

# KWS10A

## 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

- (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 … 9

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### 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

※ 当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。

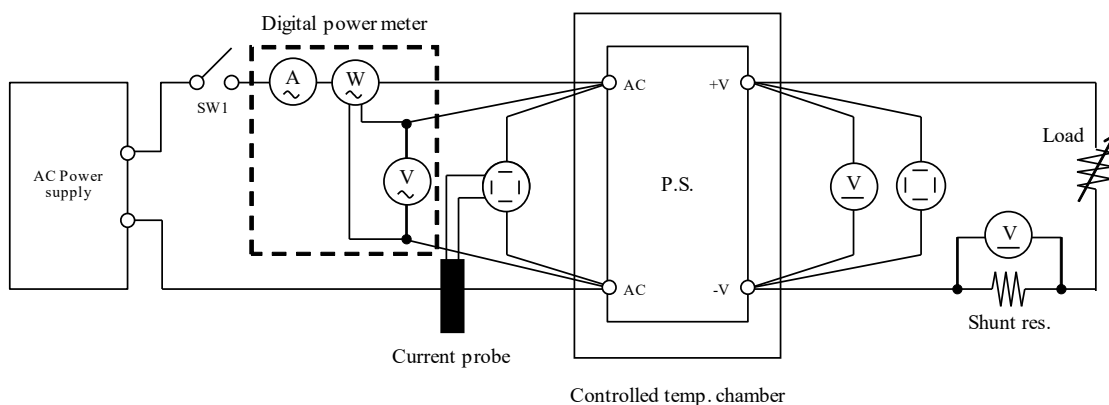
Test results are reference data based on our measurement condition.

# 1. 測定方法 Evaluation Method

## 1-1. 算出方法 Calculating Method

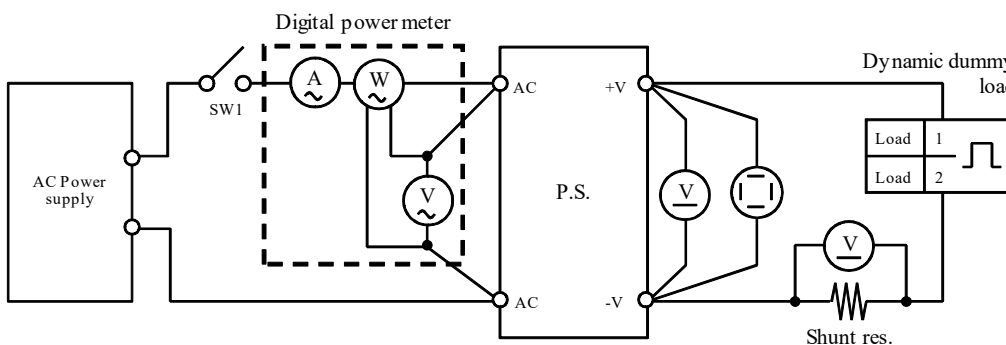
### 測定回路1 Circuit 1 used for determination

- 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
- 入力電圧瞬停特性 Response to brown out characteristics
- 入力電流波形 Input current waveform

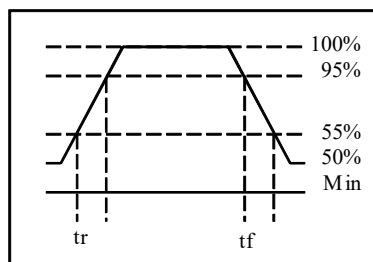


### 測定回路2 Circuit 2 used for determination

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

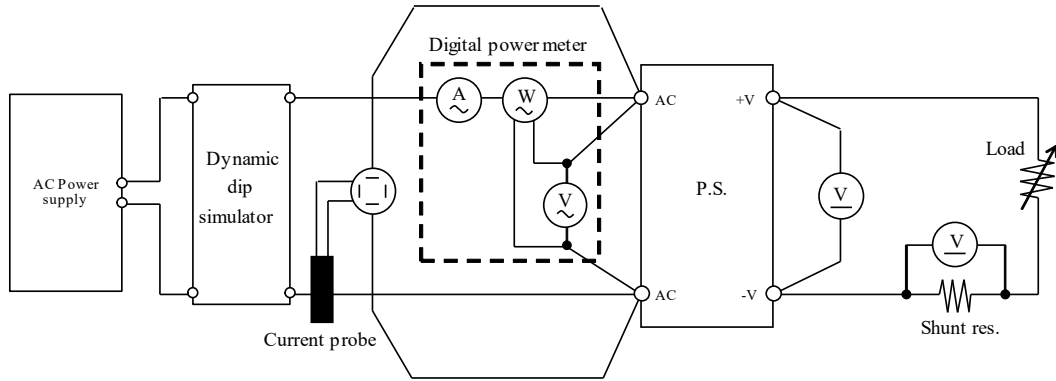


Output current waveform  
Iout 50% <==> 100%



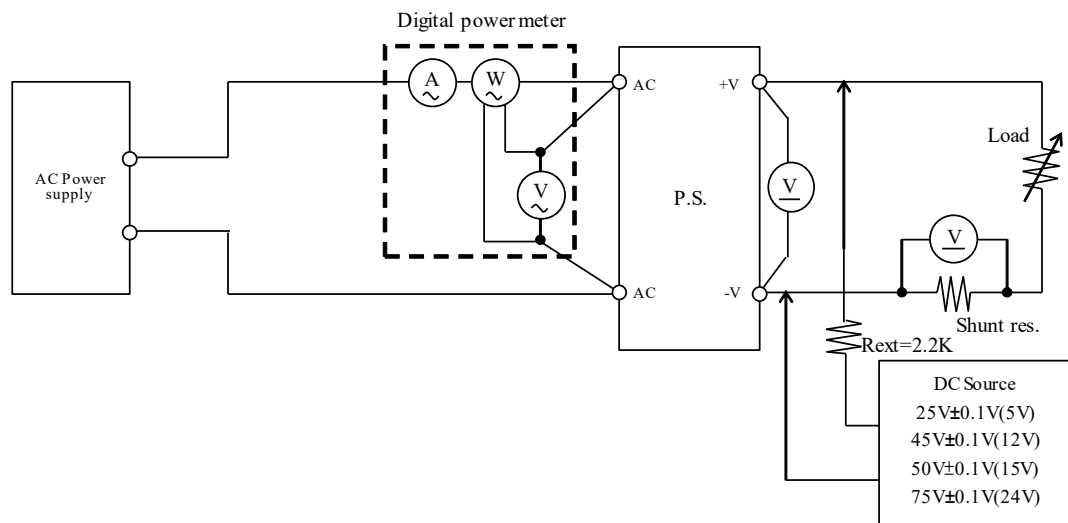
測定回路3 Circuit 3 used for determination

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



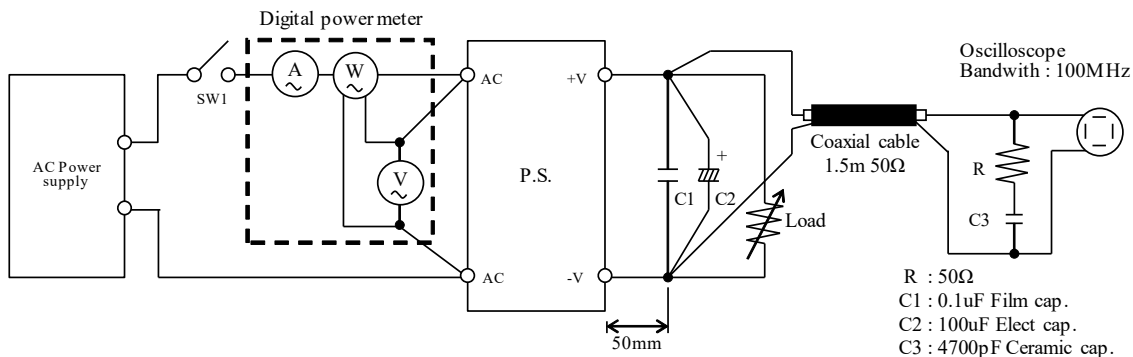
測定回路4 Circuit 4 used for determination

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



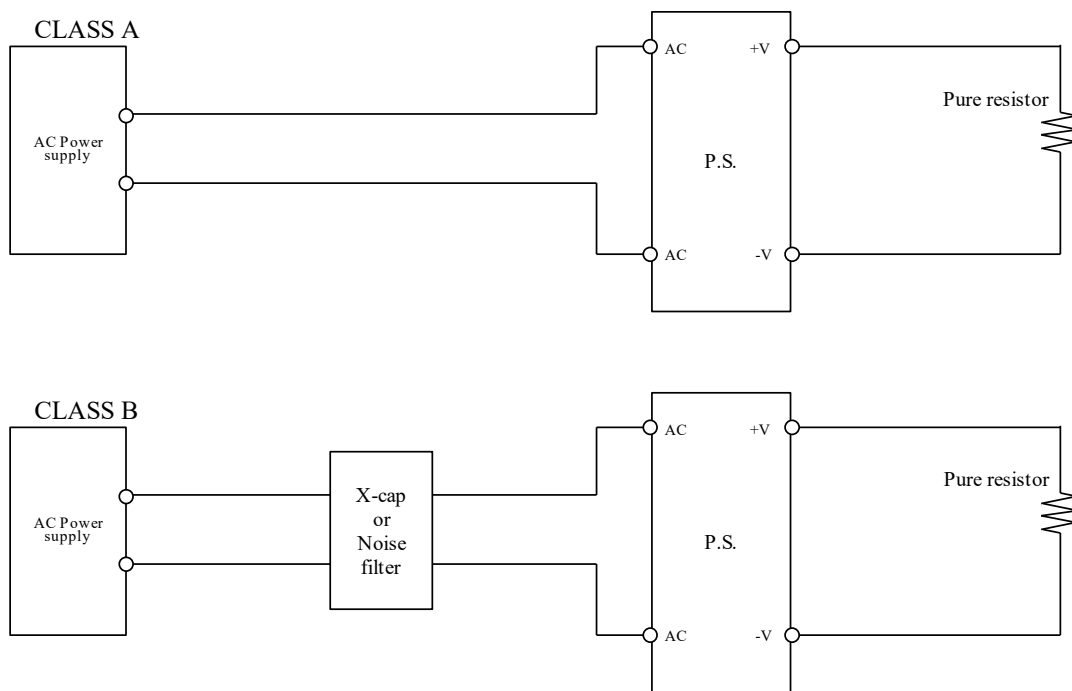
測定回路5 Circuit 5 used for determination

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



測定回路6 Circuit 6 used for determination

- EMI特性 Electro-Magnetic Interference characteristics
- 雑音電界強度(放射ノイズ) Radiated Emission

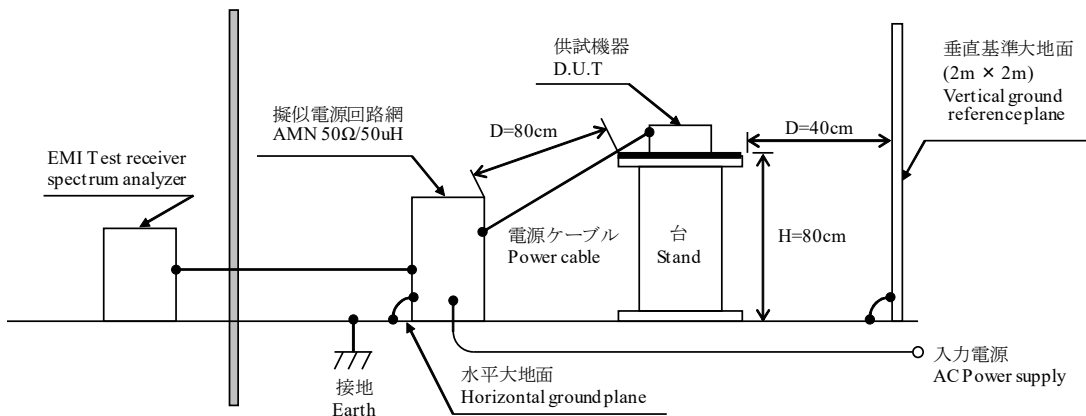


推奨 X-コンデンサ X-cap recommended :  
 ECQU3A104MG(PANASONIC) or CTX104K310VP10 (CHENG TUNG).  
 推奨ノイズフィルタ Noise filter recommended :  
 RSEG-2001 (TDK-Lambda).

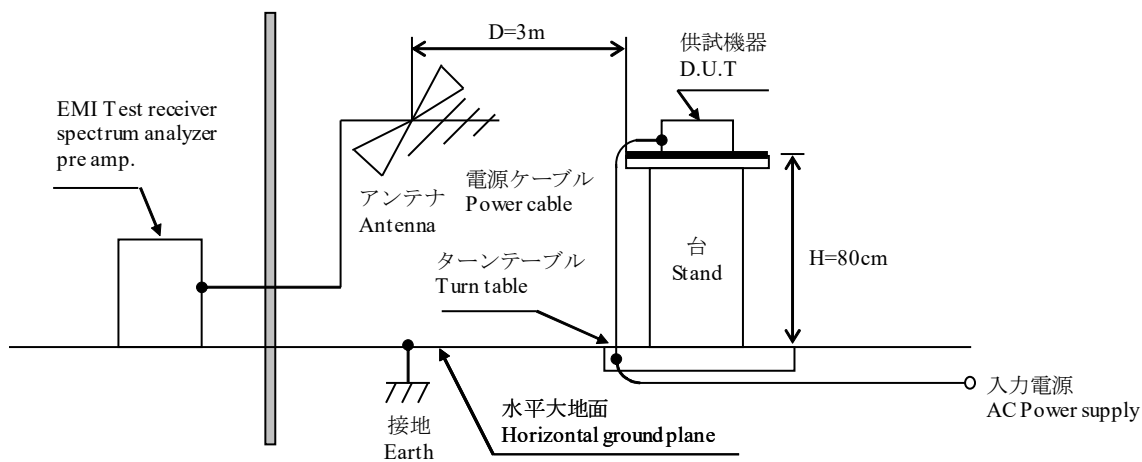
測定構成 Configuration used for determination

- EMI特性 Electro-Magnetic Interference characteristics

(a) 雑音端子電圧(帰還ノイズ) Conducted Emission



(b) 雑音電界強度(放射ノイズ) Radiated Emission



## 1-2. 使用測定機器 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	LeCroy	LT345
2	DIGITAL STORAGE OSCILLOSCOPE	TeKtronix	TDS3014B
3	DIGITAL MULTIMETER	AGILENT	34970A
4	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
5	CURRENT PROBE	TeKtronix	TPC 312
6	CURRENT AMP	TeKtronix	TCPA300
7	DYNAMIC DUMMY LOAD	PRODIGIT	3311C
8	CVCF	CHROMA	6530
9	CVCF	KIKUSUI	PCR2000L / PCR2000W
10	S.D	TAI YEESH SING	TRZ SO-45
11	CONTROLLED TEMP. CHAMBER	ESPEC	SU-261 / SU-262
12	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCS 30
13	LISN	ROHDE & SCHWARZ	ESH3-Z5
14	LISN	ROHDE & SCHWARZ	ENV216
15	COAXIAL CABLE	Harbour	RG-400
16	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESC17
17	ANTENNA	Schaffner	CBL6112B
18	Coaxial Cable	Suhner	SF104 / SF106
19	Pre-Amplifier	QuieTek	AP-025C
20	DUMMY LOAD	FUTABA	GR-25 SIRIES

## 1-3. 評価負荷条件 Load conditions

※ 入力電圧が100VAC以下の場合、下記のとおり出力デレーティングが必要です。

Output derating is needed when input voltage is 100VAC or less.

