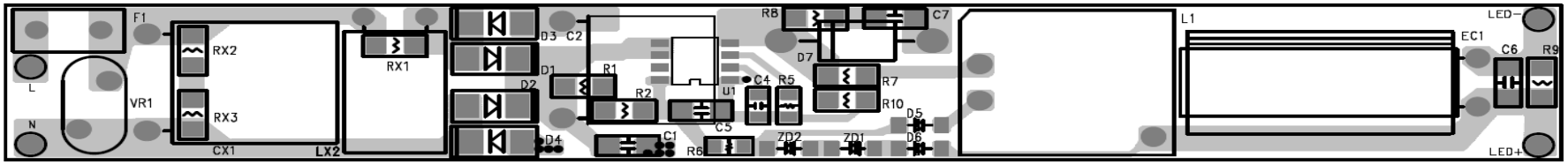
F1	Fuse, MST, T2A/300V	26.8
CX1	X-cap, HQX, 104/250V	32.7
LX2	DR0912, 3mH	50.7
D1~D4	GS1M (1A/1000V)	53.2
C2	Film cap, 224/450V	44.7
U1	RT8497A	63.3
C1	1206, 2.2nF/630V	49.2
C5	1206, 4.7uF/50V	49.3
R7,R10	1206, 2.2 ohm	52.5
D6	ES1J (1A/600V)	48.5
ZD1	BZT55C30 (30V, 0.5W)	53
D7	SF28 (2A/600V)	49.2
L1 (core)	EFD-15, 450uH	47.5
L1 (wire)		48.1
EC1	E-cap, 100uF/100V	28.5

264Vac/50Hz input

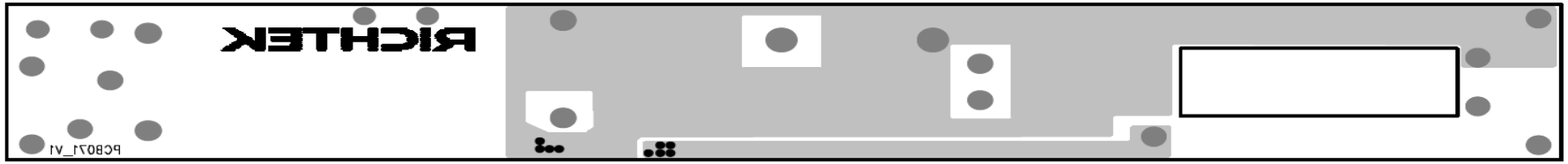
F1	Fuse, MST, T2A/300V	22.6
CX1	X-cap, HQX, 104/250V	27.8
LX2	DR0912, 3mH	37.1
D1~D4	GS1M (1A/1000V)	50.1
C2	Film cap, 224/450V	46.6
U1	RT8497A	72.3
C1	1206, 2.2nF/630V	52.1
C5	1206, 4.7uF/50V	53.2
R7,R10	1206, 2.2 ohm	61.1
D6	ES1J (1A/600V)	59.5
ZD1	BZT55C30 (30V, 0.5W)	68.2
D7	SF28 (2A/600V)	59.4
L1 (core)	EFD-15, 450uH	70.4
L1 (wire)		71.4
EC1	E-cap, 100uF/100V	48.7

