LWT15H-*

QUALITY TEST DATA

DWG. NO : PA785-53-01				
APPD.(NLJ QA)	APPD.(NLM QA)	APPROVED	CHECKED	ENGR.
T.Murayama	M.K.Ho 28/10/94	RCNGO		
26/JAN./95	28/Oct/94	27/10/94	27/10/94	26·OCT·1994

NEMIC-LAMBDA

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Terminology used :

Defination

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

LWT15H

SPECIFICATIONS

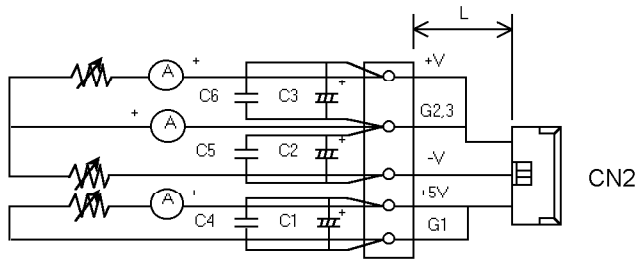
PA785-01-01A

ITEMS \ MODEL			LWT15H-5FF			LWT15H-522			LWT15H-525		
1	Nominal Output Voltage	V	+5±1%	+15	-15	+5±1%	+12	-12	+5±1%	+12	-5
2	Minimum Output Current	A	0.5	0	0	0.5	0	0	0.5	0	0
3	Maximum Output Current	A	3.0	0.6	0.4	3.0	0.6	0.4	3.0	0.6	0.4
4	Maximum Output Power /CH	W	15.0	9.0	6.0	15.0	7.2	4.8	15.0	7.2	2.0
5	Total Allowable Output Power	-	17W								
6	Efficiency (Typ) (*1)	-	72%								
7	Input Voltage Range (*8)	-	85-265VAC (47-440Hz) or 110-330VDC								
8	Input Current (Typ) 100/200V	-	0.40A / 0.22A								
9	In-rush Current (Typ) (*2)	-	14A at 100VAC, 28A 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 0871D, FCC 20780D								
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...17W, 50°C...14W, 60°C...10W								
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^2 X,Y,Z 1h each								
31	Shock	-	Less than 196.1m/s^2								
32	Weight	-	220g								
33	Size (WxHxD)	mm	60 x 26 x 128 (Refer to Outline Drawing)								

NOTES :

*1 : At 100VAC and Maximum Output Power (5V 2A, CH2,CH3 total 7W).
*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 18W.
*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 : 150mm AWG #20 (Single Wire)
C1 : Elec. Cap 470μF
C2, 3 : Elec. Cap 47μF
C4, 5, 6 : Film Cap 0.1μF
Bandwidth of scope : 100MHz EIAJ Probe

1. EVALUATION METHOD

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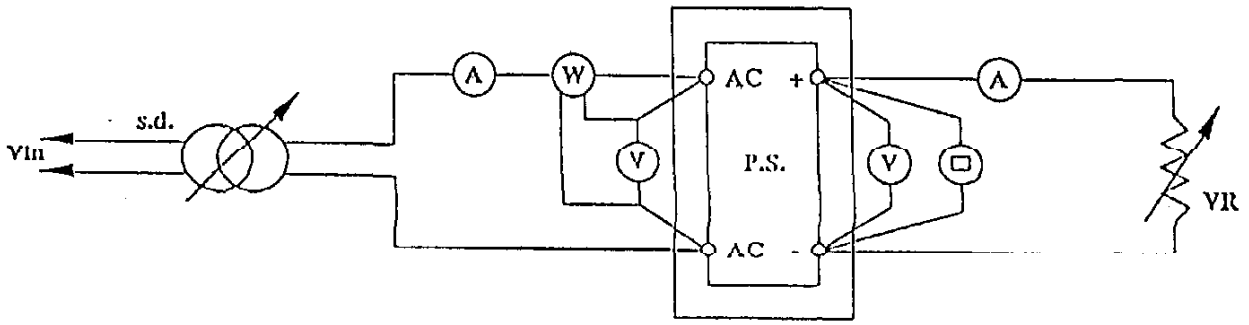
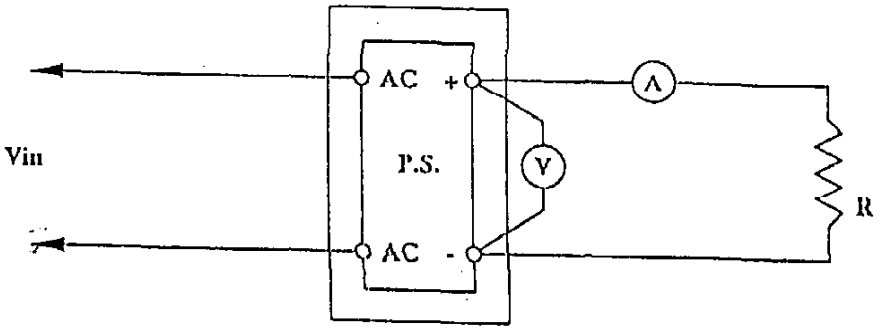
1-1 Circuits used for determination

(1) Steady state data



Controlled temp. chamber

(2) Warm up voltage drift characteristics

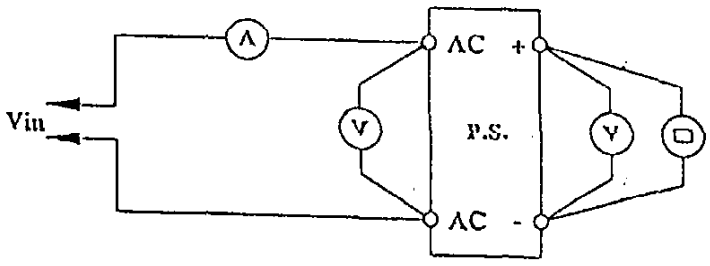


Controlled temp. chamber

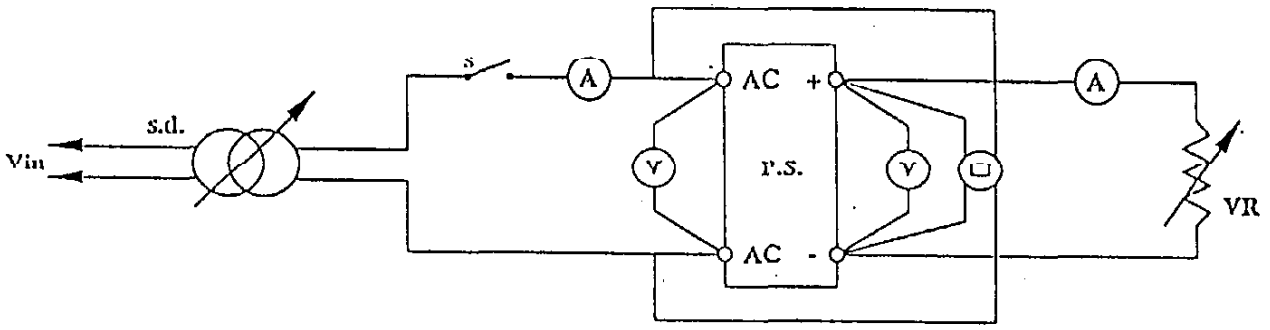
(3) Over current protection (OCP) characteristics

