

NNS15

TEST DATA

DWG. No. IA500-53-01			
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Terminology used:

Definition:

V_{in} Input Voltage

V_{out} Output Voltage

I_{in} Input Current

I_{out} Output Current

T_a Ambient Temperature

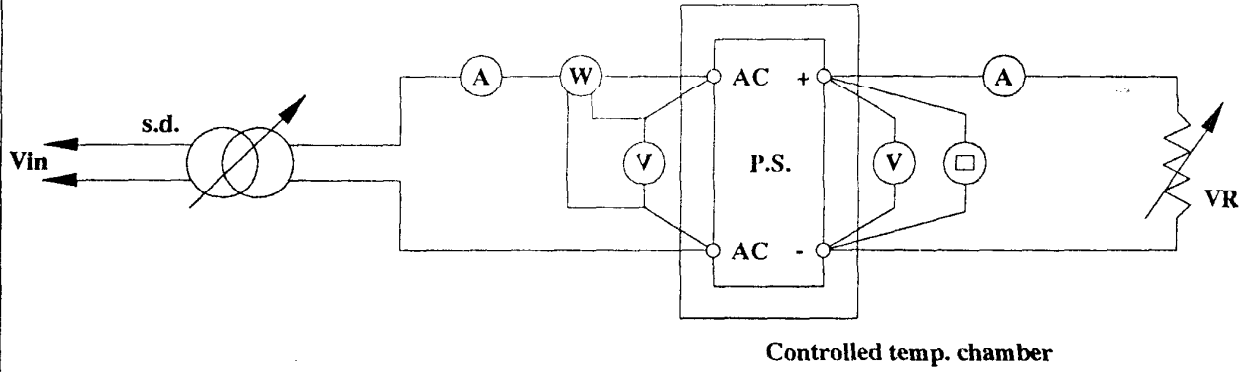
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1.EVALUATION METHOD

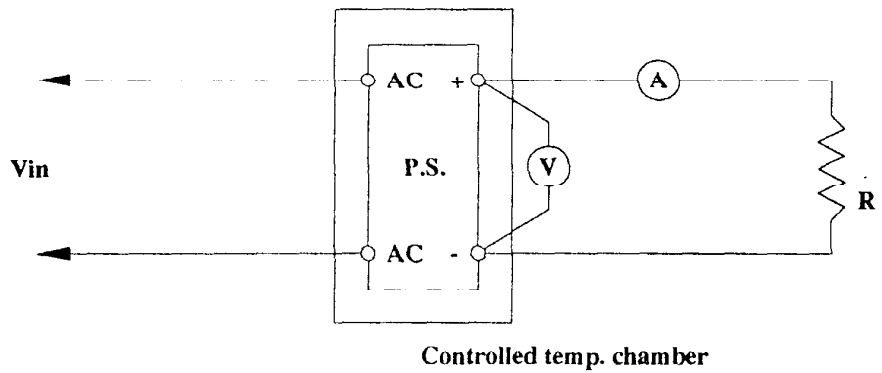
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1-1 Circuits used for determination

(1) Steady state data

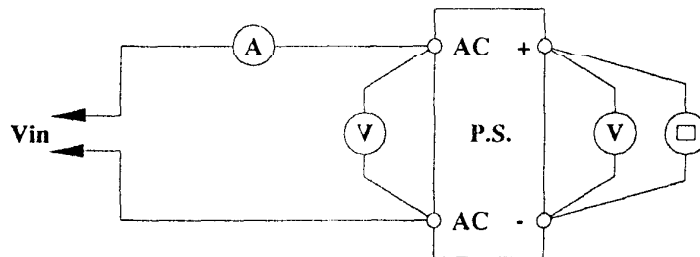


(2) Warm up voltage drift characteristics



(3) Over current protection (OCP) characteristics Same as steady state data.

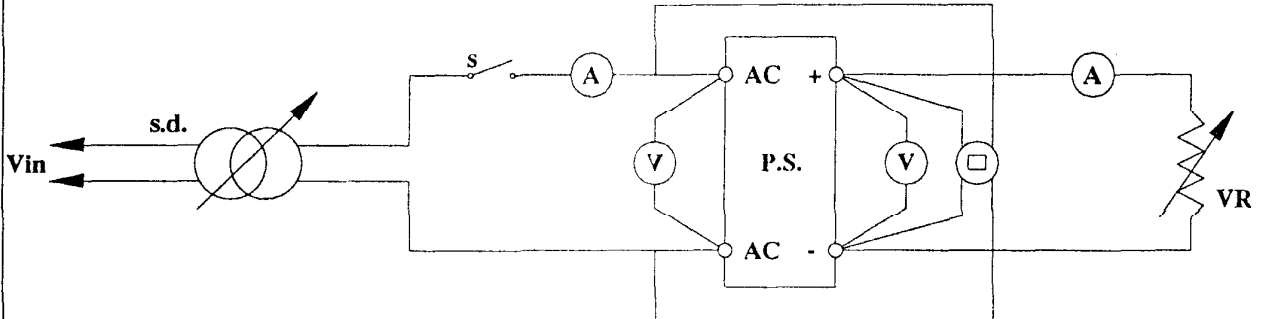
(4) Over voltage protection (OVP) characteristics



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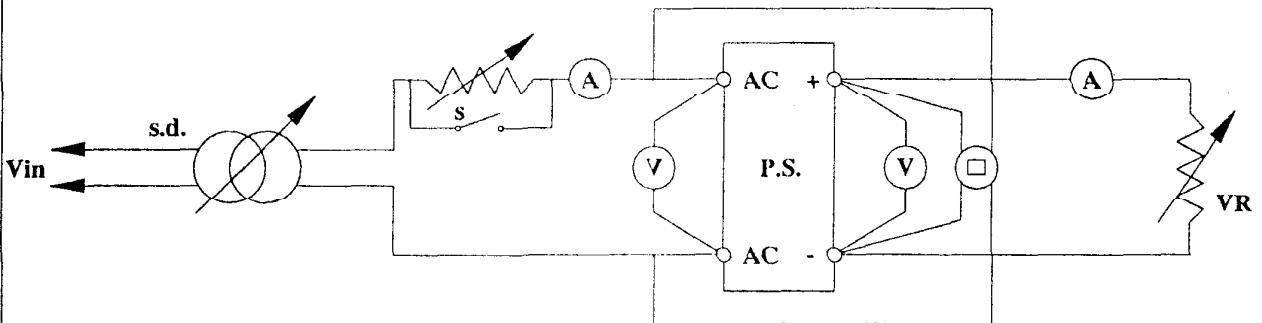
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(5) Output rise characteristics

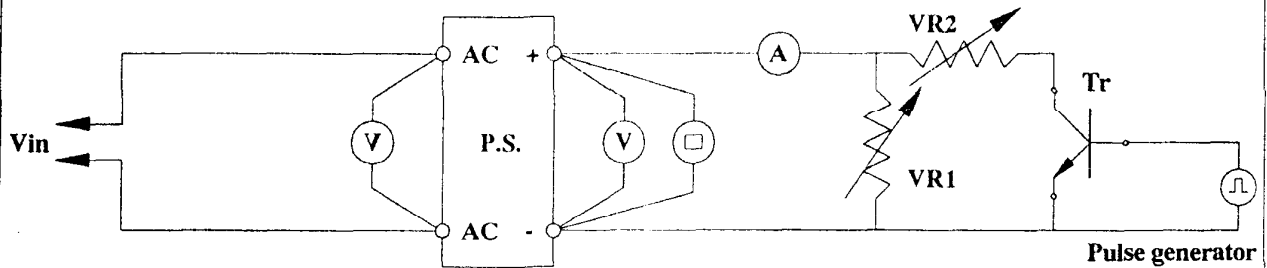


(6) Output fall characteristics
Same as Output rise characteristics

(7) Dynamic line response characteristics

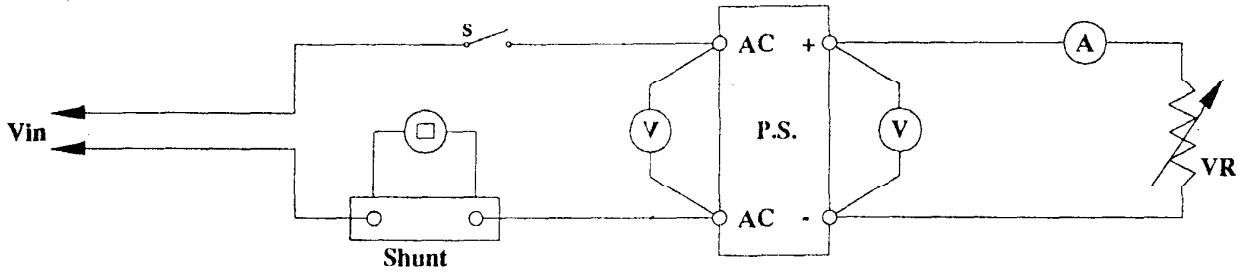


(8) Dynamic load response characteristics

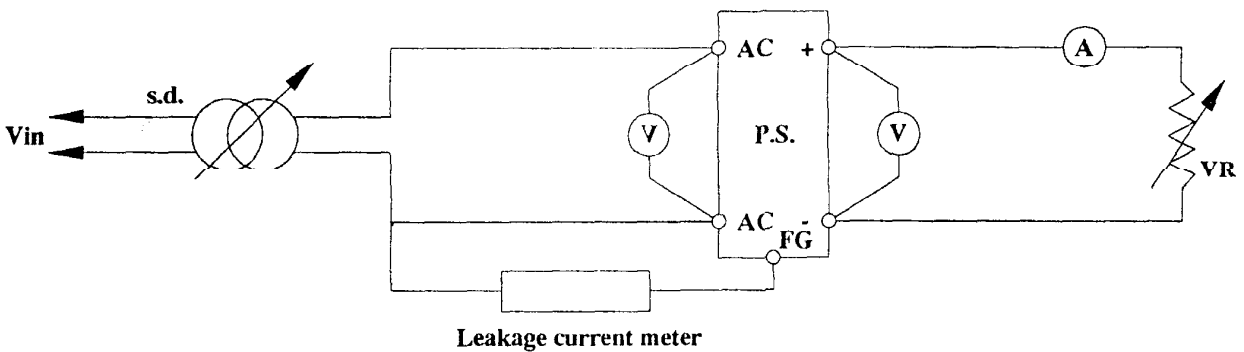


(9) Inrush current characteristics

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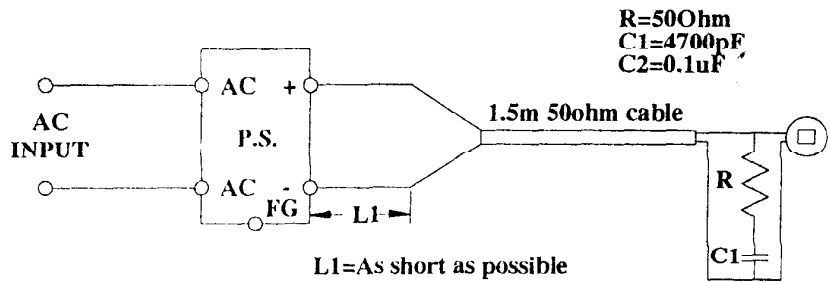
(10) Leakage current characteristics



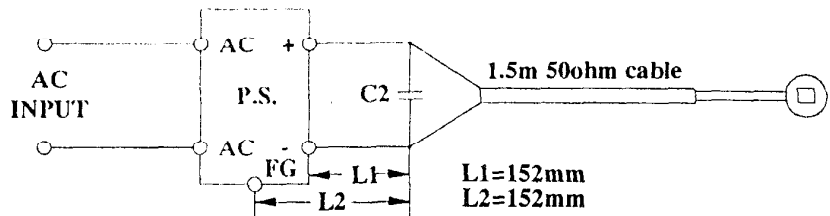
Note: Leakage current measured through a 1Kohm resistor. Range wed: AC

(11) Output-ripple, noise

a) Normal mode



b) Normal + common mode



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2. CHARACTERISTICS

2-1 STEADY STATE DATA

(1) REGULATION - Line and load, Temp. drift

5V

1. Regulation-line and load

Condition $T_a=25C$

SELECTOR 100V

Iout \ Vin	AC 85V	AC 100V	AC 115V	Line Regulation	
	0%	5.0019V	5.0019V	5.0020V	0.1mV
50%	5.0019V	5.0019V	5.0020V	0.1mV	0.002%
100%	5.0020V	5.0020V	5.0021V	0.1mV	0.002%
Load	0.1mV	0.1mV	0.1mV		
Regulation	0.002%	0.002%	0.002%		

SELECTOR 200V

Iout \ Vin	AC 170V	AC 200V	AC 230V	Line Regulation	
	0%	5.0019V	5.0019V	5.0020V	0.1mV
50%	5.0019V	5.0020V	5.0021V	0.2mV	0.004%
100%	5.0019V	5.0020V	5.0021V	0.2mV	0.004%
Load	0mV	0.1mV	0.1mV		
Regulation	0%	0.002%	0.002%		

2. Temperature Drift

Conditions $V_{in}=AC100V$
 $I_{out}=100\%$

Ta	0C	25C	50C	Temp. Stability	
Vout	5.0120 V	5.0020 V	4.9960 V	16.0 mV	0.320 %

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REGULATION - Line and load, Temp. drift

12V

1. Regulation-line and load

Condition $T_a=25C$

SELECTOR 100V

Iout \ Vin	AC 85V	AC 100V	AC 115V	Line Regulation	
0%	12.0299v	12.0300v	12.0301v	0.2mV	0.002 %
50%	12.0300v	12.0301v	12.0300v	0.1mV	0.001 %
100%	12.0300v	12.0299v	12.0300v	0.1mV	0.001 %
Load	0.1mV	0.2 mV	0.1mV		
Regulation	0.001 %	0.002 %	0.001 %		

SELECTOR 200V

Iout \ Vin	AC 170V	AC 200V	AC 230V	Line Regulation	
0%	12.0300v	12.0301v	12.0300v	0.1mV	0.001 %
50%	12.0300v	12.0300v	12.0300v	0mV	0%
100%	12.0299v	12.0301v	12.0300v	0.2mV	0.002 %
Load	0.1mV	0.1mV	0mV		
Regulation	0.001 %	0.001 %	0%		

2. Temperature Drift

Conditions $V_{in}=AC100V$
 $I_{out}=100\%$

T_a	0C	25C	50C	Temp. Stability	
V_{out}	12.0219 v	12.0299 v	12.0289 v	8.0 mV	0.067%

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T-5

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REGULATION - Line and load, Temp. drift

24V

1. Regulation-line and load

Condition $T_a=25C$

SELECTOR 100V

Iout \ Vin	Vin			Line Regulation	
	AC 85V	AC 100V	AC 115V		
0%	24.031V	24.031	24.031V	0mV	0%
50%	24.031V	24.031	24.031	0mV	0%
100%	24.031V	24.031	24.031	0mV	0%
Load Regulation	0mV	0mV	0mV		
	0%	0%	0%		

SELECTOR 200V

Iout \ Vin	Vin			Line Regulation	
	AC 170V	AC 200V	AC 230V		
0%	24.030V	24.030	24.031V	1mV	0.004 %
50%	24.030V	24.030	24.031V	1mV	0.004 %
100%	24.030V	24.030	24.031V	1mV	0.004 %
Load Regulation	0mV	0mV	0mV		
	0%	0%	0%		

2. Temperature Drift

Conditions $V_{in}=AC100V$
 $I_{out}=100\%$

Ta	0C	25C	50C	Temp. Stability	
Vout	24.021 V	24.031 V	24.011 V	20 mV	0.083%

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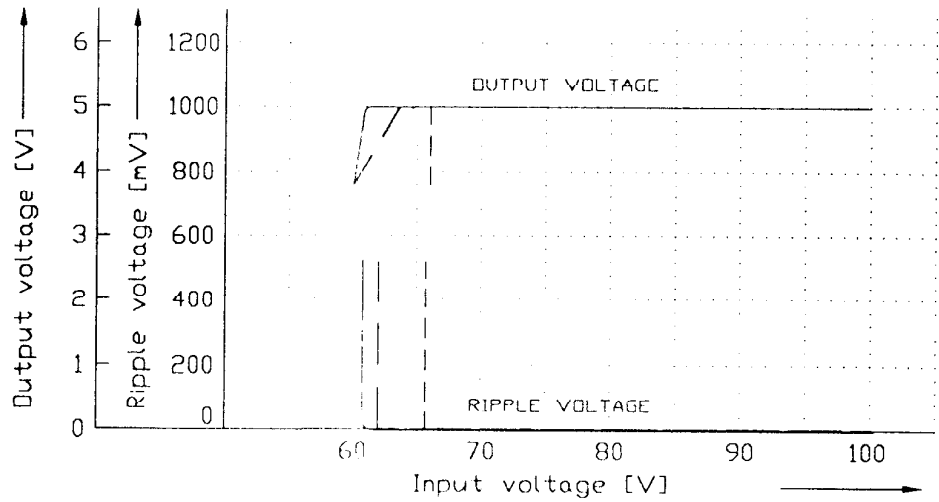
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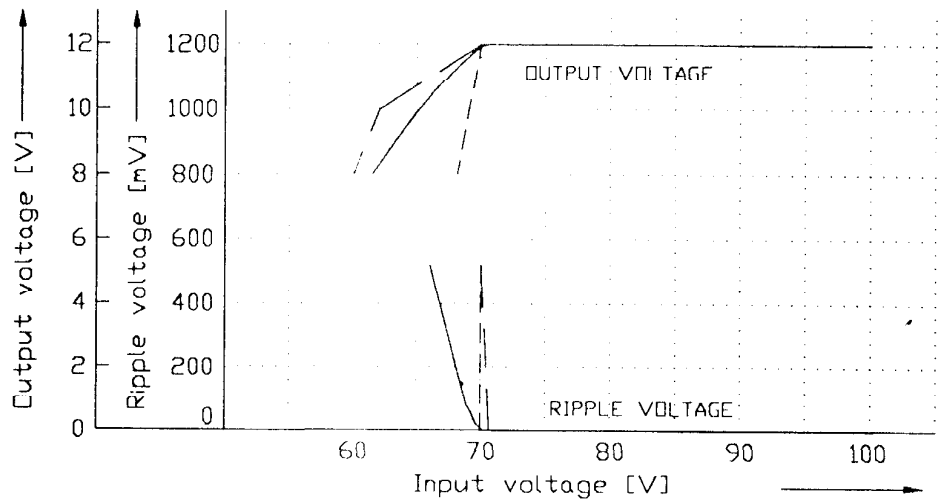
(2) Output voltage and ripple voltage
V.S. input voltage

