ZWS30B

EVALUATION DATA

型式データ

INDEX

　　　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

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
- ・過電流保護特性　　　Over current protection (OCP) characteristics
- ・過電圧保護特性　　　Over voltage protection (OVP) 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
- ・出力保持時間特性　　　Hold up time characteristics
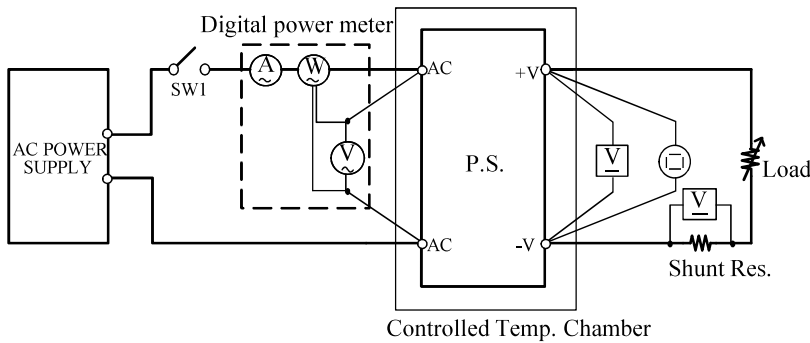
測定回路2　Circuit 2 used for determination

- ・過渡応答（負荷急変）特性　　　Dynamic load response characteristics
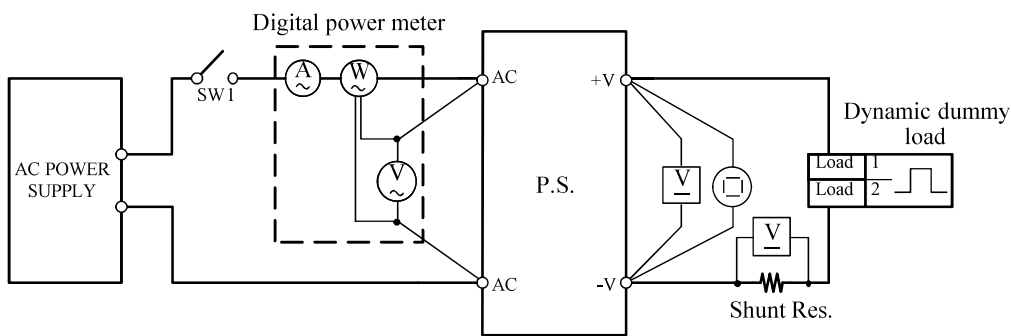
Output current waveform
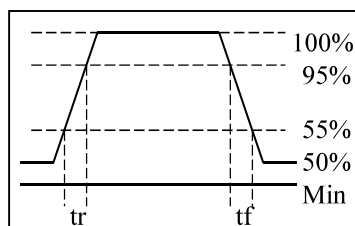
測定回路3　Circuit 3 used for determination

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

TDK-Lambda
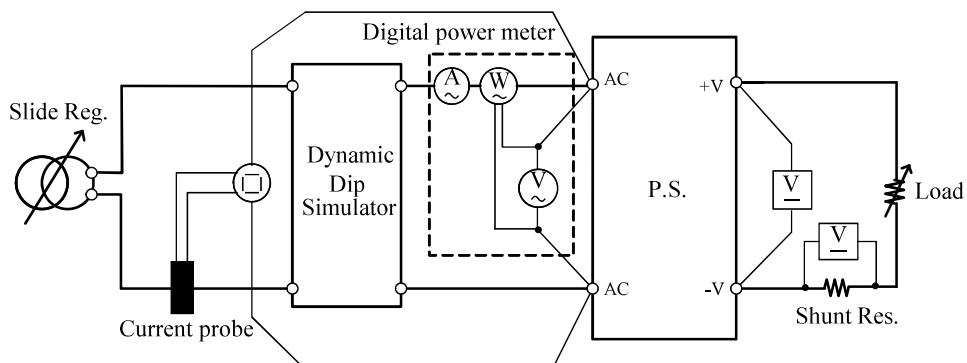
測定回路4 Circuit 4 used for determination
・リーク電流特性　　　Leakage current characteristics

Digital power meter

AC POWER SUPPLY
Isolation Trans
Leakage current meter
P.S.
Load
Shunt Res.
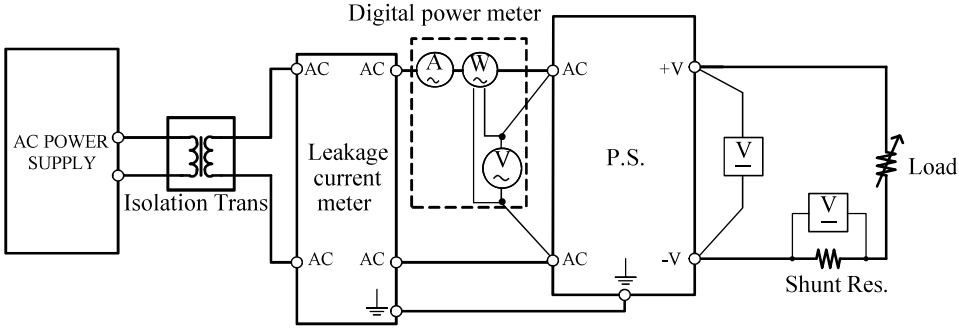
測定回路5 Circuit 5 used for determination
・出力リップル、ノイズ波形　　　Output ripple and noise waveform

Digital power meter

AC POWER SUPPLY
SW1
P.S.
1.5m 50Ω Cable
Load
C1 C2
R
C3
Oscilloscope
Bandwidth : 100MHz

150mm

R　: 50Ω
C1 : 0.1uF Film Cap.
C2 : 100uF Elect Cap.
C3 : 4700pF Ceramic Cap.
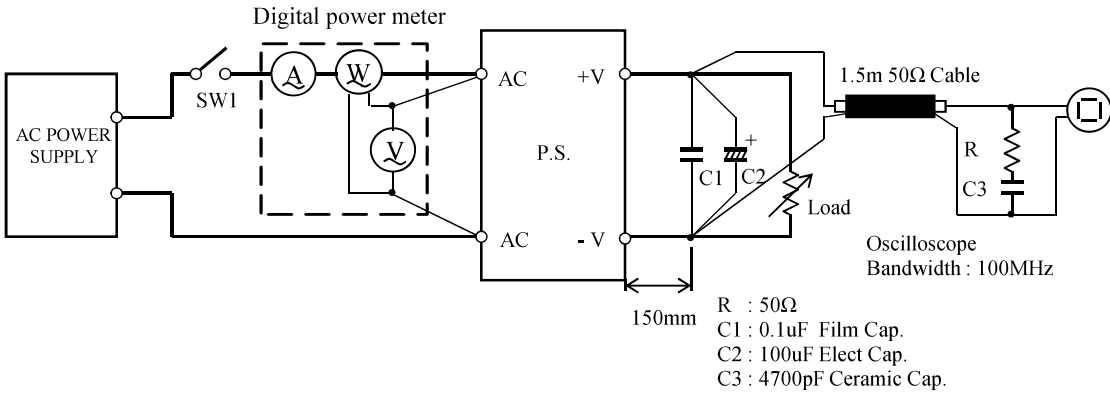
測定構成　　　Configuration used for determination
・ＥＭＩ特性　　　Electro-Magnetic Interference characteristics
(a) 雑音端子電圧（帰還ノイズ）　　　Conducted Emission

供試機器（接地）
アルミ板
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
接地
水平大地面
入力電源
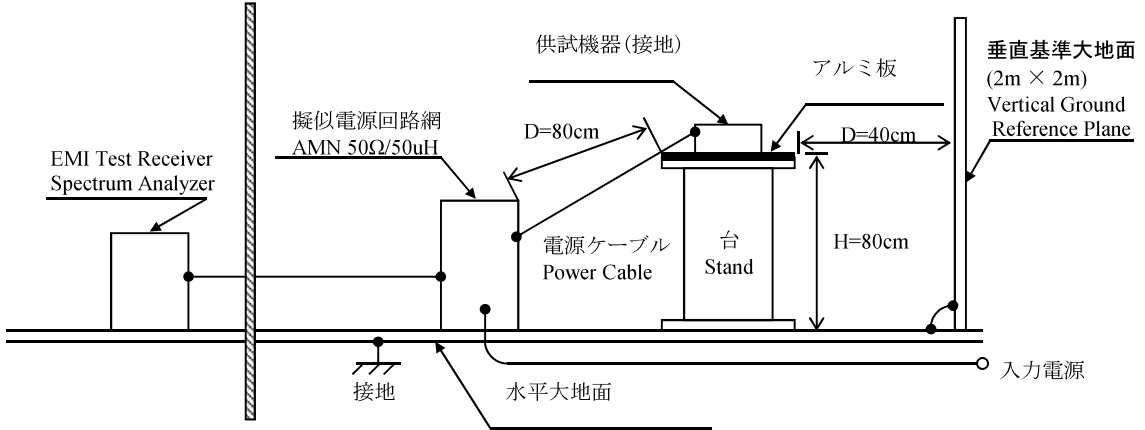
(b) 雑音電界強度（放射ノイズ）　　　Radiated Emission

D=3m
供試機器（接地）
アルミ板
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
台
Stand
H=80cm
接地
水平大地面
入力電源

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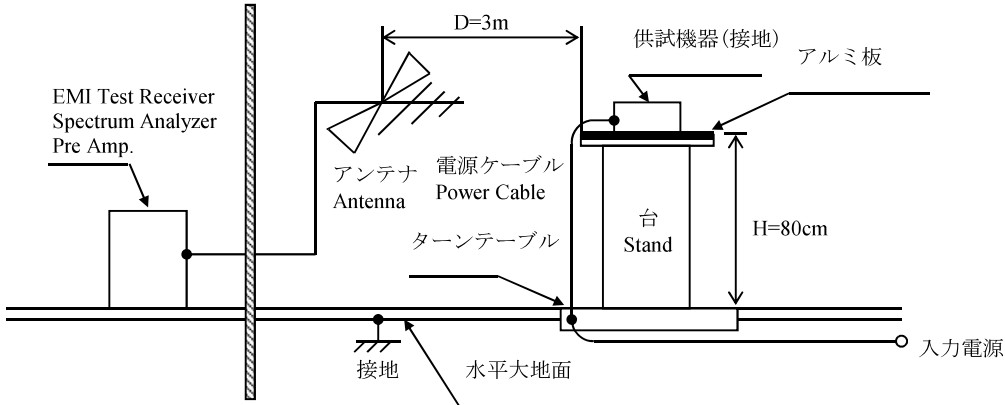
1.2 使用測定機器　　List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	TEKTRONIX	TDS 540A
2	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL1720E
3	DIGITAL MULTIMETER	FLUKE	45
4	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
5	CURRENT PROBE	TEKTRONIX	63202
6	DC AMPERE METER	TEKTRONIX	P5100
7	DYNAMIC DUMMY LOAD	CHROMA	63030
8	CVCF	KIKUSUI	PCR2000L
9	LEAKAGE CURRENT METER	SIMPSON	228
10	CONTROLLED TEMP. CHAMBER	TABAI-ESPEC	63203
11	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI-03
12	LISN	ROHDE & SCHWARZ	ENV216
13	BICONICAL ANTENNA	EMCO	63208

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 ℃

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	4.998V	4.998V	4.998V	4.998V	0mV	0.000%
50%	4.999V	4.999V	4.999V	4.999V	0mV	0.000%
100%	4.999V	4.999V	4.999V	4.999V	0mV	0.000%
load	1mV	1mV	1mV	1mV		
regulation	0.020%	0.020%	0.020%	0.020%		

