

GWS500

EVALUATION DATA

DWG. No. PA590-53-01		
APPD	CHK	DWG
<i>2018</i> <i>1/8/11</i>	<i>h3</i>	<i>GAPET</i>

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Terminology used

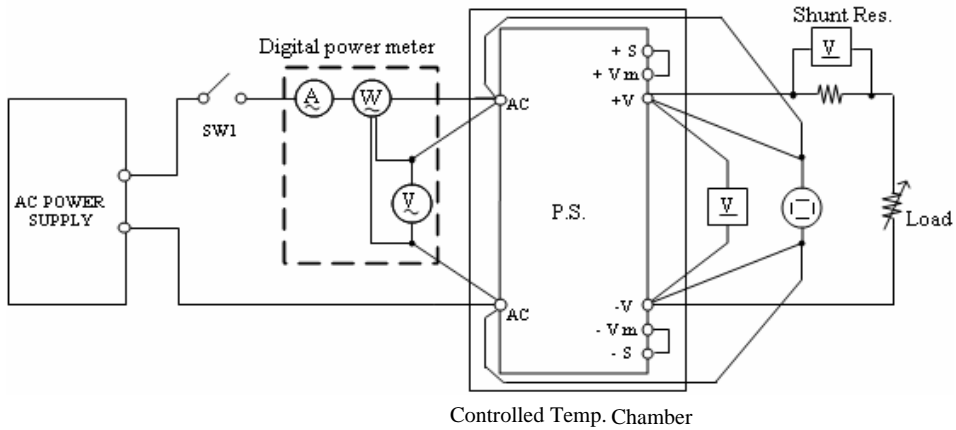
	Definition
V_{in} Input voltage
V_{out} Output voltage
I_{in} Input current
I_{out} Output current
T_a Ambient temperature
f Frequency

1. Evaluation Method

1.1 Circuit used for determination

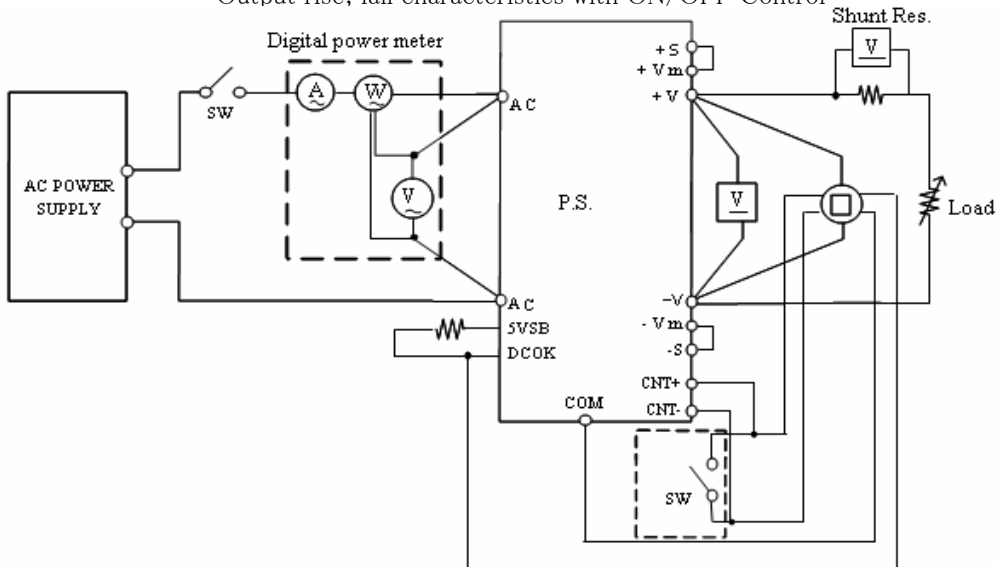
Circuit 1 used for determination

- Steady state data
- Over current protection (OCP) characteristics
- Over voltage protection (OVP) characteristics
- Output rise characteristics
- Output fall characteristics
- Hold up time characteristics



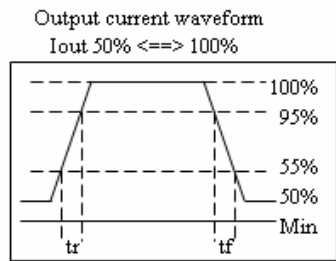
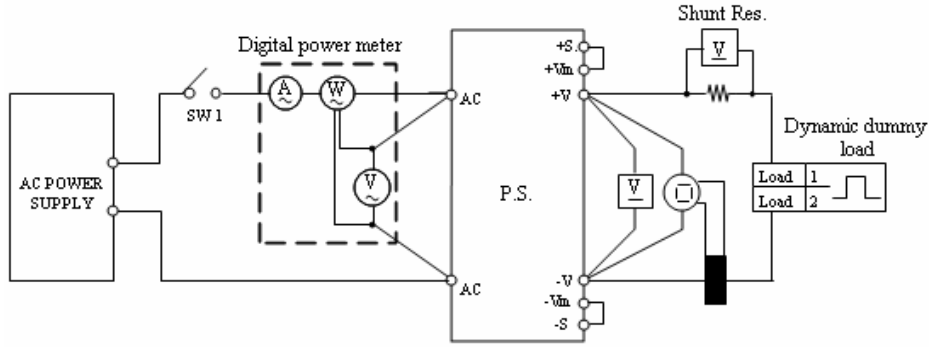
Circuit 2 used for determination

- Output rise, fall characteristics with ON/OFF Control



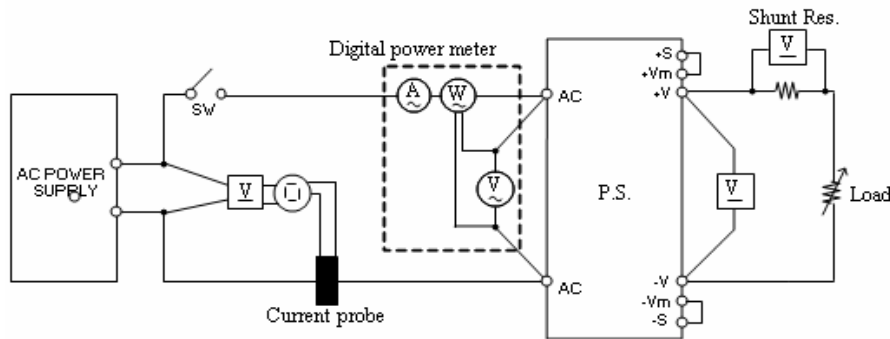
Circuit 3 used for determination

• Dynamic load response characteristics



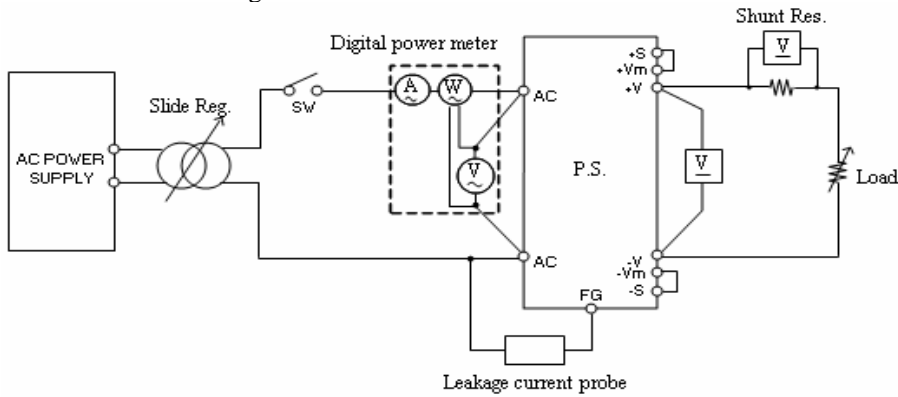
Circuit 4 used for determination

• Inrush current waveform



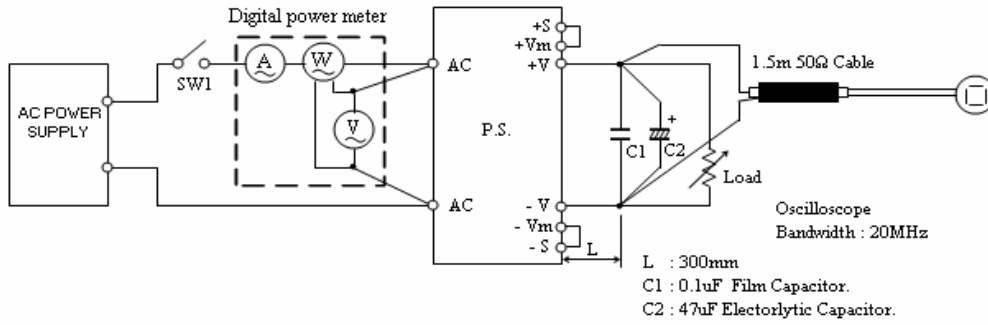
Circuit 5 used for determination

• Leakage current characteristics



Circuit 6 used for determination

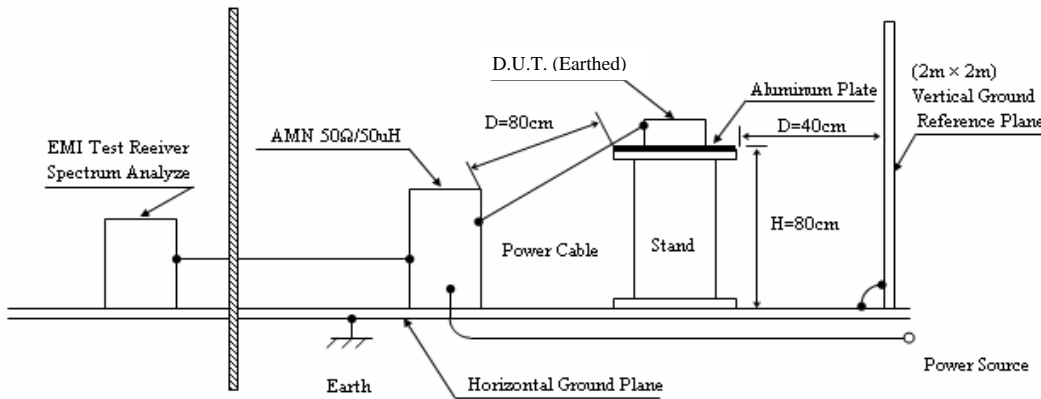
• Output ripple and noise waveform



Configuration used for determination

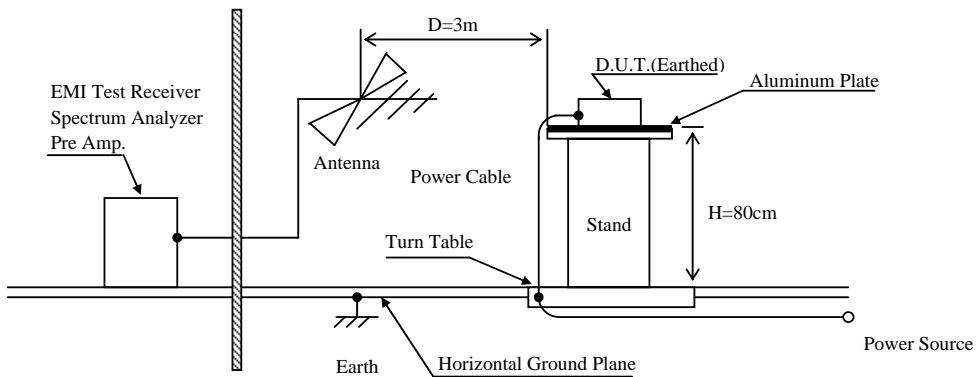
• Electro-Magnetic Interference characteristics

