QUALITY TEST DATA

KWS15

DWG. NO.		PA768 – 53 – 01			
QA APPROVAL		R / D			
NLJ	NLS	APPROVED	CHECKED	ENGR.	DRAWN
N. Ioku	*(signature)*	*(signature)*	*(signature)*	*(signature)*	WILLIAM PHIA
25. 6. 92	17. JUN. 92	16 JUN. 92	16. JUN. 92	16. JUN. 92	15 JUNE '92

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—— INDEX ——

Terminology used

Definition

Vin .... Input voltage

Vout ...... Output voltage

Iin .... Input current

Iout ...... Output current

Ta .... Temperature

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KWS15 Specifications

*: For delivery, contact to our sales office.

PA768-01-01A

	ITEMS	MODEL		KWS15-5	KWS15-12	KWS15-15
1	Nominal Output Voltage		V	5	12	15
2	Minimum Output Current		A	0	0	0
3	Maximum Output Current		A	3.0	1.3	1
4	Maximum Output Power		W	15.0	15.6	15
5	Efficiency (typ)	(*1)	%	74	77	77
6	Input Voltage Range	(*2)	-	85 ~ 265VAC (47~440Hz) or 110 ~ 340VDC		
7	Input Current (typ)	(*1)	A	0.4A at 100VAC		
8	Inrush Current (typ)		A	20A at 100VAC, 40A at 200VAC		
9	Output Voltage Range		-	FIXED ±5% (Max)		
10	Maximum Ripple & Noise	(*3)	mV	120	150	150
11	Maximum Line Regulation	(*3,*4)	mV	20	48	60
12	Maximum Load Regulation	(*3,*5)	mV	40	96	120
13	Maximum Temperature Drift	(*3,*6)	mV	50	120	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 15W, 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, CSA950, EN60950		
29	Conducted Radio Noise	(*9)	-	Built to meet VCCI-Class A, FCC-class B, VDE-classB		
30	Weight		g	150g		
31	Size (WxHxD)		mm	48 x 23.5 x 70 (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 30seconds.

*8. Over Voltage Clamping by Zener Diode.

*9. VDE class-B with external capacitor.
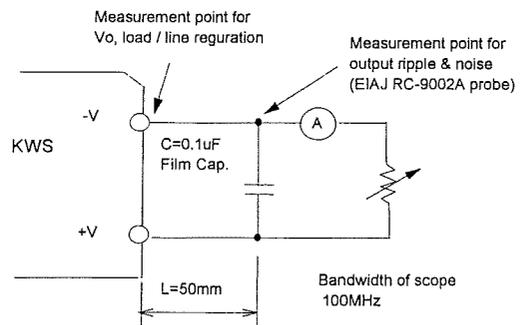
Fig.A

２．評価測定方法　EVALUATION METHOD

２－１　測定回路　Circuits used for determination

(1)　静特性　Steady state data

controlled temp.,chamber
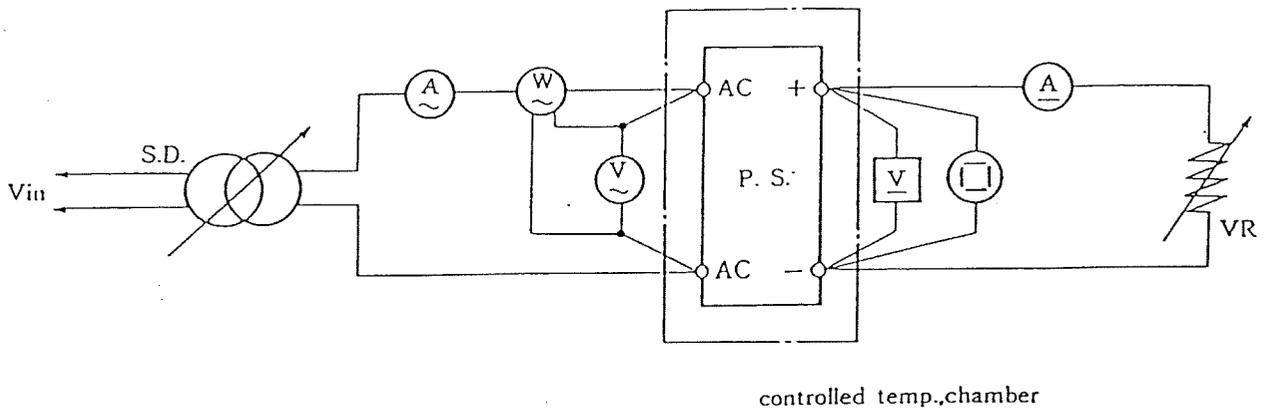
(2)　通電ドリフト特性　Warm up voltage drift characteristics

controlled temp.,chamber
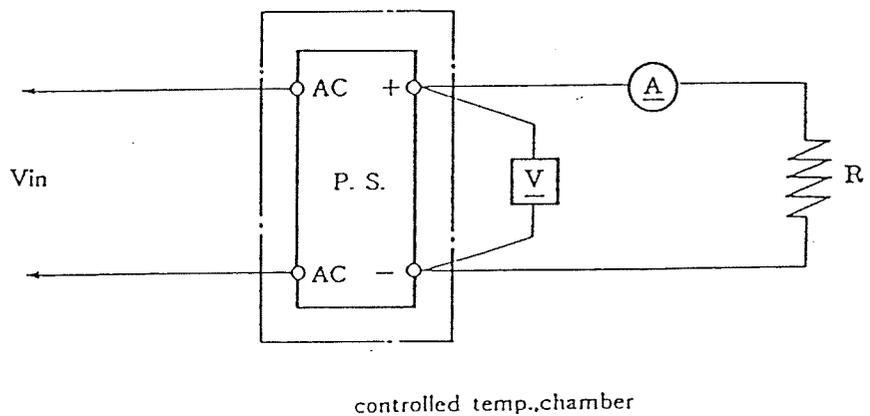
(3)　過電流保護特性　Over current protection (OCP) characteristics

Same as steady state data.

(4)　過電圧保護特性　Over voltage protection (OVP) characteristics


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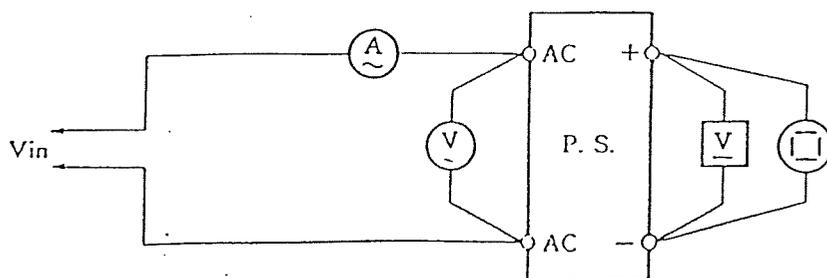
(5) 出力立上り特性　Output rise characteristics
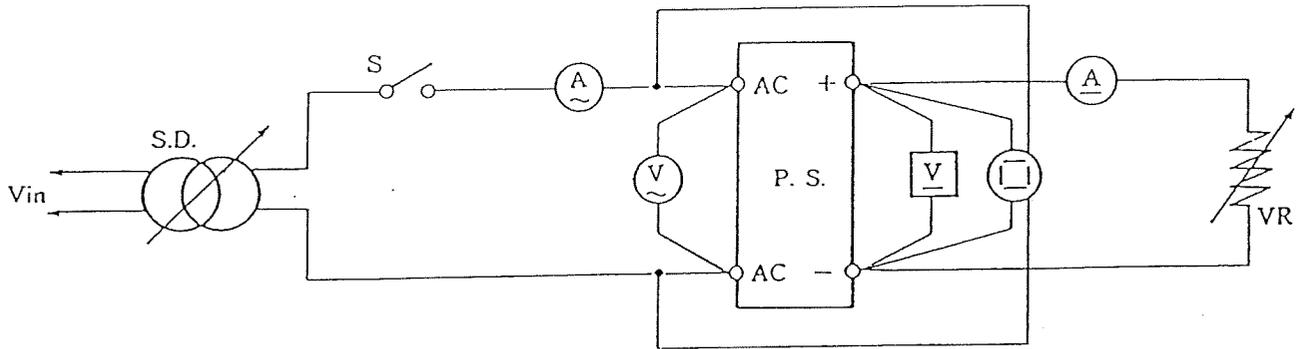
(6) 出力立下り特性　Output fall characteristics

Same as output rise characteristics.

(7) 過渡応答（入力急変）特性　Dynamic line response characteristics
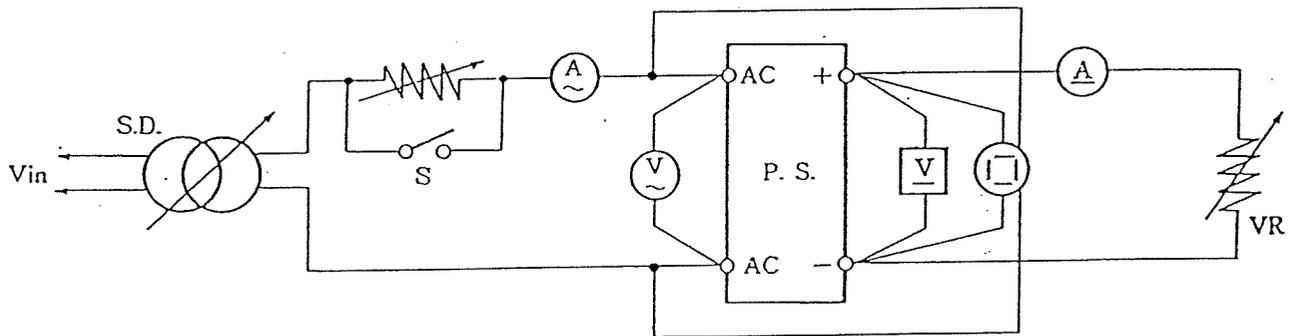
(8) 過渡応答（負荷急変）特性　Dynamic load response characteristics

Pulse generator

ΛNEMIC·LAMBDA
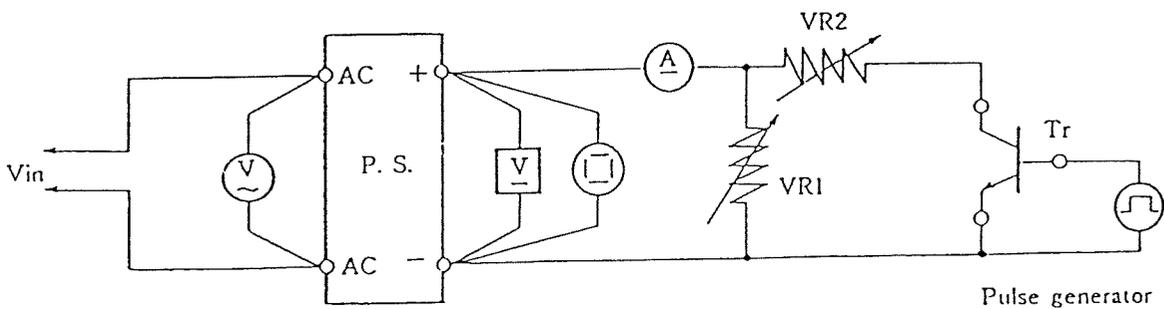
(9) 入力サージ電流（突入電流）特性　Inrush current characteristics
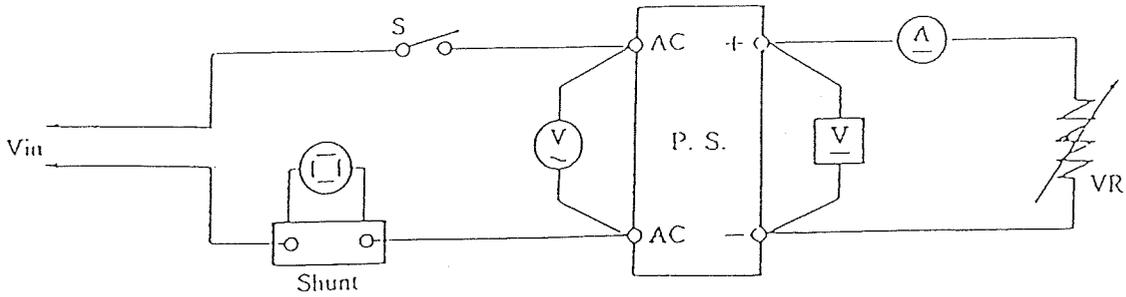
(10) リーク電流（漏洩電流）特性　Leakage current characteristics

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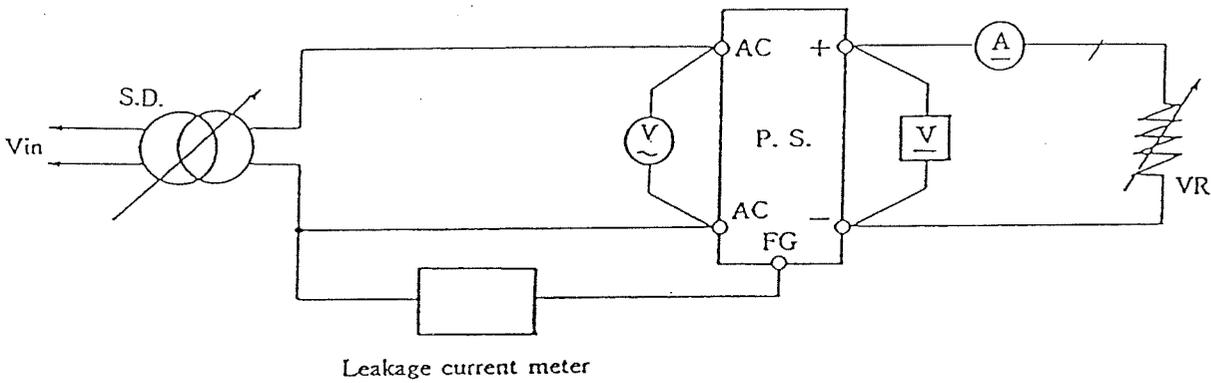
Note : Leakage current measured through a 1kΩ resistor.

Range wed : AC + DC

11) Output-ripple, noise

$R = 50\,\Omega$
$C1 = 4700 pF$
$C2 = 0.1\mu F$

a) NORMAL MODE

$L1 = 50mm$

b) NORMAL + COMMON MODE

$L2 = 120\ mm$

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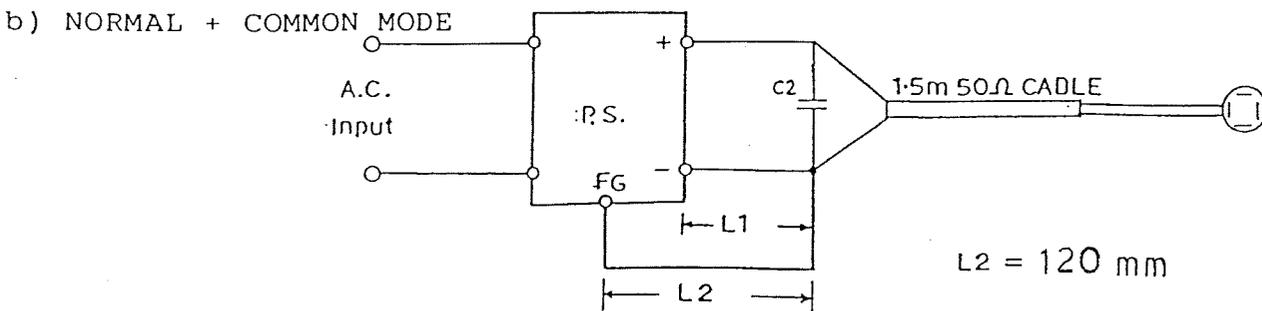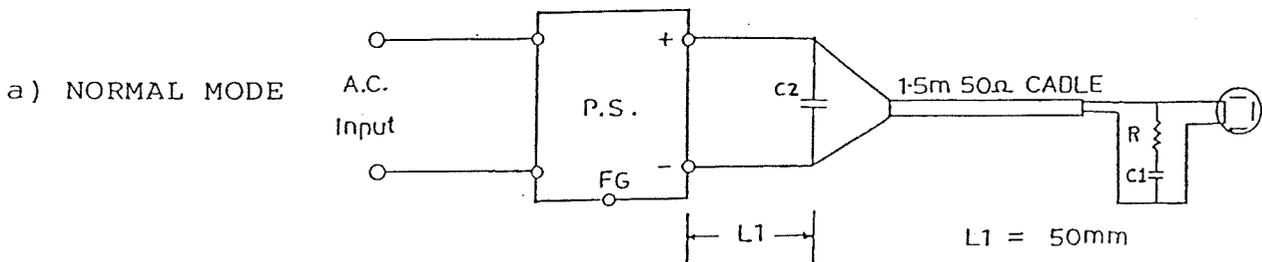
2－2　使用測定機器　List of equipment used

	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 BT
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 -	

5 V

1. Regulation – Line and Load

Condition   Ta : 25°C

Iout \ Vin	AC 85 v	AC 100 v	AC 220 v	AC 265 v	Line Regulation	
0 %	5.016 v	5.016 v	5.017 v	5.016 v	1 mv	0.02 %
50 %	5.010 v	5.010 v	5.010 v	5.010 v	0 mv	0 %
100 %	5.005 v	5.005 v	5.005 v	5.005 v	0 mv	0 %
Load	11 mv	11 mv	12 mv	11 mv		
Regulation	0.22 %	0.22 %	0.24 %	0.22 %		

2. Temperature Drift

Conditions   Vin : AC100v
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	5.005 v	5.005 v	5.002 v	3 mv	0.06 %

12 V

1. Regulation – Line and Load

Condition   Ta : 25°C

Iout \ Vin	AC 85 v	AC 100 v	AC 220 v	AC 265 v	Line Regulation	
0 %	12.061 v	12.061 v	12.062 v	12.061 v	1 mv	0.01 %
50 %	12.052 v	12.052 v	12.050 v	12.049 v	3 mv	0.03 %
100 %	12.045 v	12.045 v	12.044 v	12.042 v	3 mv	0.03 %
Load	16 mv	16 mv	18 mv	19 mv		
Regulation	0.133 %	0.133 %	0.150 %	0.158 %		

2. Temperature Drift

Conditions   Vin : AC100v
Iout : 100 %

Ta	0 °C	25 °C	50 °C	Temp. Stability	
Vout	12.040 v	12.045 v	12.048 v	8 mv	0.07 %

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5V
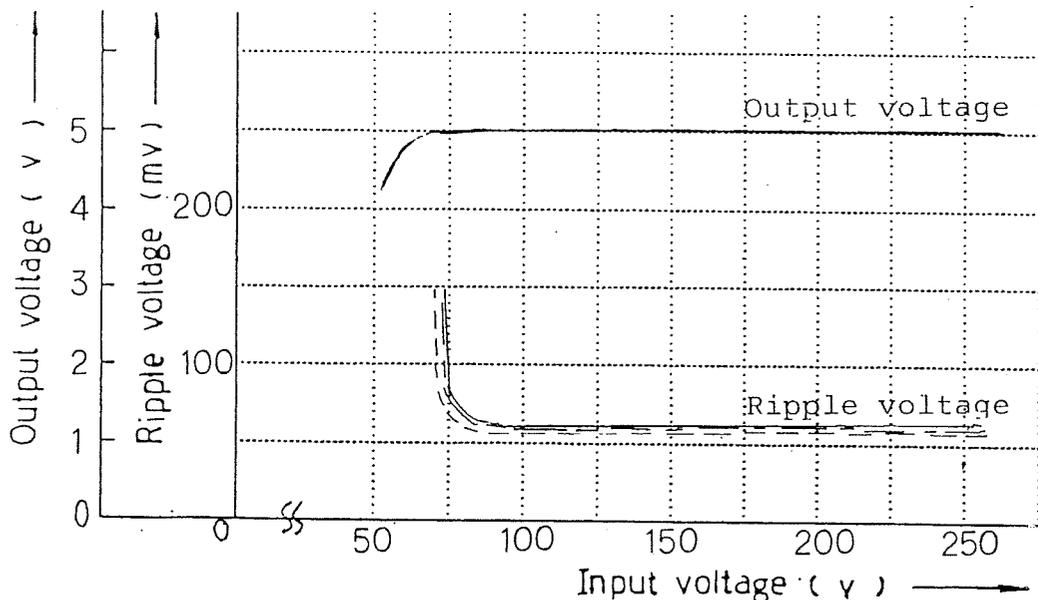
12V

Input voltage (V)

ΛNEMIC·LAMBDA
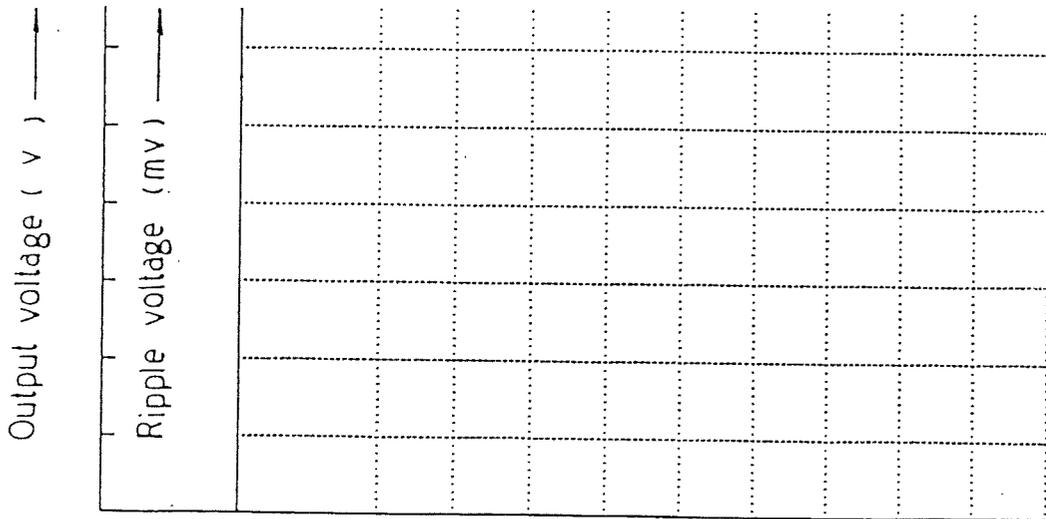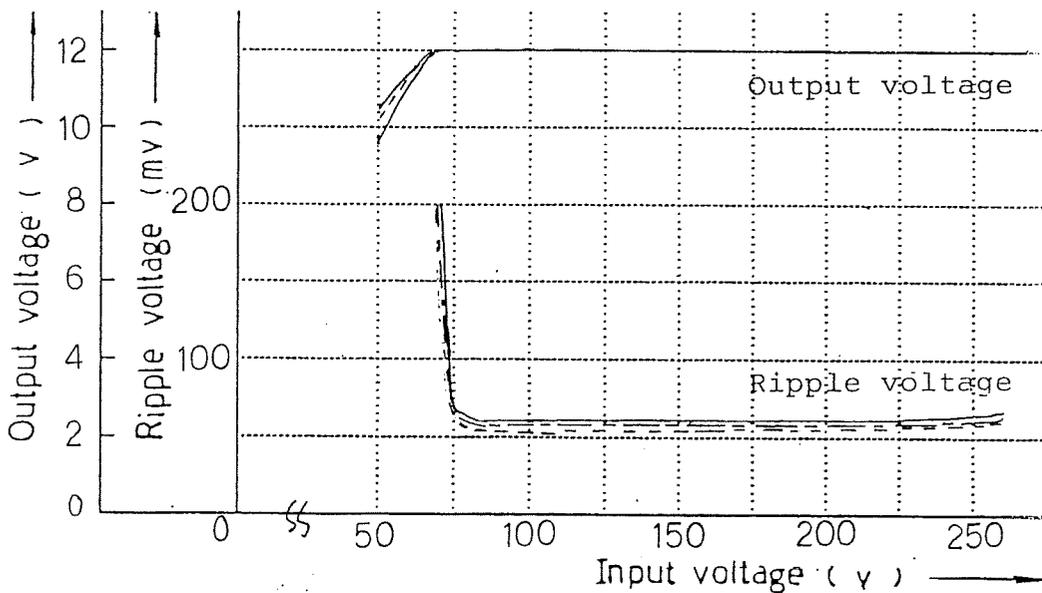
KWS 15

Conditions Vin : AC 100 v
          Ta : 2.5 °C

5V

12V

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8/36
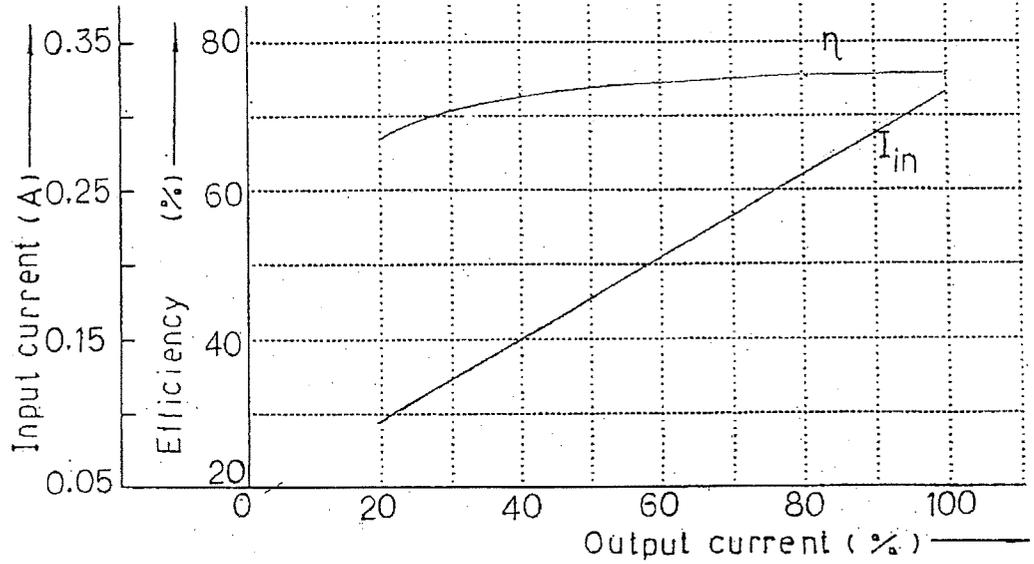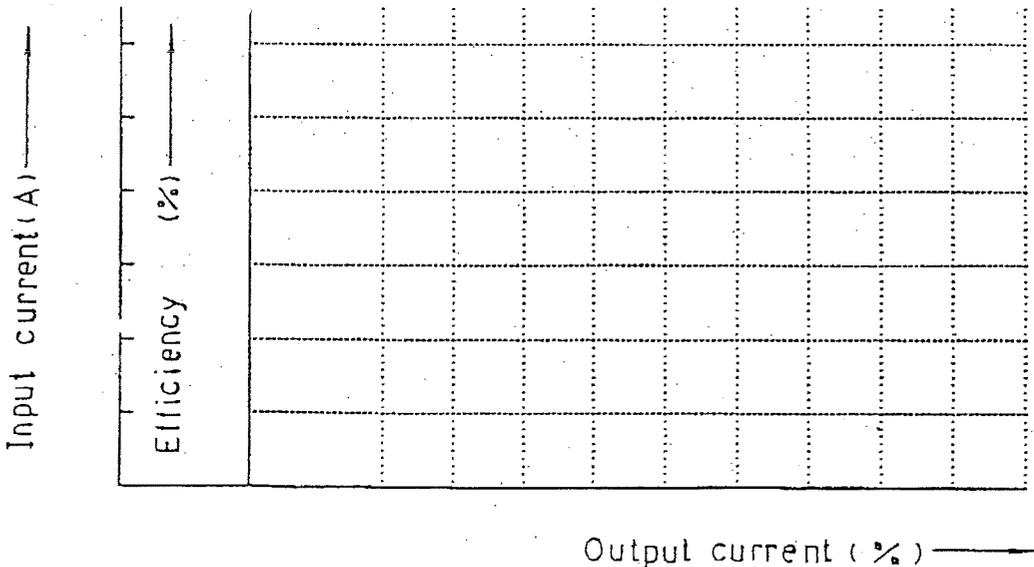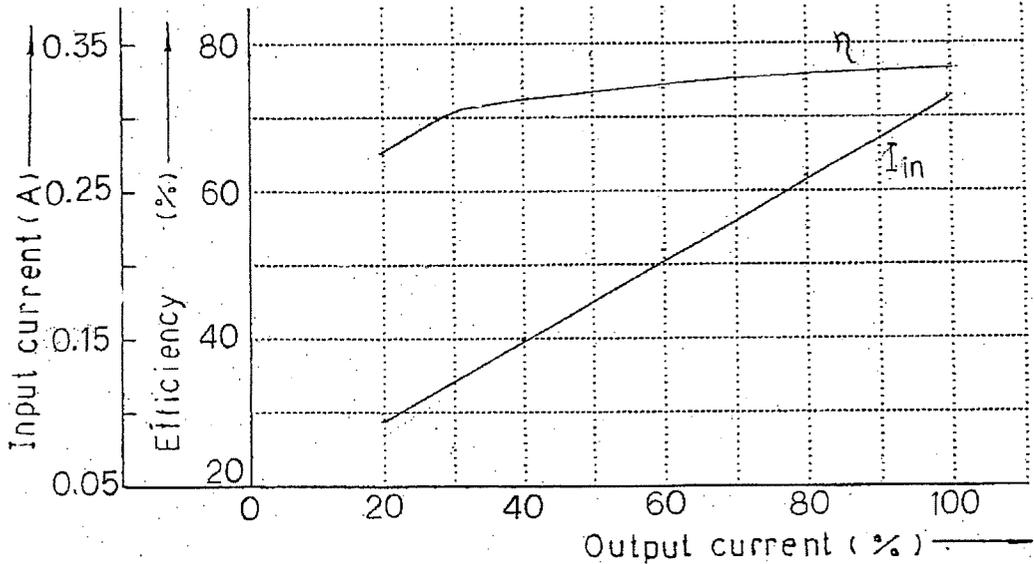
Conditions Vin : AC 220 v
Ta : 2.5°C

5V

12V

ΛNEMIC·LAMBDA
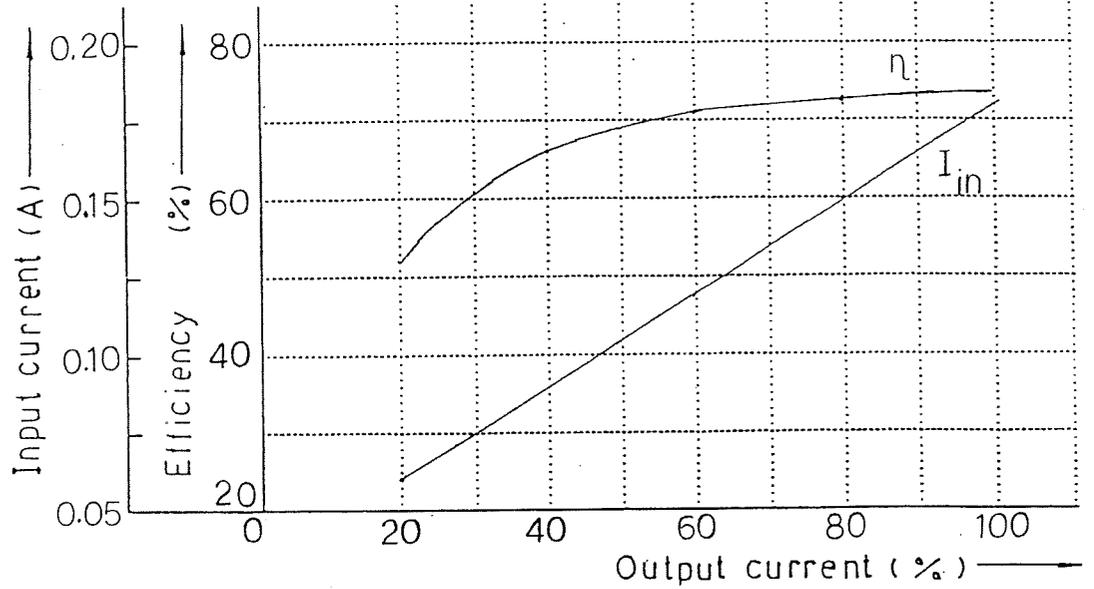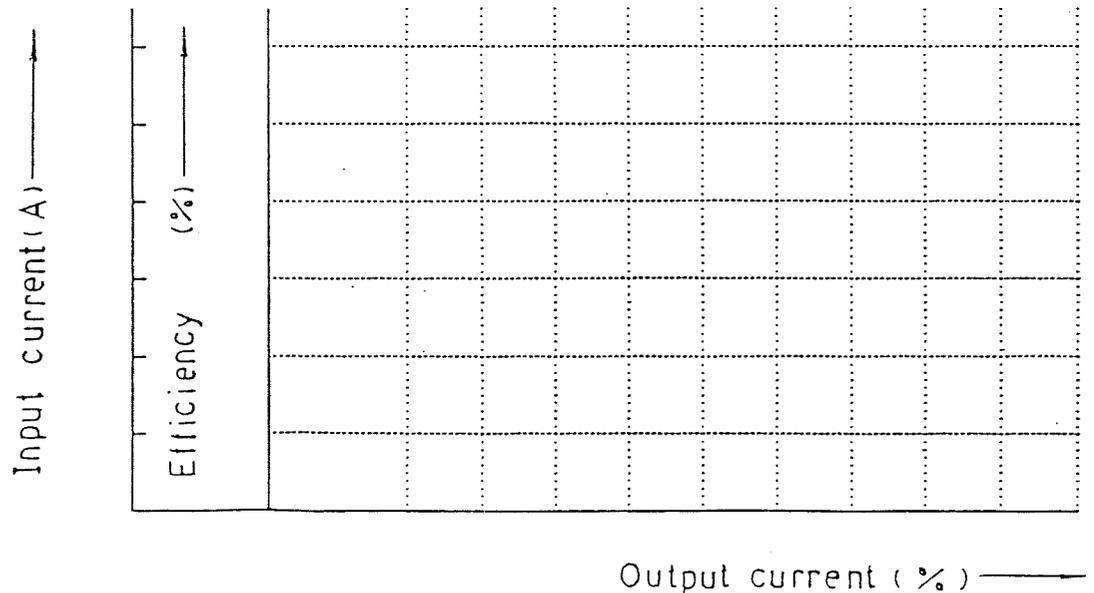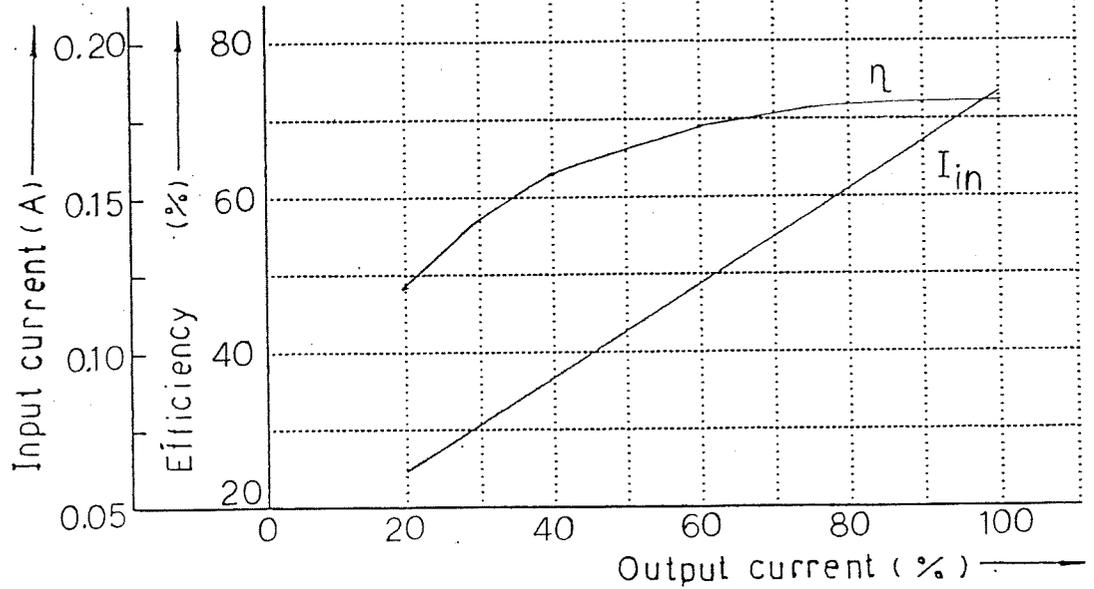
KWS 15

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

5V
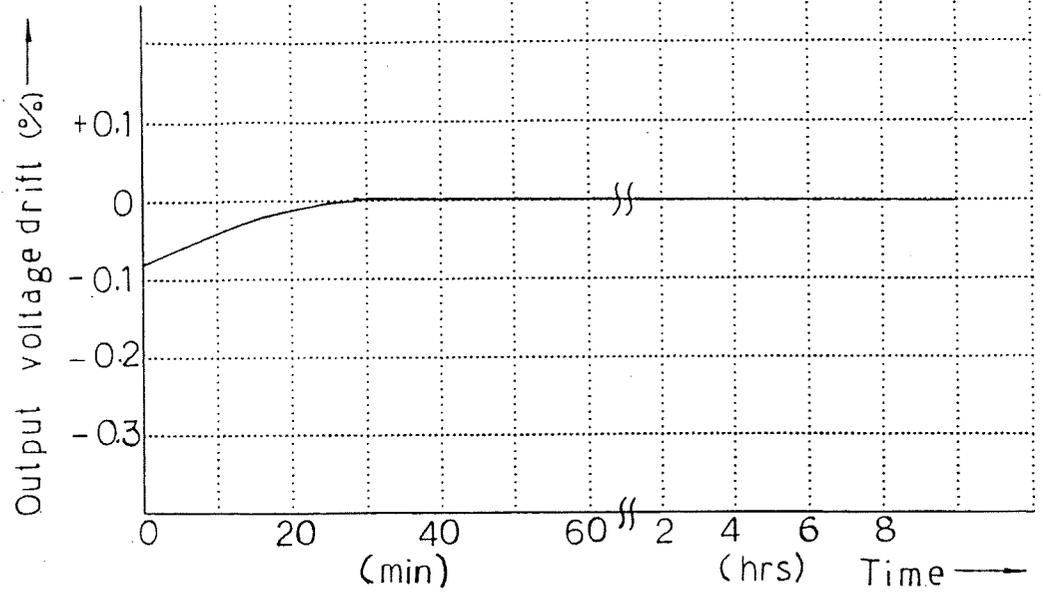
12 V
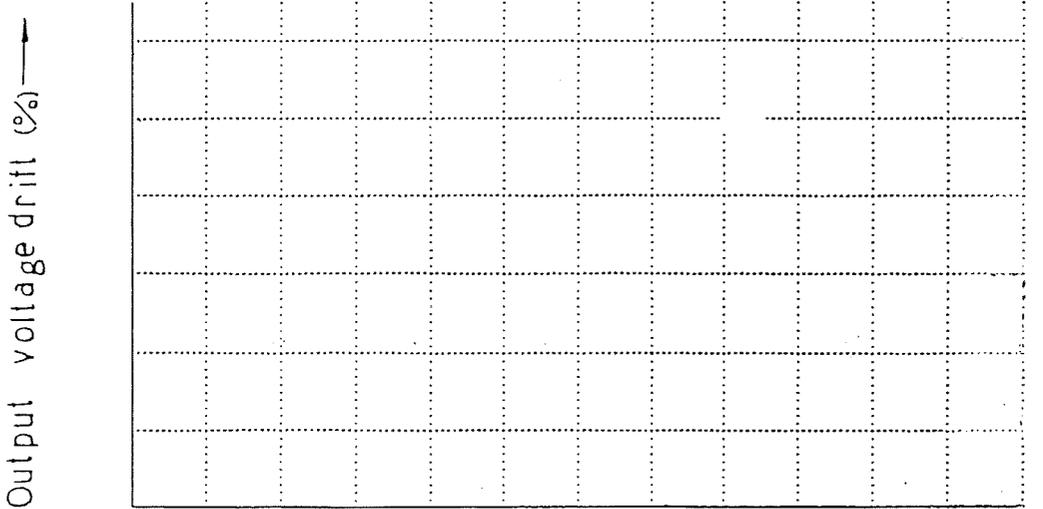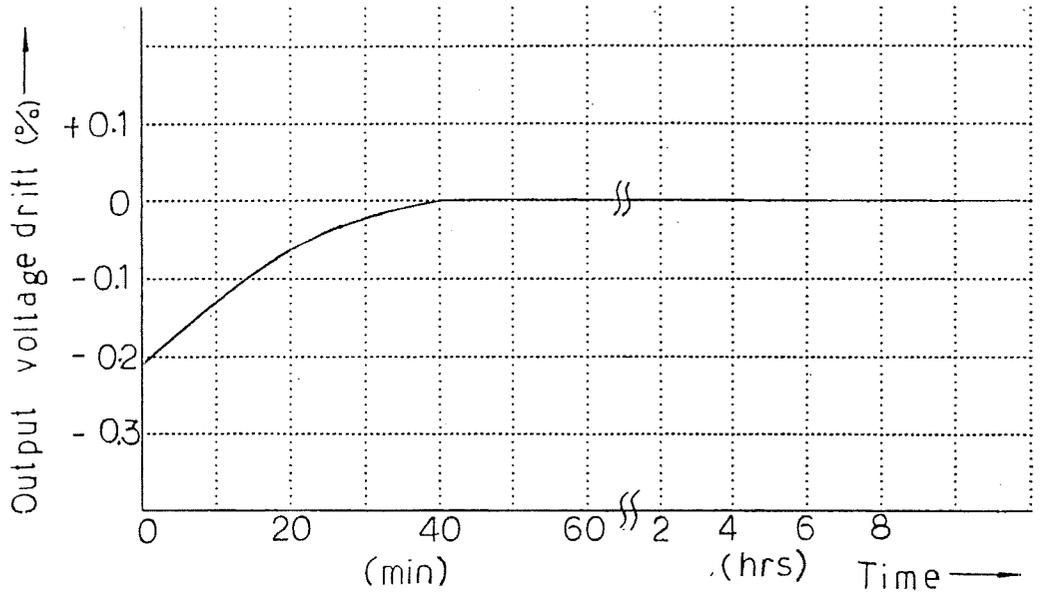
Time ——→

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O.C.P Characteristics

5V

Output voltage (v)

5
4
3
2
1
0

40 80 120 160 200 240 280 320 360

Output current (%)

12V

Output voltage (v)

12
10
8
6
4
2
0

40 80 120 160 200 240 280 320 360

Output current (%)

Output voltage (v)

Output current (%)

ᴧNEMIC·LAMBDA
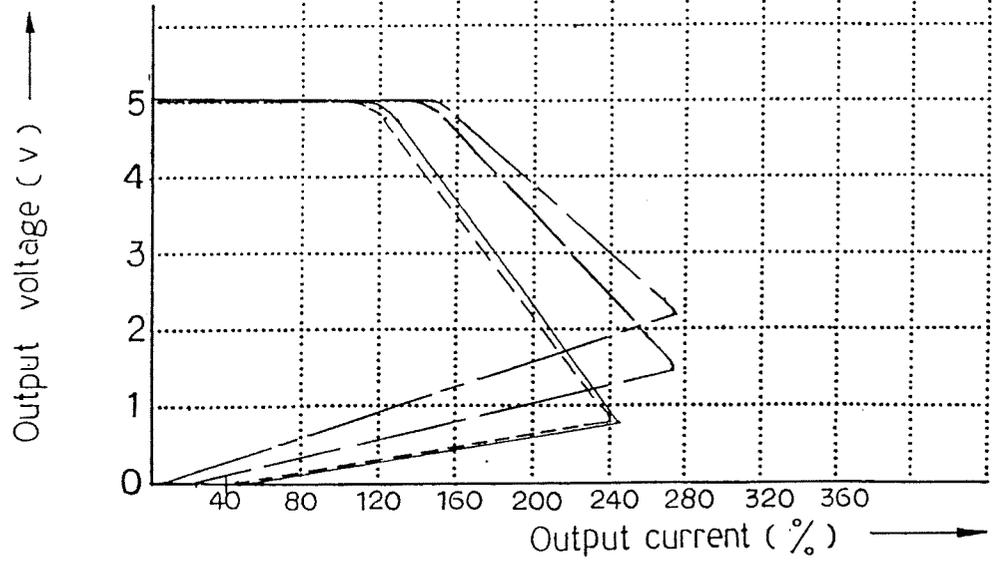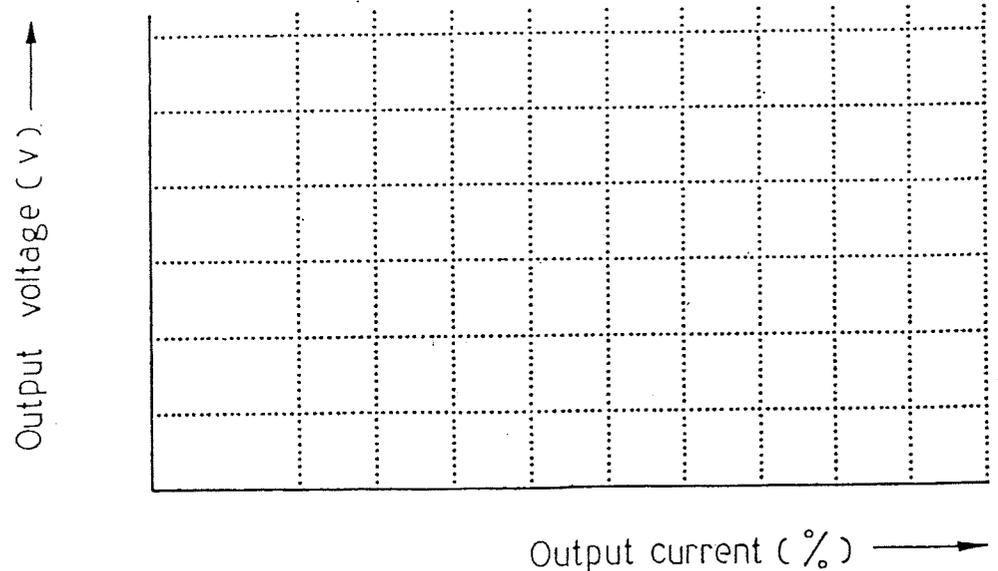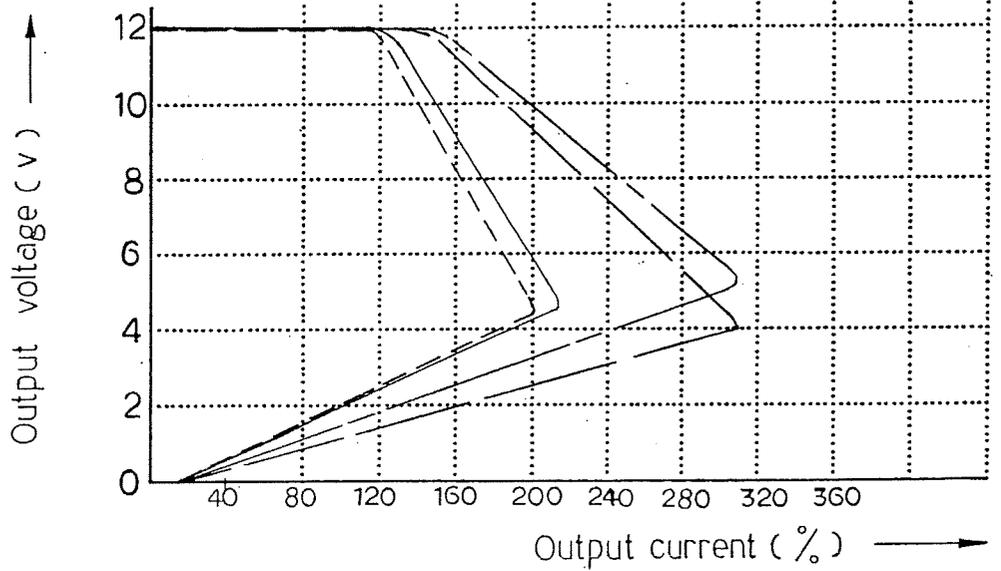
O.C.P Characteristics

Conditions Vin : AC 100 v
Ta : 0°C ————
25°C — — —
50°C — — —

5V

12V

Output current (%) ——▶

△NEMIC·LAMBDA
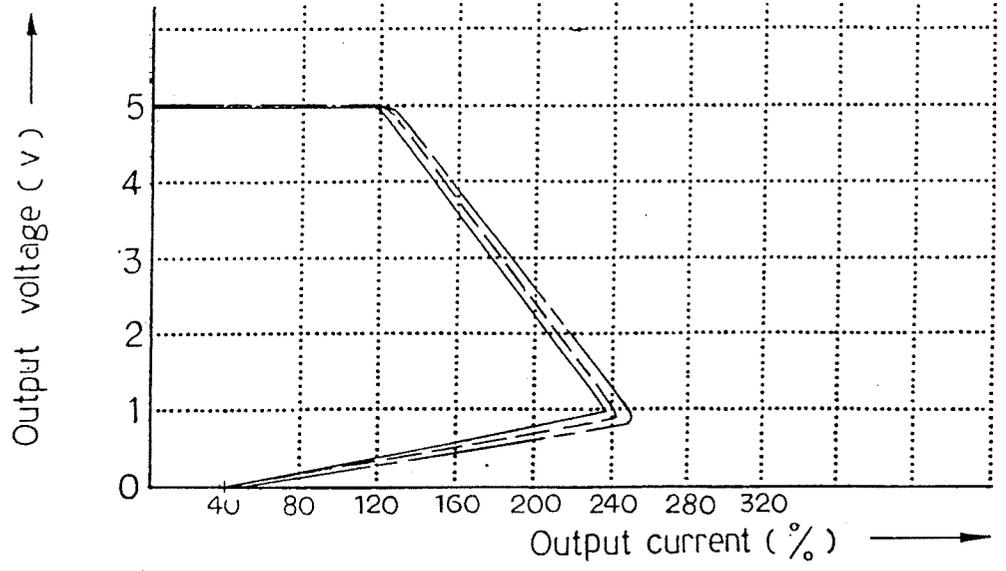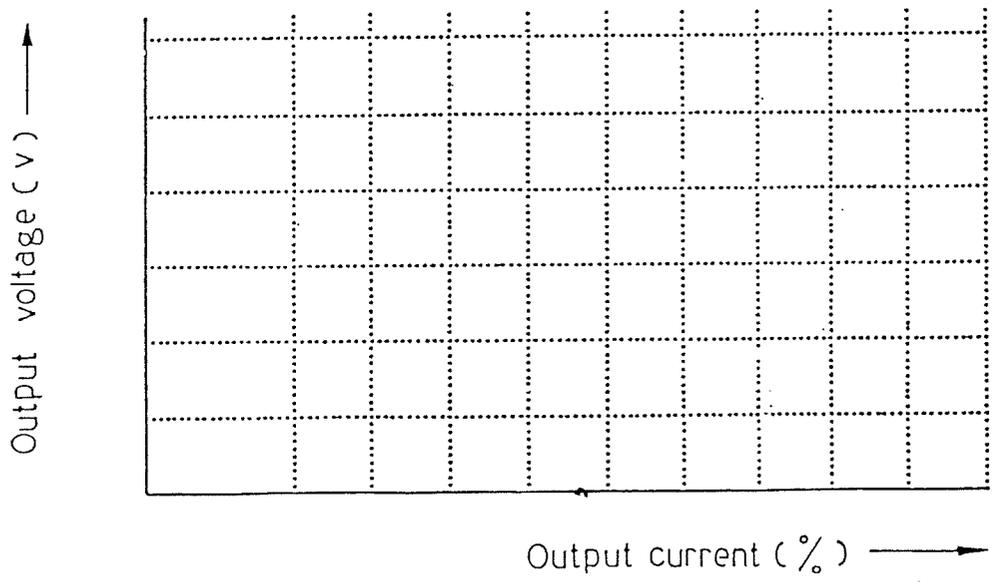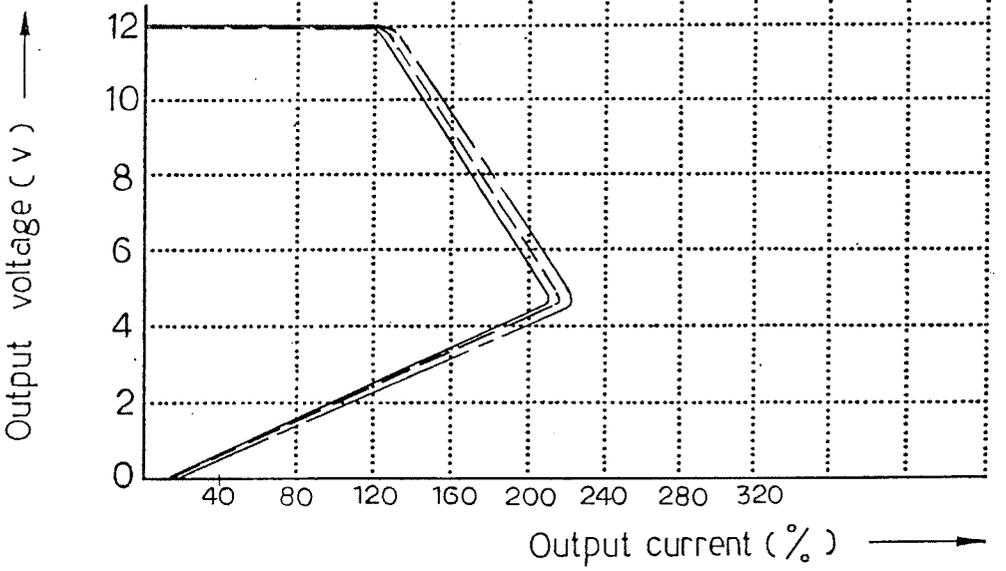
KWS 15

Conditions   Vin: AC100 v
Iout: 0 %
Ta: 25°C

5V
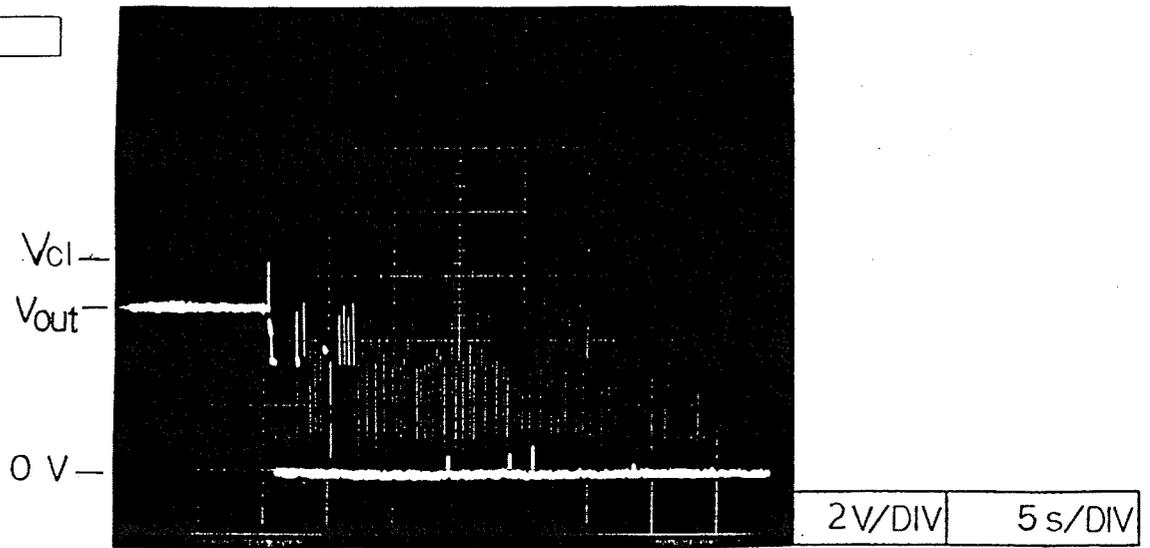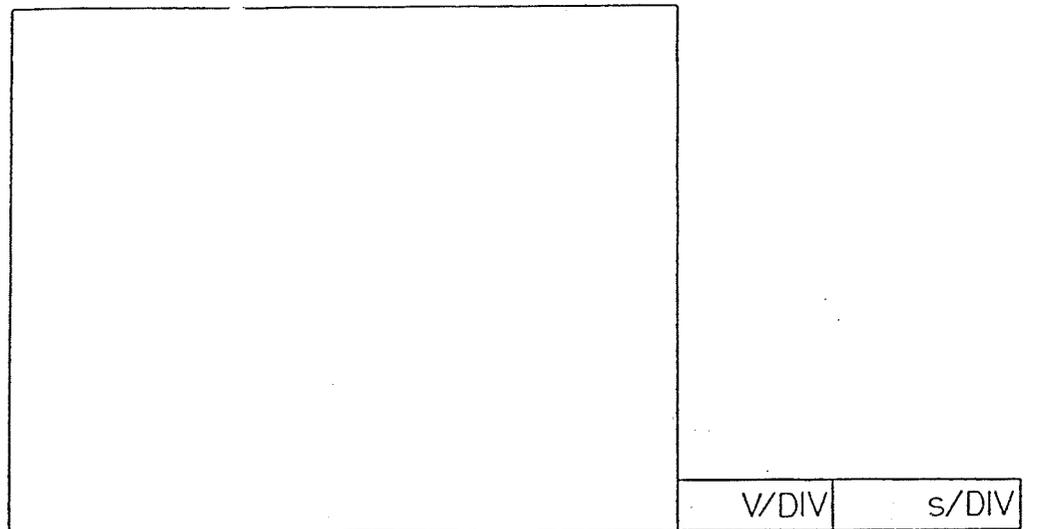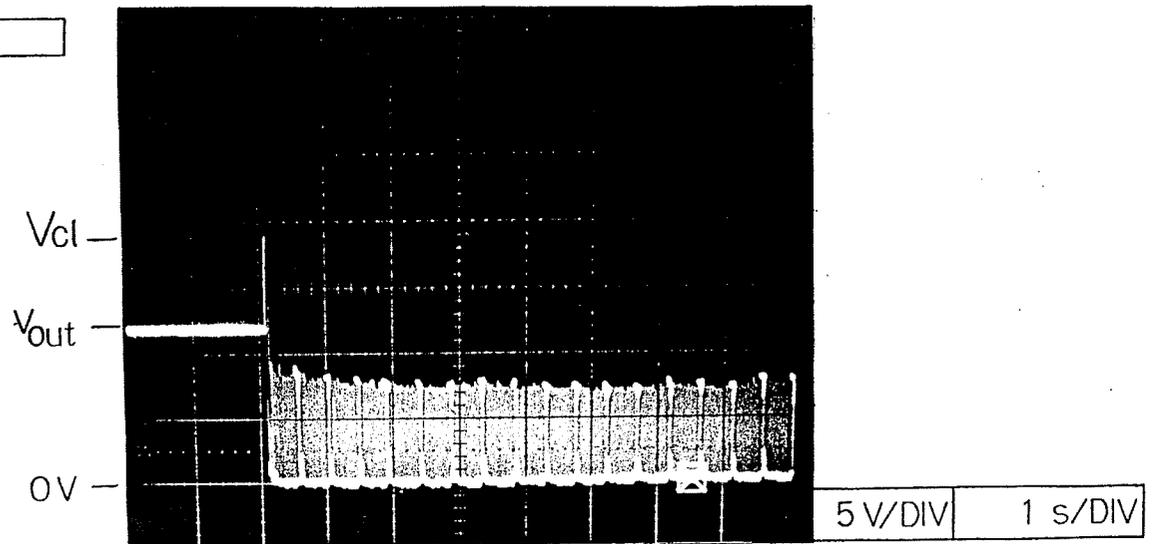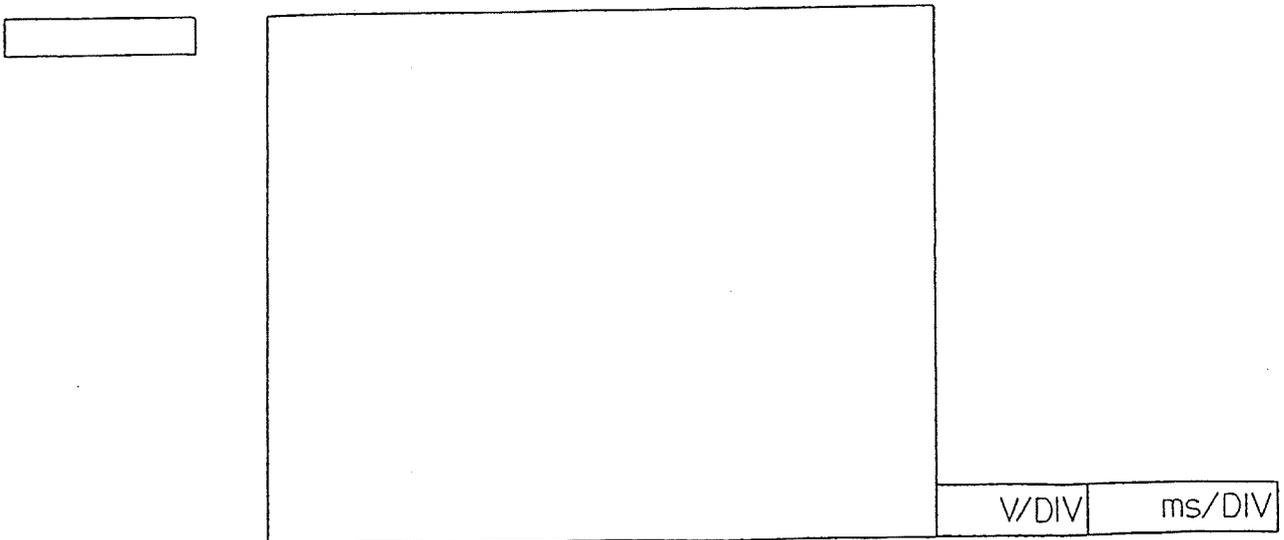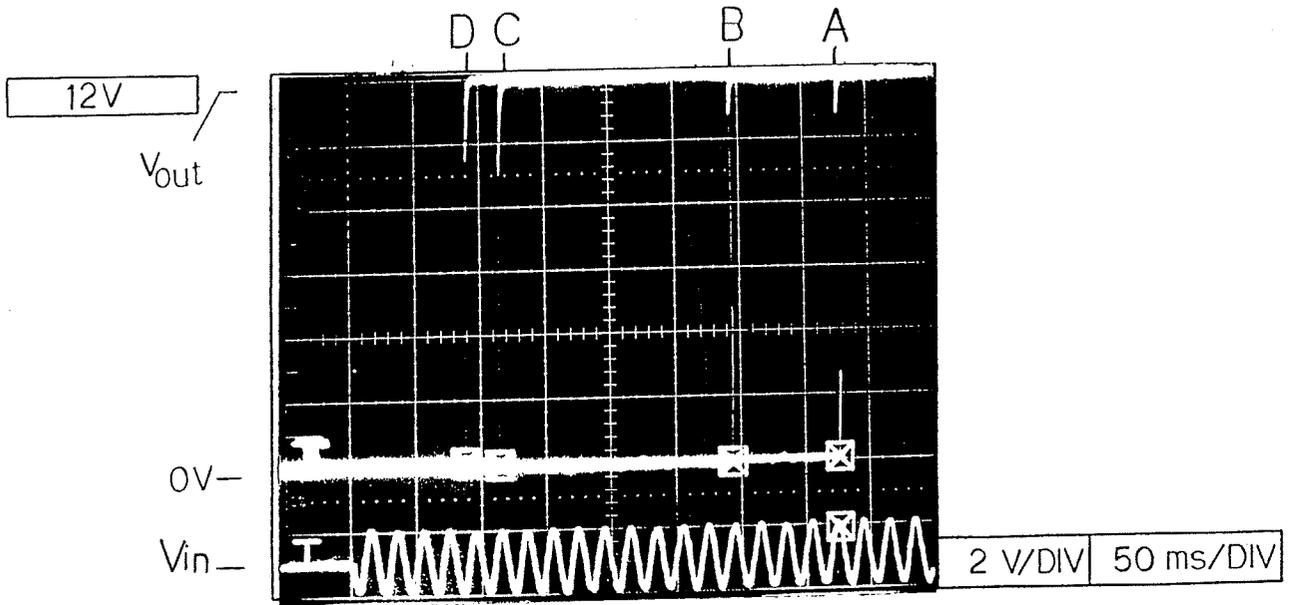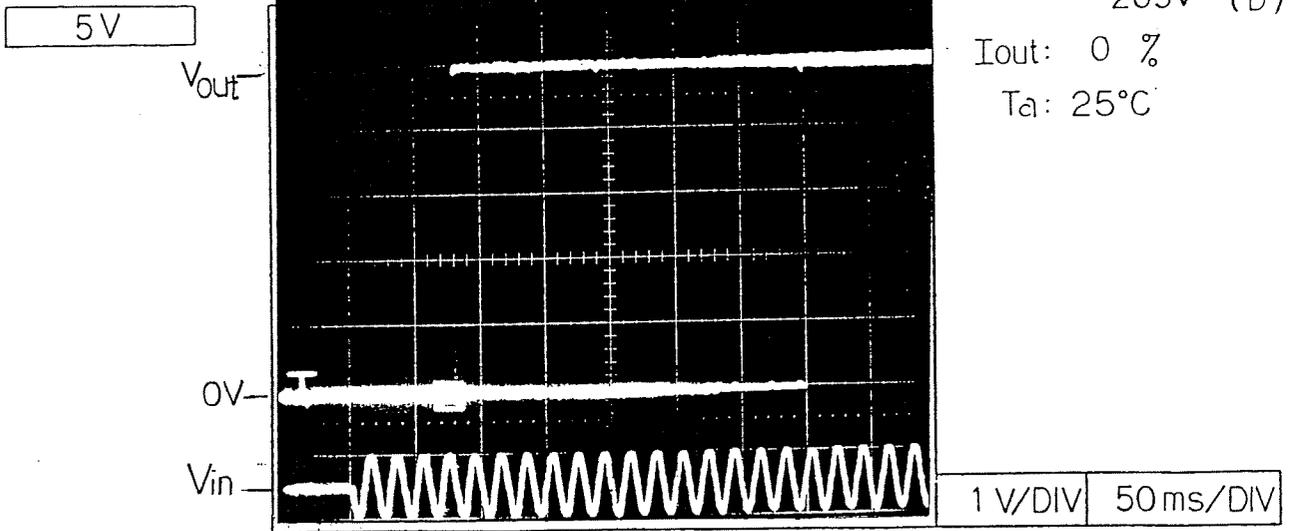
Vcl —
Vout —

0 V —

| 2V/DIV | 5 s/DIV |

12V

Vcl —

Vout —

0V —

| 5 V/DIV | 1 s/DIV |

| V/DIV | s/DIV |

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Output rise time

Conditions

Vin: AC 85v (A)
100v (B)
220v (C)
265v (D)

Iout: 0 %
Ta: 25°C

5 V

D C   B   A

Vout

0V

Vin

| 1 V/DIV | 50 ms/DIV |

12V

D C   B   A

Vout

0V

Vin

| 2 V/DIV | 50 ms/DIV |

| V/DIV | ms/DIV |

14/3

△NEMIC·LAMBDA

Output rise time

Conditions   Vin: AC 85v (A)
                      100v (B)
                      220v (C)
                      265v (D)
              Iout: 100 %
   Ta: 25°C

5V

Vout —

D C   B   A

OV —

Vin —

| 1 V/DIV | 50 ms/DIV |

12 V

Vout

D C   B   A

OV —

Vin —

| 2 V/DIV | 50 ms/DIV |

| V/DIV | ms/DIV |

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KWS 15

Conditions Vin: AC 85v (A)
100 v (B)
220 v (C)
265 v (D)
Iout: 0 %
Ta: 25°C

5V

A B　　　　C　　D

V_{out}

OV

V_{in}

1 V/DIV	0.5 s/DIV

12 V

A B　　　　C　　D

V_{out}

OV

V_{in}
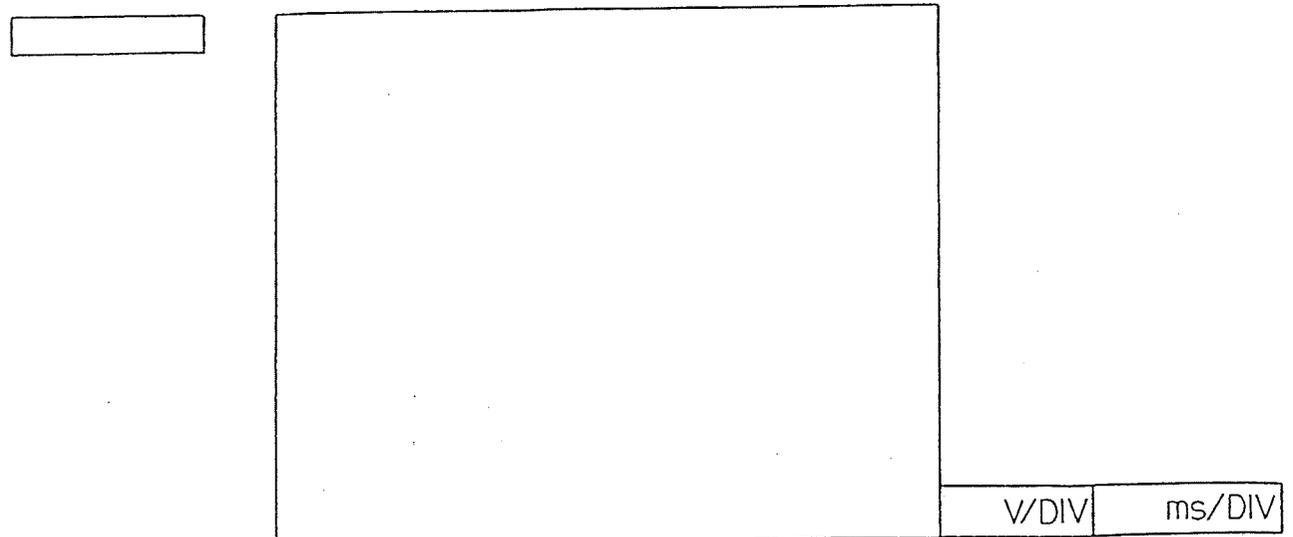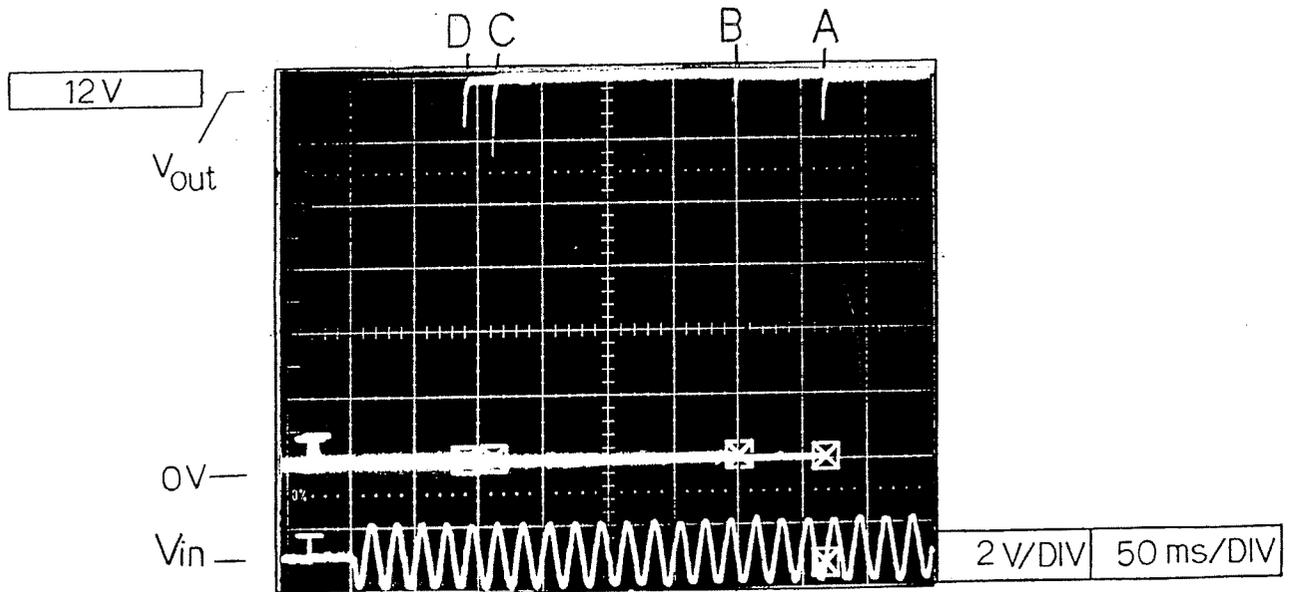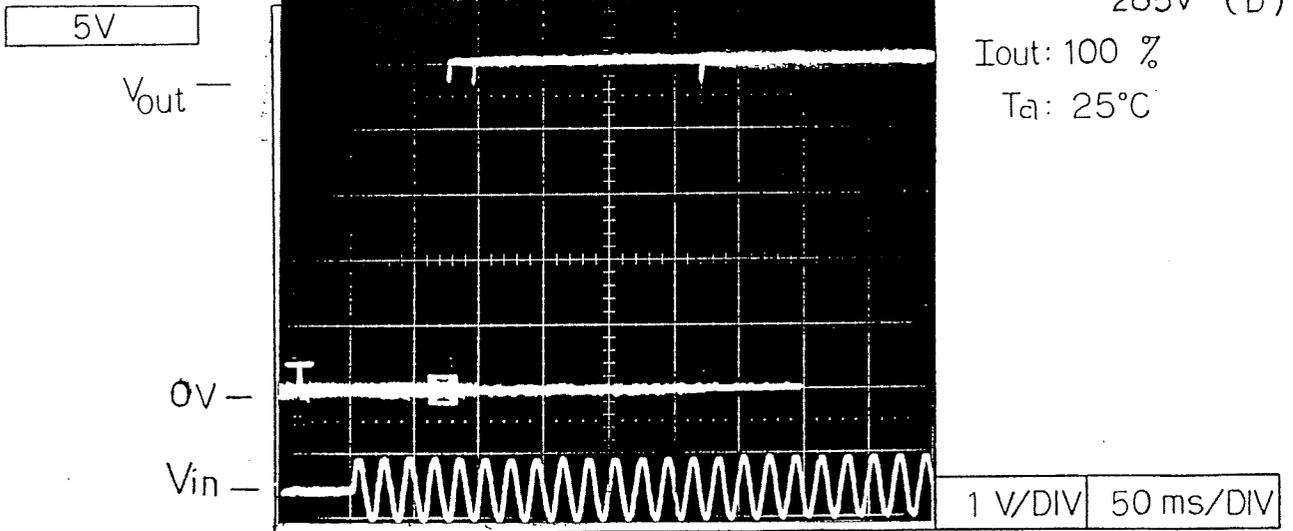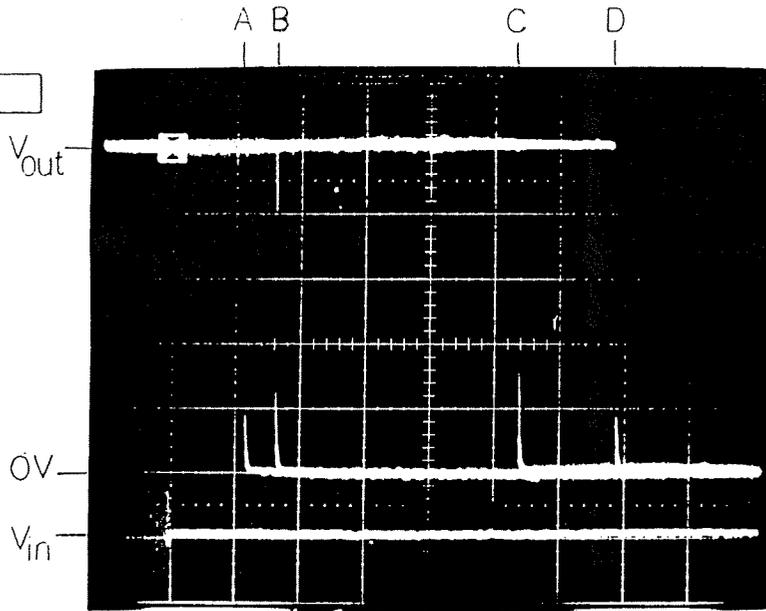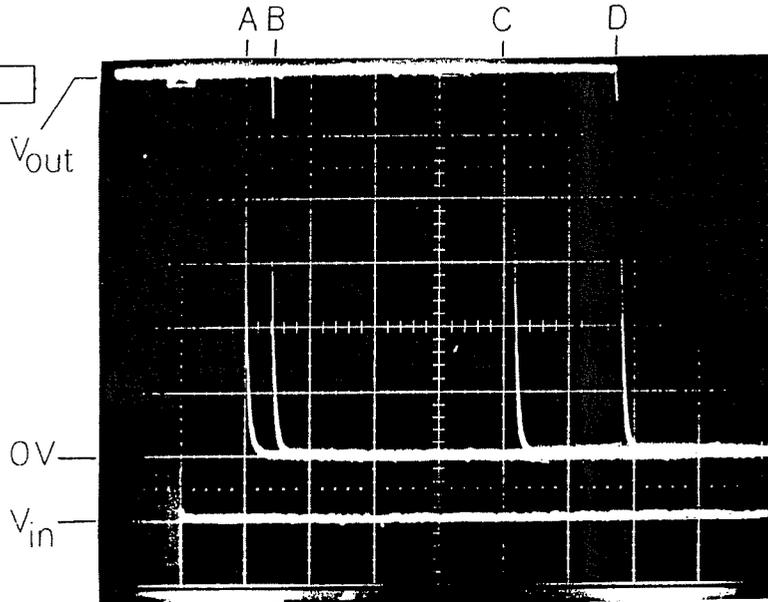
2 V/DIV	0.5 s/DIV
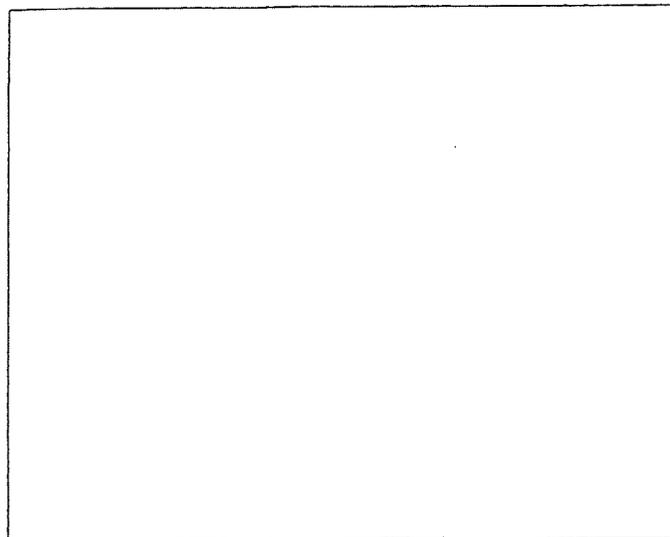
V/DIV	s/DIV

Output fall time

Conditions   Vin: AC 85v (A)
100v (B)
220v (C)
265v (D)
Iout: 100 %
Ta: 25°C

5V

V_{out}

0V

V_{in}

1 V/DIV | 50 ms/DIV

12 V

V_{out}

0V

V_{in}

2 V/DIV | 50 ms/DIV

V/DIV | s/DIV

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Hold up time

5V

Hold up time (ms) →

Output current (%) →

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Hold up time

12V
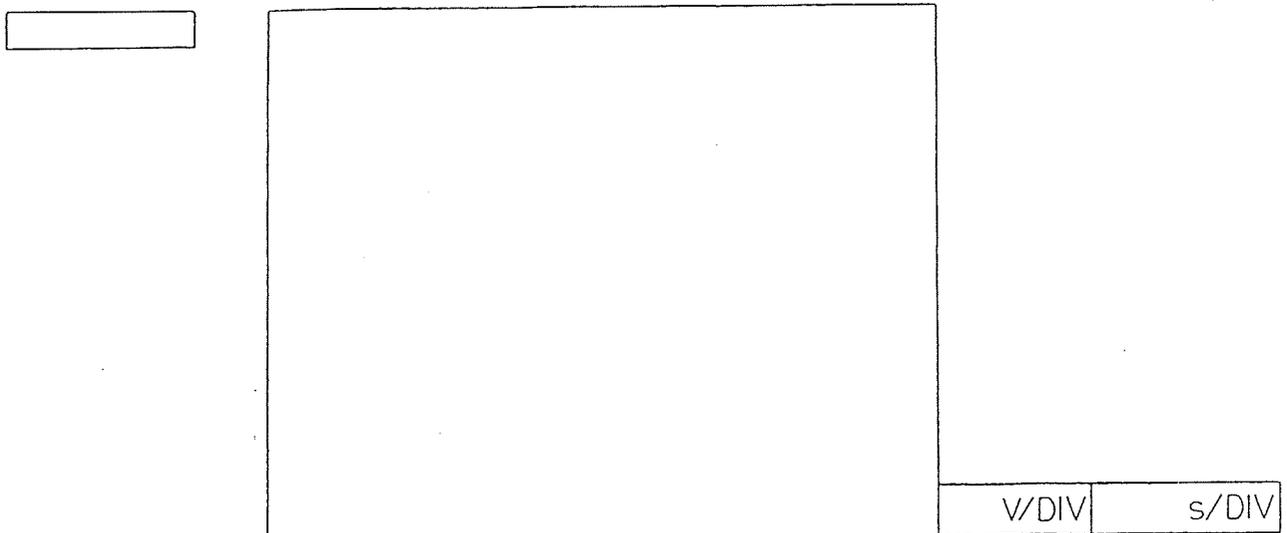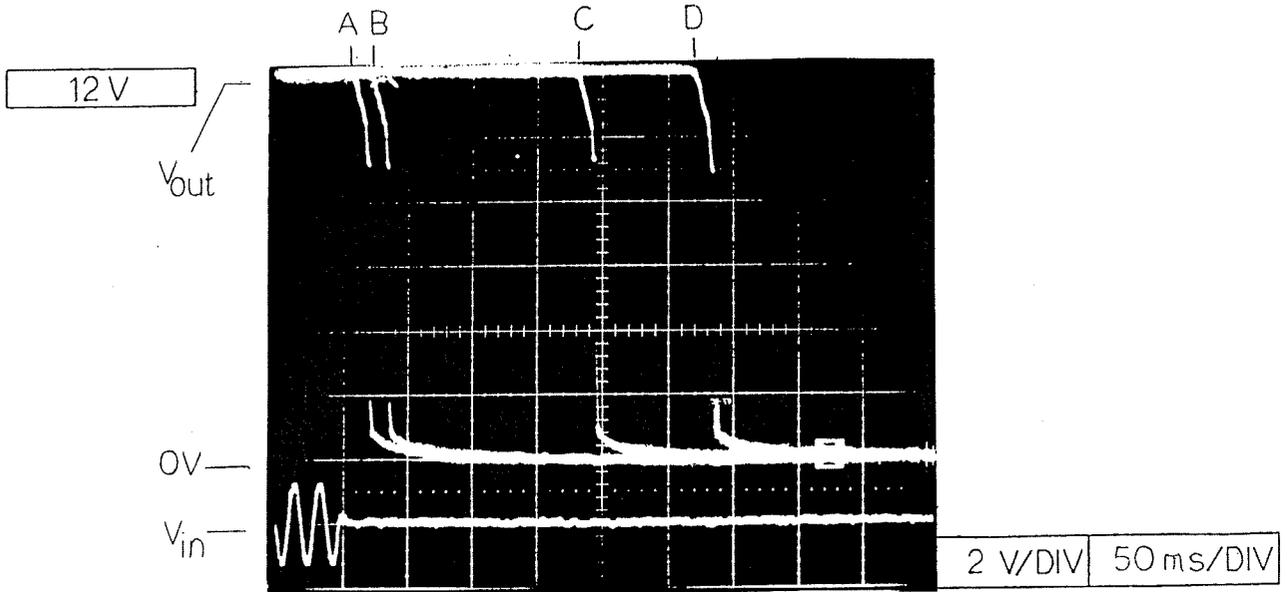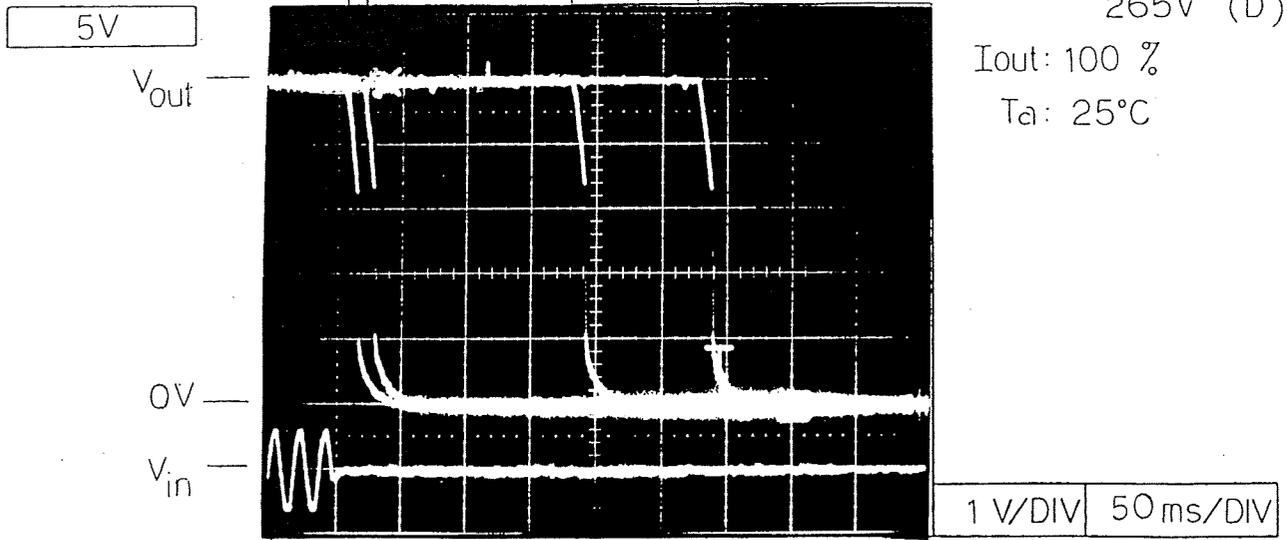
Condition Vin : AC 85v ———— A
AC 100v – – – – B
AC 220v —–—–— C
AC 265v ·········· D

Ta : 25°C

Hold up time (ms) →

Output current (%) →

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Dynamic line response

Vin : AC 85 v ⟶ AC 132 v

5V

V_out ⎯

V_in ⎯

200mV/DIV | 0.2 s/DIV

12V

V_out ⎯

V_in ⎯

200 mV/DIV | 0.2 s/DIV

△NEMIC·LAMBDA
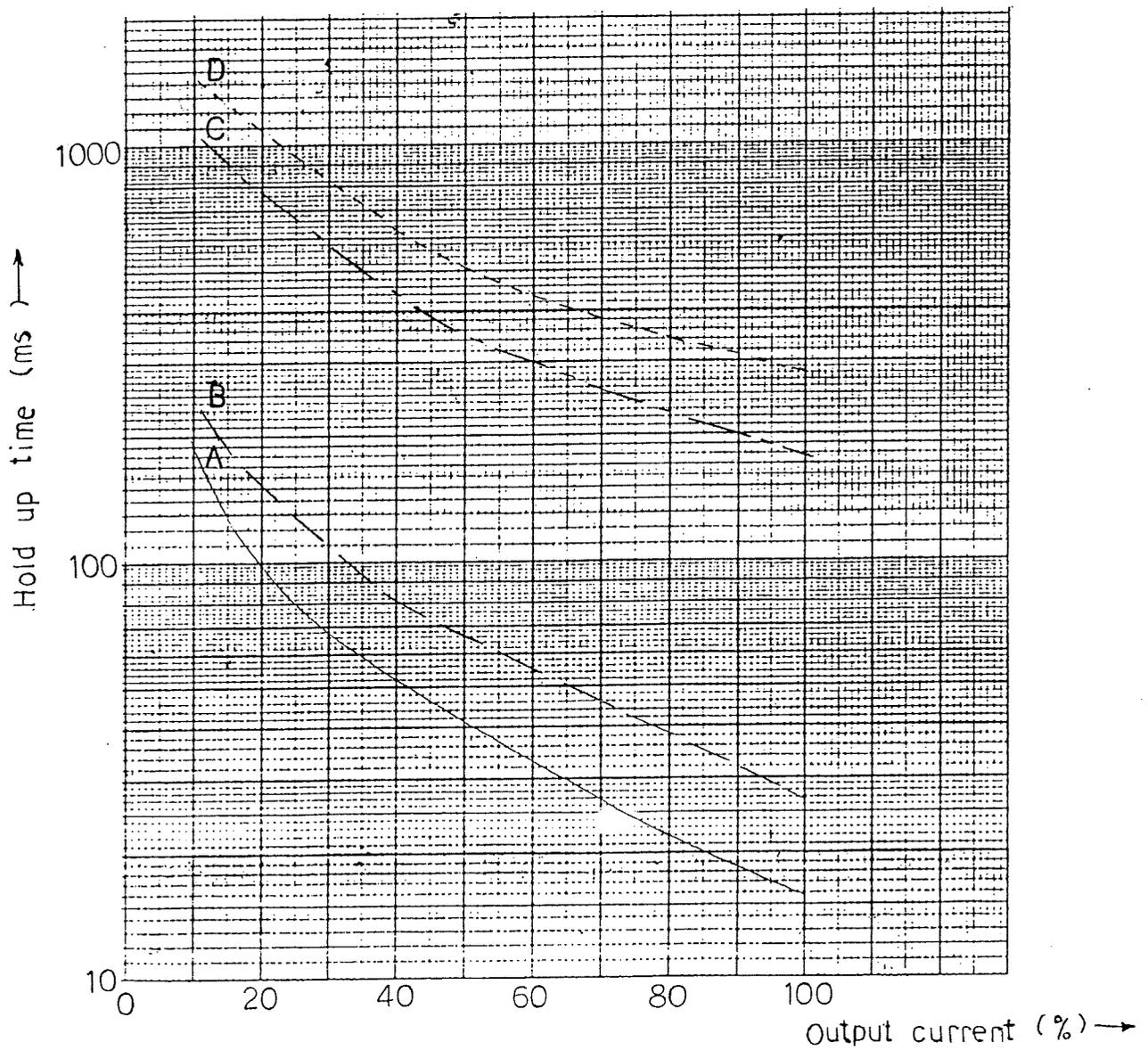
KWS 15

Vin : AC170v ←——→ AC265v

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

5v

V_{out} —

V_{in} —

| 200mV/DIV | 0.2 s/DIV |

12v

V_{out} —

V_{in} —

| 200mV/DIV | 0.2 s/DIV |

△NEMIC·LAMBDA
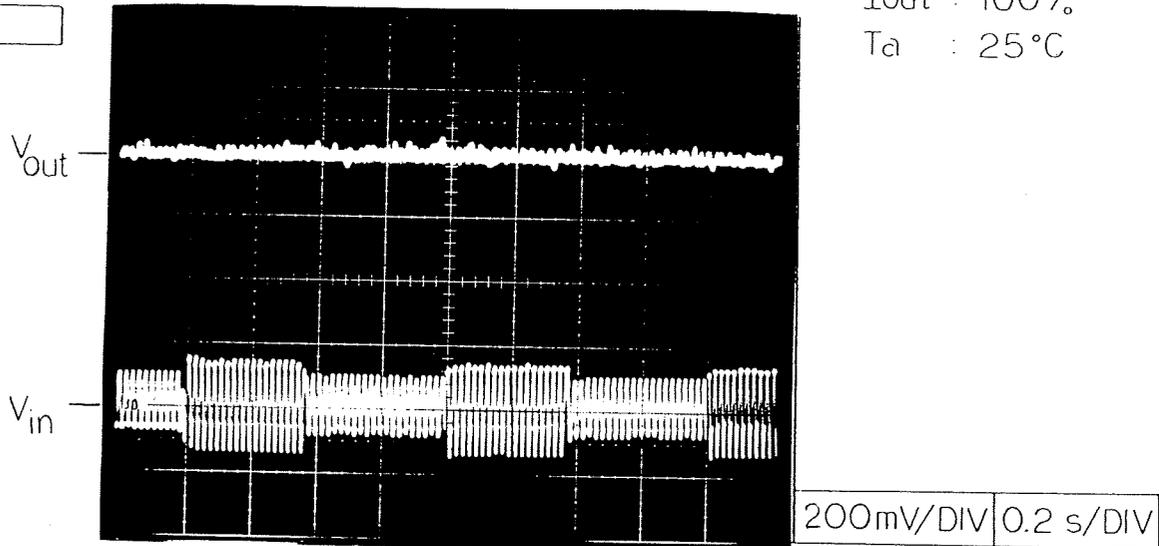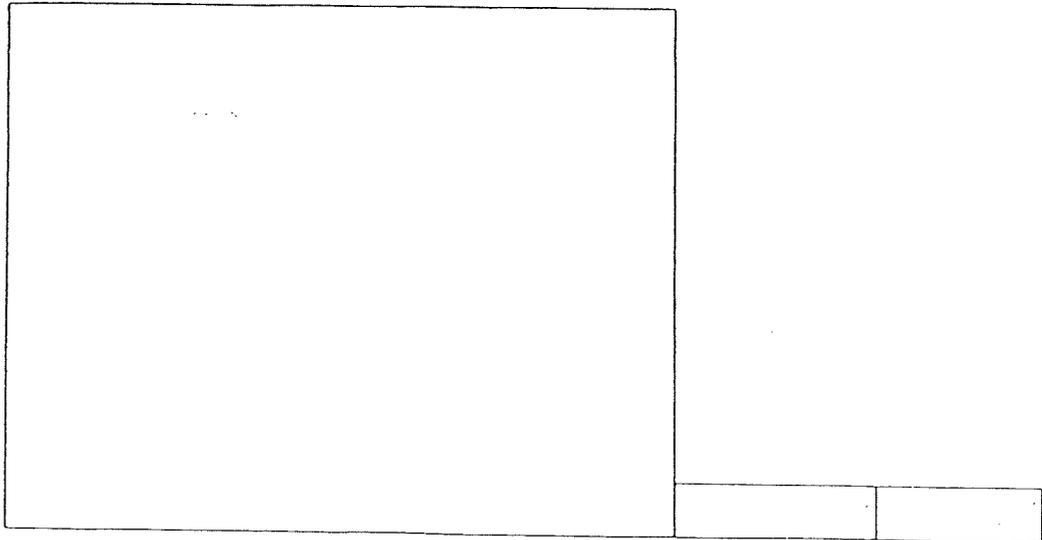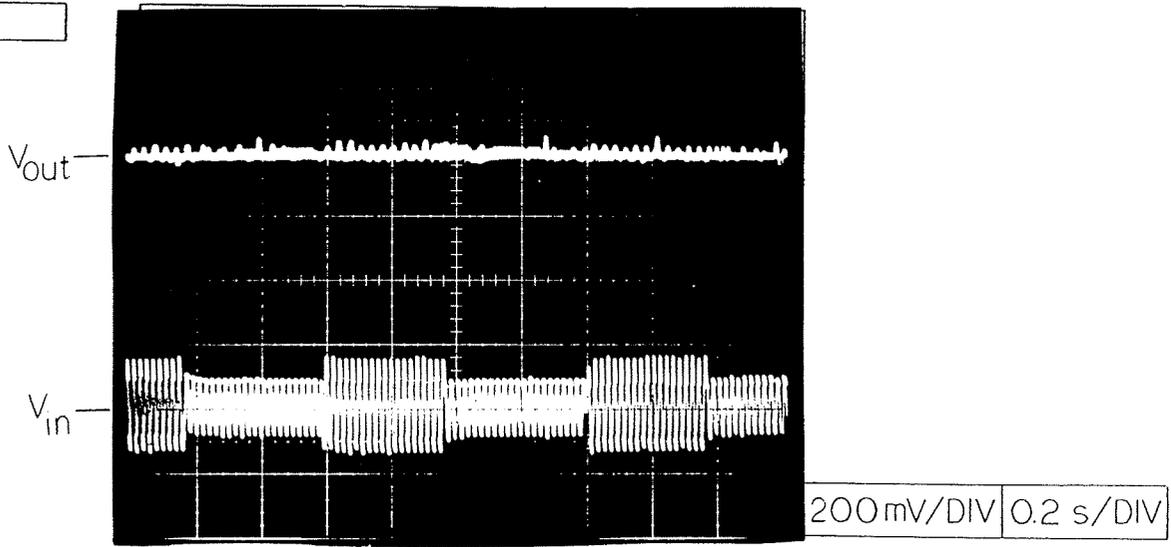
KWS 15

. Conditions   Vin : AC 100 V
                Ta : 25. °C

5V

Iout   50 ⟷ 100%   f = 100 Hz

Vout—
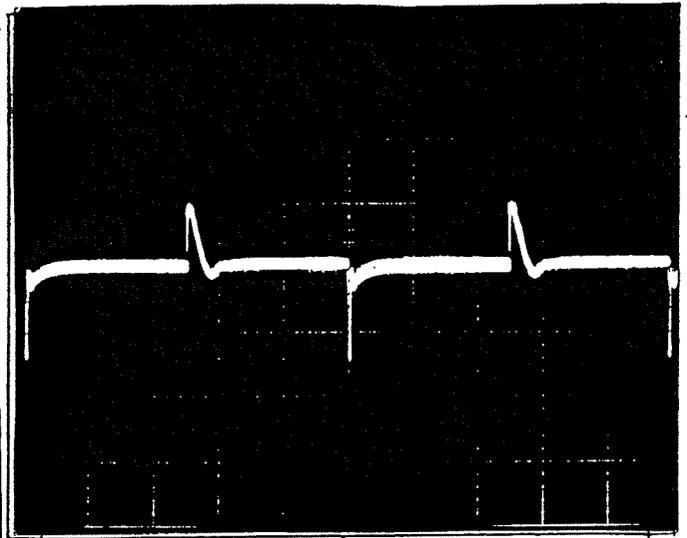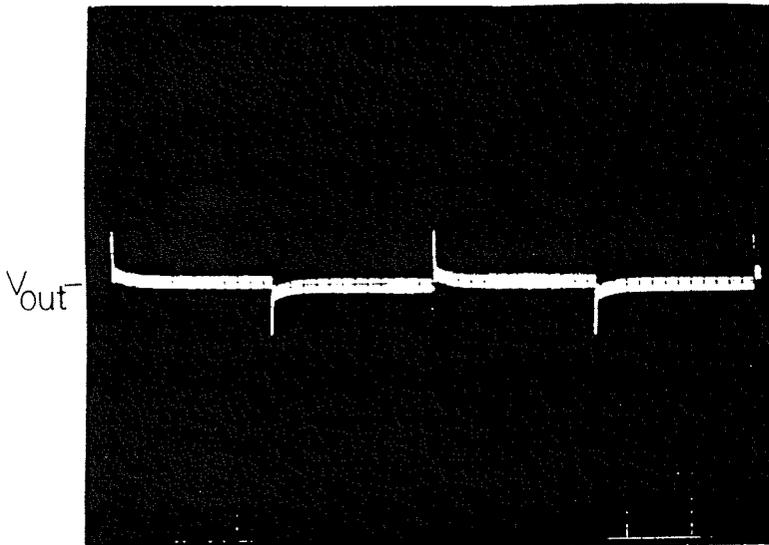
200 mv / DIV	2 mS / DIV
+3.2%	−3.2%

Iout   0 ⟷ 100%   f = 100 Hz

200 mv / DIV	2 mS / DIV
+4.0%	−5.8%

Iout 50 ⟷ 100%   f = 1 kHz

Vout—
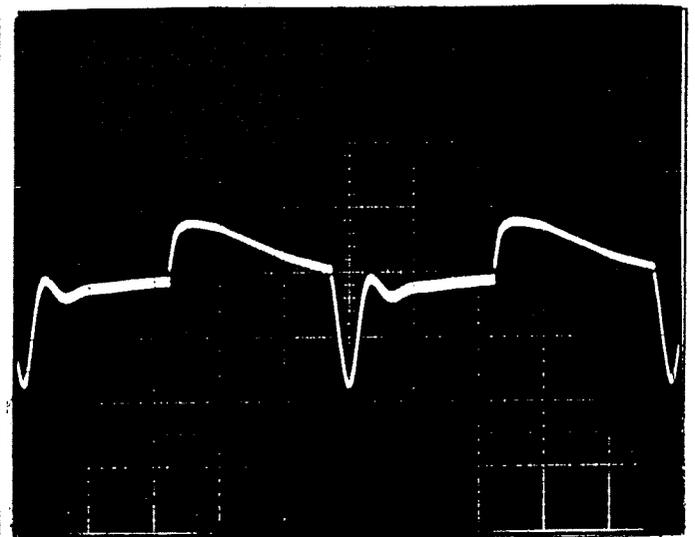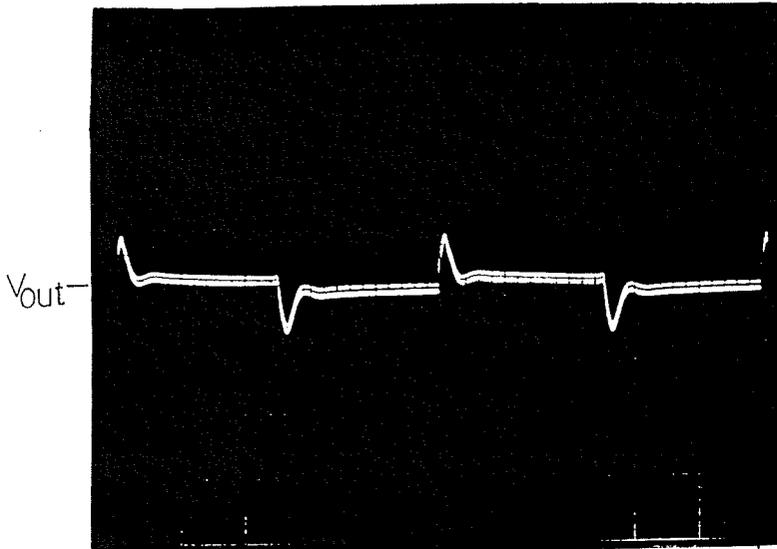
200 mv / DIV	0.2 mS / DIV
+3.2%	−3.2%

Iout   0 ⟷ 100%   f = 1 kHz

200 mv / DIV	0.2 mS / DIV
+3.6%	−7.2%

△NEMIC·LAMBDA

Conditions   Vin : AC 220 V
                      Ta : 25 °C

5V

Iout   50 ⟷ 100%   f = 100Hz
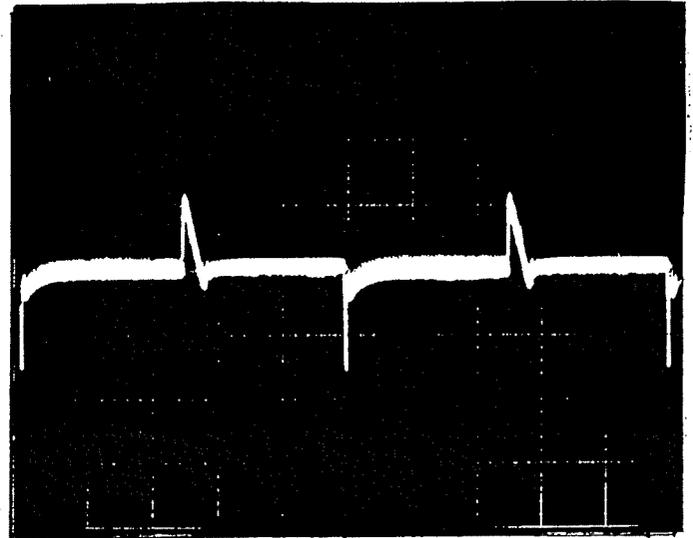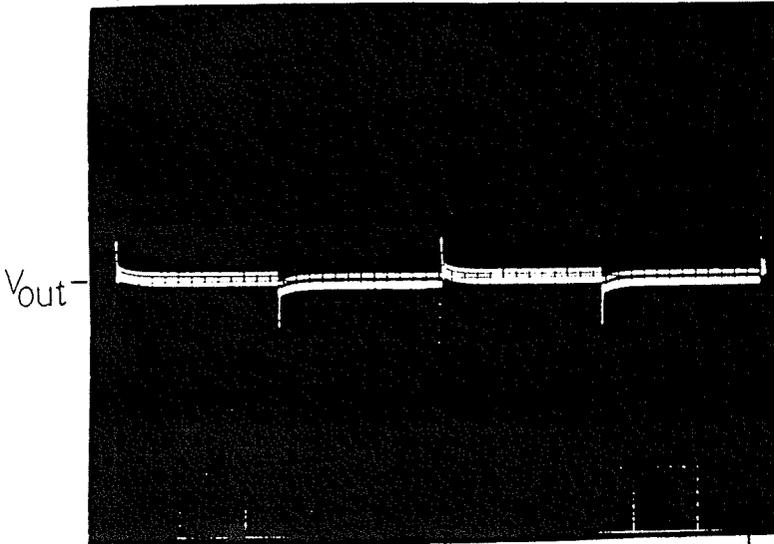
200 mv / DIV	2 mS / DIV
+3.2%	−3.2%

Iout   0 ⟷ 100%   f = 100Hz

200 mv / DIV	2 mS / DIV
+4.8%	−6.4%

Iout   50 ⟷ 100%   f = 1 kHz
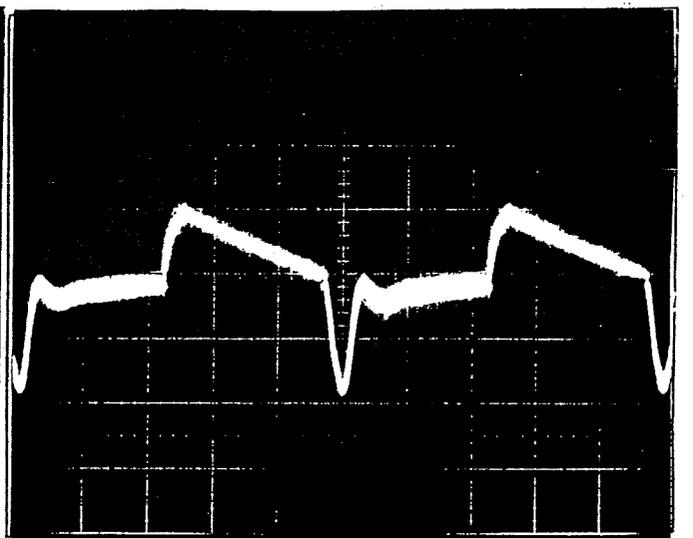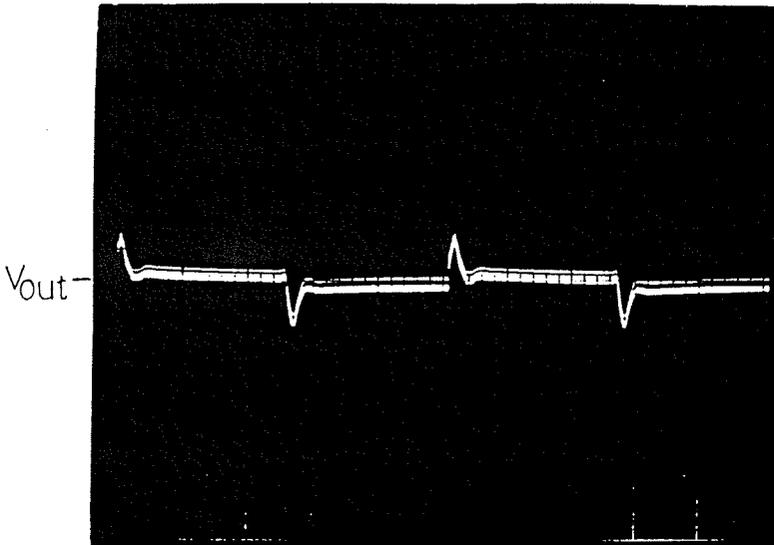
200 mv / DIV	0.2 mS / DIV
+3.2%	−3.2%

Iout   0 ⟷ 100%   f = 1 kHz

200 mv / DIV	0.2 mS / DIV
+4.4%	−7.6%

△NEMIC·LAMBDA

KWS 15

Conditions　　Vin : AC 100 V
　　　　　　　　Ta : 25 ℃

12V

Iout　50 ⟷ 100 %　　f = 100 Hz

Vout —

200 mv / DIV	2 mS / DIV
+1.8%	−1.8%

Iout　0 ⟷ 100 %　　f = 100 Hz
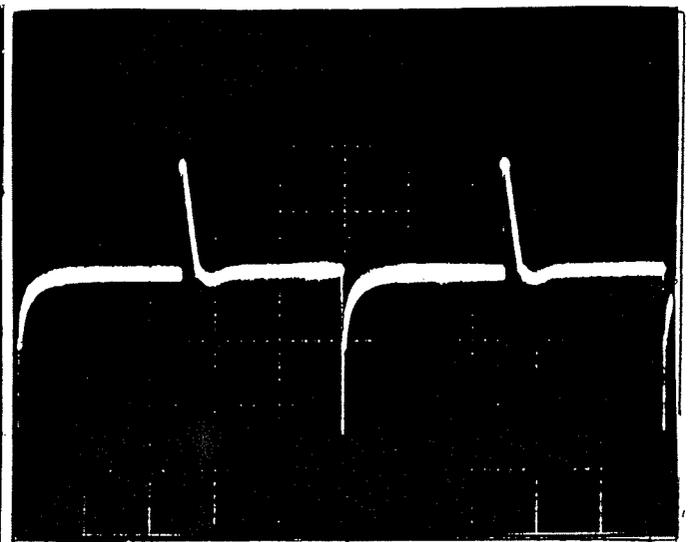
200 mv / DIV	2 mS / DIV
+3.0%	−4.2%

Iout　50 ⟷ 100 %　　f = 1 kHz

Vout —
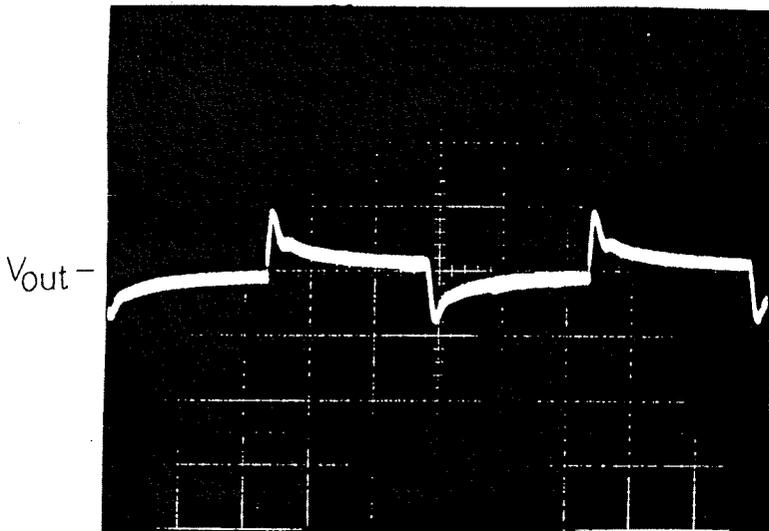
200 mv / DIV	0.2 mS / DIV
+1.7%	−1.7%

Iout　0 ⟷ 100 %　　f = 1 kHz
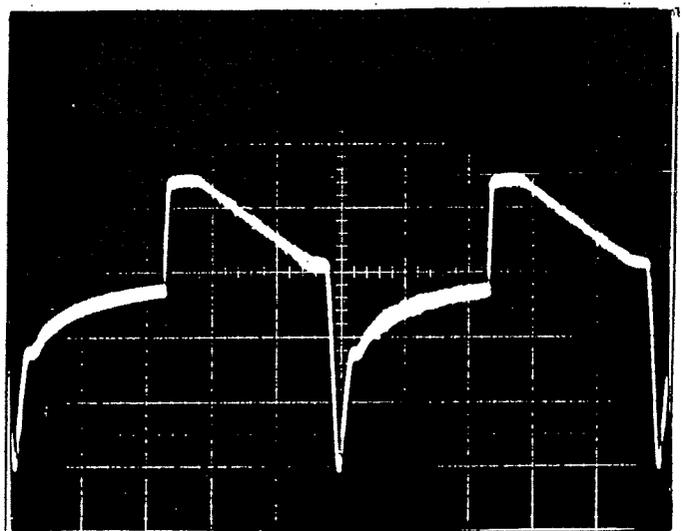
200 mv / DIV	0.2 mS / DIV
+2.7%	−5.2%

△NEMIC·LAMBDA

KWS 15

Conditions   Vin : AC 220 V
              Ta : 25 °C

12V

Iout   50 ←→ 100%   f = 100Hz

Vout —
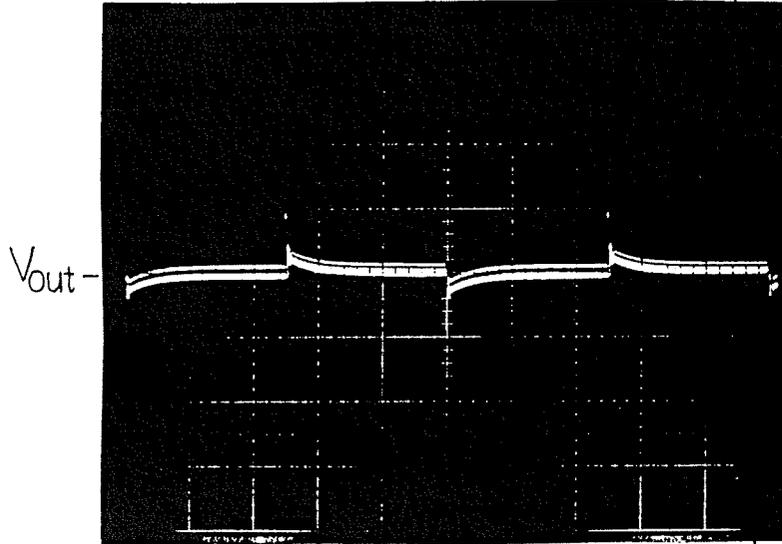
200 mv / DIV	2 mS / DIV
+1.7%	−1.5%

Iout   0 ←→ 100%   f = 100Hz
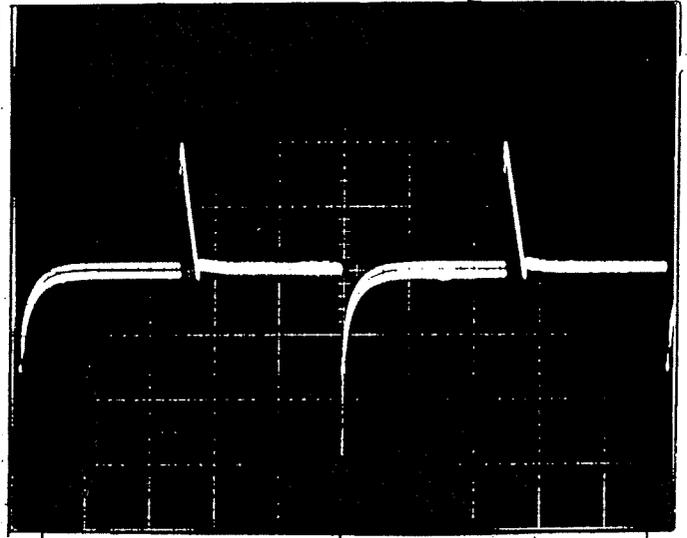
200 mv / DIV	2 mS / DIV
+3.3%	−4.8%

Iout   50 ←→ 100%   f = 1kHz

Vout —
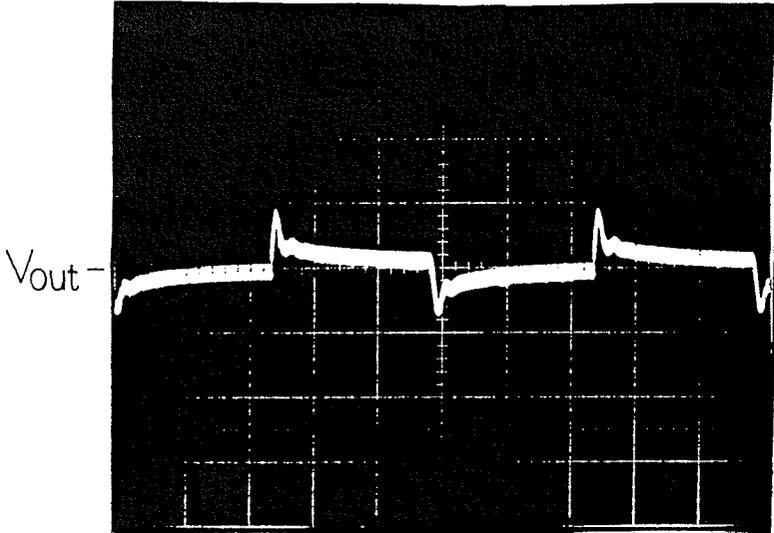
200 mv / DIV	0.2 mS / DIV
+1.7%	−1.4%

Iout   0 ←→ 100%   f = 1kHz
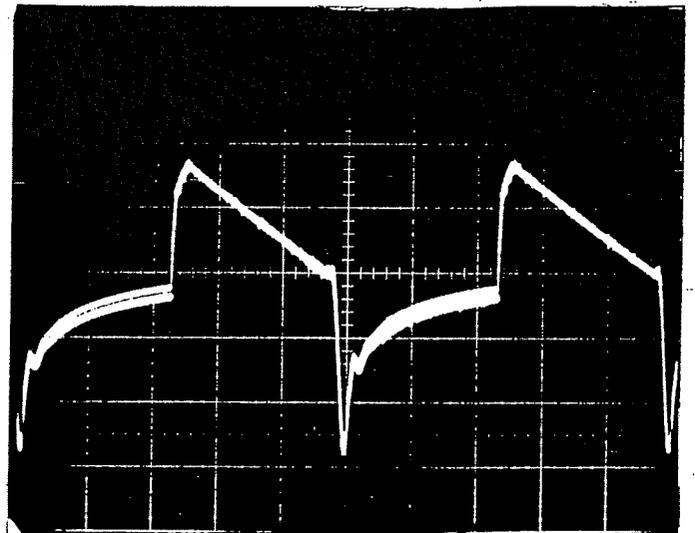
200 mv / DIV	0.2 mS / DIV
+3.0%	−4.8%

NEMIC·LAMBDA

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

5 V
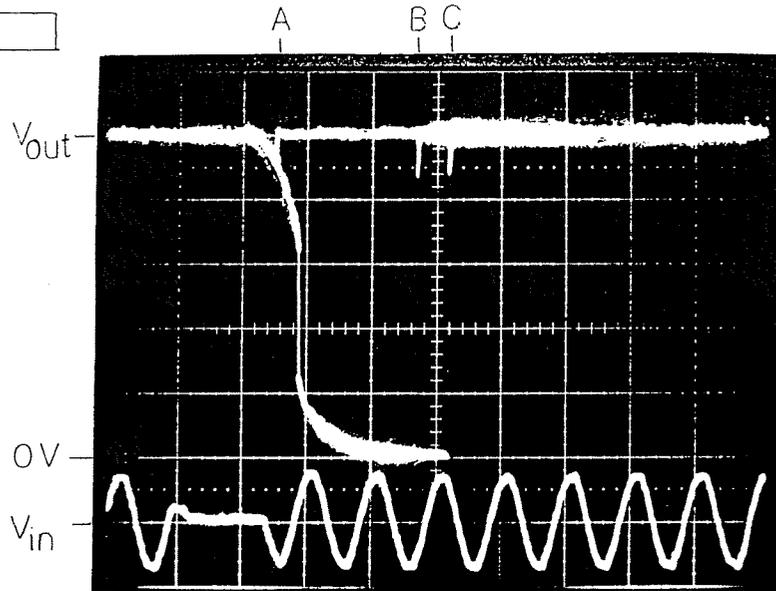
Brown out time :

A : 30 ms

B : 39 ms

C : 49 ms

V_out

0 V

V_in

1 V /DIV 20ms/DIV

12V

V_out

A : 30 ms

B : 39 ms

C : 59 ms

0 V

V_in

2 V /DIV 20ms/DIV

A :   ms

B :   ms

C :   ms

/DIV /DIV

ΛNEMIC·LAMBDA
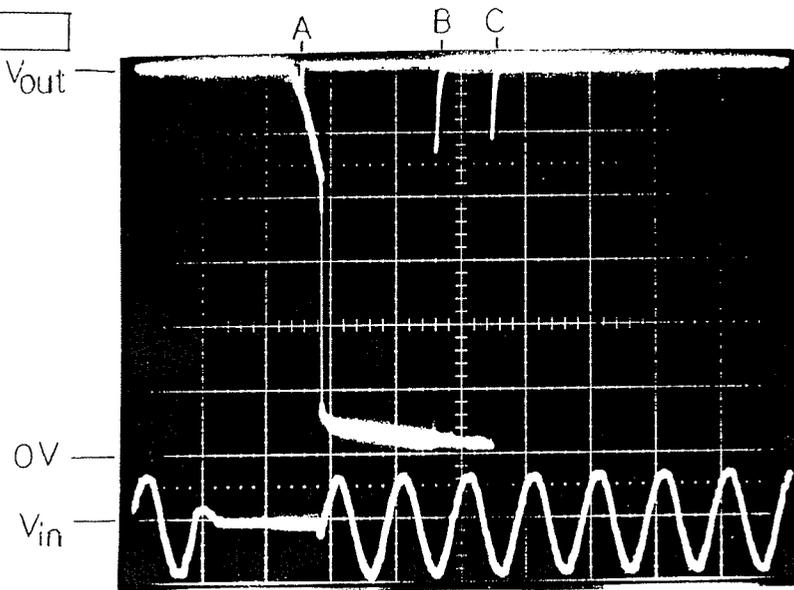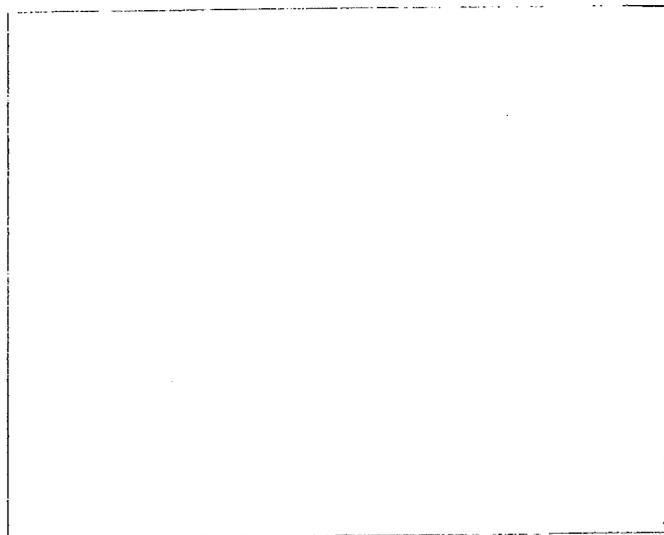
KWS 15

Conditions Vin : AC 220v
Iout:100%
Ta :25°C

5V

Vout

OV

Vin
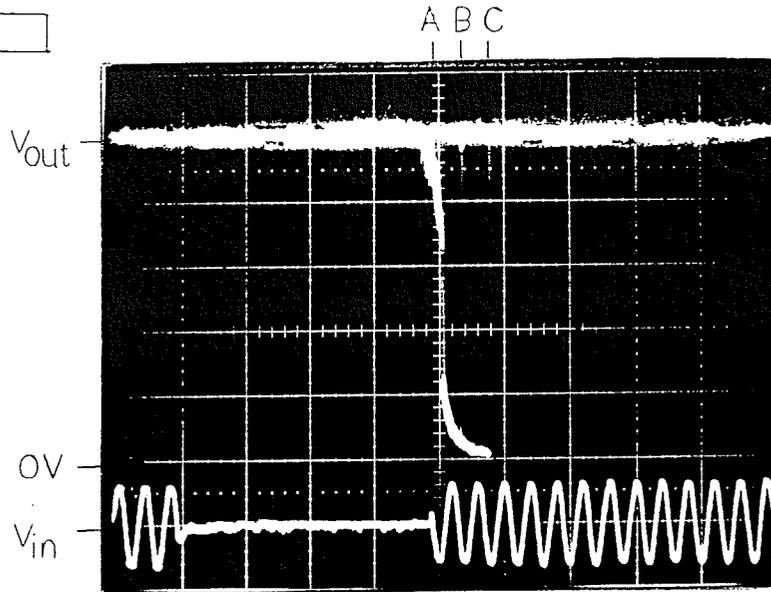
Brown out time :

A : 198 ms

B : 206ms

C : 226ms
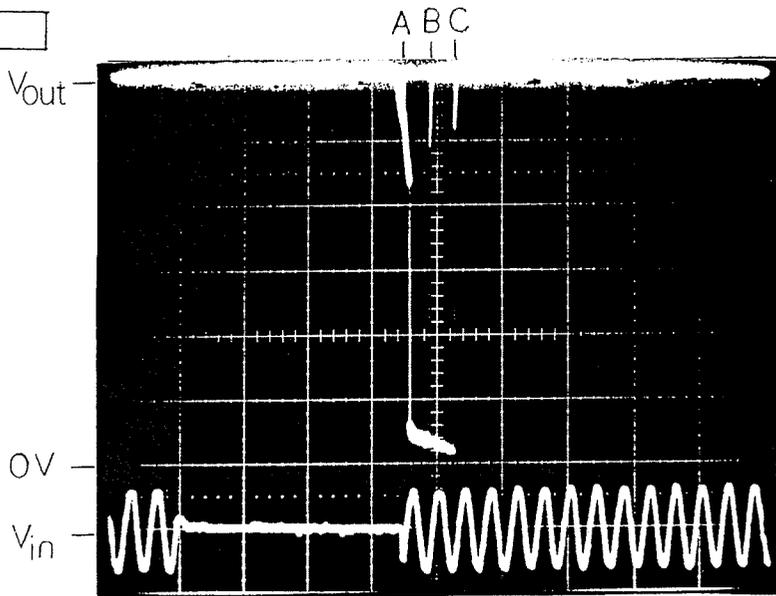
A B C

1V/DIV 50ms/DIV

12V

Vout

OV

Vin

A B C

A : 176 ms

B : 182 ms

C : 200 ms

2V/DIV 50ms/DIV

A : ms

B : ms

C : ms

/DIV /DIV

△NEMIC·LAMBDA
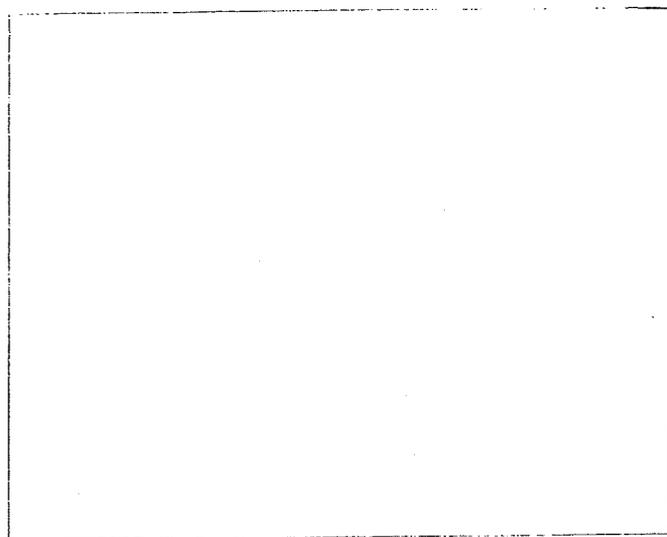
Inrush Current Characteristics

KWS 15

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

(Max) Inrush Current (A)

Brown out time (s)

△NEMIC·LAMBDA
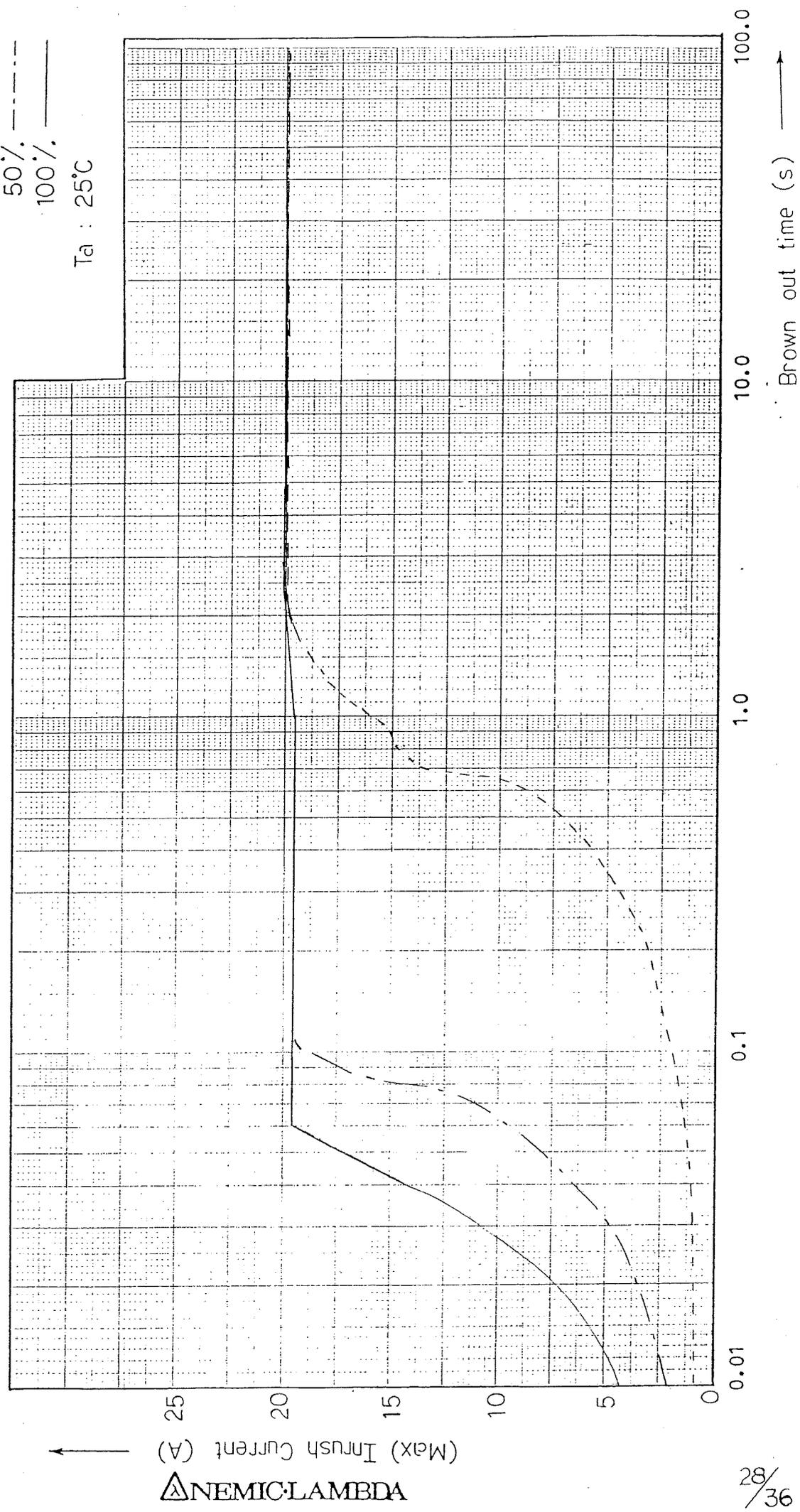
Inrush Current Characteristics

Vin : AC 230v
Iout :
- 0% ------
- 50% -·-·-
- 100% ——

Ta : 25°C
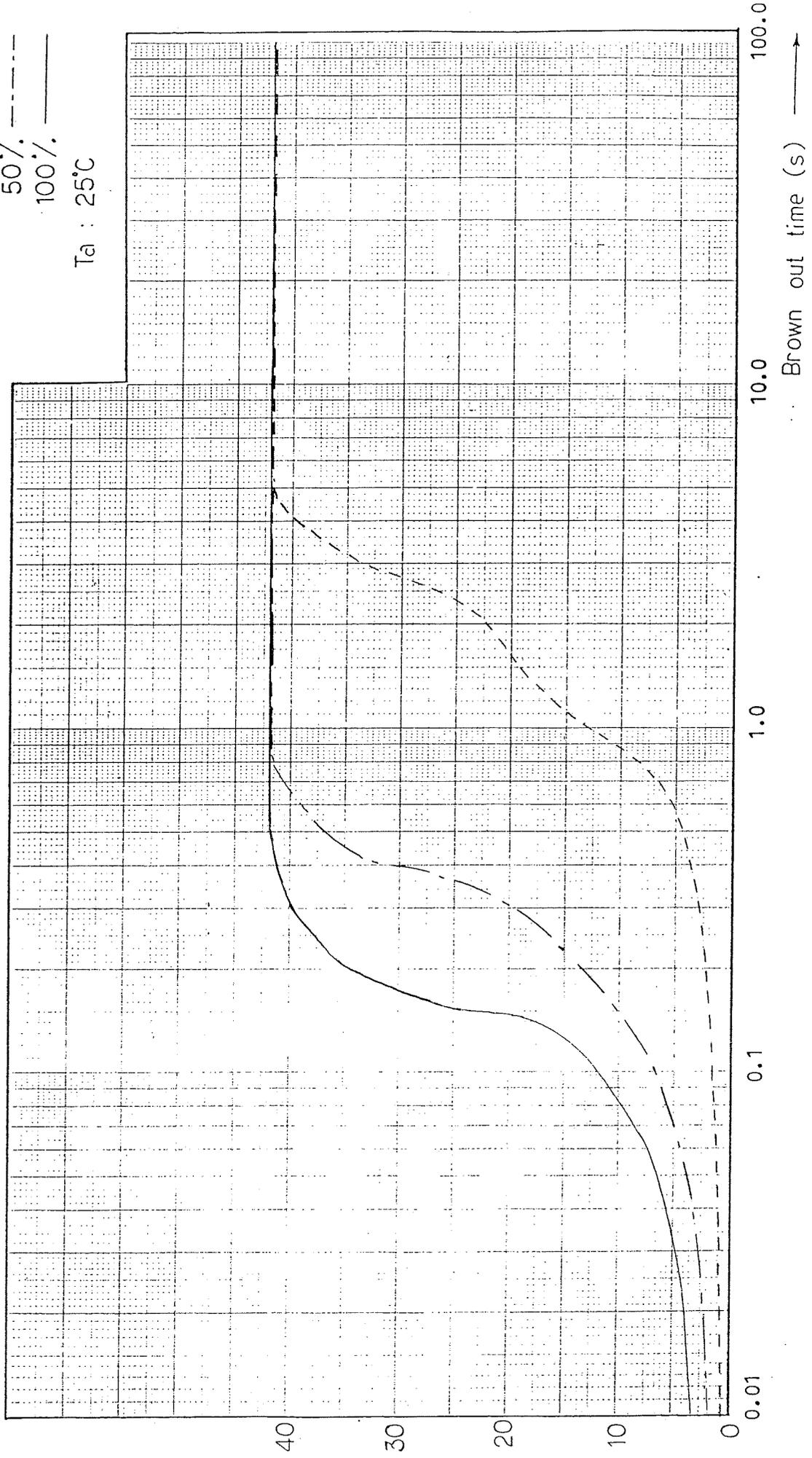
(Max) Inrush Current (A)

Brown out time (s)

△NEMIC·LAMBDA

KWS 15

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

Switch in phase angle
  of input AC voltage

$\phi = 0°$

—I_{in}

—V_{in}

10 A /DIV	20 ms /DIV

Switch in phase angle
  of input AC voltage

$\phi = 90°$

—I_{in}

—V_{in}

10 A /DIV	20 ms /DIV

ΛNEMIC·LAMBDA

KWS 15

Switch in phase angle
of input AC voltage

$\phi = 0°$

— I_{in}

— V_{in}

20 A /DIV	20 ms /DIV

Switch in phase angle
of input AC voltage

$\phi = 90°$

— I_{in}

— V_{in}

20 A /DIV	20 ms /DIV
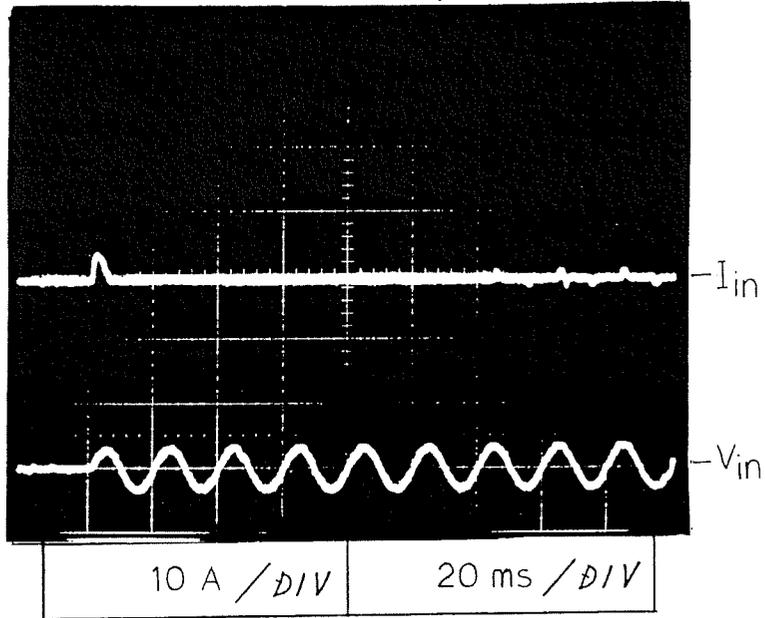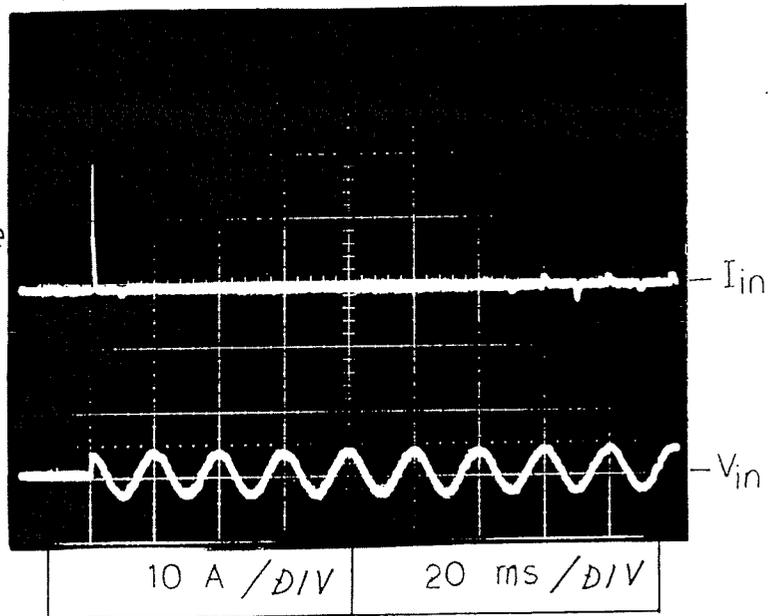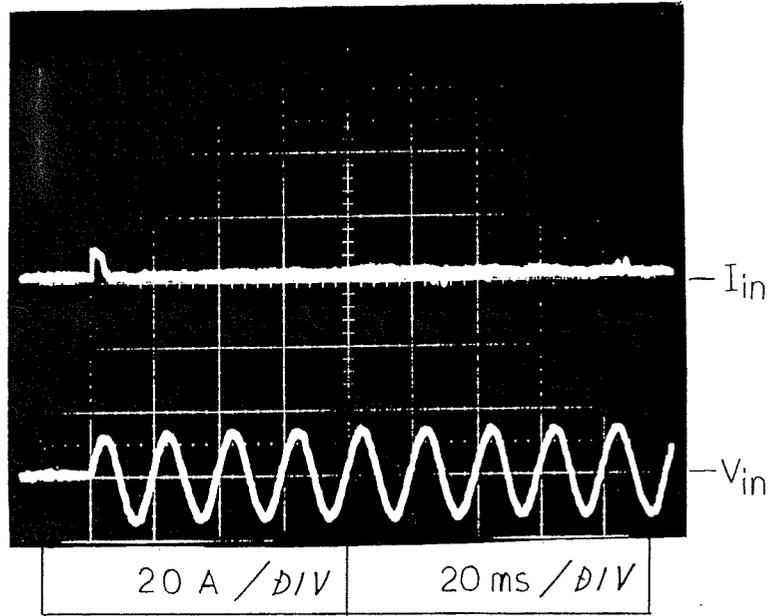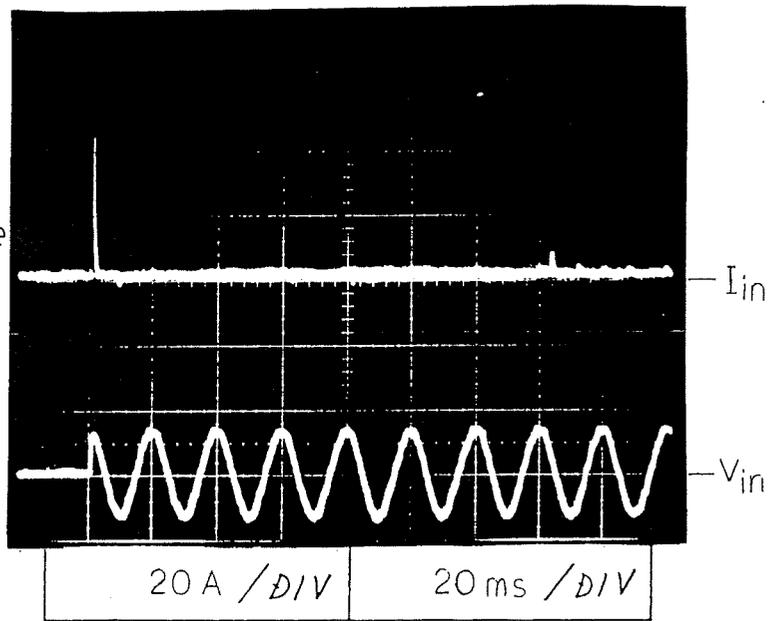
Leakage current

Conditions   Iout : 100% ———
0% -----
Ta : 25℃

5V

12V

Vin   (V) ——→

△NEMIC·LAMBDA
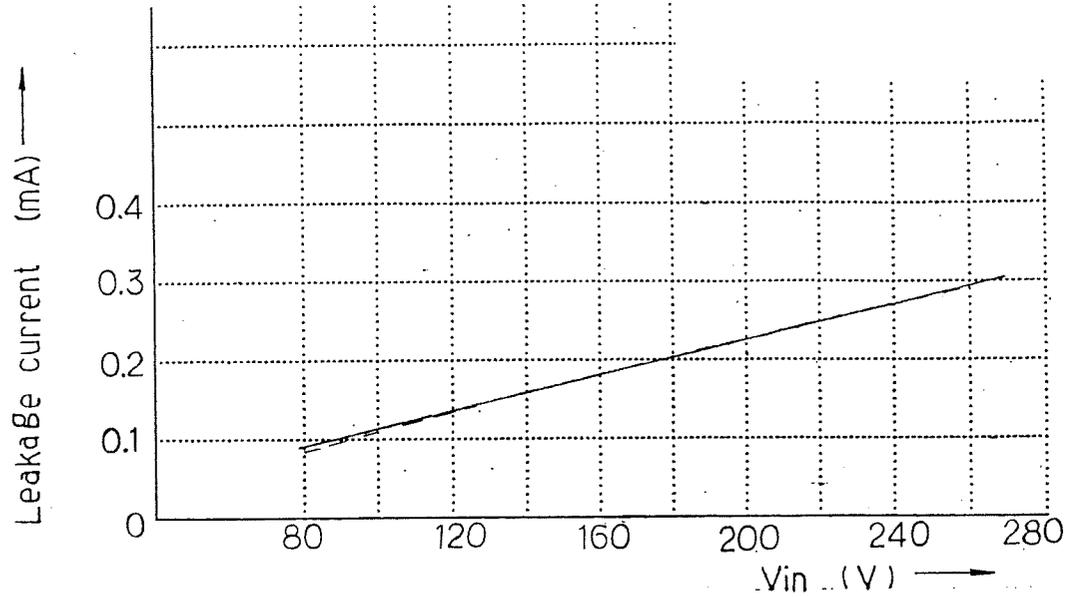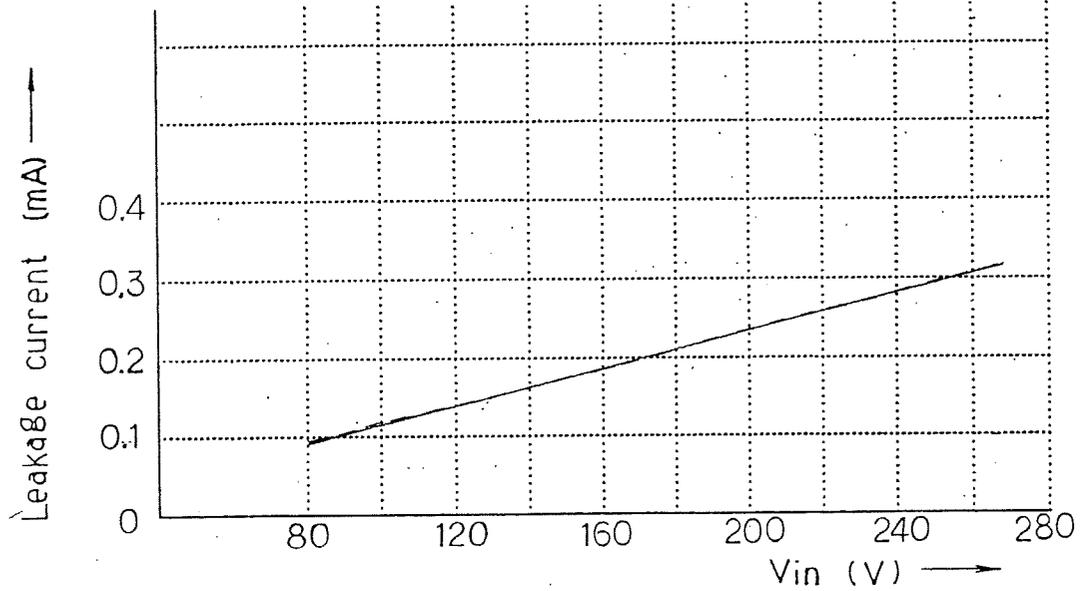
OUTPUT—RIPPLE , NOISE

KWS 15

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

NORMAL MODE

5 V

20 mV/DIV	2 μs/DIV

12 V

20 mV/DIV	2 μs/DIV

mV/DIV	μs/DIV

ANEMIC·LAMBDA

OUTPUT−RIPPLE , NOISE

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

NORMAL MODE

5 V
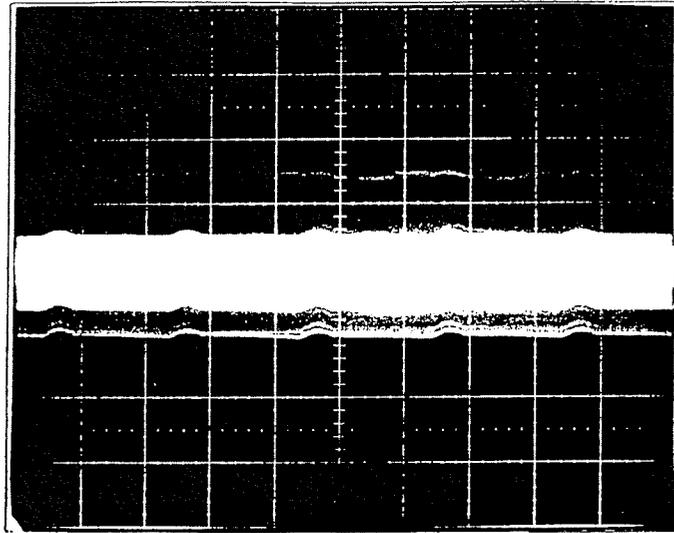
20 mV/DIV	5 ms/DIV

12 V
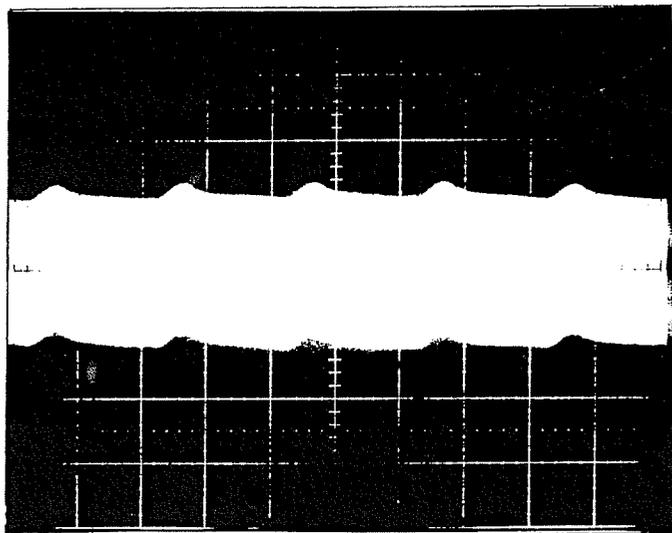
20 mV/DIV	5 ms/DIV

CH.3

mV/DIV	µs/DIV

$\frac{34}{3\epsilon}$

△NEMIC·LAMBDA

KWS 15

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

COMMON + NORMAL MODE

5 V

| 50 mV/DIV | 2 Us/DIV |

12 V

| 50 mV/DIV | 2 Us/DIV |

| mV/DIV | Us/DIV |

ANEMIC LAMBDA

OUTPUT-RIPPLE , NOISE

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

### COMMON + NORMAL MODE

5 V
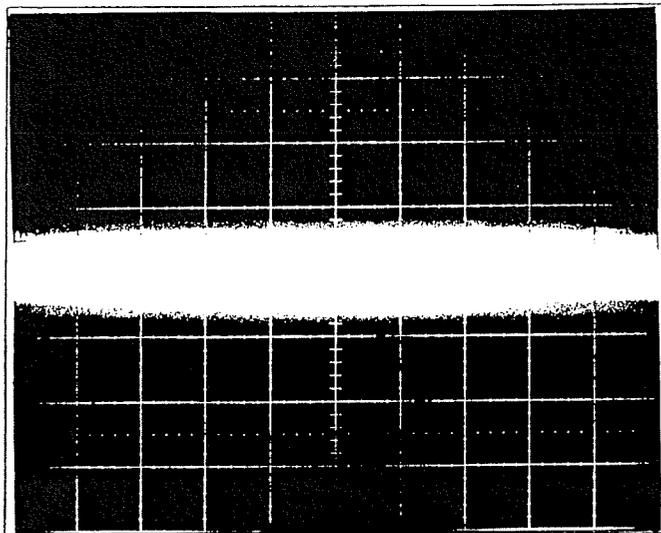
50mV/DIV	5 ms/DIV

12 V

50 mV/DIV	5 ms/DIV

mV/DIV	μs/DIV

36/36