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

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	5.005V	4.999V	4.994V	11mV	0.220%

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

Start up voltage (Vin)	52VAC
Drop out voltage (Vin)	41VAC

12V

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

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	12.003V	12.003V	12.003V	12.003V	0mV	0.000%
50%	12.004V	12.004V	12.004V	12.004V	0mV	0.000%
100%	12.004V	12.004V	12.004V	12.004V	0mV	0.000%
load	1mV	1mV	1mV	1mV		
regulation	0.008%	0.008%	0.008%	0.008%		

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

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	12.022V	12.004V	11.968V	54mV	0.450%

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

Start up voltage (Vin)	49VAC
Drop out voltage (Vin)	41VAC

24V

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

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	24.014V	24.014V	24.014V	24.014V	0mV	0.000%
50%	24.014V	24.014V	24.014V	24.014V	0mV	0.000%
100%	24.013V	24.013V	24.013V	24.013V	0mV	0.000%
load	1mV	1mV	1mV	1mV		
regulation	0.004%	0.004%	0.004%	0.004%		

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

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	24.086V	24.013V	23.970V	116mV	0.483%

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

Start up voltage (Vin)	53VAC
Drop out voltage (Vin)	46VAC

TDK-Lambda

（2）効率対出力電流
　　　Efficiency vs. Output current

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

5V

Efficiency (%)

Output current (%)

12V

Efficiency (%)

Output current (%)
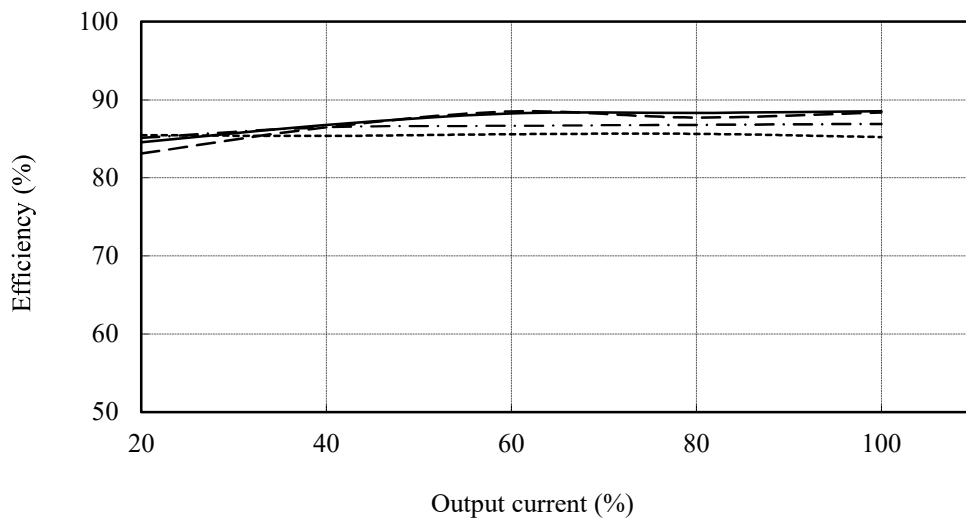
24V

Efficiency (%)

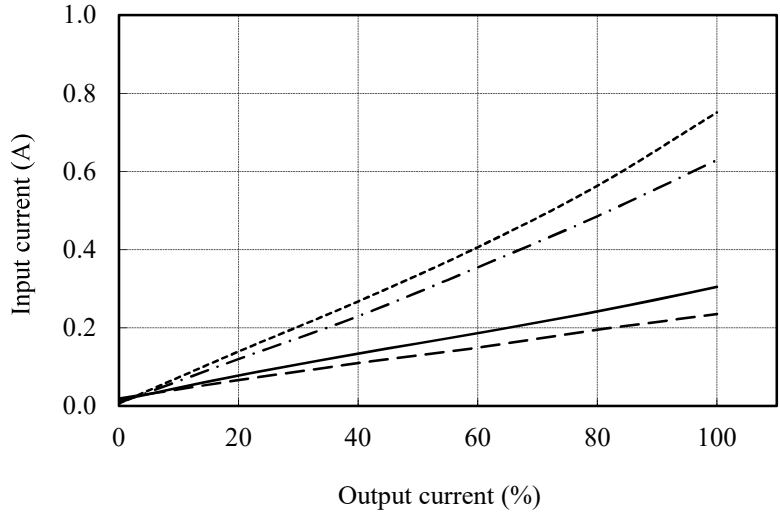Output current (%)

TDK-Lambda

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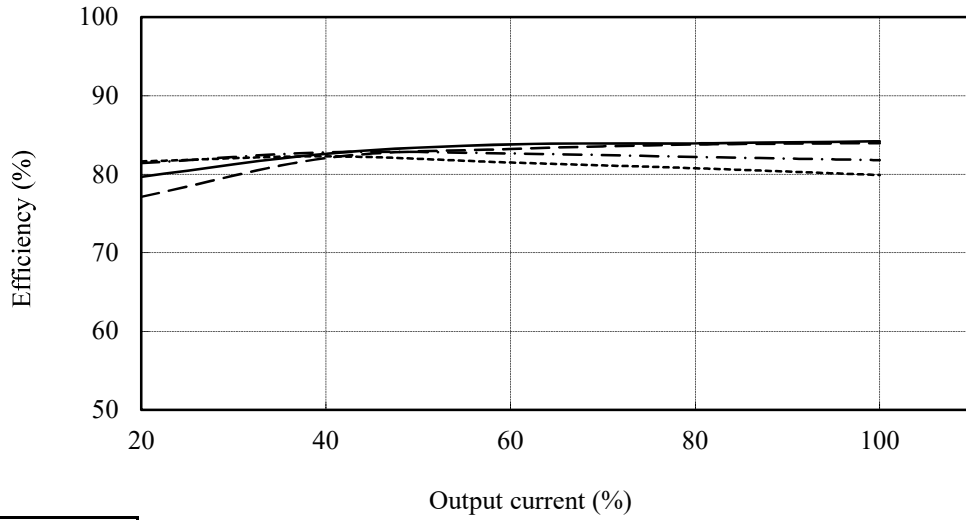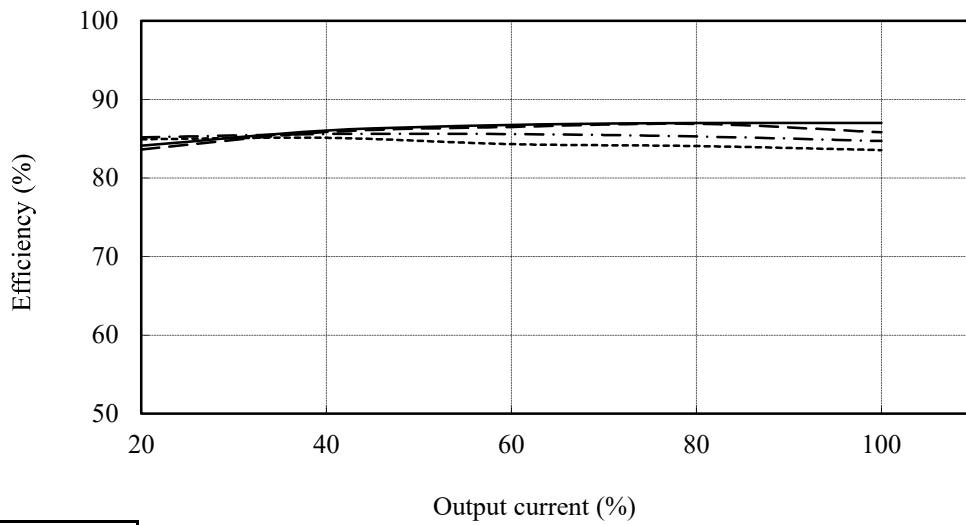
（3）入力電流対出力電流
Input current vs. Output current

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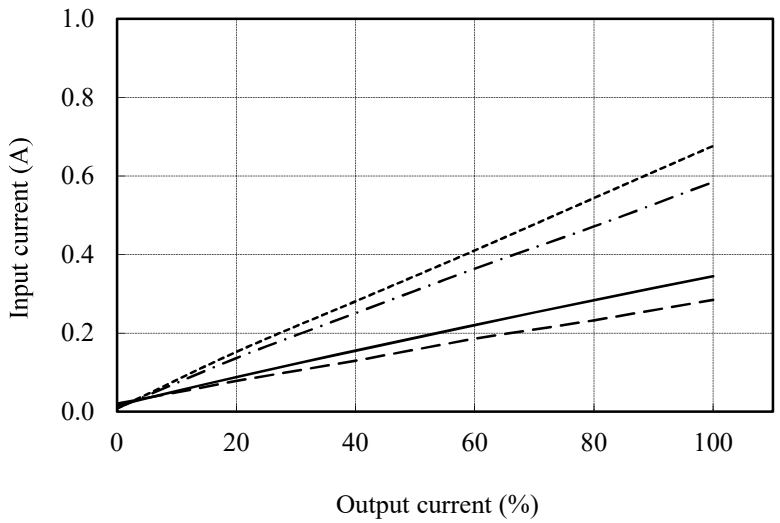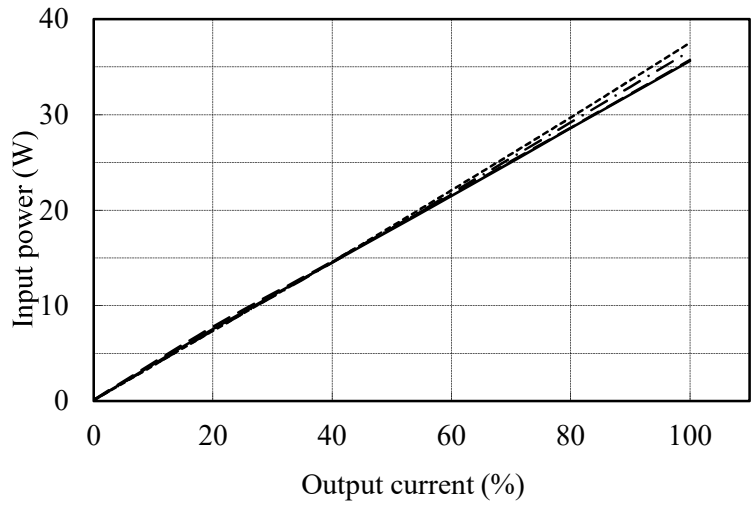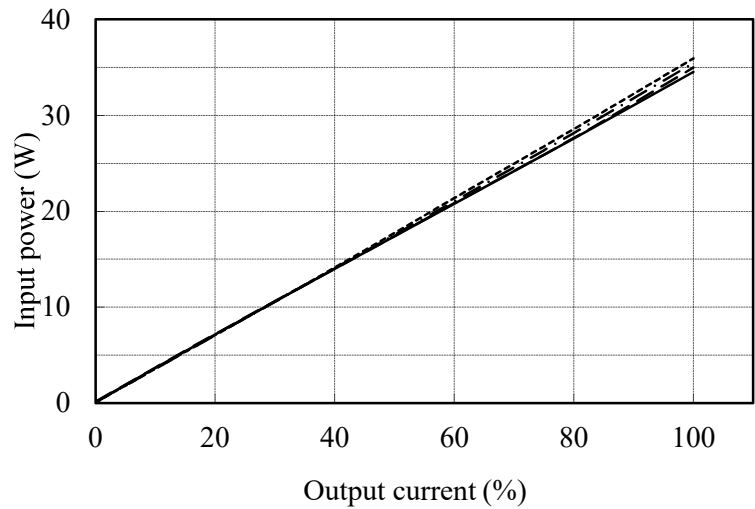: 200 VAC ——
: 265 VAC - - - -
Ta : 25 ℃

5V

Io: 0%

Vin	Input current
85VAC	0.007A
100VAC	0.008A
200VAC	0.015A
265VAC	0.019A

12V

Io: 0%

Vin	Input current
85VAC	0.008A
100VAC	0.008A
200VAC	0.016A
265VAC	0.021A

24V

Io: 0%

Vin	Input current
85VAC	0.008A
100VAC	0.009A
200VAC	0.016A
265VAC	0.021A

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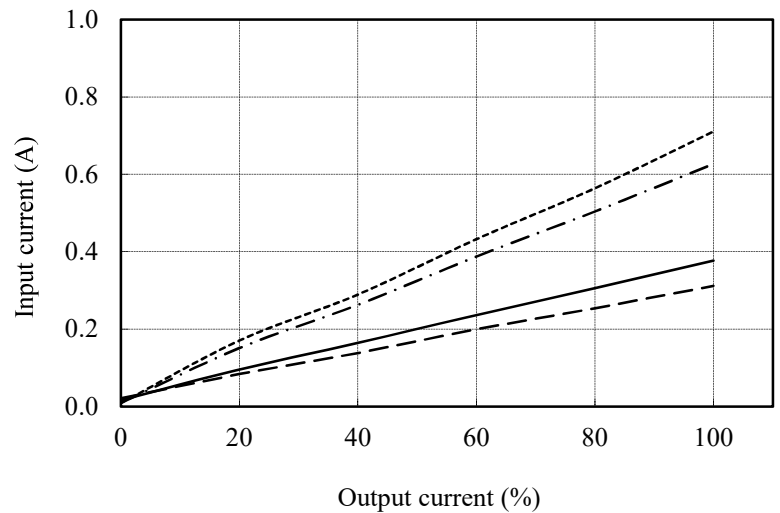
（4） 入力電力対出力電流
Input power vs. Output current

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

5V

Io: 0%

Vin	Input power
85VAC	0.07W
100VAC	0.08W
200VAC	0.11W
265VAC	0.13W

12V

Io: 0%

Vin	Input power
85VAC	0.05W
100VAC	0.06W
200VAC	0.10W
265VAC	0.14W

24V

Io: 0%

Vin	Input power
85VAC	0.11W
100VAC	0.11W
200VAC	0.18W
265VAC	0.24W

TDK-Lambda
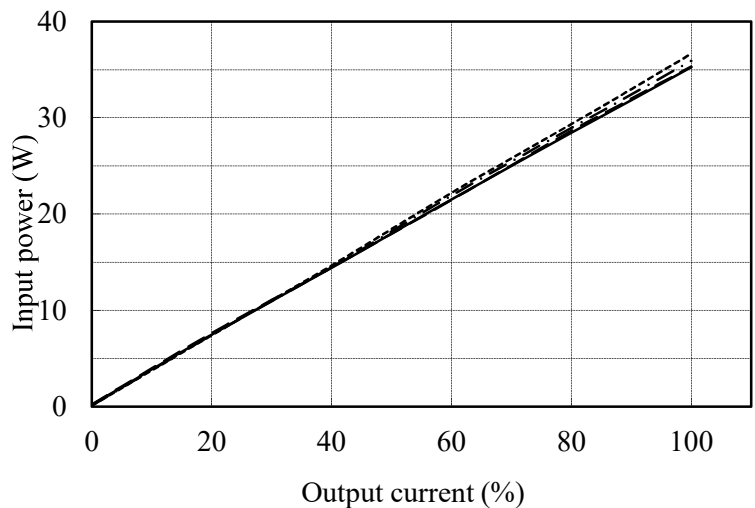
2.2 過電流保護特性
Over current protection (OCP) characteristics
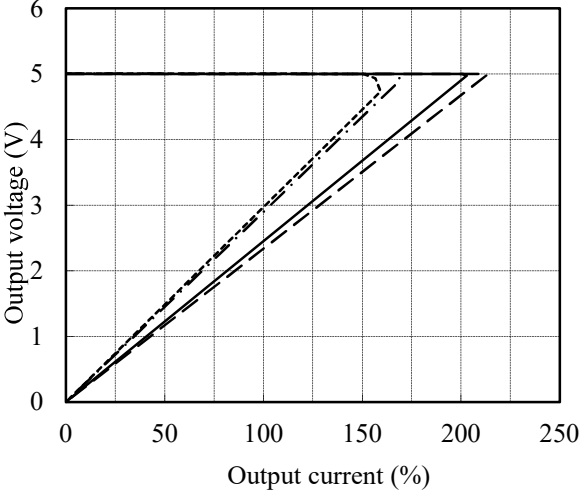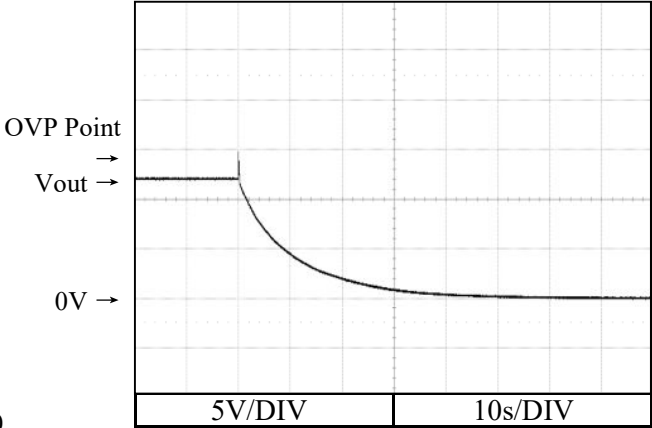
2.3 過電圧保護特性
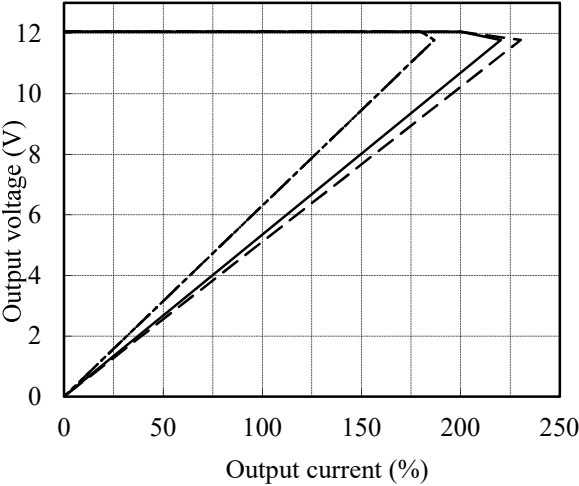Over voltage protection (OVP) characteristics

Conditions Vin :   85 VAC ------
                    100 VAC -·-·-·-
                    200 VAC ———
                    265 VAC ― ― ―
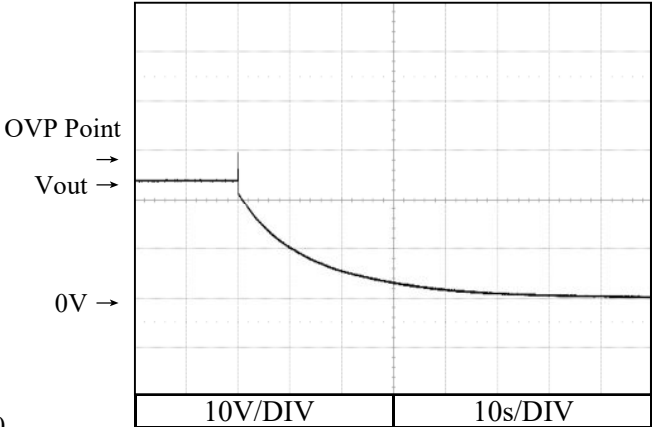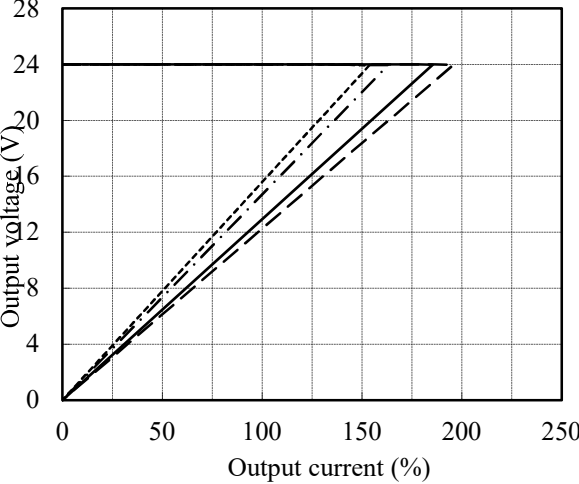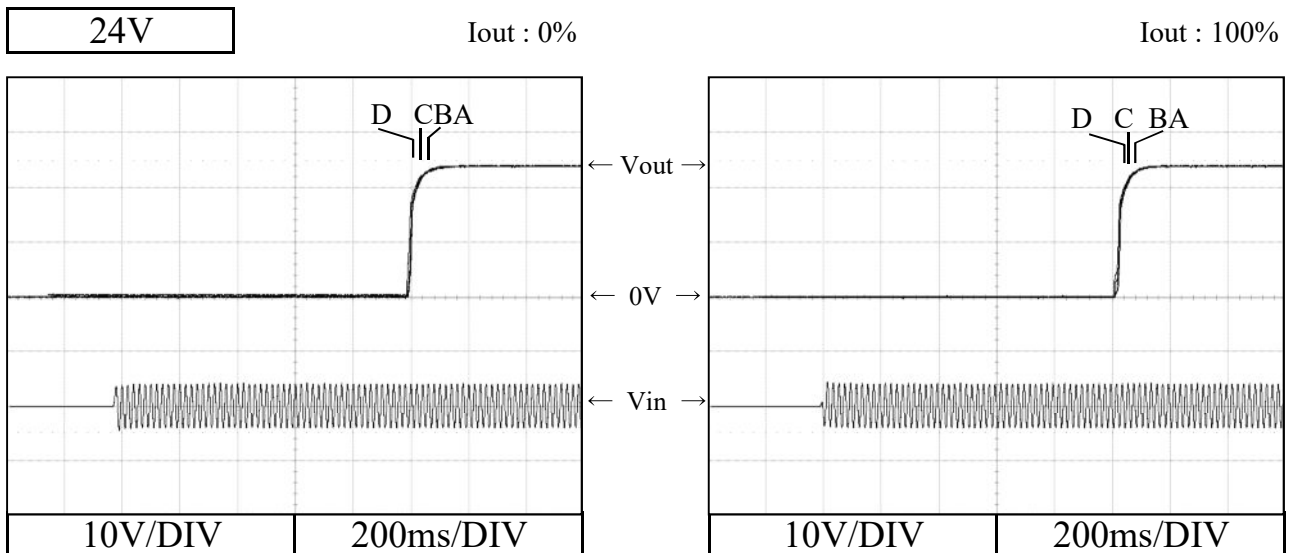   Ta :   25 ℃
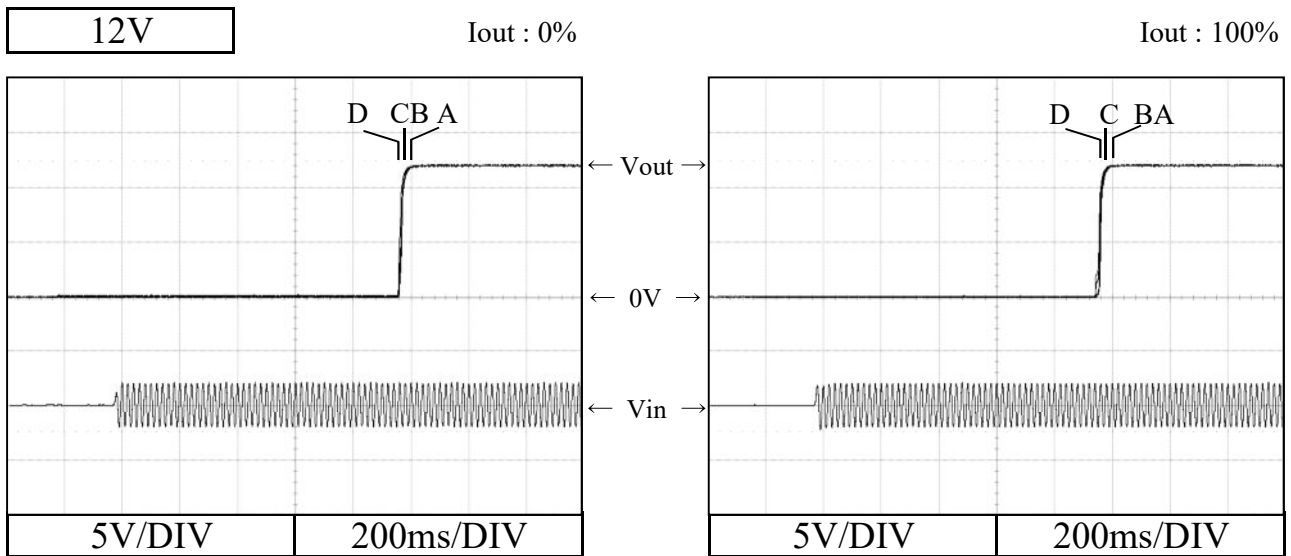
Conditions Vin : 100 VAC
            Iout :   0 %
            Ta :   25 ℃

