PAF500F48-*

EVALUATION DATA

型式データ

DWG.No. C160-53-01A			
承認	承認	査閲	担当
T.Murayama	Tomioka	T.Ueno	D.Fujisaki
8/May/00	28/APR/00	28/APR/00	28/Apr/'00

DENSEI-LAMBDA

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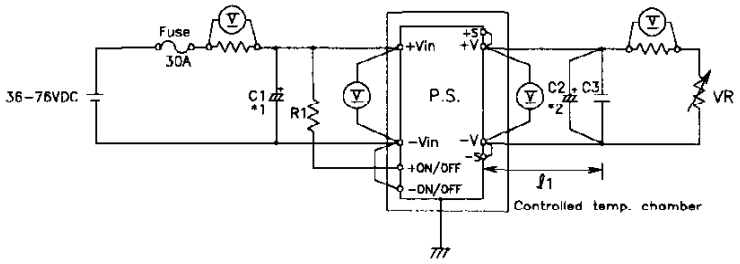
使用記号 Terminology used

	Definition
Vin	.....入力電圧 Input Voltage
Vout	.....出力電圧 Output Voltage
Von/off	.....ON/OFF電圧 ON/OFF Voltage
Iin	.....入力電流 Input Current
Iout	.....出力電流 Output Current
Tp	.....ベースプレート温度 Base-Plate Temperature

1. 測定方法　Evaluation Method

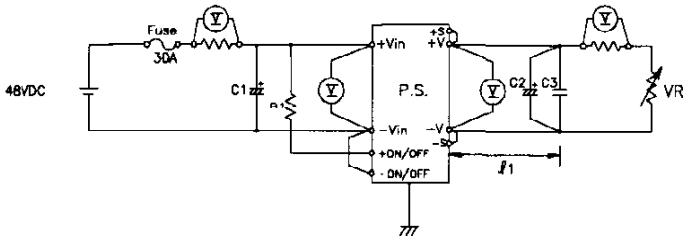
1.1 測定回路　Circuits used for determination

(1) 静特性　Steady state data



C1: 100uF Electrolytic Capacitor　　R1: 30kΩ
C2: 5V-5600uF X2Para Electrolytic Capacitor　　ℓ1: 50mm
12V-470uF Electrolytic Capacitor
28V-220uF Electrolytic Capacitor
C3: 10uF Ceramic Capacitor
==NOTE==
*1,*2. If the ambient temperature is less than -20℃,
use two pieces of the recommended capacitor above.

(2) 通電ドリフト　Warm up voltage drift characteristics



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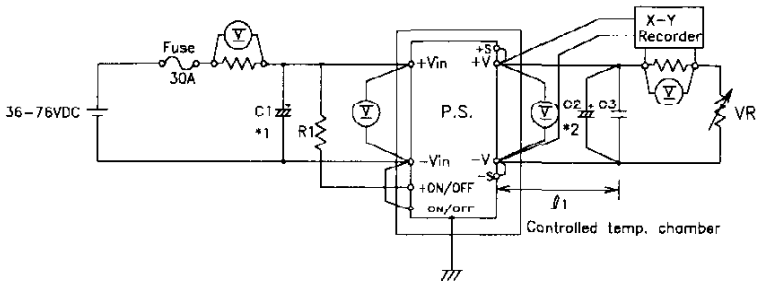
28V-220uF Electrolytic Capacitor
C3: 10uF Ceramic Capacitor

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



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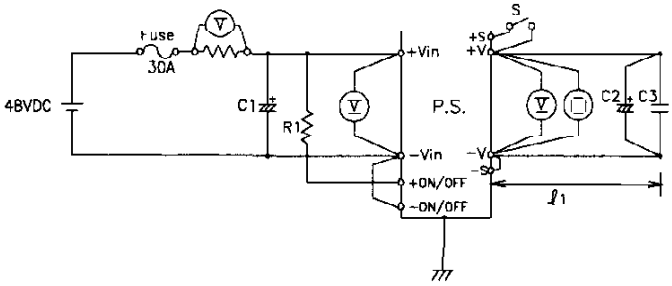
==NOTE==
*1,*2. If the ambient temperature is less than -20℃,
use two pieces of the recommended capacitor above.

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



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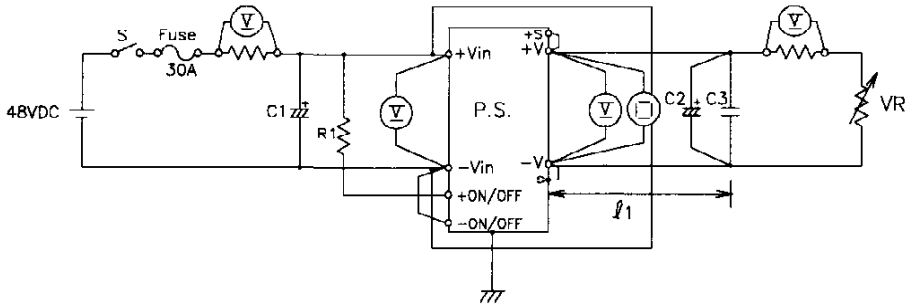
C2: 5V-5600uF X2Para Electrolytic Capacitor
12V-470uF Electrolytic Capacitor
28V-220uF Electrolytic Capacitor
C3: 10uF Ceramic Capacitor
R1: 30kΩ
ℓ1: 50mm

(5) 出力立ち上がり特性　Output rise characteristics



C1: 100uF Electrolytic Capacitor
C2: 5V-5600uF X2Para Electrolytic Capacitor
12V-470uF Electrolytic Capacitor
28V-220uF Electrolytic Capacitor
C3: 10uF Ceramic Capacitor
R1: 30kΩ
ℓ1: 50mm

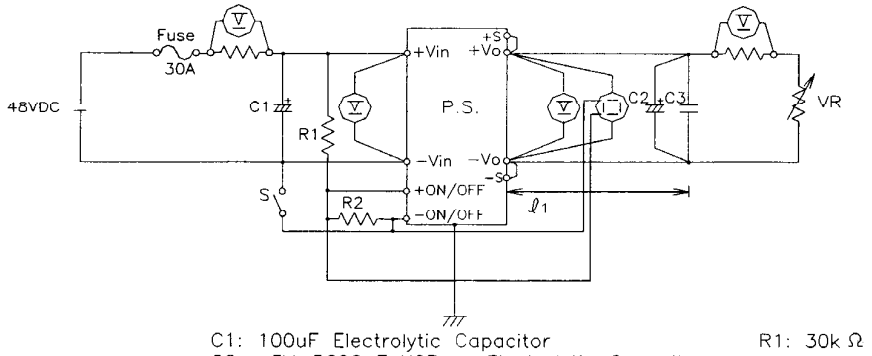
(6) 出力立ち下がり Output fall characteristics

出力立ち上がり特性と同じ

Same as output rise characteristics

(7) 出力立ち上がり特性　（ＯＮ/ＯＦＦコントロール時）

Output rise characteristics with CONTROL ON/OFF



C1: 100uF Electrolytic Capacitor
C2: 5V−5600uF X2Para Electrolytic Capacitor
12V−470uF Electrolytic Capacitor
28v−220uF Electrolytic Capacitor
C3: 10uF Ceramic Capacitor

R1: 30k Ω
R2: 1M Ω
ℓ1: 50mm

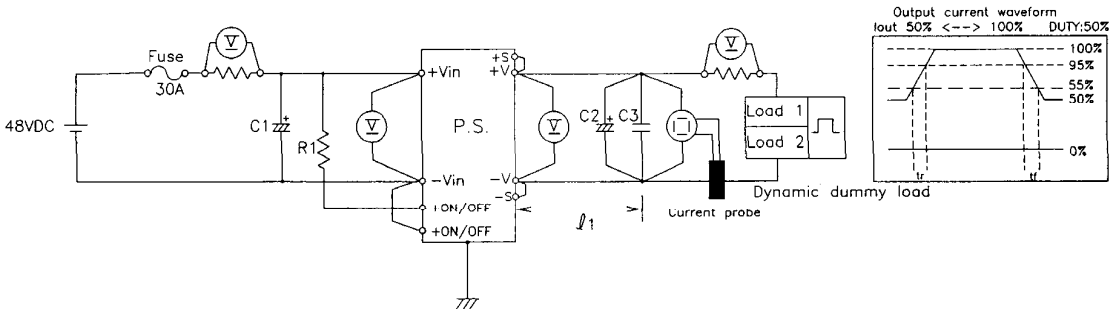
(8) 出力立ち下がり特性　（ＯＮ/ＯＦＦコントロール時）

Output fall characteristics with CONTROL ON/OFF

出力立ち上がり特性（ＯＮ/ＯＦＦコントロール時）と同じ

Same as output rise characteristics with CONTROL ON/OFF

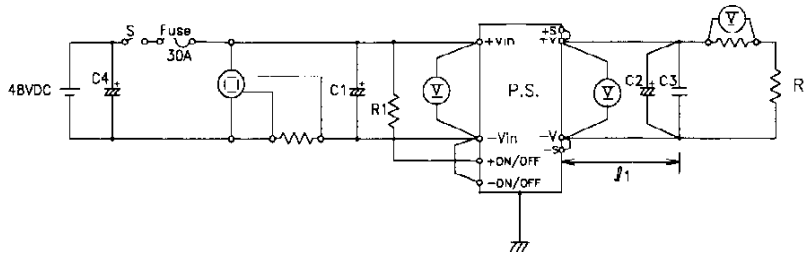
(9) 過渡応答(負荷急変)特性　**Dynamic load response characteristics**



C1: 100uF Electrolytic Capacitor
C2: 5V−5600uF X2Para Electrolytic Capacitor
12V−470uF Electrolytic Capacitor
28V−220uF Electrolytic Capacitor
C3: 10uF Ceramic Capacitor

R1: 30kΩ
ℓ1: 50mm

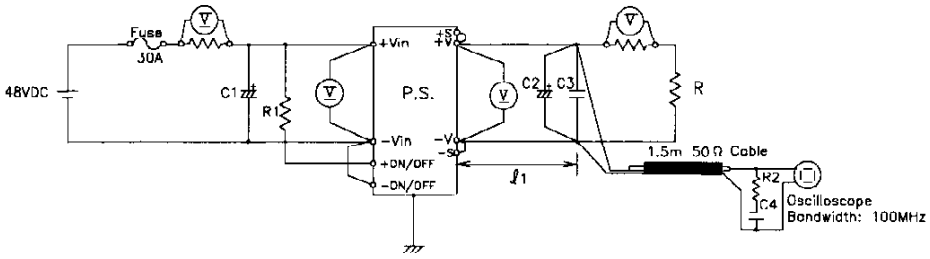
(10) 入力サージ電流（突入電流）特性　Inrush current characteristics



C1: 100uF Electrolytic Capacitor　　R1: 30kΩ
C2: 220uF Electrolytic Capacitor　　ℓ1: 50mm
C3: 10uF Ceramic Capacitor
C4: 15000uF Electrolytic Capacitor

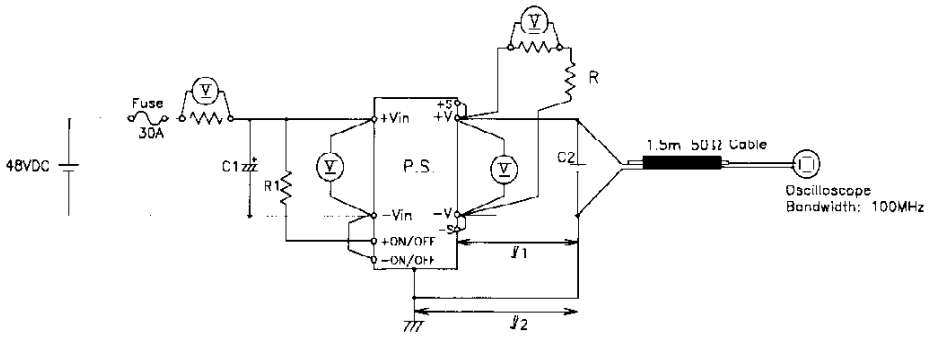
(11) 出力リップル、ノイズ波形　Output ripple and noise waveform

(a) Normal Mode



C1: 100uF Electrolytic Capacitor　　R1: 30kΩ
C2: 5V-5600uF X2Para Electrolytic Capacitor　　R2: 50 Ω
12V-470uF Electrolytic Capacitor　　ℓ1: 50mm
28V-220uF Electrolytic Capacitor
C3: 10uF Ceramic Capacitor
C4: 4700pF Film Capacitor

(b) Normal + Common Mode



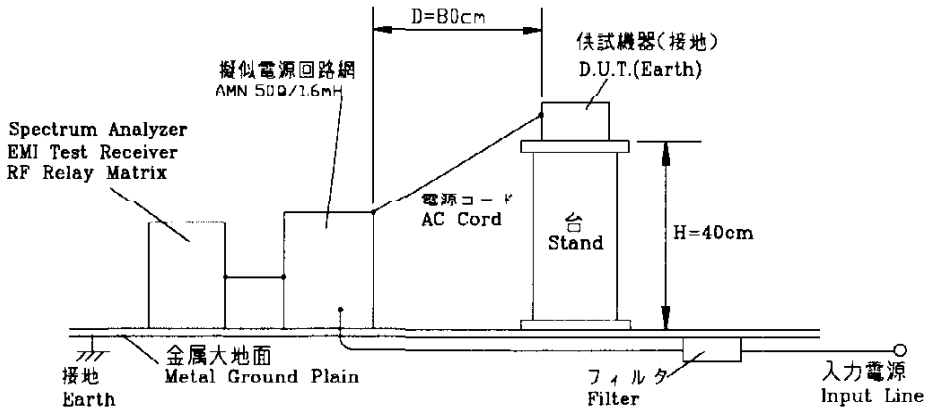
C1: 100uF Electrolytic Capacitor　　R1: 30kΩ
C2: 0.1uF Ceramic Capacitor　　ℓ1, ℓ2: 152mm

