

HWS600P

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	
	測定回路1 Circuit 1 used for determination	T-1
	静特性 Steady state data	
	通電ドリフト特性 Warm up voltage drift characteristics	
	過電圧保護特性 Over voltage protection (OVP) characteristics	
	過電流保護特性 Over current protection (OCP) characteristics	
	出力立ち上がり特性 Output rise characteristics	
	出力立ち下がり特性 Output fall characteristics	
	過渡応答 (入力急変) 特性 Dynamic line response characteristics	
	スタンバイ電流特性 Standby current characteristics	
	測定回路2 Circuit 2 used for determination	T-1
	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	
	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	
	測定回路3 Circuit 3 used for determination	T-2
	過渡応答 (負荷急変) 特性 Dynamic load response characteristics	
	測定回路4 Circuit 4 used for determination	T-2
	入力サージ電流 (突入電流) 波形 Inrush current waveform	
	瞬停時突入電流特性 Inrush current characteristics	
	測定回路5 Circuit 5 used for determination	T-2
	リーク電流特性 Leakage current characteristics	
	測定回路6 Circuit 6 used for determination	T-3
	出力リップル、ノイズ波形 Output ripple and noise waveform	
	(a) Normal mode	
	(b) Normal + Common mode	
	測定構成 Configuration used for determination	T-4
	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	T-5
1.3	評価負荷条件 Load condition	T-5

2. 特性データ Characteristics	PAGE
2.1 静特性 Steady state data	
(1) 入力・負荷・温度変動 Regulation - line and load, Temperature drift	T-6
(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	T-7
(3) 効率・入力電流対出力電流 Efficiency and Input current vs. Output current	T-8
(4) 力率・入力電流対出力電流 Power factor and Input current vs. Output current	T-9
2.2 通電ドリフト特性 Warm up voltage drift characteristics	T-10
2.3 過電流保護特性 Over current protection (OCP) characteristics	T-11~12
2.4 過電圧保護特性 Over voltage protection (OVP) characteristics	T-13
2.5 出力立ち上がり特性 Output rise characteristics	T-14~16
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)波形 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-34~36
2.19 スタンバイ電流特性 Standby current characteristics	T-37
2.20 EMI特性 Electro-Magnetic Interference characteristics	T-38~43

使用記号 Terminology used

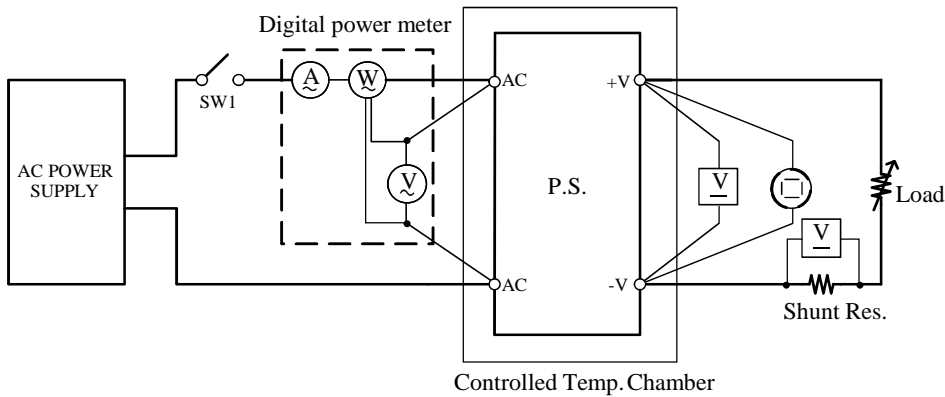
	Definition
Vin 入力電圧 Input voltage
Vout 出力電圧 Output voltage
Iin 入力電流 Input current
Iout 出力電流 Output current
Ta 周囲温度 Ambient temperature
f 周波数 Frequency

1. 測定方法 **Evaluation Characteristics**

1.1 測定回路 Circuit used for measurement

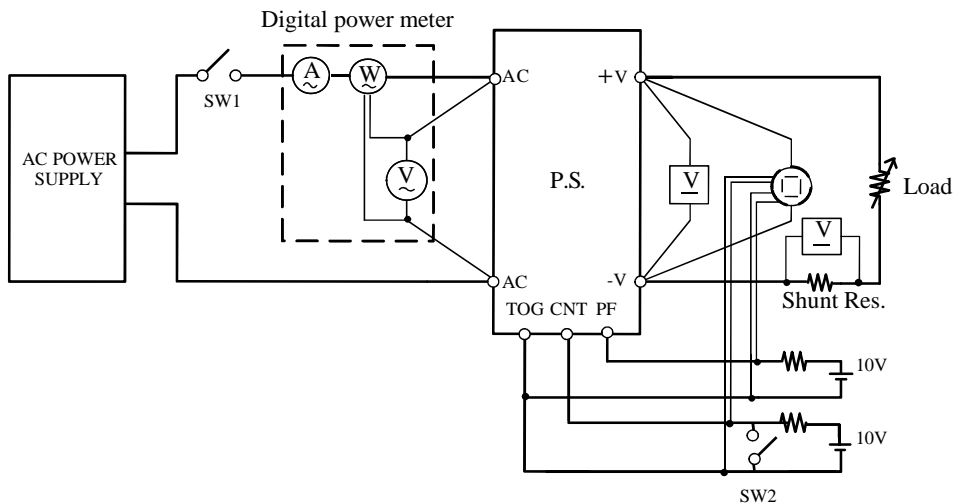
測定回路1 **Circuit 1**

- | | |
|------------------|---|
| • 静特性 | Steady state data |
| • 通電ドリフト特性 | Warm up voltage drift characteristics |
| • 過電圧保護特性 | Over voltage protection (OVP) characteristics |
| • 過電流保護特性 | Over current protection (OCP) characteristics |
| • 出力立ち上がり特性 | Output rise characteristics |
| • 出力立ち下がり特性 | Output fall characteristics |
| • 過渡応答 (入力急変) 特性 | Dynamic line response characteristics |
| • スタンバイ電流特性 | Standby current characteristics |



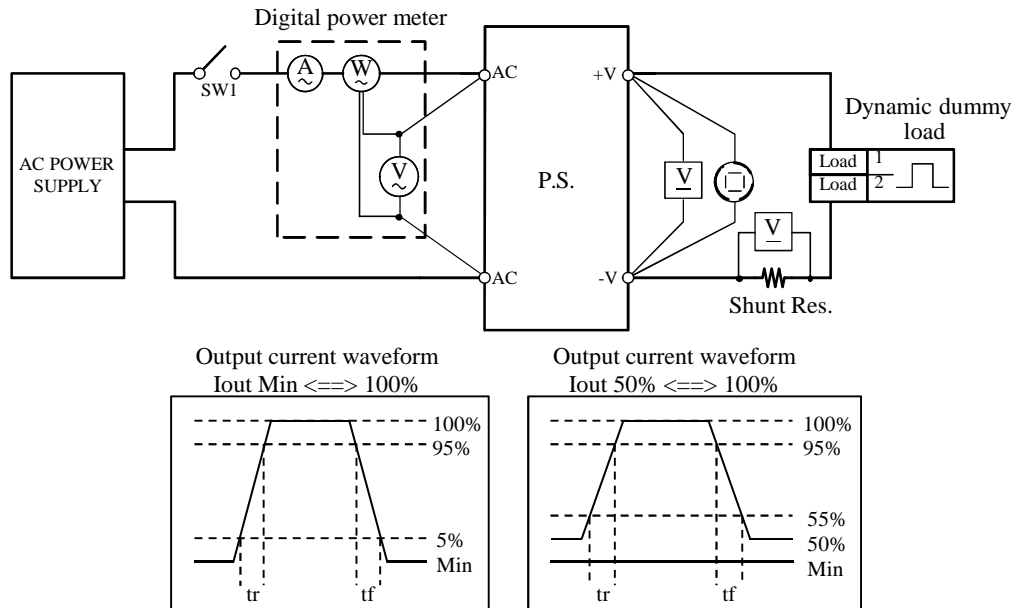
測定回路2 **Circuit 2**

- 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
- 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



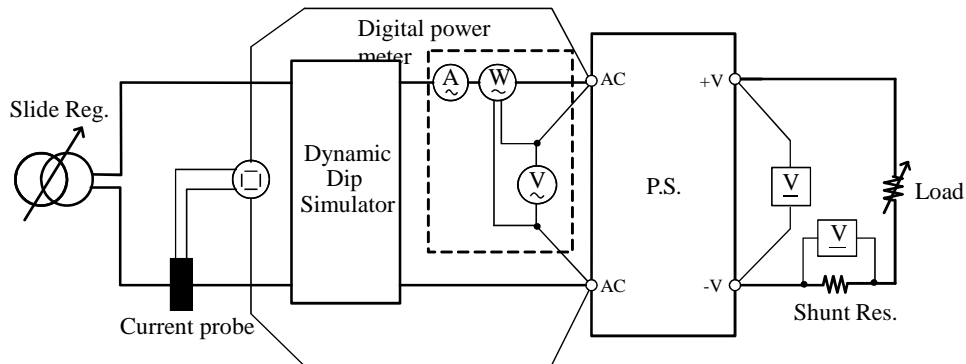
測定回路3 Circuit 3

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



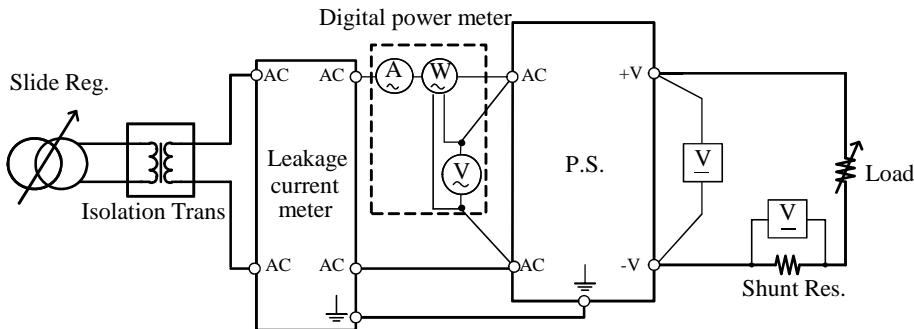
測定回路4 Circuit 4

・入力サージ電流（突入電流）波形 Inrush current waveform
 ・瞬停時突入電流特性 Inrush current characteristics



測定回路5 Circuit 5

・リーク電流特性 Leakage current characteristics

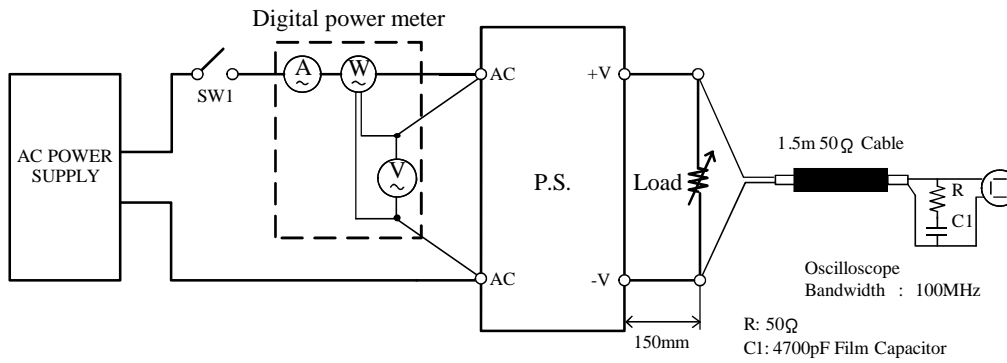


NOTE: Leakage current meter HIOKI TYPE 3156

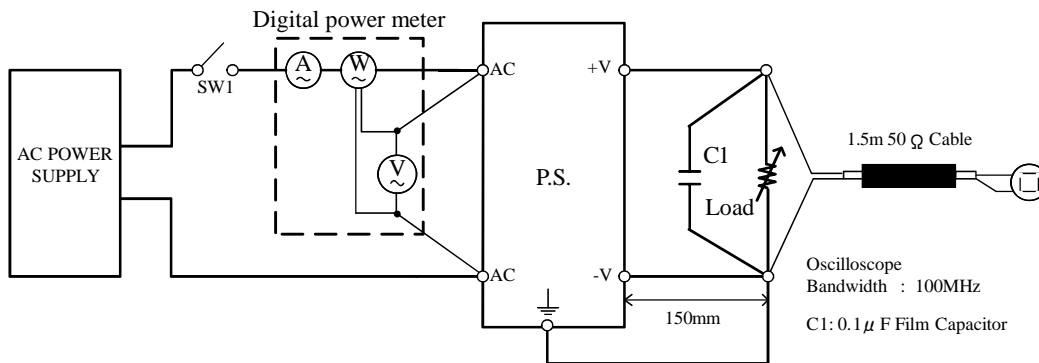
測定回路6 Circuit 6

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

(a) Normal mode



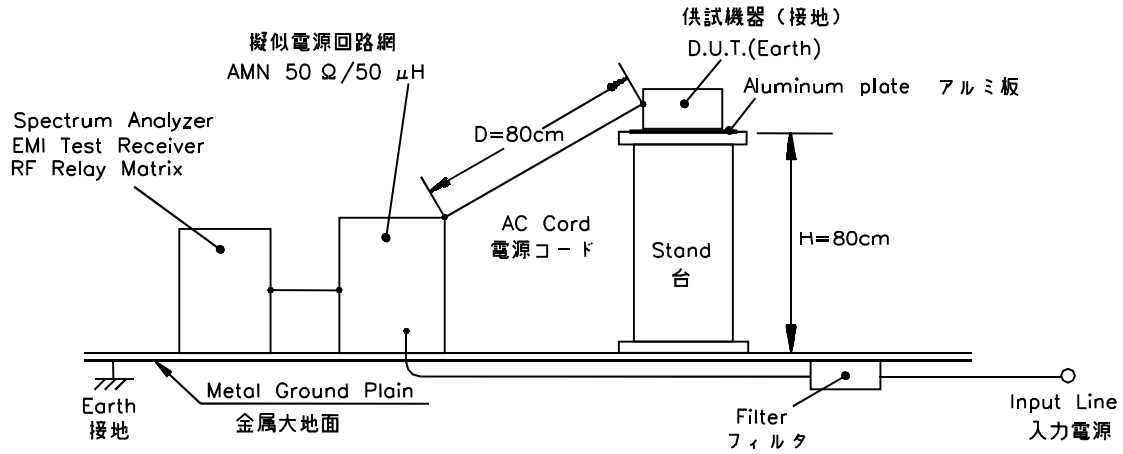
(b) Normal + Common mode



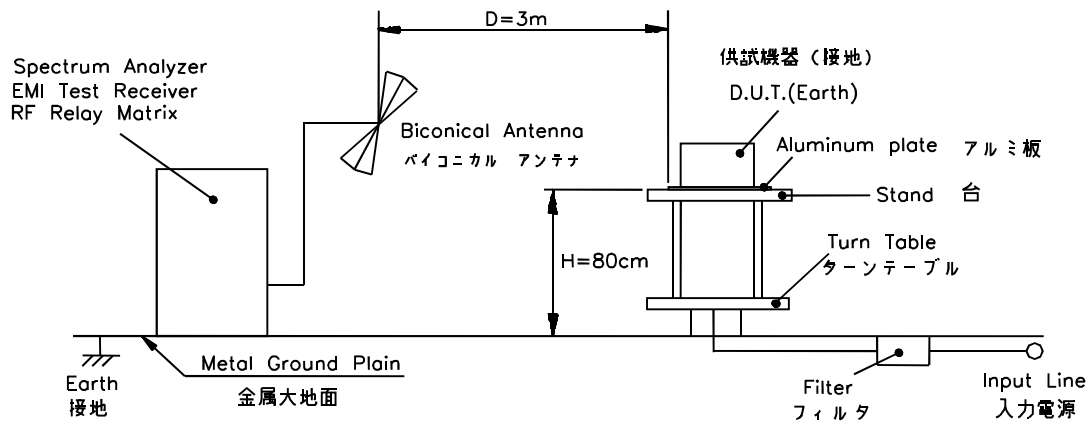
測定構成 Configuration

•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	V-1100A
2	OSCILLOSCOPE	YOKOGAWA ELECT.	DL1740EL/9040L
3	DIGITAL MULTIMETER	AGILENT	34970A
4	DYNAMIC DIP SIMULATOR	TAKAMISAWA	PSA-210
5	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
6	DYNAMIC DUMMY LOAD	TAKASAGO	1000L
7	DUMMY LOAD	PCN	RHF250 Series
8	SLIDE REGURATOR	MATSUNAGA	SD-2450
9	AC POWER SUPPLY	KIKUSUI	PCR-4000L
10	LEAKAGE CURRENT METER	HIOKI	3156
11	CONTROLLED TEMP. CHAMBER	EMIC CORP.	VC-101DAMX-32-P1R
12	SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESPI3
13	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESHS10
14	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESVS10
15	RF RELAY MATRIX	ROHDE & SCHWARZ	PSU
16	AMN	KYORITU DENSHI	KNW-242
17	ANTENA(BICONICAL ANTENA)	SCHWARZBECK	BBA9106

1.3 評価負荷条件 Load condition

Output	Load conditions		
	24V	36V	48V
	Io(A)		
100%	25	16.7	12.5
100VAC_Peak Load	40.5	27	20
200VAC_Peak Load	83	55.5	41.5

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

24V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	24.071V	24.070V	24.070V	24.071V	1mV	0.004%
50%	24.046V	24.046V	24.046V	24.047V	1mV	0.004%
100%	24.016V	24.017V	24.018V	24.018V	2mV	0.008%
load	55mV	53mV	52mV	53mV		
regulation	0.229%	0.221%	0.217%	0.221%		

2. Temperature drift

Conditions Vin=100VAC

Iout=100%

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	23.906V	24.017V	24.077V	171mV	0.713%

36V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	36.132V	36.129V	36.131V	36.131V	3mV	0.008%
50%	36.097V	36.095V	36.097V	36.097V	2mV	0.006%
100%	36.053V	36.052V	36.054V	36.054V	2mV	0.006%
load	79mV	77mV	77mV	77mV		
regulation	0.219%	0.214%	0.214%	0.214%		

2. Temperature drift

Conditions Vin=100VAC

Iout=100%

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	35.867V	36.052V	36.173V	306mV	0.850%

48V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	48.121V	48.120V	48.120V	48.120V	1mV	0.002%
50%	48.076V	48.077V	48.077V	48.078V	2mV	0.004%
100%	48.020V	48.021V	48.023V	48.024V	4mV	0.008%
load	101mV	99mV	97mV	96mV		
regulation	0.210%	0.206%	0.202%	0.200%		

2. Temperature drift

Conditions Vin=100VAC

Iout=100%

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	47.793V	48.021V	48.173V	380mV	0.792%

(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

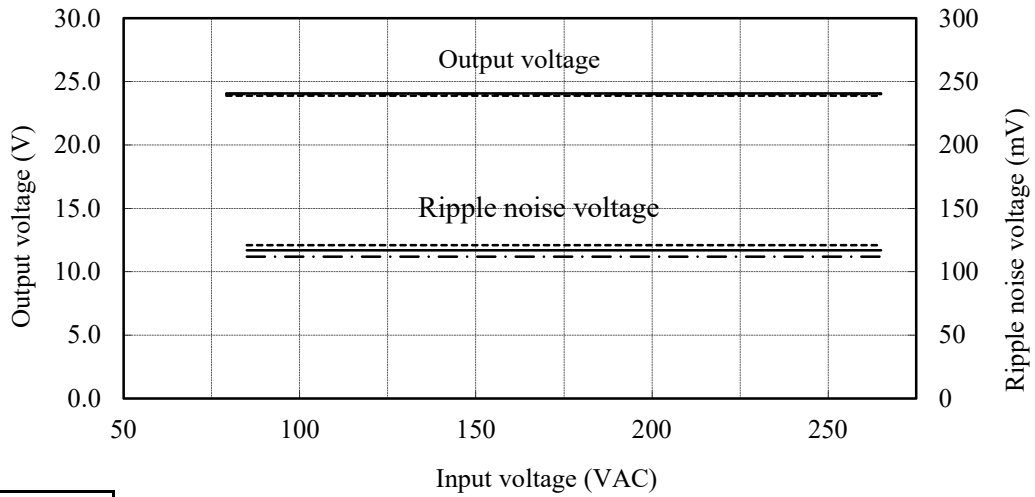
Conditions Iout : 100 %

Ta : -10 °C -----

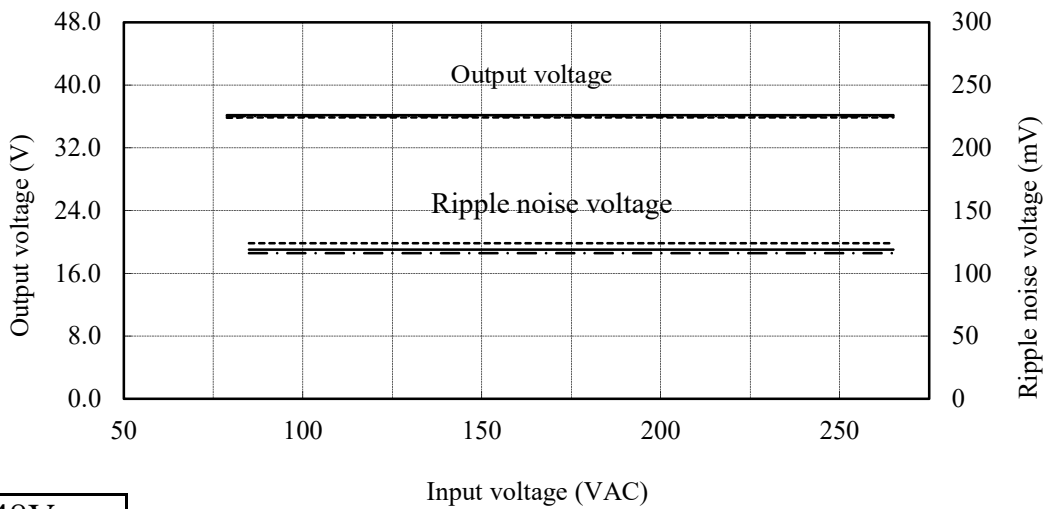
25 °C -.-.-.-

50 °C _____

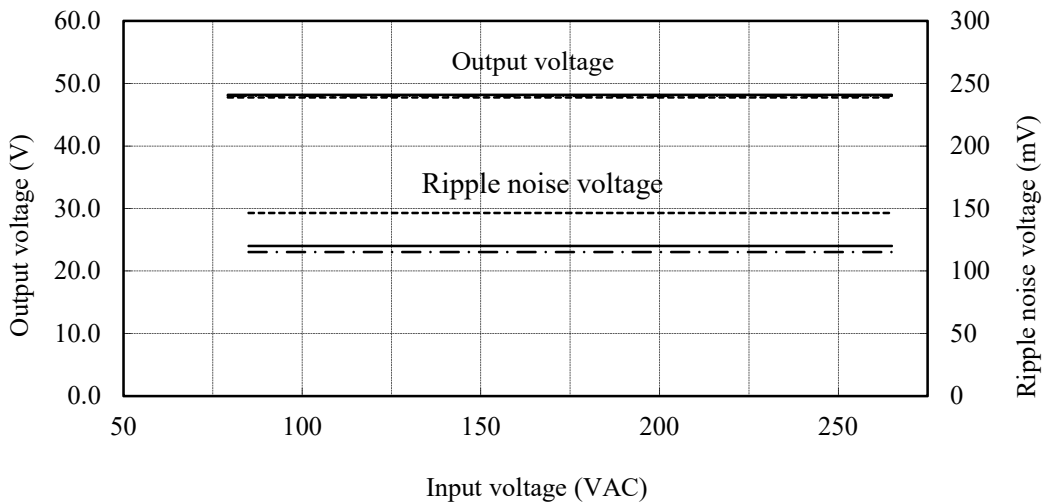
24V



36V



48V

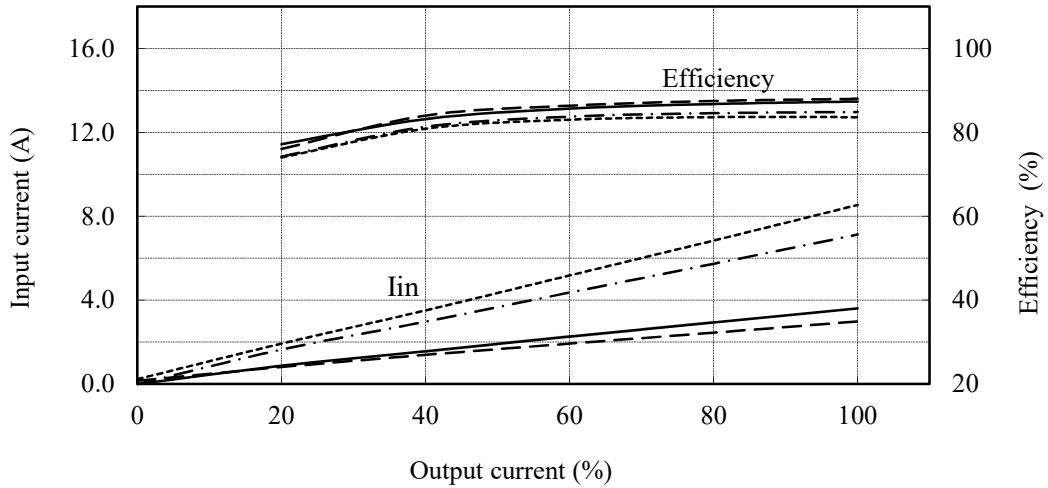


(3) 効率・入力電流対出力電流

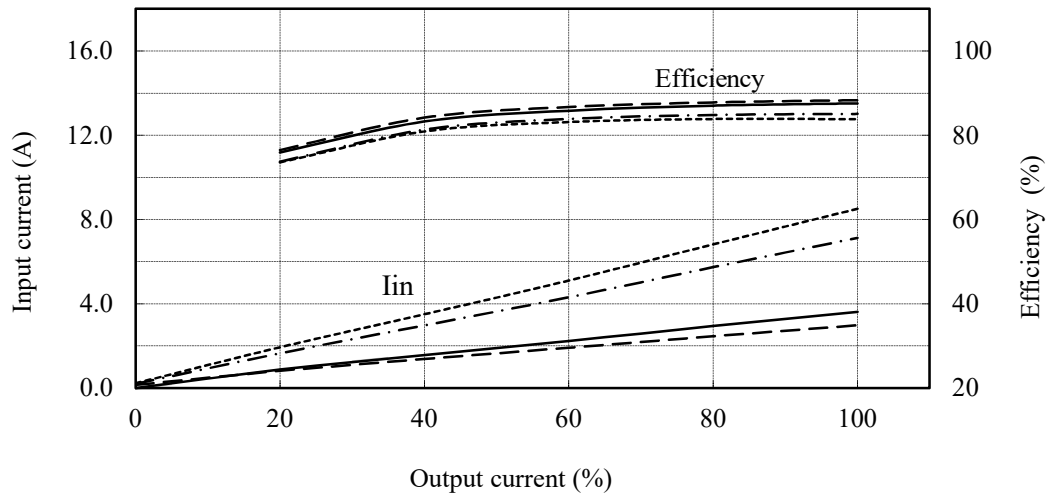
Efficiency and Input current vs. Output current

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

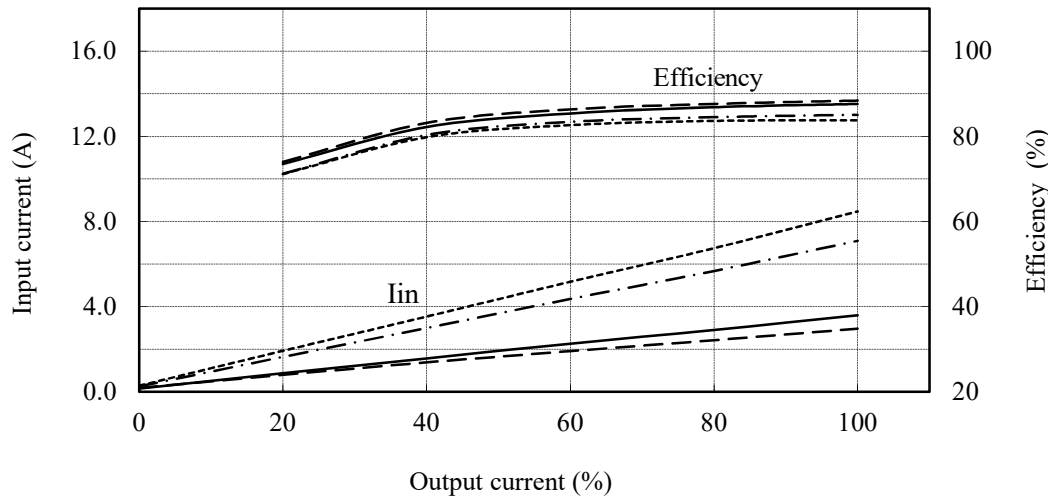
24V



36V



48V

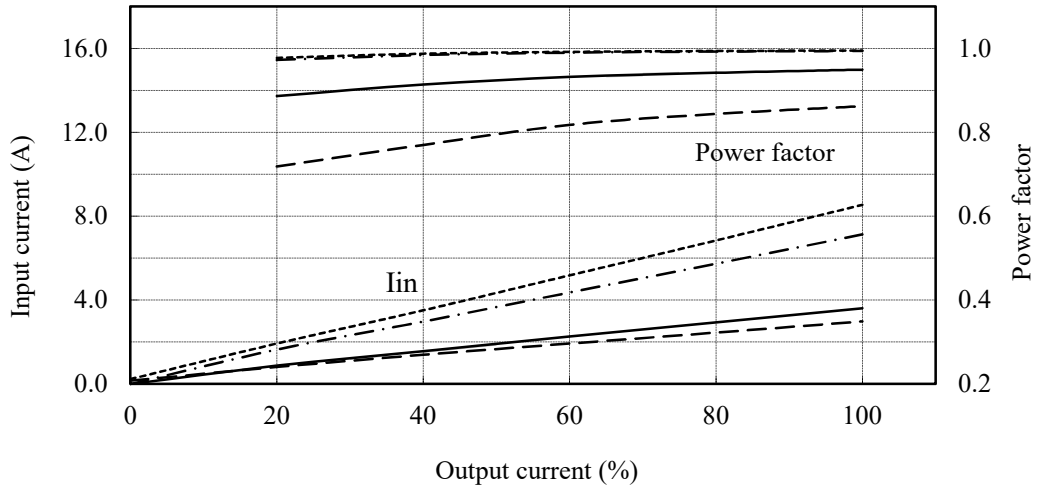


(4) 力率・入力電流対出力電流

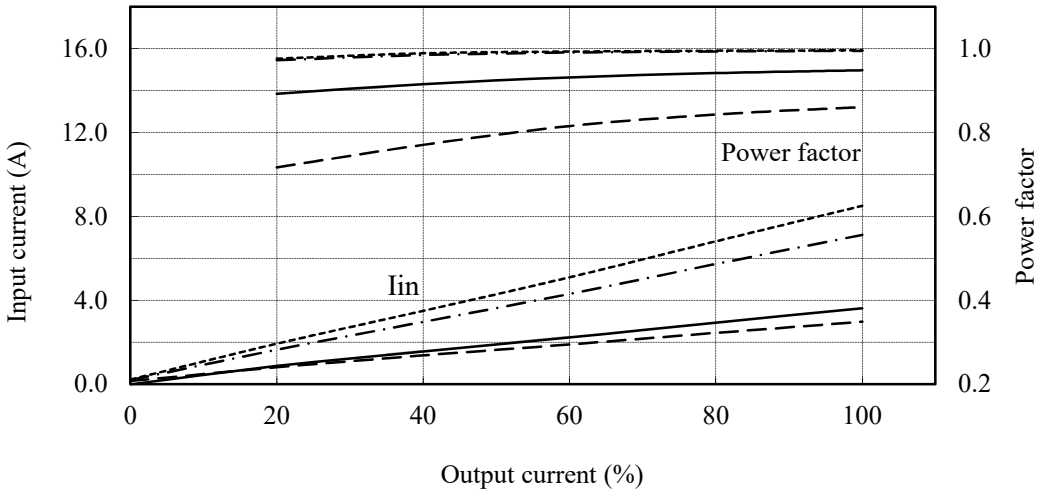
Power factor and Input current vs. Output current

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

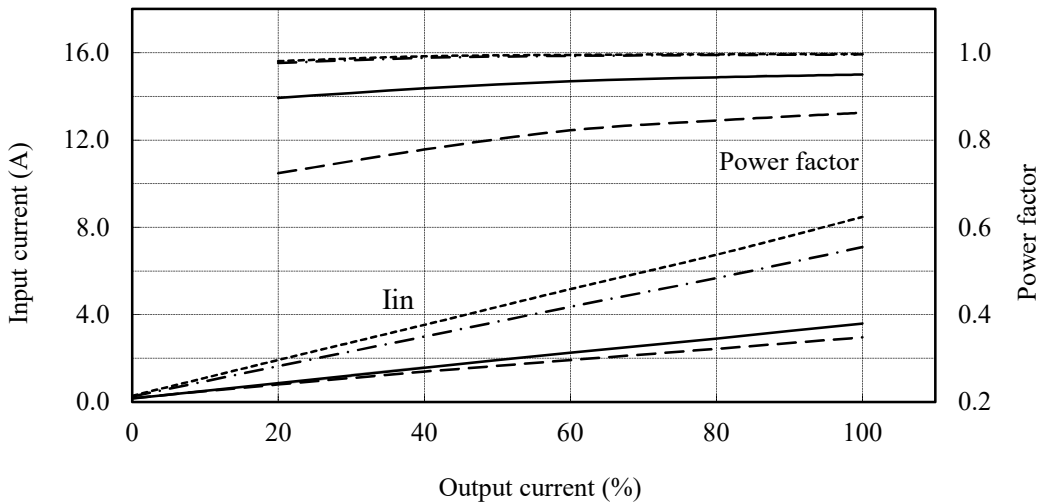
24V



36V



48V



2.2 通電ドリフト特性

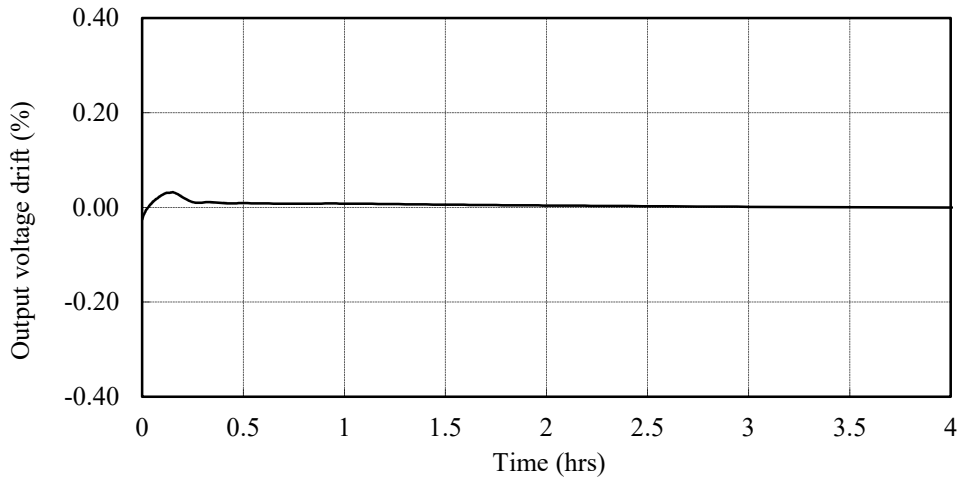
Warm up voltage drift characteristics

Conditions V_{in} : 100 VAC

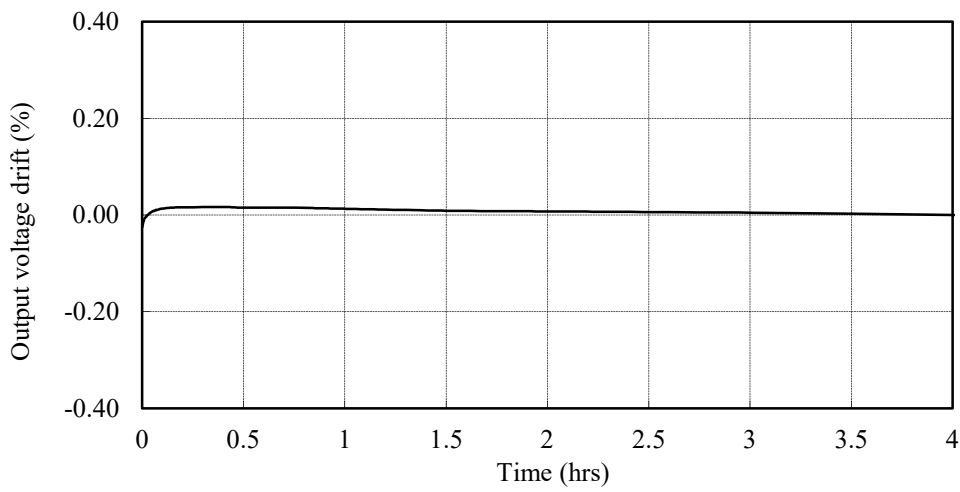
I_{out} : 100 %

T_a : 25 °C

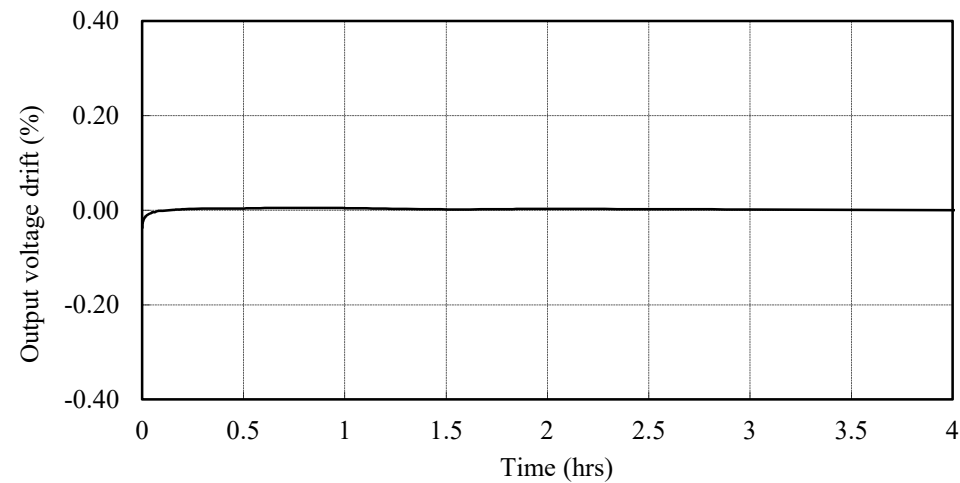
24V



36V



48V



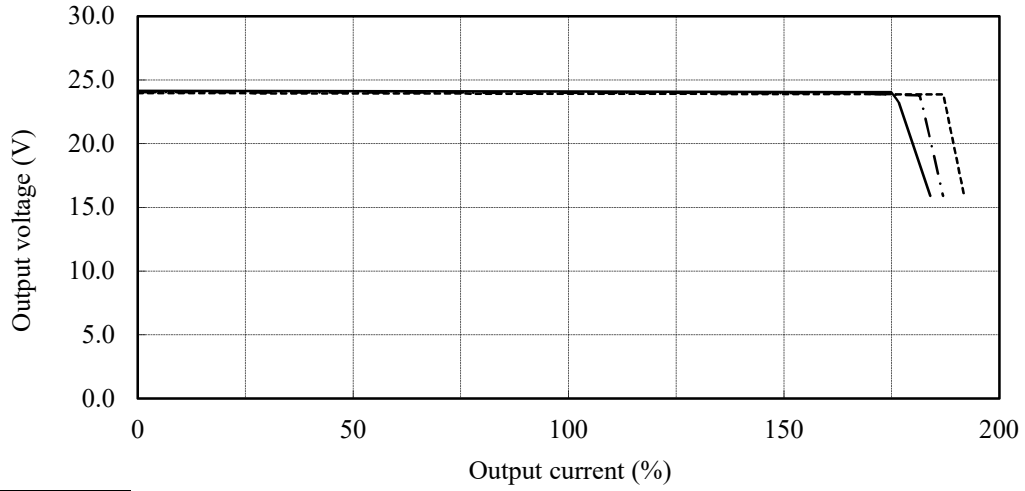
2.3 過電流保護特性

Over current protection (OCP) characteristics

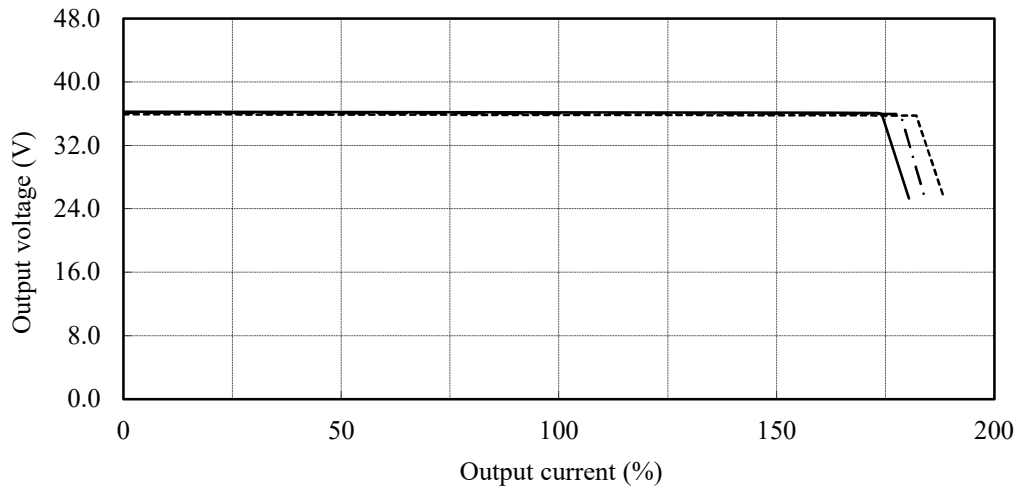
Conditions V_{in} : 100 VAC

T_a : -10 °C -----
 25 °C - · - · -
 50 °C ———

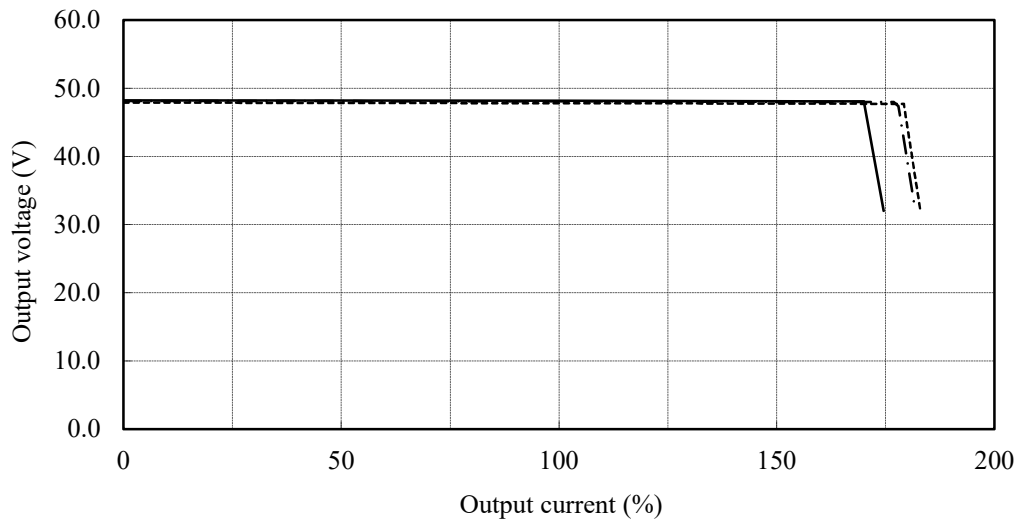
24V



36V



48V



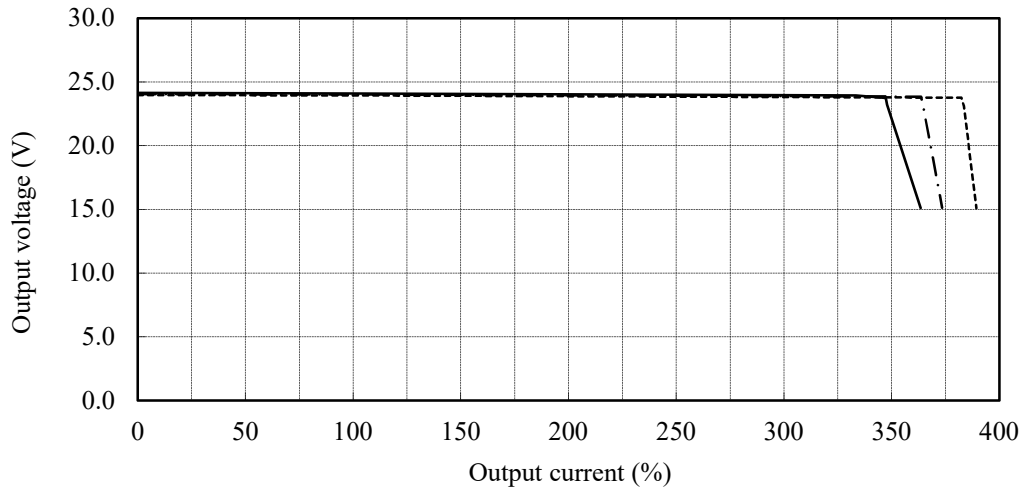
2.3 過電流保護特性

Over current protection (OCP) characteristics

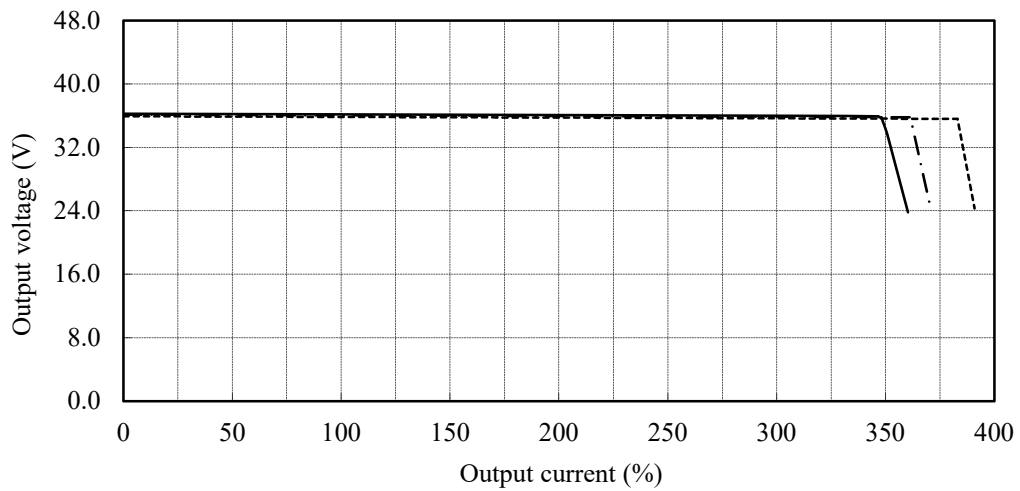
Conditions V_{in} : 200 VAC

T_a : -10 °C -----
 25 °C - · - · -
 50 °C ———

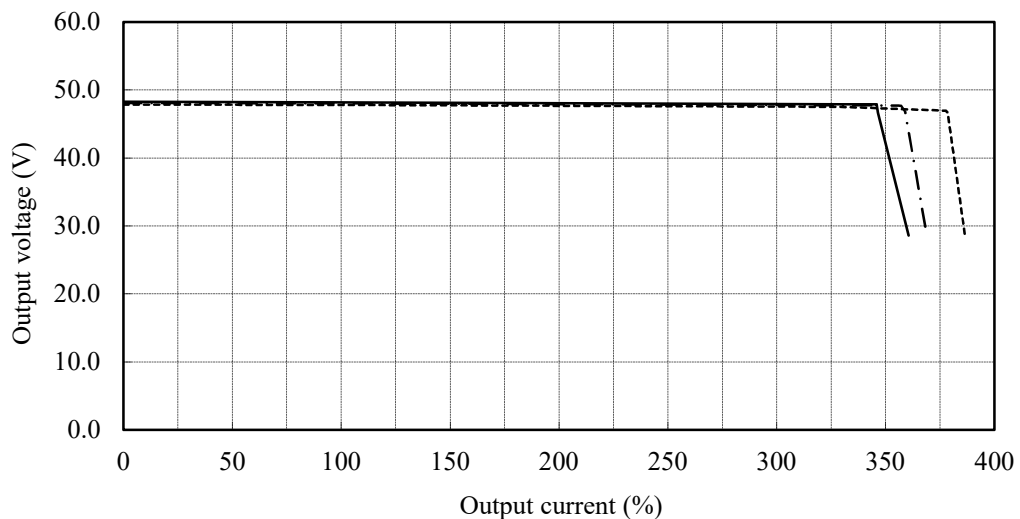
24V



36V



48V



2.4 過電圧保護特性

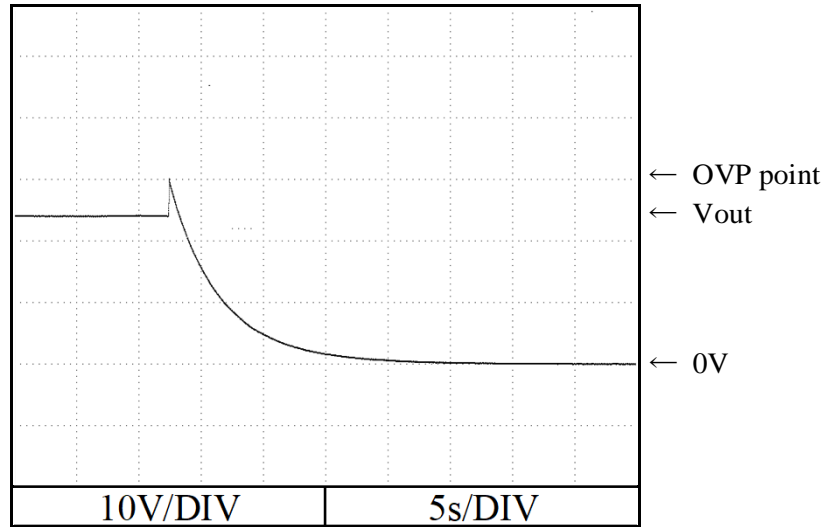
Over voltage protection (OVP) characteristics

Conditions Vin : 100 VAC

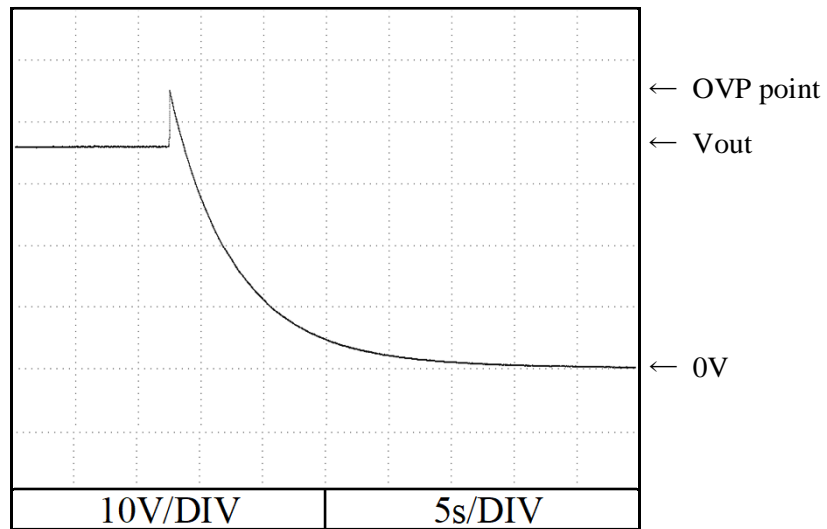
Iout : 0 %

Ta : 25 °C

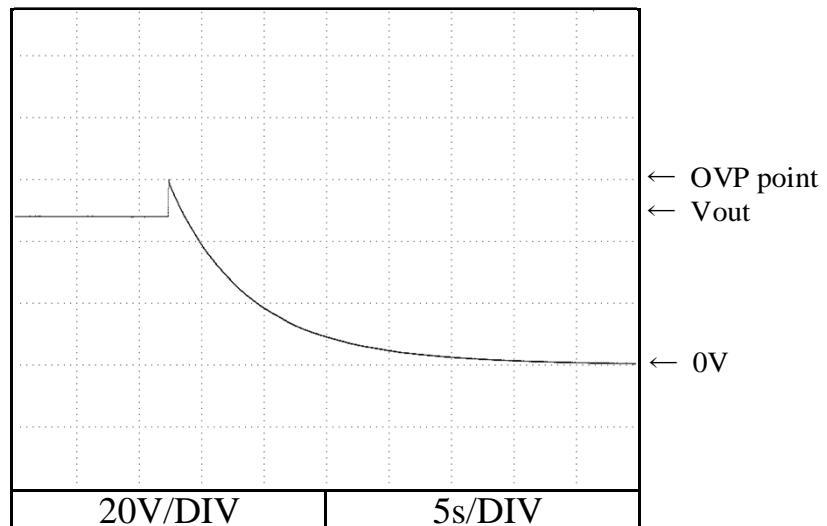
24V



36V



48V



2.5 出力立ち上がり特性

Output rise characteristics

Condition Vin : 85 VAC (A)

100 VAC (B)

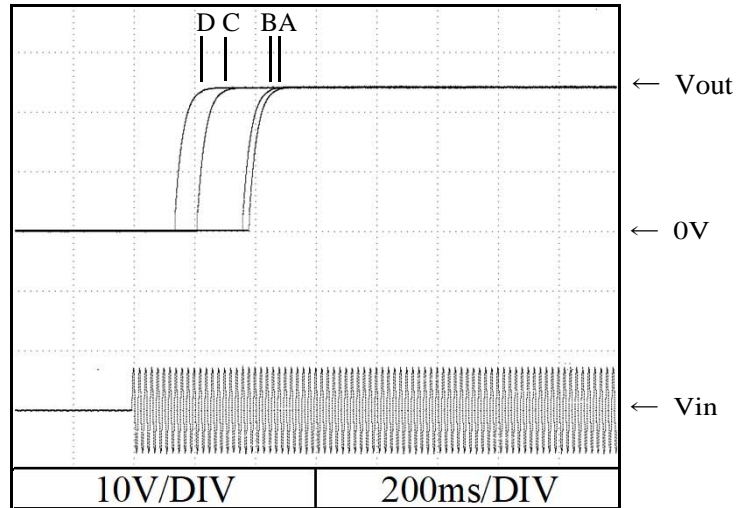
200 VAC (C)

265 VAC (D)

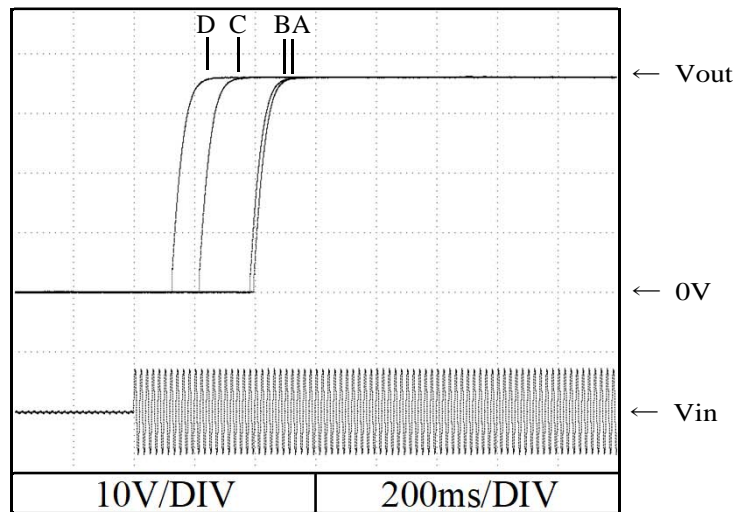
Iout : 0 %

Ta : 25 °C

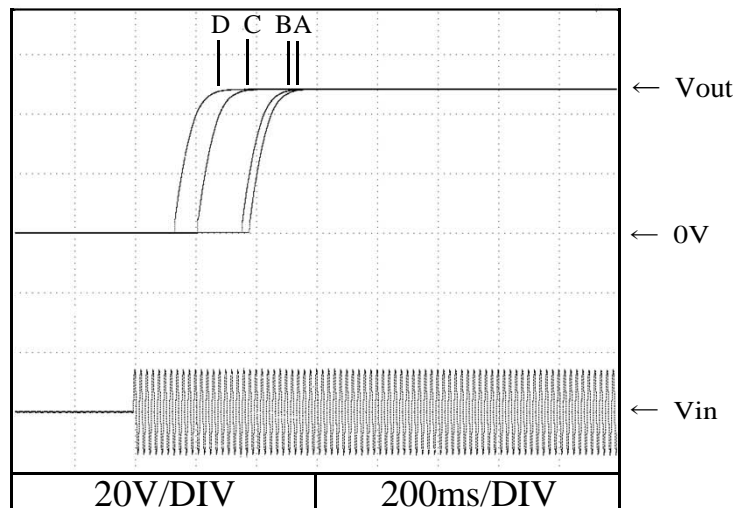
24V



36V



48V



2.5 出力立ち上がり特性

Output rise characteristics

Condition Vin : 85 VAC (A)

100 VAC (B)

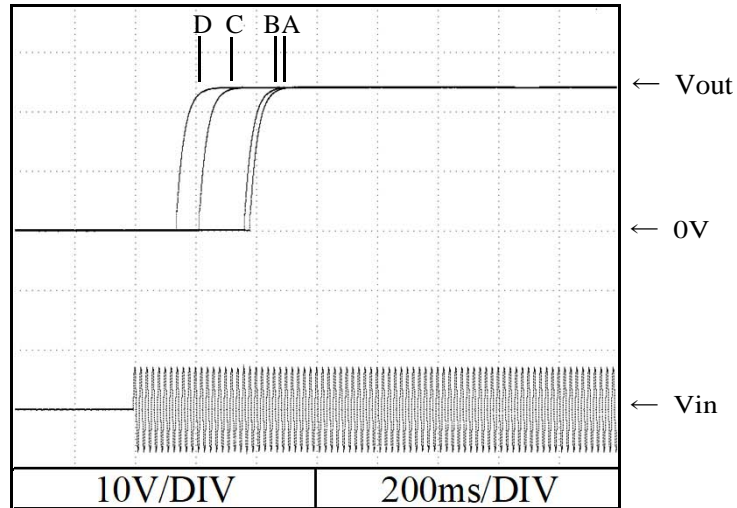
200 VAC (C)

265 VAC (D)

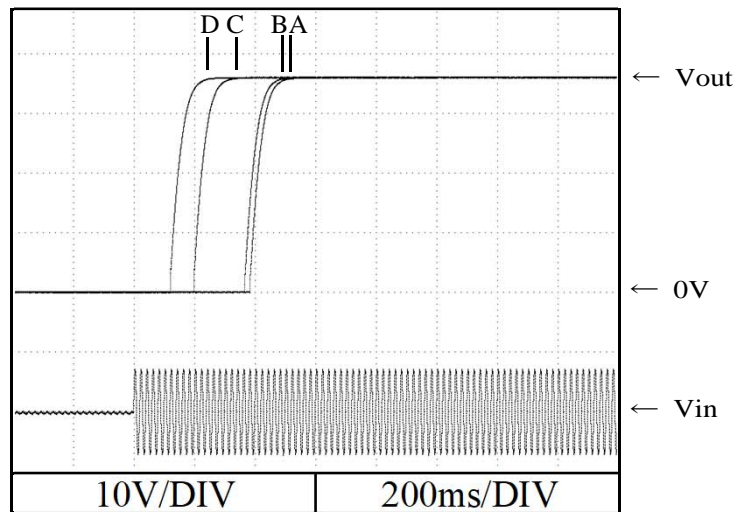
Iout : 100 %

Ta : 25 °C

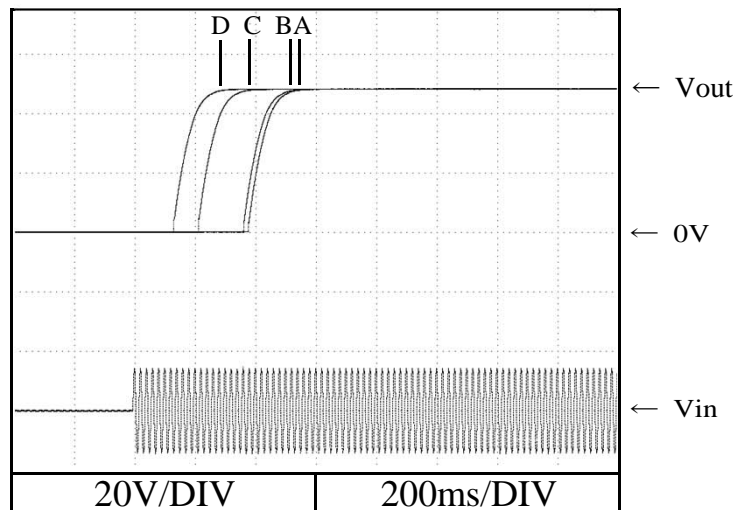
24V



36V



48V

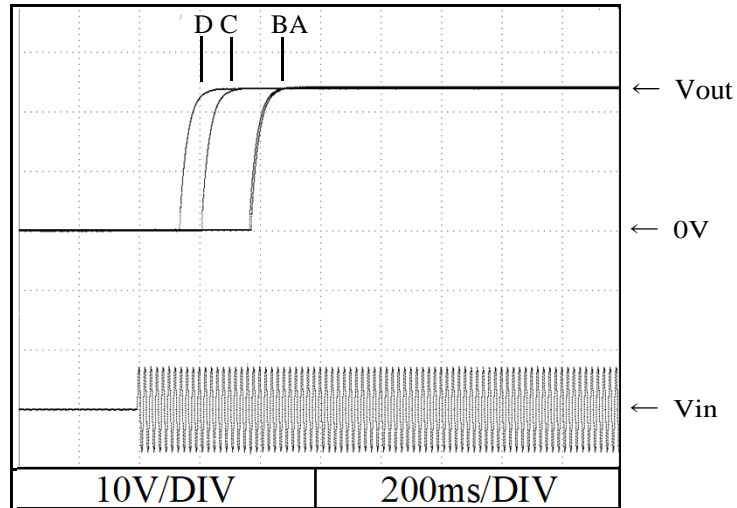


2.5 出力立ち上がり特性

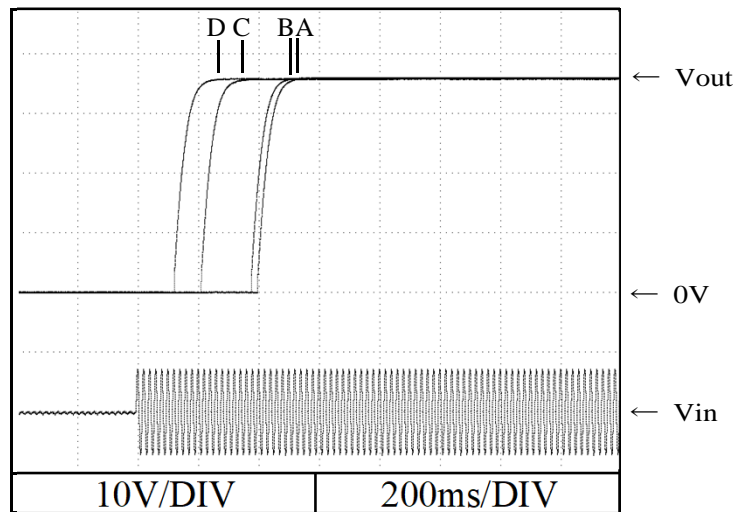
Output rise characteristics

Condition Vin : 85 VAC (A)
 100 VAC (B)
 200 VAC (C)
 265 VAC (D)
 Iout : Peak load
 Ta : 25 °C

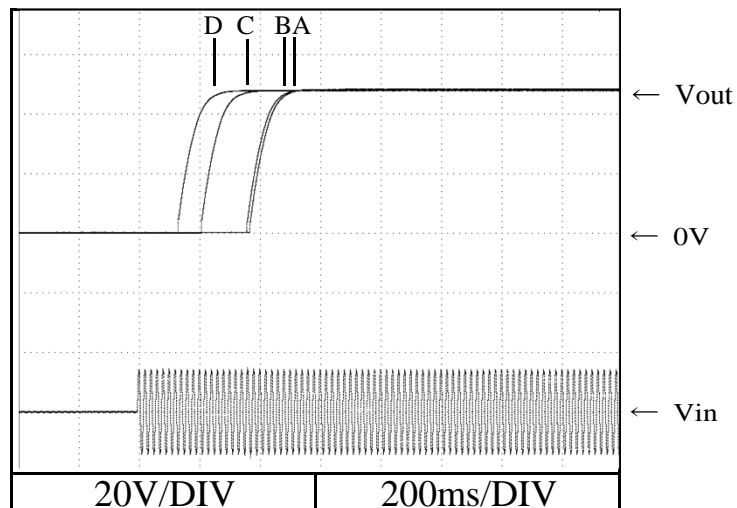
24V



36V



48V



2.6 出力立ち下がり特性

Output fall characteristics

Conditions Vin : 85 VAC (A)

100 VAC (B)

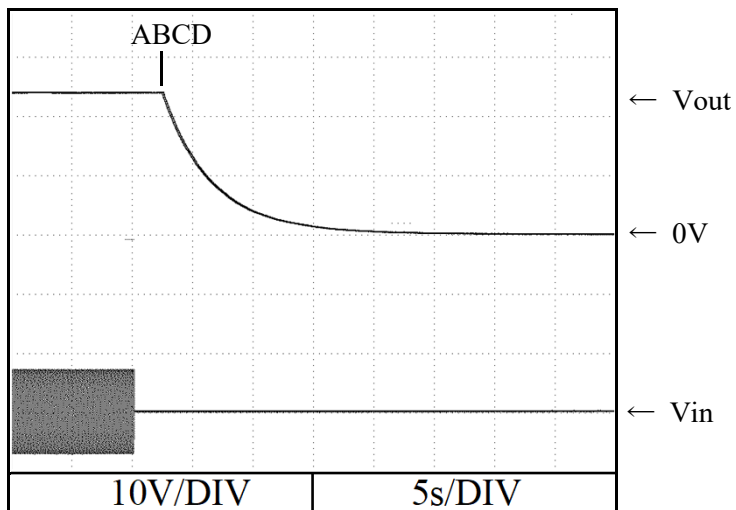
200 VAC (C)

265 VAC (D)

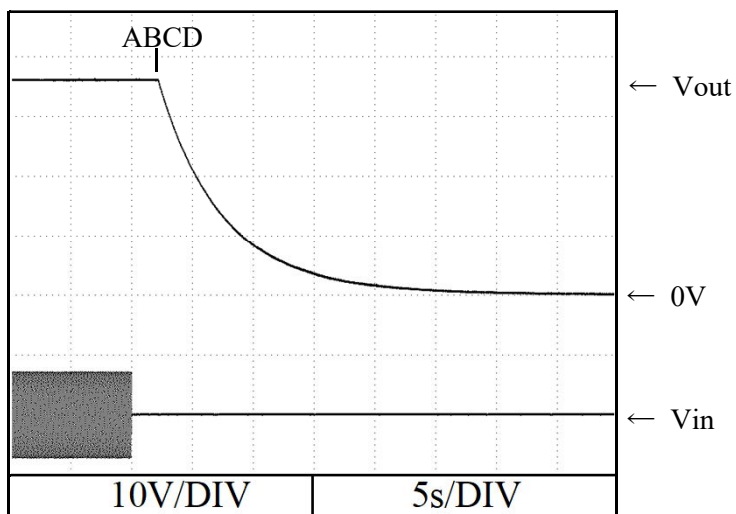
Iout : 0 %

Ta : 25 °C

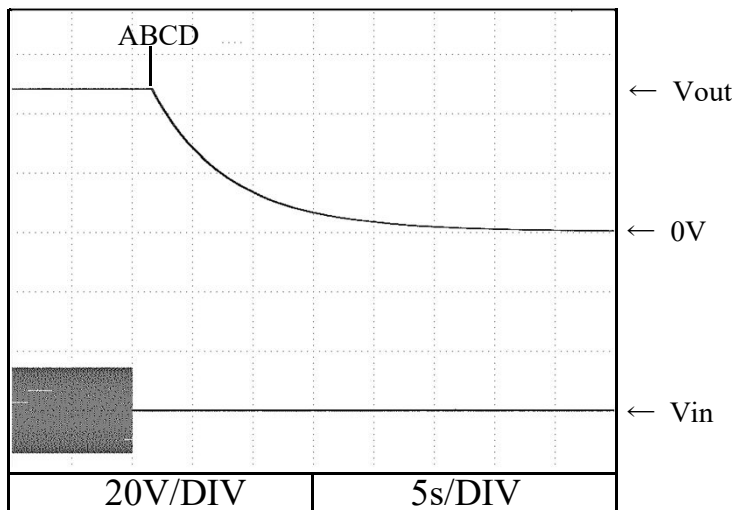
24V



36V



48V



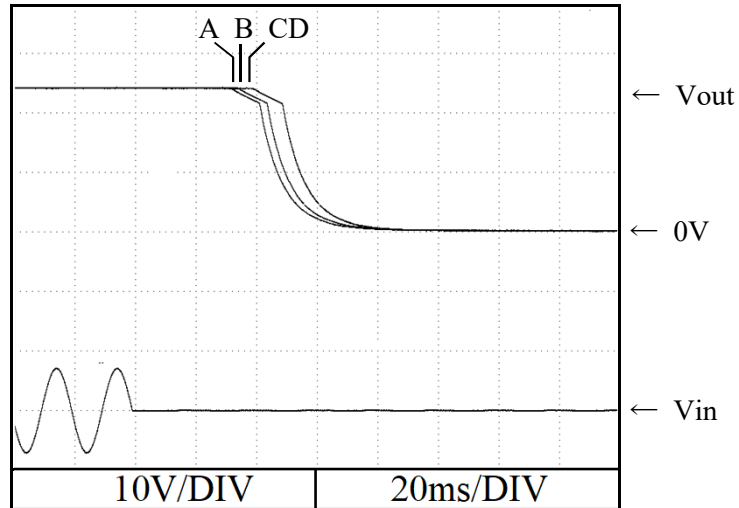
2.6 出力立ち下がり特性

Output fall characteristics

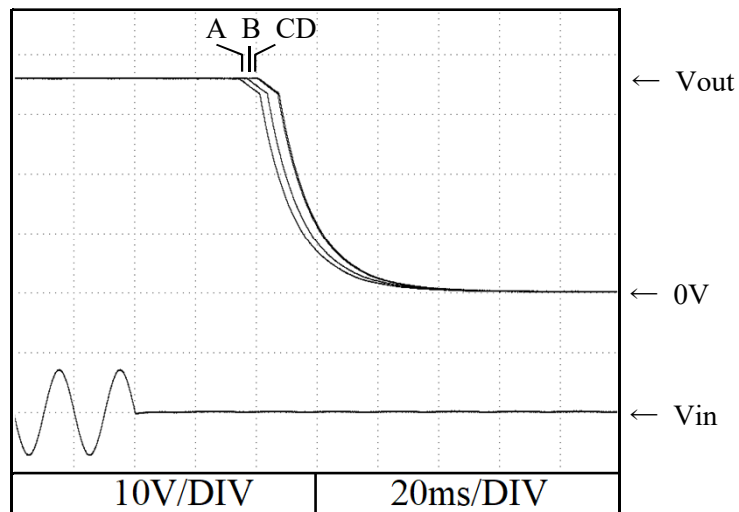
Conditions Vin : 85 VAC (A)
 100 VAC (B)
 200 VAC (C)
 265 VAC (D)

Iout : 100 %
 Ta : 25 °C

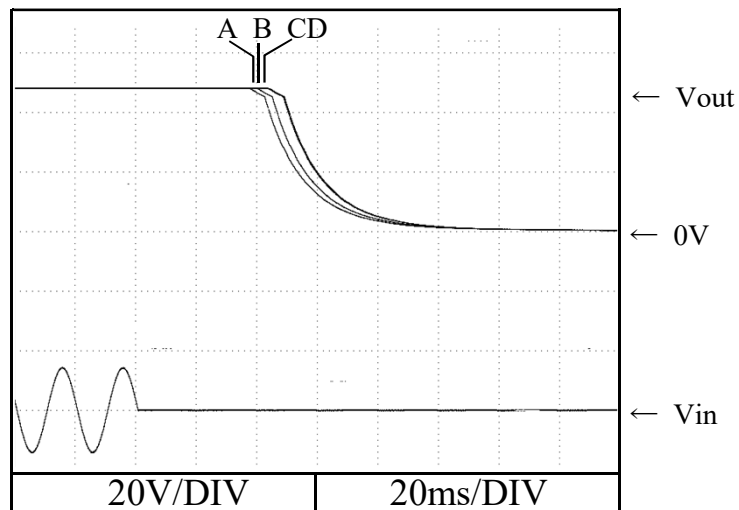
24V



36V



48V



2.7 ON/OFFコントロール時出力立ち上がり特性

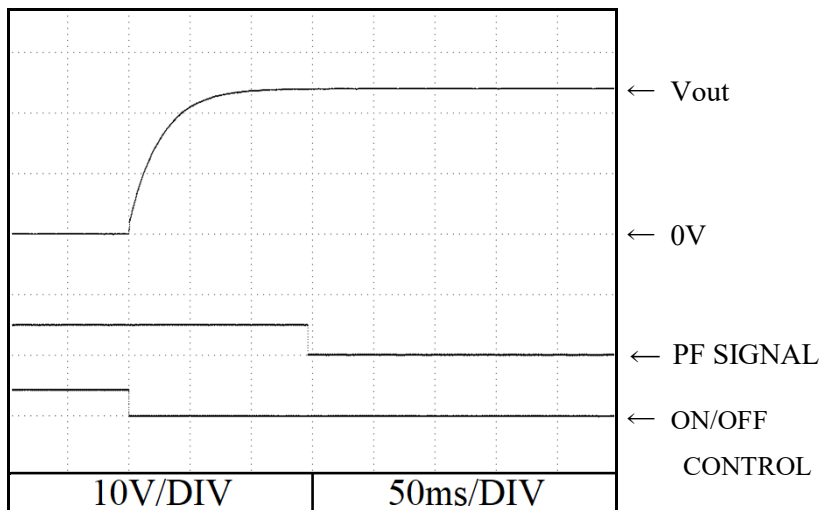
Output rise characteristics with ON/OFF Control

Conditions V_{in} : 100 VAC

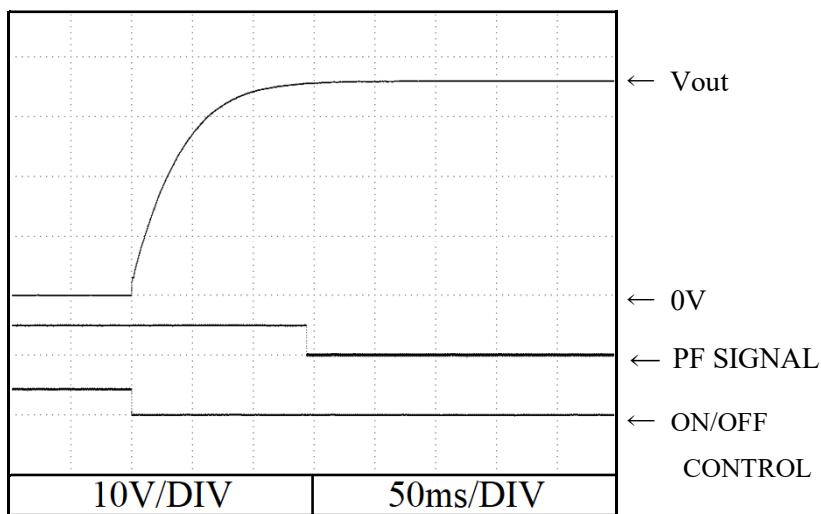
I_{out} : 100 %

T_a : 25 °C

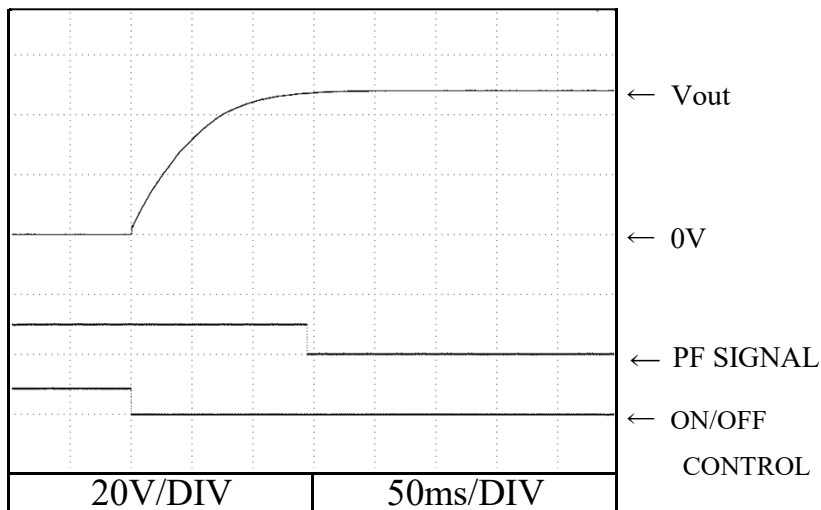
24V



36V



48V



2.8 ON/OFFコントロール時出力立ち下がり特性

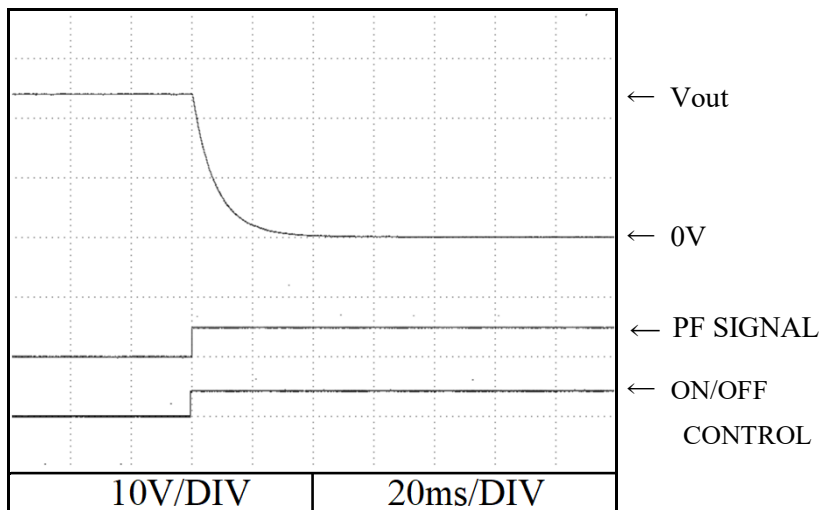
Output fall characteristics with ON/OFF Control

