

HWS300

EVALUATION DATA

型式データ

INDEX

1. 測定方法	Evaluation Method	PAGE
1.1	測定回路 Circuit used for determination	T-1～5
	(1) 静特性 Steady state data	
	(2) 通電ドリフト特性 Warm up voltage drift characteristics	
	(3) 過電流保護特性 Over current protection (OCP) characteristics	
	(4) 過電圧保護特性 Over voltage protection (OVP) characteristics	
	(5) 出力立ち上がり特性 Output rise characteristics	
	(6) 出力立ち下がり特性 Output fall characteristics	
	(7) ON/OFFコントロール時出力立ち上がり特性 Output rise characteristics with ON/OFF CONTROL	
	(8) ON/OFFコントロール時出力立ち下がり特性 Output fall characteristics with ON/OFF CONTROL	
	(9) 過渡応答（入力急変）特性 Dynamic line response characteristics	
	(10) 過渡応答（負荷急変）特性 Dynamic load response characteristics	
	(11) 入力サージ電流（突入電流）特性 Inrush current characteristics	
	(12) リーク電流特性 Leakage current characteristics	
	(13) 出力リップル、ノイズ波形 Output ripple and noise waveform	
	(14) スタンバイ電流 Stand by current	
	(15) EMI特性 Electro-Magnetic Interference characteristics	
1.2	使用測定機器 List of equipment used	T-6
2.	特性データ Characteristics	
2.1	静特性 Steady state data	
	(1) 入力・負荷・温度変動 Regulation - line and load, Temperature drift	T-7
	(2) 出力電圧・リップル電圧対入力電圧 Output voltage and Ripple noise voltage vs. Input voltage	T-8
	(3) 効率・入力電流対出力電流 Efficiency and Input current vs. Output current	T-9
	(4) 力率・入力電流対出力電流 Power factor and Input current vs. Output current	T-10
2.2	通電ドリフト特性 Warm up voltage drift characteristics	T-11
2.3	過電流保護特性 Over current protection (OCP) characteristics	T-12～13
2.4	過電圧保護特性 Over voltage protection (OVP) characteristics	T-14
2.5	出力立ち上がり特性 Output rise characteristics	T-15～16
2.6	出力立ち下がり特性 Output fall characteristics	T-17～18

2.7	ON/OFFコントロール時出力立ち上がり特性		
	Output rise characteristics with ON/OFF CONTROL	.....	T-19
2.8	ON/OFFコントロール時出力立ち下がり特性		
	Output fall characteristics with ON/OFF CONTROL	.....	T-20
2.9	出力保持時間特性	Hold up time characteristics	..... T-21
2.10	過渡応答（入力急変）特性	Dynamic line response characteristics	..... T-22
2.11	過渡応答（負荷急変）特性	Dynamic load response characteristics	..... T-23~25
2.12	入力電圧瞬停特性	Response to brown out characteristics	..... T-26~27
2.13	入力サージ電流（突入電流）特性	Inrush current waveform	..... T-28~29
2.14	瞬停時突入電流特性	Inrush current characteristics	..... T-30
2.15	入力電流波形	Input current waveform	..... T-31
2.16	高調波成分	Input current harmonics	..... T-32
2.17	リーク電流特性	Leakage current characteristics	..... T-33
2.18	出力リップル、ノイズ波形	Output ripple and noise waveform	..... T-34~35
2.19	スタンバイ電流	Stand by current	..... T-36
2.20	E M I 特性	Electro-Magnetic Interference characteristics	..... T-37~42

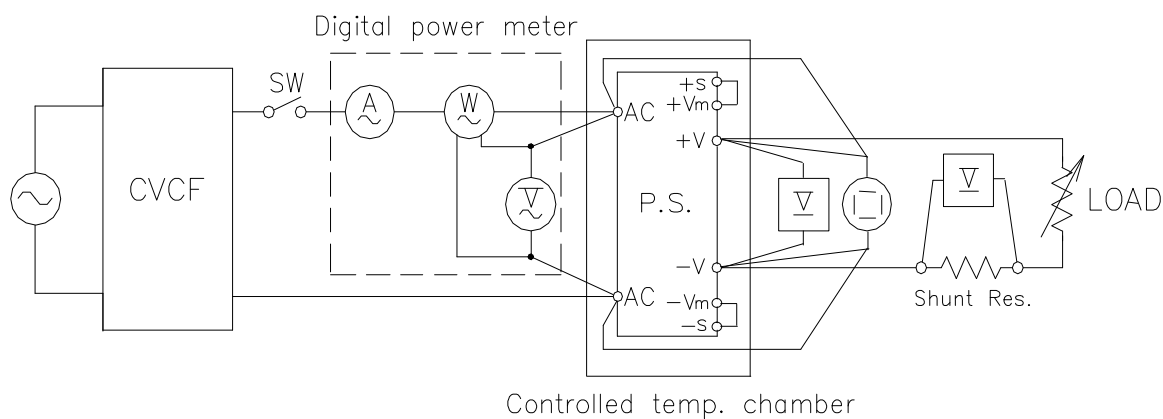
使用記号 Terminology used

V_{in}	.....	入力電圧	Input voltage
V_{out}	.....	出力電圧	Output voltage
I_{in}	.....	入力電流	Input current
I_{out}	.....	出力電流	Output current
T_a	.....	周囲温度	Ambient temperature
f	.....	周波数	Frequency
FG	.....	フレームグラウンド	Frame GND

1. 測定方法 Evaluation Method

1.1 測定回路 Circuit used for determination

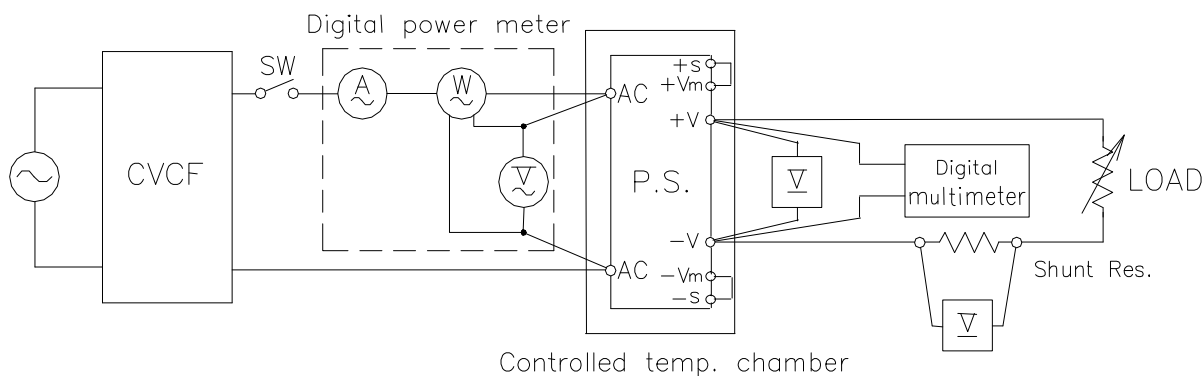
(1) 静特性 Steady state data



(2) 通電ドリフト特性 Warm up voltage drift characteristics

Same as Steady state data

(3) 過電流保護特性 Over current protection (OCP) characteristics



(4) 過電圧保護特性 Over voltage protection (OVP) characteristics

Same as Steady state data

(5) 出力立ち上がり特性 Output rise characteristics

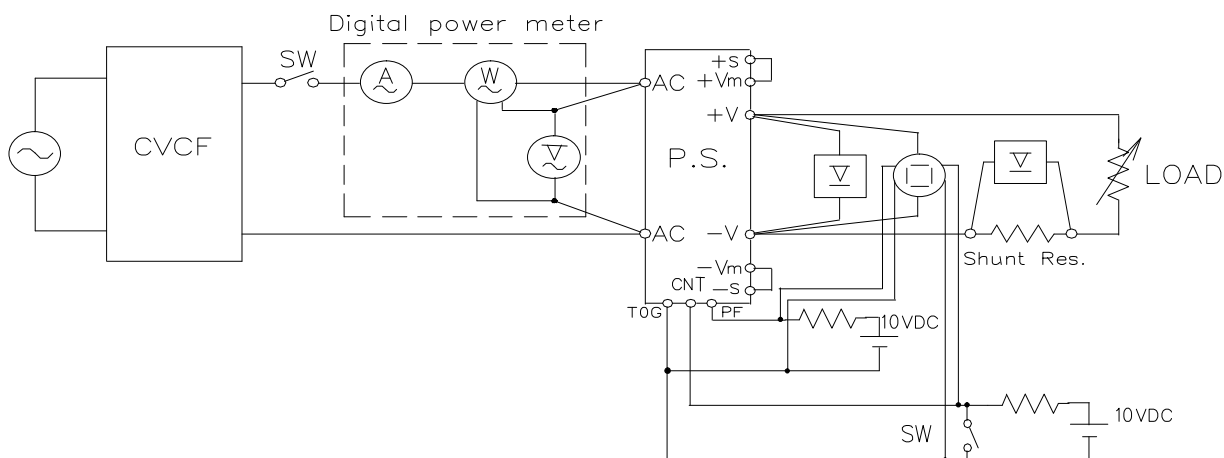
Same as Steady state data

(6) 出力立ち下がり特性 Output fall characteristics

Same as Steady state data

(7) ON/OFFコントロール時出力立ち上がり特性

Output rise characteristics with ON/OFF CONTROL



(8) ON/OFFコントロール時出力立ち下がり特性

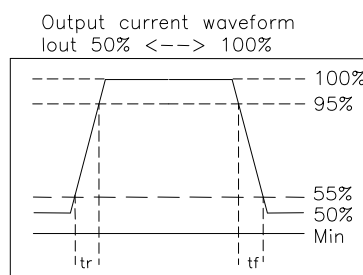
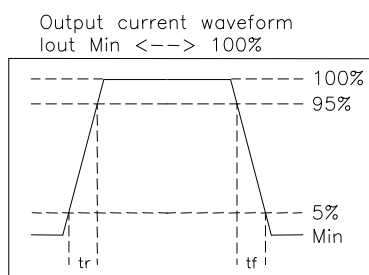
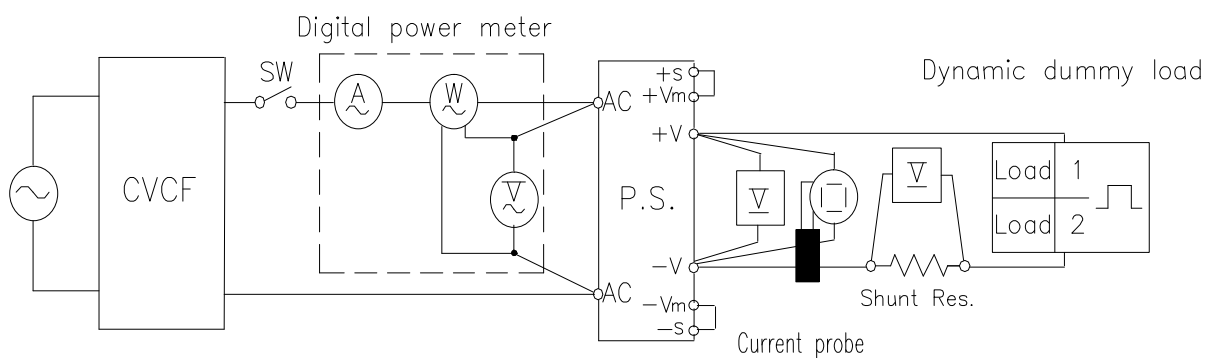
Output fall characteristics with ON/OFF CONTROL

Same as Output rise characteristics with ON/OFF CONTROL

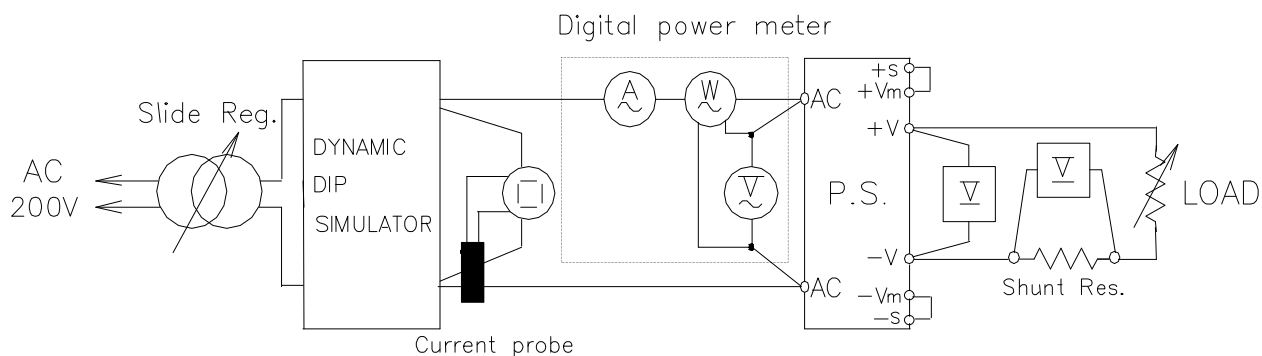
(9) 過渡応答（入力急変）特性 Dynamic line response characteristics

Same as Steady state data

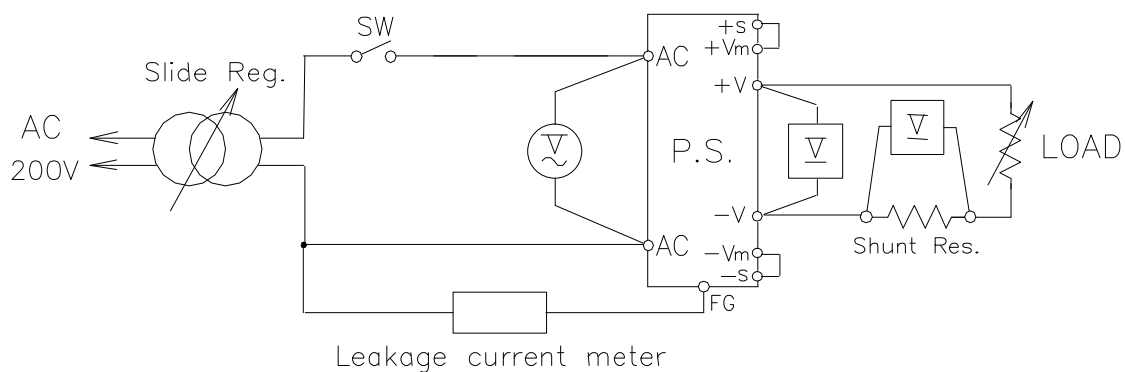
(10) 過渡応答（負荷急変）特性 Dynamic load response characteristics



(11) 入力サージ電流（突入電流）特性 Inrush current characteristics



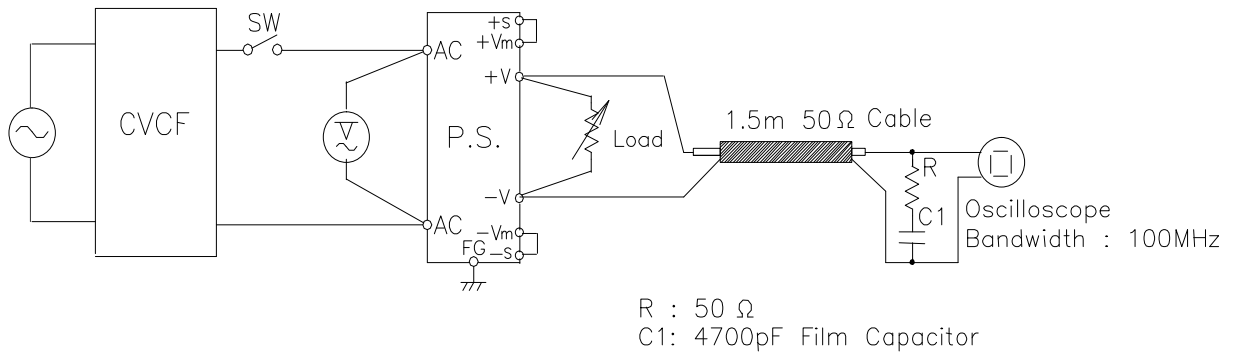
(12) リーク電流特性 Leakage current characteristics



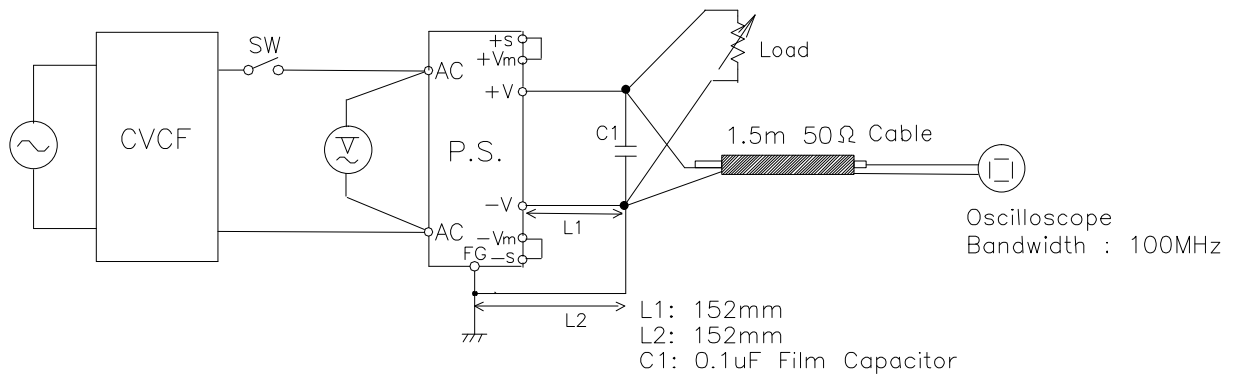
NOTE : Range used---AC(For SIMPSON MODEL 229-2)

(13) 出力リップル、ノイズ特性 Output ripple and noise waveform

(a) Normal Mode (JEITA Standard RC-9131A)



(b) Normal + Common Mode



(14) スタンバイ電流 Stand by current

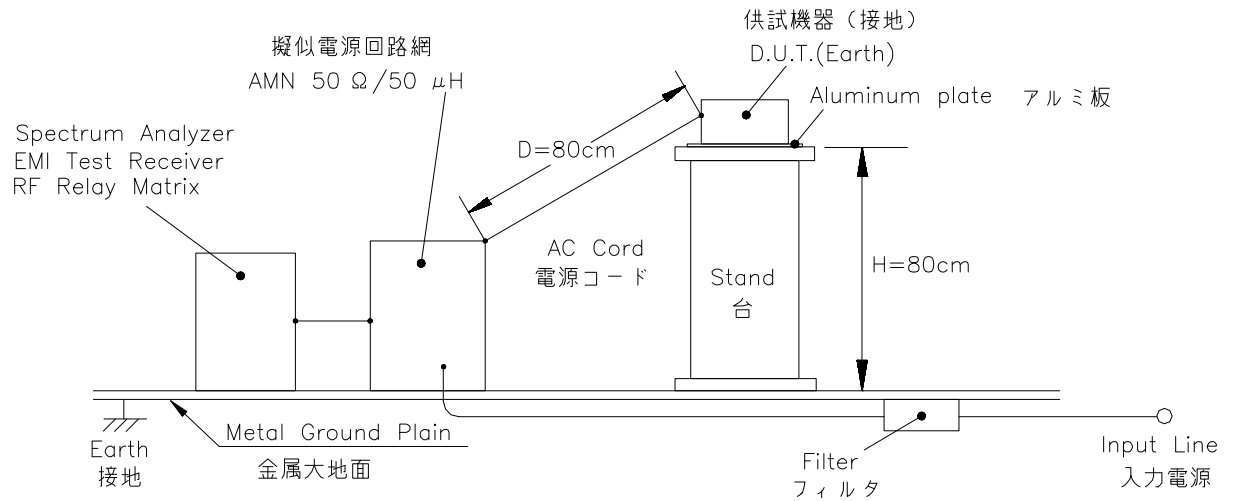
Same as Steady state data

(15) EMI 特性

Electro-Magnetic Interference characteristics

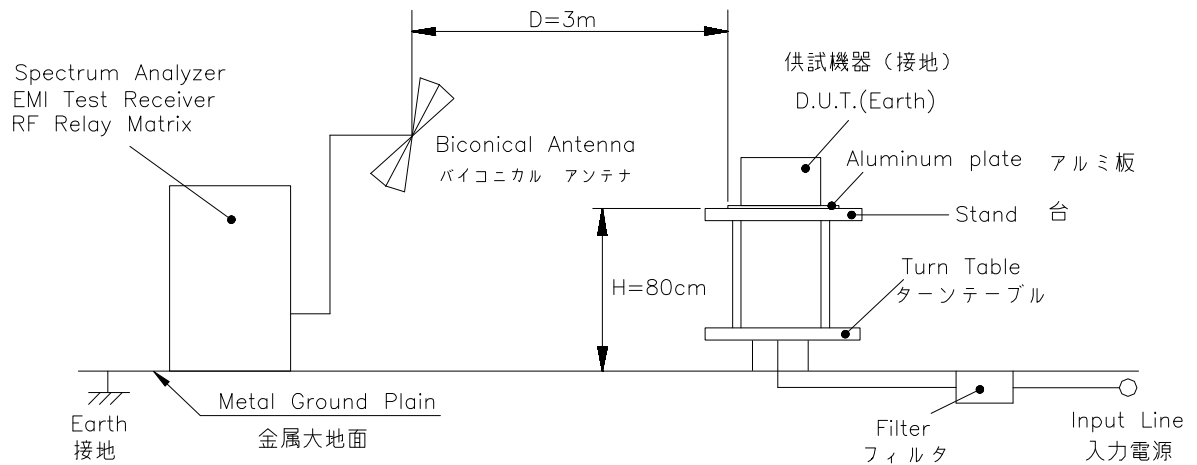
(a) 雑音端子電圧 (帰還ノイズ)

Conducted Emission Noise



(b) 雑音電界強度 (輻射ノイズ)

Radiated Emission Noise



1.2 使用測定機器 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	OSCILLOSCOPE	HITACHI DENSHI	V-1100A
2	DIGITAL STORAGE OSCILLOSCOPE	TEKTRONIX	TDS540B/TDS540D
3	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL1740E/DL1740EL
4	DIGITAL MULTIMETER	YOKOGAWA ELECT.	7544 01
5	DIGITAL MULTIMETER	AGILENT	34970A
6	DIGITAL POWER METER	YOKOGAWA ELECT.	WT110/WT210
7	CURRENT PROBE/AMPLIFIER	TEKTRONIX	A6303/AM503
8	DYNAMIC DUMMY LOAD	TAKASAGO	FK-400L/FK-1000L
9	SHUNT RESISTOR	YOKOGAWA ELECT.	2215
10	SLIDE REGULATOR	MATSUNAGA	SD-2650
11	CVCF	TAKASAGO	AA2000XG
12	CVCF	KIKUSUI	PCR-2000L/PCR-4000L
13	LEAKAGE CURRENT METER	SIMPSON	229-2
14	DYNAMIC DIP SIMULATOR	TAKAMIZAWA CYBERNETICS	PSA-210
15	CONTROLLED TEMP. CHAMBER	ESPEC	SU-240/SU-261
16	SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSA
17	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESHS10
18	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESVS10
19	RF RELAY MATRIX	ROHDE & SCHWARZ	PSU
20	AMN	KYORITU DENSHI	KNW-242
21	ANTENA(BICONICAL ANTENA)	SCHWARZBECK	BBA9106
22	UNIVERSAL POWER ANALYZER	VOLTECH	PM3000A
23	SINGLE-PHASE MASTER	NF ELECTRONIC INSTRUMENTS	4420
24	REFERENCE IMPEDANCE NETWORK 20A	NF ELECTRONIC INSTRUMENTS	4150

2.1 静特性 Steady state data

(1) 入力・負荷・温度変動 Regulation - line and load, Temperature drift

5V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	5.023V	5.023V	5.023V	5.022V	1mV	0.020%
50%	5.016V	5.015V	5.015V	5.015V	1mV	0.020%
100%	5.009V	5.009V	5.009V	5.008V	1mV	0.020%
load	14mV	14mV	14mV	14mV		
regulation	0.280%	0.280%	0.280%	0.280%		

2. Temperature drift

Conditions Vin=100VAC

Iout=100%

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	4.997V	5.009V	5.010V	13mV	0.260%

12V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	12.127V	12.127V	12.126V	12.126V	1mV	0.008%
50%	12.122V	12.122V	12.121V	12.120V	2mV	0.017%
100%	12.117V	12.116V	12.116V	12.115V	2mV	0.017%
load	10mV	11mV	10mV	11mV		
regulation	0.083%	0.092%	0.083%	0.092%		

2. Temperature drift

Conditions Vin=100VAC

Iout=100%

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	12.085V	12.116V	12.116V	31mV	0.259%

24V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	24.000V	24.000V	24.000V	24.000V	0mV	0.000%
50%	24.001V	24.001V	24.001V	24.001V	0mV	0.000%
100%	24.012V	24.012V	24.011V	24.011V	1mV	0.003%
load	12mV	12mV	11mV	11mV		
regulation	0.050%	0.050%	0.046%	0.046%		

2. Temperature drift

Conditions Vin=100VAC

Iout=100%

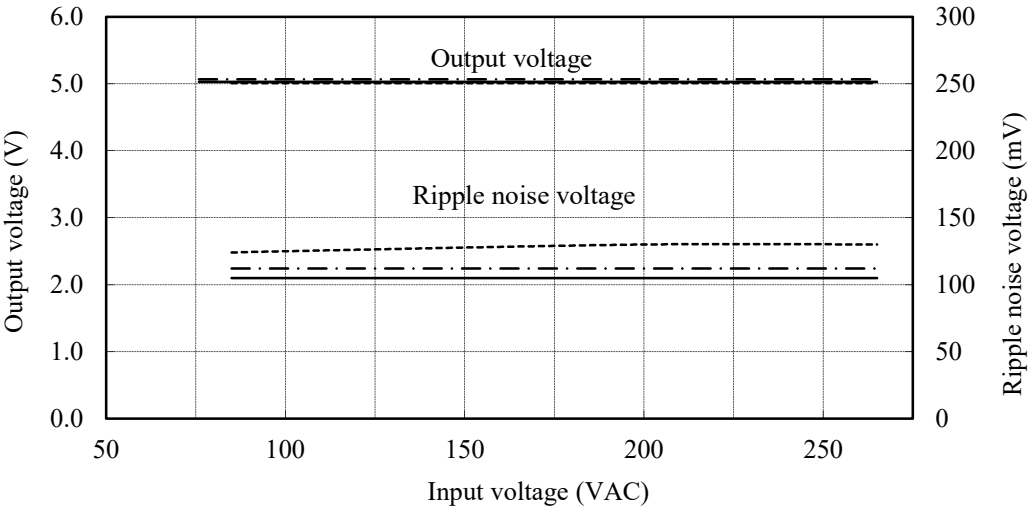
Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	23.948V	24.012V	24.013V	65mV	0.271%

(2) 出力電圧・リップル電圧対入力電圧

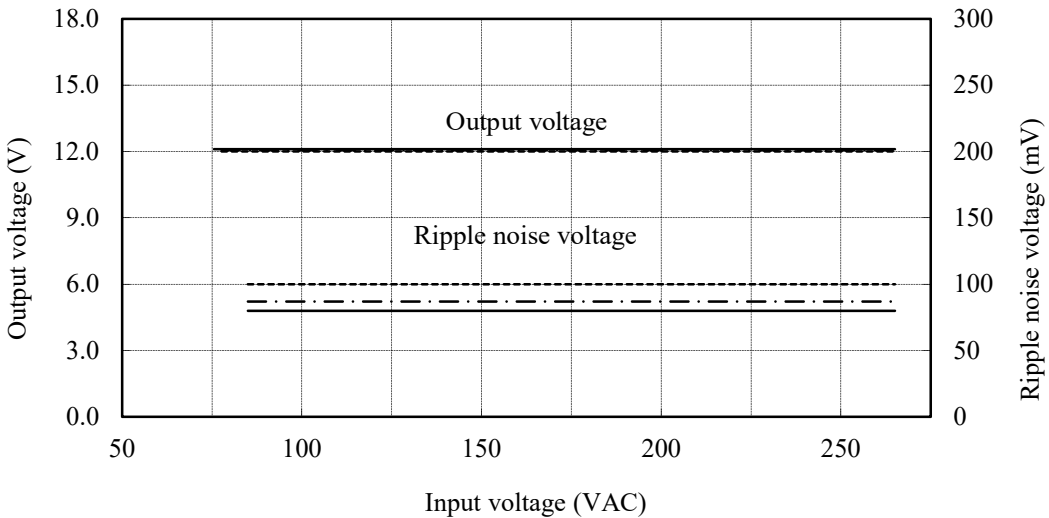
Output voltage and Ripple noise voltage vs. Input voltage

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

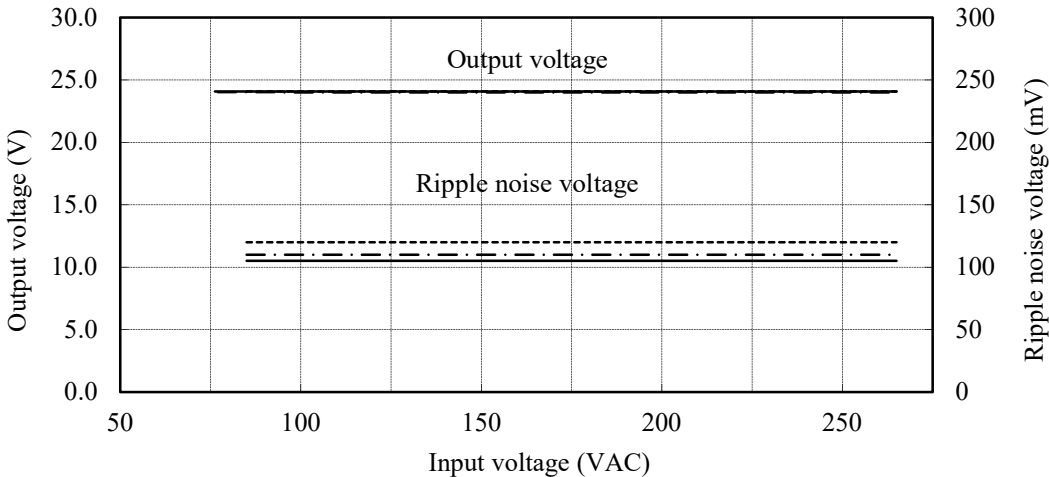
5V



12V



24V

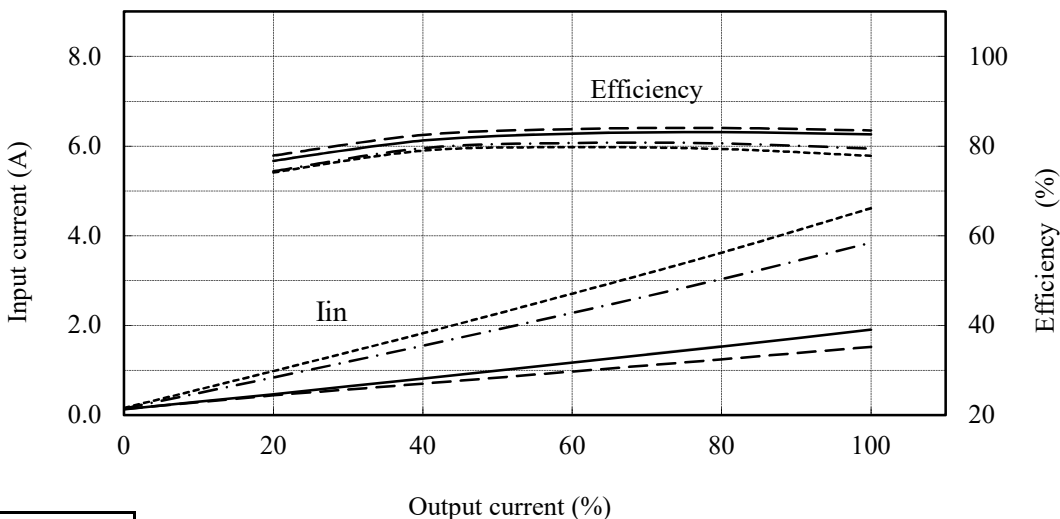


(3) 効率・入力電流対出力電流

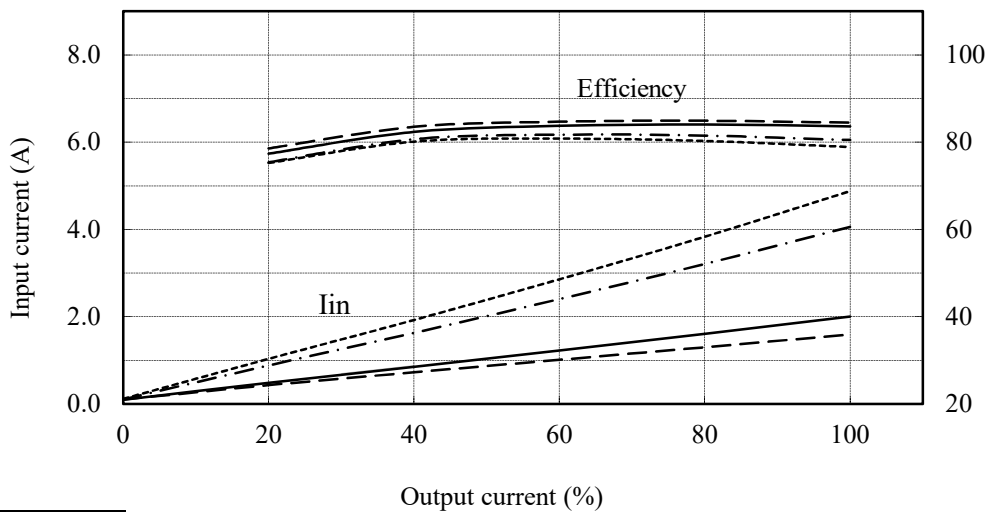
Efficiency and Input current vs. Output current

Conditions Vin : 85 VAC -----
 : 100 VAC -.-.-.-
 : 200 VAC ————
 : 265 VAC - - - - -
 Ta : 25 °C

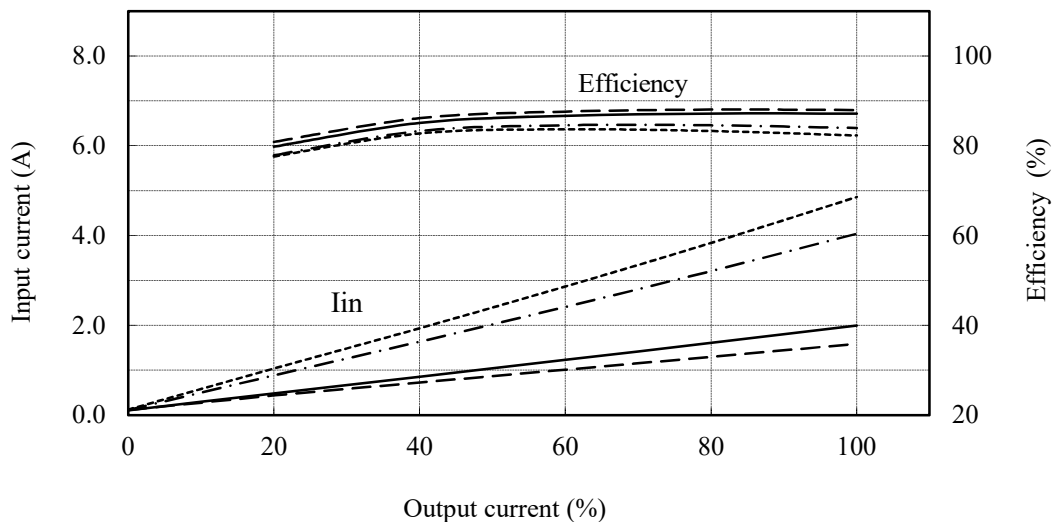
5V



12V



24V

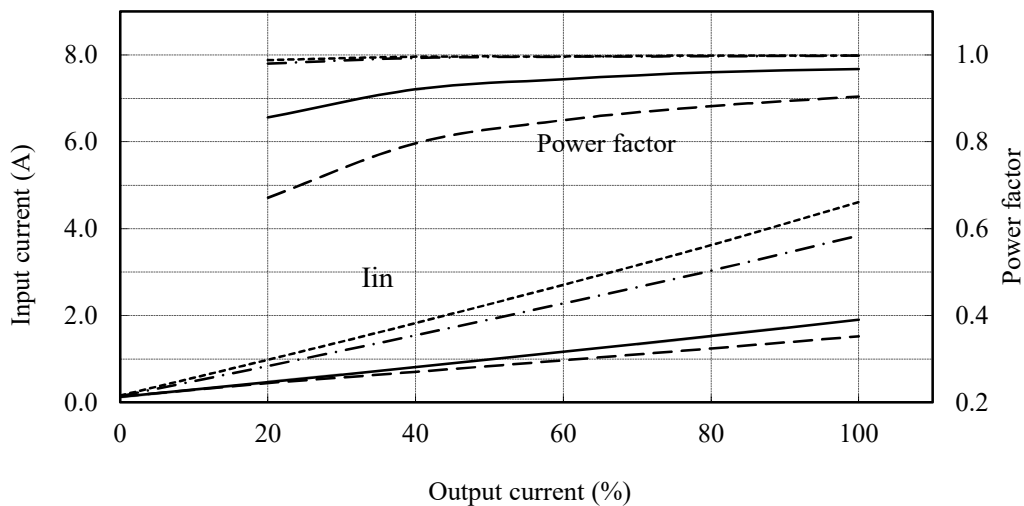


(4) 力率・入力電流対出力電流

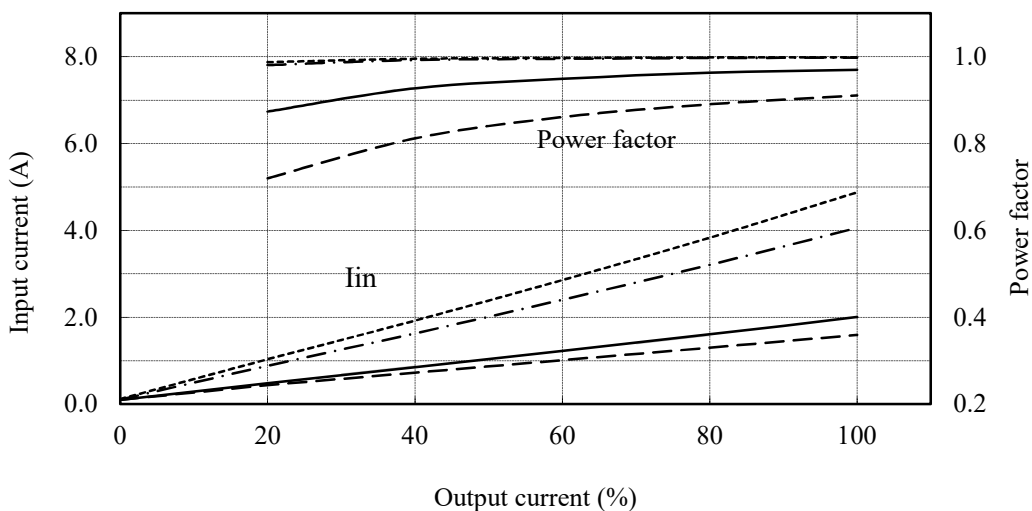
Power factor and Input current vs. Output current

Conditions V_{in} : 85 VAC -----
 : 100 VAC -.-.-.-
 : 200 VAC ————
 : 265 VAC -.-.-.-
 T_a : 25 °C

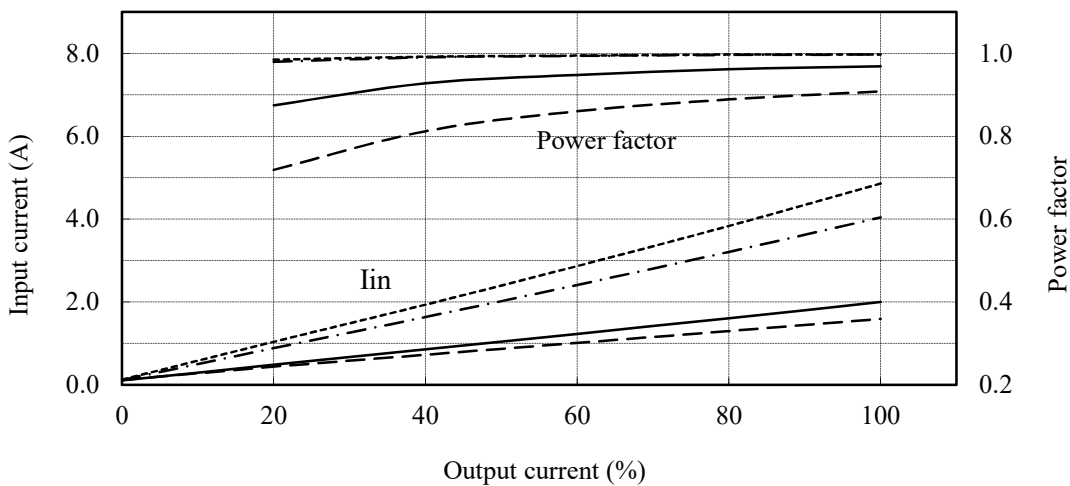
5V



12V



24V



2.2 通電ドリフト特性

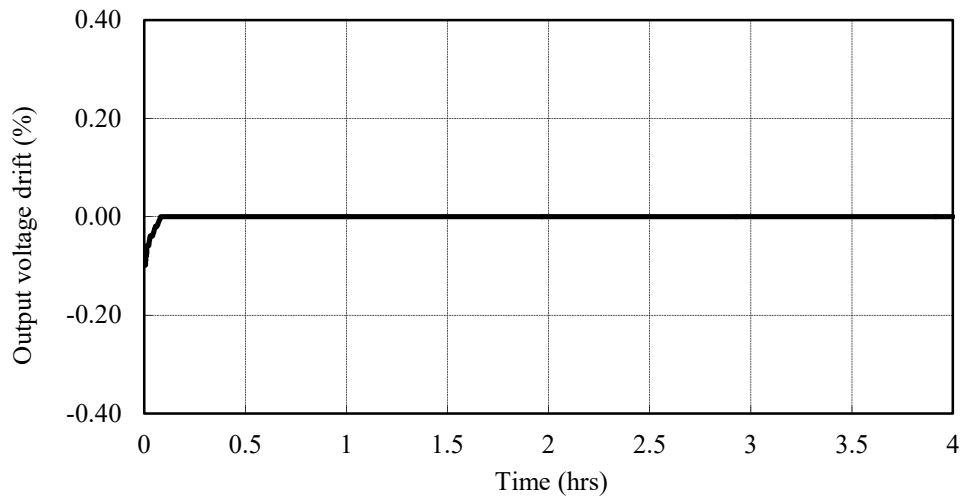
Warm up voltage drift characteristics

Conditions V_{in} : 100 VAC

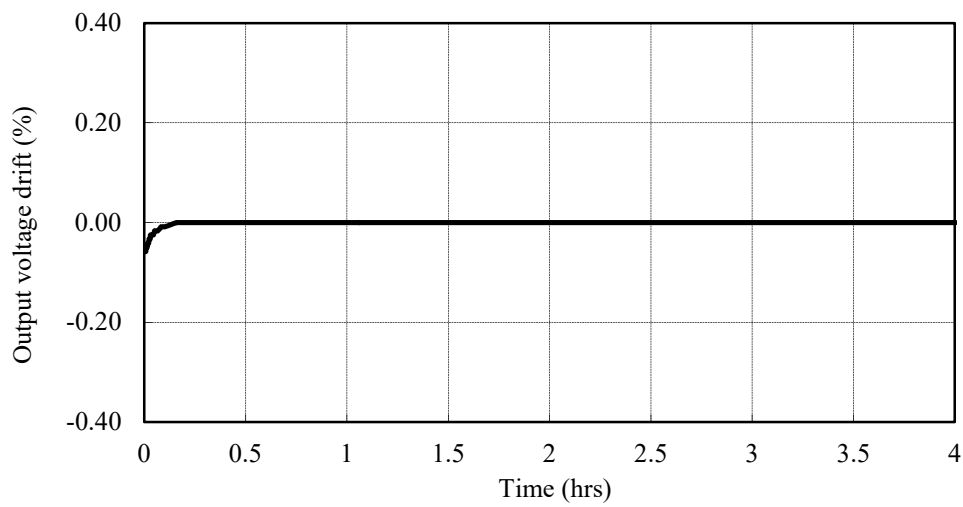
I_{out} : 100 %

T_a : 25 °C

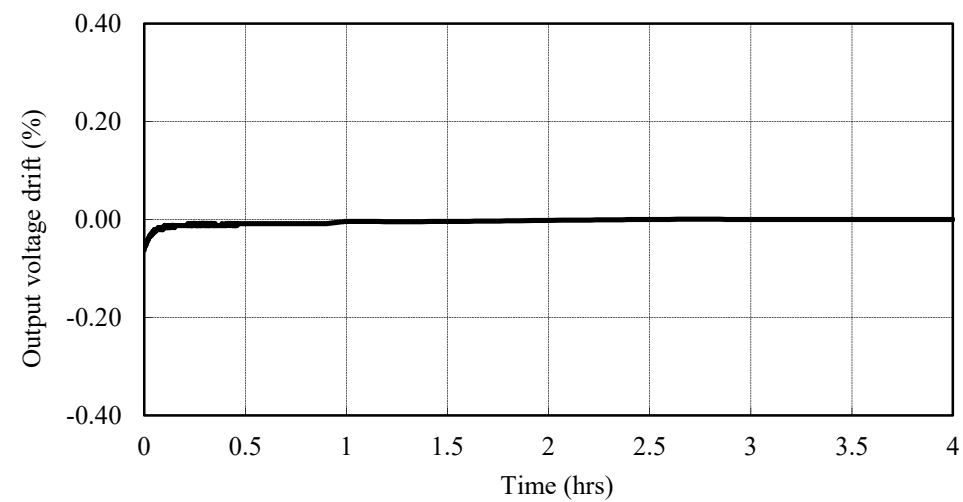
5V



12V



24V

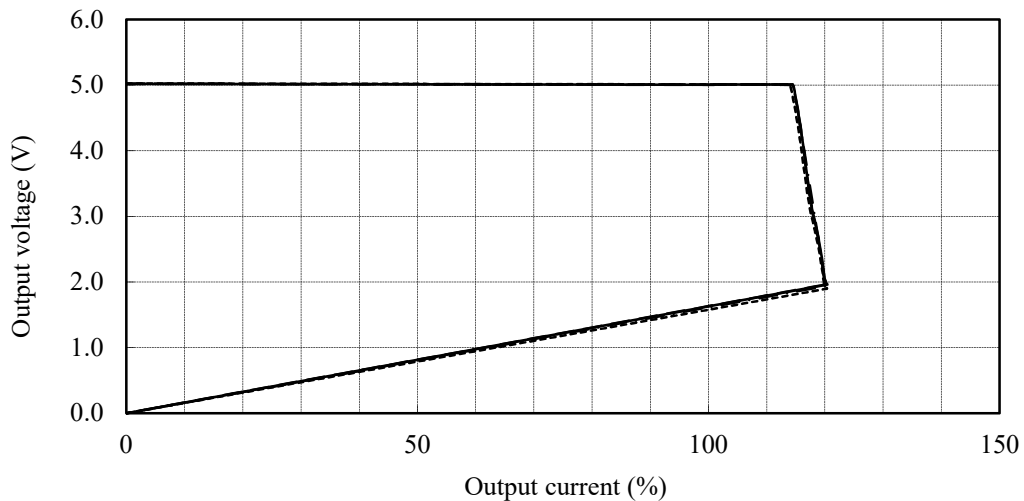


2.3 過電流保護特性

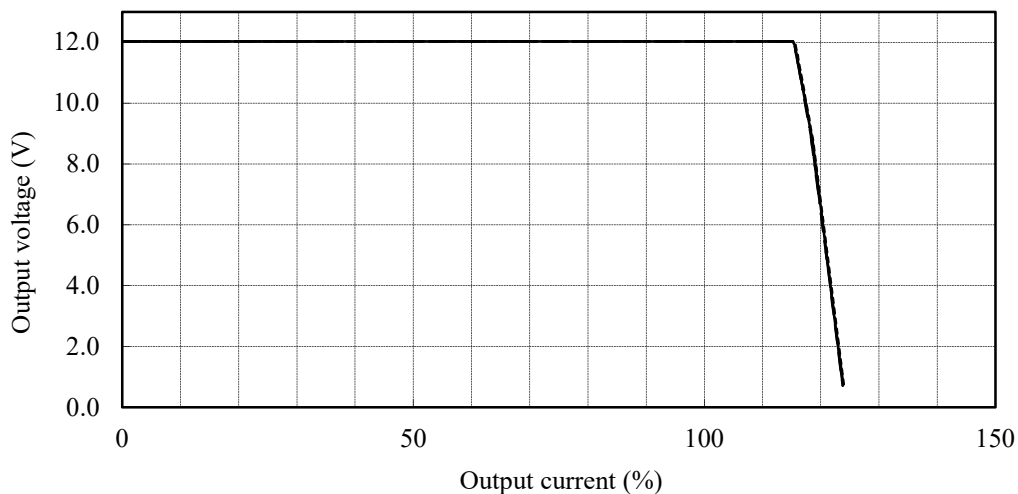
Over current protection (OCP) characteristics

Conditions Vin : 85 VAC -----
 100 VAC -.-.-.-.-
 200 VAC —————
 265 VAC - - - - -
 Ta : 25 °C

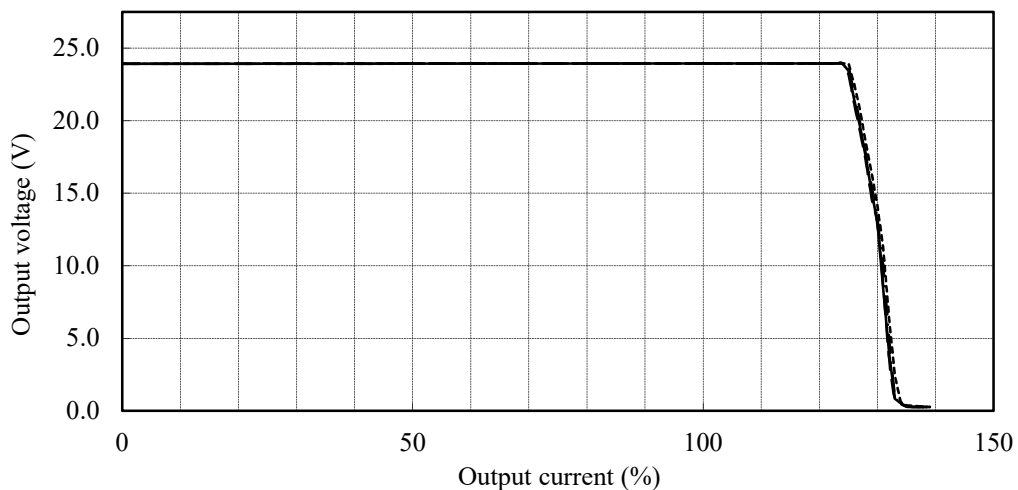
5V



12V



24V



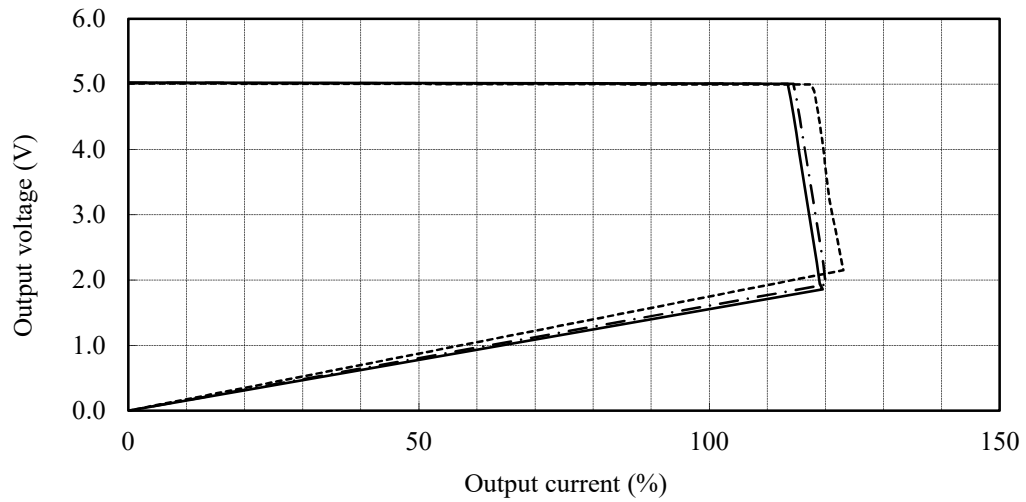
2.3 過電流保護特性

Over current protection (OCP) characteristics

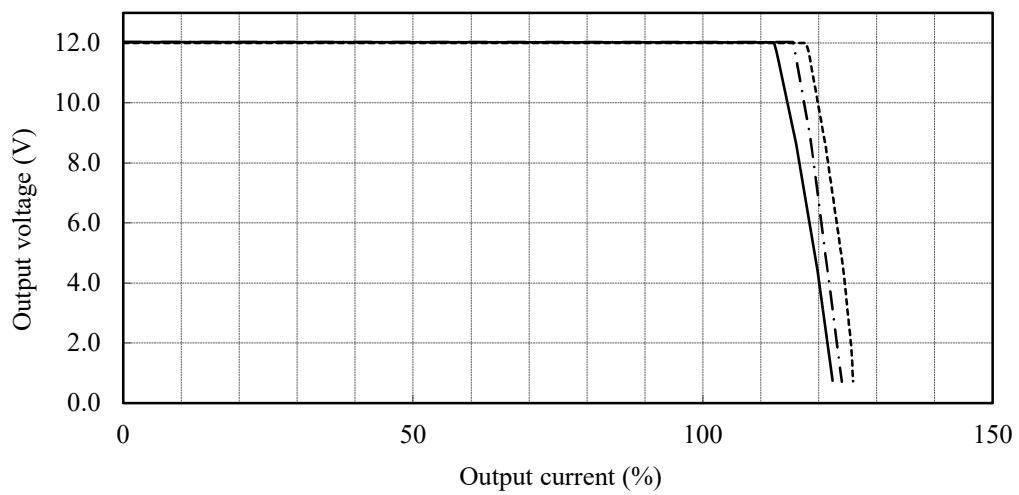
Conditions $V_{in} : 100 \text{ VAC}$

$T_a : -10 \text{ }^\circ\text{C}$ -----
 $25 \text{ }^\circ\text{C}$ - · - · -
 $50 \text{ }^\circ\text{C}$ ———

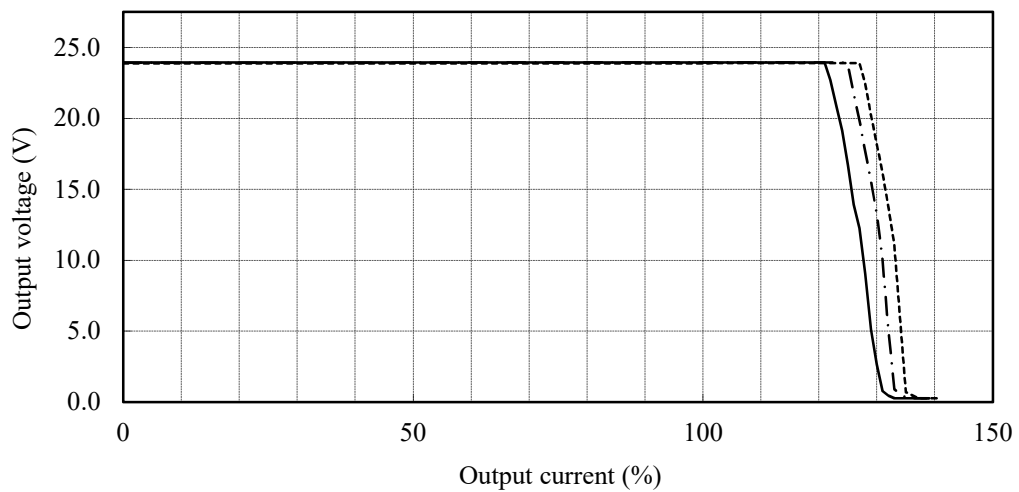
5V



12V



24V



2.4 過電圧保護特性

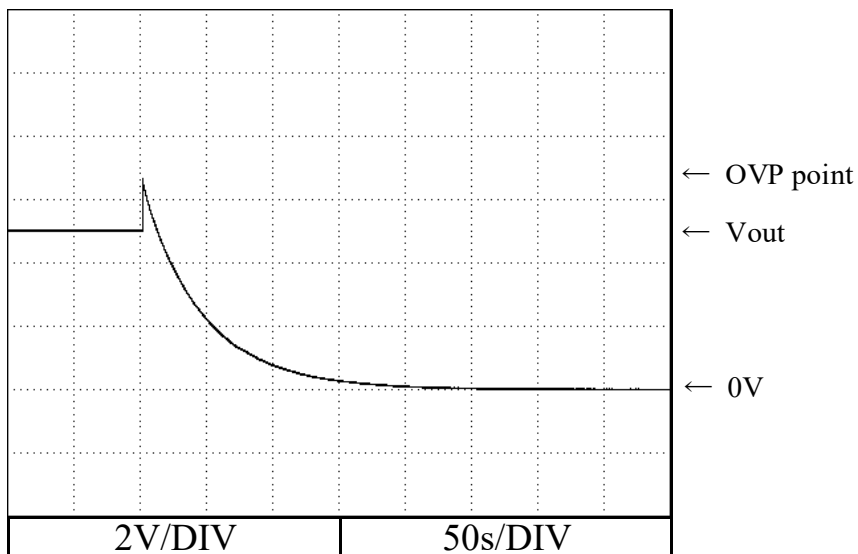
Over voltage protection (OVP) characteristics

Conditions V_{in} : 100 VAC

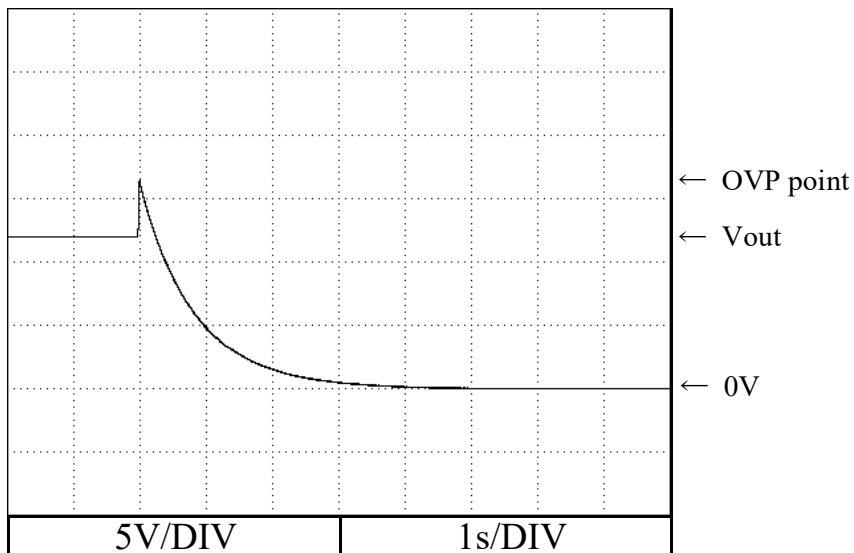
I_{out} : 0 %

T_a : 25 °C

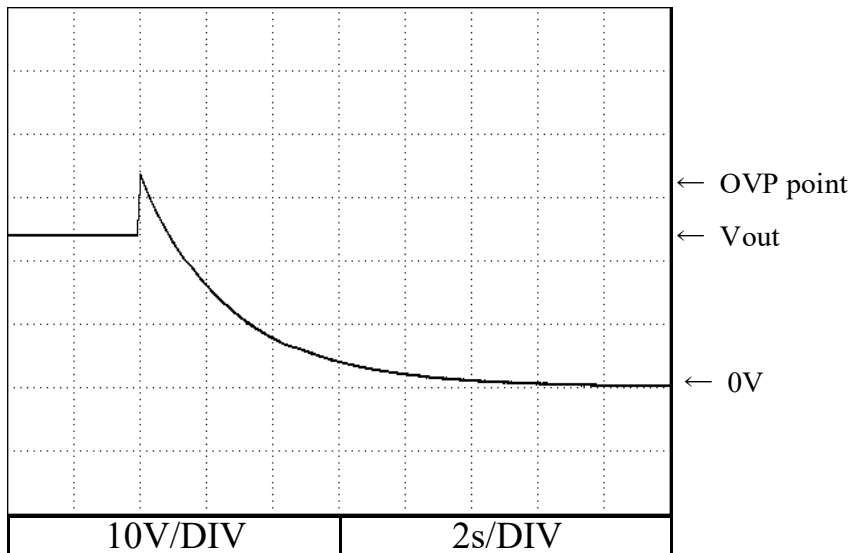
5V



12V



24V

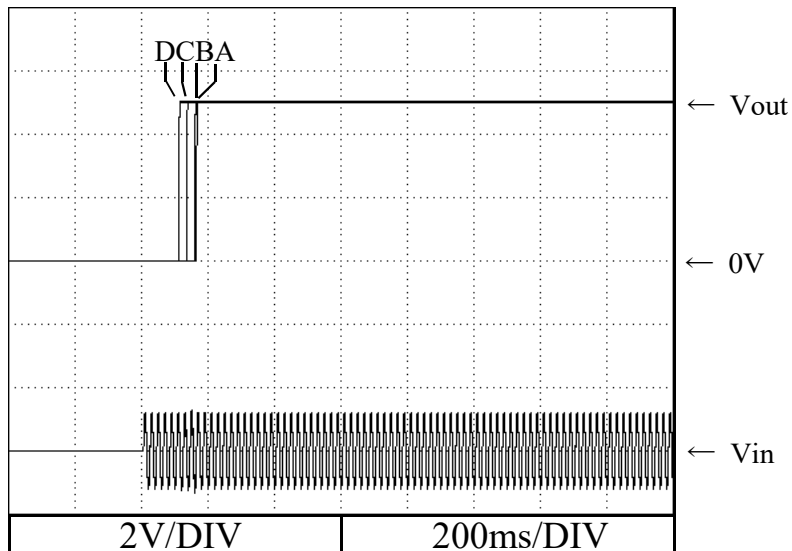


2.5 出力立ち上がり特性

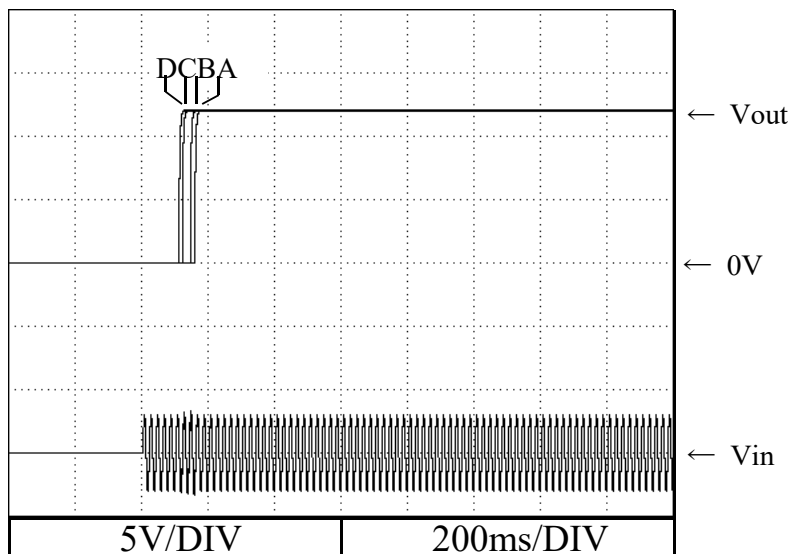
Output rise characteristics

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

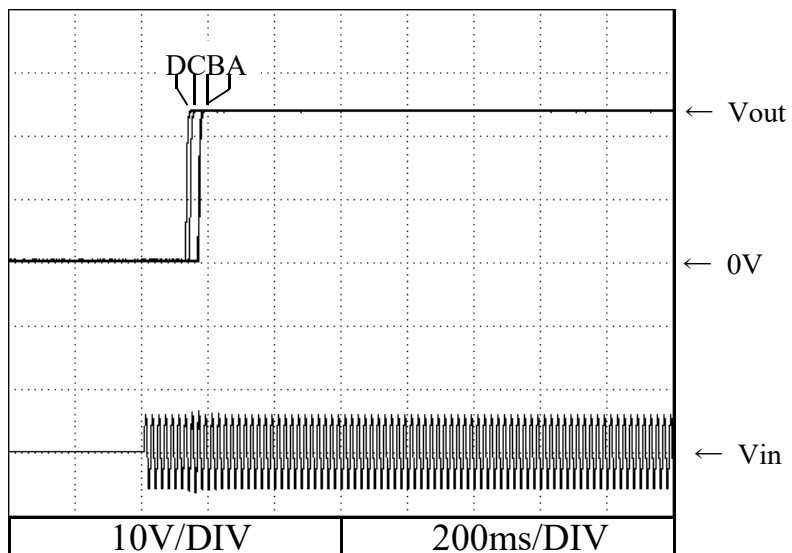
5V



12V



24V

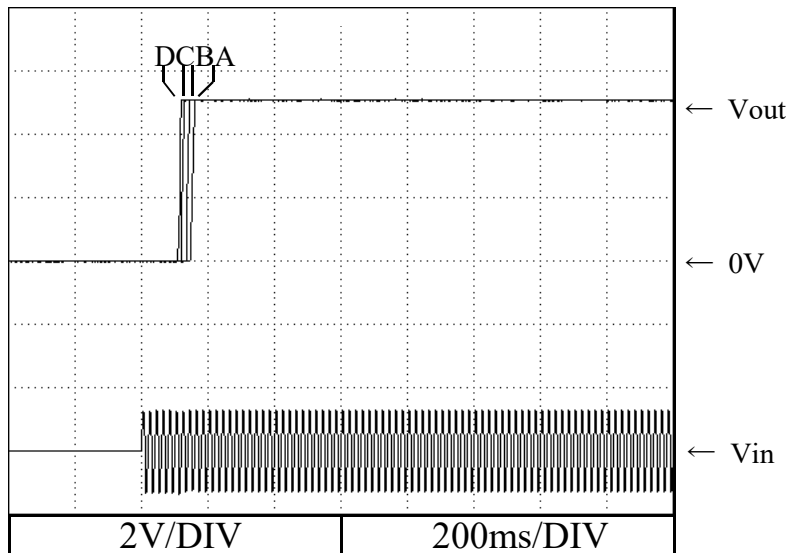


2.5 出力立ち上がり特性

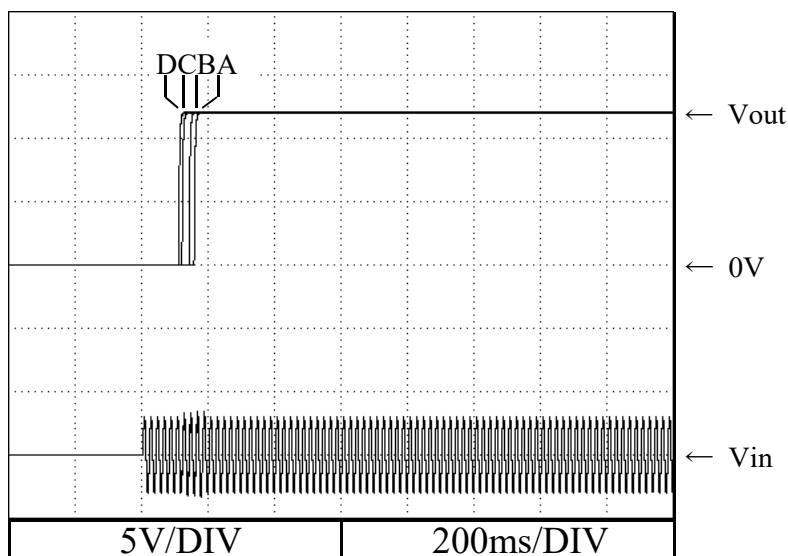
Output rise characteristics

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

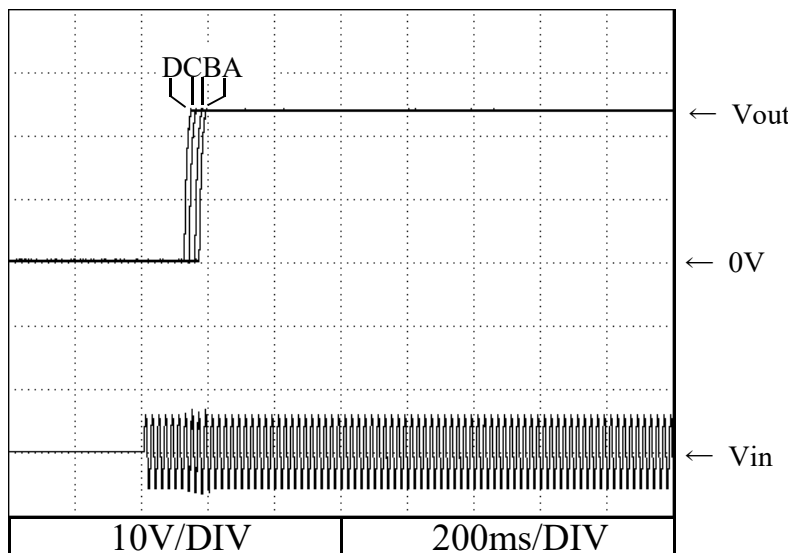
5V



12V



24V

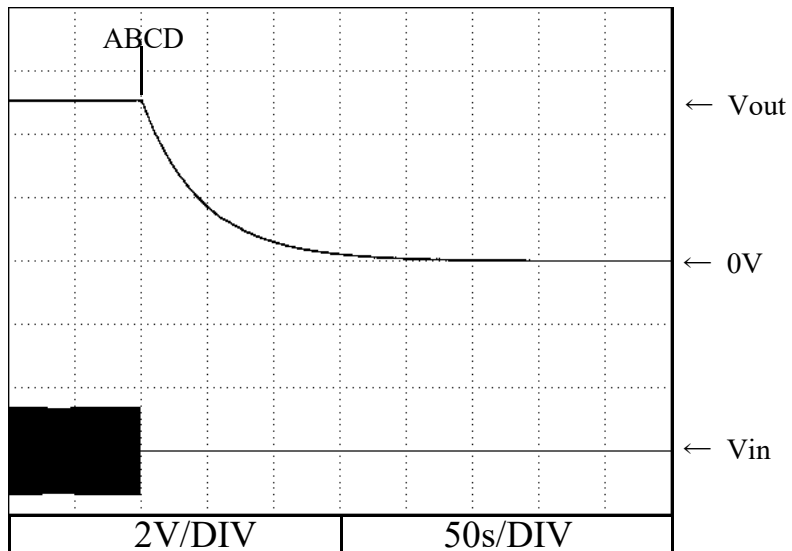


2.6 出力立ち下がり特性

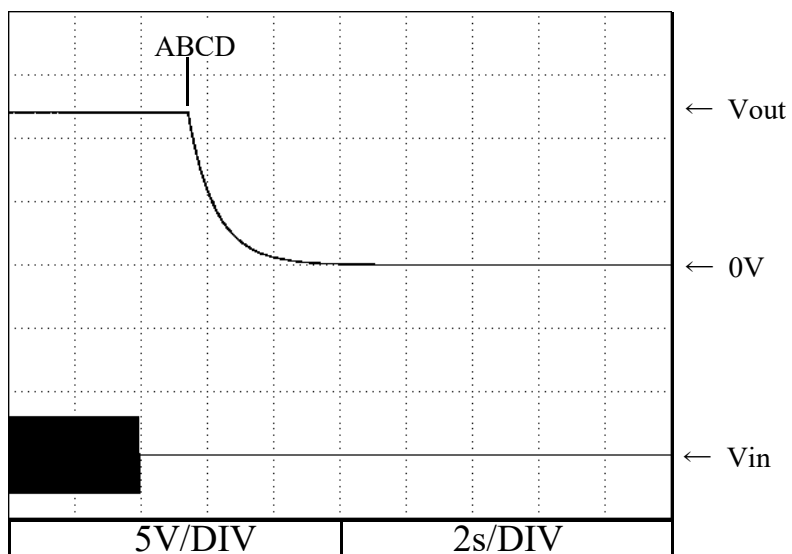
Output fall characteristics

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

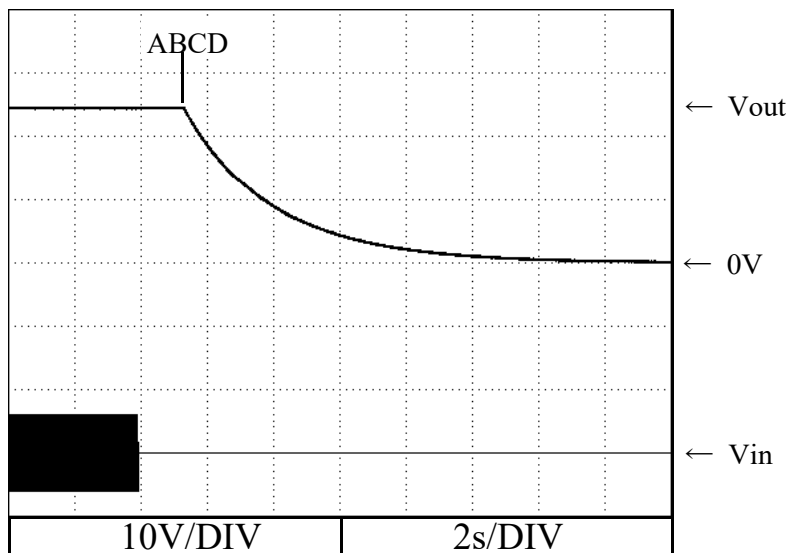
5V



12V



24V

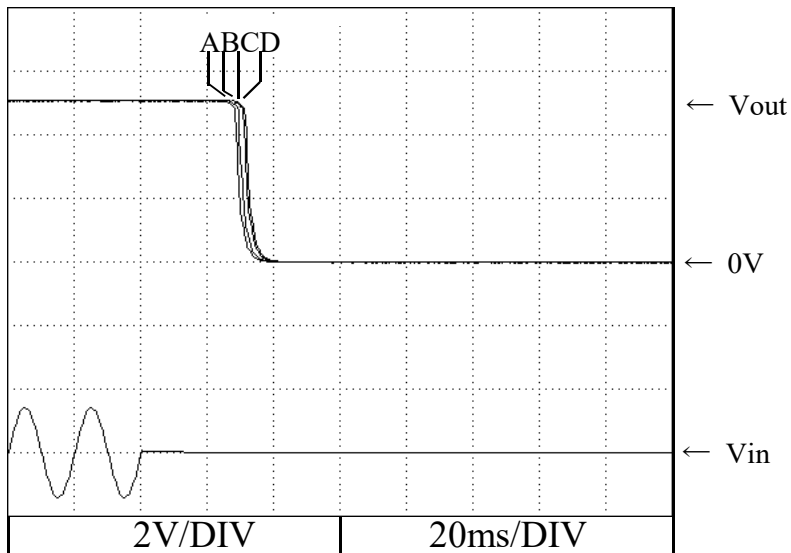


2.6 出力立ち下がり特性

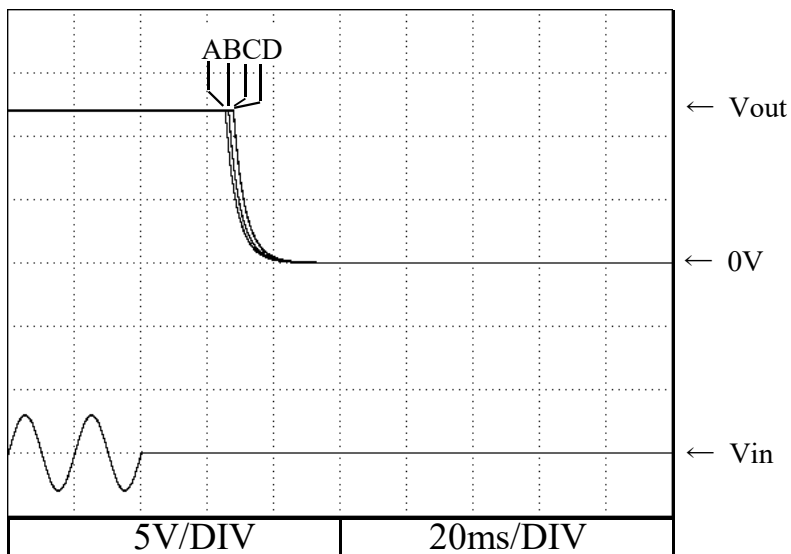
Output fall characteristics

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

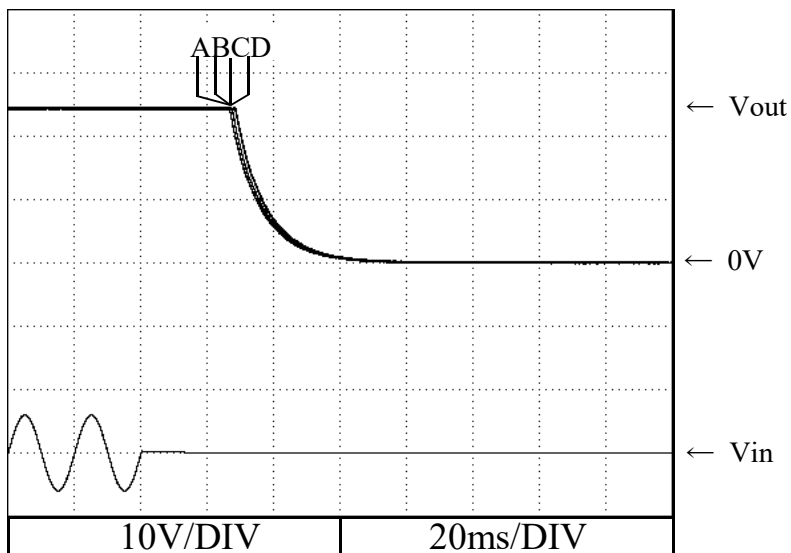
5V



12V



24V



2.7 ON/OFFコントロール時出力立ち上がり特性

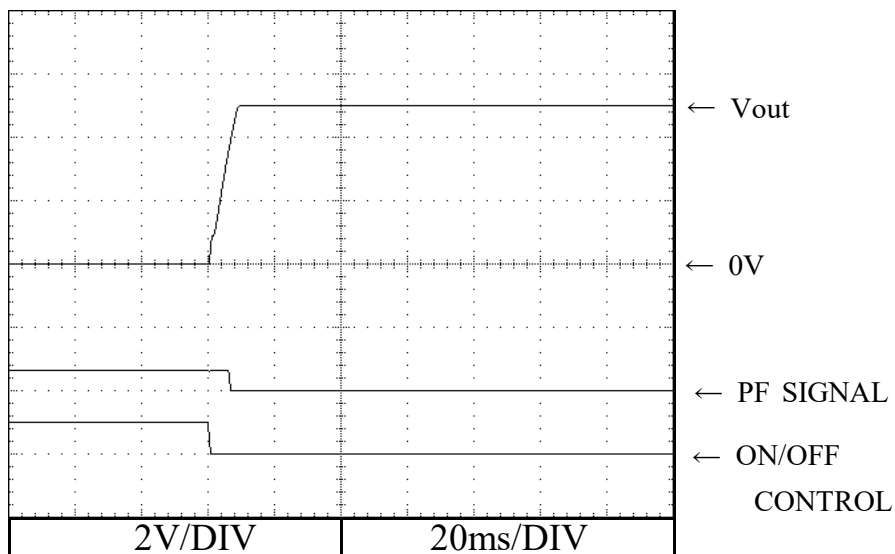
Output rise characteristics with ON/OFF CONTROL

Conditions V_{in} : 100 VAC

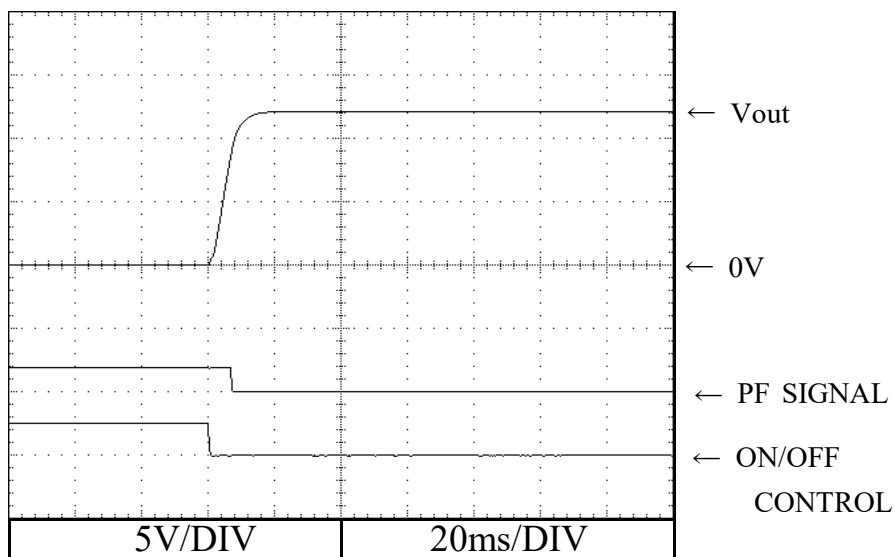
I_{out} : 100 %

T_a : 25 °C

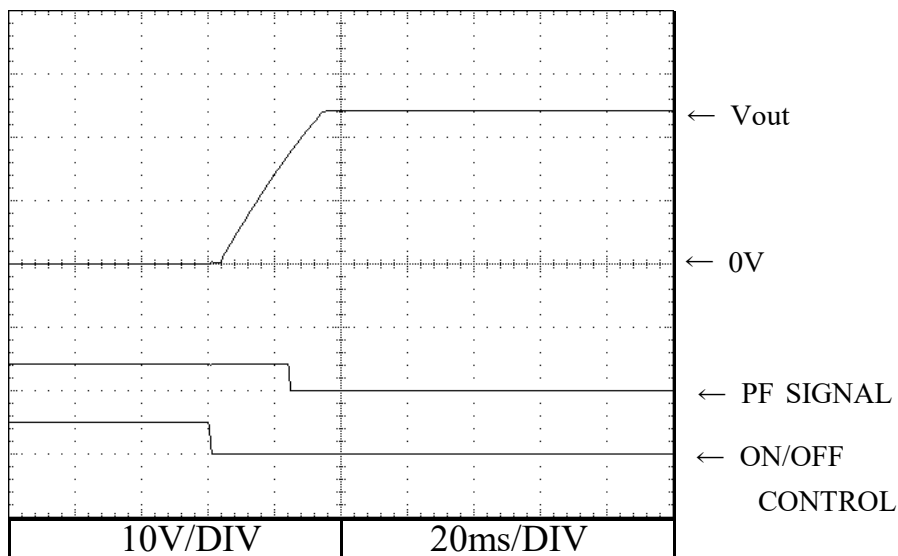
5V



12V



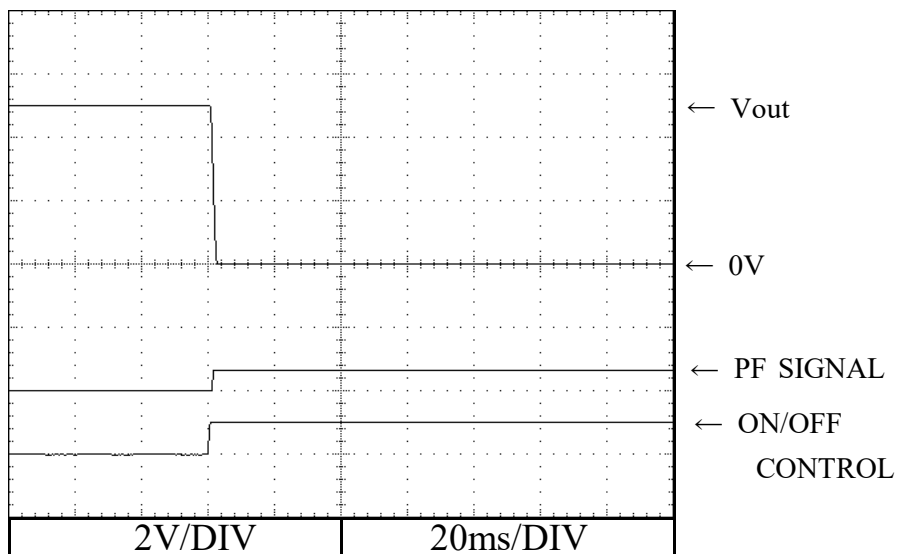
24V



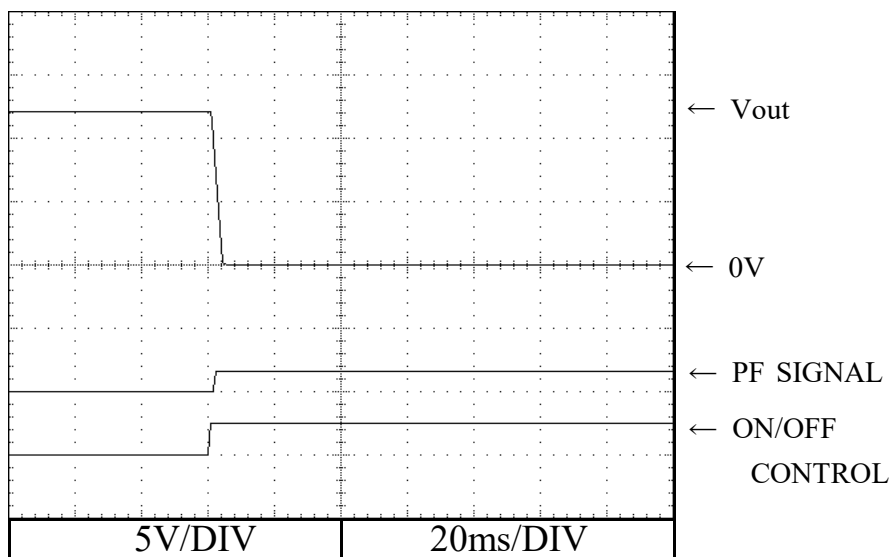
2.8 ON/OFFコントロール時出力立ち下がり特性 Output fall characteristics with ON/OFF CONTROL

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

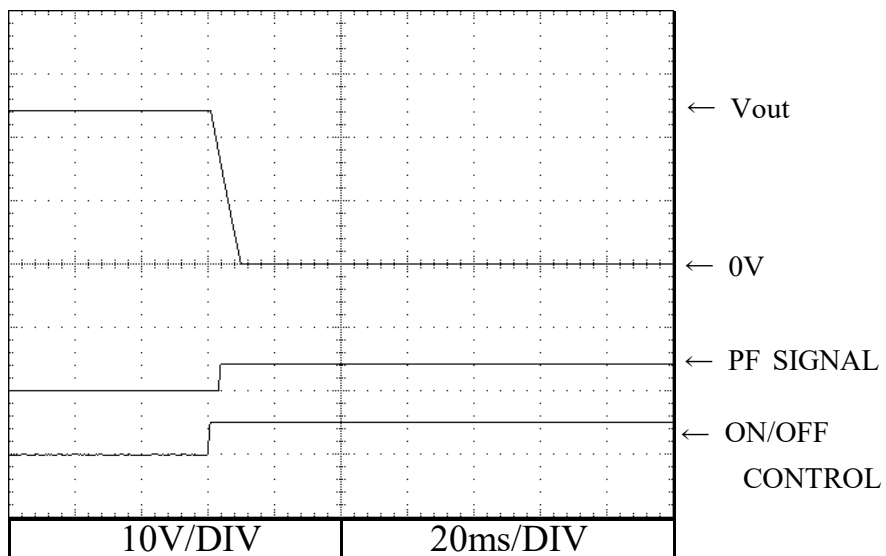
5V



12V



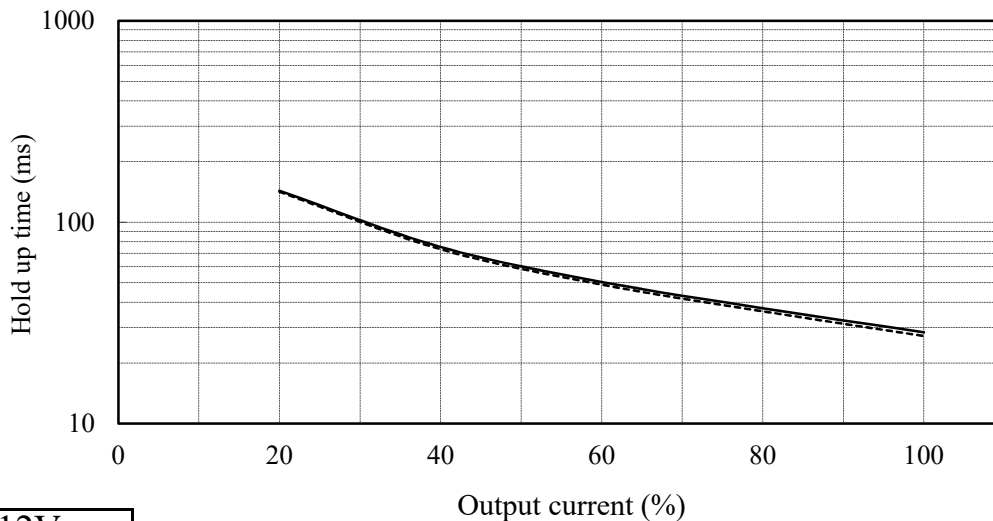
24V



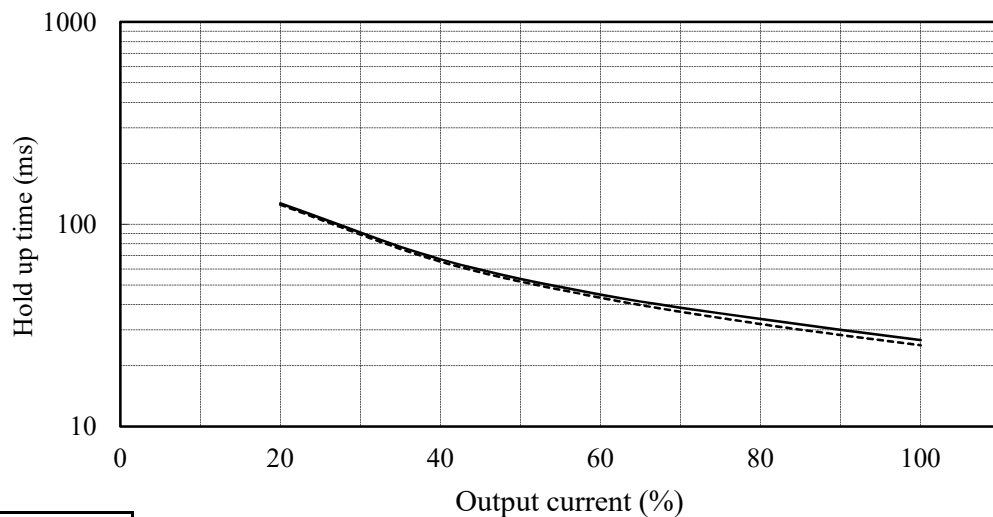
2.9 出力保持時間特性
Hold up time characteristics

Conditions V_{in} : 100 VAC -----
200 VAC ————
 T_a : 25 °C

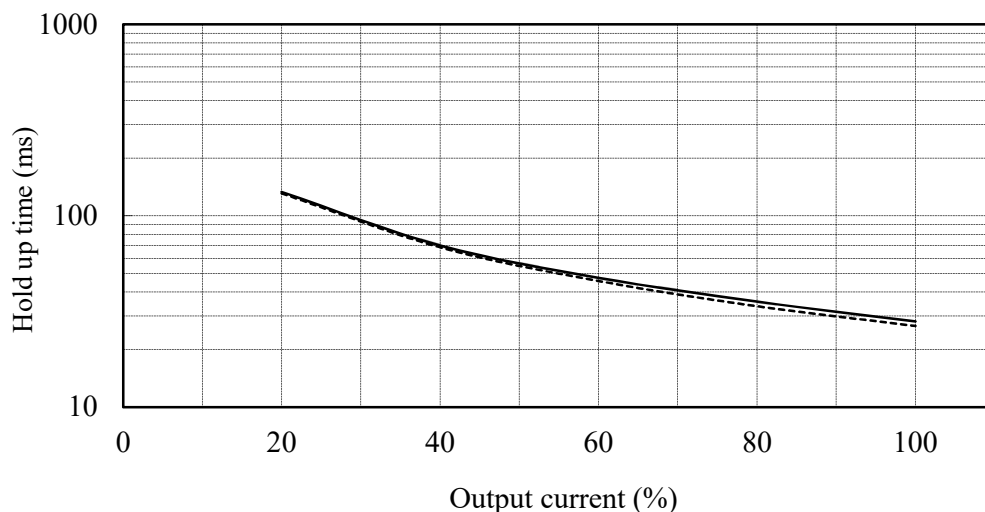
5V



12V



24V



2.10 過渡応答（入力急変）特性

Dynamic line response characteristics

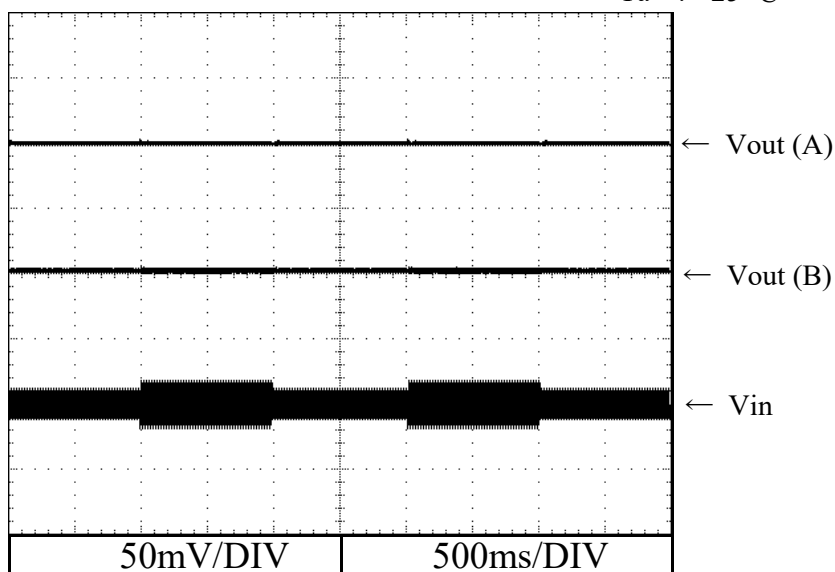
Conditions V_{in} : 85 VAC \longleftrightarrow 132VAC (A)

170 VAC \longleftrightarrow 265VAC (B)

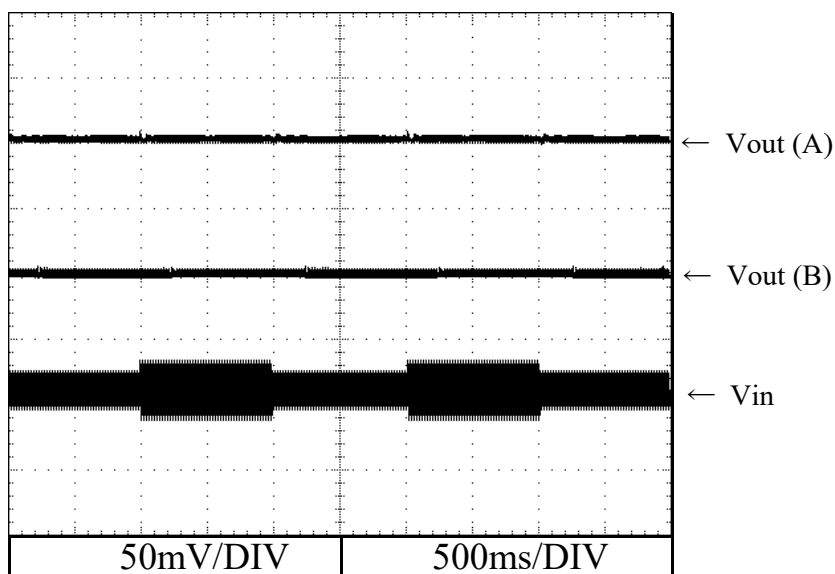
I_{out} : 100 %

T_a : 25 °C

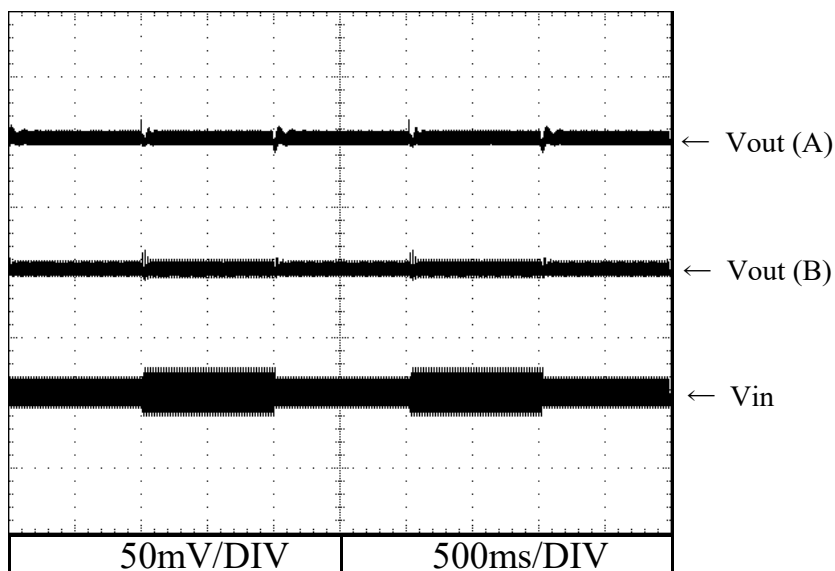
5V



12V



24V



2.11 過渡応答（負荷急変）特性

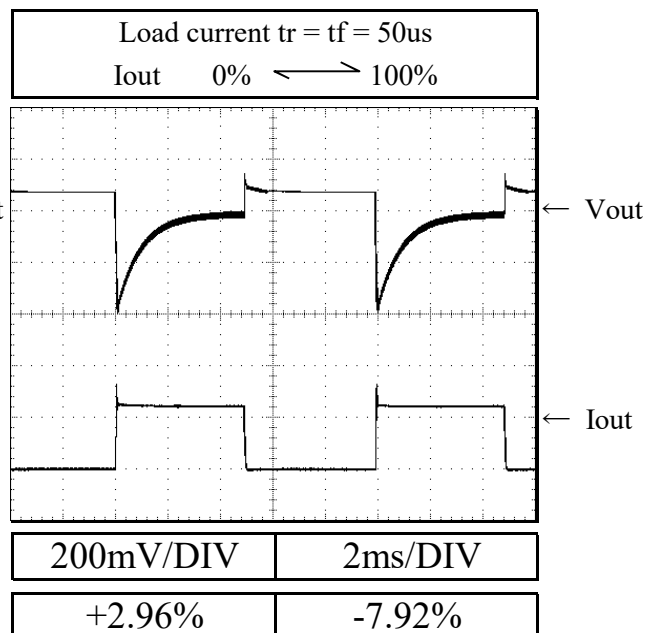
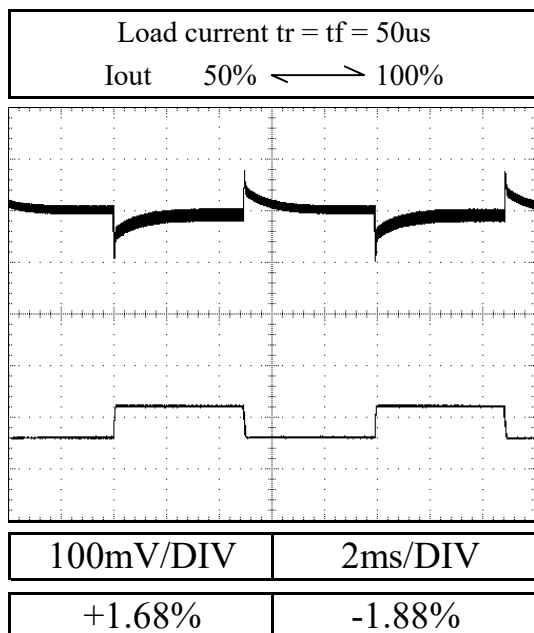
Dynamic load response characteristics

Conditions V_{in} : 100 VAC

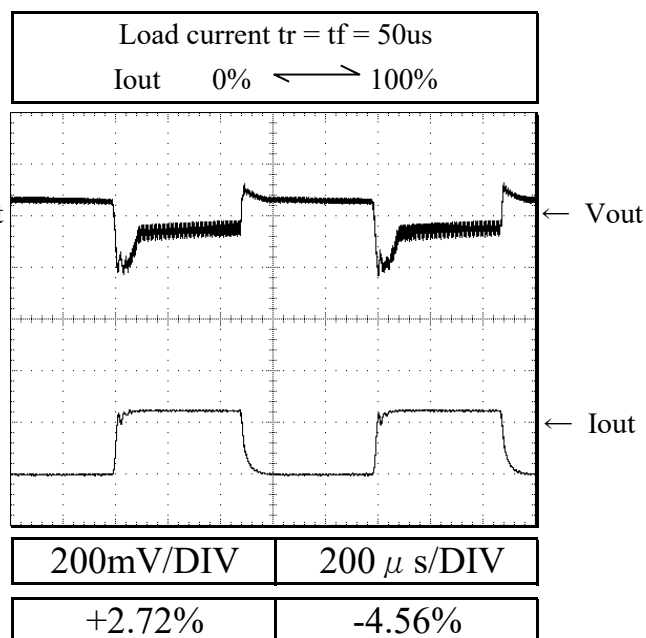
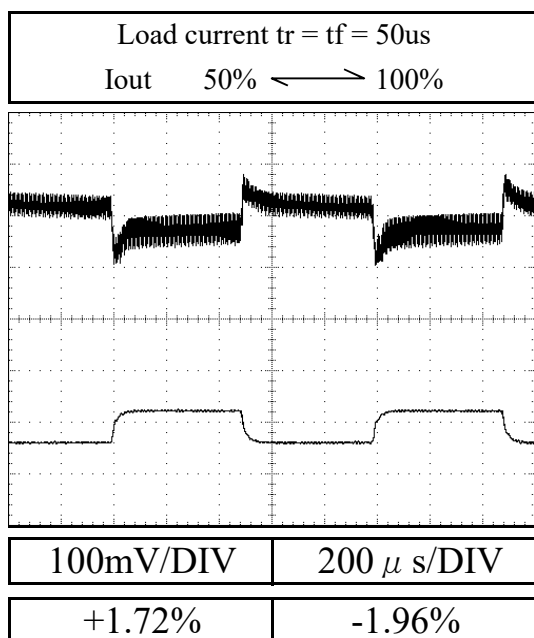
T_a : 25 °C

5V

$f=100\text{Hz}$



$f=1\text{kHz}$



2.11 過渡応答（負荷急変）特性

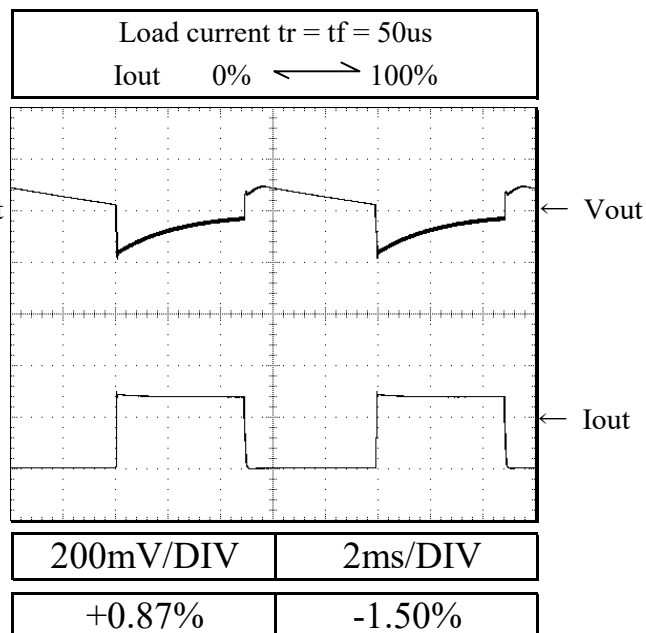
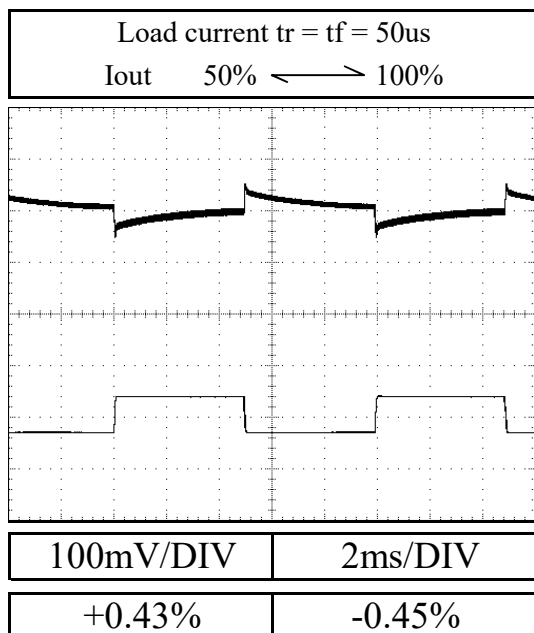
Dynamic load response characteristics

Conditions V_{in} : 100 VAC

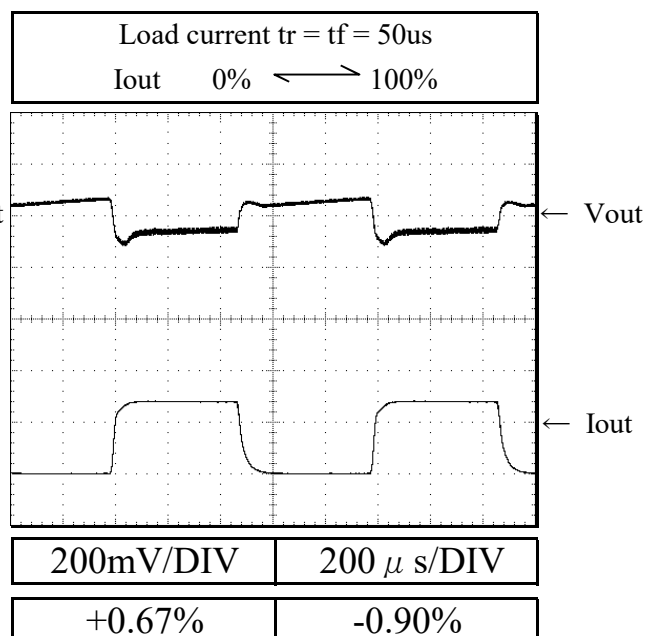
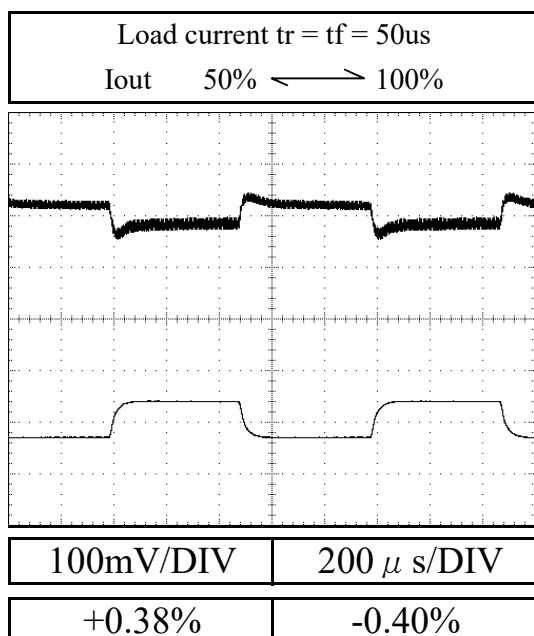
T_a : 25 °C

12V

$f=100\text{Hz}$



$f=1\text{kHz}$

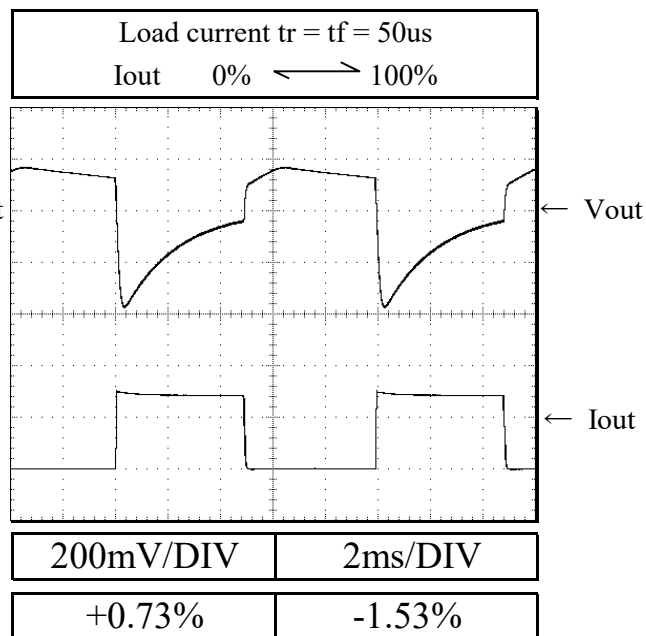
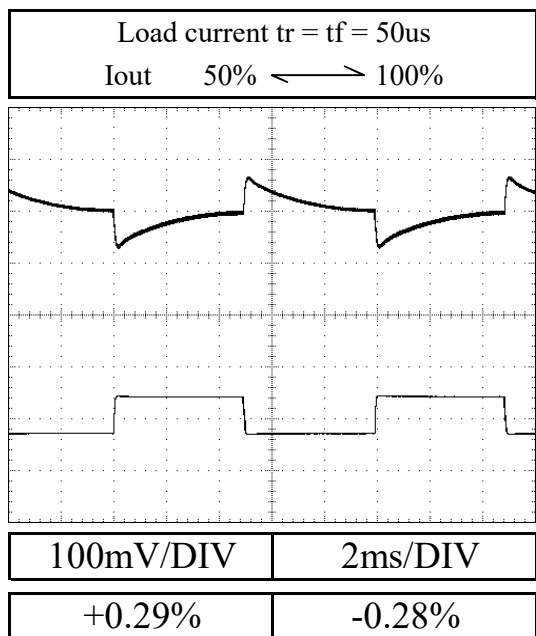


2.11 過渡応答（負荷急変）特性
Dynamic load response characteristics

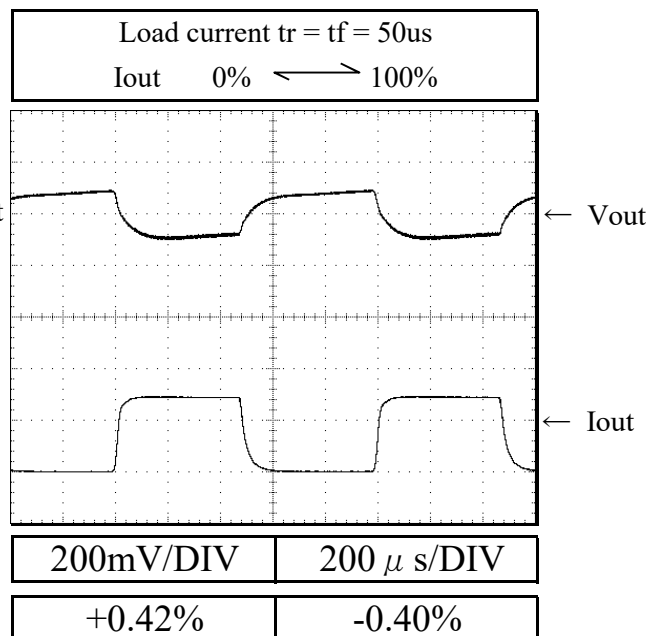
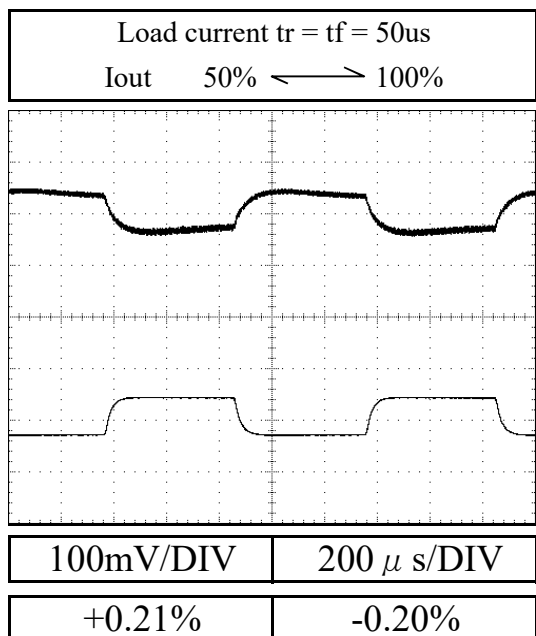
Conditions V_{in} : 100 VAC
 T_a : 25 °C

24V

$f=100\text{Hz}$



$f=1\text{kHz}$



2.12 入力電圧瞬停特性

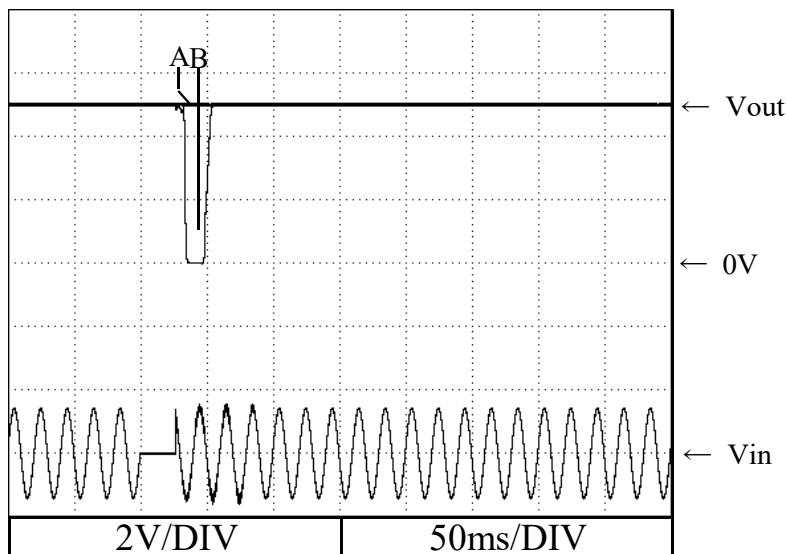
Response to brown out characteristics

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

5V

A = 26ms

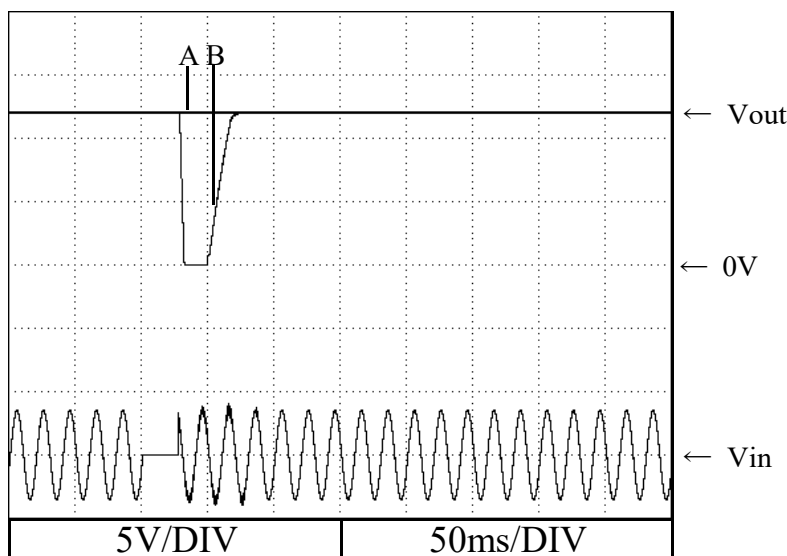
B = 27ms



12V

A = 26ms

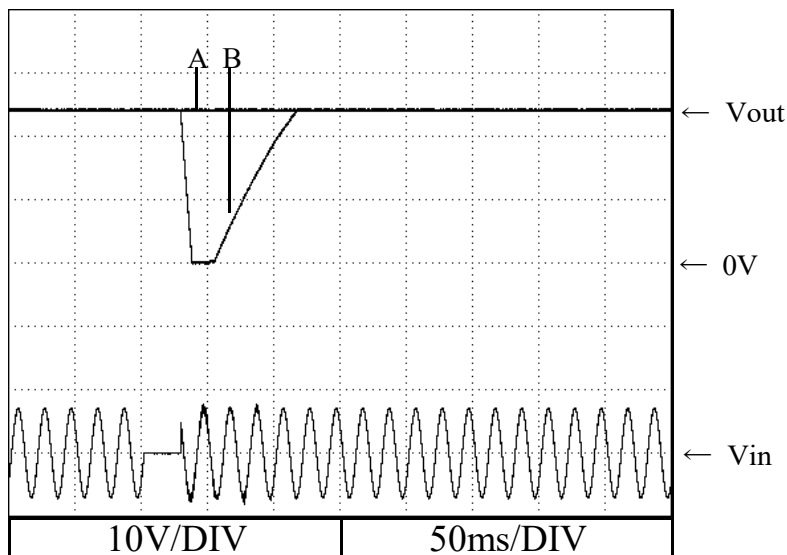
B = 27ms



24V

A = 26ms

B = 27ms



2.12 入力電圧瞬停特性

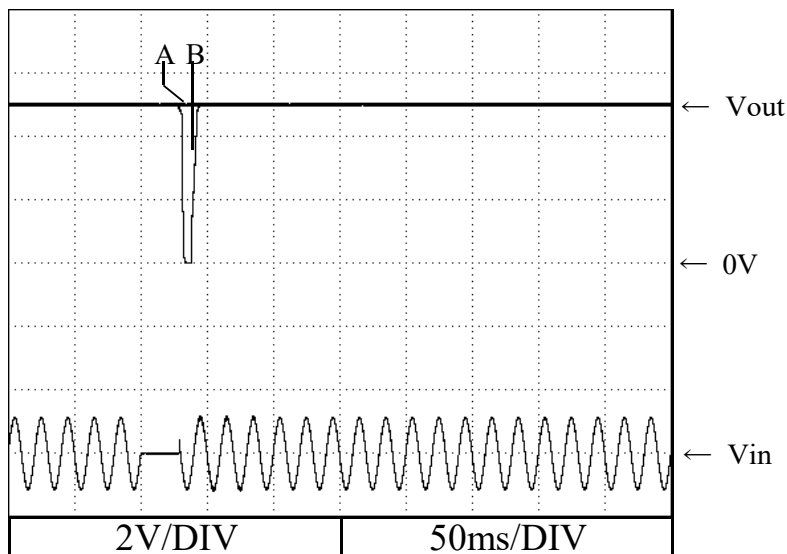
Response to brown out characteristics

Conditions Vin : 200 VAC
Iout : 100 %
Ta : 25 °C

5V

A = 28ms

B = 29ms

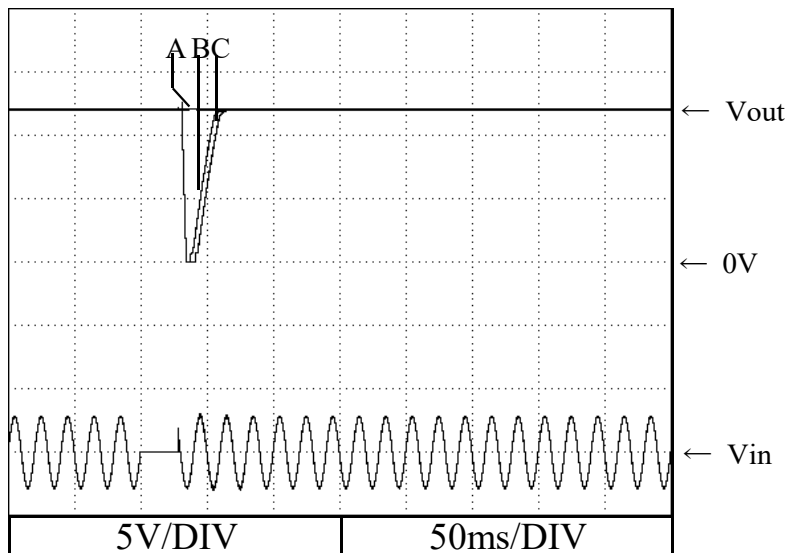


12V

A = 27ms

B = 28ms

C = 29ms

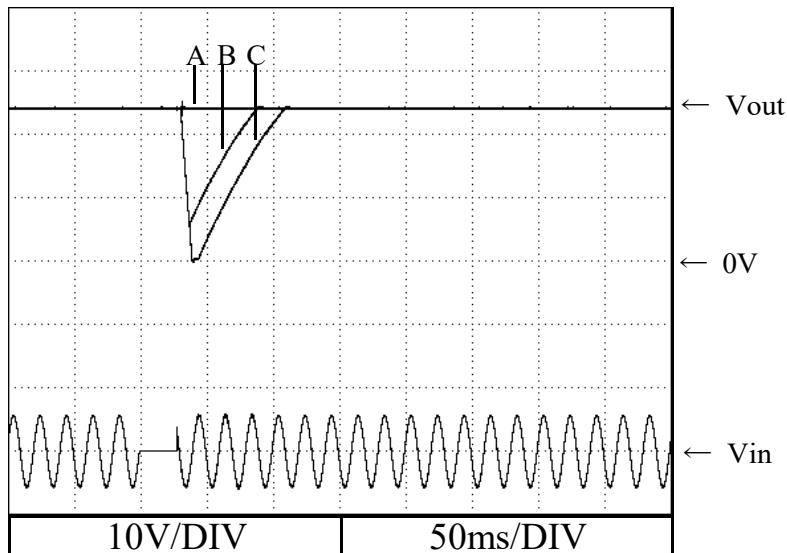


24V

A = 27ms

B = 28ms

C = 29ms



2.13 入力サージ電流（突入電流）特性

Inrush current waveform

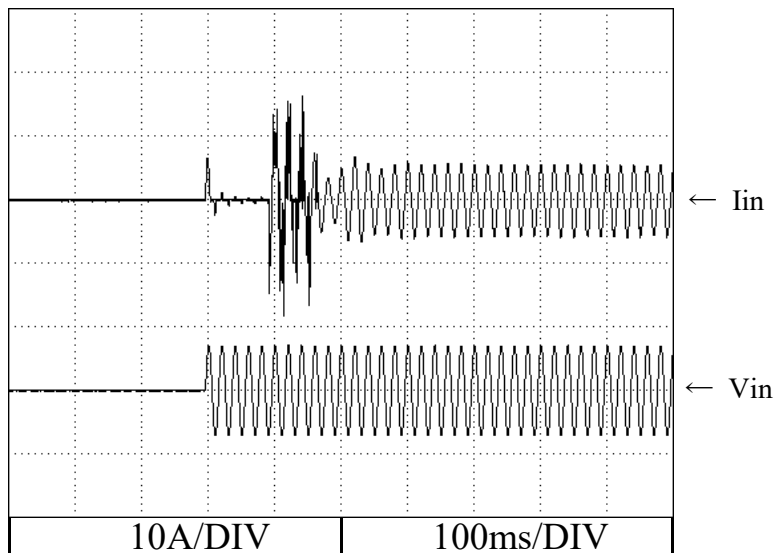
Conditions V_{in} : 100 VAC

I_{out} : 100 %

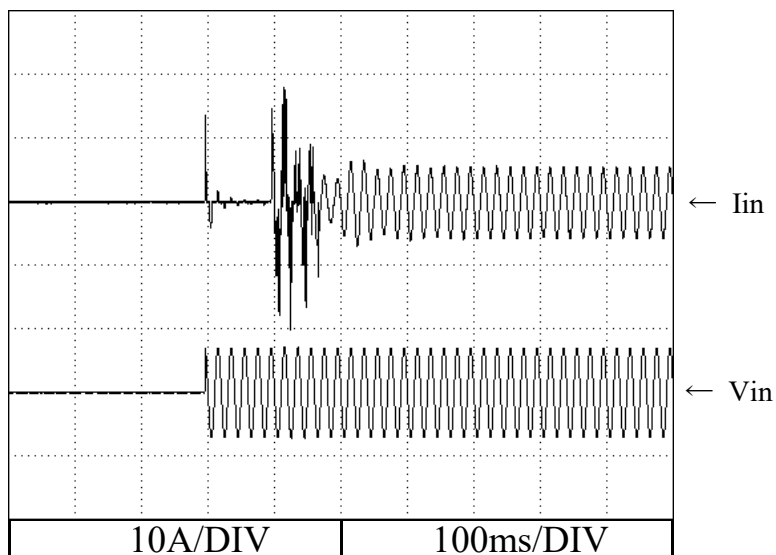
T_a : 25 °C

5V

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



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



2.13 入力サージ電流（突入電流）特性

Inrush current waveform

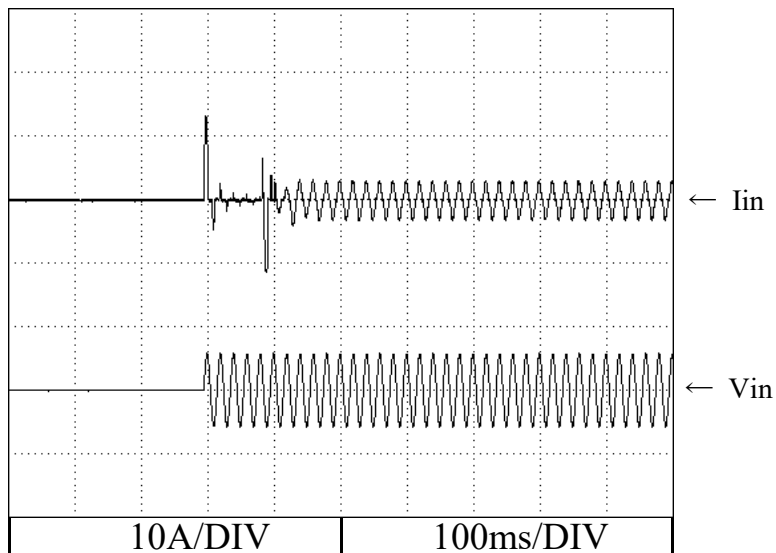
Conditions V_{in} : 200 VAC

I_{out} : 100 %

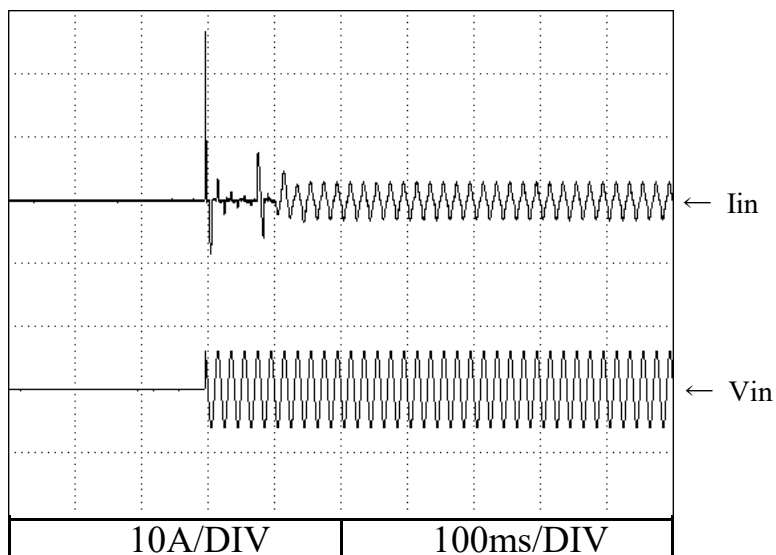
T_a : 25 °C

5V

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



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

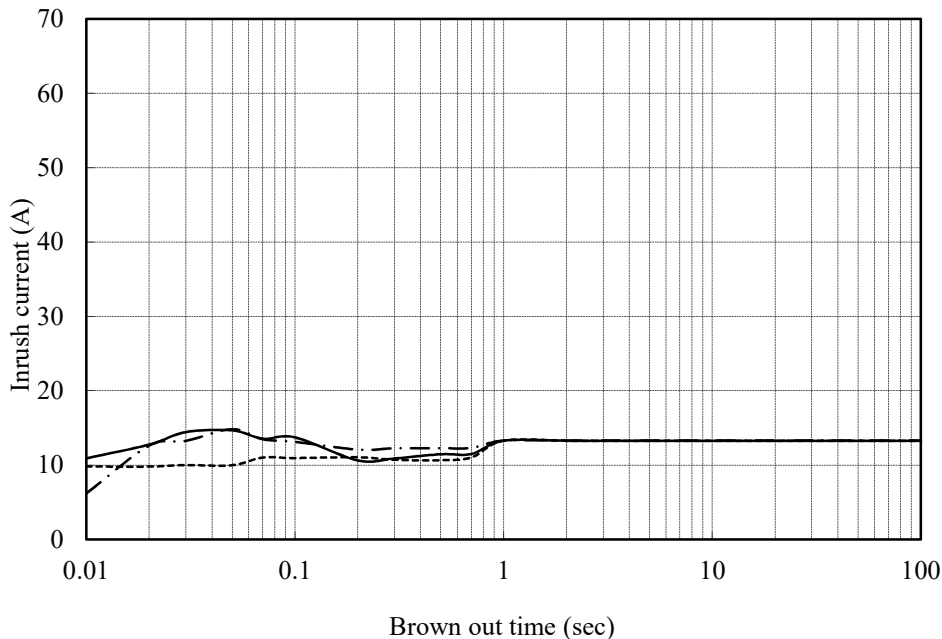


2.14 瞬停時突入電流特性
Inrush current characteristics

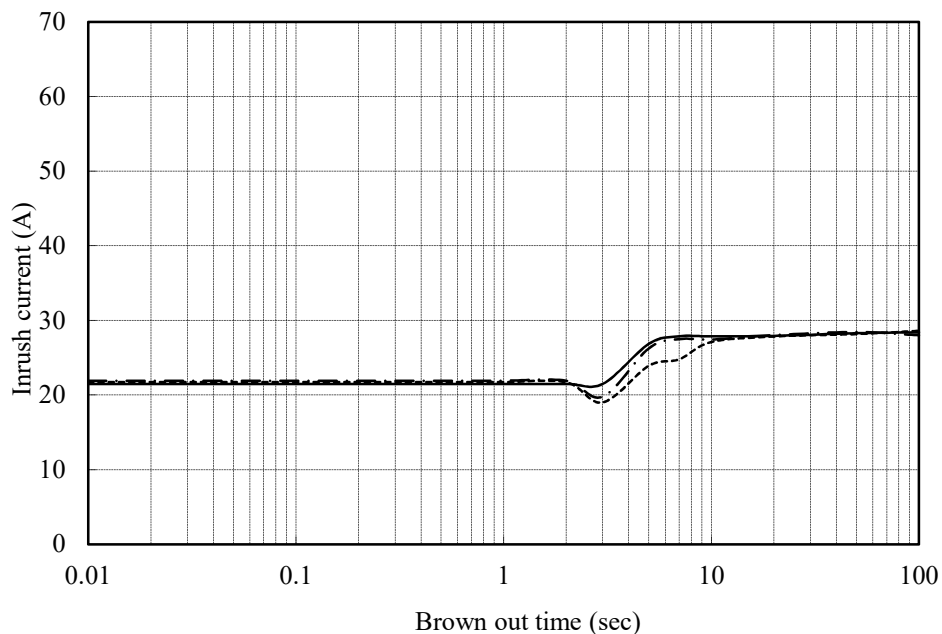
Conditions Iout : 0 % -----
50 % -.-.-.
100 % _____
Ta : 25 °C

5V

Vin : 100 VAC



Vin : 200 VAC



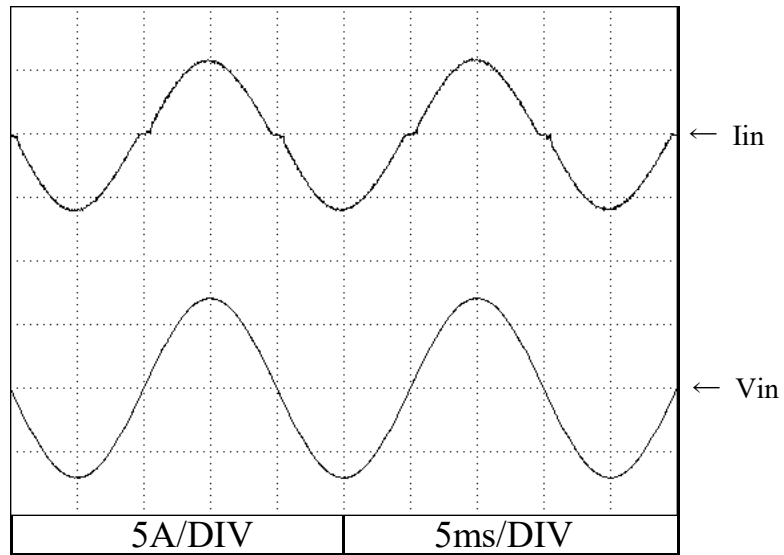
※ 上記値は、2次突入電流を含んだ値である。
Above data includes secondary inrush current.

2.15 入力電流波形
Input current waveform

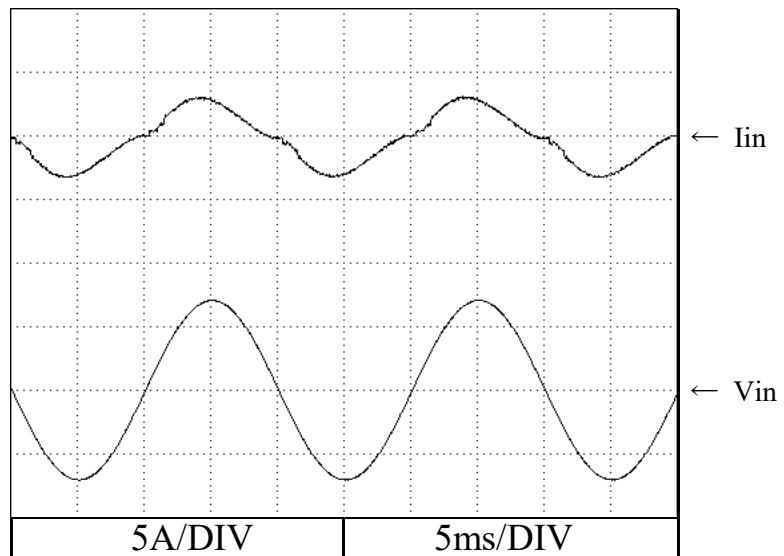
Conditions $I_{out} : 100\%$
 $T_a : 25\text{ }^\circ\text{C}$

5V

$V_{in} : 100\text{ VAC}$



$V_{in} : 200\text{ VAC}$

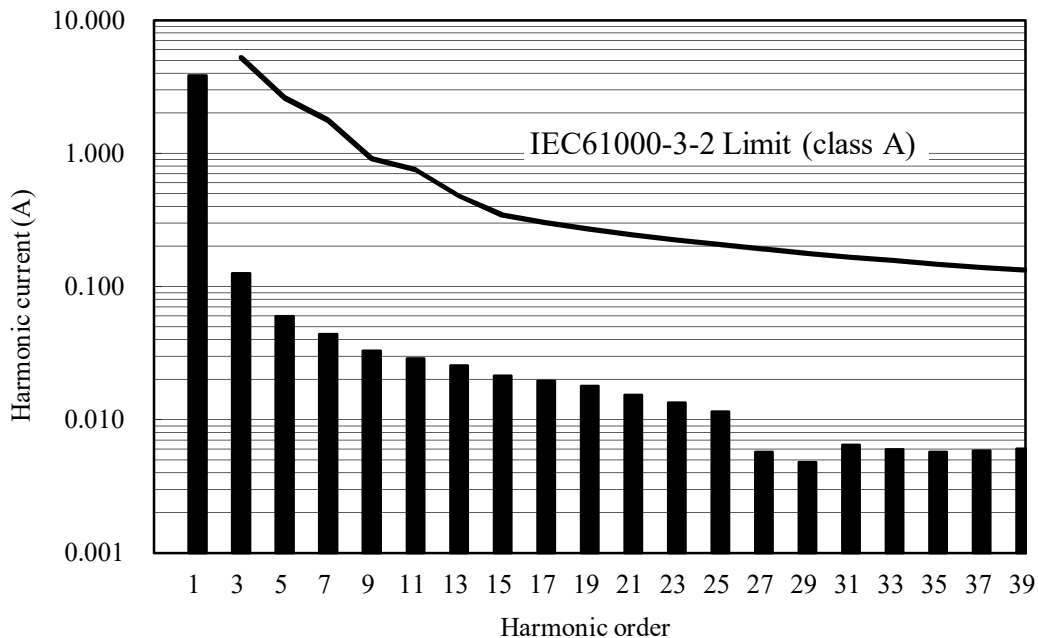


2.16 高調波成分

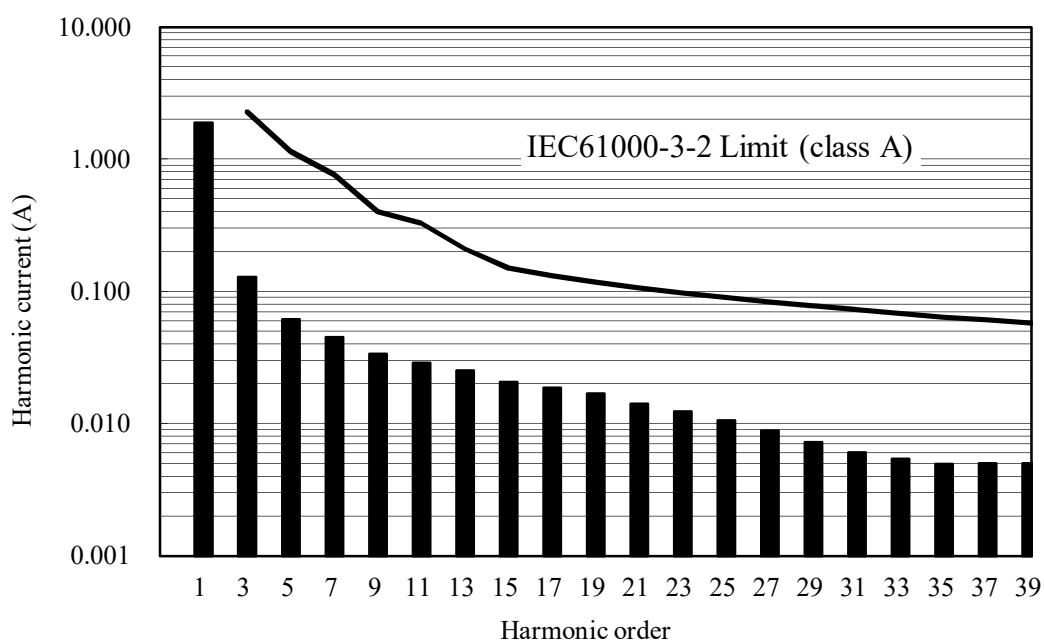
Input current harmonics

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

5V



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

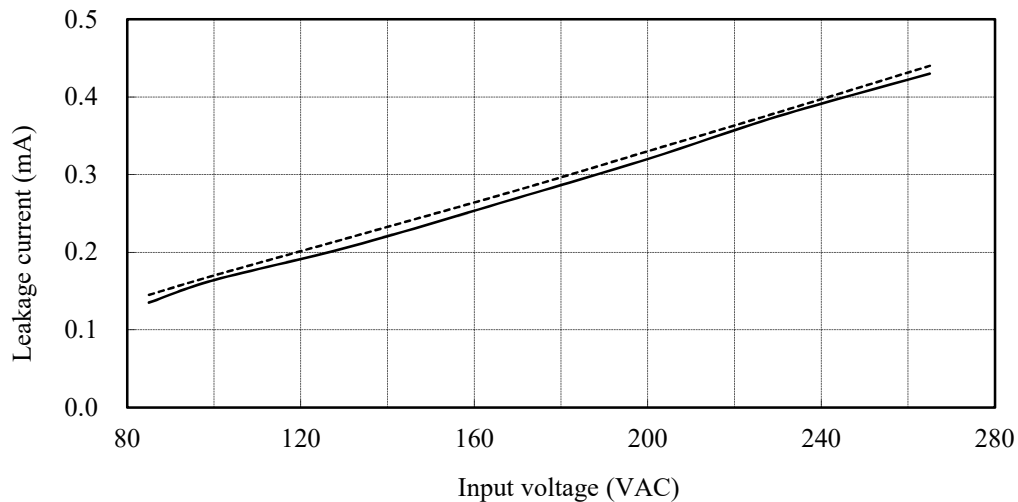


2.17 リーク電流特性 Leakage current characteristics

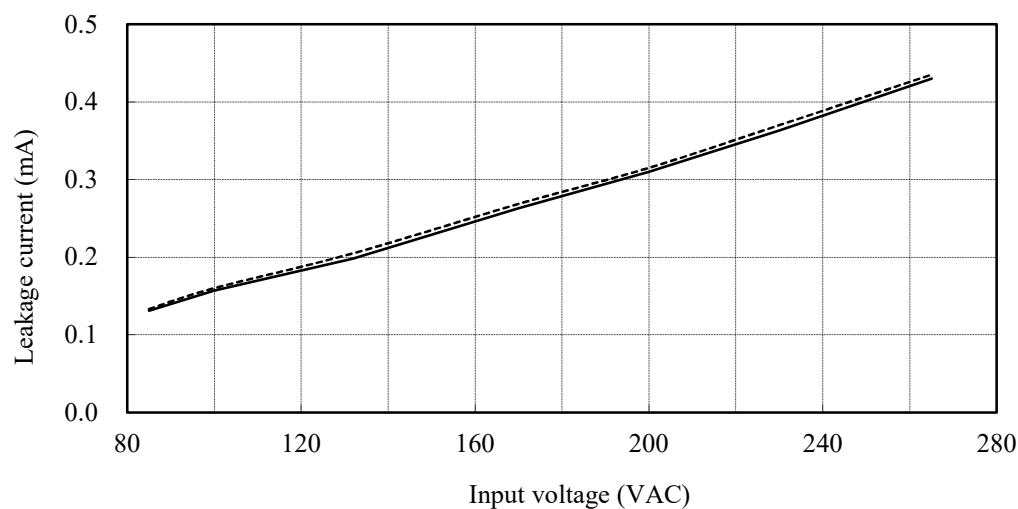
Conditions Iout : 0 % - - - - -
 100 % - - - - -
 Ta : 25 °C
 f : 50 Hz

Equipment used : MODEL 229-2
 (Simpson)

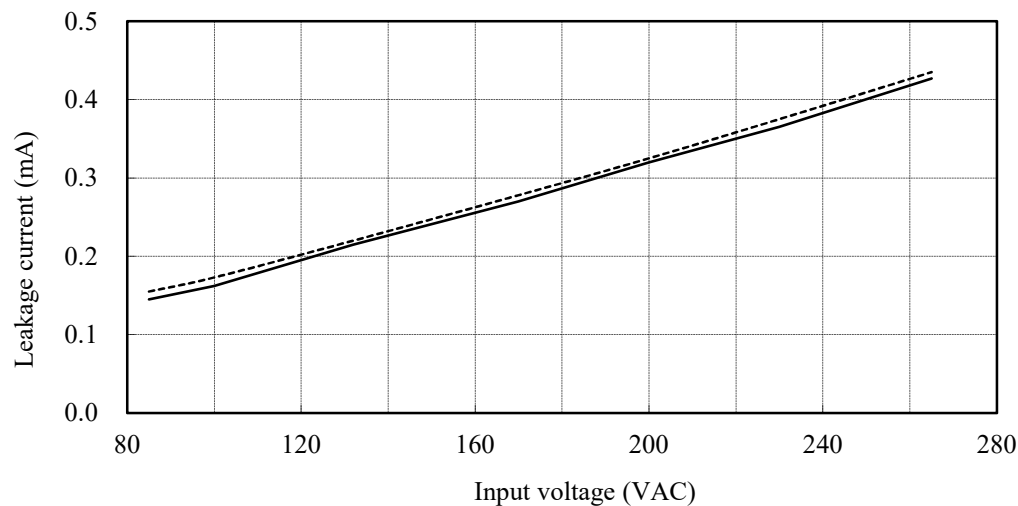
5V



12V



24V

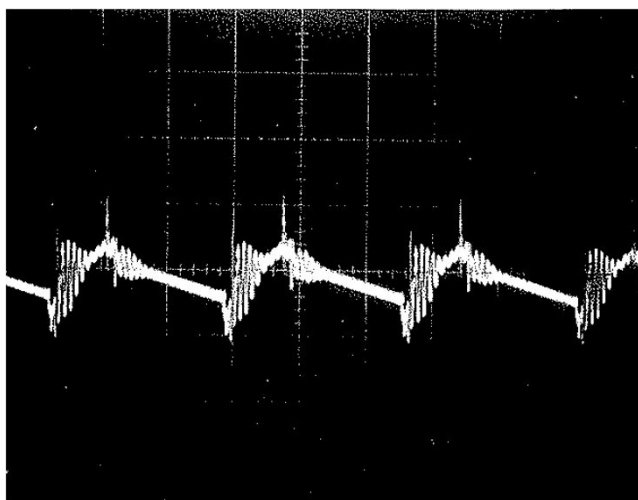


2.18 出力リップル、ノイズ波形
Output ripple and noise waveform

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

NORMAL MODE

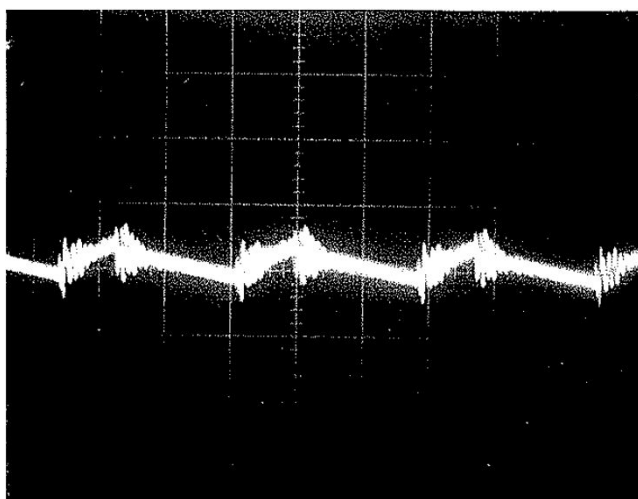
5V



50mV/DIV

2 μ s/DIV

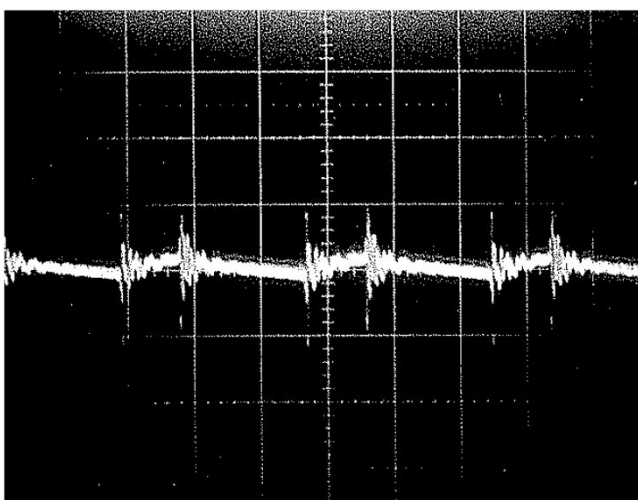
12V



50mV/DIV

2 μ s/DIV

24V



50mV/DIV

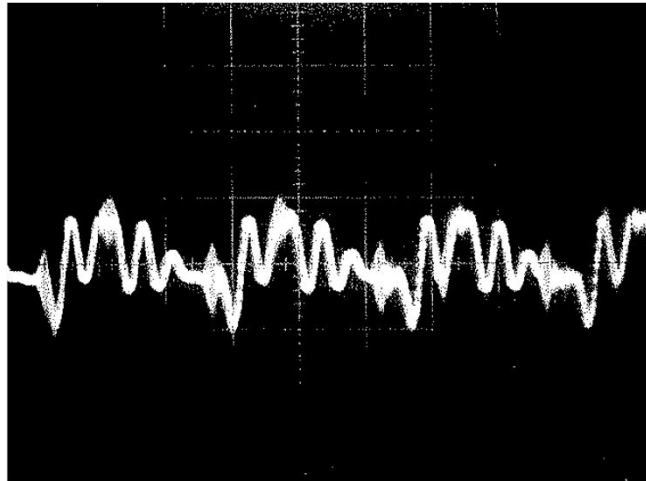
2 μ s/DIV

2.18 出力リップル、ノイズ波形
Output ripple and noise waveform

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

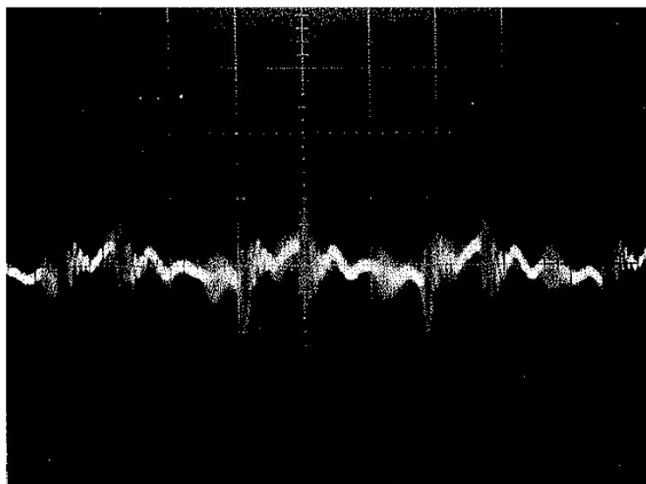
NORMAL + COMMON MODE

5V



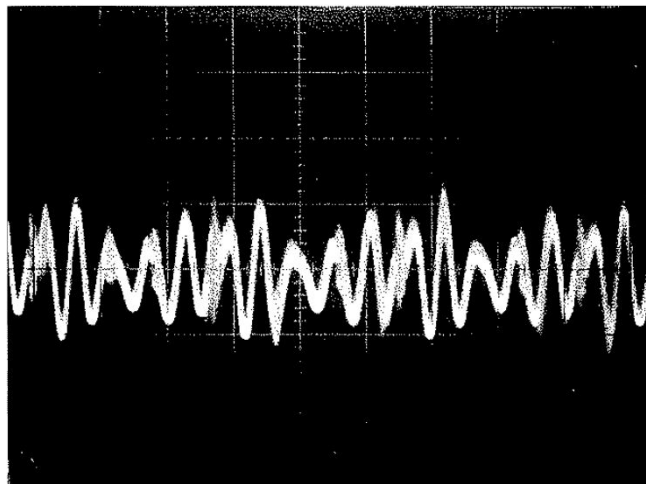
50mV/DIV 2 μs/DIV

12V



50mV/DIV 2 μs/DIV

24V



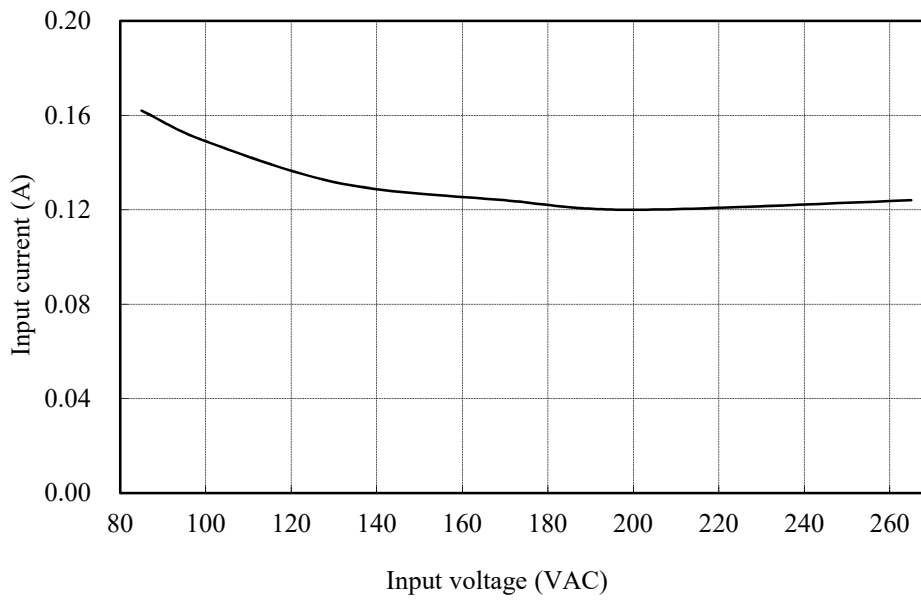
50mV/DIV 2 μs/DIV

2.19 スタンバイ電流
Stand by current

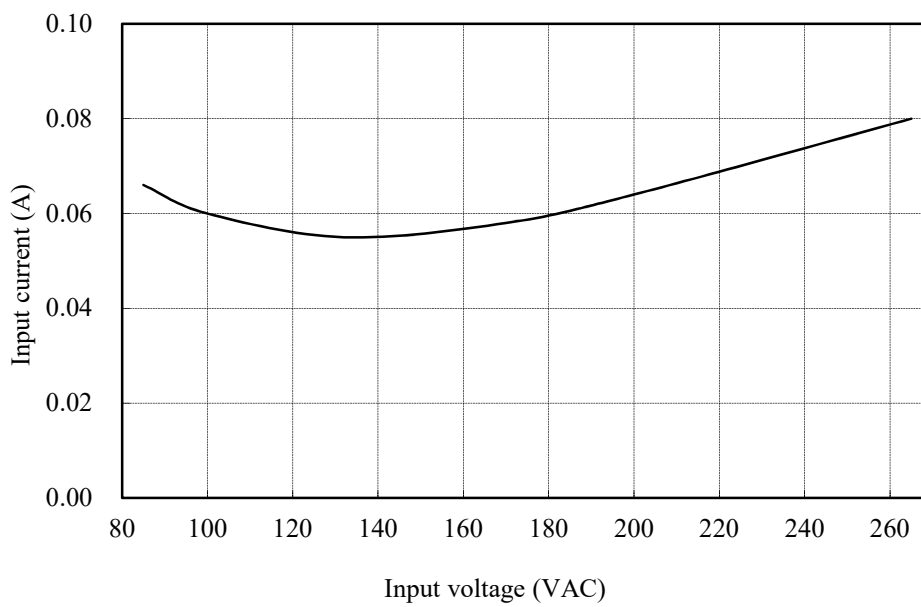
Condition Ta: 25 °C

5V

Io = 0%



Remote control OFF



2.20 EMI 特性

Electro-Magnetic Interference characteristics

Conditions V_{in} : 100VAC

I_{out} : 100%

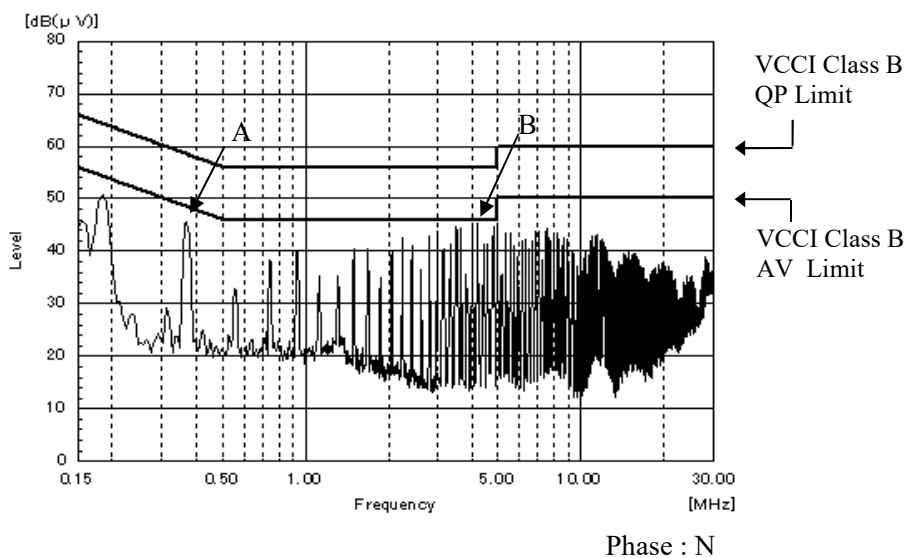
(a) 雑音端子電圧

Conducted Emission

5V

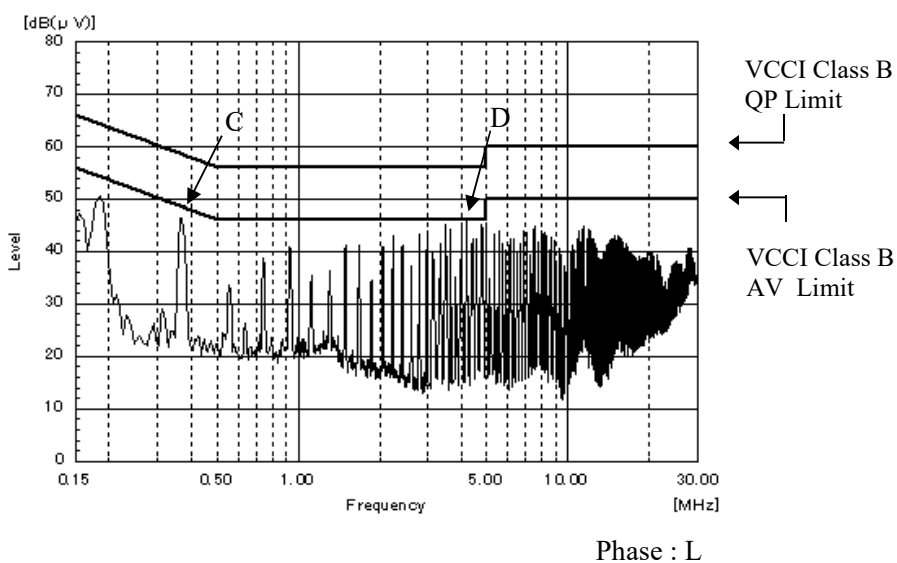
Point A (371kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	58.5	44.9
AV	48.5	44.6

Point B (4.26MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	56.0	43.6
AV	46.0	42.8



Point C (371kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	58.5	45.3
AV	48.5	45.0

Point D (4.26MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	56.0	43.1
AV	46.0	42.5



EN55011-B,EN55032-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B are same as its VCCI class B.

2.20 EMI 特性

Electro-Magnetic Interference characteristics

Conditions $V_{in} : 100VAC$

$I_{out} : 100\%$

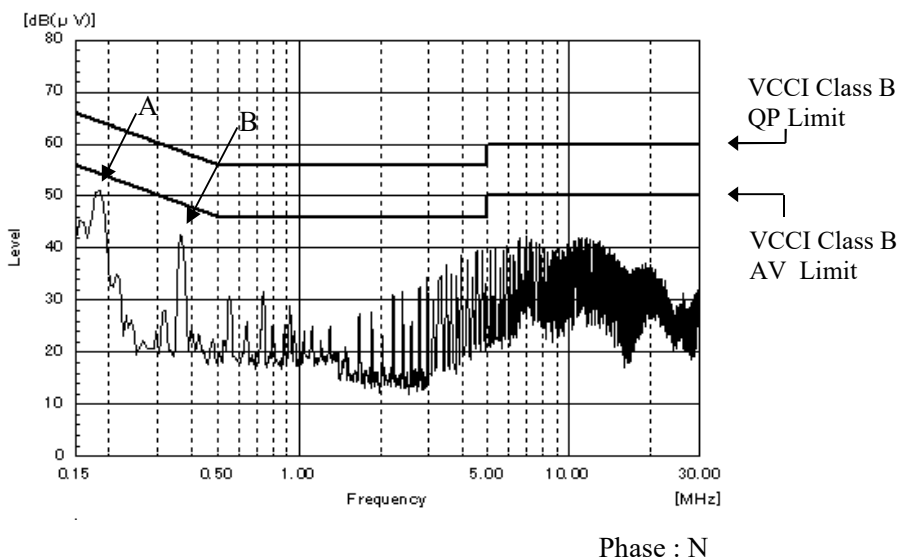
(a) 雑音端子電圧

Conducted Emission

12V

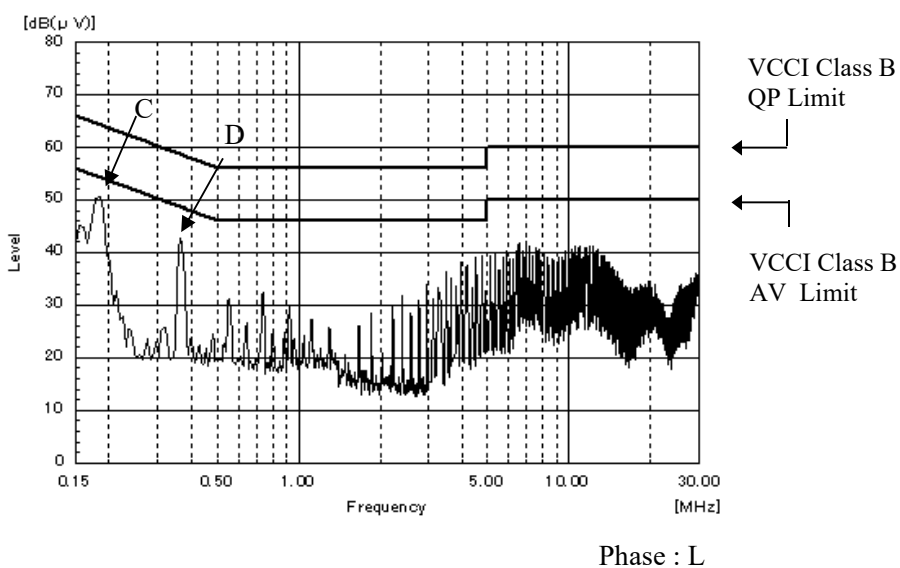
Point A (184kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.3	49.0
AV	54.3	48.1

Point B (368kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	58.6	41.4
AV	48.6	41.6



Point C (184kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.4	49.4
AV	54.3	48.7

Point D (369kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	58.5	41.5
AV	48.5	41.7



EN55011-B,EN55032-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B are same as its VCCI class B.

2.20 EMI 特性

Electro-Magnetic Interference characteristics

Conditions V_{in} : 100VAC

I_{out} : 100%

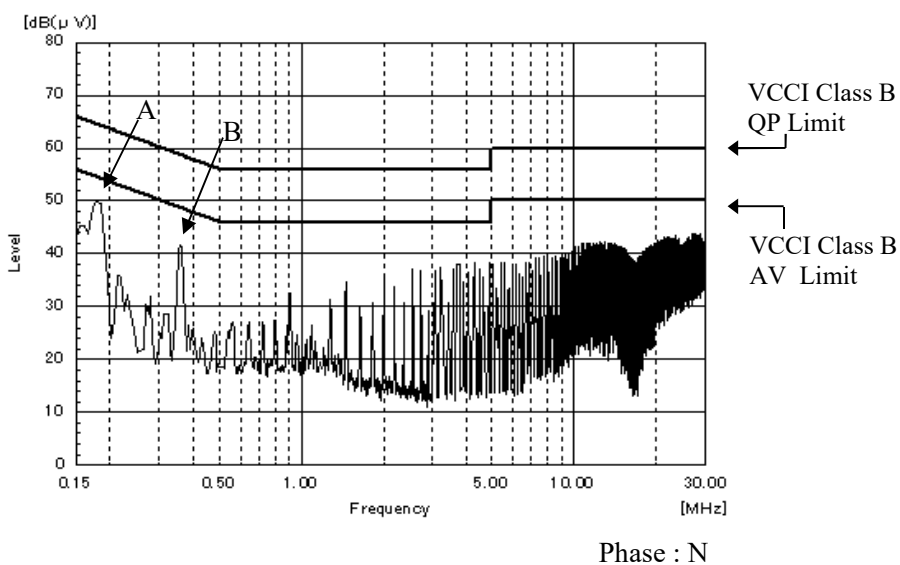
(a) 雑音端子電圧

Conducted Emission

24V

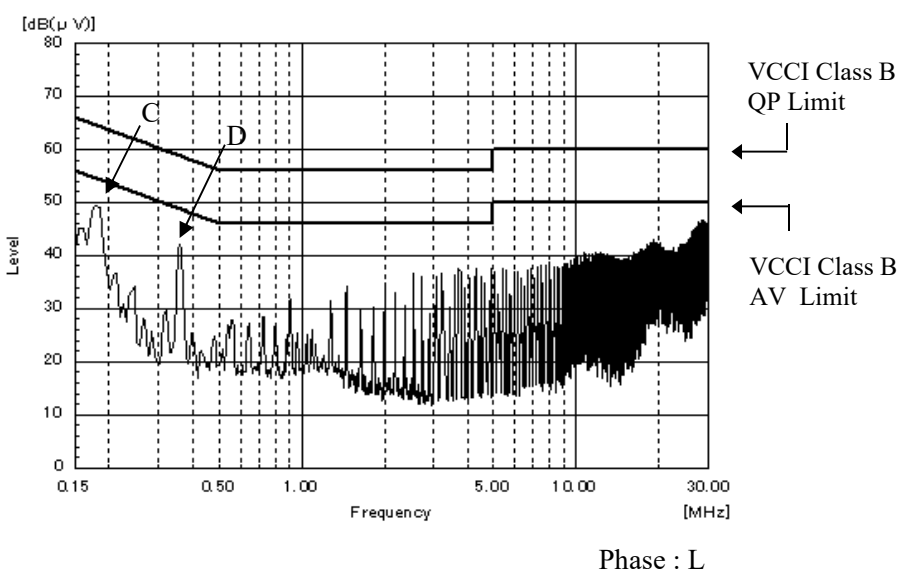
Point A (182kHz)		
Ref. Data	Limit (dB μ V)	Measure (dB μ V)
QP	64.4	49.2
AV	54.4	48.1

Point B (362kHz)		
Ref. Data	Limit (dB μ V)	Measure (dB μ V)
QP	58.7	41.1
AV	48.7	41.1



Point C (182kHz)		
Ref. Data	Limit (dB μ V)	Measure (dB μ V)
QP	64.4	48.7
AV	54.4	48.1

Point D (362kHz)		
Ref. Data	Limit (dB μ V)	Measure (dB μ V)
QP	58.7	41.3
AV	48.7	41.4



EN55011-B,EN55032-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B are same as its VCCI class B.

2.20 EMI 特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC

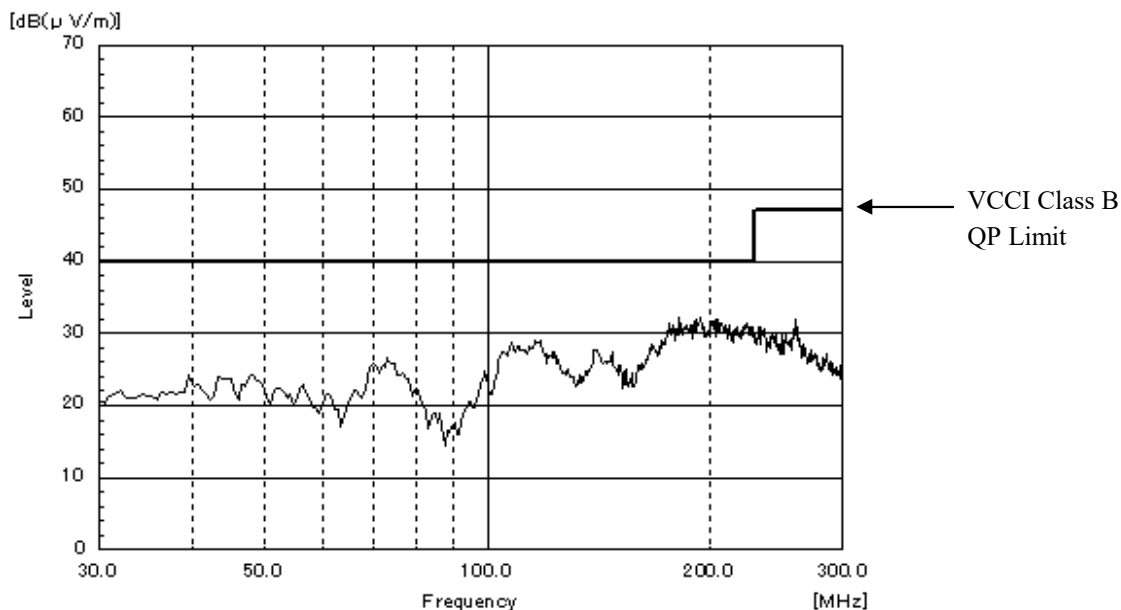
Iout : 100%

(b) 雑音電界強度

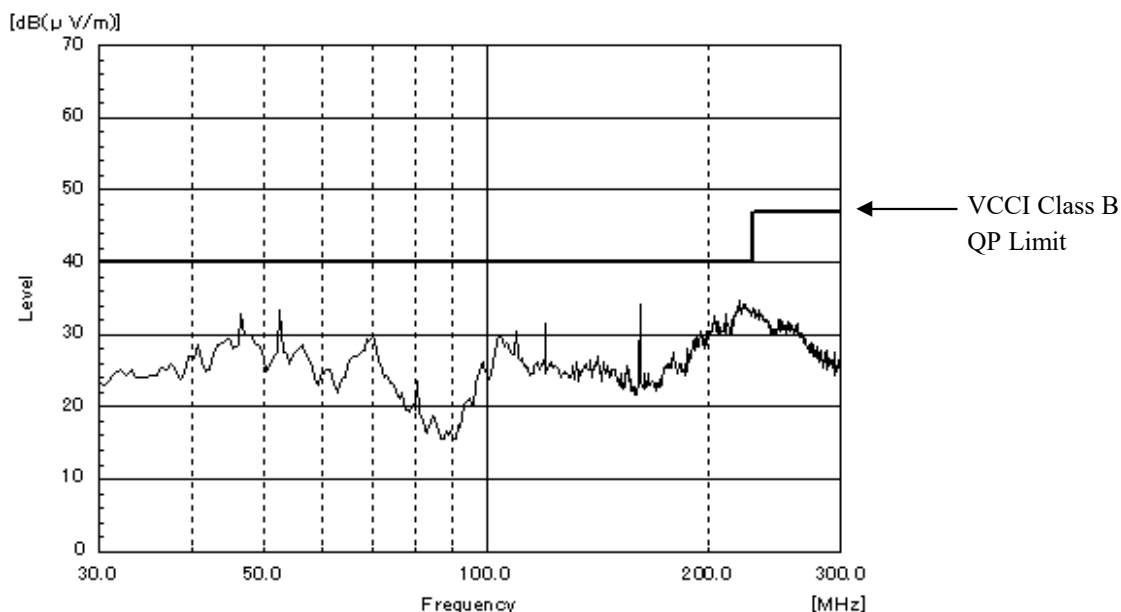
Radiated Emission

5V

HORIZONTAL



VERTICAL



EN55011-B,EN55032-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B are same as its VCCI class B.

2.20 EMI 特性

Electro-Magnetic Interference characteristics

Conditions V_{in} : 230VAC

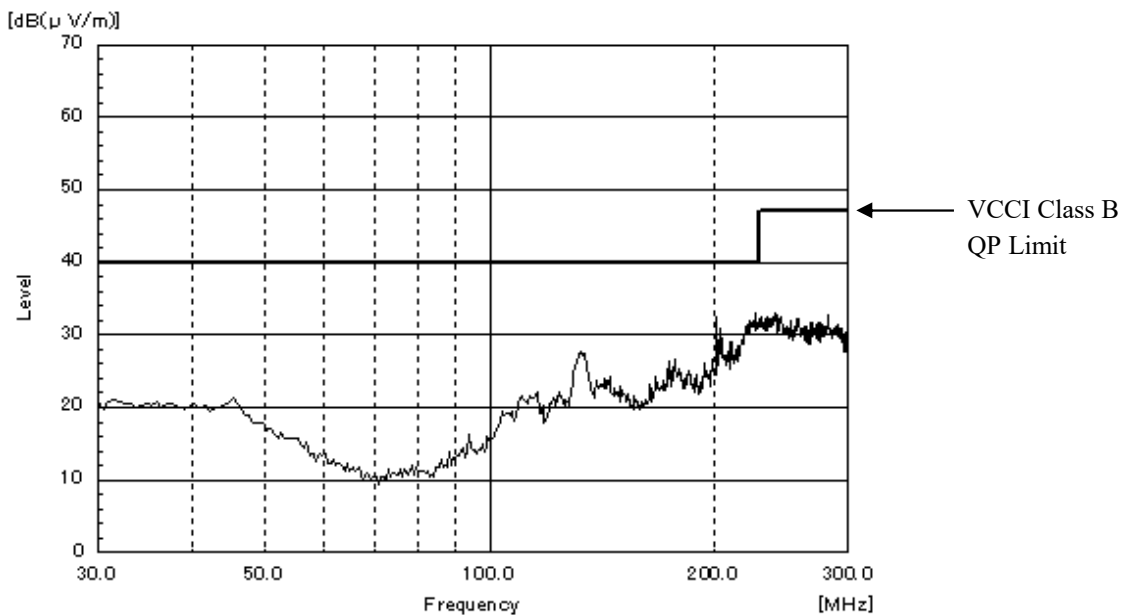
I_{out} : 100%

(b) 雑音電界強度

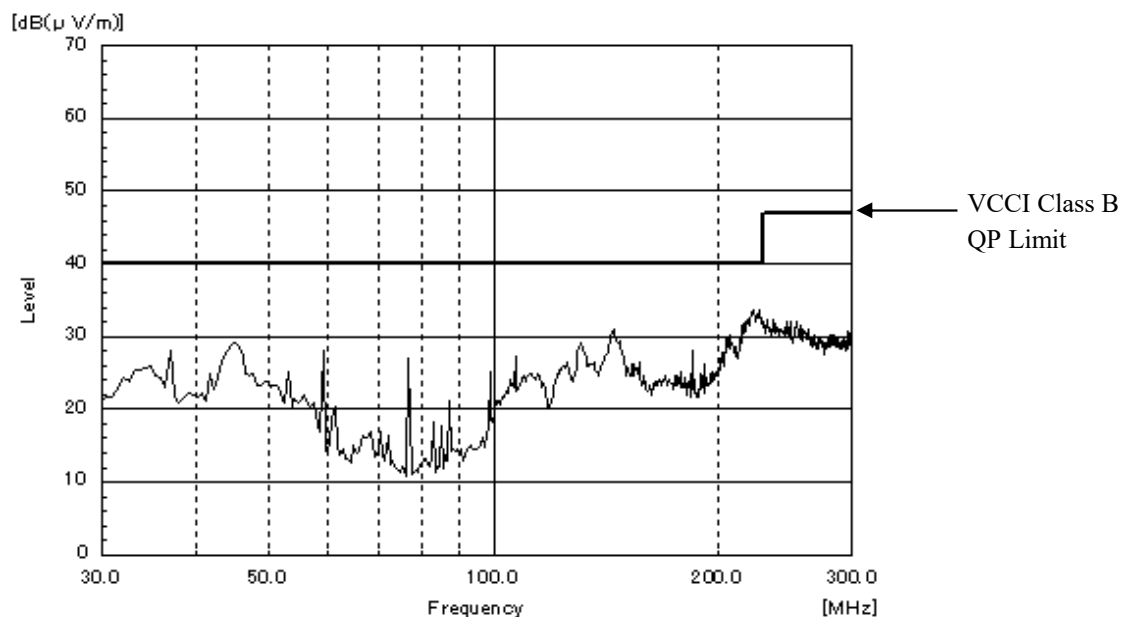
Radiated Emission

12V

HORIZONTAL



VERTICAL



EN55011-B,EN55032-Bの限界値はVCCI class Bの限界値と同じ
 Limit of EN55011-B,EN55032-B are same as its VCCI class B.

2.20 EMI 特性

Electro-Magnetic Interference characteristics

Conditions V_{in} : 230VAC

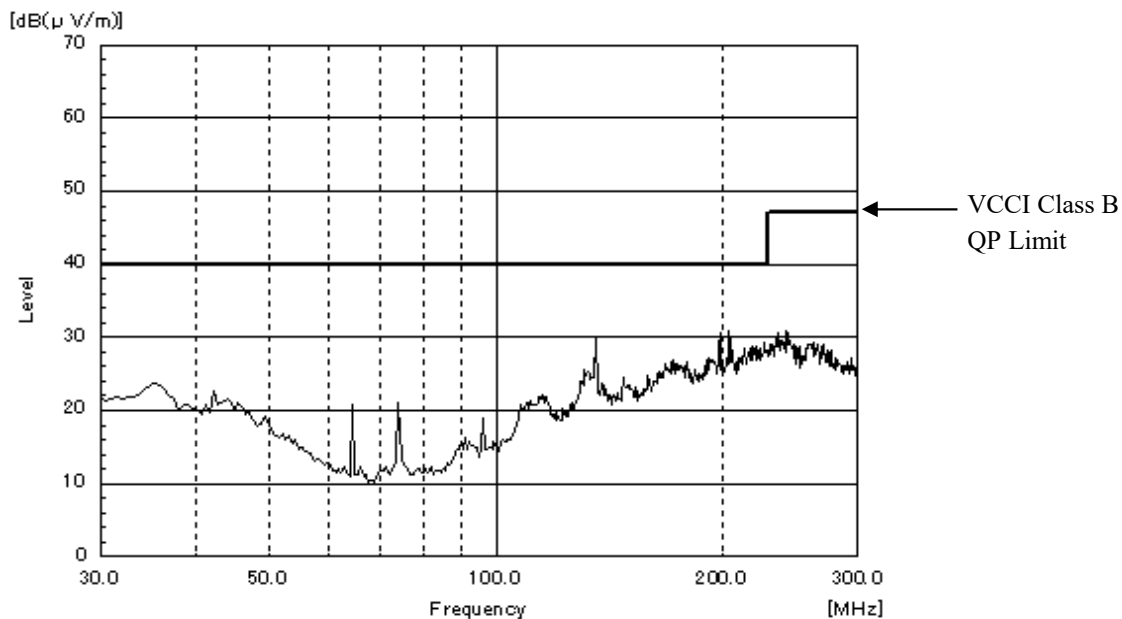
I_{out} : 100%

(b) 雑音電界強度

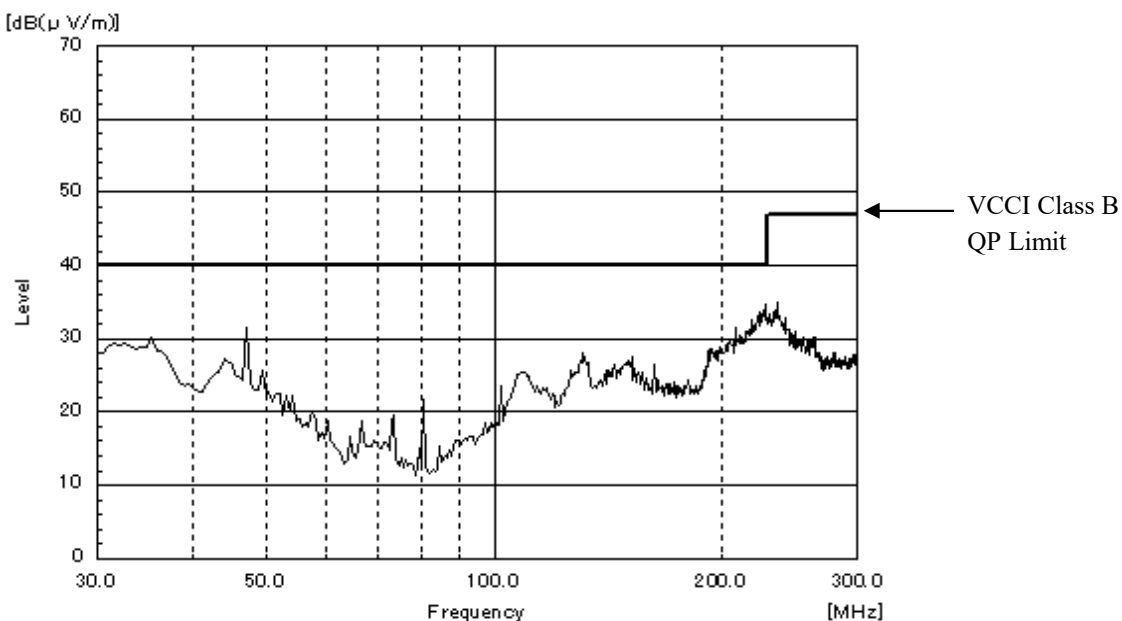
Radiated Emission

24V

HORIZONTAL



VERTICAL



EN55011-B,EN55032-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B are same as its VCCI class B.