

MTW60-51212

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 | |
| | 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 | T-1 |
| | 過渡応答 (負荷急変) 特性 | Dynamic load response characteristics | |
| | 測定回路3 | Circuit 3 used for determination | T-2 |
| | 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 | T-2 |
| | リーク電流特性 | Leakage current characteristics | |
| | 測定回路5 | Circuit 5 used for determination | T-2 |
| | 出力リップル、ノイズ波形 | Output ripple and noise waveform | |
| | 測定構成 | Configuration used for determination | T-3 |
| | 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 | T-4 |

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 T-5

(2) リップルノイズ電圧対入力電圧
Ripple noise voltage vs. Input voltage T-6

(3) 効率・力率対出力電流
Efficiency and Power factor vs. Output current T-7

(4) 入力電力対出力電流
Input power vs. Output current T-8

(5) 入力電流対出力電流
Input current vs. Output current T-8

2.2 通電ドリフト特性 Warm up voltage drift characteristics T-9

2.3 出力保持時間特性 Hold up time characteristics T-9

2.4 出力立ち上がり特性 Output rise characteristics T-10

2.5 出力立ち下がり特性 Output fall characteristics T-11

2.6 過電流保護特性 Over current protection (OCP) characteristics T-12 ~ 13

2.7 過電圧保護特性 Over voltage protection (OVP) characteristics T-14

2.8 過渡応答（負荷急変）特性 Dynamic load response characteristics T-15

2.9 入力電圧瞬停特性 Response to brown out characteristics T-16

2.10 入力サージ電流（突入電流）波形 Inrush current waveform T-17

2.11 リーク電流特性 Leakage current characteristics T-18

2.12 出力リップル、ノイズ波形 Output ripple and noise waveform T-19

2.13 EMI特性 Electro-Magnetic Interference characteristics T-20 ~ 21

使用記号 Terminology used

| | 定義 | Definition |
|------------------|------------|---------------------|
| V _{in} | 入力電圧 | Input voltage |
| V _{out} | 出力電圧 | Output voltage |
| I _{in} | 入力電流 | Input current |
| I _{out} | 出力電流 | Output current |
| T _a | 周囲温度 | Ambient temperature |
| f | 周波数 | Frequency |

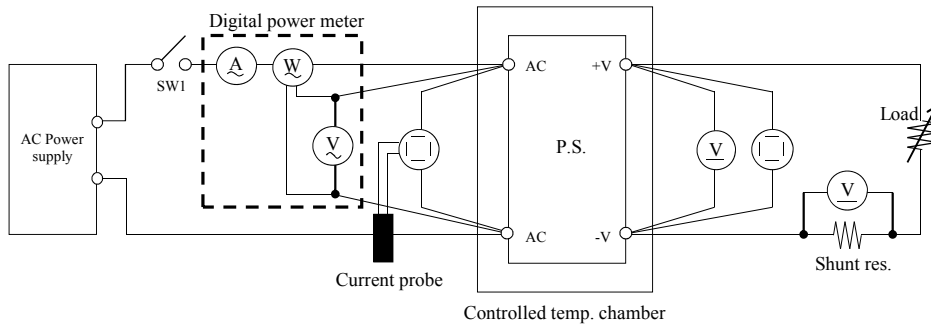
※ 弊社測定条件における結果であり、参考値としてお考え願います。
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1.1 測定回路 Circuit used for determination

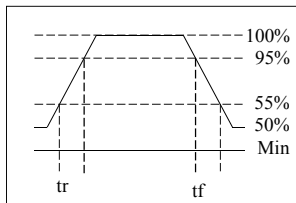
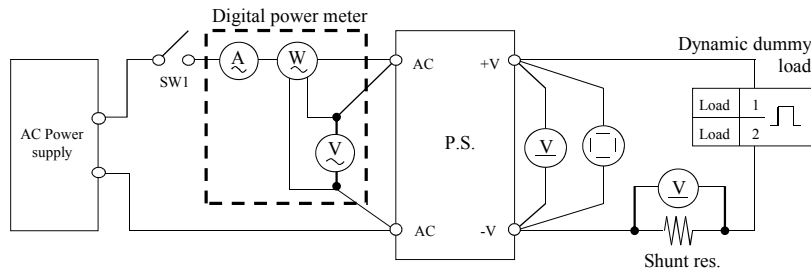
測定回路1 Circuit 1 used for determination

- ・ 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



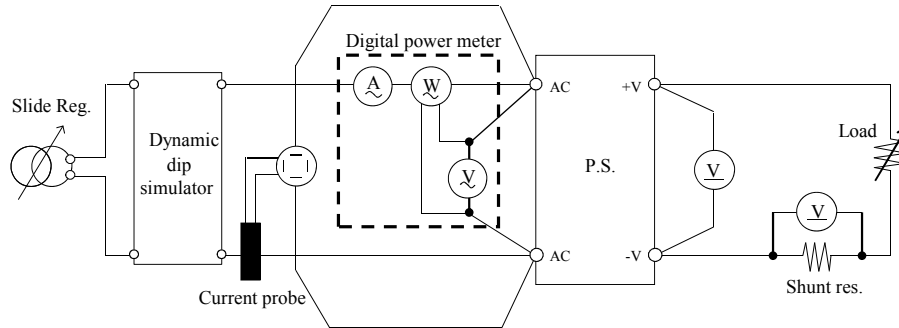
測定回路2 Circuit 2 used for determination

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



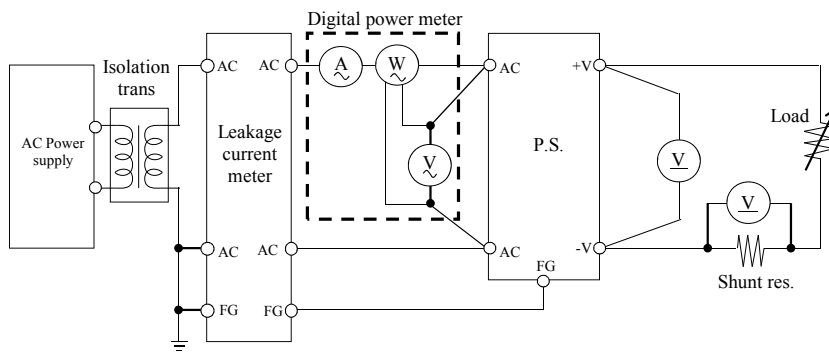
測定回路3 Circuit 3 used for determination

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



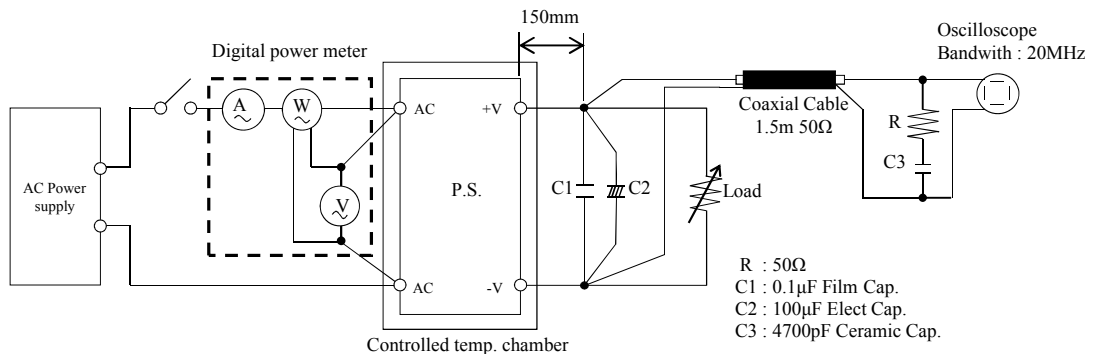
測定回路4 Circuit 4 used for determination

- ・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

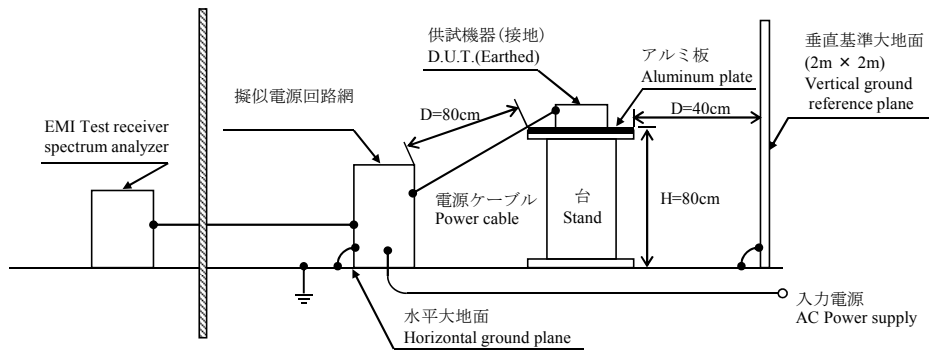


測定構成 Configuration used for determination

- 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 : 12V | V3 : -12V |
| Min Load | 0.0A | 0.0A | 0.0A |
| 100% | 5.0A | 2.5A | 0.5A |

1. Regulation - line and load

Condition Ta : 25 °C

V1 : 5V

| | | | | | | |
|-----------------|--------|--------|--------|--------|-----------------|--------|
| Iout \ Vin | 85VAC | 100VAC | 200VAC | 265VAC | Line regulation | |
| Min Load | 5.059V | 5.059V | 5.058V | 5.059V | 1mV | 0.020% |
| 50% | 5.060V | 5.060V | 5.060V | 5.059V | 1mV | 0.020% |
| 100% | 5.059V | 5.059V | 5.059V | 5.059V | 0mV | 0.000% |
| Load regulation | 1mV | 1mV | 2mV | 0mV | | |
| | 0.020% | 0.020% | 0.040% | 0.000% | | |

V2 : 12V

| | | | | | | |
|-----------------|---------|---------|---------|---------|-----------------|--------|
| Iout \ Vin | 85VAC | 100VAC | 200VAC | 265VAC | Line regulation | |
| Min Load | 11.811V | 11.811V | 11.811V | 11.811V | 0mV | 0.000% |
| 50% | 11.816V | 11.816V | 11.816V | 11.816V | 0mV | 0.000% |
| 100% | 11.816V | 11.816V | 11.816V | 11.816V | 0mV | 0.000% |
| Load regulation | 5mV | 5mV | 5mV | 5mV | | |
| | 0.042% | 0.042% | 0.042% | 0.042% | | |

V3 : -12V

| | | | | | | |
|-----------------|----------|----------|----------|----------|-----------------|--------|
| Iout \ Vin | 85VAC | 100VAC | 200VAC | 265VAC | Line regulation | |
| Min Load | -11.937V | -11.936V | -11.936V | -11.936V | 1mV | 0.008% |
| 50% | -11.939V | -11.939V | -11.939V | -11.939V | 0mV | 0.000% |
| 100% | -11.941V | -11.941V | -11.941V | -11.941V | 0mV | 0.000% |
| Load regulation | 4mV | 5mV | 5mV | 5mV | | |
| | 0.033% | 0.042% | 0.042% | 0.042% | | |

