PH50A280- *

EVALUATION DATA

型式データ

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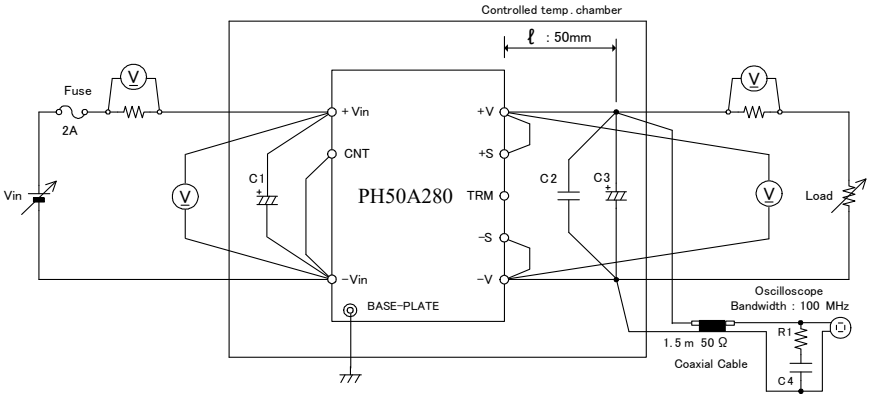
使用記号　Terminology used

	Definition	
Vin ·····	入力電圧	Input voltage
Vo ·····	出力電圧	Output voltage
Vcnt ·····	CNT電圧	CNT voltage
Iin ·····	入力電流	Input current
Io ·····	出力電流	Output current
Tbp ·····	ベースプレート温度	Base-plate temperature
Ta ·····	周囲温度	Ambient temperature
f ·····	周波数	Frequency

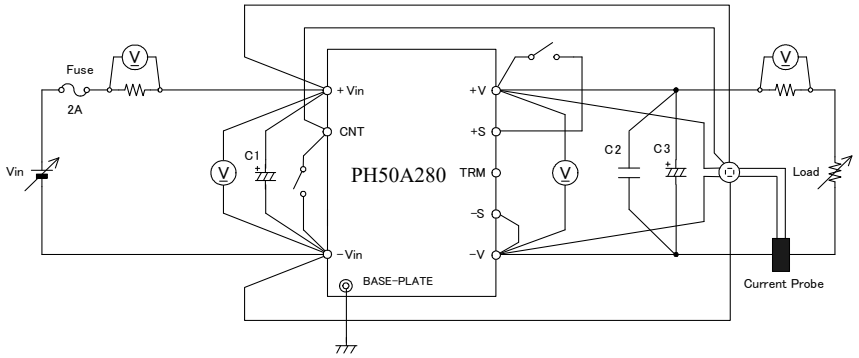
1. 評価方法　　Evaluation Method

1.1 測定回路　　Measurement Circuits

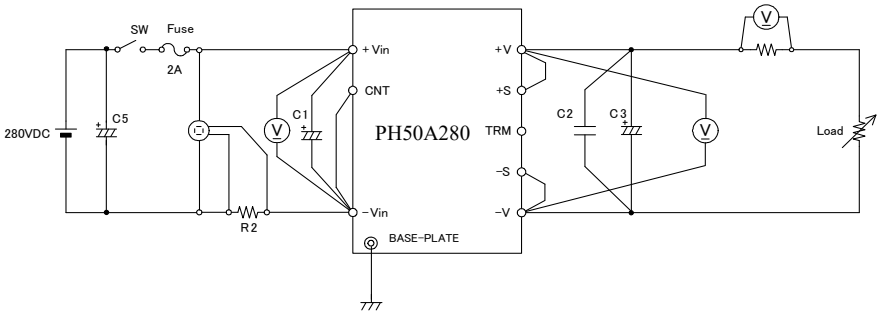
(1) 静特性、過電流保護特性、出力リップル・ノイズ波形
Steady state characteristics, Over current protection (OCP) characteristics, and Output ripple and noise waveform



(2) 過渡応答、過電圧保護特性、その他
Dynamic response, Over voltage protection (OVP) characteristics and Other characteristics



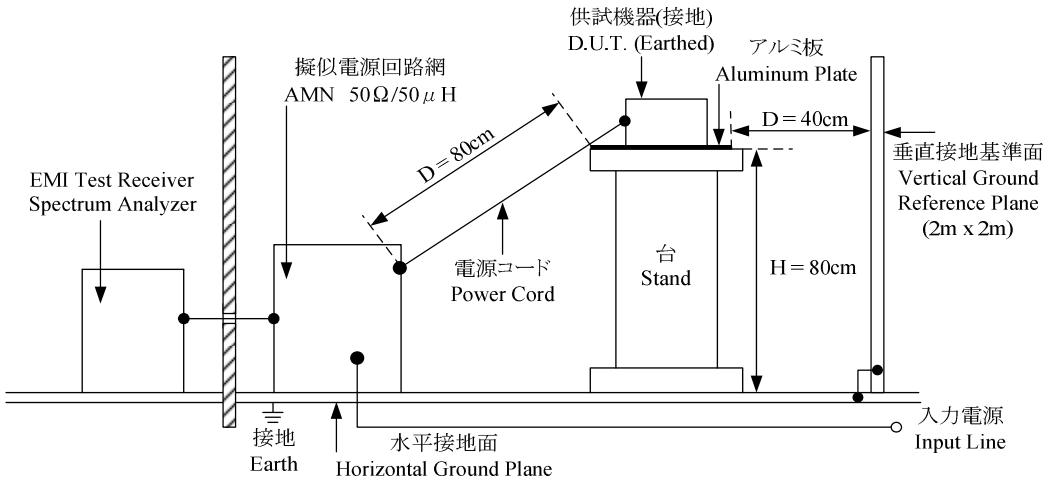
(3) 入力サージ電流（突入電流）特性
Inrush current characteristics



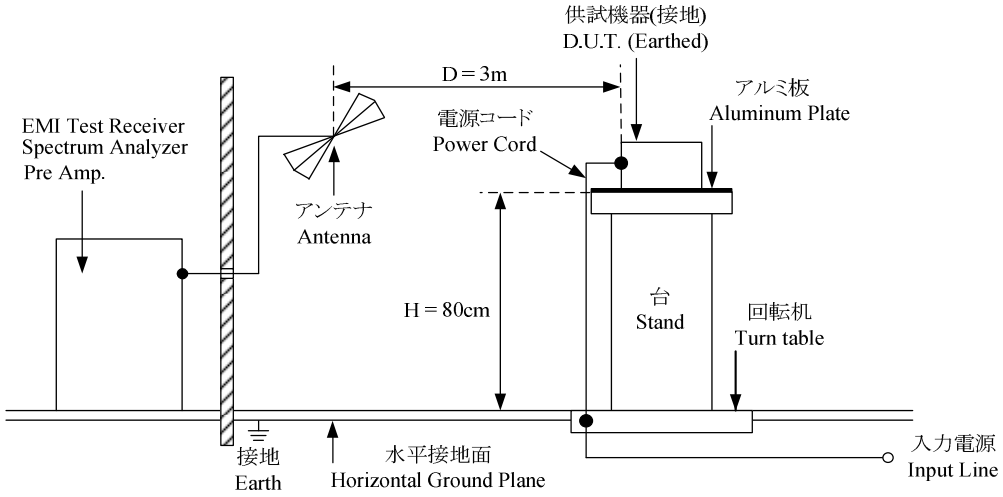
C1 : 22uF Electrolytic Capacitor
C2 : 2.2μF Ceramic Capacitor
C3 : 5V-2200uF Electrolytic Capacitor
: 12V-560uF Electrolytic Capacitor
: 24V-220uF Electrolytic Capacitor
: 48V-220uF×2series Electrolytic Capacitor
C4 : 4700pF Ceramic Capacitor
C5 : 8000uF Electrolytic Capacitor
R1 : 50Ω
R2 : 0.01Ω

(4) EMI特性 Electro-Magnetic Interference characteristics

(a) 雑音端子電圧 (帰還ノイズ) Conducted Emission Noise

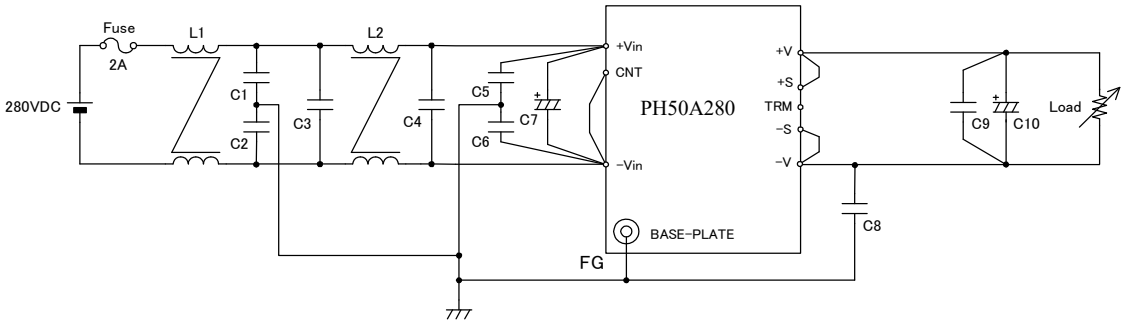


(b) 雑音電界強度(輻射ノイズ) Radiated Emission Noise



*入出力ケーブルとしてシールドケーブルを使用
Shielded cable used to input and output cable.

VCCI class A対応アプリケーションシステム
VCCI class A application system



C1,C2 : 470pF Ceramic Capacitor
C3 : 1.5μF Film Capacitor
C4 : 1.5μF Film Capacitor
C5,C6 : 2200pF Ceramic Capacitor
C7 : 22uF Electrolytic Capacitor
C8 : 0.022μF Ceramic Capacitor
C9 : 2.2μF Ceramic Capacitor
C10 : 5V-2200uF Electrolytic Capacitor
: 12V-560uF Electrolytic Capacitor
: 24V-220uF Electrolytic Capacitor
: 48V-220uF×2series Electrolytic Capacitor
L1 : 0.6mH
L2 : 3.0mH

1.2 使用測定機器　　List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	AC POWER SUPPLY	KIKUSUI	PCR2000L
2	DYNAMIC DUMMY LOAD	Chrome	63030
3	DUMMY LOAD	ARCOL	HS50 SERIES
4	DATA ACQUISITION / SWITCH UNIT	AGILENT	34970A
5	SHUNT RESISTER	YOKOGAWA ELECT.	2215
6	CONTROLLED TEMP. CHAMBER	ESPEC CORP.	SH-661
7	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DLM2054
8	CURRENT PROBE	YOKOGAWA	701932
9	EMI TEST RECEIVER SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCI
10	PRE AMP.	SONOMA	310N
11	AMN	SCHWARZBECK	NNLK8121
12	ANTENNA(BI-LOG ANTENNA)	TESEQ	CBL6111D

2. 特性データ Characteristics

2.1 静特性 Steady state data
(1) 入力変動、負荷変動、温度変動 Line regulation, Load regulation, Temperature drift

5V

1. Line regulation and Load regulation　　Condition　Tbp : 25℃

Io \ Vin	200VDC	280VDC	380VDC	425VDC	Line regulation	
0%	5.005V	5.005V	5.005V	5.005V	0mV	0.002%
50%	5.006V	5.005V	5.005V	5.005V	1mV	0.020%
100%	5.006V	5.005V	5.005V	5.005V	1mV	0.020%
Load	1mV	0mV	0mV	0mV		
regulation	0.020%	0.000%	0.000%	0.000%		

2. Temperature drift　　Conditions　Vin : 280VDC
Io : 100%

Tbp	-40℃	+25℃	+100℃	Temperature stability	
Vo	4.975V	5.005V	5.013V	38mV	0.760%

12V

1. Line regulation and Load regulation　　Condition　Tbp : 25℃

Io \ Vin	200VDC	280VDC	380VDC	425VDC	Line regulation	
0%	11.979V	11.979V	11.979V	11.979V	0mV	0.000%
50%	11.975V	11.975V	11.974V	11.973V	2mV	0.017%
100%	11.976V	11.975V	11.972V	11.971V	5mV	0.042%
Load	3mV	4mV	7mV	8mV		
regulation	0.025%	0.033%	0.058%	0.067%		

2. Temperature drift　　Conditions　Vin : 280VDC
Io : 100%

Tbp	-40℃	+25℃	+100℃	Temperature stability	
Vo	11.912V	11.975V	11.953V	63mV	0.525%

(1) 入力変動、負荷変動、温度変動 Line regulation, Load regulation, Temperature drift

24V

1. Line regulation and Load regulation　　Condition　Tbp : 25℃

Io \ Vin	200VDC	280VDC	380VDC	425VDC	Line regulation	
0%	23.959V	23.959V	23.959V	23.959V	0mV	0.001%
50%	23.952V	23.955V	23.949V	23.946V	9mV	0.037%
100%	23.951V	23.954V	23.948V	23.945V	9mV	0.038%
Load	8mV	5mV	11mV	14mV		
regulation	0.033%	0.021%	0.046%	0.058%		

2. Temperature drift　　Conditions　Vin : 280VDC
Io : 100%

Tbp	-40℃	+25℃	+100℃	Temperature stability	
Vo	23.848V	23.954V	23.912V	106mV	0.442%

48V

1. Line regulation and Load regulation　　Condition　Tbp : 25℃

Io \ Vin	200VDC	280VDC	380VDC	425VDC	Line regulation	
0%	47.730V	47.731V	47.731V	47.731V	1mV	0.002%
50%	47.721V	47.725V	47.727V	47.728V	7mV	0.015%
100%	47.721V	47.724V	47.726V	47.726V	5mV	0.010%
Load	9mV	7mV	5mV	5mV		
regulation	0.019%	0.015%	0.010%	0.010%		

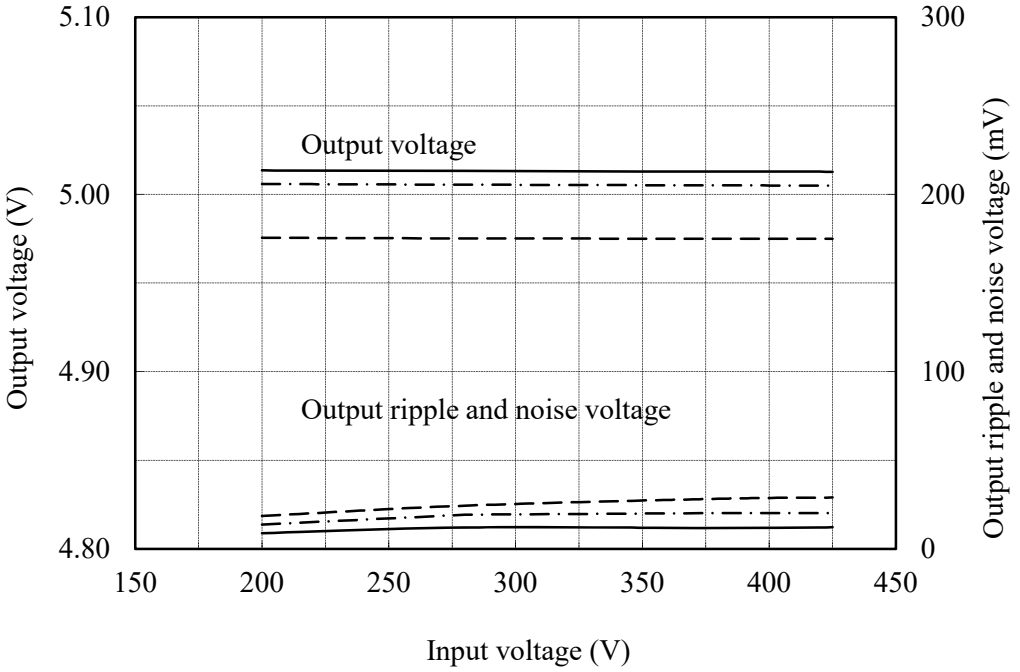
2. Temperature drift　　Conditions　Vin : 280VDC
Io : 100%

Tbp	-40℃	+25℃	+100℃	Temperature stability	
Vo	47.608V	47.724V	47.766V	158mV	0.329%

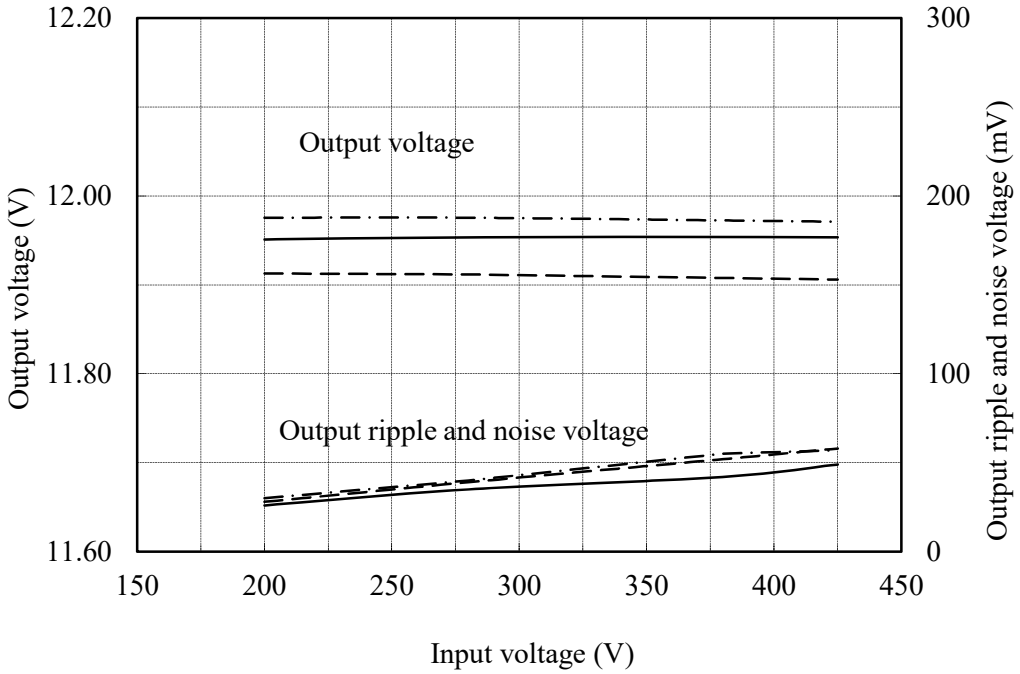
(2) 出力電圧、出力リップル・ノイズ電圧 対 入力電圧
Output voltage and Output ripple and noise voltage vs. Input voltage

Conditions Io : 100 %
Tbp : -40 ℃
: 25 ℃
: 100 ℃

5V



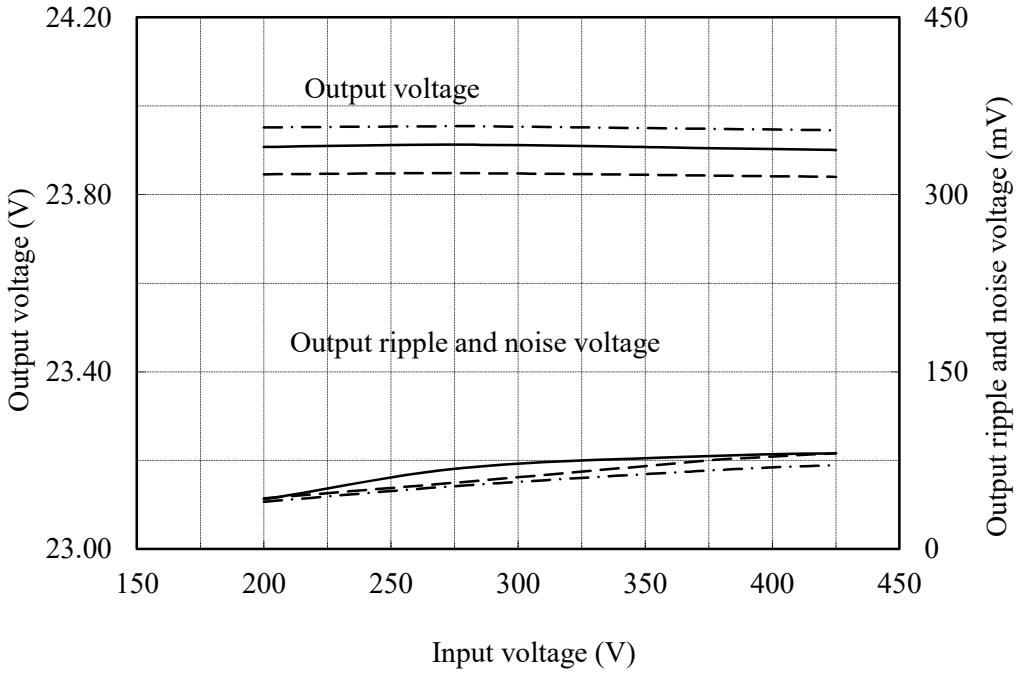
12V



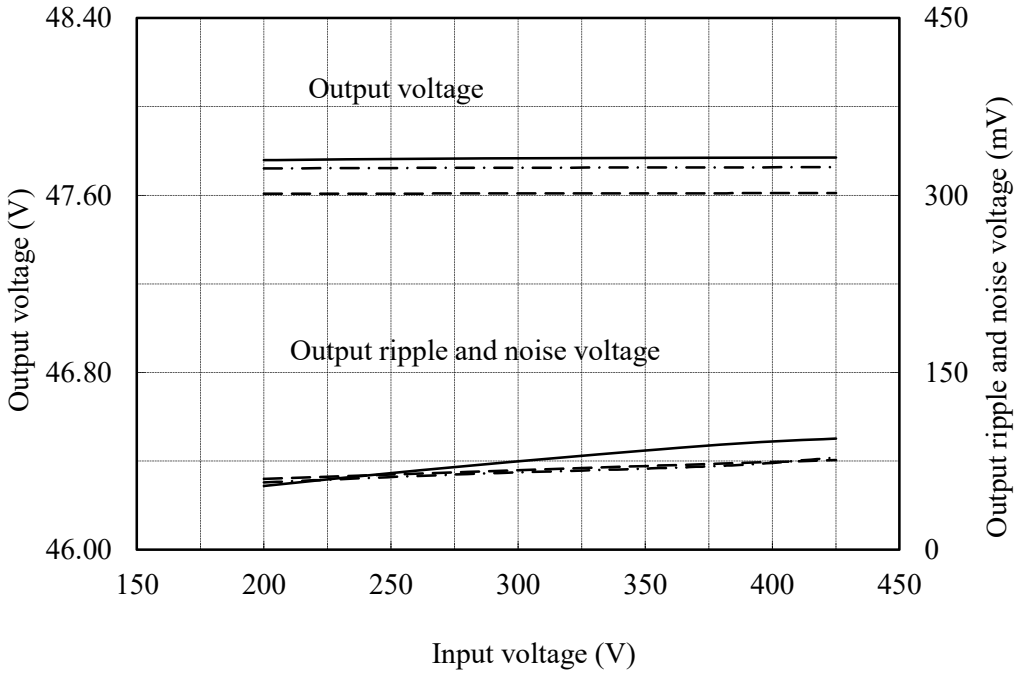
(2) 出力電圧、出力リップル・ノイズ電圧 対 入力電圧
Output voltage and Output ripple and noise voltage vs. Input voltage

Conditions Io : 100 %
Tbp : -40 ℃
: 25 ℃
: 100 ℃

24V



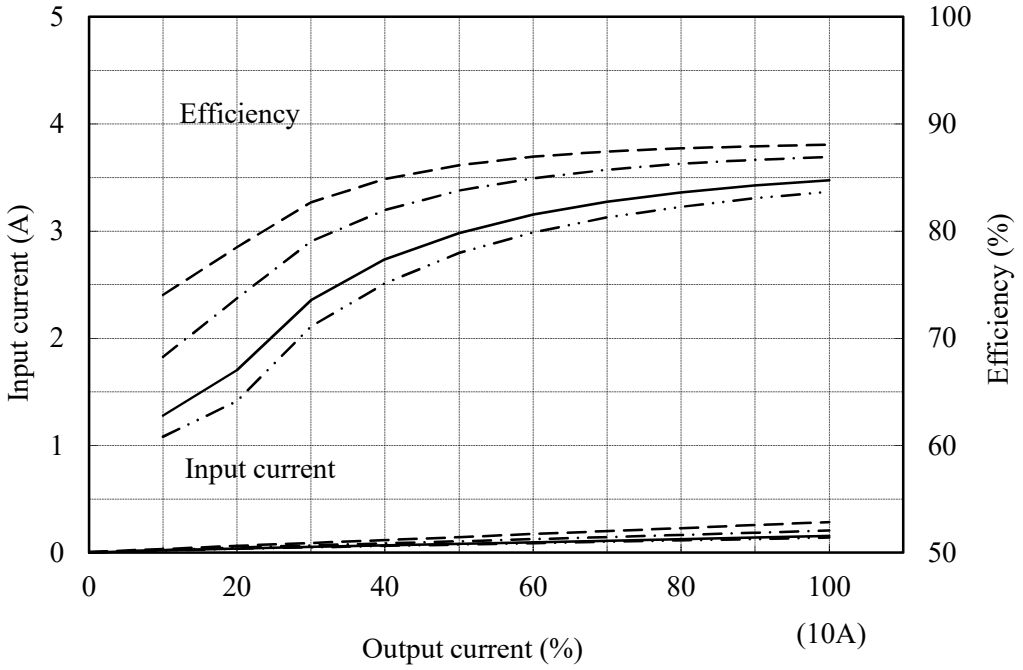
48V



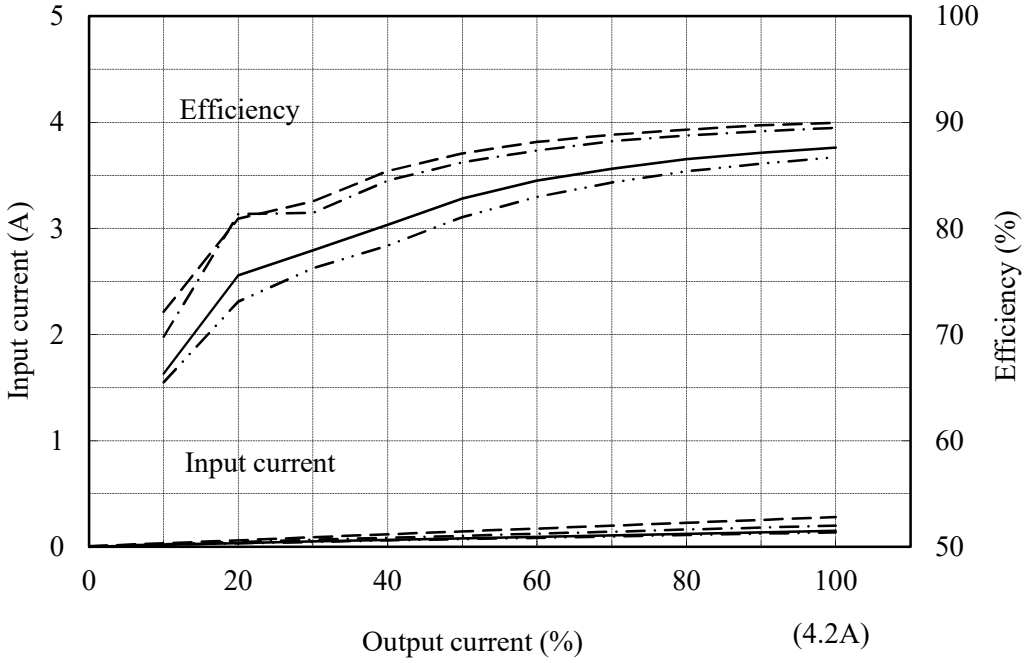
(3) 入力電流、効率 対 出力電流
Input current and Efficiency vs. Output current

Conditions Vin : 200 VDC
: 280 VDC
: 380 VDC
: 425 VDC
Tbp : 25 ℃

5V



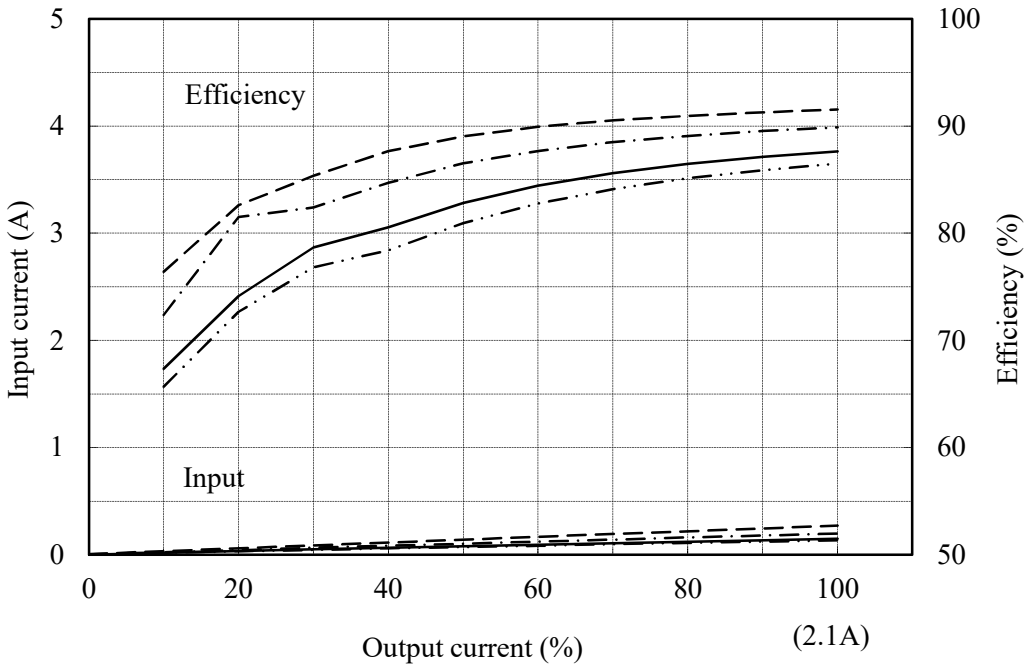
12V



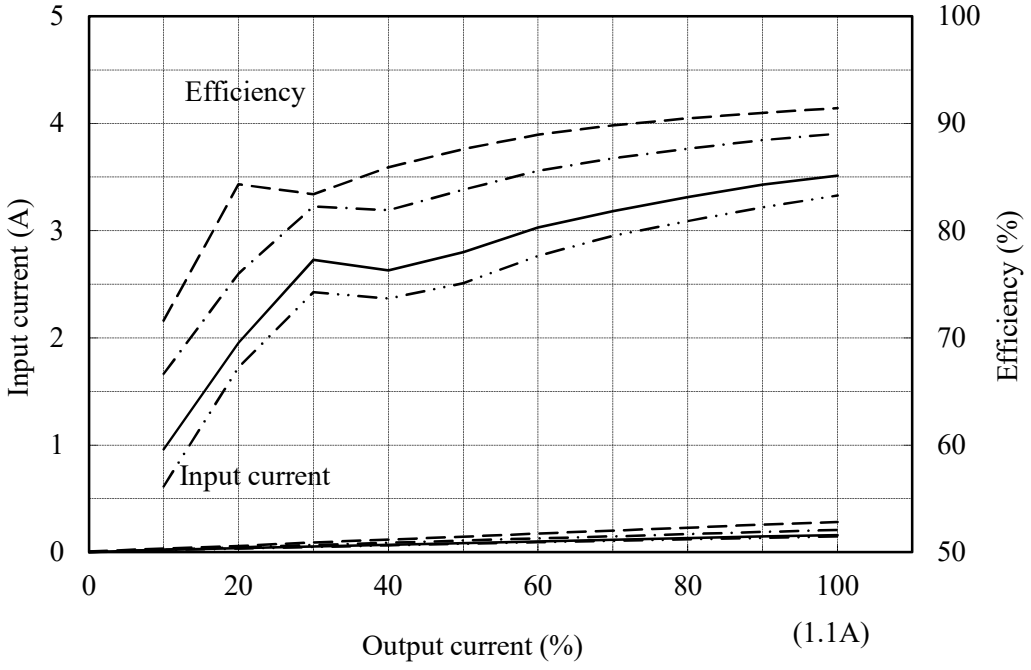
(3) 入力電流、効率 対 出力電流
Input current and Efficiency vs. Output current

Conditions Vin : 200 VDC
: 280 VDC
: 380 VDC
: 425 VDC
Tbp : 25 ℃

24V



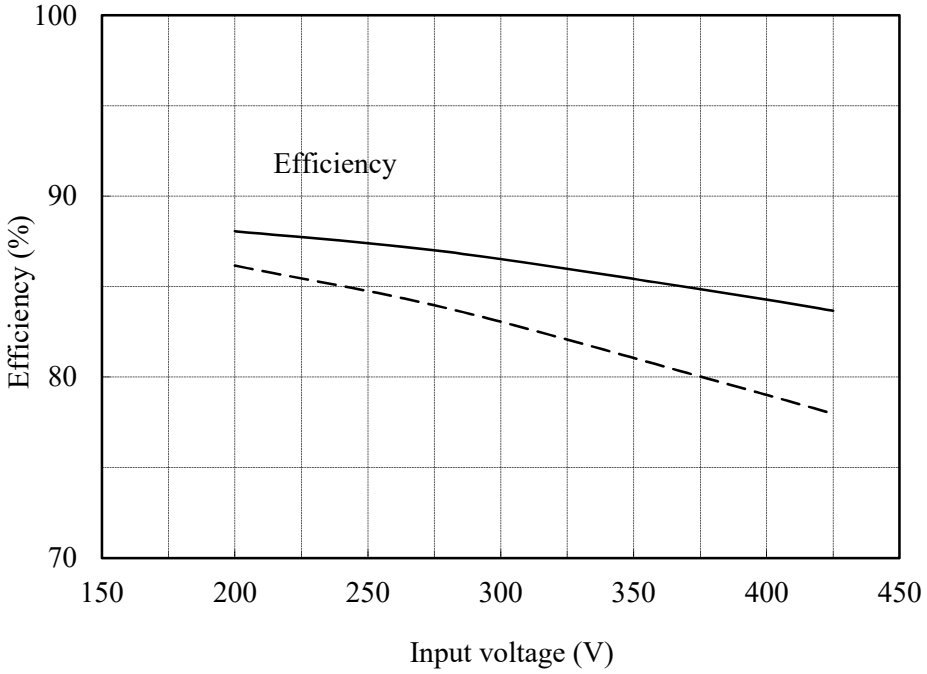
48V



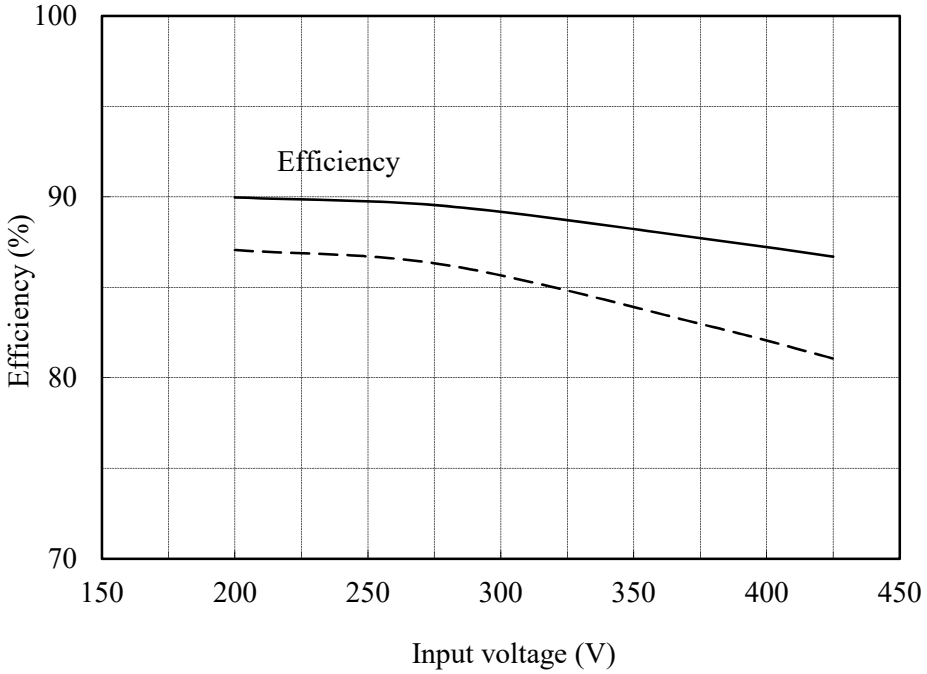
(4) 効率 対 入力電圧
Efficiency vs. Input voltage

Conditions Io : 50 % ----
: 100 % ——
Tbp : 25 ℃

5V



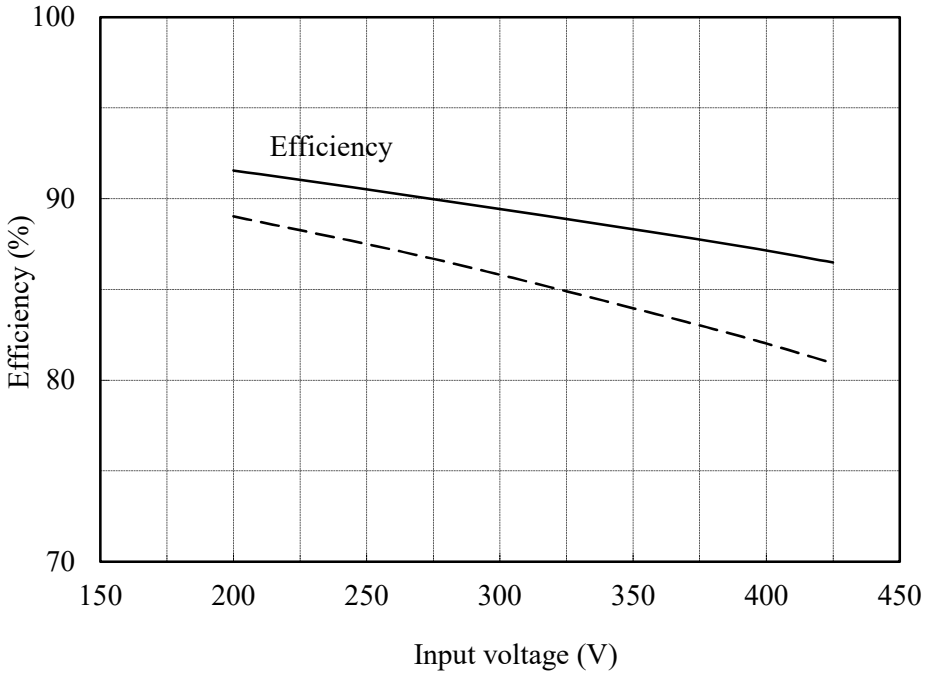
12V



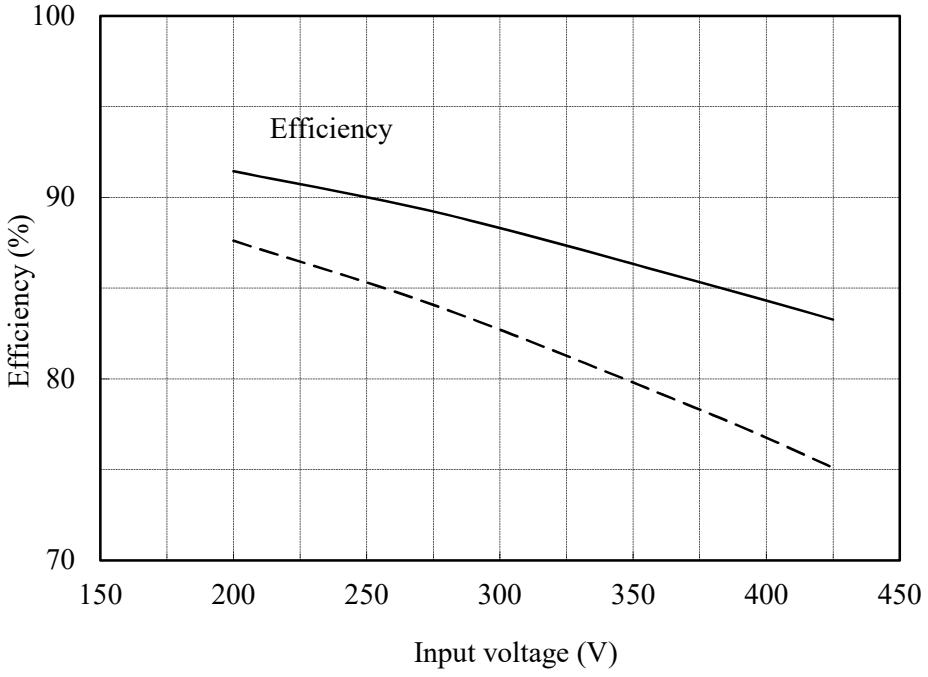
(4) 効率 対 入力電圧
Efficiency vs. Input voltage

Conditions Io : 50 % ----
: 100 % ——
Tbp : 25 ℃

24V



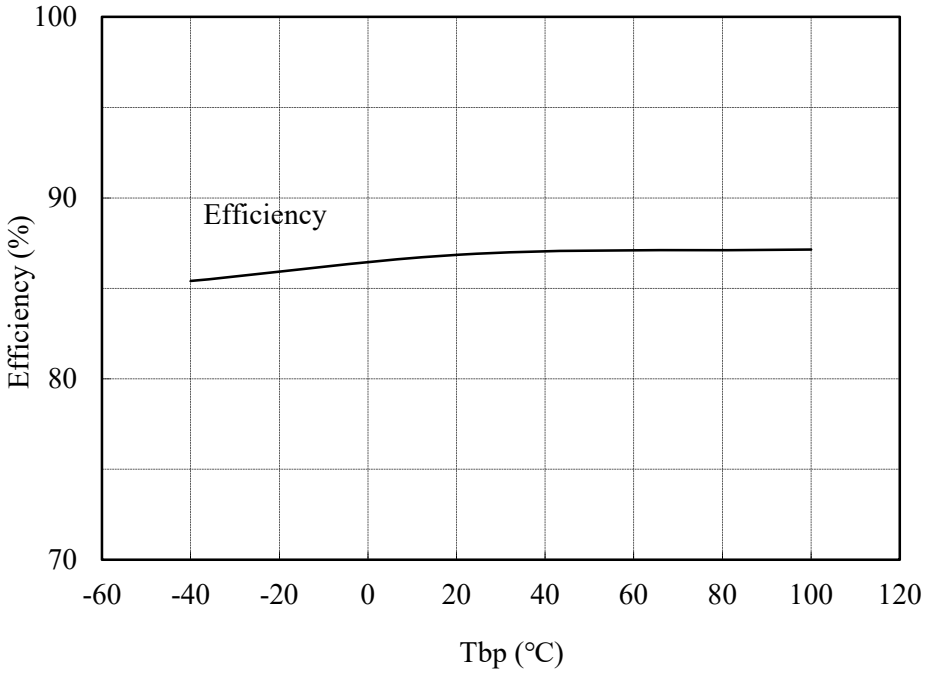
48V



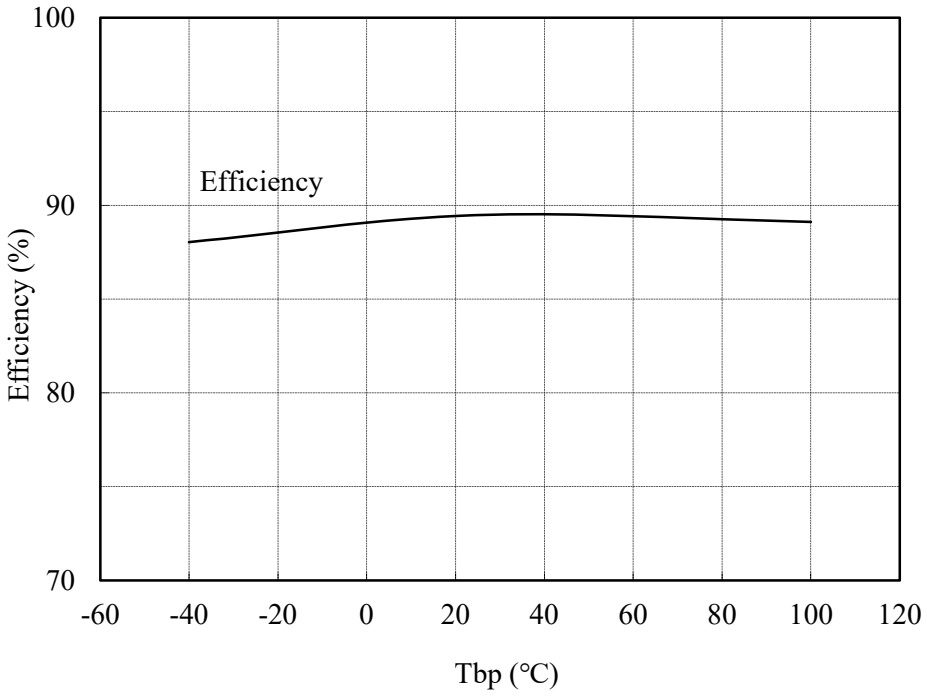
(5) 効率 対 ベースプレート温度
Efficiency vs. Base-plate temperature

Conditions Vin : 280 VDC
Io : 100 %

5V



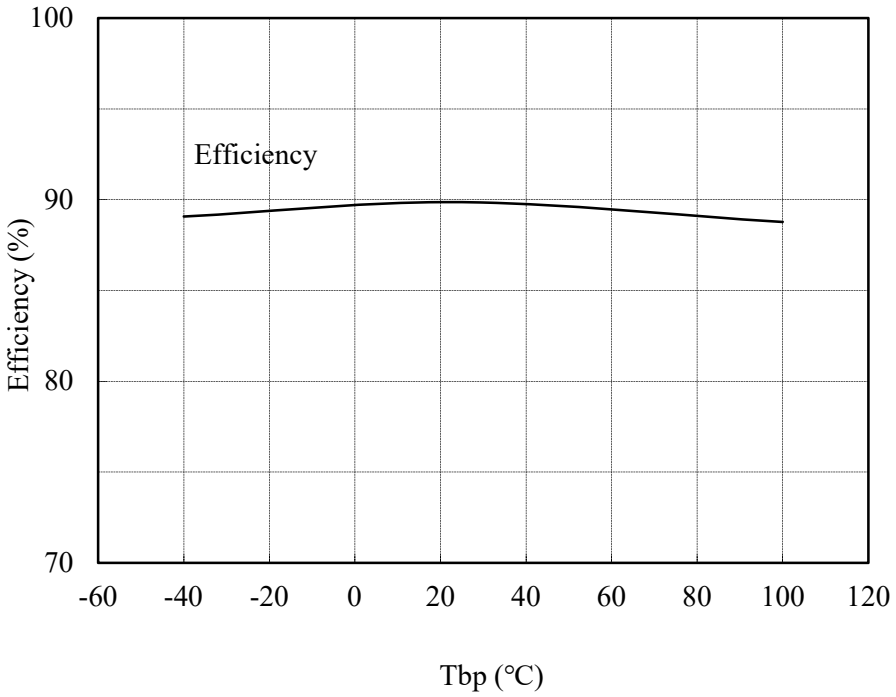
12V



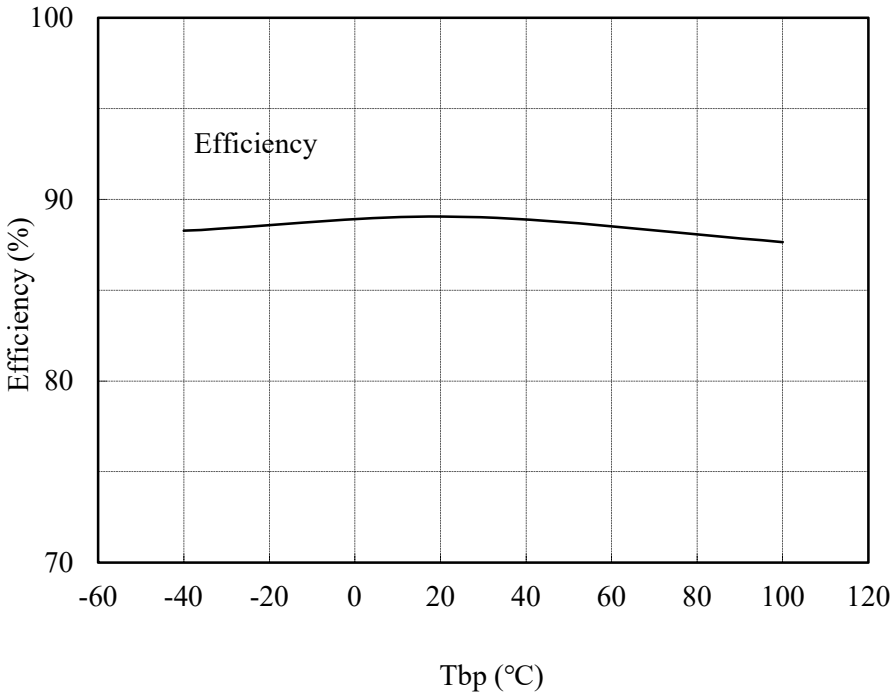
(5) 効率 対 ベースプレート温度
Efficiency vs. Base-plate temperature

Conditions Vin : 280 VDC
Io : 100 %

24V



48V

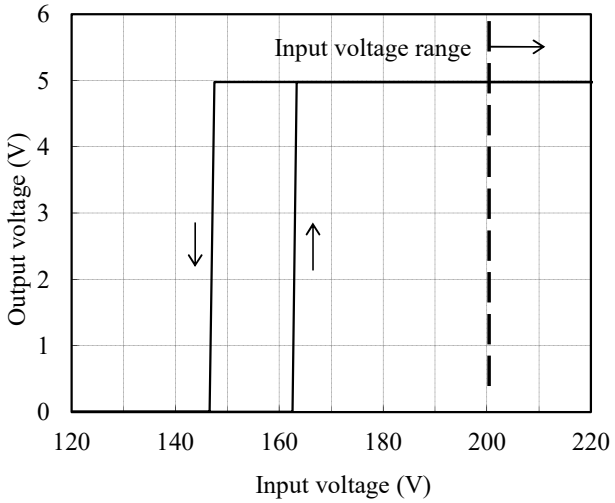


(6) 起動、停止電圧特性
Start and Stop voltage characteristics

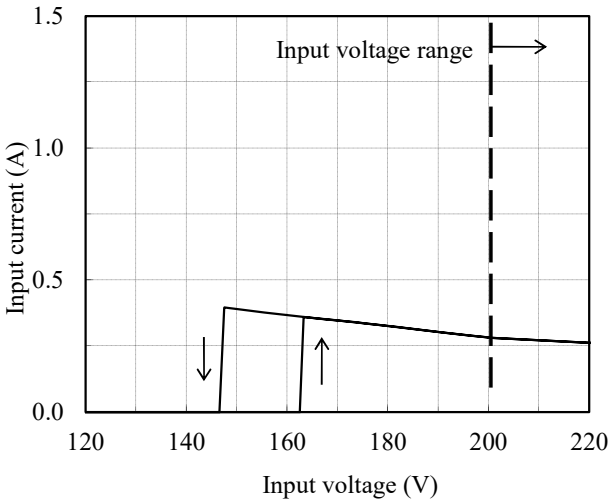
出力電圧 対 入力電圧
Output voltage vs. Input voltage
Conditions Io : 100 %
Tbp : 25 ℃

入力電流 対 入力電圧
Input current vs. Input voltage
Conditions Io : 100 %
Tbp : 25 ℃

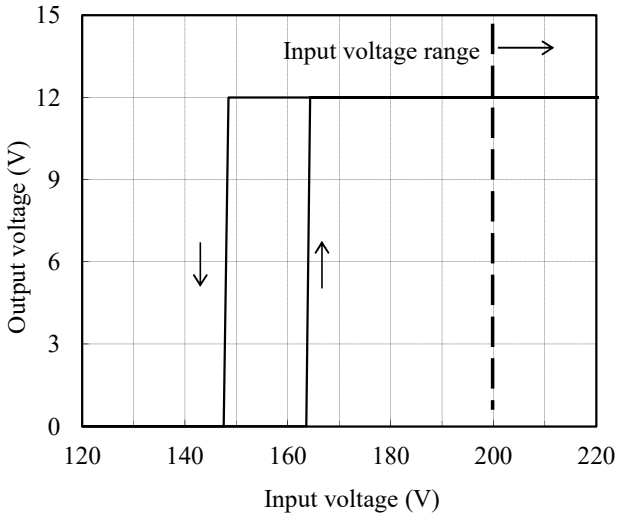
5V



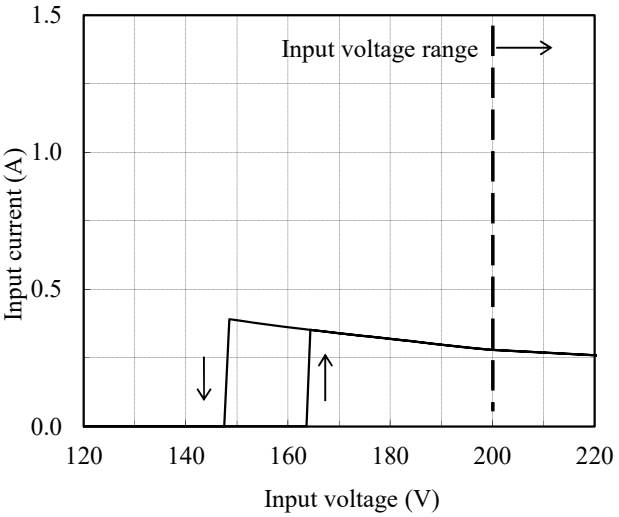
5V



12V



12V

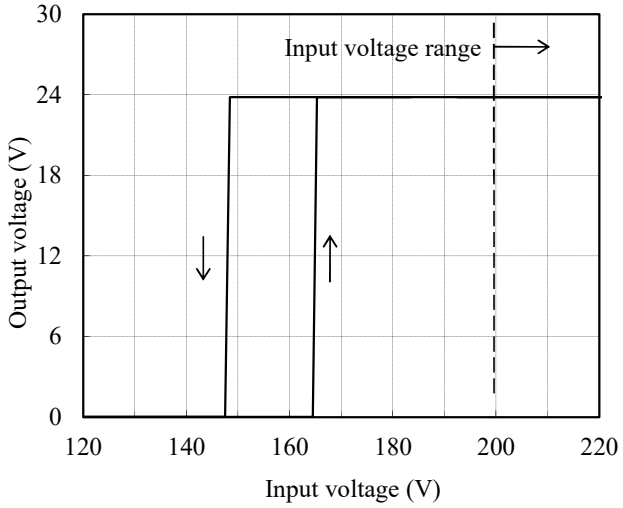


(6) 起動、停止電圧特性
Start and Stop voltage characteristics

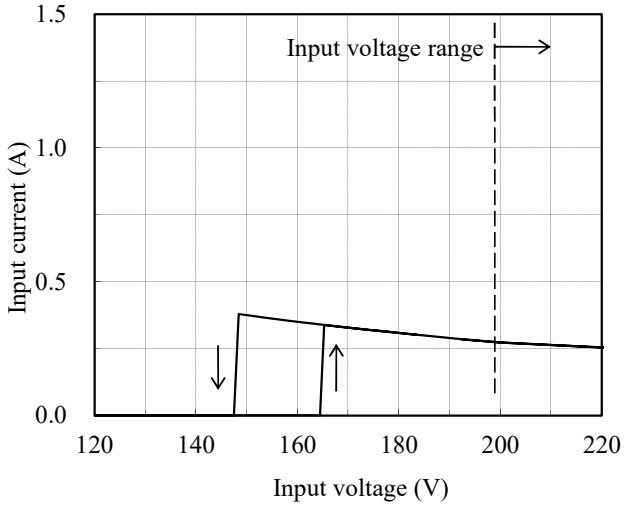
出力電圧 対 入力電圧
Output voltage vs. Input voltage
Conditions Io : 100 %
Tbp : 25 ℃

入力電流 対 入力電圧
Input current vs. Input voltage
Conditions Io : 100 %
Tbp : 25 ℃

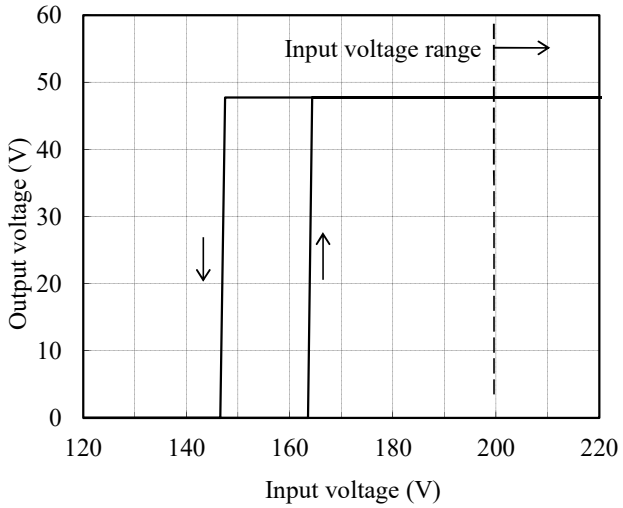
24V



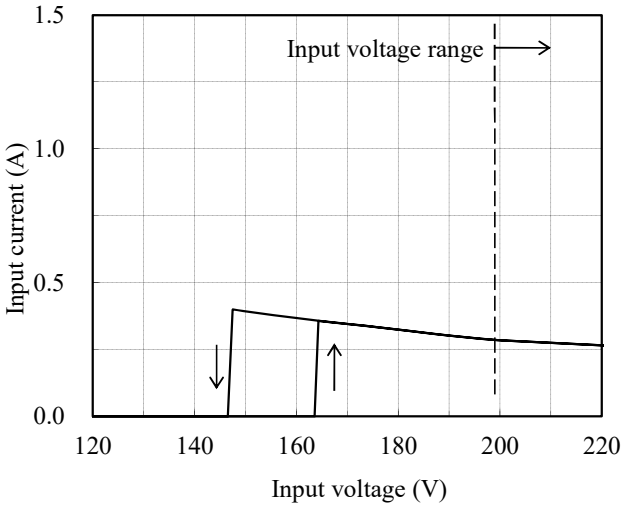
24V



48V



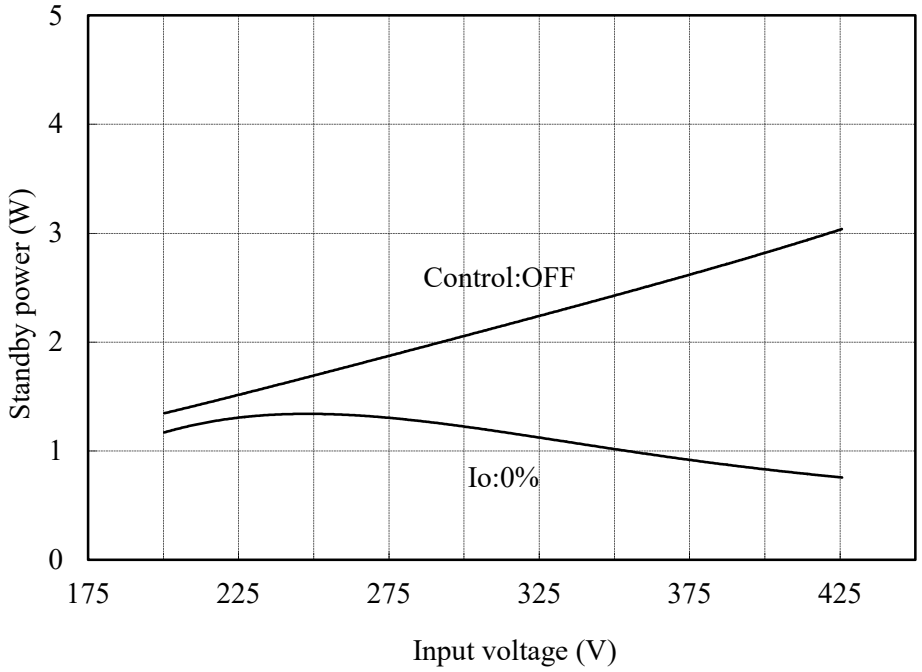
48V



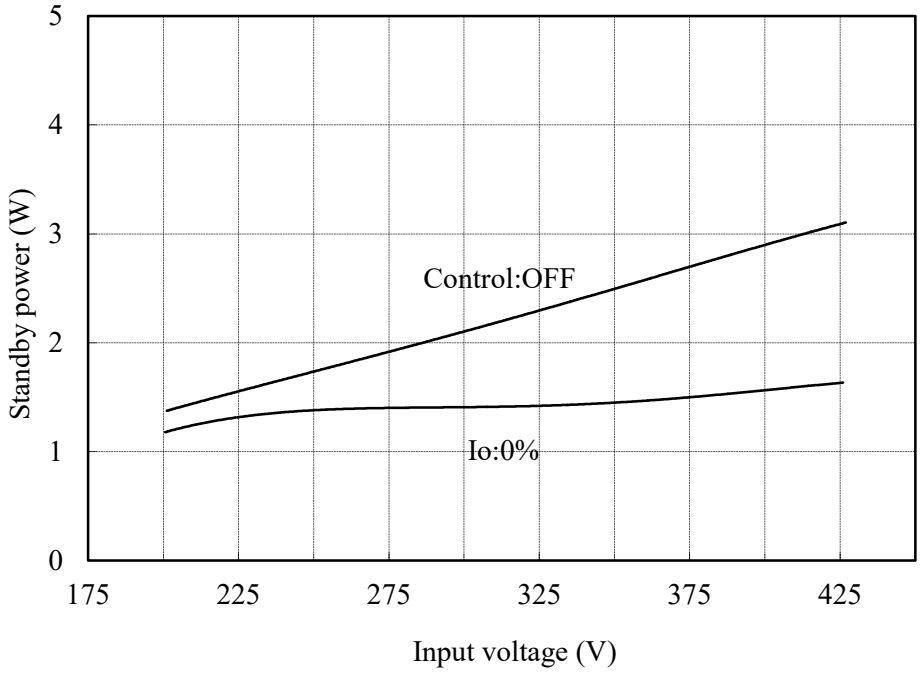
2.2 待機電力特性
Standby power characteristics

Conditions Tbp : 25 ℃

5V



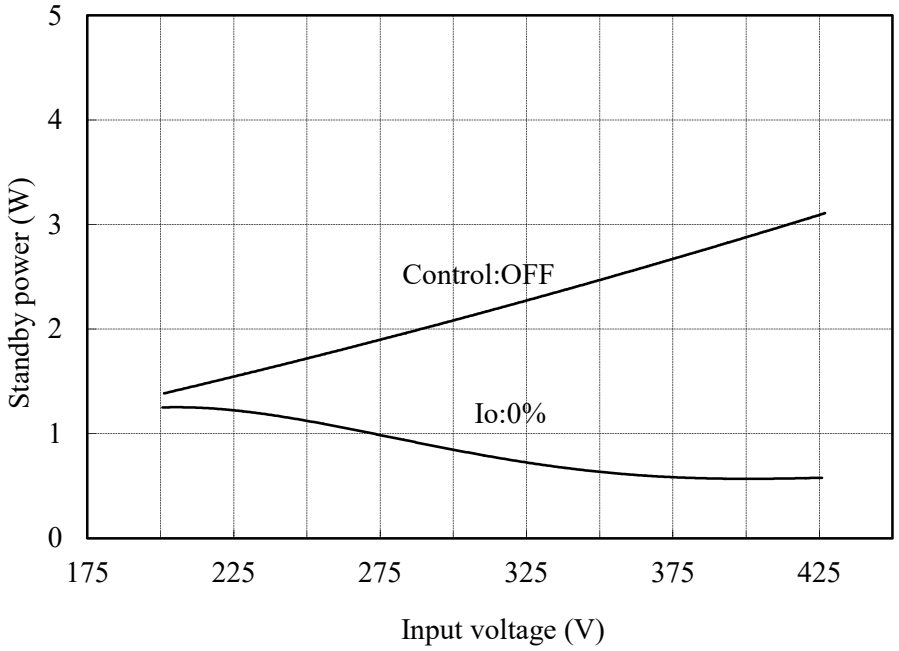
12V



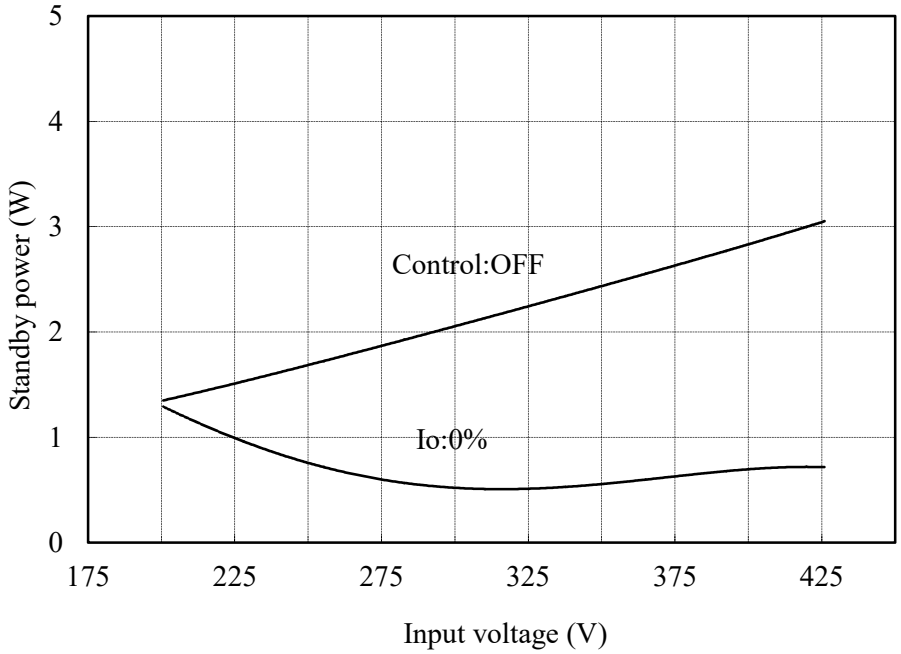
2.2 待機電力特性
Standby power characteristics

Conditions Tbp : 25 ℃

24V



48V

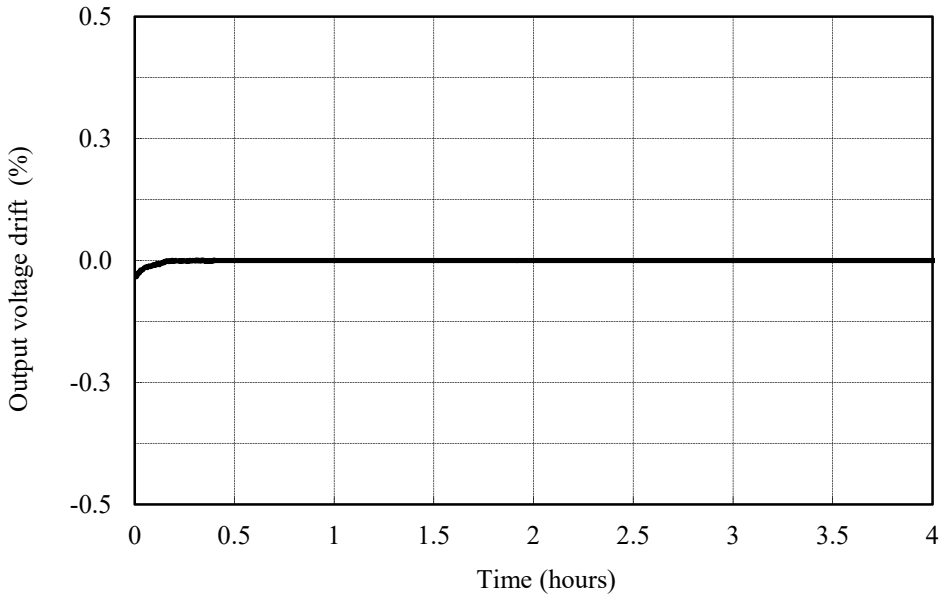


2.3 通電ドリフト特性

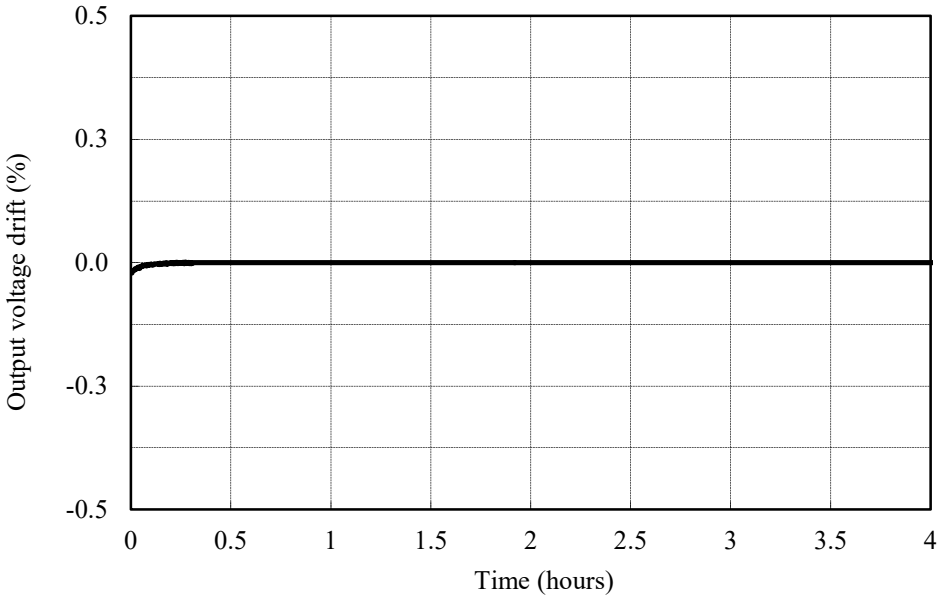
Warm up voltage drift characteristics

Conditions Vin : 280 VDC
Io : 100 %
Ta : 25 ℃

5V



12V

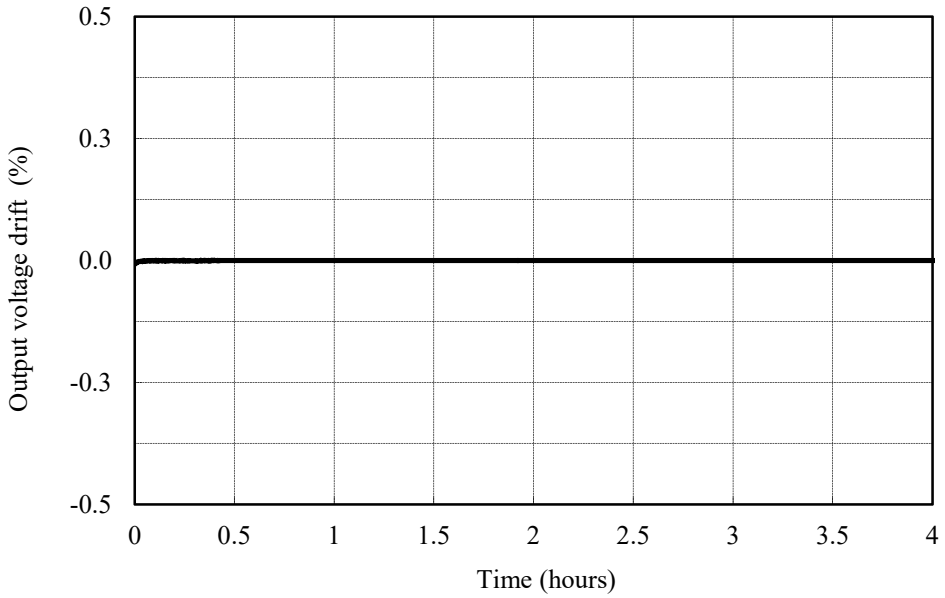


2.3 通電ドリフト特性

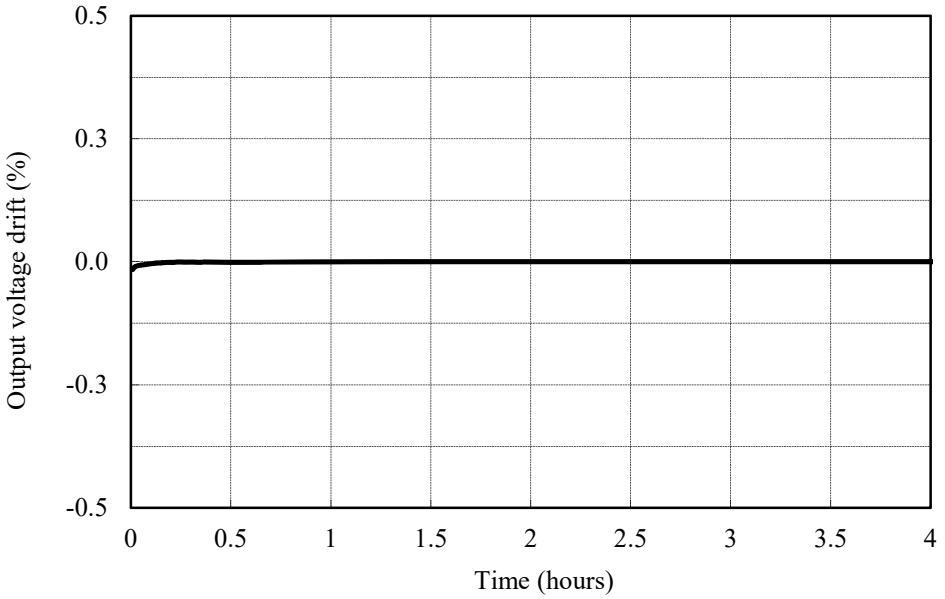
Warm up voltage drift characteristics

Conditions Vin : 280 VDC
Io : 100 %
Ta : 25 ℃

24V



48V



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

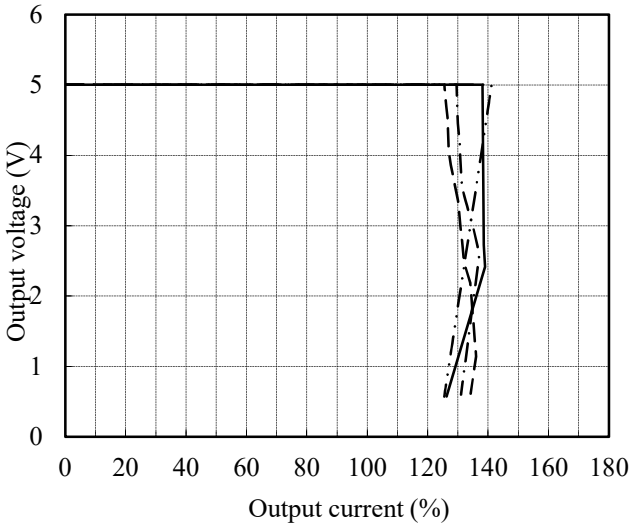
入力電圧依存性
Input voltage dependence

Conditions Vin : 200 VDC
: 280 VDC
: 380 VDC
: 425 VDC
Tbp : 25 ℃

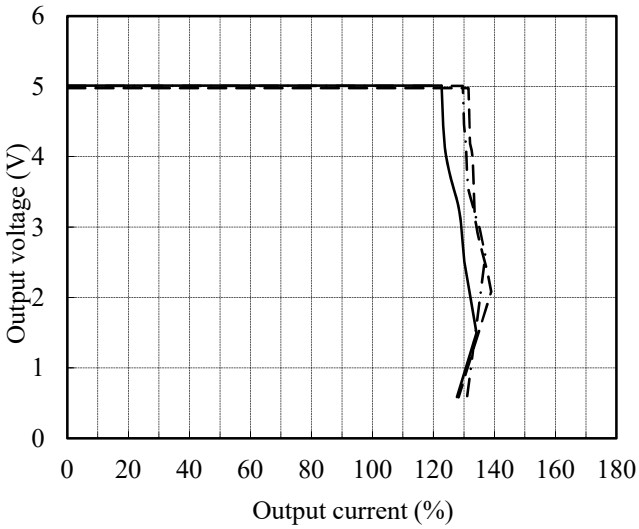
ベースプレート温度依存性
Base-plate temperature dependence

Conditions Vin : 280 VDC
Tbp : -40 ℃
: 25 ℃
: 100 ℃

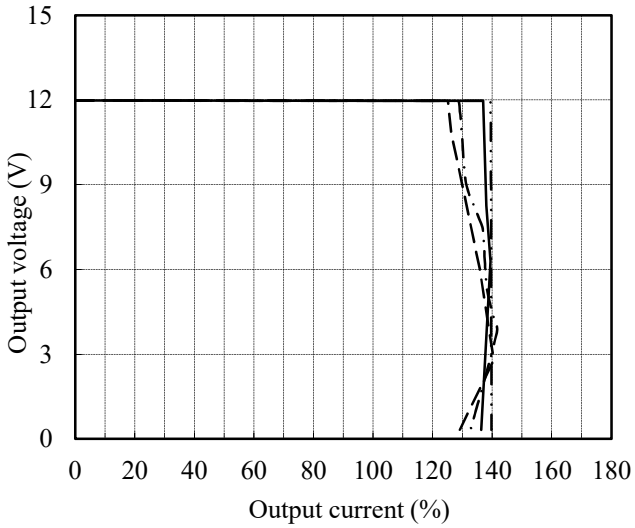
5V



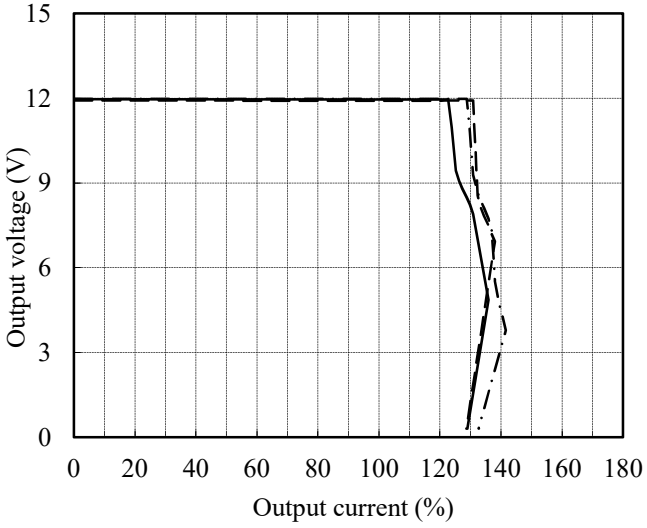
5V



12V



12V



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

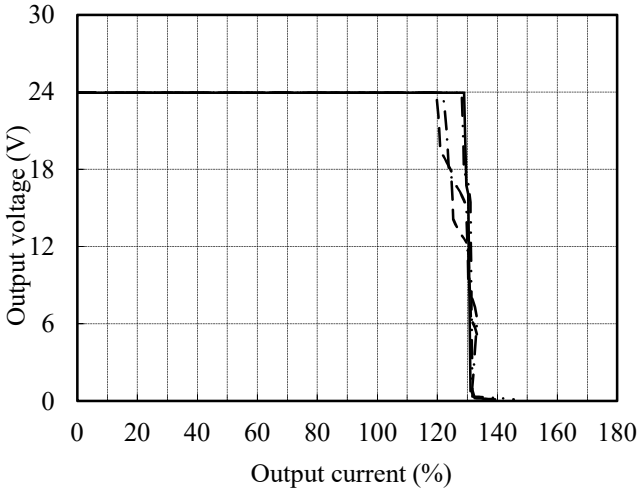
入力電圧依存性
Input voltage dependence

Conditions Vin : 200 VDC
: 280 VDC
: 380 VDC
: 425 VDC
Tbp : 25 ℃

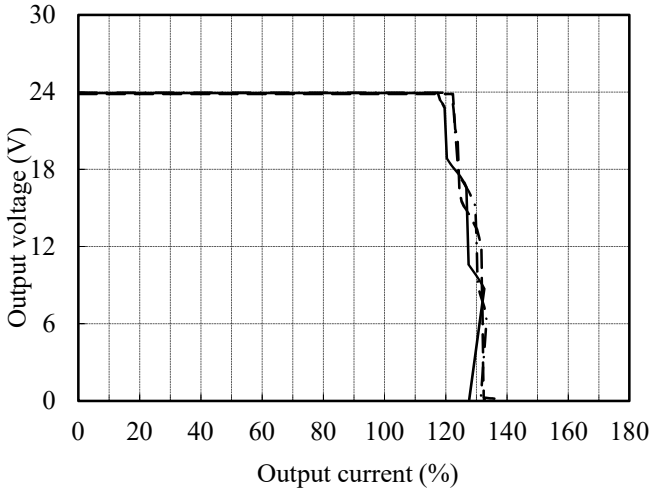
ベースプレート温度依存性
Base-plate temperature dependence

Conditions Vin : 280 VDC
Tbp : -40 ℃
: 25 ℃
: 100 ℃

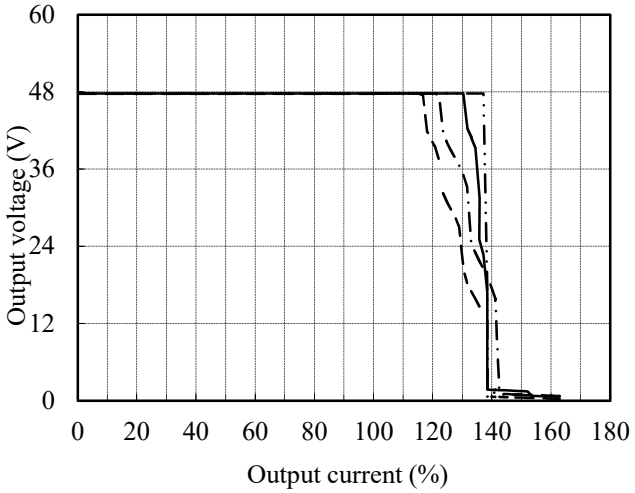
24V



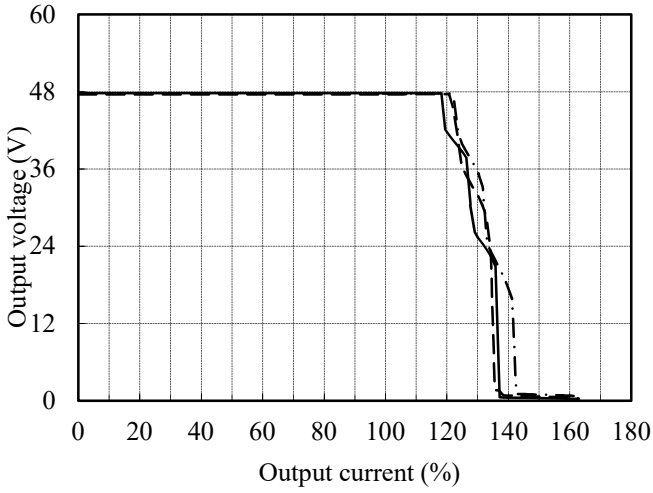
24V



48V



48V

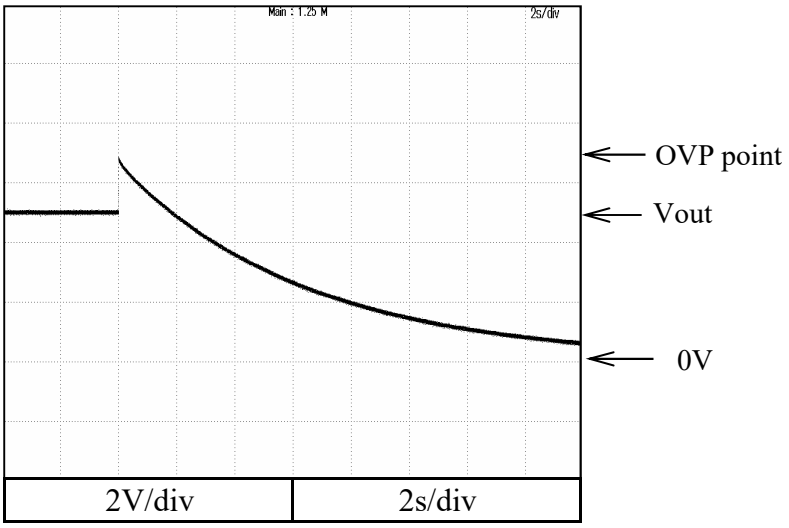


2.5 過電圧保護特性

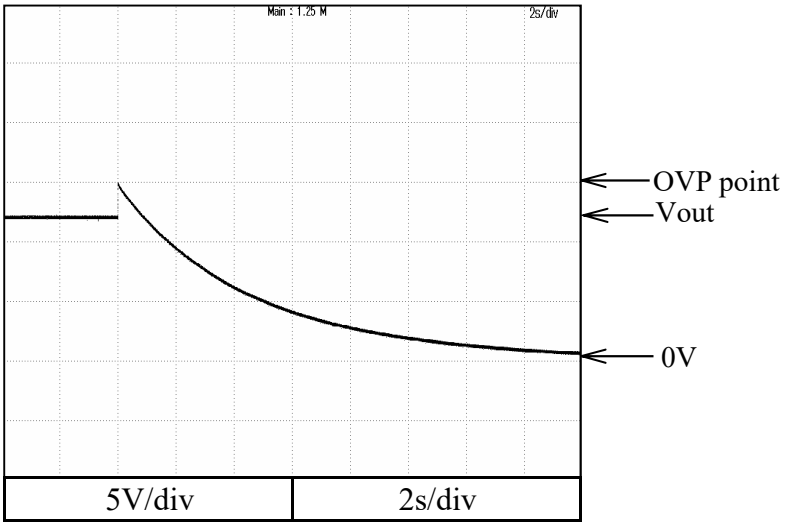
Over voltage protection (OVP) characteristics