Same as steady state data

(4) Over voltage protection (OVP) characteristics



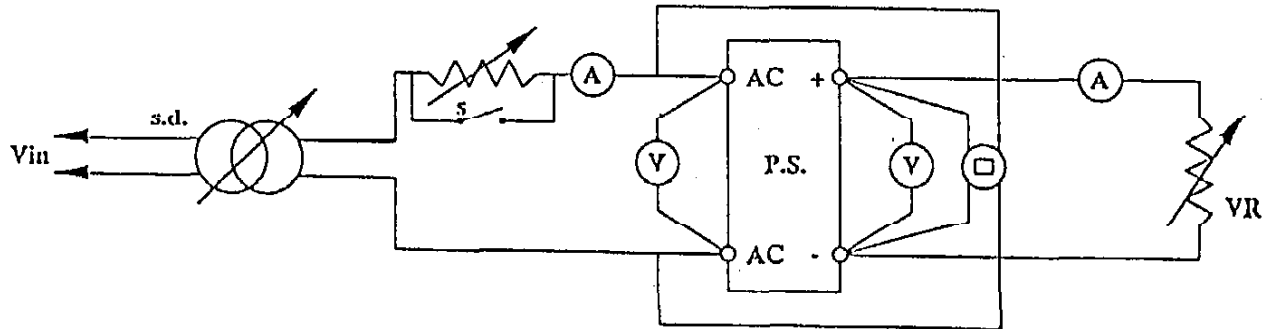
(5) Output rise characteristics



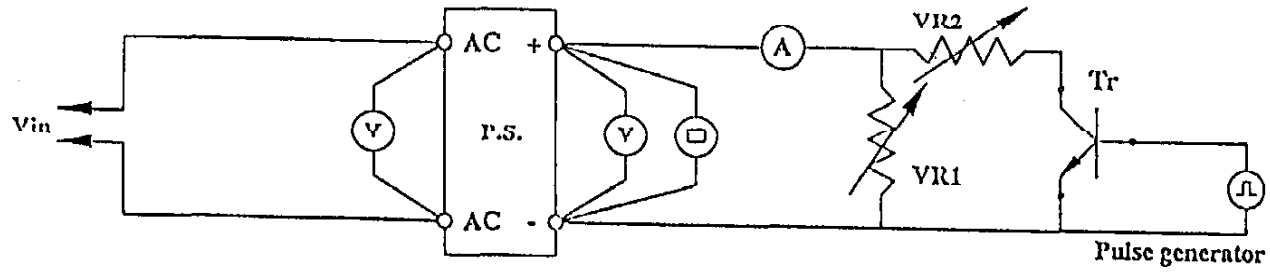
(6) Output fall characteristics

Same as Output rise characteristics

(7) Dynamic line response characteristics



(8) Dynamic load response characteristics



(9) Inrush current characteristics

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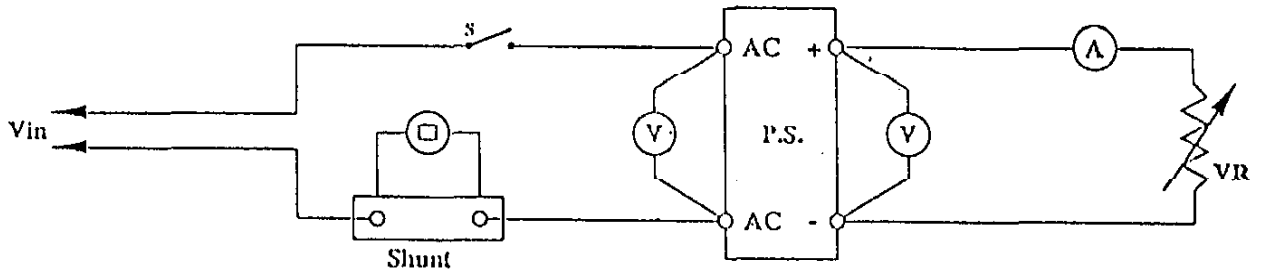
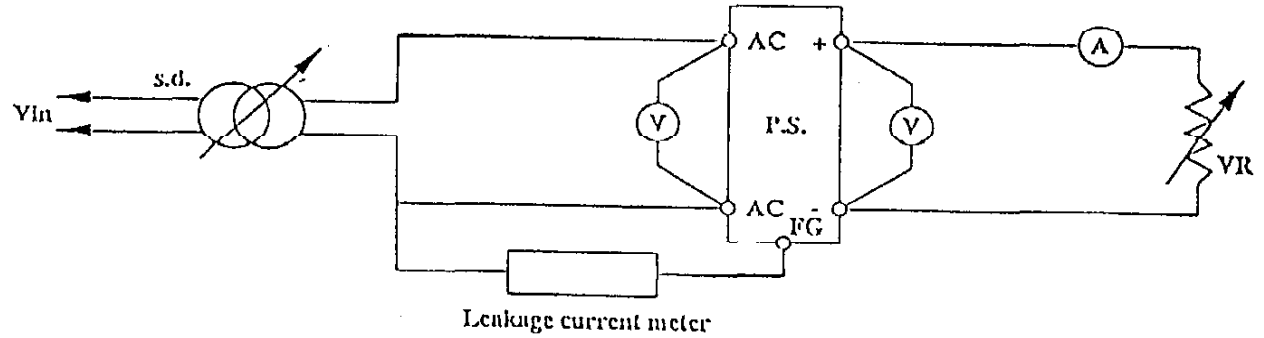


(10) Leakage current characteristics



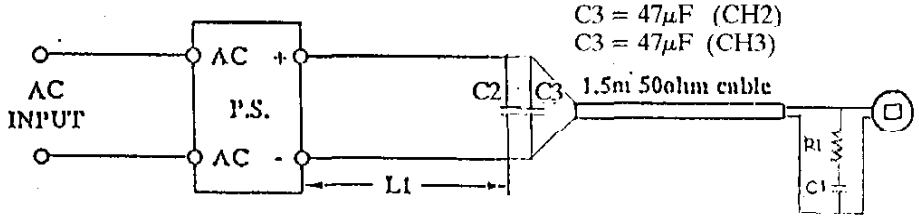
Note : Leakage current measure through a 1K ohm resistor. Range wed : AC + DC

(11) Output-ripple, noise

Bandwidth of scope : 100MHz B.W

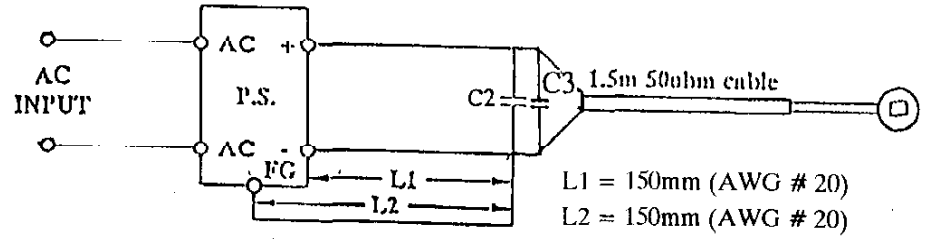
(a) Normal mode

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



L1 = 150mm

(b) Normal + common mode



L1 = 150mm (AWG # 20)
L2 = 150mm (AWG # 20)

3. List Of Equipment Used

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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

Condition CH2 : 0.08 A
CH3 : 0.05 A
Ta : 25°C

Vin / Iout	AC 85 V	AC 100 V	AC 220 V	AC 265 V	LINE REGULATION	
17 %	5.023 V	5.023 V	5.022 V	5.022 V	1 mV	0.02 %
50 %	5.004 V	5.004 V	5.003 V	5.003 V	1 mV	0.02 %
100 %	4.974 V	4.974 V	4.973 V	4.972 V	2 mV	0.04 %
LOAD	49 mV	49 mV	49 mV	50 mV		
REGULATION	0.98 %	0.98 %	0.98 %	1.00 %		

