DRJ30

EVALUATION DATA

型式データ

INDEX

2. 特性データ   **Characteristics**

使用記号   Terminology used

定義   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

※ 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　　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
・入力電流波形	Input current waveform
・高調波成分	Input current harmonics
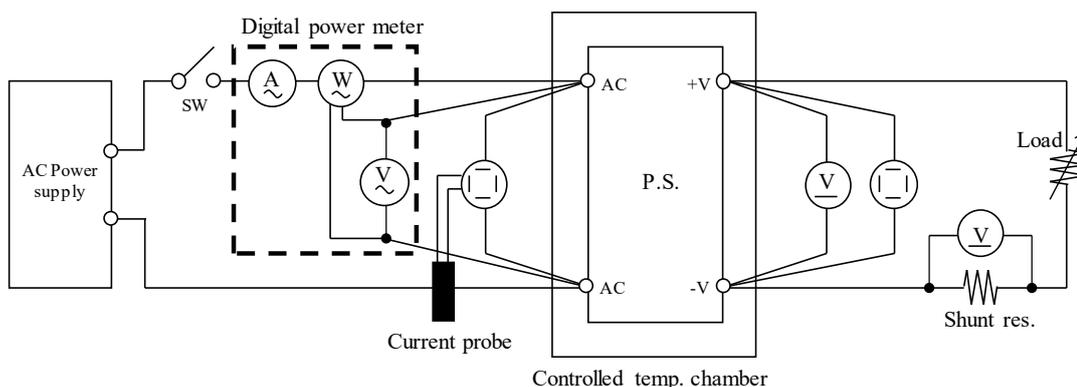
測定回路2　Circuit 2 used for determination

・過渡応答（負荷急変）特性　　Dynamic load response characteristics
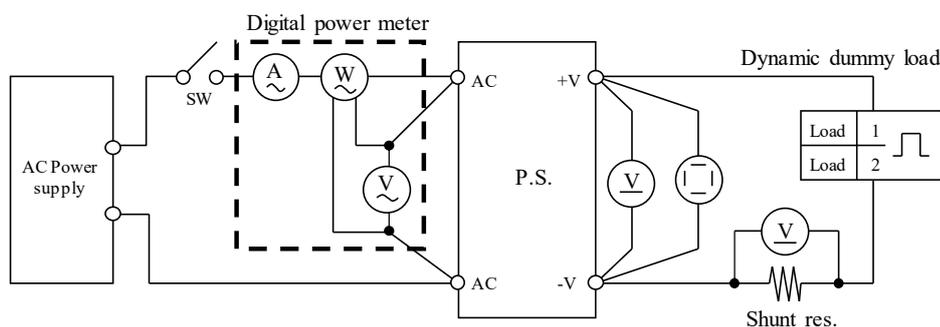
Output current waveform
Iout 50% <⟹> 100%
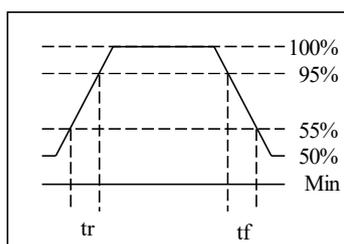
測定回路3 Circuit 3 used for determination
・入力サージ電流（突入電流）波形　Inrush current waveform
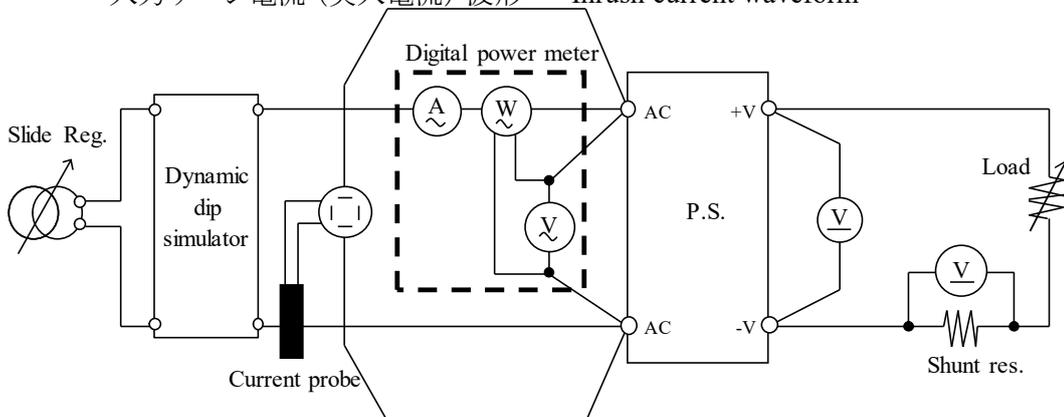
測定回路4 Circuit 4 used for determination
・リーク電流特性　Leakage current characteristics
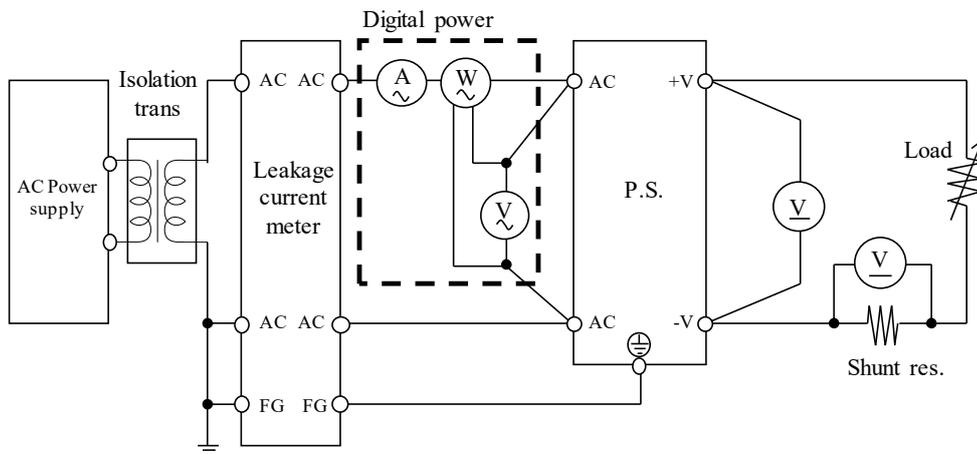
測定回路5 Circuit 5 used for determination
・出力リップル、ノイズ波形　Output ripple and noise waveform

R : 50Ω
C1 : 0.1uF Film cap.
C2 : 100uF Elect cap.
C3 : 4700pF Ceramic cap.

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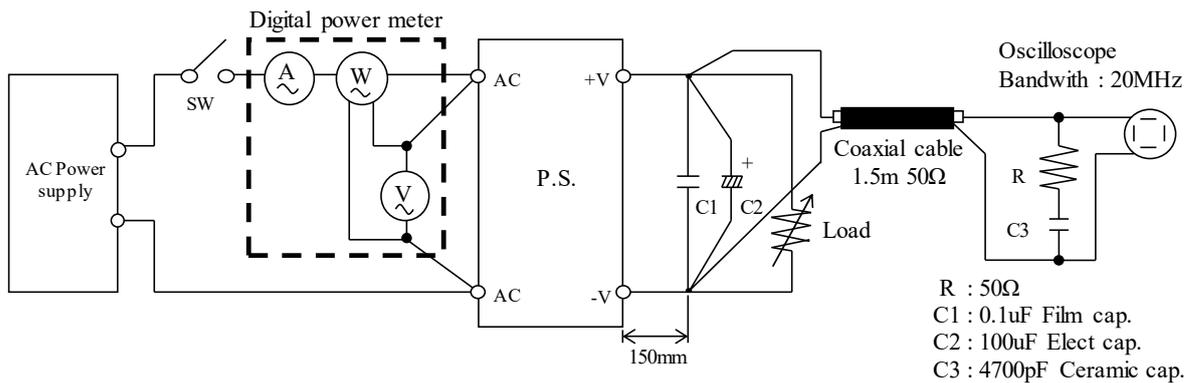
測定構成　Configuration used for determination
　　　・EMI特性　　Electro-Magnetic Interference characteristics
　　(a) 雑音端子電圧 (帰還ノイズ)
　　　　Conducted Emission

DINレール取付治具
DIN rail installation fixture

供試機器
D.U.T.

垂直基準大地面
(2m × 2m)
Vertical ground
reference plane

擬似電源回路網
AMN 50Ω/50uH

D=80cm

D=40cm

EMI Test receiver
spectrum analyzer

電源ケーブル
Power cable

台
Stand

H=80cm

入力電源
AC Power supply

水平大地面
Horizontal ground plane
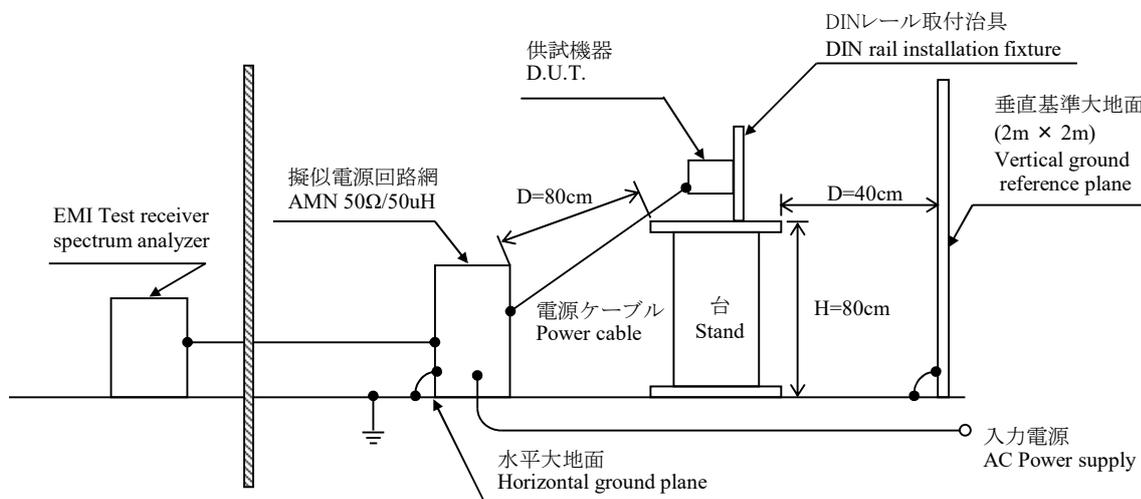
　　(b) 雑音電界強度 (放射ノイズ)
　　　　Radiated Emission

供試機器
D.U.T.

D=3m

DINレール取付治具
DIN rail installation fixture

EMI Test receiver
spectrum analyzer
pre amp.

アンテナ
Antenna

電源ケーブル
Power cable

ターンテーブル
Turn table

台
Stand

H=80cm

水平大地面
Horizontal ground plane

入力電源
AC Power supply

TDK-Lambda
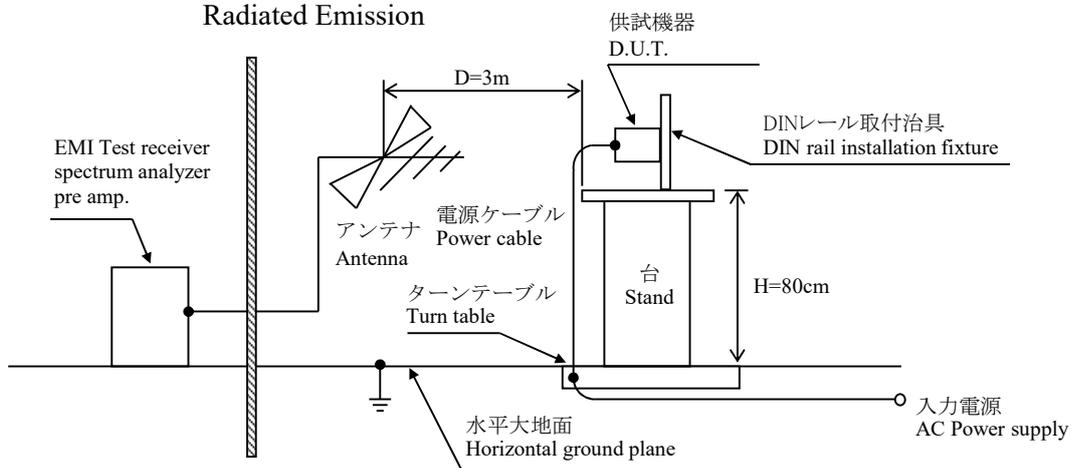
1.2 使用測定機器　　　　List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DLM2054 / DL1740EL
2	DIGITAL MULTIMETER	AGILENT	34970A
3	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
4	CURRENT PROBE	YOKOGAWA ELECT.	701928 / 701930
5	DYNAMIC DUMMY LOAD	TAKASAGO	FK-200L / FK-400L
6	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ150U
7	DUMMY LOAD	PCN	PHF250 SERIES
8	ISOLATION TRANS	MATSUNAGA	3WTC-50K
9	CVCF	TAKASAGO	AA2000XG
10	CVCF	KIKUSUI	PCR4000L
11	CVCF	NF	ES10000S
12	LEAKAGE CURRENT METER	HIOKI	3156
13	DYNAMIC DIP SIMULATOR	TAKAMISAWA	PSA-210
14	CONTROLLED TEMP. CHAMBER	ESPEC	PL-1KP / SH-240
15	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCI
16	PRE AMP.	SONOMA	310N
17	AMN	SCHWARZBECK	NNLK8121
18	ANTENNA	SCHWARZBECK	CBL6111D
19	HARMONIC / FLICKER ANALYZER	KIKUSUI	KHA1000
20	SINGLE-PHASE MASTER	NF	4420
21	REFERENCE IMPEDANCE NETWORK 20A	NF	4150
22	MULTI OUTLET UNIT	KIKUSUI	OT01-KHA

1.3 評価負荷条件　　Load conditions

　　　*入力電圧が90VAC未満の場合、下記のとおり出力ディレーティングが必要です。

　　　Output derating is needed when input voltage is less than 90VAC.

Output voltage : 5V, 12V, 24V

Vin	Iout : Full load	5V	12V	24V
90 - 265VAC	100%	4.0A	2.3A	1.25A
85VAC	80%	3.2A	1.84A	1.0A

TDK-Lambda

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

5V

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

Iout \ Vin	90VAC	100VAC	230VAC	265VAC	line regulation	
0%	5.100V	5.100V	5.100V	5.100V	0mV	0.000%
50%	5.089V	5.089V	5.088V	5.088V	1mV	0.020%
100%	5.076V	5.076V	5.076V	5.076V	0mV	0.000%
load	24mV	24mV	24mV	24mV		
regulation	0.480%	0.480%	0.480%	0.480%		

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

Ta	-10℃	+25℃	+55℃	temperature stability	
Vout	5.063V	5.076V	5.077V	14mV	0.280%

3. Start up voltage and Drop out voltage   Conditions   Ta :   25 ℃
                                                                            Iout : 100 %

Start up voltage (Vin)	43VAC
Drop out voltage (Vin)	40VAC

12V

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

Iout \ Vin	90VAC	100VAC	230VAC	265VAC	line regulation	
0%	12.039V	12.038V	12.038V	12.038V	1mV	0.008%
50%	12.033V	12.033V	12.033V	12.032V	1mV	0.008%
100%	12.026V	12.026V	12.026V	12.026V	0mV	0.000%
load	13mV	12mV	12mV	12mV		
regulation	0.108%	0.100%	0.100%	0.100%		

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

Ta	-10℃	+25℃	+55℃	temperature stability	
Vout	11.992V	12.026V	12.027V	35mV	0.292%

3. Start up voltage and Drop out voltage   Conditions   Ta :   25 ℃
                                                                            Iout : 100 %

Start up voltage (Vin)	62VAC
Drop out voltage (Vin)	59VAC

24V

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

Iout \ Vin	90VAC	100VAC	230VAC	265VAC	line regulation	
0%	24.054V	24.052V	24.058V	24.056V	6mV	0.025%
50%	24.050V	24.050V	24.049V	24.049V	1mV	0.004%
100%	24.046V	24.045V	24.043V	24.042V	4mV	0.017%
load	8mV	7mV	15mV	14mV		
regulation	0.033%	0.029%	0.063%	0.058%		

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

Ta	-10℃	+25℃	+55℃	temperature stability	
Vout	24.020V	24.045V	24.035V	25mV	0.104%

3. Start up voltage and Drop out voltage   Conditions   Ta :   25 ℃
   Iout : 100 %

| Start up voltage (Vin)	59VAC
Drop out voltage (Vin)	56VAC

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

Conditions　Ta :　-10 ℃ --------
　　　　　　　　　　 25 ℃ —·—·—
　　　　　　　　　　 55 ℃ ———

5V

Io = 0%

Io = 100%

12V

Io = 0%

Io = 100%

24V

Io = 0%

Io = 100%
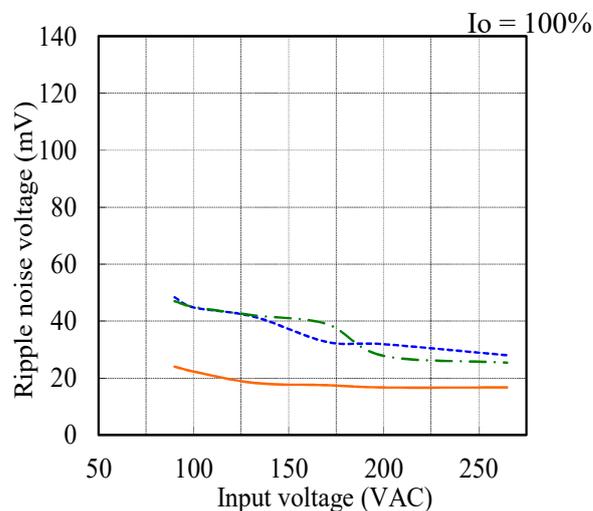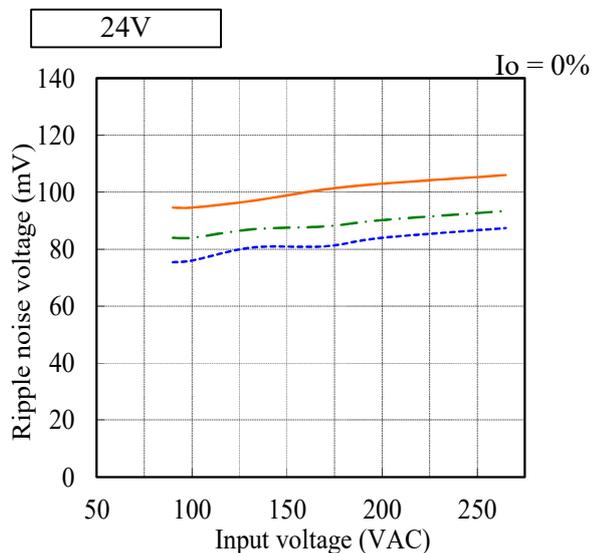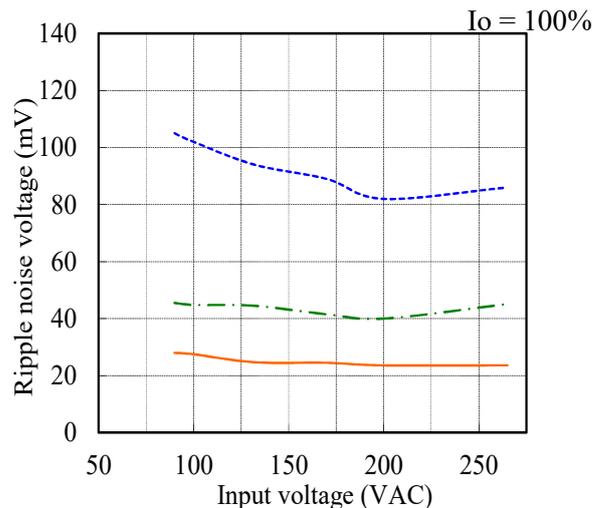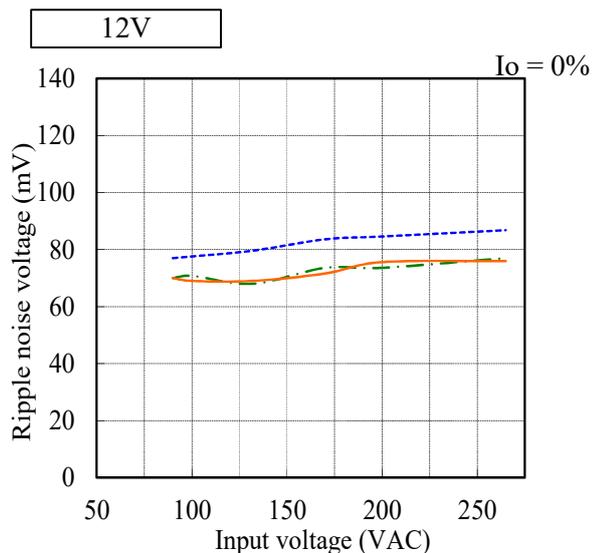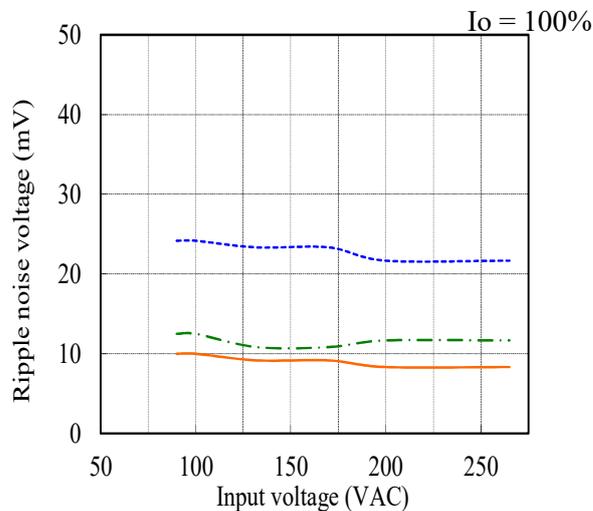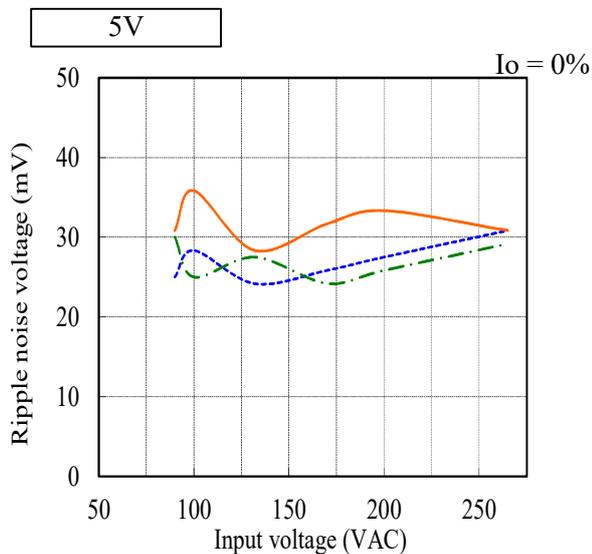
(3) 効率・力率対出力電流
   Efficiency and Power factor vs. Output current

Conditions　Vin :　85 VAC
　　　　　　　　　100 VAC
　　　　　　　　　230 VAC
　　　　　　　　　265 VAC
　　　　　Ta :　25 ℃
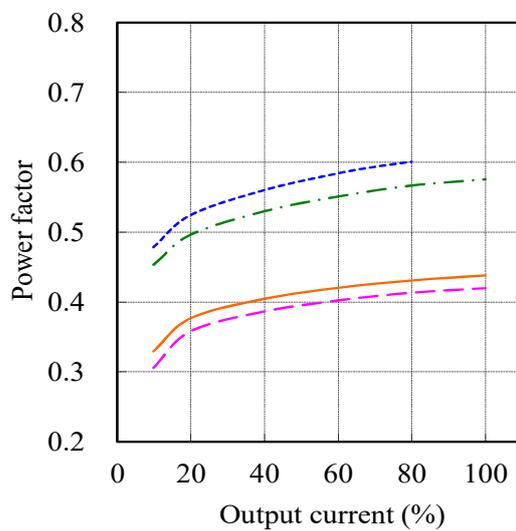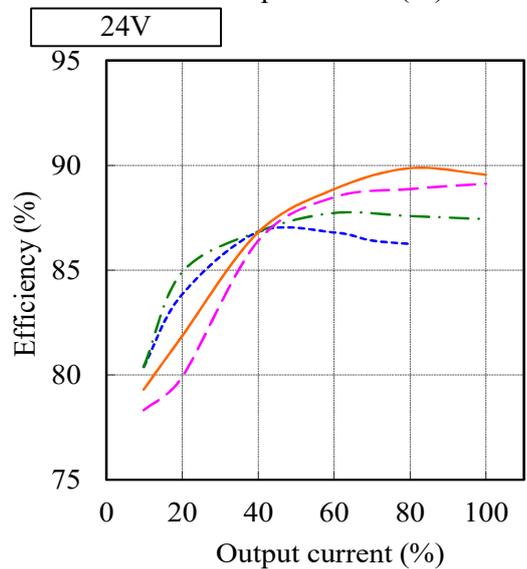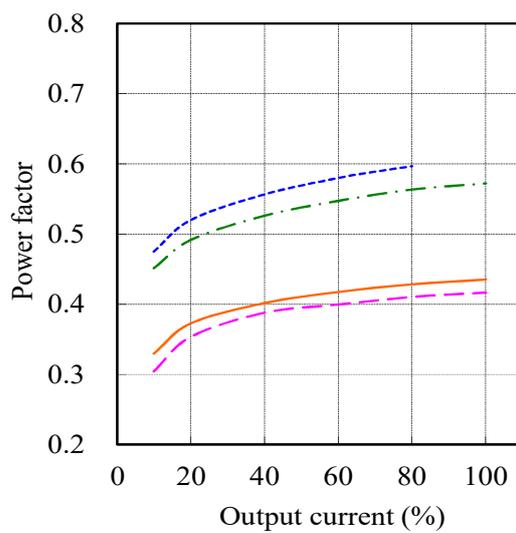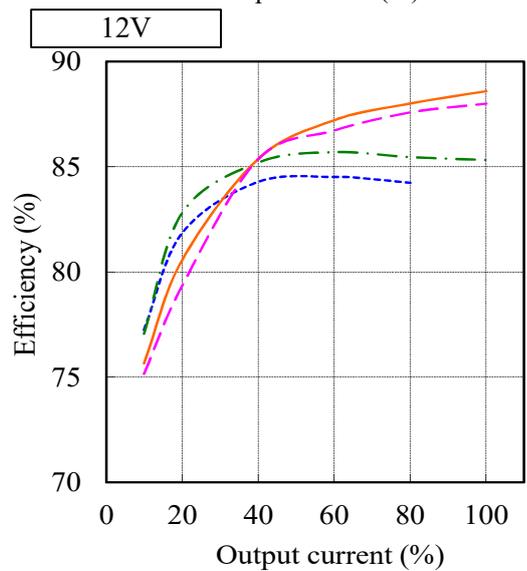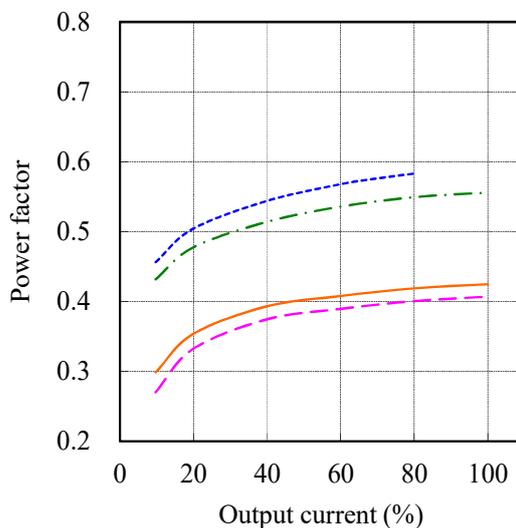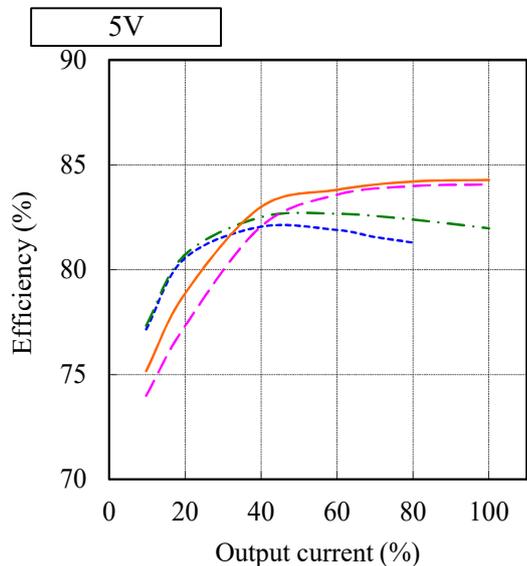
(4) 入力電力対出力電流
   Input power vs. Output current

5V	

Vin	Input power
	Iout : 0%
85VAC	0.26W
100VAC	0.27W
200VAC	0.32W
265VAC	0.37W
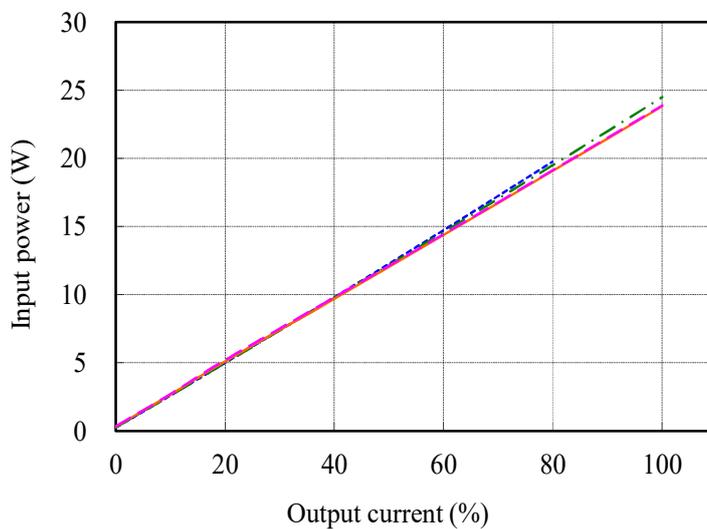
12V	

Vin	Input power
	Iout : 0%
85VAC	0.46W
100VAC	0.47W
230VAC	0.51W
265VAC	0.53W
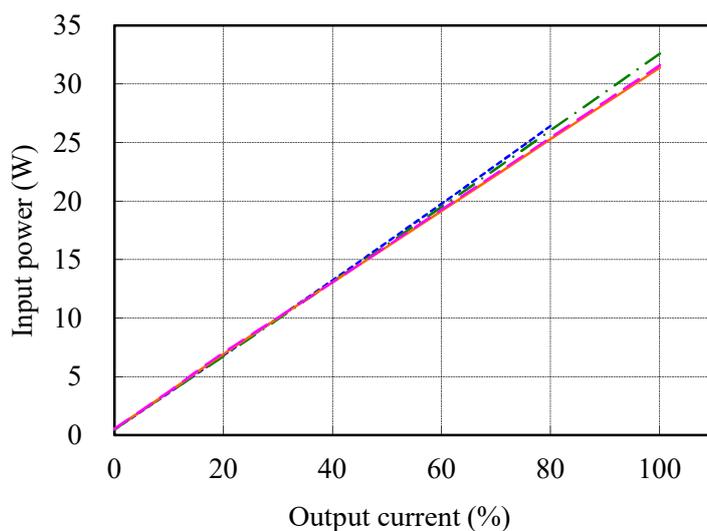
24V	

Vin	Input power
	Iout : 0%
85VAC	0.31W
100VAC	0.32W
230VAC	0.36W
265VAC	0.37W

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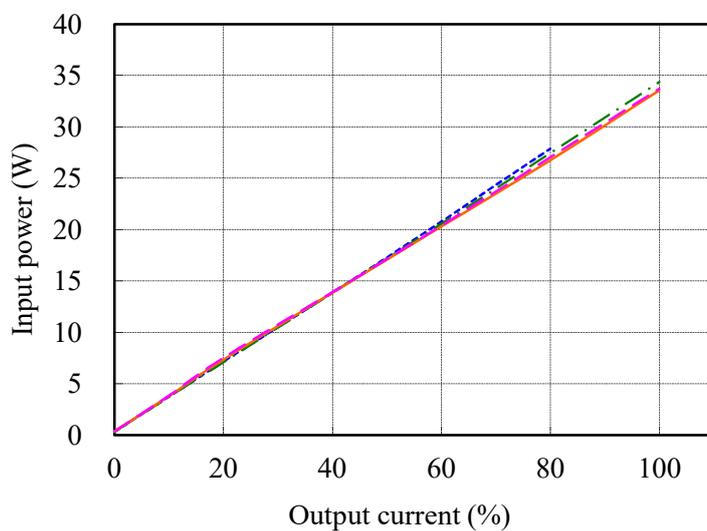
(5) 入力電流対出力電流
Input current vs. Output current

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

5V	

Vin	Input current
	Iout : 0%
85VAC	0.007A
100VAC	0.008A
200VAC	0.018A
265VAC	0.021A
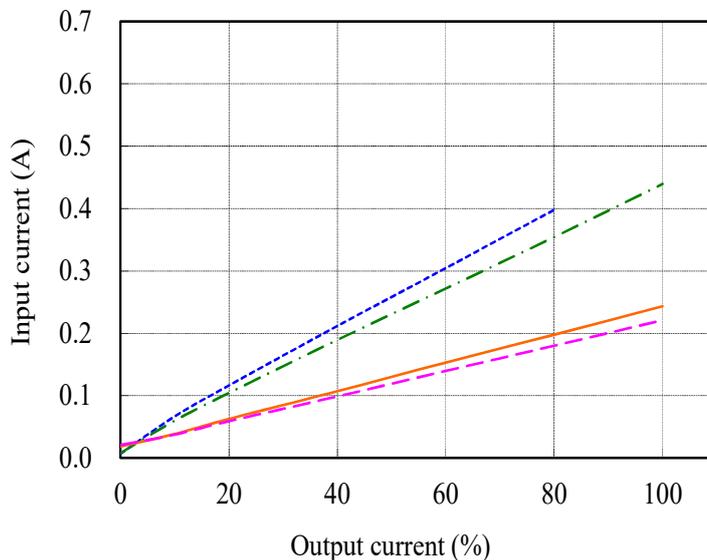
12V	

Vin	Input current
	Iout : 0%
85VAC	0.016A
100VAC	0.015A
230VAC	0.017A
265VAC	0.019A
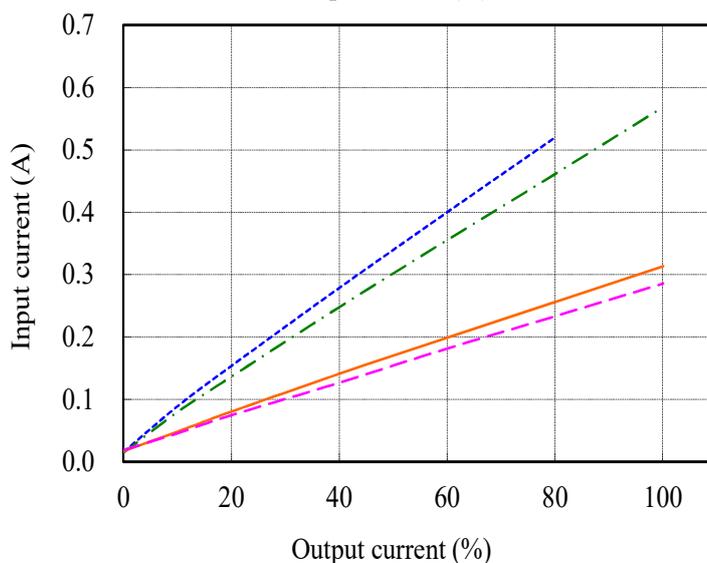
24V	

Vin	Input current
	Iout : 0%
85VAC	0.012A
100VAC	0.011A
230VAC	0.016A
265VAC	0.018A

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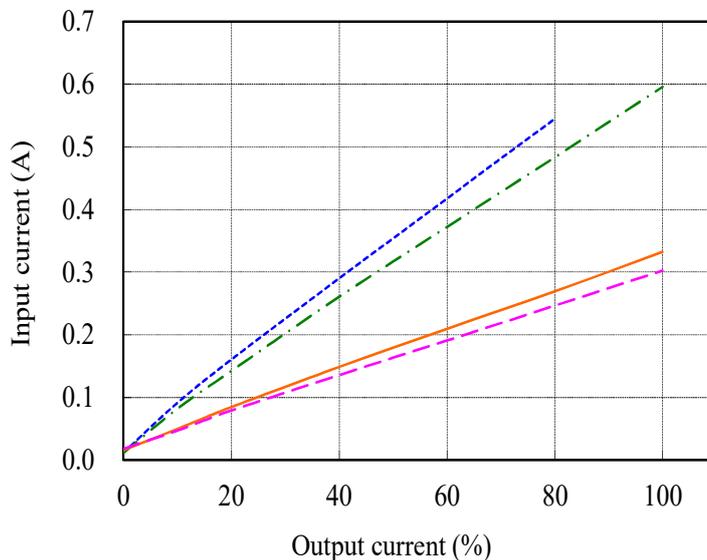
2.2 通電ドリフト特性
  Warm up voltage drift characteristics

Conditions Vin : 100 VAC
         Iout : 100 %
          Ta : 25 ℃
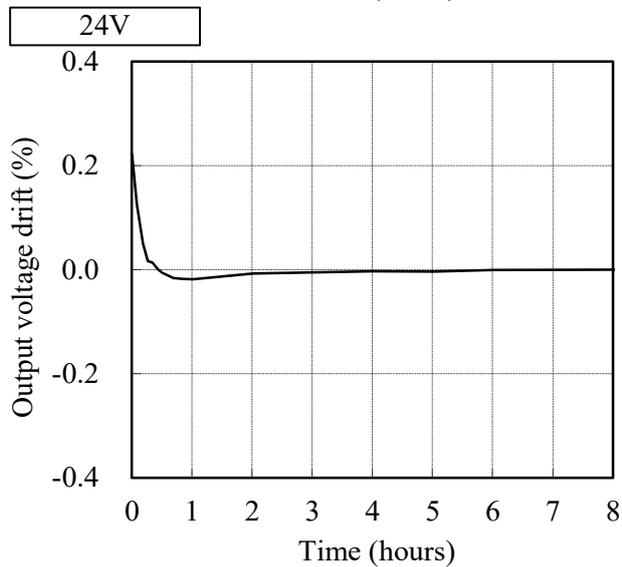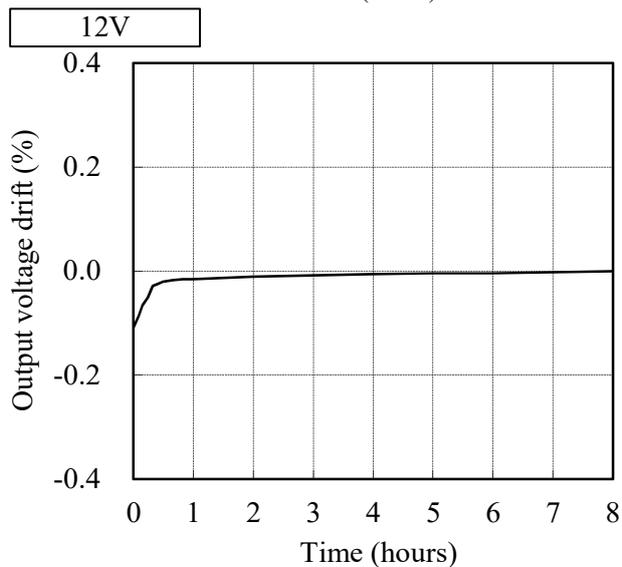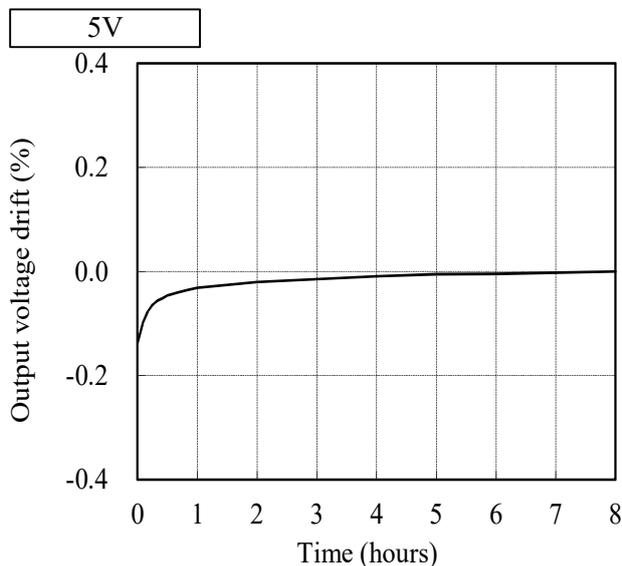
2.3 出力保持時間特性
  Hold up time characteristics

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

| 5V |

| 12V |

| 24V |

| 5V |

| 12V |

| 24V |

TDK-Lambda

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

5V

Iout : 0%

D C   BA

←Vout→

← 0V →

← Vin →

2V/DIV	200ms/DIV

Iout : 100%

D C   B A

←Vout→

← 0V →

← Vin →

2V/DIV	200ms/DIV

12V

Iout : 0%

D C BA

←Vout→

← 0V →

← Vin →

5V/DIV	200ms/DIV

Iout : 0%

D C B A

←Vout→

← 0V →

← Vin →

5V/DIV	200ms/DIV

24V

Iout : 0%

DCB A

←Vout→

← 0V →

← Vin →

10V/DIV	200ms/DIV

Iout : 100%

DC BA

←Vout→

← 0V →

← Vin →

| 10V/DIV	200ms/DIV

TDK-Lambda
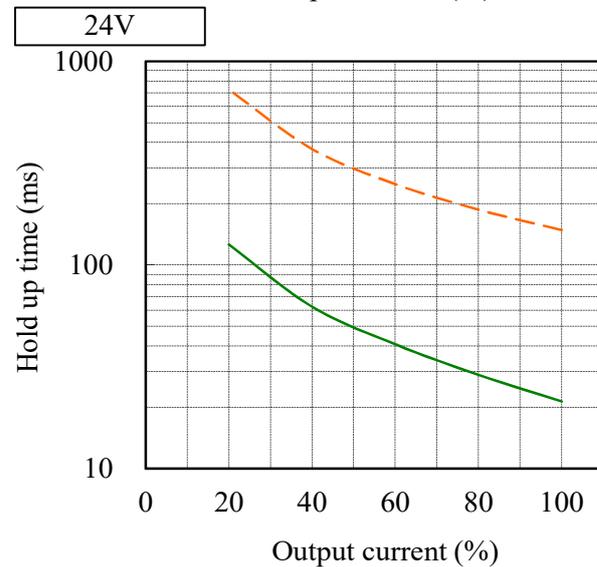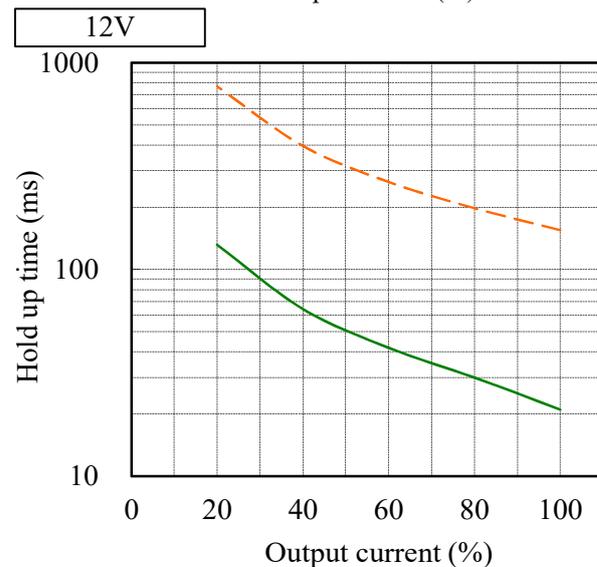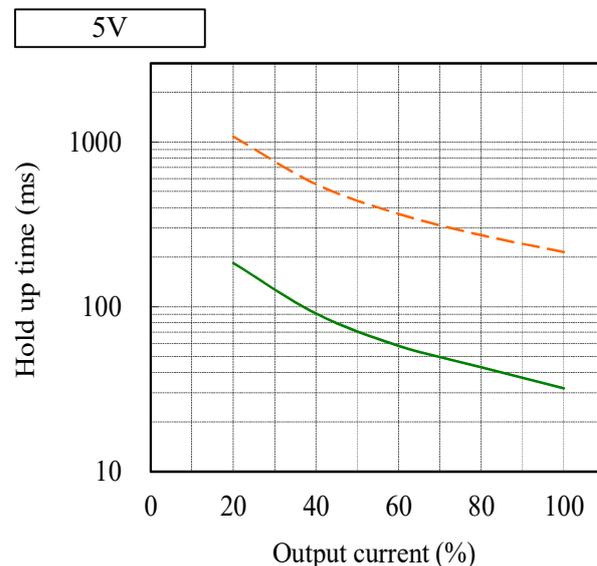
2.5 出力立ち下がり特性
Output fall characteristics

Conditions　Vin :　90 VAC (A)
100 VAC (B)
230 VAC (C)
265 VAC (D)
Ta :　25 ℃
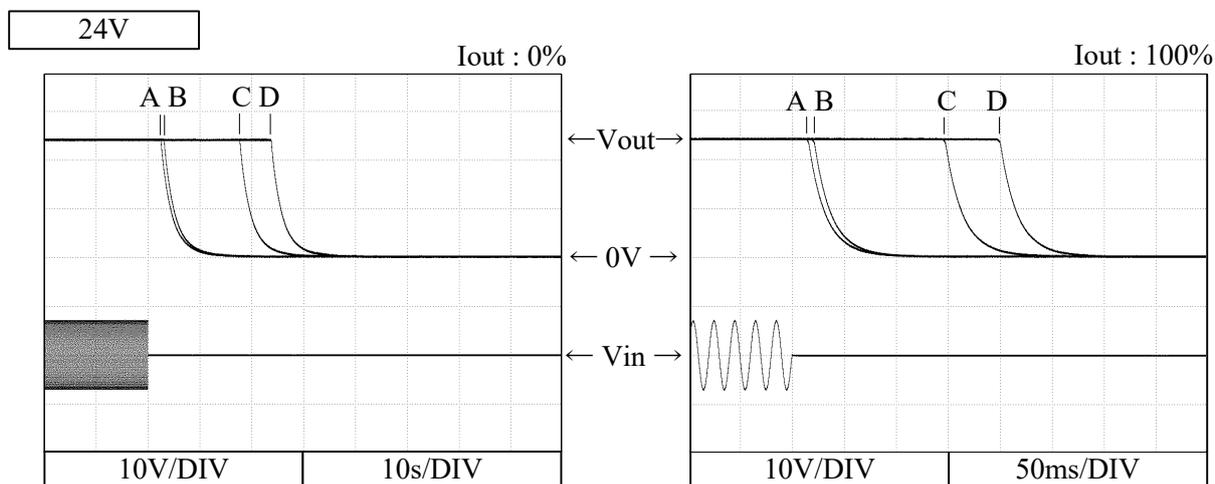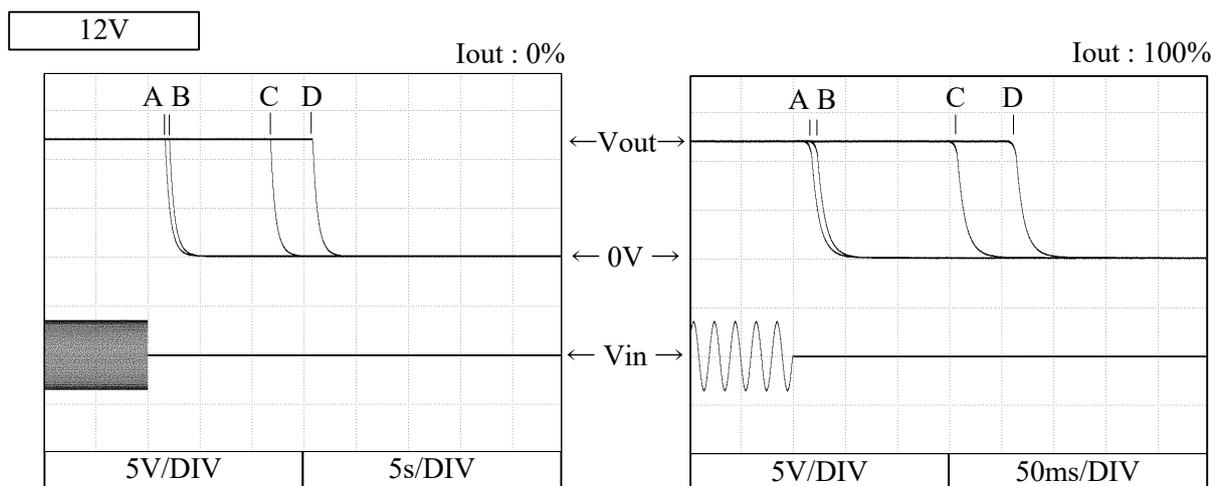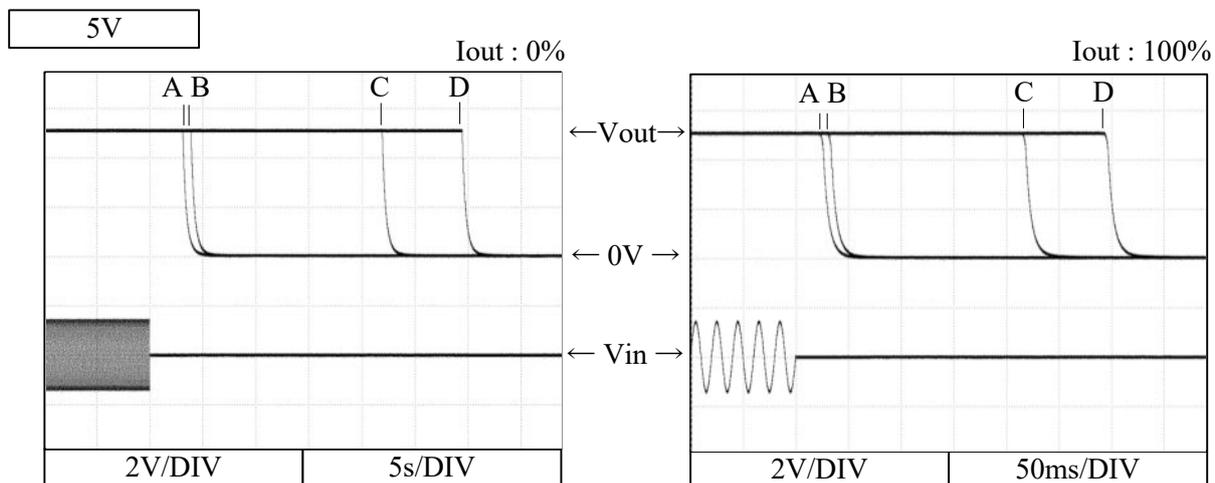
5V

Iout : 0%

A B　　C　D

←Vout→

← 0V →

← Vin →

2V/DIV　　5s/DIV

Iout : 100%

A B　　C　D

←Vout→

← 0V →

← Vin →

2V/DIV　　50ms/DIV

12V

Iout : 0%

A B　C　D

←Vout→

← 0V →

← Vin →

5V/DIV　　5s/DIV

Iout : 100%

A B　C　D

←Vout→

← 0V →

← Vin →

5V/DIV　　50ms/DIV

24V

Iout : 0%

A B　C D

←Vout→

← 0V →

← Vin →

10V/DIV　　10s/DIV

Iout : 100%

A B　C D

←Vout→

← 0V →

← Vin →

10V/DIV　　50ms/DIV

TDK-Lambda

2.6 過電流保護特性
Over current protection (OCP) characteristics

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

Conditions Iout : 100 VAC
　　　　　　Ta : -10 ℃ - - - - -
　　　　　　　　 25 ℃ - · - · -
　　　　　　　　 55 ℃ ———

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

5V

5V

12V

12V

24V

24V

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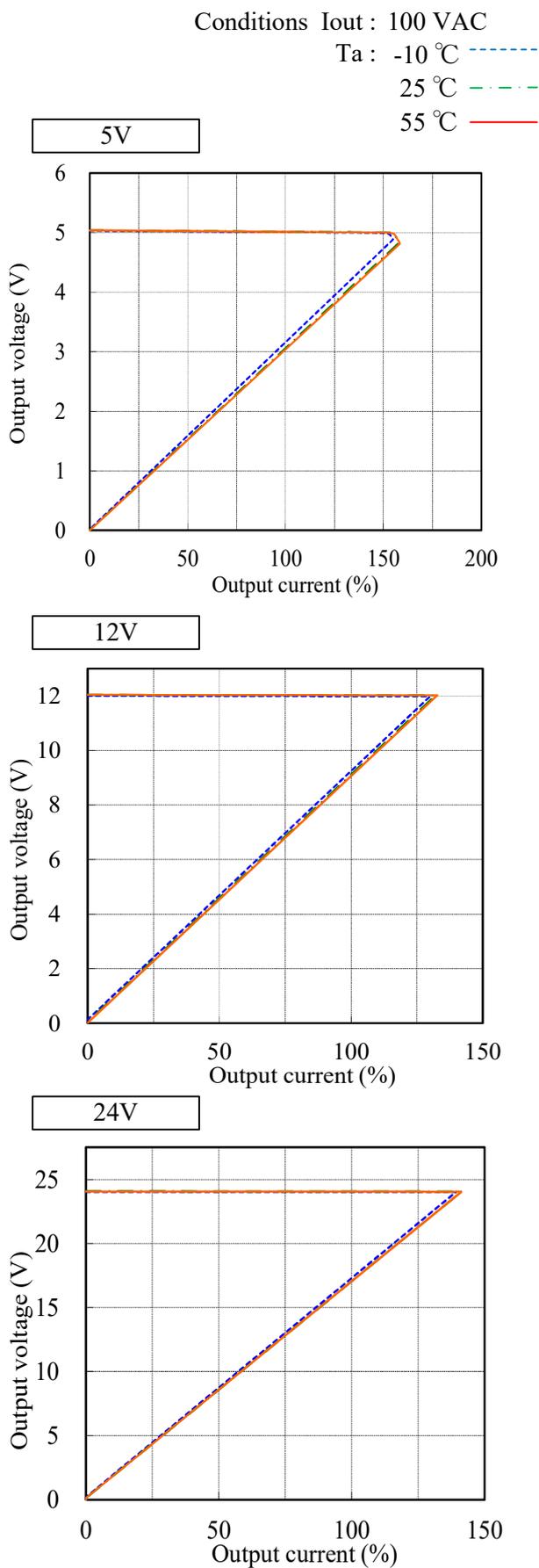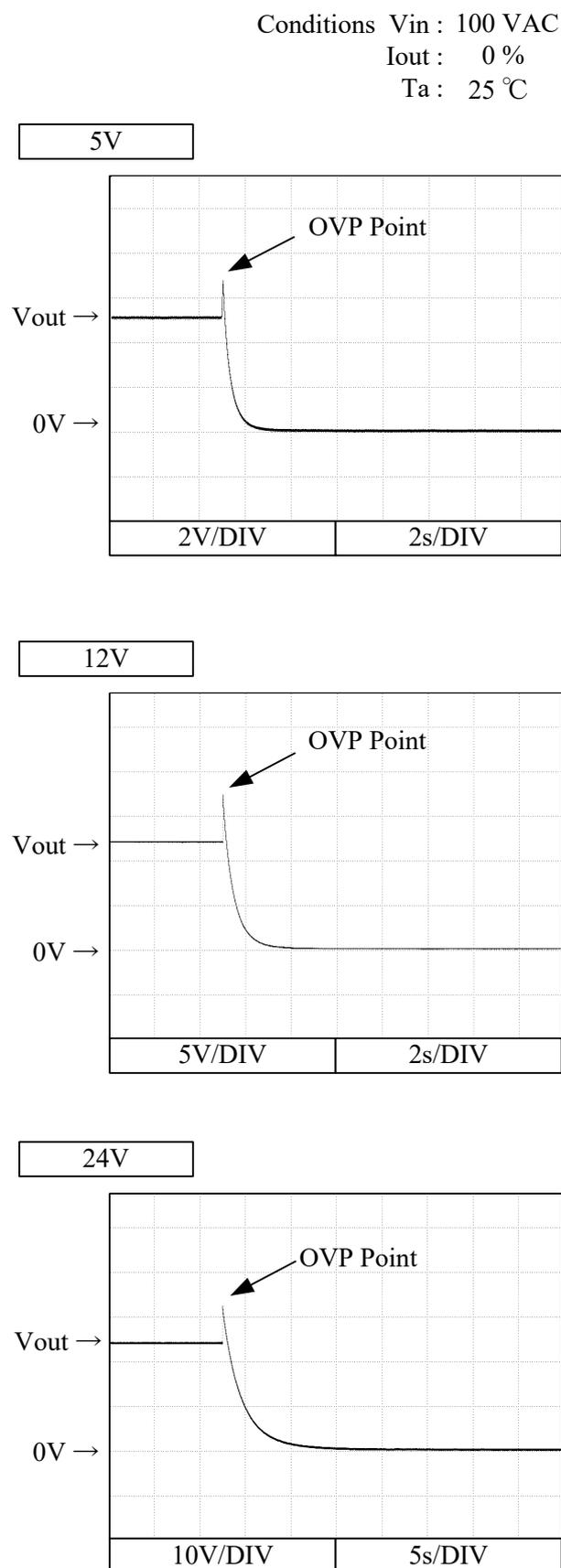
2.8 過渡応答 (負荷急変) 特性
Dynamic load response characteristics

Conditions Vin : 100 VAC
Iout : 50 % ⟷ 100%
(tr = tf = 50us)
Ta : 25℃

5V	f = 100Hz		f = 1kHz

← Vout →
← Iout →
←Iout:0%→

100mV/DIV	2ms/DIV	100mV/DIV	200μs/DIV
+0.96%	-1.27%	+0.92%	-1.12%

12V	f = 100Hz		f = 1kHz

← Vout →
← Iout →
←Iout:0%→

200mV/DIV	2ms/DIV	200mV/DIV	200μs/DIV
+0.63%	-0.61%	+0.55%	-0.49%

24V	f = 100Hz		f = 1kHz

← Vout →
← Iout →
←Iout:0%→

200mV/DIV	2ms/DIV	200mV/DIV	200μs/DIV
+0.37%	-0.35%	+0.28%	-0.25%

TDK-Lambda
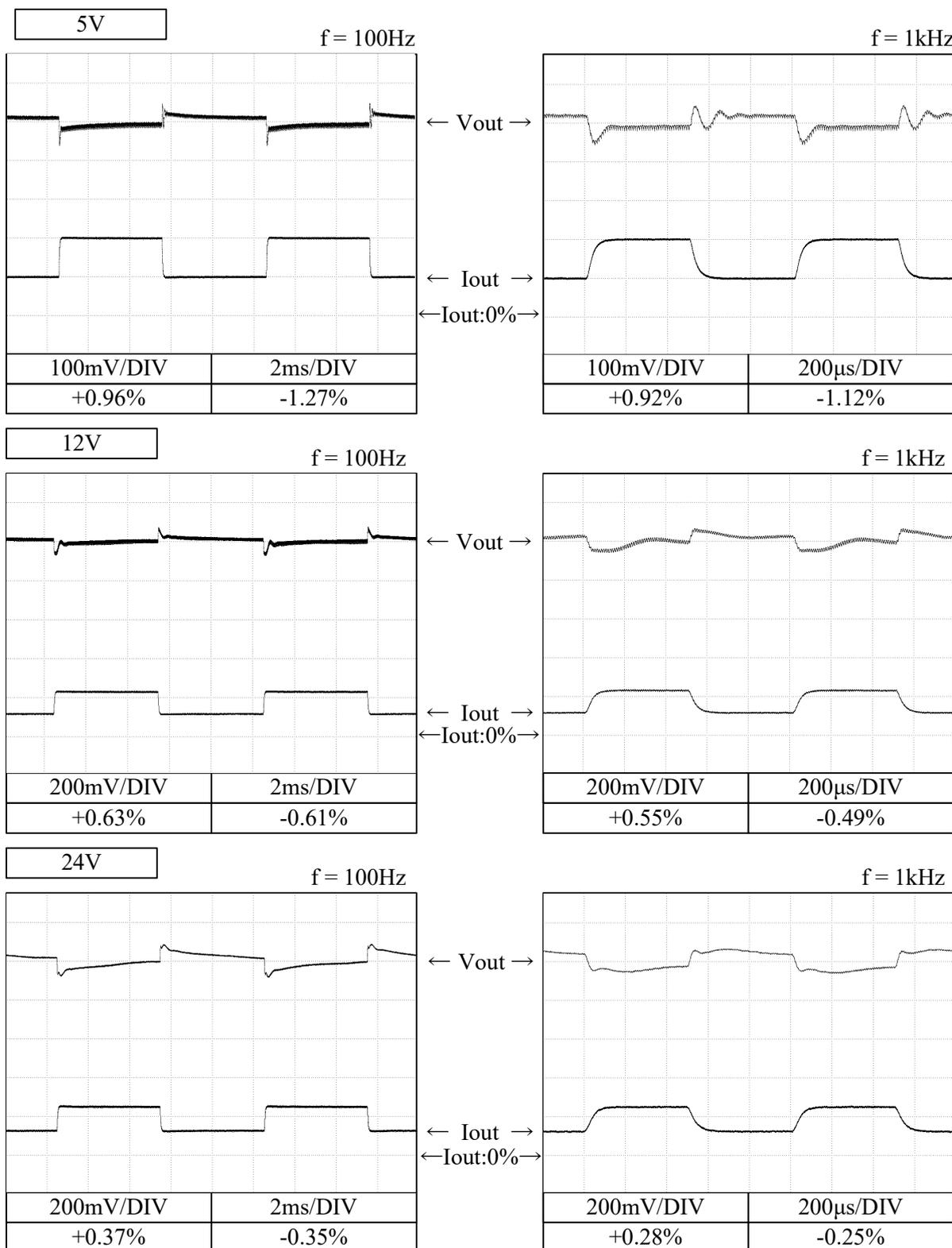
2.9 入力電圧瞬停特性
Response to brown out characteristics

Conditions　　Iout : 　100 %
　　　　　　　Ta : 　　25 ℃

瞬停時間　　　　　　Interruption time
A : 出力電圧が低下なし　　　　Output voltage does not drop.
B : 出力電圧が0Vまで低下しない　Output voltage drops down not reaching 0V.
C : 出力電圧が0Vまで低下　　　Output voltage drops until 0V.

5V

Vin : 100VAC
A = 31ms , B = 35ms , C = 40ms
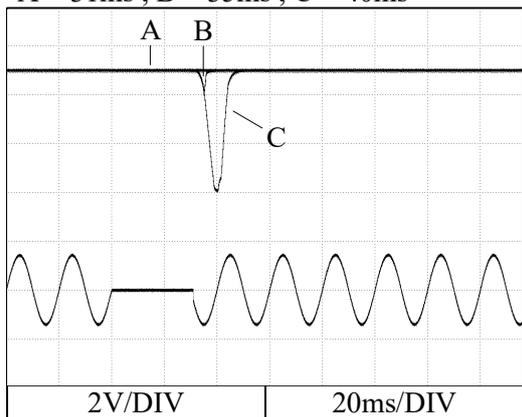
Vin : 230VAC
A = 224ms, B = 229ms , C = 233ms

← Vout →
← 0V →
← Vin →

2V/DIV　　20ms/DIV

2V/DIV　　50ms/DIV
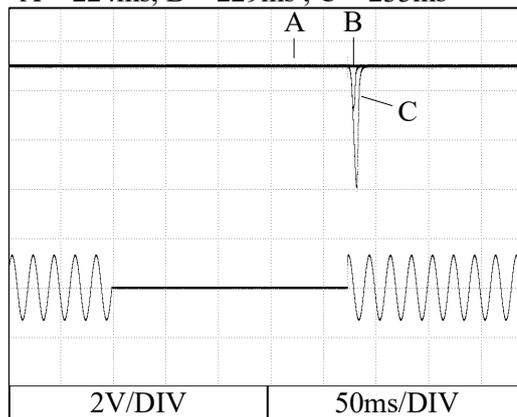
12V

Vin : 100VAC
A = 17ms , B = 25ms , C = 31ms
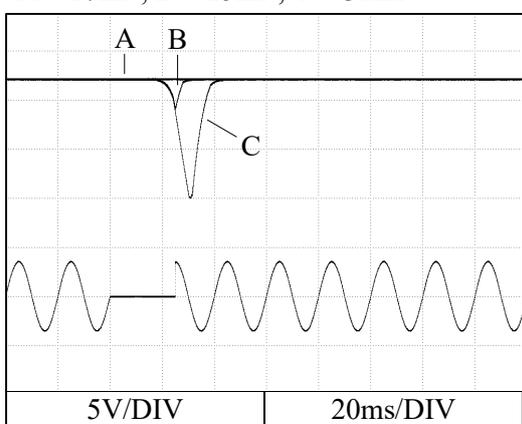
Vin : 230VAC
A = 154ms, B = 161ms , C = 168ms