Conditions：Vin : 280VDC
Iout : 0%
Ta : 25°C

5V



12V

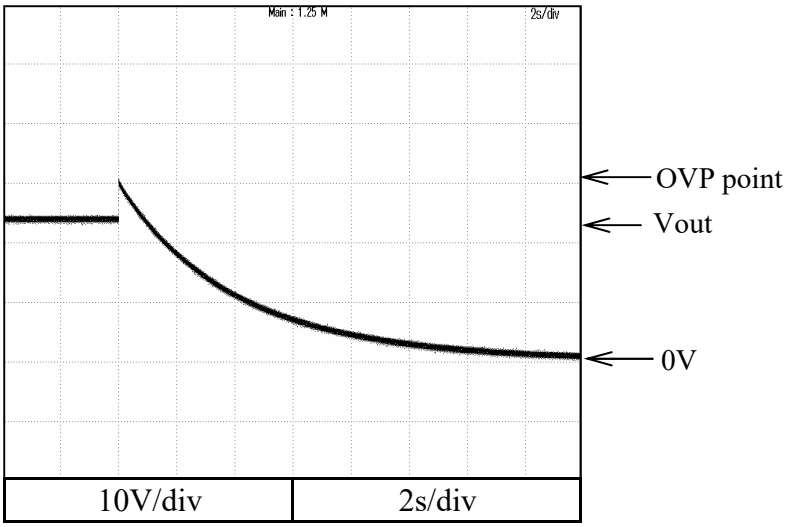


2.5 過電圧保護特性

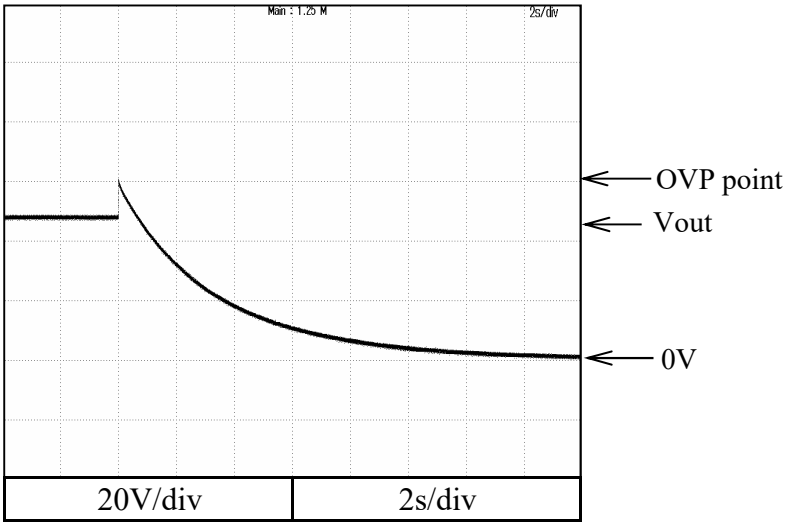
Over voltage protection (OVP) characteristics

Conditions：Vin : 280VDC
Iout : 0%
Ta : 25°C

24V



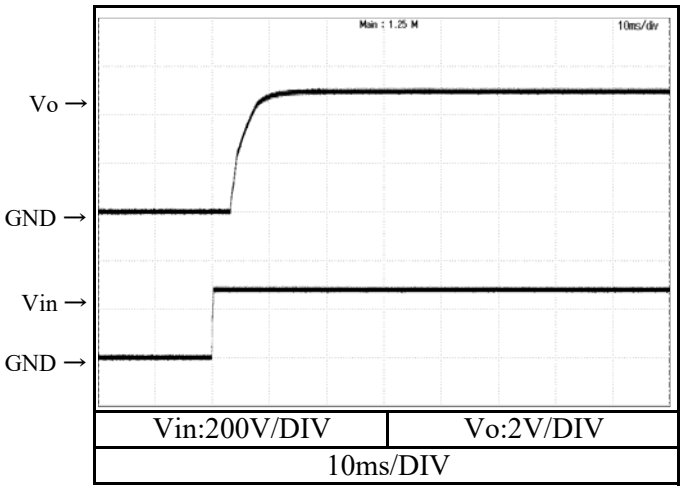
48V



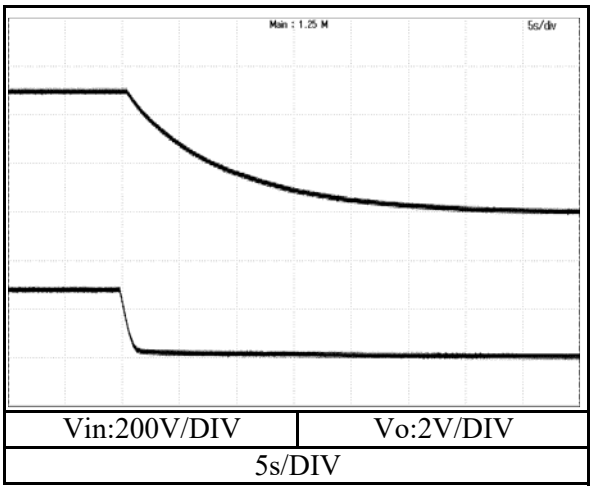
2.6 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

Conditions Vin : 280 VDC
Io : 0 %
Tbp : 25 ℃

5V

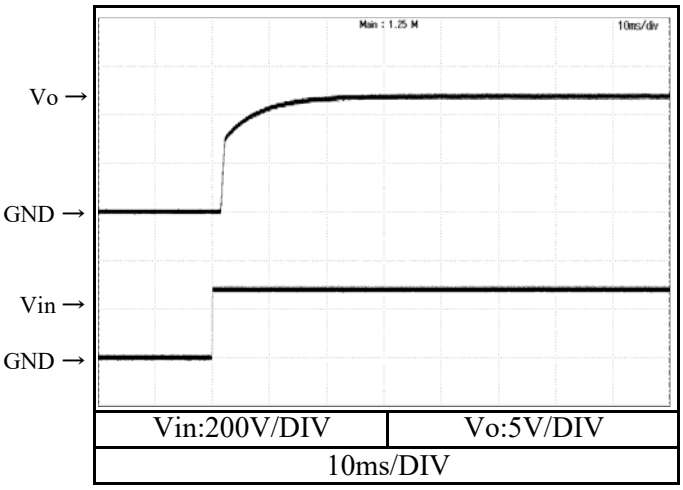


Vin:200V/DIV	Vo:2V/DIV
10ms/DIV	

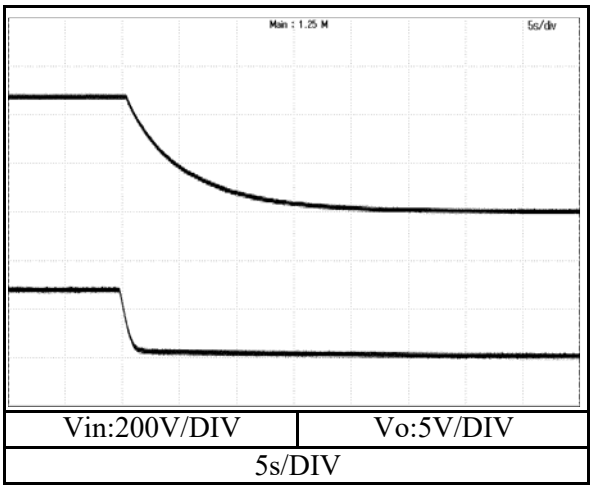


Vin:200V/DIV	Vo:2V/DIV
5s/DIV	

12V



Vin:200V/DIV	Vo:5V/DIV
10ms/DIV	

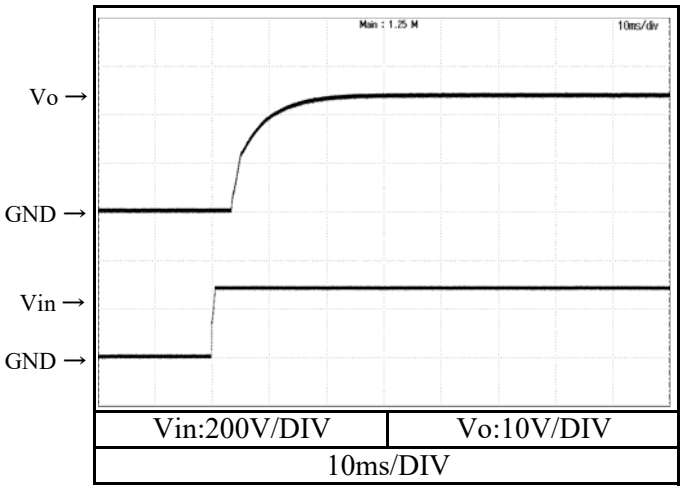


Vin:200V/DIV	Vo:5V/DIV
5s/DIV	

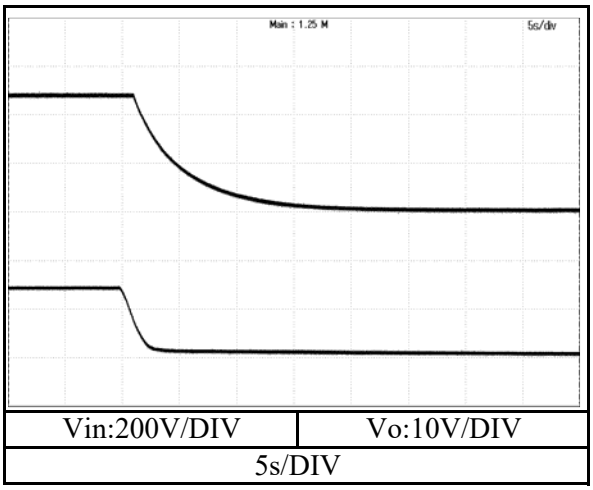
2.6 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

Conditions Vin : 280 VDC
Io : 0 %
Tbp : 25 ℃

24V

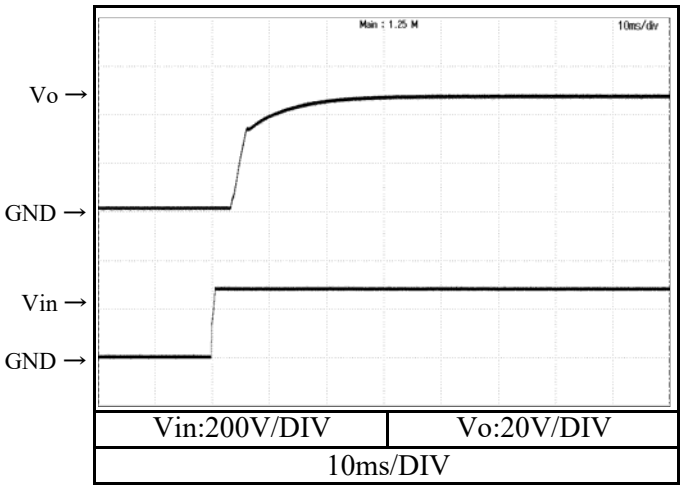


Vin:200V/DIV	Vo:10V/DIV
10ms/DIV	

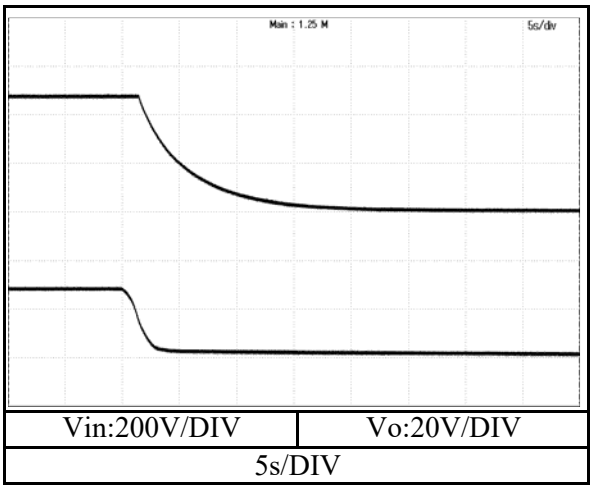


Vin:200V/DIV	Vo:10V/DIV
5s/DIV	

48V



Vin:200V/DIV	Vo:20V/DIV
10ms/DIV	

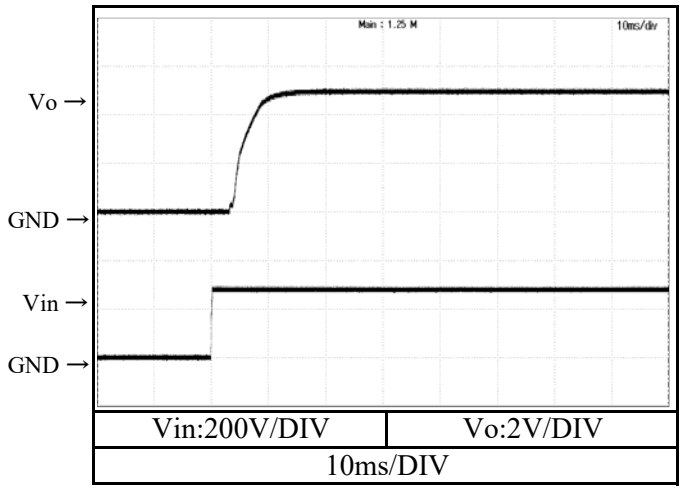


Vin:200V/DIV	Vo:20V/DIV
5s/DIV	

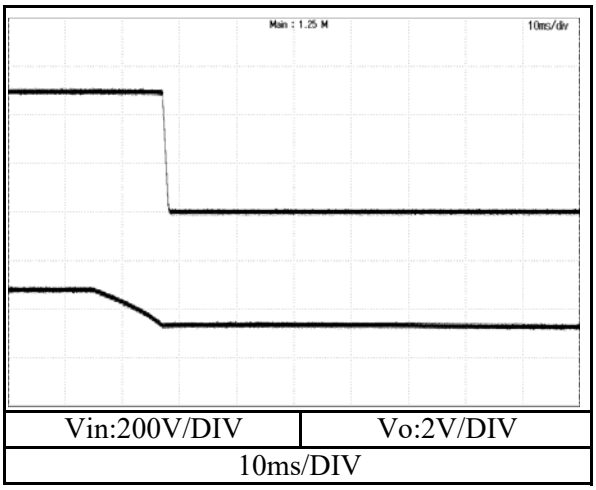
2.6 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

5V

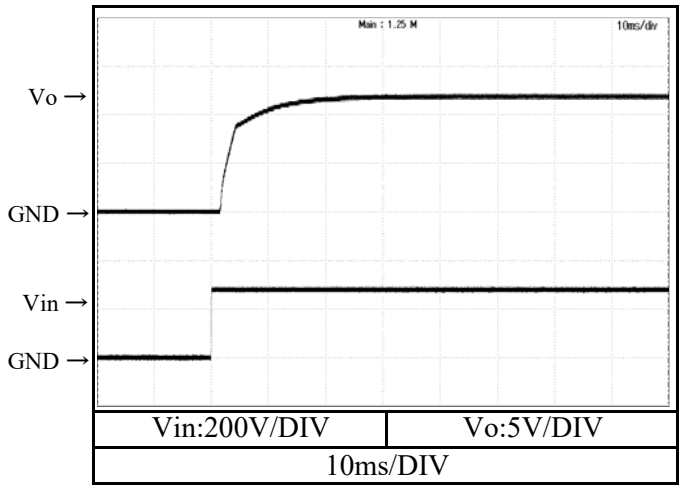


Vin:200V/DIV	Vo:2V/DIV
10ms/DIV	

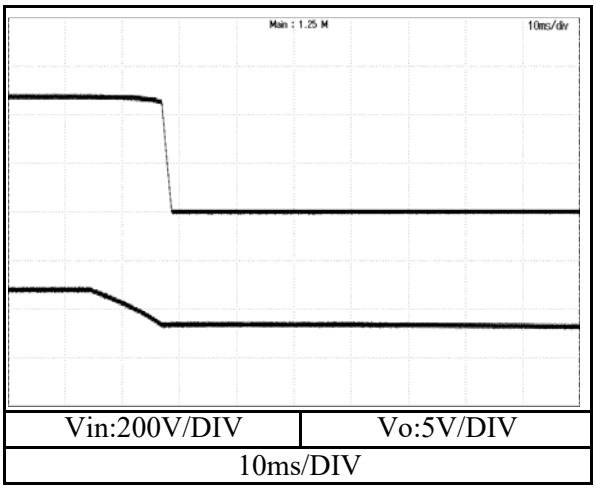


Vin:200V/DIV	Vo:2V/DIV
10ms/DIV	

12V



Vin:200V/DIV	Vo:5V/DIV
10ms/DIV	

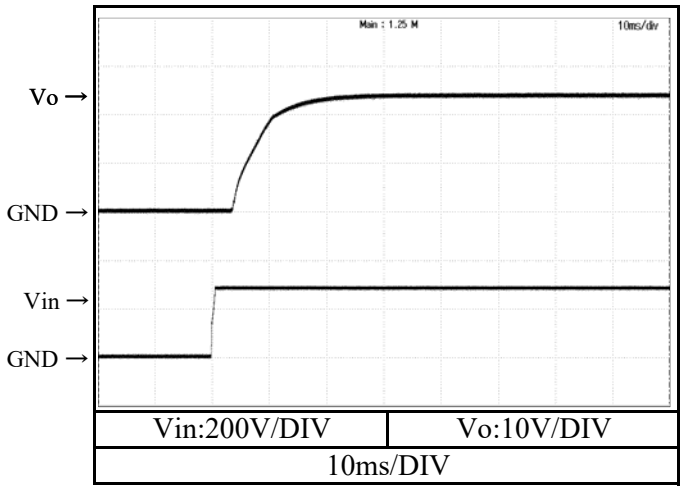


Vin:200V/DIV	Vo:5V/DIV
10ms/DIV	

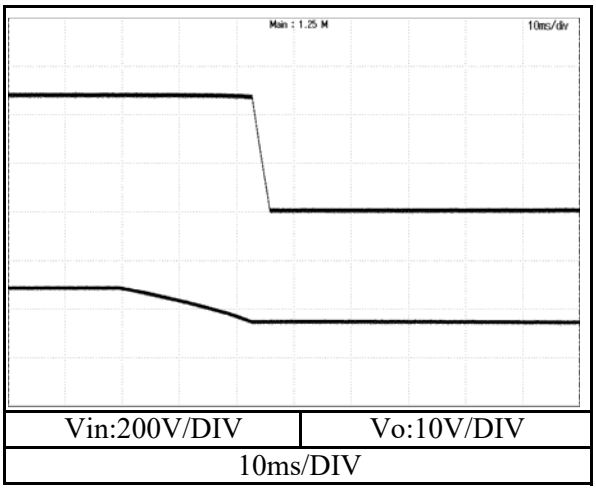
2.6 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

24V

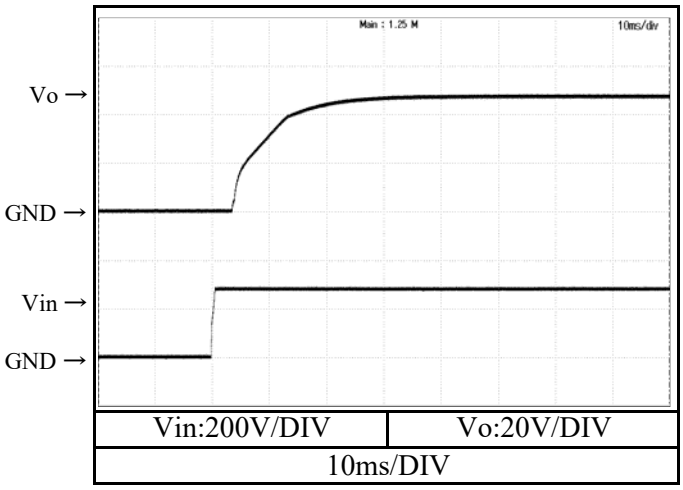


Vin:200V/DIV	Vo:10V/DIV
10ms/DIV	

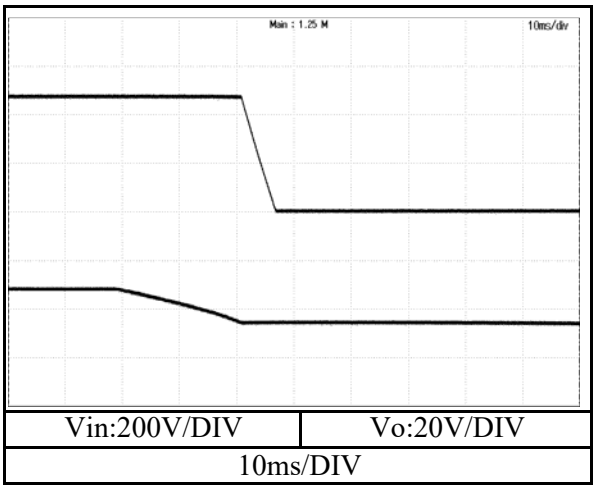


Vin:200V/DIV	Vo:10V/DIV
10ms/DIV	

48V



Vin:200V/DIV	Vo:20V/DIV
10ms/DIV	

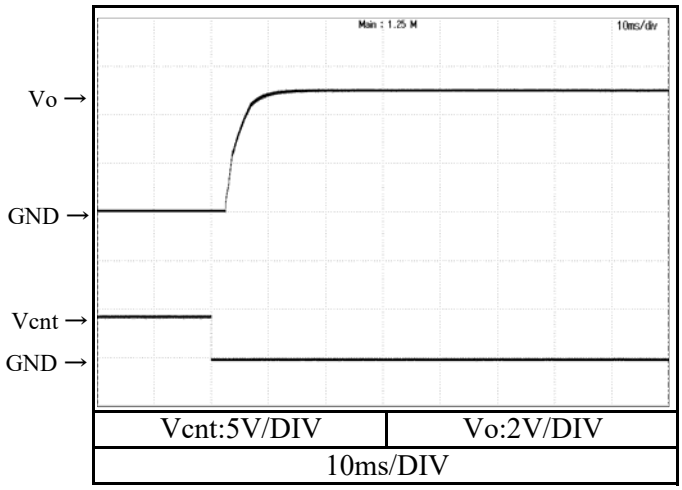


Vin:200V/DIV	Vo:20V/DIV
10ms/DIV	

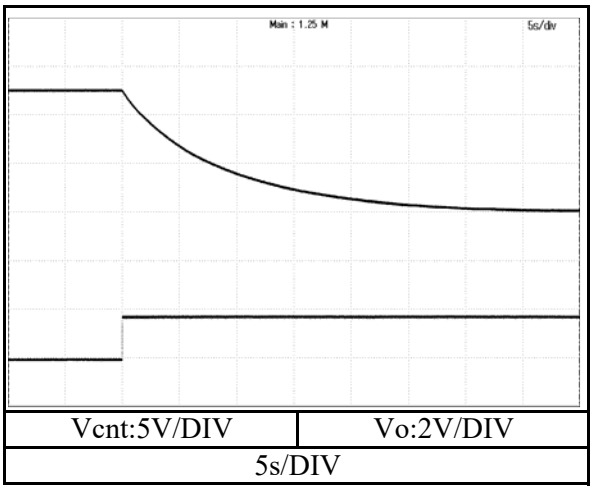
2.6 出力立ち上がり、立ち下がり特性 （ON/OFFコントロール時）

Output rise and fall characteristics with ON/OFF CONTROL　　Conditions　　Vin : 280 VDC
Io : 0 %
Tbp : 25 ℃

5V

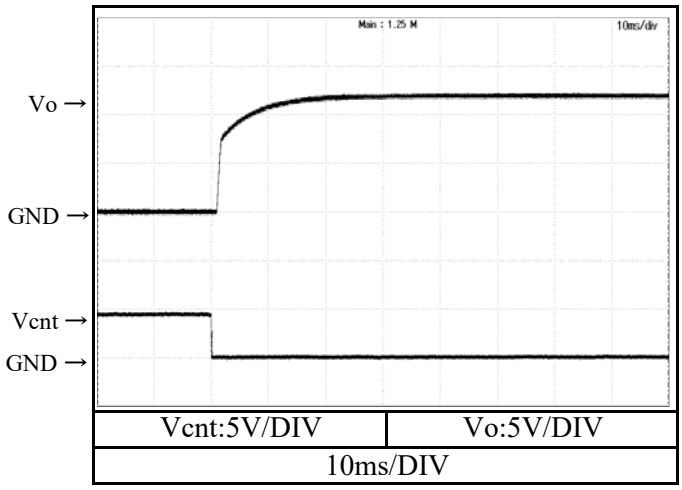


Vcnt:5V/DIV	Vo:2V/DIV
10ms/DIV	

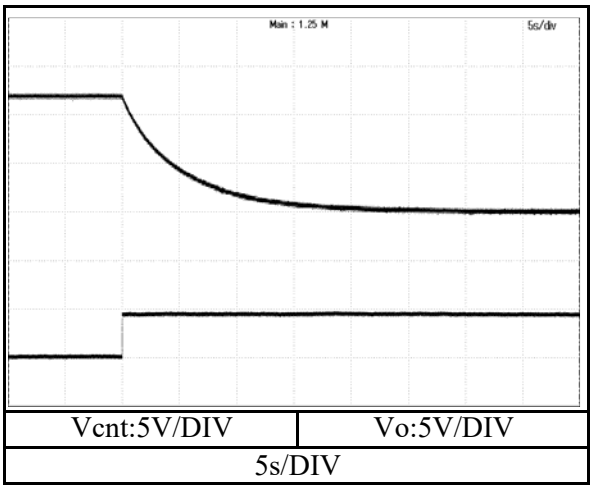


Vcnt:5V/DIV	Vo:2V/DIV
5s/DIV	

12V



Vcnt:5V/DIV	Vo:5V/DIV
10ms/DIV	

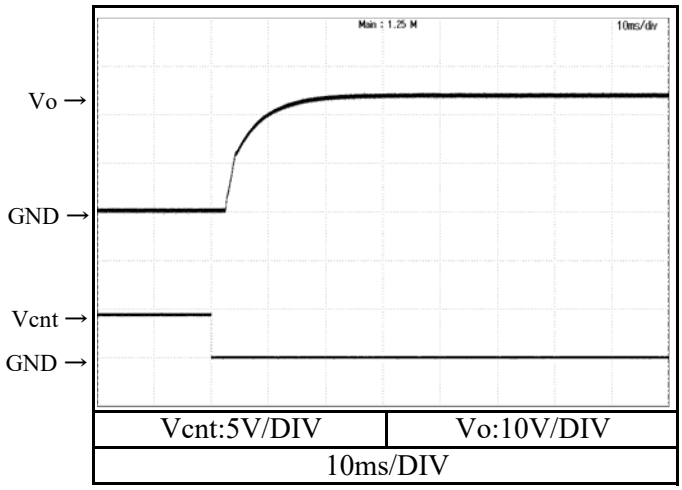


Vcnt:5V/DIV	Vo:5V/DIV
5s/DIV	

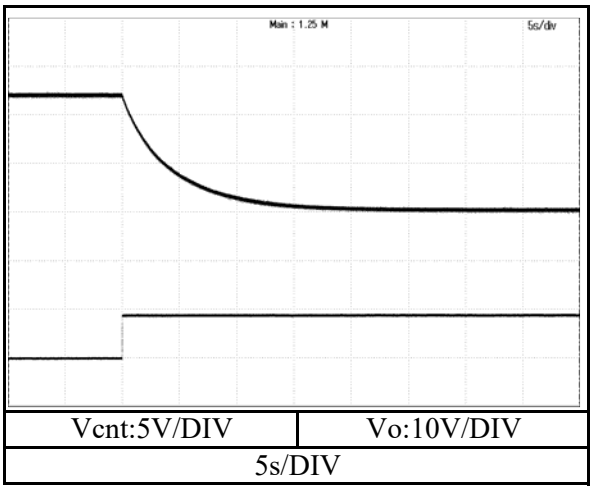
2.6 出力立ち上がり、立ち下がり特性 （ON/OFFコントロール時）

Output rise and fall characteristics with ON/OFF CONTROL　　Conditions　　Vin : 280 VDC
Io : 0 %
Tbp : 25 ℃

24V

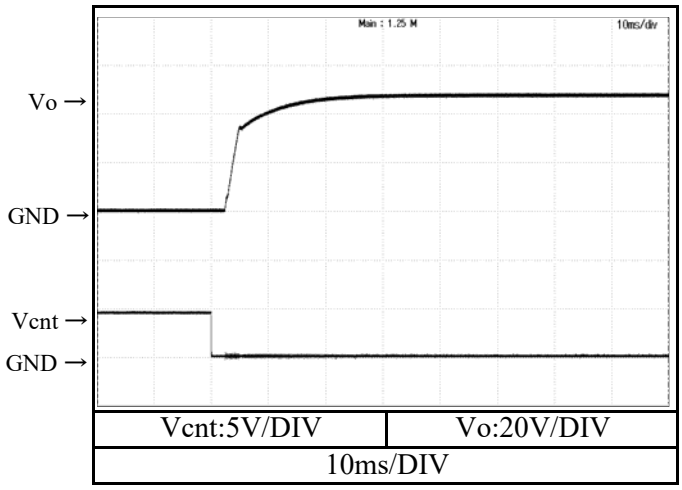


Vcnt:5V/DIV	Vo:10V/DIV
10ms/DIV	

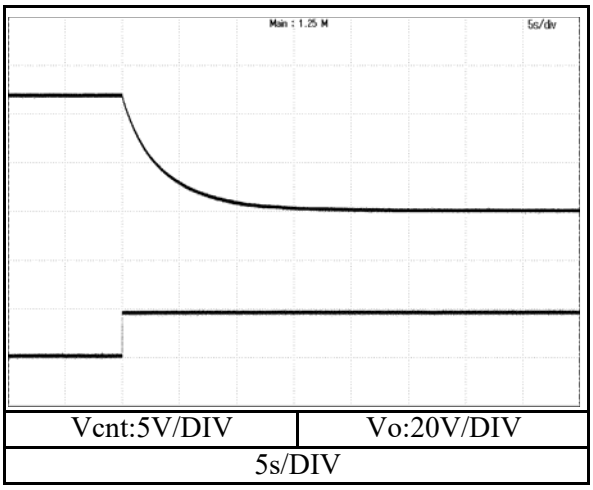


Vcnt:5V/DIV	Vo:10V/DIV
5s/DIV	

48V



Vcnt:5V/DIV	Vo:20V/DIV
10ms/DIV	

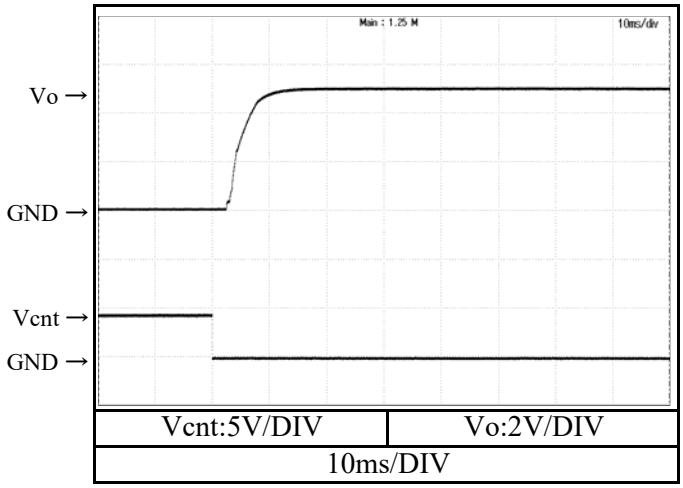


Vcnt:5V/DIV	Vo:20V/DIV
5s/DIV	

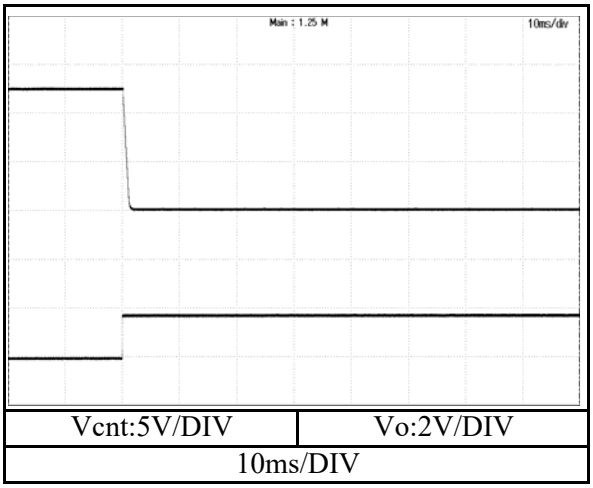
2.6 出力立ち上がり、立ち下がり特性 （ON/OFFコントロール時）

Output rise and fall characteristics with ON/OFF CONTROL　　Conditions　　Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

5V

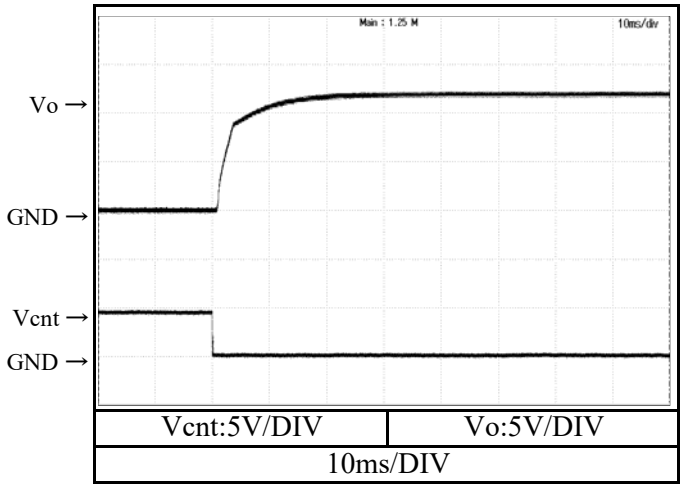


Vcnt:5V/DIV	Vo:2V/DIV
10ms/DIV	

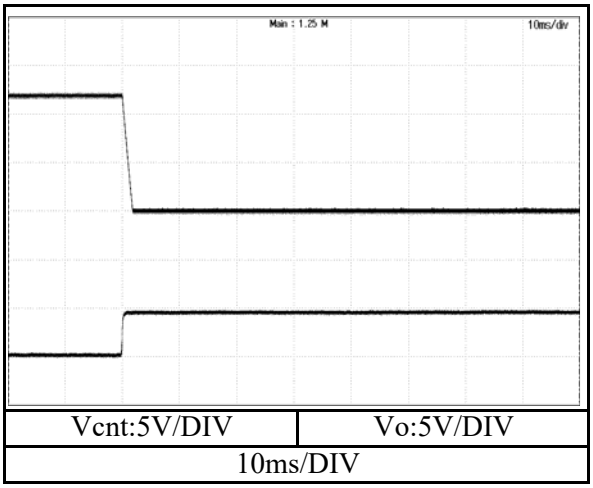


Vcnt:5V/DIV	Vo:2V/DIV
10ms/DIV	

12V



Vcnt:5V/DIV	Vo:5V/DIV
10ms/DIV	

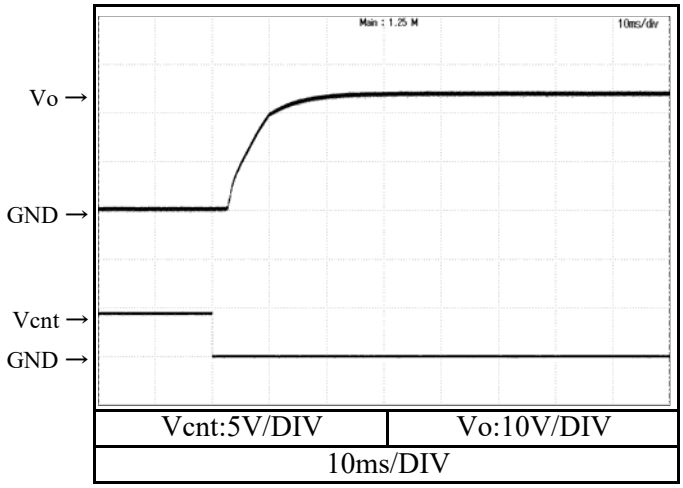


Vcnt:5V/DIV	Vo:5V/DIV
10ms/DIV	

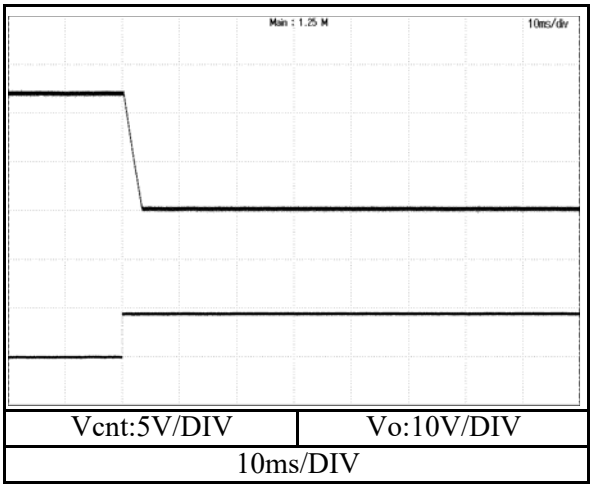
2.6 出力立ち上がり、立ち下がり特性 （ON/OFFコントロール時）

Output rise and fall characteristics with ON/OFF CONTROL　　Conditions　　Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

24V

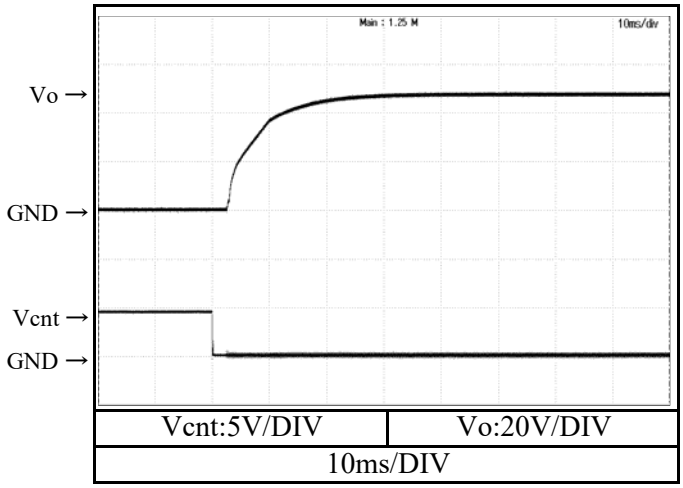


Vcnt:5V/DIV	Vo:10V/DIV
10ms/DIV	

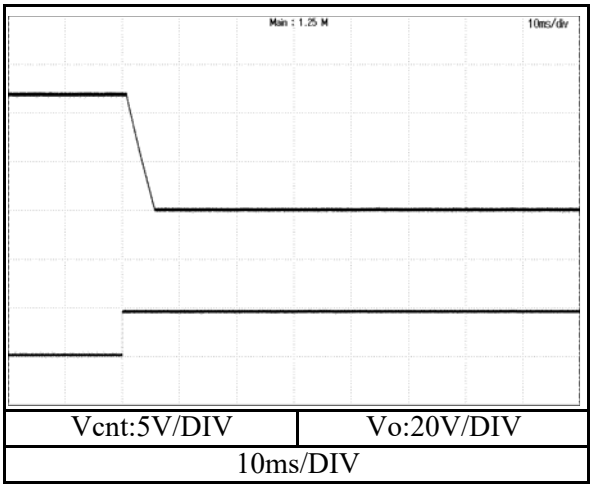


Vcnt:5V/DIV	Vo:10V/DIV
10ms/DIV	

48V



Vcnt:5V/DIV	Vo:20V/DIV
10ms/DIV	

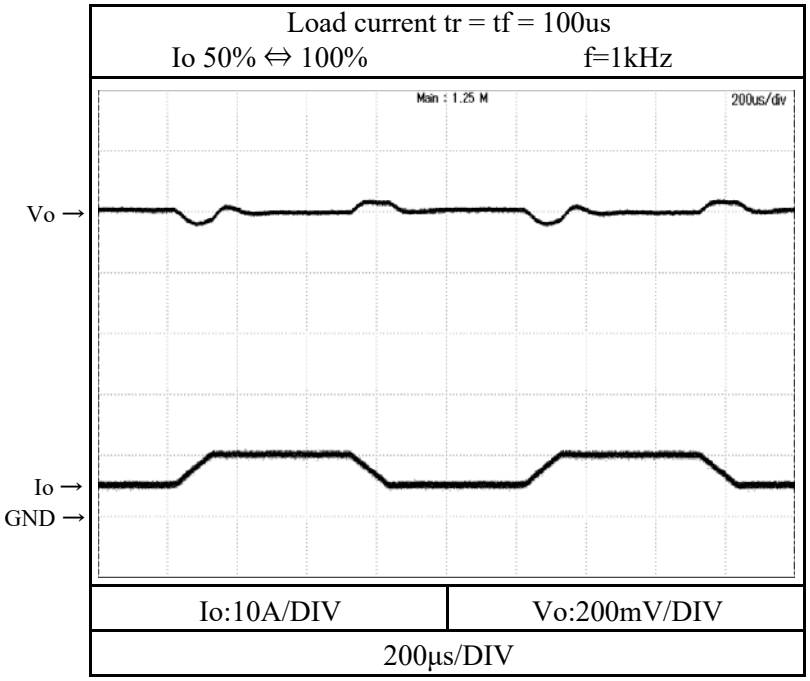


Vcnt:5V/DIV	Vo:20V/DIV
10ms/DIV	

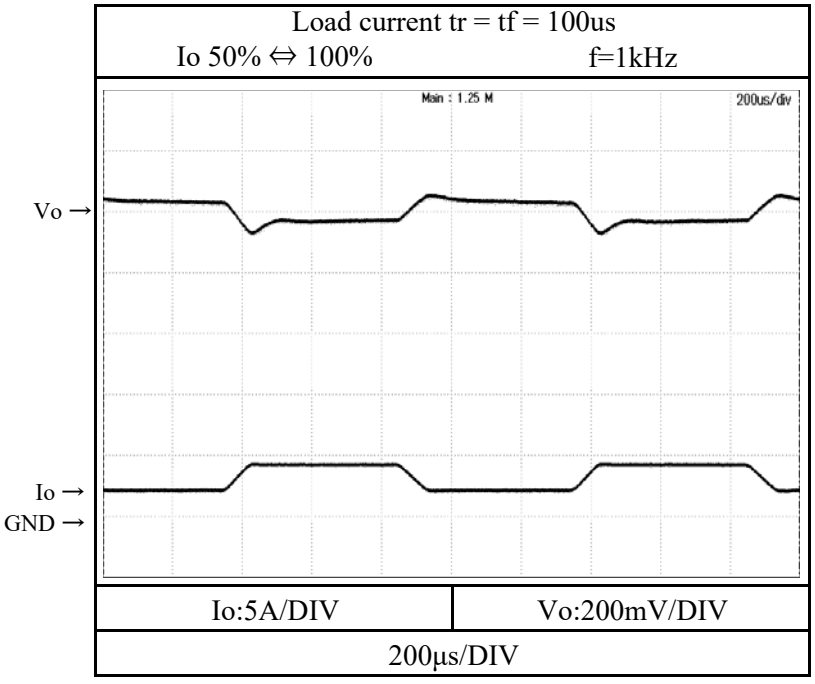
2.7 過渡応答（負荷急変）特性
Dynamic load response characteristics

Conditions Vin : 280 VDC
Tbp : 25 ℃

5V



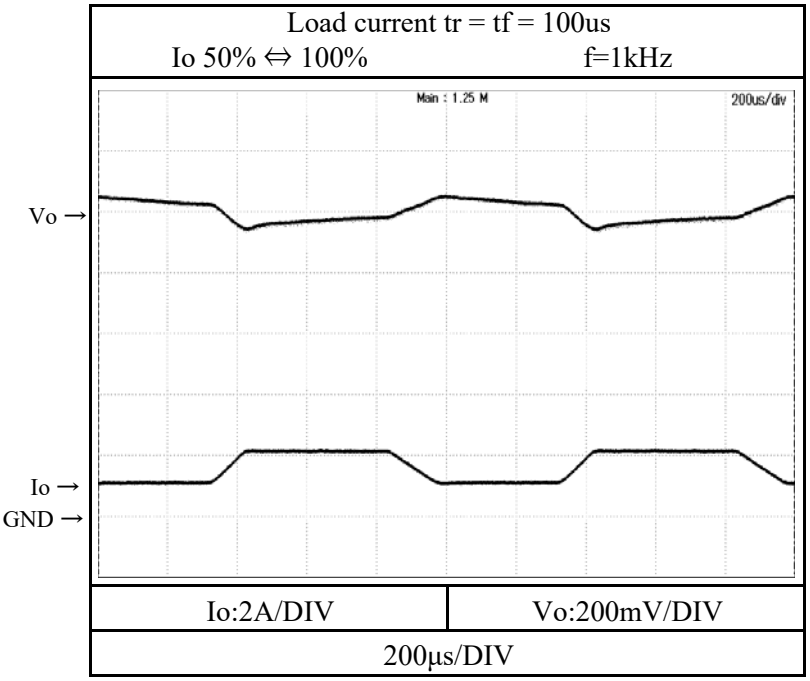
12V



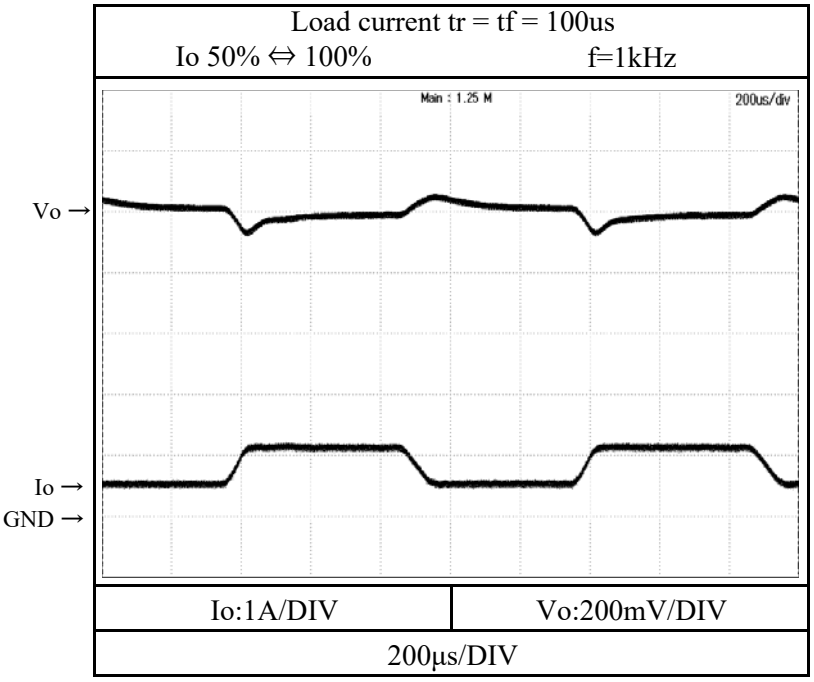
2.7 過渡応答（負荷急変）特性
Dynamic load response characteristics

Conditions Vin : 280 VDC
Tbp : 25 ℃

24V



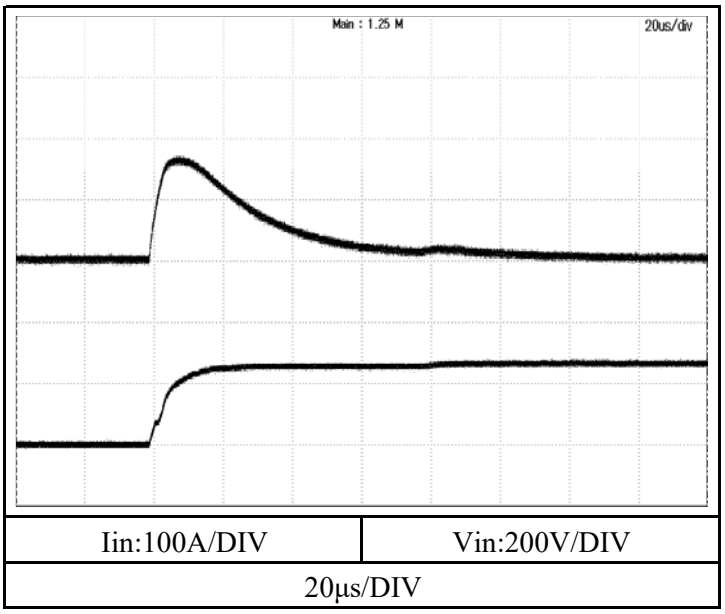
48V



2.8 入力サージ電流（突入電流）特性
Inrush current characteristics

Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

48V



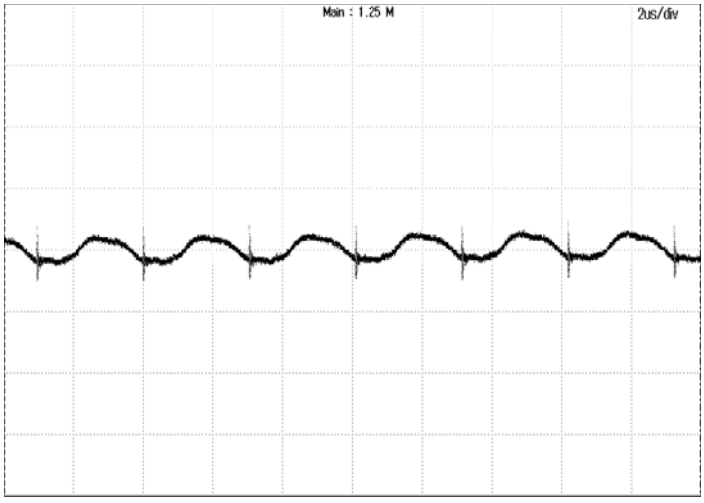
Iin:100A/DIV	Vin:200V/DIV
20μs/DIV	

2.9 出力リップル・ノイズ波形

Output ripple and noise waveform

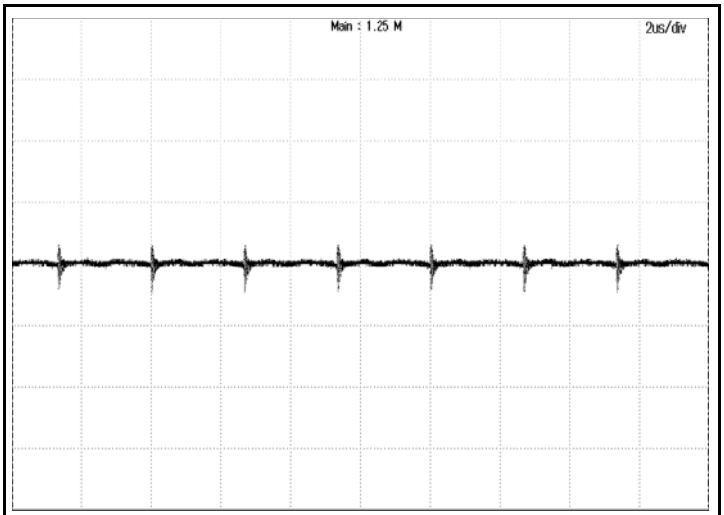
Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

5V



20mV/DIV	2μs/DIV

12V



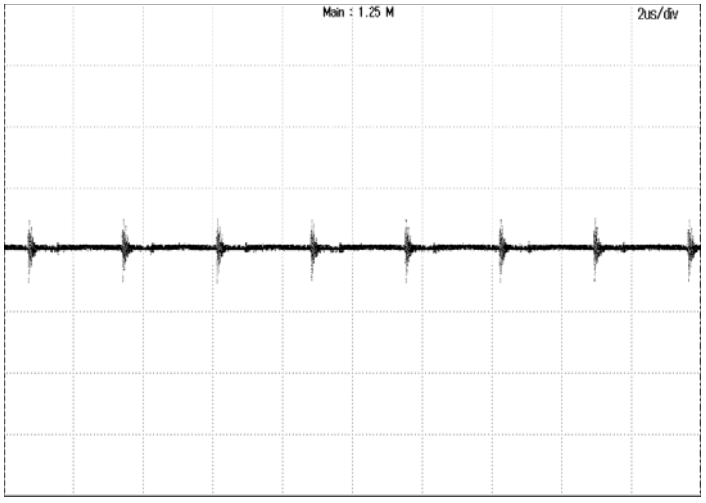
50mV/DIV	2μs/DIV

2.9 出力リップル・ノイズ波形

Output ripple and noise waveform

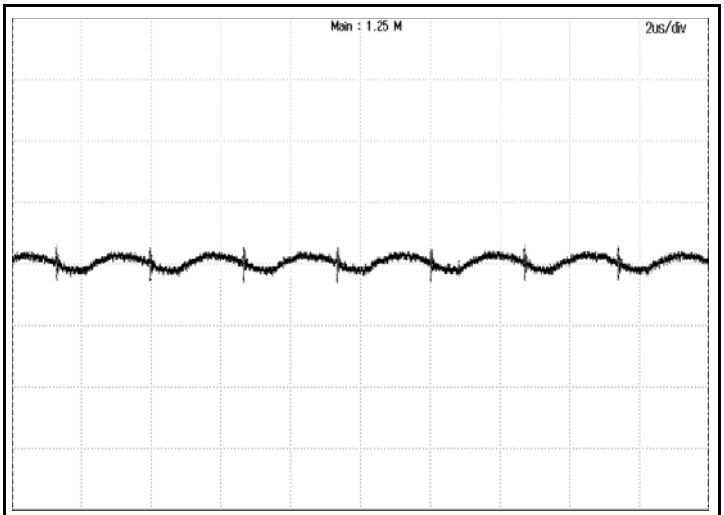
Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

24V



50mV/DIV	2μs/DIV

48V



100mV/DIV	2μs/DIV

2.10 EMI特性

Electro-Magnetic Interference characteristics

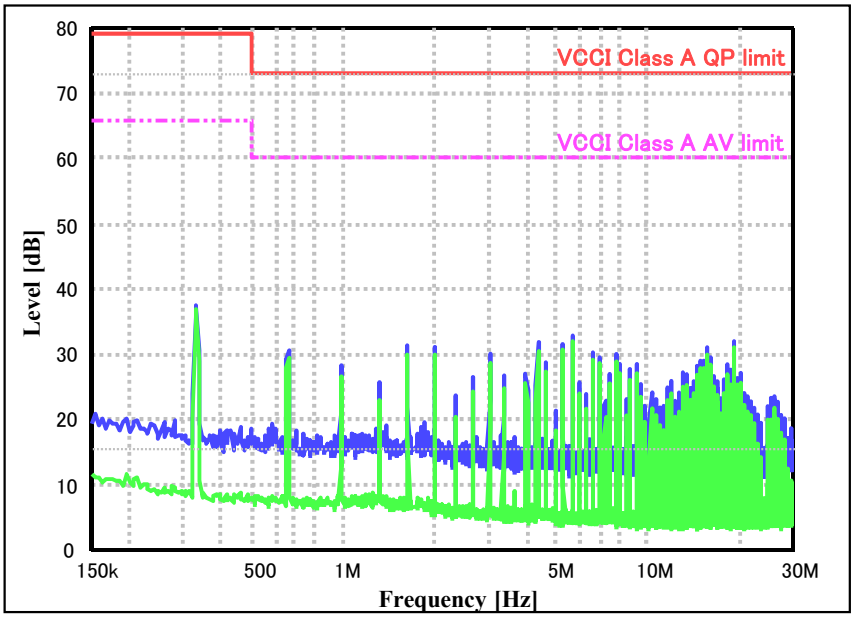
(a) 雑音端子電圧（帰還ノイズ)

Conducted Emission Noise

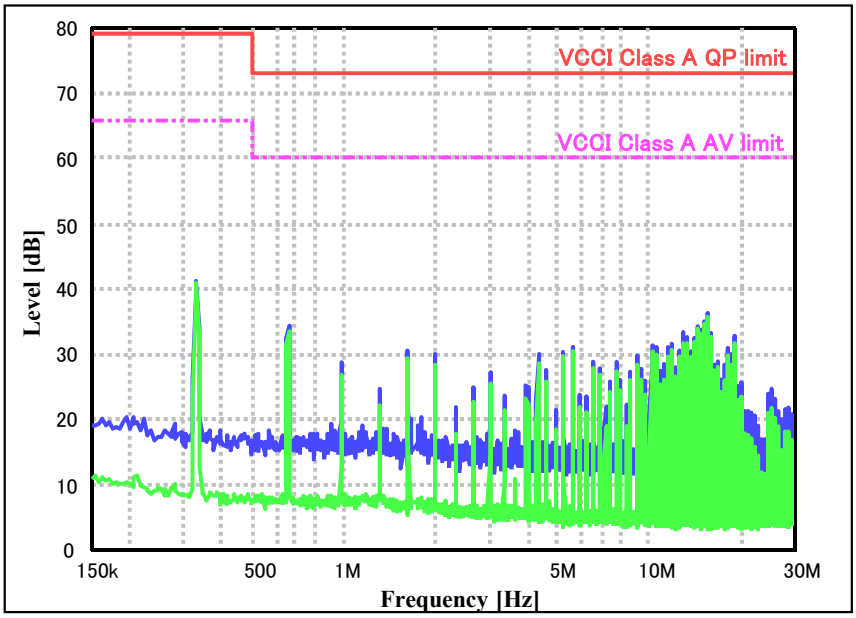
Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

5V

+Vin



-Vin



EN55011-A, EN55032-A, FCC Part.15 Subpart.B ClassAの限界値は、VCCI ClassAの限界値と同じ
Limit of EN55011-A, EN55032-A and FCC Part.15 Subpart.B ClassA are same as its VCCI ClassA.

2.10 EMI特性

Electro-Magnetic Interference characteristics

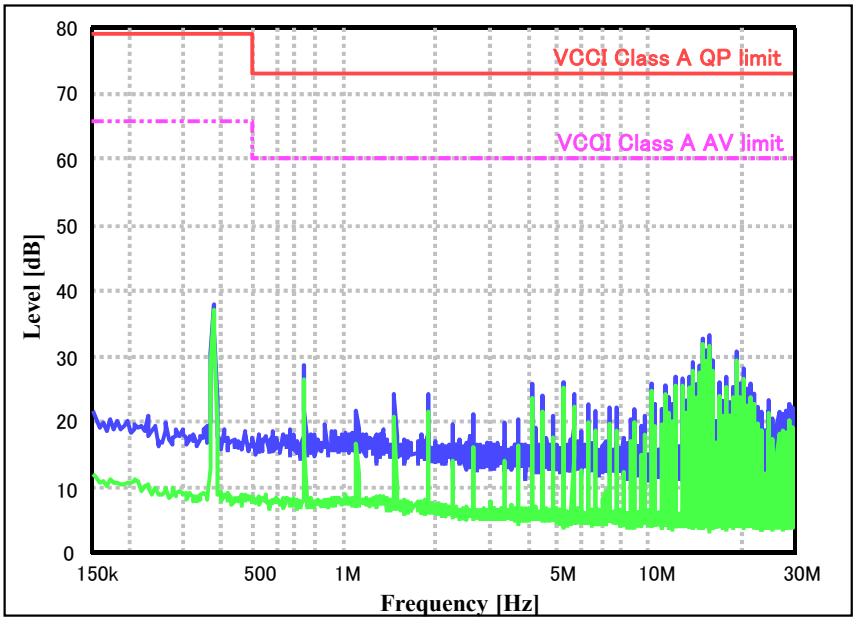
(a) 雑音端子電圧（帰還ノイズ）

Conducted Emission Noise

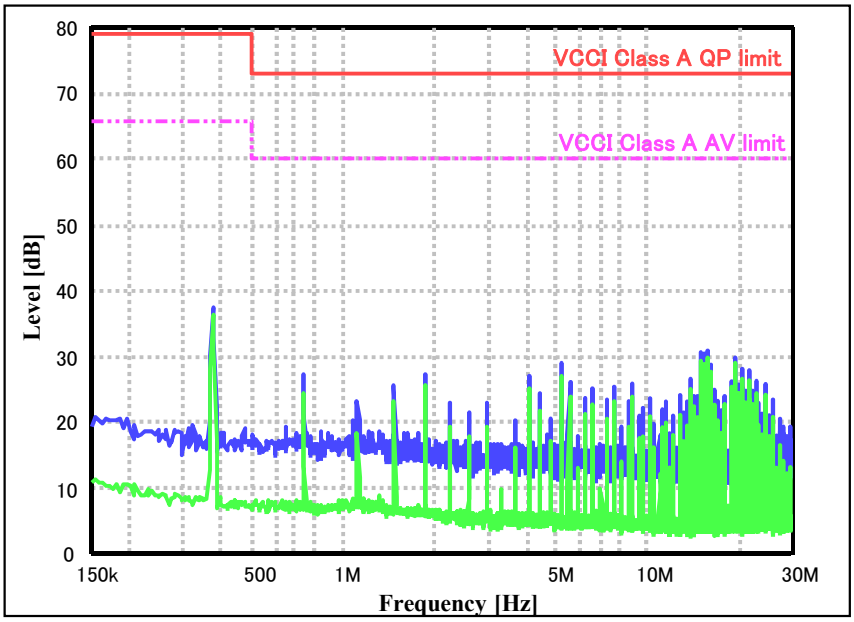
Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

12V

+Vin



-Vin



EN55011-A, EN55032-A, FCC Part.15 Subpart.B ClassAの限界値は、VCCI ClassAの限界値と同じ
Limit of EN55011-A, EN55032-A and FCC Part.15 Subpart.B ClassA are same as its VCCI ClassA.

2.10 EMI特性

Electro-Magnetic Interference characteristics

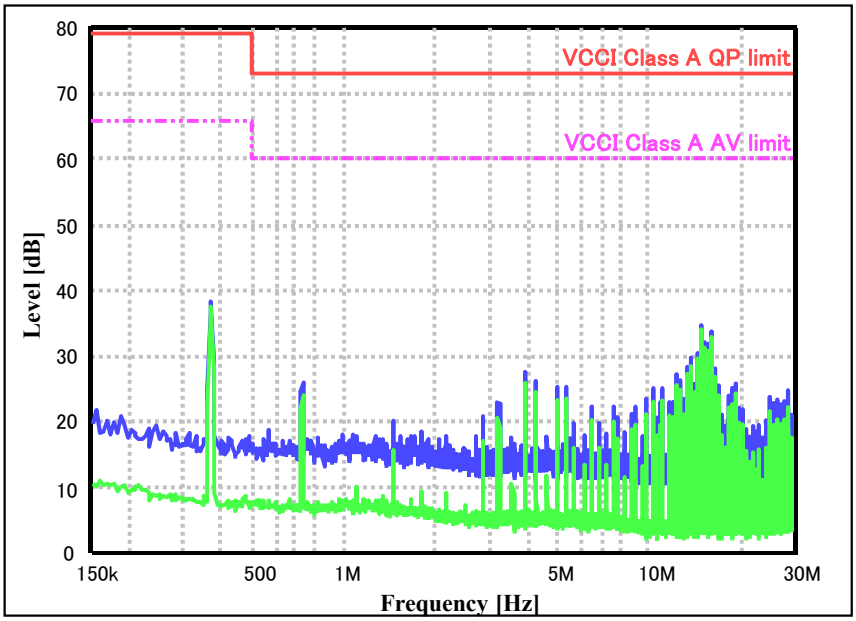
(a) 雑音端子電圧（帰還ノイズ）

Conducted Emission Noise

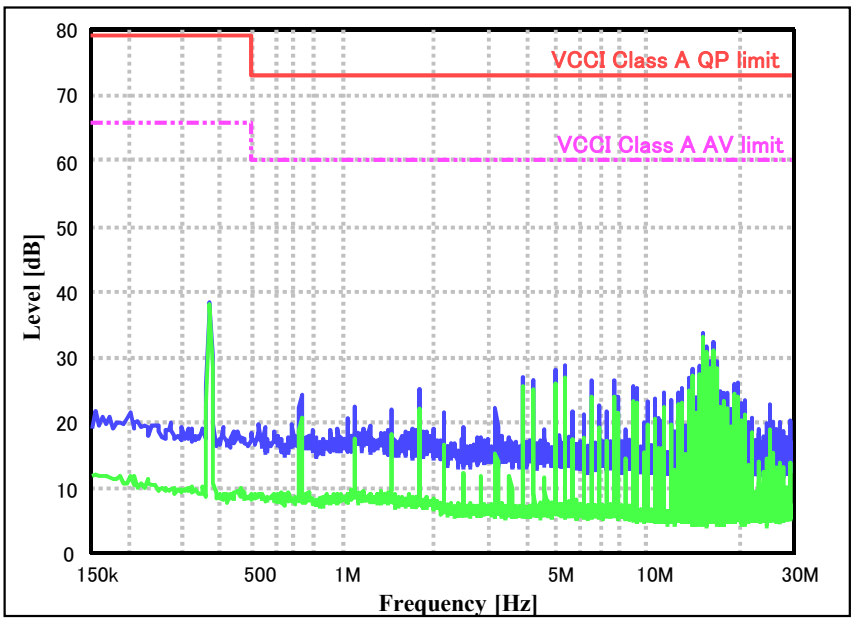
Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

24V

+Vin



-Vin



EN55011-A, EN55032-A, FCC Part.15 Subpart.B ClassAの限界値は、VCCI ClassAの限界値と同じ
Limit of EN55011-A, EN55032-A and FCC Part.15 Subpart.B ClassA are same as its VCCI ClassA.

2.10 EMI特性

Electro-Magnetic Interference characteristics

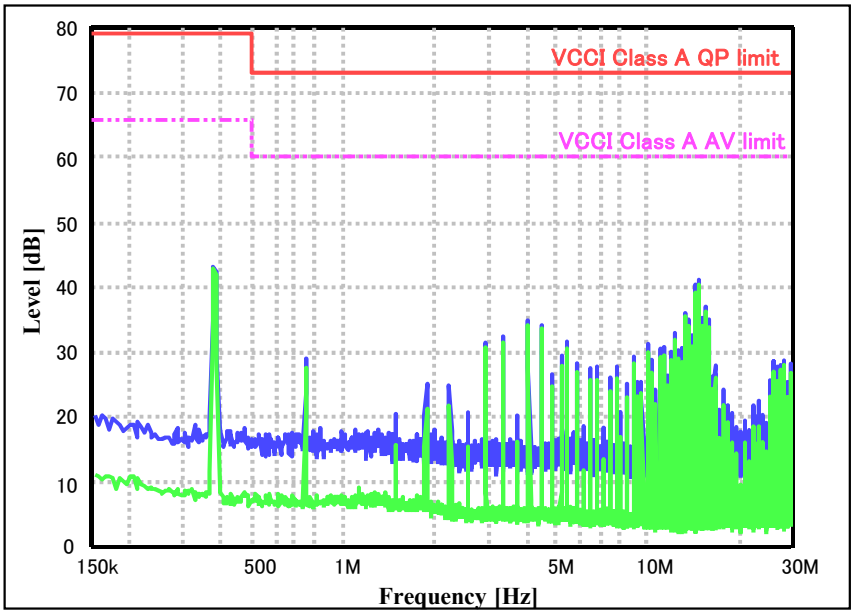
(a) 雑音端子電圧（帰還ノイズ）

Conducted Emission Noise

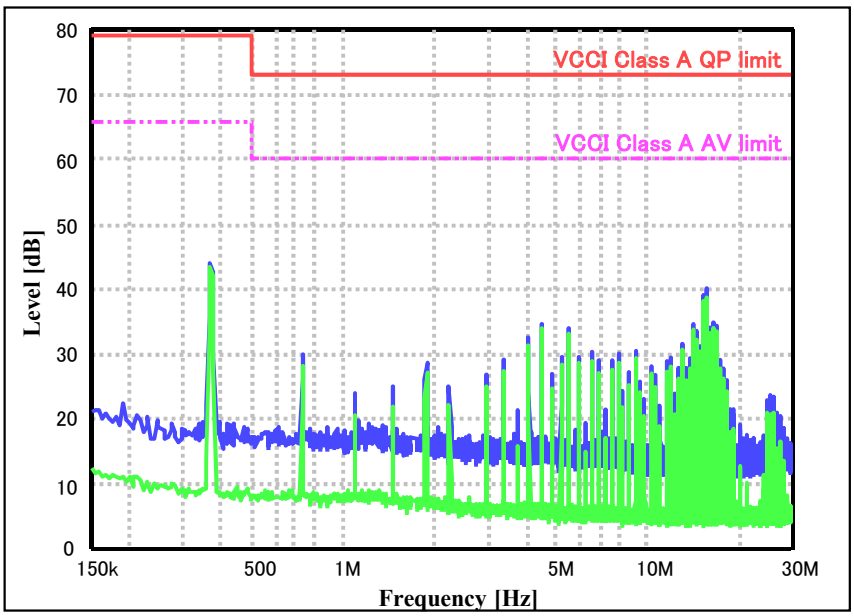
Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

48V

+Vin



-Vin



EN55011-A, EN55032-A, FCC Part.15 Subpart.B ClassAの限界値は、VCCI ClassAの限界値と同じ
Limit of EN55011-A, EN55032-A and FCC Part.15 Subpart.B ClassA are same as its VCCI ClassA.

2.10 EMI特性

Electro-Magnetic Interference characteristics

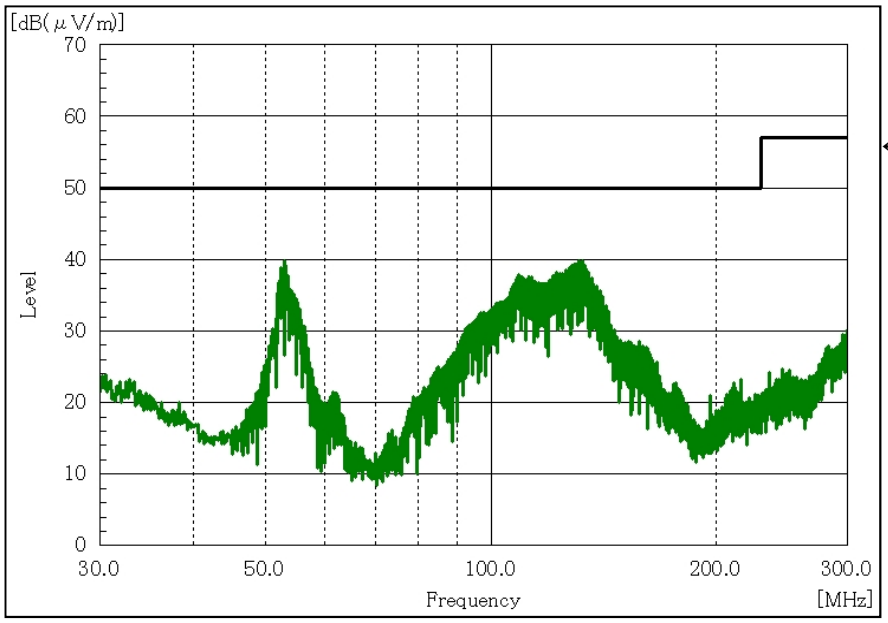
(b) 雑音電界強度（輻射ノイズ）

Radiated Emission Noise

Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

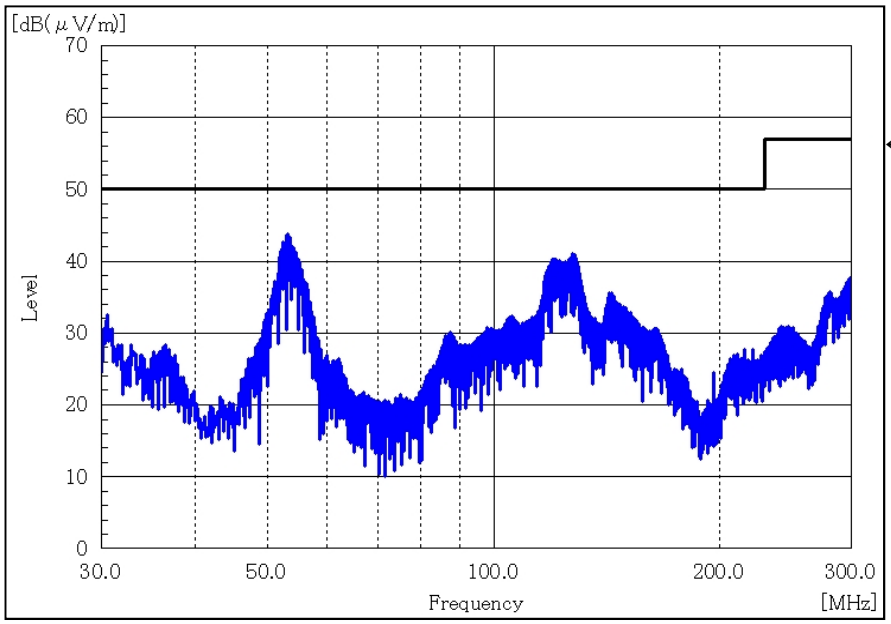
5V

HORIZONTAL



← VCCI classA
QP Limit
(Distance: 3m)

VERTICAL



← VCCI classA
QP Limit
(Distance: 3m)

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

2.10 EMI特性

Electro-Magnetic Interference characteristics

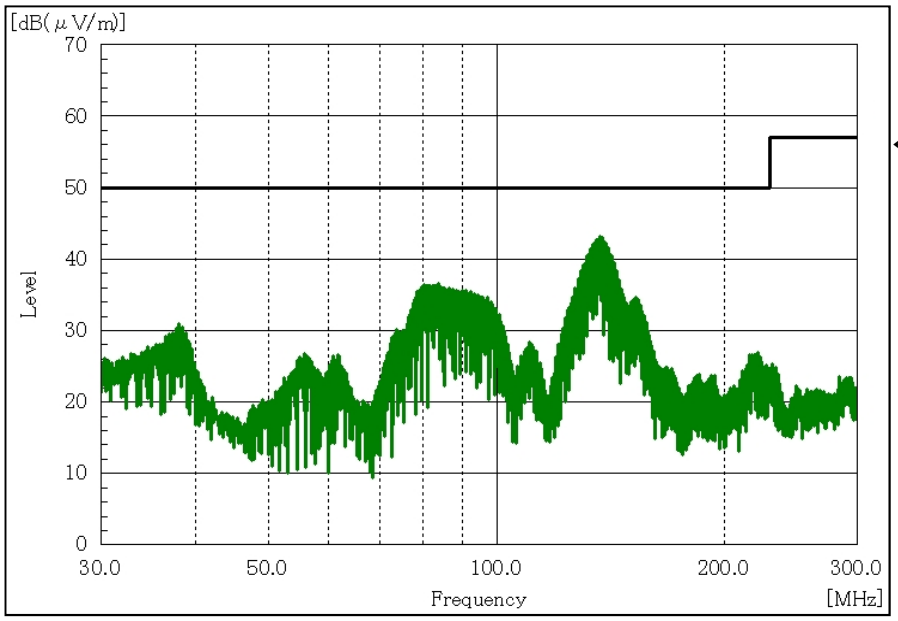
(b) 雑音電界強度（輻射ノイズ)

Radiated Emission Noise

Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

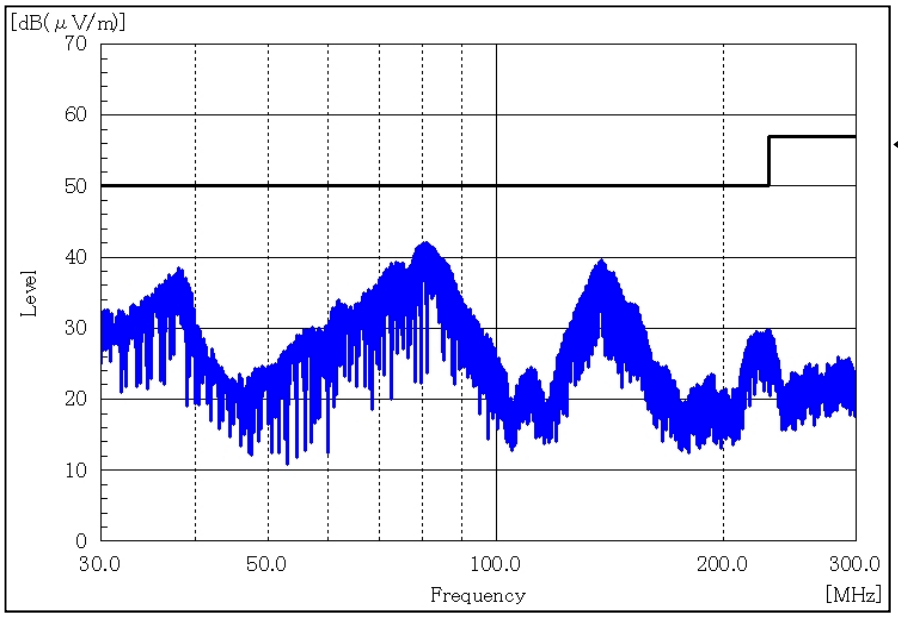
12V

HORIZONTAL



← VCCI classA
QP Limit
(Distance: 3m)

VERTICAL



← VCCI classA
QP Limit
(Distance: 3m)

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

2.10 EMI特性

Electro-Magnetic Interference characteristics

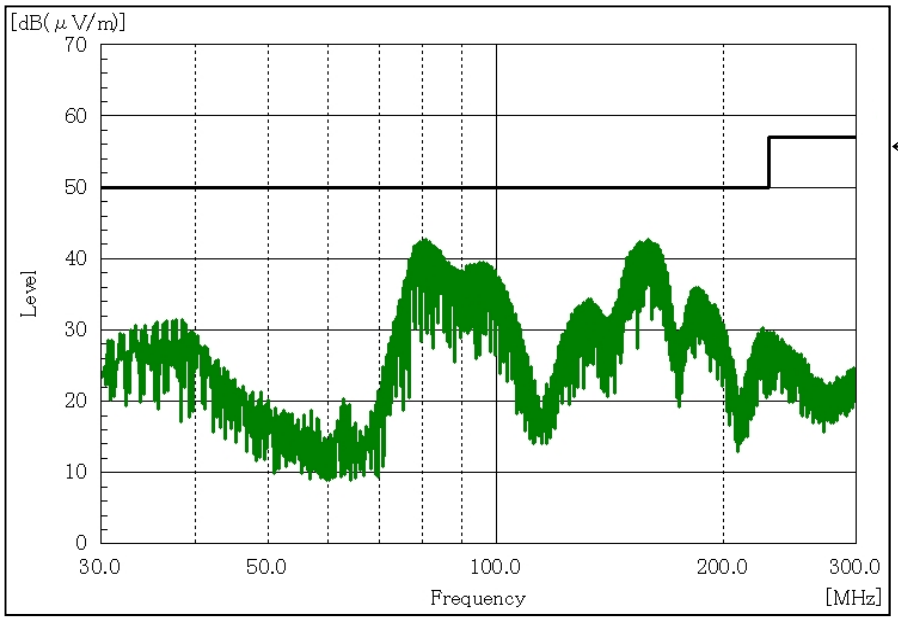
(b) 雑音電界強度（輻射ノイズ)

Radiated Emission Noise

Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

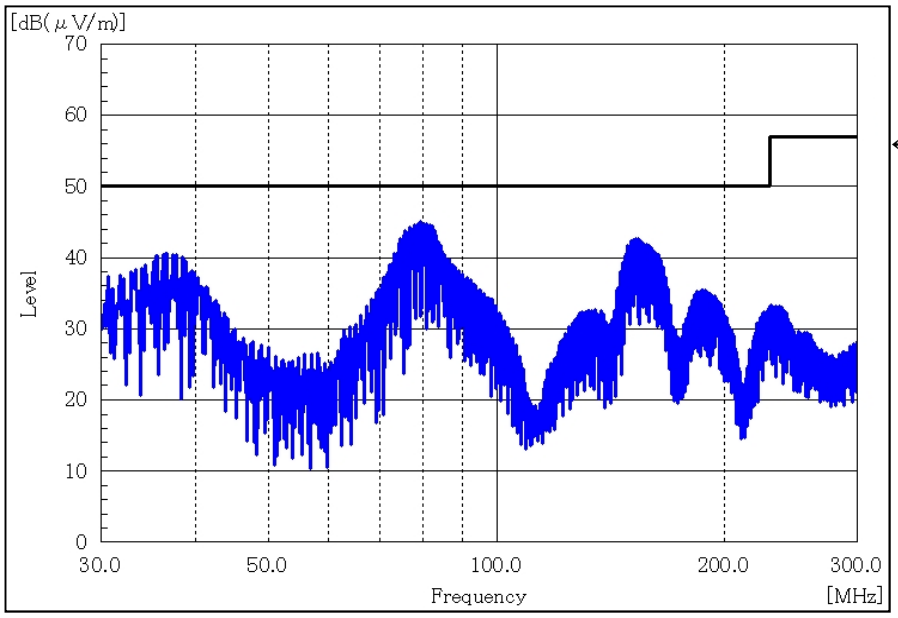
24V

HORIZONTAL



← VCCI classA
QP Limit
(Distance: 3m)

VERTICAL



← VCCI classA
QP Limit
(Distance: 3m)

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

2.10 EMI特性

Electro-Magnetic Interference characteristics

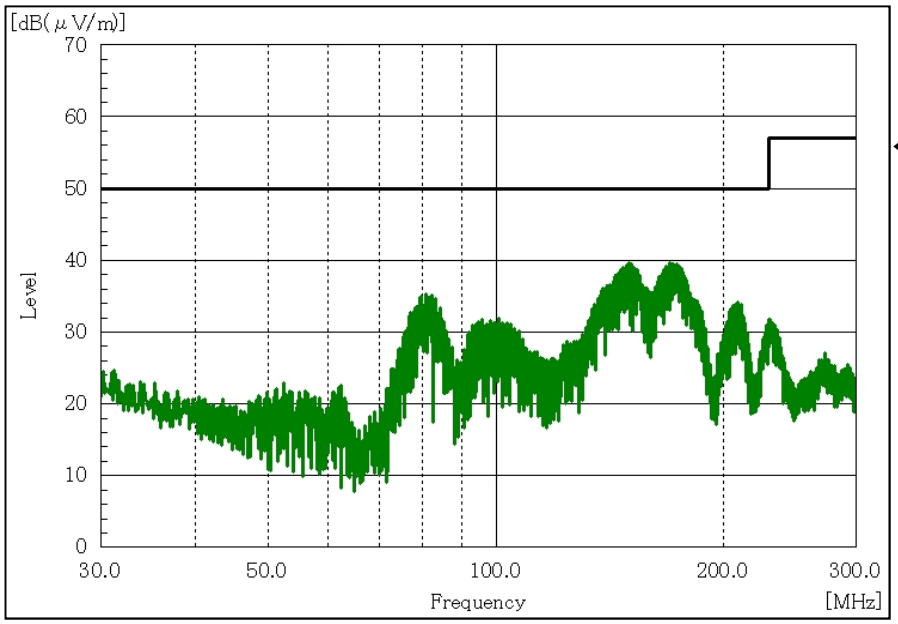
(b) 雑音電界強度（輻射ノイズ)

Radiated Emission Noise

Conditions Vin : 280 VDC
Io : 100 %
Tbp : 25 ℃

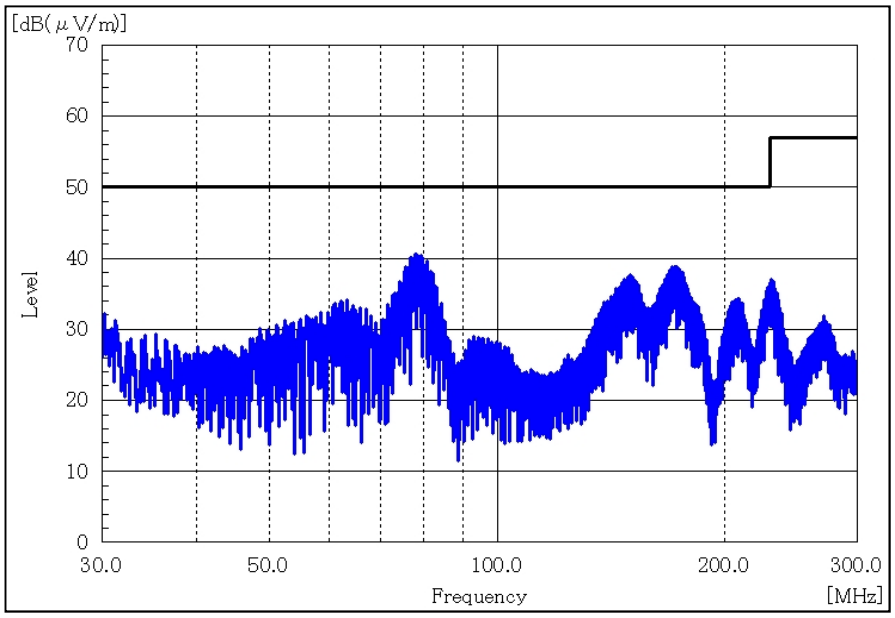
48V

HORIZONTAL



← VCCI classA
QP Limit
(Distance: 3m)

VERTICAL



← VCCI classA
QP Limit
(Distance: 3m)

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