(a) Conducted Emission



(b) Radiated Emission

Radiated Emission



1.2 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DL1740/DL1740E
2	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DLM2054
3	DIGITAL MULTIMETER	FLUKE	89VI
4	DIGITAL MULTIMETER	YOKOGAWA	73402
5	DIGITAL POWER METER	HIOKI	3333
6	CURRENT PROBE/AMPLIFIER	YOKOGAWA	701931
7	DATA ACQUISITION UNIT	AGILENT	34970A
8	DYNAMIC DUMMY LOAD	FUJITSU	EUL-300/EUL-600
9	DYNAMIC DUMMY LOAD	CHROMA	63030
10	DYNAMIC DUMMY LOAD	CHROMA	63204
11	CONTROLLED TEMP. CHAMBER	ESPEC	SH-641
12	LEAKAGE CURRENT METER	SIMPSON	228
13	AC SOURCE	KIKUSUI	PCR-2000L
14	AC SOURCE	CHROMA	61503/61505
15	POWER ANALYZER	CHROMA	6630
16	EMI TEST RECEIVER	TESEQ	SCR3502
17	LISN	TESEQ	CFLN-8312
18	LISN	TESEQ	NNB42C
19	BILOG ANTENNA	TESEQ	CBL6112B
20	SPECTRUM ANALYZER	ADVANTEST	R313A

2 Characteristics

2.1 Steady state data

(1) Regulation - line and load, Temperature drift / Start up voltage and Drop out voltage

12V 1. Regulation - line and load Conditions Ta : 25°C

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	12.063V	12.063V	12.063V	12.063V	0mV	0.000%
50%	12.056V	12.056V	12.056V	12.056V	0mV	0.000%
100%	12.050V	12.050V	12.050V	12.049V	1mV	0.008%
load	13mV	13mV	13mV	14mV		
regulation	0.108%	0.108%	0.108%	0.117%		

2. Temperature drift Conditions Vin : 115VAC
Iout : 100%

Ta	-25°C	25°C	50°C	temperature stability	
Vout	11.998V	12.050V	12.051V	53mV	0.442%

3. Start up voltage and Drop out voltage Conditions Ta : 25°C
Iout : 100%

Start up voltage (Vin)	77VAC
Drop out voltage (Vin)	64VAC

24V 1. Regulation - line and load Conditions Ta : 25°C

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	24.019V	24.022V	24.022V	24.022V	3mV	0.013%
50%	24.020V	24.022V	24.022V	24.023V	3mV	0.013%
100%	24.020V	24.022V	24.022V	24.022V	2mV	0.008%
load	1mV	0mV	0mV	1mV		
regulation	0.008%	0.000%	0.000%	0.008%		

2. Temperature drift Conditions Vin : 115VAC
Iout : 100%

Ta	-25°C	25°C	50°C	temperature stability	
Vout	23.985V	24.022V	24.003V	0mV	0.002%

3. Start up voltage and Drop out voltage Conditions Ta : 25°C
Iout : 100%

Start up voltage (Vin)	77VAC
Drop out voltage (Vin)	64VAC

48V 1. Regulation - line and load Condition Ta : 25°C

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	47.767V	47.767V	47.766V	47.766V	1mV	0.002%
50%	47.768V	47.768V	47.768V	47.767V	1mV	0.002%
100%	47.769V	47.769V	47.770V	47.769V	1mV	0.002%
load	2mV	2mV	4mV	3mV		
regulation	0.017%	0.017%	0.033%	0.025%		

2. Temperature drift Conditions Vin : 115VAC
Iout : 100%

Ta	-25°C	25°C	50°C	temperature stability	
Vout	47.641V	47.769V	47.743V	0mV	0.003%

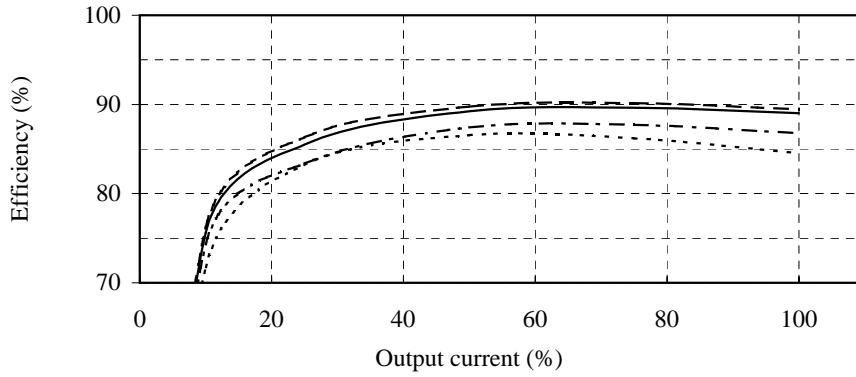
3. Start up voltage and Drop out voltage Conditions Ta : 25°C
Iout : 100%

Start up voltage (Vin)	77VAC
Drop out voltage (Vin)	66VAC

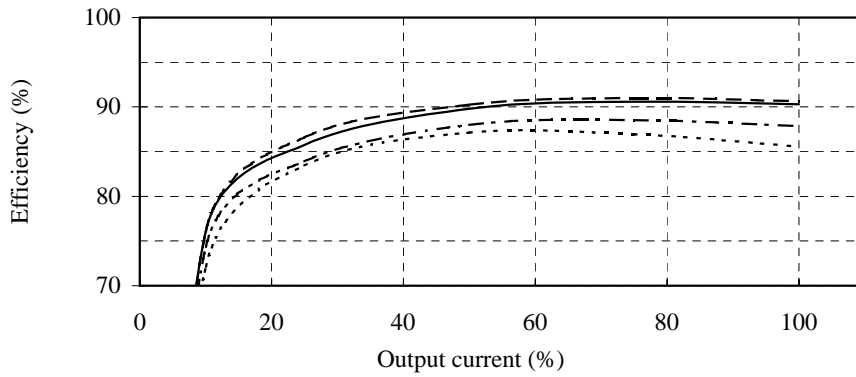
(2) Efficiency vs. Output current

Conditions Vin : 85VAC -----
 : 115VAC - - - - -
 : 230VAC ————
 : 264VAC - - - - -
 Ta : 25°C

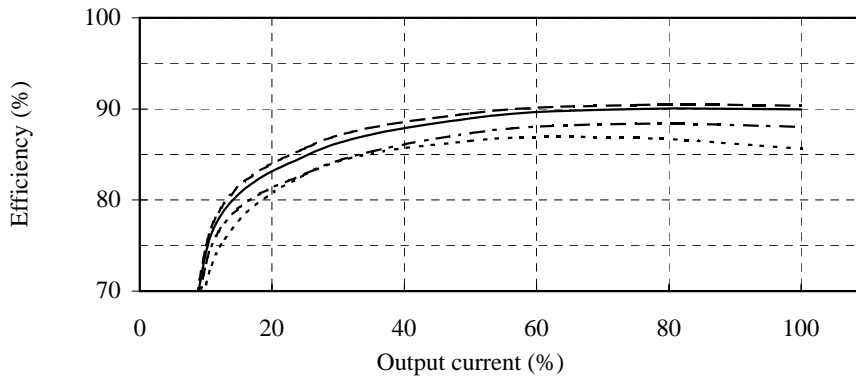
12V



24V



48V

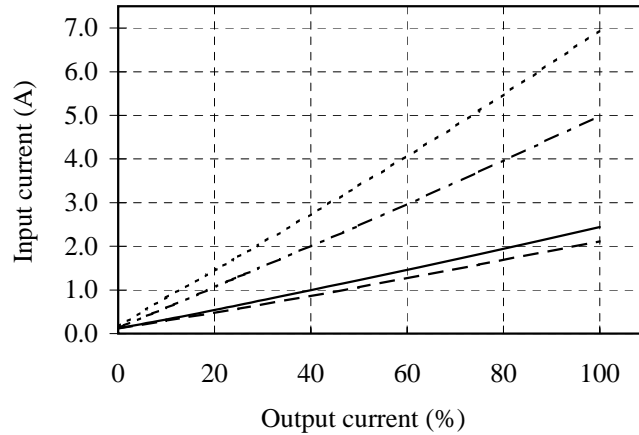


(3) Input current vs. Output current

Conditions Vin : 85VAC -----
 : 115VAC -.-.-.-
 : 230VAC ————
 : 264VAC - - - -
 Ta : 25°C