2. Temperature Drift

Conditions Vin : AC100V
Iout : CH1 : 3 A
CH2 : 0.08 A
CH3 : 0.05 A

Ta	0 °C	25 °C	40 °C	TEMP. STABILITY	
Vout	4.979 V	4.974 V	4.965 V	14 mV	0.28 %

CH2

1. Regulation – Line and Load

Condition CH1 : 0.5 A
CH3 : 0.4 A
Ta : 25°c

Vin / Iout	AC 85 V	AC 100 V	AC 220 V	AC 265 V	LINE REGULATION	
0 %	14.877 V	14.877 V	14.877 V	14.876 V	1 mV	0.01 %
50 %	14.870 V	14.870 V	14.870 V	14.870 V	0 mV	0.00 %
100 %	14.865 V	14.865 V	14.865 V	14.865 V	0 mV	0.00 %
LOAD	12 mV	12 mV	12 mV	11 mV		
REGULATION	0.08 %	0.08 %	0.08 %	0.07 %		

2. Temperature Drift

Conditions Vin : AC100V
Iout : CH1 : 0.5 A
CH2 : 0.6 A
CH3 : 0.4 A

Ta	0 °C	25 °C	40 °C	TEMP. STABILITY	
Vout	14.813 V	14.865 V	14.875 V	62 mV	0.41 %

REGULATION – Line And Load, Temp. Drift

CH3

Conditions Ta : 25°C

CH1 : 0.5 A
CH2 : 0.6 A

1. Regulation – Line and Load

Vin / Iout	AC 85 V	AC 100 V	AC 220 V	AC 265 V	LINE REGULATION	
0 %	14.993 V	14.990 V	14.986 V	14.986 V	7 mV	0.05 %
50 %	14.969 V	14.969 V	14.967 V	14.967 V	2 mV	0.01 %
100 %	14.949 V	14.949 V	14.948 V	14.948 V	1 mV	0.01 %
LOAD	44 mV	41 mV	38 mV	38 mV		
REGULATION	0.27 %	0.27 %	0.25 %	0.25 %		

2. Temperature Drift

Conditions Vin : AC100V
Iout : CH1 : 0.5 A
CH2 : 0.6 A
CH3 : 0.4 A

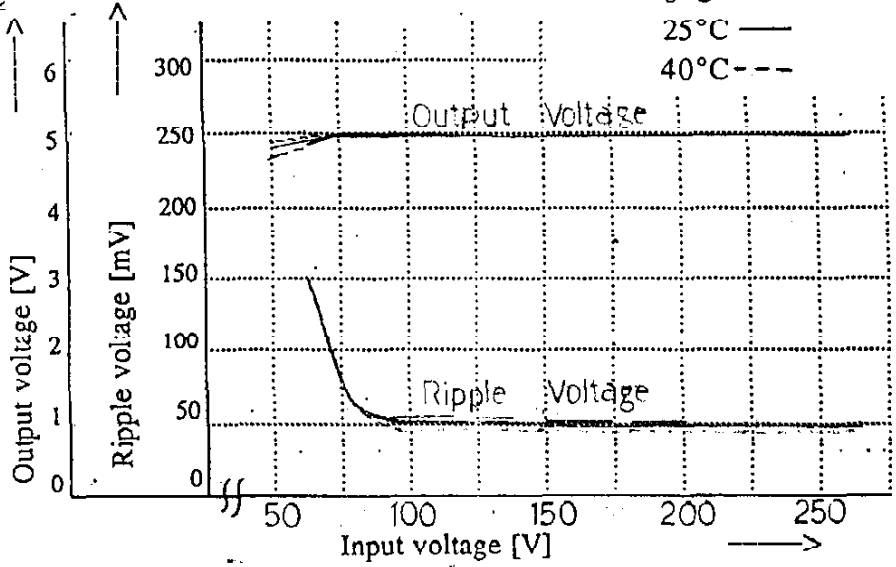
Ta	0 °C	25 °C	40 °C	TEMP. STABILITY	
Vout	14.921 V	14.949 V	14.990 V	69 mV	0.46 %

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

Iout : 100%
0°C – –
25°C ——
40°C– – –

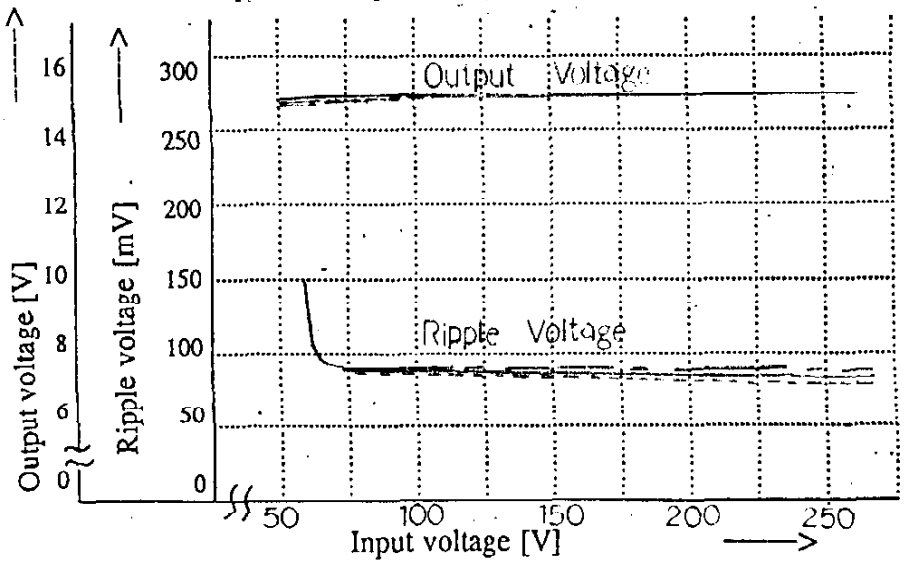
CH1

CH1 : 3A
CH2 : 0.08A
CH3 : 0.05A



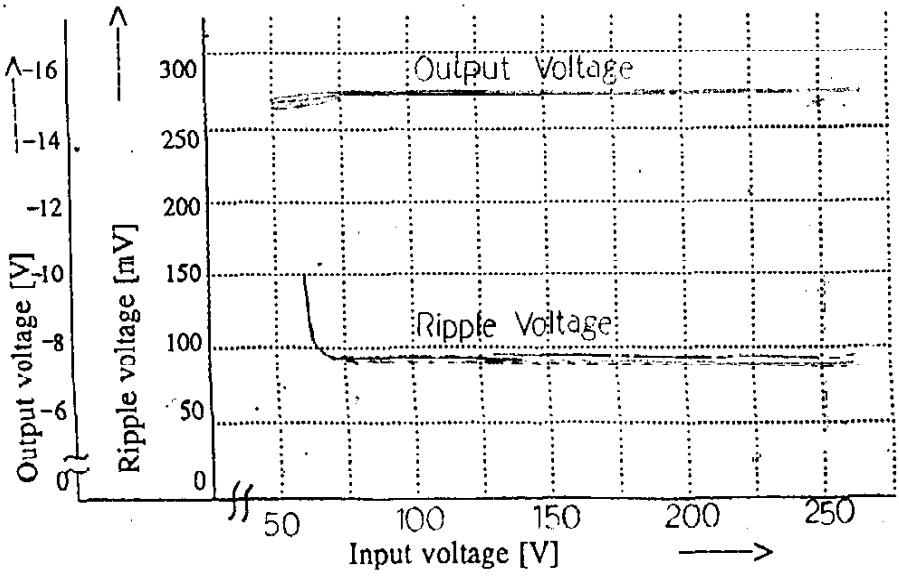
CH2

CH1 : 0.5A
CH2 : 0.6A
CH3 : 0.4A



CH3

CH1 : 0.5A
CH2 : 0.6A
CH3 : 0.4A

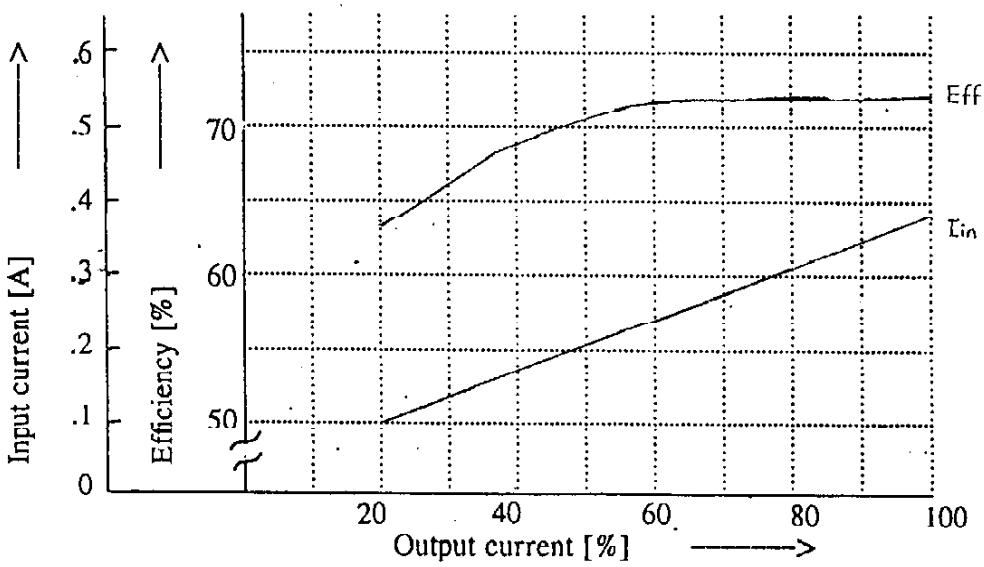


(3) Efficiency and input current v.s. output current

Conditions Vin AC100V

Ta : 25°C

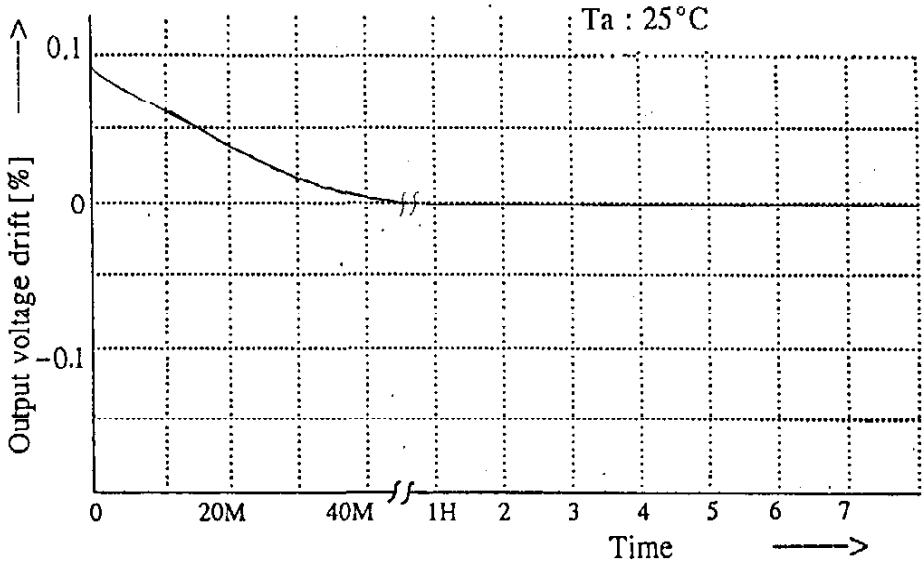
100% = CH1 : 2 A
CH2 : 0.28 A
CH3 : 0.19 A



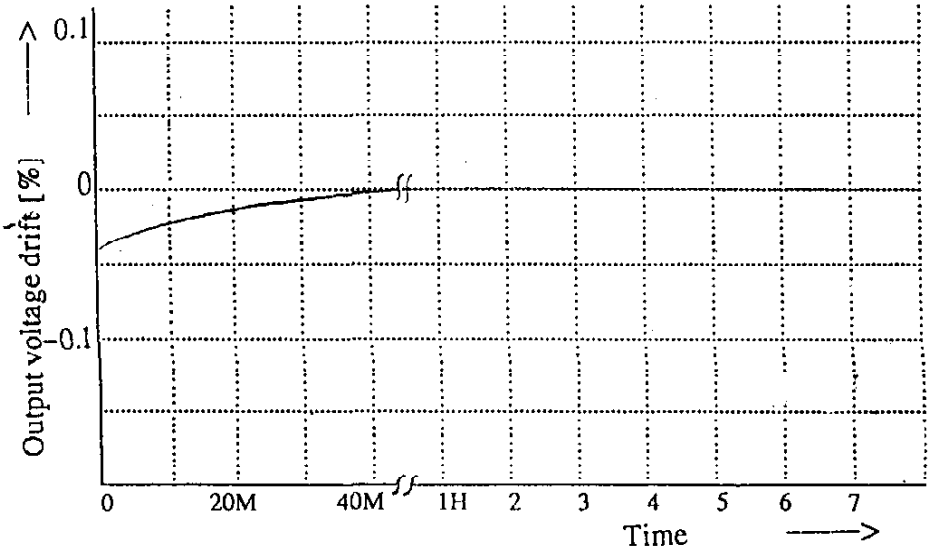
Warm up voltage drift

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

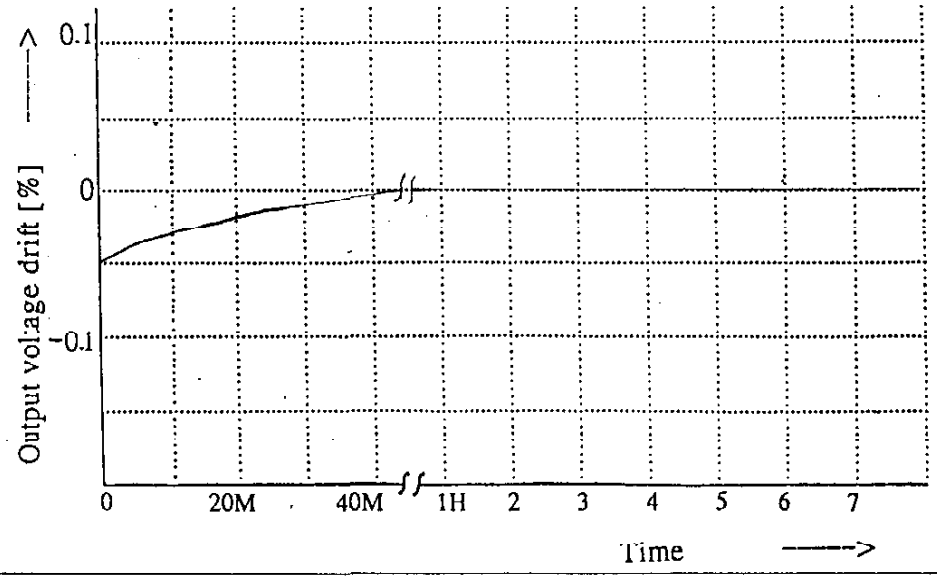
CH1



CH2



CH3



LWT15H-5FF

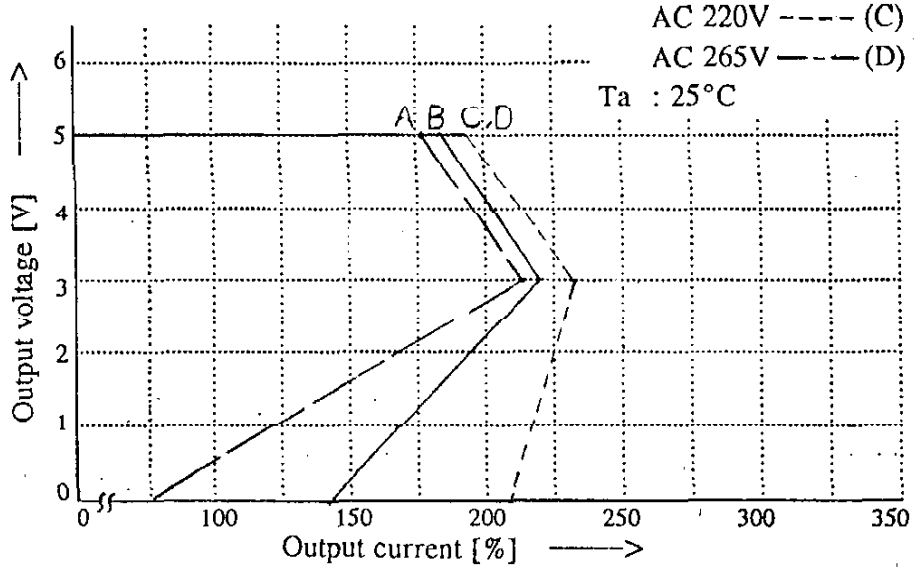
OCP Characteristics

Condition

Vin AC 85V — — (A)
AC 100V —— (B)
AC 220V - - - - (C)
AC 265V — - — (D)
Ta : 25°C

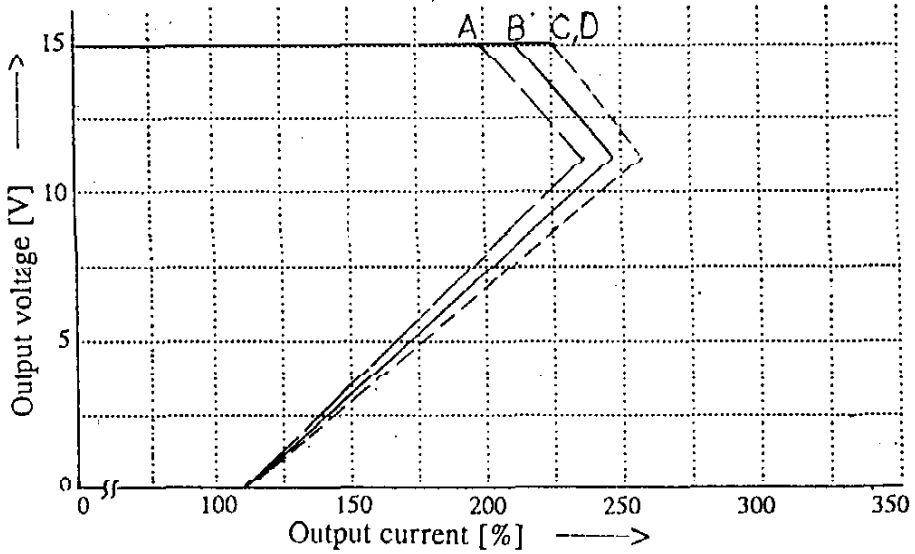
CH1

Iout {CH2 : 0.08A
CH3 : 0.05A



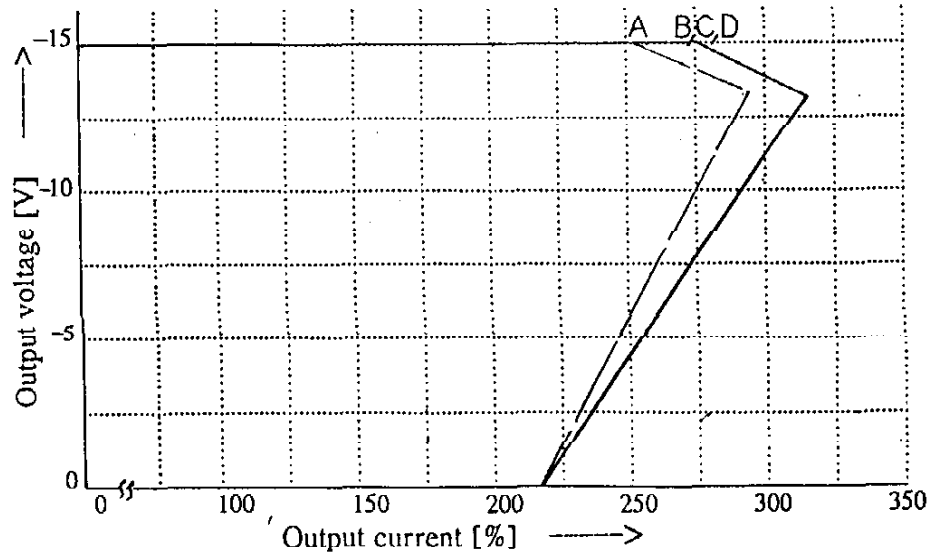
CH2

Iout {CH1 : 0.5A
CH3 : 0.4A



CH3

Iout {CH1 : 0.5A
CH2 : 0.6A



LWT15H-5FF

OCP Characteristics

Condition

Vin AC 100V

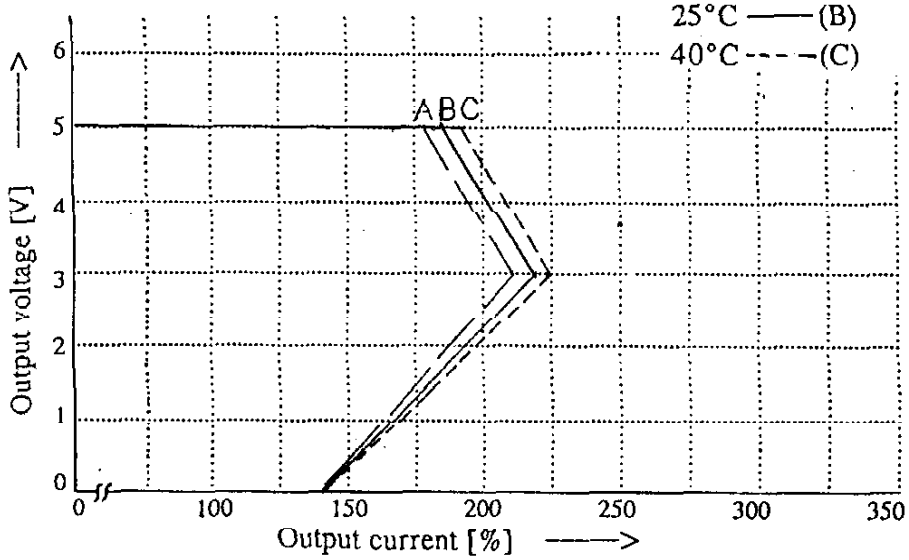
Ta : 0°C — — (A)

25°C —— (B)

40°C - - - - (C)

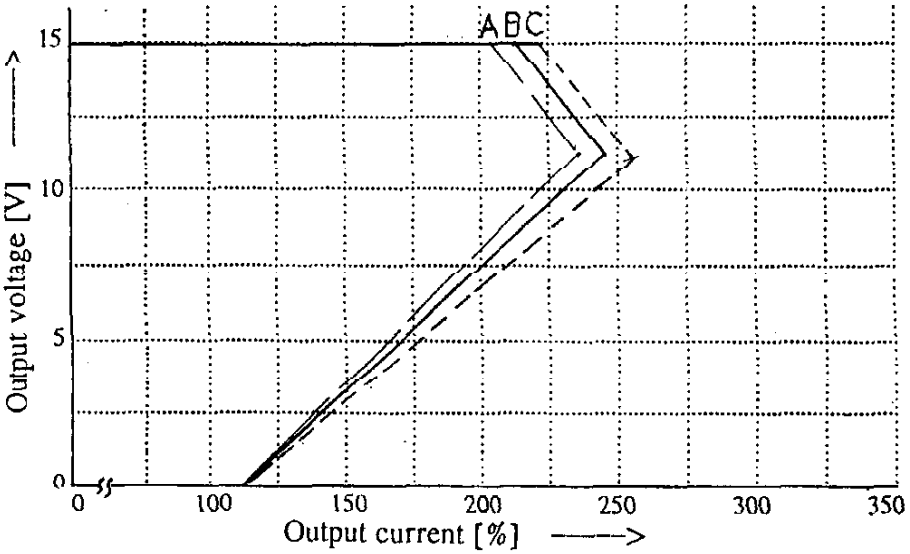
CH1

Iout {CH2 : 0.08A
CH3 : 0.05A



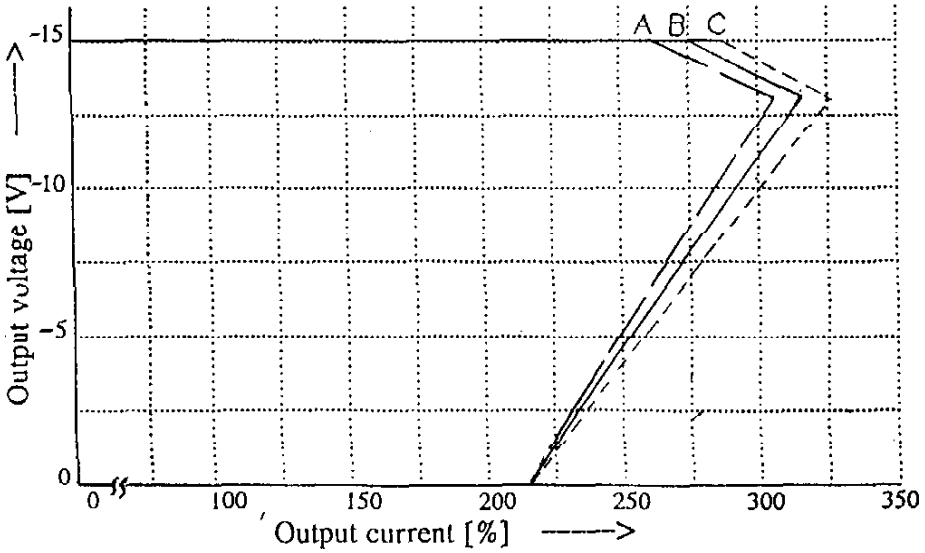
CH2

Iout {CH1 : 0.5A
CH3 : 0.4A



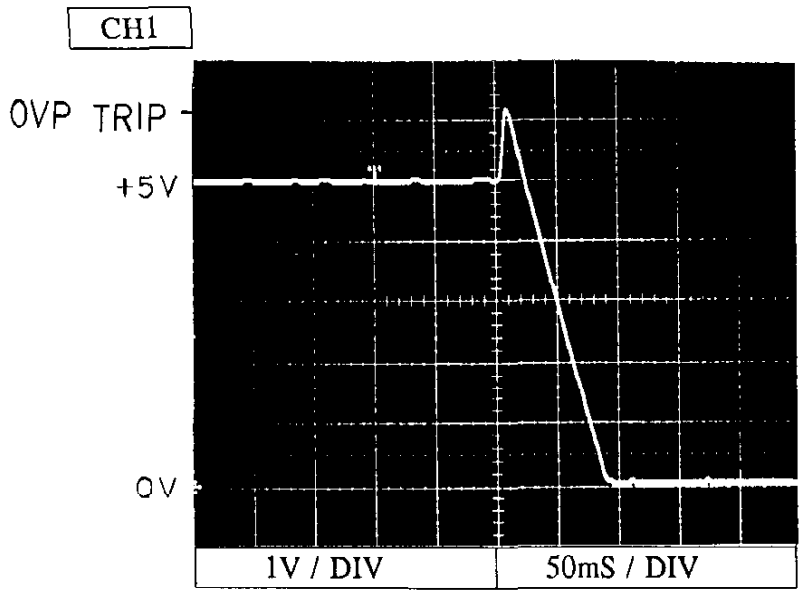
CH3

Iout {CH1 : 0.5A
CH2 : 0.6A



OVP Characteristics

Conditions Vin AC100V
Ta : 25°C
Iout : MIN
CH1 : 0.5 A
CH2 : 0 A
CH3 : 0 A

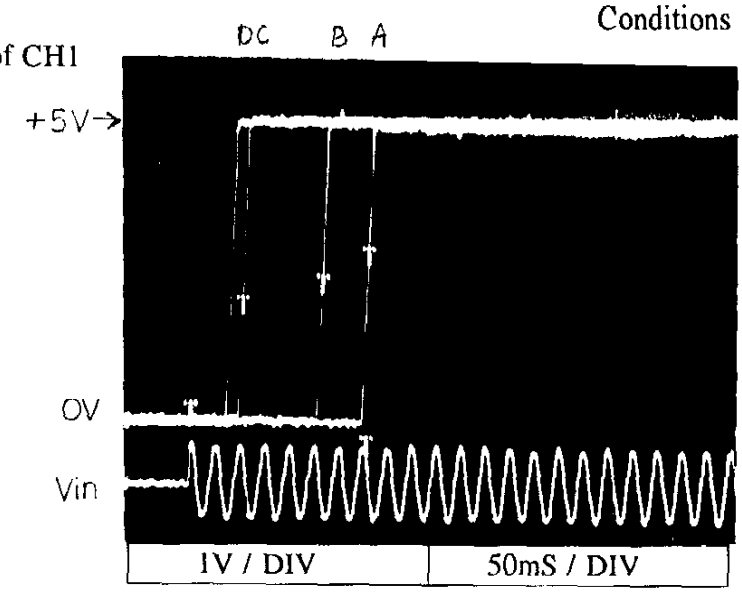


Output Rise Time

LWT15H-5FF

Conditions : Ta : 25°C

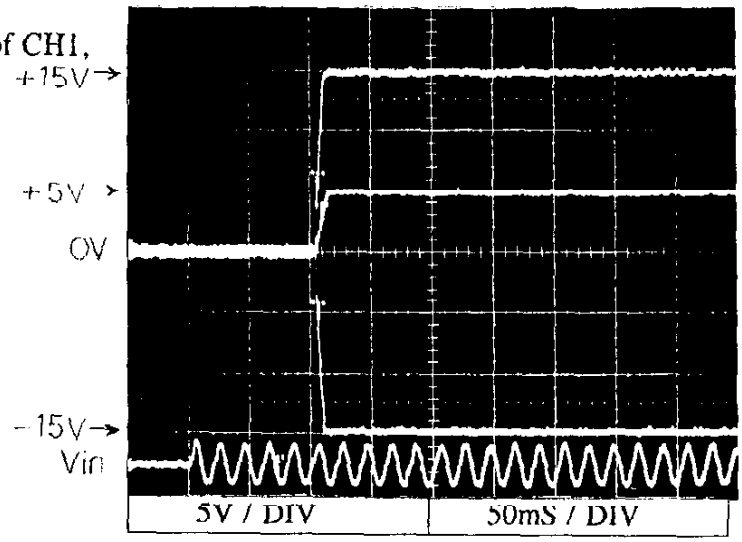
Waveform of CH1



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