5V

12V

24V

TDK-Lambda
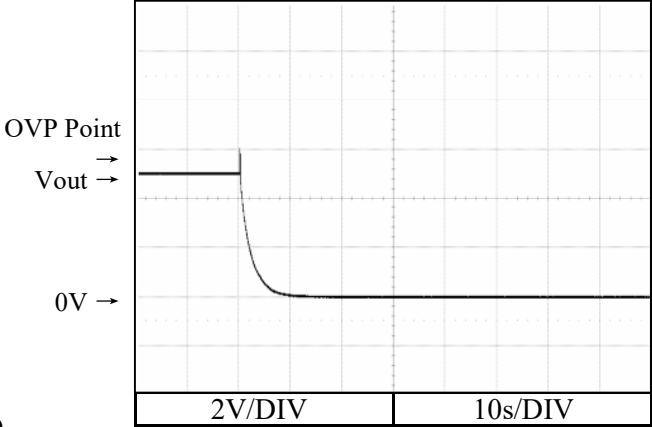
Conditions   Vin :   85 VAC (A)
                 100 VAC (B)
                 200 VAC (C)
                 265 VAC (D)
      Ta :   25 ℃

| 5V | Iout : 0% | Iout : 100% |

← Vout →
← 0V →
← Vin →

| 2V/DIV | 200ms/DIV | 2V/DIV | 200ms/DIV |

| 12V | Iout : 0% | Iout : 100% |

← Vout →
← 0V →
← Vin →

| 5V/DIV | 200ms/DIV | 5V/DIV | 200ms/DIV |

| 24V | Iout : 0% | Iout : 100% |

← Vout →
← 0V →
← Vin →

| 10V/DIV | 200ms/DIV | 10V/DIV | 200ms/DIV |

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

5V	Iout : 0%	Iout : 100%

A B　　　　C　　　　D
← Vout →
AB　　　C　　　D
← 0V →
← Vin →

2V/DIV	10s/DIV	2V/DIV	50ms/DIV

12V	Iout : 0%	Iout : 100%

AB　　　C　　　D
← Vout →
AB　　　C　　　D
← 0V →
← Vin →

5V/DIV	20s/DIV	5V/DIV	50ms/DIV

24V	Iout : 0%	Iout : 100%

A B　　　C　　　D
← Vout →
A B　　　C　　　D
Main : 1.25 M　　　20s/div
← 0V →
← Vin →

10V/DIV	20s/DIV	10V/DIV	50ms/DIV

TDK-Lambda

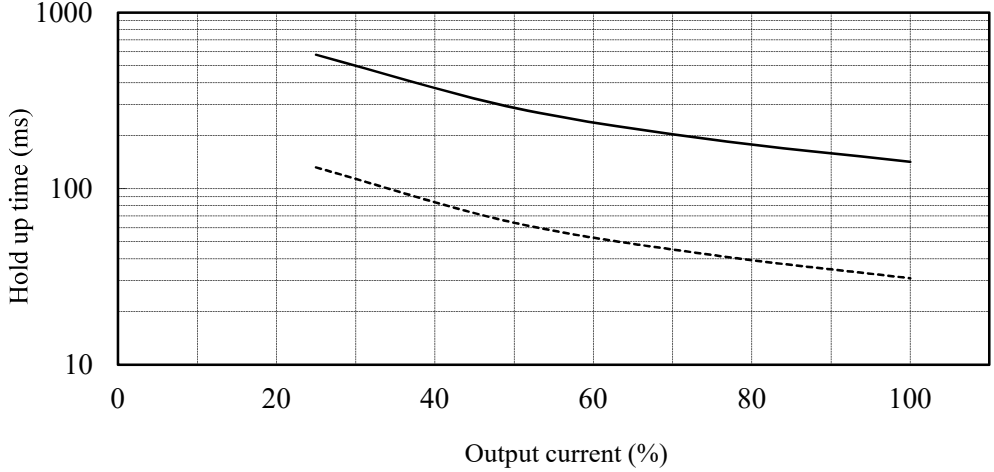2.6 出力保持時間特性
     Hold up time characteristics

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

5V

Hold up time (ms) vs Output current (%)

12V

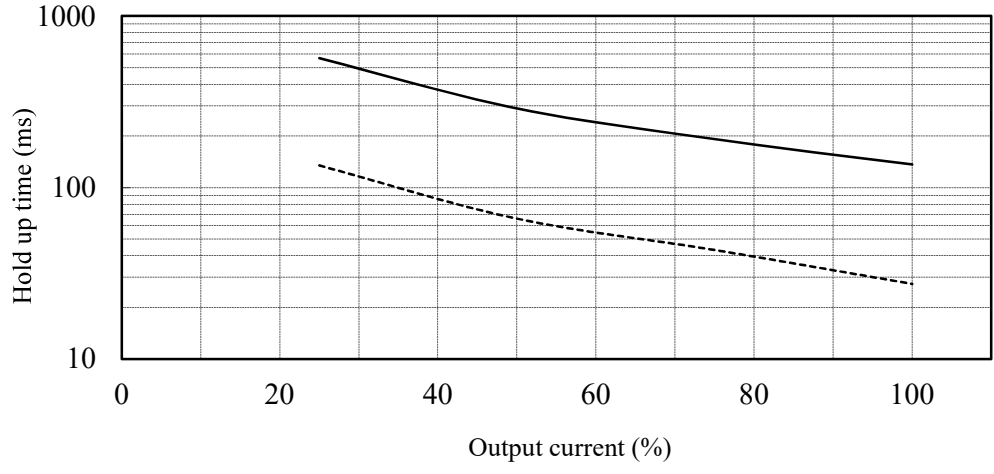Hold up time (ms) vs Output current (%)

24V

Hold up time (ms) vs Output current (%)

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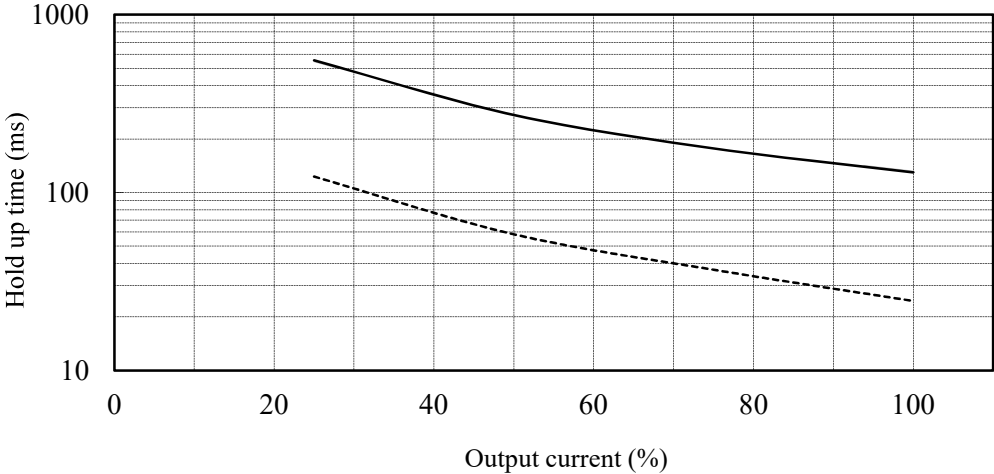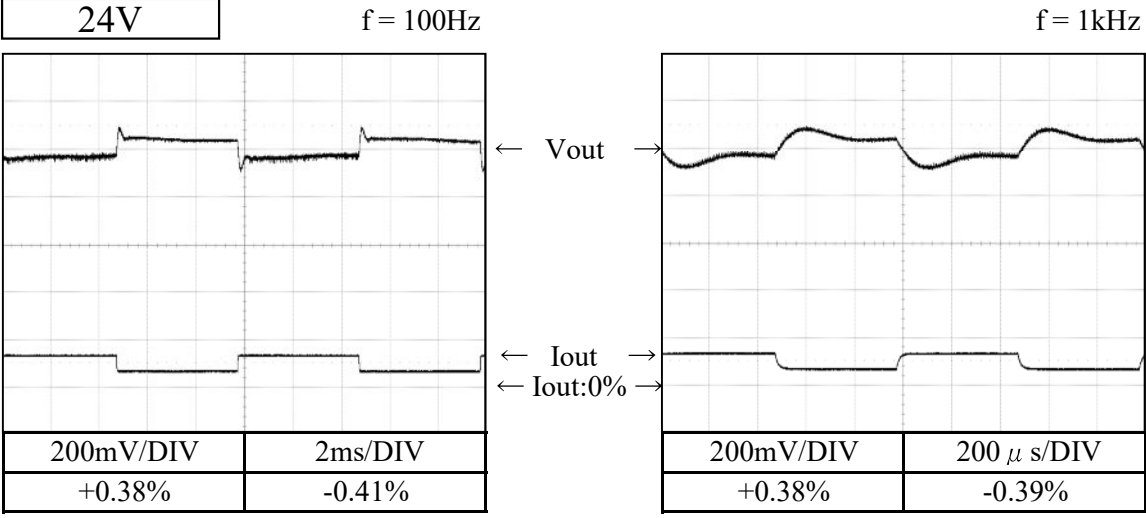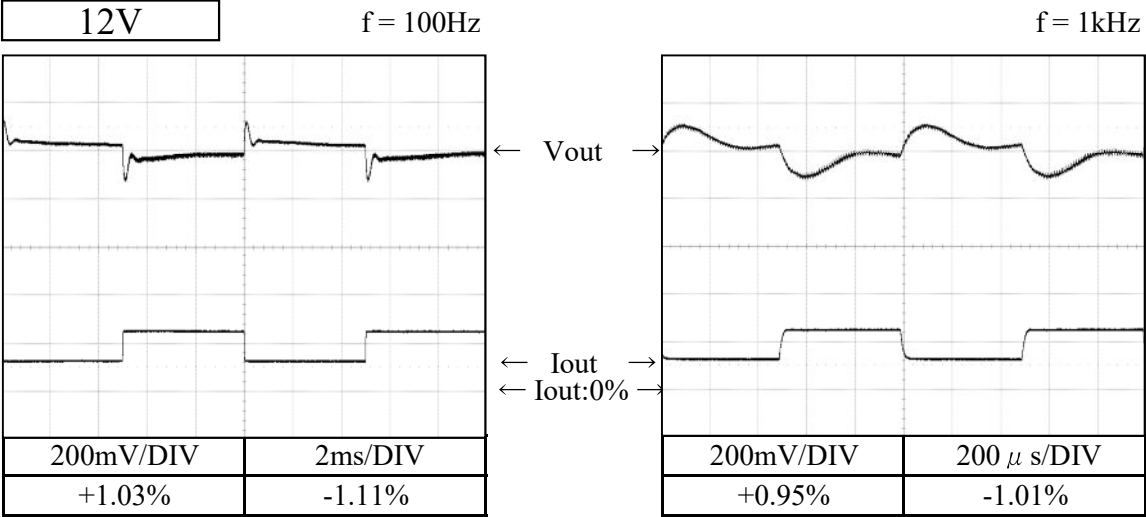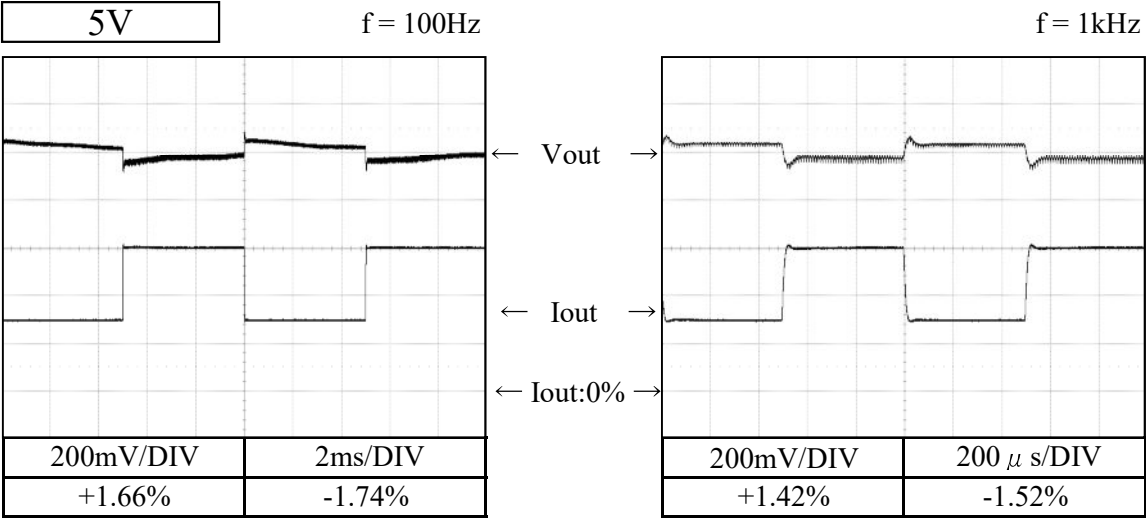
2.7 過渡応答（負荷急変）特性
　　Dynamic load response characteristics

