

PAF600F24-*

EVALUATION DATA

型式データ

| DWG.No. C169-53-01/6 A | | | |
|------------------------|------------------|-----------------|-----------------|
| 承認 | 承認 | 査閲 | 担当 |
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| 10-Jan.'02 | 10-Jan.'02 | 10-Jan.'02 | 10-Jan.'02 |

DENSEI-LAMBDA

INDEX

| 1. 測定方法 | Evaluation Method | PAGE |
|---------|--|---------|
| 1.1 | 測定回路 Circuits used for determination | T-1~6 |
| | (1) 静特性 Steady state data | |
| | (2) 通電ドリフト特性 Warm up voltage drift characteristics | |
| | (3) 過電流保護特性 Over current protection (OCP) characteristics | |
| | (4) 過電圧保護特性 Over voltage protection (OVP) characteristics | |
| | (5) 出力立ち上がり特性 Output rise characteristics | |
| | (6) 出力立ち下がり特性 Output fall characteristics | |
| | (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 | |
| | (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 | |
| | (9) 過渡応答 (負荷急変) 特性 Dynamic load response characteristics | |
| | (10) 入力サージ電流 (突入電流) 特性 Inrush current characteristics | |
| | (11) 出力リップル、ノイズ波形 Output ripple and noise waveform | |
| | (12) EMI特性 Electro-Magnetic Interference characteristics | |
| 1.2 | 使用測定機器 List of equipments used | T-7 |
| 2. | 特性データ Characteristics | |
| 2.1 | (1) 入力・負荷・温度変動 Regulation - line and load, temperature drift | T-8 |
| | (2) 出力電圧・リップル電圧対入力電圧 Output voltage and ripple voltage v.s. input voltage | T-9 |
| | (3) 効率・入力電流対出力電流 Efficiency and input current v.s. output current | T-10 |
| | (4) 効率対入力電圧 Efficiency v.s. input voltage | T-11 |
| | (5) 効率対ベースプレート温度 Efficiency v.s. base-plate temperature | T-12 |
| 2.2 | 通電ドリフト特性 Warm up voltage drift characteristics | T-13 |
| 2.3 | 過電流保護特性 Over current protection (OCP) characteristics | T-14~15 |
| 2.4 | 過電圧保護特性 Over voltage protection (OVP) characteristics | T-16 |
| 2.5 | 出力立ち上がり特性 Output rise characteristics | T-17~18 |
| 2.6 | 出力立ち下がり特性 Output fall characteristics | T-19~20 |
| 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 | T-21~22 |
| 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 | T-23~24 |

2.9 過渡応答（負荷急変）特性 Dynamic load response characteristics T-25~26

2.10 入力サージ電流（突入電流）特性 Inrush current waveform T-27

2.11 出力リップル、ノイズ波形 Output ripple and noise waveform T-28~29

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

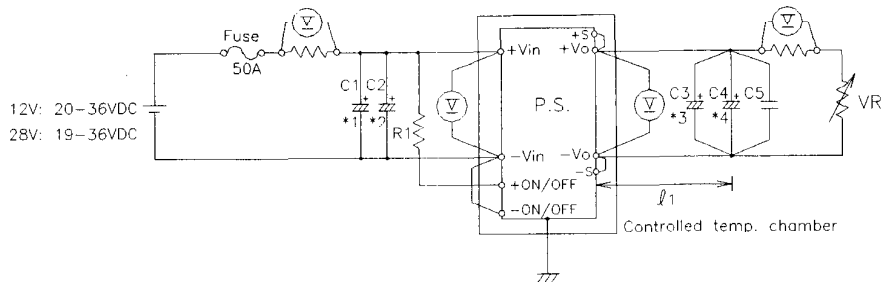
使用記号 Terminology used

| | 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

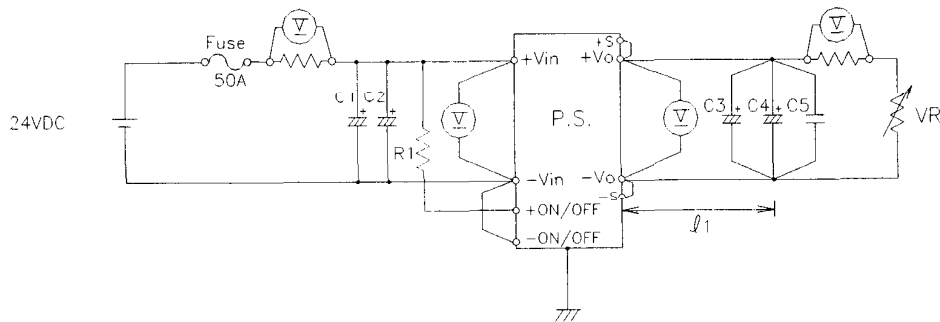


C1,C2: 560uF Electrolytic Capacitor
 C3,C4: 12V-470uF Electrolytic Capacitor
 28V-220uF Electrolytic Capacitor
 C5: 10uF Ceramic Capacitor
 R1: 15kΩ (1/4W)
 φ1: 50mm

==NOTE==

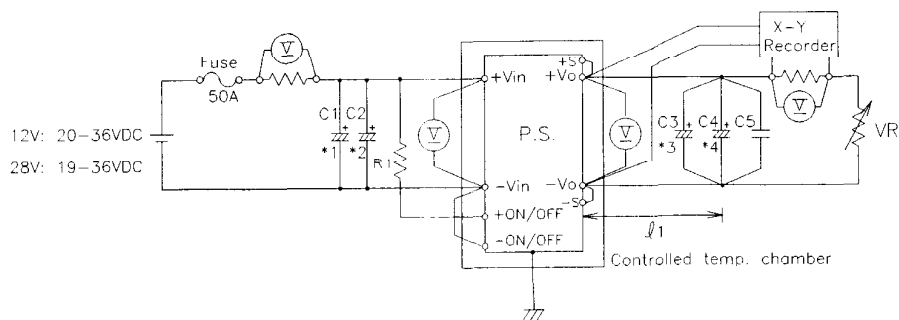
*1,*2,*3,*4. If the ambient temperature is less than -20°C,
 use twice of the recommended capacitor above.

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



C1,C2: 560uF Electrolytic Capacitor
 C3,C4: 12V-470uF Electrolytic Capacitor
 28V-220uF Electrolytic Capacitor
 C5: 10uF Ceramic Capacitor
 R1: 15kΩ (1/4W)
 φ1: 50mm

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

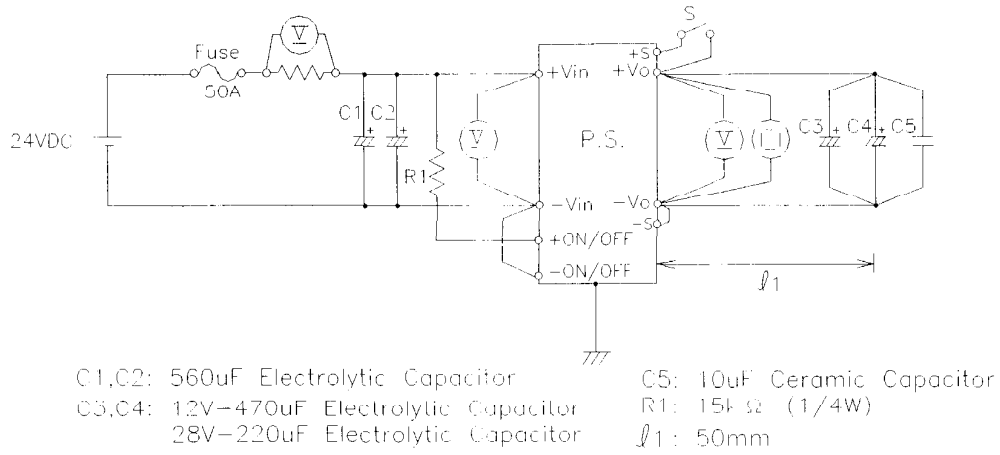


C1,C2: 560uF Electrolytic Capacitor
 C3,C4: 12V-470uF Electrolytic Capacitor
 28V-220uF Electrolytic Capacitor
 C5: 10uF Ceramic Capacitor
 R1: 15kΩ (1/4W)
 φ1: 50mm

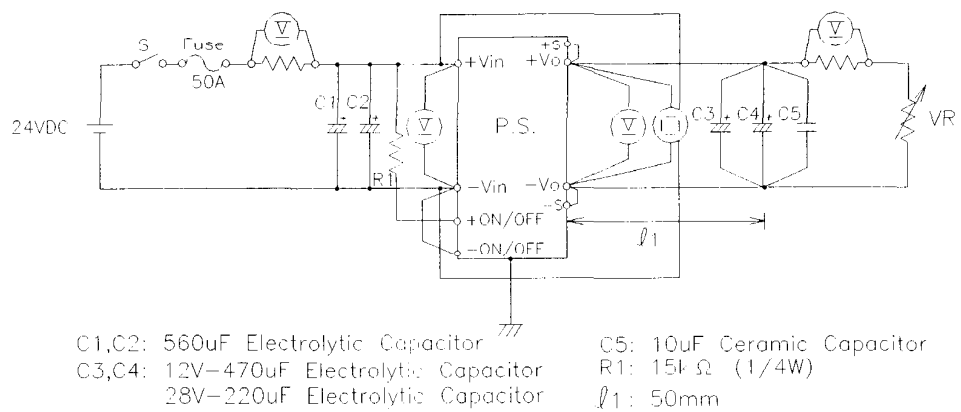
==NOTE==

*1,*2,*3,*4. If the ambient temperature is less than -20°C,
 use twice of the recommended capacitor above.

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



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



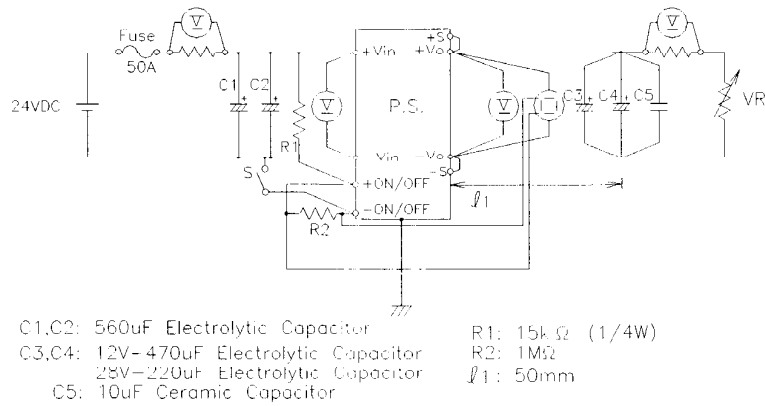
(6) 出力立ち下がり特性 Output fall characteristics

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 ON/OFF CONTROL.



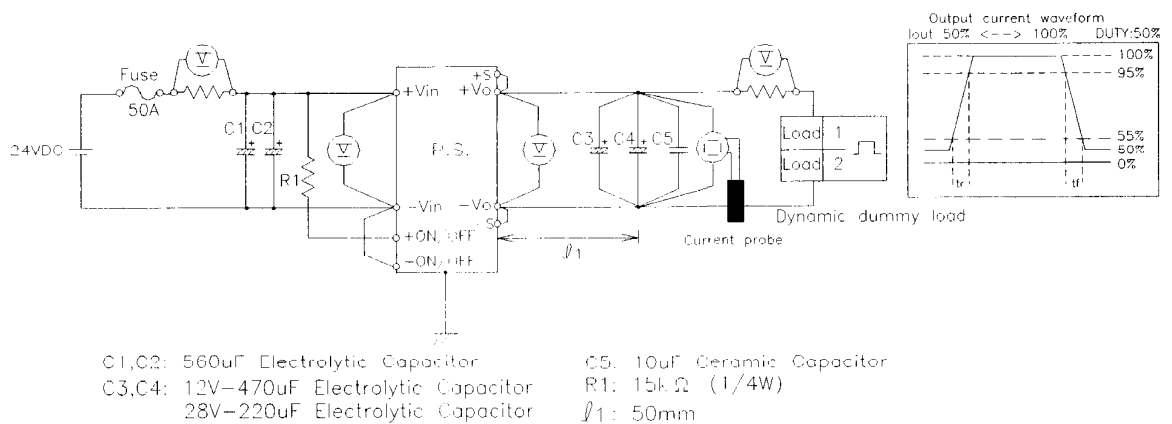
(8) 出力立ち下がり特性 (ON/OFFコントロール時)

Output fall characteristics with ON/OFF CONTROL

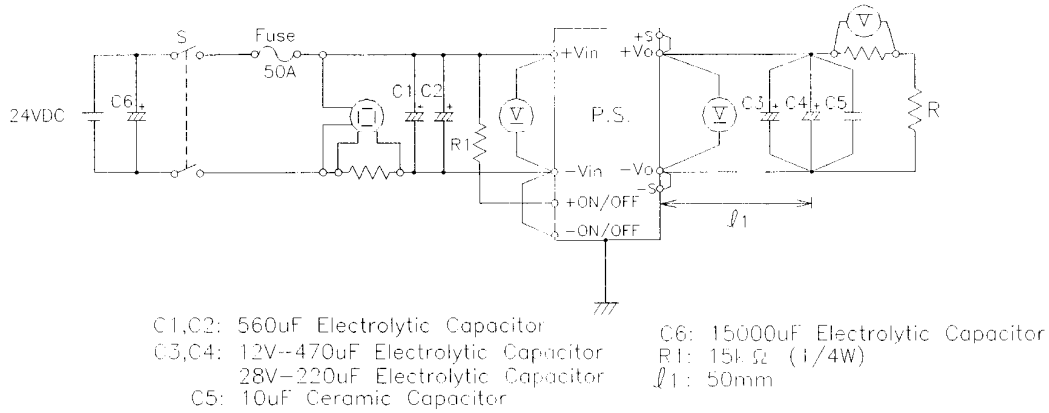
出力立ち上がり特性 (ON/OFFコントロール時) と同じ

Same as output rise characteristics with ON/OFF CONTROL

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

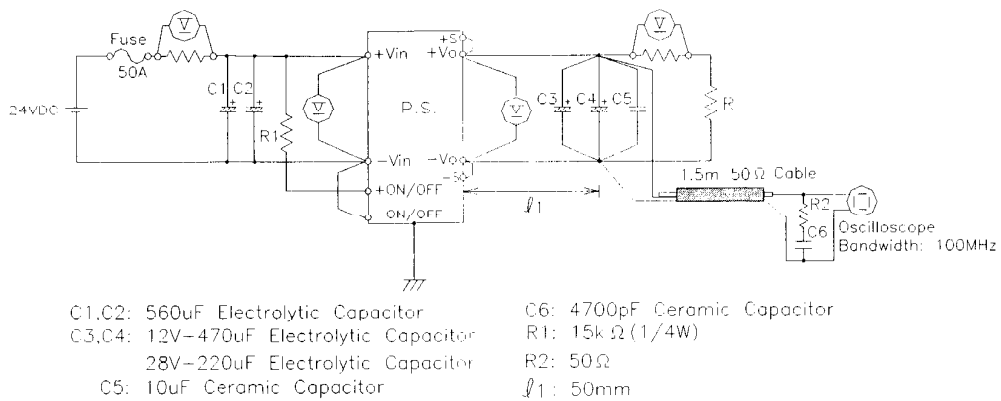


(10) 入力サージ電流 (突入電流) 特性 Inrush current characteristics

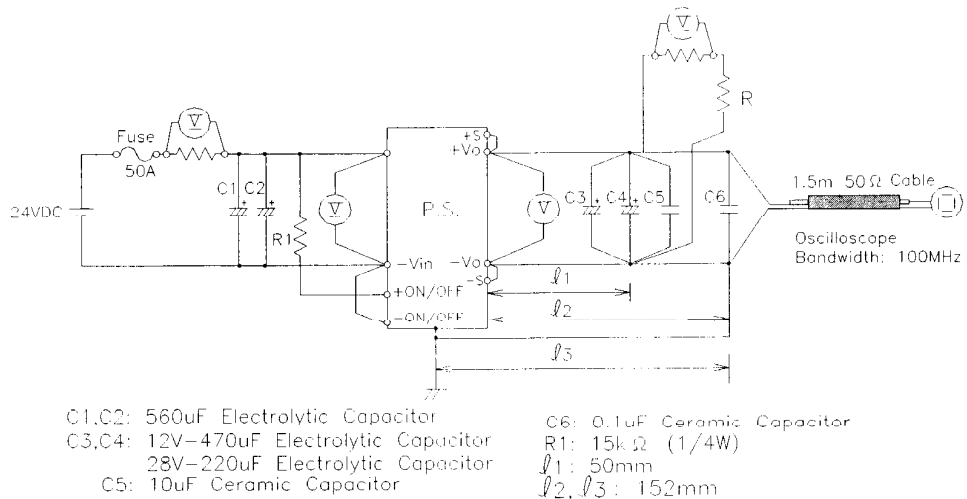


(11) 出力リップル、ノイズ波形 Output ripple and noise waveform

(a) Normal Mode



(b) Normal + Common Mode

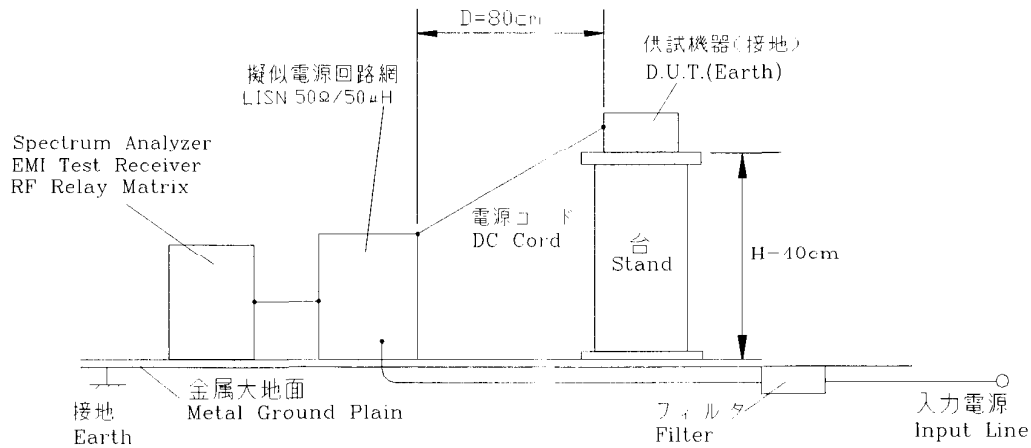


(12) EMI 特性

Electro-Magnetic Interference characteristics

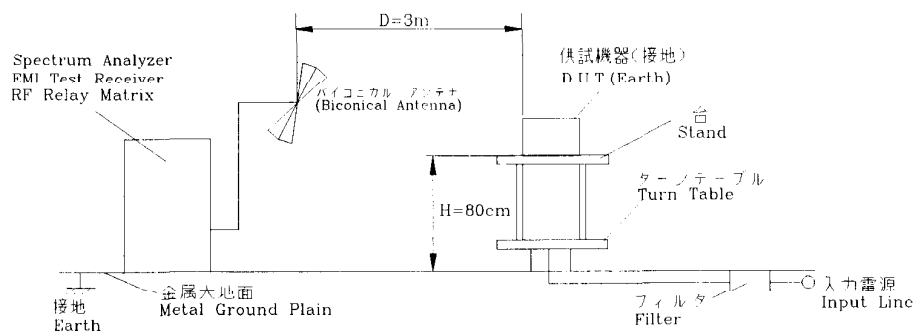
(a) 雑音端子電圧 (帰還ノイズ)

Conducted Emission Noise



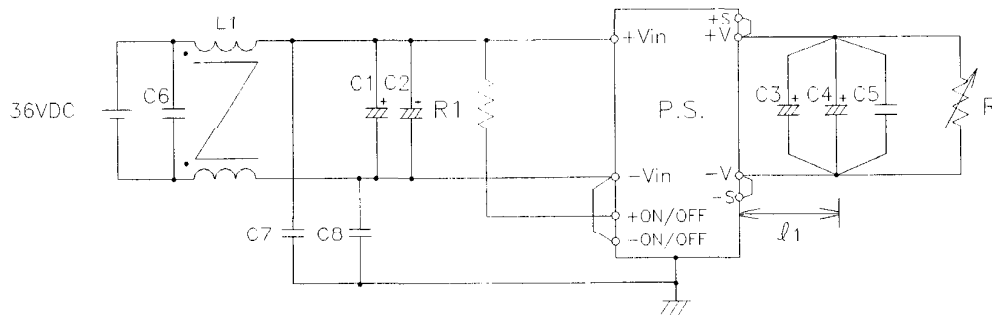
(b) 雑音電界強度 (輻射ノイズ)

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,C2 : 560uF Electrolytic Capacitor
 C3,C4 : 12V-470uF Electrolytic Capacitor
 28V-220uF Electrolytic Capacitor
 C5 : 10uF Ceramic Capacitor

C6 : 2.2uF Ceramic Capacitor
 C7,C8 : 0.1uF Ceramic Capacitor
 R1 : 15kΩ (1/4W)
 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 | DC POWER SUPPLY | TAKASAGO | EX-1500L |
| 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-408 |
| 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 $T_p : 25^{\circ}\text{C}$

| $I_{out} \setminus V_{in}$ | 20VDC | 24VDC | 36VDC | line regulation | |
|----------------------------|---------|---------|---------|-----------------|--------|
| 0% | 12.003V | 12.003V | 12.003V | 0mV | 0.000% |
| 50% | 12.003V | 12.003V | 12.003V | 0mV | 0.000% |
| 100% | 12.003V | 12.002V | 12.003V | 1mV | 0.008% |
| load | 0mV | 1mV | 0mV | | |
| regulation | 0.000% | 0.008% | 0.000% | | |

2. Temperature drift

conditions $V_{in} : 24\text{VDC}$ $I_{out} : 100\%$

| T_p | -40°C | 25°C | 85°C | temperature stability | |
|-----------|-----------------------|----------------------|----------------------|-----------------------|--------|
| V_{out} | 11.993V | 12.002V | 11.948V | 54mV | 0.450% |

28V

1. Regulation - line and load

condition $T_p : 25^{\circ}\text{C}$

| $I_{out} \setminus V_{in}$ | 19VDC | 24VDC | 36VDC | line regulation | |
|----------------------------|---------|---------|---------|-----------------|--------|
| 0% | 28.011V | 28.010V | 28.009V | 2mV | 0.007% |
| 50% | 28.010V | 28.009V | 28.009V | 1mV | 0.004% |
| 100% | 28.010V | 28.009V | 28.008V | 2mV | 0.007% |
| load | 1mV | 1mV | 1mV | | |
| regulation | 0.004% | 0.004% | 0.004% | | |

2. Temperature drift

conditions $V_{in} : 24\text{VDC}$ $I_{out} : 100\%$

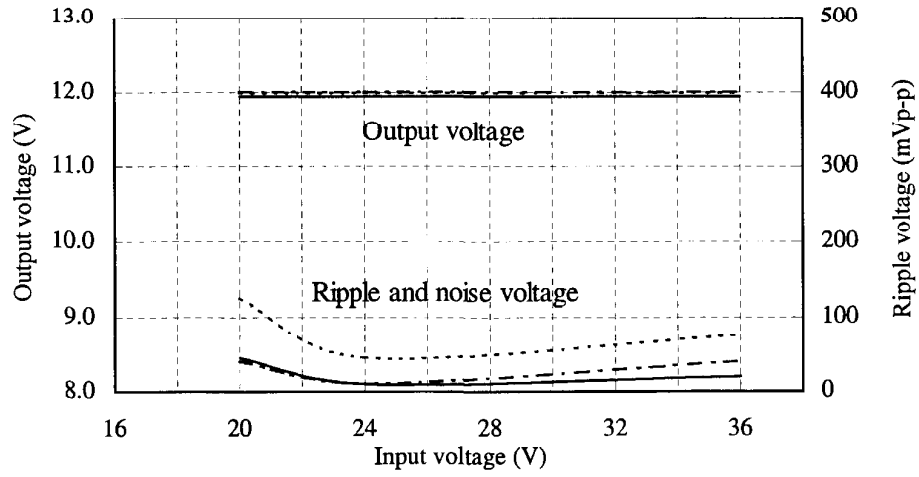
| T_p | -40°C | 25°C | 85°C | temperature stability | |
|-----------|-----------------------|----------------------|----------------------|-----------------------|--------|
| V_{out} | 28.056V | 28.009V | 27.893V | 163mV | 0.582% |

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

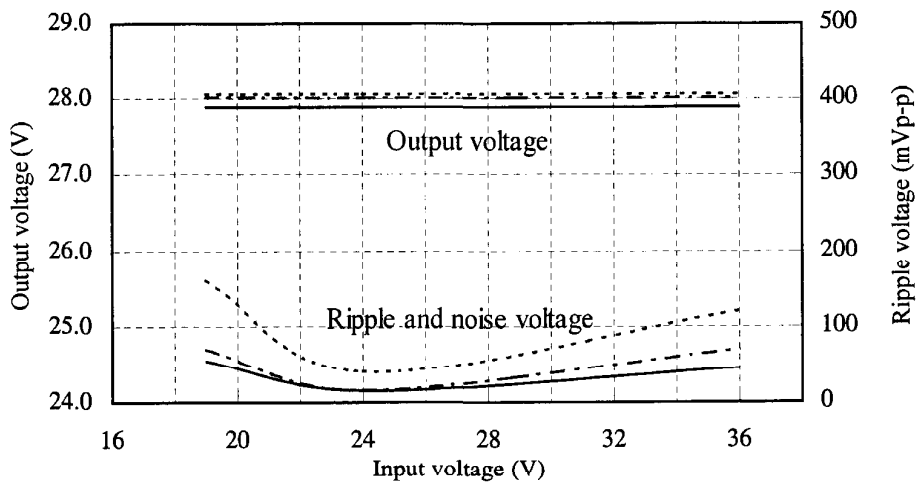
Conditions Iout : 100 %

Tp : -40 °C -----
: 25 °C - - - - -
: 85 °C _____

12V



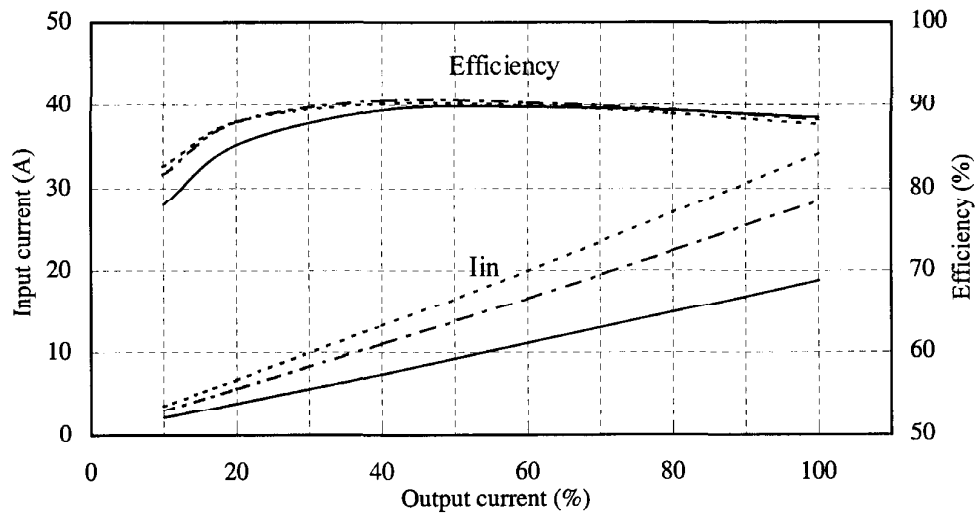
28V



2.1 (3) 効率、入力電流対出力電流
Efficiency and input current vs output current

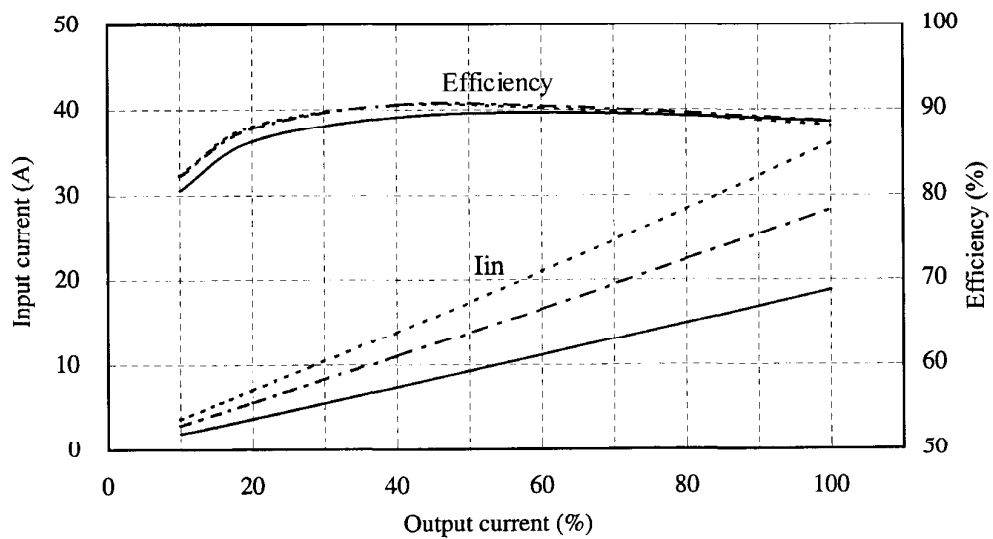
12V

Conditions Vin : 20 VDC -----
 : 24 VDC -.-.-.-
 : 36 VDC ————
Tp : 25 °C



28V

Conditions Vin : 19 VDC -----
 : 24 VDC -.-.-.-
 : 36 VDC ————
Tp : 25 °C

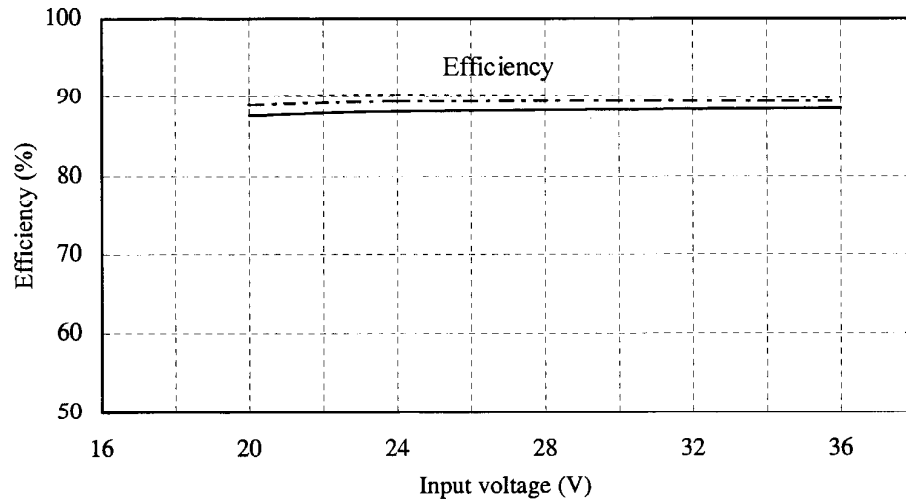


2.1 (4) 効率対入力電圧
Efficiency vs input voltage

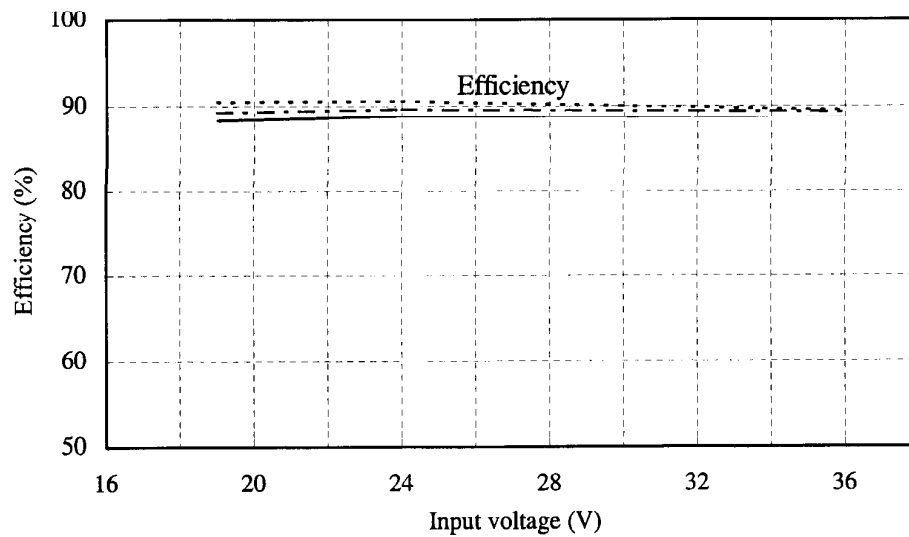
Conditions T_p : 25 °C

I_{out} : 50 % -----
80 % -.-.-.-.-
100 % _____

12V



28V

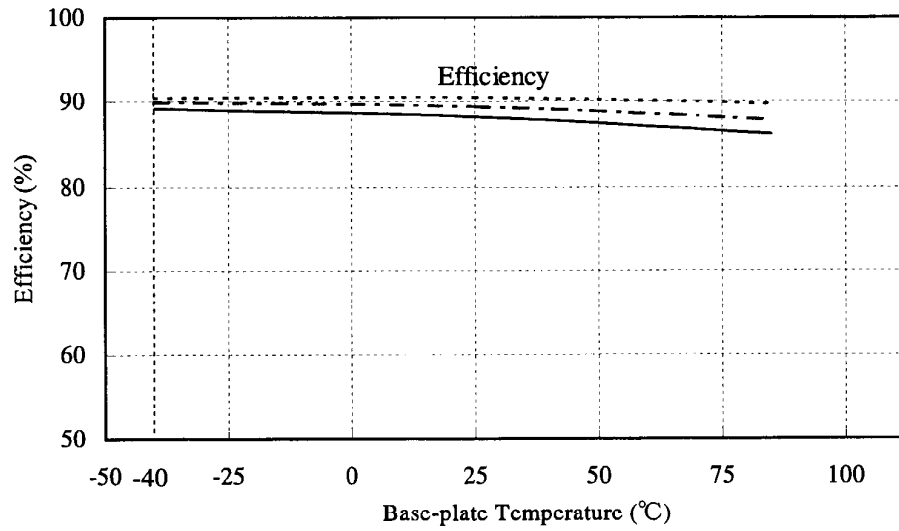


2.1 (5) 効率対ベースプレート温度
Efficiency vs base-plate temperature

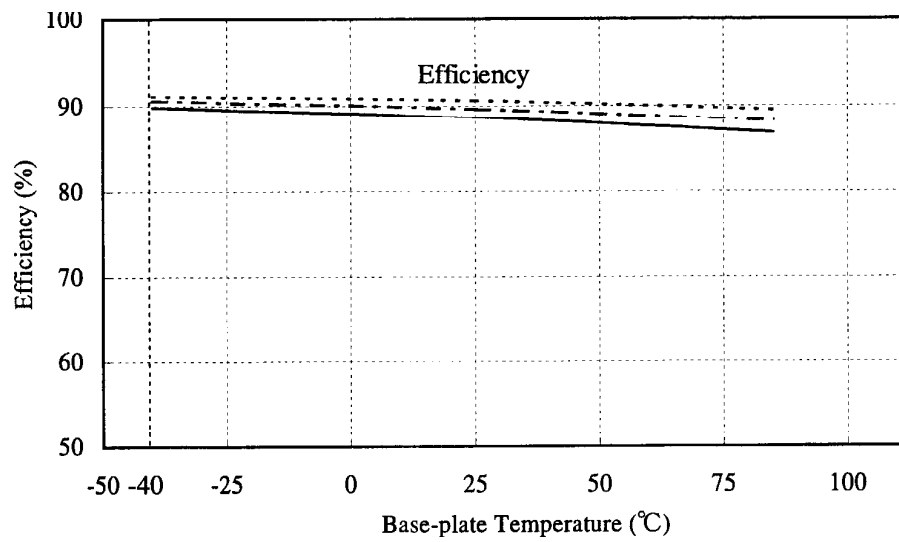
Conditions Vin : 24 VDC

Iout : 50 % -----
80 % - - - - -
100 % _____

12V

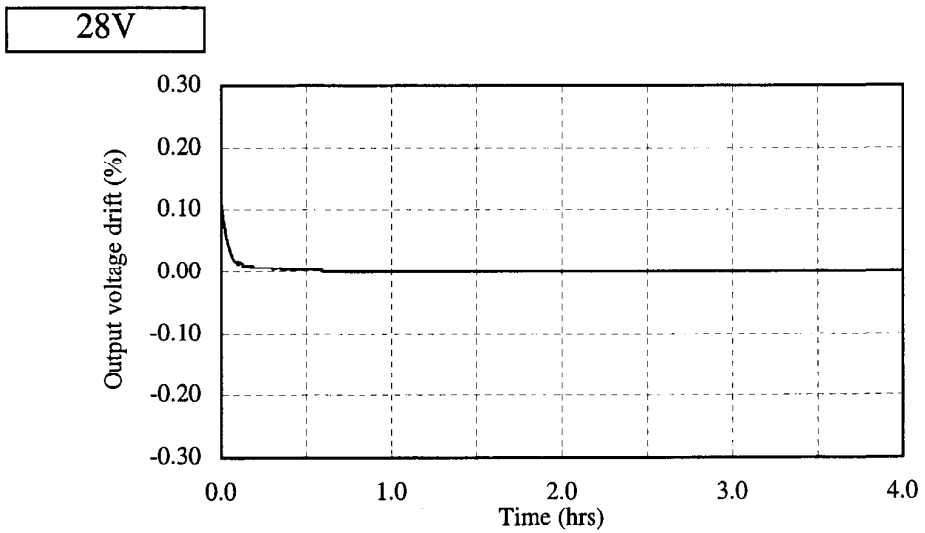
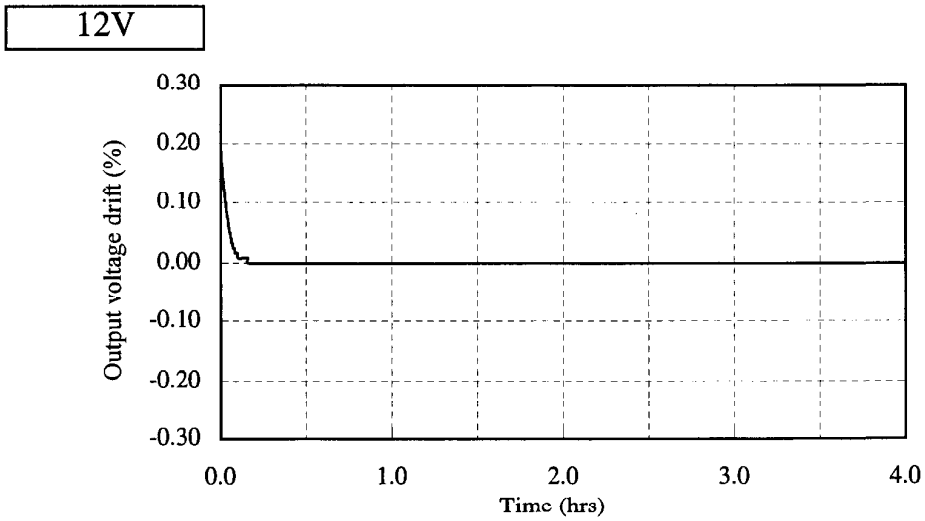


28V



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

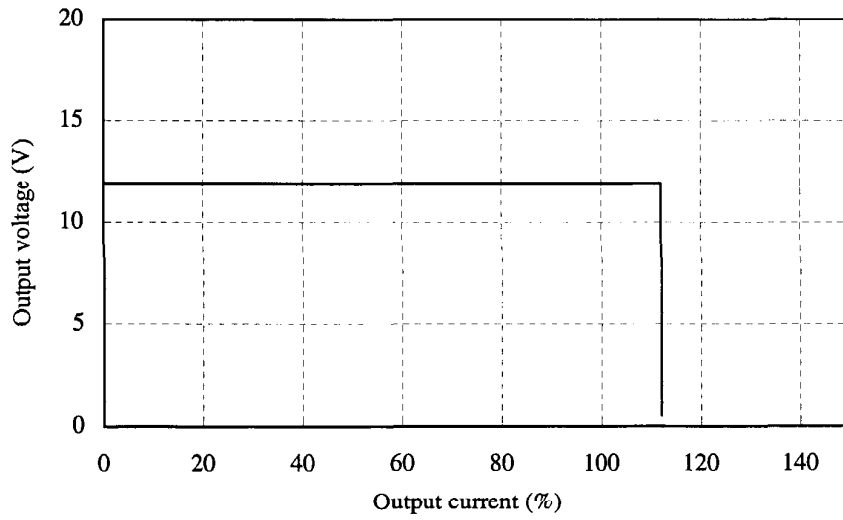
Conditions Vin : 24 VDC
Iout : 100 %
Tp : 25 °C



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

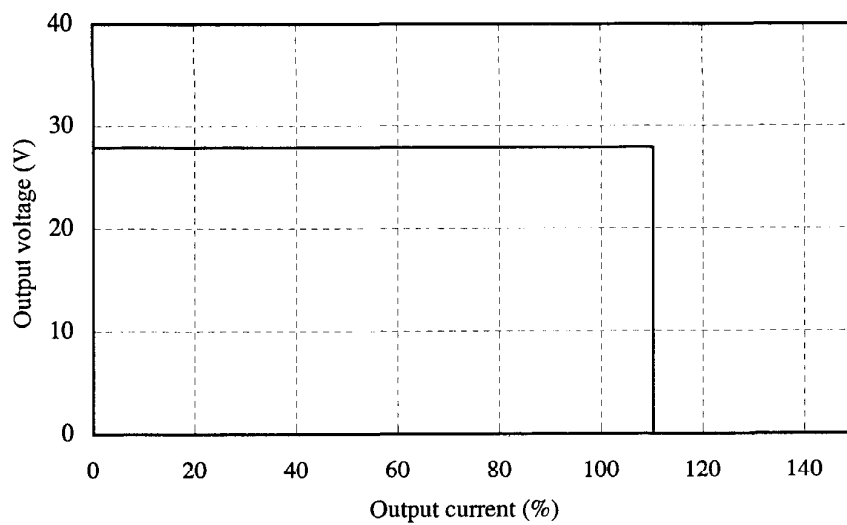
12V

Conditions Vin : 20 VDC -----
 : 24 VDC -.-.-.-.-
 : 36 VDC _____
Tp : 25 °C



28V

Conditions Vin : 19 VDC -----
 : 24 VDC -.-.-.-.-
 : 36 VDC _____
Tp : 25 °C

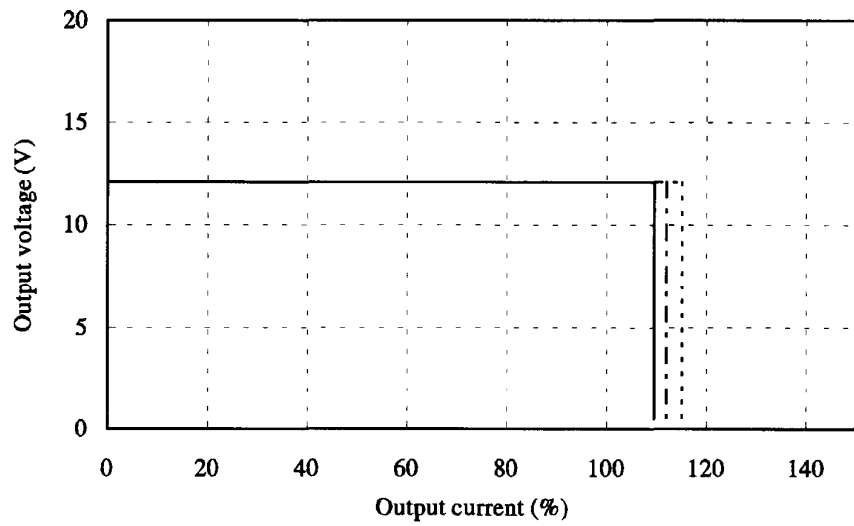


2.3 過電流保護特性
Over current protection (OCP) characteristics

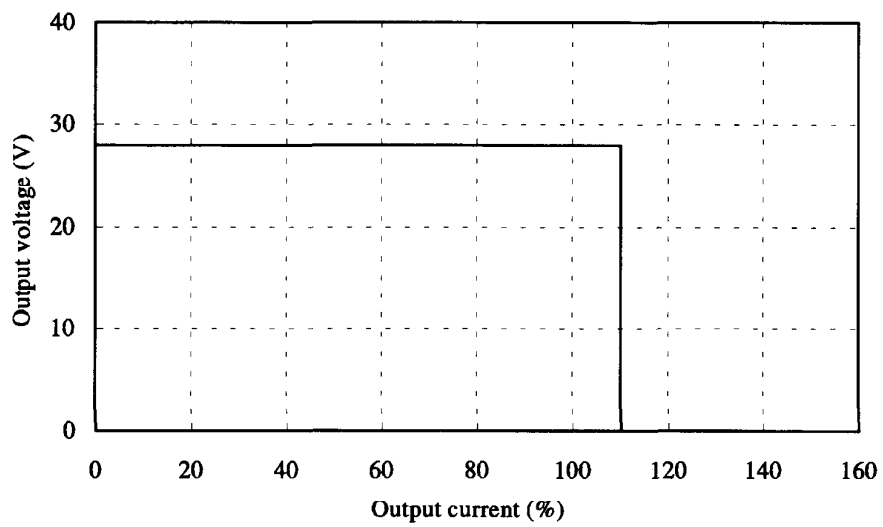
Conditions Vin : 24 VDC

Tp : -40 °C -----
 : 25 °C - - - - -
 : 85 °C _____

12V



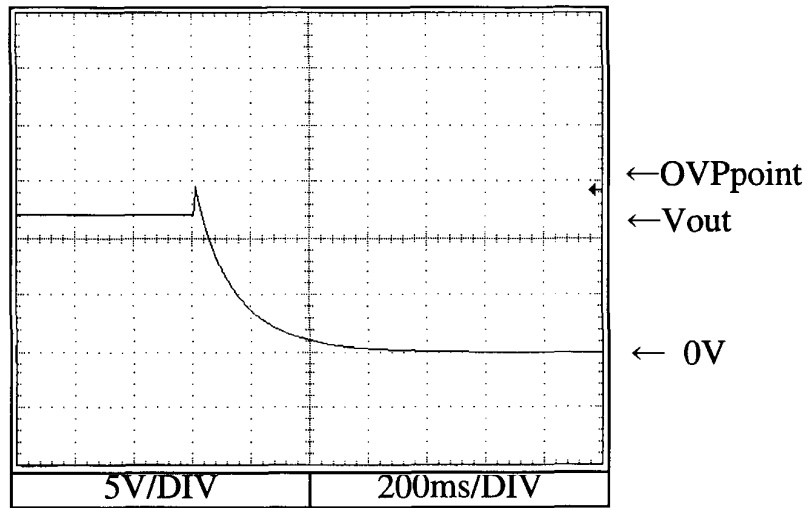
28V



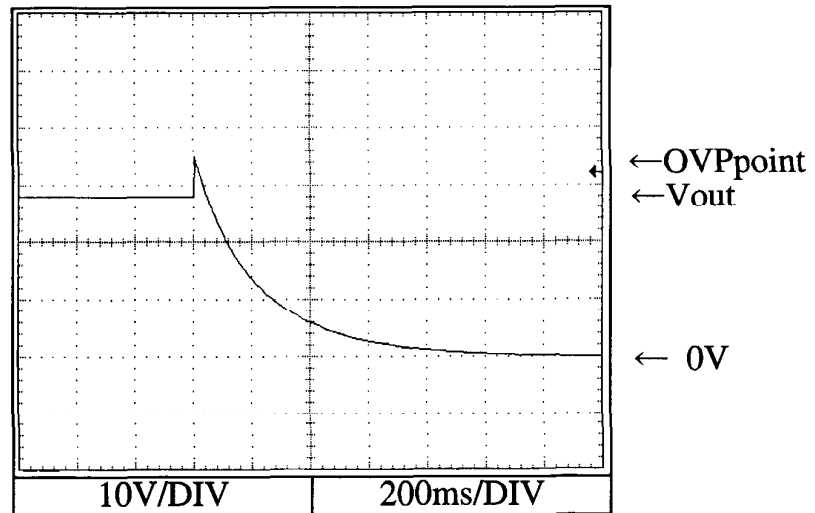
2.4 過電圧保護特性
Over voltage protection (OVP) characteristics

Conditions Vin : 24 VDC
Iout : 0 %
Tp : 25 °C

12V



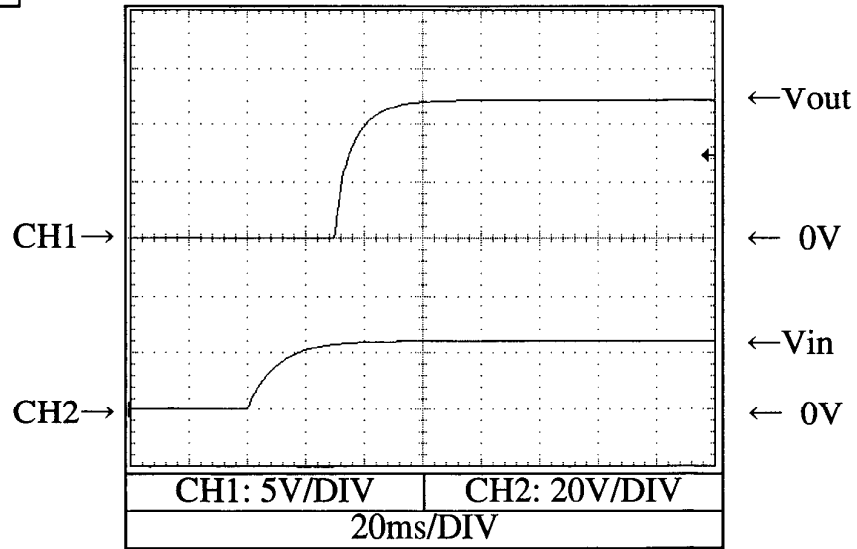
28V



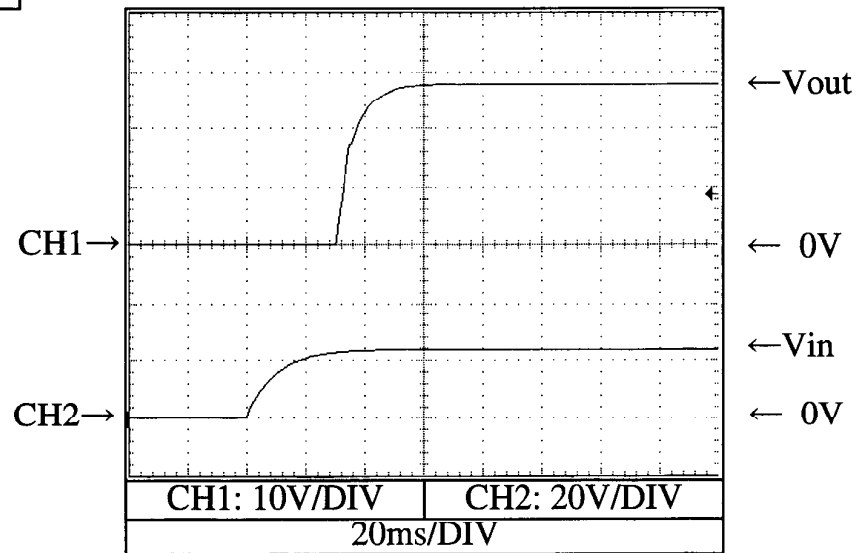
2.5 出力立ち上がり特性
Output rise characteristics

Conditions Vin : 24 VDC
Iout : 0 %
Tp : 25 °C

12V



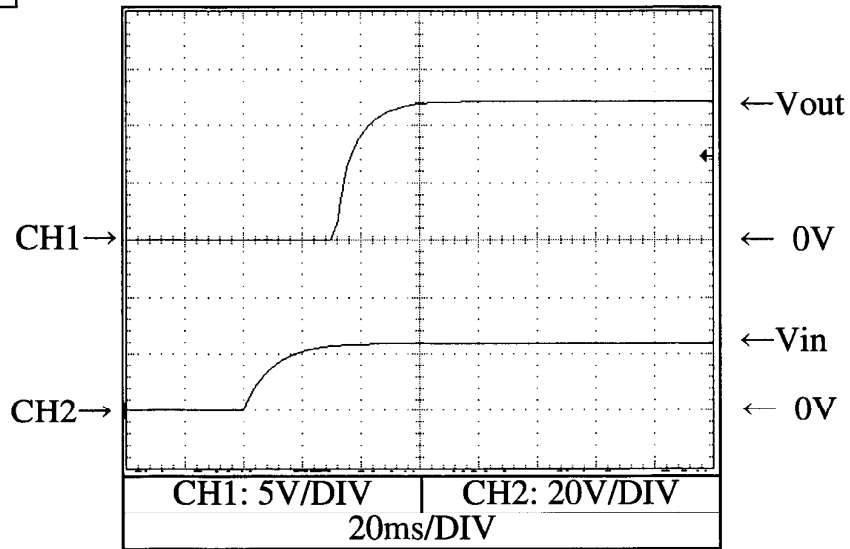
28V



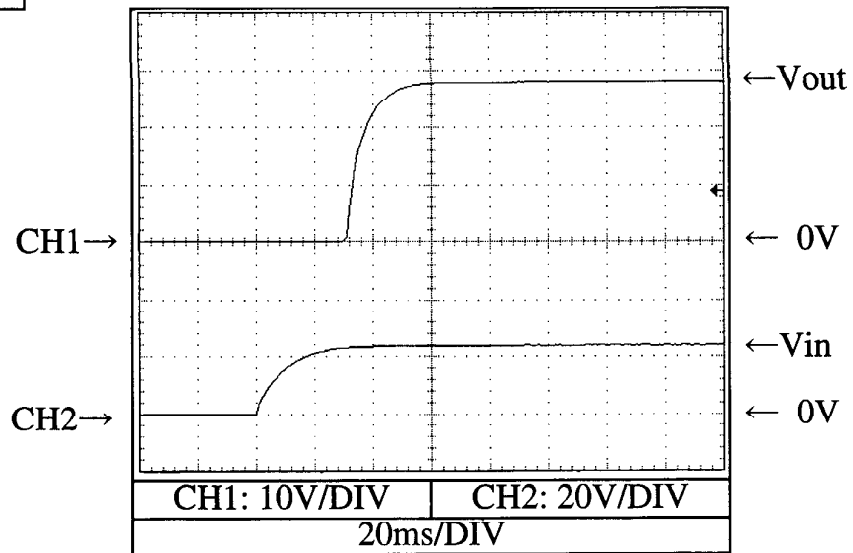
2.5 出力立ち上がり特性
Output rise characteristics

Conditions Vin : 24 VDC
Iout : 100 %
Tp : 25 °C

12V



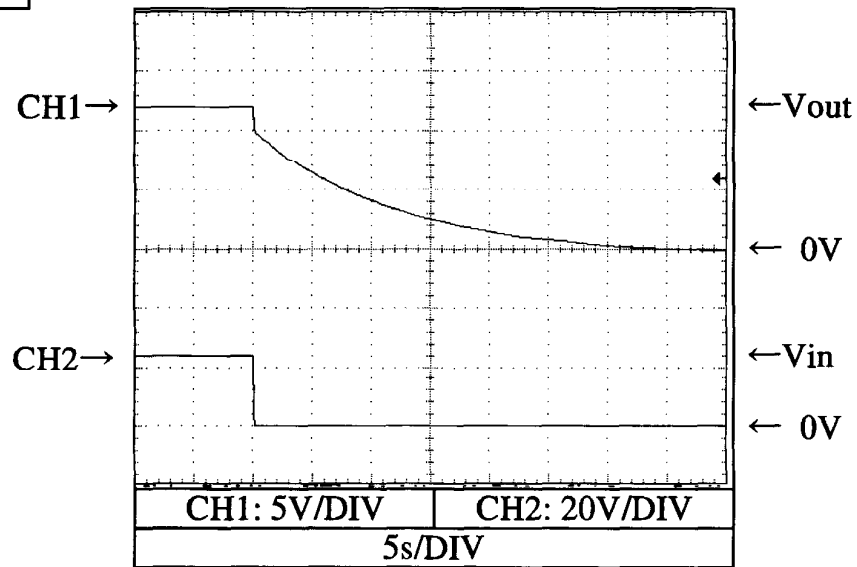
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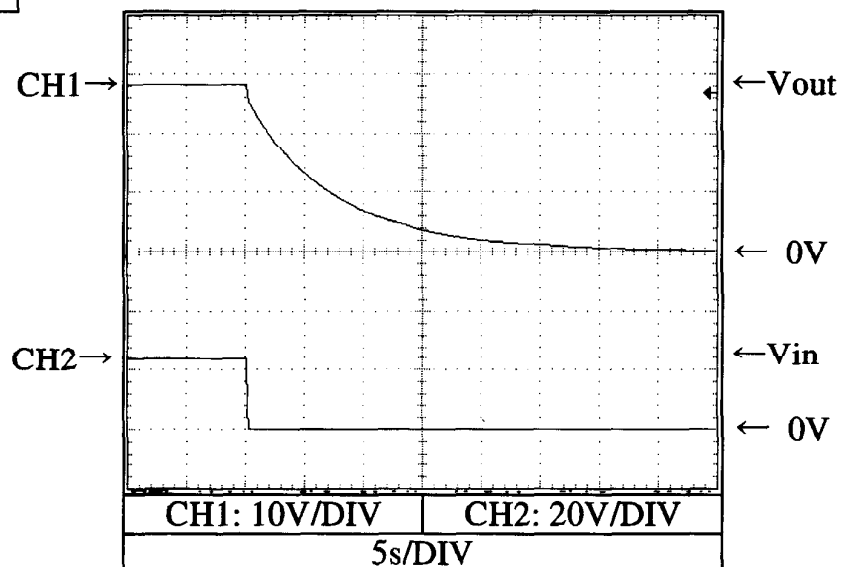
2.6 出力立ち下がり特性
Output fall characteristics

Conditions Vin : 24 VDC
Iout : 0 %
Tp : 25 °C

12V



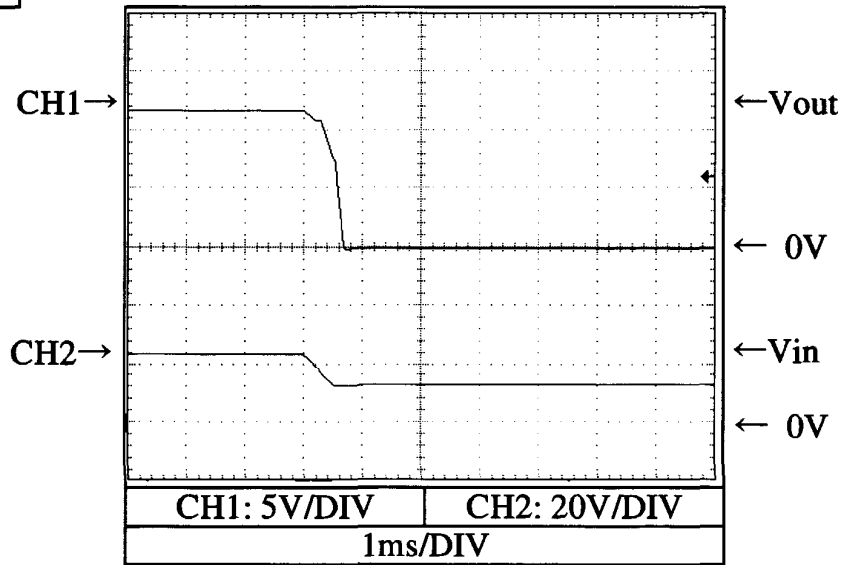
28V



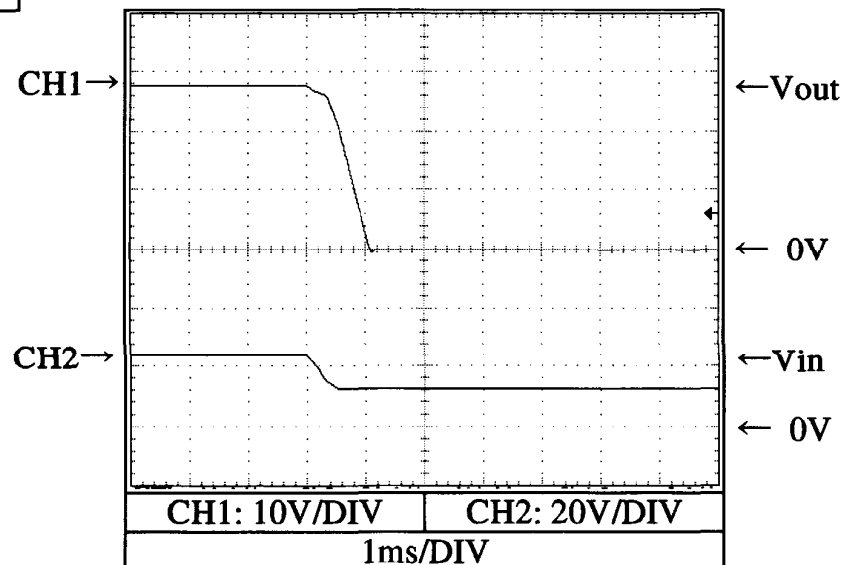
2.6 出力立ち下がり特性
Output fall characteristics

Conditions Vin : 24 VDC
Iout : 100 %
Tp : 25 °C

12V



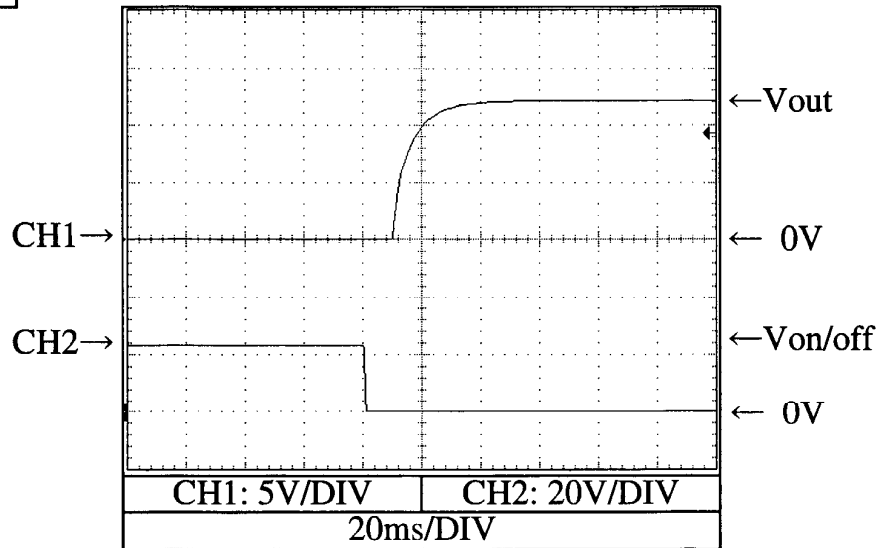
28V



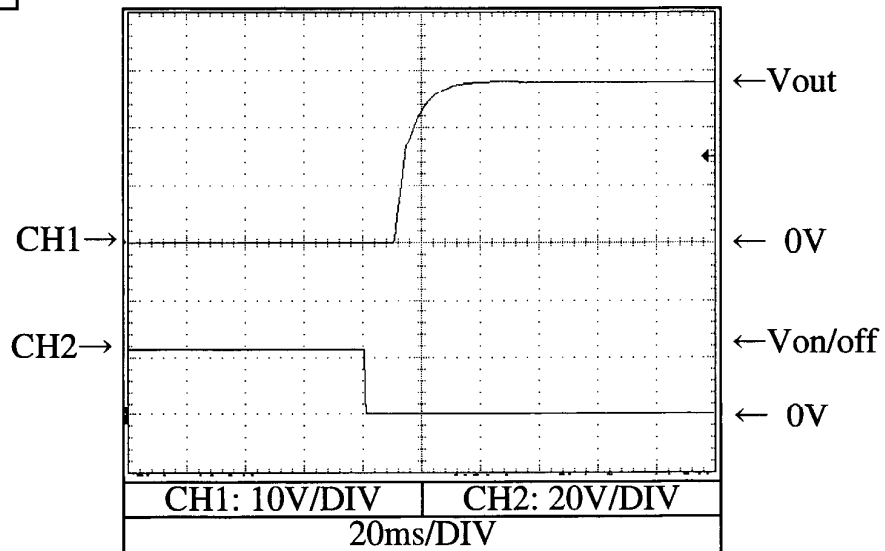
2.7 出力立ち上がり特性 (ON/OFFコントロール時)
Output rise characteristics with ON/OFF CONTROL

Conditions Vin : 24 VDC
Iout : 0 %
Tp : 25 °C

12V



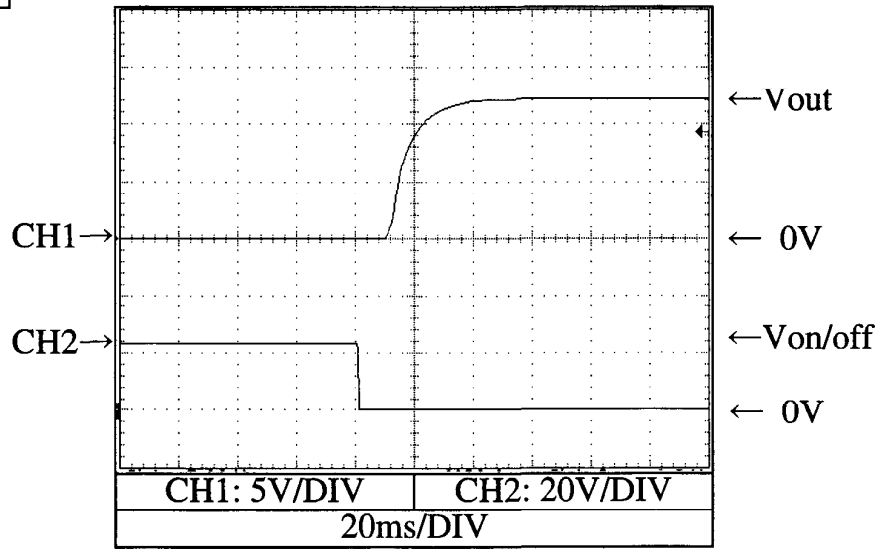
28V



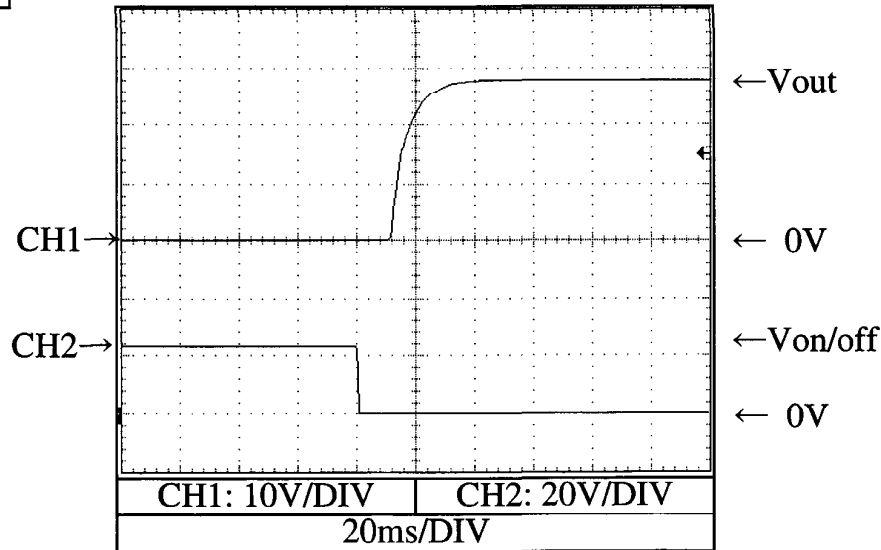
2.7 出力立ち上がり特性 (ON/OFFコントロール時)
Output rise characteristics with ON/OFF CONTROL

Conditions Vin : 24 VDC
Iout : 100 %
Tp : 25 °C

12V



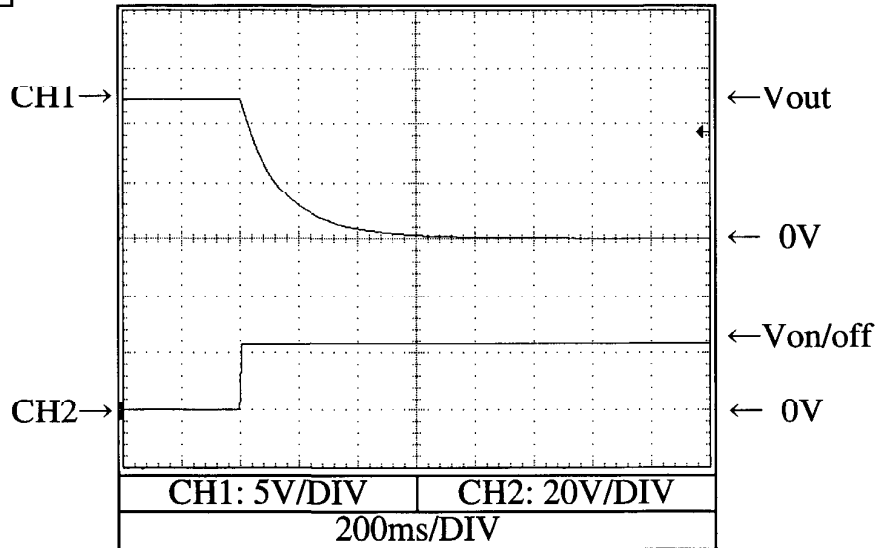
28V



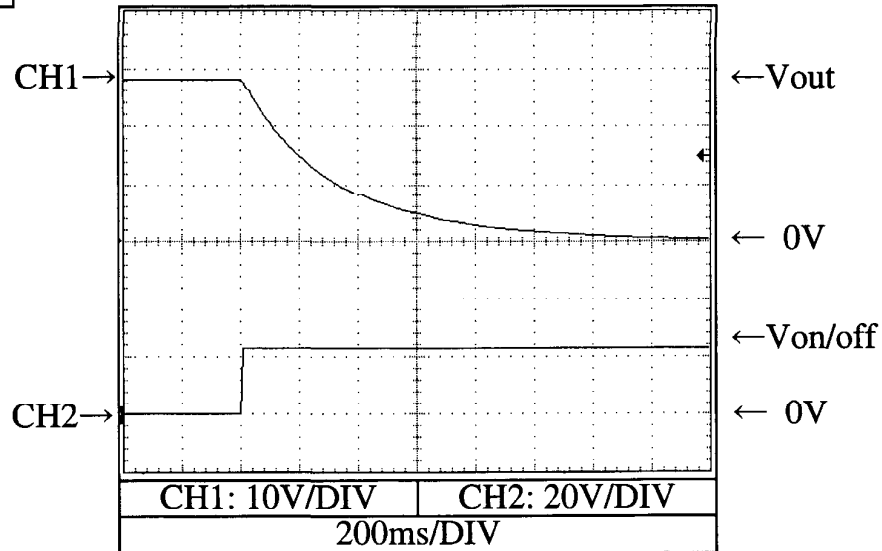
2.8 出力立ち下がり特性 (ON/OFFコントロール時)
Output fall characteristics with ON/OFF CONTROL

Conditions Vin : 24 VDC
Iout : 0 %
Tp : 25 °C

12V



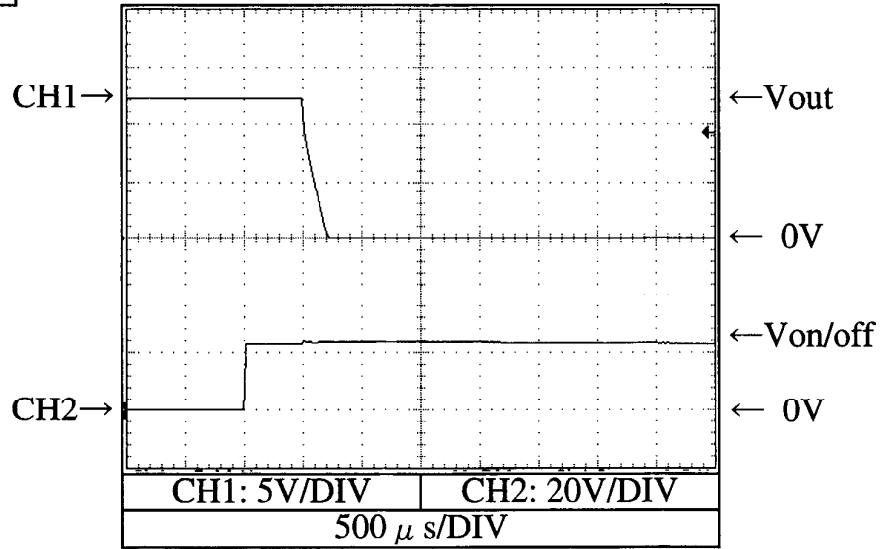
28V



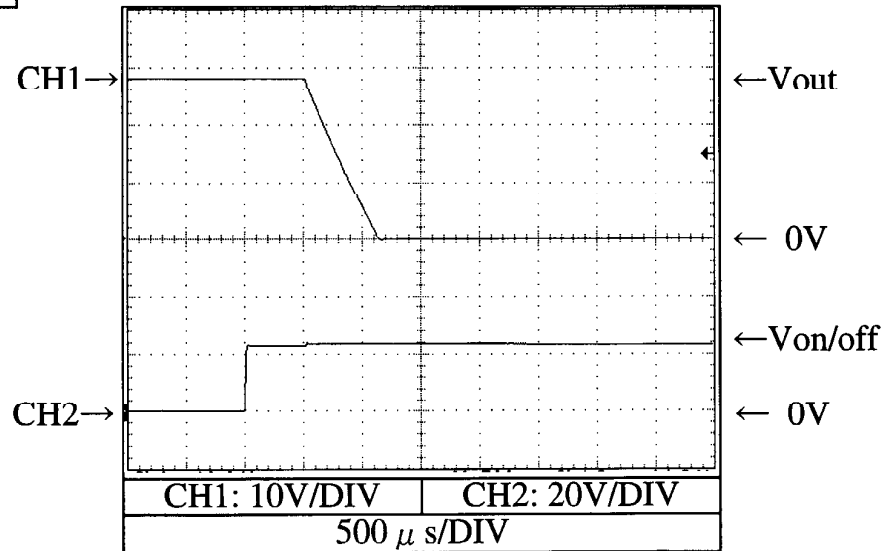
2.8 出力立ち下がり特性 (ON/OFFコントロール時)
Output fall characteristics with ON/OFF CONTROL

Conditions Vin : 24 VDC
Iout : 100 %
Tp : 25 °C

12V



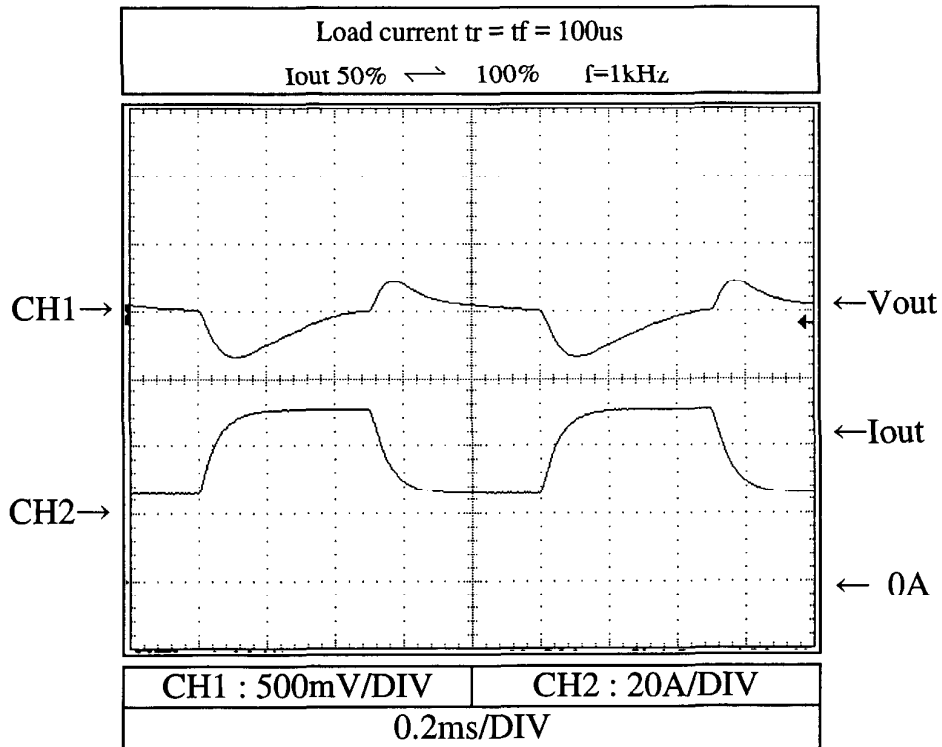
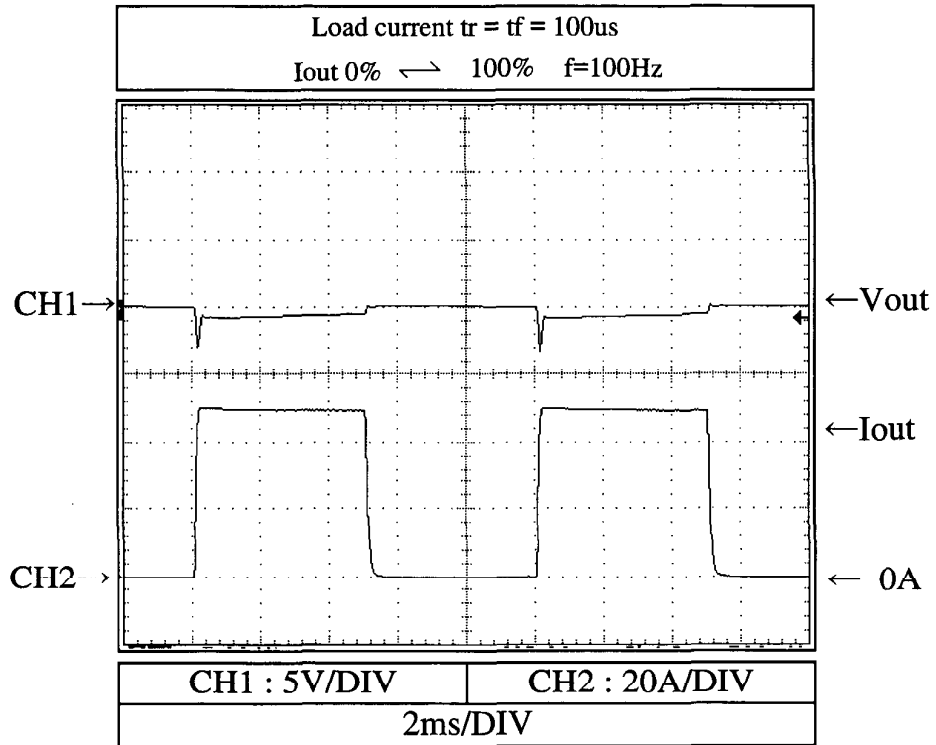
28V



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

Conditions Vin : 24 VDC
Tp : 25 °C

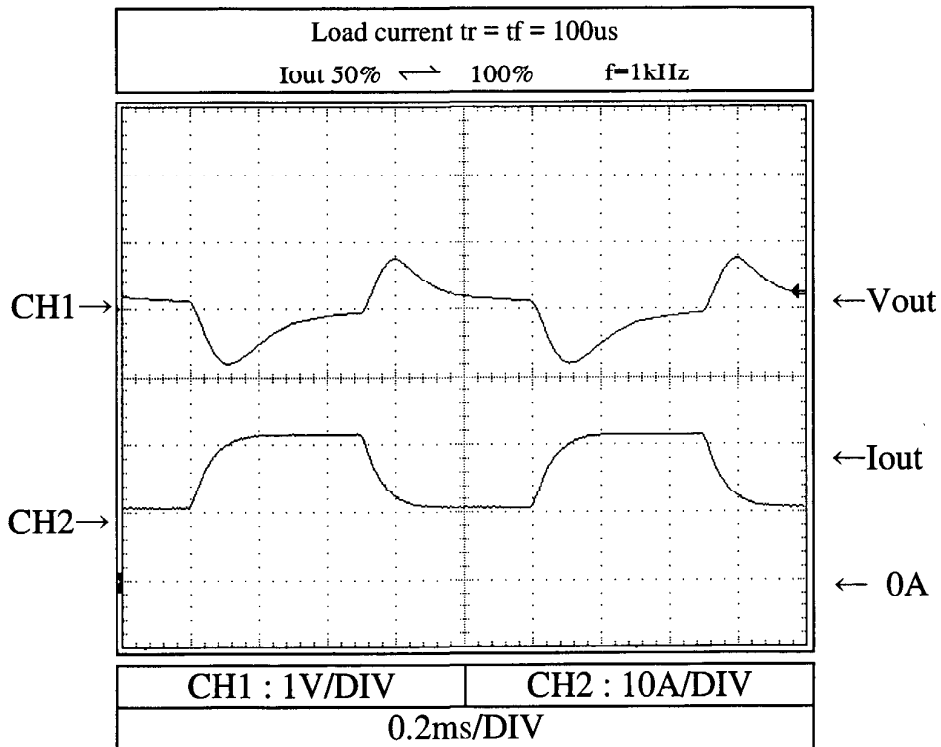
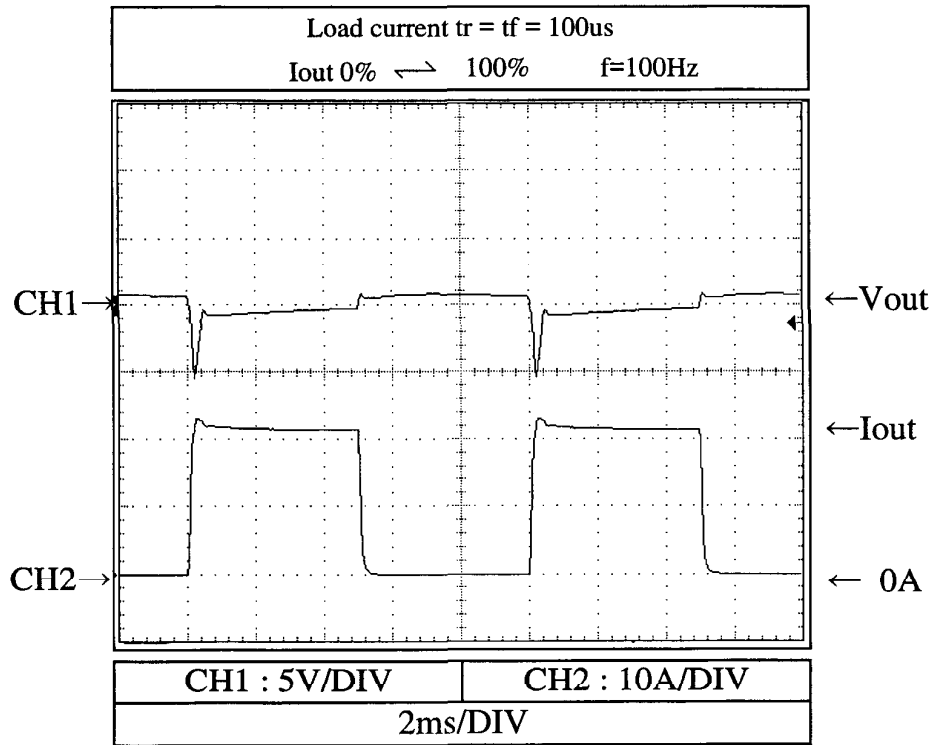
12V



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

Conditions Vin : 24 VDC
Tp : 25 °C

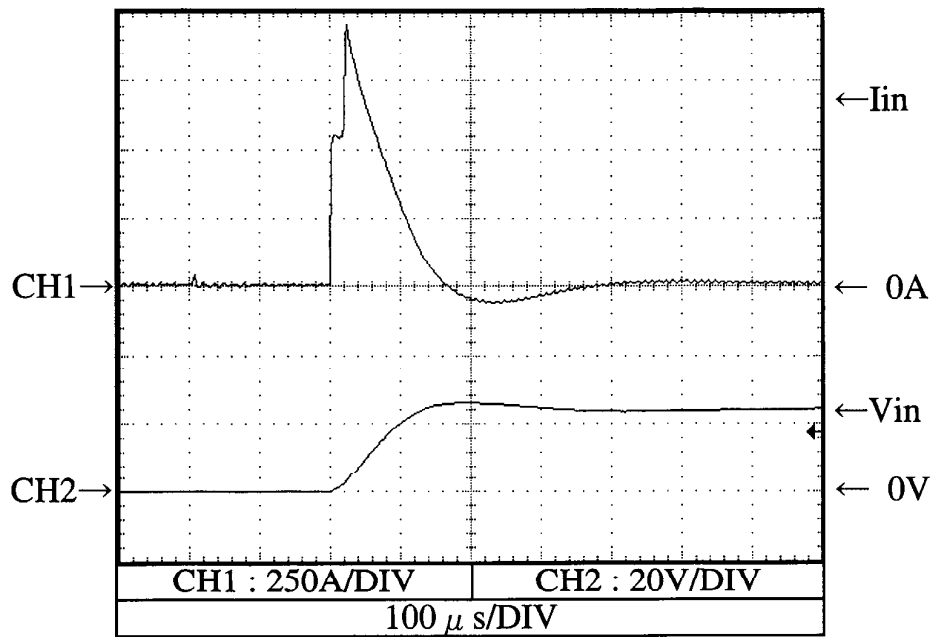
28V



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

Conditions Vin : 24 VDC
Iout : 100 %
Tp : 25 °C

12V

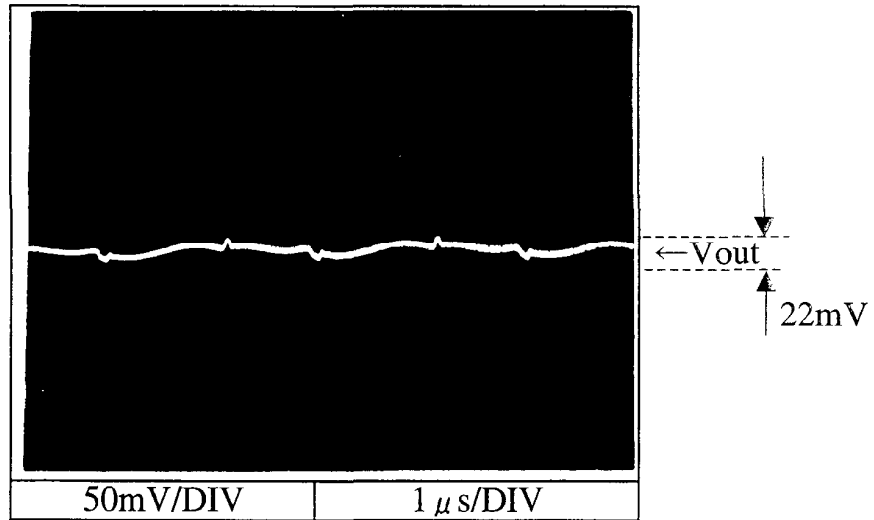


2.11 出力リップル、ノイズ波形
Output ripple and noise waveform

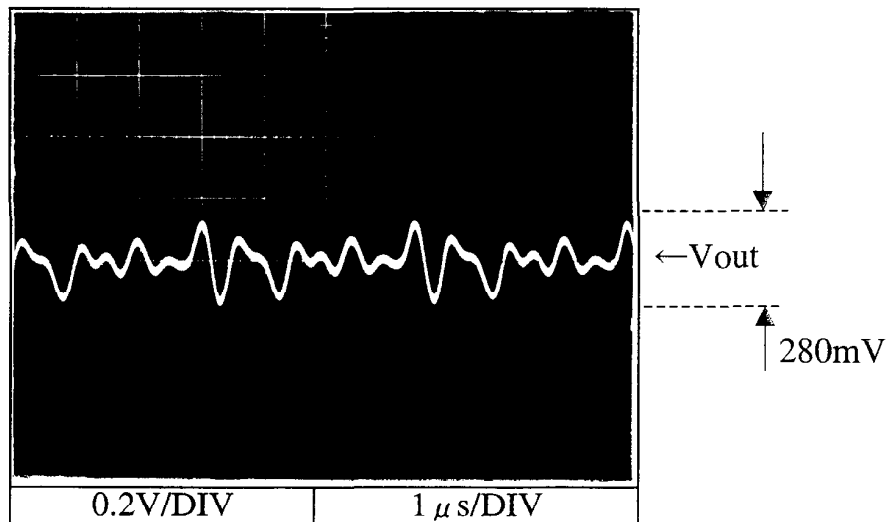
Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 °C

12V

Normal mode



Normal + common mode

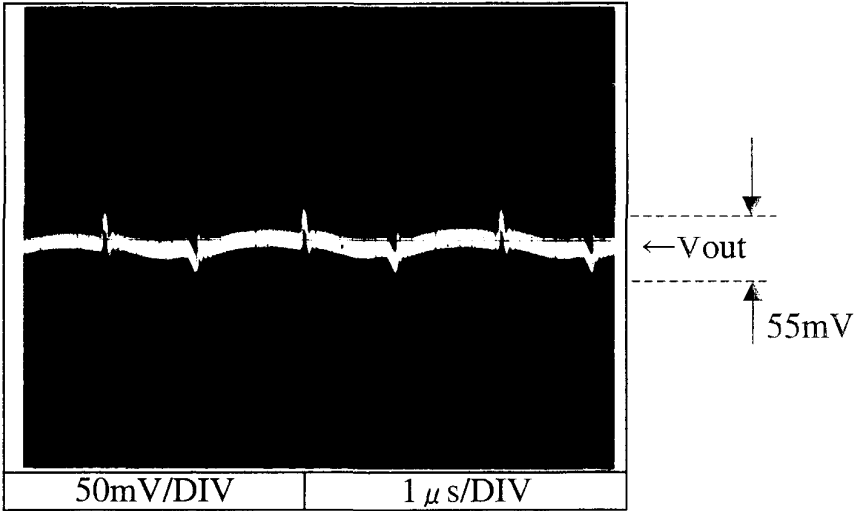


2.11 出力リップル、ノイズ波形
Output ripple and noise waveform

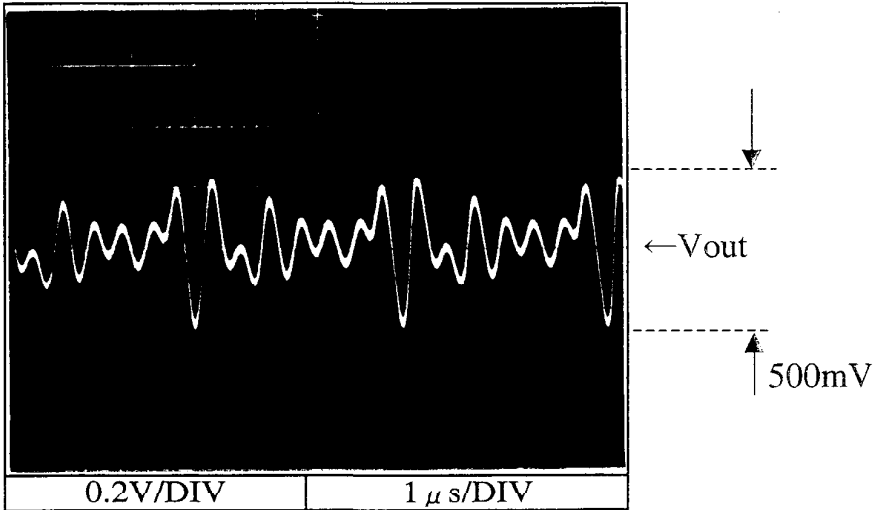
Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 °C

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 : 36 VDC

Conducted Emission

Iout : 100 %

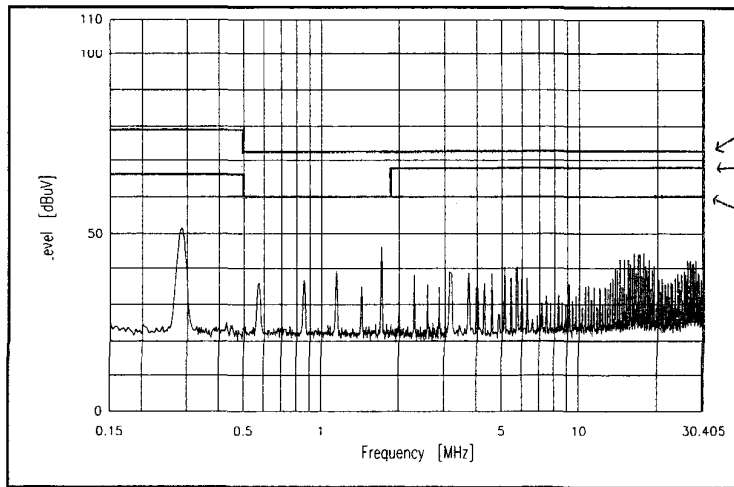
(1) VCCI class A 対応アプリケーションシステム

Tp : 25 °C

VCCI class A application system

12V

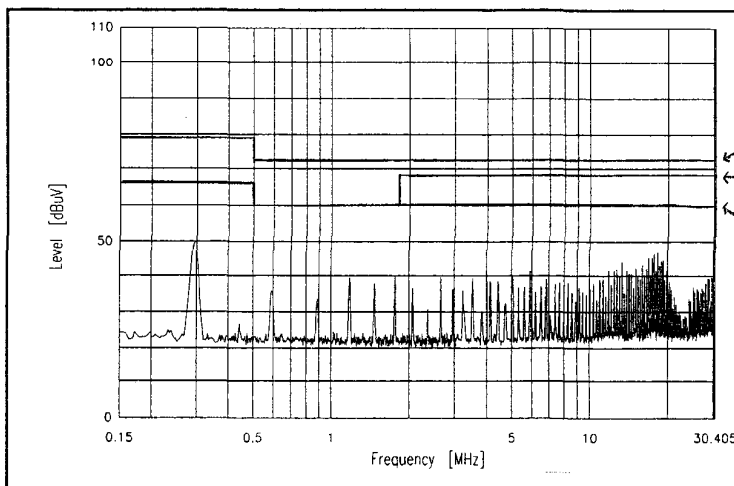
| Point (328kHz) | | |
|-------------------|--------|---------|
| Ref | Limit | Measure |
| Date | (dbuV) | (dbuV) |
| QP | 79.0 | 50.9 |
| AV | 66.0 | 50.9 |



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

28V

| Point (322kHz) | | |
|-------------------|--------|---------|
| Ref | Limit | Measure |
| Date | (dbuV) | (dbuV) |
| QP | 79.0 | 49.1 |
| AV | 66.0 | 49.1 |



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

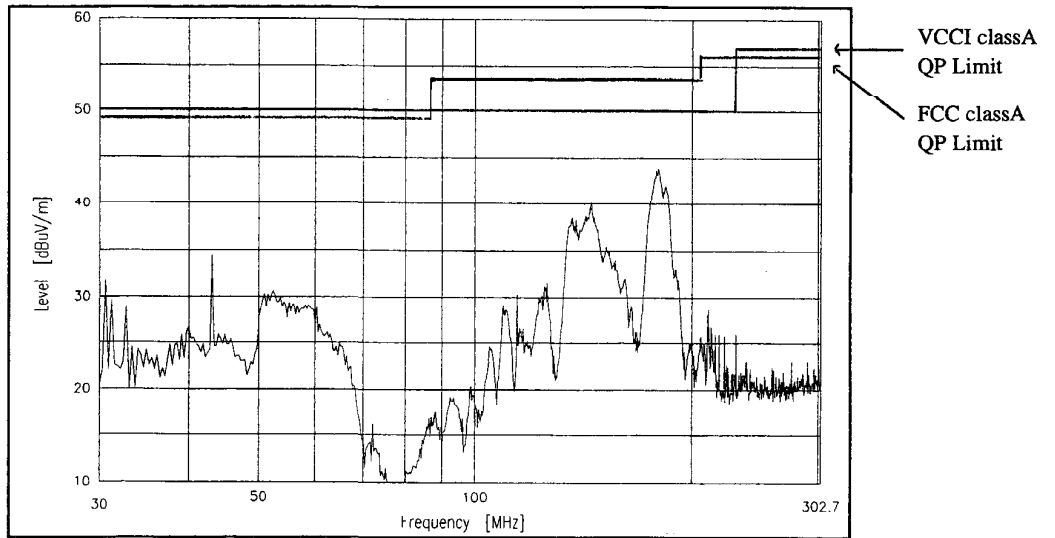
Conditions Vin : 36 VDC

Iout : 100 %

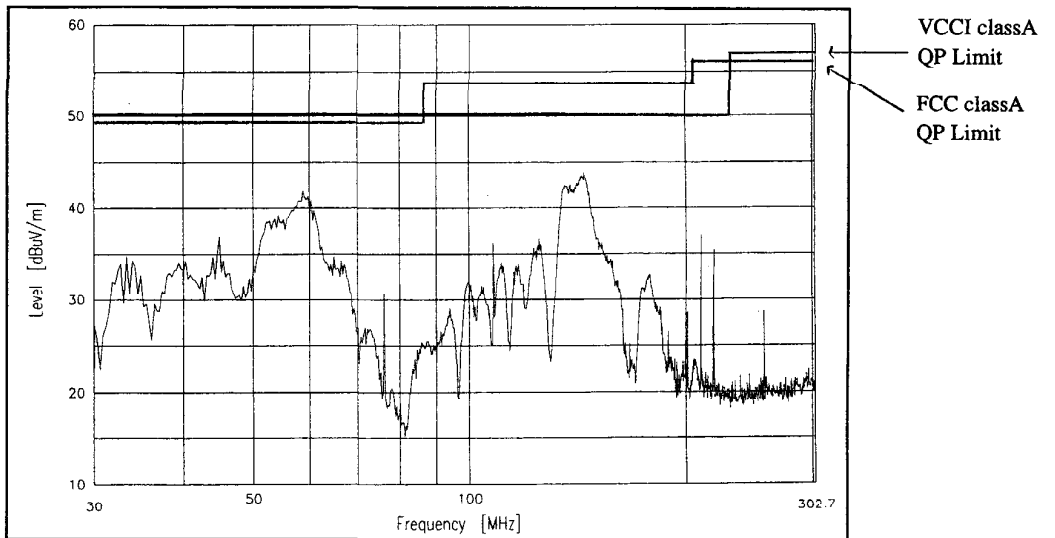
Tp : 25 °C

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

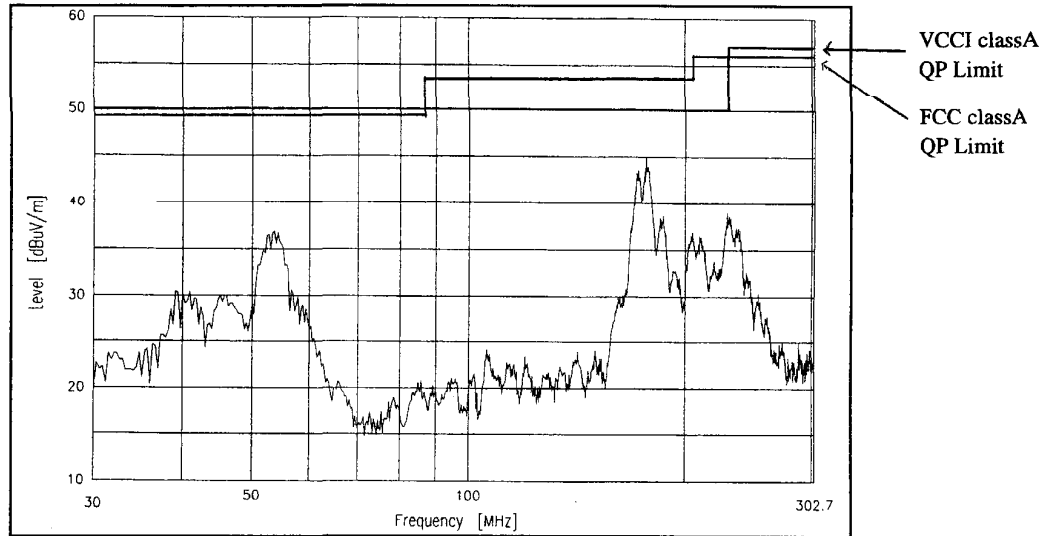
(1) VCCI class A 対応アプリケーションシステム

VCCI class A application system

Conditions Vin : 36 VDC
Iout : 100 %
Tp : 25 °C

28V

HORIZONTAL:



VERTICAL:

