

**MTW60-51515**

**EVALUATION DATA**

**型式データ**

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2. 特性データ Characteristics

2.1 静特性 Steady state data

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使用記号 Terminology used

	定義	Definition
V <sub>in</sub>	..... 入力電圧	Input voltage
V <sub>out</sub>	..... 出力電圧	Output voltage
I <sub>in</sub>	..... 入力電流	Input current
I <sub>out</sub>	..... 出力電流	Output current
T <sub>a</sub>	..... 周囲温度	Ambient temperature
f	..... 周波数	Frequency

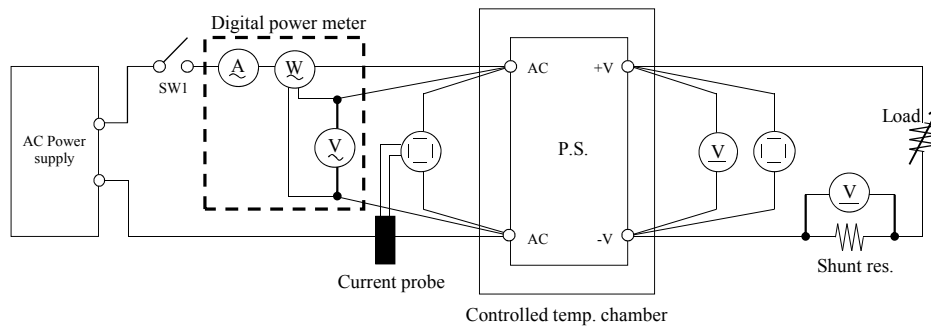
※ 弊社測定条件における結果であり、参考値としてお考え願います。  
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1.1 測定回路 Circuit used for determination

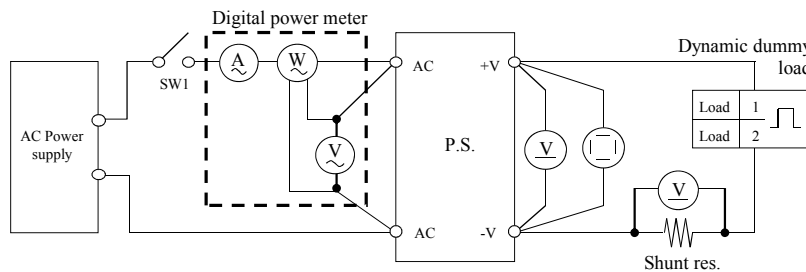
測定回路1 Circuit 1 used for determination

- ・ 静特性 Steady state data
- ・ 通電ドリフト特性 Warm up voltage drift characteristics
- ・ 出力保持時間特性 Hold up time 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
- ・ 過電流保護特性 Over current protection (OCP) characteristics
- ・ 過電圧保護特性 Over voltage protection (OVP) characteristics
- ・ 入力電圧瞬停特性 Response to brown out characteristics

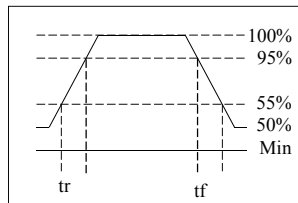


測定回路2 Circuit 2 used for determination

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

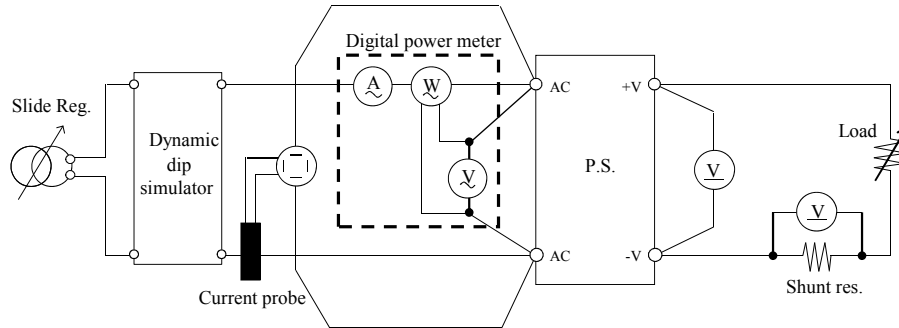


Output current waveform



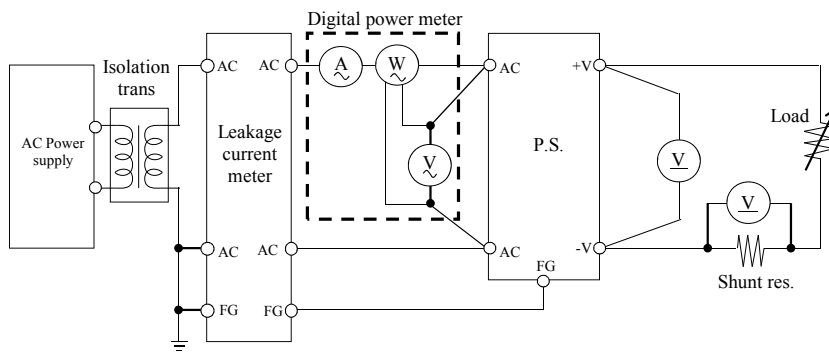
測定回路3 Circuit 3 used for determination

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



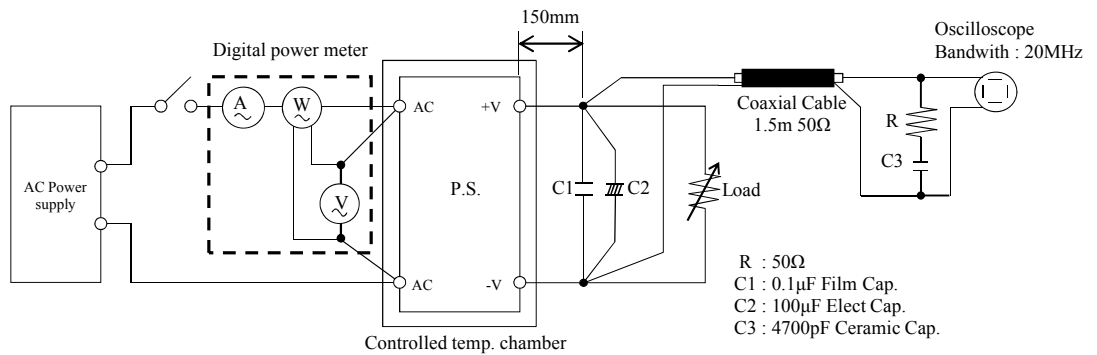
測定回路4 Circuit 4 used for determination

- ・リーク電流特性 Leakage current characteristics



測定回路5 Circuit 5 used for determination

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

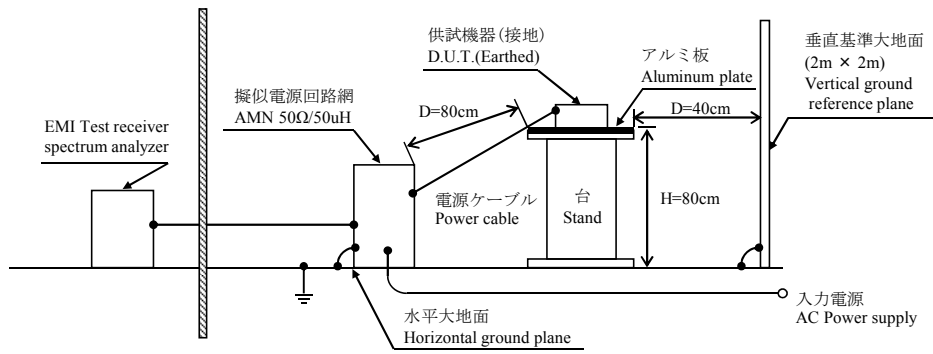


測定構成 Configuration used for determination

- EMI特性 Electro-Magnetic Interference characteristics

雑音端子電圧 (帰還ノイズ)

Conducted Emission



## 1.2 使用測定機器 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL1740 / DL9040L / DLM2054
2	DIGITAL MULTIMETER	AGILENT	34970A
3	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
4	CONTROLLED TEMP. CHAMBER	ESPEC	SH-240S1
5	DYNAMIC DUMMY LOAD	TAKASAGO	FK-200L / FK-400L
6	DUMMY LOAD	PCN	PHF250 SERIES
7	CURRENT PROBE	YOKOGAWA ELECT.	701928 / 701930
8	AC POWER SUPPLY	TAKASAGO	AA2000XG
9	AC POWER SUPPLY	KIKUSUI	PCR2000L / PCR4000L
10	SHUNT RESISTOR	YOKOGAWA	MODEL 2215
11	SHUNT RESISTOR	DAIICHI ELECT.	TYPE DS
12	LEAKAGE CURRENT METER	HIOKI	3156
13	DYNAMIC DIP SIMULATOR	TAKAMISAWA	PSA-210
14	ISOLATION TRANS	TOYO ELECT.	LCC-B-1000
15	SLIDE REGULATOR	MATSUNAGA	SD-2450
16	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCI3
17	PRE AMP.	HEWLETT-PACKARD	8447D OPT 010
18	AMN	SCHWARZBECK	NNLK8121
19	ANTENNA	SCHWARZBECK	BBA9106 / UHALP9107

2. 特性データ Characteristics

2.1 静特性 Steady state data

(1) 入力・負荷・温度変動／出力起動・遮断電圧

Regulation - line and load, Temperature drift / Start up voltage and Drop out voltage

・測定条件 Measuring Condition : 出力電圧、電流 Output voltage & current

Iout \ Vout	V1 : 5V	V2 : 15V	V3 : -15V
Min Load	0.0A	0.0A	0.0A
100%	5.0A	2.0A	0.5A

1. Regulation - line and load

Condition Ta : 25 °C

V1 : 5V

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	Line regulation	
Min Load	5.042V	5.042V	5.042V	5.042V	0mV	0.000%
50%	5.043V	5.043V	5.043V	5.043V	0mV	0.000%
100%	5.042V	5.042V	5.042V	5.042V	0mV	0.000%
Load regulation	1mV	1mV	1mV	1mV		
	0.020%	0.020%	0.020%	0.020%		

V2 : 15V

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	Line regulation	
Min Load	14.907V	14.908V	14.907V	14.907V	1mV	0.007%
50%	14.911V	14.911V	14.911V	14.911V	0mV	0.000%
100%	14.911V	14.912V	14.912V	14.912V	1mV	0.007%
Load regulation	4mV	4mV	5mV	5mV		
	0.027%	0.027%	0.033%	0.033%		

V3 : -15V

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	Line regulation	
Min Load	-15.034V	-15.035V	-15.036V	-15.036V	2mV	0.013%
50%	-15.006V	-15.007V	-15.008V	-15.009V	3mV	0.020%
100%	-14.979V	-14.979V	-14.979V	-14.979V	0mV	0.000%
Load regulation	55mV	56mV	57mV	57mV		
	0.367%	0.373%	0.380%	0.380%		