Output voltage : 5V, 12V, 15V, 24V

$V_{in}$	$I_{out}$ : Full load	5V	12V	15V	24V
100 - 265VAC	100%	2.000A	0.900A	0.700A	0.500A
90VAC	90%	1.800A	0.810A	0.630A	0.450A
85VAC	80%	1.600A	0.720A	0.560A	0.400A



## 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

**5V** 1. Regulation - line and load Condition Ta : 25 °C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	Line regulation	
0%	4.989V	4.996V	4.992V	4.991V	7mV	0.140%
50%	4.988V	4.988V	4.988V	4.988V	0mV	0.000%
Full load	4.983V	4.983V	4.982V	4.983V	1mV	0.020%
Load regulation	6mV	13mV	10mV	8mV		
	0.120%	0.260%	0.200%	0.160%		

#### 2. Temperature drift

Conditions Vin : 100 VAC  
Iout : Full load

Ta	-10°C	+25°C	+45°C	Temperature stability	
Vout	4.958V	4.983V	4.985V	27mV	0.540%

#### 3. Start up voltage and Drop out voltage

Conditions Ta : 25 °C  
Iout : 100 %

Start up voltage (Vin)	61.0VAC
Drop out voltage (Vin)	59.2VAC

**12V** 1. Regulation - line and load Condition Ta : 25 °C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	Line regulation	
0%	11.939V	11.938V	11.940V	11.940V	2mV	0.017%
50%	11.936V	11.936V	11.937V	11.937V	1mV	0.008%
Full load	11.933V	11.931V	11.932V	11.931V	2mV	0.017%
Load regulation	6mV	7mV	8mV	9mV		
	0.050%	0.058%	0.067%	0.075%		

#### 2. Temperature drift

Conditions Vin : 100 VAC  
Iout : Full load

Ta	-10°C	+25°C	+55°C	Temperature stability	
Vout	11.933V	11.931V	11.927V	6mV	0.050%

#### 3. Start up voltage and Drop out voltage

Conditions Ta : 25 °C  
Iout : 100 %

Start up voltage (Vin)	64.1VAC
Drop out voltage (Vin)	63.0VAC

**24V** 1. Regulation - line and load Condition Ta : 25 °C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	Line regulation	
0%	23.708V	23.708V	23.709V	23.709V	1mV	0.004%
50%	23.708V	23.708V	23.707V	23.708V	1mV	0.004%
Full load	23.706V	23.703V	23.702V	23.703V	4mV	0.017%
Load regulation	2mV	5mV	7mV	6mV		
	0.008%	0.021%	0.029%	0.025%		

#### 2. Temperature drift

Conditions Vin : 100 VAC  
Iout : Full load

Ta	-10°C	+25°C	+55°C	Temperature stability	
Vout	23.712V	23.703V	23.683V	29mV	0.121%

#### 3. Start up voltage and Drop out voltage

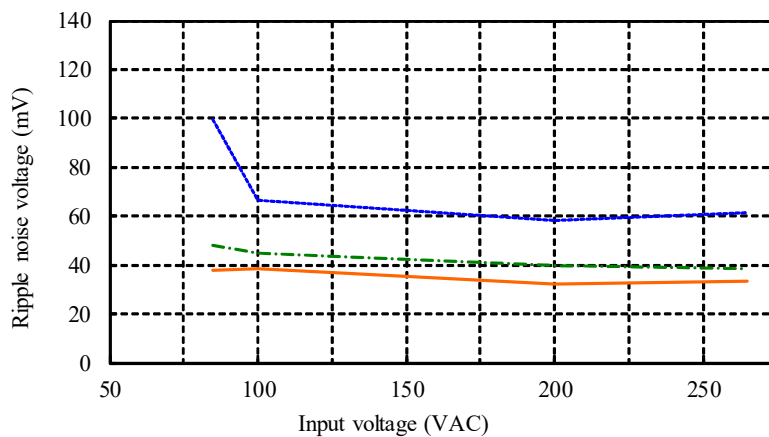
Conditions Ta : 25 °C  
Iout : 100 %

Start up voltage (Vin)	65.1VAC
Drop out voltage (Vin)	64.0VAC

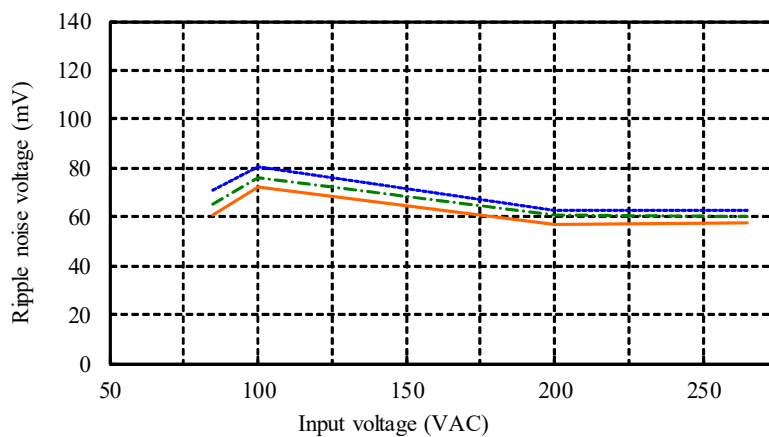
(2) リップルノイズ電圧対入力電圧 Ripple noise voltage vs. Input voltage

Conditions Iout : Full load  
 Ta : -10 °C  
 25 °C  
 55 °C  
 5V:45 °C

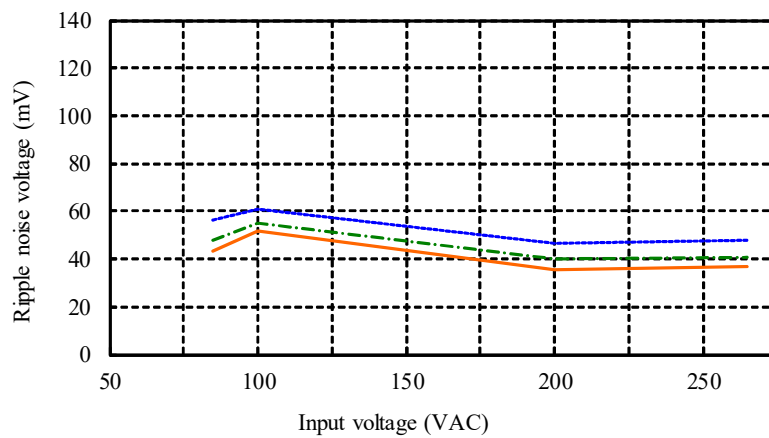
5V



12V



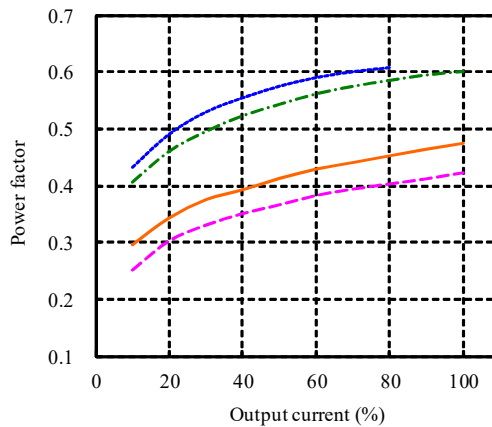
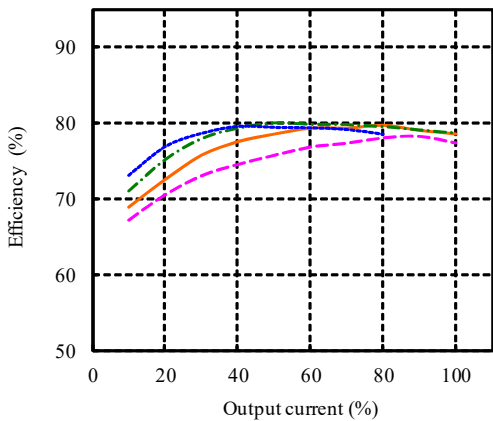
24V



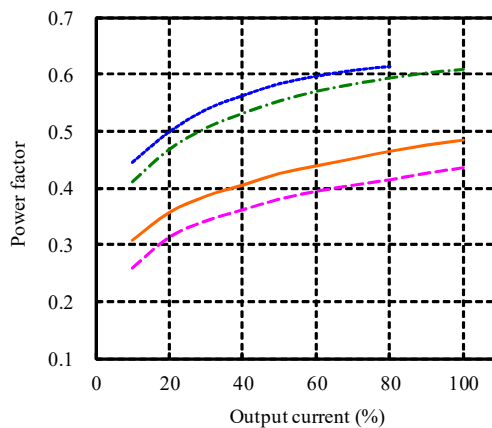
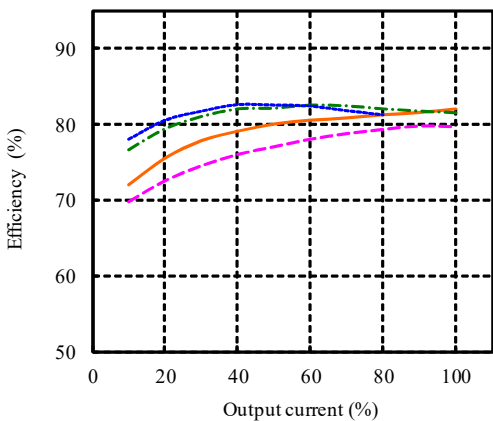
(3) 効率・力率対出力電流 Efficiency and Power factor vs. Output current

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

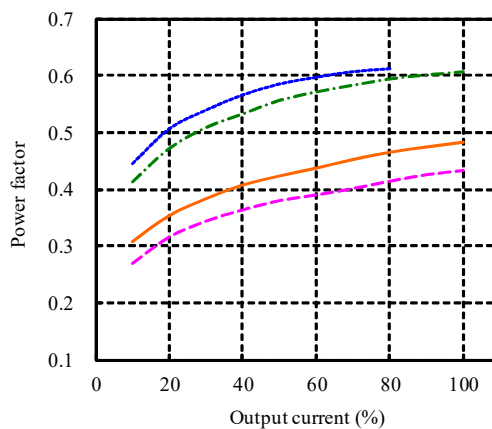
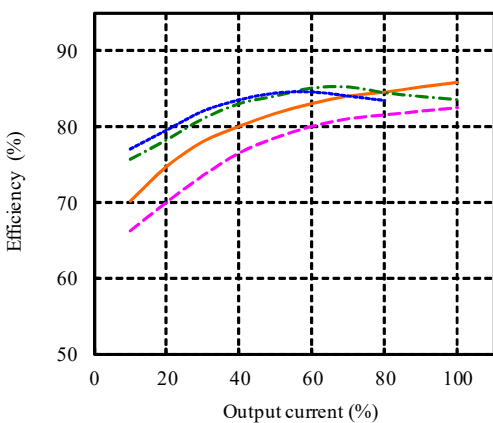
5V



