MS-10

TEST DATA

QUALITY

DRAWING No. A007-53-01		
DRAWN BY	CHEKED BY	APPROVED BY
中島 60.4.13	渡辺 60.4.13	矢沢 60.4.13

NEMIC-LAMBDA

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Terminology used

Definition

Vin ----- Input voltage

Vout----- Output voltage

Iin ----- Input current

Iout ----- Output current

Ta ----- Temperature

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SPECIFICATIONS

A007-01-01A

	Items \ Model		MS-10-2	MS-10-5	MS-10-6	MS-10-9	MS-10-12	MS-10-15	MS-10-18	MS-10-24	MS-10-28	MS-10-48
1	Nominal Output Voltage	V	2	5	6	9	12	15	18	24	28	48
2	Maximum Output Current	A	10	10	8.5	6.0	5.0	4.0	3.5	3.0	2.5	1.5
3	Maximum Output Power	W	20	50	51	54	60	60	63	72	70	72
4	Efficiency (Typ) (*1)	%	65	75	75	75	78	80	80	82	83	83
5	Input Voltage Range (*9)	—	85~132VAC (47~440Hz) or 90~165VDC									
6	Input Current (Typ) (*1)	A	0.5	1.2	1.2	1.3	1.35	1.3	1.4	1.5	1.45	1.45
7	In-rush Current (Typ) (*2)	A	20A at 100VAC									
8	Output Voltage Range	%	±10% (Typ)									
9	Maximum Ripple & Noise	mV	50	50	50	60	60	60	80	80	80	100
10	Maximum Line Regulation (*3)	mV	20	20	24	36	48	60	72	96	112	192
11	Maximum Load Regulation (*4)	mV	20	20	24	36	48	60	72	96	112	192
12	Over Current Protection (*5)	A	11.0~13.0	11.0~13.0	9.4~11.0	6.6~7.8	5.5~6.5	4.4~5.2	3.9~4.6	3.3~4.0	2.8~3.3	1.7~2.0
13	Over Voltage Protection (*6)	V	2.7~2.9	5.75~6.25	6.9~7.5	10.5~11.2	14.0~15.0	17.5~18.7	21.0~22.5	28.0~30.0	32.7~35.0	56.2~60.0
14	Hold-Up Time (*7)	ms	More than 20ms									
15	Remote Sensing	—	Possible									
16	Remote ON/OFF Control (*8)	—	Possible									
17	Parallel Operation	—	Possible									
18	Series Operation	—	Possible									
19	Operating Temperature (*9)	℃	-10 ~ +71									
20	Operating Humidity	%	30% ~ 90% RH									
21	Storage Temperature	℃	-30 ~ +85									
ZZ	Storage Humidity	%	10% ~ 95% RH									
23	Cooling	—	Convection cooled									
24	Temperature Coefficient	%	Less than 1% at -10℃ ~ +71℃									
25	Withstand Voltage	kV	Input-Output , Input-Chassis…2.0kVAC 1min (20mA)									
26	Isolation Resistance	Ω	More than 100MΩ at 25℃ and 70%RH Output-Chassis…500VDC									
27	Vibration	G	Less than 19.6 m/s²									
28	Shock	G	Less than 196.1m/s²									
29	Weight	g	690									
30	Size	—	Refer to Outline Drawing									

NOTES

*1 : At 100VAC & maximum output power.

*2 : When resuming operation in less than 5 sec after power failure at no load, softstart circuit will not limit the in-rush current at turn-on.

*3 : From 85~132VAC or 90~165VDC, constant load.

*4 : From No load ~ Full load, constant input voltage.

*5 : Constant current limiting with automatic recovery.

*6 : Inverter shut-down method, manual reset.

*7 : At 100VAC input, and output power of 50 W.

*8 : TTL compatible input :greater than 2V or open…shutdown, 0V~0.8V…power on. Supply voltage to CNT must not exceed 7V.

*9 : Ratings : Percent of maximum output current or maximum output power, whichever is greater.

i) With respect to operating temperature

-10℃… 60% , 60℃…70%

0~50℃…100% , 71℃…50% (61℃~71℃ Forced air cooling)

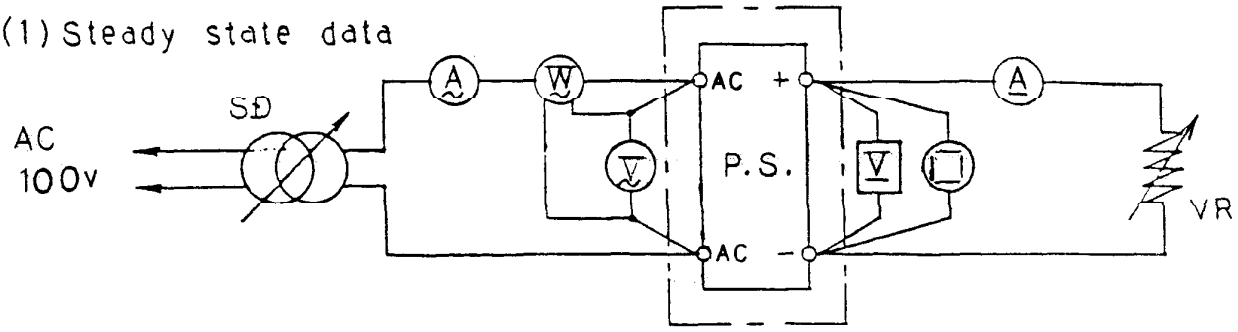
ii) With respect to input voltage

85~132VAC or 110~165VDC…100%

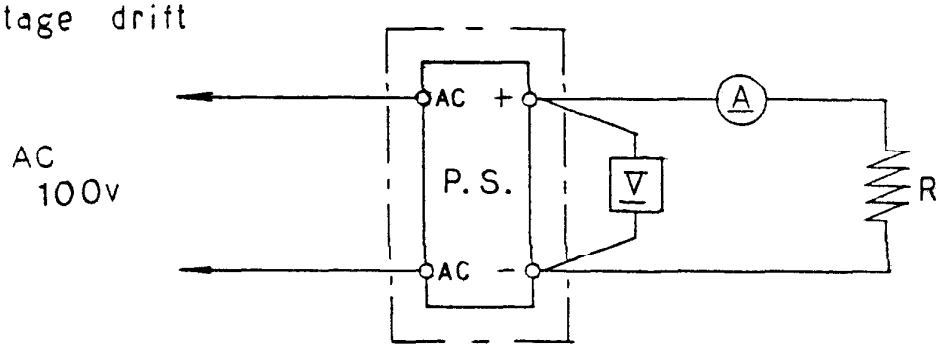
90~110VDC… 80%

Circuits used for determination

(1) Steady state data



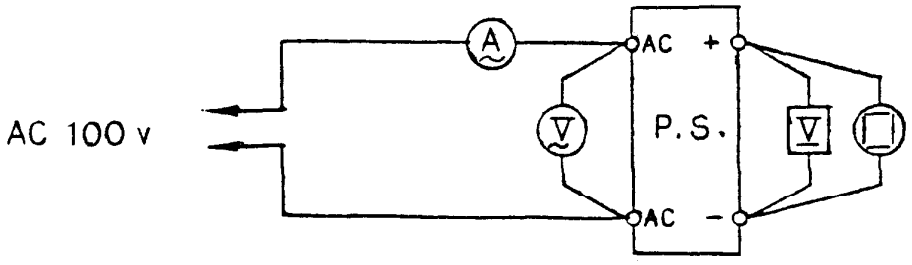
(2) Warm up voltage drift



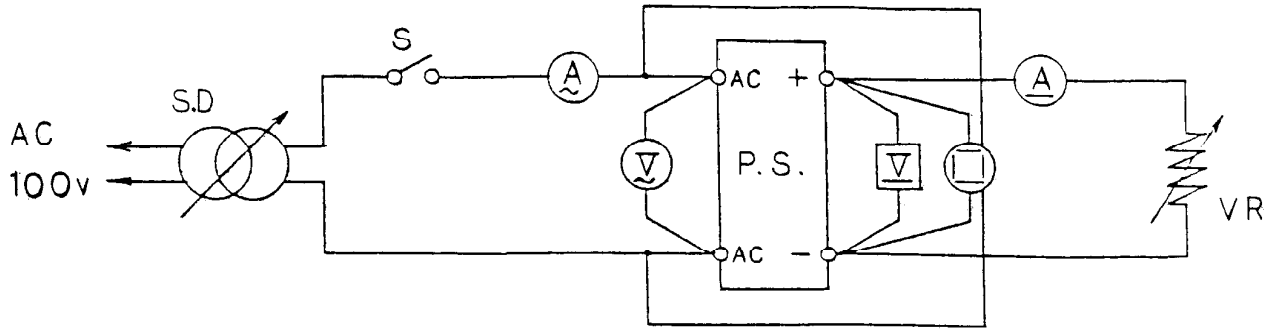
(3) Over current protection (o.c.p) characteristics

Same as steady state data.

(4) Over voltage protection (o.v.p) characteristics



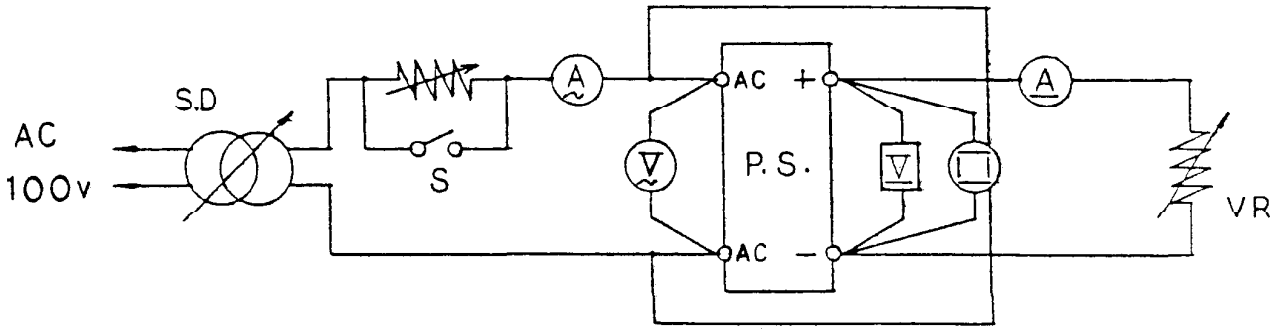
(5) Output rise characteristics



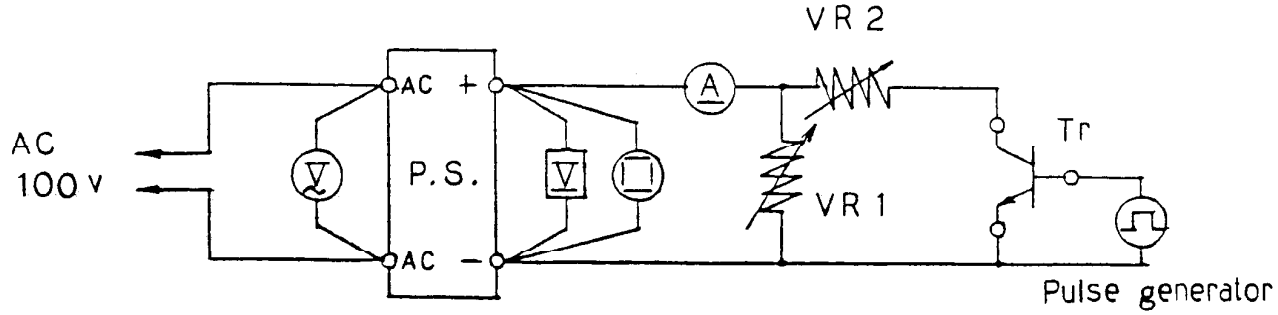
(6) Output fall characteristics

Same as output rise characteristics.

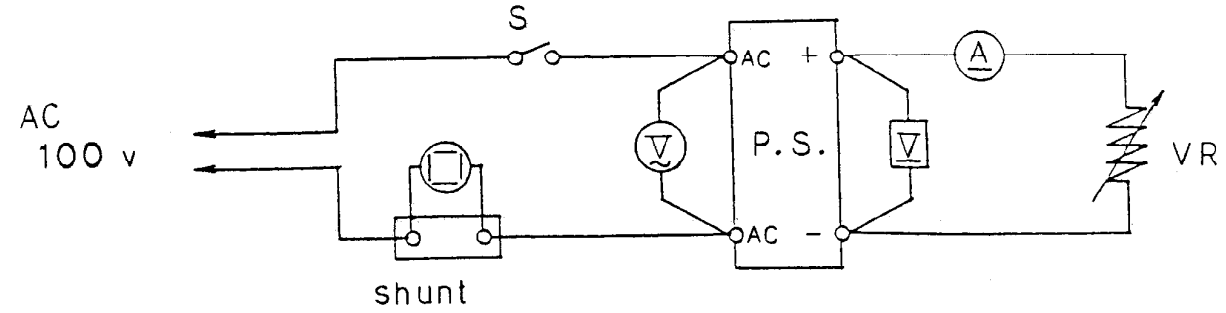
(7) Dynamic line response



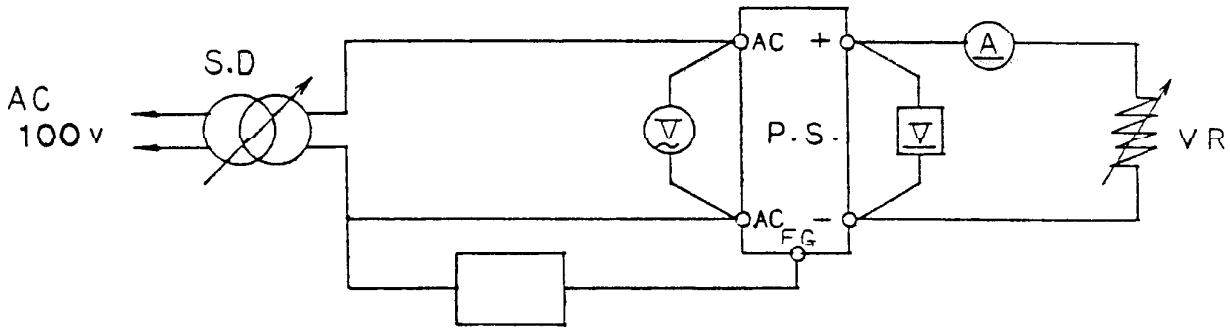
(8) Dynamic load response



(9)Inrush current characteristics



(10)Leakage current

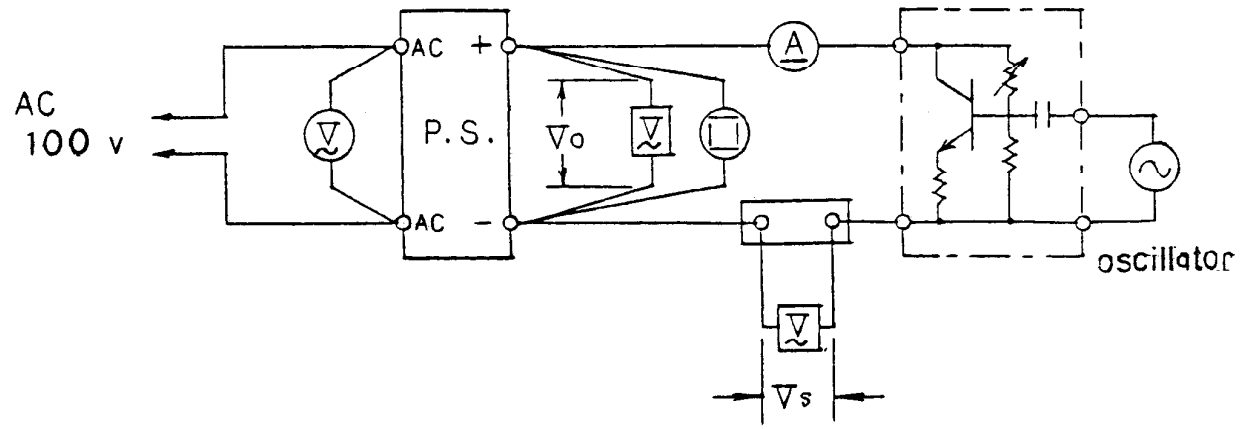


leakage current meter

Note : ·Leakage current measured through a 1kΩ resistor.

·Range wed— AC + DC

(11)Output impedance



Note ; Output impedance $|Z| = \frac{V_o}{V_s} \cdot R_s$ (R_s ; 0.1Ω)

List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL.NO
1	Oscilloscope	HITACHI·DENSHI	V-1050F
2	Storage oscilloscope	SONY·TEKTRONIX	7633
3	Digital volt meter	A & D	5512A
4	A.C. Ampere meter	YOKOGAWA·ELEC.,	2053
5	A.C. Volt meter	〃	2052
6	A.C. Watt meter	〃	2041
7	D.C. Ampere meter	〃	2051
8	Variac	MATSUNAGA	SD-1320
9	Variable resistive load	IWASHITA·ELEC.,	44/11Ω, 24/06Ω
10	Dynamic dummy load	TAKAMIZAWA CYBERNETICS	PSA-150D
11	Digirush currenter	〃	PSA-200
12	Oscillator	NF CIRCUIT DESIGN BLOCK	CR-116
13	Controlled temp., chamber	TABAI	INP105
14	Leakage current meter	YOKOGAWA·ELEC.,	3226
15	Equipment for dynamic line response	-BUILT IN-HOUSE	———
16	Output impedance measuring equipment	〃	———
17			
18			
19			

Regulation – line and load , temp. drift

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5 v

1. Regulation – line and load

Condition Ta : 25°C

Iout \ Vin	AC 85 v	AC100 v	AC132 v	line regulation	
0 %	5.078 v	5.079 v	5.079 v	1 mv	0.02 %
50 %	5.071 v	5.072 v	5.072 v	1 mv	0.02 %
100 %	5.065 v	5.065 v	5.065 v	0 mv	0 %
load regulation	13 mv	14 mv	14 mv		
	0.26 %	0.28 %	0.28 %		

2. Temperature drift

Conditions Vin : AC 100 v
Iout: 100%

Ta	0 °C	25 °C	50 °C	Temp.stability	
Vout	5.056 v	5.065 v	5.068 v	12 mv	0.24 %

12 v

1. Regulation – line and load

Condition Ta : 25°C

Iout \ Vin	AC 85 v	AC100 v	AC132 v	line regulation	
0 %	12.059 v	12.060 v	12.059 v	1 mv	0.008 %
50 %	12.059 v	12.058 v	12.059 v	1 mv	0.008 %
100 %	12.057 v	12.058 v	12.057 v	1 mv	0.008 %
load regulation	2 mv	2 mv	2 mv		
	0.02 %	0.02 %	0.02 %		

2. Temperature drift

Conditions Vin : AC 100 v
Iout: 100%

Ta	0 °C	25 °C	50 °C	Temp.stability	
Vout	12.039 v	12.058 v	12.086 v	47 mv	0.39 %

Regulation – line and load , temp. drift

MS-10

24 V

1. Regulation – line and load Condition Ta.: 25°C

Iout \ Vin	AC 85 V	AC 100 V	AC 132 V	line regulation	
0 %	24.070 V	24.060 V	24.060 V	10 mV	0.04 %
50 %	24.060 V	24.060 V	24.060 V	0 mV	0 %
100 %	24.060 V	24.060 V	24.060 V	0 mV	0 %
load regulation	10 mV	0 mV	0 mV		
	0.04 %	0 %	0 %		

2. Temperature drift Conditions Vin : AC 100 V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. stability	
Vout	24.000 V	24.060 V	24.080 V	80 mV	0.33 %

Output voltage and ripple voltage v.s. input voltage

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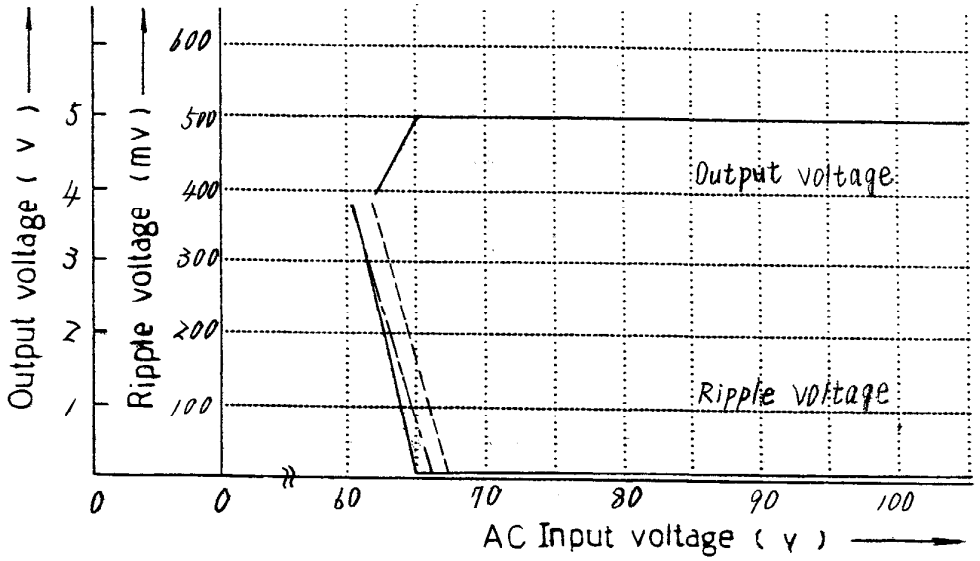
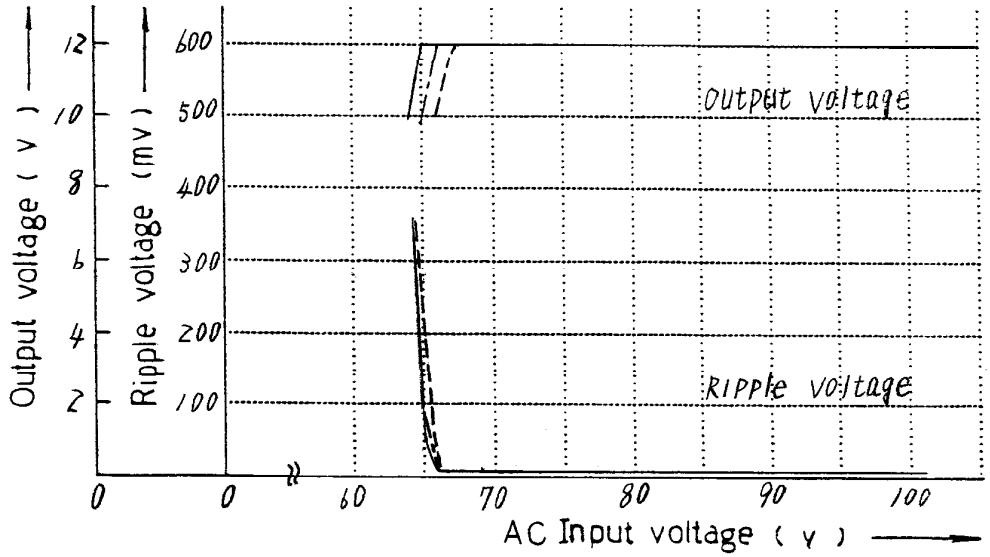
Conditions Iout : 100 %
Ta : 0°C -----
25°C ——
50°C ——

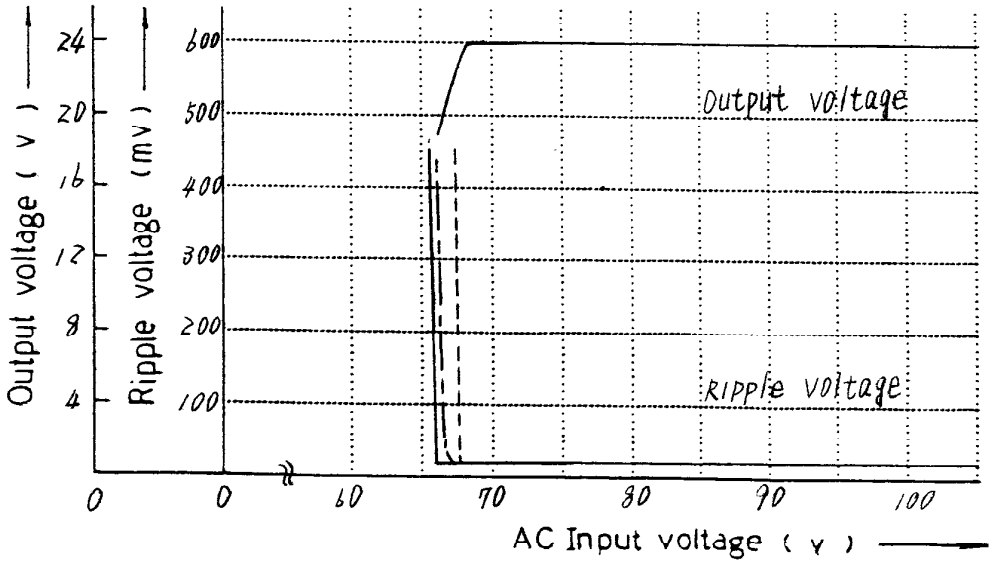
5 v



12 v



24 v

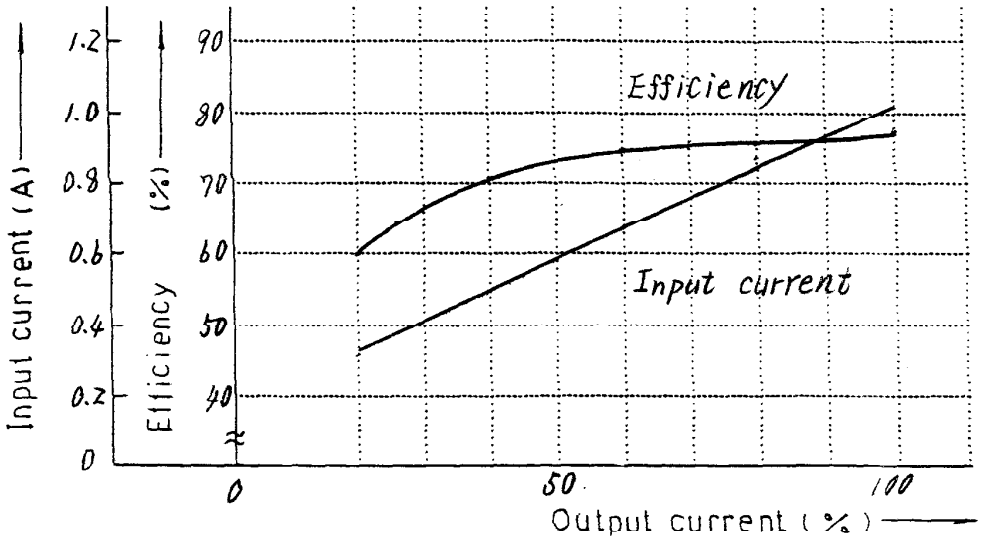


Efficiency and input current v.s. output current

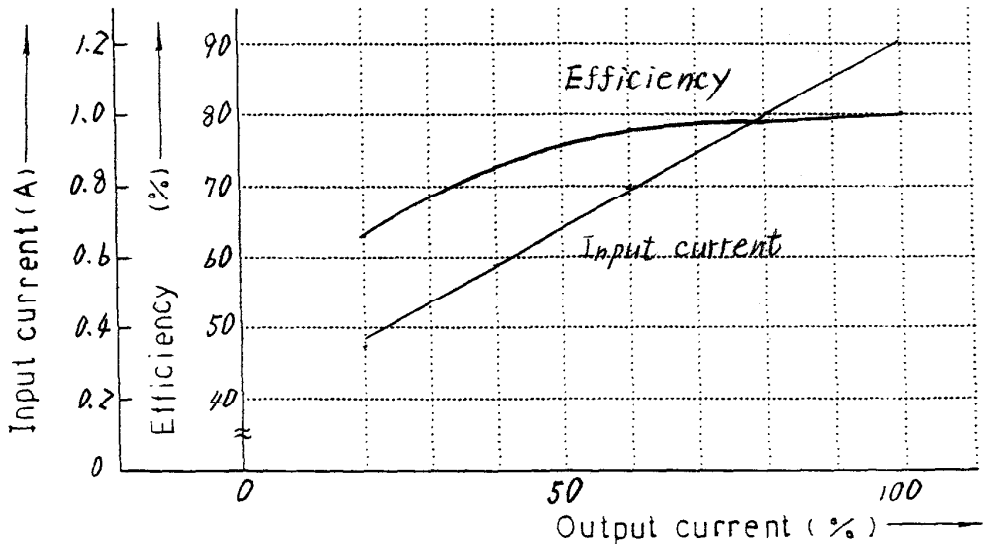
MS-10

Conditions Vin : AC 100 v
Ta : 25 °C

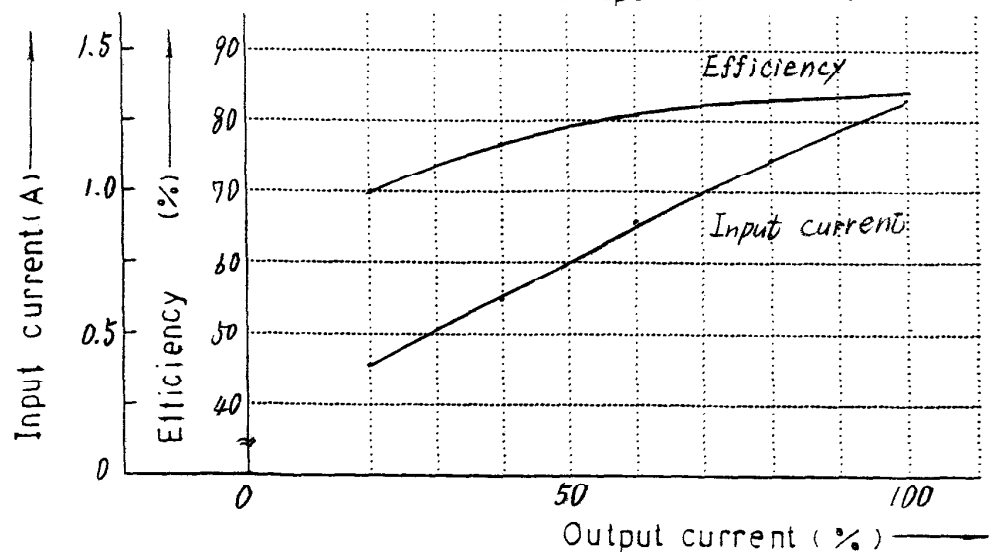
5 v



12 v



24 v



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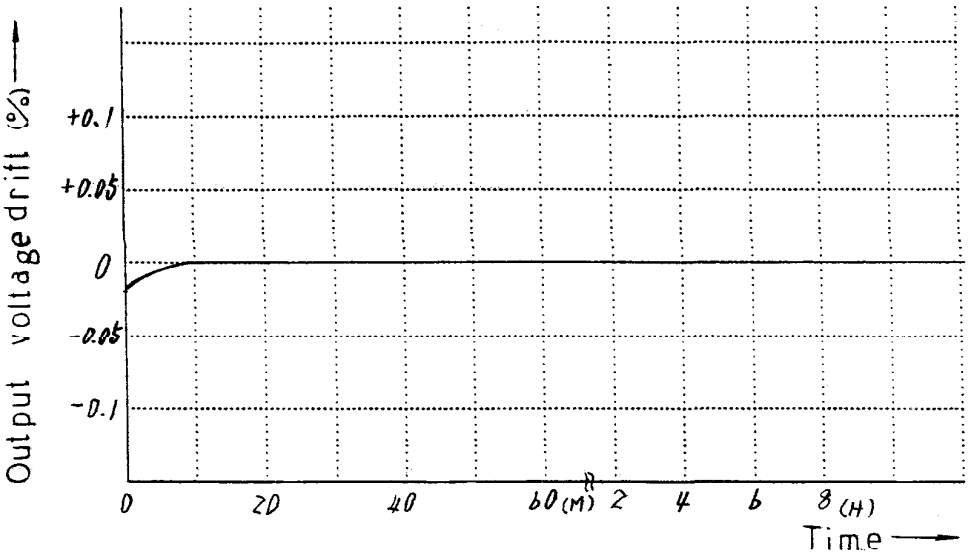
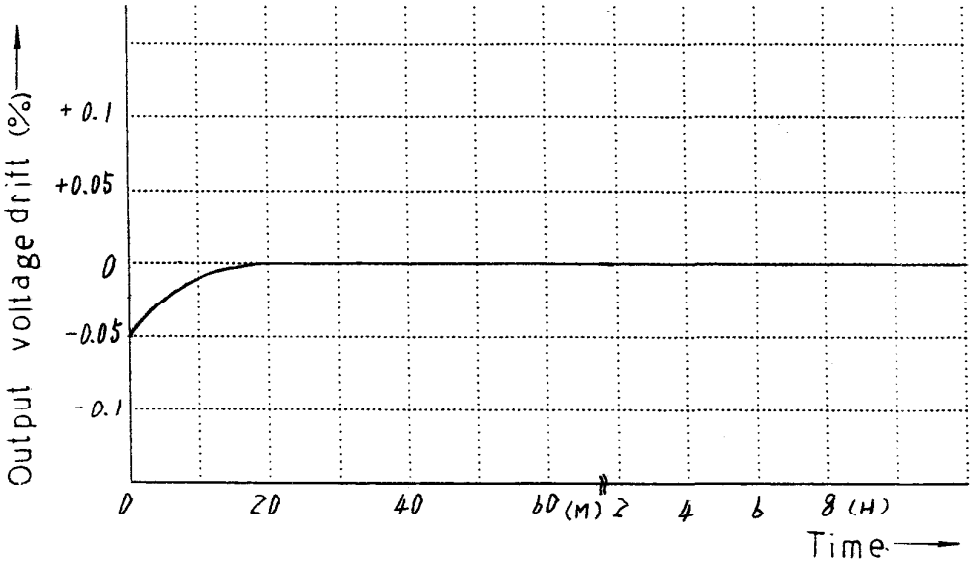
Warm up voltage drift

Conditions Vin : AC 100v
Vout,Iout : 100%
Ta : 25°C

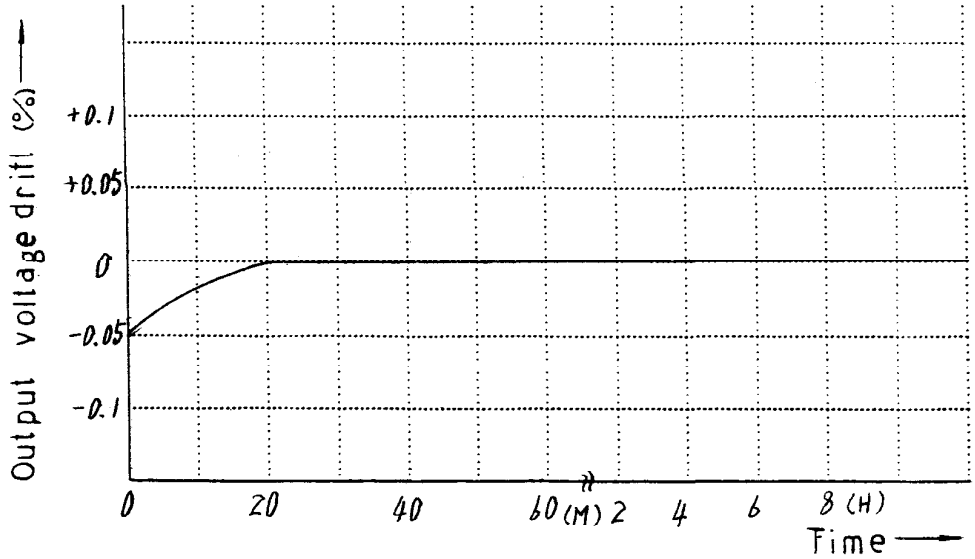
5v



12v



24v

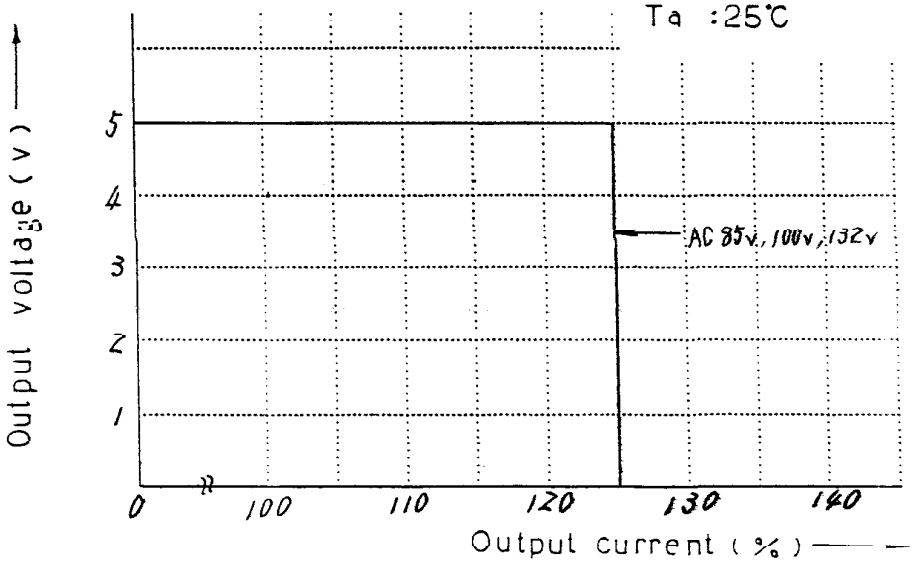


MS-10

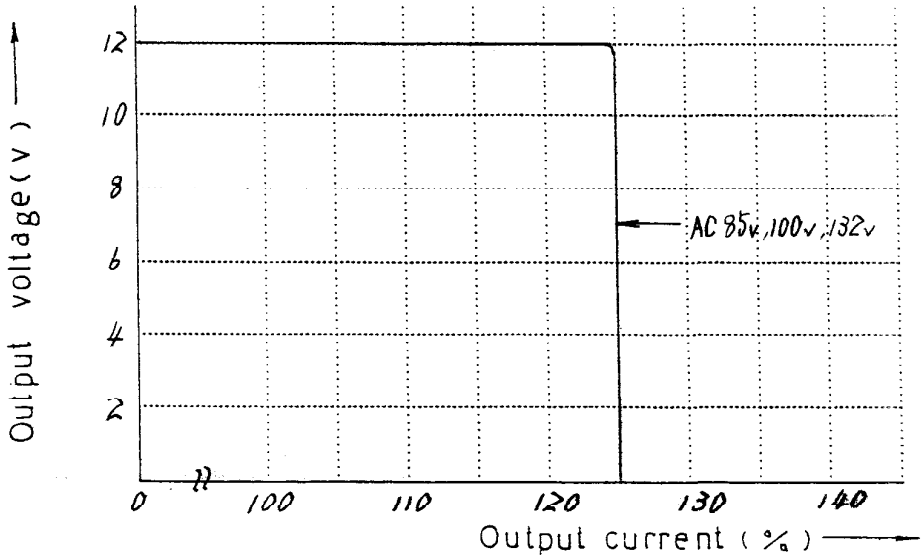
O.C.P characteristics

Conditions Vin :AC 85v———
AC100v- - - - -
AC132v— - —
Ta :25°C

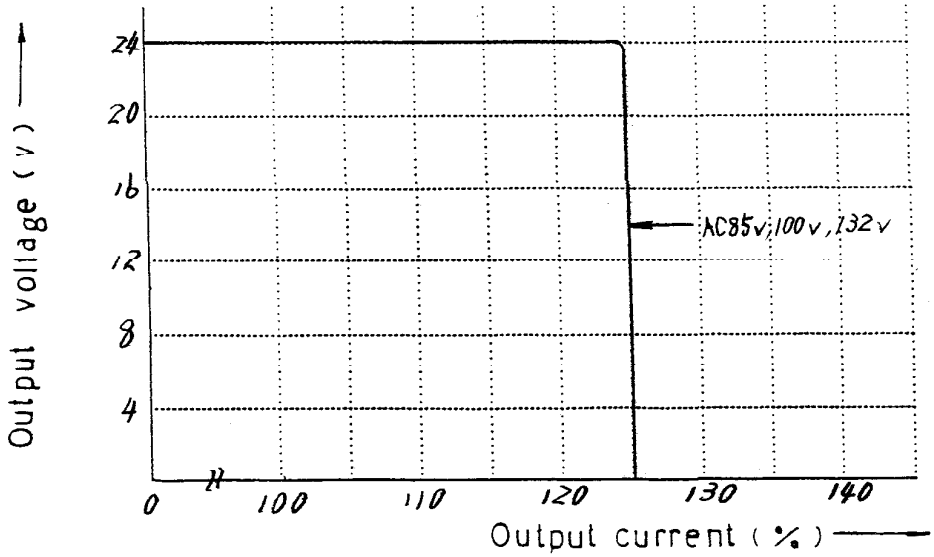
5 v



12 v



24 v

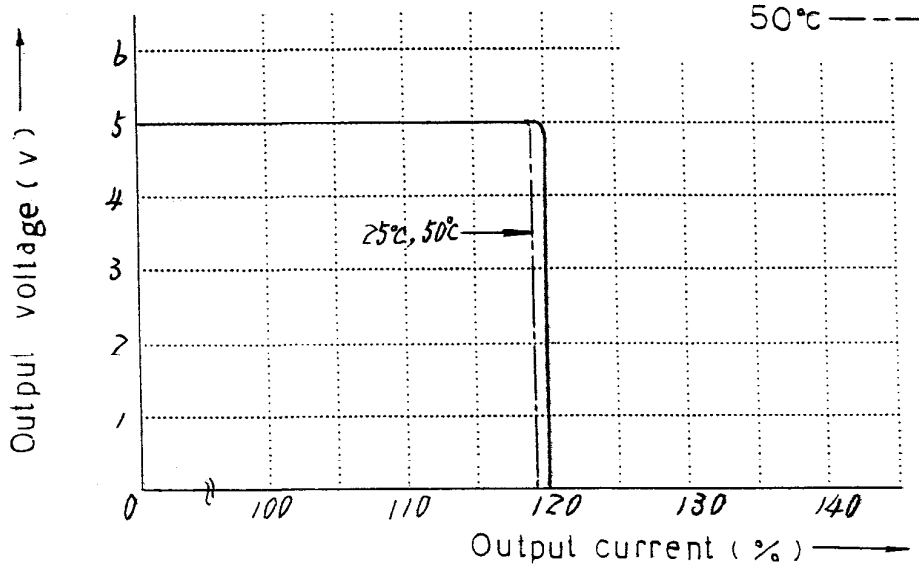


MS-10

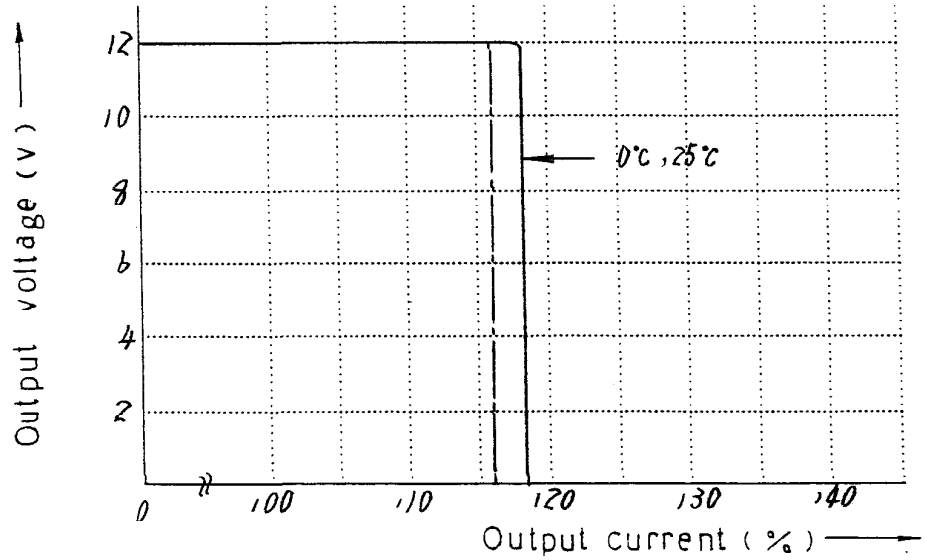
O.C.P characteristics

Conditions Vin : AC100 v
Ta : 0 ℃ ——
25℃ - - - -
50℃ — - —

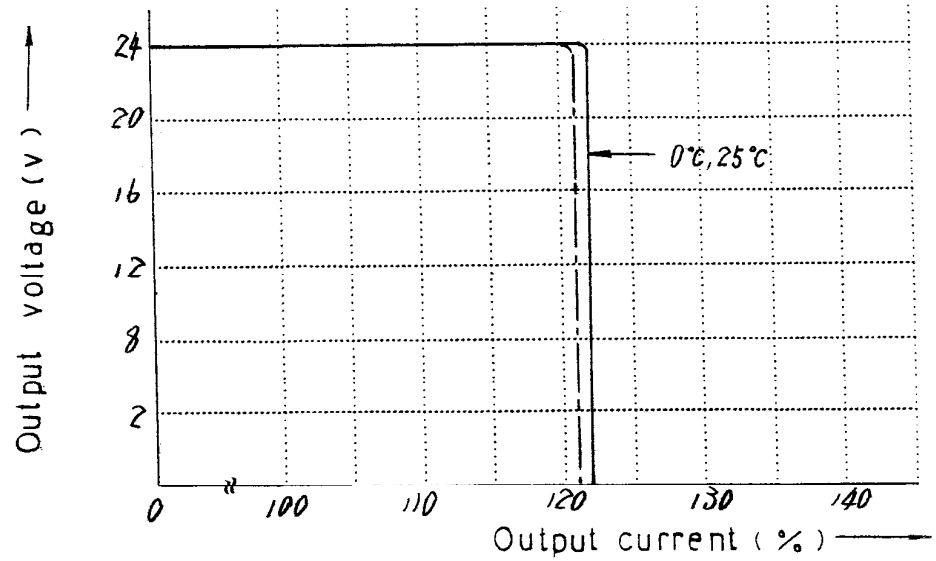
5 V



12 V



24 V



O.V.P. Characteristics

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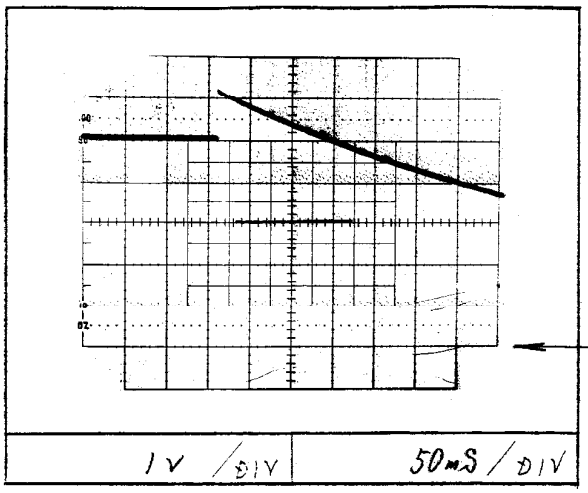
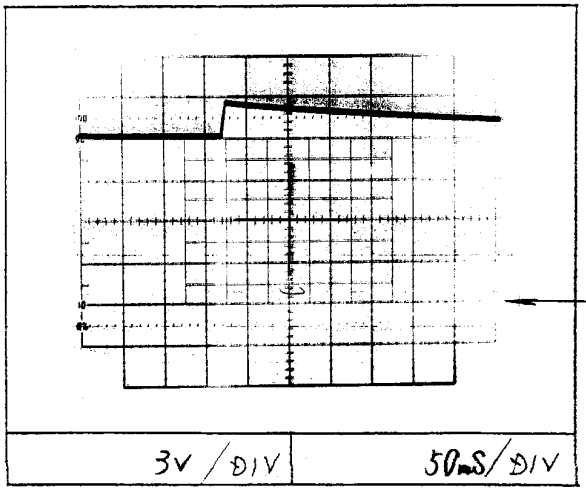
Conditions Vin : AC100v
Iout : 0%
Ta : 25°C

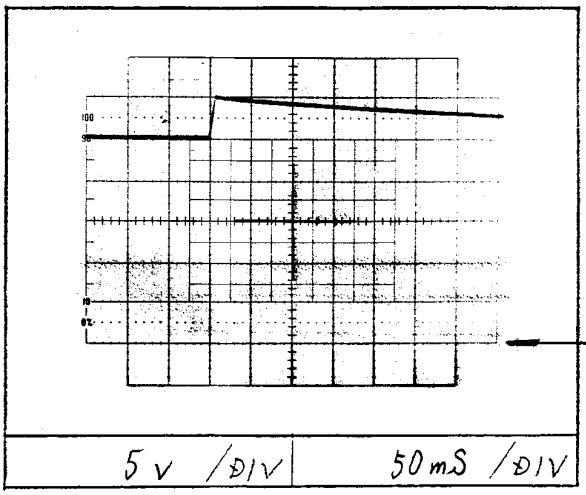
5 v



12 v



24 v



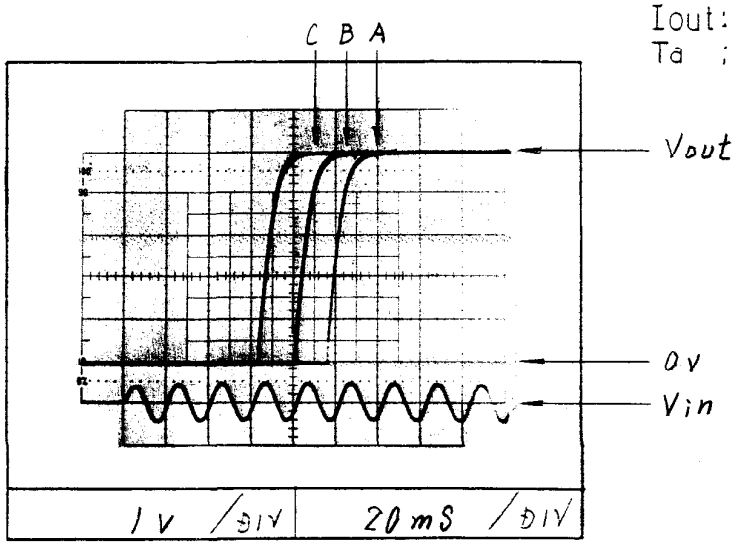
MS-10

Output rise time

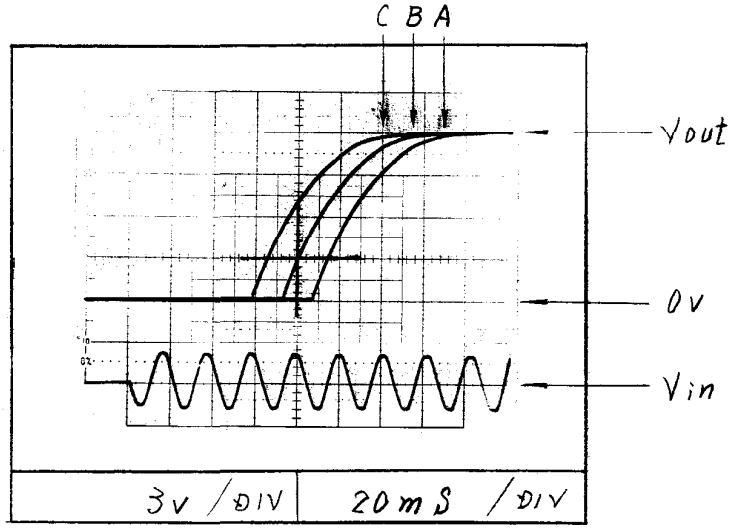
A B C

Conditions Vin: AC 85v, 100v, 132v
Iout: 100%
Ta : 25°C

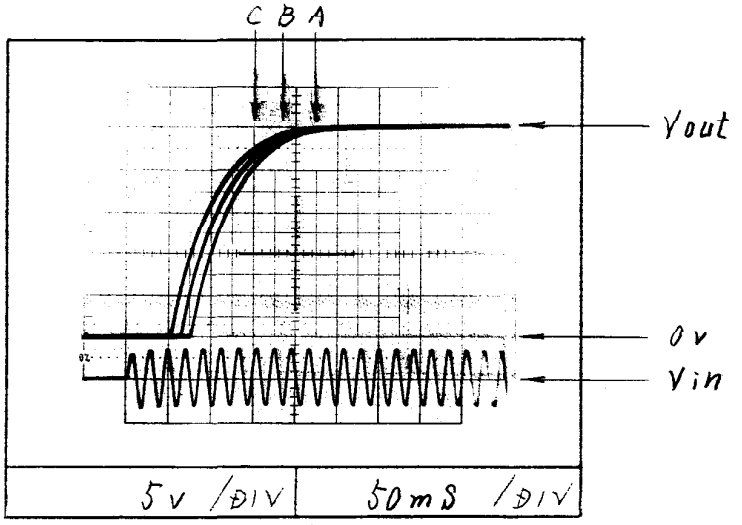
5 v



12 v



24 v



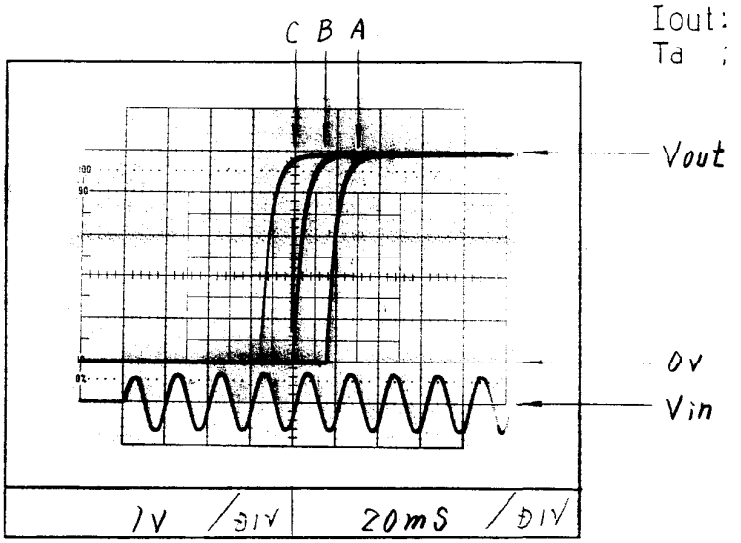
Output rise time

MS-10

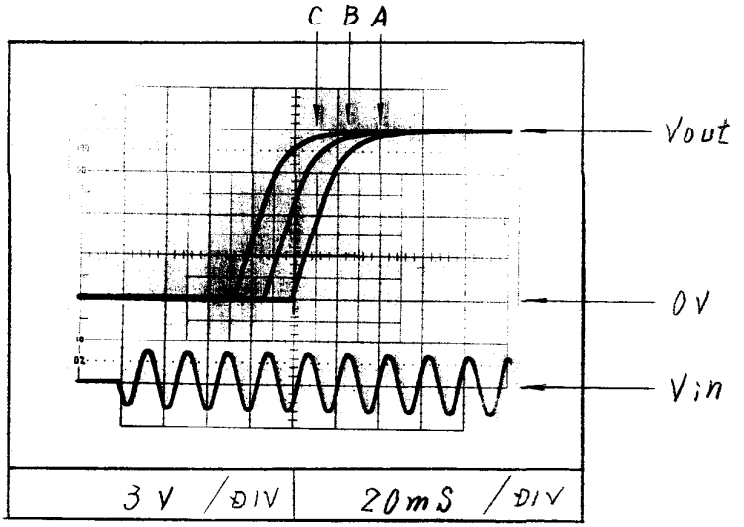
A B C

Conditions Vin: AC 85v, 100v, 132v
Iout: 0 %
Ta : 25°C

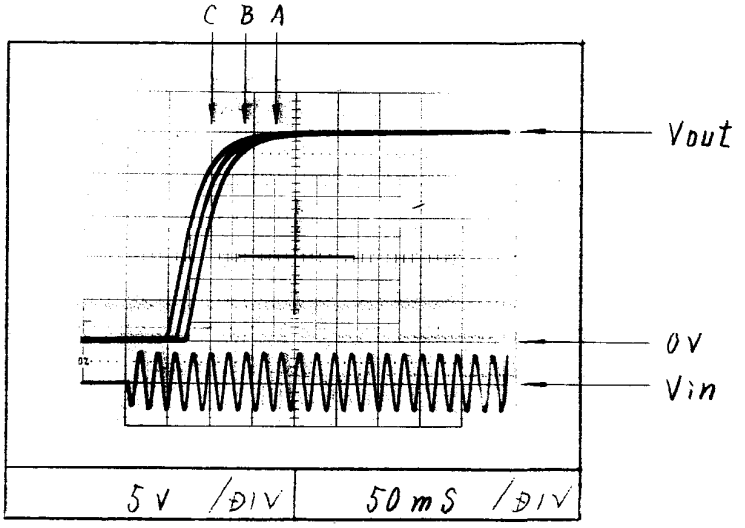
5 V



12 V



24 V

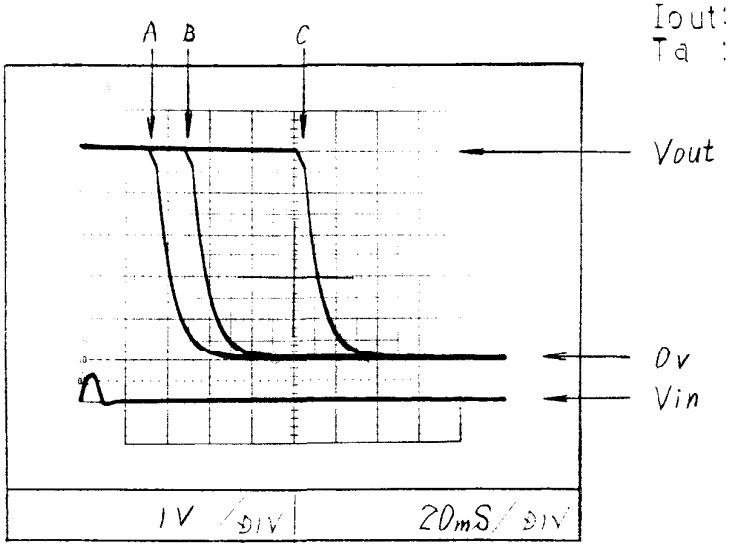


MS - 10

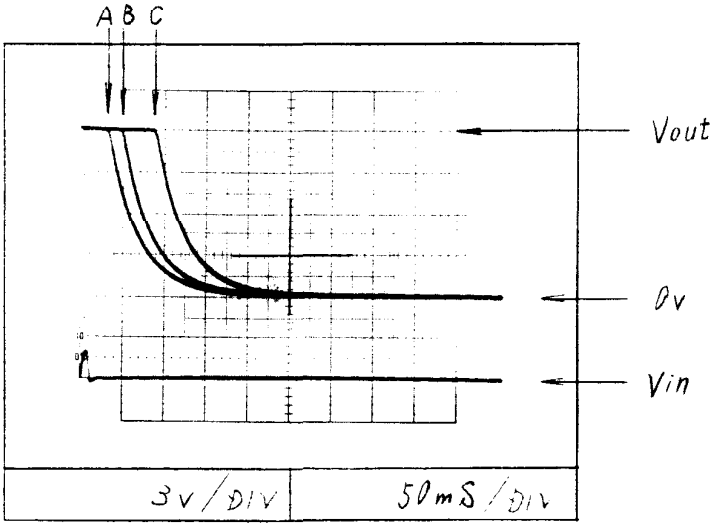
Output fall time

Conditions Vin : AC85v, 100v, 132v (A, B, C)
Iout: 100 %
Ta : 25°C

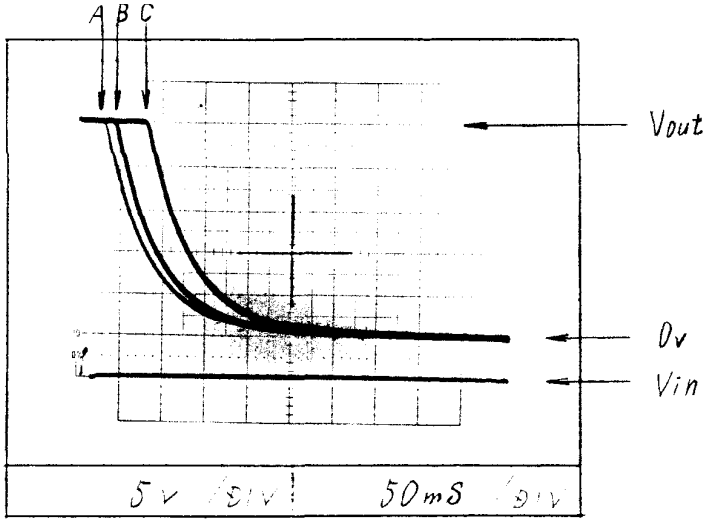
5 V



12 V



24 V

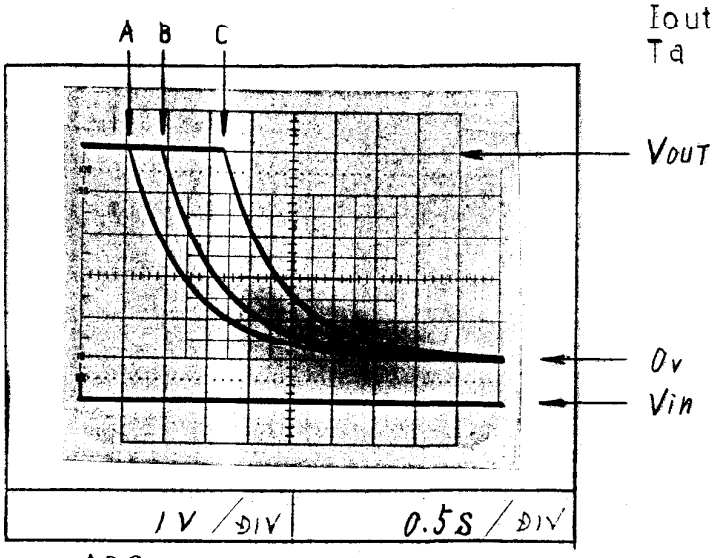


Output fall time

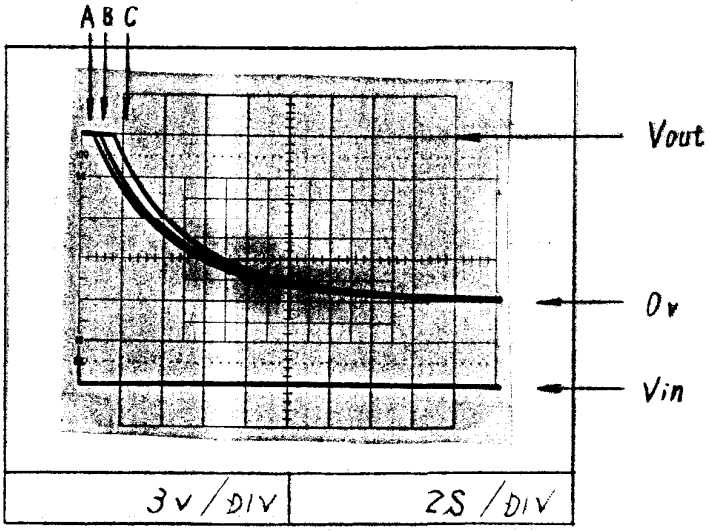
MS-10

A B C
Conditions Vin : AC85v, 100v, 132v
Iout: 0 %
Ta : 25°C

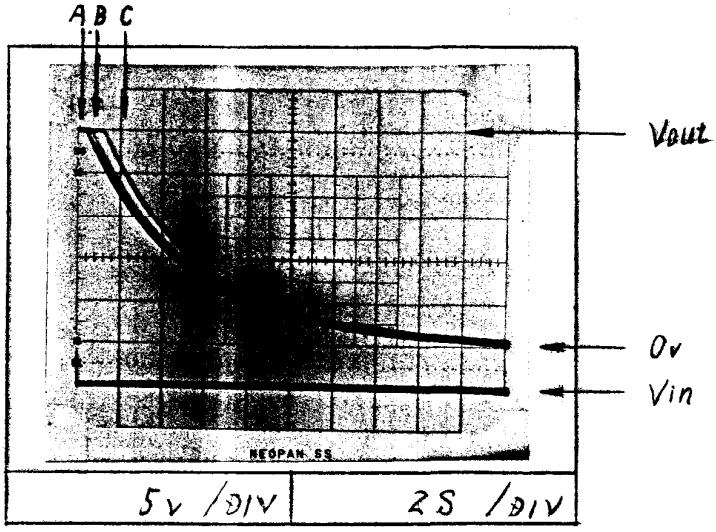
5V



12V



24V

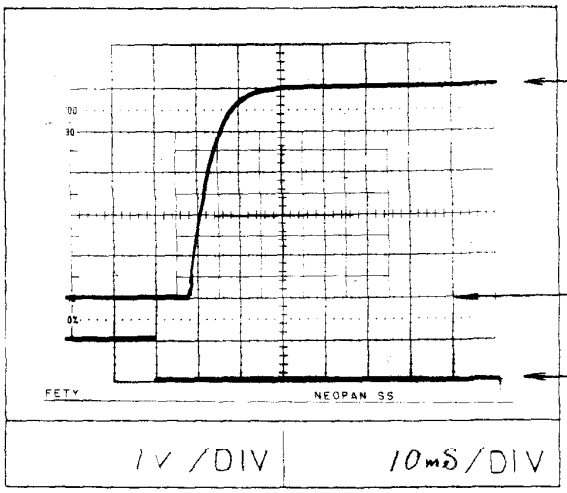


MS-10

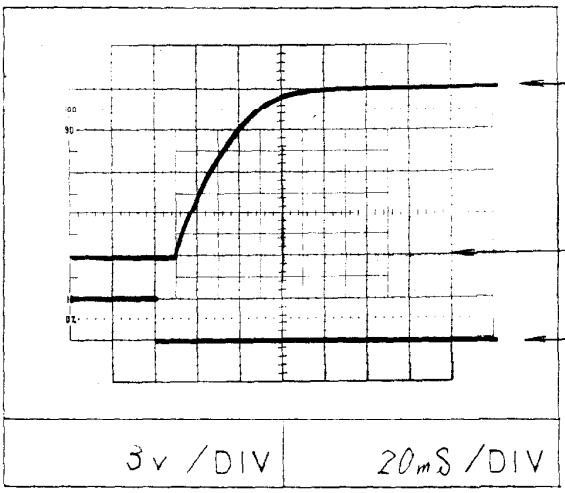
Output rise time with ON/OFF CONTROL

Conditions Vin : AC100 v
Iout : 100 %
Ta : 25 °C

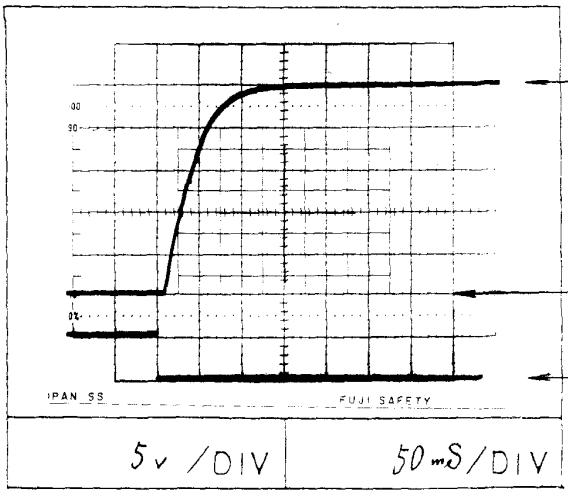
5 v



12 v



24 v

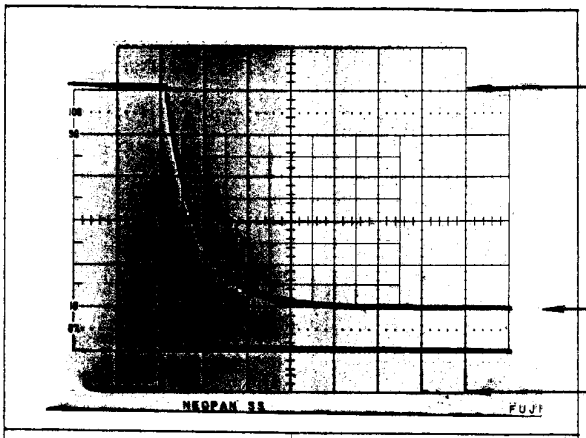


Output fall time with ON/OFF CONTROL

MS-10

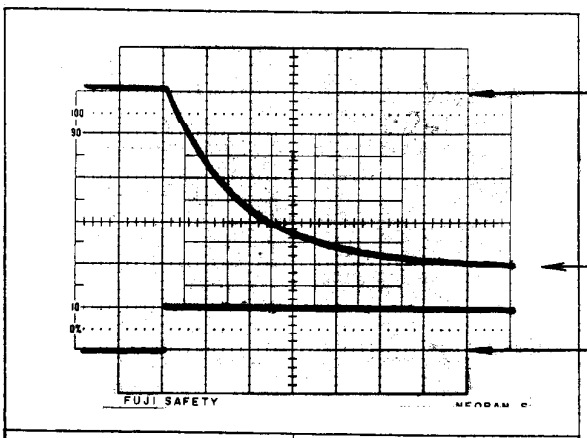
Conditions Vin : AC100v
Iout : 100%
Ta : 25°C

5v



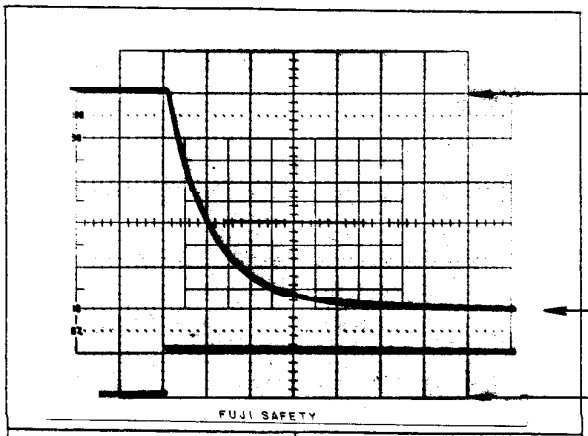
1v /DIV | 10mS /DIV

12v



3v /DIV | 20mS /DIV

24v



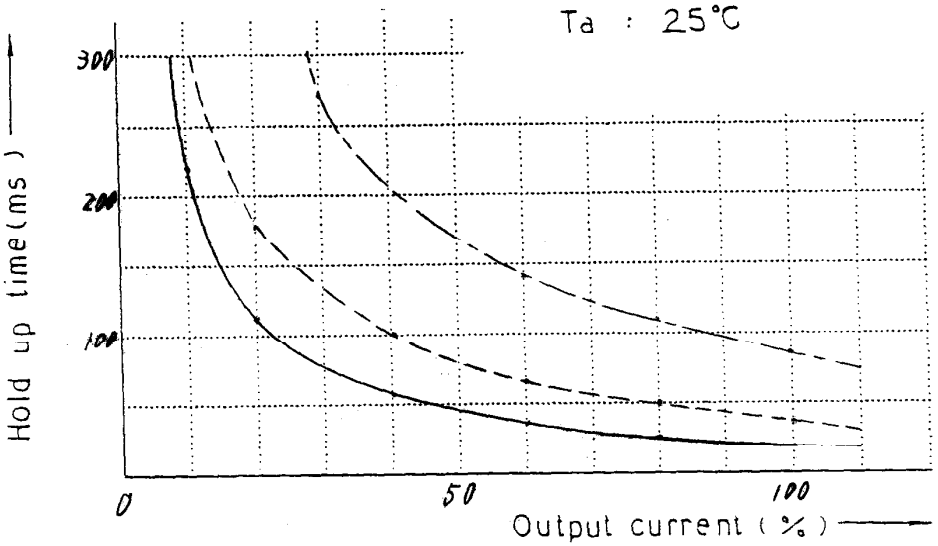
5v /DIV | 50mS/DIV

MS-10

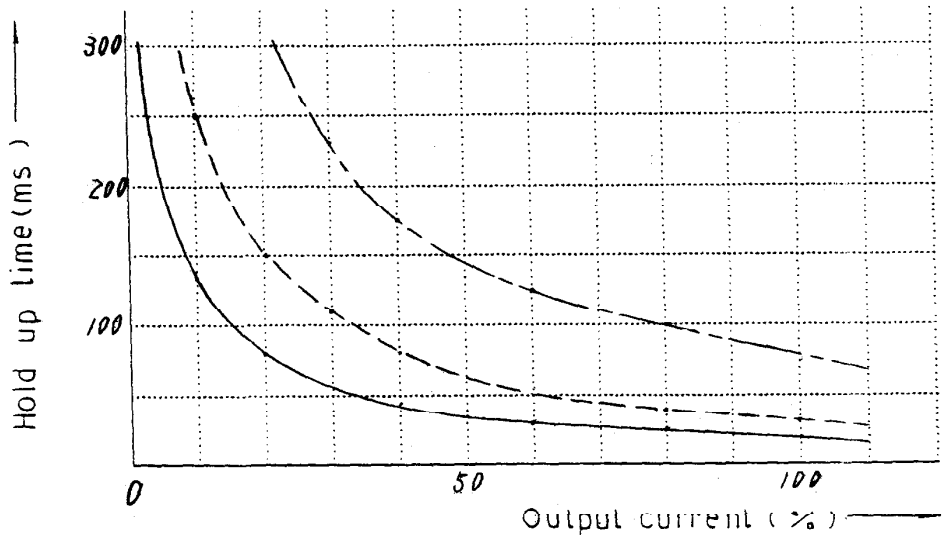
Hold up time

Conditions Vin : AC 85 v ——
AC 100 v - - - -
AC 132 v — — —
Ta : 25°C

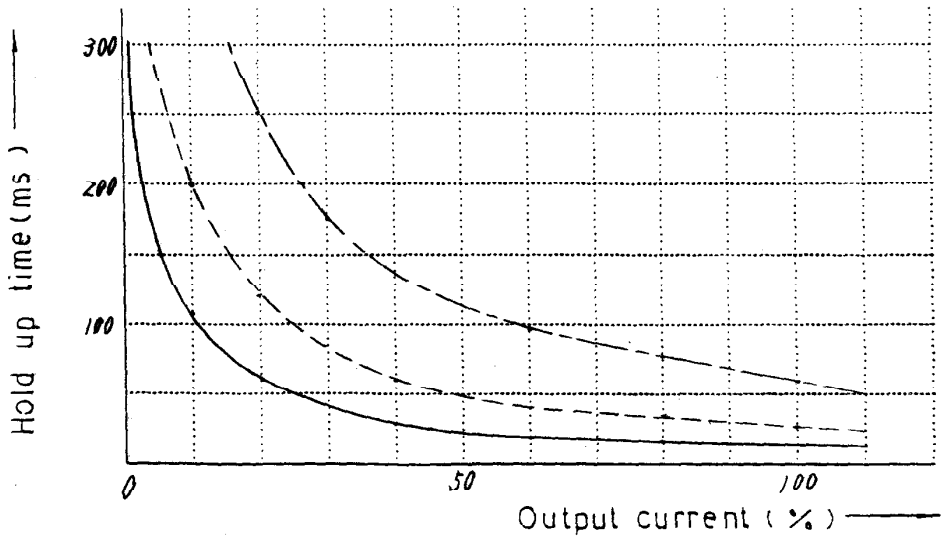
5 v



12 v



24 v



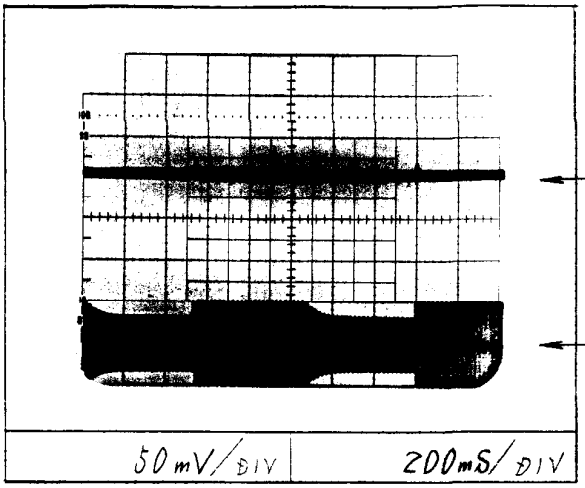
Dynamic line — Response

MS-10

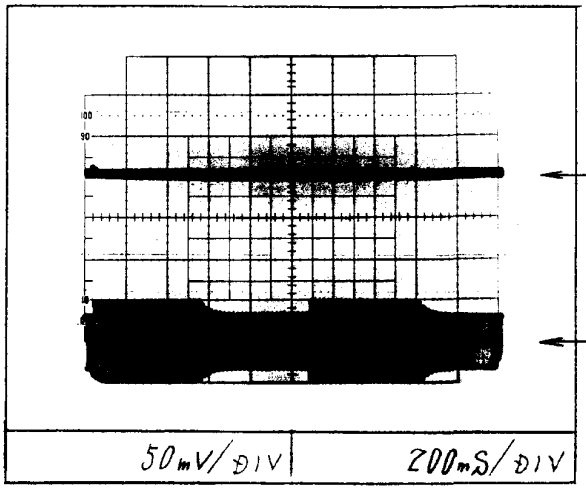
Vin : AC85V ⇄ AC132V

Conditions
Vout: Rated
Iout: 100%
Ta : 25°C

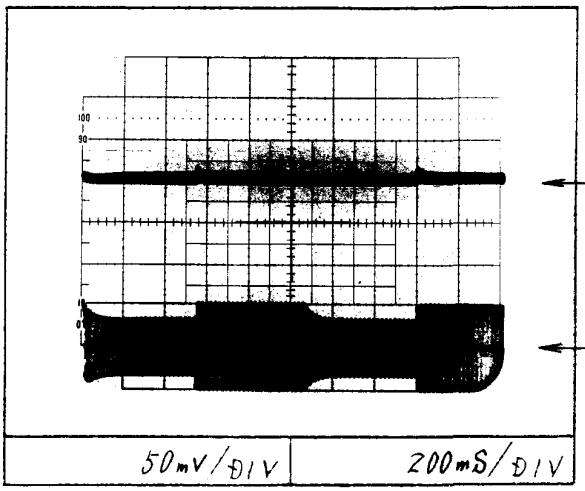
5V



12V



24V



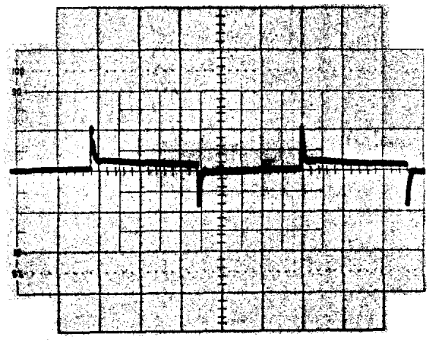
Dynamic load response

MS-10

Conditions Vin : AC 100 V
Ta : 25 °C

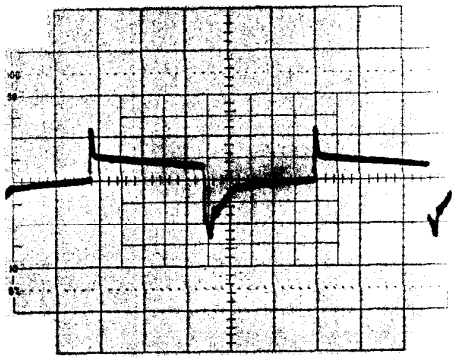
5 V

Iout 50 ⟷ 100% f = 100Hz



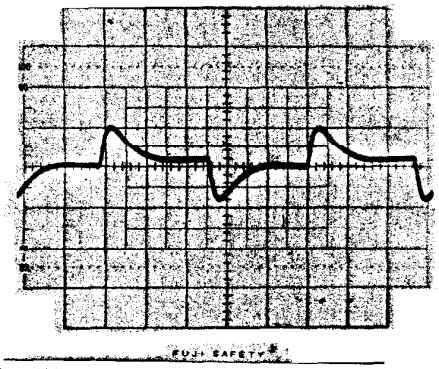
100 mV / DIV	2 mS / DIV
+ 2.2 %	- 1.8 %

Iout 0 ⟷ 100 % f = 100Hz



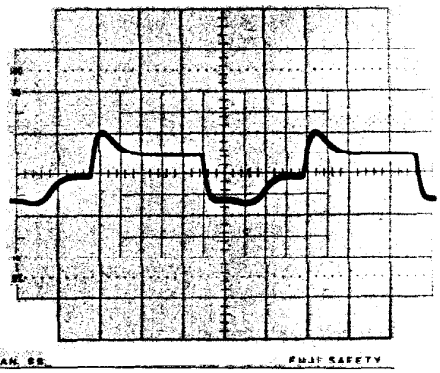
200 mV / DIV	2 mS / DIV
+ 4.8 %	- 5.6 %

Iout 50 ⟷ 100% f = 1kHz



100 mV / DIV	0.2 mS / DIV
+ 2 %	- 1.6 %

Iout 0 ⟷ 100% f = 1kHz



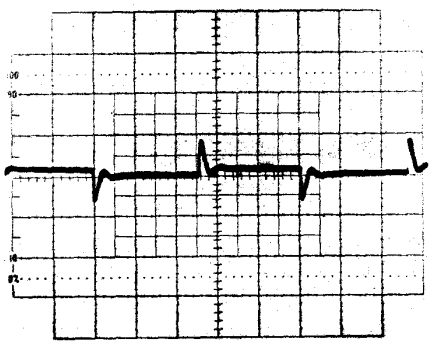
200 mV / DIV	0.2 mS / DIV
+ 4 %	- 3.2 %

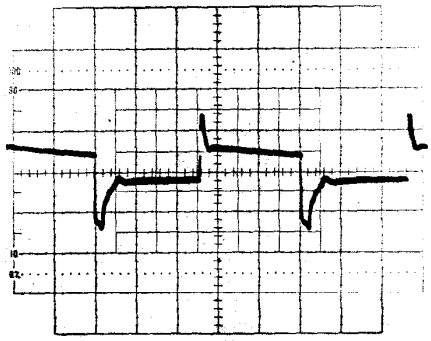
Dynamic load response

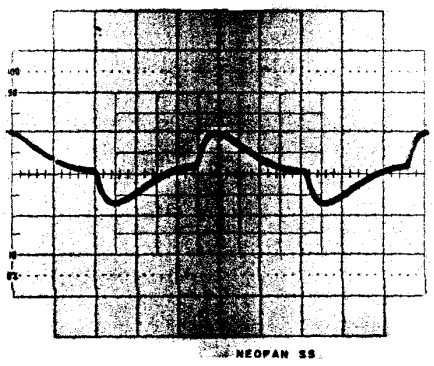
MS-10

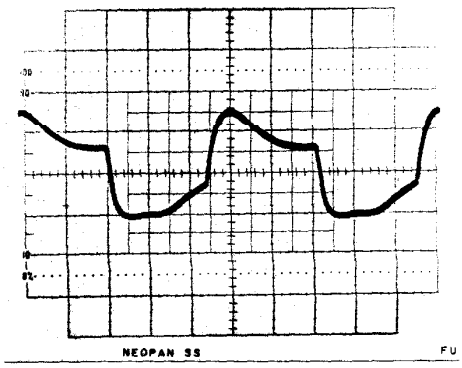
Conditions Vin : AC 100 V
Ta : 25 °C

12 V

Iout 50 ⟷ 100% f = 100Hz	
	
100 mV / DIV	2 mS / DIV
+0.67%	-0.5%

Iout 0 ⟷ 100 % f = 100Hz	
	
100 mV / DIV	2 mS / DIV
+1.2%	-1.1%

Iout 50 ⟷ 100% f = 1kHz	
	
100 mV / DIV	0.2 mS / DIV
+0.83%	-0.67%

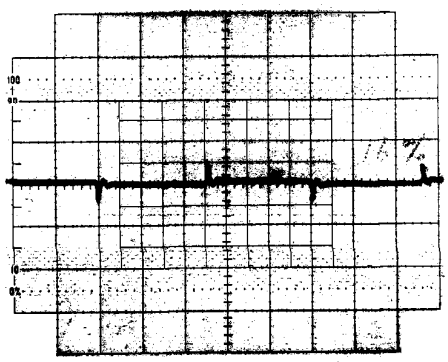
Iout 0 ⟷ 100% f = 1kHz	
	
100 mV / DIV	0.2 mS / DIV
+1.3%	-0.83%

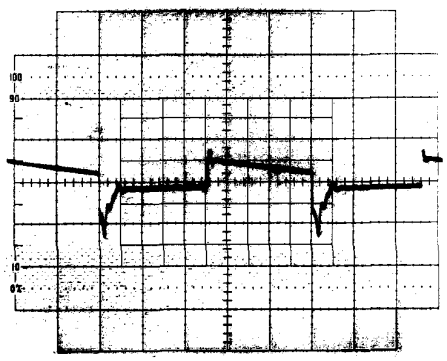
Dynamic load response

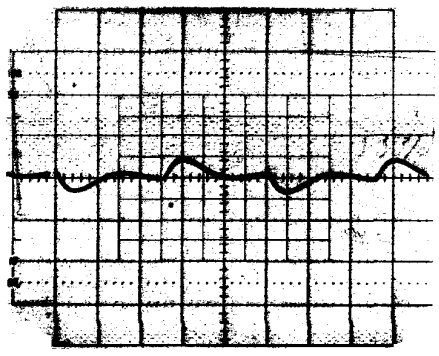
MS-10

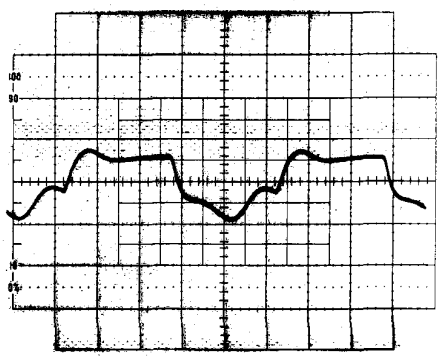
Conditions Vin : AC 100 V
Ta : 25 °C

24 V

Iout 50 ⟷ 100% f = 100Hz	
	
100 mV / DIV	2 mS / DIV
+0.16 %	−0.16 %

Iout 0 ⟷ 100 % f = 100Hz	
	
100 mV / DIV	2 mS / DIV
+0.33 %	−0.54 %

Iout 50 ⟷ 100% f = 1kHz	
	
100 mV / DIV	0.2 mS / DIV
+0.21 %	+0.13 %

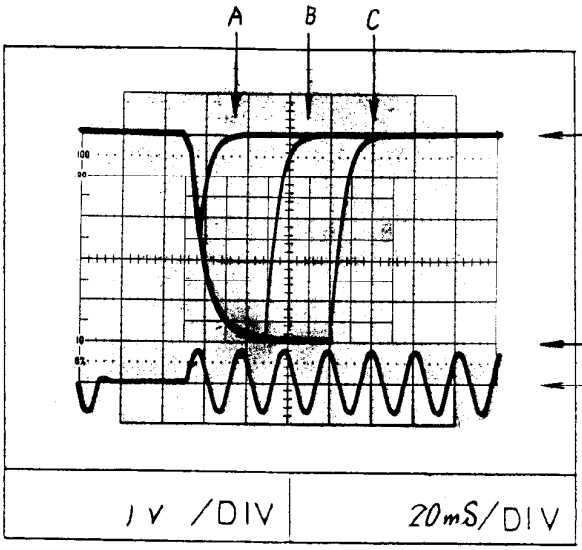
Iout 0 ⟷ 100% f = 1kHz	
	
100 mV / DIV	0.2 mS / DIV
+0.33 %	−0.38 %

Response to brown out

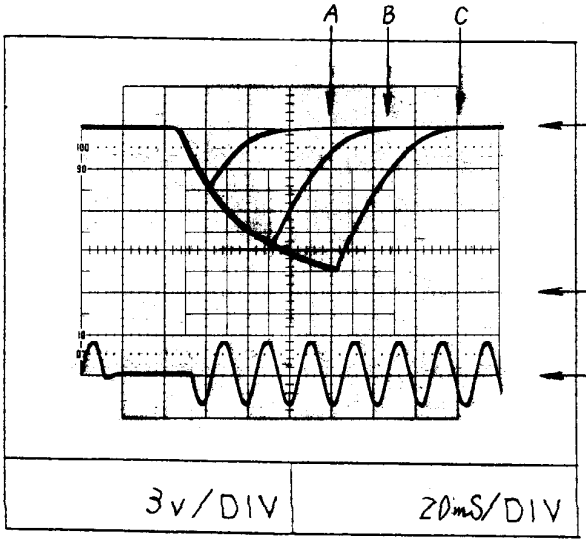
MS-10

Conditions Vin.: AC 100v
Iout: 100%
Ta : 25°C
Brow out time
A: 40ms
B: 70ms
C: 100ms

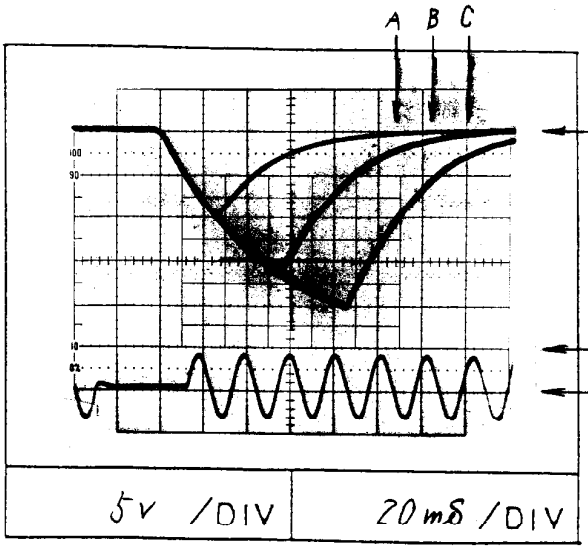
5v



12v



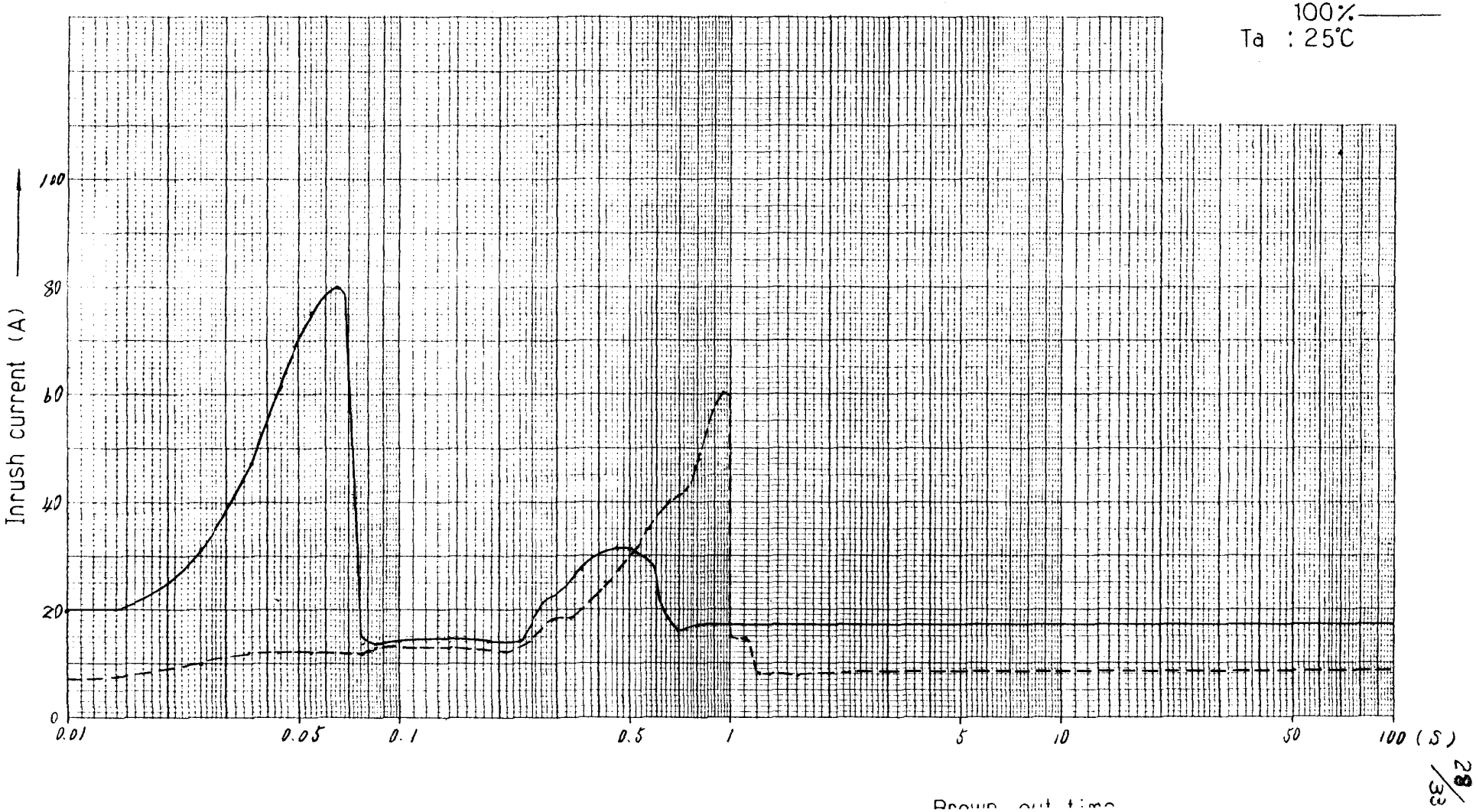
24v



Inrush current characteristics

MS-10

Conditions Vin :AC 100v
Iout: 0%------
100%———
Ta : 25℃



ΔNEMIC·LAMBDA

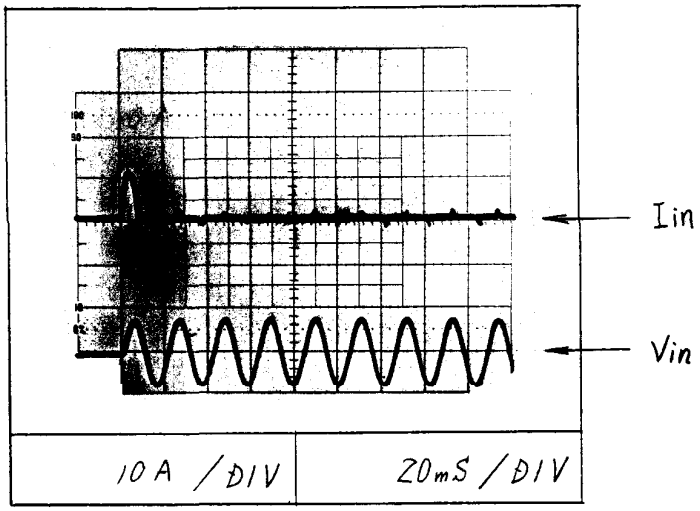
Inrush current wavefome

MS - 10

Conditions Vin : AC100 v
Iout : 100 %
Ta : 25 ℃

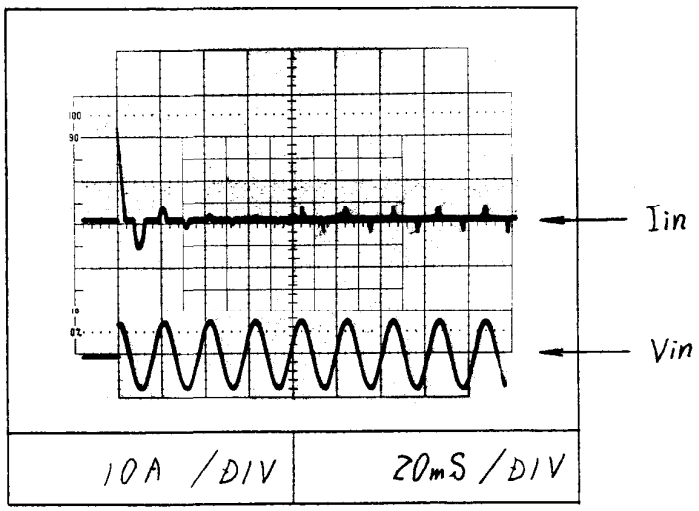
Switch in phase angle
of input AC voltage

$\phi = 0°$



Switch in phase angle
of input AC voltage

$\phi = 90°$

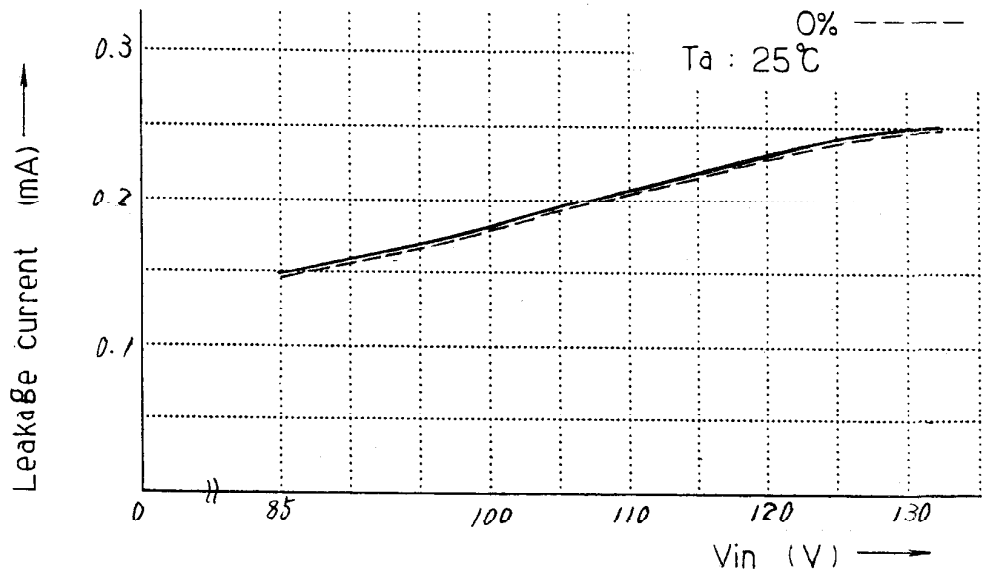


Leakage current

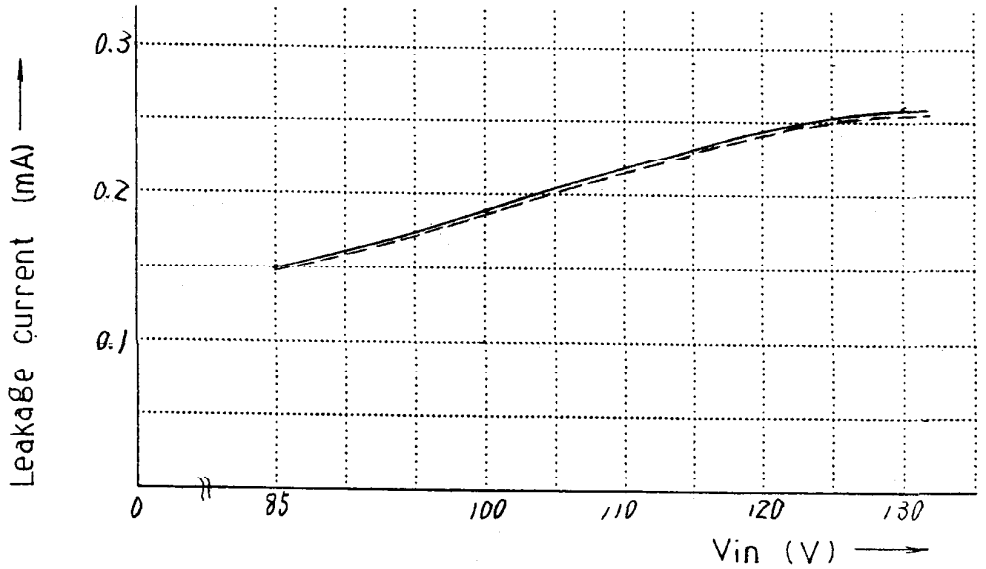
MS-10

Conditions FG – ACG SHORT
Vin : (AC) or DC
Iout : 100% ——
0% – – – –
Ta : 25℃

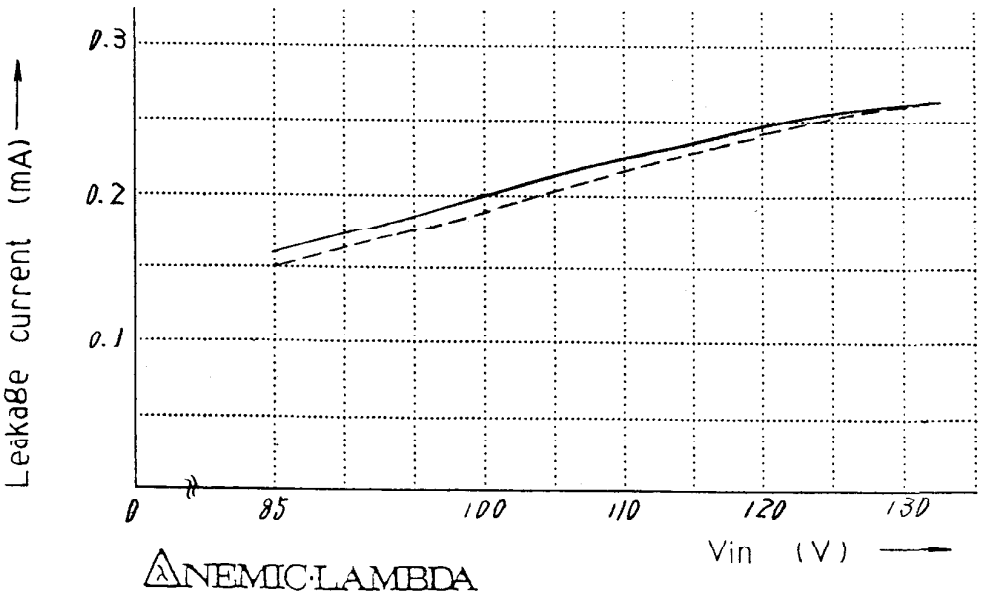
5 V



12 V



24 V

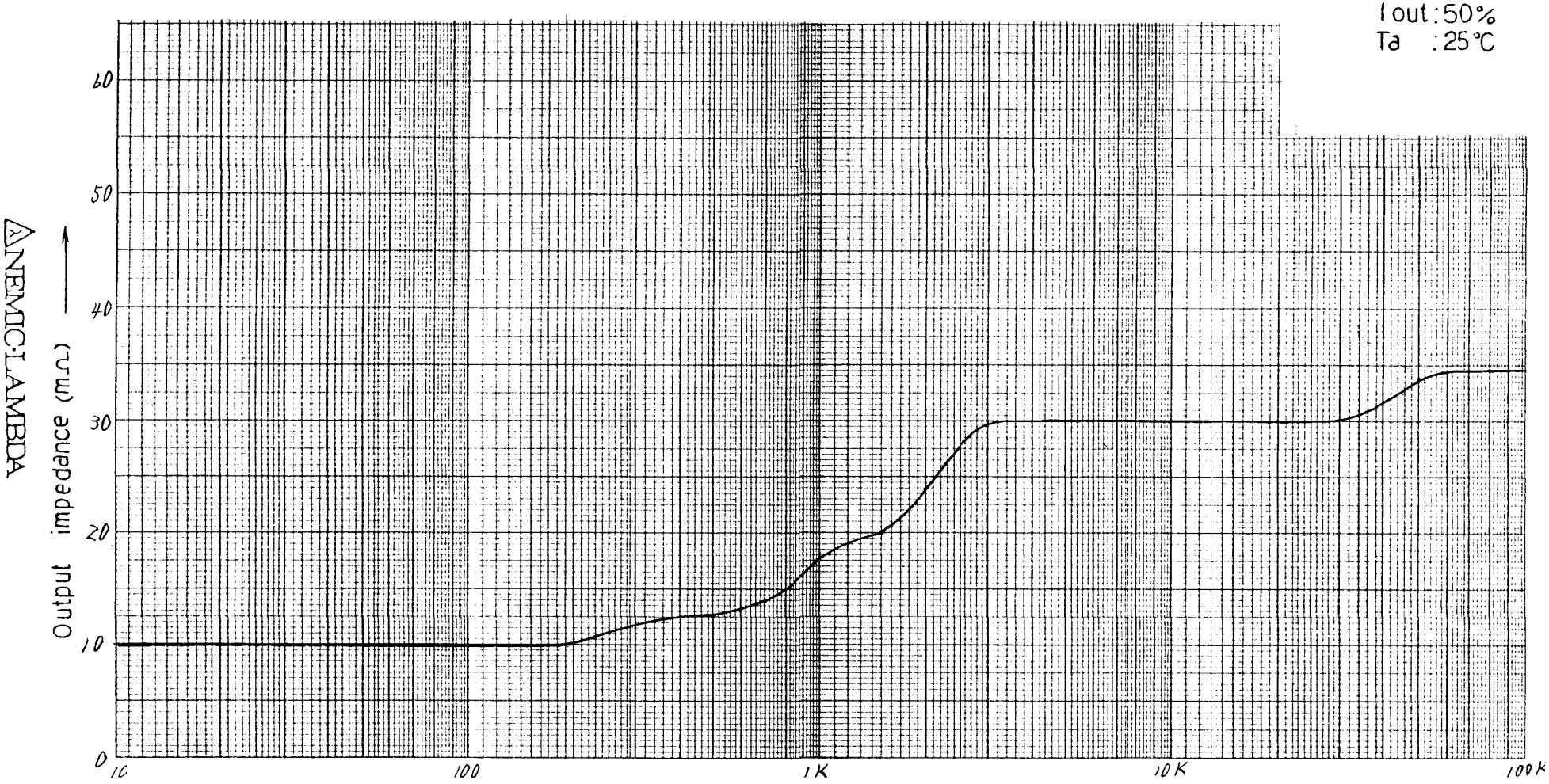


MS-10

Output impedance — Frequency

5 V

Conditions Vin : AC100V
Iout : 50%
Ta : 25°C



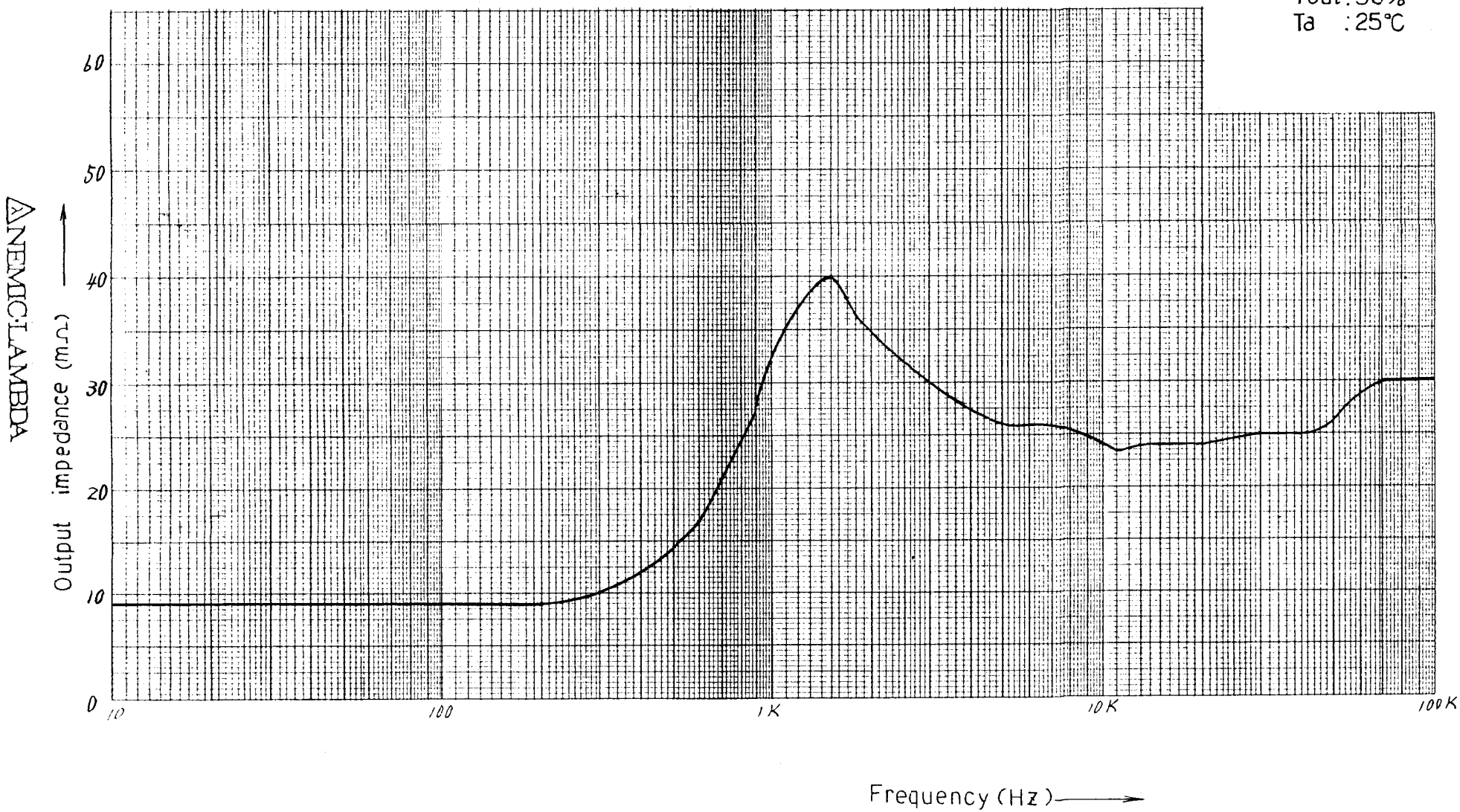
△NEMIC-LAMBDA

MS-10

Output impedance — Frequency

12V

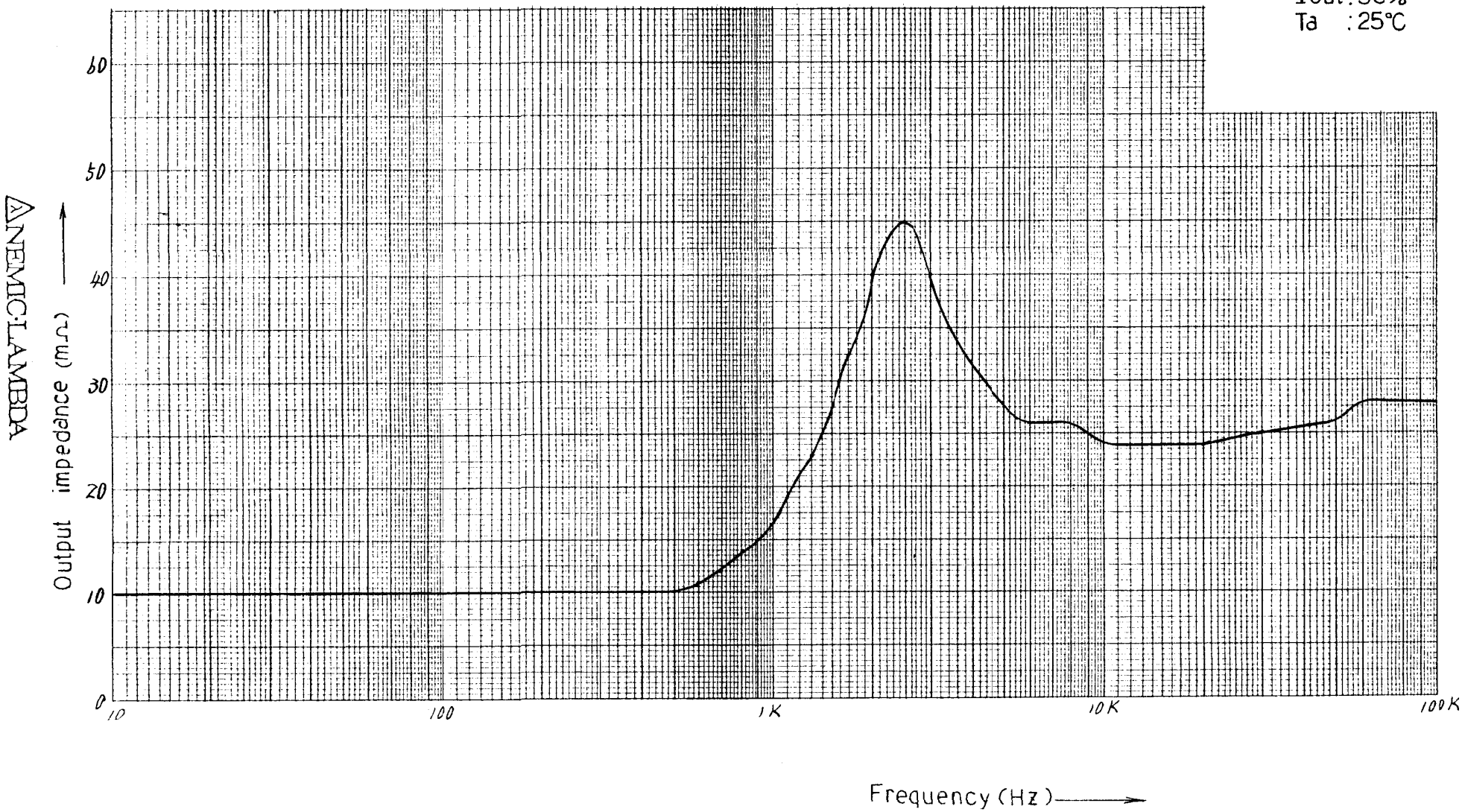
Conditions Vin : AC100V
Iout : 50%
Ta : 25°C



ΔNEMIC-LAMBDA

MS-10

Output impedance — Frequency

24 V

Conditions Vin : AC100V
Iout : 5C%
Ta : 25°C