2. Temperature drift

Conditions Vin : 100 VAC

Iout : 100 %

V1 : 5V

Ta	-10°C	+25°C	+50°C	Temperature stability	
Vout	5.018V	5.042V	5.042V	24mV	0.480%

V2 : 15V

Ta	-10°C	+25°C	+50°C	Temperature stability	
Vout	14.783V	14.912V	14.907V	129mV	0.860%

V3 : -15V

Ta	-10°C	+25°C	+50°C	Temperature stability	
Vout	-15.024V	-14.979V	-14.911V	113mV	0.753%

3. Start up voltage and Drop out voltage

Conditions Ta : 25 °C

Iout : 100 %

Start up voltage (Vin)	46VAC
Drop out voltage (Vin)	37VAC

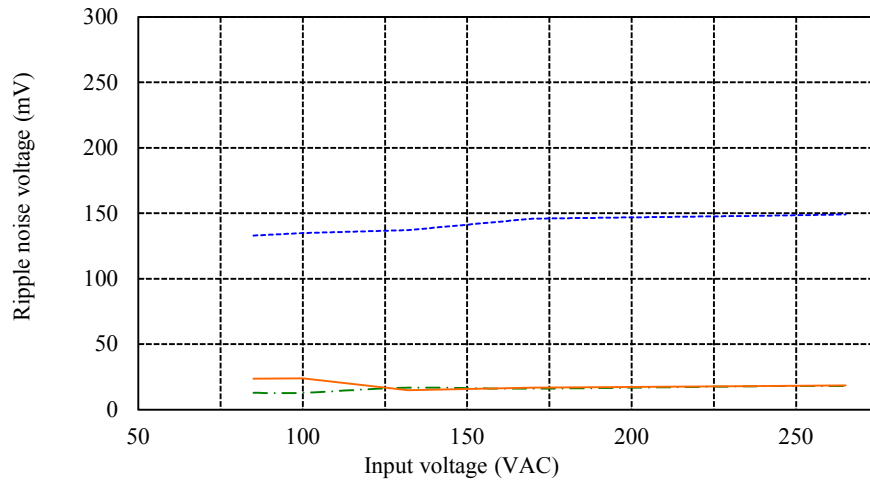


(2) リップルノイズ電圧対入力電圧

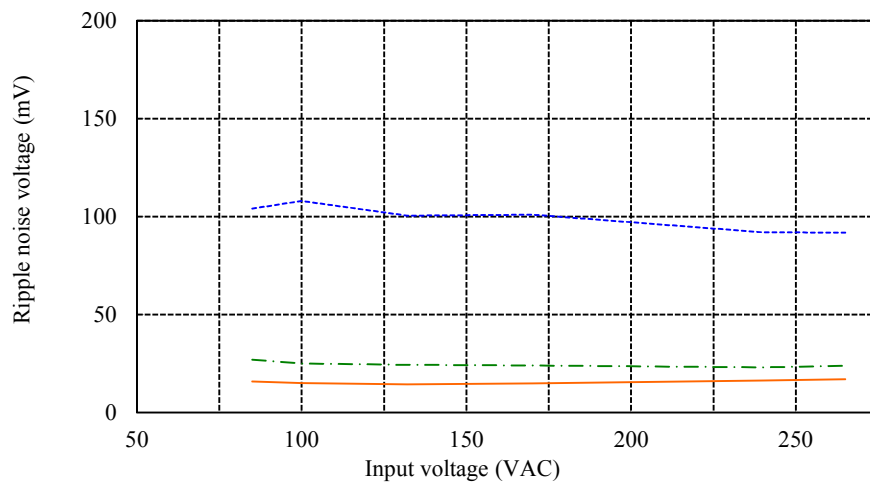
Ripple noise voltage vs. Input voltage

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

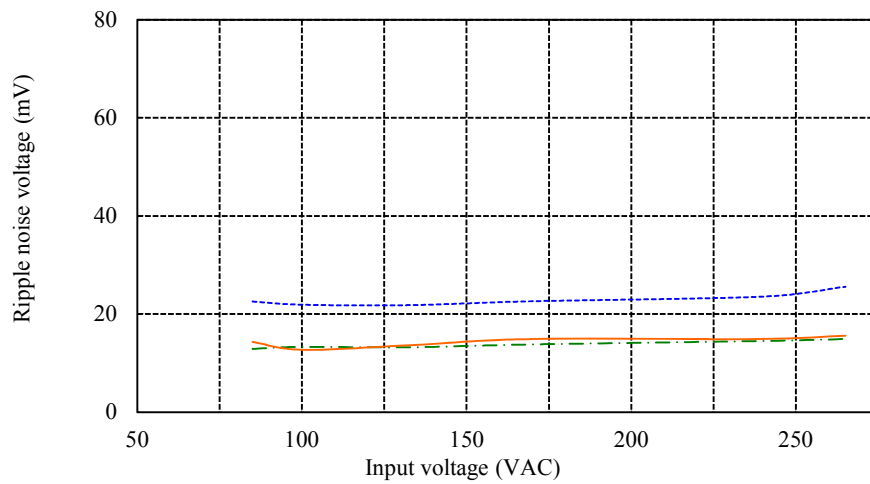
V1 : 5V



V2 : 15V



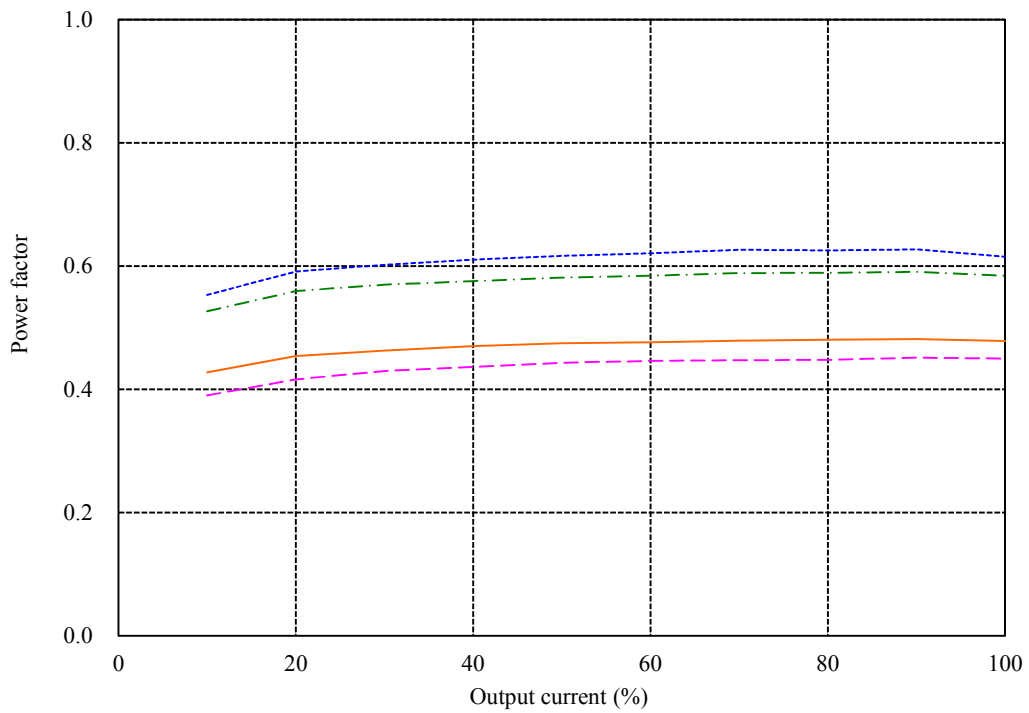
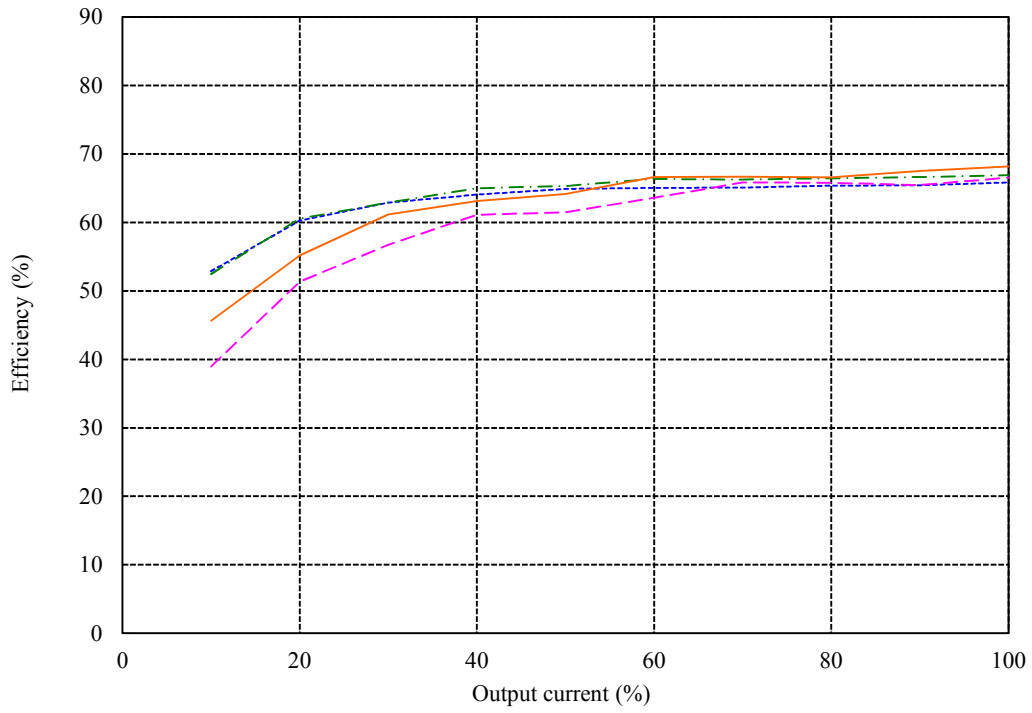
V3 : -15V



(3) 効率・力率対出力電流

Efficiency and Power factor vs. Output current

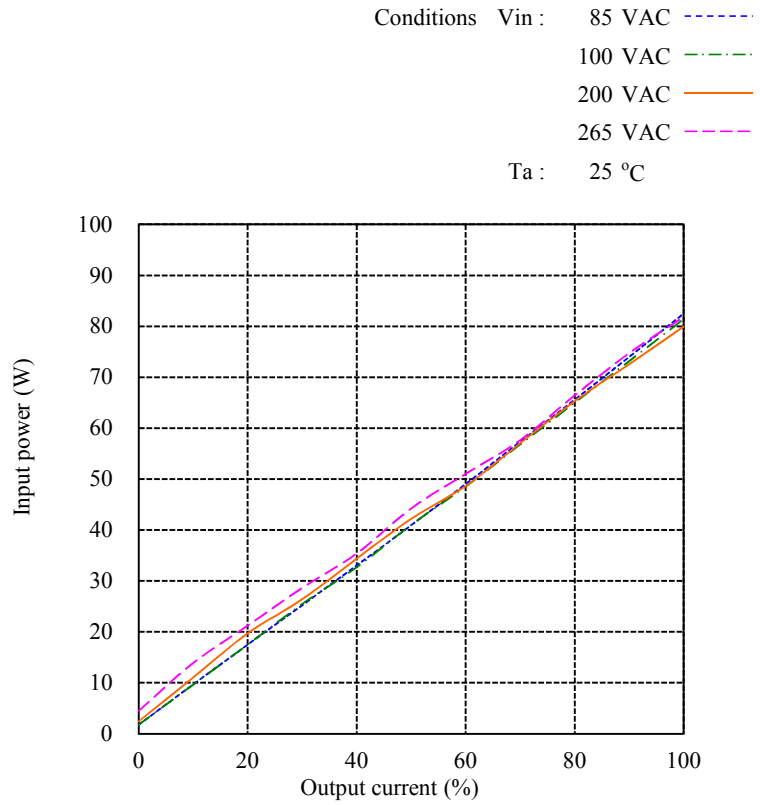
Conditions Vin : 85 VAC ---  
 100 VAC - - -  
 200 VAC ———  
 265 VAC - · - · -  
 Ta : 25 °C



(4) 入力電力対出力電流

Input power vs. Output current

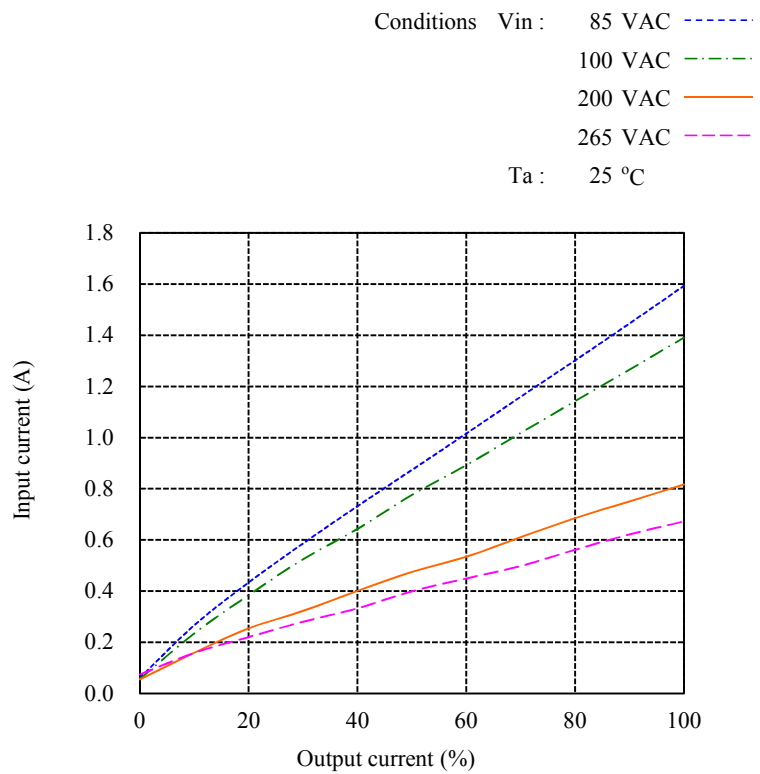
Vin	Input power
	Iout : 0%
85VAC	1.75W
100VAC	1.78W
200VAC	2.43W
265VAC	4.50W



(5) 入力電流対出力電流

Input current vs. Output current

Vin	Input current
	Iout : 0%
85VAC	0.06A
100VAC	0.06A
200VAC	0.05A
265VAC	0.07A

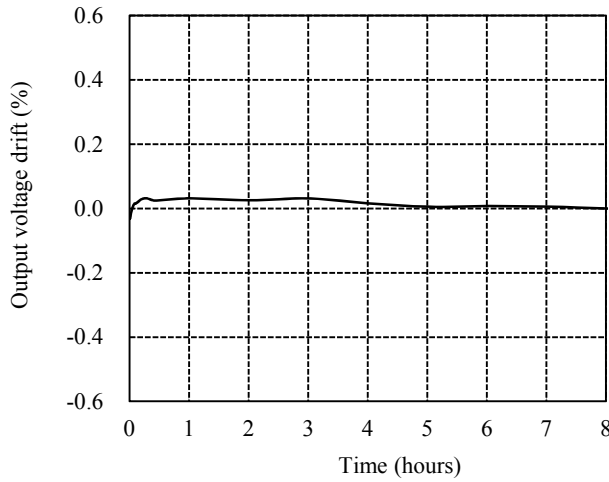


2.2 通電ドリフト特性

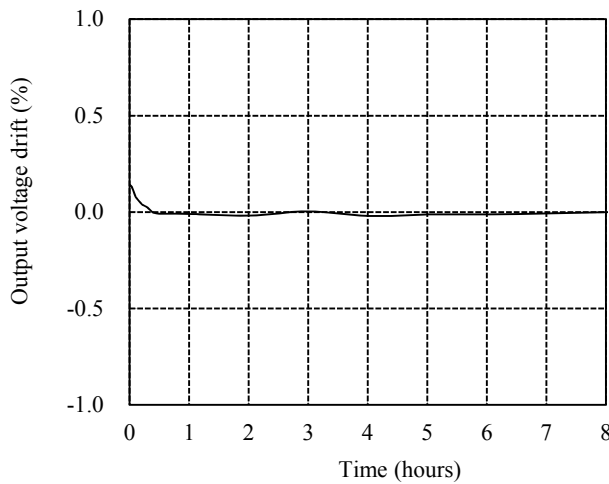
Warm up voltage drift characteristics

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

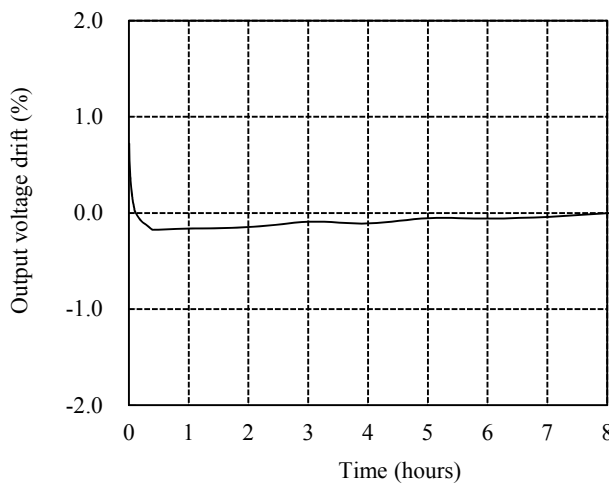
V1 : 5V



V2 : 15V



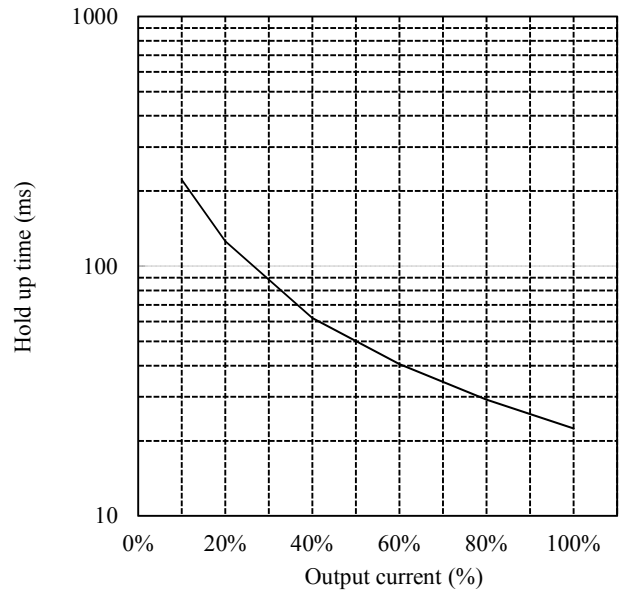
V3 : -15V



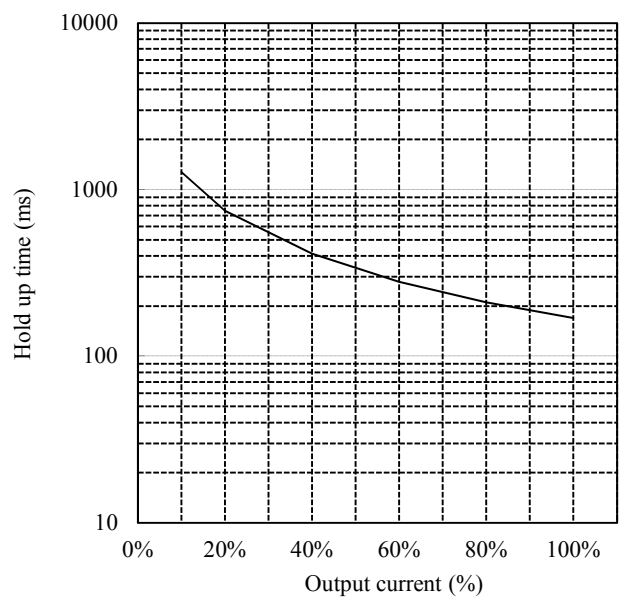
2.3 出力保持時間特性

Hold up time characteristics

Conditions Vin : 100 VAC  
Ta : 25 °C



Conditions Vin : 240 VAC  
Ta : 25 °C

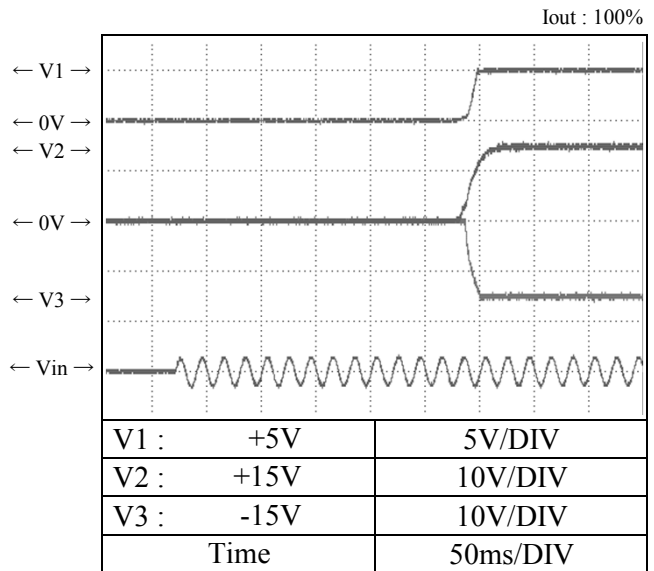
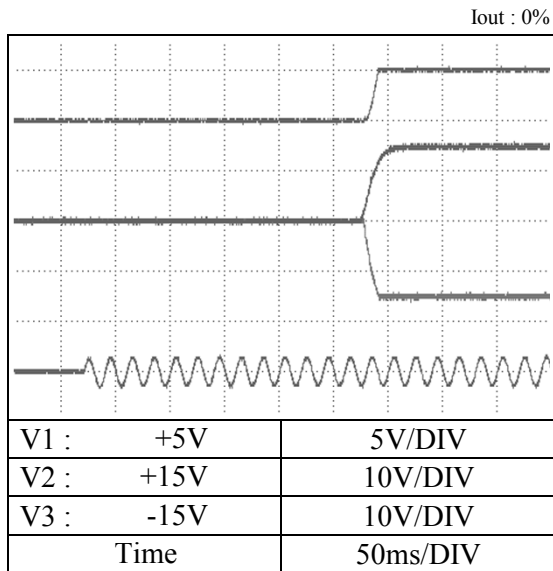


2.4 出力立ち上がり特性

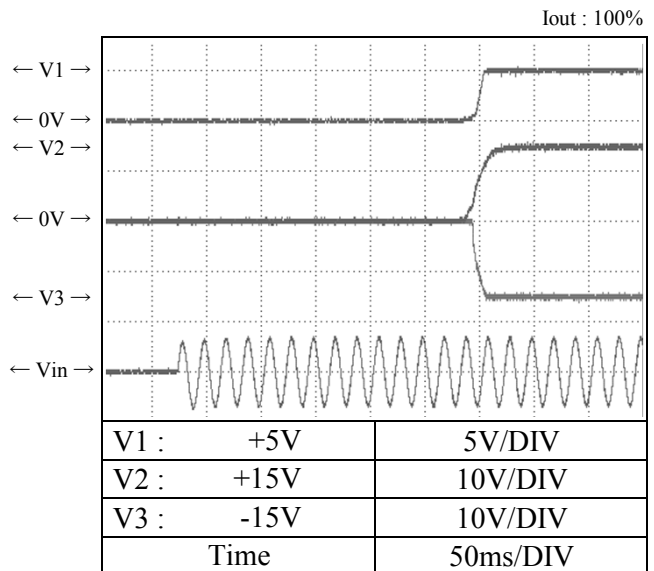
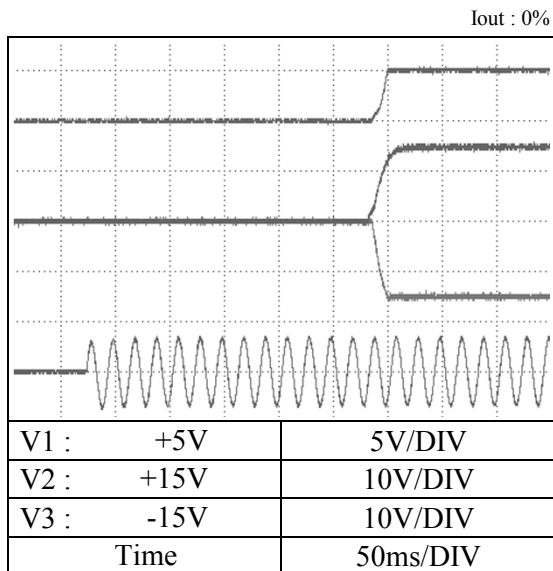
Output rise characteristics

Conditions Ta : 25 °C

Vin = 100VAC



Vin = 240VAC

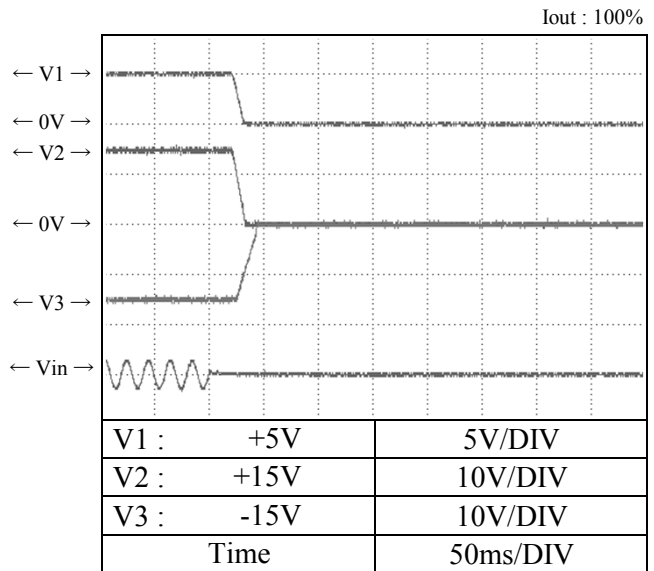
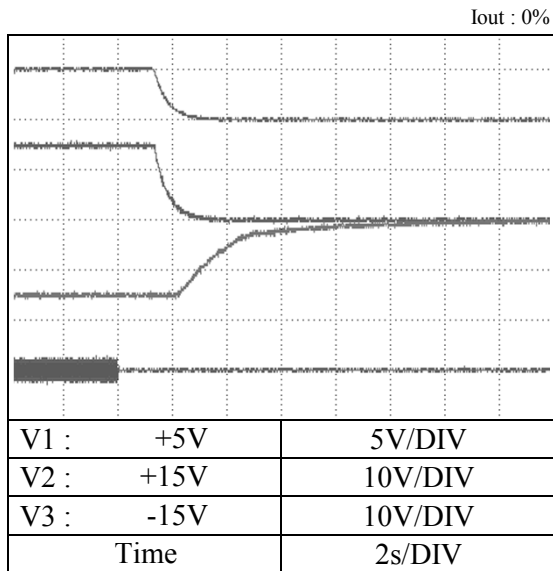


2.5 出力立ち下がり特性

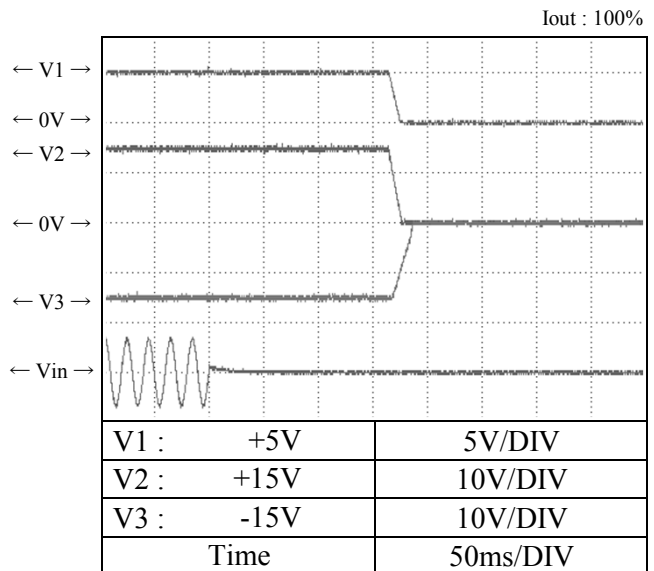
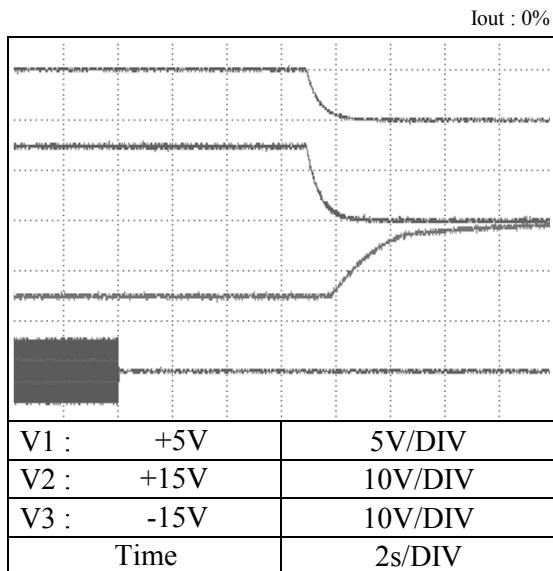
Output fall characteristics

Conditions Ta : 25 °C

Vin = 100VAC



Vin = 240VAC



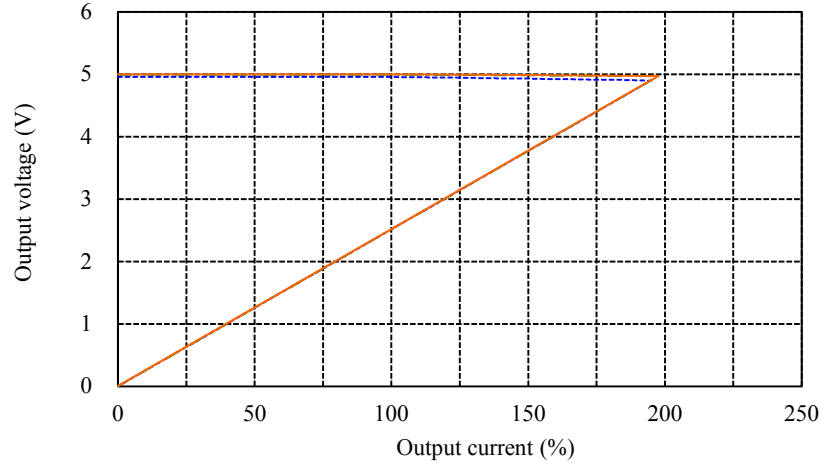
2.6 過電流保護特性

Over current protection (OCP) characteristics

Conditions Vin : 100 VAC  
 Ta : -10 °C ---  
 25 °C - - -  
 50 °C ———

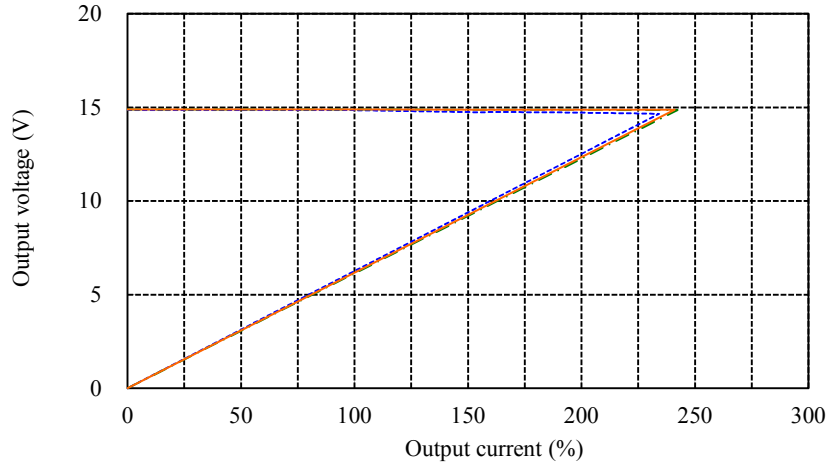
V1 : 5V

V2, V3 : Io = 100%



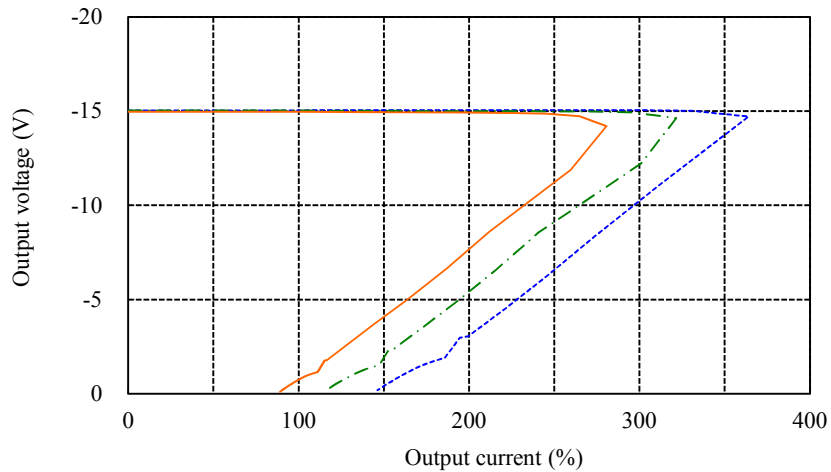
V2 : 15V

V1, V3 : Io = 100%



V3 : -15V

V1, V2 : Io = 100%



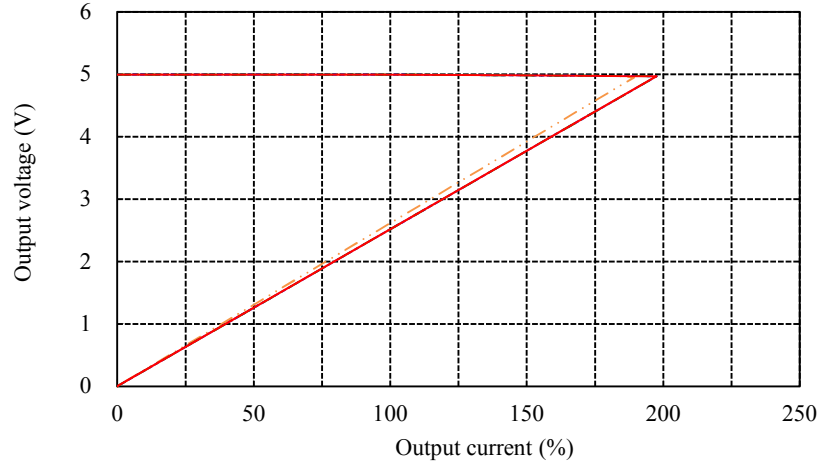
2.6 過電流保護特性

Over current protection (OCP) characteristics

Conditions Vin : 85 VAC ———  
 100 VAC - - - -  
 240 VAC - · - · -  
 265 VAC ———  
 Ta : 25 °C

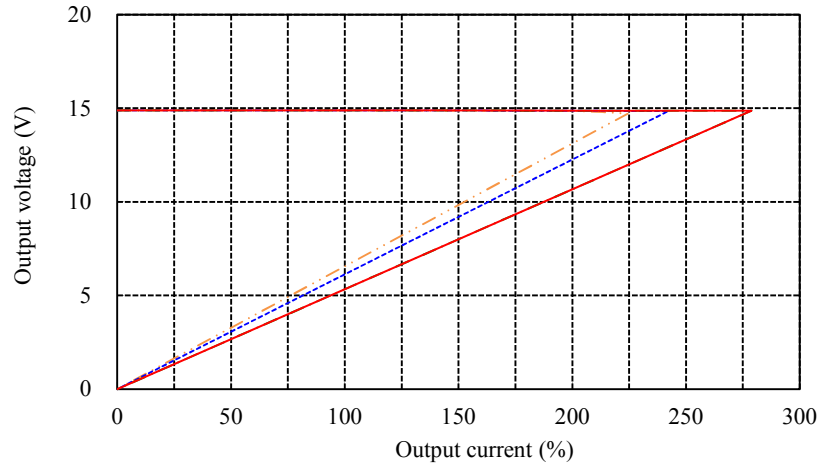
V1 : 5V

V2, V3 : Io = 100%



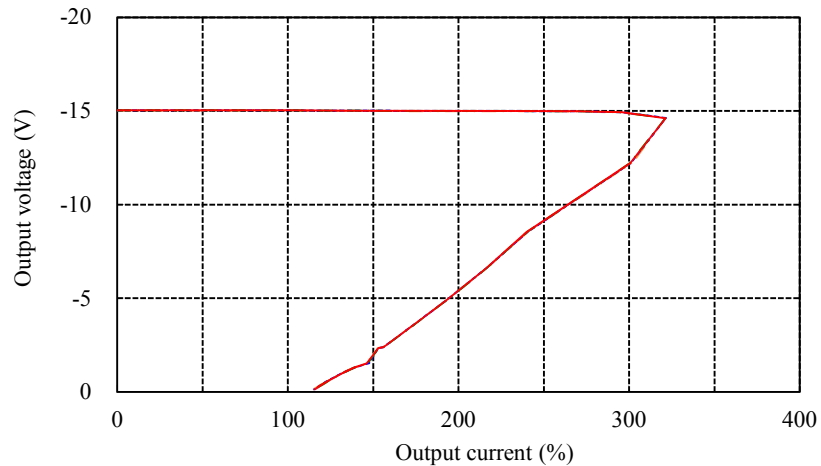
V2 : 15V

V1, V3 : Io = 100%



V3 : -15V

V1, V2 : Io = 100%

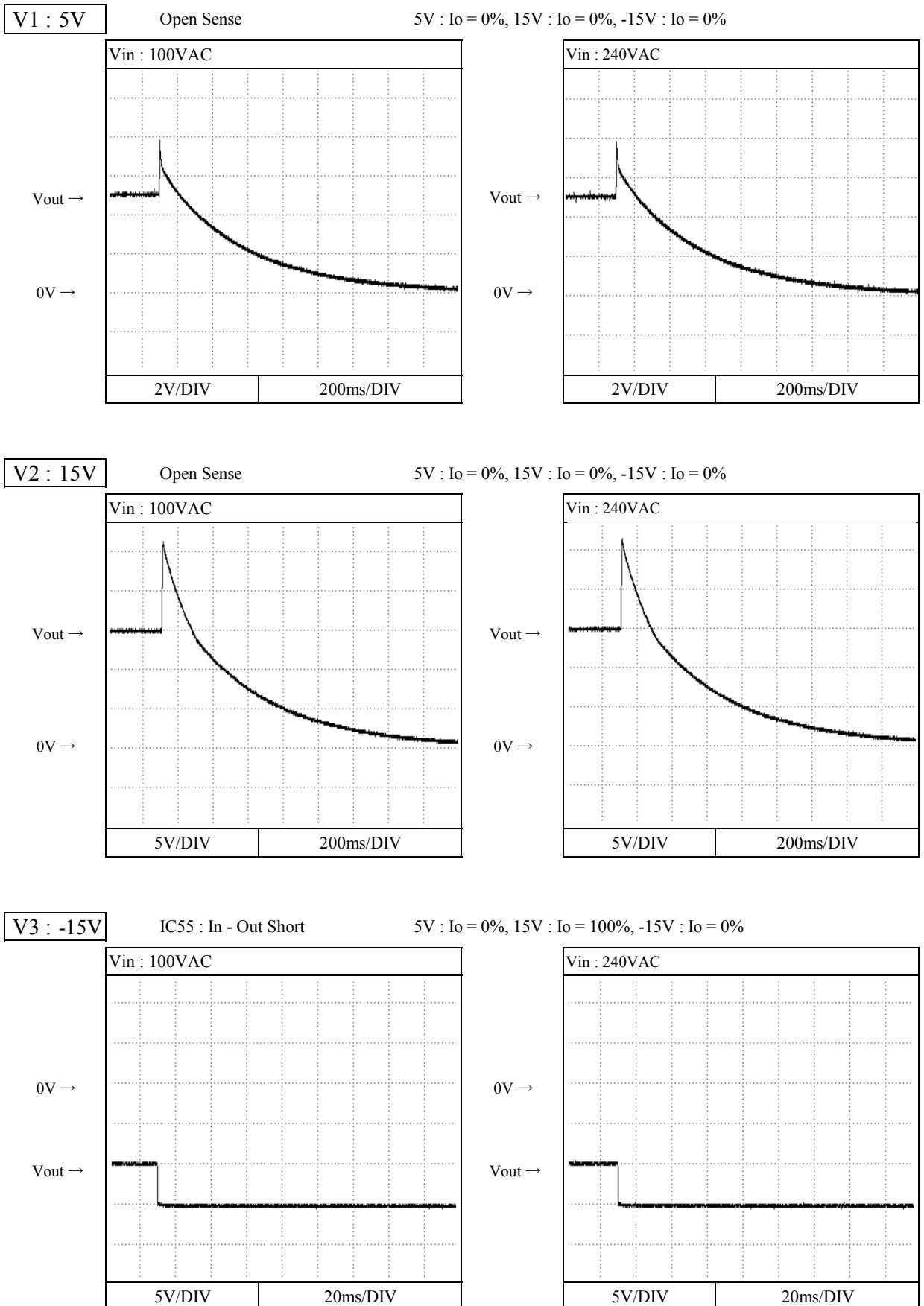




2.7 過電圧保護特性

Over voltage protection (OVP) characteristics

Conditions Ta : 25 °C

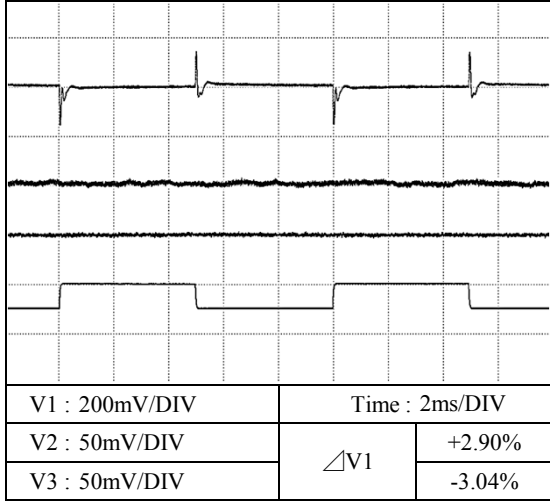


2.9 過渡応答（負荷急変）特性

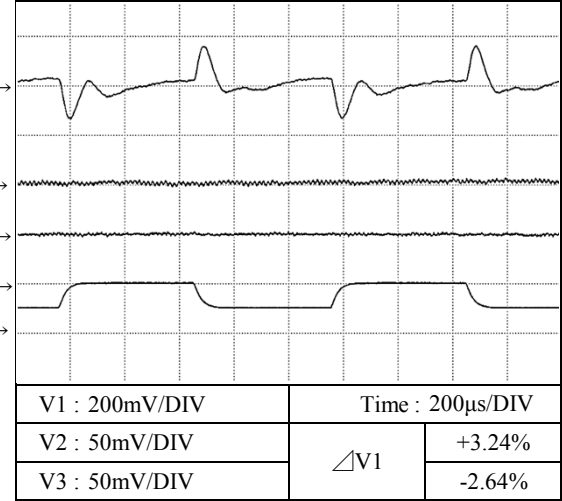
Dynamic load response characteristics

Conditions Vin : 100 VAC  
Ta : 25 °C

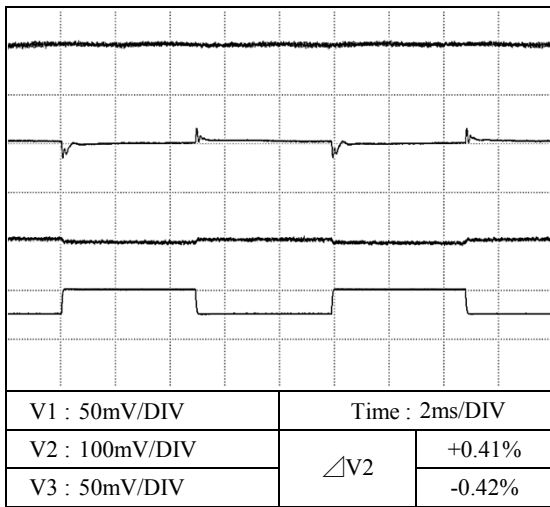
**V1 : 5V** Io (V1) : 50% ↔ 100% (tr = tf = 50μs) f = 100Hz



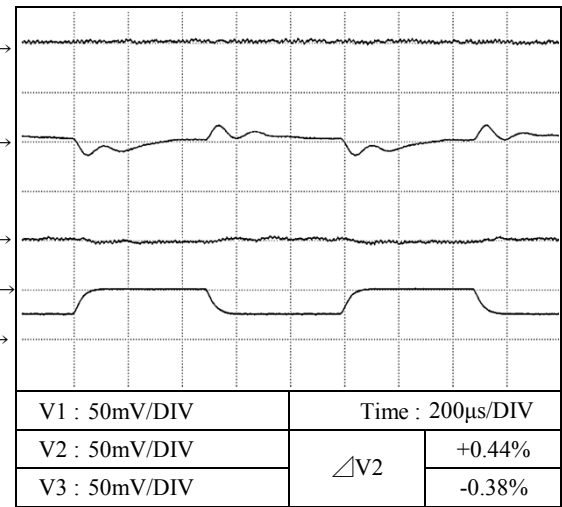
Io (V2) : 100% Io (V3) : 100% f = 1kHz



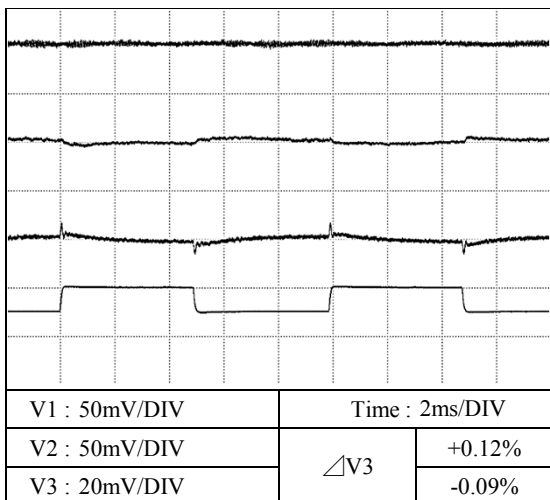
**V2 : 15V** Io (V1) : 100% Io (V2) : 50% ↔ 100% (tr = tf = 50μs) f = 100Hz



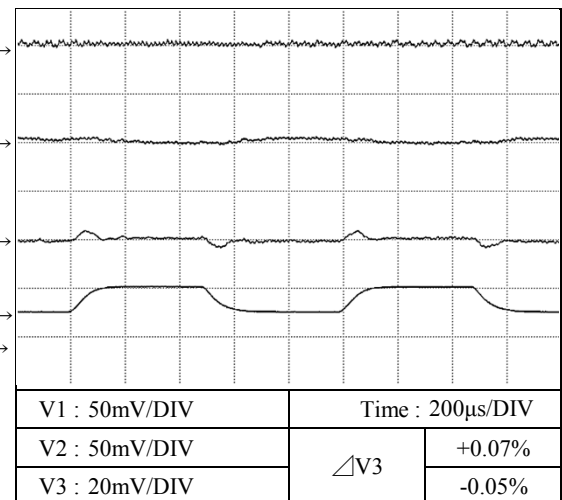
Io (V3) : 100% f = 1kHz



**V3 : -15V** Io (V1) : 100% Io (V2) : 100% Io (V3) : 50% ↔ 100% (tr = tf = 50μs) f = 100Hz



f = 1kHz



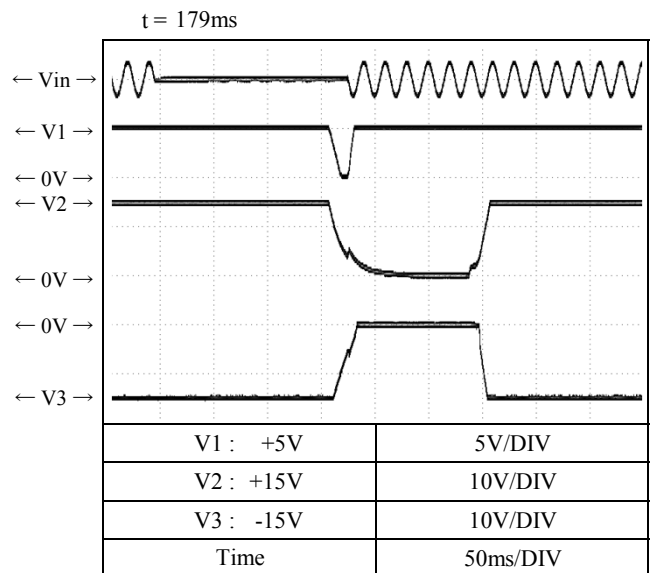
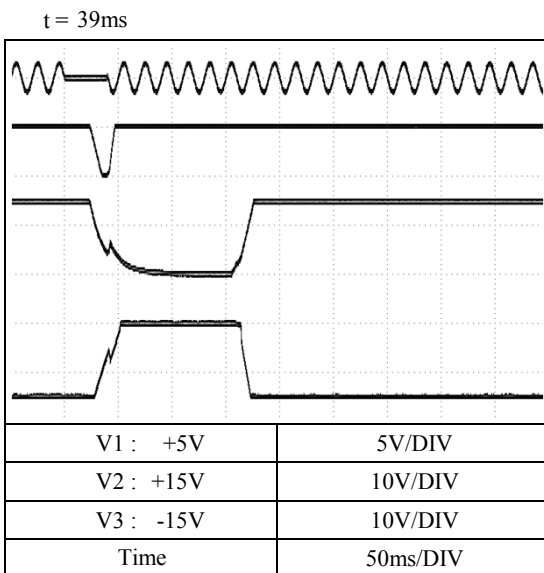
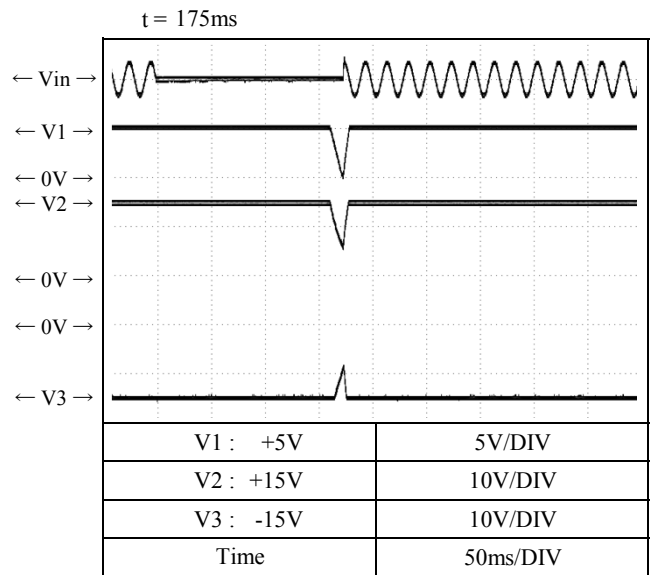
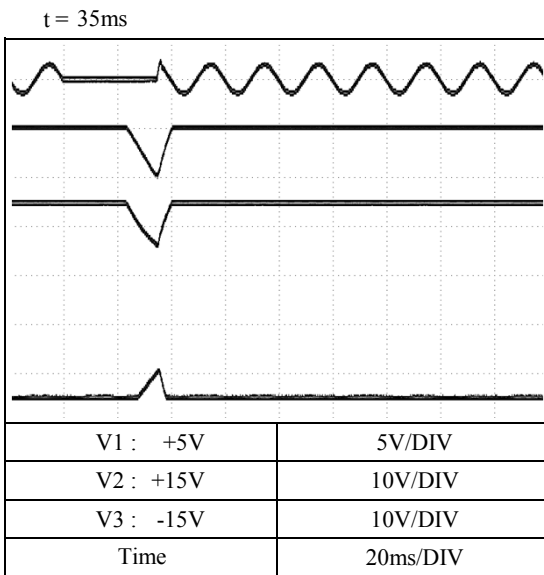
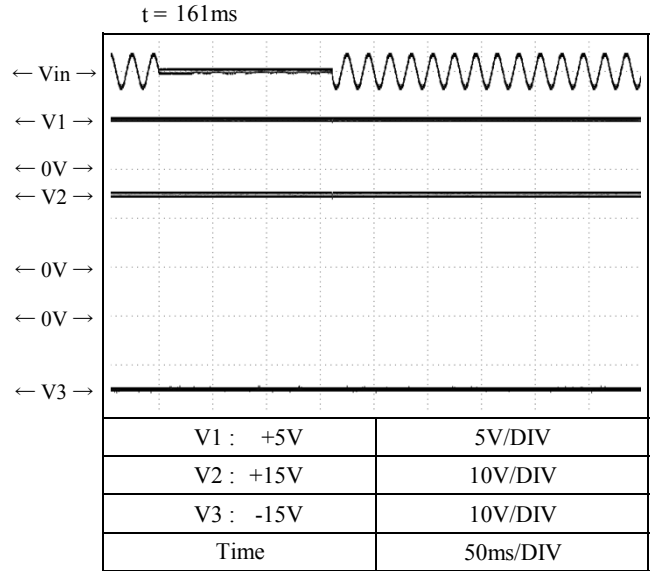
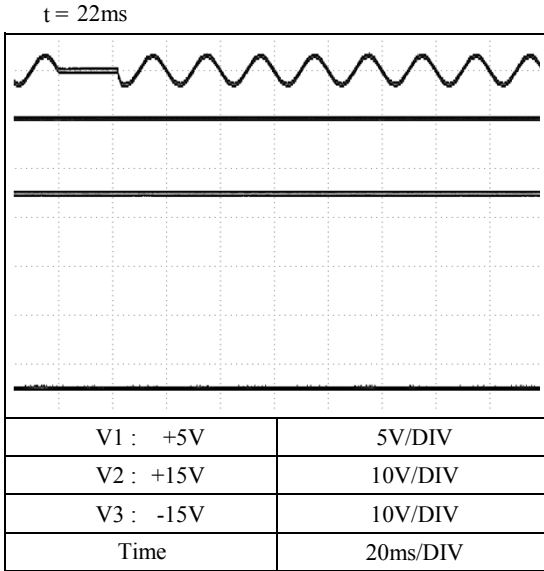
2.10 入力電圧瞬停特性

Response to brown out characteristics

Conditions Iout : 100 %  
Ta : 25 °C

Vin = 100VAC

Vin = 240VAC



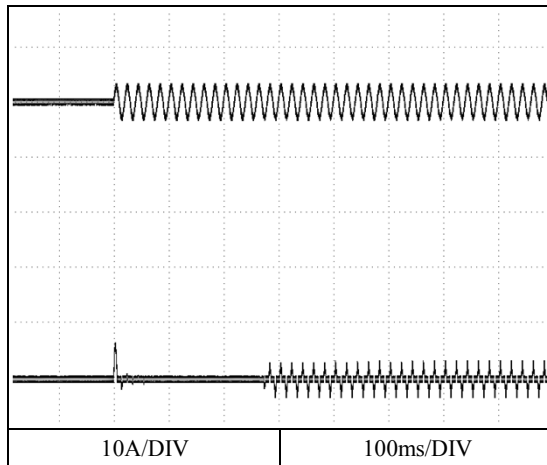
2.11 入力サージ電流（突入電流）波形

Inrush current waveform

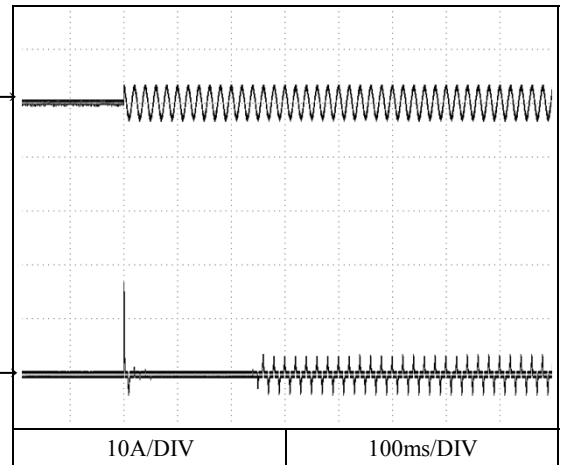
Conditions Iout : 100 %  
Ta : 25 °C

Vin = 100VAC

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

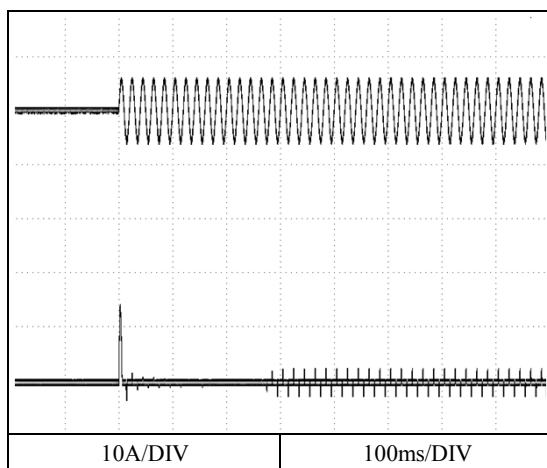


Switch on phase angle of input AC voltage  
 $\phi = 90^\circ$

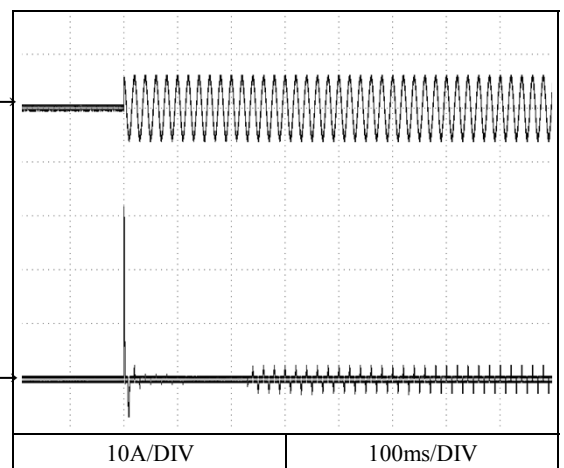


Vin = 240VAC

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



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

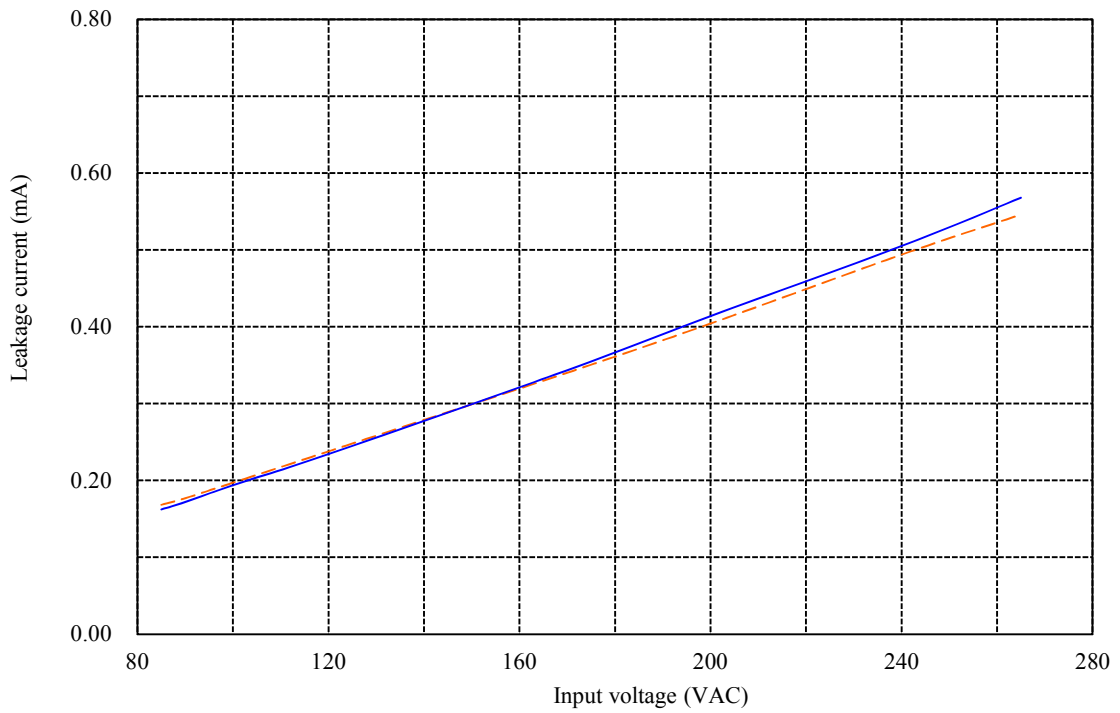


2.12 リーク電流特性

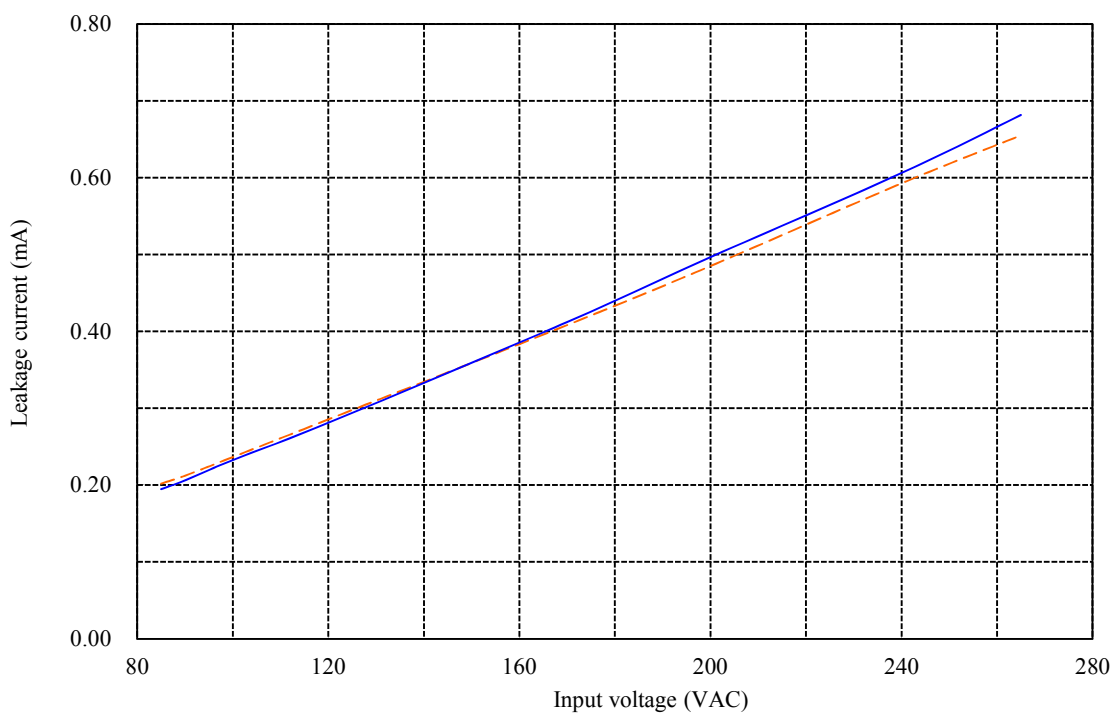
Leakage current characteristics

Conditions Iout : 0 % ———  
 100 % - - - - -  
 Ta : 25 °C  
 Equipment used : 3156 (HIOKI)

f : 50 Hz



f : 60 Hz

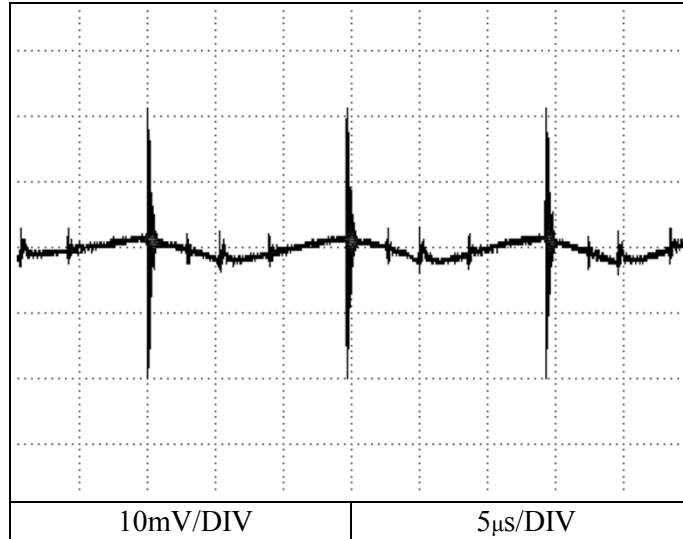


2.13 出力リップル、ノイズ波形

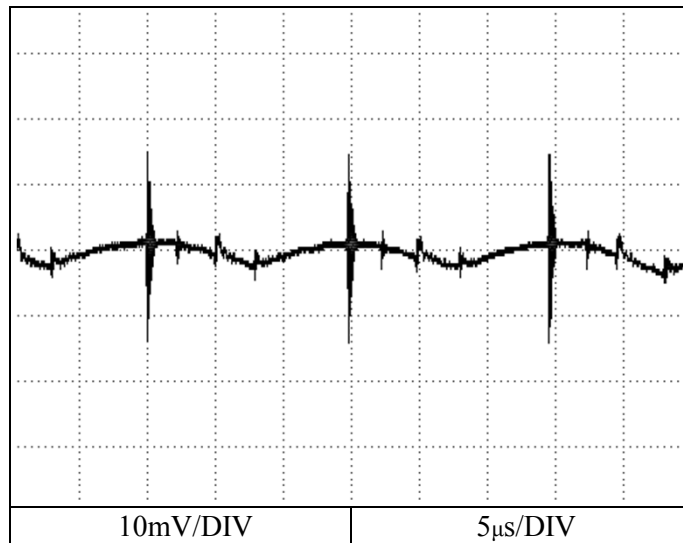
Output ripple and noise waveform

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

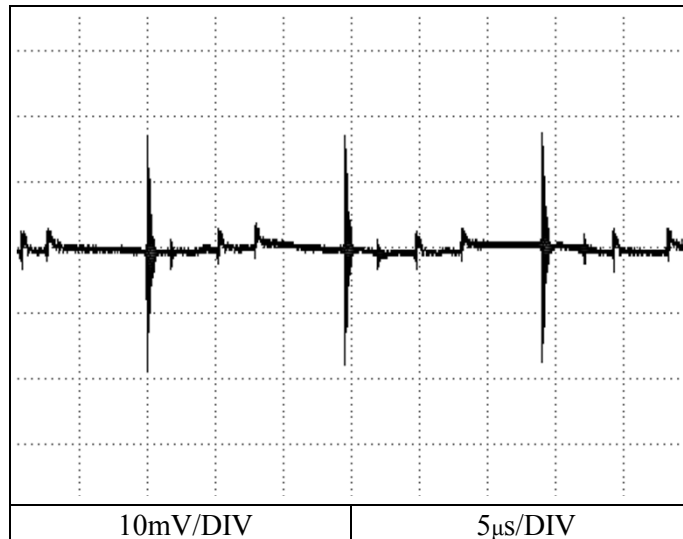
V1 : 5V



V2 : 15V



V3 : -15V



2.14 EMI 特性

Electro-Magnetic Interference characteristics

Conditions Vin : 100 VAC

Iout : 100 %

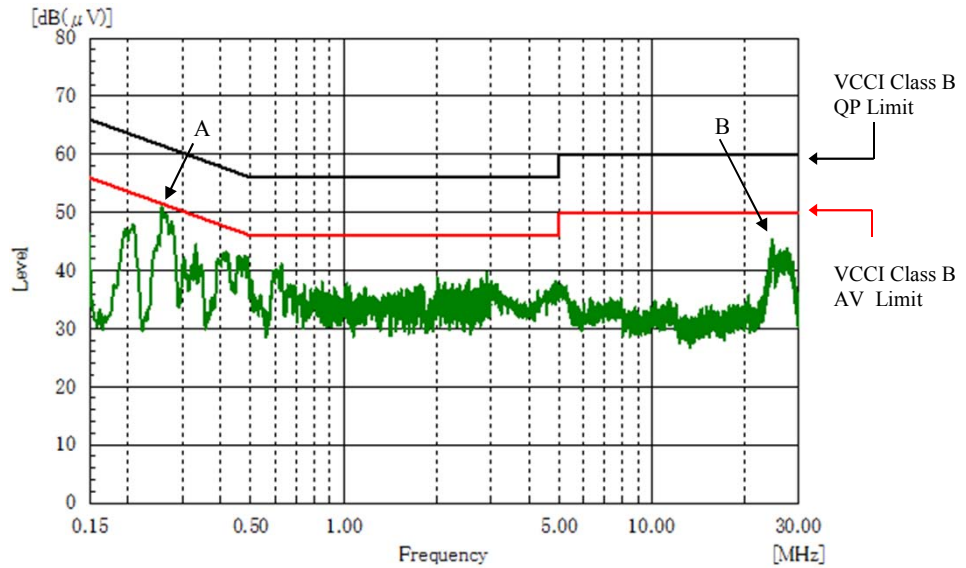
Ta : 25 °C

雑音端子電圧

Conducted Emission

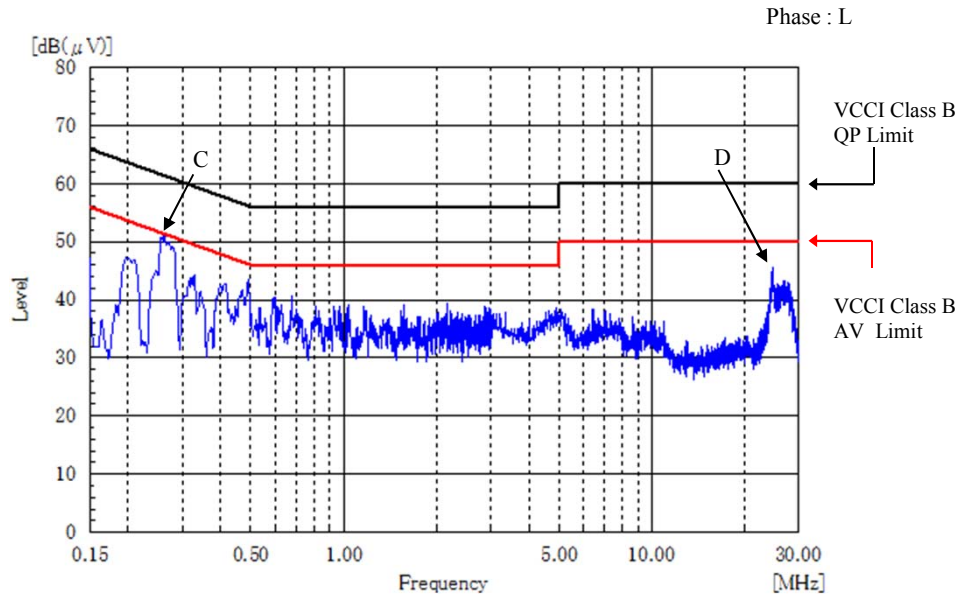
Point A (259kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.5	44.9
AV	51.5	29.7

Point B (24.59MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	42.2
AV	50.0	34.7



Point C (258kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.5	45.2
AV	51.5	30.2

Point D (24.67MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	41.3
AV	50.0	33.8



EN55011-B,EN55022-B,FCC-Bの限界値はVCCI class Bの限界値と同じ

Limit of EN55011-B,EN55022-B,FCC-B are same as its VCCI class B.

2.14 EMI 特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230 VAC

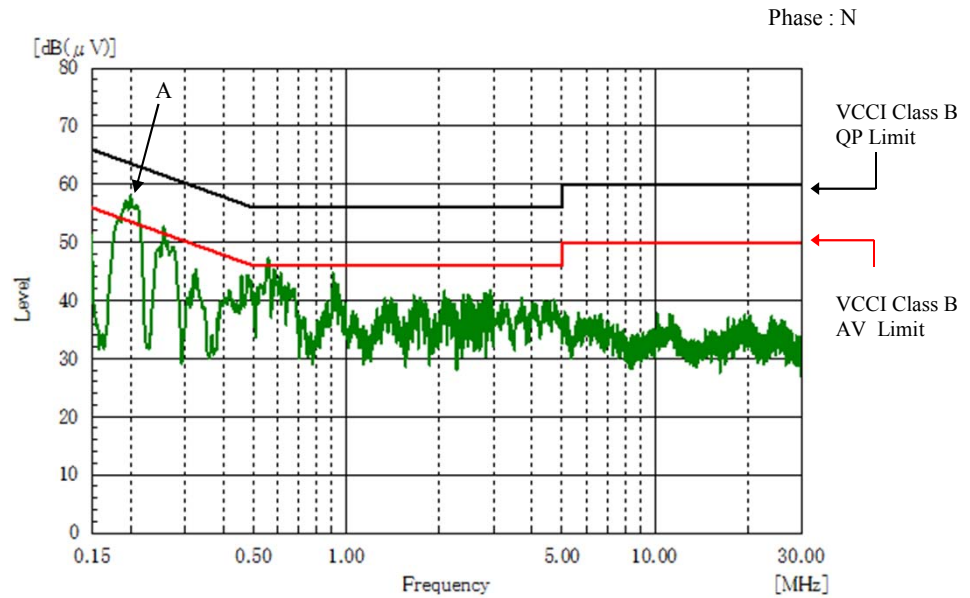
Iout : 100 %

Ta : 25 °C

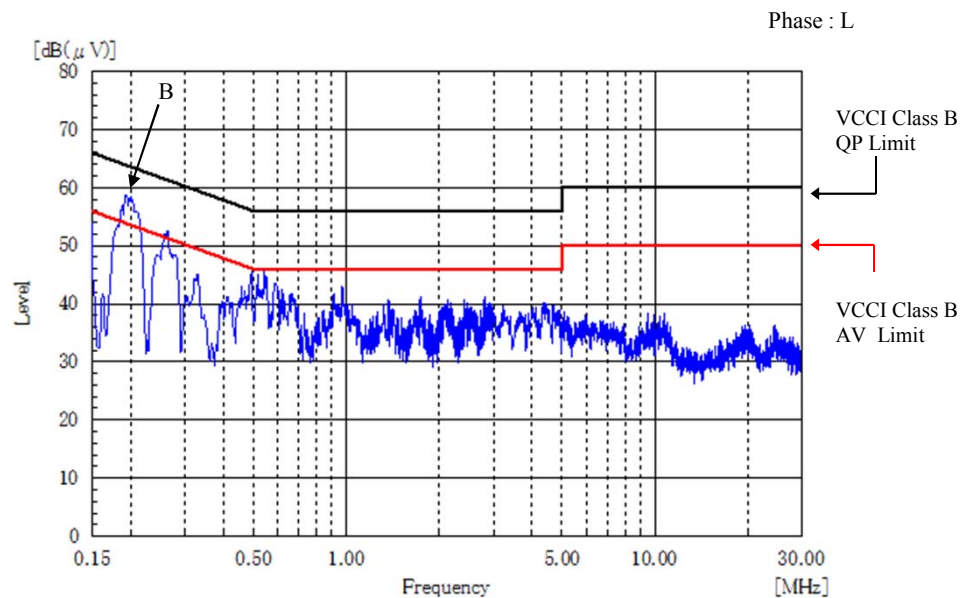
雑音端子電圧

Conducted Emission

Point A (193kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.9	52.2
AV	53.9	36.9



Point B (196kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.8	54.6
AV	53.8	36.9



EN55011-B,EN55022-B,FCC-Bの限界値はVCCI class Bの限界値と同じ

Limit of EN55011-B,EN55022-B,FCC-B are same as its VCCI class B.