(12) ＥＭＩ特性

Electro-Magnetic Interference characteristics

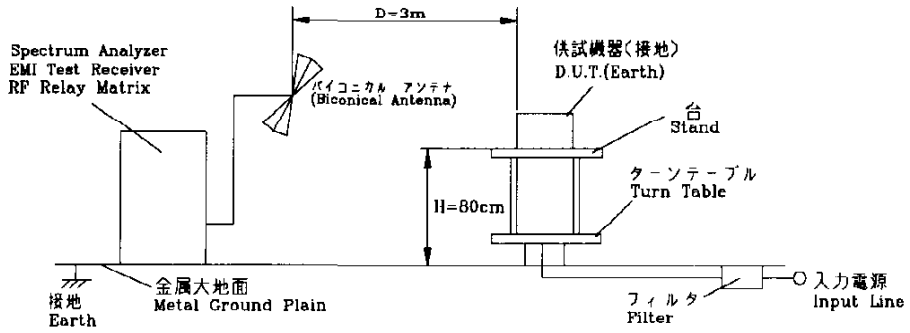
(a) 雑音端子電圧（帰還ノイズ）

Conducted Emission Noise



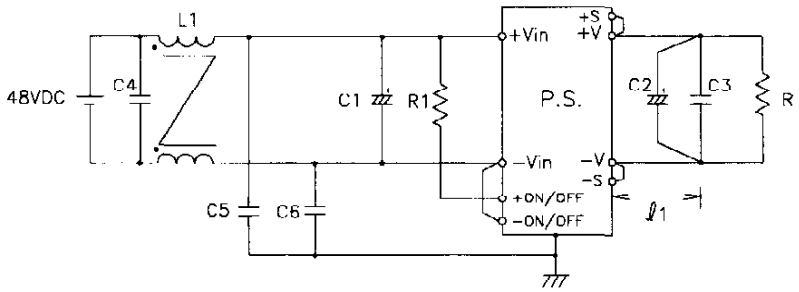
(b) 雑音電界強度（輻射ノイズ）

Radiated Emission Noise



(1) VCCI class A 対応アプリケーションシステム

VCCI class A application system



L1 : 1mH
C1 : 470uF Electrolytic Capacitor
C2 : 5V-5600uF X2Para Electrolytic Capacitor
12V-470uF Electrolytic Capacitor
28V-220uF Electrolytic Capacitor
C3 : 10uF Ceramic Capacitor
C4 : 2.2uF Ceramic Capacitor
C5,C6 : 0.1uF Ceramic Capacitor
R1 : 30kΩ
ℓ1 : 50mm

1.2 使用測定機器　List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	OSCILLO SCOPE	HITACHI DENSHI	V-1100A
2	DIGITAL STORAGE OSCILLOSCOPE	TEKTRONIX	TDS540B
3	DIGITAL MULTIMETER	YOKOGAWA ELECT.	7544
4	DIGITAL POWER METER	YOKOGAWA ELECT.	WT110
5	CURRENT PROBE/AMPLIFIER	TEKTRONIX	A6303/AM503
6	DYNAMIC DUMMY LOAD	TAKASAGO	FK-1000L
7	AC POWER SUPPLY	KIKUSUI	PCR4000L
8	X-Y RECORDER	GRAPHTEC	WX4309
9	CONTROLLED TEMP. CHAMBER	TABAI ESPEC	SH-240
10	SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSA
11	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESHS10
12	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESVS10
13	RF RELAY MATRIX	ROHDE & SCHWARZ	PSU
14	AMN	KYORITSU DENSHI	KNW-242
15	ANTENNA(BICONICAL ANTENNA)	SCHWARZBECK	BBA9106

2. 特性データ
2.1 静特性　　Steady state data
(1) 入力、負荷、温度変動　Regulation - line and load, temperature drift

5V

1. Regulation - line and load　　condition　Tp : 25℃

Iout \ Vin	36VDC	48VDC	76VDC	line regulation	
0%	4.964V	4.964V	4.964V	0mV	0.000%
50%	4.962V	4.962V	4.963V	1mV	0.020%
100%	4.962V	4.962V	4.962V	0mV	0.000%
load regulation	2mV	2mV	2mV		
	0.040%	0.040%	0.040%		

2. Temperature drift　　conditions　Vin : 48VDC
Iout : 100%

Tp	-40℃	25℃	100℃	temperature stability	
Vout	4.972V	4.962V	4.948V	24mV	0.480%

12V

1. Regulation - line and load　　condition　Tp : 25℃

Iout \ Vin	36VDC	48VDC	76VDC	line regulation	
0%	11.995V	11.995V	11.997V	2mV	0.017%
50%	11.995V	11.994V	11.995V	1mV	0.008%
100%	11.996V	11.996V	11.995V	1mV	0.008%
load regulation	1mV	2mV	3mV		
	0.008%	0.017%	0.017%		

2. Temperature drift　　conditions　Vin : 48VDC
Iout : 100%

Tp	-40℃	25℃	100℃	temperature stability	
Vout	12.016V	11.996V	11.987V	29mV	0.242%

28V

1. Regulation - line and load　　condition　Tp : 25℃

Iout \ Vin	36VDC	48VDC	76VDC	line regulation	
0%	27.916V	27.916V	27.917V	1mV	0.004%
50%	27.915V	27.914V	27.915V	1mV	0.004%
100%	27.914V	27.914V	27.914V	0mV	0.000%
load regulation	2mV	2mV	3mV		
	0.007%	0.007%	0.011%		

2. Temperature drift　　conditions　Vin : 48VDC
Iout : 100%

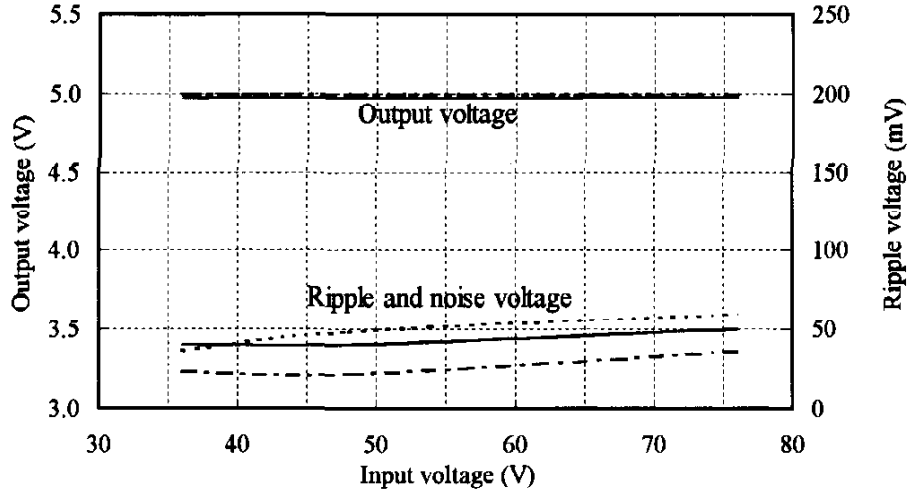
Tp	-40℃	25℃	100℃	temperature stability	
Vout	27.956V	27.914V	27.764V	192mV	0.686%

2.1 (2) 出力電圧、リップル電圧対入力電圧

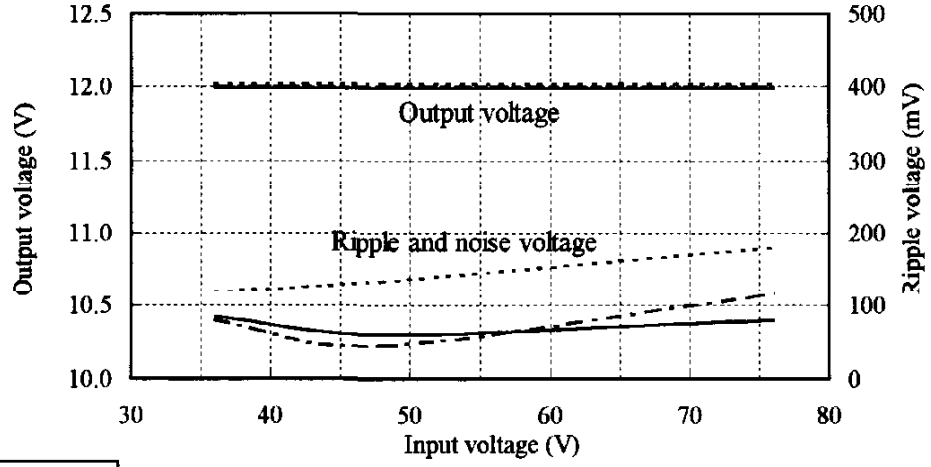
Output voltage and ripple voltage vs input voltage

Conditions Iout : 100 %
Tp : -40 ℃ ------
: 25 ℃ -·-·-·-
: 100 ℃ ———

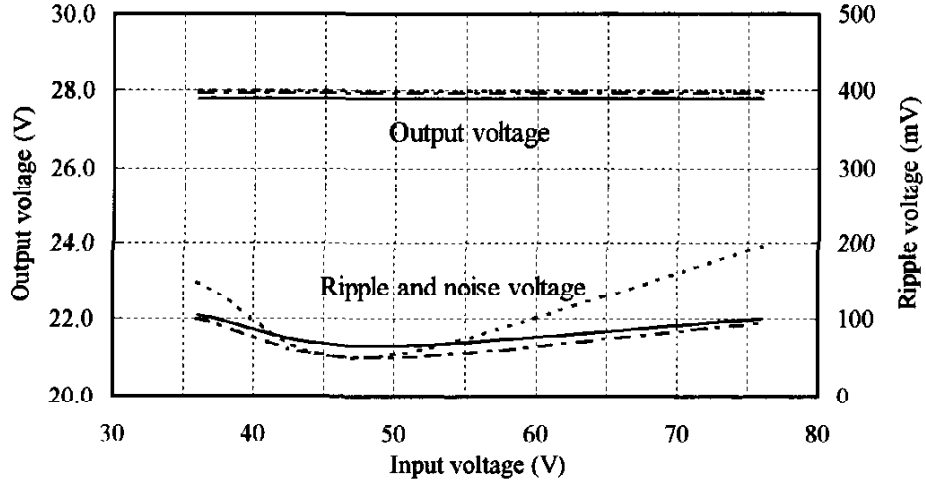
5V



12V



28V

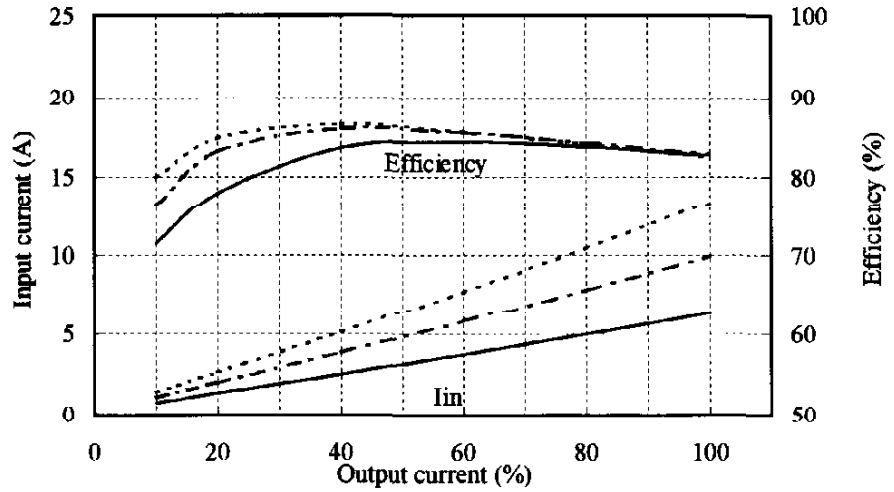


2.1 (3) 効率、入力電流対出力電流

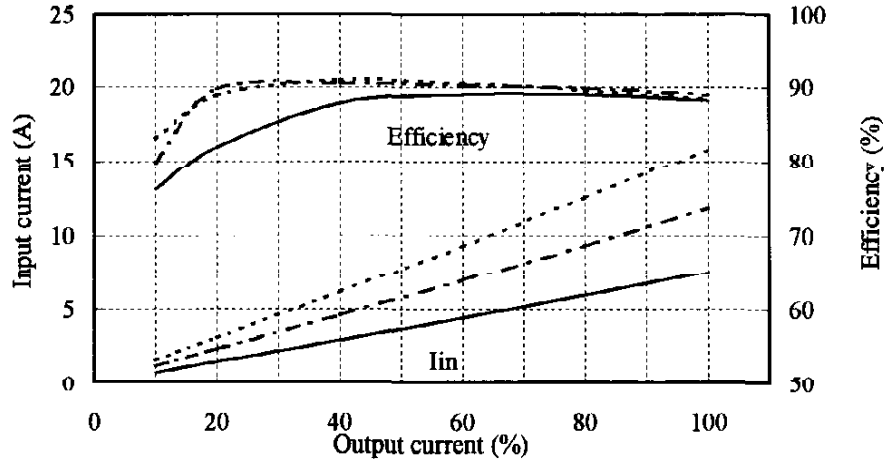
Efficiency and input current vs output current

Conditions Vin : 36 VDC-------
48 VDC- - - - -
76 VDC———
Tp : 25 ℃

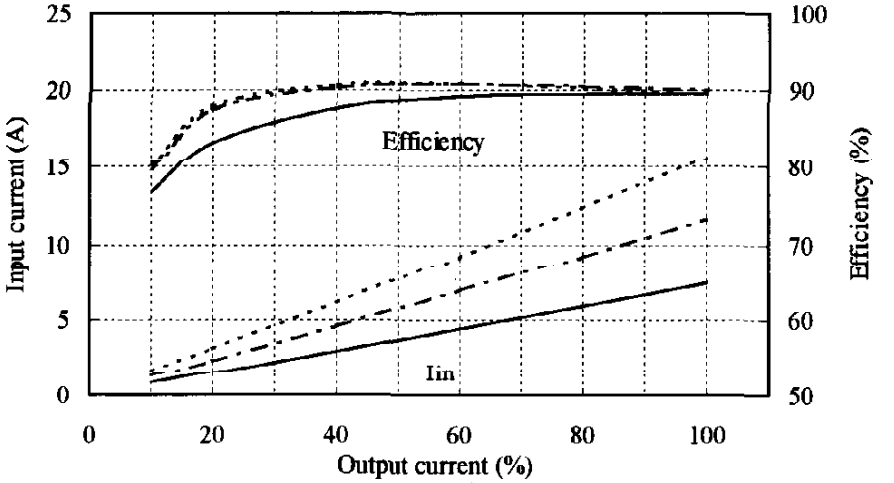
5V



12V



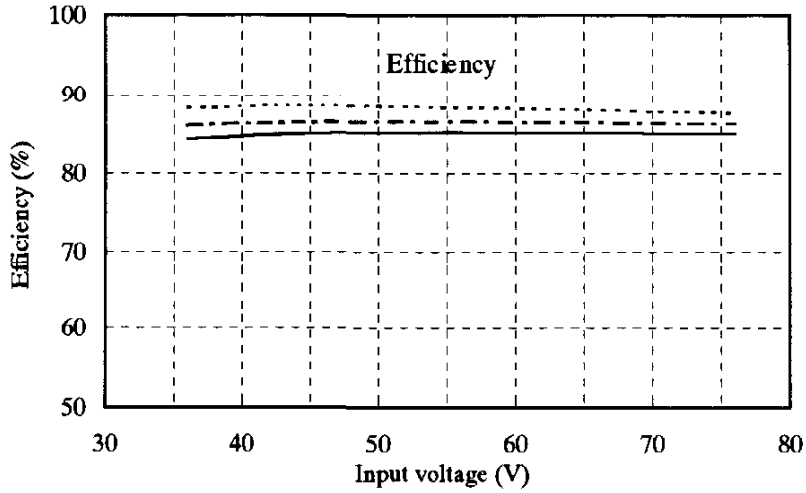
28V



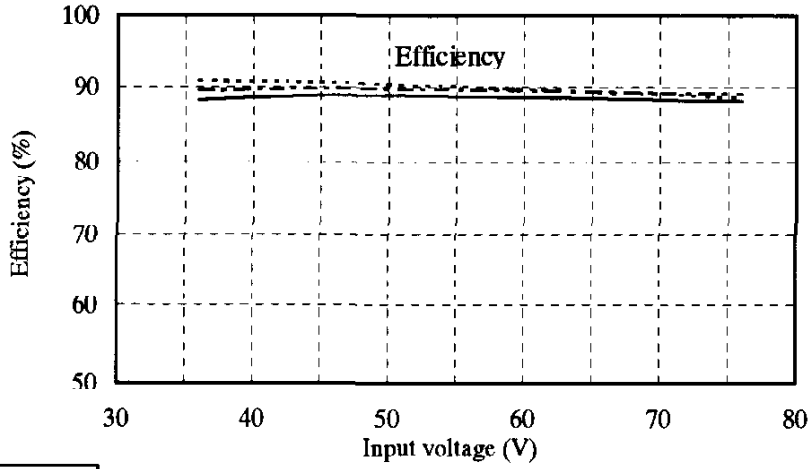
2.1 (4) 効率対入力電圧
Efficiency vs input voltage

Conditions Tp : 25 ℃
Iout : 50 % ---
80 % -.-.-
100 % ———

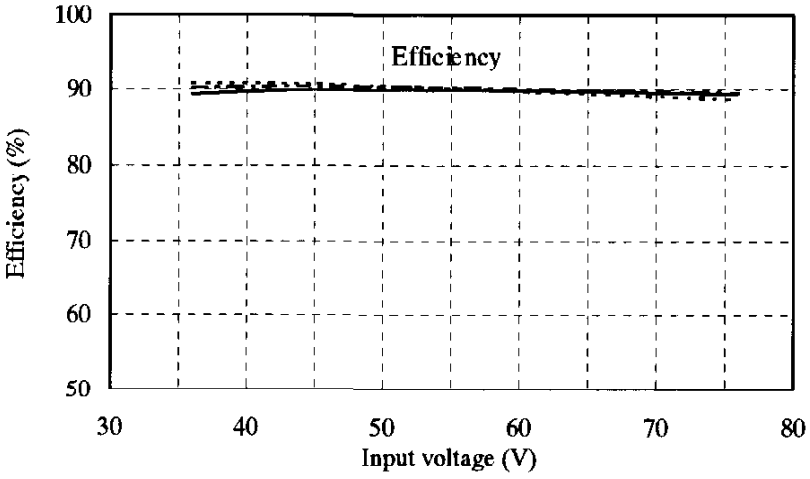
5V



12V



28V

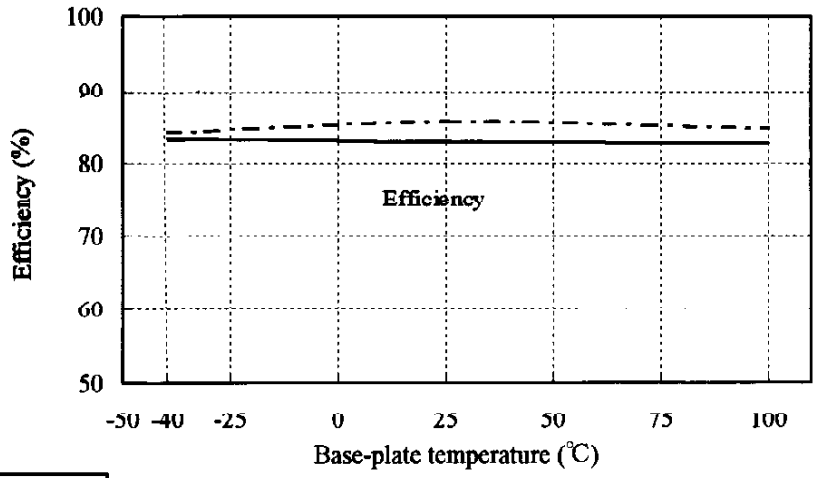


2.1 (5) 効率対ベースプレート温度

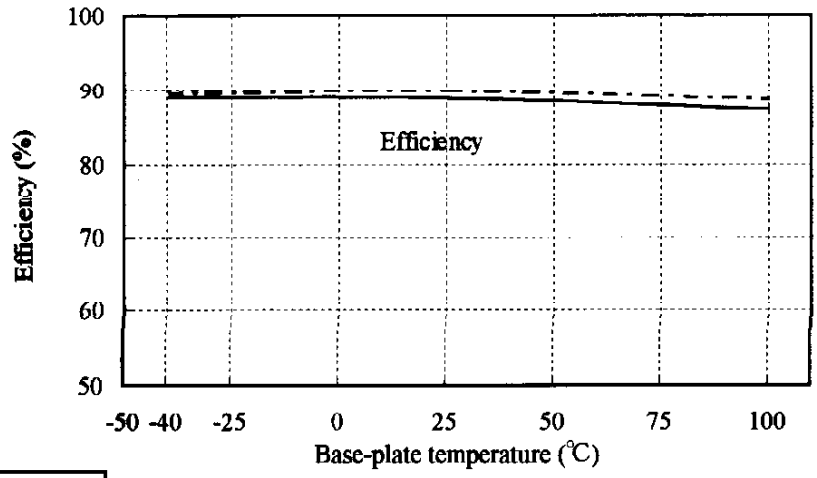
Efficiency vs base-plate temperature

Conditions Vin : 48 VDC
Iout : 80 % -·-·-·-
100 % ———

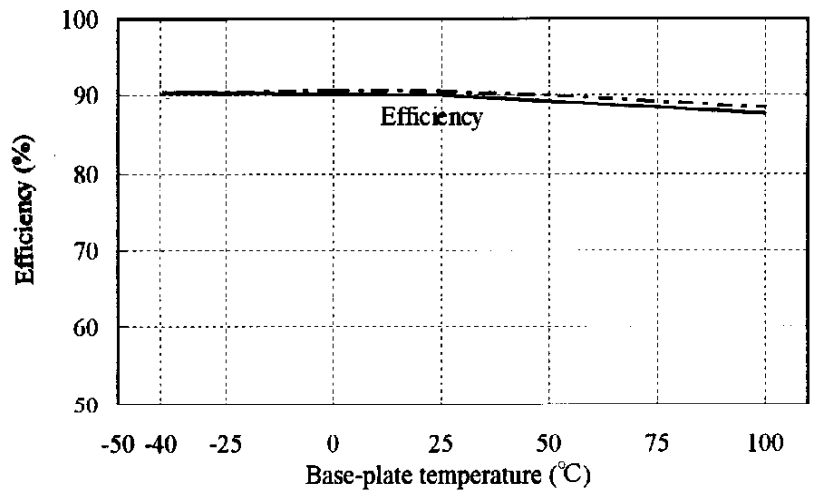
5V



12V



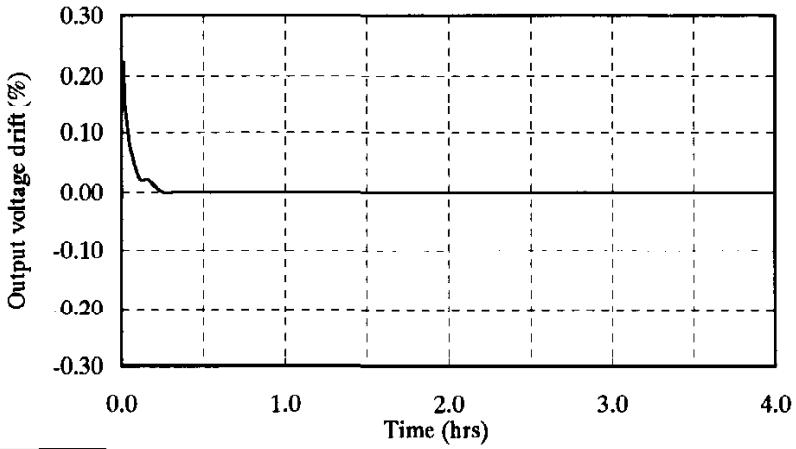
28V



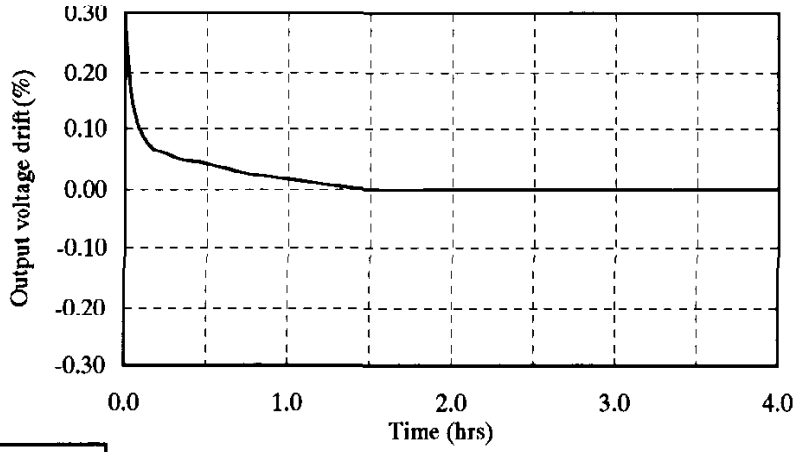
2.2 通電ドリフト特性
Warm up voltage drift characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

5V



12V



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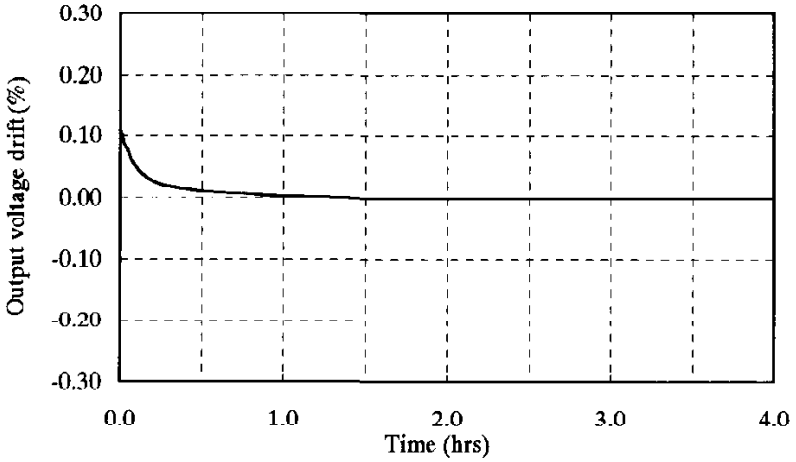
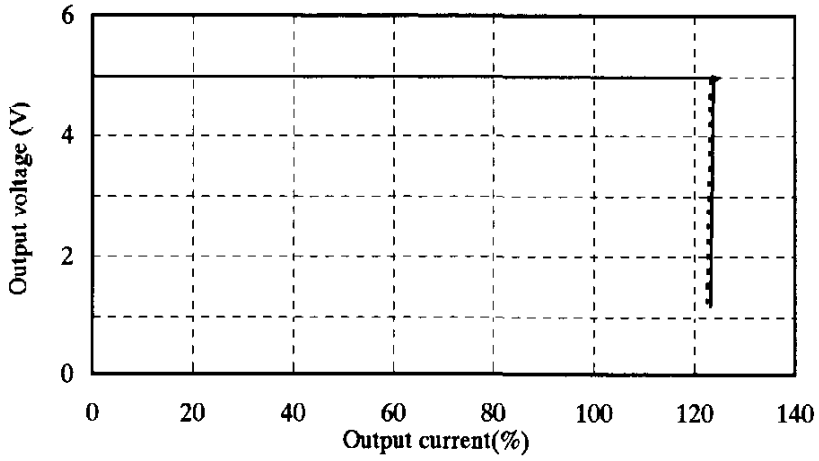


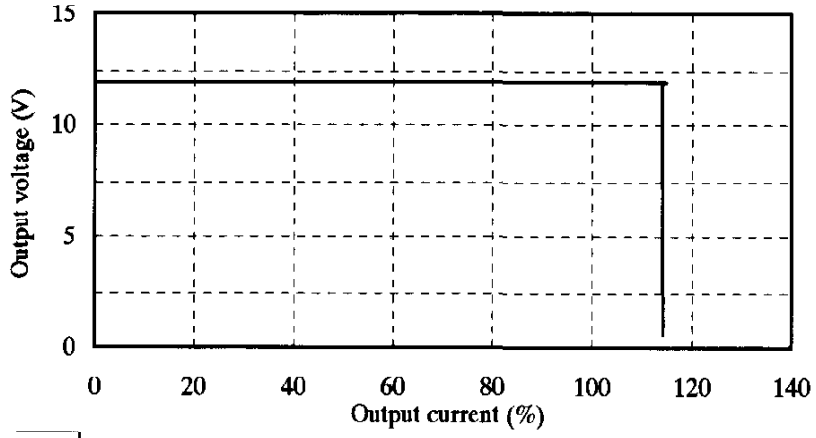
2.3 過電流保護特性
Over current protection (OCP) characteristics

Conditions Vin : 36 VDC -------
48 VDC -·-·-·-
76 VDC ———
Tp : 25 ℃

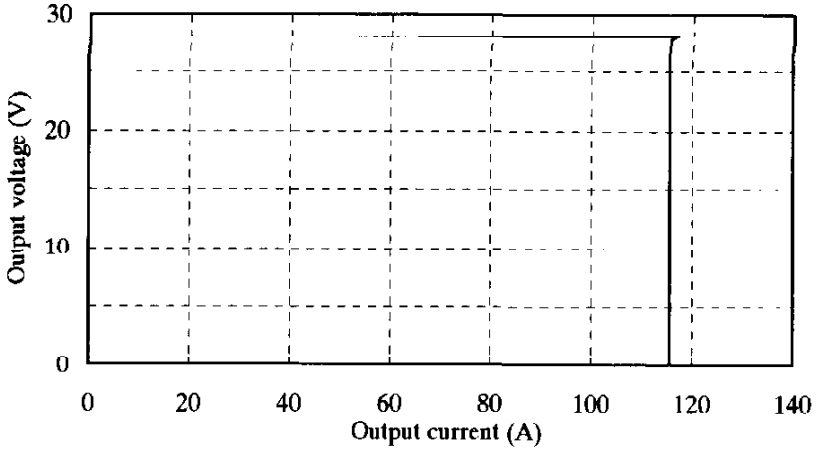
5V



12V



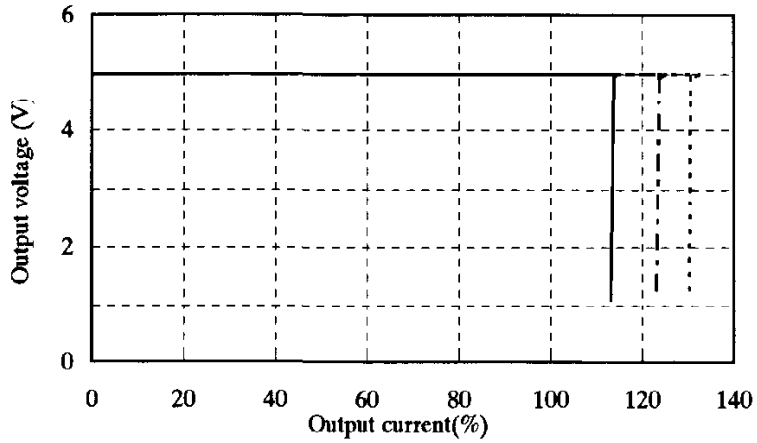
28V



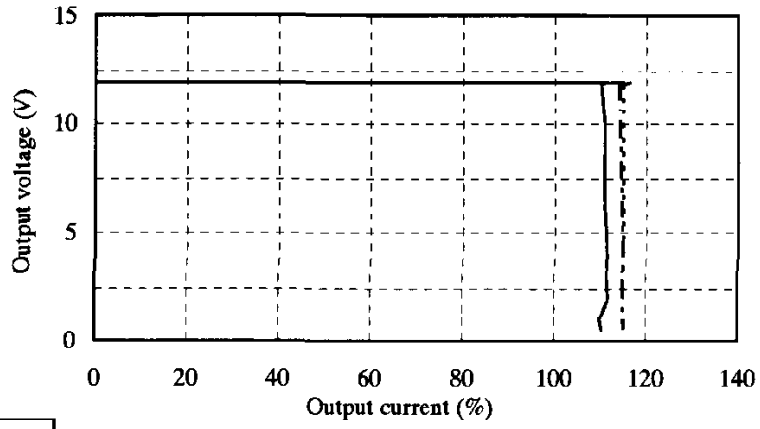
2.3 過電流保護特性
Over current protection (OCP) characteristics