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

5V	f = 100Hz

← Vout →
← Iout →
← Iout:0% →

200mV/DIV	2ms/DIV
+1.66%	-1.74%

f = 1kHz

200mV/DIV	200 μ s/DIV
+1.42%	-1.52%

12V	f = 100Hz

← Vout →
← Iout →
← Iout:0% →

200mV/DIV	2ms/DIV
+1.03%	-1.11%

f = 1kHz

200mV/DIV	200 μ s/DIV
+0.95%	-1.01%

24V	f = 100Hz

← Vout →
← Iout →
← Iout:0% →

200mV/DIV	2ms/DIV
+0.38%	-0.41%

f = 1kHz

200mV/DIV	200 μ s/DIV
+0.38%	-0.39%

TDK-Lambda

2.8 入力電圧瞬停特性
Response to brown out characteristics

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

5V

A = 21ms

B = 27ms
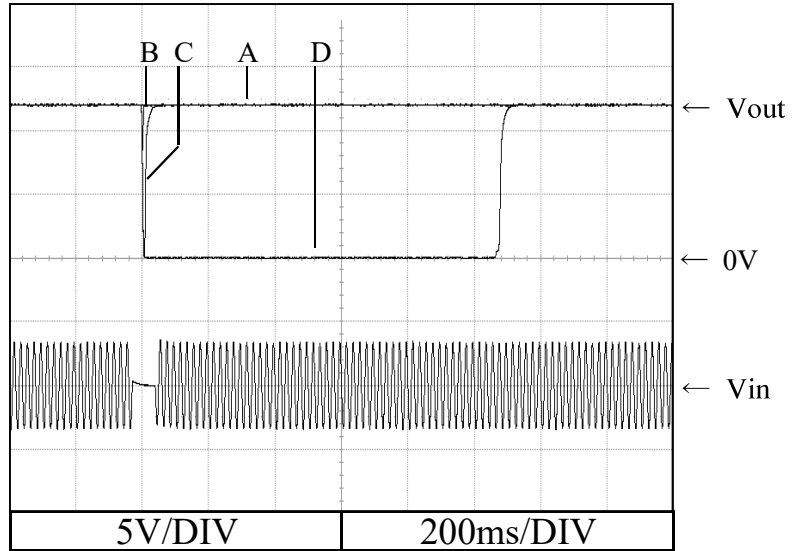
C = 35ms

D = 65ms

← Vout

← 0V

← Vin

2V/DIV　　　200ms/DIV
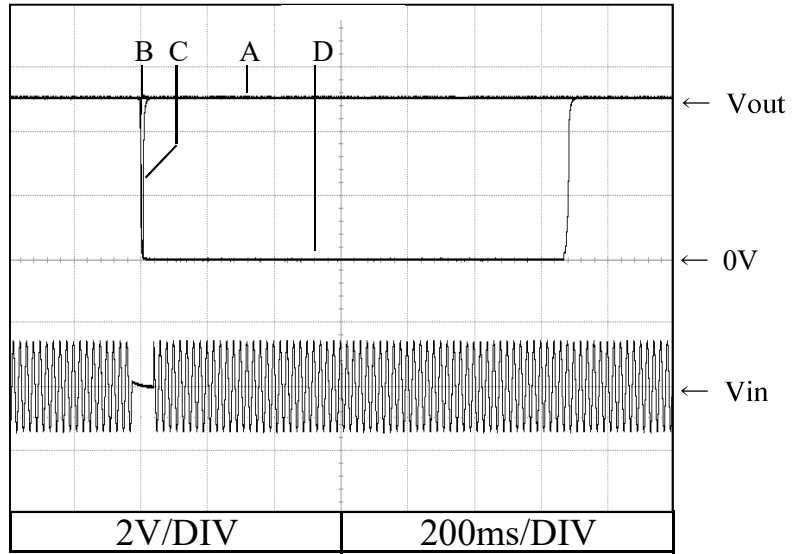
12V

A = 25ms

B = 32ms

C = 38ms

D = 68ms

← Vout

← 0V

← Vin

5V/DIV　　　200ms/DIV

24V

A = 22ms

B = 29ms

C = 42ms

D = 72ms

← Vout

← 0V

← Vin

10V/DIV　　　200ms/DIV
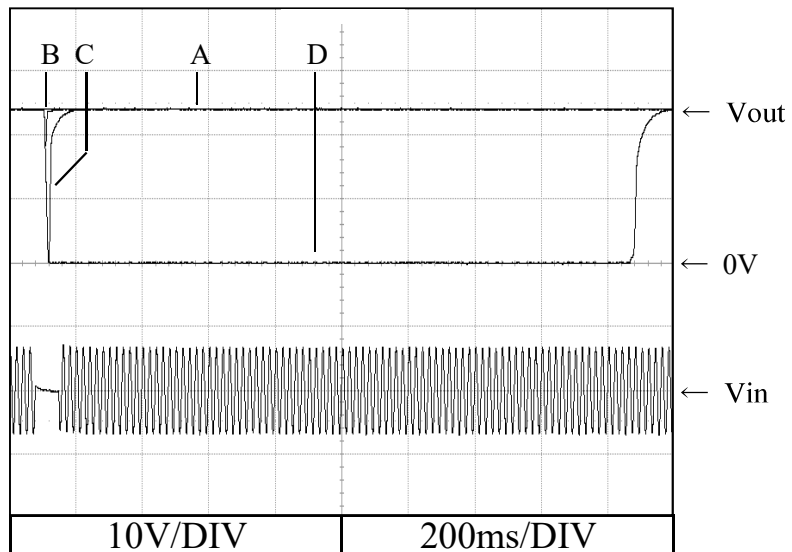
2.8 入力電圧瞬停特性
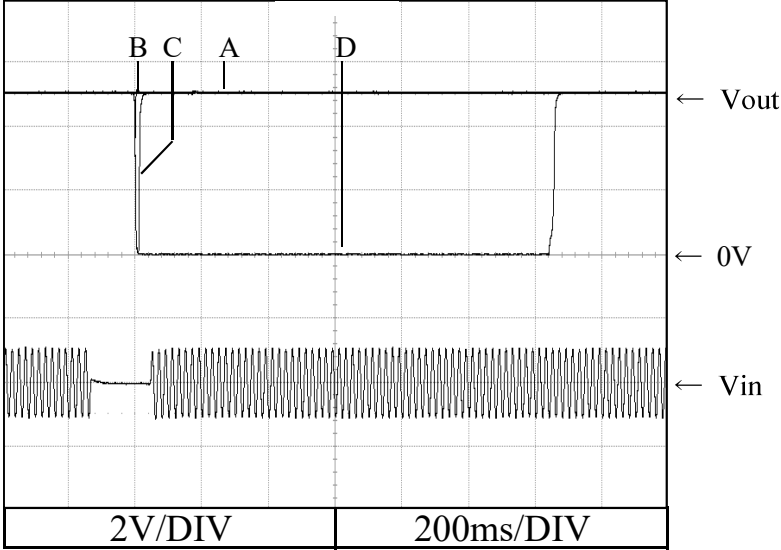　　　Response to brown out characteristics   Conditions　Vin : 200 VAC
                                                                Iout : 100 %
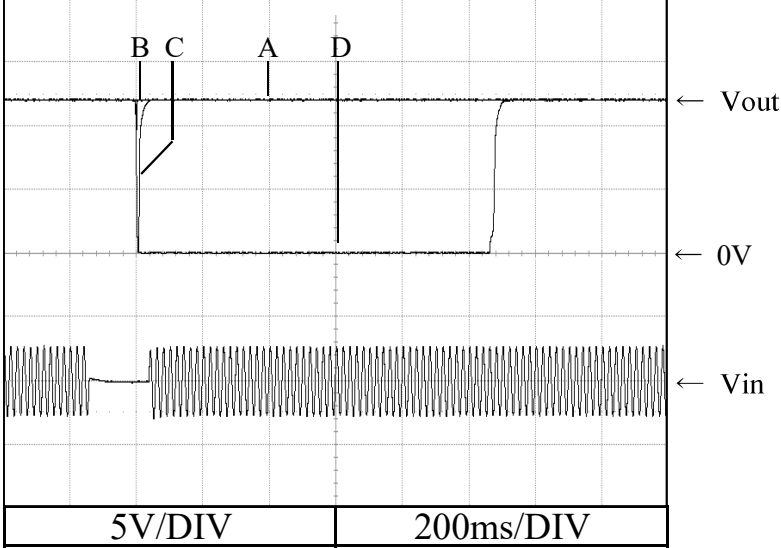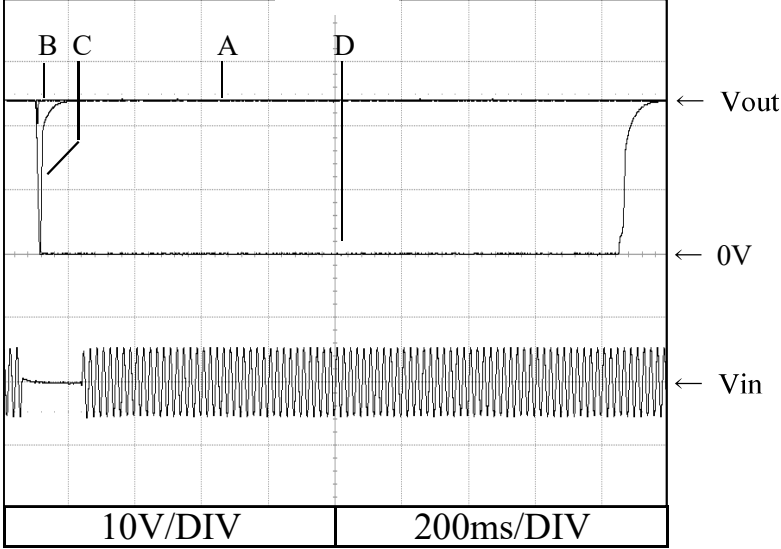   Ta : 25 ℃

| 5V |

A = 128ms

B = 134ms

C = 145ms

D = 180ms

← Vout

← 0V

← Vin

| 2V/DIV | 200ms/DIV |

| 12V |

A = 135ms

B = 142ms

C = 150ms

D = 177ms

← Vout

← 0V

← Vin

| 5V/DIV | 200ms/DIV |

| 24V |

A = 132ms

B = 137ms

C = 149ms

D = 179ms

← Vout

← 0V

← Vin

| 10V/DIV | 200ms/DIV |

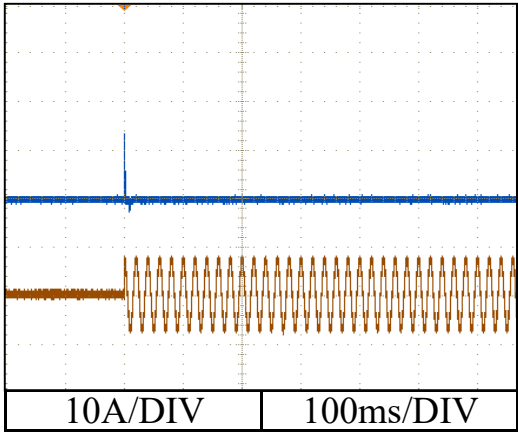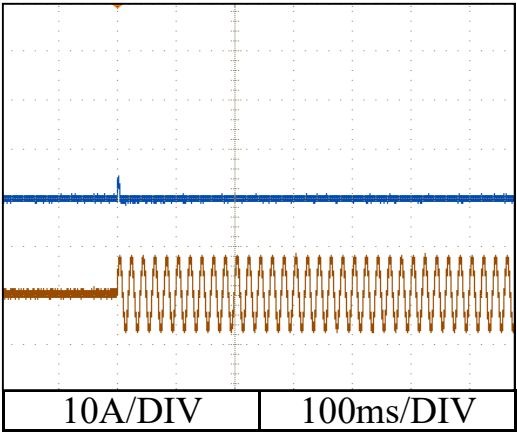TDK-Lambda   T-14

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

5V

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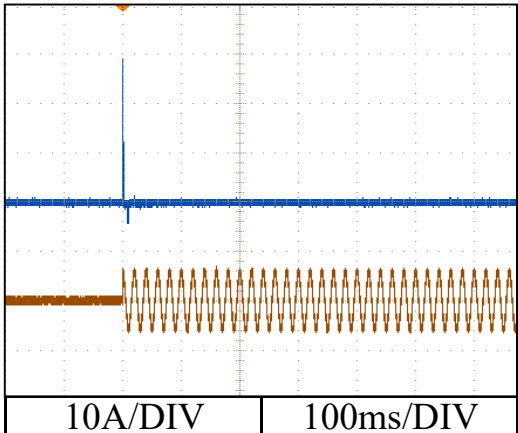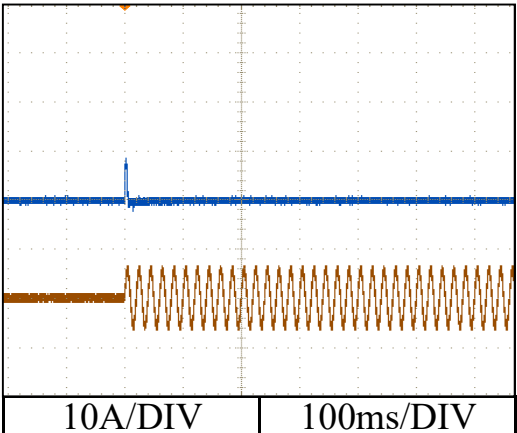
Switch on phase angle of input AC voltage
$\phi = 0°$

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

← Iin →

← Vin →

10A/DIV   100ms/DIV

10A/DIV   100ms/DIV

Conditions   Vin : 200 VAC
Iout : 100 %
Ta :   25 ℃

Switch on phase angle of input AC voltage
$\phi = 0°$
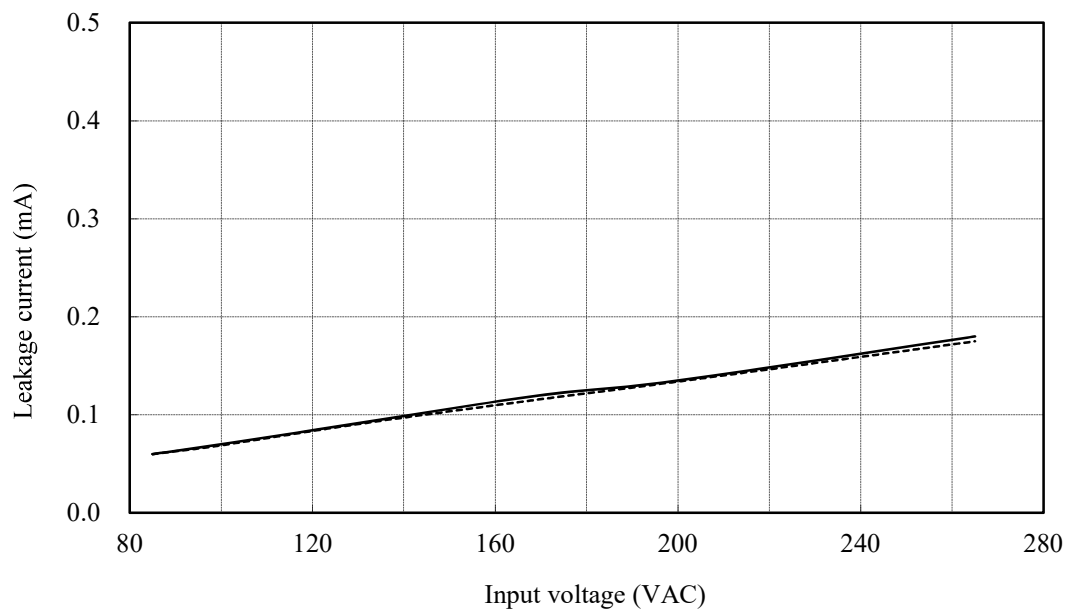
Switch on phase angle of input AC voltage
$\phi = 90°$

← Iin →

← Vin →

10A/DIV   100ms/DIV

10A/DIV   100ms/DIV

TDK-Lambda

2.10 リーク電流特性
　　　Leakage current characteristics

5V

f :　50 Hz

Leakage current (mA)

Input voltage (VAC)

f :　60 Hz

Leakage current (mA)

Input voltage (VAC)

TDK-Lambda

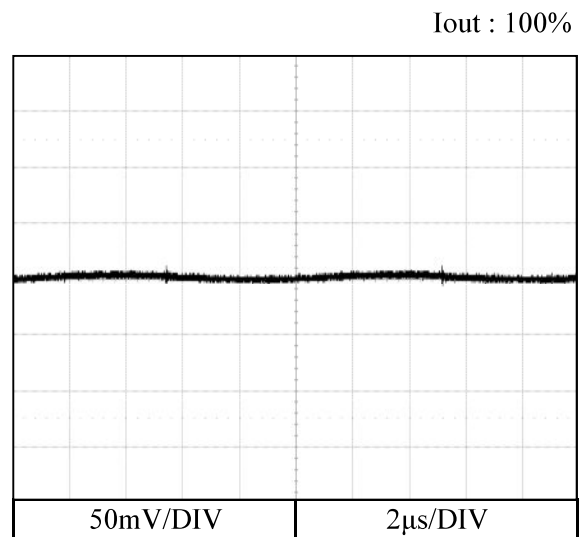## 2.11 出力リップル、ノイズ波形
Output ripple and noise waveform
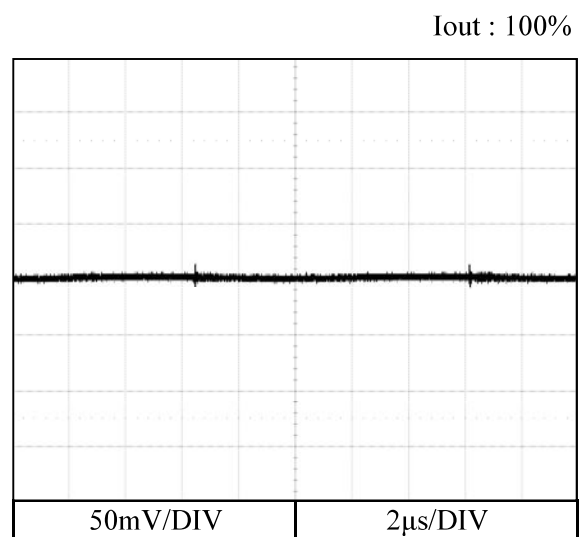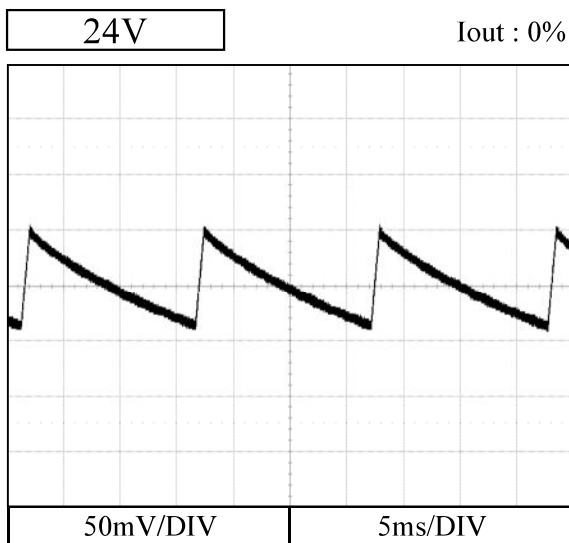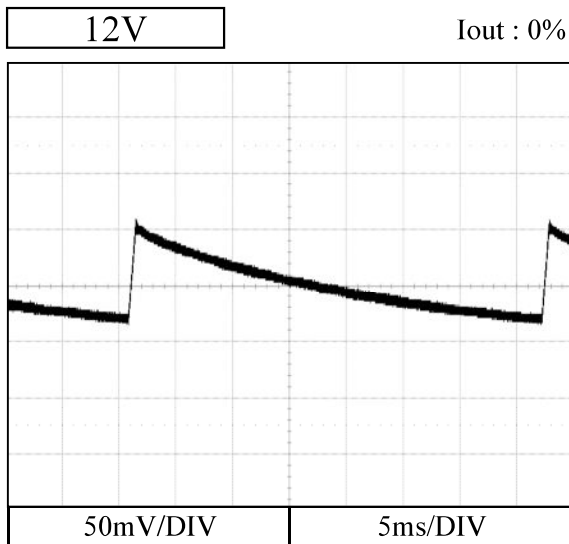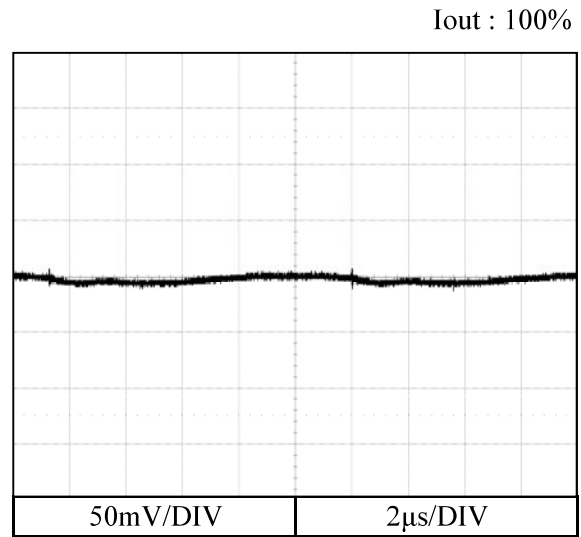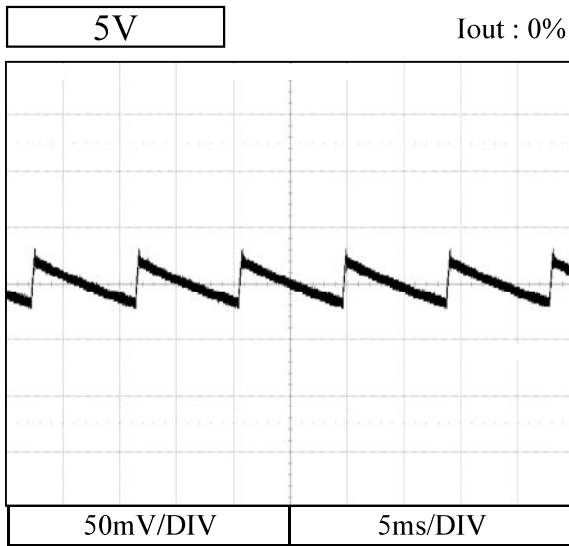
5V		Iout : 0%	Iout : 100%