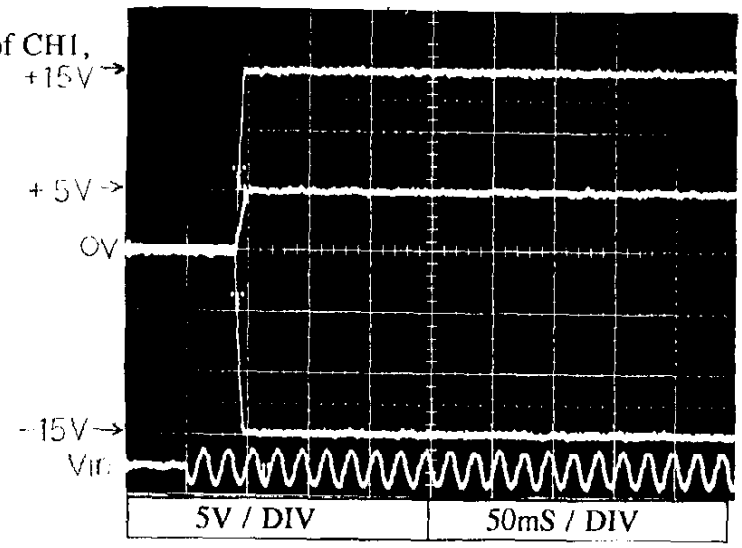
Iout : MIN
CH1 : 0.5 A
CH2 : 0 A
CH3 : 0 A

Waveform of CH1, CH2, CH3



Vin : AC100V
Iout : MIN

Waveform of CH1, CH2, CH3



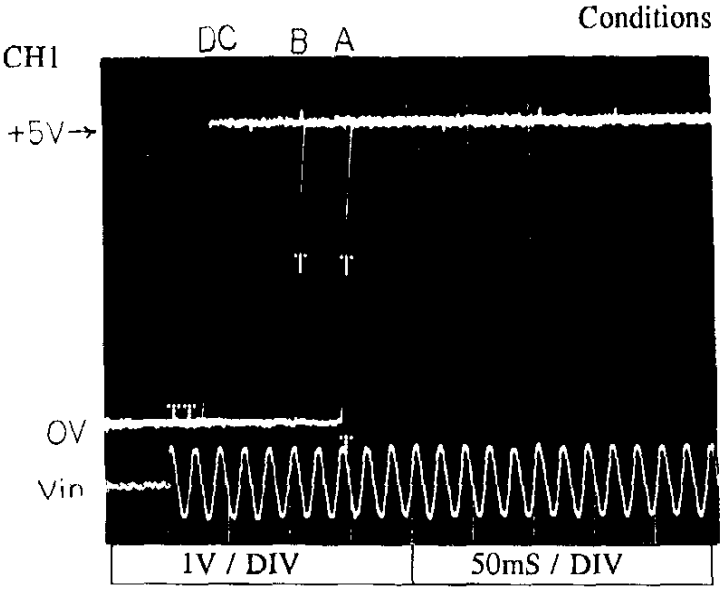
Vin : AC220V
Iout : MIN

Output Rise Time

LWT15H-5FF

Conditions : Ta : 25°C

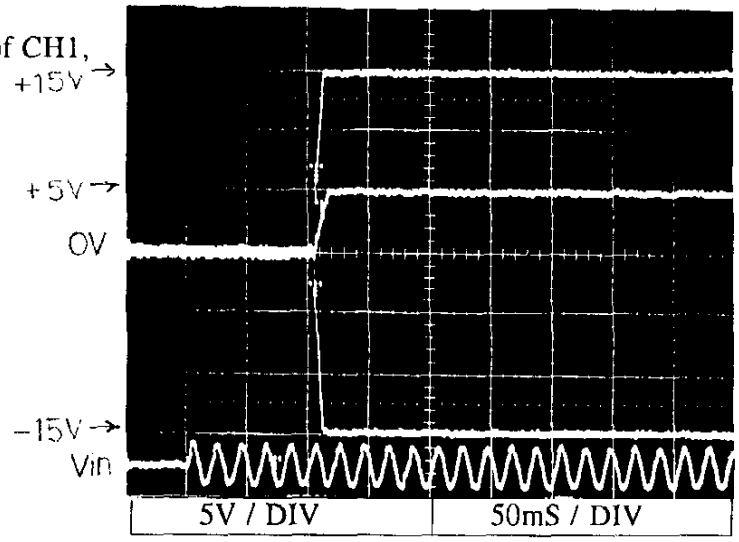
Waveform of CH1



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

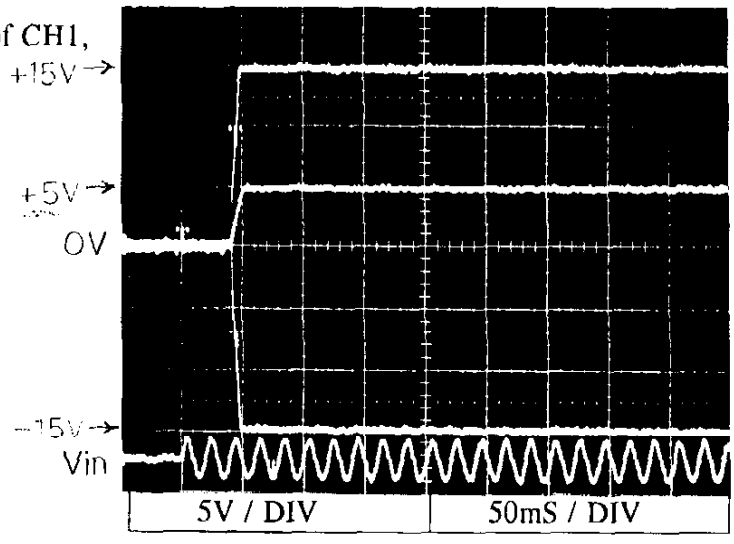
Iout : 100%
CH1 : 2 A
CH2 : 0.28 A
CH3 : 0.19 A