Conditions Vin : 48 VDC
Tp : -40 ℃ -------
25 ℃ -·-·-·-
100 ℃ ———

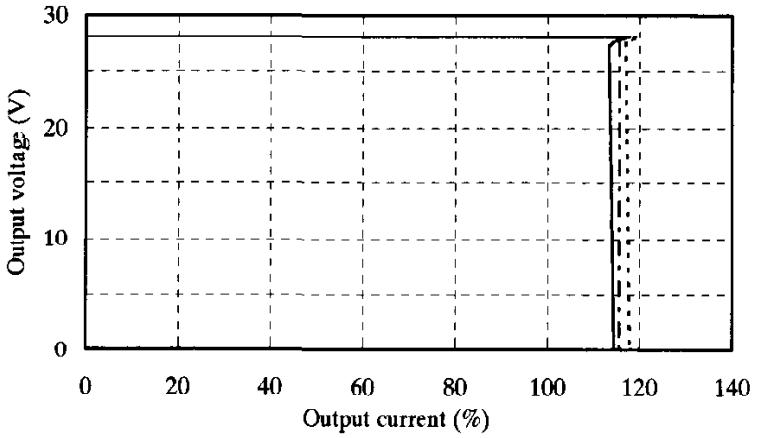
5V



12V



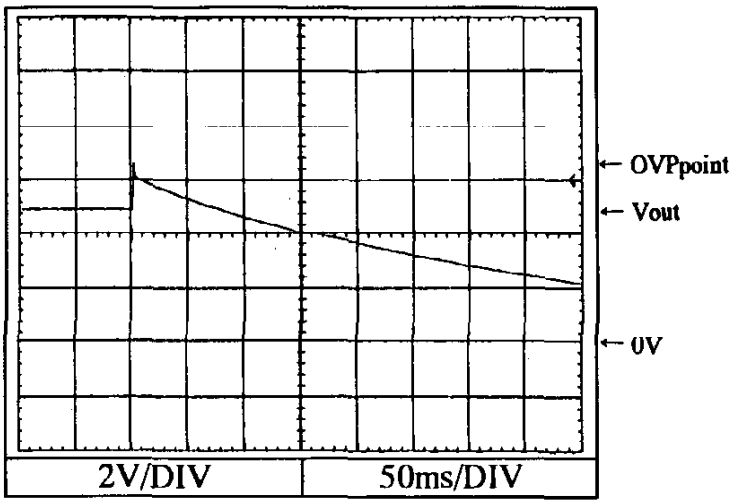
28V



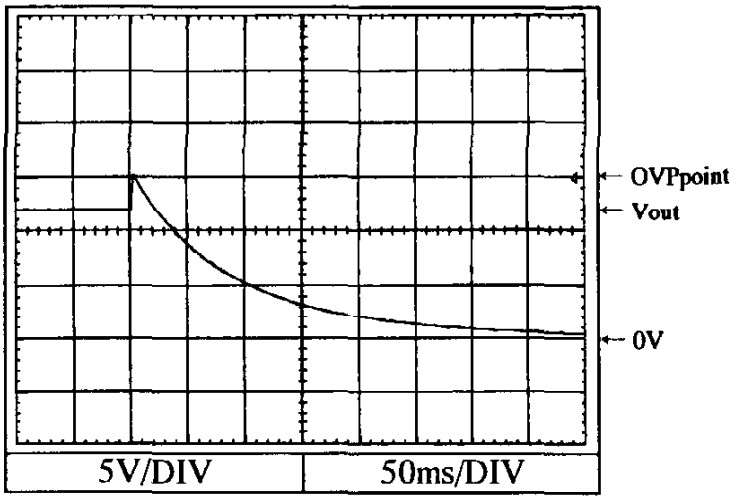
2.4 過電圧保護特性
Over voltage protection (OVP) characteristics

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 ℃

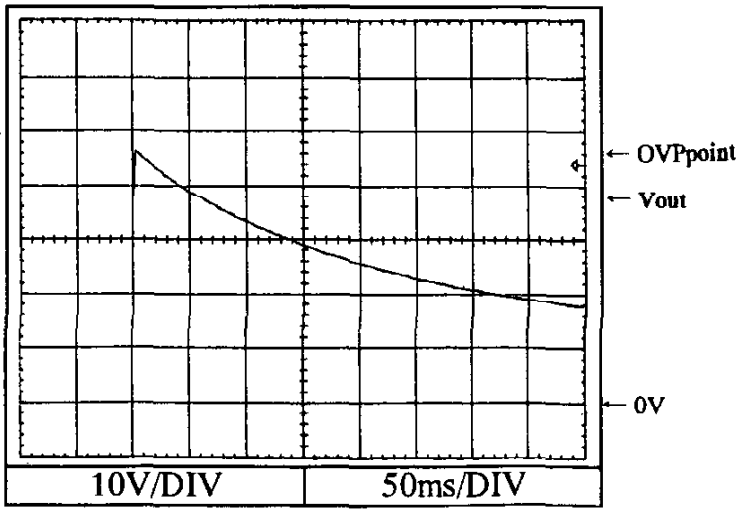
5V



12V



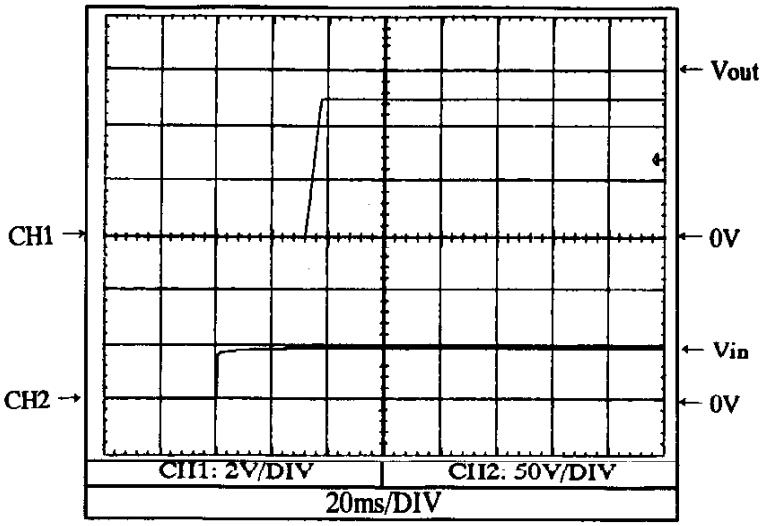
28V



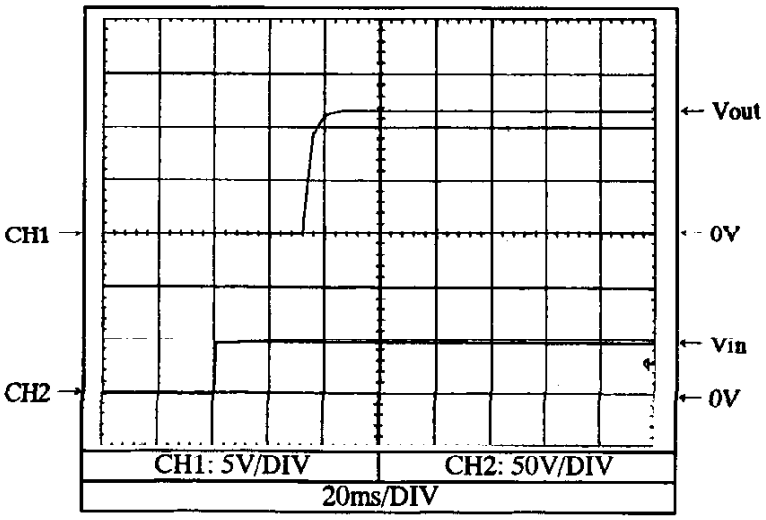
2.5 出力立ち上がり特性
Output rise characteristics

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 ℃

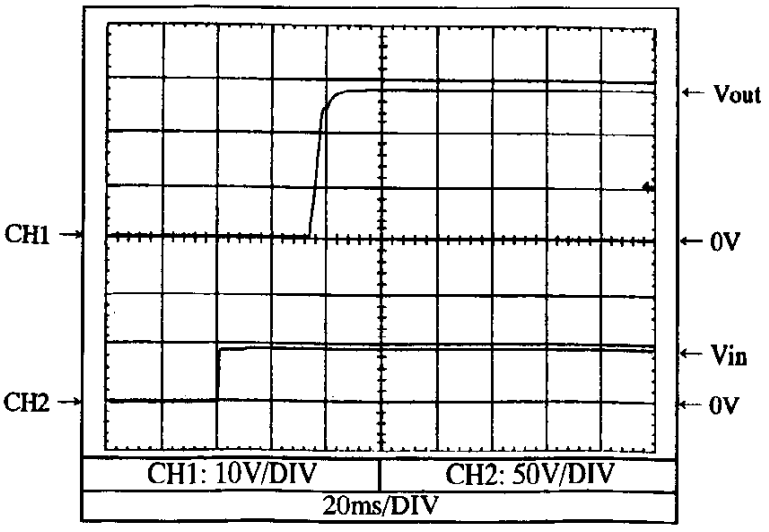
5V



12V



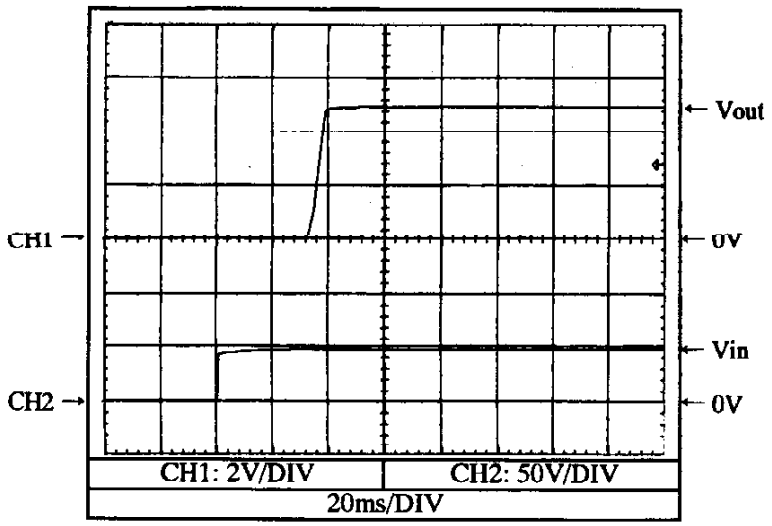
28V



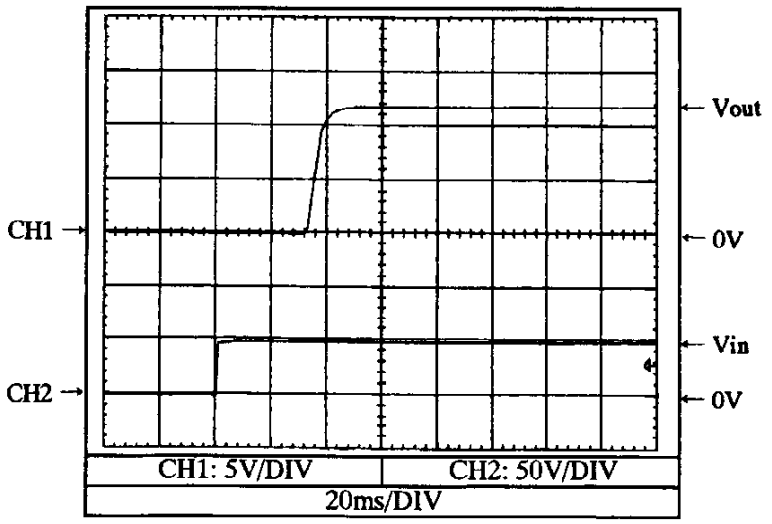
2.5 出力立ち上がり特性
Output rise characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

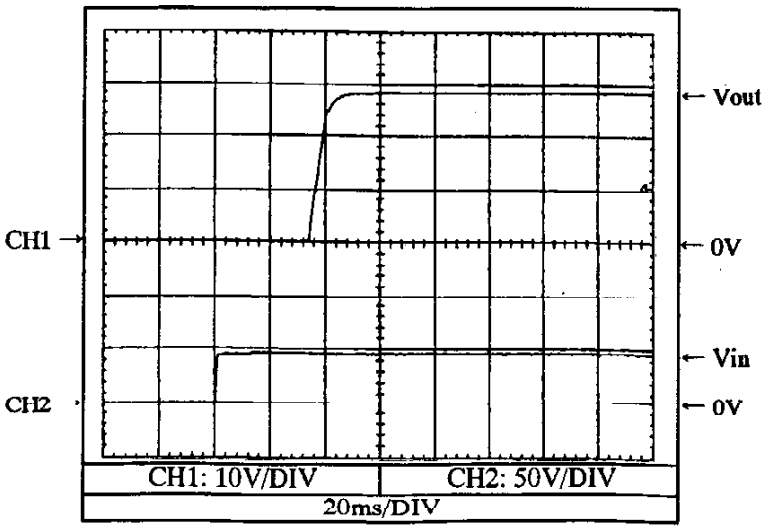
5V



12V



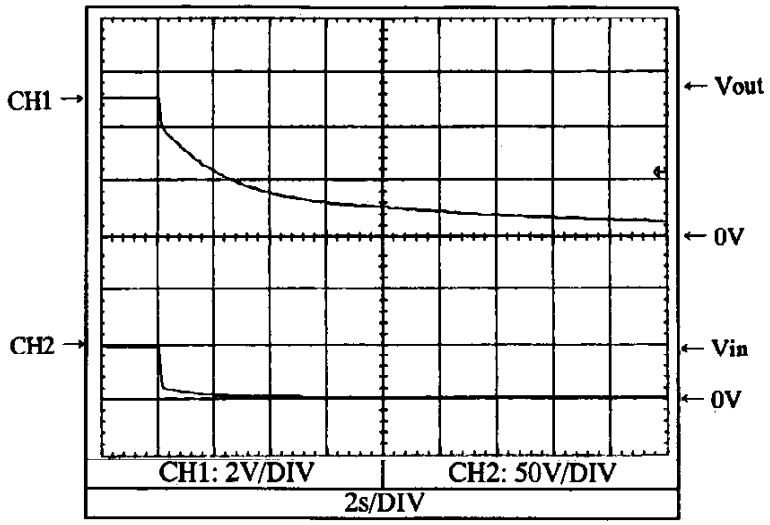
28V



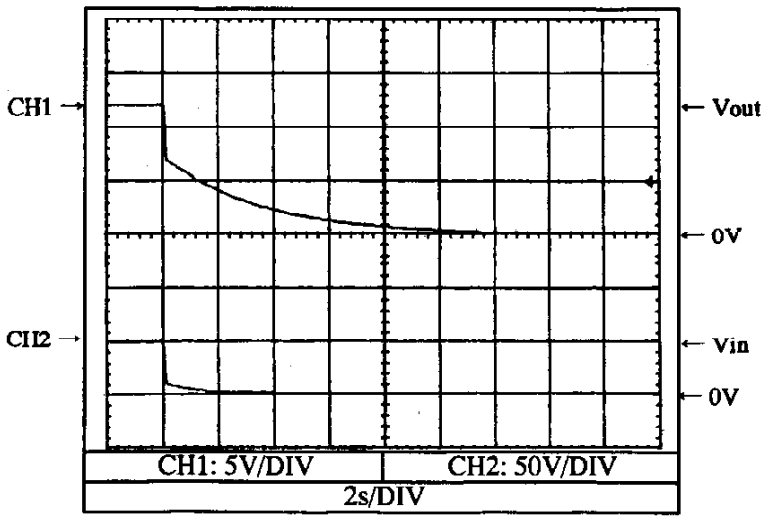
2.6 出力立ち下がり特性
Output fall characteristics