12V



24V

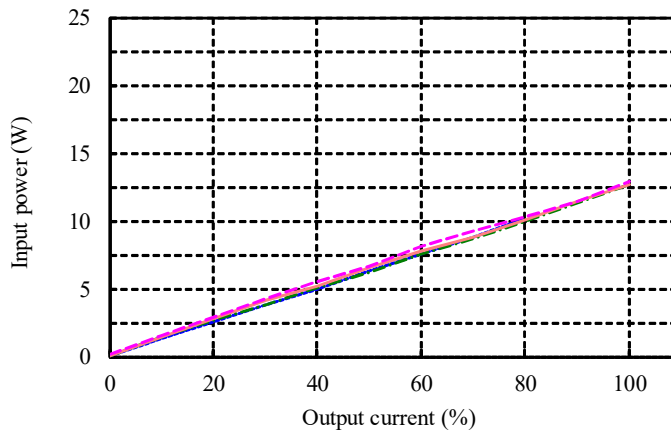


(4) 入力電力対出力電流 Input power vs. Output current

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

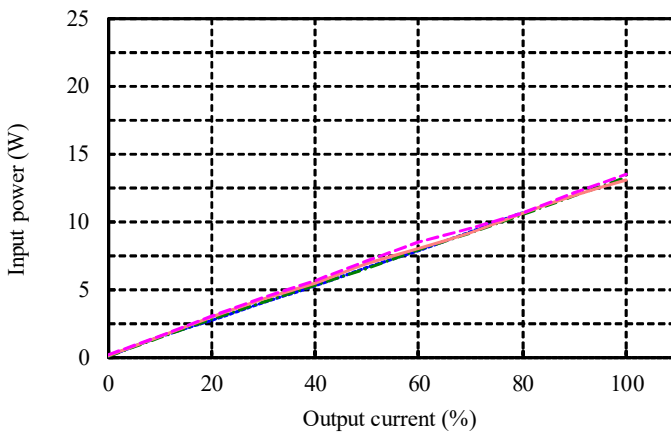
5V

Vin	Input power
	Iout : 0%
85VAC	0.01W
100VAC	0.03W
200VAC	0.07W
265VAC	0.12W



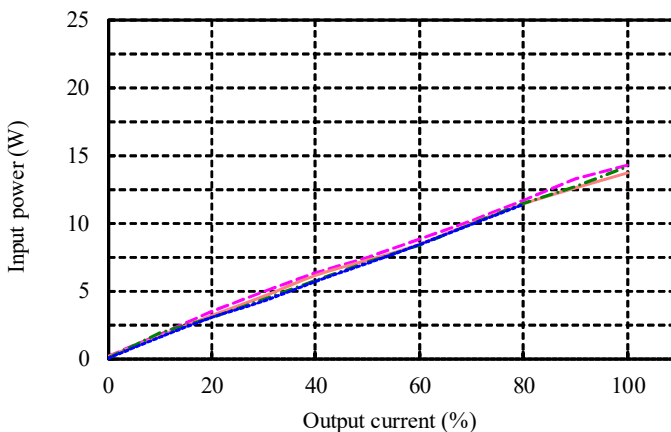
12V

Vin	Input power
	Iout : 0%
85VAC	0.04W
100VAC	0.04W
200VAC	0.09W
265VAC	0.11W



24V

Vin	Input power
	Iout : 0%
85VAC	0.01W
100VAC	0.07W
200VAC	0.11W
265VAC	0.18W

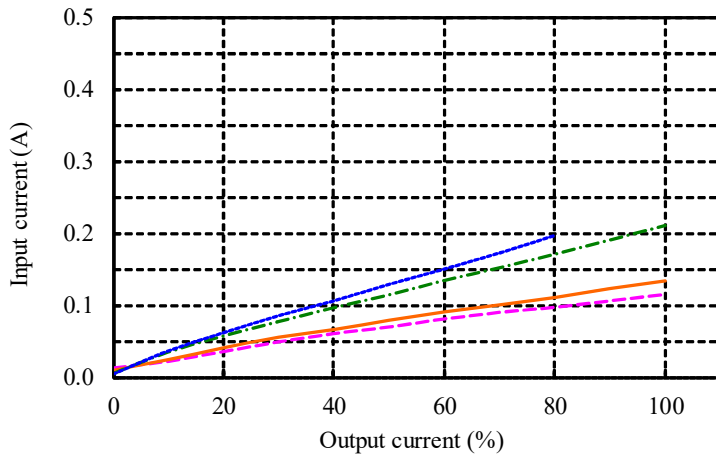


(5) 入力電流対出力電流 Input current vs. Output current

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

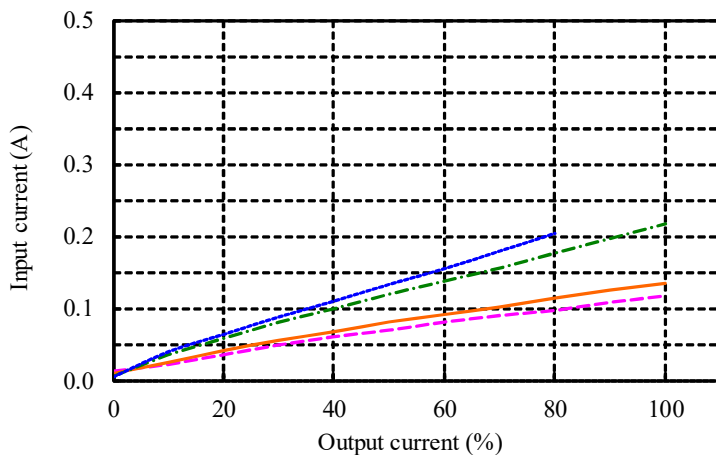
5V

Vin	Input current
	Iout : 0%
85VAC	0.004A
100VAC	0.005A
200VAC	0.009A
265VAC	0.012A



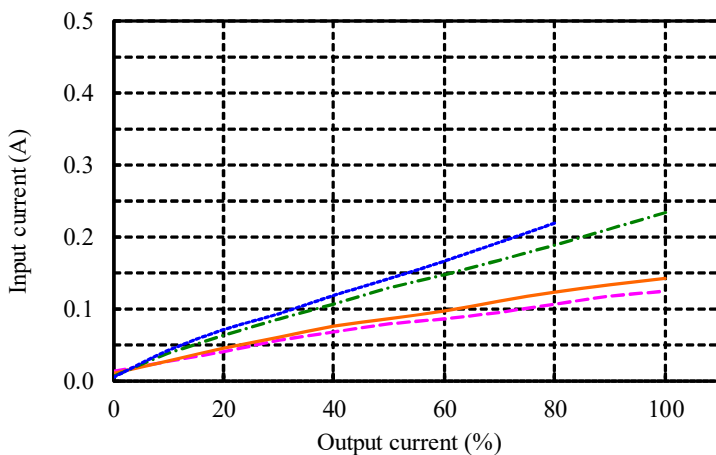
12V

Vin	Input current
	Iout : 0%
85VAC	0.004A
100VAC	0.005A
200VAC	0.009A
265VAC	0.012A



24V

Vin	Input current
	Iout : 0%
85VAC	0.004A
100VAC	0.005A
200VAC	0.009A
265VAC	0.012A

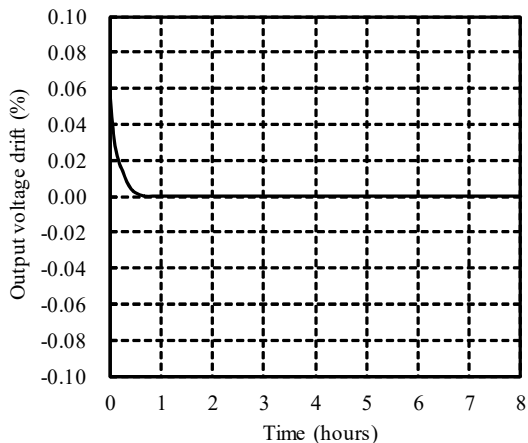


2-2. 通電ドリフト特性

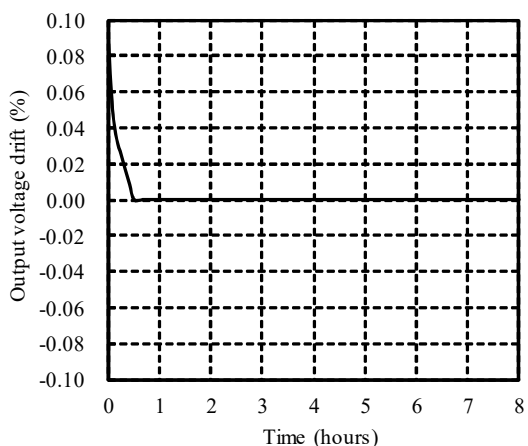
Warm up voltage drift characteristics

Conditions  $V_{in}$  : 100 VAC  
 $I_{out}$  : Full load  
 $T_a$  : 25 °C

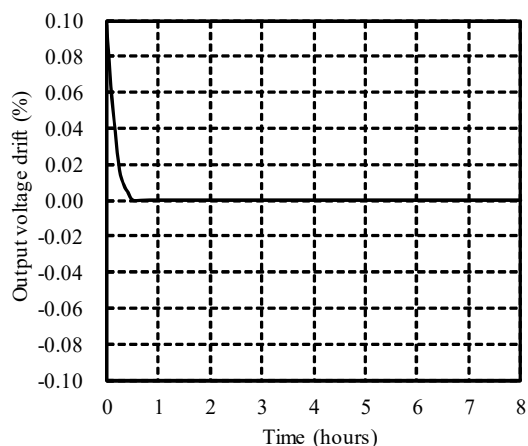
5V



12V



24V

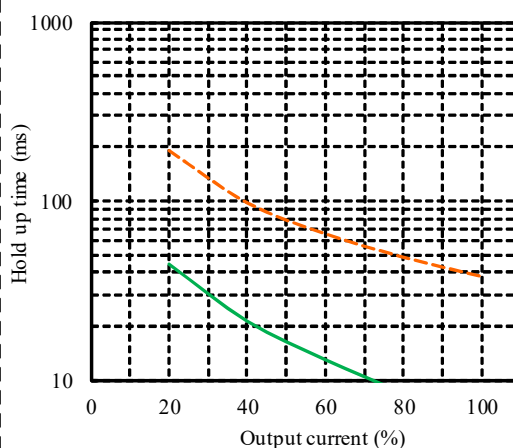
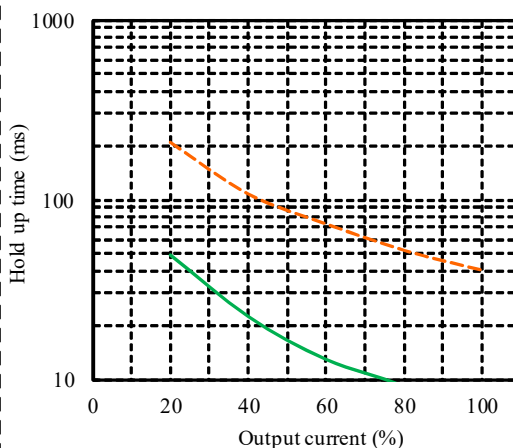
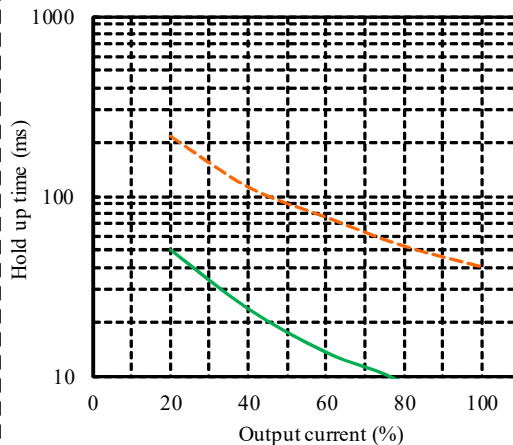


2-3. 出力保持時間特性

Hold up time characteristics

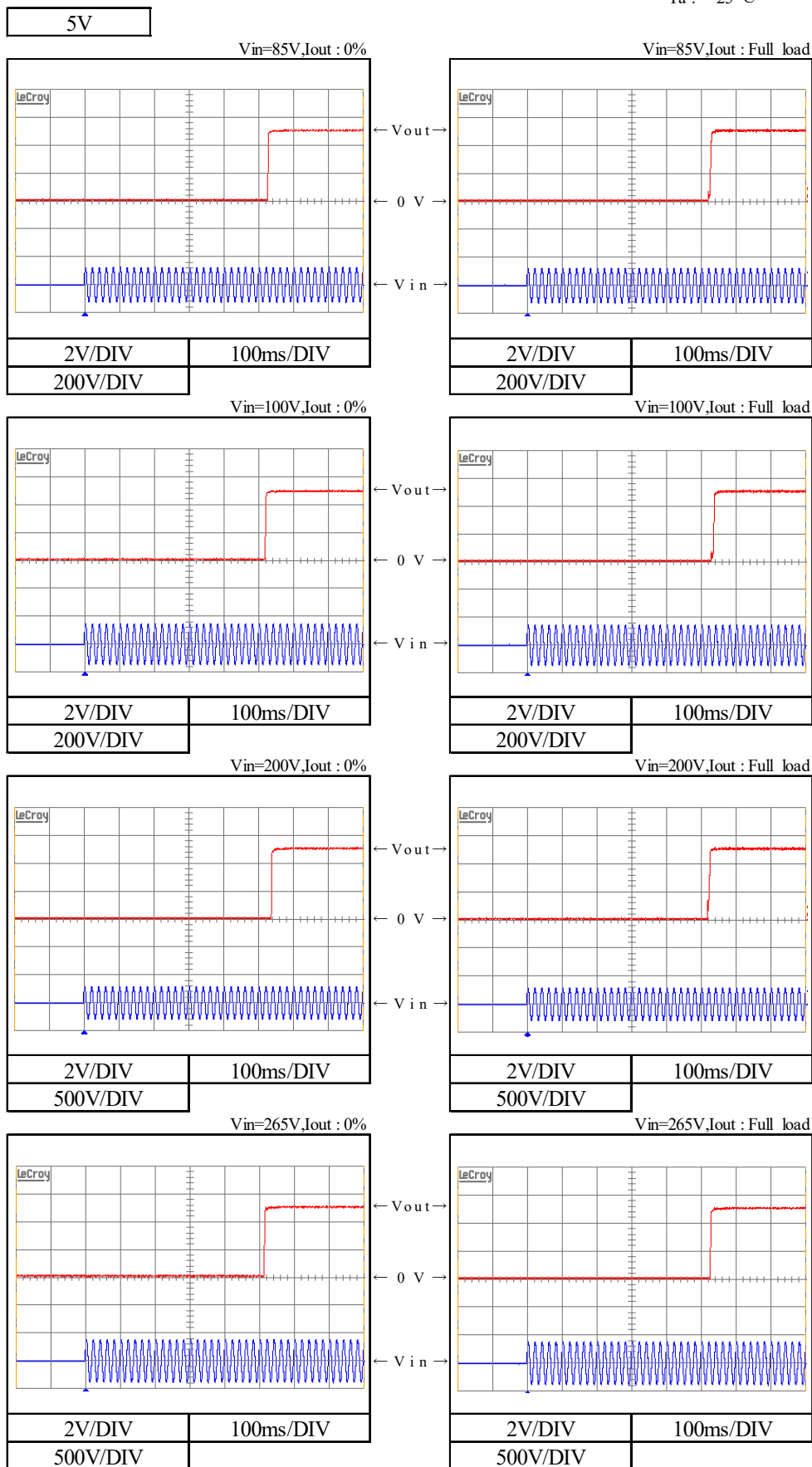
Conditions  $V_{in}$  : 100 VAC  
 200 VAC  
 $T_a$  : 25 °C

— (solid green line)  
 - - - (dashed orange line)



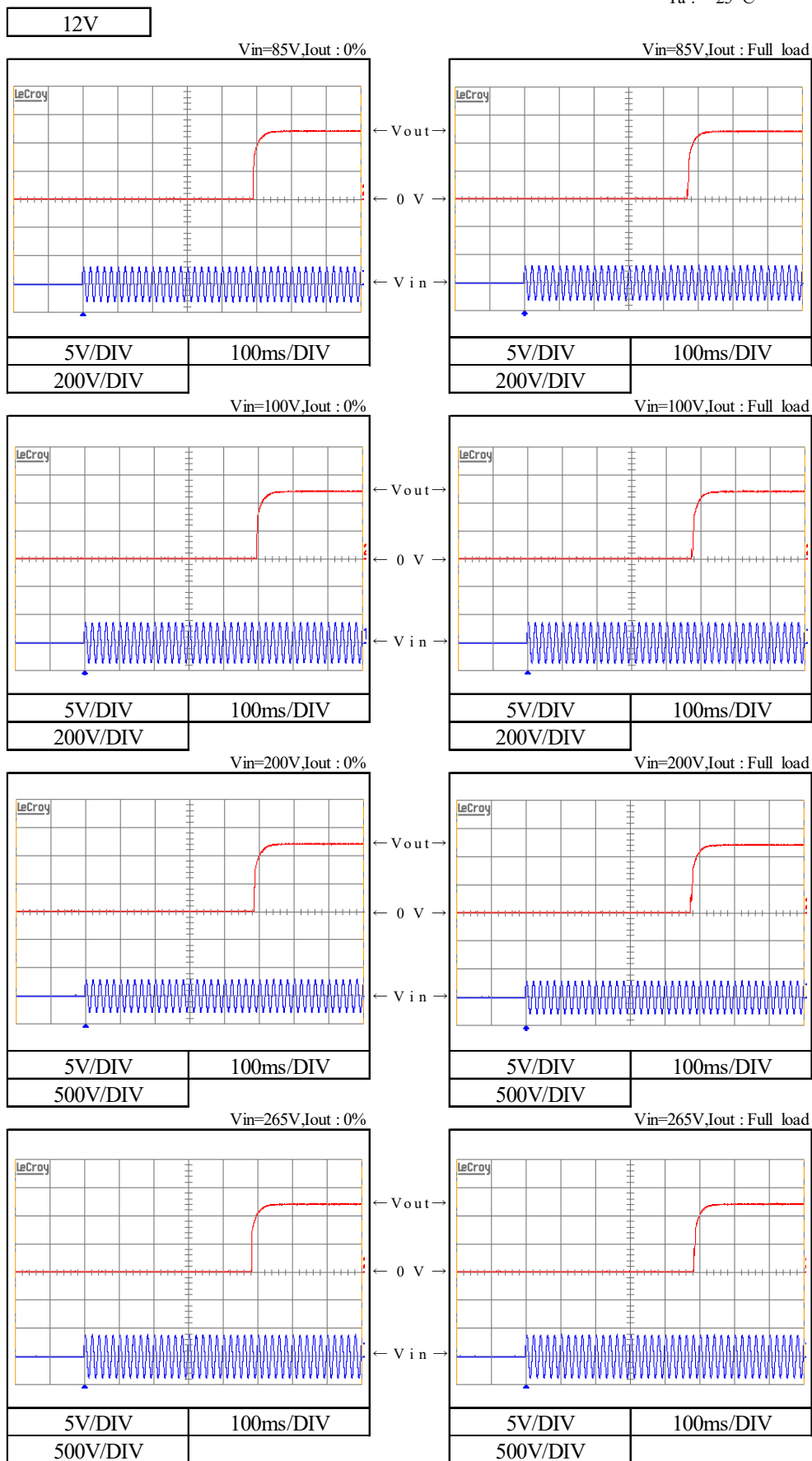
2-4. 出力立ち上がり特性 Output rise characteristics

Ta : 25 °C



2-4. 出力立ち上がり特性 Output rise characteristics

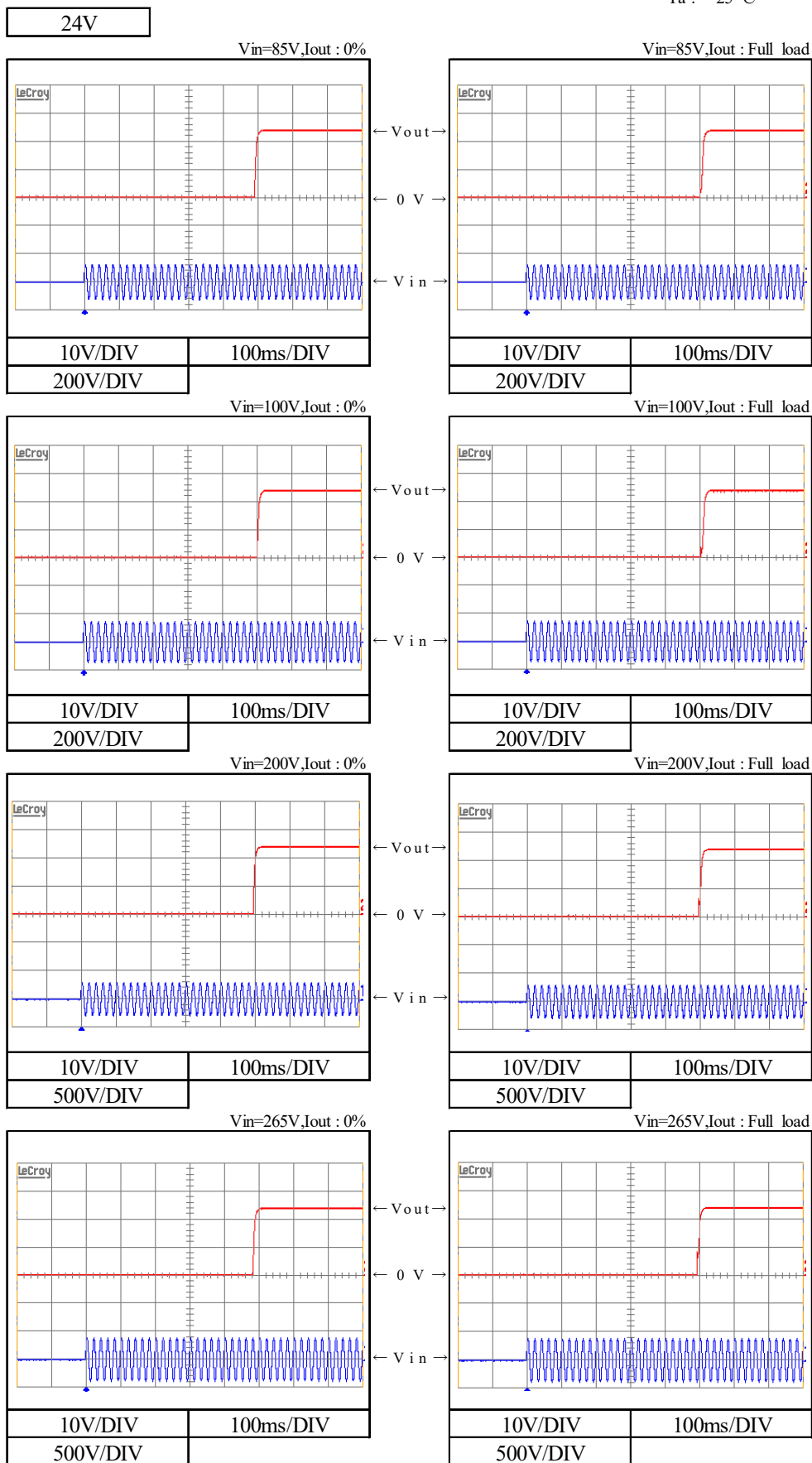
Ta : 25 °C





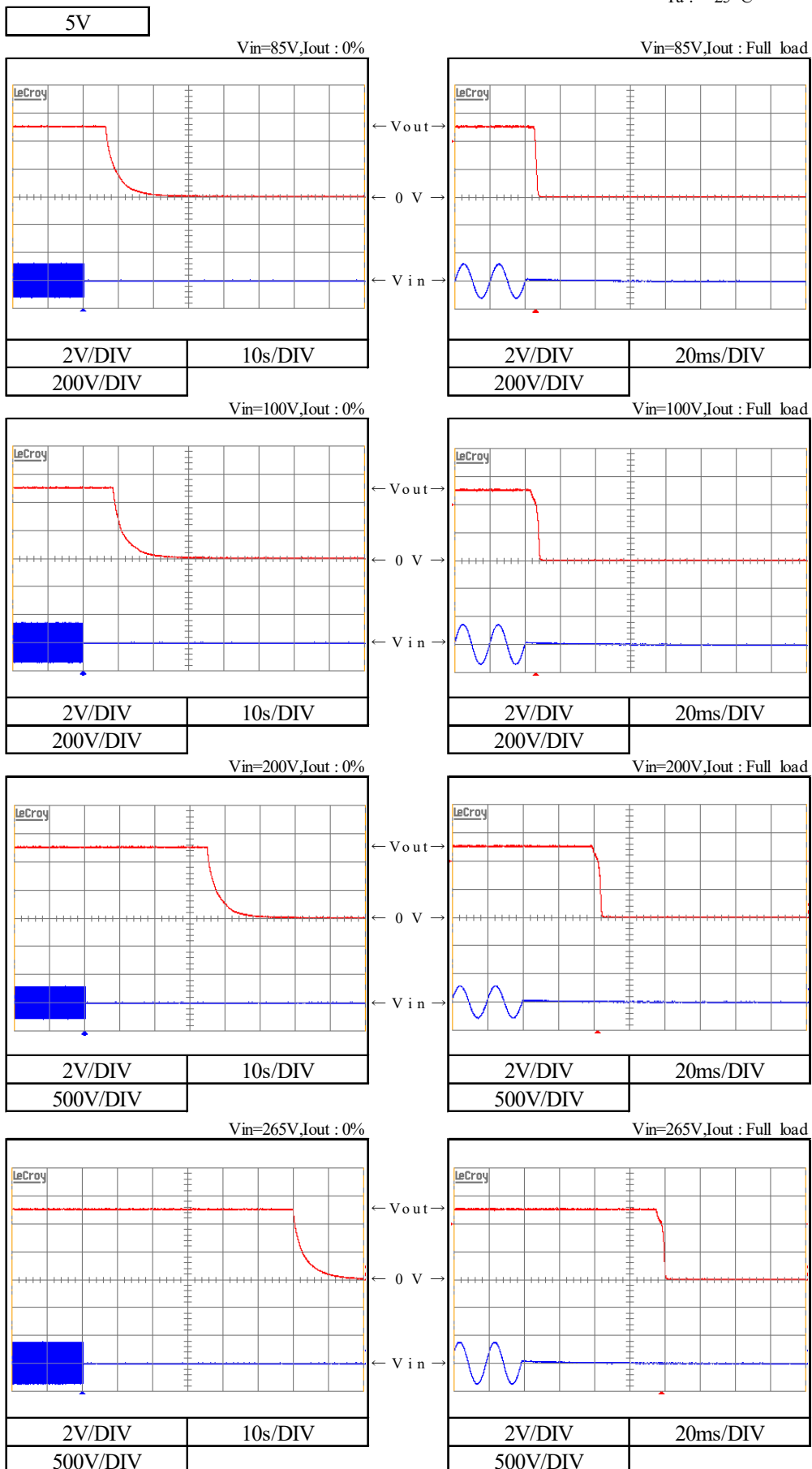
2-4. 出力立ち上がり特性 Output rise characteristics

Ta : 25 °C



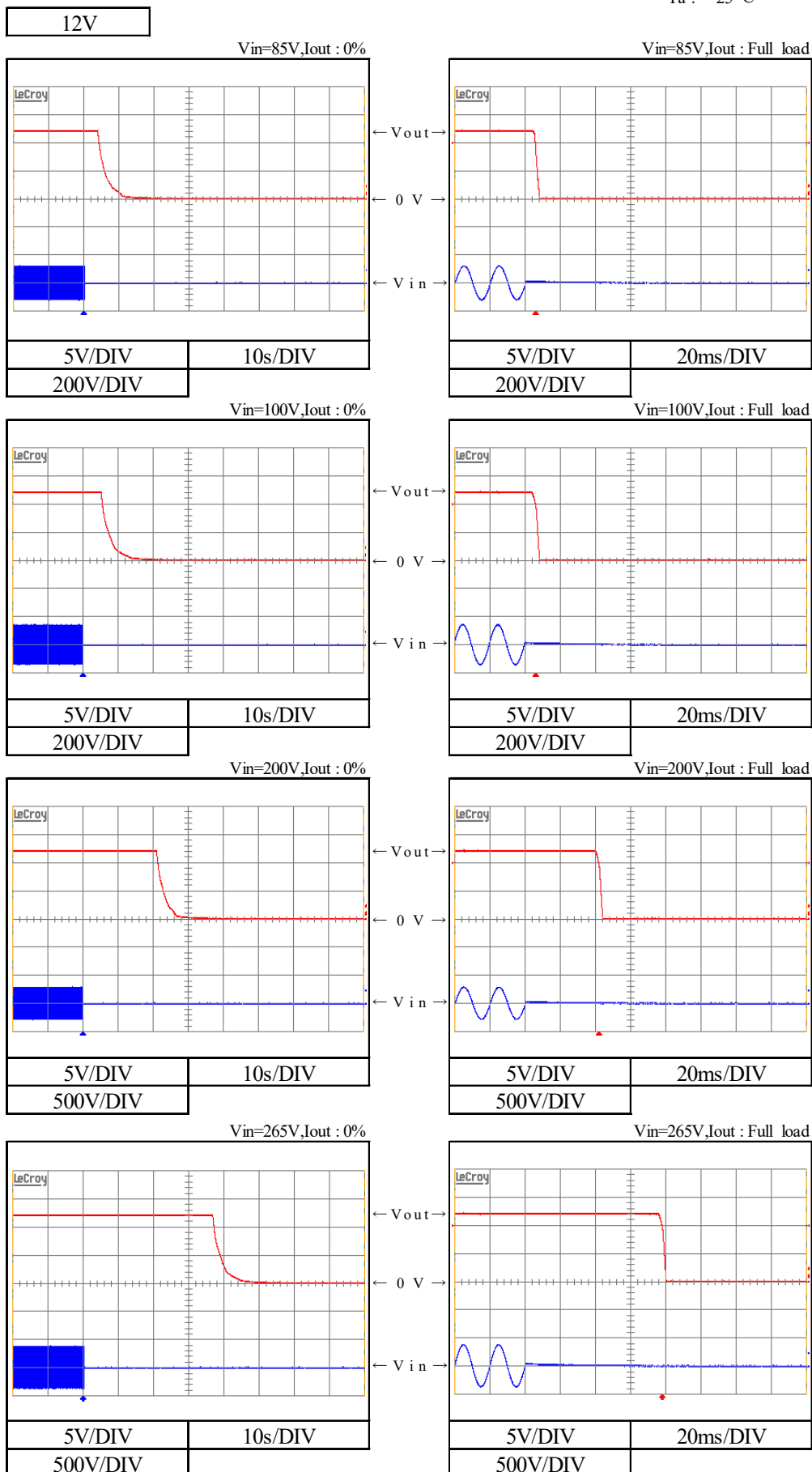
2-5. 出力立ち下がり特性 Output fall characteristics

