NNS50
TEST DATA

DWG: IA507-53-01		
Q.A.	ENG.	APP.
T.Murayama	נחמ ה"ר	Doron Peled
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NEMIC-LAMBDA LTD.

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Terminology used:

Definition:

Vin ..... Input Voltage

Vout ..... Output Voltage

Iin ..... Input current

Iout ..... Output current

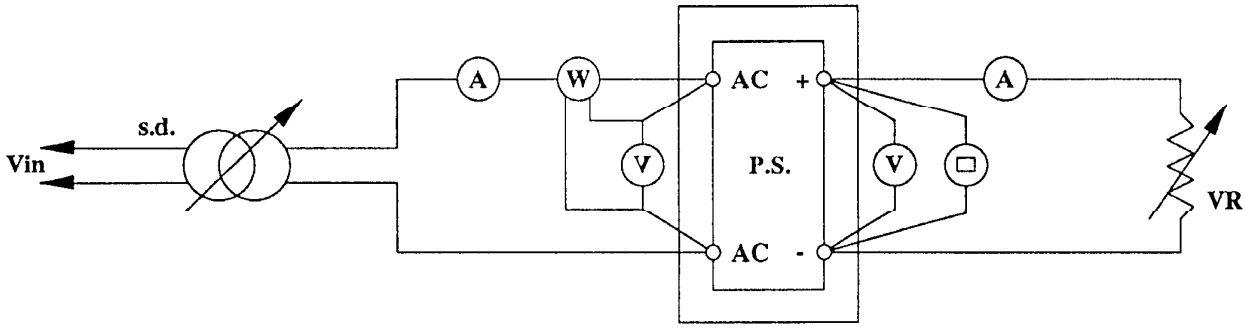
Ta ..... Ambient temperature

1.EVALUATION METHOD

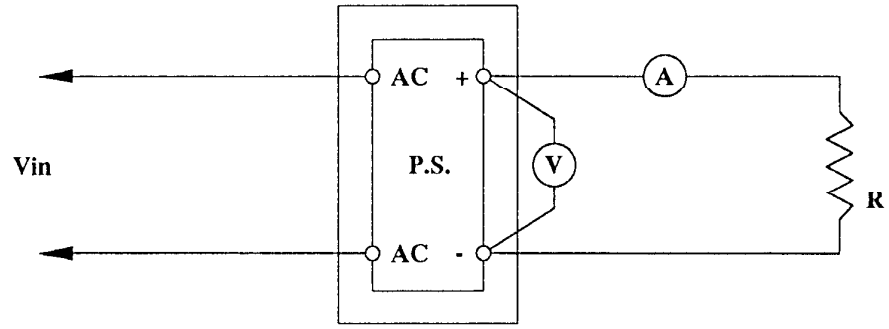
NNS50

1-1 Circuits used for determination

(1) Steady state data



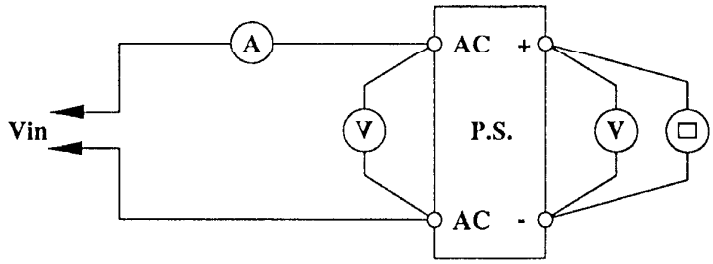
(2) Warm up voltage drift characteristics



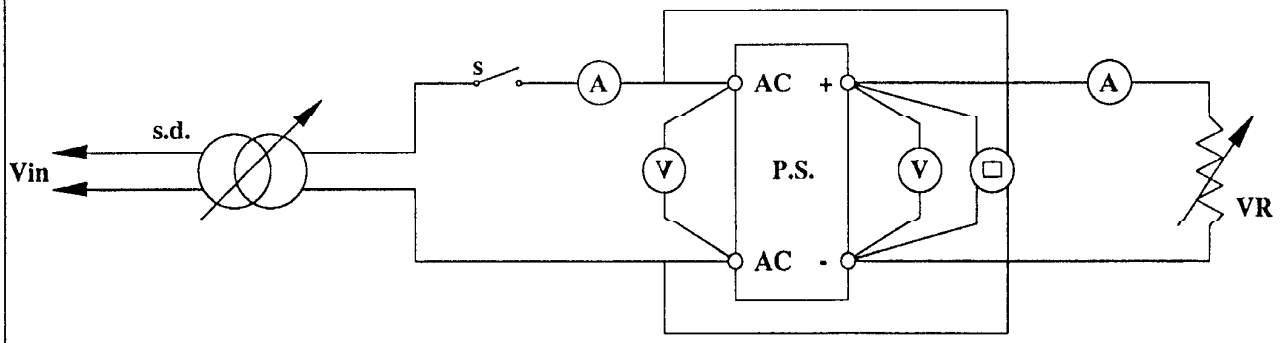
(3) Over current protection (OCP) characteristics

Same as steady state data.

(4) Over voltage protection (OVP) characteristics



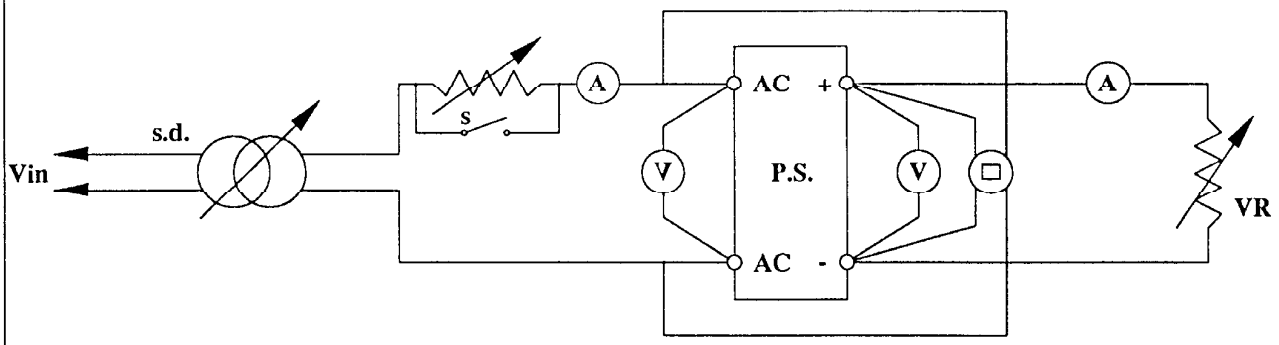
(5) Output rise characteristics



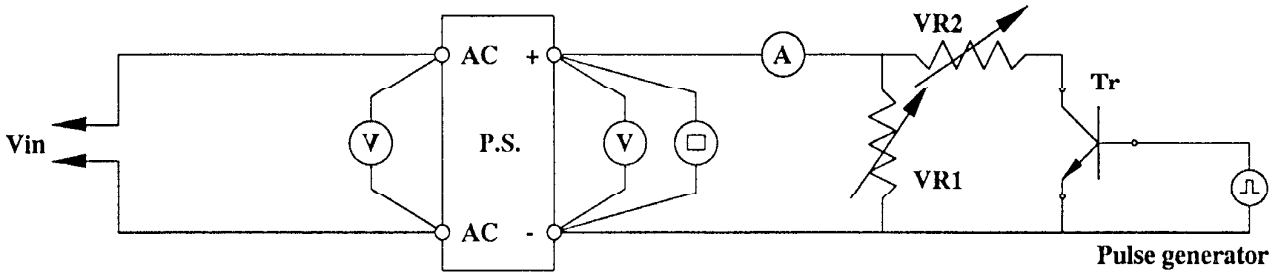
(6) Ouput fall characteristics

Same as Ouput rise characteristics

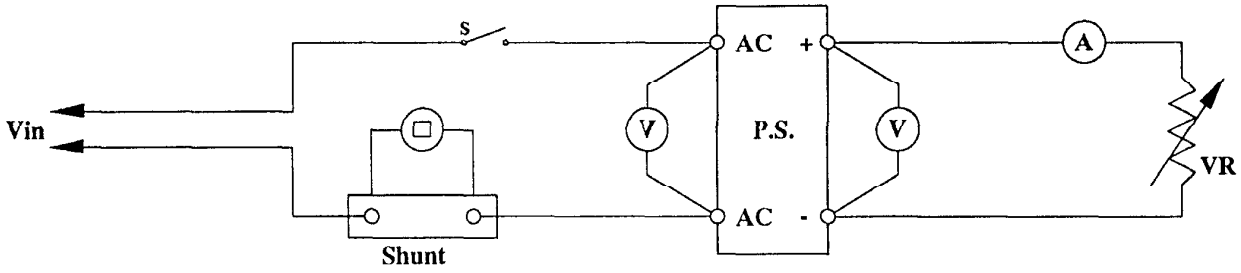
(7) Dynamic line response characteristics



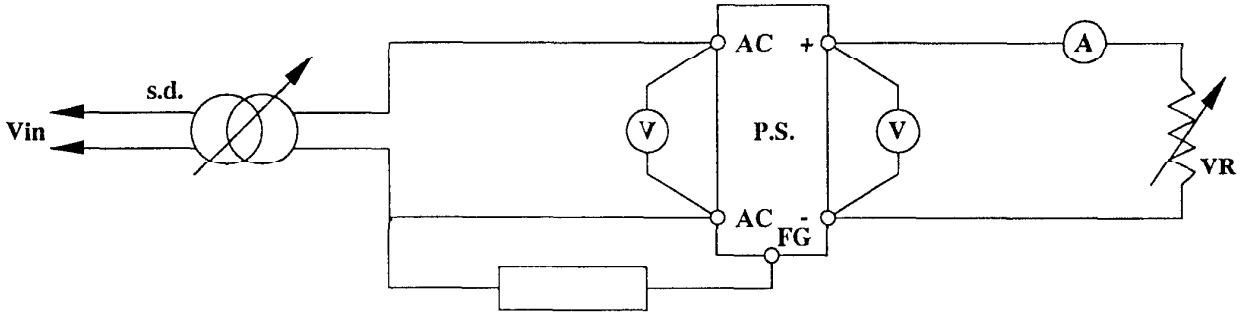
(8) Dynamic load response characteristics



(9) Inrush current characteristics



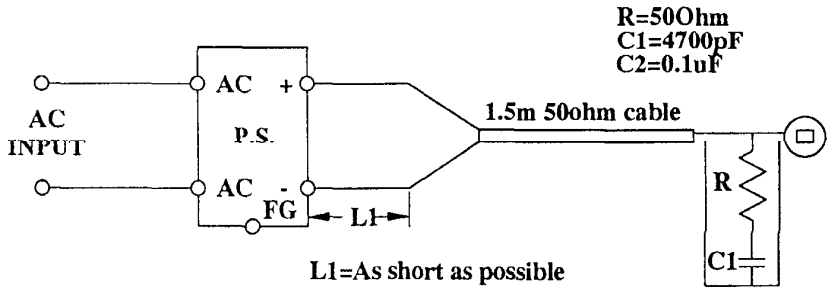
(10) Leakage current characteristics



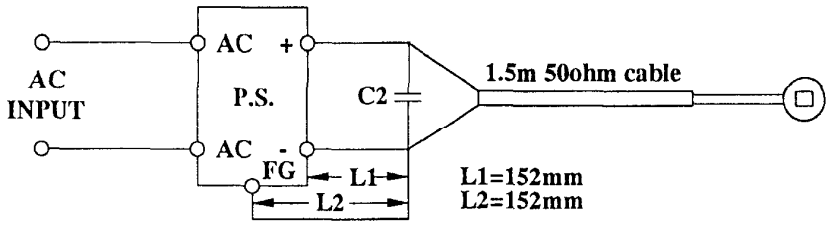
Note: Leakage current measured through a 1Kohm resistor. Range wed: AC+DC

(11) Output-ripple, noise

a) Normal mode



b) Normal + common mode



2. CHARACTERISTICS

2-1 STEADY STATE DATA

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

5V

1. Regulation-line and load Condition Ta=25C

INPUT 100V

Iout \ Vin	AC 85V	AC 100V	AC 115V	Line Regulation	
0%	5.0000	4.9998	5.0000	0.2mV	0.004%
50%	5.0000	4.9998	4.9998	0.2mv	0.004%
100%	5.000	4.9998	4.9998	0.2mv	0.004%
Load	0 mv	0 mV	0.2mV		
Regulation	0 %	0 %	0.004%		

INPUT 200V

Iout \ Vin	AC 170V	AC 200V	AC 230V	Line Regulation	
0%	4.9998	4.9998	4.9998	0 mv	0 %
50%	4.9998	4.9998	4.9998	0 mv	0 %
100%	4.9998	4.9998	4.9998	0 mV	0 %
Load	0 mv	0 mV	0 mV		
Regulation	0 %	0 %	0 %		

2. Temperature Drift Conditions Vin=AC100V
Iout=100%

Ta	0C	25C	50C	Temp. Stability	
Vout	5.0015	5.0010	4.9970	4.5mv	0.09%

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REGULATION - Line and load, Temp. drift

12V

1. Regulation-line and load Condition Ta=25C

INPUT 100V

Iout \ Vin	AC 85V	AC 100V	AC 115V	Line Regulation	
0%	11.9953	11.9952	11.9947	0.6mv	0.005%
50%	11.9956	11.9954	11.9950	0.6mv	0.005 %
100%	11.9958	11.9956	11.9953	0.5mV	0.004%
Load Regulation	0.5mV	0.4mV	0.6mV		
	0.004%	0.003%	0.005%		

INPUT 200V

Iout \ Vin	AC 170V	AC 200V	AC 230V	Line Regulation	
0%	11.9944	111.9942	11.9945	0.3mV	0.0025%
50%	11.9947	11.9945	11.9948	0.3mV	0.0025%
100%	11.9948	11.9948	11.9951	0.3mv	0.0025%
Load Regulation	0.4mV	0.6mV	0.3mV		
	0.0033%	0.005%	0.0025%		

2. Temperature Drift Conditions Vin=AC100V Iout=100%

Ta	0C	25C	50C	Temp. Stability	
Vout	12.0043	11.9916	11.9677	36mv	0.3%

REGULATION - Line and load, Temp. drift

24V

1. Regulation-line and load Condition Ta=25C

INPUT 100V

Iout \ Vin	AC 85V	AC 100V	AC 115V	Line Regulation	
0%	24.015	24.015	24.013	2mV	0.008%
50%	24.014	24.015	24.013	2mV	0.008%
100%	24.014	24.015	24.013	2mV	0.008%
Load Regulation	1mV	0mV	0mV		
	0,004%	0%	0%		

INPUT 200V

Iout \ Vin	AC 170V	AC 200V	AC 230V	Line Regulation	
0%	24.013	24.013	24.013	0mV	0%
50%	24.013	24.013	24.013	0mV	0%
100%	24.013	24.013	24.013	0mV	0%
Load Regulation	0mV	0mV	0mV		
	0%	0%	0%		

2. Temperature Drift Conditions Vin=AC100V Iout=100%

Ta	0C	25C	50C	Temp. Stability	
Vout	24.009	24.036	24.038	29mv	0.12%

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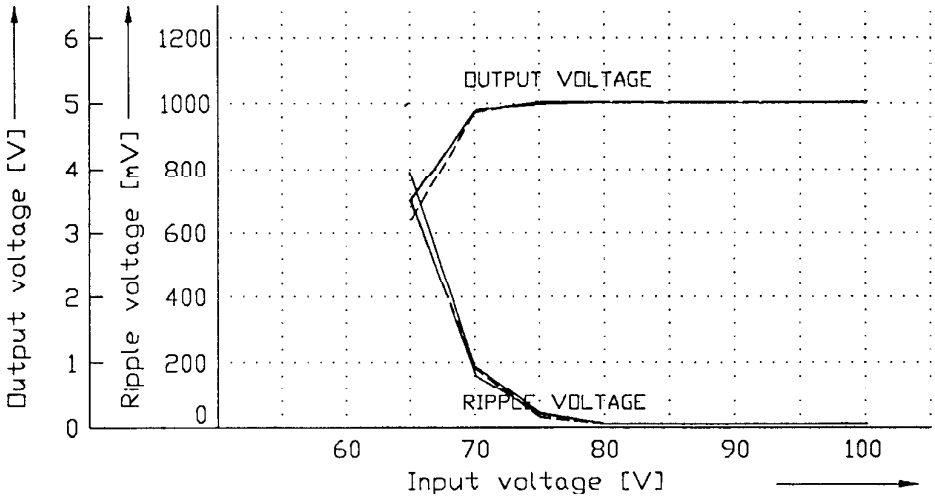
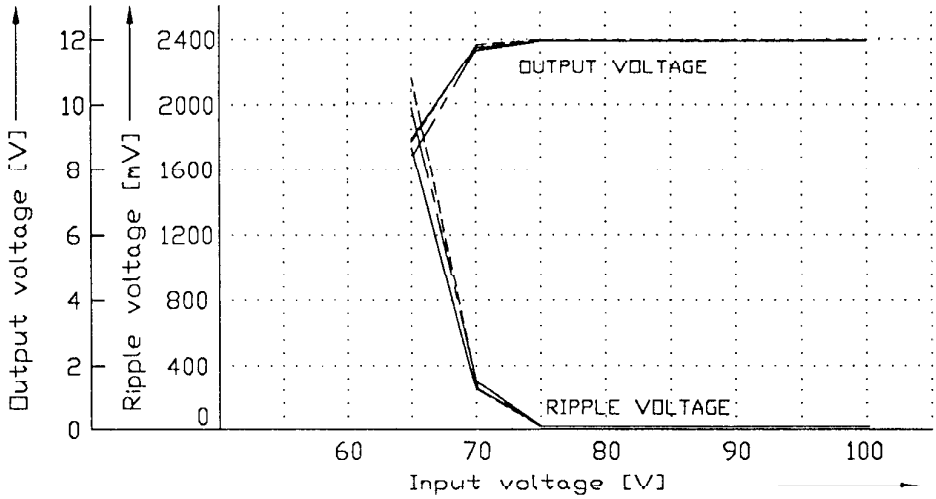
(2) Output voltage and ripple voltage V.S. input voltage

Iout=100%
Conditions Ta: 0C----
25C——
50C- - -

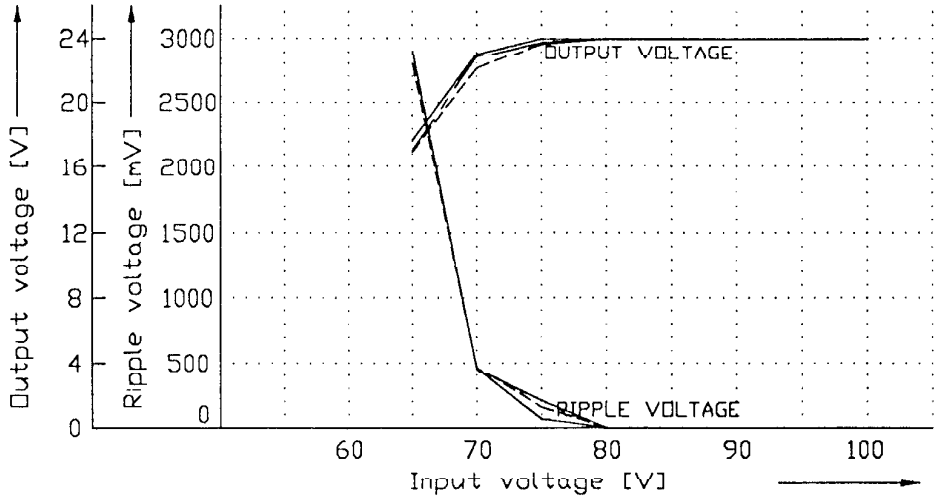
5V



12V



24V



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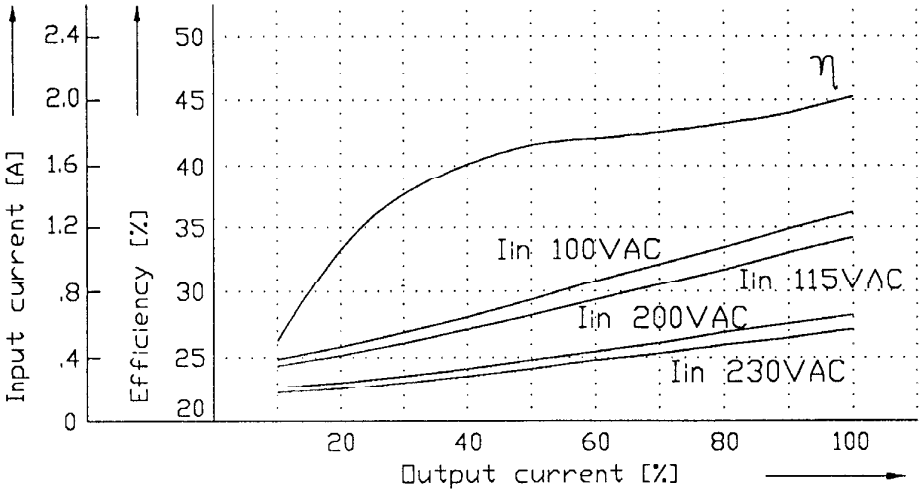
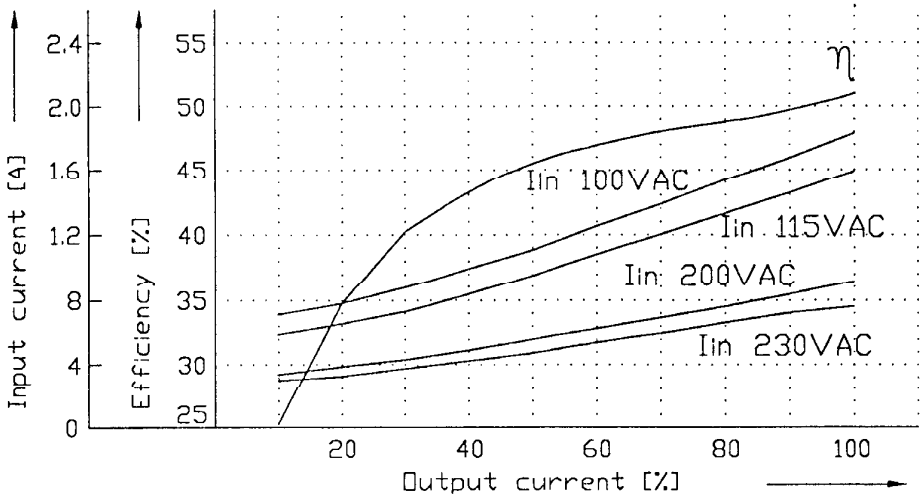
(3) Efficiency and input current V.S. output current

Conditions Ta=25C

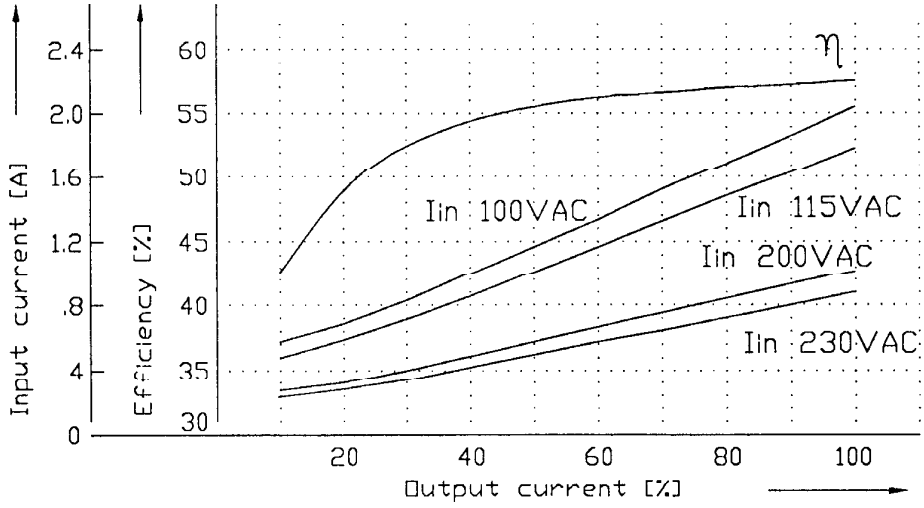
5V



12V



24V



2-2 Warm up voltage drift

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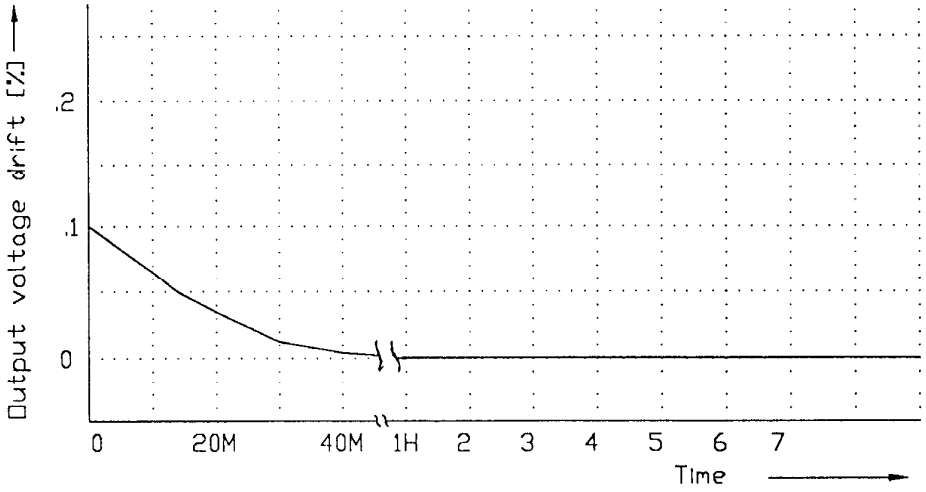
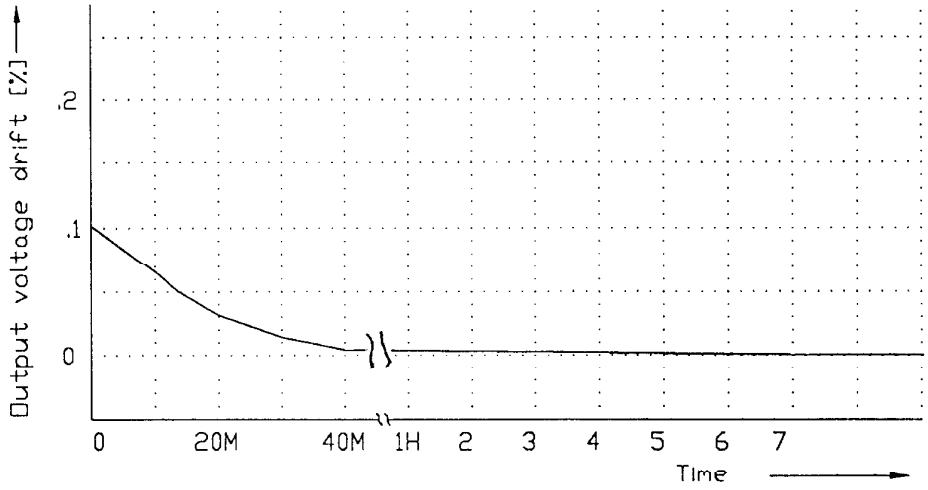
Conditions Vin=AC100V
Vout,Iout=100%
Ta=25C

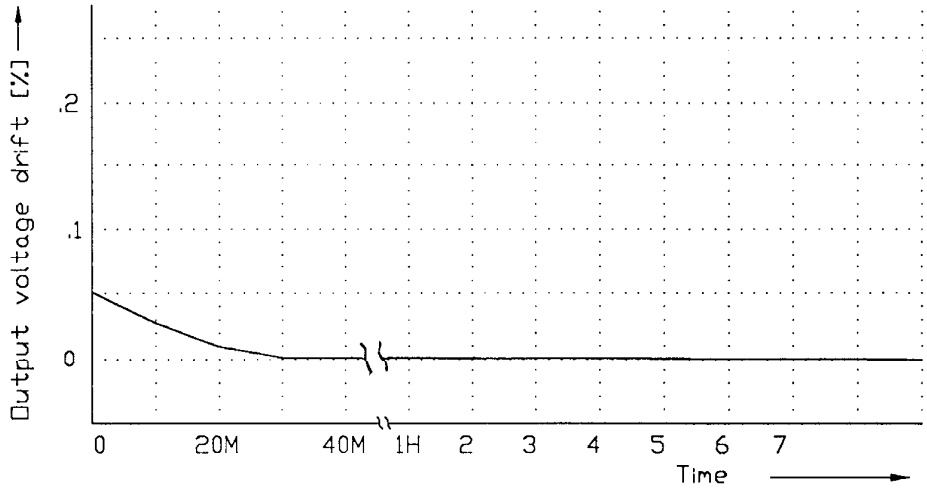
5V



12V



24V



2-3 OCP Characteristics

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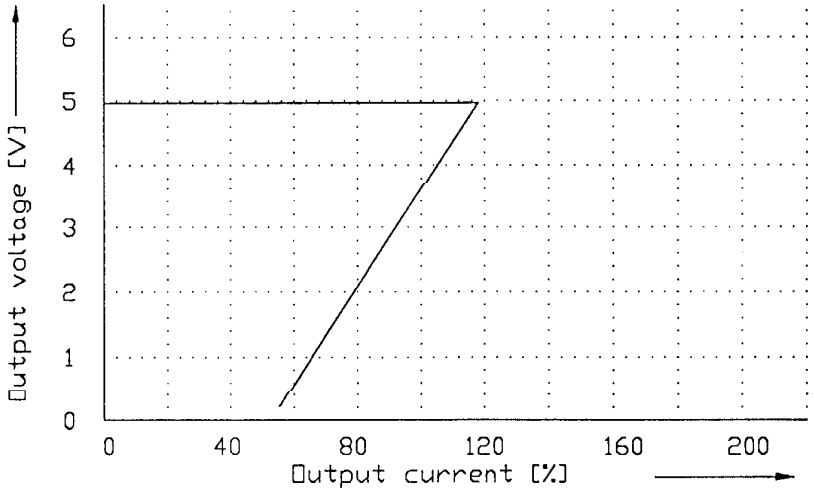
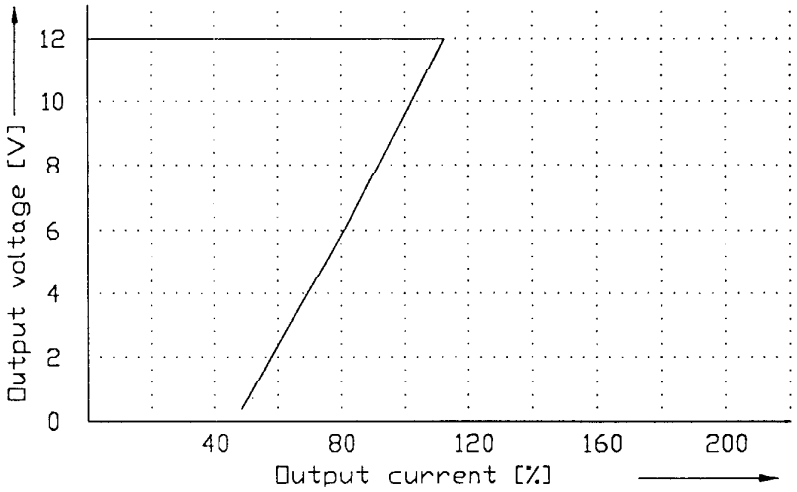
Conditions Ta=25C
Vin: AC 85V ----
AC 100V ——
AC 115V ——

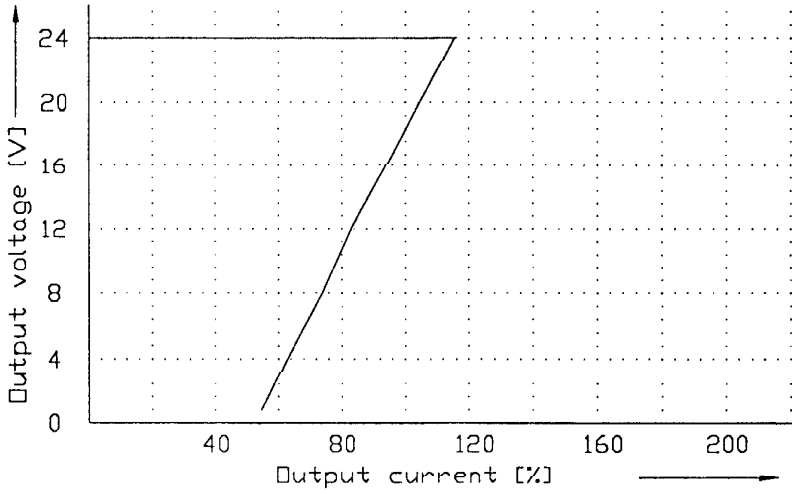
5V



12V



24V



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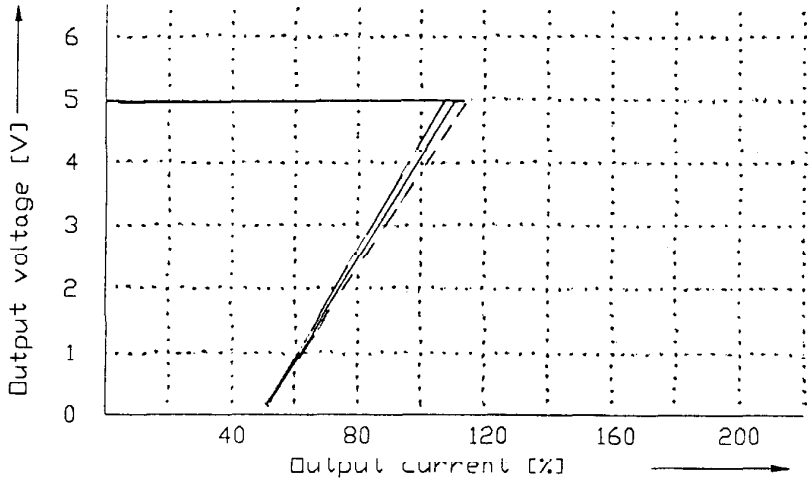
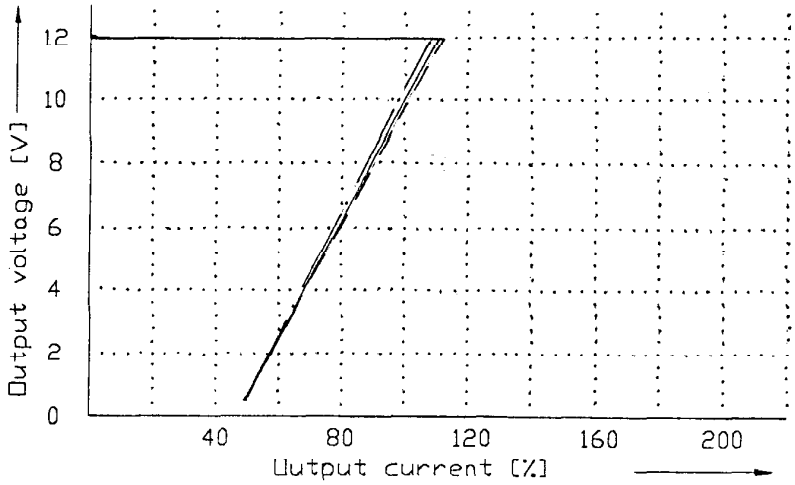
OCP Characteristics

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

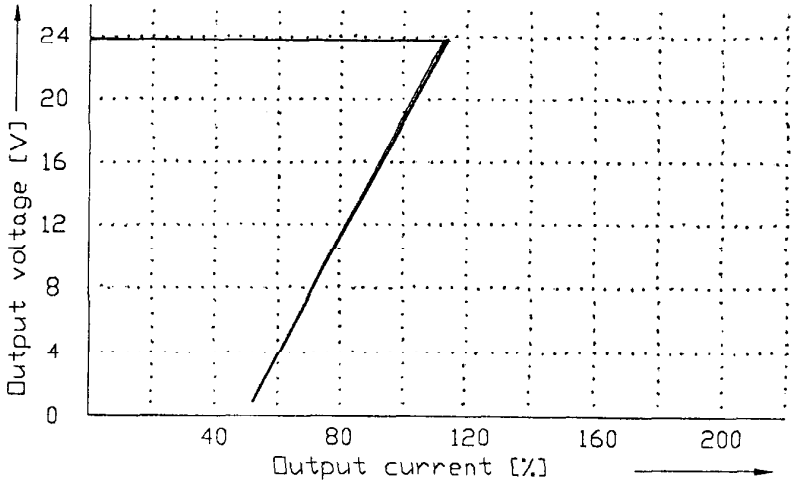
5V



12V



24V

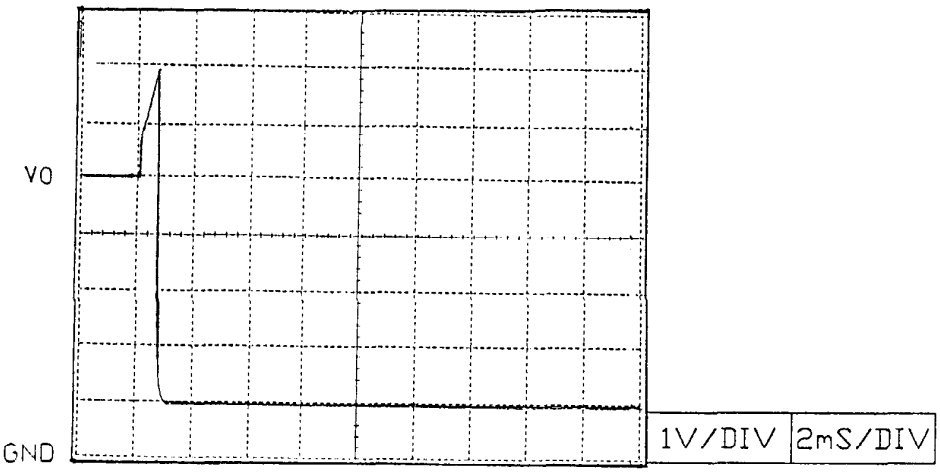


2-4 OVP Characteristics

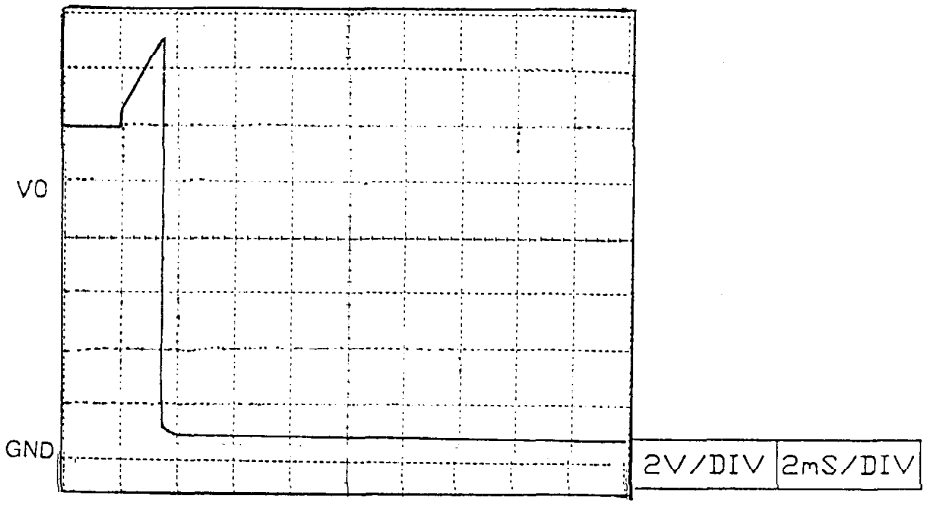
NNS50

Conditions Vin= AC 100V
Iout= 0%
Ta= 25C

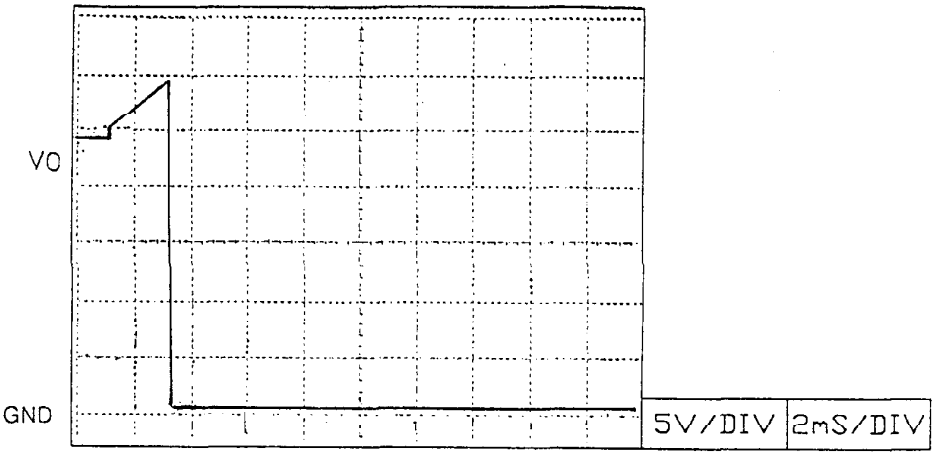
5V



12V



24V



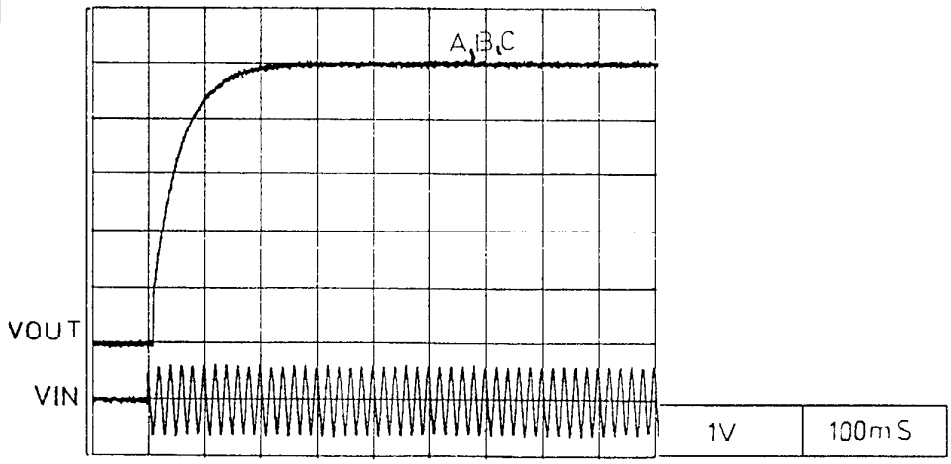
2-5 Output rise time

NNS50

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

Iout= 100%
Ta= 25C

5V



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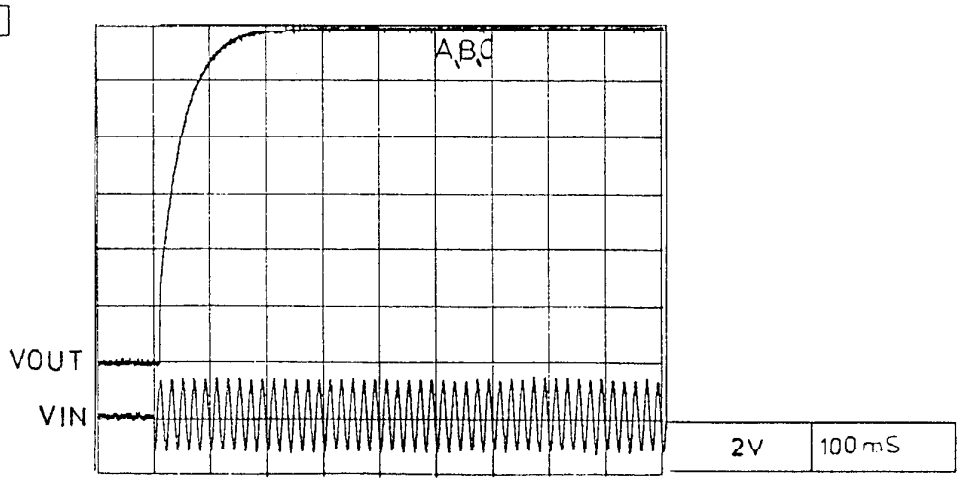
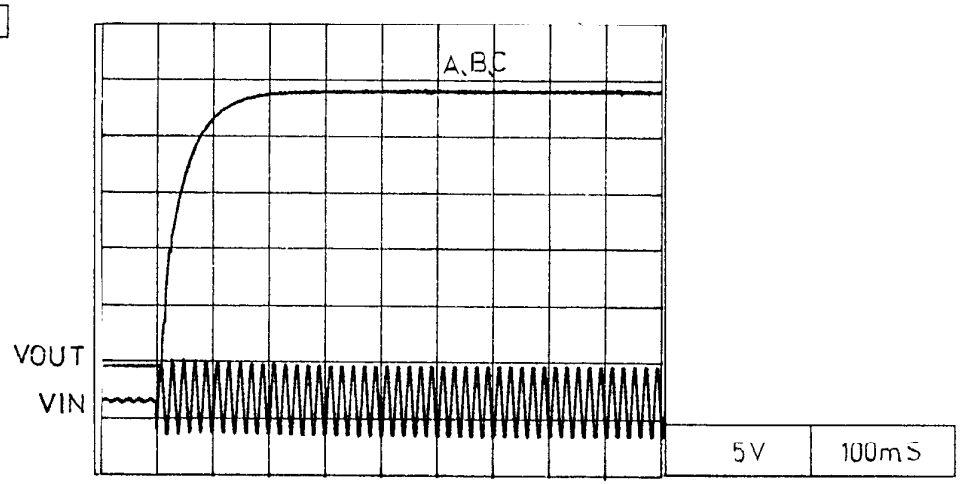


24V



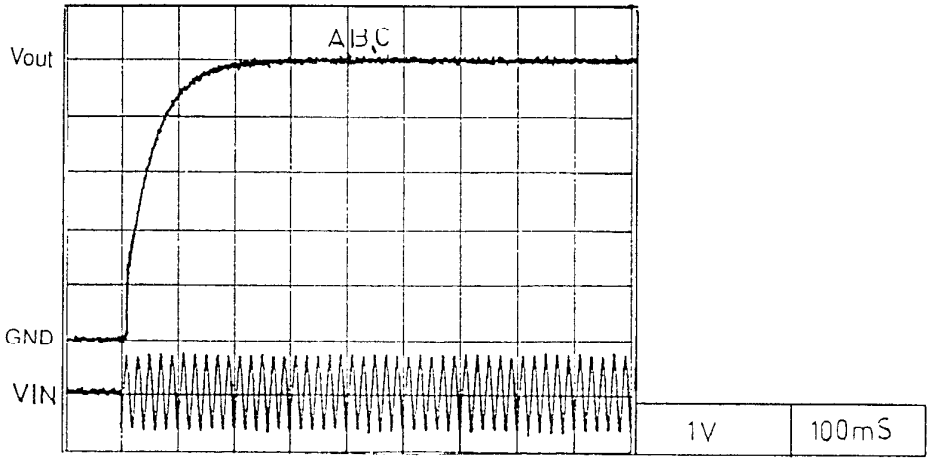
NNS50

Output rise time

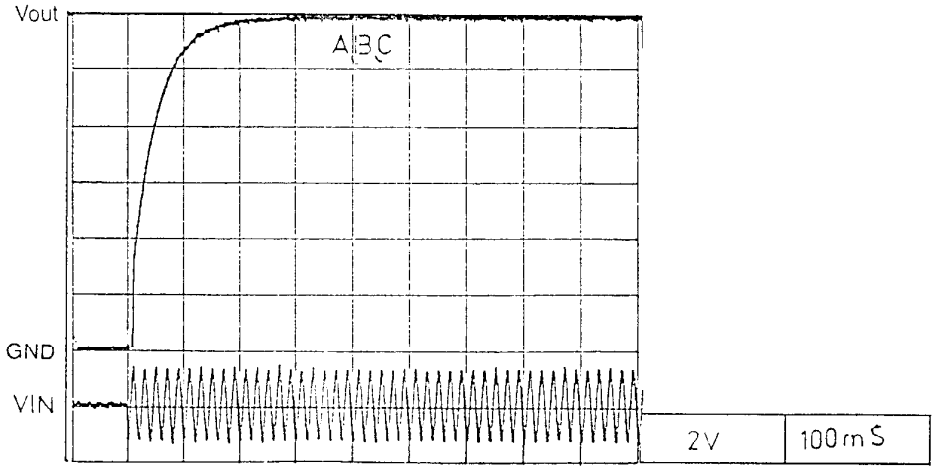
Conditions Vin= 85Vac (A)
100Vac (B)
115Vac (C)

Iout= 0%
Ta= 25C

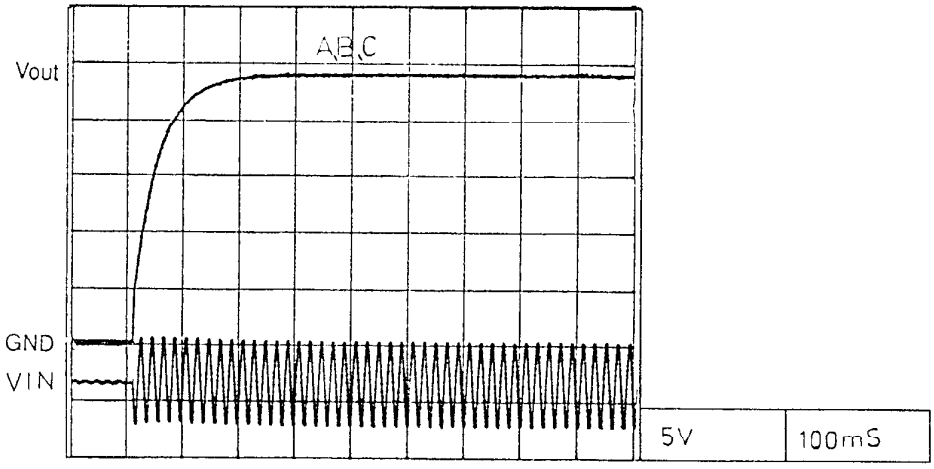
5V



12V



24V



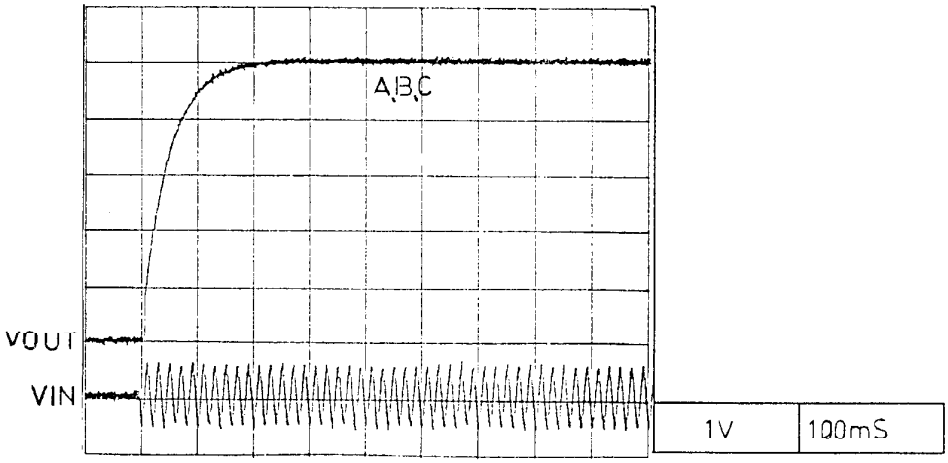
NNS50

Output rise time

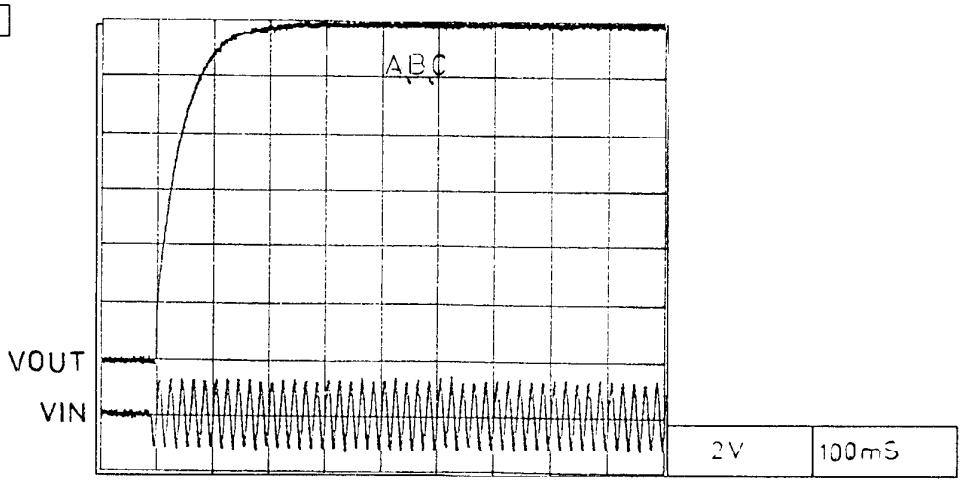
Conditions Vin= 170Vac (A)
200Vac (B)
230Vac (C)

Iout= 100%
Ta= 25C

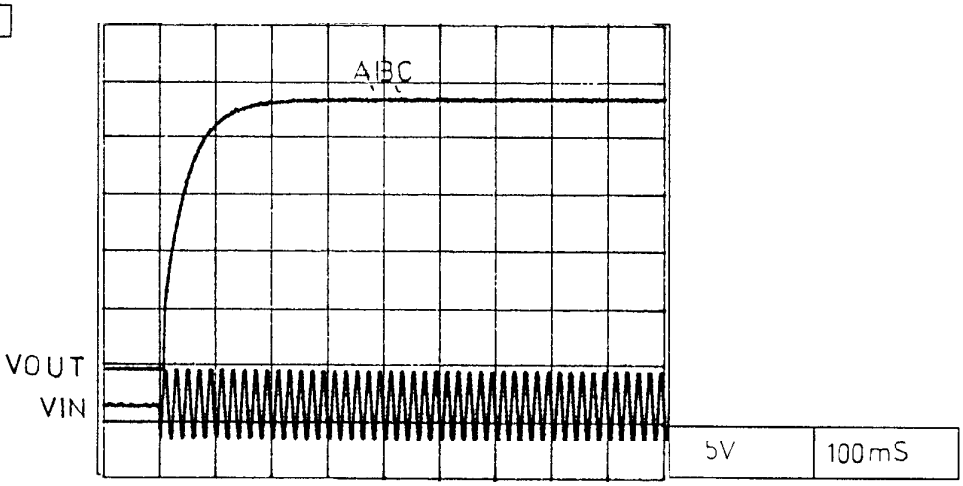
5V



12V



24V



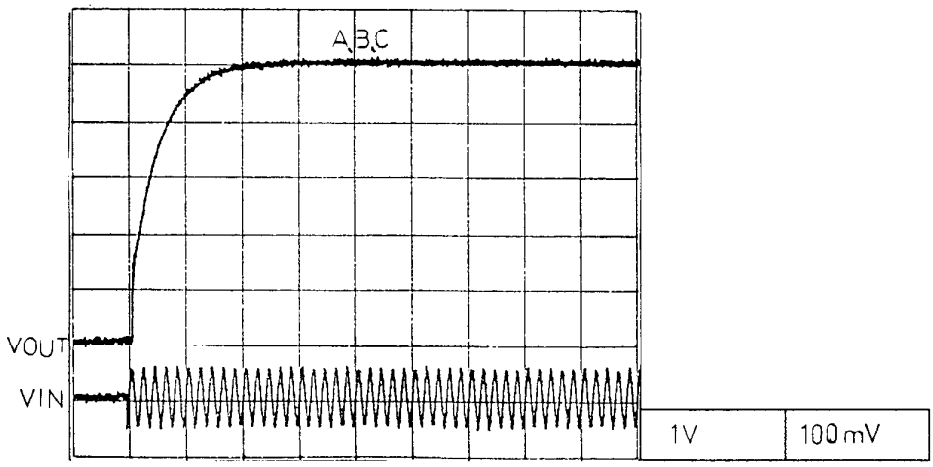
NNS50

Output rise time

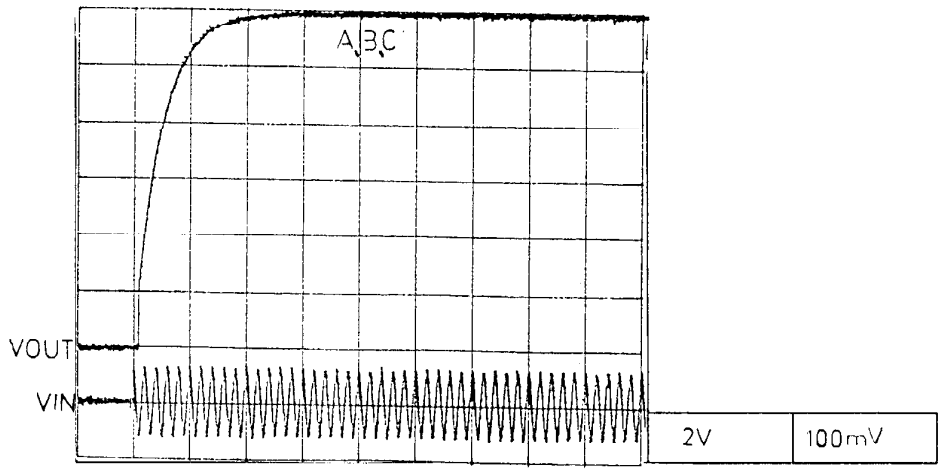
Conditions Vin= 170Vac (A)
200Vac (B)
230Vac (C)

Iout= 0%
Ta= 25C

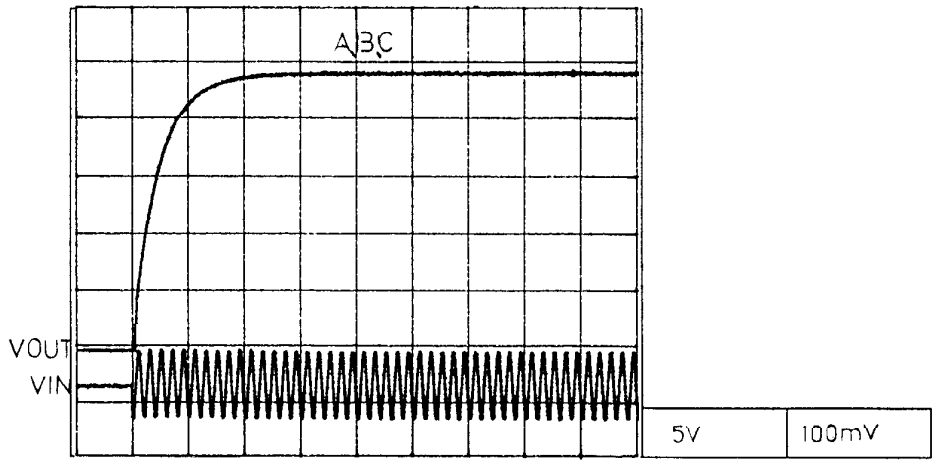
5V



12V



24V



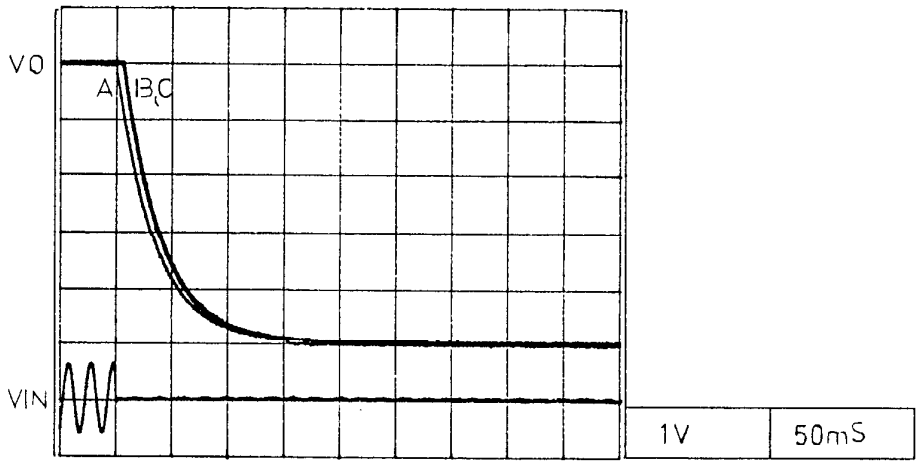
2-6 Output fall time

NNS50

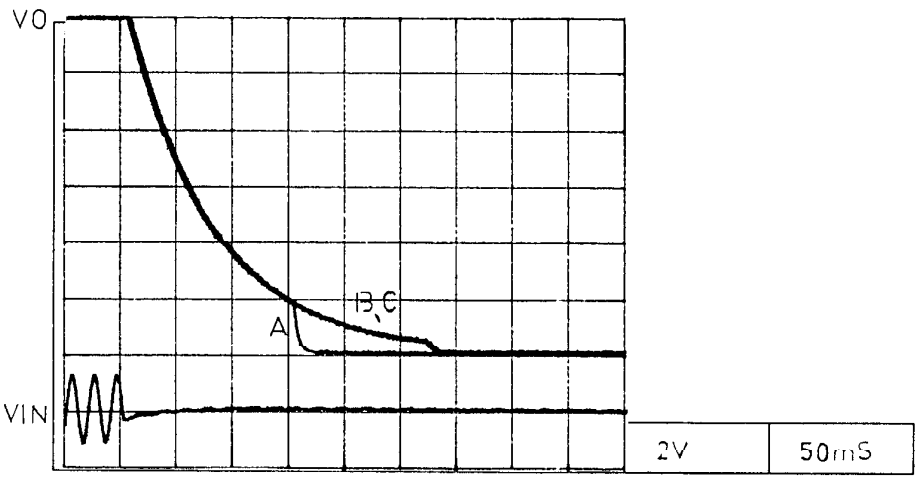
Conditions Vin= 85Vac (A)
100Vac (B)
115Vac (C)

Iout= 100%
Ta= 25C

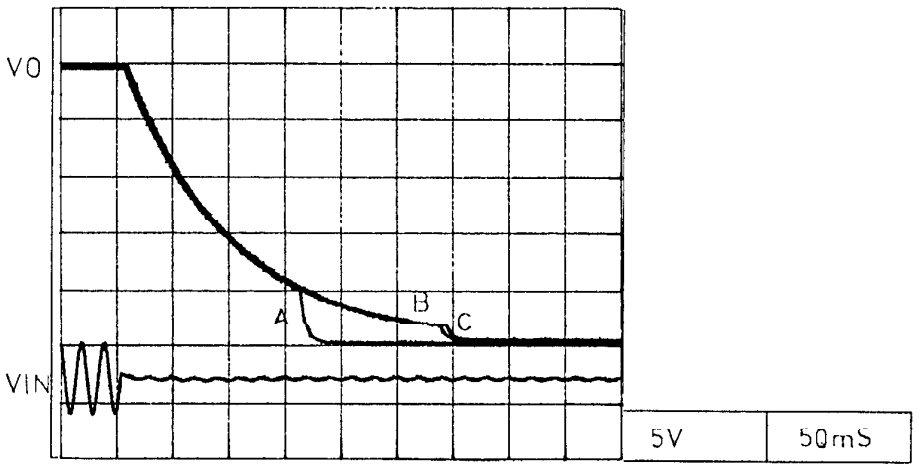
5V



12V



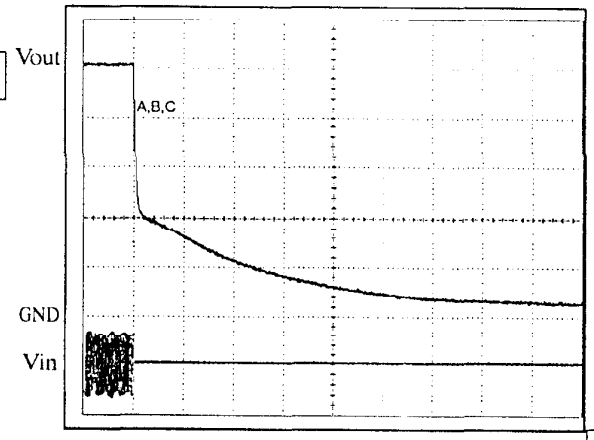
24V



Output Fall Time

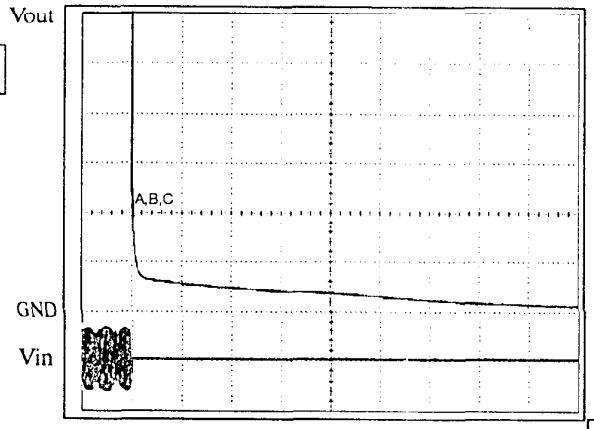
Conditions Vin: 85VAC (A)
100VAC (B)
115VAC (C)
Iout: 0%
Ta: 25°C

5v



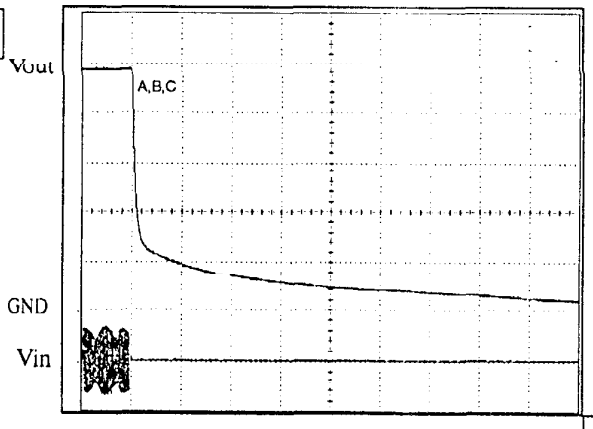
1V/DIV	20s/DIV

12v



2V/DIV	20s/DIV

24v



5V/DIV	20s/DIV

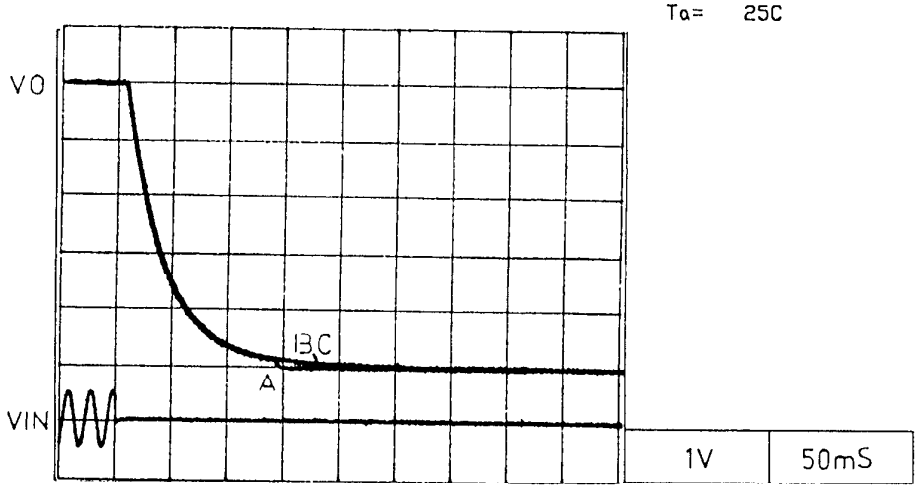
Output fall time

NNS50

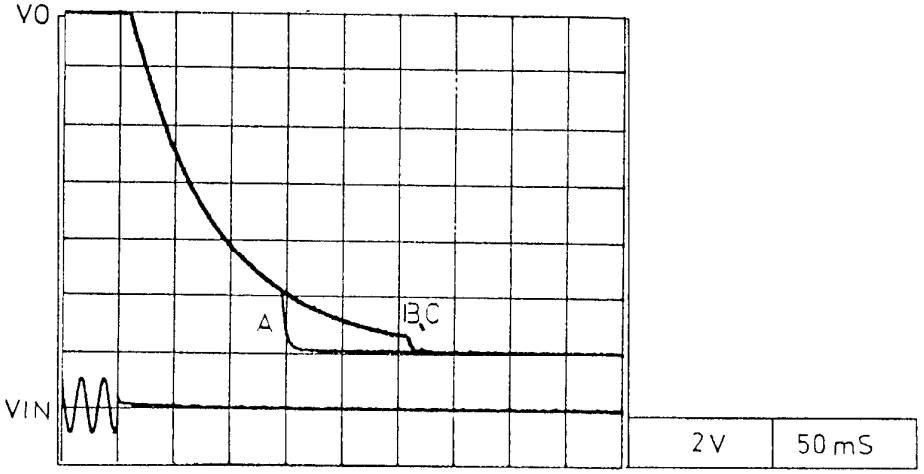
Conditions Vin= 170Vac (A)
200Vac (B)
230Vac (C)

Iout= 100%
Ta= 25C

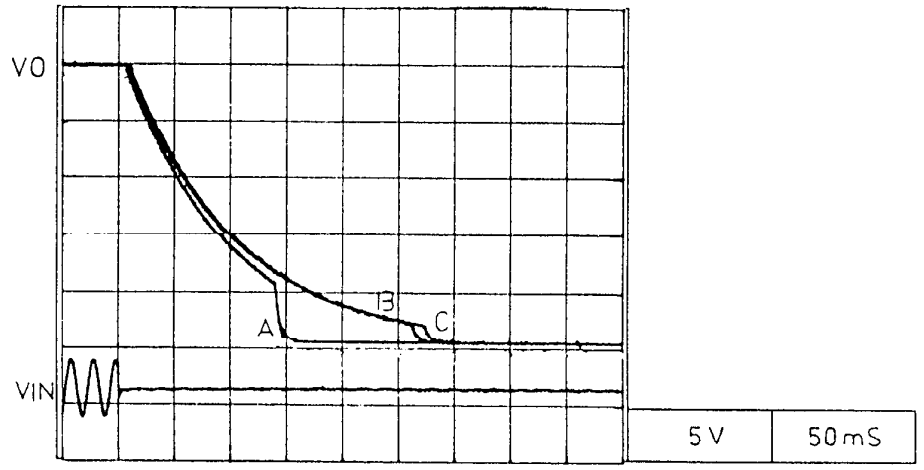
5V



12V



24V



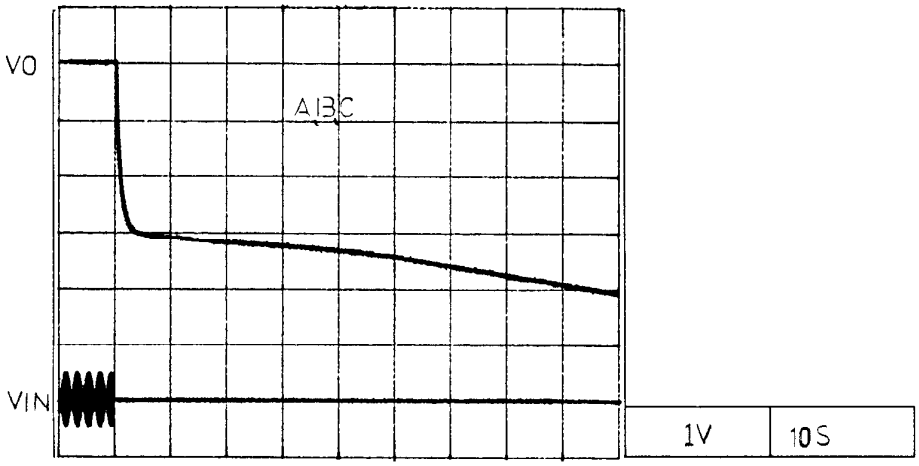
NNS50

Output fall time

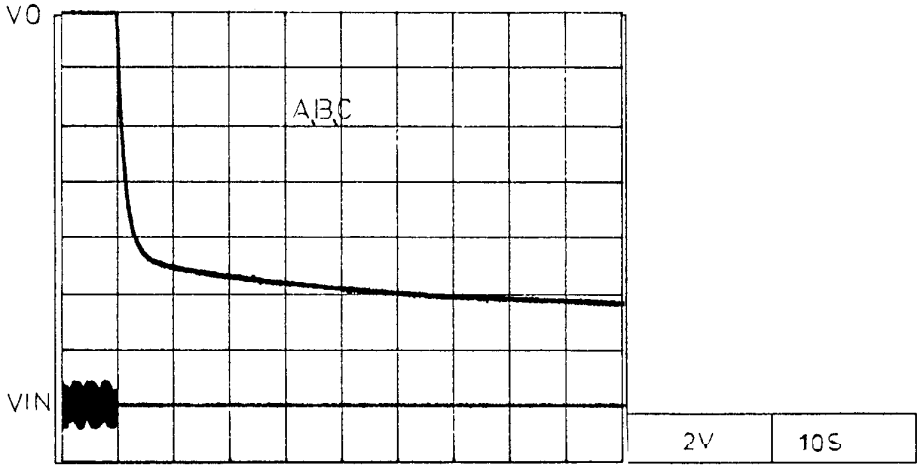
Conditions Vin= 170Vac (A)
200Vac (B)
230Vac (C)

Iout= 0%
Ta= 25C

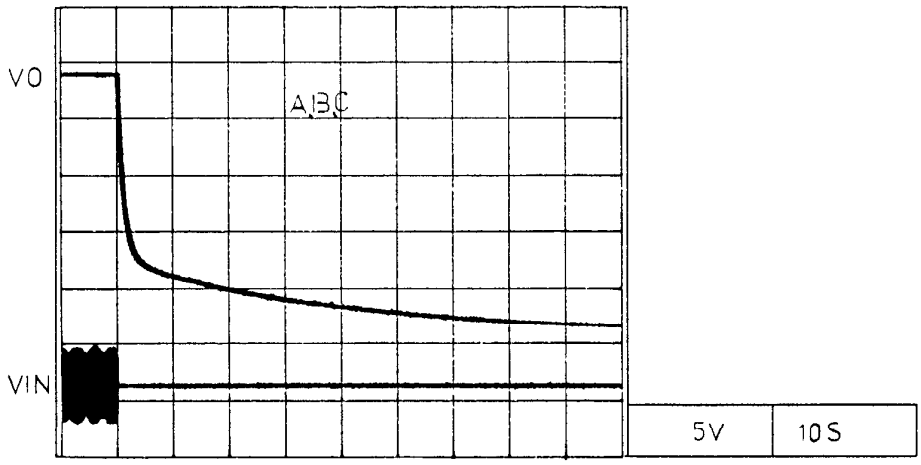
5V



12V



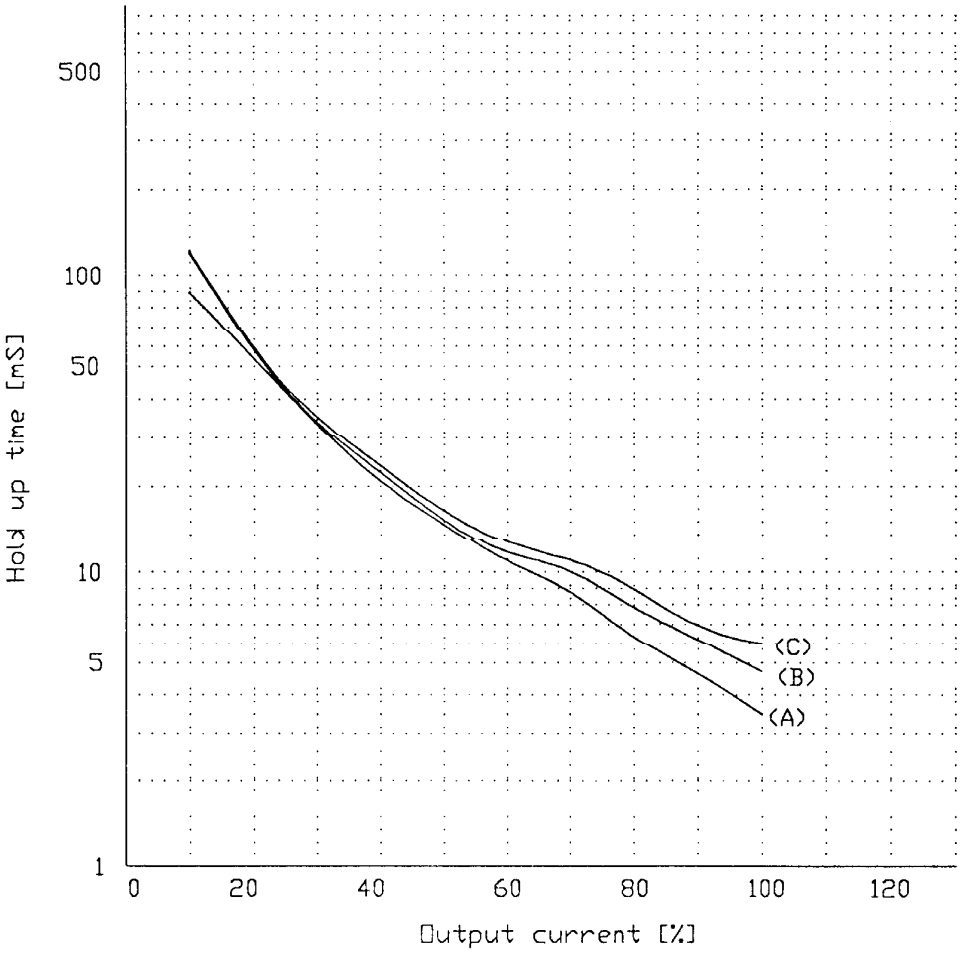
24V



2-7 HOLD UP TIME

CURVE OF 5V

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

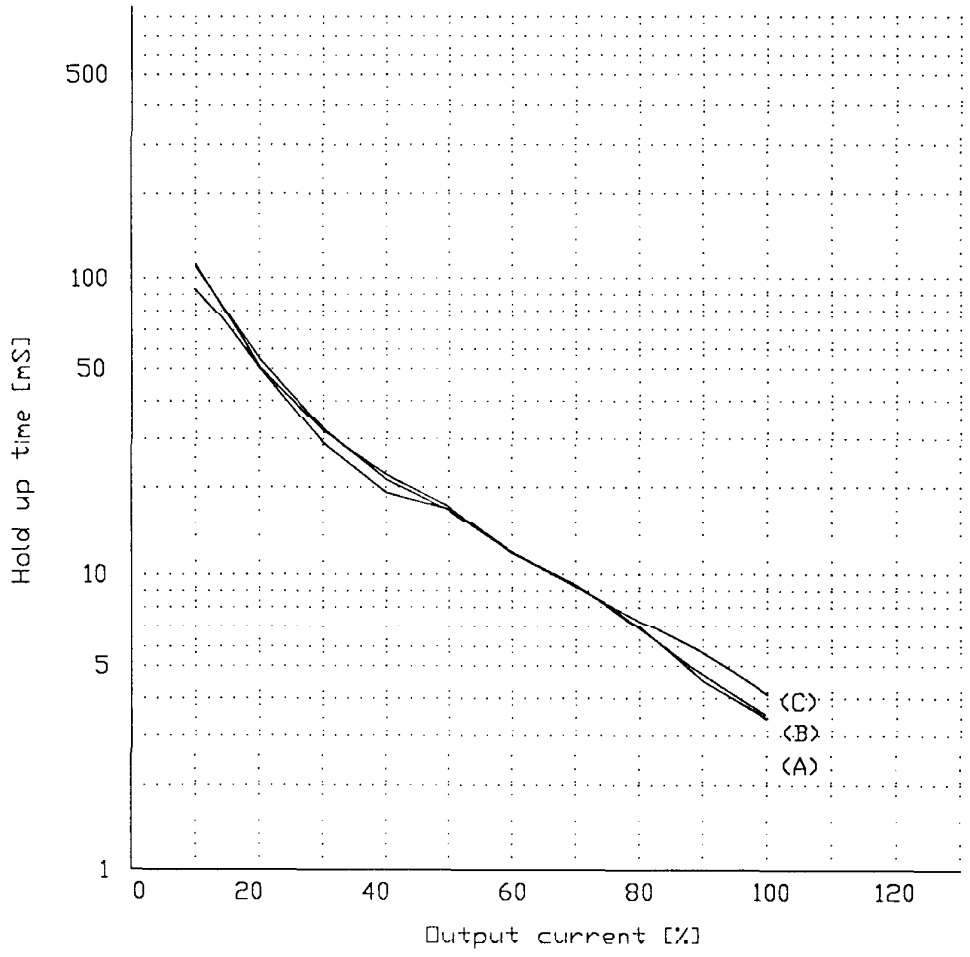


HOLD UP TIME

NNS50

CURVE OF 12V

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

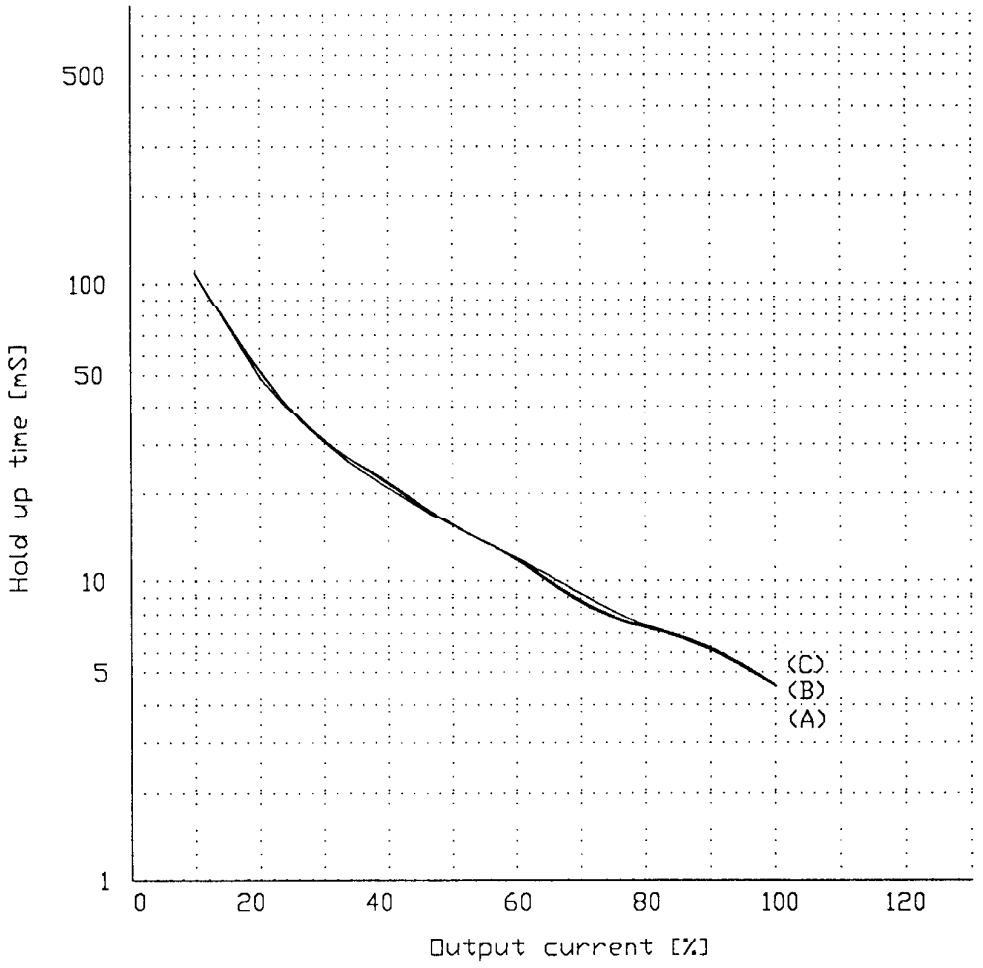


HOLD UP TIME

NNS50

CURVE OF 24V

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



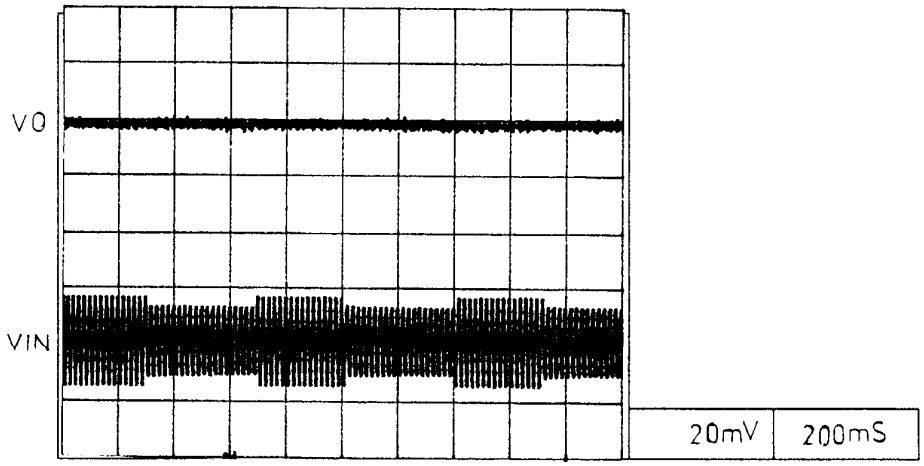
NNS50

2-8 Dynamic line response

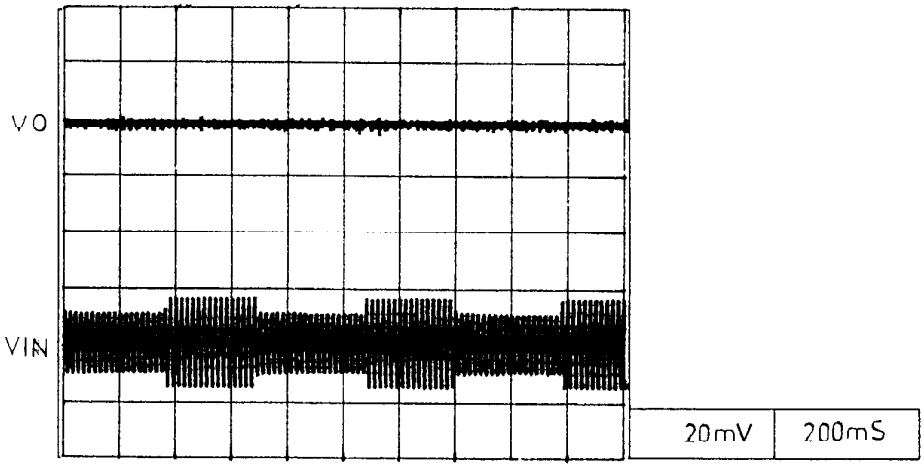
Conditions
Vout=Rated
Iout= 100%
Ta= 25C

Vin: 85Vac ⟷ 115Vac

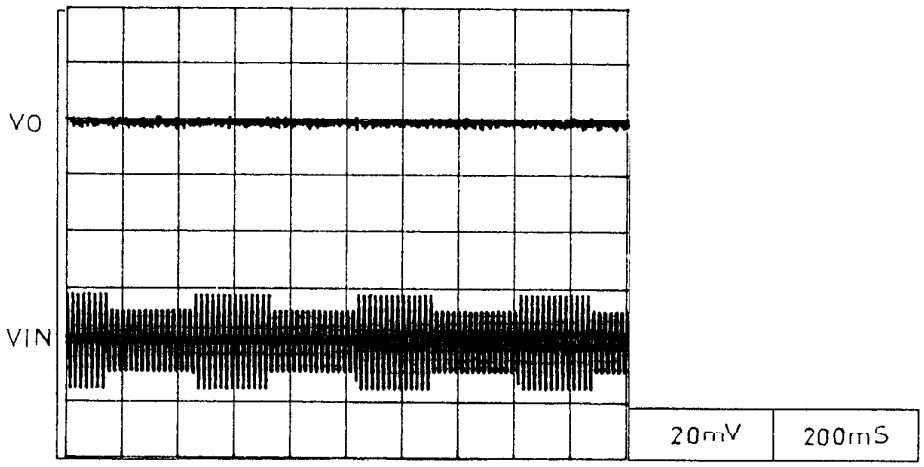
5V



12V



24V



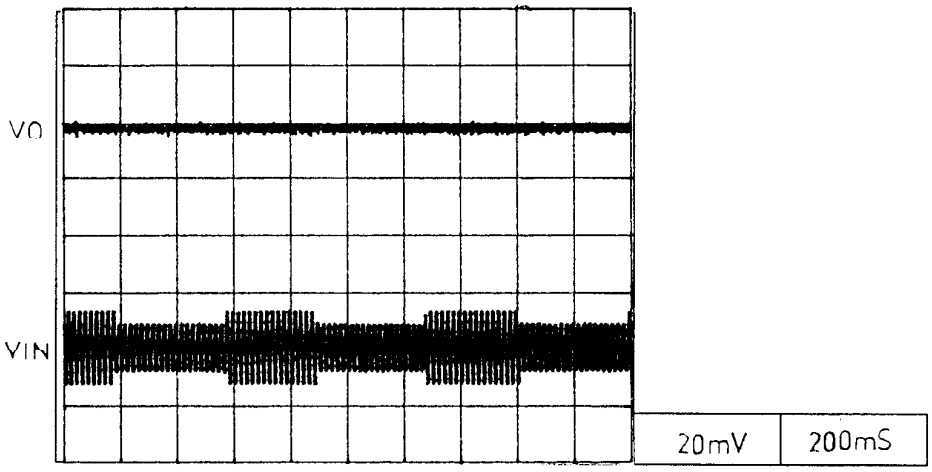
NNS50

Dynamic line response

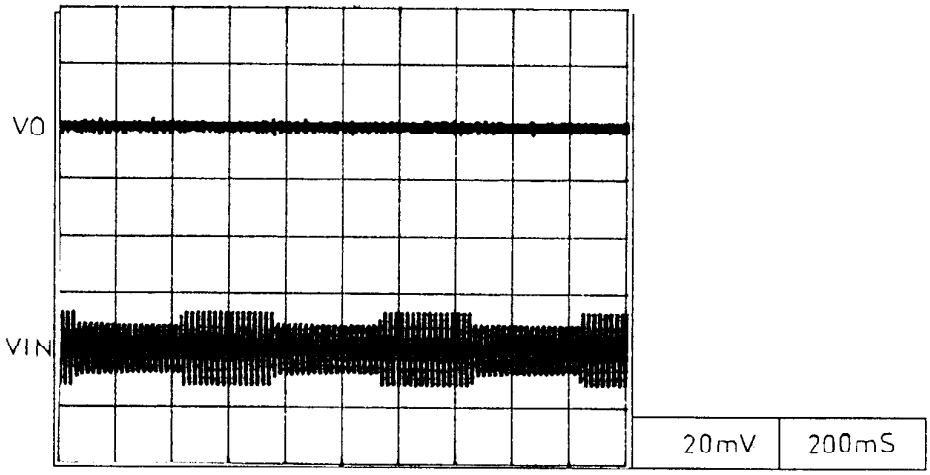
Conditions
Vout=Rated
Iout= 100%
Ta= 25C

Vin: 170Vac ⟷ 230Vac

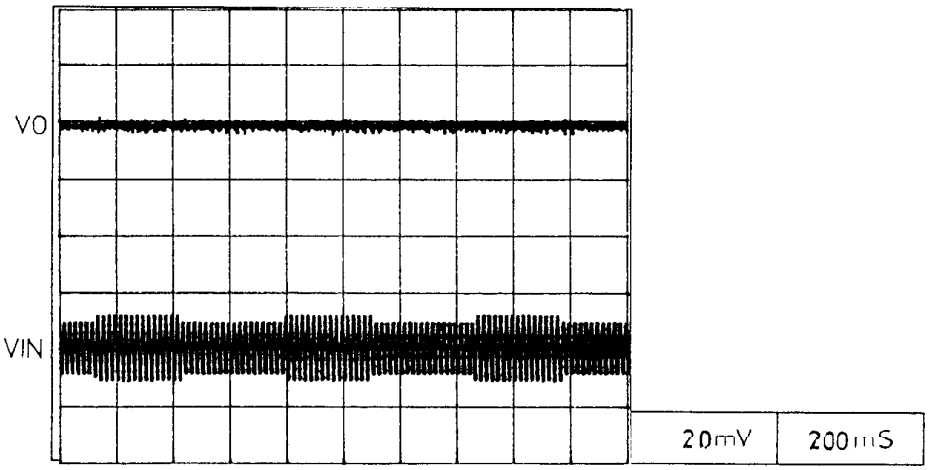
5V



12V



24V



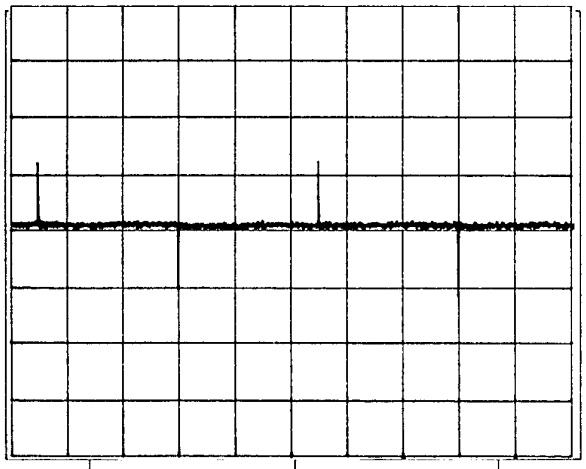
2-9 Dynamic load response

NNS50

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

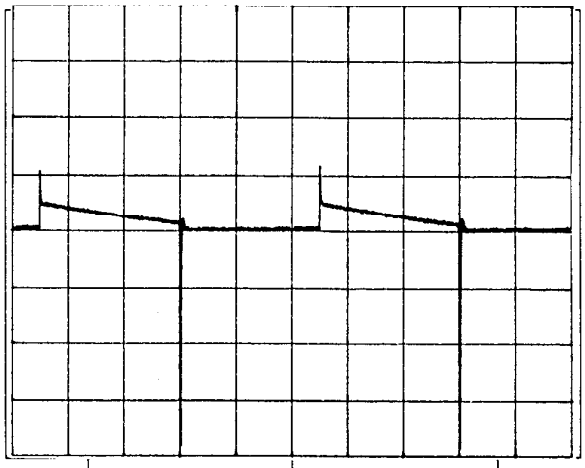
5V

Iout: 50 ⟷ 100% f=100Hz



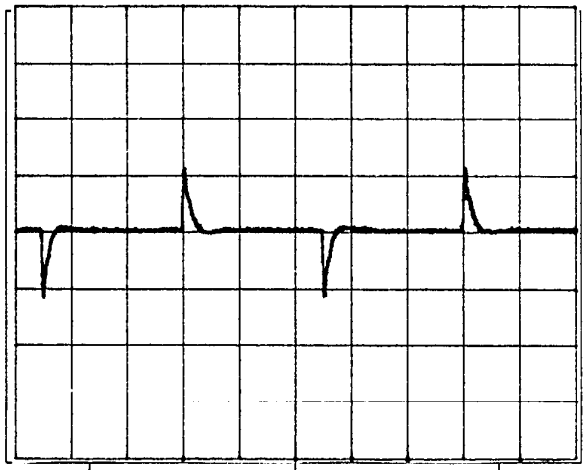
50mv\DIV	2mS/DIV
+ 1.3%	- 1.2%

Iout: 0 ⟷ 100% f=100Hz



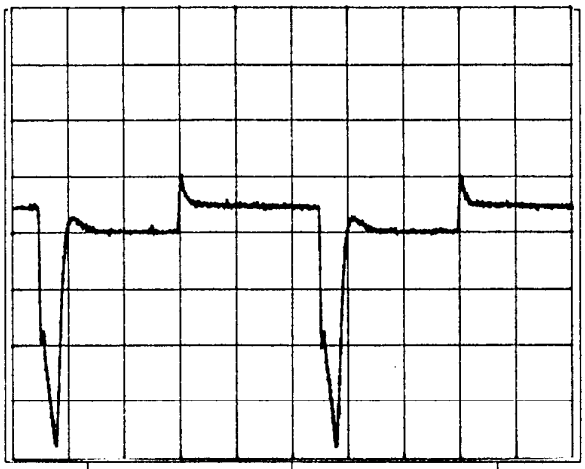
100mV/DIV	2mS/DIV
+2.4%	- 7.6%

Iout: 50 ⟷ 100% f=1KHz



50mV/DIV	0.2mS/DIV
+1.2%	-1.2%

Iout: 0 ⟷ 100% f=1KHz



100mV/DIV	0.2mS/DIV
+ 2%	- 7.6%

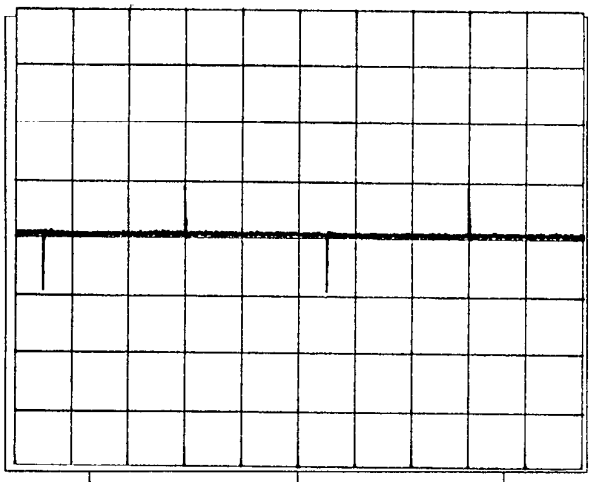
Dynamic load response

NNS50

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

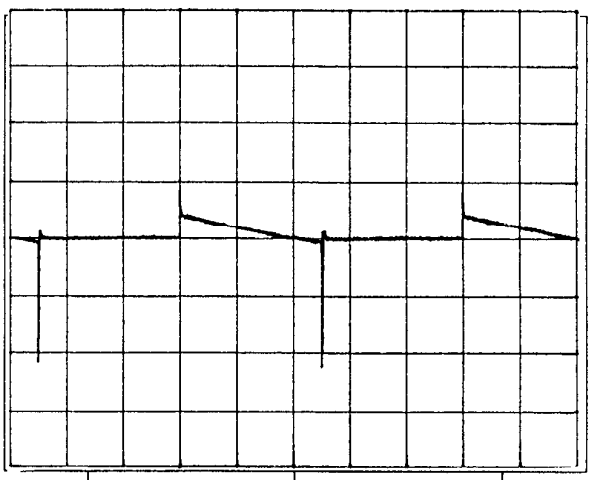
12V

Iout: 50 ⟷ 100% f=100Hz



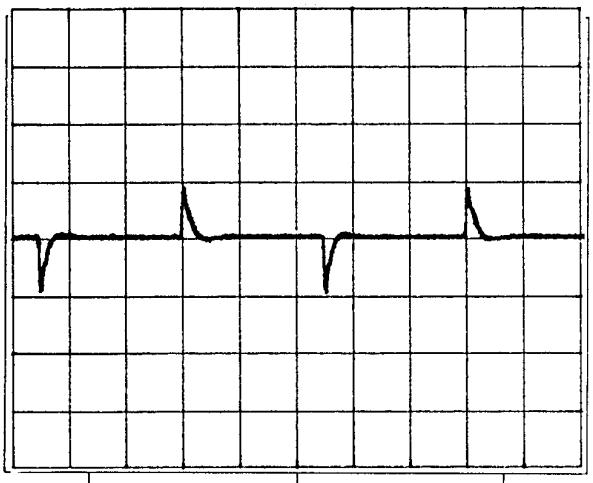
50mV/DIV	5mS/DIV
+0.37%	-0.37%

Iout: 0 ⟷ 100% f=100Hz



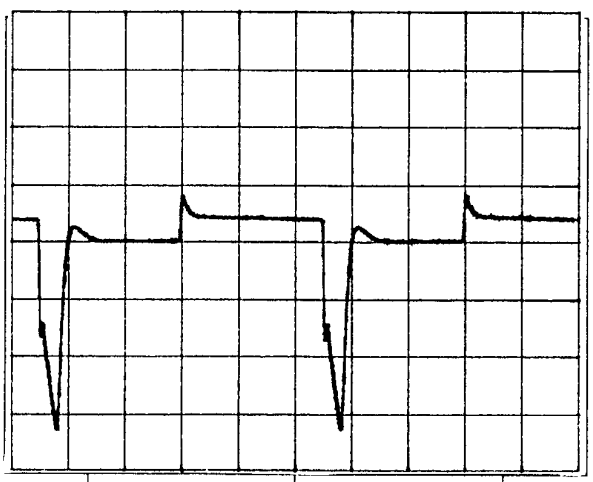
100mV/DIV	2mS/DIV
+0.66%	-1.9%

Iout: 50 ⟷ 100% f=1KHz



50mV/DIV	0.2mS/DIV
+0.37%	-0.37%

Iout: 0 ⟷ 100% f=1KHz



100mV/DIV	0.2mS/DIV
+0.66%	-2.75%

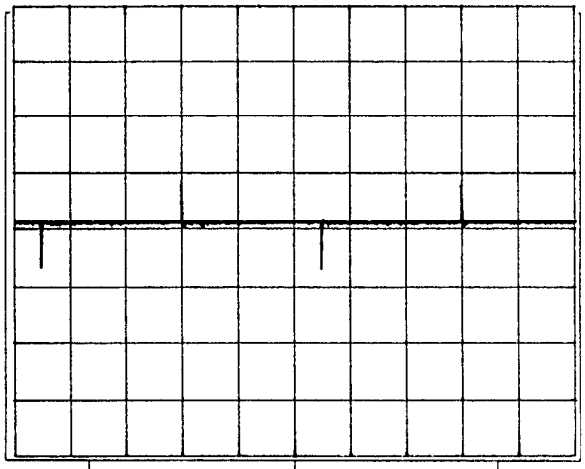
Dynamic load response

NNS50

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

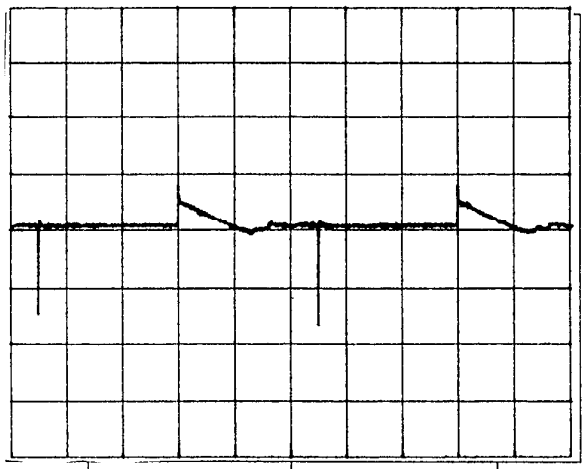
24V

Iout: 50 ⟷ 100% f=100Hz



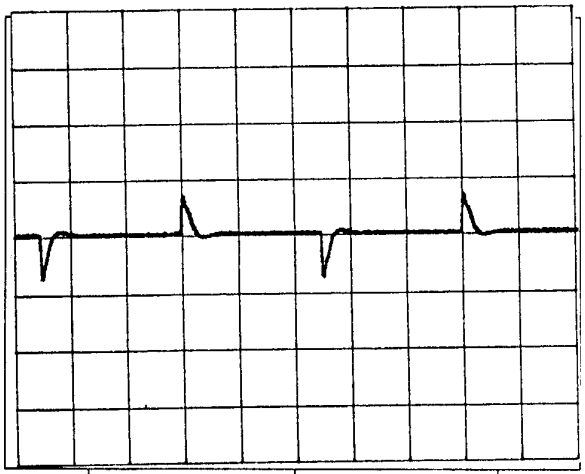
50mV/DIV	2mS/DIV
+0.17%	-0.17%

Iout: 0 ⟷ 100% f=100Hz



100mV/DIV	2mS/DIV
+0.33%	-0.71%

Iout: 50 ⟷ 100% f=1KHz



50mV/DIV	0.2mS/DIV
+0.15%	-0.15%

Iout: 0 ⟷ 100% f=1KHz

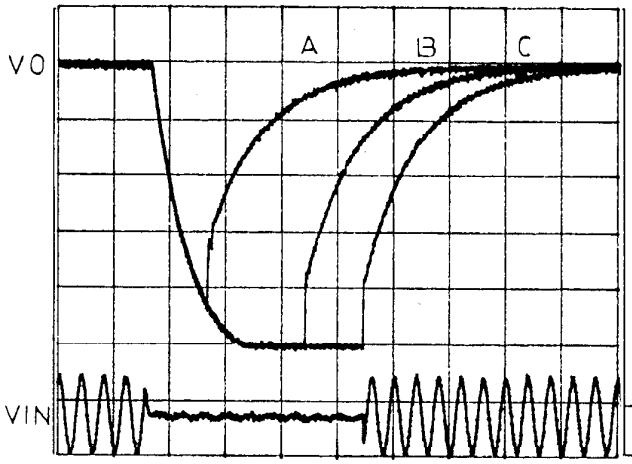
100mV/DIV	0.2mS/DIV
+0.25%	-1.6%

2-10 Response to brown out

NNS50

Conditions
Vin= 100Vac
Iout= 100%
Ta= 25C

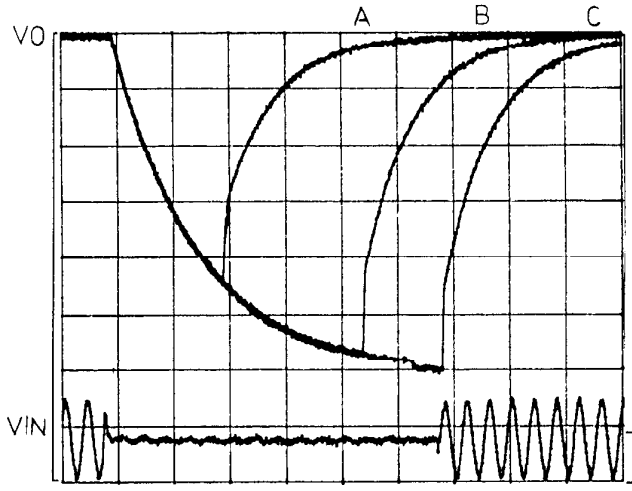
5V



Brown out time
A: 50mS
B: 137mS
C: 187mS

1V/DIV | 50mS/DIV

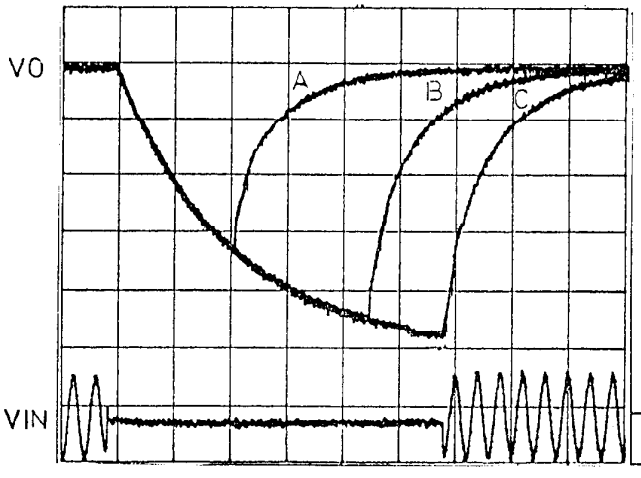
12V



Brown out time
A: 97mS
B: 219mS
C: 285mS

2V/DIV | 50mS/DIV

24V



Brown out time
A: 103mS
B: 222mS
C: 285mS

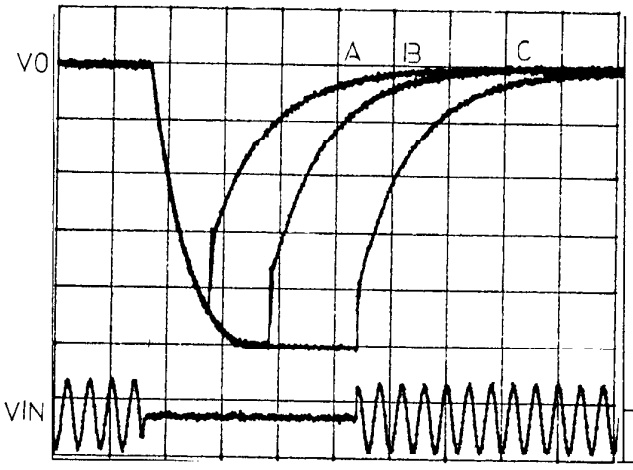
5V/DIV | 50mS/DIV

Response to brown out

NNS50

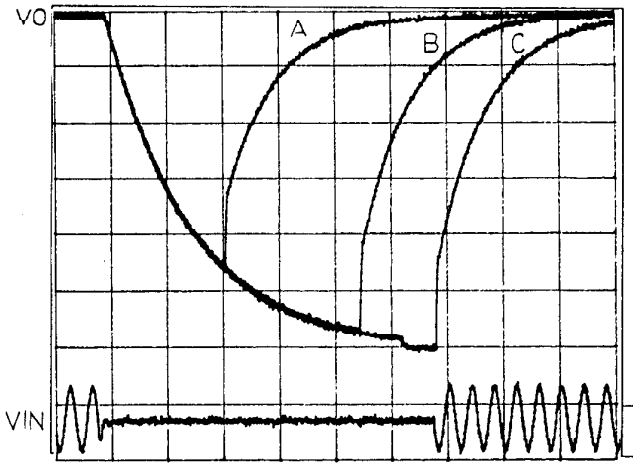
Conditions
Vin= 200Vac
Iout= 100%
Ta= 25C

5V



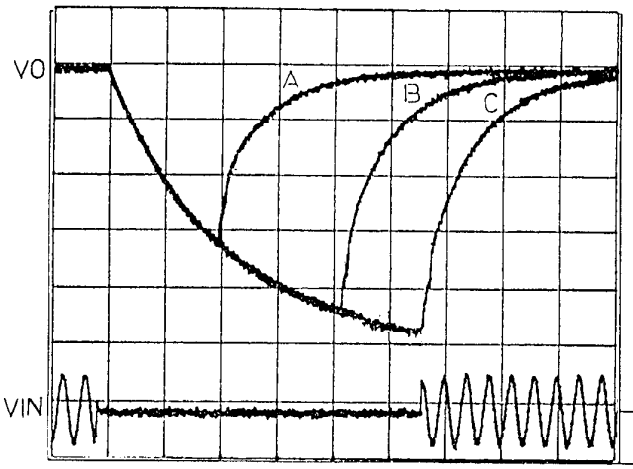
Brown out time
A: 53mS
B: 106mS
C: 187mS

12V



Brown out time
A: 109mS
B: 225mS
C: 297mS

24V



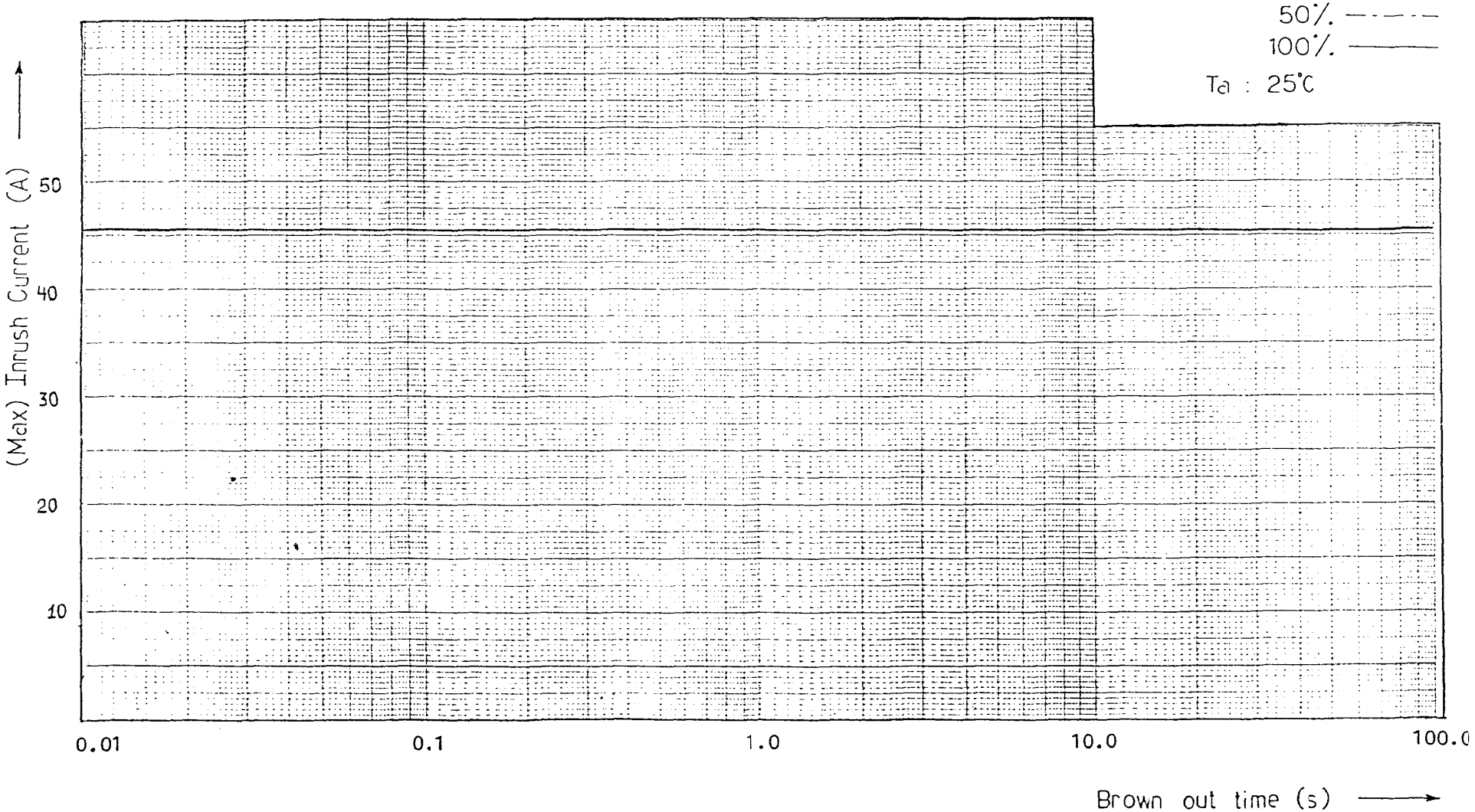
Brown out time
A: 100mS
B: 203mS
C: 278mS

2-11 Inrush Current Characteristics

NNS50

T-31

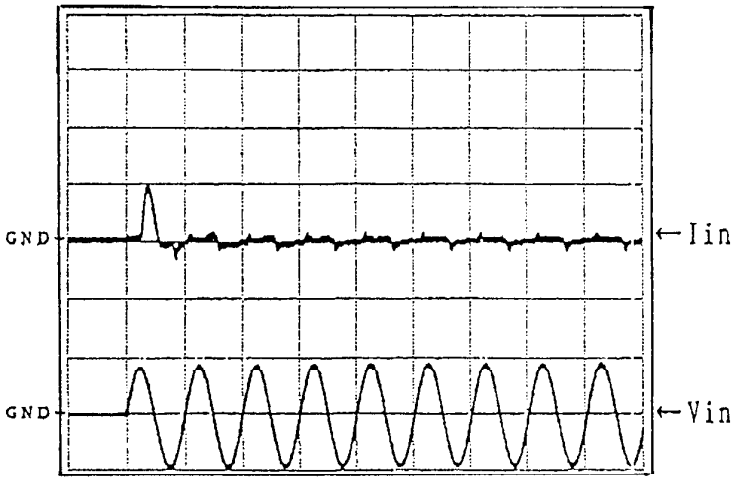
Vin : AC100 v
Iout : 0% ------
50% — · — · —
100% ——
Ta : 25°C



NNS50

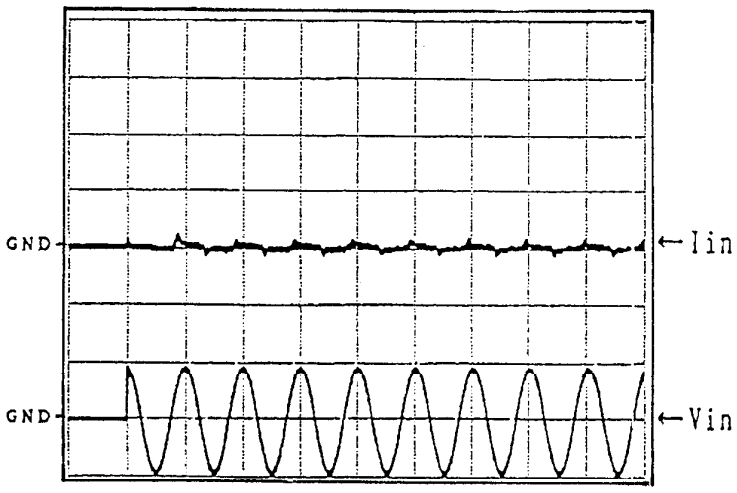
Inrush current waveform

Conditions
Vin= 100Vac
Iout= 100%
Ta= 25C



50 A/DIV 20 mS/DIV

Switch on phase angle of input AC voltage
ø=0°



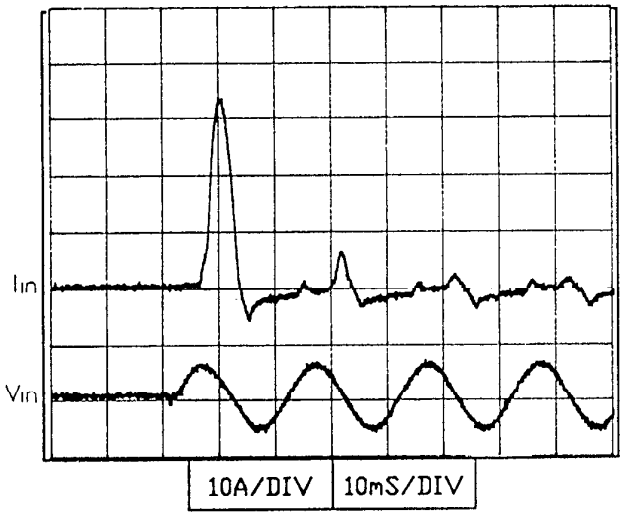
50 A/DIV 20 mS/DIV

Switch on phase angle of input AC voltage
ø=90°

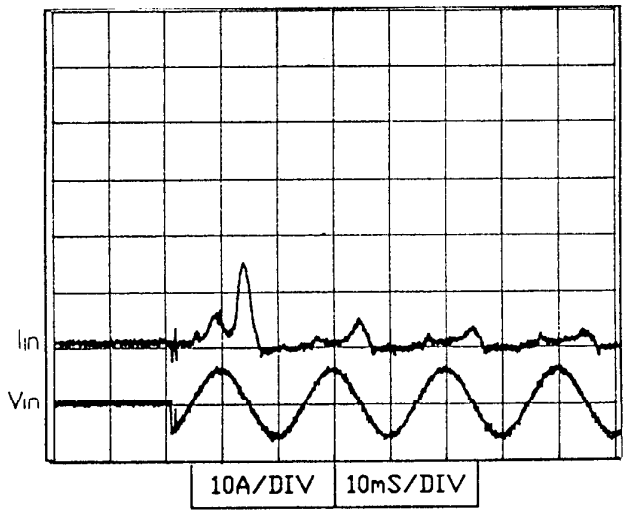
Inrush current waveform

NNS50

Conditions
Vin= 230Vac
Iout= 100%
Ta= 25C



Switch on phase angle
of input AC voltage
ϕ=0°



Switch on phase angle
of input AC voltage
ϕ=90°

2-12 Leakage current

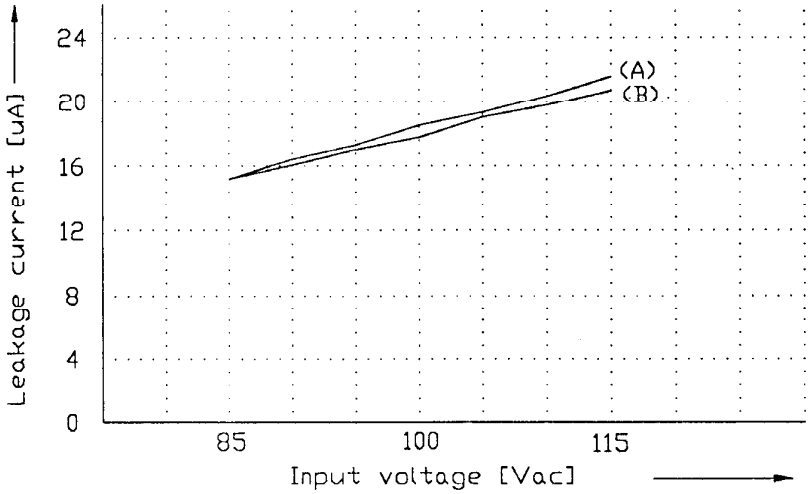
NNS50

F.L ——— A
N.L ——— B

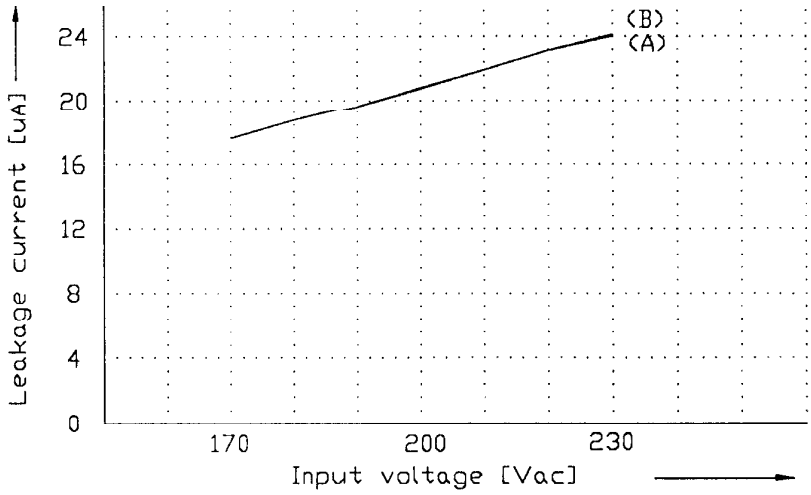
Ta= 25C

5V

Iout=0%



Iout=100%



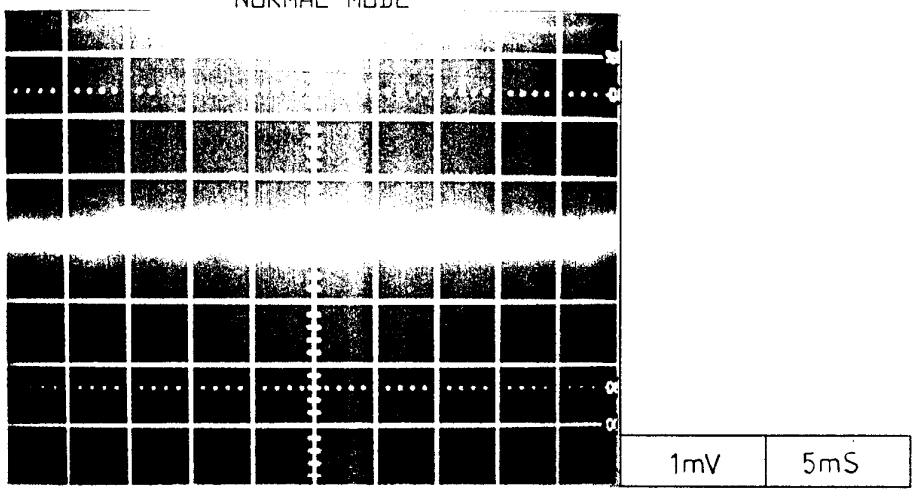
2-13 OUTPUT-RIPPLE, NOISE

NNS50

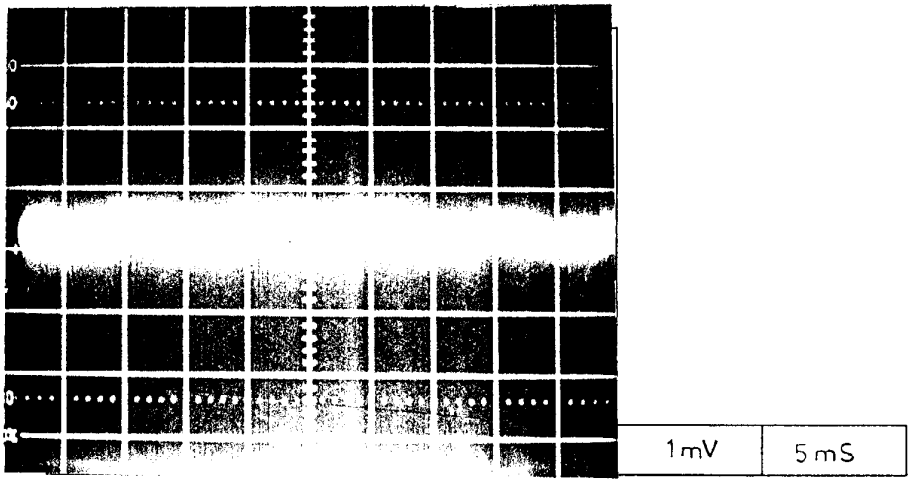
Conditions
Vin= 100Vac
Iout= 100%
Ta= 25C

NORMAL MODE

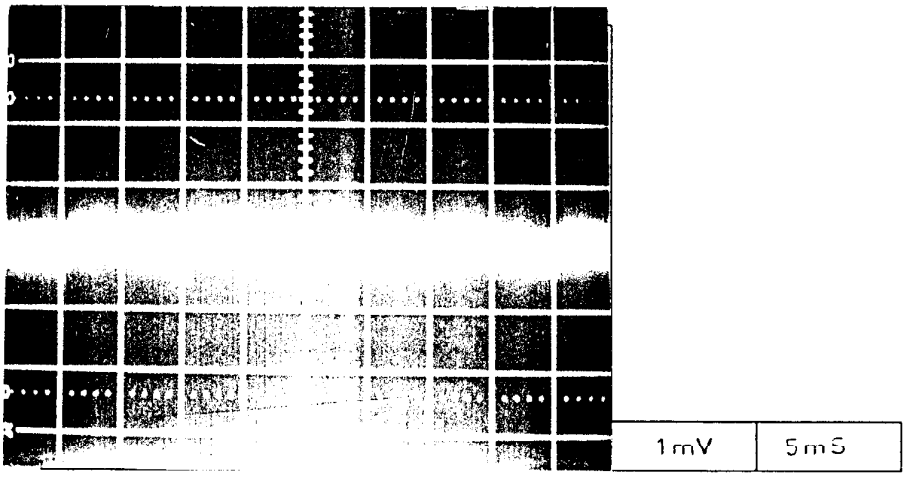
5V



12V



24V



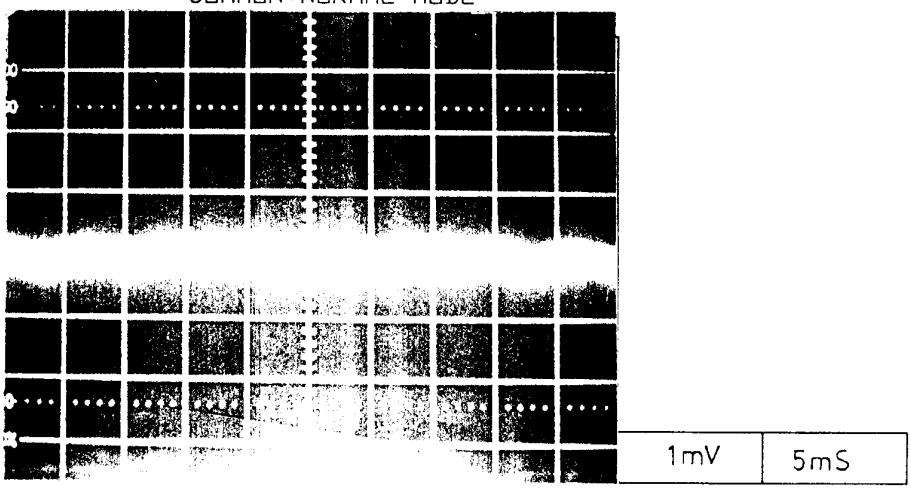
NNS50

OUTPUT-RIPPLE, NOISE

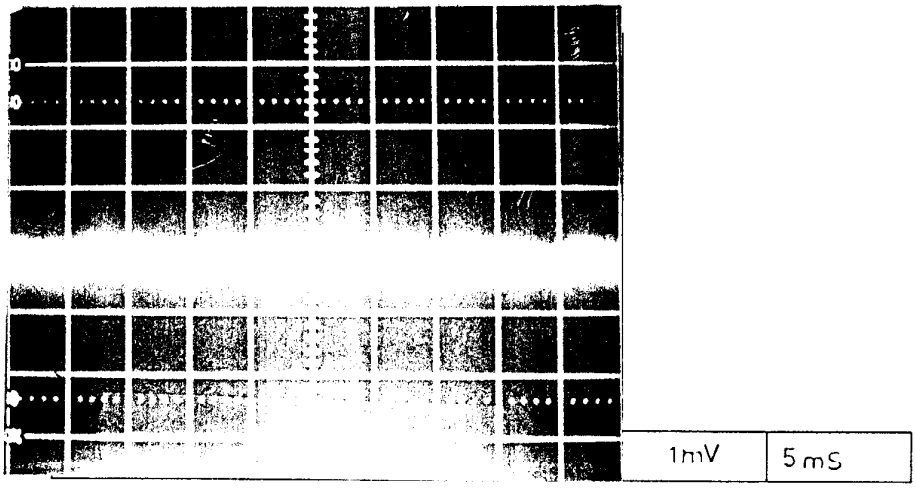
Conditions
Vin= 100Vac
Iout= 100%
Ta= 25C

COMMON+NORMAL MODE

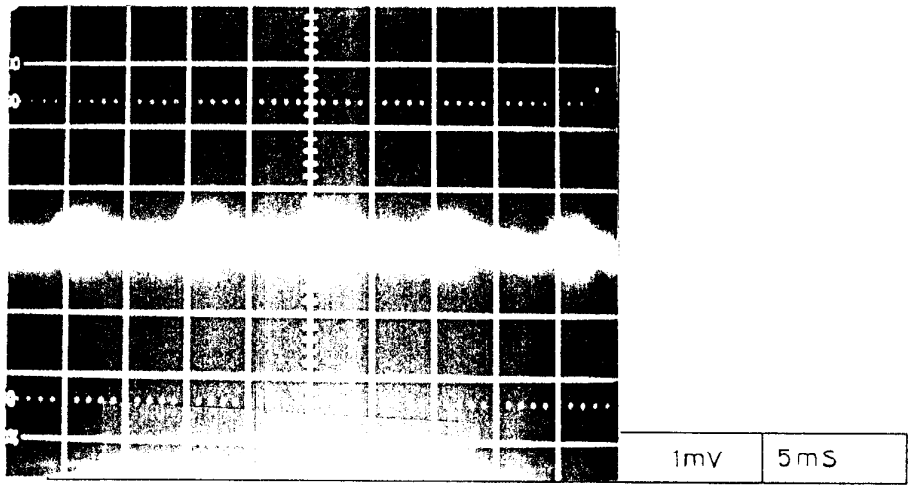
5V



12V



24V



2.14 E M I

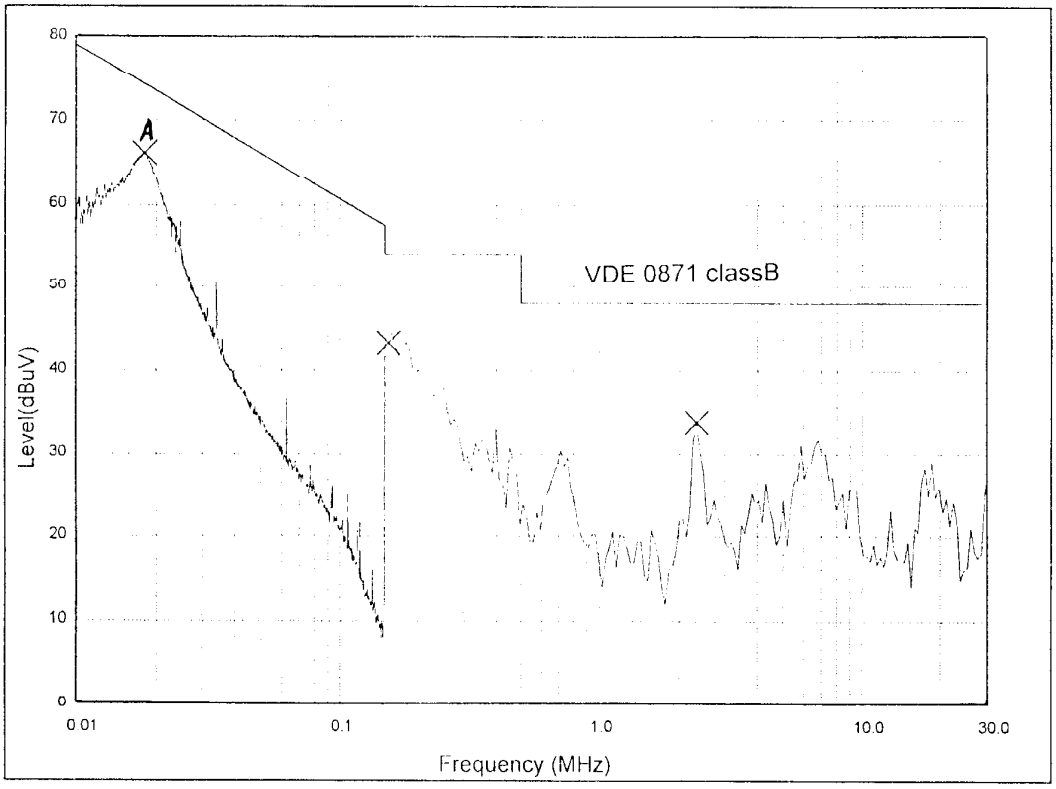
Electro-Magnetic Interference characteristics.
Conducted Emission

Conditions: Vin: 100VAC
Iout: 100%

NNS50

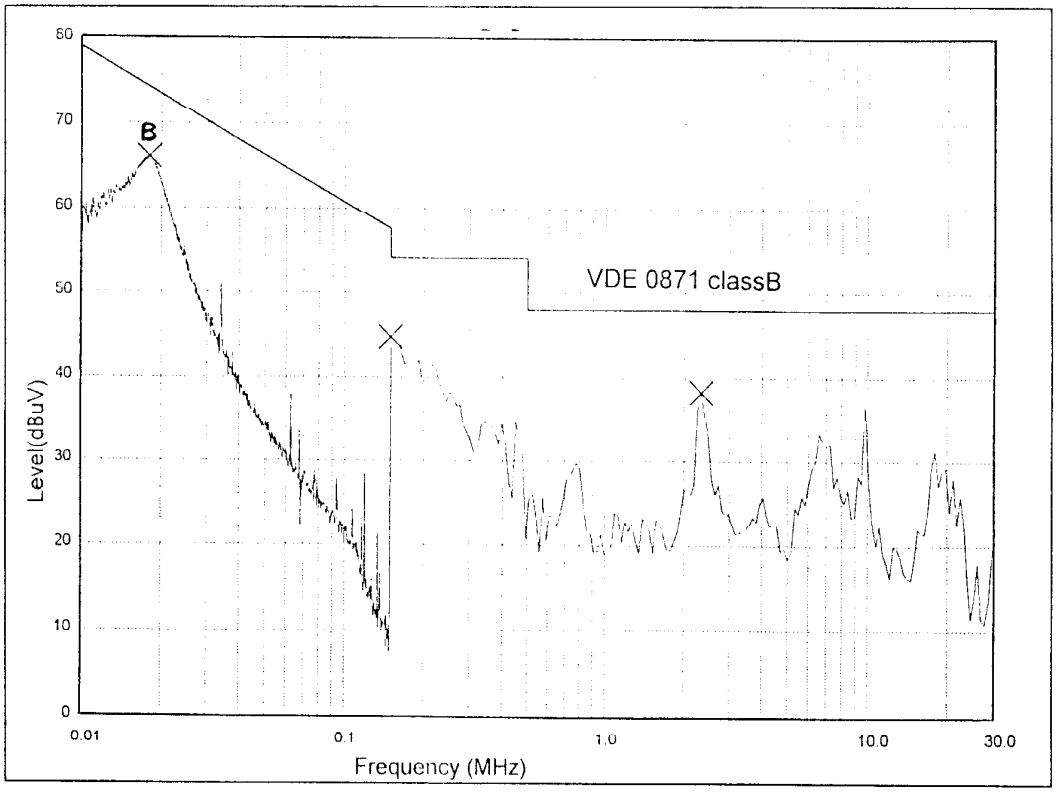
5v

Phase: L



	Point A	
Ref. Data	Measure (dBuV)	Limit (dBuV)
QP	66	74

Phase: N



	Point B	
Ref. Data	Measure (dBuV)	Limit (dBuV)
QP	66	74

EMI

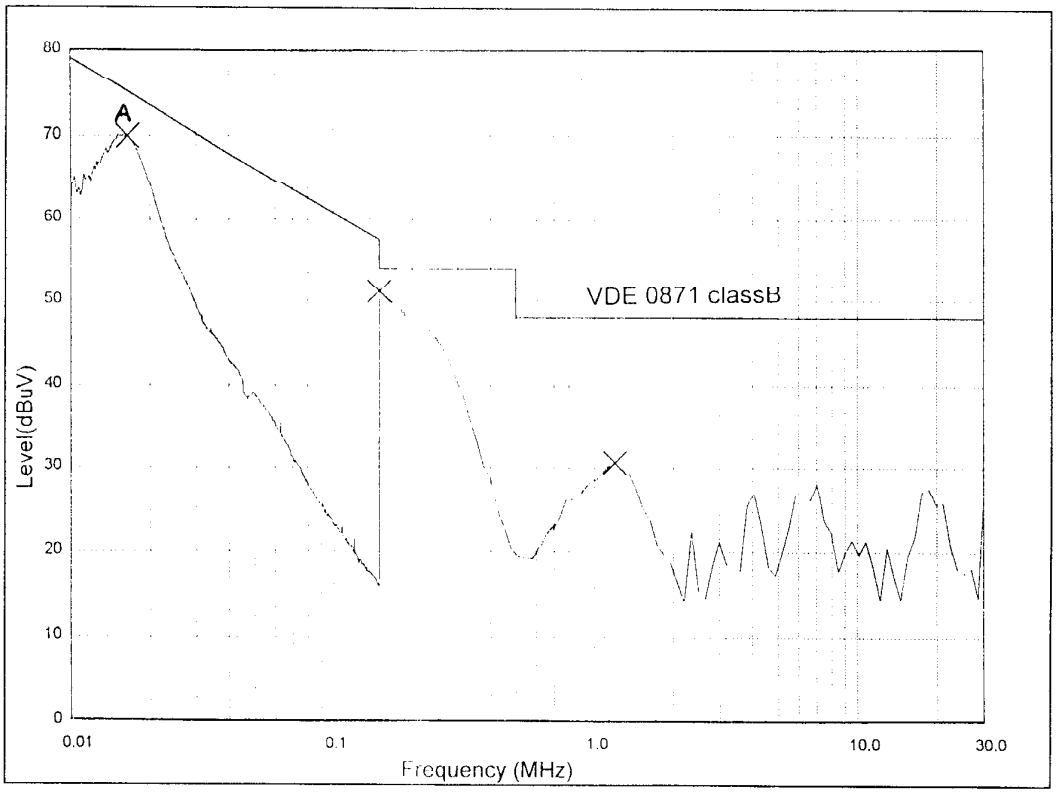
Electro-Magnetic Interference characteristics.
Conducted Emission

Conditions: Vin: 100VAC
Iout: 100%

NNS50

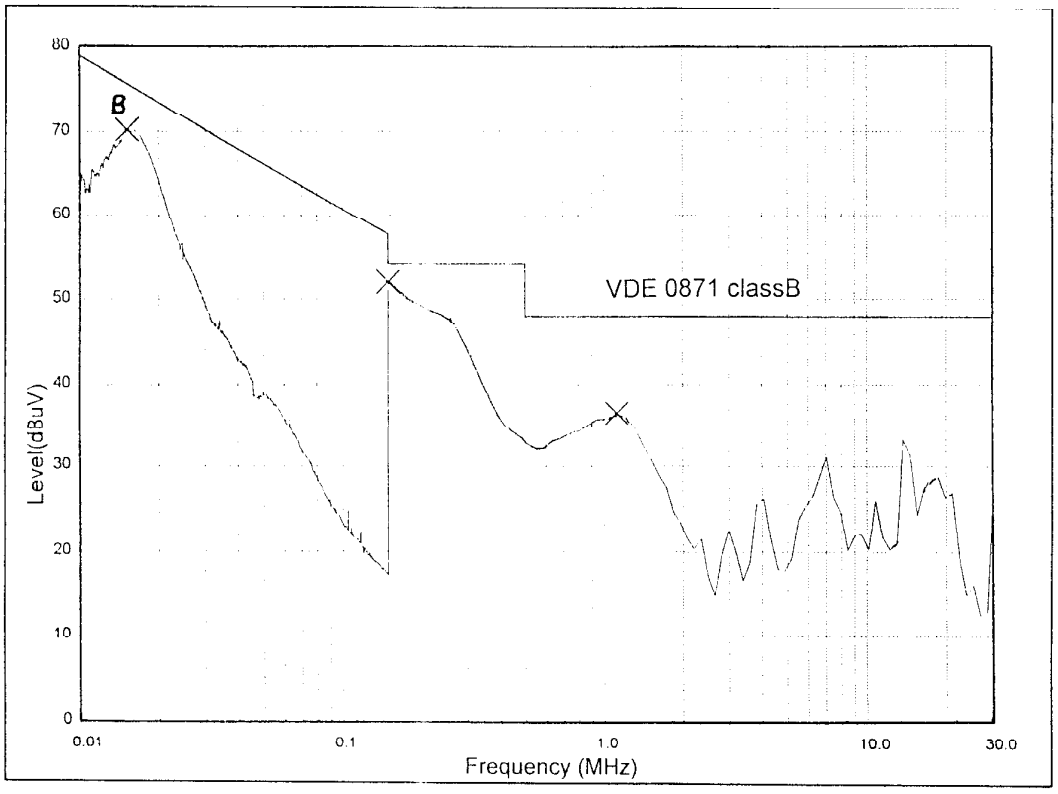
12v

Phase: L



	Point A	
Ref. Data	Measure (dBuV)	Limit (dBuV)
QP	70	74

Phase: N



	Point B	
Ref. Data	Measure (dBuV)	Limit (dBuV)
QP	69	74

E M I

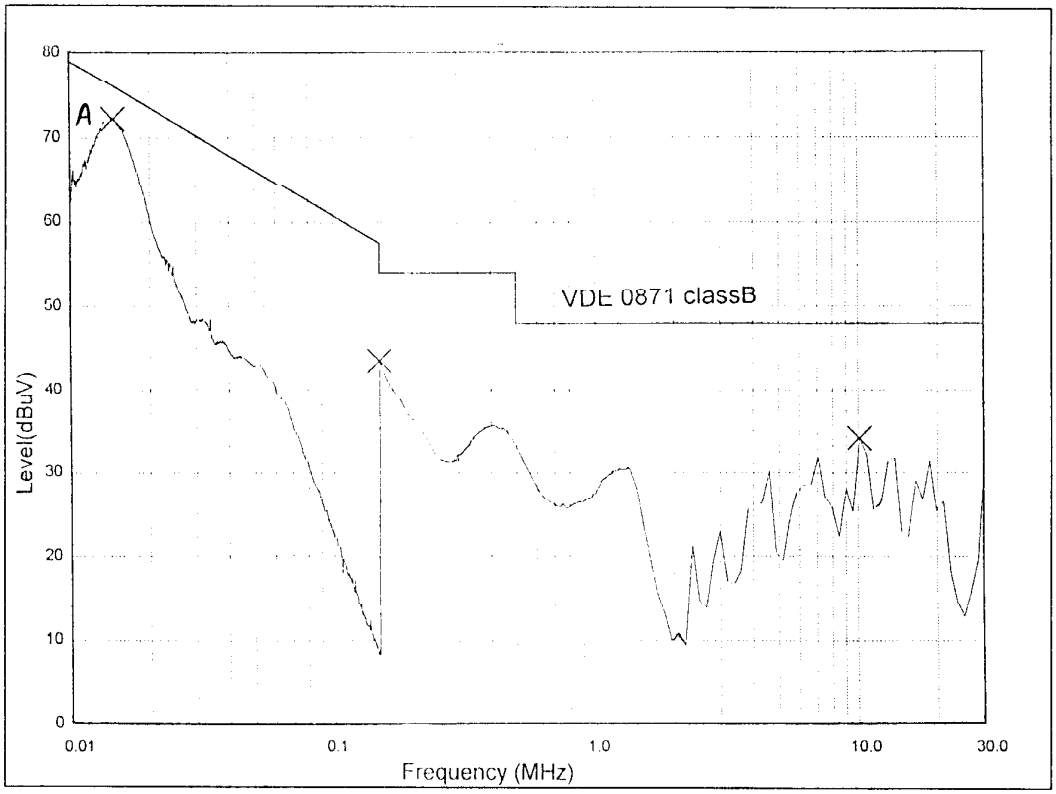
Electro-Magnetic Interference characteristics.
Conducted Emission

Conditions: Vin: 100VAC
Iout: 100%

NNS50

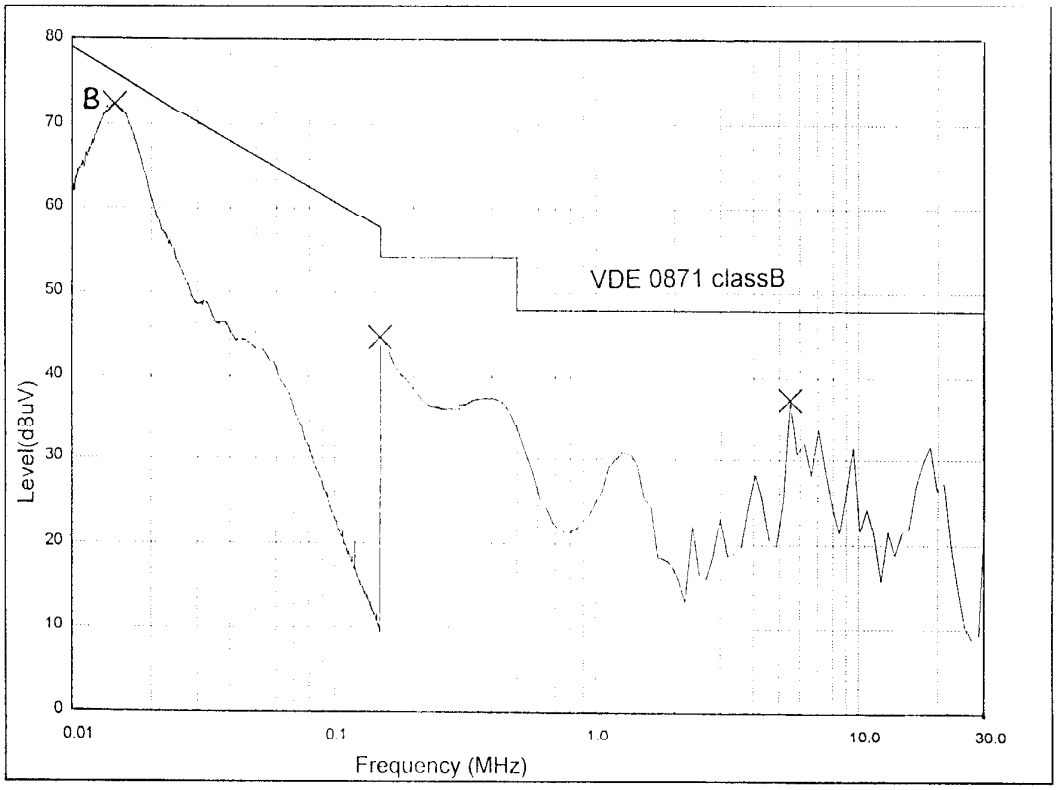
24v

Phase: L



Ref Data	Point A Measure (dBuV)	Point A Limit (dBuV)
QP	72	76

Phase: N



Ref Data	Point B Measure (dBuV)	Point B Limit (dBuV)
QP	72	76

NNS50

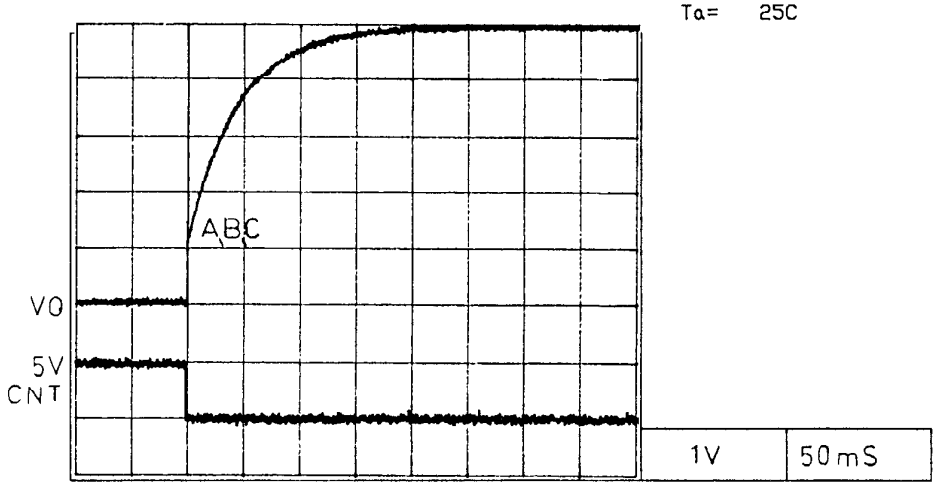
2-15 Output rise time with

ON/OFF CONTROL

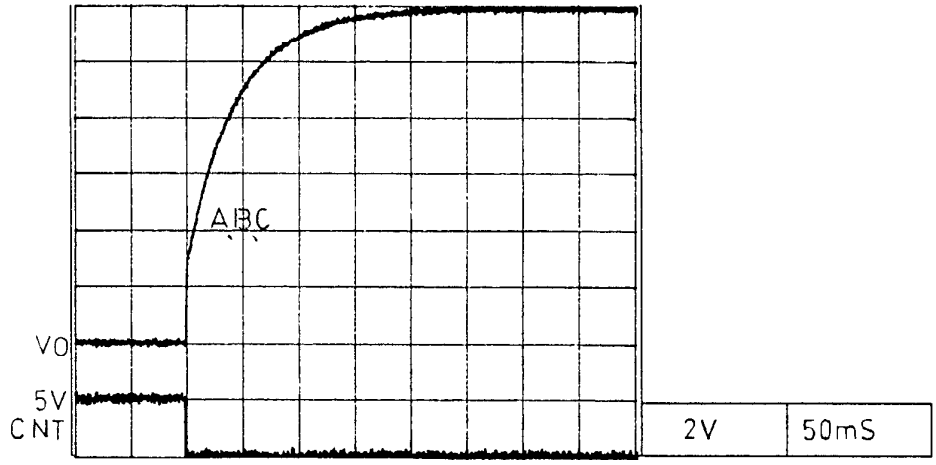
Conditions Vin= 85Vac (A)
100Vac (B)
115Vac (C)

Iout= 100%
Ta= 25C

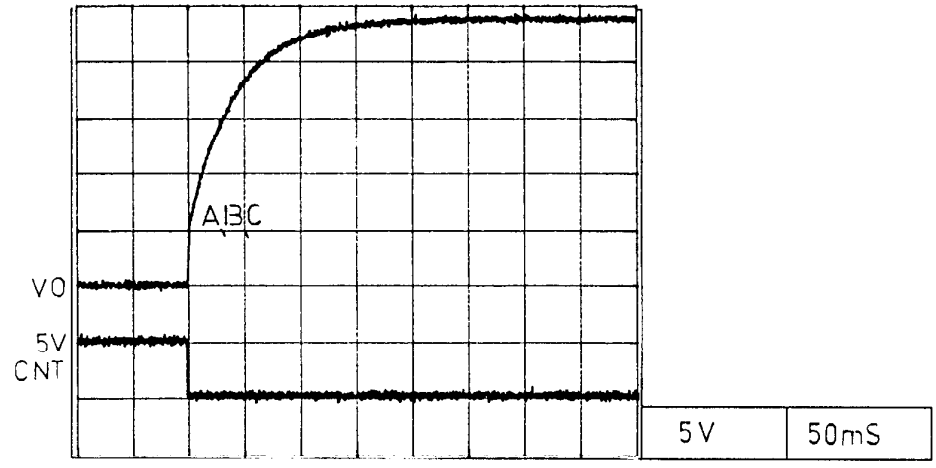
5V



12V



24V



NNS50

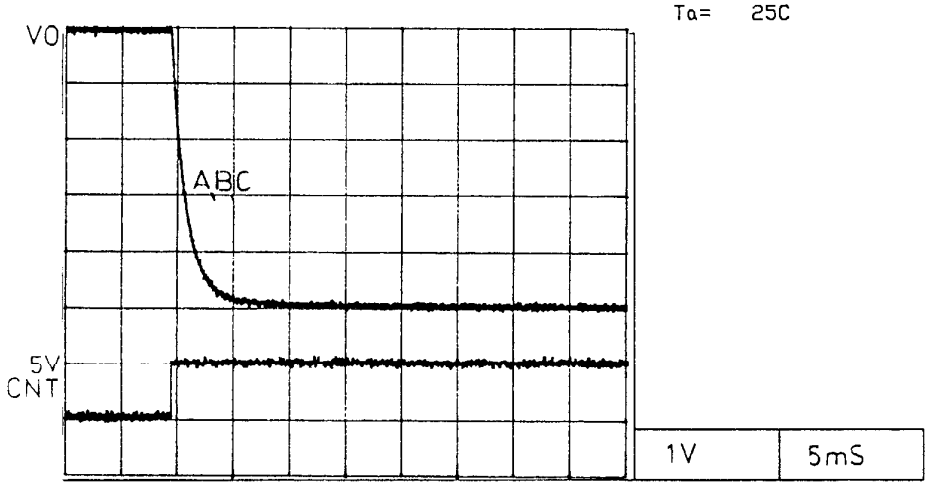
Output fall time with

ON/OFF CONTROL

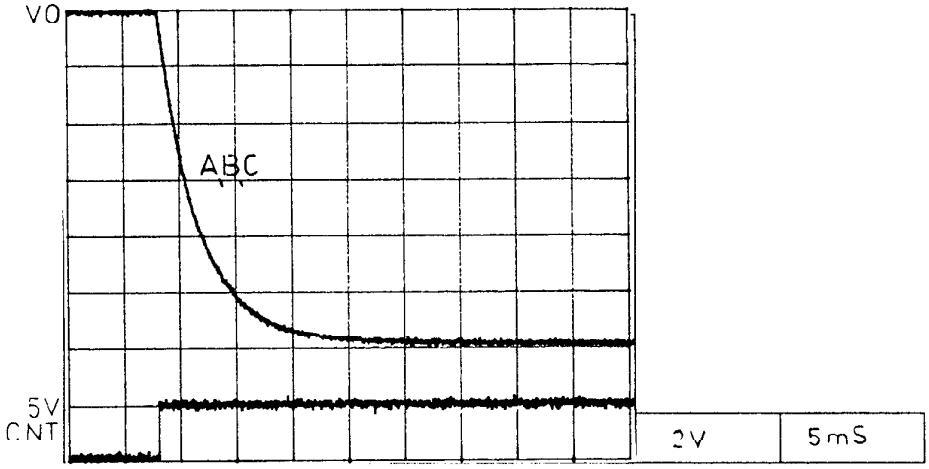
Conditions Vin= 85Vac (A)
100Vac (B)
115Vac (C)

Iout= 100%
Ta= 25C

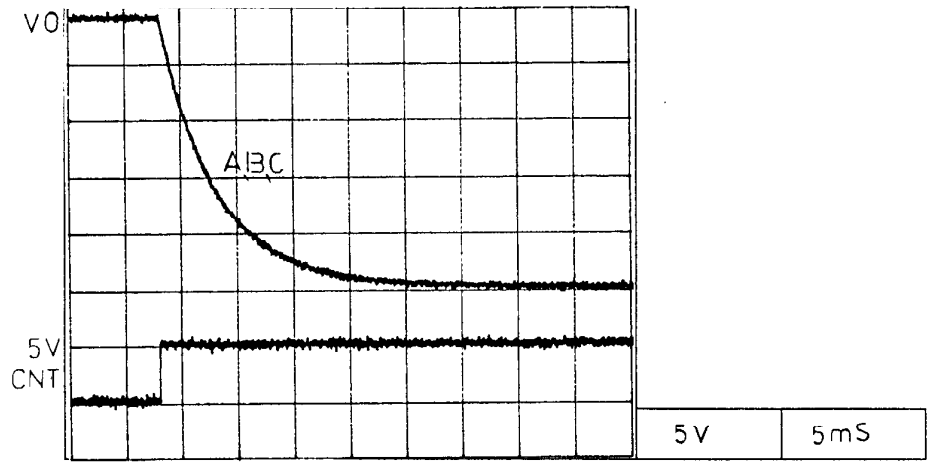
5V



12V



24V



3. LIST OF EQUIPMENT USED

	EQUIPMENT USED	MANUFACTURER	MODEL No.
1	Oscilloscope	TEKTRONIX	2232
2	Digitat 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	HERAUS	HC-7015
12	Leakage Current meter	FLUKE	8840A
13	Equipment for dynamic line response	BUILT IN - HOUSE	
14	Conducted emission	ROHDE & SCHWARZ	ESS