SWS1000L

EVALUATION DATA

PA578-53-01A

INDEX

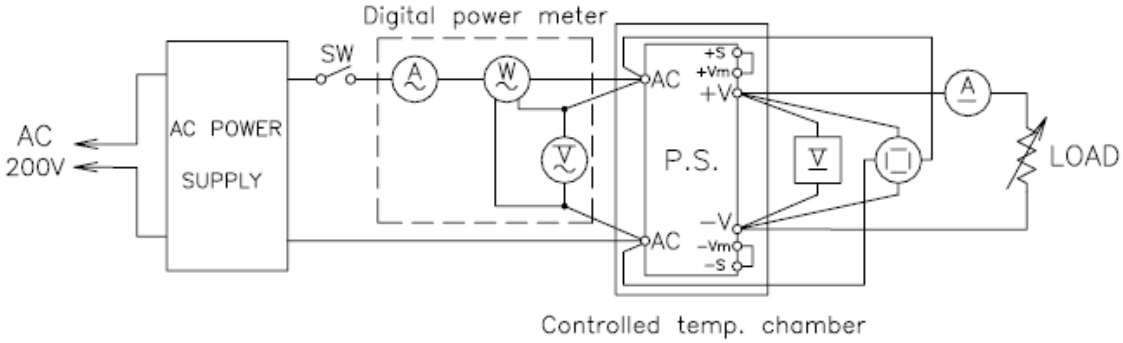
Terminology used

	Definition
Vin	. . . . . Input voltage
Vout	. . . . . Output voltage
Iin	. . . . . Input current
Iout	. . . . . Output current
Ta	. . . . . Ambient temperature
f	. . . . . Frequency
FG	. . . . . Frame Ground

1. Evaluation Method

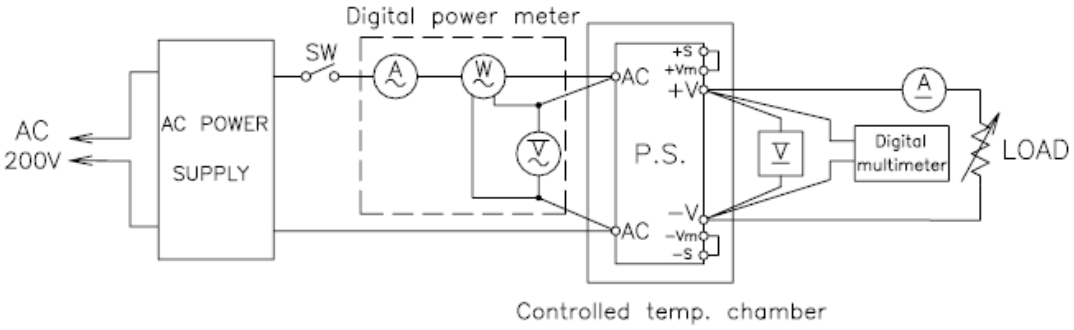
1.1 Circuit used for determination

(1) Steady state data



(2) Warm up voltage drift characteristics
Same as Steady state data

(3) Over current protection (OCP) characteristics

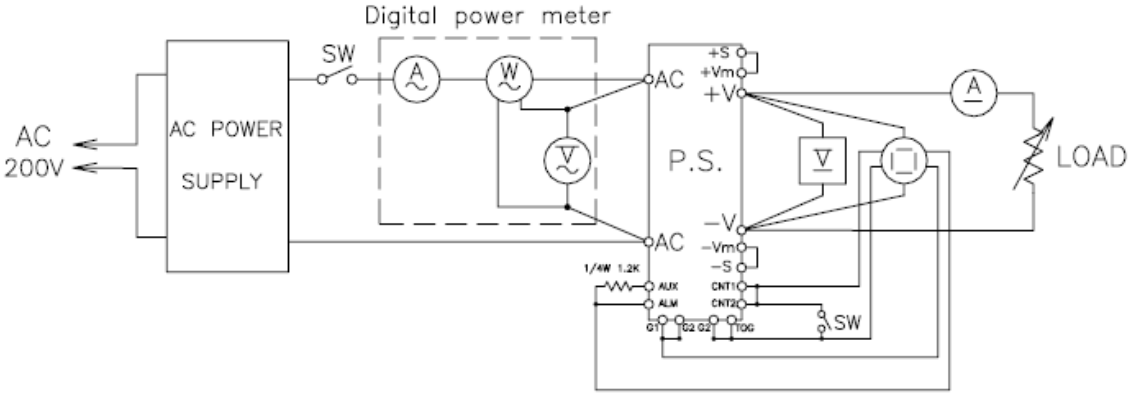


(4) Over voltage protection (OVP) characteristics
Same as Steady state data

(5) Output rise characteristics
Same as Steady state data

(6) Output fall characteristics
Same as Steady state data

(7) Output rise characteristics with ON/OFF CONTROL



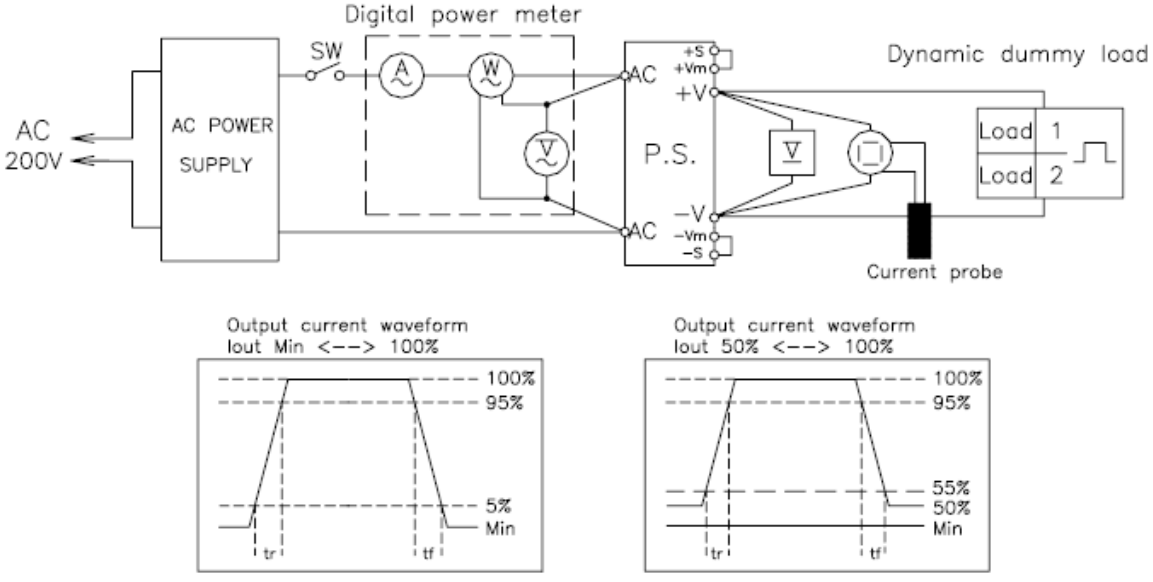
(8) Output fall characteristics with ON/OFF CONTROL

Same as Output rise characteristics with ON/OFF CONTROL

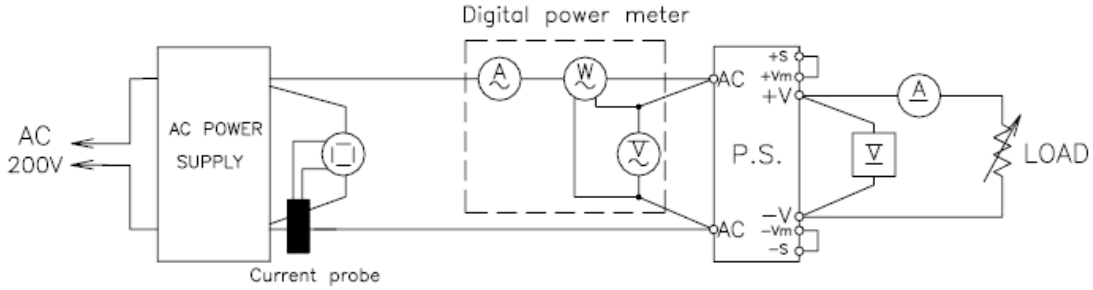
(9) Dynamic line response characteristics

Same as Steady state data

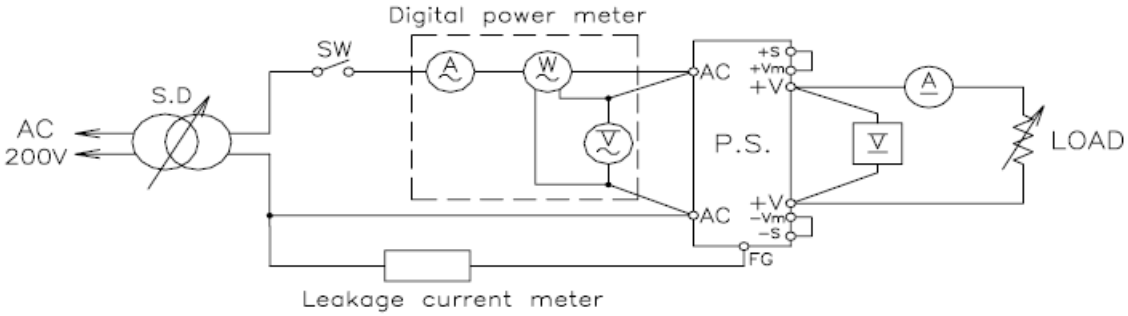
(10) Dynamic load response characteristics



(11) Inrush current characteristics



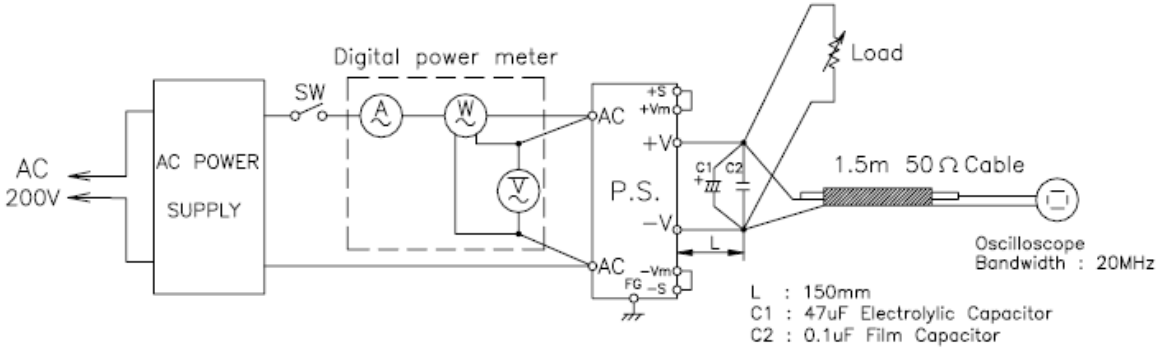
(12) Leakage current characteristics



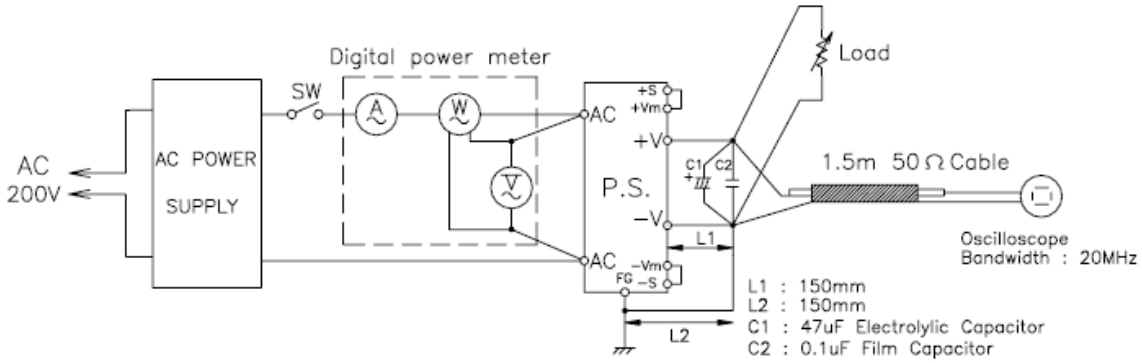
Range used−−−AC (For SIMPSON TYPE 228)

(13) Output ripple and noise waveform

(a) Normal Mode (using a 150mm twisted pair terminated with 0.1uF and 47uF capacitor at 20MHz)



(b) Normal + Common Mode

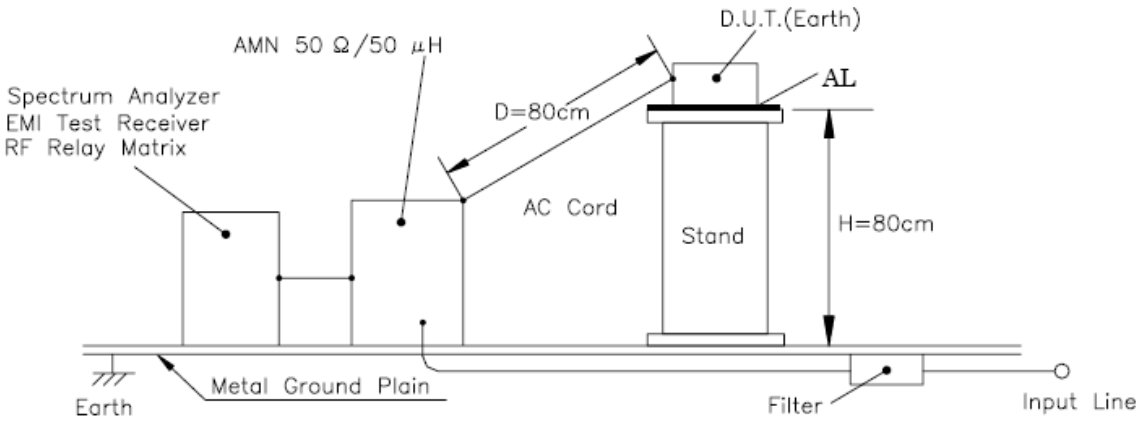


(14) Standby current

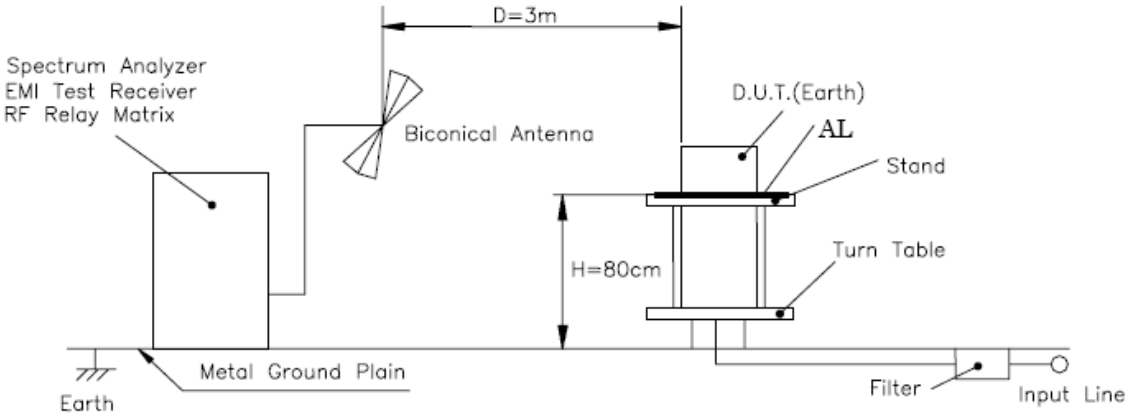
Same as Steady state data

(15) Electro-Magnetic Interference characteristics

(a) Conducted Emission Noise



(b) Radiated Emission Noise



1.2 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	AC SOURCE	CHROMA	6520
2	AC SOURCE	CHROMA	61505
3	ANTENNA	TDK	HLP-3003C
4	CONTROLLED TEMP. CHAMBER	ESPEC	PL-2KD
5	CONTROLLED TEMP. CHAMBER	ESPEC	SH-661
6	CURRENT PROBE	YOKOGAWA	701931
7	CURRENT PROBE	YOKOGAWA	701933
8	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DL1740
9	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DL1740E
10	DIGITAL MULTIMETER	FLUKE	89 VI
11	DIGITAL MULTIMETER	AGILENT	34970A
12	DIGITAL POWER METER	YOKOGAWA	WT210
13	ELECTRONIC LOAD	CHROMA	63030
14	ELECTRONIC LOAD	CHROMA	63206
15	ELECTRONIC LOAD	KIKUSUI	PLZ1002Z
16	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI
17	EMI TEST RECEIVER	SCHAFFNER	SMR4503
18	LEAKAGE CURRENT METER	SIMPSON	228
19	LISN	SCHAFFNER	NNB41
20	SHUNT RESISTOR	KYOWA	300A / 60mV

2. CHARACTERISTICS

2.1 Steady State Data

(1) Regulation - Line and Load, Temperature Drift

5V

1.1 Regulation - Line and Load

Conditions: Ta = 25°C

Io \ Vin	85Vac	115Vac	230Vac	265Vac	Line Regulation	
0%	4.989V	4.989V	4.990V	4.990V	0.001V	0.02%
50%	4.986V	4.987V	4.989V	4.990V	0.004V	0.08%
100%	4.984V	4.987V	4.986V	4.987V	0.003V	0.06%
Load Regulation	0.005V	0.002V	0.004V	0.003V		
	0.10%	0.04%	0.08%	0.06%		

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1.2 Temperature Drift

Conditions: Vin = 115Vac
Iout = 100%

Ta	-20°C	25°C	50°C	Temp. Stability	
Vout	4.977V	4.987V	4.982V	0.010V	0.20%

12V

1.1 Regulation - Line and Load

Conditions: Ta = 25°C

Io \ Vin	85Vac	115Vac	230Vac	265Vac	Line Regulation	
0%	12.097V	12.097V	12.097V	12.097V	0.000V	0.00%
50%	12.097V	12.097V	12.086V	12.097V	0.011V	0.09%
100%	12.092V	12.092V	12.097V	12.097V	0.005V	0.04%
Load Regulation	0.005V	0.005V	0.011V	0.000V		
	0.04%	0.04%	0.09%	0.00%		

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1.2 Temperature Drift

Conditions: Vin = 115Vac
Iout = 100%

Ta	-20°C	25°C	50°C	Temp. Stability	
Vout	12.043V	12.092V	12.103V	0.060V	0.50%

24V

1.1 Regulation - Line and Load

Conditions: Ta = 25°C

Io \ Vin	85Vac	115Vac	230Vac	265Vac	Line Regulation	
0%	24.204V	24.193V	24.188V	24.188V	0.016V	0.07%
50%	24.204V	24.193V	24.177V	24.177V	0.027V	0.11%
100%	24.198V	24.182V	24.182V	24.188V	0.016V	0.07%
Load Regulation	0.006V	0.011V	0.011V	0.011V		
	0.03%	0.05%	0.05%	0.05%		

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1.2 Temperature Drift

Conditions: Vin = 115Vac
Iout = 100%

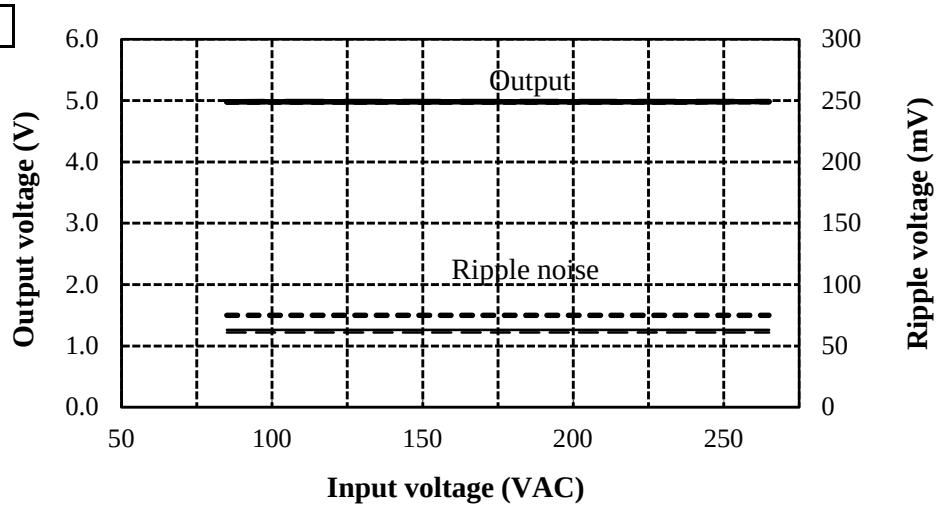
Ta	-20°C	25°C	50°C	Temp. Stability	
Vout	23.991V	24.182V	24.226V	0.235V	0.98%

2.1 Steady State Data

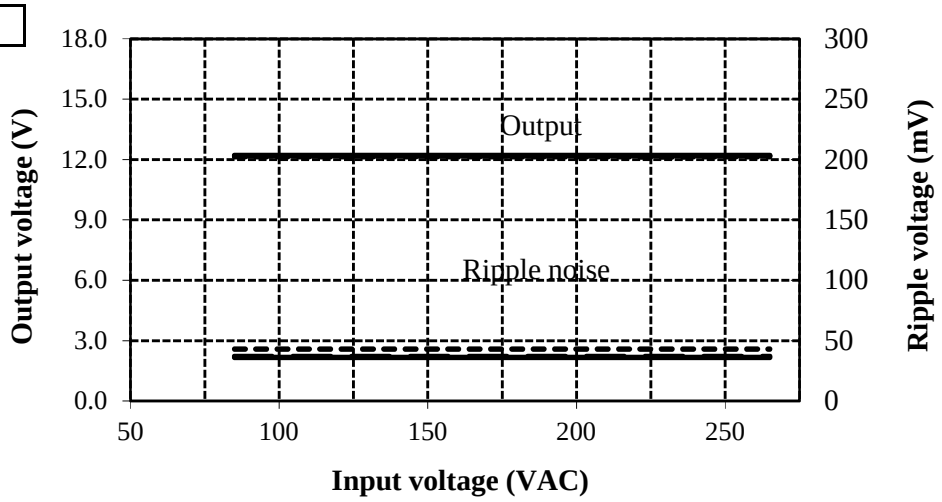
(2) Output voltage and Ripple voltage v.s. Input voltage

Conditions: Iout : 100%
Ta : -20°C
: 25°C
: 50°C

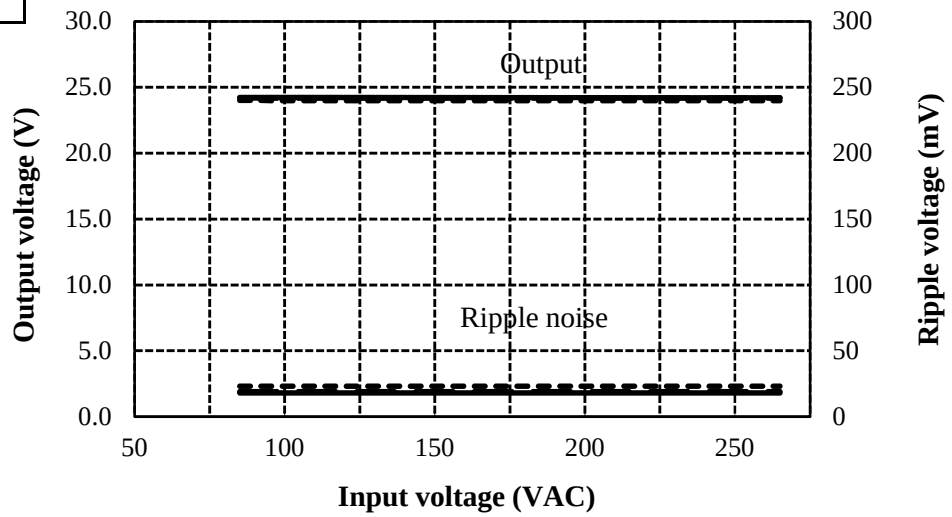
5V



12V



24V

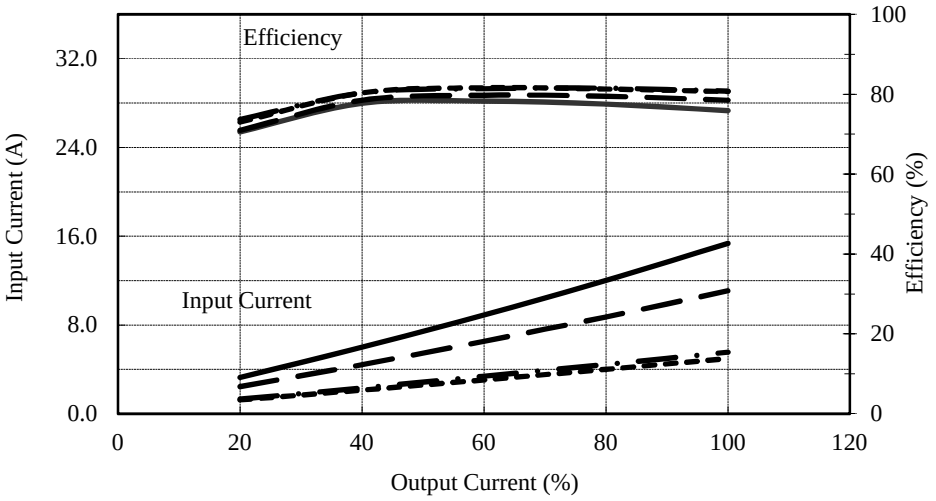


2.1 Steady State Data

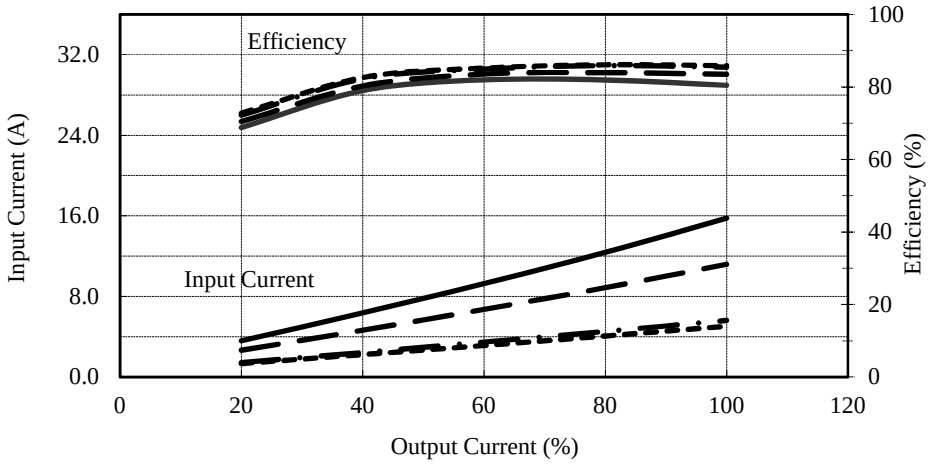
(3) Efficiency and Input current v.s. Output current

Conditions: Ta = 25°C
Vin = 85Vac
115Vac
230Vac
265Vac

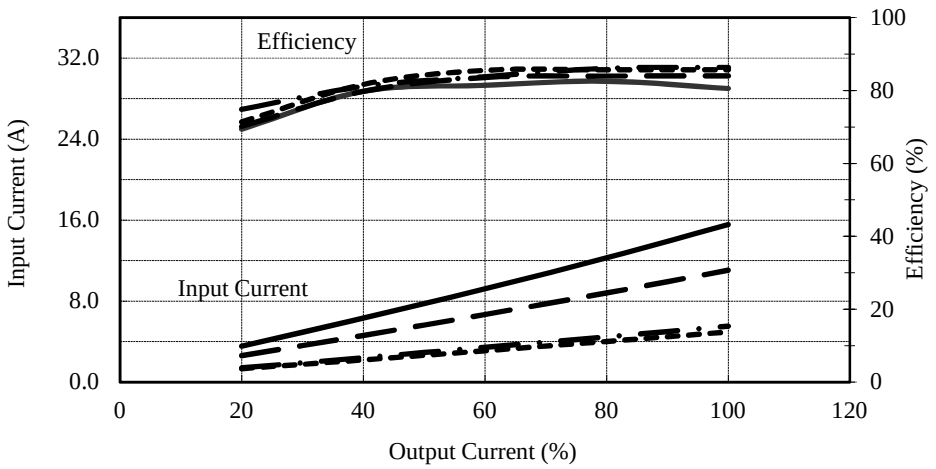
5V



12V



24V

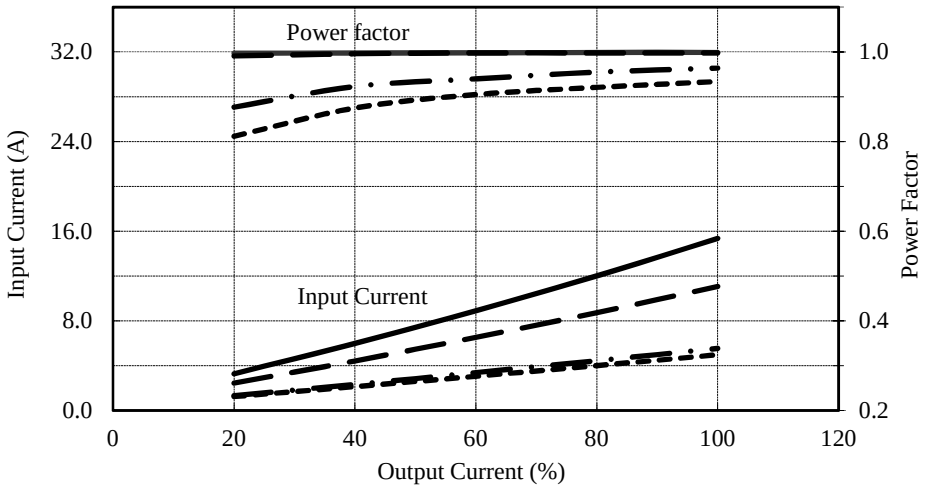


2.1 Steady State Data

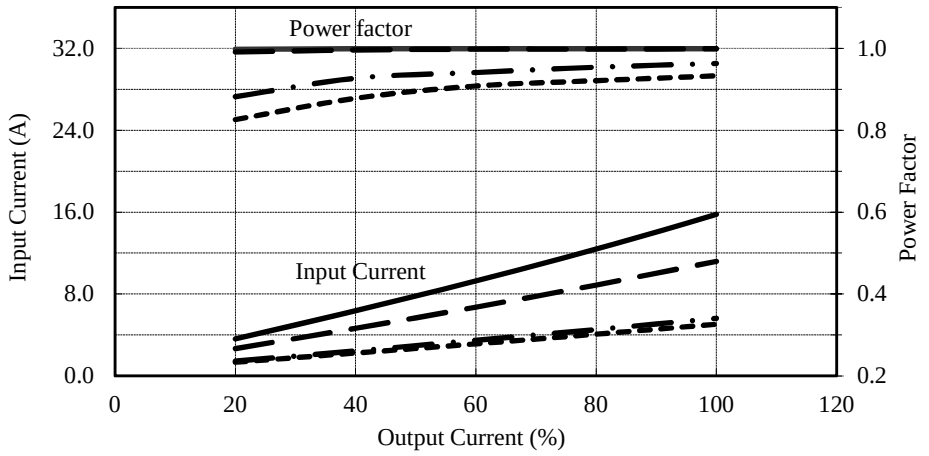
(4) Power factor and Input current v.s. Output current

Conditions: Ta = 25°C
Vin = 85Vac
115Vac
230Vac
265Vac

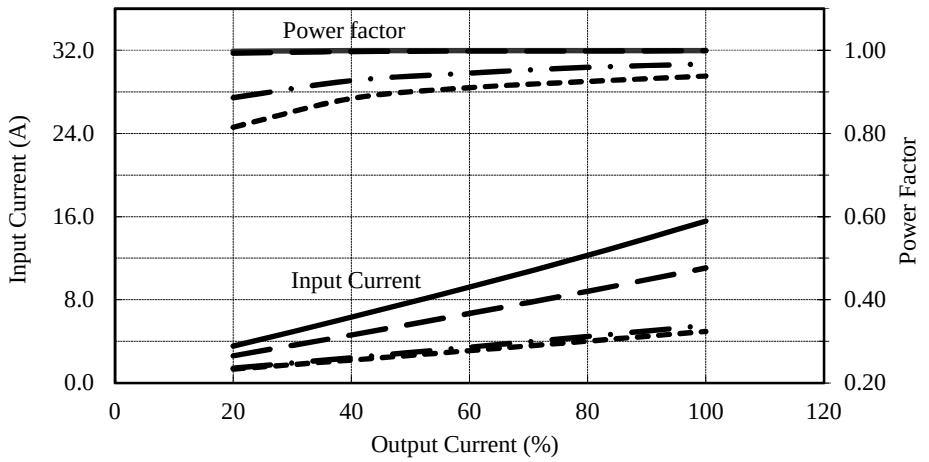
5V



12V



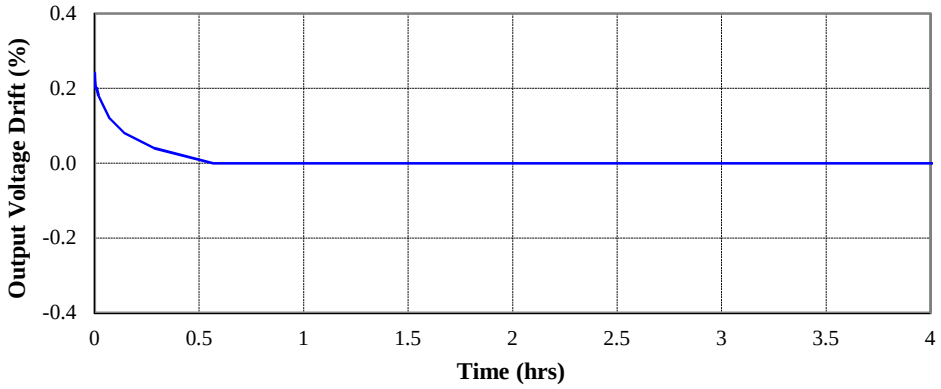
24V



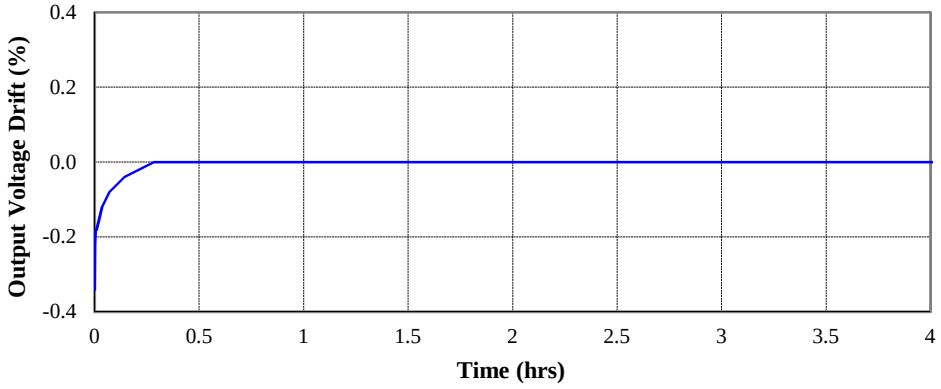
2.2 Warm up voltage drift characteristics

Conditions : Vin: 115VAC
Iout: 100%
Ta: 25°C

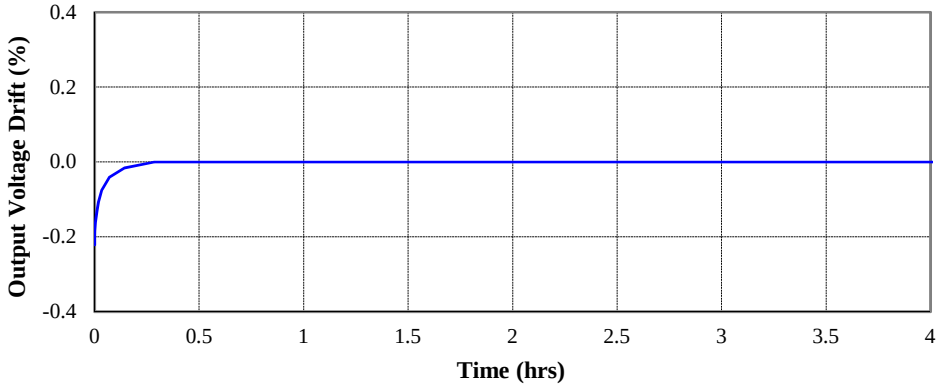
5V



12V



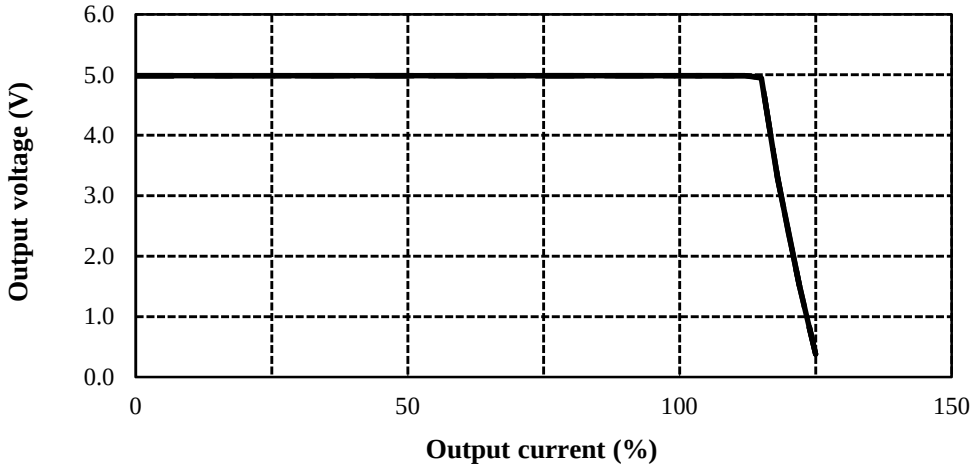
24V



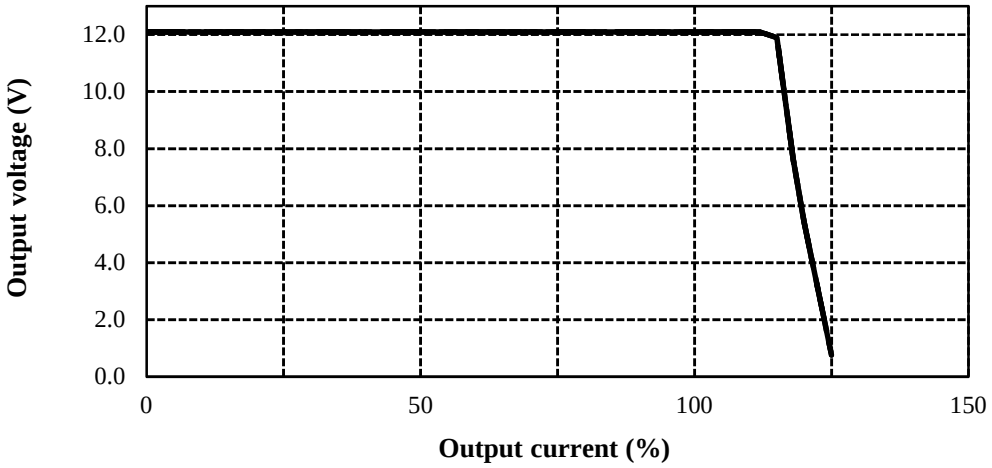
2.3 Over current protection (OCP) characteristics

Conditions: Vin : 85 VAC
115 VAC
230 VAC
265 VAC
Ta : 25℃

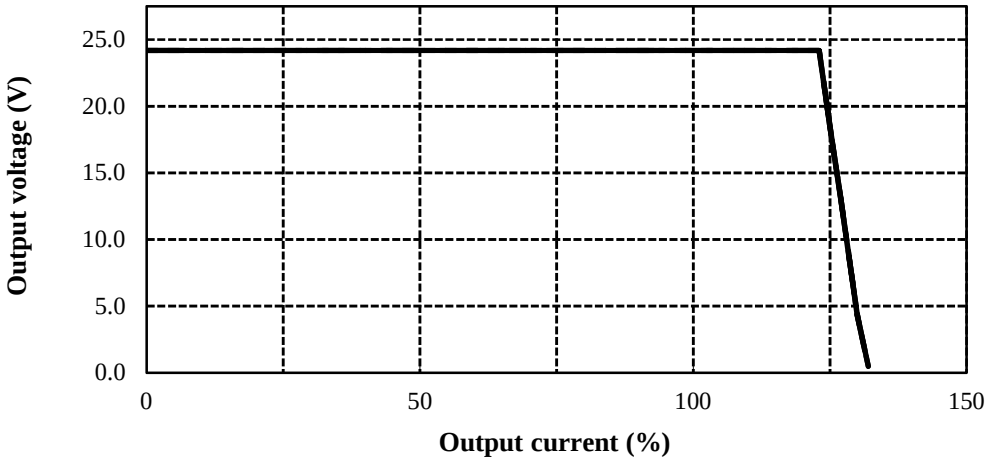
5V



12V



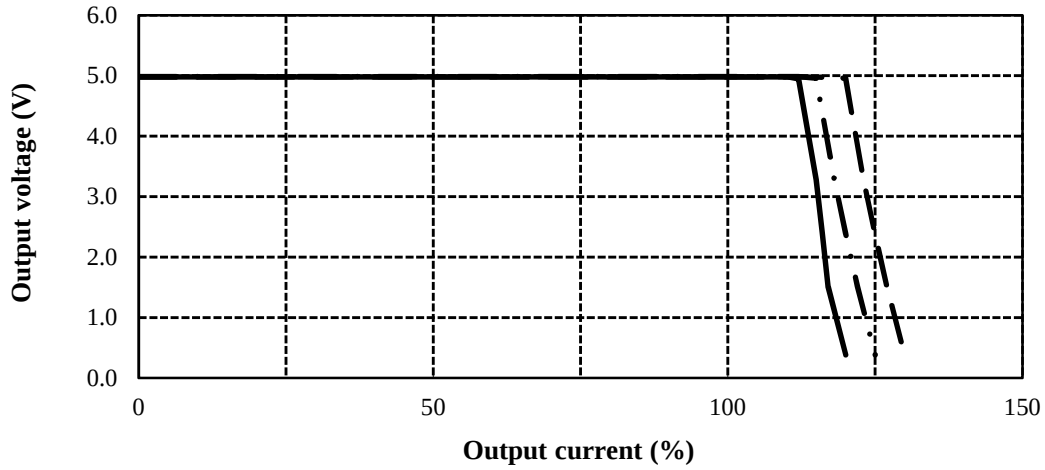
24V



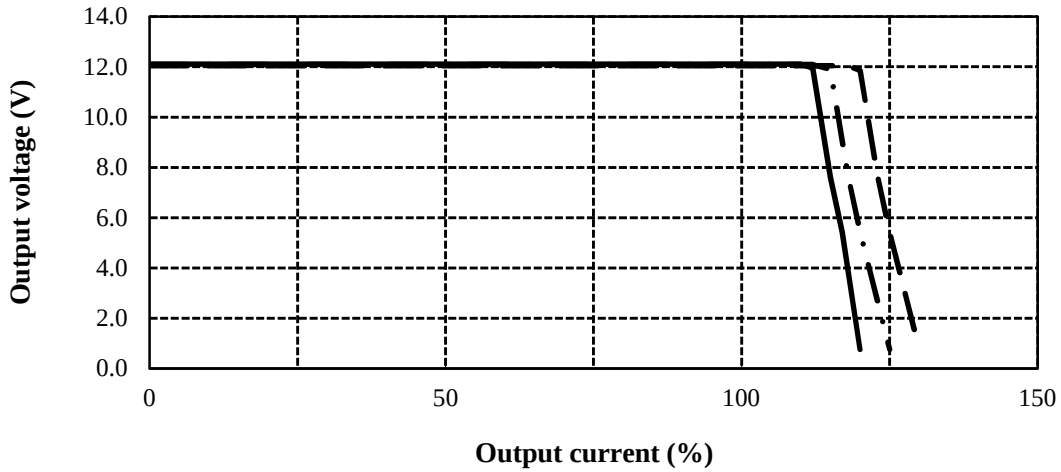
2.3 Over current protection (OCP) characteristics

Conditions: Vin : 115VAC
Ta : -20℃
25℃
50℃

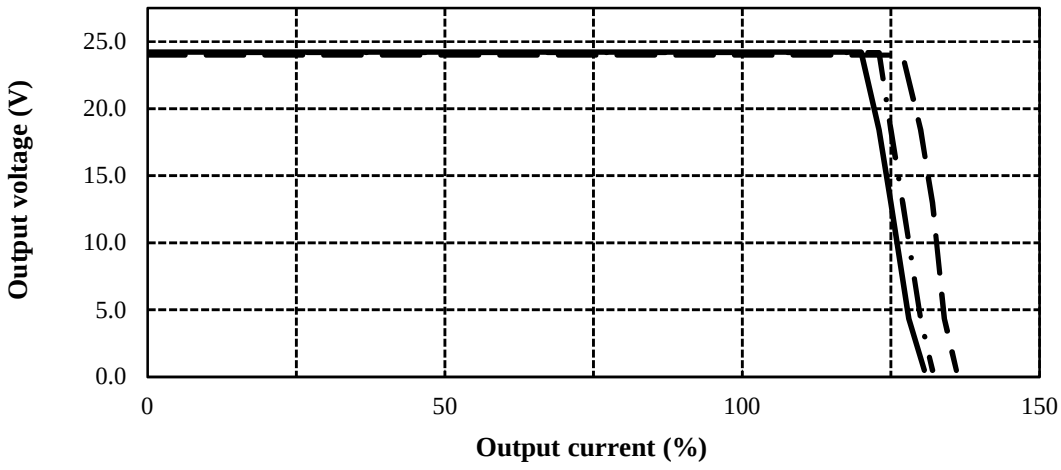
5V



12V



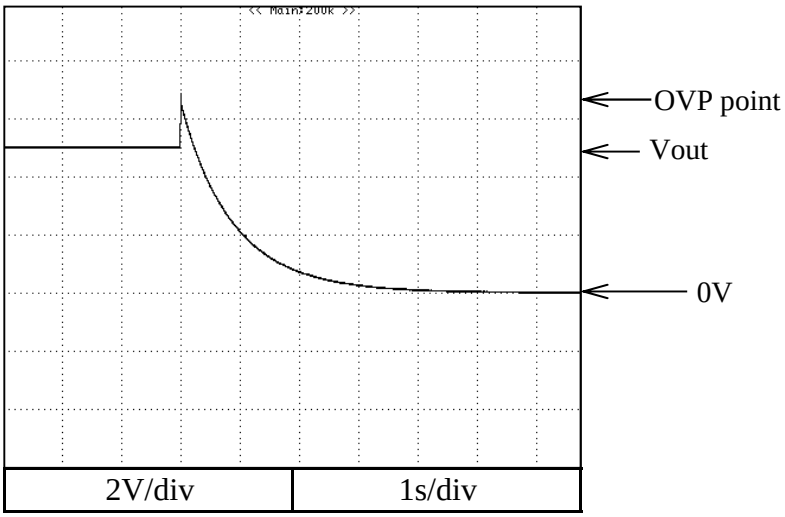
24V



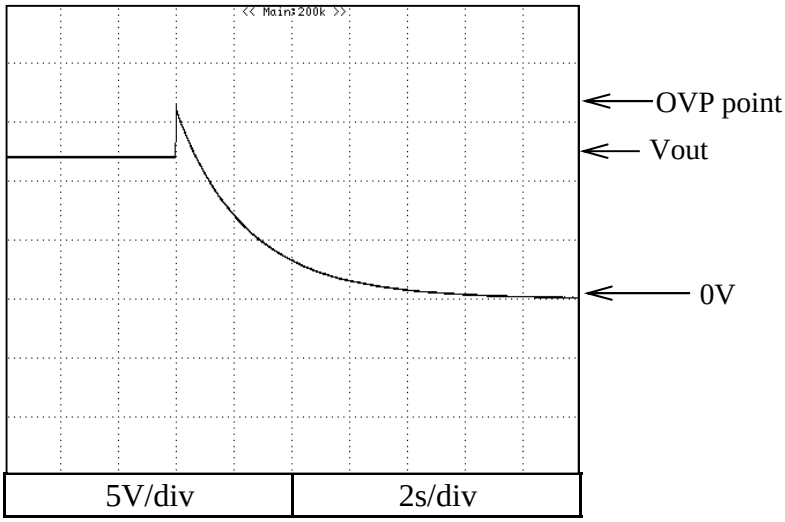
2.4 Over voltage protection (OVP) characteristics

Conditions: Vin : 115VAC
Iout : 0%
Ta : 25°C

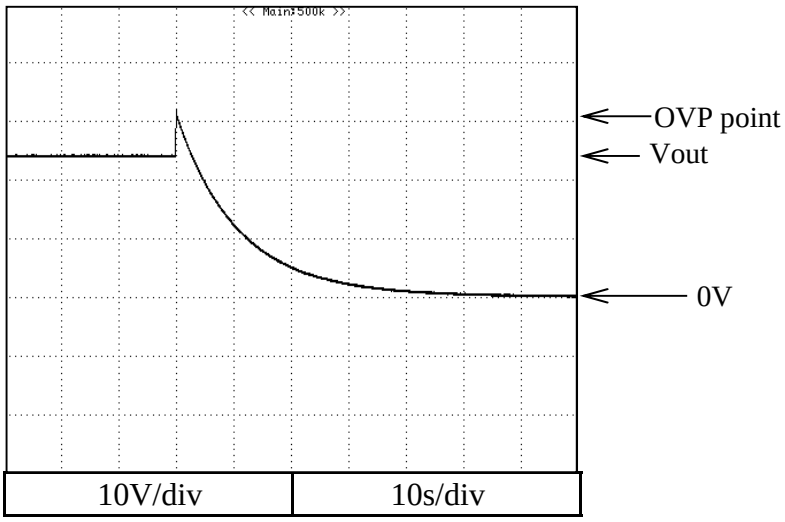
5V



12V



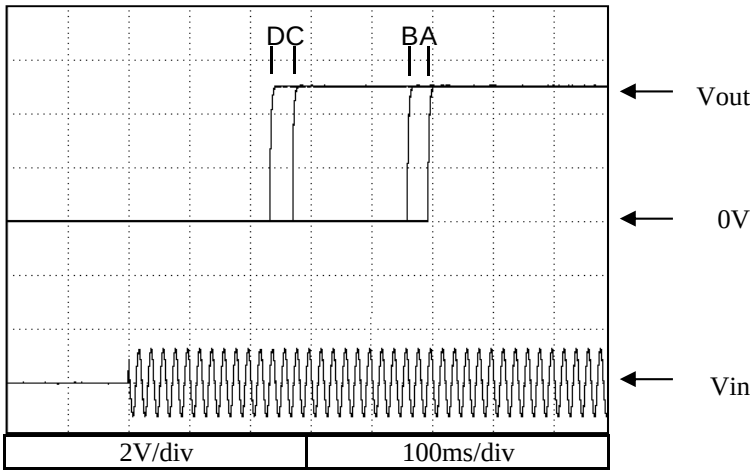
24V



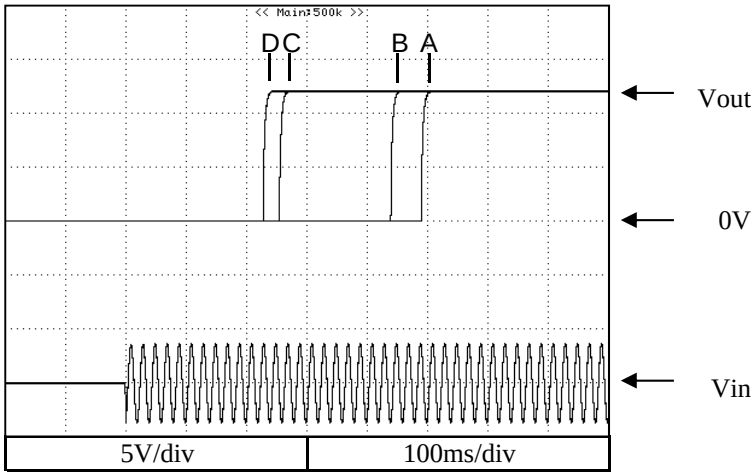
2.5 Output rise characteristics

Conditions: Vin : 85VAC (A)
: 115VAC (B)
: 230VAC (C)
: 265VAC (D)
Iout : 0%
Ta : 25°C

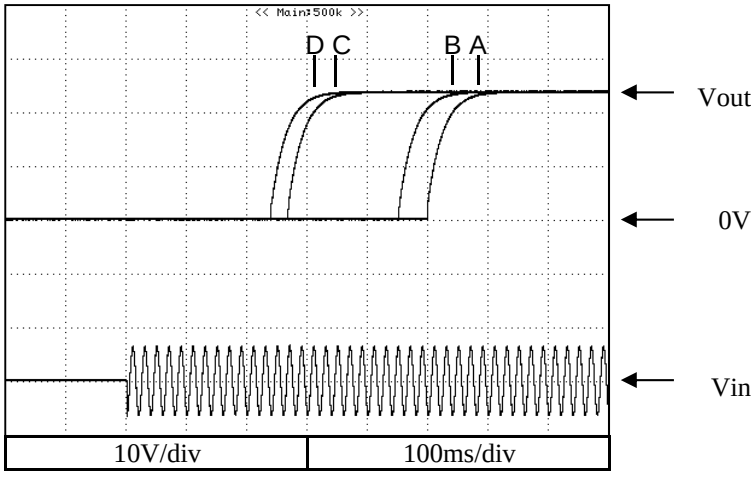
5V



12V



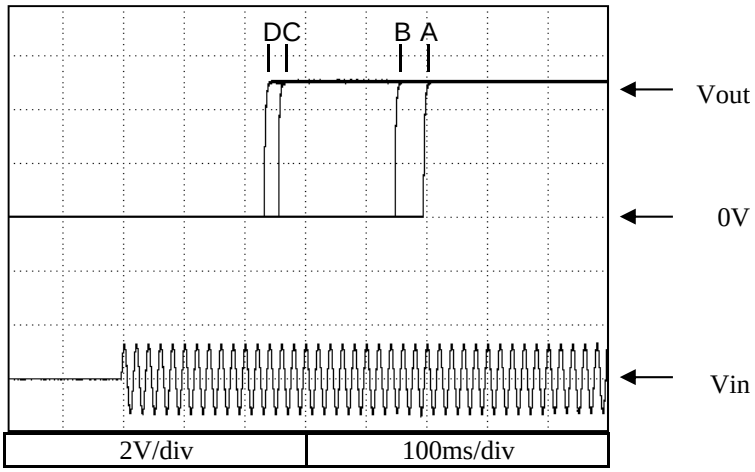
24V



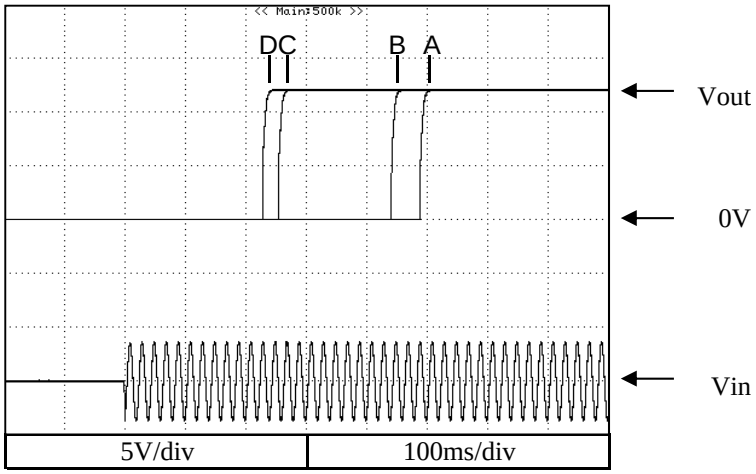
2.5 Output rise characteristics

Conditions: Vin : 85VAC (A)
: 115VAC (B)
: 230VAC (C)
: 265VAC (D)
Iout : 100%
Ta : 25°C

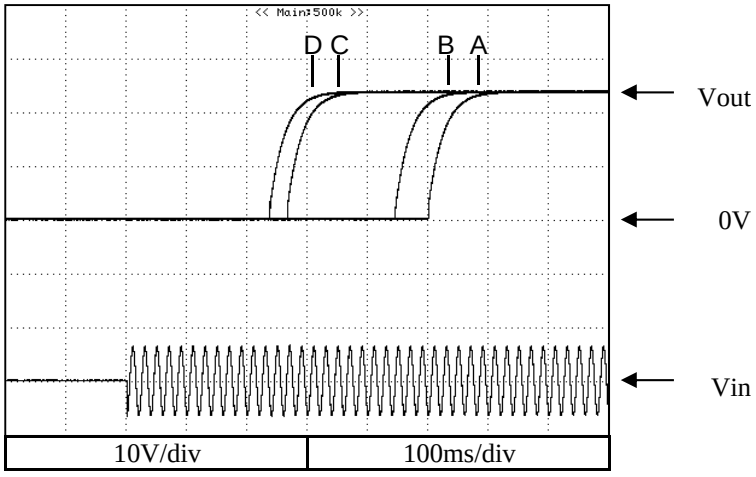
5V



12V



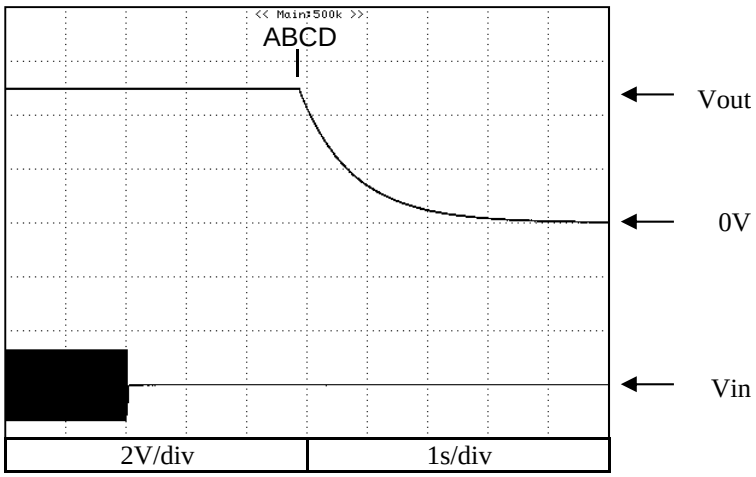
24V



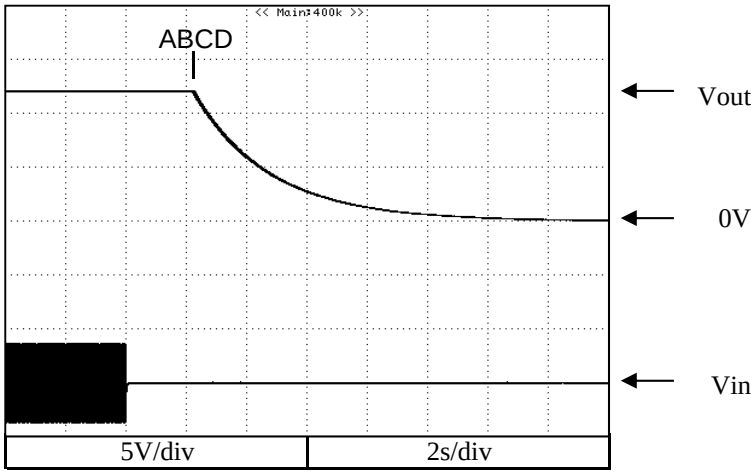
2.6 Output fall characteristics

Conditions: Vin : 85VAC (A)
: 115VAC (B)
: 230VAC (C)
: 265VAC (D)
Iout : 0%
Ta : 25°C

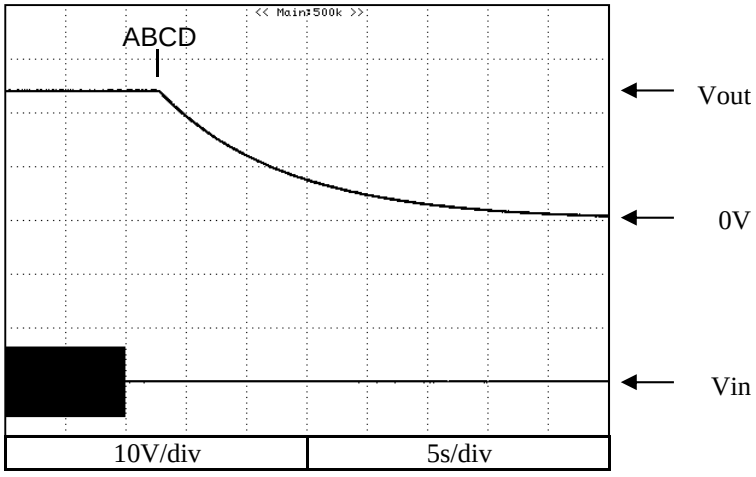
5V



12V



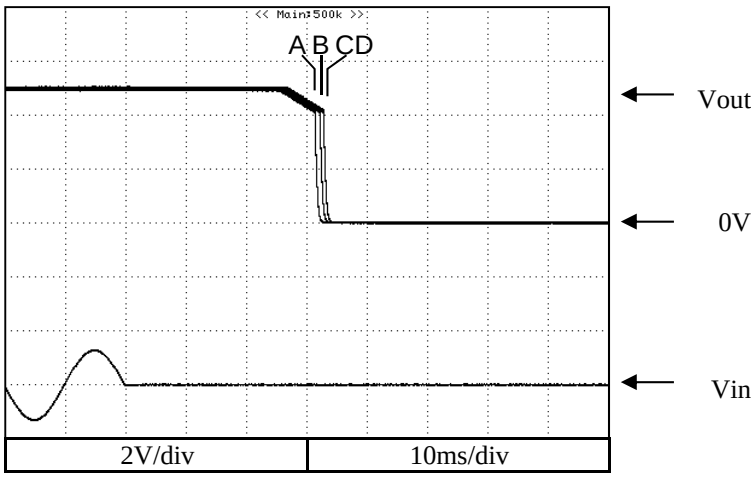
24V



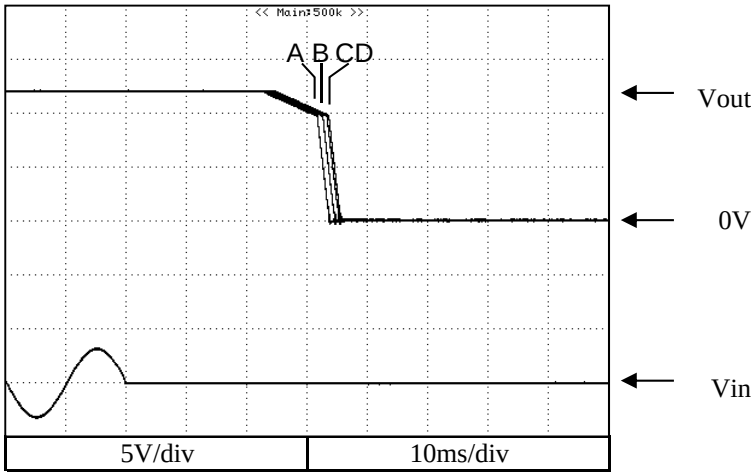
2.6 Output fall characteristics

Conditions: Vin : 85VAC (A)
: 115VAC (B)
: 230VAC (C)
: 265VAC (D)
Iout : 100%
Ta : 25°C

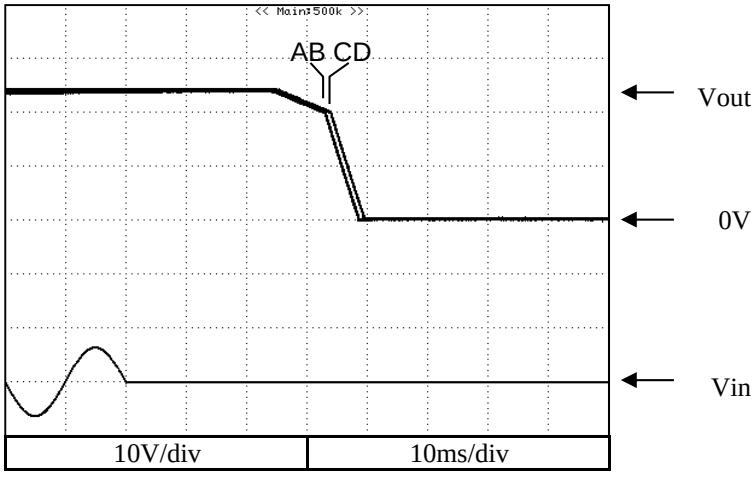
5V



12V



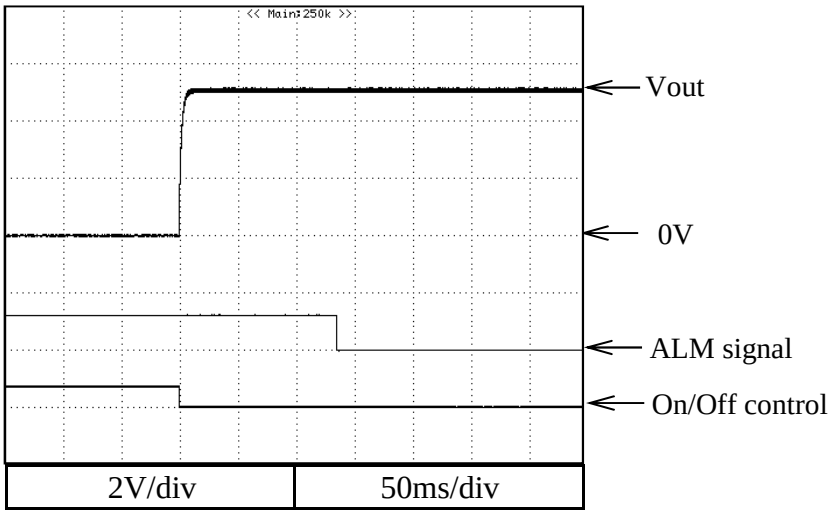
24V



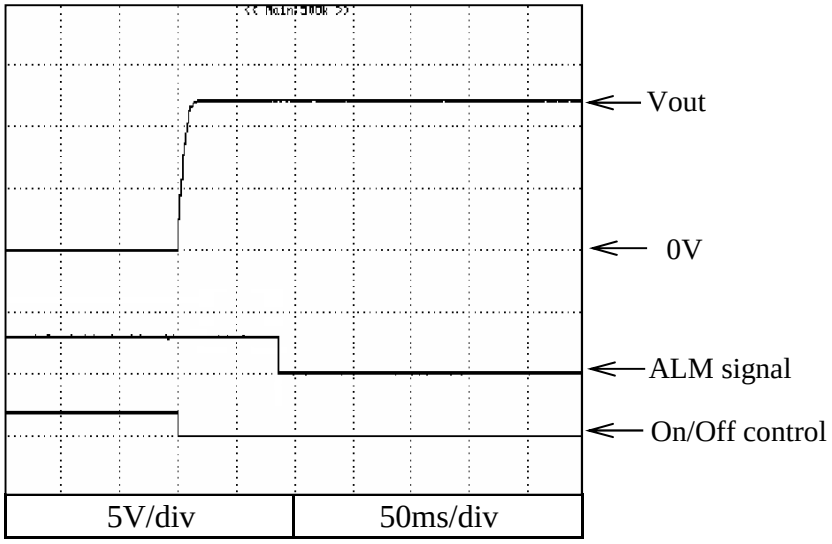
2.7 Output rise characteristics with On/Off control

Conditions: Vin : 115VAC
Iout : 100%
Ta : 25°C

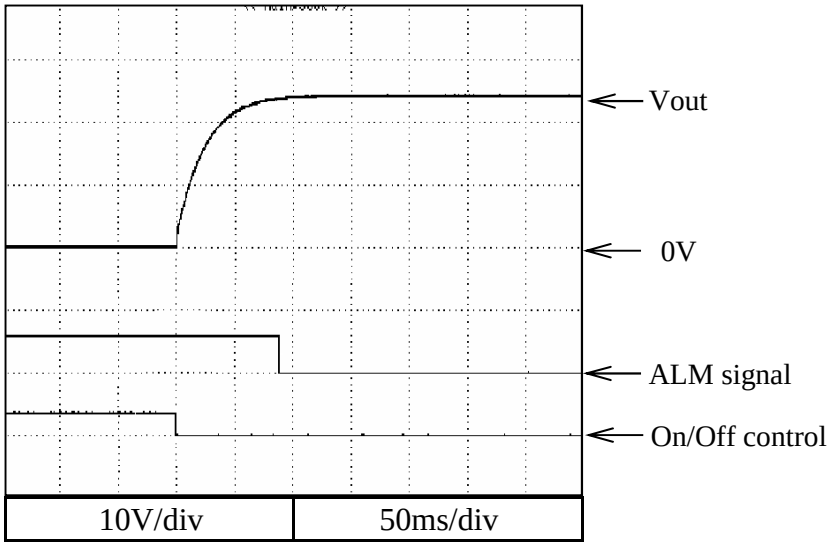
5V



12V



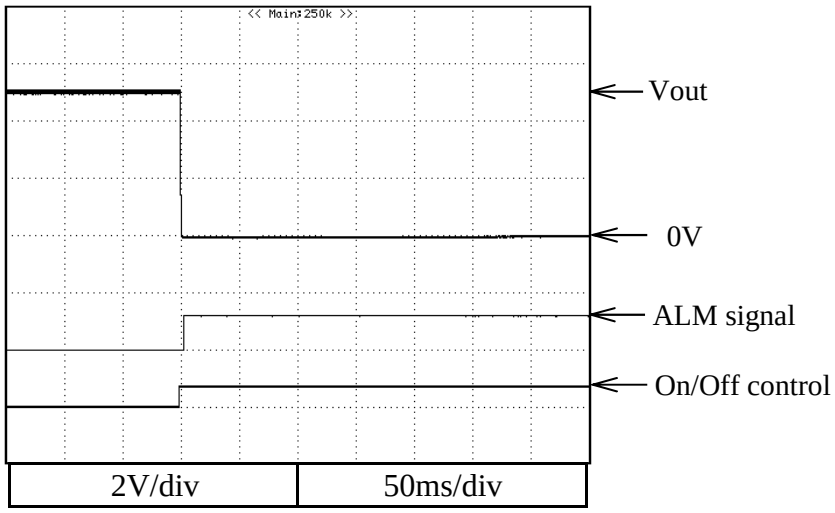
24V



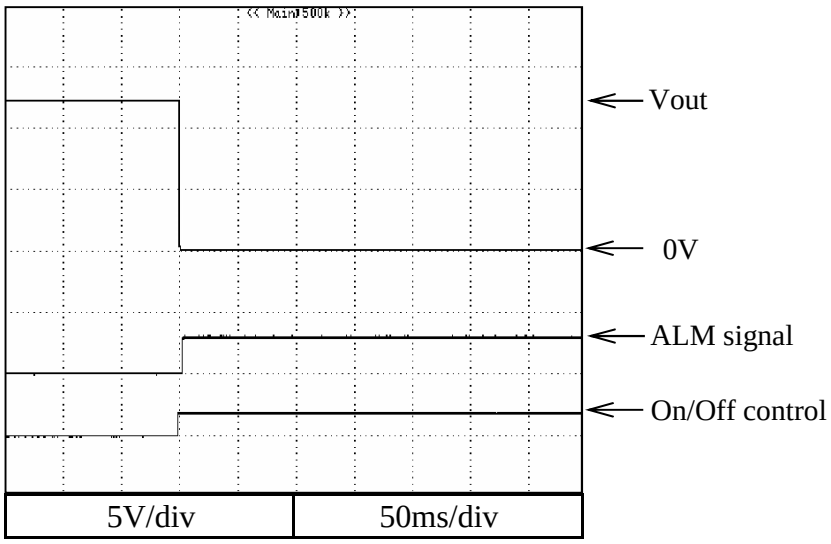
2.8 Output fall characteristics with On/Off control

Conditions: Vin : 115VAC
Iout : 100%
Ta : 25°C

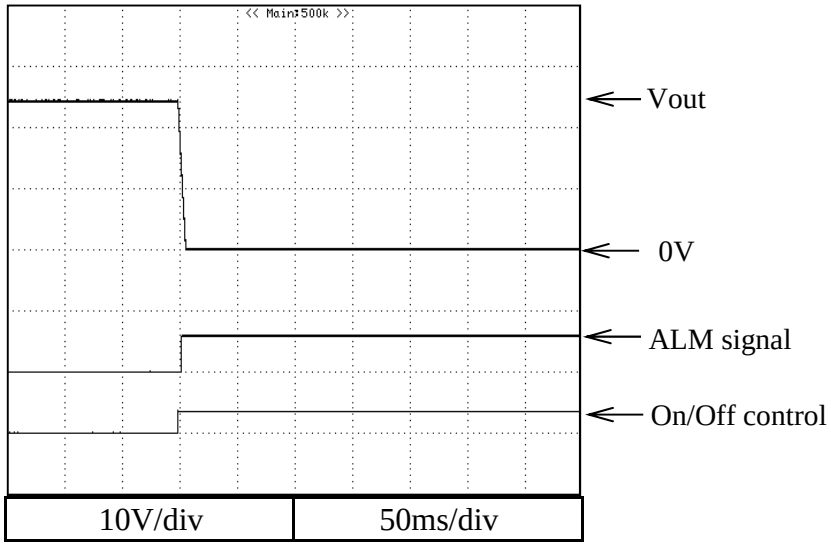
5V



12V



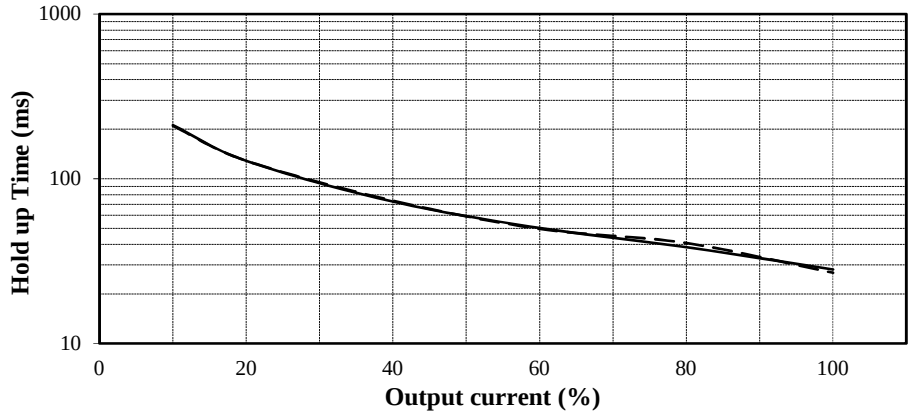
24V



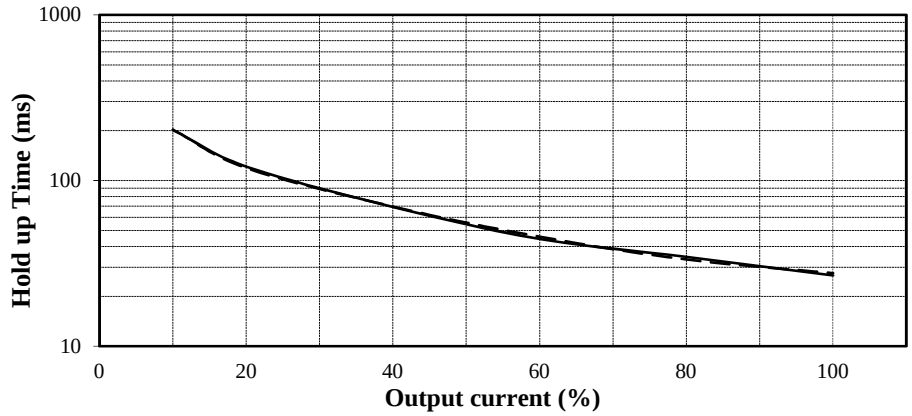
2.9 Hold up time characteristics

Conditions: Vin: 115VAC ——
230VAC – – – –
Ta: 25°C

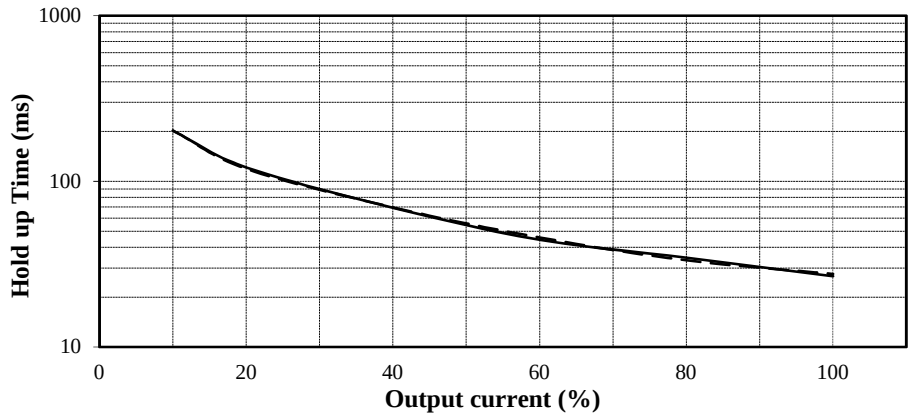
5V



12V



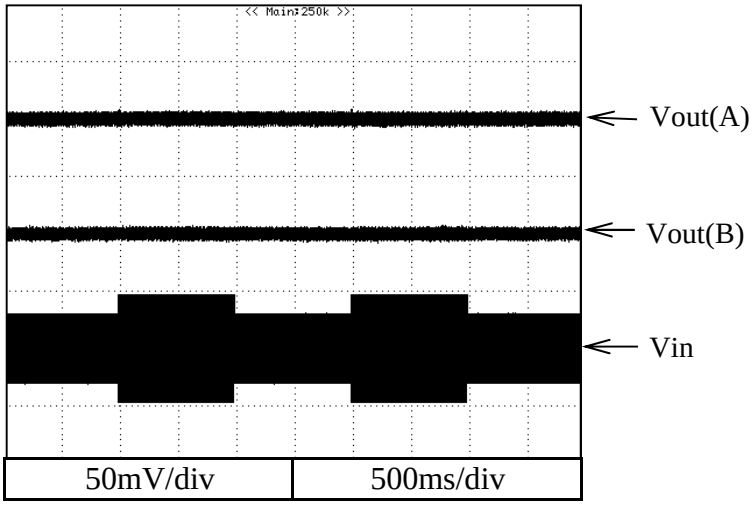
24V



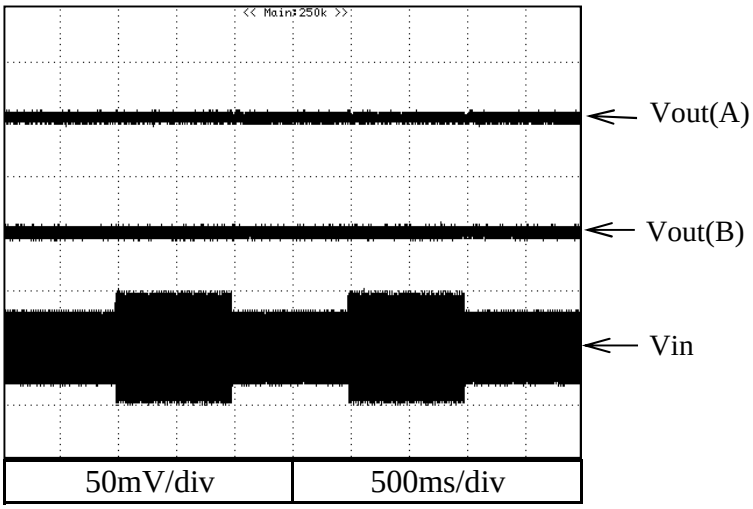
2.10 Dynamic line response characteristics

Conditions: Vin : 85VAC⇔ 132VAC(A)
170VAC⇔ 265VAC(B)
Iout : 100%
Ta : 25°C

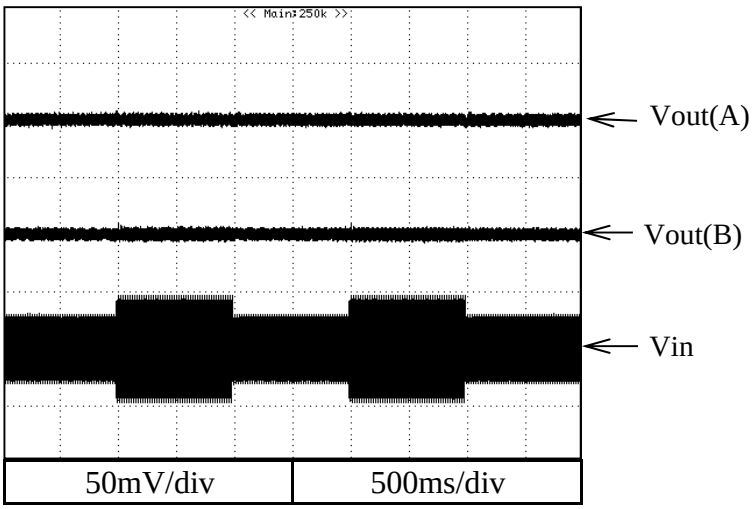
5V



12V



24V

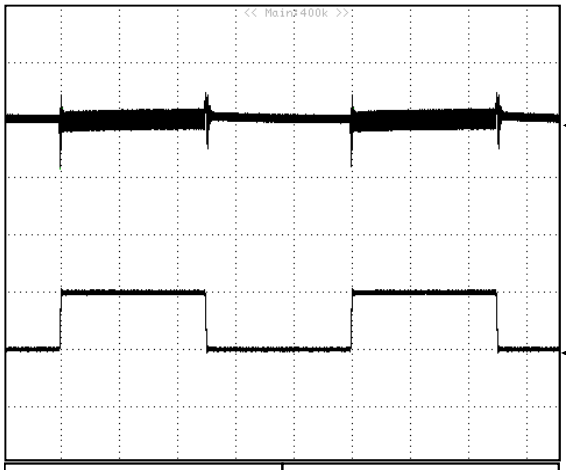
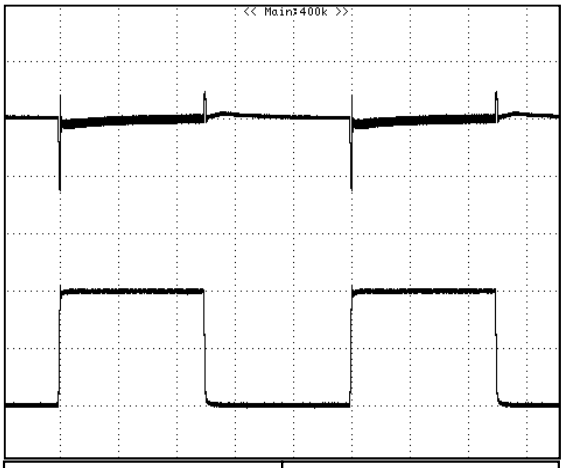


2.11 Dynamic load response characteristics

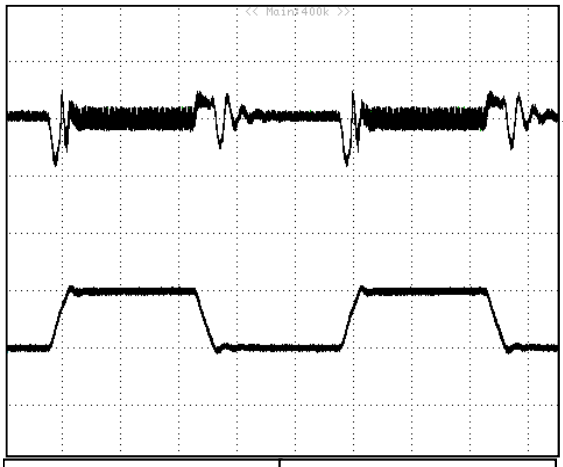
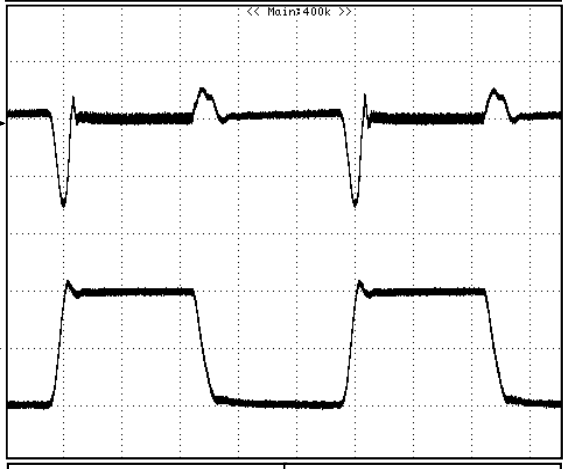
Conditions: Vin : 115VAC
Ta : 25°C

5V

f=100Hz

Load current tr = tf = 50µs 50% ⟷ 100%		Load current tr = tf = 50µs 0% ⟷ 100%	
			
200mV/DIV	2ms/DIV	500mV/DIV	2ms/DIV
+1.72%	-3.38%	+4.76%	-12.6%

f=1kHz

Load current tr = tf = 50µs 50% ⟷ 100%		Load current tr = tf = 50µs 0% ⟷ 100%	
			
200mV/DIV	200µs/DIV	500mV/DIV	200us/DIV
+2.00%	-3.34%	+5.40%	-15.4%

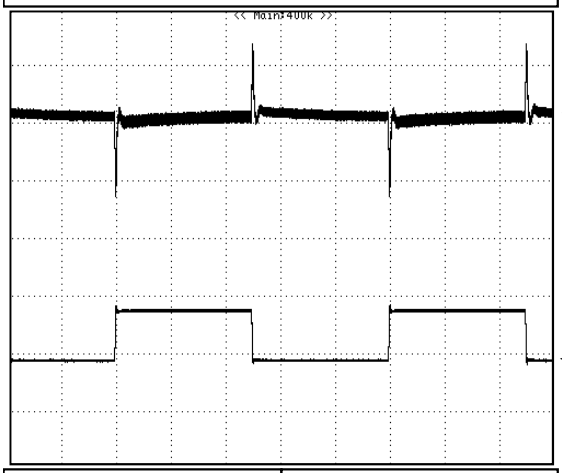
2.11 Dynamic load response characteristics

Conditions: Vin : 115VAC
Ta : 25°C

12V

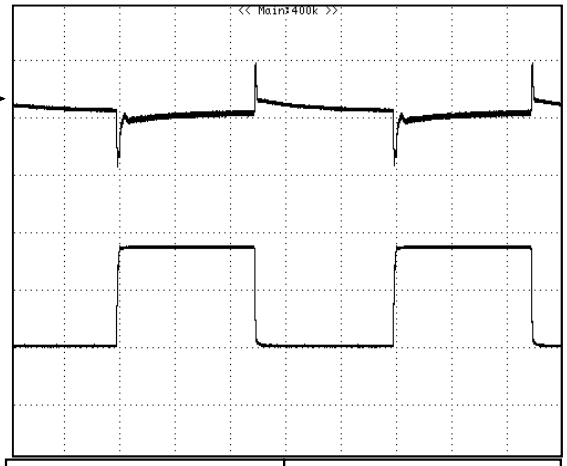
f=100Hz

Load current tr = tf = 50μs
50% ⟷ 100%



200mV/DIV	2ms/DIV
+2.12%	-2.28%

Load current tr = tf = 50μs
0% ⟷ 100%



500mV/DIV	2ms/DIV
+3.57%	-3.93%

f=1kHz

Load current tr = tf = 50μs
50% ⟷ 100%

200mV/DIV	200μs/DIV
+2.19%	-2.25%

Load current tr = tf = 50μs
0% ⟷ 100%

500mV/DIV	200us/DIV
+3.4%	-5.27%

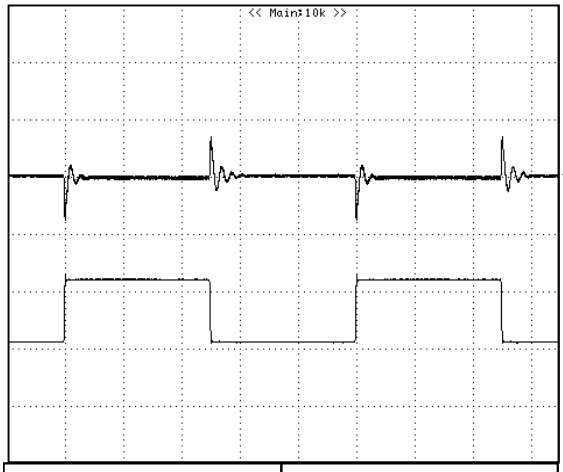
2.11 Dynamic load response characteristics

Conditions: Vin : 115VAC
Ta : 25°C

24V

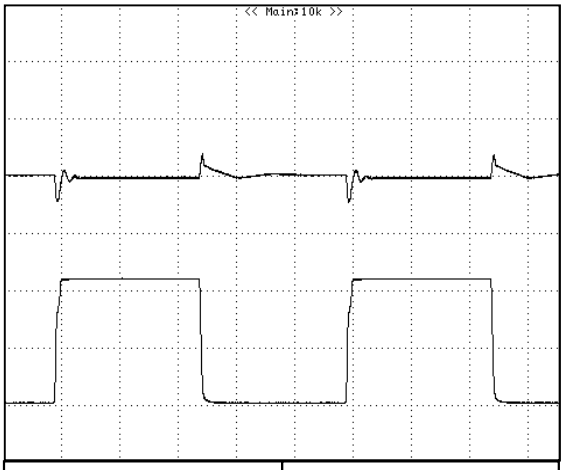
f=100Hz

Load current tr = tf = 50μs
50% ⟷ 100%



200mV/DIV	2ms/DIV
+0.59%	-0.63%

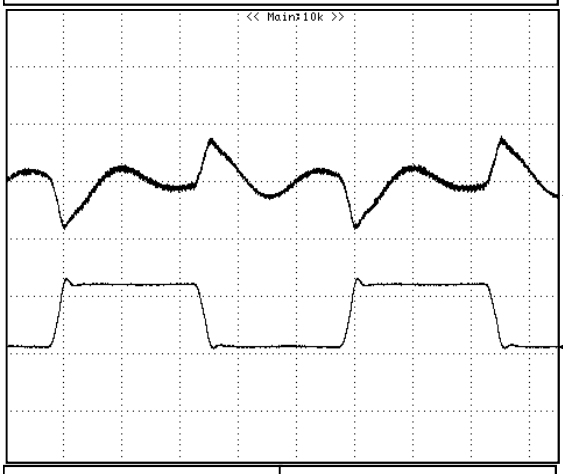
Load current tr = tf = 50μs
0% ⟷ 100%



500mV/DIV	2ms/DIV
+0.80%	-0.94%

f=1kHz

Load current tr = tf = 50μs
50% ⟷ 100%



200mV/DIV	200μs/DIV
+0.65%	-0.69%

Load current tr = tf = 50μs
0% ⟷ 100%

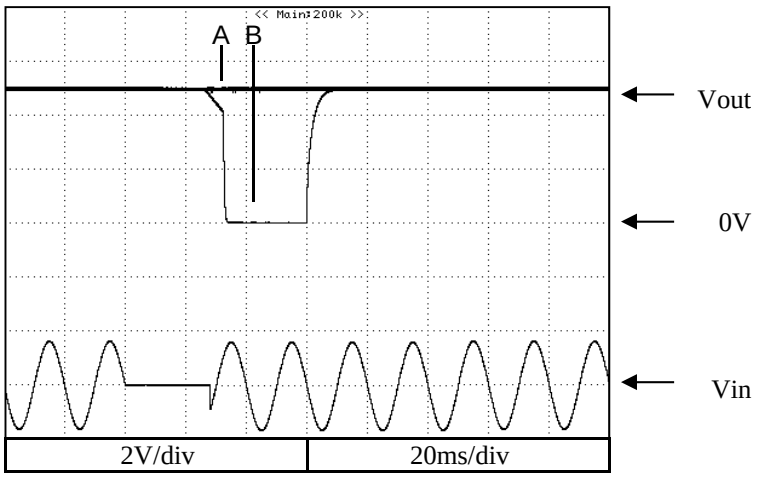
500mV/DIV	200us/DIV
+1.89%	-2.49%

2.12 Response to brown out characteristics

Conditions: Vin : 115VAC
Iout : 100%
Ta : 25°C

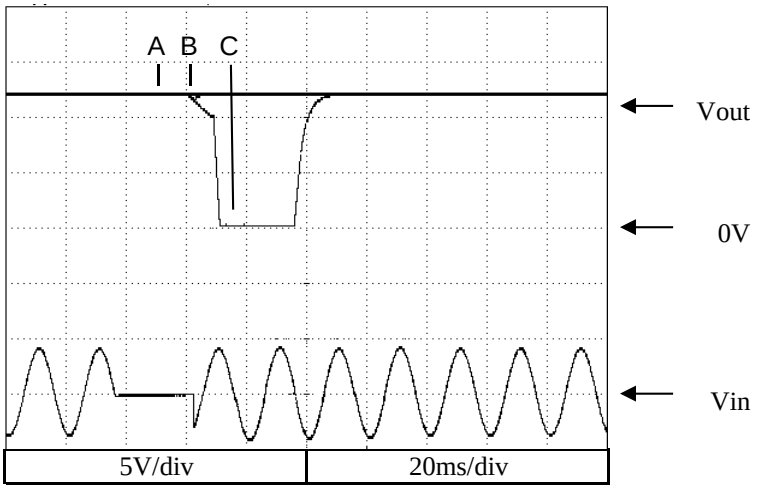
5V

A = 27ms
B = 28ms



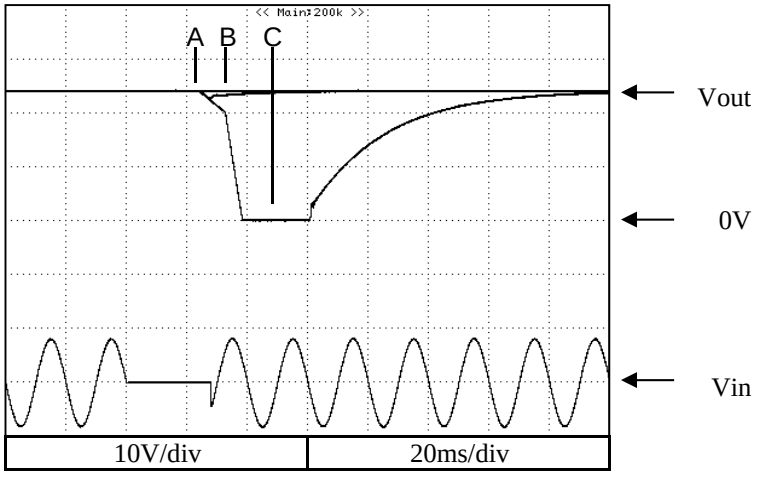
12V

A = 25ms
B = 26ms
C = 28ms



24V

A = 25ms
B = 26ms
C = 28ms

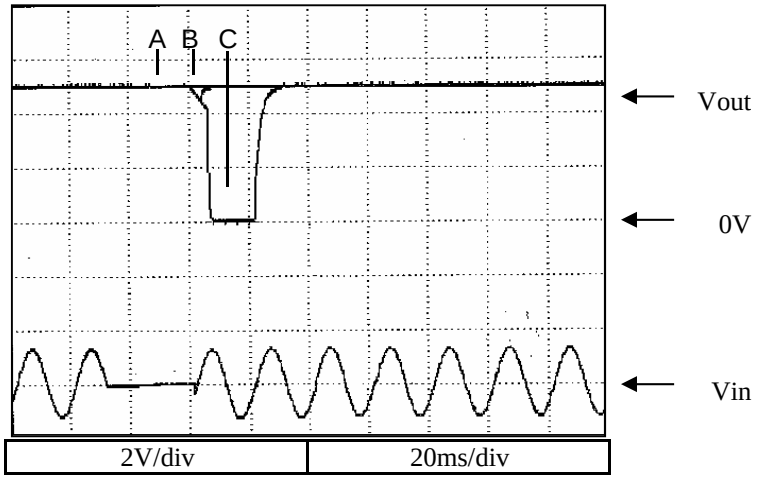


2.12 Response to brown out characteristics

Conditions: Vin : 230VAC
Iout : 100%
Ta : 25°C

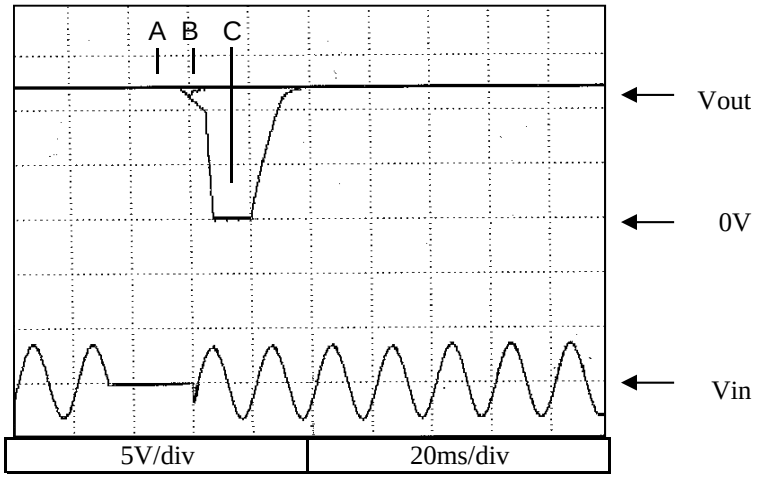
5V

A = 28ms
B = 29ms
C = 34ms



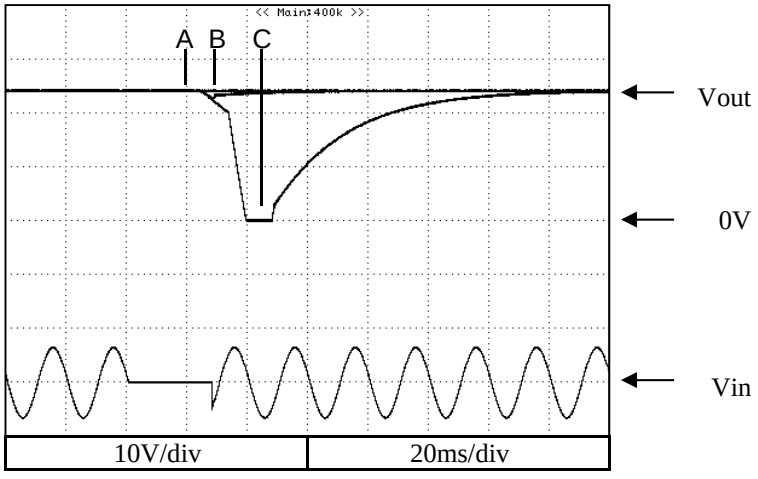
12V

A = 25ms
B = 28ms
C = 34ms



24V

A = 25ms
B = 28ms
C = 33ms

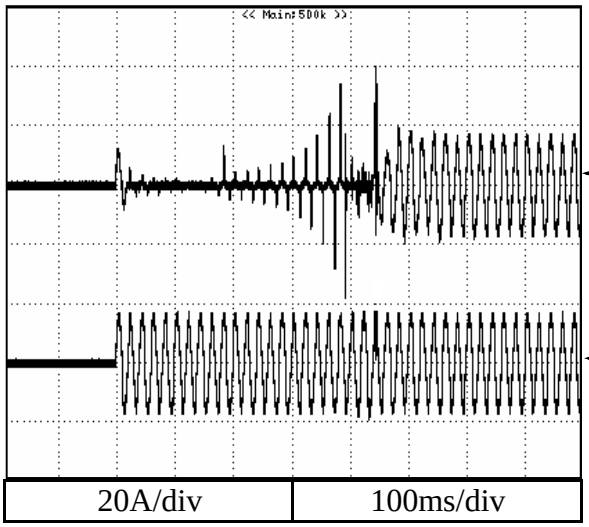


2.13 Inrush current waveform

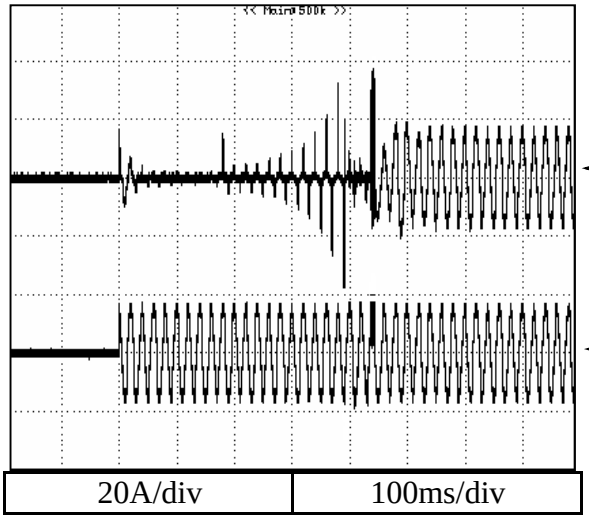
Conditions: Vin : 115VAC
Iout : 100%
Ta : 25°C

5V

Switch on phase angle of input AC voltage
$\phi = 0^{o}$



Switch on phase angle of input AC voltage
$\phi = 90^{o}$

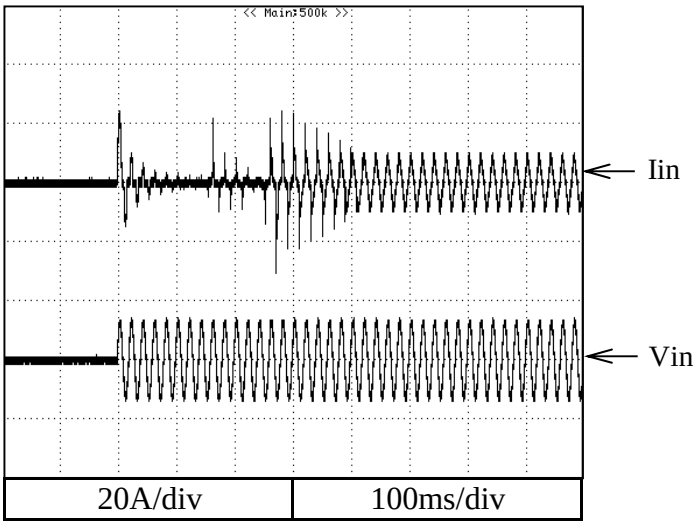


2.13 Inrush current waveform

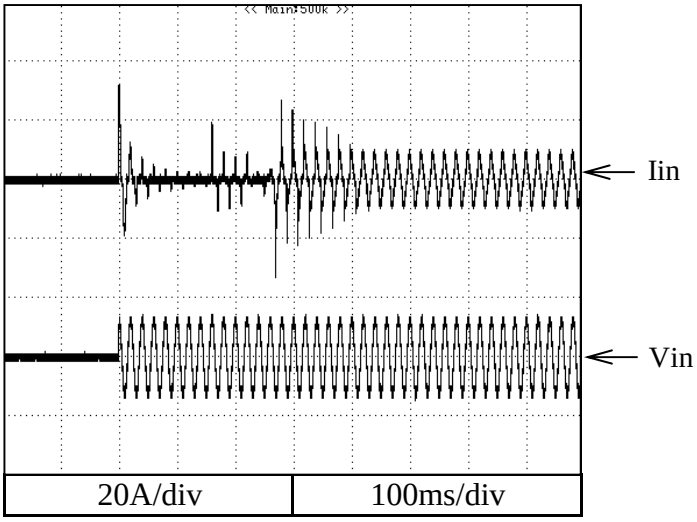
Conditions: Vin : 230VAC
Iout : 100%
Ta : 25°C

5V

Switch on phase angle of input AC voltage
$\phi = 0^{o}$



Switch on phase angle of input AC voltage
$\phi = 90^{o}$

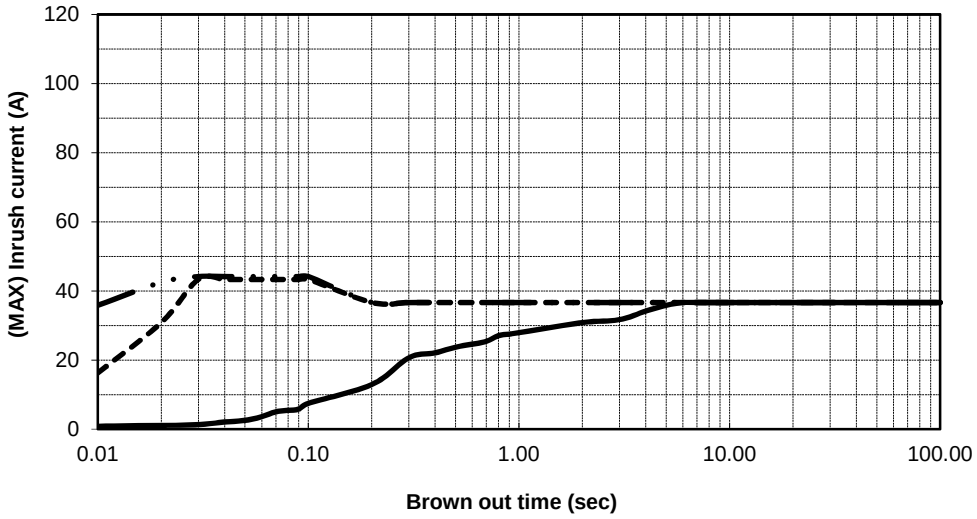


2.14 Inrush current characteristics

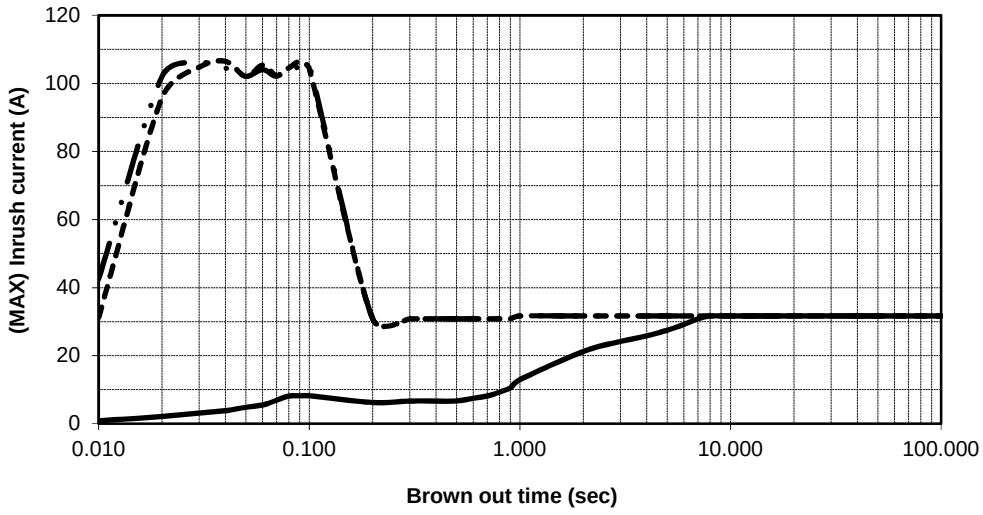
Conditions: Iout : 0%
: 50%
: 100%
Ta : 25°C

5V

Vin = 115VAC



Vin = 230VAC



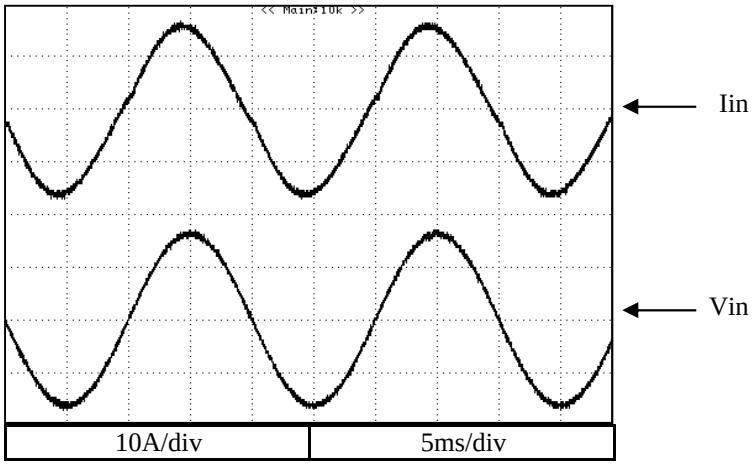
Above data included secondary inrush current.

2.15 Input current waveform

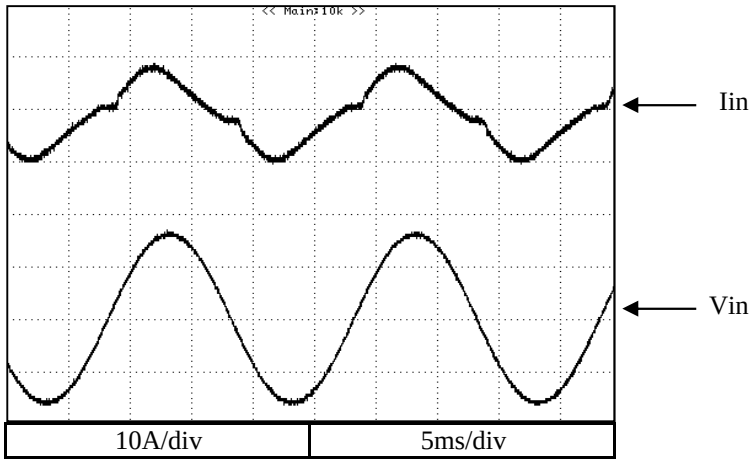
Conditions: Iout : 100%
Ta : 25°C

5V

Vin = 115VAC



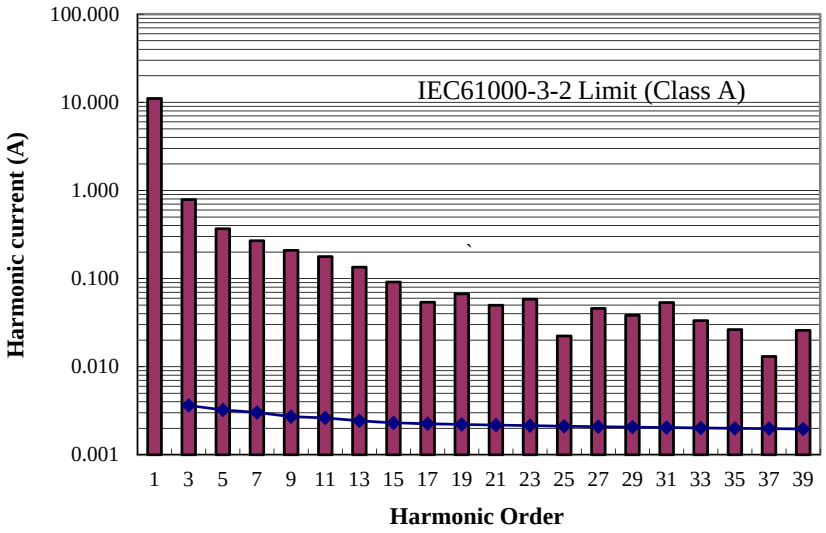
Vin = 230VAC



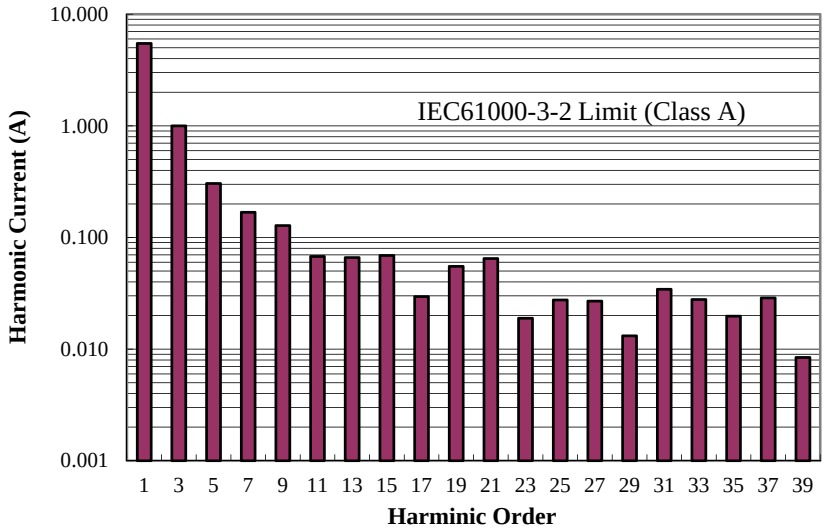
2.16 Input current harmonics

Conditions : Vin : 115VAC
Iout : 100%
Ta : 25°C

5V



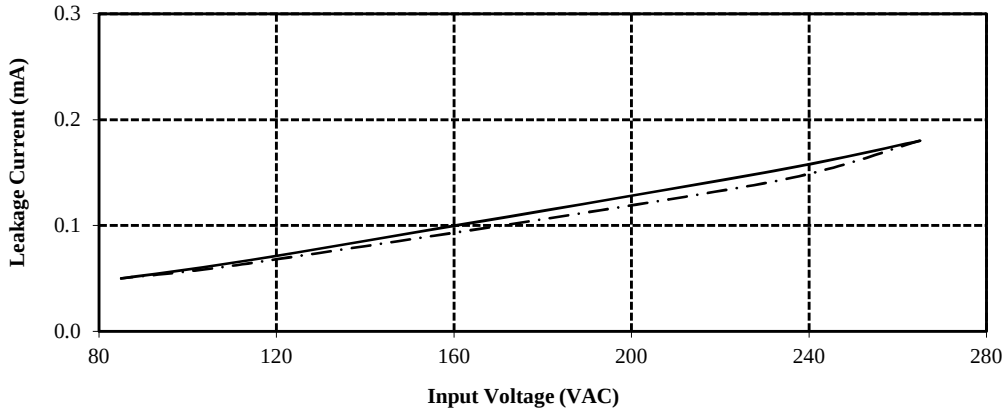
Conditions : Vin : 230VAC
Iout : 100%
Ta : 25°C



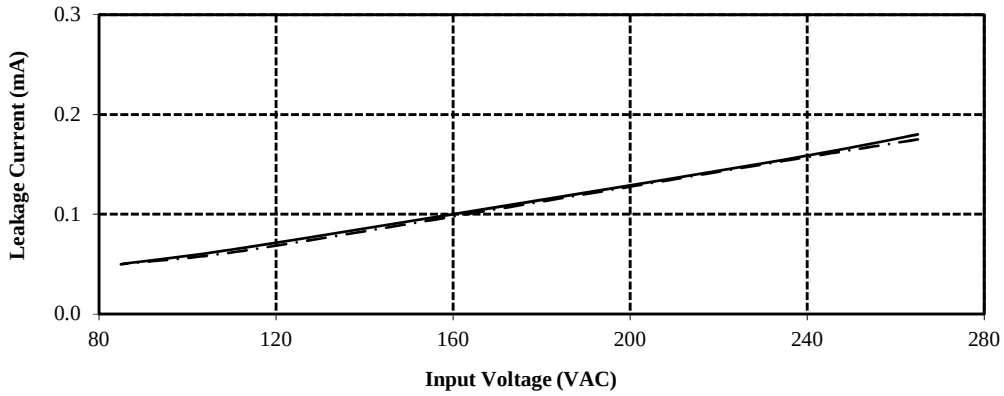
2.17 Leakage current characteristics

Conditions : Iout: 0% ——
100% ----------
Ta: 25°C
f: 50Hz

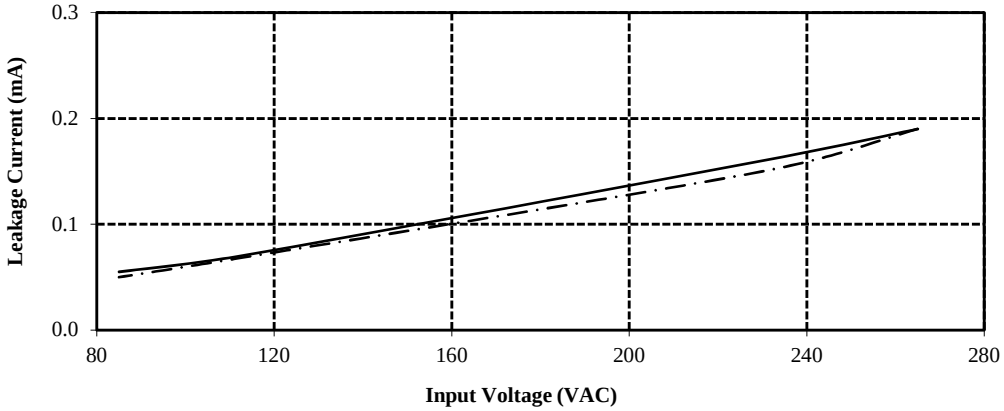
5V



12V



24V

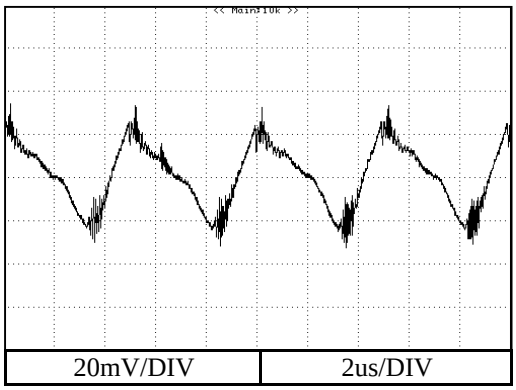


2-18 Output ripple and noise waveform

Conditions: Vin : 115VAC
Iout : 100%
Ta : 25°C

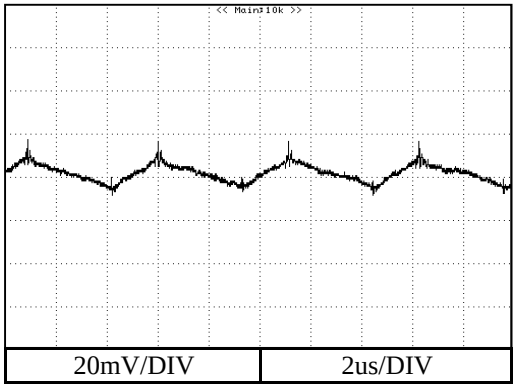
NORMAL MODE

5V



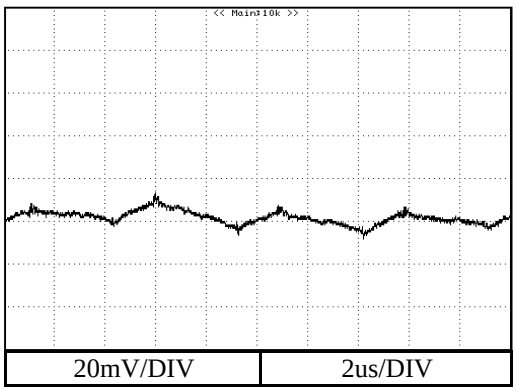
20mV/DIV	2us/DIV

12V



20mV/DIV	2us/DIV

24V



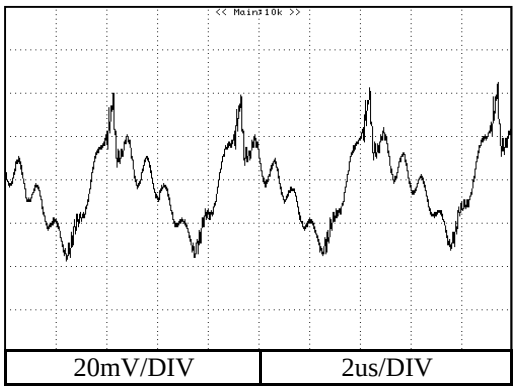
20mV/DIV	2us/DIV

2-18 Output ripple and noise waveform

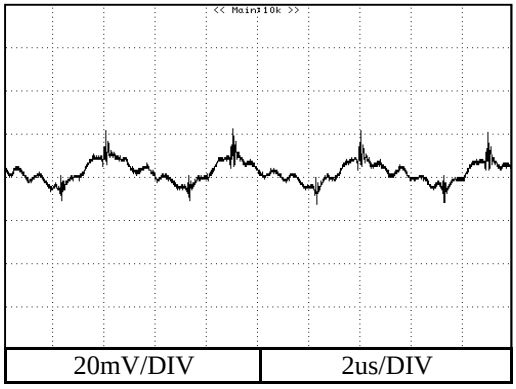
Conditions: Vin : 115VAC
Iout : 100%
Ta : 25°C

NORMAL+ COMMON MODE

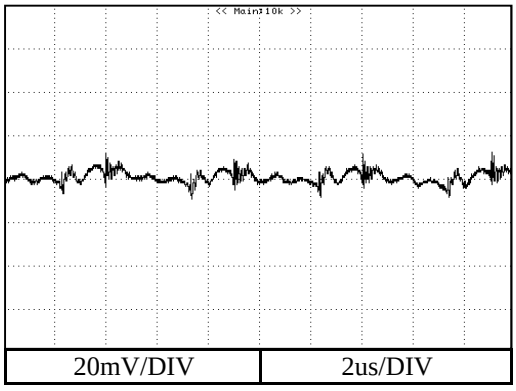
5V



12V



24V

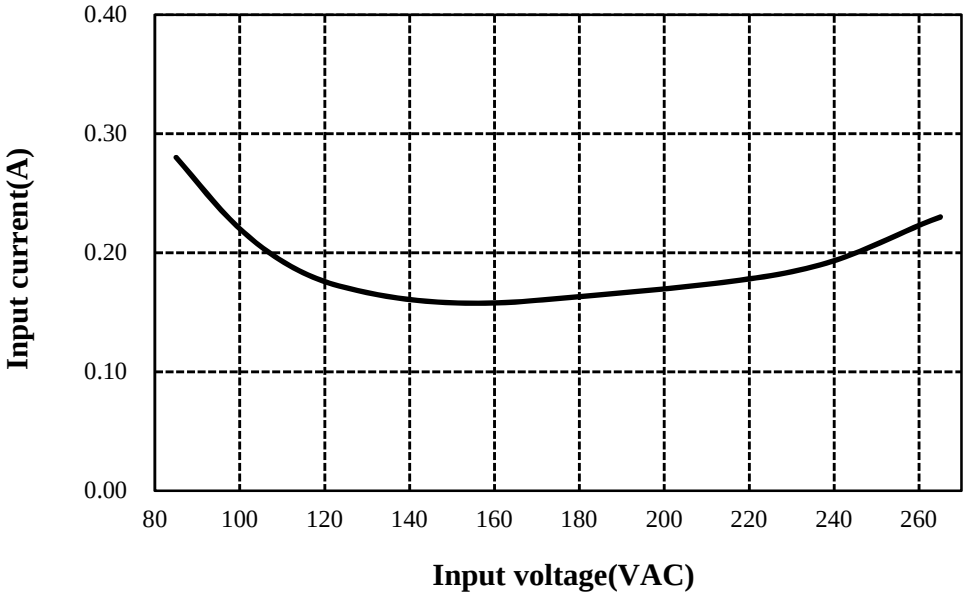


2.19 Standby current

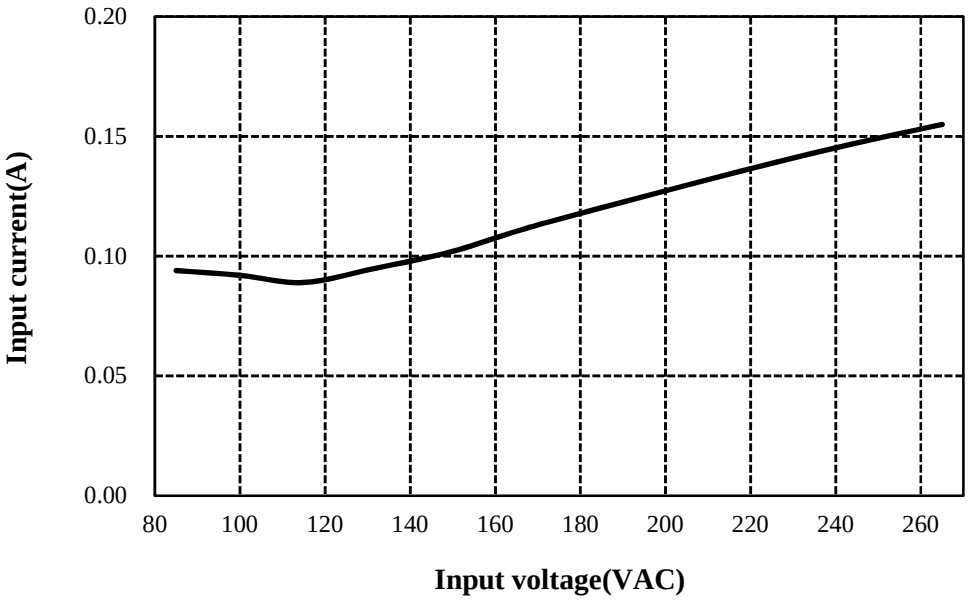
Conditions: Ta : 25°C

5V

Io=0%



Remote control OFF



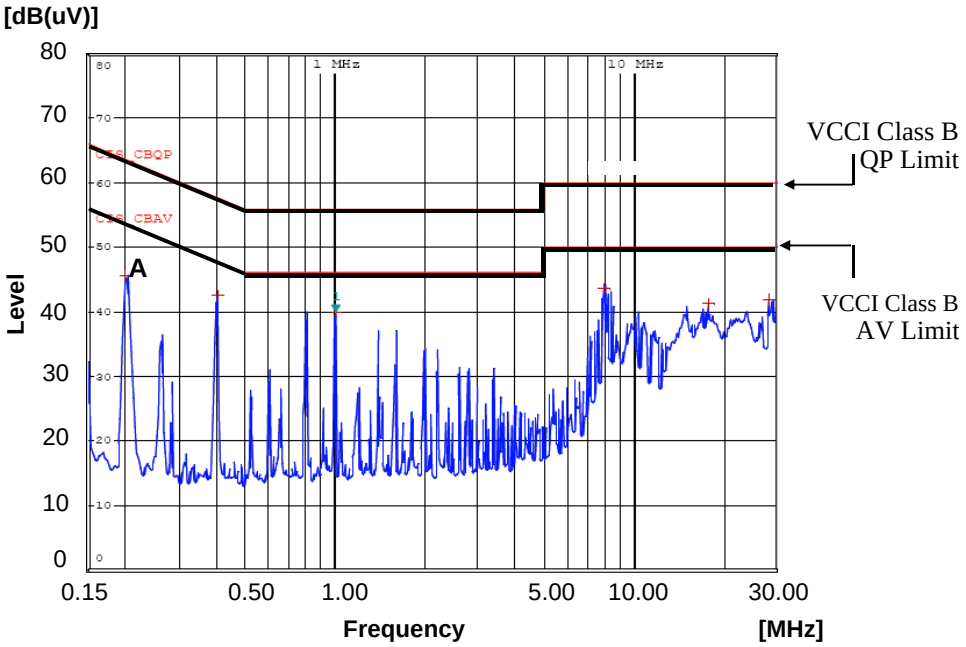
2.20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

Conducted Emission

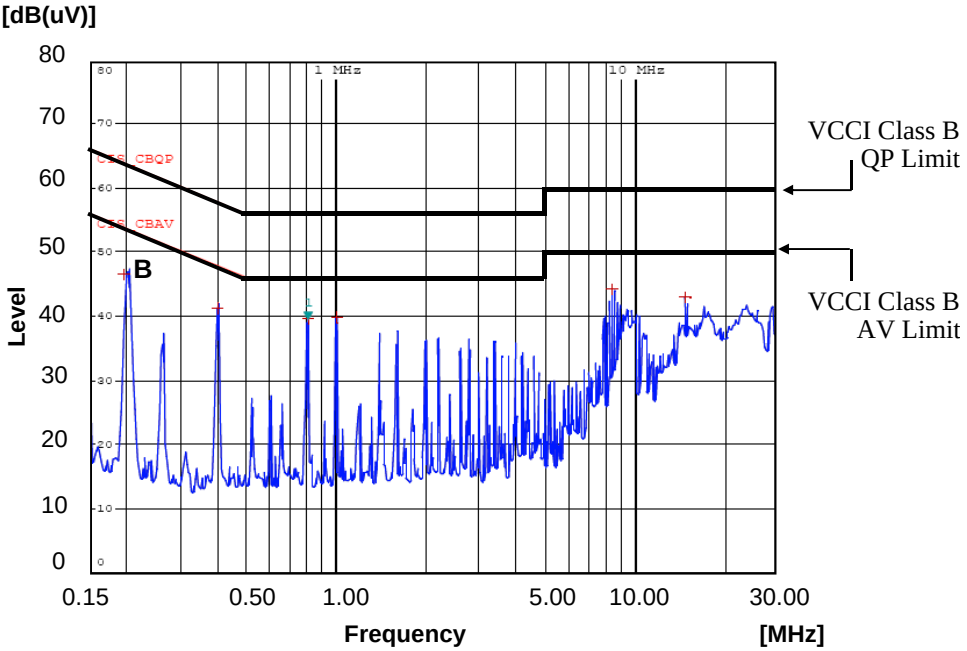
5V

Ref. / Data	Point A (0.20MHz) Limit (dBµV)	Measure (dBµV)
QP	64.5	45.8
AV	54.5	45.4



Phase : L

Ref. / Data	Point B (0.20MHz) Limit (dBµV)	Measure (dBµV)
QP	64.5	47.5
AV	54.5	47.1



Phase : N

Limit of EN55011-B,EN55032-B are same as its VCCI Class B.

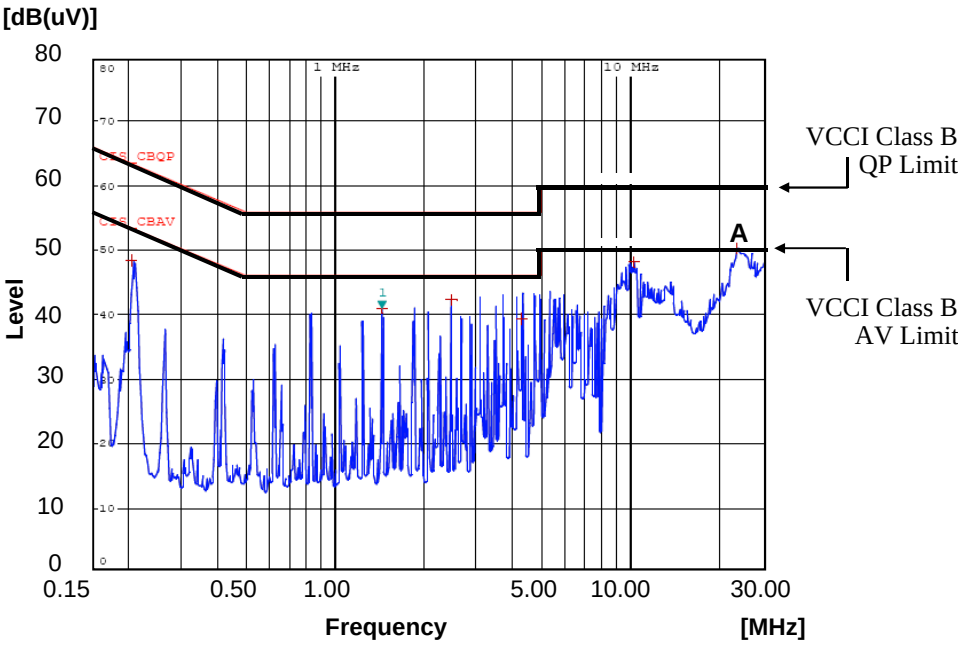
2.20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

Conducted Emission

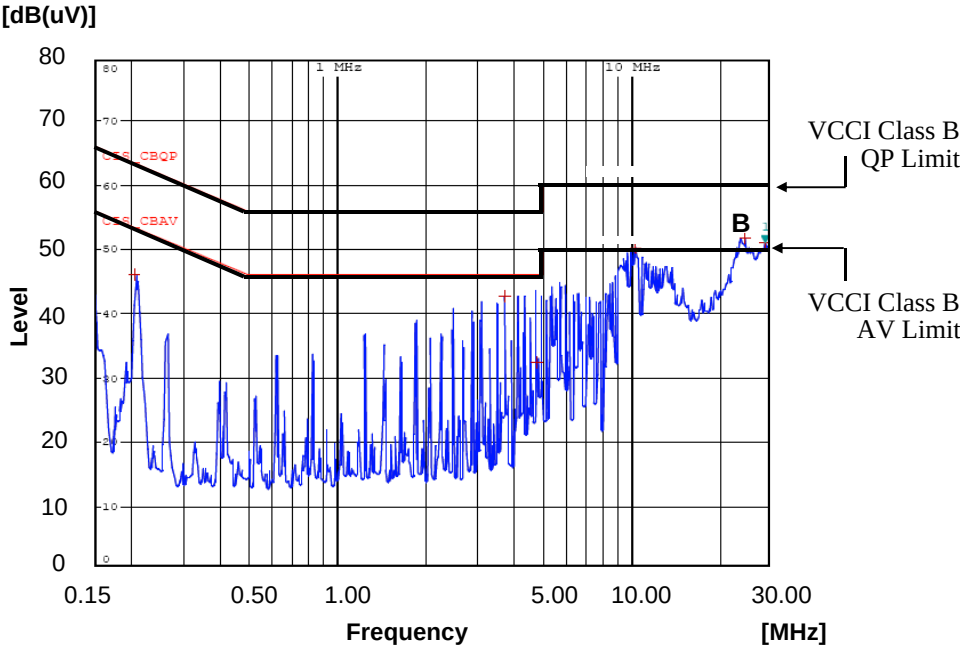
12V

Ref. / Data	Point A (23.36MHz) Limit (dBµV)	Measure (dBµV)
QP	60.0	43.4
AV	50.0	33.4



Phase : L

Ref. / Data	Point B (24.55MHz) Limit (dBµV)	Measure (dBµV)
QP	60.0	43.2
AV	50.0	34.3



Phase : N

Limit of EN55011-B,EN55032-B are same as its VCCI Class B.

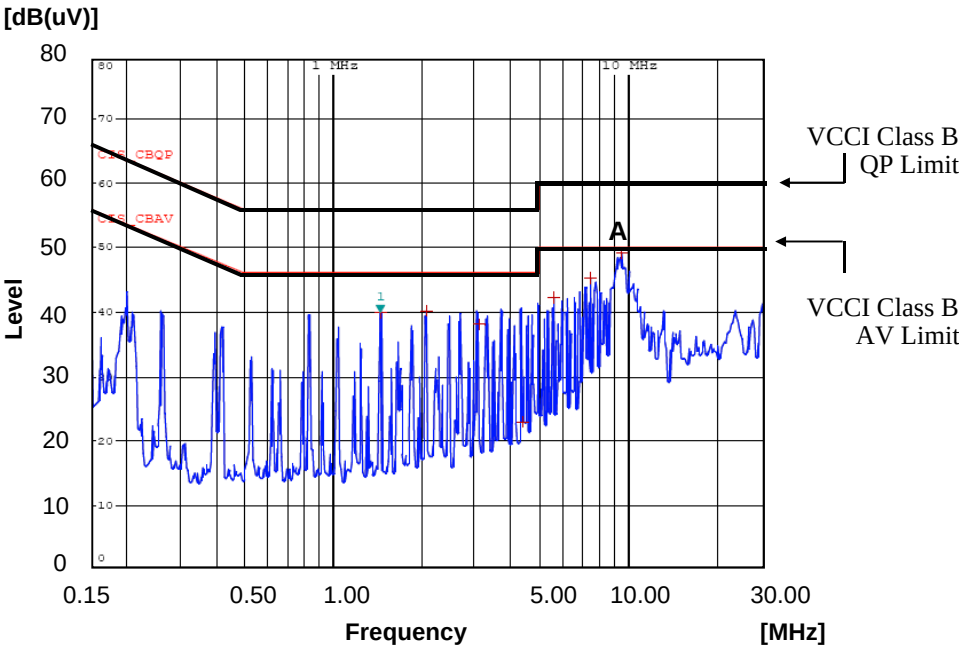
2.20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

Conducted Emission

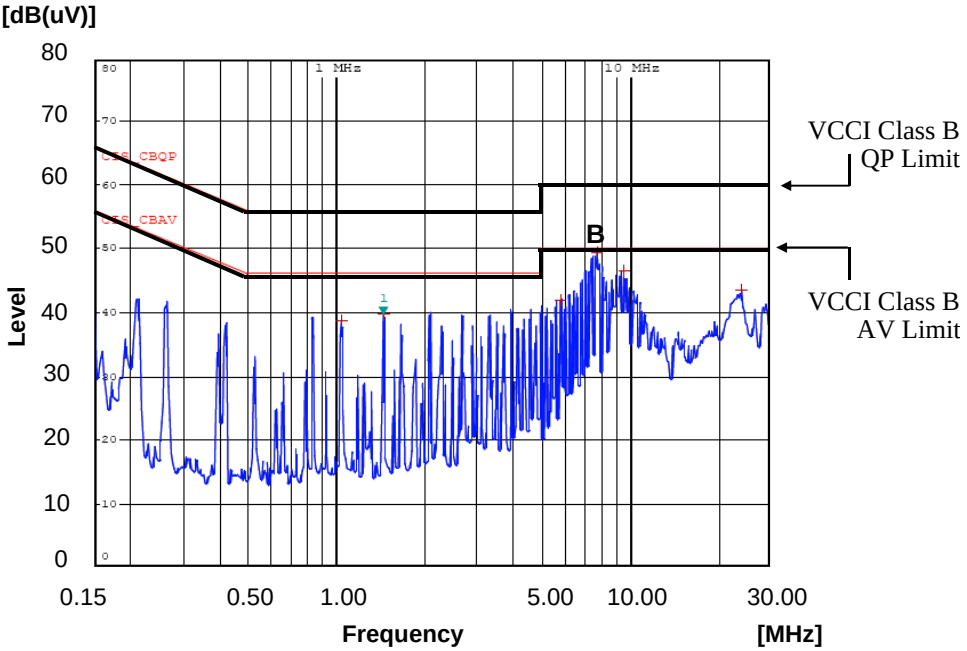
24V

Ref. / Data	Point A (9.57 MHz) Limit (dBµV)	Measure (dBµV)
QP	60.0	46.5
AV	50.0	34.5



Phase : L

Ref. / Data	Point B (7.71MHz) Limit (dBµV)	Measure (dBµV)
QP	60.0	48.3
AV	50.0	37.3



Phase : N

Limit of EN55011-B,EN55032-B are same as its VCCI Class B.

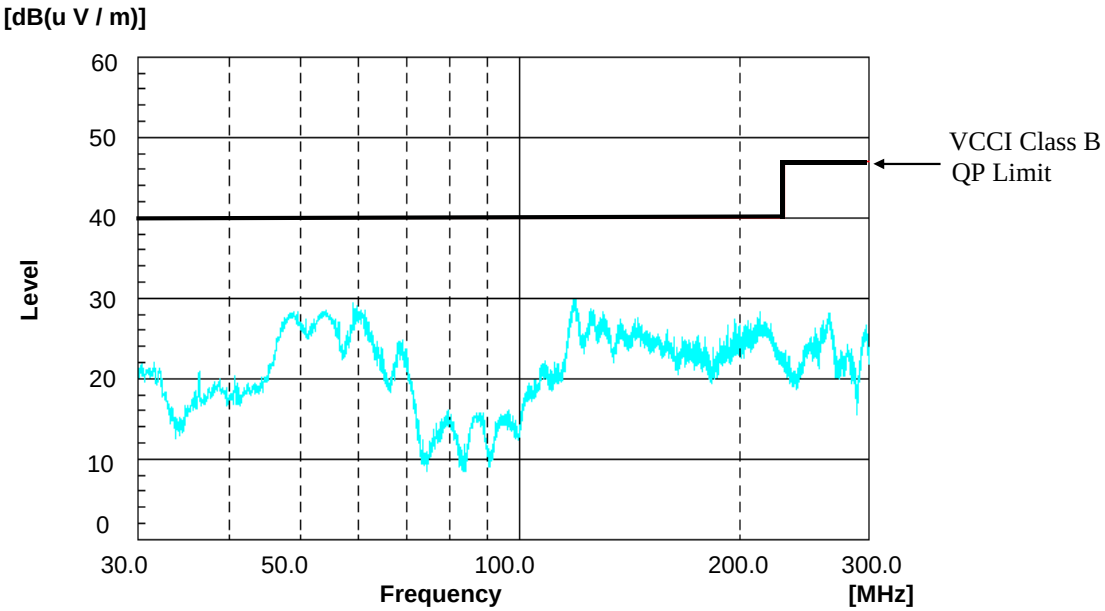
2.20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

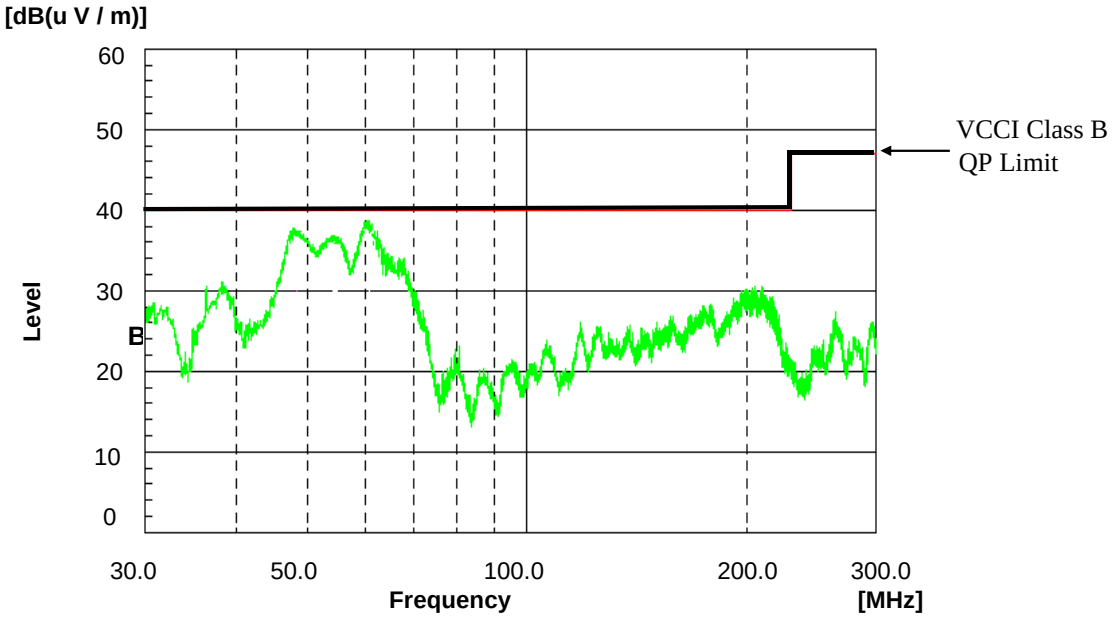
Radiated Emission

5V

HORIZONTAL



VERTICAL



Limit of EN55011-B,EN55032-B are same as its VCCI Class B

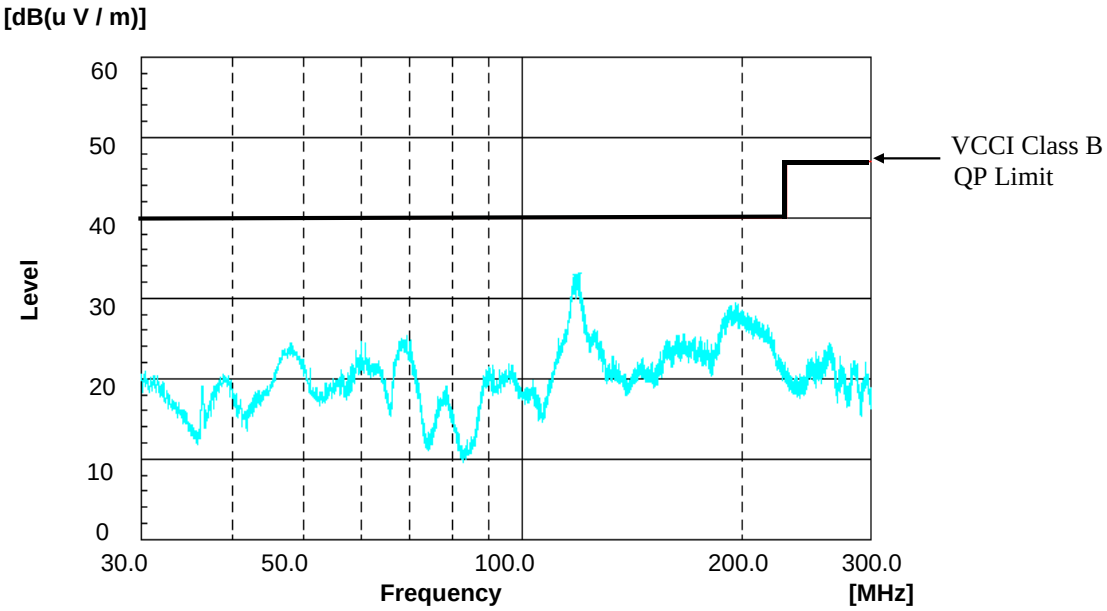
2.20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

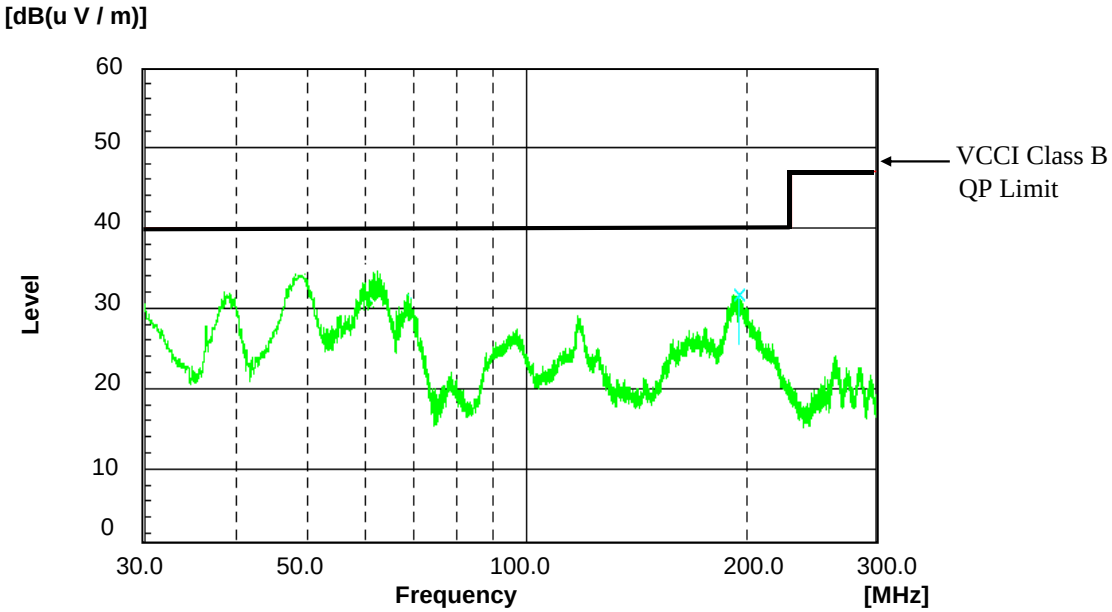
Radiated Emission

12V

HORIZONTAL



VERTICAL



Limit of EN55011-B,EN55032-B are same as its VCCI Class B

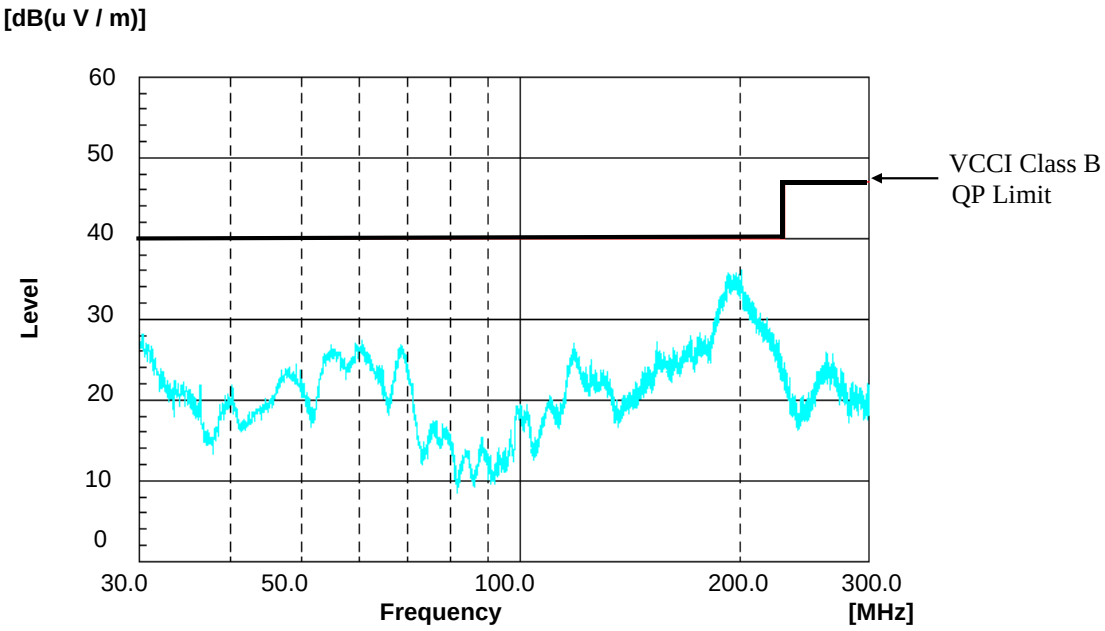
2.20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

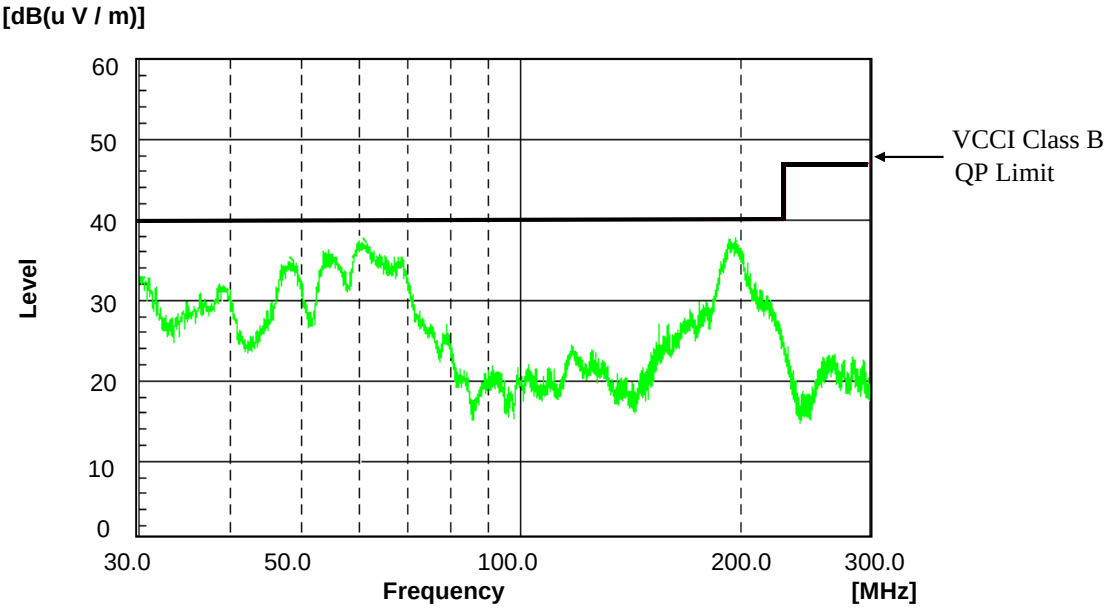
Radiated Emission

24V

HORIZONTAL



VERTICAL



Limit of EN55011-B,EN55032-B are same as its VCCI Class B