VS10C

EVALUATION DATA

DWG No. : CA709-53-01			
APPD	APPD	CHK	DWG
T.Murayama 31. Aug. '99	10. Aug. 99	Aug. 10. '99	Aug. 06. 99

INDEX

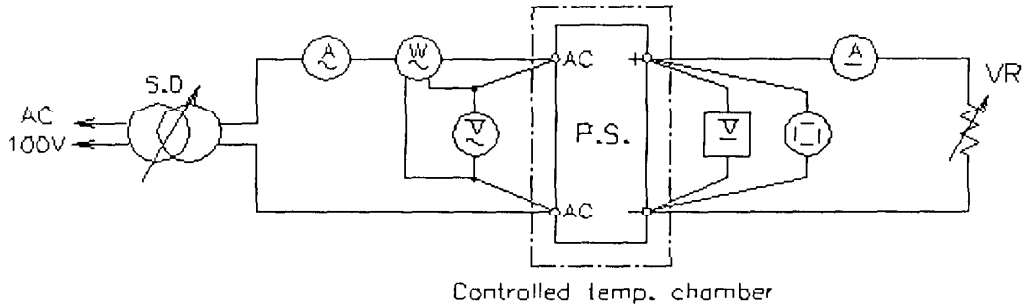
Terminology used

	Definition	
Vin	. . . . .	Input voltage
Vout	. . . . .	Output voltage
Iin	. . . . .	Input current
Iout	. . . . .	Output current
Ta	. . . . .	Ambient temperature

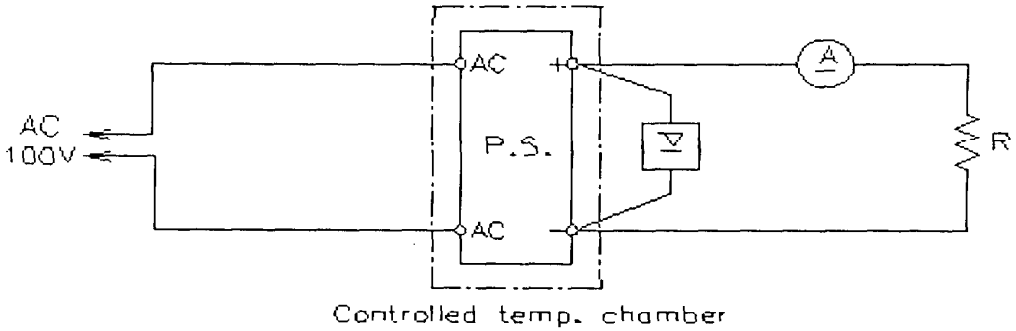
1. Evaluation Method

1.1 Circuit used for determination

(1)Steady state data



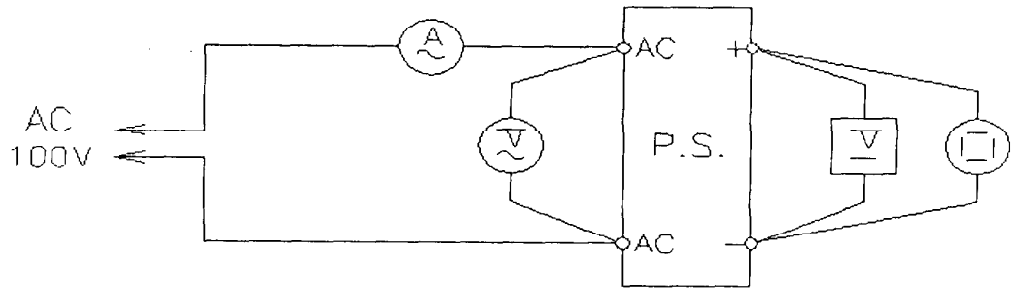
(2)Warm up voltage drift characteristics



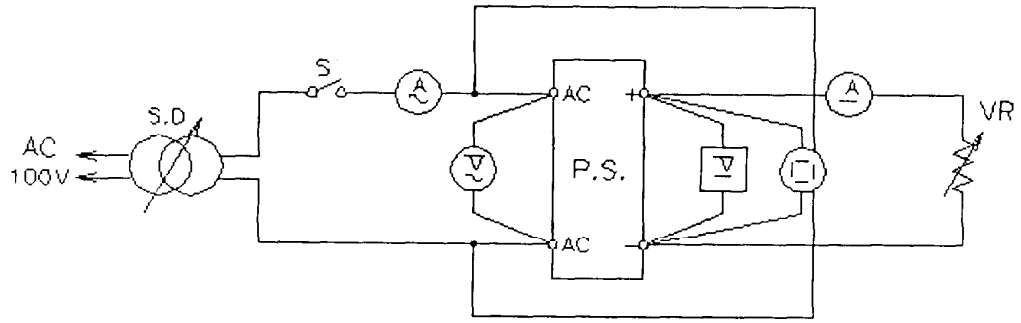
(3) Over current protection (O.C.P) characteristics

Same as Steady state data.

(4) Over voltage protection (O.V.P) characteristics



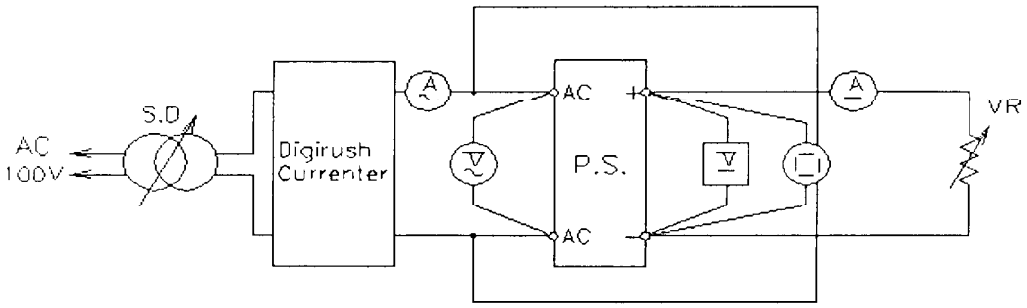
(5) Output rise characteristics



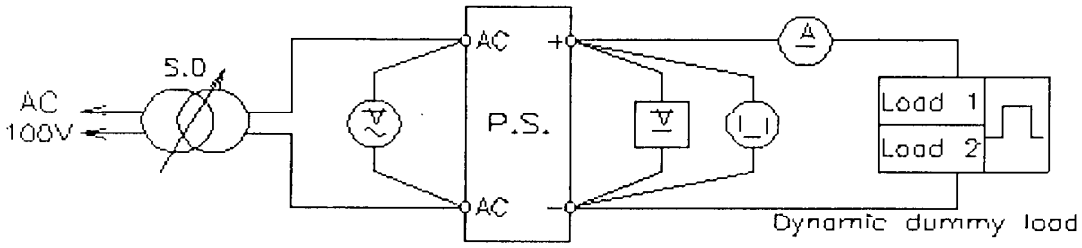
(6) Output fall characteristics

Same as output rise characteristics.

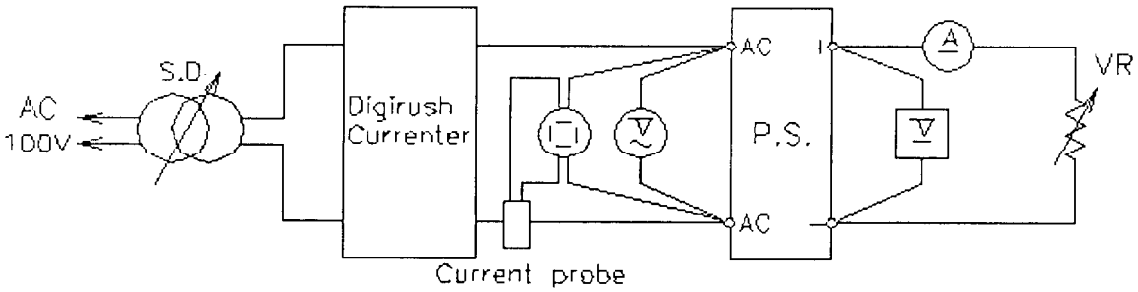
(7) Dynamic line response characteristics



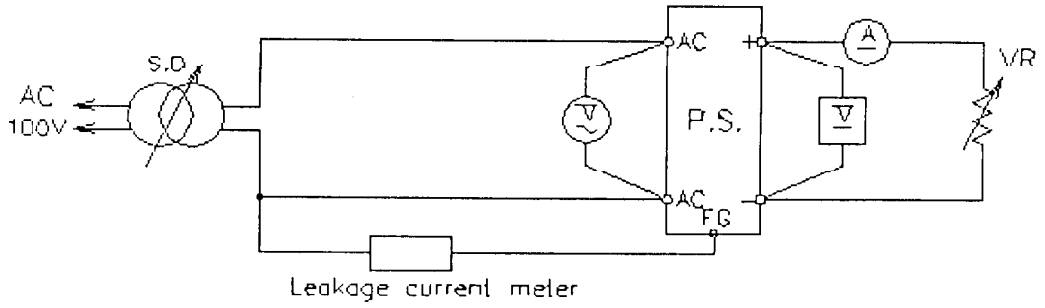
(8) Dynamic load response characteristics



(9) Inrush current characteristics

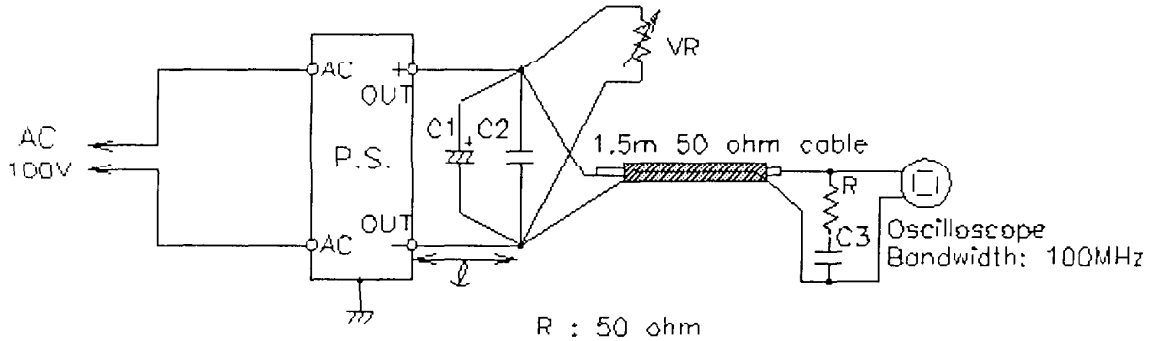


(10) Leakage current characteristics



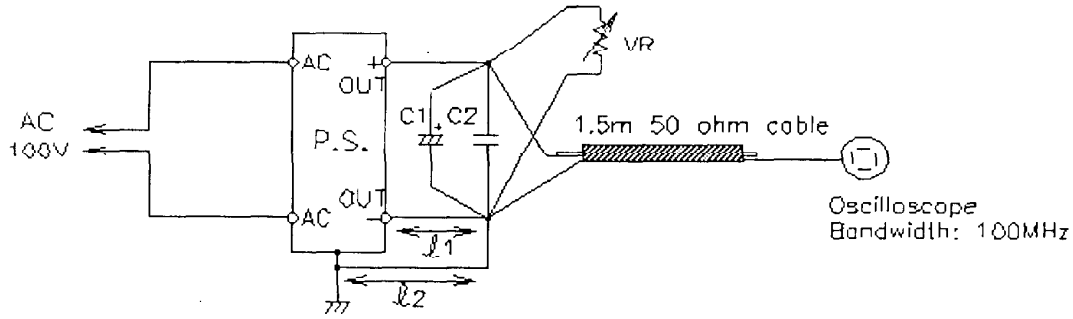
11)Output ripple and noise waveform

a)Normal Mode (EIAJ Standard RC - 9002A)



R : 50 ohm
C3: 4700P Ceramic Capacitor
ℓ : 150mm
C1: 100uF Electrolytic Capacitor
C2: 0.1uF Film Capacitor

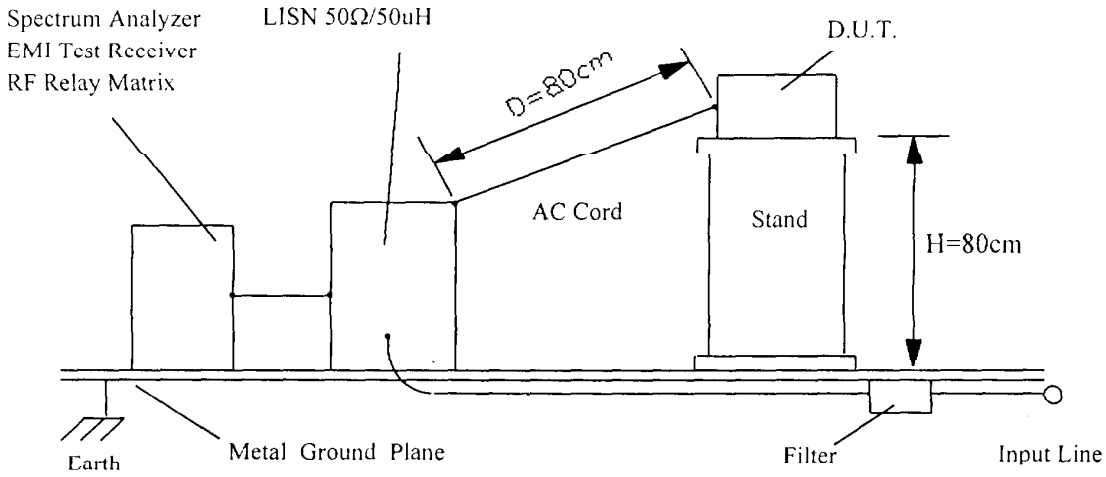
b)Normal + Common Mode



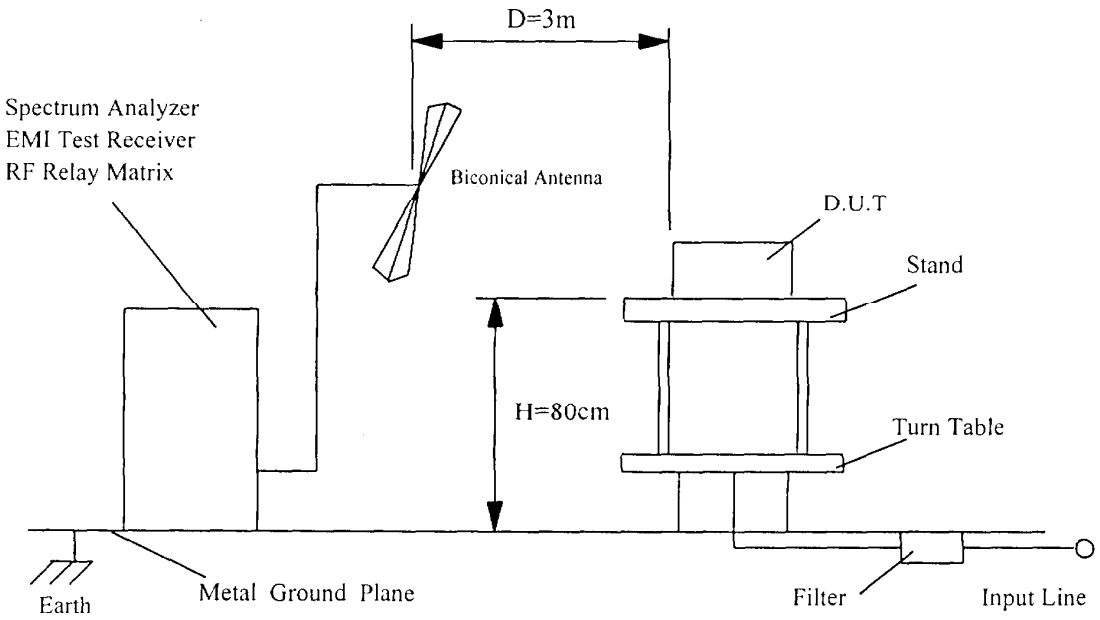
ℓ1: 150mm
ℓ2: 244mm
C1: 100uF Electrolytic Capacitor
C2: 0.1uF Film Capacitor

12)Electro-Magnetic Interference characteristics

(a) Conducted Emission Noise



(b) Radiated Emission Noise



1.2 LIST OF EQUIPMENT USED

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	Oscilloscope	HITACHI	V-1050
2	Digital storage oscilloscope	TEKTRONIX	TDS-540A
3	Digital volt meter	LEADER	856
4	Digital watt/current/volt meter	HIOKI	3186
5	DC ampere meter	YOKOGAWA	2051
6	Dynamic dummy load	KIKUSUI	PLZ152W
7	Current probe/amplifier	TEKTRONIX	A6303/AM503B
8	Controlled temperature chamber	TABAI-ESPEC	SU-240
9	Leakage current meter	SIMPSON	228
10	Digirush currenter	TAKAMISAWA CYBERNETICS	PSA-200

2. Characteristics

2.1 Steady state data

(1) Regulation - line and load, temperature drift

5V

1. Regulation - line and load

Condition Ta : 25°C

Iout\Vin	85V	100V	132V	Line regulation	
0%	5.018	5.018	5.016	2 mV	0.04%
50%	5.017	5.016	5.015	2 mV	0.04%
100%	5.012	5.013	5.014	2 mV	0.04%
Load	6 mV	5 mV	2 mV		
Regulation	0.12%	0.10%	0.04%		

2. Temperature drift

Conditions Vin=100Vac
Io =100%

Ta(°C)	-10°C	+25°C	+50°C	Temperature drift	
Vo(Vdc)	5.029	5.013	5.023	16 mV	0.32%

12V

1. Regulation - line and load

Condition Ta : 25°C

Iout\Vin	85V	100V	132V	Line regulation	
0%	12.044	12.041	12.042	3 mV	0.025%
50%	12.038	12.038	12.036	2 mV	0.017%
100%	12.035	12.031	12.036	5 mV	0.042%
Load	9 mV	10 mV	6 mV		
Regulation	0.075%	0.083%	0.050%		

2. Temperature drift

Conditions Vin=100Vac
Io =100%

Ta(°C)	-10°C	+25°C	+50°C	Temperature drift	
Vo(Vdc)	12.012	12.031	12.057	45 mV	0.375%

24V

1. Regulation - line and load

Condition Ta : 25°C

Iout\Vin	85V	100V	132V	Line regulation	
0%	24.092	24.091	24.093	2 mV	0.008%
50%	24.085	24.078	24.075	10 mV	0.042%
100%	24.081	24.078	24.072	9 mV	0.038%
Load	11 mV	13 mV	21 mV		
Regulation	0.046%	0.054%	0.088%		

2. Temperature drift

Conditions Vin=100Vac
Io =100%

Ta(°C)	-10°C	+25°C	+50°C	Temperature drift	
Vo(Vdc)	24.163	24.078	24.086	85 mV	0.354%

2.1. (2) Output voltage and Ripple voltage v.s. Input voltage

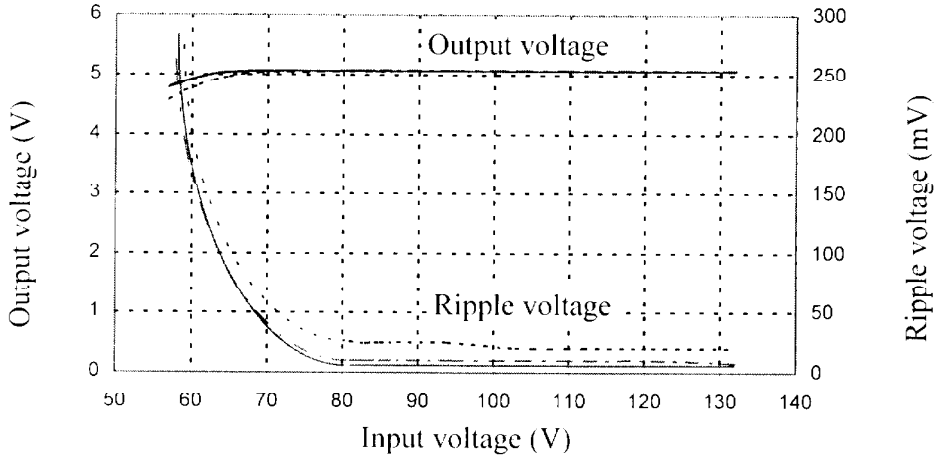
Conditions Iout : 100%

Ta : -10°C ·····

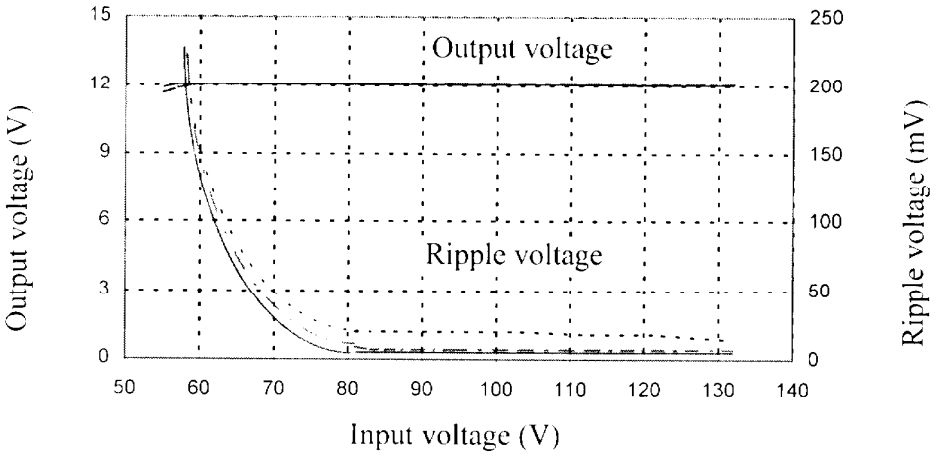
25°C — · — · —

50°C ————

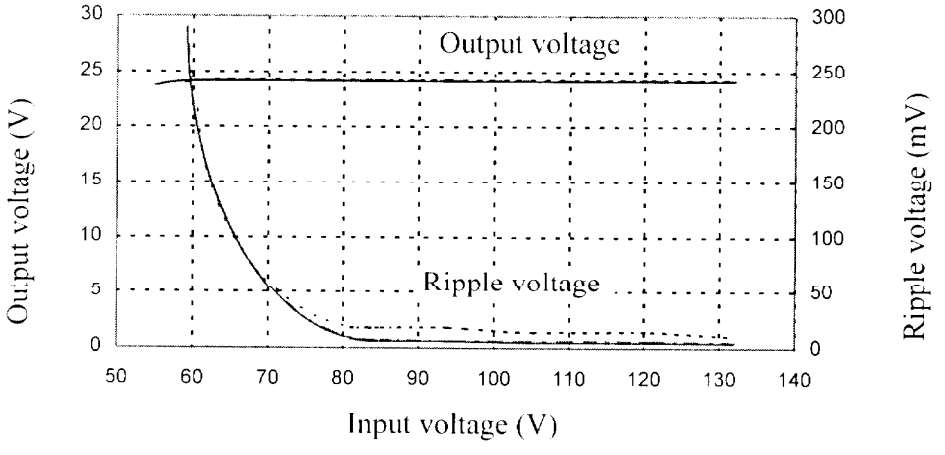
5V



12V



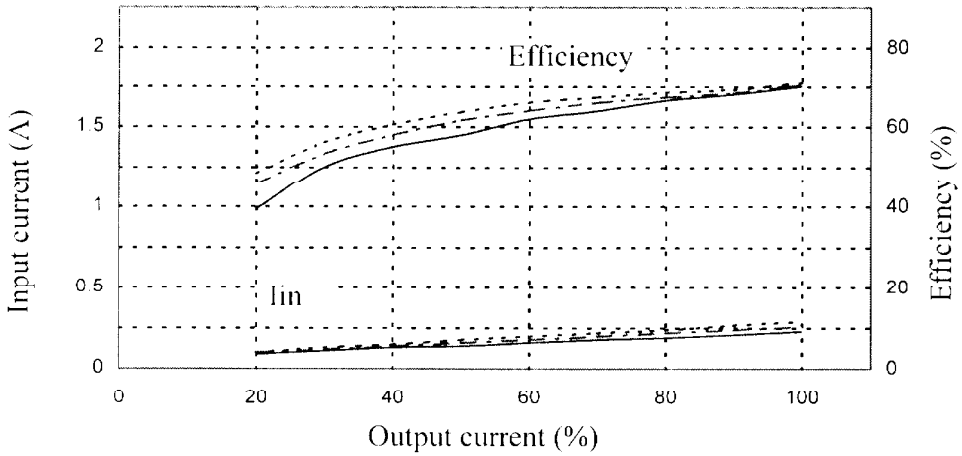
24V



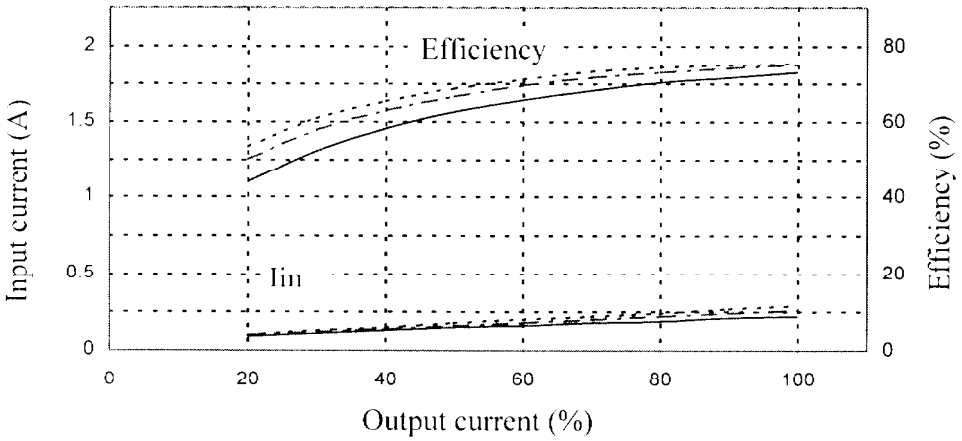
2.1. (3) Efficiency and Input current v.s. Output current

Conditions Ta : 25°C
Vin : 85Vac
100Vac
132Vac

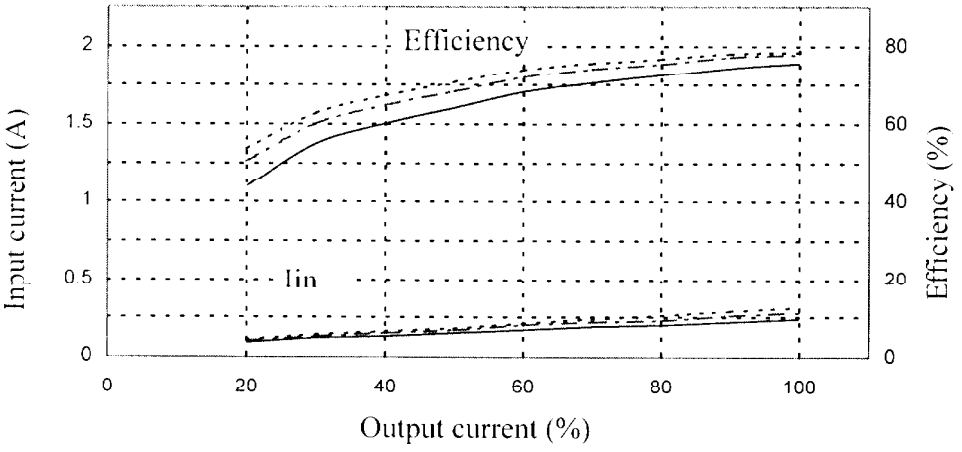
5V



12V



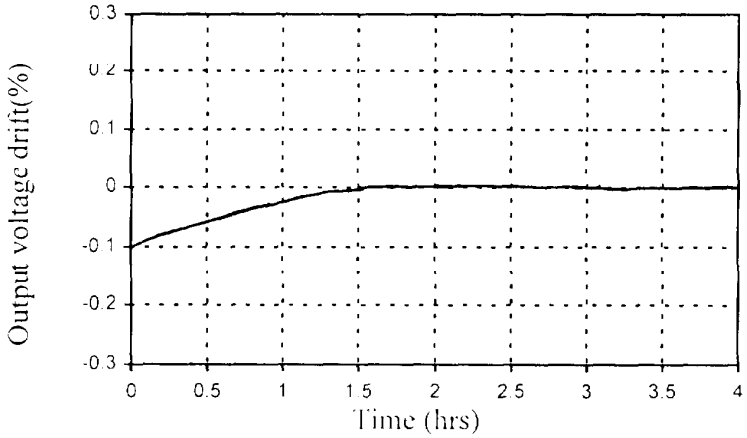
24V



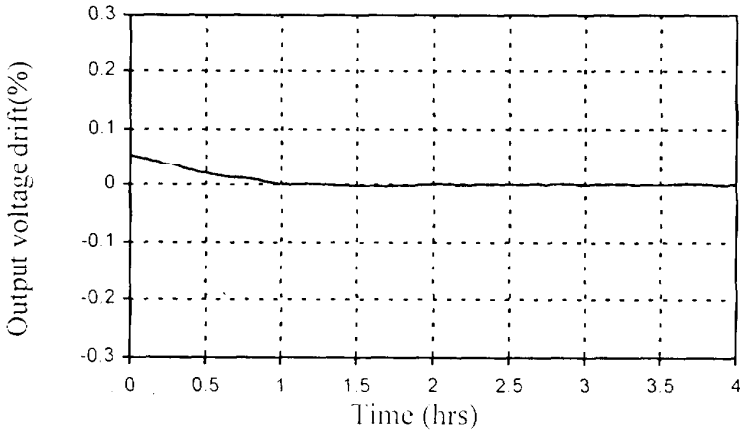
2.2 Warm up voltage drift characteristics

Conditions Vin : 100VAC
Iout : 100%
Ta : 25°C

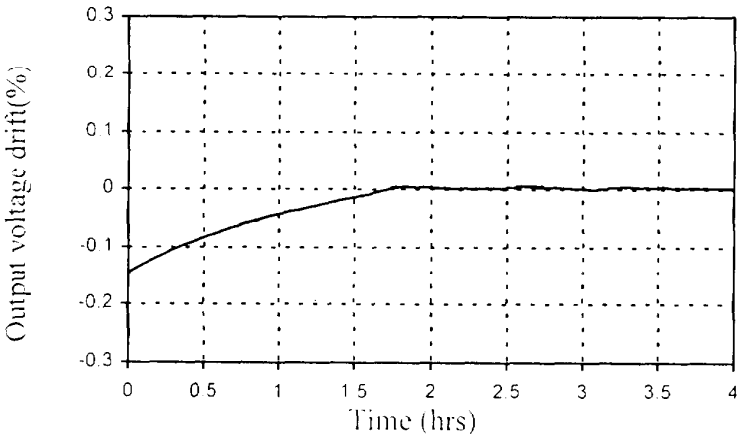
5V



12V



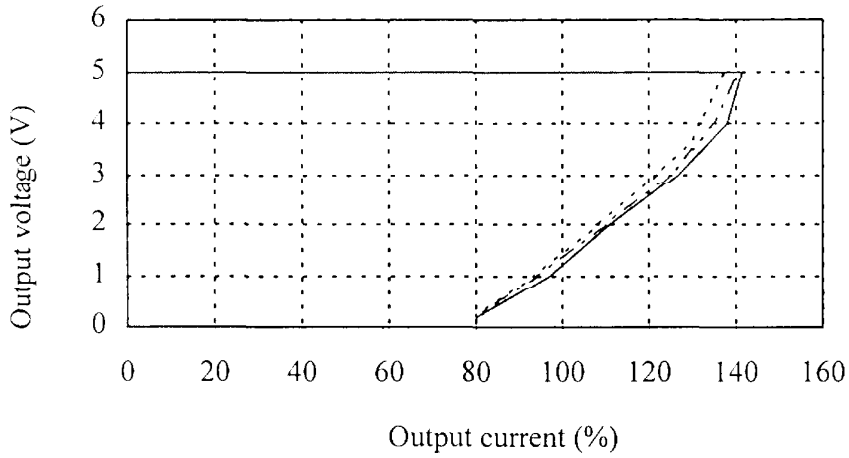
24V



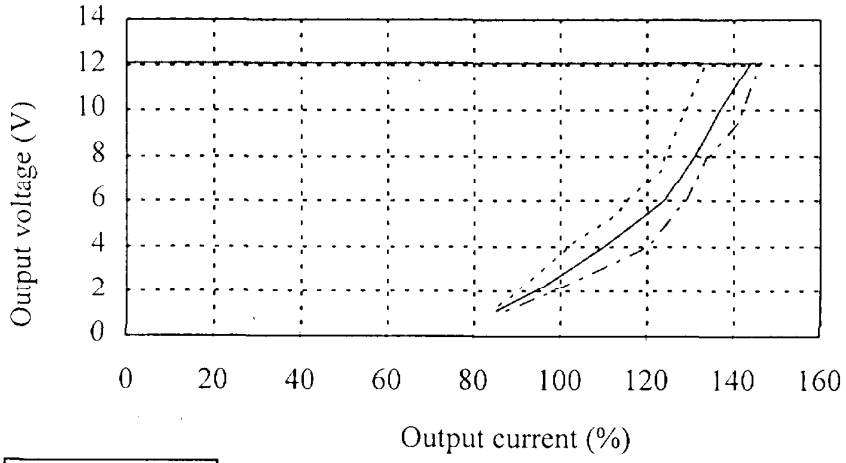
2.3 Over current protection (OCP) characteristics

Conditions Ta : 25°C
Vin : 85Vac
100Vac
132Vac

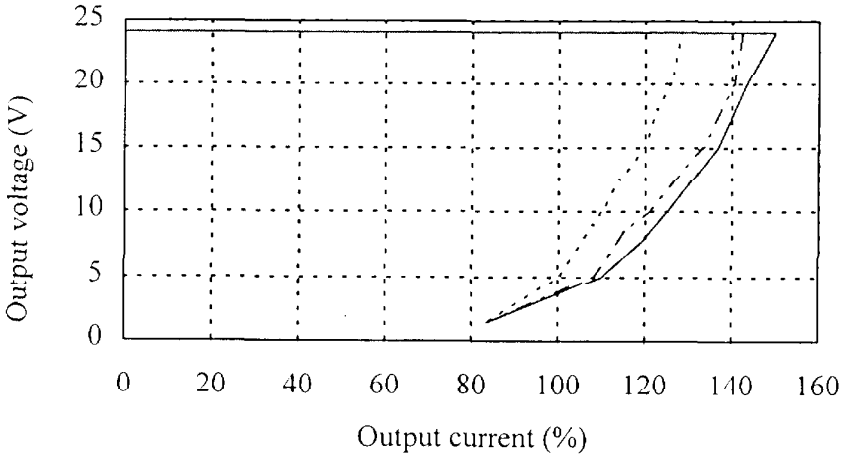
5V



12V



24V



2.3 Over current protection (OCP) characteristics

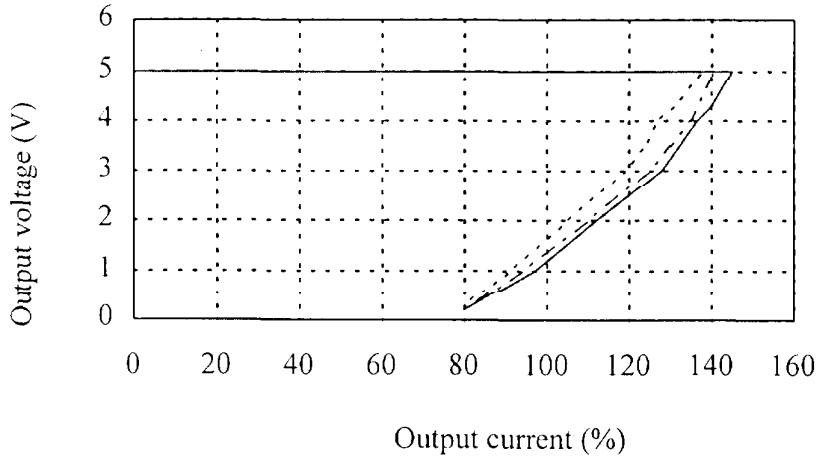
Conditions Vin : 100VAC

Ta : -10°C ·····

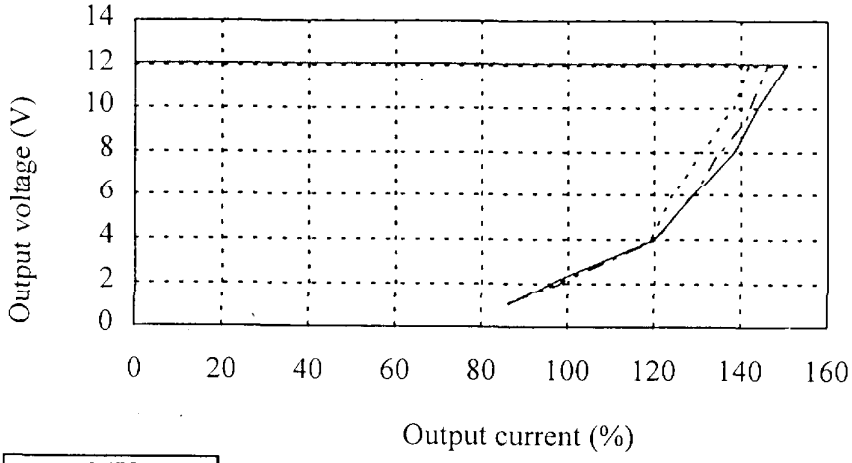
25°C – – – – –

50°C ———

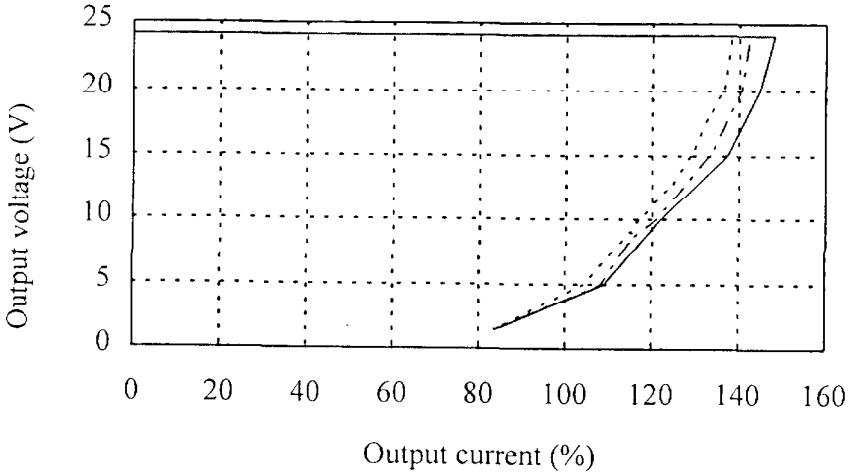
5V



12V



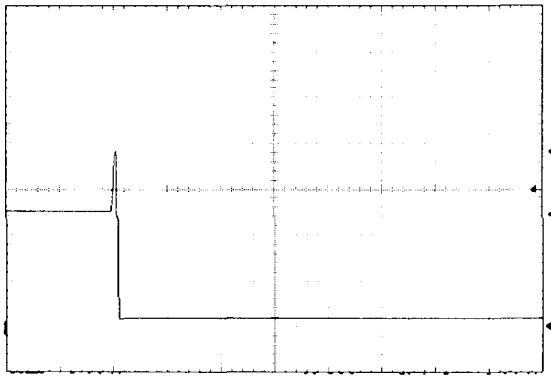
24V



2.4 Over voltage protection (OVP) characteristics

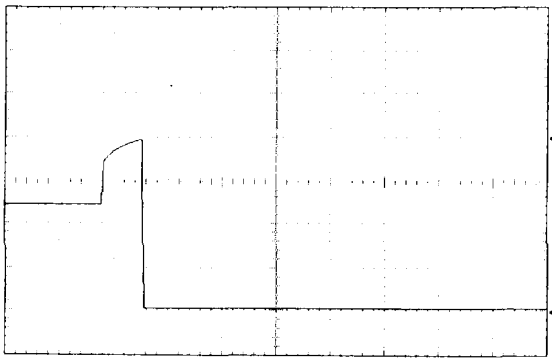
Conditions Ta : 25°C
Vin : 100Vac
Io : 0%

5V



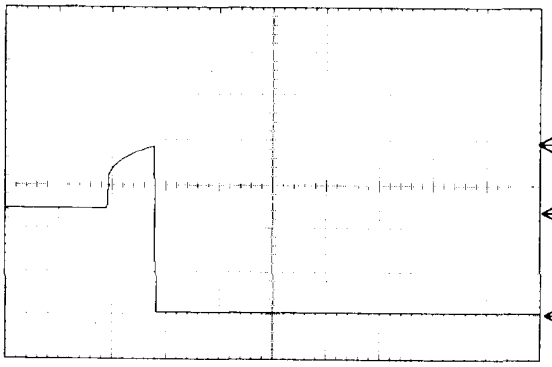
2V/DIV	200mS/DIV

12V



5V/DIV	200mS/DIV

24V

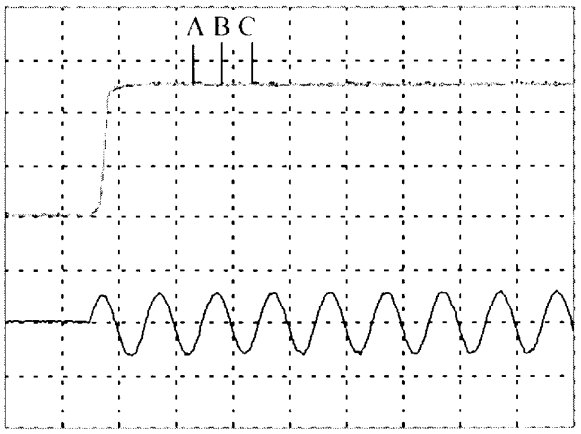


10V/DIV	200mS/DIV

2.5 Output rise characteristics

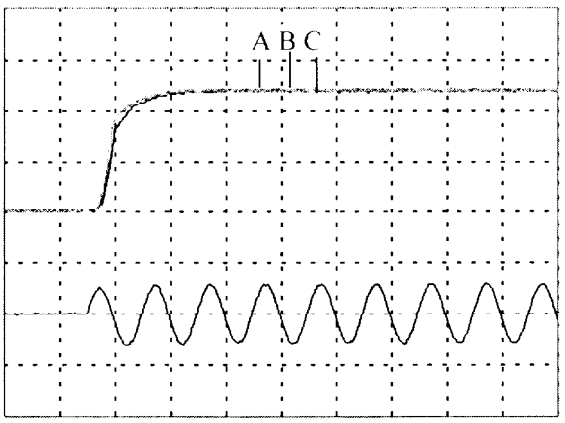
Conditions Vin : 85Vac (A)
: 100Vac (B)
: 132Vac (C)
Iout : 0%
Ta : 25°C

5V



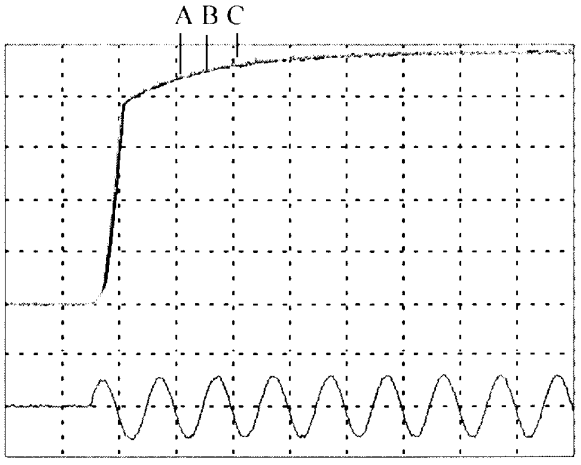
2.00V/DIV	20mS/DIV

12V



5V/DIV	20mS/DIV

24V

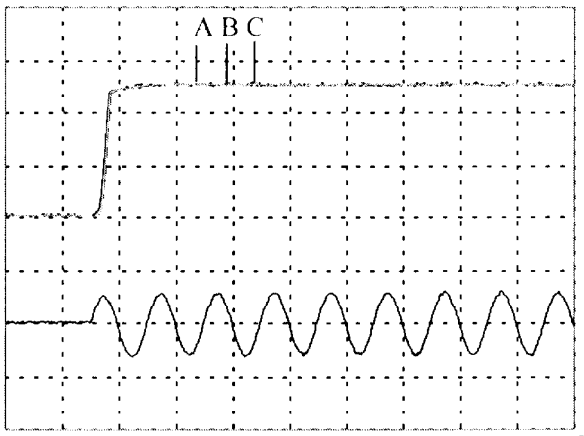


5V/DIV	20mS/DIV

2.5 Output rise characteristics

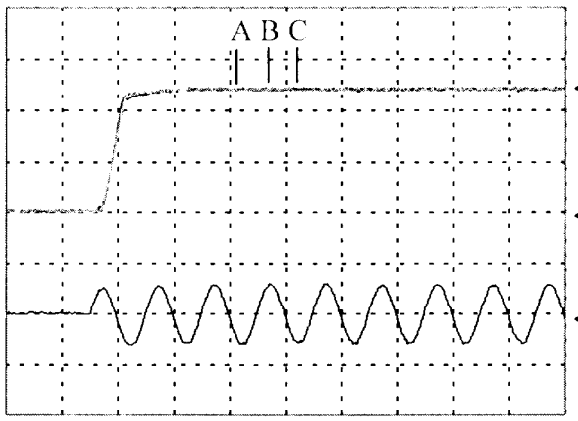
Conditions Vin : 85Vac (A)
: 100Vac (B)
: 132Vac (C)
Iout : 100%
Ta : 25°C

5V



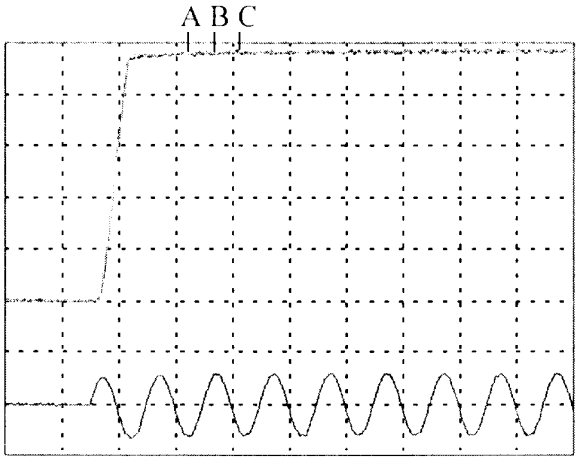
2.00V/DIV	20mS/DIV

12V



5V/DIV	20mS/DIV

24V



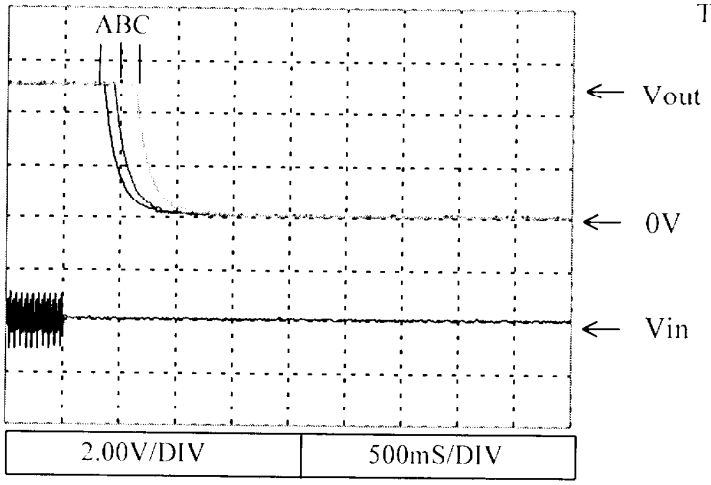
5V/DIV	20mS/DIV

VS10C

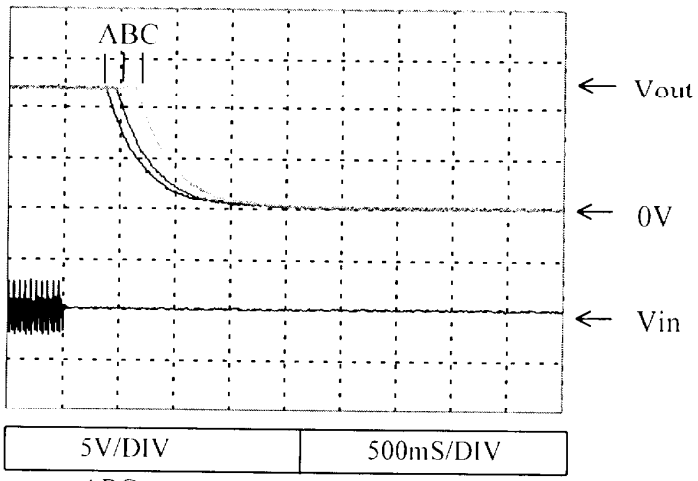
2.6 Output fall characteristics

Conditions Vin : 85Vac (A)
: 100Vac (B)
: 132Vac (C)
Iout : 0%
Ta : 25°C

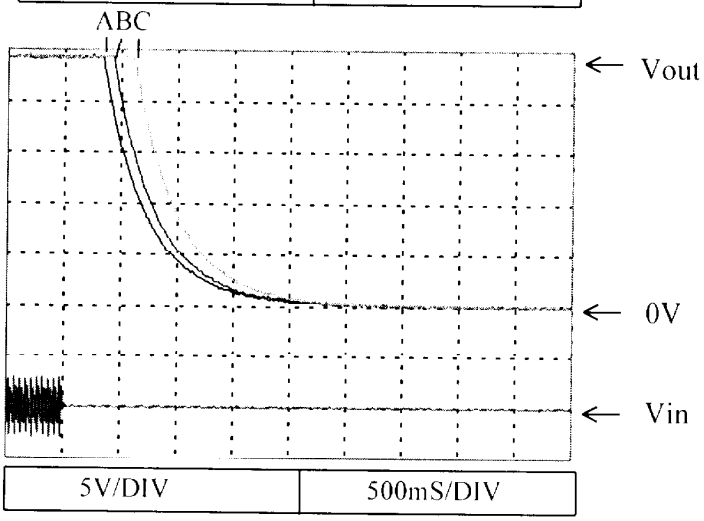
5V



12V



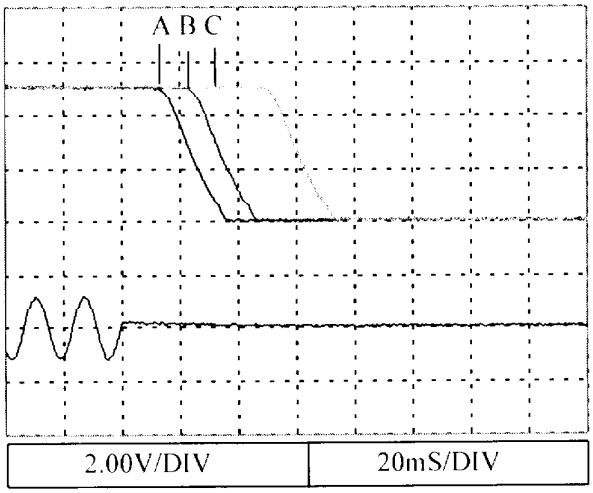
24V



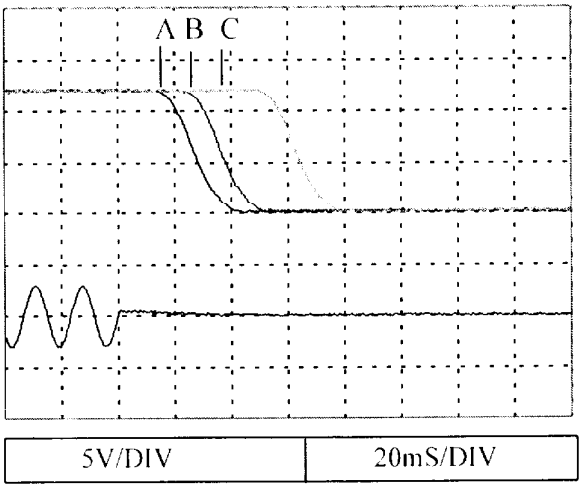
2.6 Output fall characteristics

Conditions Vin : 85Vac (A)
: 100Vac (B)
: 132Vac (C)
Iout : 100%
Ta : 25°C

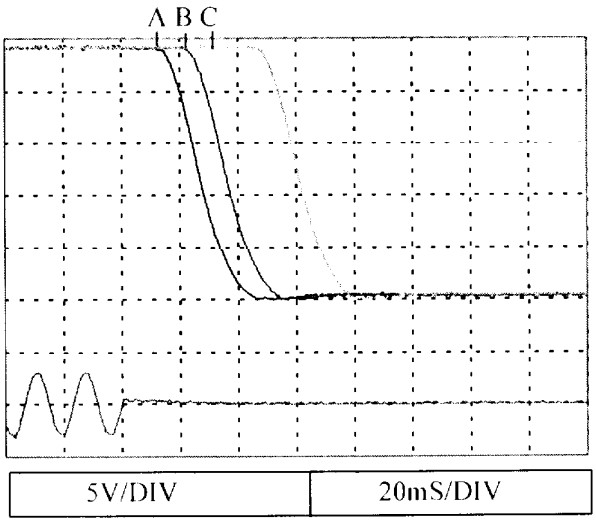
5V



12V



24V



VS10C

2.7 Hold up time characteristics

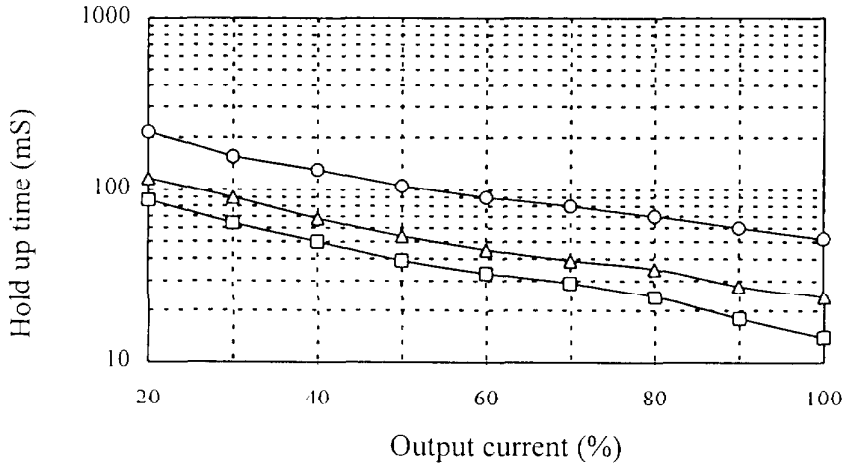
Conditions Ta : 25°C

Vin : 85Vac

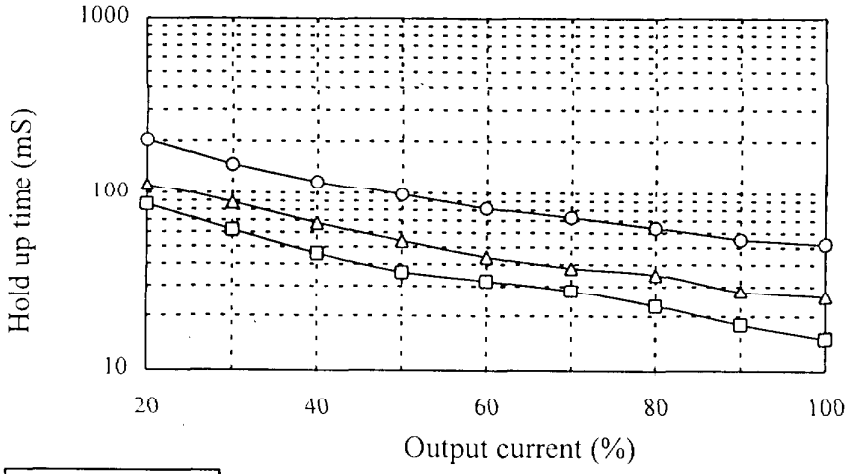
100Vac

132Vac

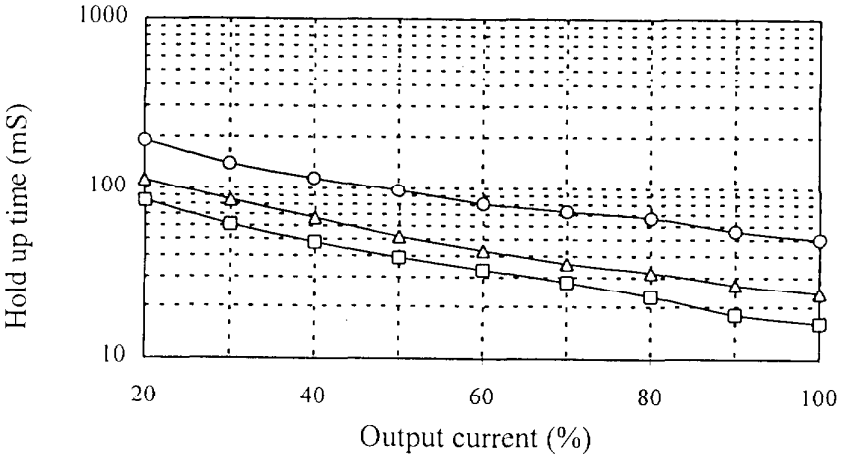
5V



12V



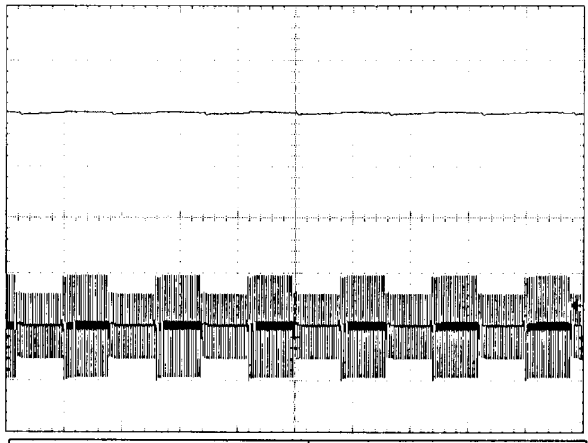
24V



2.8 Dynamic line response characteristics

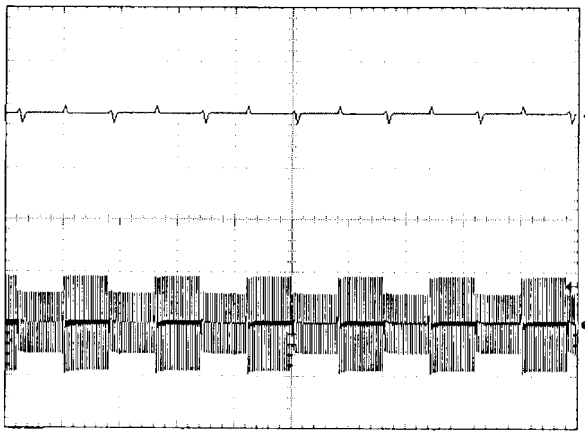
Conditions Vin : 85Vac ⟷ 132Vac
Iout : 100%
Ta : 25°C

5V



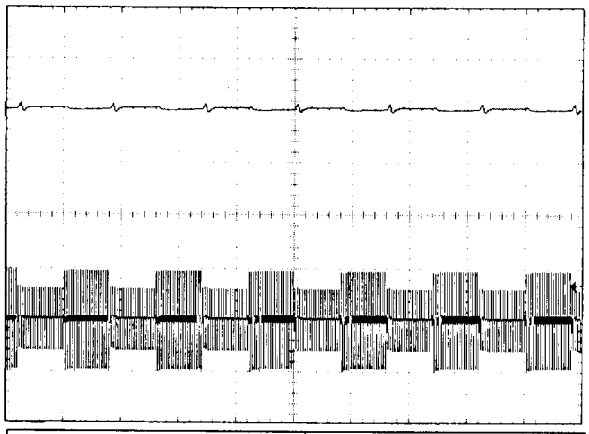
50mV/DIV | 500mS/DIV

12V



50mV/DIV | 500mS/DIV

24V

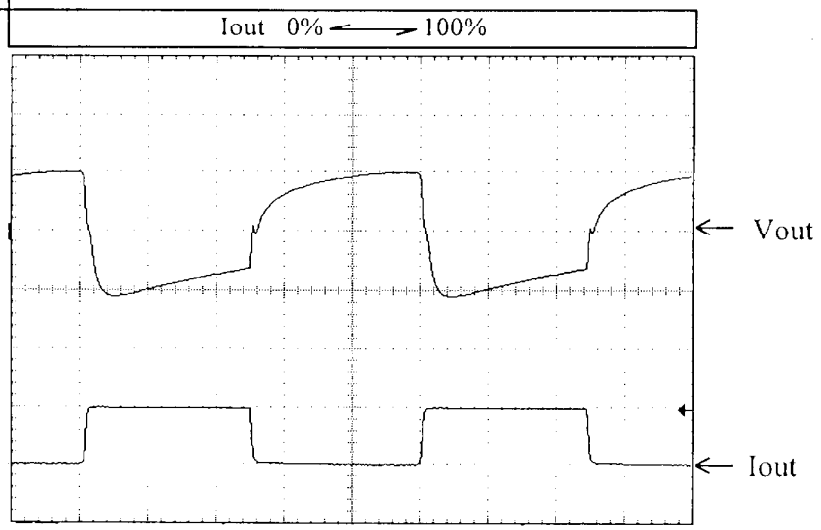


50mV/DIV | 500mS/DIV

2.9 Dynamic load response characteristics

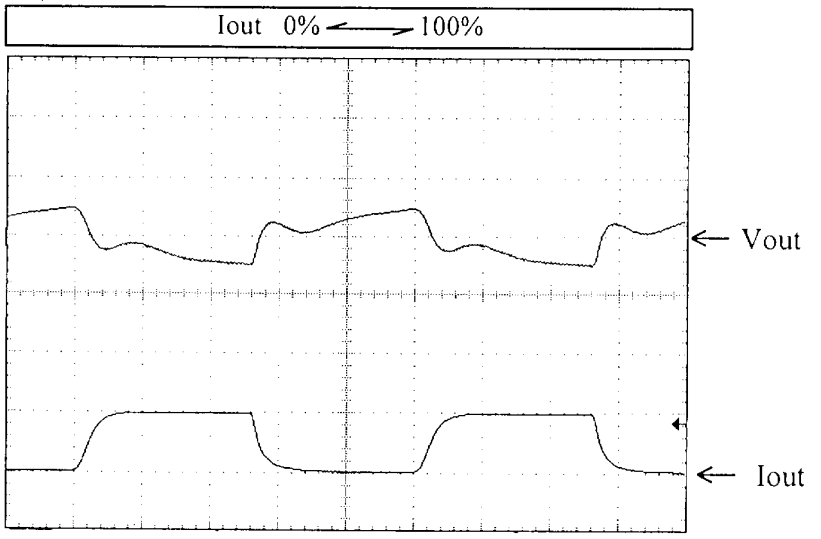
Conditions Vin : 100Vac
Ta : 25°C

5V **f=100Hz**



200mV/DIV	2mS/DIV
+4.0 %	-4.5 %

f=1kHz

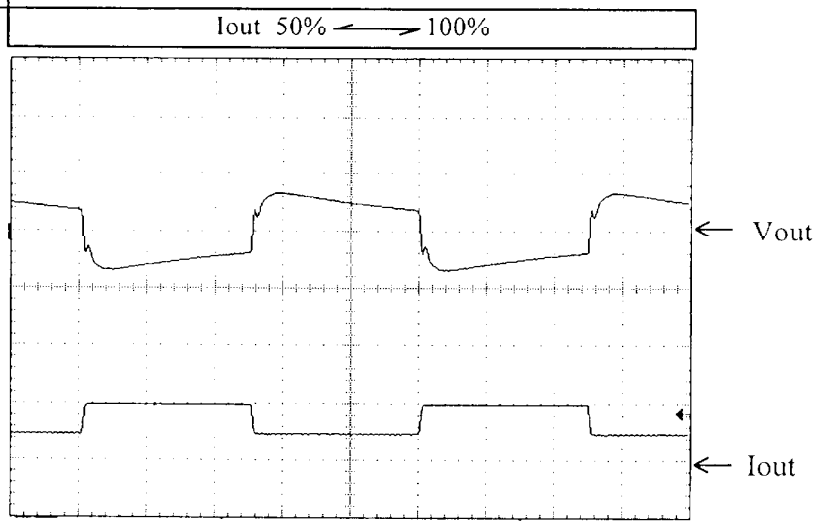


200mV/DIV	200uS/DIV
+1.9 %	-2.0 %

2.9 Dynamic load response characteristics

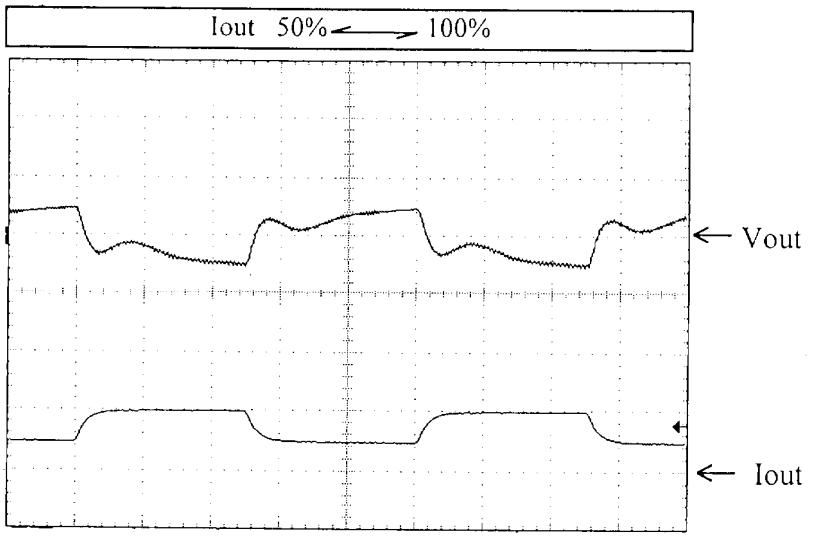
Conditions Vin : 100Vac
Ta : 25°C

5V f=100Hz



100mV/DIV	2mS/DIV
+1.4 %	-1.4 %

f=1kHz

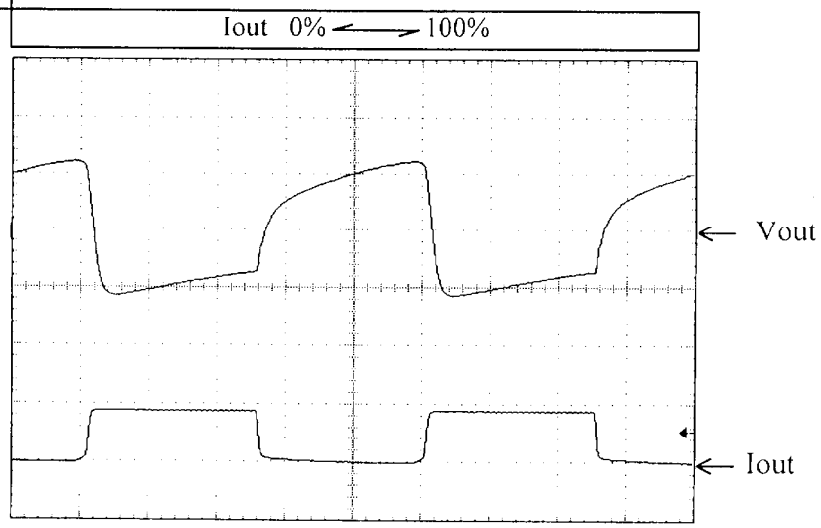


100mV/DIV	200uS/DIV
+0.9 %	-1.1 %

2.9 Dynamic load response characteristics

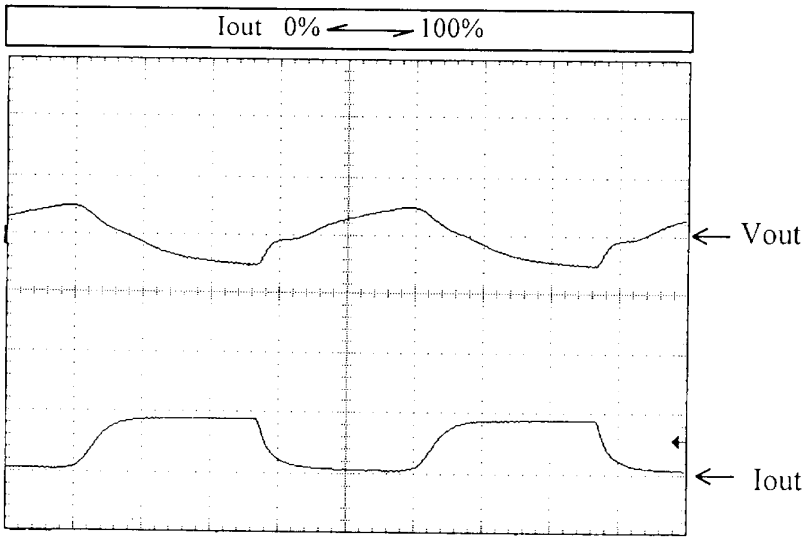
Conditions Vin : 100Vac
Ta : 25°C

12V **f=100Hz**



200mV/DIV	2mS/DIV
+2.0 %	-2.0 %

f=1kHz

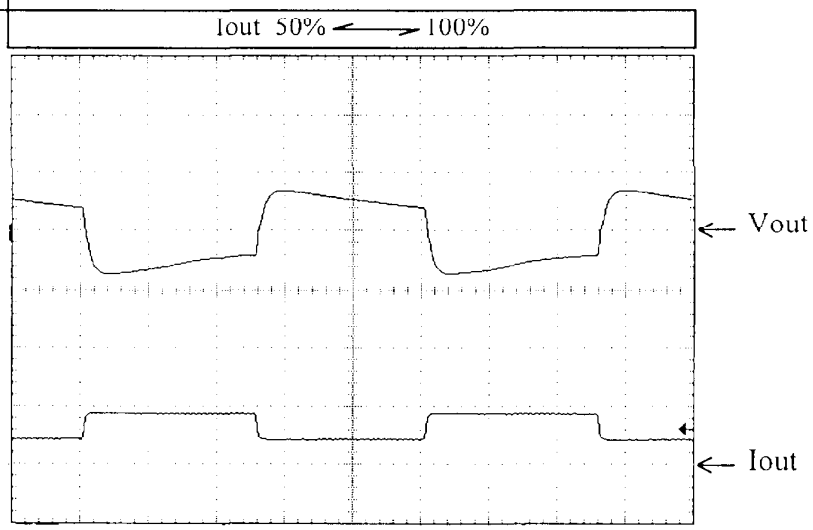


200mV/DIV	200uS/DIV
+0.8 %	-0.8 %

2.9 Dynamic load response characteristics

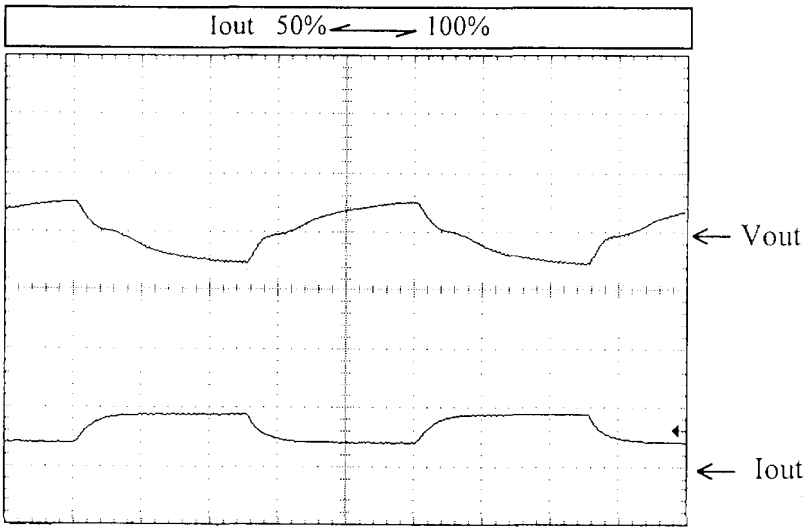
Conditions Vin : 100Vac
Ta : 25°C

12V	f=100Hz



100mV/DIV	2mS/DIV
+0.6 %	-0.7 %

f=1kHz

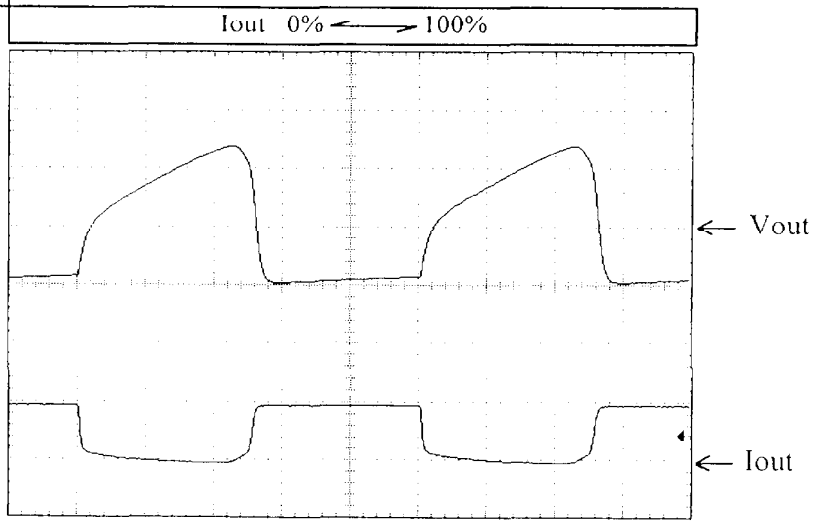


100mV/DIV	200uS/DIV
+0.4 %	-0.5 %

2.9 Dynamic load response characteristics

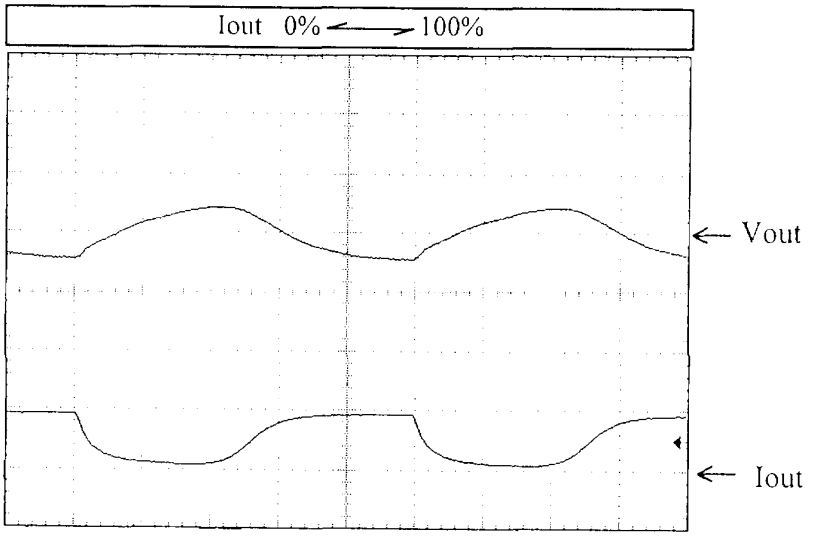
Conditions Vin : 100Vac
Ta : 25°C

24V **f=100Hz**



200mV/DIV	2mS/DIV
+1.2 %	-0.8 %

f=1kHz



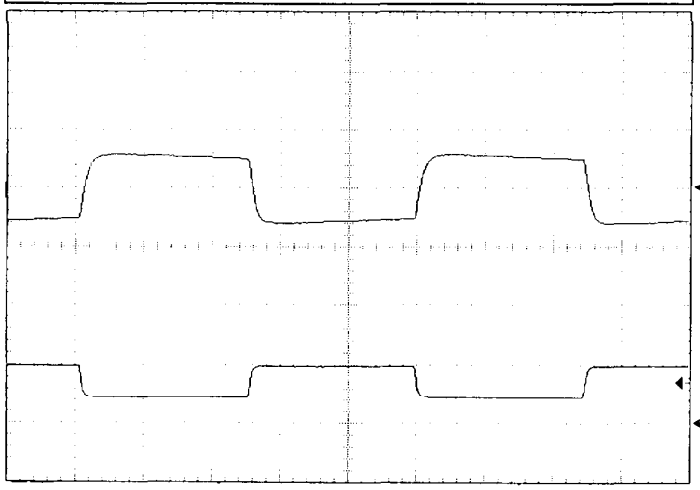
200mV/DIV	200uS/DIV
+0.3 %	-0.4 %

2.9 Dynamic load response characteristics

Conditions Vin : 100Vac
Ta : 25°C

24V	f=100Hz

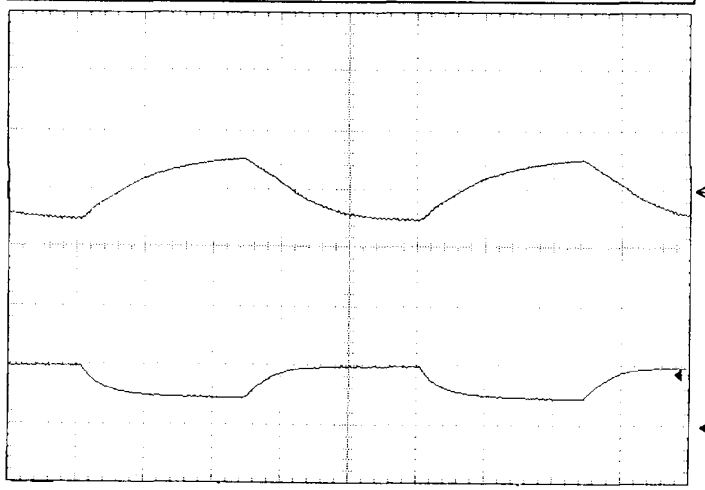
Iout 50% ⟷ 100%



100mV/DIV	2mS/DIV
+0.3 %	-0.3 %

f=1kHz

Iout 50% ⟷ 100%

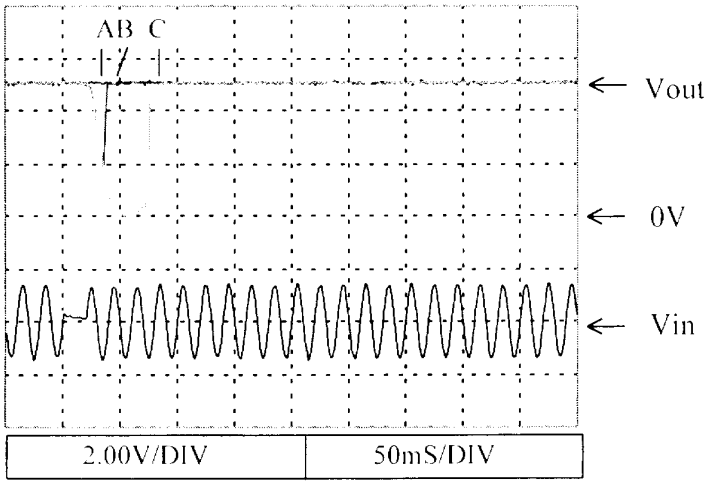


100mV/DIV	200uS/DIV
+0.2 %	-0.2 %

2.10 Response to brown out characteristics

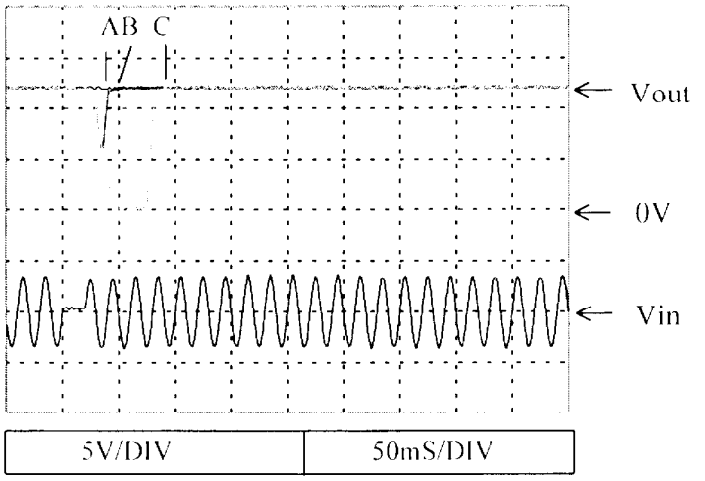
Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

5V



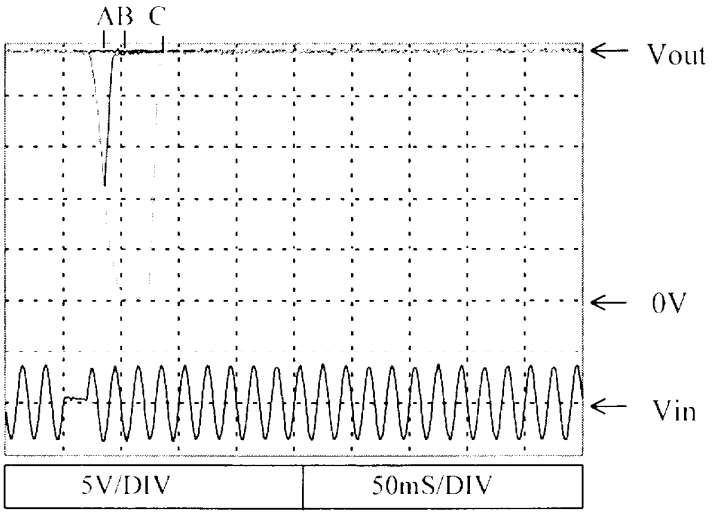
A = 20 mS
B = 35 mS
C = 70 mS

12V



A = 20 mS
B = 35 mS
C = 70 mS

24V



A = 20 mS
B = 35 mS
C = 70 mS

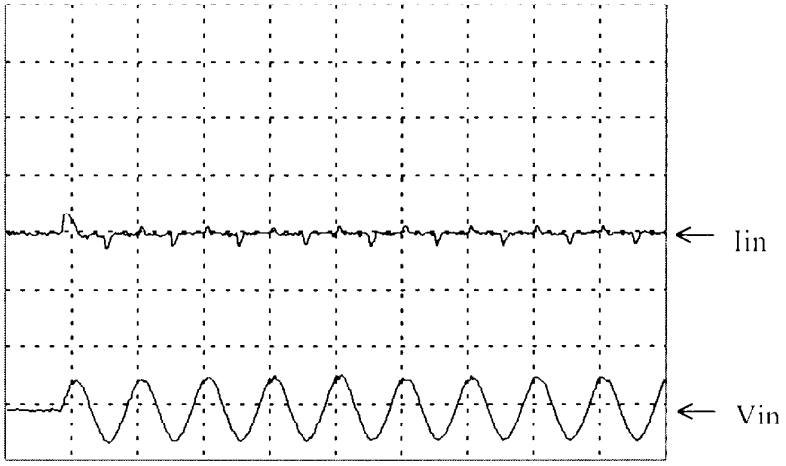
2.11 Inrush current waveform

Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

5V

Switch on phase angle of input AC voltage :

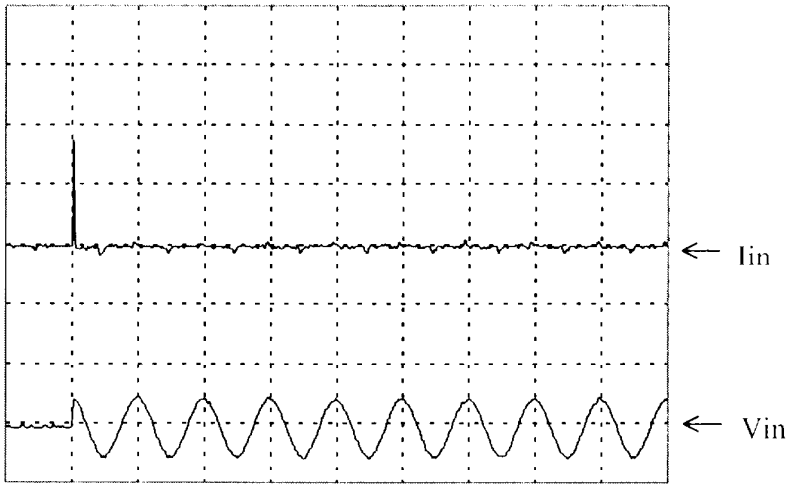
Φ=0°



5.0A/DIV	20mS/DIV

Switch on phase angle of input AC voltage :

Φ=90°



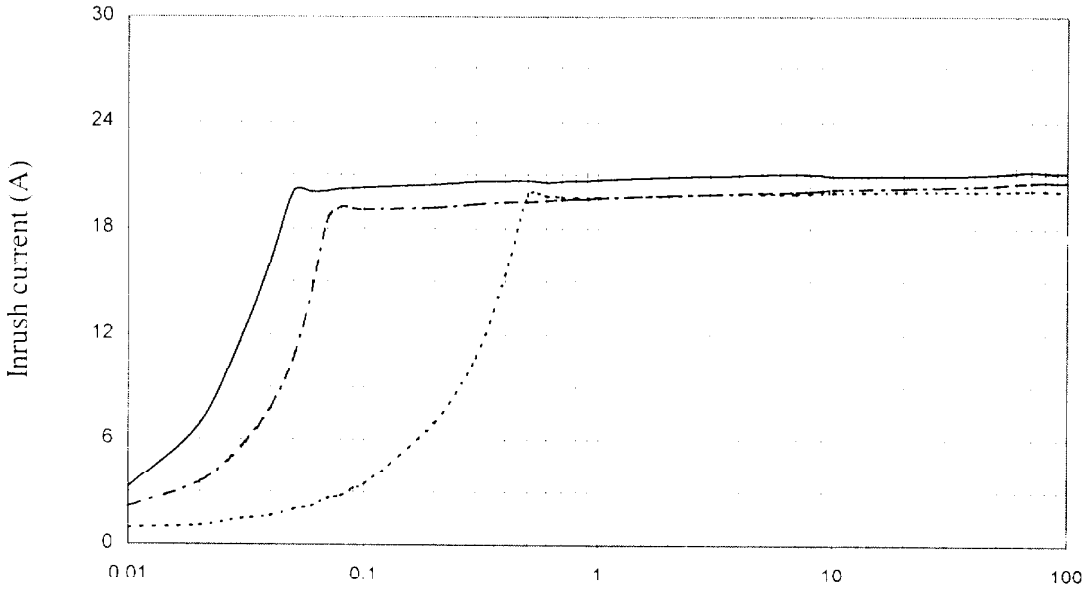
10.0A/DIV	20mS/DIV

2.12 Inrush currentcharacteristics

VS10C

Conditions Vin : 100Vac
Iout : 0% - - - - - - - - - - - -
50% — · — · — · —
100% ————————
Ta : 25°C

5V



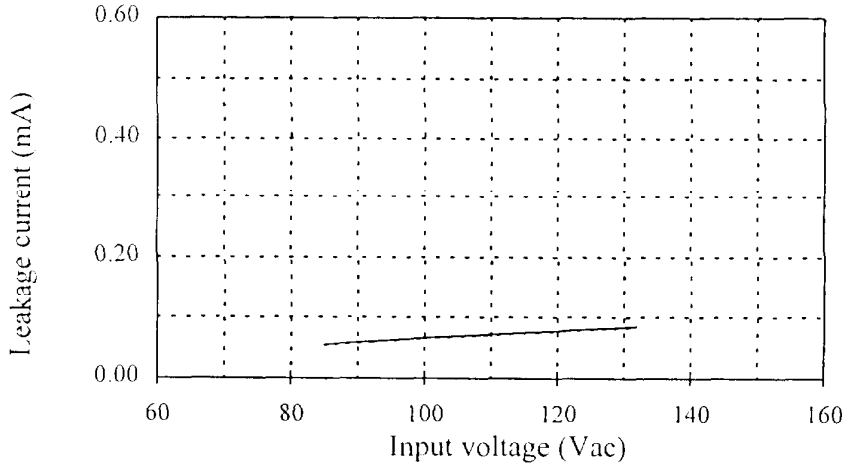
2.13 Leakage current characteristics

Conditions Ta : 25°C

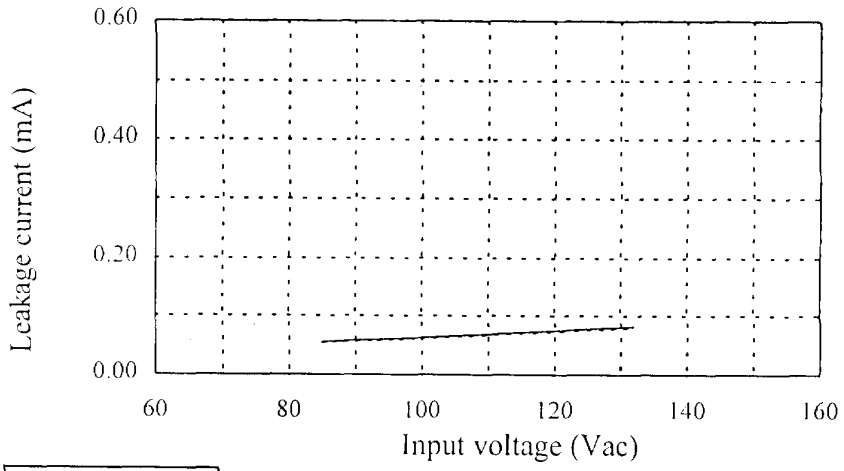
Vin : 0% - - - - - - - -

100% ————

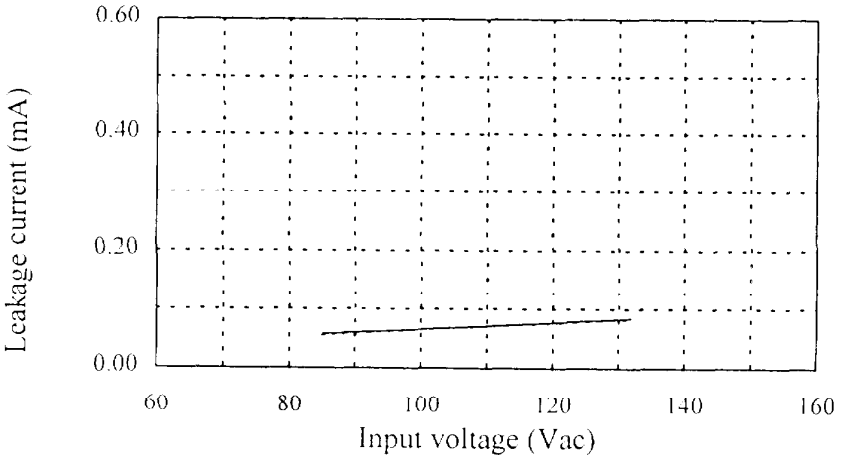
5V



12V



24V

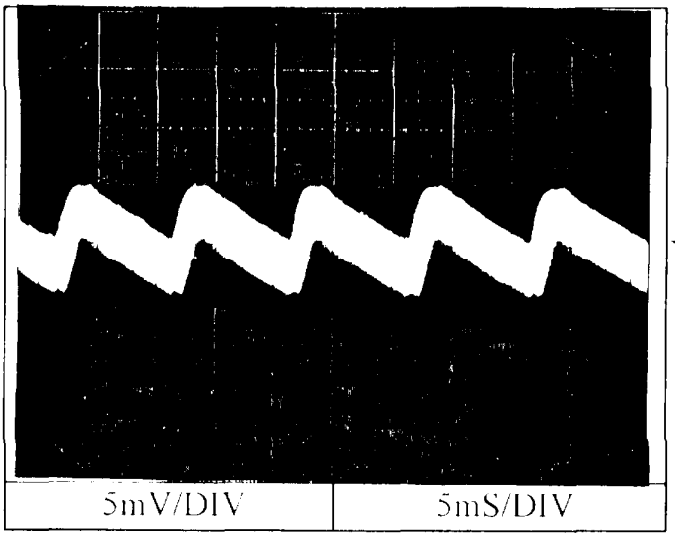


2.14 Output ripple and noise waveform

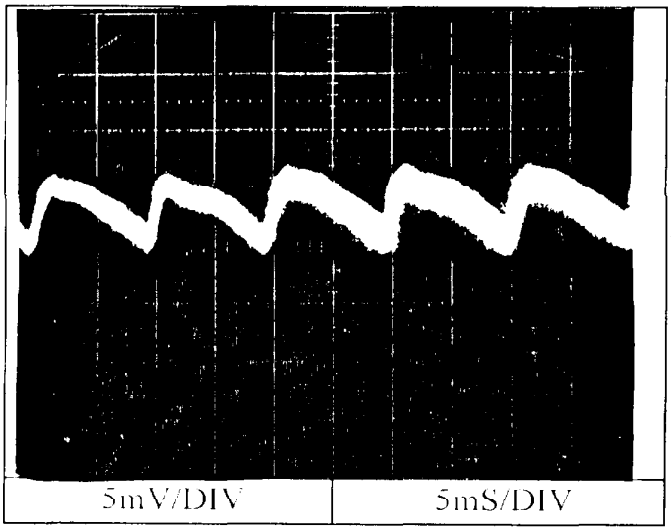
Conditions Vin : 100VAC
Iout : 100%
Ta : 25°C

NORMAL MODE

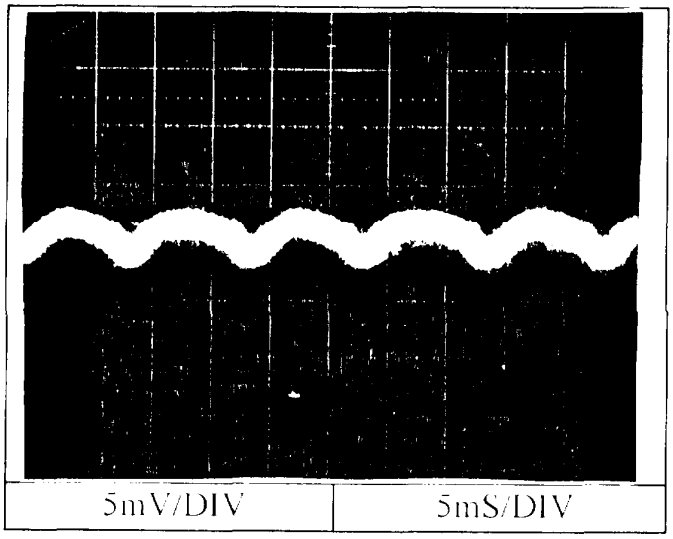
5V



12V



24V

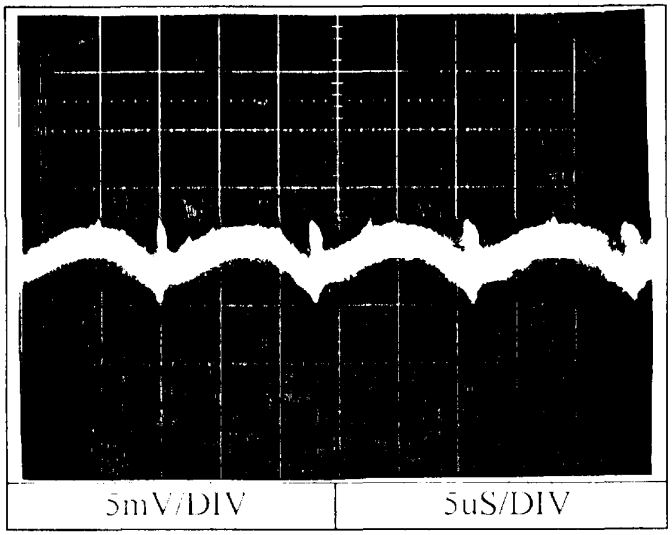


2.14 Output ripple and noise waveform

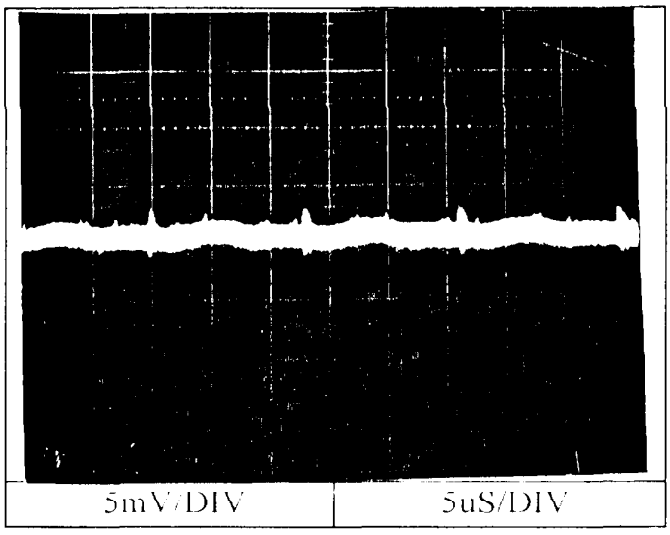
Conditions Vin : 100VAC
Iout : 100%
Ta : 25°C

NORMAL MODE

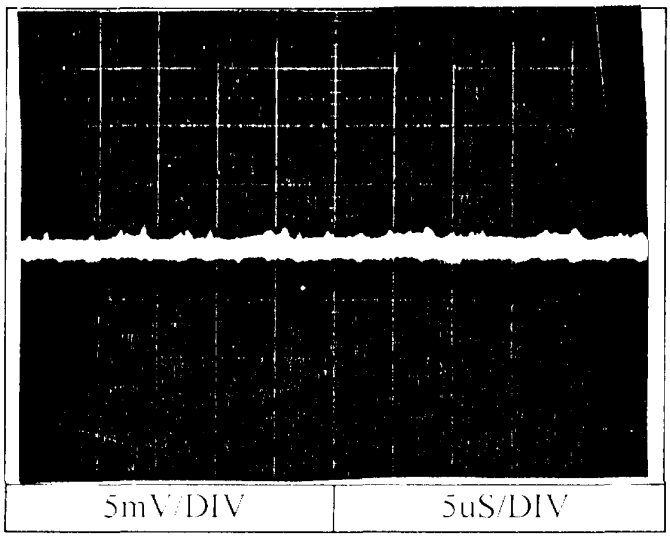
5V



12V



24V

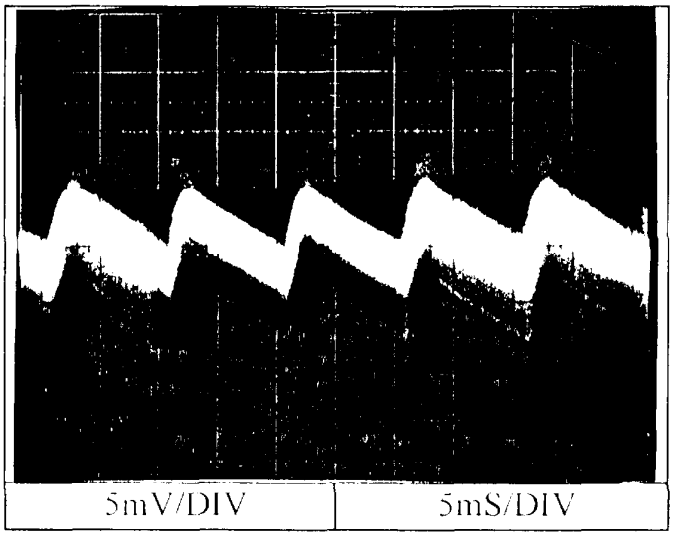


2.14 Output ripple and noise waveform

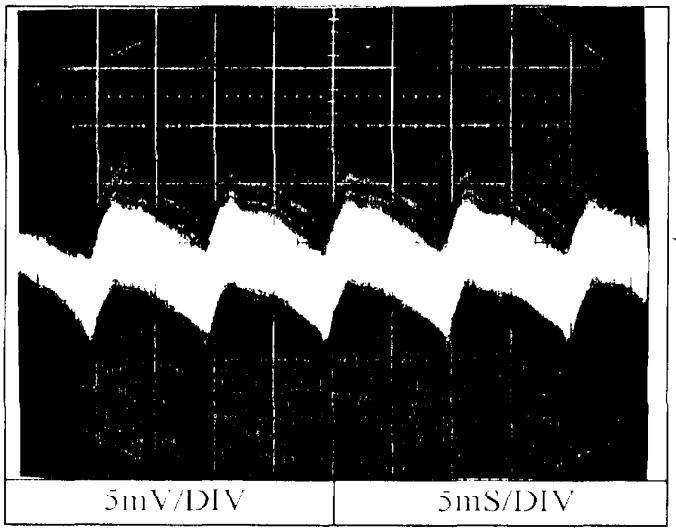
Conditions Vin : 100VAC
Iout : 100%
Ta : 25°C

NORMAL + COMMON MODE

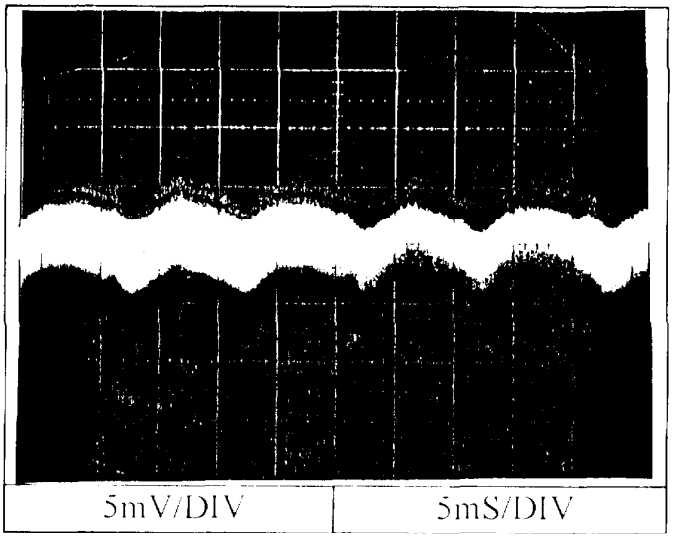
5V



12V



24V

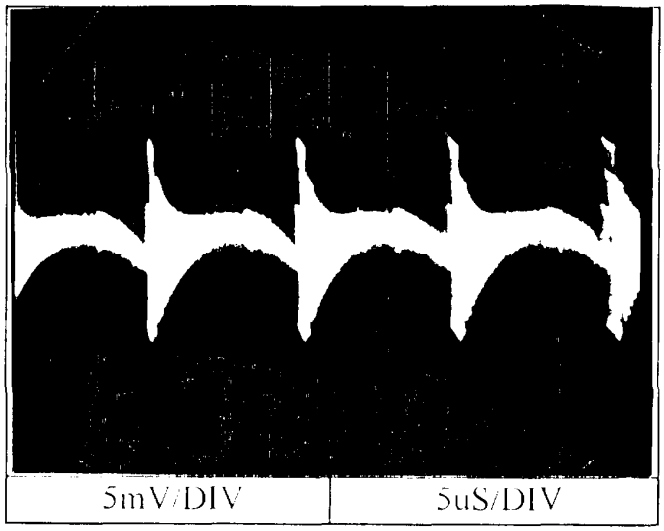


2.14 Output ripple and noise waveform

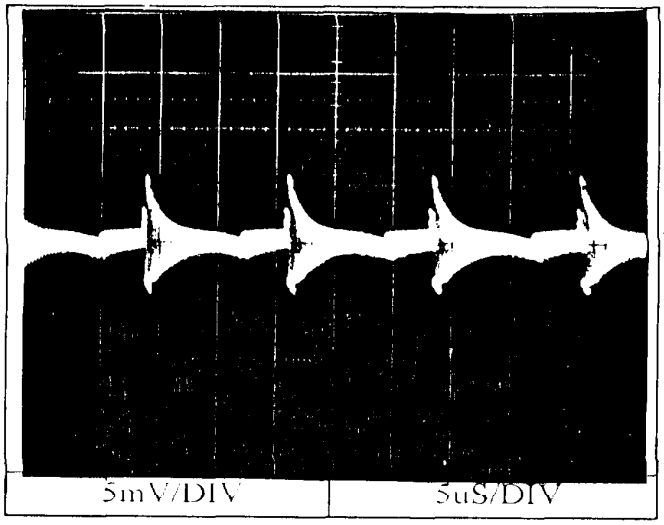
Conditions Vin : 100VAC
Iout : 100%
Ta : 25°C

NORMAL + COMMON MODE

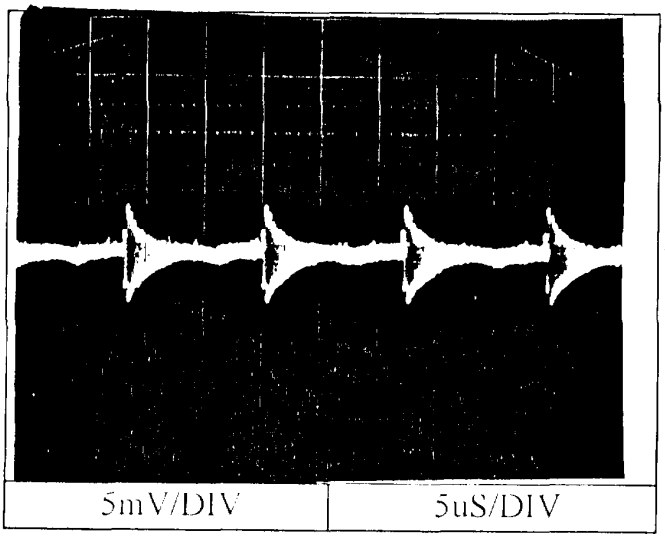
5V



12V



24V



VS10C

2.15 Electro Magnetic Interference characteristics

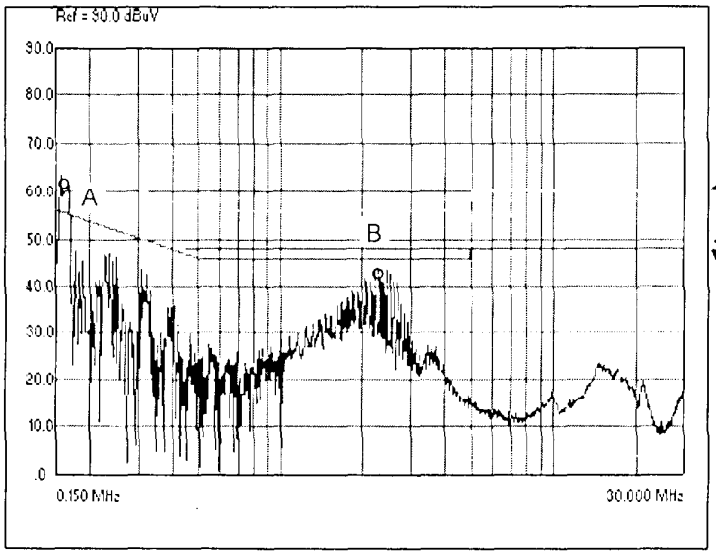
Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

Conducted Emission

5V

Ref.	Point A (159.2kHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	65.55	60.9
AV	55.55	44.3

Ref.	Point B (2.29MHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	56.00	40.4
AV	46.00	14.8

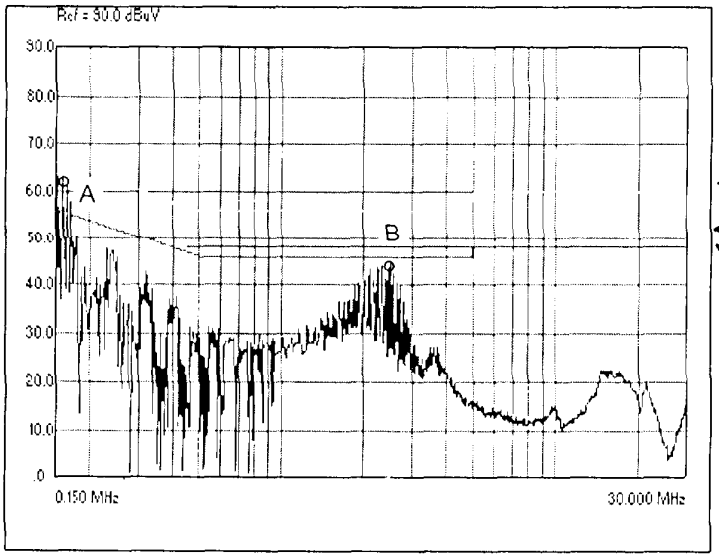


Phase : L

5V

Ref.	Point A (152.8kHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	65.86	62.0
AV	55.86	41.2

Ref.	Point B (2.46MHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	56.00	39.4
AV	46.00	14.5



Phase : N

2.15 Electro Magnetic Interference characteristics

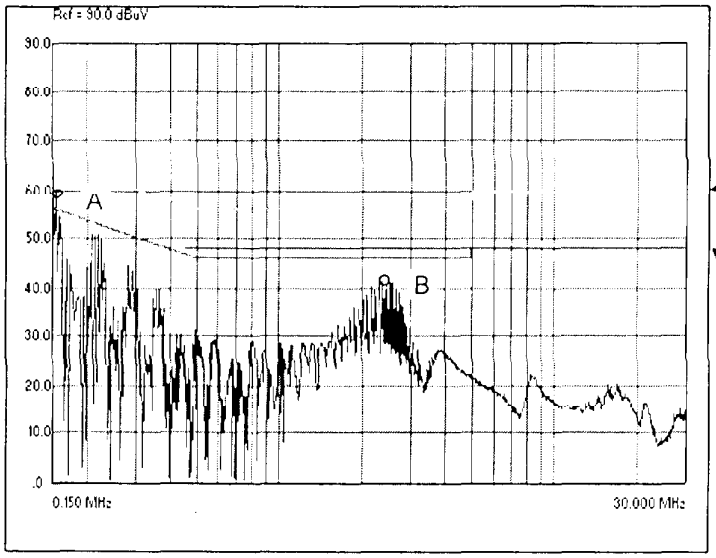
Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

Conducted Emission

12V

Ref.	Point A (154.2kHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	65.79	57.8
AV	55.79	37.9

Ref.	Point B (2.37MHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	56.00	37.2
AV	46.00	15.3

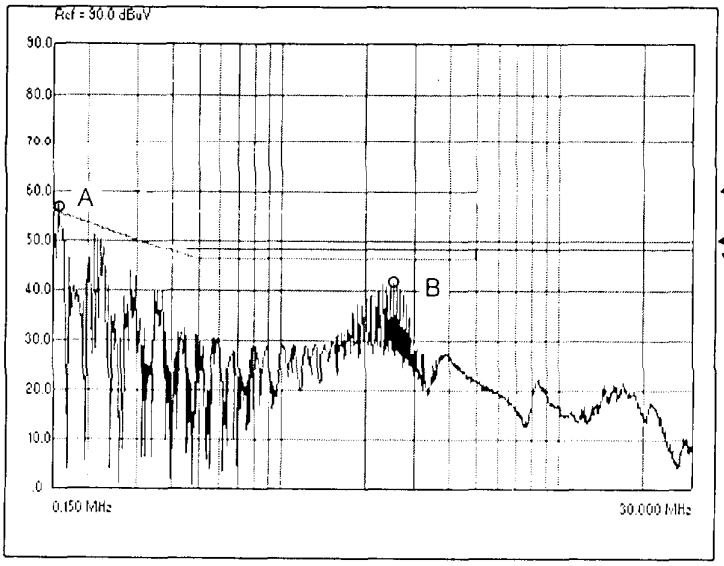


Phase : L

12V

Ref.	Point A (154.7kHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	65.77	57.0
AV	55.77	36.1

Ref.	Point B (2.51MHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	56.00	36.3
AV	46.00	15.0



Phase : N

2.15 Electro-Magnetic Interference characteristics

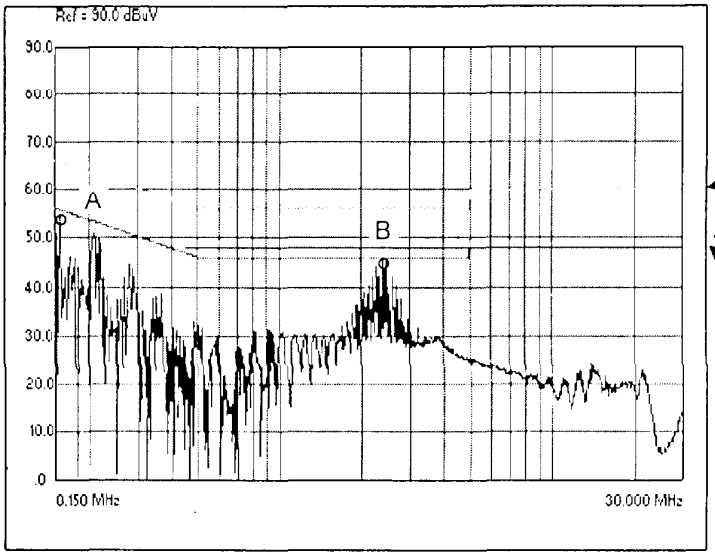
Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

Conducted Emission

24V

Ref.	Point A (155.4kHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	65.73	50.9
AV	55.73	29.9

Ref.	Point B (2.39MHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	56.00	41.5
AV	46.00	15.9

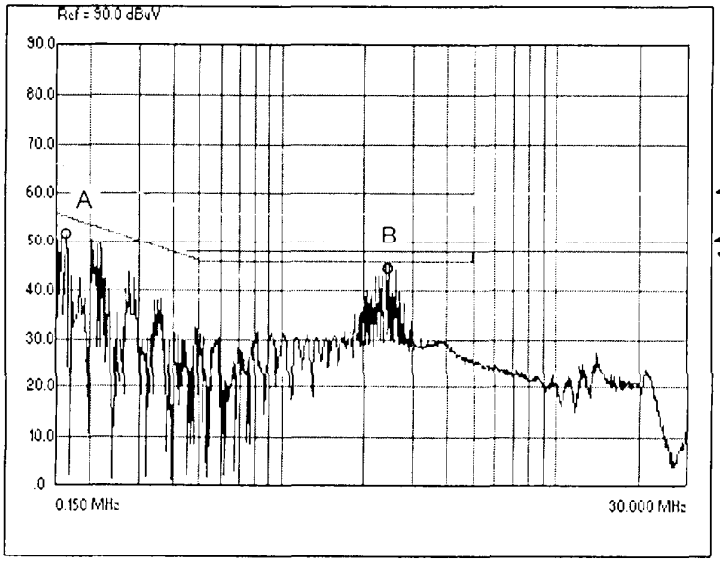


Phase : L

24V

Ref.	Point A (160.1kHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	65.53	49.4
AV	55.53	27.5

Ref.	Point B (2.39MHz)	
Data	Limit (dBuV)	Measure (dBuV)
QP	56.00	38.4
AV	46.00	15.3



Phase : N

VS10C

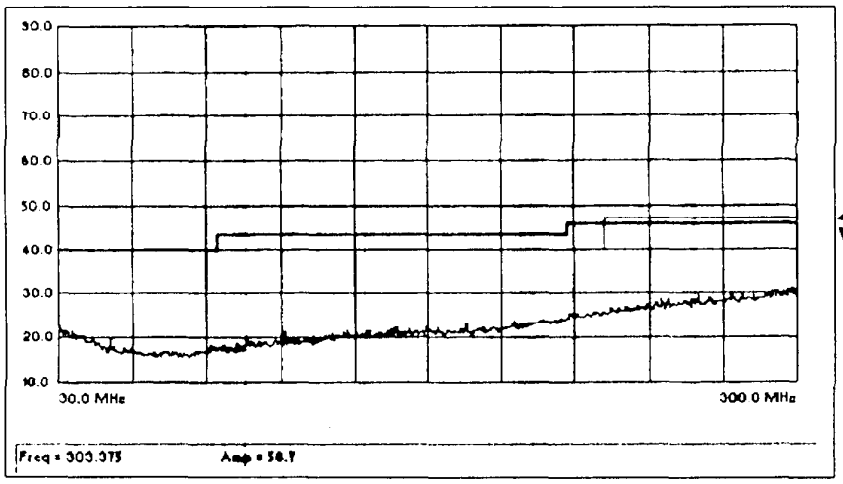
2.15 Electro Magnetic Interference characteristics

Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

Radiated Emission Noise

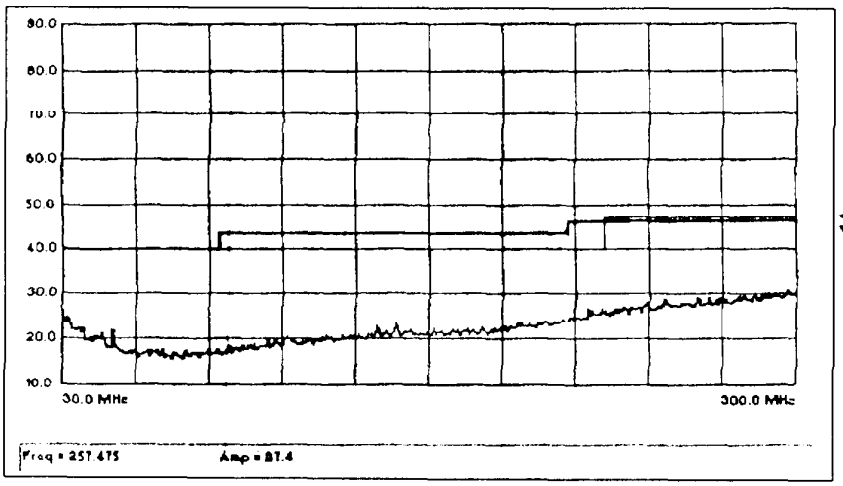
5V

HORIZONTAL :



5V

VERTICAL :



VS10C

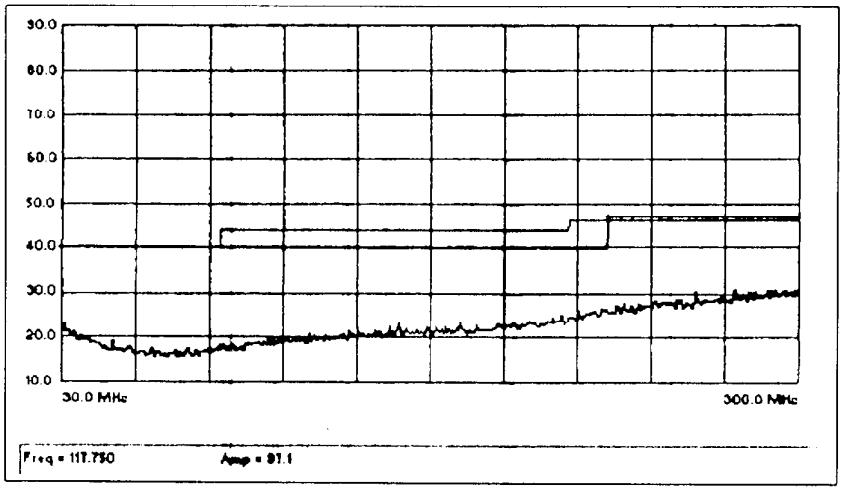
2.15 Electro Magnetic Interference characteristics

Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

Radiated Emission Noise

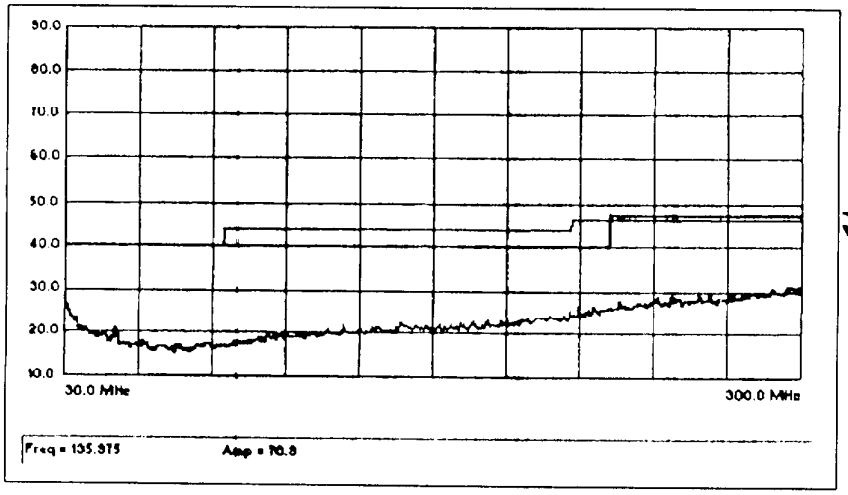
12V

HORIZONTAL :



12V

VERTICAL :



VS10C

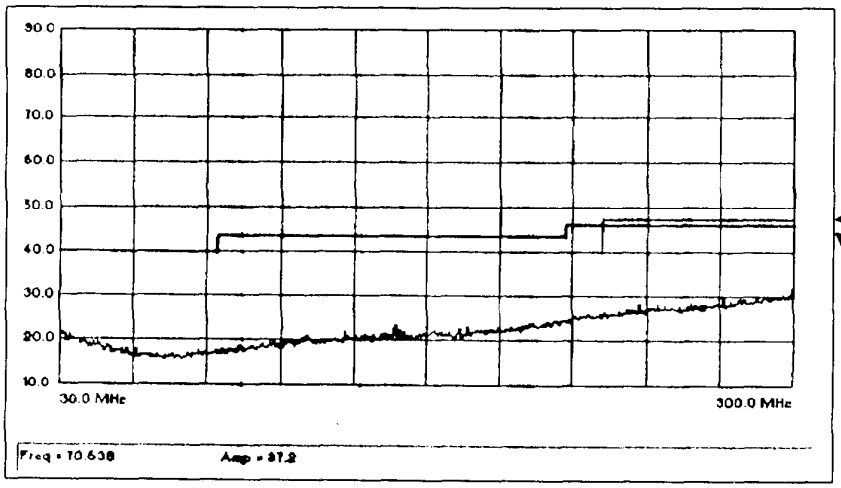
2.15 Electro Magnetic Interference characteristics

Conditions Vin : 100Vac
Iout : 100%
Ta : 25°C

Radiated Emission Noise

24V

HORIZONTAL :



24V

VERTICAL :