HWS600

EVALUATION DATA

型式データ

TDK-Lambda

A232-53-01B

INDEX

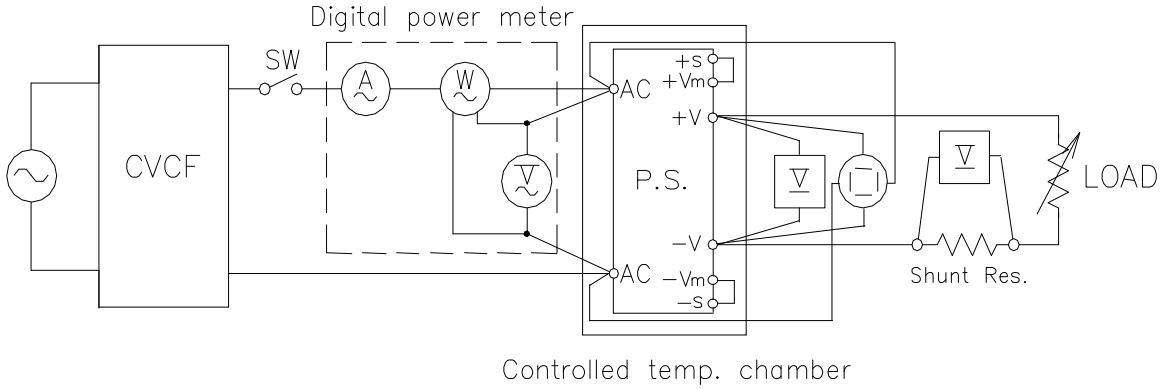
使用記号　Terminology used

	Definition
Vin	..... 入力電圧　Input voltage
Vout	..... 出力電圧　Output voltage
Iin	..... 入力電流　Input current
Iout	..... 出力電流　Output current
Ta	..... 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

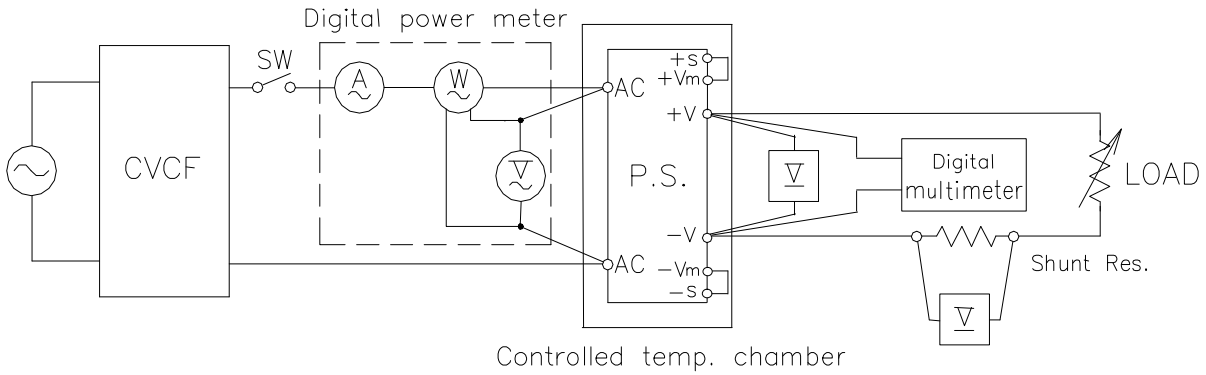
(1) 静特性　Steady state data



(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

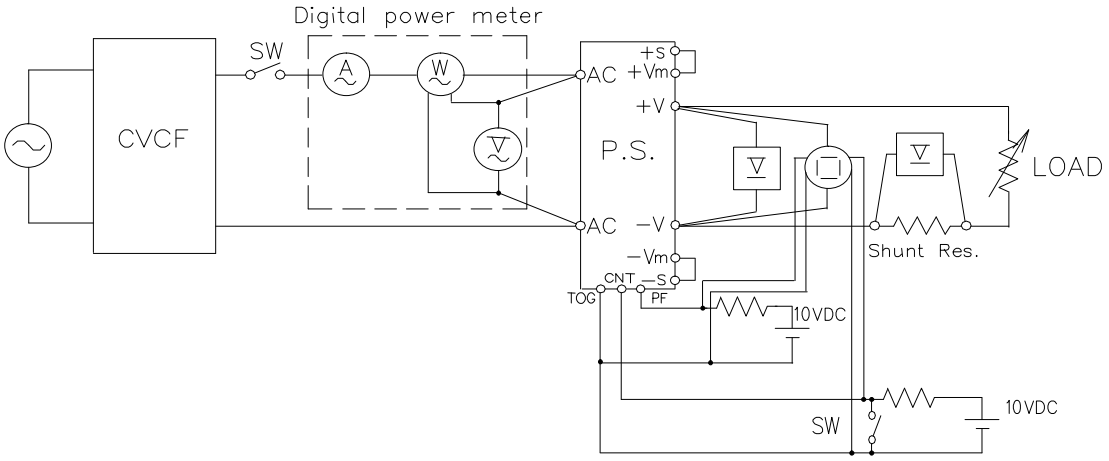
(5) 出力立ち上がり特性　Output rise characteristics

Same as Steady state data

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

Same as Steady state data

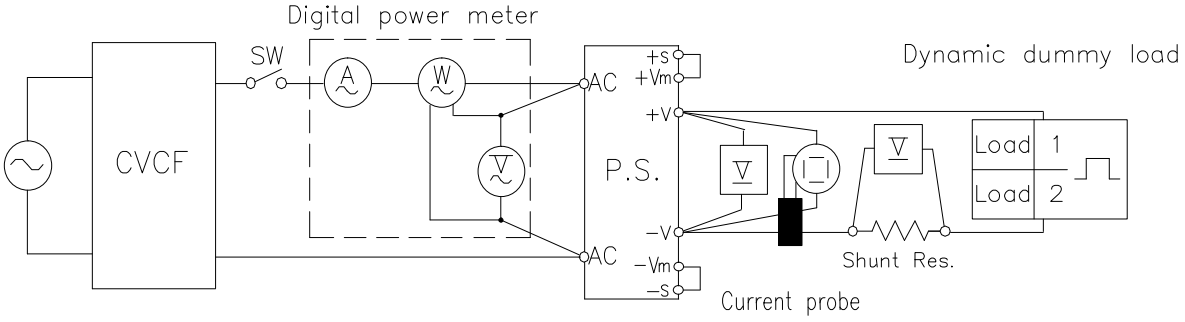
(7) ＯＮ／ＯＦＦコントロール時出力立ち上がり特性
Output rise characteristics with ON/OFF CONTROL

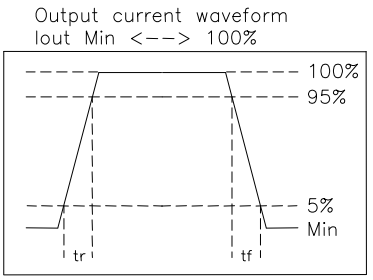


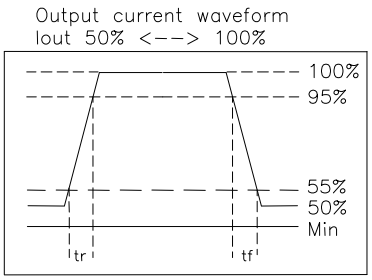
(8) ＯＮ／ＯＦＦコントロール時出力立ち下がり特性
Output fall characteristics with ON/OFF CONTROL
Same as Output rise characteristics with ON/OFF CONTROL

(9) 過渡応答（入力急変）特性　Dynamic line response characteristics
Same as Steady state data

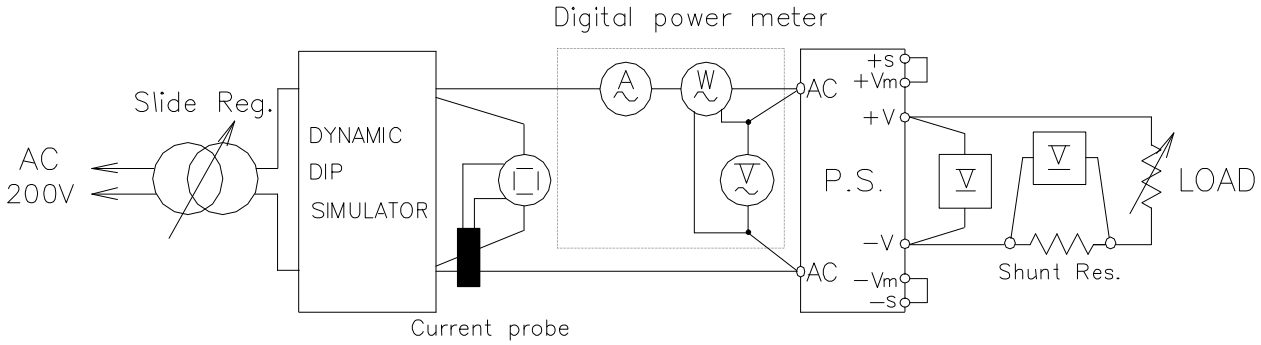
(10) 過渡応答（負荷急変）特性　Dynamic load response characteristics



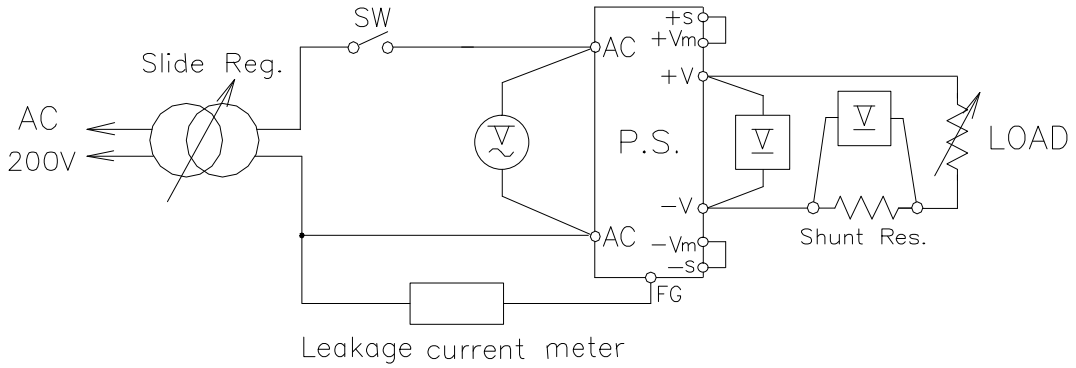




(11) 入力サージ電流（突入電流）特性　Inrush current characteristics



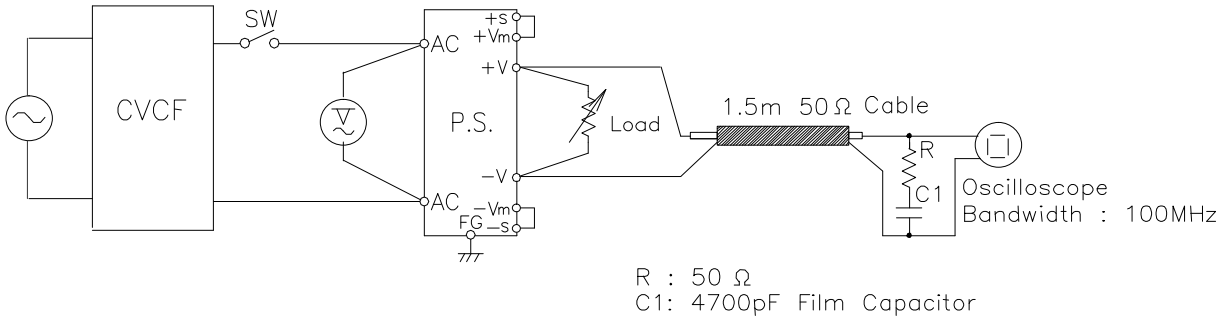
(12) リーク電流特性　Leakage current characteristics



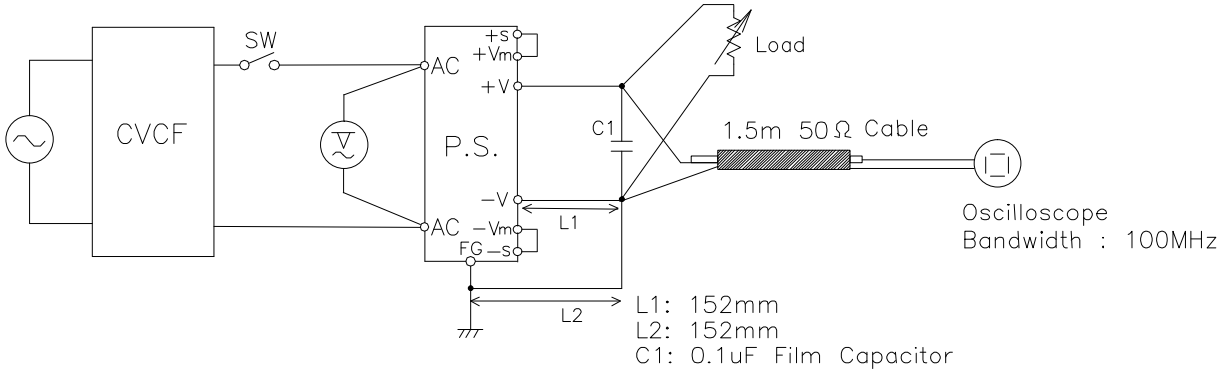
Range used−−−AC(For SIMPSON MODEL 229−2)

(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　Standby current

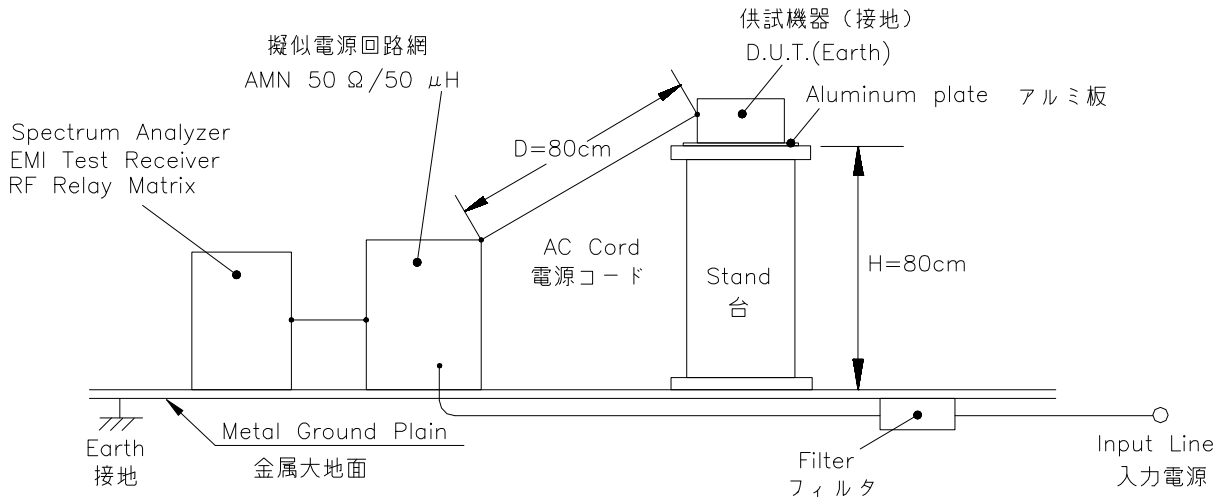
Same as Steady state data

(15) ＥＭＩ特性

Electro-Magnetic Interference characteristics

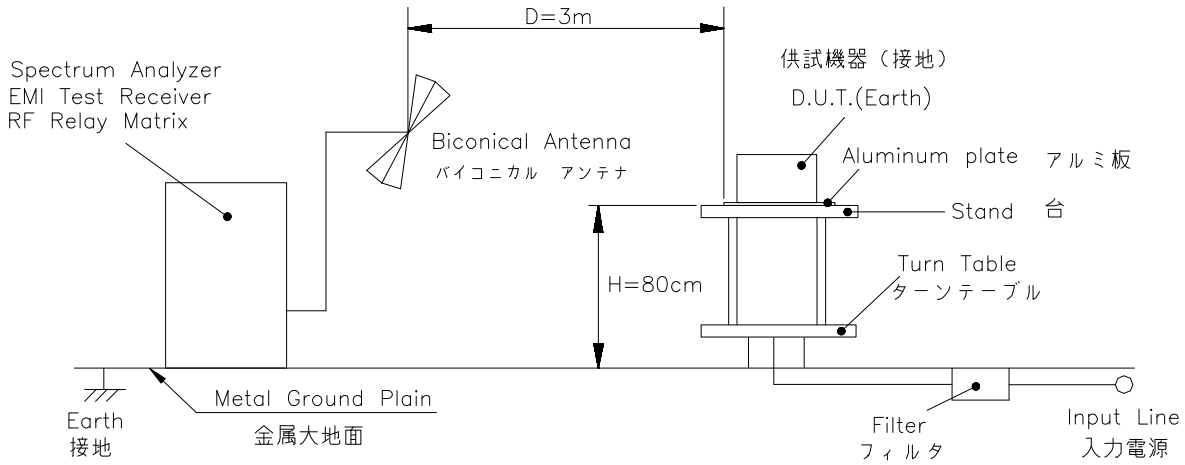
(a) 雑音端子電圧（帰還ノイズ）

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-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	SPL-2KPH-A
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℃

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	5.014V	5.014V	5.014V	5.014V	0mV	0.000%
50%	5.013V	5.014V	5.013V	5.013V	1mV	0.020%
100%	5.013V	5.013V	5.013V	5.013V	0mV	0.000%
load regulation	1mV	1mV	1mV	1mV		
	0.020%	0.020%	0.020%	0.020%		

2. Temperature drift　Conditions Vin=100VAC Iout=100%

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	5.010V	5.013V	5.013V	3mV	0.066%

12V

1. Regulation - line and load　Condition　Ta : 25℃

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	12.025V	12.025V	12.025V	12.025V	0mV	0.000%
50%	12.024V	12.025V	12.024V	12.025V	1mV	0.008%
100%	12.025V	12.025V	12.024V	12.025V	1mV	0.008%
load regulation	1mV	0mV	1mV	0mV		
	0.008%	0.000%	0.008%	0.000%		

2. Temperature drift　Conditions Vin=100VAC Iout=100%

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	12.019V	12.024V	12.031V	12mV	0.098%

24V

1. Regulation - line and load　Condition　Ta : 25℃

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	24.009V	24.010V	24.011V	24.011V	2mV	0.008%
50%	24.010V	24.011V	24.011V	24.011V	1mV	0.004%
100%	24.011V	24.012V	24.012V	24.012V	1mV	0.004%
load regulation	2mV	2mV	1mV	1mV		
	0.008%	0.008%	0.004%	0.004%		

2. Temperature drift　Conditions Vin=100VAC Iout=100%

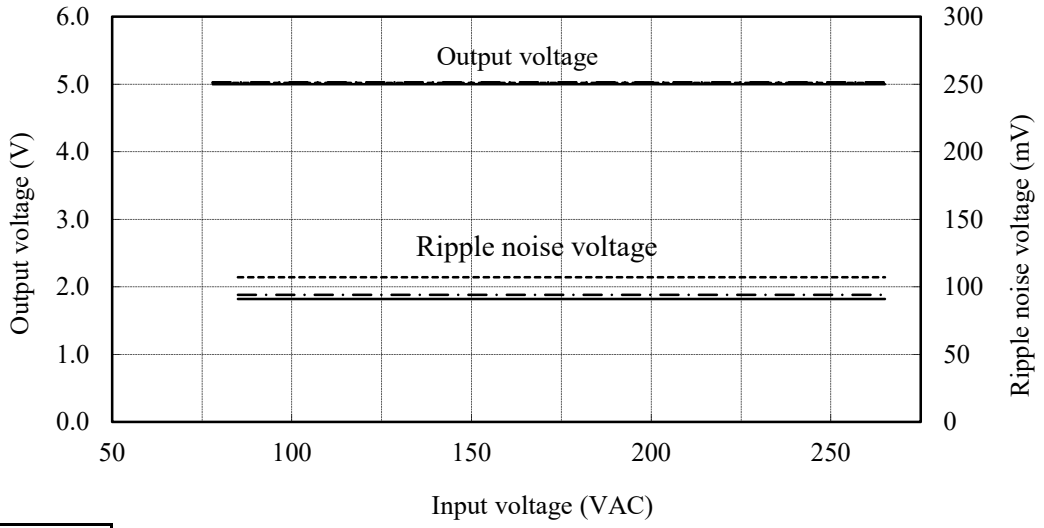
Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	23.980V	24.011V	24.030V	50mV	0.210%

(2) 出力電圧・リップルノイズ電圧対入力電圧

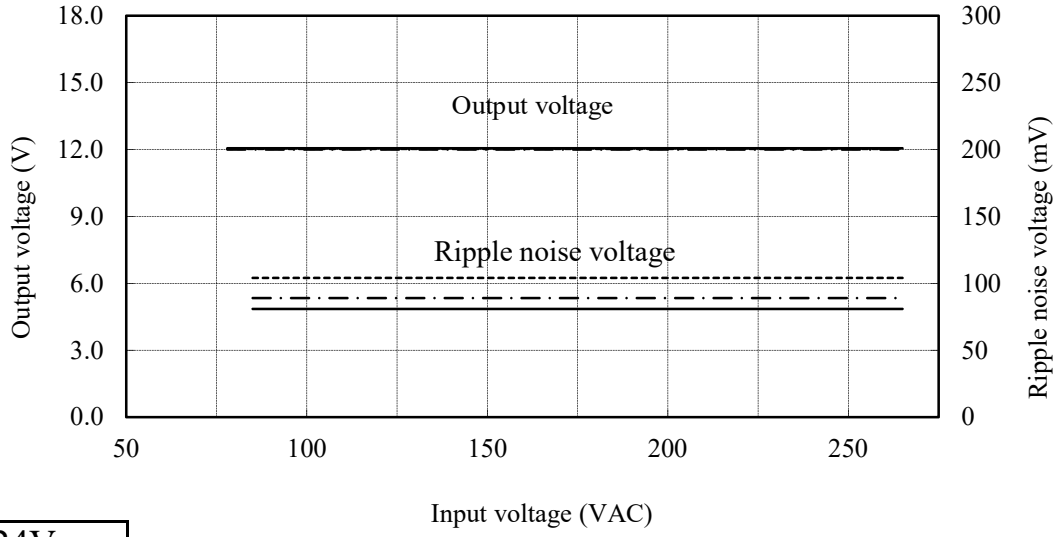
Output voltage and Ripple noise voltage vs. Input voltage

Conditions Iout : 100 %
Ta : -10 ℃ ------
25 ℃ -·-·-
50 ℃ ——

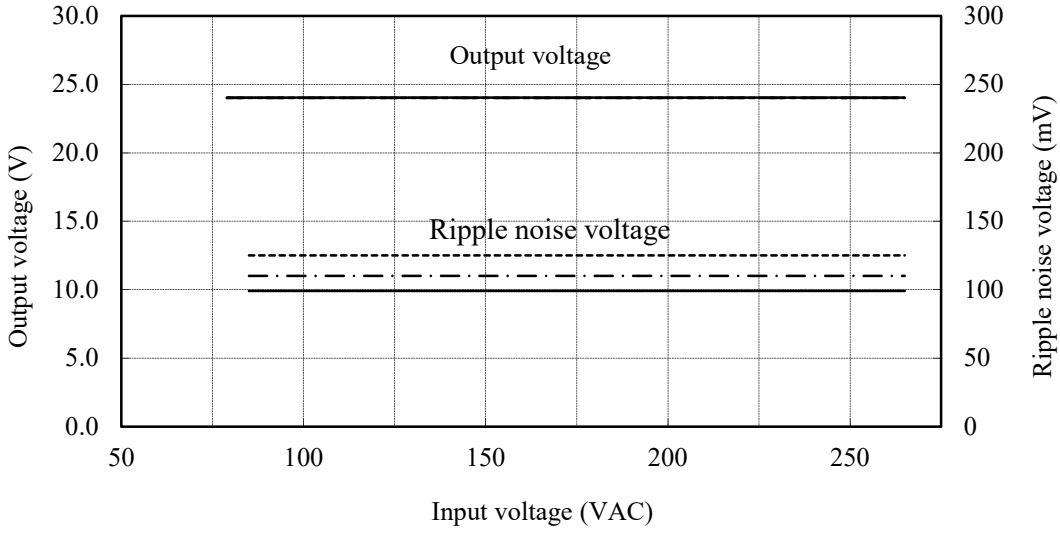
5V



12V



24V

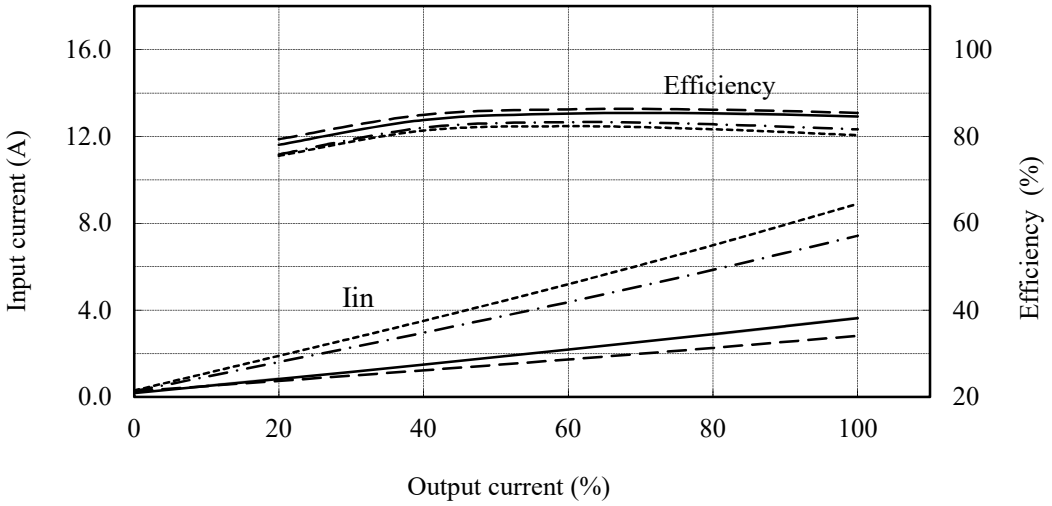


(3) 効率・入力電流対出力電流

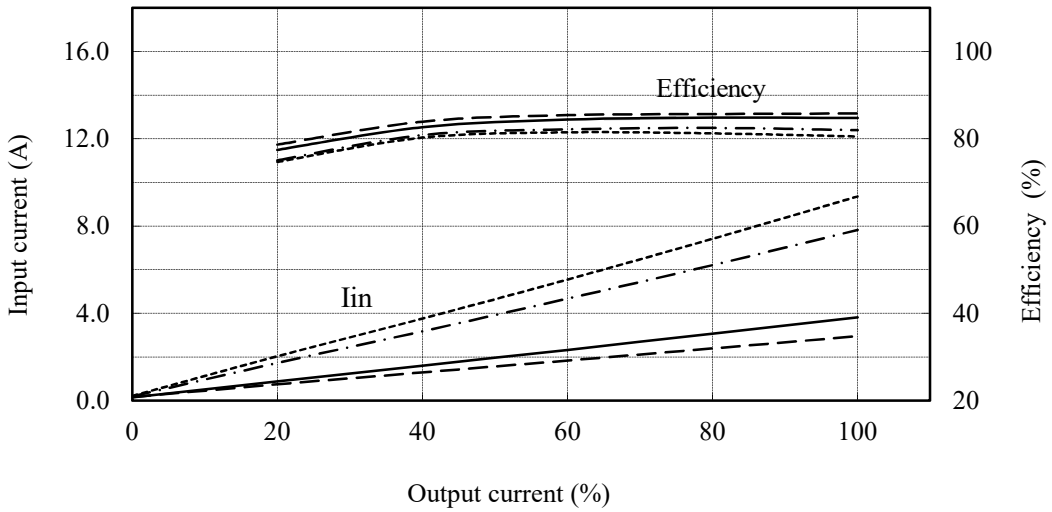
Efficiency and Input current vs. Output current

Conditions Vin : 85 VAC ------
: 100 VAC –·–·–
: 200 VAC ——
: 265 VAC – – – –
Ta : 25 ℃

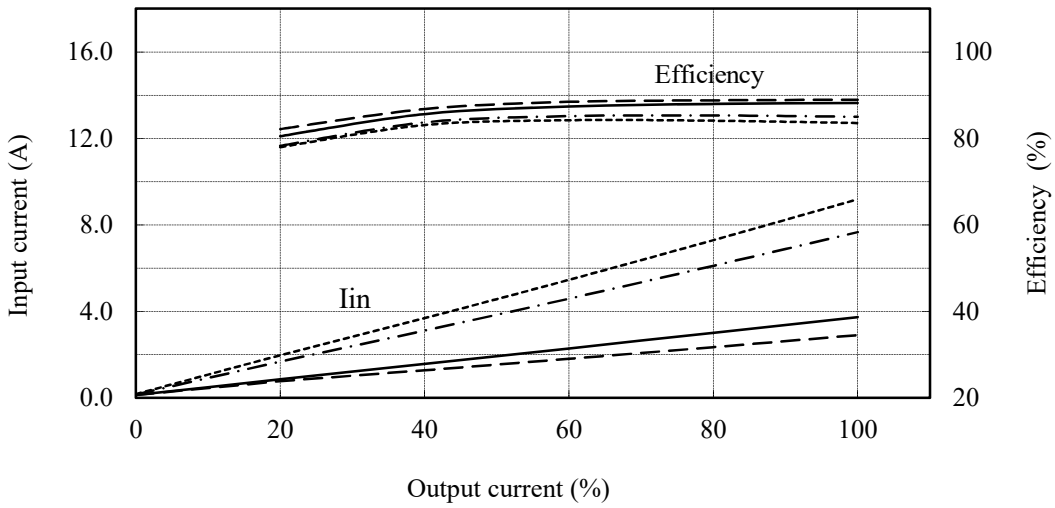
5V



12V



24V

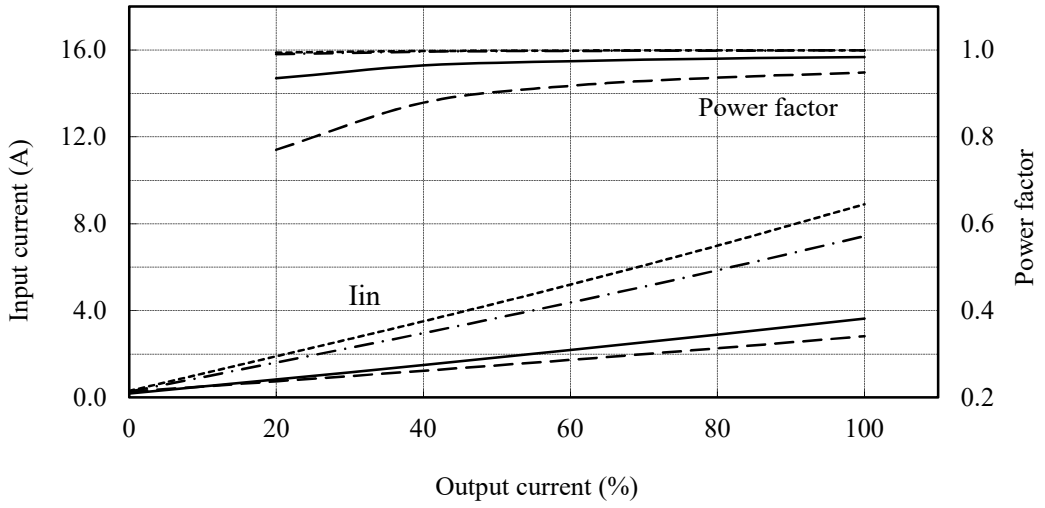


(4) 力率・入力電流対出力電流

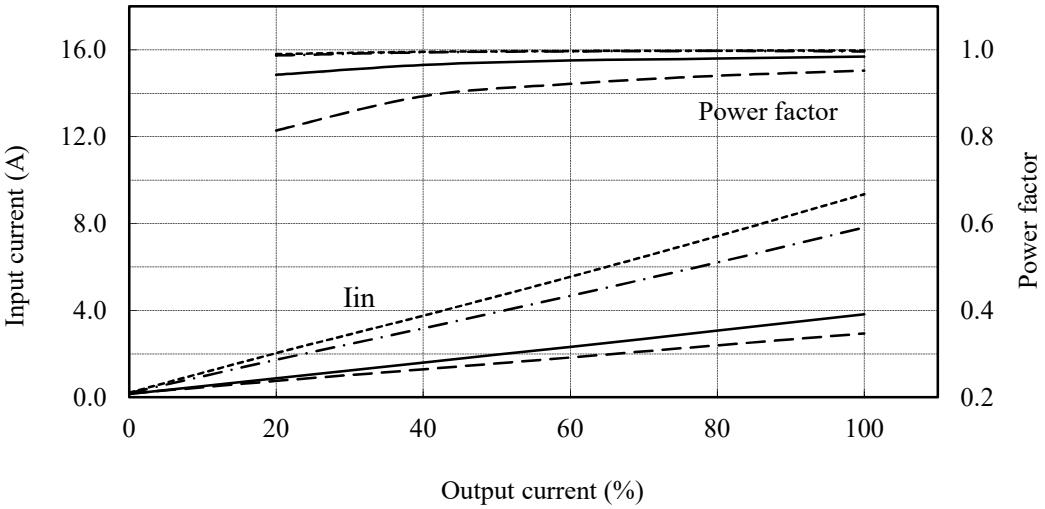
Power factor and Input current vs. Output current

Conditions Vin : 85 VAC ------
: 100 VAC –·–·–
: 200 VAC ——
: 265 VAC – – – –
Ta : 25 ℃

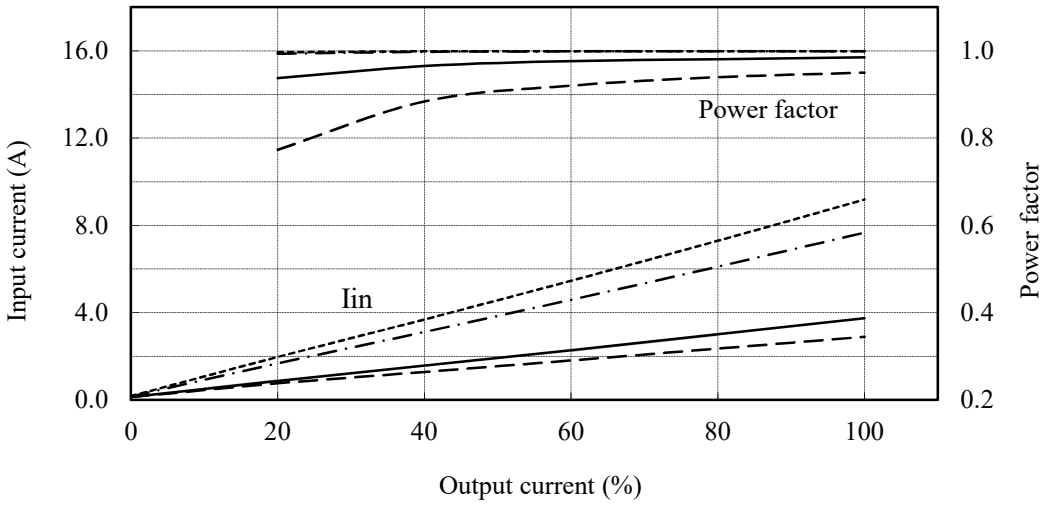
5V



12V



24V

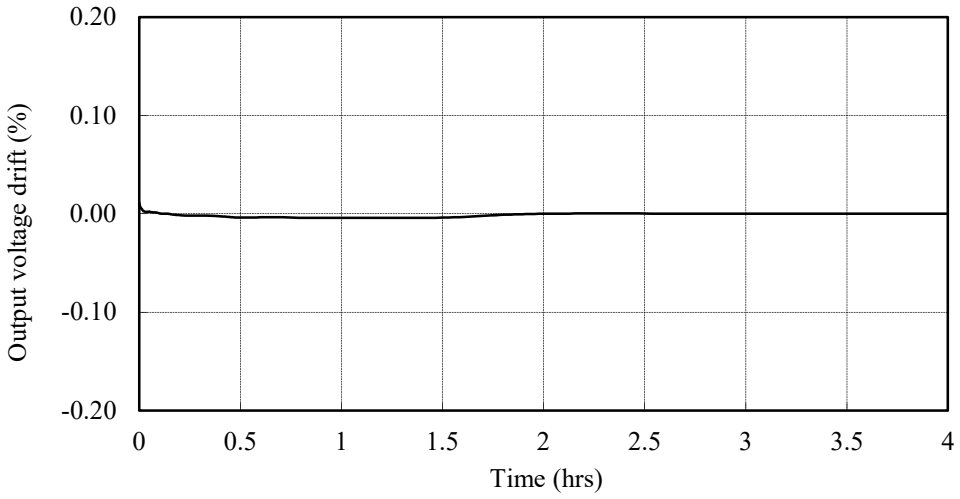


2.2 通電ドリフト特性

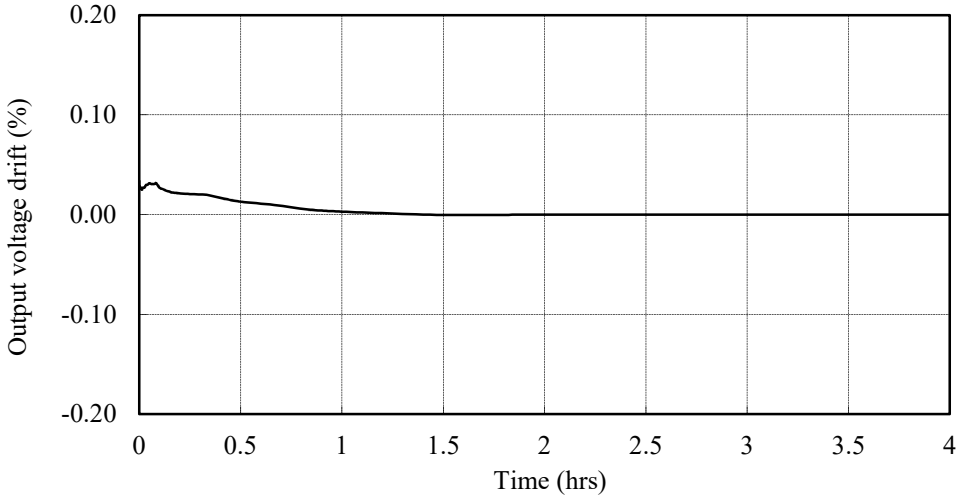
Warm up voltage drift characteristics

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

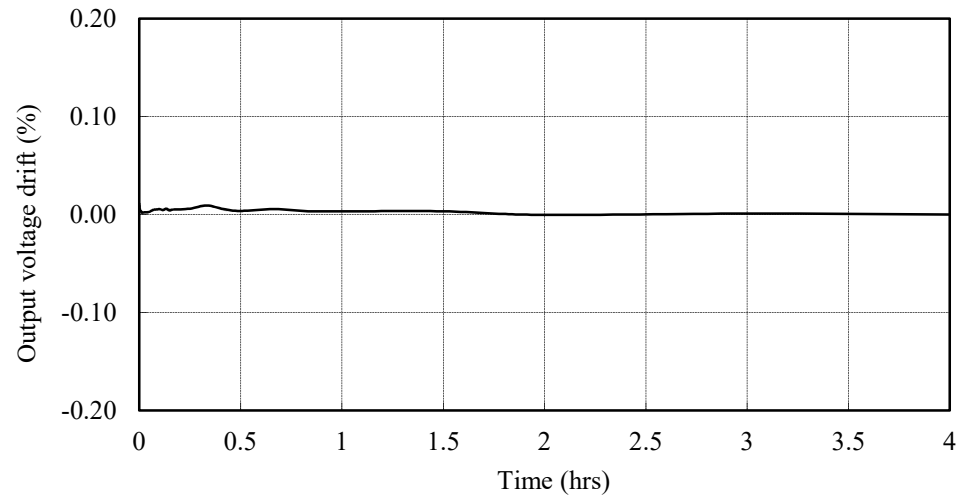
5V



12V



24V

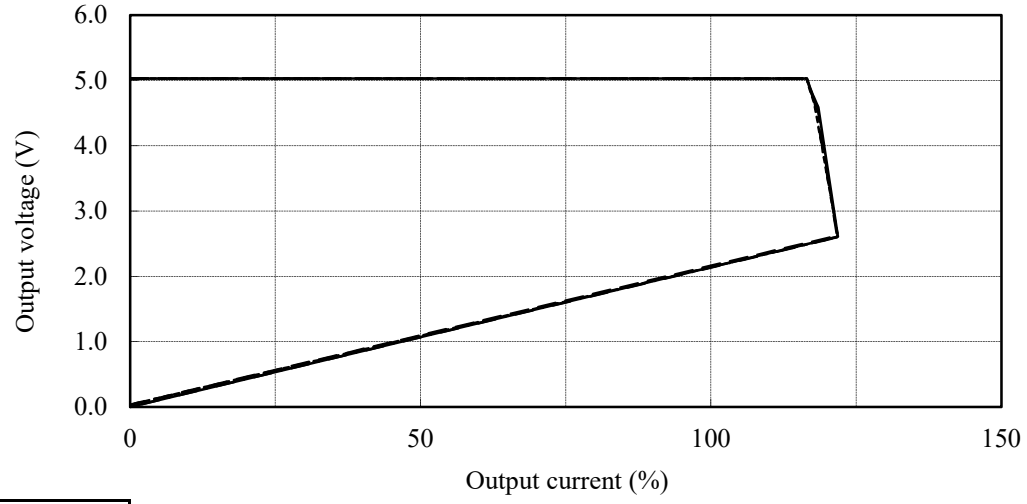


2.3 過電流保護特性

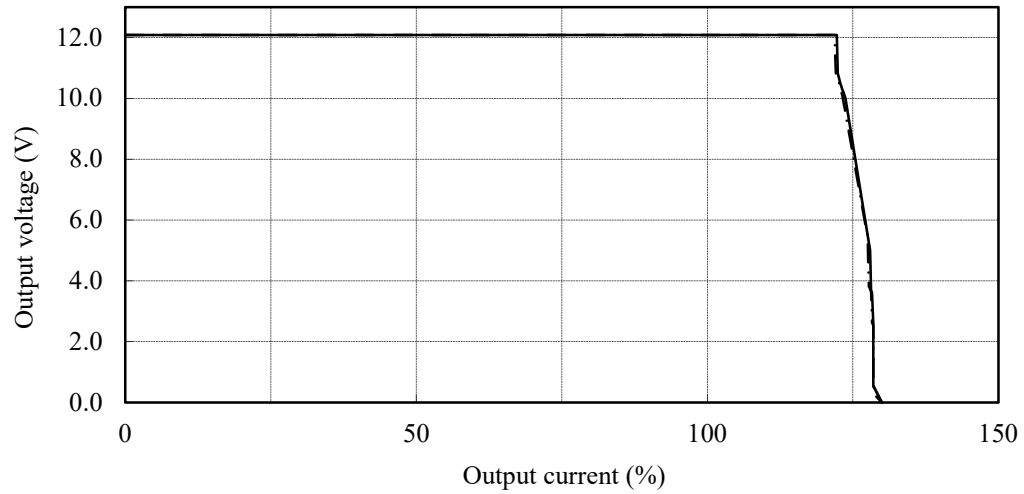
Over current protection (OCP) characteristics

Conditions Vin : 85 VAC --------
100 VAC -·-·-·-
200 VAC ——
265 VAC – – – –
Ta : 25 ℃

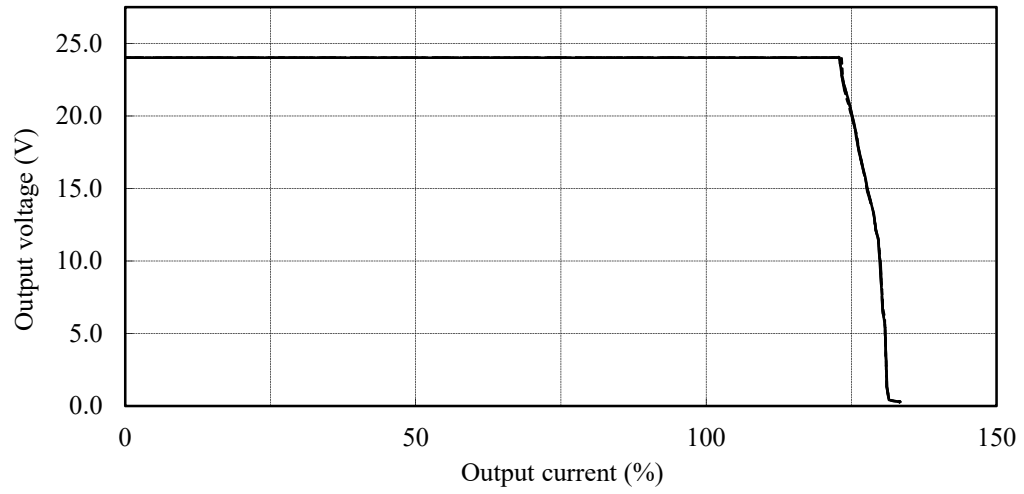
5V



12V



24V

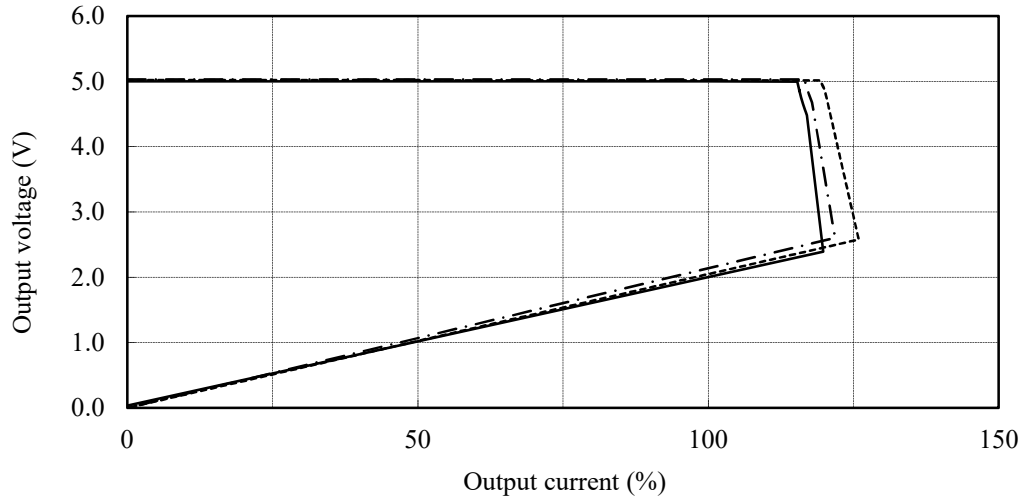


2.3 過電流保護特性

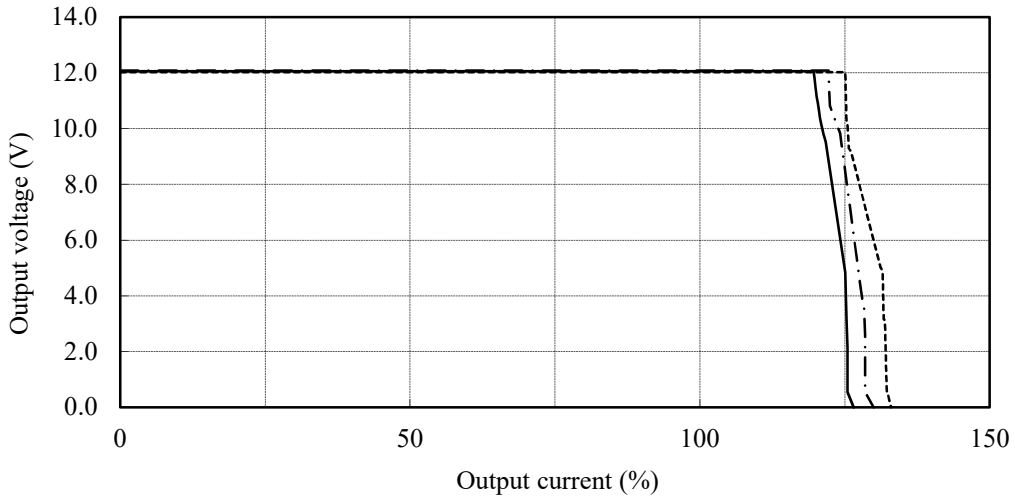
Over current protection (OCP) characteristics

Conditions Vin : 100 VAC
Ta : -10 ℃ ------
25 ℃ –·–·–
50 ℃ ——

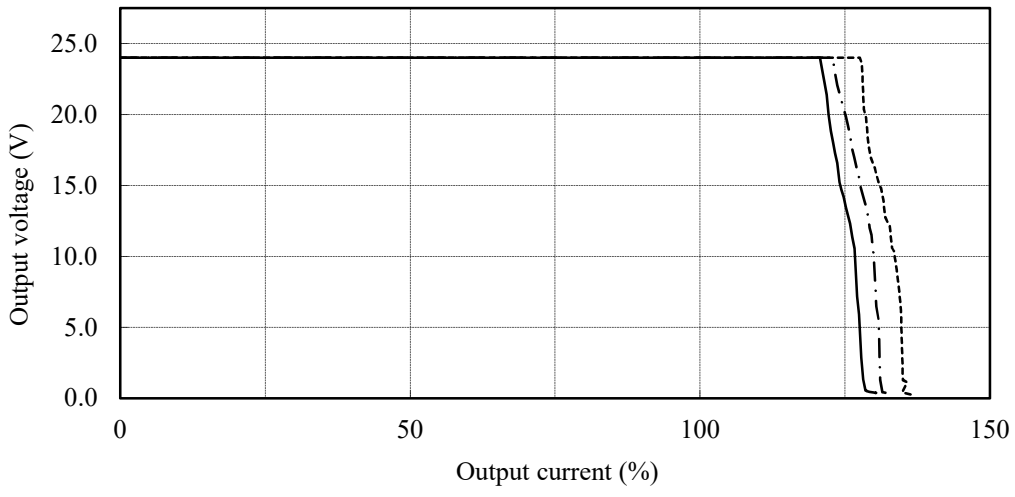
5V



12V



24V

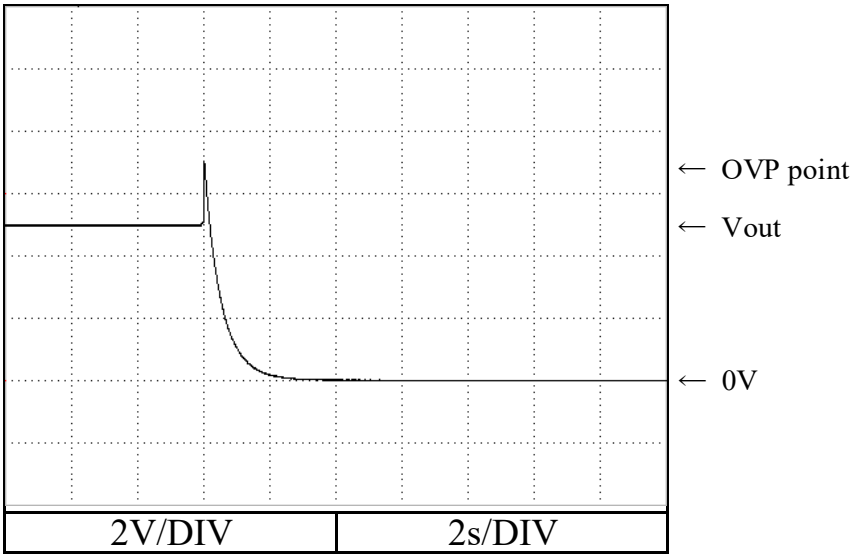


2.4 過電圧保護特性

Over voltage protection (OVP) characteristics

Conditions Vin : 100 VAC
Iout : 0 %
Ta : 25 ℃

5V



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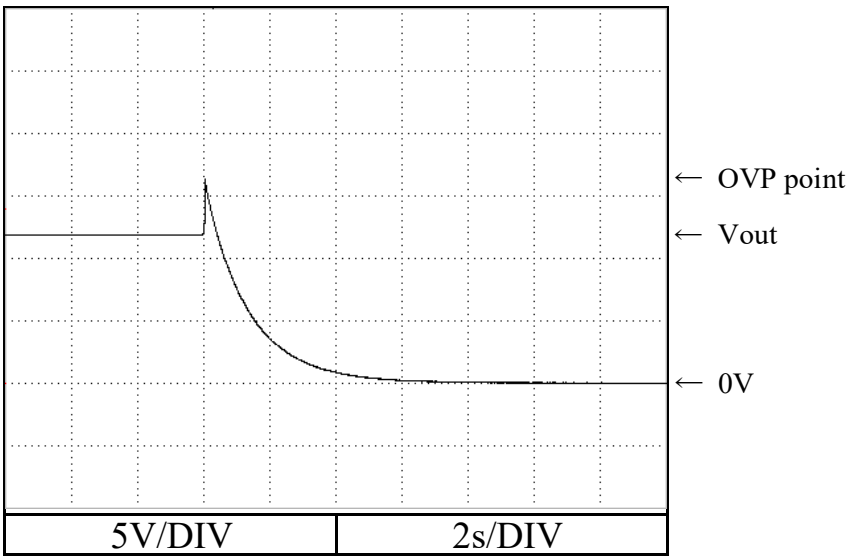
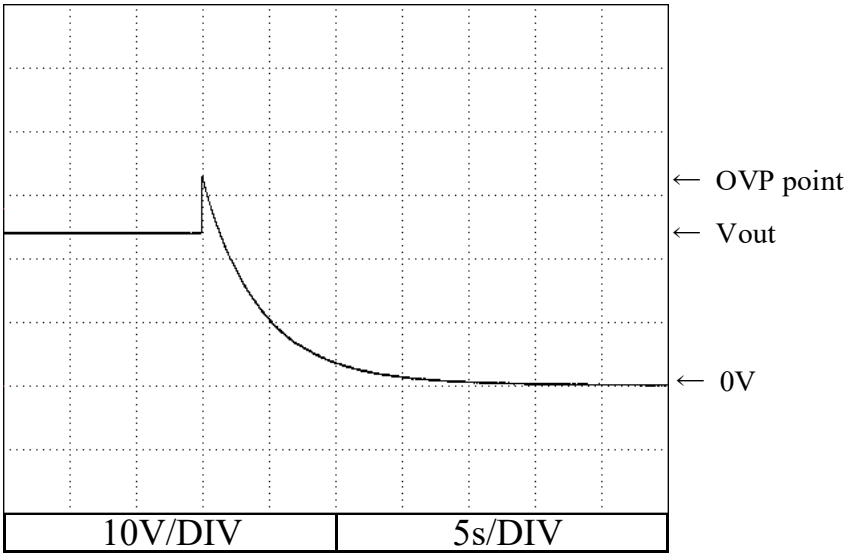


24V

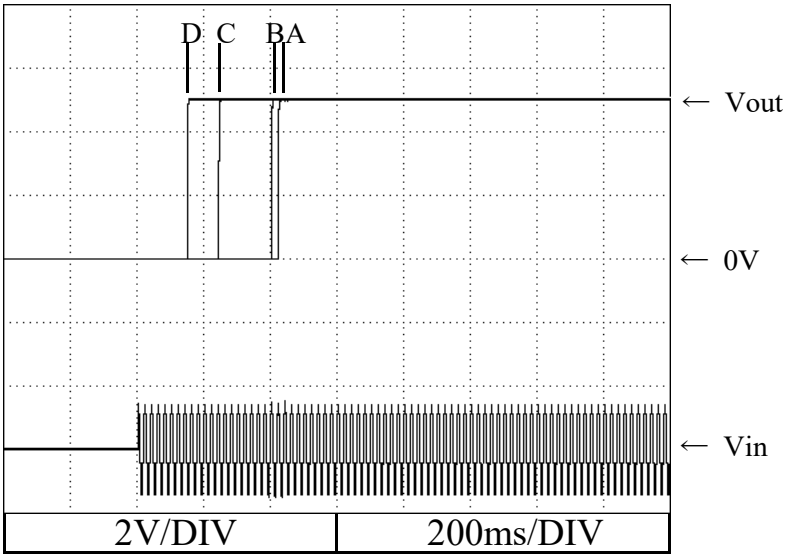


2.5 出力立ち上がり特性

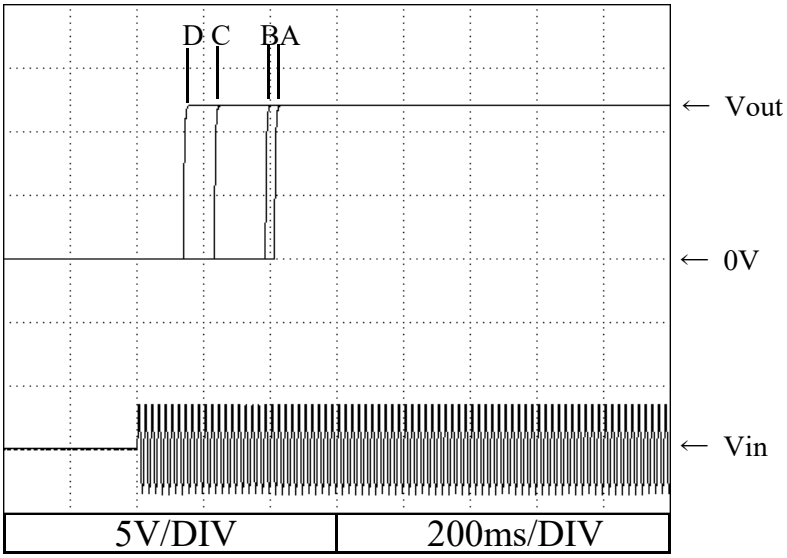
Output rise characteristics

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

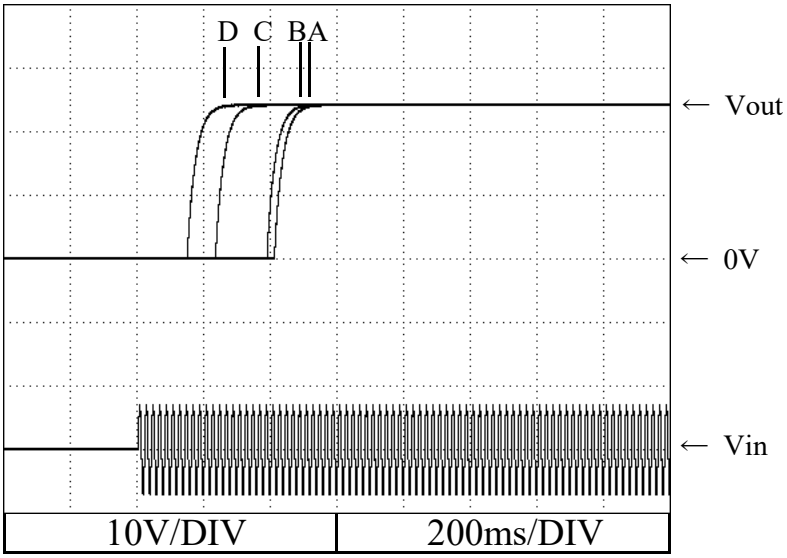
5V



12V



24V

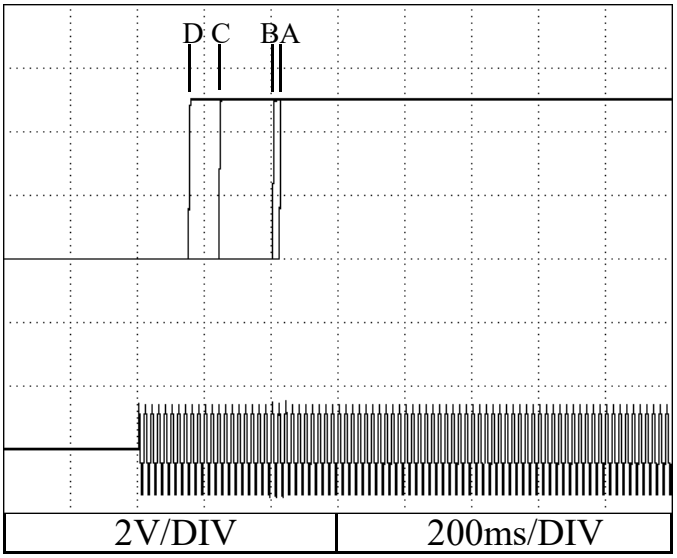


2.5 出力立ち上がり特性

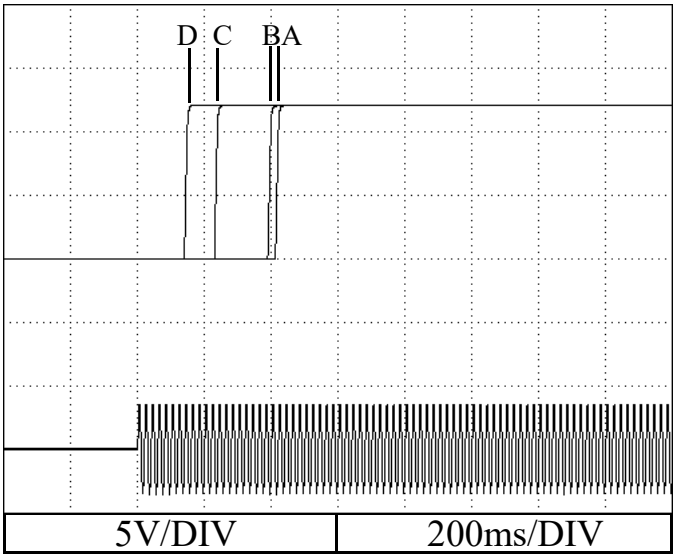
Output rise characteristics

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

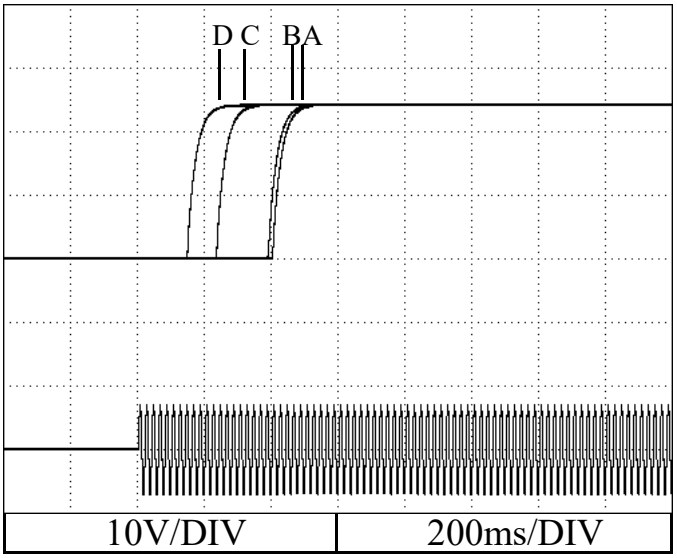
5V



12V



24V

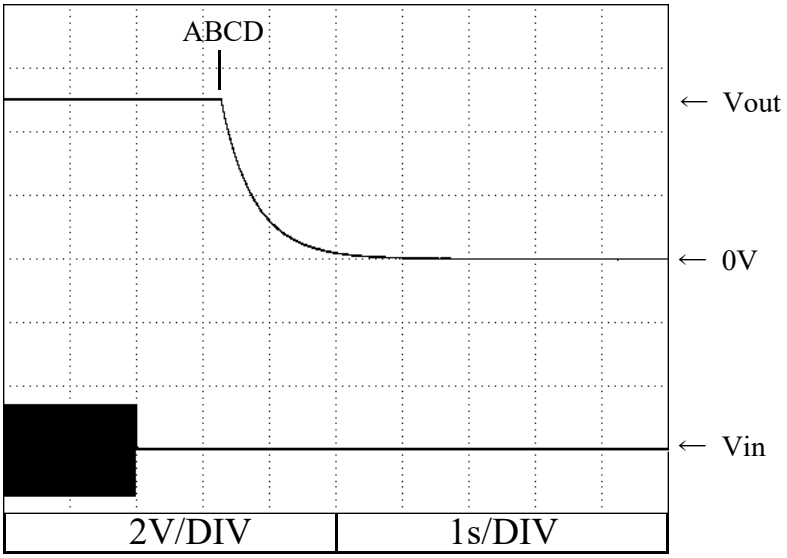


2.6 出力立ち下がり特性

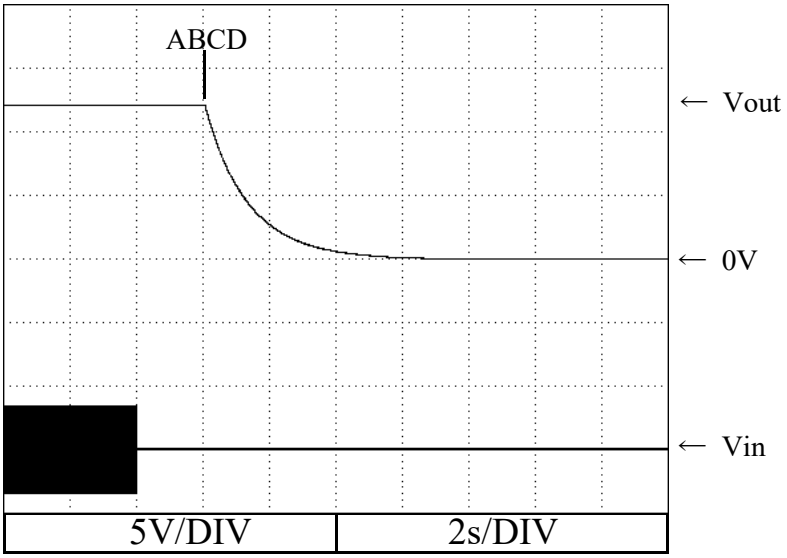
Output fall characteristics

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

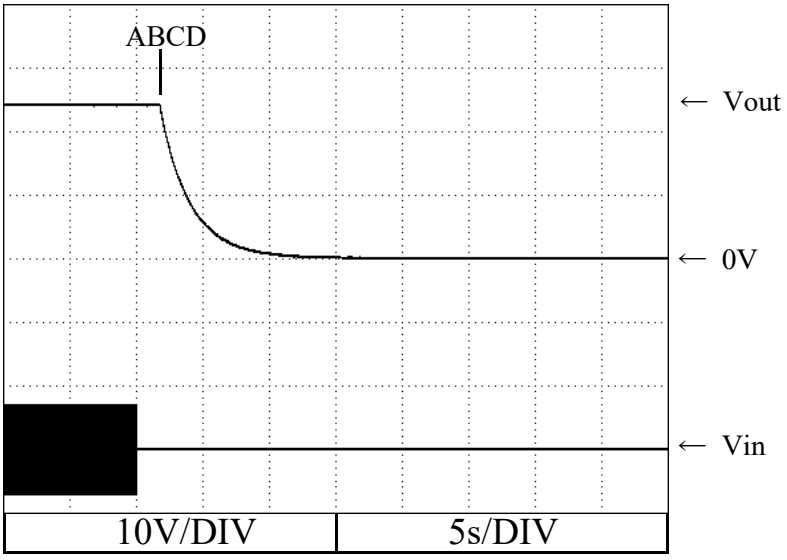
5V



12V



24V

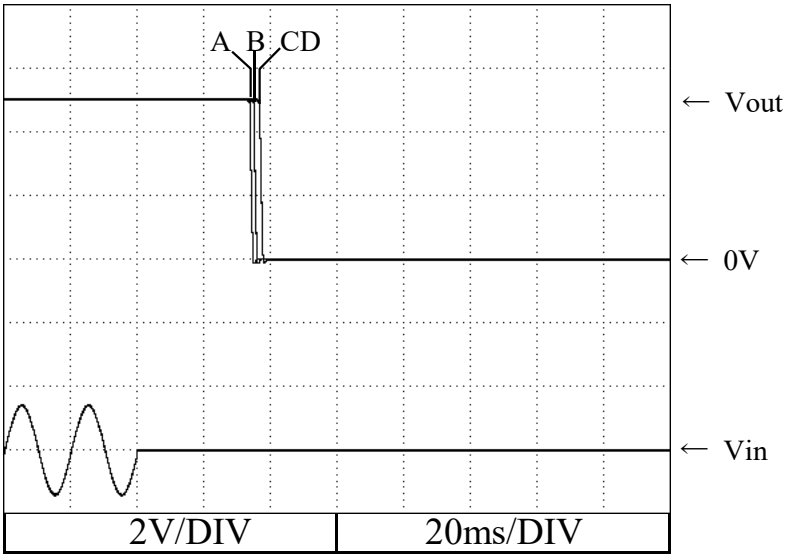


2.6 出力立ち下がり特性

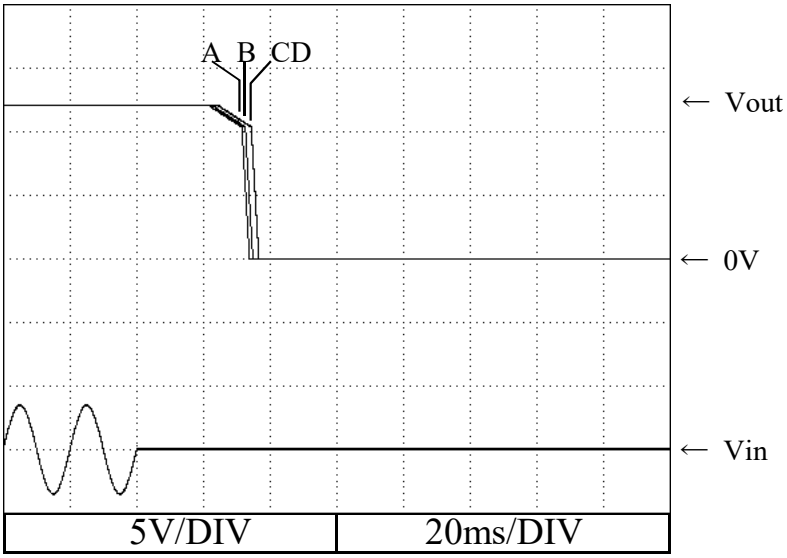
Output fall characteristics

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

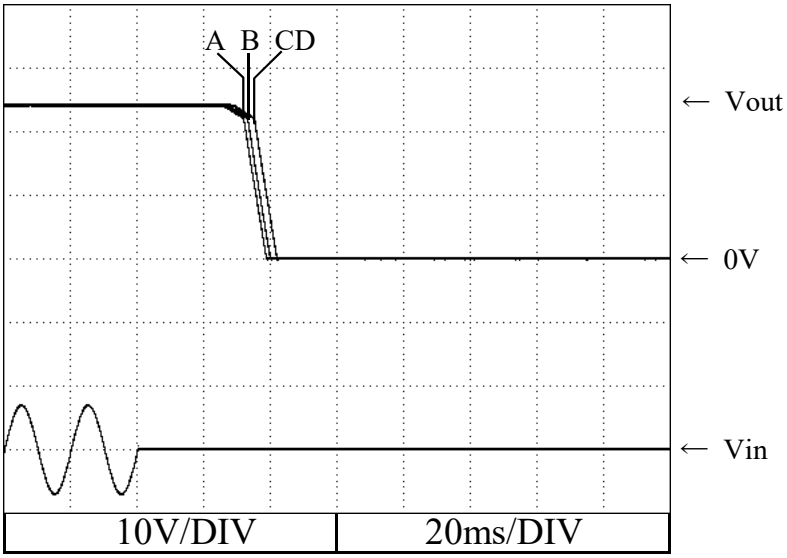
5V



12V



24V

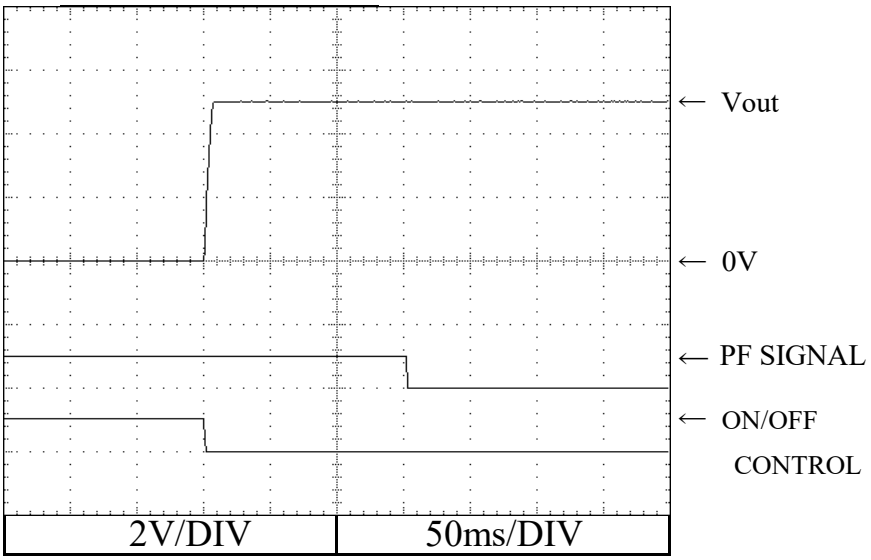


2.7　ＯＮ／ＯＦＦコントロール時出力立ち上がり特性

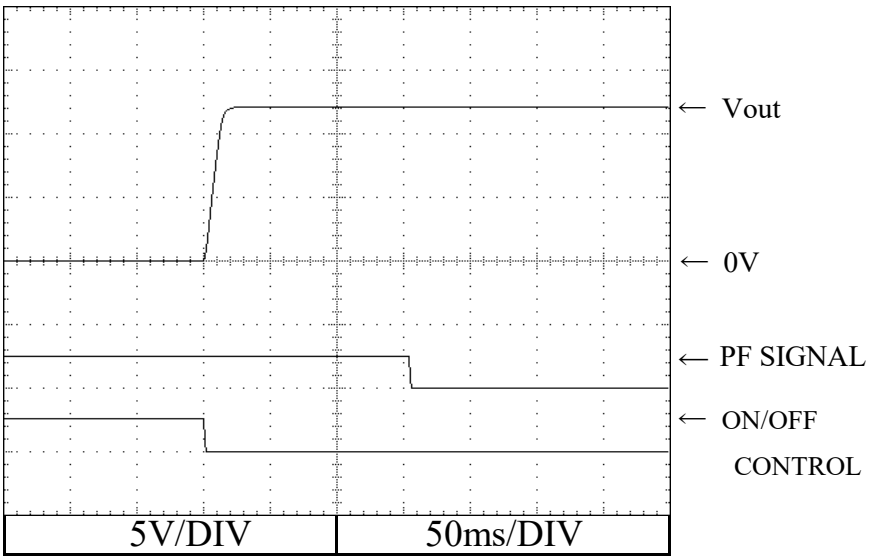
Output rise characteristics with ON/OFF CONTROL

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

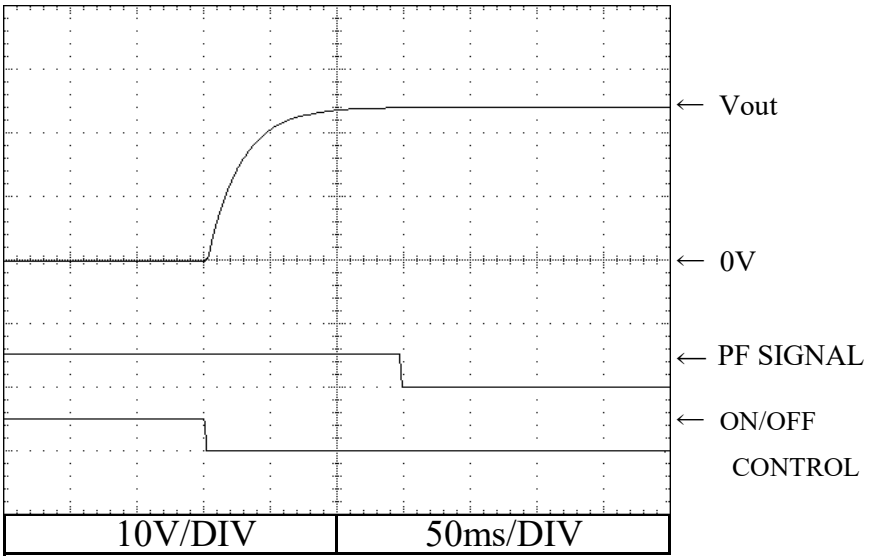
5V



12V



24V

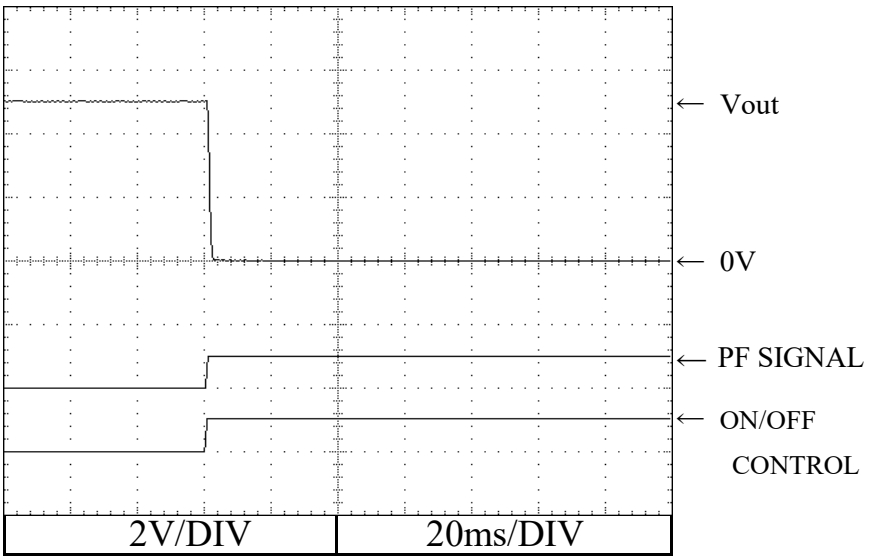


2.8　ＯＮ／ＯＦＦコントロール時出力立ち下がり特性

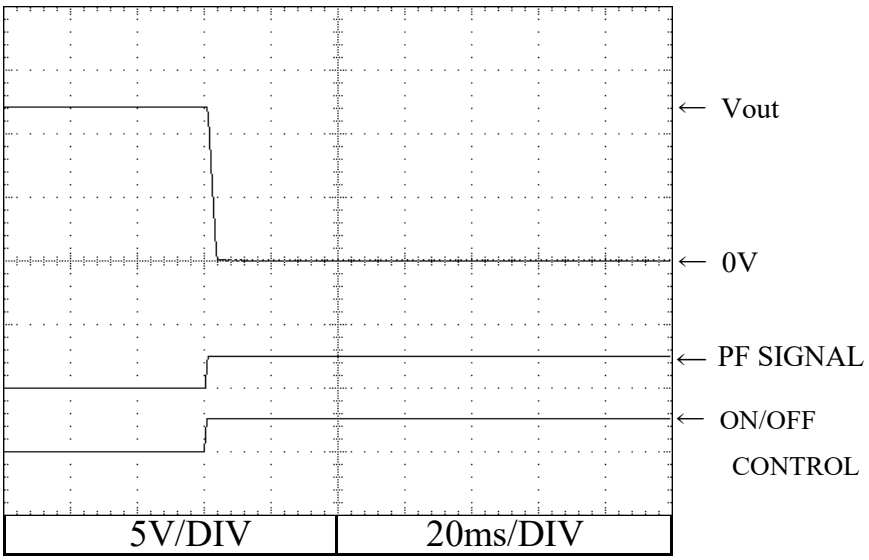
Output fall characteristics with ON/OFF CONTROL

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

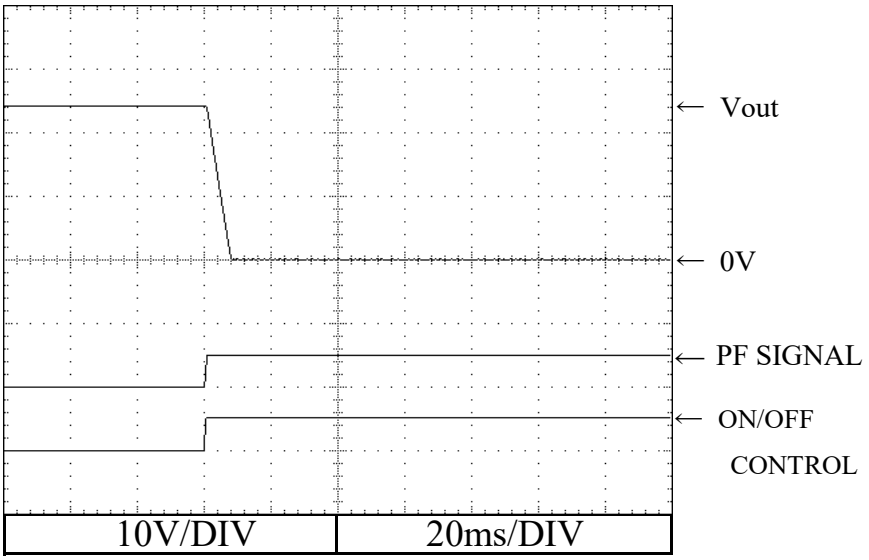
5V



12V



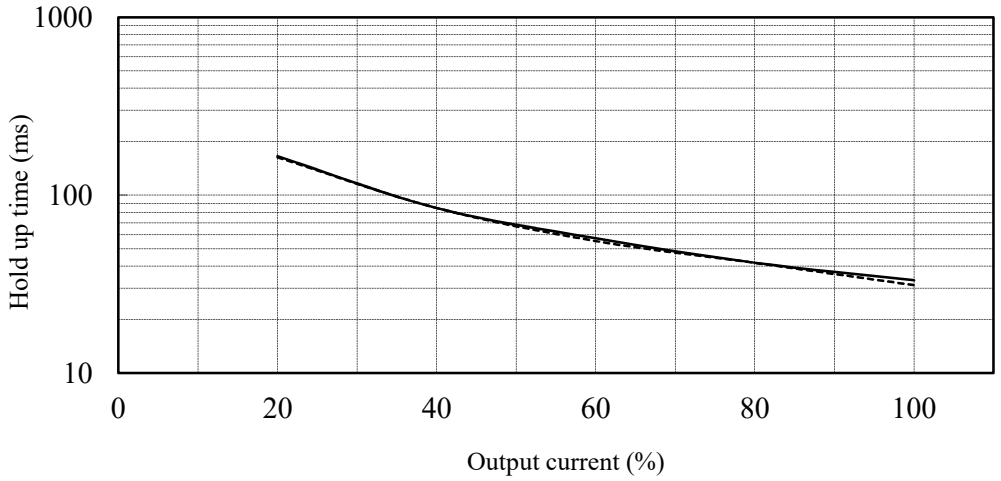
24V



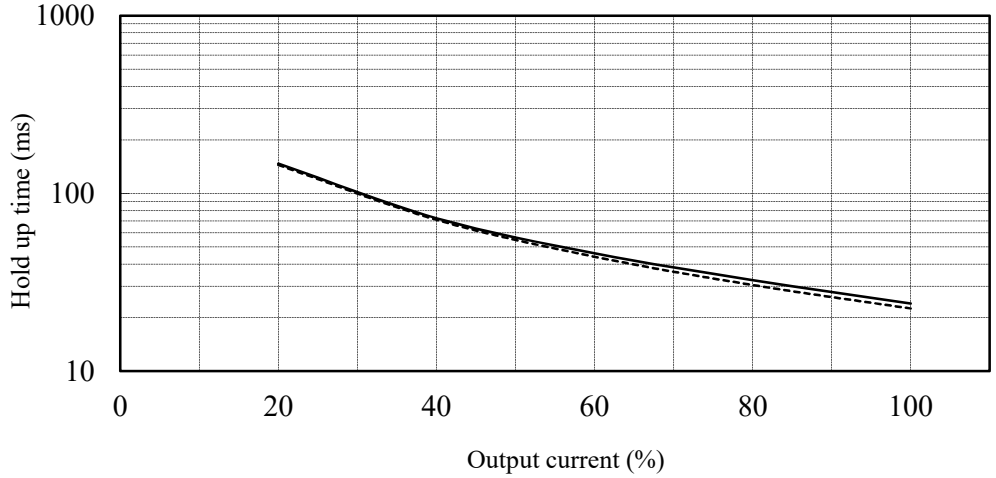
2.9 出力保持時間特性
Hold up time characteristics

Conditions Vin : 100 VAC ------
200 VAC ——
Ta : 25 ℃

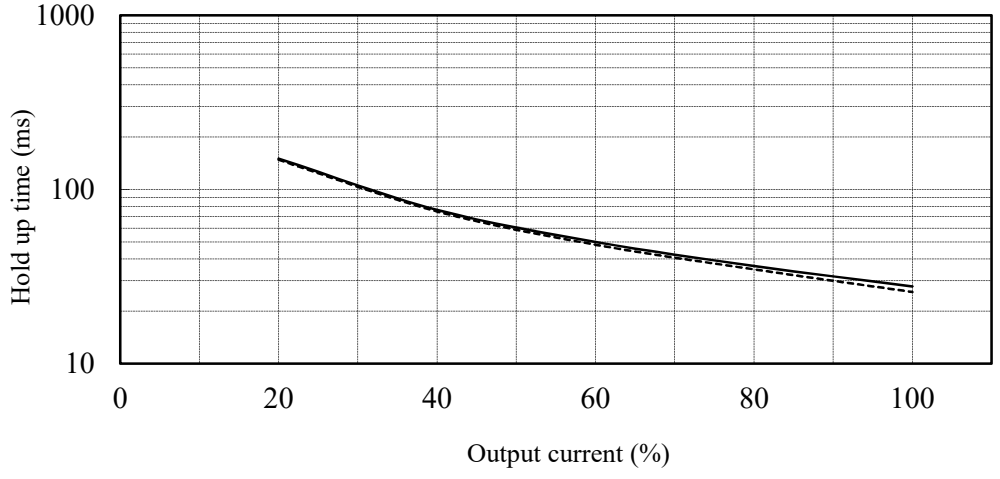
5V



12V



24V

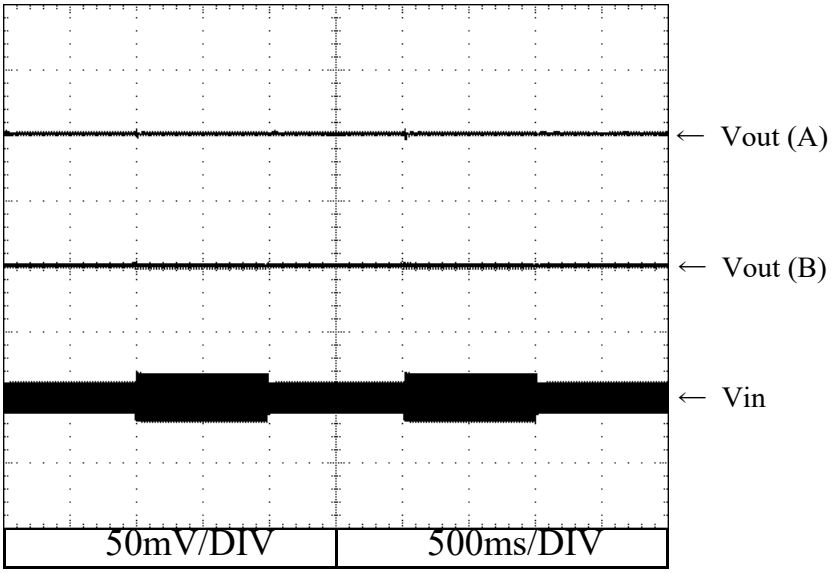


2.10 過渡応答（入力急変）特性

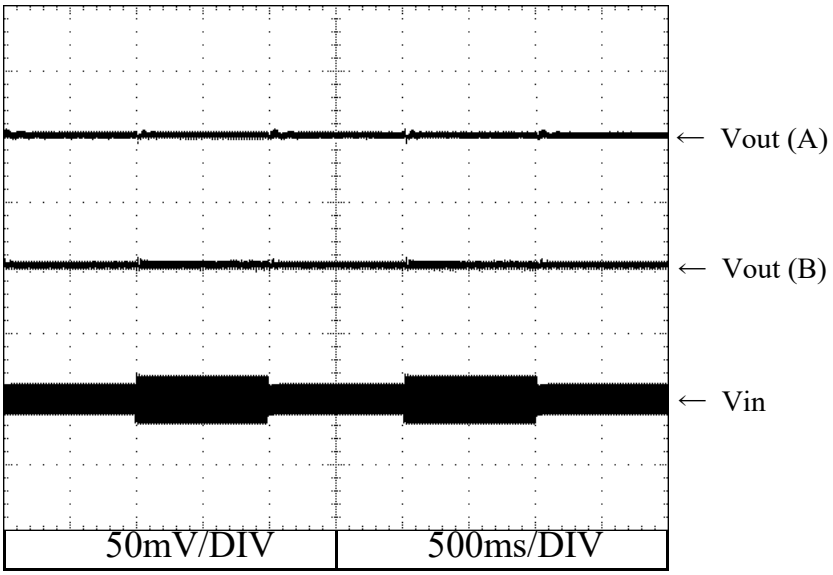
Dynamic line response characteristics

Conditions Vin : 85 VAC←→132VAC (A)
170 VAC←→265VAC (B)
Iout : 100 %
Ta : 25 ℃

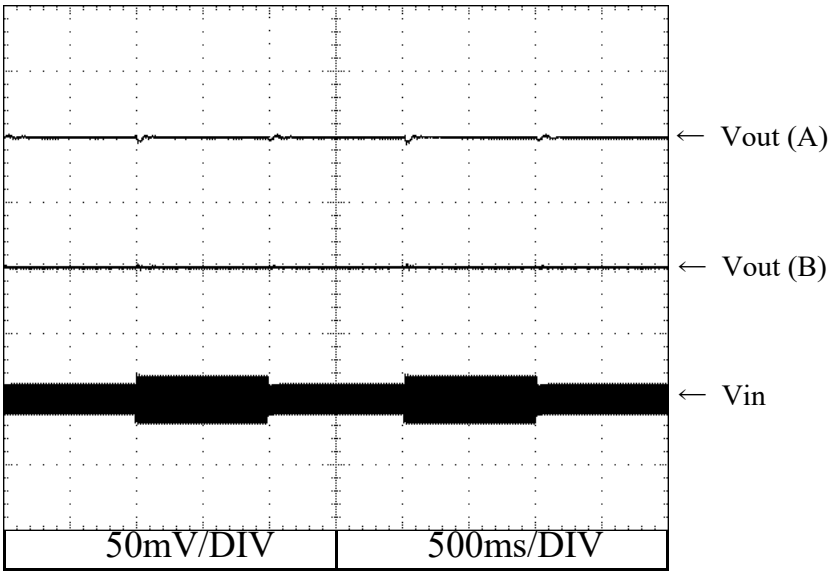
5V



12V



24V



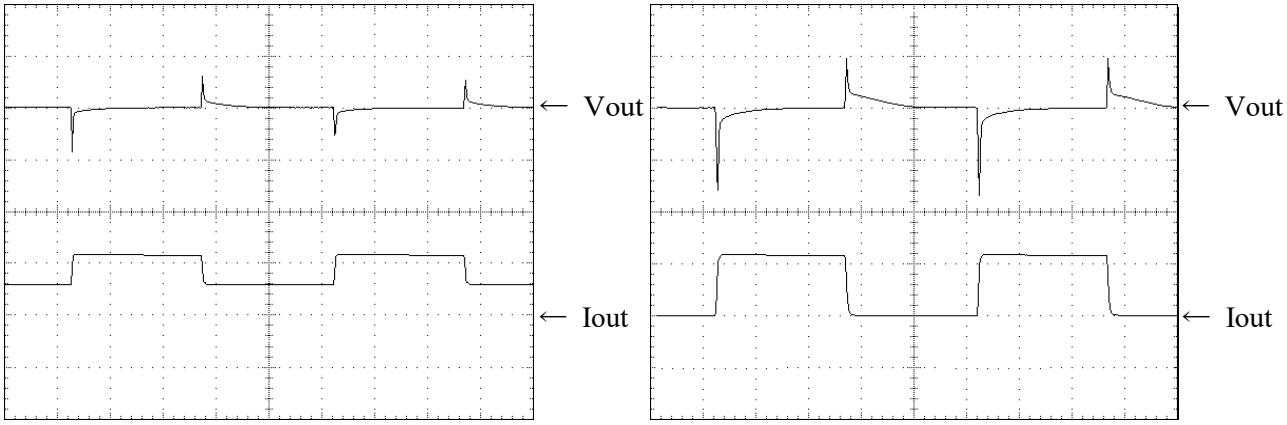
2.11 過渡応答（負荷急変）特性

Dynamic load response characteristics

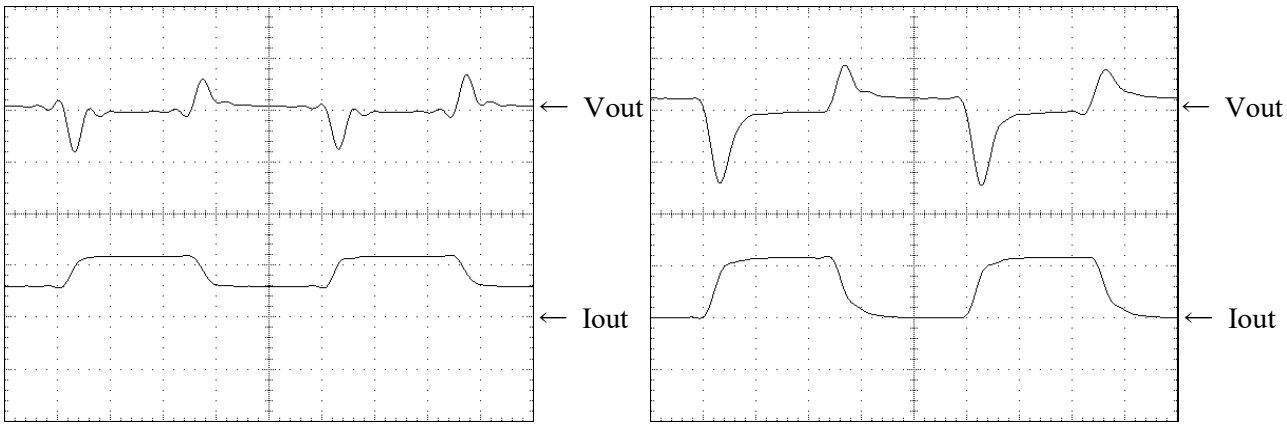
Conditions Vin : 100 VAC
Ta : 25 ℃

5V

f=100Hz

Load current tr = tf = 50us Iout 50% ⟷ 100%		Load current tr = tf = 50us Iout 0% ⟷ 100%	
			
200mV/DIV	2ms/DIV	200mV/DIV	2ms/DIV
+3.40%	3.90%	+5.10%	-8.10%

f=1kHz

Load current tr = tf = 50us Iout 50% ⟷ 100%		Load current tr = tf = 50us Iout 0% ⟷ 100%	
			
200mV/DIV	200 μ s/DIV	200mV/DIV	200 μ s/DIV
+3.70%	-3.80%	+5.00%	-7.30%

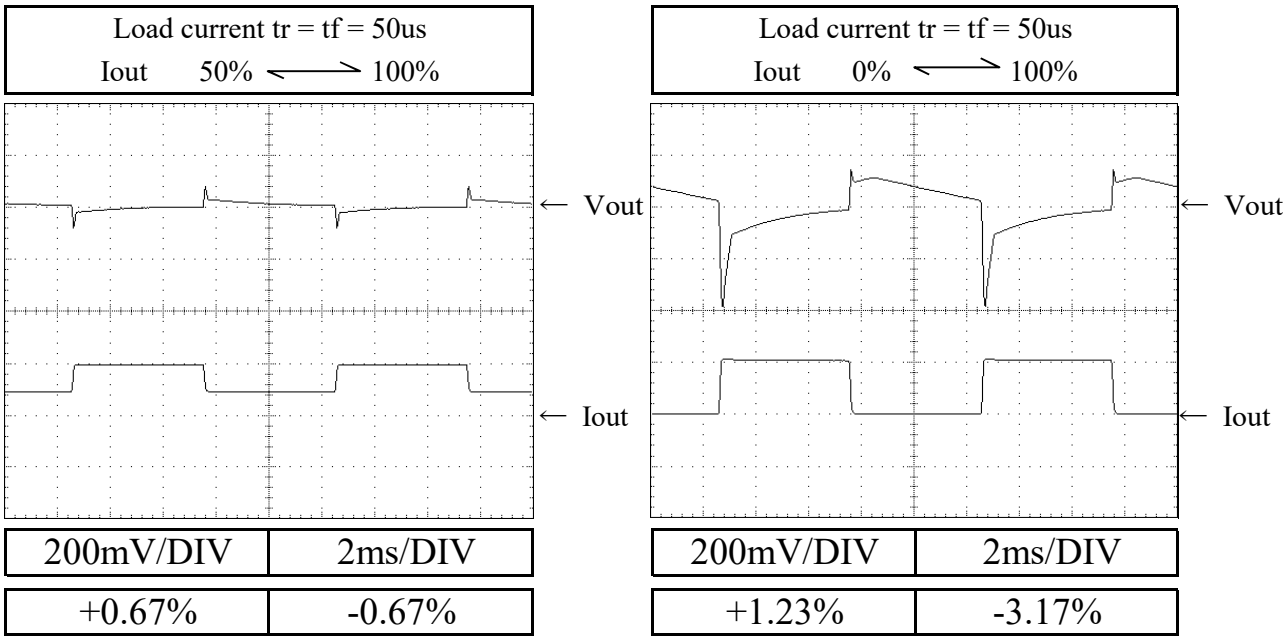
2.11 過渡応答（負荷急変）特性

Dynamic load response characteristics

Conditions Vin : 100 VAC
Ta : 25 ℃

12V

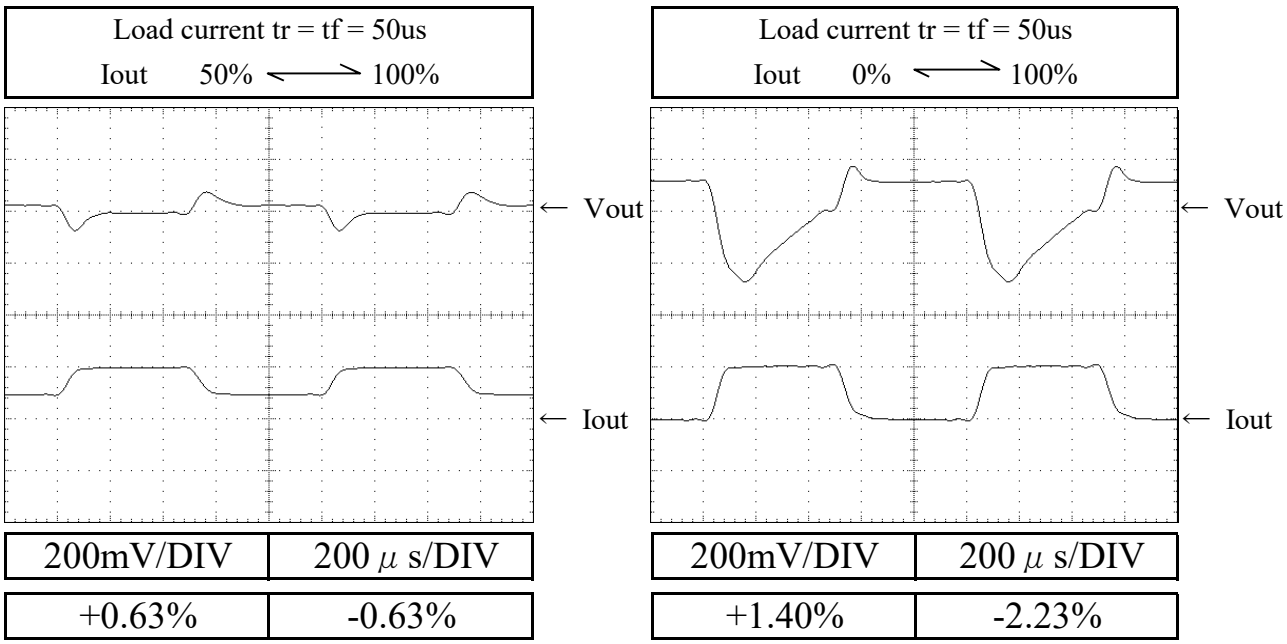
f=100Hz



200mV/DIV	2ms/DIV
+0.67%	-0.67%

200mV/DIV	2ms/DIV
+1.23%	-3.17%

f=1kHz



200mV/DIV	200 μ s/DIV
+0.63%	-0.63%

200mV/DIV	200 μ s/DIV
+1.40%	-2.23%

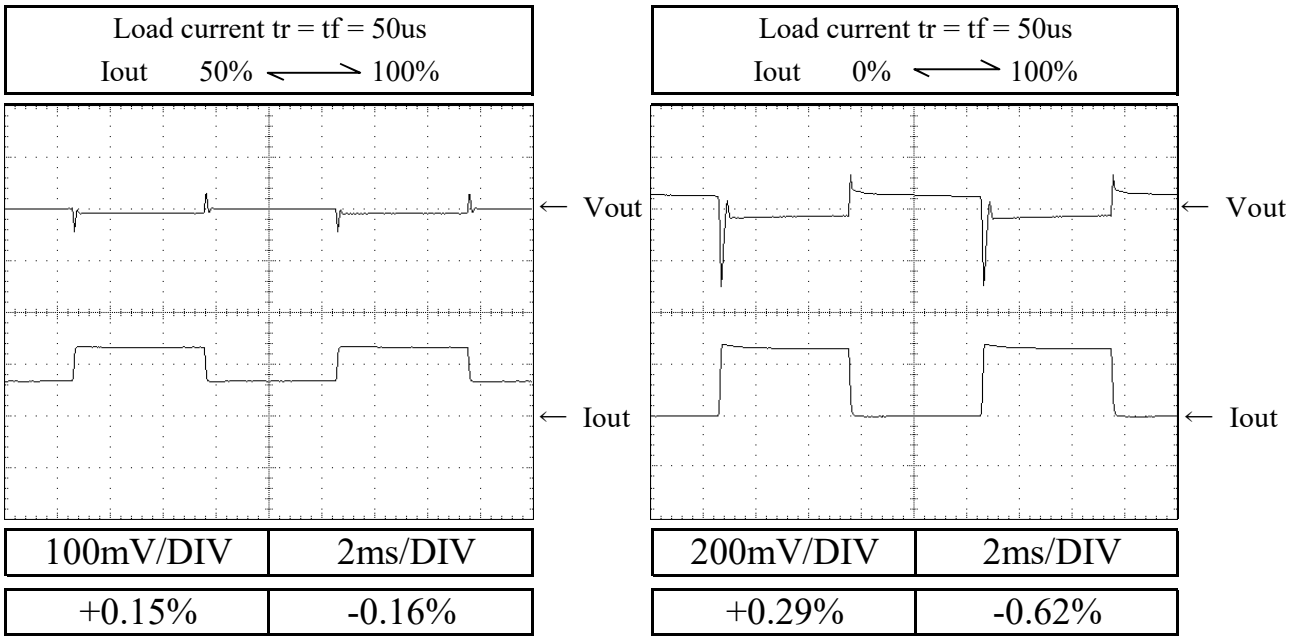
2.11 過渡応答（負荷急変）特性

Dynamic load response characteristics

Conditions Vin : 100 VAC
Ta : 25 ℃

24V

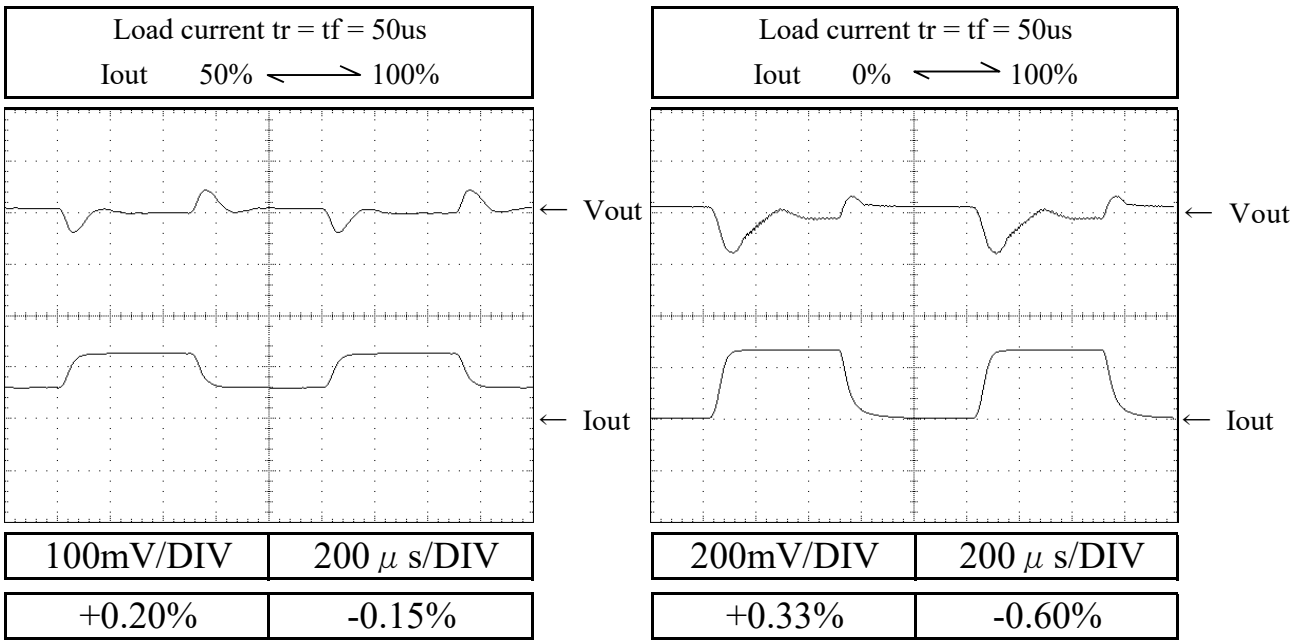
f=100Hz



100mV/DIV	2ms/DIV
+0.15%	-0.16%

200mV/DIV	2ms/DIV
+0.29%	-0.62%

f=1kHz



100mV/DIV	200 μ s/DIV
+0.20%	-0.15%

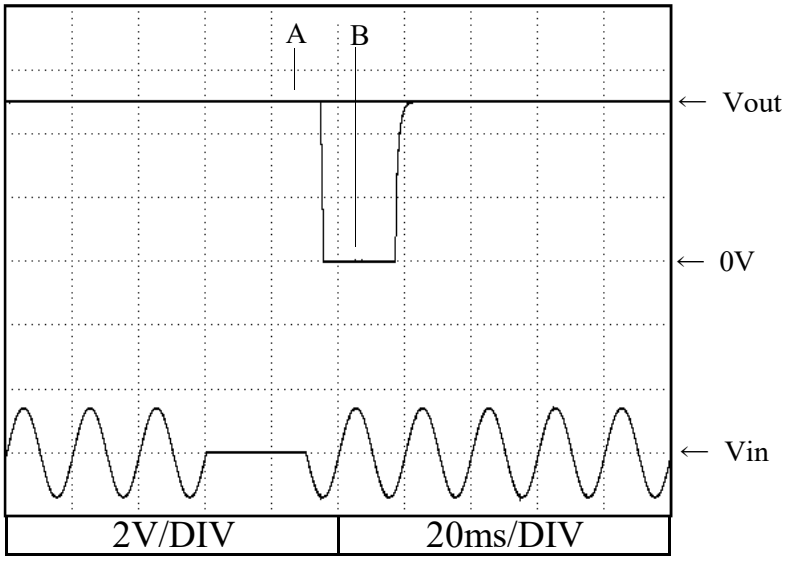
200mV/DIV	200 μ s/DIV
+0.33%	-0.60%

2.12 入力電圧瞬停特性

Response to brown out characteristics

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

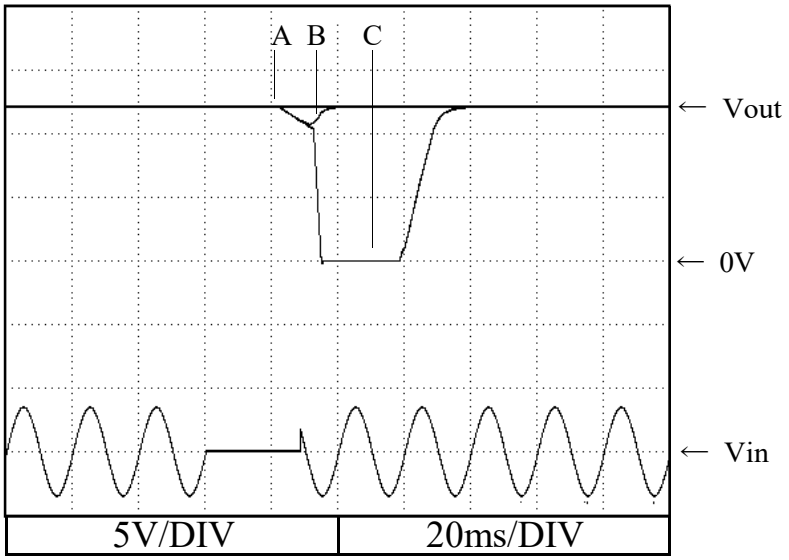
5V



A = 28ms

B = 29ms

12V

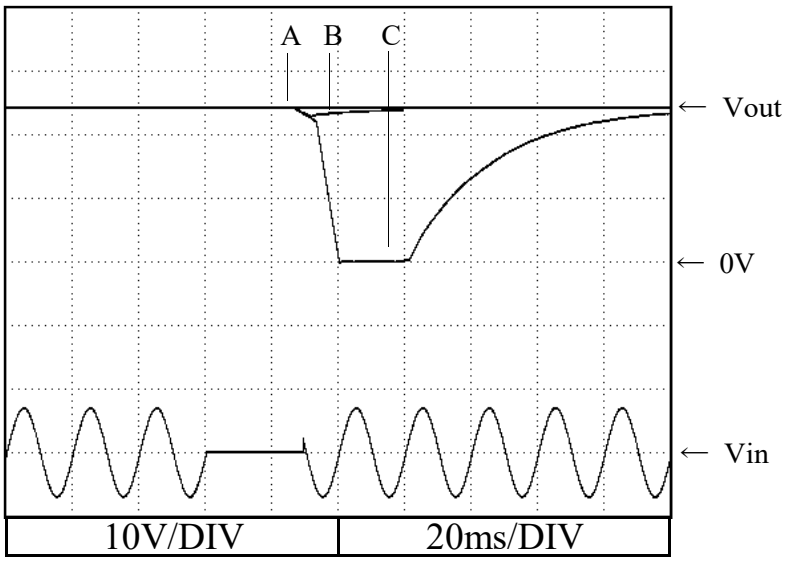


A = 23ms

B = 28ms

C = 29ms

24V



A = 25ms

B = 28ms

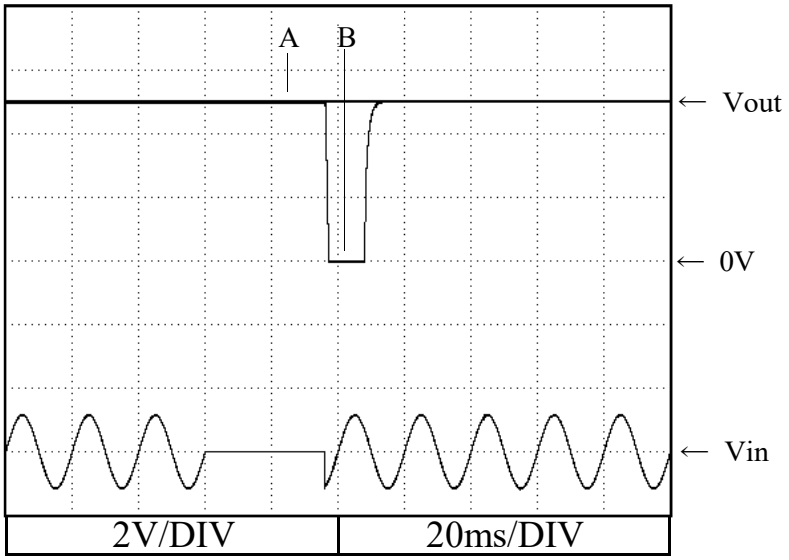
C = 29ms

2.12 入力電圧瞬停特性

Response to brown out characteristics

Conditions Vin : 200 VAC
Iout : 100 %
Ta : 25 ℃

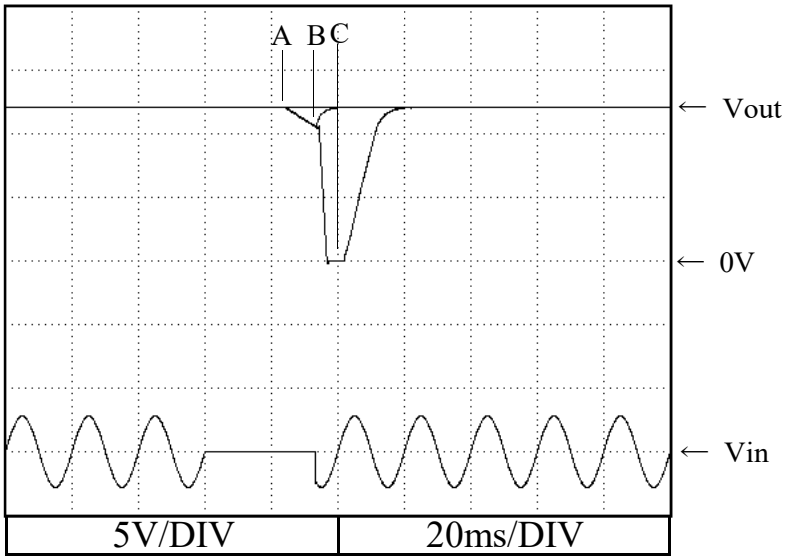
5V



A = 35ms

B = 36ms

12V

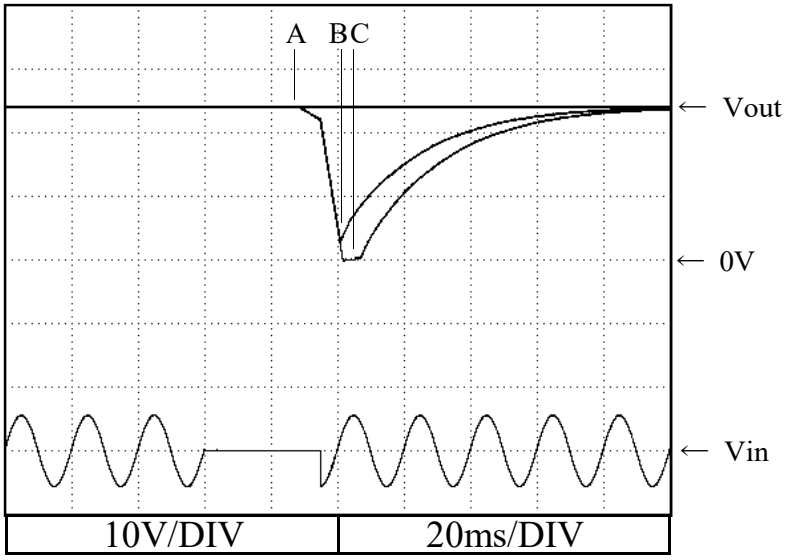


A = 25ms

B = 34ms

C = 35ms

24V



A = 28ms

B = 34ms

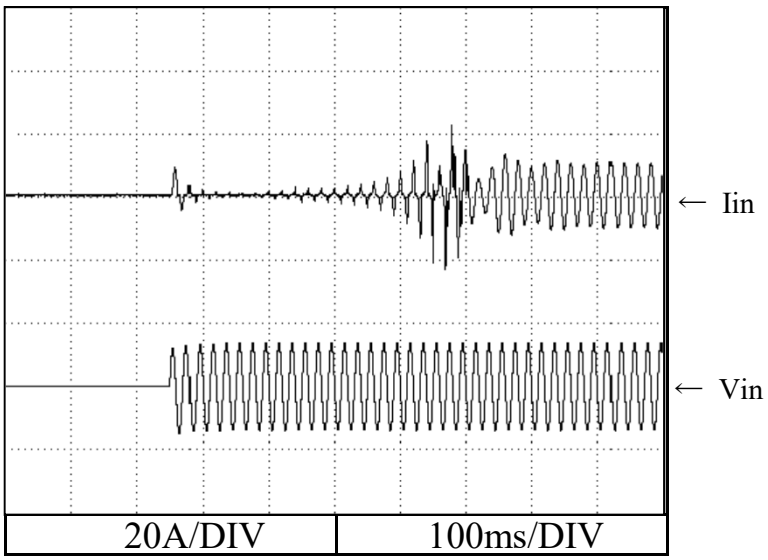
C = 35ms

2.13 入力サージ電流（突入電流）特性
Inrush current waveform

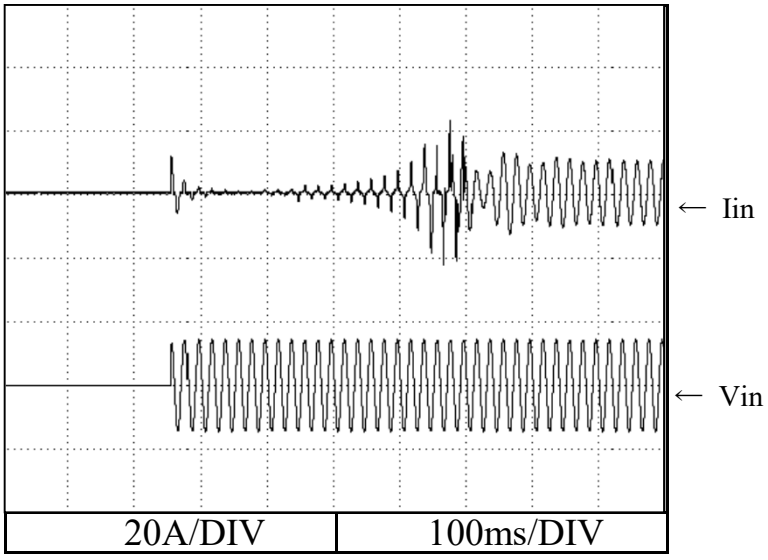
Conditions Vin : 100 VAC
Iout : 100 %
Ta : 25 ℃

5V

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



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



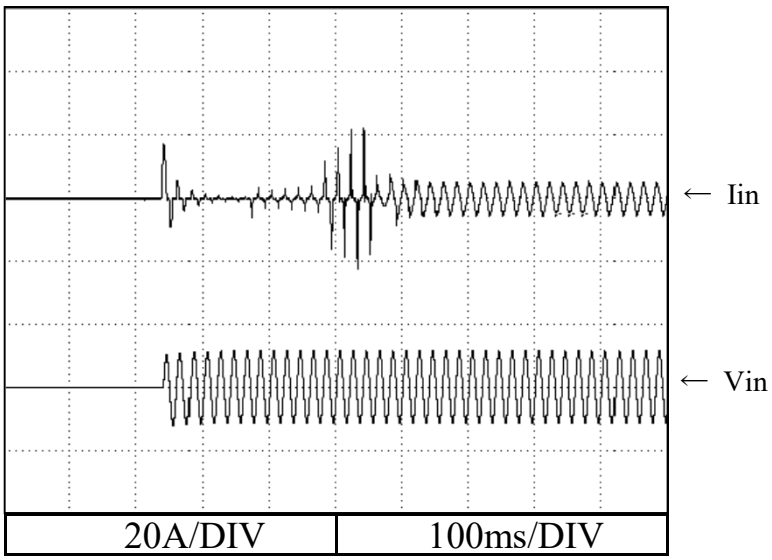
2.13 入力サージ電流（突入電流）特性

Inrush current waveform

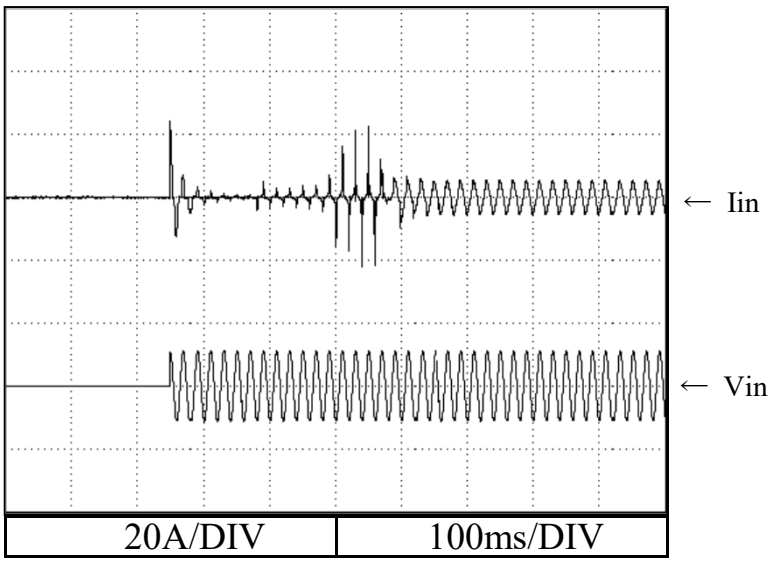
Conditions Vin : 200 VAC
Iout : 100 %
Ta : 25 ℃

5V

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



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

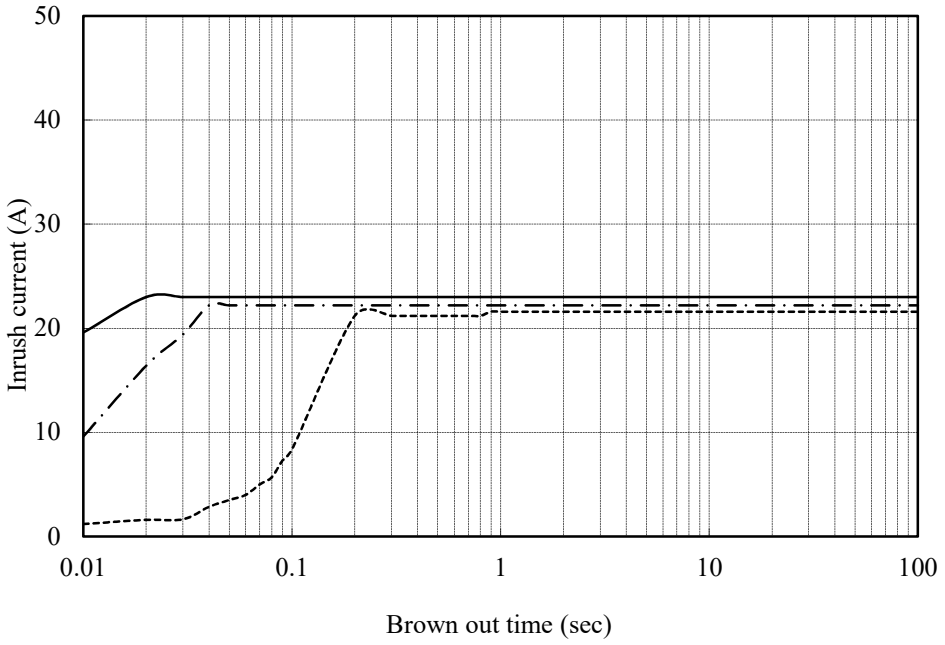


2. 14 瞬停時突入電流特性
Inrush current characteristics

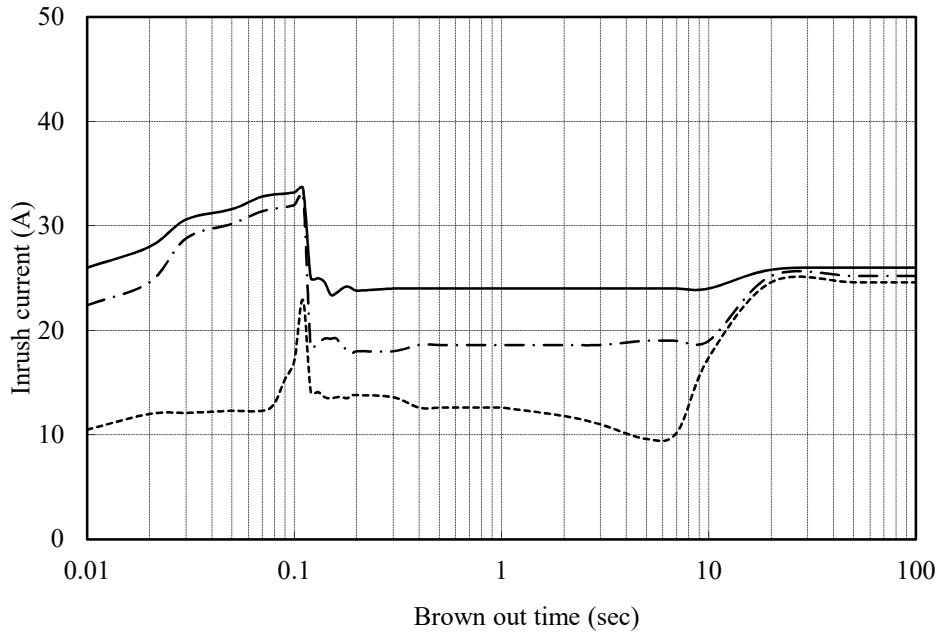
Conditions Iout : 0 % ------
50 % –·–·–
100 % ——
Ta : 25 ℃

5V

Vin : 100 VAC



Vin : 200 VAC



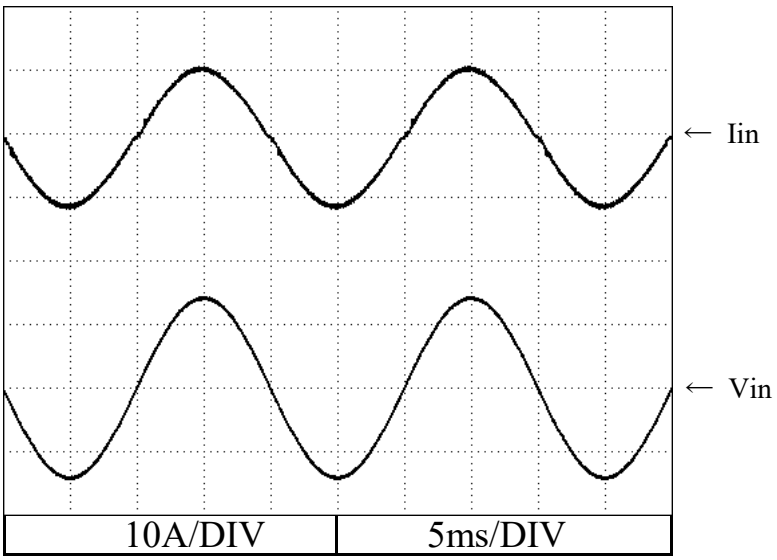
※ 上記値は、2次突入電流を含んだ値である。
Above data includes secondary inrush current.

2.15 入力電流波形
Input current waveform

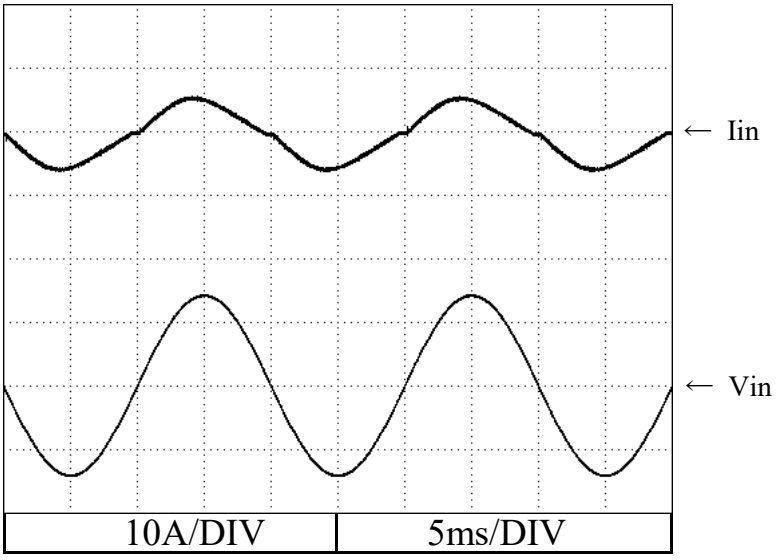
Conditions Iout : 100 %
Ta : 25 ℃

5V

Vin : 100 VAC



Vin : 200 VAC

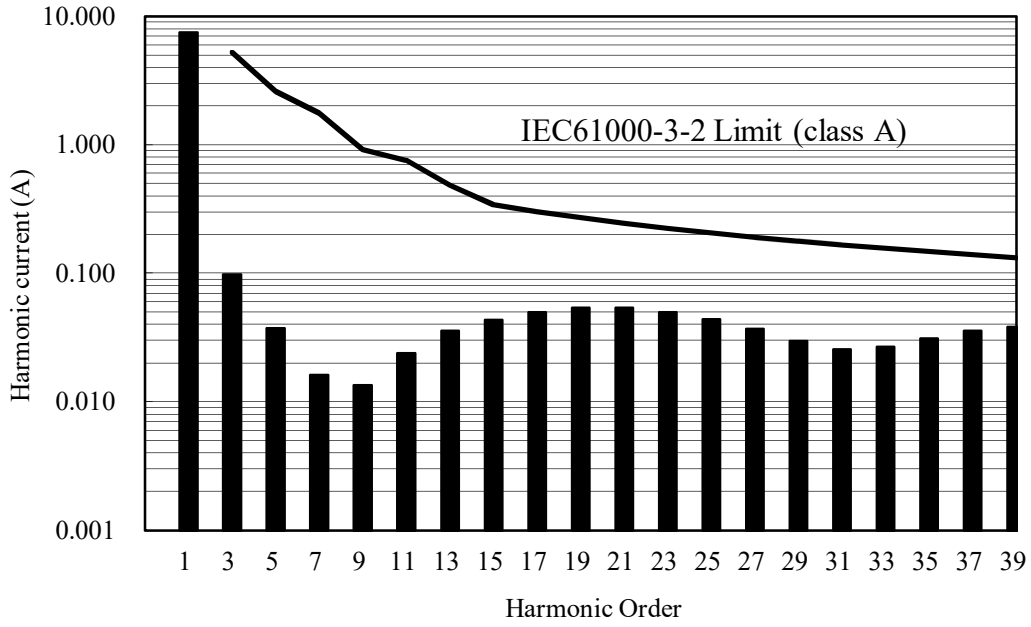


2.16 高調波成分

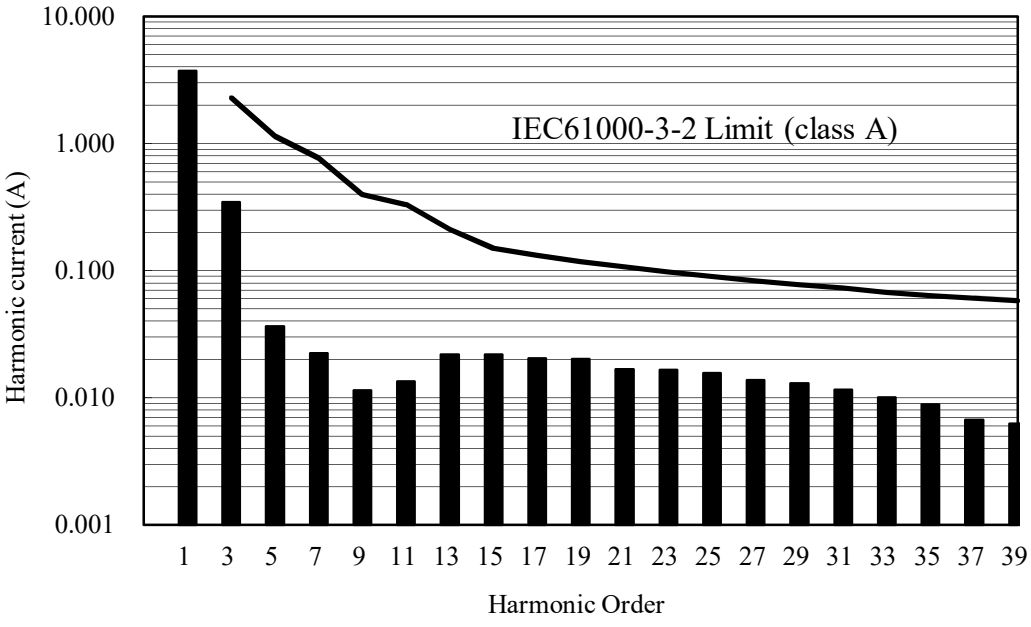
Input current harmonics

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

5V



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



2.17 リーク電流特性

Leakage current characteristics

Conditions Iout : 0 % ------

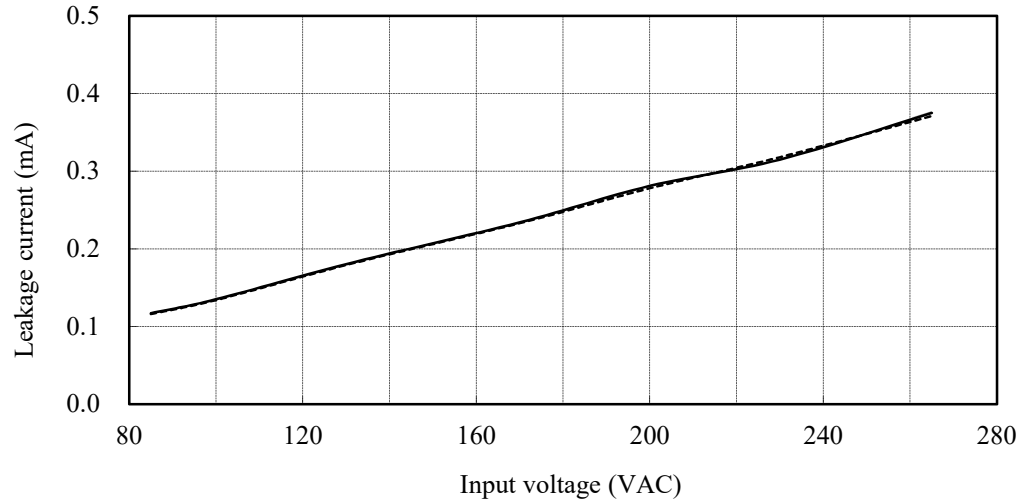
100 % ——

Ta : 25 ℃

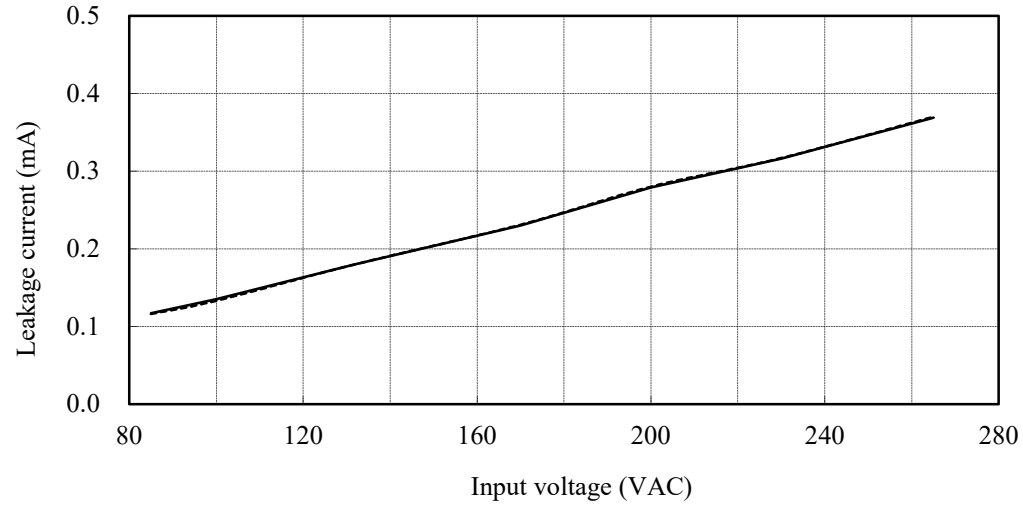
f : 50 Hz

Equipment used : MODEL 229-2 (Simpson)

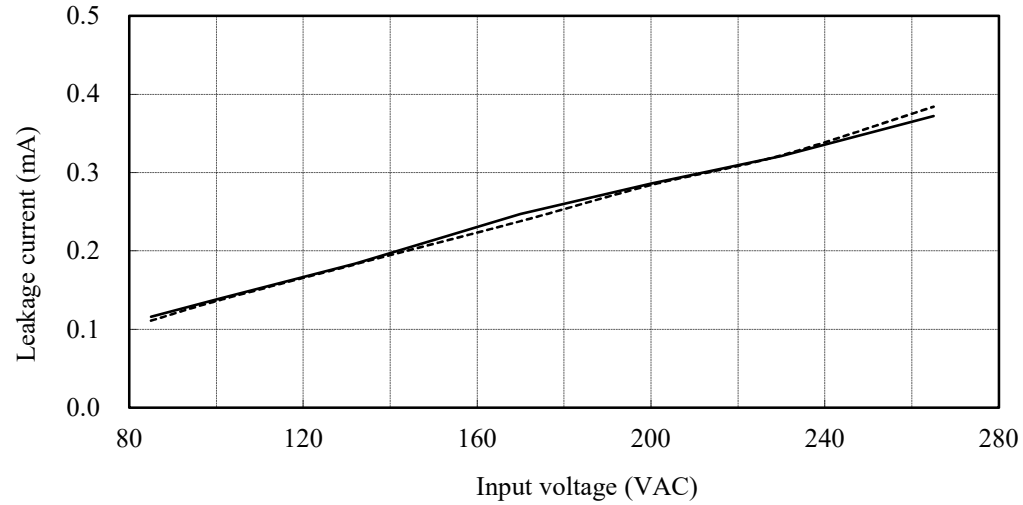
5V



12V



24V

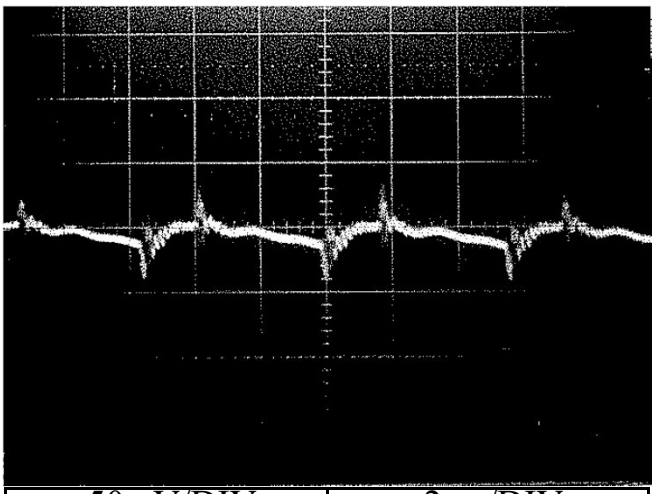


2.18 出力リップル、ノイズ波形
Output ripple and noise waveform

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

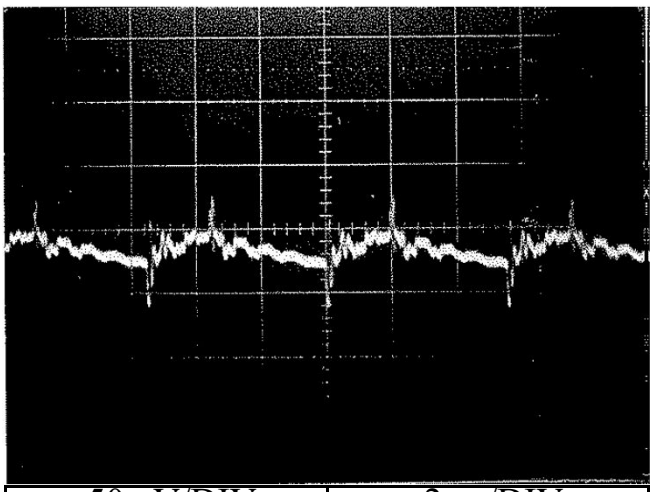
NORMAL MODE

5V



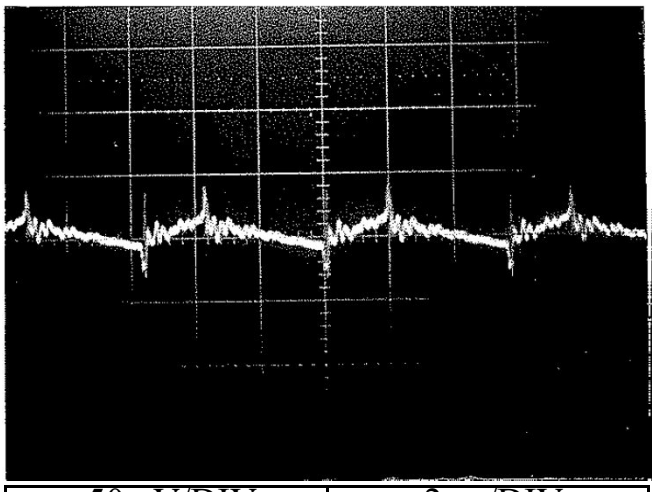
50mV/DIV	2μs/DIV

12V



50mV/DIV	2μs/DIV

24V



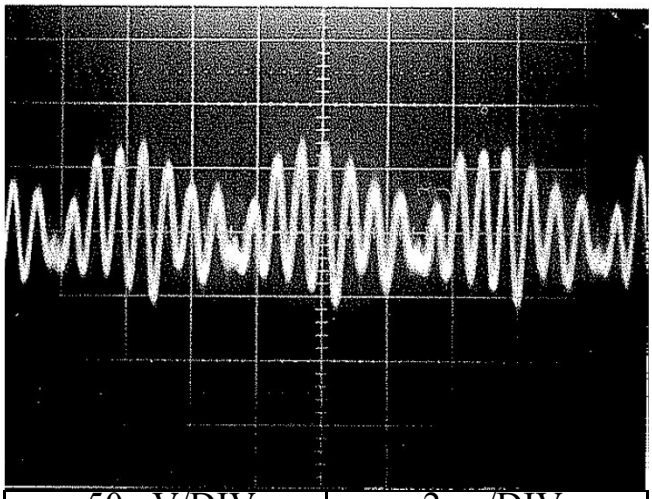
50mV/DIV	2μs/DIV

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 ℃

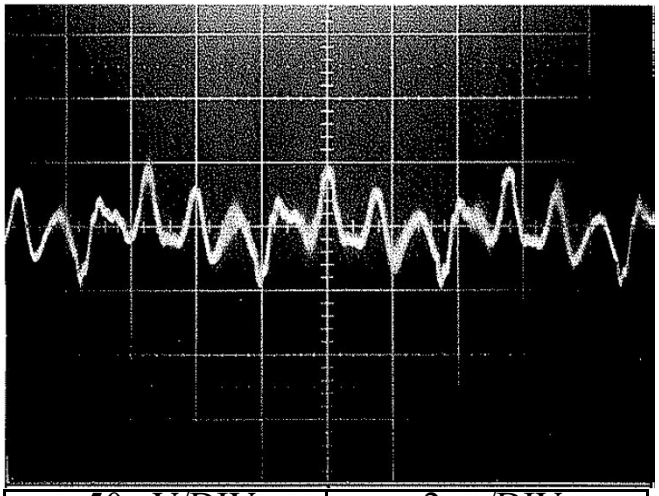
NORMAL + COMMON MODE

5V



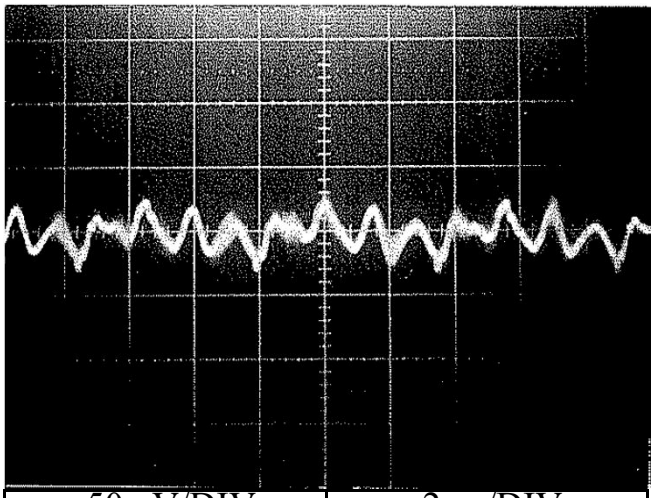
50mV/DIV	2μs/DIV

12V



50mV/DIV	2μs/DIV

24V



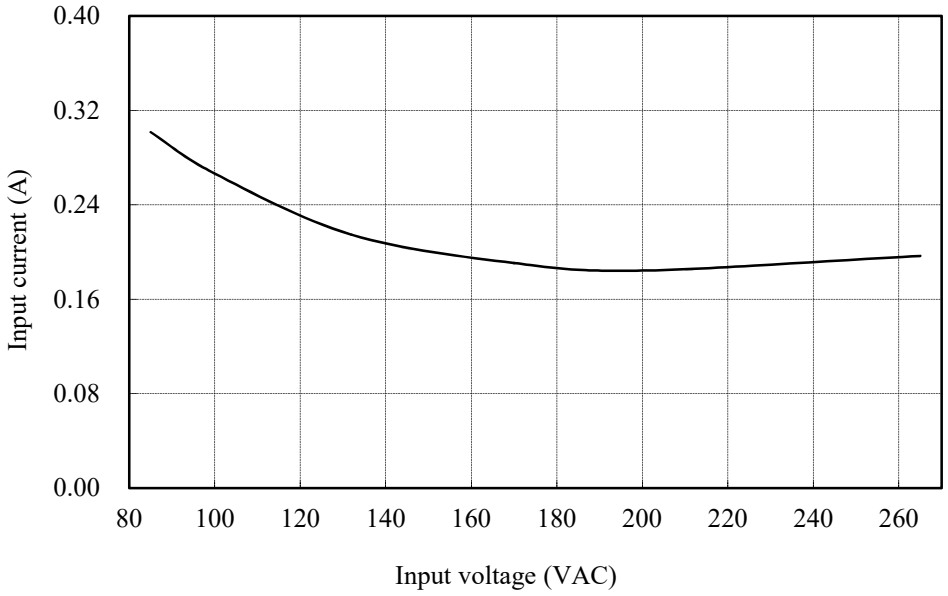
50mV/DIV	2μs/DIV

2. 19 スタンバイ電流

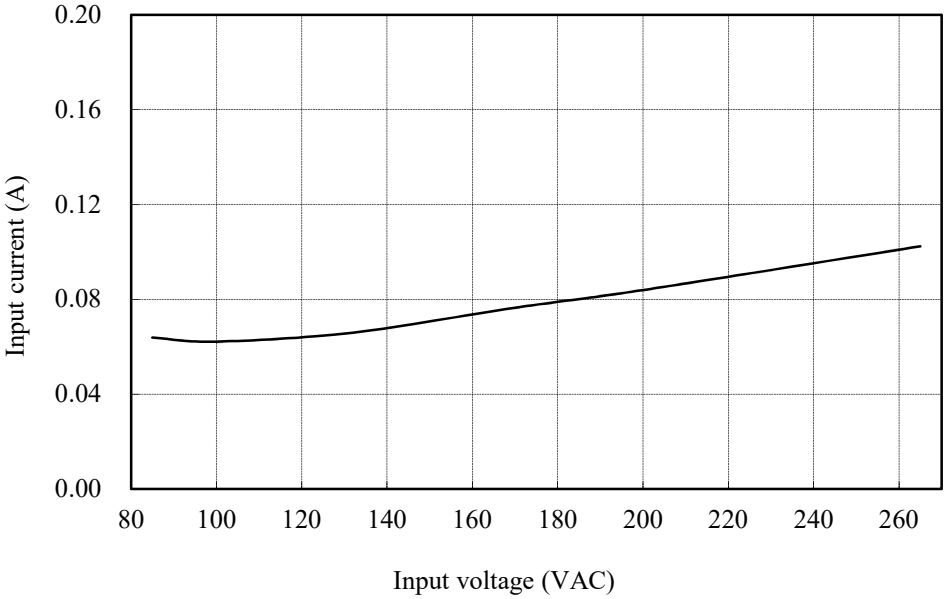
Stand by current　　Condition　Ta :　25 ℃

5V

Io = 0%



Remote control OFF



2. 20 ＥＭＩ特性

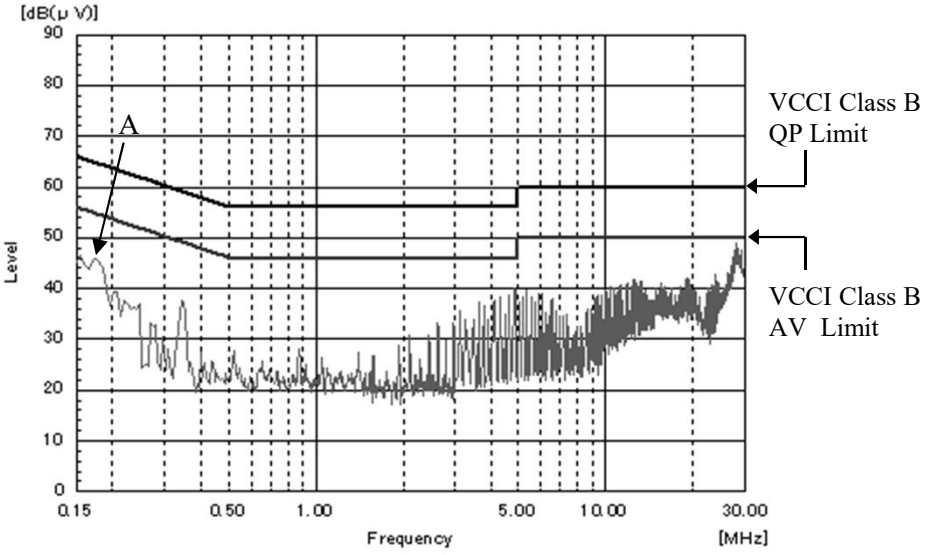
Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC
Iout : 100%

雑音端子電圧

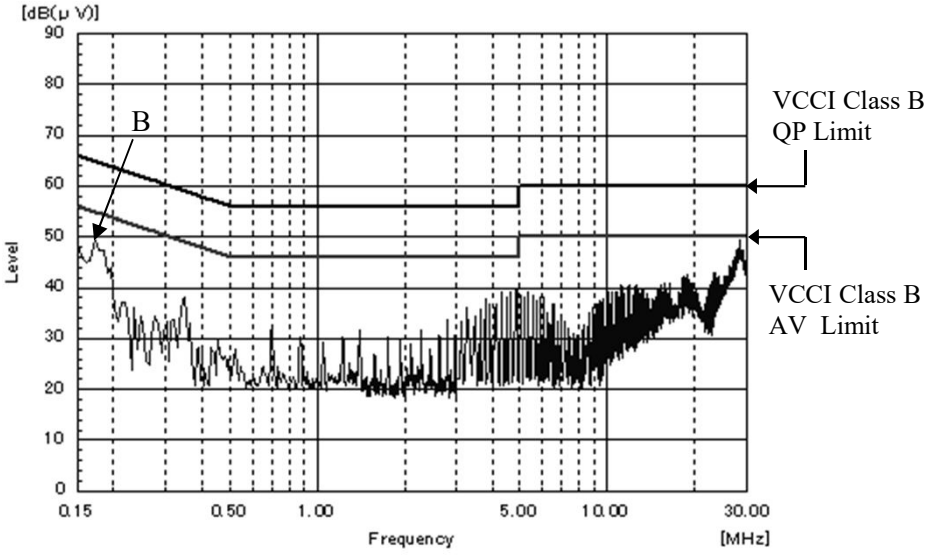
Conducted Emission

5V



Ref. Data	Point A (175kHz) Limit (dBuV)	Measure (dBuV)
QP	64.7	43.3
AV	54.7	42.4

Phase : N



Ref. Data	Point B (175kHz) Limit (dBuV)	Measure (dBuV)
QP	64.7	44.8
AV	54.7	44.1

Phase : L

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

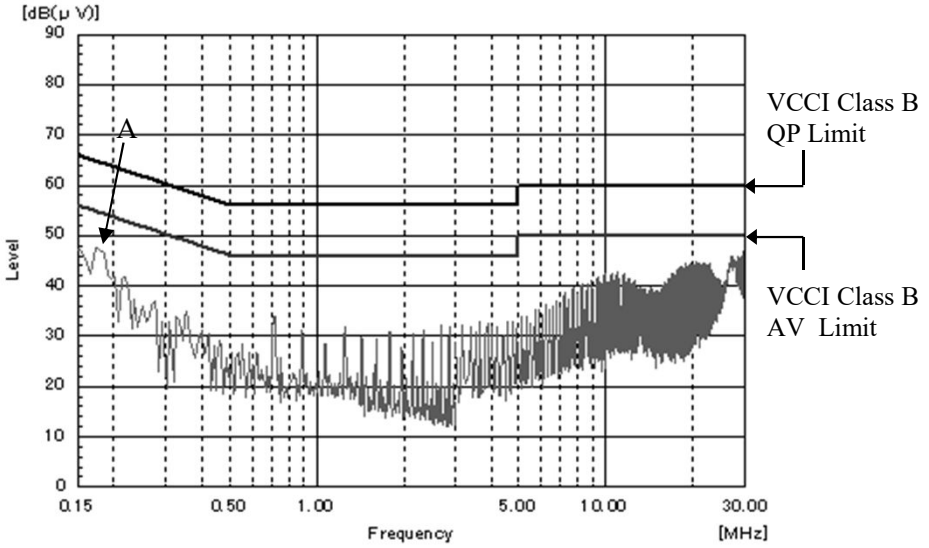
Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC
Iout : 100%

雑音端子電圧

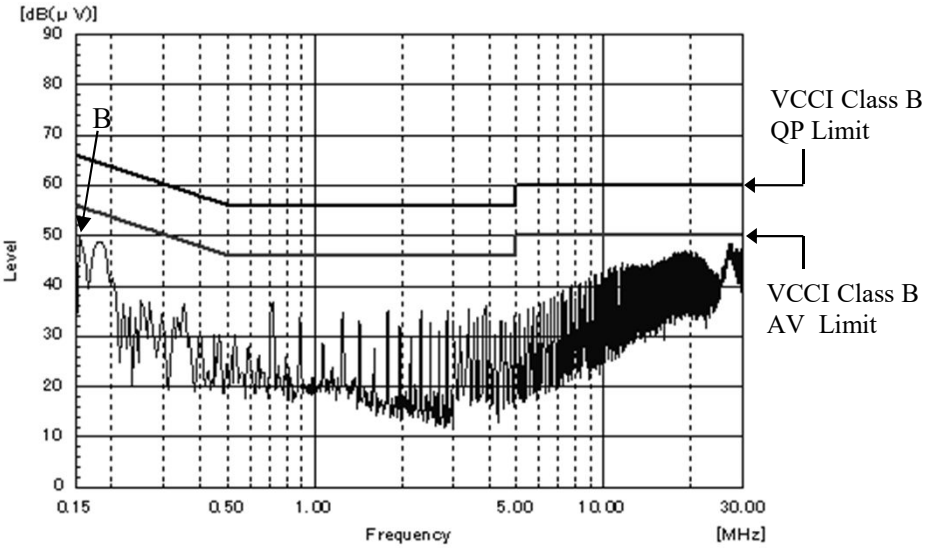
Conducted Emission

12V



Ref. Data	Point A (178kHz) Limit (dBuV)	Measure (dBuV)
QP	64.6	45.4
AV	54.6	44.2

Phase : N



Ref. Data	Point B (179kHz) Limit (dBuV)	Measure (dBuV)
QP	64.5	43.2
AV	54.5	41.5

Phase : L

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

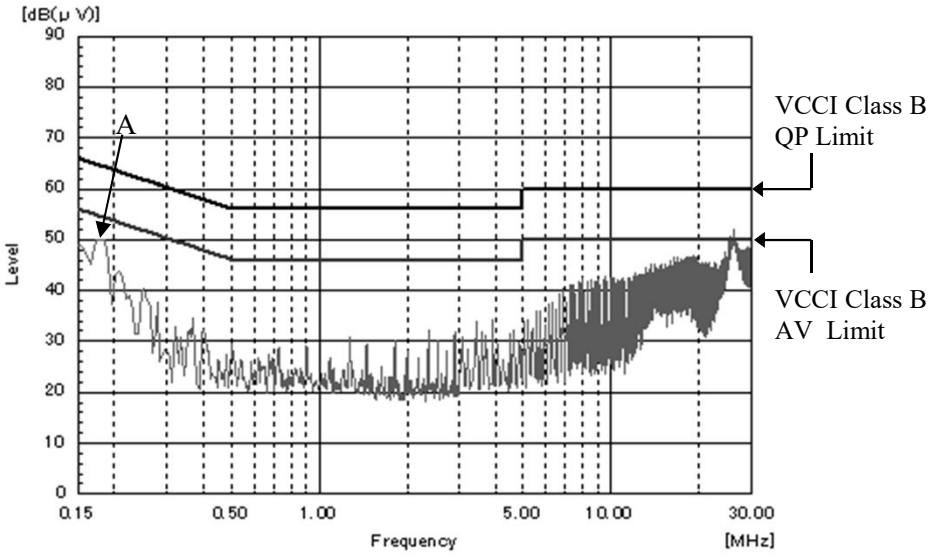
Conditions Vin : 230VAC
Iout : 100%

雑音端子電圧

Conducted Emission

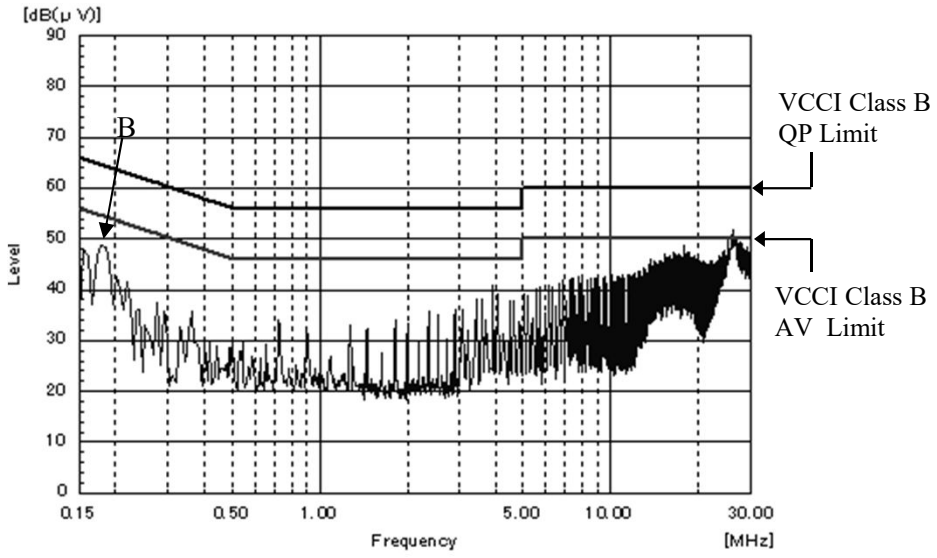
24V

Ref. Data	Point A (182kHz) Limit (dBuV)	Measure (dBuV)
QP	64.2	47.0
AV	54.4	45.9



Phase : N

Ref. Data	Point B (182kHz) Limit (dBuV)	Measure (dBuV)
QP	64.4	45.6
AV	54.4	44.3



Phase : L

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

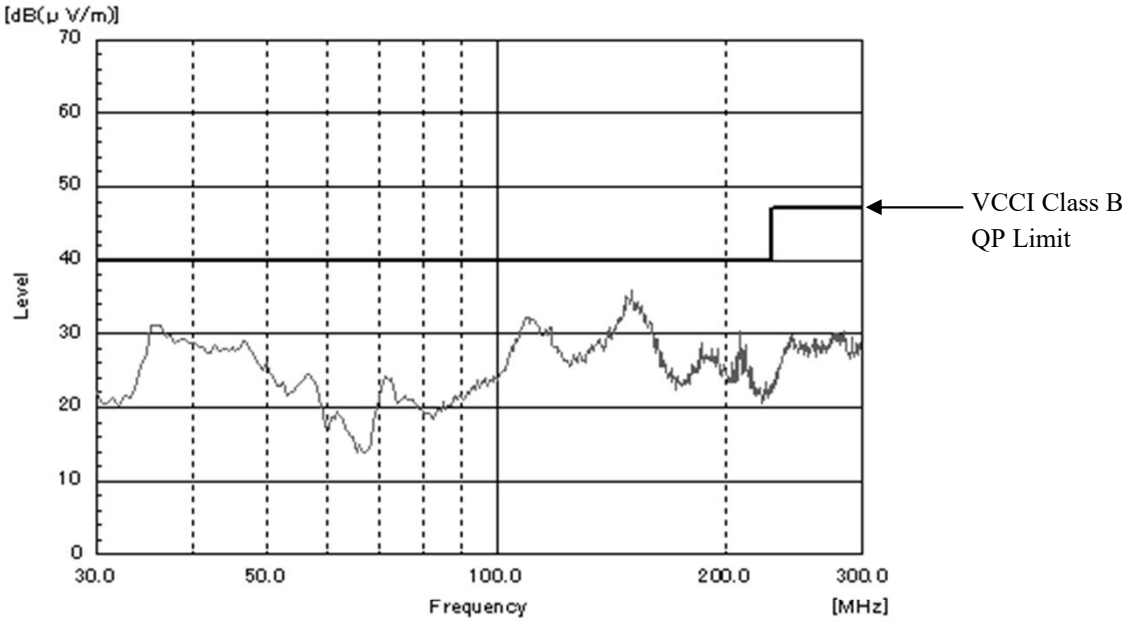
Electro-Magnetic Interference characteristics　　Conditions　Vin ：100VAC
Iout ：100%

雑音電界強度

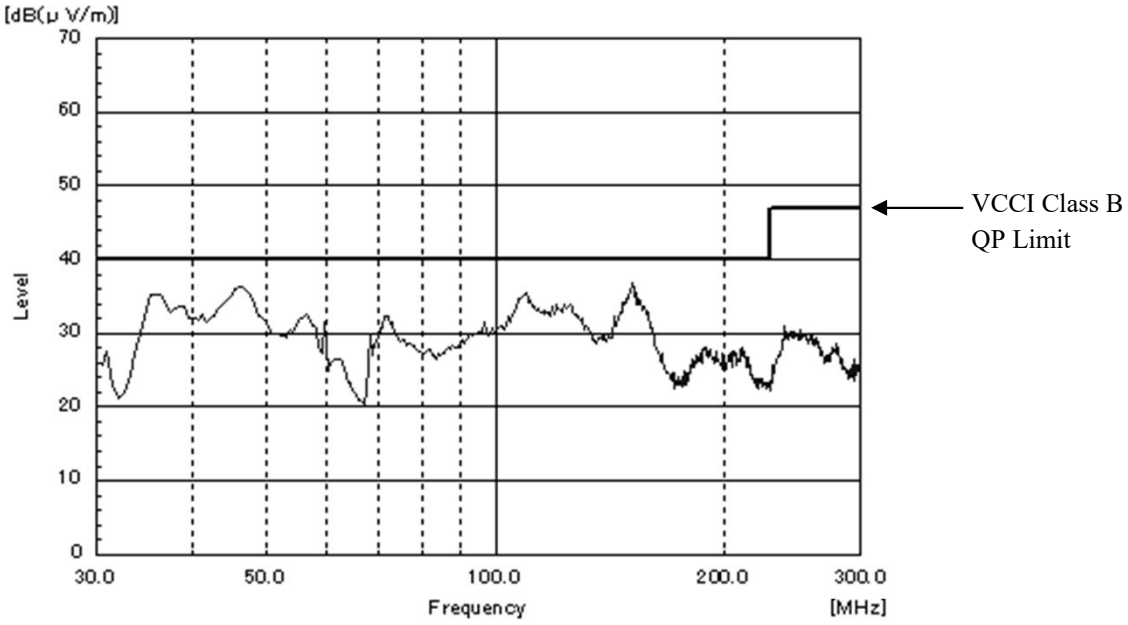
Radiated Emission

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

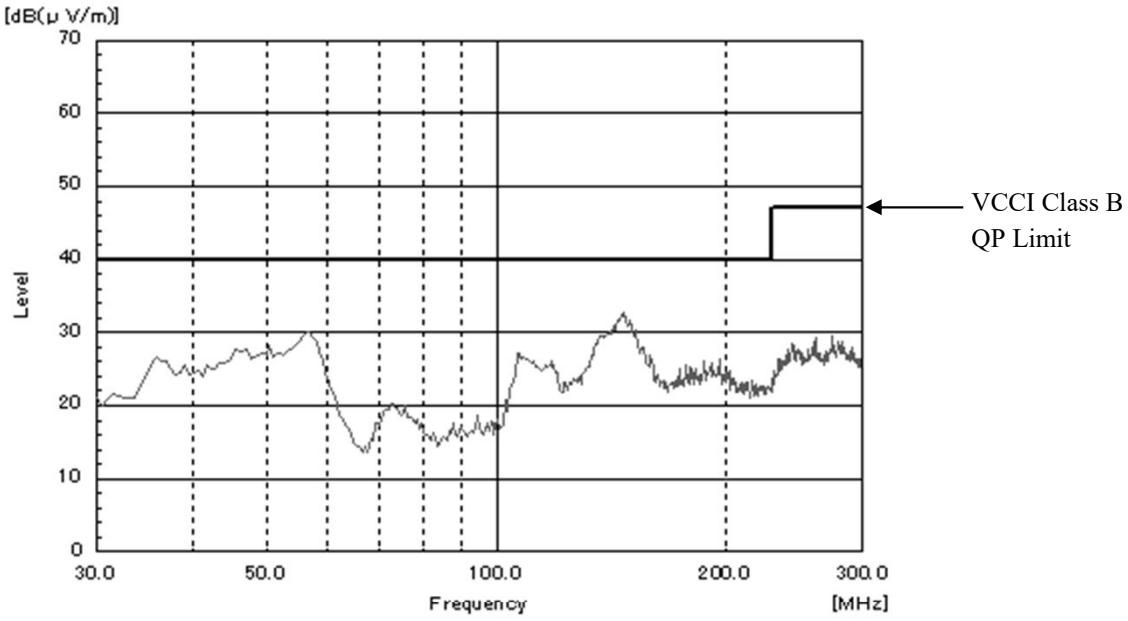
Electro-Magnetic Interference characteristics　　Conditions　Vin ：100VAC
Iout ：100%

雑音電界強度

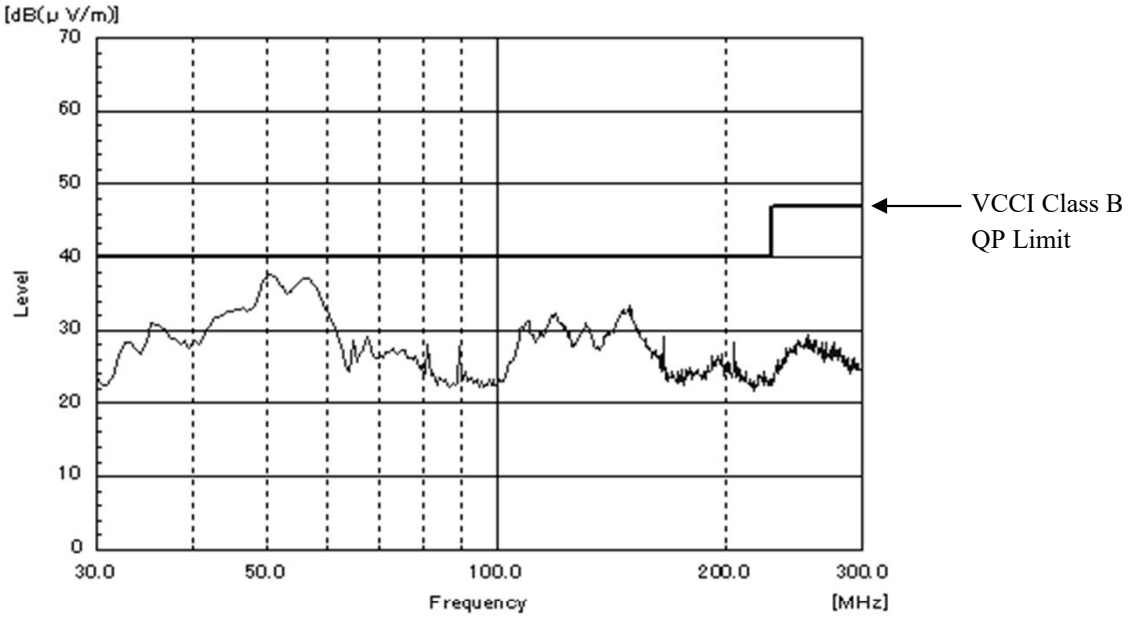
Radiated Emission

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

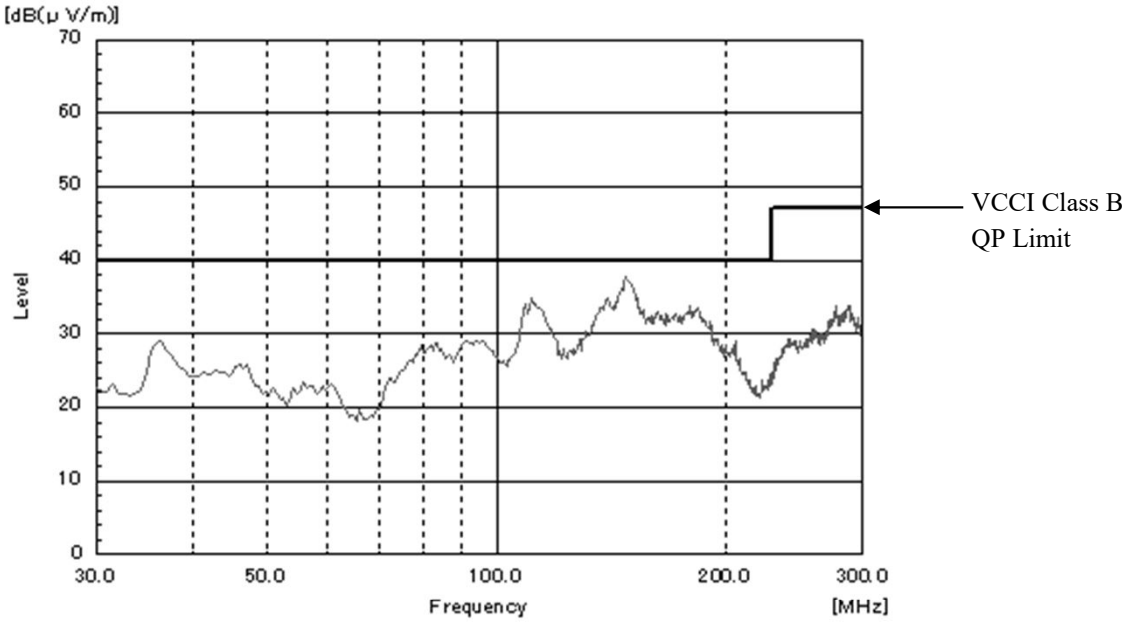
Conditions Vin : 100VAC
Iout : 100%

雑音電界強度

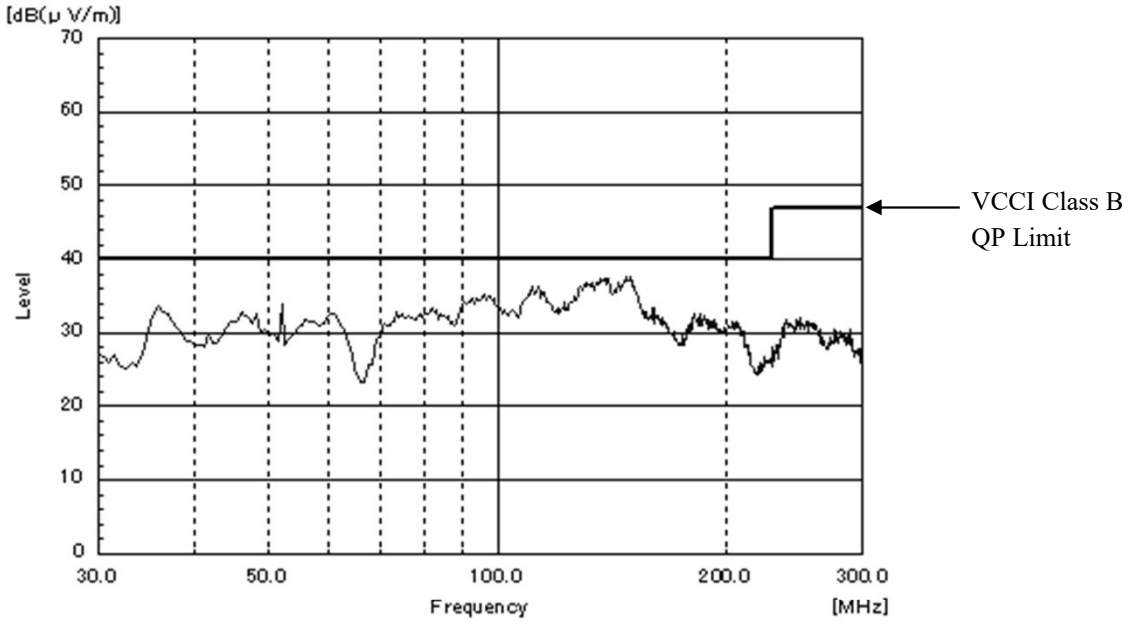
Radiated Emission

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.