

PAF600F48-*

EVALUATION DATA

型式データ

DWG.No. C160-53-01/6			
承認	承認	査閲	担当
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23/Apr./01	23/Apr./01	23/Apr./01	20/Apr./01

DENSEI-LAMBDA

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2.12 EMI特性 Electro-Magnetic Interference characteristics

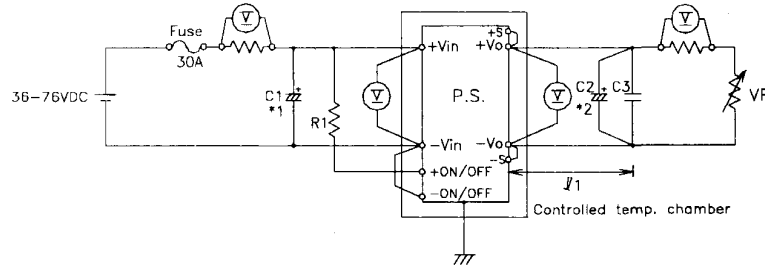
 VCCI class A 対応アプリケーションシステム

 VCCI class A application system T-30~32

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

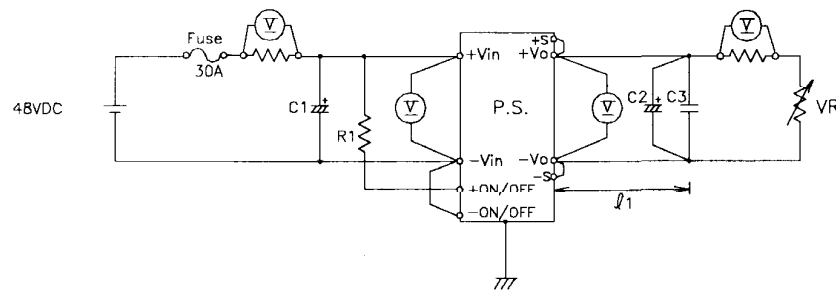


C1: 100uF Electrolytic Capacitor R1: 30k Ω
 C2: 12V-470uF Electrolytic Capacitor ℓ1: 50mm
 28v-220uF Electrolytic Capacitor
 C3: 10uF Ceramic Capacitor

==NOTE==

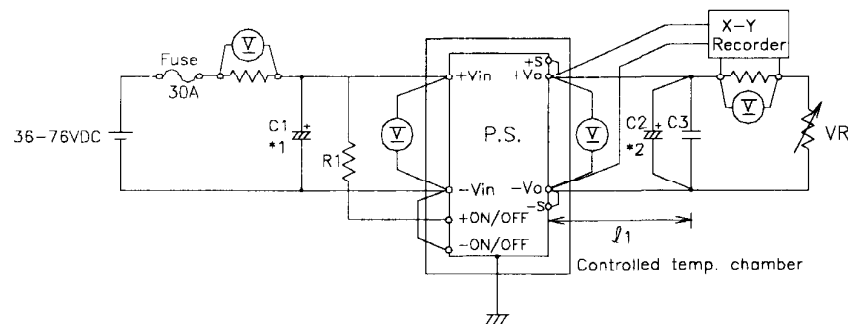
*1,*2. If the ambient temperature is less than -20°C,
 use three pieces of the recommended capacitor above.

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



C1: 100uF Electrolytic Capacitor R1: 30k Ω
 C2: 12V-470uF Electrolytic Capacitor ℓ1: 50mm
 28v-220uF Electrolytic Capacitor
 C3: 10uF Ceramic Capacitor

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

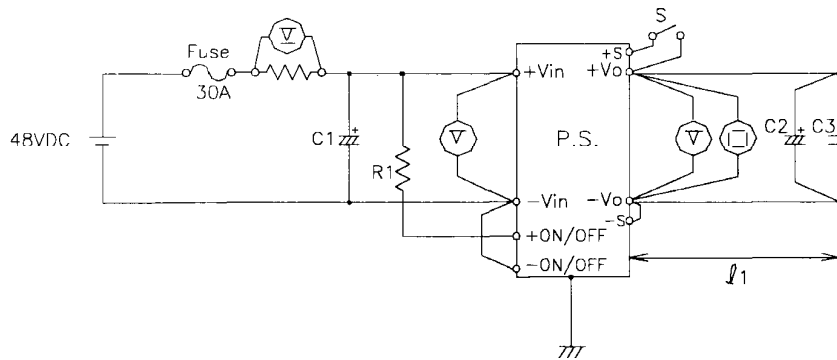


C1: 100uF Electrolytic Capacitor R1: 30k Ω
 C2: 12V-470uF Electrolytic Capacitor ℓ1: 50mm
 28v-220uF Electrolytic Capacitor
 C3: 10uF Ceramic Capacitor

==NOTE==

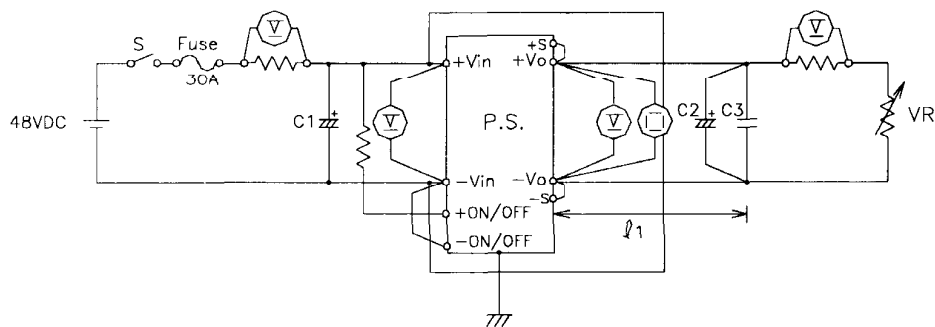
*1,*2. If the ambient temperature is less than -20°C,
 use three pieces of the recommended capacitor above.

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



C1: 100uF Electrolytic Capacitor
 C2: 12V-470uF Electrolytic Capacitor
 28v-220uF Electrolytic Capacitor
 C3: 10uF Ceramic Capacitor
 R1: 30k Ω
 l1: 50mm

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



C1: 100uF Electrolytic Capacitor
 C2: 12V-470uF Electrolytic Capacitor
 28v-220uF Electrolytic Capacitor
 C3: 10uF Ceramic Capacitor
 R1: 30k Ω
 l1: 50mm

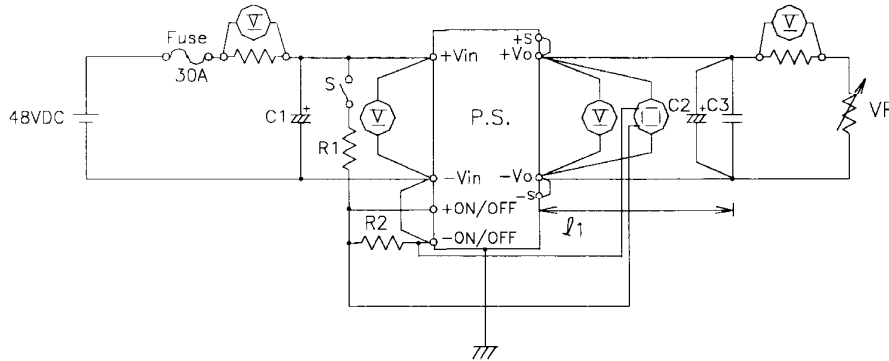
(6) 出力立ち下がり Output fall characteristics

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 | R1: 30k Ω |
| C2: 12V-470uF Electrolytic Capacitor | R2: 1M Ω |
| 28v-220uF Electrolytic Capacitor | ℓ1: 50mm |
| C3: 10uF Ceramic Capacitor | |

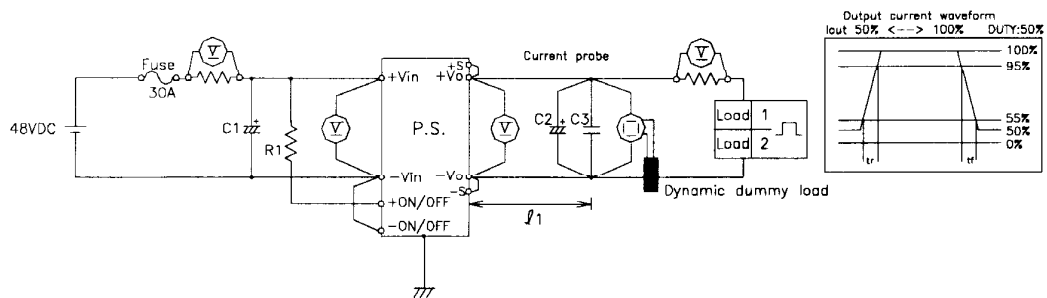
(8) 出力立ち下がり特性 (ON/OFFコントロール時)

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

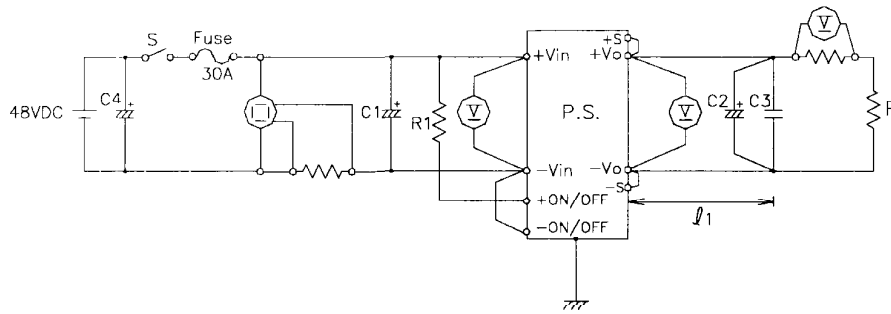
Same as output rise characteristics with CONTROL ON/OFF

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



- | | |
|--------------------------------------|-----------|
| C1: 100uF Electrolytic Capacitor | R1: 30k Ω |
| C2: 12V-470uF Electrolytic Capacitor | ℓ1: 50mm |
| 28v-220uF Electrolytic Capacitor | |
| C3: 10uF Ceramic Capacitor | |

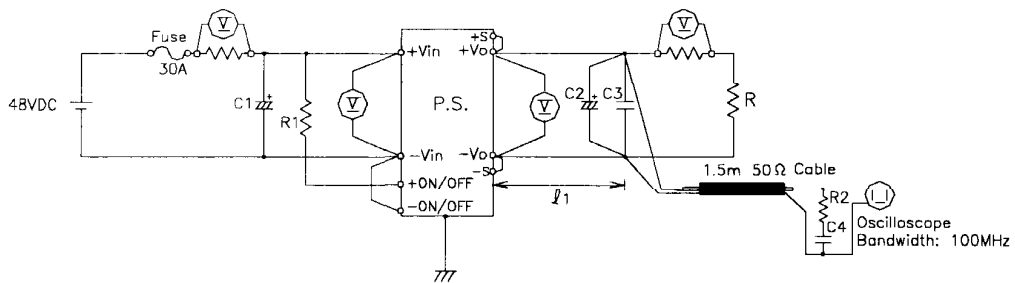
(10) 入力サージ電流 (突入電流) 特性 Inrush current characteristics



- C1: 100 μ F Electrolytic Capacitor
 C2: 220 μ F Electrolytic Capacitor
 C3: 10 μ F Ceramic Capacitor
 C4: 15000pF Electrolytic Capacitor
 R1: 30k Ω
 l_1 : 50mm

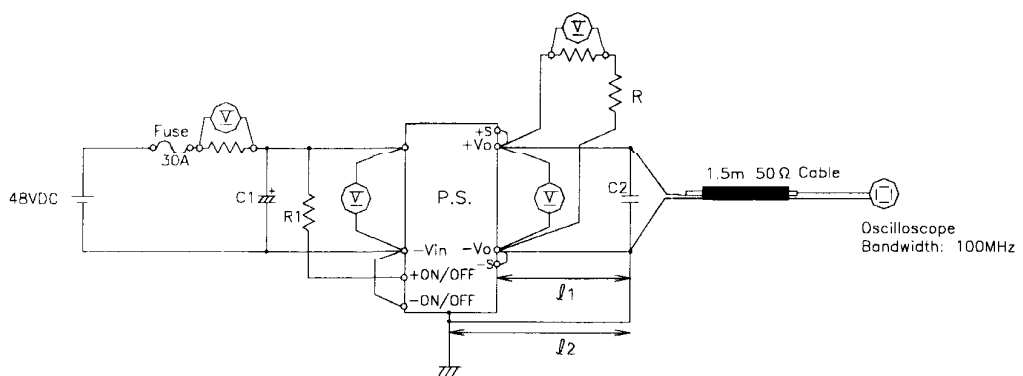
(11) 出力リップル、ノイズ波形 Output ripple and noise waveform

(a) Normal Mode



- C1: 100 μ F Electrolytic Capacitor
 C2: 12V-470 μ F Electrolytic Capacitor
 28V-220 μ F Electrolytic Capacitor
 C3: 10 μ F Ceramic Capacitor
 C4: 4700pF Film Capacitor
 R1: 30k Ω
 R2: 50 Ω
 l_1 : 50mm

(b) Normal + Common Mode



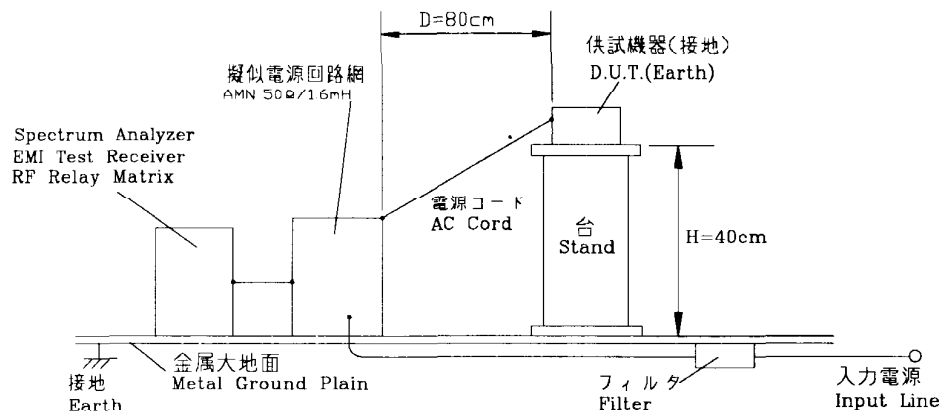
- C1: 100 μ F Electrolytic Capacitor
 C2: 0.1 μ F Ceramic Capacitor
 R1: 30k Ω
 l_2, l_3 : 152mm

(12) EMI 特性

Electro-Magnetic Interference characteristics

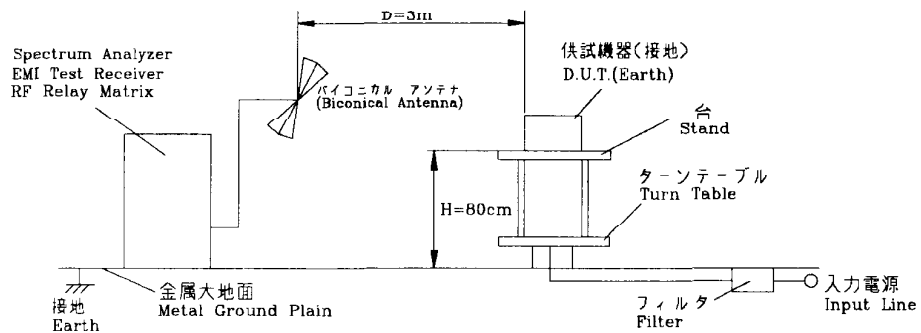
(a) 雑音端子電圧 (帰還ノイズ)

Conducted Emission Noise



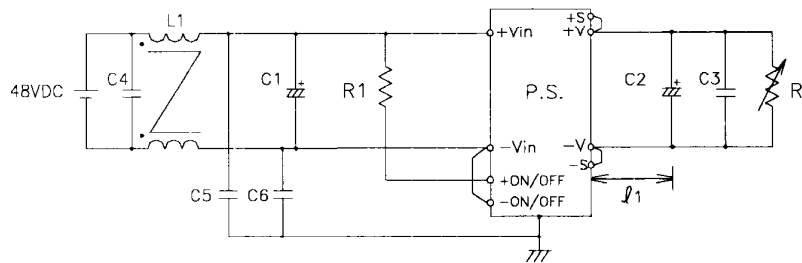
(b) 雑音電界強度 (輻射ノイズ)

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 | C4 : 2.2uF Ceramic Capacitor |
| C1 : 470uF Electrolytic Capacitor | C5,C6 : 0.15uF Ceramic Capacitor |
| C2 : 12V-470uF Electrolytic Capacitor | R1 : 30k Ω |
| 28V-220uF Electrolytic Capacitor | I1 : 50mm |
| C3 : 10uF Ceramic Capacitor | |

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

12V

1. Regulation - line and load condition $T_p : 25^{\circ}\text{C}$

Iout \ Vin	36VDC	48VDC	76VDC	line regulation	
0%	11.974V	11.974V	11.975V	1mV	0.008%
50%	11.973V	11.973V	11.974V	1mV	0.008%
100%	11.972V	11.973V	11.974	2mV	0.017%
load regulation	2mV	1mV	1mV		
	0.017%	0.008%	0.008%		

2. Temperature drift conditions $V_{in} : 48\text{VDC}$
 $I_{out} : 100\%$

T_p	-40°C	25°C	100°C	temperature stability	
Vout	12.002V	11.973V	11.909V	93mV	0.775%

28V

1. Regulation - line and load condition $T_p : 25^{\circ}\text{C}$

Iout \ Vin	36VDC	48VDC	76VDC	line regulation	
0%	28.079V	28.080V	28.081V	2mV	0.007%
50%	28.080V	28.079V	28.081V	2mV	0.007%
100%	28.080V	28.078V	28.080V	2mV	0.007%
load regulation	1mV	2mV	1mV		
	0.004%	0.007%	0.004%		

2. Temperature drift conditions $V_{in} : 48\text{VDC}$
 $I_{out} : 100\%$

T_p	-40°C	25°C	100°C	temperature stability	
Vout	28.154mV	28.078mV	27.883mV	271mV	0.968%

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

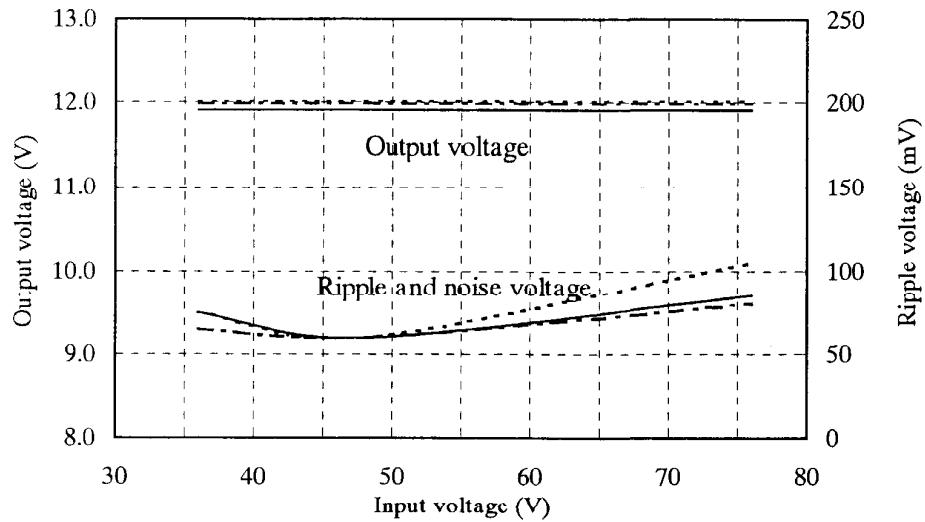
Conditions Iout : 100 %

Tp : -40 °C -----

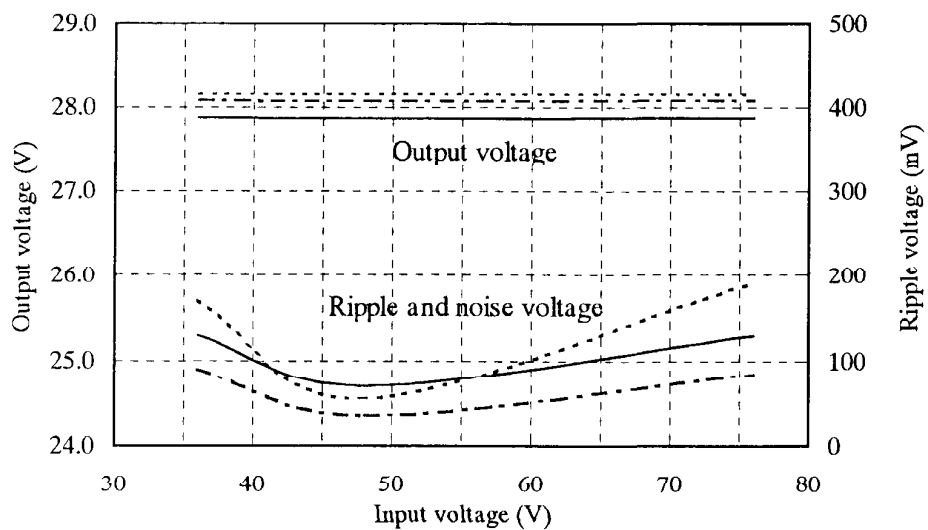
: 25 °C - - - - -

: 100 °C _____

12V



28V

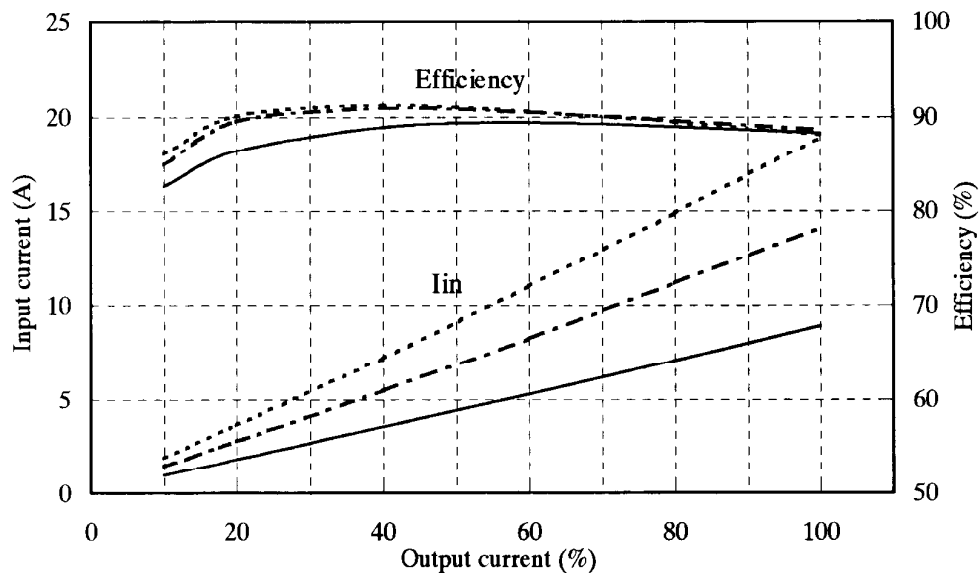


2.1 (2) 効率、入力電流対出力電流

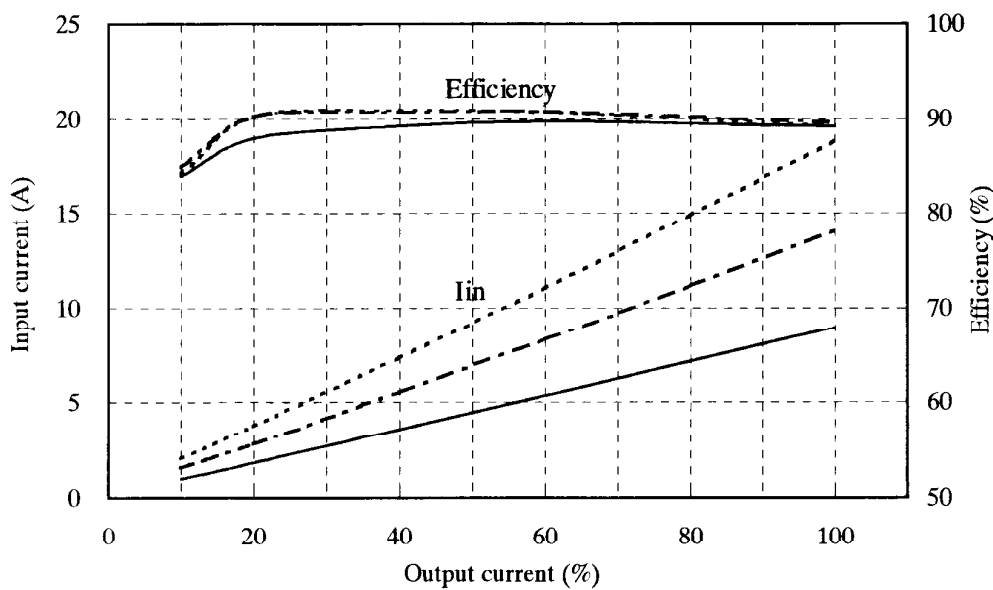
Efficiency and input current vs output current

Conditions V_{in} : 36 VDC -----
 : 48 VDC - - - - -
 : 76 VDC ————
 T_p : 25 °C

12V



28V



2.1 (3) 効率対入力電圧

Efficiency vs input voltage

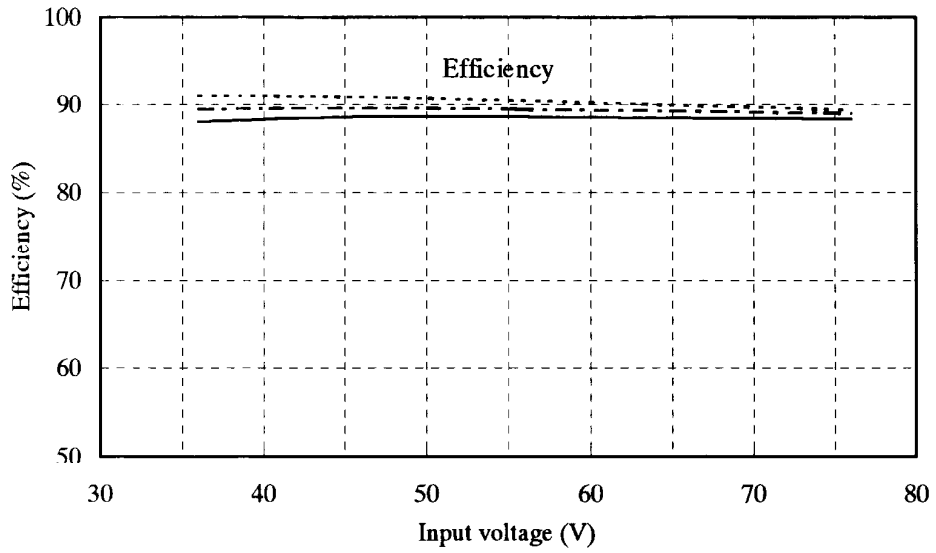
Conditions T_p : 25 °C

I_{out} : 50 % -----

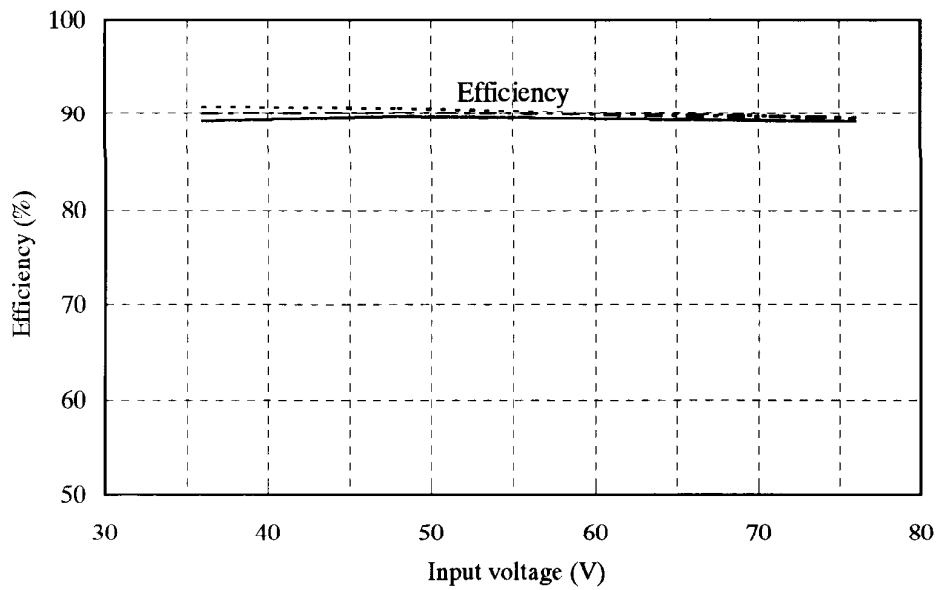
80 % -.-.-.-

100 % _____

12V



28V



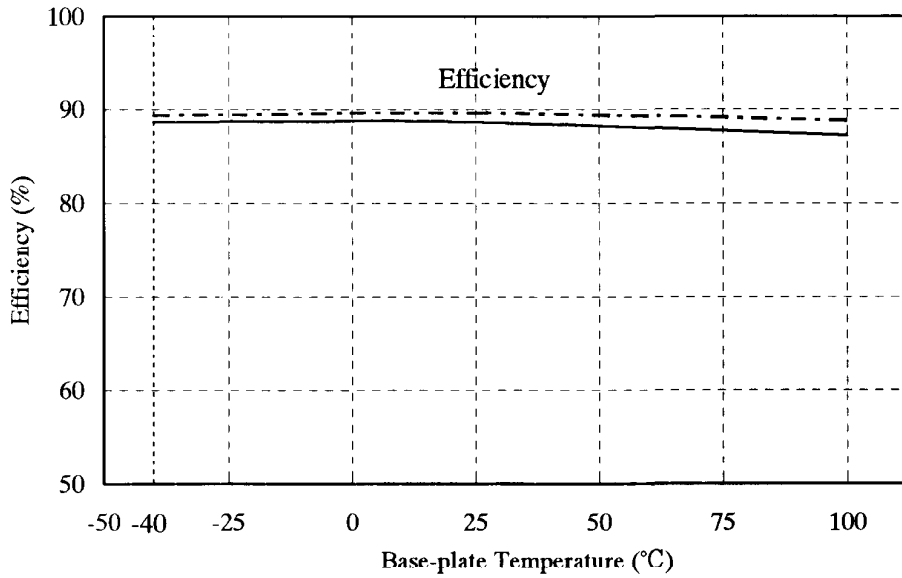
2.1 (4) 効率対ベースプレート温度
Efficiency vs base-plate temperature

Conditions Vin : 48 VDC

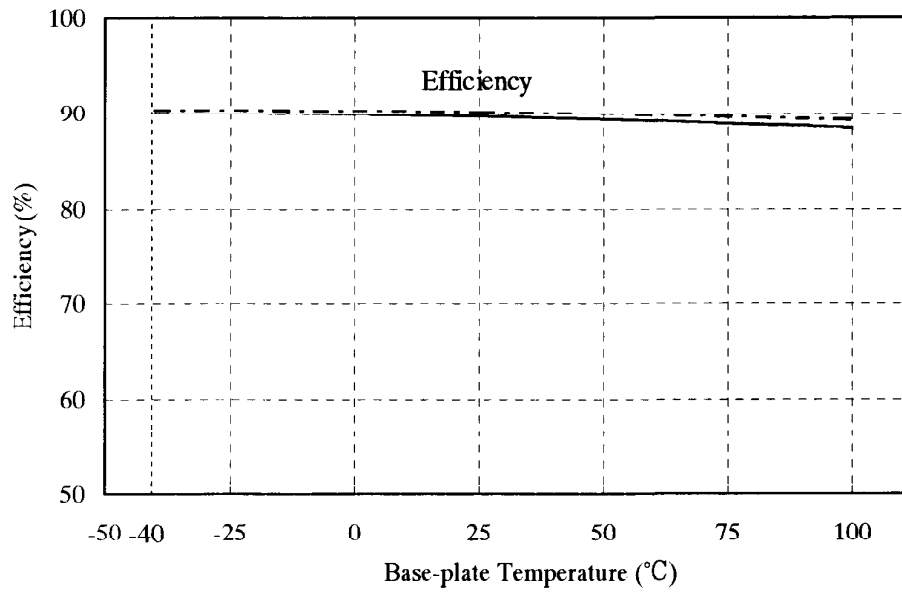
Iout : 80 % - - - - -

100 % ———

12V



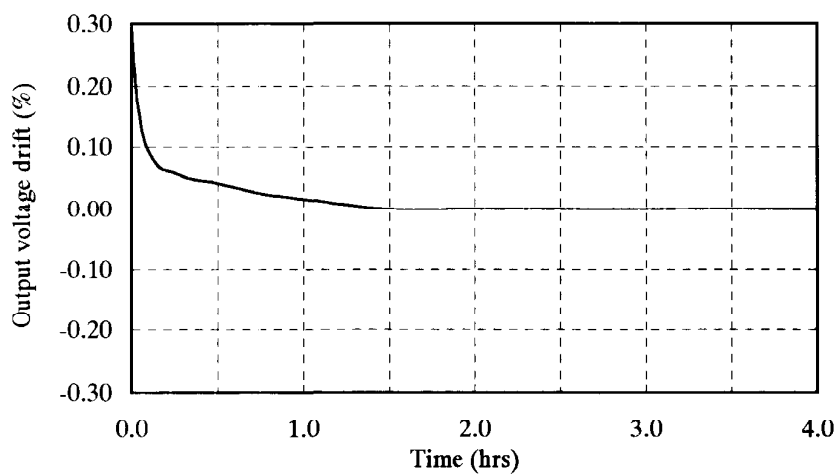
28V



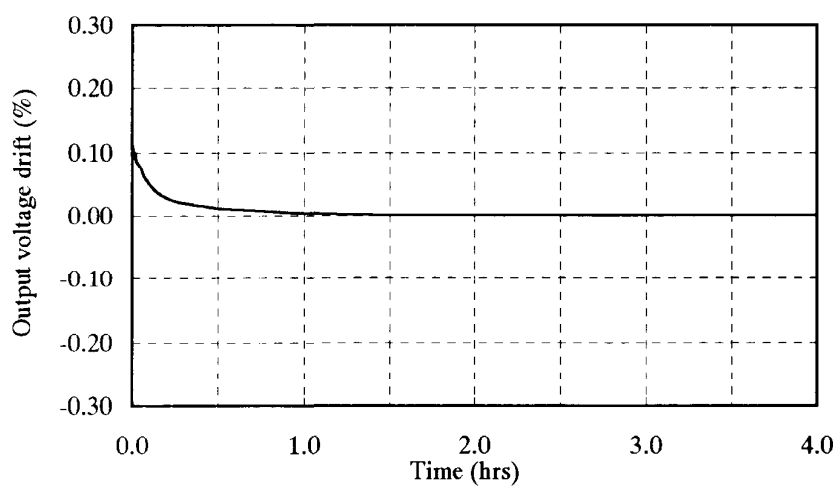
2.2 通電ドリフト特性
Warm up voltage drift characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 °C

12V



28V

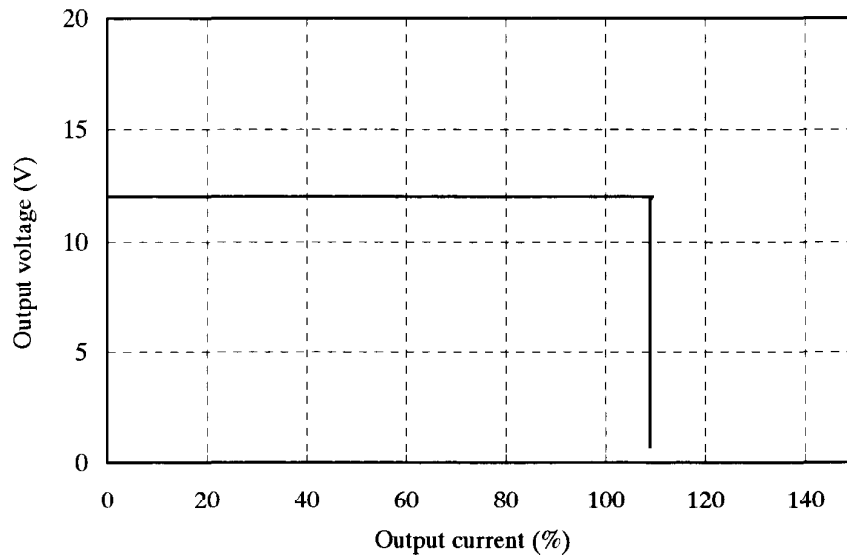


2.3 過電流保護特性

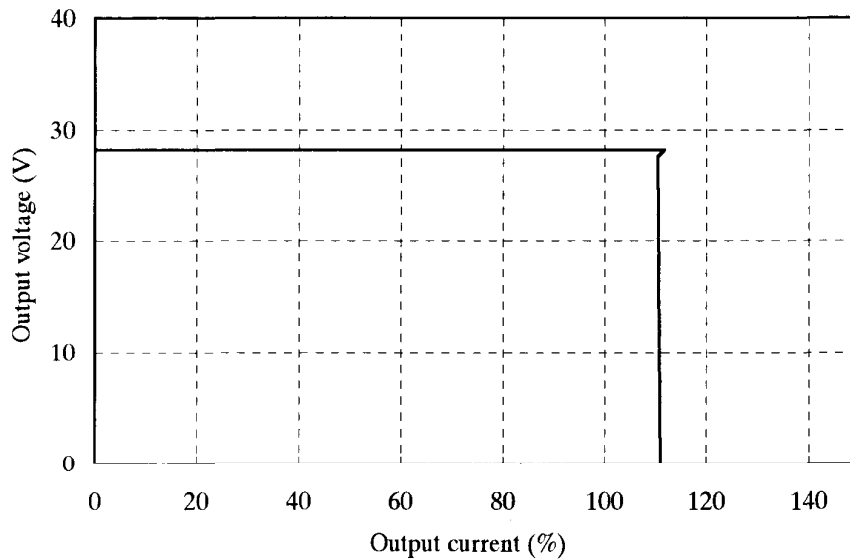
Over current protection (OCP) characteristics

Conditions Vin : 36 VDC -----
 : 48 VDC - - - - -
 : 76 VDC ————
 Tp : 25 °C

12V



28V



2.3 過電流保護特性

Over current protection (OCP) characteristics

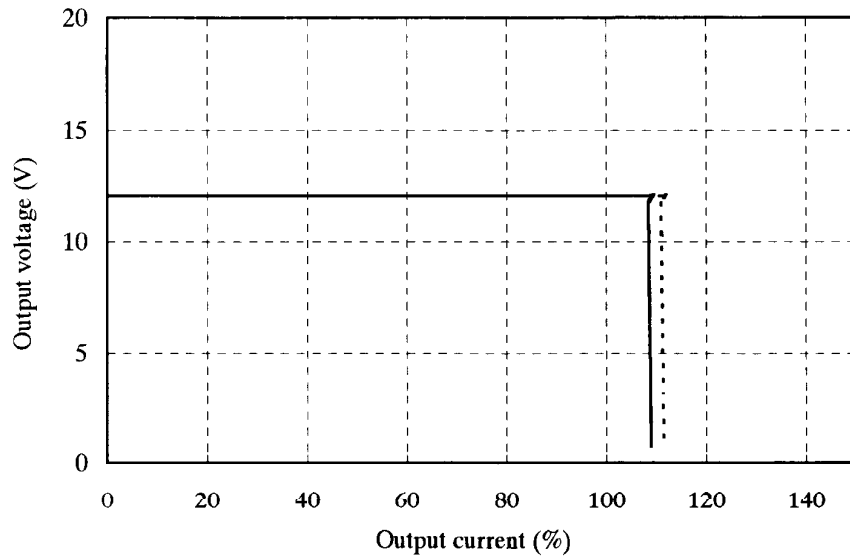
Conditions Vin : 48 VDC

Tp : -40 °C -----

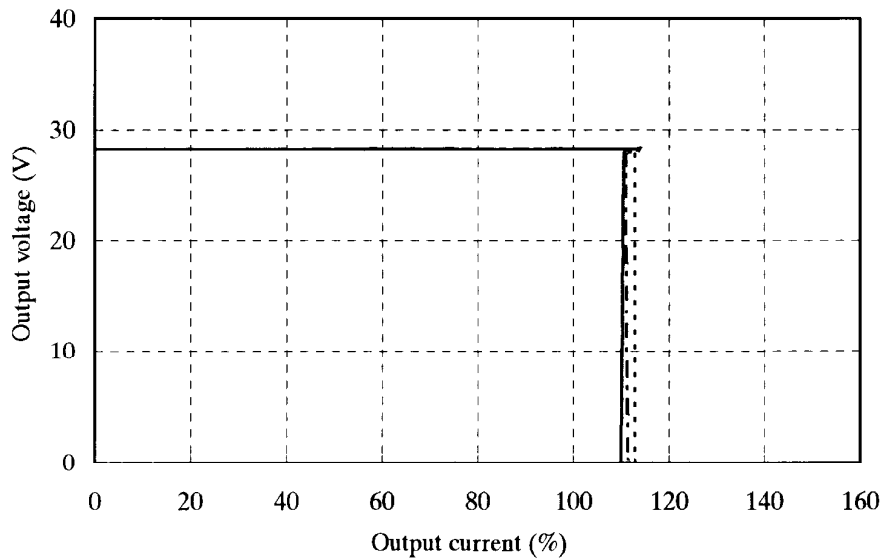
: 25 °C - - - - -

: 100 °C _____

12V



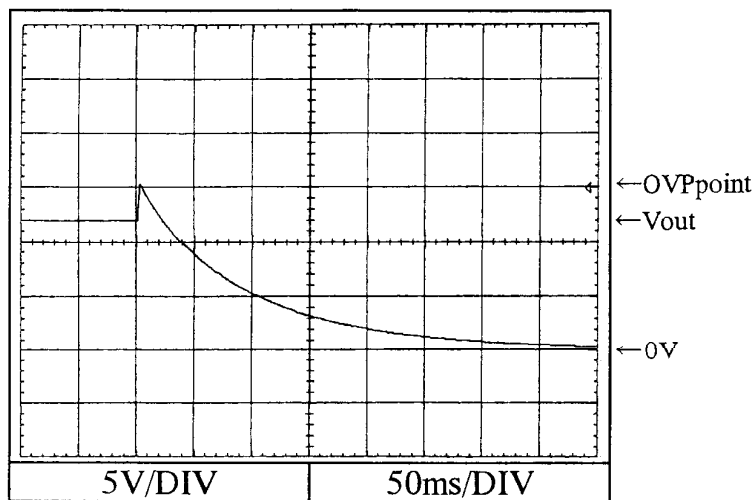
28V



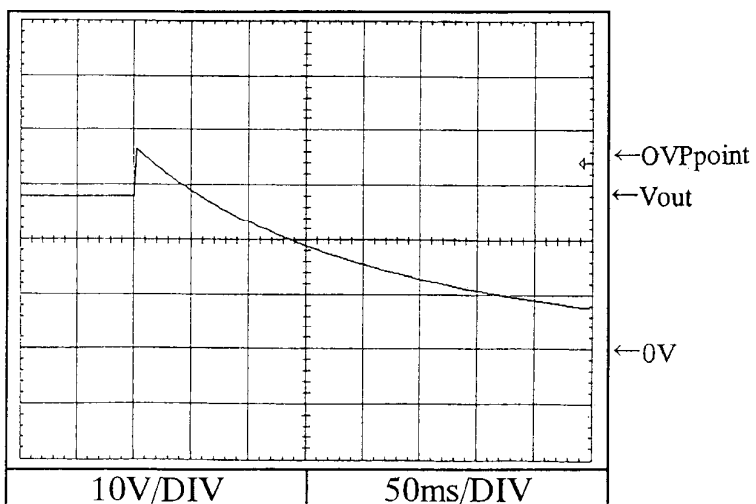
2.4 過電圧保護特性
Over voltage protection (OVP) characteristics

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 °C

12V



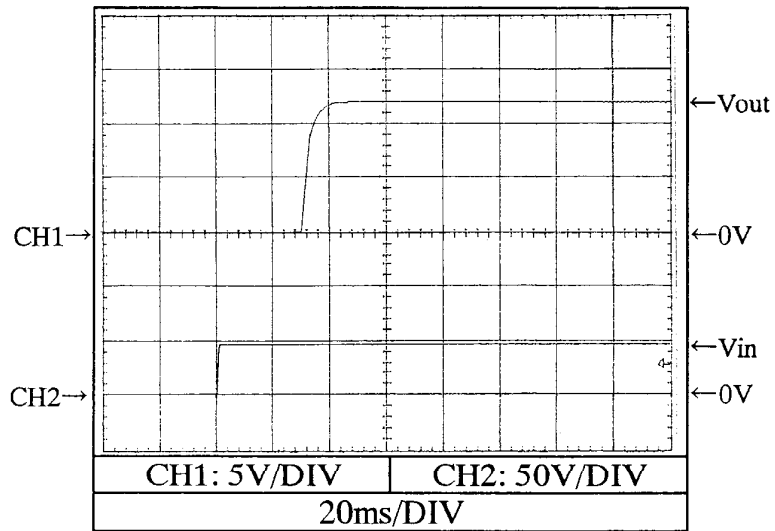
28V



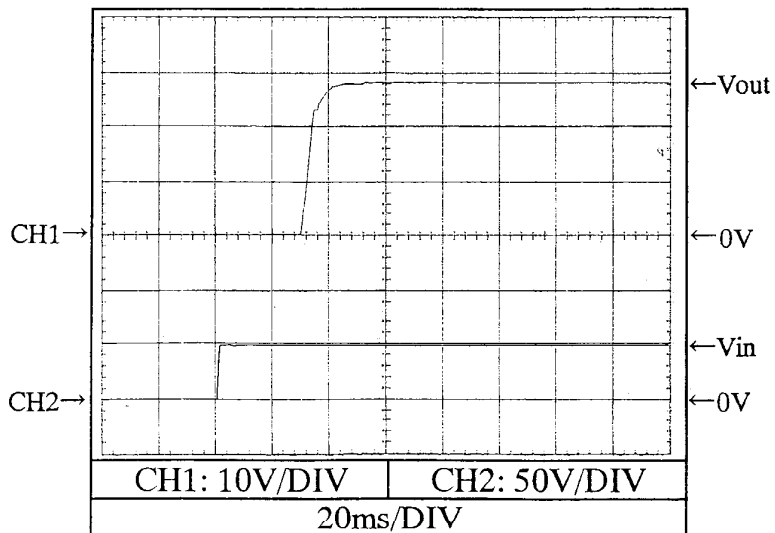
2.5 出力立ち上がり特性
Output rise characteristics

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 °C

12V



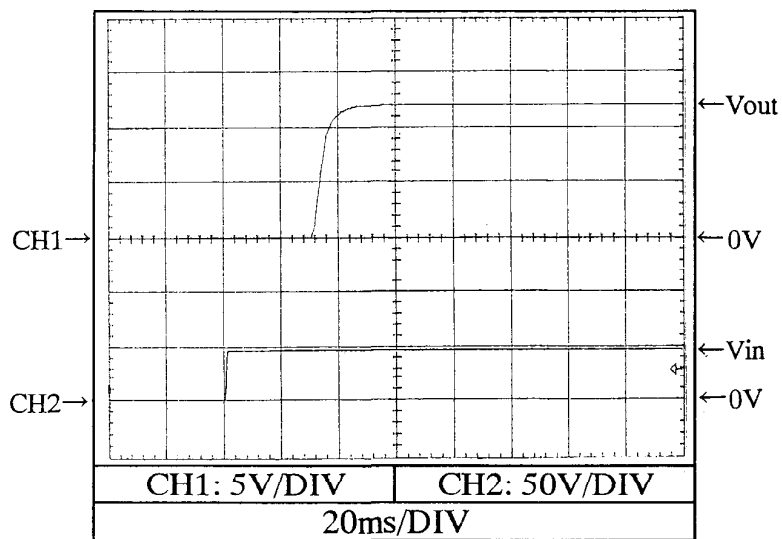
28V



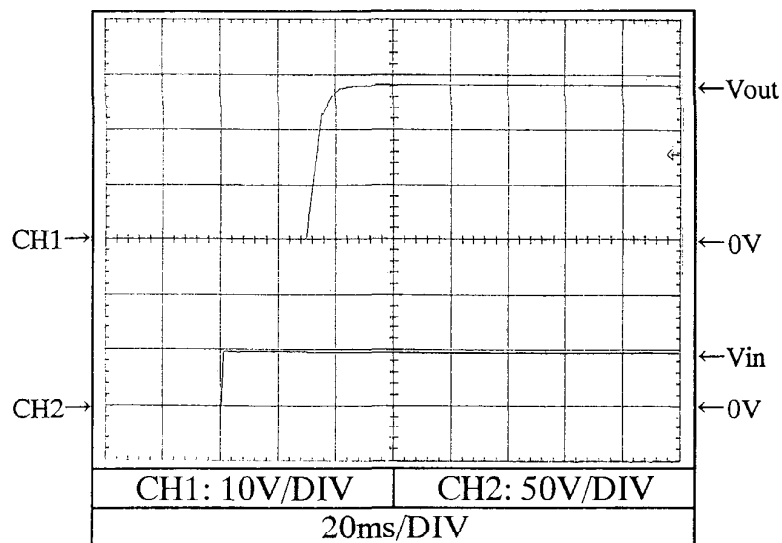
2.5 出力立ち上がり特性
Output rise characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 °C

12V



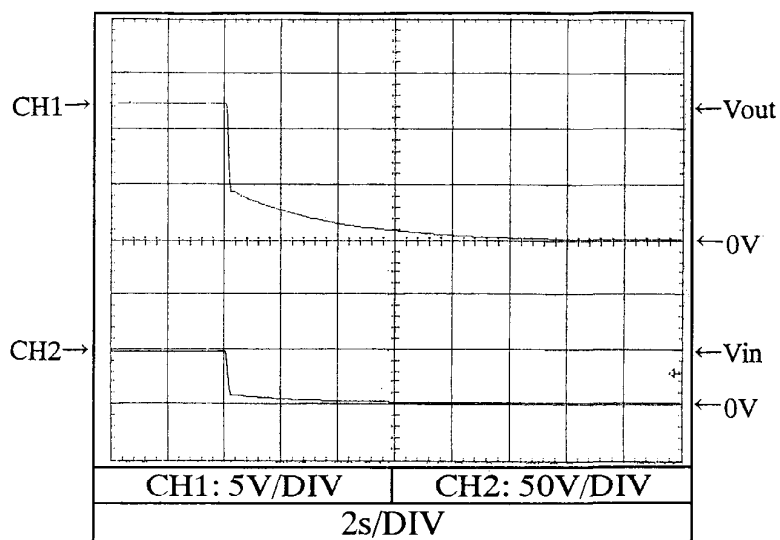
28V



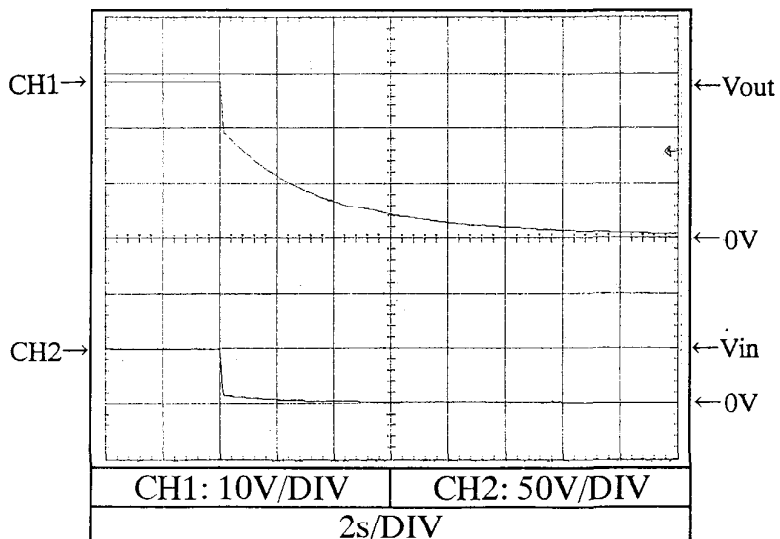
2.6 出力立ち下がり特性
Output fall characteristics

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 °C

12V



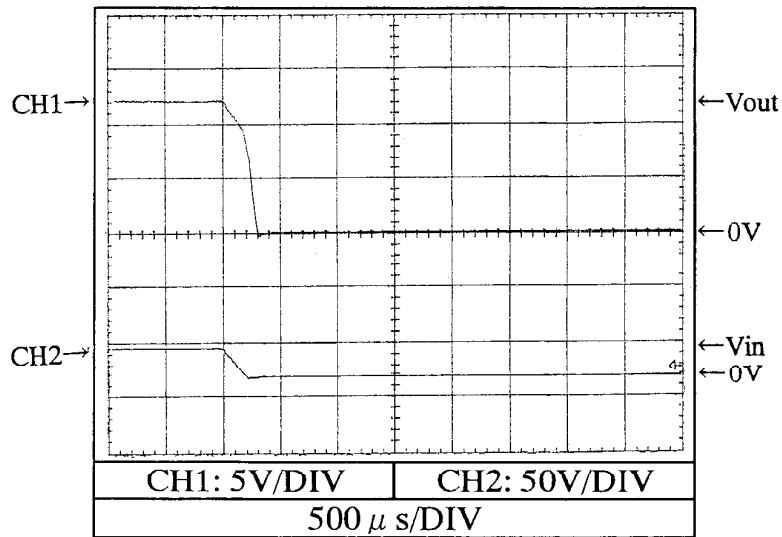
28V



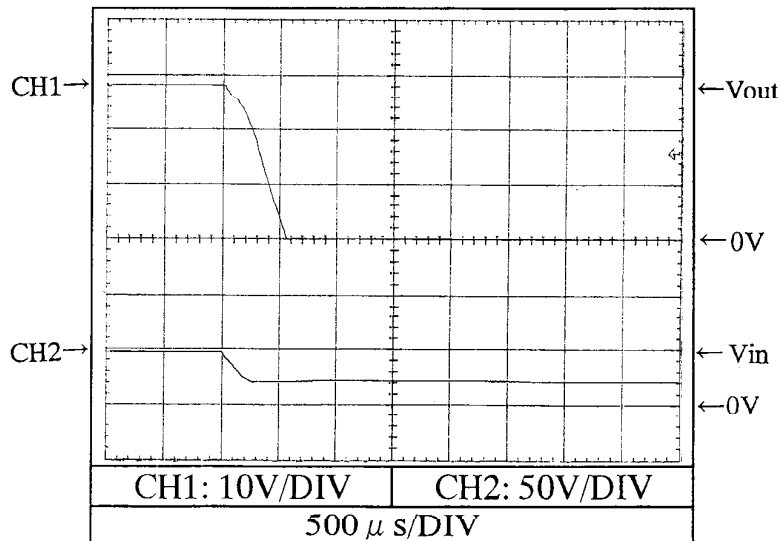
2.6 出力立ち下がり特性
Output fall characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 °C

12V



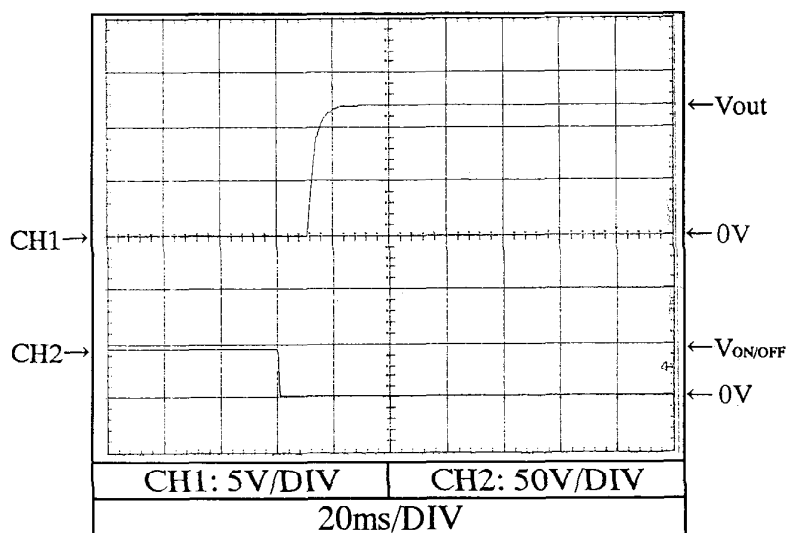
28V



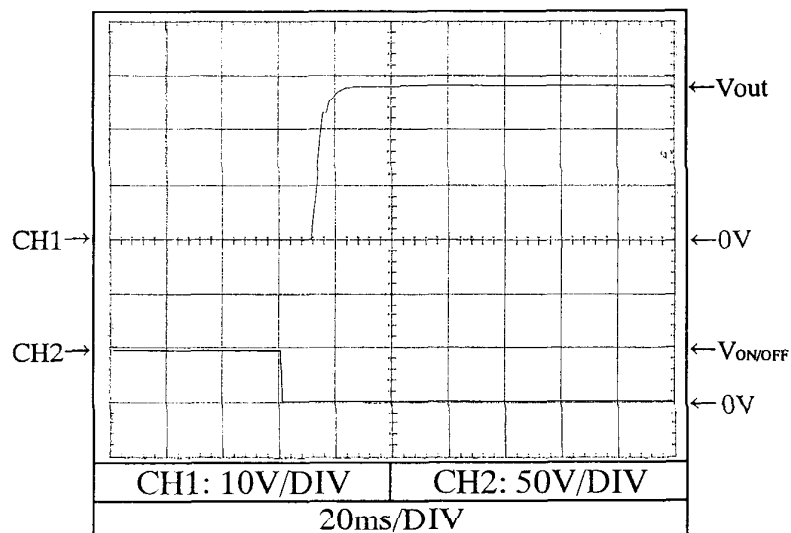
2.7 出力立ち上がり特性 (ON/OFFコントロール時)
Output rise characteristics with ON/OFF CONTROL

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 °C

12V



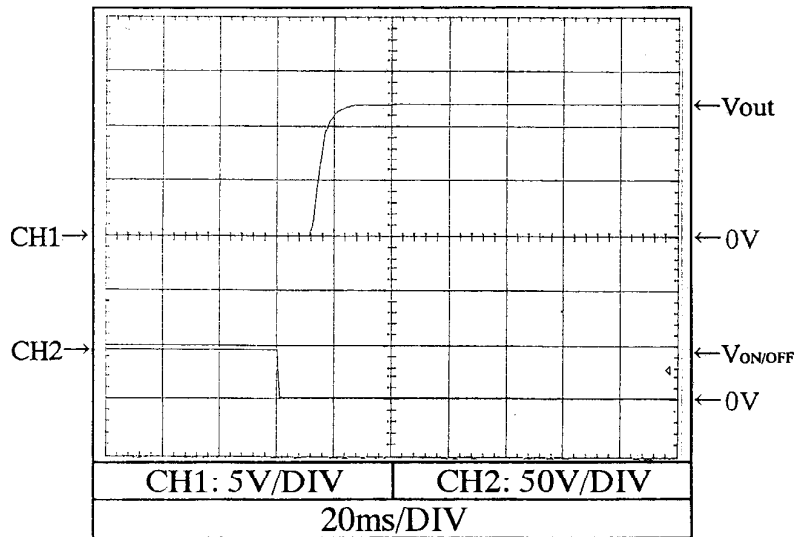
28V



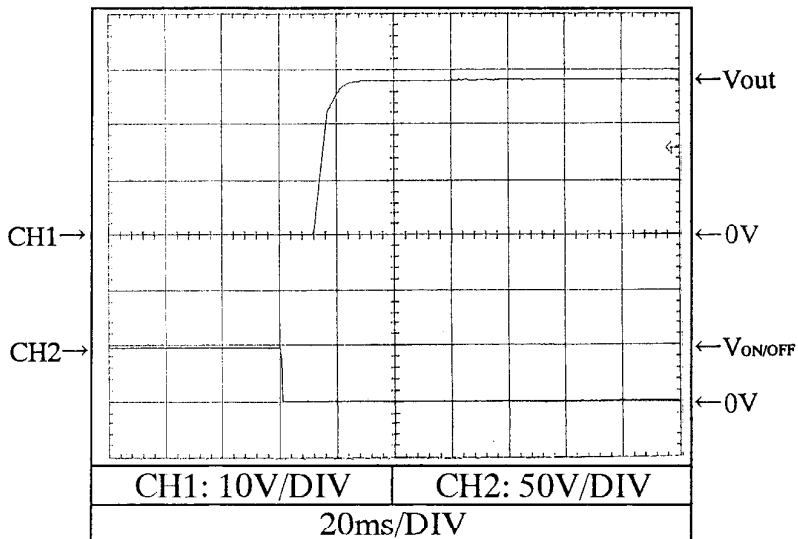
2.7 出力立ち上がり特性 (ON/OFFコントロール時)
Output rise characteristics with ON/OFF CONTROL

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 °C

12V



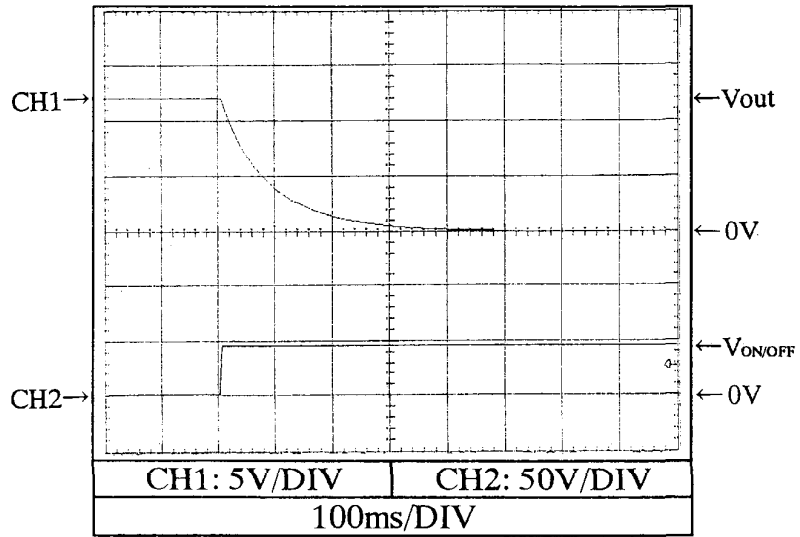
28V



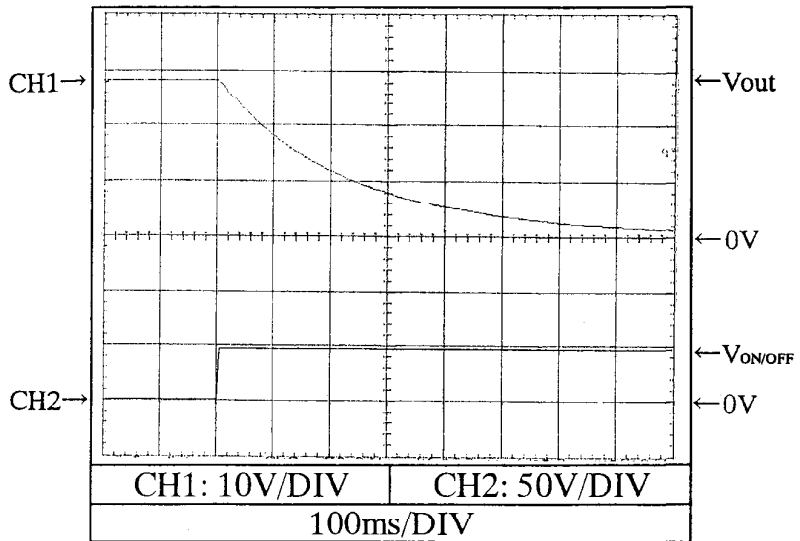
2.8 出力立ち下がり特性 (ON/OFFコントロール時)
Output fall characteristics with ON/OFF CONTROL

Conditions Vin : 48 VDC
Iout : 0 %
Tp : 25 °C

12V



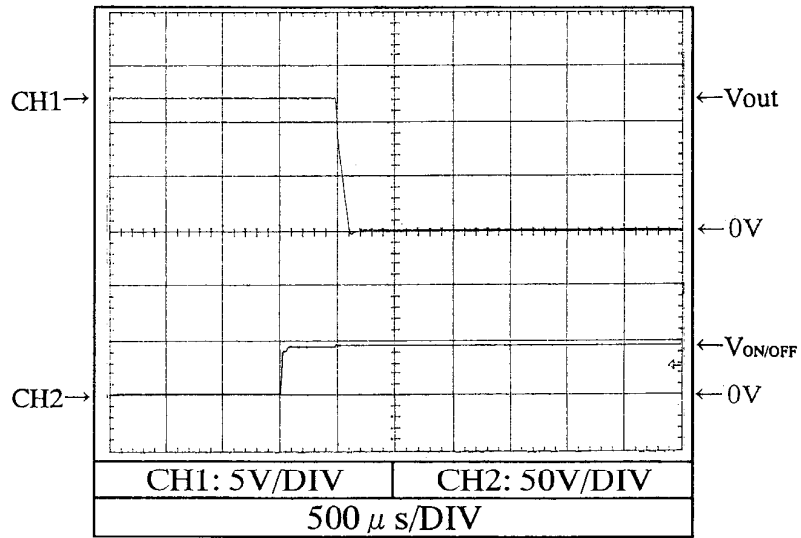
28V



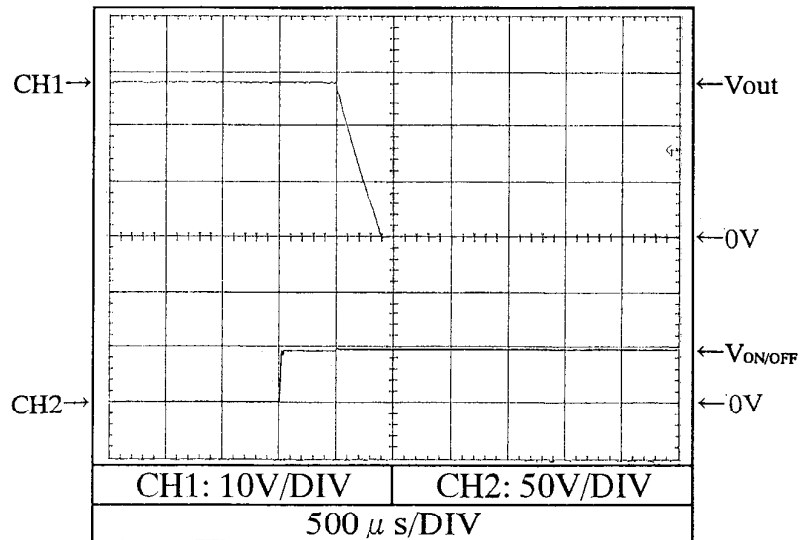
2.8 出力立ち下がり特性 (ON/OFFコントロール時)
Output fall characteristics with ON/OFF CONTROL

Conditions V_{in} : 48 VDC
 I_{out} : 100 %
 T_p : 25 °C

12V



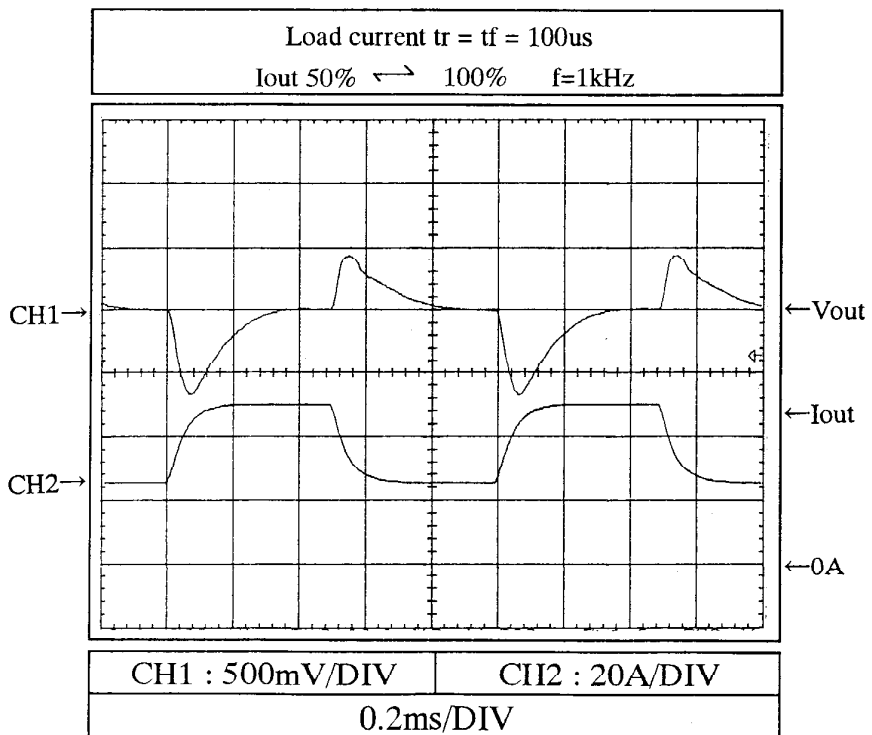
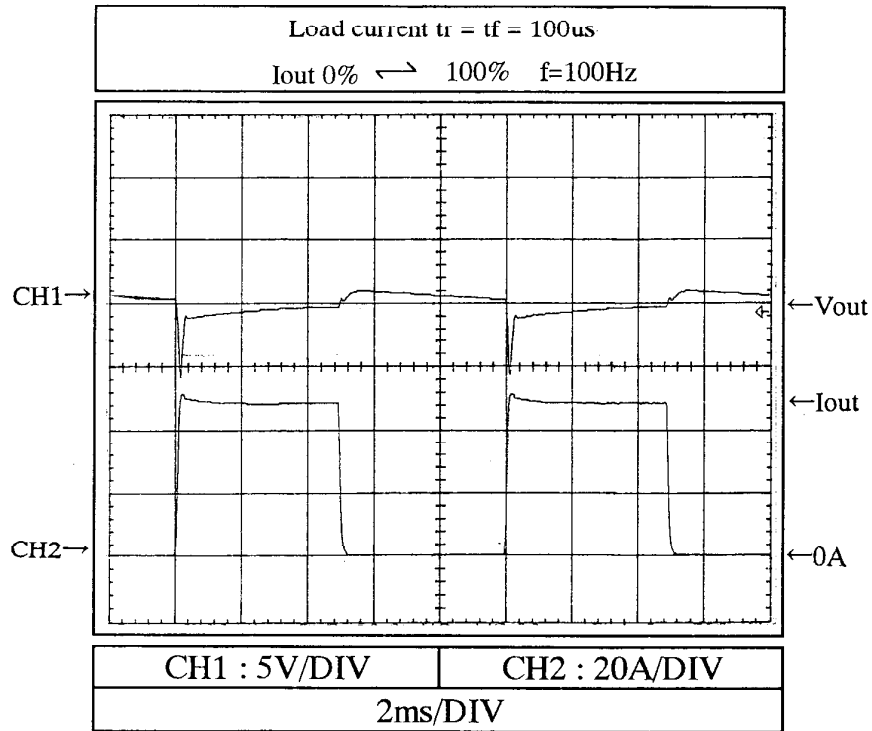
28V



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

Conditions Vin : 48 VDC
Tp : 25 °C

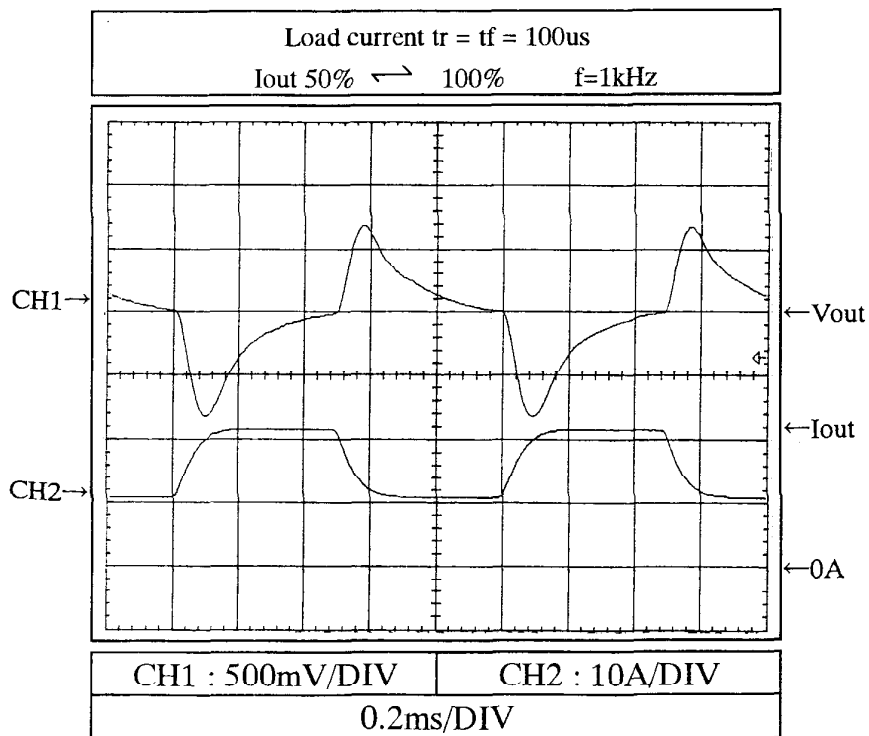
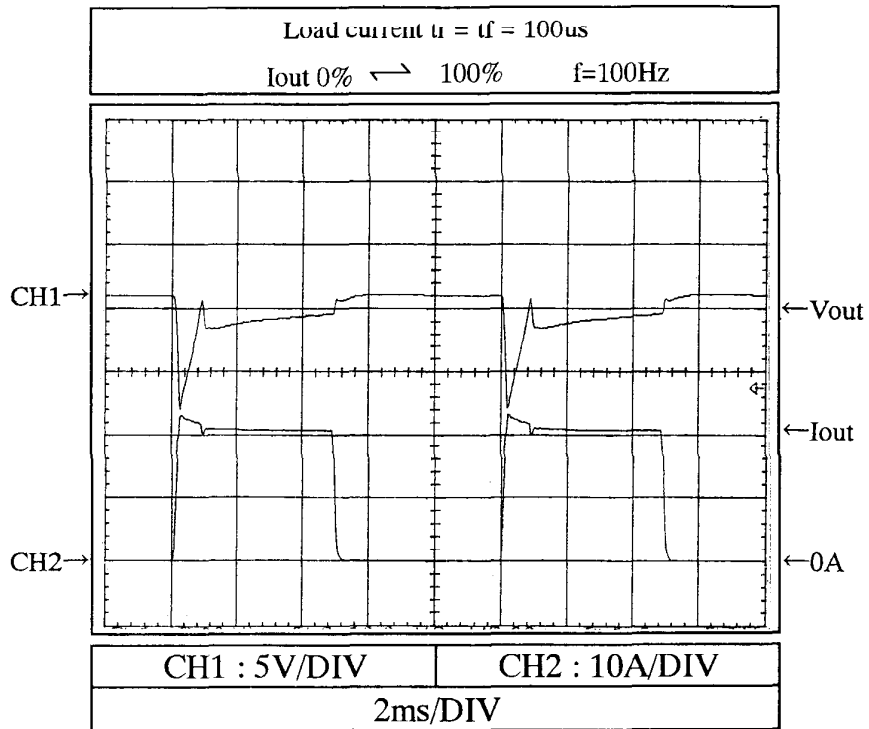
12V



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

Conditions Vin : 48 VDC
Tp : 25 °C

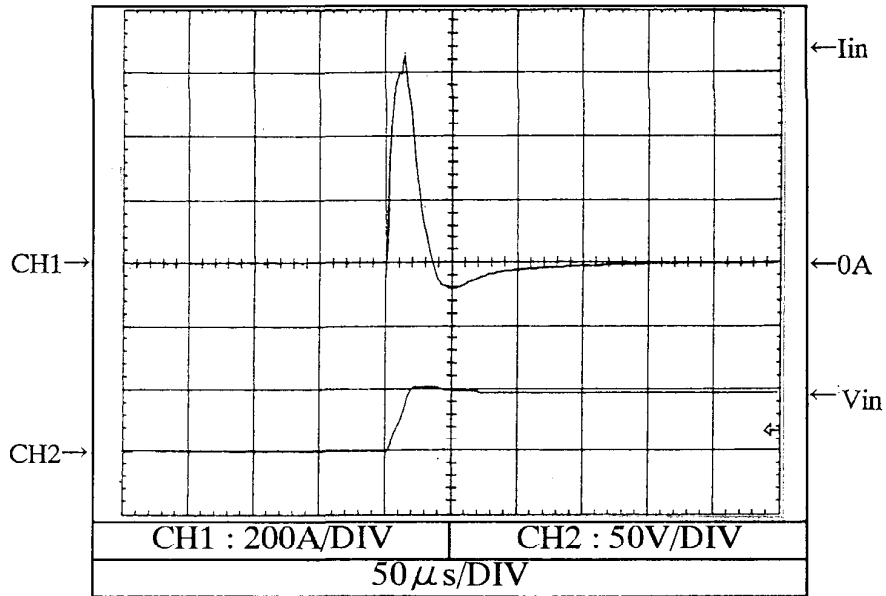
28V



2.10 入力リージ電流（突入電流）特性
Inrush current waveform

Conditions Vin : 48 VDC
Iout : 100 %
Tp : 25 °C

28V

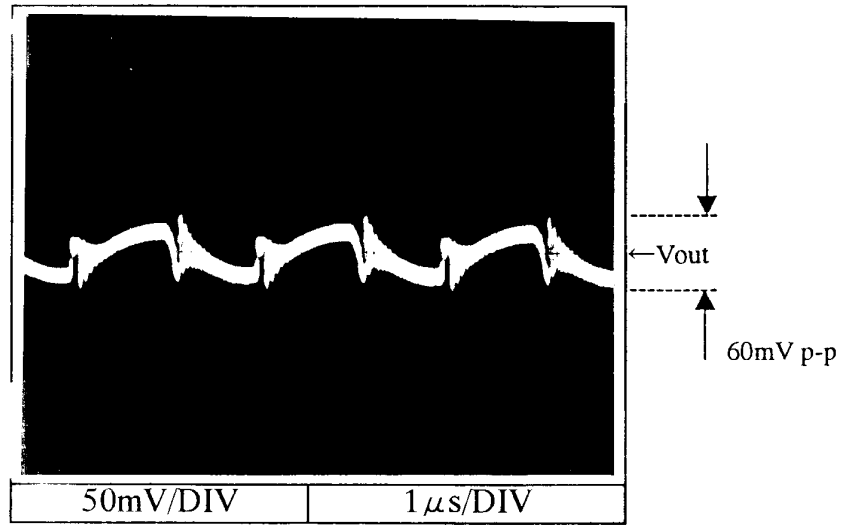


2.11 出力リップル、ノイズ波形
Output ripple and noise waveform

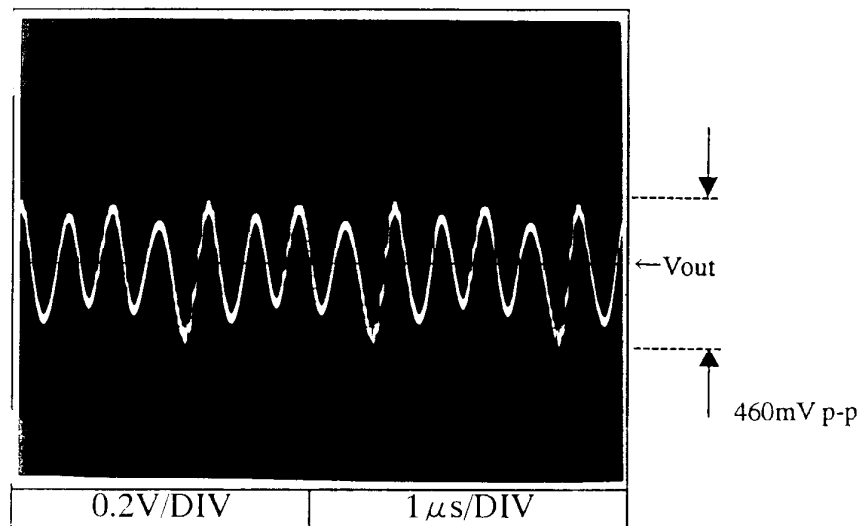
Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 °C

12V

Normal mode



Normal + common mode

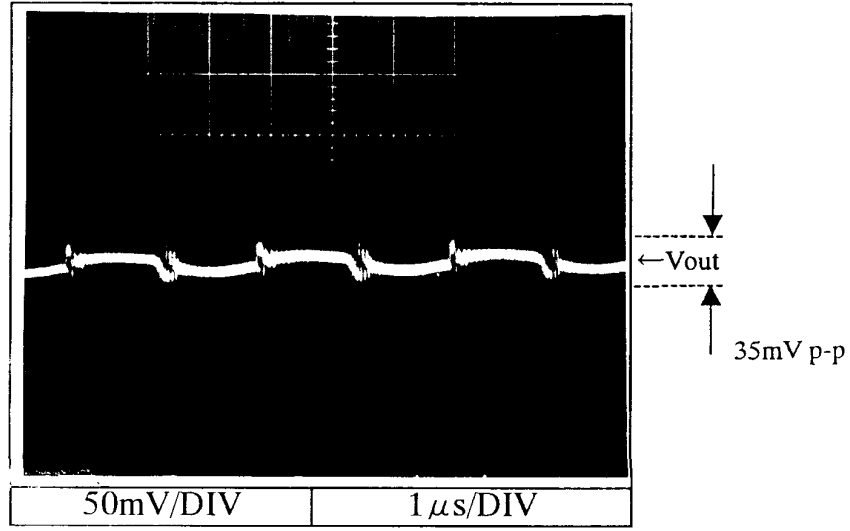


2.11 出力リップル、ノイズ波形
Output ripple and noise waveform

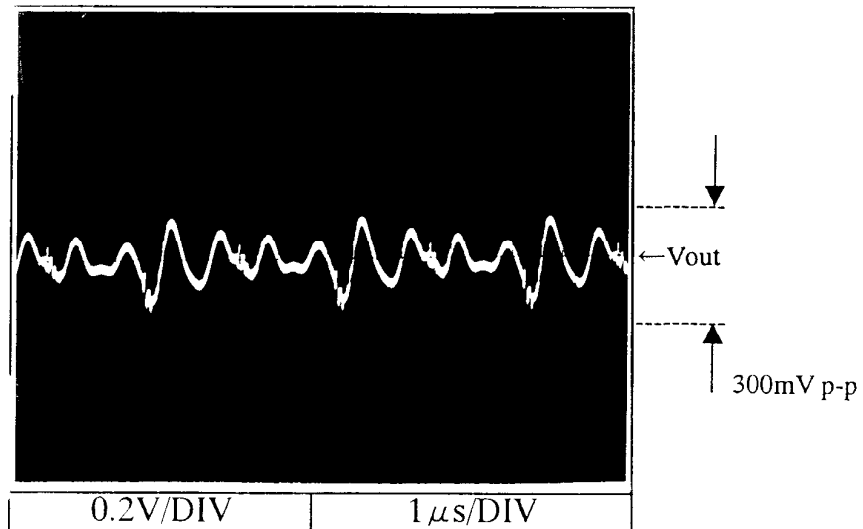
Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 °C

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)

Conditions Vin : 48 VDC

Conducted Emission

Iout : 100 %

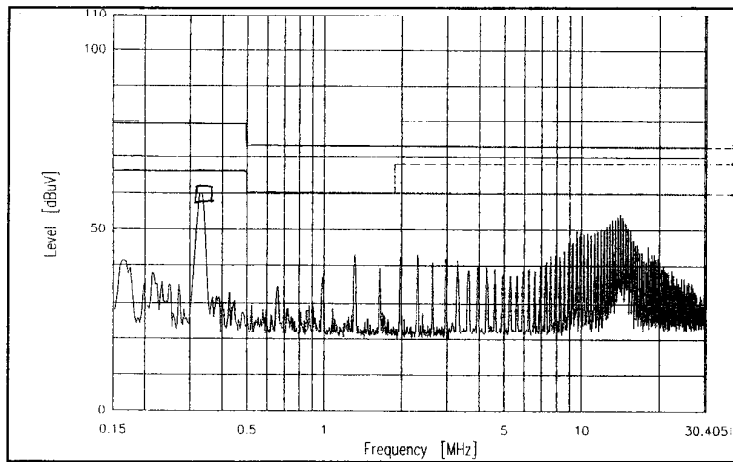
(1) VCCI class A 対応アプリケーションシステム

Tp : 25 °C

VCCI class A application system

12V

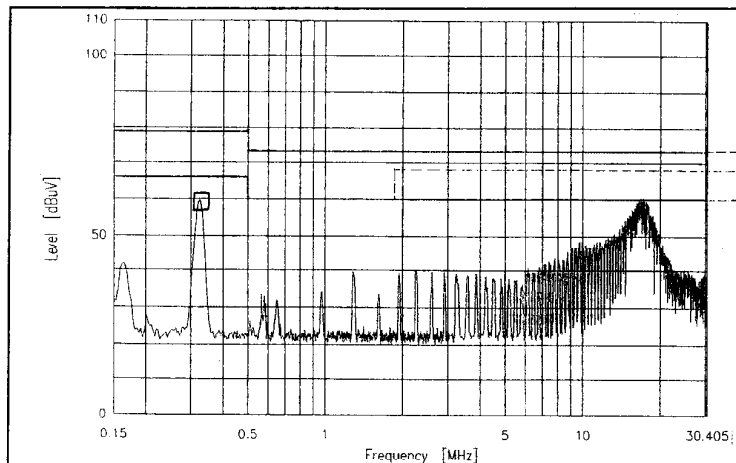
Point (328kHz)		
Ref	Limit	Measure
Date	(dbuV)	(dbuV)
QP	79.0	60.4
AV	66.0	60.0



VCCI classA
QP Limit
FCC classA
QP Limit
VCCI classA
AV Limit

28V

Point (322kHz)		
Ref	Limit	Measure
Date	(dbuV)	(dbuV)
QP	79.0	59.1
AV	66.0	58.5



VCCI classA
QP Limit
FCC classA
QP Limit
VCCI classA
AV Limit

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

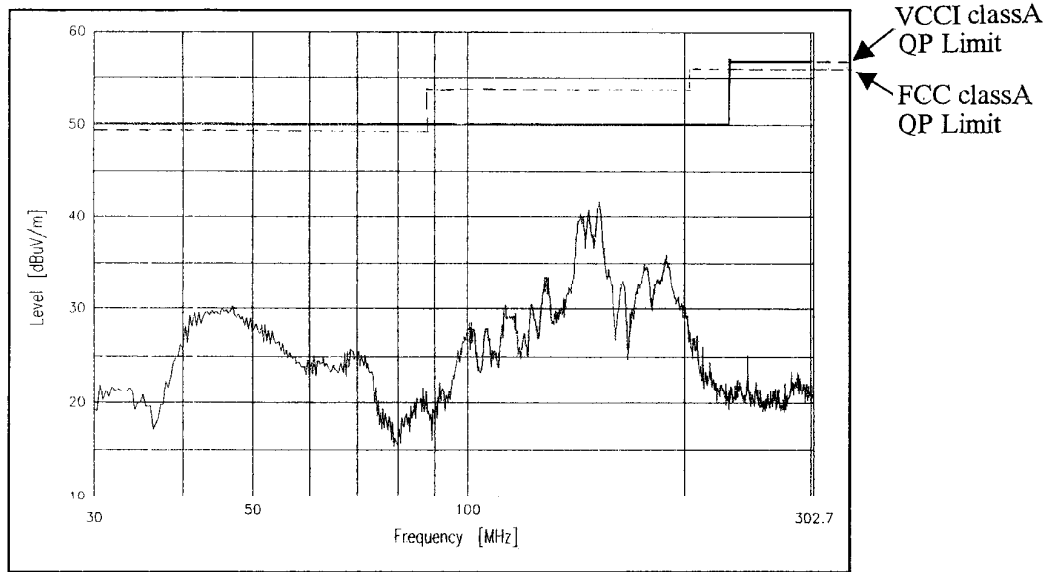
Conditions Vin : 48 VDC

Iout : 100 %

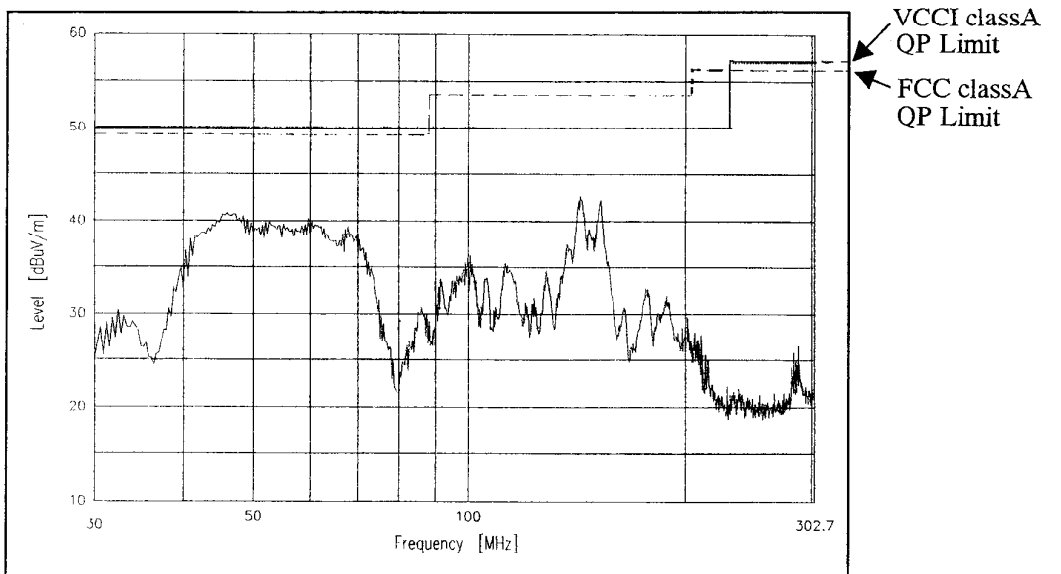
Tp : 25 °C

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

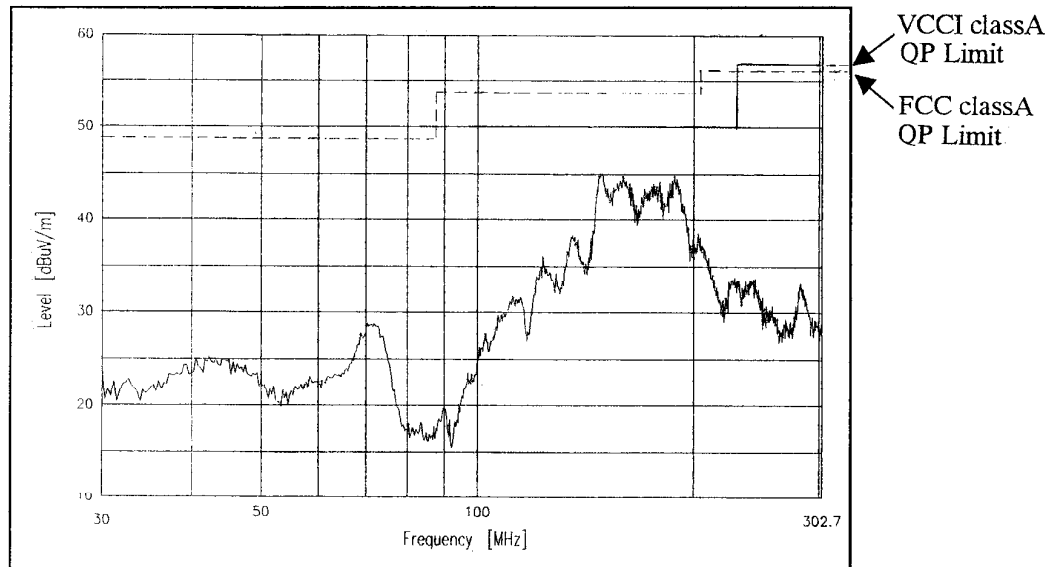
'Conditions Vin : 48 VDC

Iout : 100 %

Tp : 25 °C

28V

HORIZONTAL:



VERTICAL:

