GWS250

EVALUATION DATA

DWG.No PA589-53-01		
APPD	CHK	DWG
26/1/11	21 Jan 11	21 Jan 2011

TDK-Lambda

INDEX

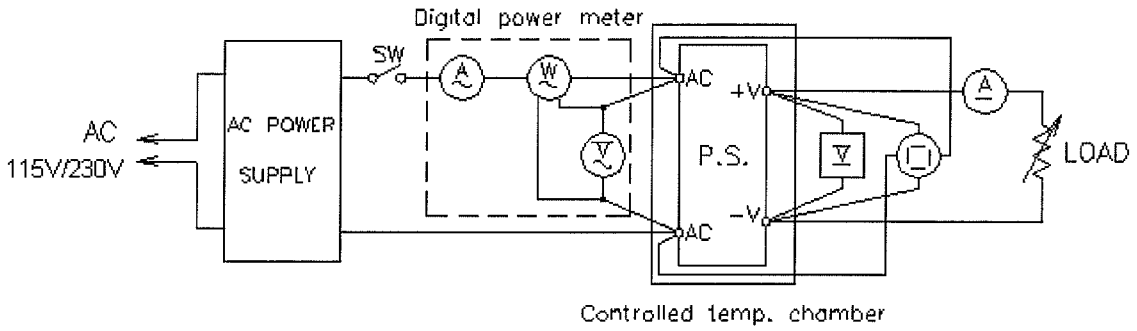
Terminology Used

	Definition
Vin	..... Input Voltage
Vout	..... Output Voltage
Iin	..... Input Current
Iout	..... Output Current
Ta	..... Ambient Temperature
f	..... Frequency
FG	..... Frame GND

1. Evaluation Method

1-1 Circuit used for determination

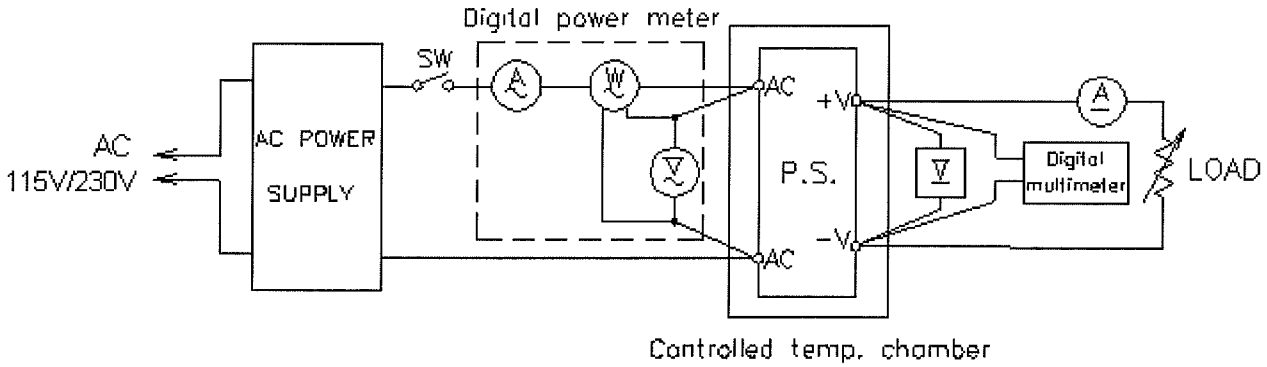
(1) Steady state data



(2) Warm up voltage drift characteristics

Same as Steady state data

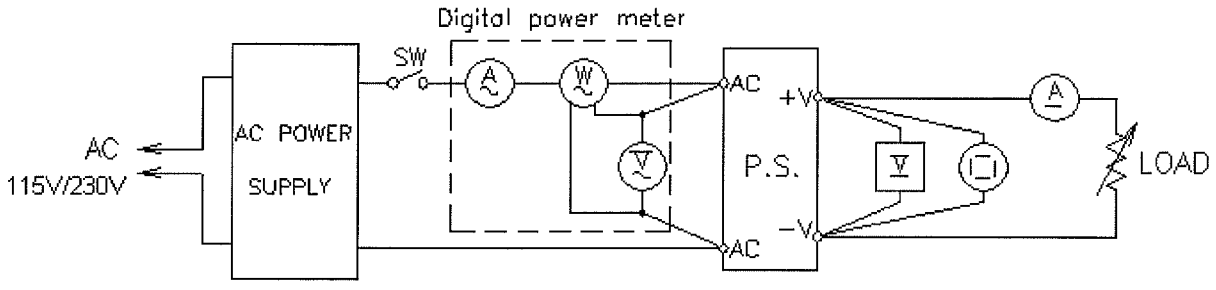
(3) Over current protection (OCP) characteristics



(4) Over voltage protection (OVP) characteristics

Same as Steady state data

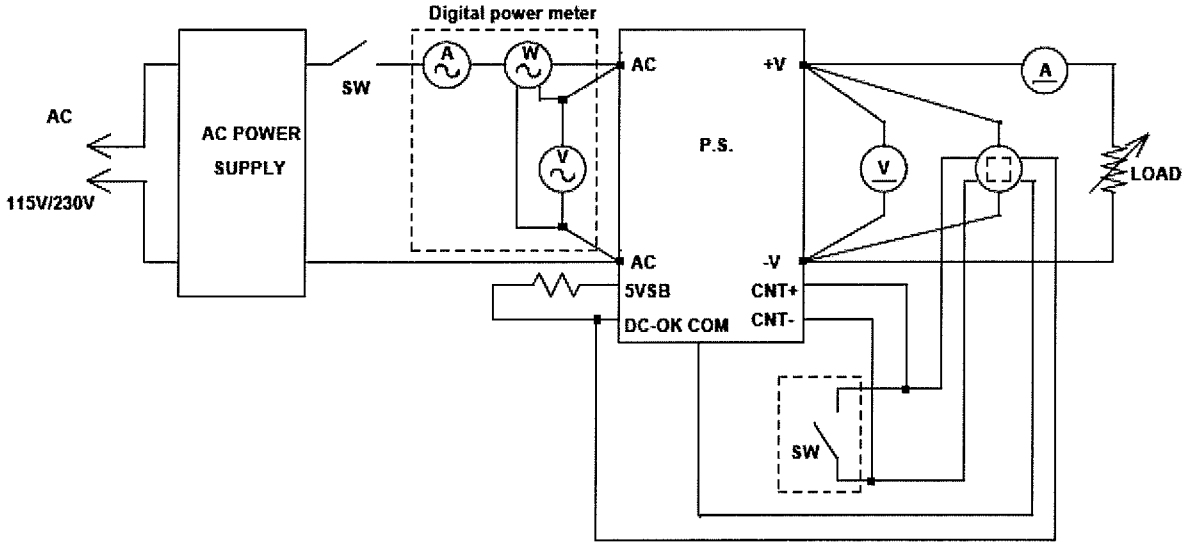
(5) Output rise characteristics



(6) Output fall characteristics

Same as Output rise characteristics

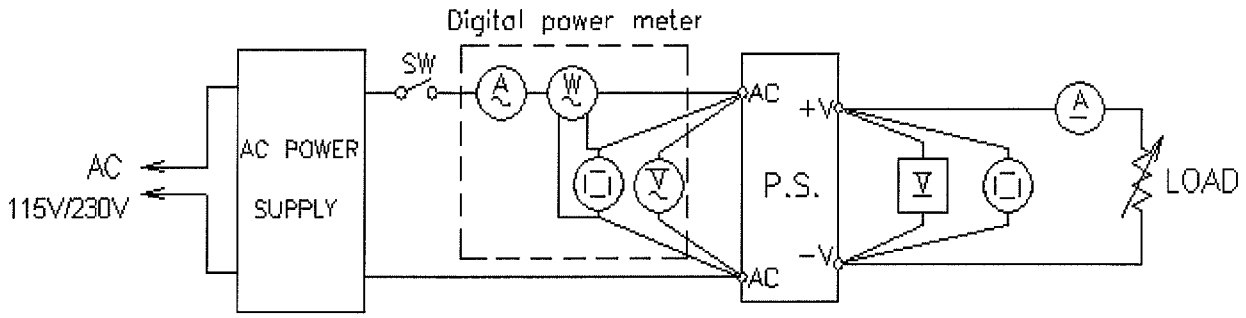
(7) Output rise characteristics with ON/OFF CONTROL



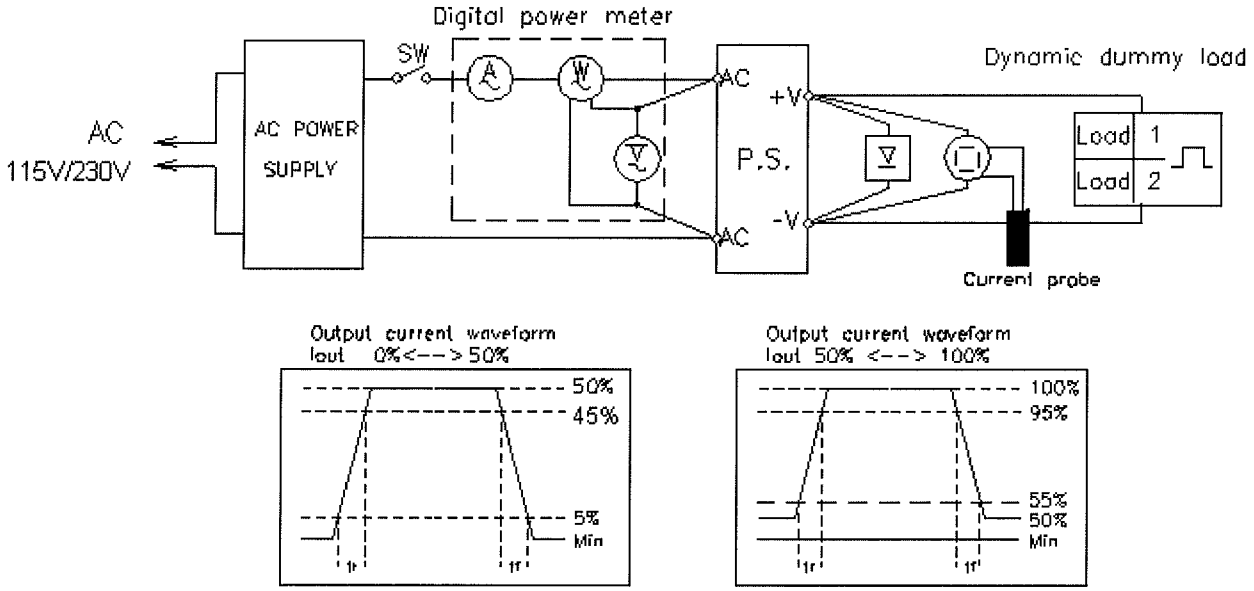
(8) Output fall characteristics with ON/OFF CONTROL

Same as Output rise characteristics with ON/OFF CONTROL

(9) Dynamic line characteristics



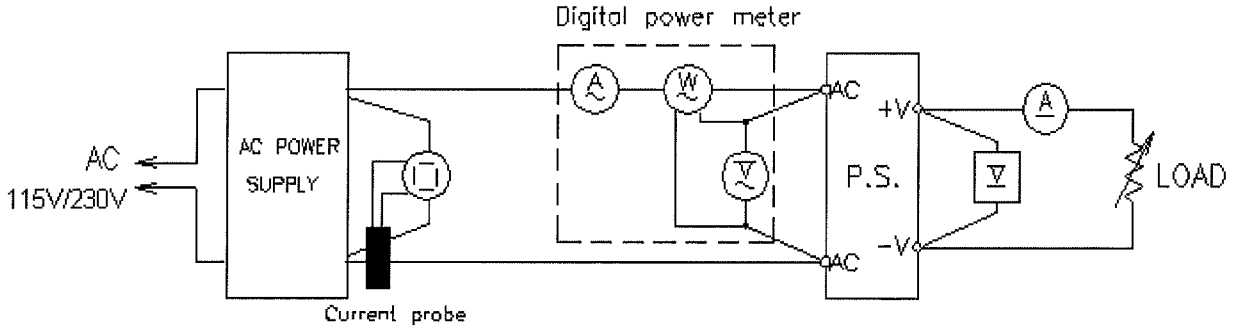
(10) Dynamic load response characteristics



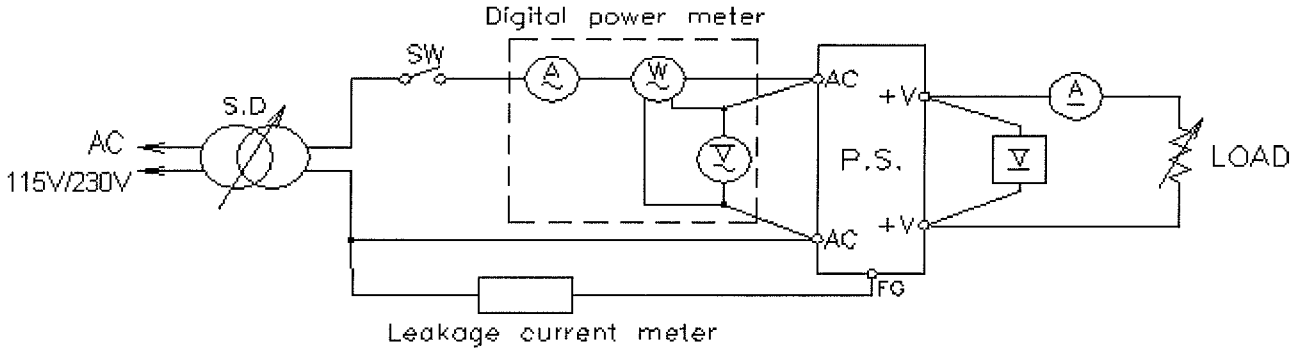
(11) Response to brown out characteristics

Same as Dynamic line characteristics

(12) Inrush current characteristics



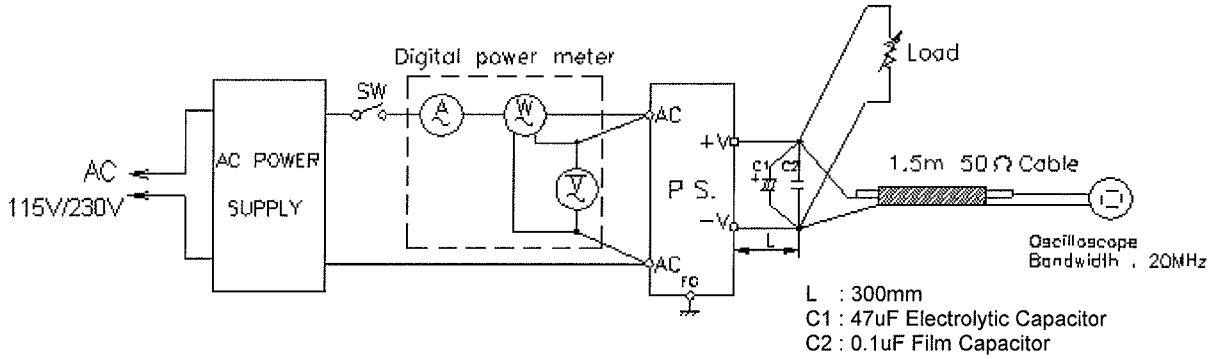
(13) Leakage current characteristics



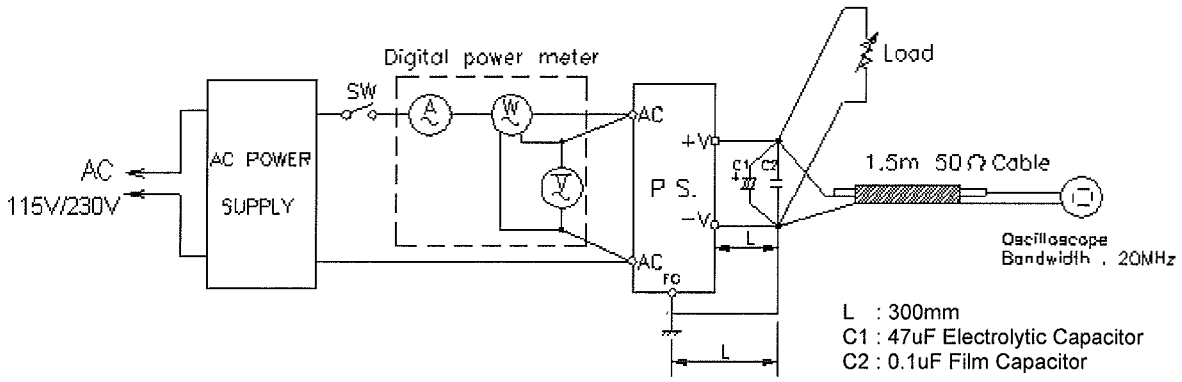
Range used---AC (For SIMPSON TYPE 228)

(14) Output ripple and noise waveform

a. Normal Mode (using a 300mm twisted pair terminated with 0.1uF and 47uF capacitor at 20MHz)



b. Normal + Common Mode



(15) Stand-by current

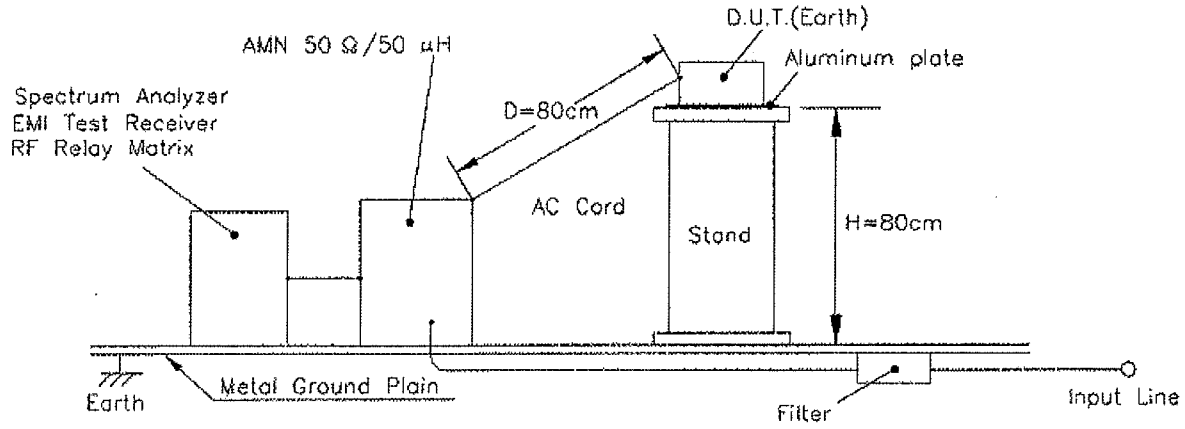
Same as Steady state data

(16) Stand-by power

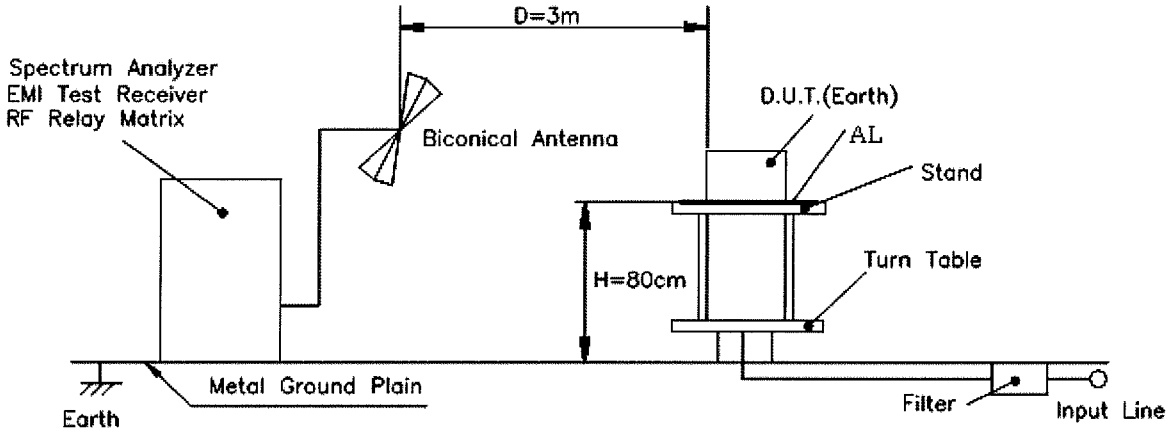
Same as Steady state data

(17) Electro-Magnetic Interference characteristics

(a) Conducted Emission Noise



(b) Radiated Emission Noise



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	89 VI
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	CONTROLLED TEMP. CHAMBER	ESPEC	SH-641
11	LEAKAGE CURRENT METER	SIMPSON	228
12	AC SOURCE	KIKUSUI	PCR-2000L
13	AC SOURCE	CHROMA	61503/61505
14	POWER ANALYZER	CHROMA	6630
15	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI
16	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESI26
17	LISN	ROHDE&SCHWARZ	ENV216
18	ANTENNA	ROHDE&SCHWARZ	HL562

2. Characteristics

2-1 Steady state data

(1) Regulation - line and load, Temperature drift

12V

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

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	12.035	12.034	12.035	12.036	0.002	0.017%
50%	12.012	12.011	12.012	12.012	0.001	0.008%
100%	11.988	11.987	11.988	11.988	0.001	0.008%
load	0.047	0.047	0.047	0.048		
regulation	0.392%	0.392%	0.392%	0.400%		

2. Temperature drift — Conditions Vin = 115VAC, Iout =100%

Ta	-25°C	25°C	50°C	temperature stability	
Vout	11.939V	11.987V	11.968V	0.048V	0.400%

24V

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

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	24.069	24.068	24.068	24.072	0.004	0.017%
50%	24.055	24.056	24.057	24.060	0.005	0.021%
100%	24.043	24.044	24.047	24.048	0.005	0.021%
load	0.026	0.024	0.021	0.024		
regulation	0.108%	0.100%	0.088%	0.100%		

2. Temperature drift — Conditions Vin = 115VAC, Iout = 100%

Ta	-25°C	25°C	50°C	temperature stability	
Vout	23.989V	24.044V	24.039V	0.055V	0.229%

48V

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

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	47.987	47.987	47.986	47.986	0.001	0.002%
50%	47.978	47.977	47.977	47.976	0.002	0.004%
100%	47.969	47.969	47.968	47.968	0.001	0.002%
load	0.018	0.018	0.018	0.018		
regulation	0.038%	0.038%	0.037%	0.037%		

2. Temperature drift — Conditions Vin = 115VAC, Iout =100%

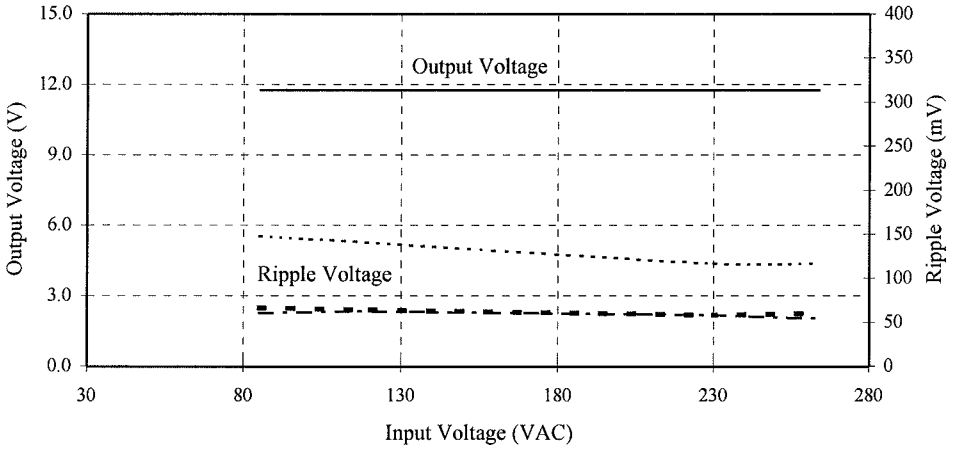
Ta	-25°C	25°C	50°C	temperature stability	
Vout	47.816V	47.969V	47.961V	0.153V	0.319%