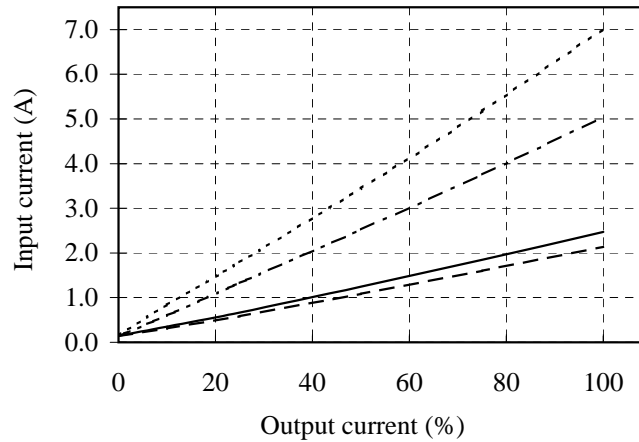
12V

Vin	Input current
	Iout : 0%
85VAC	0.17A
115VAC	0.14A
230VAC	0.13A
264VAC	0.12A



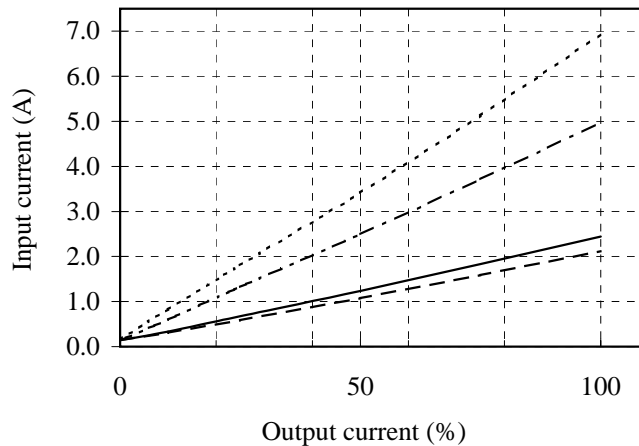
24V

Vin	Input current
	Iout : 0%
85VAC	0.16A
115VAC	0.14A
230VAC	0.14A
264VAC	0.15A



48V

Vin	Input current
	Iout : 0%
85VAC	0.17A
115VAC	0.14A
230VAC	0.14A
264VAC	0.15A

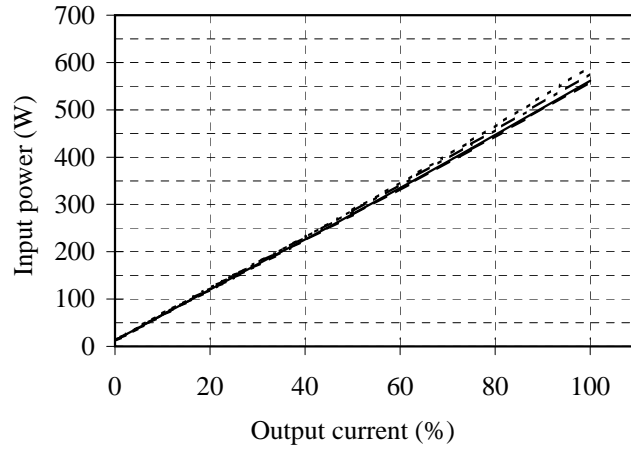


(4) Input power vs. Output current

Conditions Vin: 85VAC -----
 : 115VAC -.-.-.-
 : 230VAC _____
 : 264VAC - - - - -
 Ta: 25°C

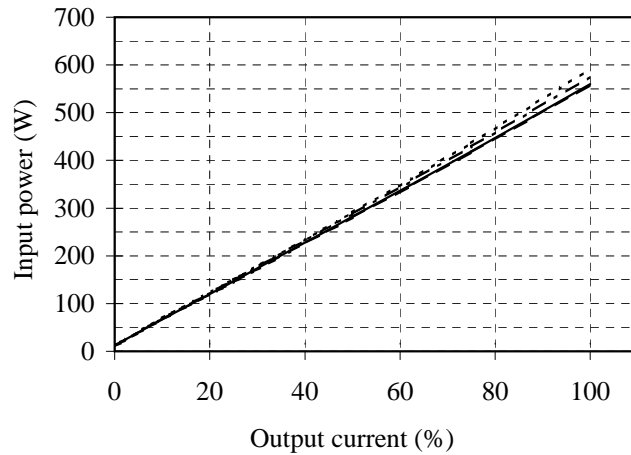
12V

Vin	Input power	
	Iout : 0%	Control OFF
85VAC	13.3W	0.02W
115VAC	13.5W	0.04W
230VAC	13.1W	0.34W
265VAC	11.6W	0.44W



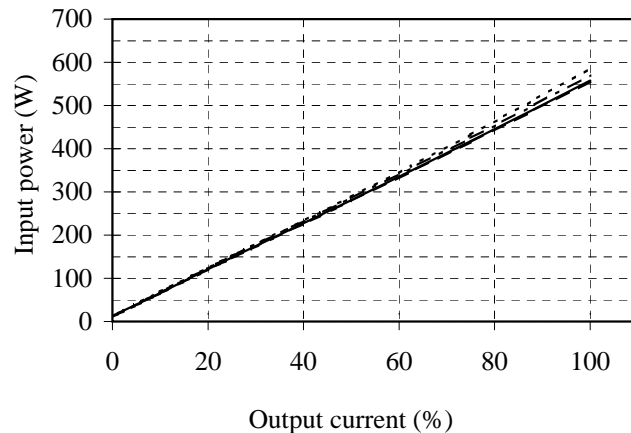
24V

Vin	Input power	
	Iout : 0%	Control OFF
85VAC	12.4W	0.03W
115VAC	12.6W	0.05W
230VAC	12.3W	0.39W
265VAC	10.9W	0.49W



48V

Vin	Input power	
	Iout : 0%	Control OFF
85VAC	12.8W	0.03W
115VAC	12.7W	0.05W
230VAC	12.7W	0.38W
265VAC	11.5W	0.50W



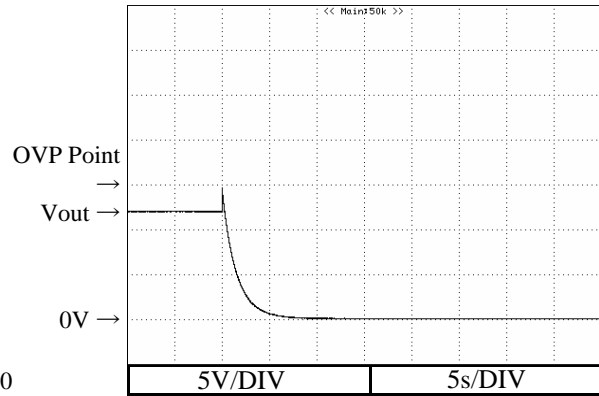
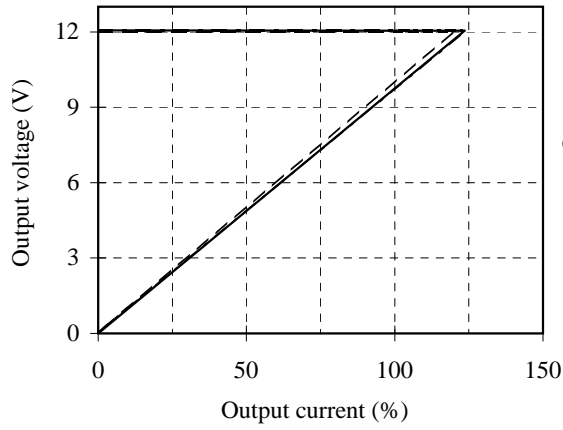
2.2 Over current protection (OCP) characteristics

2.3 Over voltage protection (OVP) characteristics

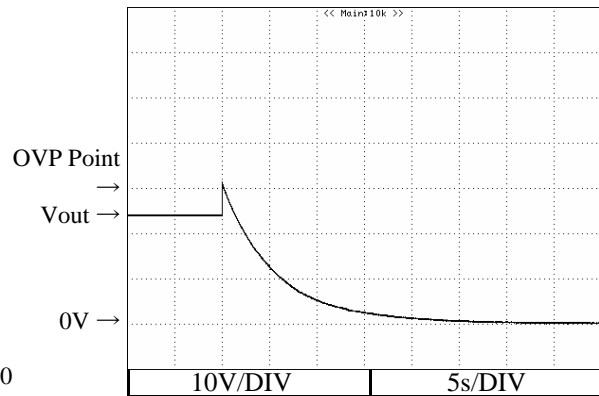
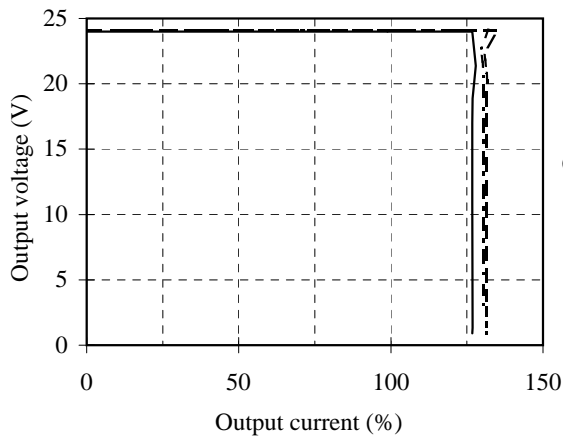
Conditions Vin : 115VAC
 Ta : -25°C -----
 25°C - - - - -
 50°C _____

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

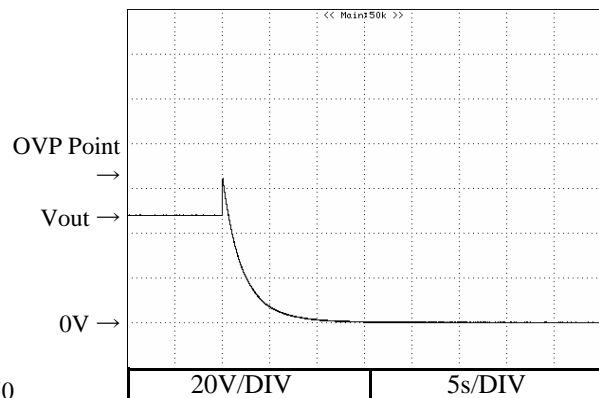
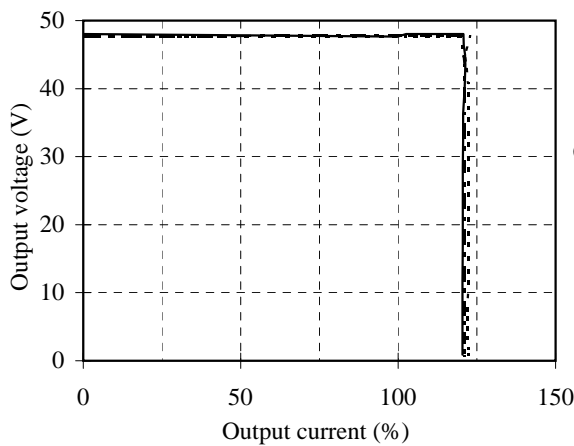
12V



24V

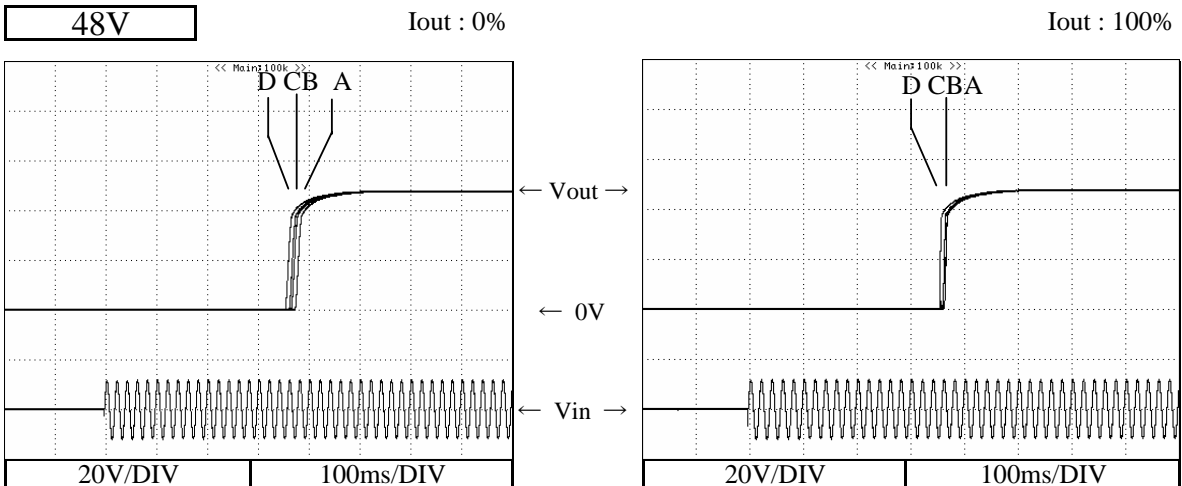
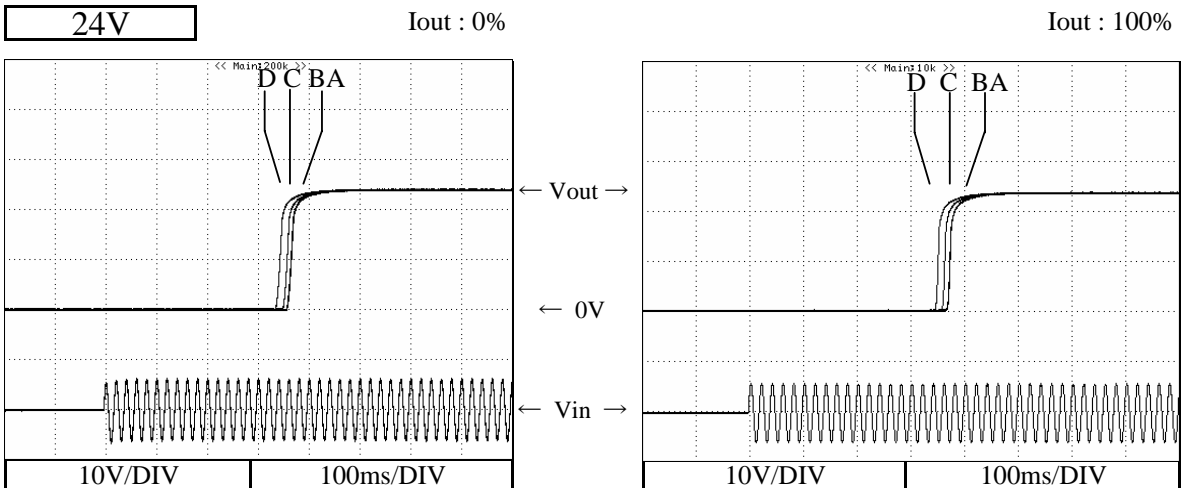
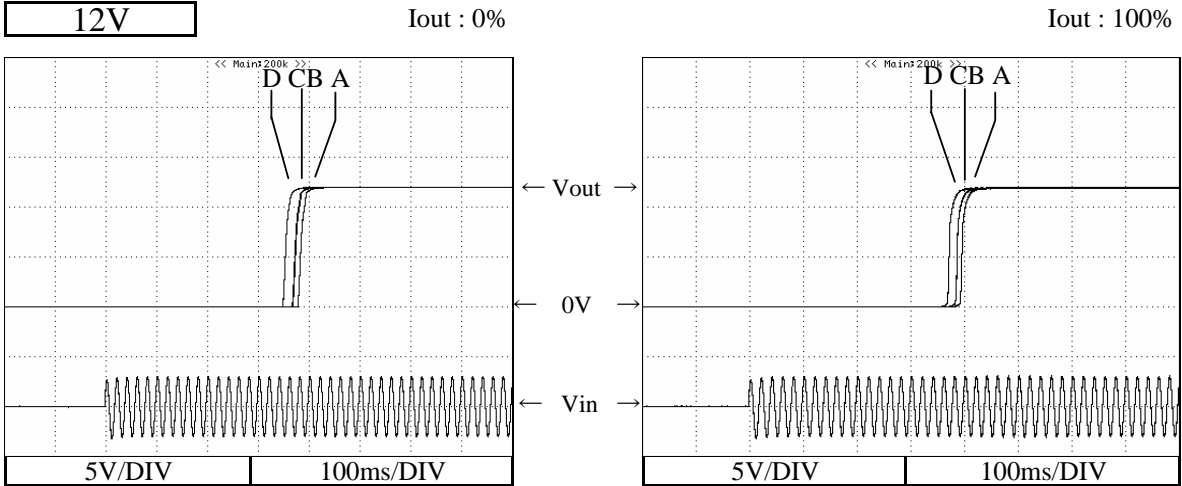


48V



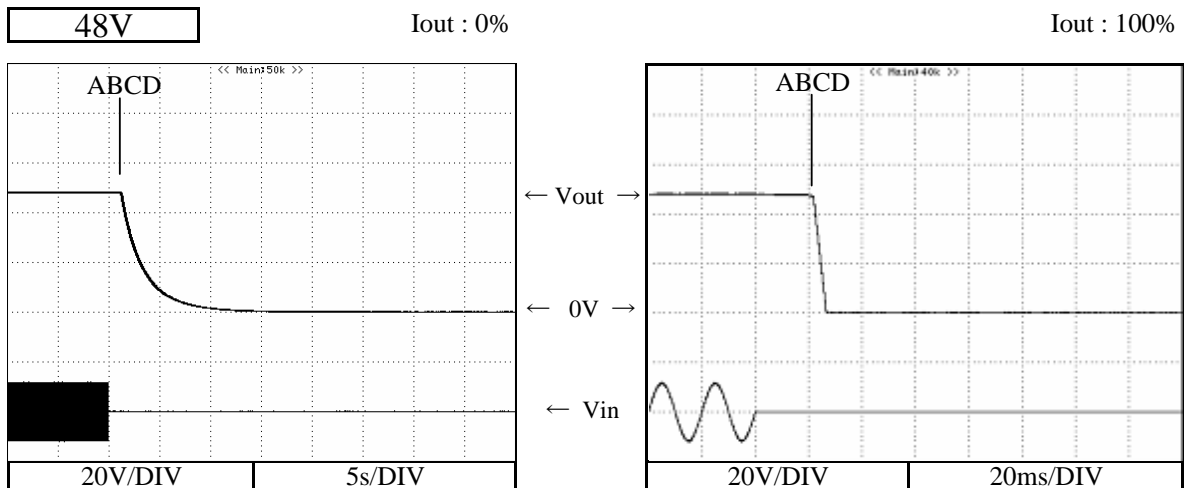
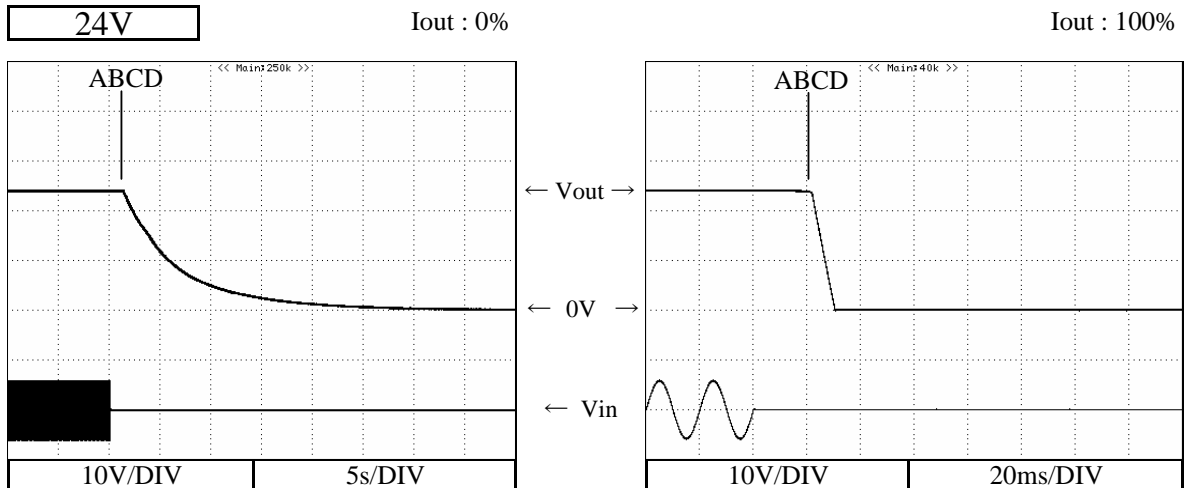
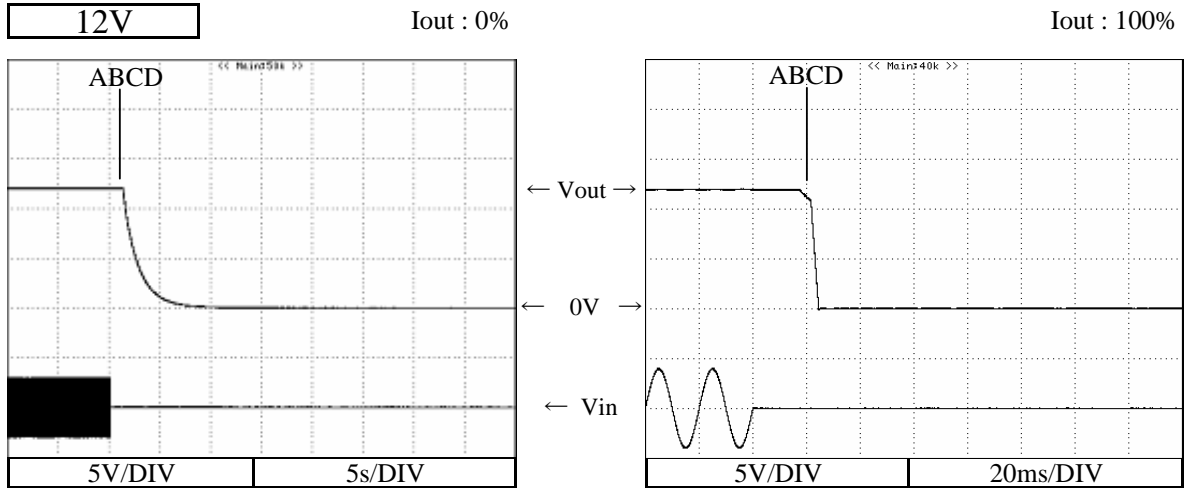
2.4 Output rise characteristics

Conditions Vin : 85VAC (A)
 : 115VAC (B)
 : 230VAC (C)
 : 264VAC (D)
 Ta : 25°C
 Iout : 0%
 Iout : 100%



2.5 Output fall characteristics

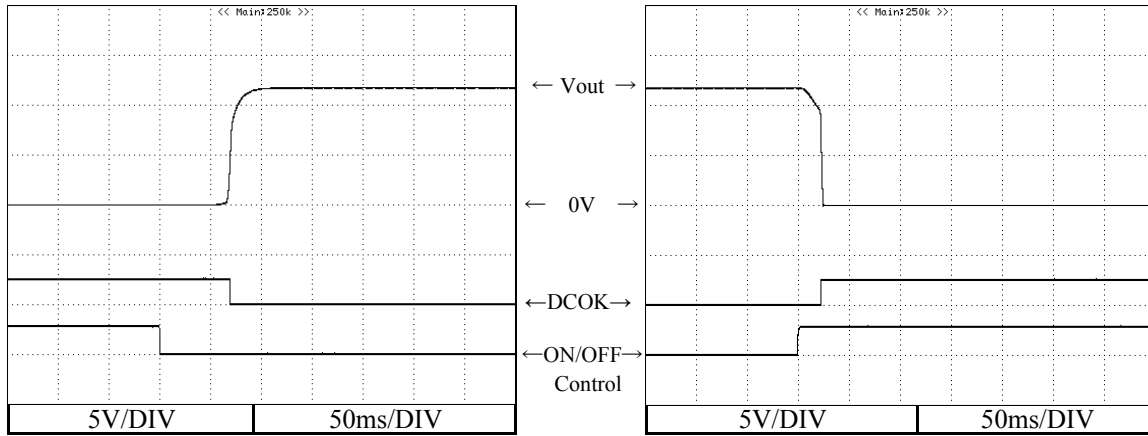
Conditions Vin : 85VAC (A)
 : 115VAC (B)
 : 230VAC (C)
 : 264VAC (D)
 Ta : 25°C
 Iout : 0% Iout : 100%



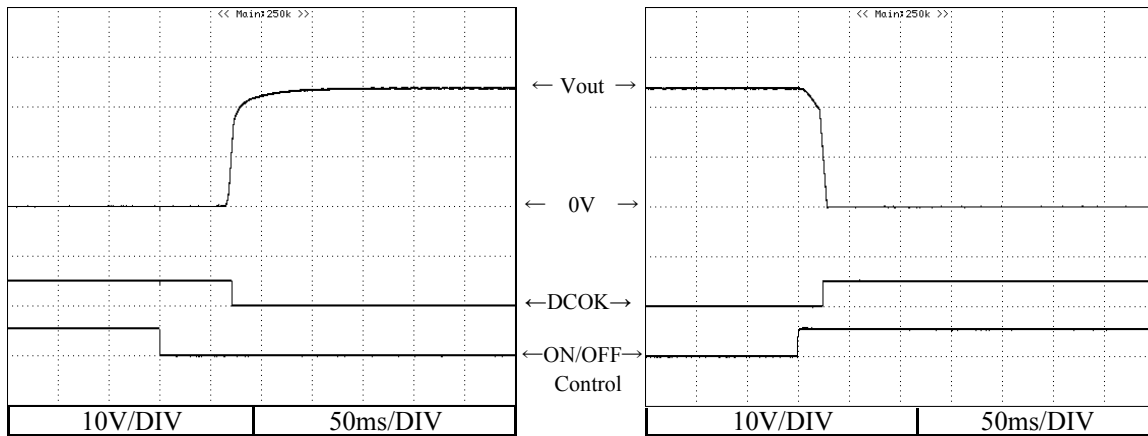
2.6 Output rise, fall characteristics with ON/OFF Control

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

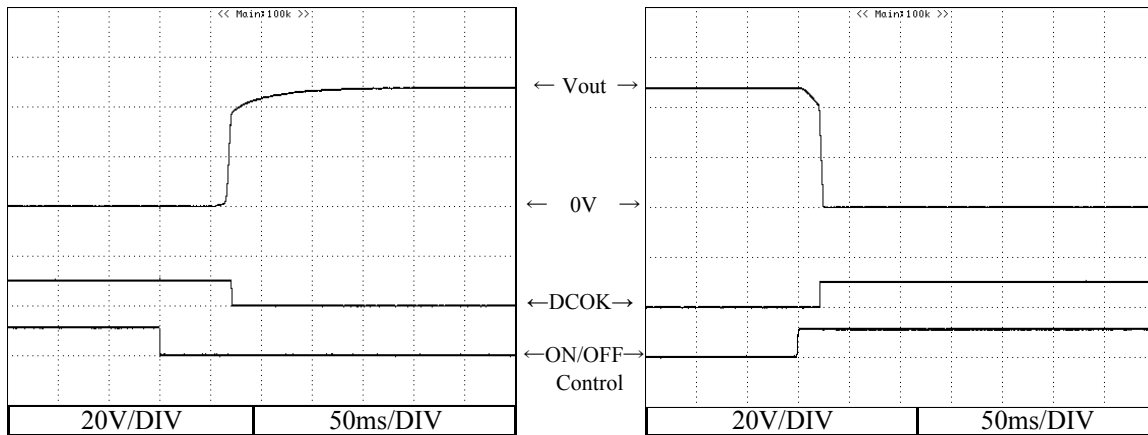
12V



24V



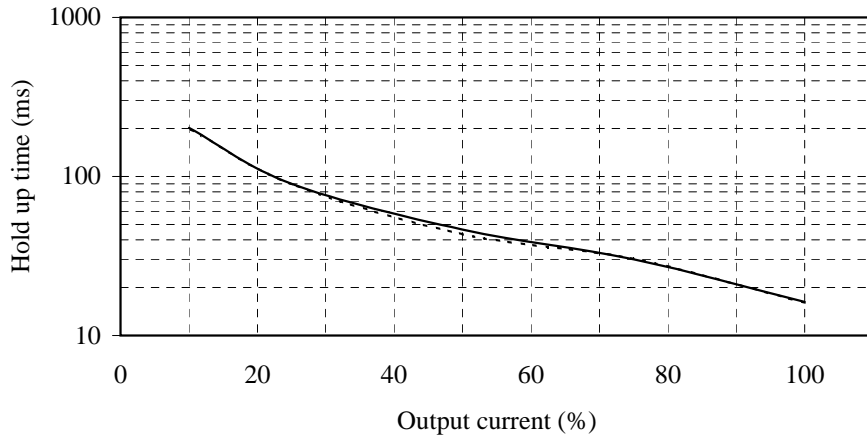
48V



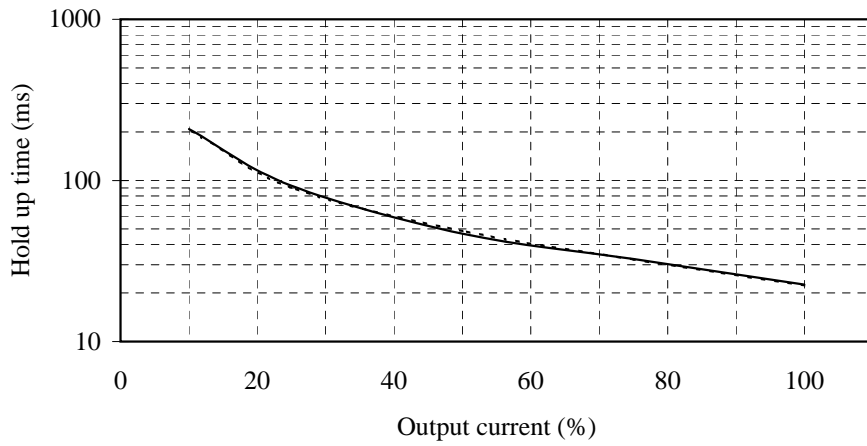
2.7 Hold up time characteristics

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

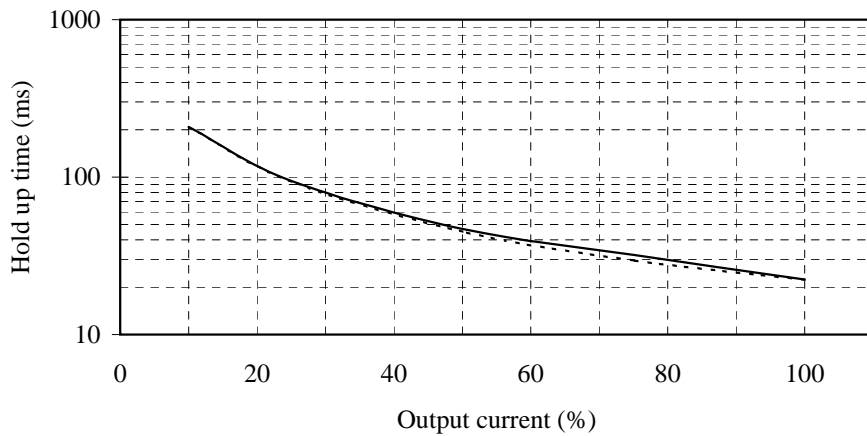
12V



24V

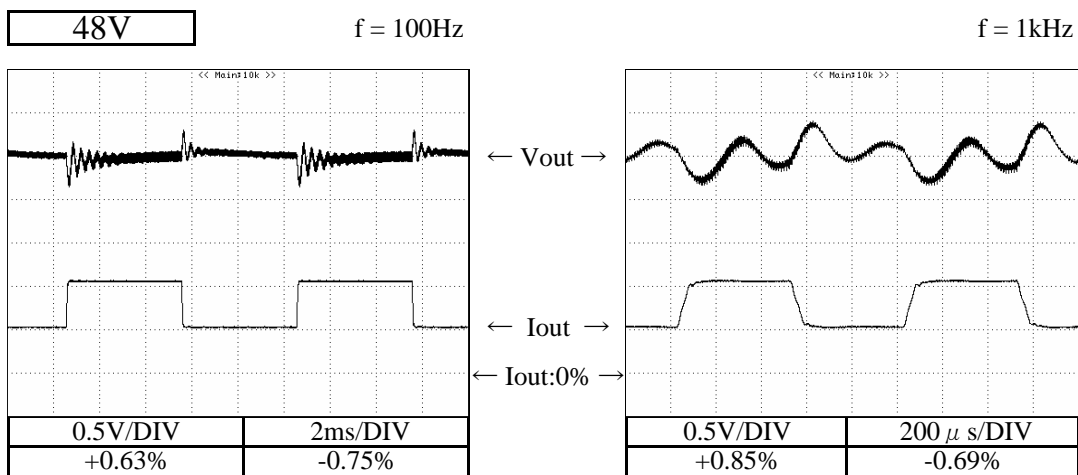
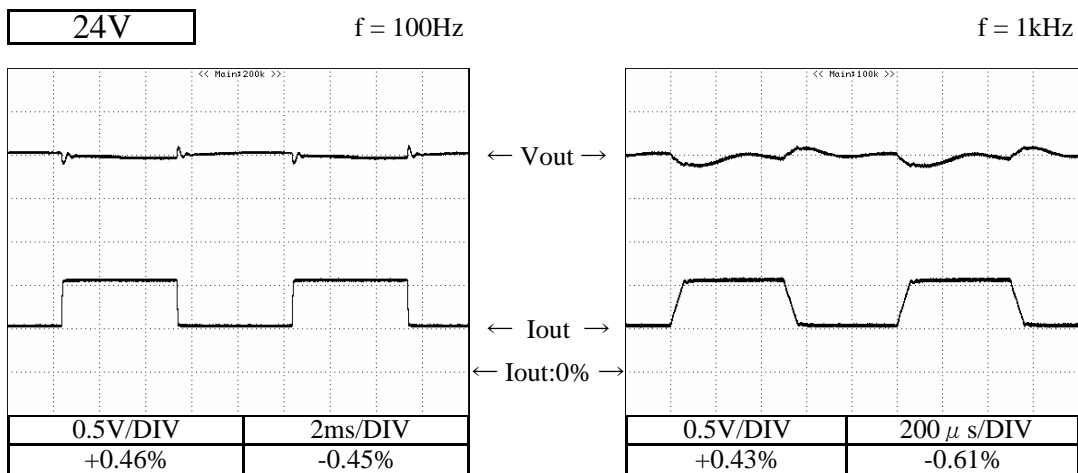
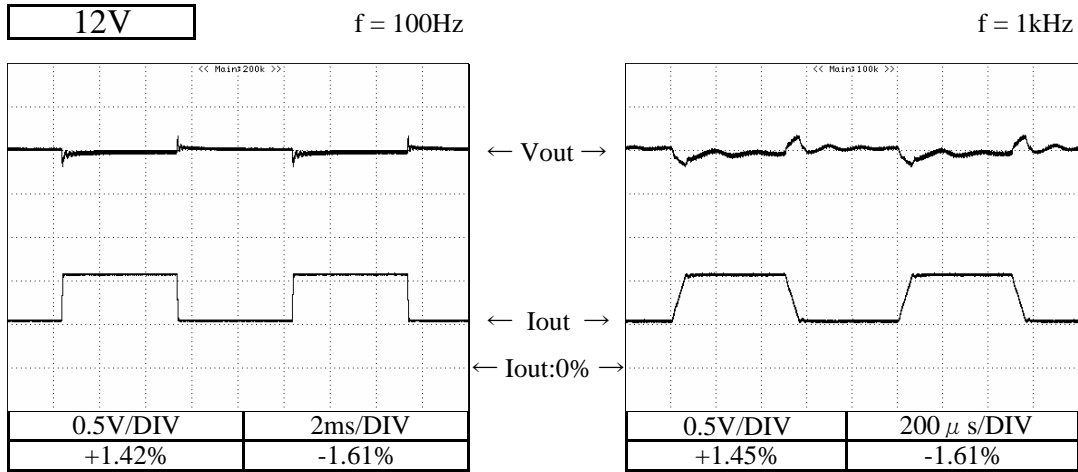


48V



2.8 Dynamic load response characteristics

Conditions Vin : 115VAC
 Iout : 50% ↔ 100%
 (tr = tf = 50us)
 Ta : 25°C

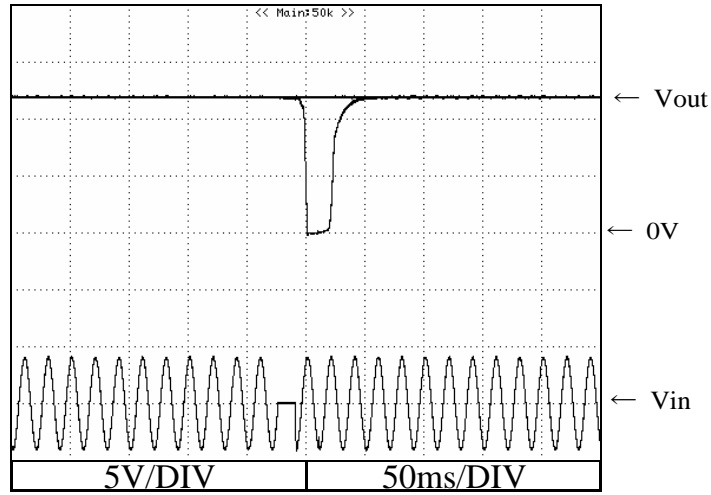


2.9 Response to brown out characteristics

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

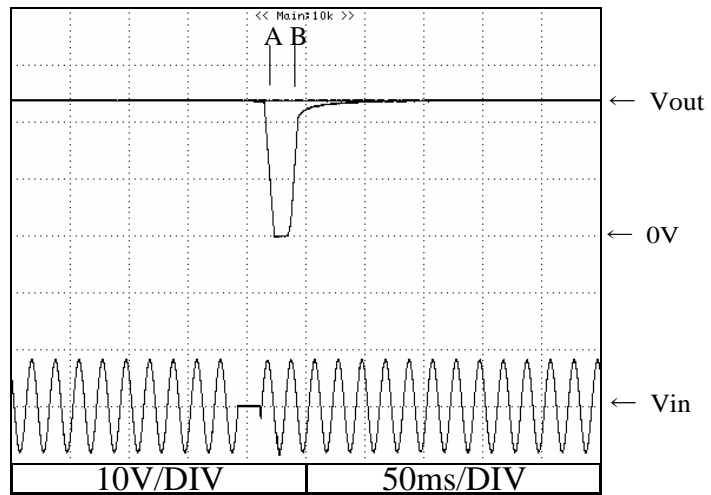
12V

A = 9ms
B = 15ms



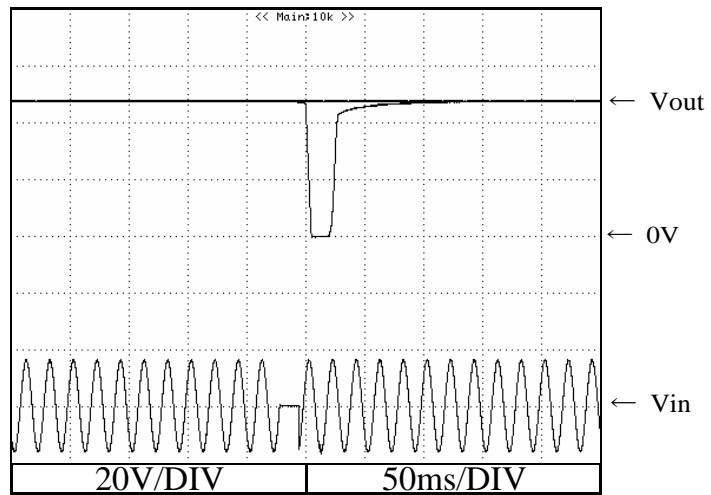
24V

A = 15ms
B = 19ms



48V

A = 14ms
B = 16ms

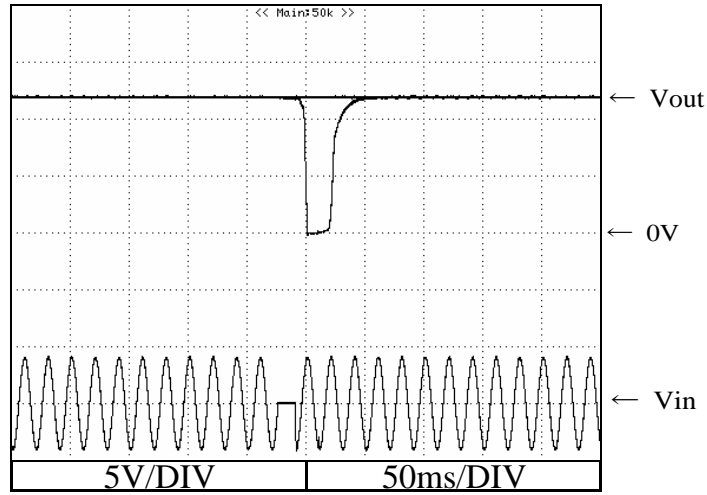


2.9 Response to brown out characteristics

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

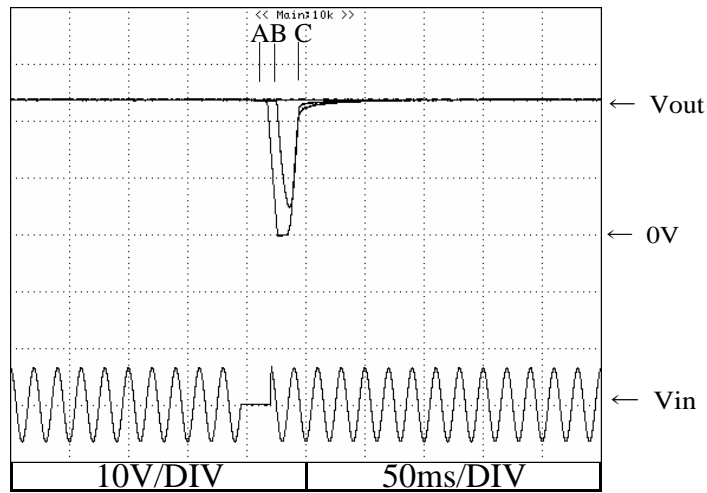
12V

A = 15ms
B = 17ms



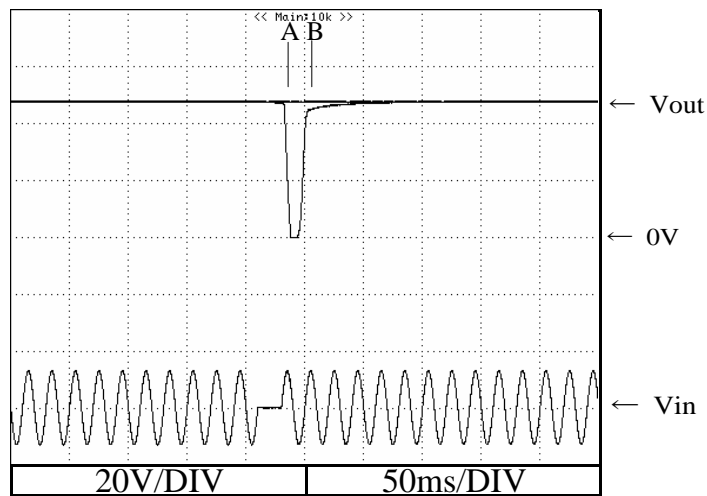
24V

A = 16ms
B = 17ms
C = 25.5ms



48V

A = 17ms
B = 20ms

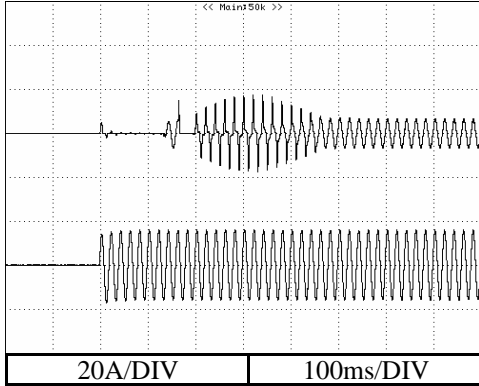


2.10 Inrush current waveform

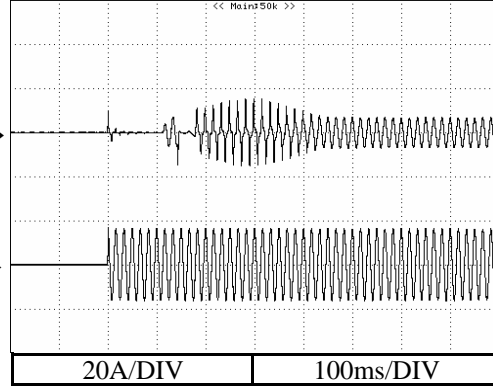
12V

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

Switch on phase angle of input AC voltage
 $\phi = 0^\circ$

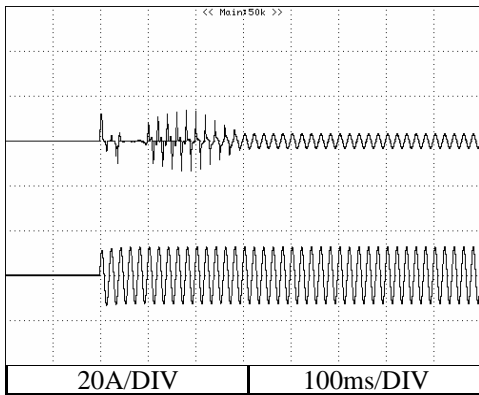


Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

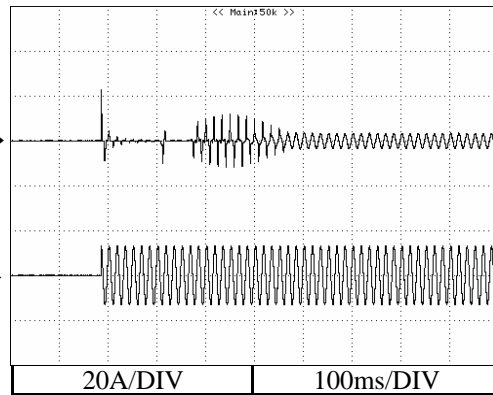


Conditions Vin : 230VAC
Iout : 100%
Ta : 25°C

Switch on phase angle of input AC voltage
 $\phi = 0^\circ$



Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

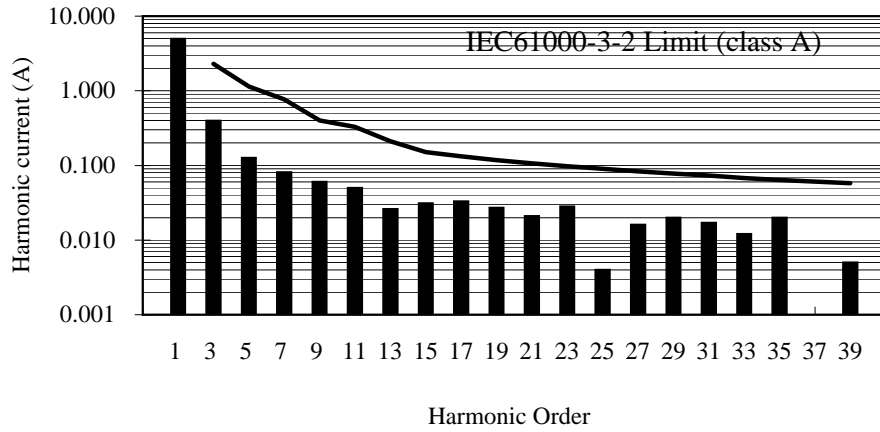


2.11 Input current harmonics

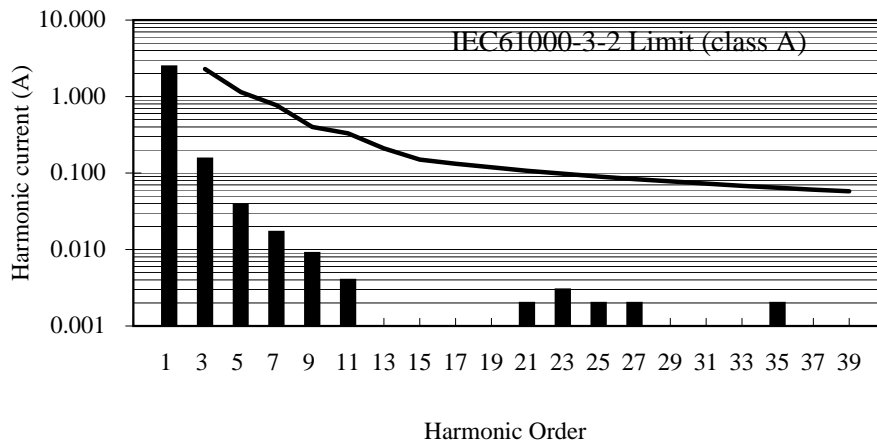
Conditions Iout : 100%
Ta : 25°C

12V

Vin : 115VAC

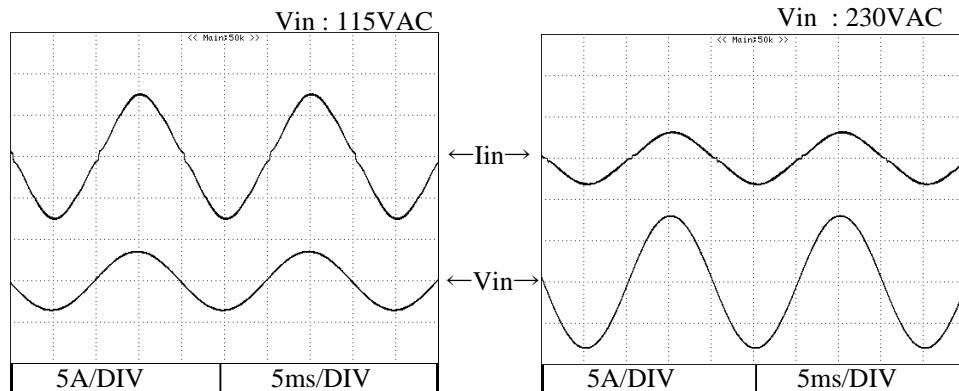


Vin : 230VAC



2.12 Input current waveform

Conditions Iout : 100%
Ta : 25°C

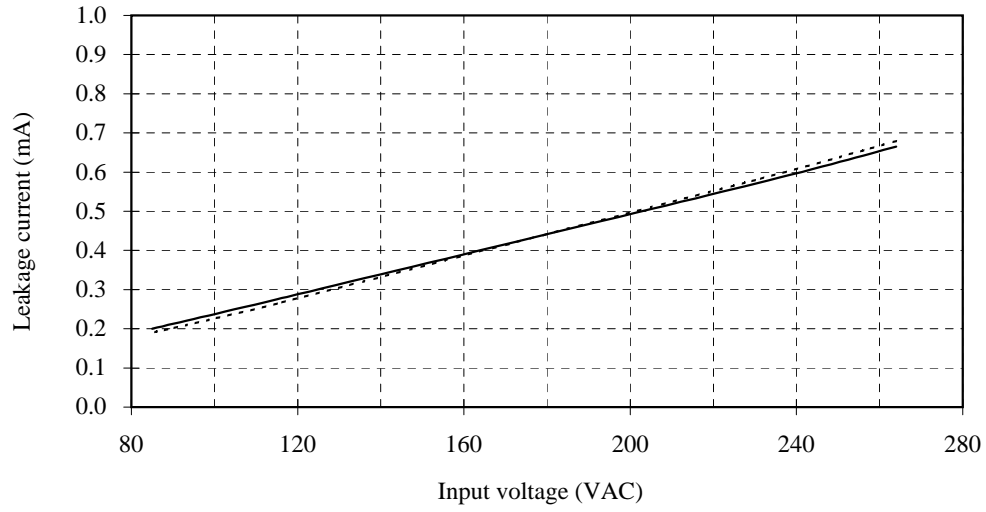


2.13 Leakage current characteristics

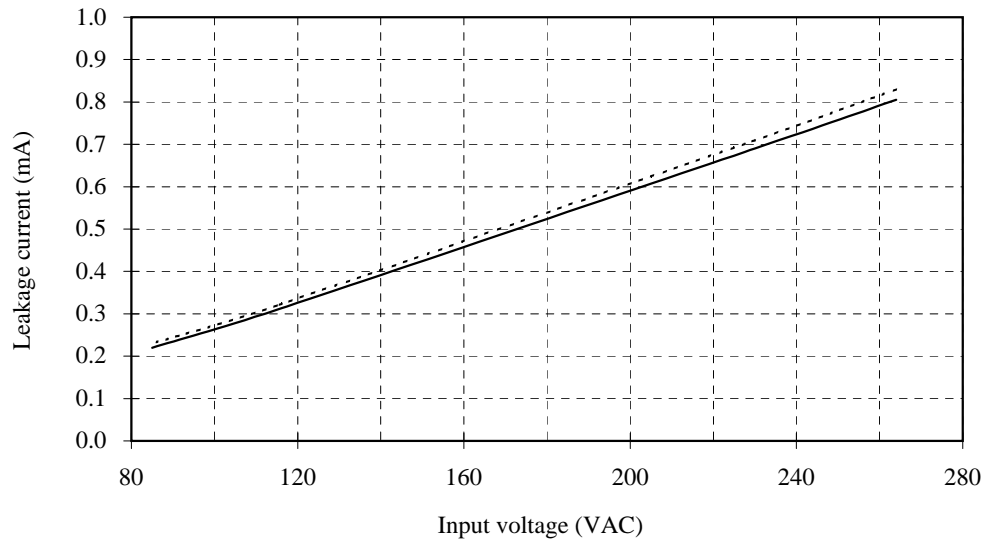
Conditions Iout : 0% -----
 100% ————
 Ta : 25°C