I_{out}=100%
Conditions Ta: 0C ---
25C ---
30C ---

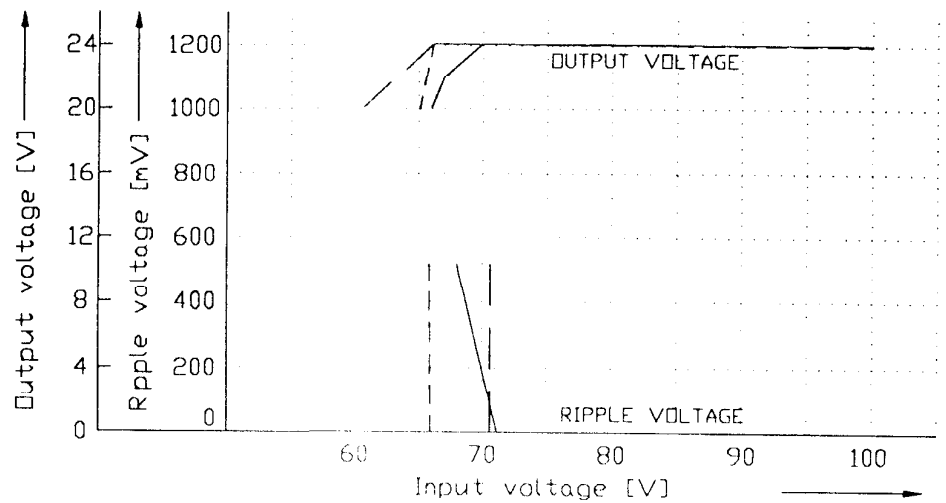
5V



12V



24V



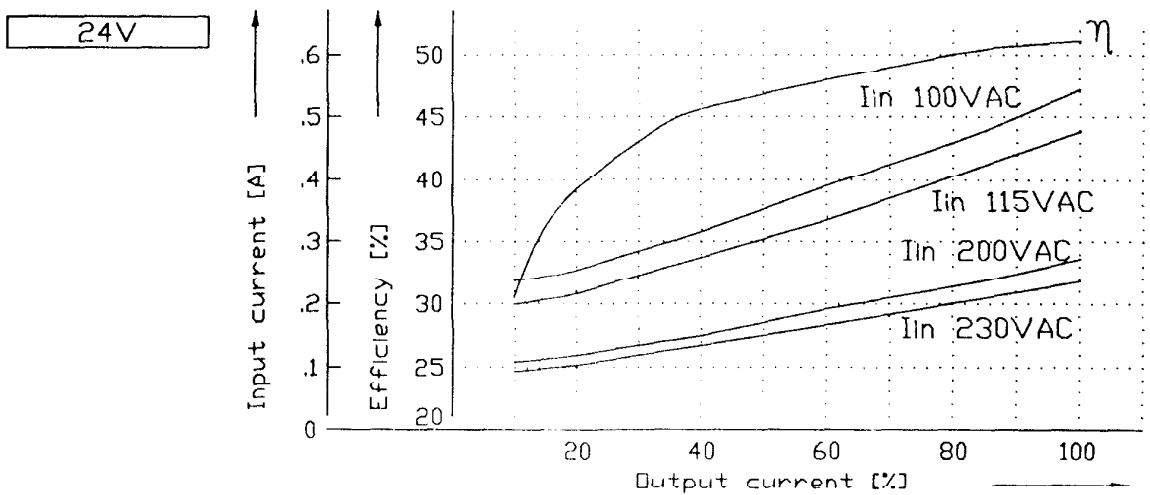
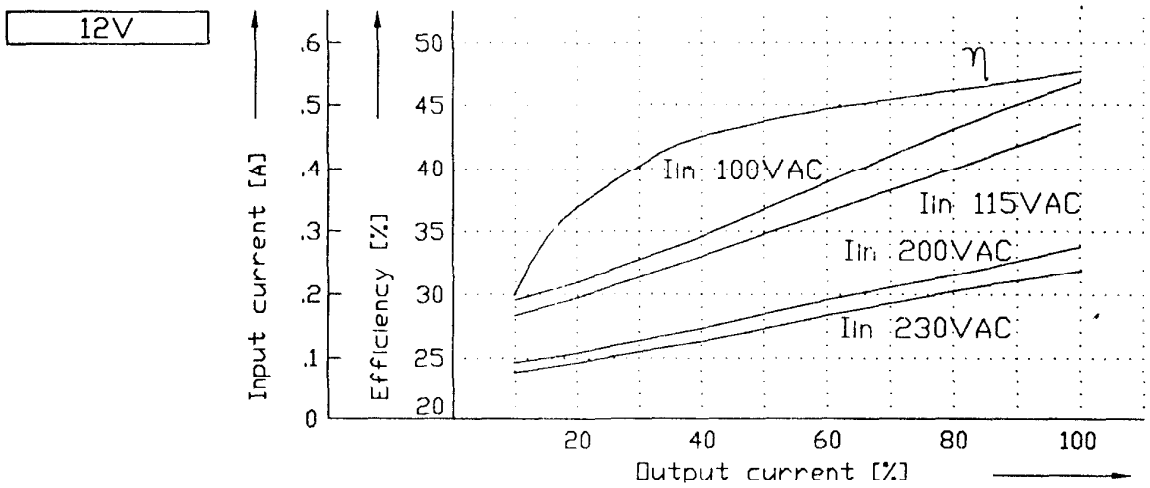
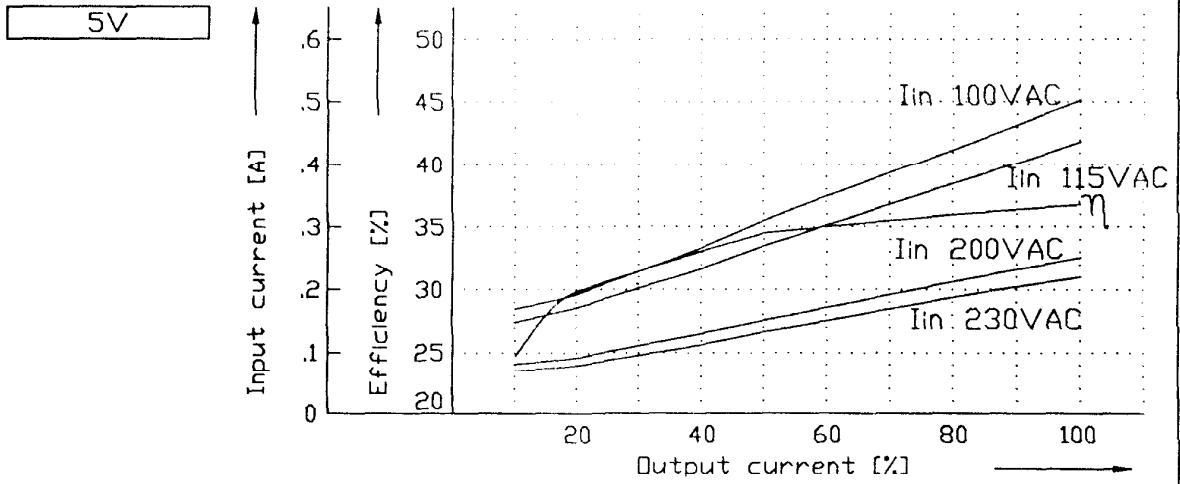
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(3) Efficiency and Input current
V.S. output current

Conditions $T_a=25C$

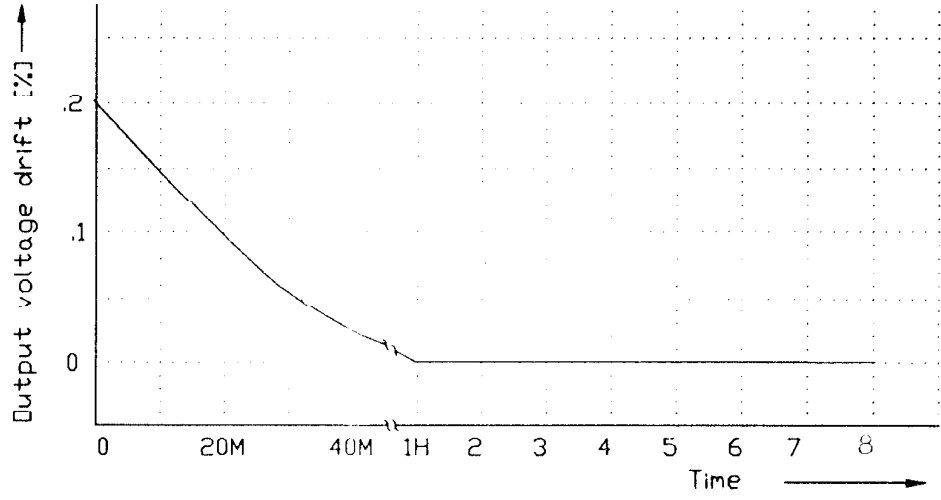


2-2 Warm up voltage drift

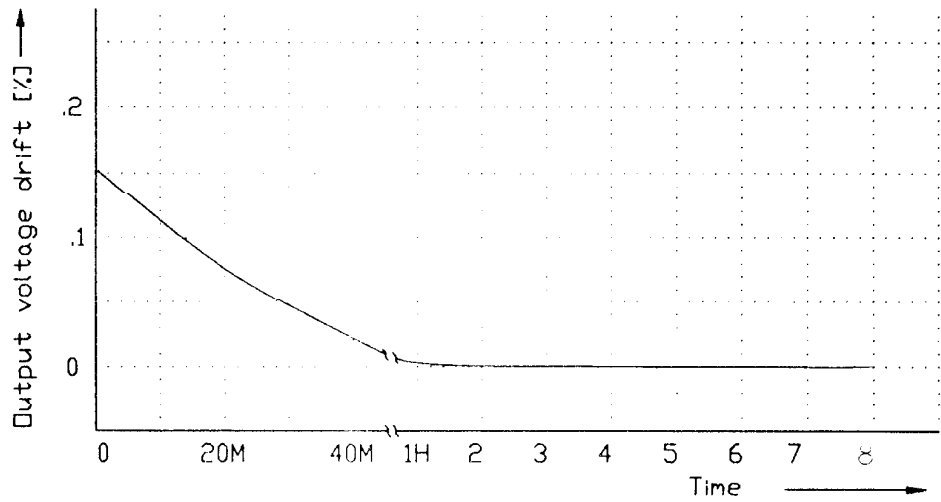
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Conditions Vin=AC100V
Vout,Iout=100%
Ta=25C

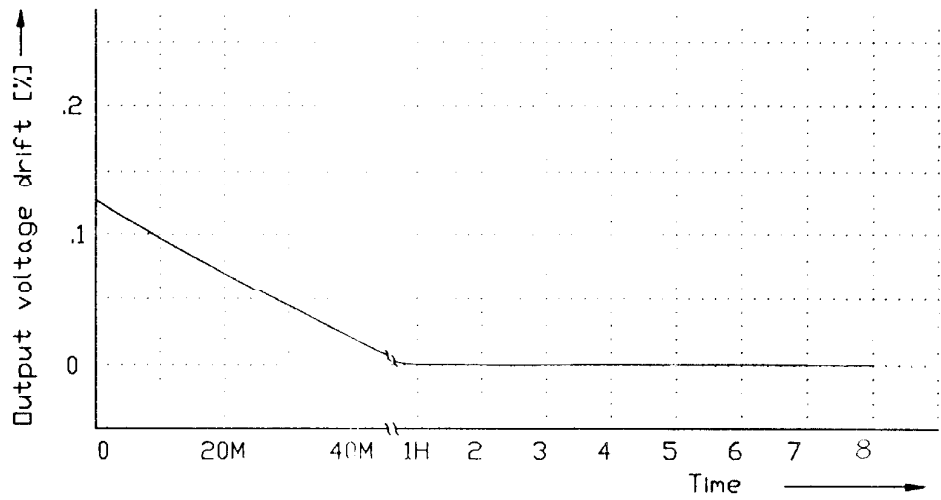
5V



12V



24V



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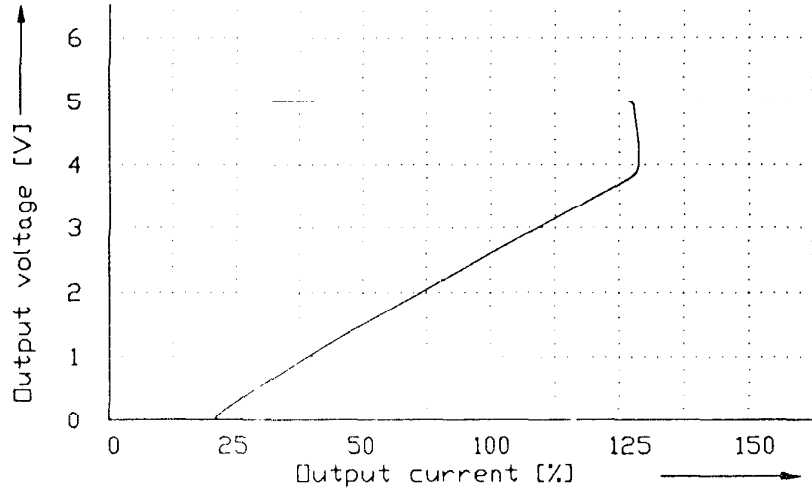
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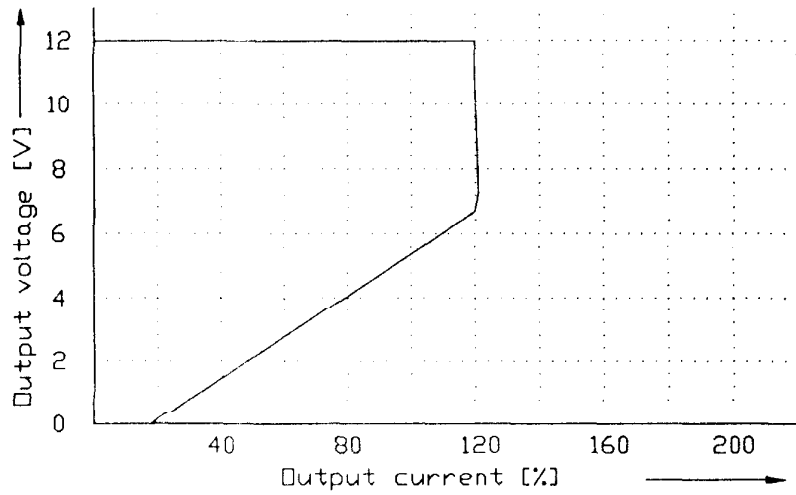
2-3 DCP Characteristics

Conditions $T_a=25C$
 V_{in} AC 85V ---
AC 100V ———
AC 115V - - - -

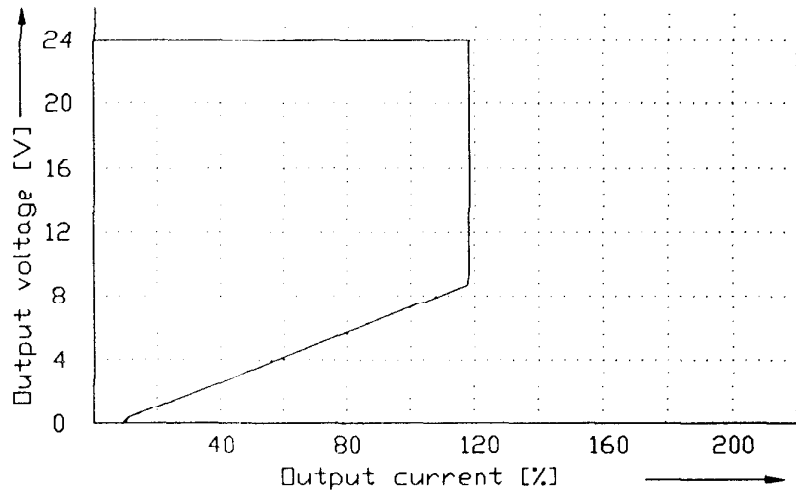
5V



12V



24V



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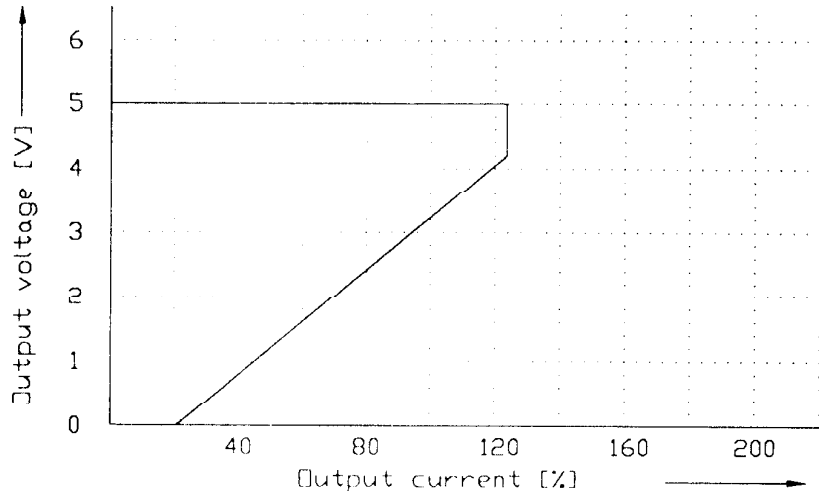
T-10

DCP Characteristics

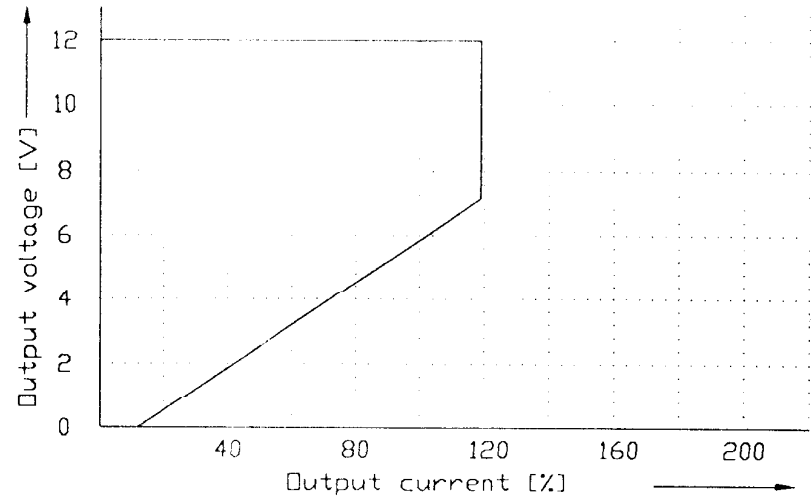
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Conditions Vin= AC 100V
Ta= 0C ———
25C - - - -
50C - - - -

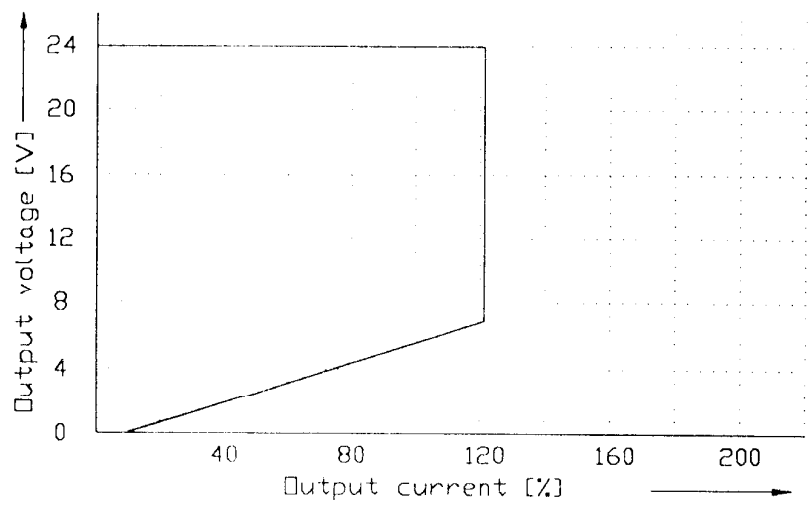
5V



12V



24V



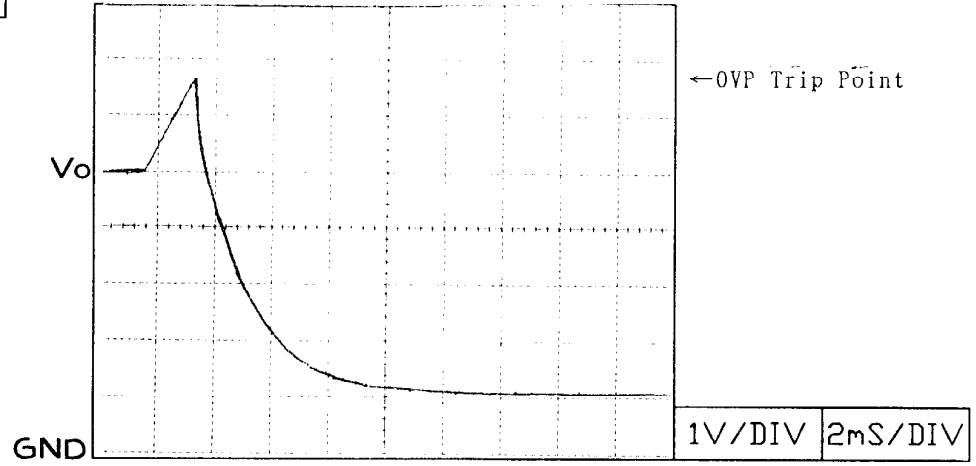
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2-4 OVP Characteristics