← Vout →
← 0V →
← Vin →

5V/DIV　　20ms/DIV

5V/DIV　　50ms/DIV
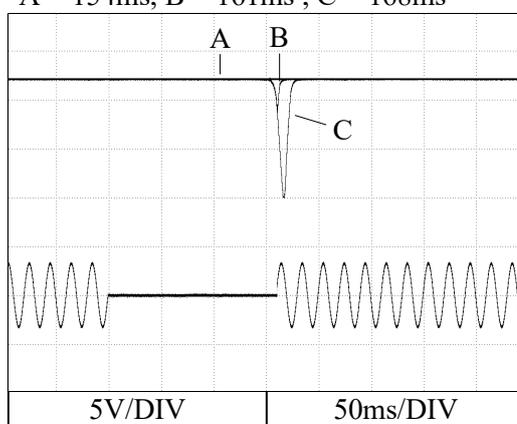
24V

Vin : 100VAC
A = 18ms , B = 25ms , C = 39ms
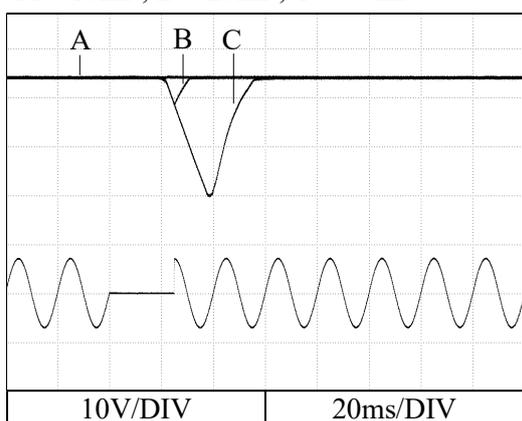
Vin : 230VAC
A = 143ms, B = 150ms , C = 166ms

← Vout →
← 0V →
← Vin →

10V/DIV　　20ms/DIV

10V/DIV　　50ms/DIV

TDK-Lambda　　　18/28
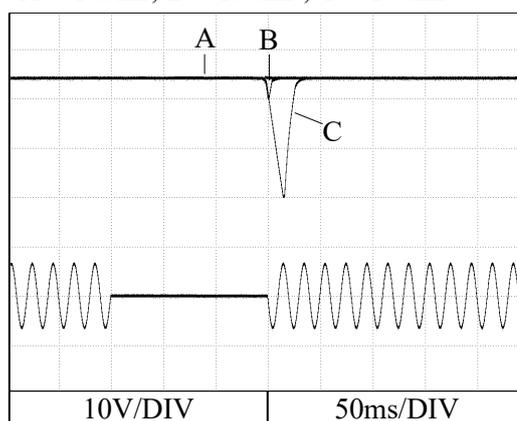
2.10 入力サージ電流(突入電流)波形
Inrush current waveform

24V

Conditions Vin : 100 VAC
Iout : 100 %
Ta :   25 ℃
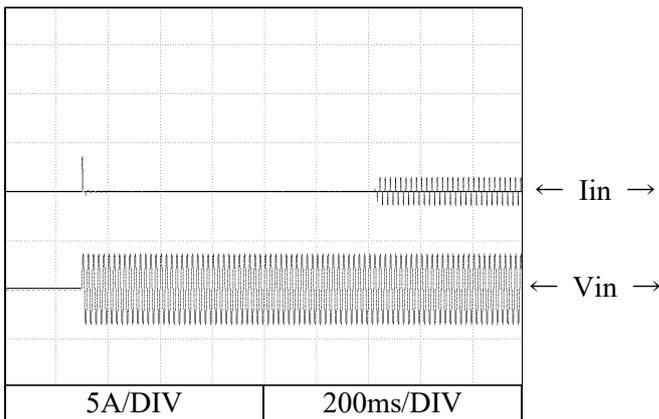
Switch on phase angle of input AC voltage
$\phi = 0°$

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

← Iin →

← Vin →

5A/DIV	200ms/DIV

5A/DIV	200ms/DIV

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

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

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

← Iin →

← Vin →

10A/DIV	200ms/DIV

10A/DIV	200ms/DIV

2.11 高調波成分
Input current harmonics

24V

Vin : 100VAC

IEC61000-3-2 Limit (class A)

Harmonic current (A)

Harmonic order

Vin : 230VAC

IEC61000-3-2 Limit (class A)

Harmonic current (A)

Harmonic order
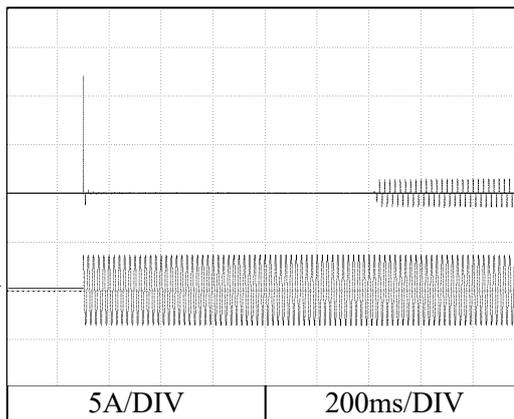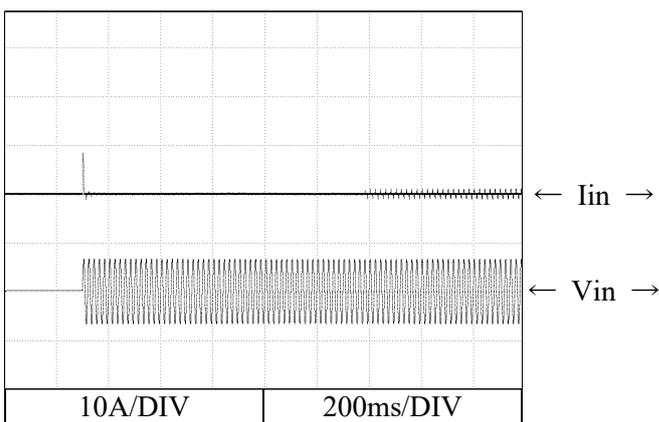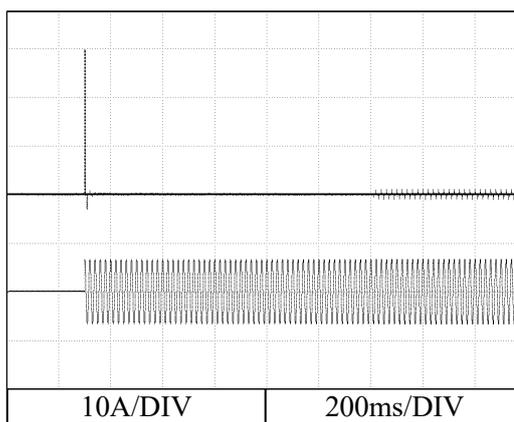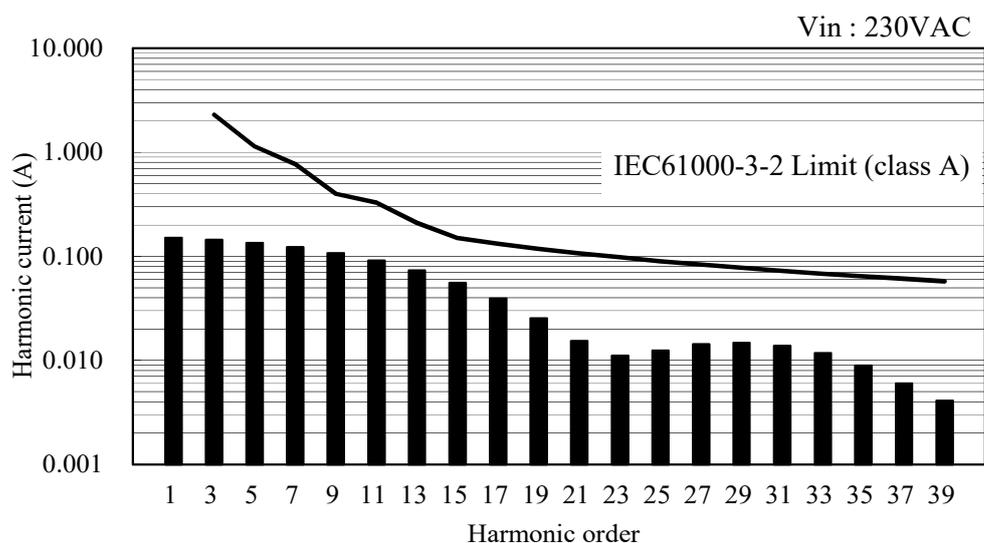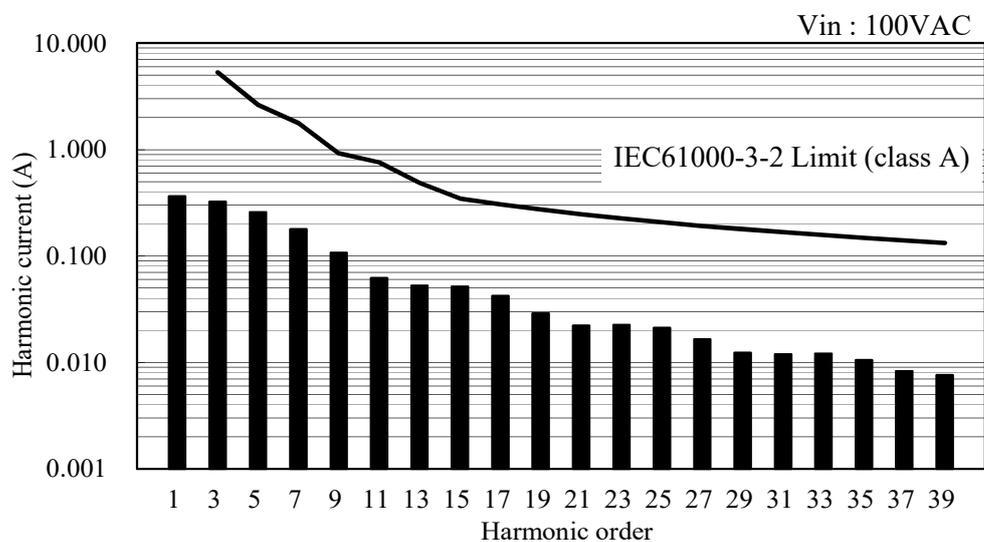
2.12 入力電流波形
Input current waveform

Conditions Iout : 100 %

Ta :   25 ℃

24V

Vin : 100VAC

Vin : 230VAC

← Iin →

← Vin →

1A/DIV	5ms/DIV

1A/DIV	5ms/DIV
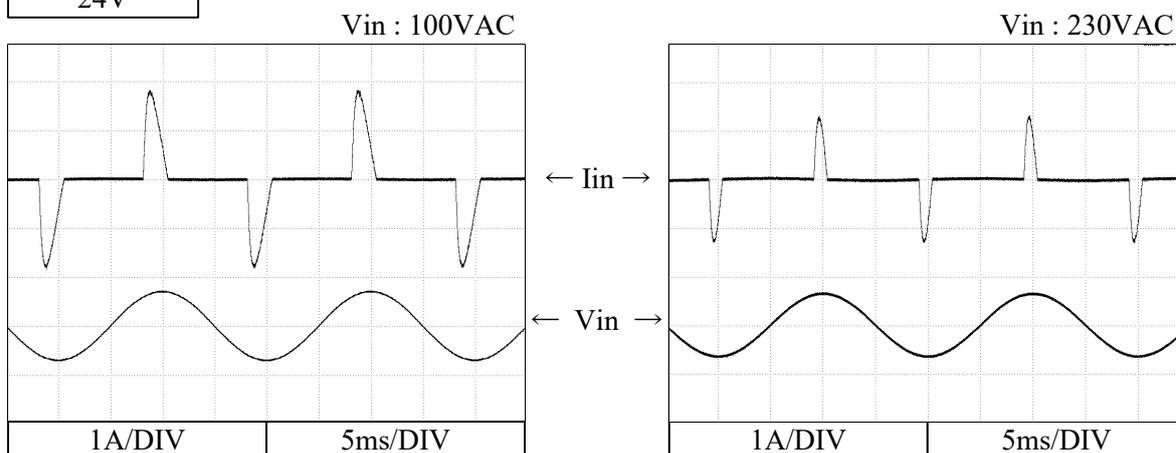
2.13 リーク電流特性
　　　 Leakage current characteristics

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

24V

f :　50　Hz

Input voltage　(VAC)

f :　60　Hz

Input voltage　(VAC)

TDK-Lambda　　　21/28
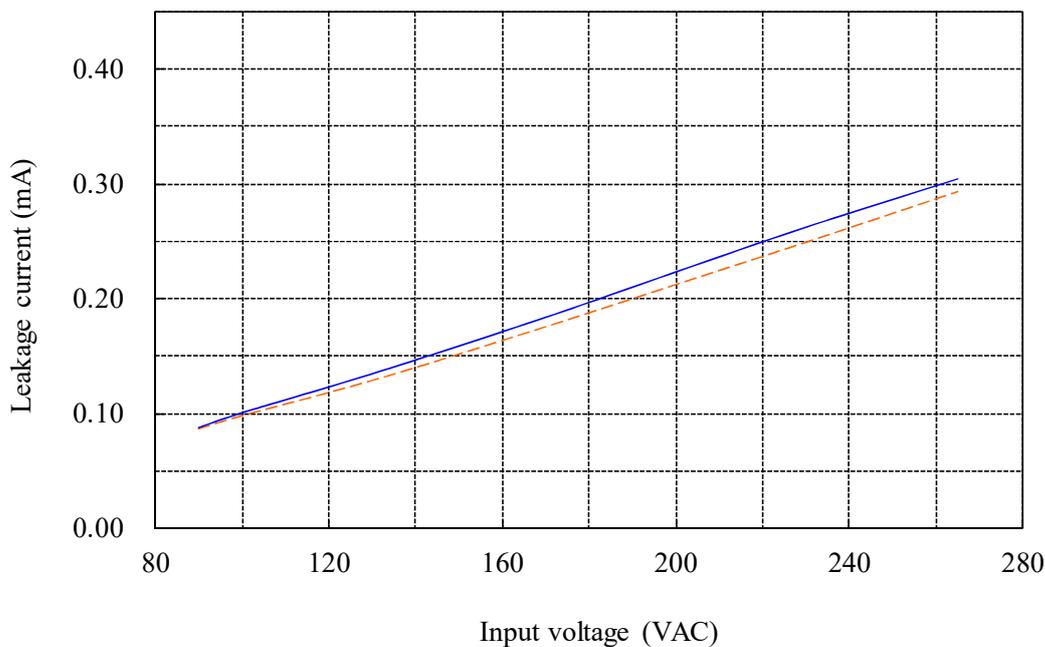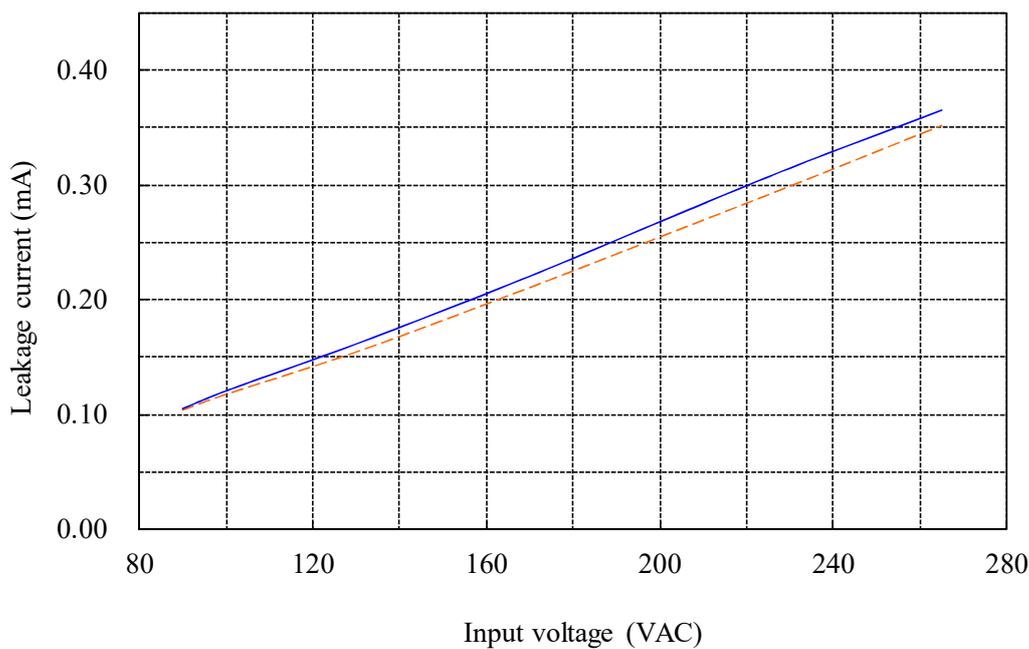
2.14 出力リップル、ノイズ波形
　　　Output ripple and noise waveform

Conditions Vin : 100 VAC
Ta : 25 ℃
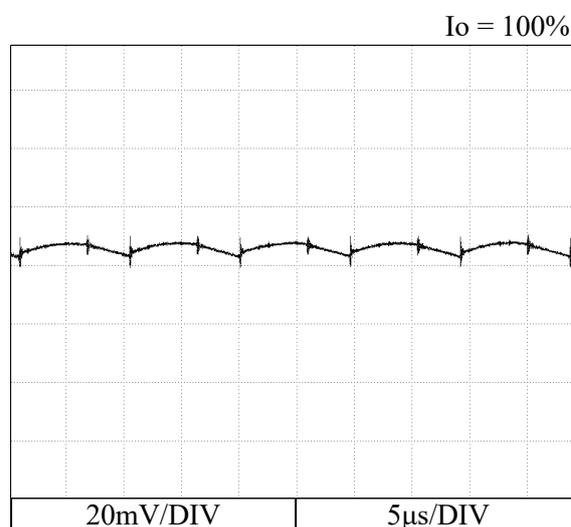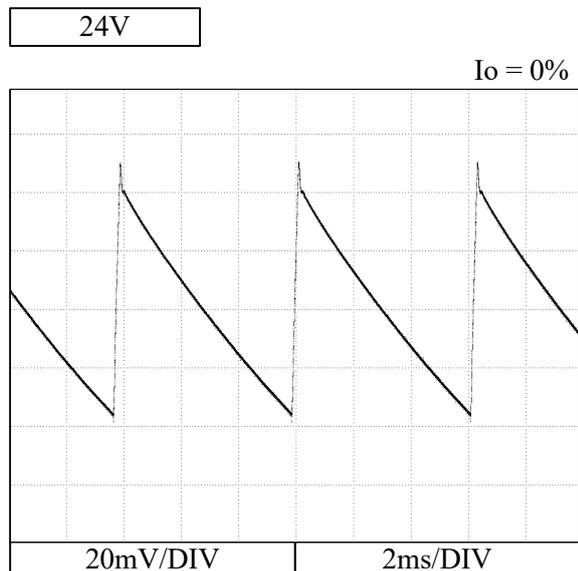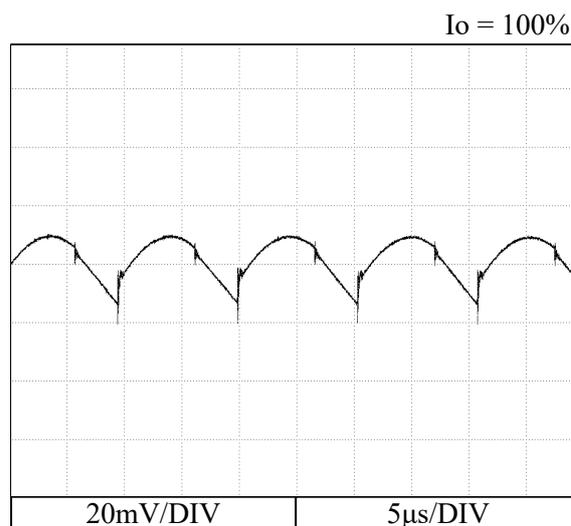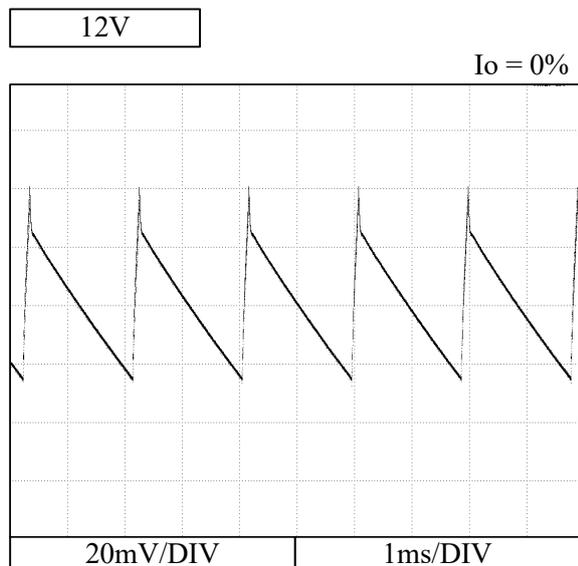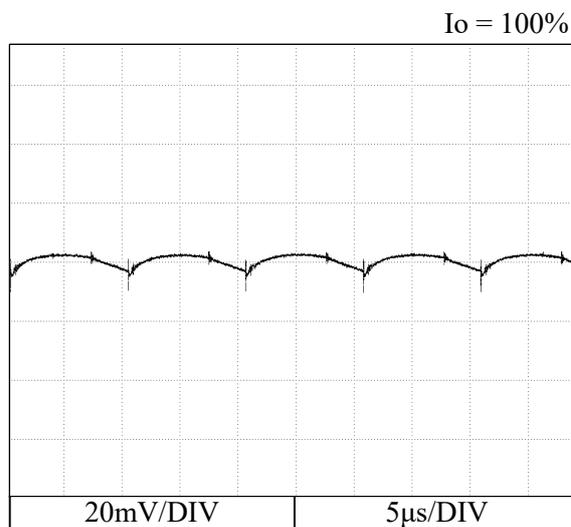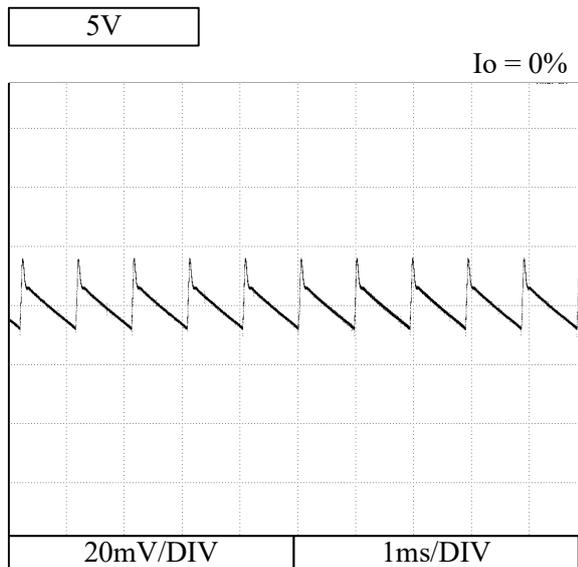
5V

Io = 0%　　　　　　　　　　　　　Io = 100%

| 20mV/DIV | 1ms/DIV |
| 20mV/DIV | 5μs/DIV |

12V

Io = 0%　　　　　　　　　　　　　Io = 100%

| 20mV/DIV | 1ms/DIV |
| 20mV/DIV | 5μs/DIV |

24V

Io = 0%　　　　　　　　　　　　　Io = 100%

| 20mV/DIV | 2ms/DIV |
| 20mV/DIV | 5μs/DIV |

TDK-Lambda　　　22/28

2.15 EMI特性
Electro-Magnetic Interference characteristics

雑音端子電圧
Conducted Emission

5V

Point A (200kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.8	55.2
AV	53.8	39.6

Point B (15MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	48.2
AV	50.0	36.9

Phase : N
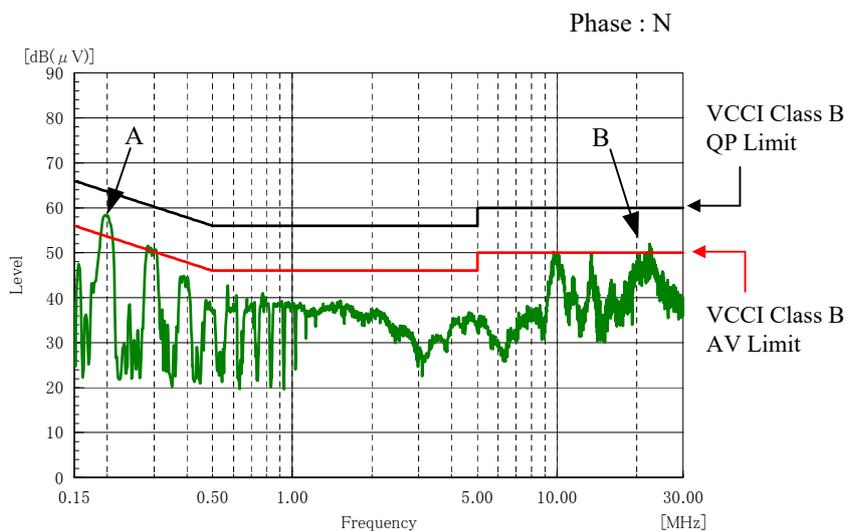
Point C (207kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.8	52.7
AV	53.8	38.6

Point D (15MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	41.2
AV	50.0	35.1

Phase : L

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

TDK-Lambda

2.15 EMI特性
　Electro-Magnetic Interference characteristics

雑音端子電圧
Conducted Emission

12V

Point A (200kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.6	52.7
AV	53.6	33.5

Point B (15MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	51.6
AV	50.0	36.7

Phase : N
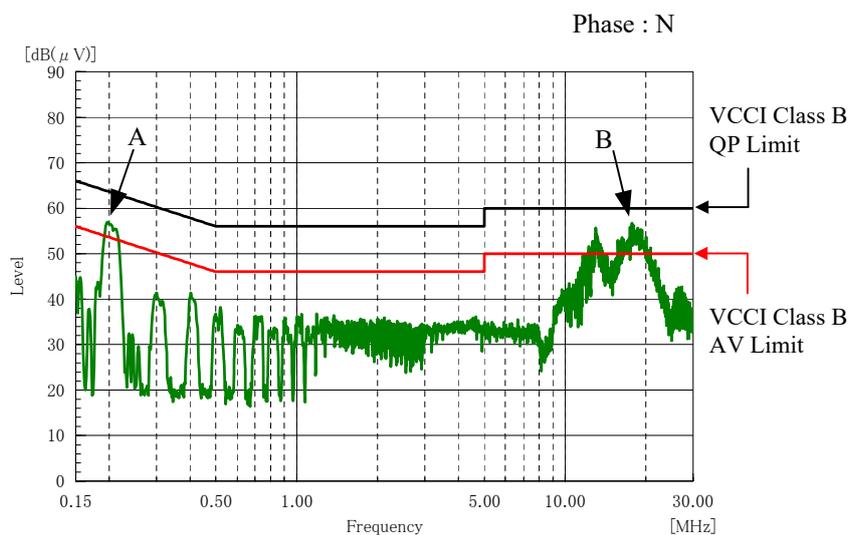
Point C (207kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.3	54.1
AV	53.3	37.6

Point D (15MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	53.4
AV	50.0	40.4

Phase : L

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

TDK-Lambda

2.15 EMI特性
   Electro-Magnetic Interference characteristics

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

雑音端子電圧
Conducted Emission

24V

Phase : N

Point A (201kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.9	53.1
AV	53.9	35.0

Point B (20MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	45.9
AV	50.0	39.3

Phase : L
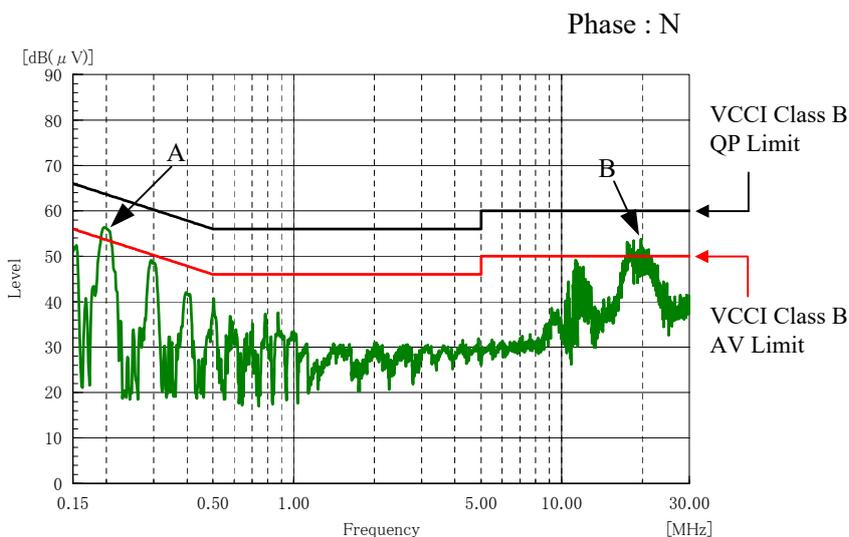
Point C (201kHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	63.6	52.3
AV	53.6	34.3

Point D (18MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	60.0	46.8
AV	50.0	39.2

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

TDK-Lambda   25/28

2.15 EMI特性
　　　Electro-Magnetic Interference characteristics

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

　　　雑音電界強度
　　　Radiated Emission

5V

Point A (124MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	35.0

Point B (146MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	37.0
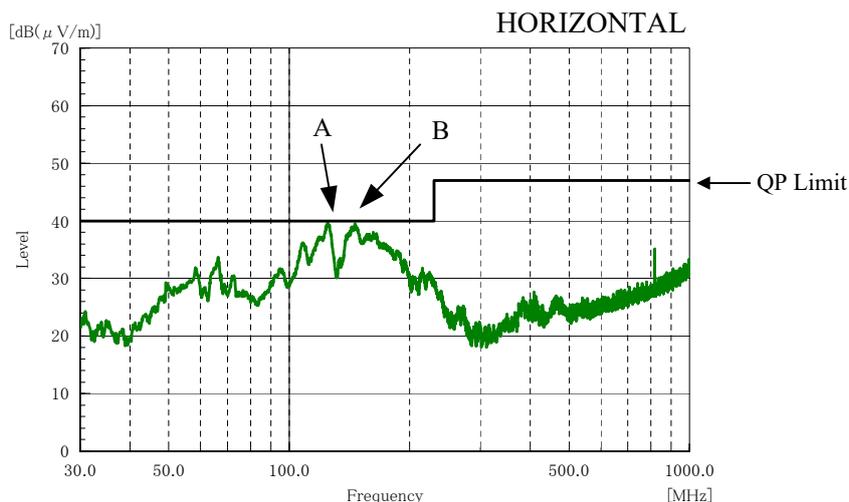
Point C (109MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	32.9

Point D (163MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	33.7
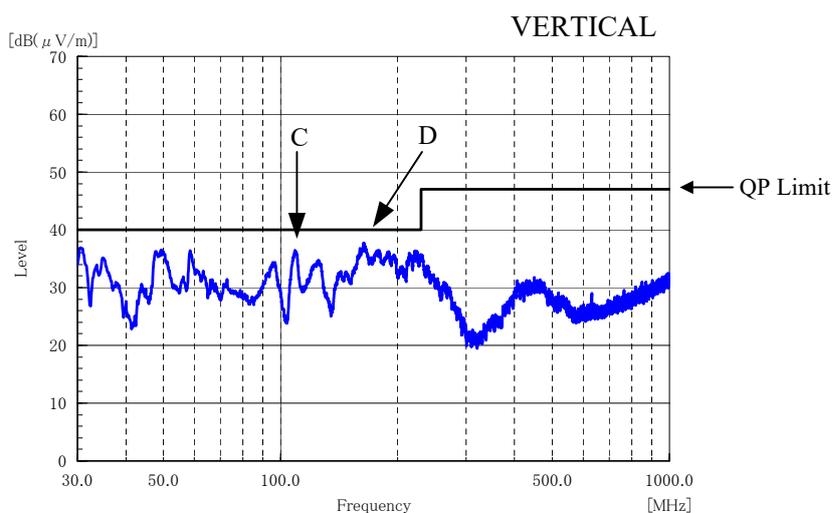
EN55011-B,EN55032-B,FCC-Bの限界値はVCCI classB の限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.

2.15 EMI特性
Electro-Magnetic Interference characteristics

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

雑音電界強度
Radiated Emission

12V

Point A (102MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	36.5

HORIZONTAL
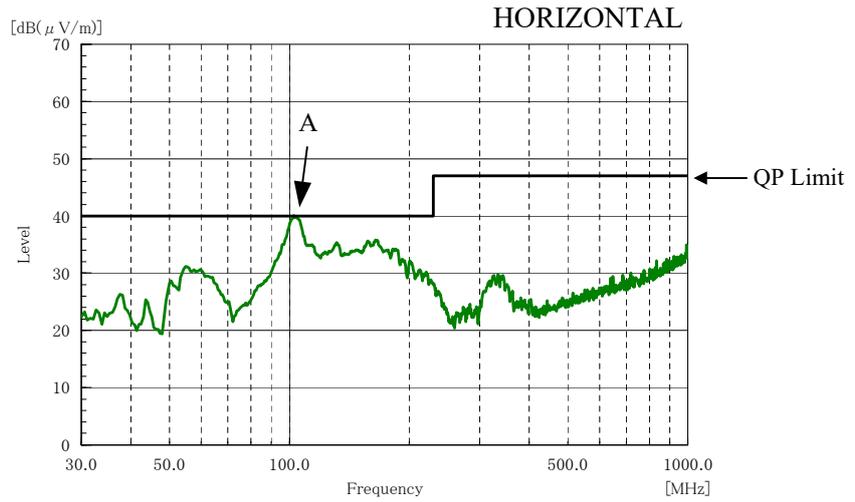
Point B (37MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	36.6
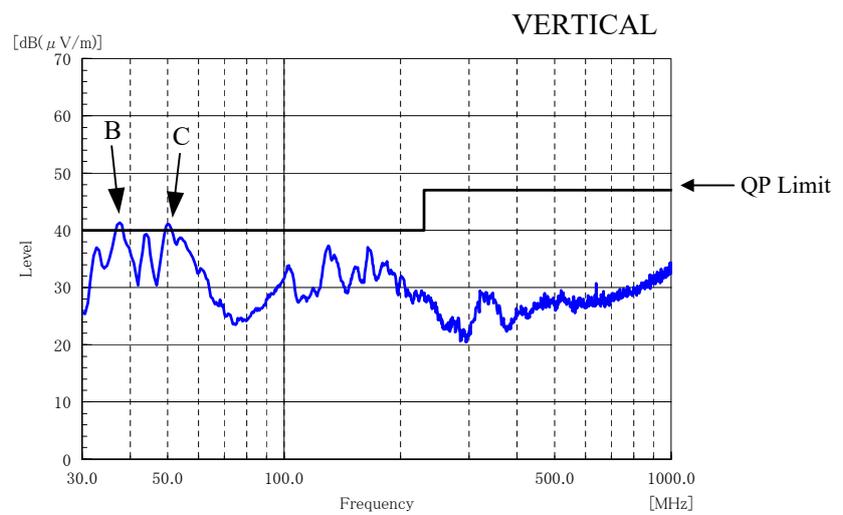
Point C (50MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	31.6

VERTICAL

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

TDK-Lambda

2.15 EMI特性
Electro-Magnetic Interference characteristics

雑音電界強度
Radiated Emission

24V

Point A (100MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	28.7
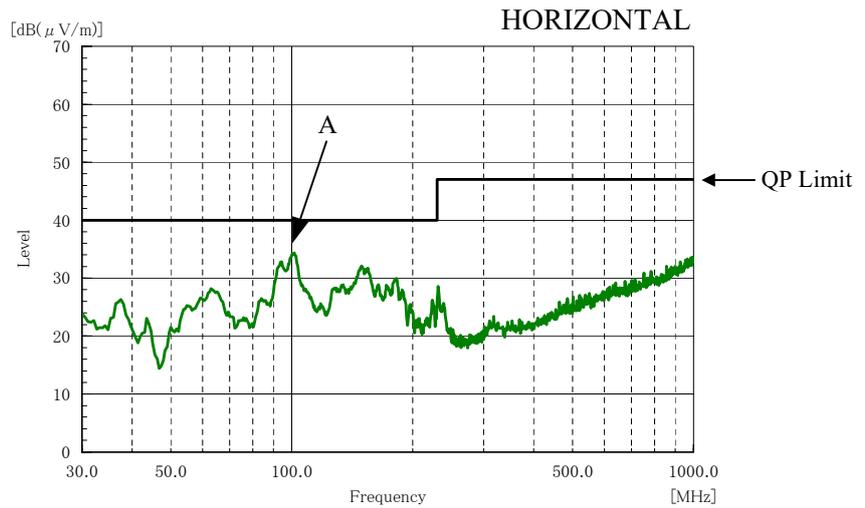
Point B (38MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	36.7
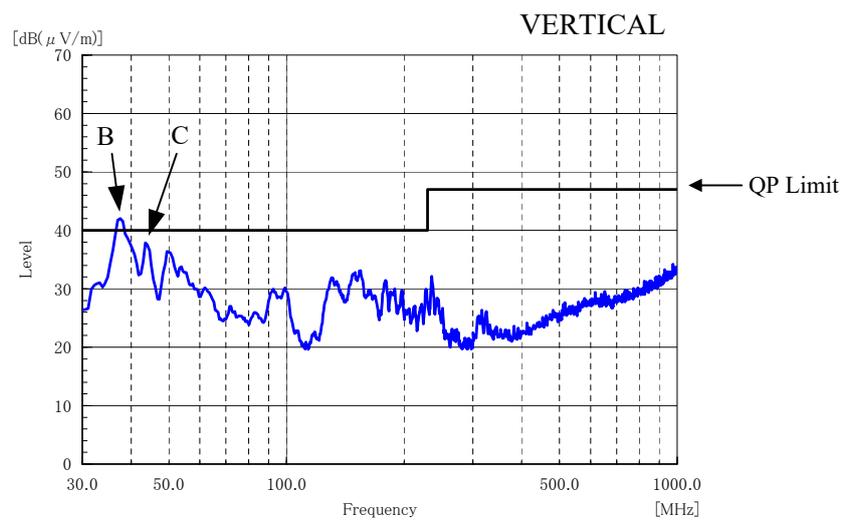
Point C (44MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	40.0	34.3

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

TDK-Lambda