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 ℃

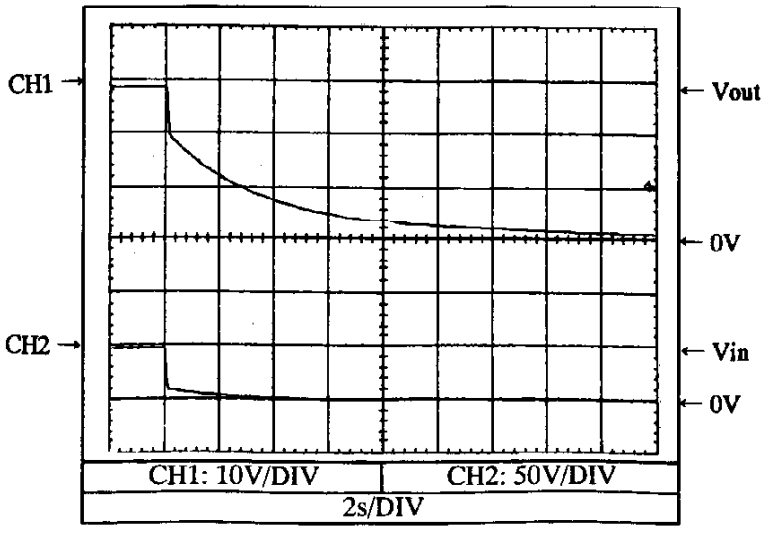
5V



12V



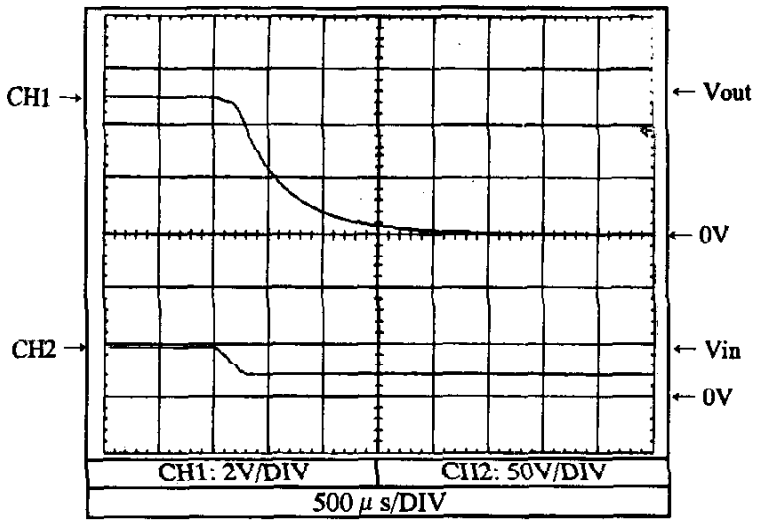
28V



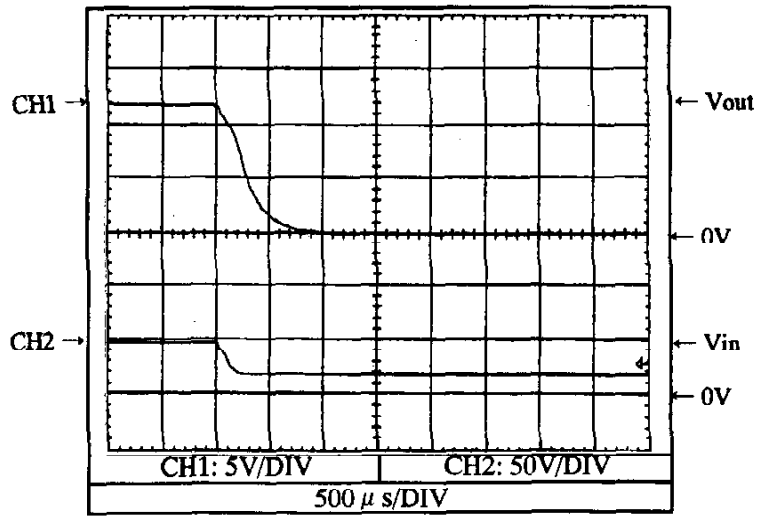
2.6 出力立ち下がり特性
Output fall characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

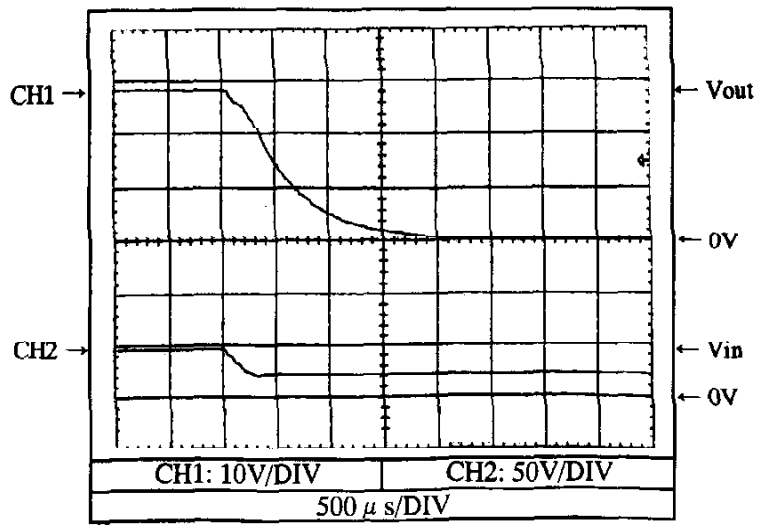
5V



12V



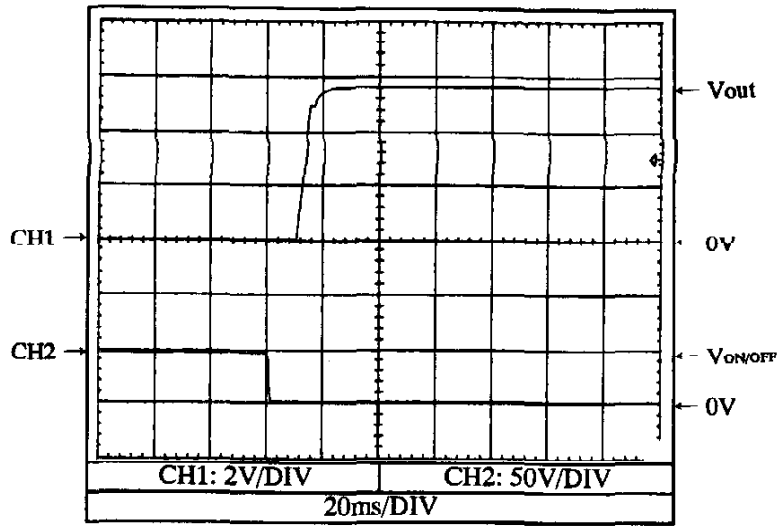
28V



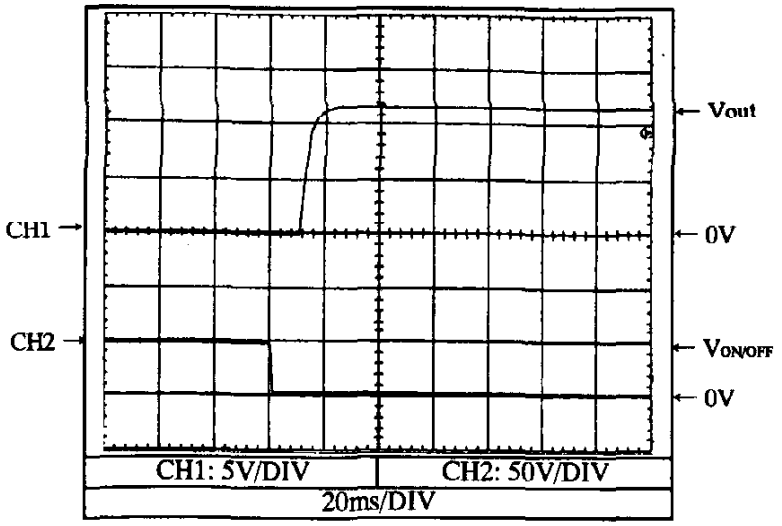
2.7 出力立ち上がり特性 （ＯＮ／ＯＦＦコントロール時）
Output rise characteristics with ON/OFF CONTROL

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 ℃

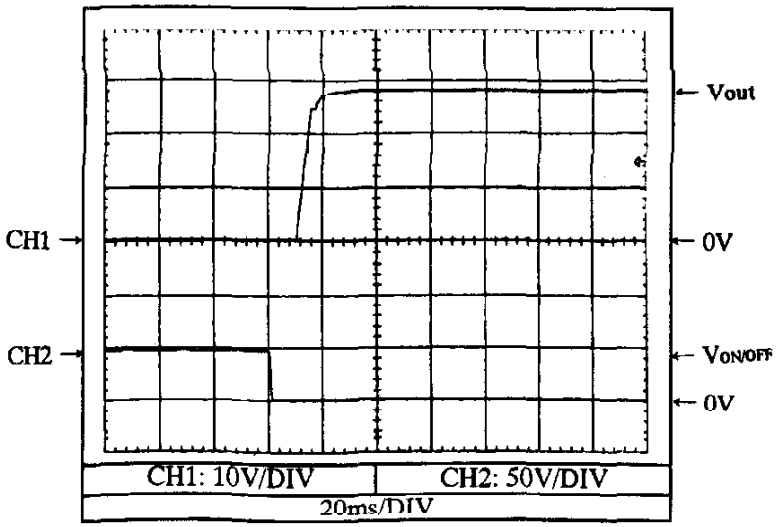
5V



12V



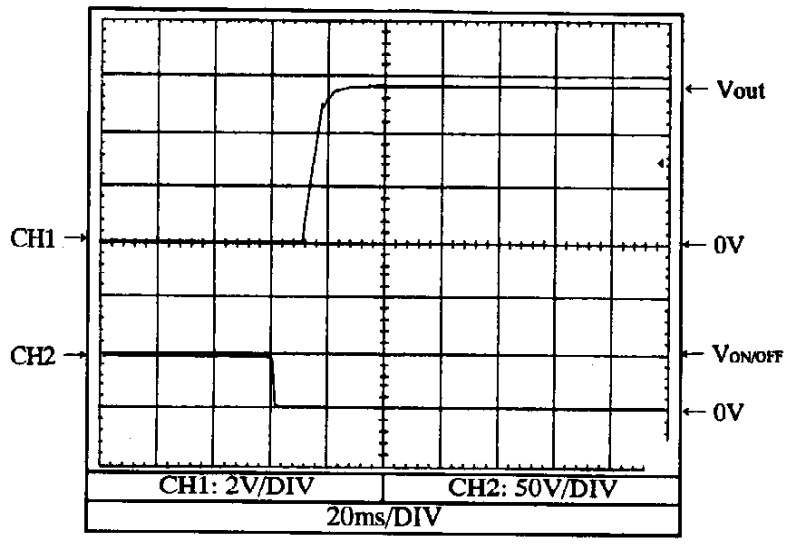
28V



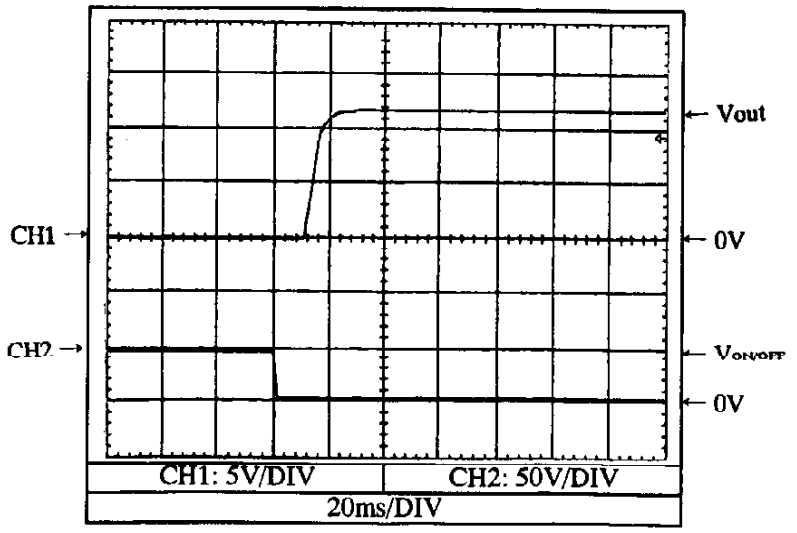
2.7 出力立ち上がり特性 （ＯＮ／ＯＦＦコントロール時）
Output rise characteristics with ON/OFF CONTROL