2. Temperature drift

Conditions Vin : 100 VAC

Iout : 100 %

V1 : 5V

| | | | | | |
|------|--------|--------|--------|-----------------------|--------|
| Ta | -10°C | +25°C | +50°C | Temperature stability | |
| Vout | 5.035V | 5.059V | 5.059V | 24mV | 0.480% |

V2 : 12V

| | | | | | |
|------|---------|---------|---------|-----------------------|--------|
| Ta | -10°C | +25°C | +50°C | Temperature stability | |
| Vout | 11.664V | 11.816V | 11.852V | 188mV | 1.567% |

V3 : -12V

| | | | | | |
|------|----------|----------|----------|-----------------------|--------|
| Ta | -10°C | +25°C | +50°C | Temperature stability | |
| Vout | -11.938V | -11.941V | -11.945V | 7mV | 0.058% |

3. Start up voltage and Drop out voltage

Conditions Ta : 25 °C

Iout : 100 %

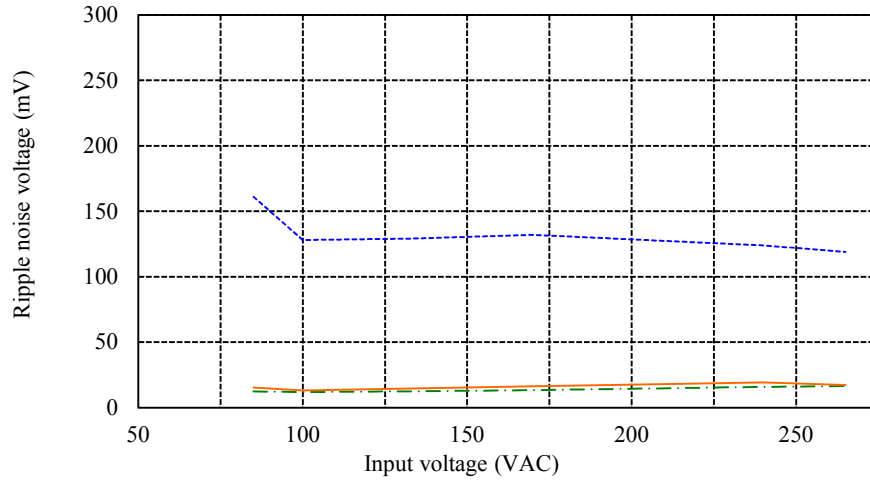
| | |
|------------------------|-------|
| Start up voltage (Vin) | 47VAC |
| Drop out voltage (Vin) | 41VAC |

(2) リップルノイズ電圧対入力電圧

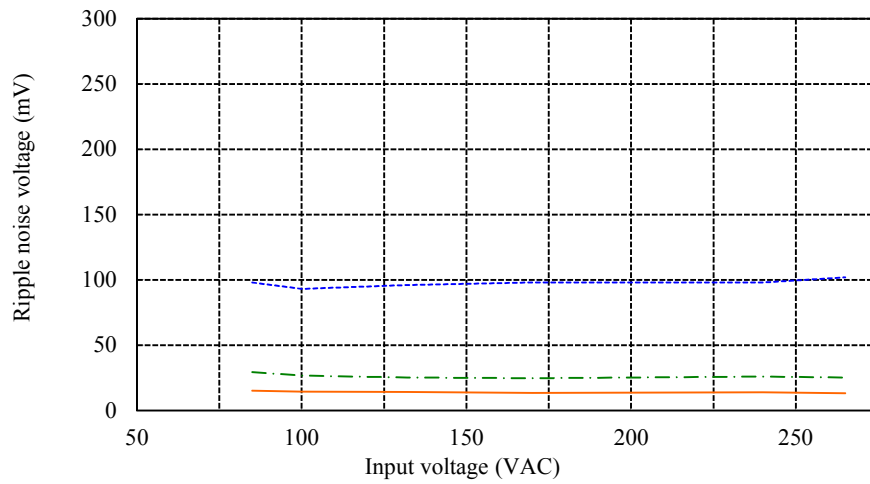
Ripple noise voltage vs. Input voltage

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

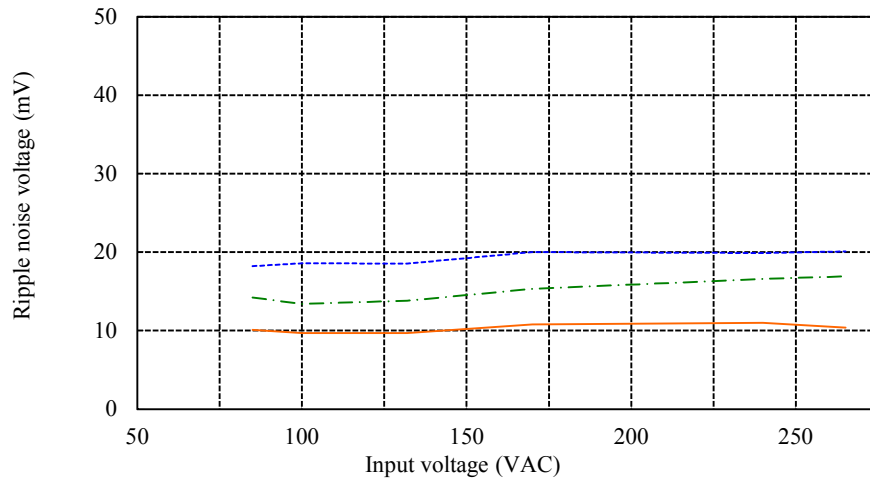
V1 : 5V



V2 : 12V



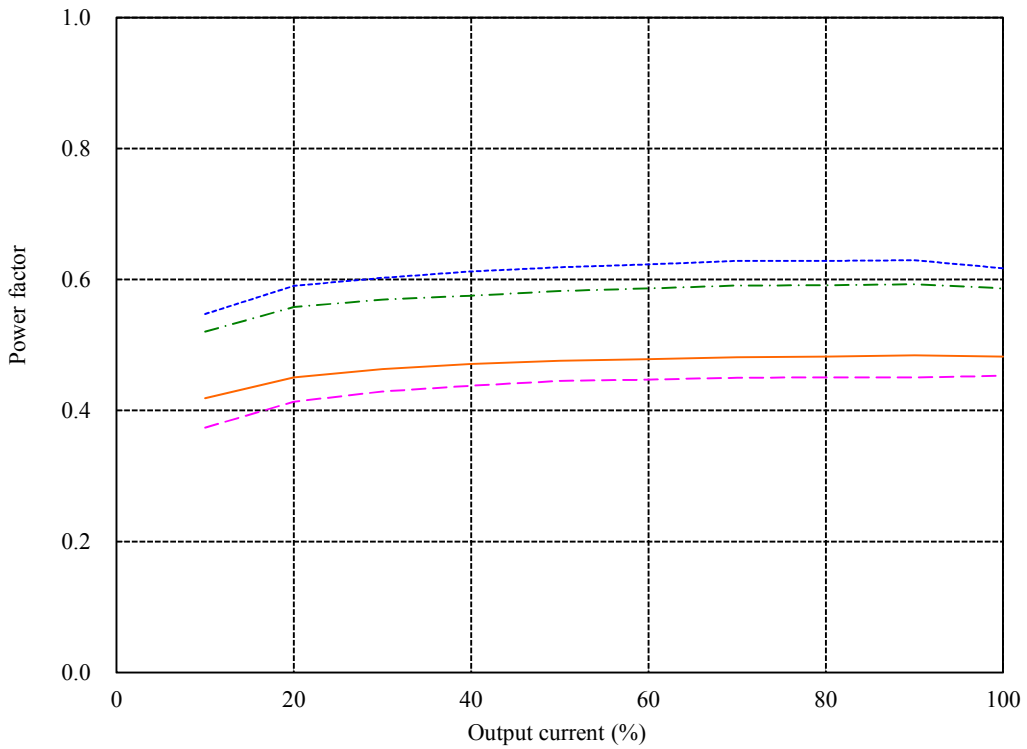
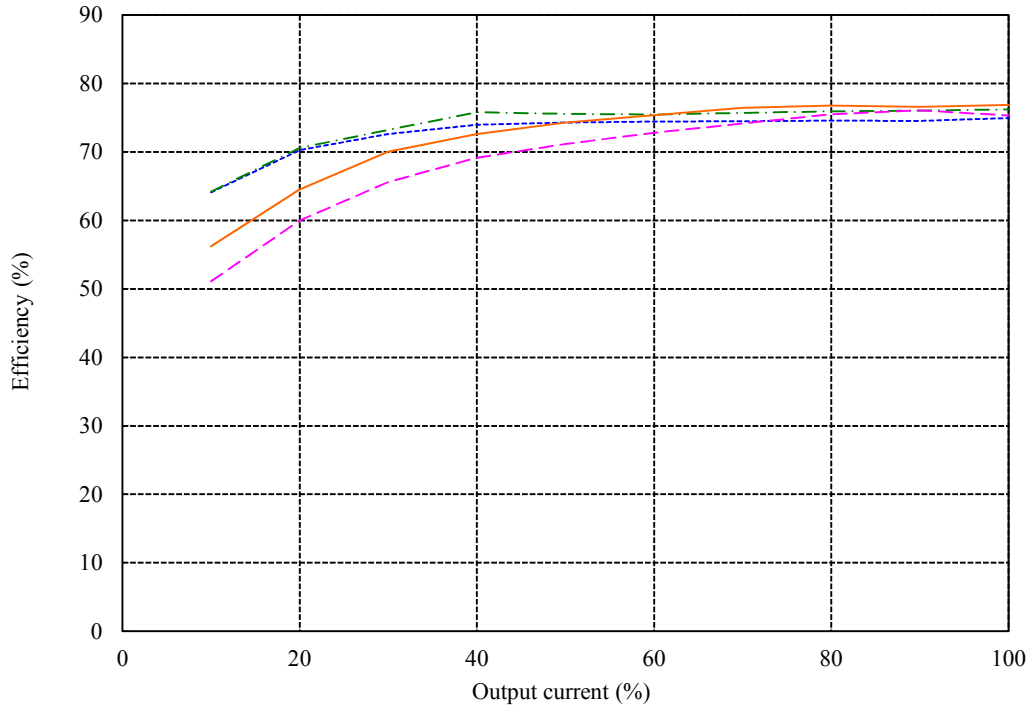
V3 : -12V