12V

f : 50Hz



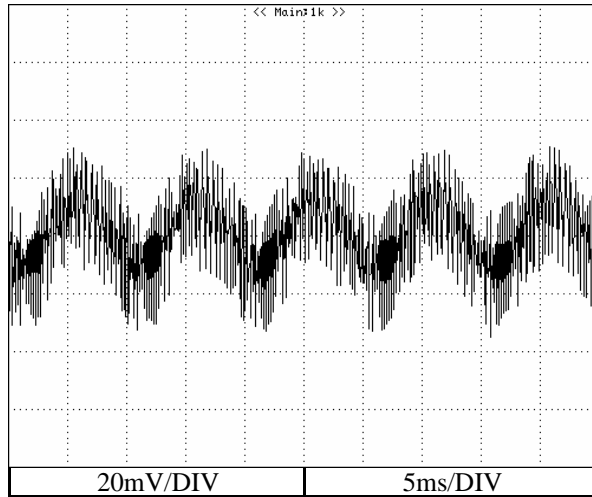
f : 60Hz



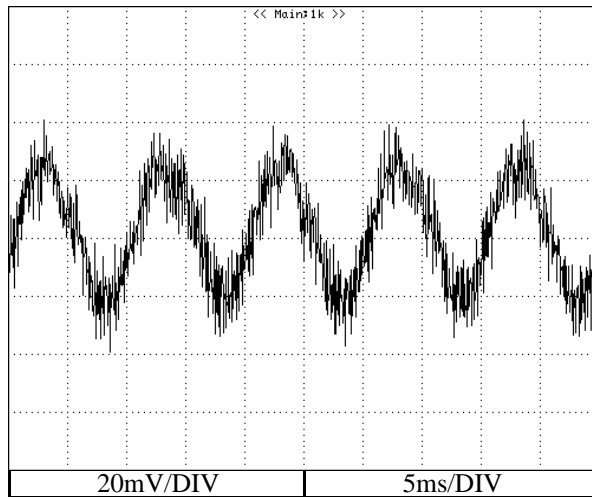
2.14 Output ripple and noise waveform

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

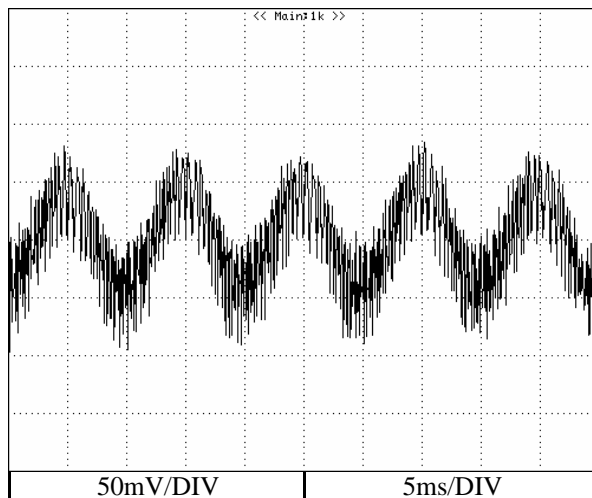
12V



24V



48V



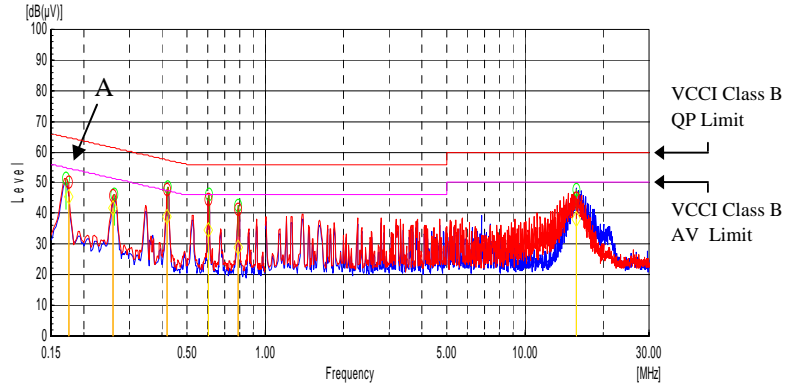
2.15 Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC
 Iout : 100%
 Ta : 25°C
 Phase N : — (blue)
 Phase L : — (red)

Conducted Emission

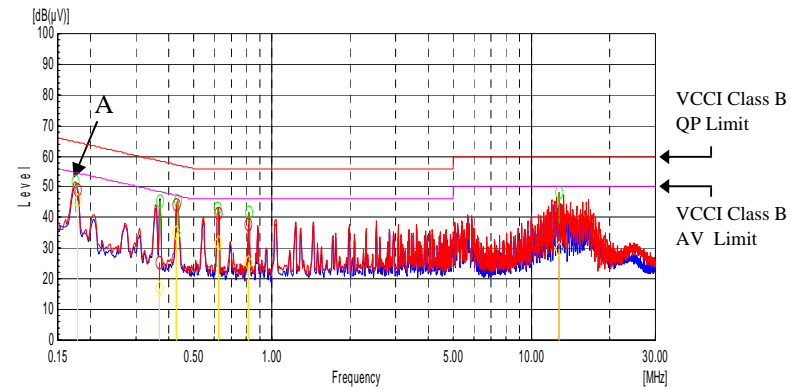
12V

Point A (0.18MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.7	50.4
AV	54.7	45.6



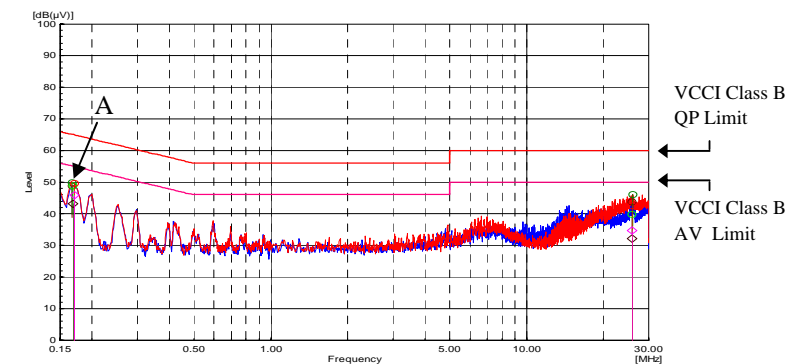
24V

Point A (0.18MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.5	48.9
AV	54.5	45.6



48V

Point A (0.17MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	65.0	49.5
AV	55.0	45.9



Limit of EN55011-B, EN55022-B, FCC-B are same as its VCCI class B.
 Indication is peak values.

2.15 Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC

Iout : 100%

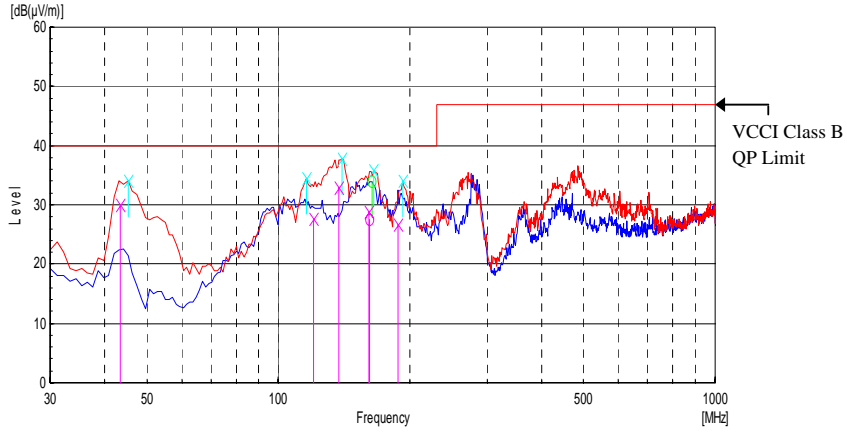
Ta : 25°C

Radiated Emission

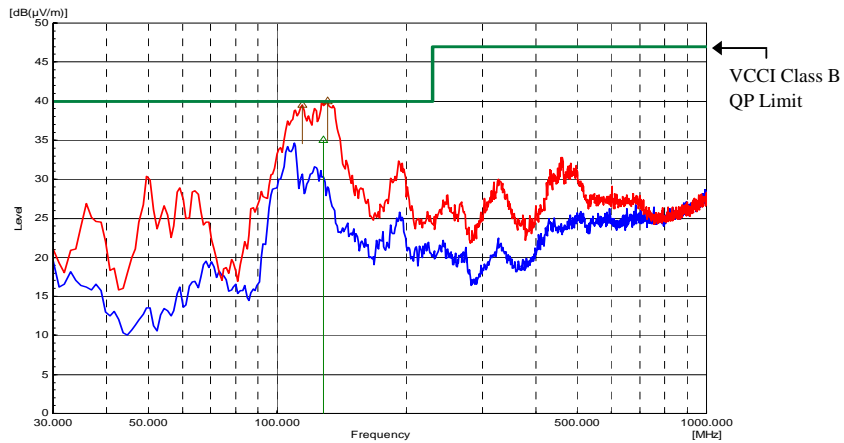
Horizontal : — (blue line)

Vertical : — (red line)

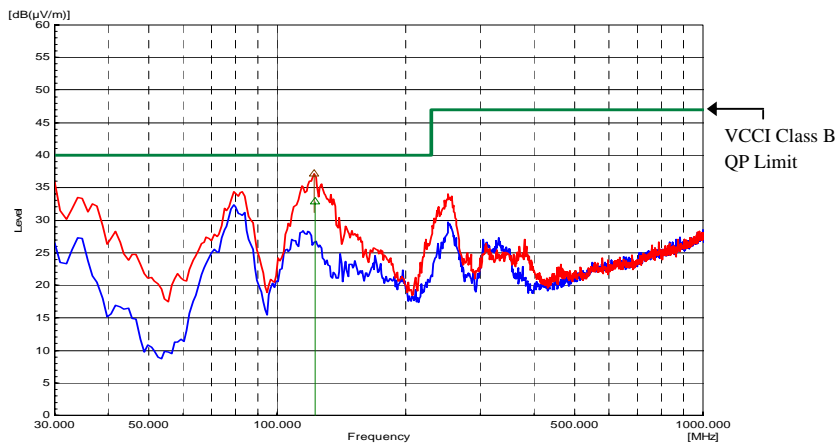
12V



24V



48V



Limit of EN55011-B, EN55022-B are same as its VCCI class B.

Indication is peak values.