

# LWT30H

## EVALUATION DATA

### 型式データ

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Terminology used :

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

**SPECIFICATIONS**

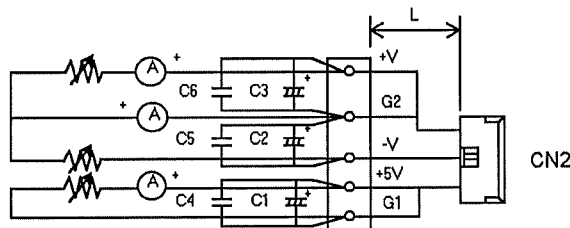
PA786-01-01C

ITEMS		MODEL	LWT30H-5FF			LWT30H-522			LWT30H-525			
1	Nominal Output Voltage	V	+5±1%	+15	-15	+5±1%	+12	-12	+5±1%	+12	-5	
2	Minimum Output Current	A	0.7	0	0	0.7	0	0	0.7	0	0	
3	Maximum Output Current	A	5.0	1.2	0.6	5.0	1.2	0.6	5.0	1.2	0.6	
4	Maximum Output Power /CH	W	25.0	18.0	9.0	25.0	14.4	7.2	25.0	14.4	3.0	
5	Total Allowable Output Power	-	30W									
6	Efficiency (Typ)	(*1)	73%									
7	Input Voltage Range	(*8)	85-265VAC (47-440Hz) or 110-330VDC									
8	Input Current (Typ) 100/200V	-	0.7A / 0.42A									
9	In-rush Current (Typ)	(*2)	16A at 100VAC, 32A at 200VAC									
10	Output Voltage Range	-	CH1 : (+5%, -0% max); CH2, CH3 : FIXED (±5% max)									
11	Maximum Ripple & Noise	(*1)	mV	100	150	150	100	150	150	100	150	150
12	Maximum Line Regulation	(*3, 7)	mV	50	150	150	50	120	120	50	120	50
13	Maximum Load Regulation	(*4, 7)	mV	100	300	300	100	240	240	100	240	100
14	Over Current Protection	(*5)	-	More than 105% for each channel								
15	Over Voltage Protection	(*6)	-	CH1 Only ... 5.75V ~ 6.75V								
16	Hold-Up Time (Typ)	(*1)	-	20ms at 100VAC								
17	Conducted EMI	-	Designed to meet VDE 0871B, FCC 20780B									
18	Safety Agency	-	Built to meet UL1950, CSA234, IEC950, EN60950, S.E.L.V.									
19	Parallel Operation	-	-									
20	Remote ON/OFF	-	-									
21	Remote Sensing	-	-									
22	Operating Temperature	(*9)	-	0 ~ 60°C Convection cooled : 0 ~ 40°C...30W, 50°C...24W, 60°C...18W								
23	Operating Humidity	-	30 ~ 90% RH									
24	Storage Temperature	-	-30 ~ 85°C									
25	Storage Humidity	-	10 ~ 95% RH									
26	Cooling	-	Convection Cooled									
27	Temperature Coefficient	-	CH1...Less than 1%, CH2,CH3...less than 2% at 0 ~ 60°C									
28	Withstand Voltage	-	Input - Chassis : 2kVAC, Input-Output : 3kVAC 1min (20mA)									
29	Isolation Resistance	-	More than 100MΩ at 25°C and 70%RH Output-Chassis ... 500VDC									
30	Vibration	-	10 ~ 55Hz (sweep 1 min) Less than 19.6m/s <sup>2</sup> X,Y,Z 1h each									
31	Shock	-	Less than 196.1m/s <sup>2</sup>									
32	Weight	-	300g									
33	Size (WxHxD)	mm	70 x 26 x 160 (Refer to Outline Drawing)									

**NOTES :**

- \*1 : At 100VAC and Maximum Output Power (5V 4A, CH2,CH3 total 10W).
- \*2 : Typical value at cold start Ta = 25°C.
- \*3 : From 85-265VAC or 110-330VDC, constant load.
- \*4 : From Min output current - Max output current.
- \*5 : The operation of the OCP will be given priority by the output total power at more than 32W.
- \*6 : Inverter shutdown method, manual reset. (OVP circuit will shutdown all outputs).
- \*7 : Please refer to Fig. A for measurement determination of line & load regulation and output ripple voltage.
- \*8 : For cases where conformance to various safety specs (UL, CSA, VDE, etc.) are required, input voltage and frequency range will be 100-240VAC, 50/60Hz.
- \*9 : Applies to Std. Mounting position. For other mounting position, refer to Instruction Manual.

Fig.A



L : 200mm AWG #20 (Dual Wire)

C1 : Elec. Cap 470µF

C2 : Elec. Cap 47µF

C3 : Elec. Cap 100µF

C4, 5, 6 : Film Cap 0.1µF

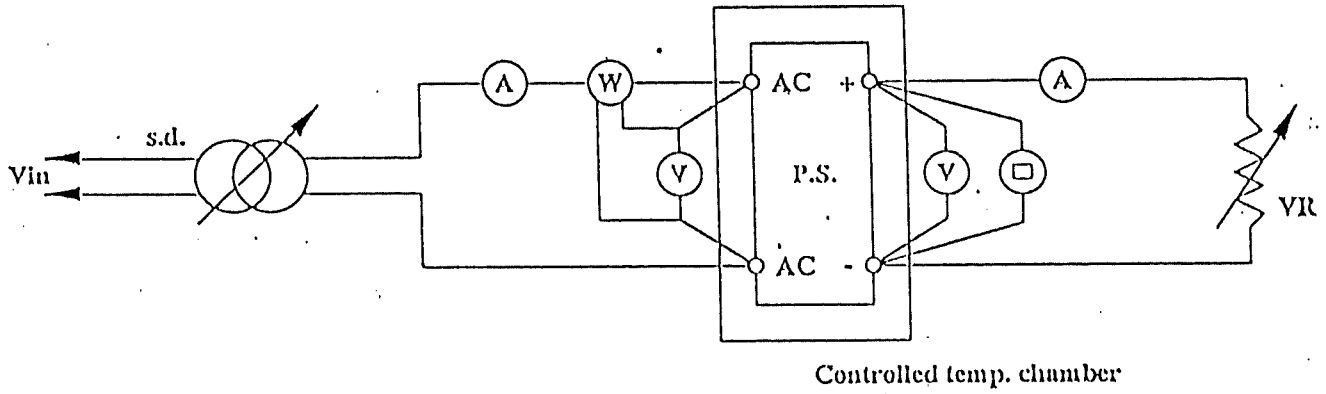
Bandwidth of scope : 100MHz EIAJ Probe

# 1. EVALUATION METHOD

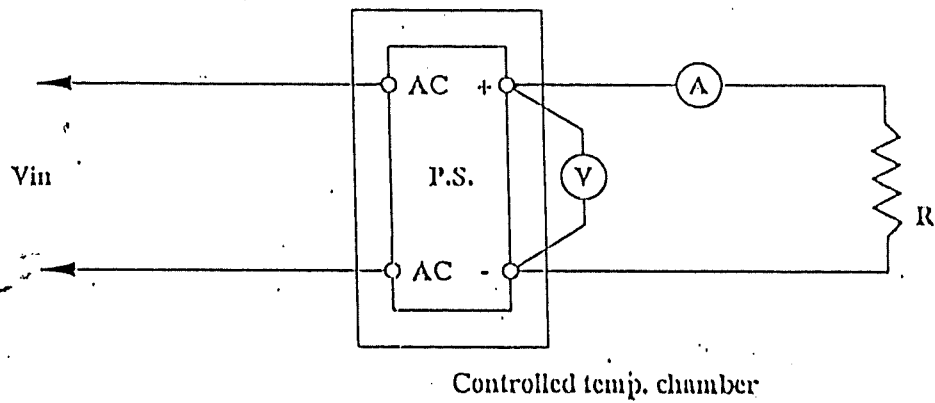
LWT30H

## 1-1 Circuits used for determination

### (1) Steady state data

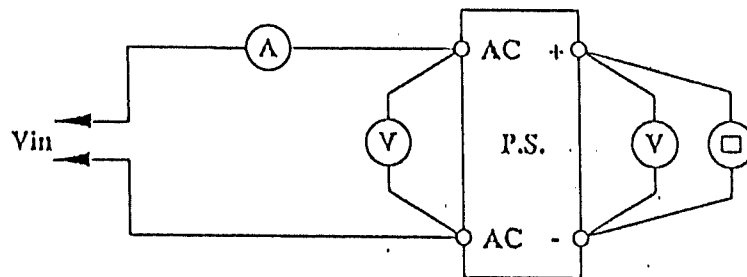


### (2) Warm up voltage drift characteristics

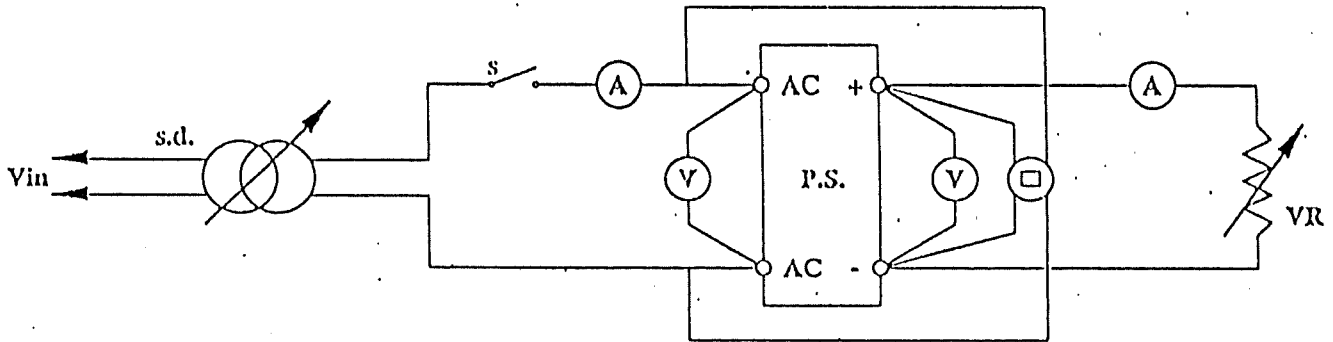


### (3) Over current protection (OCP) characteristics Same as steady state data

### (4) Over voltage protection (OVP) characteristics

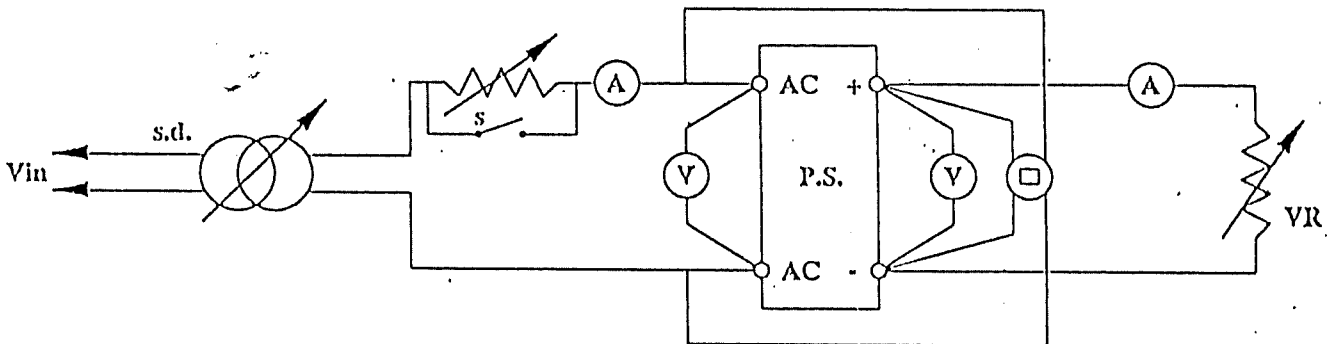


(5) Output rise characteristics

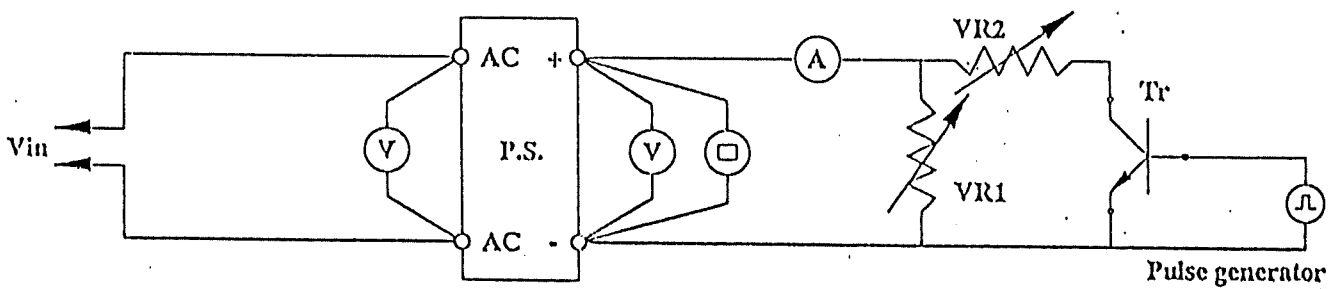


(6) Output fall characteristics  
Same as Output rise characteristics

(7) Dynamic line response characteristics

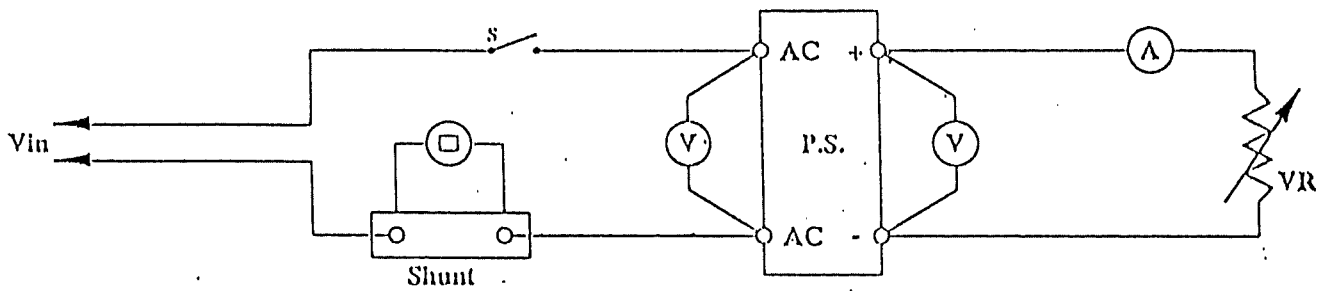


(8) Dynamic load response characteristics

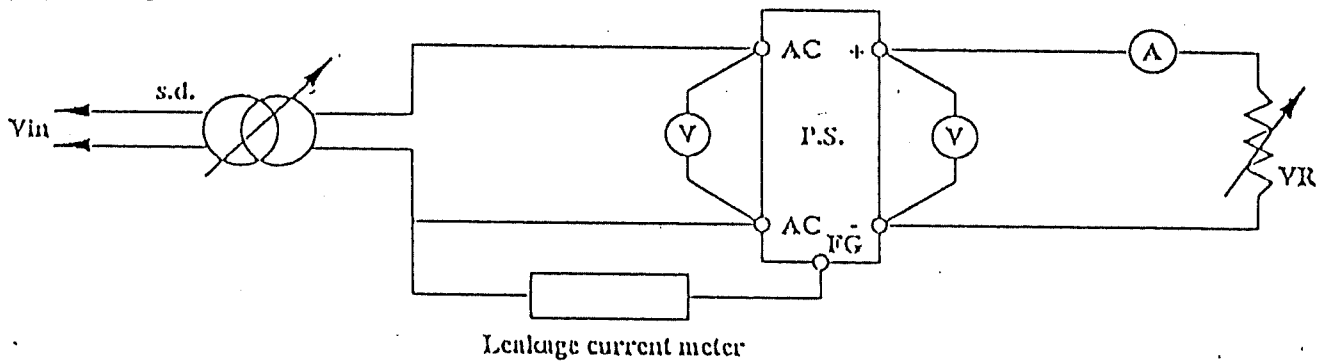


(9) Inrush current characteristics

LWT30H



(10) Leakage current characteristics



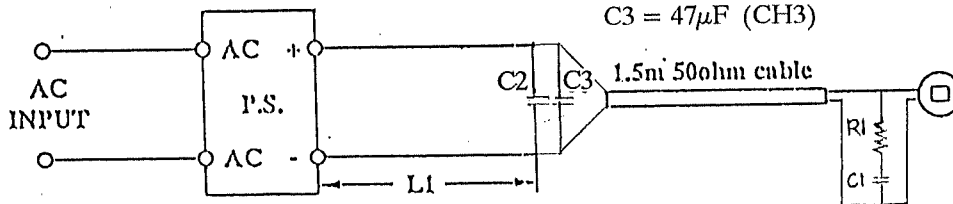
Note : Leakage current measure through a 1K ohm resistor. Range wcd : AC + DC

(11) Output-ripple, noise

Bandwidth of scope : 100MHz B.W

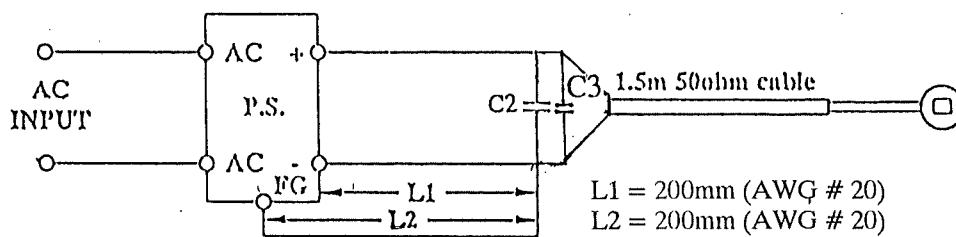
(a) Normal mode

- R = 50Ω
- C1 = 4700pF
- C2 = 0.1μF
- C3 = 470μF (CH1)
- C3 = 100μF (CH2)
- C3 = 47μF (CH3)



L1 = 200mm

(b) Normal + common mode



- L1 = 200mm (AWG # 20)
- L2 = 200mm (AWG # 20)

## 3. List Of Equipment Used

LWT30H

NO	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1.	Oscilloscope	Iwatsu	SS-7610
2.	Digital Storage Oscilloscope	Tektronix	2432A / TDS620
3.	Digital Voltmeter	Hewlett Packard	34401A
4.	Digital Watt / Current Voltmeter	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-2150D PLZ72W, PLZ150WA
9.	Digirush Currenter	Takamizawa Cybernetics	PSA-200
10.	Current Probe / Amplifier	Tektronic	A6303 / AM503
11.	Controlled Temperature Chamber	Tabai	PL-1G
12.	Leakage Current meter	Yokogawa Electric	3226
13.	Equipment For Dynamic Line Response	- Built in - House -	-



**REGULATION – Line And Load, Temp. Drift**

CH1

1. Regulation – Line and Load

Conditions  
 CH2 : 0.22 A  
 CH3 : 0.11 A  
 Ta : 25°C

Iout	Vin	AC				LINE REGULATION	
		85 V	100 V	220 V	265 V	mV	%
14	%	5.022 V	5.022 V	5.022 V	5.022 V	0	0
50	%	5.006 V	5.006 V	5.006 V	5.006 V	0	0
100	%	4.985 V	4.985 V	4.985 V	4.985 V	0	0
LOAD REGULATION		37 mV	37 mV	37 mV	37 mV		
		0.74 %	0.74 %	0.74 %	0.74 %		

2. Temperature Drift

Conditions  
 Vin : AC100V  
 Iout : CH1 : 5 A  
 CH2 : 0.22 A  
 CH3 : 0.11 A

Ta	0 °C	25 °C	40 °C	TEMP. STABILITY	
Vout	4.979 V	4.985 V	5.008 V	29 mV	0.58 %

CH2

1. Regulation – Line and Load

Conditions  
 CH1 : 0.7 A  
 CH3 : 0.6 A  
 Ta : 25°C

Iout	Vin	AC				LINE REGULATION	
		85 V	100 V	220 V	265 V	mV	%
0	%	14.876 V	14.876 V	14.876 V	14.876 V	0	0
50	%	14.870 V	14.870 V	14.870 V	14.871 V	1	0.01
100	%	14.866 V	14.866 V	14.867 V	14.867 V	1	0.01
LOAD REGULATION		10 mV	10 mV	9 mV	9 mV		
		0.07 %	0.07 %	0.06 %	0.06 %		

2. Temperature Drift

Conditions  
 Vin : AC100V  
 Iout : CH1 : 0.7 A  
 CH2 : 1.2 A  
 CH3 : 0.6 A

Ta	0 °C	25 °C	40 °C	TEMP. STABILITY	
Vout	14.827 V	14.866 V	14.905 V	78 mV	0.52 %

REGULATION – Line And Load, Temp. Drift

CH3

Conditions    Ta : 25°C  
                   CH1 : 0.7 A  
                   CH2 : 1.2 A

1. Regulation – Line and Load

Iout	Vin	AC 85 V	AC 100 V	AC 220 V	AC 265 V	LINE REGULATION	
0	%	15.000 V	15.000 V	15.000 V	14.999 V	1 mV	0.01 %
50	%	14.990 V	14.990 V	14.990 V	14.990 V	0 mV	0 %
100	%	14.980 V	14.980 V	14.985 V	14.985 V	5 mV	0.03 %
LOAD REGULATION		20 mV	20 mV	15 mV	14 mV		
		0.13 %	0.13 %	0.10 %	0.09 %		

2. Temperature Drift

Conditions    Vin : AC100V  
                   Iout : CH1 : 0.7 A  
                       CH2 : 1.2 A  
                       CH3 : 0.6 A

Ta	0 °C	25 °C	40 °C	TEMP. STABILITY	
Vout	14.930 V	14.980 V	15.025 V	95 mV	0.63 %

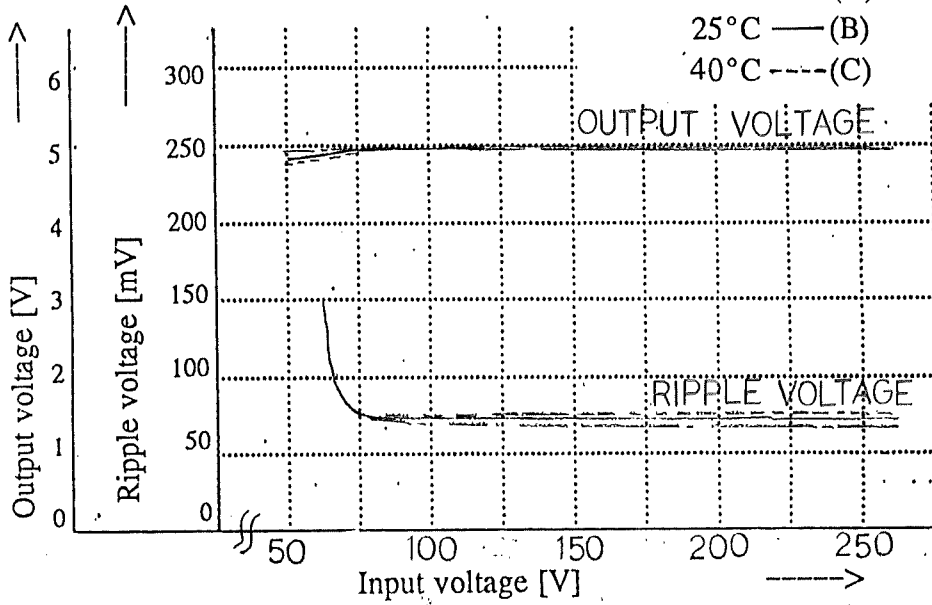
# LWT30H-5FF

**(2) Output voltage and ripple voltage  
v.s. input voltage**

I<sub>out</sub> : 100%  
 0°C --- (A)  
 25°C — (B)  
 40°C - - - (C)

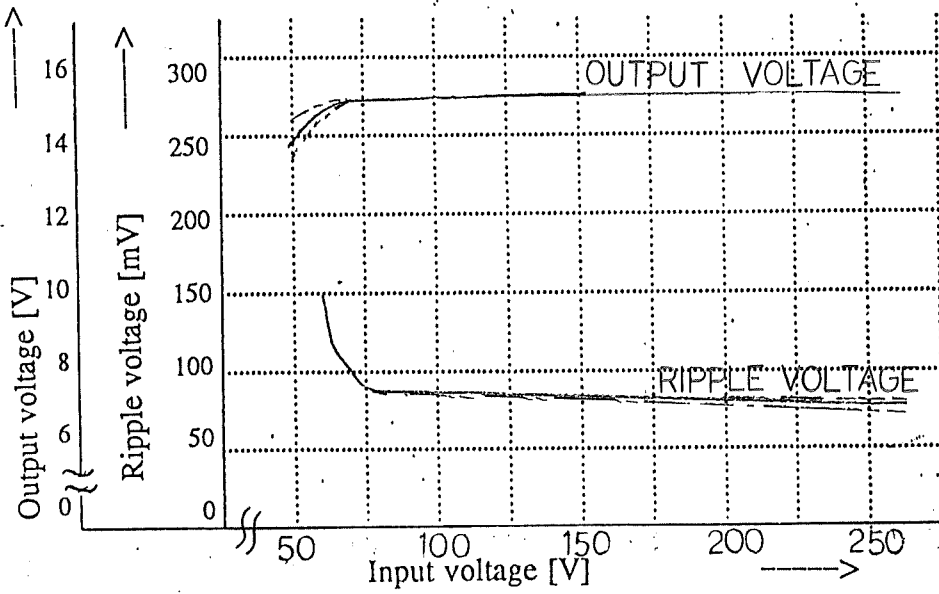
**CH1**

CH1 : 5A  
 CH2 : 0.22A  
 CH3 : 0.11A



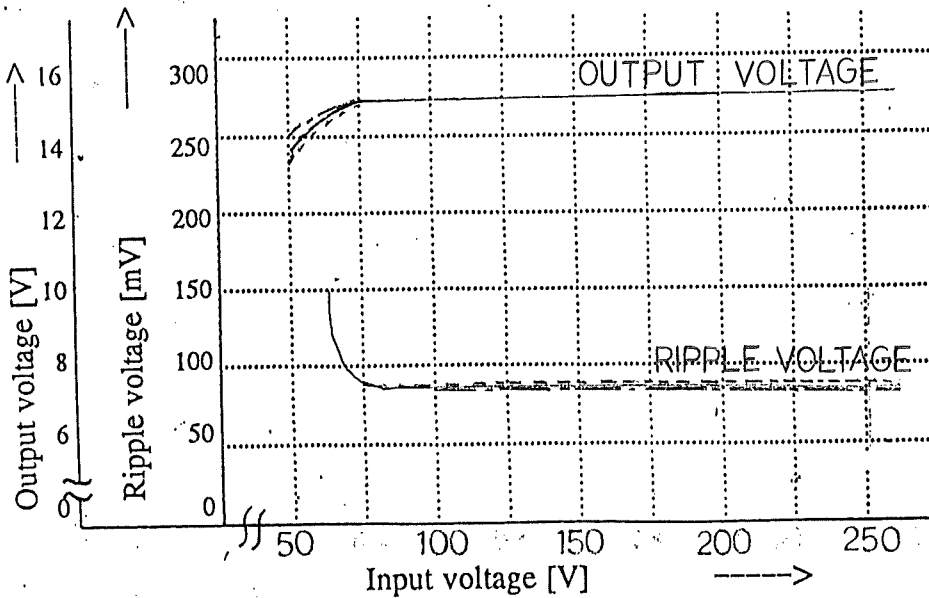
**CH2**

CH1 : 0.7A  
 CH2 : 1.2A  
 CH3 : 0.6A



**CH3**

CH1 : 0.7A  
 CH2 : 1.2A  
 CH3 : 0.6A

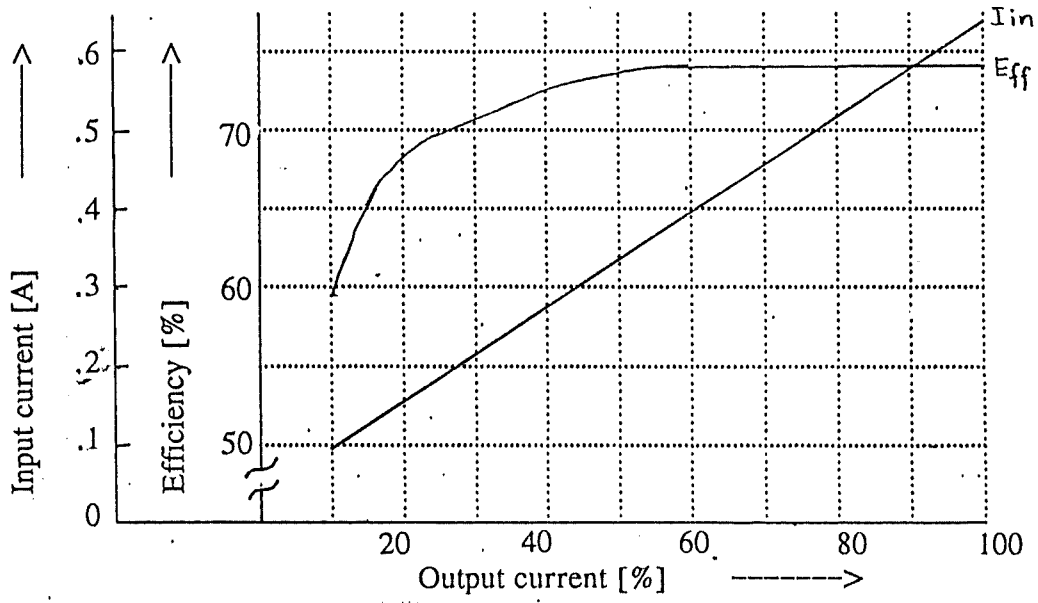


# LWT30H-5FF

## (3) Efficiency and input current v.s. output current

Conditions  $V_{in}$  : AC100V  
 $T_a$  : 25°C

CH1 : 4 A  
100% = CH2 : 0.45 A  
CH3 : 0.22 A



# LWT30H-5FF

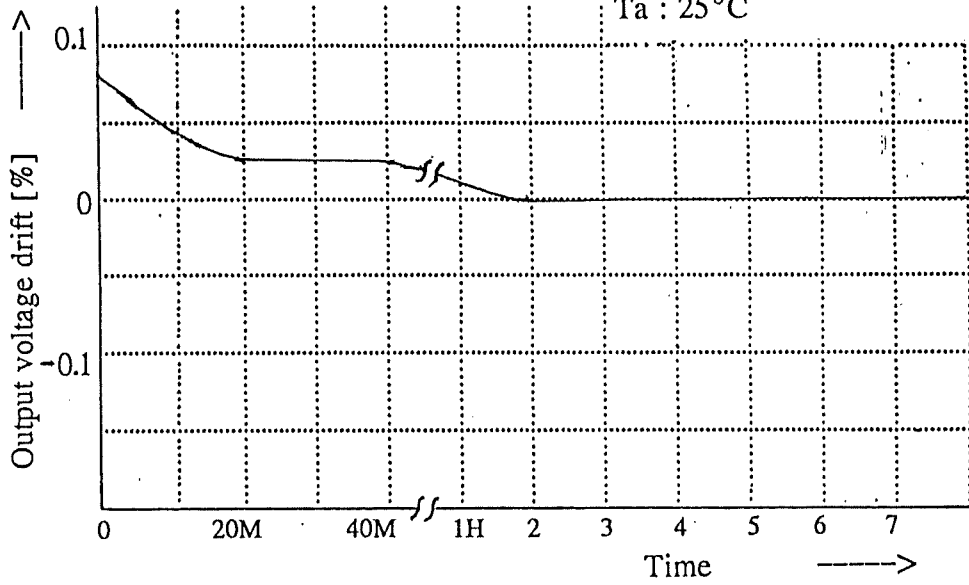
## Warm up voltage drift

Conditions Vin : AC100V

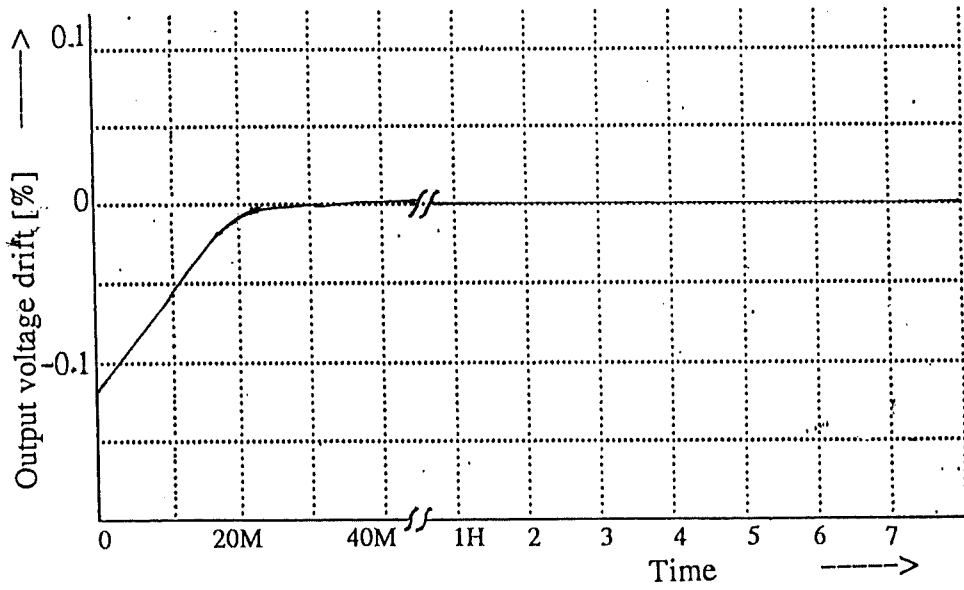
Iout : 100%

Ta : 25°C

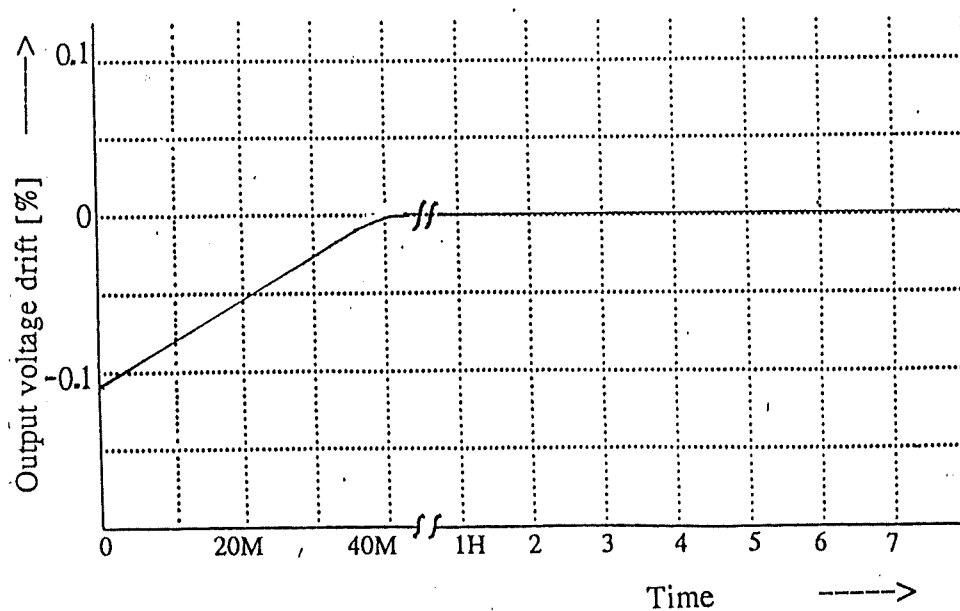
CH1



CH2



CH3



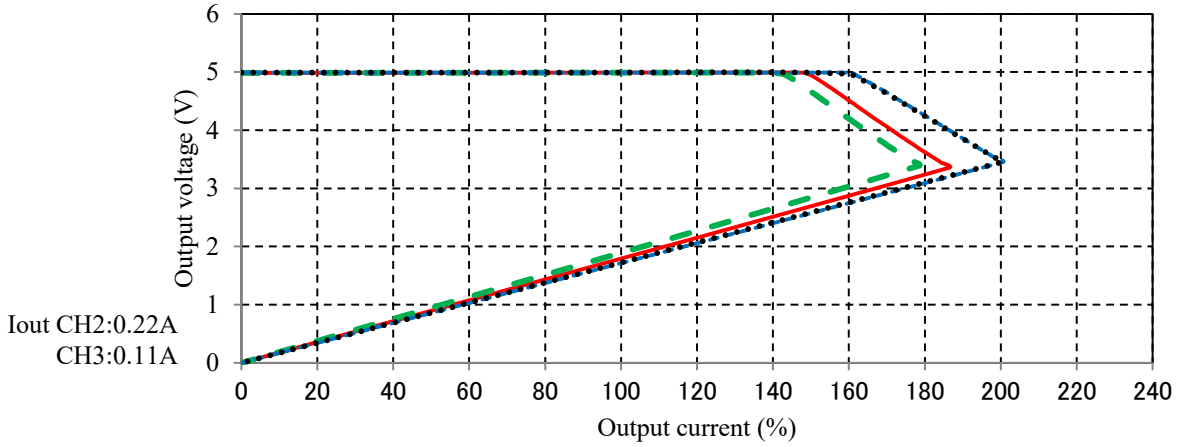
2-3. 過電流保護特性

Over current protection (OCP) characteristics

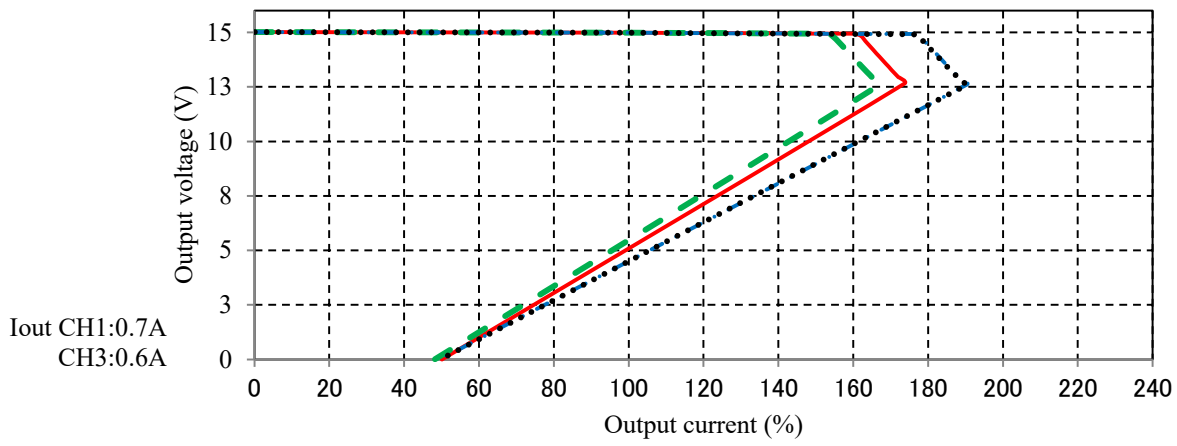
Conditions Ta : 25°C

Vin : AC85V  
 AC100V  
 AC220V  
 AC265V

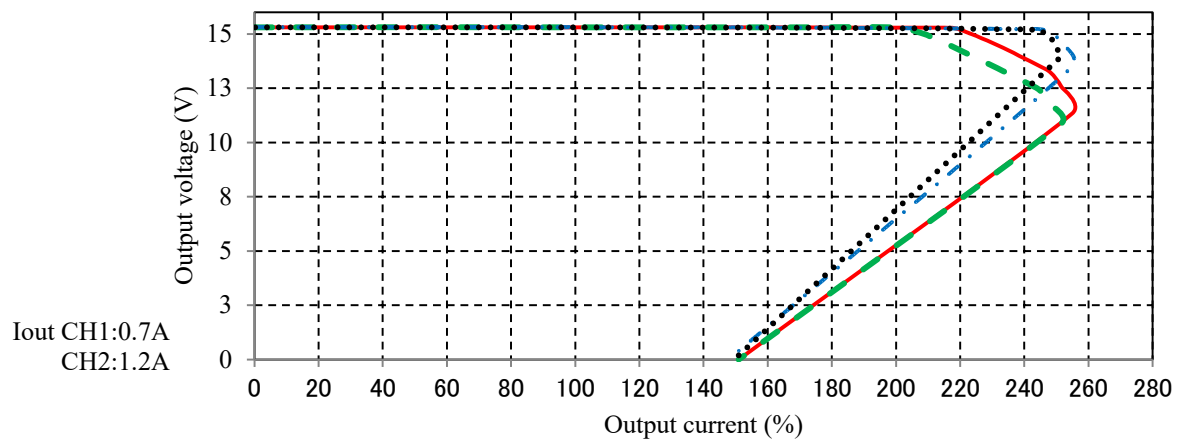
1CH



2CH



3CH



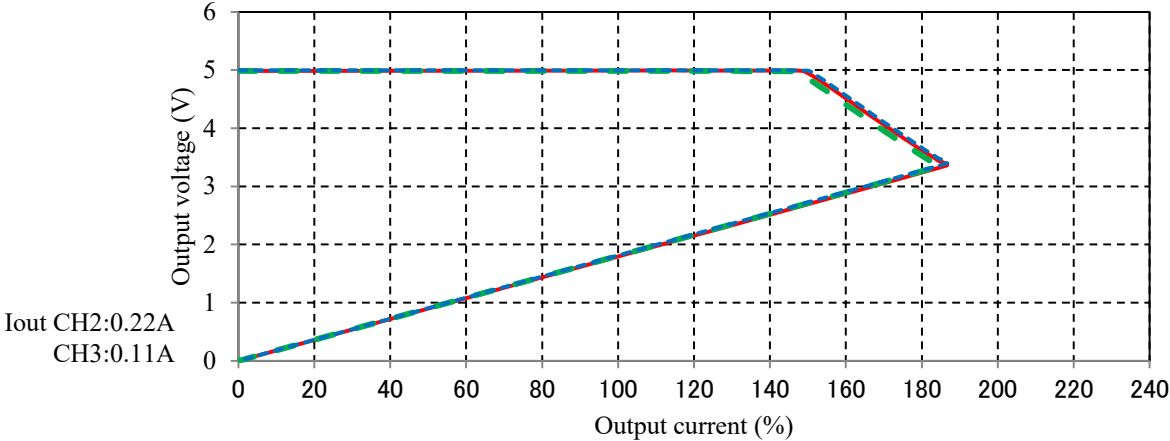
2-3. 過電流保護特性

Over current protection (OCP) characteristics

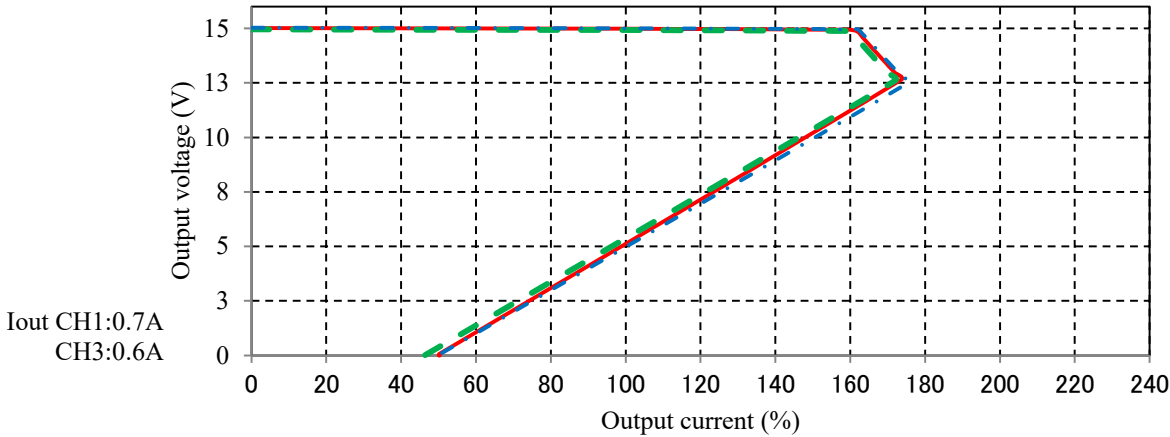
Conditions Vin : 100 VAC

Ta : 0 °C ---  
25 °C ---  
40 °C ---

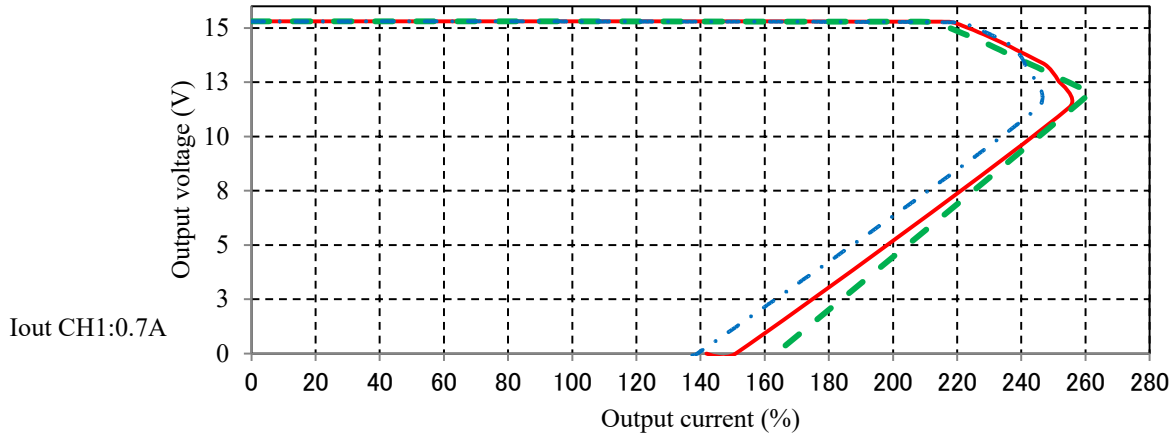
1CH



2CH



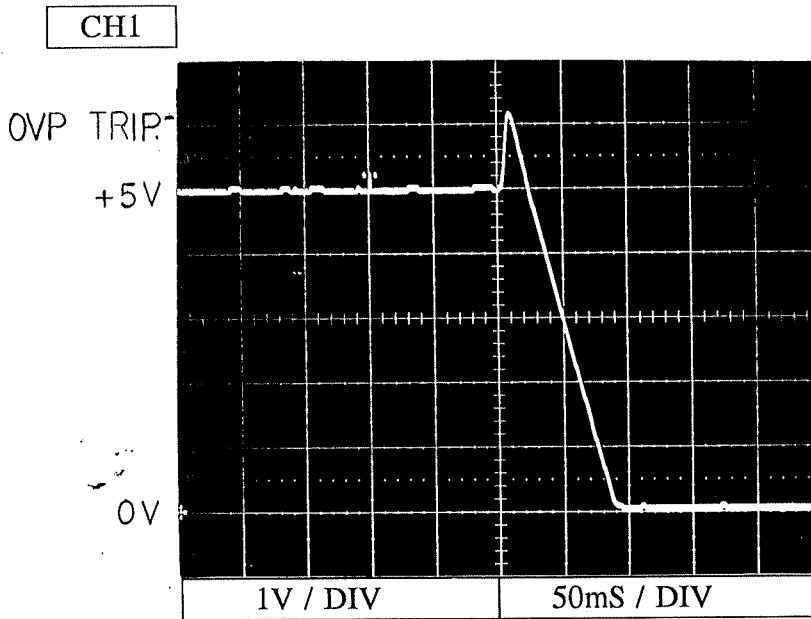
3CH



LWT30H-5FF

OVP Characteristics

Conditions Vin AC100V  
Ta : 25°C  
Iout : MIN  
CH1 : 0.7 A  
CH2 : 0 A  
CH3 : 0 A



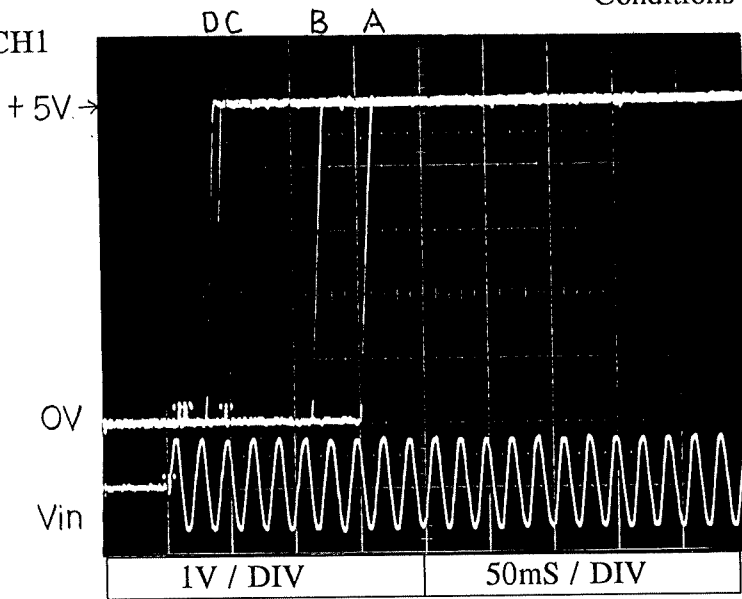


Output Rise Time

LWT30H-5FF

Conditions : Ta : 25°C

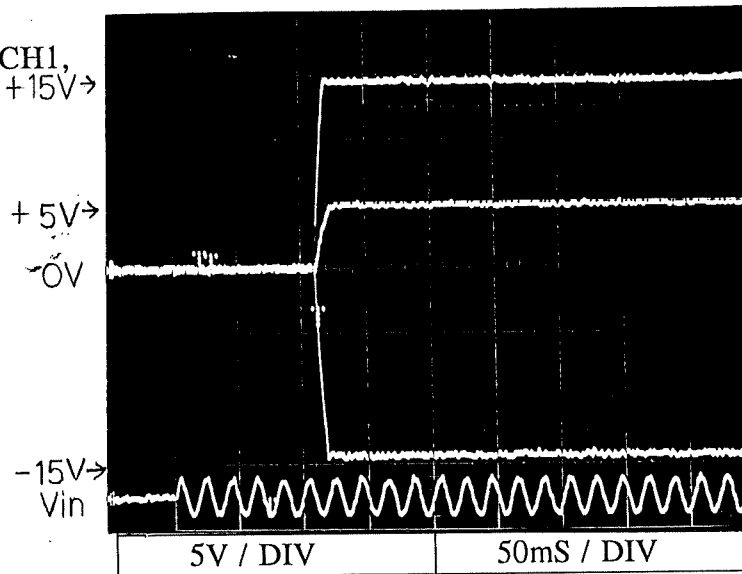
Waveform of CH1



Vin : AC85V (A)  
AC100V (B)  
AC220V (C)  
AC265V (D)

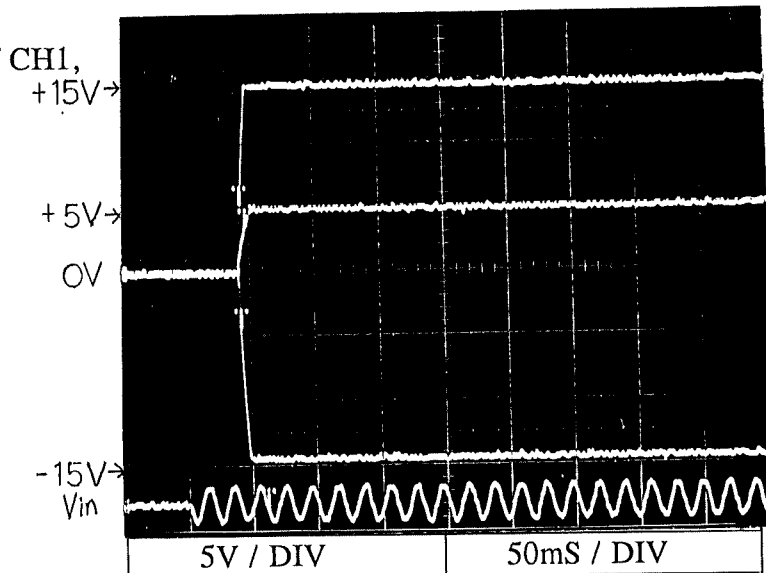
Iout : MIN  
CH1 : 0.7 A  
CH2 : 0 A  
CH3 : 0 A

Waveform of CH1, CH2, CH3



Vin : AC100V  
Iout : MIN

Waveform of CH1, CH2, CH3



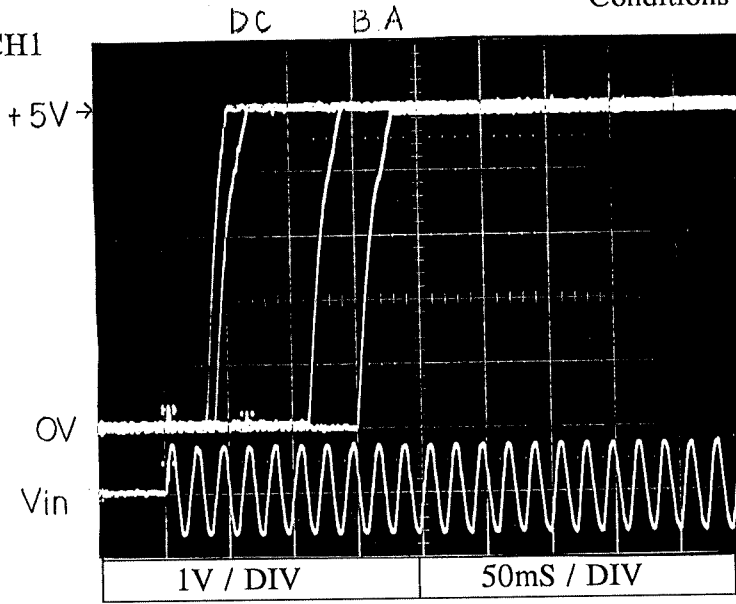
Vin : AC220V  
Iout : MIN

Output Rise Time

LWT30H-5FF

Conditions : Ta : 25°C

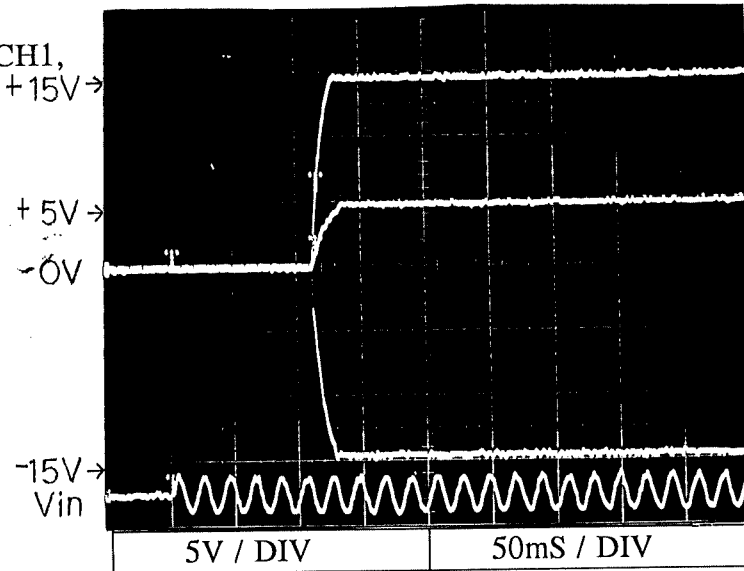
Waveform of CH1



Vin : AC85V (A)  
AC100V (B)  
AC220V (C)  
AC265V (D)

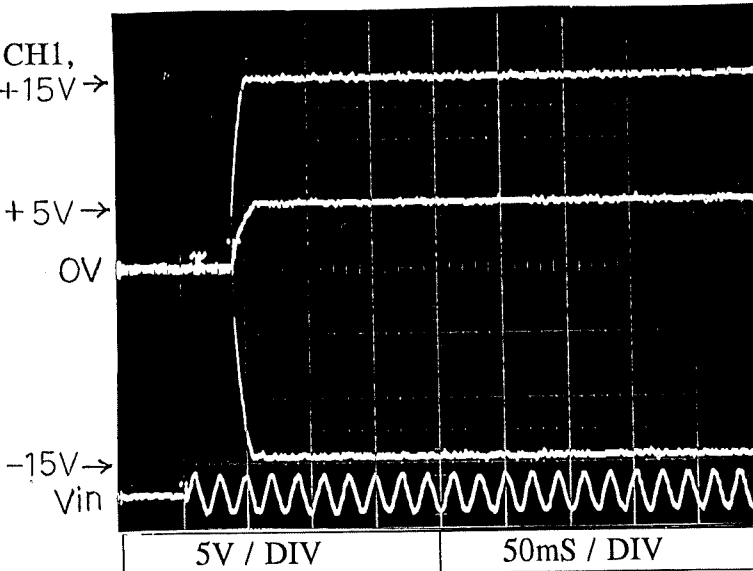
Iout : 100%  
CH1 : 4 A  
CH2 : 0.45 A  
CH3 : 0.22 A

Waveform of CH1,  
CH2, CH3



Vin : AC100V  
Iout : 100%

Waveform of CH1,  
CH2, CH3



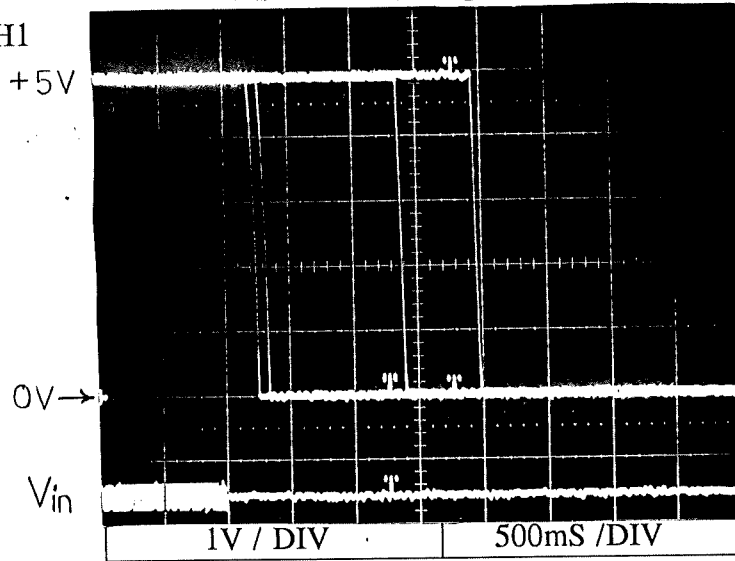
Vin : AC220V  
Iout : 100%

Output Fall Time

LWT30H-5FF

AB C D Conditions : Ta : 25°C

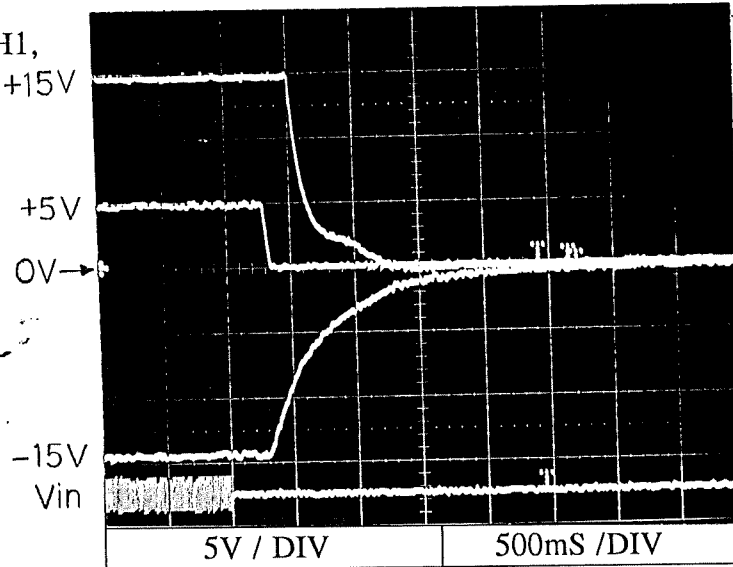
Waveform of CH1



Vin : AC85V (A)  
AC100V (B)  
AC220V (C)  
AC265V (D)

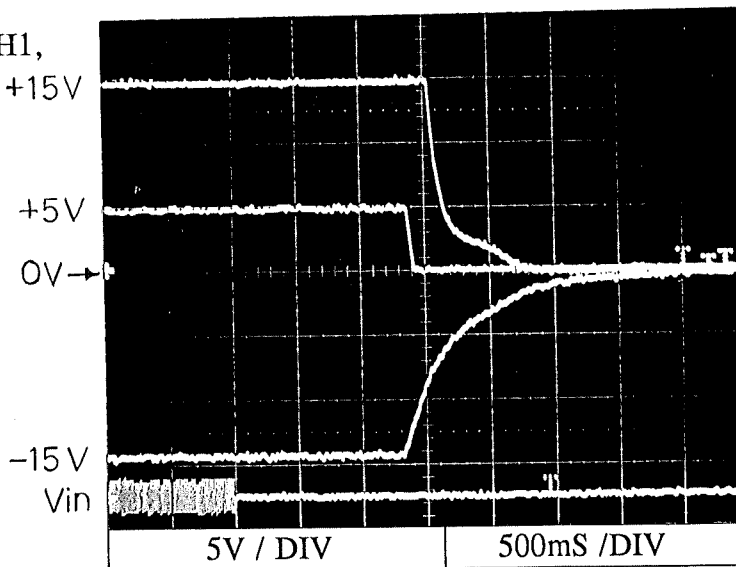
Iout : MIN  
CH1 : 0.7 A  
CH2 : 0 A  
CH3 : 0 A

Waveform of CH1,  
CH2, CH3



Vin AC100V  
Iout : MIN

Waveform of CH1,  
CH2, CH3



Vin AC220V  
Iout : MIN

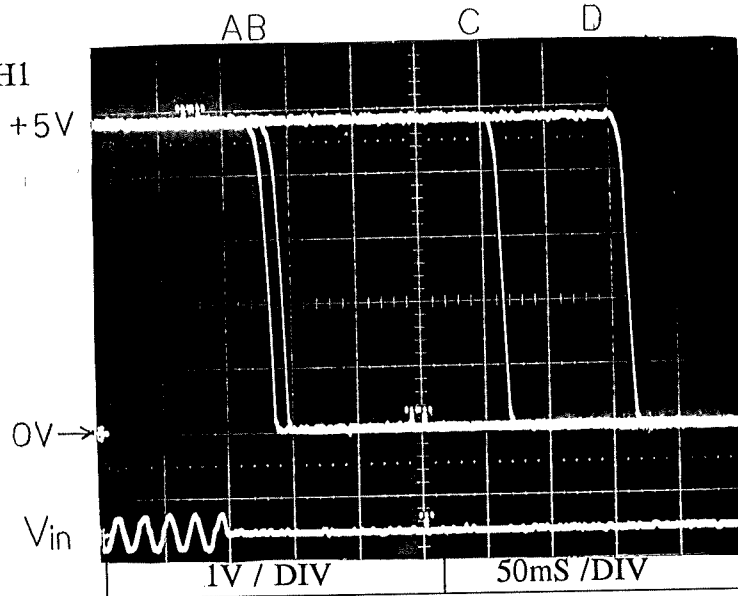
Output Fall Time

LWT30H-5FF

Conditions : Ta : 25°C

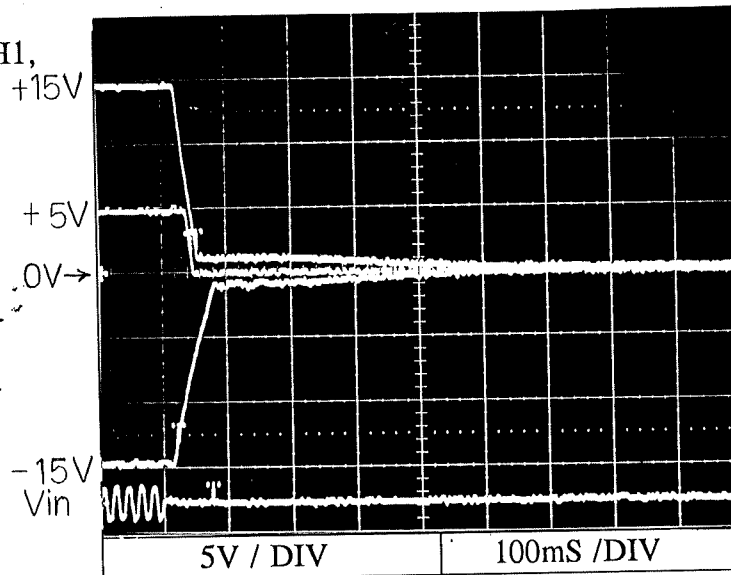
Vin : AC85V (A)  
AC100V (B)  
AC220V (C)  
AC265V (D)

Waveform of CH1



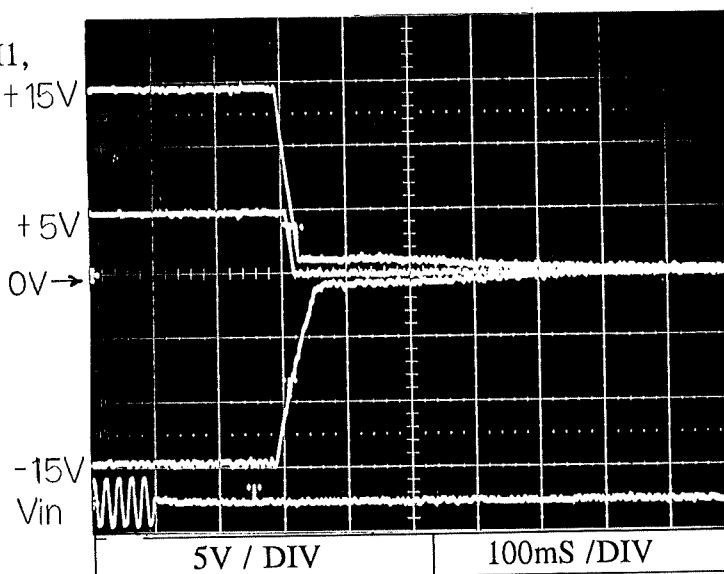
Iout : 100%  
CH1 : 4 A  
CH2 : 0.45 A  
CH3 : 0.22 A

Waveform of CH1,  
CH2, CH3



Vin AC100V  
Iout : 100%

Waveform of CH1,  
CH2, CH3



Vin AC220V  
Iout : 100%

# LWT30H-5FF

## Hold Up Time

CH1

### Conditions

Ta : 25°C

Vin : 85VAC (A)

100VAC (B)

220VAC (C)

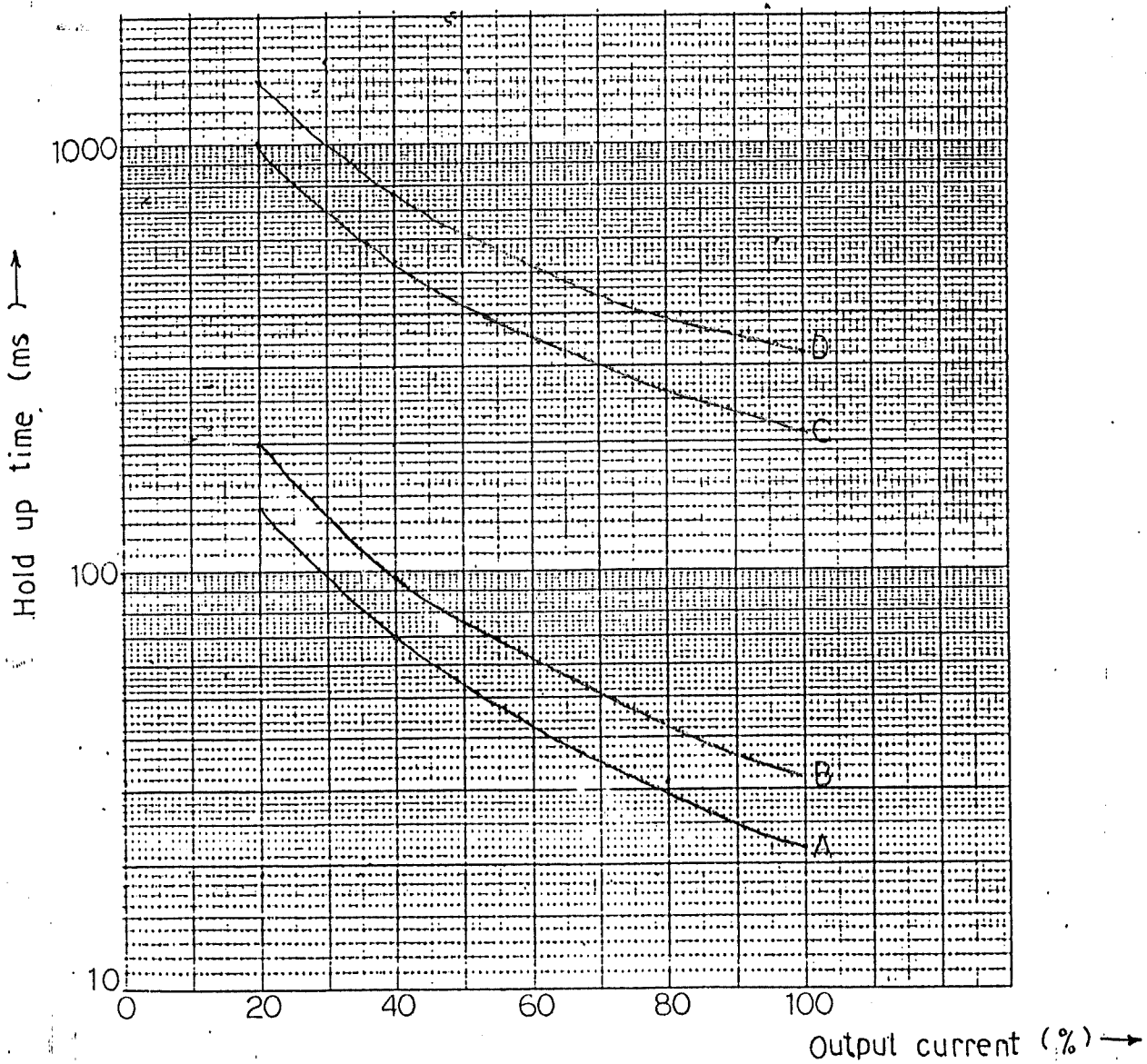
265VAC (D)

Iout : 100%

CH1 : 4A

CH2 : 0.45A

CH3 : 0.22A



LWT30H-5FF

Dynamic Line Response

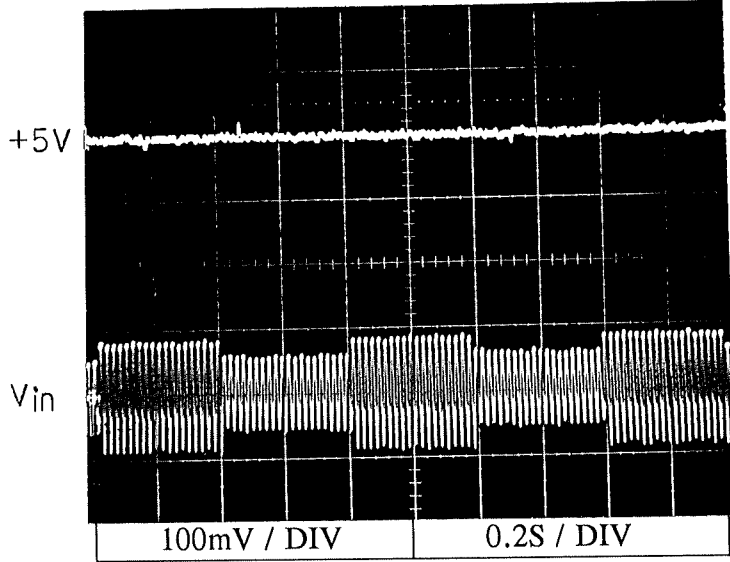
Conditions

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

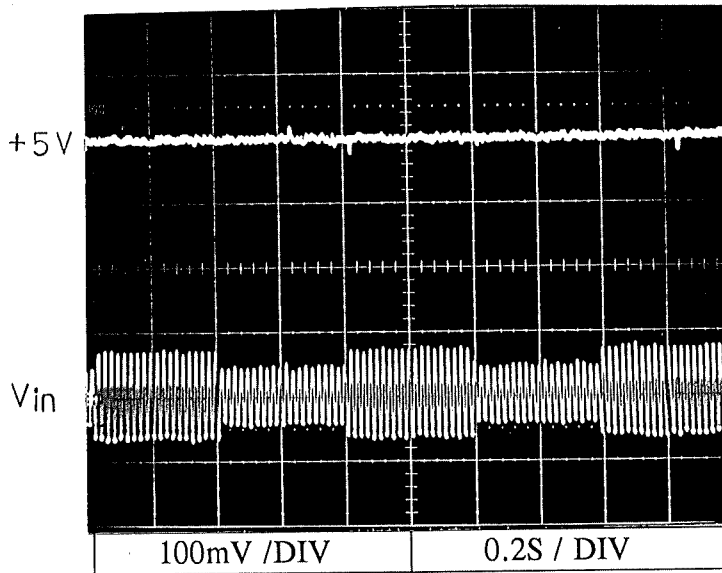
CH1

Vin : 85VAC ↔ 132VAC

CH1 : 5 A  
CH2 : 0.22 A  
CH3 : 0.11 A



Vin : 170VAC ↔ 265VAC



# LWT30H-5FF

## Dynamic Line Response

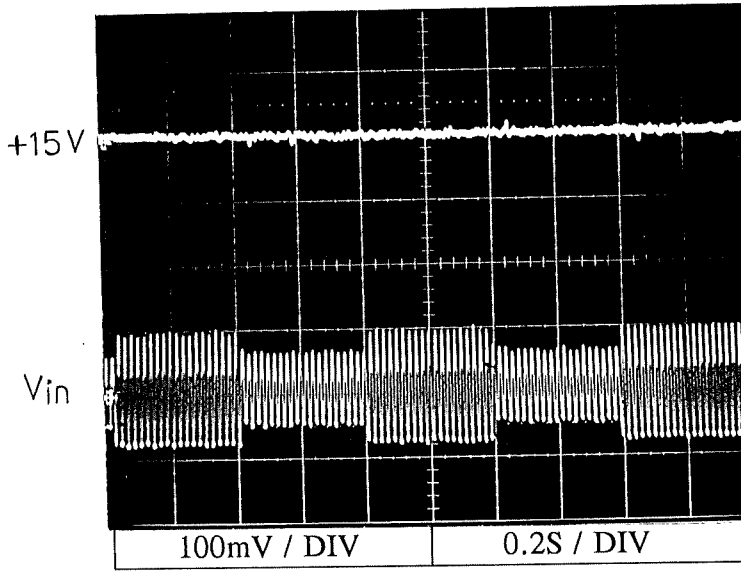
### Conditions

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

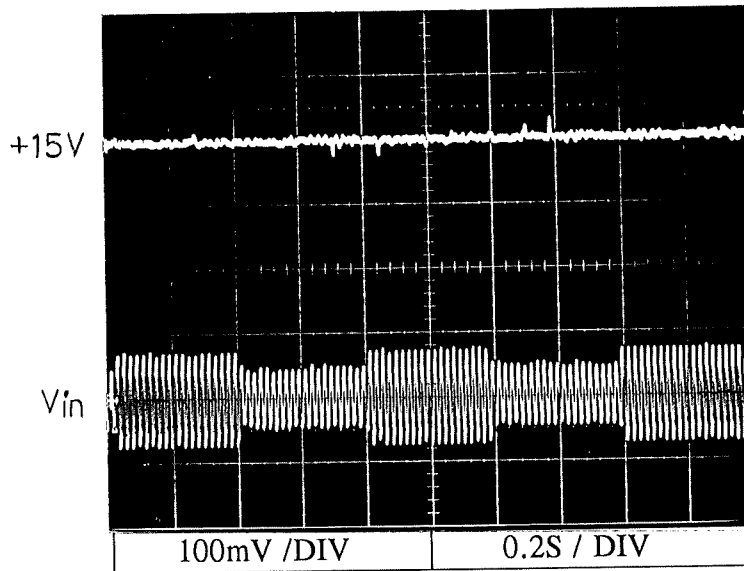
CH1 : 0.7 A  
CH2 : 1.2 A  
CH3 : 0.6 A

CH2

Vin : 85VAC  $\rightleftharpoons$  132VAC



Vin : 170VAC  $\rightleftharpoons$  265VAC



LWT30H-5FF

Dynamic Line Response

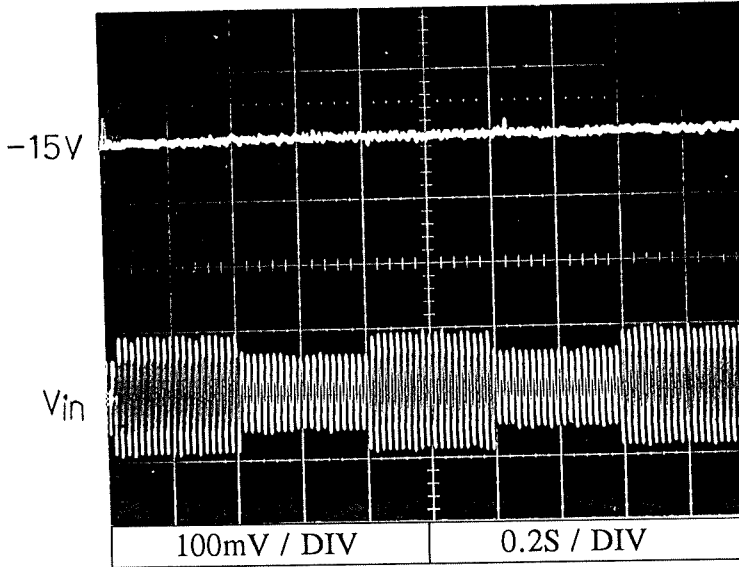
Conditions

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

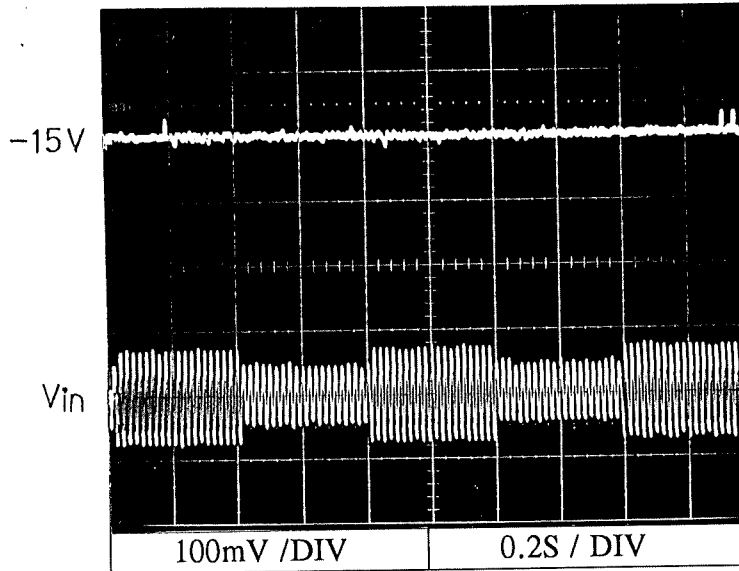
CH3

Vin : 85VAC ⇌ 132VAC

CH1 : 0.7 A  
CH2 : 1.2 A  
CH3 : 0.6 A



Vin : 170VAC ⇌ 265VAC





# LWT30H-5FF

## Dynamic Load Response

### Conditions

Vout : 5V

Vin : AC 100V

Ta : 25°C

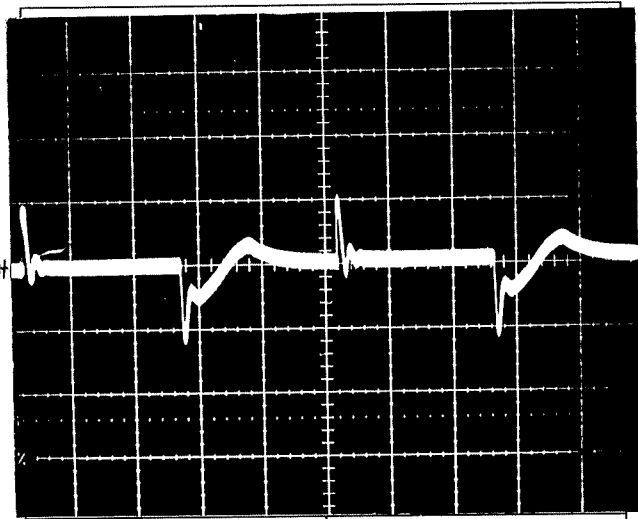
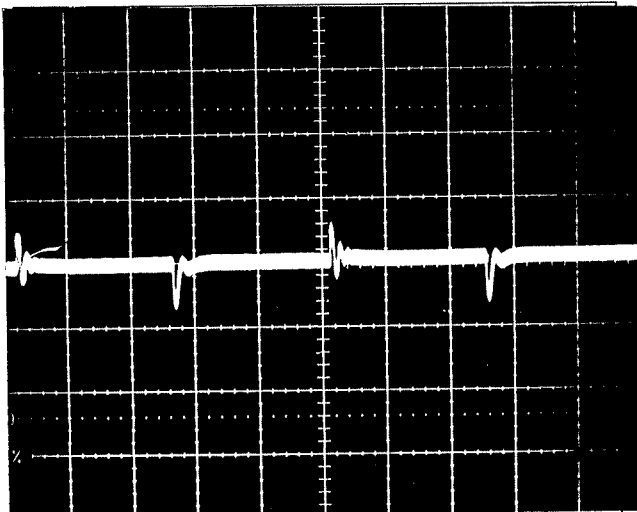
Iout = CH2: 0.22A

CH3: 0.11A

CH1

Iout : 50% <-----> 100% f = 100Hz

Iout : 14% <-----> 100% f = 100Hz

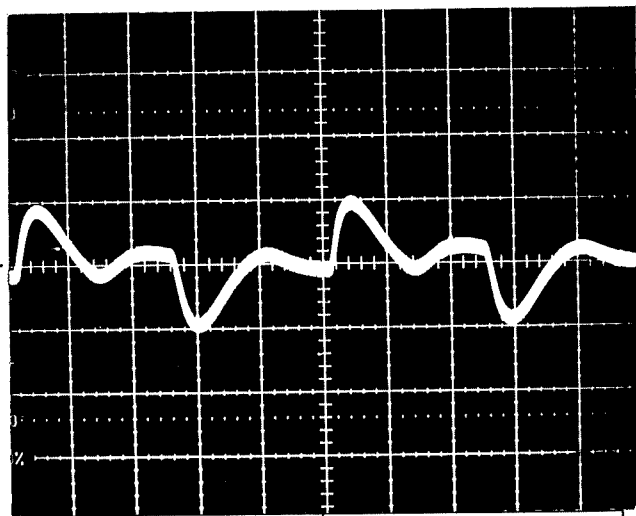
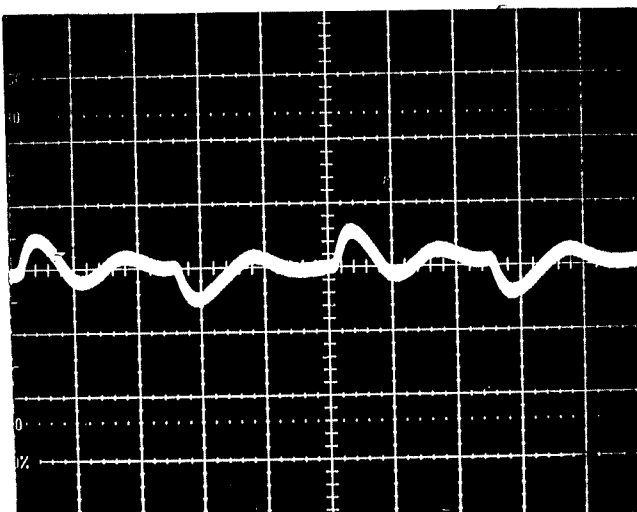


100mV / DIV	2mS / DIV
-1.4%	+1.2%

100mV / DIV	2mS / DIV
-2.4%	+2.2%

Iout : 50% <-----> 100% f = 1KHz

Iout : 14% <-----> 100% f = 1KHz



100mV / DIV	0.2mS / DIV
-1.2%	+1.4%

100mV / DIV	0.2mS / DIV
-2.0%	+2.0%

# LWT30H-5FF

## Dynamic Load Response

### Conditions

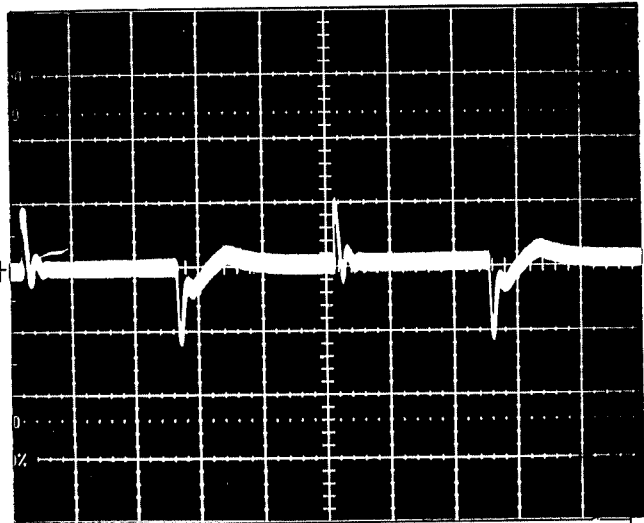
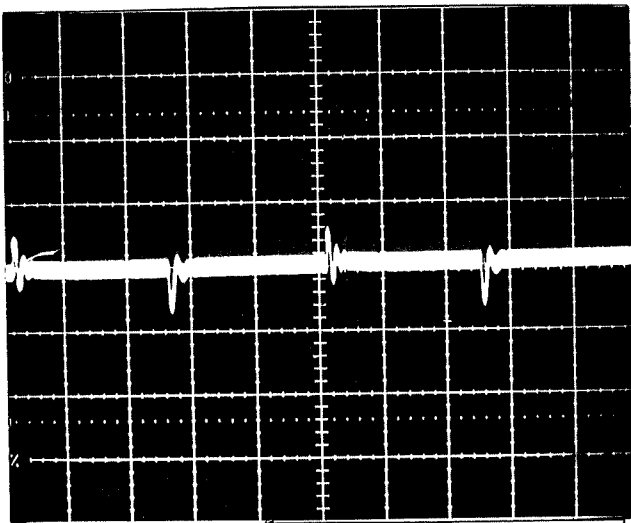
Vout : 5V  
 Vin : AC 220V  
 Ta : 25°C

Iout = CH2 : 0.22A  
 CH3 : 0.11A

CH1

Iout : 50% <-----> 100% f = 100Hz

Iout : 14% <-----> 100% f = 100Hz

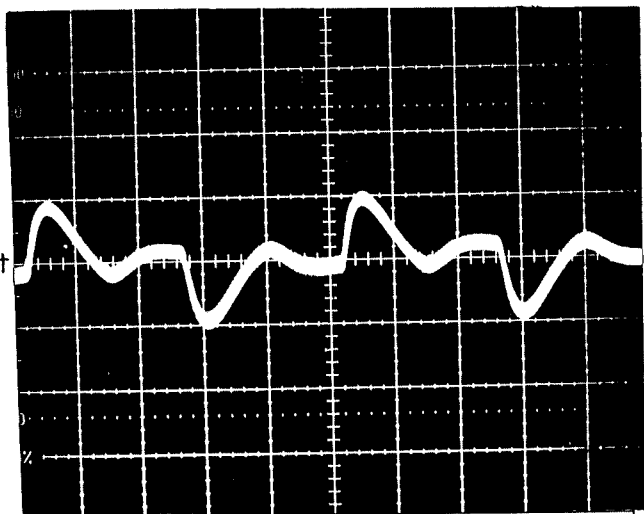
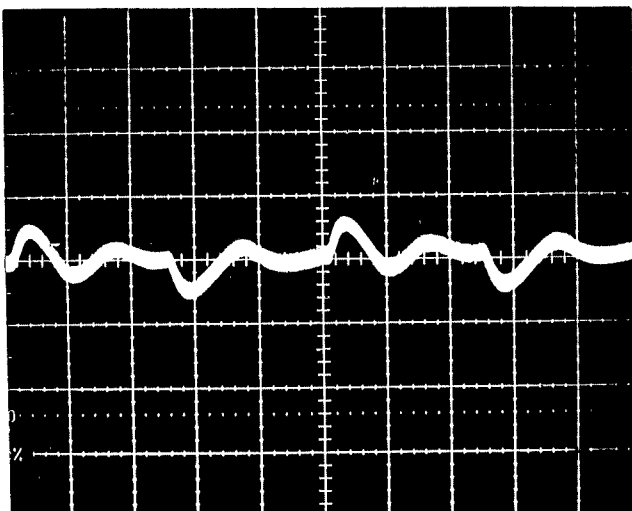


100mV / DIV	2mS / DIV
-1.4%	+1.2%

100mV / DIV	2mS / DIV
-2.4%	+2.0%

Iout : 50% <-----> 100% f = 1KHz

Iout : 14% <-----> 100% f = 1KHz



100mV / DIV	0.2mS / DIV
-1.2%	+1.4%

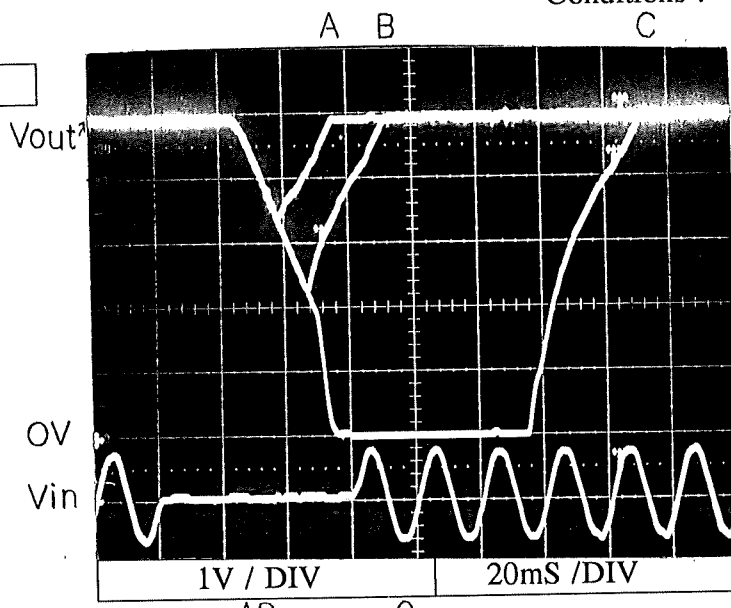
100mV / DIV	0.2mS / DIV
-2.0%	+2.0%

Response To Brown Out

LWT30H-5FF

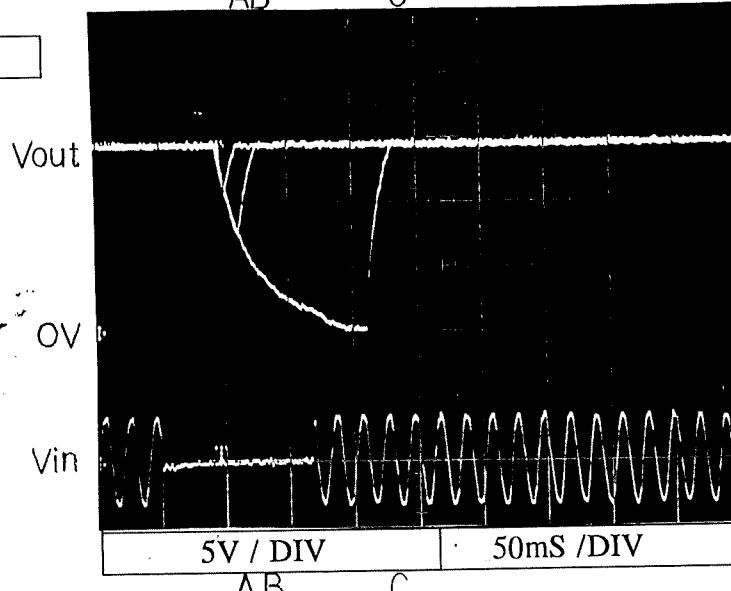
Conditions : Ta : 25°C  
 Vin : AC 100V  
 Iout : 100%  
 CH1 : 4 A  
 CH2 : 0.45 A  
 CH3 : 0.22 A

CH1



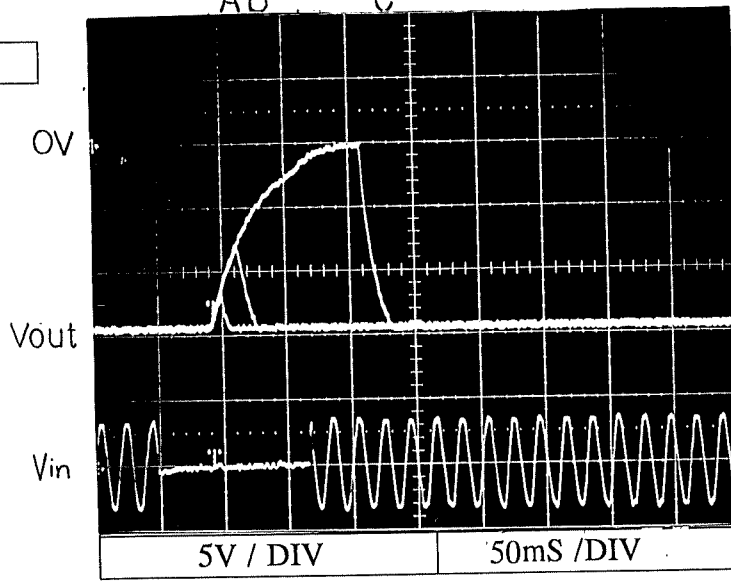
Brown Out Time  
 A - 37mS  
 B - 46mS  
 C - 60mS

CH2



Brown Out Time  
 A - 43mS  
 B - 57mS  
 C - 116mS

CH3

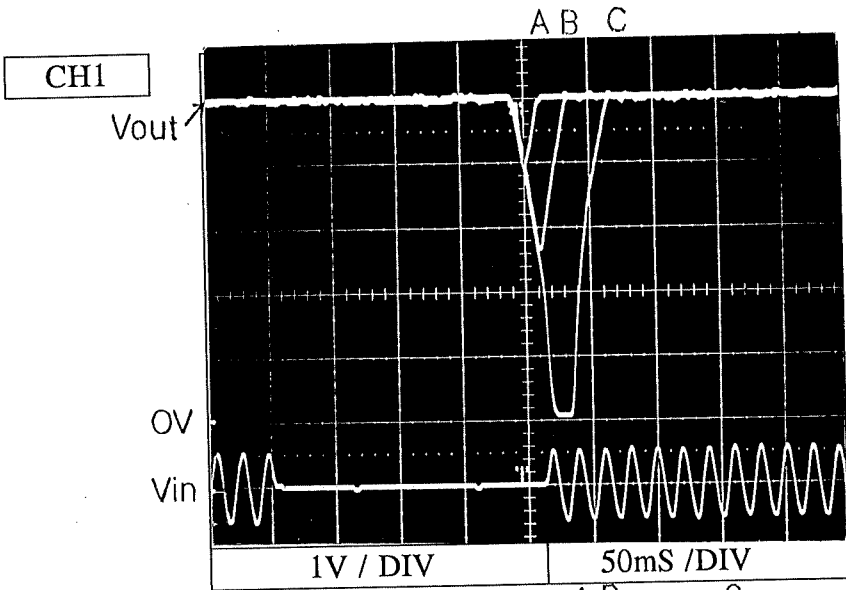


Brown Out Time  
 A - 44mS  
 B - 57mS  
 C - 116mS

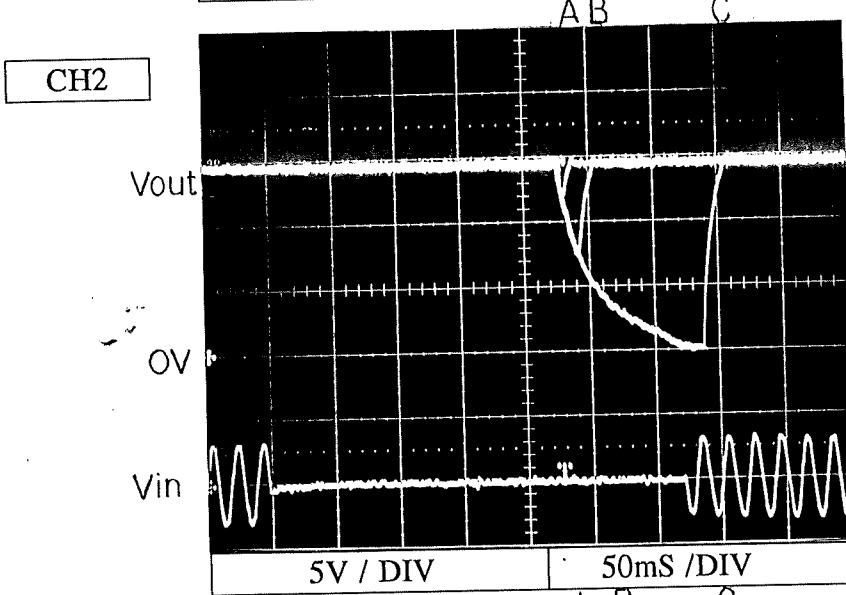
Response To Brown Out

LWT30H-5FF

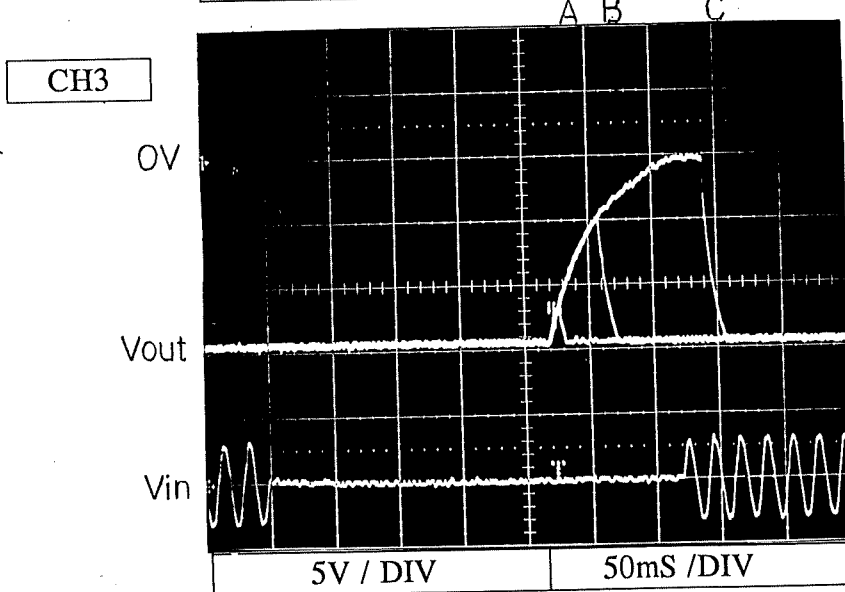
Conditions : Ta : 25°C  
 Vin : AC220V  
 Iout : 100%  
 CH1 : 4 A  
 CH2 : 0.45 A  
 CH3 : 0.22 A



Brown Out Time  
 A - 197mS  
 B - 207mS  
 C - 210mS



Brown Out Time  
 A - 226mS  
 B - 239mS  
 C - 320mS



Brown Out Time  
 A - 222mS  
 B - 243mS  
 C - 320mS

# LWT30H-5FF

## Inrush Current Characteristic

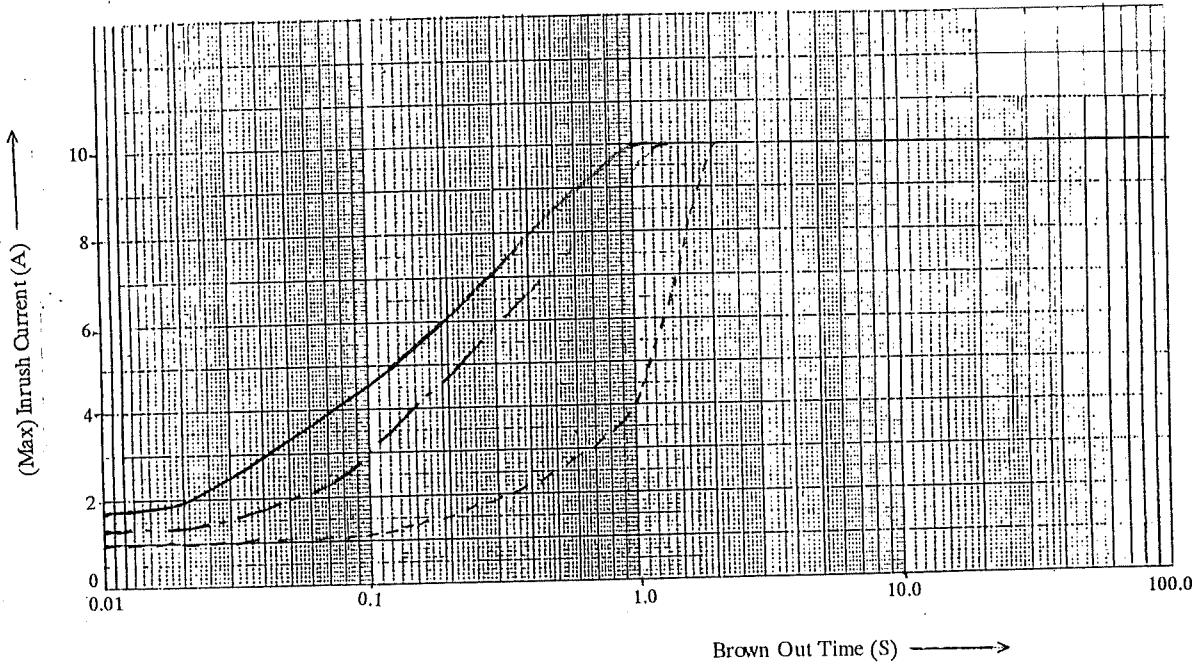
Conditions Vin : AC100V

Iout : 14% - - - -

50% - - - -

100% - - - -

Ta : 25°C



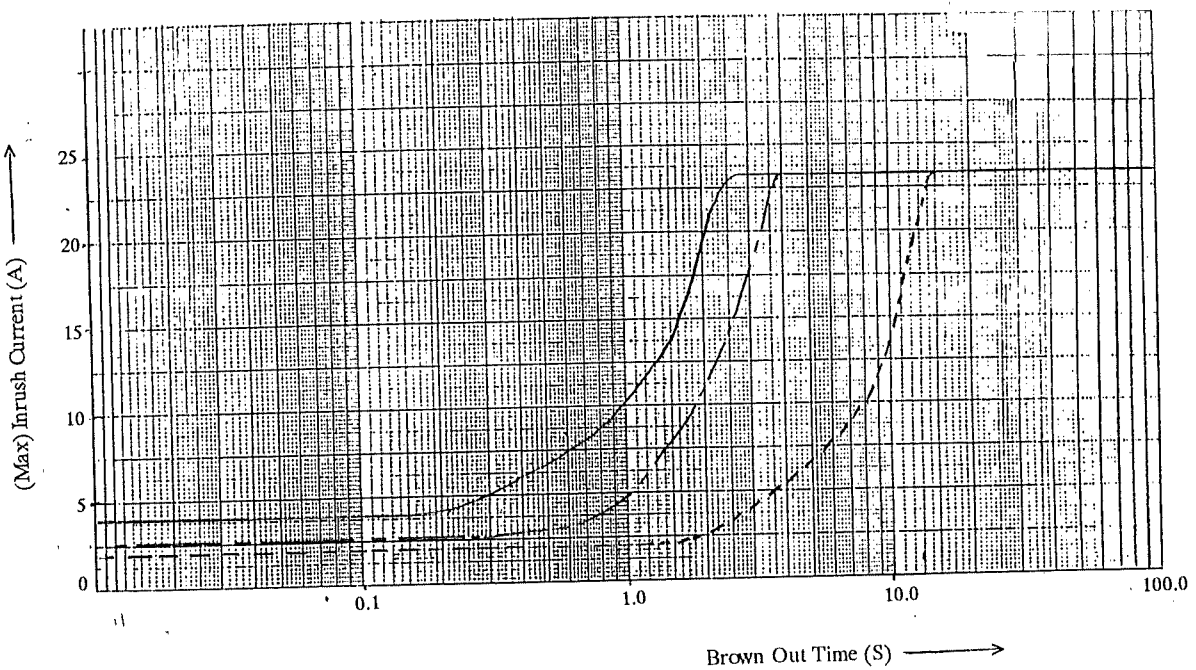
Conditions Vin : AC230V

Iout : 14% - - - -

50% - - - -

100% - - - -

Ta : 25°C



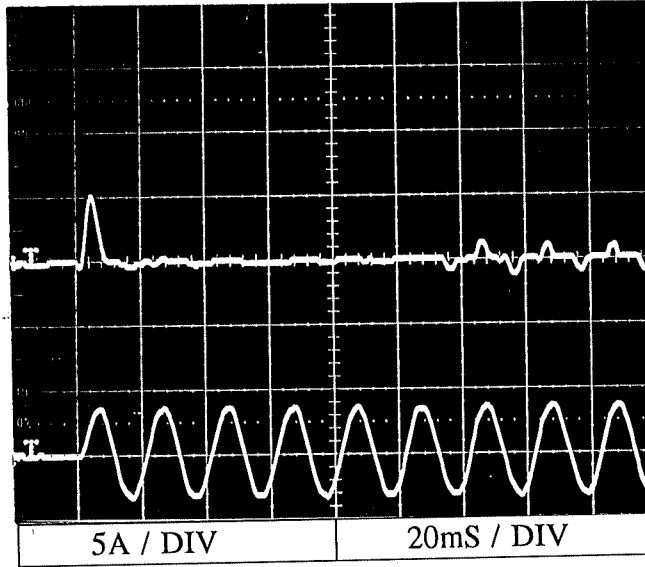
Inrush current waveform

LWT30H-5FF

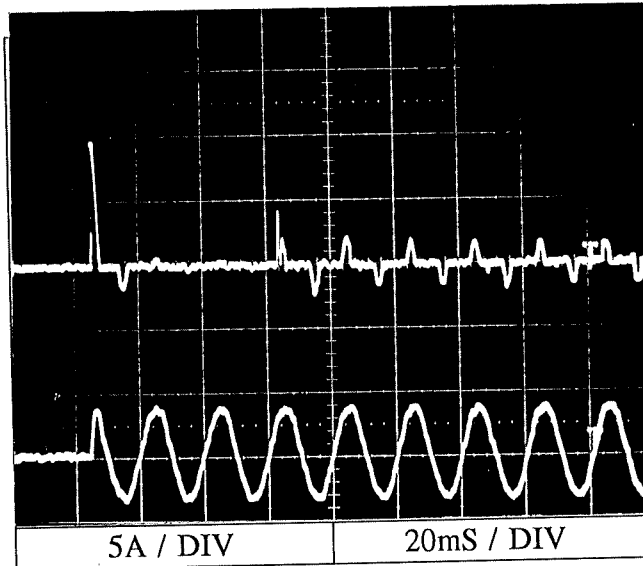
Conditions

Ta : 25°C  
Vin : 100VAC  
Iout : 100%

CH1 : 4 A  
CH2 : 0.45 A  
CH3 : 0.22 A



Switch on phase angle  
of input AC voltage  
 $\phi = 0^\circ$



Switch on phase angle  
of input AC voltage  
 $\phi = 90^\circ$

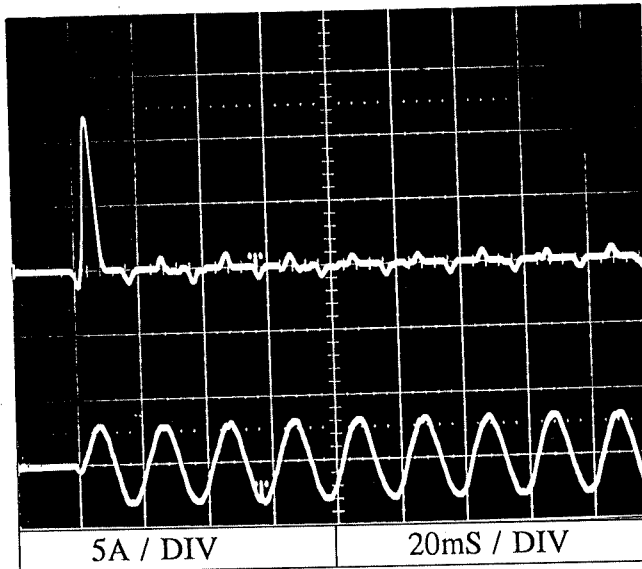
Inrush current waveform

LWT30H-5FF

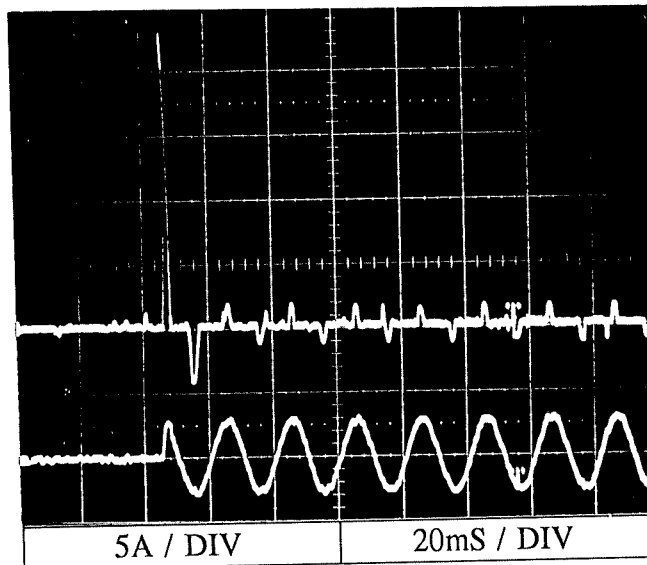
Conditions

Ta : 25°C  
Vin : 230VAC  
Iout : 100%

CH1 : 4 A  
CH2 : 0.45 A  
CH3 : 0.22 A



Switch on phase angle  
of input AC voltage  
 $\phi = 0^\circ$



Switch on phase angle  
of input AC voltage  
 $\phi = 90^\circ$

# LWT30H-5FF

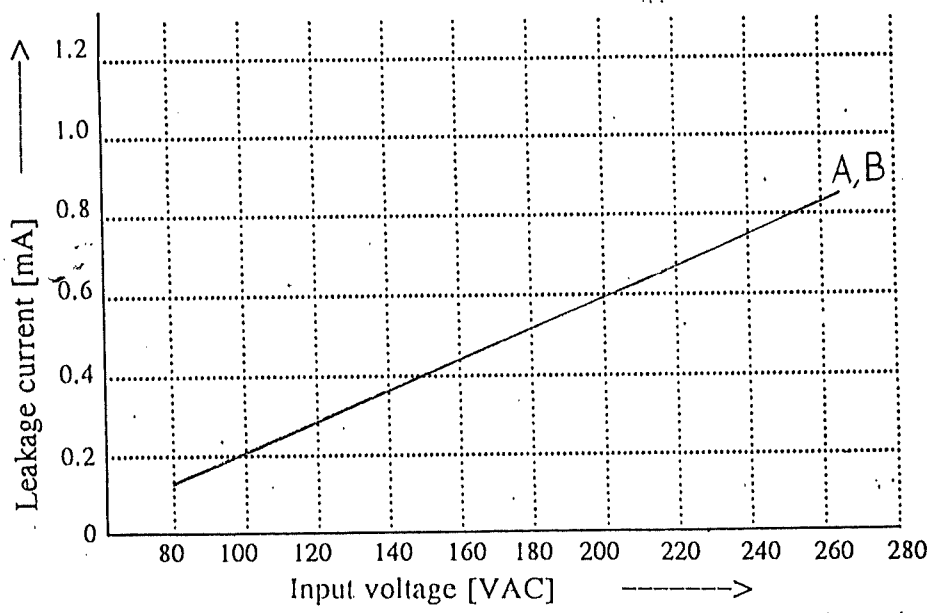
## Leakage current

Conditions  $V_{in} : 85 - 265VAC$

$T_a : 25^{\circ}C$

$I_{out} : 100\%$  \_\_\_\_\_ (A)

MIN ----- (B)



TDK-LAMBDA



Output Ripple, Noise

LWT30H-5FF

NORMAL MODE

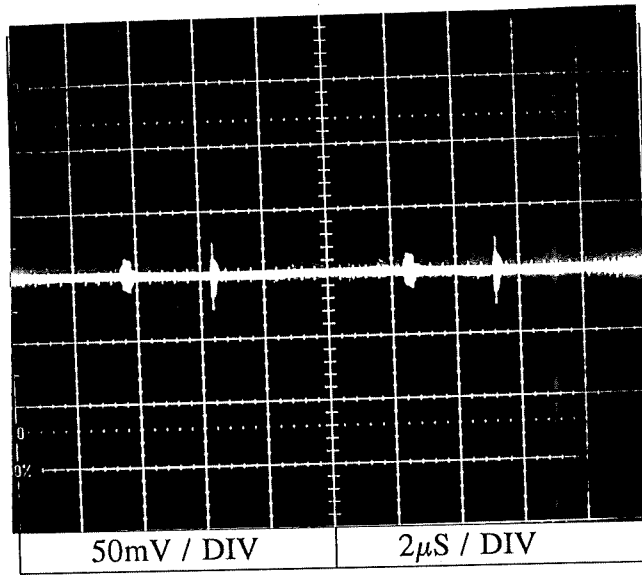
Conditions

Vin : AC100V

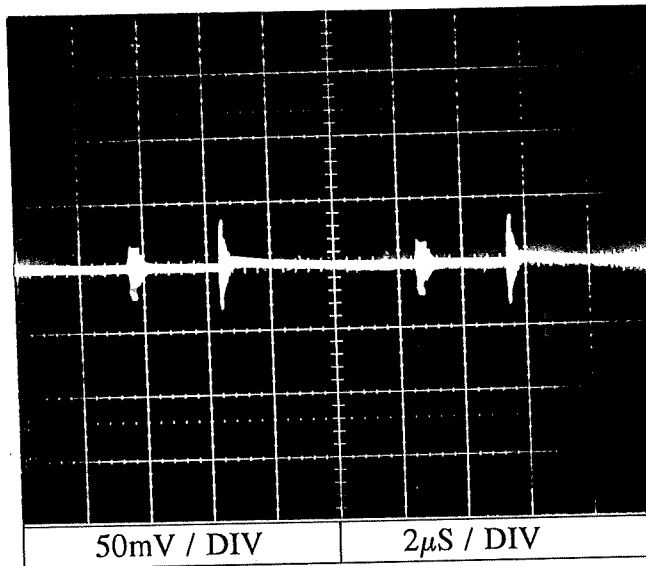
Iout : 100%

Ta : 25°C

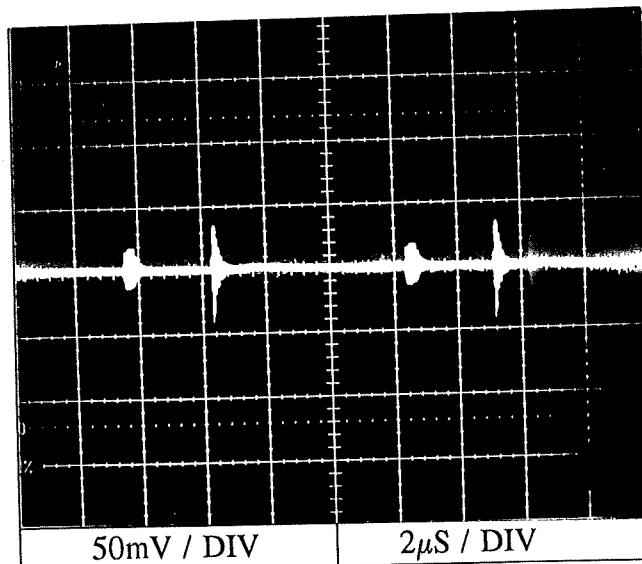
CH1



CH2



CH3



Output Ripple, Noise

LWT30H-5FF

COMMON+NORMAL MODE

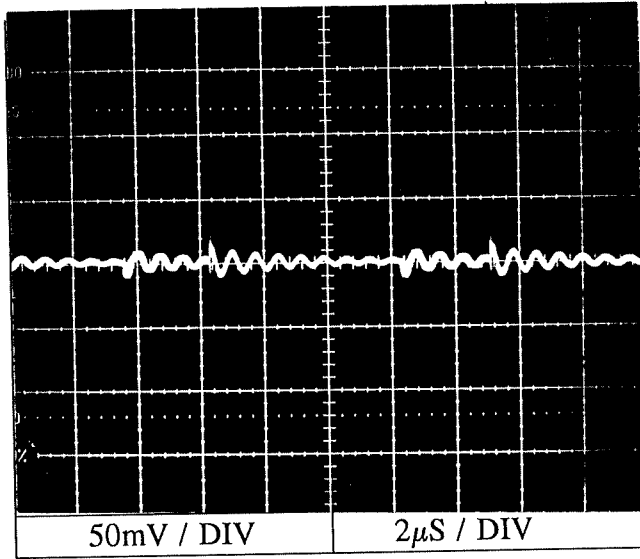
Conditions

Vin : AC100V

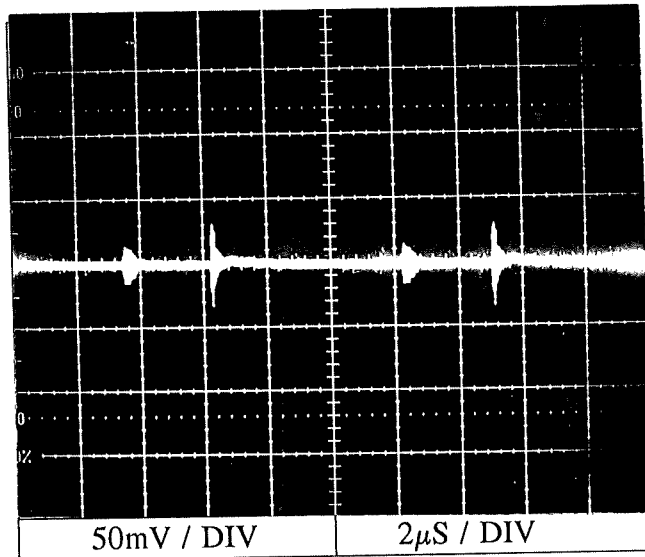
Iout : 100%

Ta : 25°C

CH1



CH2



CH3