Ta : 25 °C



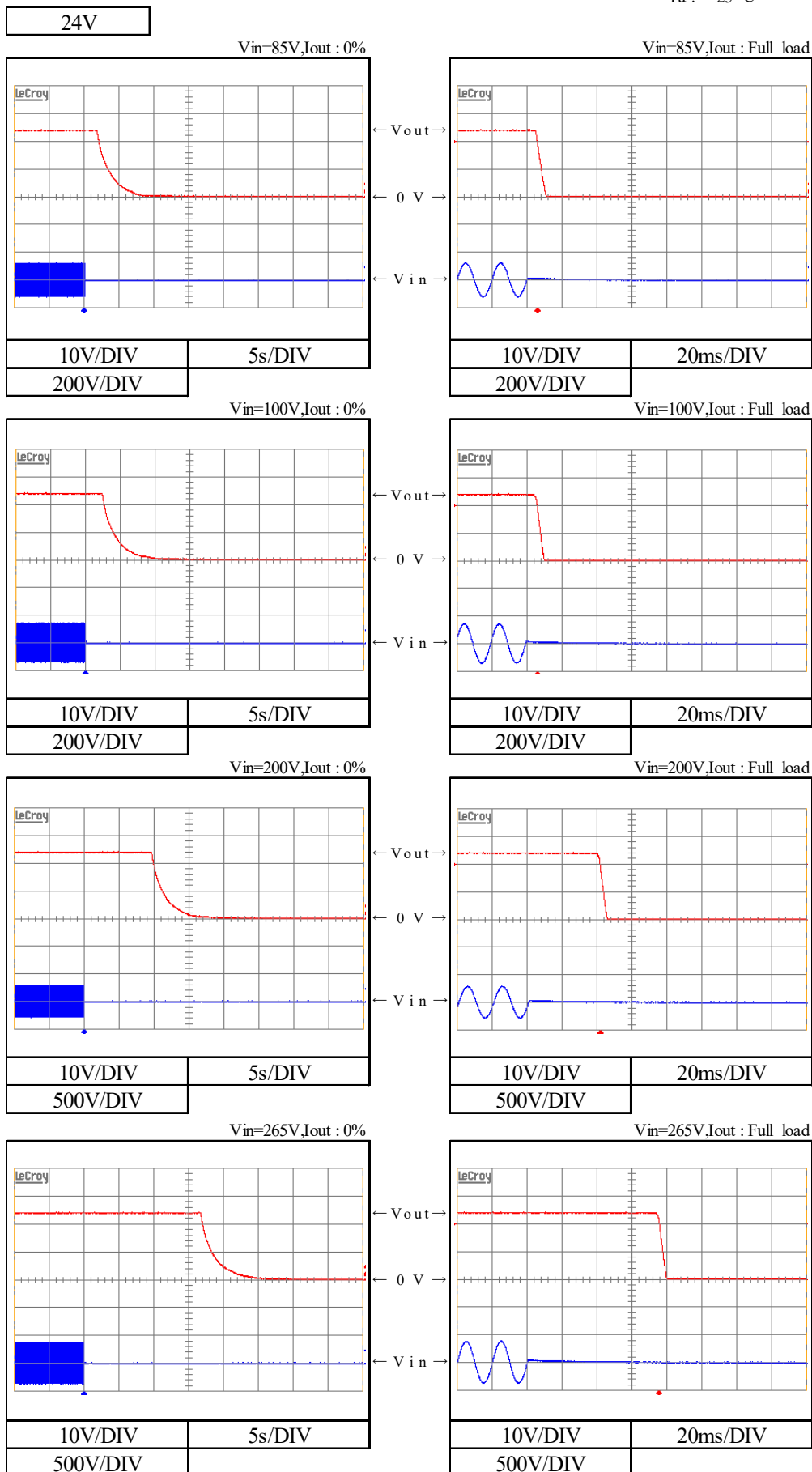
2-5. 出力立ち下がり特性 Output fall characteristics

Ta : 25 °C



2-5. 出力立ち下がり特性 Output fall characteristics

Ta : 25 °C

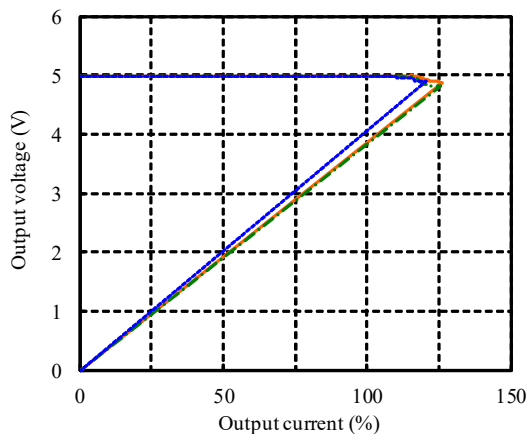


2-6. 過電流保護特性

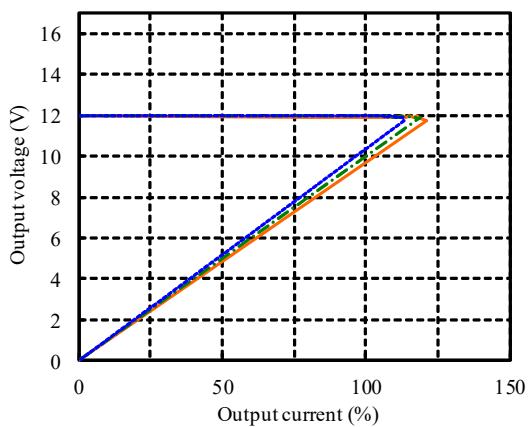
Over current protection (OCP) characteristics

Conditions Vin : 100 VAC  
 Ta : -10 °C (---)  
 25 °C (---)  
 55 °C (---)  
 5V:45 °C (---)

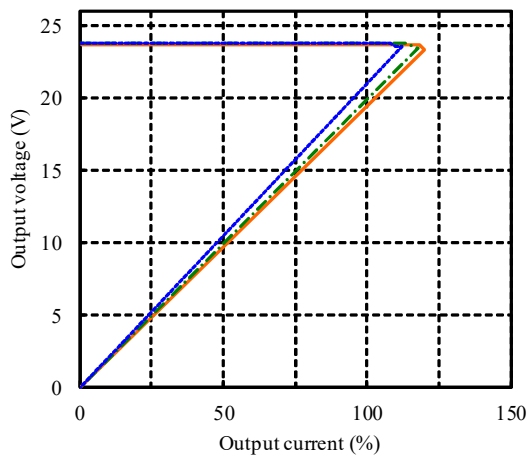
5V



12V



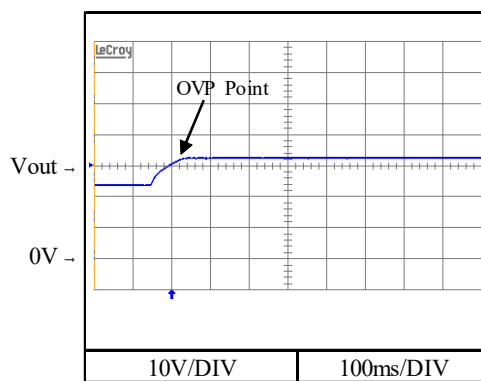
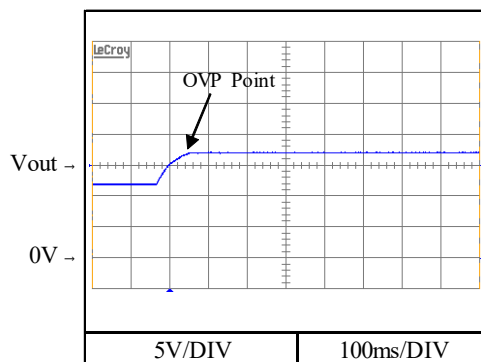
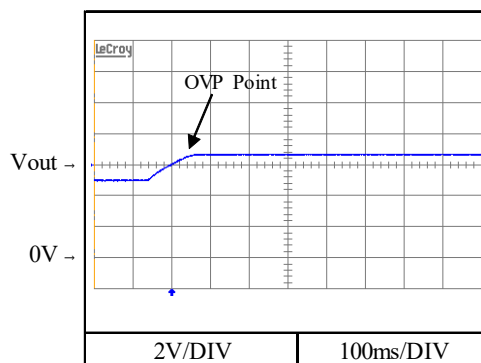
24V



2-7. 過電圧保護特性

Over voltage protection (OVP) characteristics

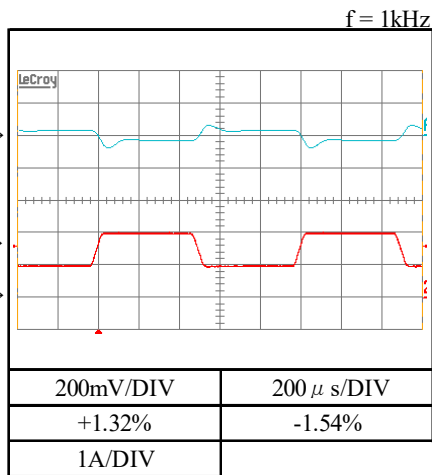
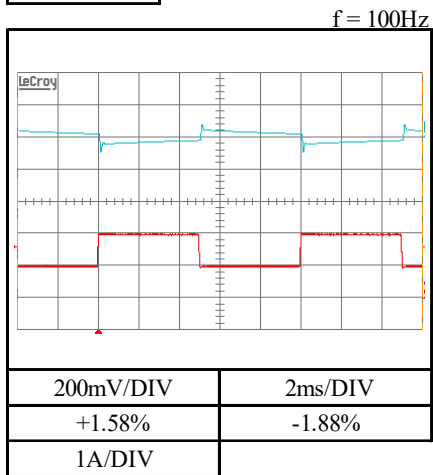
Conditions Vin : 100 VAC  
 Iout : 0 %  
 Ta : 25 °C



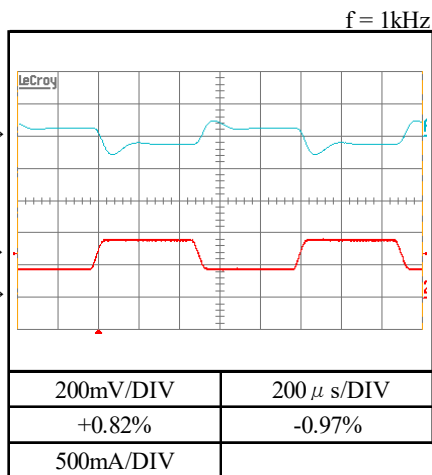
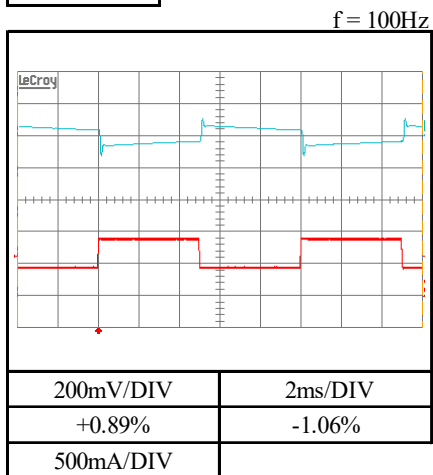
2-8. 過渡応答(負荷急変)特性 Dynamic load response characteristics

Conditions Vin : 100 VAC  
 Iout : 50 % ↔ 100 %  
 (tr = tf = 50us)  
 Ta : 25 °C

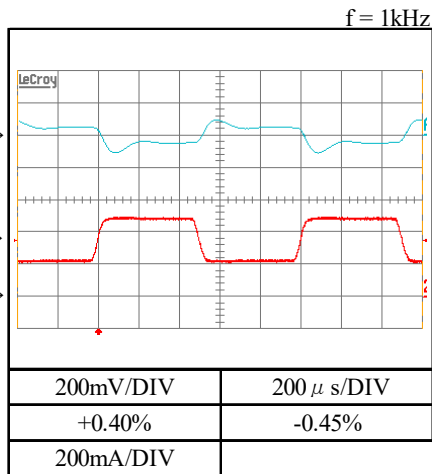
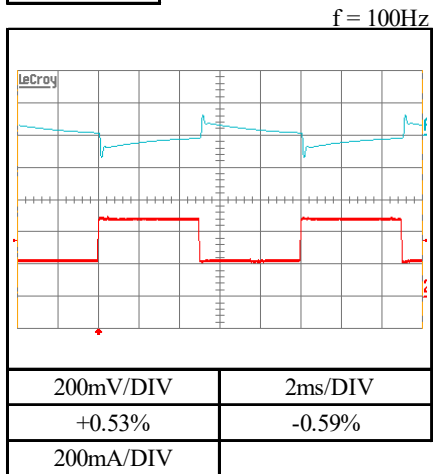
5V



12V



24V



2-9. 入力電圧瞬停特性 Response to brown out characteristics

Conditions Ta : 25 °C  
Iout : Full load

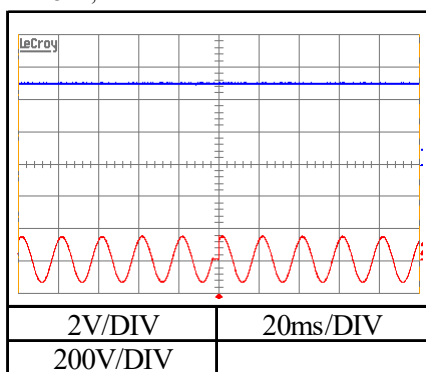
瞬停時間 Interruption time

- A : 出力電圧が低下なし Without any output voltage drop.
- B : 出力電圧が20-40%低下 Output voltage to drop down to 20-40%.
- C : 出力電圧が0Vまで低下 Output voltage to drop down to 0V.

5V

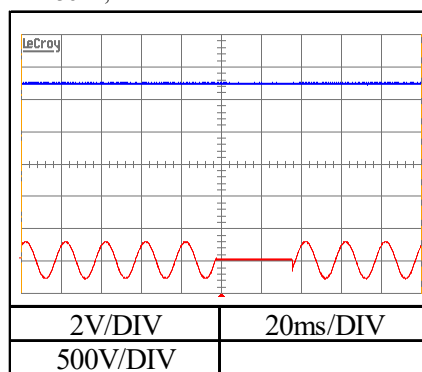
Vin : 100VAC

A = 3ms,



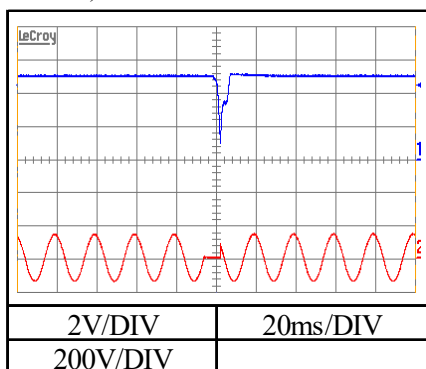
Vin : 200VAC

A = 38ms,



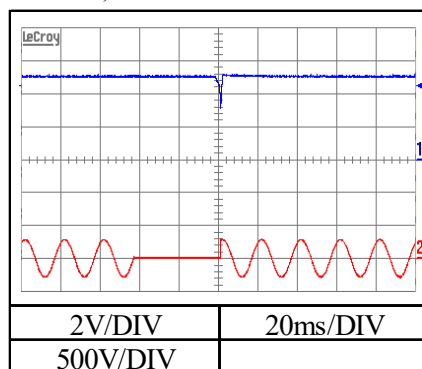
Vin : 100VAC

B = 8ms,



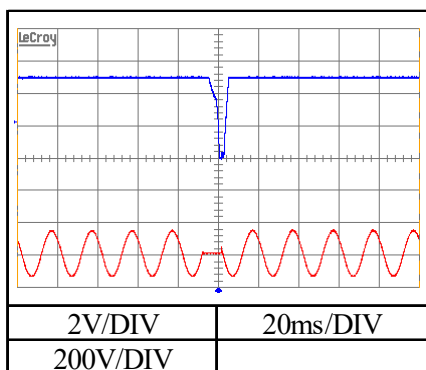
Vin : 200VAC

B = 44ms,



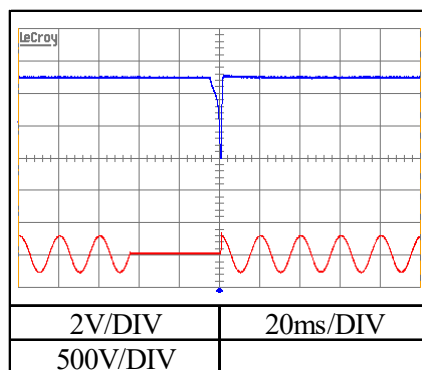
Vin : 100VAC

C = 9ms



Vin : 200VAC

C = 45ms



2-9. 入力電圧瞬停特性 Response to brown out characteristics

Conditions Ta : 25 °C  
Iout : Full load

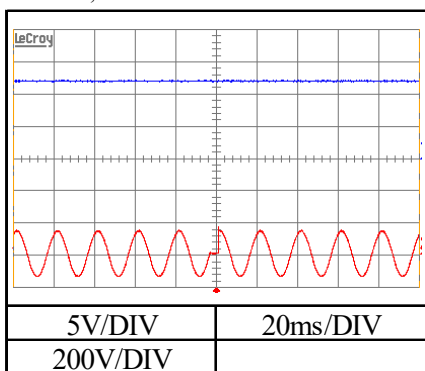
瞬停時間 Interruption time

- A : 出力電圧が低下なし Without any output voltage drop.
- B : 出力電圧が20-40%低下 Output voltage to drop down to 20-40%.
- C : 出力電圧が0Vまで低下 Output voltage to drop down to 0V.