50mV/DIV	5ms/DIV

50mV/DIV	2μs/DIV

12V		Iout : 0%	Iout : 100%

50mV/DIV	5ms/DIV

50mV/DIV	2μs/DIV

24V		Iout : 0%	Iout : 100%

50mV/DIV	5ms/DIV

50mV/DIV	2μs/DIV

TDK-Lambda

2.12 ＥＭＩ特性
Electro-Magnetic Interference characteristics

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

雑音端子電圧
　Conducted Emission
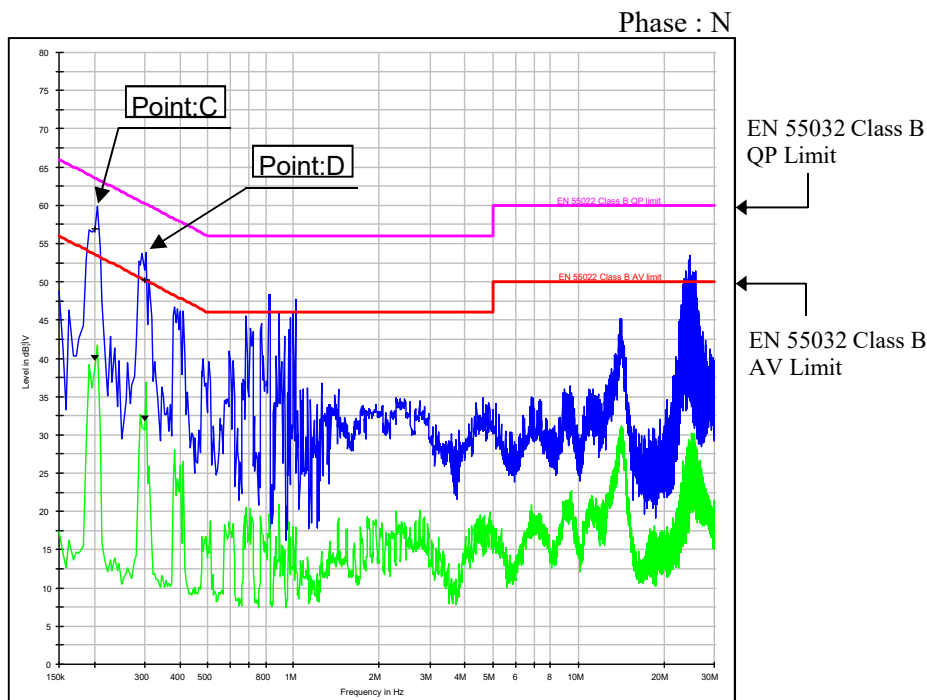
5V

Phase : L

Ref. Data	Point A (202kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.5	55.6
AV	53.5	40.6

Ref. Data	Point B (303kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	60.2	50.4
AV	50.2	34.7

Point:A
Point:B

EN 55032 Class B QP Limit

EN 55032 Class B AV Limit

Phase : N
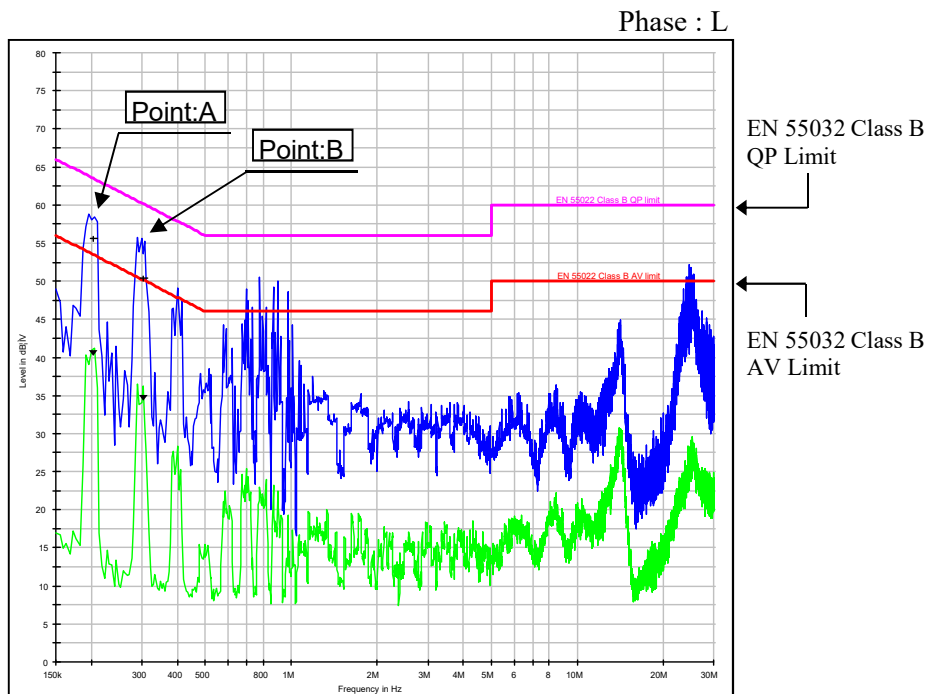
Ref. Data	Point C (201kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.6	56.9
AV	53.6	40.0

Ref. Data	Point D (301kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	60.2	50.3
AV	50.2	32.1

Point:C
Point:D

EN 55032 Class B QP Limit

EN 55032 Class B AV Limit

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

TDK-Lambda

2.12 ＥＭＩ特性
Electro-Magnetic Interference characteristics

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

雑音端子電圧
Conducted Emission

12V

Ref. Data	Point A (203.2kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.5	56.0
AV	53.5	40.9

Phase : L

Point:A

EN 55032 Class B QP Limit

EN 55032 Class B AV Limit
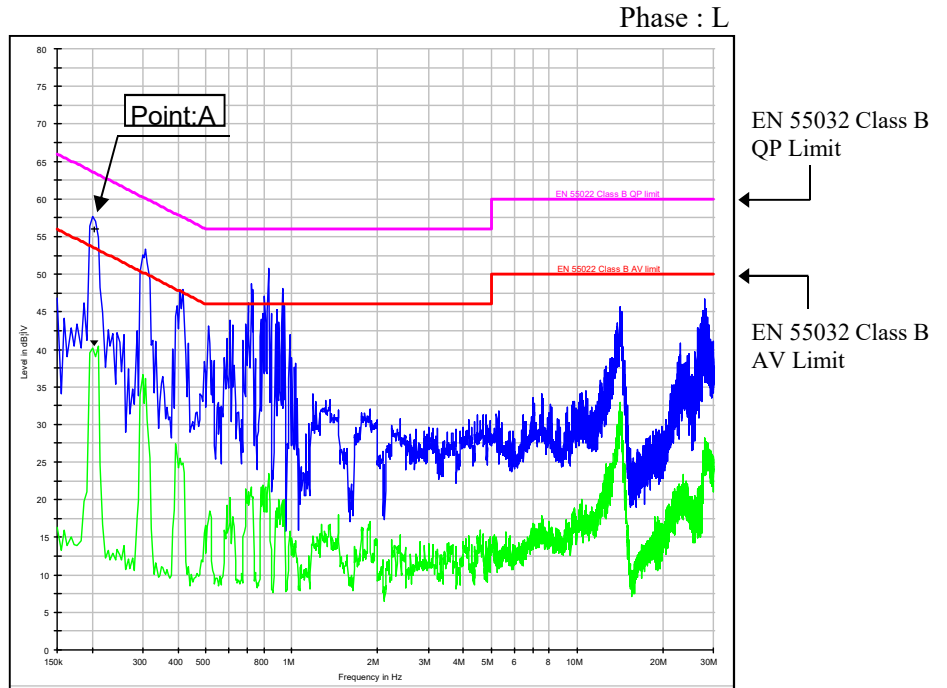
Ref. Data	Point B (200kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.6	57.6
AV	53.6	41.0