2-1 Steady State Data

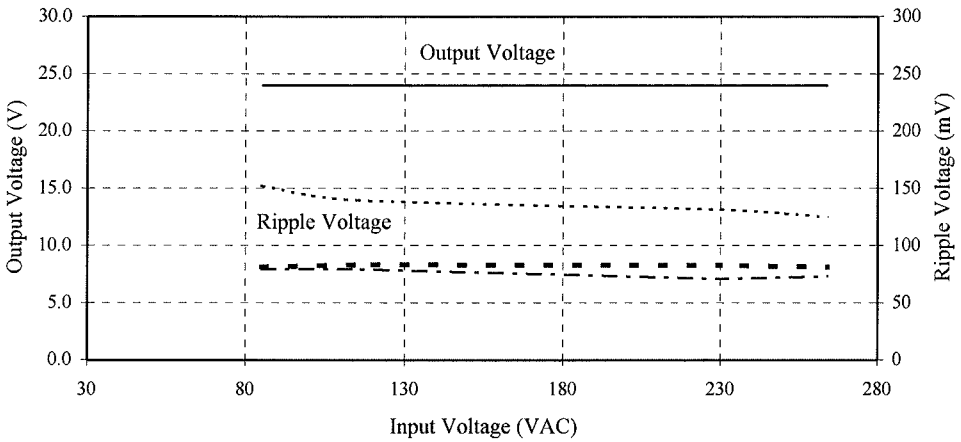
(2) Output Voltage And Ripple Voltage Vs Input Voltage

Condition : Iout = 100%
Ta = -25°C
= 25°C
= 50°C

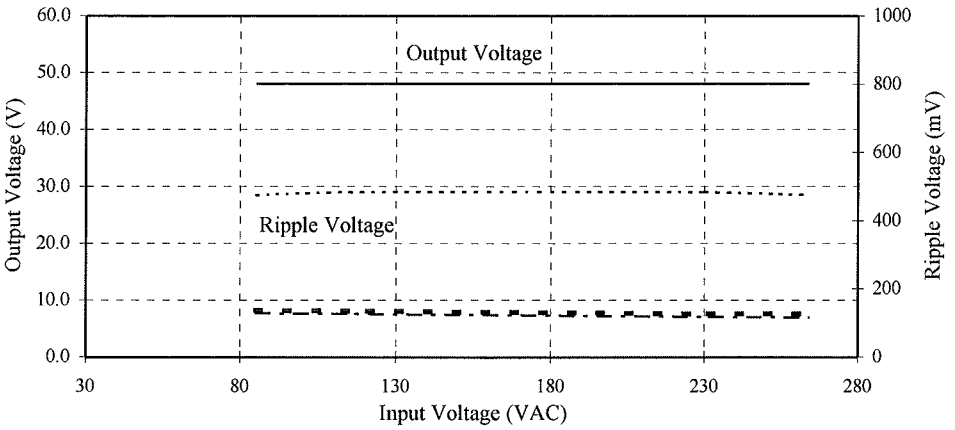
12V



24V



48V

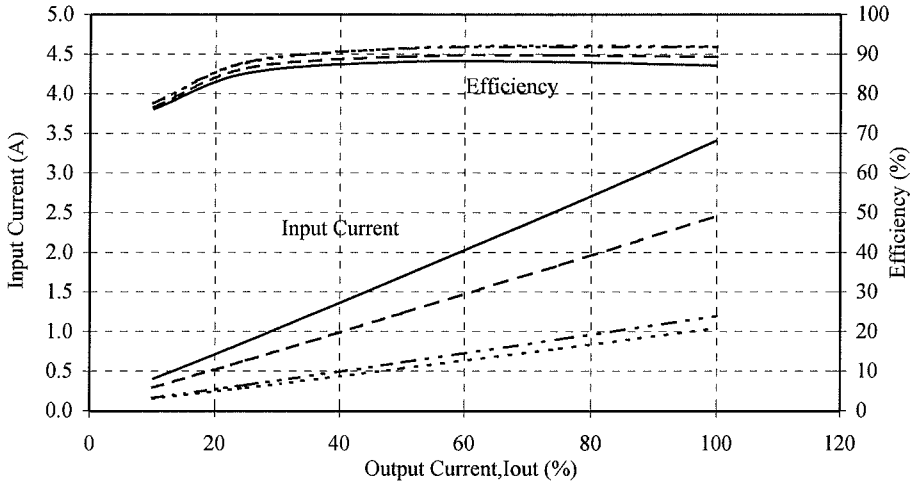


2-1 Steady State Data

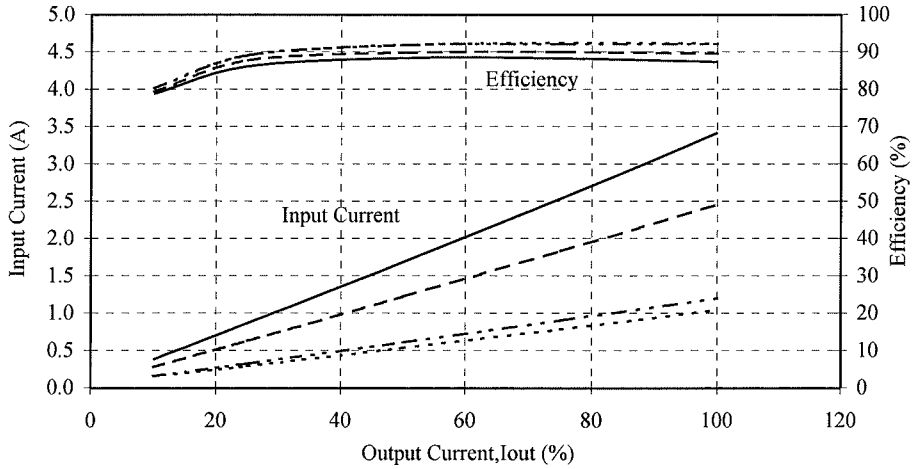
(3) Efficiency And Input Current Vs Output Current

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

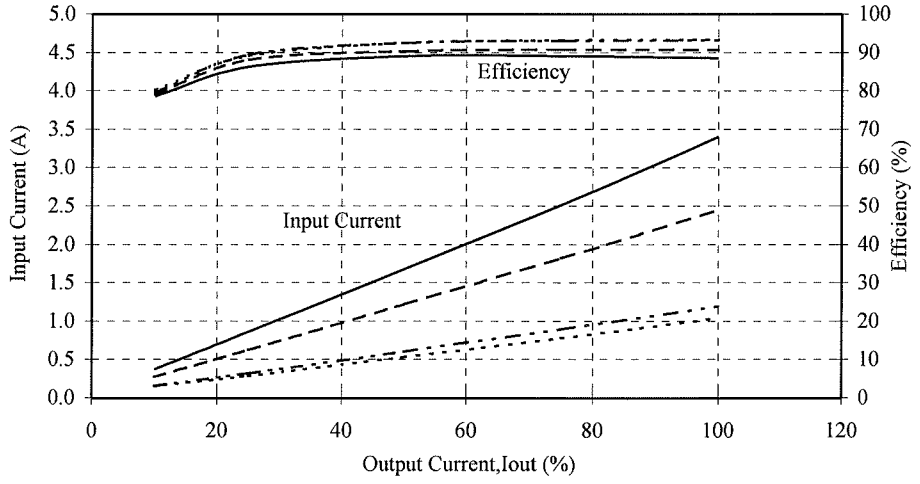
12V



24V



48V

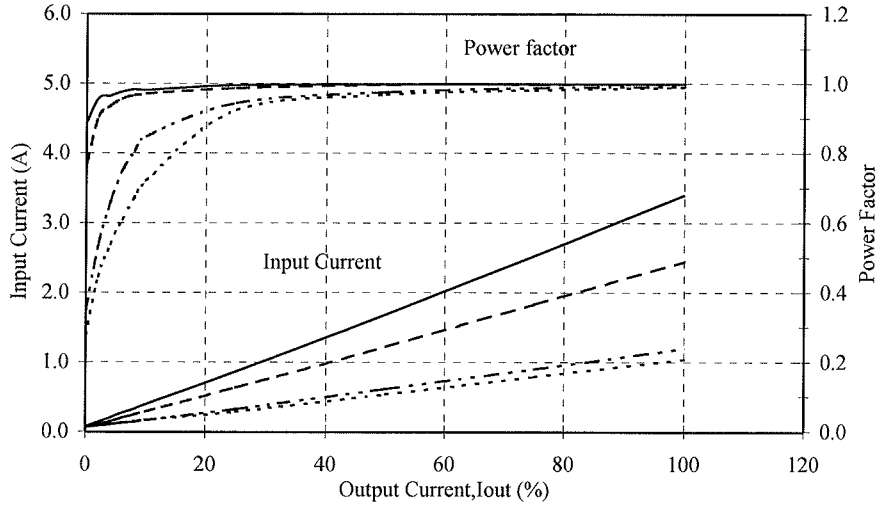


2-1 Steady State Data

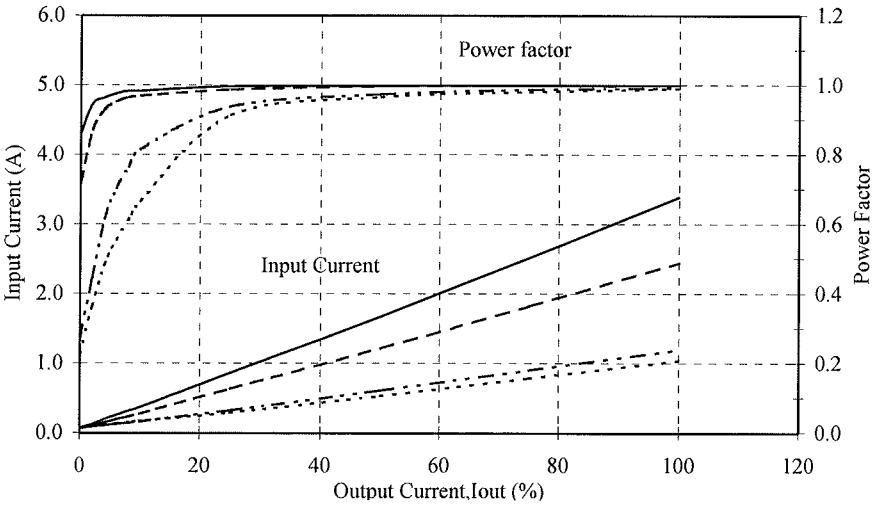
(4) Power factor And Input Current Vs Output Current

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

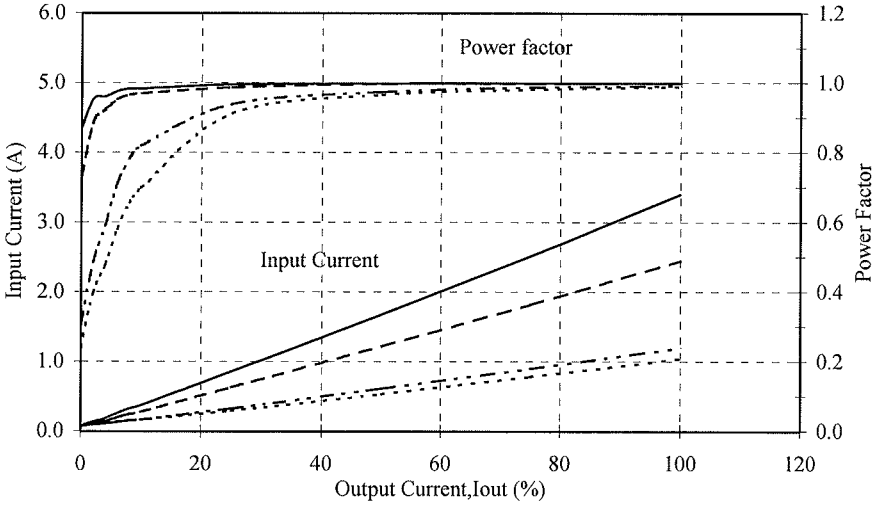
12V



24V



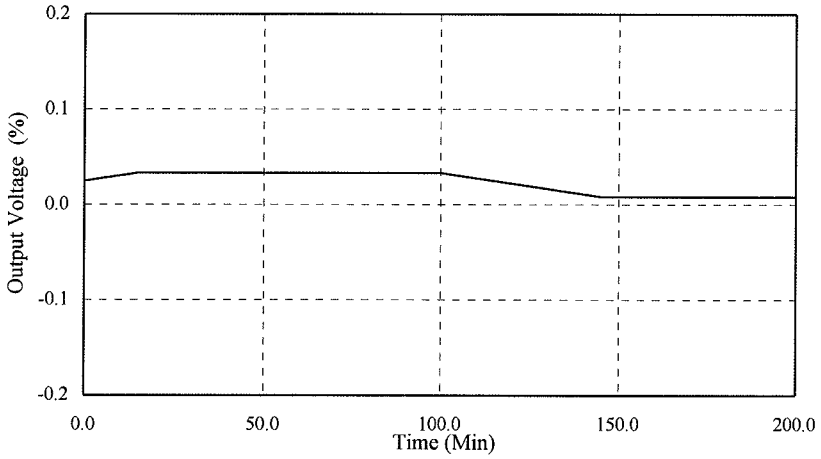
48V



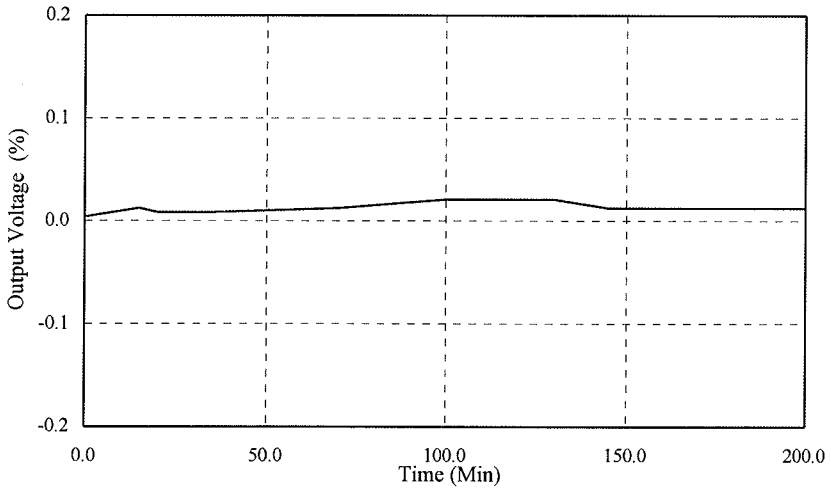
2-2 Warm up voltage drift characteristics

Conditions: Vin : 230VAC
Iout : 100%
Ta : 25℃

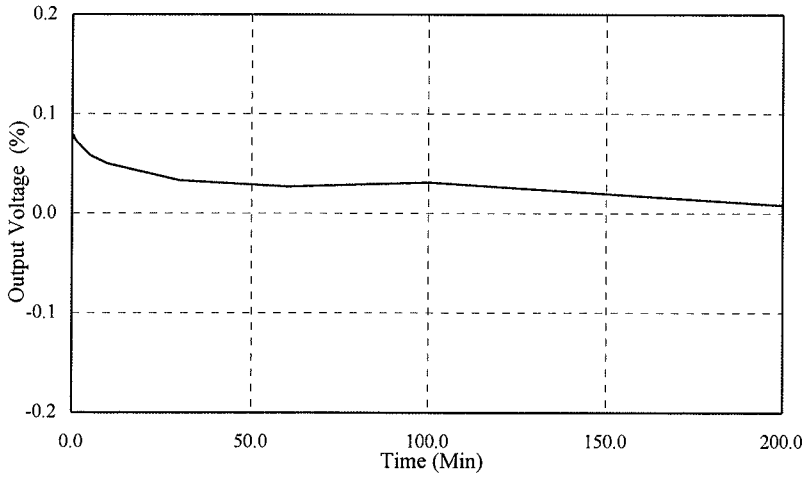
12V



24V



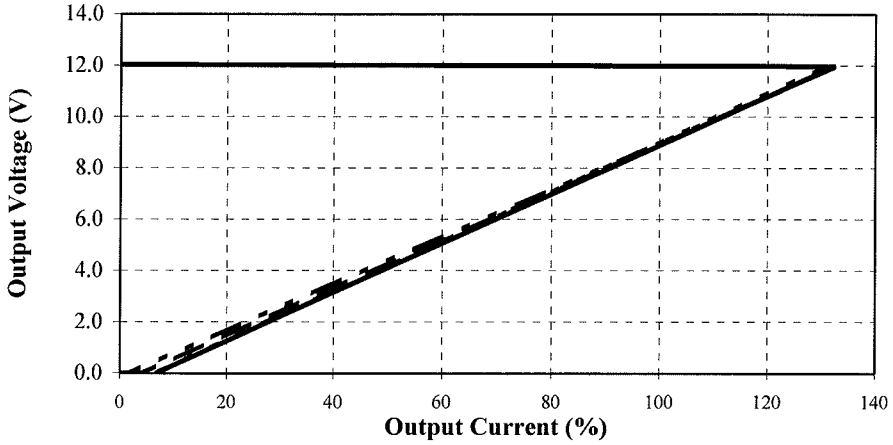
48V



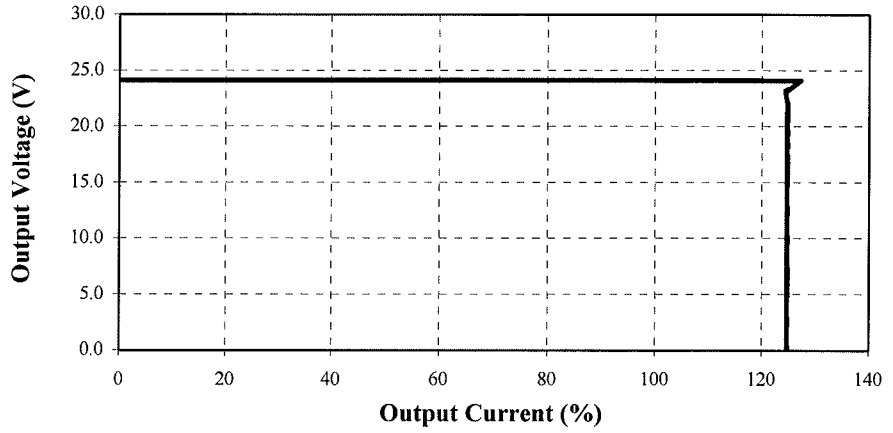
2-3 Over current protection (OCP) characteristics

Conditions: Vin : 85 VAC ——
115 VAC – – – –
230 VAC – · – · –
264 VAC ·····
Ta : 25℃

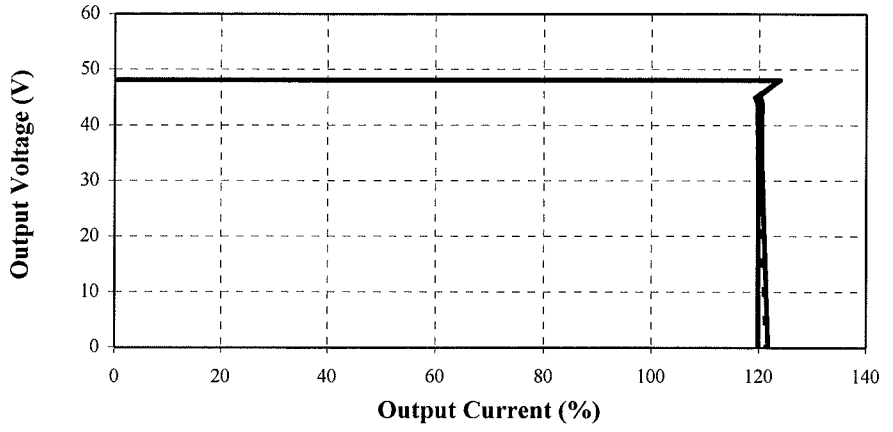
12V



24V



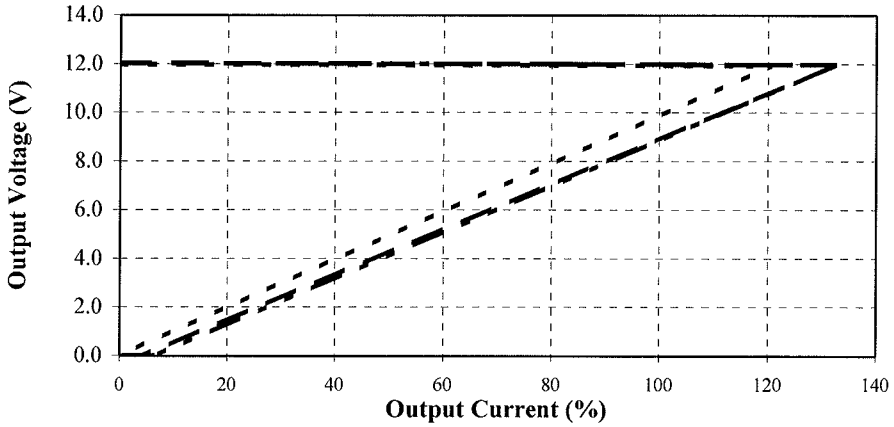
48V



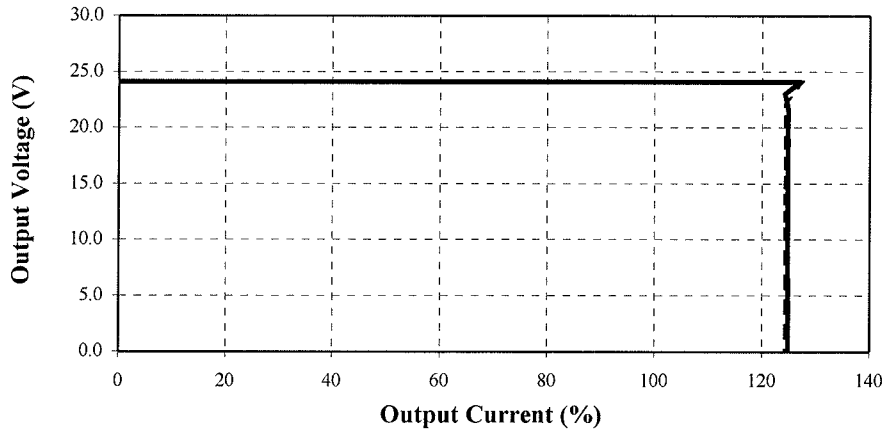
2-3 Over current protection (OCP) characteristics

Conditions: Vin : 115VAC
Ta : 50℃ ——
25℃ - - - -
-25℃ -·-·-·-

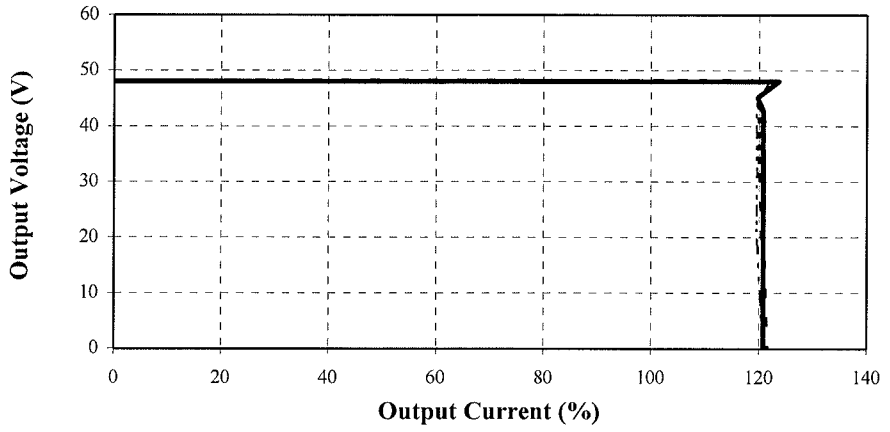
12V



24V



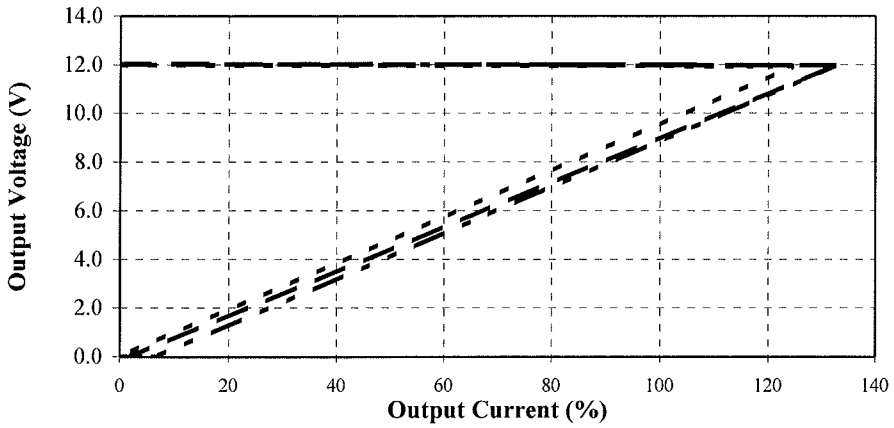
48V



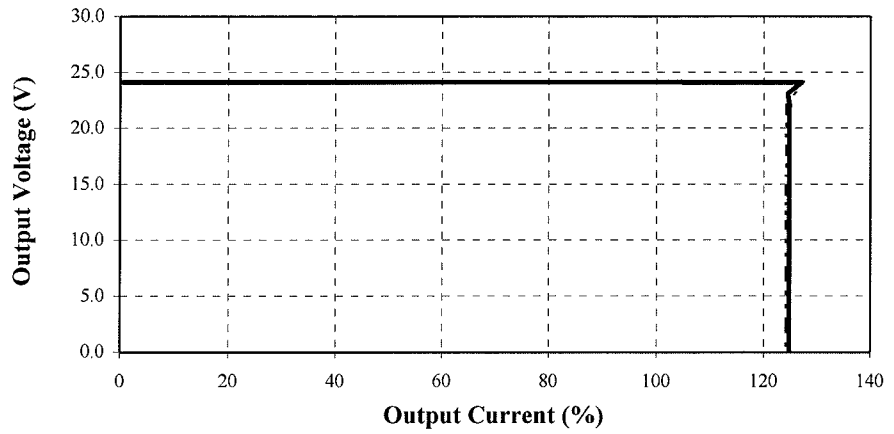
2-3 Over current protection (OCP) characteristics

Conditions: Vin : 230VAC
Ta : 50℃ ——————
25℃ – – – –
-25℃ —·—·—·—

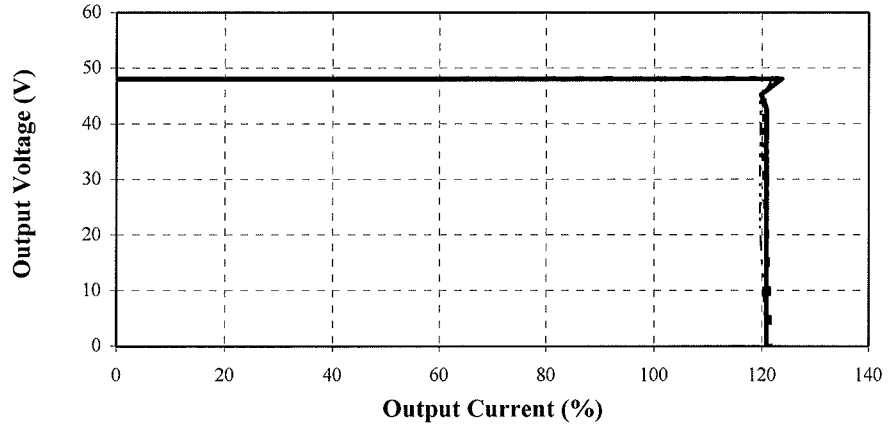
12V



24V



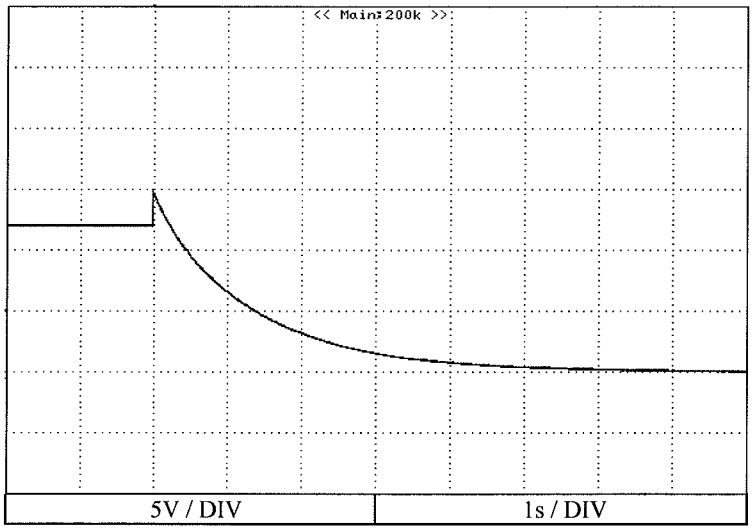
48V



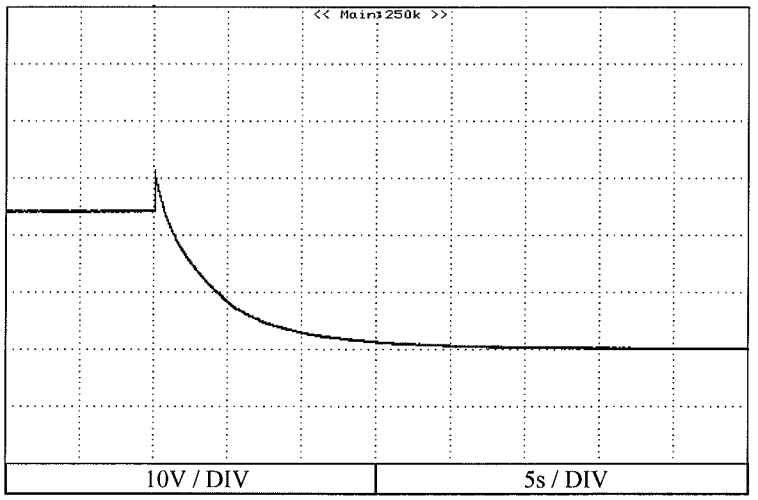
2-4 Over voltage protection (OVP) characteristics

Conditions : Ta = 25°C
Vin = 230VAC
Iout = 0%

12V



24V



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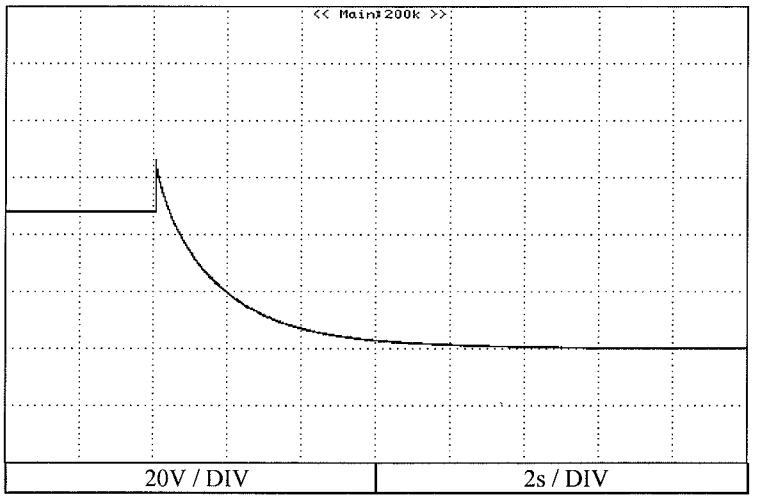
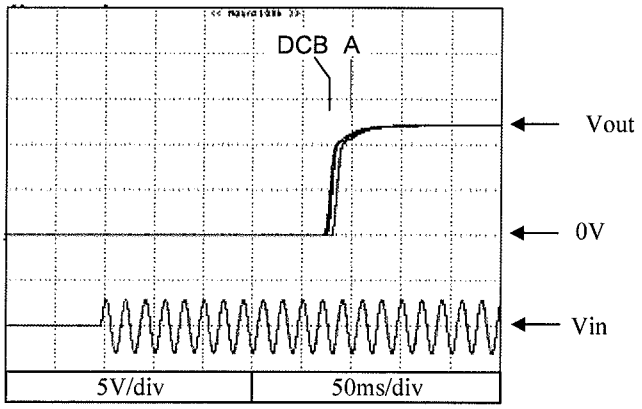


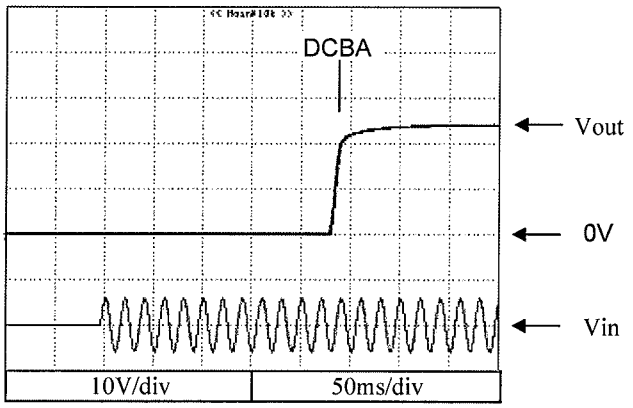
2-5 Output Rise Characteristics

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

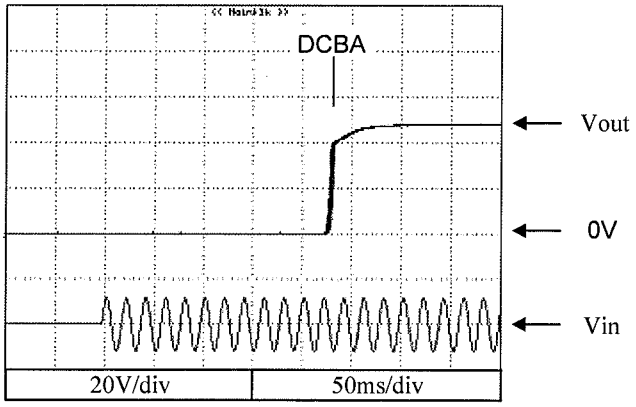
12V



24V



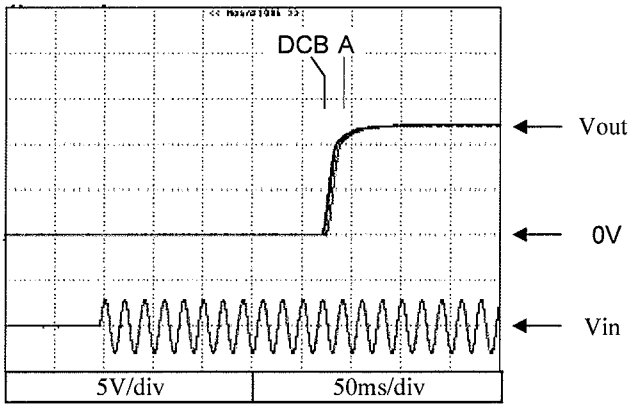
48V



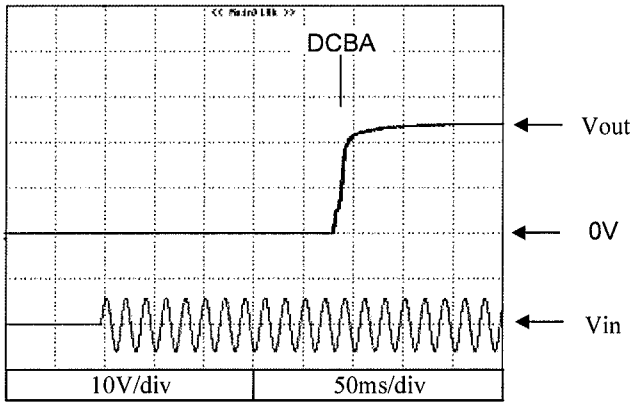
2-5 Output Rise Characteristics

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

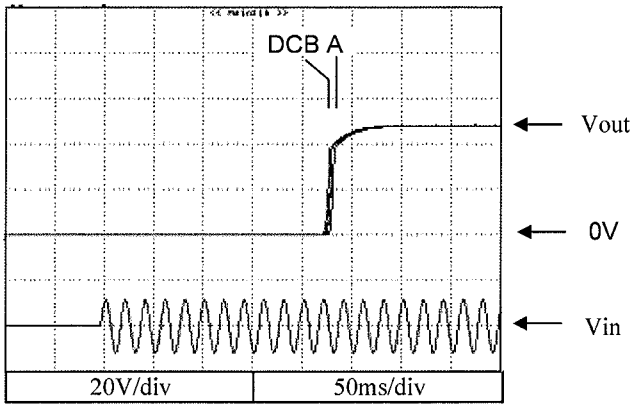
12V



24V



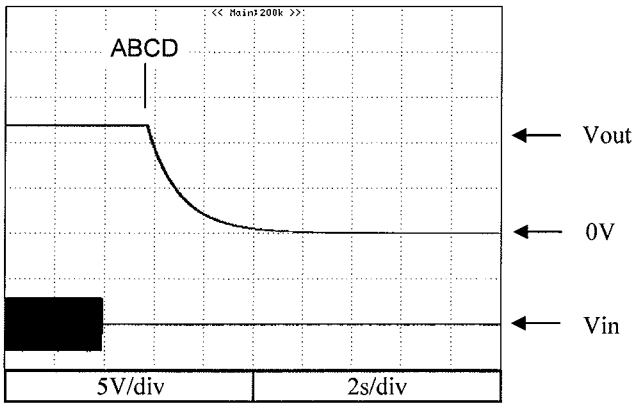
48V



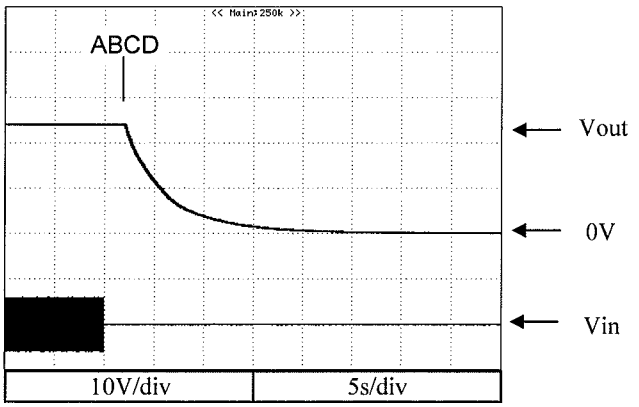
2-6 Output Fall Characteristics

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

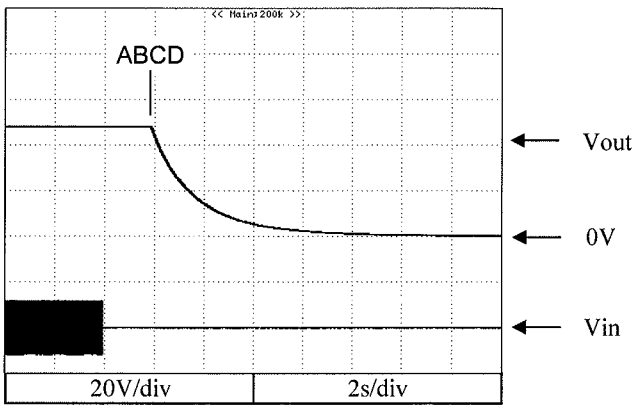
12V



24V



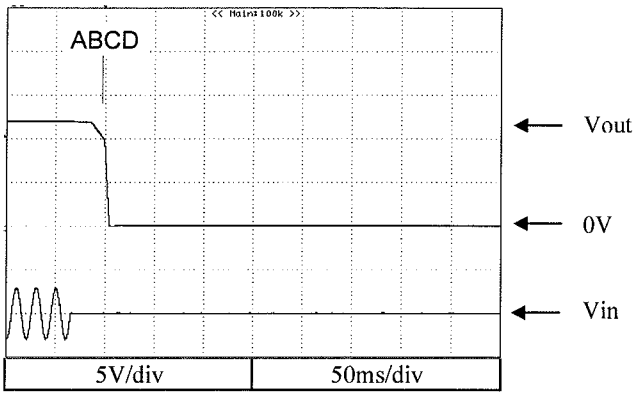
48V



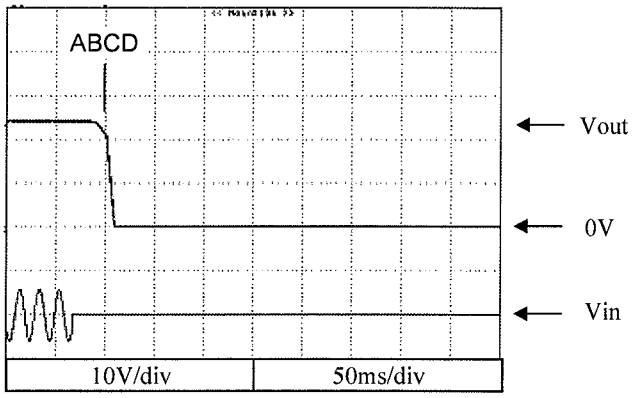
2-6 Output Fall Characteristics

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

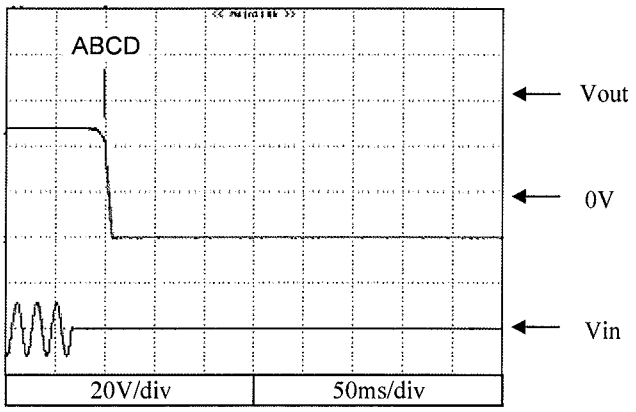
12V



24V



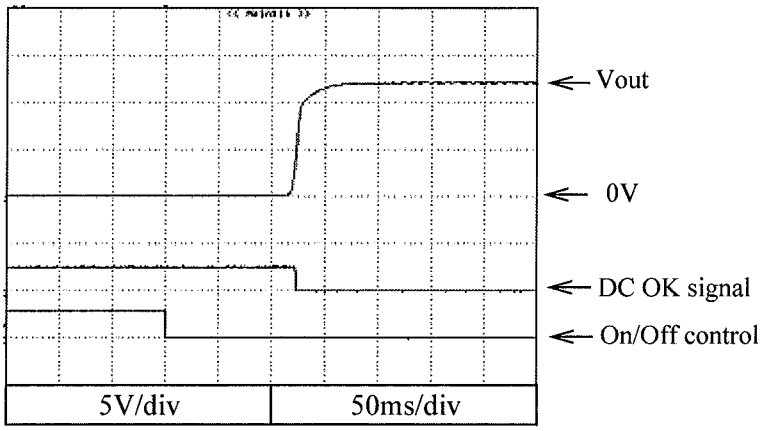
48V



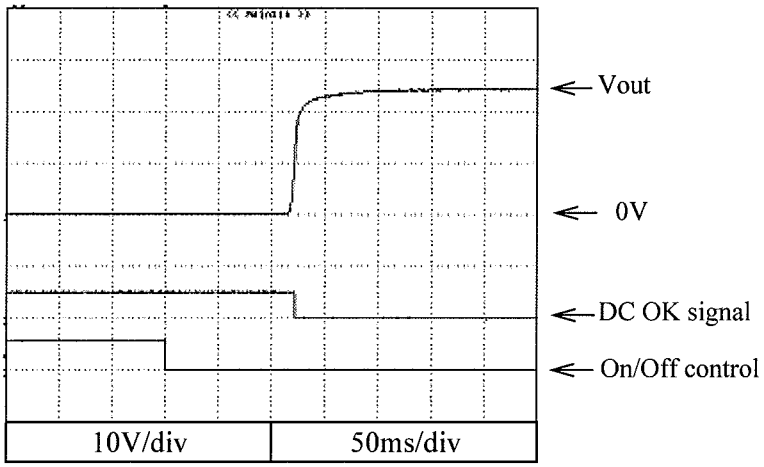
2-7 Output rise characteristics with On/Off control

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

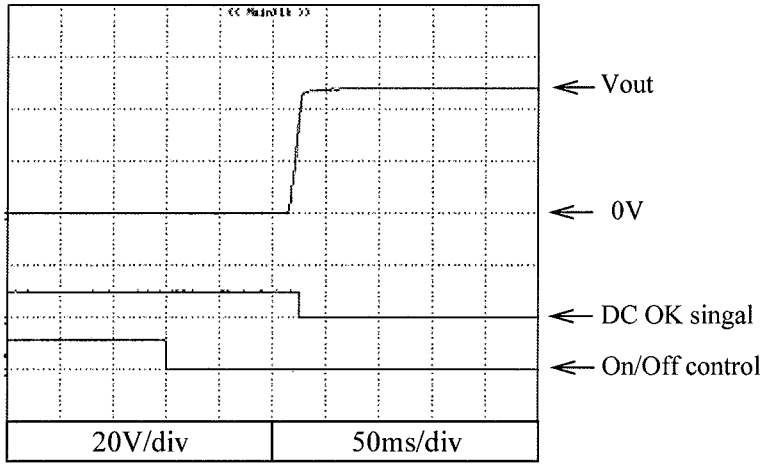
12V



24V



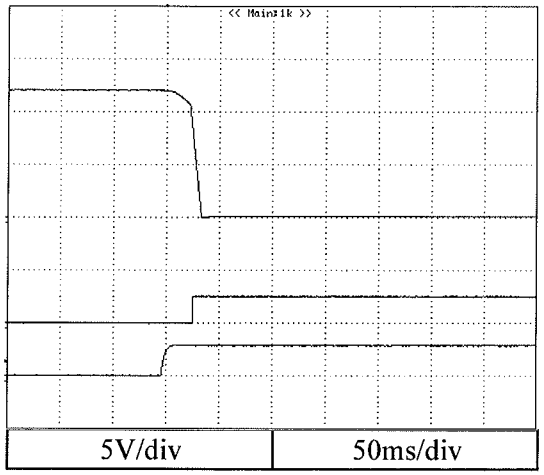
48V



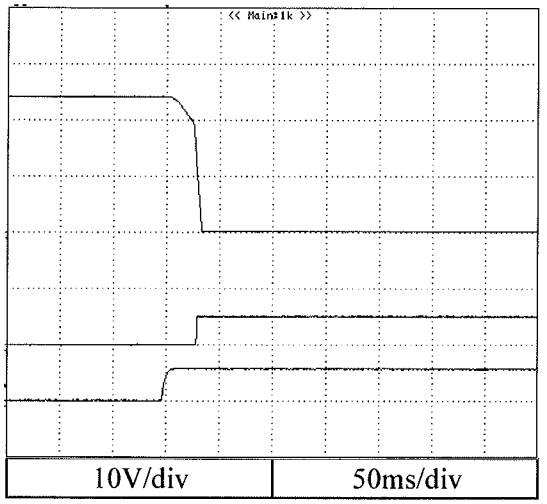
2-8 Output fall characteristics with On/Off control

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

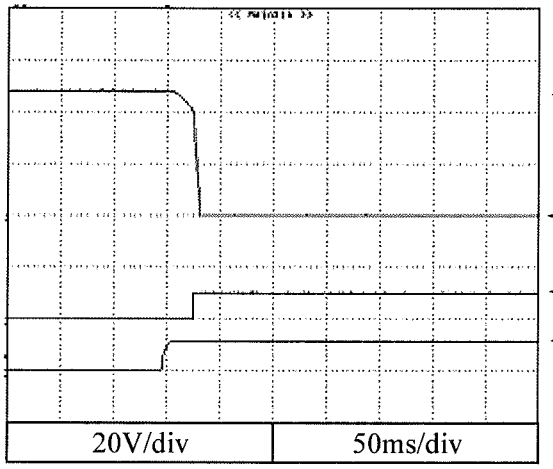
12V



24V



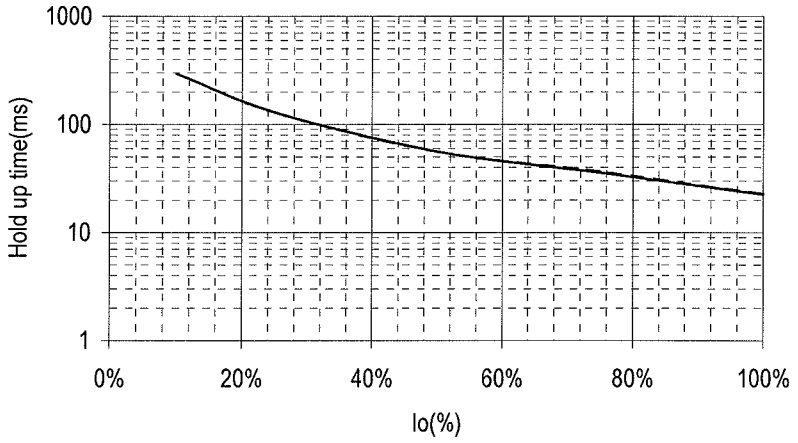
48V



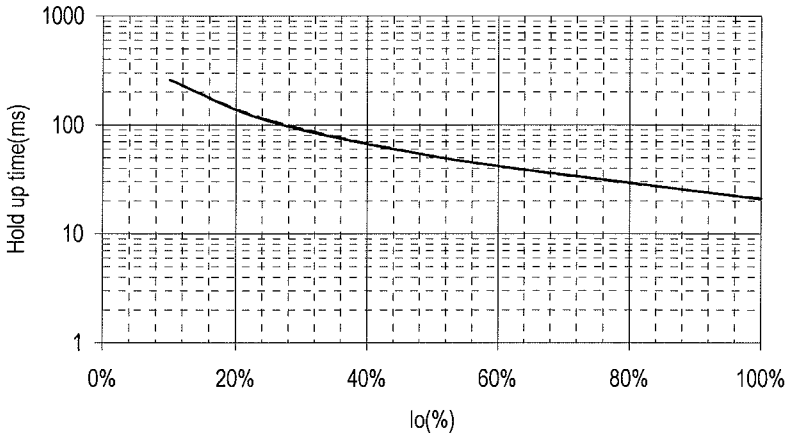
2-9 Hold Up Time Characteristics

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

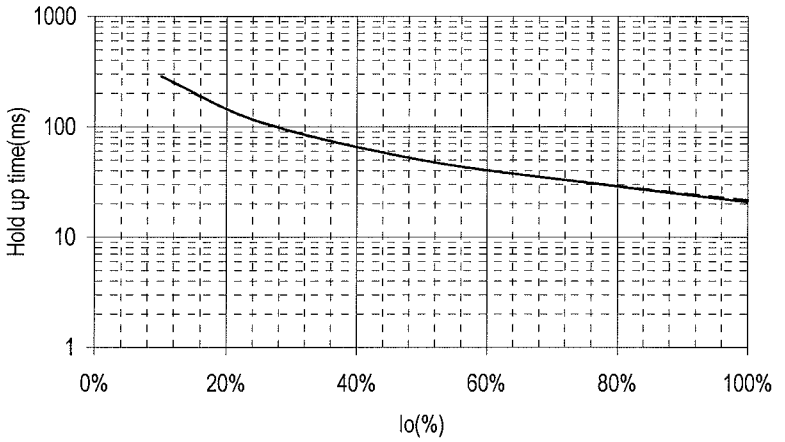
12V



24V



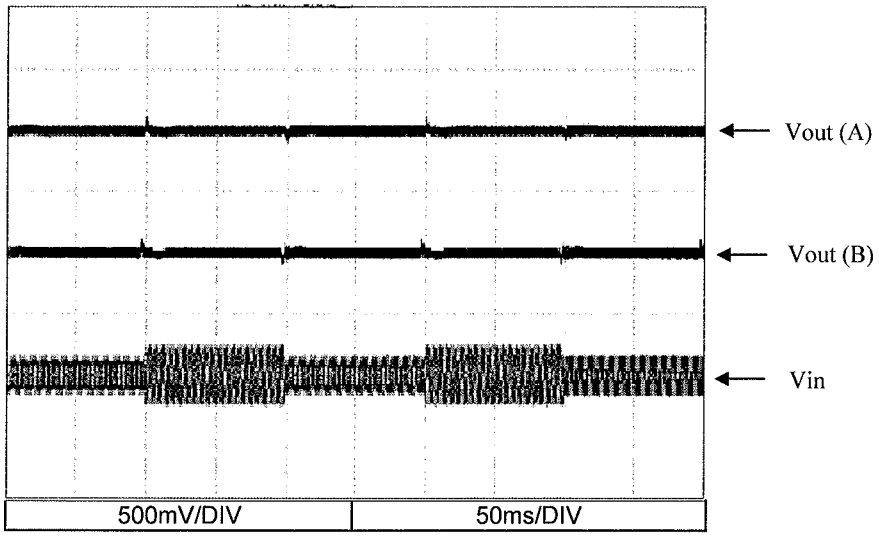
48V



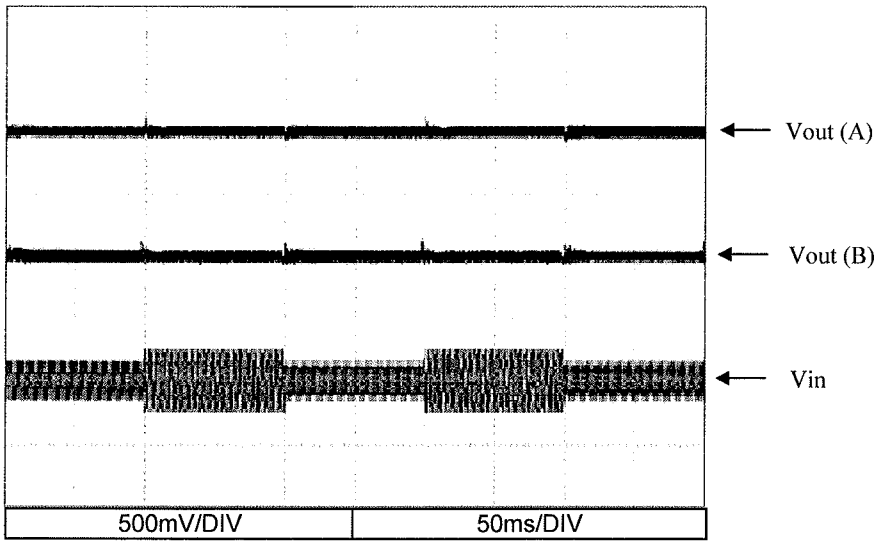
2-10 Dynamic Line Response Characteristics

Conditions : Vin = 85<=>132 VAC (A)
= 170<=>264 VAC (B)
Iout = 100%
Ta = 25°C

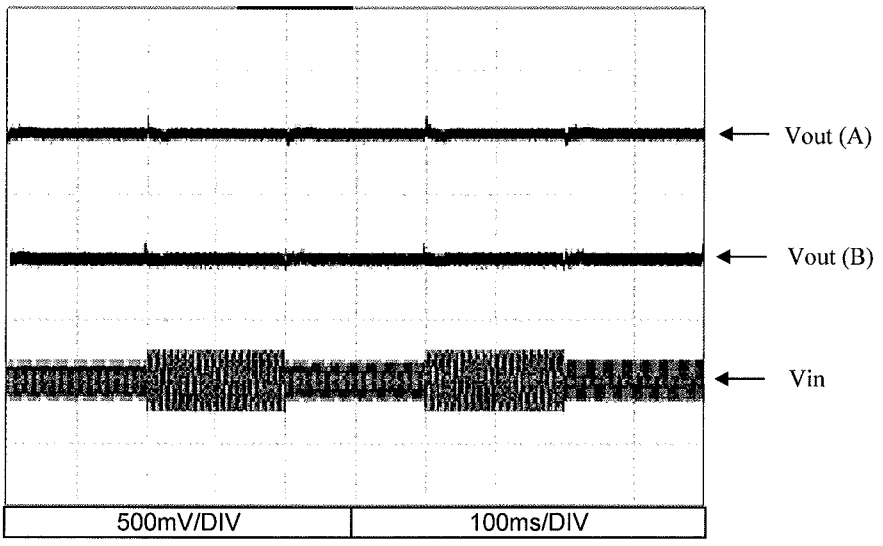
12V



24V



48V

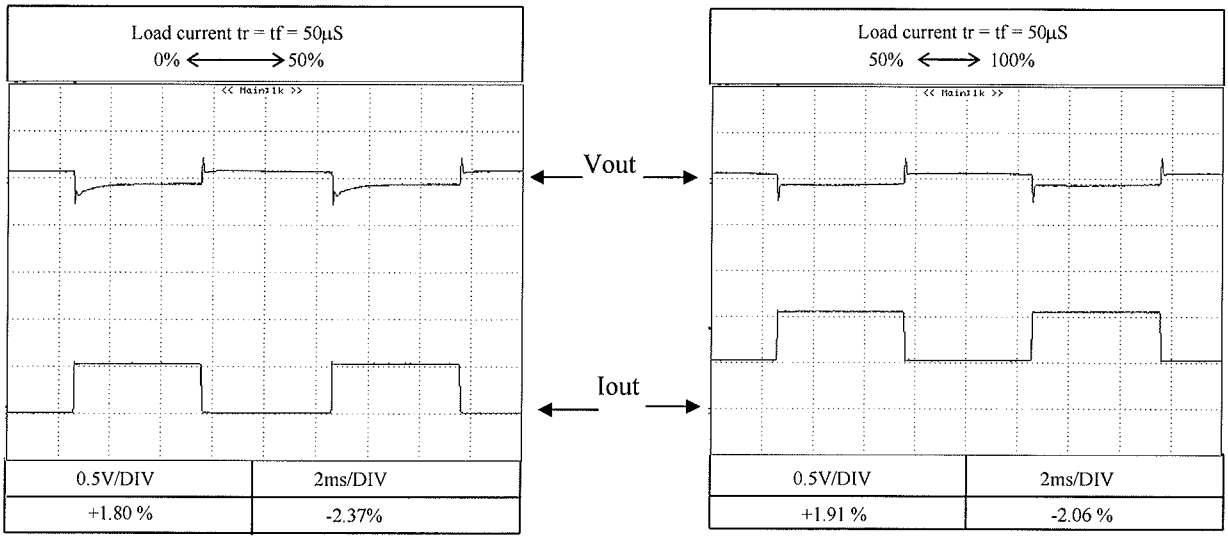


2-11 Dynamic Load Response Characteristics

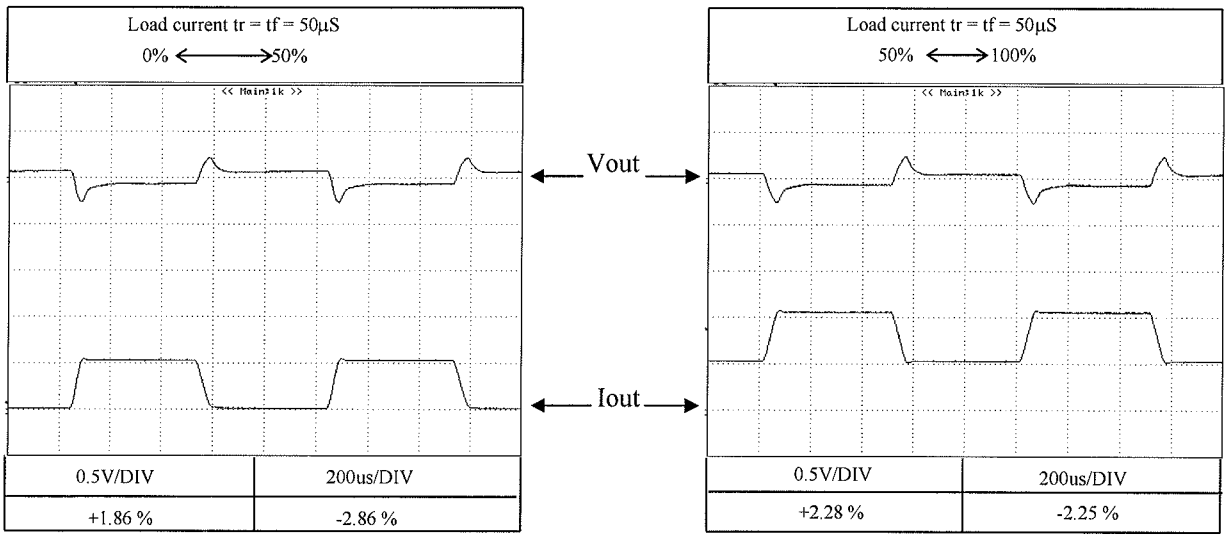
Conditions : Vin = 115VAC
Ta = 25°C

12V

f=100Hz



f=1KHz

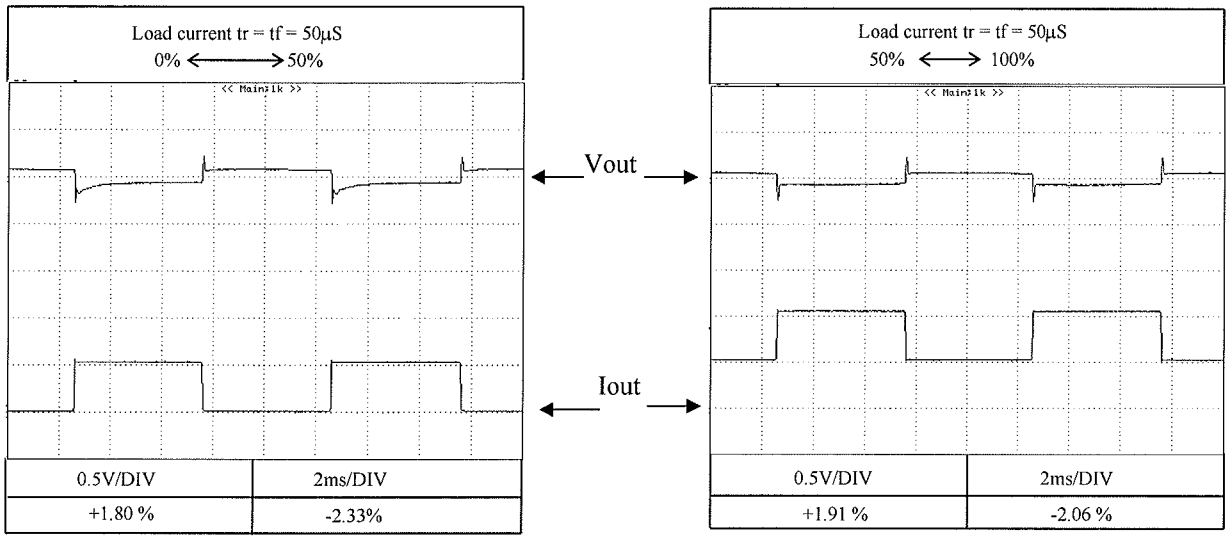


2-11 Dynamic Load Response Characteristics

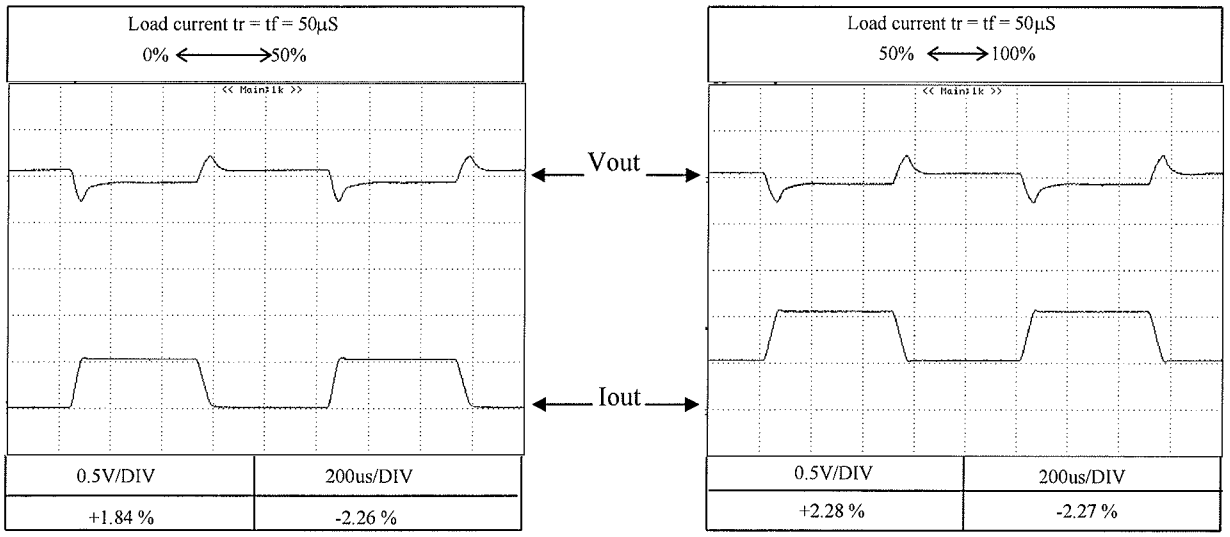
Conditions : Vin = 230VAC
Ta = 25°C

12V

f=100Hz



f=1KHz

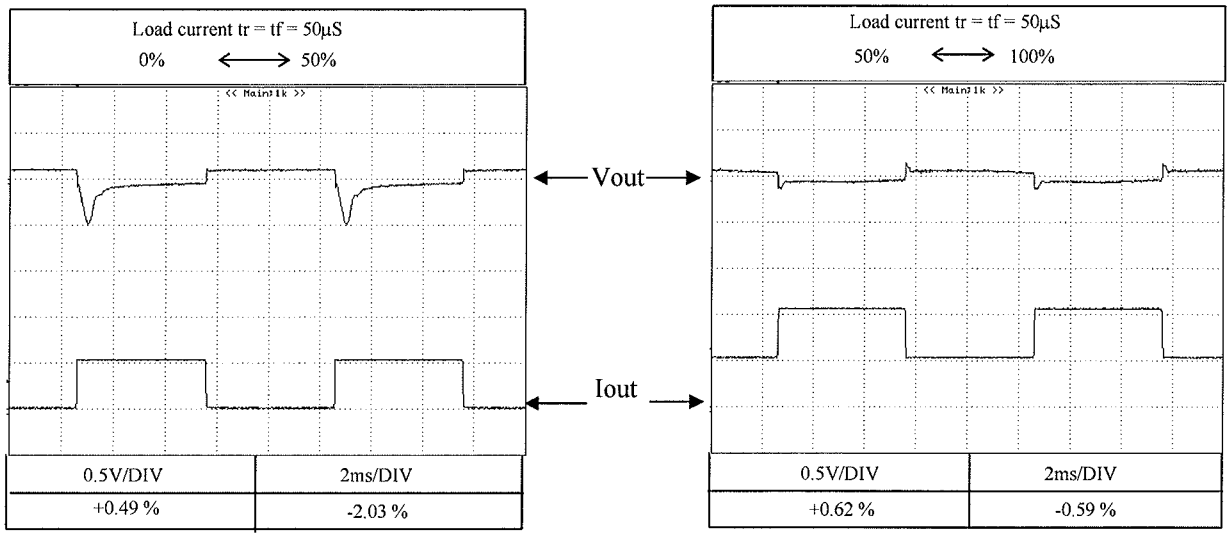


2-11 Dynamic Load Response Characteristics

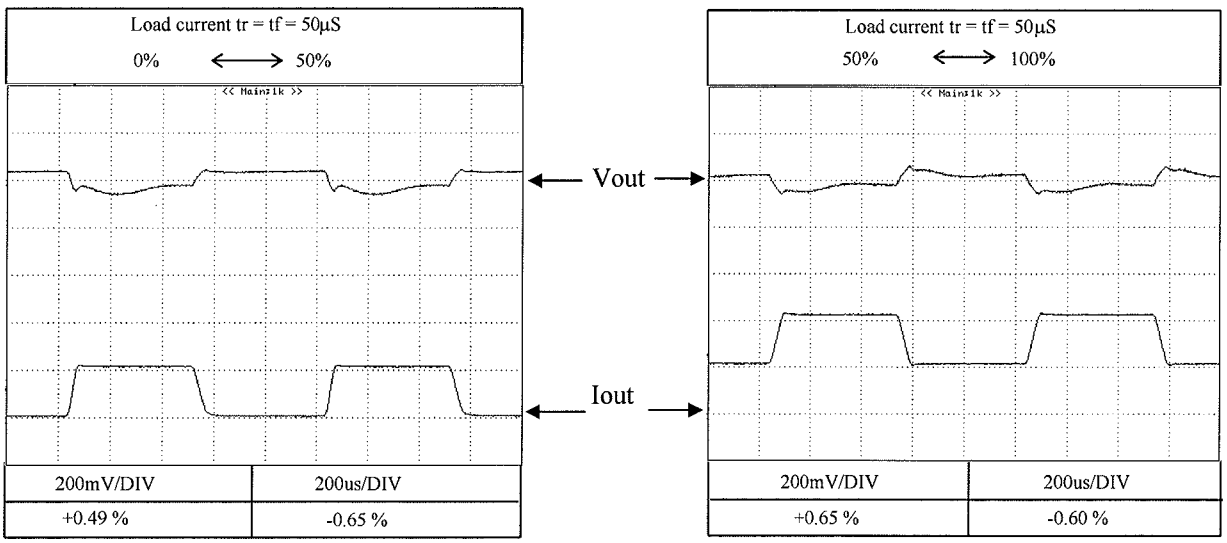
Conditions : Vin = 115VAC
Ta = 25°C

24V

f=100Hz



f=1KHz

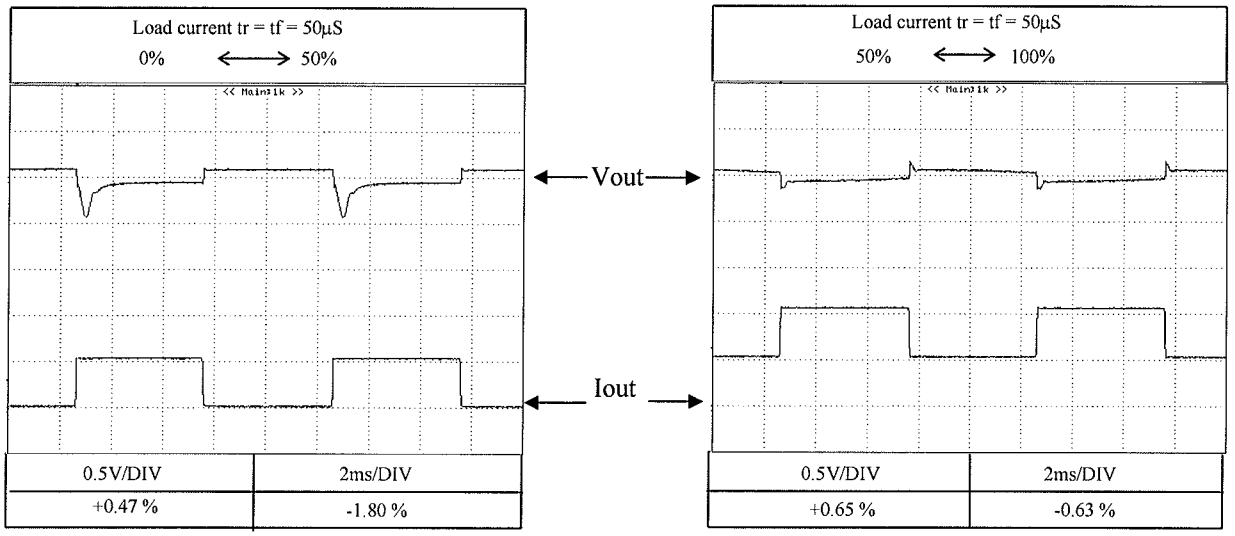


2-11 Dynamic Load Response Characteristics

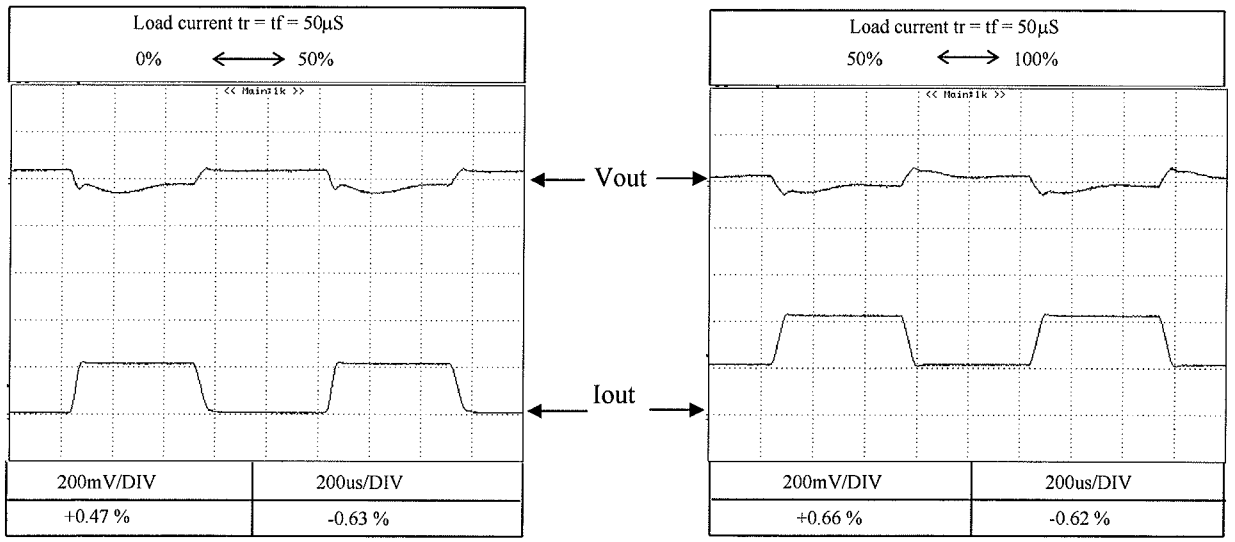
Conditions : Vin = 230VAC
Ta = 25°C

24V

f=100Hz



f=1KHz

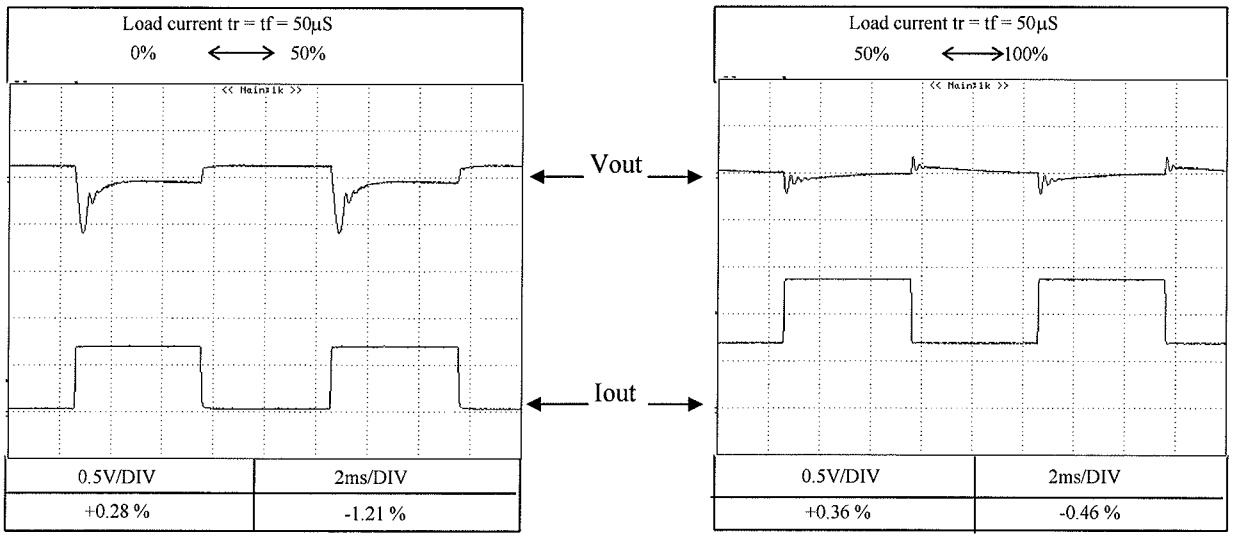


2-11 Dynamic Load Response Characteristics

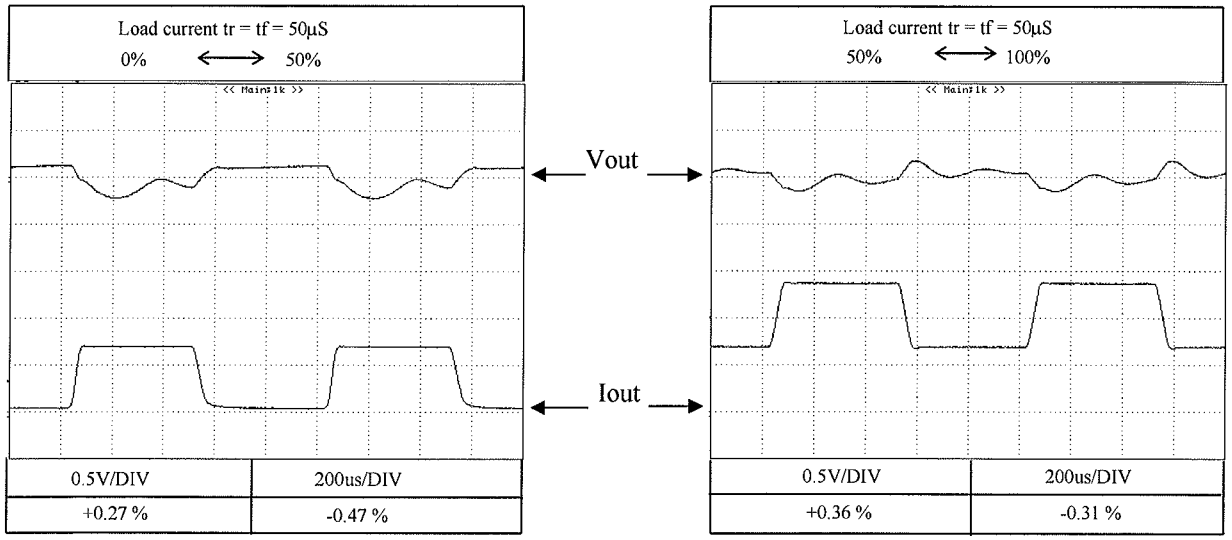
Conditions : Vin = 115VAC
Ta = 25°C

48V

f=100Hz



f=1KHz

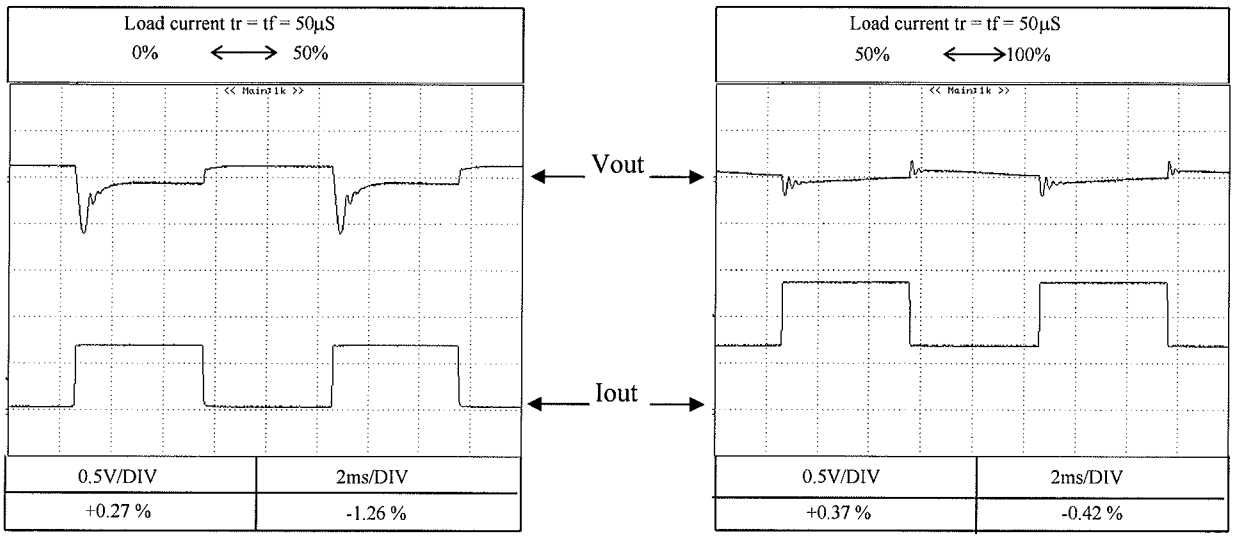


2-11 Dynamic Load Response Characteristics

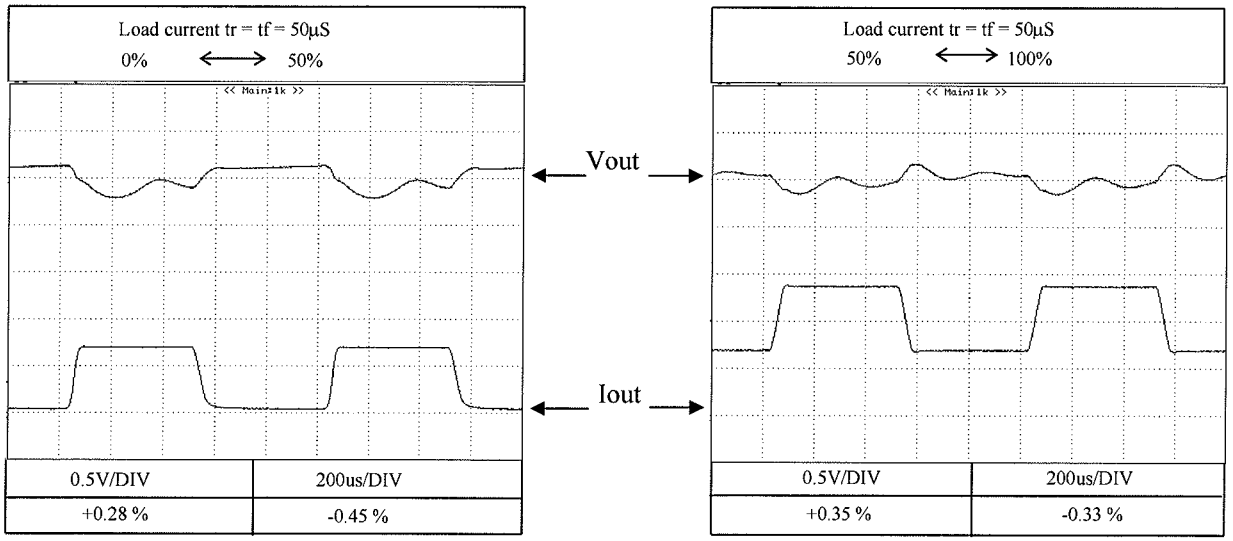
Conditions : Vin = 230VAC
Ta = 25°C

48V

f=100Hz



f=1KHz

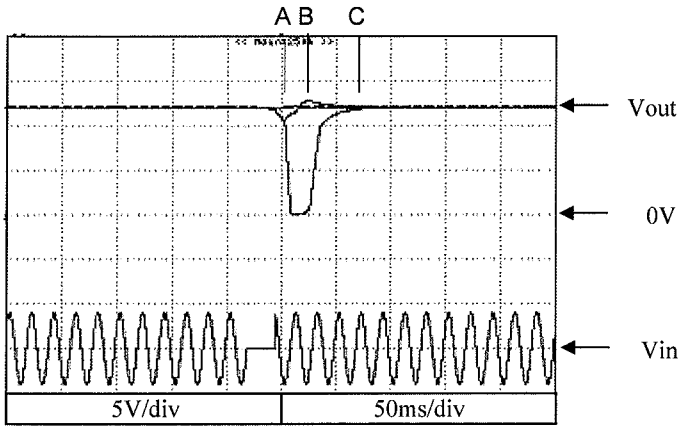


2-12 Response to Brown Out Characteristics

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

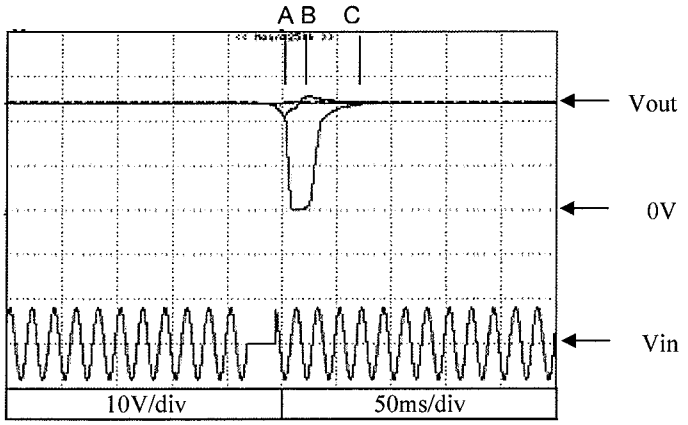
12V

A = 15ms
B = 24ms
C = 26ms



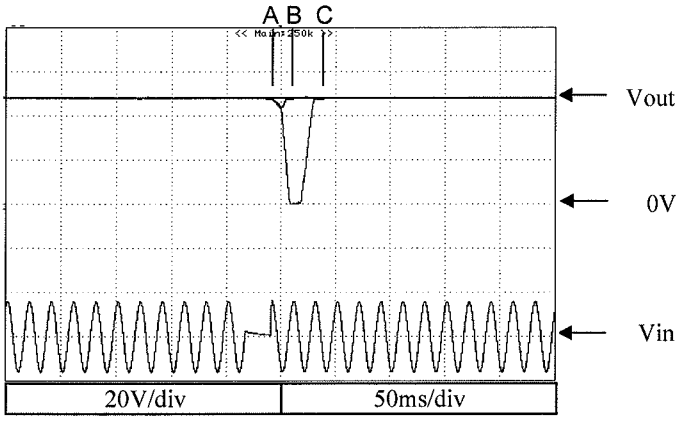
24V

A = 15ms
B = 20.5ms
C = 22ms



48V

A = 18ms
B = 24ms
C = 26ms

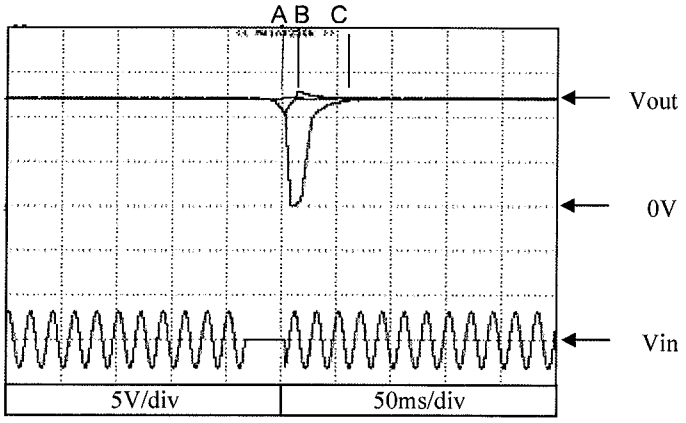


2-12 Response to Brown Out Characteristics

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

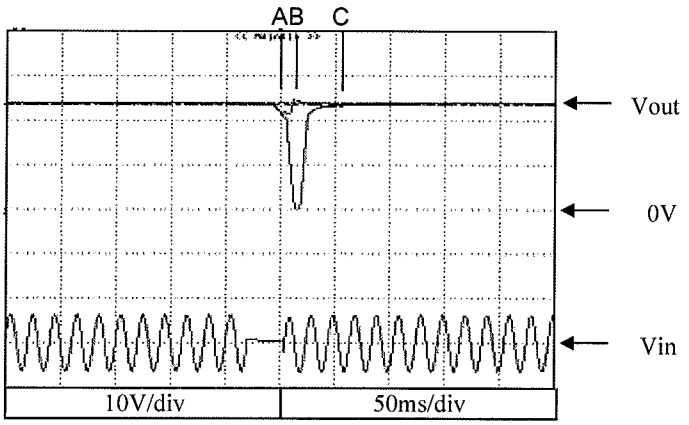
12V

A = 16ms
B = 35ms
C = 36ms



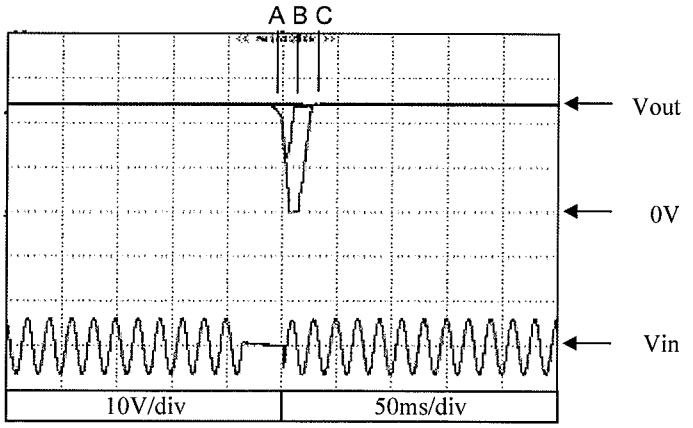
24V

A = 21ms
B = 30ms
C = 32ms



48V

A = 15ms
B = 34ms
C = 37ms

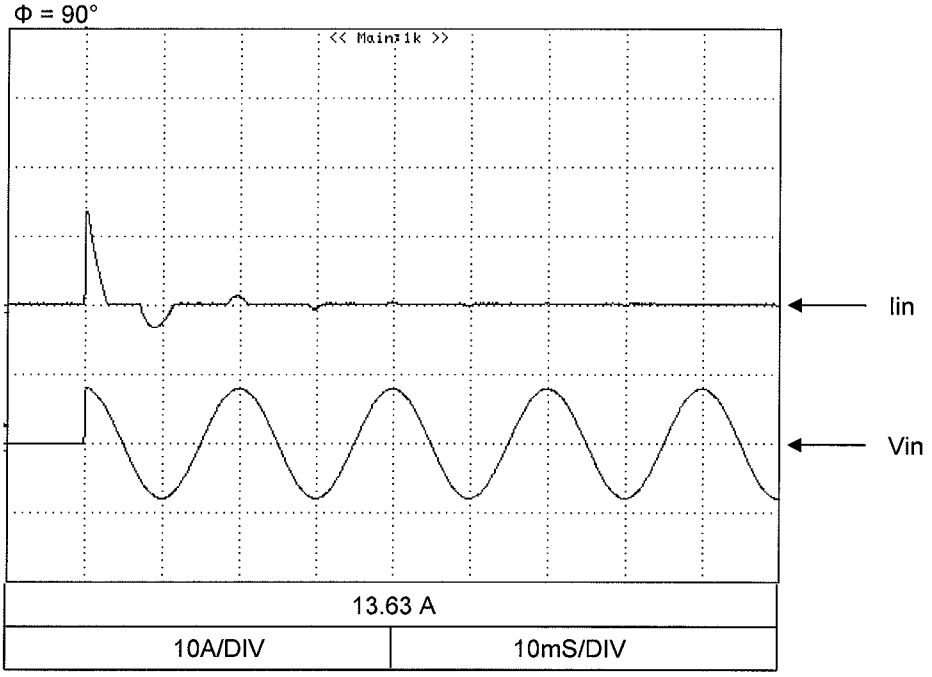


2-13 Inrush Current

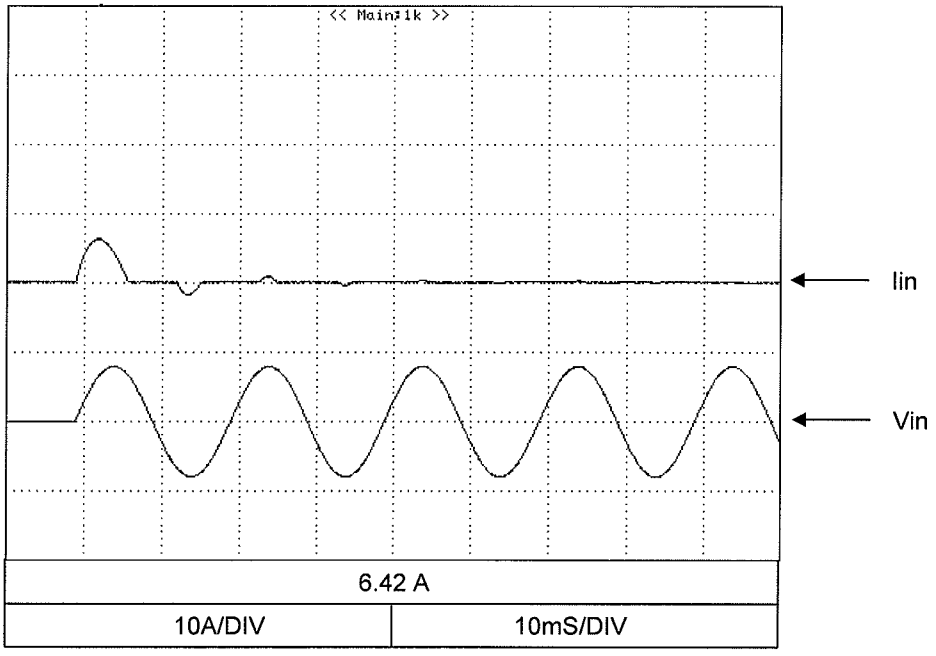
Conditions : Vin = 115Vac
Iout = 100%
Ta = 25°C

12V

Φ = 90°



Φ = 0°

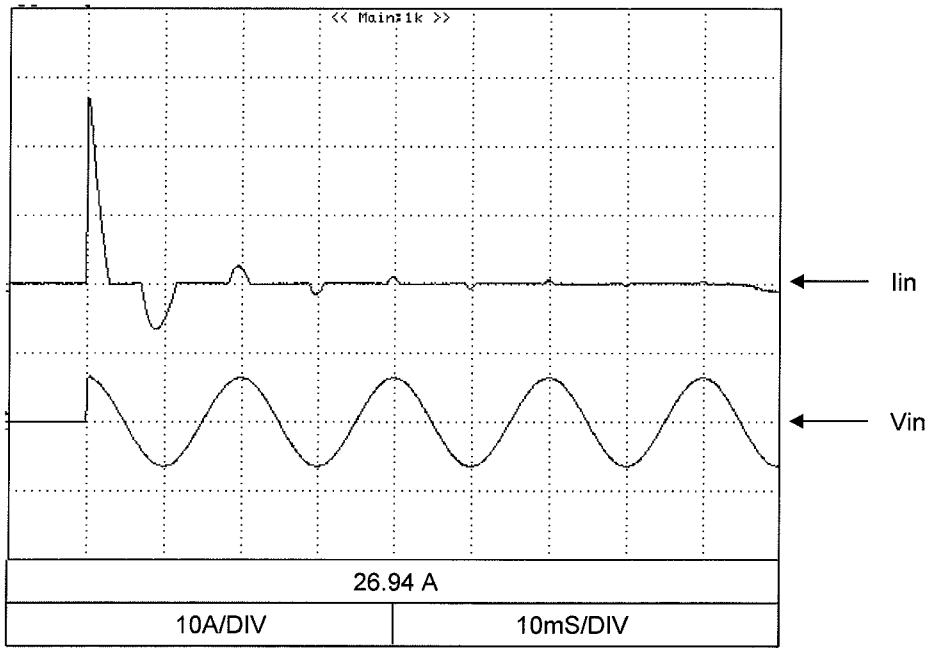


2-13 Inrush Current

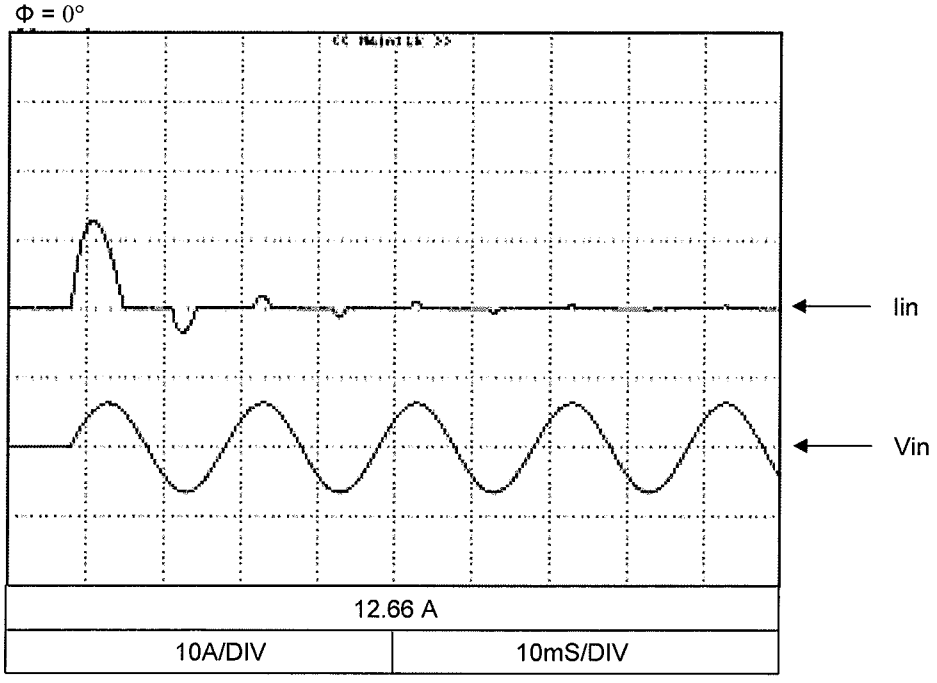
Conditions : Vin = 230Vac
Iout = 100%
Ta = 25°C

12V

Φ = 90°



Φ = 0°

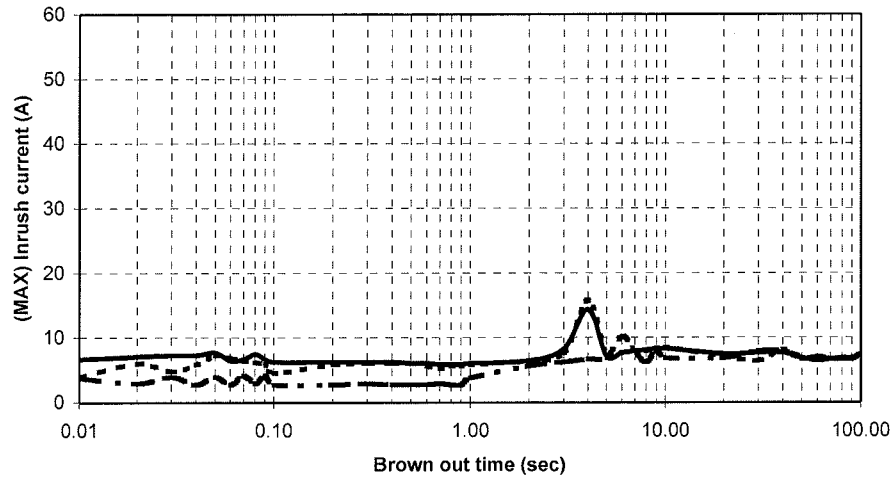


2-14 Inrush current characteristics

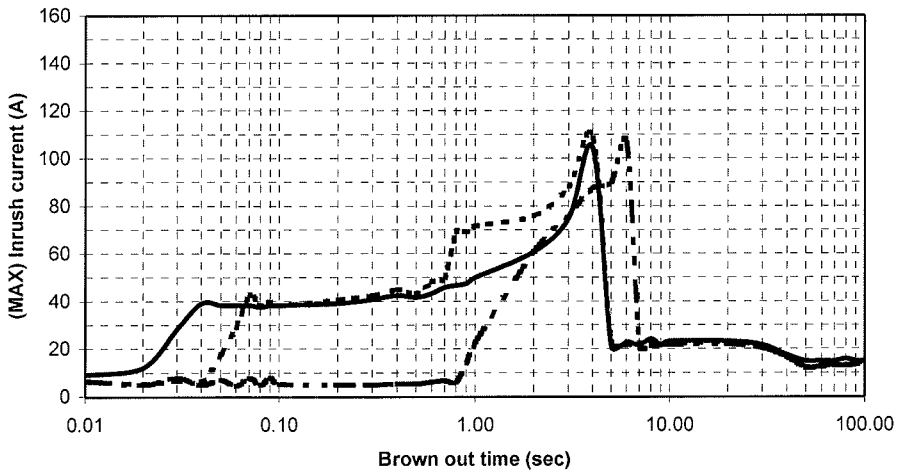
Conditions: Iout : 0% ——
: 50% – – – –
: 100% —·—·—
Ta : 25°C

36V

Vin = 115VAC



Vin = 230VAC

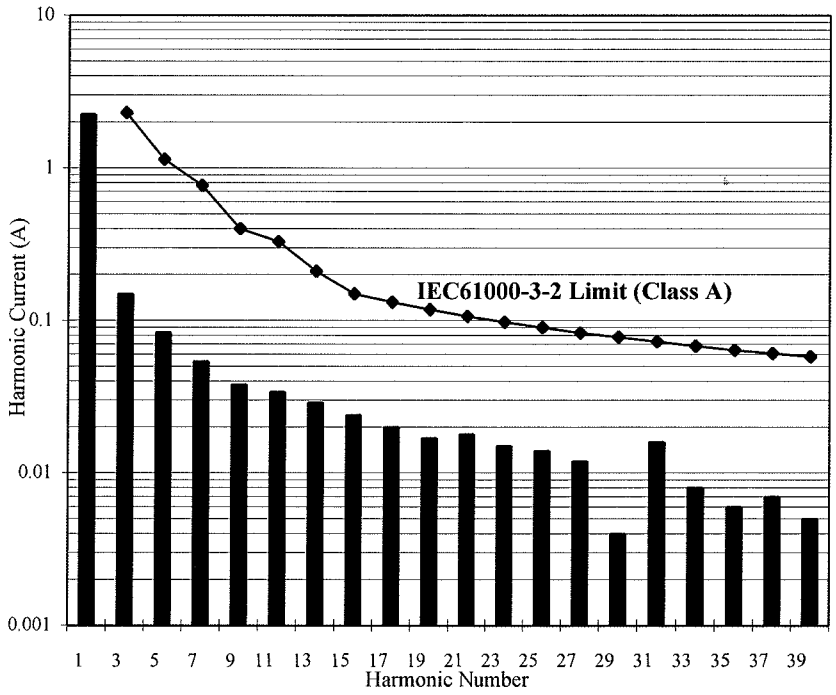


Above data included secondary inrush current.

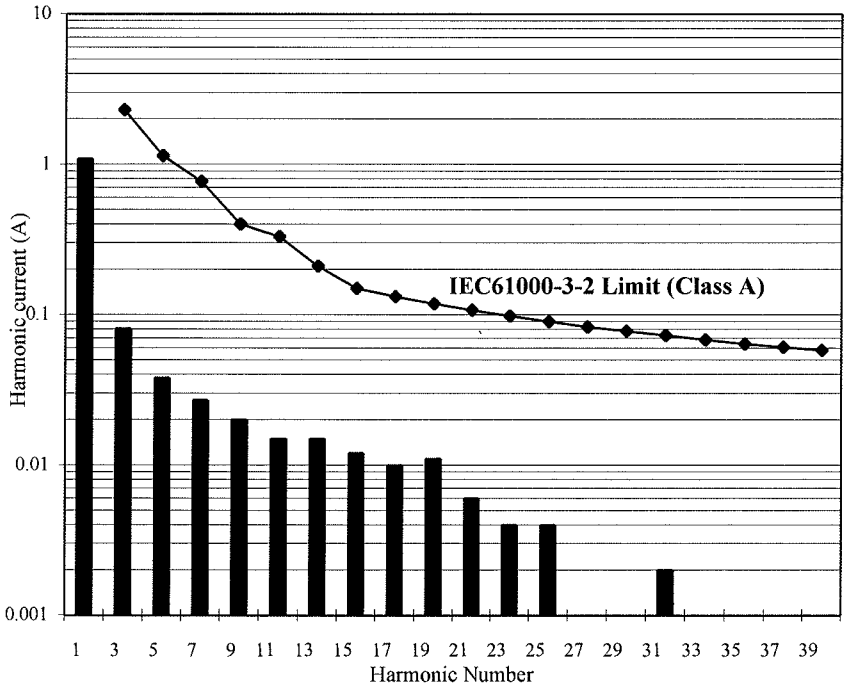
2-15 Input current harmonics

Conditions : Ta = 25°C
Vin = 115VAC
I = 21A

12V



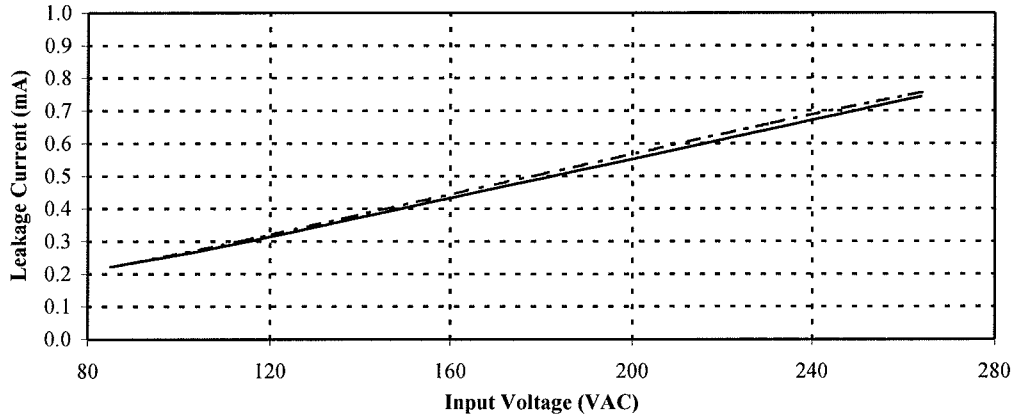
Conditions : Ta = 25°C
Vin = 230VAC
I = 21A



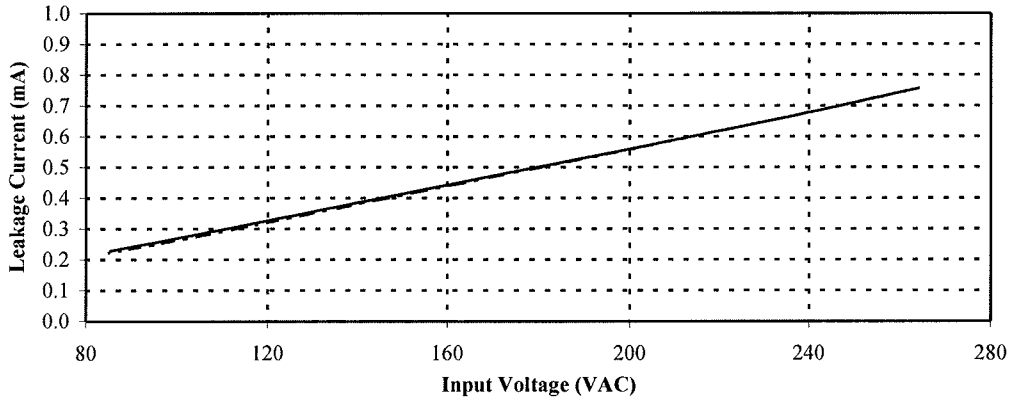
2.16 Leakage current characteristics

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

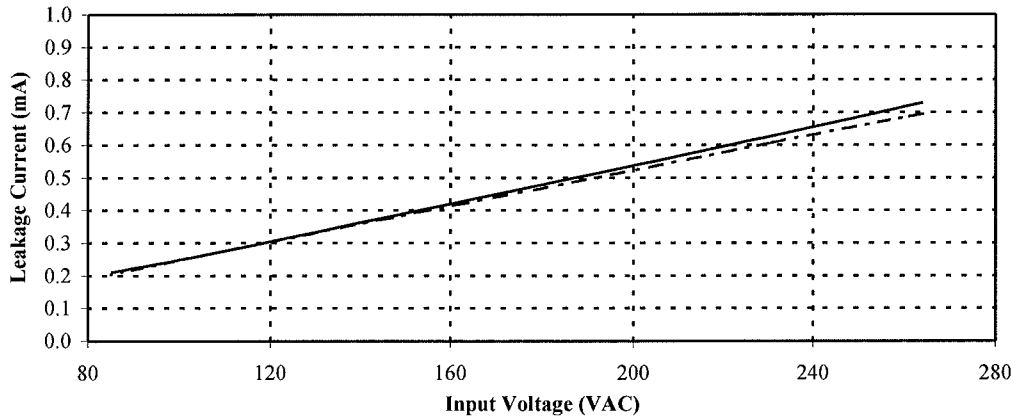
12V



24V



48V

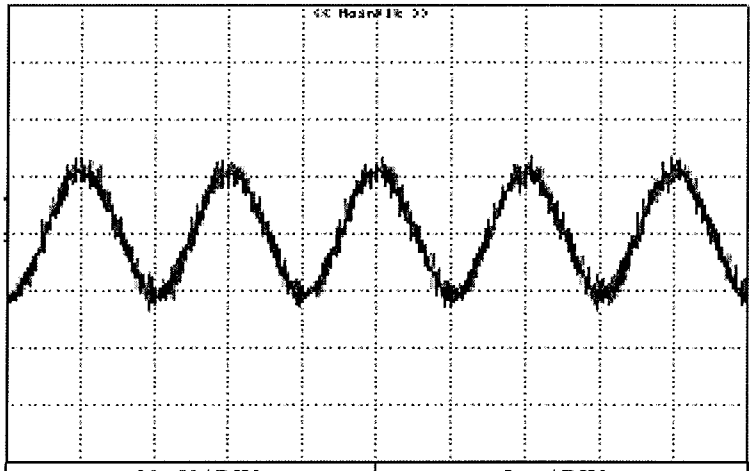


2-17 Output Ripple And Noise Waveform

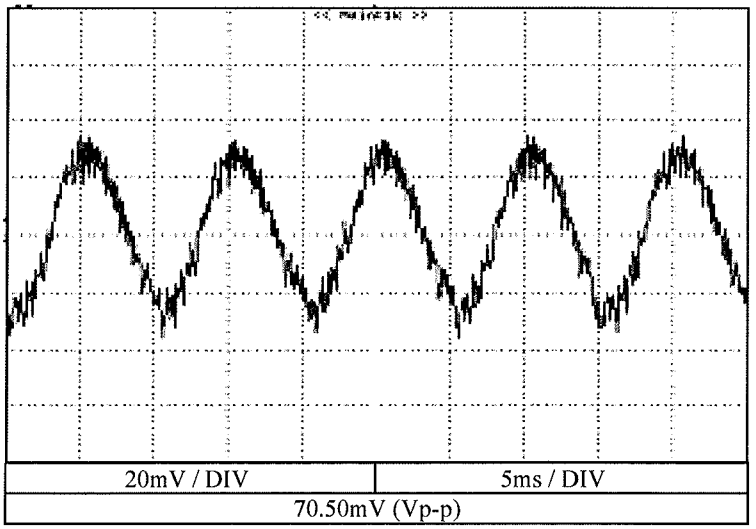
Conditions : Vin = 230VAC
Iout = 100%
Ta = 25°C