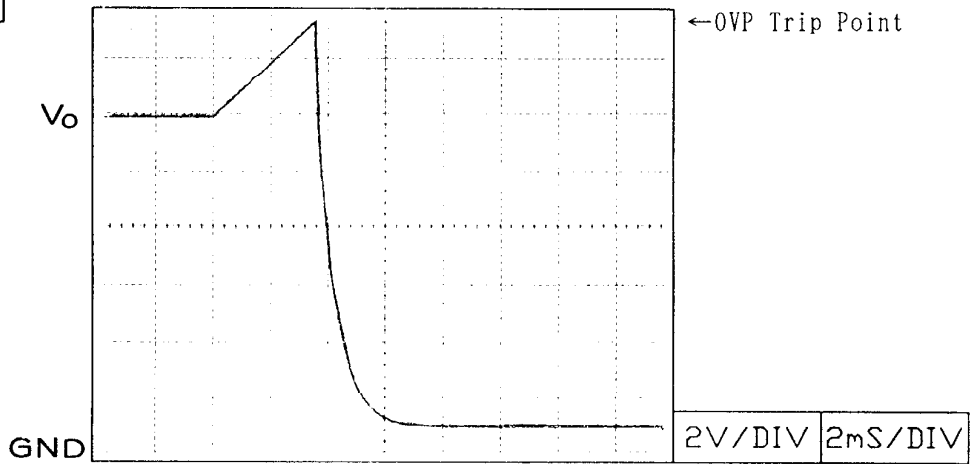
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Conditions $V_{in} = AC\ 100V$
 $I_{out} = 0\%$
 $T_a = 25C$

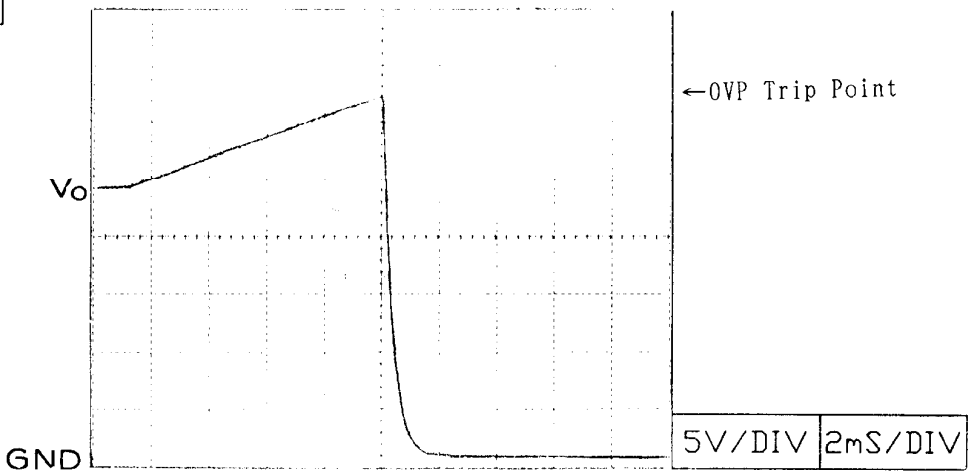
5V



12V



24V



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T-12

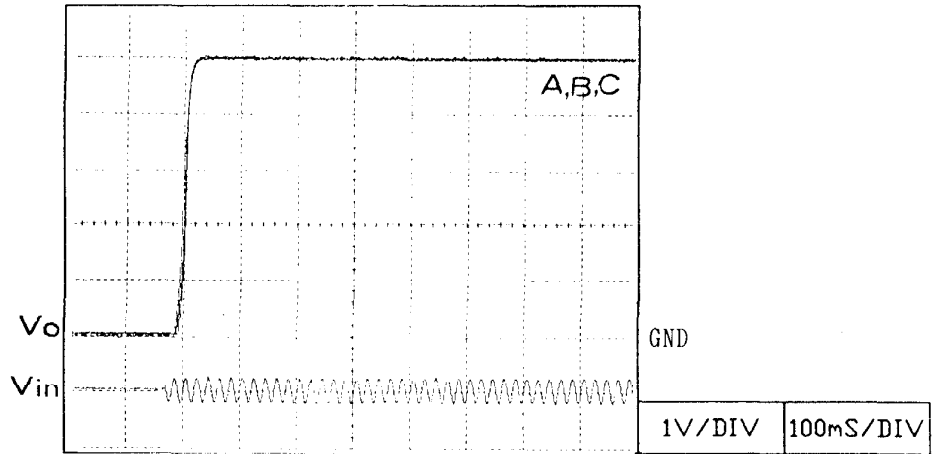
2-5 Output rise time

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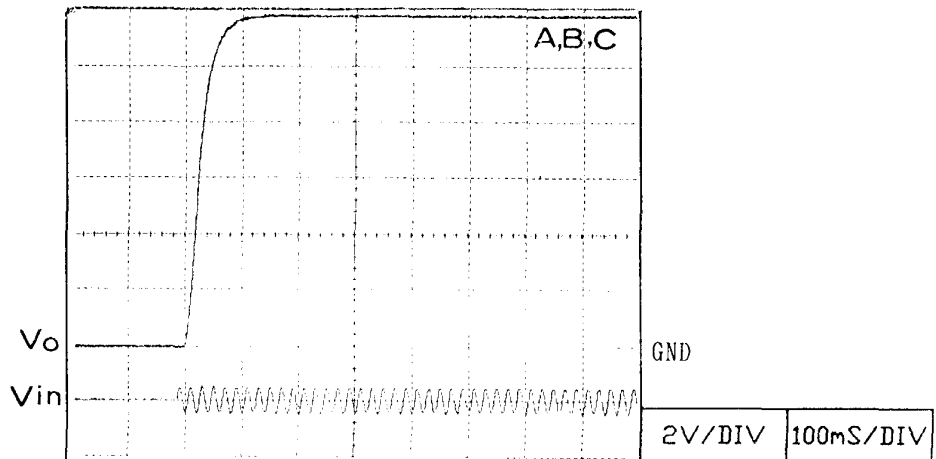
Conditions $V_{in} = 85V_{ac}$ (A)
 $100V_{ac}$ (B)
 $115V_{ac}$ (C)

$I_{out} = 100\%$
 $T_a = 25^\circ C$

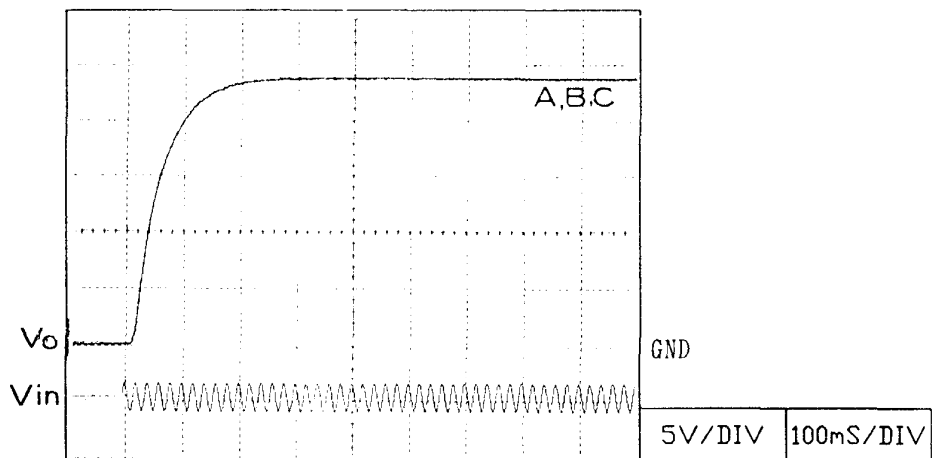
5V



12V



24V



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T-13

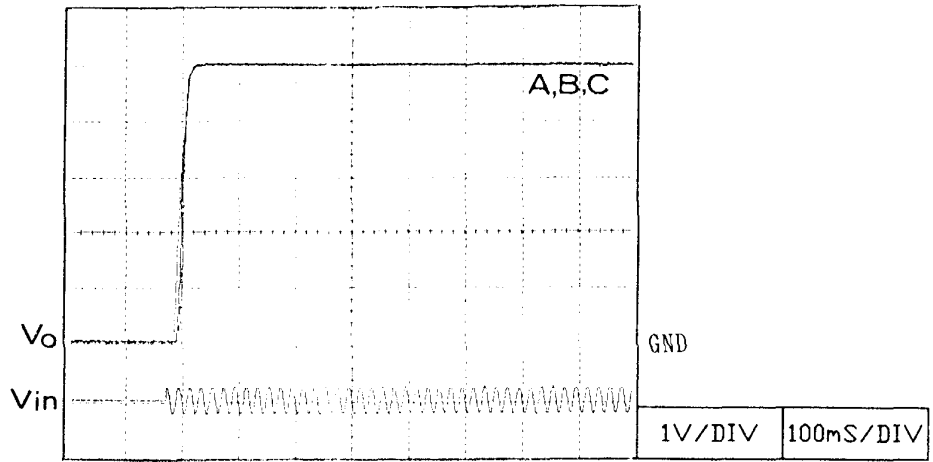
Output rise time

NNS15

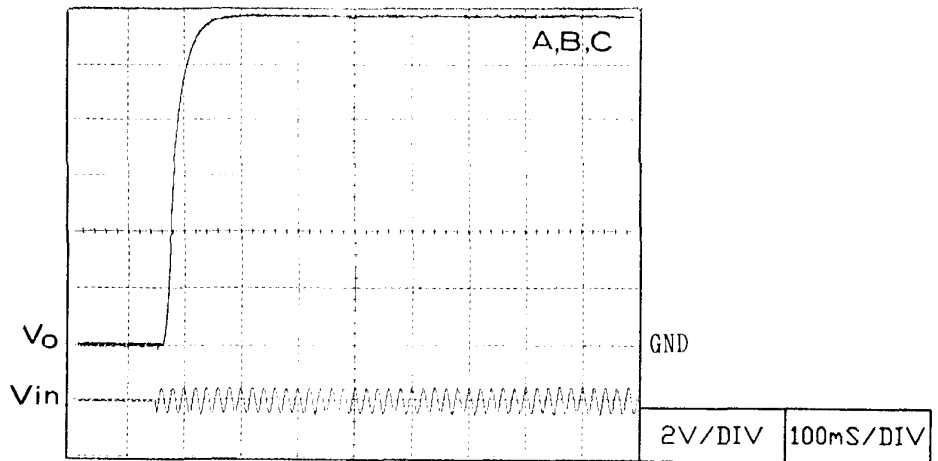
Conditions $V_{in} = 85V_{ac}$ (A)
 $100V_{ac}$ (B)
 $115V_{ac}$ (C)

$I_{out} = 0\%$
 $T_a = 25^{\circ}C$

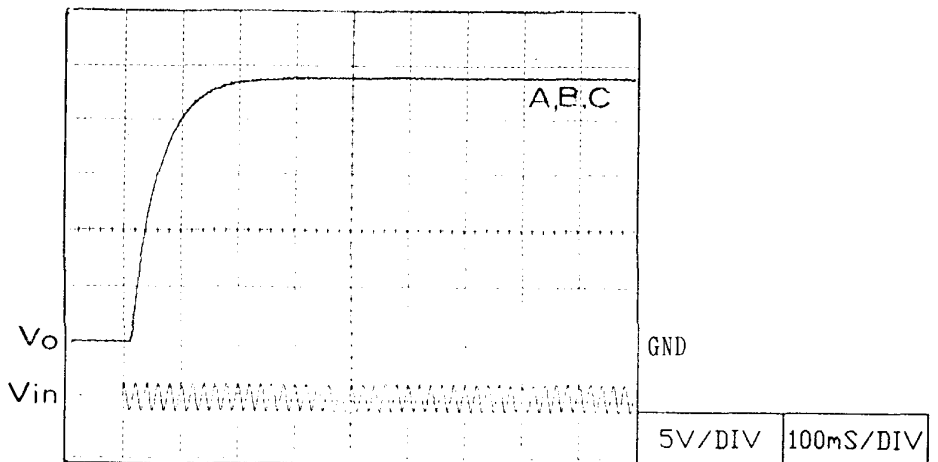
5V



12V



24V



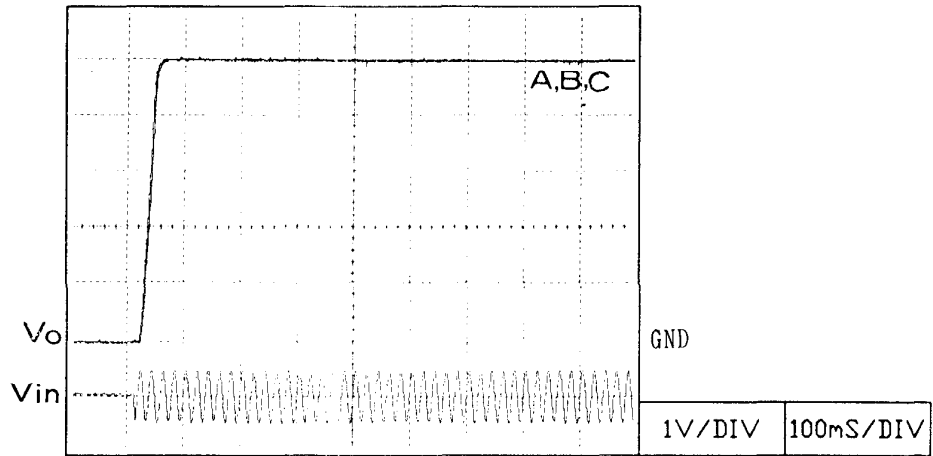
Output rise time

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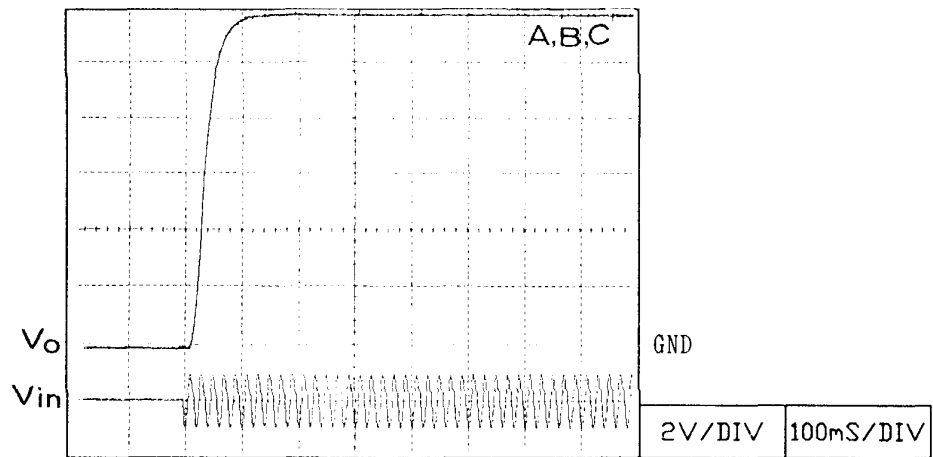
Conditions $V_{in} = 170V_{ac}$ (A)
 $200V_{ac}$ (B)
 $230V_{ac}$ (C)

$I_{out} = 100\%$
 $T_a = 25C$

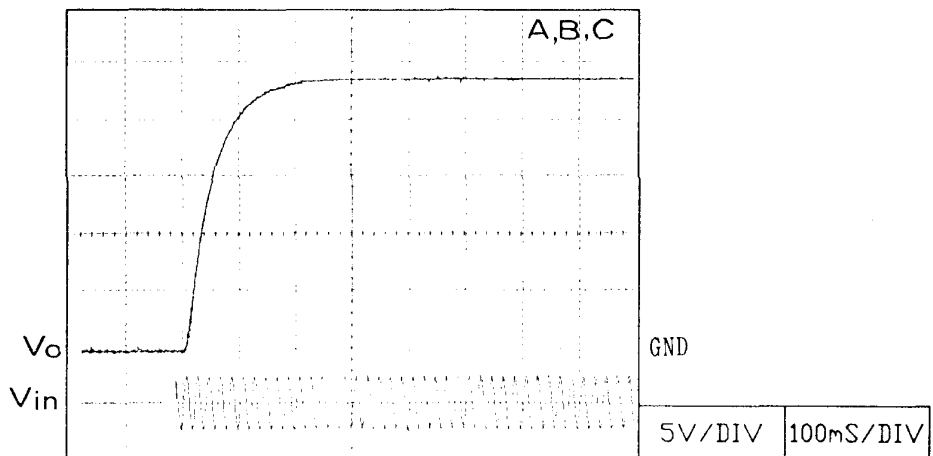
5V



12V



24V



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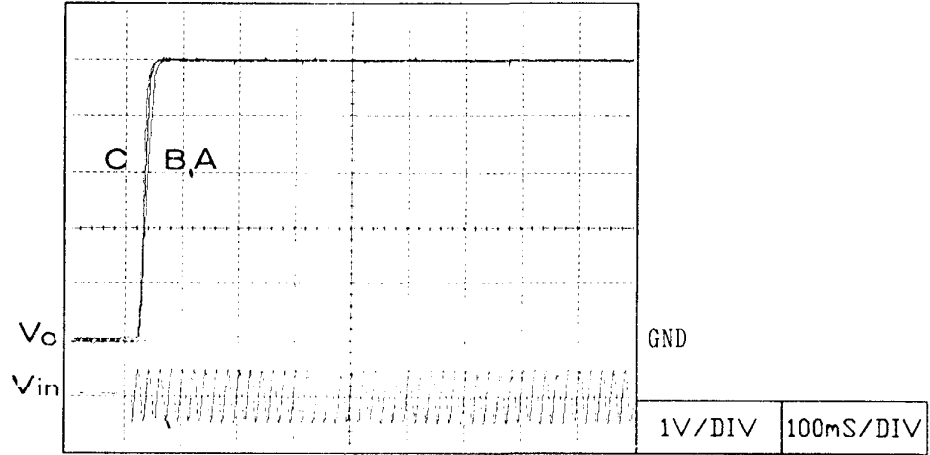
Output rise time

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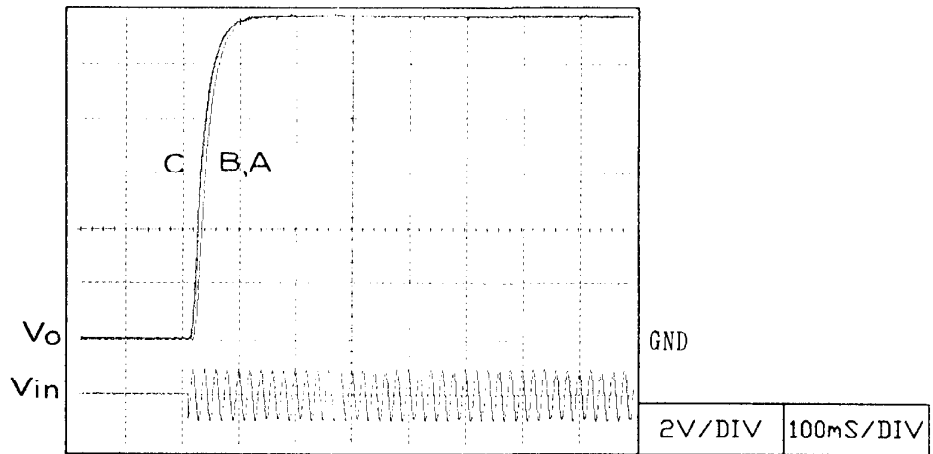
Conditions $V_{in} = 170V_{ac}$ (A)
 $200V_{ac}$ (B)
 $230V_{ac}$ (C)

$I_{out} = 0\%$
 $T_a = 25^{\circ}C$

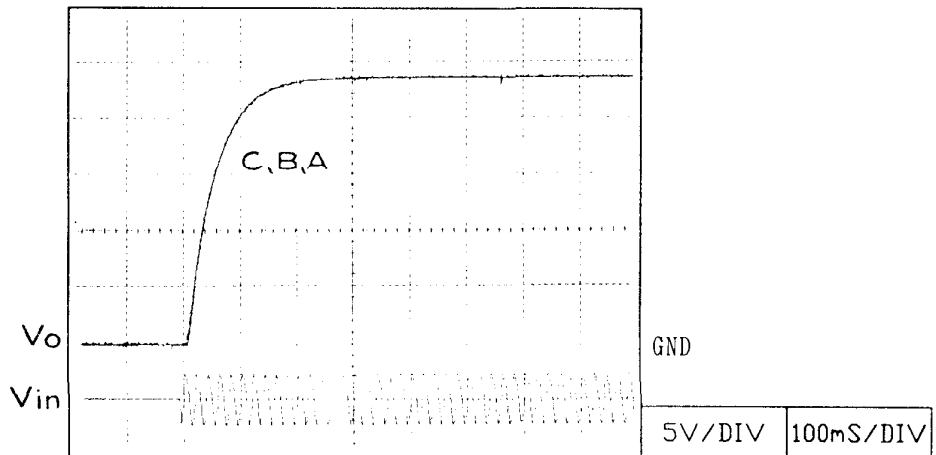
5V



12V



24V

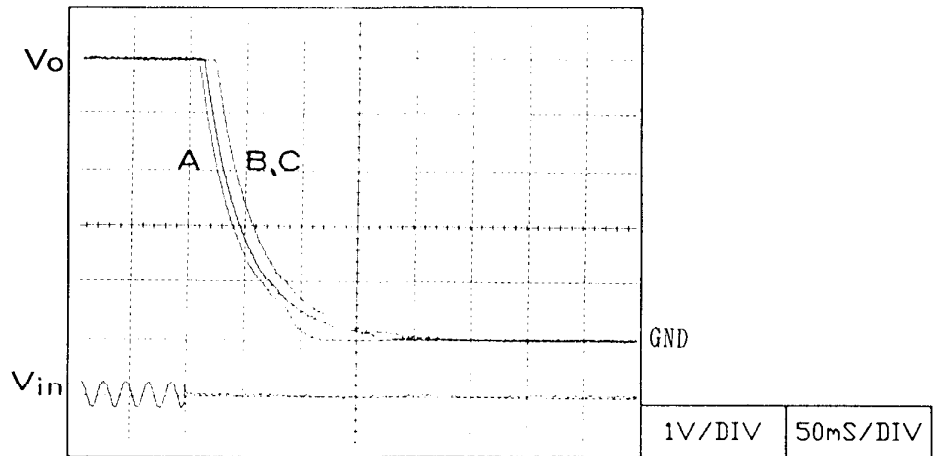


2-6 Output fall time

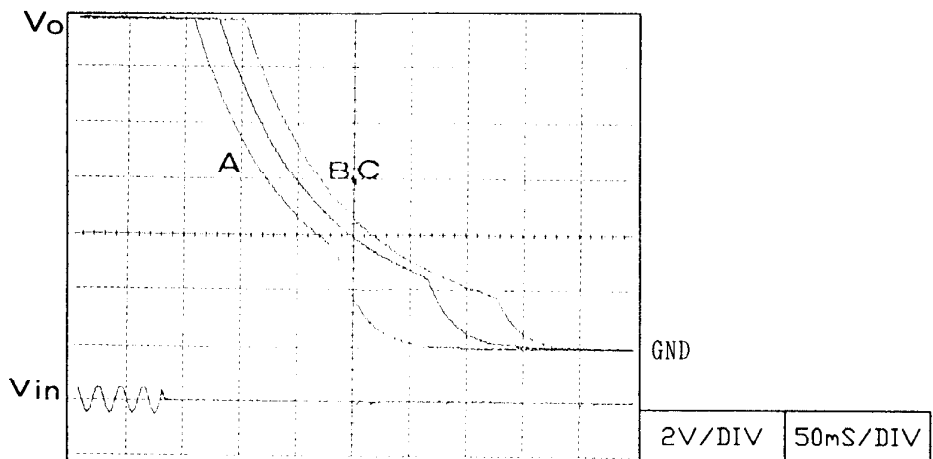
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Conditions $V_{in} = 85V_{ac}$ (A)
 $100V_{ac}$ (B)
 $115V_{ac}$ (C)
 $I_{out} = 100\%$
 $T_a = 25^\circ C$

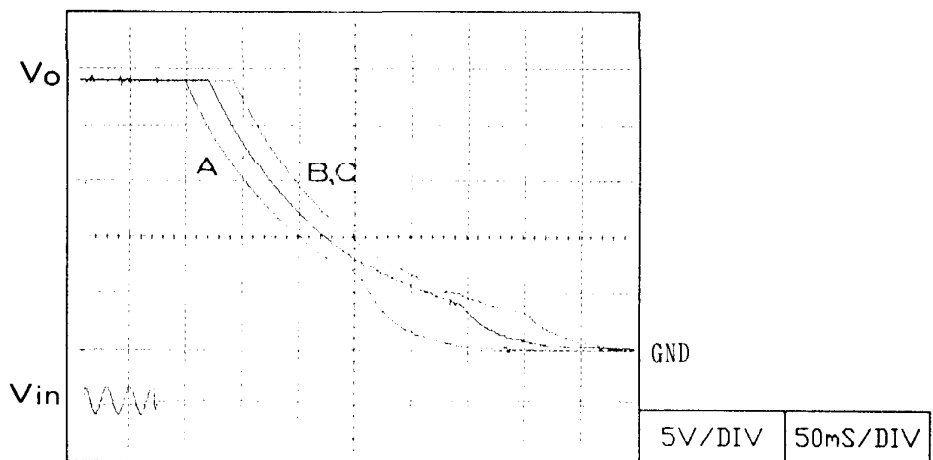
5V



12V



24V



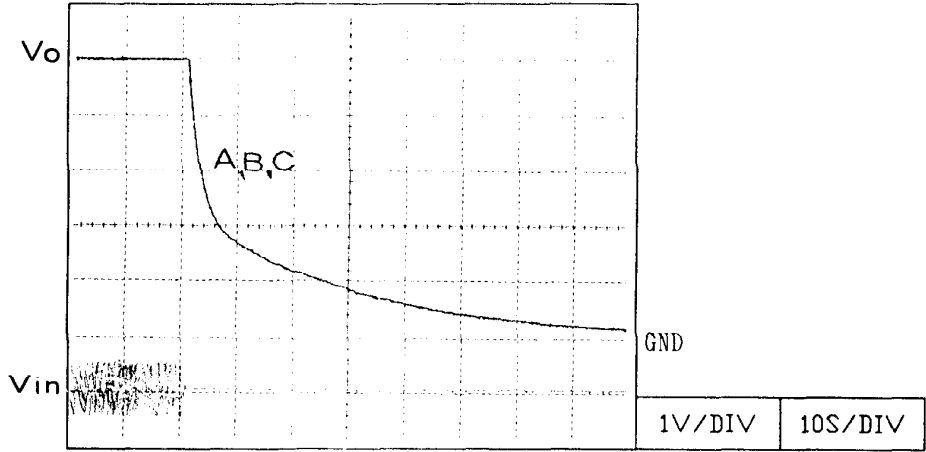
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Output fall time

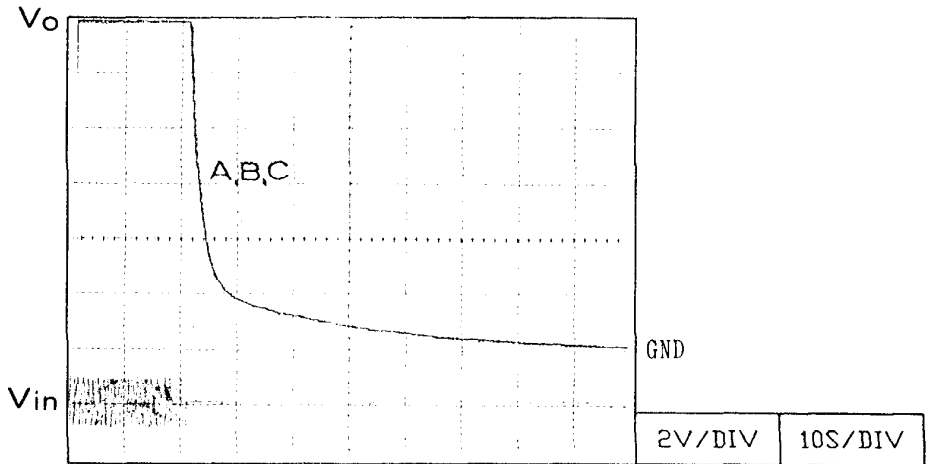
Conditions Vin= 85Vac (A)
100Vac (B)
115Vac (C)

Iout= 0%
Ta= 25C

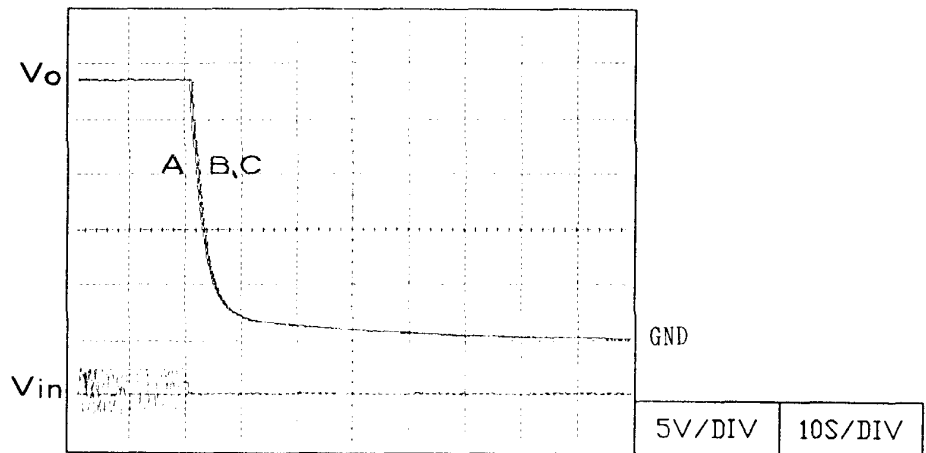
5V



12V



24V



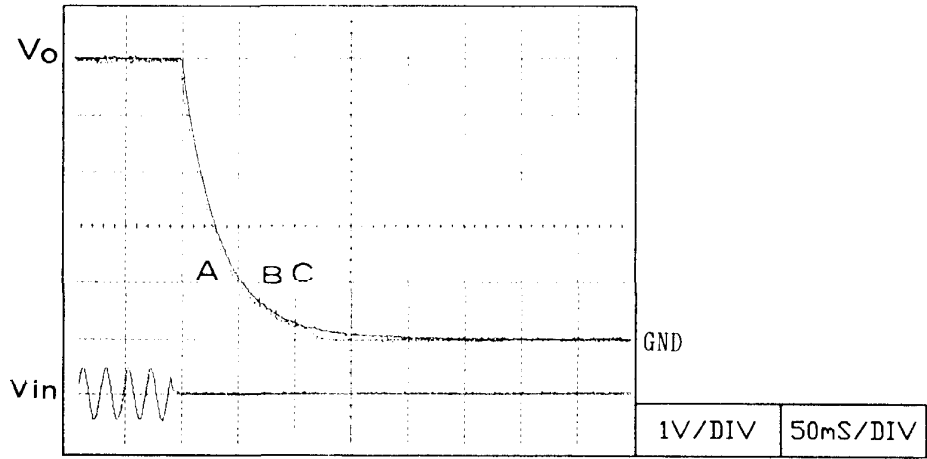
Output fall time

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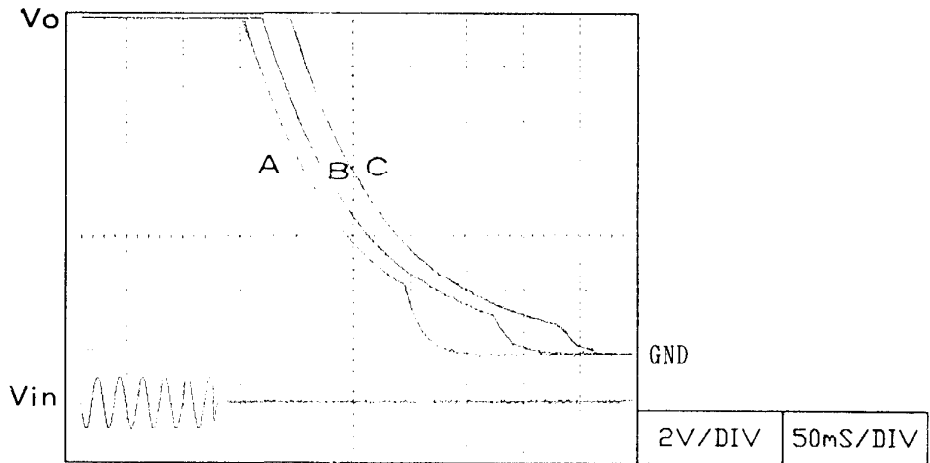
Conditions $V_{in} = 170V_{ac}$ (A)
 $200V_{ac}$ (B)
 $230V_{ac}$ (C)

$I_{out} = 100\%$
 $T_a = 25^{\circ}C$

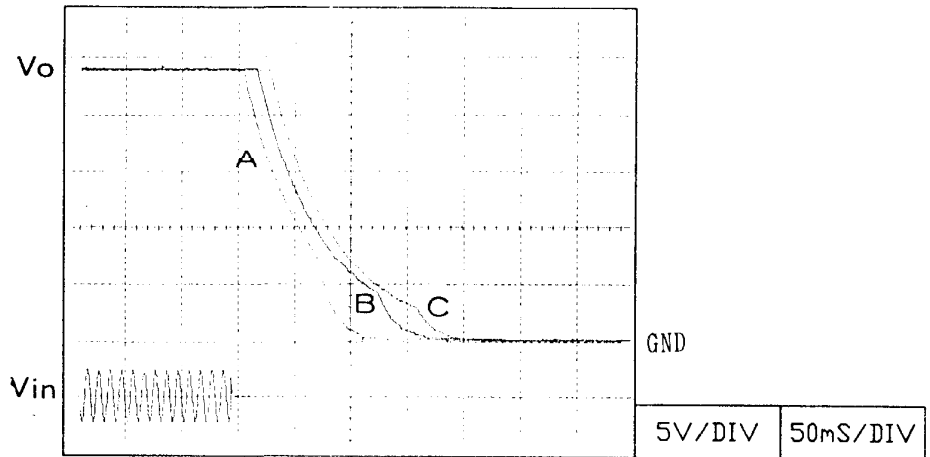
5V



12V



24V



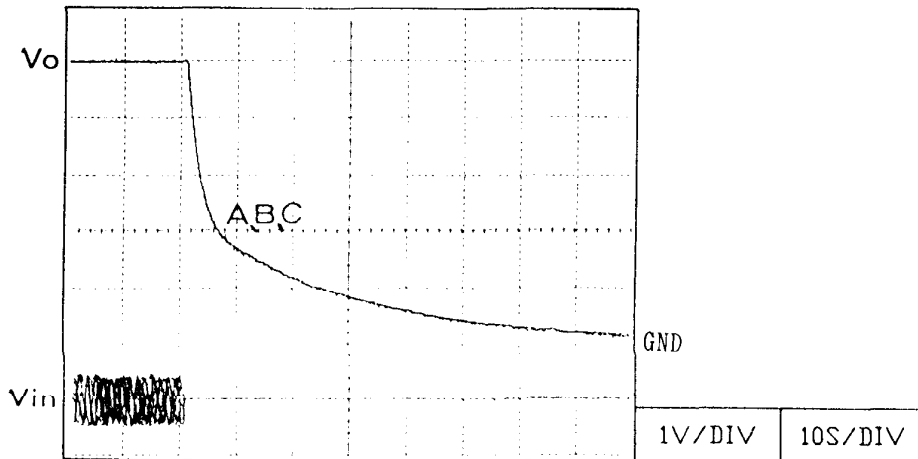
Output fall time

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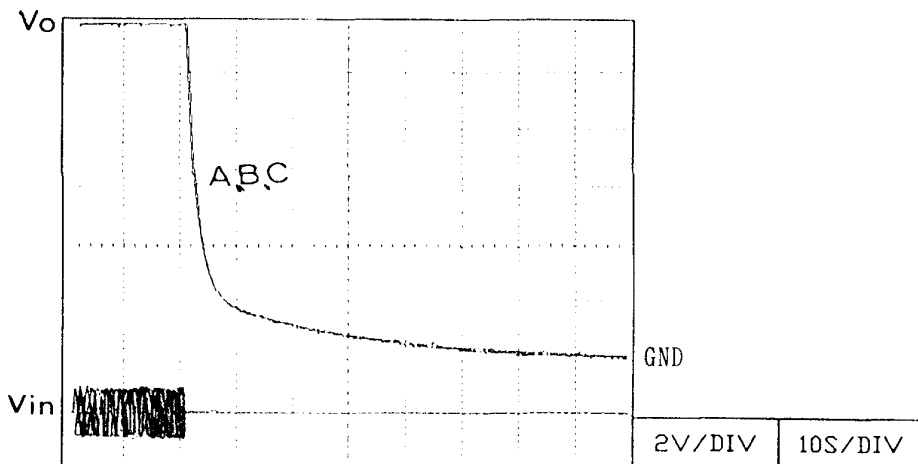
Conditions Vin= 170Vac (A)
200Vac (B)
230Vac (C)

Iout= 0%
Ta= 25C

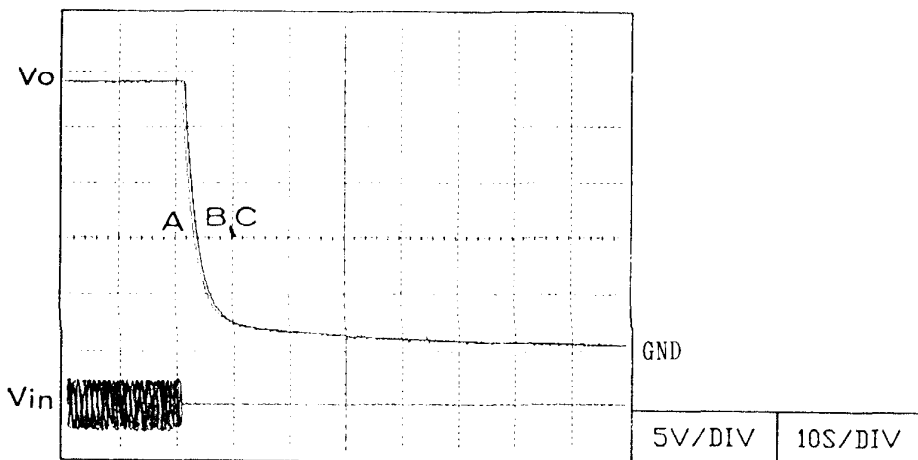
5V



12V



24V



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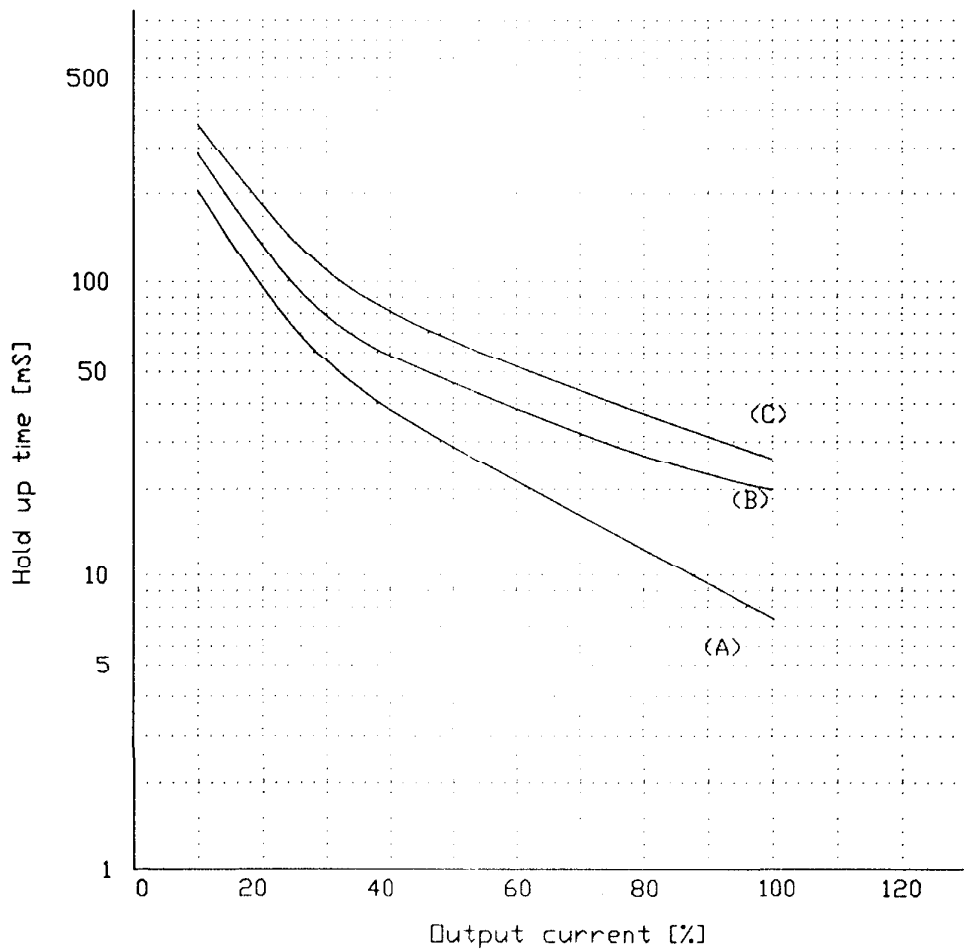
T-20

2-7 HOLD UP TIME

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CURVE OF 5V

Conditions
T_a = 25°C
V_{in} = 85V_{ac} — (A)
100V_{ac} — (B)
115V_{ac} — (C)



HOLD UP TIME

NNS15

CURVE OF 12V

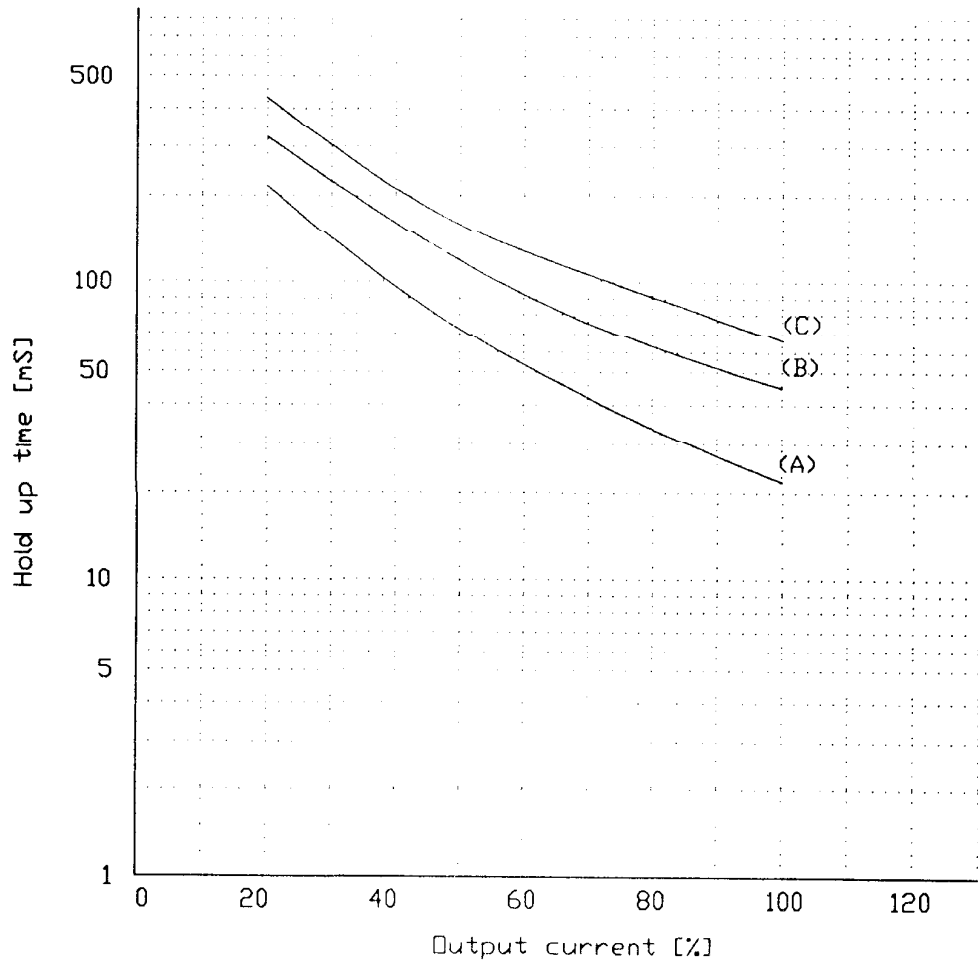
Conditions

$T_a = 25^\circ\text{C}$

$V_{in} = 85\text{Vac}$ — (A)

100Vac — (B)

115Vac — (C)

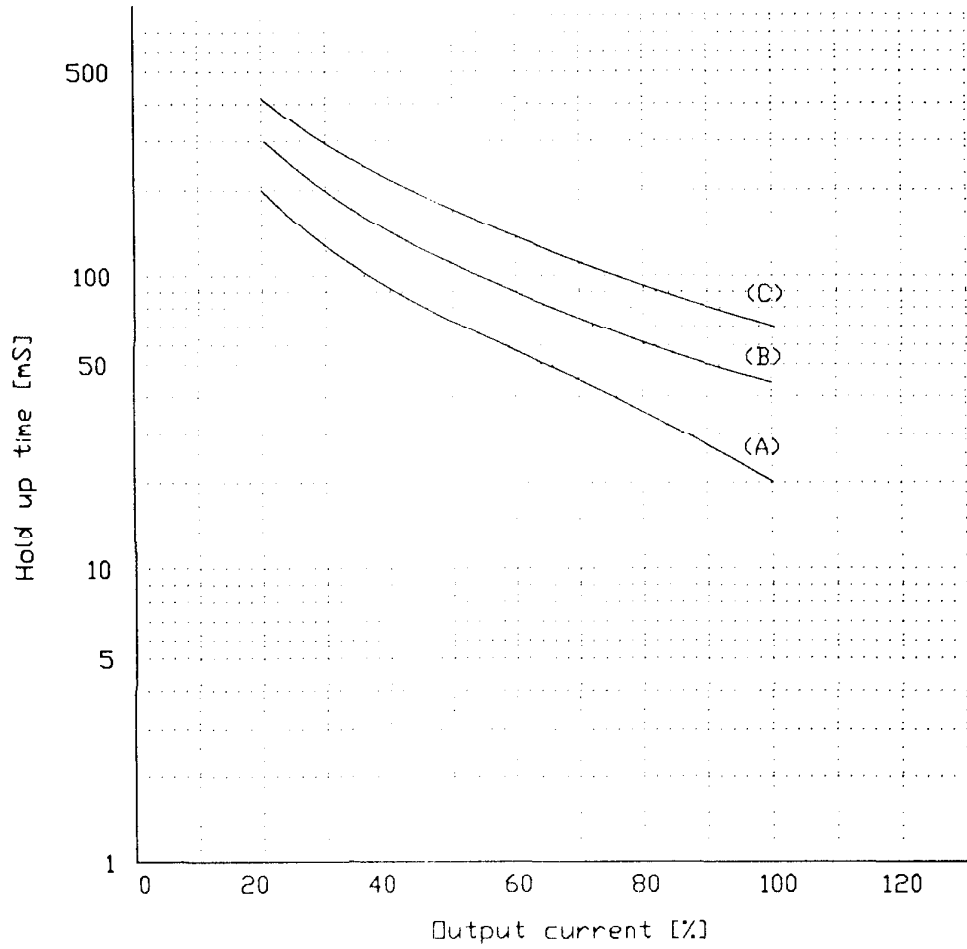


HOLD UP TIME

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CURVE OF 24V

Conditions
Ta= 25C
Vin= 85Vac — (A)
100Vac — (B)
115Vac — (C)



2-8 Dynamic line response

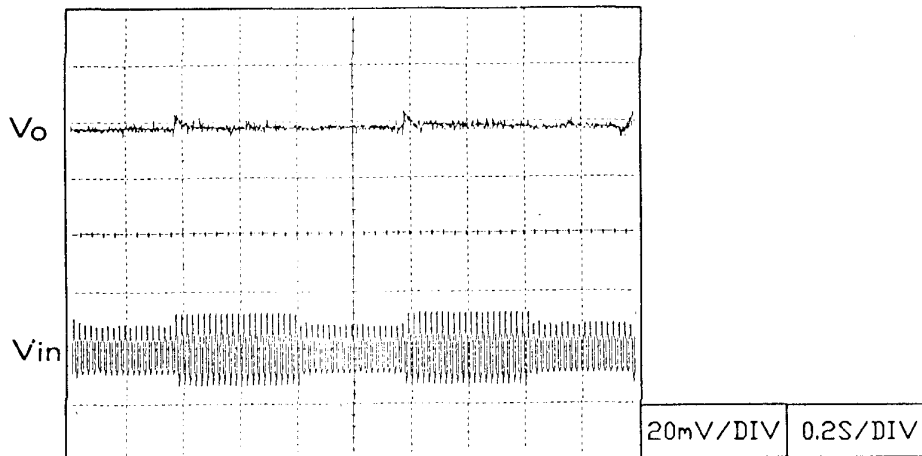
NNS15

Conditions

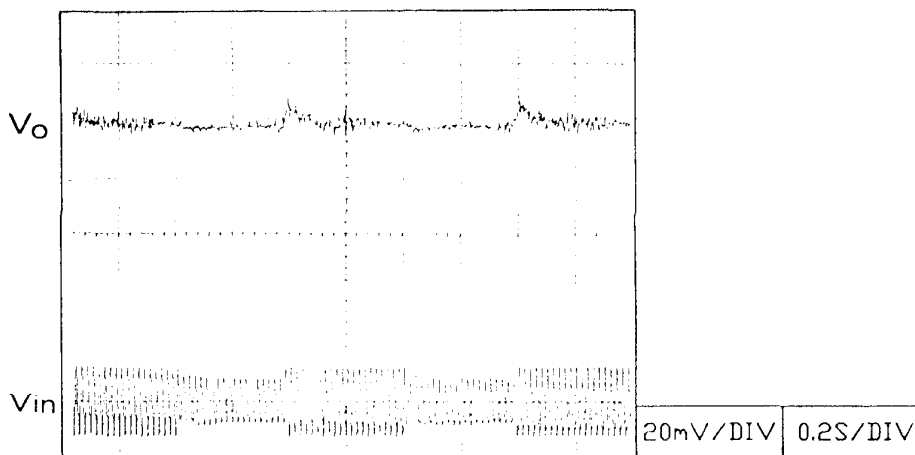
Vout=Rated
Iout= 100%
Ta= 25C

Vin: 85Vac \rightleftharpoons 115Vac

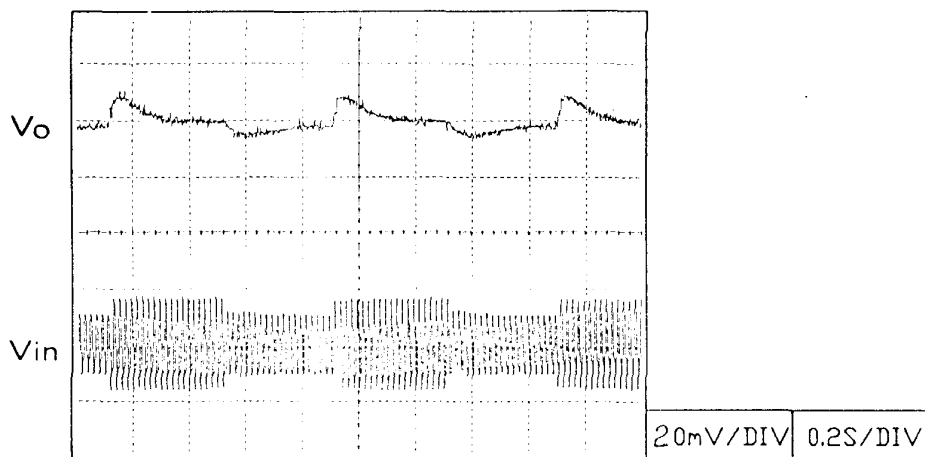
5V



12V



24V



NEMIC-LAMBDA

T-24

Dynamic line response

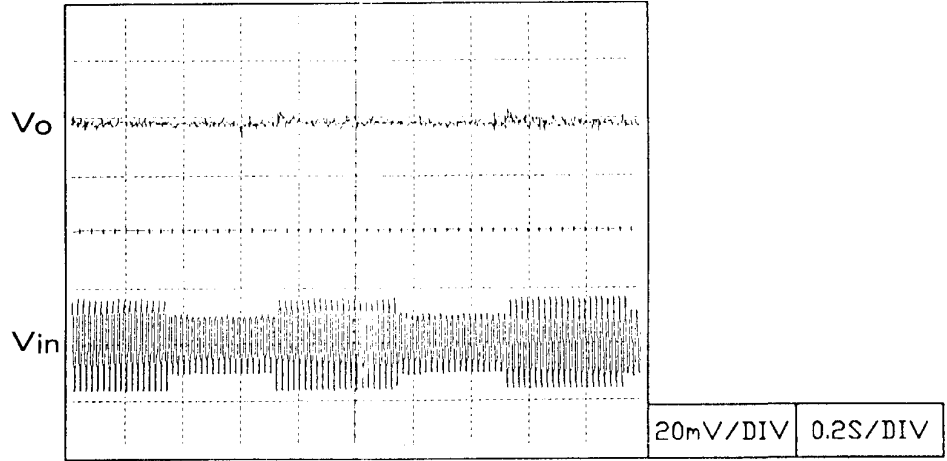
NNS15

Conditions

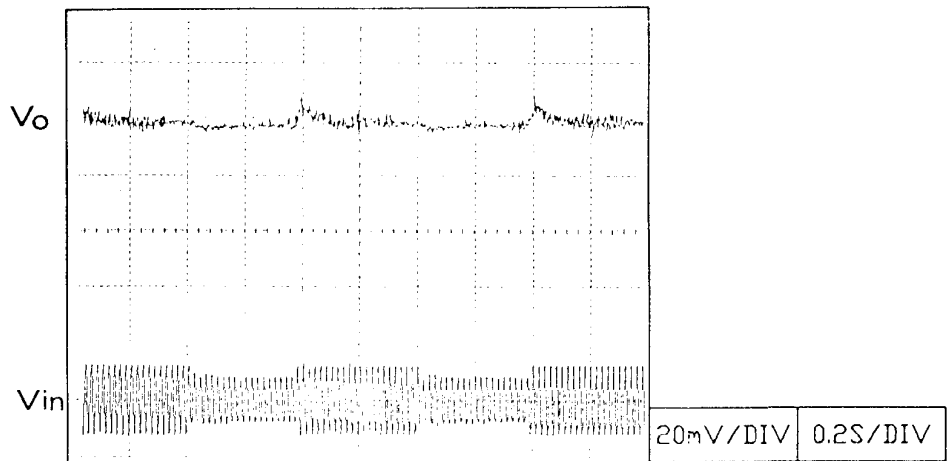
Vout=Rated
Iout= 100%
Ta= 25C

Vin: 170Vac \longleftrightarrow 230Vac

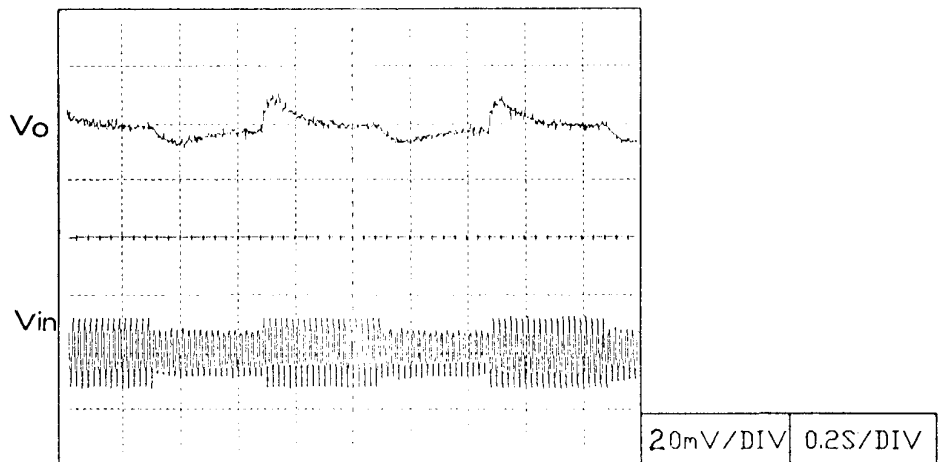
5V



12V



24V



NEMIC-LAMBDA

T-25

2-7 Dynamic load response

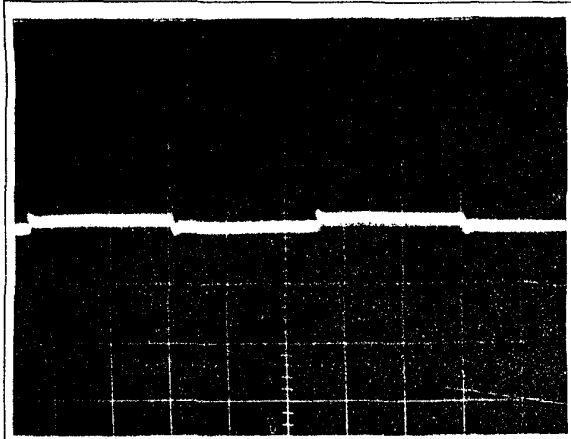
NNS15

Conditions

V_{out}=Rated
V_{in}=100Vac / 200Vac
T_a= 25C

5V

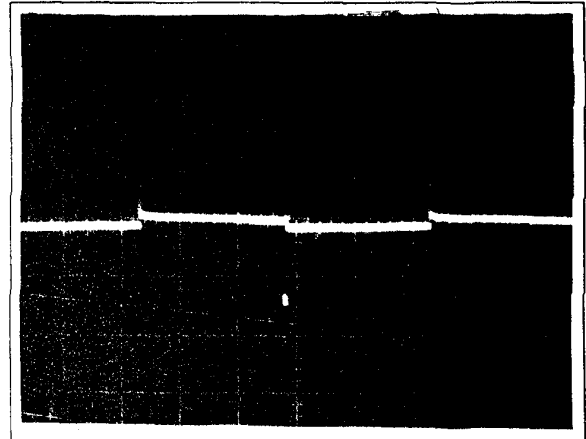
I_{out}: 50 ↔ 100% f=100Hz



50mV/DIV 2nS/DIV

+1.5% -1.5%

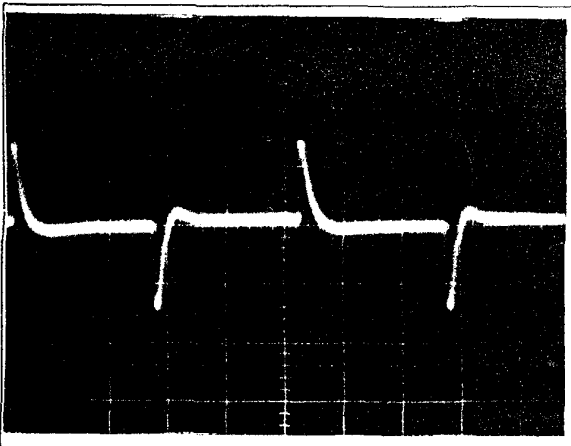
I_{out}: 0 ↔ 100% f=100Hz



100mV/DIV 2nS/DIV

+1.4% -4.4%

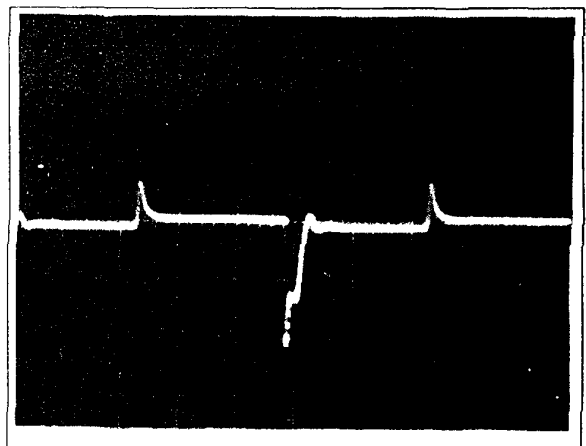
I_{out}: 50 ↔ 100% f=1KHz



50mV/DIV 0.2nS/DIV

+1.5% -1.5%

I_{out}: 0 ↔ 100% f=1KHz



100mV/DIV 0.2nS/DIV

+1.4% -4.4%

Dynamic load response

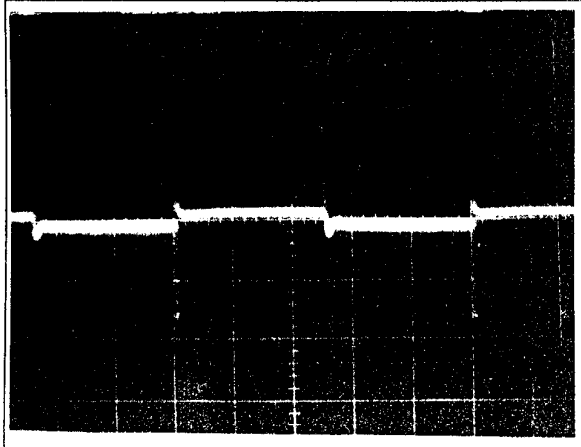
NNS15

Conditions

Vout=Rated
Vin=100Vac / 200Vac
Ta= 25C

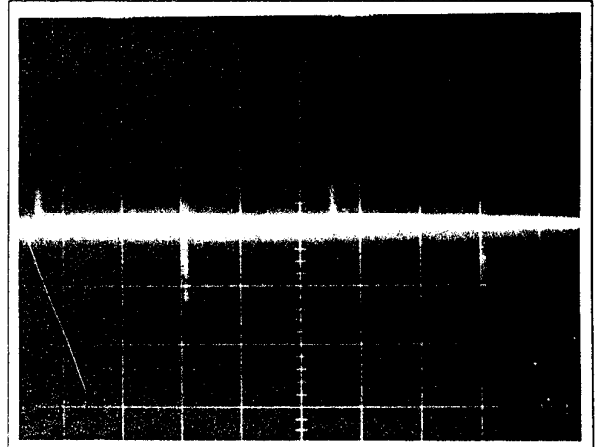
12V

Iout: 50 ↔ 100% f=100Hz



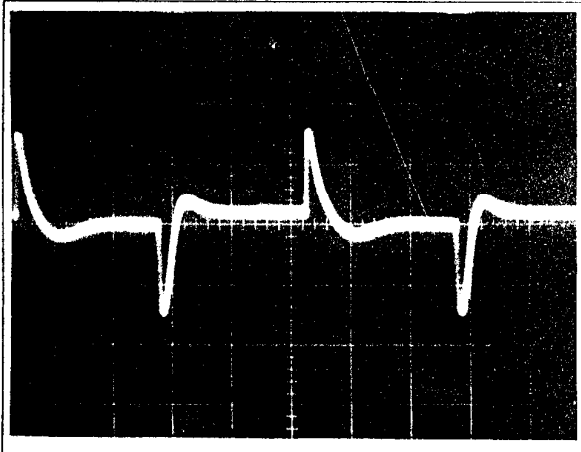
50mV/DIV	2mS/DIV
+0.6%	-0.6%

Iout: 0 ↔ 100% f=100Hz



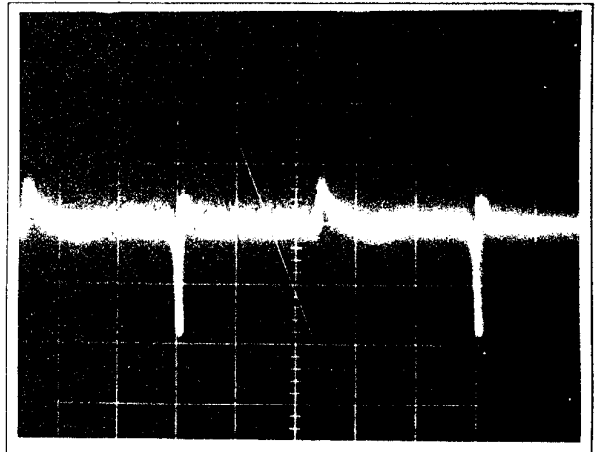
100mV/DIV	2mS/DIV
+0.6%	-1.0%

Iout: 50 ↔ 100% f=1KHz



50mV/DIV	0.2mS/DIV
+0.6%	-0.6%

Iout: 0 ↔ 100% f=1KHz



100mV/DIV	0.2mS/DIV
+0.6%	-1.5%

Dynamic load response

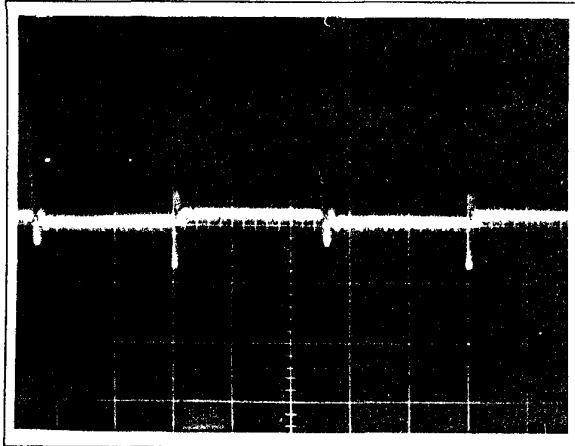
NNS15

Conditions

Vout=Rated
Vin=100Vac / 200Vac
Ta= 25C

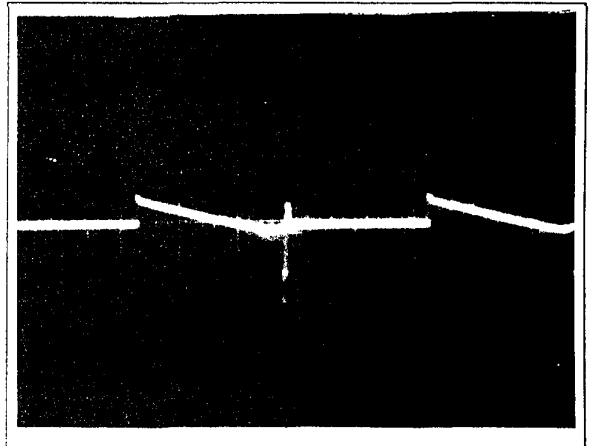
24V

Iout: 50 \longleftrightarrow 100% f=100Hz



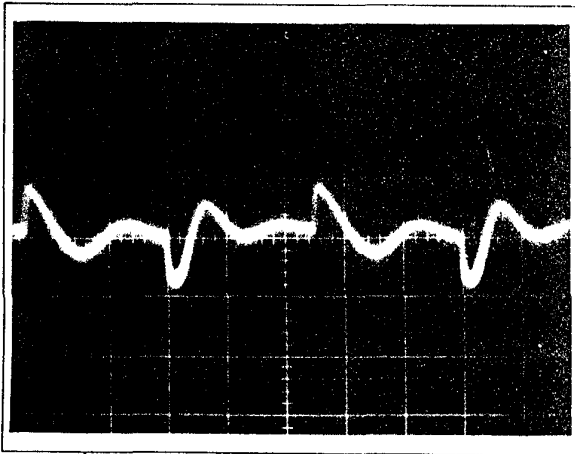
50mV/DIV	2mS/DIV
+0.2%	-0.2%

Iout: 0 \longleftrightarrow 100% f=100Hz



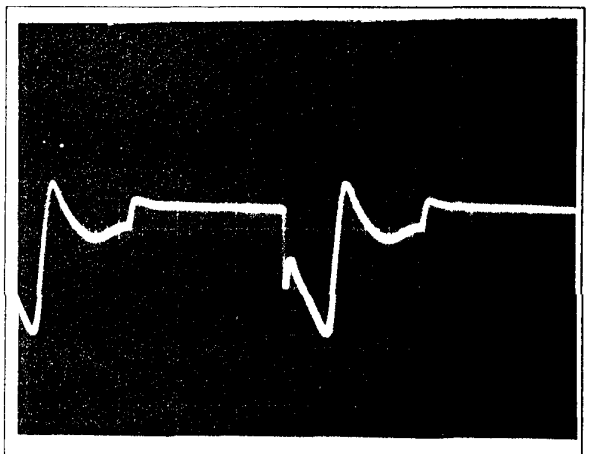
100mV/DIV	2mS/DIV
+0.3%	-0.6%

Iout: 50 \longleftrightarrow 100% f=1KHz



50mV/DIV	0.2mS/DIV
+0.2%	-0.2%

Iout: 0 \longleftrightarrow 100% f=1KHz



100mV/DIV	0.2mS/DIV
+0.3%	-0.8%

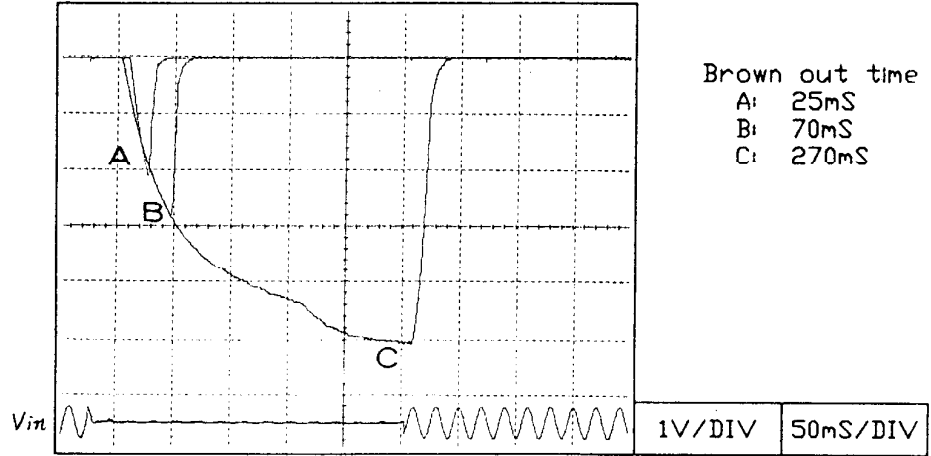
2-10 Response to brown out

NNS15

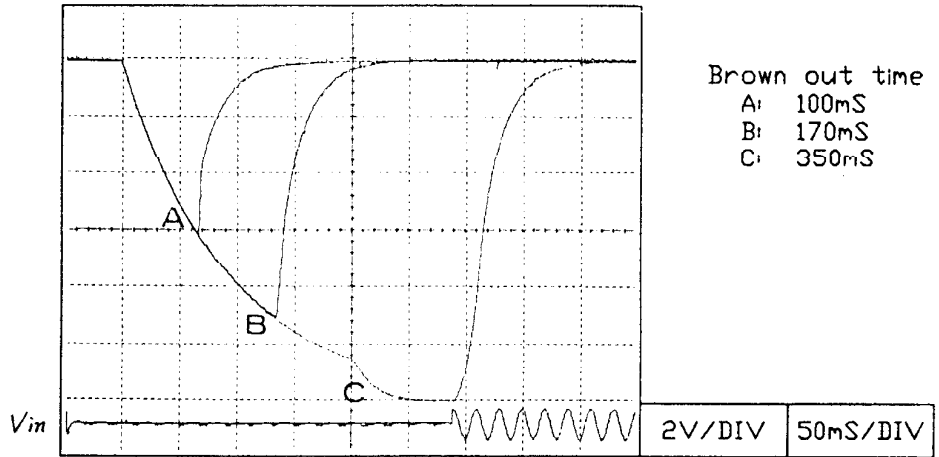
Conditions

$V_{in} = 100V_{ac}$
 $I_{out} = 100\%$
 $T_a = 25C$

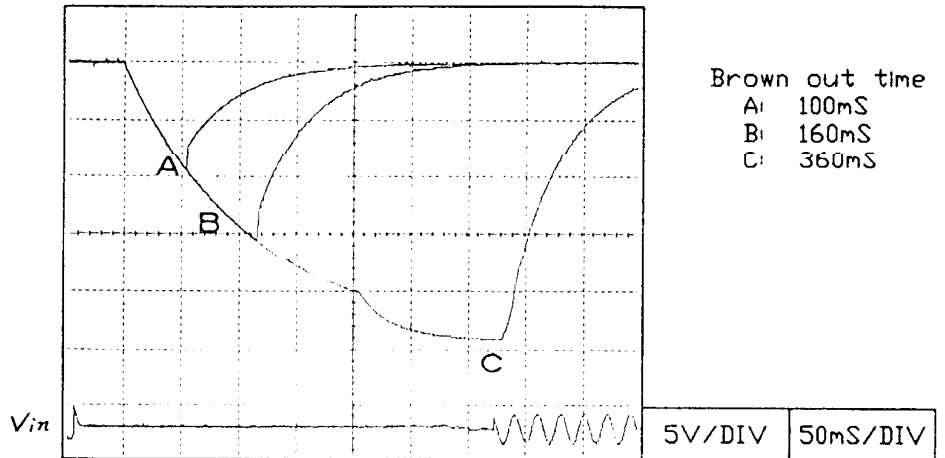
5V



12V



24V



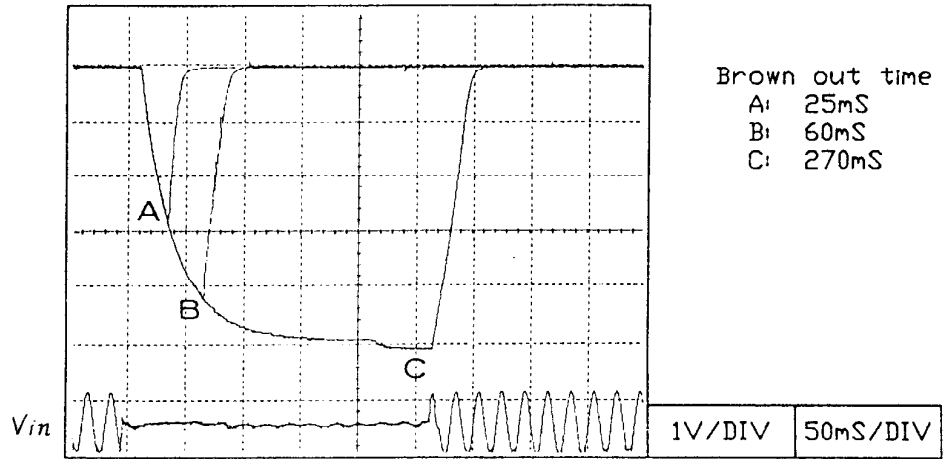
Response to brown out

NNS15

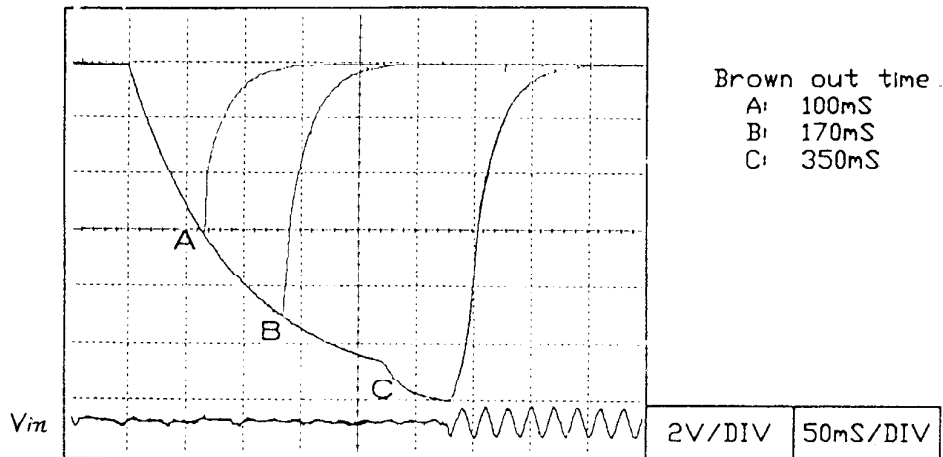
Conditions

V_{in} = 200Vac
 I_{out} = 100%
 T_a = 25C

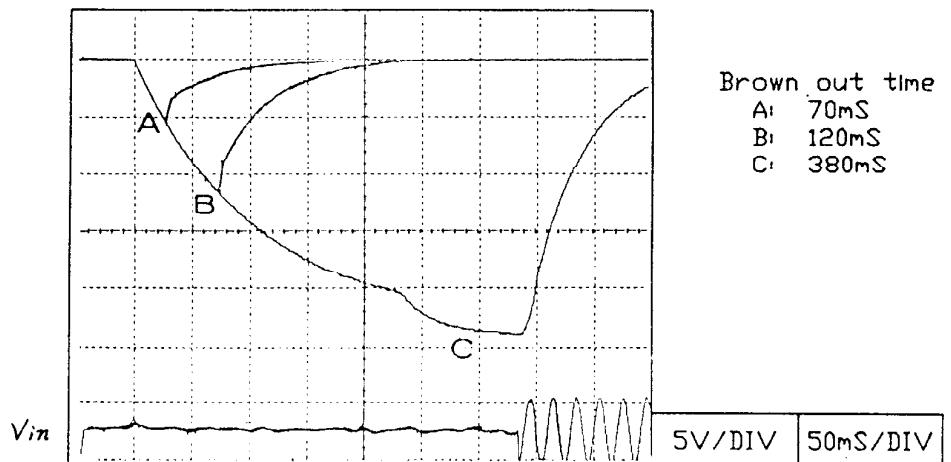
5V



12V



24V



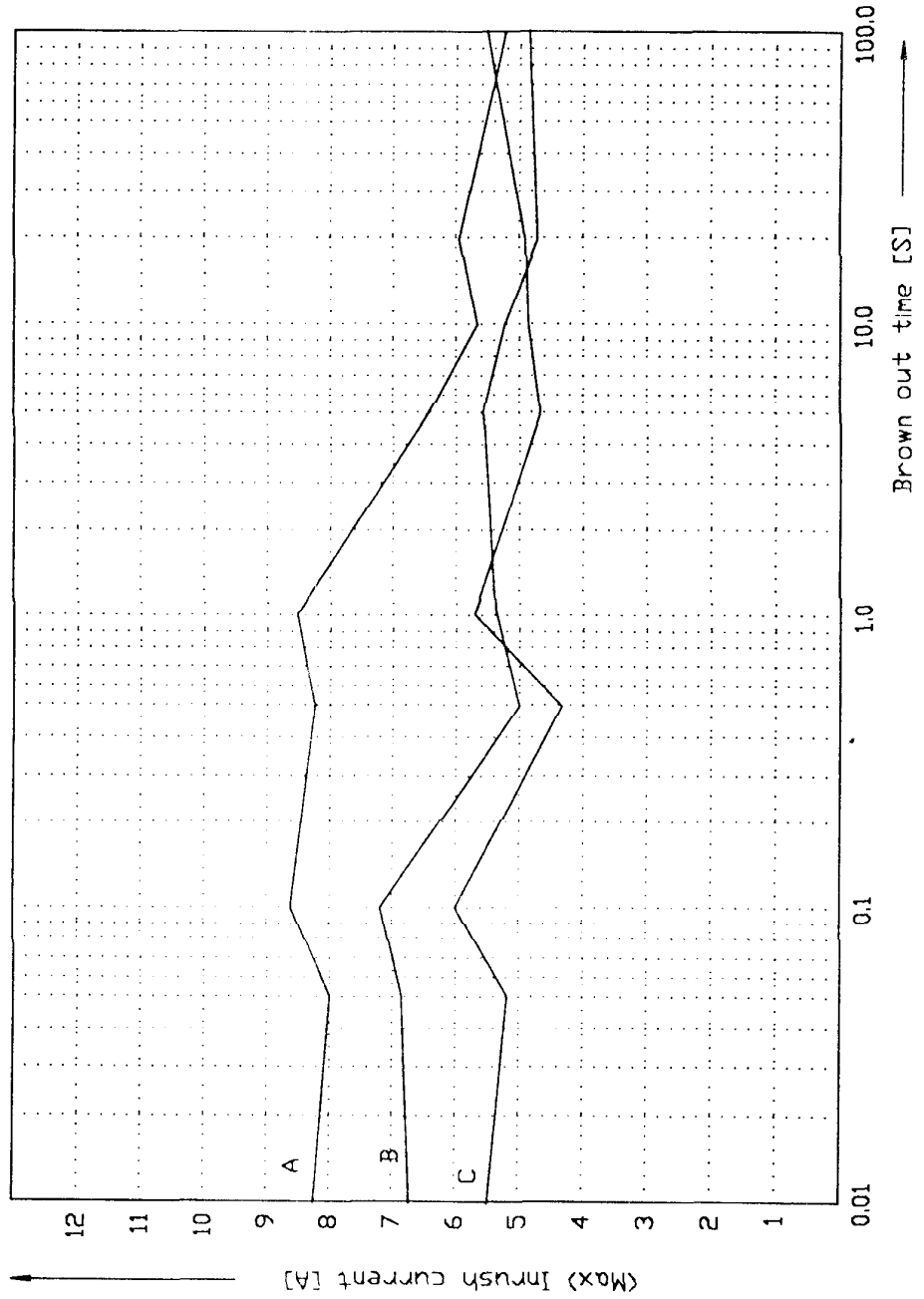
NEMIC-LAMBDA

T-30

NNS15

2-11 Inrush current characteristics

$V_{in} = 100V_{ac}$
 $I_{out} = 0\% - A$
 50% - B
 100% - C
 $T_a = 25C$



NEMIC-LAMBDA

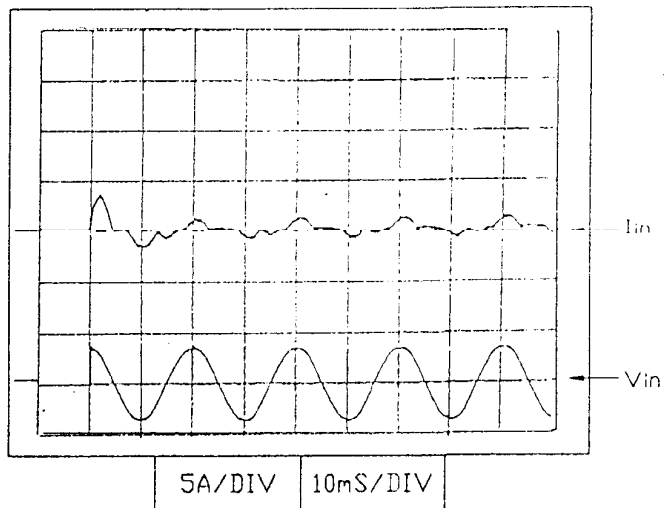
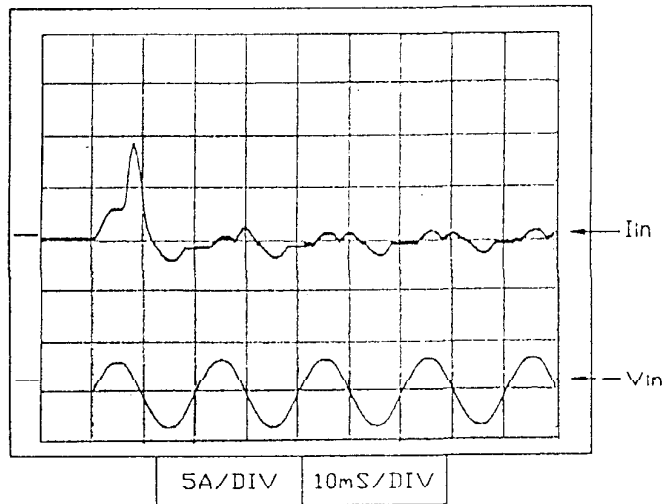
T-31

NNS15

Inrush current waveform

Conditions

$V_{in} = 100V_{ac}$
 $I_{out} = 100\%$
 $T_a = 25C$



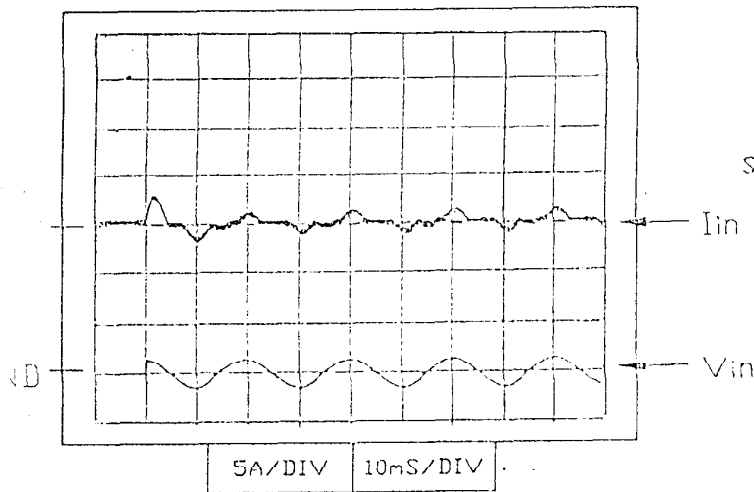
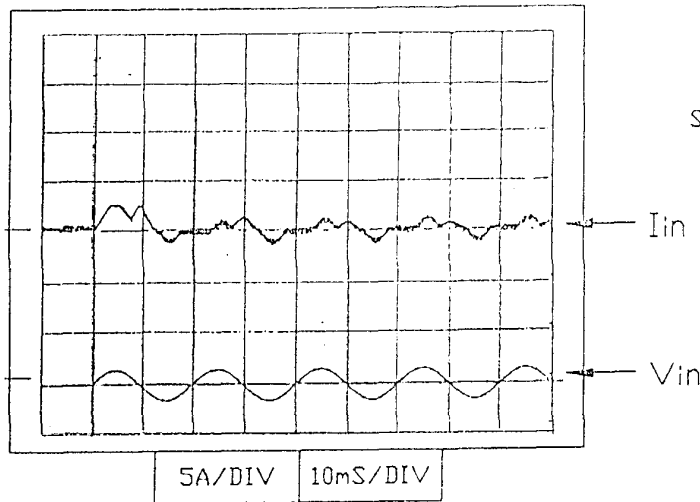
NEMIC-LAMBDA

T-32

Inrush current waveform

NNS15

Conditions
V_{in}= 230Vac
I_{out}= 100%
T_a= 25C



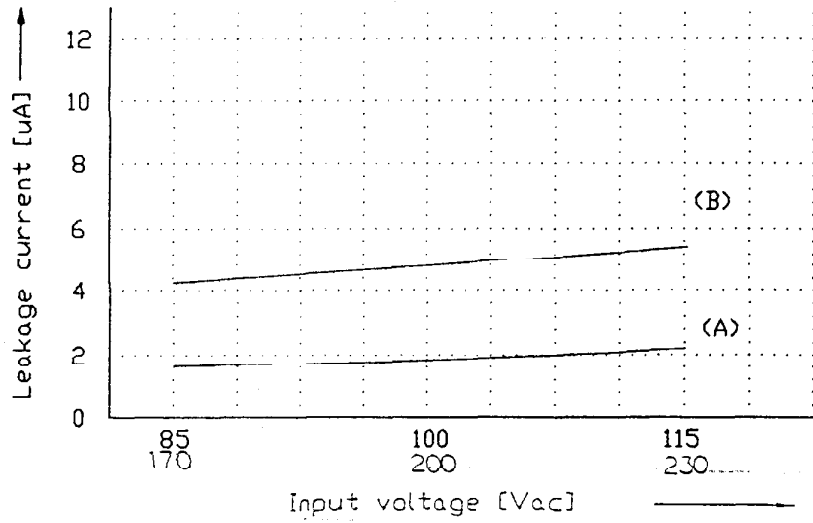
NNS15

2-12 Leakage current

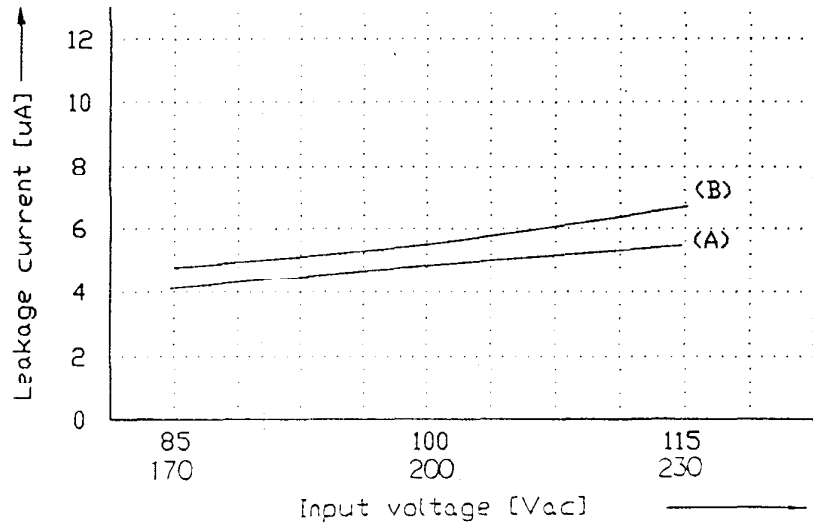
Conditions Vin= 85-115Vac (A)
Vin= 170-230Vac (B)
Ta= 25C

5V

Iout=0%



Iout=100%



2-13 OUTPUT-RIPPLE, NOISE

NNS15

Conditions

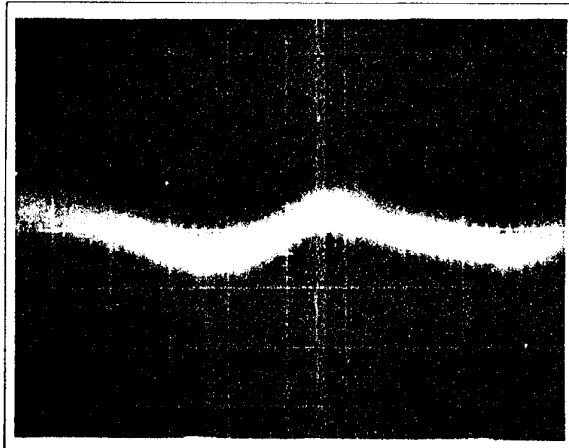
V_{in} = 100V_{ac}

I_{out} = 100%

T_a = 25°C

NORMAL MODE

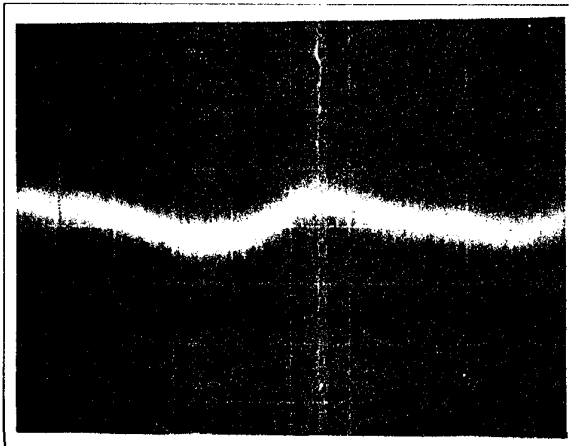
5V



1mV/DIV

2mS/DIV

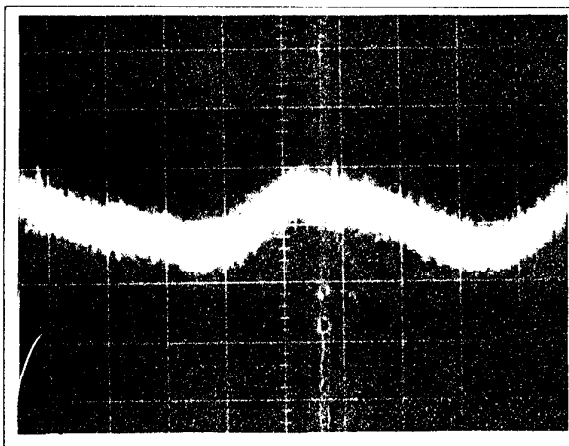
12V



1mV/DIV

2mS/DIV

24V



1mV/DIV

2mS/DIV

NEMIC-LAMBDA

T-35

OUTPUT-RIPPLE, NOISE

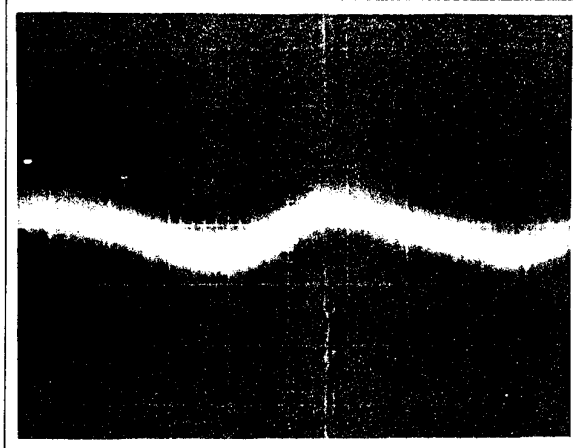
NNS15

Conditions

V_{in} = 100V_{ac}
I_{out} = 100%
T_a = 25C

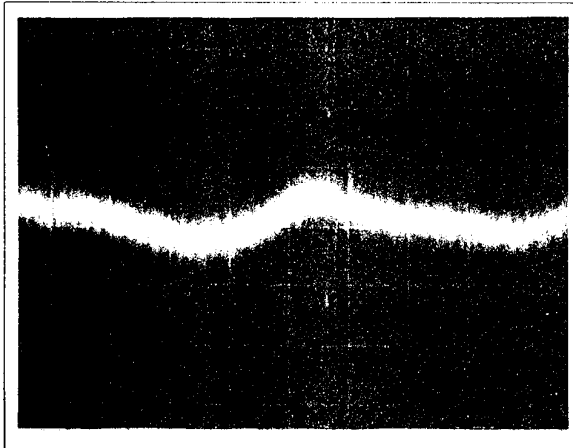
COMMON+NORMAL MODE

5V



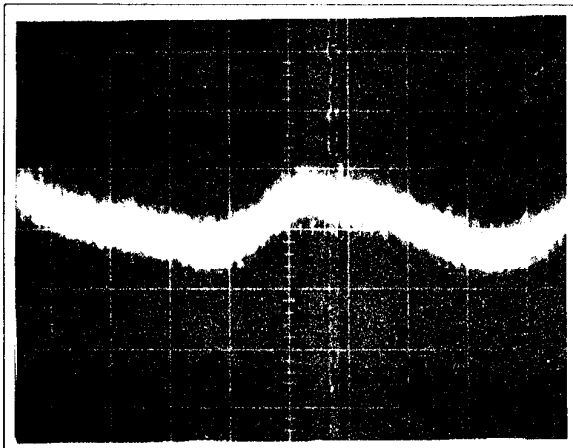
1mV/DIV 2mS/DIV

12V



1mV/DIV 2mS/DIV

24V



1mV/DIV 2mS/DIV

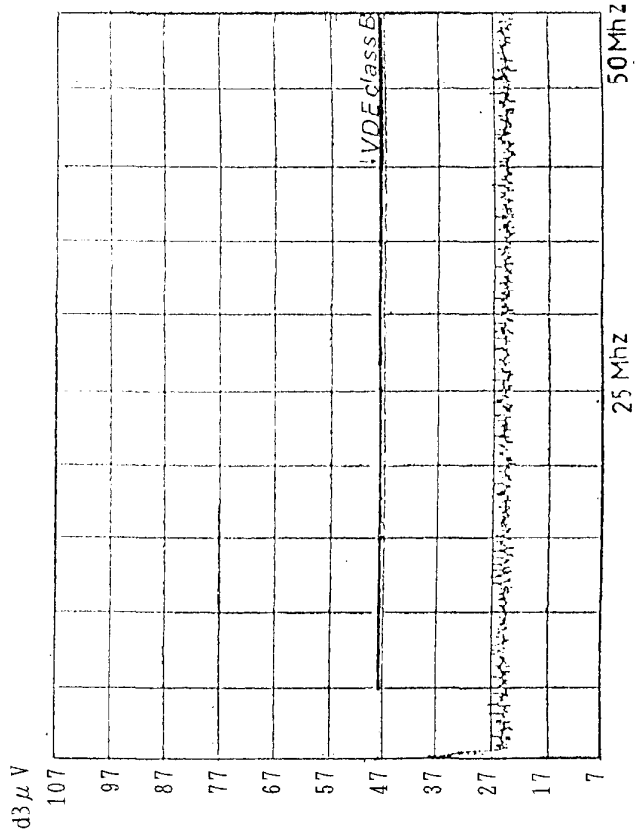
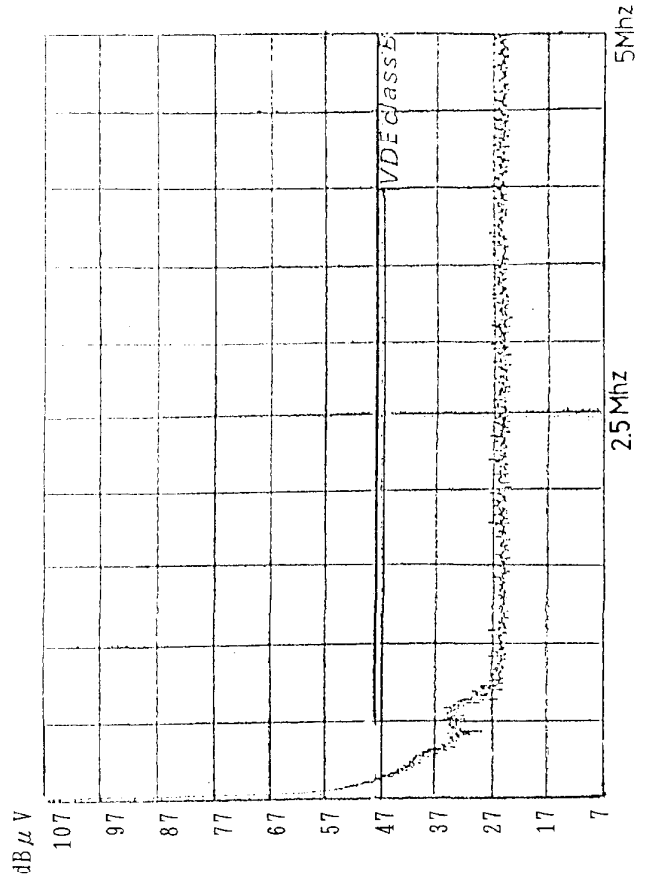
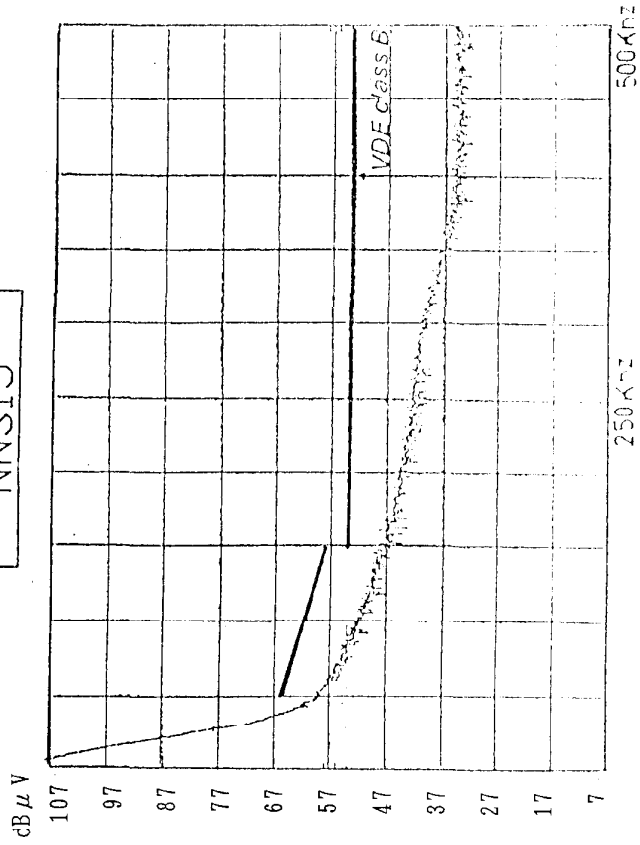
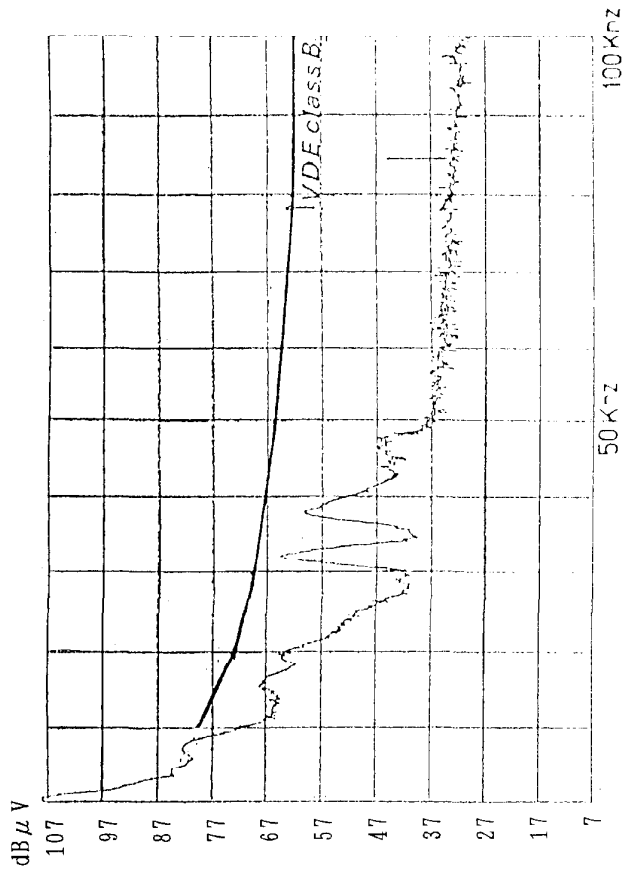
NEMIC-LAMBDA

T-36

2-14 CONDUCTED EMISSION

MODEL: NNS15-5

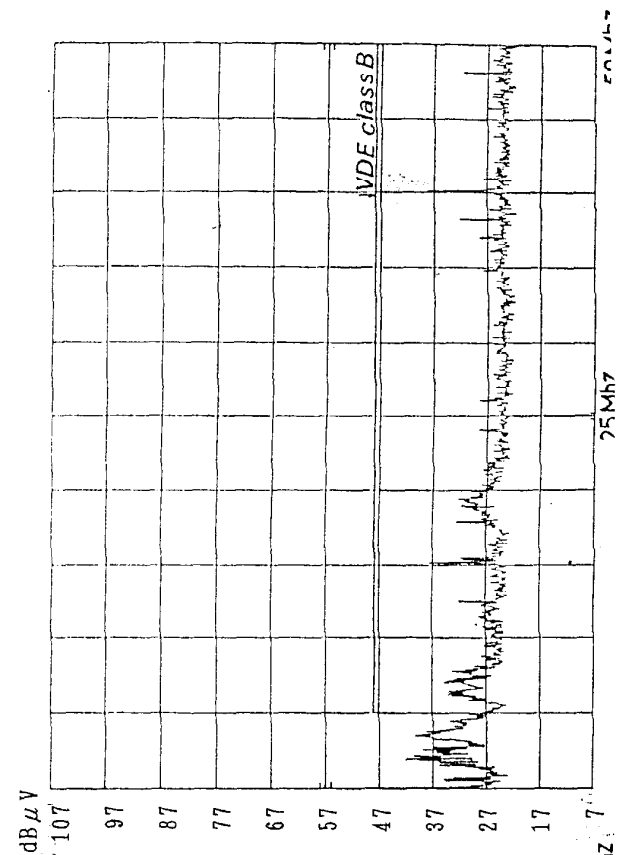
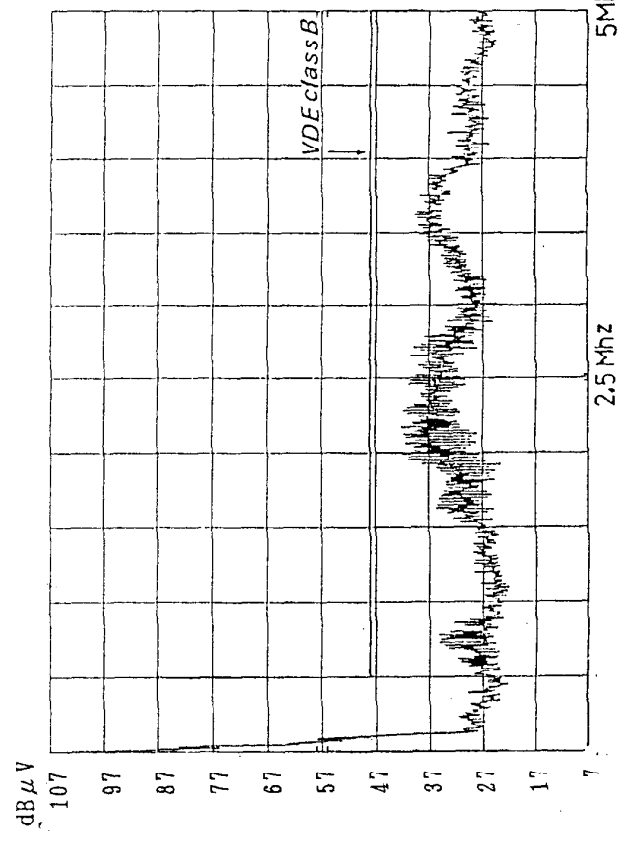
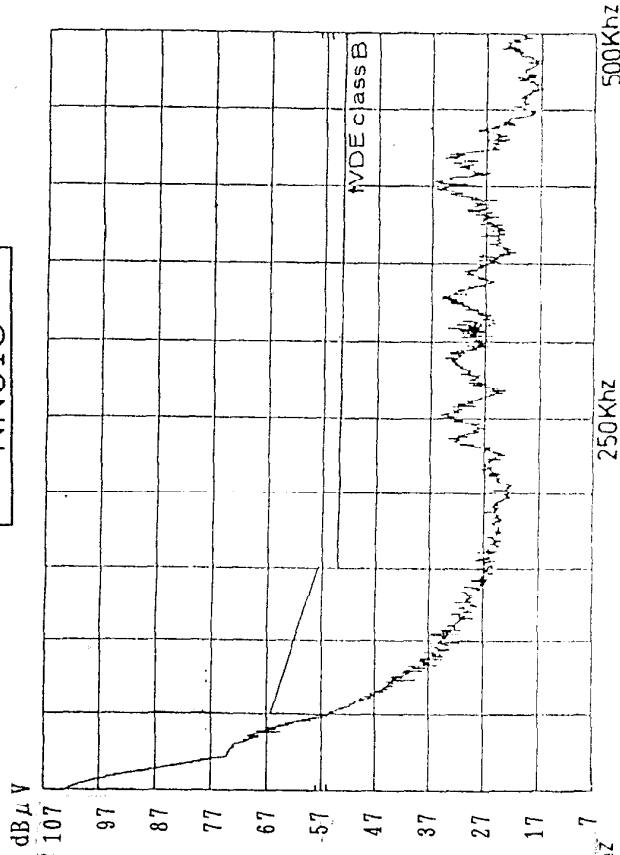
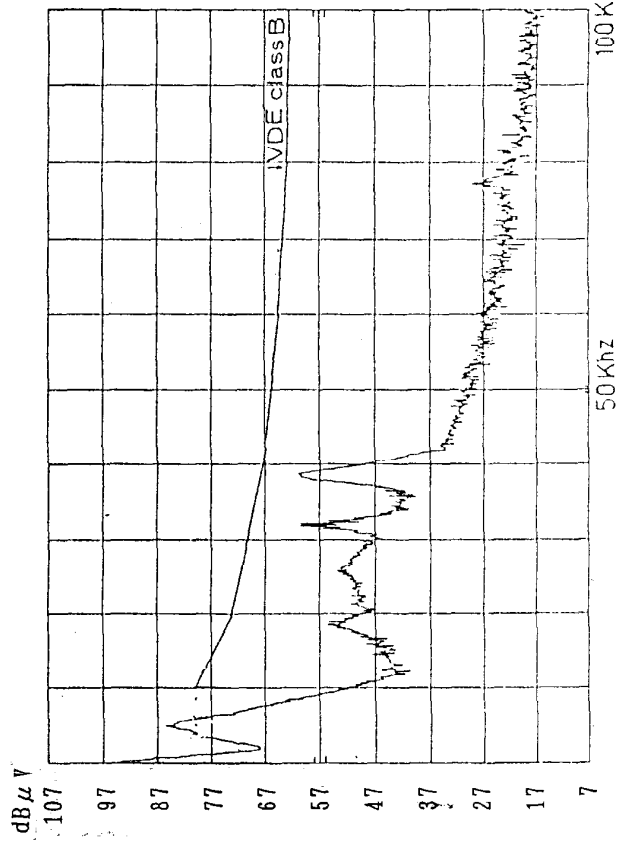
NNS15



CONDUCTED EMISSION

MODEL: NNS15-12

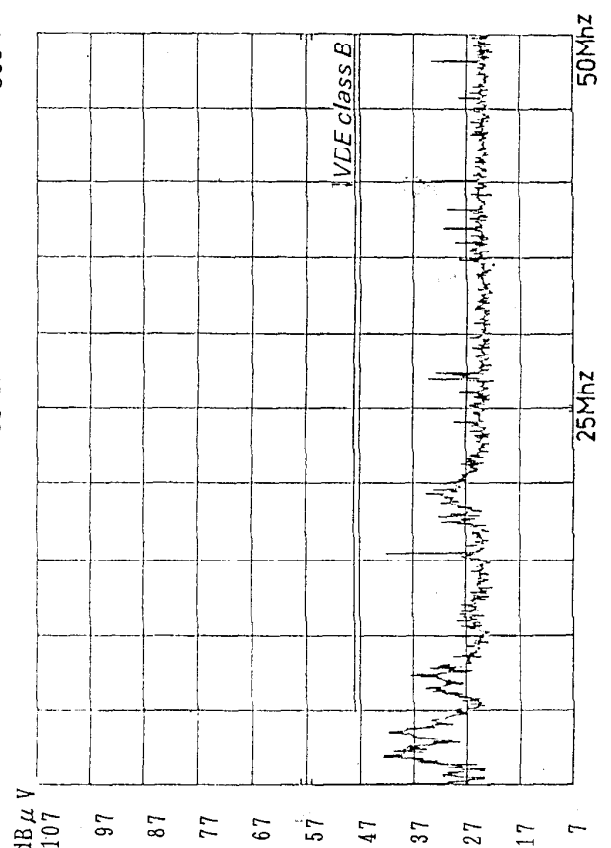
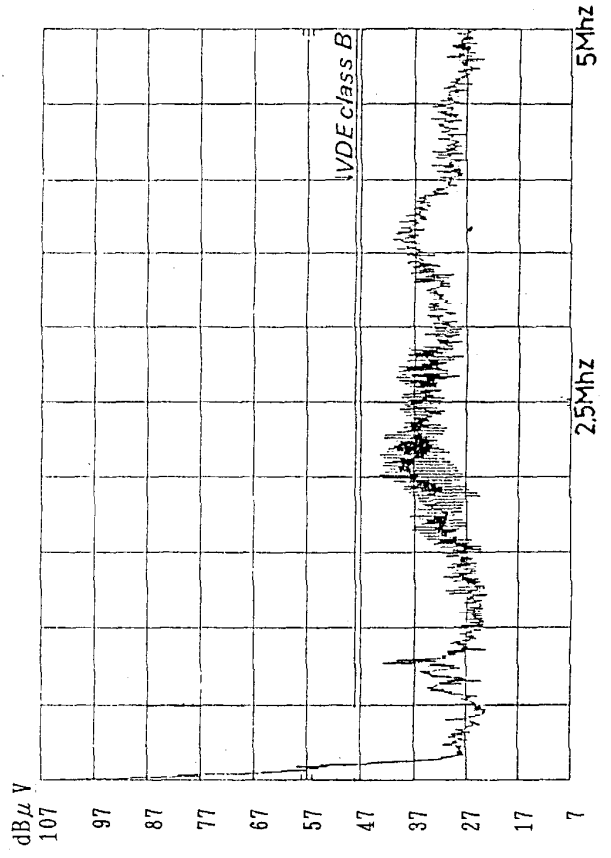
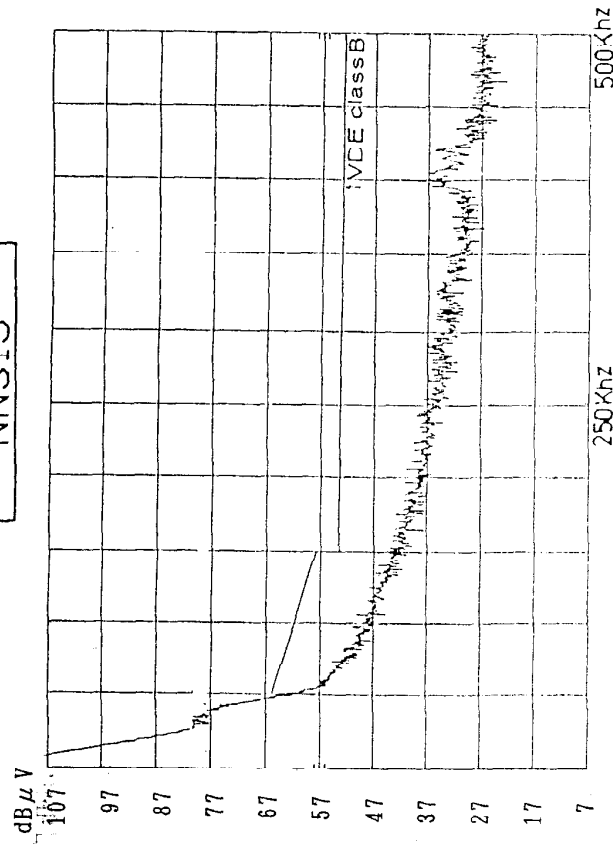
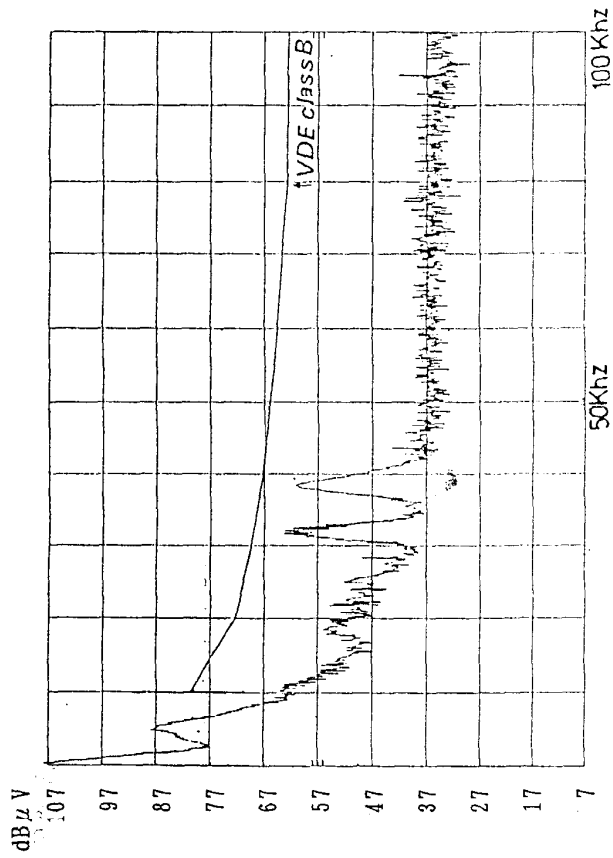
NNS15



CONDUCTED EMISSION

MODEL: NNS15-24

NNS15



3. LIST OF EQUIPMENT USED

	EQUIPMENT USED	MANUFACTURER	MODEL No.
1	Oscilloscope	KENWOOD	CS-2110
2	Digital storage Oscilloscope	GOULD	OS4040
3	Digital Voltmeter	FLUKE	8840A
4	Digital Watt / Current Volt meter	YOKOGAWA	Y2509
5	DC Ampere meter	FLUKE	25
6	Autotransformer	SUPERIOR ELECTRIC	
7	Variable resistive Load	BUILT IN - HOUSE	
8	Dynamic dummy Load	HP	6050A
9	Digirush Currenter	BUILT IN - HOUSE	
10	Current probe / Amplifier	TEKTRONIX	011-0105
11	Controlled Temp. Chamber	TABAI	PL-2GM
12	Leakage Current meter	FLUKE	8840A
13	Equipment for dynamic line response	BUILT IN - HOUSE	