Conditions V_{in} : 100 VAC

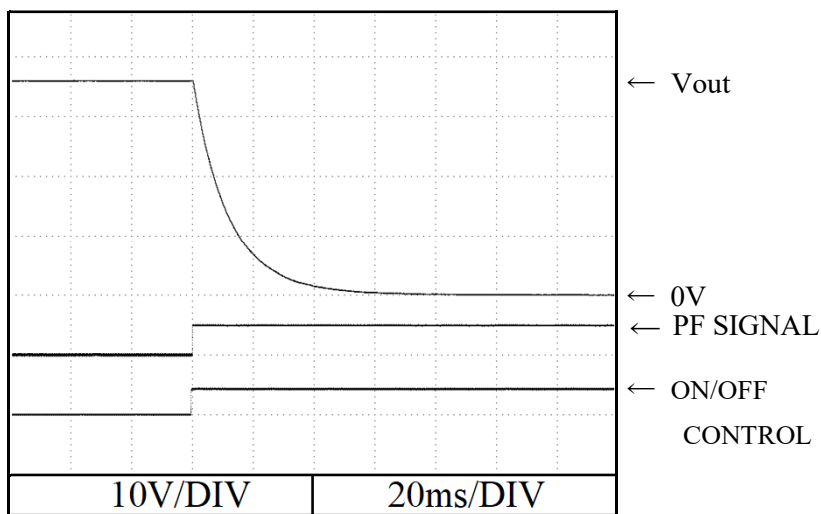
I_{out} : 100 %

T_a : 25 °C

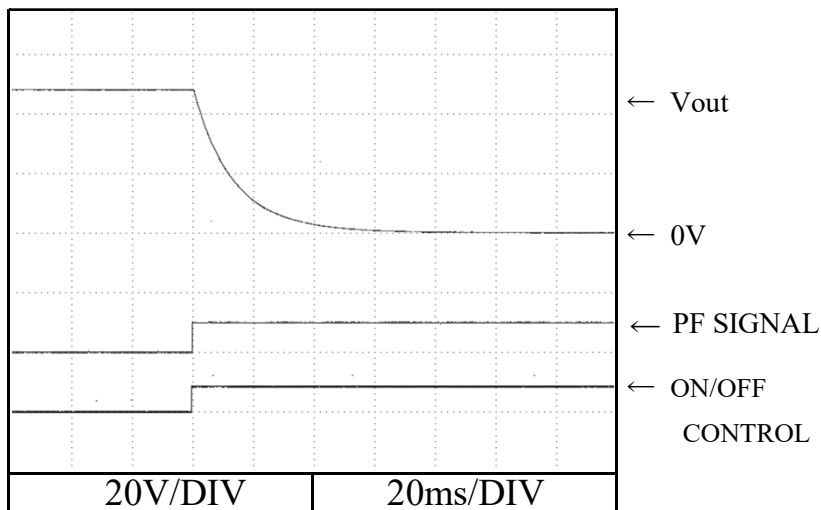
24V



36V



48V

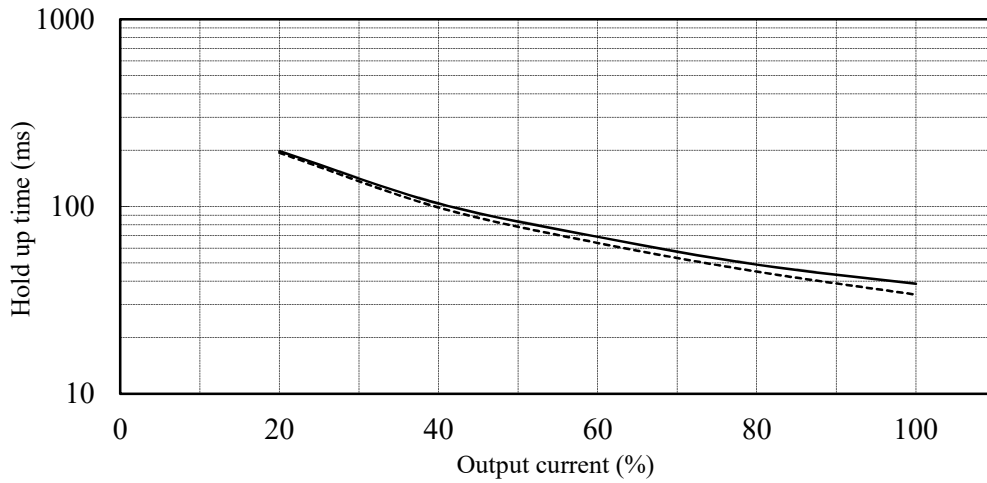


2.9 出力保持時間特性

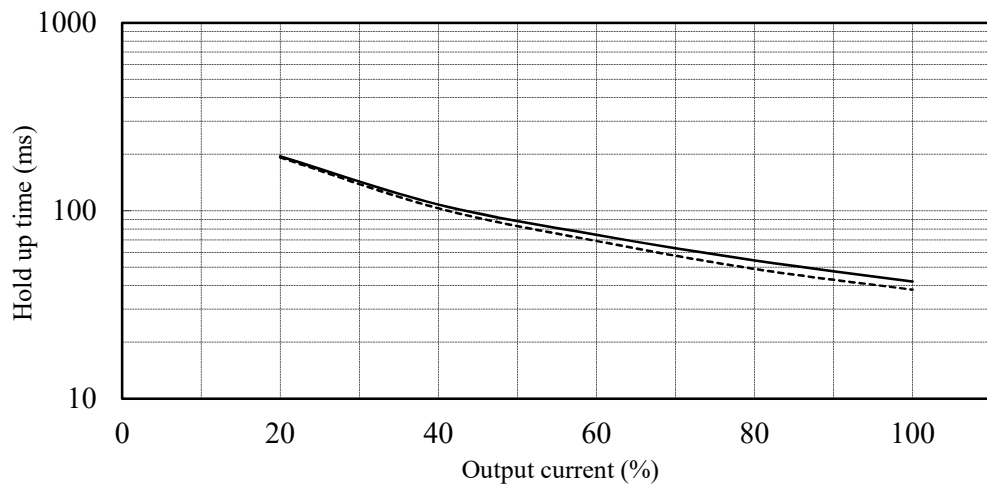
Hold up time characteristics

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

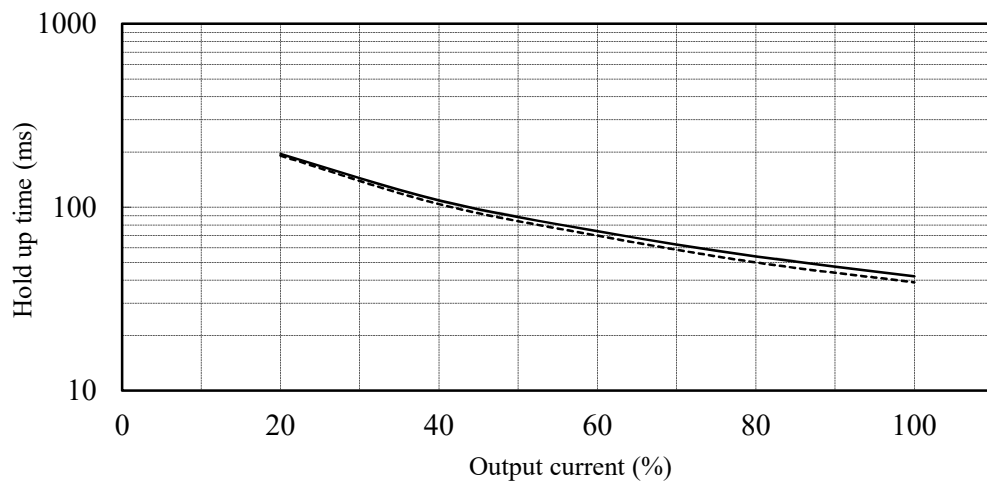
24V



36V



48V

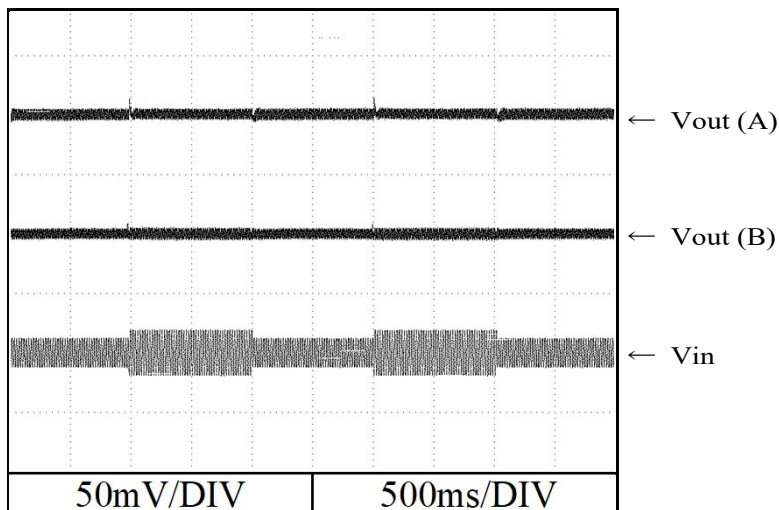


2.10 過渡応答(入力急変)特性

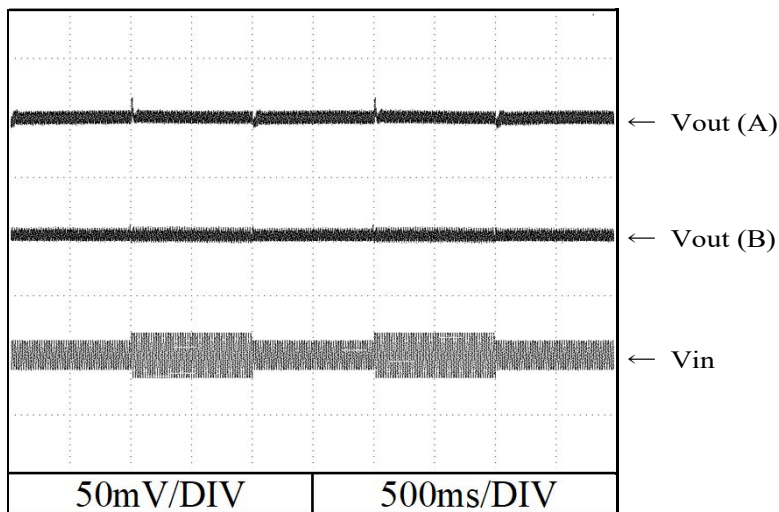
Dynamic line response characteristics

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

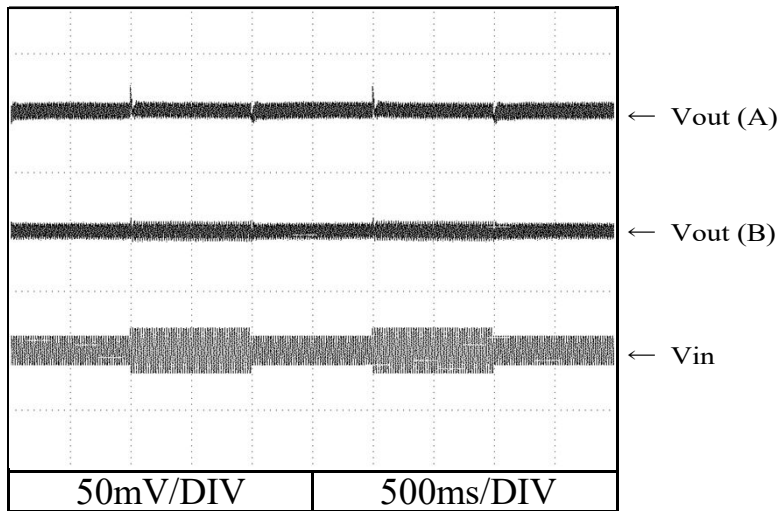
24V



36V



48V



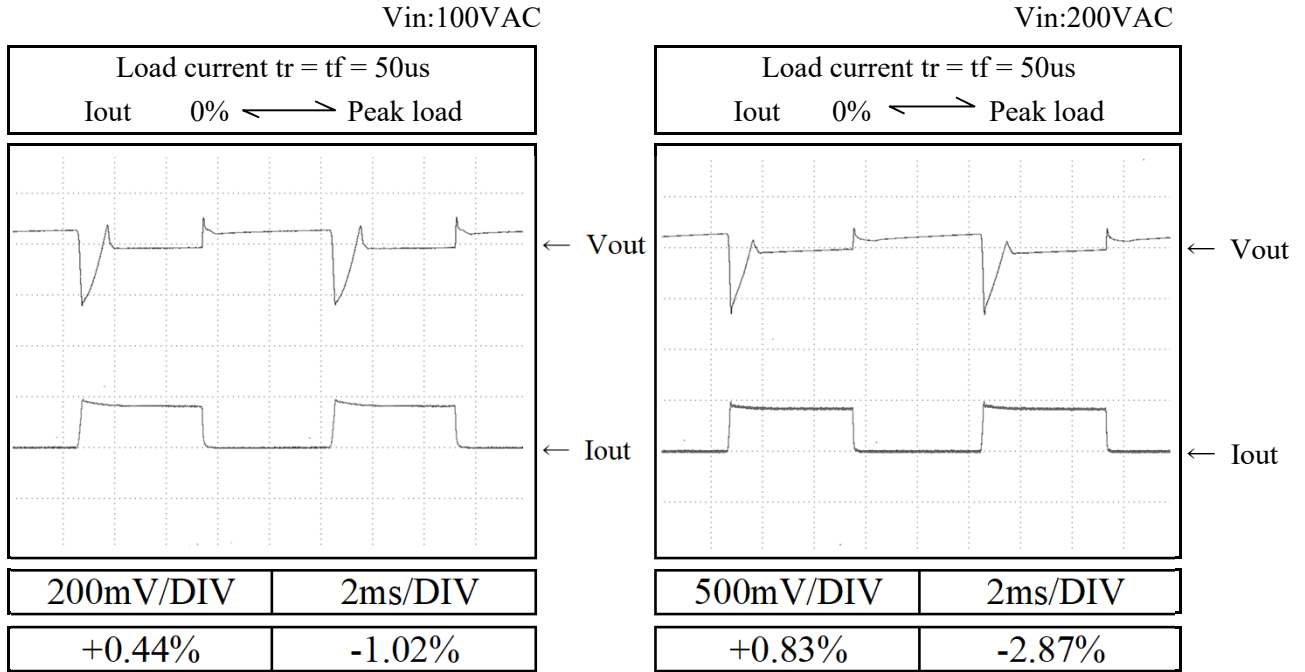
2.11 過渡応答(負荷急変)特性

Dynamic load response characteristics

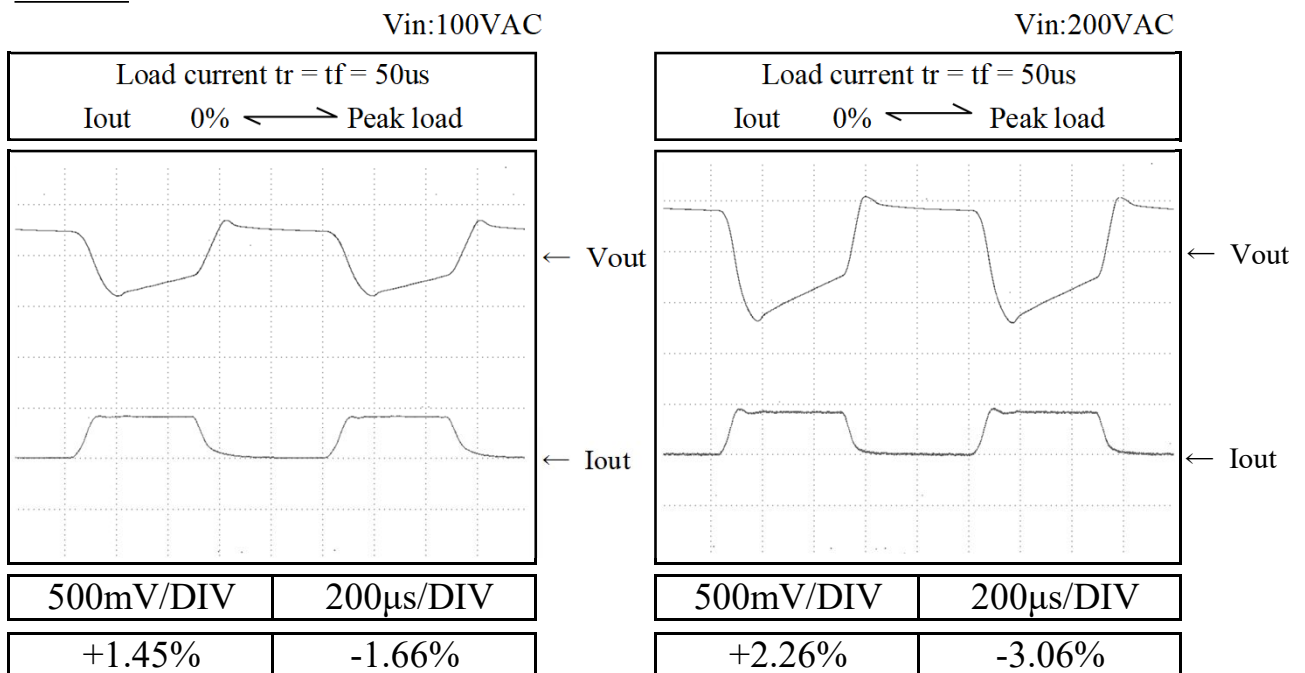
Conditions Ta : 25 °C

24V

f=100Hz



f=1kHz



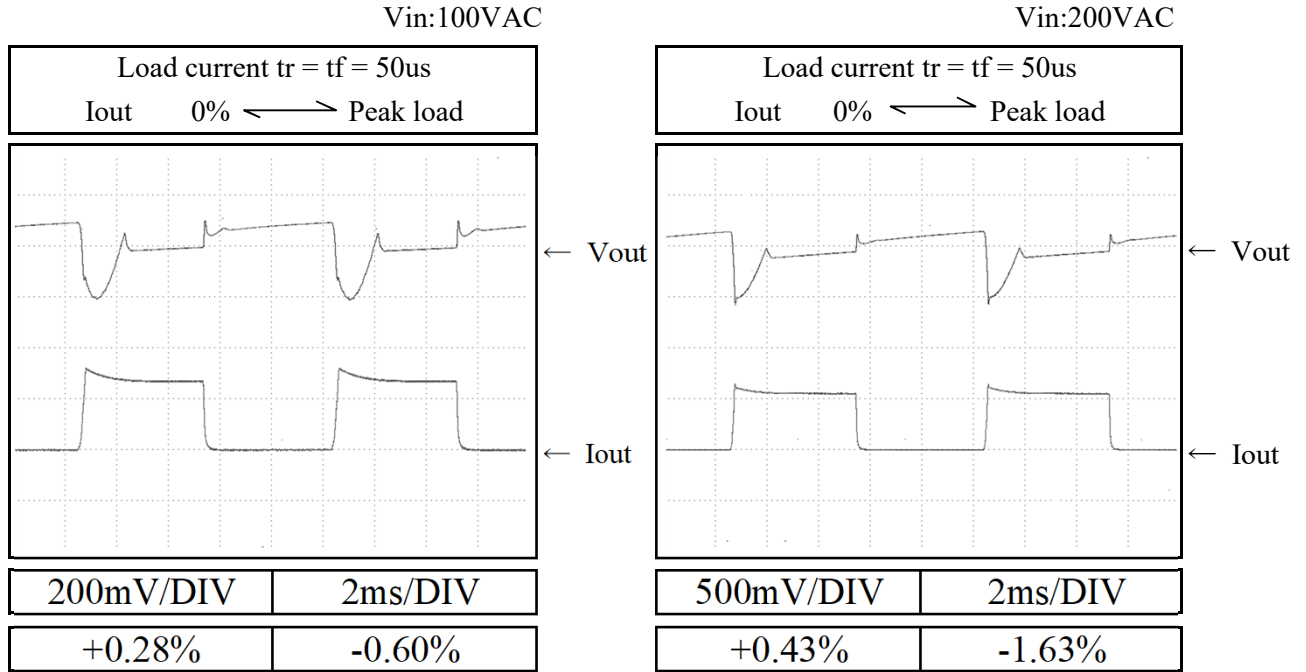
2.11 過渡応答(負荷急変)特性

Dynamic load response characteristics

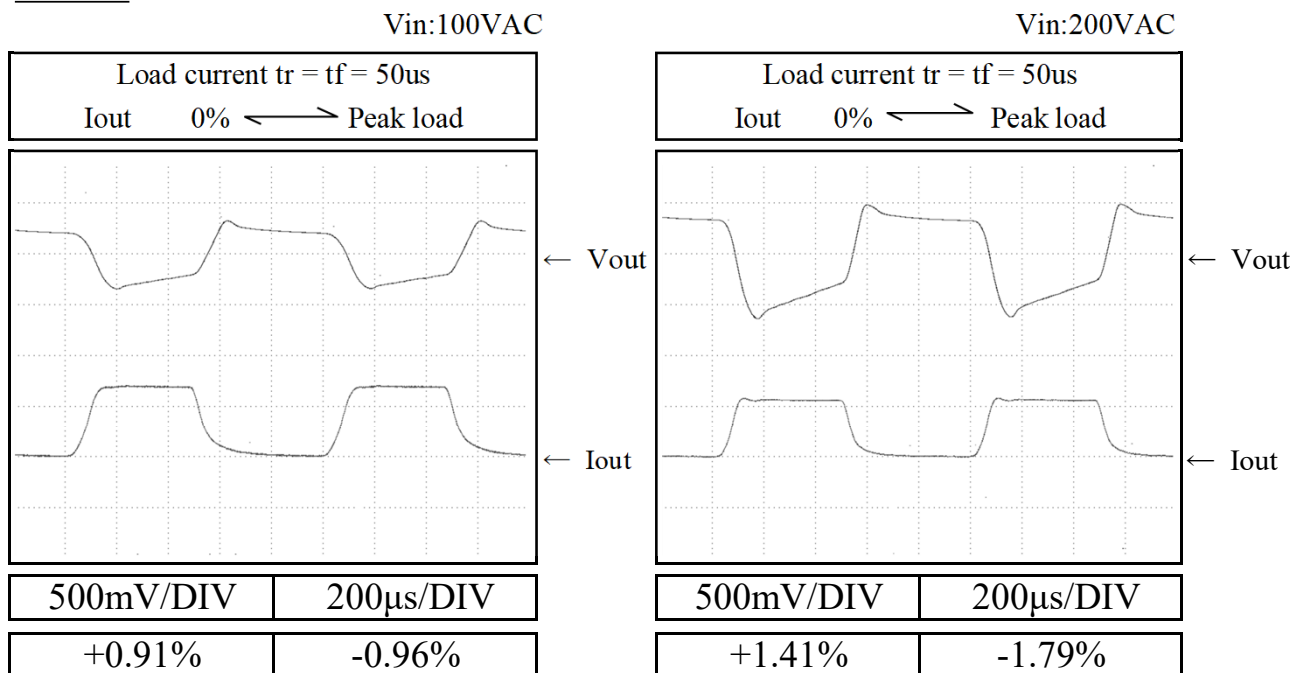
Conditions Ta : 25 °C

36V

f=100Hz



f=1kHz



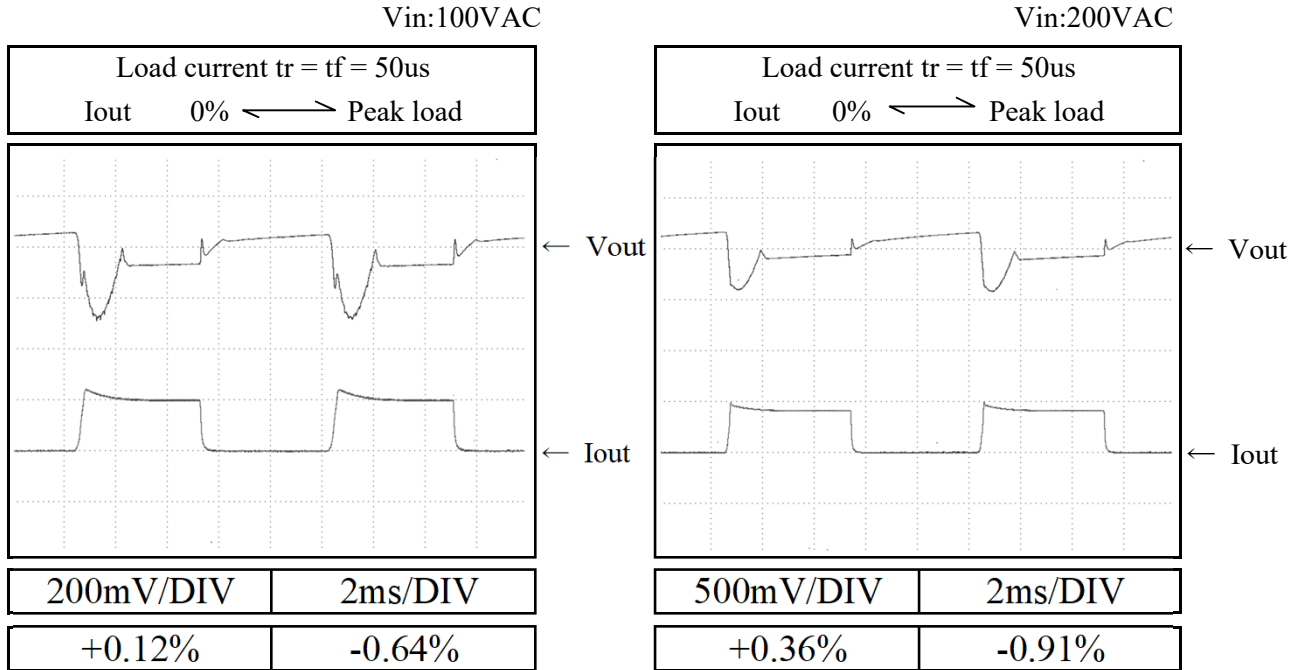
2.11 過渡応答(負荷急変)特性

Dynamic load response characteristics

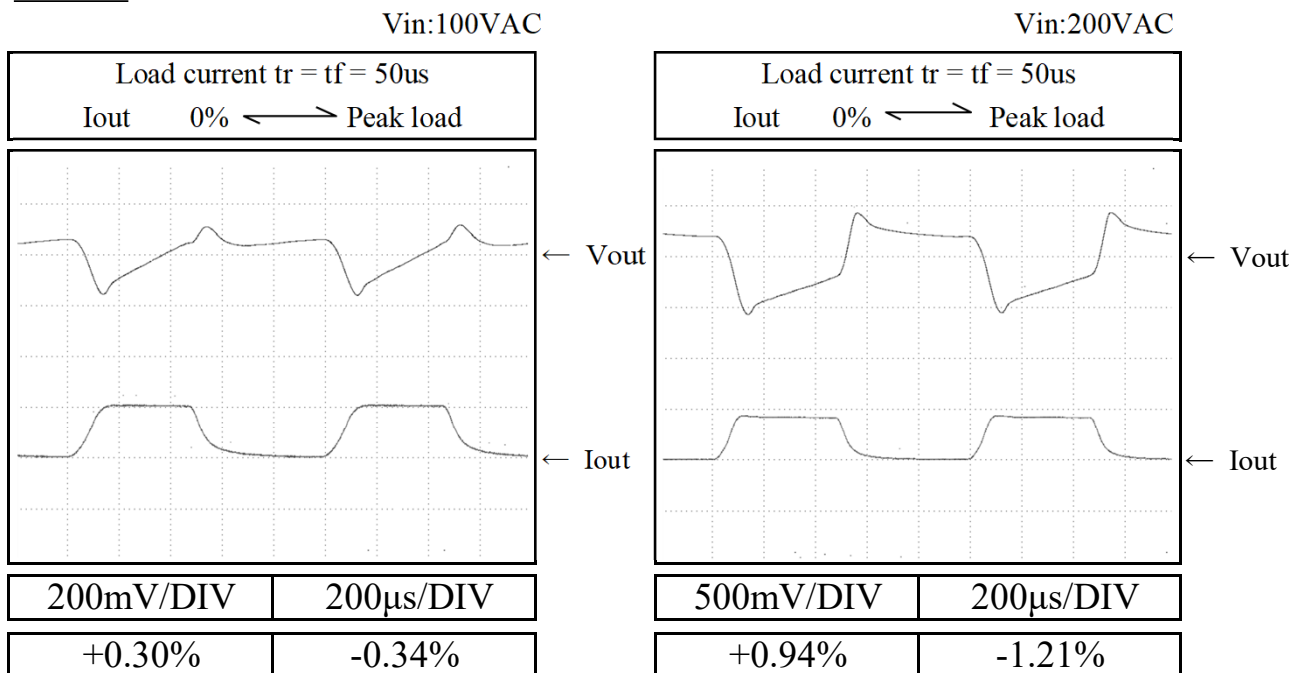
Conditions Ta : 25 °C

48V

f=100Hz



f=1kHz



2.12 入力電圧瞬停特性

Response to brown out characteristics

Conditions V_{in} : 100 VAC

I_{out} : 100 %

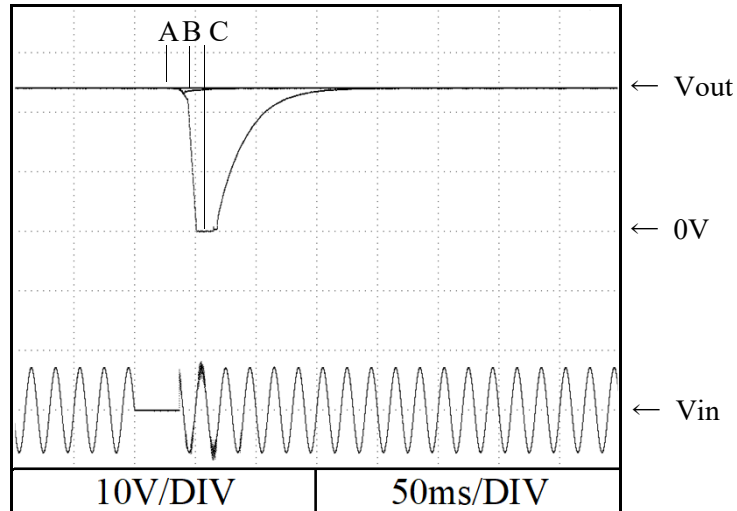
T_a : 25 °C

24V

A = 35ms

B = 38ms

C = 39ms

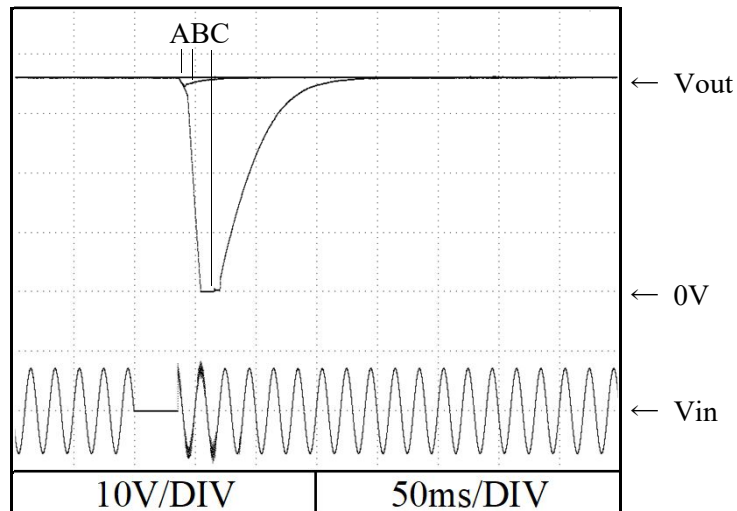


36V

A = 37ms

B = 38ms

C = 39ms

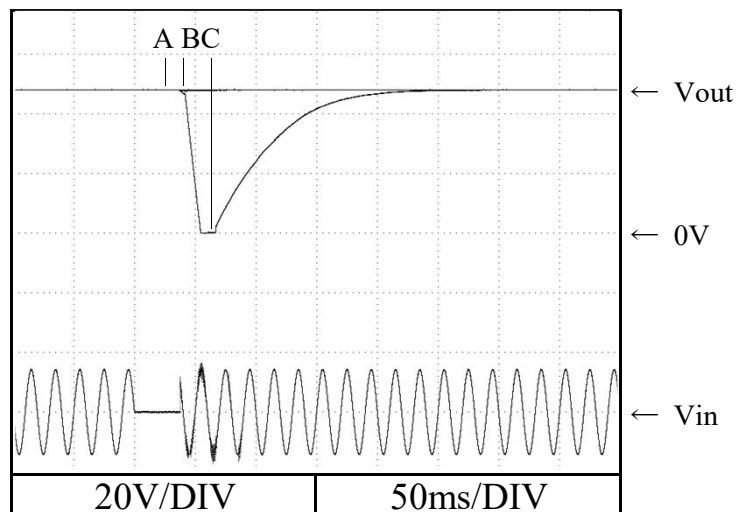


48V

A = 37ms

B = 38ms

C = 39ms



2.12 入力電圧瞬停特性

Response to brown out characteristics

Conditions V_{in} : 200 VAC

I_{out} : 100 %

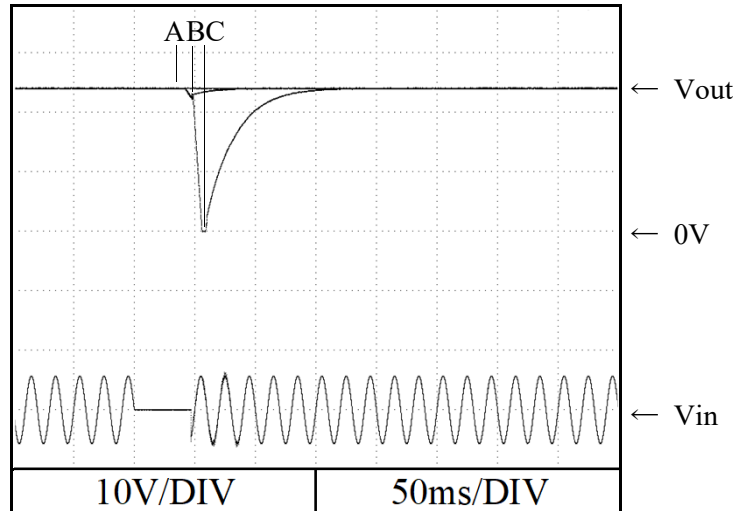
T_a : 25 °C

24V

A = 38ms

B = 47ms

C = 48ms

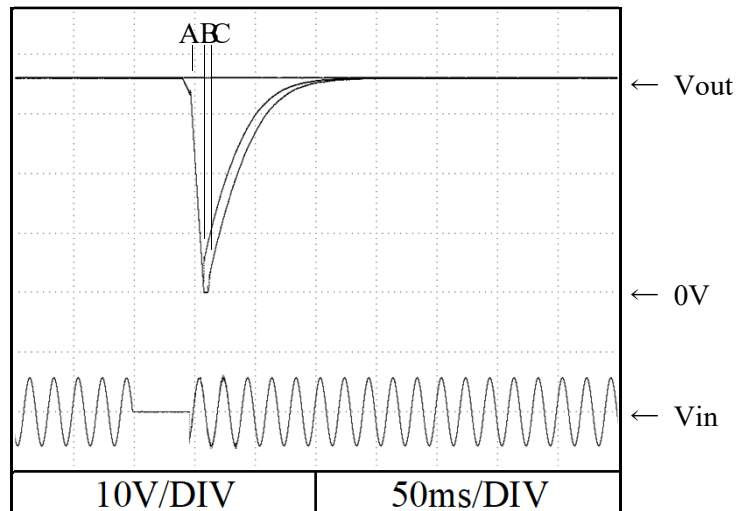


36V

A = 42ms

B = 47ms

C = 48ms

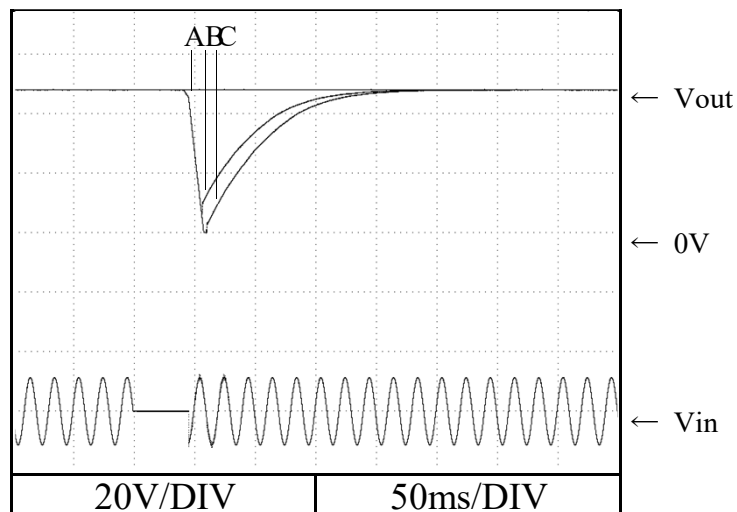


48V

A = 43ms

B = 48ms

C = 49ms

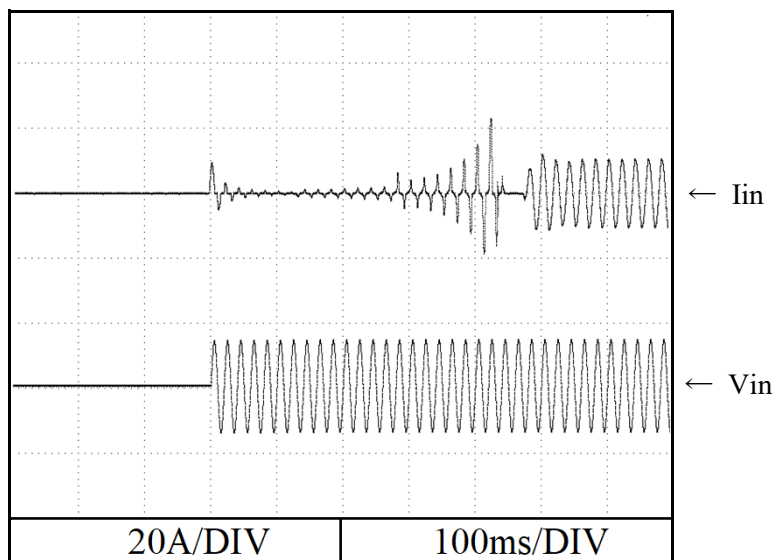


2.13 入力サージ電流(突入電流)波形
Inrush current waveform

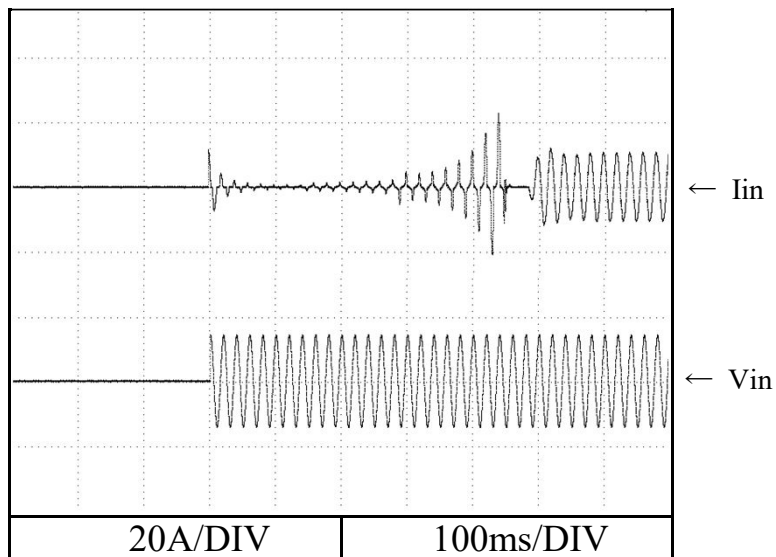
Conditions Vin : 100 VAC
Iout : 100 %
Ta : 25 °C

24V

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



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

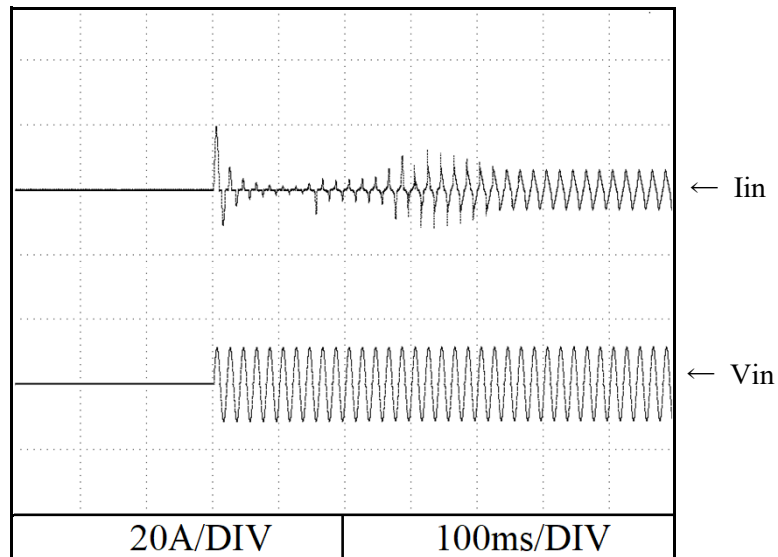


2.13 入力サージ電流(突入電流)波形
Inrush current waveform

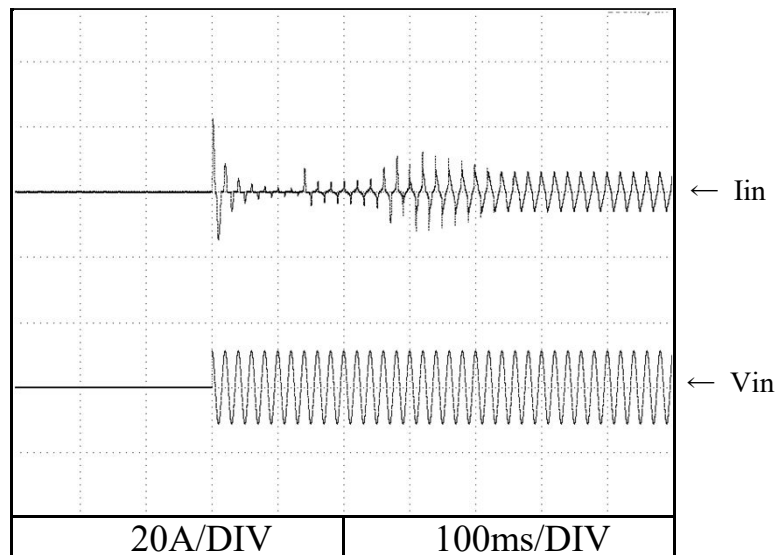
Conditions Vin : 200 VAC
Iout : 100 %
Ta : 25 °C

24V

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

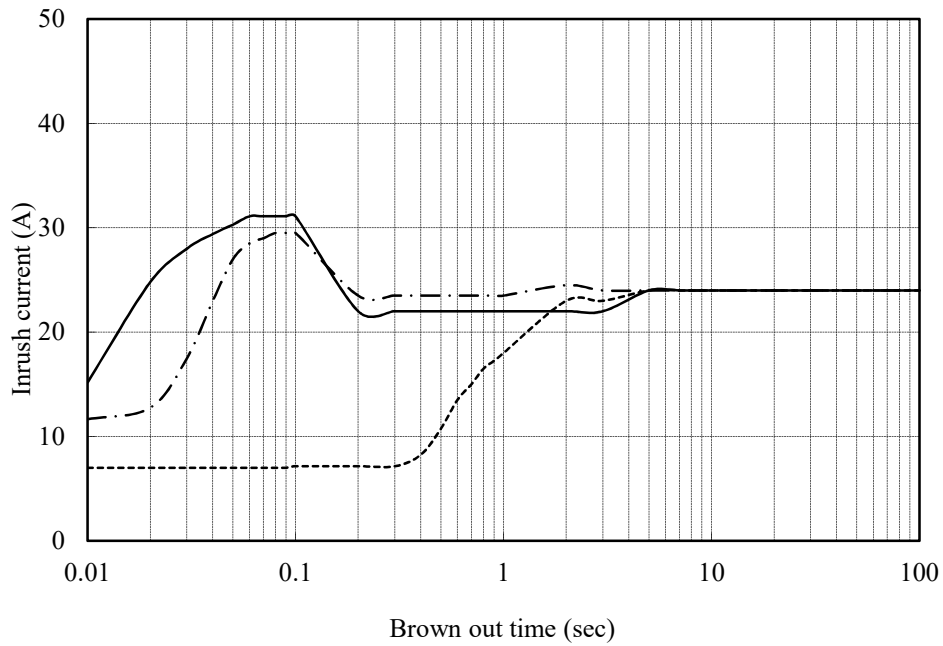
Inrush current characteristics

Conditions Iout : 0 % -----
 50 % - · - · -
 100 % ———

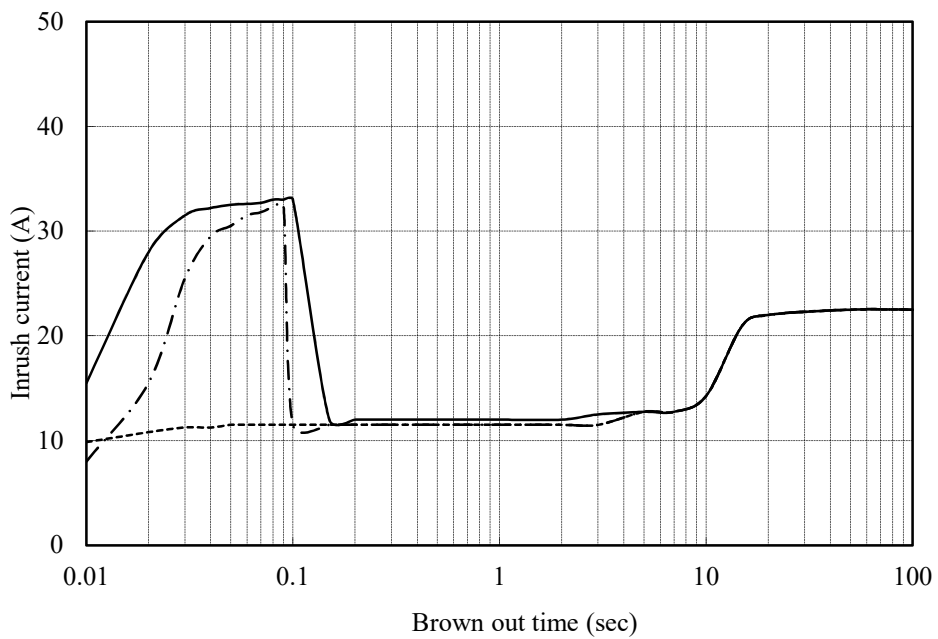
Ta : 25 °C

24V

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.

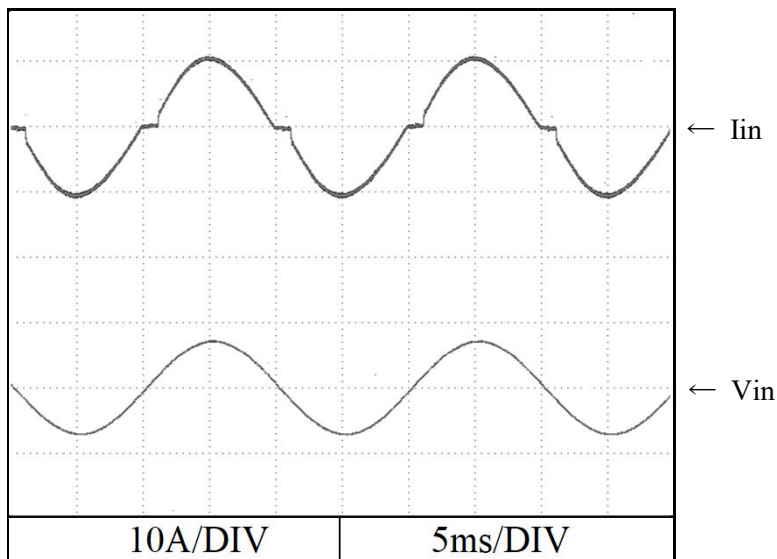
2.15 入力電流波形

Input current waveform

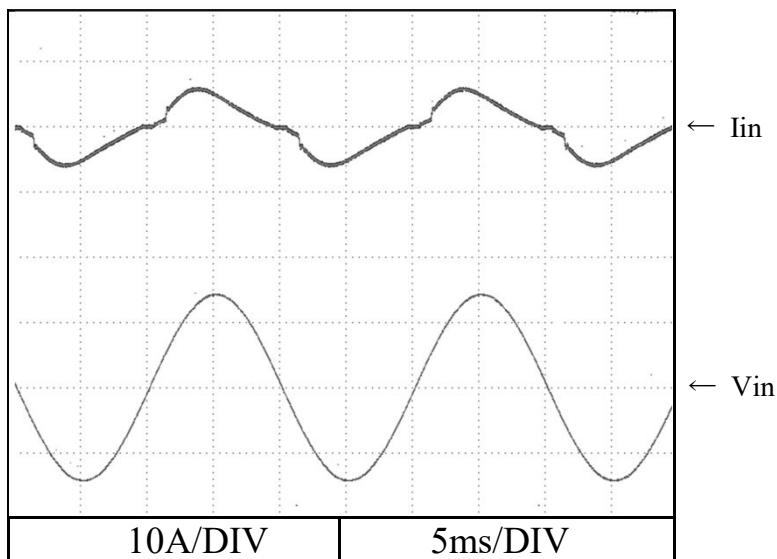
Conditions Iout : 100 %
Ta : 25 °C

24V

Vin : 100 VAC



Vin : 200 VAC

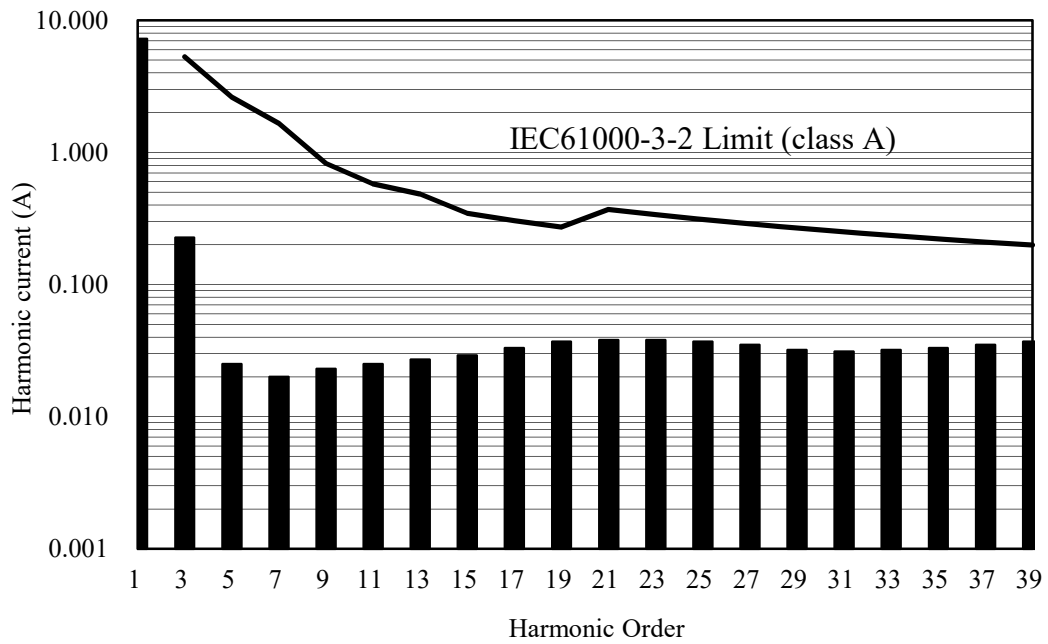


2.16 高調波成分

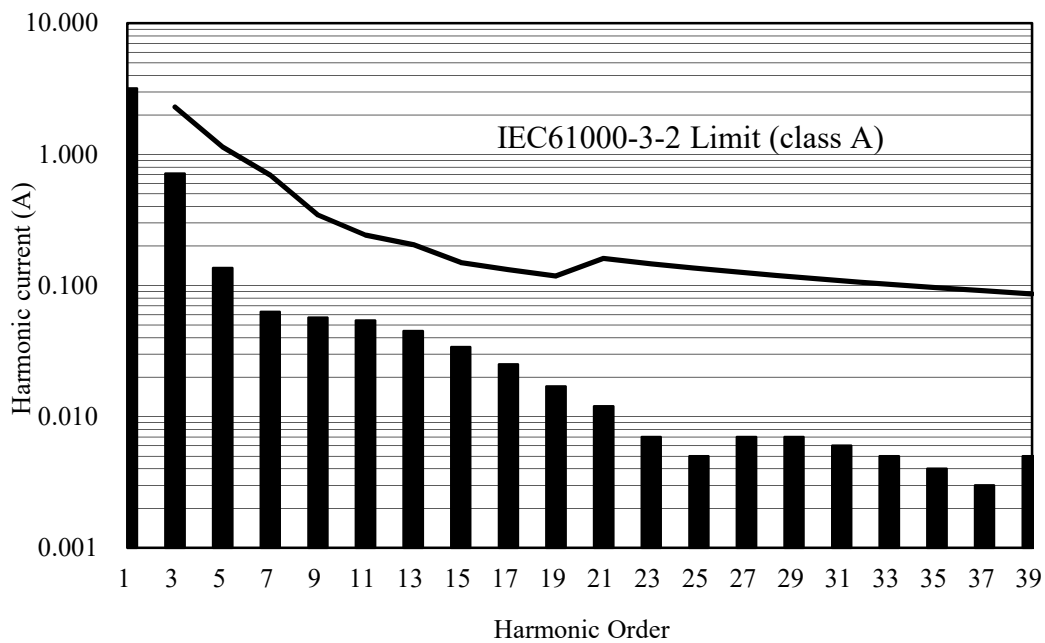
Input current harmonics

24V

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



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

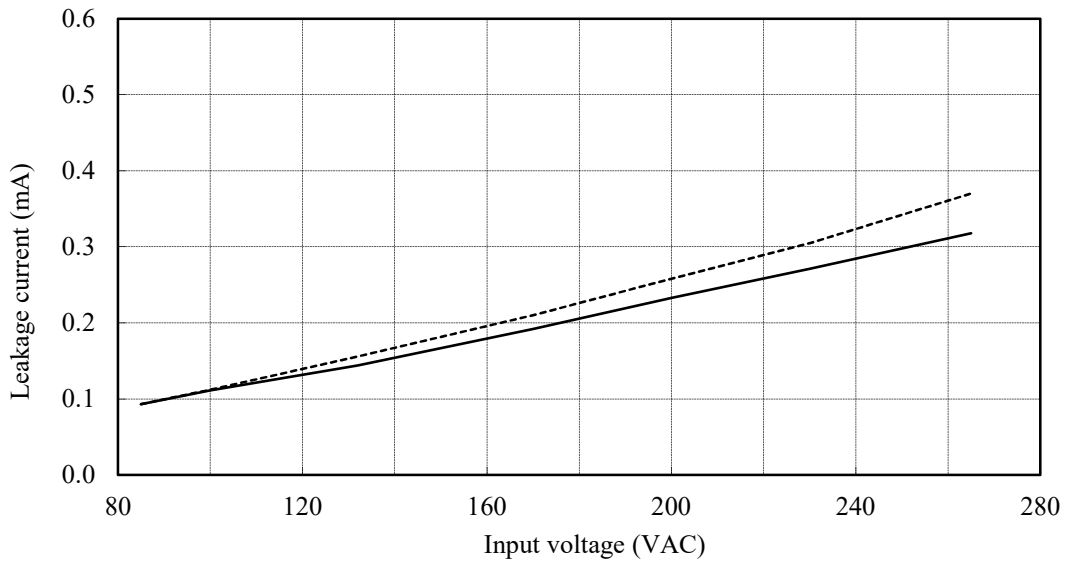


2.17 リーク電流特性
Leakage current characteristics

24V

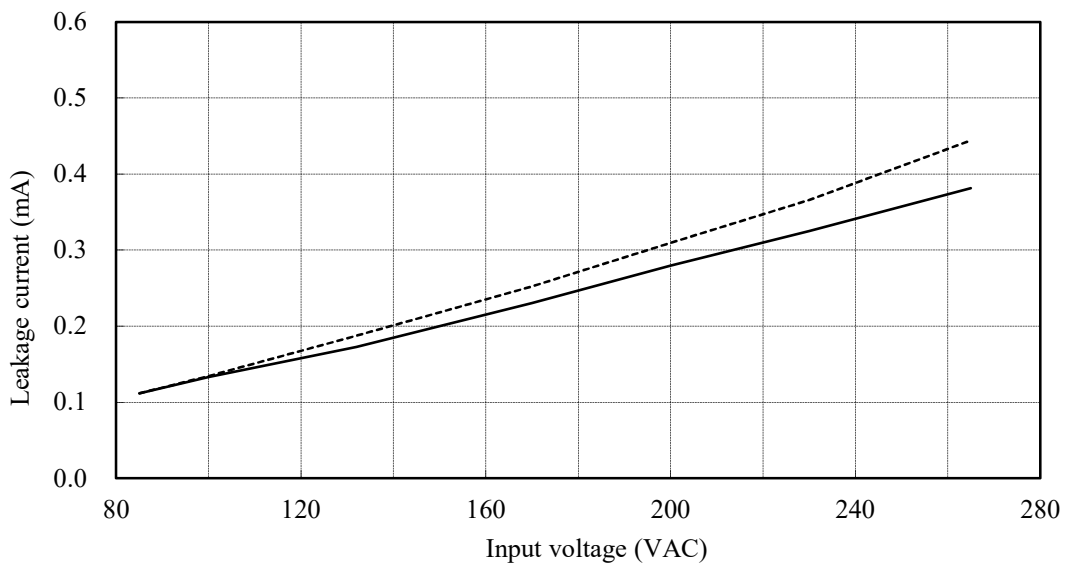
Conditions Iout : 0 % -----
 : 100 % —
 Ta : 25 °C
 f : 50 Hz

Equipment used : MODEL 3156 (HIOKI)



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

Equipment used : MODEL 3156 (HIOKI)



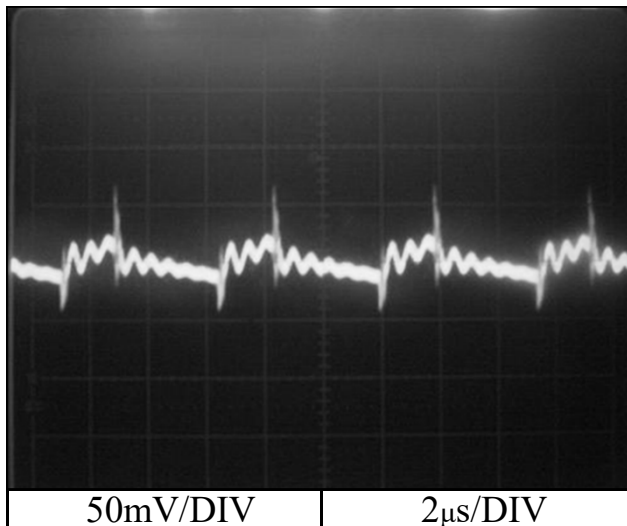
2.18 出力リップル、ノイズ波形

Output ripple and noise waveform

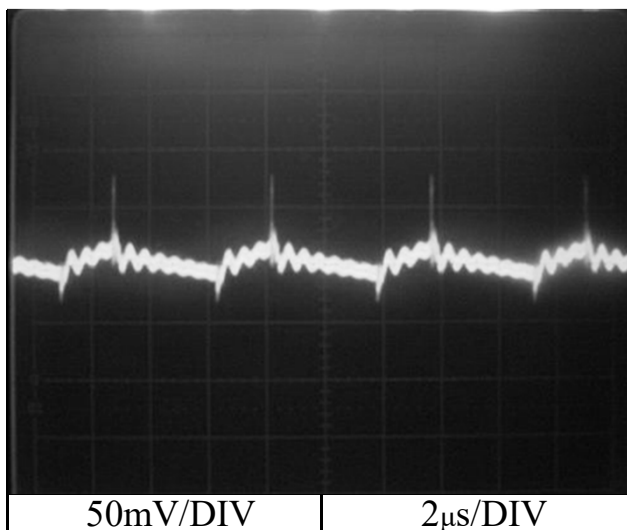
Conditions Vin : 200 VAC
Iout : 100 %
Ta : 25 °C

NORMAL MODE

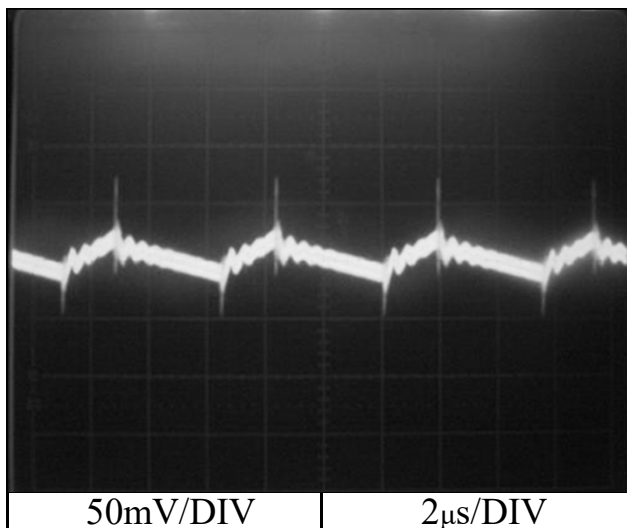
24V



36V



48V



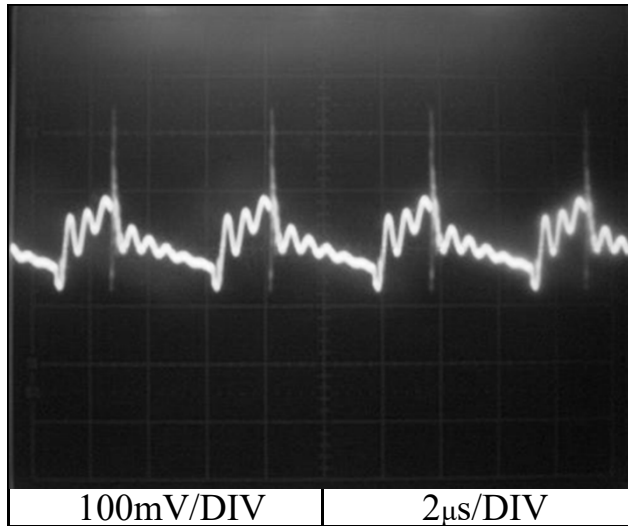
2.18 出力リップル、ノイズ波形

Output ripple and noise waveform

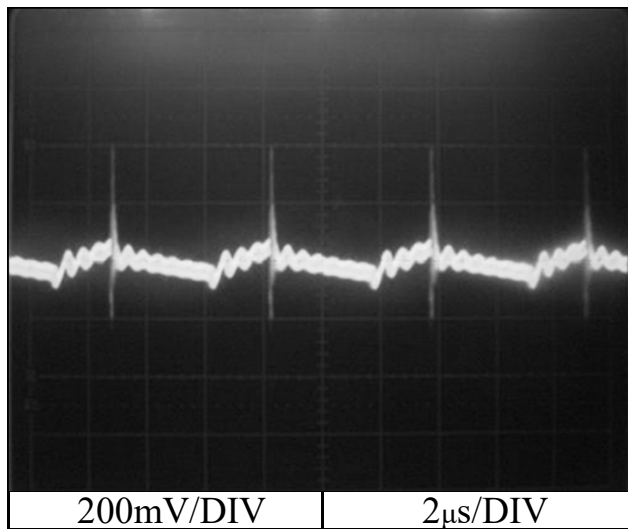
Conditions Vin : 200 VAC
Iout : Peak load
Ta : 25 °C

NORMAL MODE

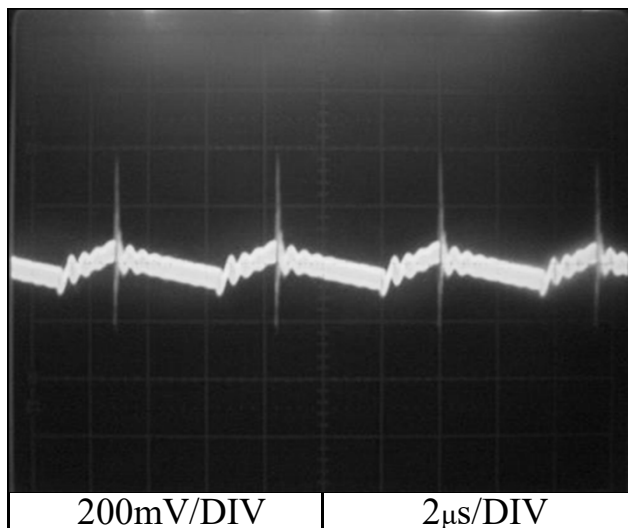
24V



36V



48V



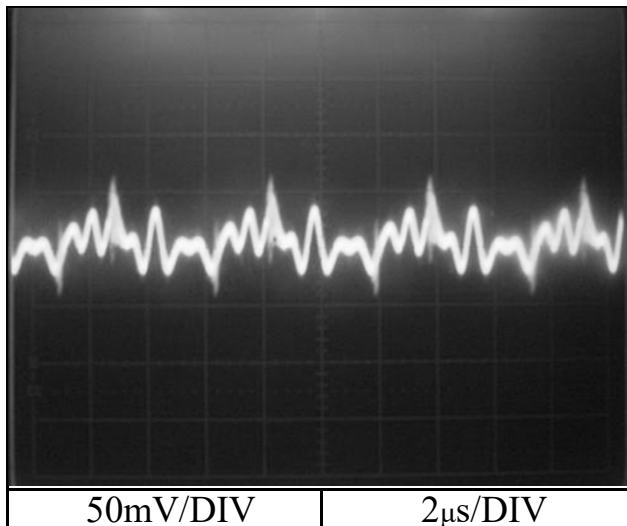
2.18 出力リップル、ノイズ波形

Output ripple and noise waveform

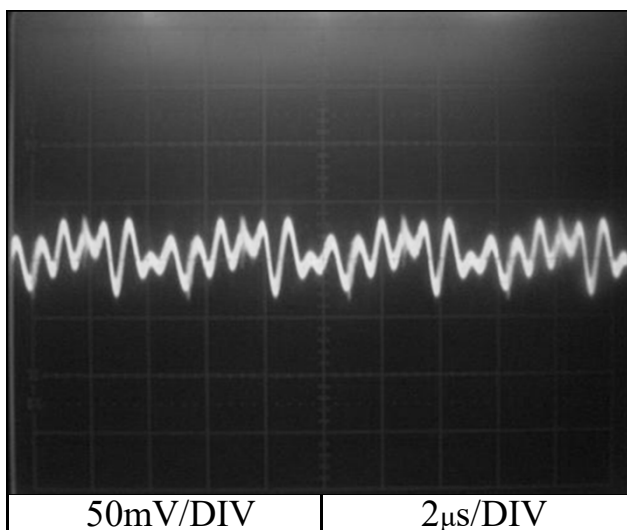
Conditions Vin : 100 VAC
Iout : 100 %
Ta : 25 °C

NORMAL + COMMON MODE

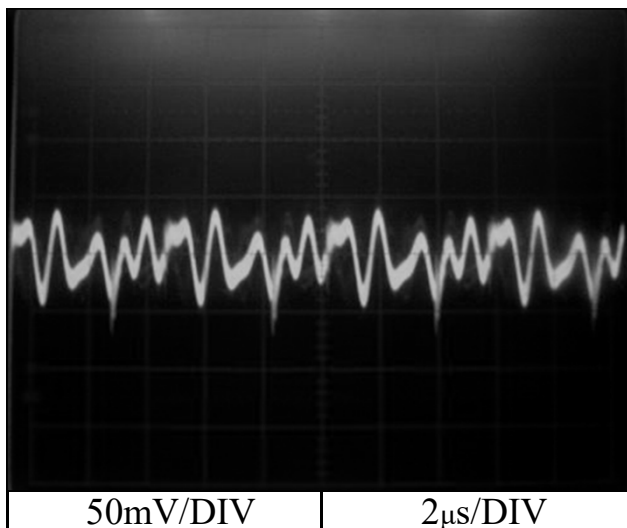
24V



36V



48V



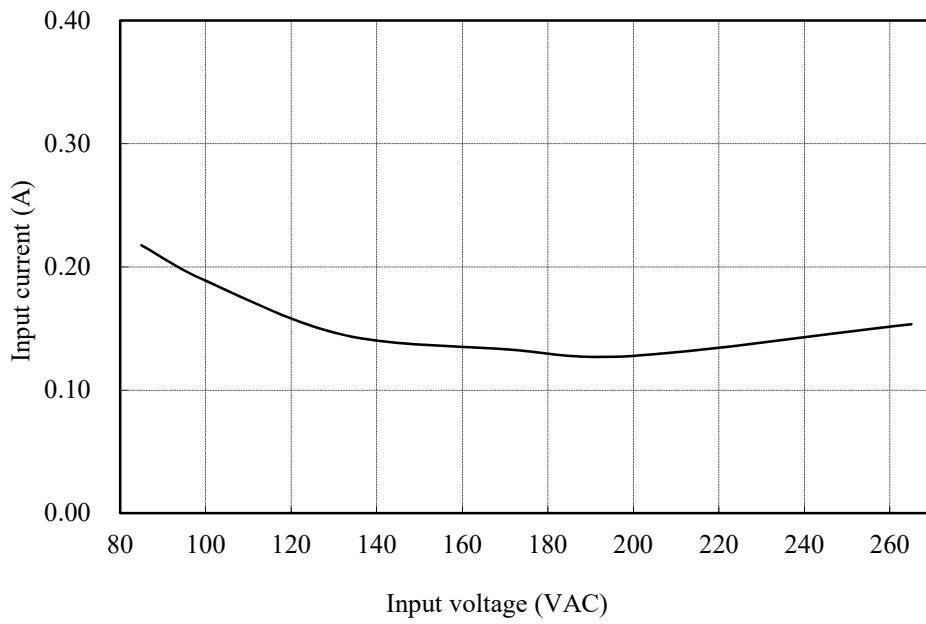
2.19 スタンバイ電流

Standby current

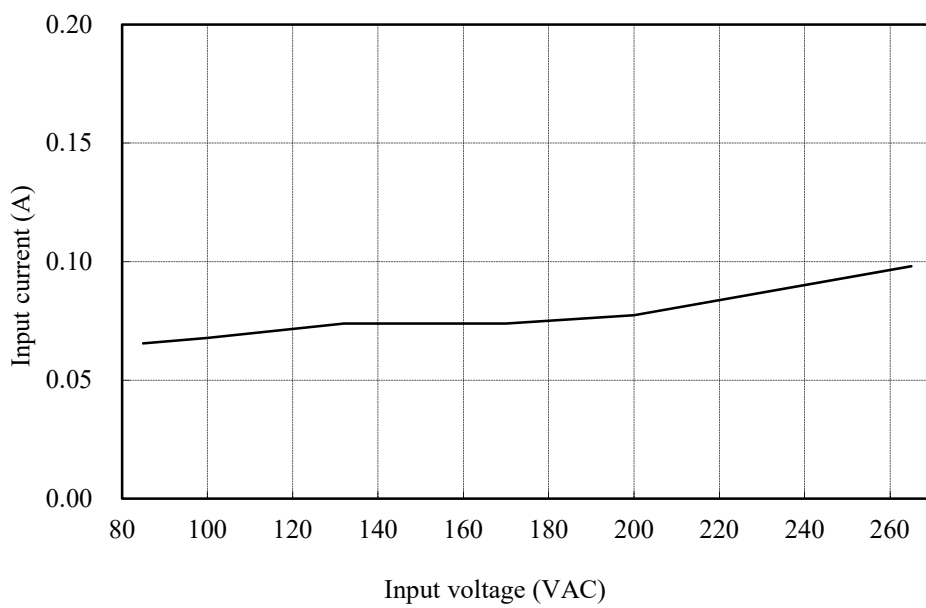
Condition Ta: 25 °C

24V

Io = 0%



Remote control OFF



2.20 EMI特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC

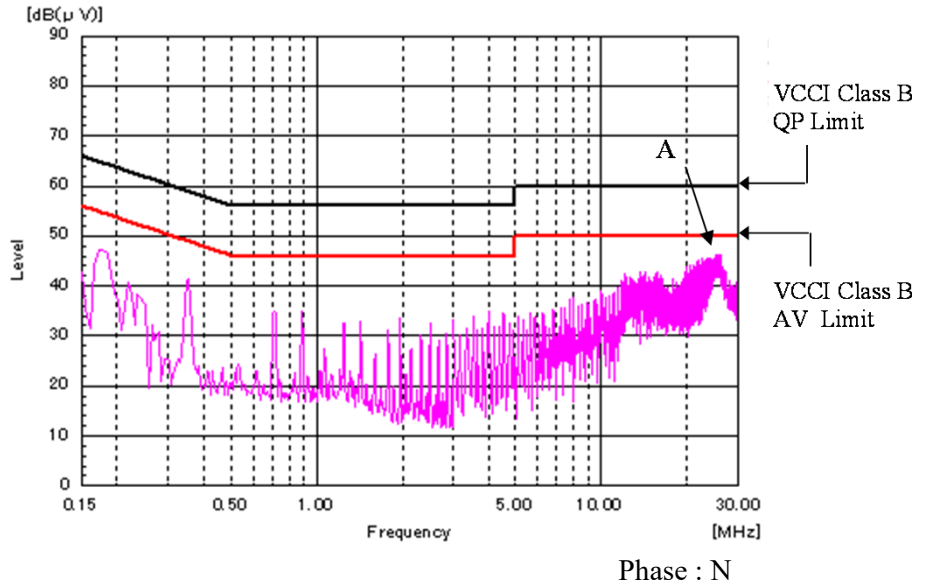
Iout : 100%

雑音端子電圧

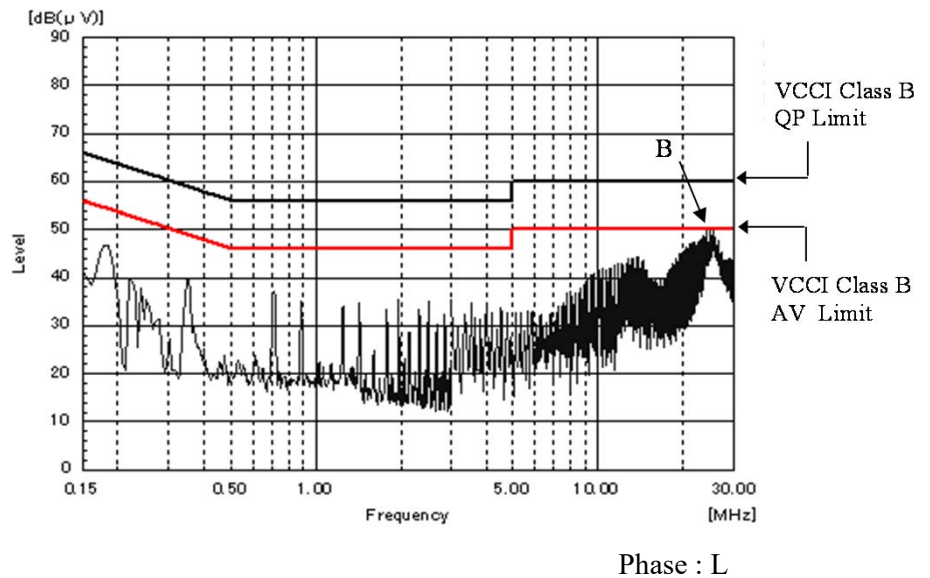
Conducted Emission

24V

Point A (25MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	42.2
AV	50.0	37.5



Point B (25MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	46.9
AV	50.0	44.1



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

2.20 EMI特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC

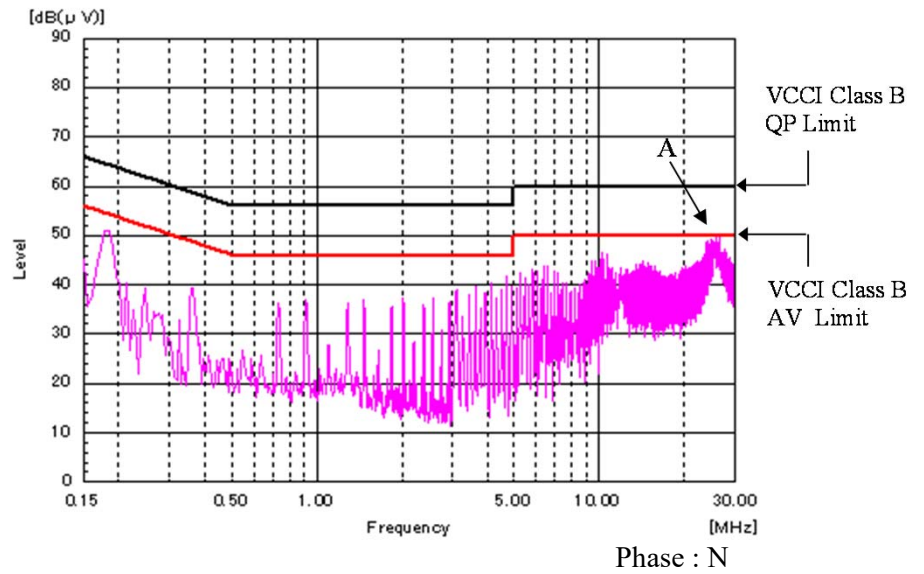
Iout : 100%

雑音端子電圧

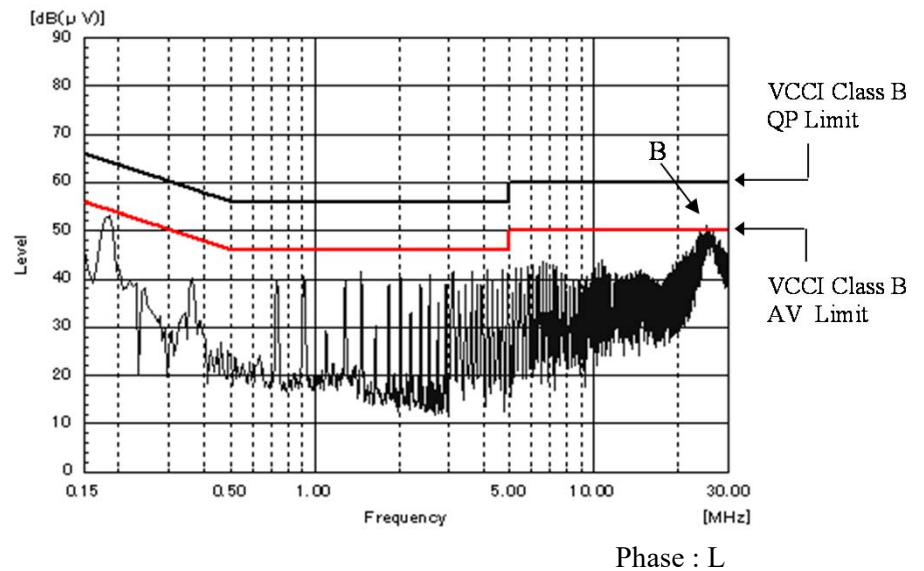
Conducted Emission

36V

Point A (25MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	45.9
AV	50.0	42.4



Point B (25MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	46.9
AV	50.0	42.9



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

2.20 EMI特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC

Iout : 100%

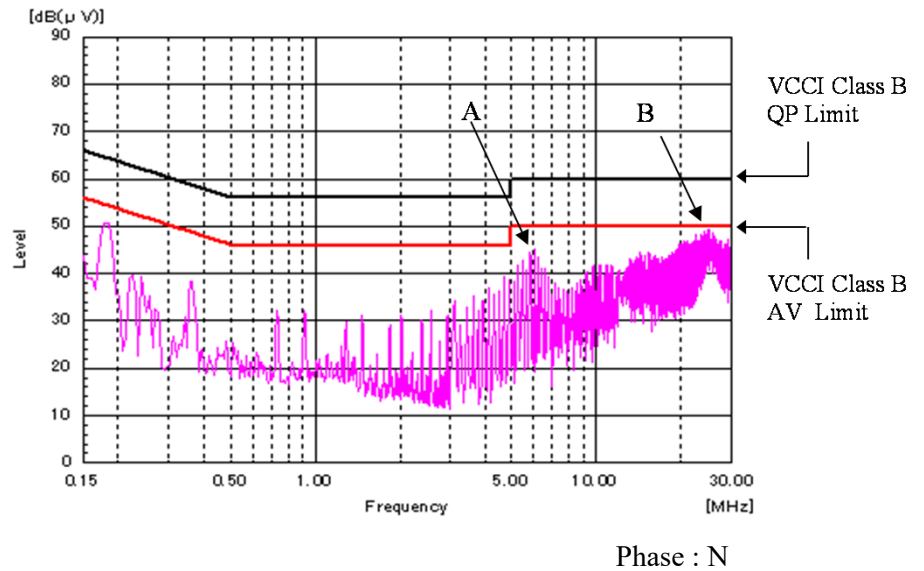
雑音端子電圧

Conducted Emission

48V

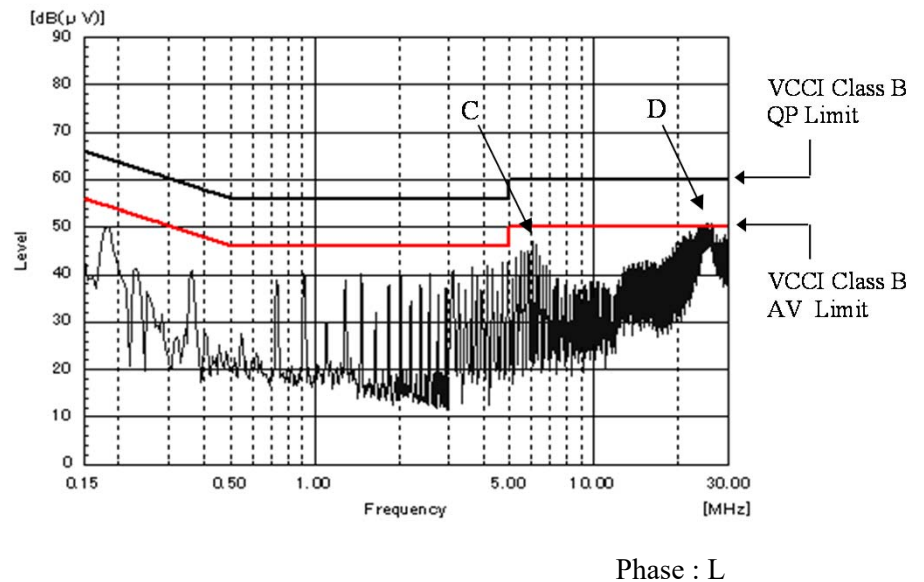
Point A (6MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	43.9
AV	50.0	43.9

Point B (25MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	46.4
AV	50.0	43.8



Point C (6MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	45.6
AV	50.0	45.6

Point D (25MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	48.0
AV	50.0	45.1



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

2.20 EMI特性

Electro-Magnetic Interference characteristics

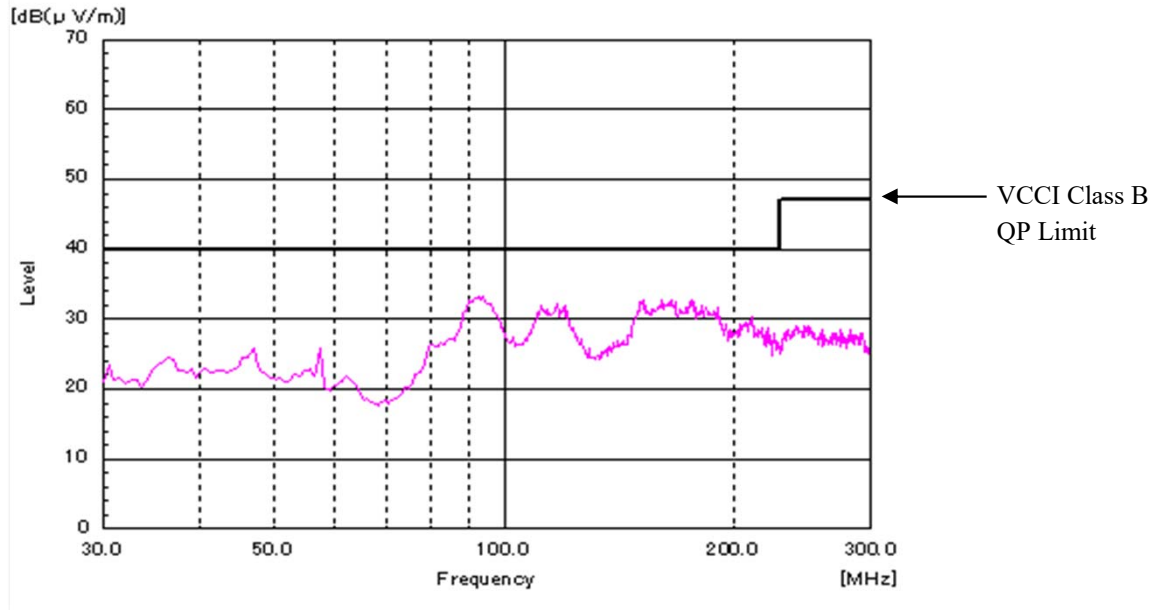
Conditions Vin : 100VAC
Iout : 100%

雑音電界強度

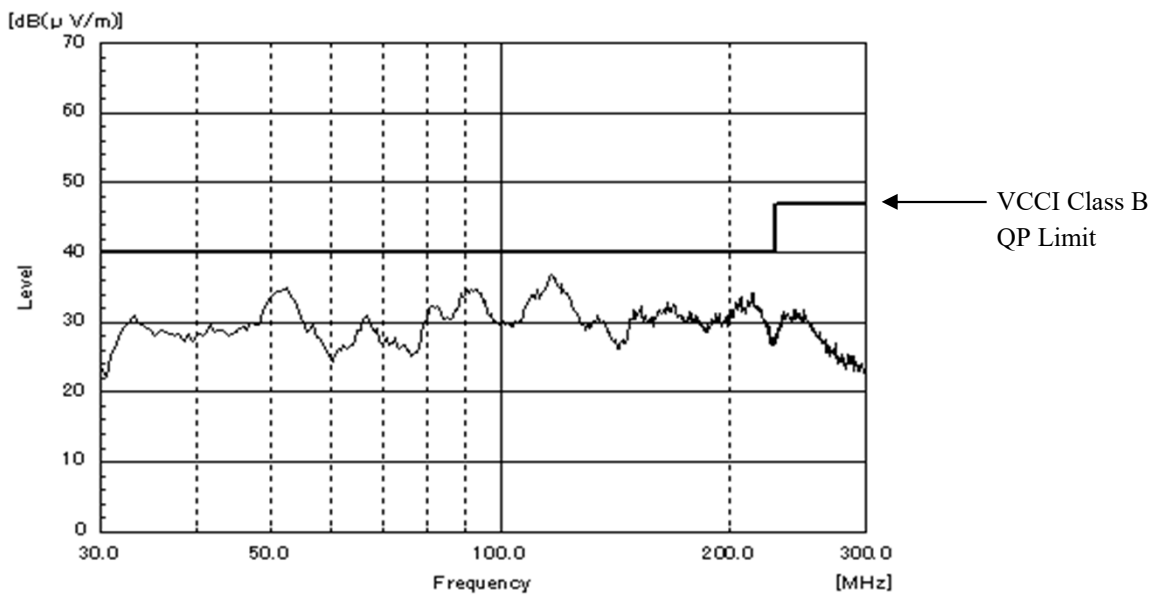
Radiated Emission

24V

HORIZONTAL



VERTICAL



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

2.20 EMI特性

Electro-Magnetic Interference characteristics

Conditions Vin : 100VAC

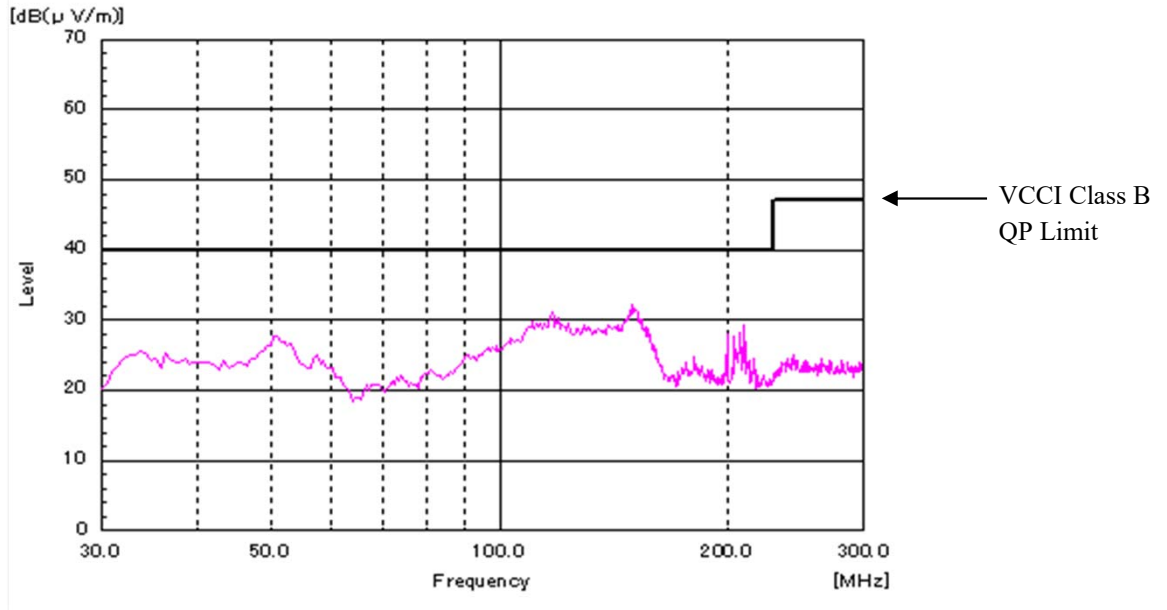
Iout : 100%

雑音電界強度

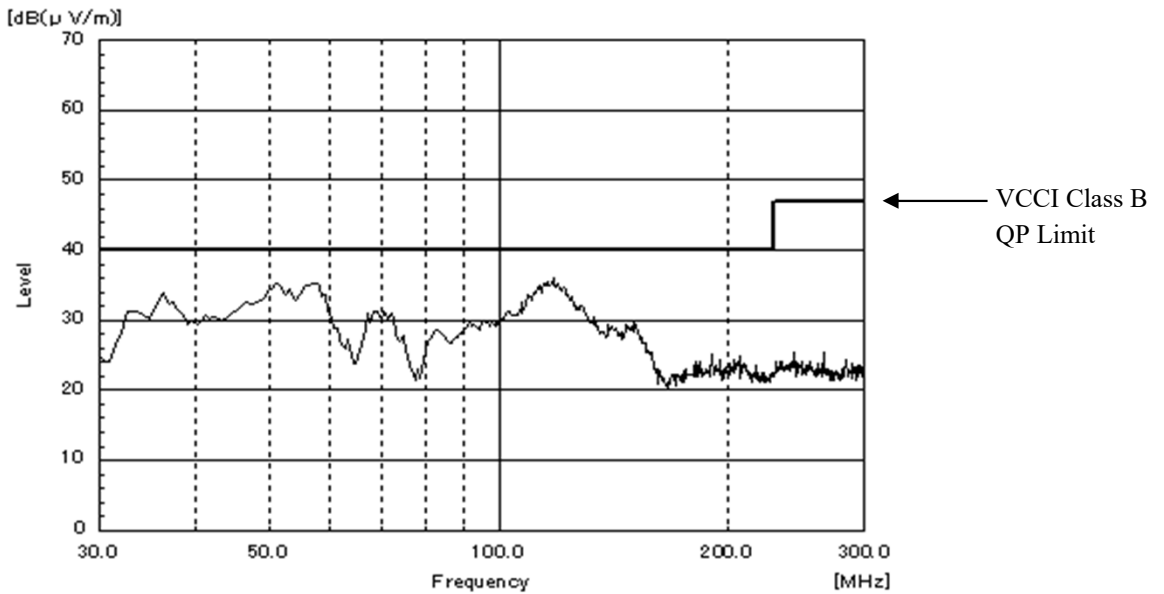
Radiated Emission

36V

HORIZONTAL



VERTICAL



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

2.20 EMI特性

Electro-Magnetic Interference characteristics

Conditions Vin : 100VAC

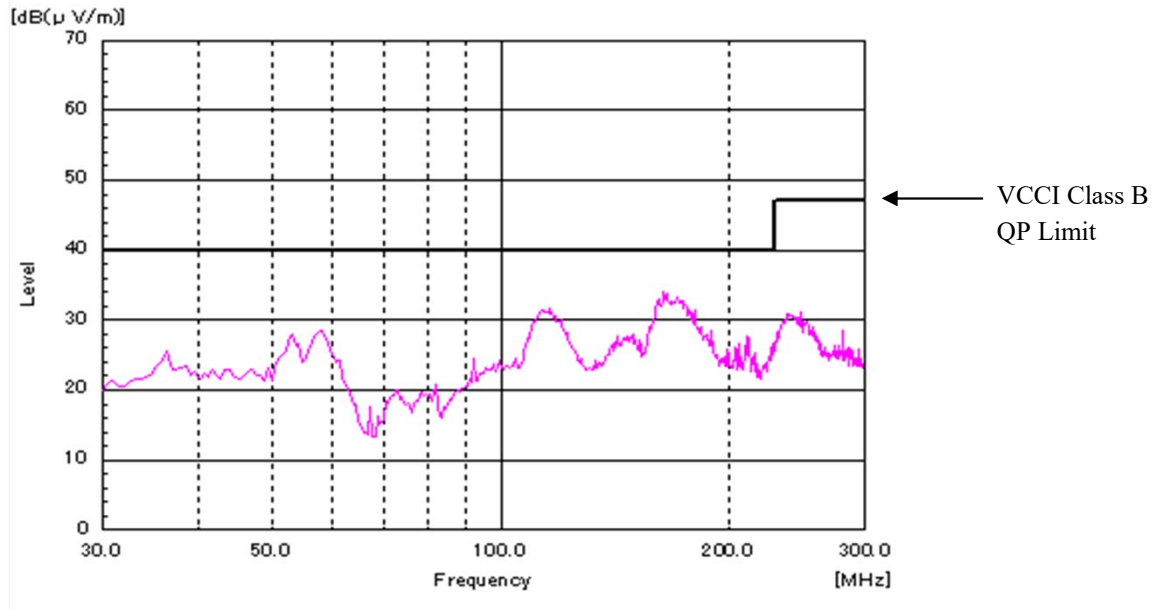
Iout : 100%

雑音電界強度

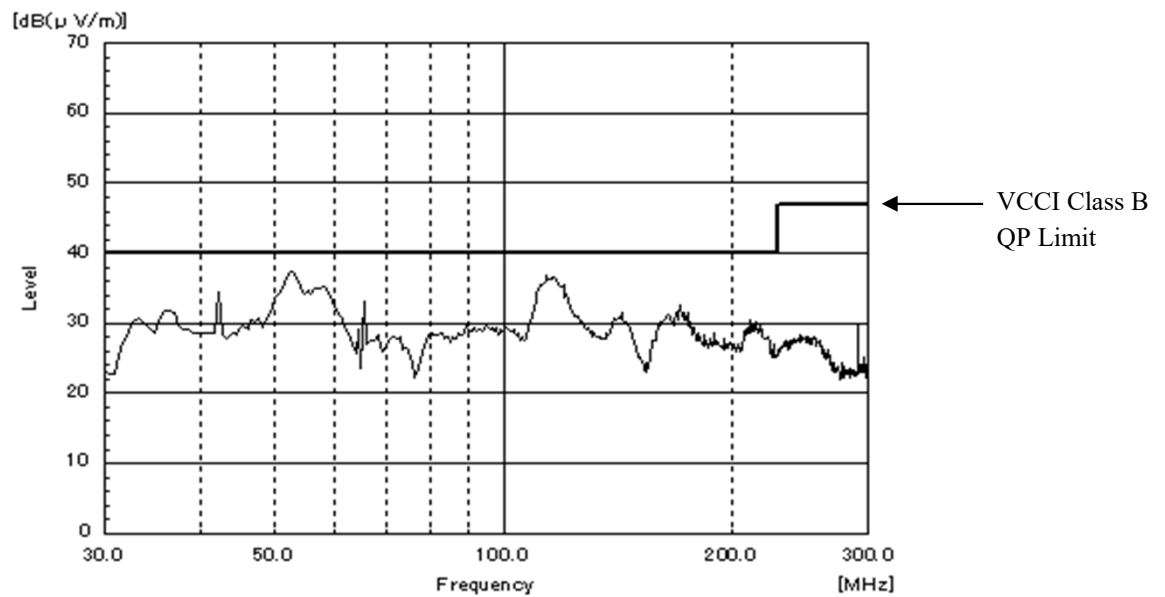
Radiated Emission

48V

HORIZONTAL



VERTICAL



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