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

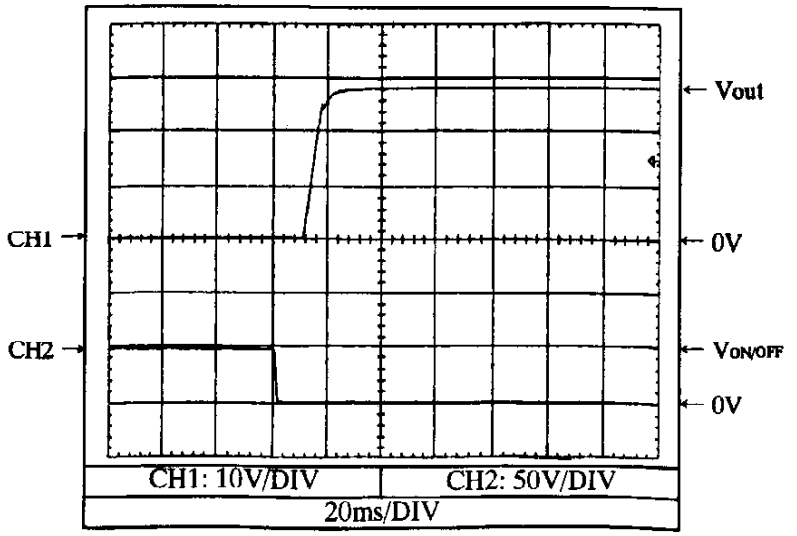
5V



12V



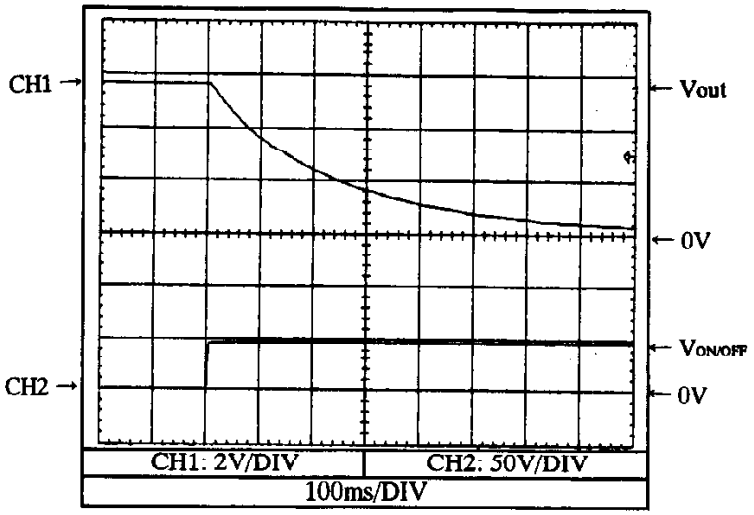
28V



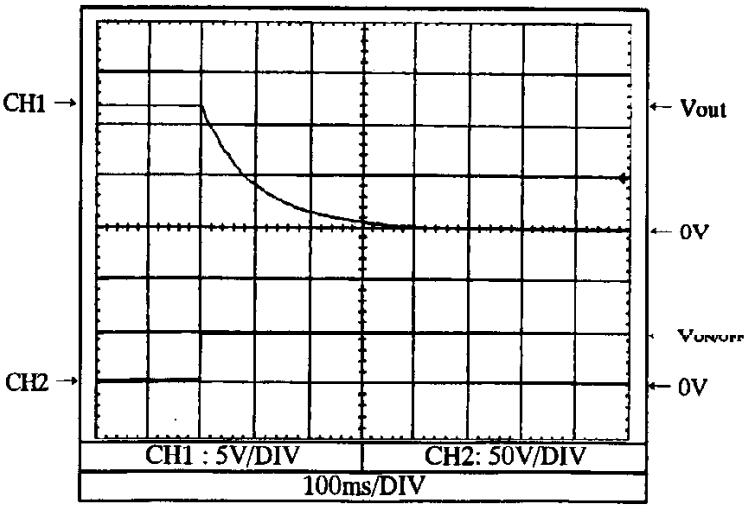
2.8 出力立ち下がり特性 （ＯＮ／ＯＦＦコントロール時）
Output fall characteristics with ON/OFF CONTROL

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 ℃

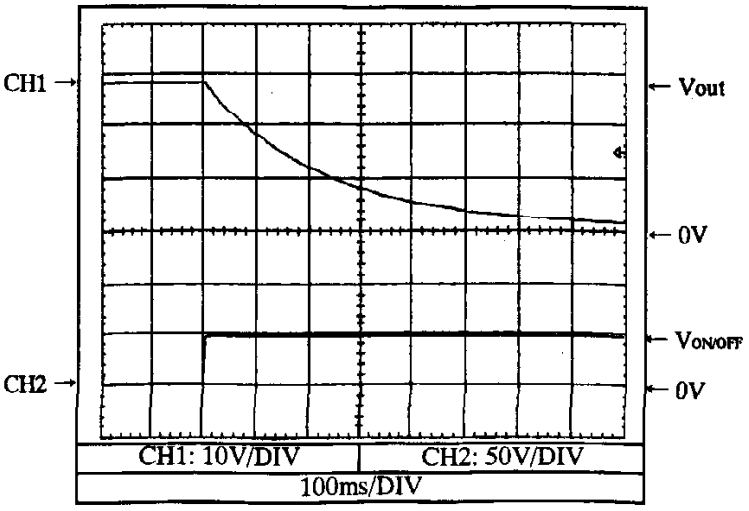
5V



12V



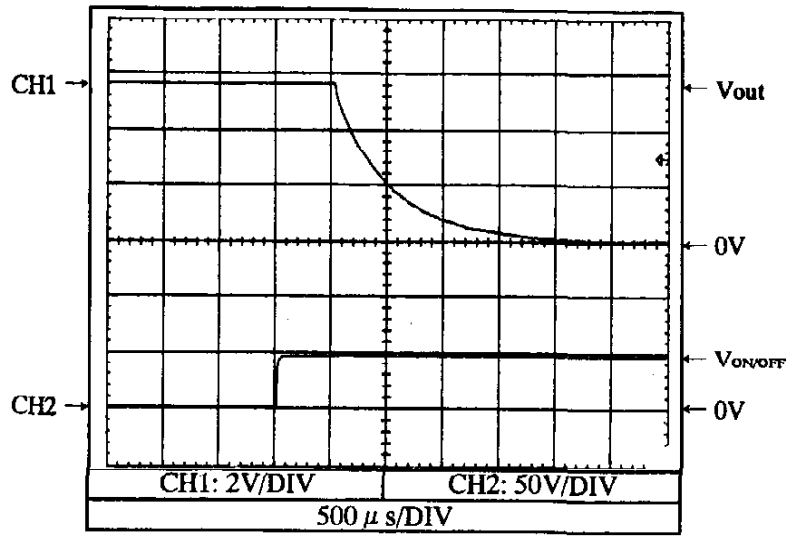
28V



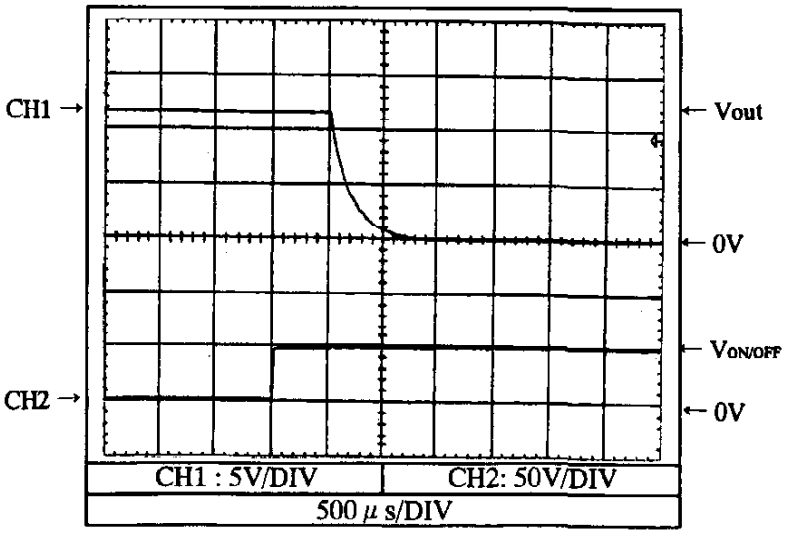
2.8 出力立ち下がり特性 （ＯＮ／ＯＦＦコントロール時）
Output fall characteristics with ON/OFF CONTROL

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

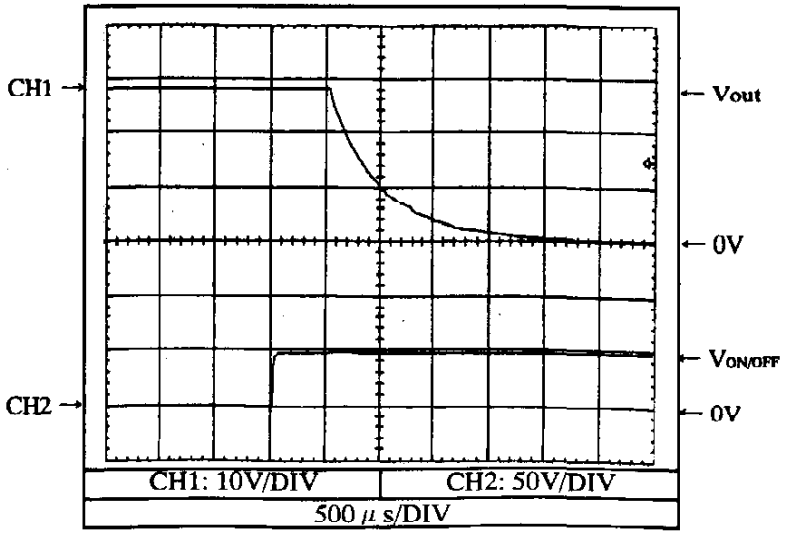
5V



12V



28V

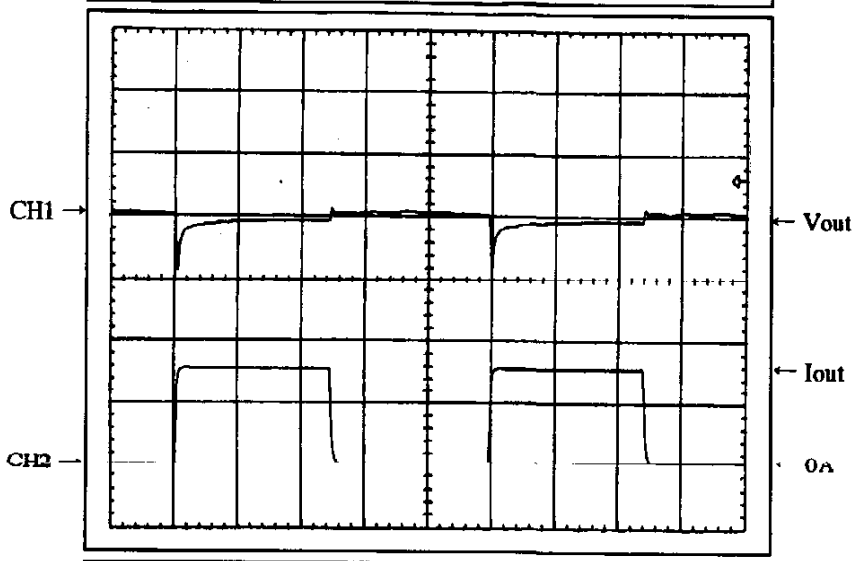


2.9 過渡応答（負荷急変）特性
Dynamic load response characteristics

Conditions Vin : 48 VDC
Tp : 25 ℃

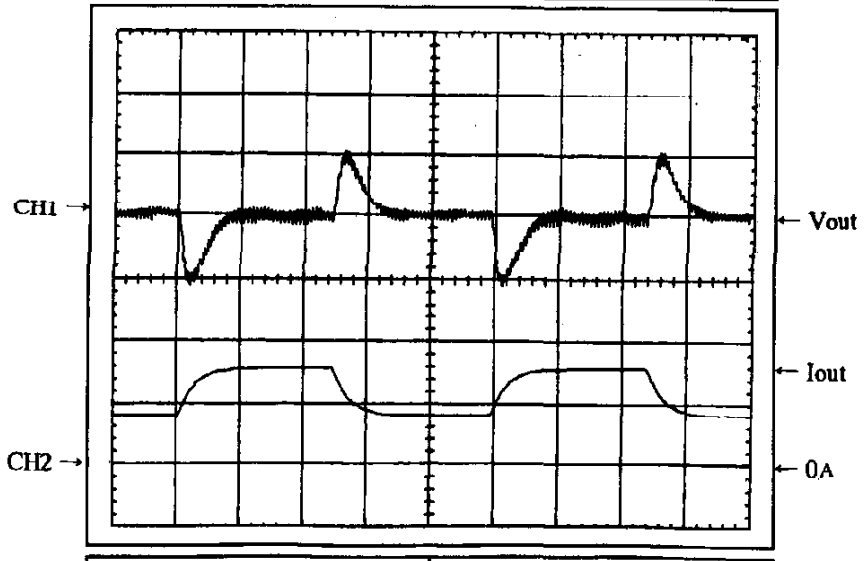
5V

Load current tr = tf = 100us
Iout 0% ⟷ 100% f=100Hz



CH1 : 1V/DIV | CH2 : 40A/DIV
2ms/DIV

Load current tr = tf = 100us
Iout 50% ⟷ 100% f=1kHz



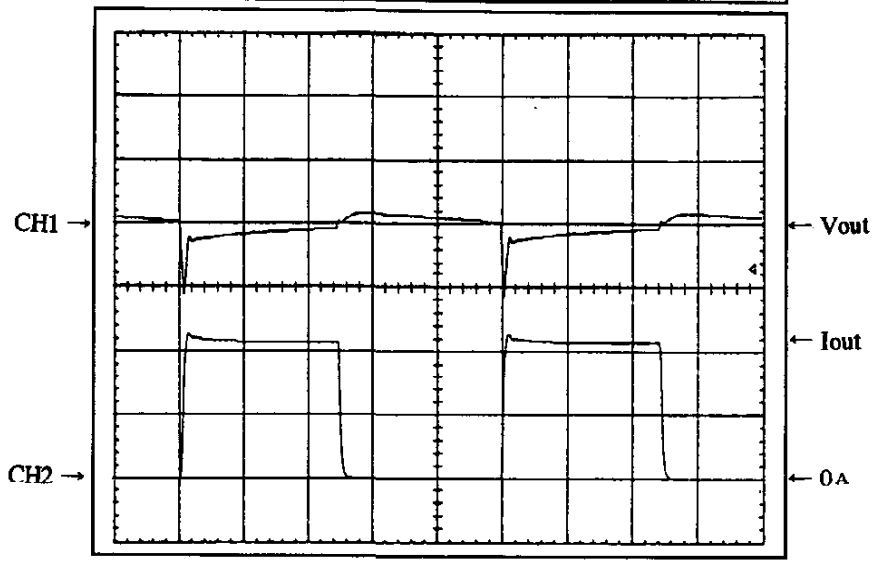
CH1 : 100mV/DIV | CH2 : 40A/DIV
0.2ms/DIV

