RFE2500

EVALUATION DATA

APPD	CHK	DWG
29/5/16	29/5/16	26.05.16

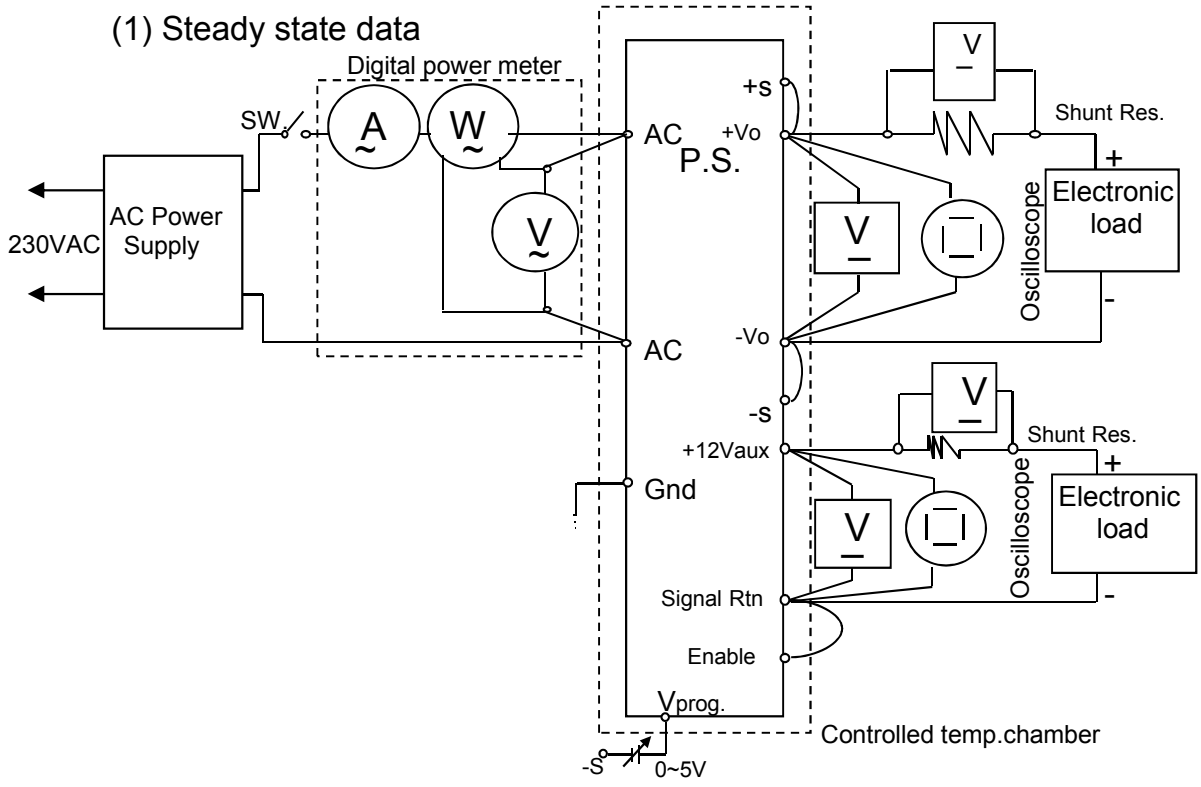
TDK-Lambda

INDEX

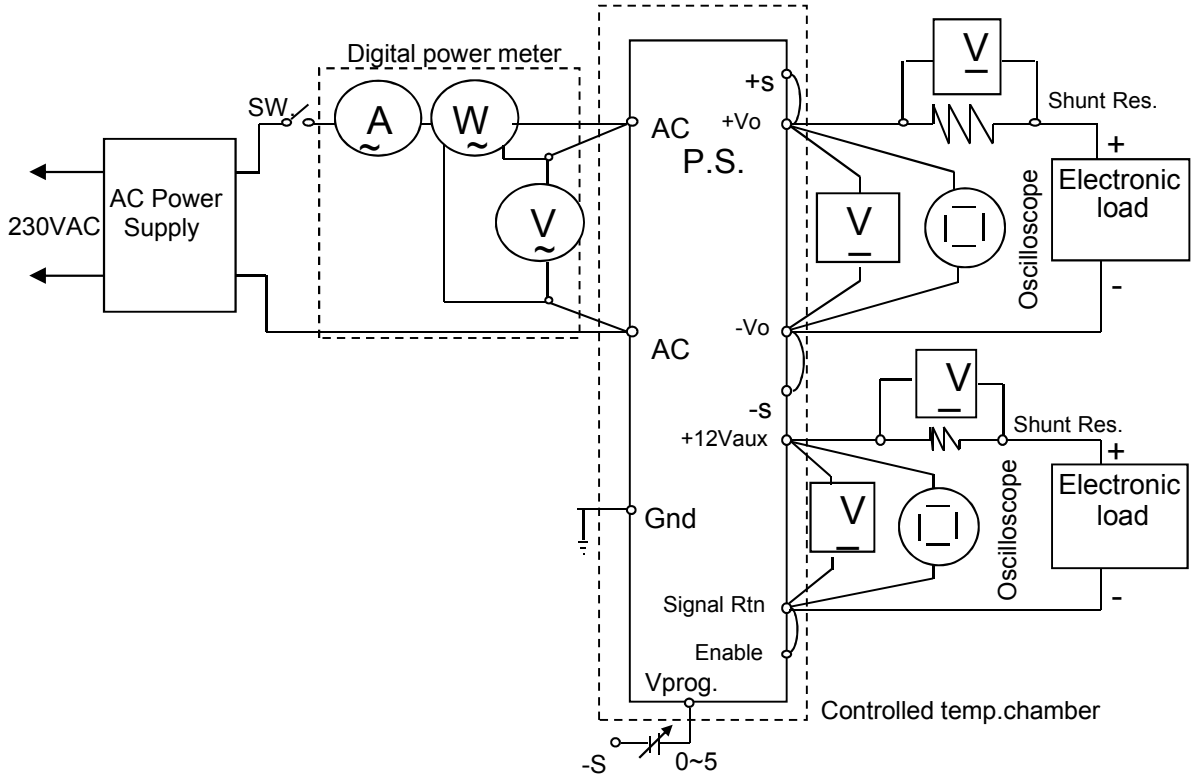
1.EVALUATION METHOD

1-1.Circuits used for determination

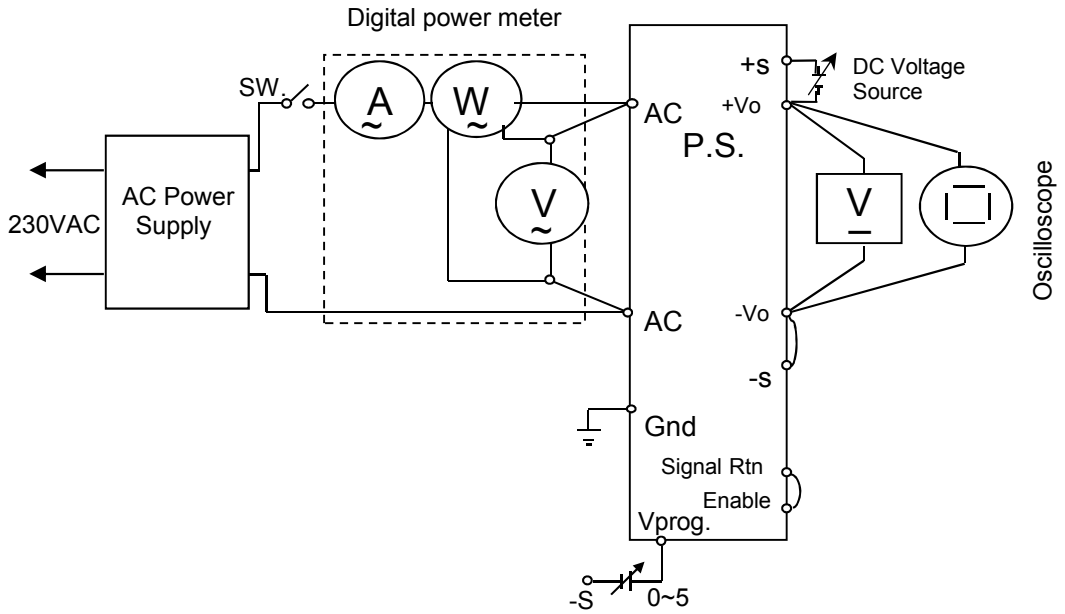
(1) Steady state data



(2) Warm up voltage drift & temperature stability



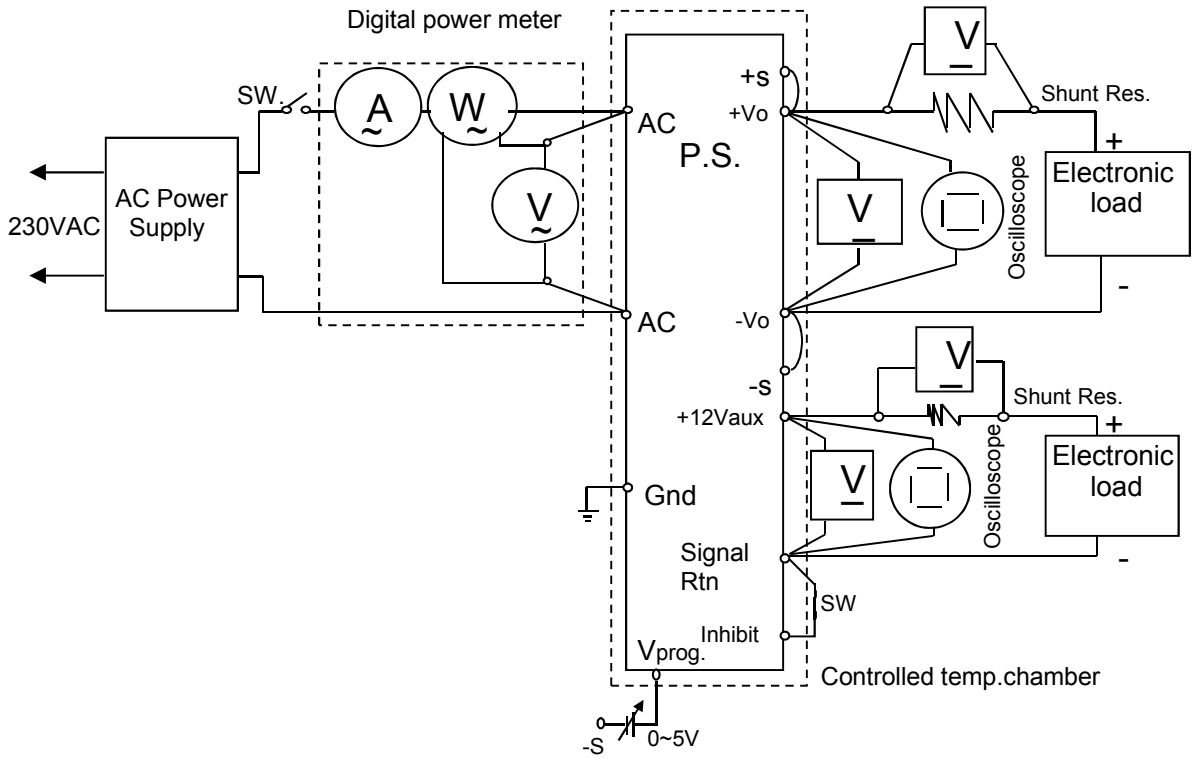
(3) Over Voltage Protection (OVP) characteristics



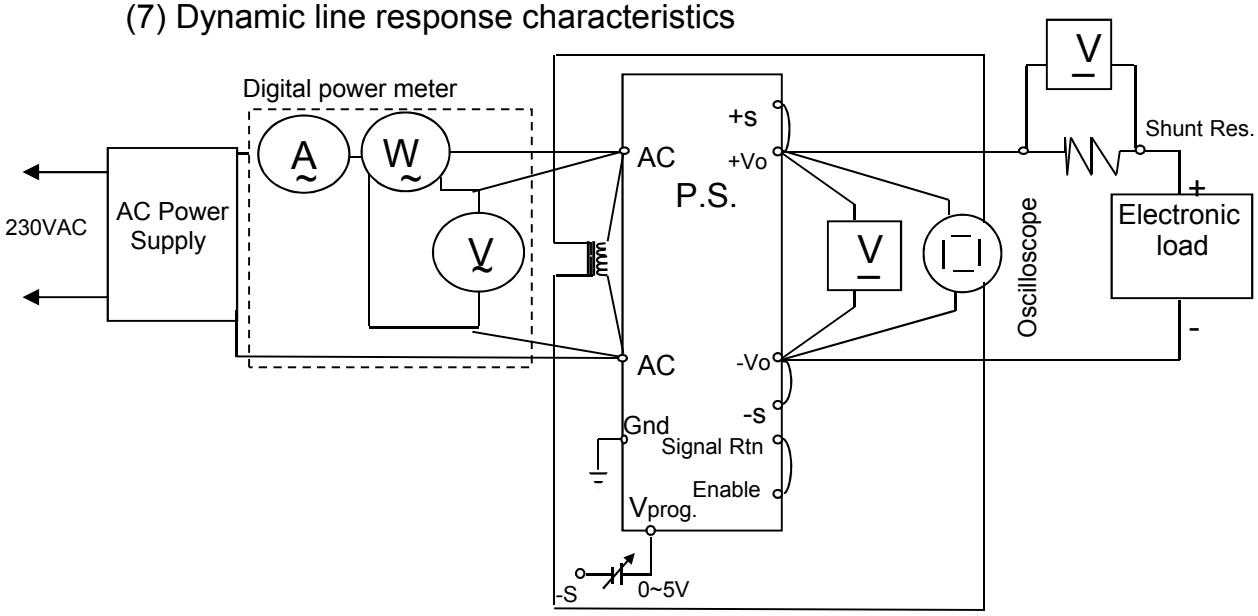
(4) Over Current Protection (OCP) characteristics

Same as item (1)

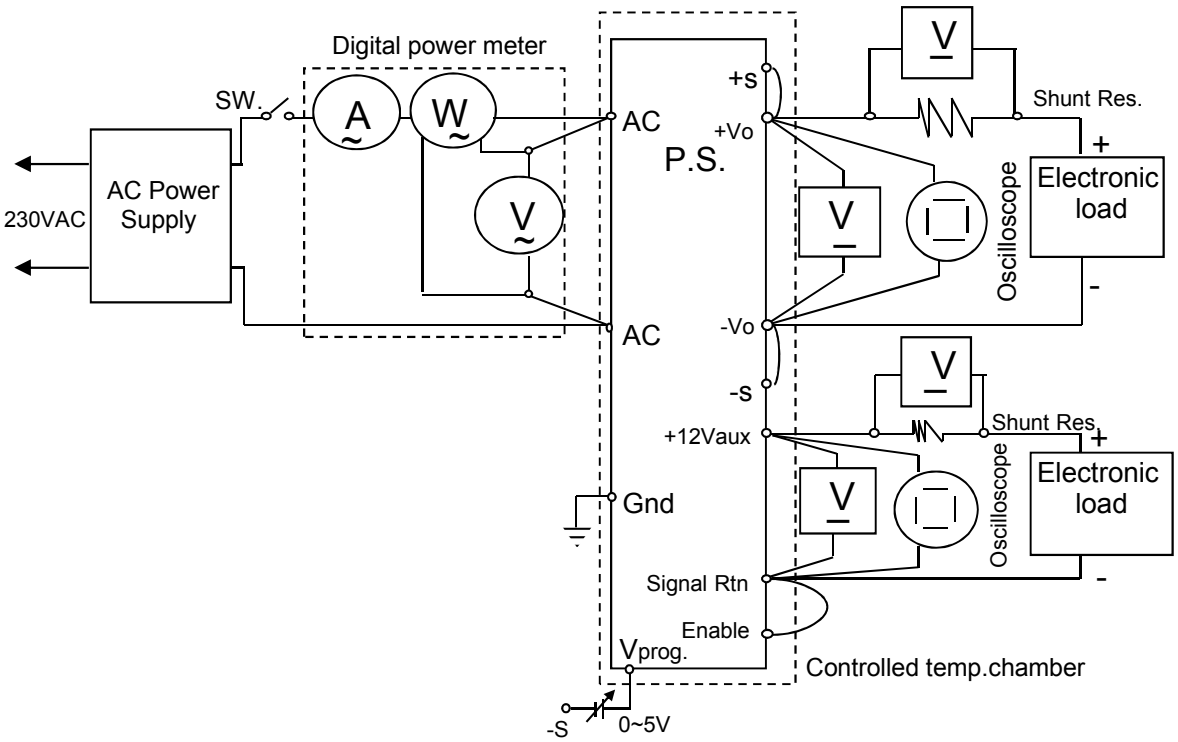
(5) (6) Output Rise & Fall Characteristics