Phase : N

Point:B

EN 55032 Class B QP Limit

EN 55032 Class B AV Limit

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

TDK-Lambda

2.12 ＥＭＩ特性
　　　Electro-Magnetic Interference characteristics

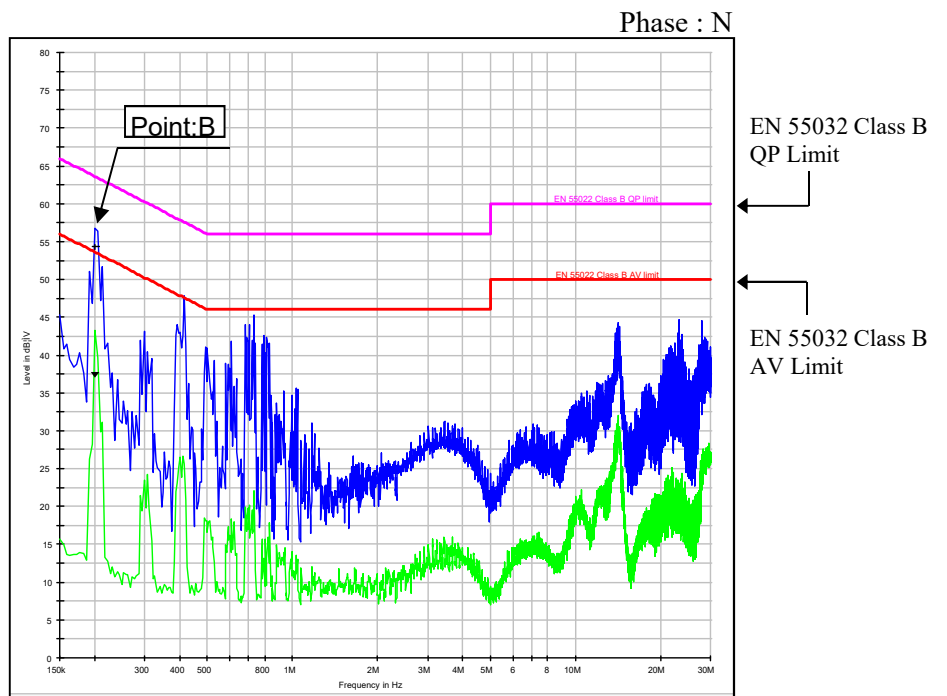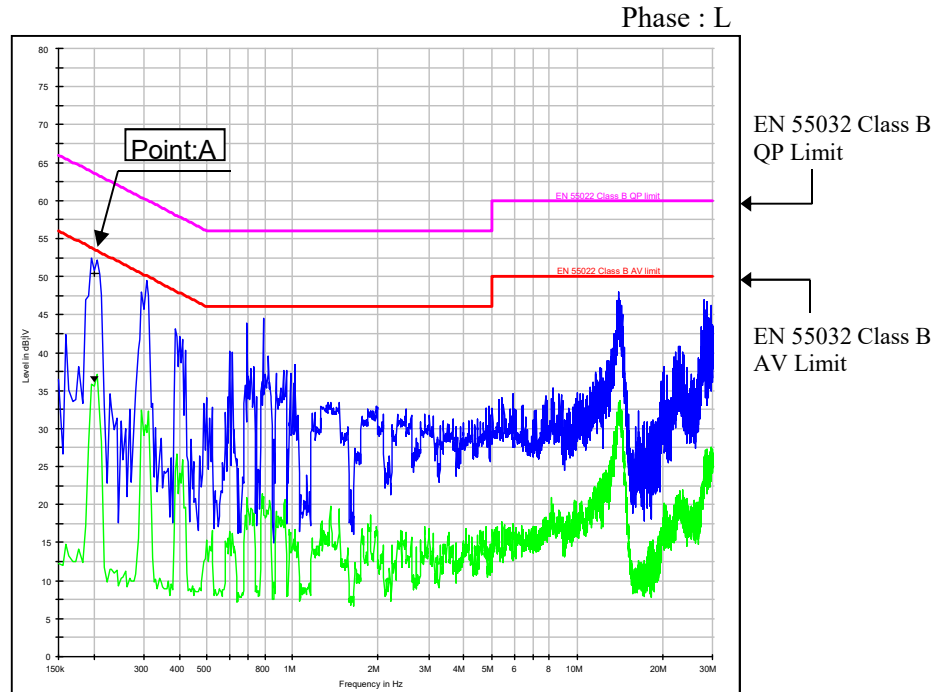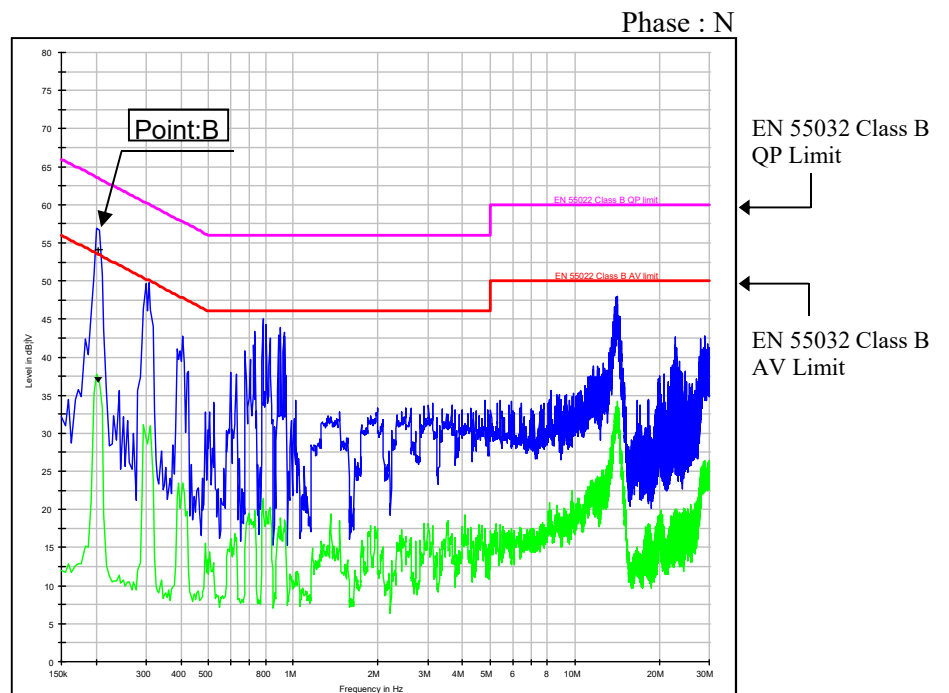Conditions　Vin　:　230 VAC
　　　　　　　Iout　:　100 %
　　　　　　　Ta　:　25 ℃

雑音端子電圧
　　Conducted Emission

24V

Phase : L

	Point A (200kHz)	
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.6	50.4
AV	53.6	36.5

Point:A

EN 55032 Class B QP Limit

EN 55032 Class B AV Limit

Phase : N

	Point B (201.5kHz)	
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.5	54.0
AV	53.5	36.9

Point:B

EN 55032 Class B QP Limit

EN 55032 Class B AV Limit

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

TDK-Lambda

2.12 ＥＭＩ特性
　　Electro-Magnetic Interference characteristics

雑音電界強度
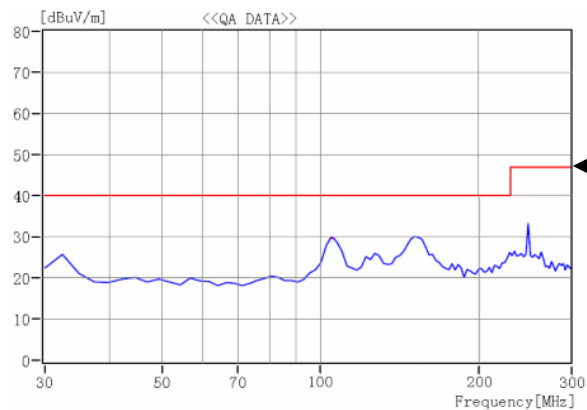　Radiated Emission
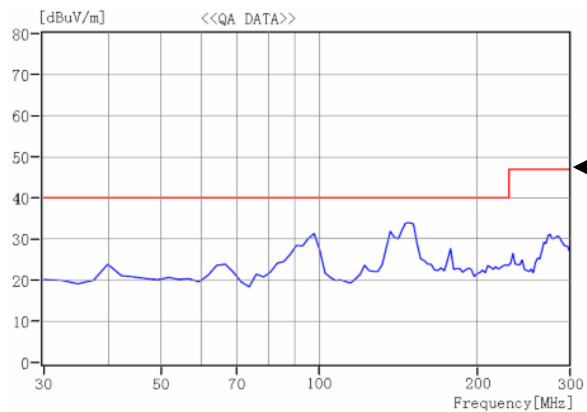
5V　　　　　HORIZONTAL　　　　　　　　　VERTICAL
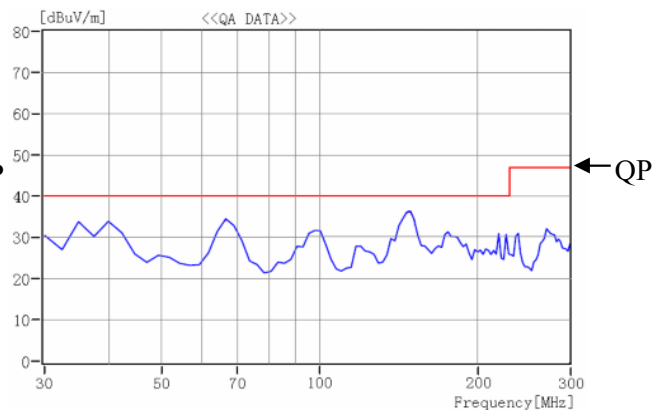
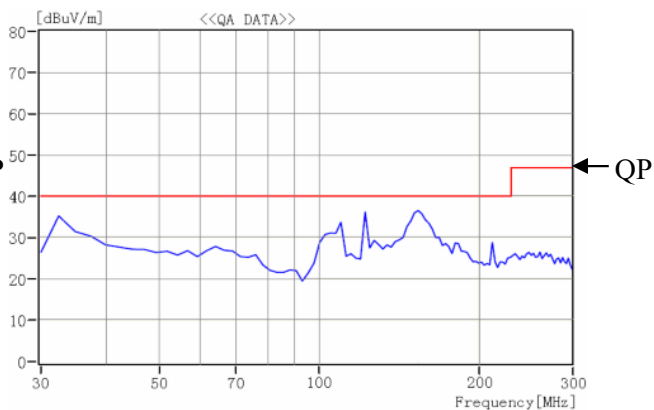

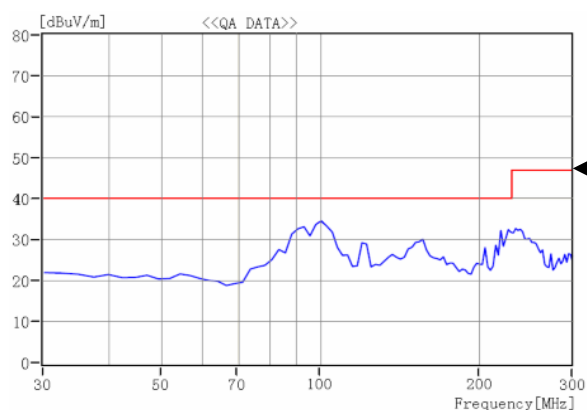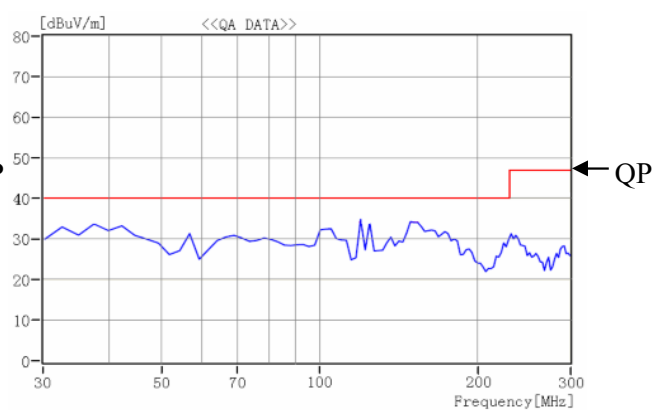**12V**　　　　　HORIZONTAL　　　　　　　　　VERTICAL

24V　　　　　HORIZONTAL　　　　　　　　　VERTICAL

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.

TDK-Lambda