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

Conditions Vin : 48 VDC
Tp : 25 ℃

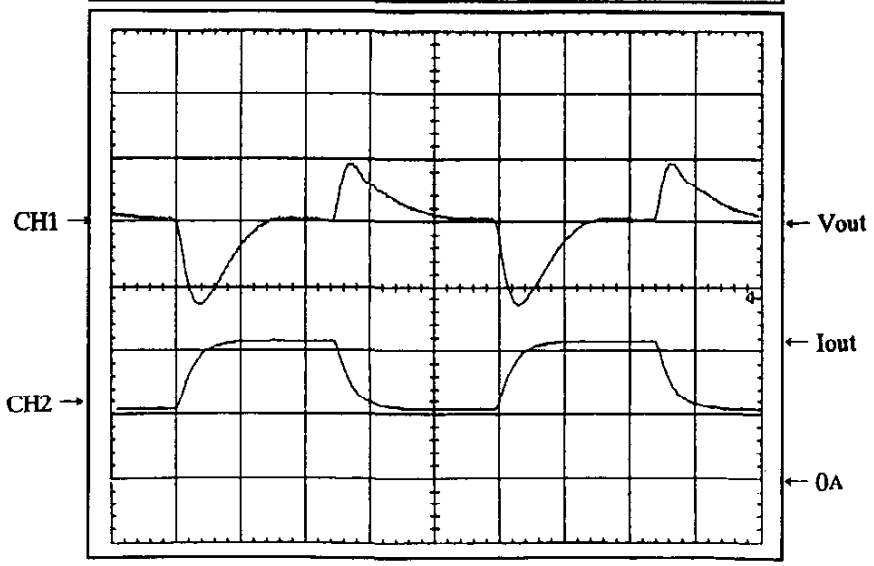
12V

Load current tr = tf = 100us
Iout 0% ⟷ 100% f=100Hz



CH1 : 5V/DIV | CH2 : 20A/DIV
2ms/DIV

Load current tr = tf = 100us
Iout 50% ⟷ 100% f=1kHz

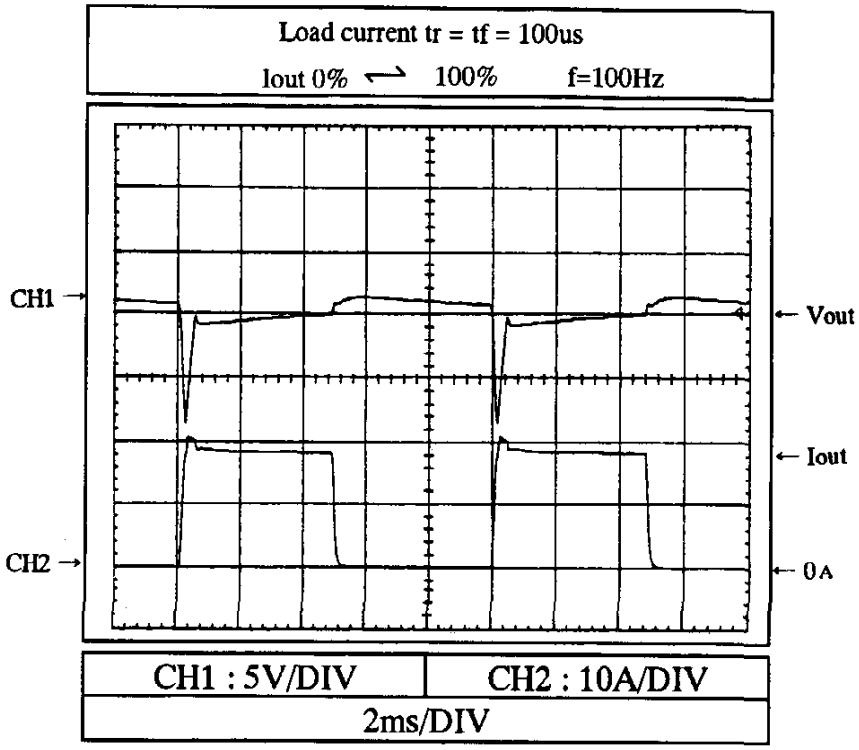


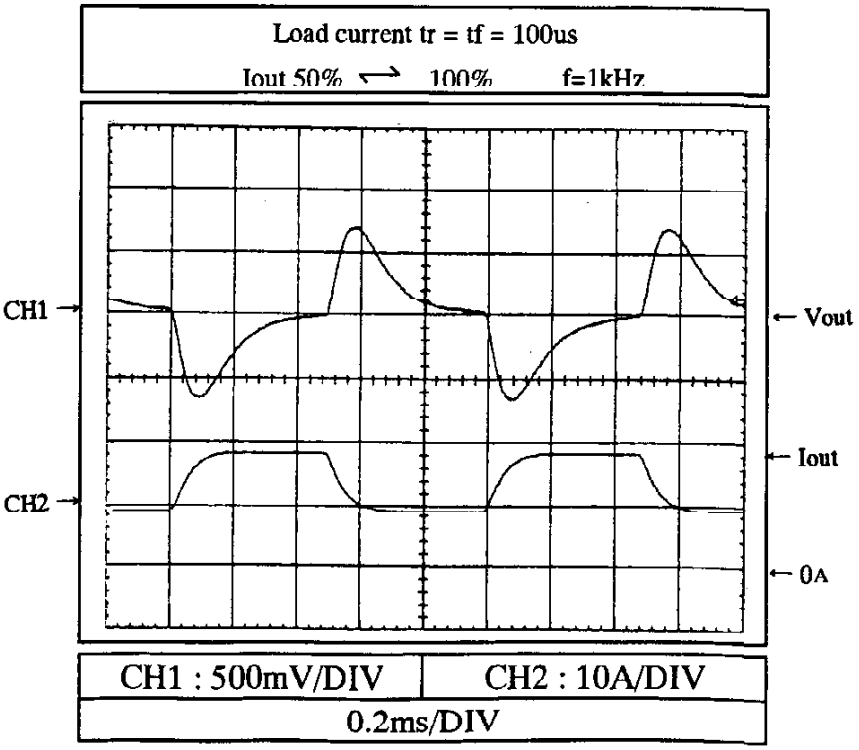
CH1 : 500mV/DIV | CH2 : 20A/DIV
0.2ms/DIV

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

Conditions Vin : 48 VDC
Tp : 25 ℃

28V

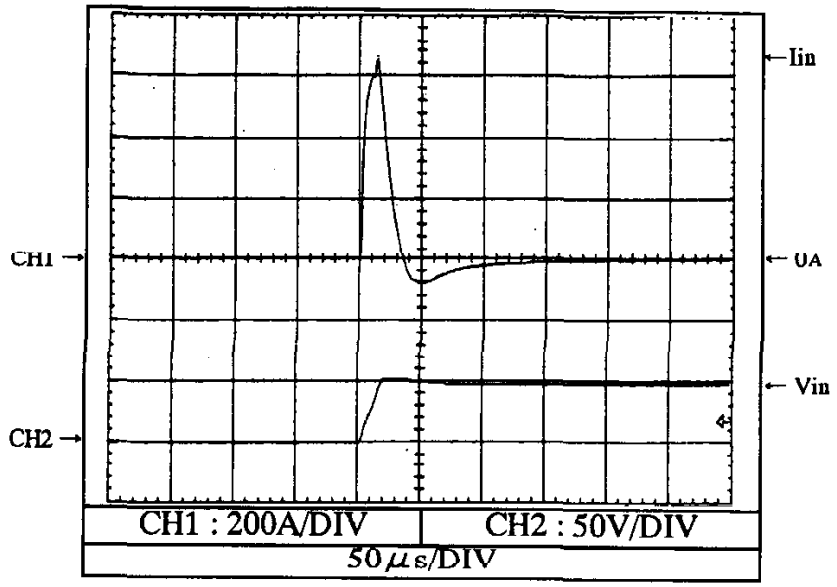




2.10 入力サージ電流（突入電流）特性
Inrush current waveform

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

28V

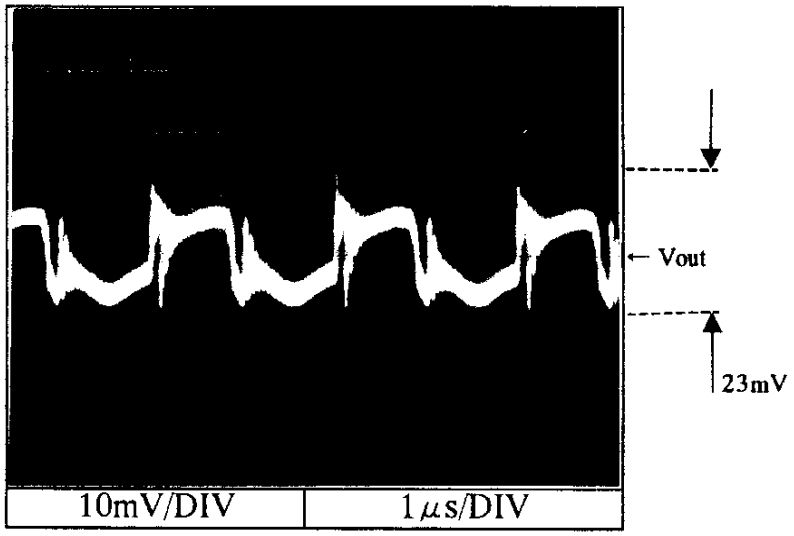


2.11 出力リップル、ノイズ波形
Output ripple and noise waveform

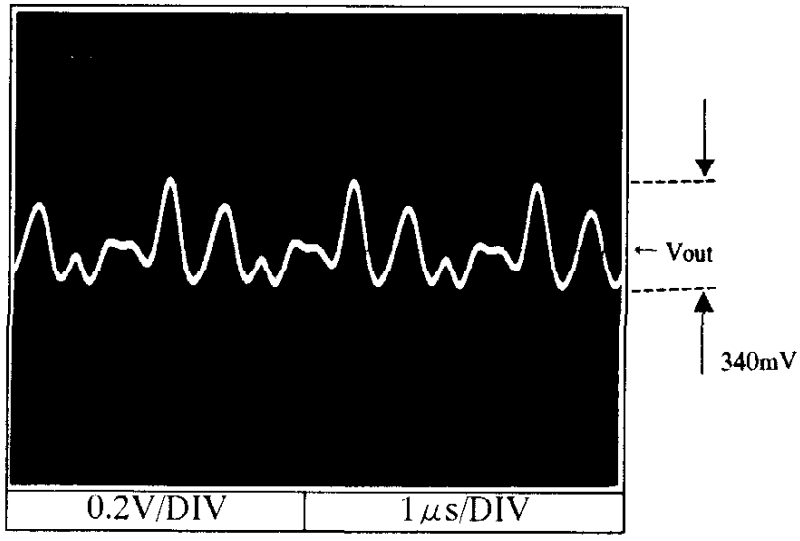
Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

5V

Normal mode



Normal + common mode

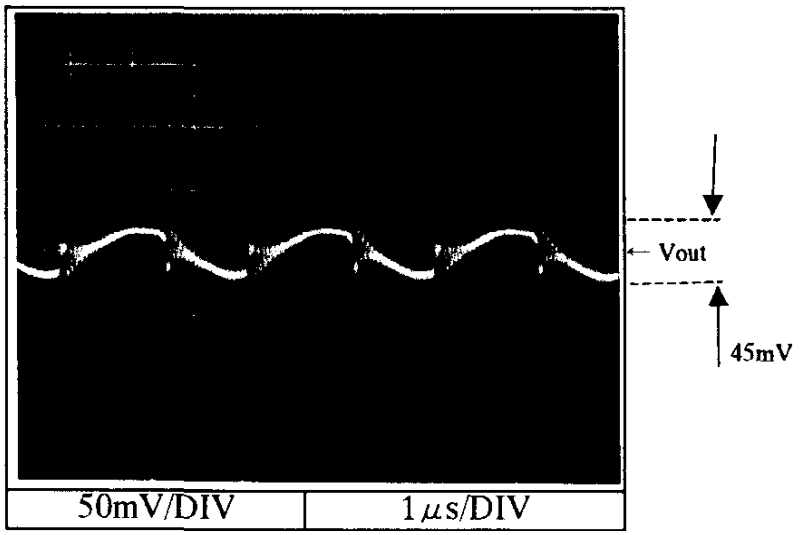


2.11 出力リップル、ノイズ波形
Output ripple and noise waveform

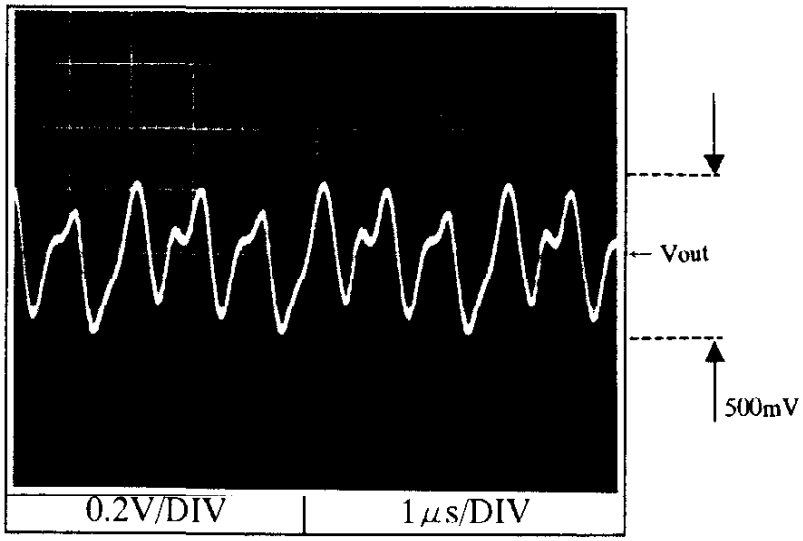
Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

12V

Normal mode



Normal + common mode

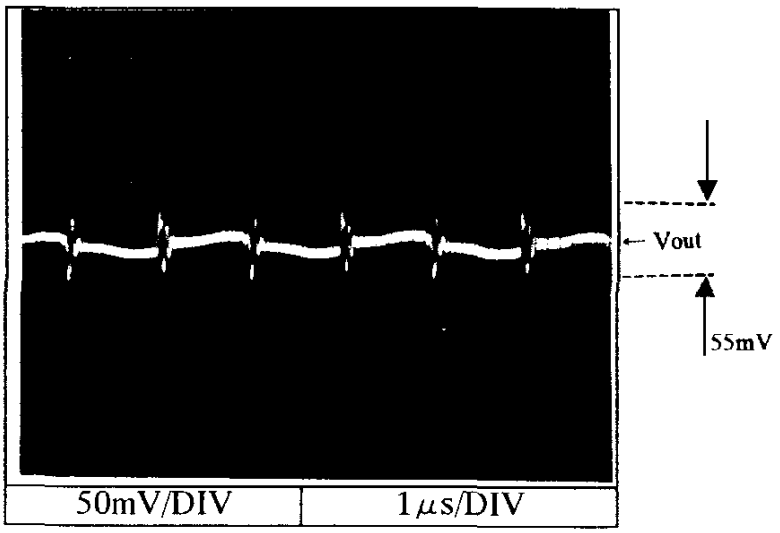


2.11 出力リップル、ノイズ波形
Output ripple and noise waveform

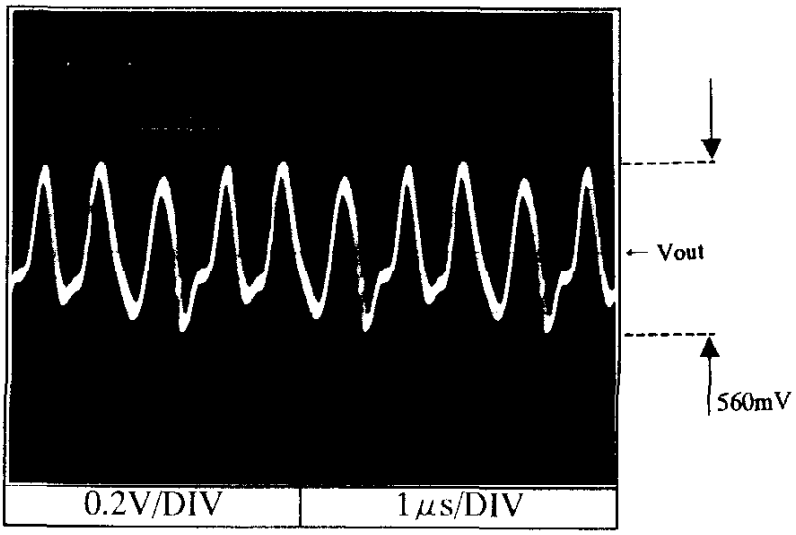
Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