(7) Dynamic line response characteristics

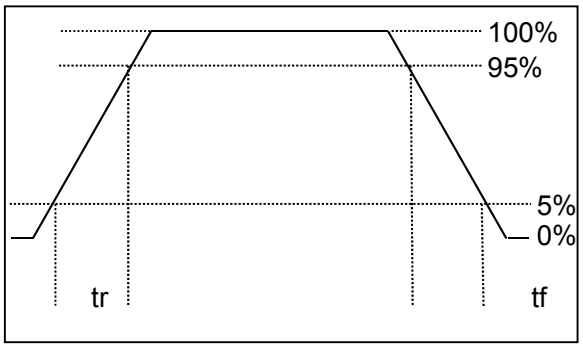


(8) Dynamic load response characteristics



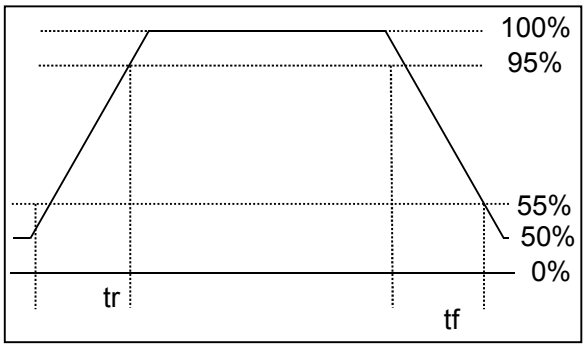
Dynamic load response characteristics

Output current waveform
Iout 0% <---> 100%



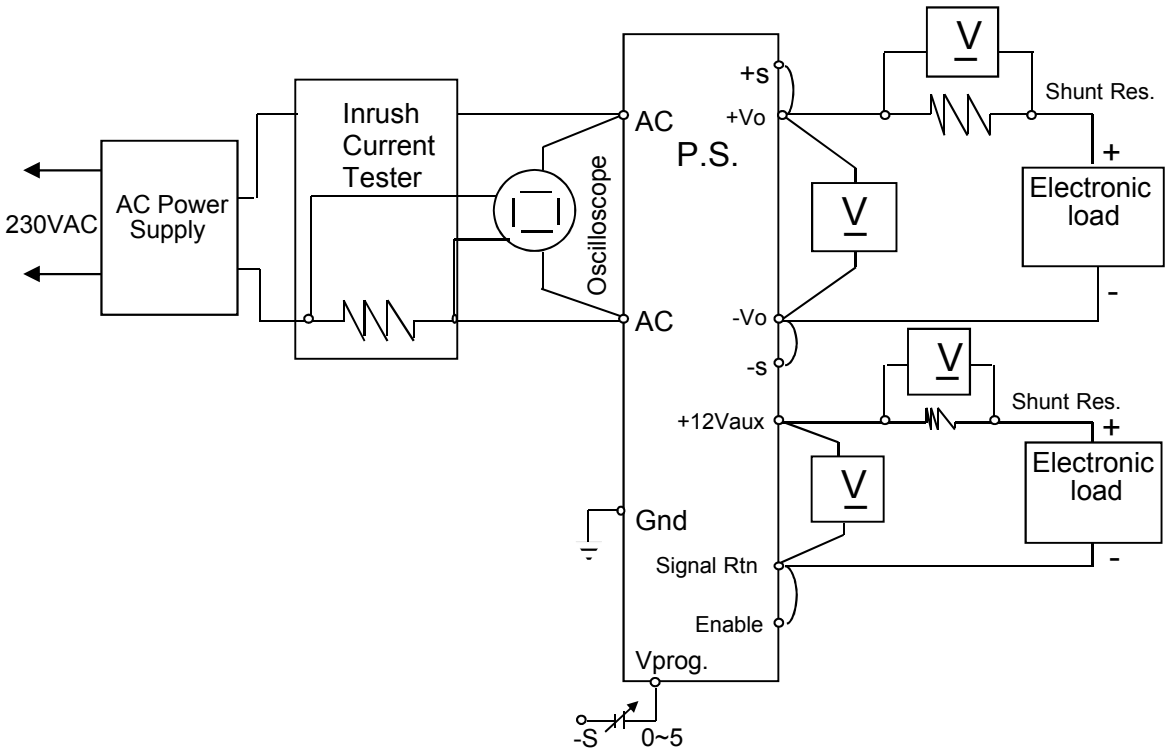
t_r = 100μs
t_f = 100μs

Output current waveform
Iout 50% <---> 100%

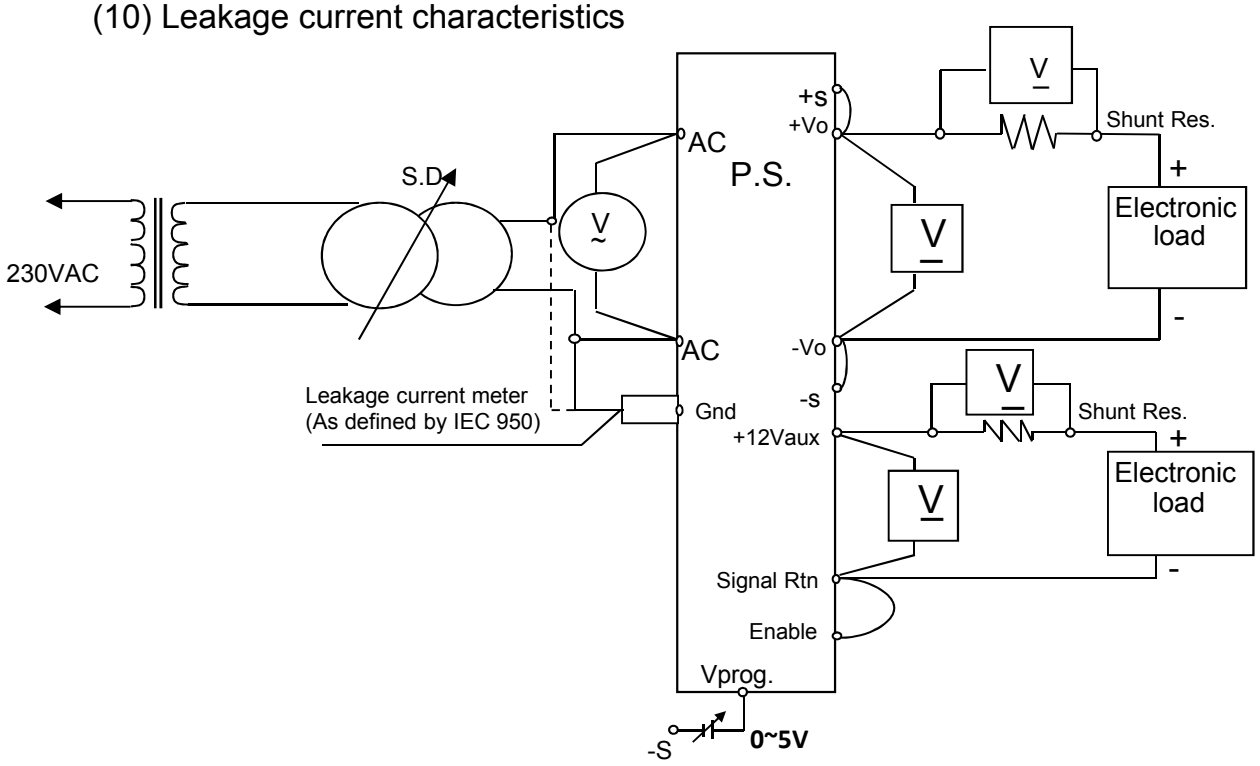


t_r = 100μs
t_f = 100μs

(9) Inrush current characteristics

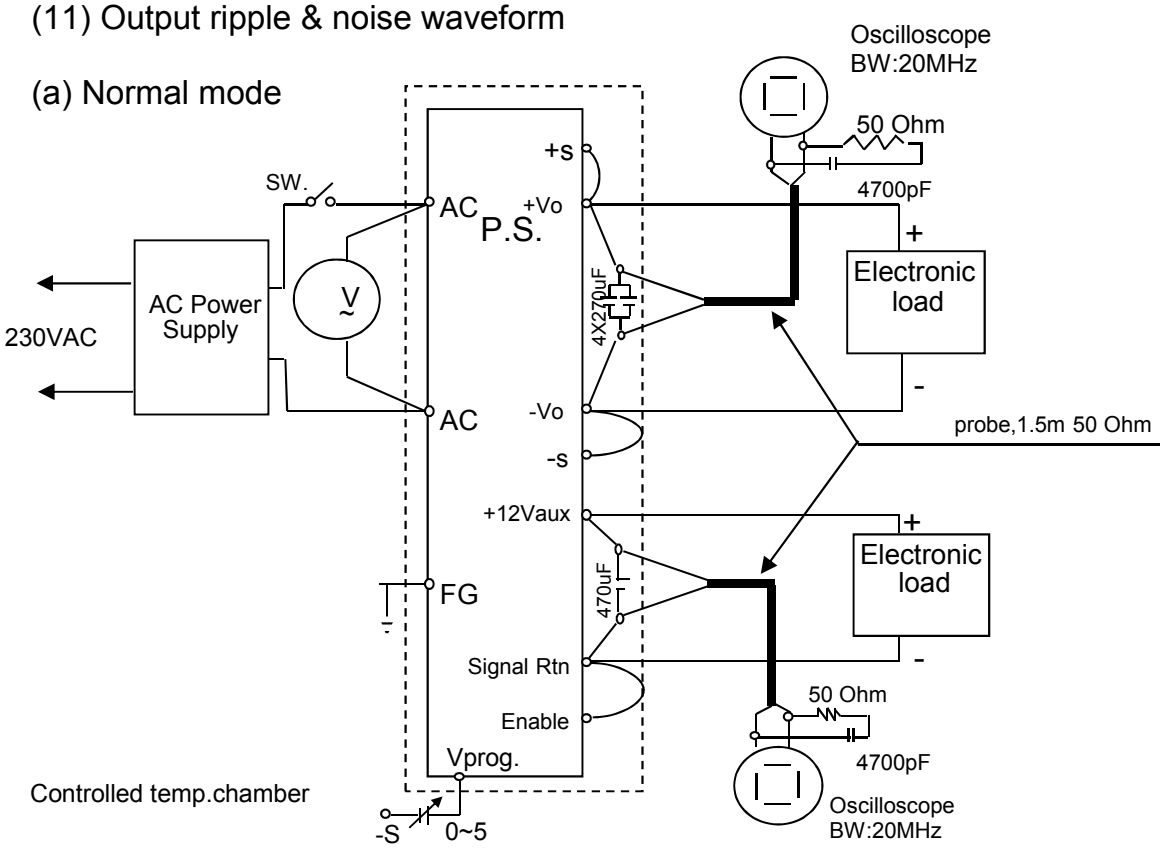


(10) Leakage current characteristics



(11) Output ripple & noise waveform

(a) Normal mode



1.2 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	AC POWER SUPPLY	CHROMA	6463
2	AC POWER SUPPLY	CHROMA	6590
3	CONTROLLED TEMP. CHAMBER	THERMOTRON	SE-600-5-5
4	CONTROLLED TEMP. CHAMBER	THERMOTRON	SE-600-6-6
5	CONTROLLED TEMP. CHAMBER	THERMOTRON	SM-16-3800
6	CURRENT PROBE	YOKOGAWA	701933
7	CURRENT TRANSDUCER	DANFYSIK	ULTRASTAB 867
8	DIGITAL MULTI METER (DMM)	AGILENT	3401A
9	DIGITAL OSCILLOSCOPE	YOKOGAWA	DL1740E / DL1740EL
10	DIGITAL POWER METER	YOKOGAWA	WT110
11	ELECTRONIC LOAD	CHROMA	63203
12	ELECTRONIC LOAD	CHROMA	63204
13	ELECTRONIC LOAD	CHROMA	63206
14	ELECTRONIC LOAD	H & H	ZS7060
15	ELECTRONIC LOAD	H & H	ZS7006
16	LEAKAGE CURRENT TESTER	KIKUSUI	TOS3200

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 $I_{AUX.}$: 0.5 A
Ta : 25 °C

Iout \ Vin	85VAC	115VAC	132VAC	Line Regulation	
0%	12.003V	12.003V	12.003V	0mV	0.00%
50%	11.999V	11.999V	11.999V	0mV	0.00%
100%	11.993V	11.993V	11.993V	0mV	0.00%
Load Regulation	10mV	10mV	10mV		
	0.08%	0.08%	0.08%		

Iout \ Vin	170VAC	230VAC	265VAC	Line Regulation	
0%	12.005V	12.005V	12.005V	0mV	0.00%
50%	11.994V	11.994V	11.994V	0mV	0.00%
100%	11.975V	11.975V	11.975V	0mV	0.00%
Load Regulation	30mV	30mV	30mV		
	0.25%	0.25%	0.25%		

* Note: Load at 85VAC is derated according to specification

2. Temperature drift

Conditions Vin : 230 VAC
Iout : 100 %
$I_{AUX.}$: 0.5 A

Ta	-10°C	25°C	50°C	Temp. Stability		
Vout	12.001V	11.990V	11.972V	0.029V	0.24%	28ppm

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

24V

1. Regulation - line and load

Conditions $I_{AUX.}$: 0.5 A
Ta : 25 °C

Iout \ Vin	85VAC	115VAC	132VAC	Line Regulation	
0%	24.001V	24.001V	24.001V	0mV	0.00%
50%	24.001V	23.999V	23.999V	2mV	0.01%
100%	23.997V	23.994V	23.993V	4mV	0.02%
Load Regulation	4mV	7mV	8mV		
	0.02%	0.03%	0.03%		

Iout \ Vin	170VAC	230VAC	265VAC	Line Regulation	
0%	24.000V	24.000V	24.000V	0mV	0.00%
50%	23.992V	23.992V	23.992V	0mV	0.00%
100%	23.981V	23.978V	23.978V	3mV	0.01%
Load Regulation	19mV	22mV	22mV		
	0.08%	0.09%	0.09%		

* Note: Load at 85VAC is derated according to specification

2. Temperature drift

Conditions Vin : 230 VAC
Iout : 100 %
$I_{AUX.}$: 0.5 A

Ta	-10°C	25°C	50°C	Temp. Stability		
Vout	24.029V	24.029V	24.025V	0.004V	0.02%	3ppm

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

48V

1. Regulation - line and load

Conditions $I_{AUX.}$: 0.5 A
Ta : 25 °C

Iout \ Vin	85VAC	115VAC	132VAC	Line Regulation	
0%	48.004V	48.004V	48.004V	0mV	0.00%
50%	48.005V	48.005V	48.005V	0mV	0.00%
100%	47.995V	47.995V	47.996V	1mV	0.00%
Load Regulation	10mV	10mV	9mV		
	0.02%	0.02%	0.02%		

Iout \ Vin	170VAC	230VAC	265VAC	Line Regulation	
0%	48.013V	48.012V	48.012V	1mV	0.00%
50%	48.006V	48.006V	48.007V	1mV	0.00%
100%	47.992V	47.993V	47.993V	1mV	0.00%
Load Regulation	21mV	19mV	19mV		
	0.04%	0.04%	0.04%		

* Note: Load at 85VAC is derated according to specification

2. Temperature drift

Conditions Vin : 230 VAC
Iout : 100 %
$I_{AUX.}$: 0.5 A

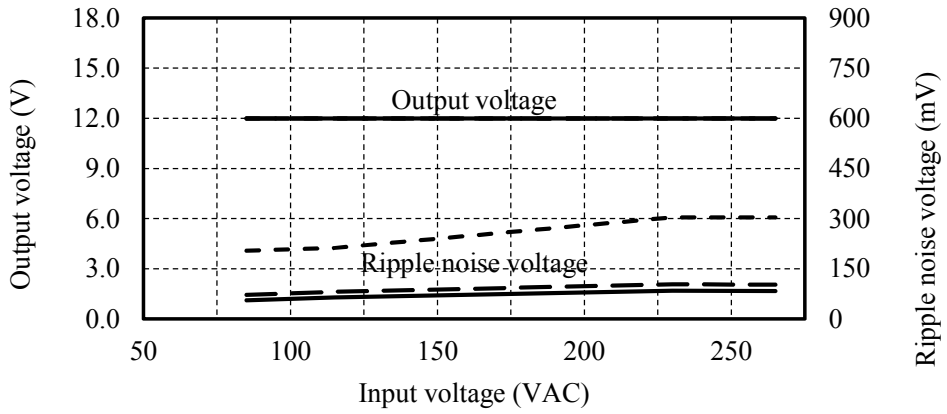
Ta	-10°C	25°C	50°C	Temp. Stability		
Vout	48.007V	47.936V	47.826V	0.181V	0.38%	44ppm

2.1 Steady state data

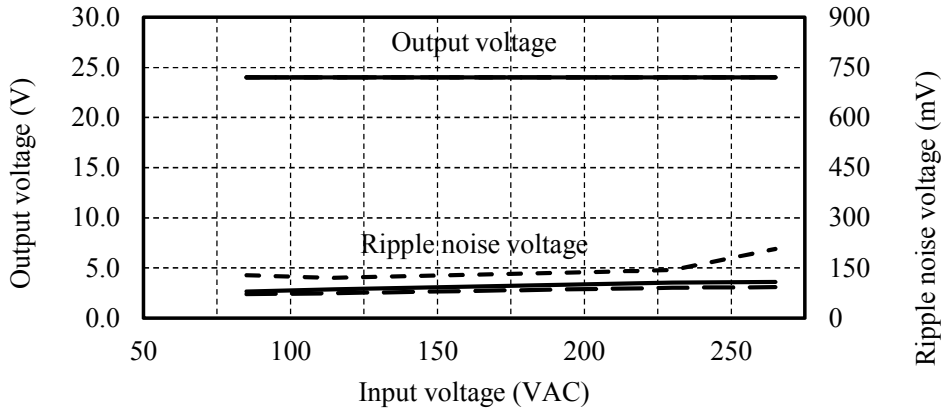
(2) Output voltage and Ripple noise voltage vs. Input voltage

Conditions Iout : 100 %
Ta : -10 °C
: 25 °C
: 50 °C

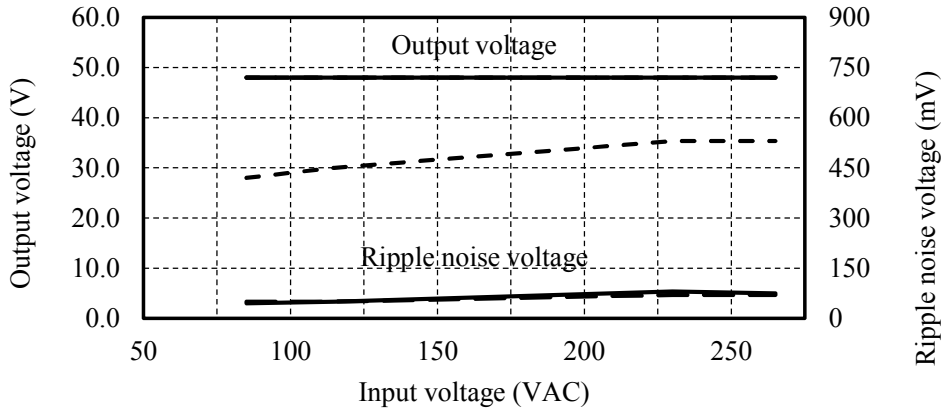
12V



24V



48V

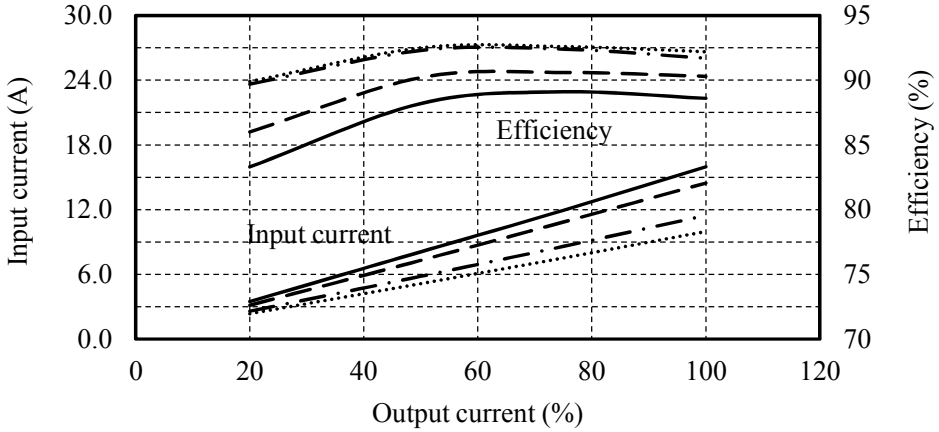


2.1 Steady state data

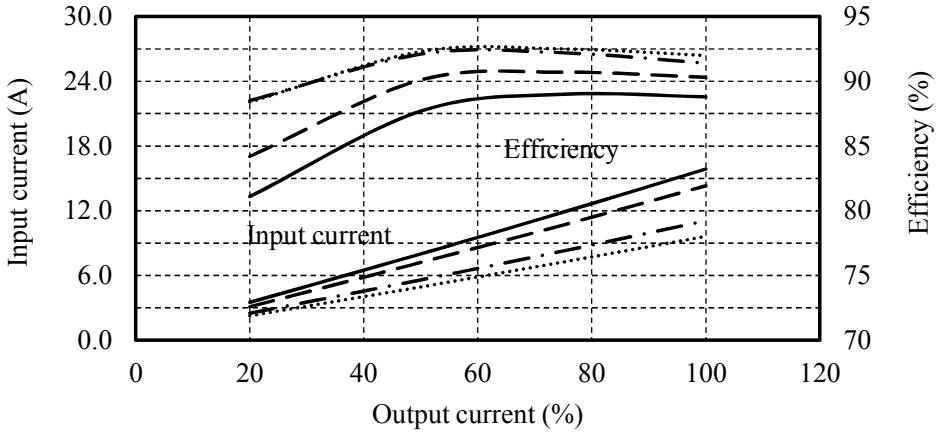
(3) Efficiency and Input current vs. Output current

Conditions Vin : 85 VAC
: 115 VAC
: 230 VAC
: 265 VAC
Ta : 25 °C

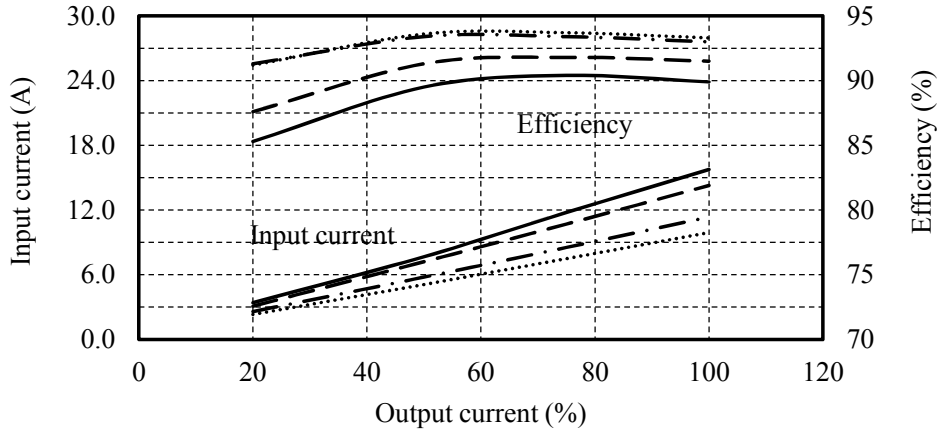
12V



24V



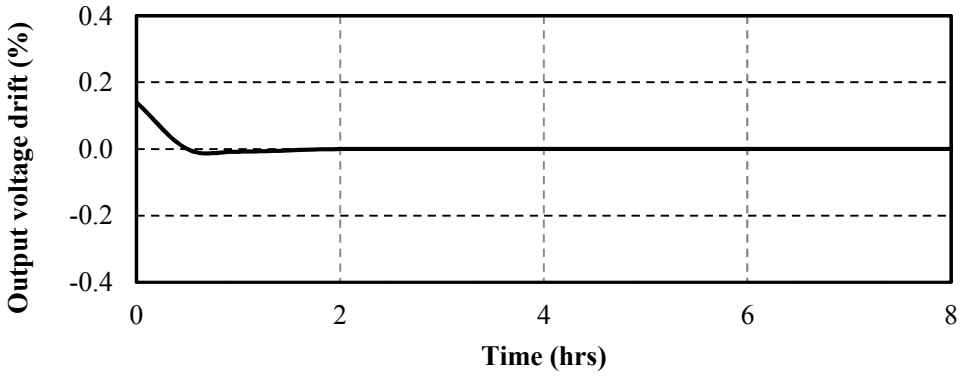
48V



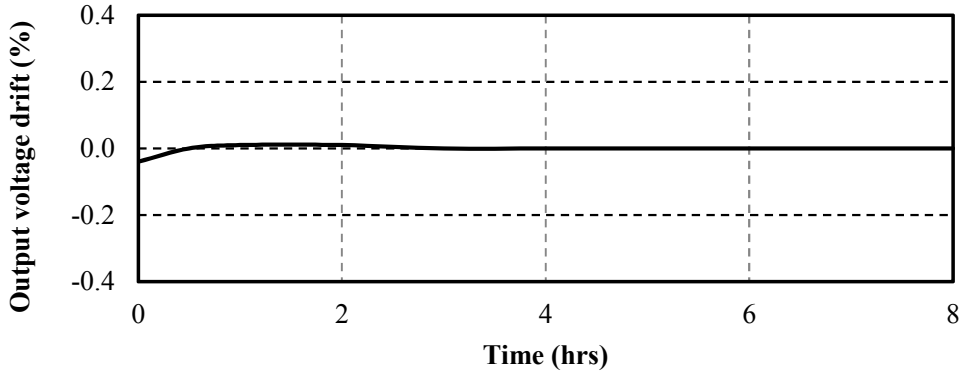
2.2 Warm up voltage drift characteristics

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

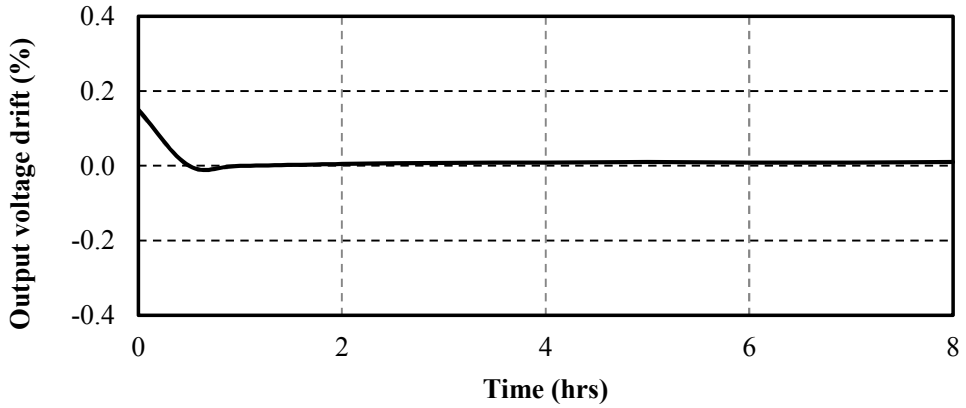
12V



24V



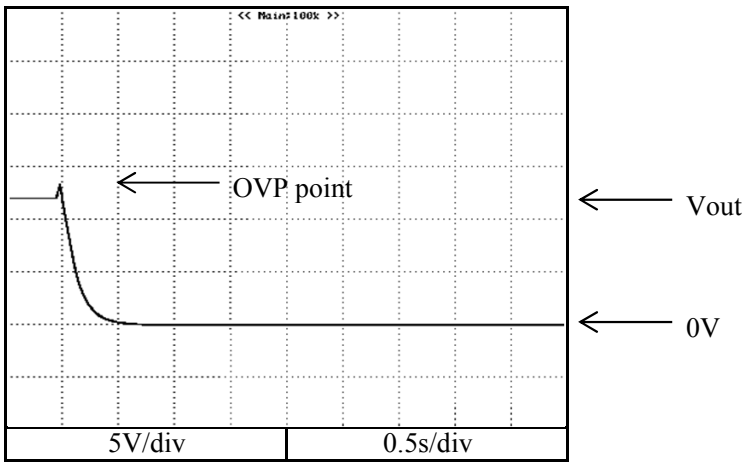
48V



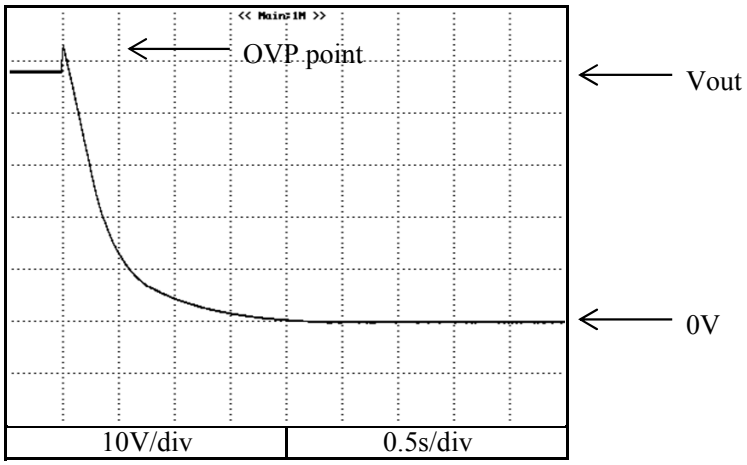
2.3 Over voltage protection (OVP) characteristics

Conditions Vin : 230 VAC
Iout : 0 %
Ta : 25 ℃

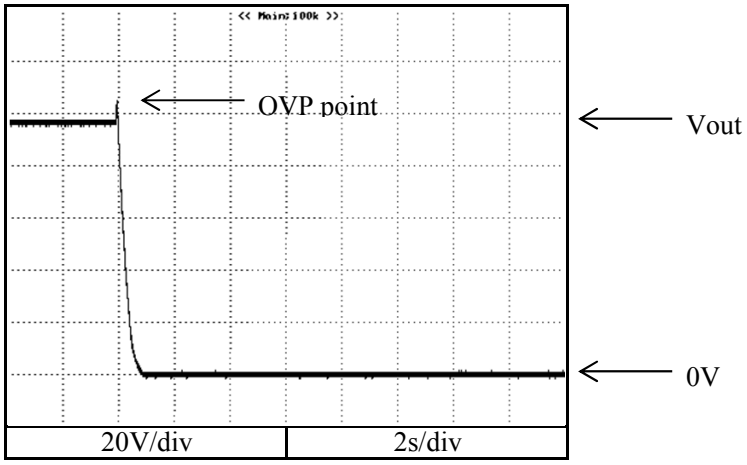
12V



24V



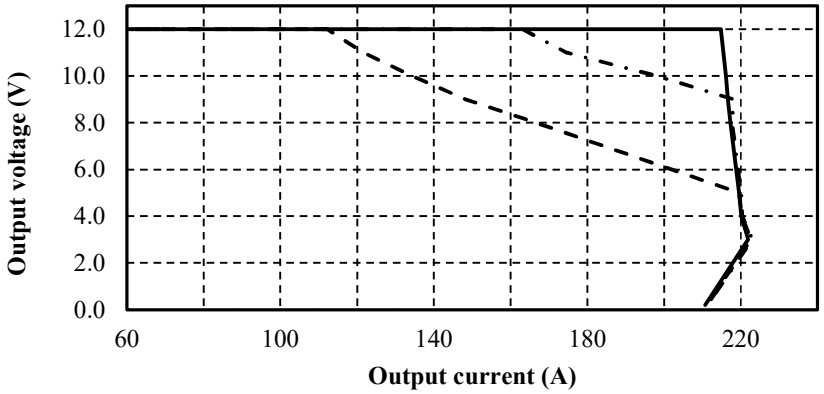
48V



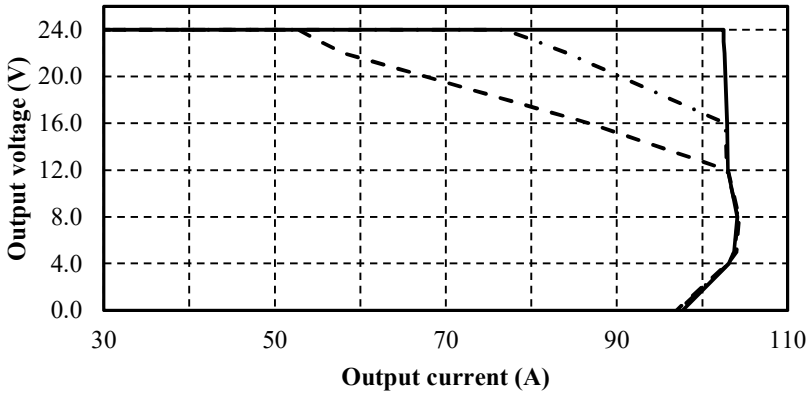
2.4 Over current protection (OCP) characteristics

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

12V



24V



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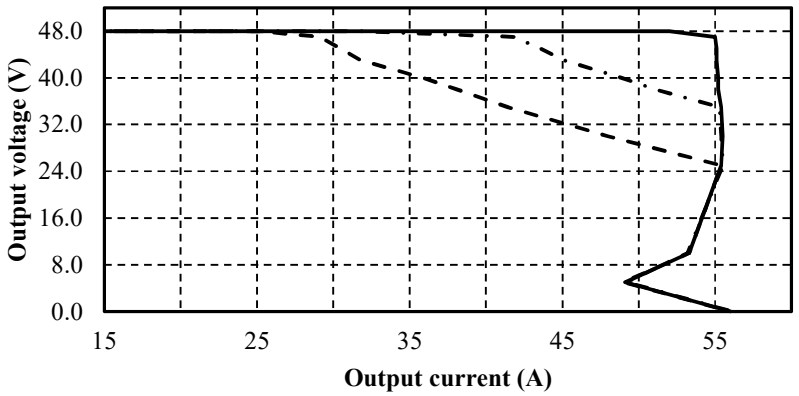
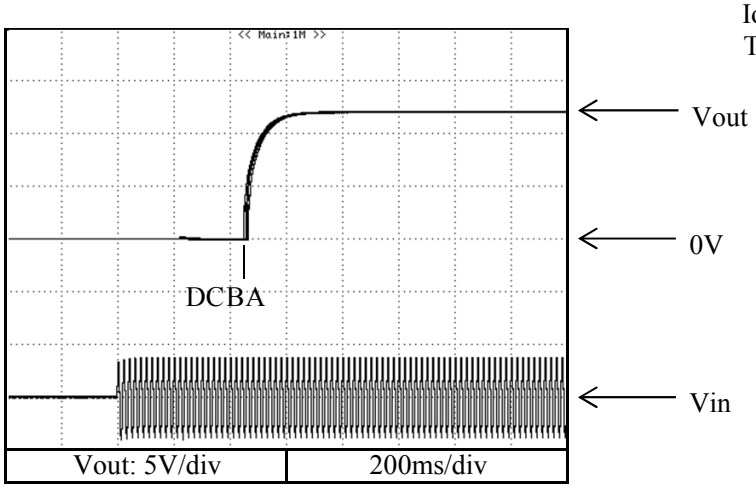


2.5 Output rise characteristics

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

12V



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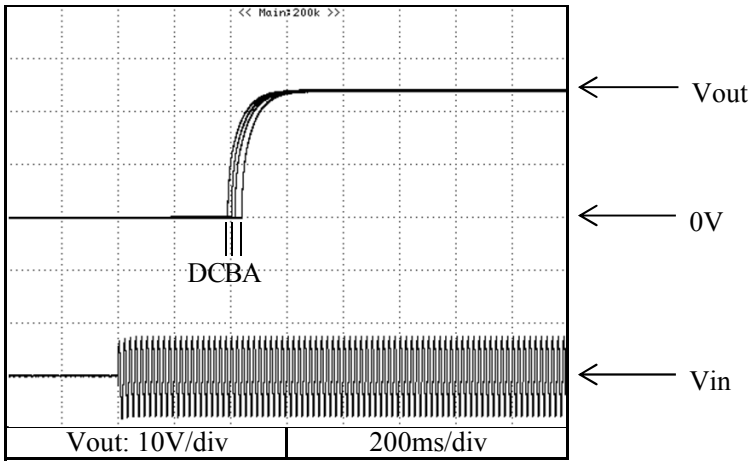
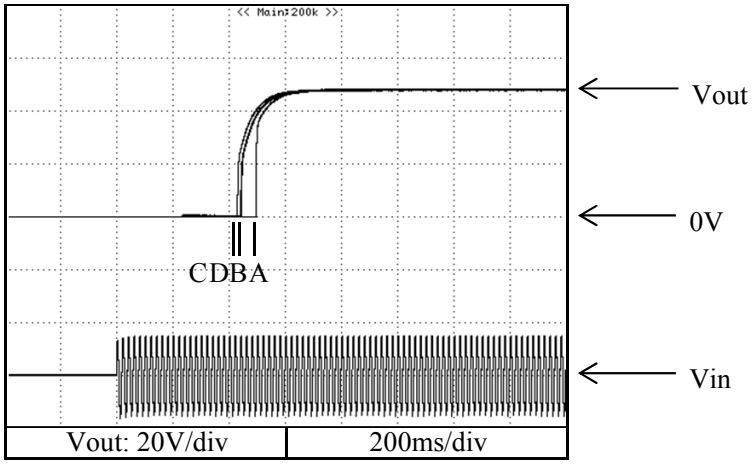


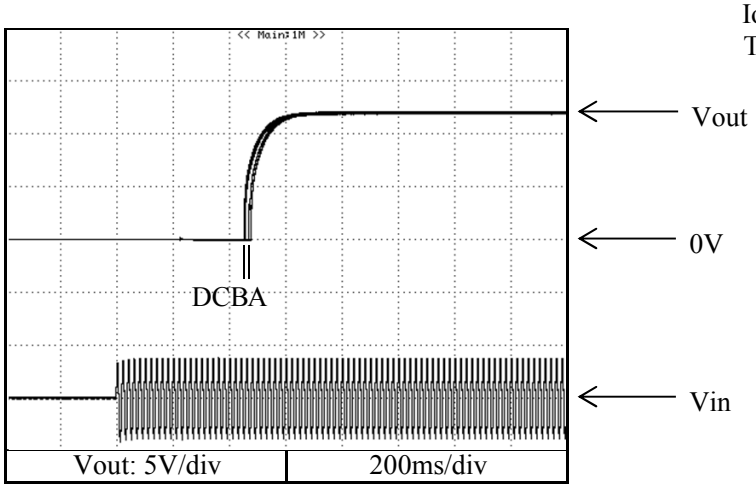
48V



2.5 Output rise characteristics

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

12V



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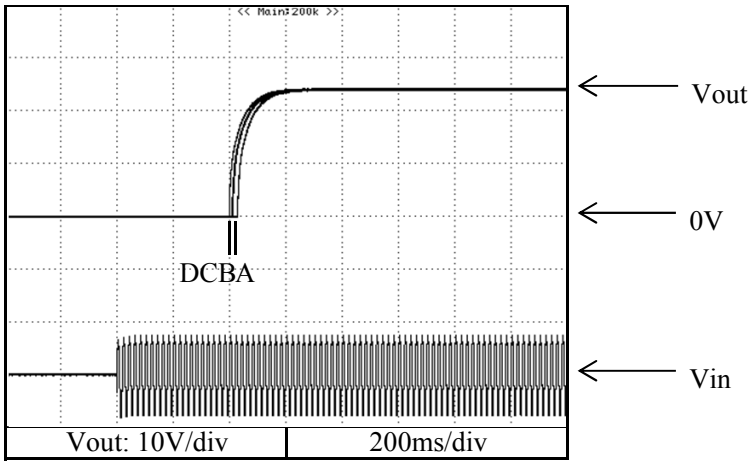
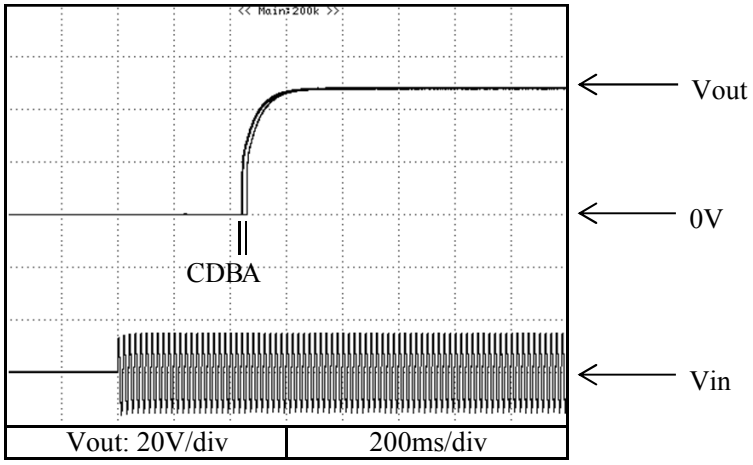


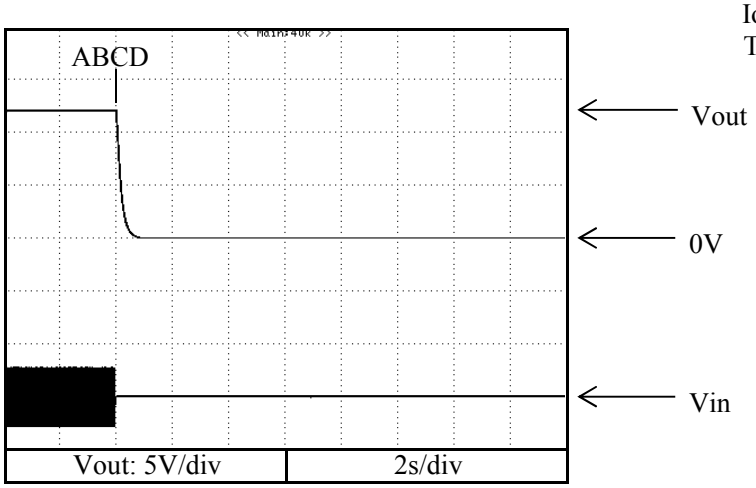
48V



2.6 Output fall characteristics

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

12V



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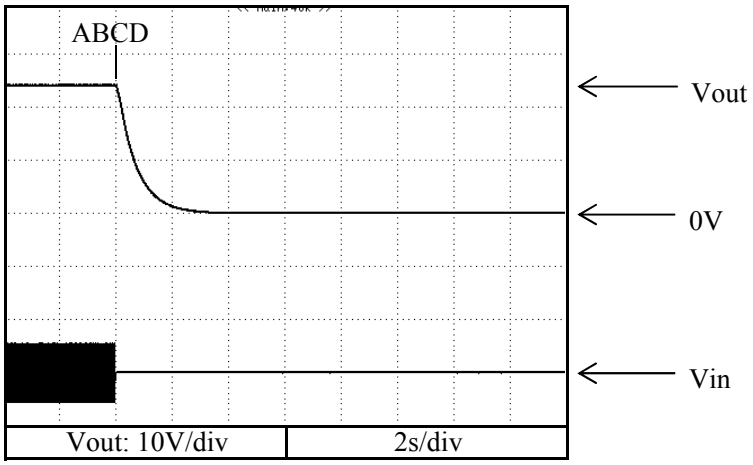
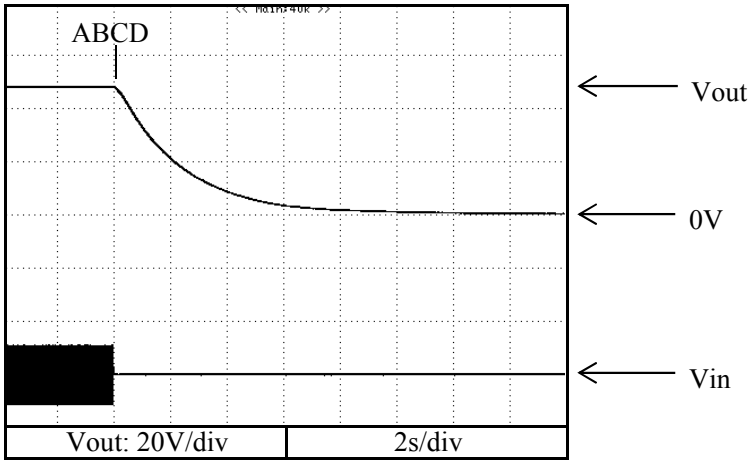


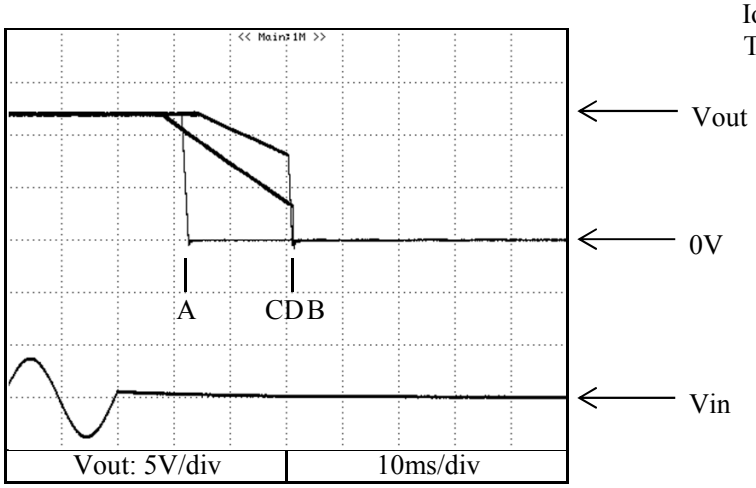
48V



2.6 Output fall characteristics

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

12V



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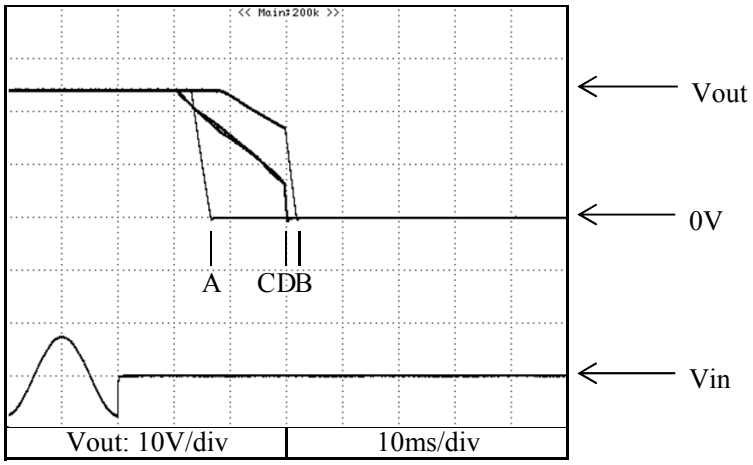

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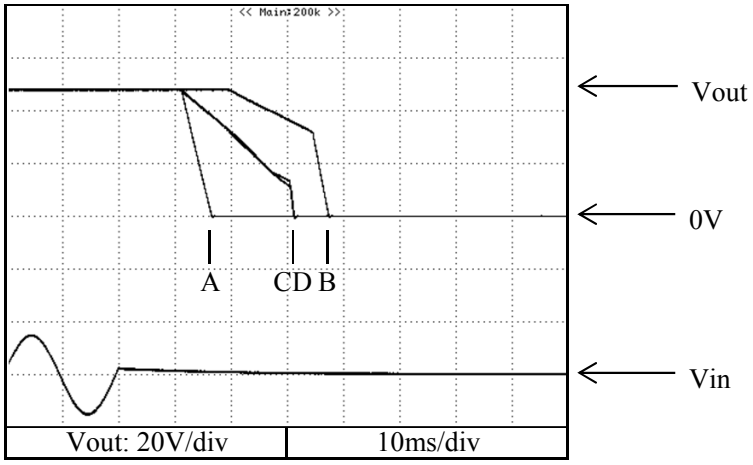
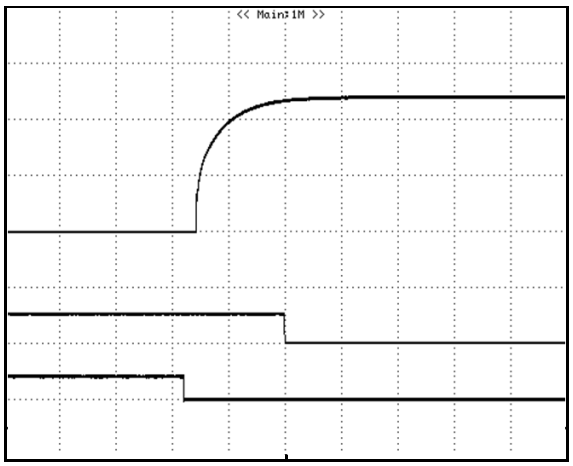


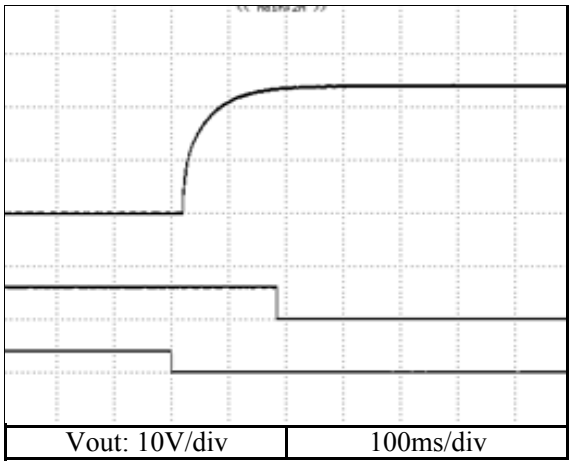
2.7 Output rise characteristics with ON/OFF CONTROL

Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 ℃

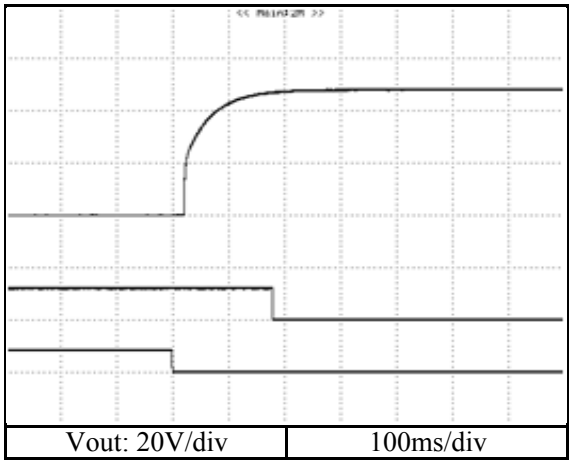
12V



24V



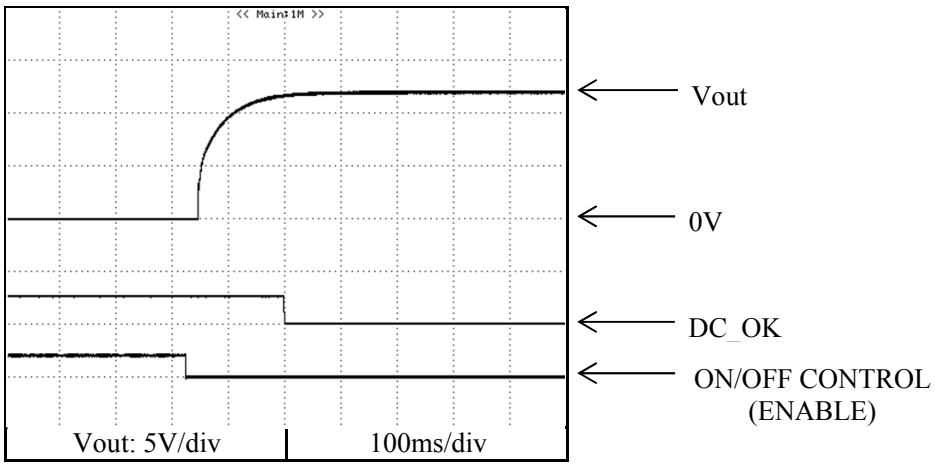
48V



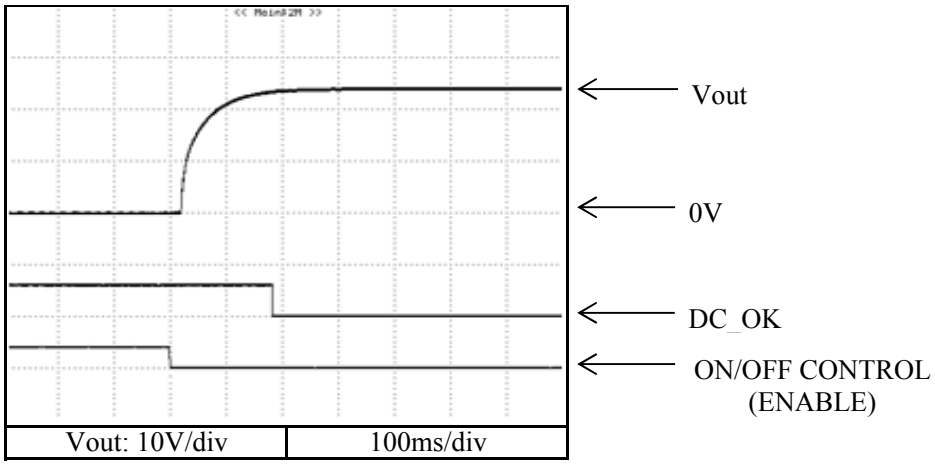
2.7 Output rise characteristics with ON/OFF CONTROL

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

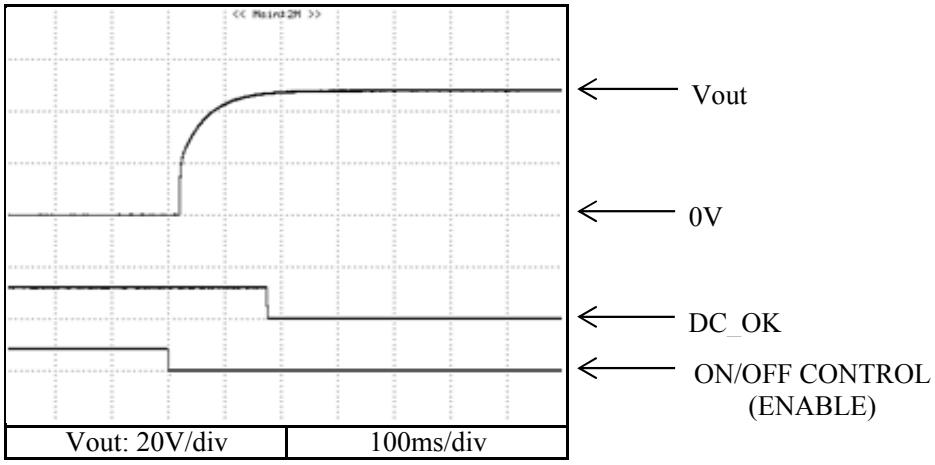
12V



24V



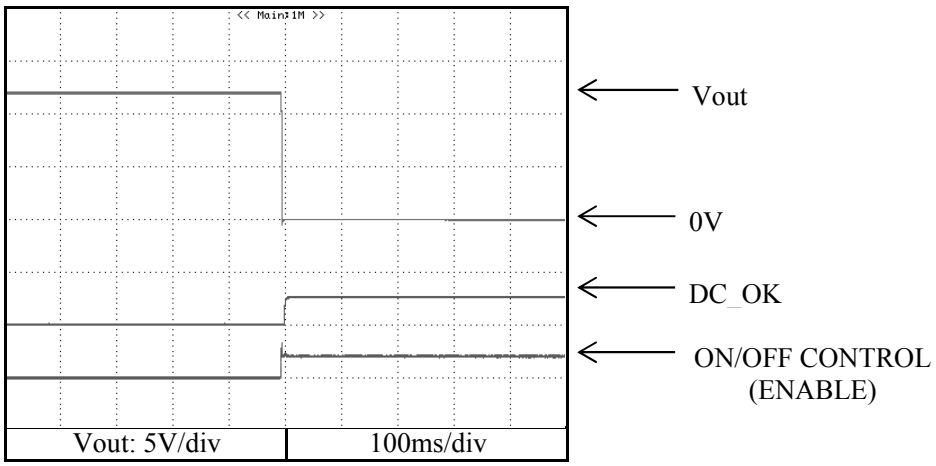
48V



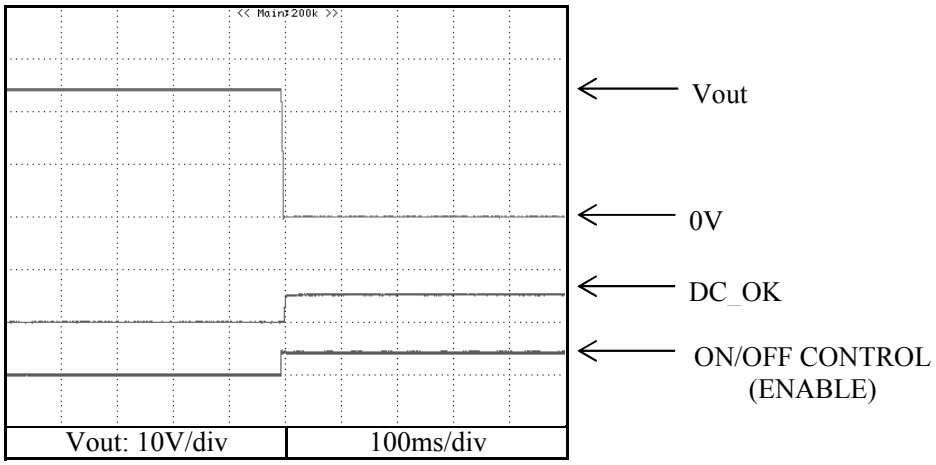
2.8 Output fall characteristics with ON/OFF CONTROL

Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 ℃

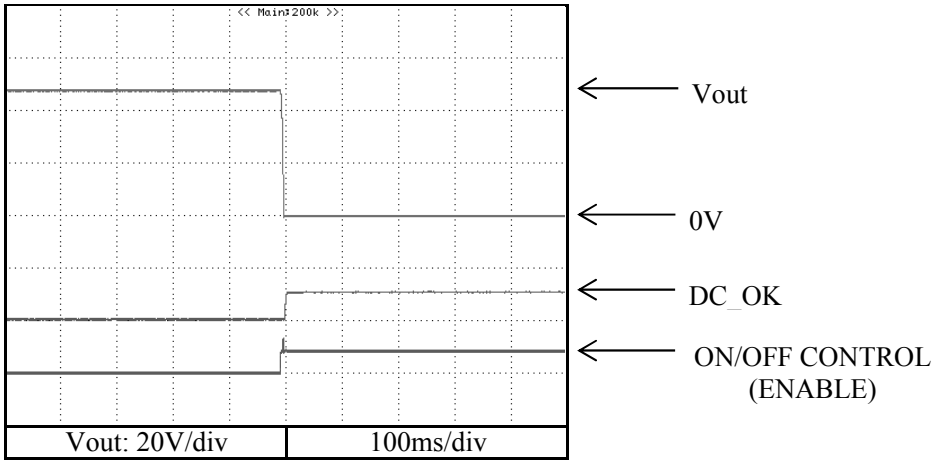
12V



24V



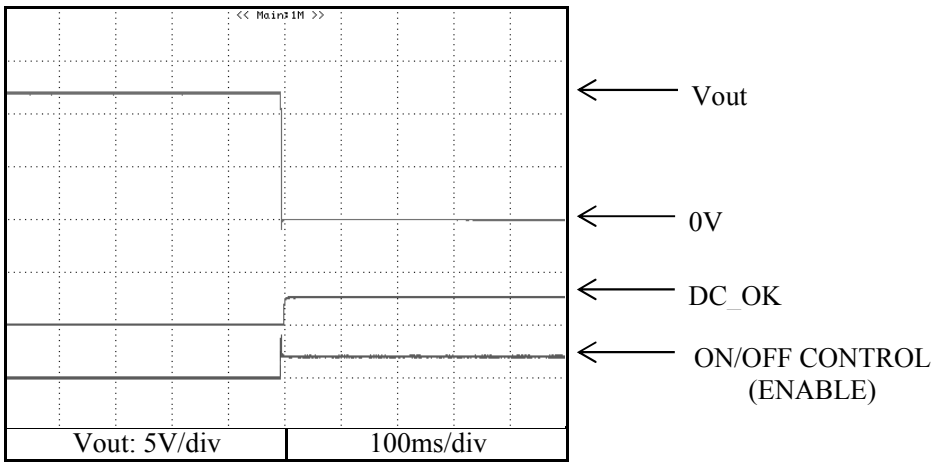
48V



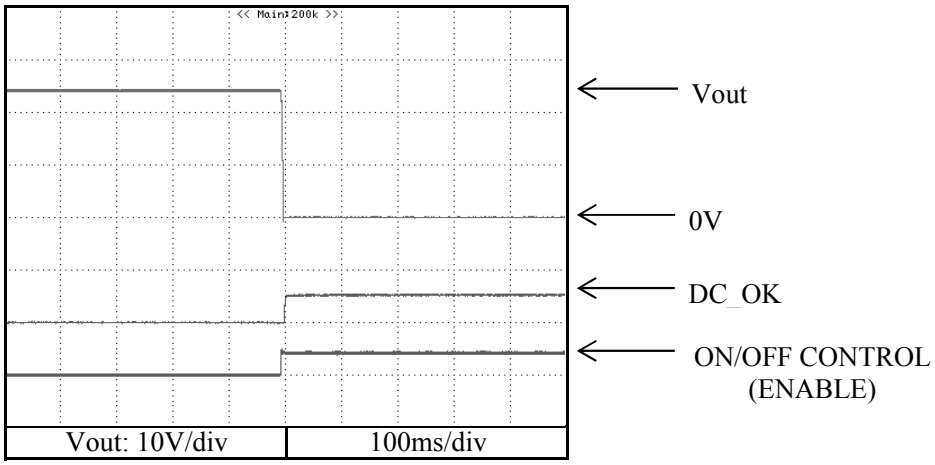
2.8 Output fall characteristics with ON/OFF CONTROL

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

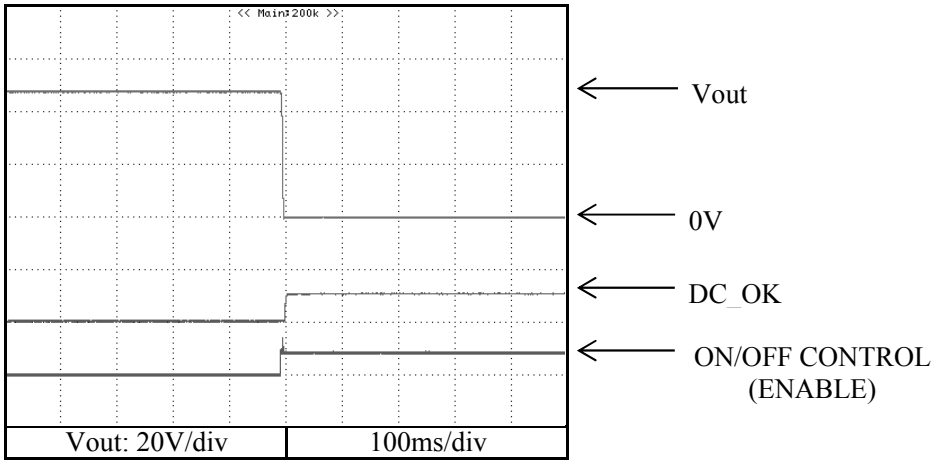
12V



24V



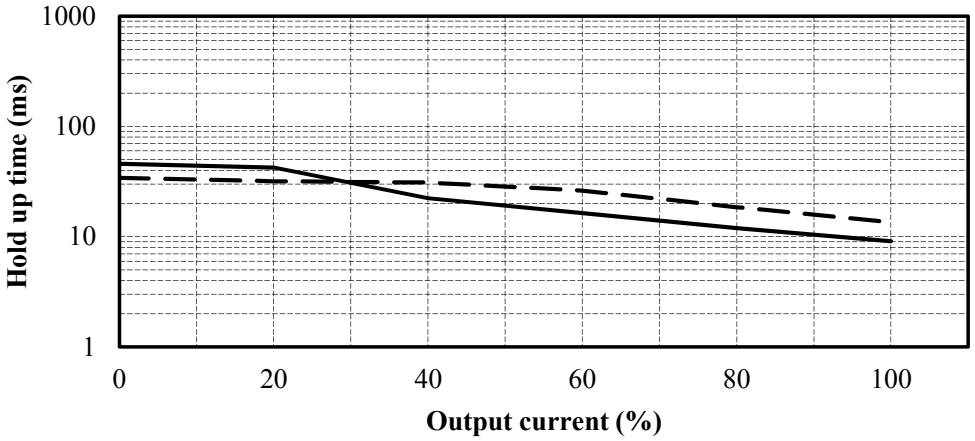
48V



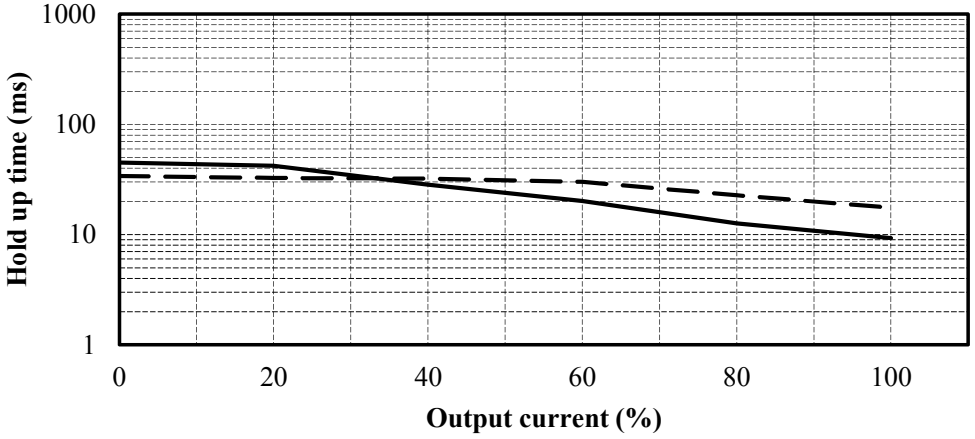
2.9 Hold up time characteristics

Conditions Vin : 115 VAC- - - - - -
: 230 VAC———
Ta : 25 ℃

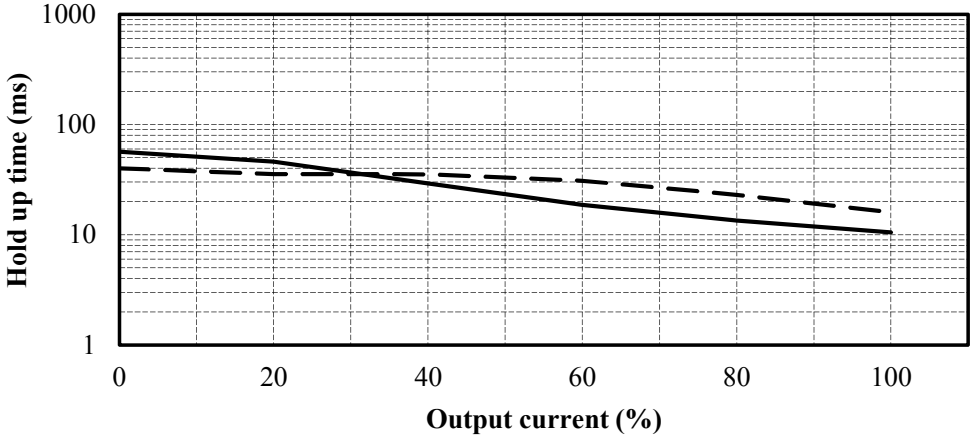
12V



24V



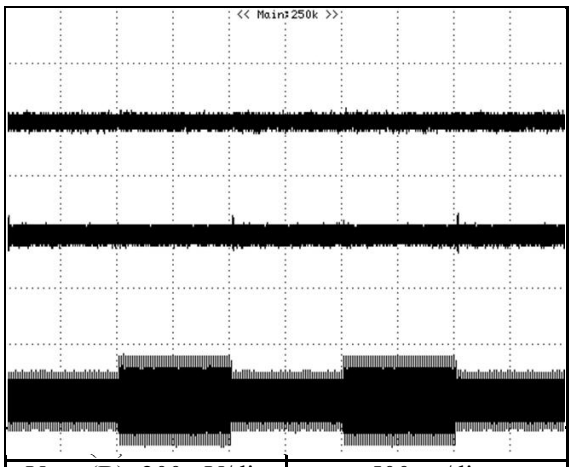
48V



2.10 Dynamic line response characteristics

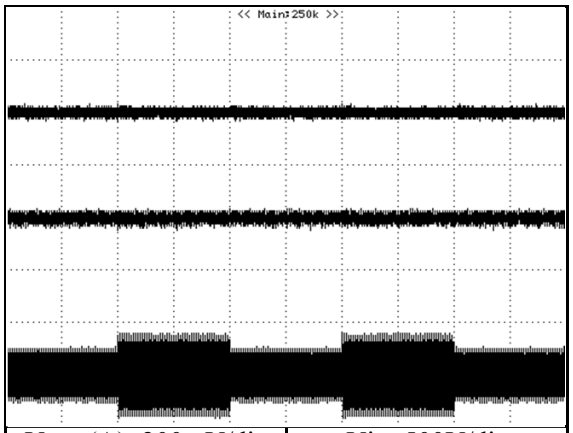
Conditions Vin : 85 VAC ↔ 132 VAC (A)
: 170 VAC ↔ 265 VAC (B)
Iout : 100 %
Ta : 25 °C

12V



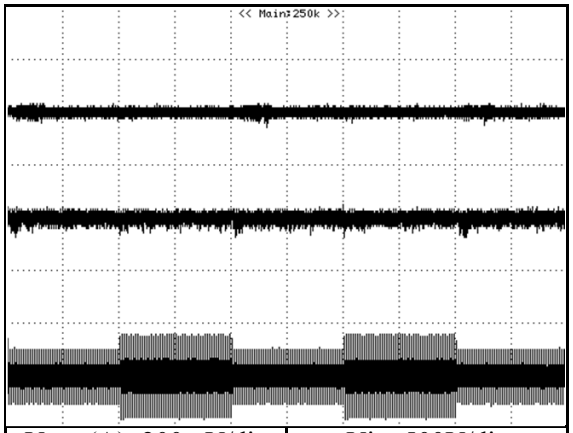
Vout (B): 200mV/div	500ms/div

24V



Vout (A): 200mV/div	Vin: 500V/div
Vout (B): 200mV/div	500ms/div

48V



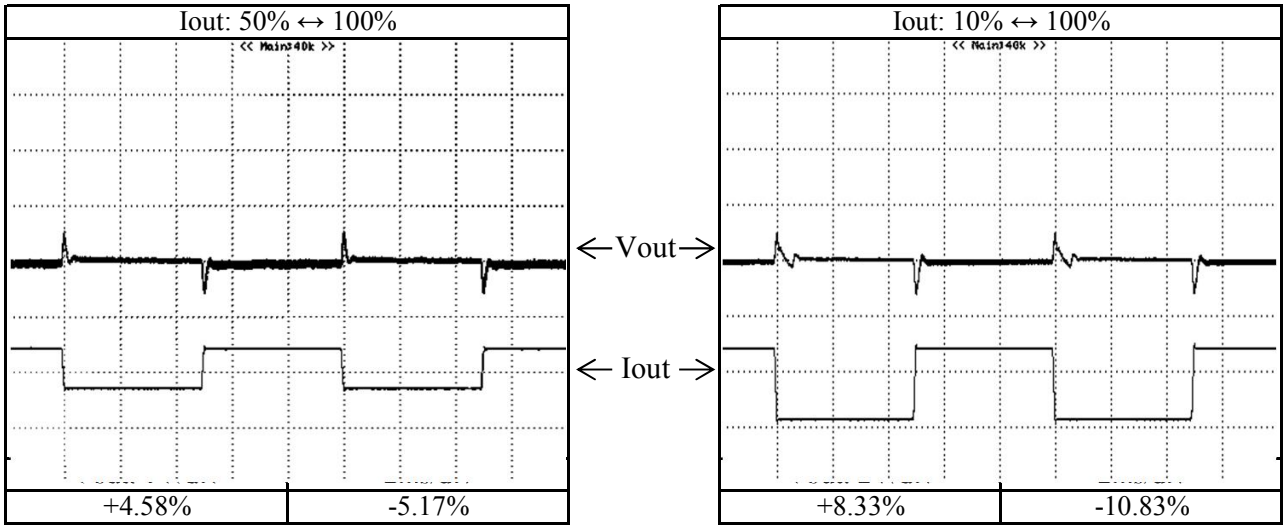
Vout (A): 200mV/div	Vin: 500V/div
Vout (B): 200mV/div	500ms/div

2.11 Dynamic load response characteristics

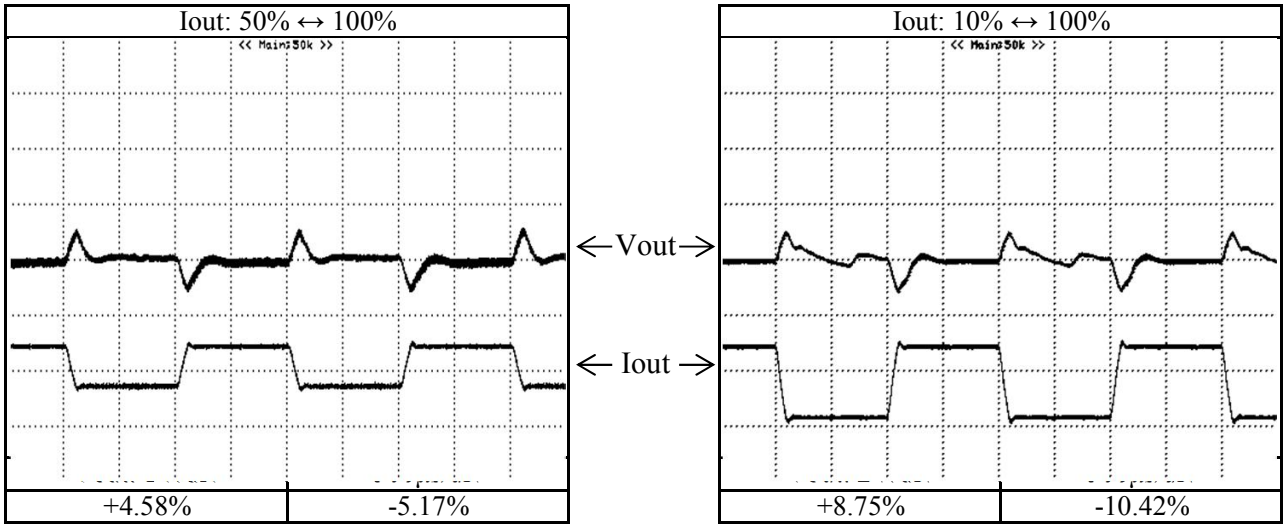
Conditions Vin : 230 VAC
Ta : 25 °C

12V

f=100Hz



f=500Hz

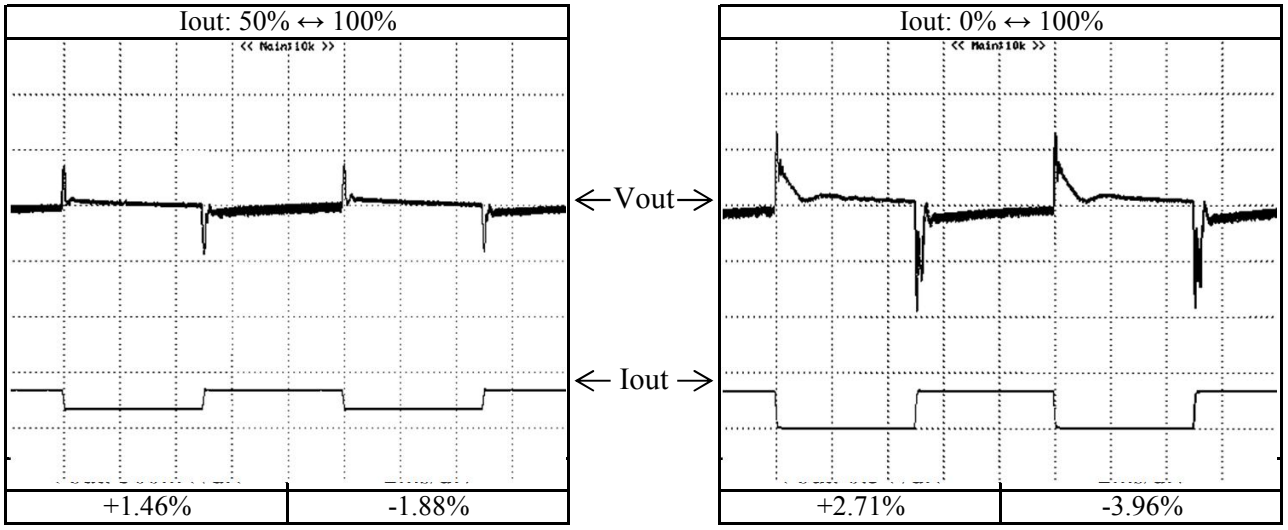


2.11 Dynamic load response characteristics

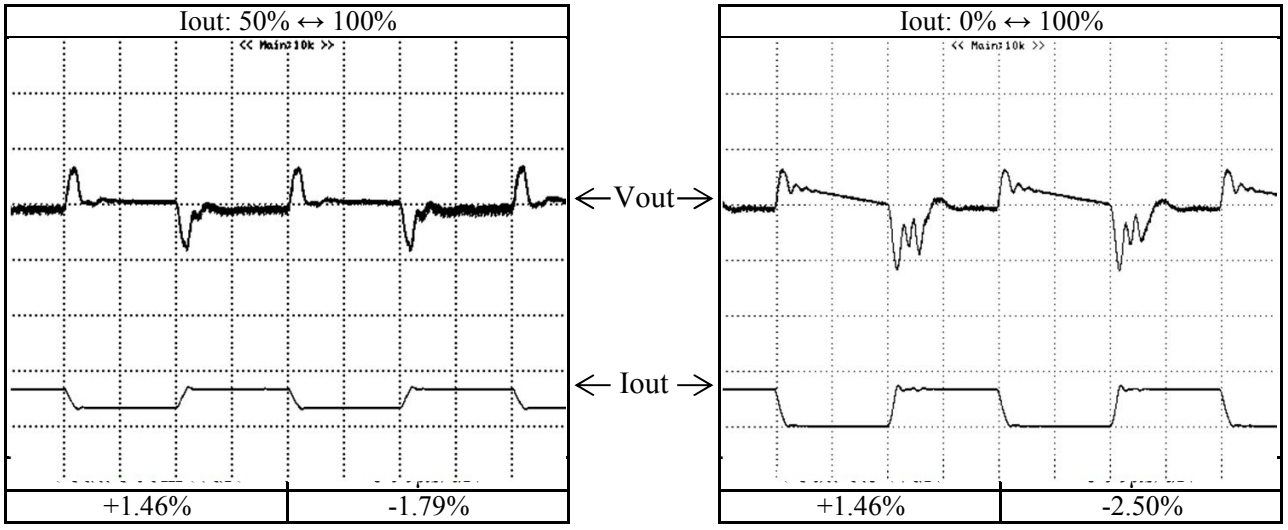
Conditions Vin : 230 VAC
Ta : 25 °C

24V

f=100Hz



f=500Hz

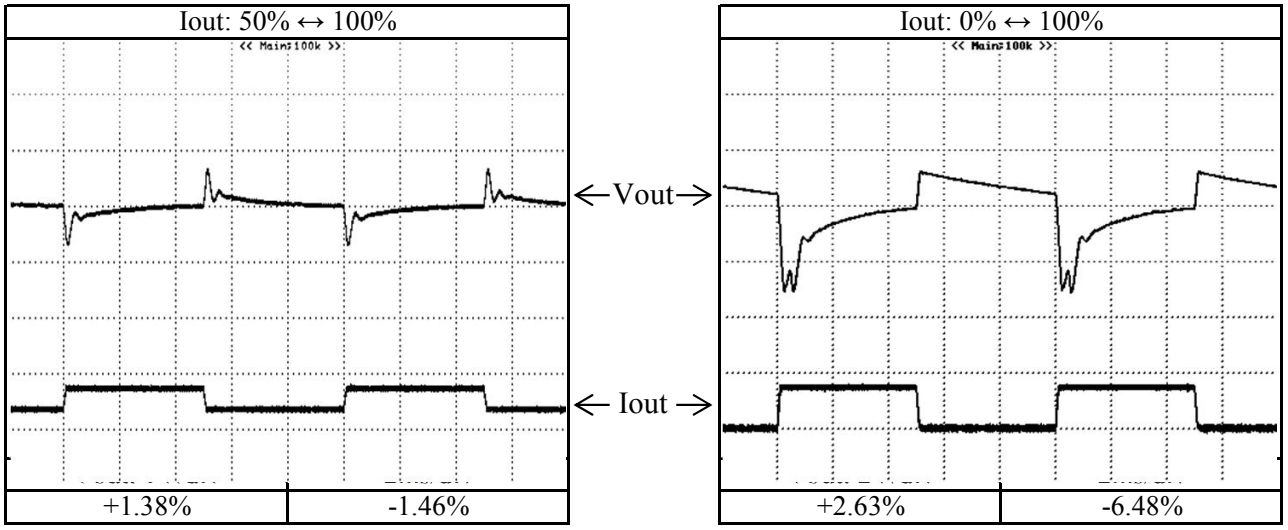


2.11 Dynamic load response characteristics

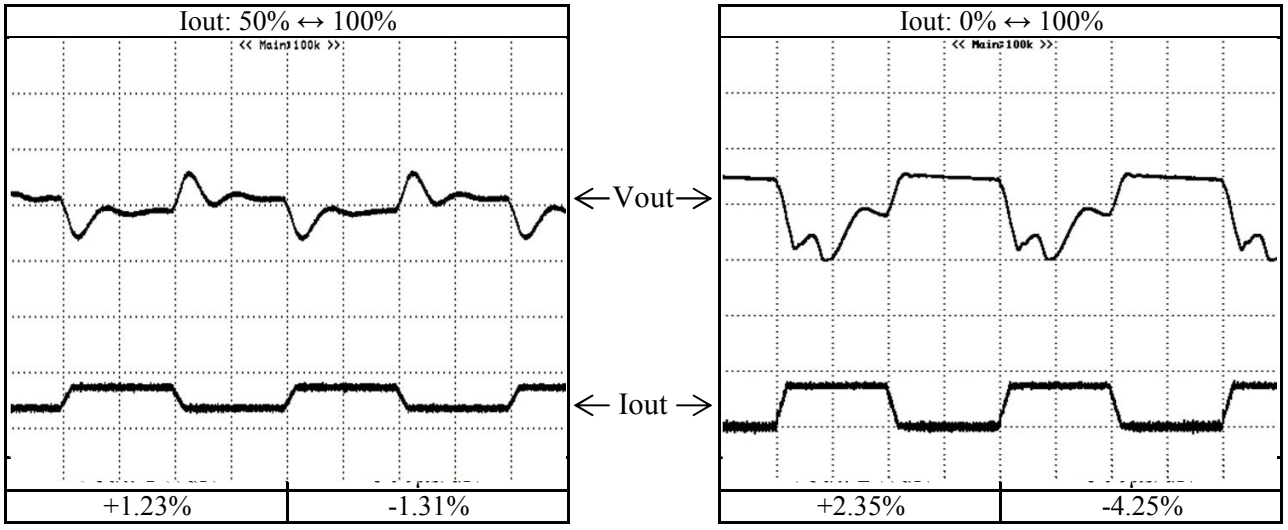
Conditions Vin : 230 VAC
Ta : 25 °C

48V

f=100Hz



f=500Hz

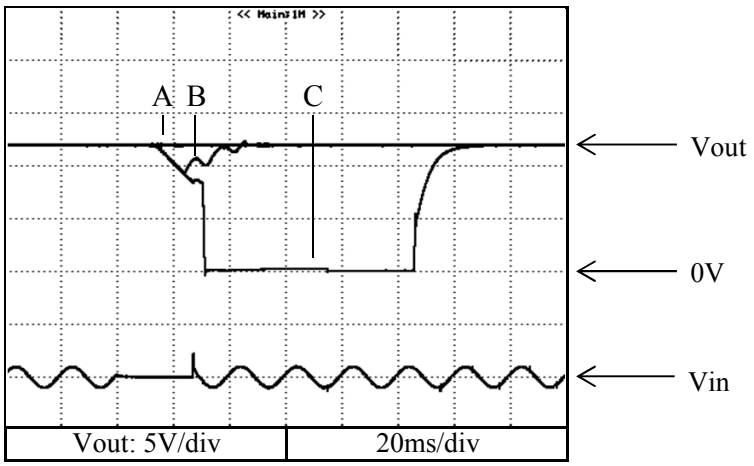


2.12 Response to brown out characteristics

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

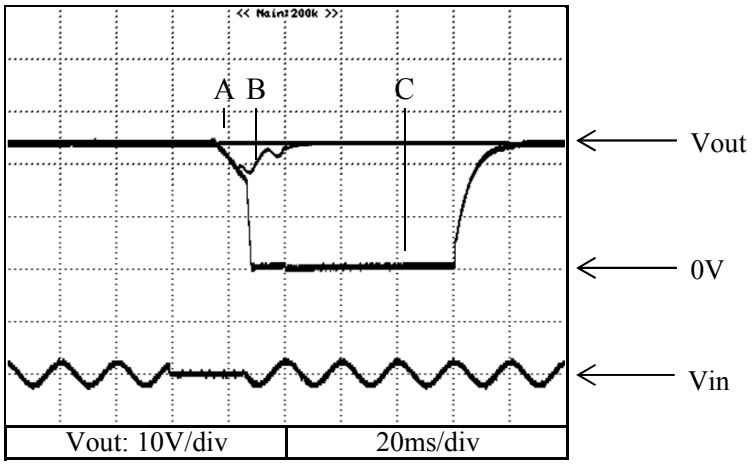
12V

A = 14ms
B = 24ms
C = 27ms



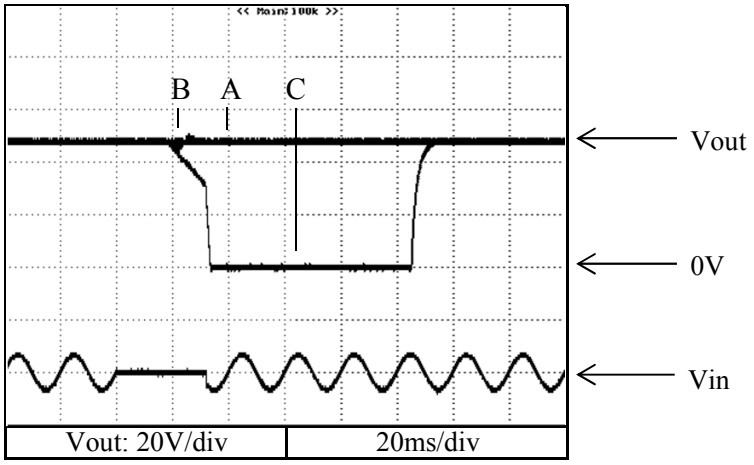
24V

A = 14ms
B = 24ms
C = 26ms



48V

A = 16ms
B = 18ms
C = 32ms

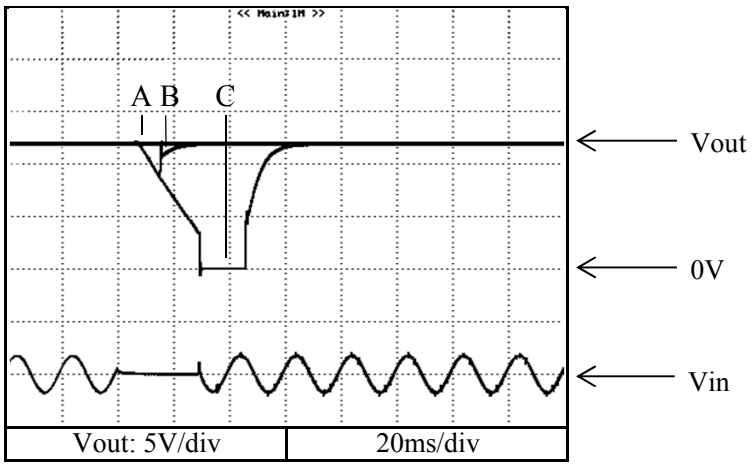


2.12 Response to brown out characteristics

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

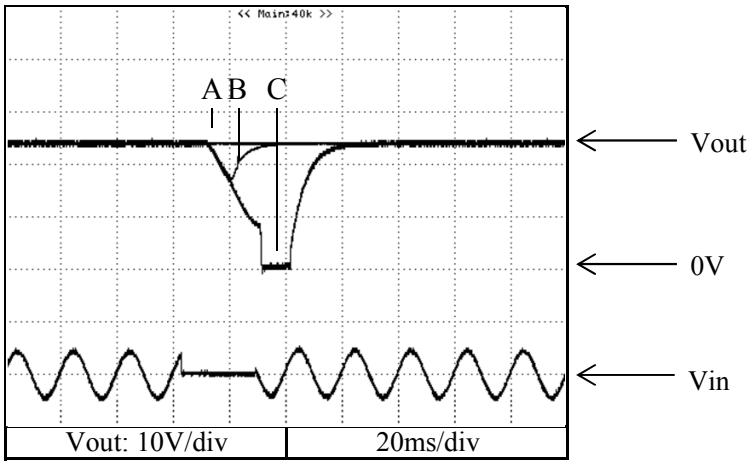
12V

A = 6ms
B = 15ms
C = 29ms



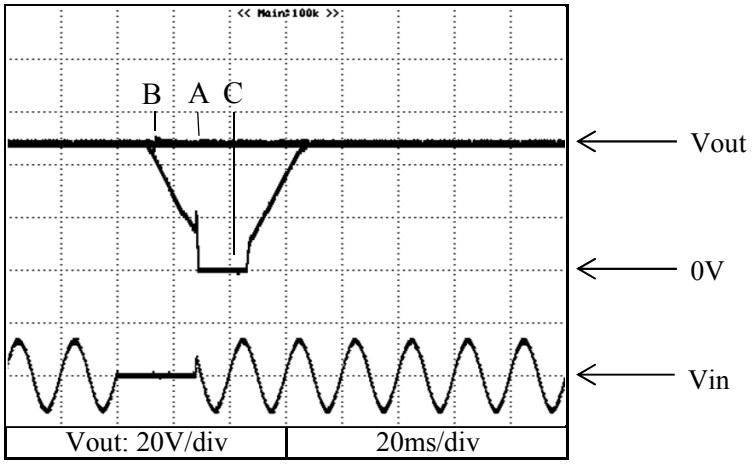
24V

A = 9ms
B = 15ms
C = 26ms



48V

A = 10ms
B = 11ms
C = 28ms

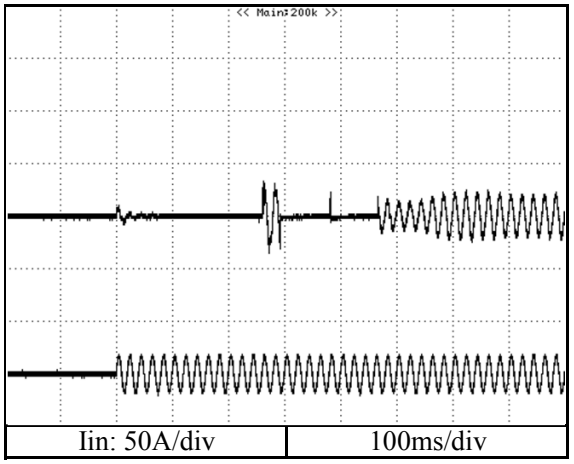


2.14 Inrush current waveform

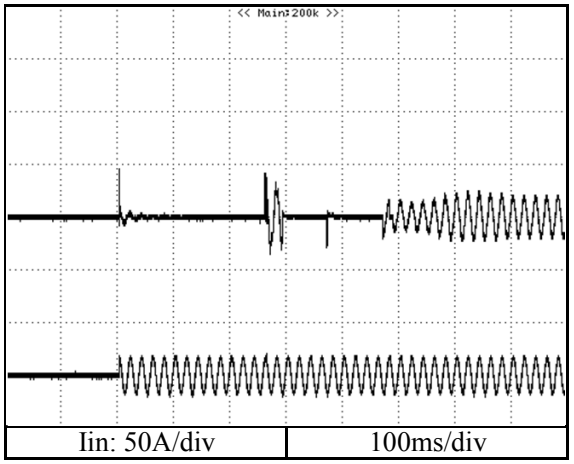
Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 °C

12V

Switch on phase angle of input AC voltage Φ = 0°



Switch on phase angle of input AC voltage Φ = 90°

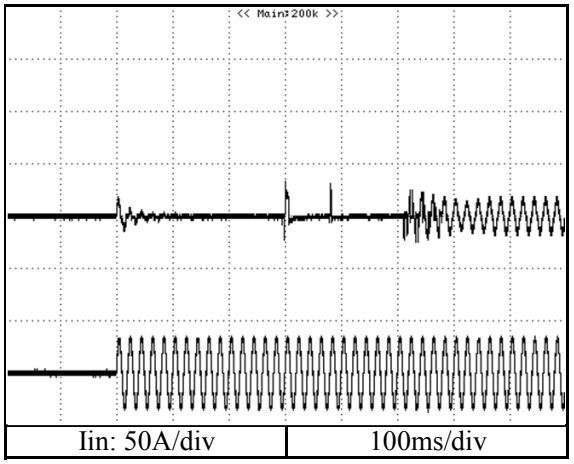


2.14 Inrush current waveform

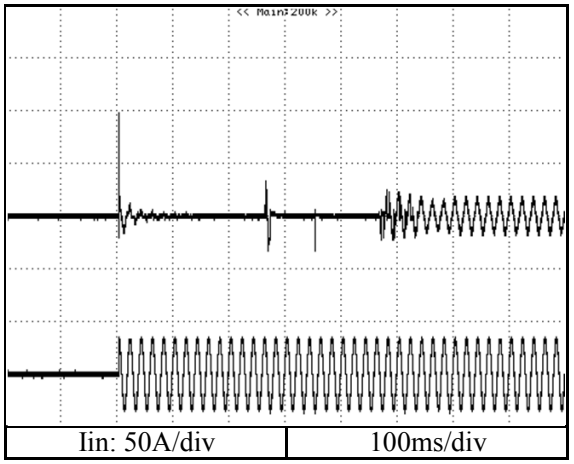
Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 °C

12V

Switch on phase angle of input AC voltage Φ = 0°



Switch on phase angle of input AC voltage Φ = 90°

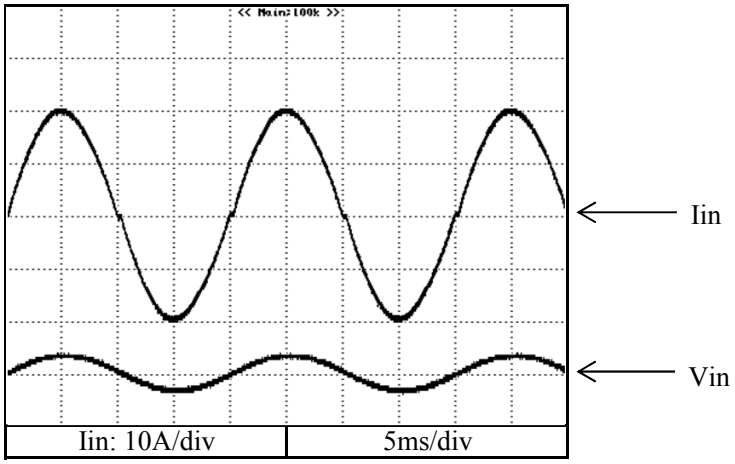


2.15 Input current waveform

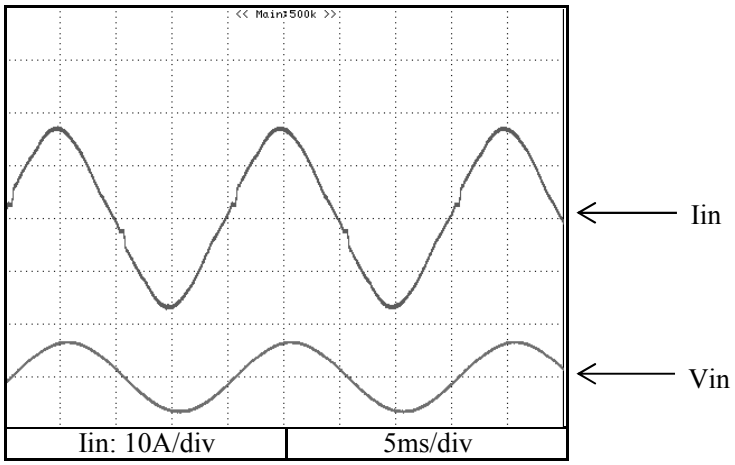
Conditions Iout : 100 %
Ta : 25 °C

12V

Vin = 115VAC



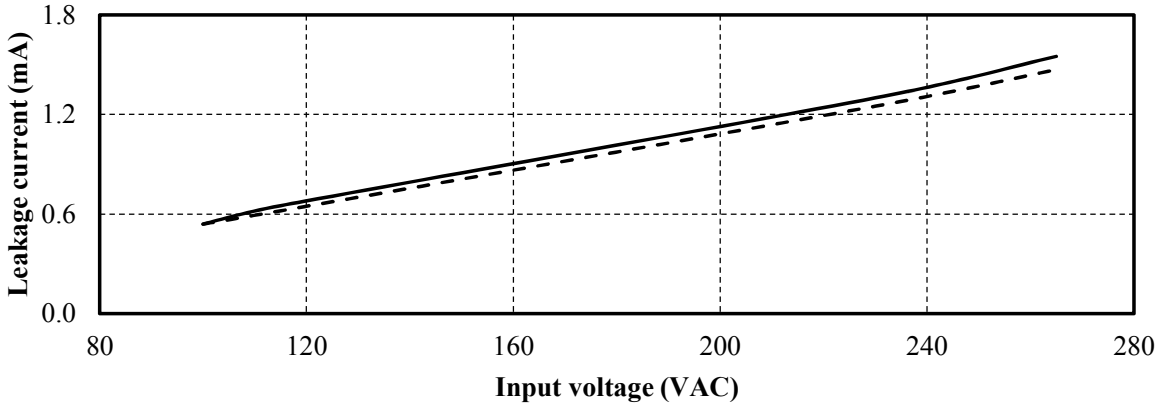
Vin = 230VAC



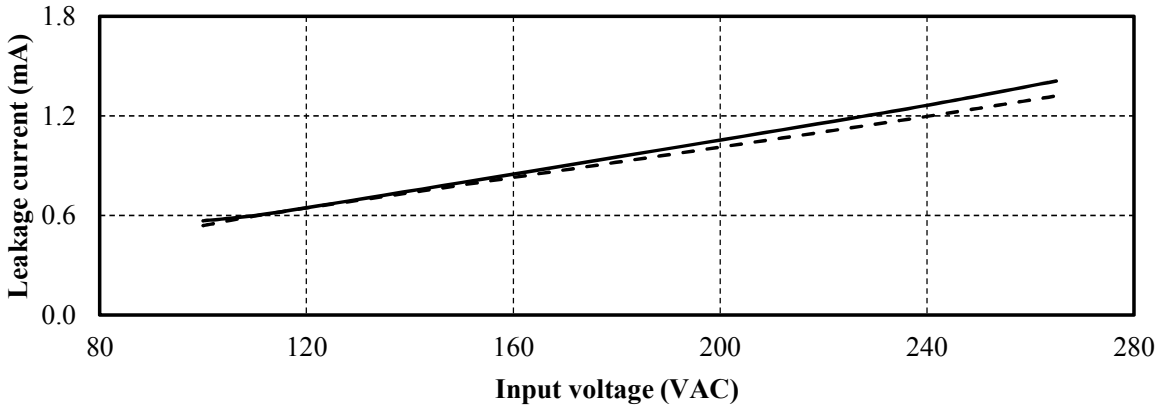
2.16 Leakage current characteristics

Conditions Iout : 0 % - - - -
: 100 % ——
Ta : 25 °C
f : 60 Hz

12V



48V

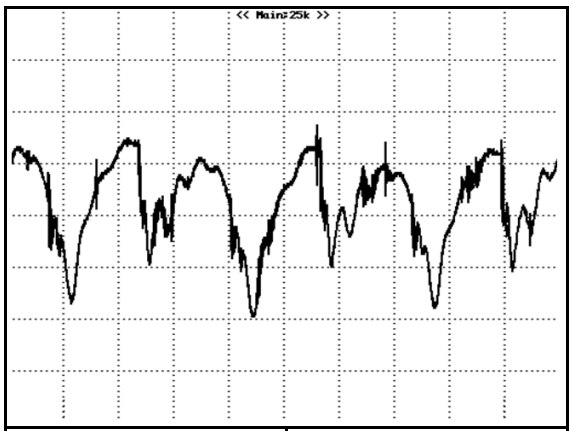


2.17 Output ripple and noise waveform

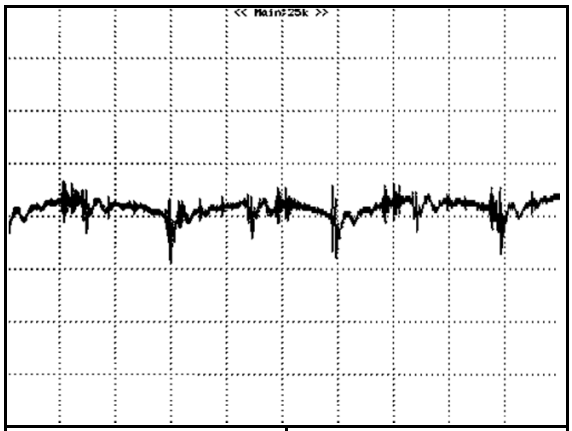
Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 °C

NORMAL MODE

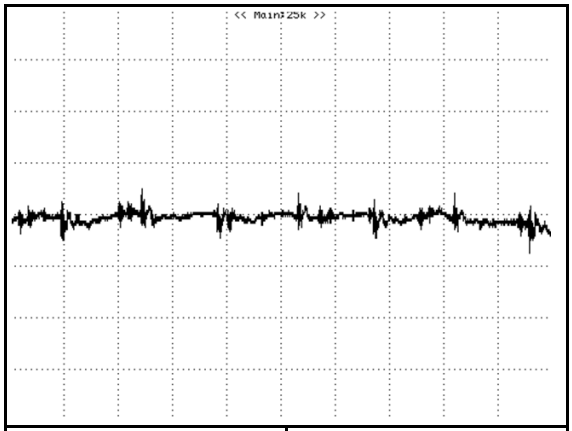
12V



24V



48V

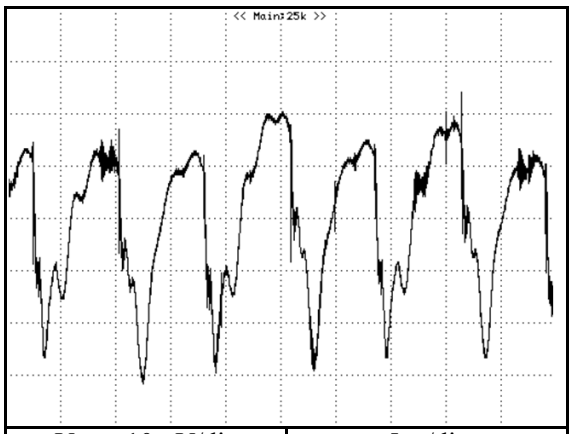


2.17 Output ripple and noise waveform

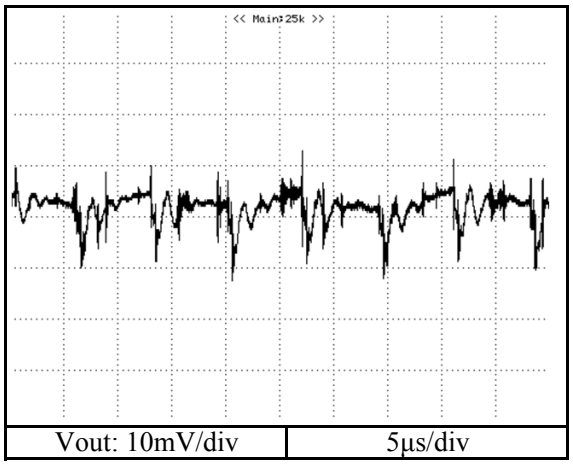
Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 °C

NORMAL MODE

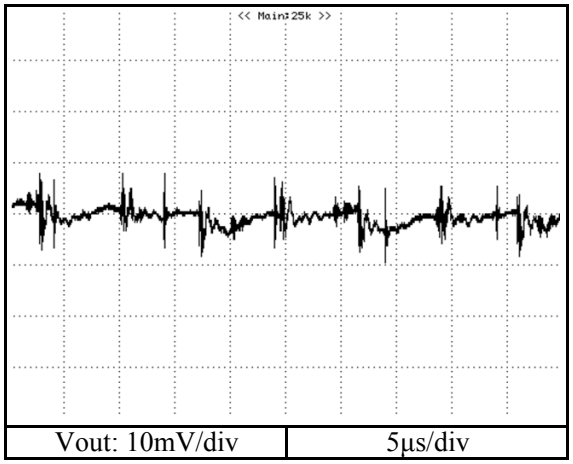
12V



24V



48V

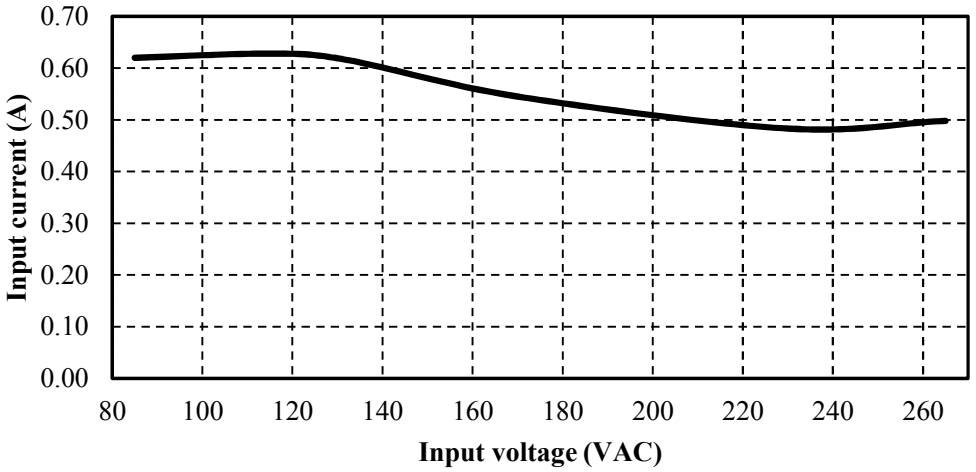


2.18 Standby current

Condition Ta : 25 °C

24V

Iout = 0%



Remote control OFF