NORMAL MODE

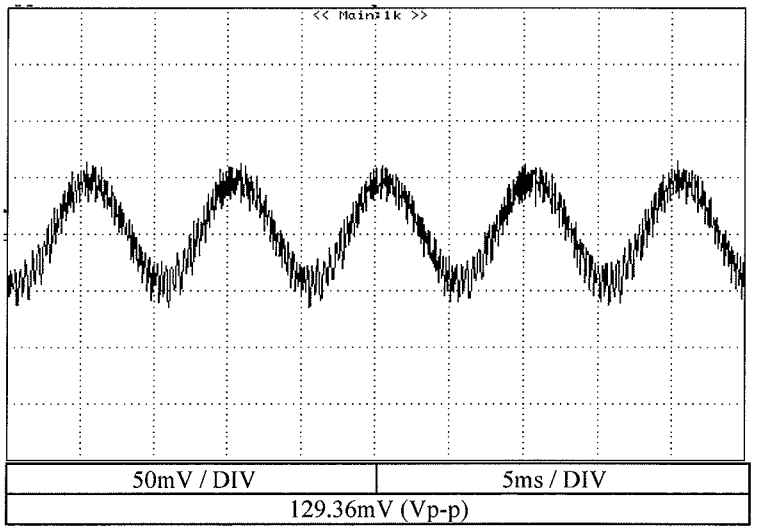
12V



24V



48V

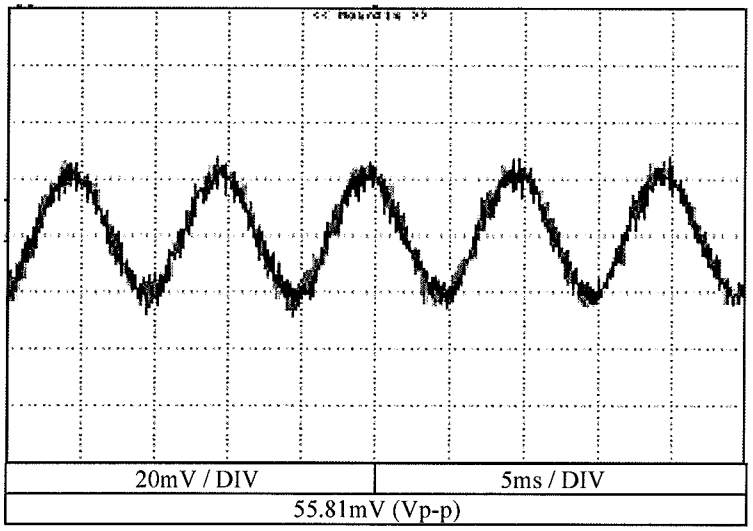


2-17 Output Ripple And Noise Waveform

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

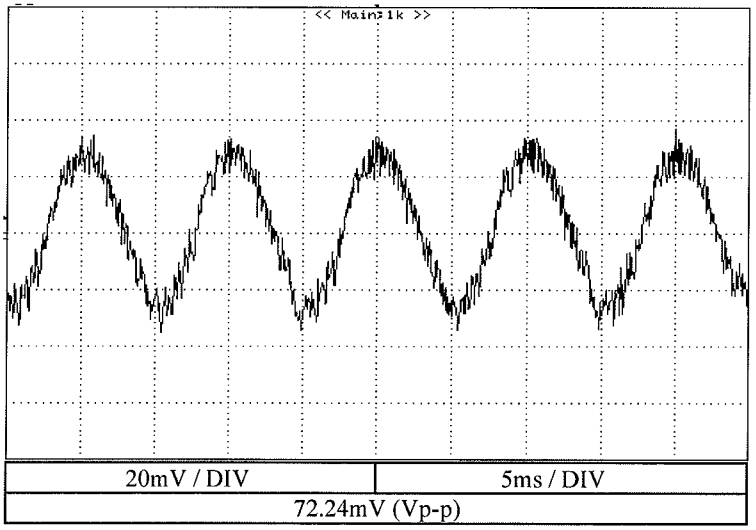
NORMAL + COMMON MODE

12V



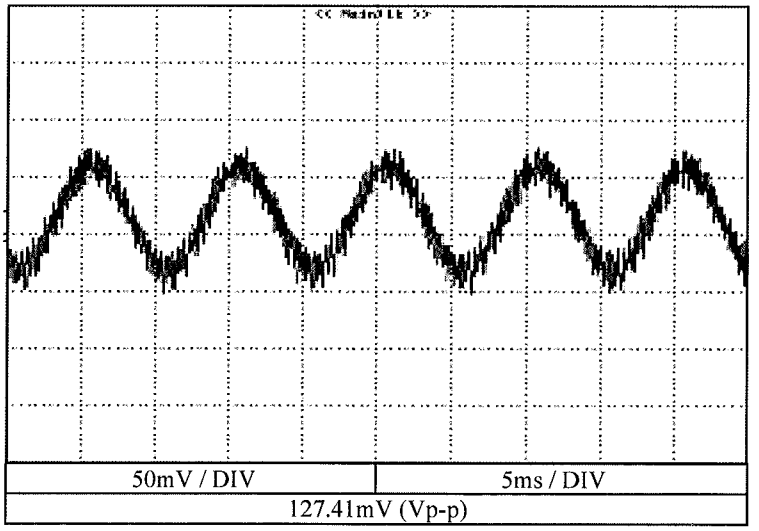
← Vout

24V



← Vout

48V



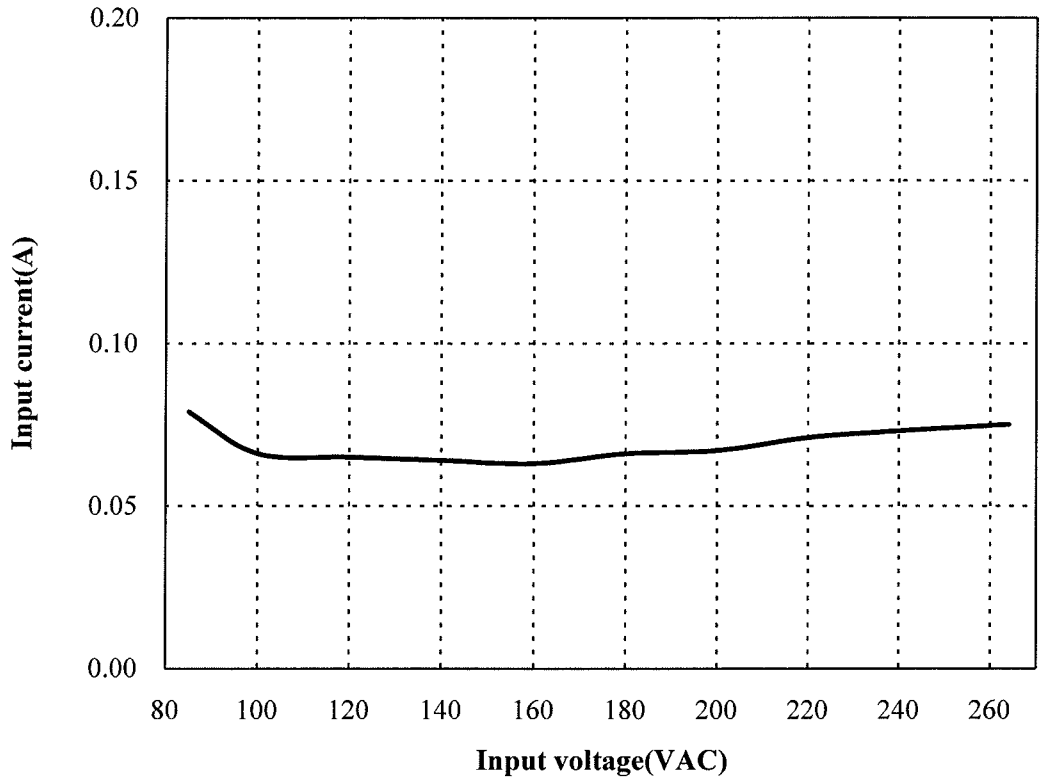
← Vout

2-18 Standby current

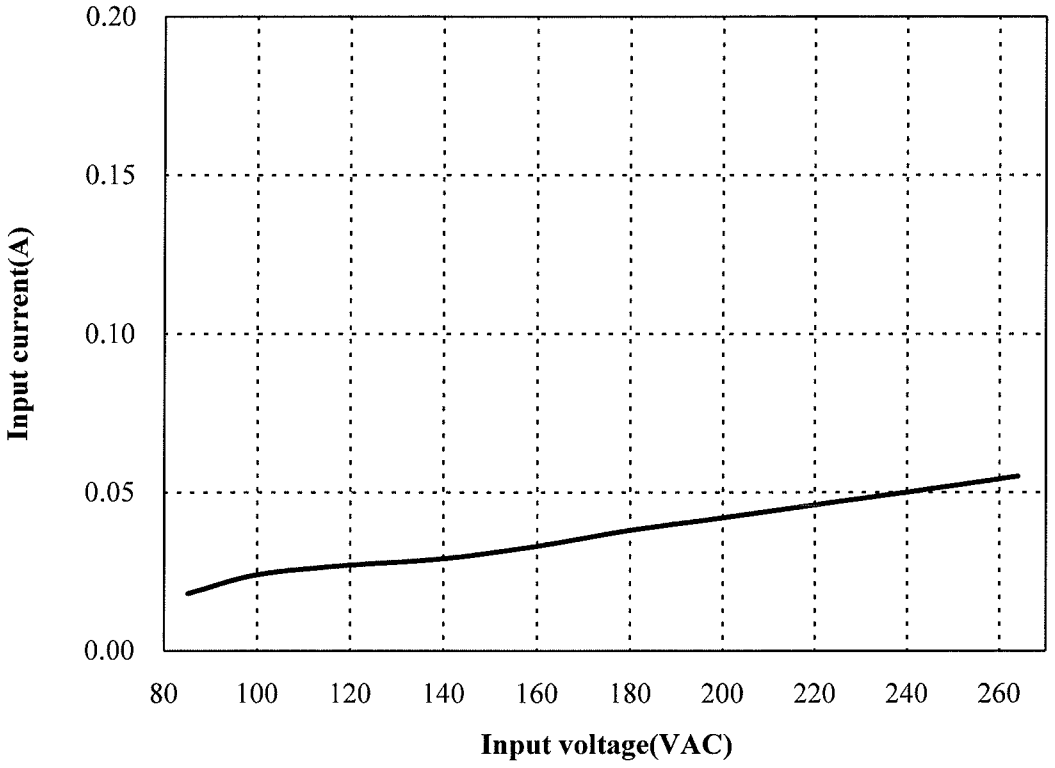
Conditions: Ta : 25°C

12V

Io=0%



Remote control OFF

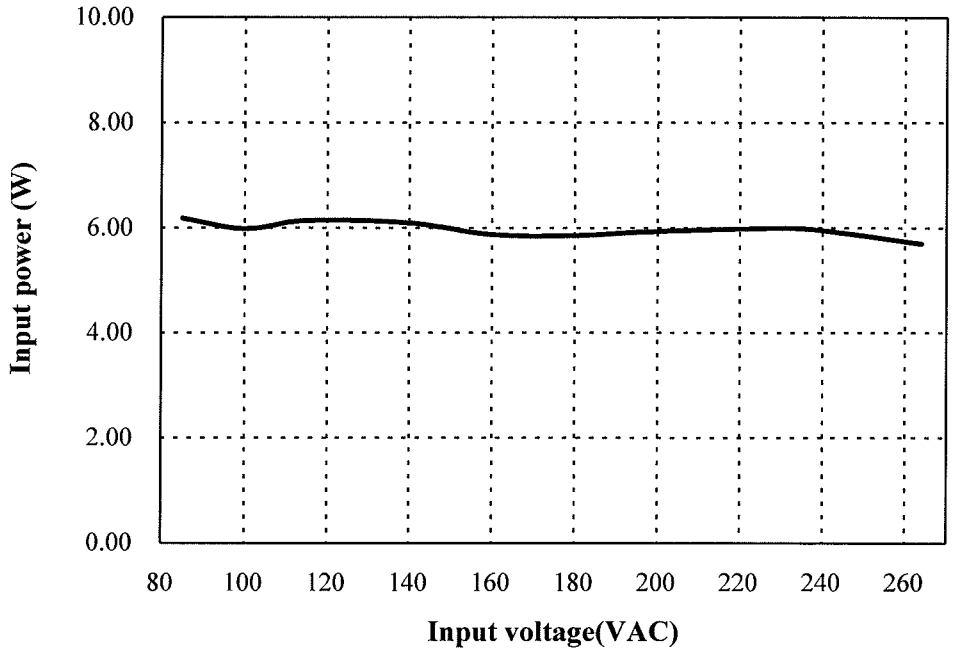


2-19 Standby power

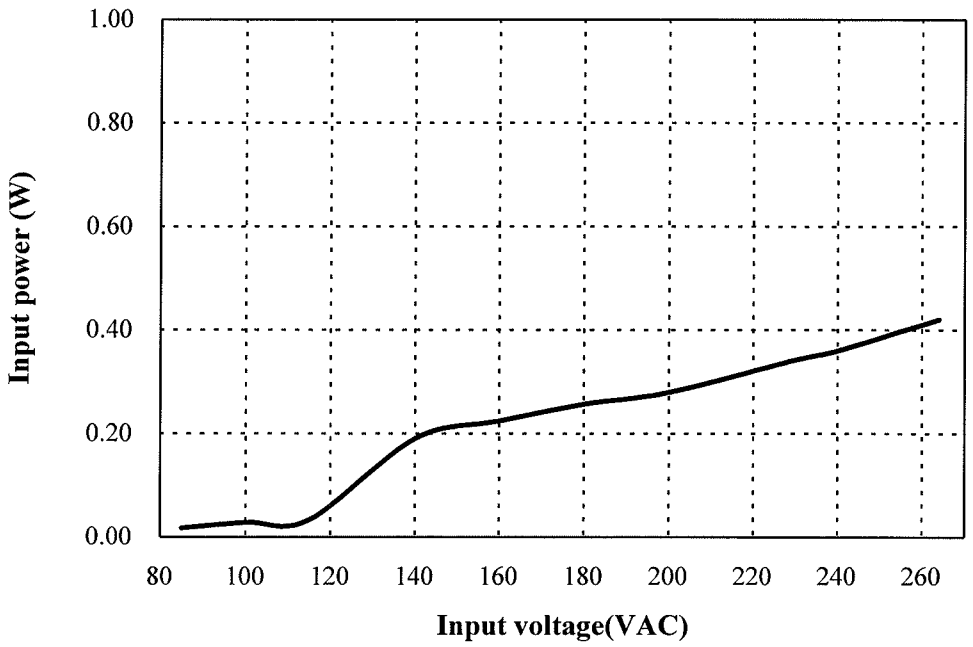
Conditions: Ta : 25°C

12V

Io=0%



Remote control OFF

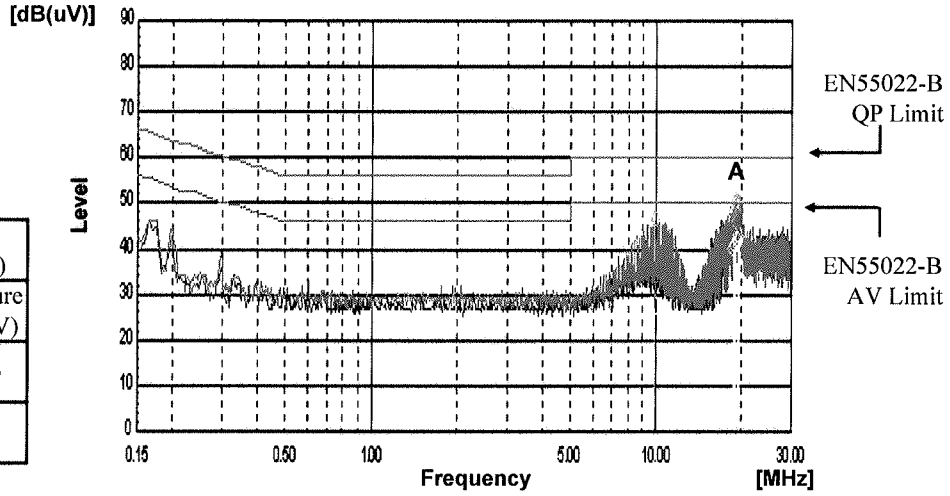


2-20 Electro-Magnetic Interference characteristics

Conditions: Vin : 115VAC
Iout : 100%

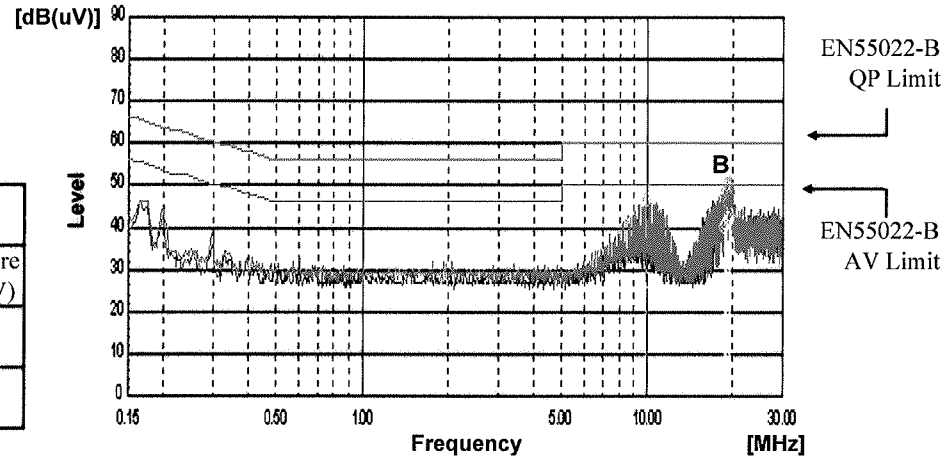
Conducted Emission

12V



Ref. / Data	Point A (19.455 MHz) Limit (dBµV)	Measure (dBµV)
QP	60.0	48.6
AV	50.0	43.3

Phase : N



Ref. / Data	Point B (19.37 MHz) Limit (dBµV)	Measure (dBµV)
QP	60.0	46.5
AV	50.0	41.3

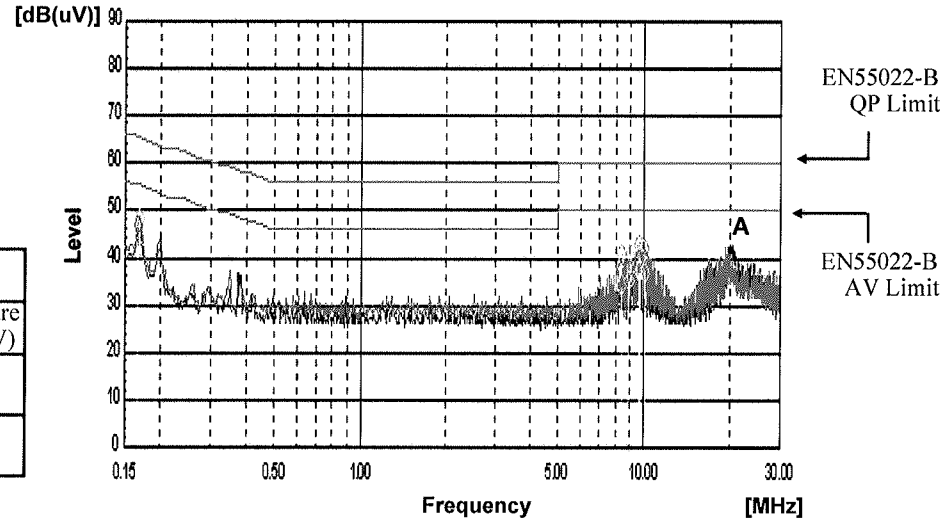
Phase : L

2-20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

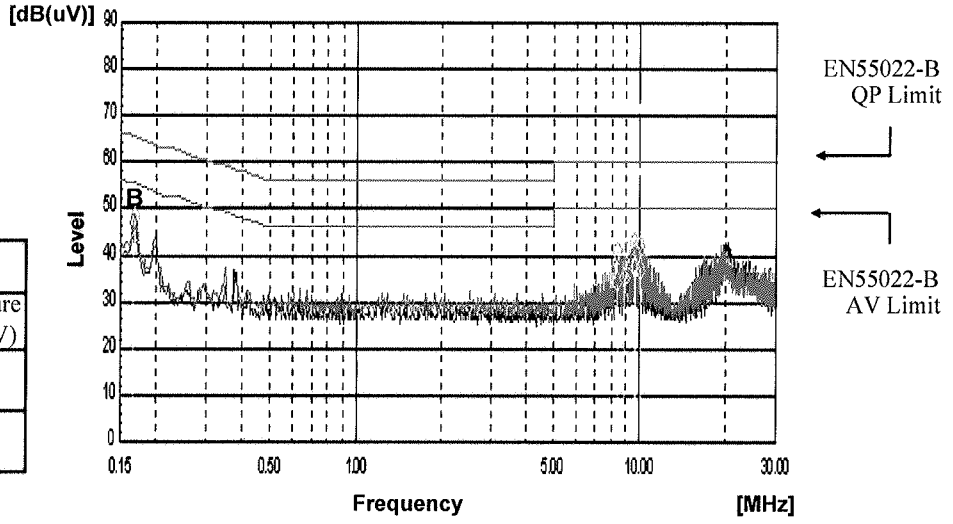
Conducted Emission

12V



Ref. / Data	Point A (21.22 MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	46.1
AV	50.0	41.6

Phase : N



Ref. / Data	Point B (0.167MHz) Limit (dBμV)	Measure (dBμV)
QP	65.1	46.8
AV	55.1	42.5

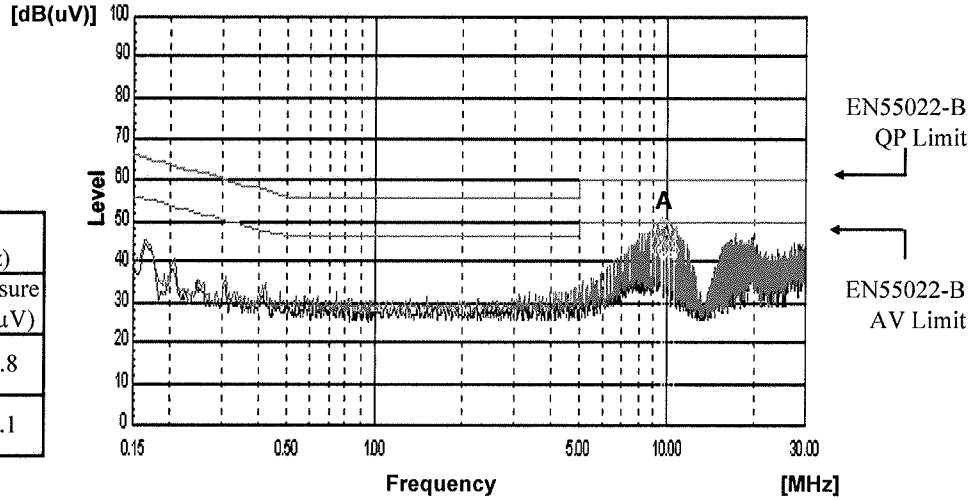
Phase : L

2-20 Electro-Magnetic Interference characteristics

Conditions: Vin : 115VAC
Iout : 100%

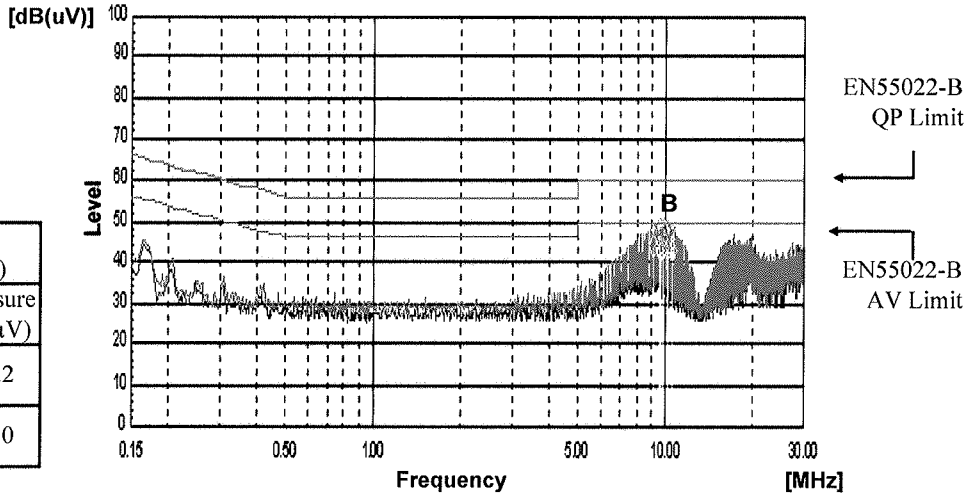
Conducted Emission

24V



Ref. / Data	Point A (9.10 MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	43.8
AV	50.0	39.1

Phase : N



Ref. / Data	Point B (9.11 MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	47.2
AV	50.0	44.0

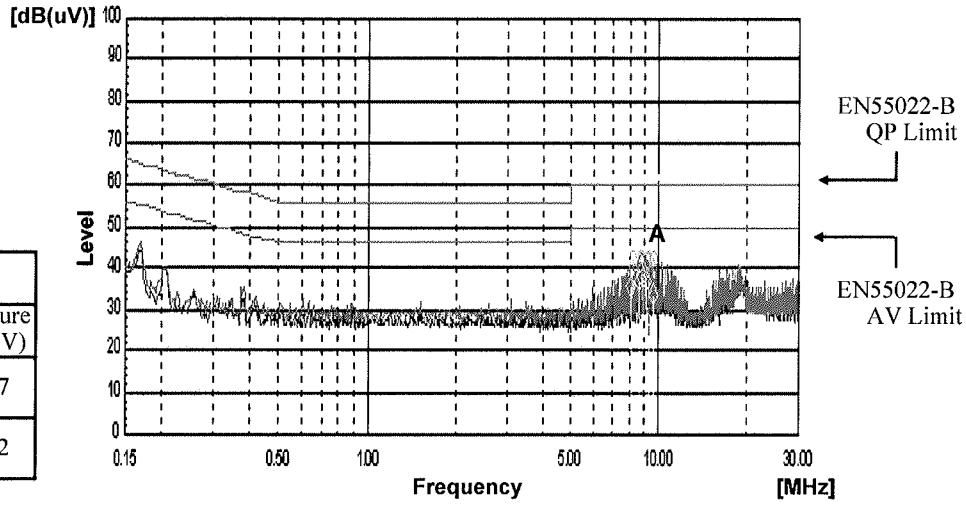
Phase : L

2-20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

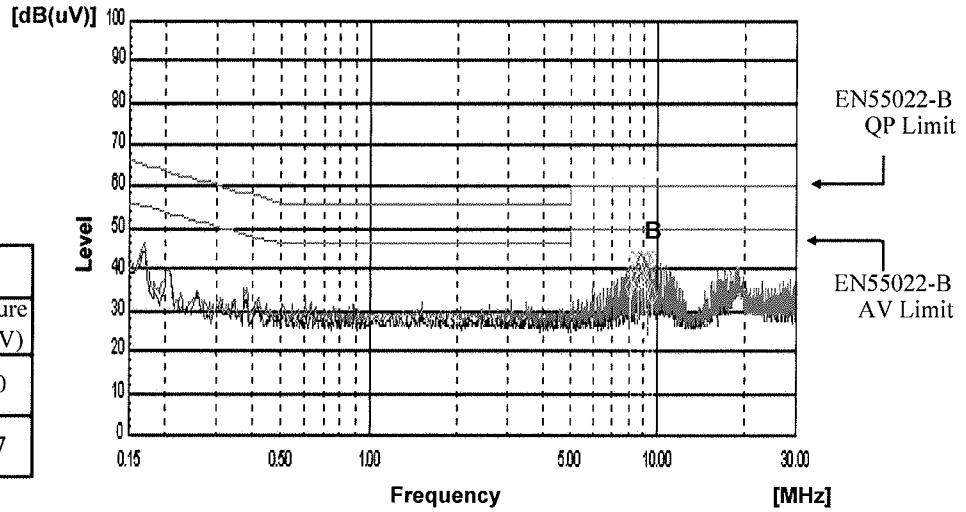
Conducted Emission

24V



Ref. / Data	Point A (8.90MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	41.7
AV	50.0	37.2

Phase : N



Ref. / Data	Point B (8.80MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	41.0
AV	50.0	37.7

Phase : L

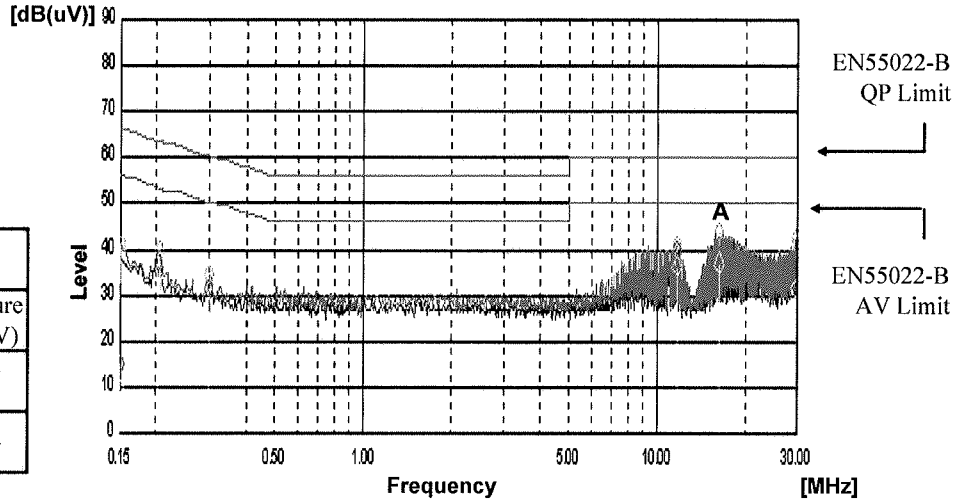
2-20 Electro-Magnetic Interference characteristics

Conditions: Vin : 115VAC
Iout : 100%

Conducted Emission

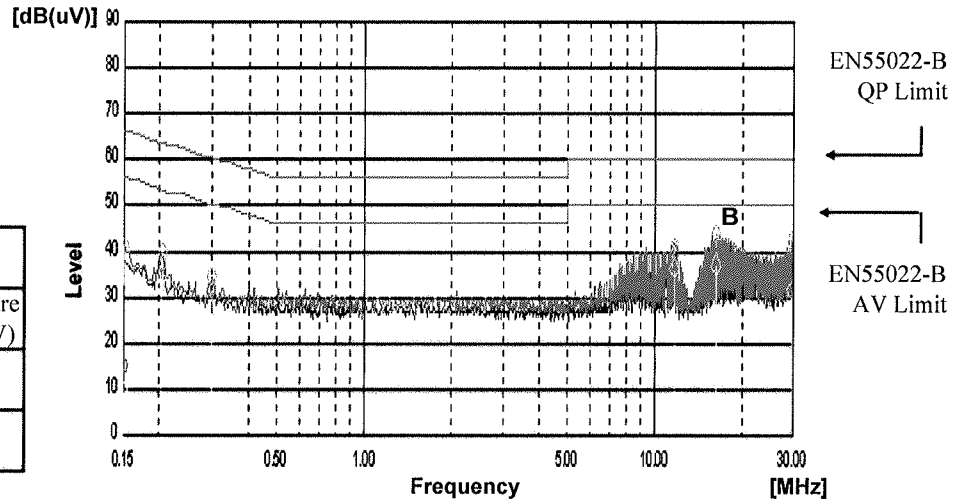
48V

Ref. / Data	Point A (15.58MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	43.5
AV	50.0	38.4



Phase : N

Ref. / Data	Point B (16.19MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	41.1
AV	50.0	36.9



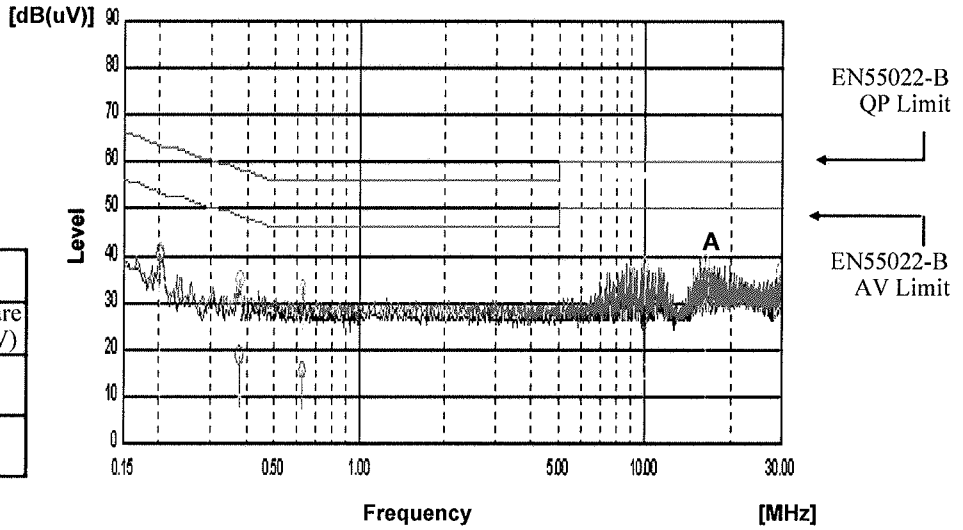
Phase : L

2-20 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

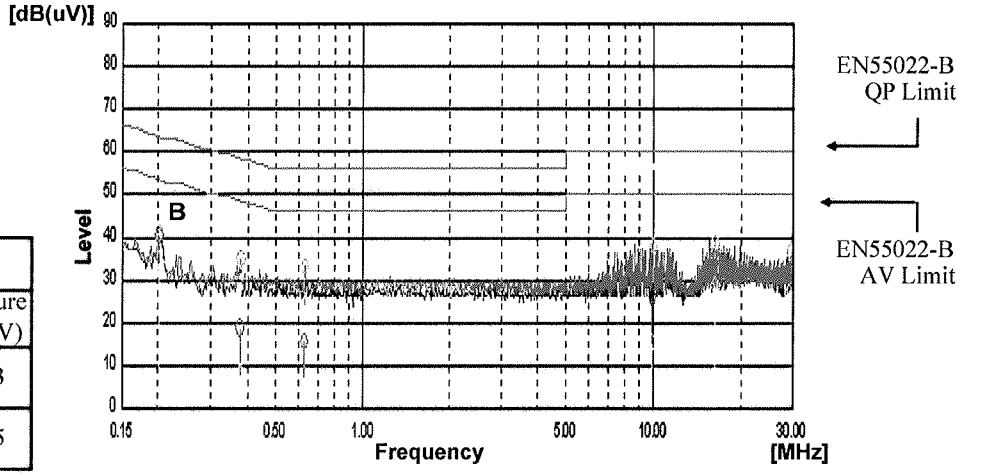
Conducted Emission

48V



Ref. / Data	Point A (15.49MHz) Limit (dBμV)	Measure (dBμV)
QP	60.0	38.6
AV	50.0	36.9

Phase : N



Ref. / Data	Point B (0.20MHz) Limit (dBμV)	Measure (dBμV)
QP	63.5	40.3
AV	53.5	34.5

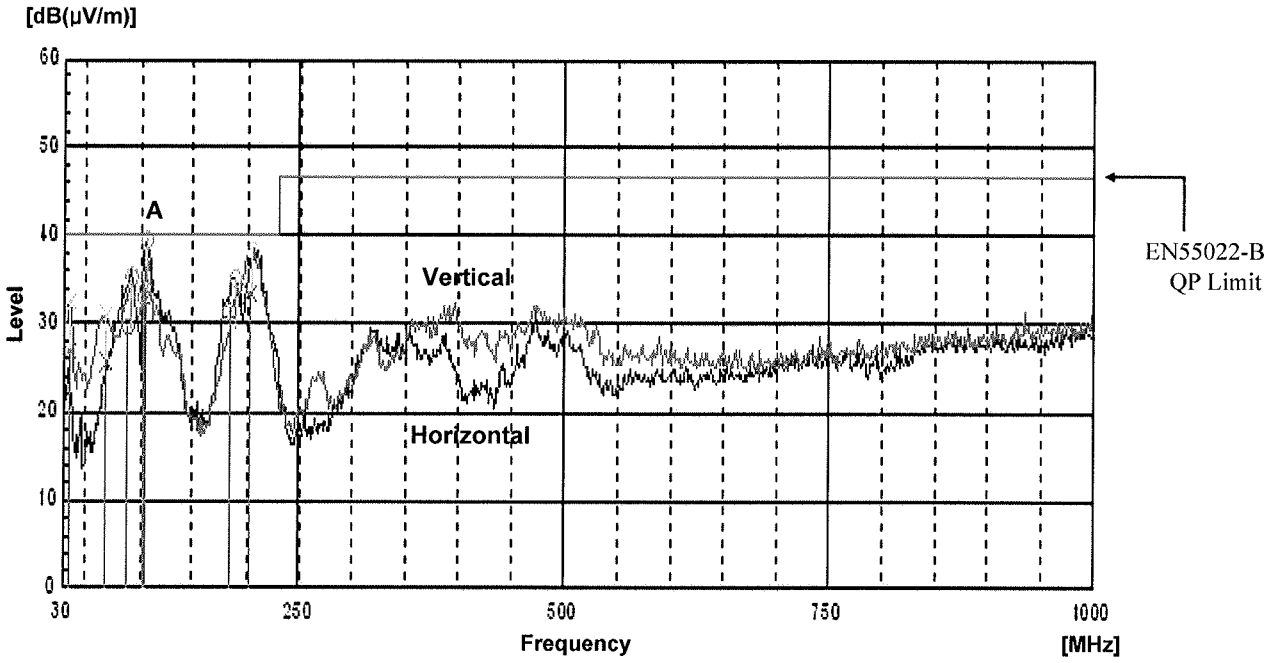
Phase : L

2-20 Electro-Magnetic Interference characteristics

Radiated Emission

Conditions: Vin : 115VAC
Iout : 100%

12V



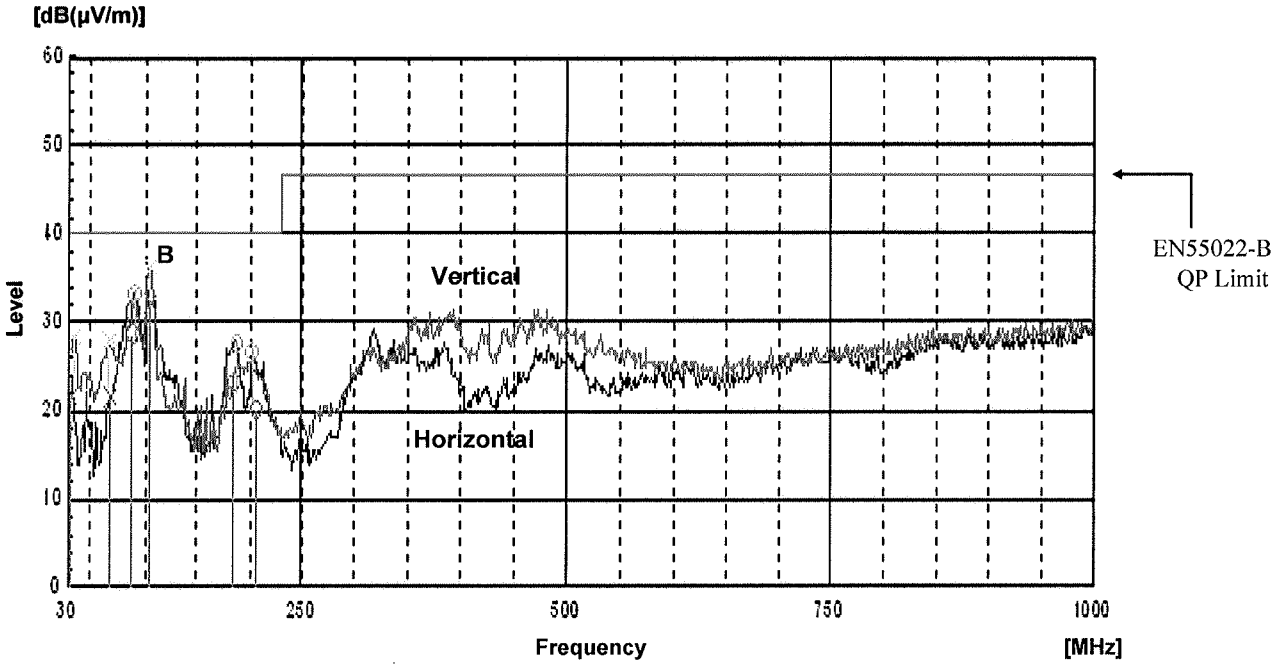
Point A (105.05MHz)		
Limit (dBμV/m)	Measure (dBμV/m)	(P)
40.0	34.0	V

2-20 Electro-Magnetic Interference characteristics

Radiated Emission

Conditions: Vin : 230VAC
Iout : 100%

12V



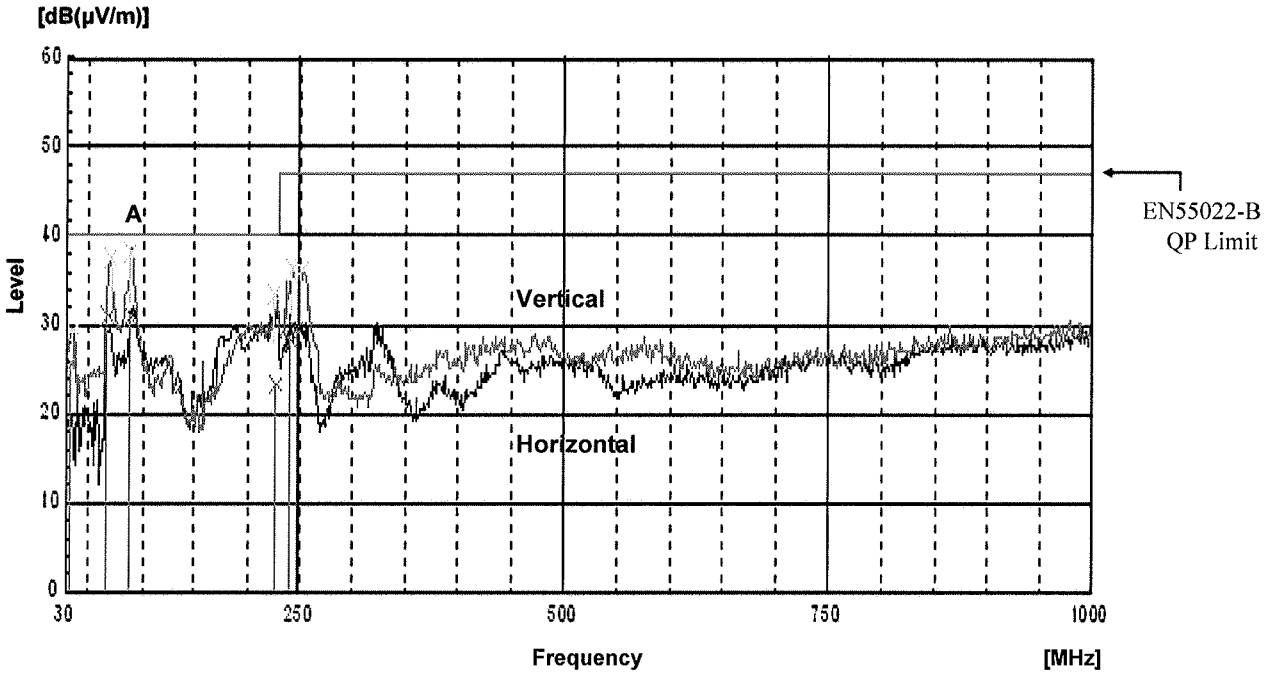
Point B (104.72MHz)		
Limit (dBμV/m)	Measure (dBμV/m)	(P)
40.0	32.2	V

2-20 Electro-Magnetic Interference characteristics

Radiated Emission

Conditions: Vin : 115VAC
Iout : 100%

24V



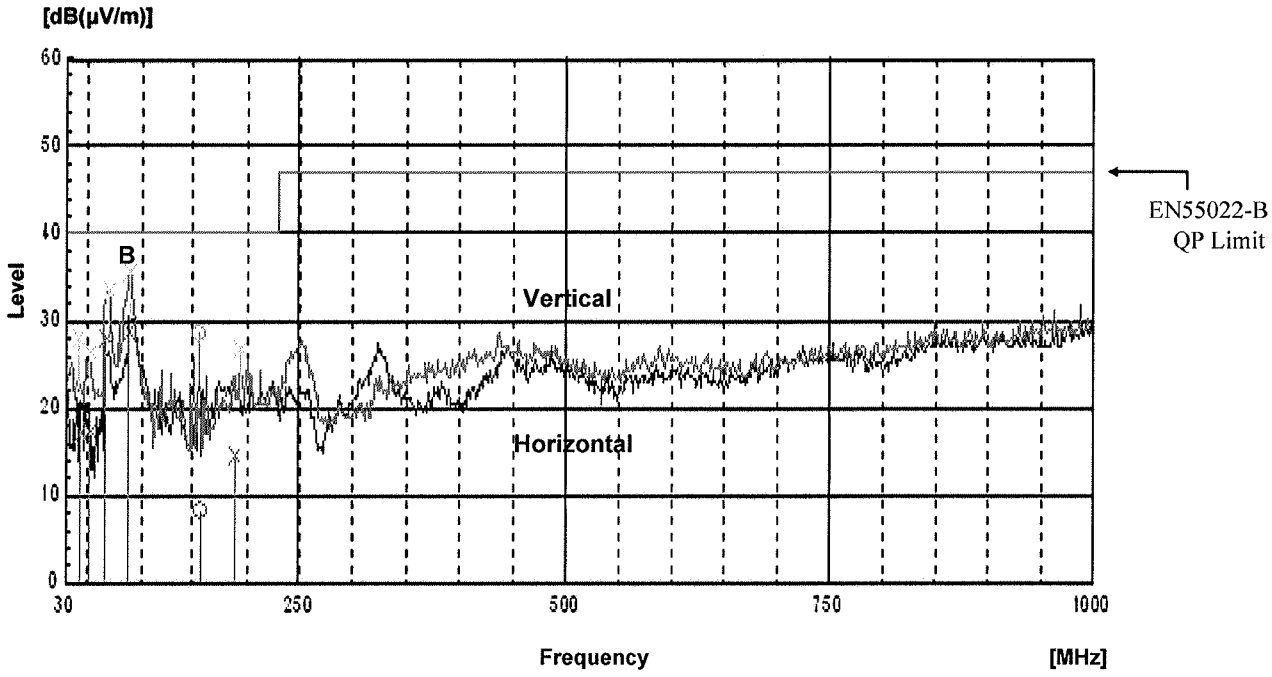
Point A (87.82MHz)		
Limit (dBμV/m)	Measure (dBμV/m)	(P)
40.0	31.1	V

2-20 Electro-Magnetic Interference characteristics

Radiated Emission

Conditions: Vin : 230VAC
Iout : 100%

24V



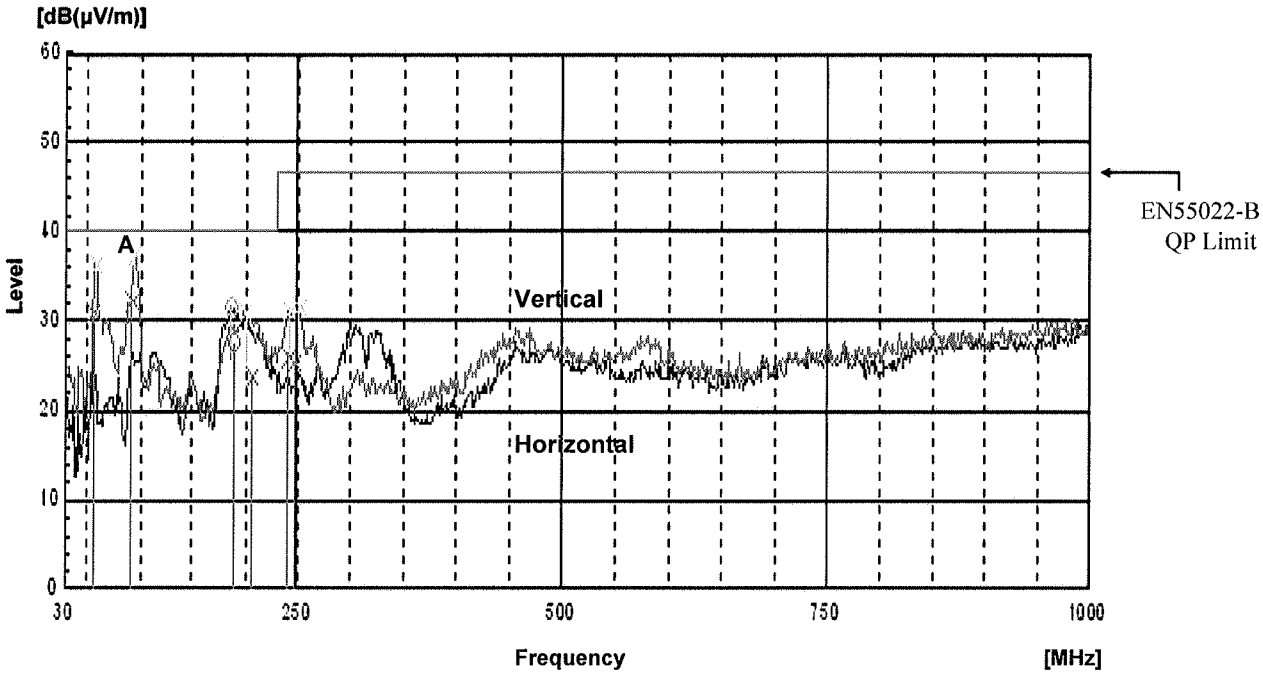
Point B (87.87MHz)		
Limit (dBμV/m)	Measure (dBμV/m)	(P)
40.0	28.8	V

2-20 Electro-Magnetic Interference characteristics

Radiated Emission

Conditions: Vin : 115VAC
Iout : 100%

48V



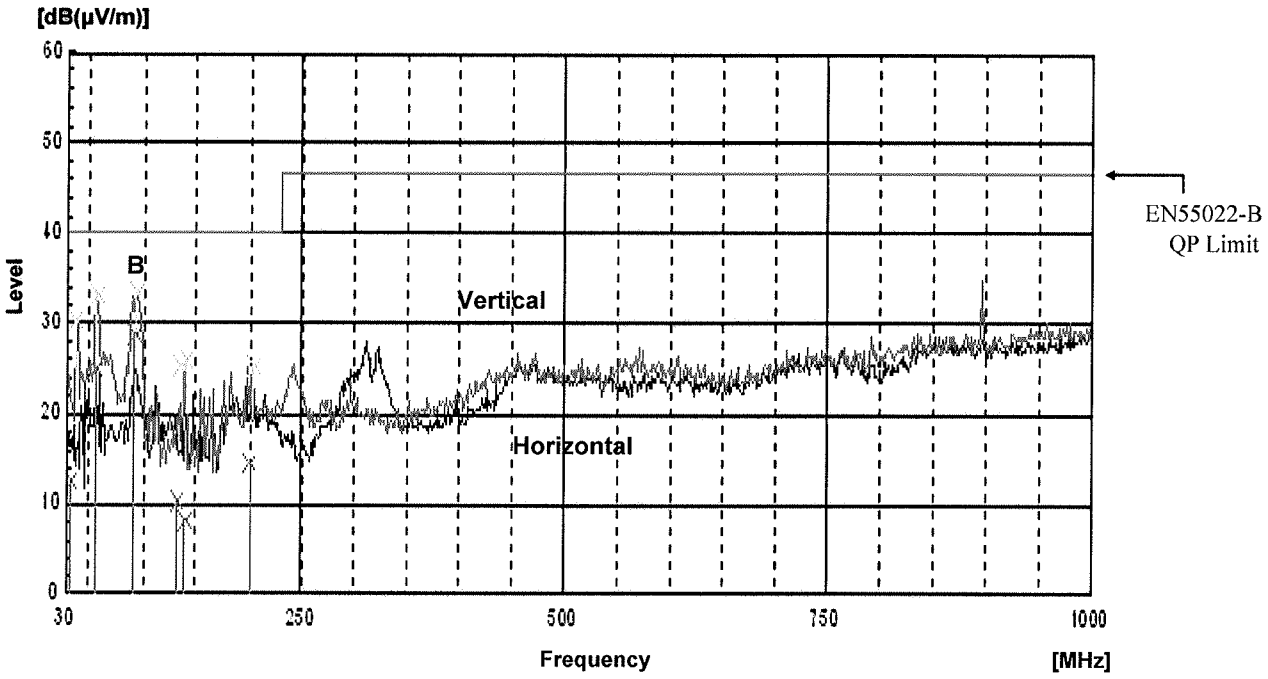
Point A (92.64MHz)		
Limit (dBμV/m)	Measure (dBμV/m)	(P)
40.0	32.2	V

2-20 Electro-Magnetic Interference characteristics

Radiated Emission

Conditions: Vin : 230VAC
Iout : 100%

48V



Point B (91.88MHz)		
Limit (dBμV/m)	Measure (dBμV/m)	(P)
40.0	28.8	V