(3) 効率・力率対出力電流

Efficiency and Power factor vs. Output current

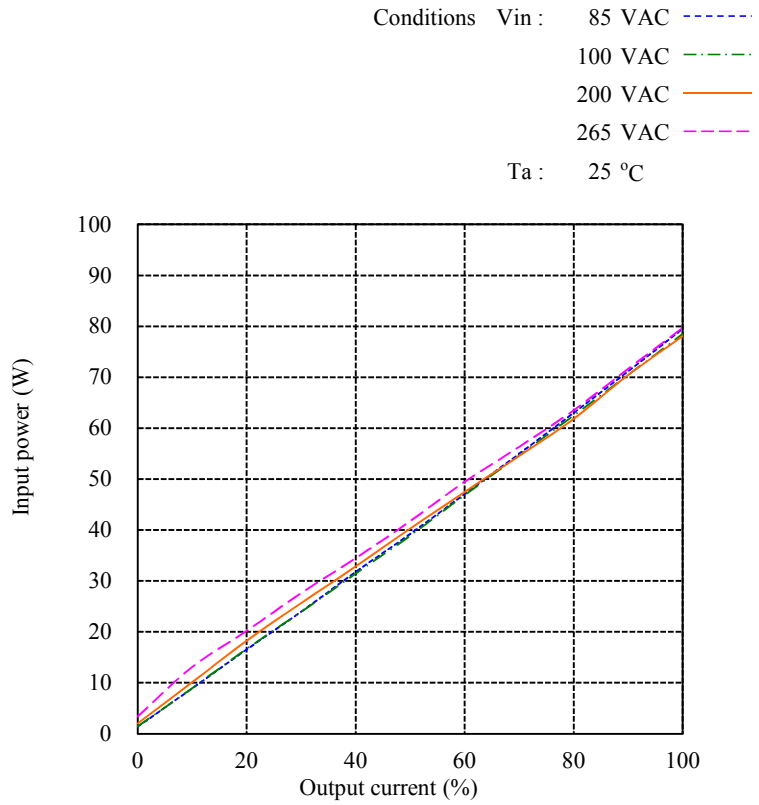
Conditions Vin : 85 VAC ---
 100 VAC - - -
 200 VAC ———
 265 VAC - · - · -
 Ta : 25 °C



(4) 入力電力対出力電流

Input power vs. Output current

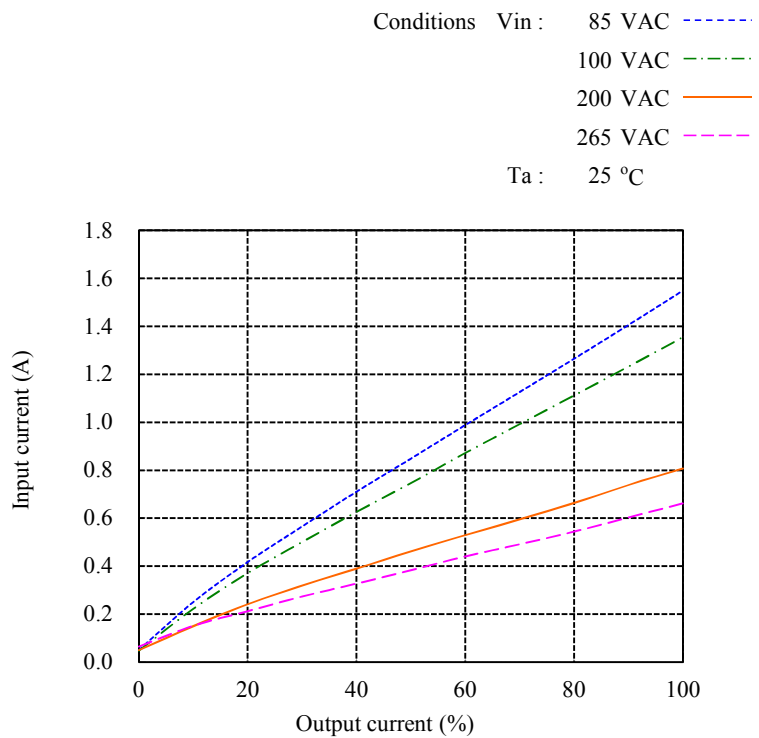
| Vin | Input power |
|--------|-------------|
| | Iout : 0% |
| 85VAC | 1.37W |
| 100VAC | 1.43W |
| 200VAC | 2.00W |
| 265VAC | 3.37W |



(5) 入力電流対出力電流

Input current vs. Output current

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

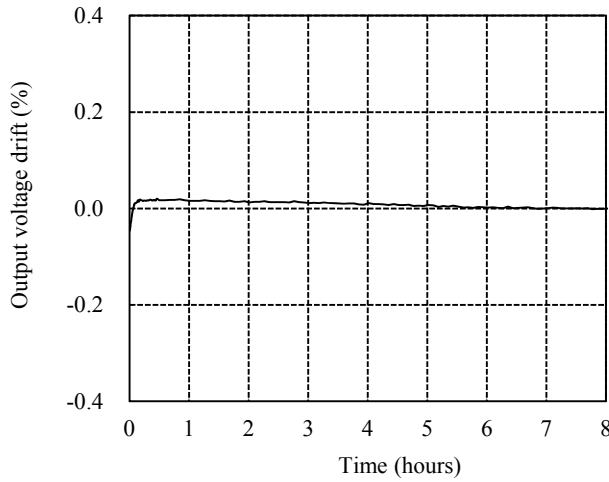


2.2 通電ドリフト特性

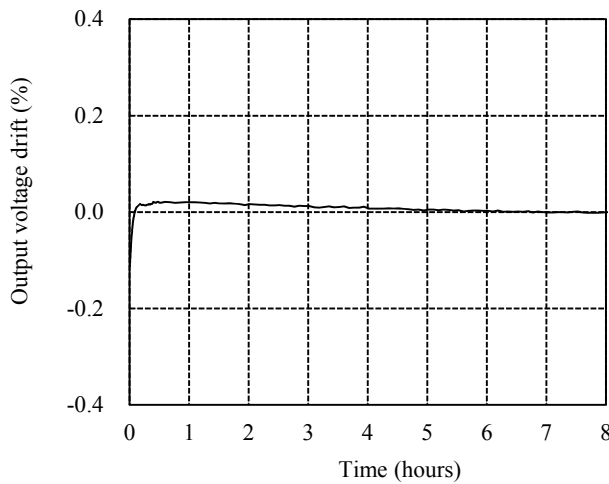
Warm up voltage drift characteristics

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

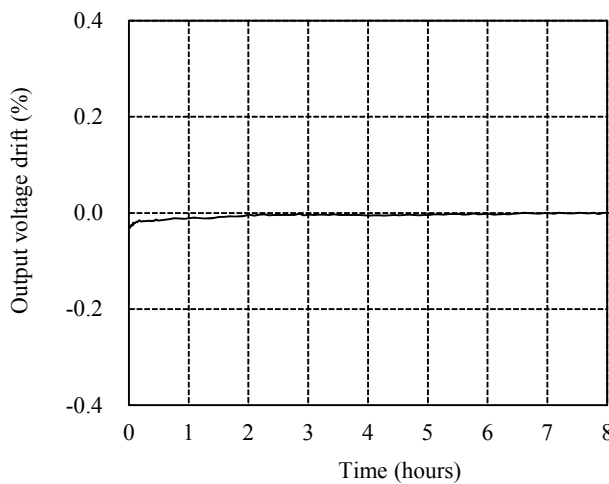
V1 : 5V



V2 : 12V



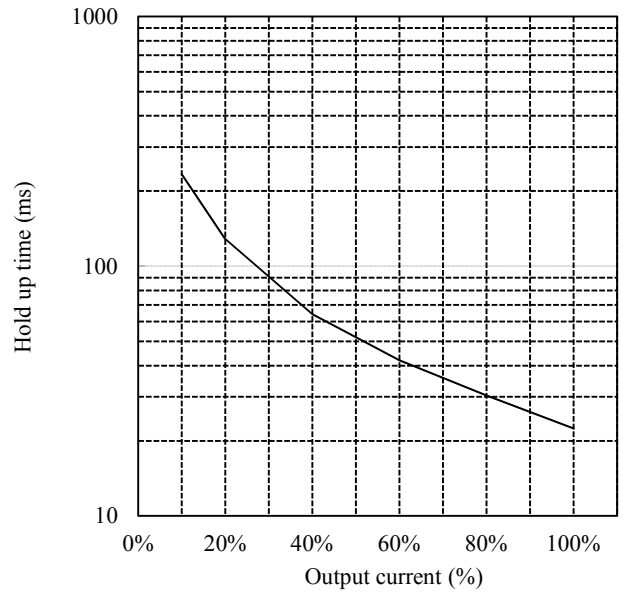
V3 : -12V



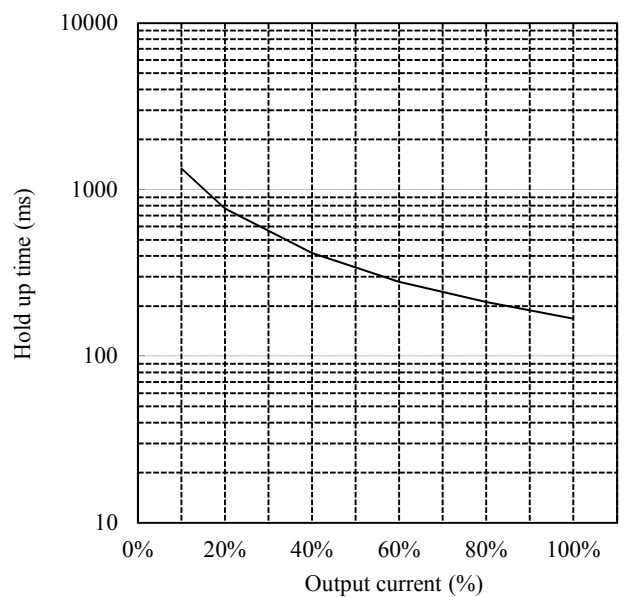
2.3 出力保持時間特性

Hold up time characteristics

Conditions Vin : 100 VAC
Ta : 25 °C



Conditions Vin : 240 VAC
Ta : 25 °C

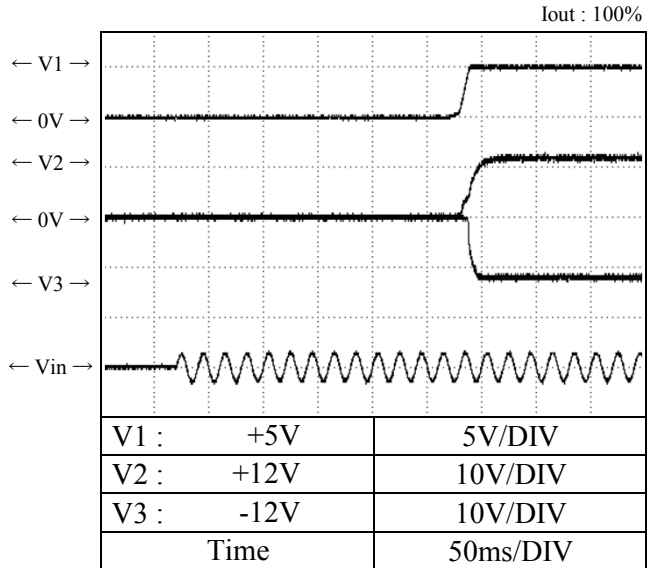
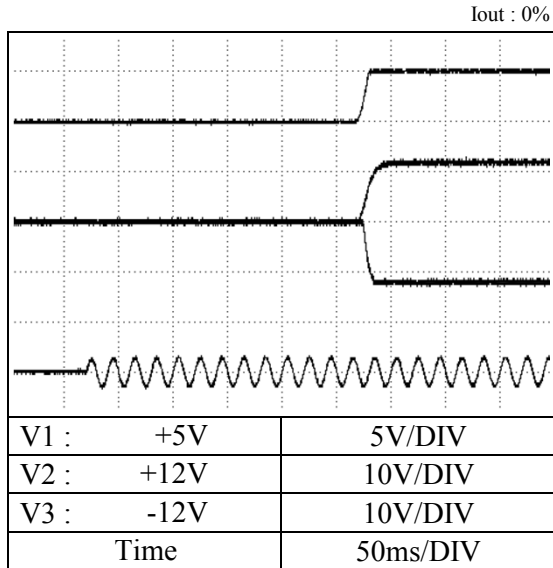


2.4 出力立ち上がり特性

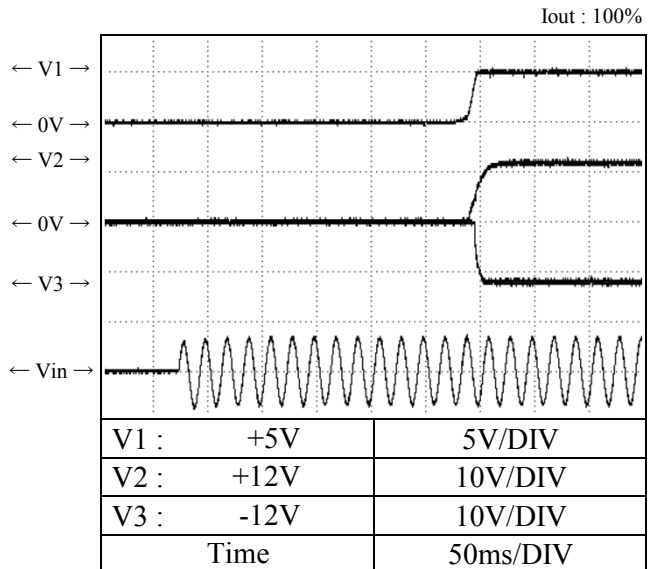
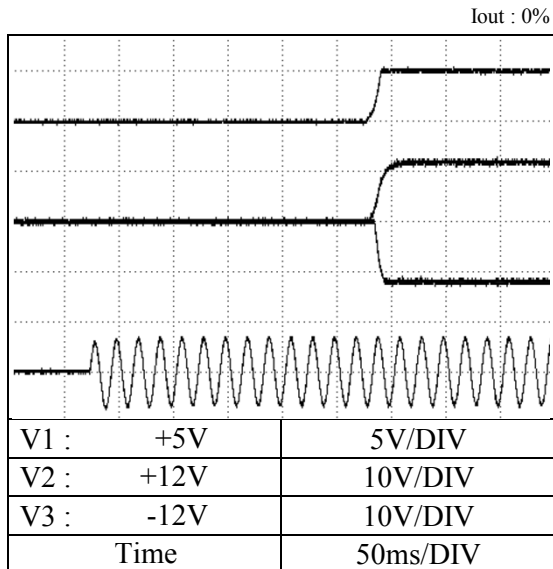
Output rise characteristics

Conditions Ta : 25 °C

Vin = 100VAC



Vin = 240VAC

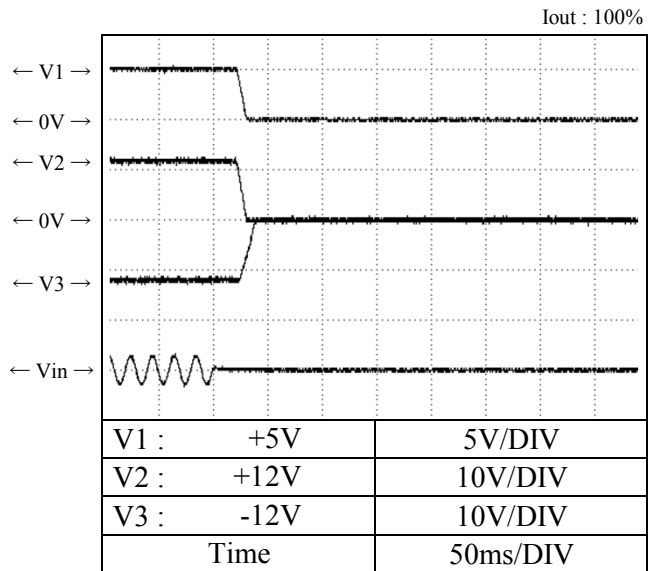
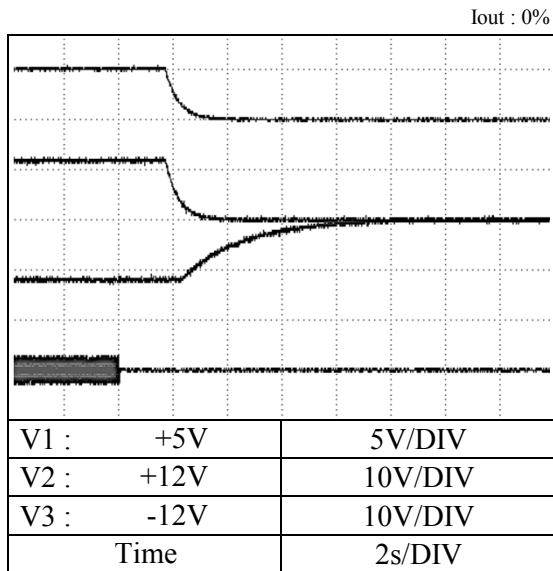


2.5 出力立ち下がり特性

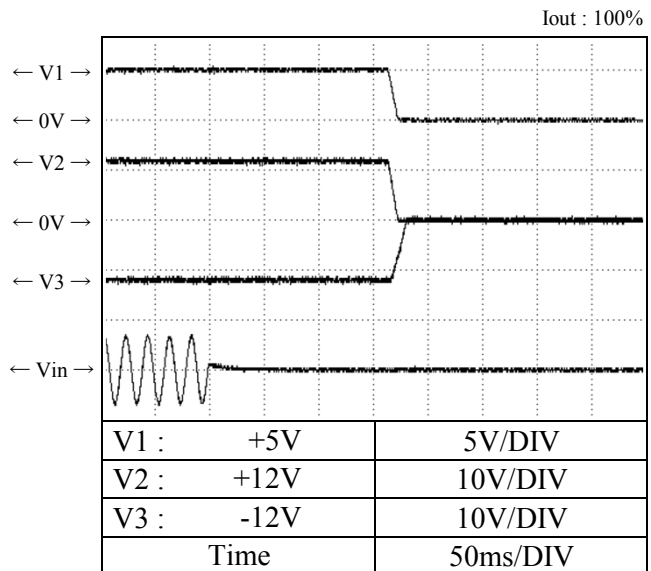
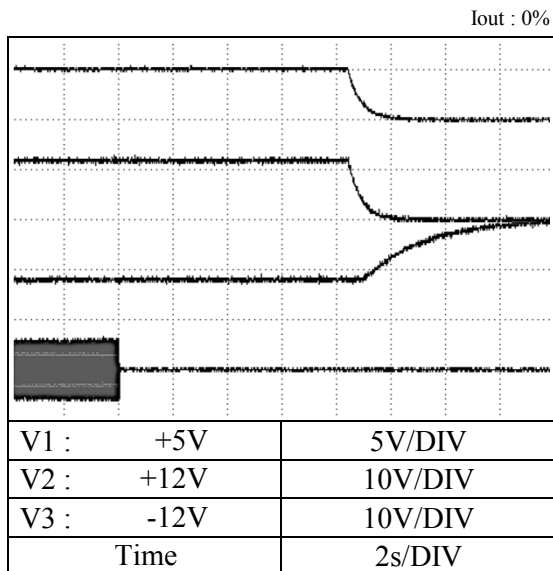
Output fall characteristics

Conditions Ta : 25 °C

Vin = 100VAC



Vin = 240VAC



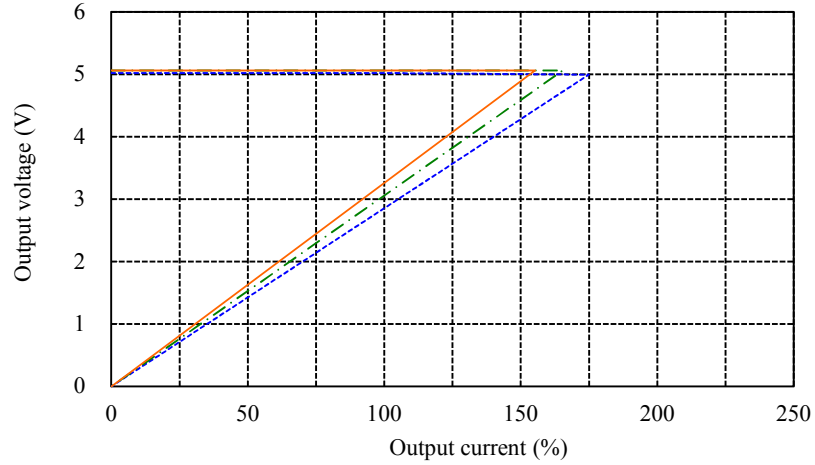
2.6 過電流保護特性

Over current protection (OCP) characteristics

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

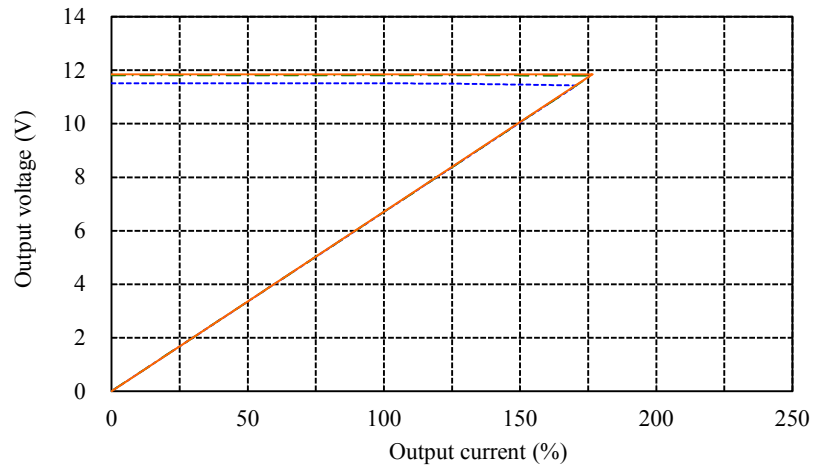
V1 : 5V

V2, V3 : Io = 100%



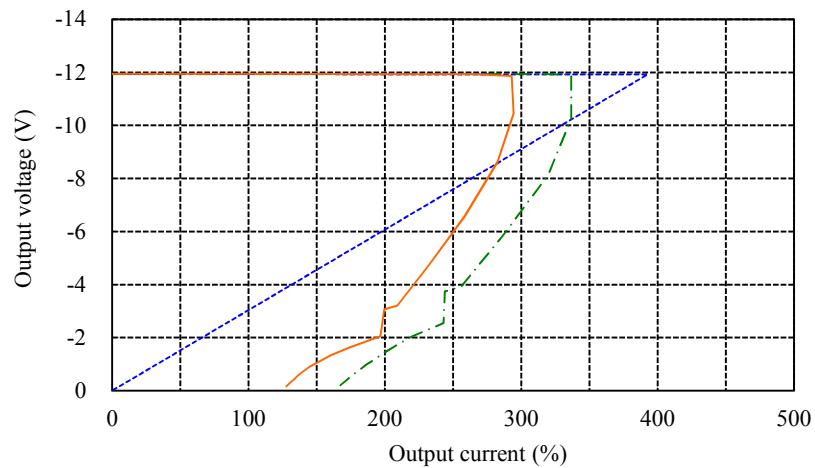
V2 : 12V

V1, V3 : Io = 100%



V3 : -12V

V1, V2 : Io = 100%



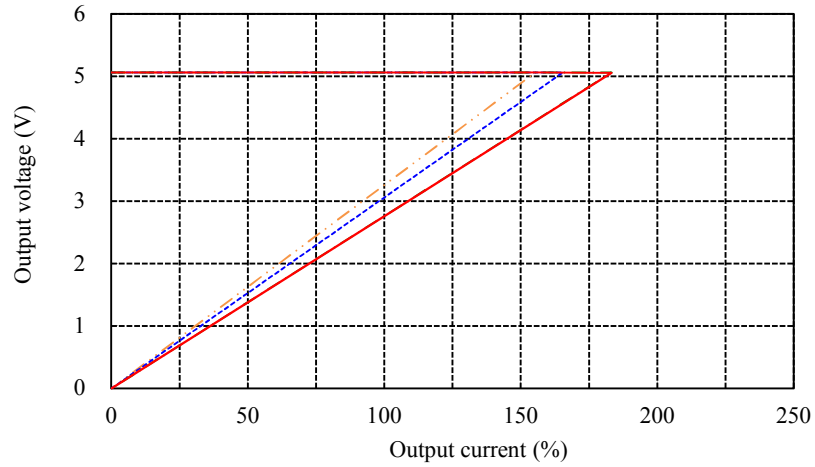
2.6 過電流保護特性

Over current protection (OCP) characteristics

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

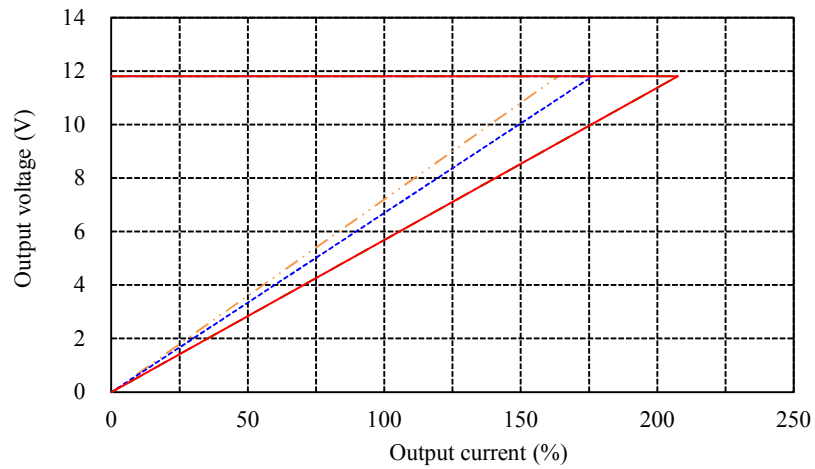
V1 : 5V

V2, V3 : Io = 100%



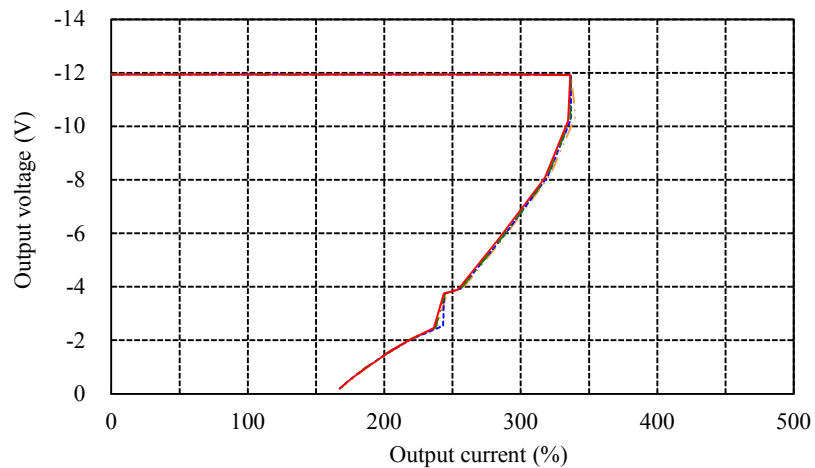
V2 : 12V

V1, V3 : Io = 100%



V3 : -12V

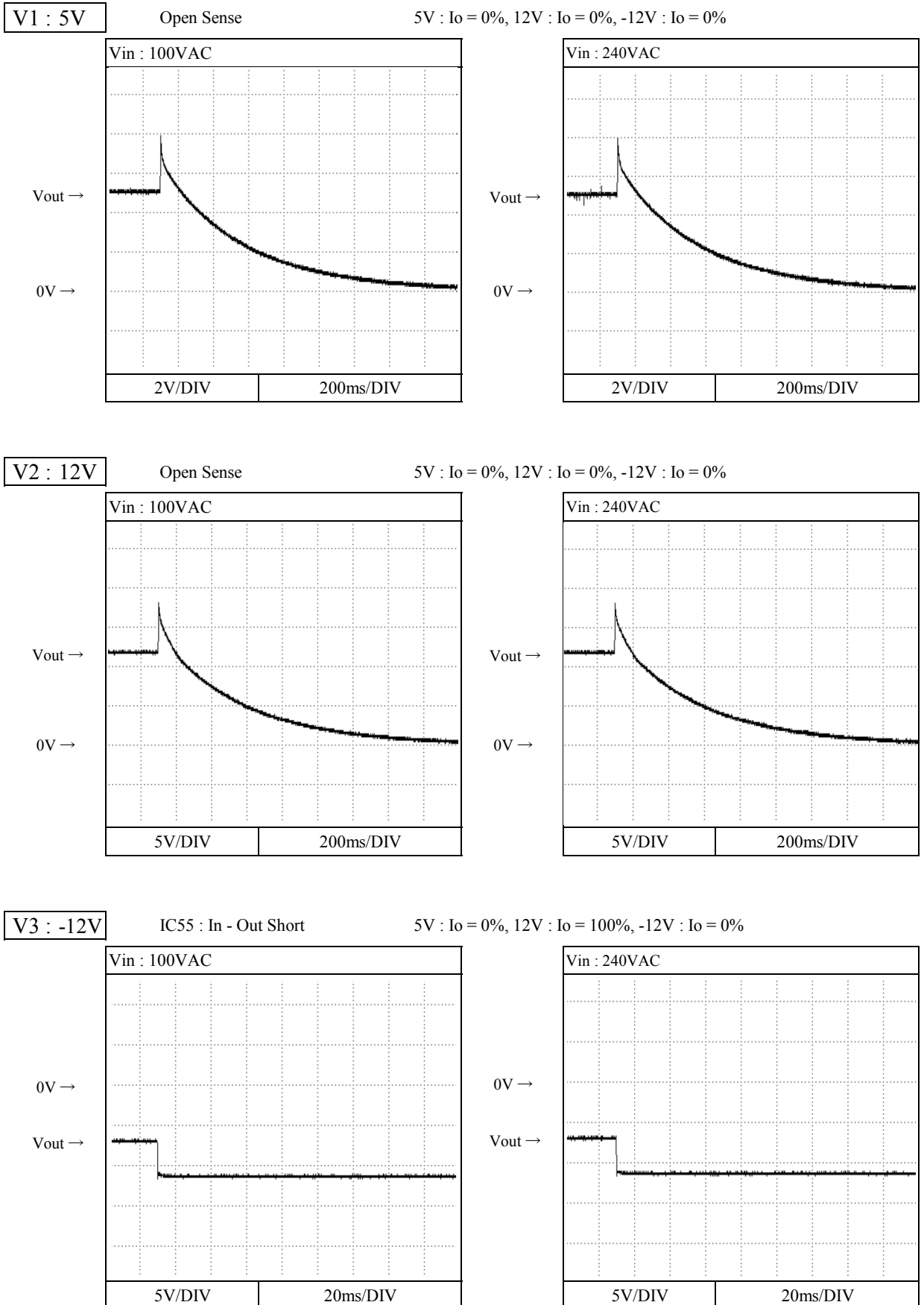
V1, V2 : Io = 100%



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



| | | |
|----------------|----------------|--------|
| V1 : 200mV/DIV | Time : 2ms/DIV | |
| V2 : 50mV/DIV | ΔV1 | +2.99% |
| V3 : 50mV/DIV | | -3.27% |

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



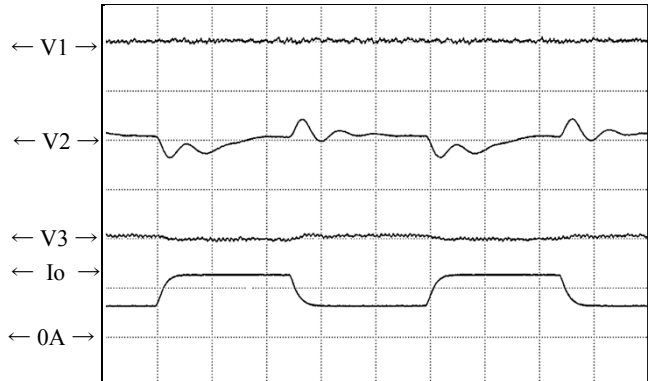
| | | |
|----------------|------------------|--------|
| V1 : 200mV/DIV | Time : 200μs/DIV | |
| V2 : 50mV/DIV | ΔV1 | +3.36% |
| V3 : 50mV/DIV | | -2.80% |

V2 : 12V Io (V1) : 100% Io (V2) : 50% ↔ 100% (tr = tf = 50μs) f = 100Hz



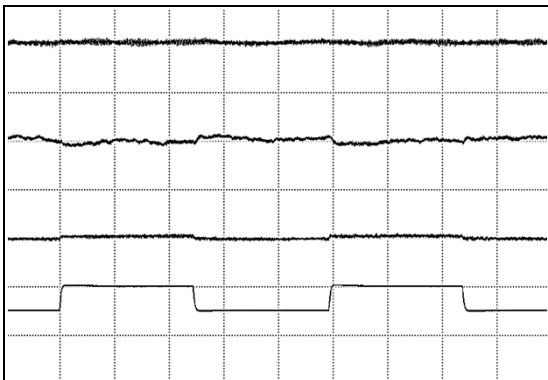
| | | |
|----------------|----------------|--------|
| V1 : 50mV/DIV | Time : 2ms/DIV | |
| V2 : 100mV/DIV | ΔV2 | +0.66% |
| V3 : 50mV/DIV | | -0.66% |

Io (V3) : 100% f = 1kHz



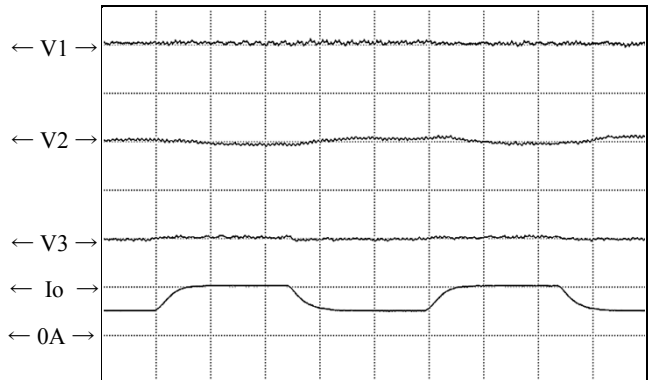
| | | |
|----------------|------------------|--------|
| V1 : 50mV/DIV | Time : 200μs/DIV | |
| V2 : 100mV/DIV | ΔV2 | +0.71% |
| V3 : 50mV/DIV | | -0.61% |

V3 : -12V Io (V1) : 100% Io (V2) : 100% Io (V3) : 50% ↔ 100% (tr = tf = 50μs) f = 100Hz



| | | |
|---------------|----------------|--------|
| V1 : 50mV/DIV | Time : 2ms/DIV | |
| V2 : 50mV/DIV | ΔV3 | +0.05% |
| V3 : 20mV/DIV | | -0.02% |

Io (V3) : 50% ↔ 100% (tr = tf = 50μs) f = 1kHz



| | | |
|---------------|------------------|--------|
| V1 : 50mV/DIV | Time : 200μs/DIV | |
| V2 : 50mV/DIV | ΔV3 | +0.04% |
| V3 : 20mV/DIV | | -0.02% |

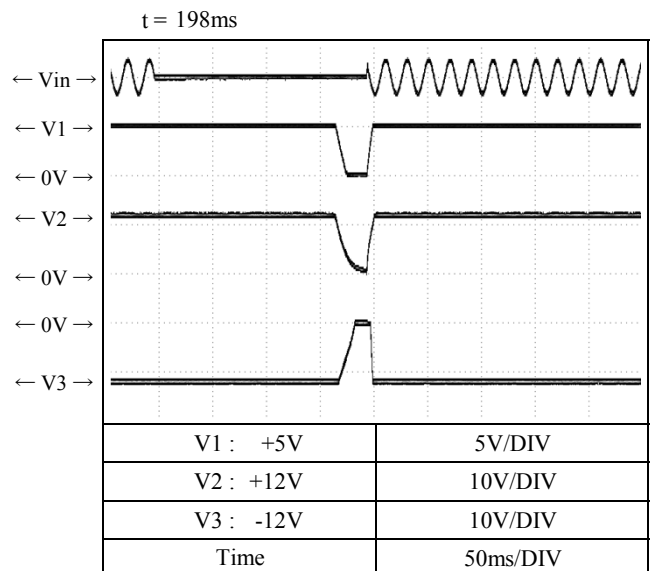
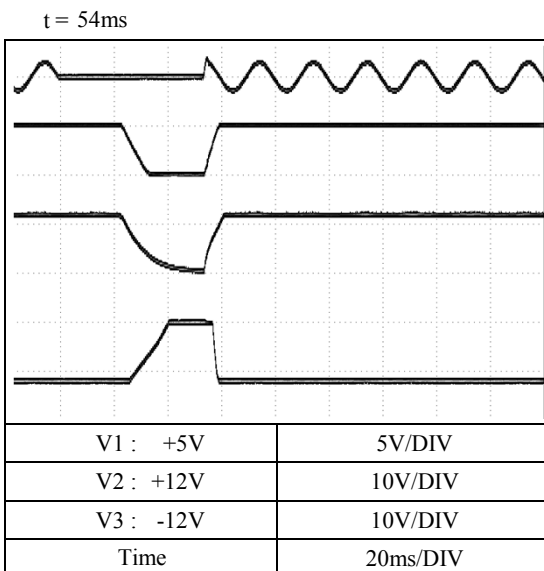
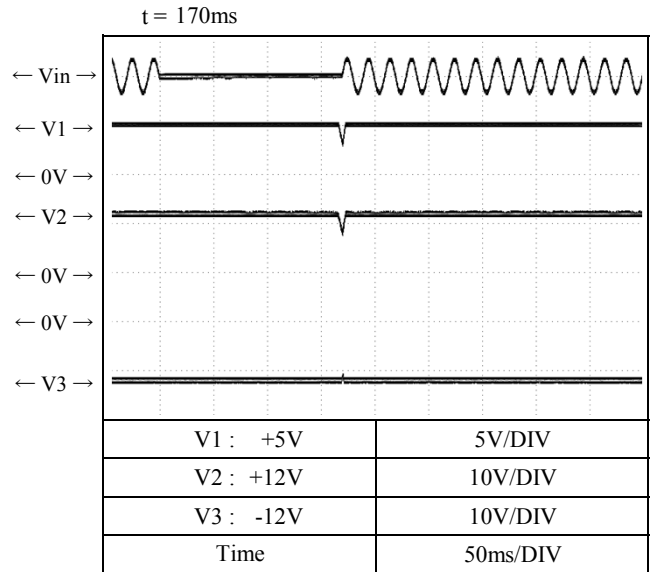
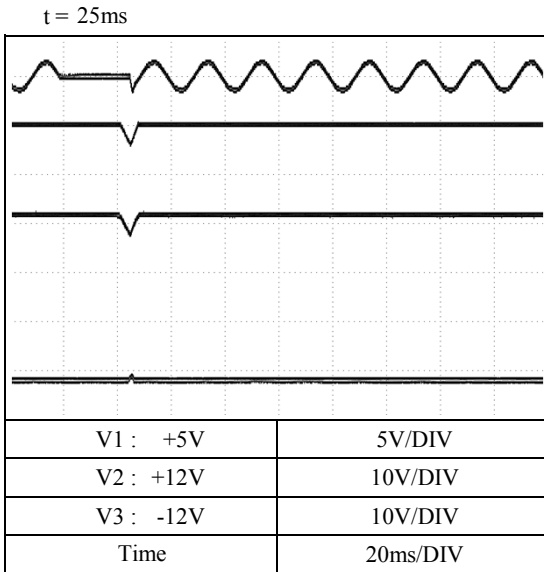
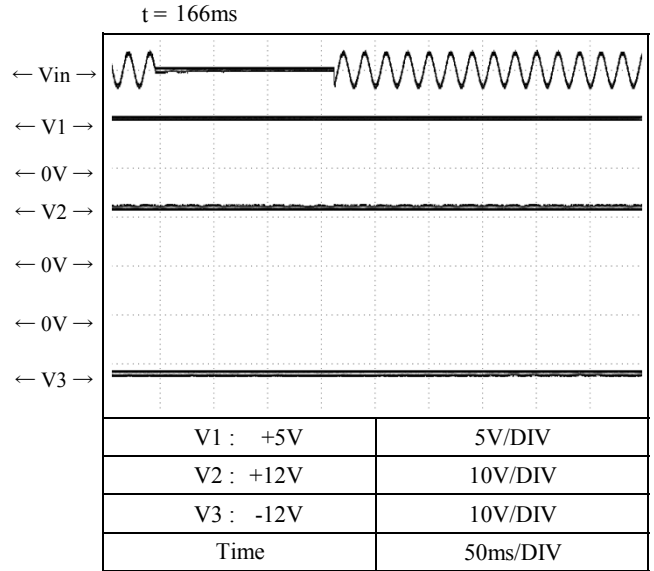
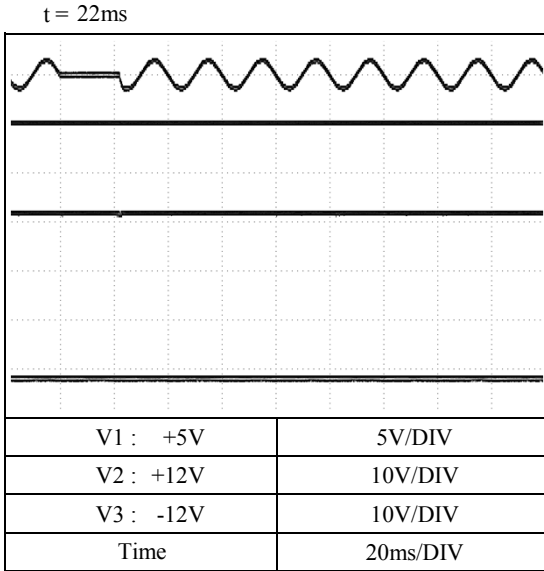
2.10 入力電圧瞬停特性

Response to brown out characteristics

Conditions Iout : 100 %
Ta : 25 °C

Vin = 100VAC

Vin = 240VAC



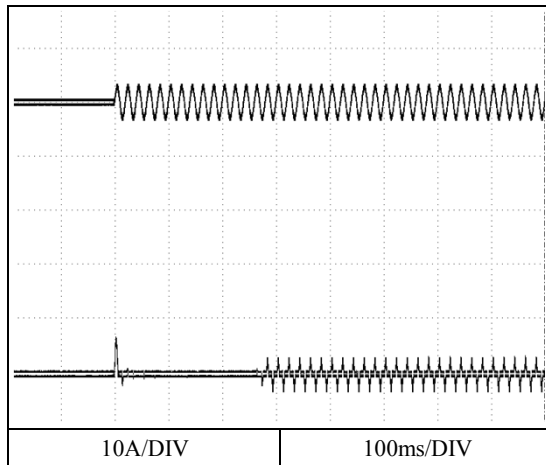
2.11 入力サージ電流（突入電流）波形

Inrush current waveform

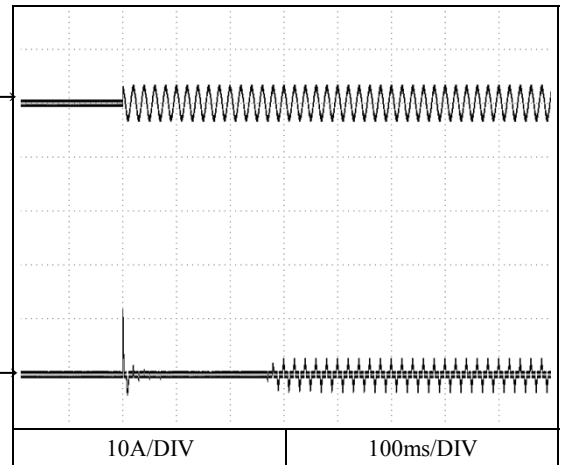
Conditions Iout : 100 %
Ta : 25 °C

Vin = 100VAC

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

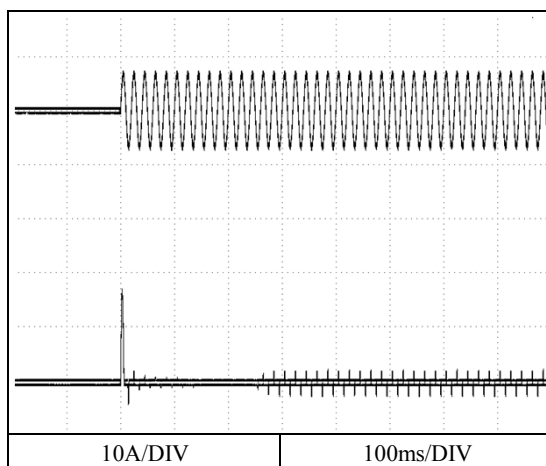


Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

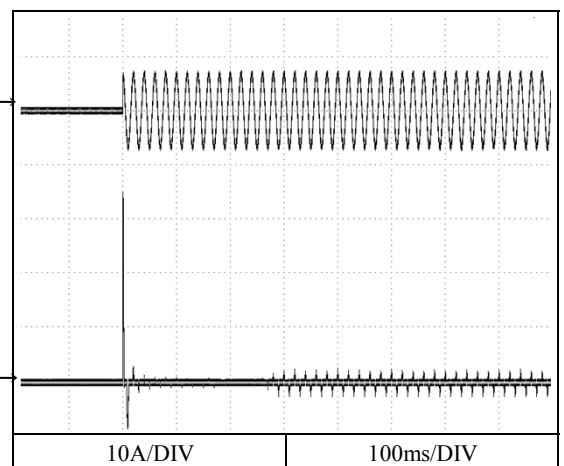


Vin = 240VAC

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



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

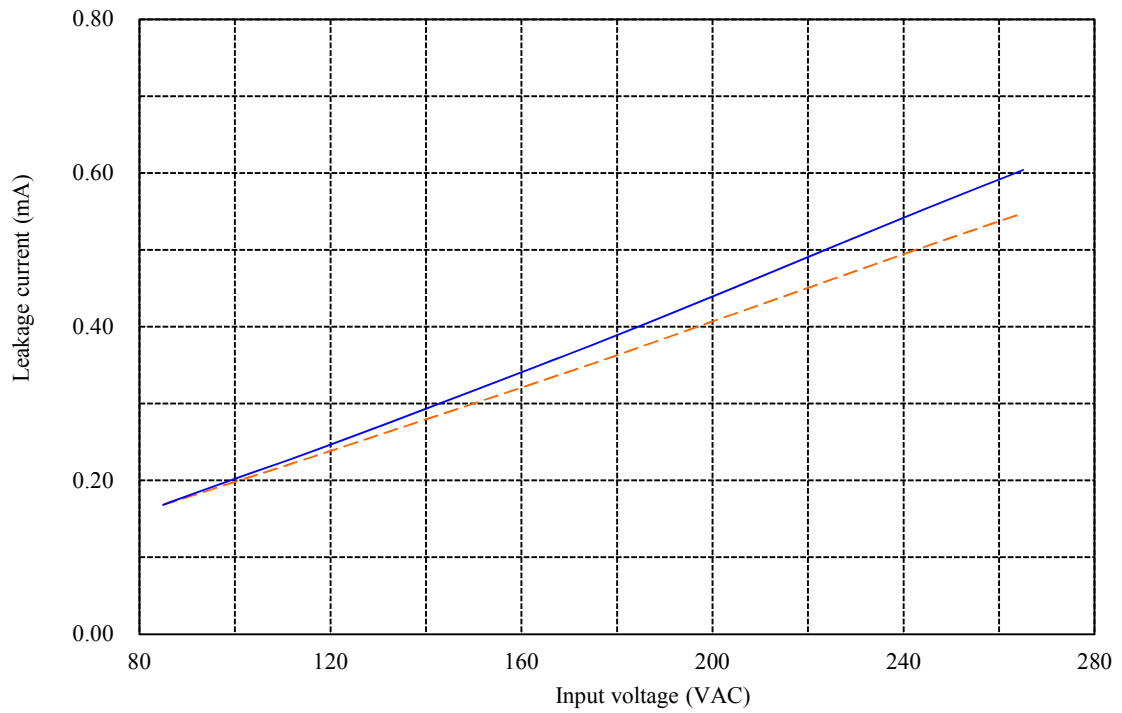


2.12 リーク電流特性

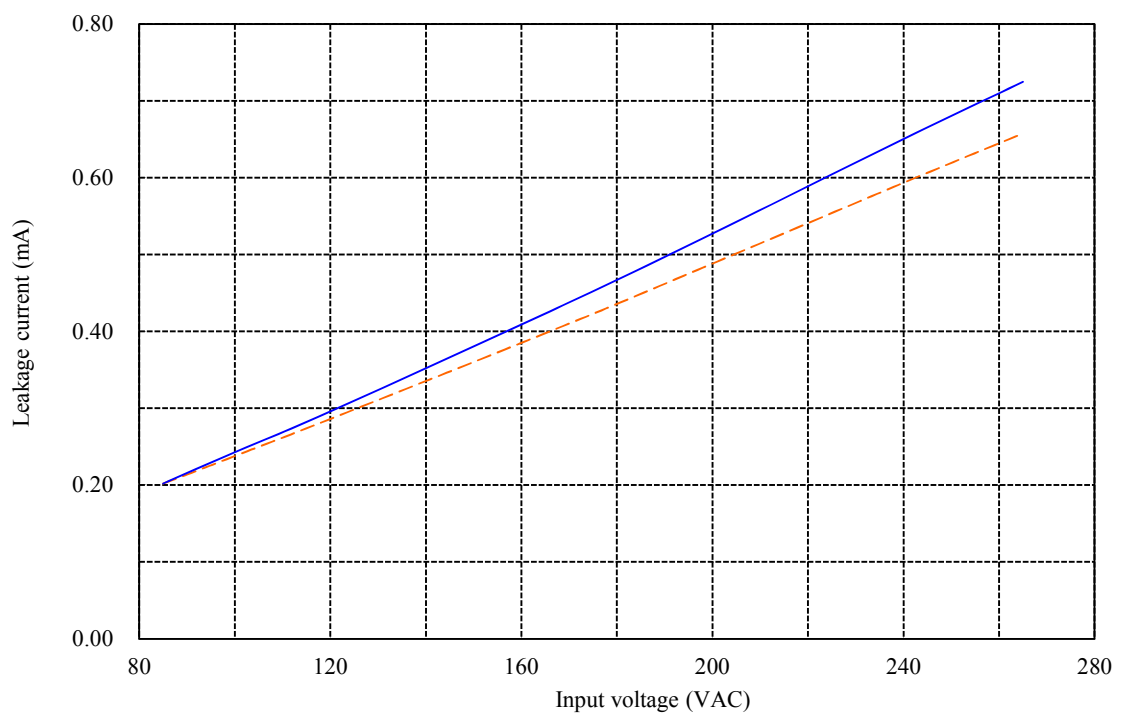
Leakage current characteristics

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

f : 50 Hz



f : 60 Hz

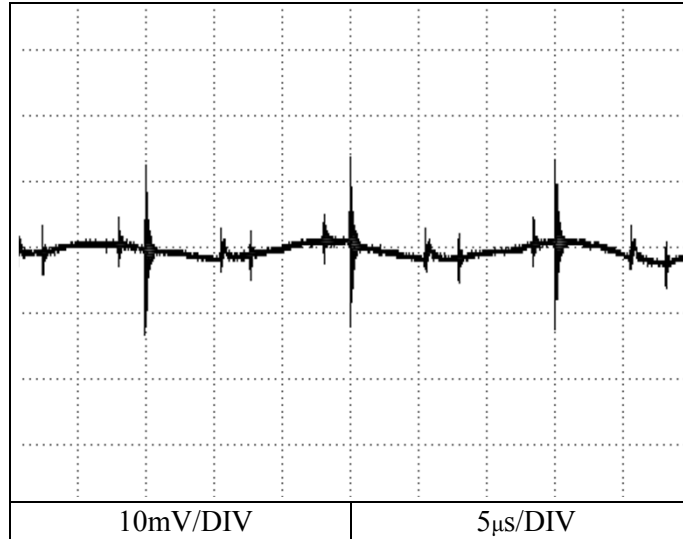


2.13 出力リップル、ノイズ波形

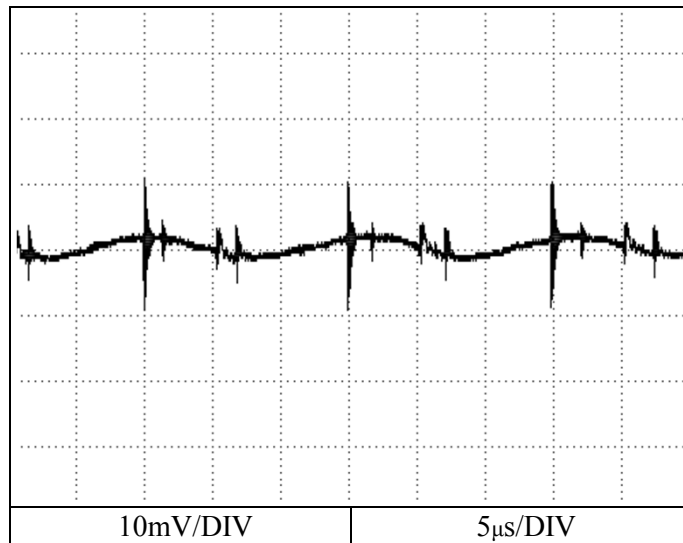
Output ripple and noise waveform

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

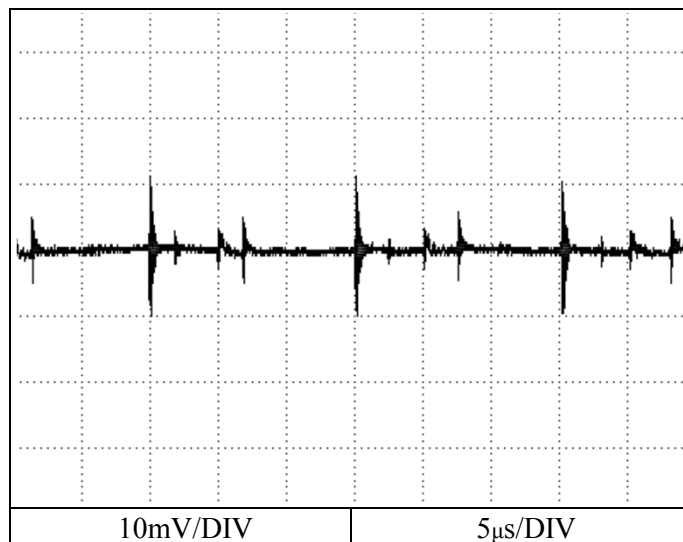
V1 : 5V



V2 : 12V



V3 : -12V



2.14 EMI 特性

Electro-Magnetic Interference characteristics

Conditions Vin : 100 VAC

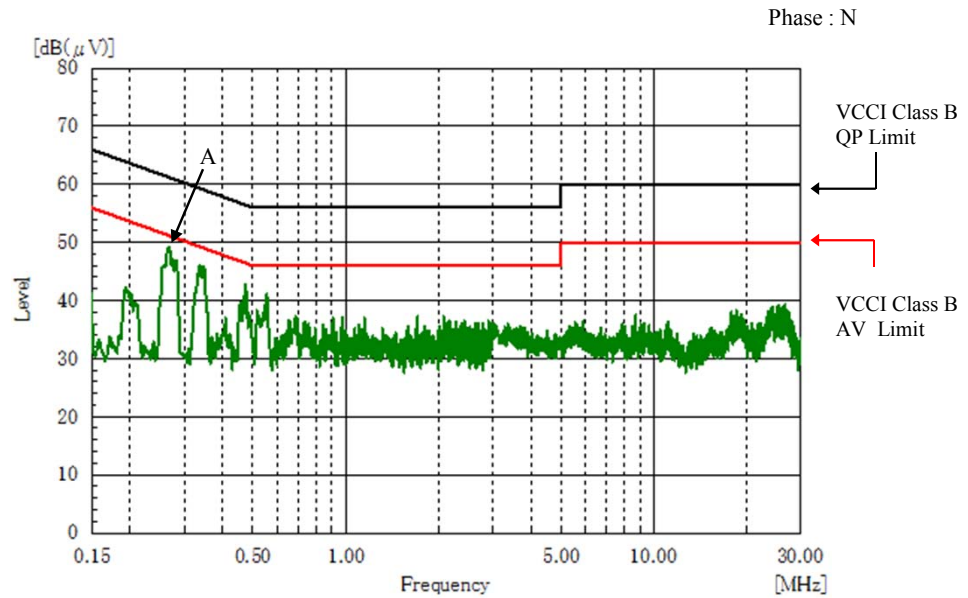
Iout : 100 %

Ta : 25 °C

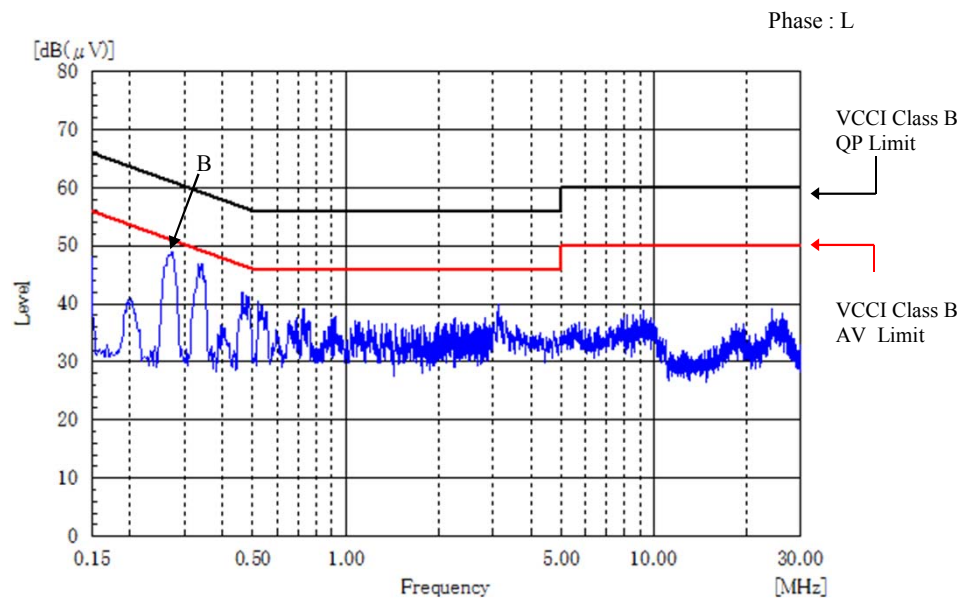
雑音端子電圧

Conducted Emission

| Point A (266kHz) | | |
|---------------------|------------|--------------|
| Ref. Data | Limit (dB) | Measure (dB) |
| QP | 61.3 | 45.0 |
| AV | 51.3 | 31.1 |



| Point B (260kHz) | | |
|---------------------|------------|--------------|
| Ref. Data | Limit (dB) | Measure (dB) |
| QP | 61.4 | 45.0 |
| AV | 51.4 | 30.0 |



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

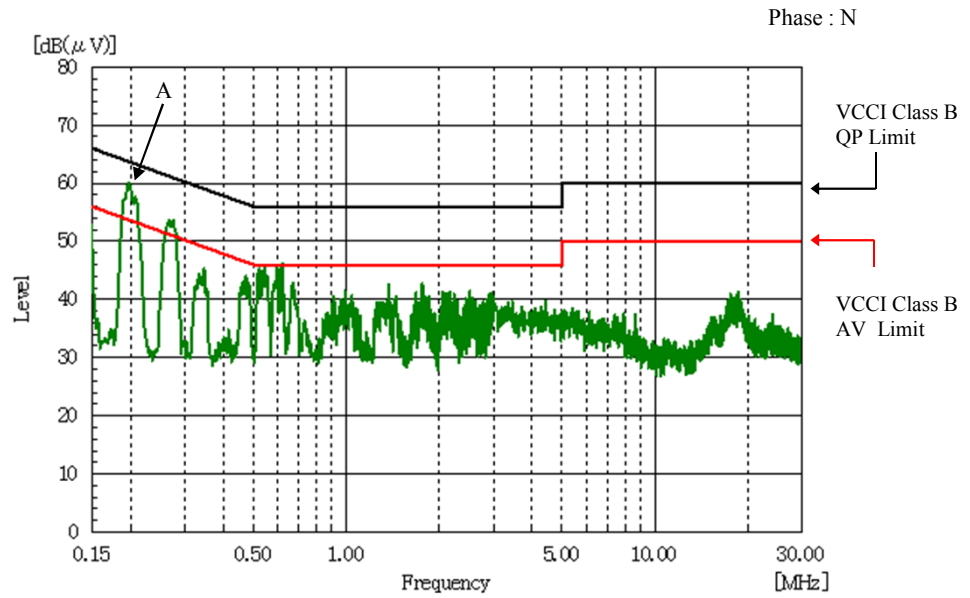
Iout : 100 %

Ta : 25 °C

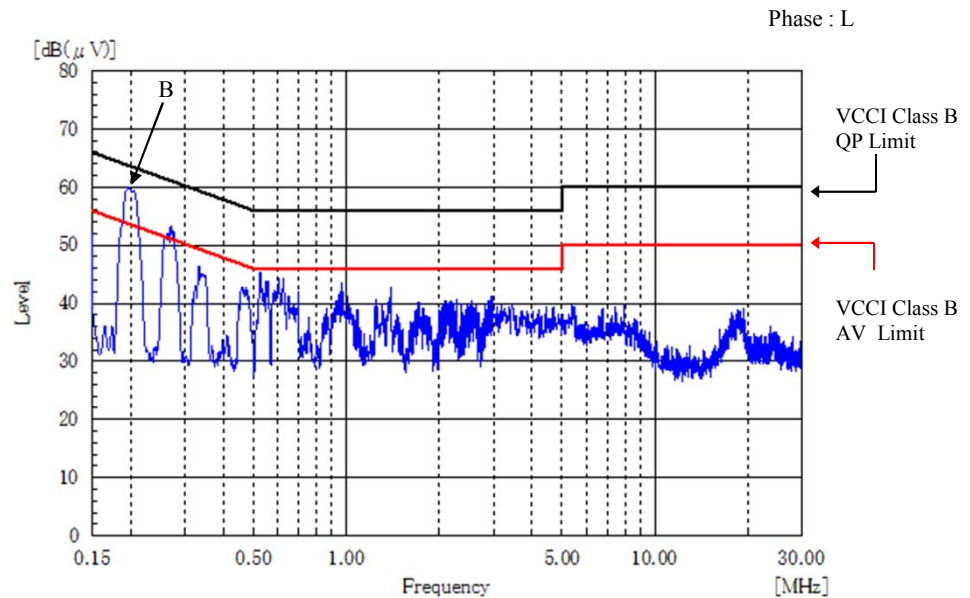
雑音端子電圧

Conducted Emission

| Point A (197kHz) | | |
|---------------------|------------|--------------|
| Ref. Data | Limit (dB) | Measure (dB) |
| QP | 63.8 | 55.4 |
| AV | 53.8 | 39.1 |



| Point B (195kHz) | | |
|---------------------|------------|--------------|
| Ref. Data | Limit (dB) | Measure (dB) |
| QP | 63.8 | 55.5 |
| AV | 53.8 | 37.6 |



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.