12V

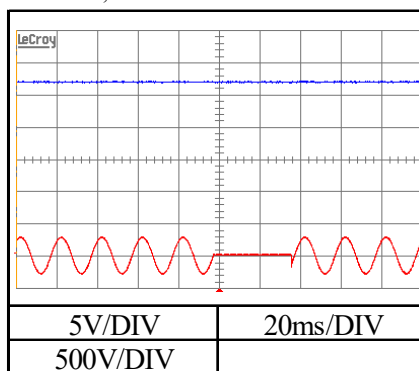
Vin : 100VAC

A = 4ms,



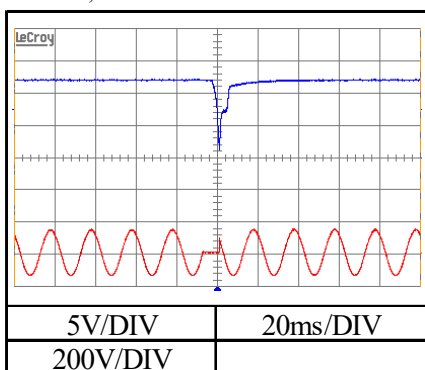
Vin : 200VAC

A = 38ms,



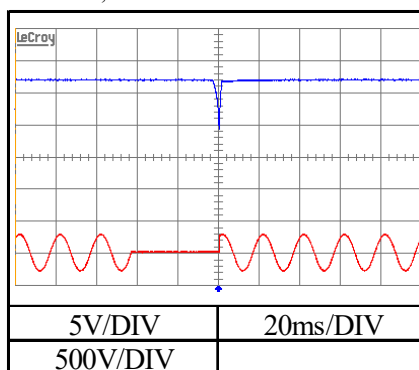
Vin : 100VAC

B = 8ms,



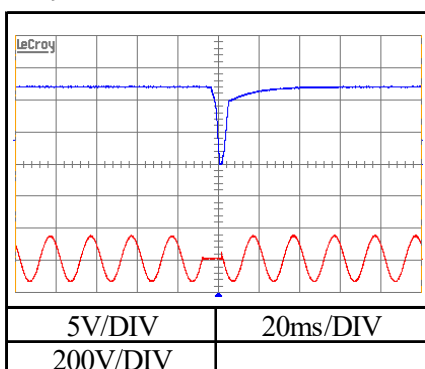
Vin : 200VAC

B = 43ms,



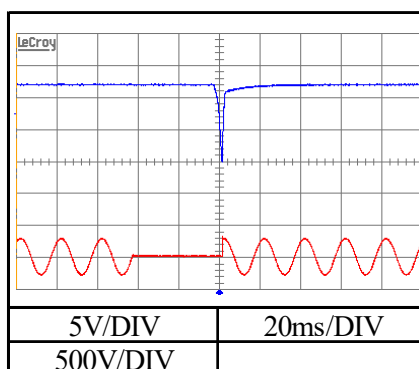
Vin : 100VAC

C = 9ms



Vin : 200VAC

C = 44ms





2-9. 入力電圧瞬停特性 Response to brown out characteristics

Conditions Ta : 25 °C  
Iout : Full load

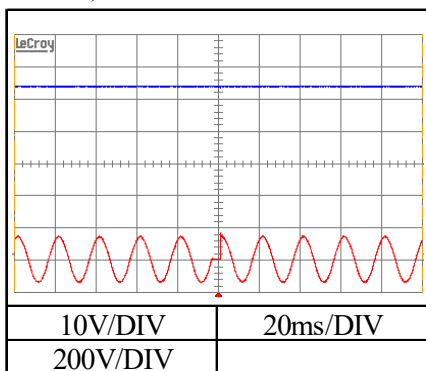
瞬停時間 Interruption time

- A : 出力電圧が低下なし Without any output voltage drop.
- B : 出力電圧が20-40%低下 Output voltage to drop down to 20-40%.
- C : 出力電圧が0Vまで低下 Output voltage to drop down to 0V.

**24V**

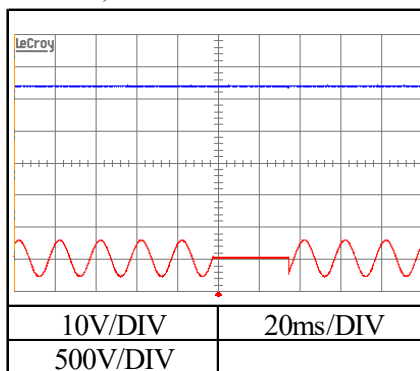
Vin : 100VAC

A = 4ms,



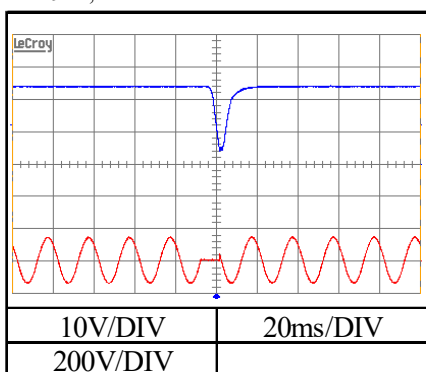
Vin : 200VAC

A = 37ms,



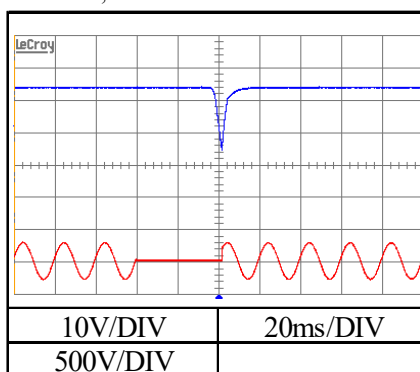
Vin : 100VAC

B = 9ms,



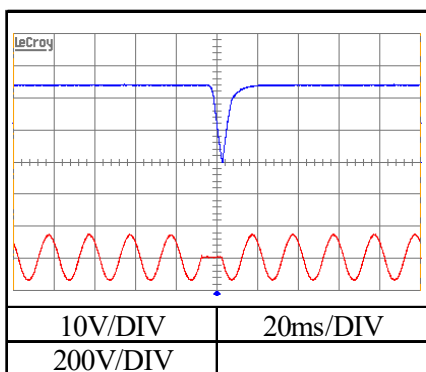
Vin : 200VAC

B = 42ms,



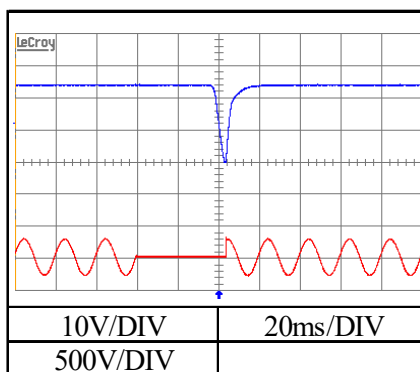
Vin : 100VAC

C = 10ms



Vin : 200VAC

C = 44ms

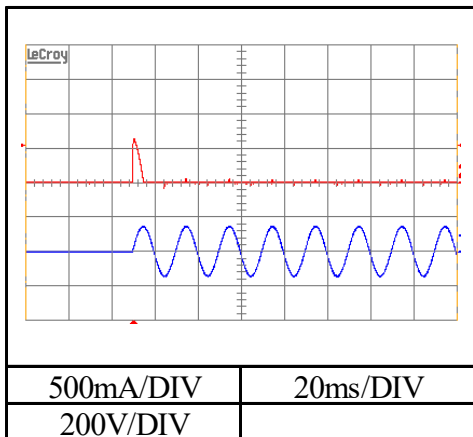


2-10. 入力サージ電流(突入電流)波形 Inrush current waveform

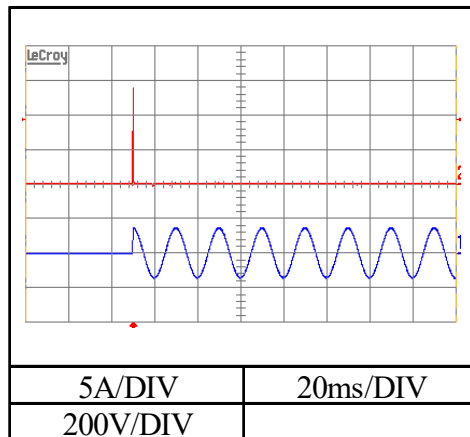
24V

Conditions Vin : 100 VAC  
Iout : Full load  
Ta : 25°C

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

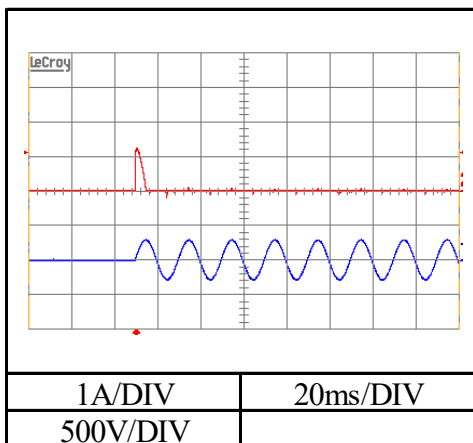


Switch on phase angle of input AC voltage  
 $\phi = 90^\circ$

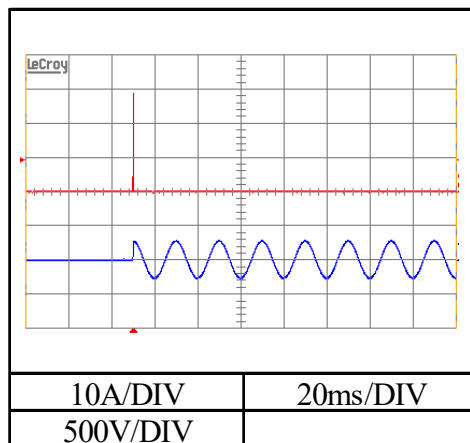


Conditions Vin : 200 VAC  
Iout : Full load  
Ta : 25°C

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



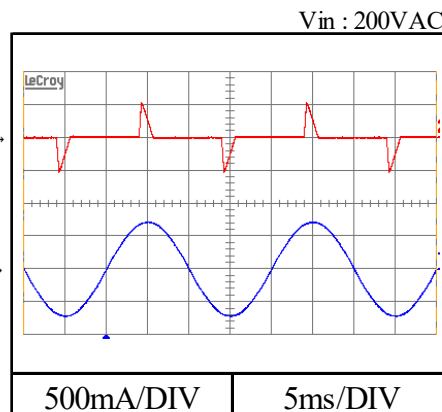
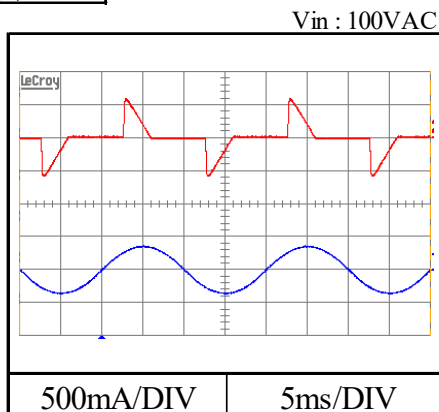
Switch on phase angle of input AC voltage  
 $\phi = 90^\circ$



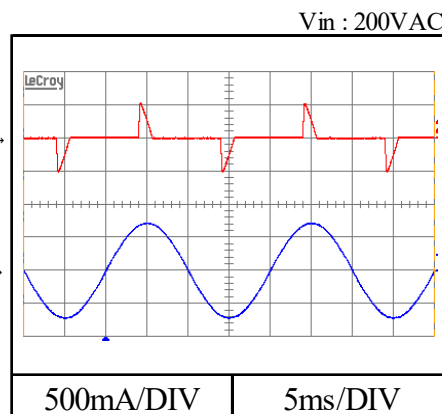
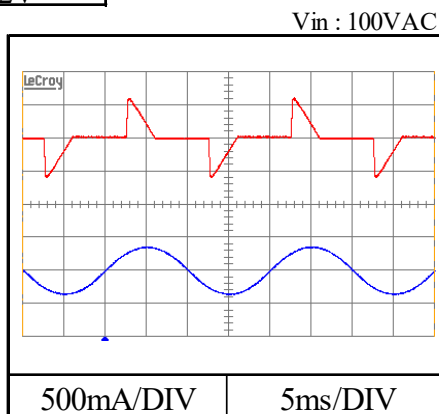
2-11. 入力電流波形 Input current waveform

Conditions Iout : Full load  
Ta : 25°C

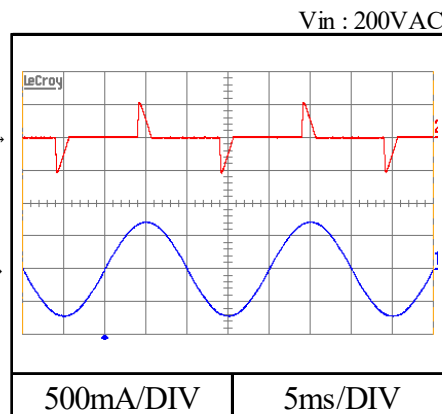
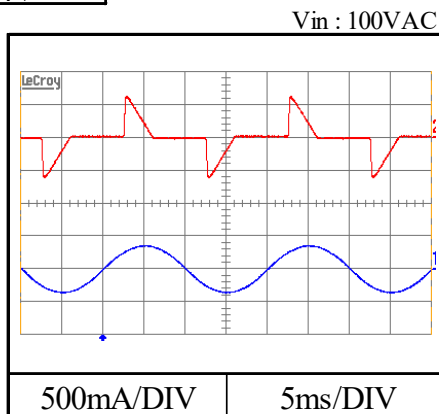
5V



12V



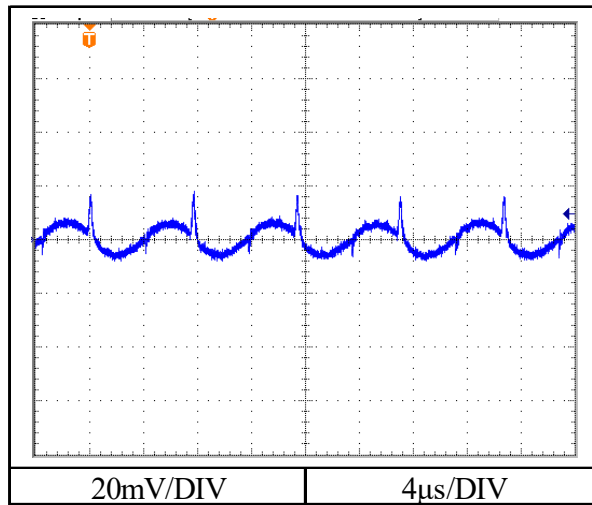
24V



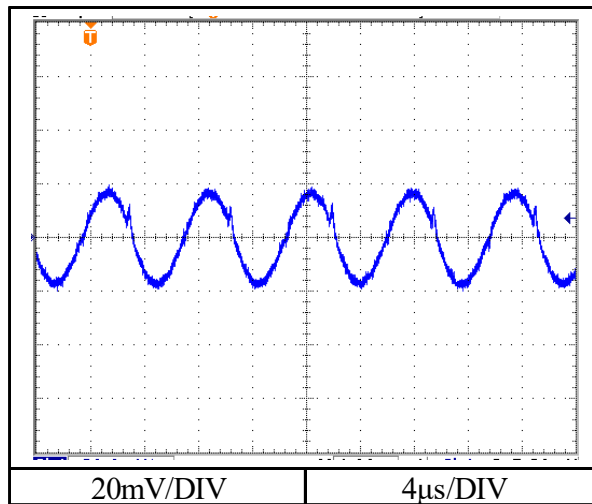
2-12. 出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions  $V_{in}$  : 100 VAC  
 $I_{out}$  : Full load  
 $T_a$  : 25°C

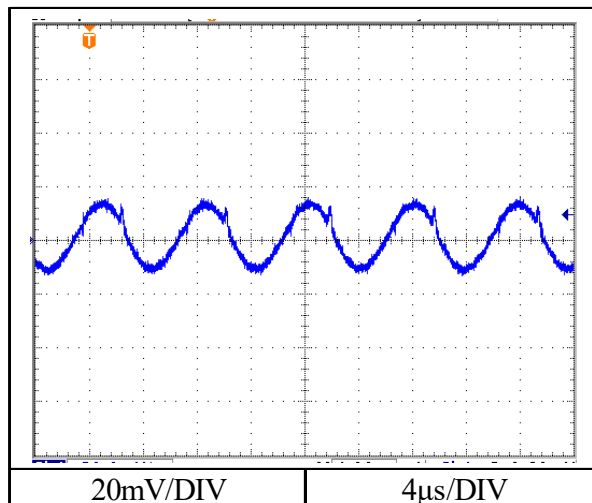
5V



12V



24V



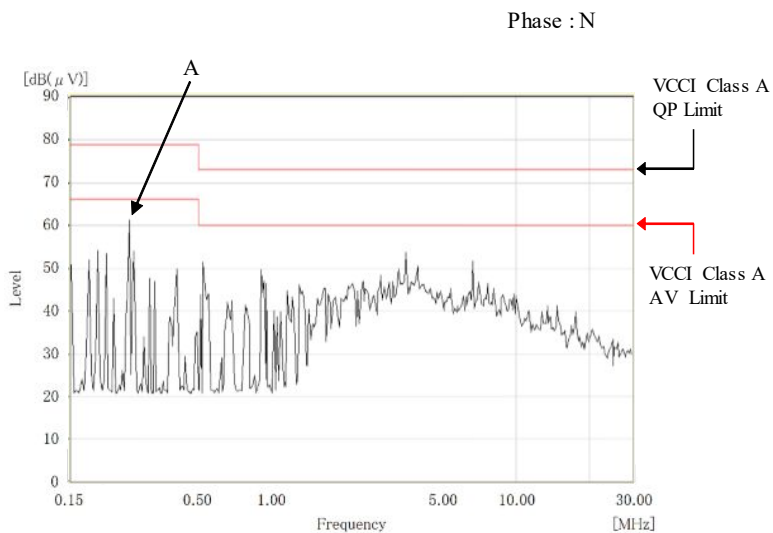
2-13. EMI特性 Electro-Magnetic Interference characteristics

Conditions Vin : 110 VAC  
Iout : Full load  
Ta : 25 °C

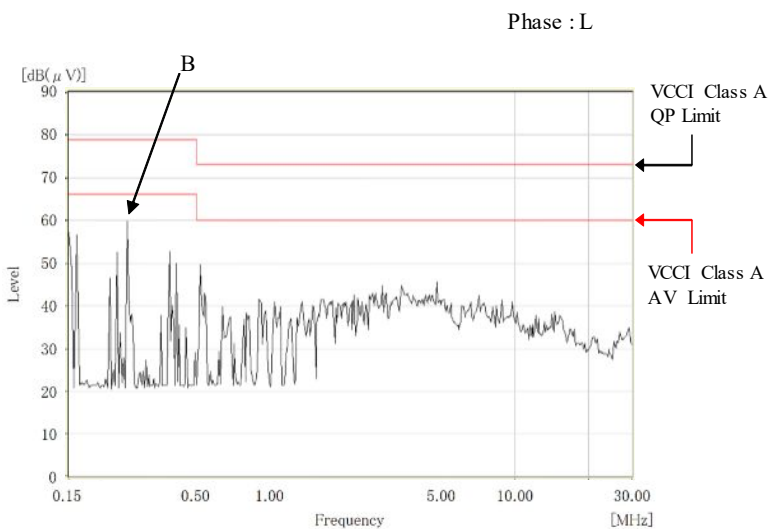
雑音端子電圧  
Conducted Emission

5V

Point A (259kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	79.0	58.6
AV	66.0	39.4



Point B (259kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	79.0	60.4
AV	66.0	38.9



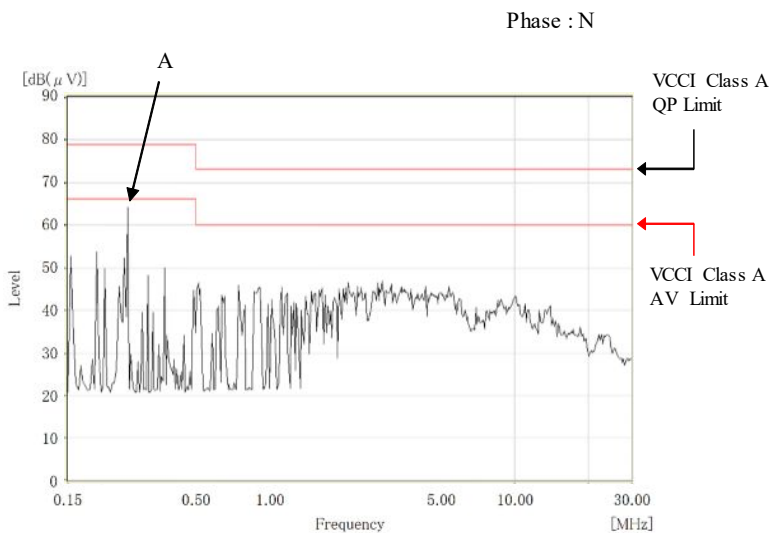
EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ  
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.

Conditions Vin : 110 VAC  
Iout : Full load  
Ta : 25°C

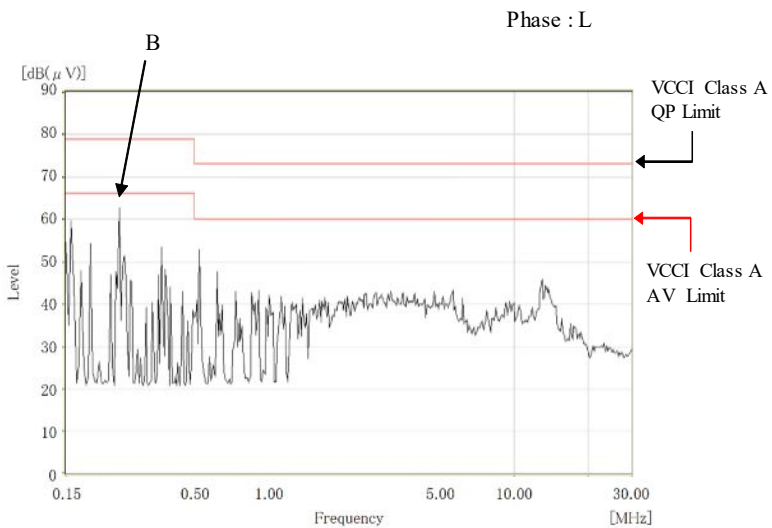
雑音端子電圧  
Conducted Emission

12V

Point A (263kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	79.0	59.9
AV	66.0	37.5



Point B (248kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	79.0	63.7
AV	66.0	41.8



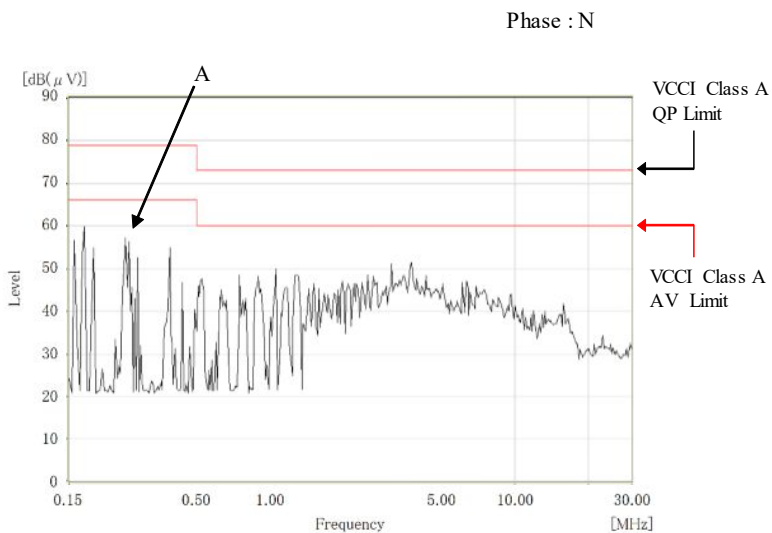
EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ  
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.

Conditions Vin : 110 VAC  
Iout : Full load  
Ta : 25°C

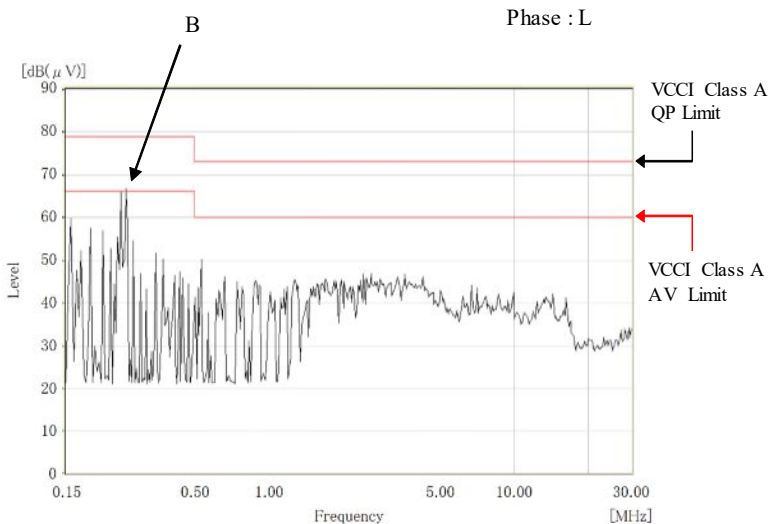
雑音端子電圧  
Conducted Emission

24V

Point A (255kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	79.0	62.2
AV	66.0	43.2



Point B (263kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	79.0	64.1
AV	66.0	41.7



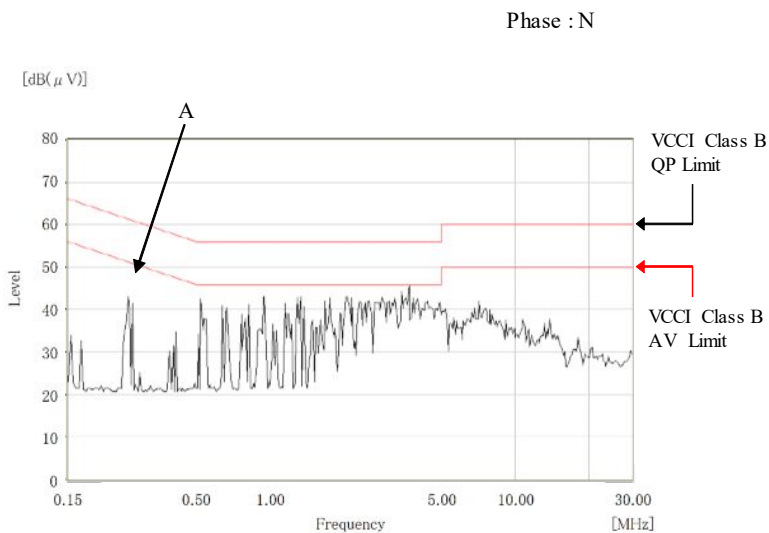
EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ  
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.

Conditions Vin : 110 VAC  
Iout : Full load  
Ta : 25 °C

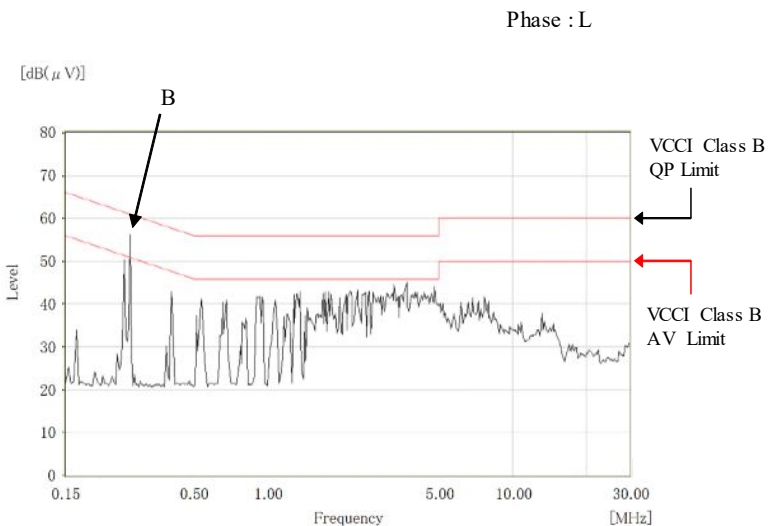
雑音端子電圧  
Conducted Emission

5V

Point A (255kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.6	50.2
AV	51.6	30.0



Point B (272kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.0	51.9
AV	51.0	31.6



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.

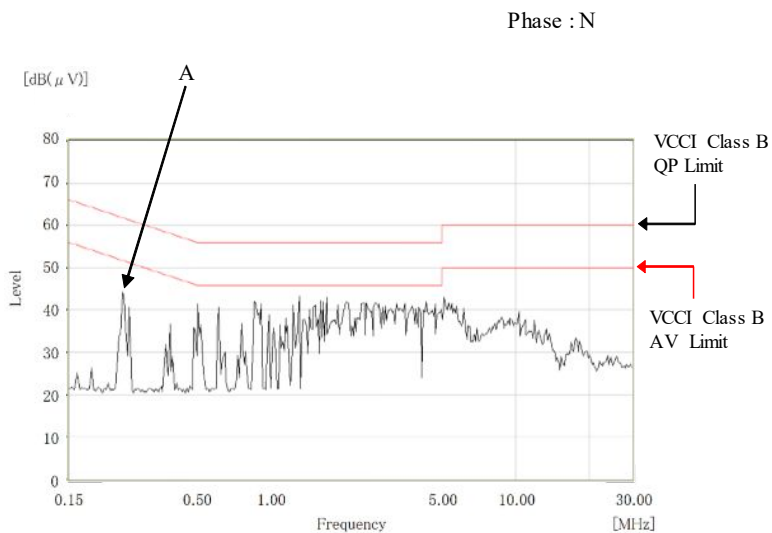


Conditions Vin : 110 VAC  
 Iout : Full load  
 Ta : 25 °C

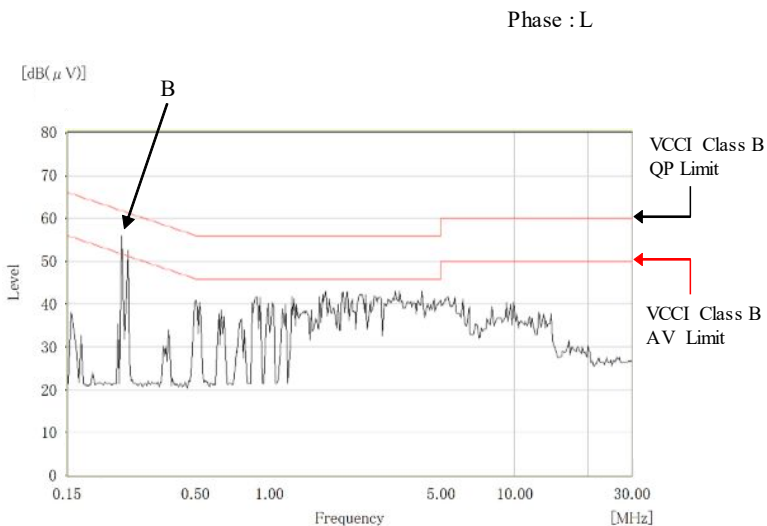
雑音端子電圧  
 Conducted Emission

12V

Point A (248kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.8	52.1
AV	51.8	33.9



Point B (248kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.8	52.6
AV	51.8	32.7



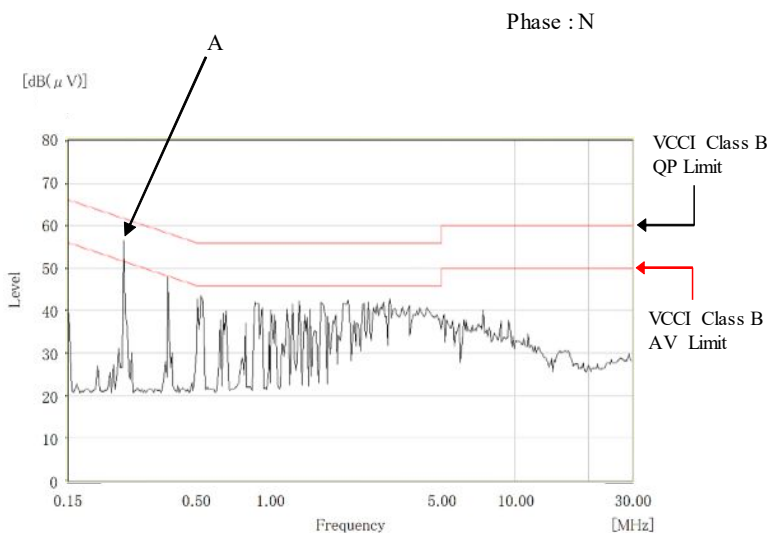
EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ  
 Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.

Conditions Vin : 110 VAC  
Iout : Full load  
Ta : 25 °C

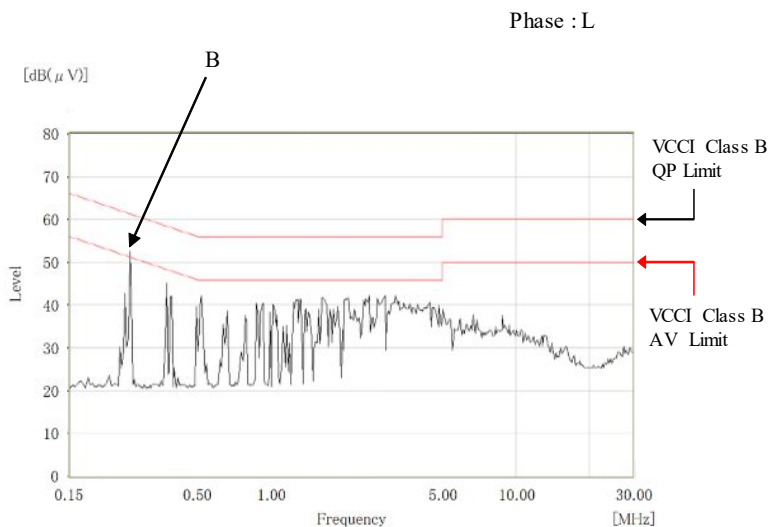
雑音端子電圧  
Conducted Emission

24V

Point A (252kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.7	54.2
AV	51.7	35.1



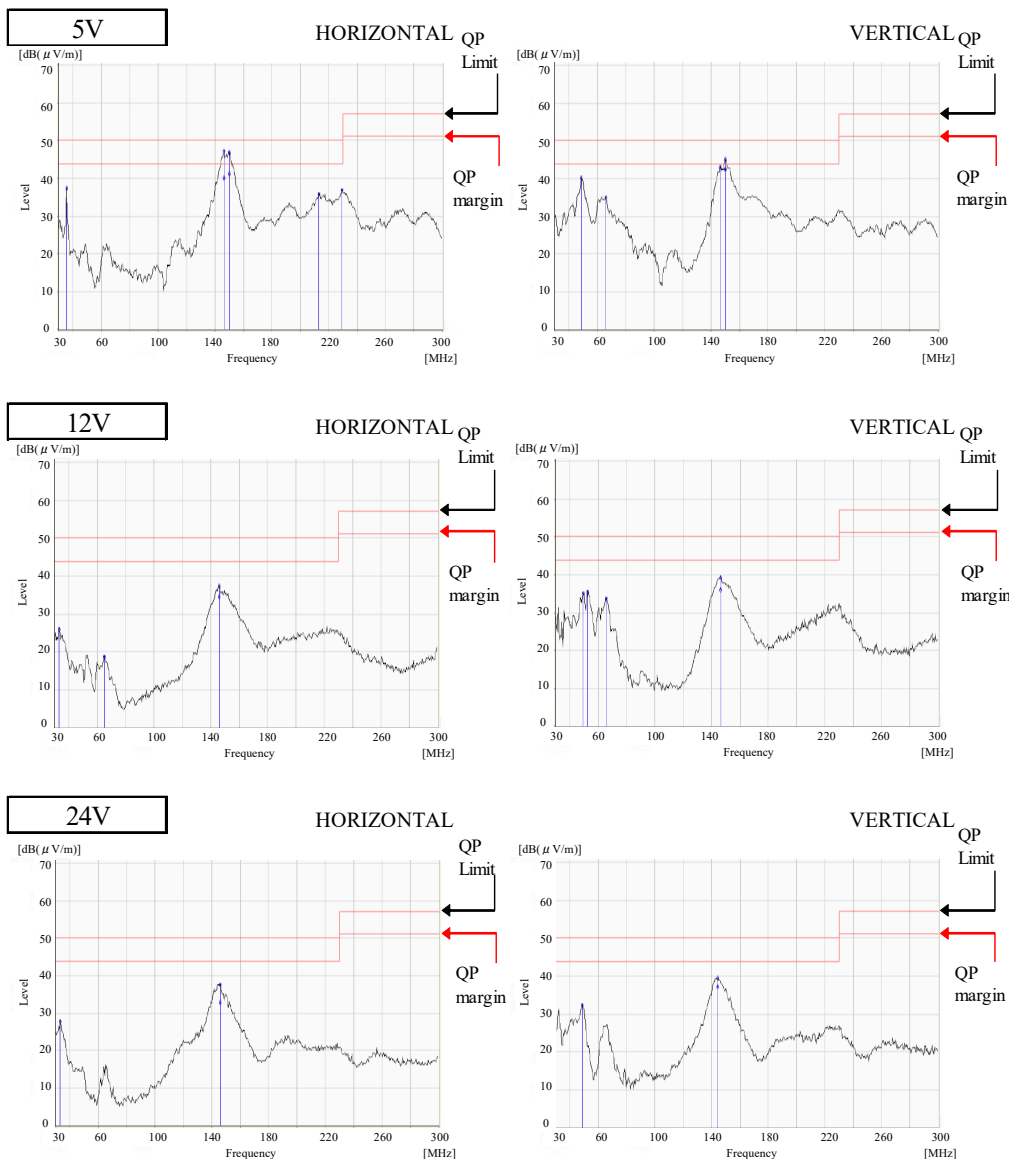
Point B (249kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	61.8	55.5
AV	51.8	33.8



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.

Conditions Vin : 110 VAC  
Iout : Full load  
Ta : 25°C

雑音電界強度  
Radiated Emission



測定条件は測定回路6を参照

Measurement condition refer Circuit 6 used for determination.

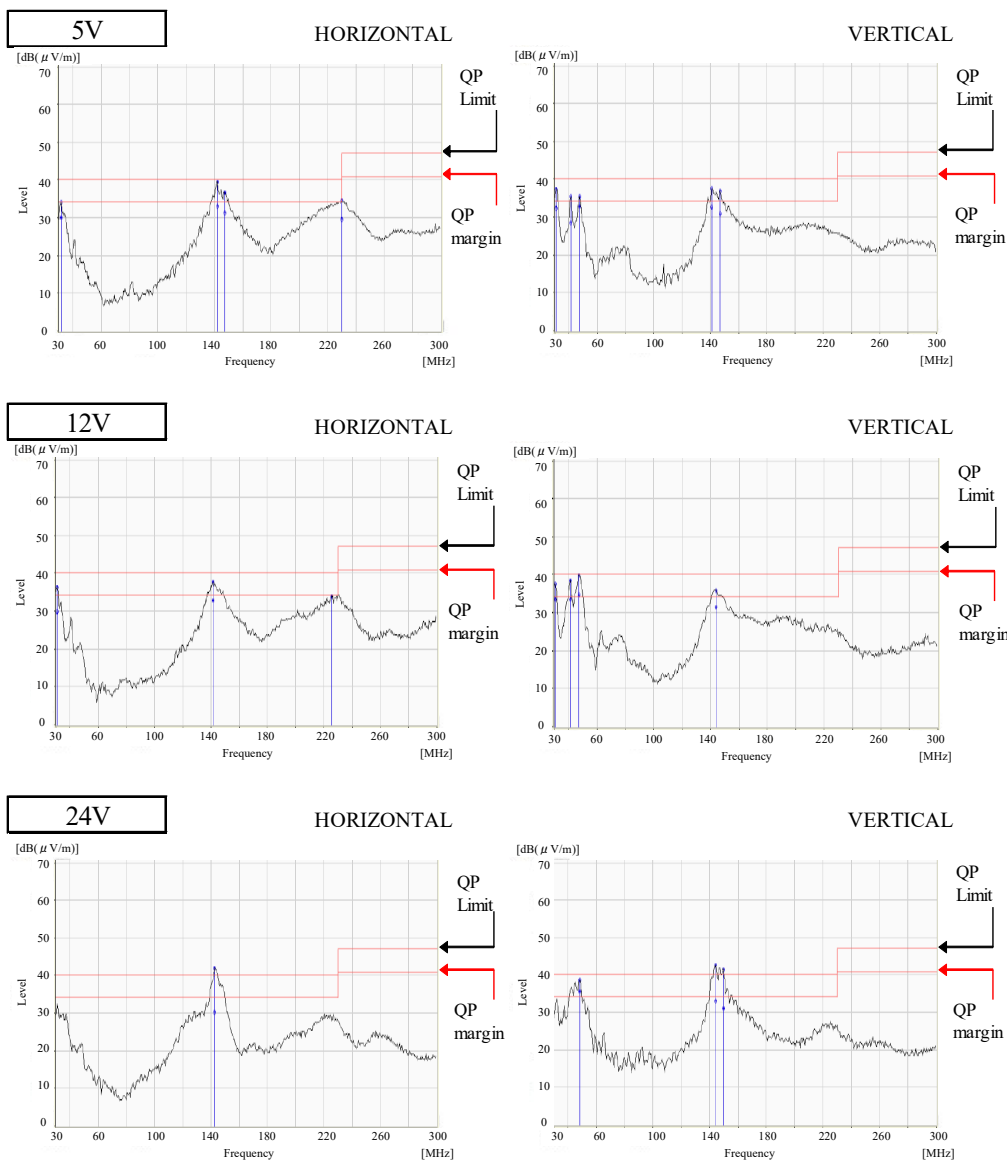
EN55011-A,EN55032-Aの限界値はVCCI class Aの限界値と同じ  
Limit of EN55011-A,EN55032-A are same as its VCCI class A.

表示はピーク値

Indication is peak values.

Conditions Vin : 110 VAC  
Iout : Full load  
Ta : 25°C

雑音電界強度  
Radiated Emission



測定条件は測定回路6を参照

Measurement condition refer Circuit 6 used for determination.

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.

表示はピーク値

Indication is peak values.