PCB Layout

TOP Layer



BOT Layer

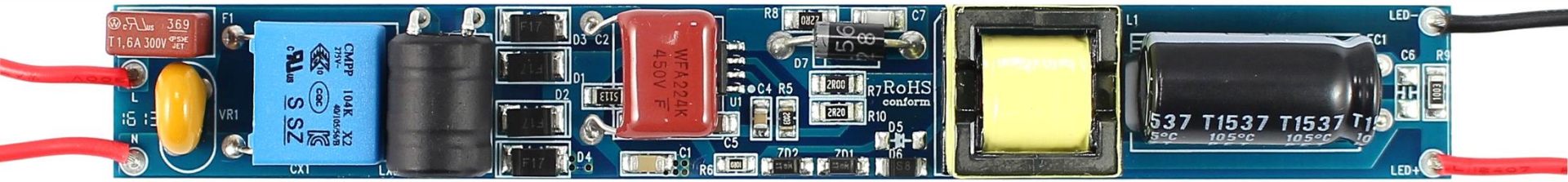


PCB No : PCB071_V1

Demo Board Photo

L

LED-



N

LED+

Length	Width	Height
123mm	16mm	12mm

BOM

Item	Location	Value	Type
1	CX1	0.1uF/275Vac	CFS-12X12
2	C1	2.2nF/1kV	C1206
3	C2	0.22uF/450V	CFS-11X10-H1
4	C4	0.1uF	C0805
5	C5	4.7uF/50V	C1206
6	C7	100pF/1kV	C1206
7	D1, D2, D3, D4	GS1M	D-SMA
8	D6	SF18	D-SOD123
9	D7	SF28/DO-15	DIODE4-12MM
10	EC1	100uF/100V	CES-10X23-H1
11	F1	1.6A/300V	FUSE-SS-5F-2P-5.08
12	LX2	3mH/DR-0912	LDS-D8X10

BOM

Item	Location	Value	Type
13	L1	450uH	LT-EFD15
14	RX1	5.1k	R1206
15	R1, R2	511k	R1206
16	R5	200k	R0805
17	R6	10R	R0805
18	R7	2R	R1206
19	R8	22R	R1206
20	R9	100k	R1206
21	R10	2R2	R1206
22	U1	RT8497AGS	SOP-8
23	VR1	TVR07471	VR-7-5MM
24	ZD1, ZD2	30V	D-SOD123

Transformer

Vender : 豐達

CORE SIZE: EFD-15 Material: PC40

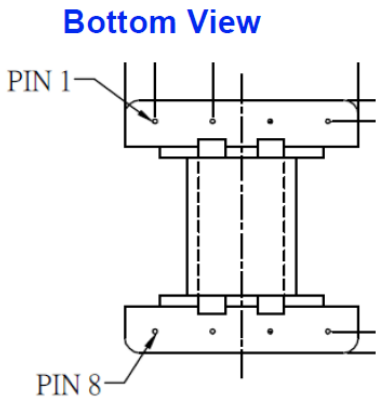
Bobbin/PINs: Horizontal/ 8 pins

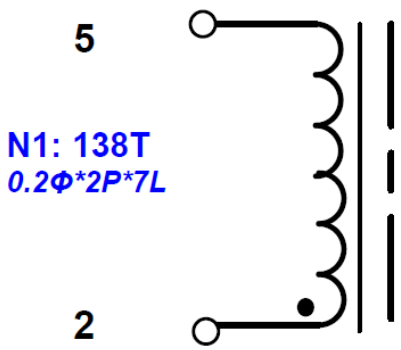
Primary inductor: (+-10%) 450uH

Leakage inductor: N/A

Test condition: 1kHz/1V

Varnish : Yes





WINDING TABLE: (繞線結構)

Winding No. (組別)	PIN (腳位)	Wire & Wire & Copper (線徑 x 股數 x 層數)	Turns (圈數)	Winding Type (繞線方式)	Tape Layer (膠帶層次)
	Bobbin				
N1	2 → 5	0.2x 2P x 7L	138Ts	密繞	2L
	Core – EFD-15			450uH	

Note1: Cut pin1, pin3, pin4, pin6, pin7, pin8.

Power Component Voltage Stress

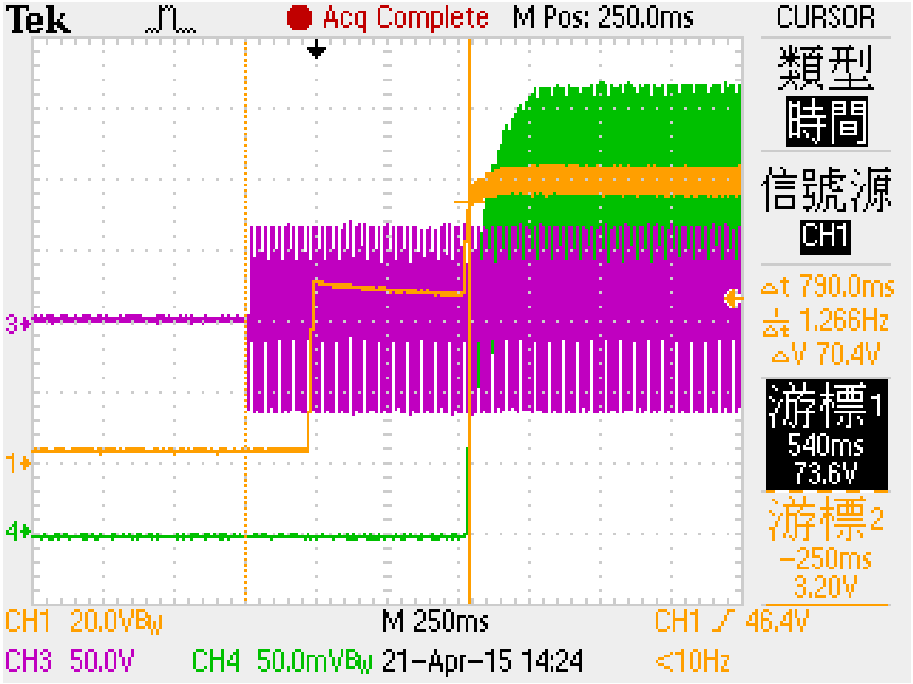
Test condition: 264Vac/50Hz input , 78V/230mA output

Stead state			
Location	Max rating (V)	Measure	De-rating
U1 (Vds)	500	412	82.4%
D7	600	416	69.3%

Transient State			
Location	Max rating (V)	Measure	De-rating
U1 (Vds)	500	464	92.8%
D7	600	412	68.7%

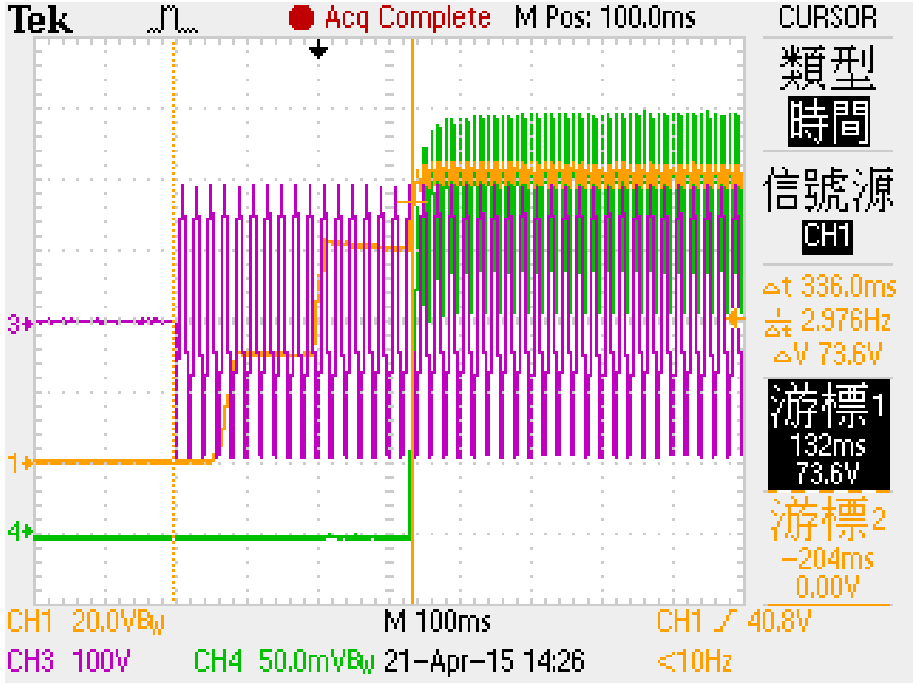
Start up waveform

Vac_in = 90V



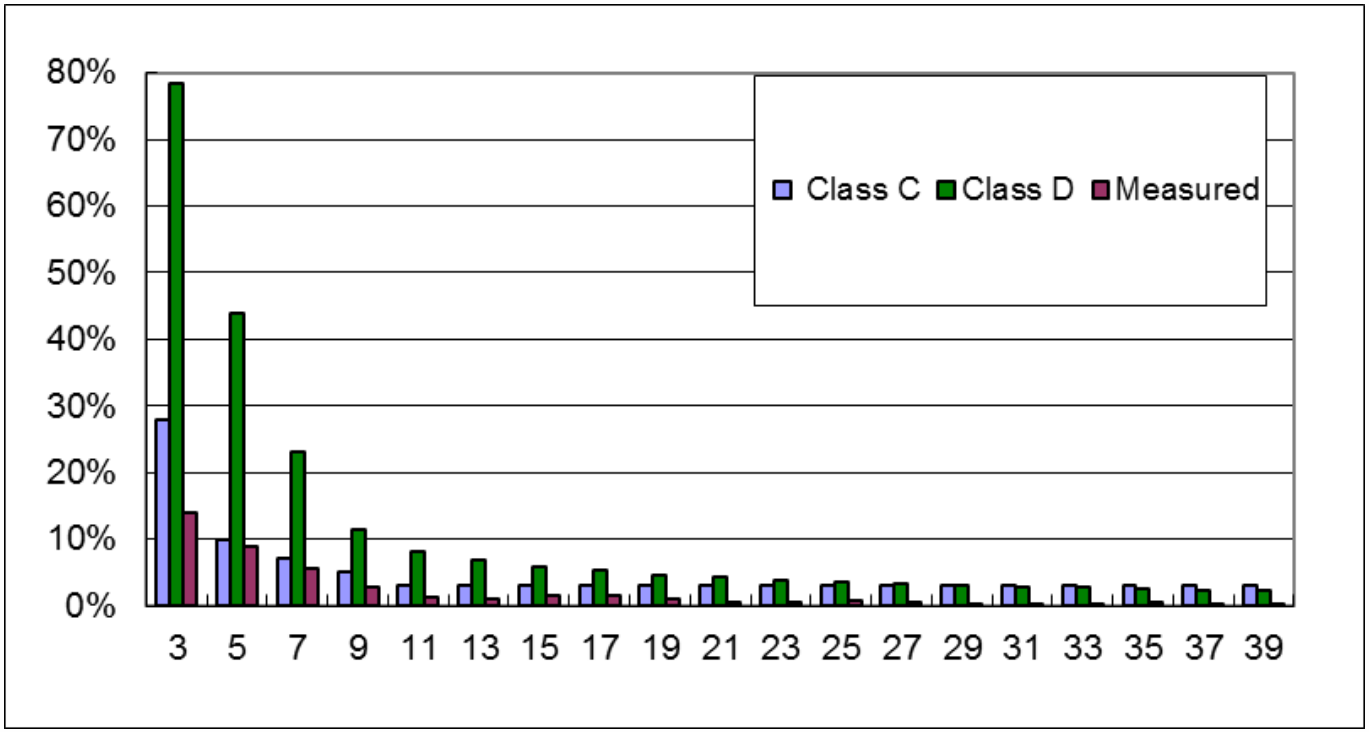
T_start up =790ms

Vac_in = 264V



T_start up =336ms

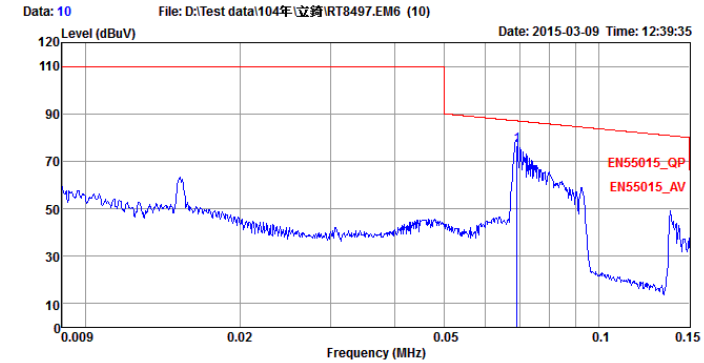
Harmonic(IEC61000-3-2)



230Vac input
Class C : Pass
Class D : Pass

EMI-Conduction(1)

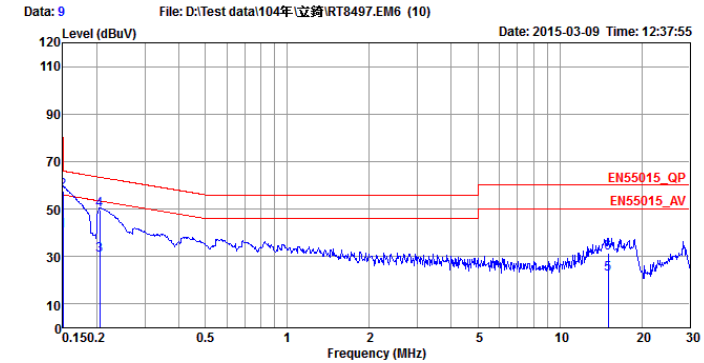
110Vac/60Hz-L➔Pass (9kHz~150kHz)



Condition: EN55015_QP LISN-03-09-2015 LINE
Engineer : Parody
EUT : RT8497
Power : 110V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 pp	0.07	76.50	-10.54	87.04	66.36	9.95	0.19	LINE	QP

110Vac/60Hz-L ➔Pass (150kHz~30MHz)

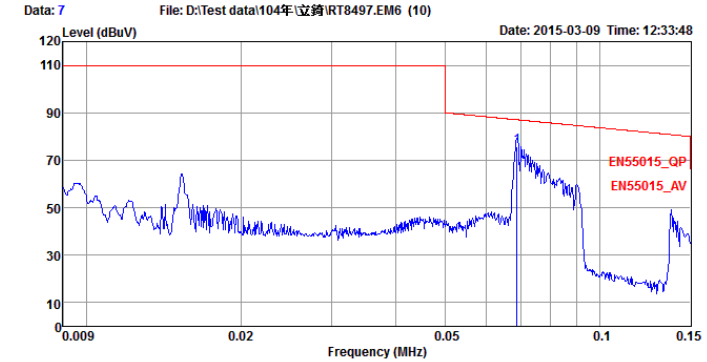


Condition: EN55015_QP LISN-03-09-2015 LINE
Engineer : Parody
EUT : RT8497
Power : 110V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 av	0.15	40.80	-15.20	56.00	30.67	9.93	0.20	LINE	Average
2 pp	0.15	57.75	-8.25	66.00	47.62	9.93	0.20	LINE	QP
3	0.21	30.75	-22.65	53.40	20.57	9.93	0.25	LINE	Average
4	0.21	49.46	-13.94	63.40	39.28	9.93	0.25	LINE	QP
5	15.07	22.54	-27.46	50.00	11.78	10.33	0.43	LINE	Average
6	15.07	31.24	-28.76	60.00	20.48	10.33	0.43	LINE	QP

EMI-Conduction(2)

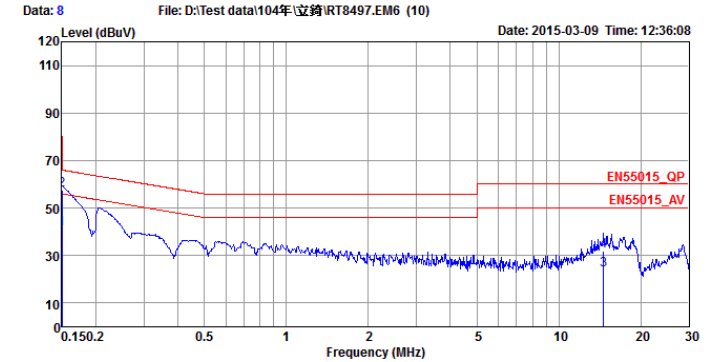
110Vac/60Hz-N➔Pass (9kHz~150kHz)



Condition: EN55015_QP LISN-03-09-2015 NEUTRAL
Engineer : Parody
EUT : RT8497
Power : 110V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 pp	0.07	75.75	-11.34	87.09	65.76	9.80	0.19	NEUTRAL	QP

110Vac/60Hz-N ➔Pass (150kHz~30MHz)

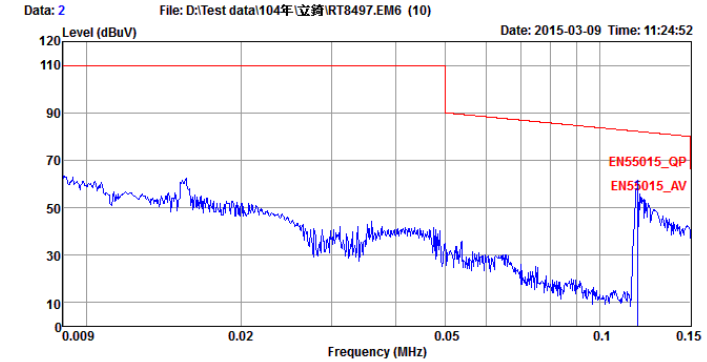


Condition: EN55015_QP LISN-03-09-2015 NEUTRAL
Engineer : Parody
EUT : RT8497
Power : 110V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 av	0.15	41.04	-14.96	56.00	31.06	9.78	0.20	NEUTRAL	Average
2 pp	0.15	57.64	-8.36	66.00	47.66	9.78	0.20	NEUTRAL	QP
3	14.59	23.78	-26.22	50.00	13.25	10.10	0.43	NEUTRAL	Average
4	14.59	32.07	-27.93	60.00	21.54	10.10	0.43	NEUTRAL	QP

EMI-Conduction(3)

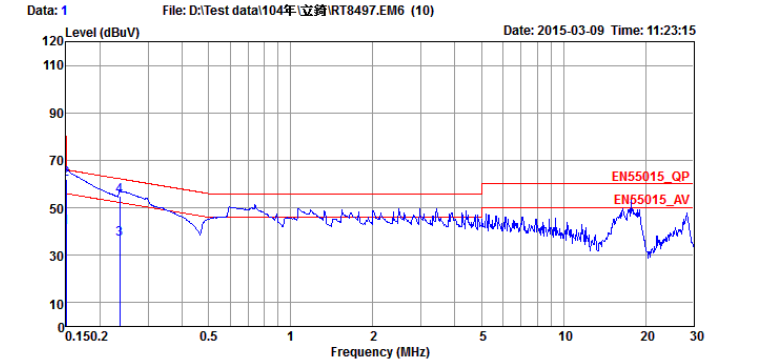
230Vac/60Hz-L➔Pass (9kHz~150kHz)



Condition: EN55015_QP LISN-03-09-2015 LINE
Engineer : Parody
EUT : RT8497
Power : 220V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 pp	0.12	56.26	-25.92	82.18	46.13	9.93	0.20	LINE	QP

230Vac/60Hz-L ➔Pass (150kHz~30MHz)

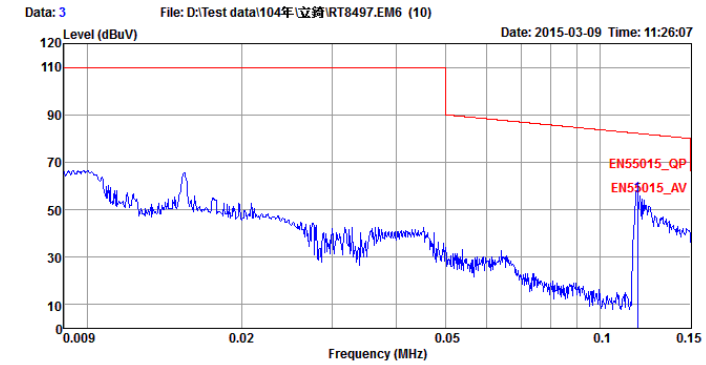


Condition: EN55015_QP LISN-03-09-2015 LINE
Engineer : Parody
EUT : RT8497
Power : 220V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 av	0.15	41.52	-14.48	56.00	31.39	9.93	0.20	LINE	Average
2 pp	0.15	61.91	-4.09	66.00	51.78	9.93	0.20	LINE	QP
3	0.24	36.59	-15.63	52.22	26.40	9.93	0.26	LINE	Average
4	0.24	54.74	-7.48	62.22	44.55	9.93	0.26	LINE	QP

EMI-Conduction(4)

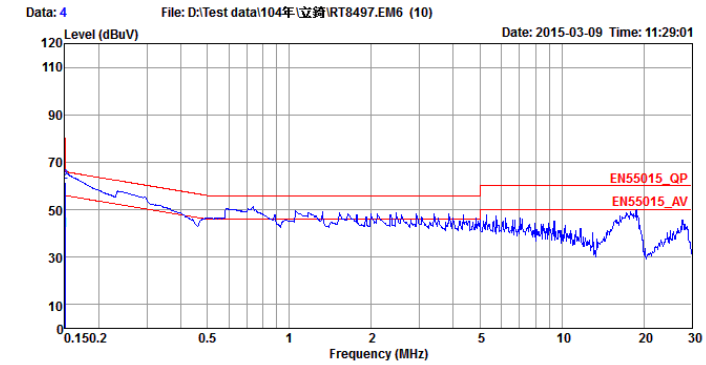
230Vac/60Hz-N➔Pass (9kHz~150kHz)



Condition: EN55015_QP LISN-03-09-2015 NEUTRAL
Engineer : Parody
EUT : RT8497
Power : 220V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 pp	0.12	56.25	-25.93	82.18	46.27	9.78	0.20	NEUTRAL	QP

230Vac/60Hz-N ➔Pass (150kHz~30MHz)



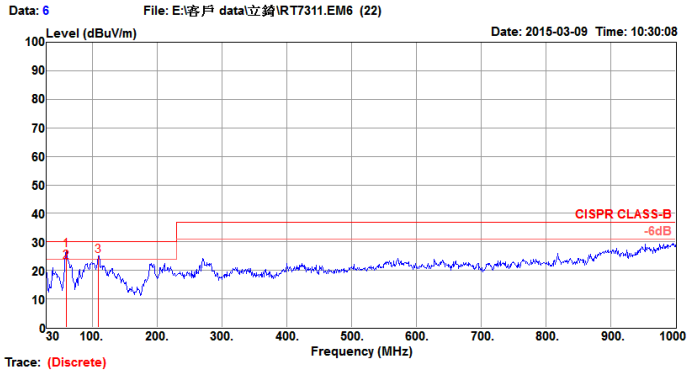
Condition: EN55015_QP LISN-03-09-2015 NEUTRAL
Engineer : Parody
EUT : RT8497
Power : 220V
Mode :
Mome1 :
Mome2 :
Mome3 :
Mome4 :

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 av	0.15	41.04	-14.96	56.00	31.06	9.78	0.20	NEUTRAL	Average
2 pp	0.15	61.54	-4.46	66.00	51.56	9.78	0.20	NEUTRAL	QP

EMI-Radiation(1)

110Vac/60Hz-V➔Pass

SPORTON LAB.
No. 8 Lane 724, Bo Ai Street, Zhubei City,
Hsin Chu Hsien 302, Taiwan, R.O.C.
TEL:03-656-9065
FAX:03-656-9085

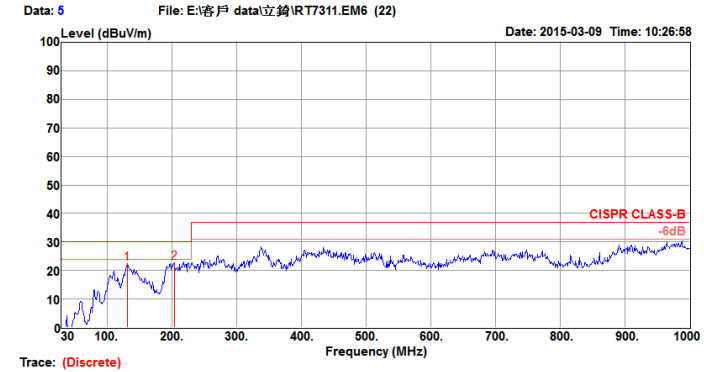


Condition: CISPR CLASS-B 10m BILOG ANT 20141111 VERTICAL
: RBW:100.000KHz VBW:300.000KHz SWT:0.500sec
Engineer : Hank
Eut : RT8497 T8
Mode : Normal
Power : AC 110V/60Hz
Memo 5-1 : 80V/230mA
Memo 5-2 :

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	60.07	27.26	30.00	-2.74	51.99	0.67	6.90	32.30	100	24	Peak	VERTICAL
2	60.07	22.97	30.00	-7.03	47.70	0.67	6.90	32.30	100	24	QP	VERTICAL
3	109.54	25.10	30.00	-4.90	47.44	0.91	12.30	32.26	100	186	Peak	VERTICAL

110Vac/60Hz-H ➔Pass

SPORTON LAB.
No. 8 Lane 724, Bo Ai Street, Zhubei City,
Hsin Chu Hsien 302, Taiwan, R.O.C.
TEL:03-656-9065
FAX:03-656-9085



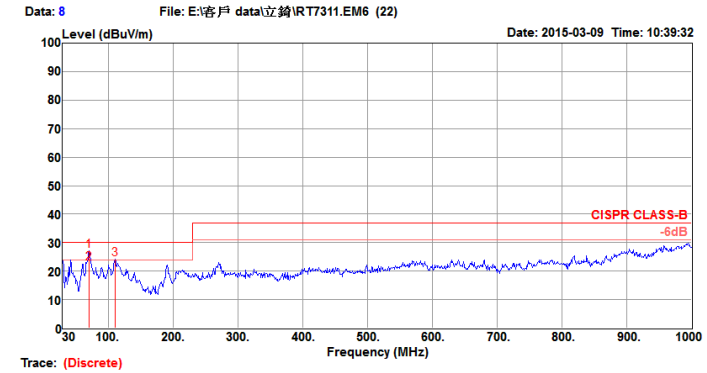
Condition: CISPR CLASS-B 10m BILOG ANT 20141111 HORIZONTAL
: RBW:100.000KHz VBW:300.000KHz SWT:0.500sec
Engineer : Hank
Eut : RT8497 T8
Mode : Normal
Power : AC 110V/60Hz
Memo 5-1 : 80V/230mA
Memo 5-2 :

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	131.85	22.41	30.00	-7.59	50.77	1.00	12.58	32.21	200	175	Peak	HORIZONTAL
2	203.63	22.73	30.00	-7.27	49.99	1.24	10.55	32.05	150	195	Peak	HORIZONTAL

EMI-Radiation(2)

230Vac/50Hz-V ➔ Pass

SPORTON LAB.
No. 8 Lane 724, Bo Ai Street, Zhubei City,
Hsin Chu Hsien 302, Taiwan, R.O.C.
TEL:03-656-9065
FAX:03-656-9085

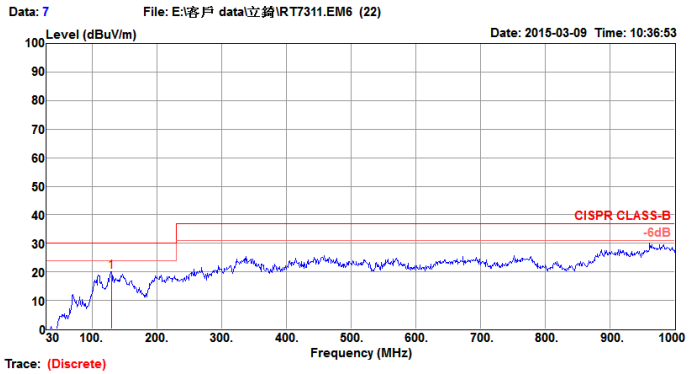


Trace: (Discrete)
Condition: CISPR CLASS-B 10m BILOG ANT 20141111 VERTICAL
: RBW:100.000KHz VBW:300.000KHz SWT:0.500sec
Engineer : Hank
Eut : RT8497 T8
Mode : Normal
Power : AC 220V/60Hz
Memo 5-1 : 80V/230mA
Memo 5-2 :

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	70.74	27.05	30.00	-2.95	55.23	0.73	6.87	32.31	200	133	Peak	VERTICAL
2	70.74	22.81	30.00	-7.19	50.99	0.73	6.87	32.31	200	133	QP	VERTICAL
3	110.51	24.07	30.00	-5.93	46.32	0.91	12.35	32.26	100	183	Peak	VERTICAL

230Vac/50Hz-H ➔ Pass

SPORTON LAB.
No. 8 Lane 724, Bo Ai Street, Zhubei City,
Hsin Chu Hsien 302, Taiwan, R.O.C.
TEL:03-656-9065
FAX:03-656-9085



Trace: (Discrete)
Condition: CISPR CLASS-B 10m BILOG ANT 20141111 HORIZONTAL
: RBW:100.000KHz VBW:300.000KHz SWT:0.500sec
Engineer : Hank
Eut : RT8497 T8
Mode : Normal
Power : AC 220V/60Hz
Memo 5-1 : 80V/230mA
Memo 5-2 :

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	129.91	20.21	30.00	-9.79	47.74	0.99	12.70	32.22	200	184	Peak	HORIZONTAL

RICHTEK

your power partner.

thank you.