

LS25

EVALUATION DATA

DWG.No PA580-53-01		
APPD	CHK	DWG
<i>Jeff</i> 5-Jan-09	<i>Ramona</i> 5-Jan-09	<i>M.</i> 5-Jan-09

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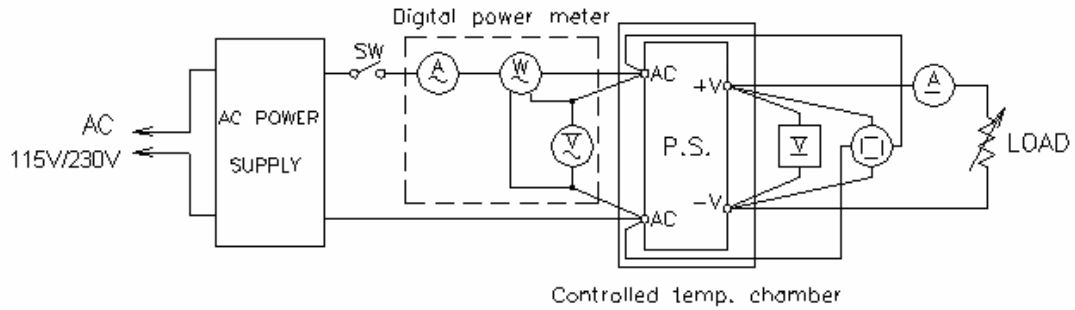
Terminology Used

	Definition
V_{in} Input voltage
V_{out} Output Voltage
I_{in} Input Current
I_{out} Output Current
T_a Ambient temperature

1. Evaluation Method

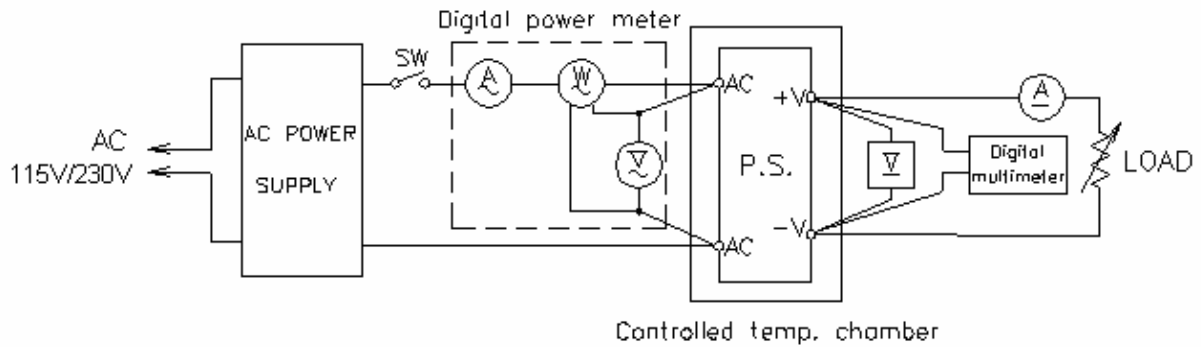
1-1 Circuit used for determination

- (1) Steady state data



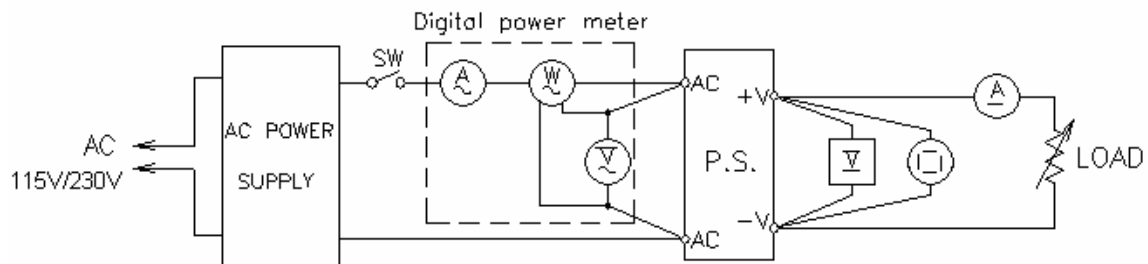
- (2) Warm up voltage drift characteristics
Same as Steady state data

- (3) Over current protection (OCP) characteristics



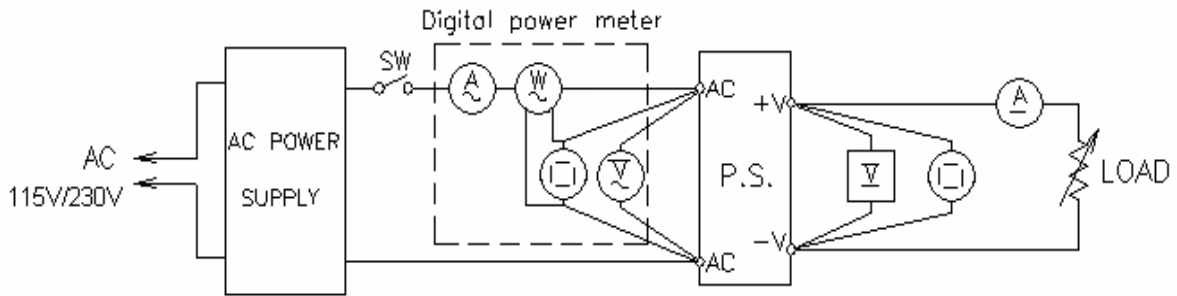
- (4) Over voltage protection (OVP) characteristics
Same as Steady state data

- (5) Output rise characteristics



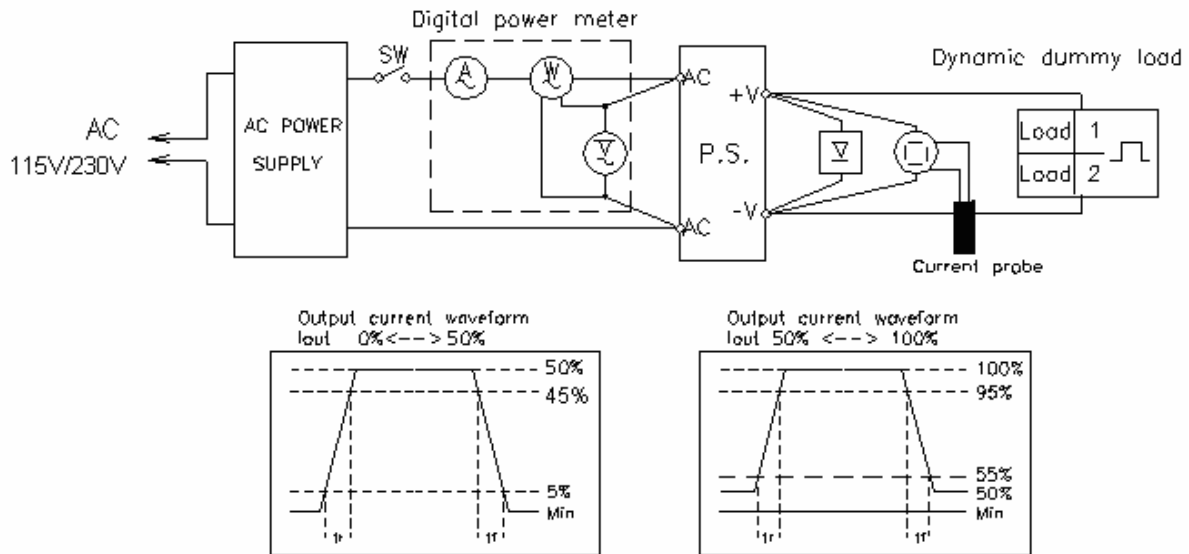
- (6) Output fall characteristics
Same as Output rise characteristics

- (7) Response to brown out characteristics

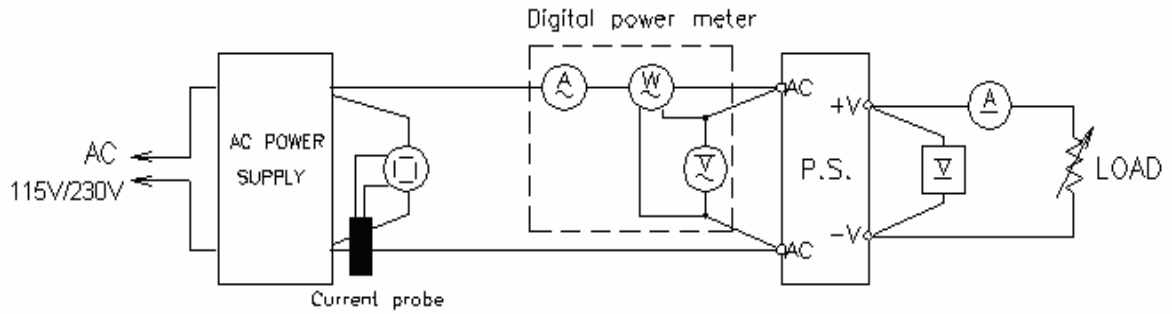


- (8) Dynamic line characteristics
Same as Response to brown out characteristics.

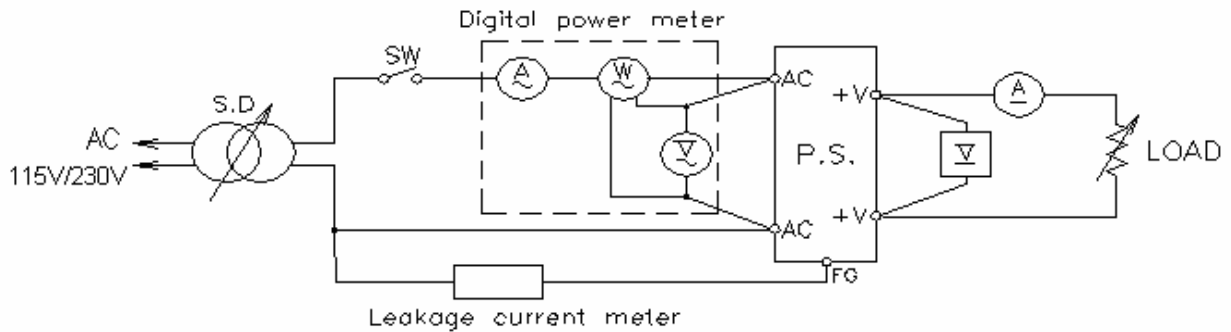
- (9) Dynamic load response characteristics



(10) Inrush current characteristics



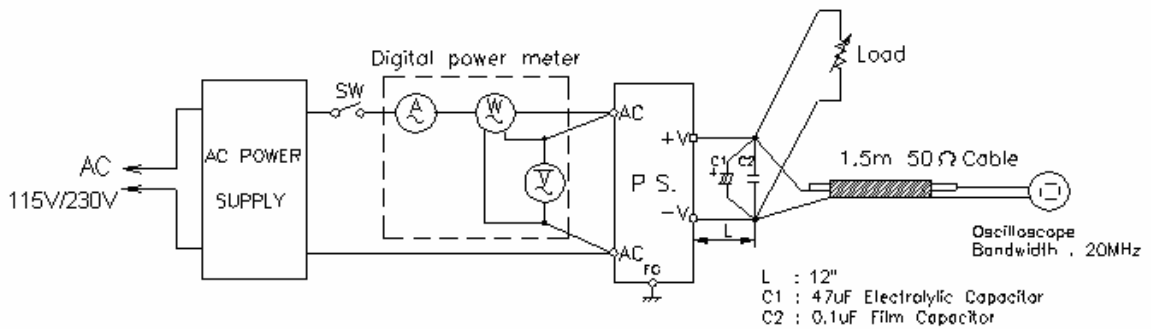
(11) Leakage current characteristics



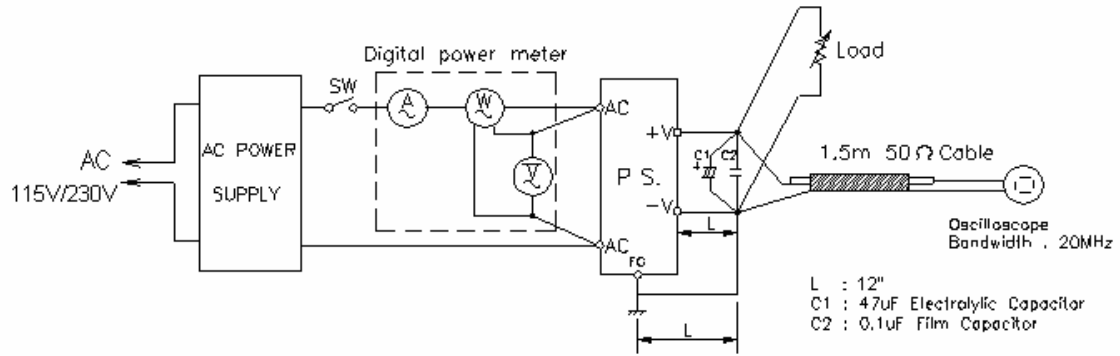
Range used---AC (For SIMPSON TYPE 228)

(12) Output ripple and noise waveform

(a) Normal Mode (using a 12" twisted pair terminated with 0.1uF and 47uF capacitor at 20MHz)

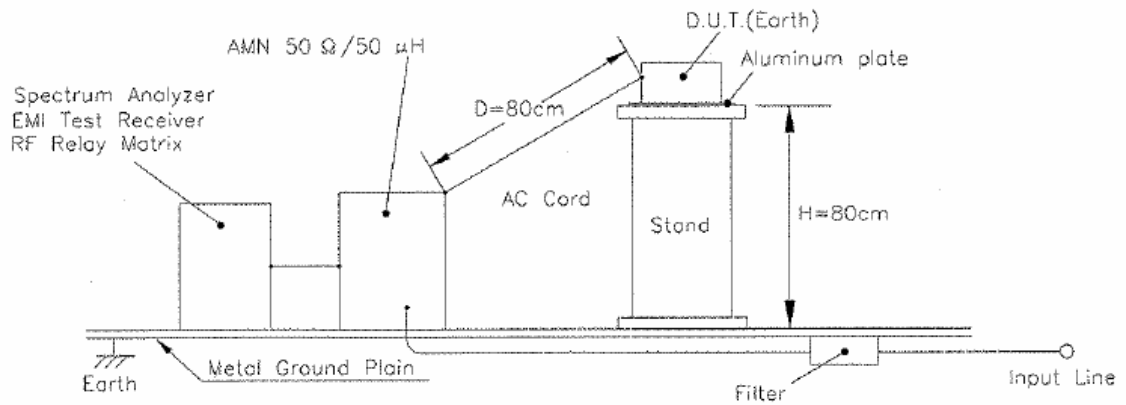


(b) Normal +Common Mode

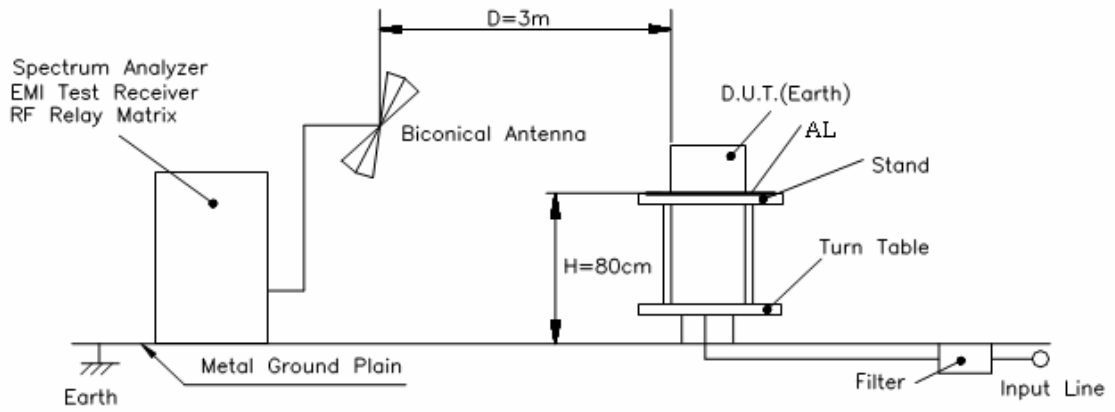


(13) Electro-Magnetic Interference characteristics

(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 MULTIMETER	FLUKE	89 VI
3	DIGITAL POWER METER	YOKOGAWA	WT210
4	CURRENT PROBE/AMPLIFIER	TEKTRONIX	TCP404XL/TCPA400
5	DYNAMIC DUMMY LOAD	CHROMA	63030/63201
6	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ1004W
7	CONTROLLED TEMP. CHAMBER	ESPEC	SU-241
8	LEAKAGE CURRENT METER	SIMPSON	228
9	AC SOURCE	KIKUSUI	PCR-2000L
10	AC SOURCE	CHROMA	6530
11	POWER ANALYZER	CHROMA	6630
12	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI
13	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESI26
14	LISN	ROHDE&SCHWARZ	ENV216
15	ANTENNA	ROHDE&SCHWARZ	HL562

2. Characteristics

2-1 Steady State Data

(1) Regulation - Line and Load, Temperature Drift

5V

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

Iout \ Vin	88VAC	115VAC	230VAC	264VAC	line regulation	
0%	5.023	5.023	5.023	5.022	0.001V	0.020%
50%	5.016	5.015	5.016	5.015	0.001V	0.020%
100%	5.008	5.008	5.007	5.007	0.001V	0.020%
load	0.015V	0.015V	0.016V	0.015V		
regulation	0.300%	0.300%	0.320%	0.300%		

2. Temperature drift Conditions; Vin = 115Vac
Iout = 100%

Ta	-25°C	25°C	50°C	temperature stability
Vout	5.015	5.008	5.001	0.014V 0.28%

12V

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

Iout \ Vin	88VAC	115VAC	230VAC	264VAC	line regulation	
0%	11.983	11.983	11.984	11.982	0.002V	0.017%
50%	11.981	11.981	11.981	11.98	0.001V	0.008%
100%	11.977	11.976	11.977	11.976	0.001V	0.008%
load	0.006V	0.007V	0.007V	0.006V		
regulation	0.050%	0.058%	0.058%	0.050%		

2. Temperature drift Conditions; Vin = 115Vac
Iout = 100%

Ta	-25°C	25°C	50°C	temperature stability
Vout	12.044	11.976	11.996	0.068V 0.567%

24V

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

Iout \ Vin	88VAC	115VAC	230VAC	264VAC	line regulation	
0%	24.029	24.029	24.034	24.034	0.005V	0.021%
50%	24.039	24.029	24.029	24.039	0.010V	0.042%
100%	24.024	24.024	24.024	24.024	0.000V	0.000%
load	0.015V	0.005V	0.010V	0.015V		
regulation	0.063%	0.021%	0.042%	0.063%		

2. Temperature drift Conditions; Vin = 115Vac
Iout = 100%

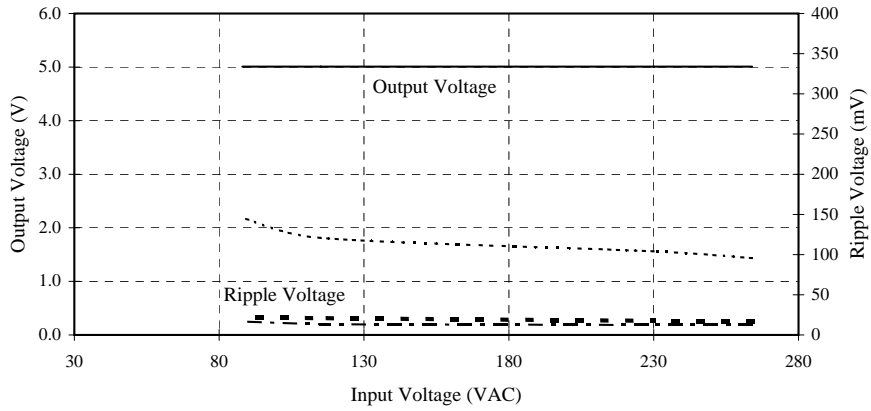
Ta	-25°C	25°C	50°C	temperature stability
Vout	24.039	24.024	23.928	0.111V 0.46%

2-1 Steady State Data

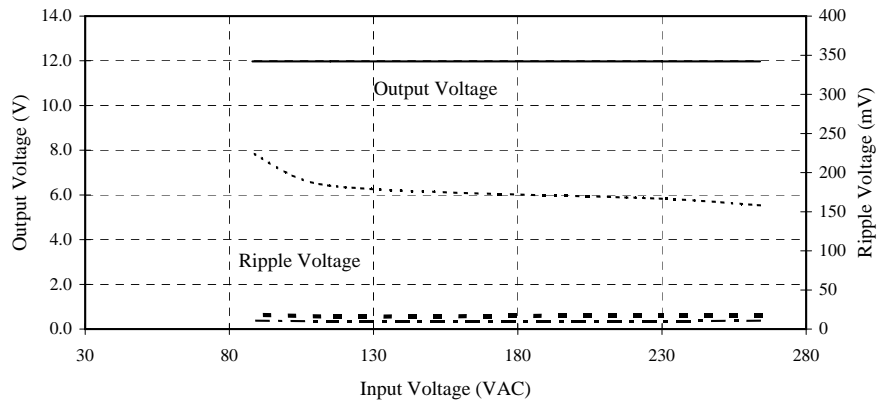
(2) Output Voltage And Ripple Voltage Vs Input Voltage

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

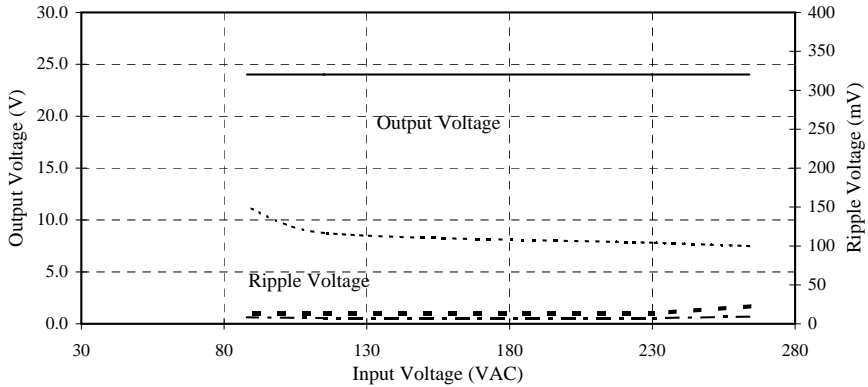
5V



12V



24V

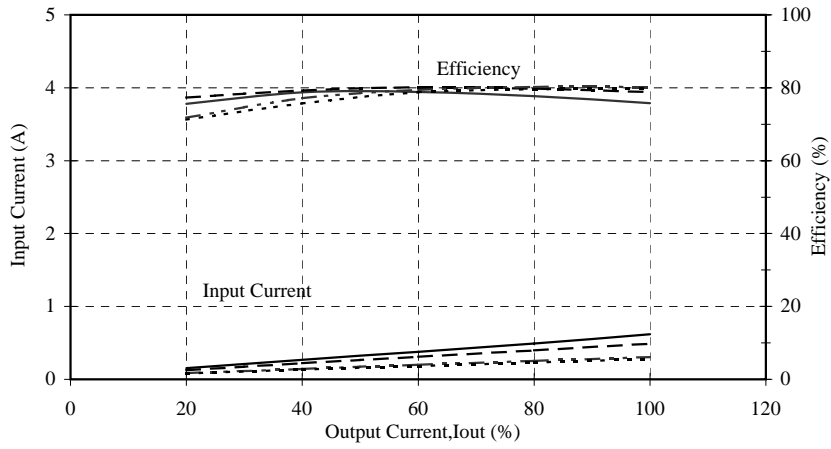


2-1 Steady State Data

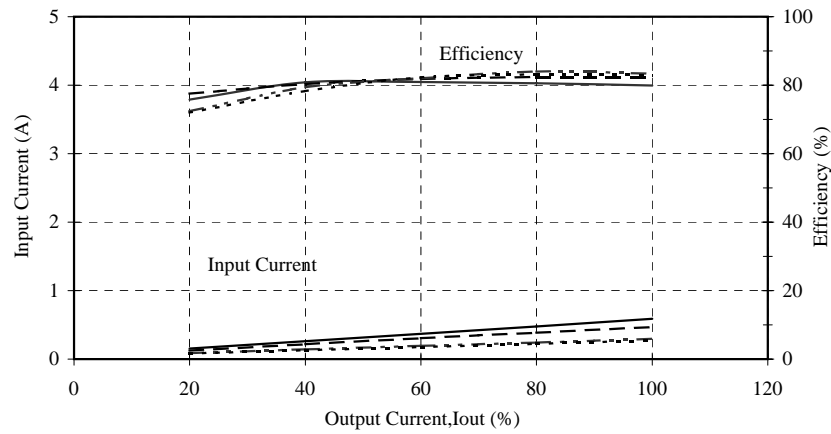
(3) Efficiency And Input Current Vs Output Current

Conditions: $T_a = 25^\circ\text{C}$
 $V_{in} = 88\text{VAC}$
 115VAC
 230VAC
 264VAC

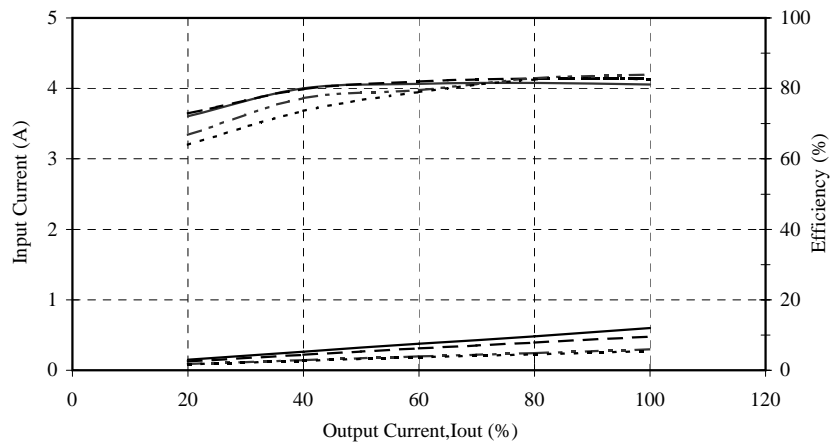
5V



12V



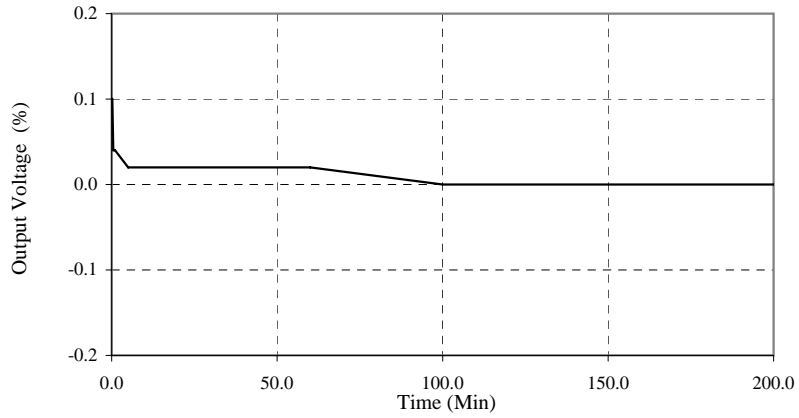
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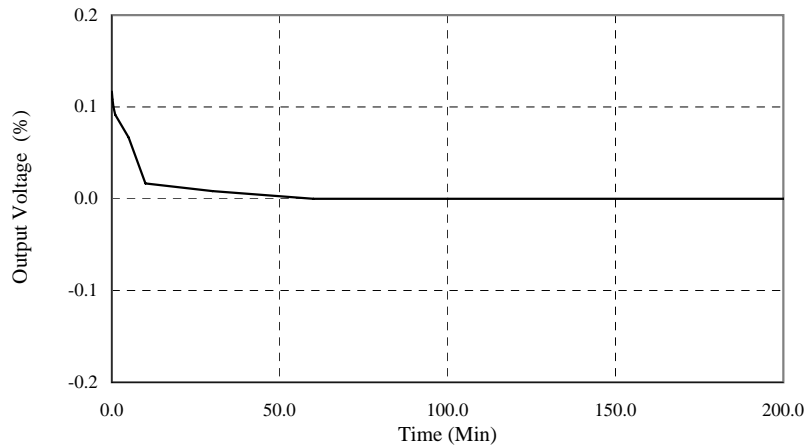
2-2 Warm up voltage drift characteristics

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

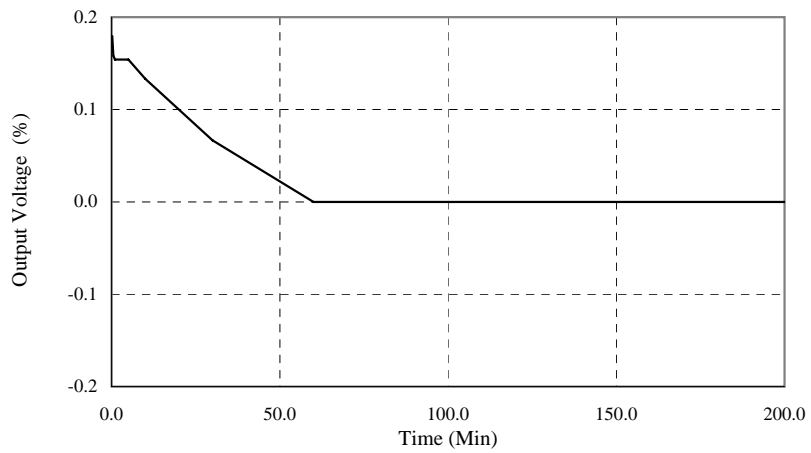
5V



12V



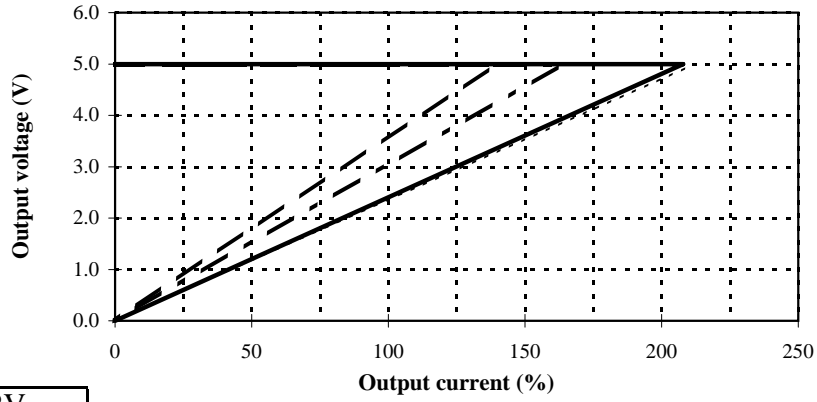
24V



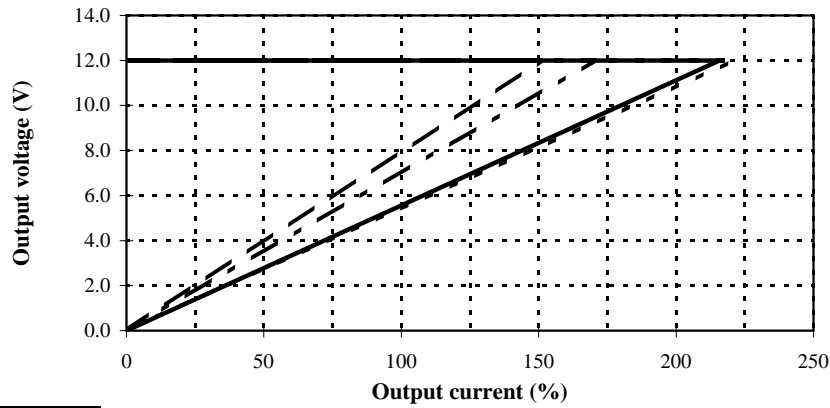
2-3 Over current protection (OCP) characteristics

Conditions: Vin : 88 VAC -----
115 VAC -.-.-.-.-
230 VAC —————
264 VAC -.-.-.-.-
Ta : 25°C

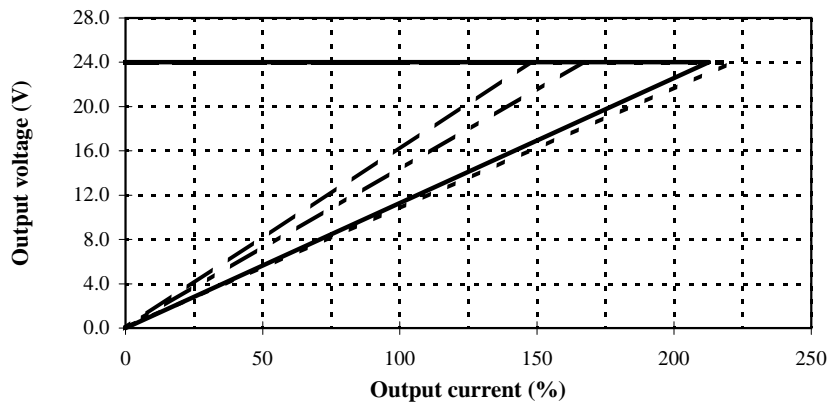
5V



12V



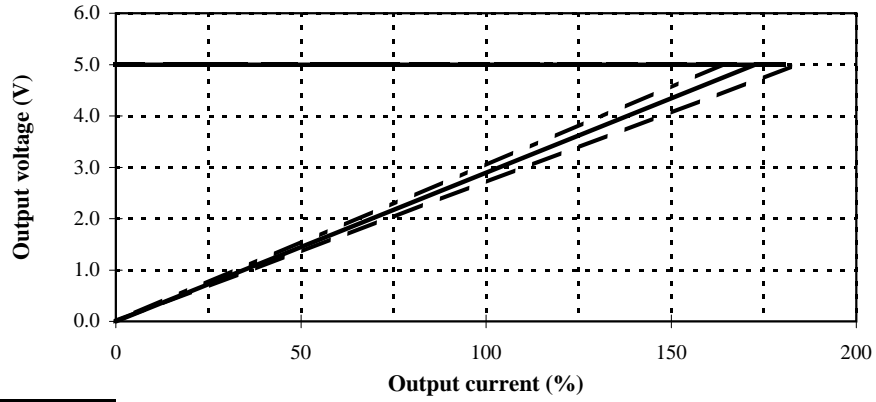
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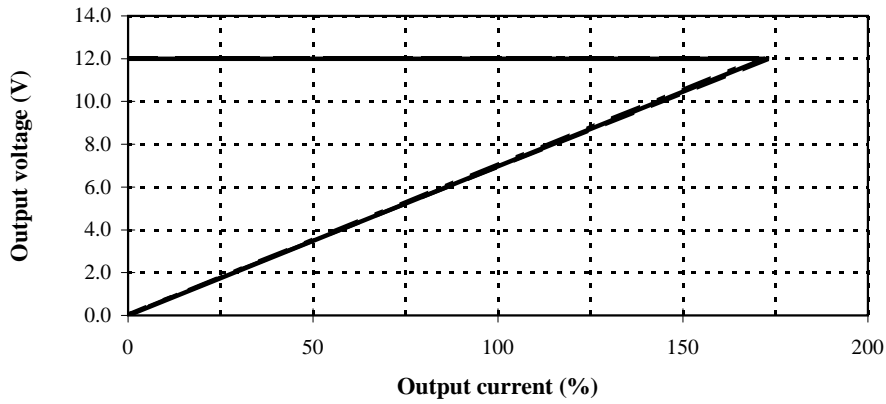
2-3 Over current protection (OCP) characteristics

Conditions: Vin : 115VAC
Ta : -25°C - - - - -
25°C - ·····
50°C - ———

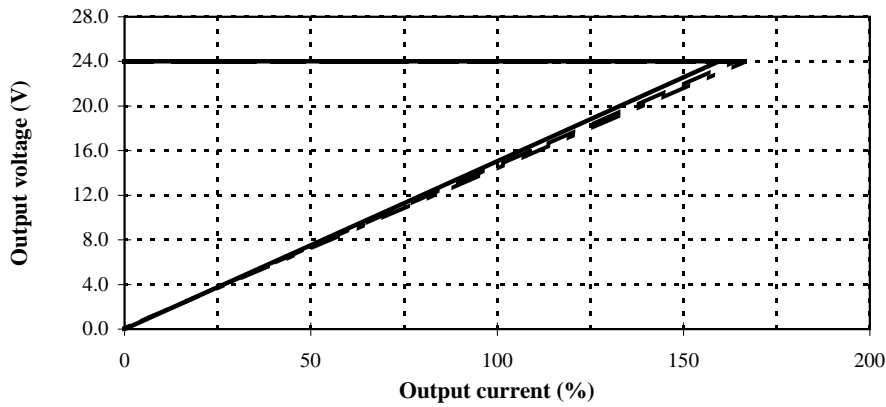
5V



12V



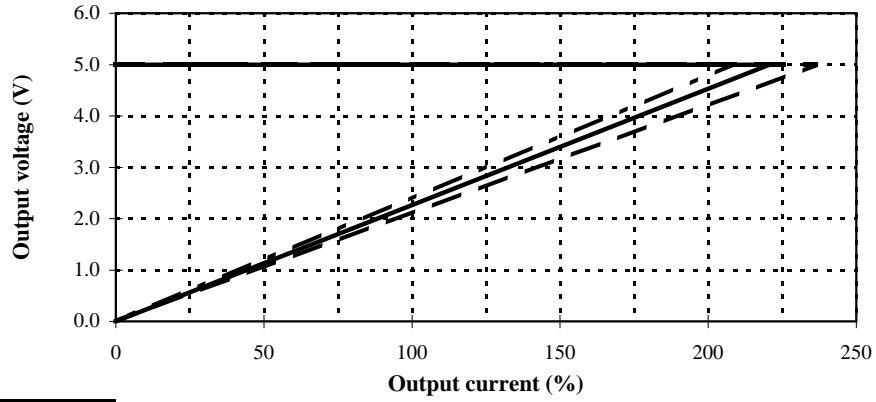
24V



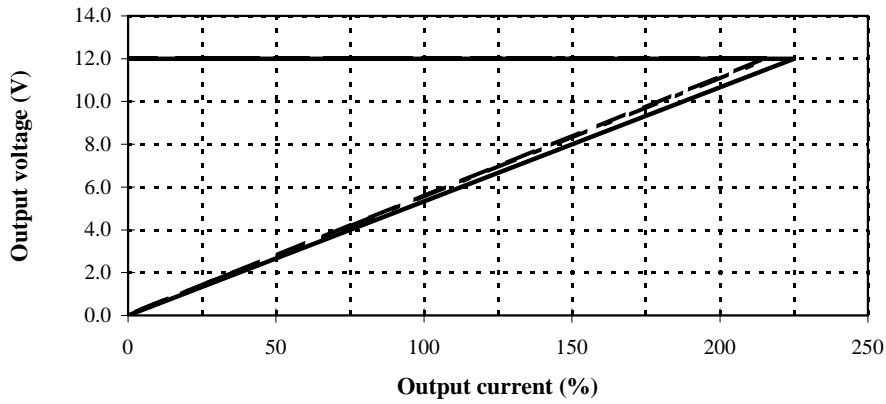
2-3 Over current protection (OCP) characteristics

Conditions: Vin : 230VAC
Ta : -25°C - - - - -
25°C - ·····
50°C - ———

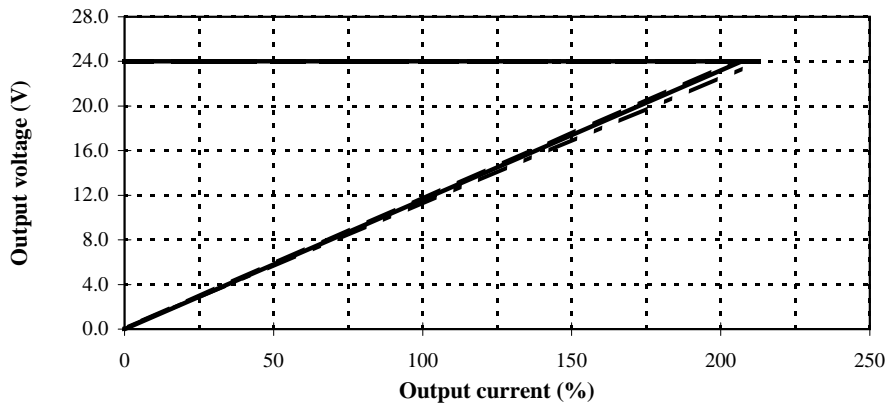
5V



12V



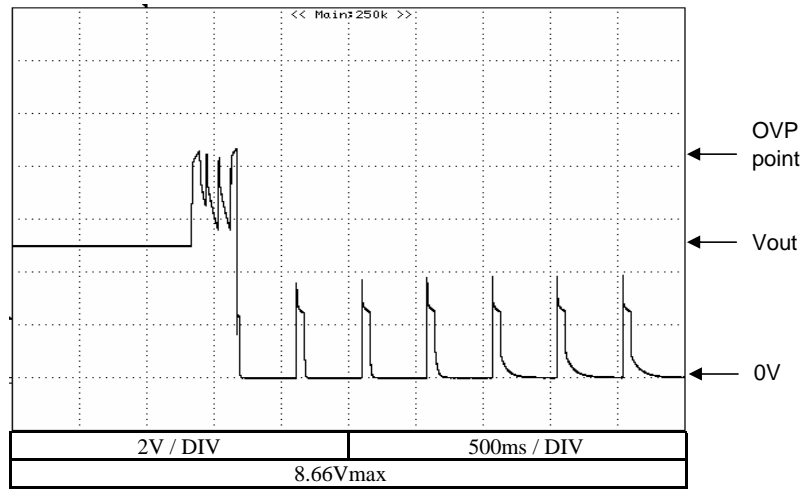
24V



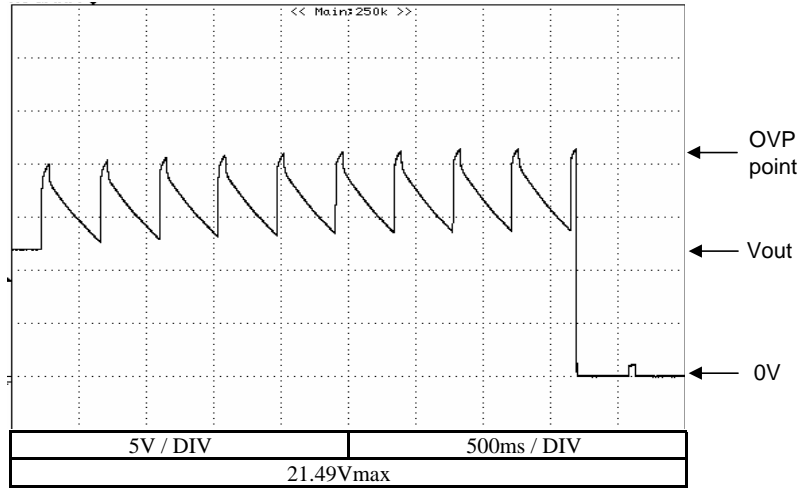
2-4 Over voltage protection (OVP) characteristics

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

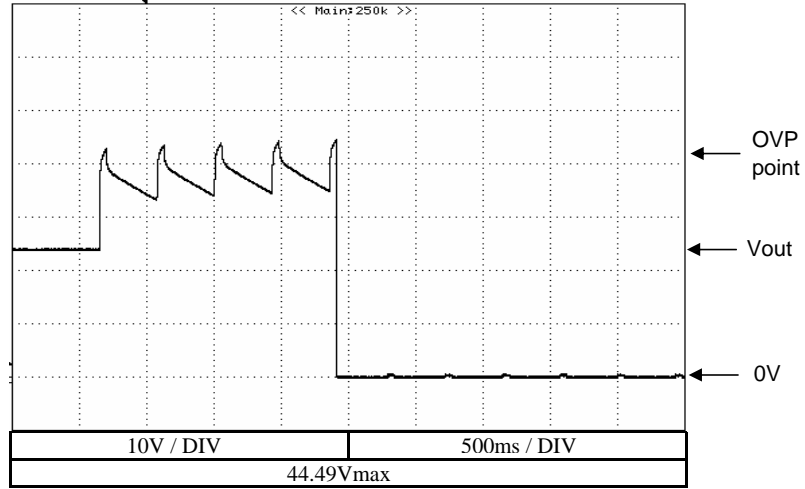
5V



12V



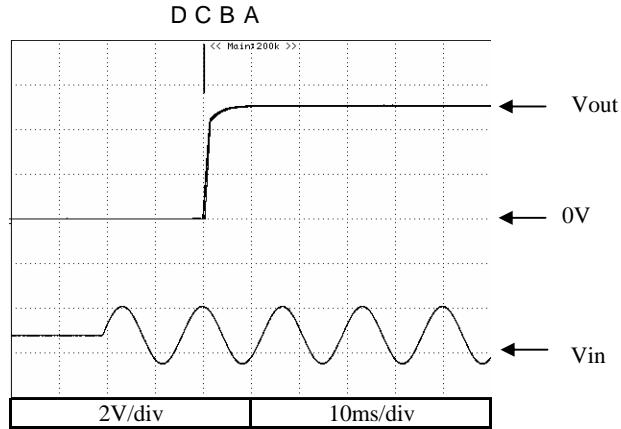
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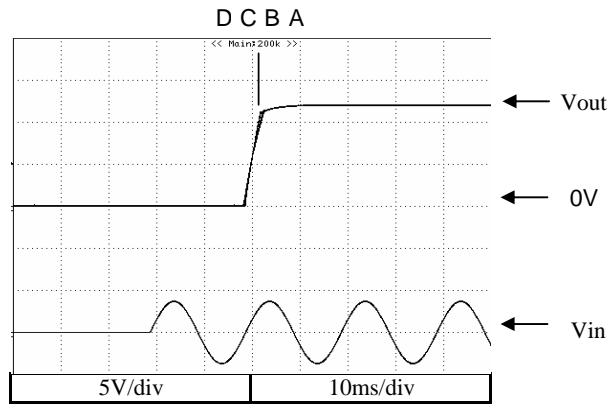
2-5 Output Rise Characteristics

Conditions: Vin : 88VAC (A)
 : 115VAC (B)
 : 230VAC (C)
 : 264VAC (D)
Iout : 0%
Ta : 25°C

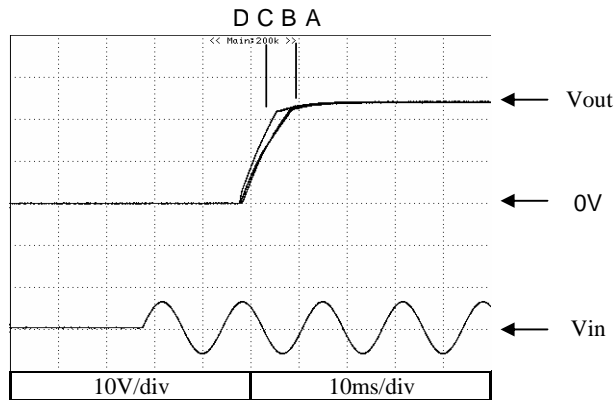
5V



12V



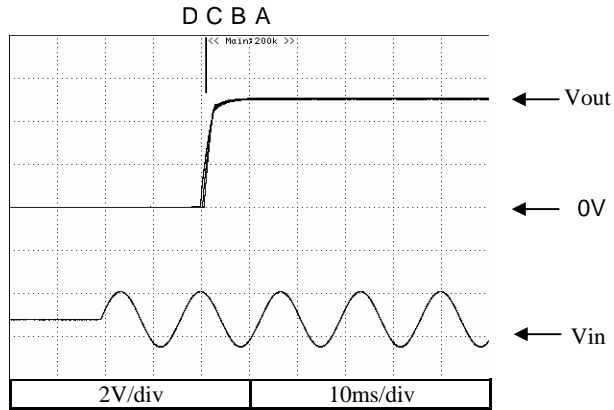
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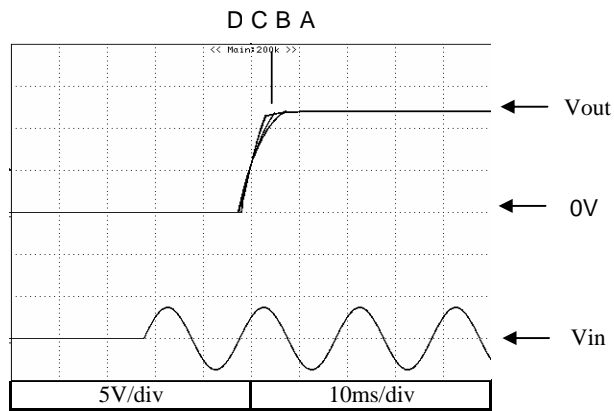
2-5 Output Rise Characteristics

Conditions: Vin : 88VAC (A)
 : 115VAC (B)
 : 230VAC (C)
 : 264VAC (D)
 Iout : 100%
 Ta : 25°C

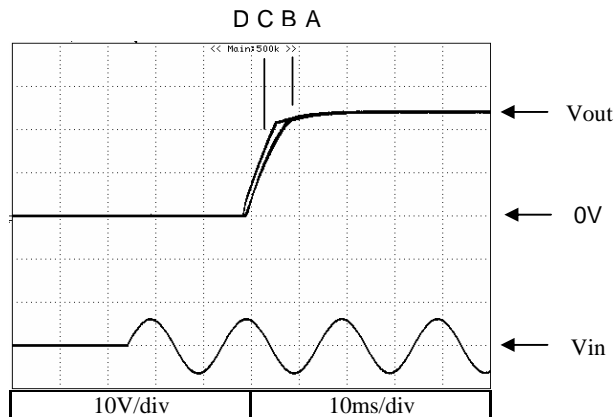
5V



12V



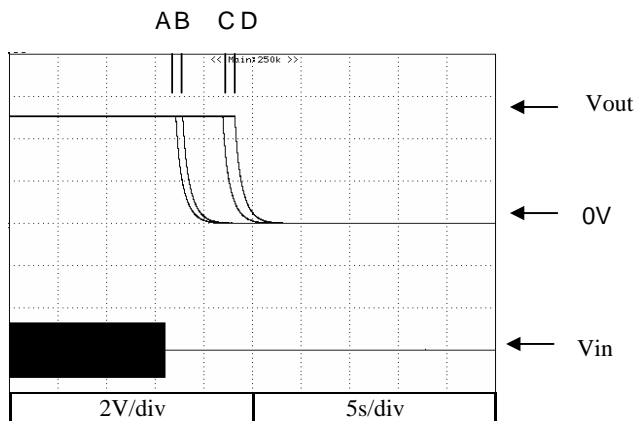
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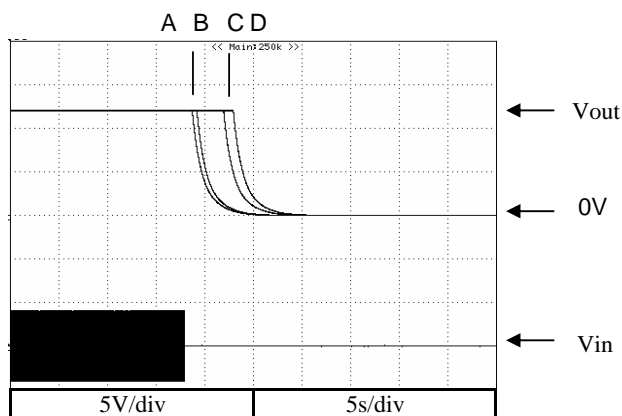
2-6 Output Fall Characteristics

Conditions: Vin : 88VAC (A)
 : 115VAC (B)
 : 230VAC (C)
 : 264VAC (D)
 Iout : 0%
 Ta : 25°C

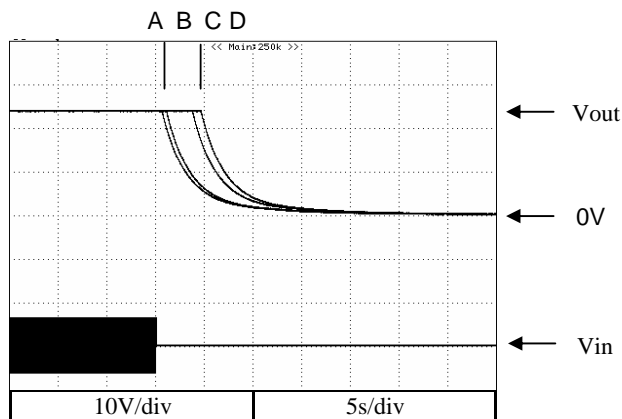
5V



12V



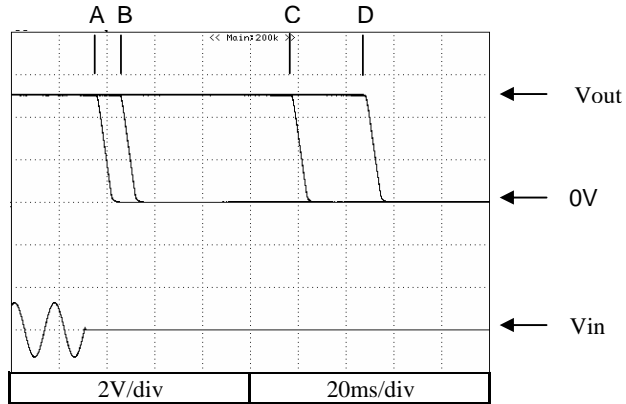
24V



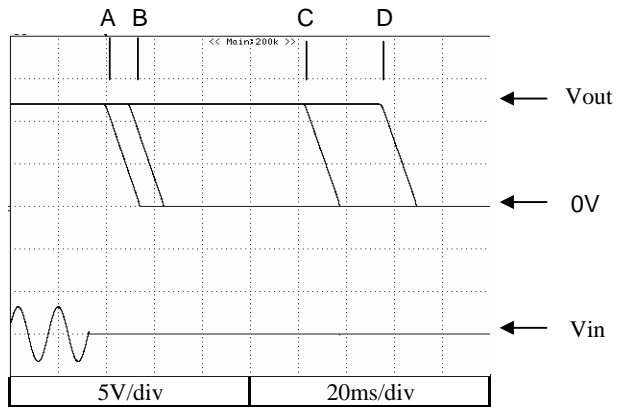
2-6 Output Fall Characteristics

Conditions: Vin : 88VAC (A)
 : 115VAC (B)
 : 230VAC (C)
 : 264VAC (D)
 Iout : 100%
 Ta : 25°C

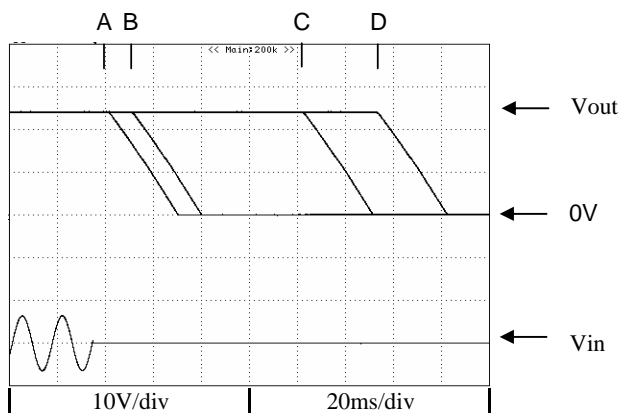
5V



12V



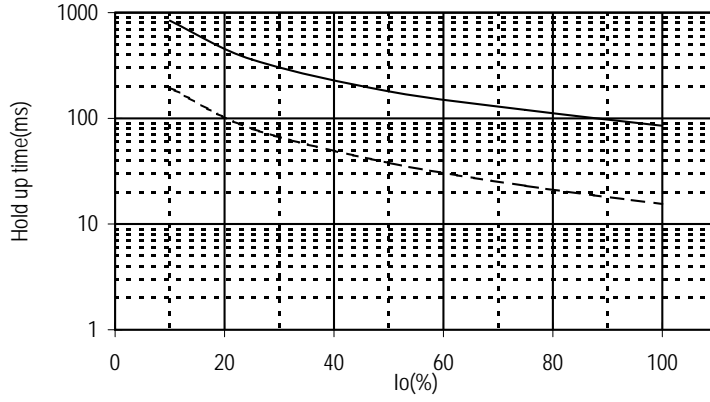
24V



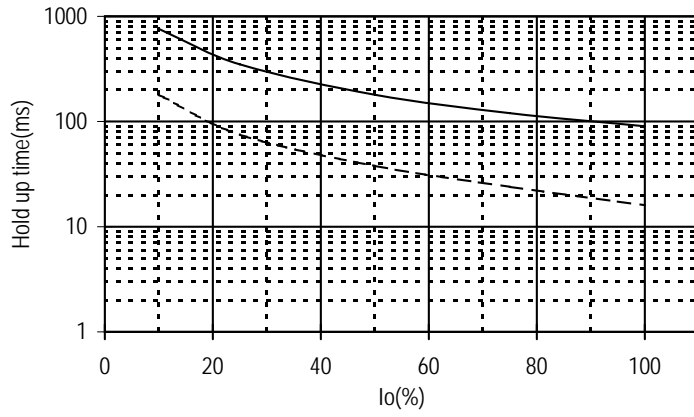
2-7 Hold Up Time Characteristics

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

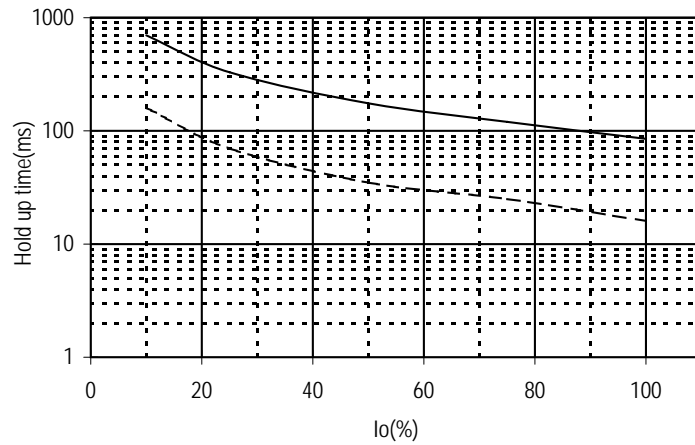
5V



12V



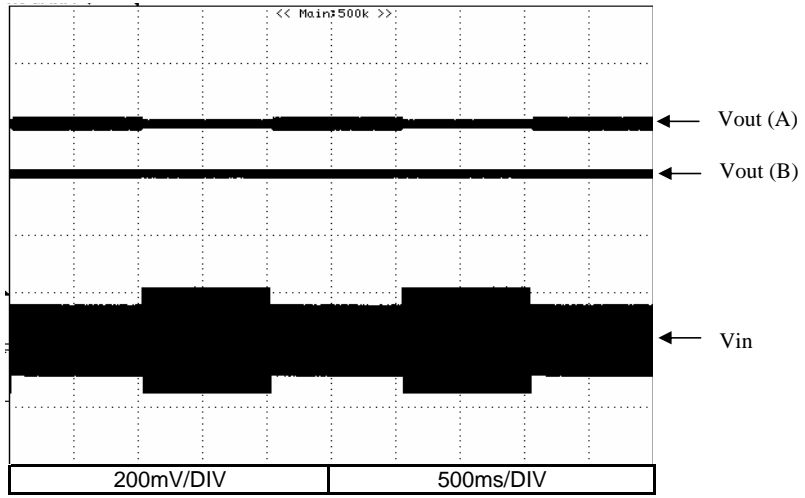
24V



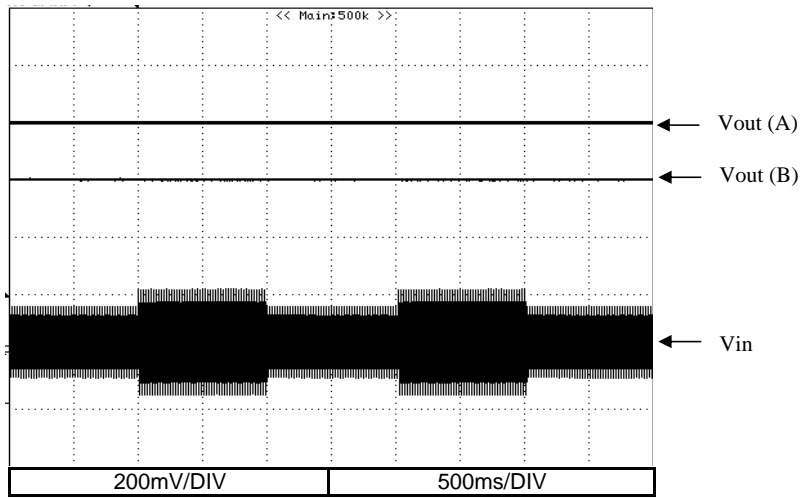
2-8 Dynamic Line Response Characteristics

Conditions : Vin = 88<=>132 VAC (A)
= 170<=>264 VAC (B)
Iout = 100%
Ta = 25°C

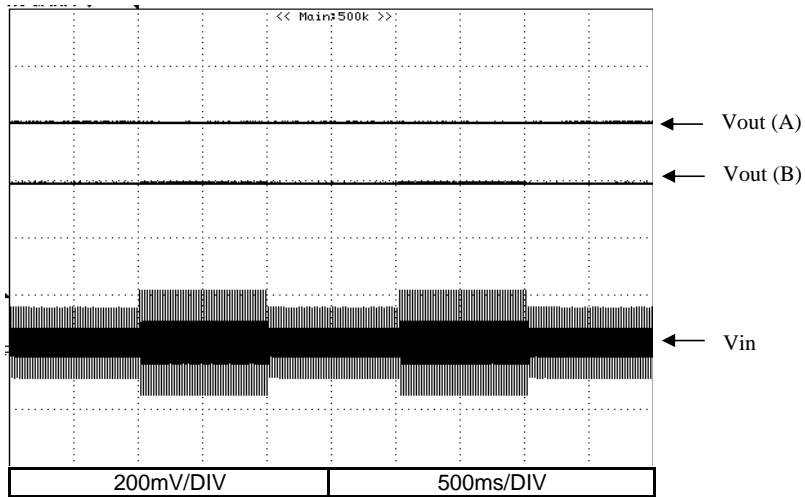
5V



12V



24V

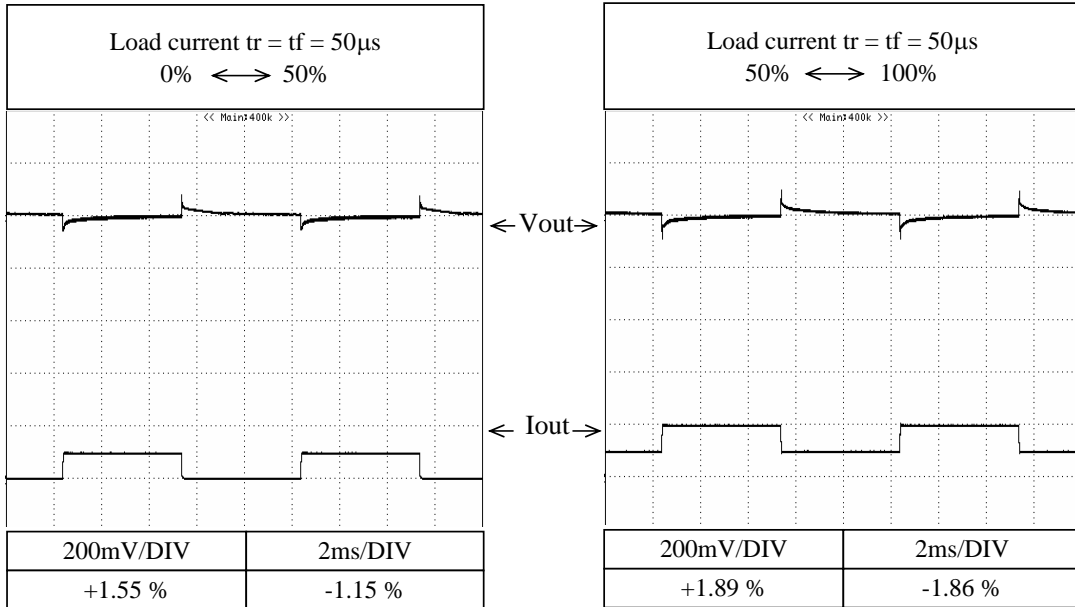


2-9 Dynamic Load Response Characteristics

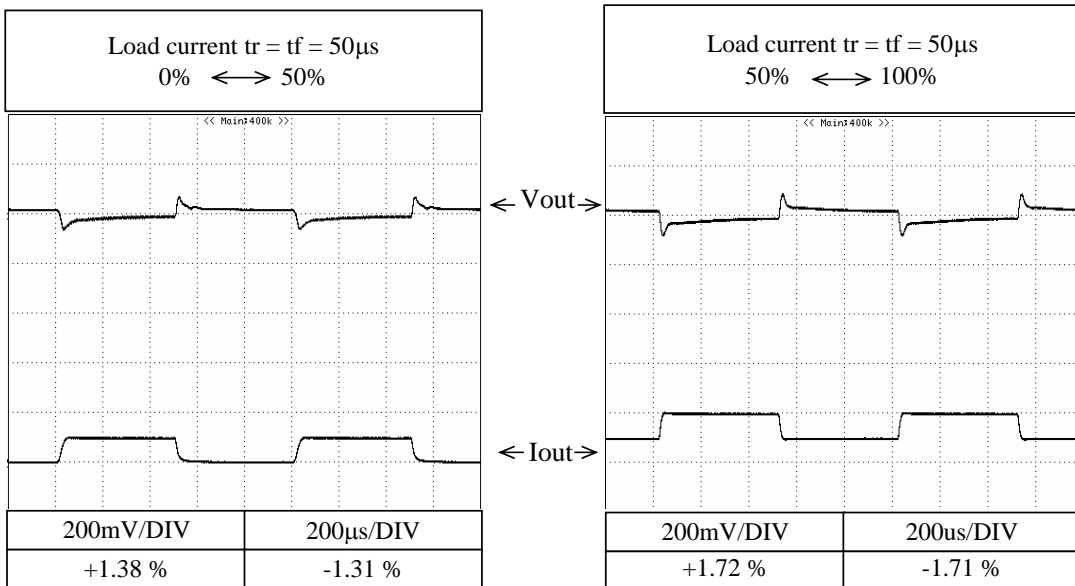
Conditions; V_{in} : 115VAC
 T_a : 25°C

5V

f=100Hz



f=1kHz

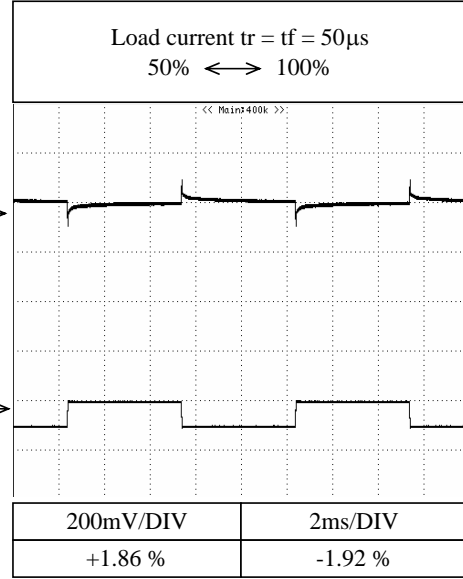
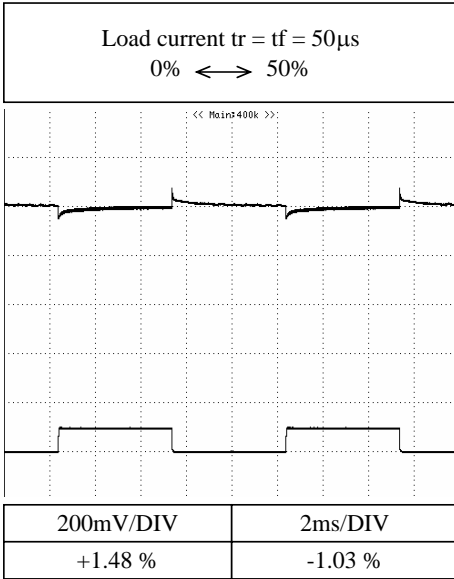


2-9 Dynamic Load Response Characteristics

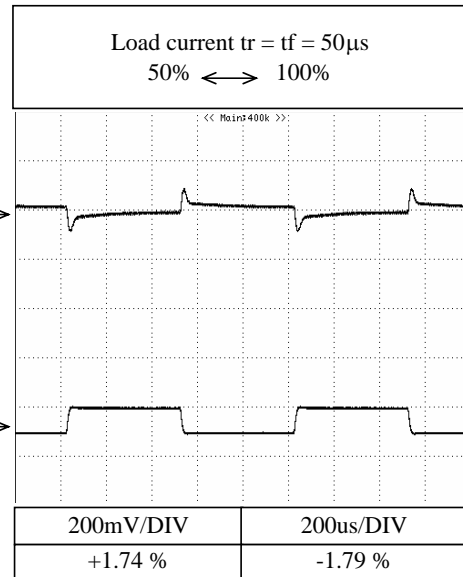
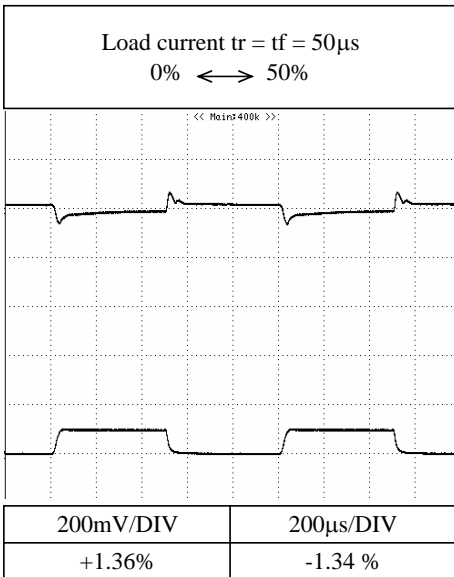
Conditions; V_{in} : 230VAC
 T_a : 25°C

5V

f=100Hz



f=1kHz

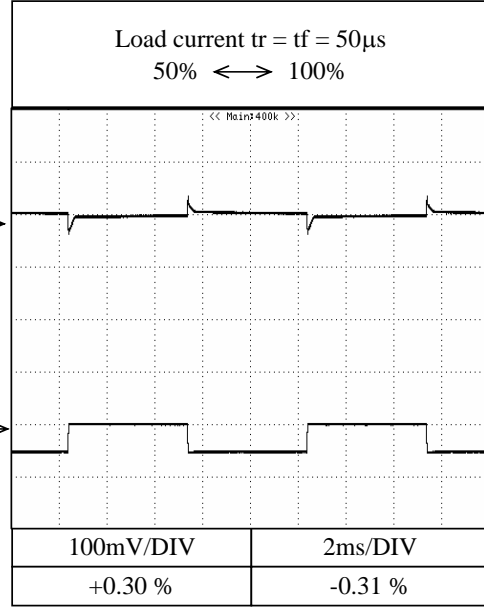
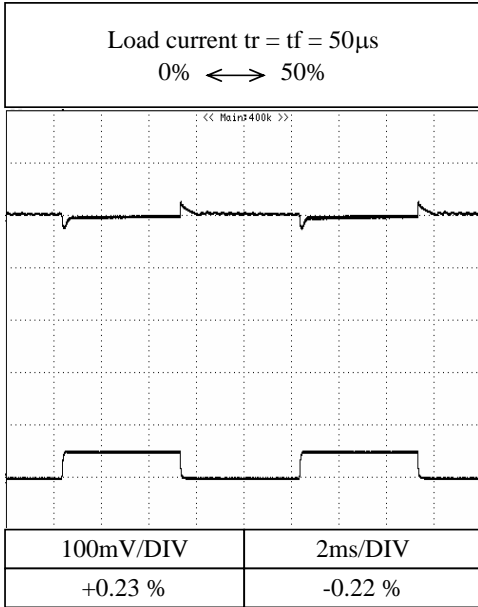


2-9 Dynamic Load Response Characteristics

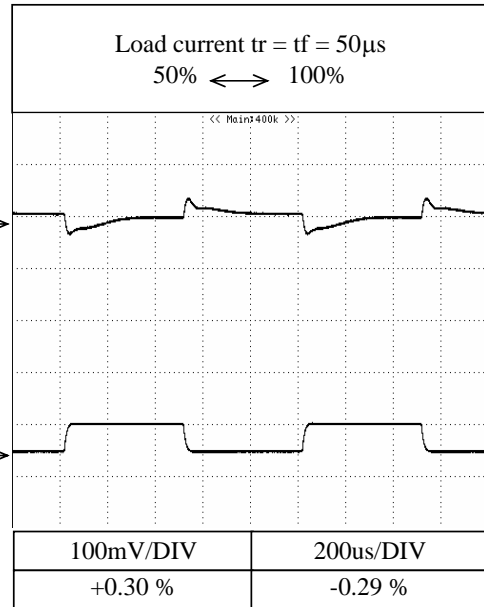
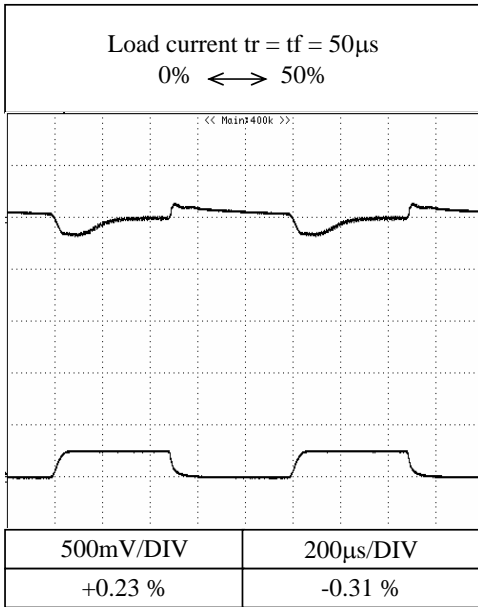
Conditions; V_{in} : 115VAC
 T_a : 25°C

12V

$f=100\text{Hz}$



$f=1\text{kHz}$

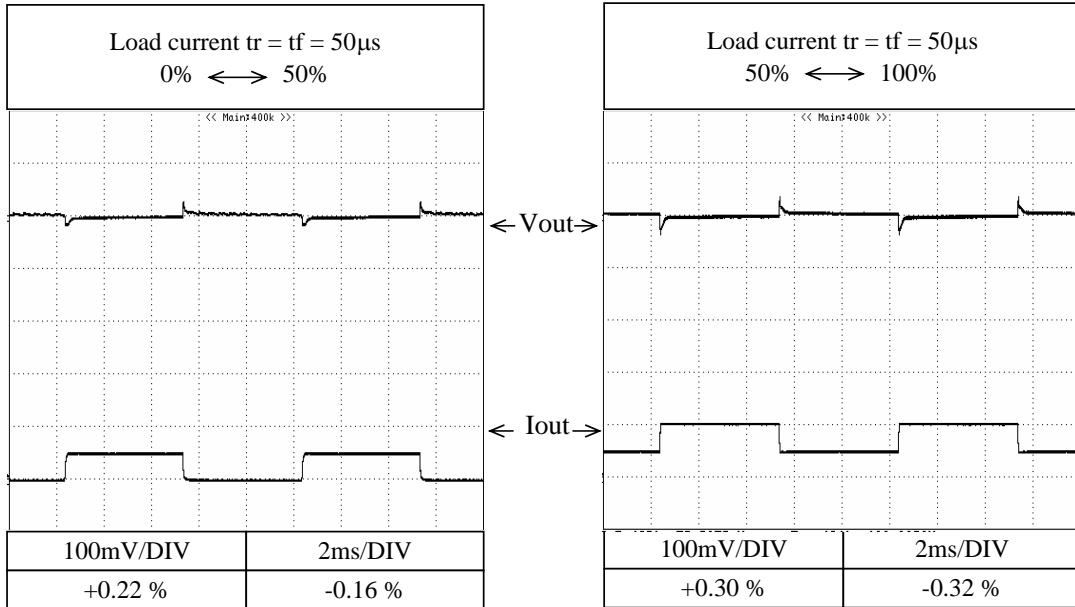


2-9 Dynamic Load Response Characteristics

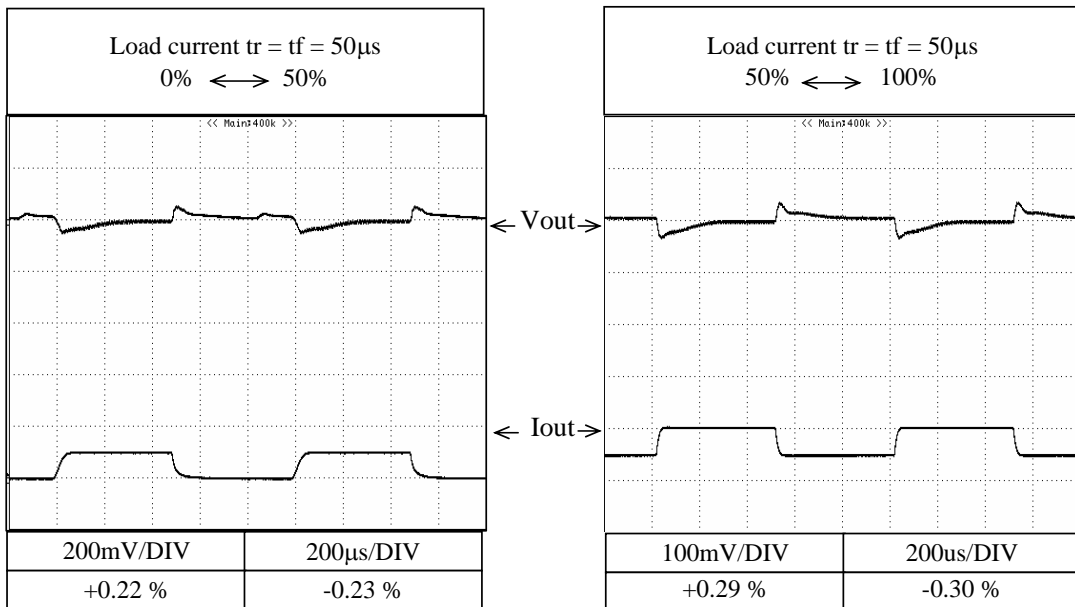
Conditions; V_{in} : 230VAC
 T_a : 25°C

12V

f=100Hz



f=1kHz

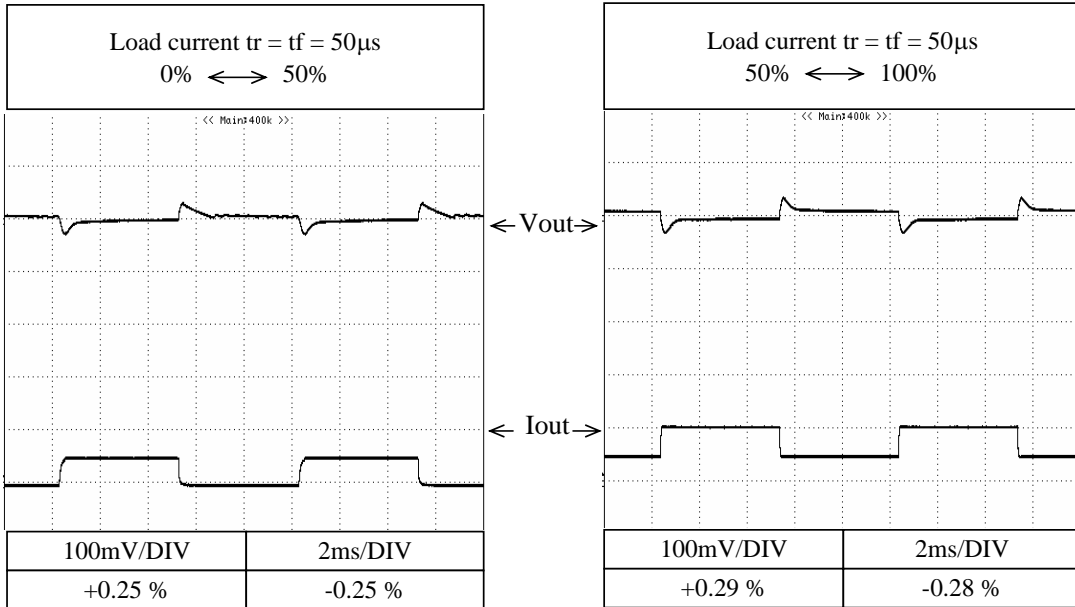


2-9 Dynamic Load Response Characteristics

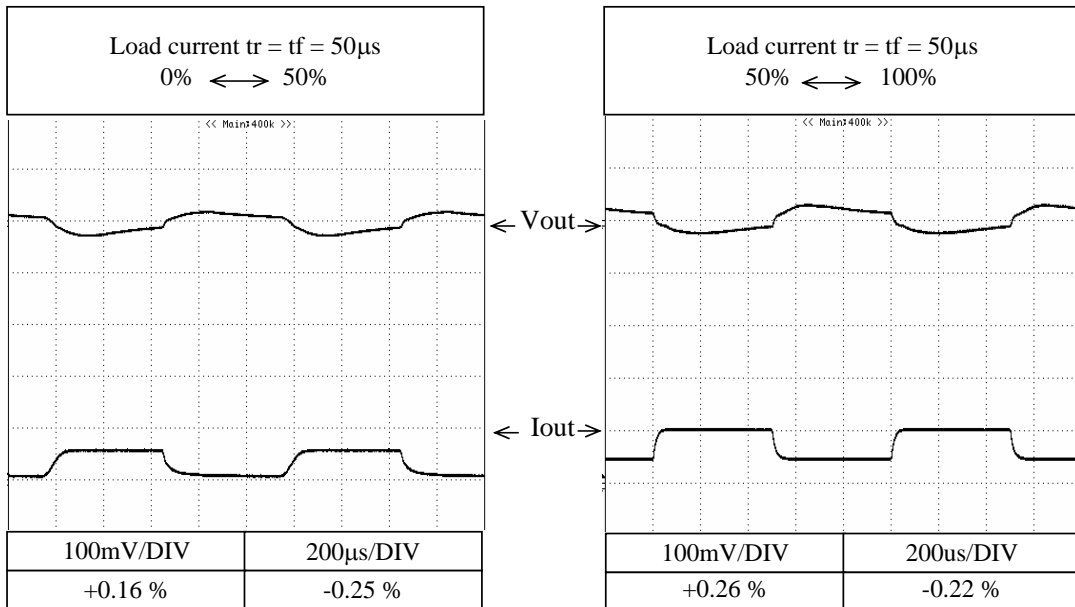
Conditions; V_{in} : 115VAC
 T_a : 25°C

24V

f=100Hz



f=1kHz



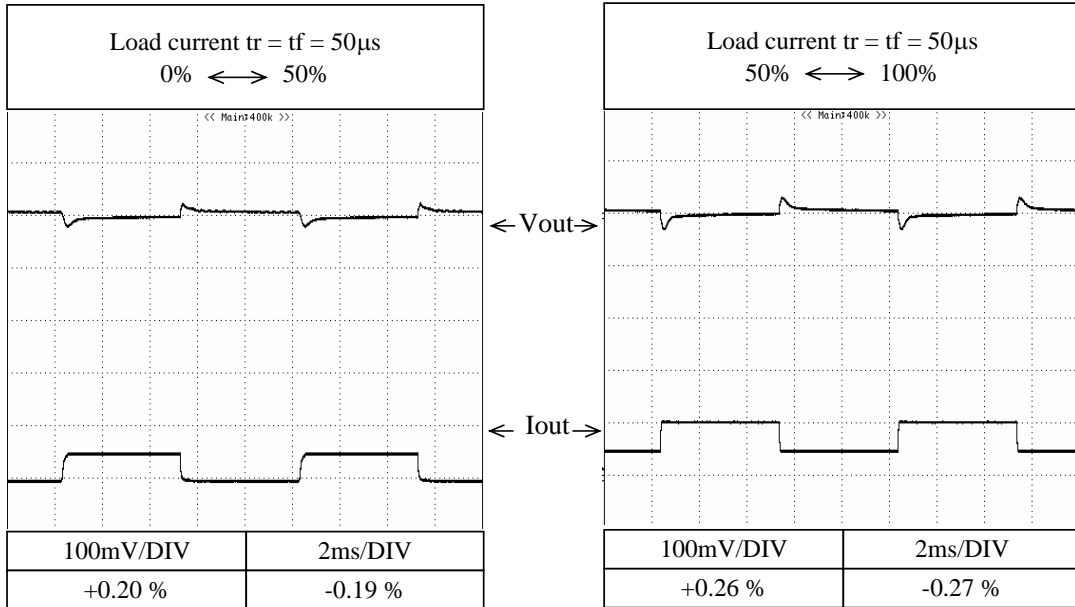
2-9 Dynamic Load Response Characteristics

Conditions; V_{in} : 230VAC

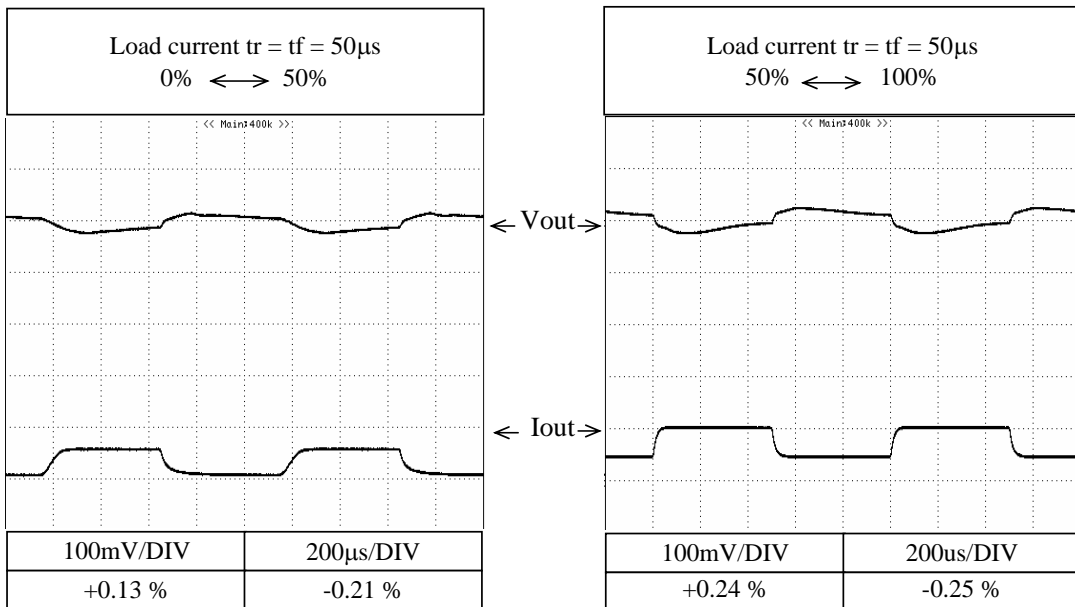
T_a : 25°C

24V

f=100Hz



f=1kHz

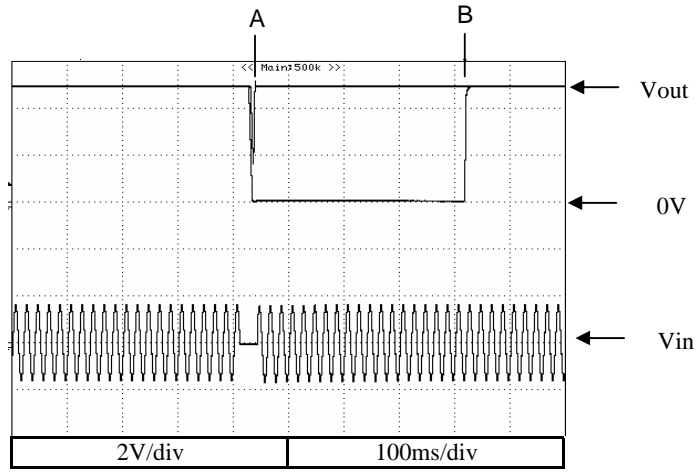


2-10 Response to Brown Out Characteristics

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

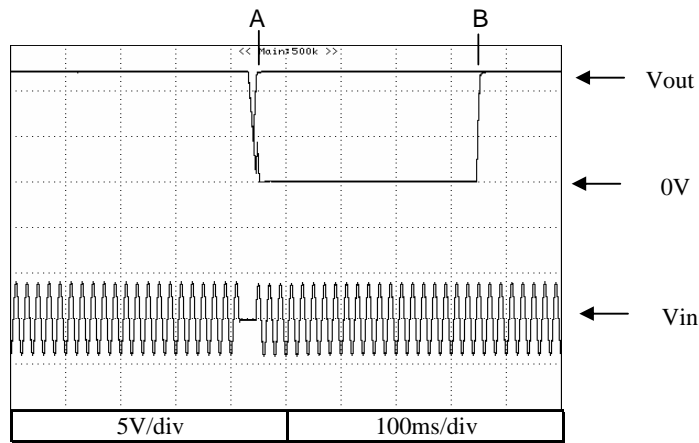
5V

A = 19ms
B = 32ms



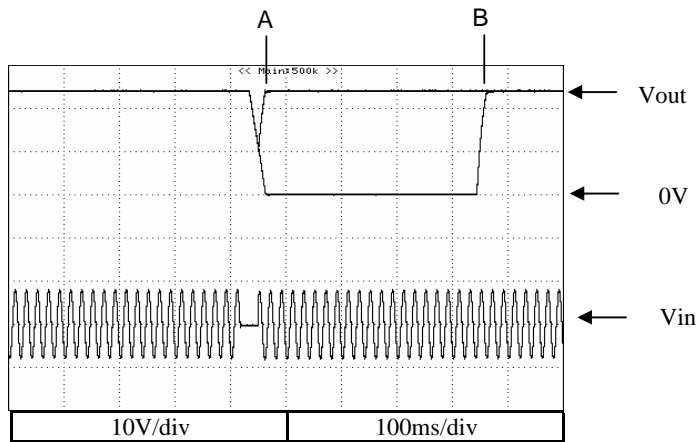
12V

A = 26ms
B = 30ms



24V

A = 33ms
B = 34ms

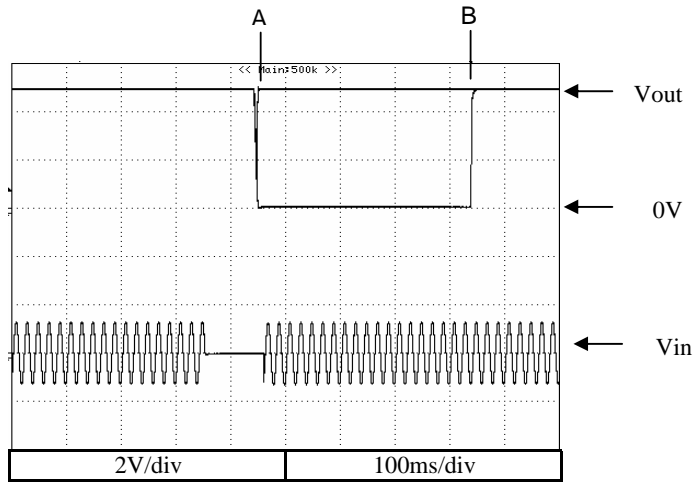


2-10 Response to Brown Out Characteristics

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

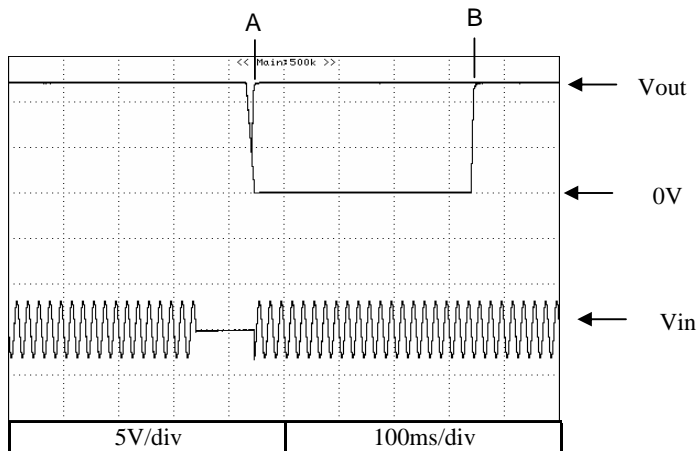
5V

A = 95ms
B = 107ms



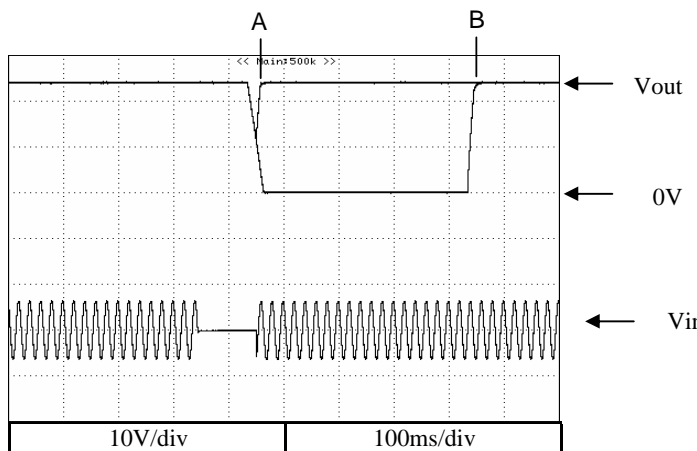
12V

A = 100ms
B = 106ms



24V

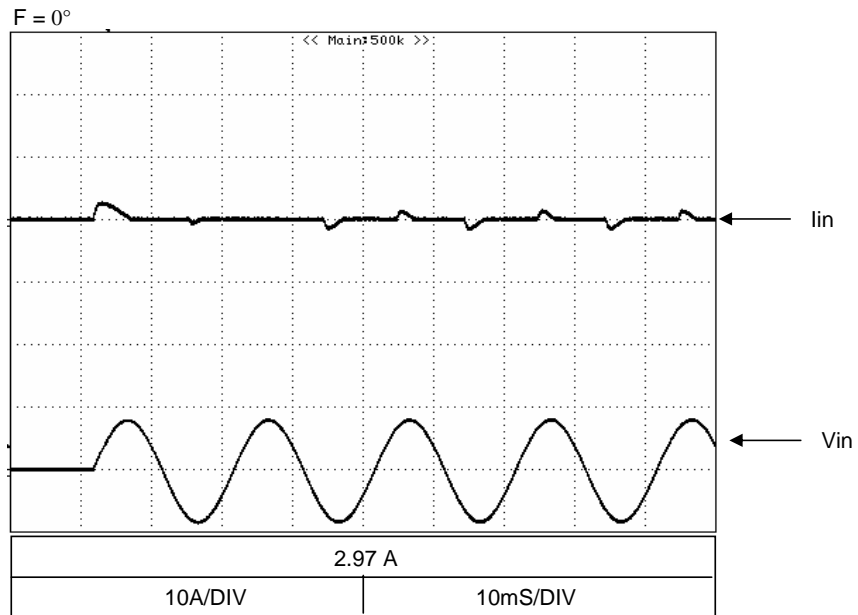
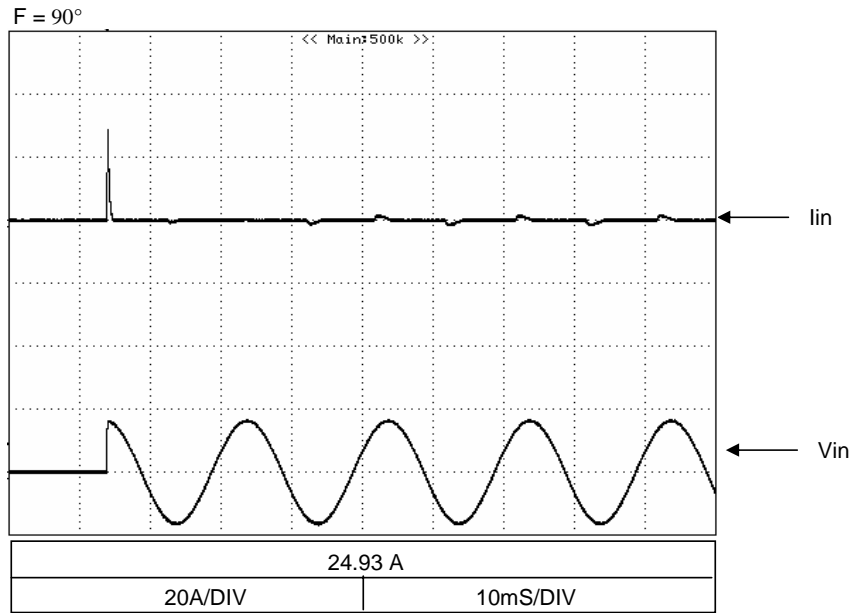
A = 106ms
B = 107ms



2-11 Inrush Current

Conditions : $V_{in} = 115VAC$
 $I_{out} = 100\%$
 $T_a = 25^{\circ}C$

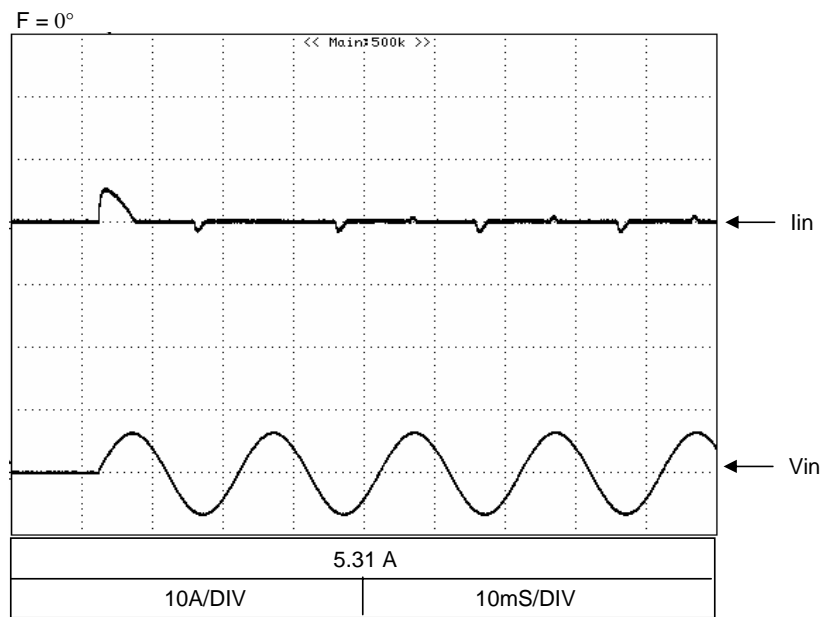
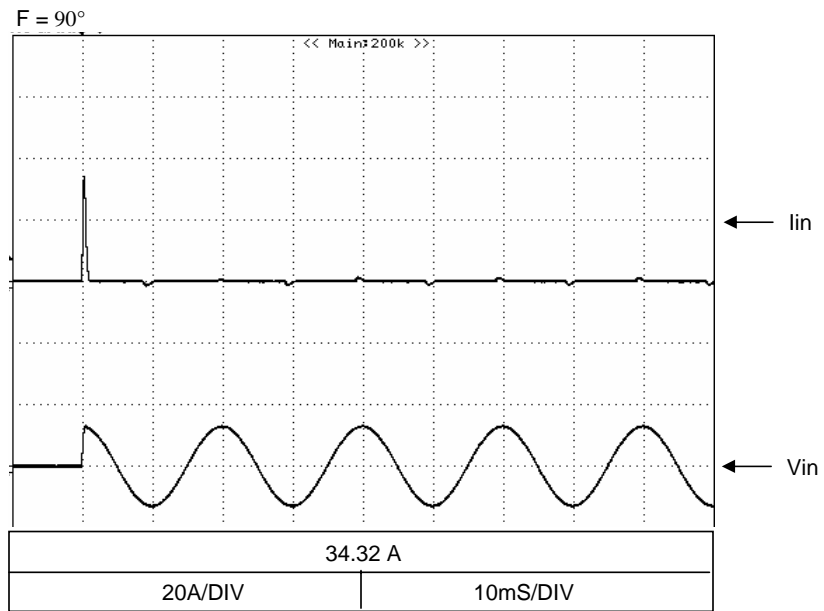
5V



2-11 Inrush Current

Conditions : $V_{in} = 230VAC$
 $I_{out} = 100\%$
 $T_a = 25^{\circ}C$

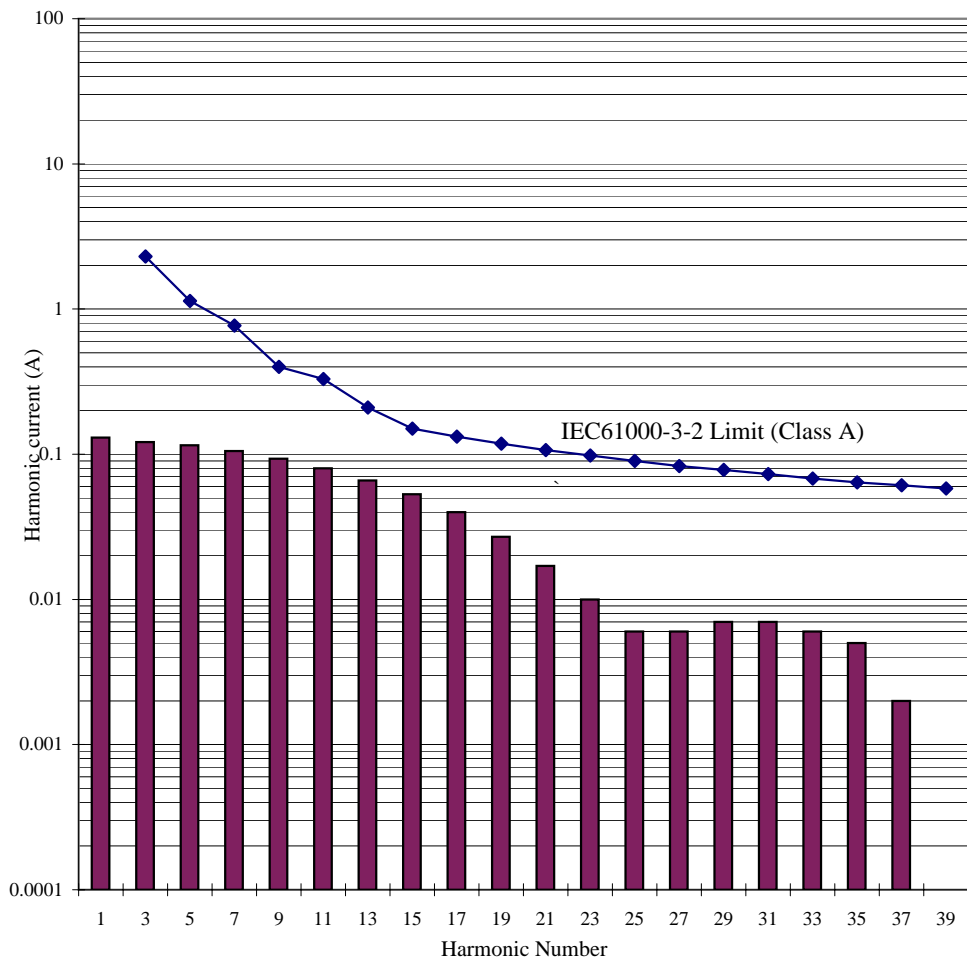
5V



2-12 Input Current Harmonics

Conditions : Vin = 230VAC
 Iout = 100%
 Ta = 25°C
 f = 60Hz

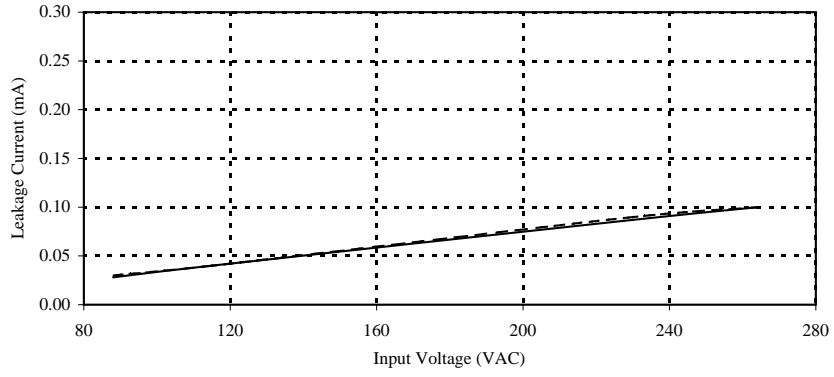
5V



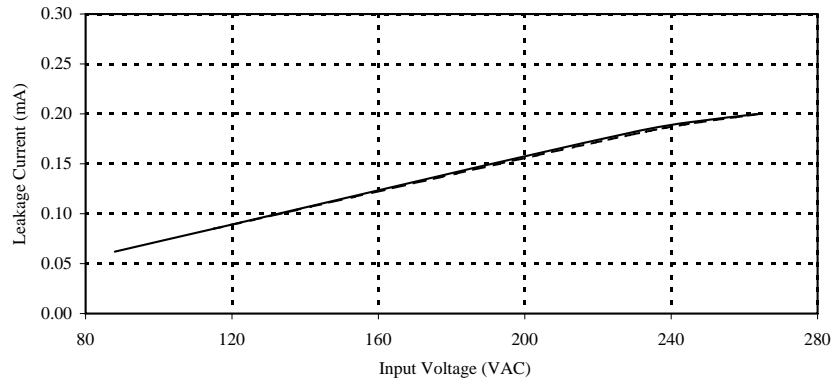
2-13 Leakage Current Characteristics

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

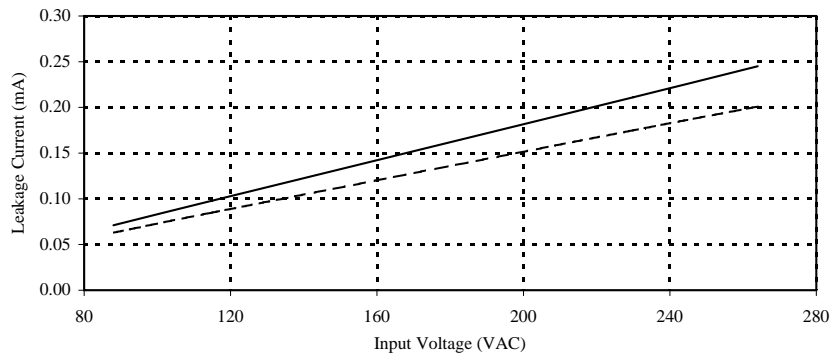
5V



12V



24V



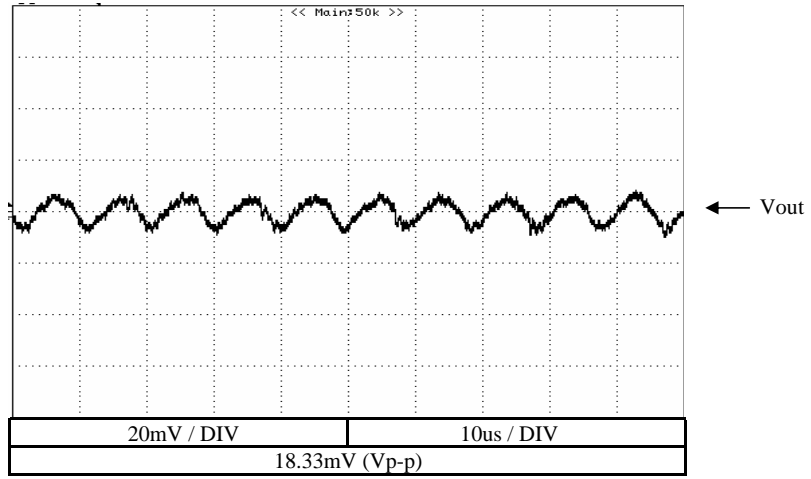
2-14 Output Ripple And Noise Waveform

Conditions

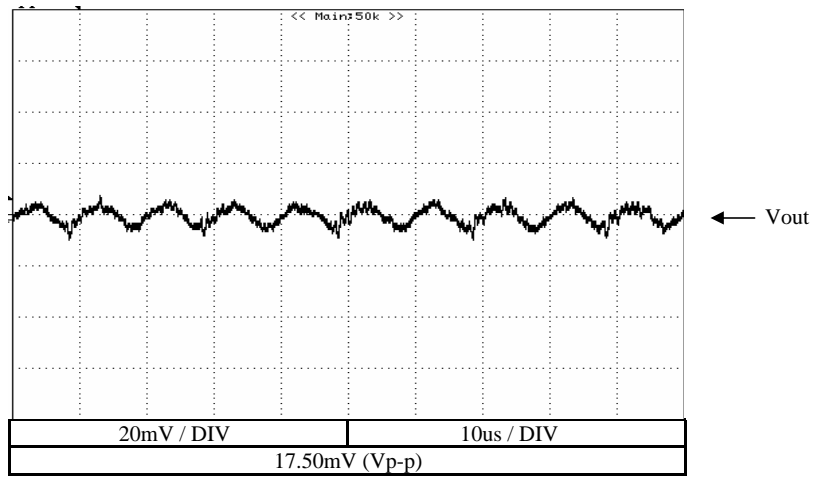
Vin = 230VAC
Iout = 100%
Ta = 25°C

NORMAL MODE

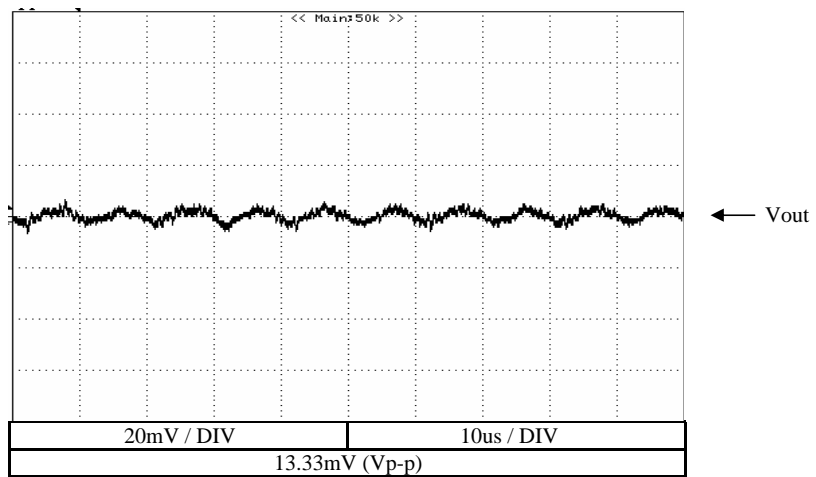
5V



12V



24V



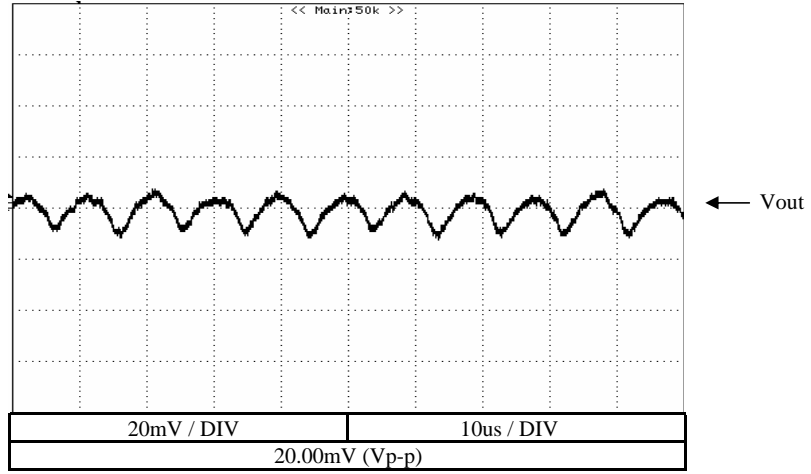
2-14 Output Ripple And Noise Waveform

Conditions

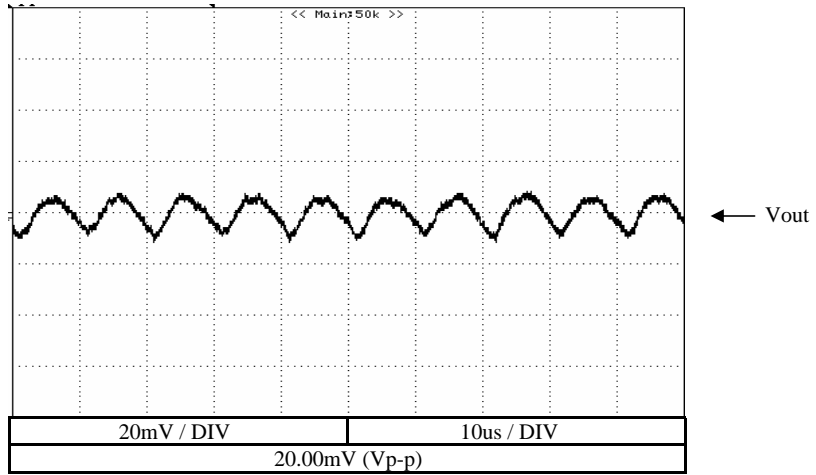
Vin = 230VAC
Iout = 100%
Ta = 25°C

NORMAL + COMMON MODE

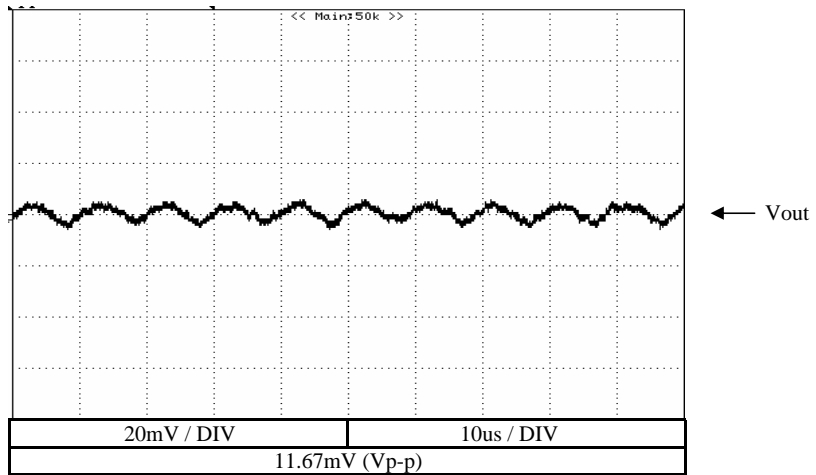
5V



12V



24V



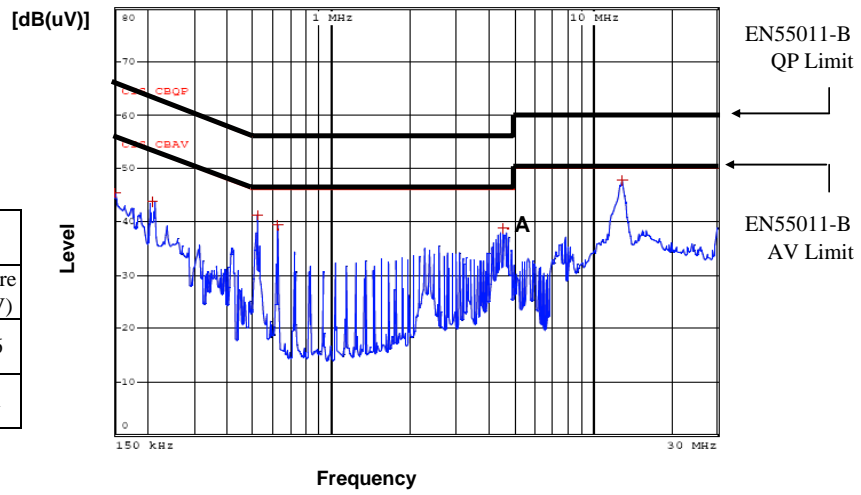
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 110VAC
Iout : 100%

Conducted Emission

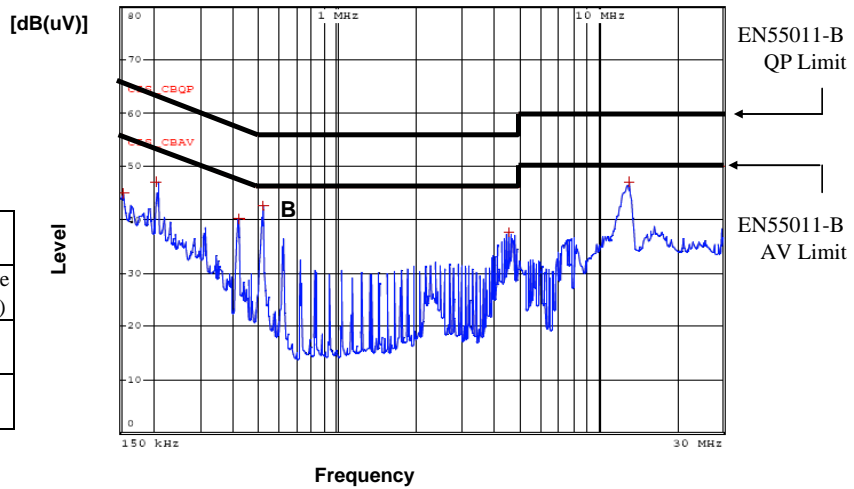
5V

Ref.	Point A (4.57MHz)	
	Limit (dB μ V)	Measure (dB μ V)
QP	56.00	37.26
AV	46.00	35.61



Phase : N

Ref.	Point B (0.52MHz)	
	Limit (dB μ V)	Measure (dB μ V)
QP	56.00	39.02
AV	46.00	35.51



Phase : L

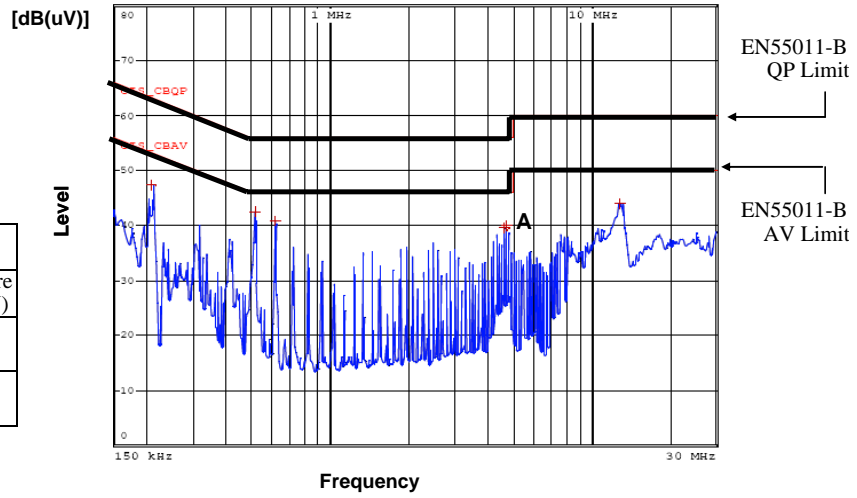
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

Conducted Emission

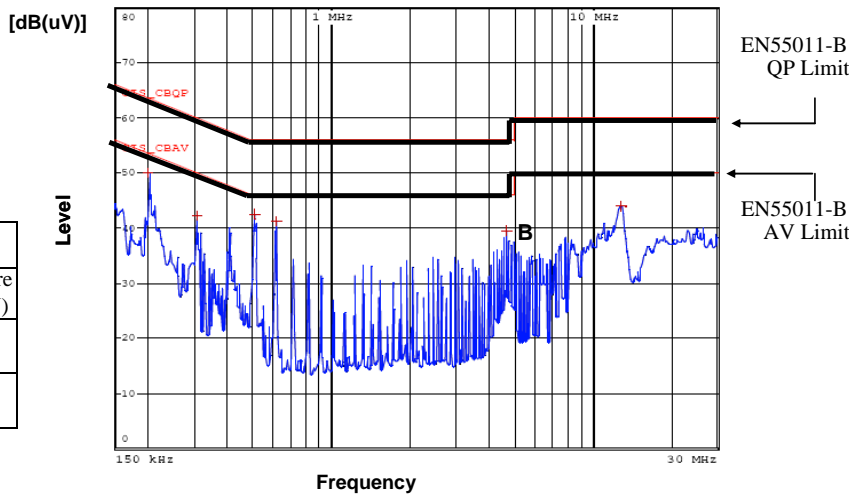
5V

Ref.	Point A (4.76MHz)	
	Data	Measure (dB μ V)
QP	Limit (dB μ V)	56.00
AV	Limit (dB μ V)	46.00



Phase : N

Ref.	Point B (4.74MHz)	
	Data	Measure (dB μ V)
QP	Limit (dB μ V)	56.00
AV	Limit (dB μ V)	46.00



Phase : L

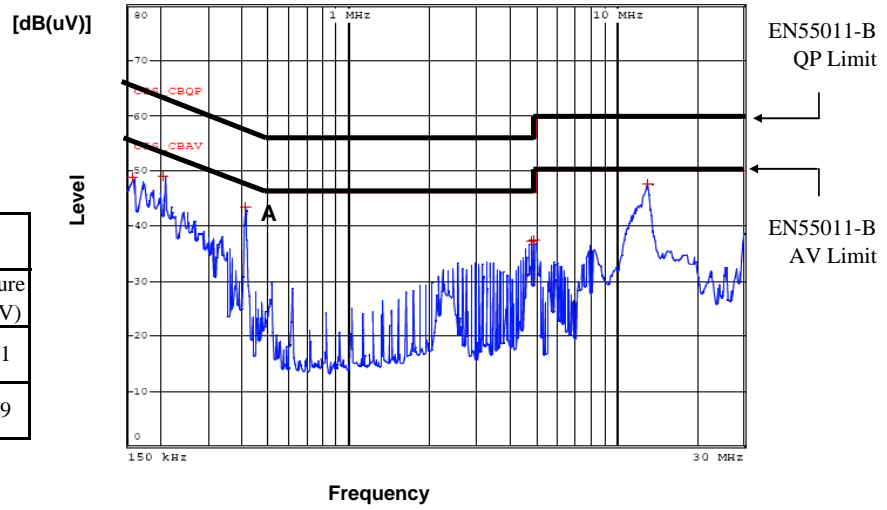
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 110VAC
Iout : 100%

Conducted Emission

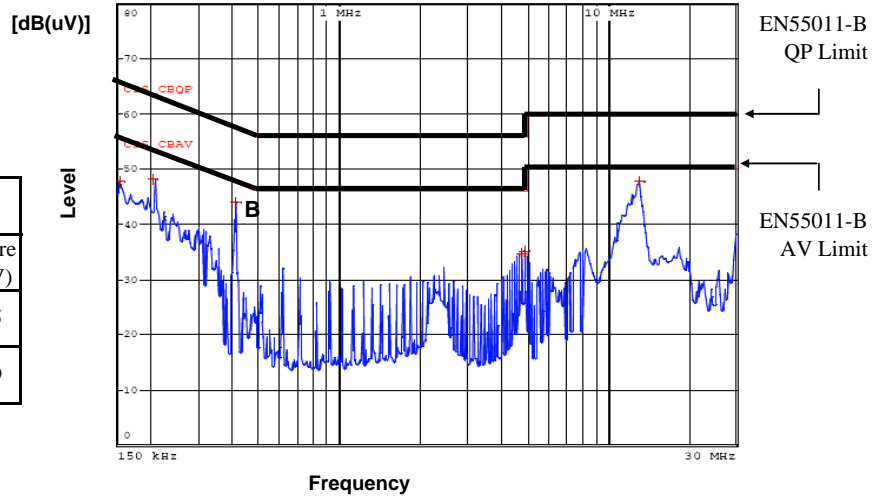
12V

Ref.		Point A (0.41 MHz)	
Data	Limit (dB μ V)	Measure (dB μ V)	
QP	57.64	43.11	
AV	47.64	40.69	



Phase : N

Ref.		Point B (0.41 MHz)	
Data	Limit (dB μ V)	Measure (dB μ V)	
QP	57.65	42.95	
AV	47.65	40.69	



Phase : L

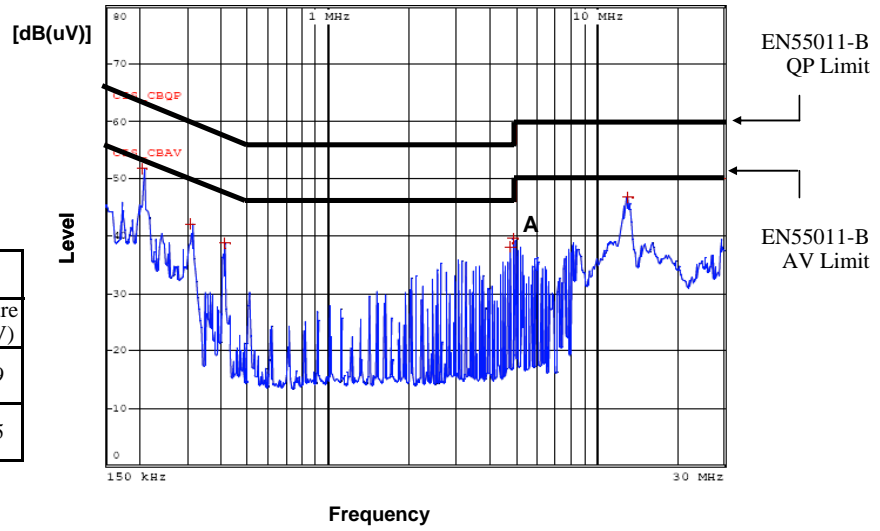
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

Conducted Emission

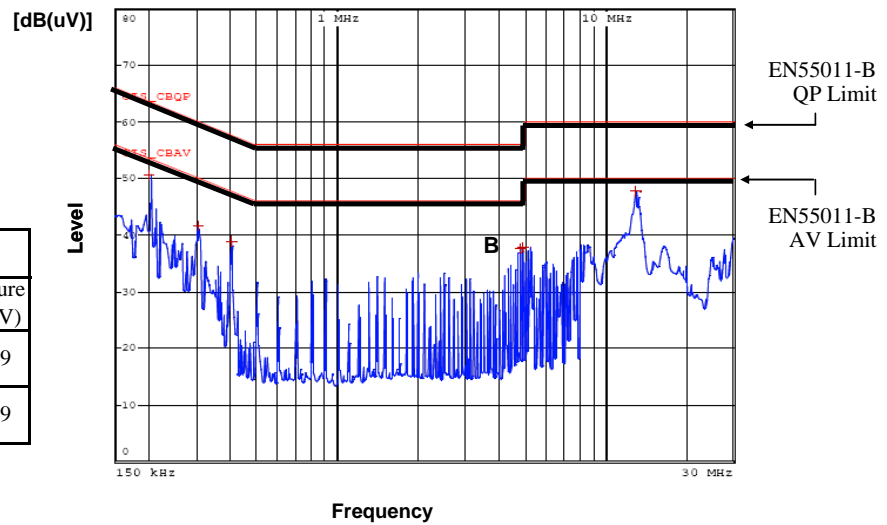
12V

Ref.	Point A (4.90 MHz)	
	Limit (dB μ V)	Measure (dB μ V)
QP	56.00	38.89
AV	46.00	38.75



Phase : N

Ref.	Point B (4.89MHz)	
	Limit (dB μ V)	Measure (dB μ V)
QP	56.00	36.49
AV	46.00	35.89



Phase : L

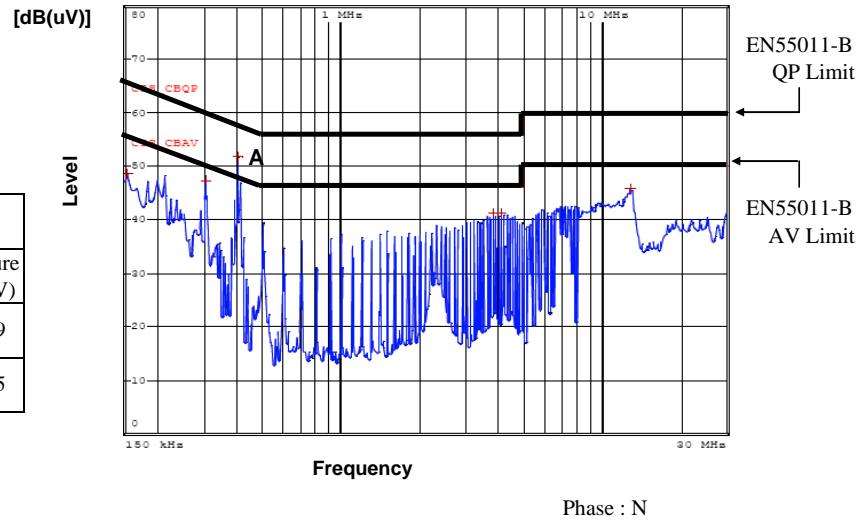
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 110VAC
Iout : 100%

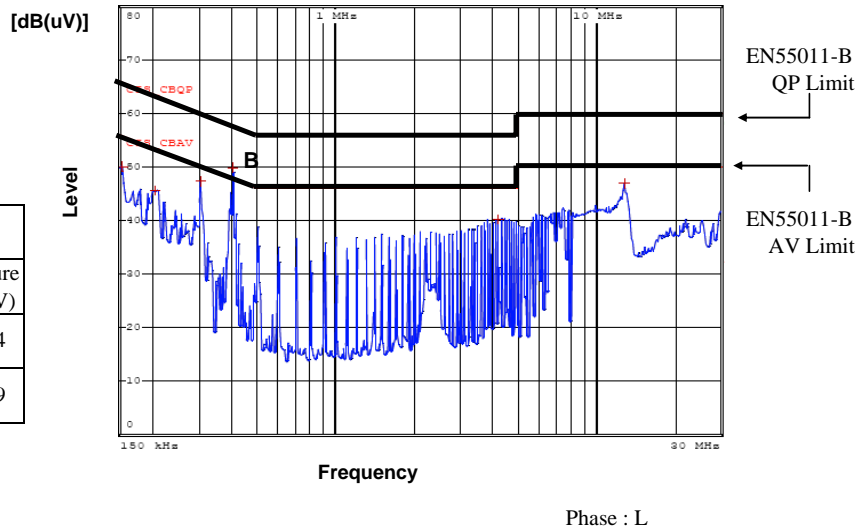
Conducted Emission

24V

Ref.	Point A (0.40 MHz)	
	Limit (dB μ V)	Measure (dB μ V)
QP	57.80	45.89
AV	47.80	38.15



Ref.	Point B (0.40 MHz)	
	Limit (dB μ V)	Measure (dB μ V)
QP	57.83	43.44
AV	47.83	36.19



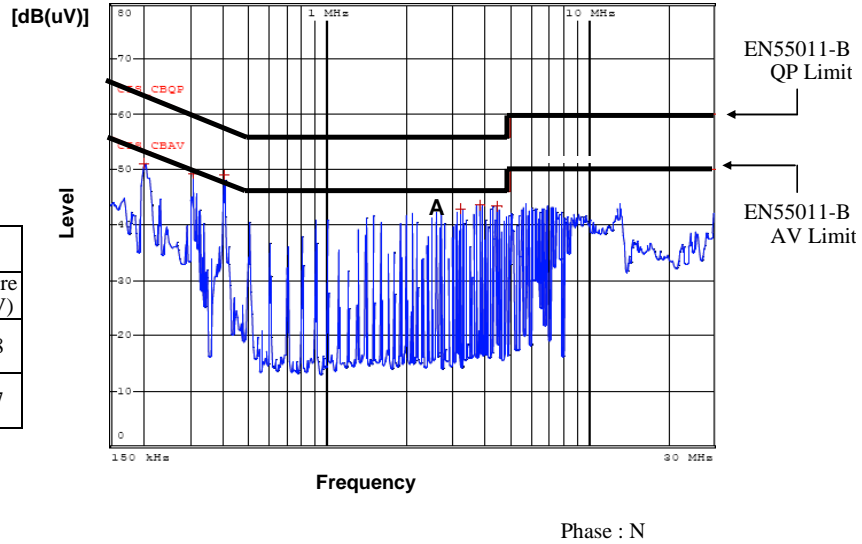
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

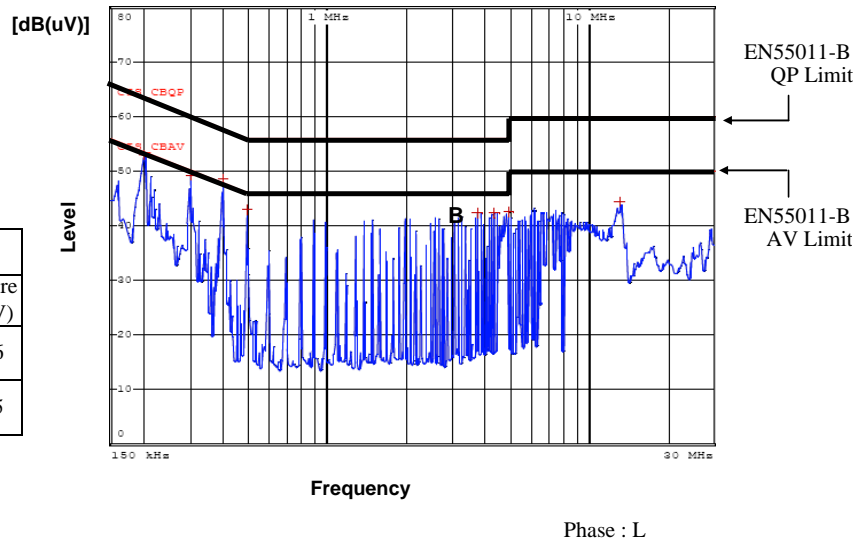
Conducted Emission

24V

Ref.	Point A (3.22MHz)	
	Data	Measure (dB μ V)
QP	Limit (dB μ V)	56.00
AV	Limit (dB μ V)	46.00



Ref.	Point B (3.82MHz)	
	Data	Measure (dB μ V)
QP	Limit (dB μ V)	56.00
AV	Limit (dB μ V)	46.00



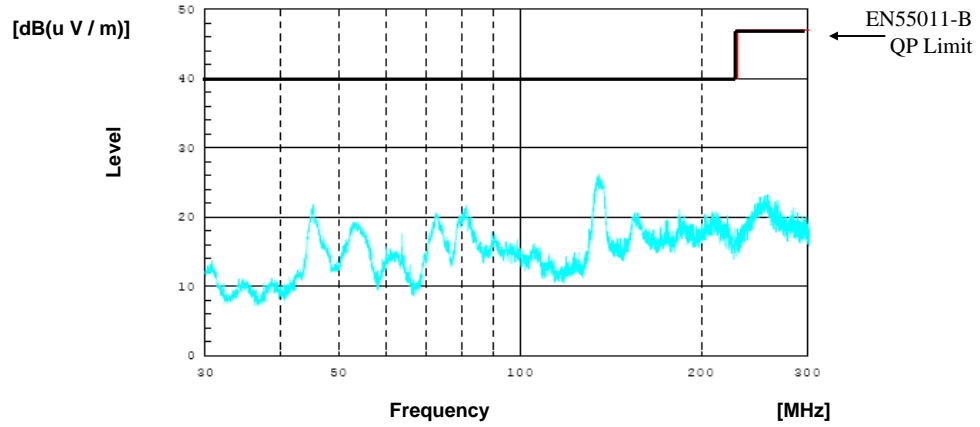
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 110VAC
Iout : 100%

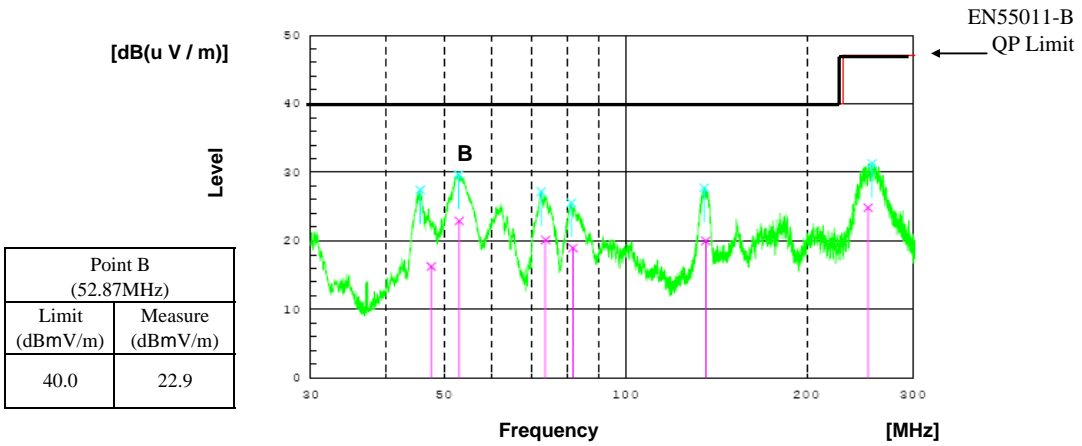
Radiated Emission

5V

HORIZONTAL



VERTICAL



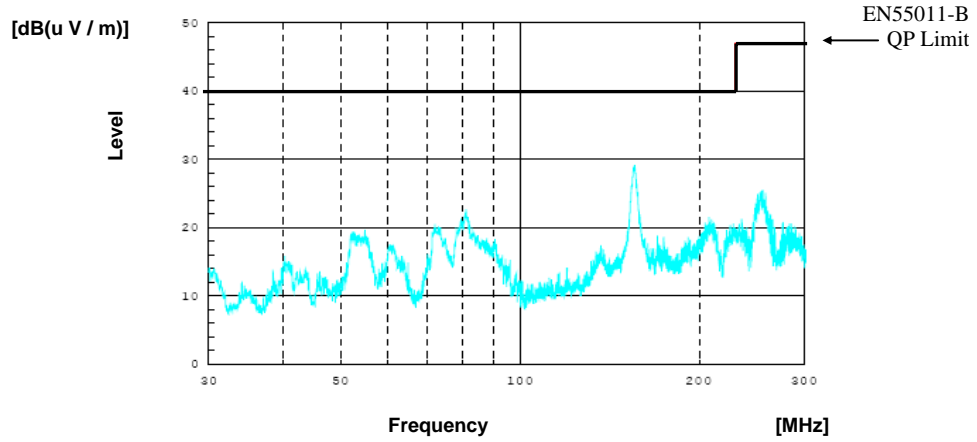
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

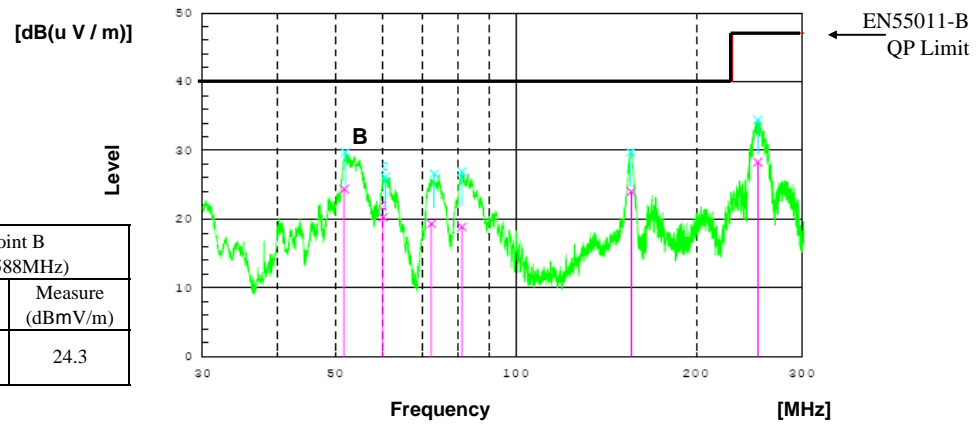
Radiated Emission

5V

HORIZONTAL



VERTICAL



Point B (51.588MHz)	
Limit (dBmV/m)	Measure (dBmV/m)
40.0	24.3

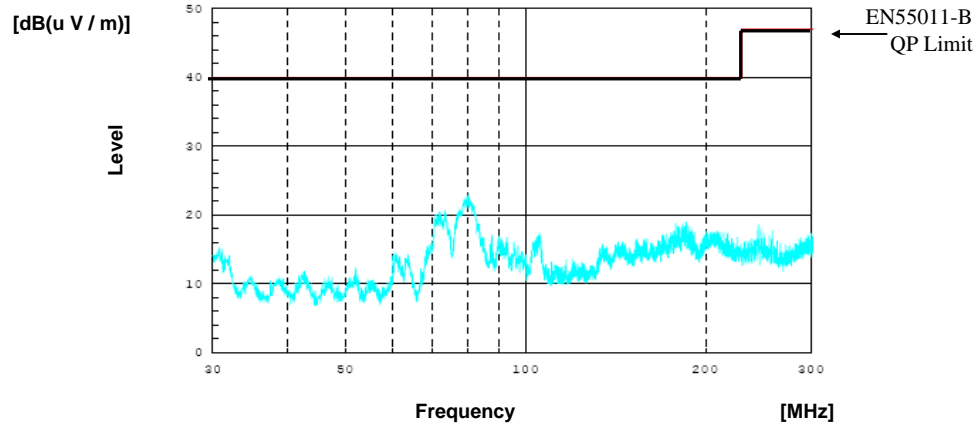
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 110VAC
Iout : 100%

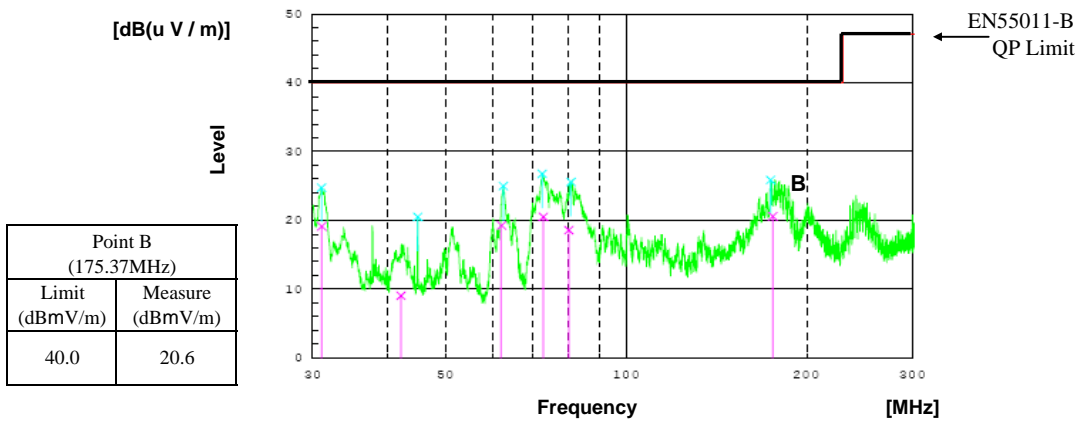
Radiated Emission

12V

HORIZONTAL



VERTICAL



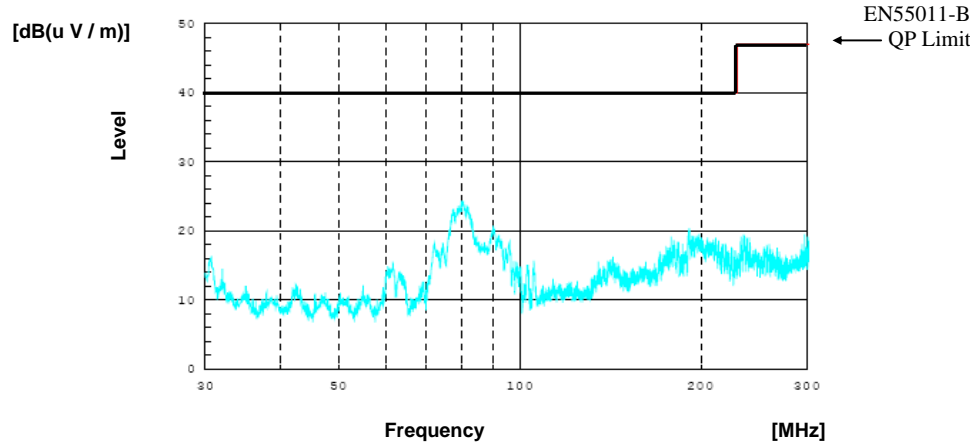
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

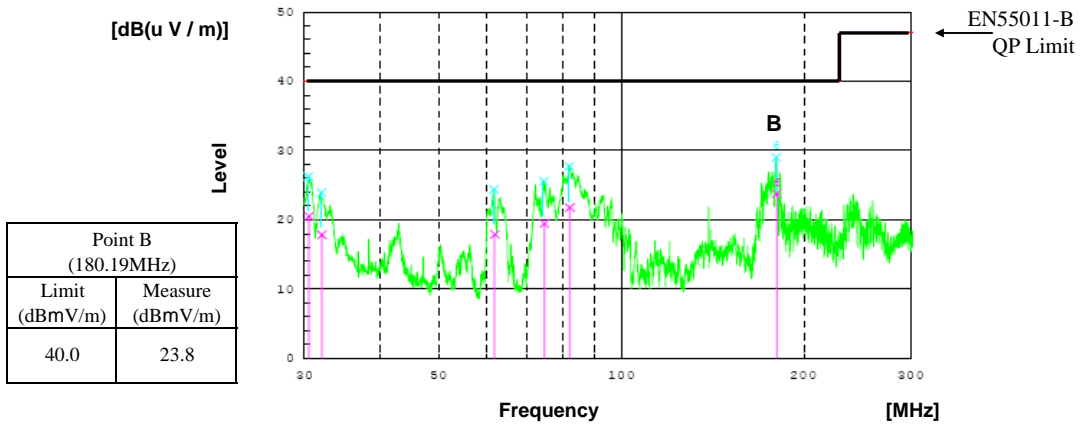
Radiated Emission

12V

HORIZONTAL



VERTICAL



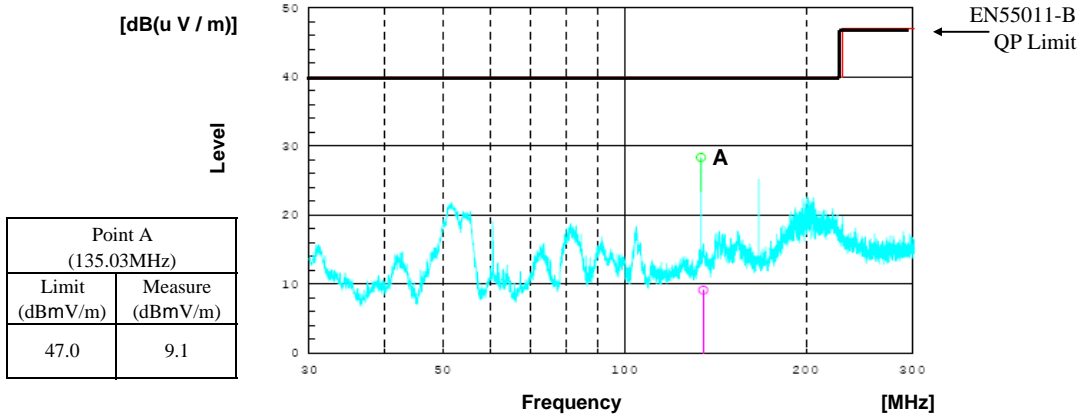
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 110VAC
Iout : 100%

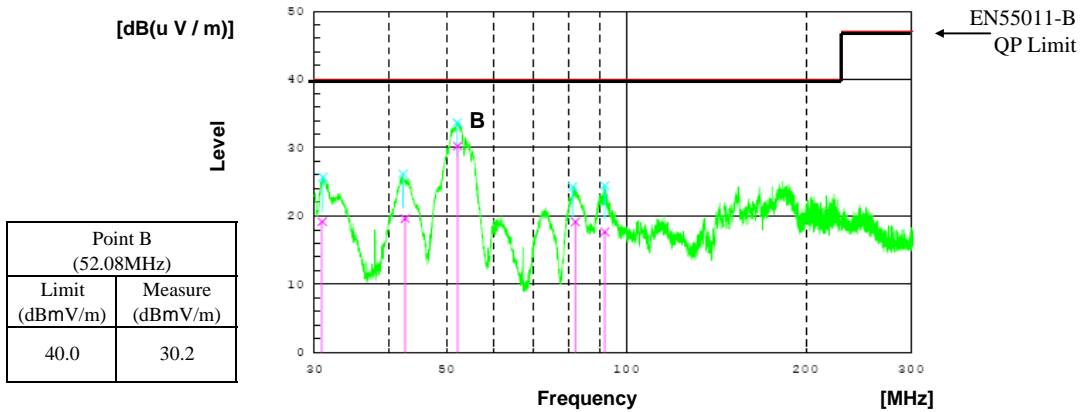
Radiated Emission

24V

HORIZONTAL



VERTICAL



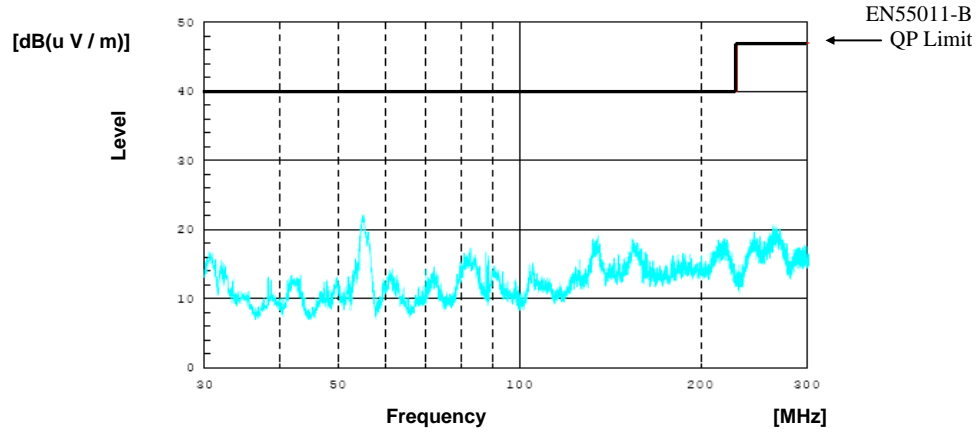
2-15 Electro-Magnetic Interference characteristics

Conditions: Vin : 230VAC
Iout : 100%

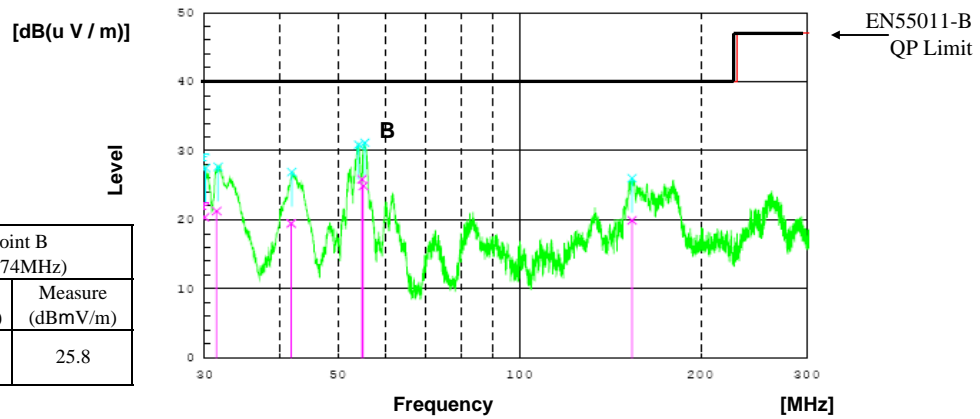
Radiated Emission

24V

HORIZONTAL



VERTICAL



Point B (54.74MHz)	
Limit (dBmV/m)	Measure (dBmV/m)
40.0	25.8