28V

Normal mode



Normal + common mode



2.12 EMI特性

Electro-Magnetic Interference characteristics

(a) 雑音端子電圧（帰還ノイズ）

Conducted Emission

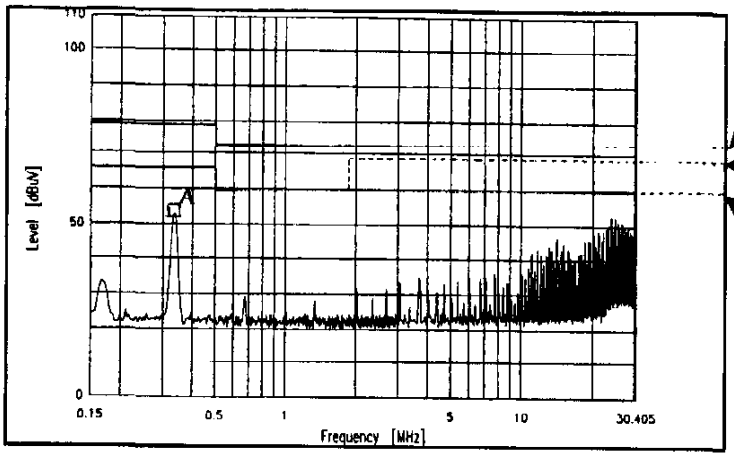
(1) VCCI class A 対応アプリケーションシステム

VCCI class A application system

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

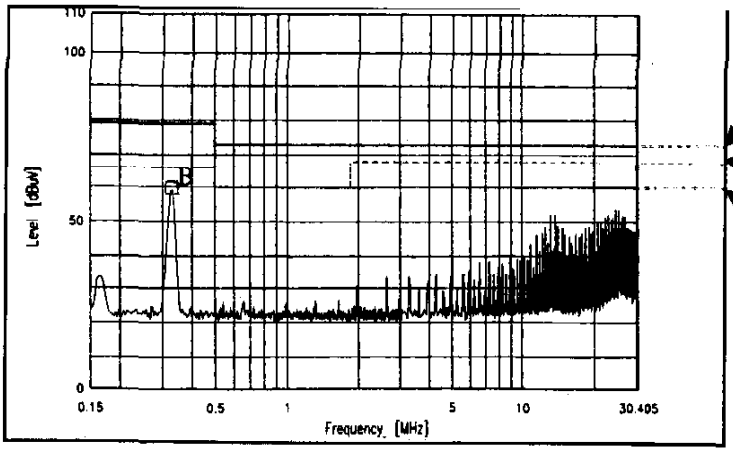
5V

Ref Date	Point A (334kHz) Limit (dbuV)	Measure (dbuV)
QP	79.0	52.5
AV	66.0	52.4



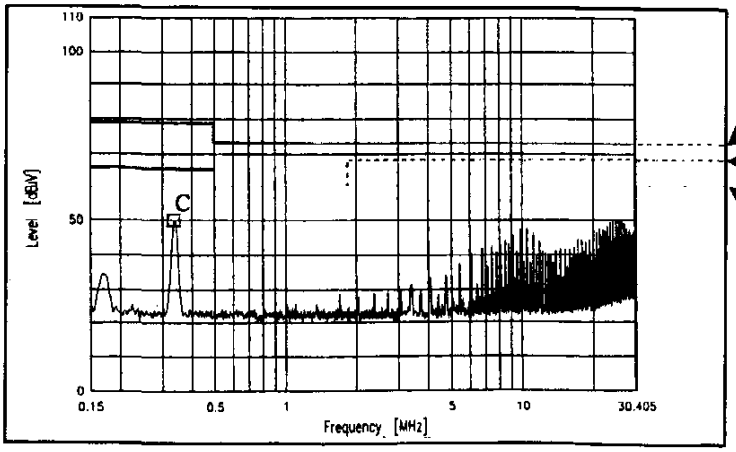
12V

Ref Date	Point B (326kHz) Limit (dbuV)	Measure (dbuV)
QP	79.0	59.2
AV	66.0	59.1



28V

Ref Date	Point C (336kHz) Limit (dbuV)	Measure (dbuV)
QP	79.0	49.8
AV	66.0	49.7



2.12 EMI特性

Electro-Magnetic Interference characteristics

(b) 雑音電界強度（輻射ノイズ）

Radiated Emission

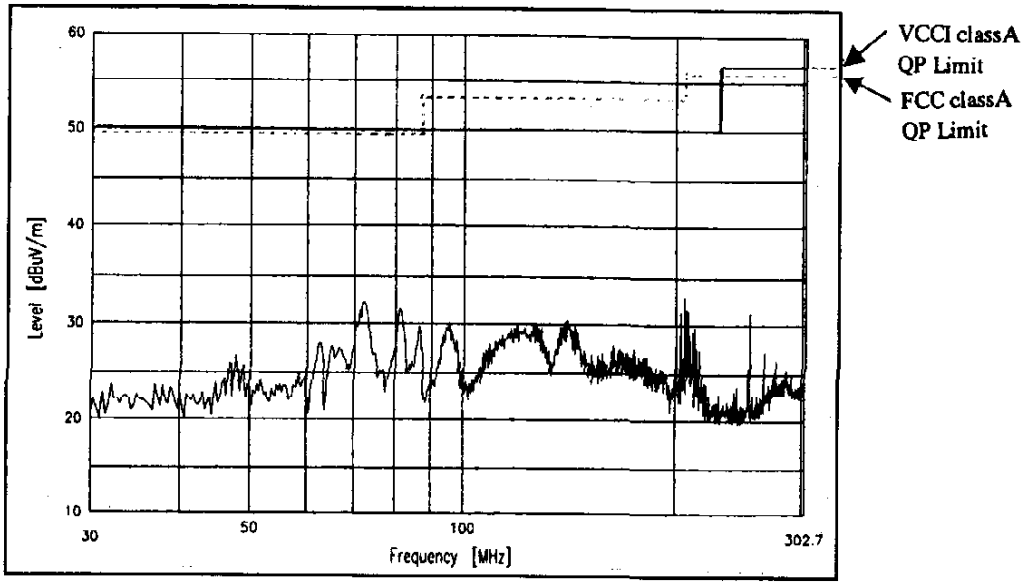
(1) VCCI class A 対応アプリケーションシステム

VCCI class A application system

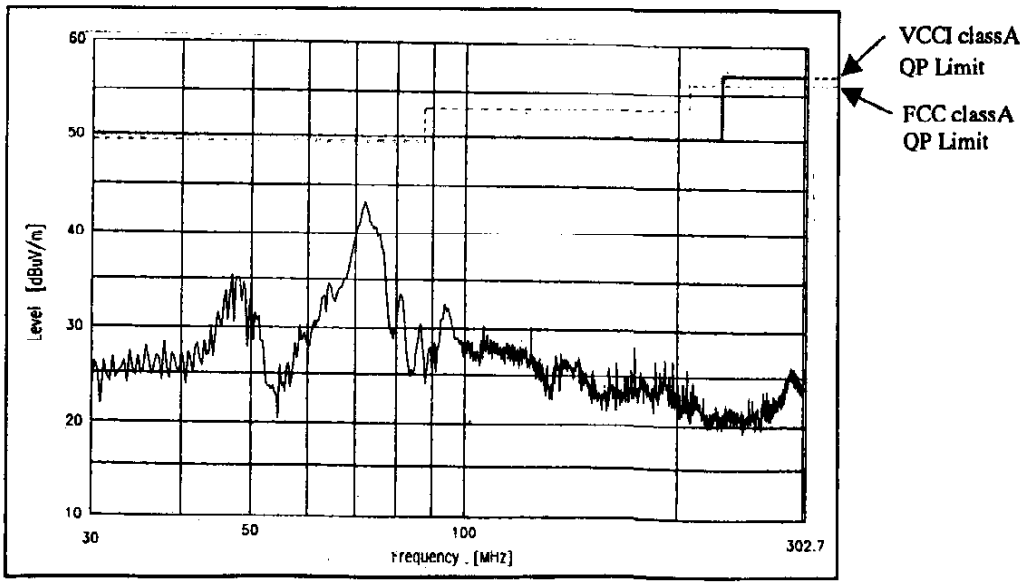
Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

5V

HORIZONTAL:



VERTICAL:



2.12 EMI特性

Electro-Magnetic Interference characteristics

(b) 雑音電界強度（輻射ノイズ）

Radiated Emission

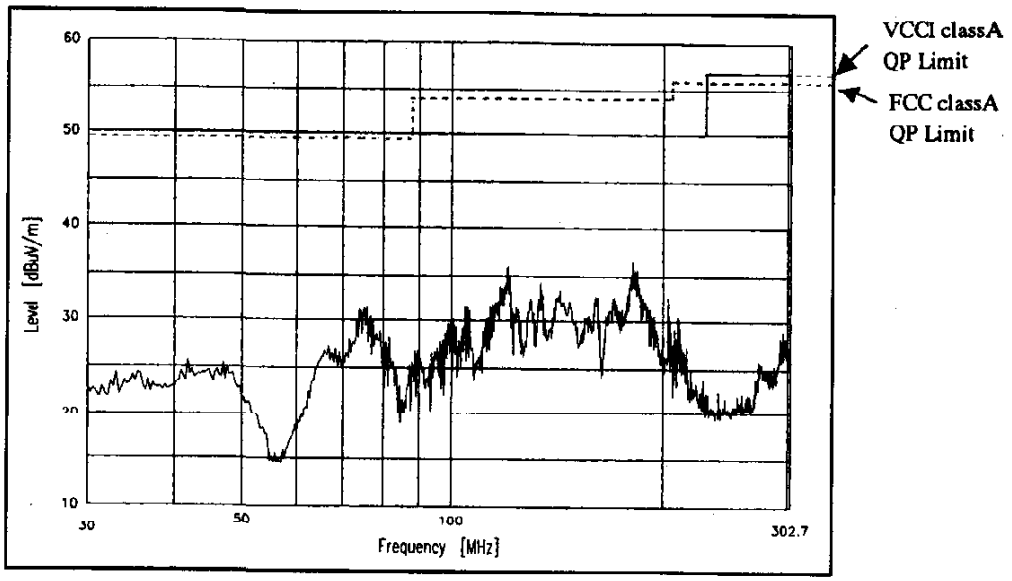
(1) VCCI class A 対応アプリケーションシステム

VCCI class A application system

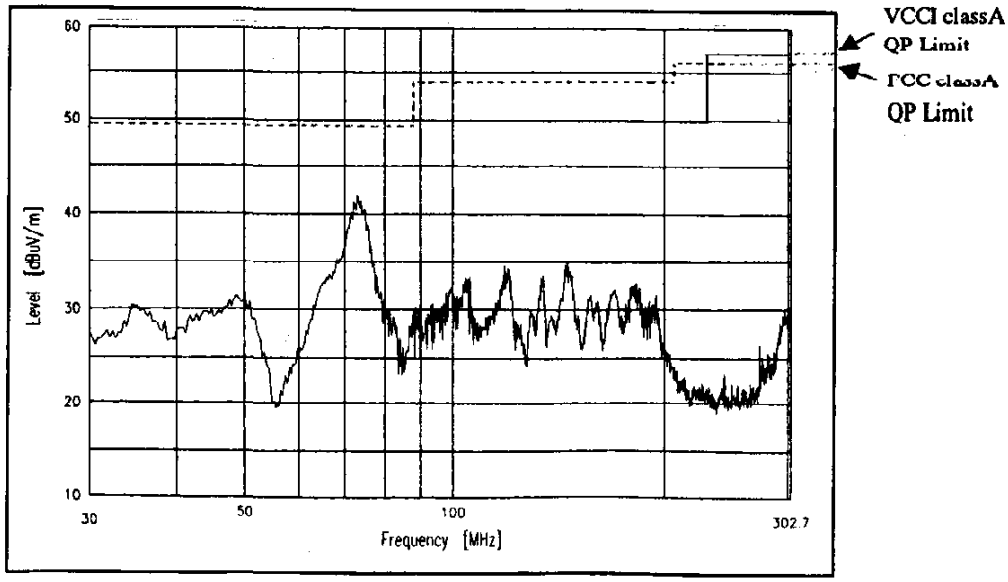
Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

12V

HORIZONTAL:



VERTICAL:



2.12 EMI特性

Electro-Magnetic Interference characteristics

(b) 雑音電界強度（輻射ノイズ）

Radiated Emission

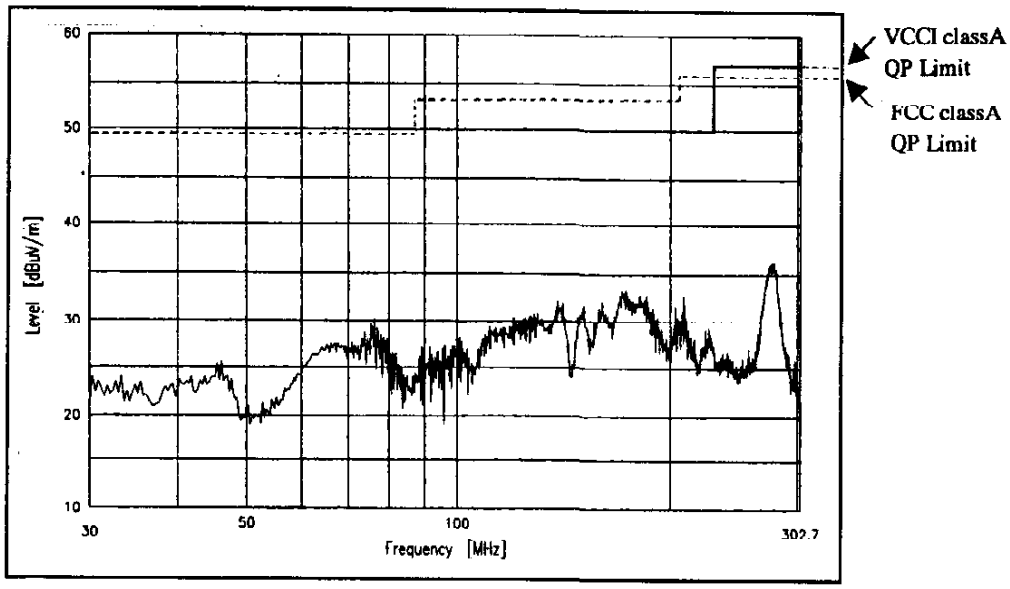
(1) VCCI class A 対応アプリケーションシステム

VCCI class A application system

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 ℃

28V

HORIZONTAL:



VERTICAL: