QUALITY TEST
DATA

KWD10

DWG. NO.		PA774-53-01			
QA APPROVAL		R / D			
NLJ	NLA	APP	CHK	ENG	DRW
T. Murayama			CCNED	AZADDIN	AZADDIN
'93.10.18	6/JAN/'93	24/DEC/'92	5/12/92	4/12/92	4/12/92

24/12/92

T. Kasa
'93.10.18

----INDEX----

Terminology used :

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

KWD10 Specifications

NEMIC-LAMBDA

PA774-01-01

*: For delivery, contact to our sales office.

	ITEMS / MODEL			KWD10-1212		KWD10-1515	
				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	0.45	0.45	0.36	0.36
4	Maximum Output Power		W	10.8		10.8	
5	Efficiency (typ)	(*1)	%	72		72	
6	Input Voltage Range	(*2)	-	85 ~ 265VAC (47~440Hz) or 110 ~ 340VDC			
7	Input Current (typ)	(*1)	A	0.3A 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 10W, 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	100g			
31	Size (WxHxD)		mm	45 x 20.5 x 64 (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 than30 seconds.

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

*9. VDE classB with extenal capacitor.

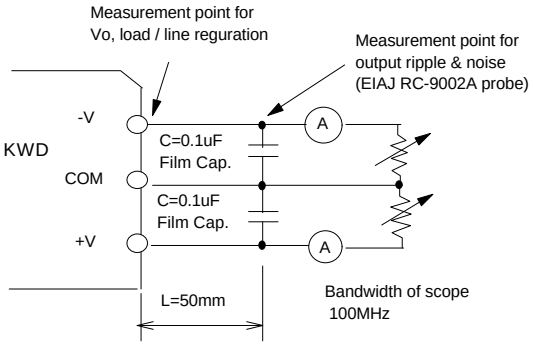
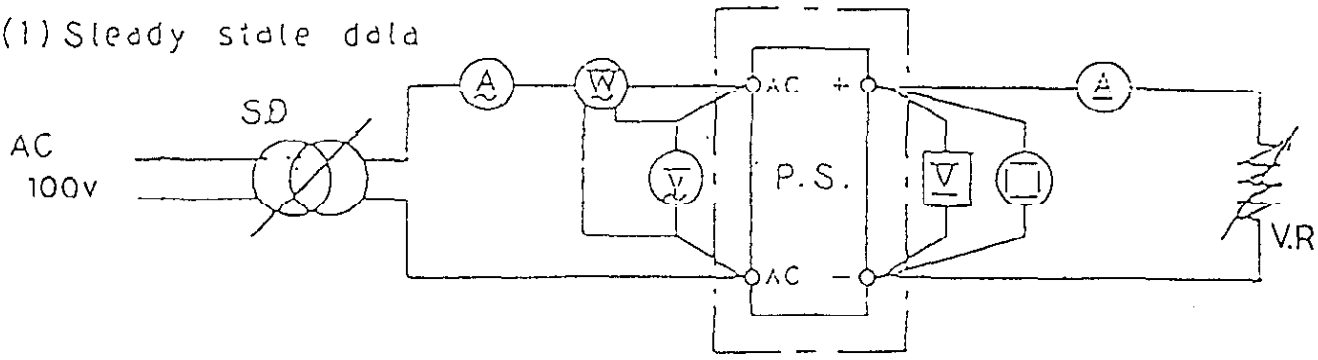


Fig.A

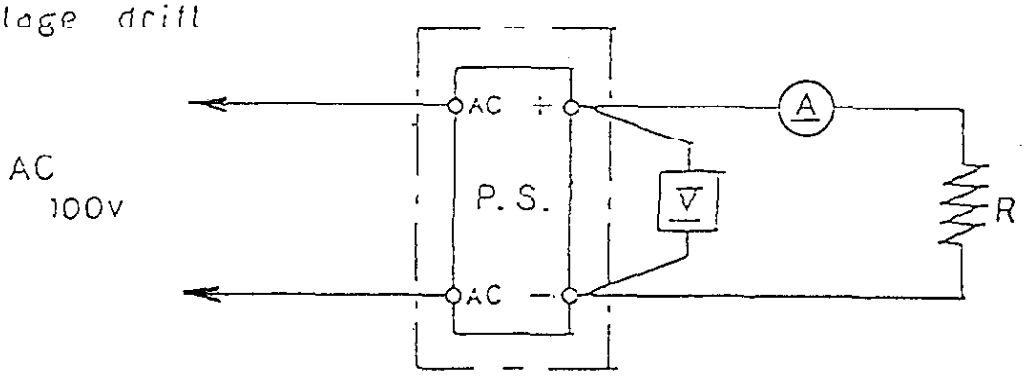
Circuits used for determination

(1) Steady state data



controlled temp., chamber

(2) Warm up voltage drift

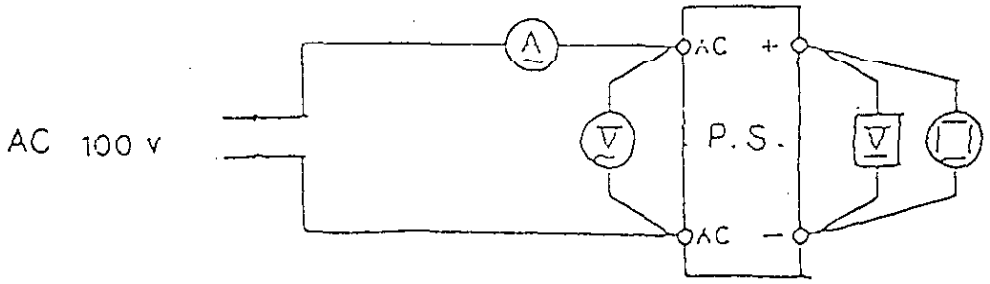


controlled temp., chamber

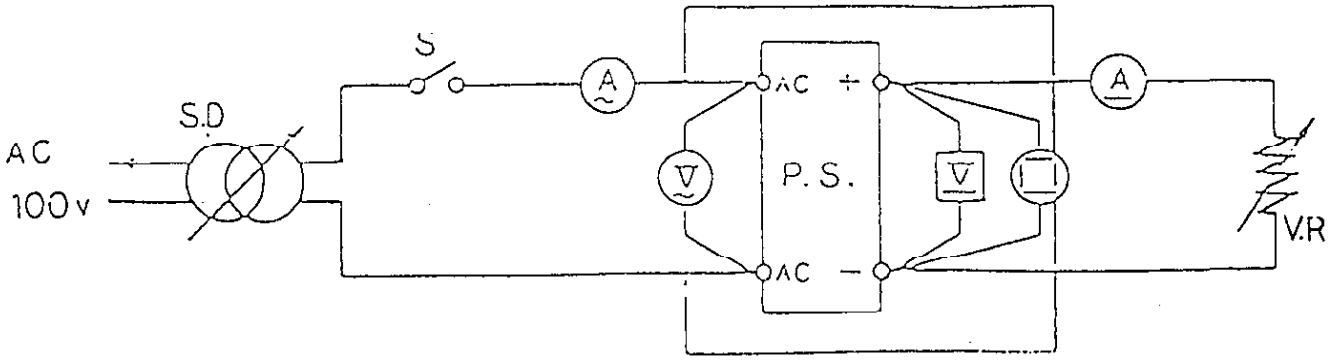
(3) Over current protection (o.c.p) characteristics

Same as steady state data.

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



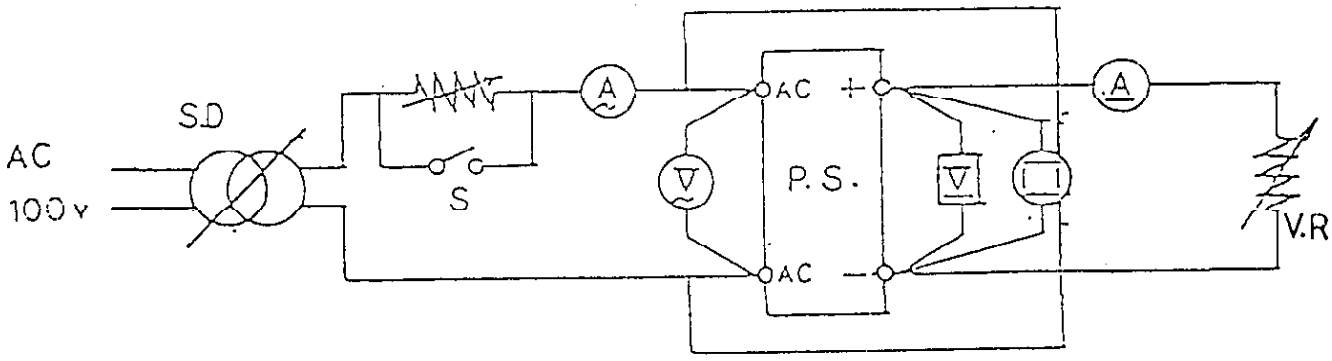
(5) Oulpul rise characleristics



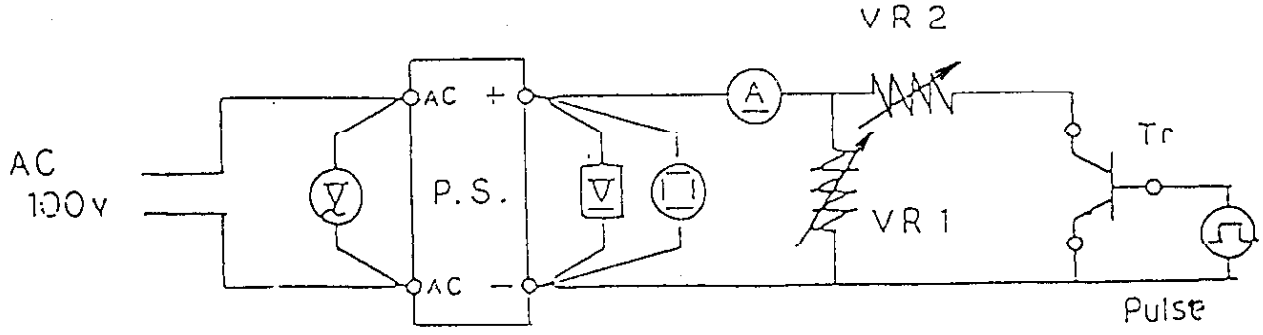
(6) Oulpul fall characleristics

Same as oulpul rise characleristics.

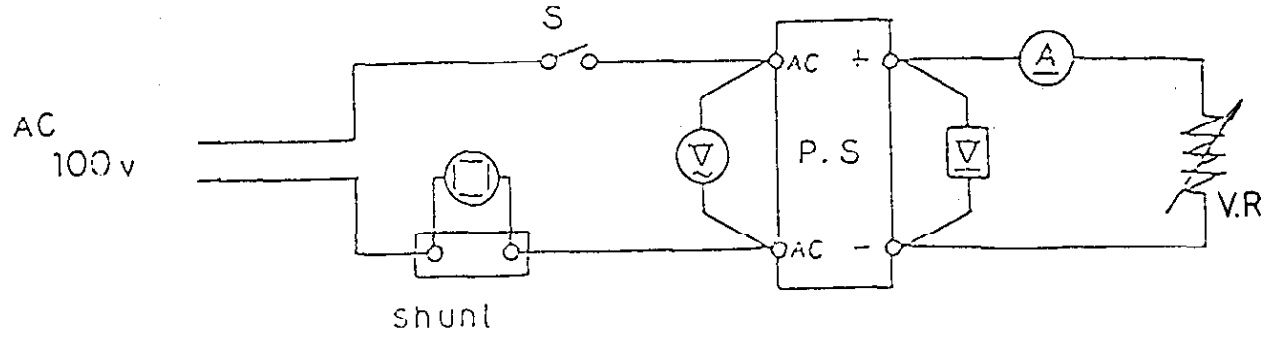
(7) Dynamic line response



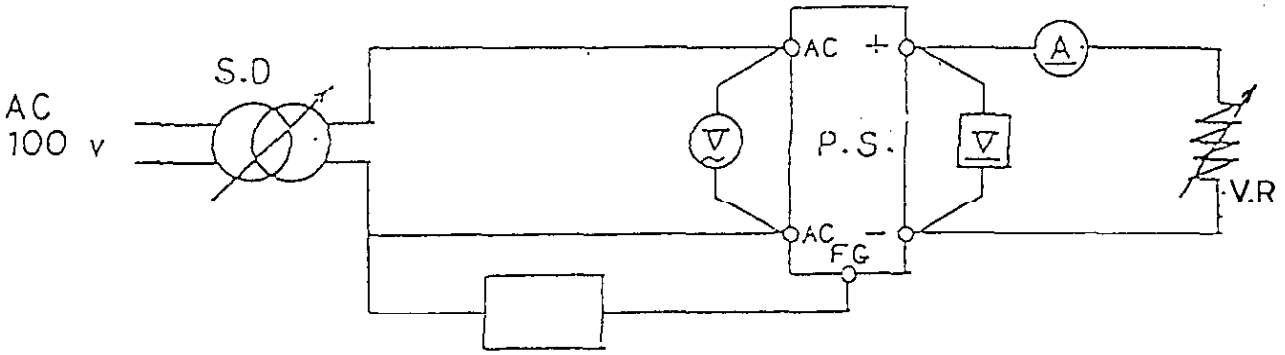
(8) Dynamic load response



(9)Inrush current characteristics



(10)Leakage current



leakage current meter

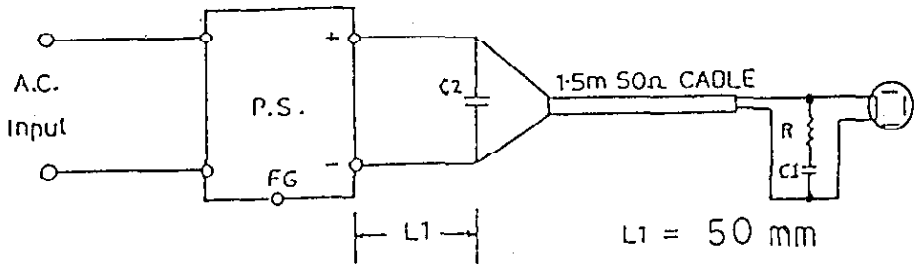
Note : ·Leakage current measured through a 1kΩ resistor.

·Range used — AC + DC

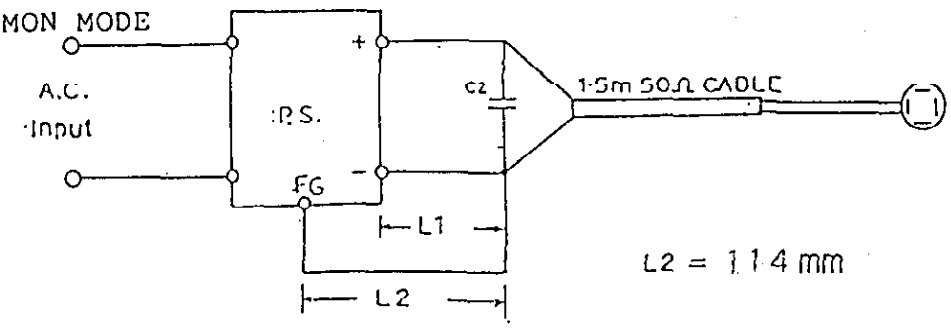
R = 50Ω
C1 = 4700pF
C2 = 0.1μF
(Ch1/Ch2/Ch1+Ch2)

(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: 0.45A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	12.239V	12.238V	12.230V	12.229V	10 mV	0.08.%
50 %	12.076V	12.074V	12.072V	12.071V	5 mV	0.04 %
100 %	11.991V	11.991V	11.990V	11.989V	2 mV	0.02 %
Load	248mV	247mV	240mV	240mV		
Regulation	2.07 %	2.06 %	2.00 %	2.00 %		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	11.983V	11.991V	11.999V	16 mV	0.13 %

-12V

1. Regulation - line and load

Condition Ta : 25°C
+12V: 0.45A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	-12.222V	-12.223V	-12.226V	-12.225V	4 mV	0.03 %
50 %	-12.079V	-12.078V	-12.081V	-12.081V	3 mV	0.03 %
100 %	-11.994V	-11.995V	-12.000V	-12.000V	6 mV	0.05 %
Load	228mV	228mV	226mV	225mV		
Regulation	1.90%	1.90%	1.88%	1.88%		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	-11.993V	-11.995V	-11.998V	5 mV	0.04 %

+15V

1. Regulation - line and load

Condition Ta : 25°C
-15V: 0.36A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	15.225V	15.223V	15.214V	15.211V	14 mV	0.09.%
50 %	15.054V	15.051V	15.048V	15.048V	6 mV	0.04 %
100 %	14.968V	14.968V	14.966V	14.966V	2 mV	0.01 %
Load	257mV	255mV	248mV	245mV		
Regulation	1.71 %	1.70 %	1.65 %	1.63 %		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	14.994V	14.968V	14.951V	43 mV	0.29 %

-15V

1. Regulation - line and load

Condition Ta : 25°C
+15V: 0.36A

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	-15.223V	-15.226V	-15.230V	-15.227V	7 mV	0.05 %
50 %	-15.056V	-15.054V	-15.057V	-15.058V	4 mV	0.03 %
100 %	-14.967V	-14.968V	-14.974V	-14.974V	7 mV	0.05 %
Load	256mV	258mV	256mV	253mV		
Regulation	1.71%	1.72%	1.71%	1.69%		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	-14.996V	-14.968V	-14.953V	43 mV	0.29 %

24V

1. Regulation - line and load

Condition Ta : 25°C

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	24.000V	24.000V	24.009V	24.008V	9 mV	0.04.%
50 %	23.991V	23.992V	23.993V	23.993V	2 mV	0.01 %
100 %	23.983V	23.986V	23.988V	23.988V	5 mV	0.02 %
Load	17 mV	14 mV	21 mV	20 mV		
Regulation	0.07 %	0.06 %	0.09 %	0.08 %		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	23.976V	23.986V	23.997V	21 mV	0.09 %

30V

1. Regulation - line and load

Condition Ta : 25°C

Iout Vin	AC 85V	AC100V	AC220V	AC265V	Line Regulation	
0 %	29.963V	29.964V	29.979V	29.976V	16 mV	0.05 %
50 %	29.947V	29.947V	29.948V	29.948V	1 mV	0.00 %
100 %	29.935V	29.936V	29.940V	29.940V	5 mV	0.02 %
Load	28 mV	28 mV	39 mV	36 mV		
Regulation	0.09%	0.09%	0.13%	0.12%		

2. Temperature Drift

Condition Vin : AC100V
Iout : 100 %

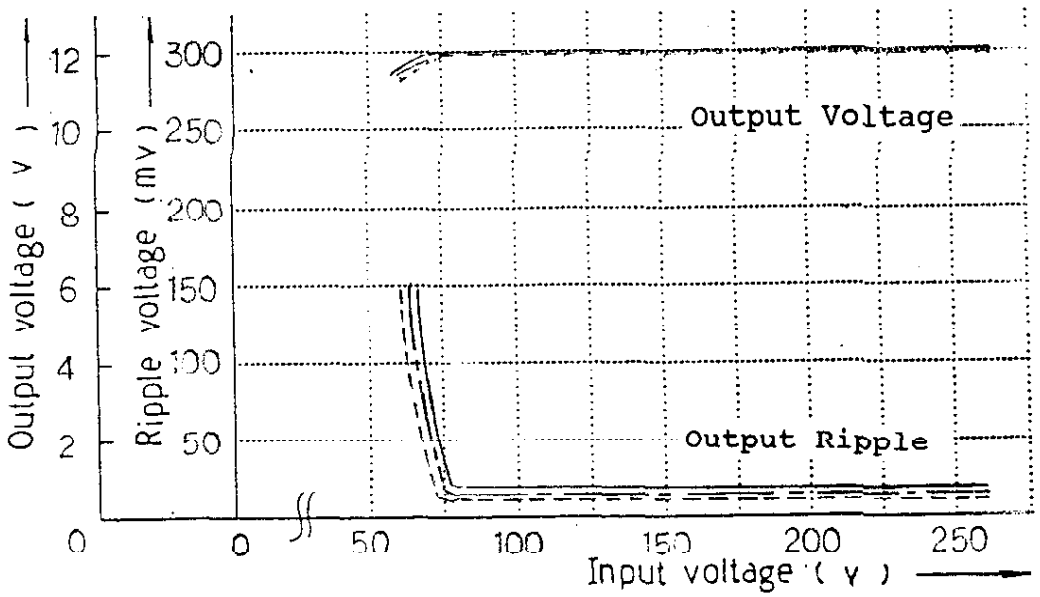
Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	29.990V	29.936V	29.904V	86mV	0.29 %

Output Voltage and Ripple Voltage v.s. Input Voltage

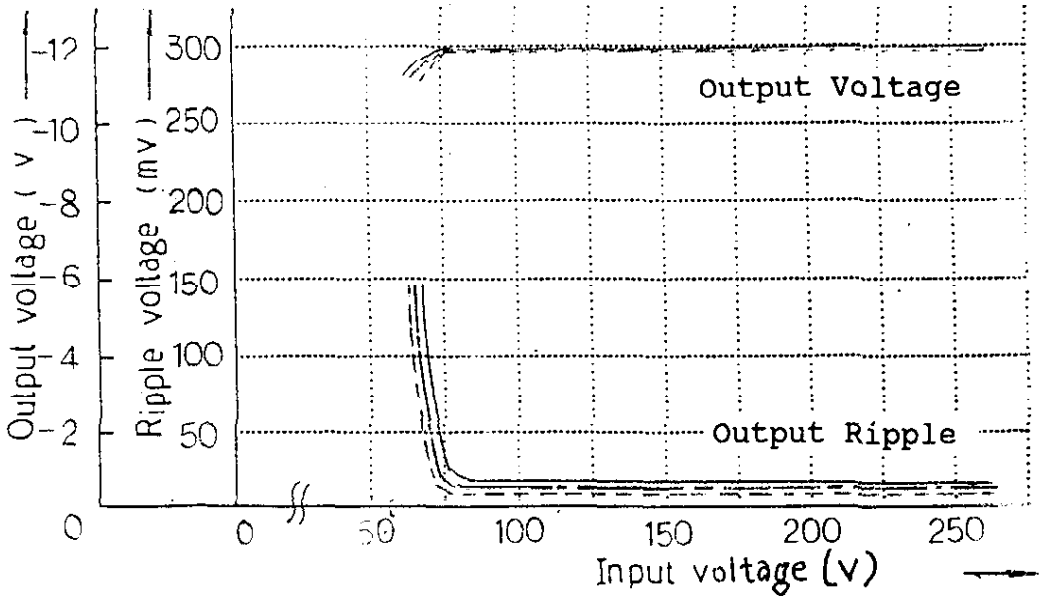
KWD10

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

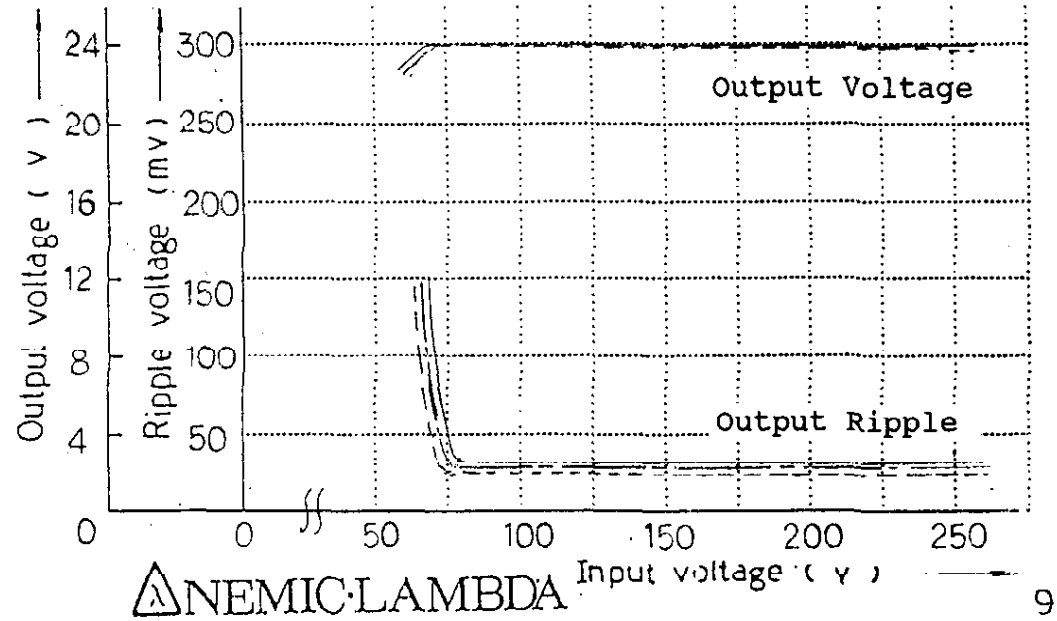
+12V



-12V



24V

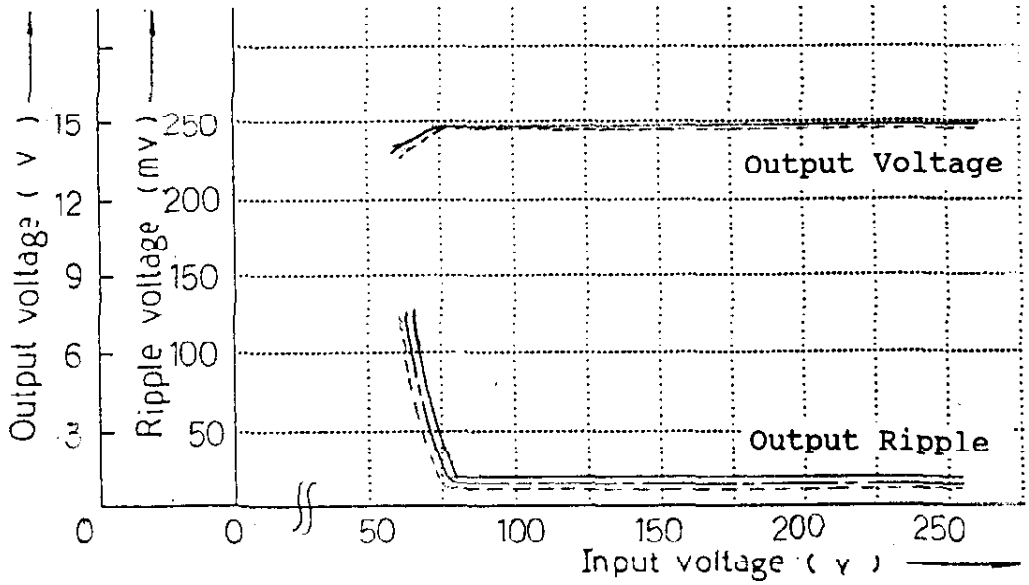


Output Voltage and Ripple Voltage v.s. Input Voltage

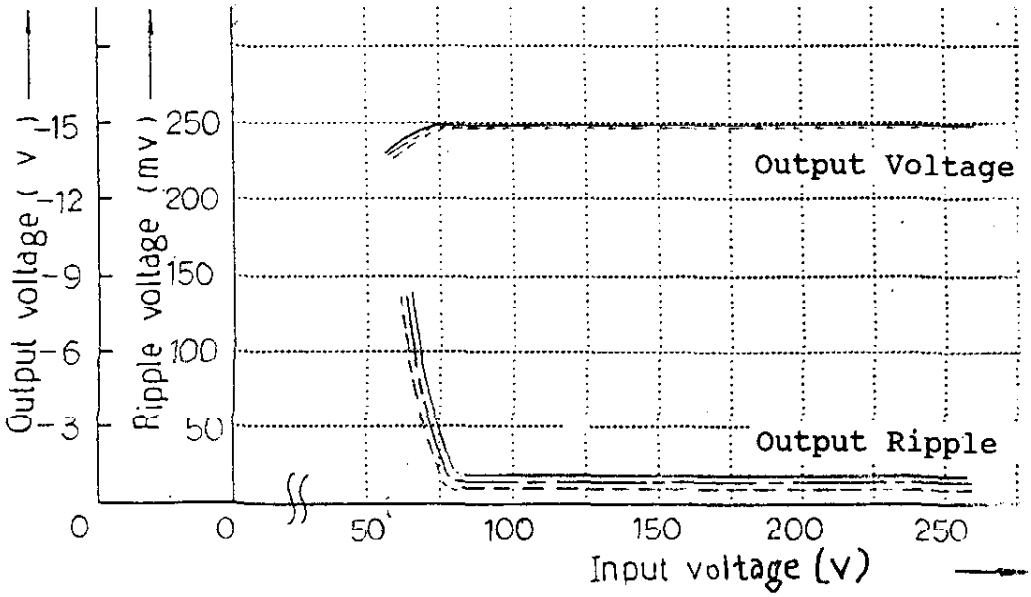
KWD10

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

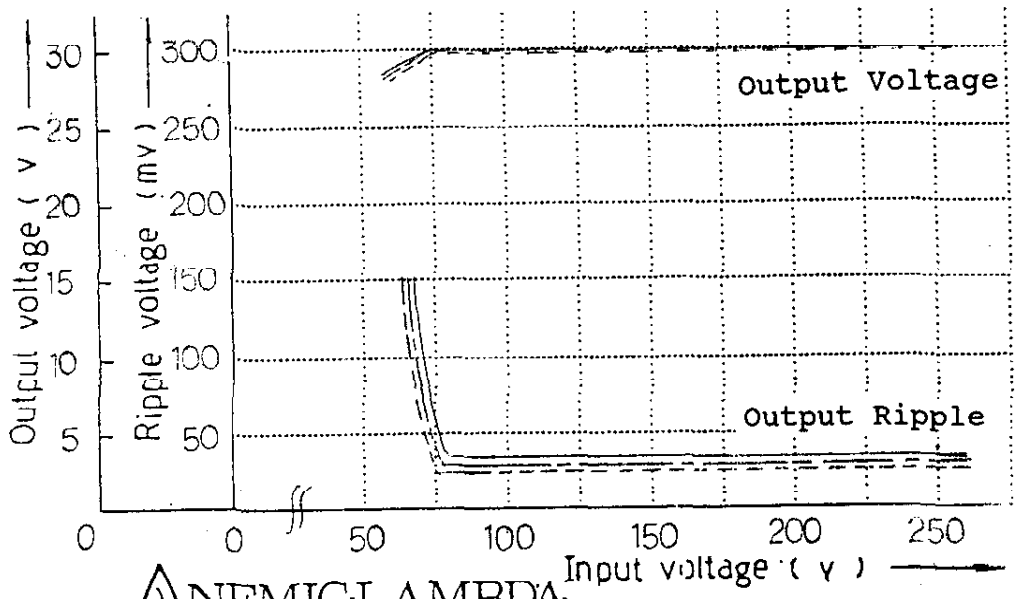
+15V



-15V



30V

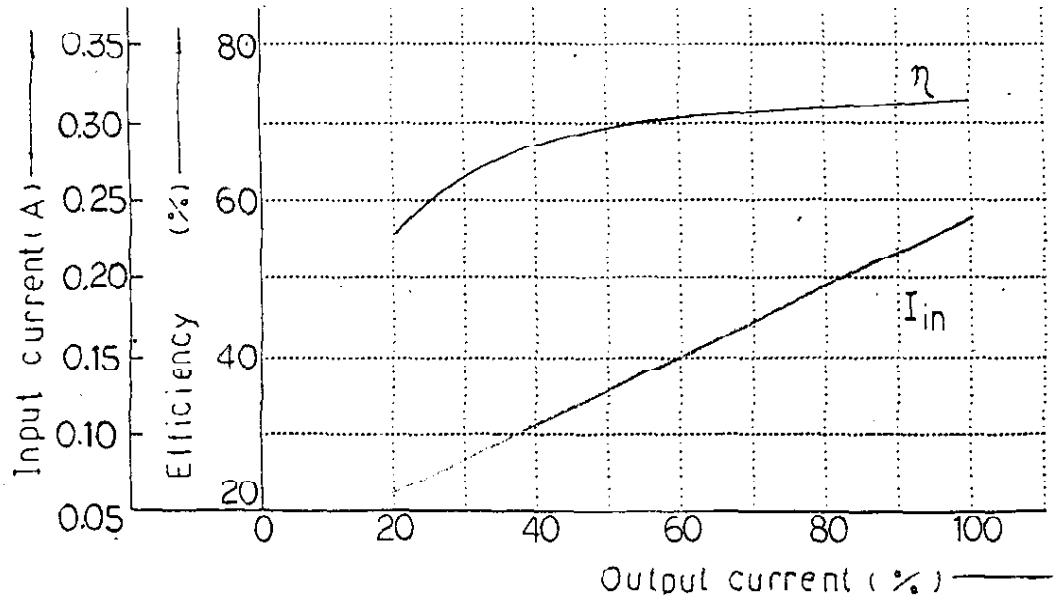


Efficiency and Input Current v.s.
Output Current

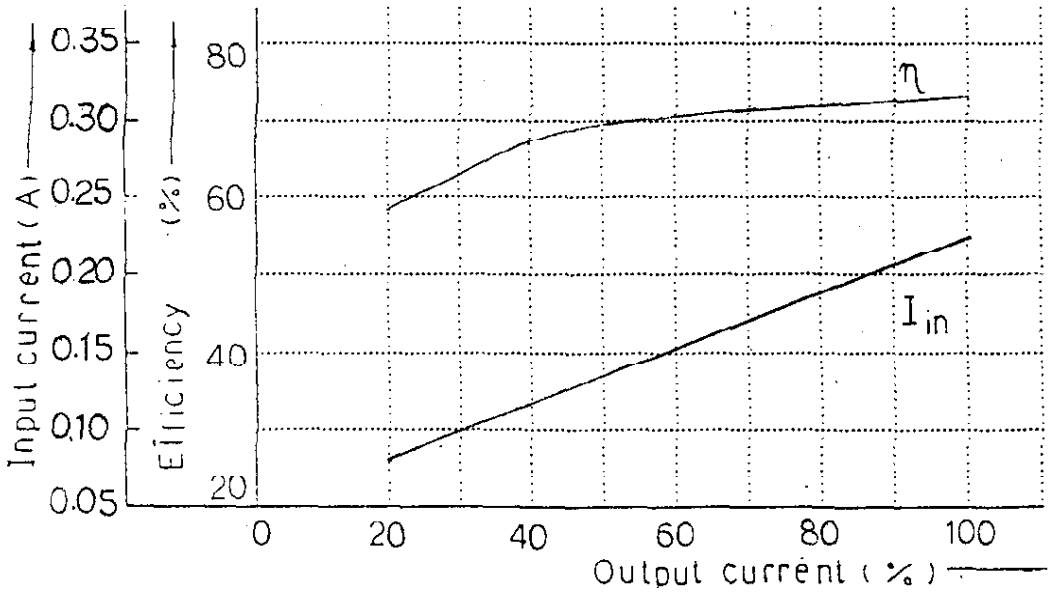
KWD10

Condition Vin : AC100V
Ta : 25 °C

24V



30V

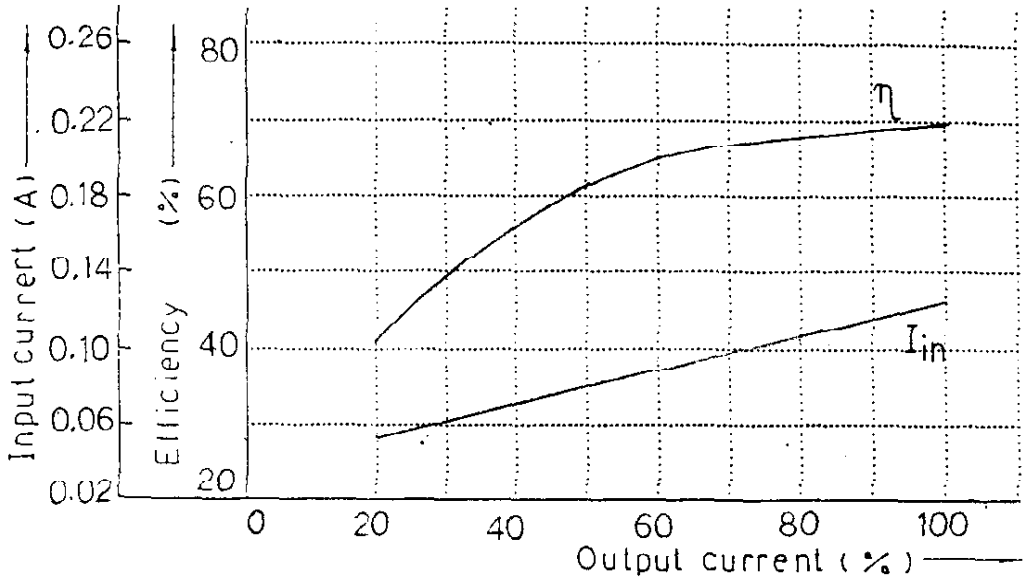


Efficiency and Input Current v.s.
Output Current

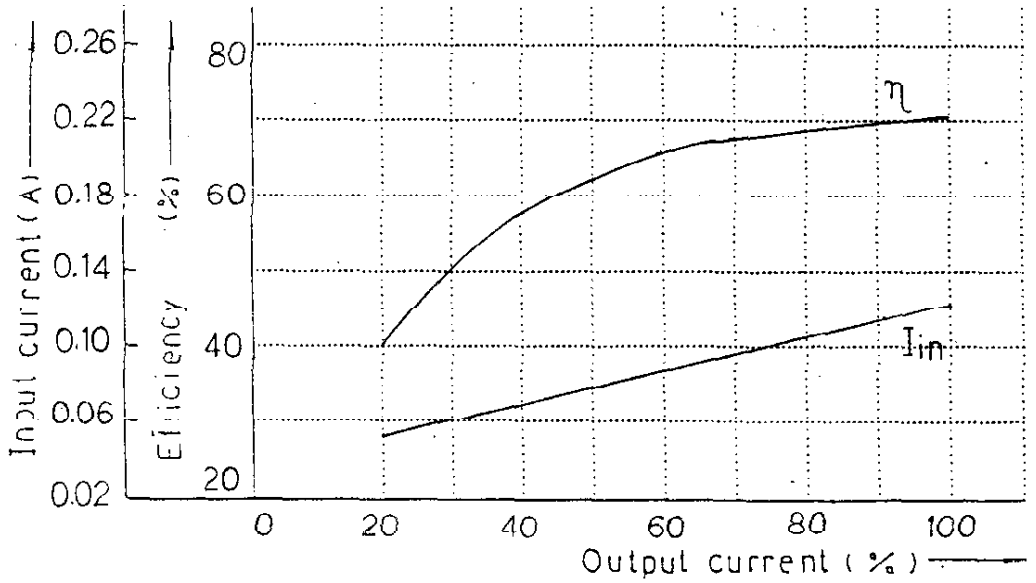
KWD10

Condition Vin : AC220V
Ta : 25°C

24V



30V

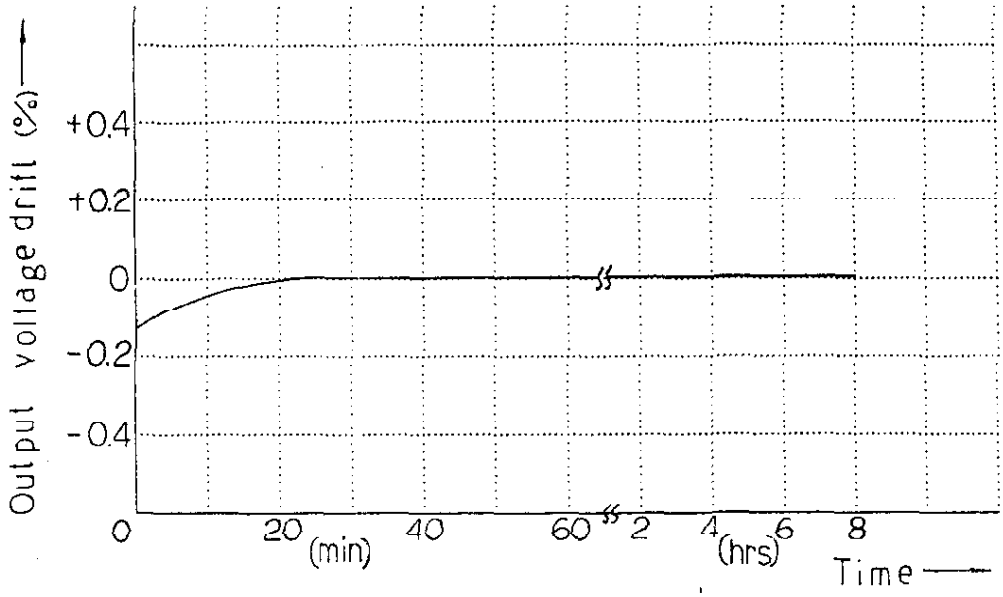


Warm Up Voltage Drift

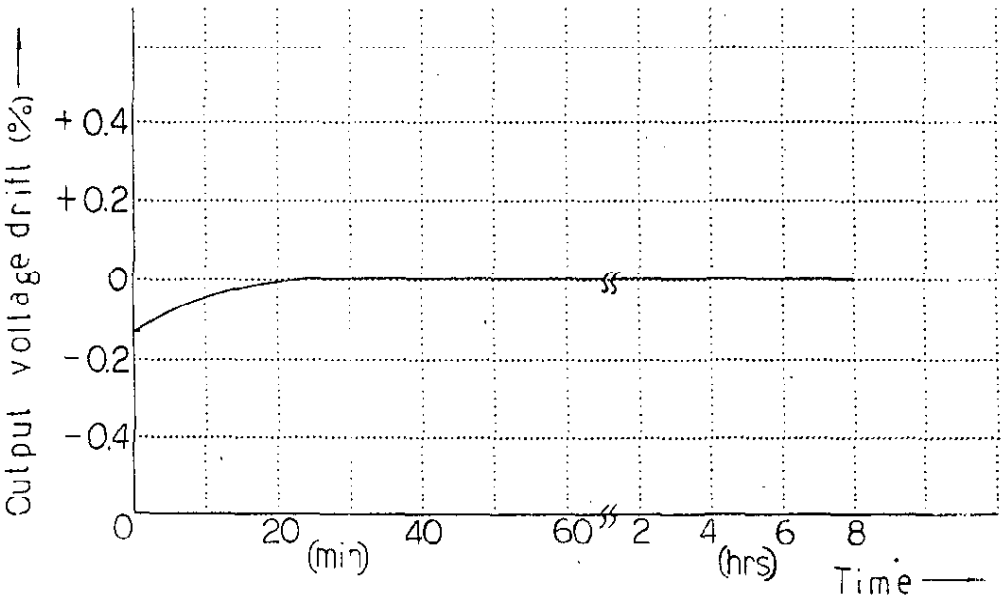
KWD10

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

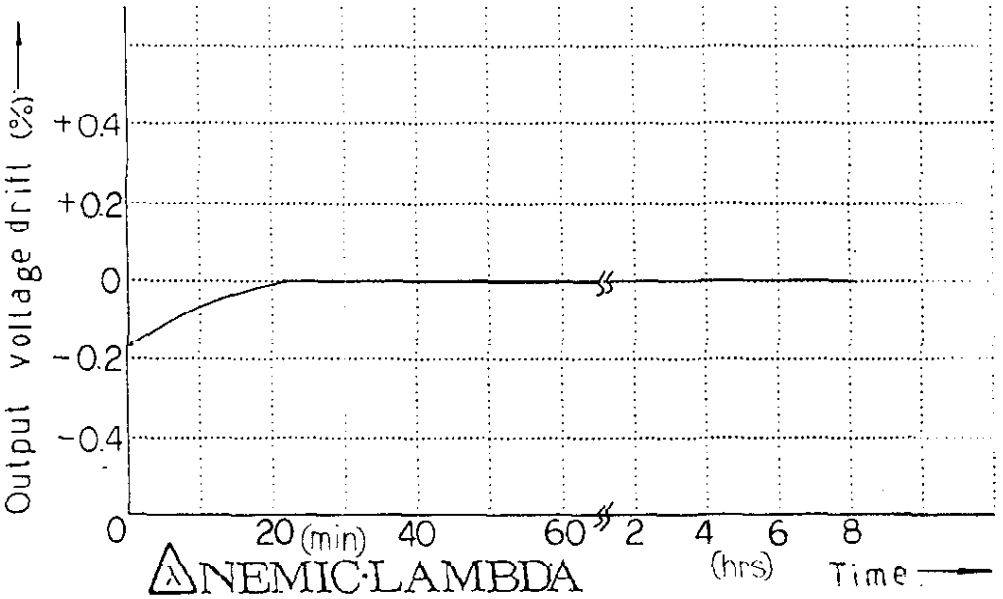
+12V



-12V



24V

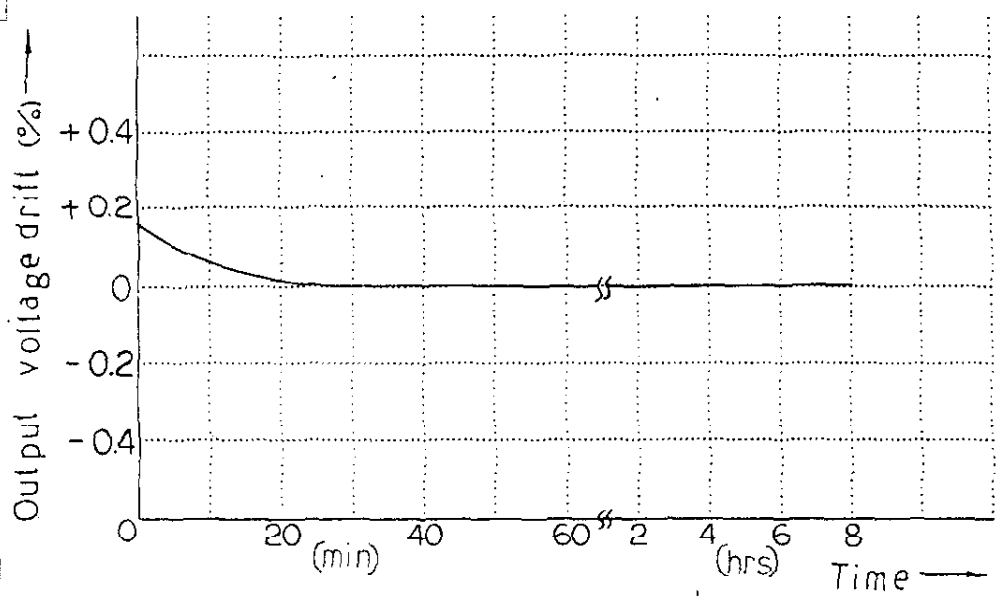


Warm Up Voltage Drift

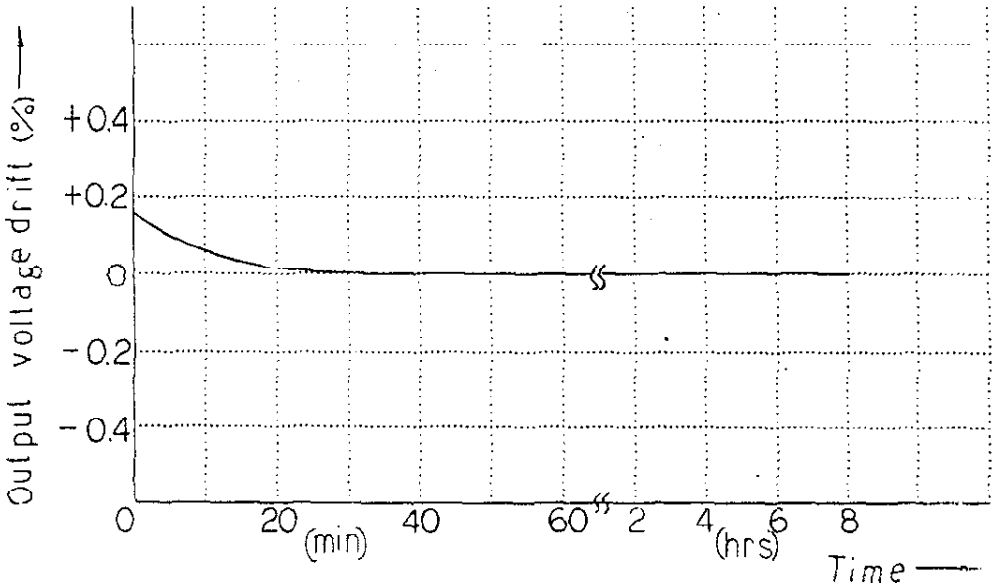
KWD10

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

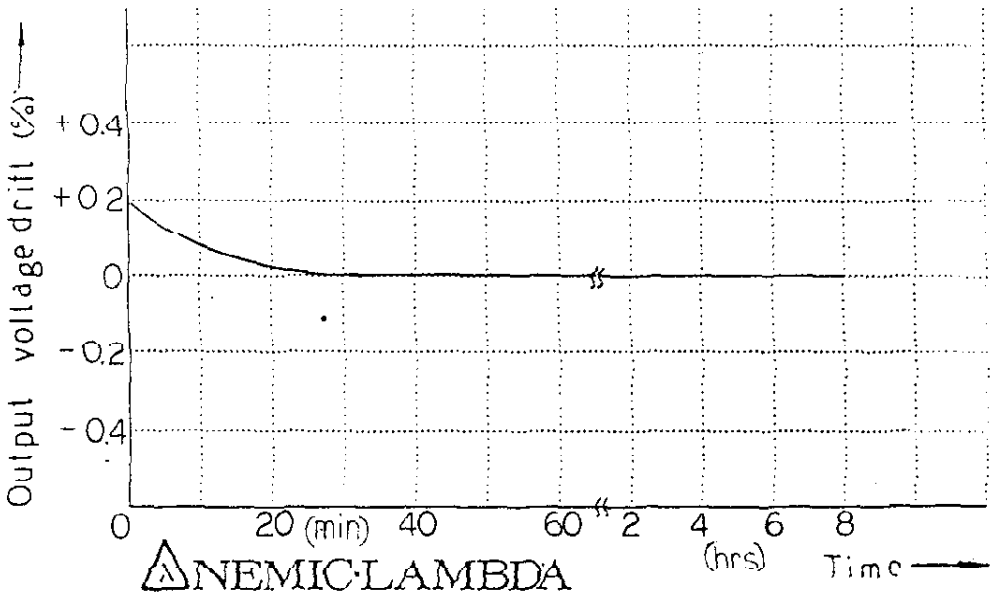
+15V



-15V



30V

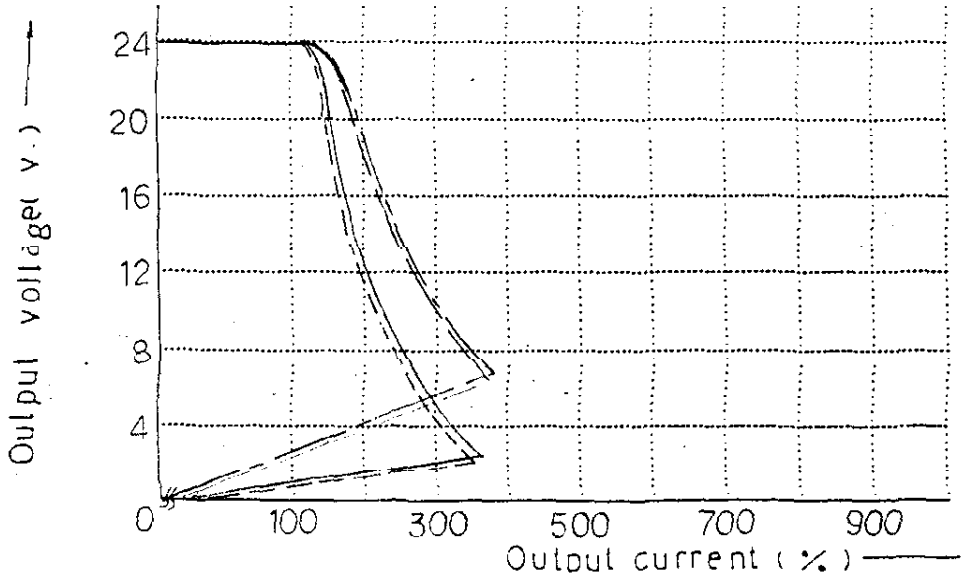


O.C.P. Characteristics

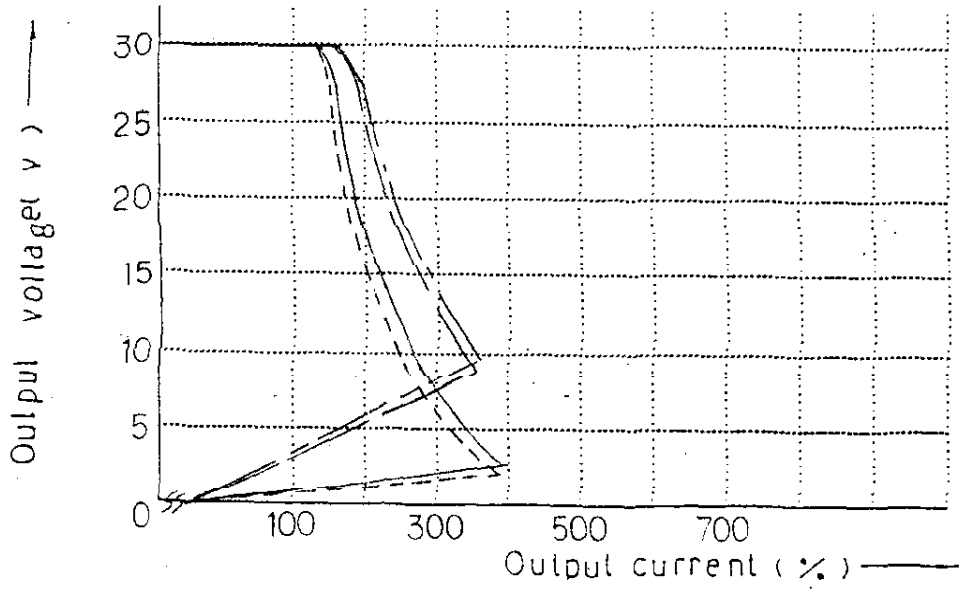
KWD10

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

24V



30V

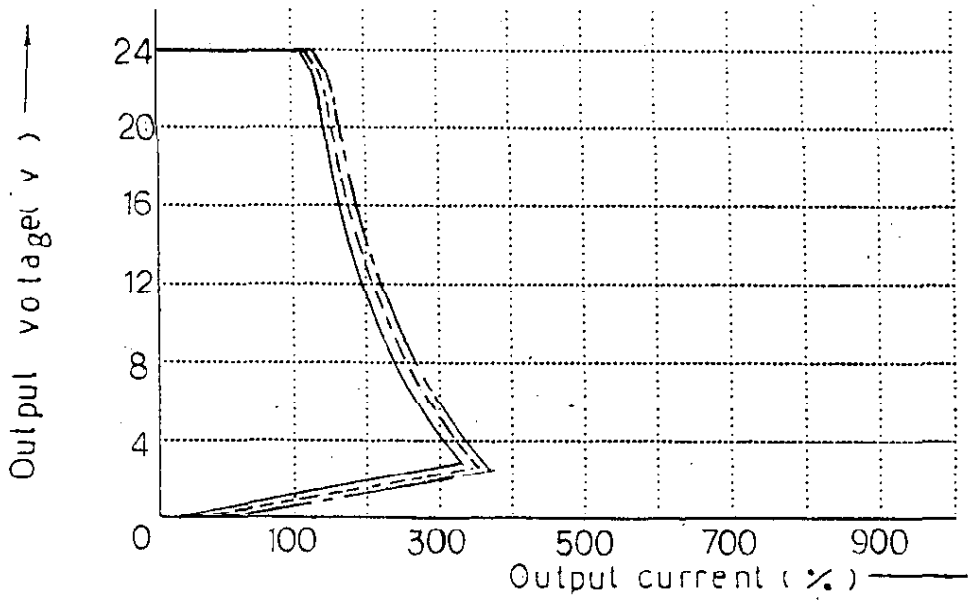


O.C.P. Characteristics

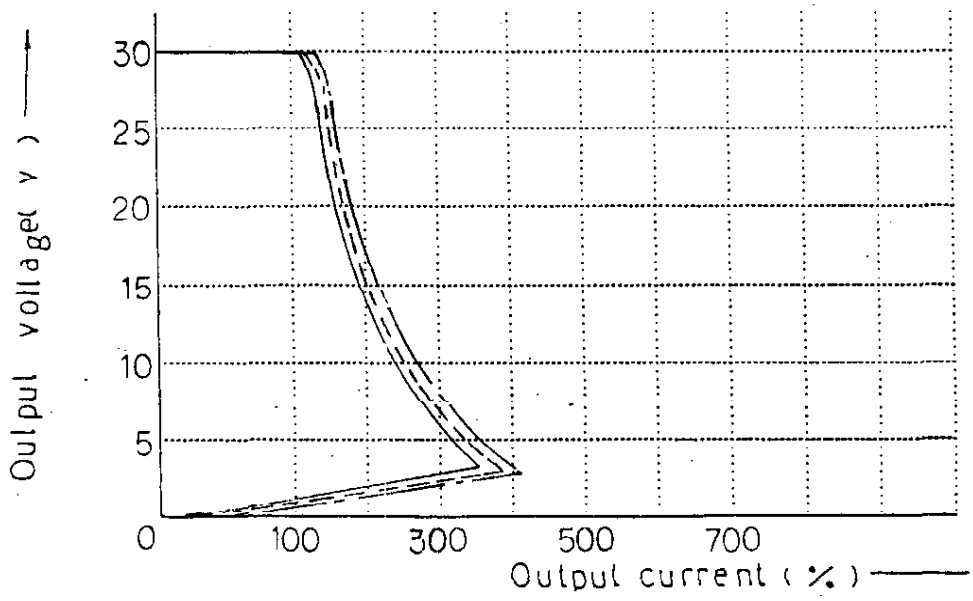
KWD10

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

24V

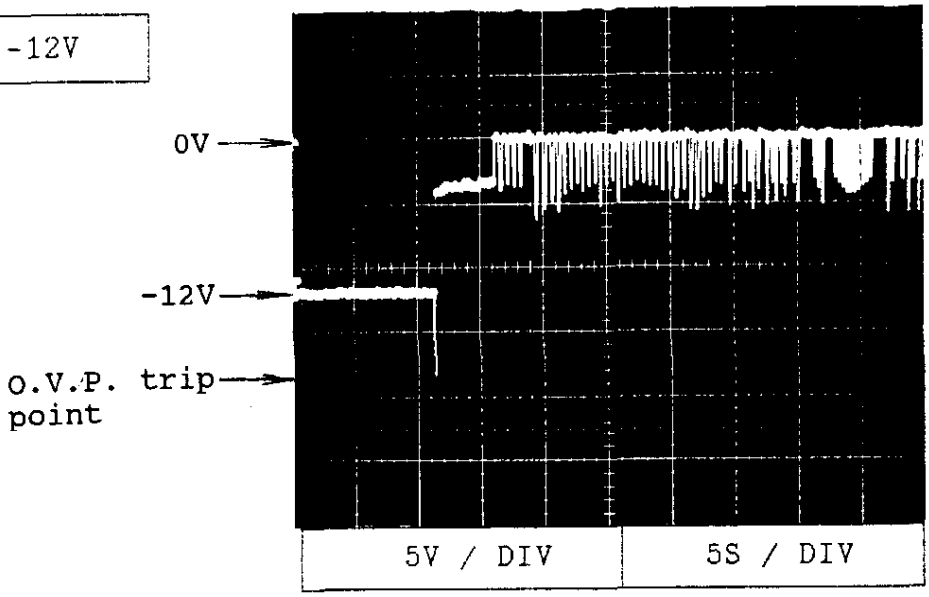


30V

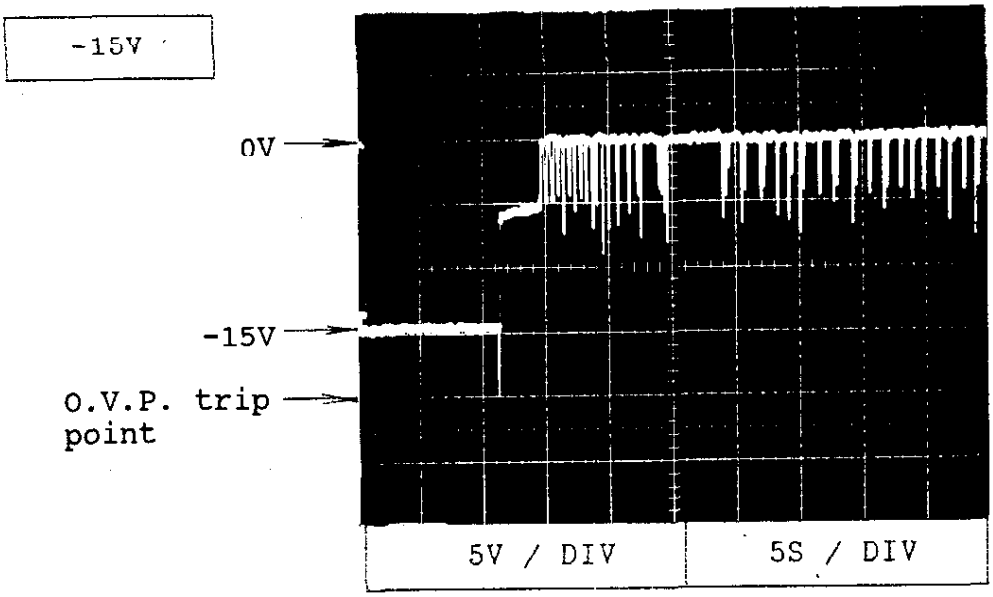


Condition Vin : AC100V
Iout: 0%
Ta : 25°C

-12V



-15V

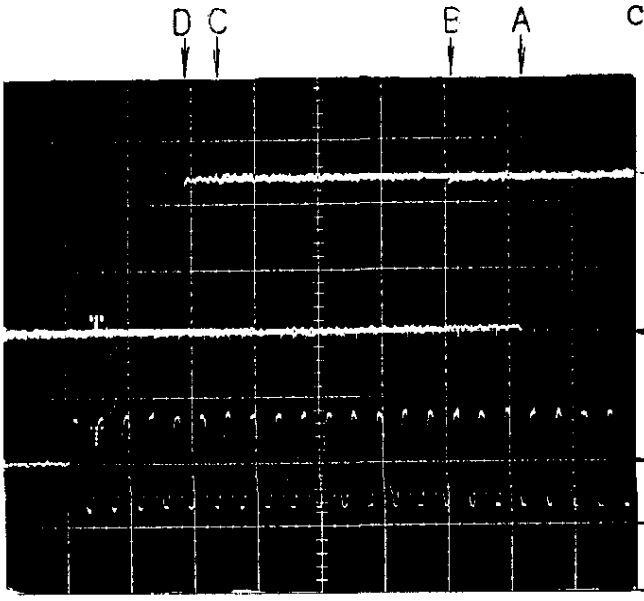


Output Rise Time

KWD10

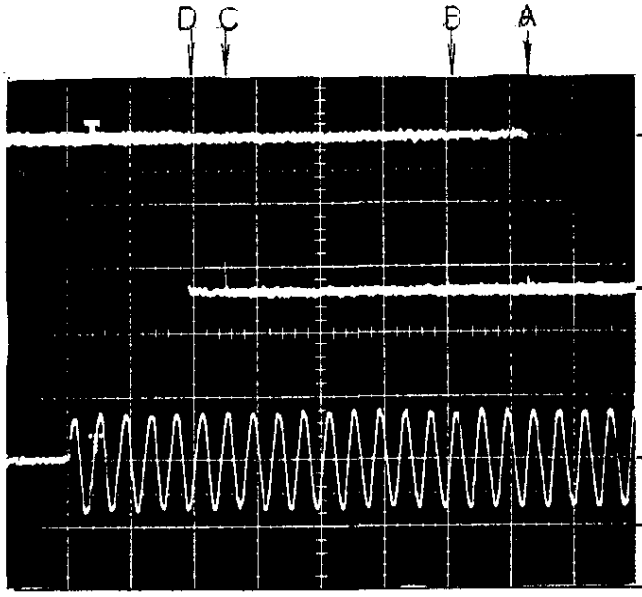
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 0 %
Ta : 25°C

+12V



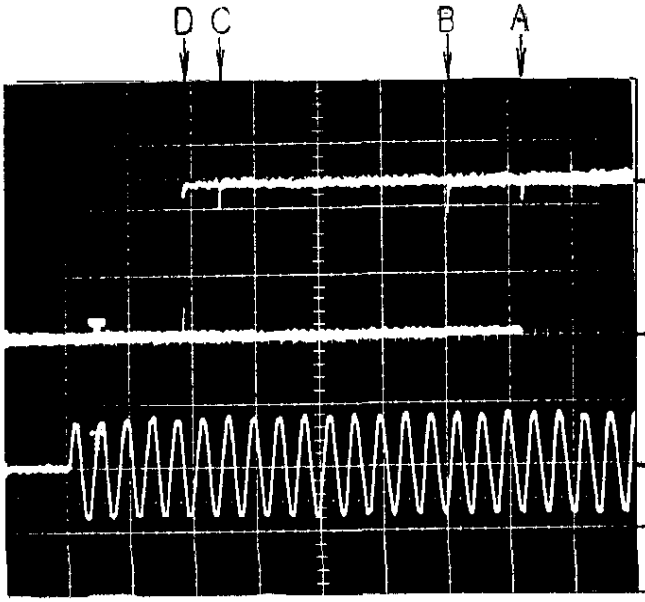
5V / DIV | 50mS / DIV

-12V



5V / DIV | 50mS / DIV

24V



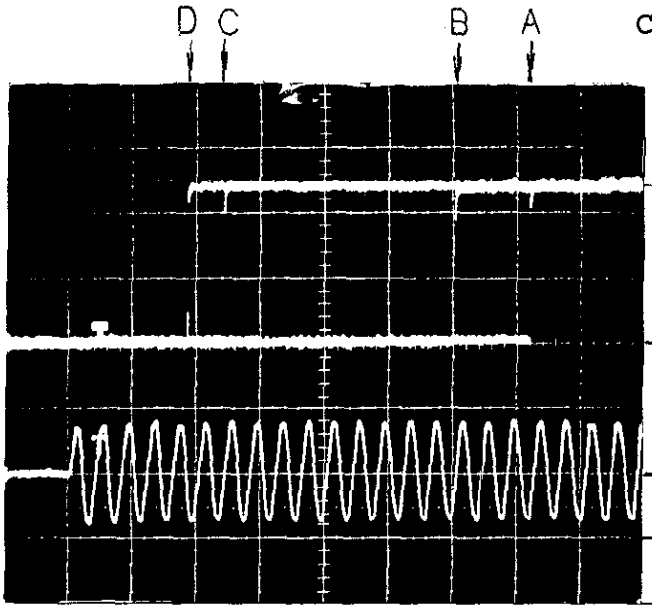
10V / DIV | 50mS / DIV

Output Rise Time

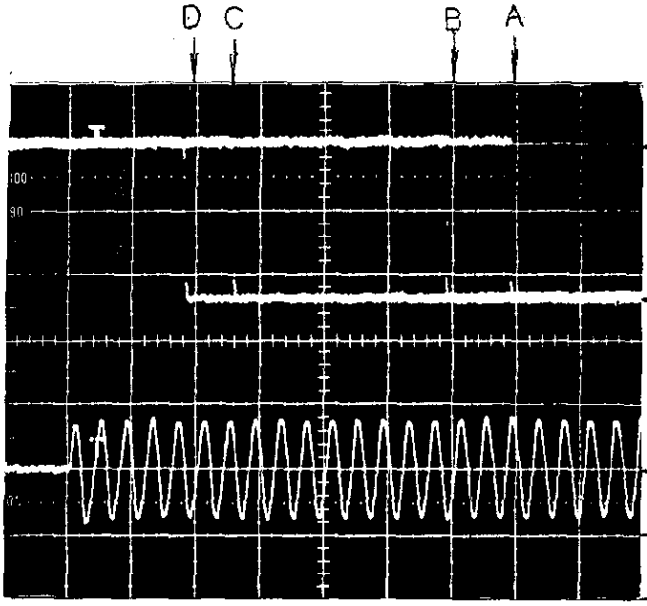
KWD10

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

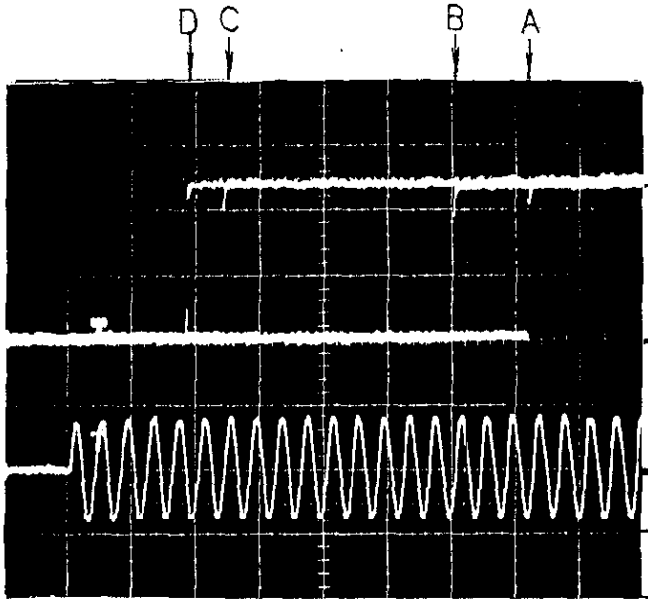
+12V



-12V



24V

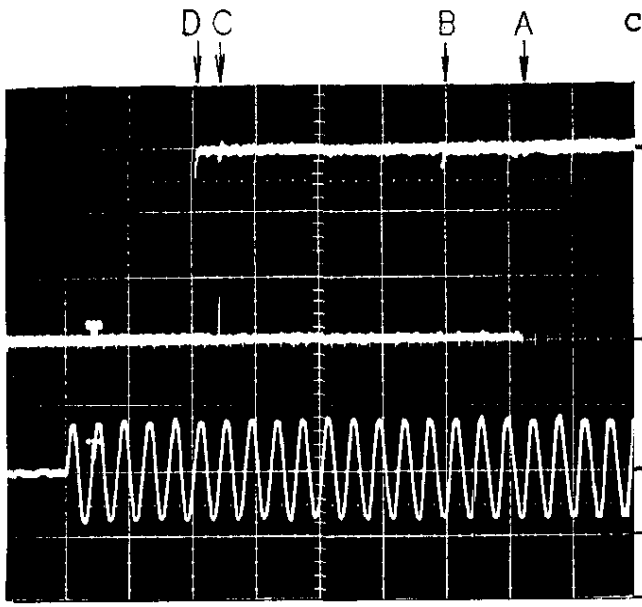


Output Rise Time

KWD10

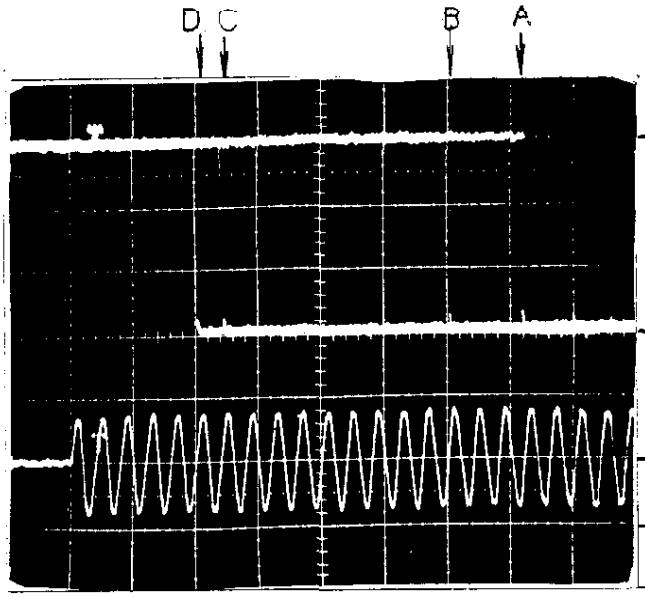
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 0 %
Ta : 25°C

+15V



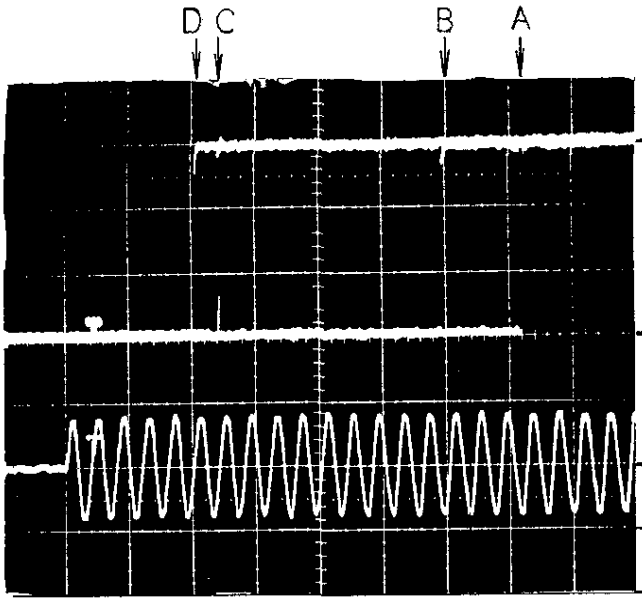
5V / DIV | 50mS / DIV

-15V



5V / DIV | 50mS / DIV

30V



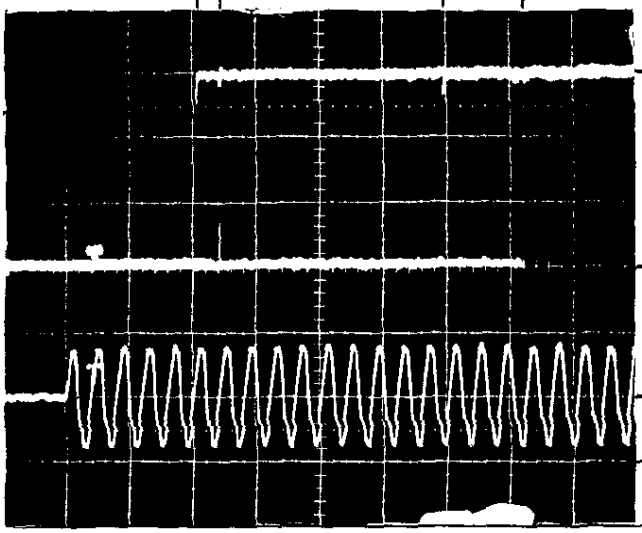
10V / DIV | 50mS / DIV

Output Rise Time

KWD10

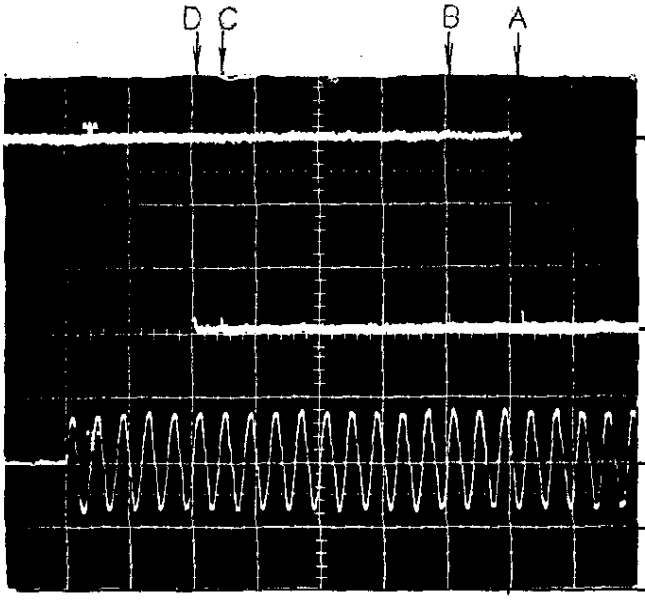
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 100 %
Ta : 25°C

+15V



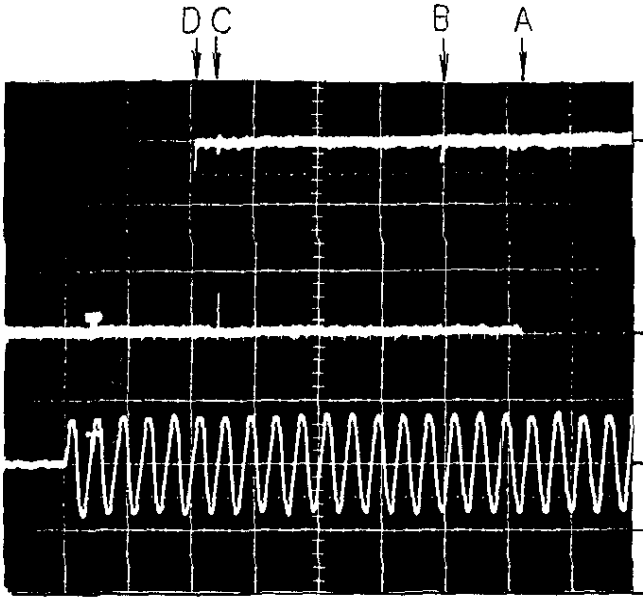
5V / DIV | 50mS / DIV

-15V



5V / DIV | 50mS / DIV

30V



10V / DIV | 50mS / DIV

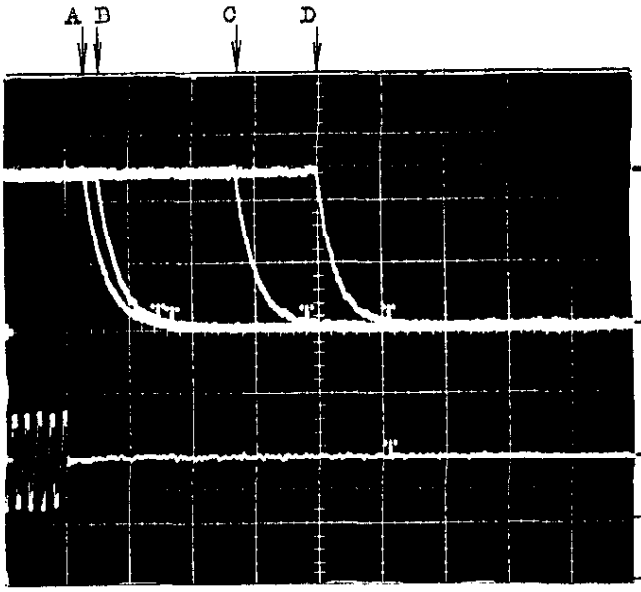
Output Fall Time

KWD10

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

Ta : 25°C

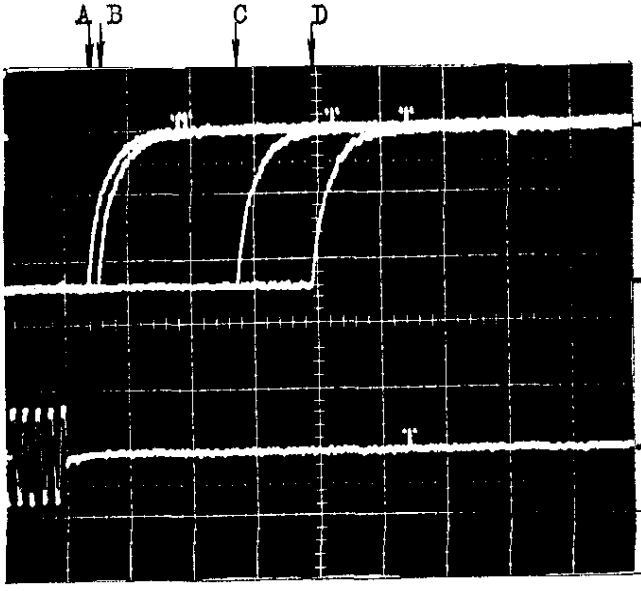
+12V



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

5V / DIV	0.1S / DIV

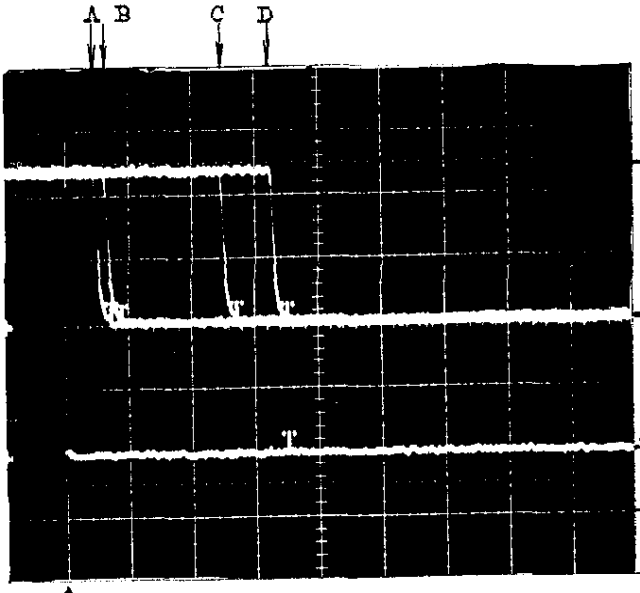
-12V



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

5V / DIV	0.1S / DIV

24V



Io : 0%

10V / DIV	0.5S / DIV

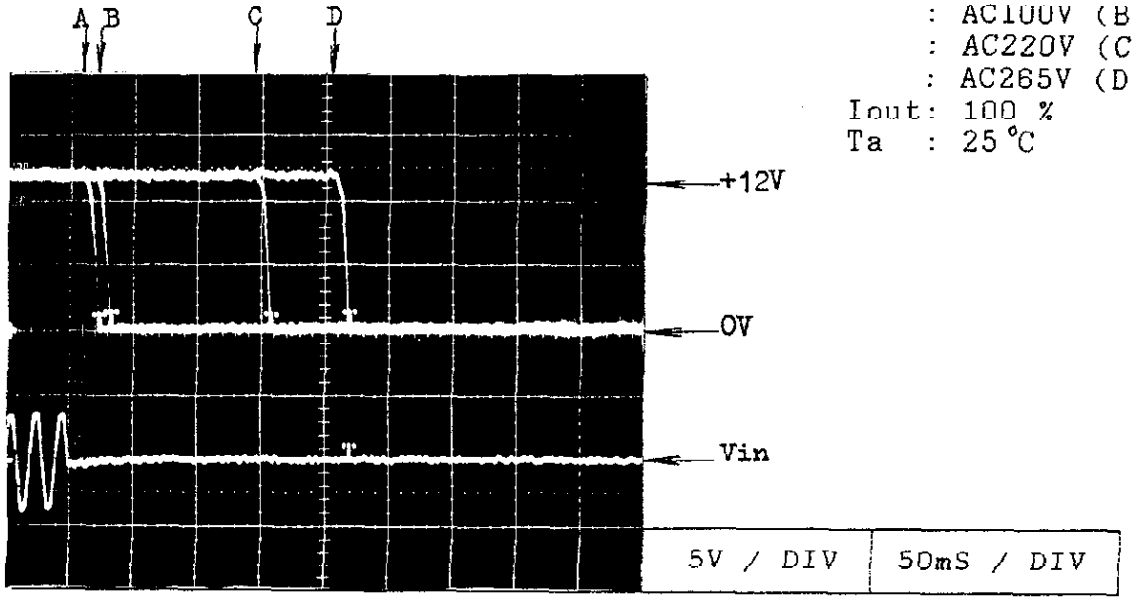
Vin turn off

Output Fall Time

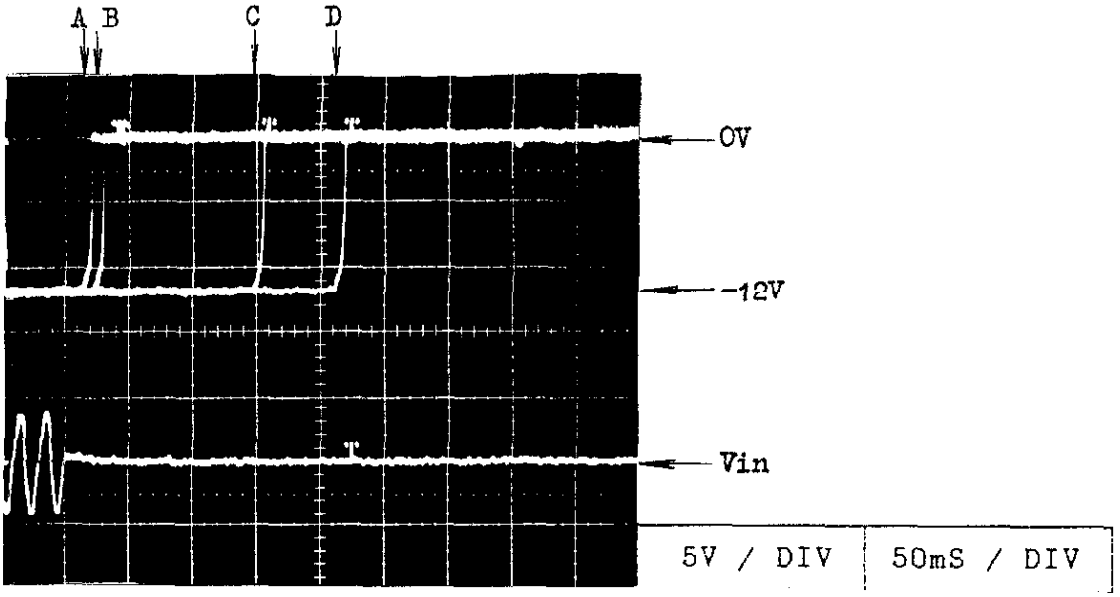
KWD10

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

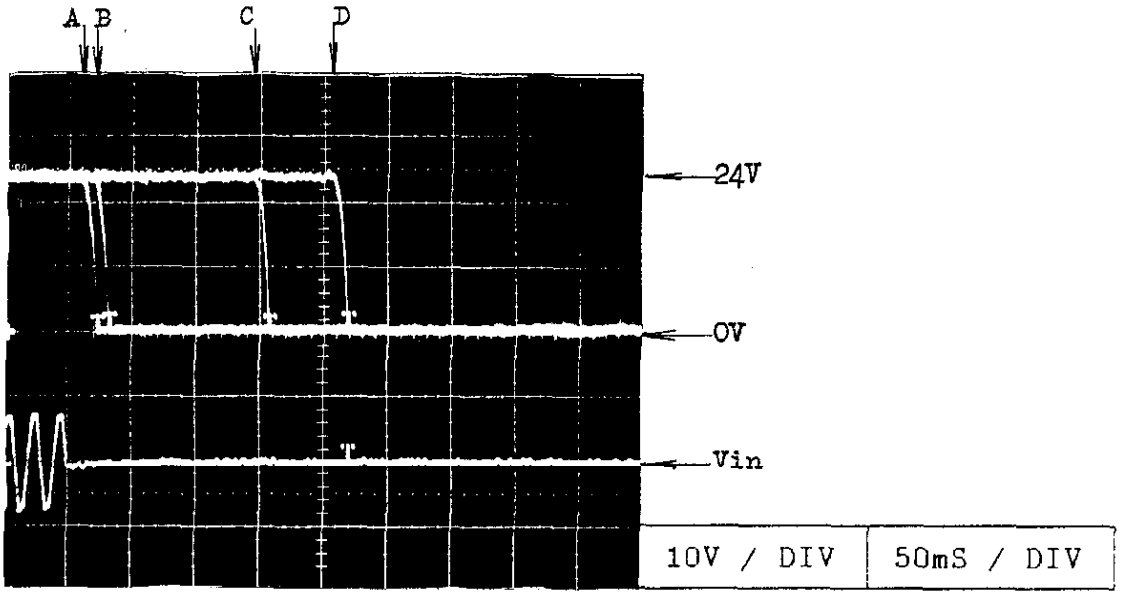
+12V



-12V



24V



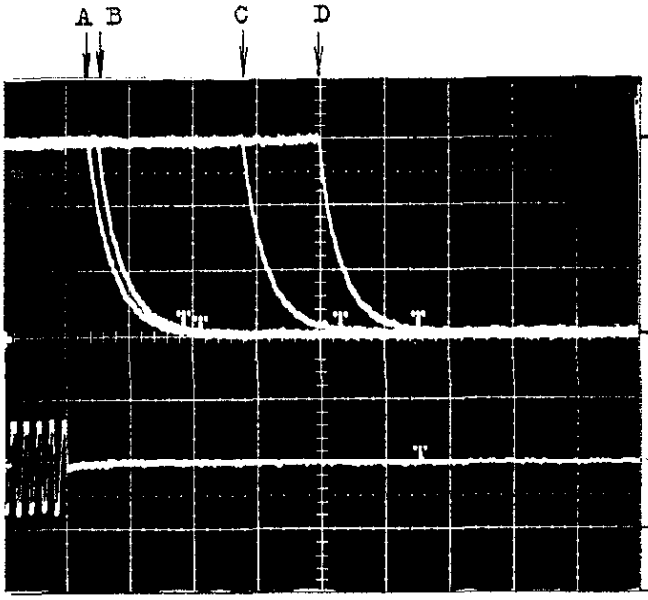
Output Fall Time

KWD10

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

Ta : 25°C

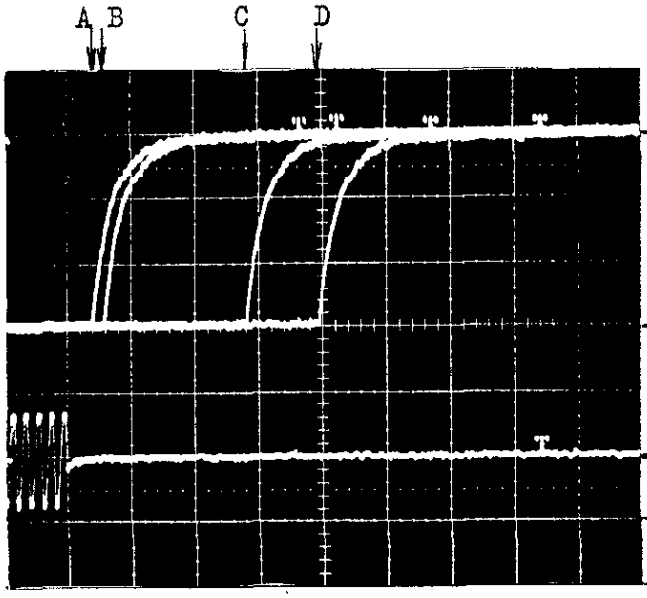
+15V



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

5V / DIV | 0.1S / DIV

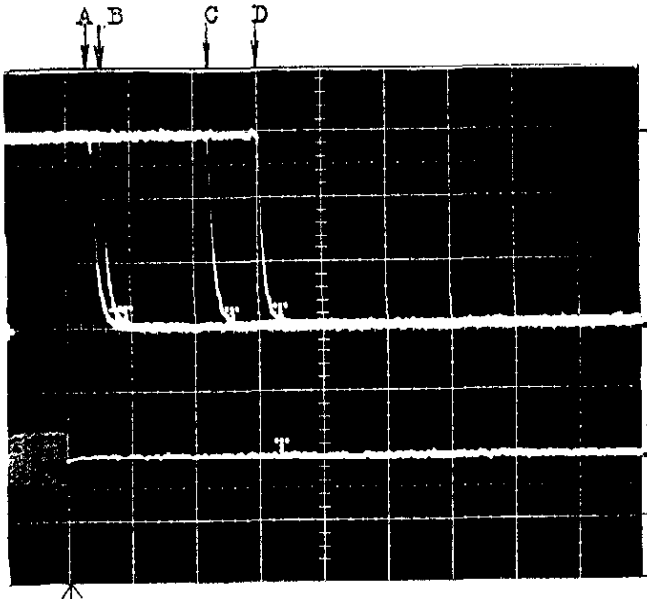
-15V



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

5V / DIV | 0.1S / DIV

30V



Io : 0%

10V / DIV | 0.5S / DIV

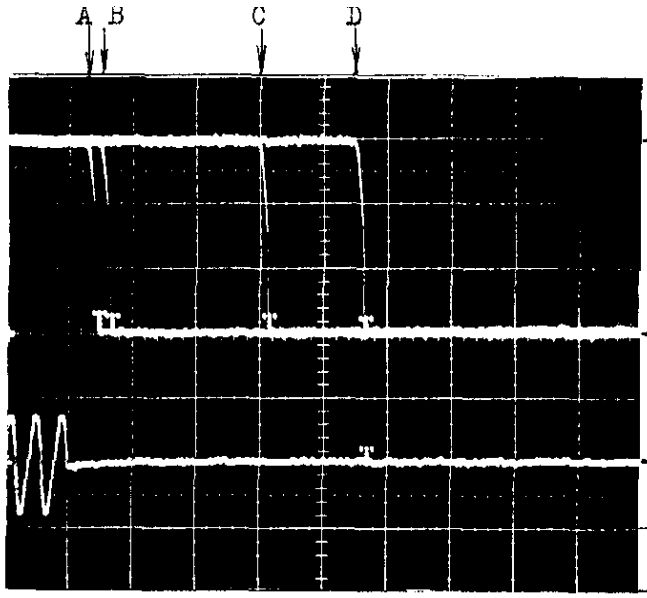
Vin turn off

Output Fall Time

KWD10

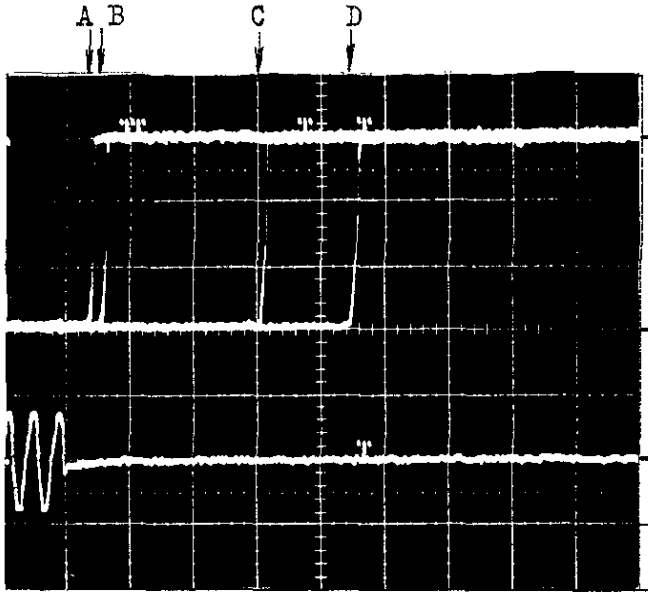
Condition Vin : AC 85V (A)
: AC100V (B)
: AC220V (C)
: AC265V (D)
Iout: 100 %
Ta : 25°C

+15V



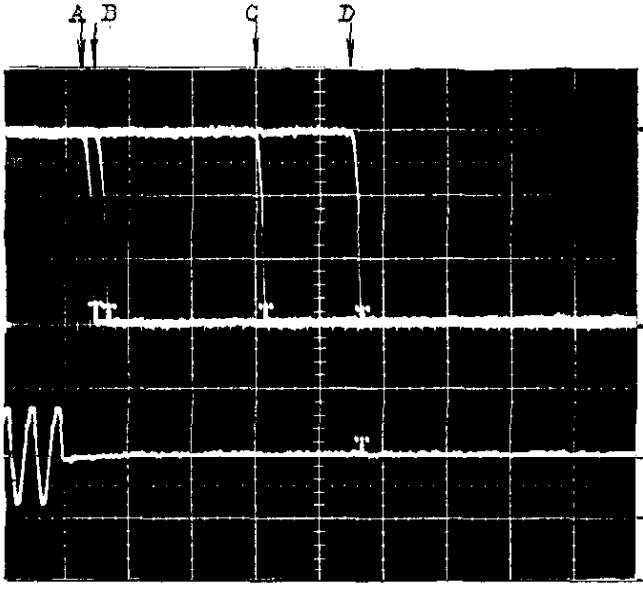
5V / DIV | 50mS / DIV

-15V



5V / DIV | 50mS / DIV

30V



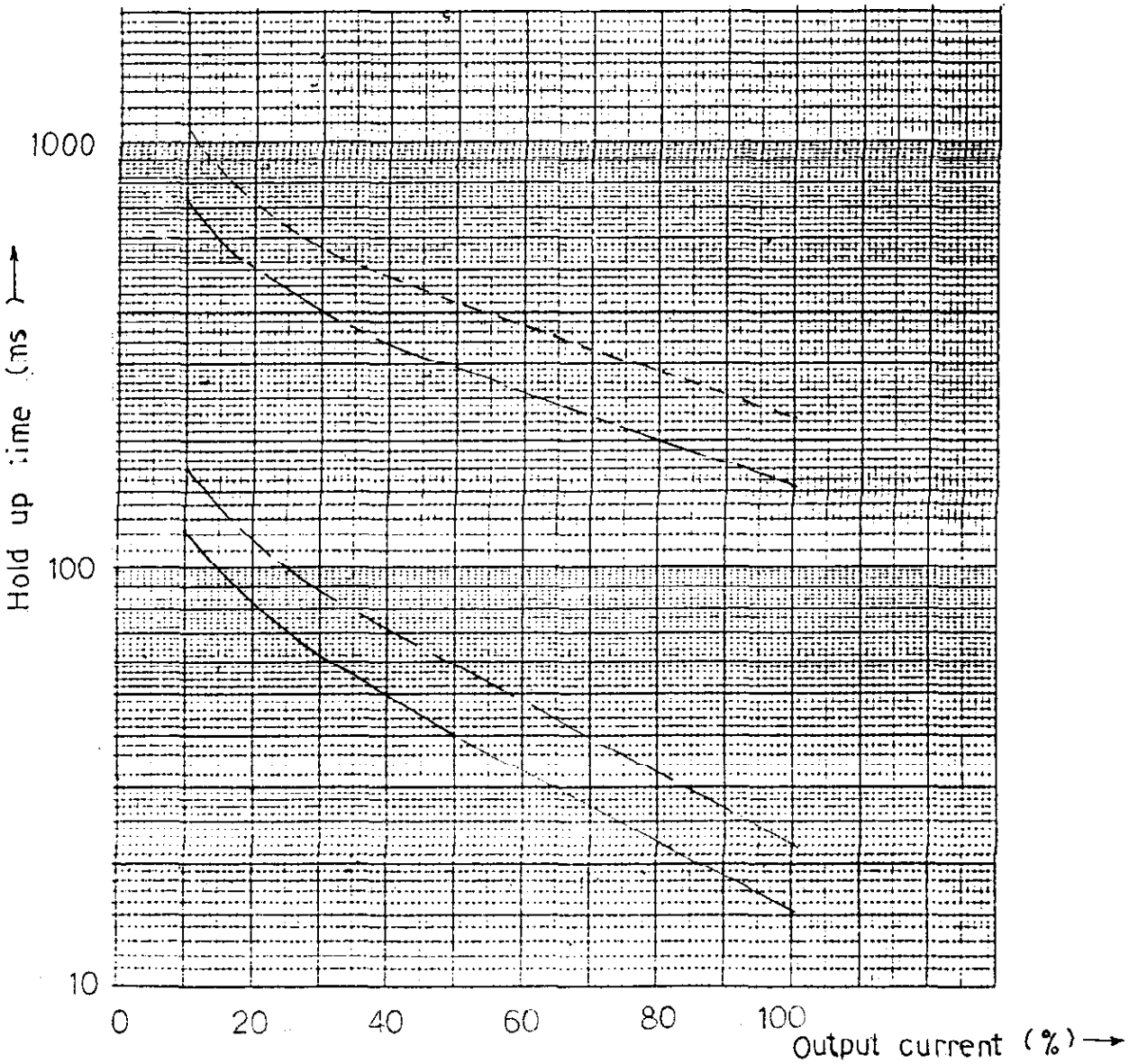
10V / DIV | 50mS / DIV

Hold Up Time

KWD10

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

24V

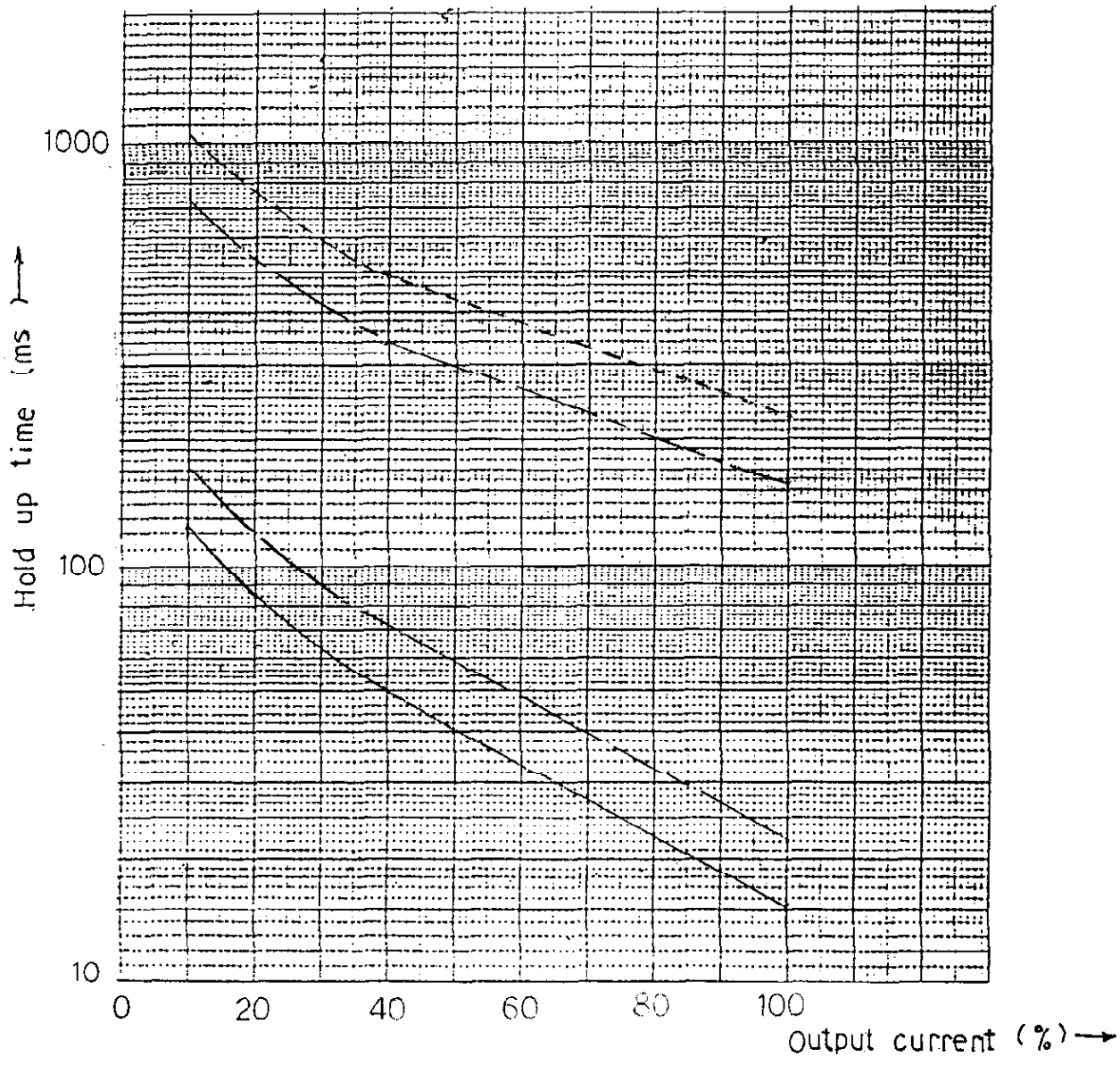


Hold Up Time

KWD10

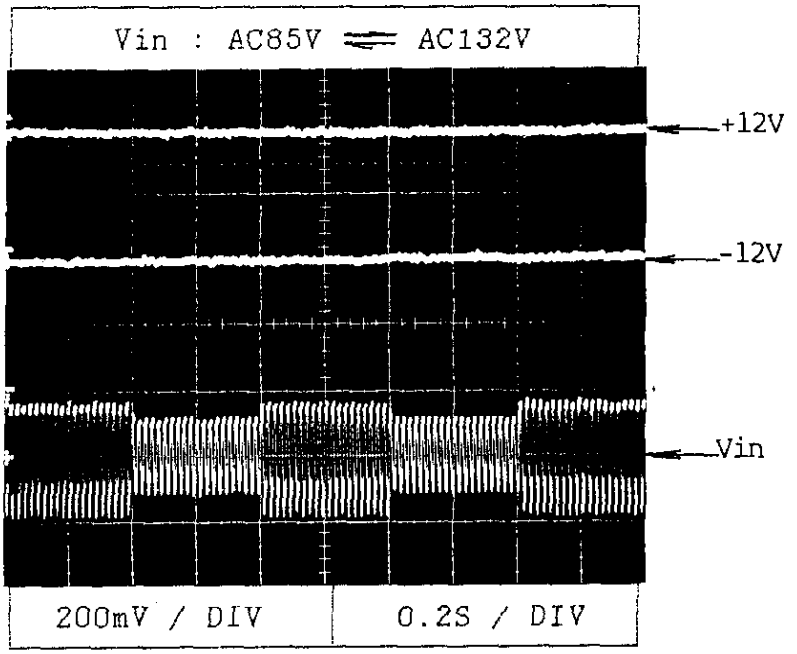
Condition Vin : AC 85V ——
AC100V – – –
AC220V —·—
AC265V - - - - -
Ta : 25°C

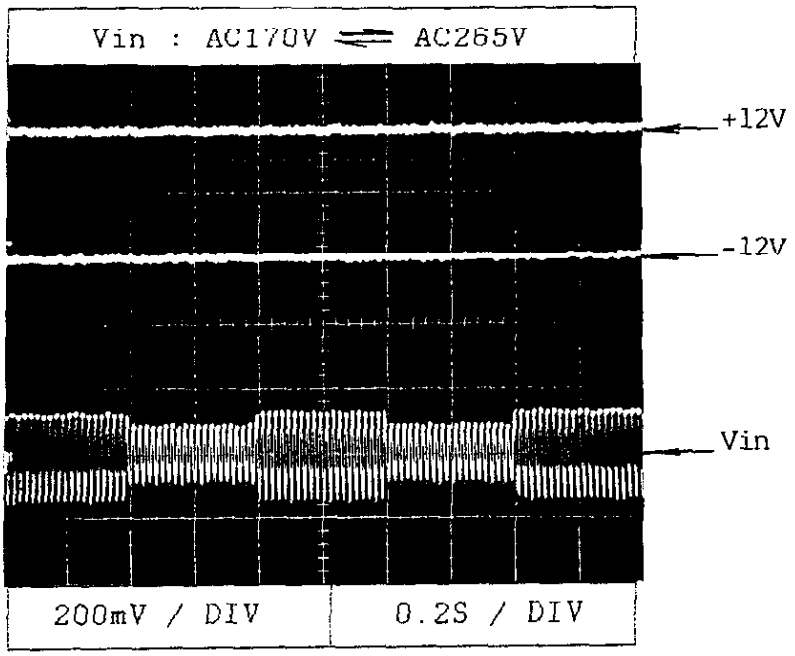
30V



Condition Iout: 100 %
Ta : 25 °C

±12V



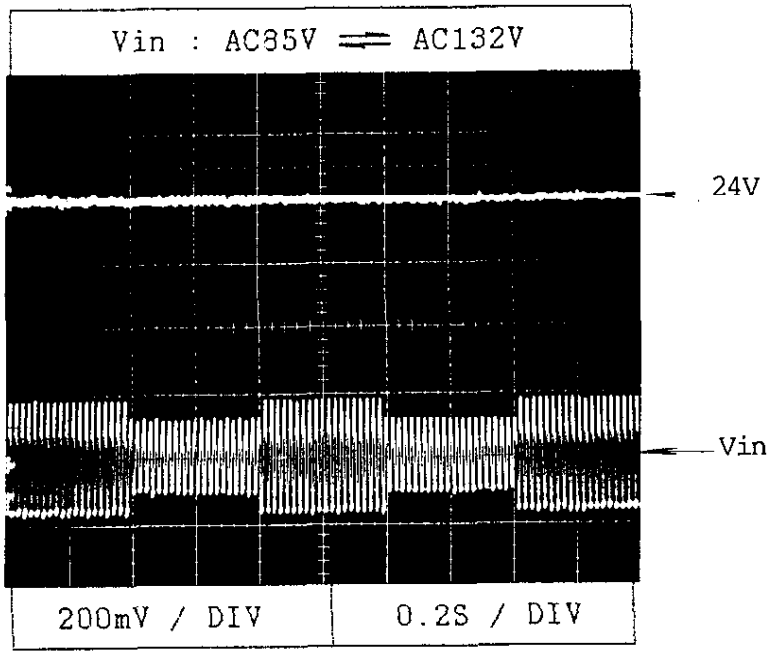


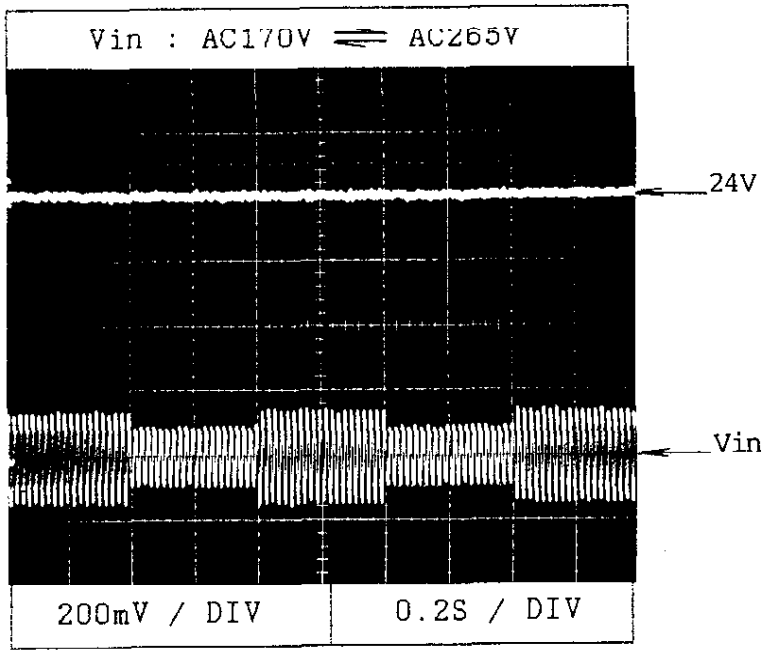
Dynamic Line Response

KWD10

Condition Iout: 100 %
Ta : 25 °C

24V



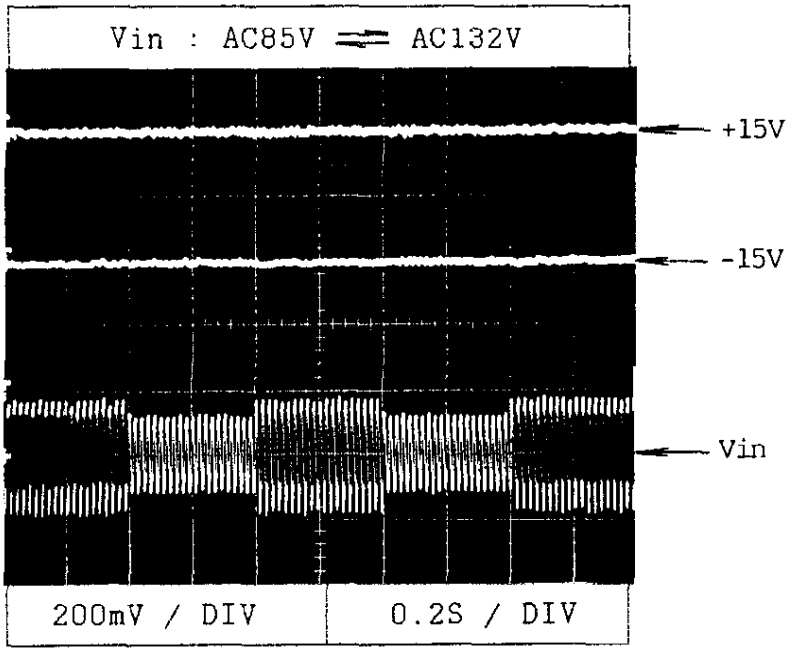


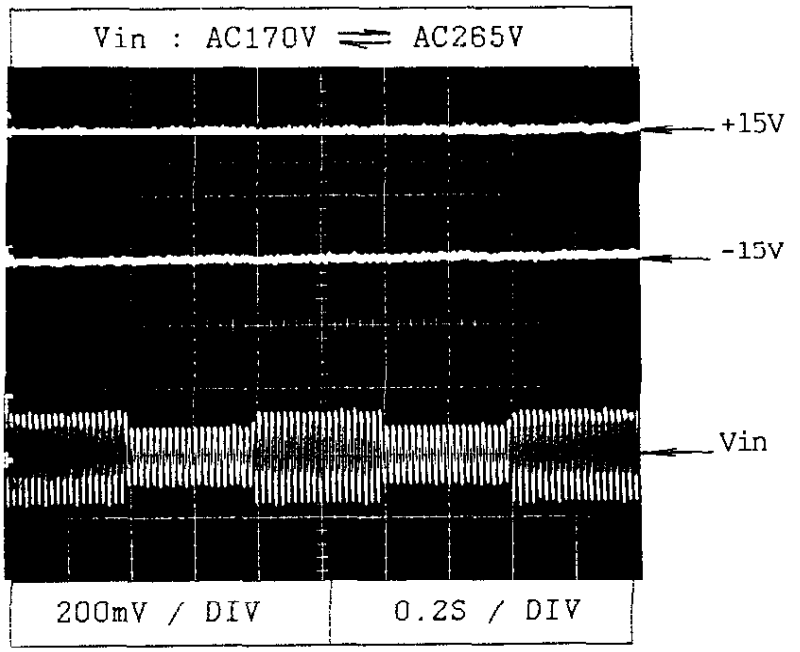
Dynamic Line Response

KWD10

Condition Iout: 100 %
Ta : 25 °C

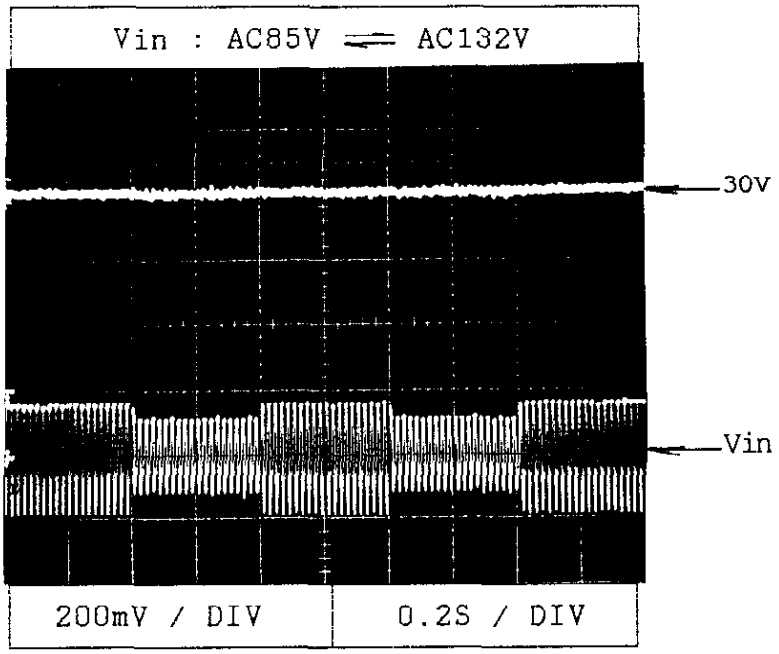
±15V

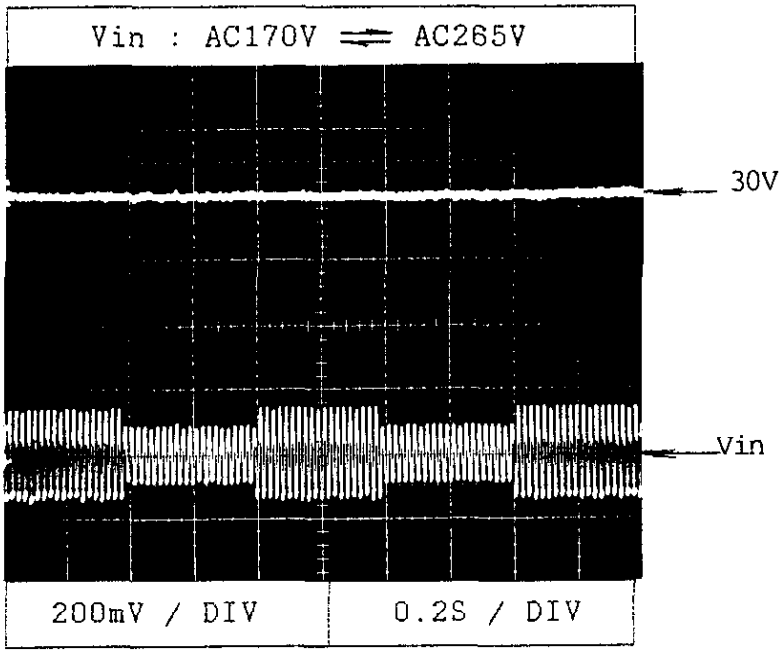




Condition Iout: 100 %
Ta : 25 °C

30V





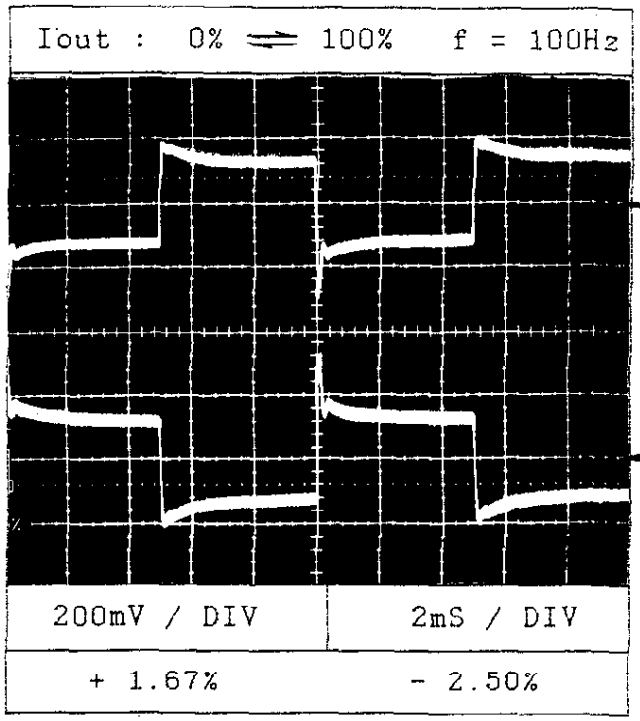
Dynamic Load Response

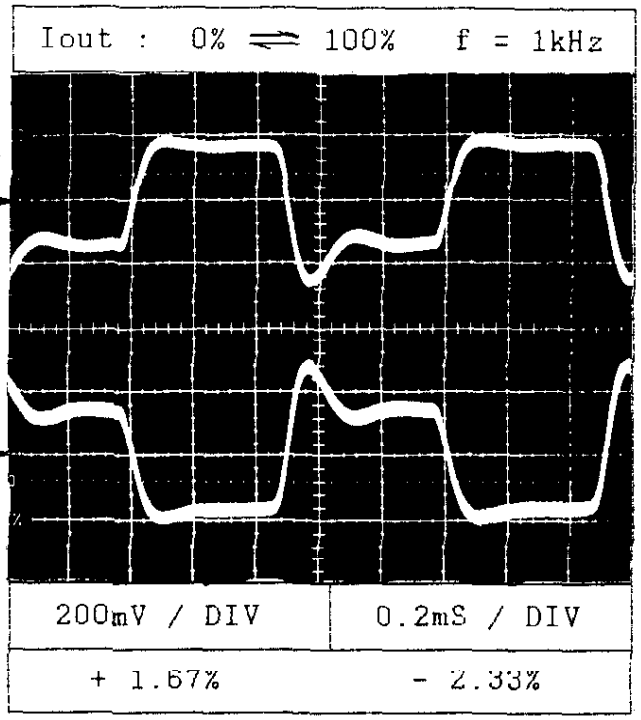
KWD10

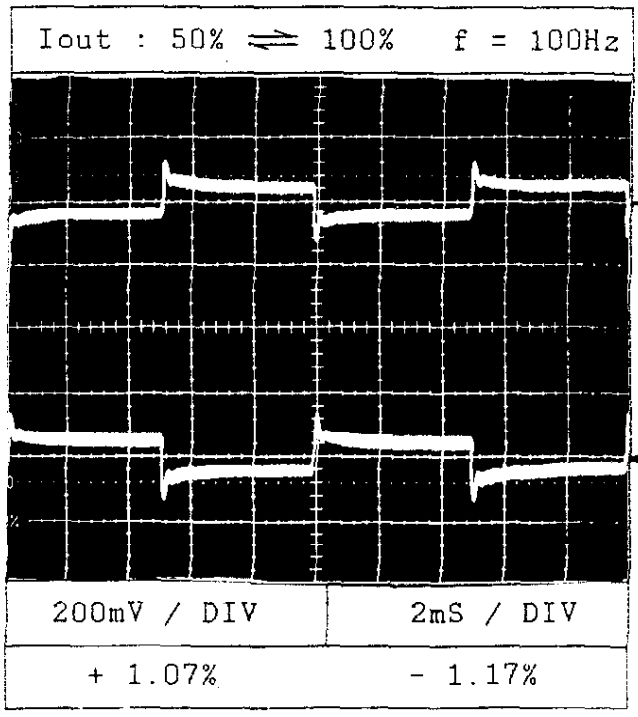
Condition Vin : AC100V
Iout : 100%

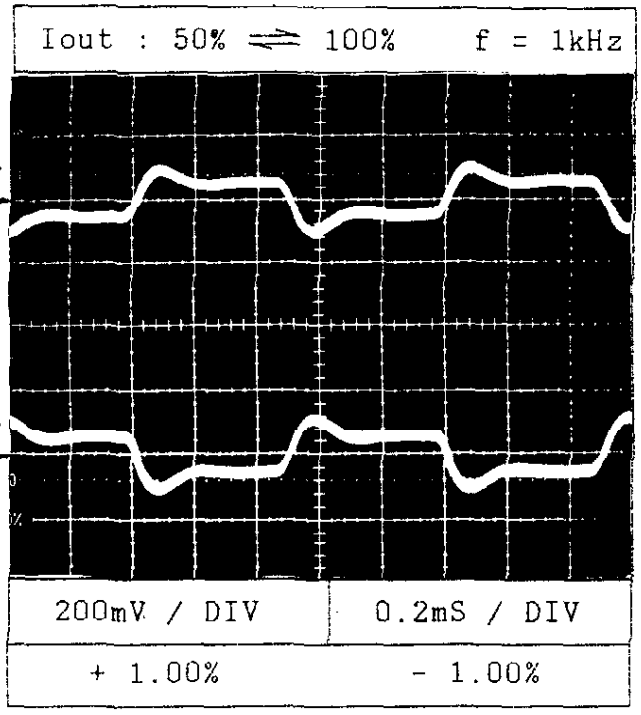
Ta : 25°C

±12V









NOTE:

When performing dynamic load for CH1:

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

(2) CH2 is at 100%

NOTE:

When performing dynamic load for CH2:

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

(2) CH1 is at 100%

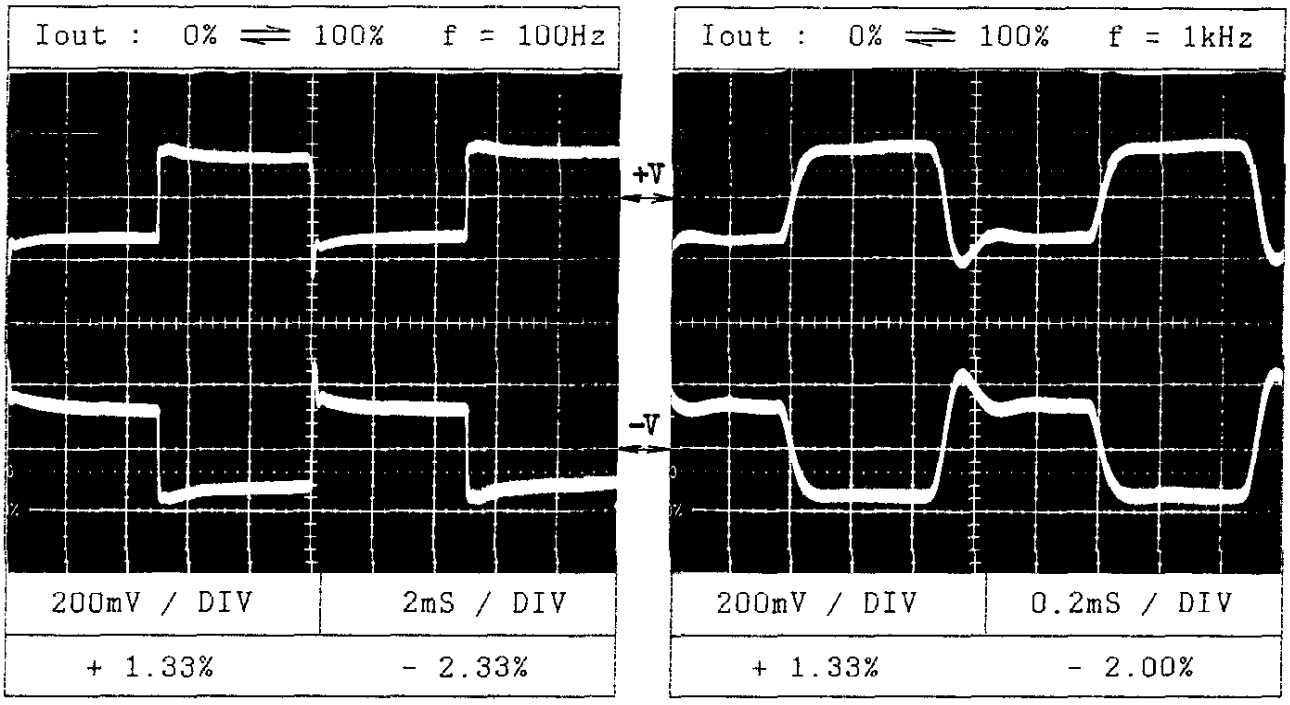
Dynamic Load Response

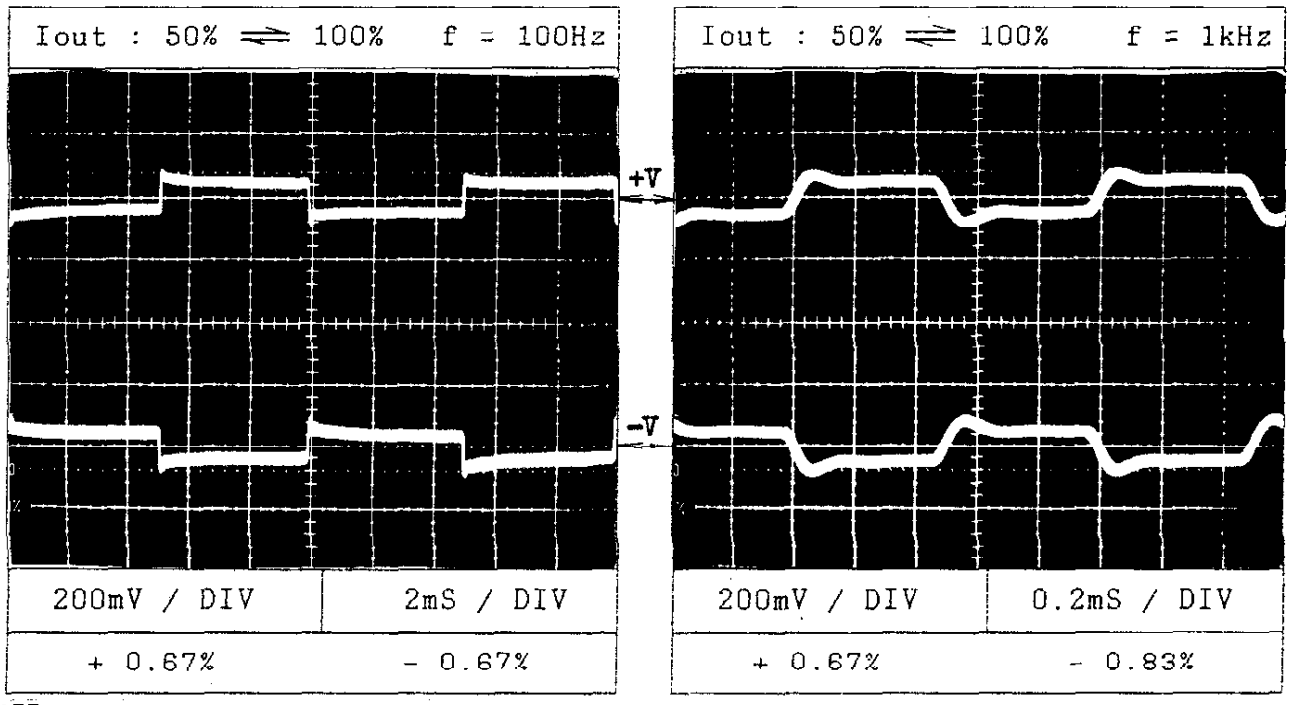
KWD10

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%

NOTE:

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

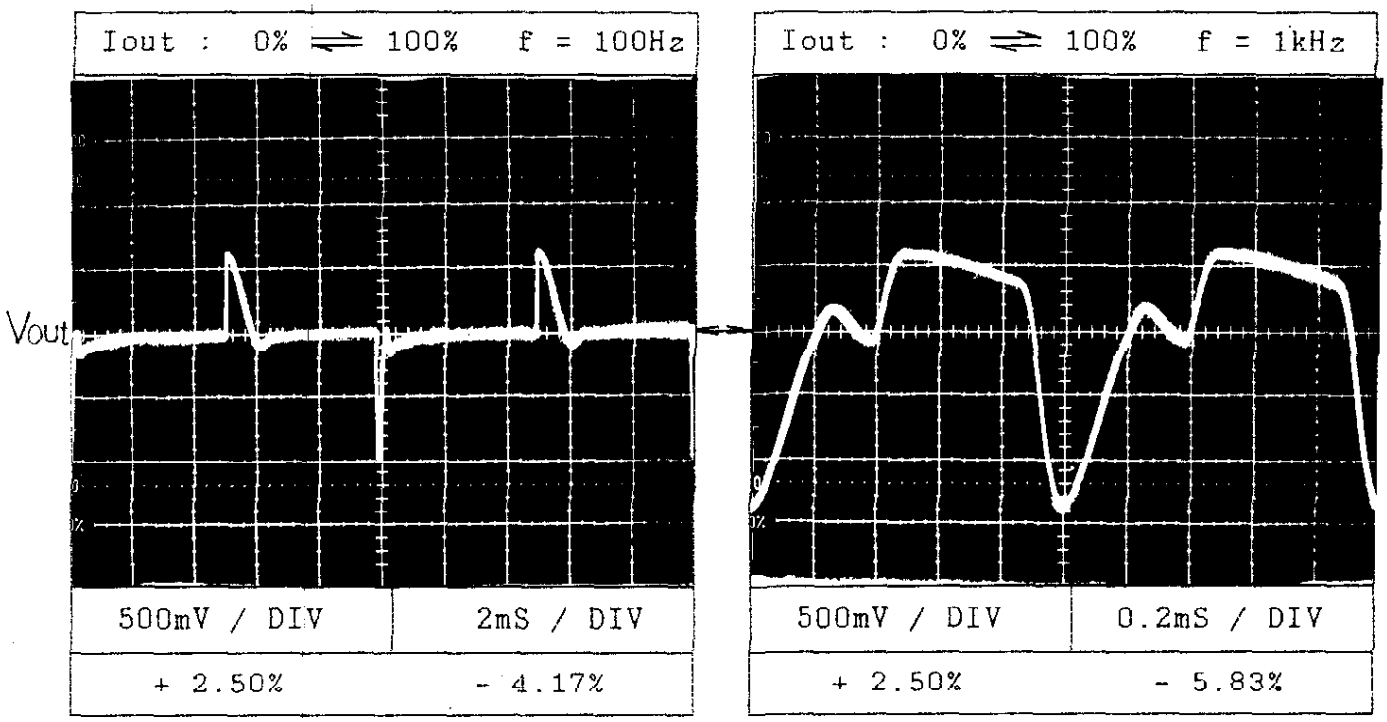
Dynamic Load Response

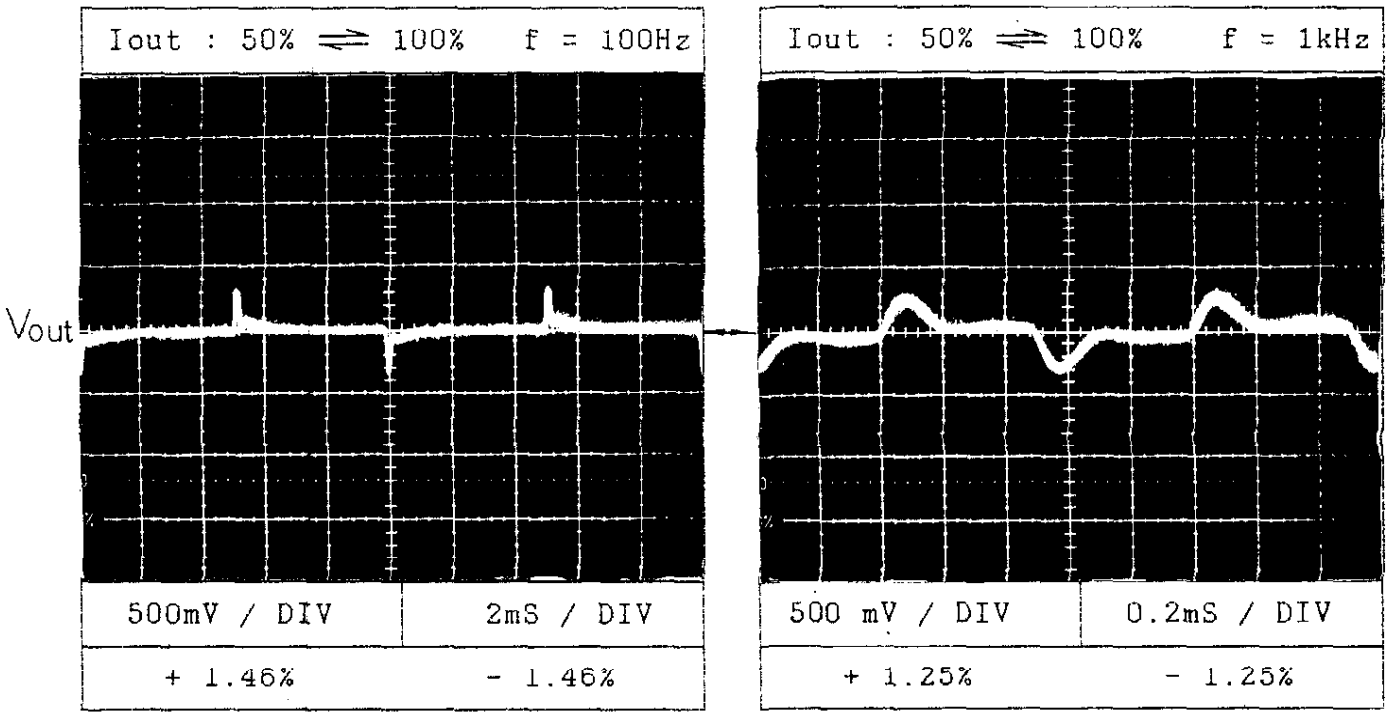
KWD10

Condition Vin : AC100V

Ta : 25°C

24V





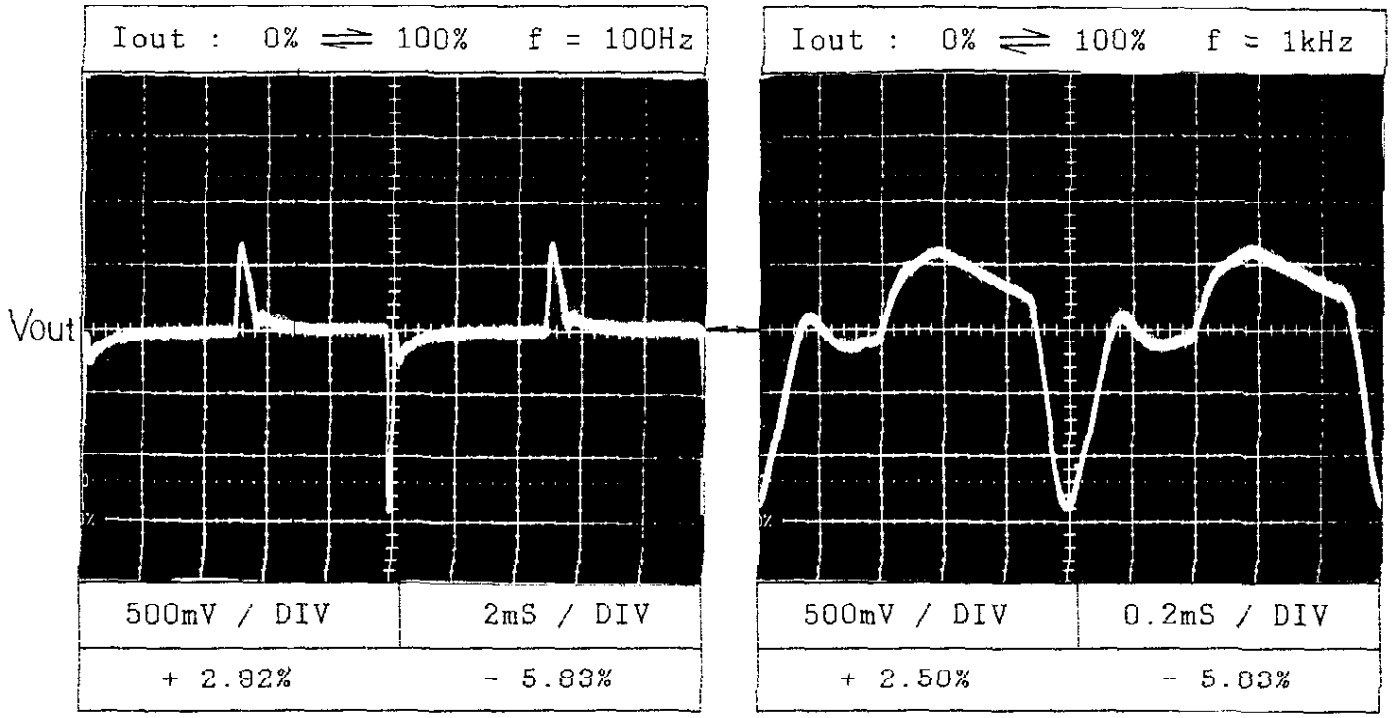
Dynamic Load Response

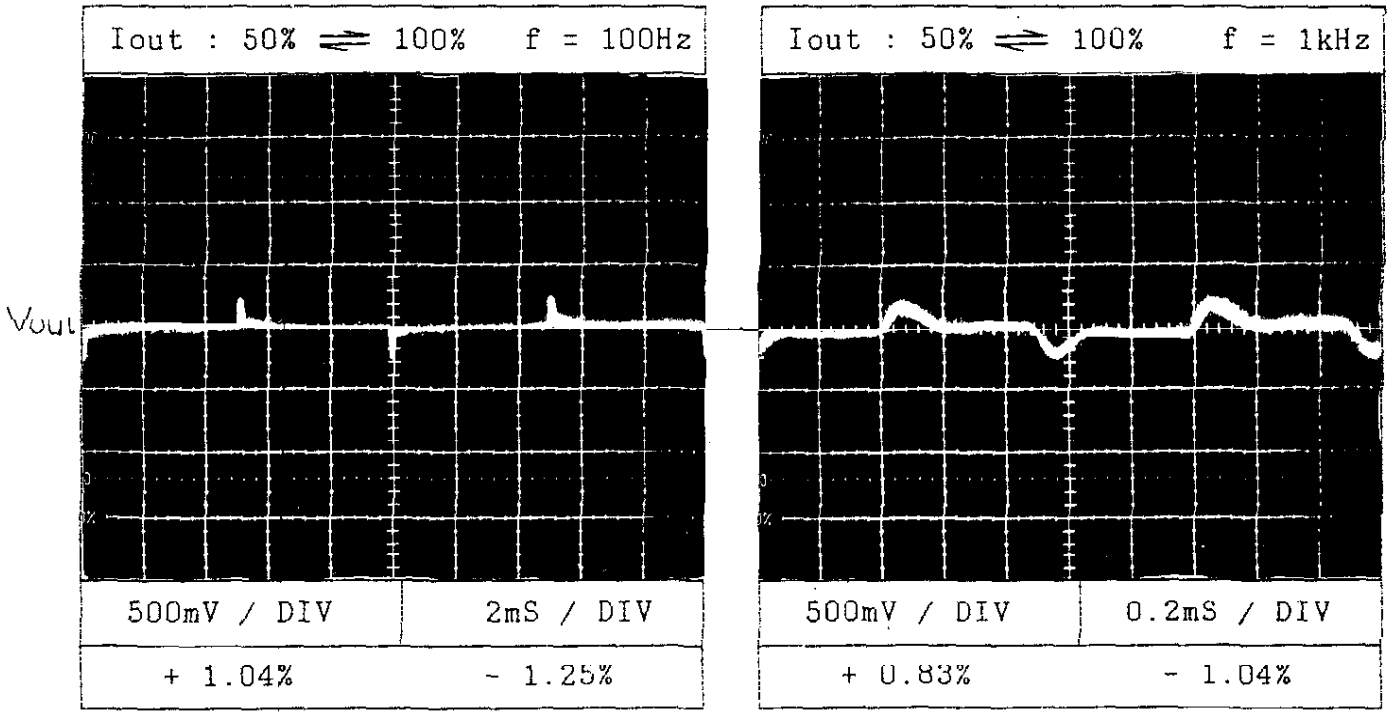
KWD10

Condition Vin : AC220V

Ta : 25°C

24V





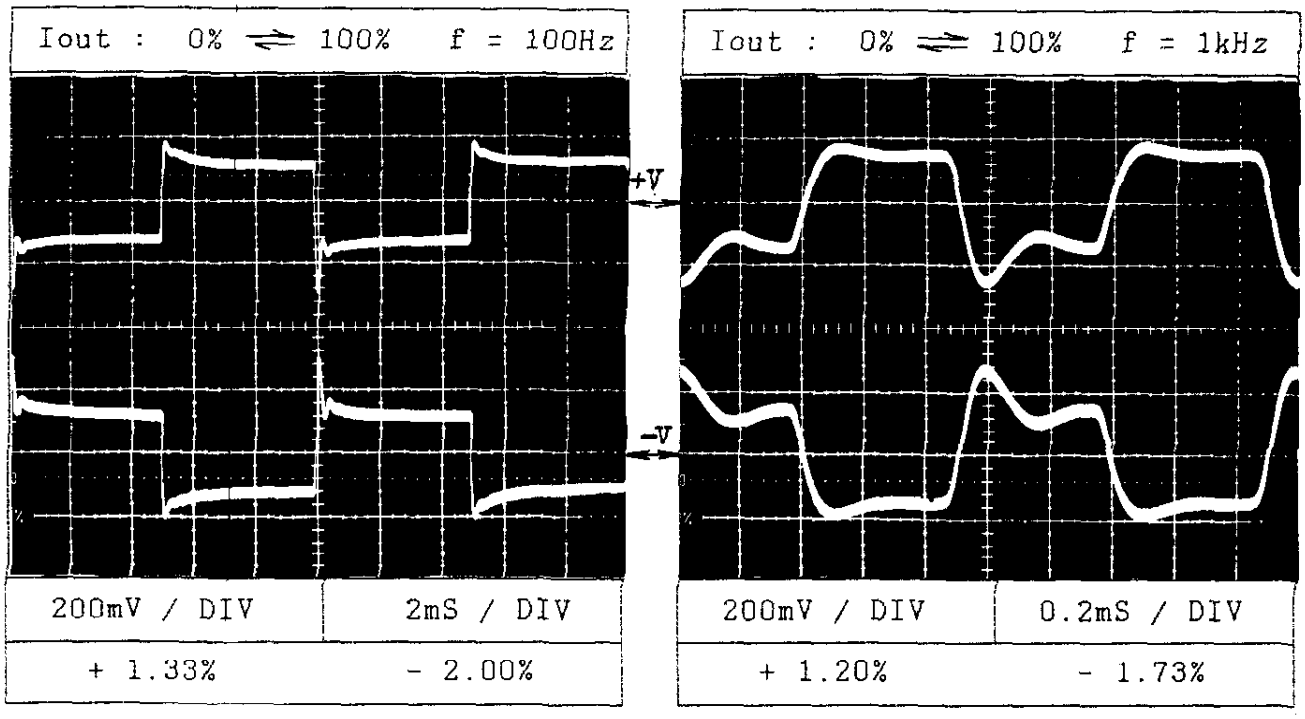
Dynamic Loac Response

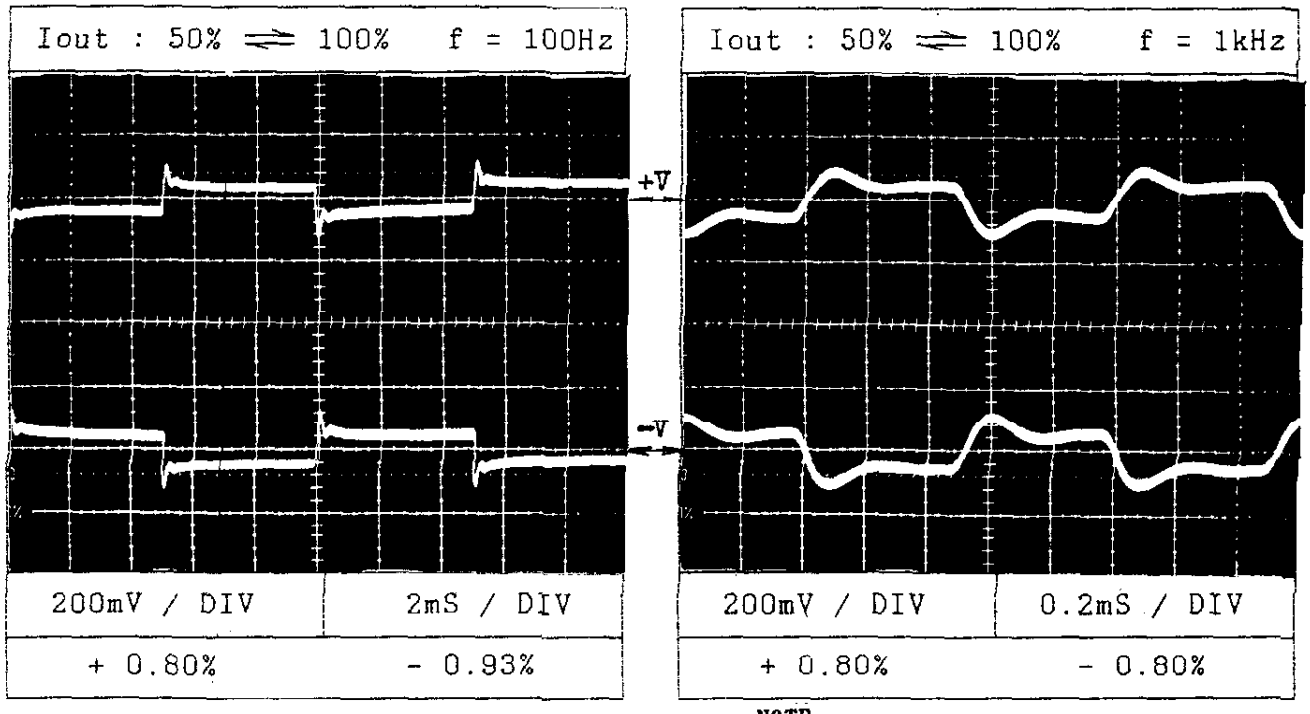
KWD10

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%

NOTE:

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

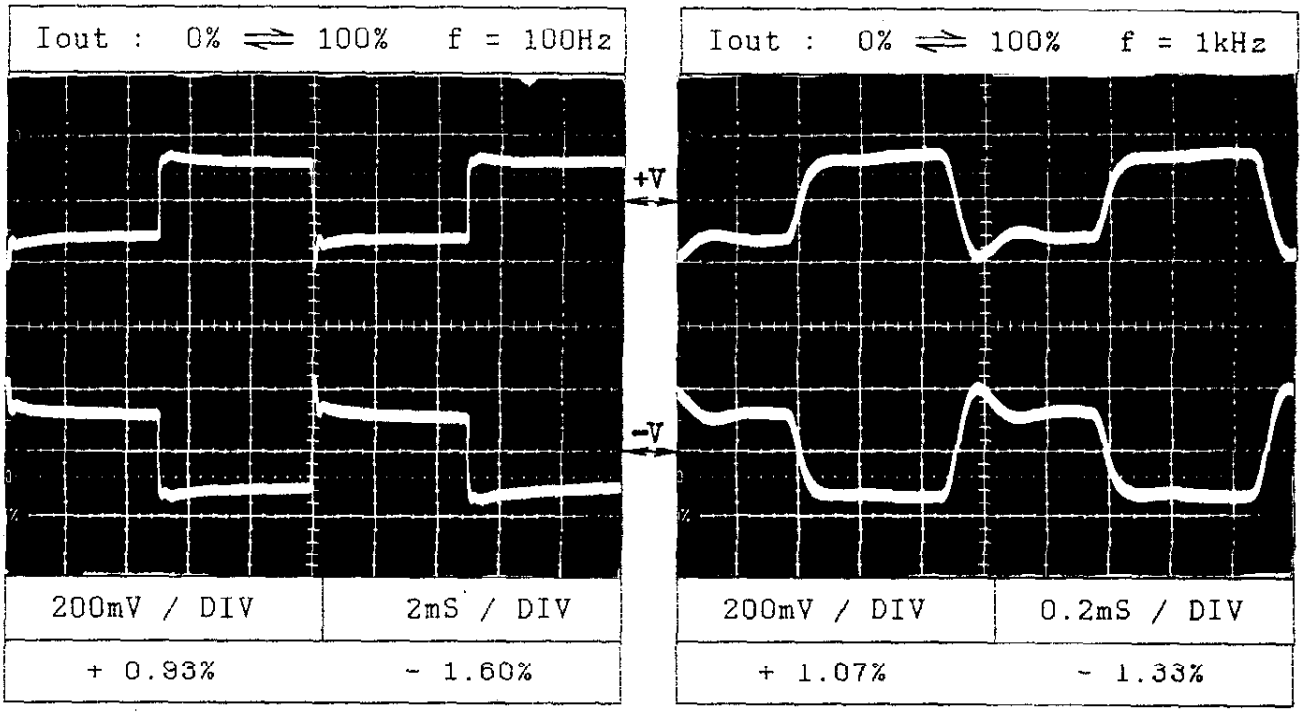
Dynamic Load Response

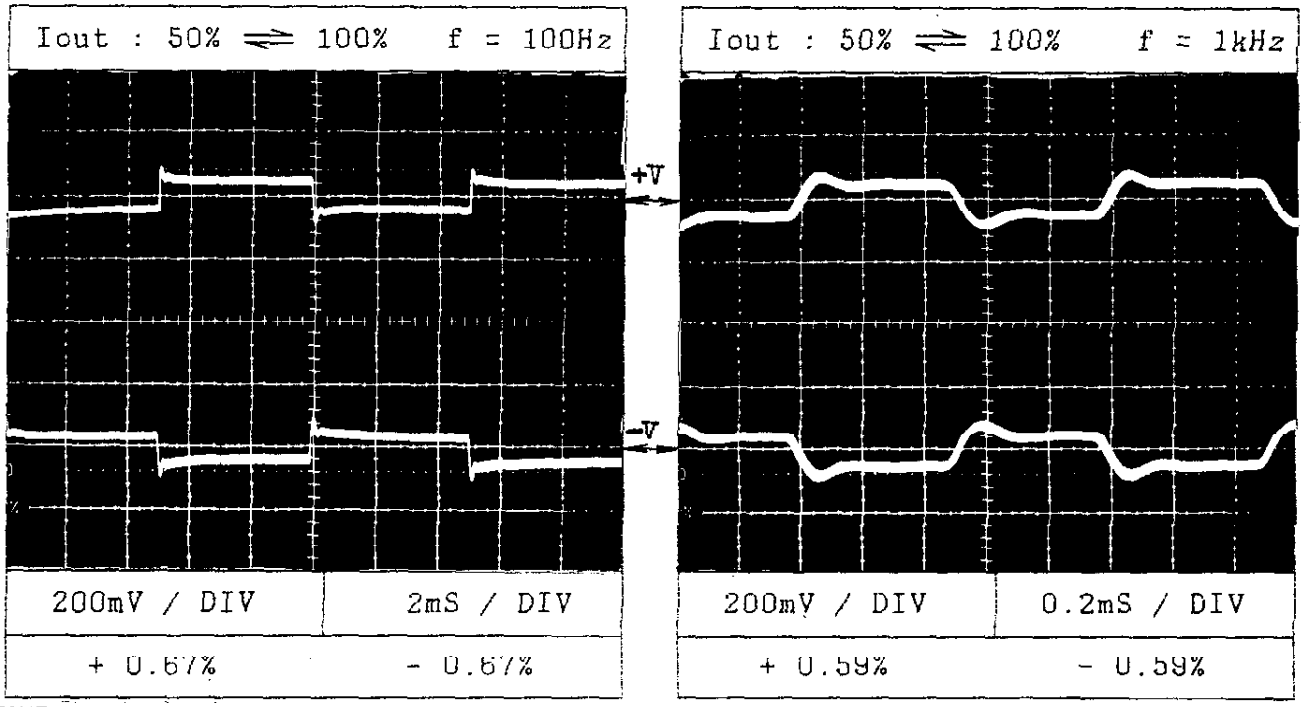
KWD10

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%

NOTE:

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

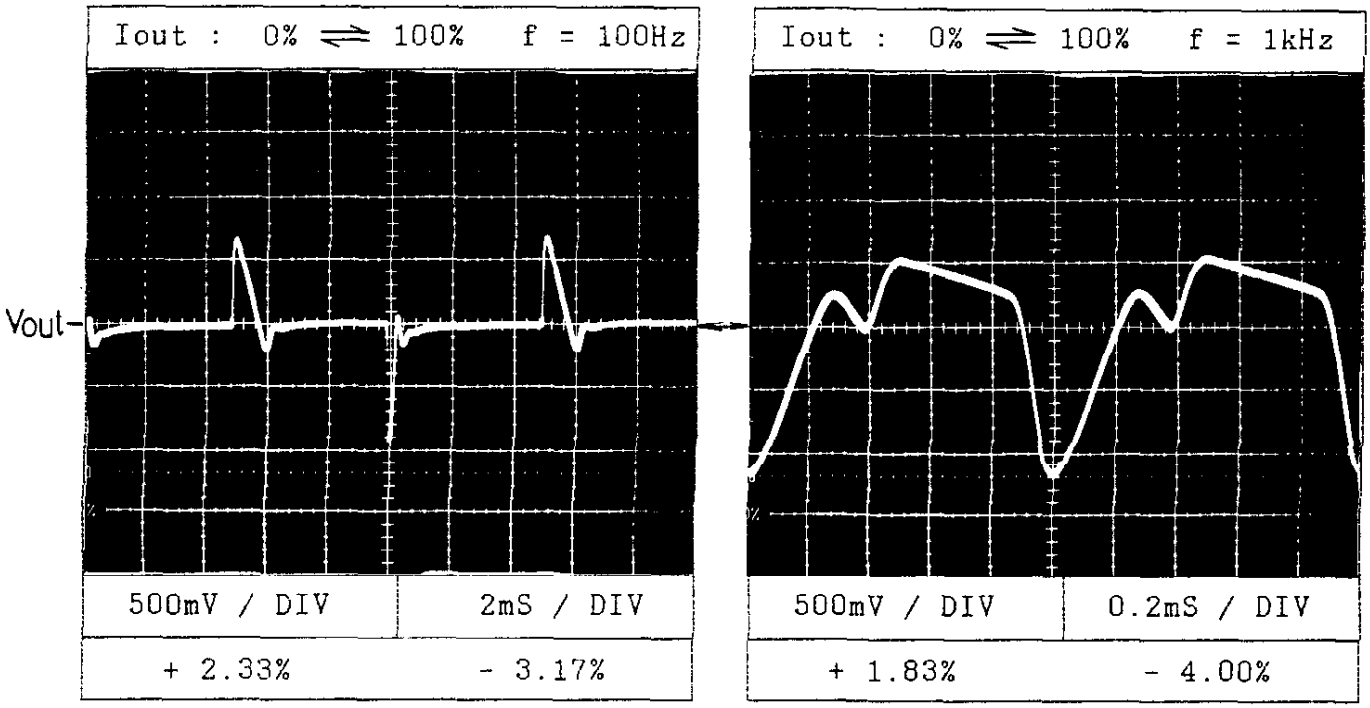
Dynamic Load Response

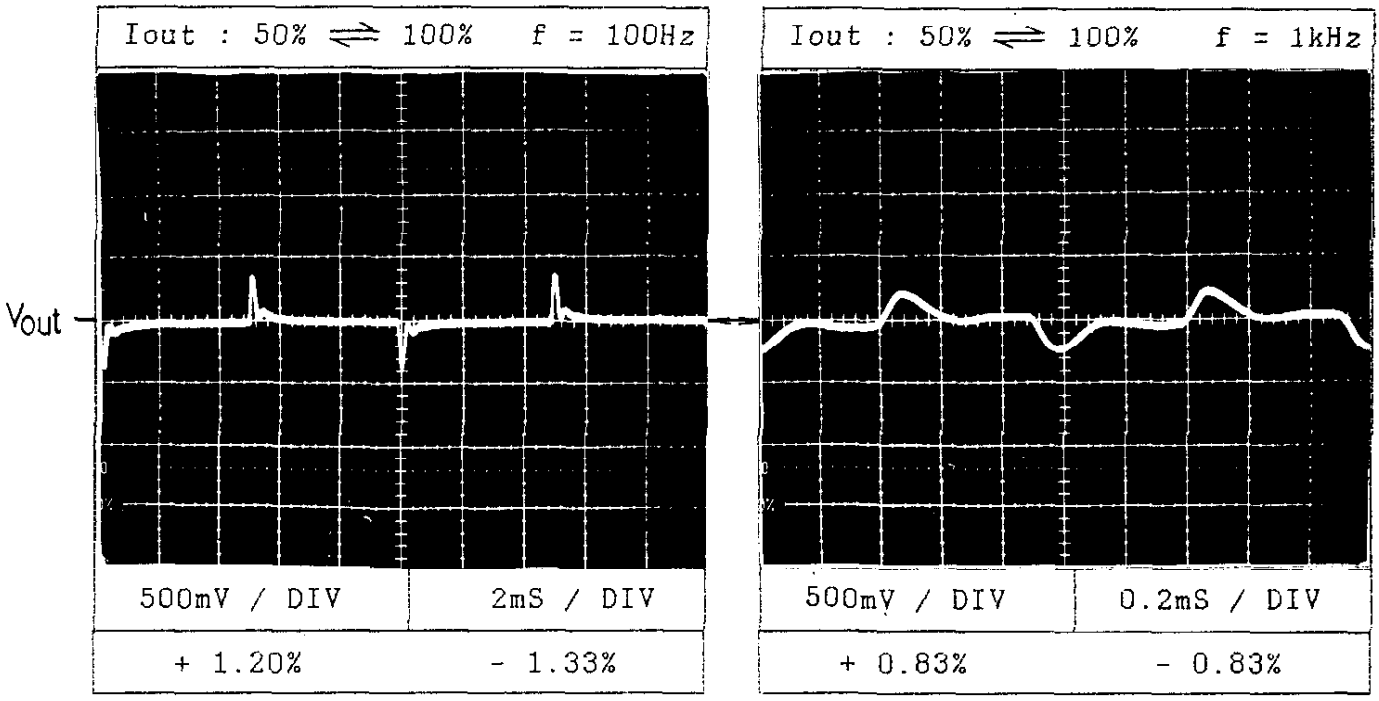
KWD10

Condition Vin : AC100V

Ta : 25°C

30V





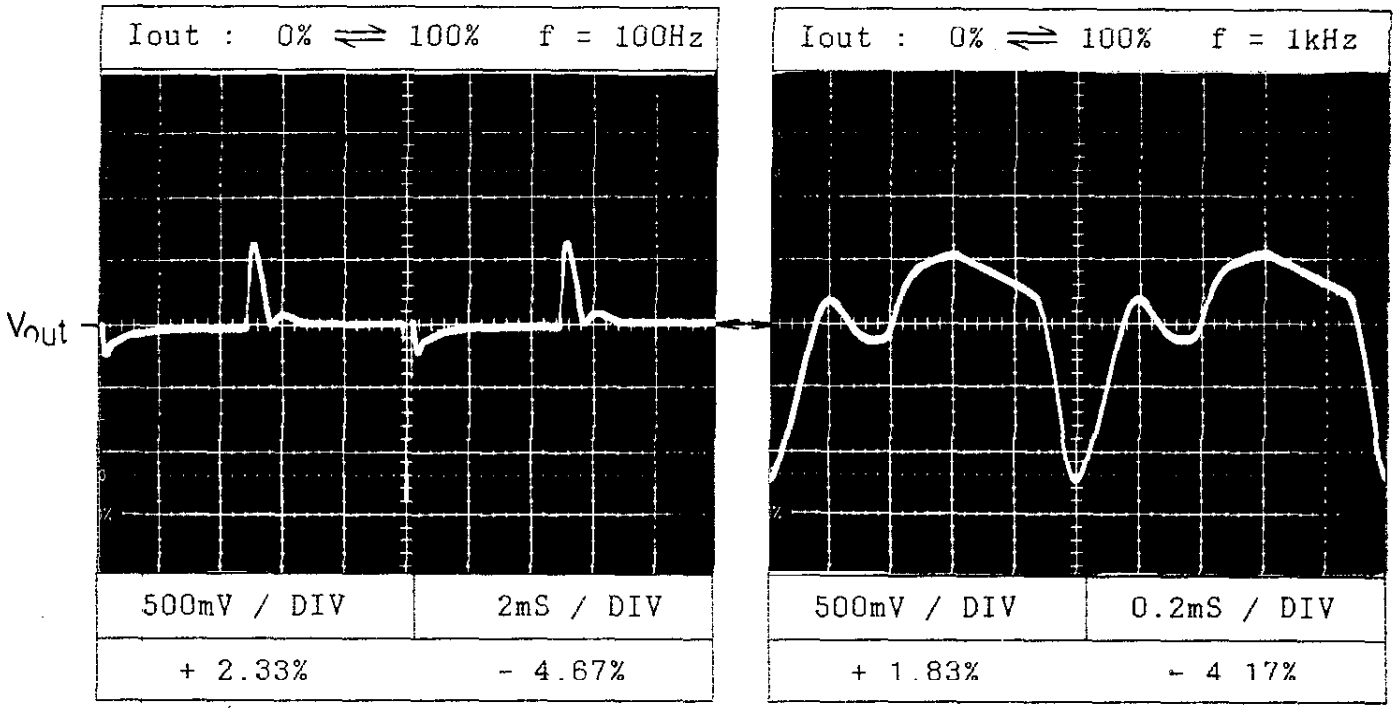
Dynamic Load Response

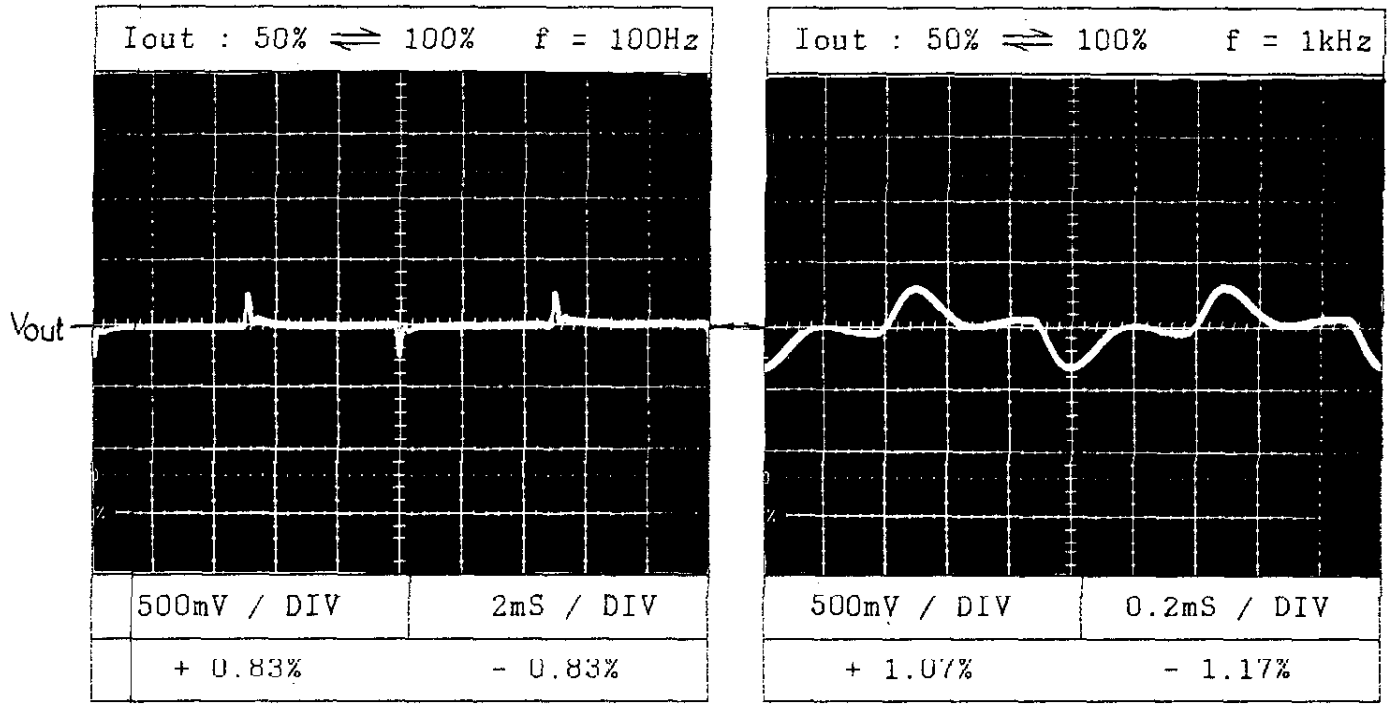
KWD10

Condition Vin : AC220V

Ta : 25°C

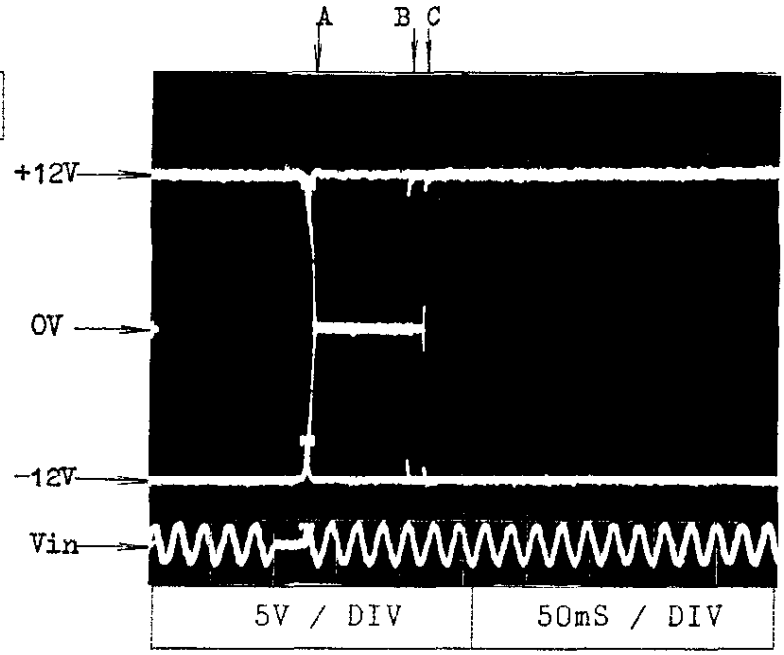
30V





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

±12V



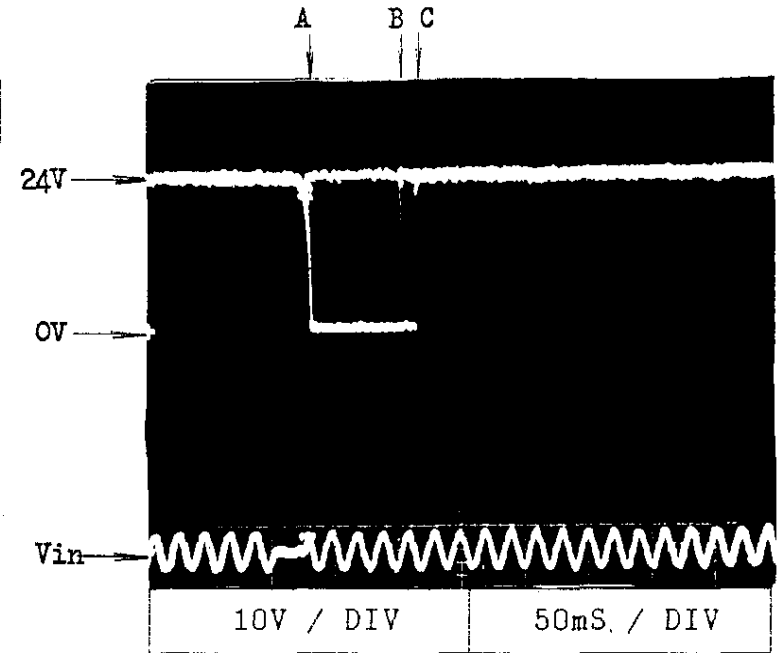
Brown out time:

A : 27 mS

B : 33 mS

C : 42 mS

24V



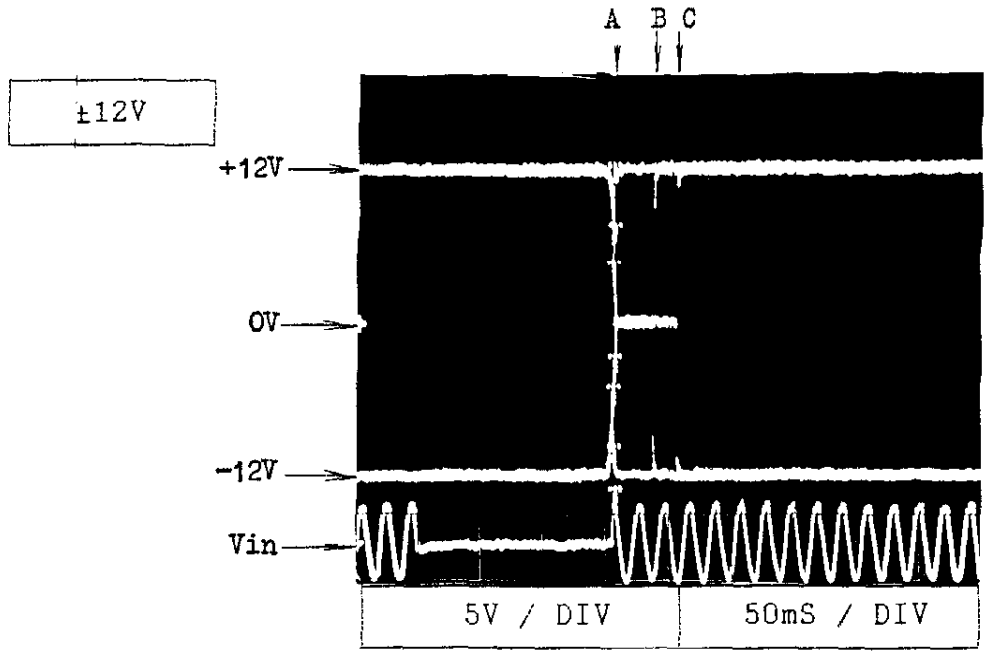
Brown out time:

A : 26 mS

B : 32 mS

C : 42 mS

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

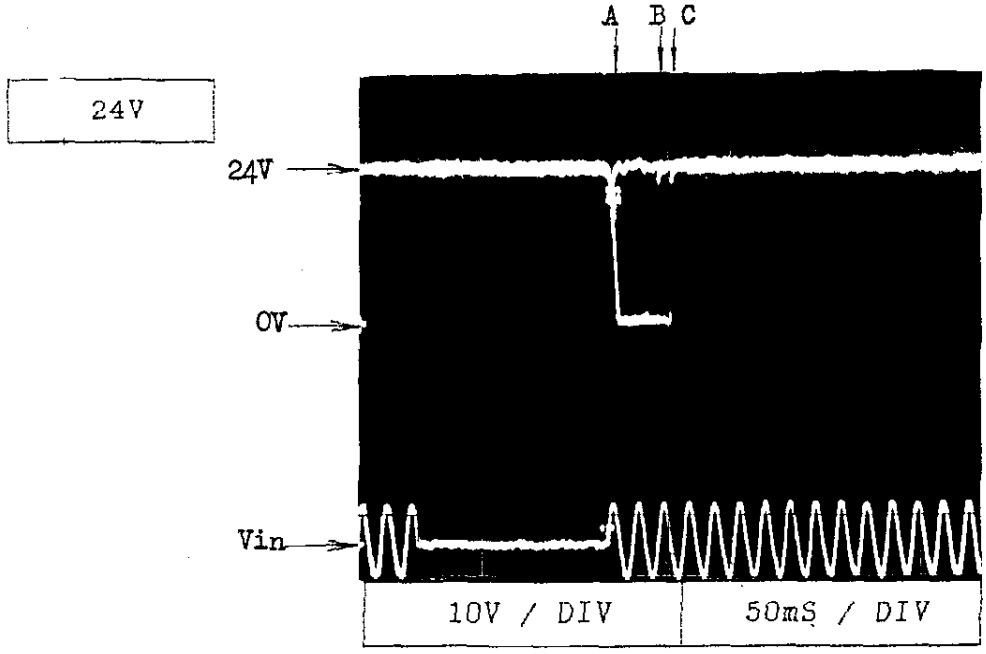


Brown out time:

A : 153 mS

B : 159 mS

C : 169 mS



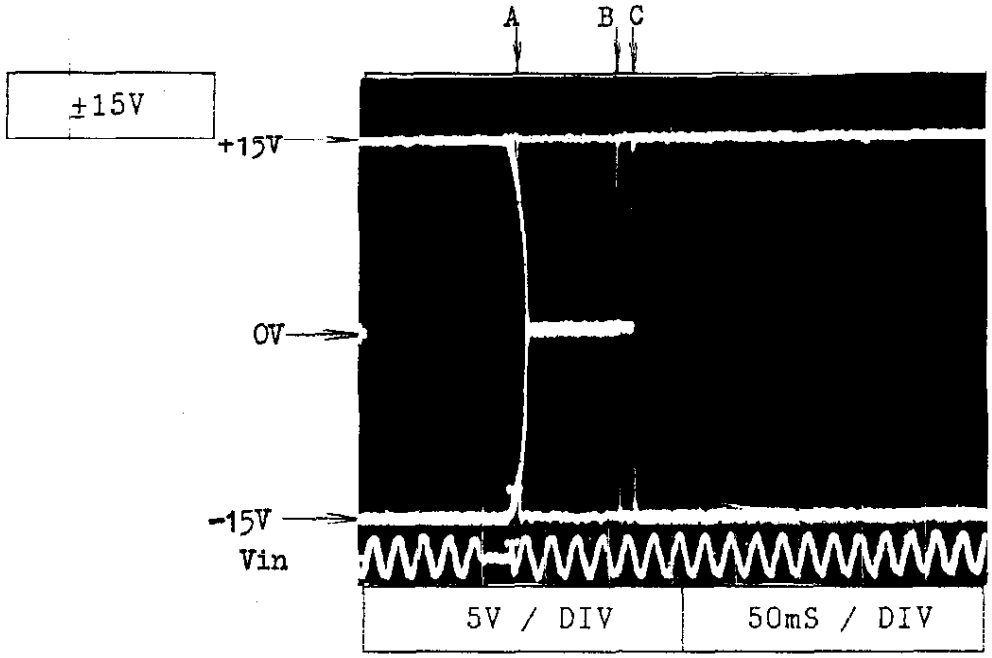
Brown out time:

A : 152 mS

B : 158 mS

C : 168 mS

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

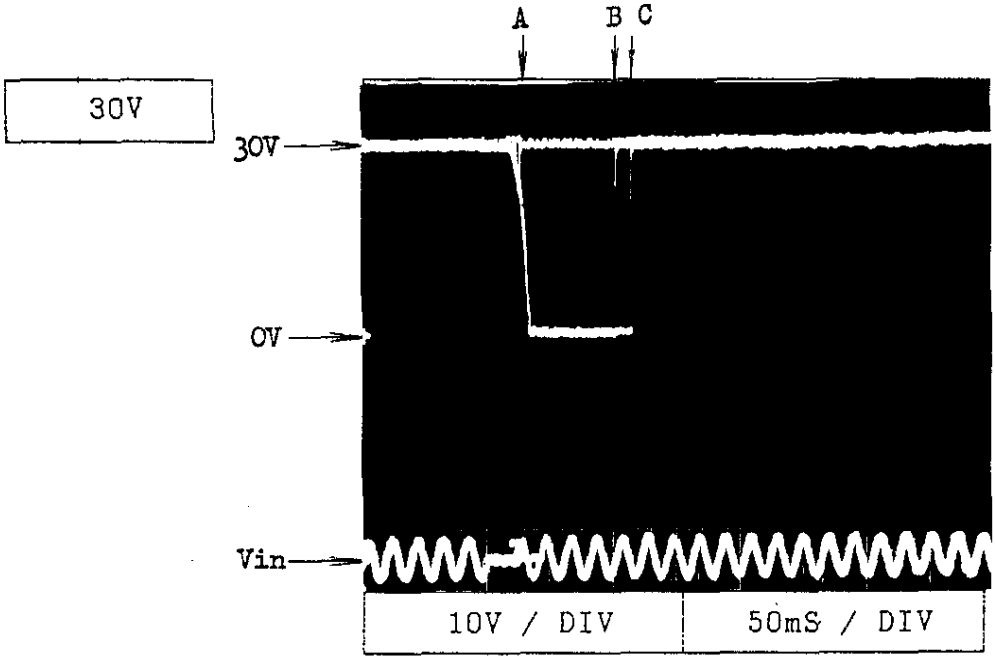


Brown out time:

A : 26 mS

B : 35 mS

C : 45 mS



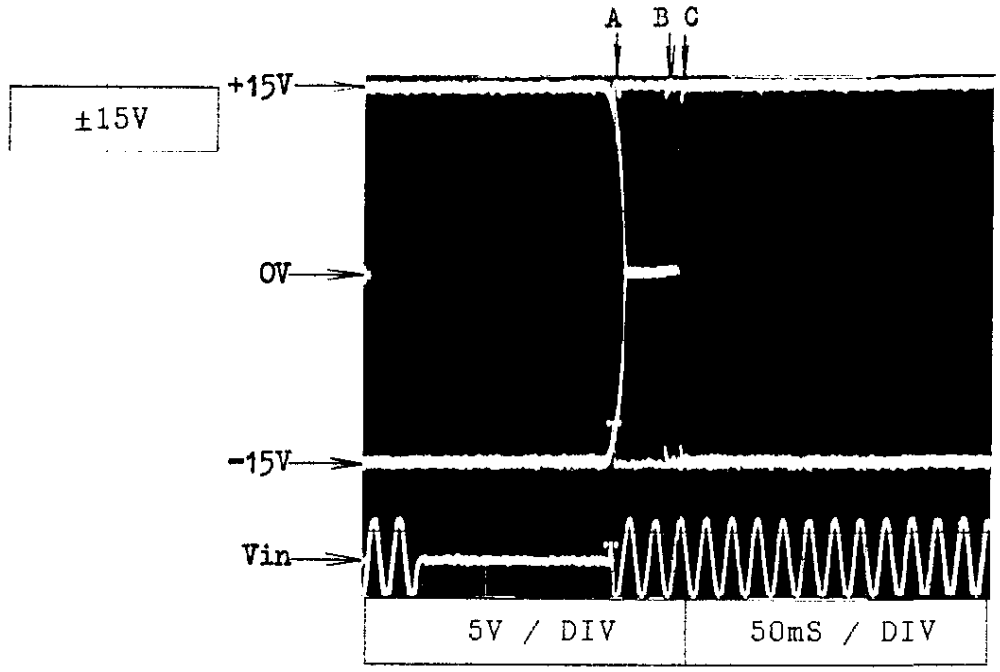
Brown out time:

A : 26 mS

B : 35 mS

C : 45 mS

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

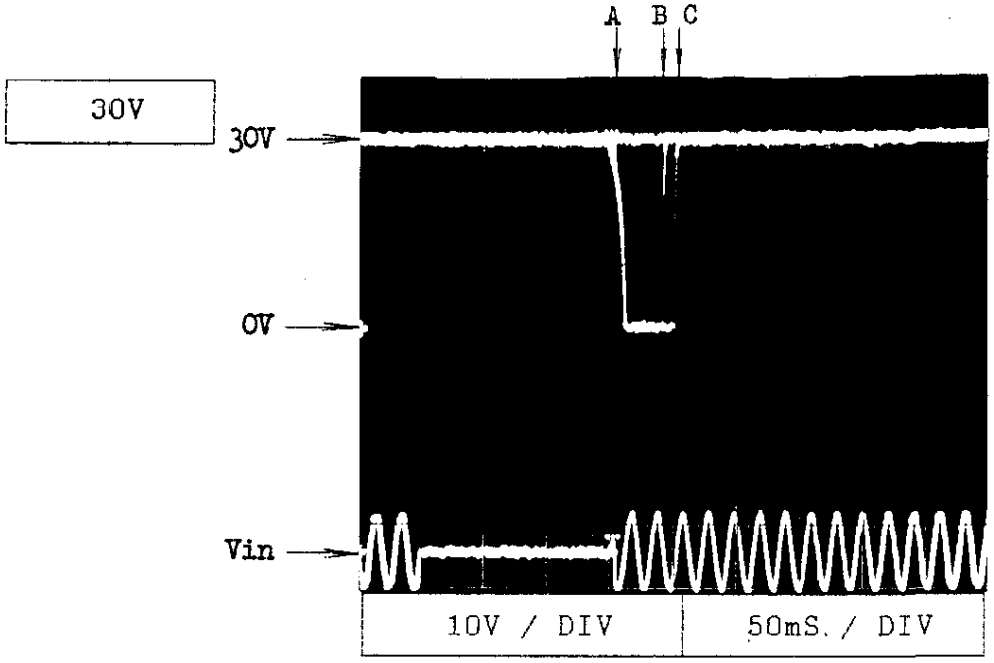


Brown out time:

A : 152 mS

B : 163 mS

C : 177 mS



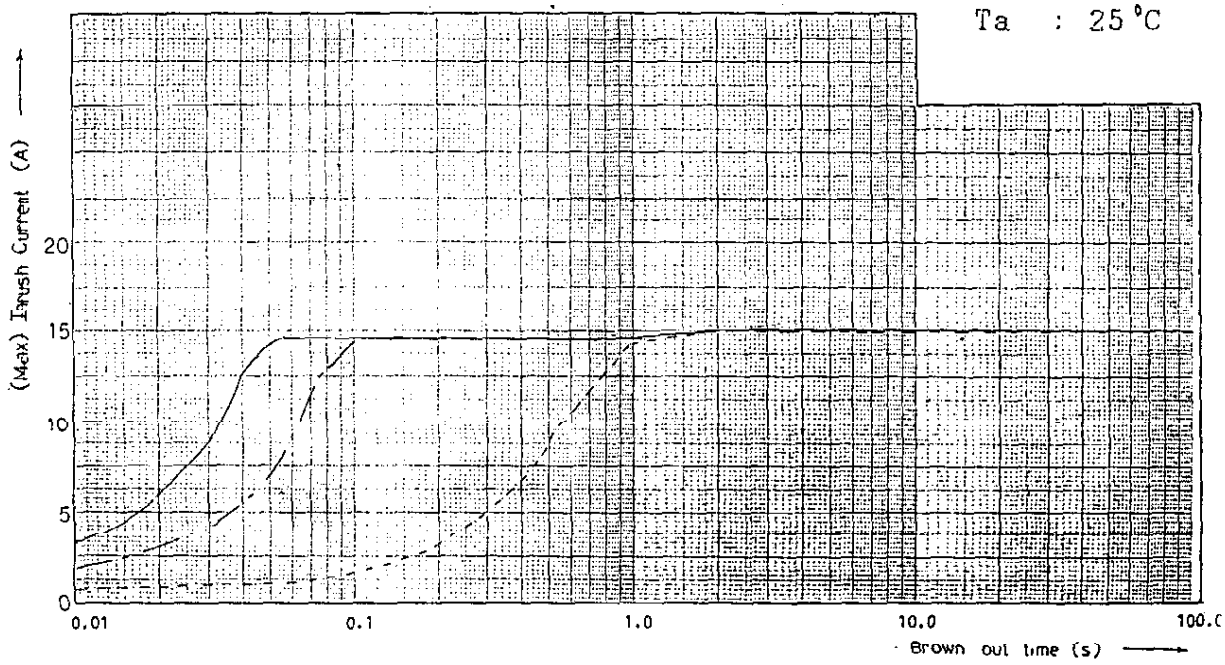
Brown out time:

A : 152 mS

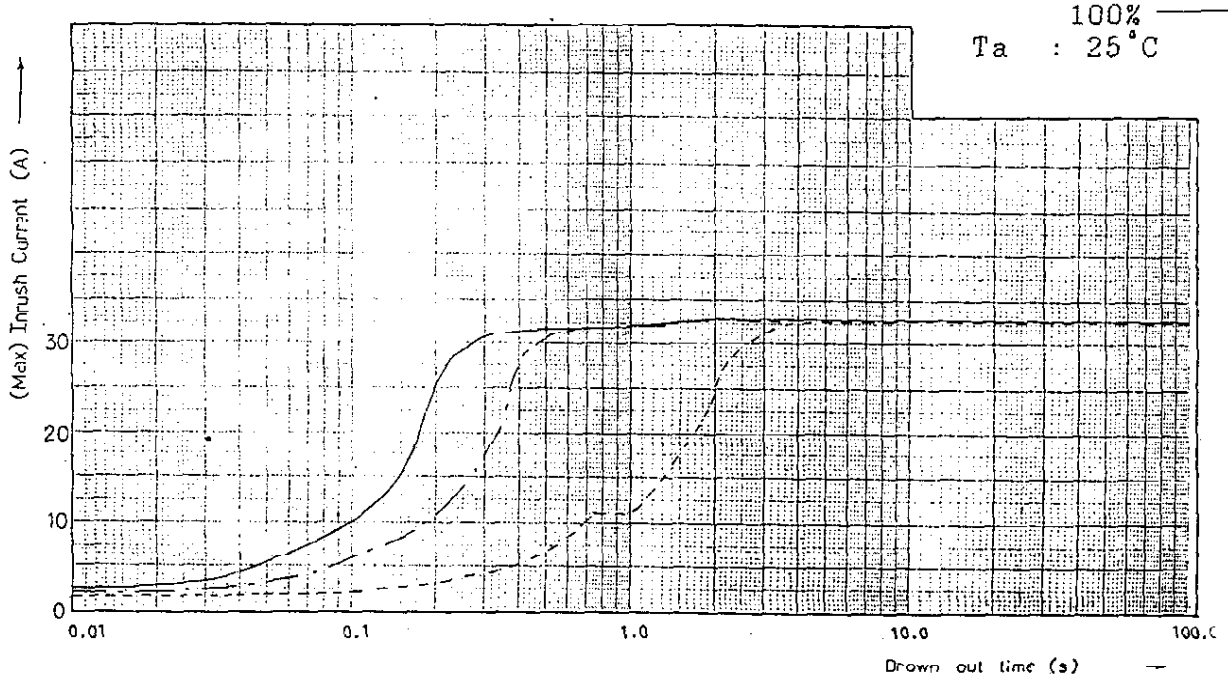
B : 163 mS

C : 173 mS

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



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



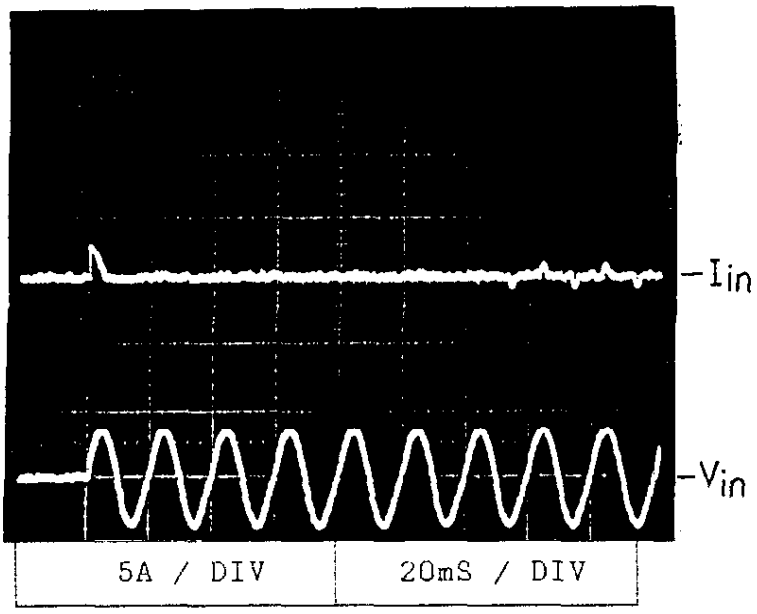
Inrush Current Waveform

KWD10

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

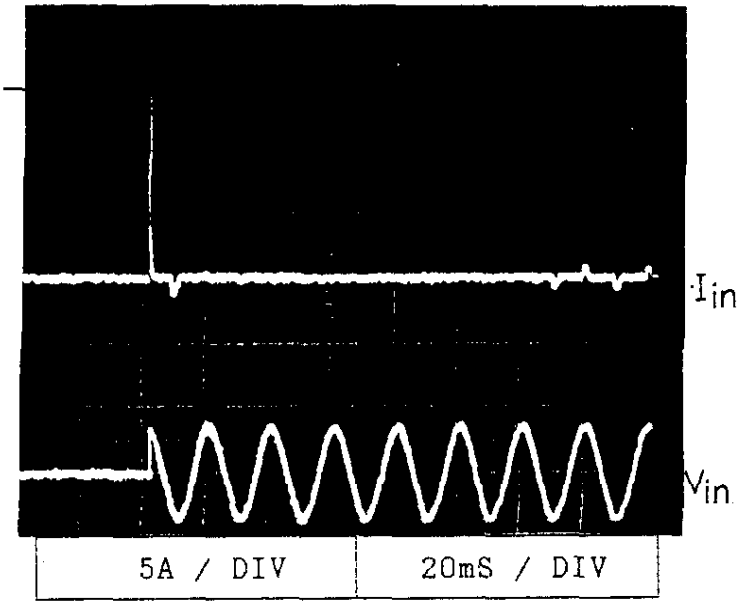
Switch in phase angle of input AC voltage:

$\phi = 0^{\circ}$



Switch in phase angle of input AC voltage:

$\phi = 90^{\circ}$



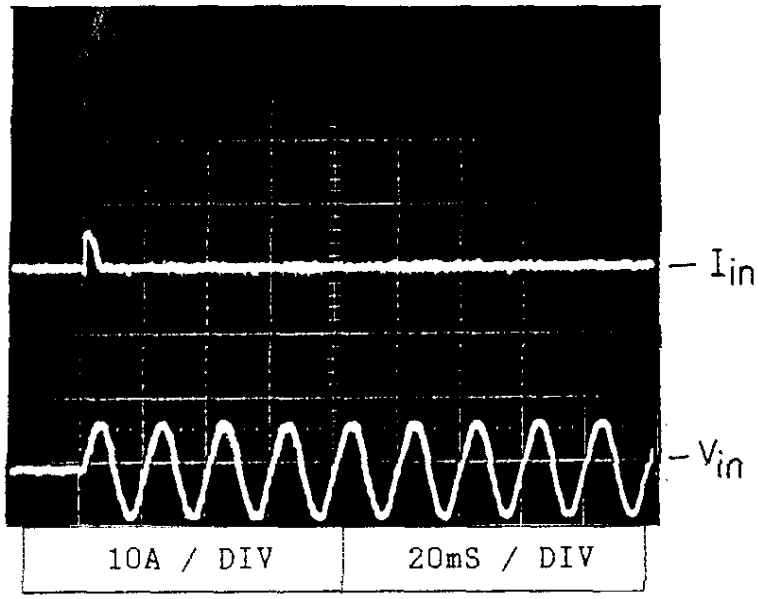
Inrush Current Waveform

KWD10

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

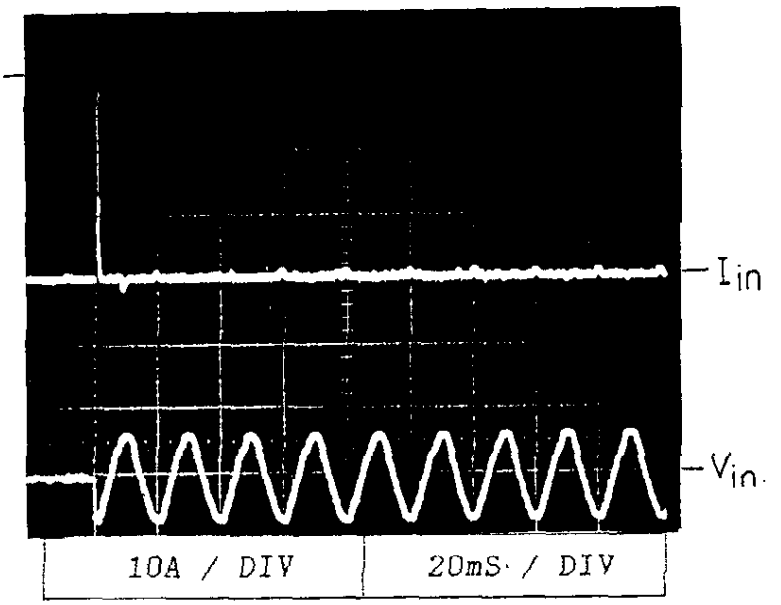
Switch in phase angle of input AC voltage:

Ø = 0°



Switch in phase angle of input AC voltage:

Ø = 90°



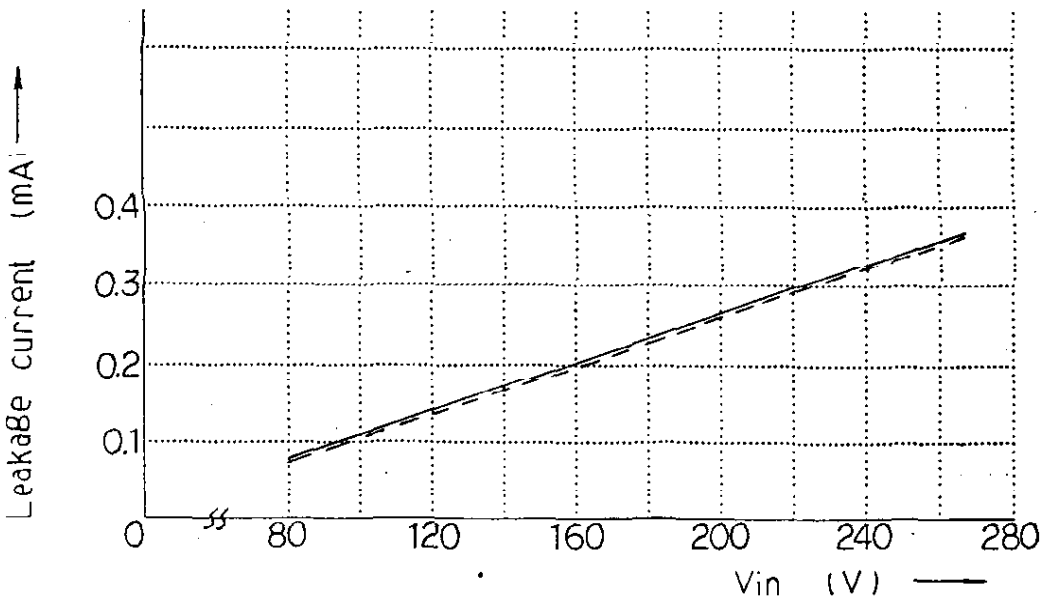
Leakage Current

KWD10

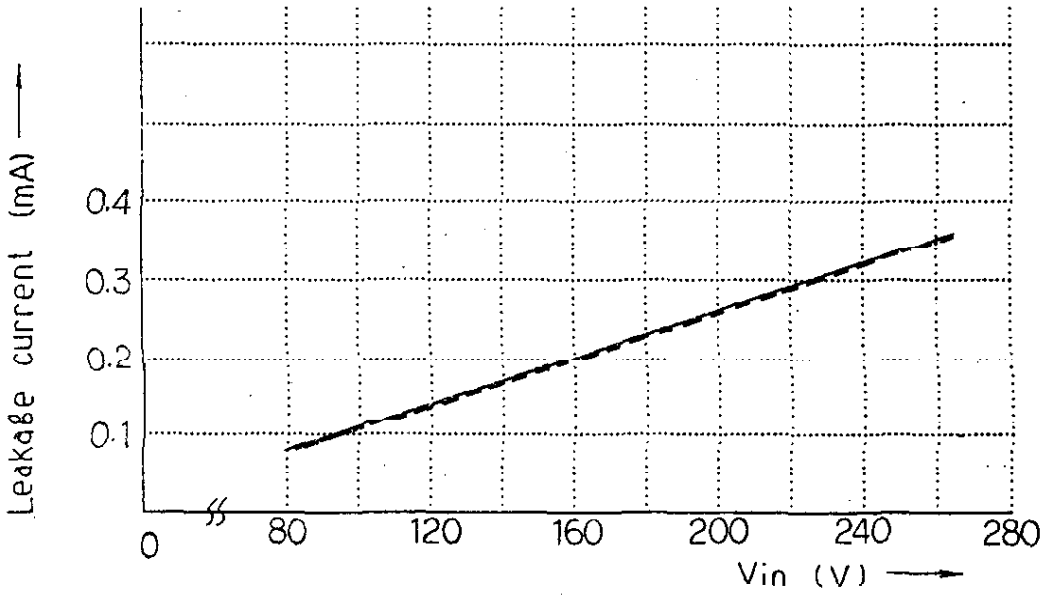
Condition

Iout: 100% ———
0% - - - - -
Ta : 25°C

24V



30V



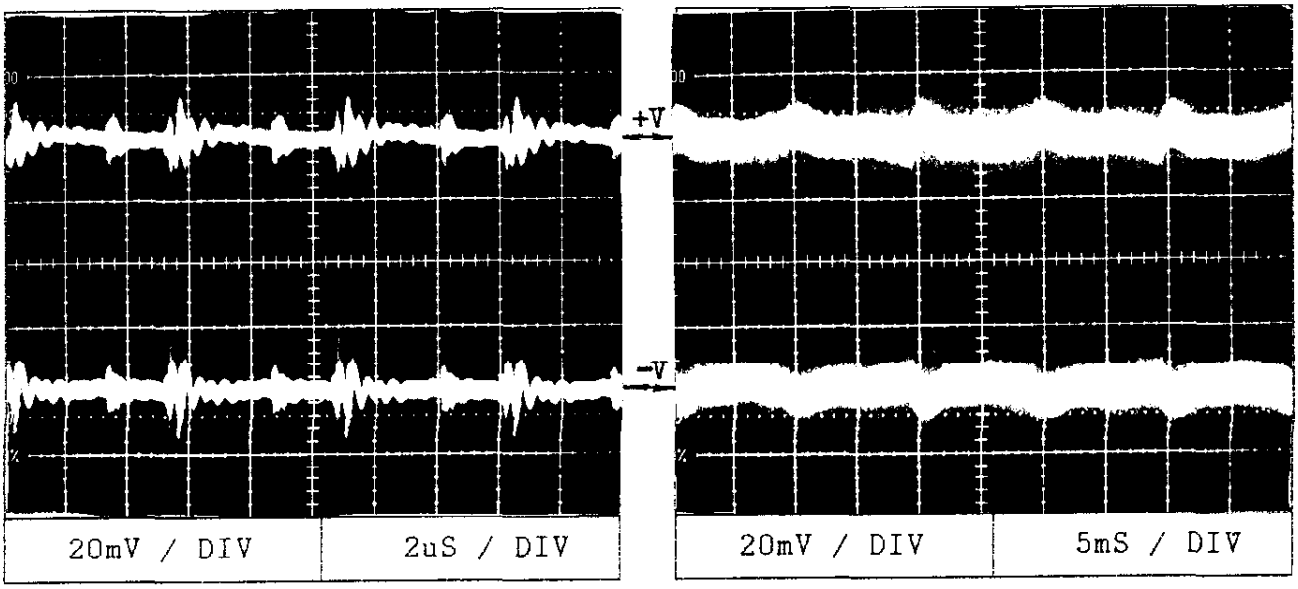
Output Ripple, Noise

KWD10

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

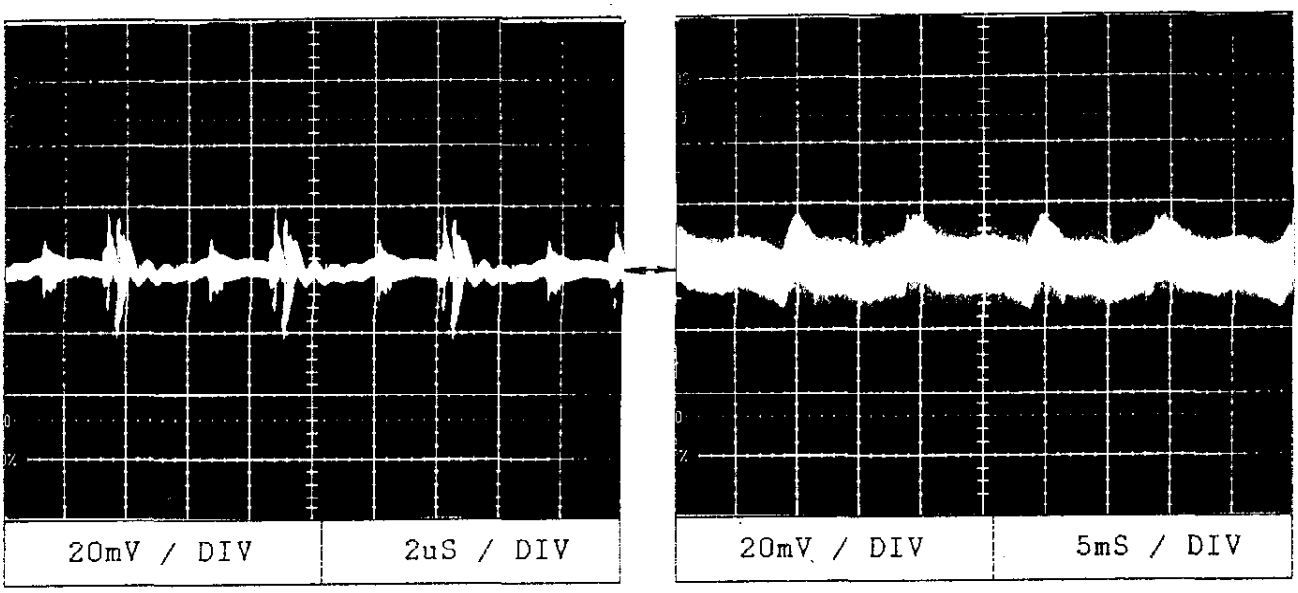
Normal Mode

±12V



24V

Vout



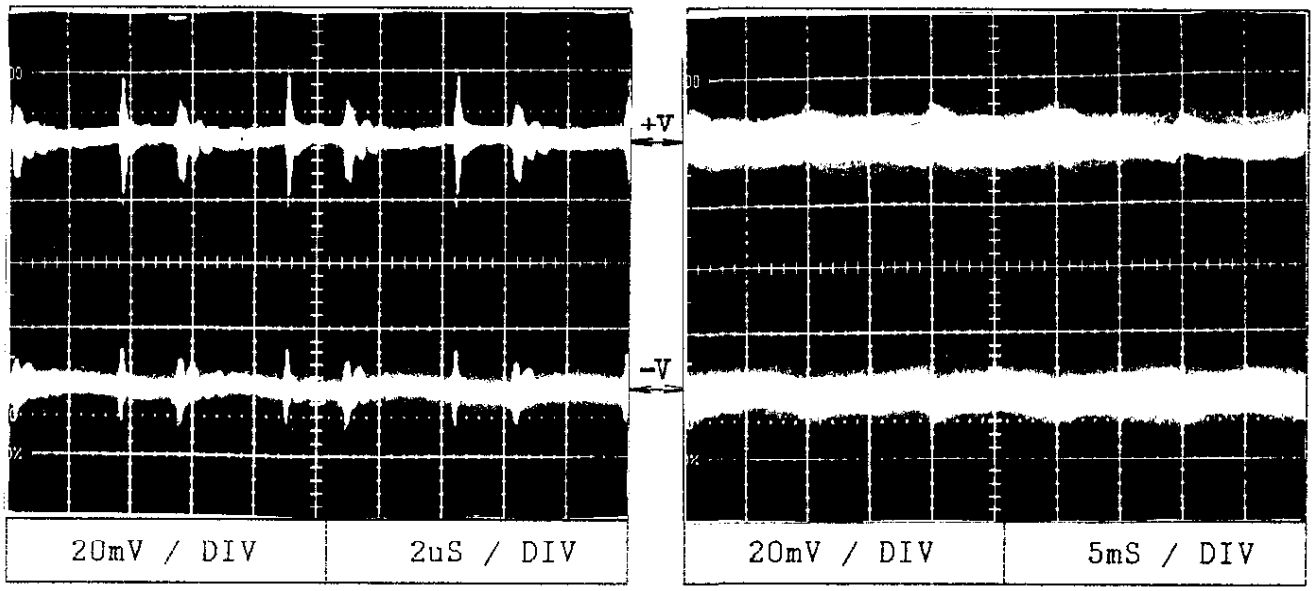
Output Ripple, Noise

KWD10

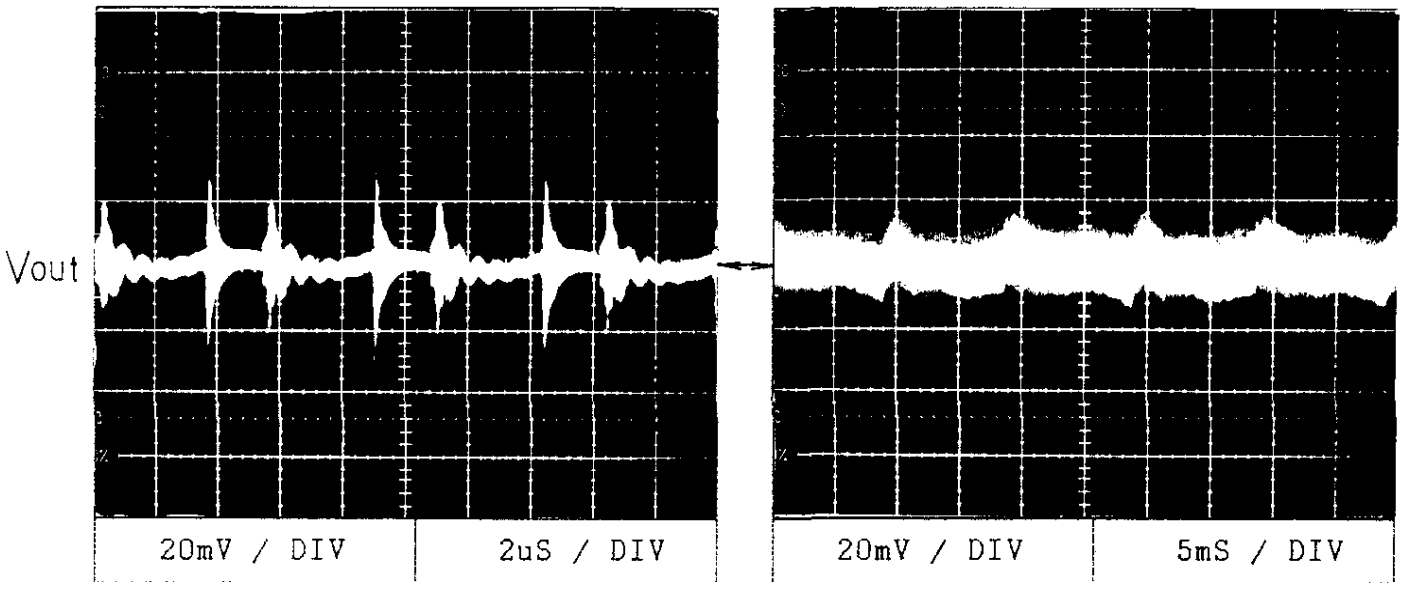
Condition Vin : AC100V
Iout: 100%
Ta : 25°C

Normal Mode

±15V



30V



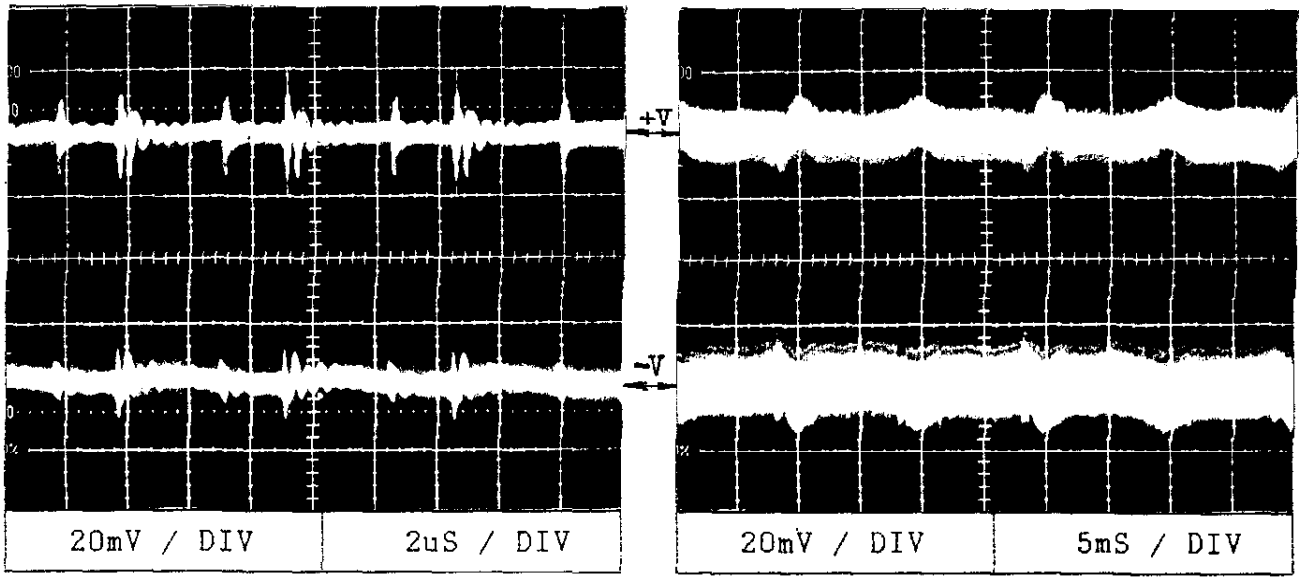
Output Ripple, Noise

KWD10

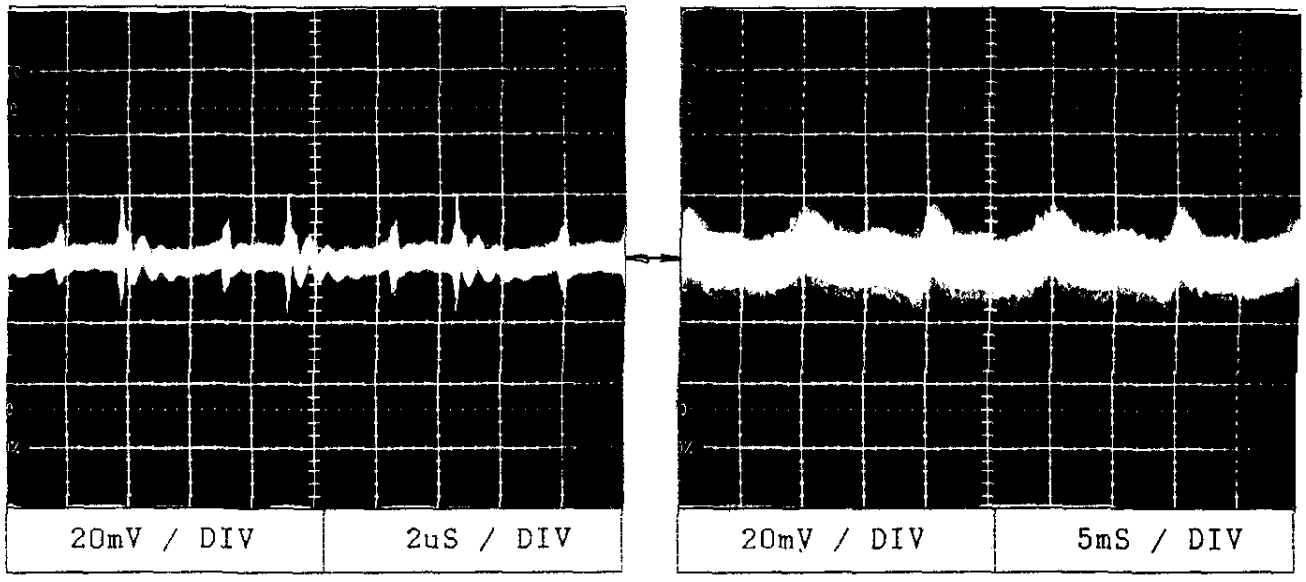
Condition Vin : AC100V
Iout: 100%
Ta : 25°C

Common + Normal Mode

±12V



24V



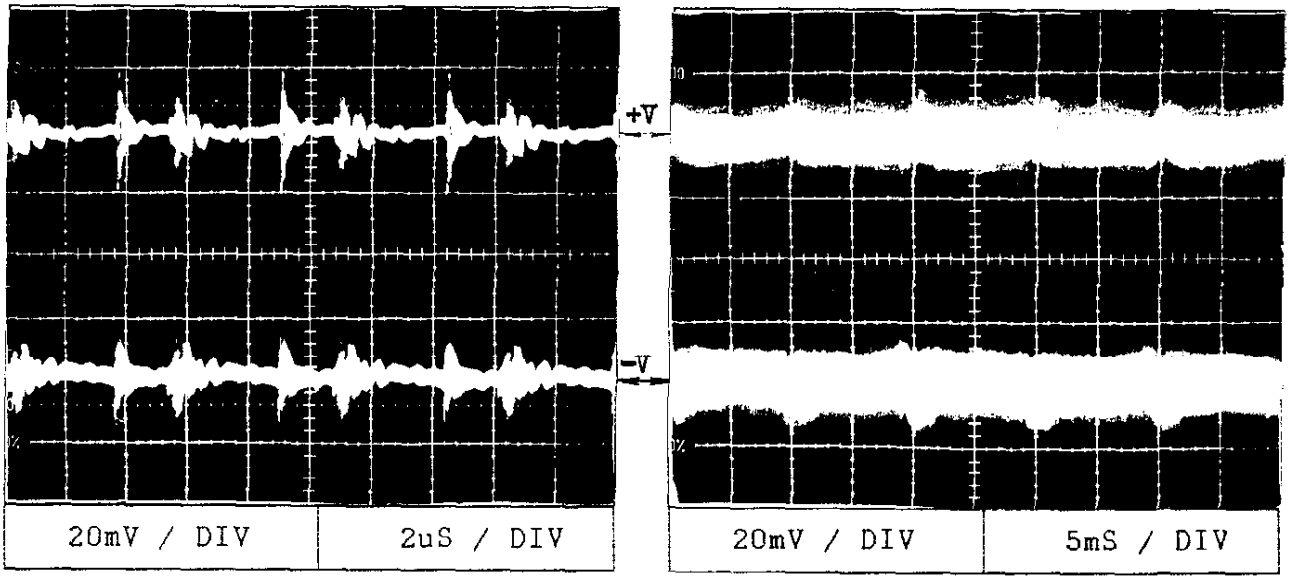
Output Ripple, Noise

KWD10

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

Common + Normal Mode

±15V



30V

Vout