QUALITY TEST
DATA

KWD5

DWG. NO.		PA773-53-01			
QA APPROVAL		R / D			
NLJ	NLA	APP	CHK	ENG	DRW
T. Murayama			CCNEO		
'93. 10. 1	1/JAN/93	24/DEC/92	5/12/92	5/12/92	5/12/92

T. Kasa
24/12/92 '93. 10. 1

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Terminology used :

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

KWD5 Specifications

NEMIC-LAMBDA

PA773-01-01

*: For delivery, contact to our sales office.

	ITEMS / MODEL			KWD5-1212		KWD5-1515	
				CH1	CH2	CH1	CH2
1	Nominal Output Voltage		V	+12V (24V) -12V		+15V (30V) -15V	
2	Minimum Output Current		A	0	0	0	0
3	Maximum Output Current		A	0.22	0.22	0.18	0.18
4	Maximum Output Power		W	5.3		5.4	
5	Efficiency (typ)	(*1)	%	69		69	
6	Input Voltage Range	(*2)	-	85 ~ 265VAC (47~440Hz) or 110 ~ 340VDC			
7	Input Current (typ)	(*1)	A	0.2A at 100VAC			
8	Inrush Current (typ)		A	15A at 100VAC, 30A at 200VAC Ta = 25°C			
9	Output Voltage Range		-	FIXED ±5% (Max)		FIXED ±5% (Max)	
10	Maximum Ripple & Noise	(*3)	mV	150	150	150	150
11	Maximum Line Regulation	(*3,*4)	mV	60	60	75	75
12	Maximum Load Regulation	(*3,*5)	mV	600	600	750	750
13	Maximum Temperature Drift	(*3,*6)	mV	120	120	150	150
14	Over Current Protection	(*7)	-	105% ~			
15	Over Voltage Protection	(*8)	-	110% ~			
16	Parallel Operation		-	———			
17	Series Operation		-	Possible			
18	Hold-Up Time (typ)		-	17mS at 5W, 100VAC, Ta = 25°C			
19	Operating Temperature		-	-10°C ~ +70°C (-10°C : 80%, 0~+50°C : 100%, +70°C : 25%)			
20	Operating Humidity		-	30 ~ 90%RH (No dewdrop)			
21	Storage Temperature		-	-30 ~ +85°C			
22	Storage Humidity		-	20%RH ~ 95%RH (No dewdrop)			
23	Cooling		-	Convection Cooling			
24	Withstand Voltage		-	Input-Output : 3kVAC(20mA), Input-FG : 2kVAC(20mA) Output-FG : 500VAC(100mA) for 1minute each.			
25	Isolation Resistance		-	More than100MΩ at 25°C and 70%RH Output-FG 500VDC			
26	Vibration		-	10~55Hz, Constant Amplitude 1.65mm p-p (Max 10G), sweep 1 Minute X,Y,Z 1 hour each			
27	Shock		-	Less than 50G for 11±5mS on ± (X, Y, Z) axis each 3 times			
28	Safety		-	Approved by UL1950, CSA234, EN60950(TUV)			
29	Conducted Radio Noise	(*9)	-	Built to meet VCCI-Class B, FCC class B, VDE classB			
30	Weight		g	75g			
31	Size (WxHxD)		mm	43 x 20.5 x 55 (Refer to Outline Drawing)			

* Read Instruction manual carefully, before using the power supply unit.

= NOTES =

*1. At 100VAC and Maximum Output Power, Ta=25C.

*2. For cases where conformance to various safety specs (UL, CSA,TUV) are required to be described as 100-240VAC, 50/60Hz on name plate.

*3. Please refer to Fig. A for measurement determination of line & load regulation and output ripple & noise voltage.

*4. From 85~265VAC, constant load.

*5. From Min load - Full load (Maximum power), constant input Voltage.

*6. From 0~50°C, constant input voltage and load.

*7. Current limiting with automatic recovery. Avoid to operate over load or dead short for more than 30 seconds.

*8. Over Voltage Clamping by Zener Diode (on CH2 only).

*9. VDE classB with extenal capacitor.

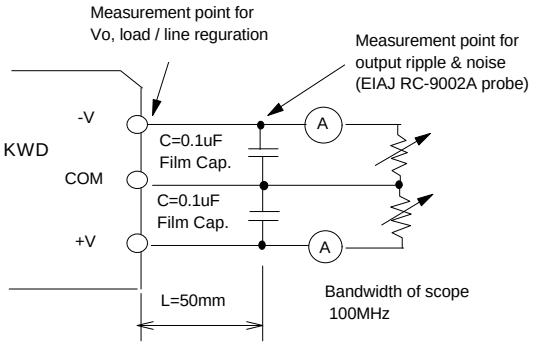
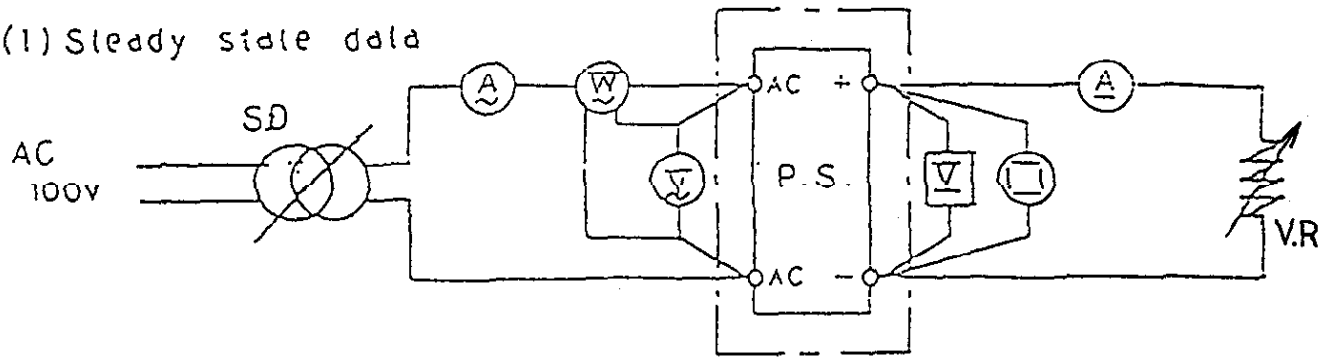


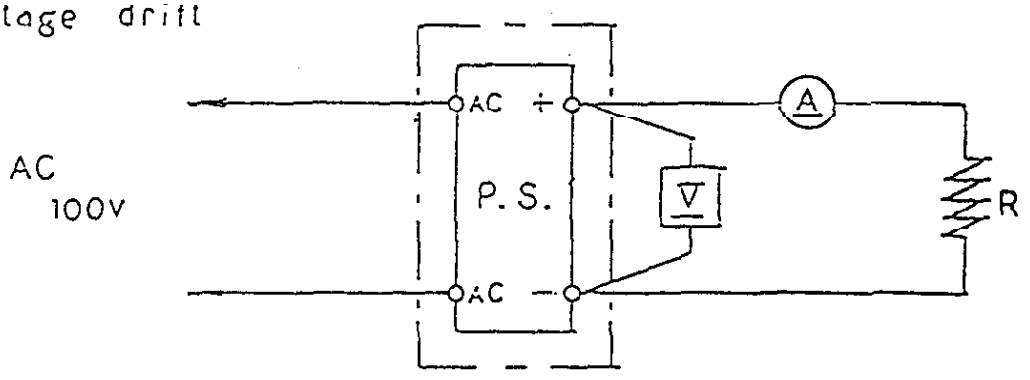
Fig.A

Circuits used for determination

(1) Steady state data



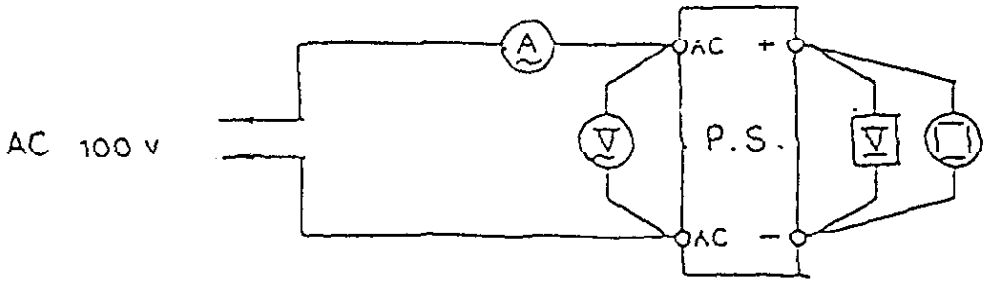
(2) Warm up voltage drift



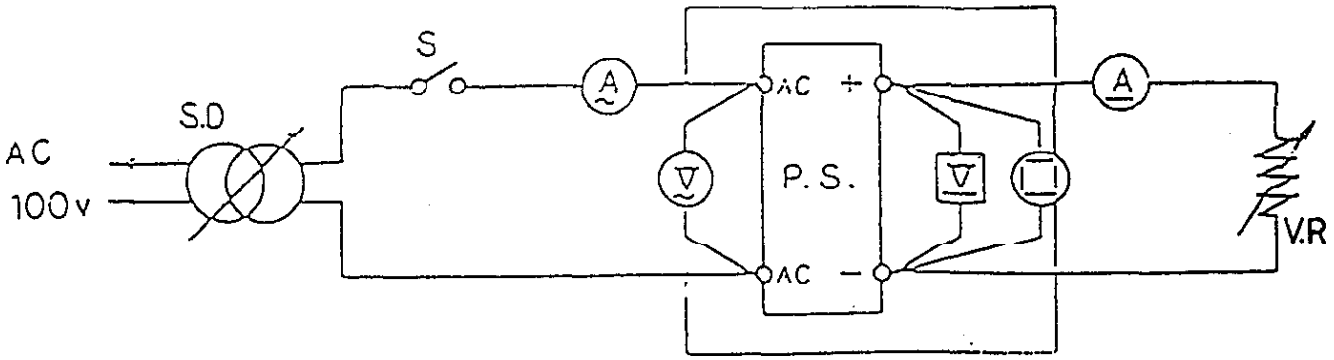
(3) Over current protection (o.c.p) characteristics

Same as steady state data.

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



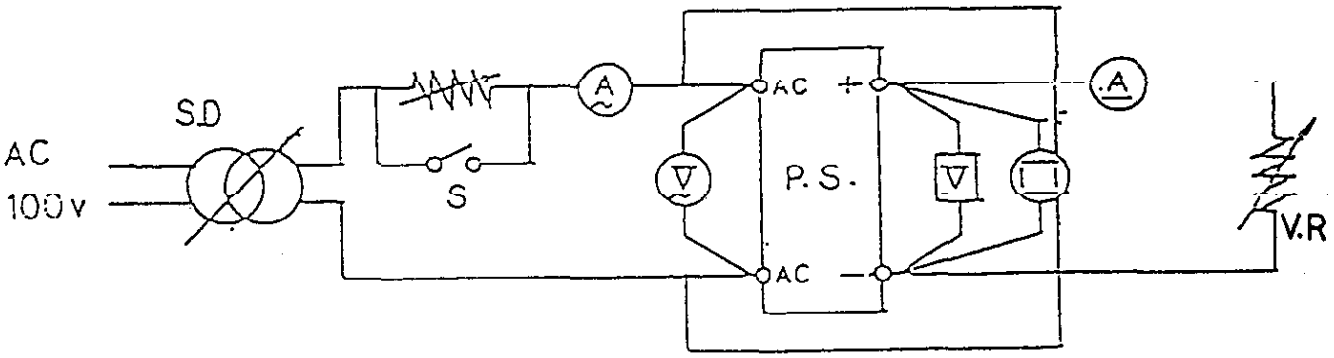
(5) Output rise characteristics



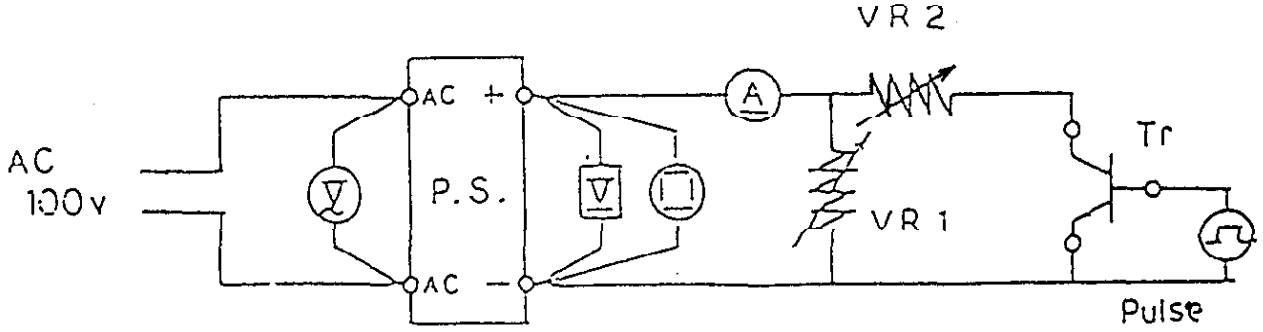
(6) Output fall characteristics

Same as output rise characteristics.

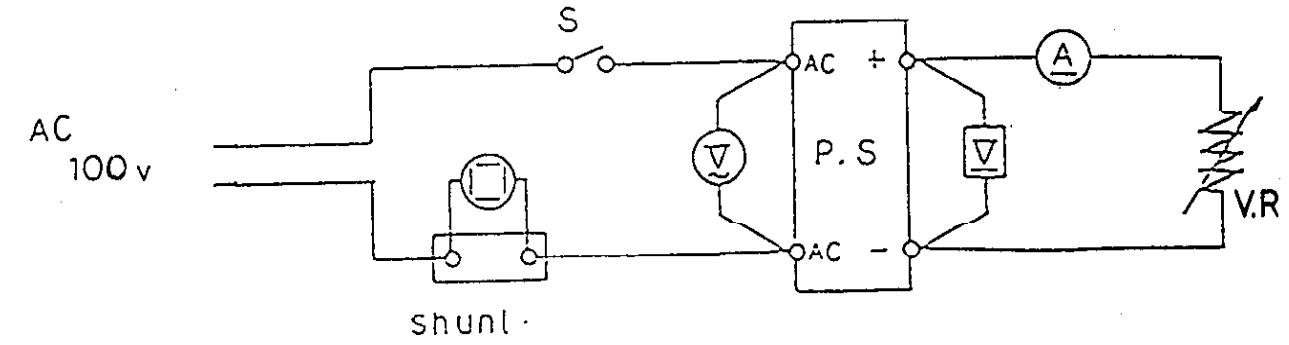
(7) Dynamic line response



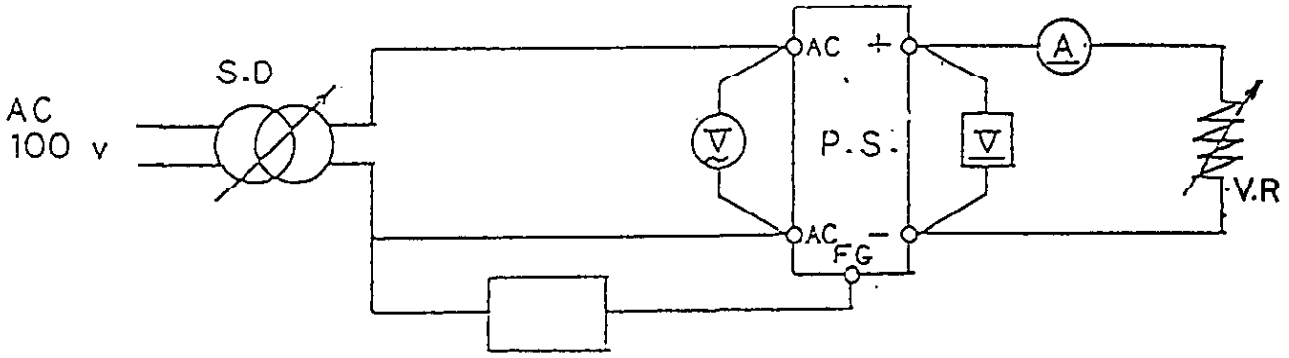
(8) Dynamic load response



(9)Inrush current characteristics



(10)Leakage current



leakage current meter

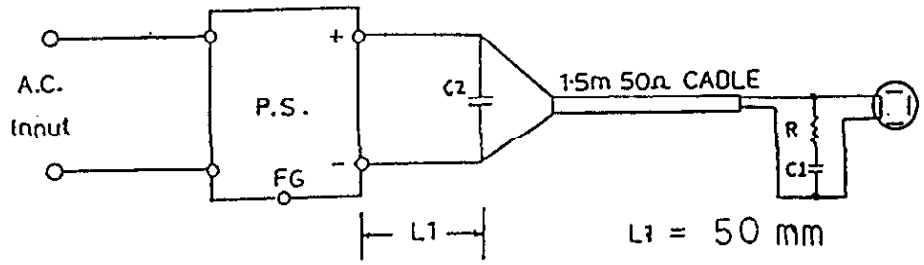
Note : ·Leakage current measured through a 1kΩ resistor.

·Range used — AC + DC

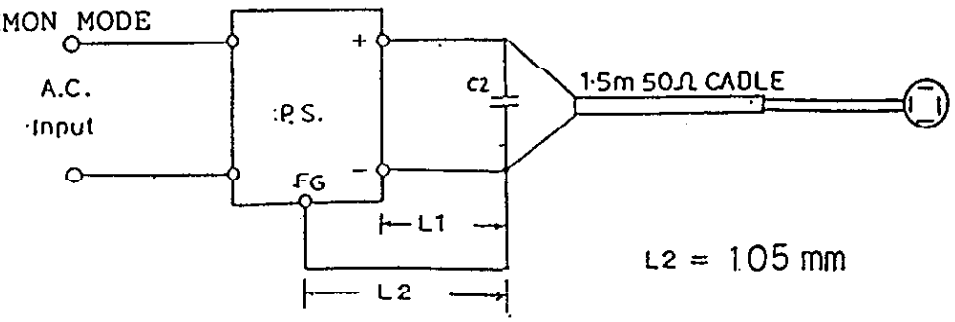
R = 50Ω
C1 = 4700pF
C2 = 0.1μF
(Ch1/Ch2/Ch1+Ch2)

(11) Output-ripple, noise

a) NORMAL MODE



b) NORMAL + COMMON MODE



List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	Oscilloscope	HITACHI DENSHI	V-1065
2	Digital storage oscilloscope	HITACHI DENSHI	VC-6041
3	Digital voltmeter	IWATSU	VDAC 7411
4	Digital watt/current/volt meter	HIOKI	3182
5	DC Ampere meter	YOKOGAWA ELECTRIC	2051
6	Autotransformer	SUPERIOR ELECTRIC	136 ST
7	Variable resistive load	IWASHITA ELECTRIC	D-5-10/16
8	Dynamic dummy load	TAKAMIZAWA CYBERNETICS KIKUSUI	PSA-150D PLZ72W, PLZ150WA
9	Digirush currenter	TAKAMIZAWA CYBERNETICS	PSA-200
10	Current Probe/Amplifier	TEKTRONIX	A6303/AM503
11	Controlled Temp. Chamber	TABAI	PL-2GM
12	Leakage current meter	YOKOGAWA ELECTRIC	3226
13	Equipment for dynamic line response	- BUILT IN-HOUSE -	

+12V

1. Regulation - line and load

Condition Ta : 25°C
-12V: 0.22A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	12.160V	12.159V	12.156V	12.155V	5 mV	0.04 %
50 %	12.026V	12.026V	12.024V	12.023V	3 mV	0.03 %
100 %	11.965V	11.964V	11.963V	11.961V	4 mV	0.03 %
Load	195mV	195mV	193mV	194mV		
Regulation	1.63 %	1.63 %	1.61 %	1.62 %		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	11.945V	11.964V	11.965V	20 mV	0.17 %

-12V

1. Regulation - line and load

Condition Ta : 25°C
+12V: 0.22A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	-12.180V	-12.180V	-12.176V	-12.175V	5 mV	0.04 %
50 %	-12.059V	-12.059V	-12.058V	-12.056V	3 mV	0.03 %
100 %	-11.999V	-11.999V	-11.998V	-11.997V	2 mV	0.02 %
Load	181mV	181mV	178mV	178mV		
Regulation	1.51%	1.51%	1.48%	1.48%		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	-11.984V	-11.999V	-12.002V	18 mV	0.15 %

+15V

1. Regulation - line and load

Condition Ta : 25°C
-15V: 0.18A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	15.121V	15.121V	15.114V	15.111V	10 mV	0.07.%
50 %	15.006V	15.006V	15.003V	15.001V	5 mV	0.03 %
100 %	14.944V	14.944V	14.942V	14.939V	5 mV	0.03 %
Load	177mV	177mV	172mV	172mV		
Regulation	1.18 %	1.18 %	1.15 %	1.15 %		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	14.978V	14.944V	14.929V	49 mV	0.33 %

-15V

1. Regulation - line and load

Condition Ta : 25°C
+15V: 0.18A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	-15.154V	-15.155V	-15.152V	-15.151V	4 mV	0.03 %
50 %	-15.037V	-15.038V	-15.038V	-15.037V	1 mV	0.01 %
100 %	-14.971V	-14.971V	-14.972V	-14.970V	2 mV	0.01 %
Load	183mV	184mV	180mV	181mV		
Regulation	1.22%	1.23%	1.20%	1.21%		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	-15.013V	-14.971V	-14.960V	53 mV	0.35 %

24V

1. Regulation - line and load

Condition Ta : 25°C

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	23.978V	23.978V	23.977V	23.973V	5 mV	0.02.%
50 %	23.969V	23.969V	23.966V	23.963V	6 mV	0.03 %
100 %	23.963V	23.963V	23.961V	23.957V	6 mV	0.03 %
Load	15 mV	15 mV	16 mV	16 mV		
Regulation	0.06 %	0.06 %	0.07 %	0.07 %		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	23.929V	23.963V	23.967V	38 mV	0.16 %

30V

1. Regulation - line and load

Condition Ta : 25°C

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	29.946V	29.946V	29.944V	29.940V	6 mV	0.02 %
50 %	29.934V	29.934V	29.932V	29.928V	6 mV	0.02 %
100 %	29.915V	29.915V	29.915V	29.909V	6 mV	0.02 %
Load	31 mV	31 mV	29 mV	31 mV		
Regulation	0.10%	0.10%	0.10%	0.10%		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

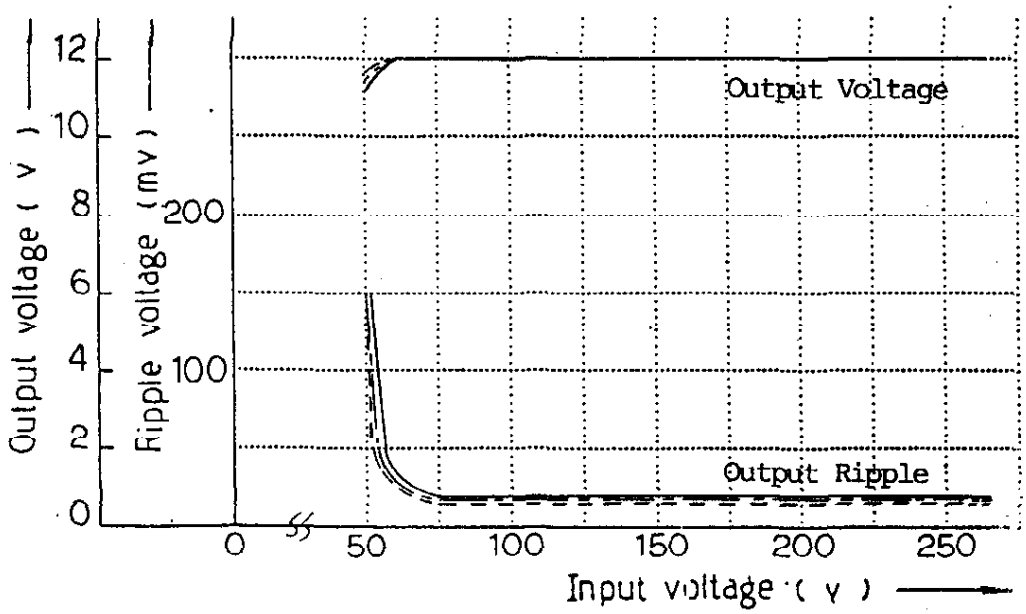
Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	29.991V	29.915V	29.889V	102mV	0.34 %

Output Voltage and Ripple Voltage v.s. Input Voltage

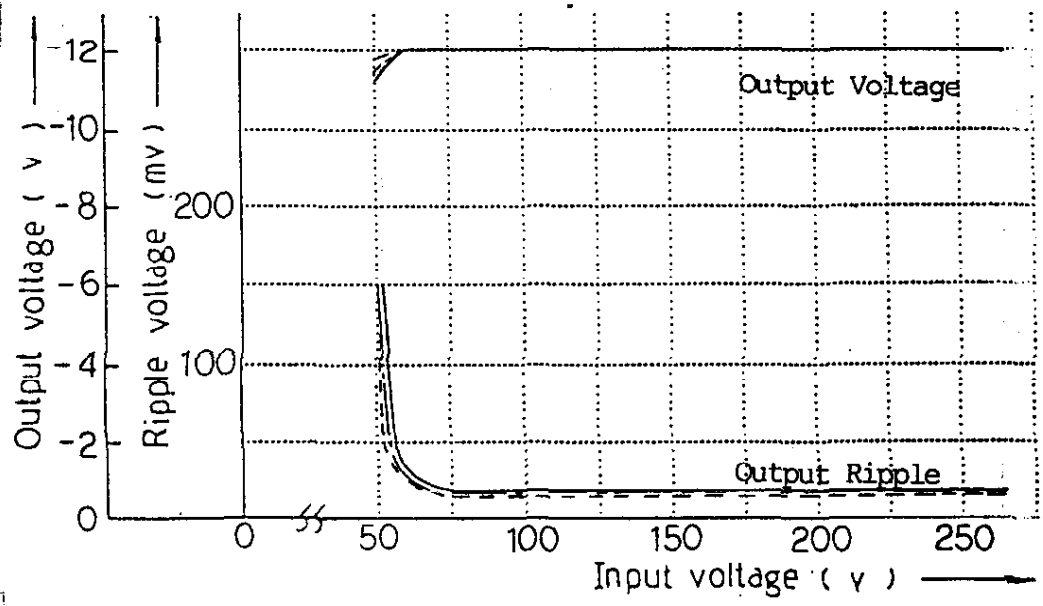
KWD5

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

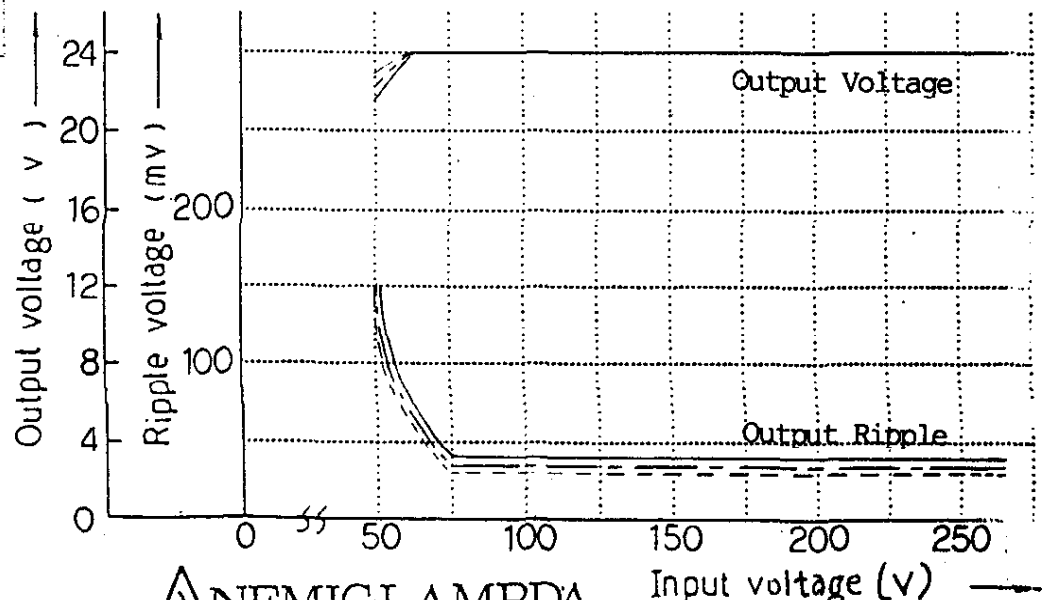
+12V



-12V



24V

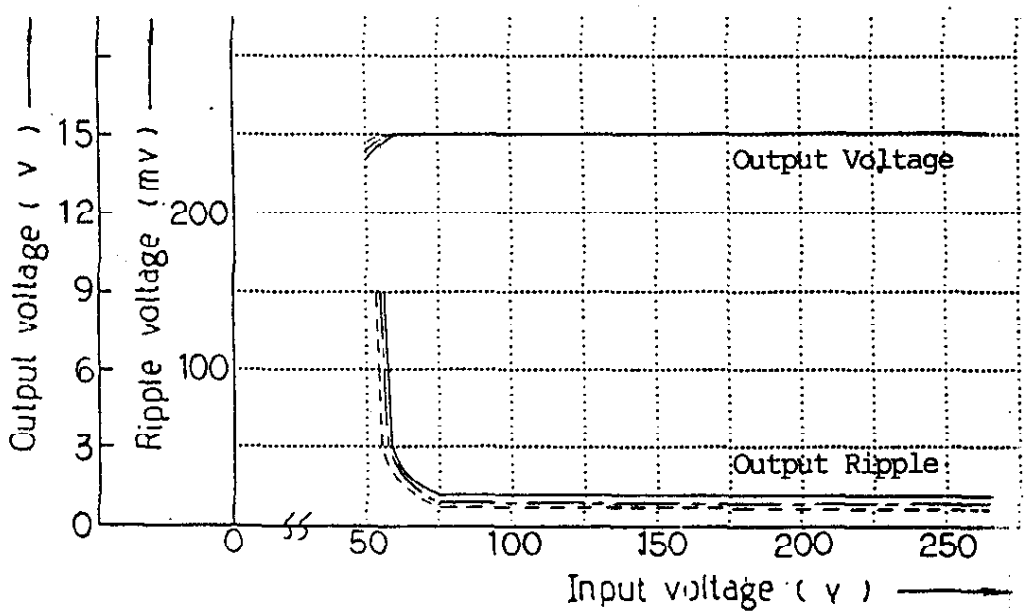


Output Voltage and Ripple Voltage v.s. Input Voltage

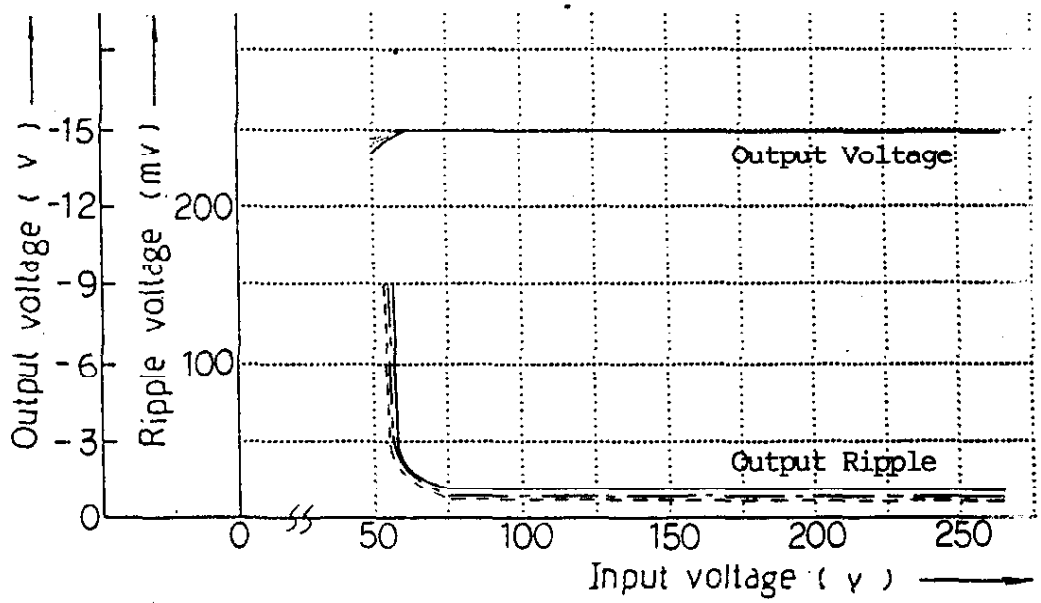
KWD5

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

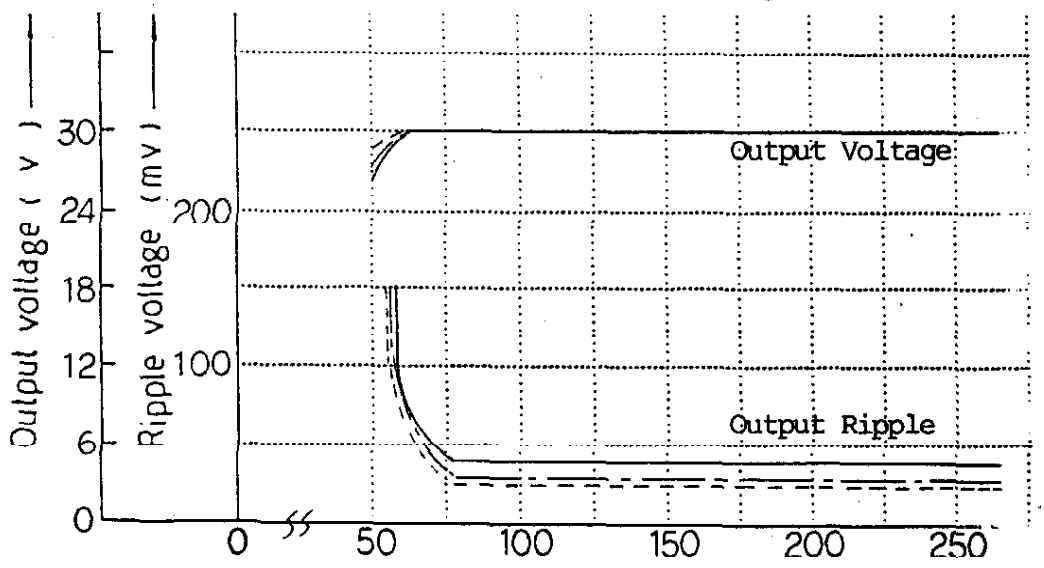
+15V



-15V



30V

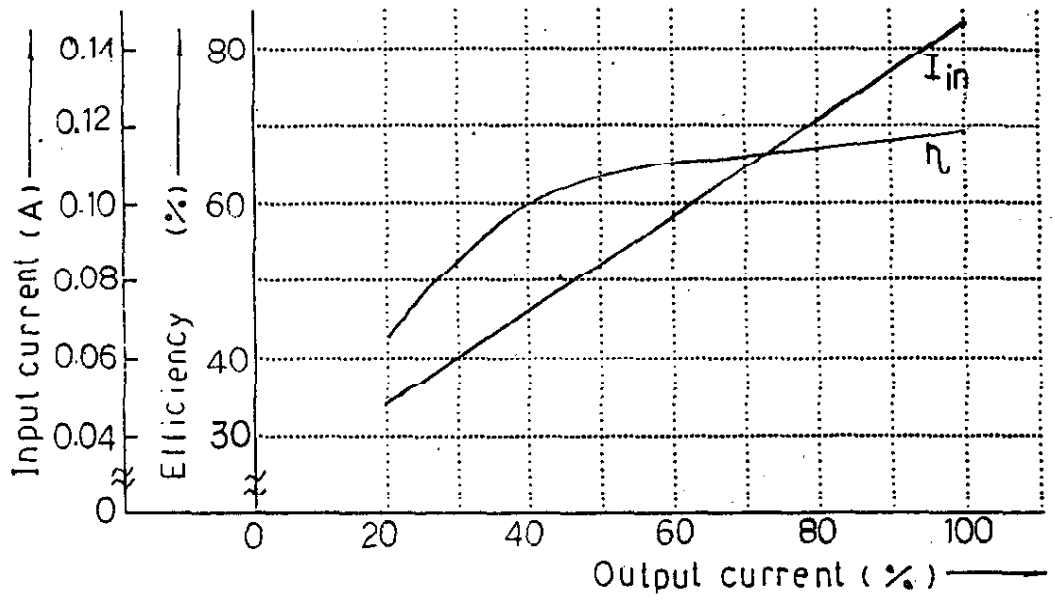


Efficiency and Input Current v.s.
Output Current

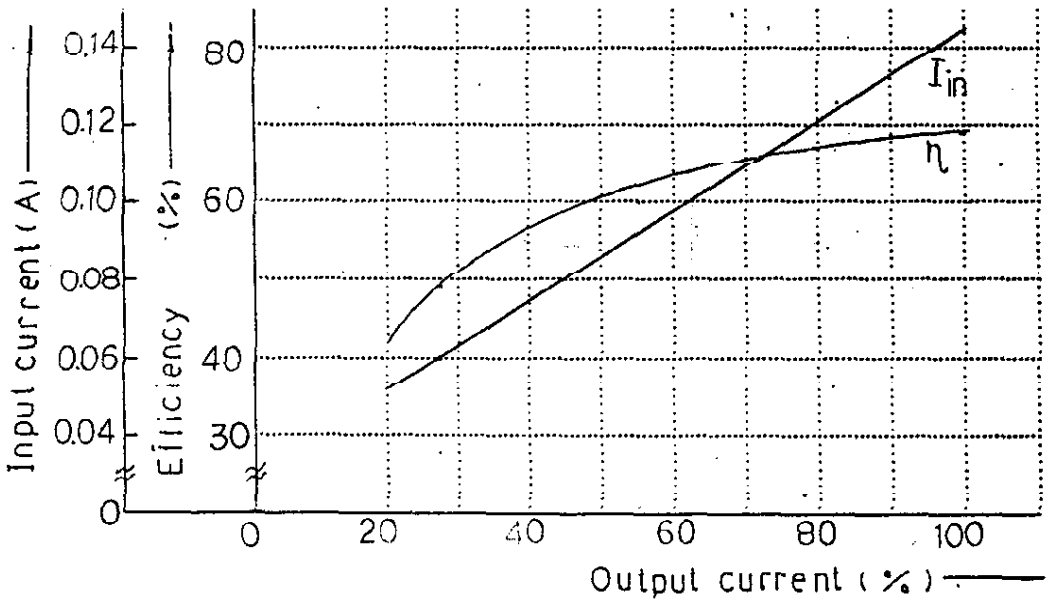
KWD5

Condition Vin : AC100V
Ta : 25°C

24V



30V

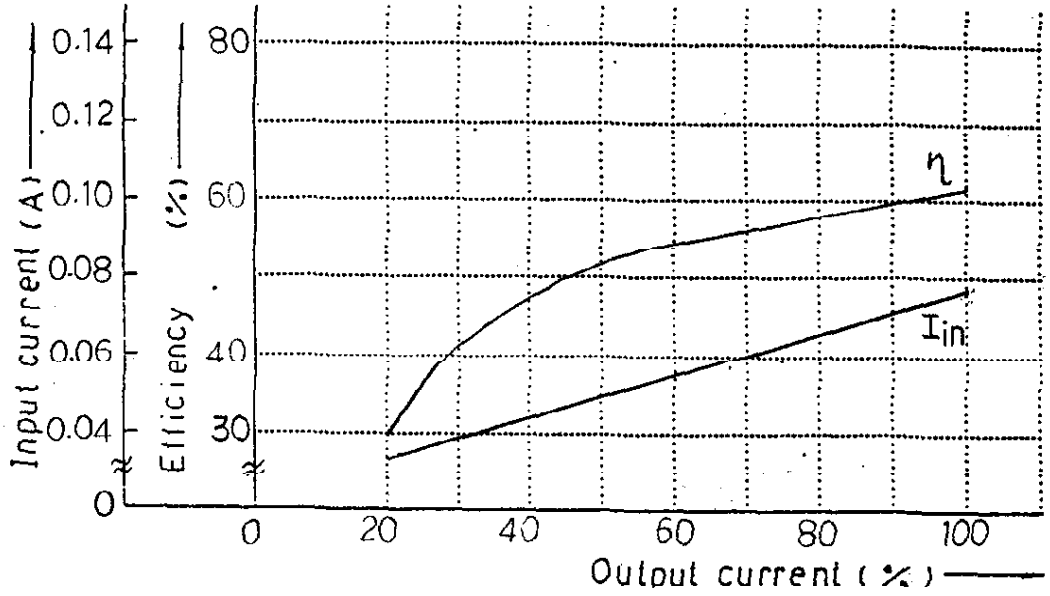


Efficiency and Input Current v.s.
Output Current

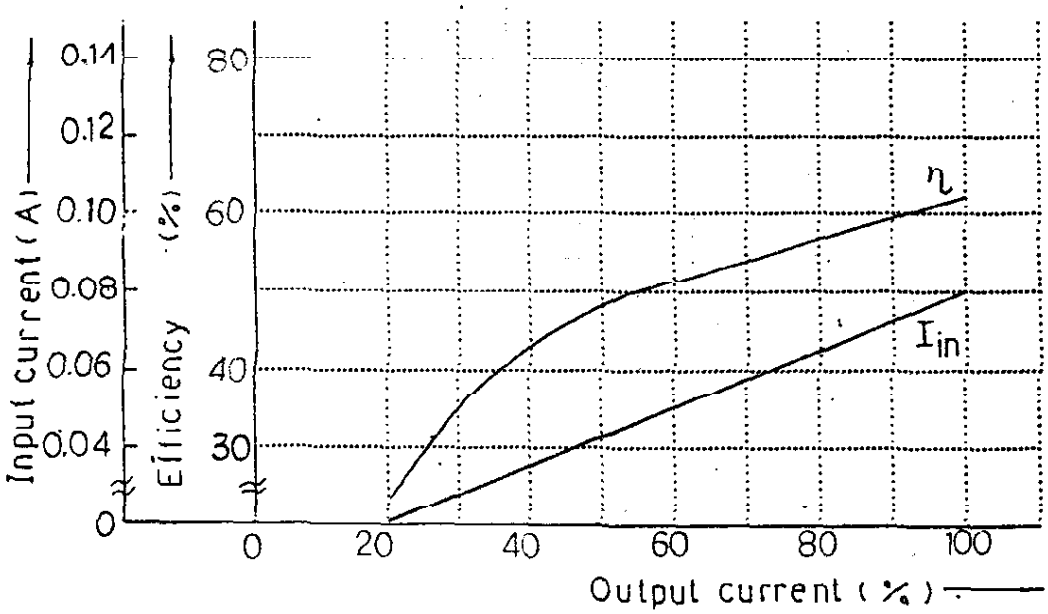
KWD5

Condition Vin : AC220V
Ta : 25°C

24V



30V

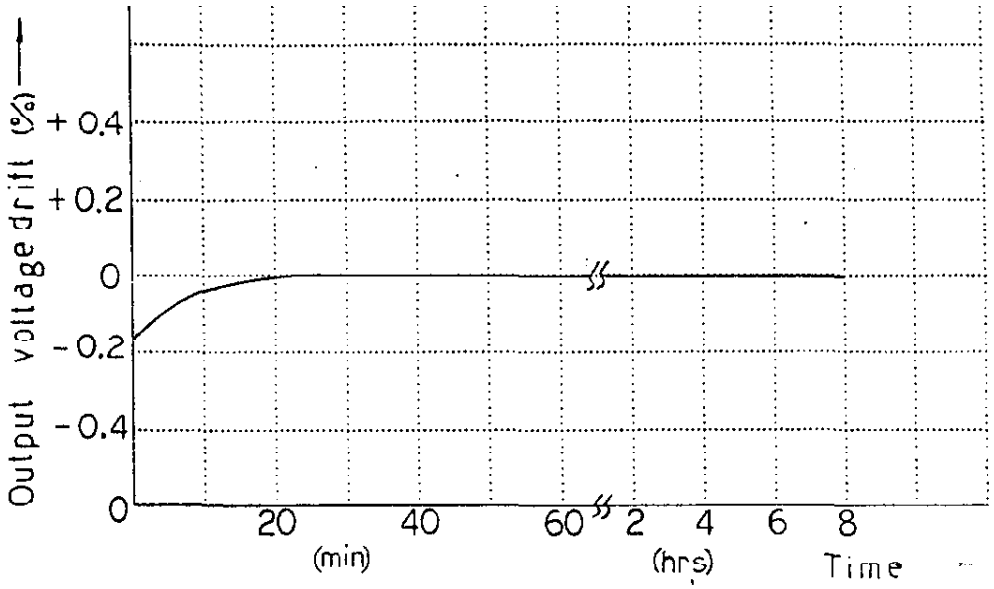


Warm Up Voltage Drift

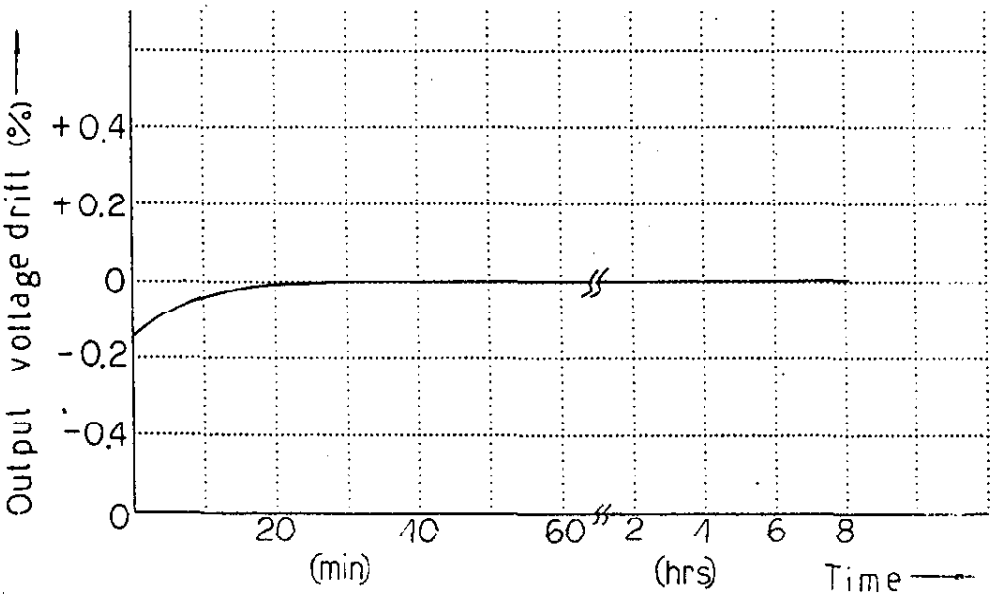
KWD5

Condition Vin : AC100V
Iout: 100%
Ta : 25°C

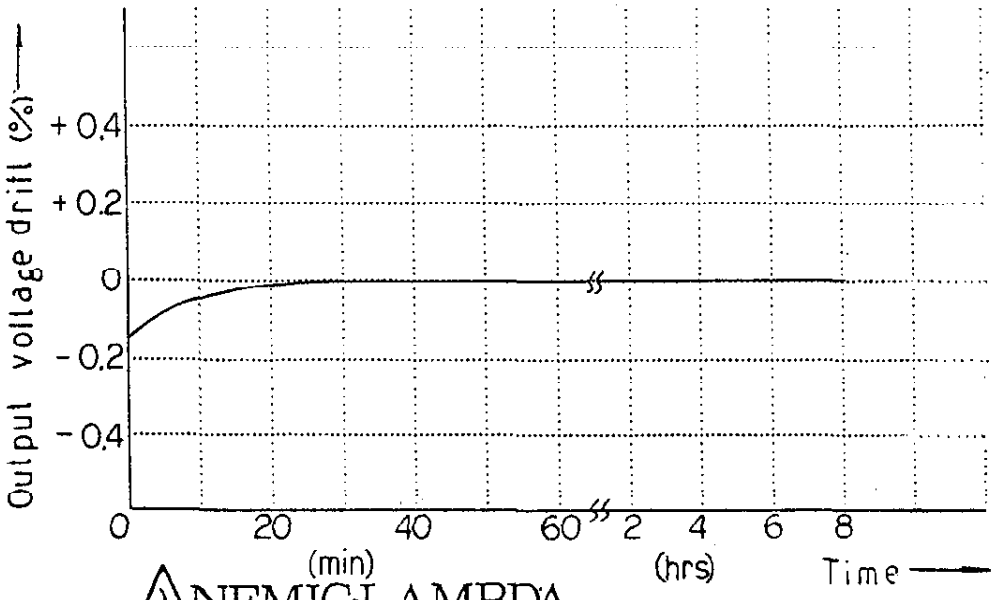
+12V



-12V



24V

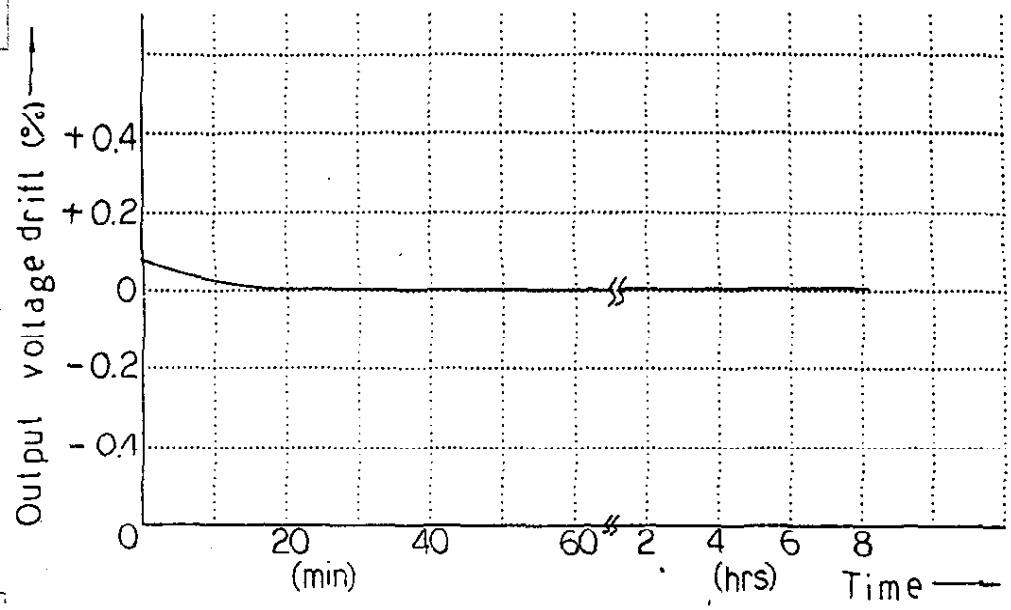


Warm Up Voltage Drift

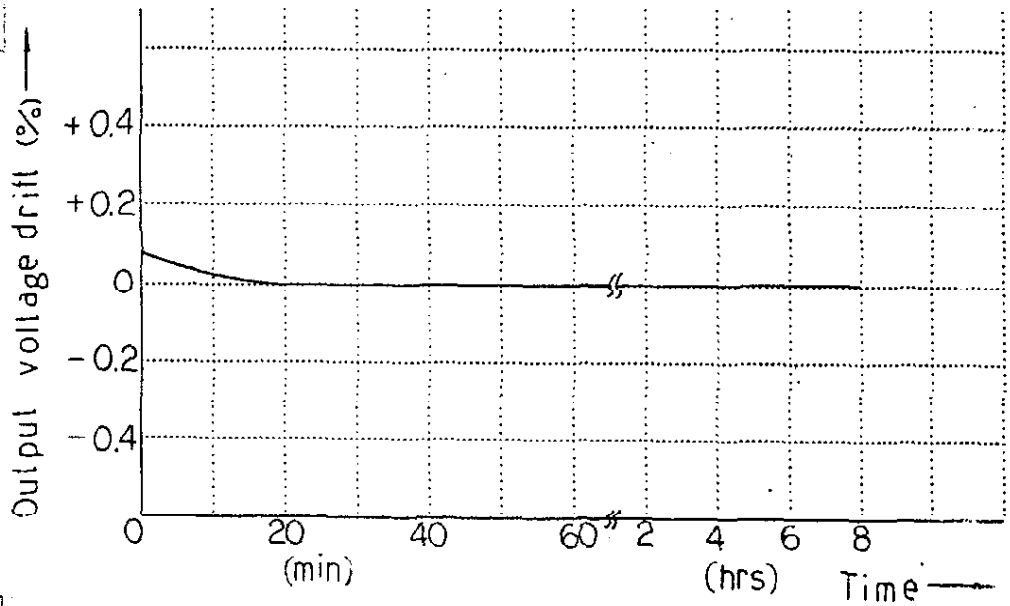
KWD5

Condition Vin : AC100V
Iout: 100%
Ta : 25°C

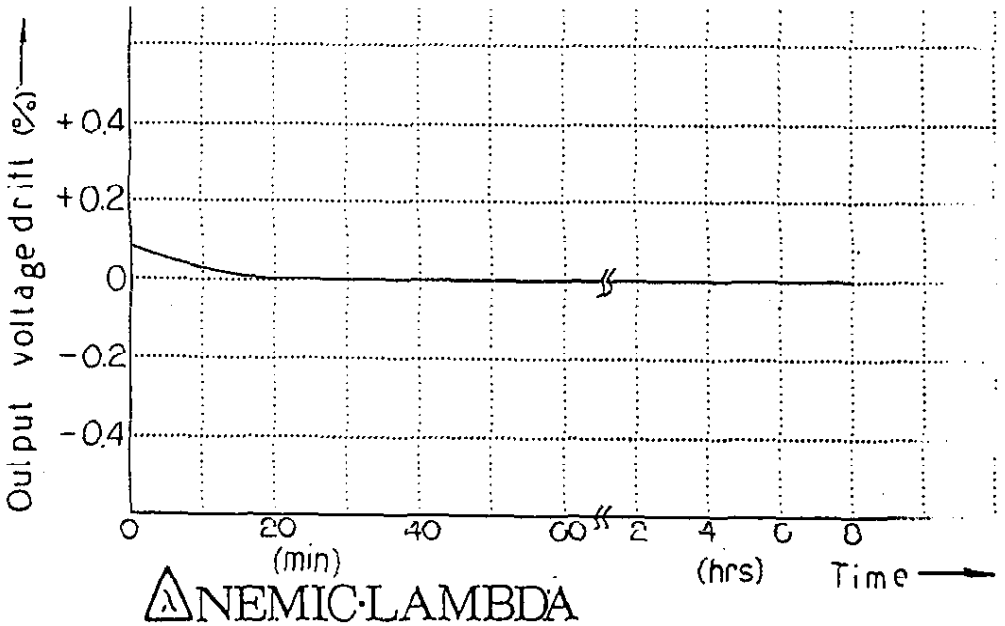
+15V



-15V



5V

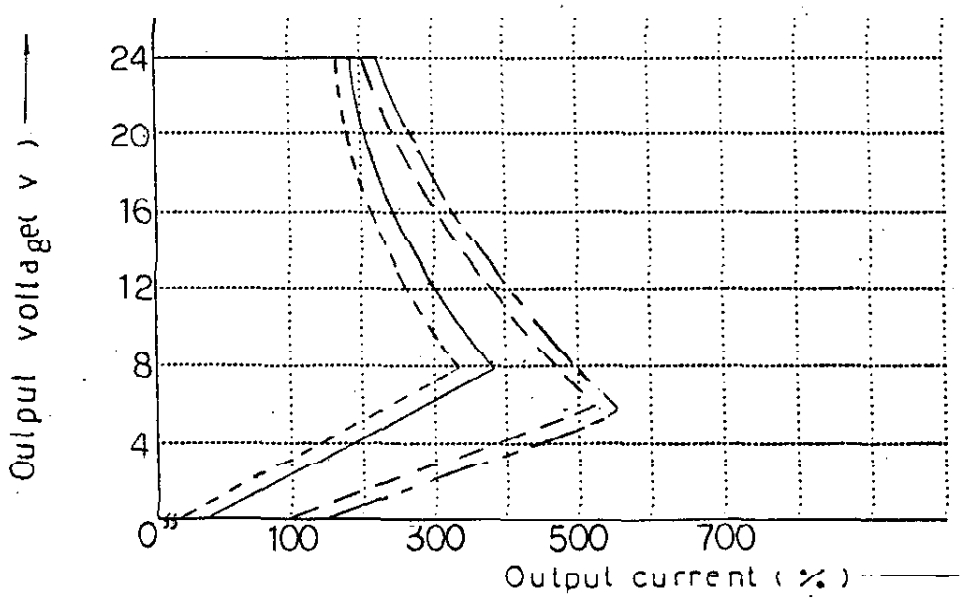


NEMIC-LAMBDA

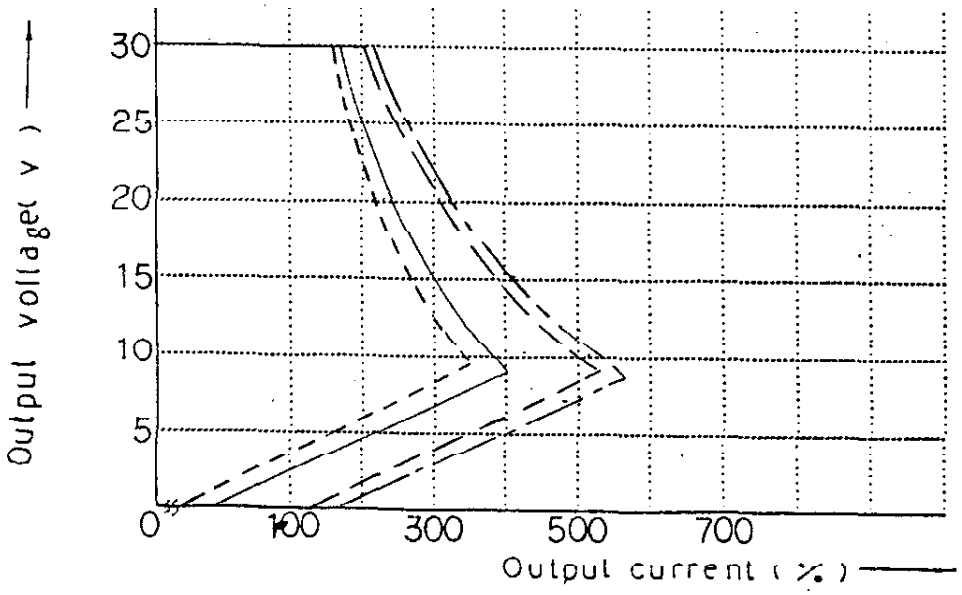
O.C.P. Characteristics

Condition Vin : AC 85V - - - - -
: AC100V ———
: AC220V — — —
: AC265V —·—·—
Ta : 25°C

24V



30V

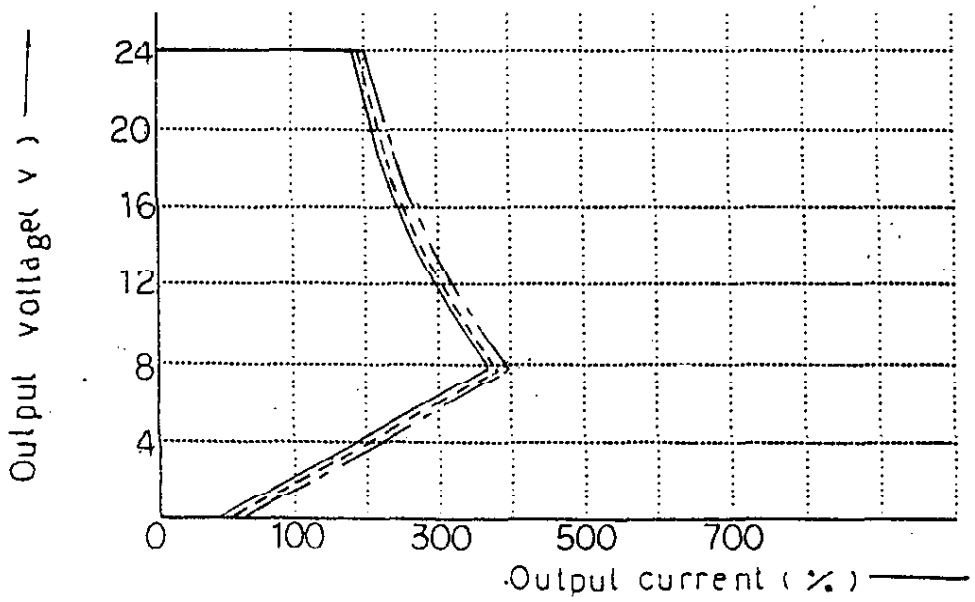


O.C.P. Characteristics

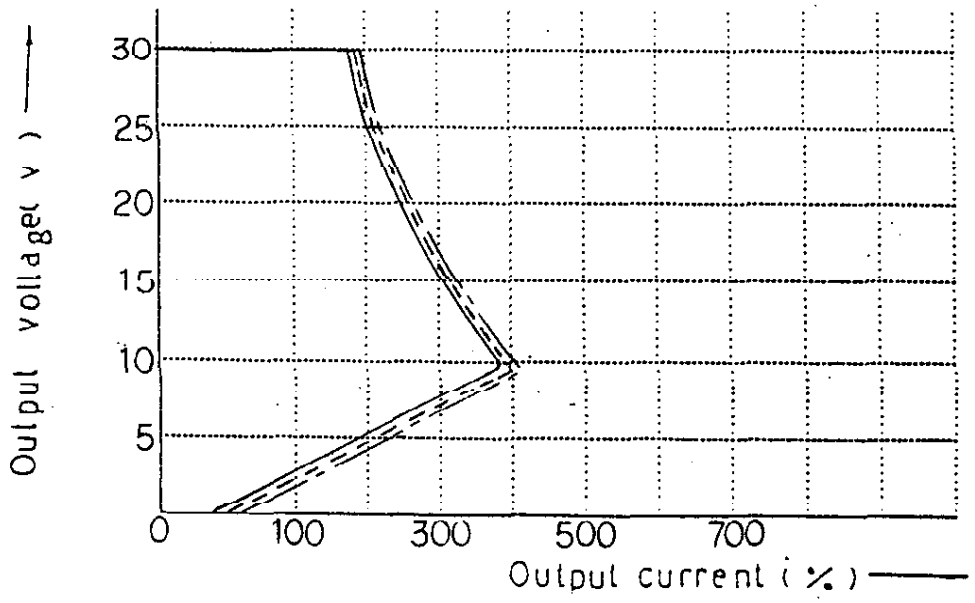
KWD5

Condition Vin : AC100V
Ta : 0°C ———
25°C - - - - -
50°C —·—

24V

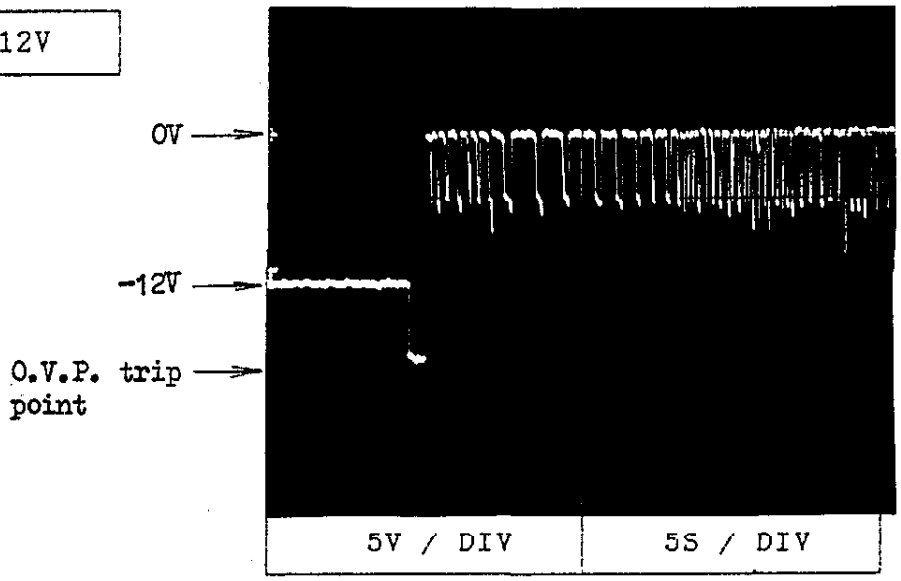


30V

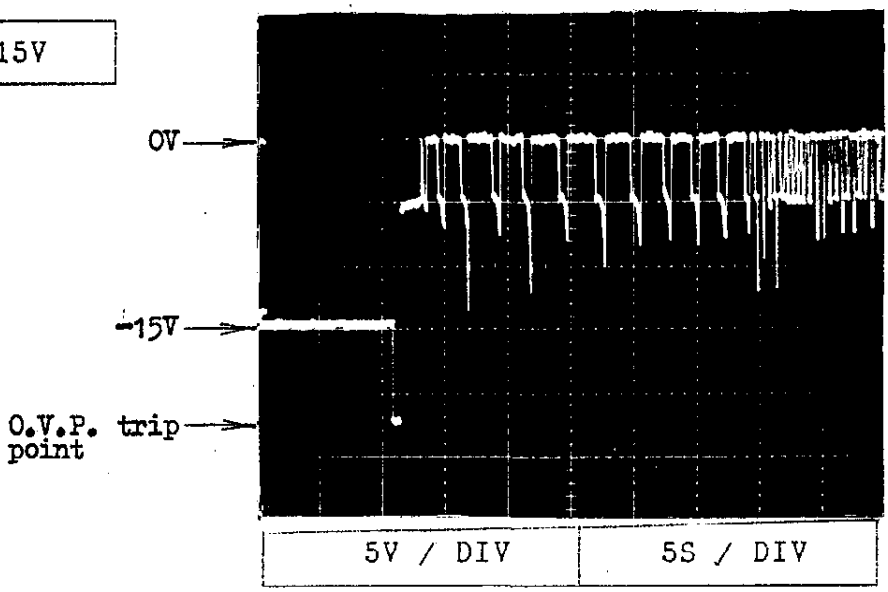


Condition Vin : AC100V
Iout: 0%
Ta : 25°C

-12V



-15V

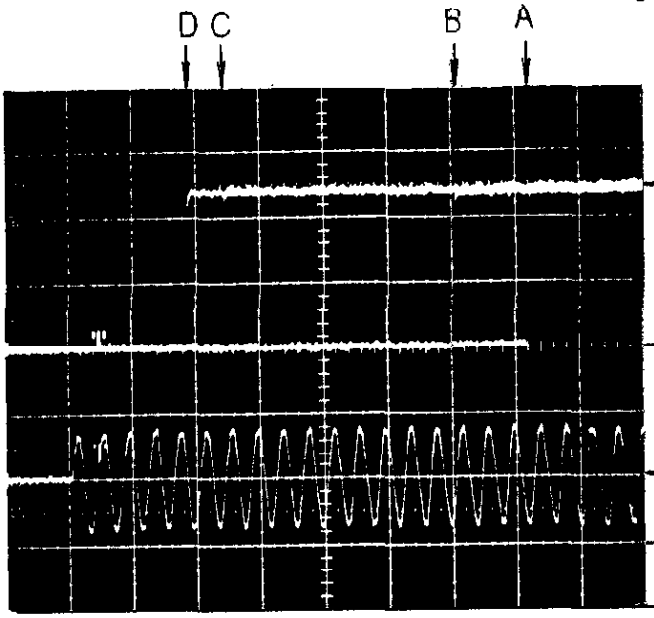


Output Rise Time

KWD5

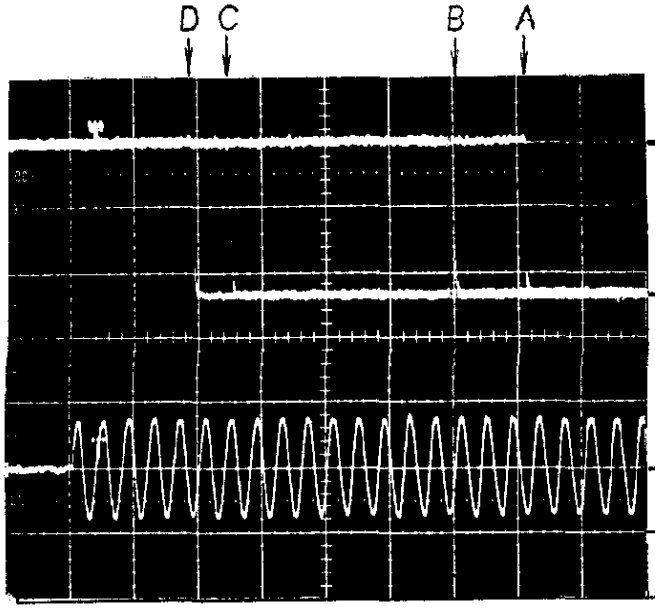
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 0 %
Ta : 25°C

+12V



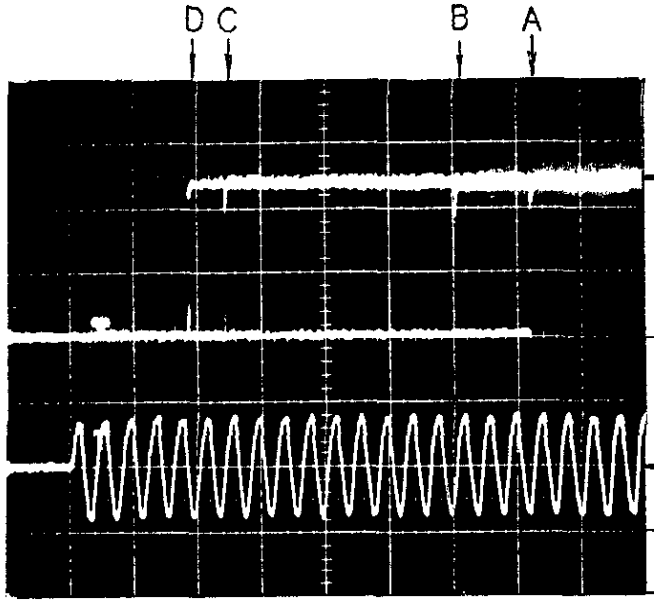
5V / DIV | 50mS / DIV

-12V



5V / DIV | 50mS / DIV

24V



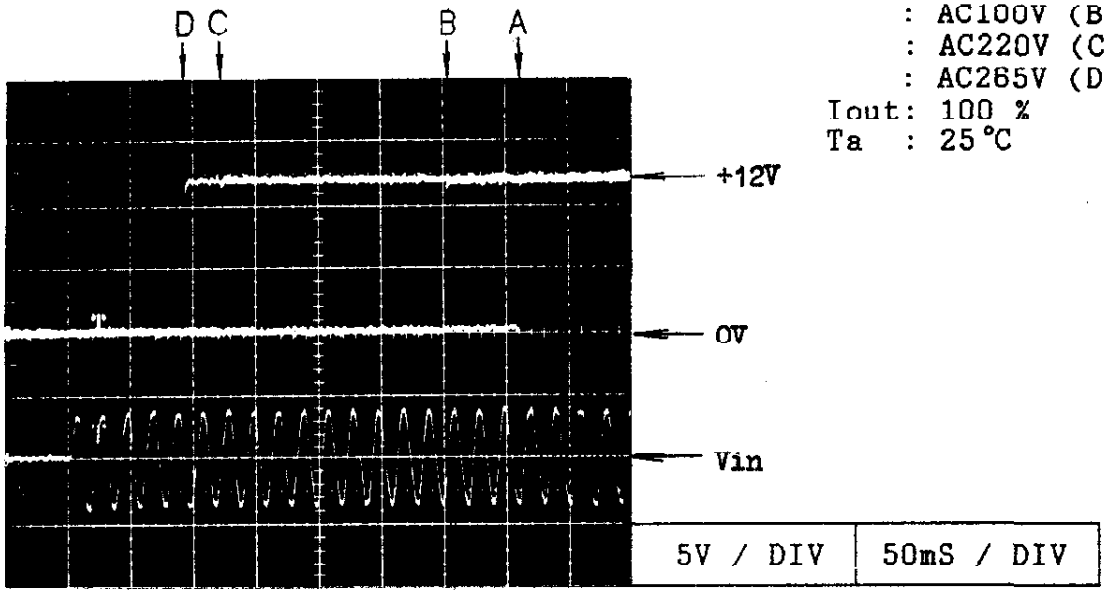
10V / DIV | 50mS / DIV

Output Rise Time

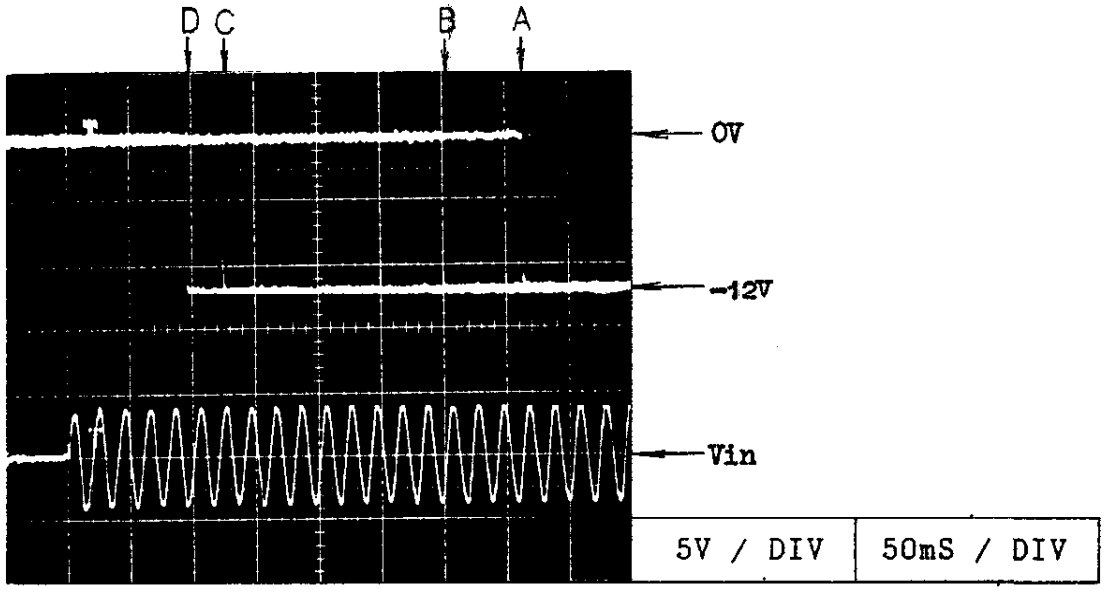
KWD5

Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 100 %
Ta : 25°C

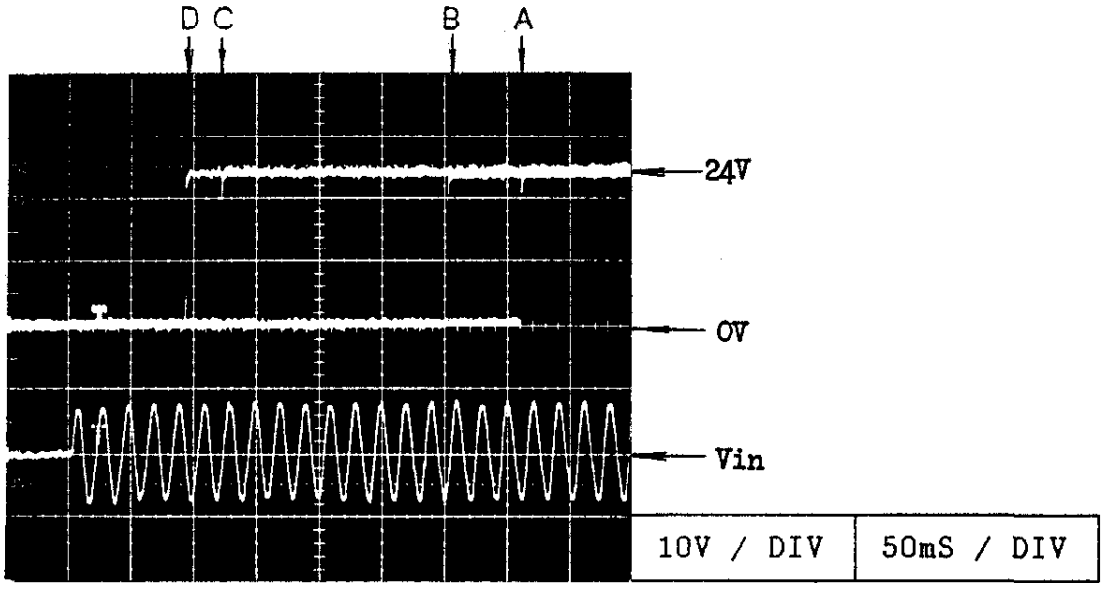
+12V



-12V



24V

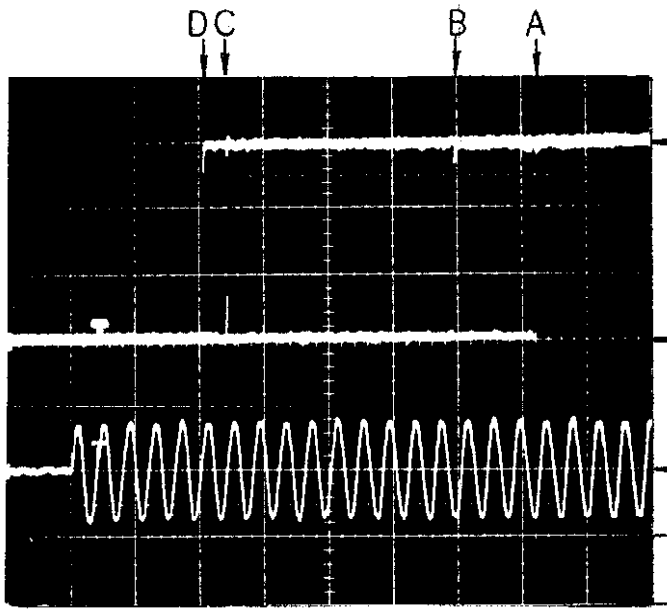


Output Rise Time

KWD5

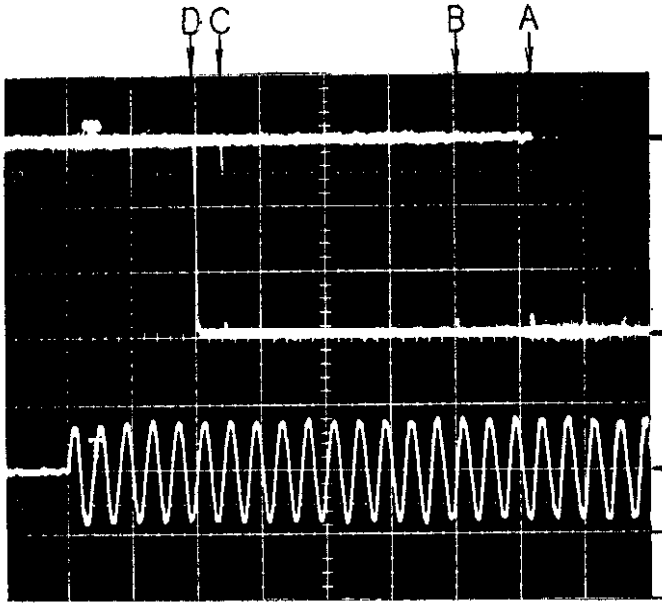
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 0 %
Ta : 25°C

+15V



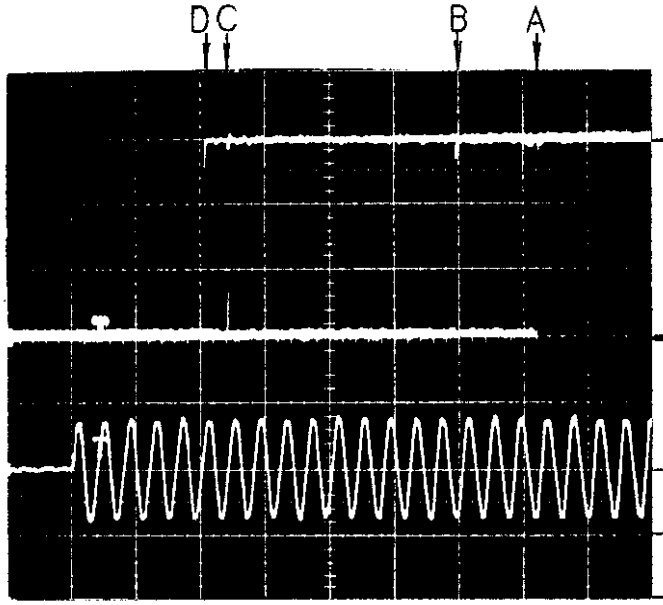
5V / DIV | 50mS / DIV

-15V



5V / DIV | 50mS / DIV

30V



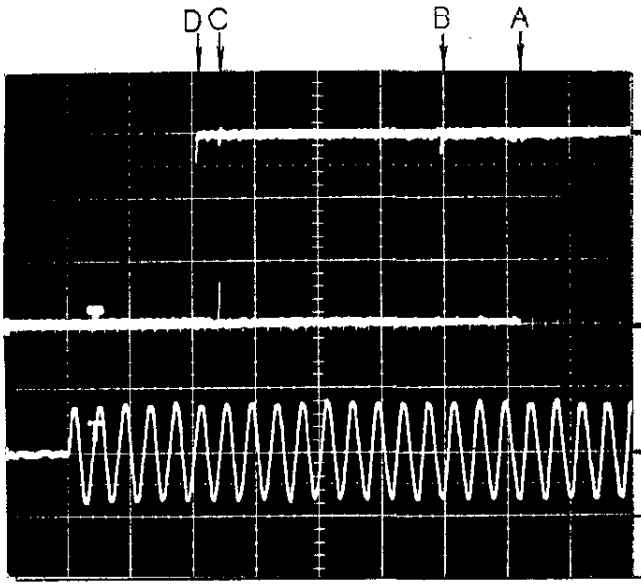
10V / DIV | 50mS / DIV

Output Rise Time

KWD5

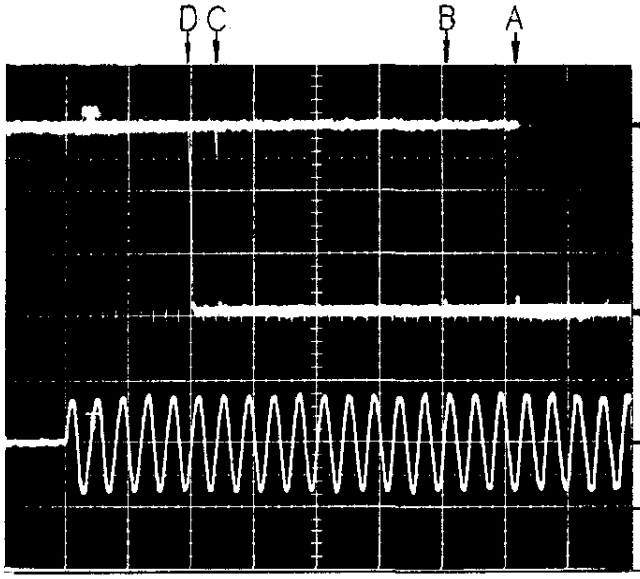
Condition Vin : AC 85V (A)
· AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 100 %
Ta : 25°C

+15V



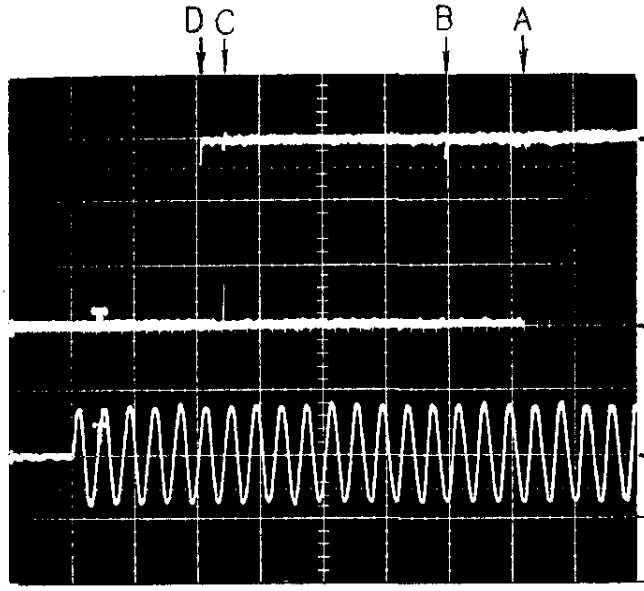
5V / DIV | 50mS / DIV

-15V



5V / DIV | 50mS / DIV

30V



10V / DIV | 50mS / DIV

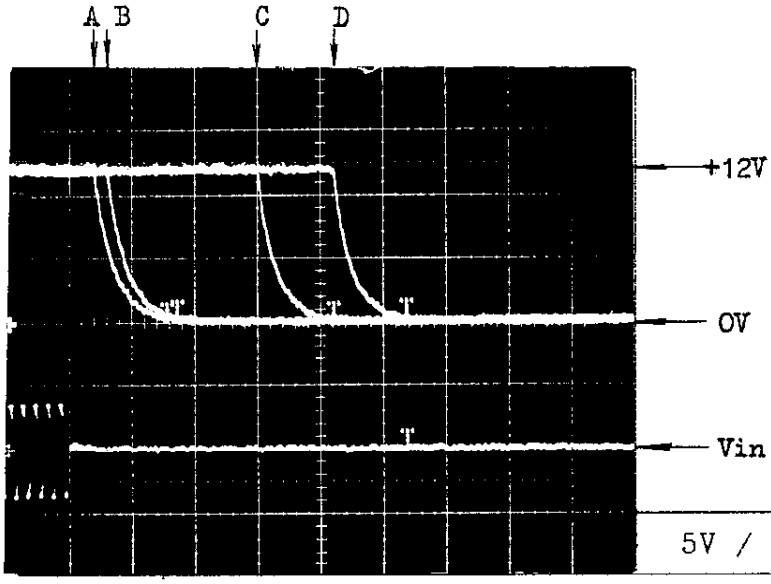
Output Fall Time

KWD5

Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)

Ta : 25°C

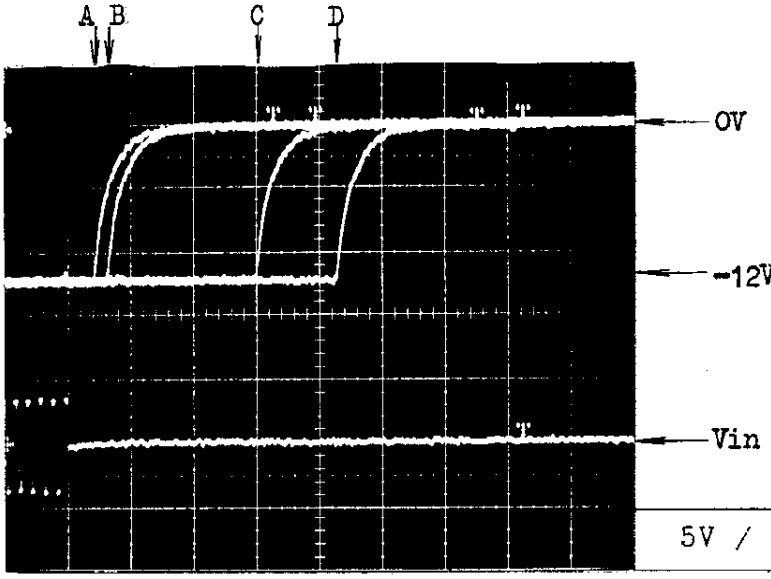
+12V



Io(CH1):0%
Io(CH2):100%

5V / DIV	0.1S / DIV

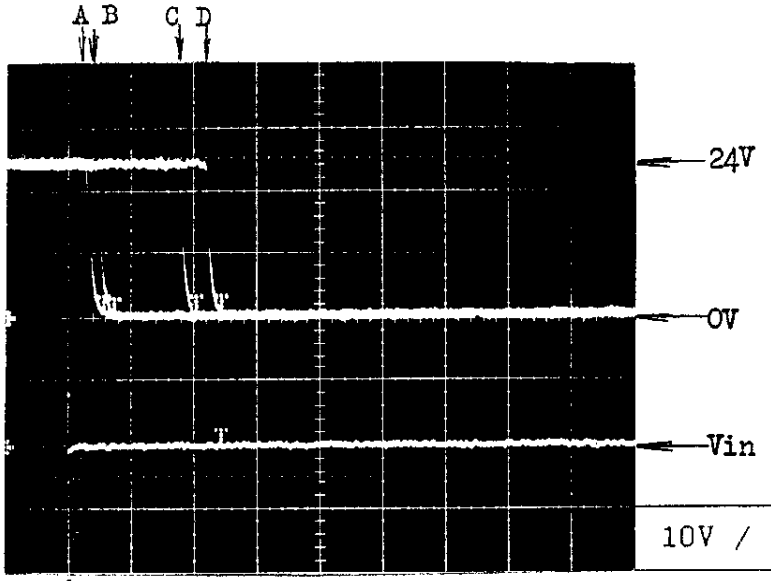
-12V



Io(CH1):100%
Io(CH2):0%

5V / DIV	0.1S / DIV

24V



Io : 0%

10V / DIV	0.5S / DIV

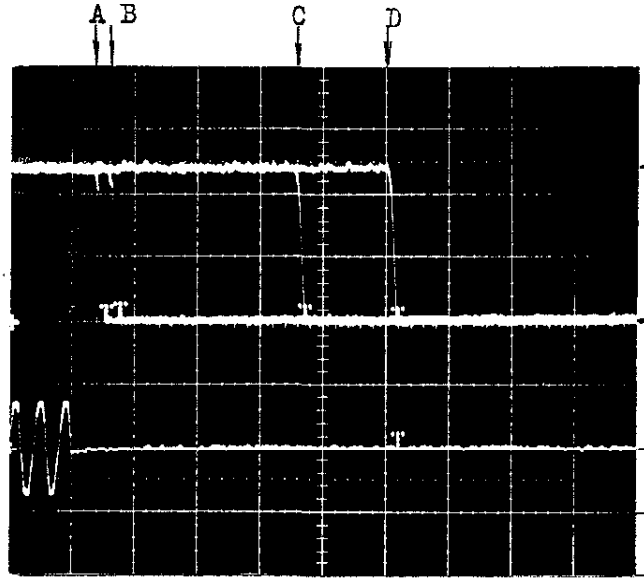
Vin Turn off

Output Fall Time

KWD5

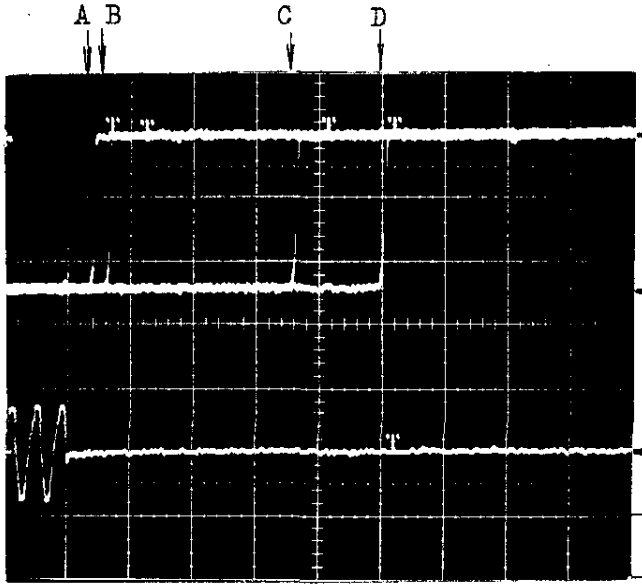
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 100 %
Ta : 25°C

+12V



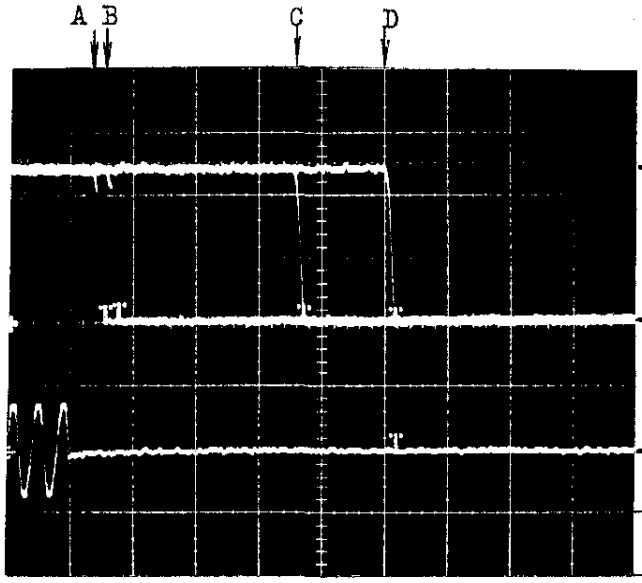
5V / DIV | 50mS / DIV

-12V



5V / DIV | 50mS / DIV

24V



10V / DIV | 50mS / DIV

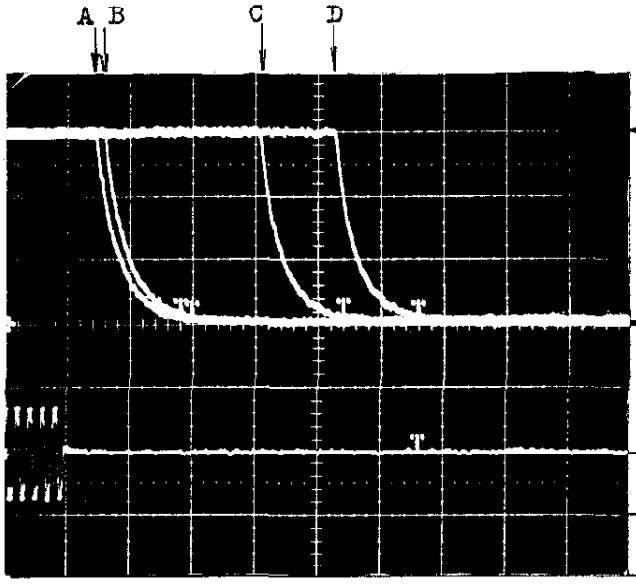
Output Fall Time

KWD5

Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)

Ta : 25°C

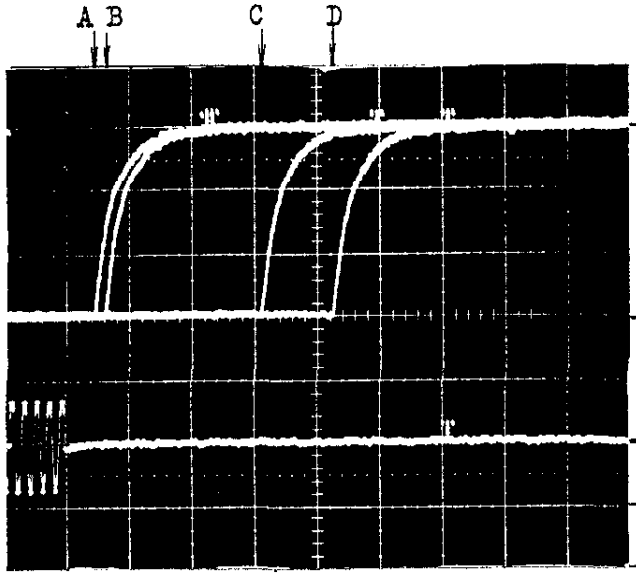
+15V



Io(CH1):0%
Io(CH2):100%

5V / DIV	0.1S / DIV

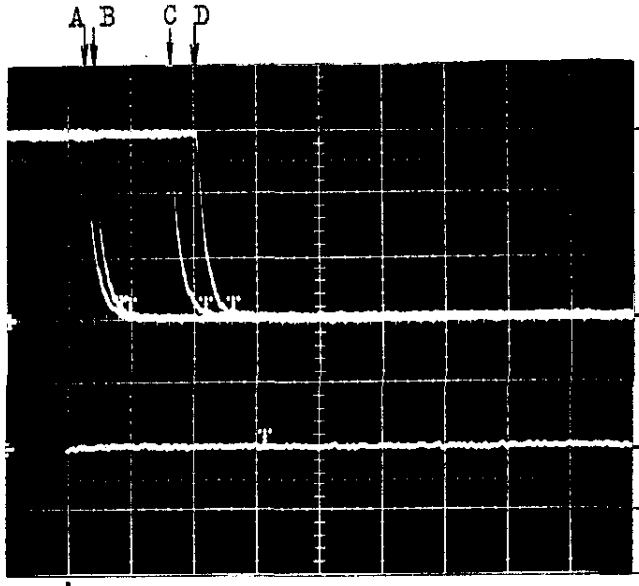
-15V



Io(CH1):100%
Io(CH2):0%

5V / DIV	0.1S / DIV

30V



Io : 0%

10V / DIV	0.5S / DIV

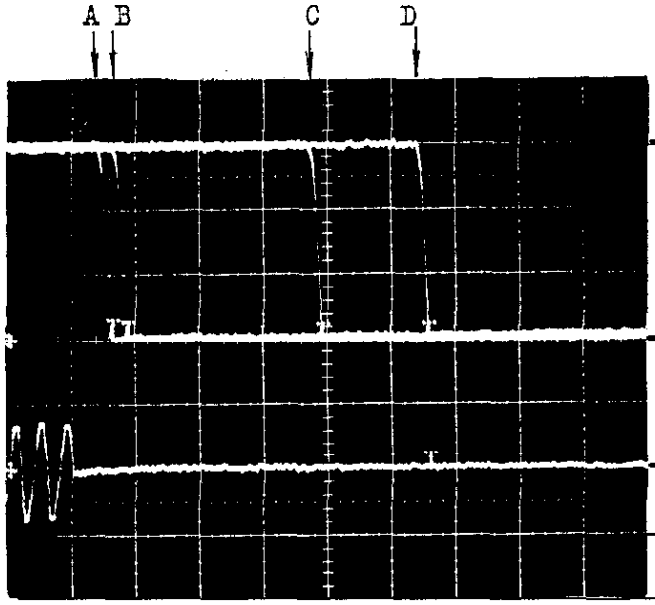
Vin Turn off

Output Fall Time

KWD5

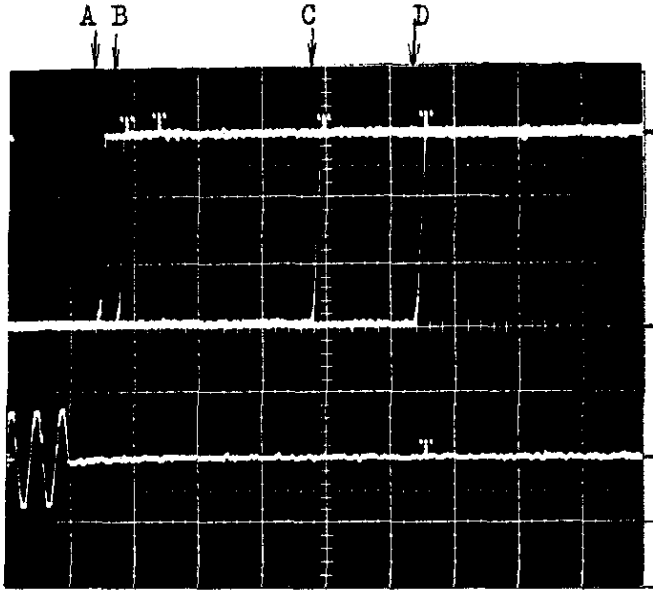
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 100 %
Ta : 25°C

+15V



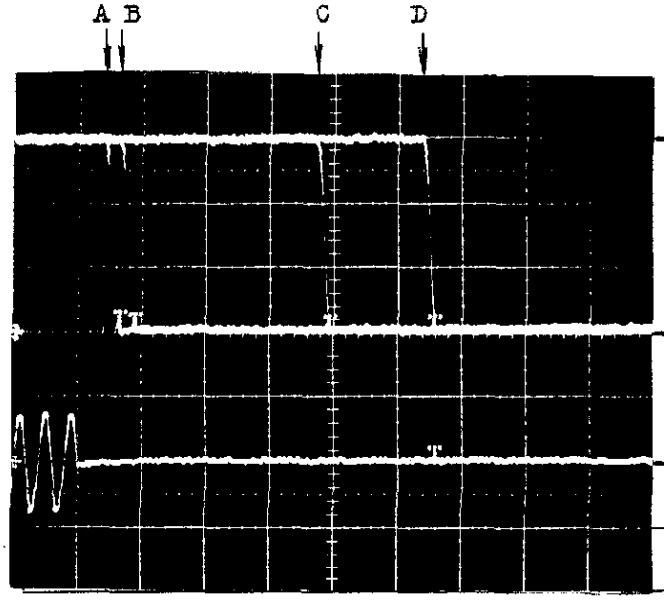
5V / DIV | 50mS / DIV

-15V



5V / DIV | 50mS / DIV

30V



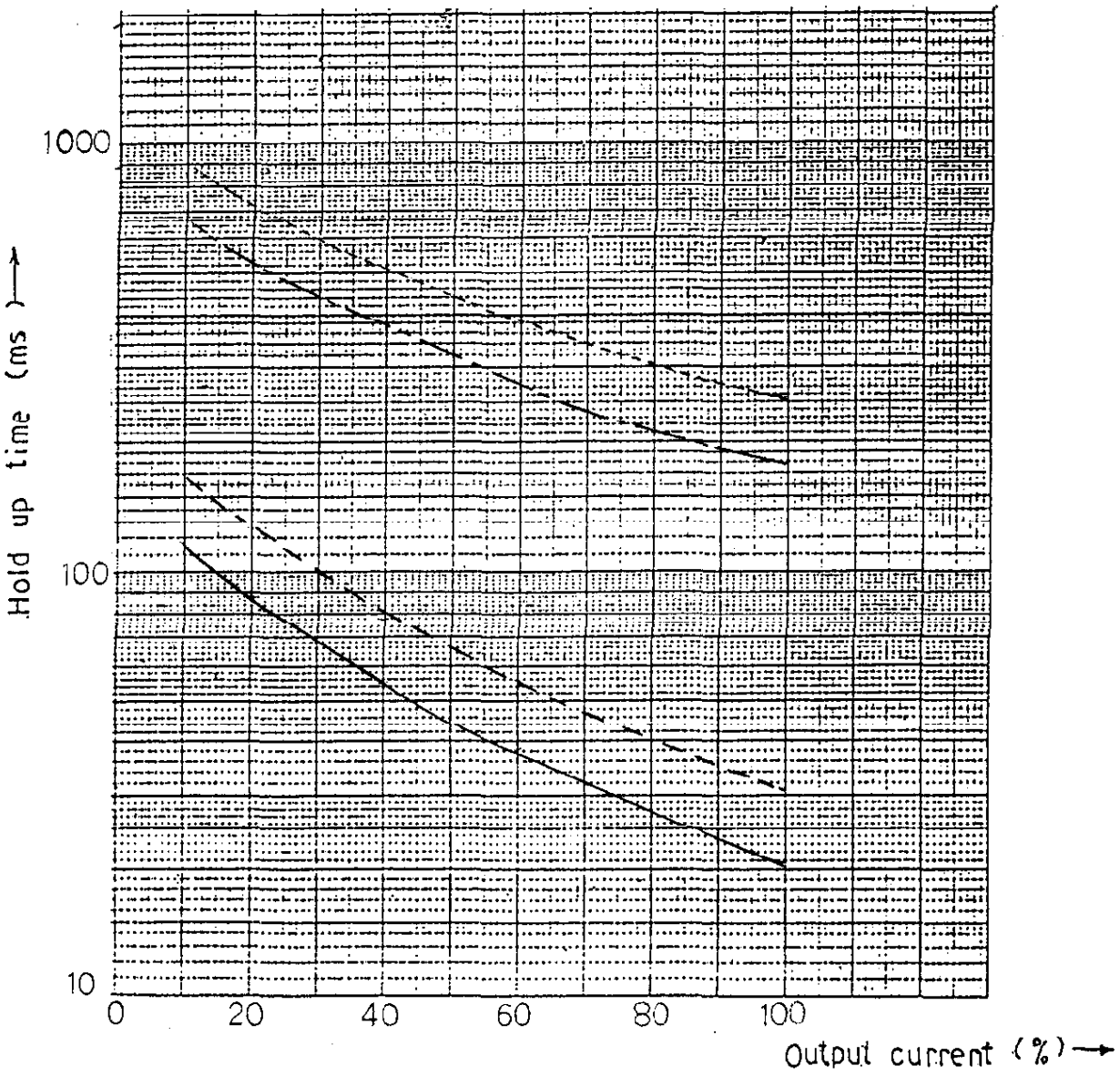
10V / DIV | 50mS / DIV

Hold Up Time

KWD5

Condition Vin : AC 85V ——
AC100V - - - -
AC220V —·—
AC265V ------
Ta : 25 °C

24V

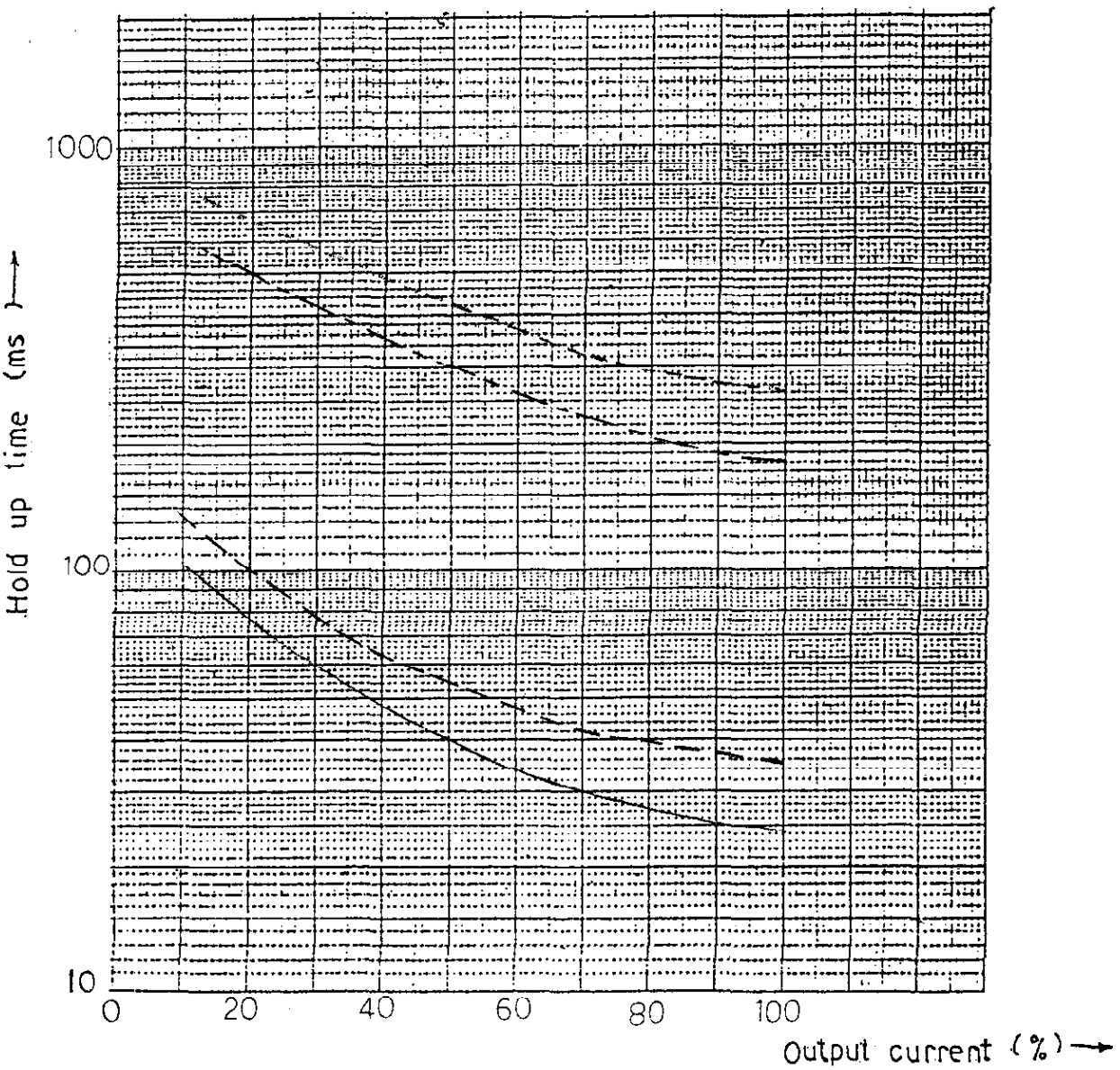


Hold Up Time

KWD5

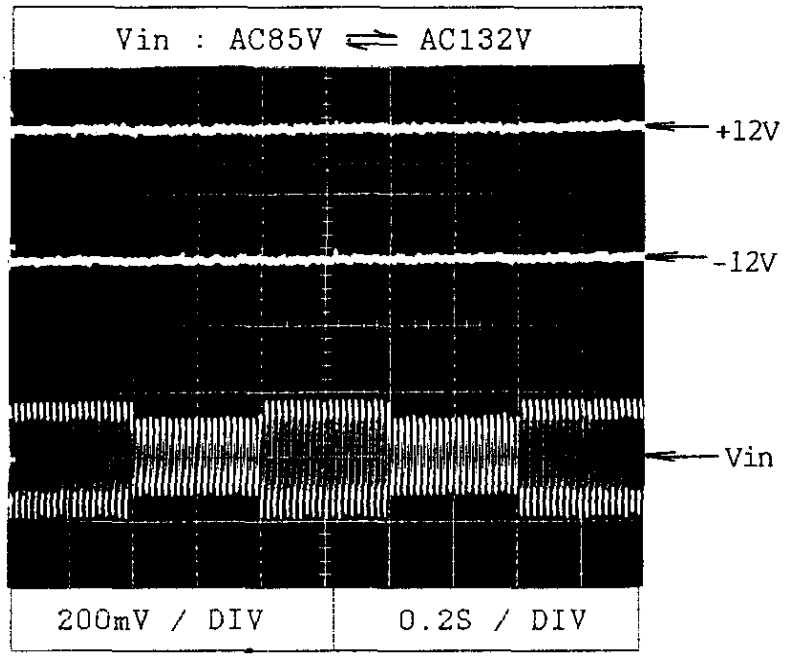
Condition Vin : AC 85V ——
AC100V - - -
AC220V —·—
AC265V - - - - -
Ta : 25°C

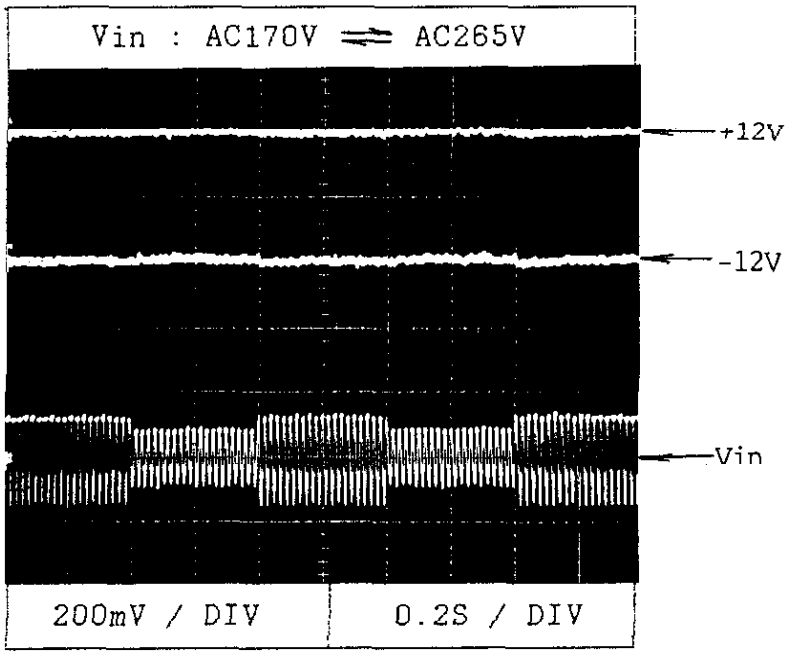
30V



Condition Iout: 100 %
Ta : 25 °C

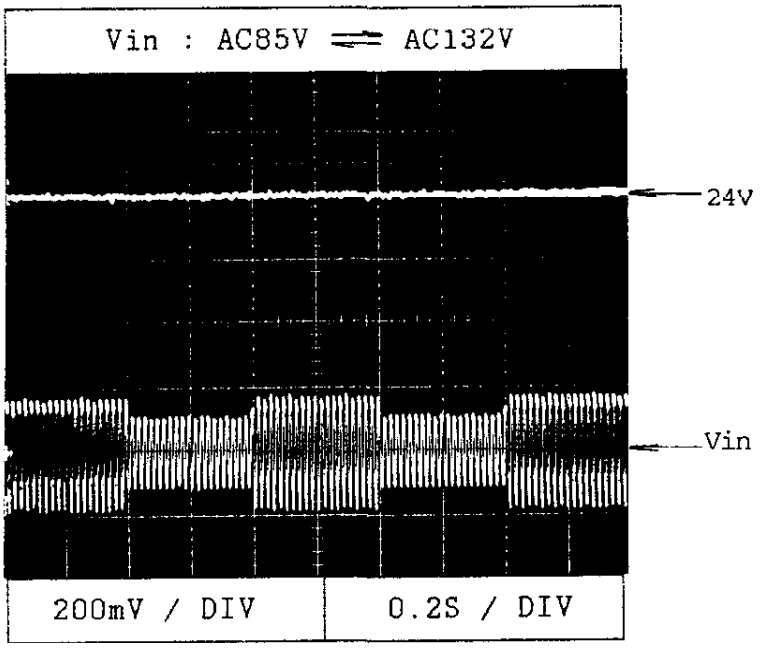
±12V

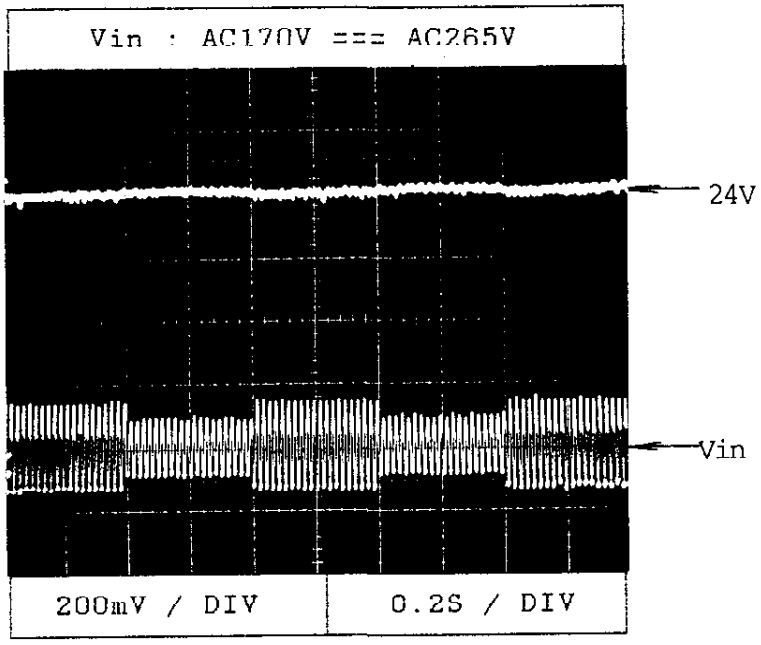




Condition Iout: 100 %
Ta . 25 °C

24V



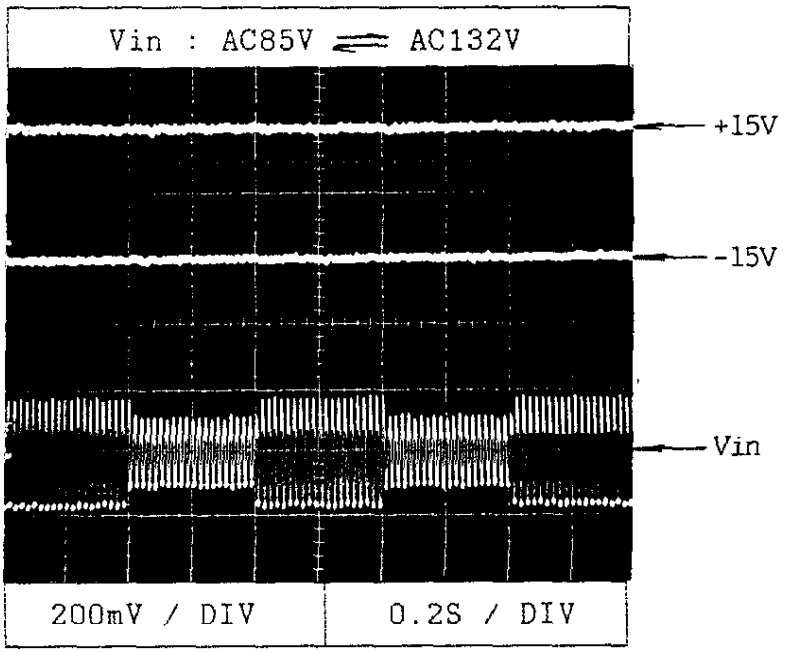


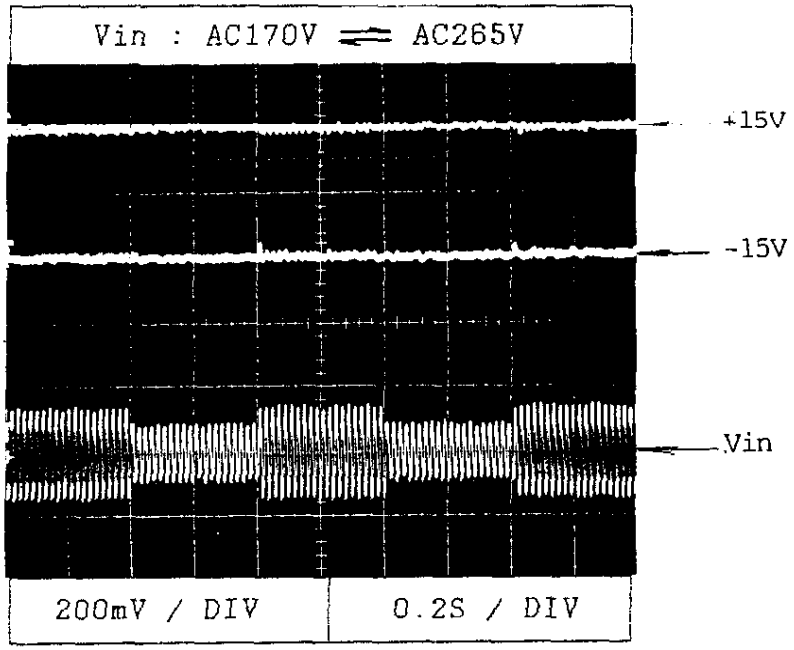
Dynamic Line Response

KWD5

Condition Iout: 100 %
Ta : 25 °C

±15V



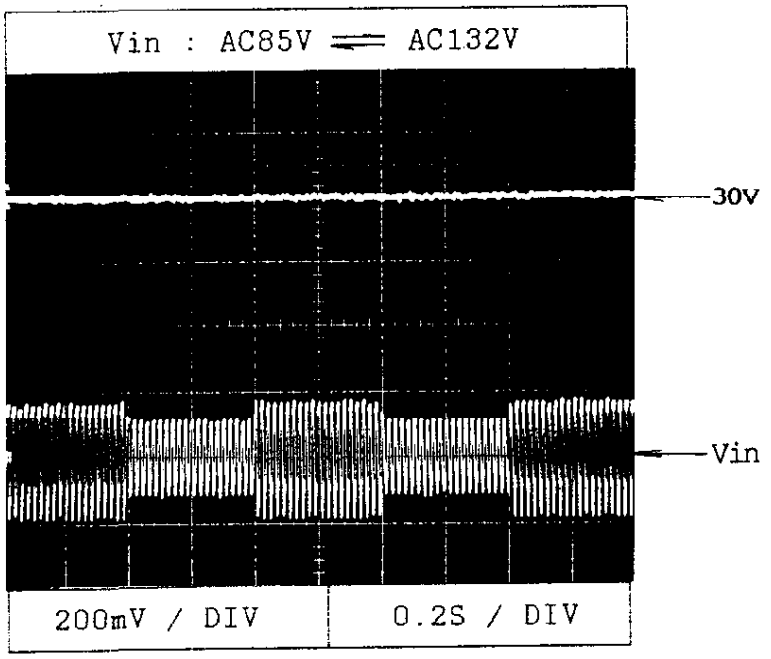


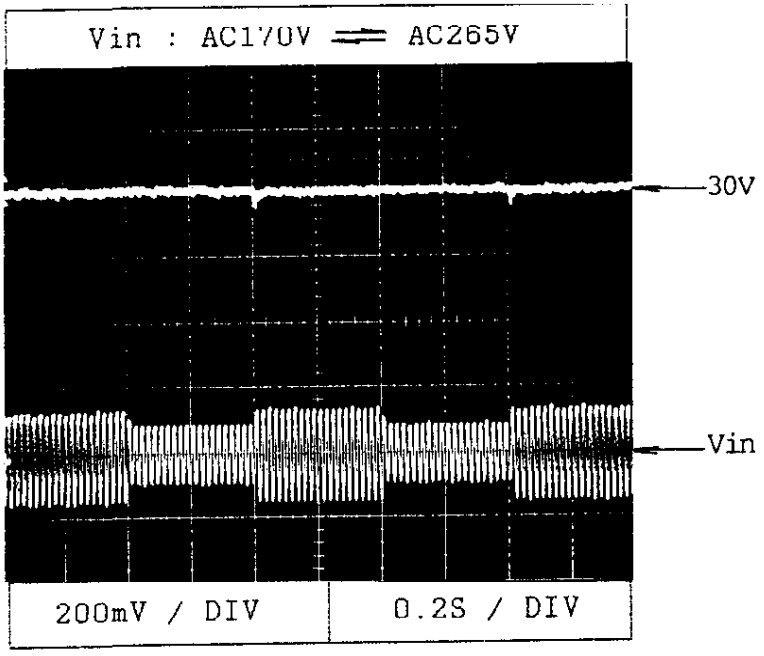
Dynamic Line Response

KWD5

Condition Iout: 100 %
Ta : 25 °C

30V





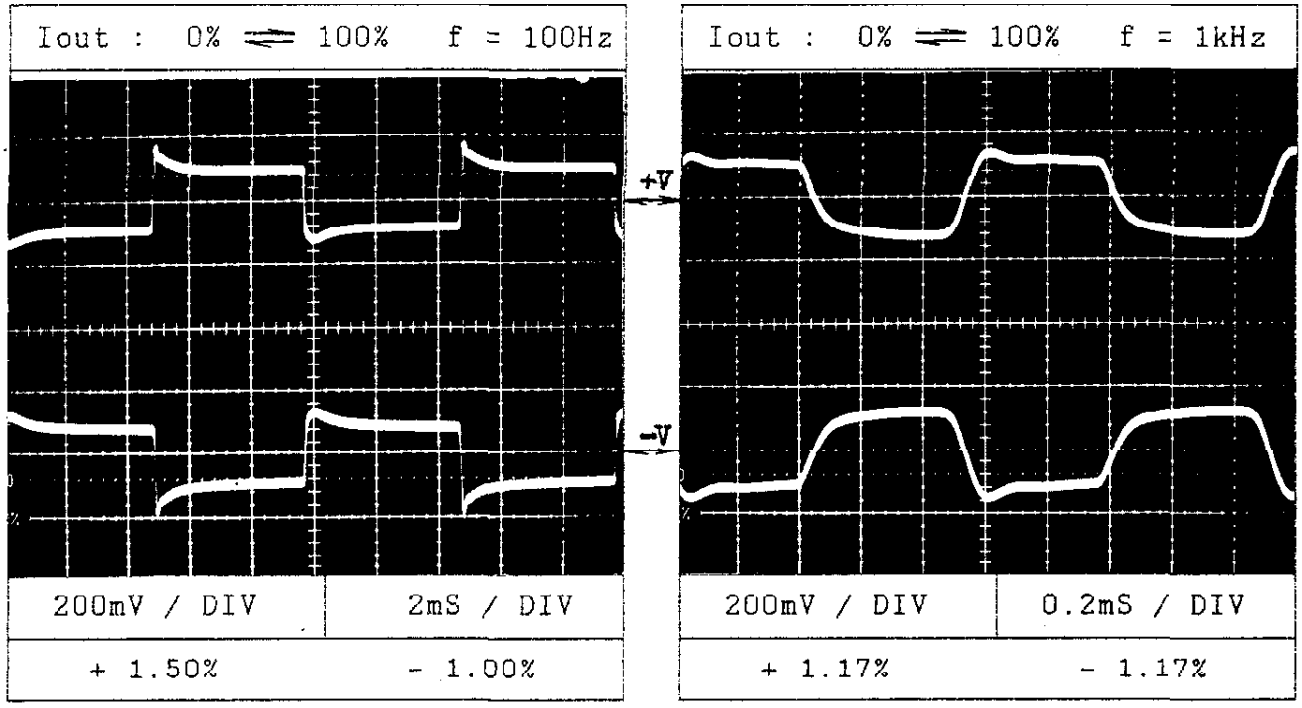
Dynamic Load Response

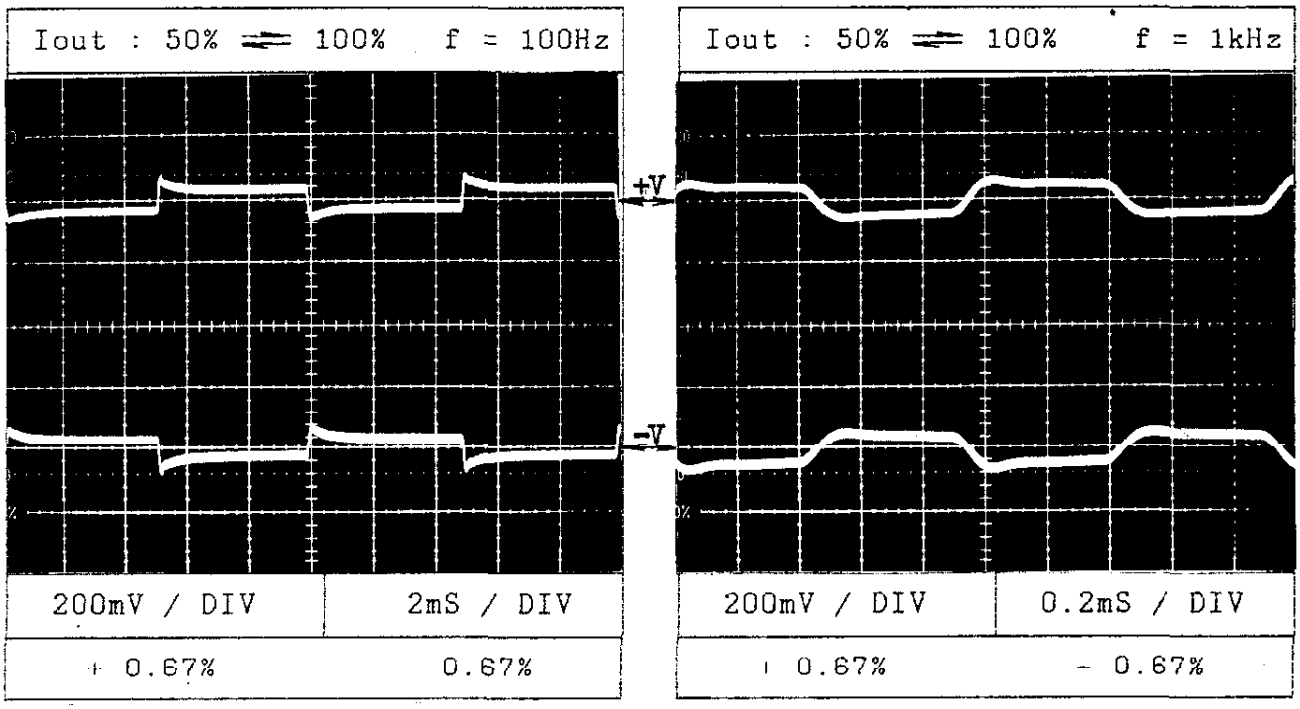
KWD5

Condition Vin : AC100V
Iout : 100%

Ta : 25°C

±12V





NOTE:

When performing dynamic load for CH1 :-
(1) Only the output waveform of this channel is taken.
(2) CH2 is at 100%.

When performing dynamic load for CH2 :-
(1) Only the output waveform of this channel is taken.
(2) CH1 is at 100%.

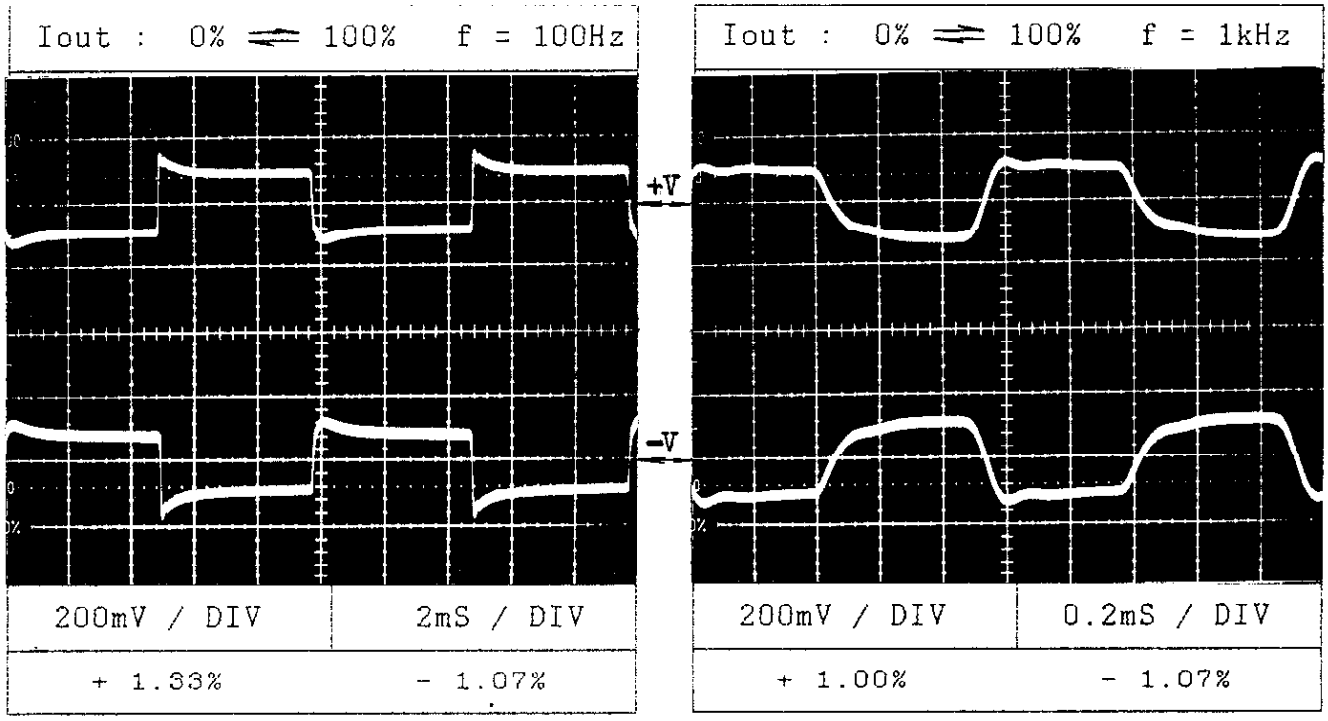
Dynamic Load Response

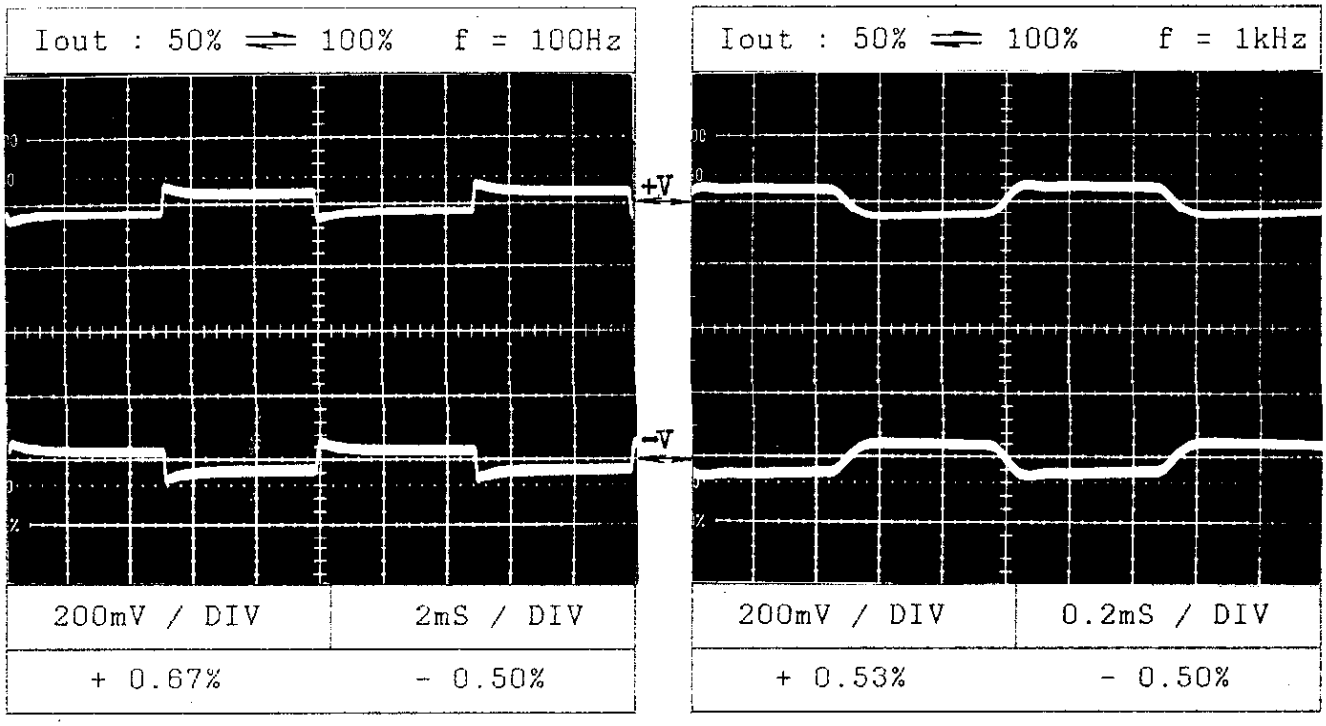
KWD5

Condition Vin : AC220V
Iout : 100%

Ta : 25 °C

±12V





NOTE:

When performing dynamic load for CH1 :-

(1) Only the output waveform of this channel is taken.

(2) CH2 is at 100%.

When performing dynamic load for CH2 :-

(1) Only the output waveform of this channel is taken.

(2) CH1 is at 100%.

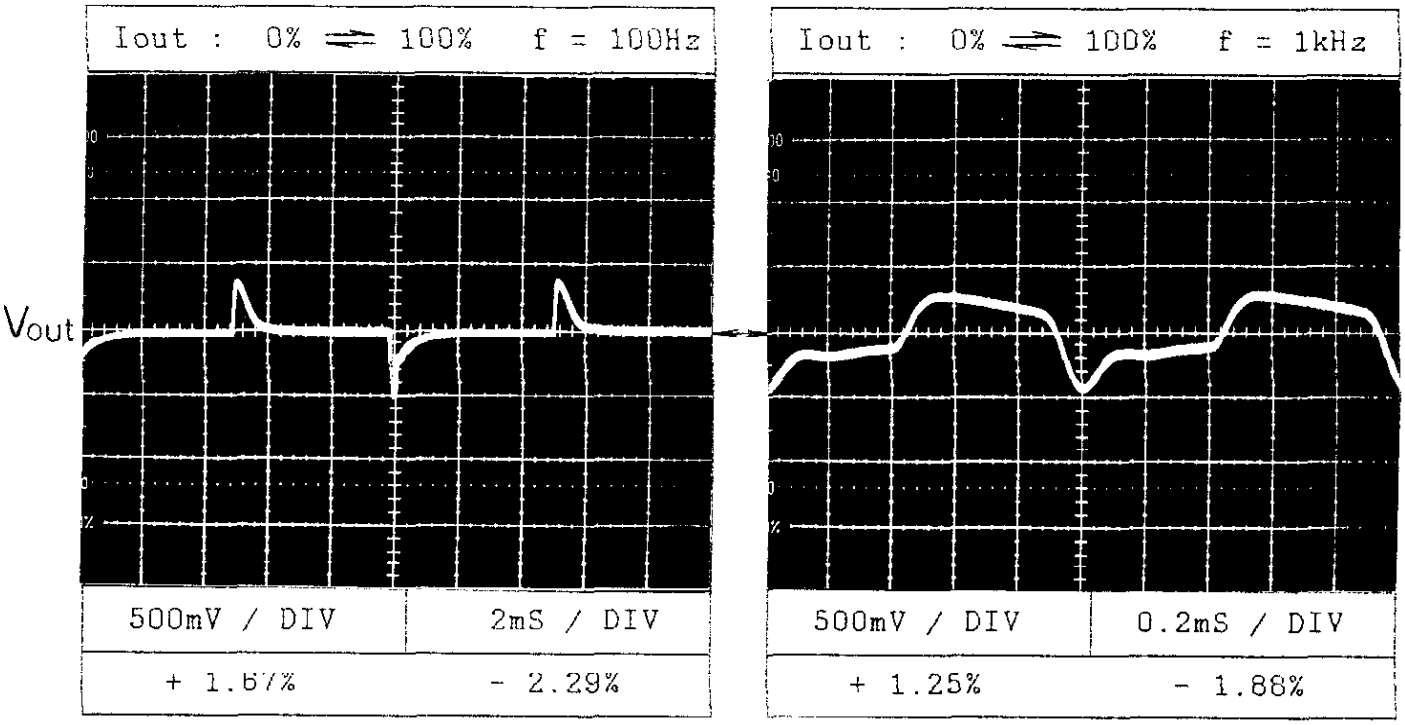
Dynamic Load Response

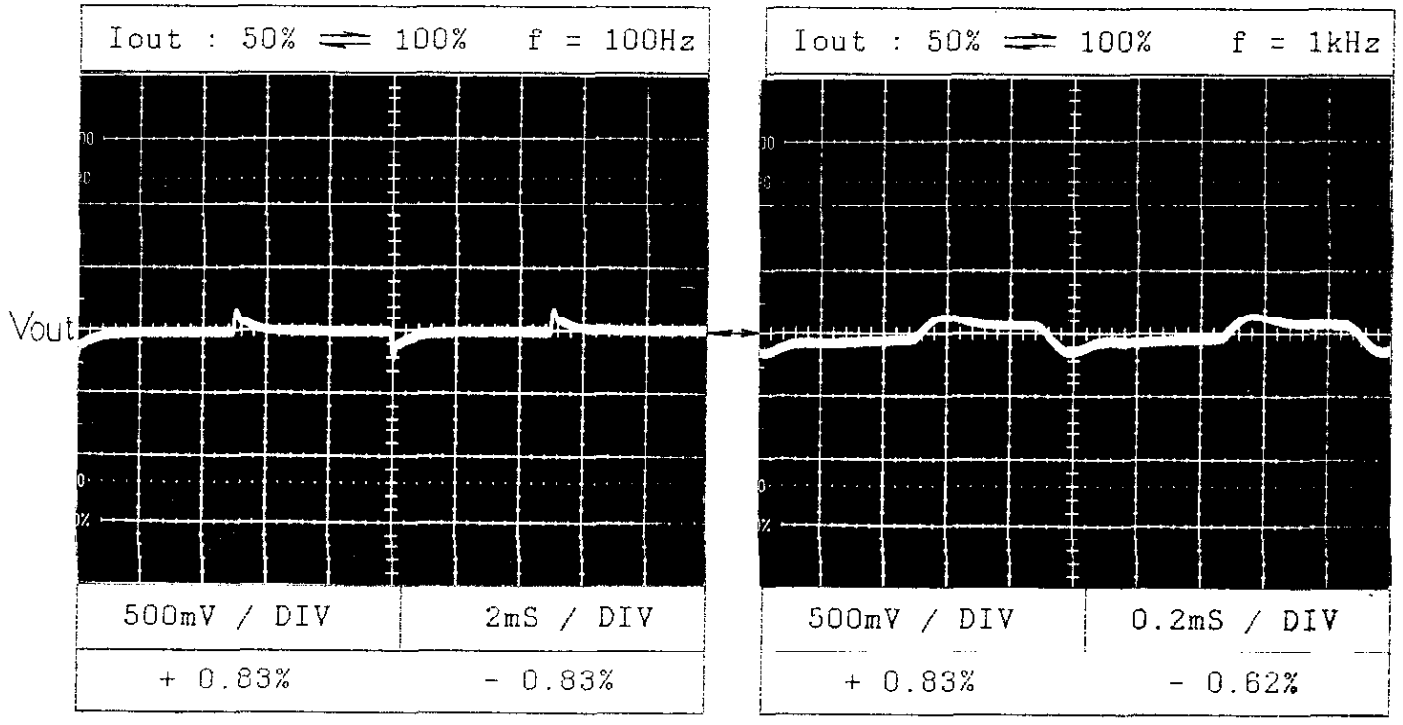
KWD5

Condition Vin : AC100V
Iout: 100%

Ta : 25 C

24V





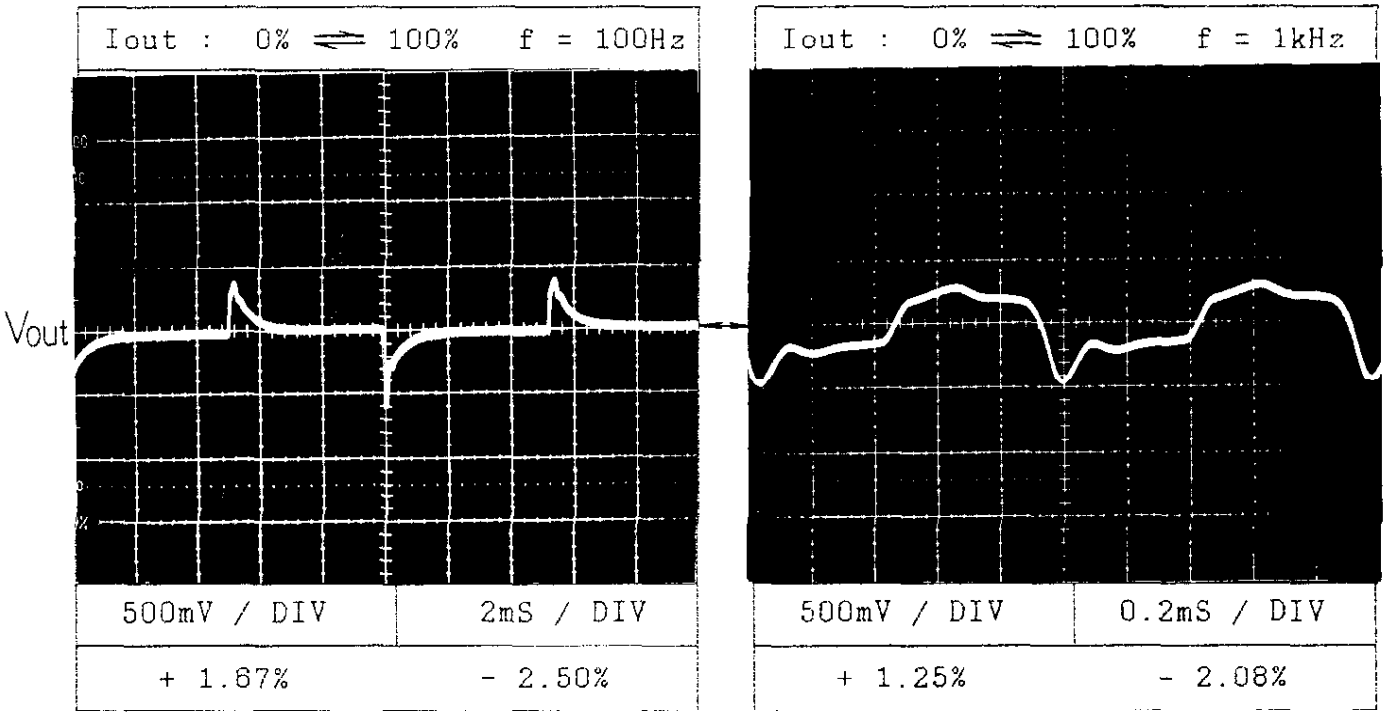
Dynamic Load Response

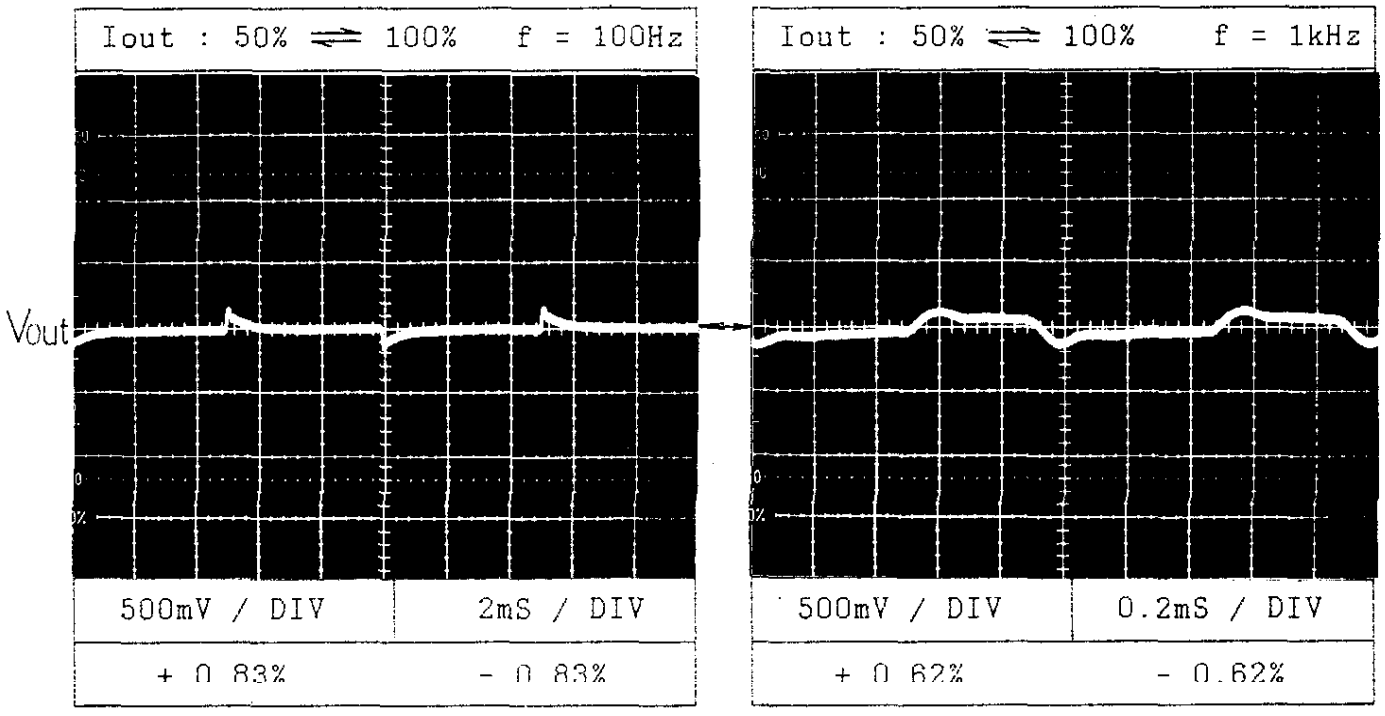
KWD5

Condition Vin : AC220V
Iout: 100%

Ta : 25 °C

24V





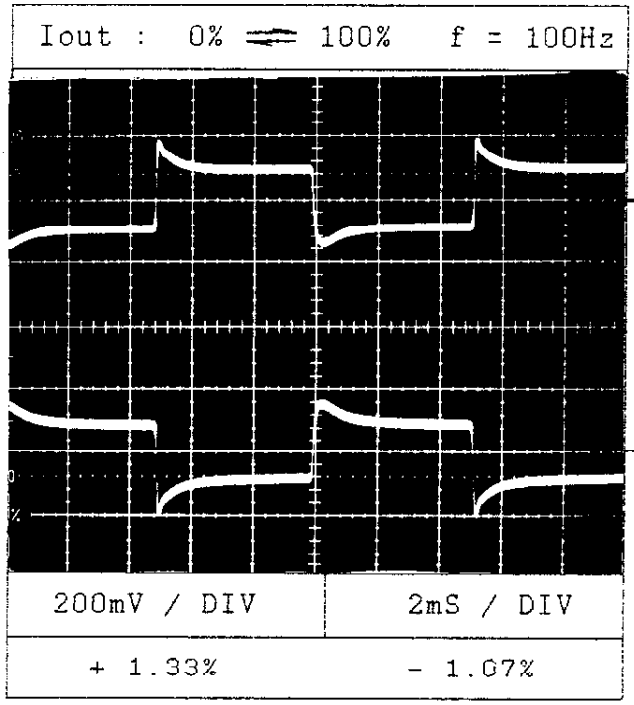
Dynamic Load Response

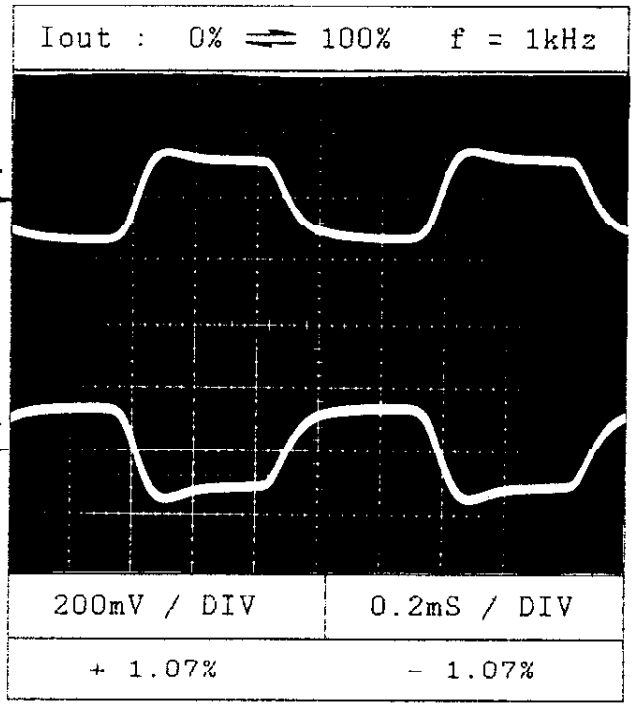
KWD5

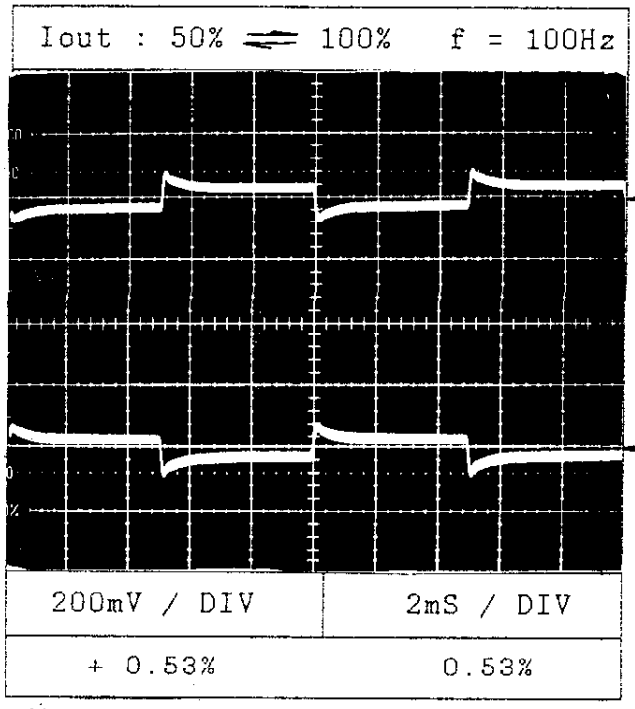
Condition Vin : AC100V
Iout: 100%

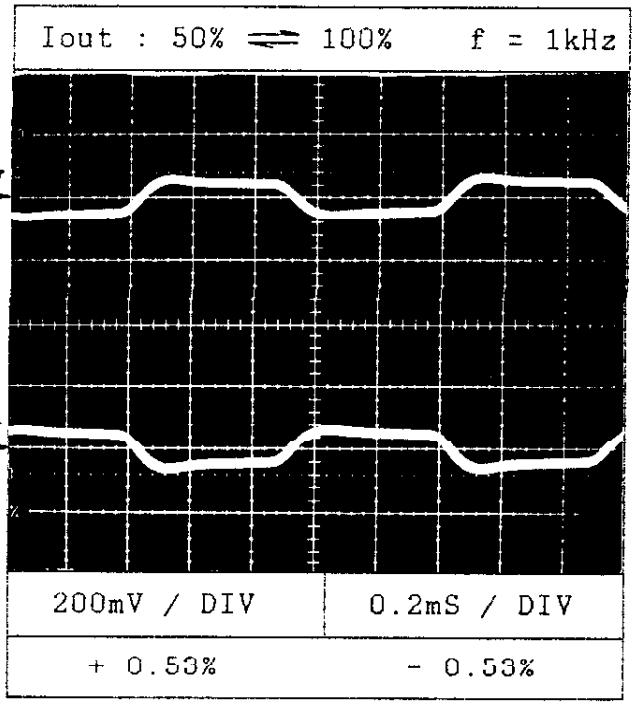
Ta : 25°C

±15V









NOTE:

When performing dynamic load for CH1 :-
(1) Only the output waveform of this channel is taken.
(2) CH2 is at 100%.

When performing dynamic load for CH2 :-
(1) Only the output waveform of this channel is taken.
(2) CH1 is at 100%.

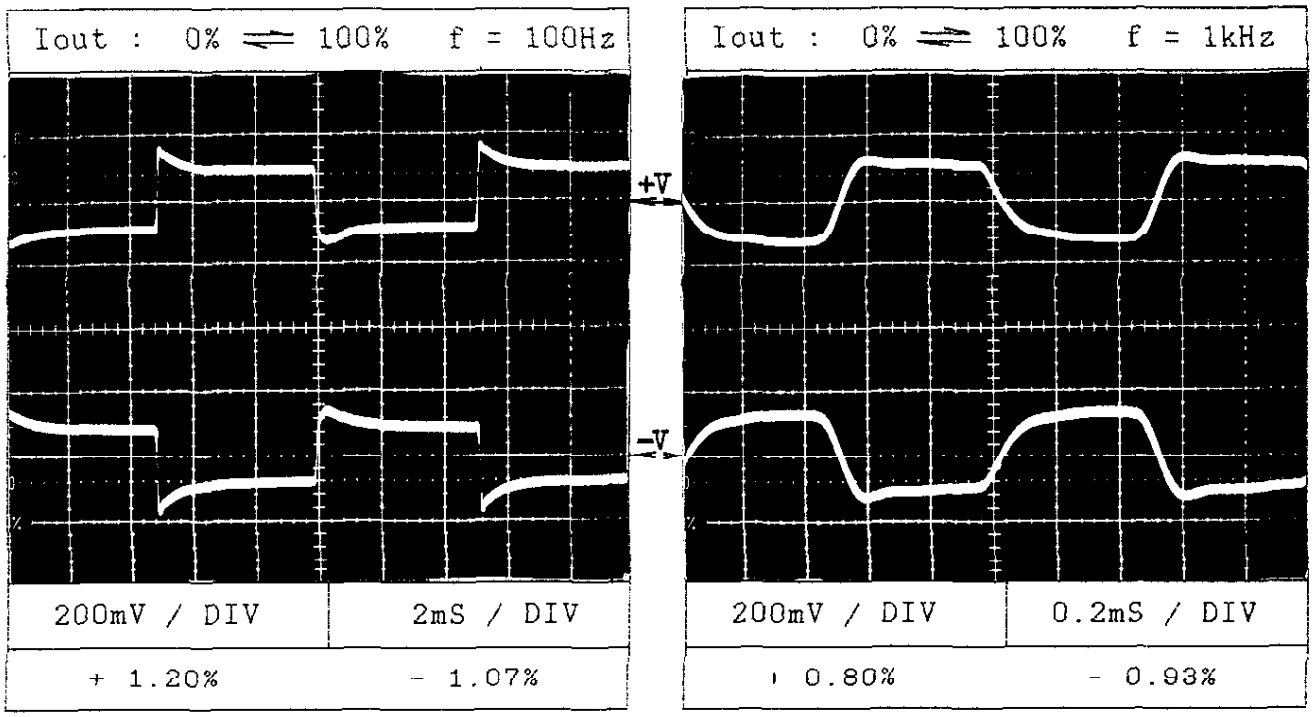
Dynamic Load Response

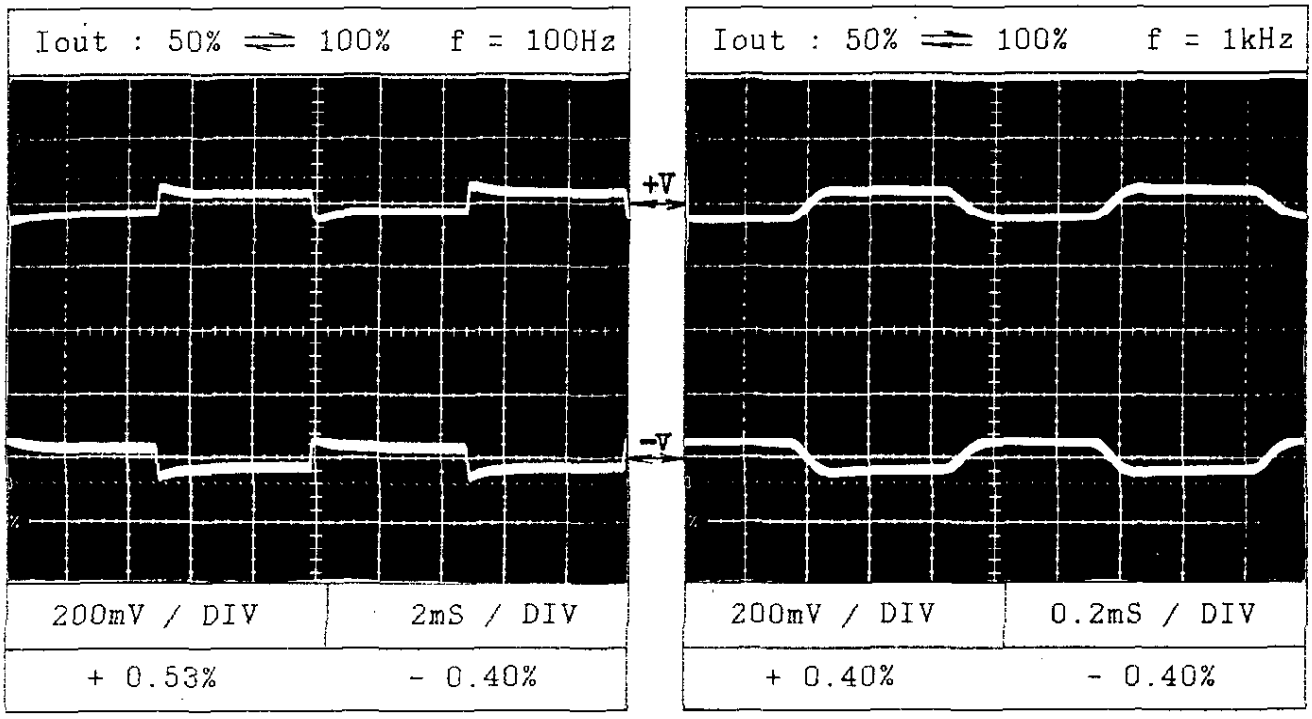
KWD5

Condition Vin : AC220V
Iout : 100%

Ta : 25°C

±15V





NOTE:

When performing dynamic load for CH1 :-
(1) Only the output waveform of this channel is taken.
(2) CH2 is at 100%.

When performing dynamic load for CH2 :-
(1) Only the output waveform of this channel is taken.
(2) CH1 is at 100%.

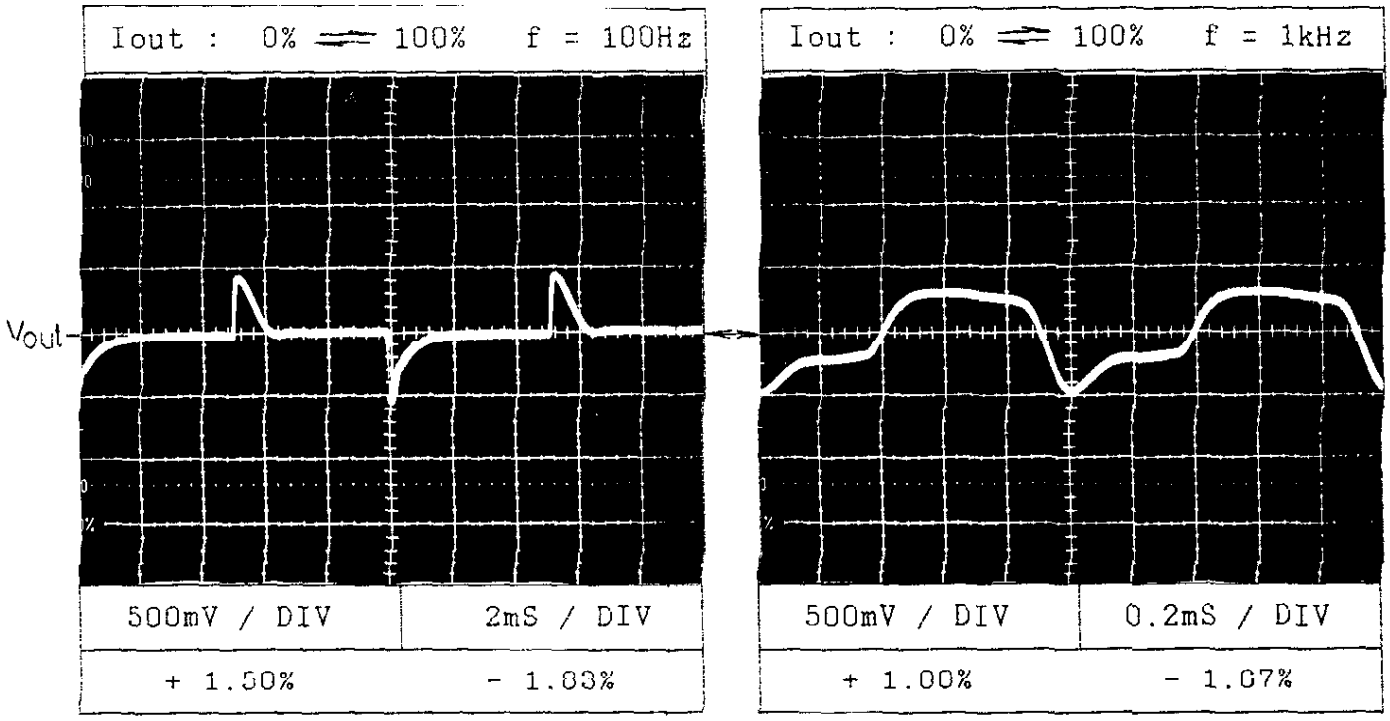
Dynamic Load Response

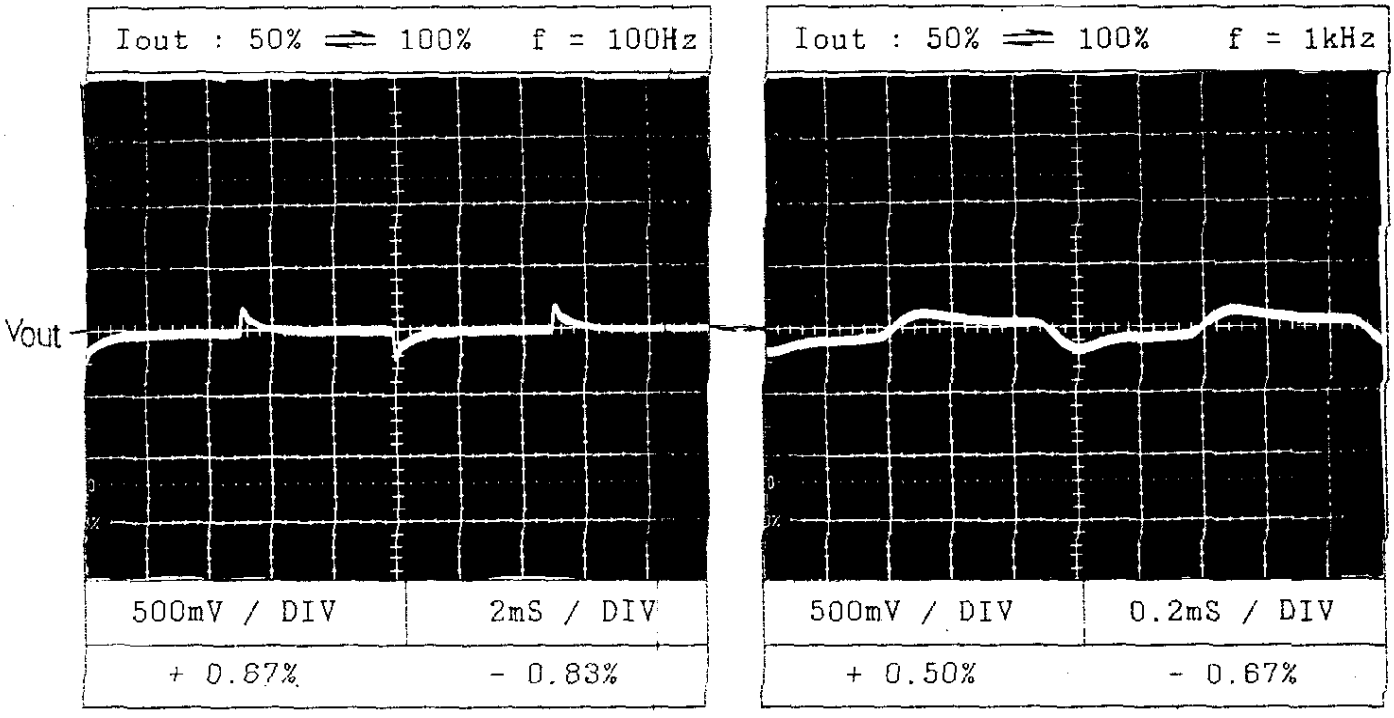
KWD5

Condition Vin : AC100V
Iout : 100%

Ta : 25°C

30V





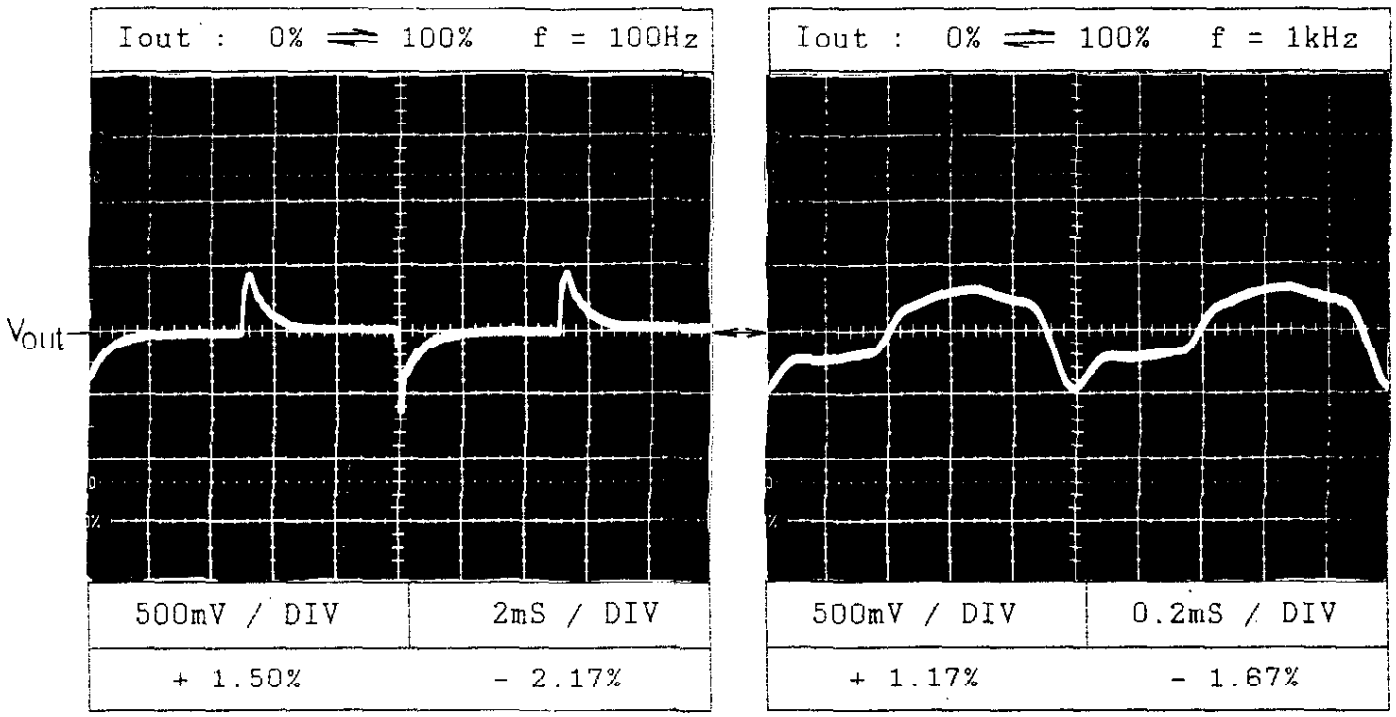
Dynamic Load Response

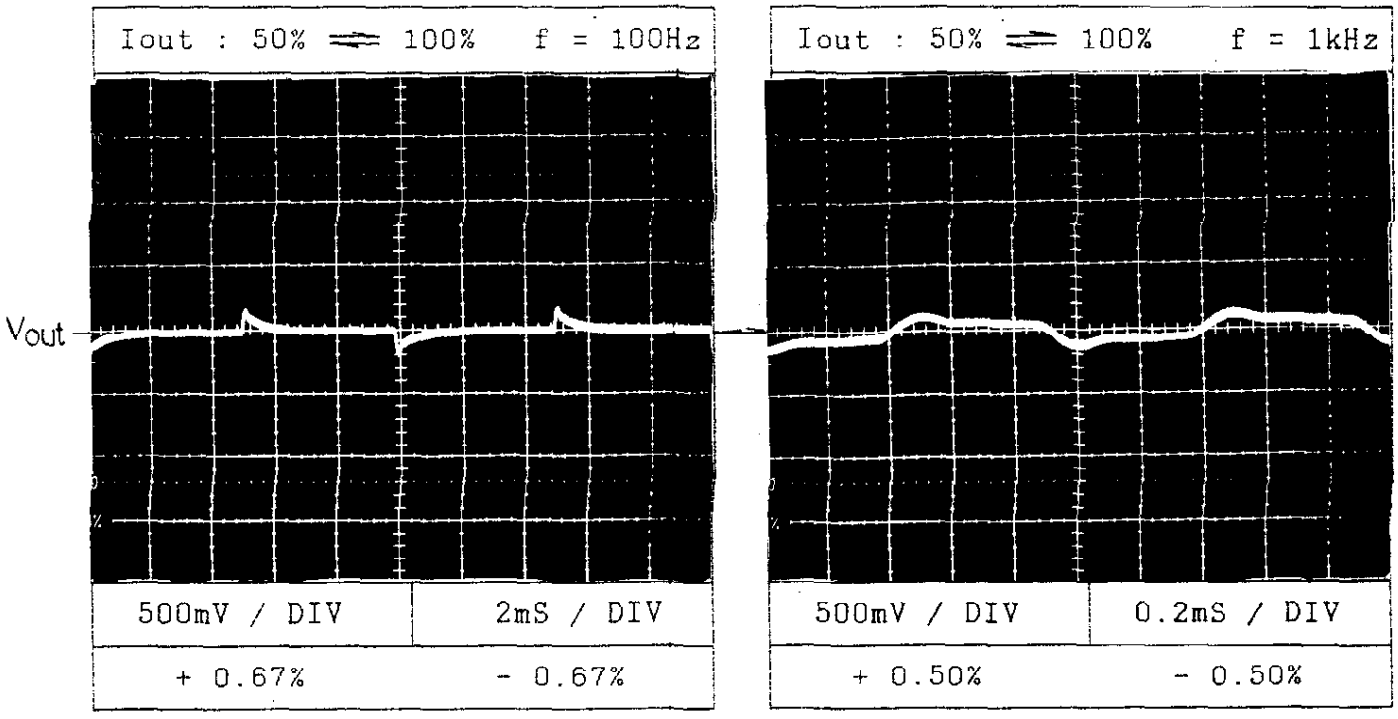
KWD5

Condition Vin : AC220V
Iout: 100%

Ta : 25°C

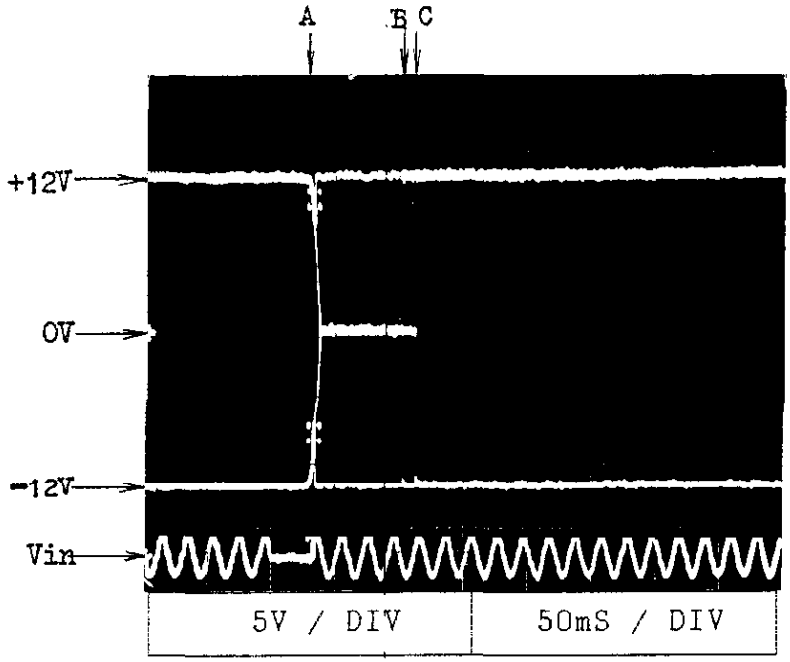
30V





Condition Vin : AC100V
Iout: 100%
Ta : 25°C

±12V



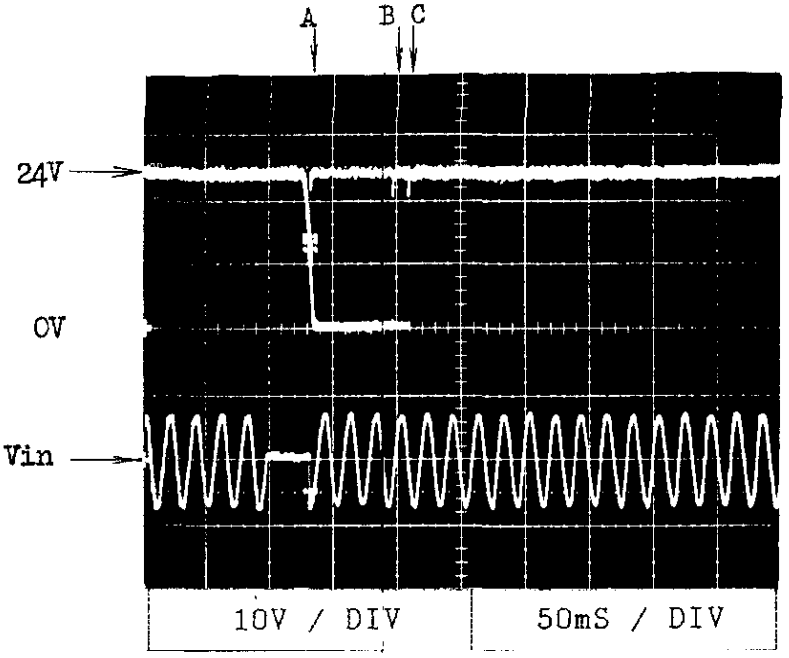
Brown out time:

A : 33 mS

B : 36 mS

C : 46 mS

24V



Brown out time:

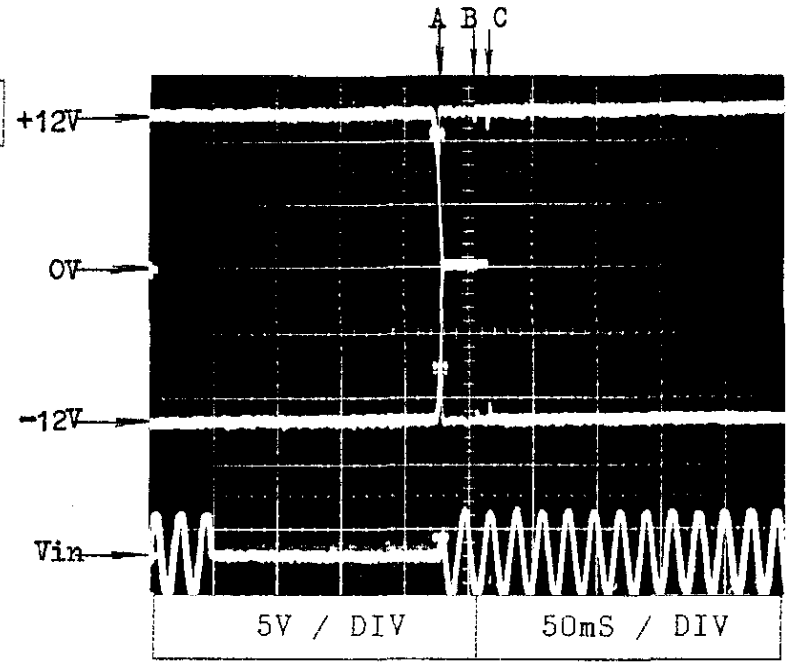
A : 33 mS

B : 36 mS

C : 46 mS

Condition Vin : AC220V
Iout: 100%
Ta : 25°C

±12V



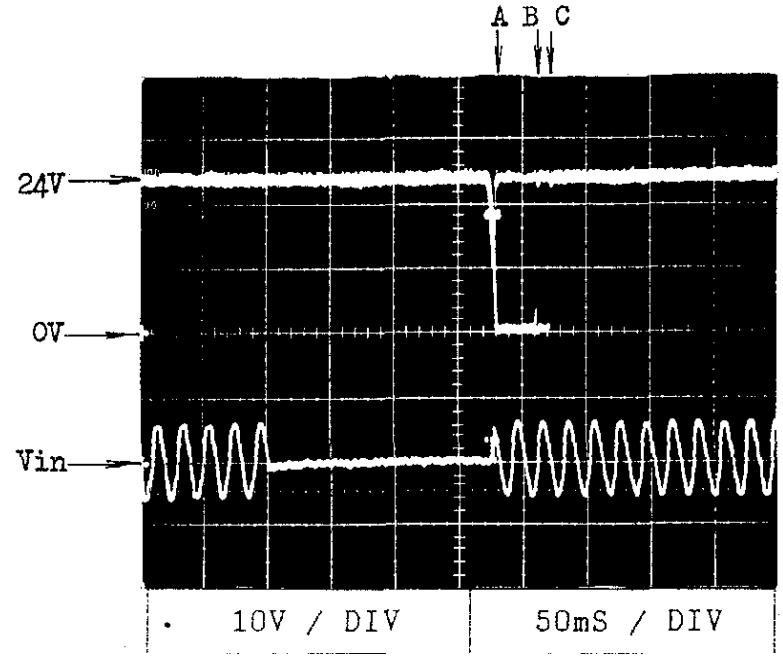
Brown out time:

A : 177 mS

B : 180 mS

C : 190 mS

24V



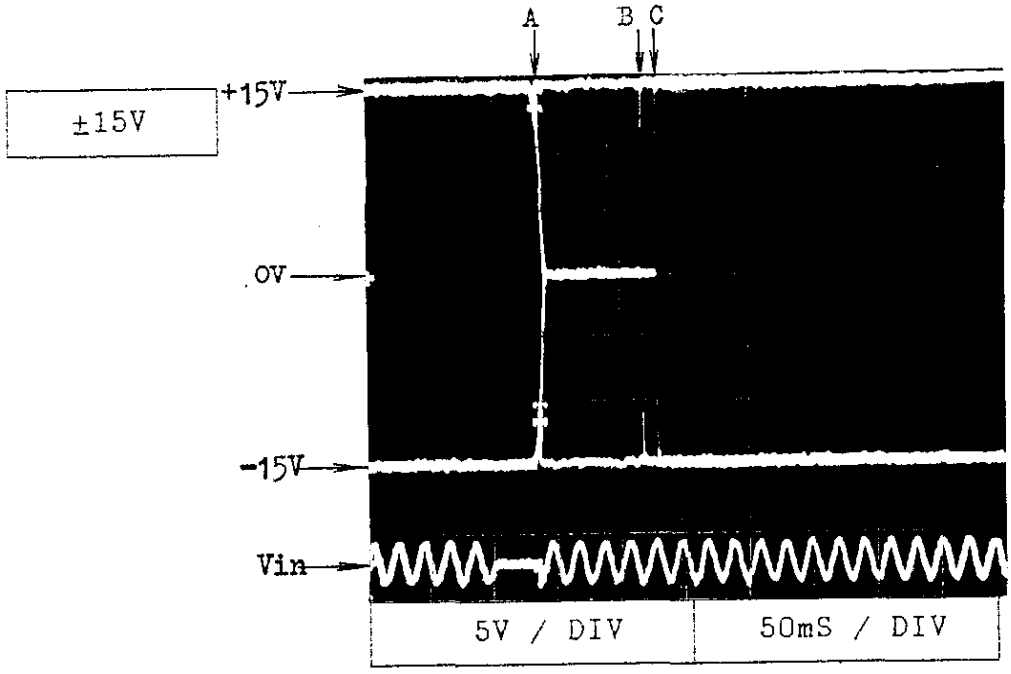
Brown out time:

A : 176 mS

B : 179 mS

C : 189 mS

Condition Vin : AC100V
Iout: 100%
Ta : 25°C

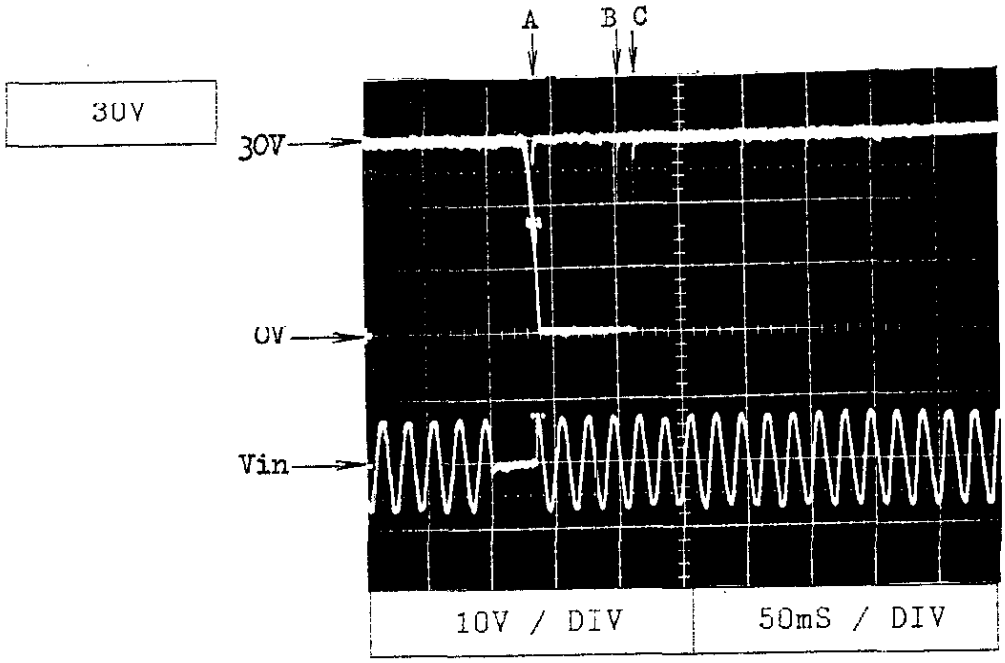


Brown out time:

A : 35 mS

B : 40 mS

C : 50 mS



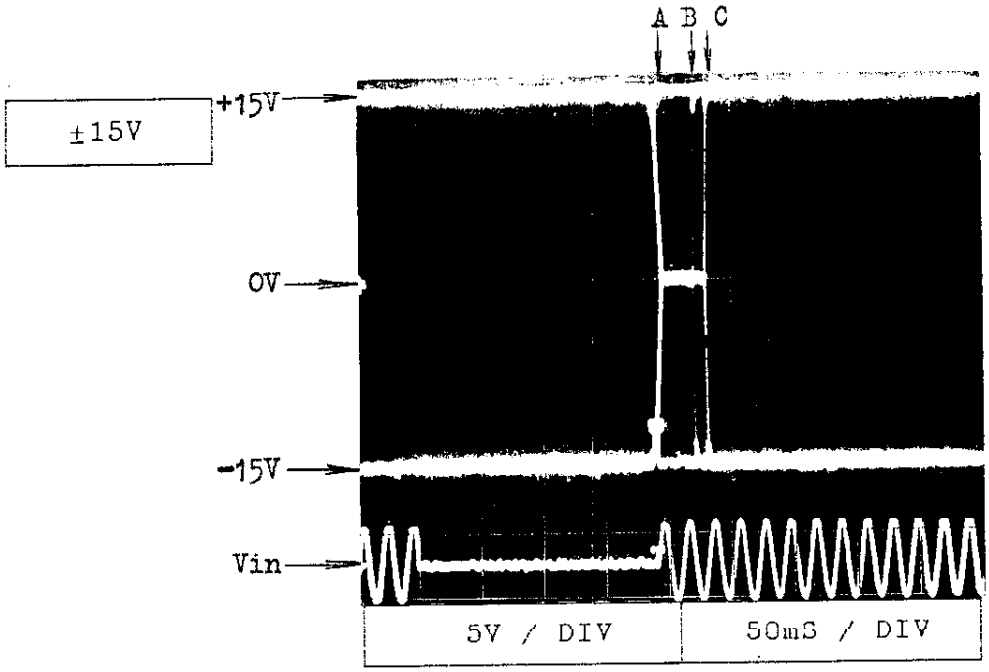
Brown out time:

A : 35 mS

B : 38 mS

C : 48 mS

Condition Vin : AC220V
Iout: 100%
Ta : 25°C

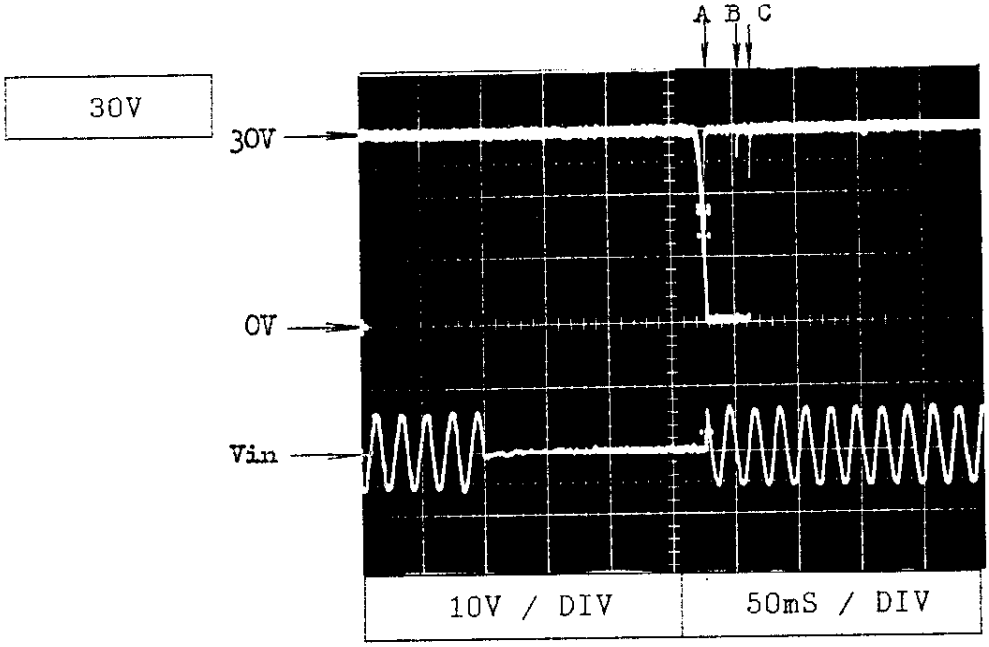


Brown out time:

A : 109 mS

B : 194 mS

C : 204 mS



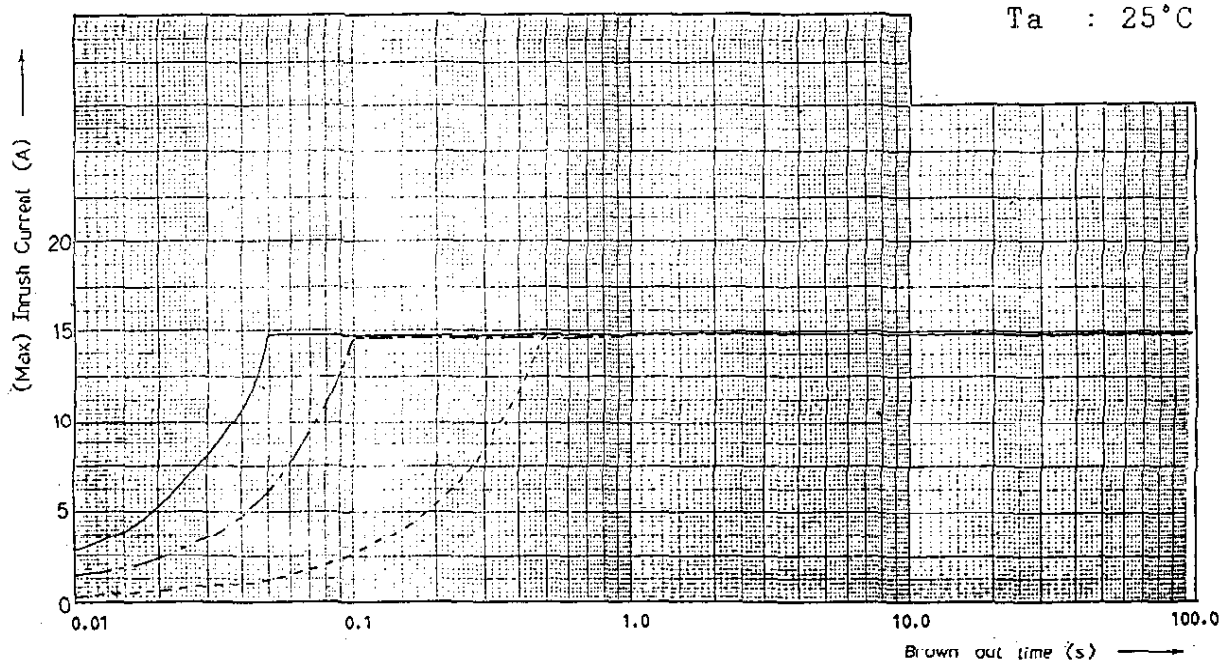
Brown out time:

A : 176 mS

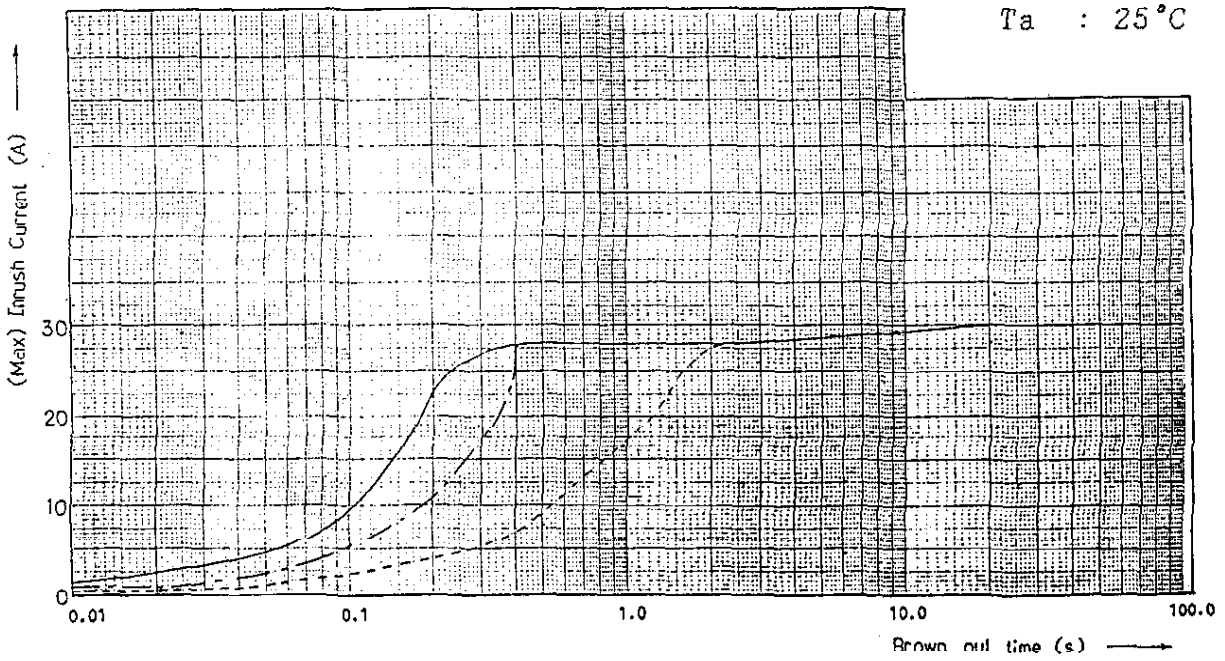
B : 179 mS

C : 189 mS

Condition Vin : AC100V
Iout: 0% ------
50% — - —
100% ———
Ta : 25°C



Condition Vin : AC230V
Iout: 0% ------
50% — - —
100% ———
Ta : 25°C

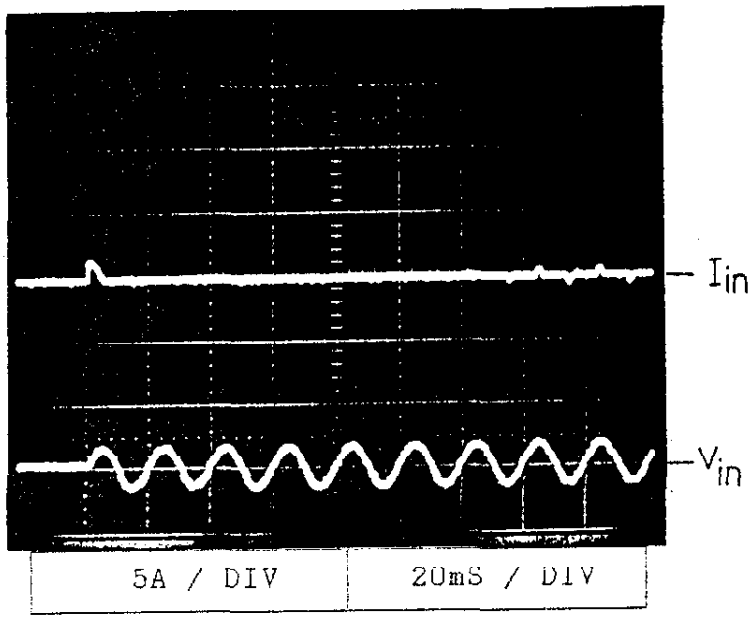


Inrush Current Waveform

Condition Vin : AC100V
Iout: 100%
Ta : 25°C

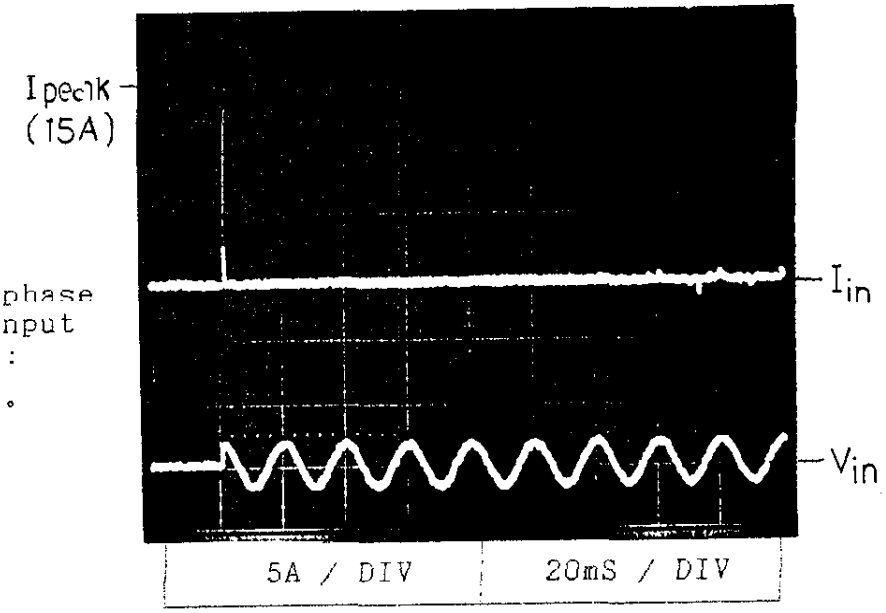
Switch in phase angle of input AC voltage:

$\phi = 0^{\circ}$



Switch in phase angle of input AC voltage:

$\phi = 90^{\circ}$



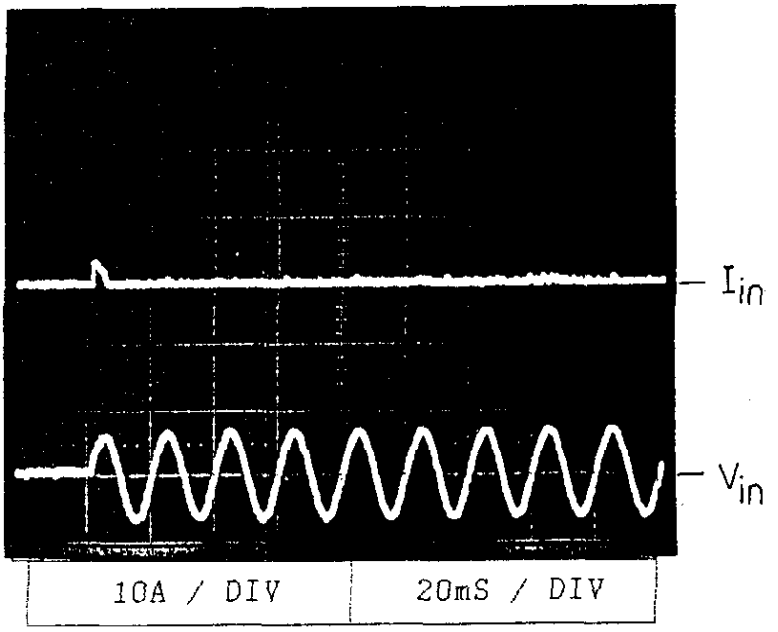
Inrush Current Waveform

KWD5

Condition Vin : AC230V
Iout: 100%
Ta : 25°C

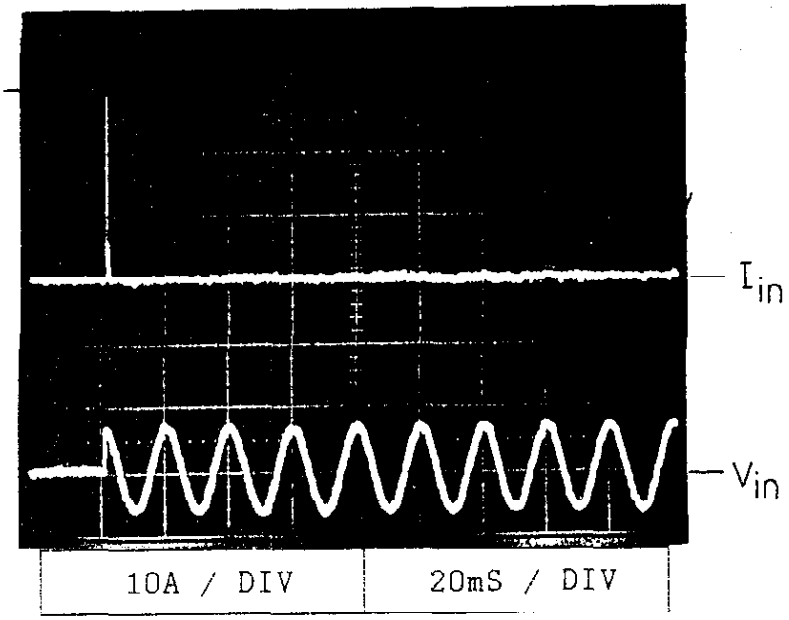
Switch in phase angle of input AC voltage:

$\phi = 0^{\circ}$



Switch in phase angle of input AC voltage:

$\phi = 90^{\circ}$



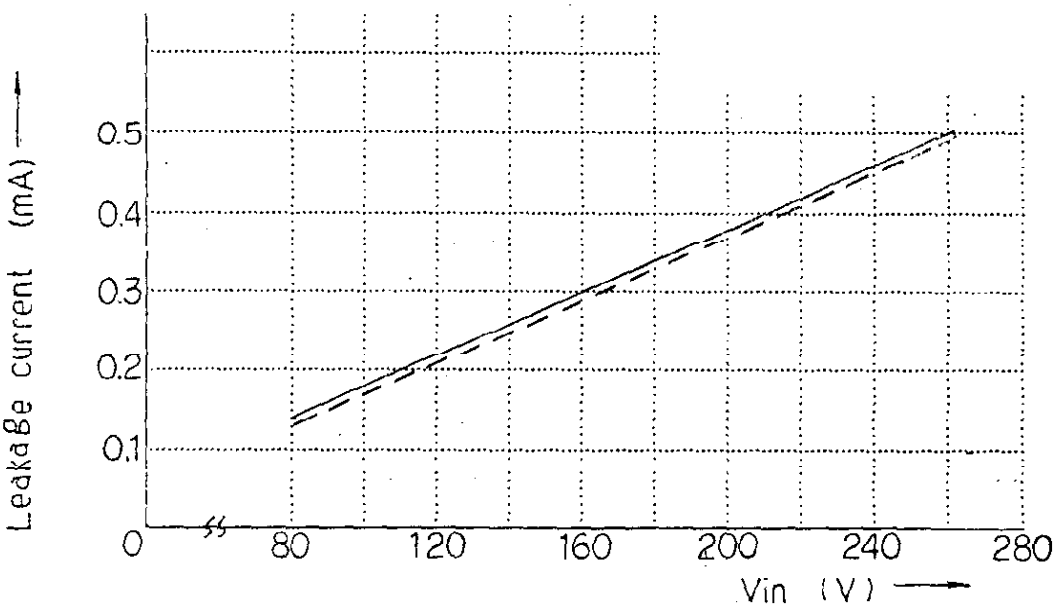
Leakage Current

KWD5

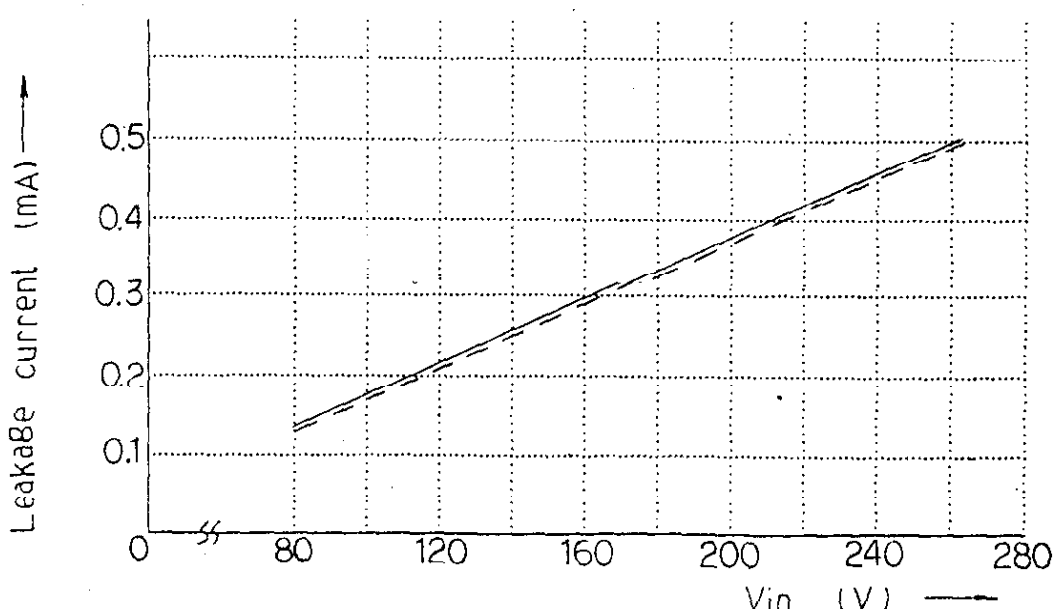
Condition

Iout: 100% ——
0% - - - -
Ta : 25 C

24V



30V



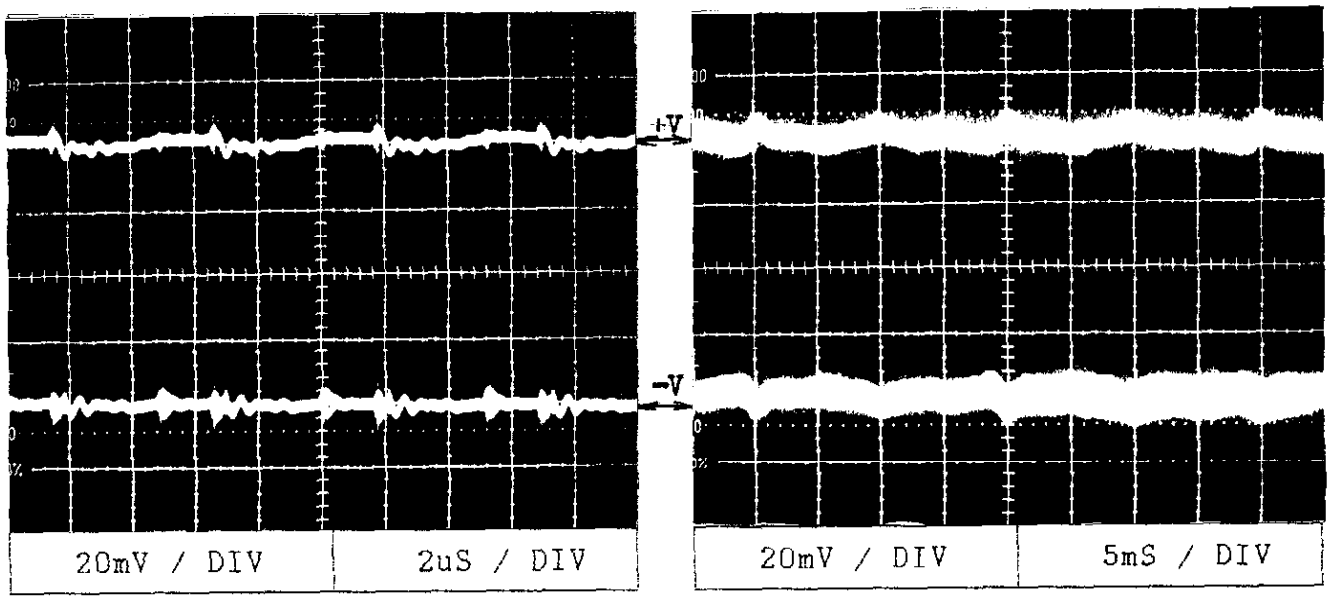
Output Ripple, Noise

KWD5

Condition Vin : AC100V
Iout: 100%
Ta : 25°C

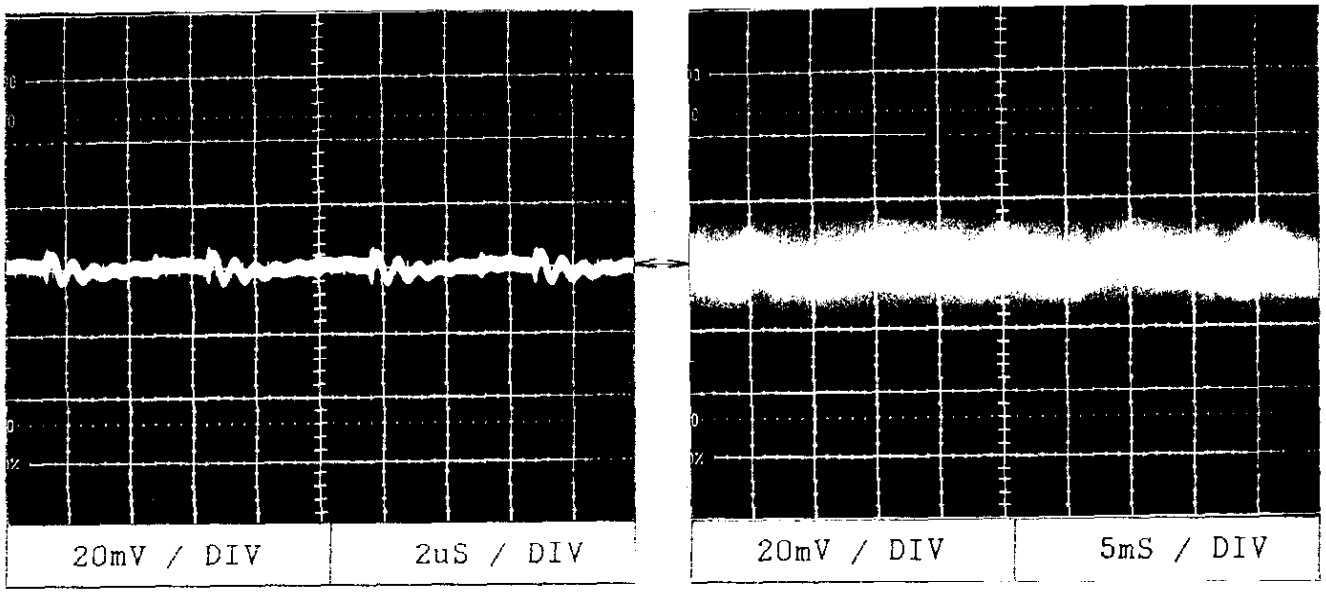
Normal Mode

±12V



24V

Vout



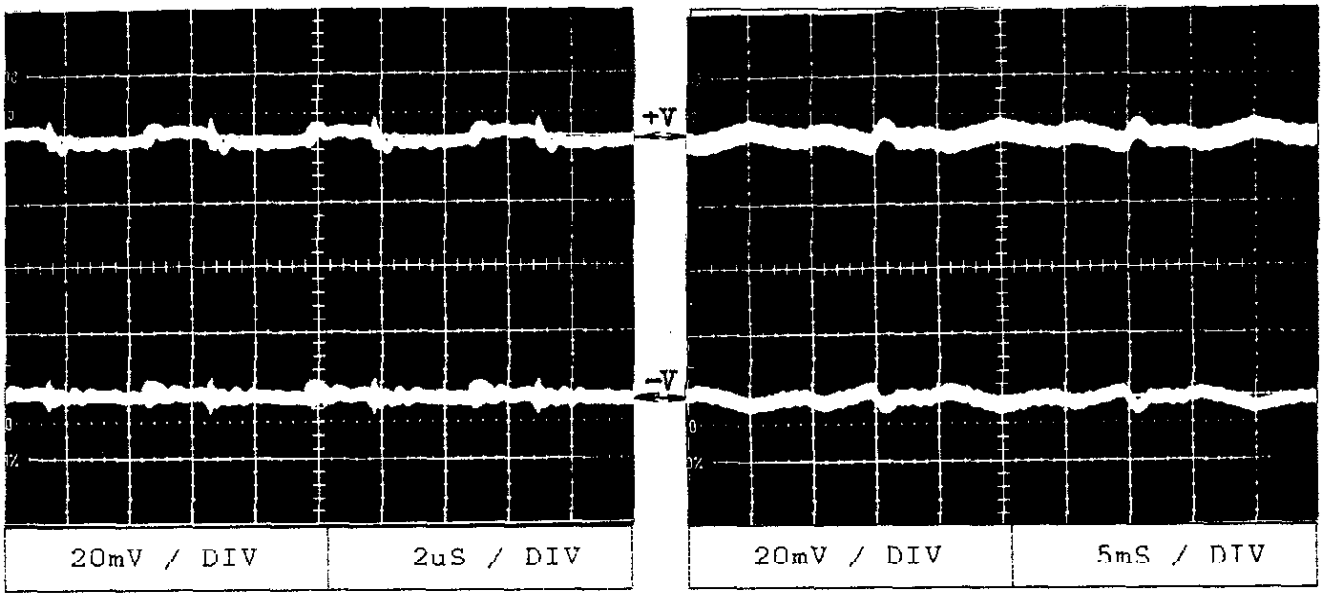
Output Ripple, Noise

KWD5

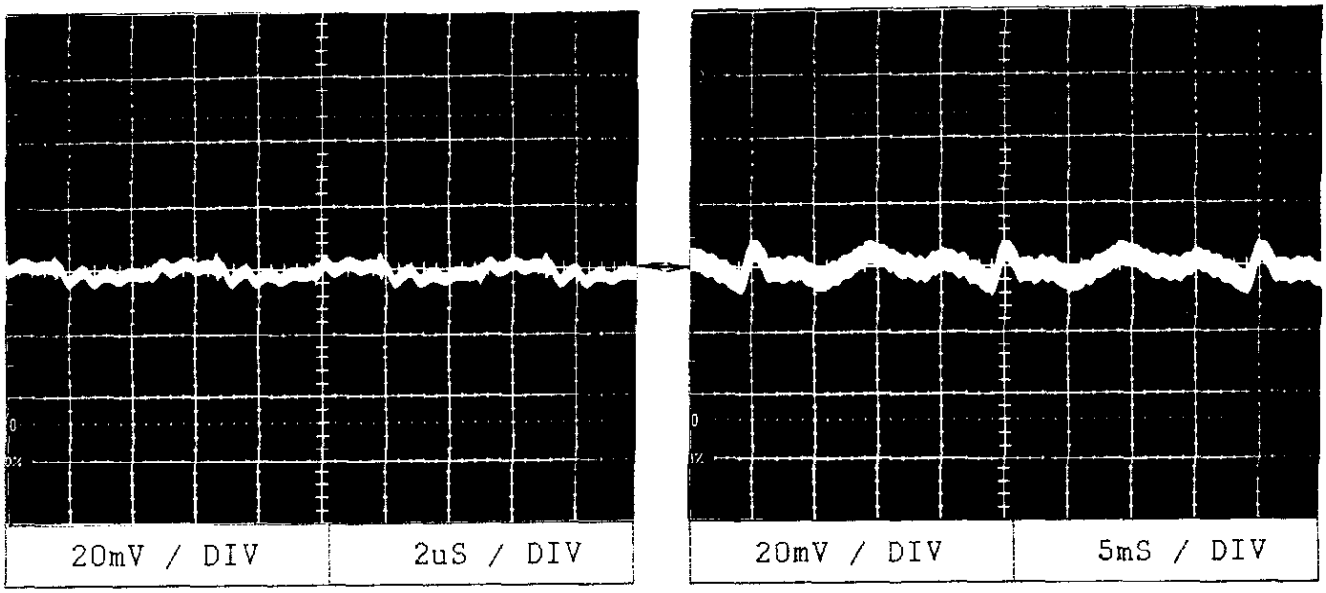
Condition Vin : AC100V
Iout: 100%
Ta : 25°C

Normal Mode

±15V



30V



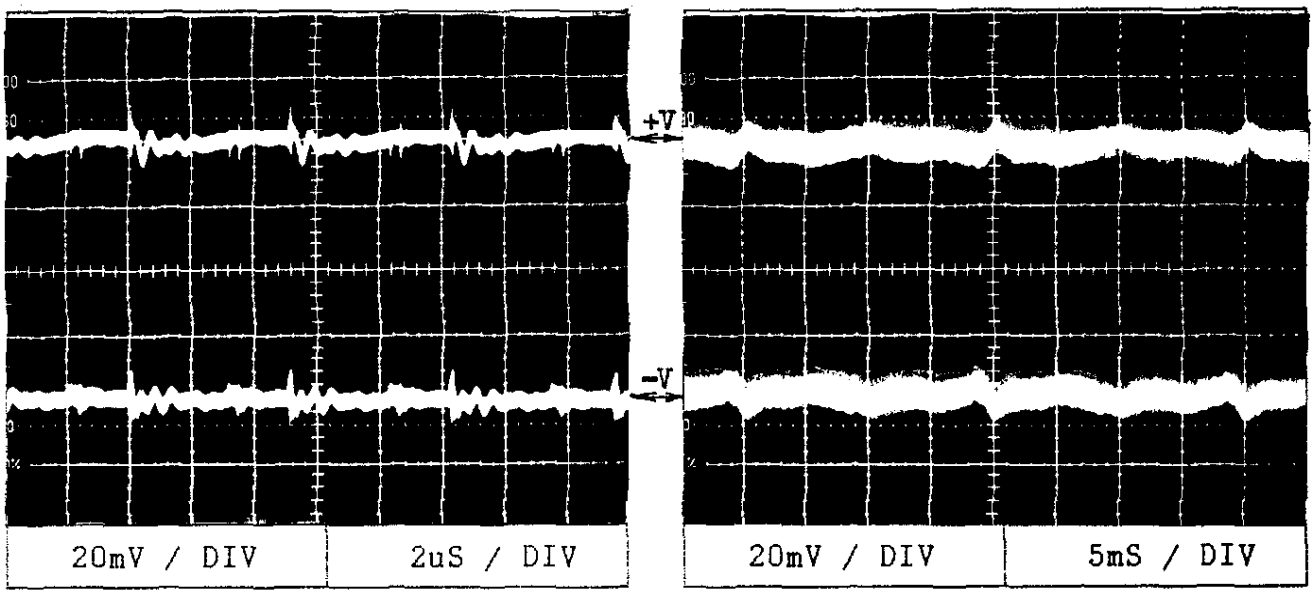
Output Ripple, Noise

KWD5

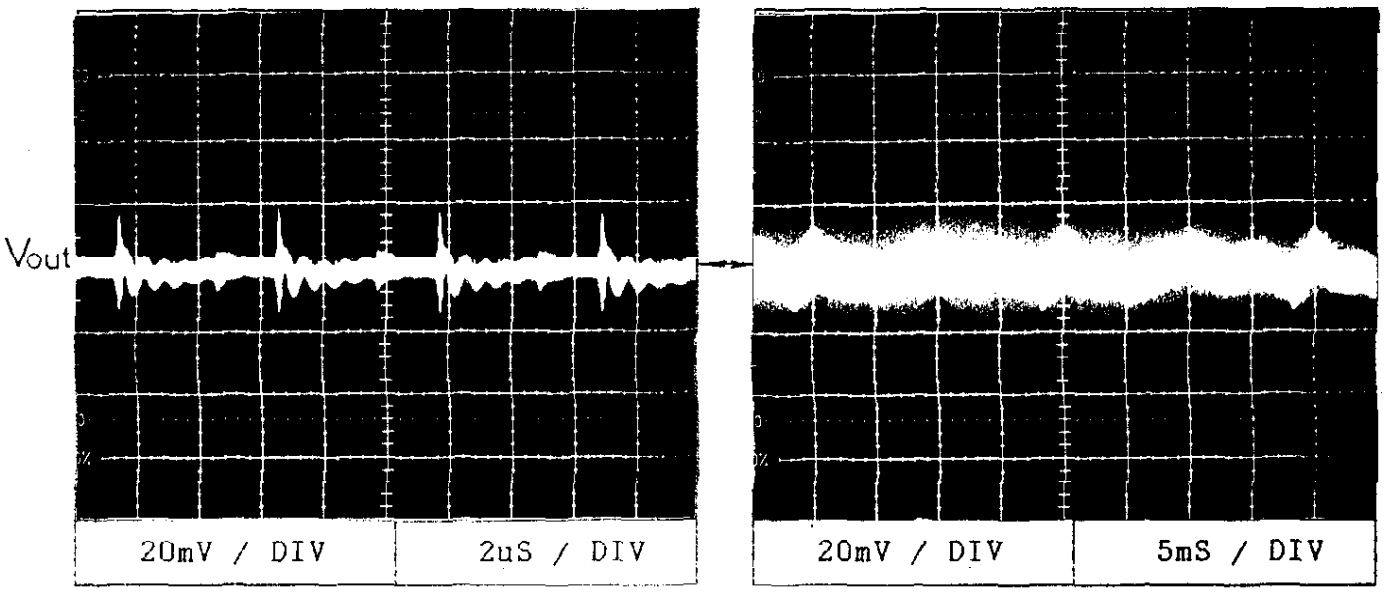
Condition Vin : AC100V
Iout: 100%
Ta : 25°C

Common + Normal Mode

±12V



24V



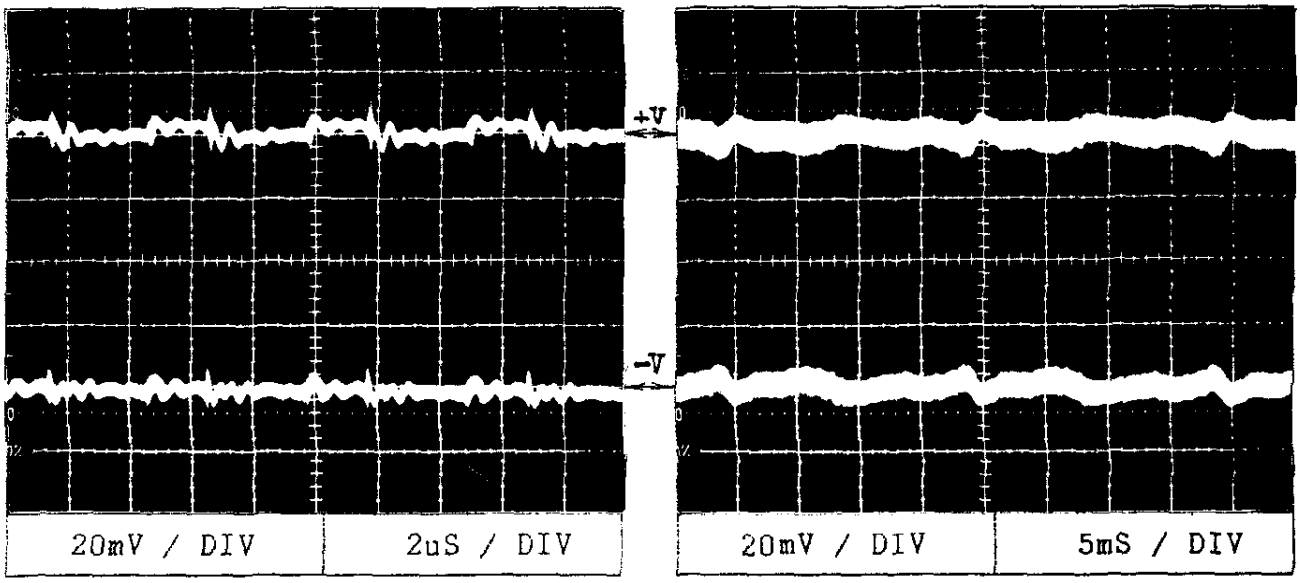
Output Ripple, Noise

KWD5

Condition Vin : AC100V
Iout: 100%
Ta : 25°C

Common + Normal Mode

±15V



30V