Waveform of CH1, CH2, CH3



Vin : AC100V
Iout : 100%

Waveform of CH1, CH2, CH3

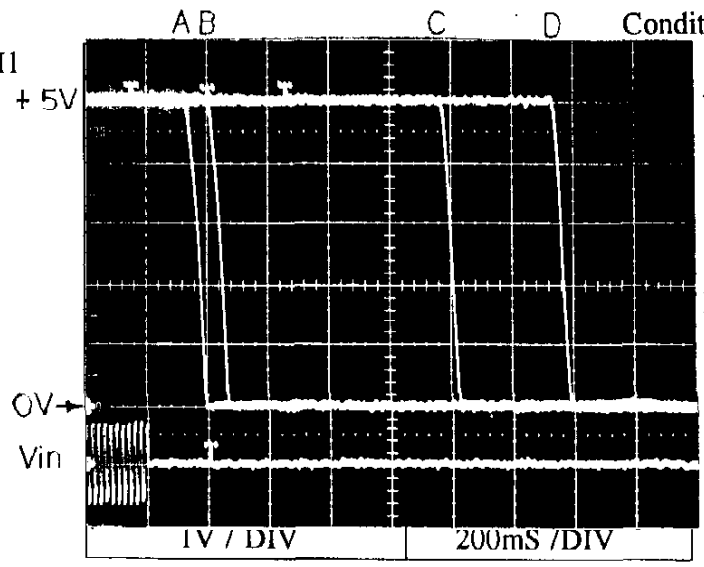


Vin : AC220V
Iout : 100%

Output Fall Time

LWT15H-5FF

Waveform of CH1

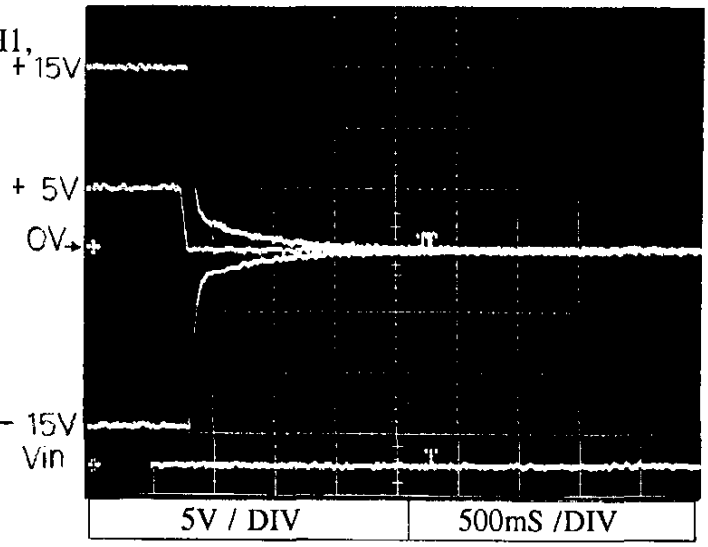


Conditions : Ta : 25°C

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

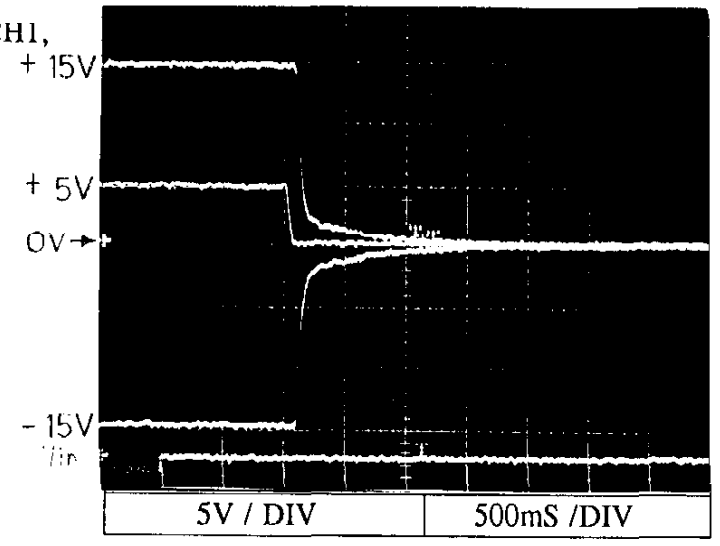
Iout : MIN
CH1 : 0.5 A
CH2 : 0 A
CH3 : 0 A

Waveform of CH1, CH2, CH3



Vin AC100V
Iout : MIN

Wavetorm of CH1, CH2, CH3

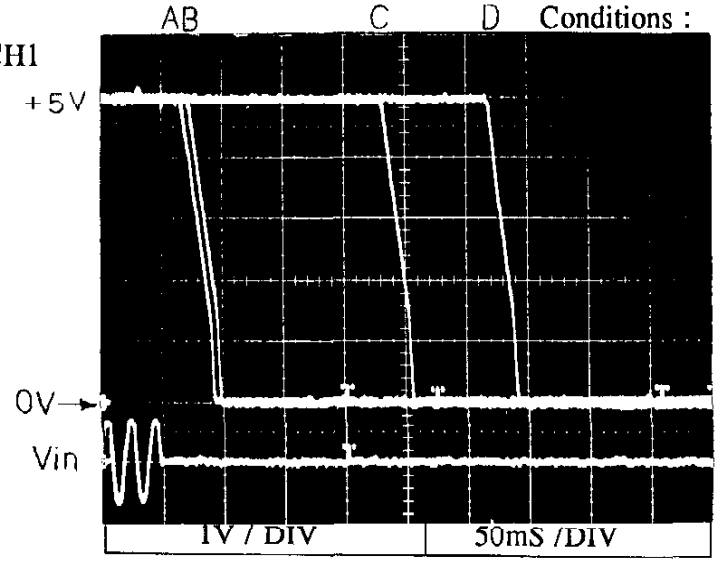


Vin AC220V
Iout : MIN

Output Fall Time

LWT15H-5FF

Waveform of CH1

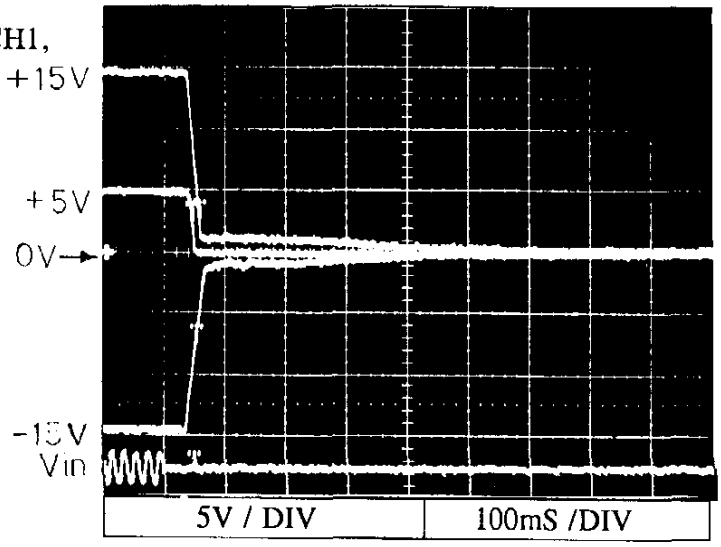


Conditions : Ta : 25°C

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

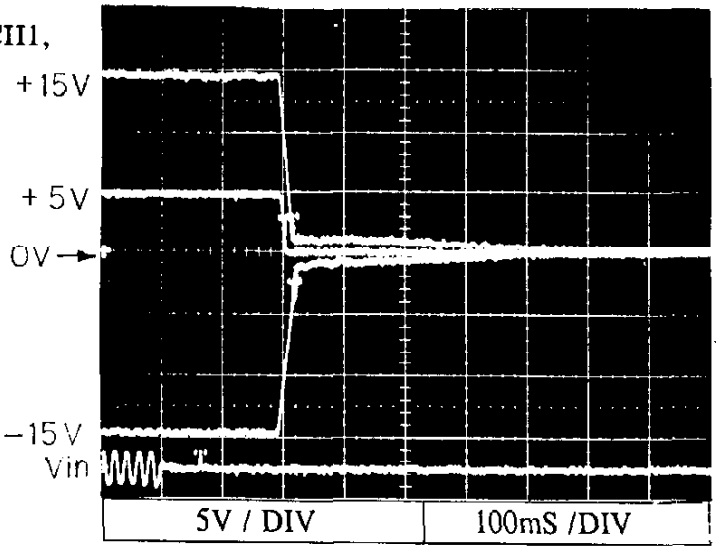
Iout : 100%
CH1 : 2 A
CH2 : 0.28 A
CH3 : 0.19 A

Waveform of CH1, CH2, CH3



Vin:AC100V
Iout : 100%

Waveform of CH1, CH2, CH3



Vin:AC220V
Iout : 100%

LWT15H-5FF

Hold up Time

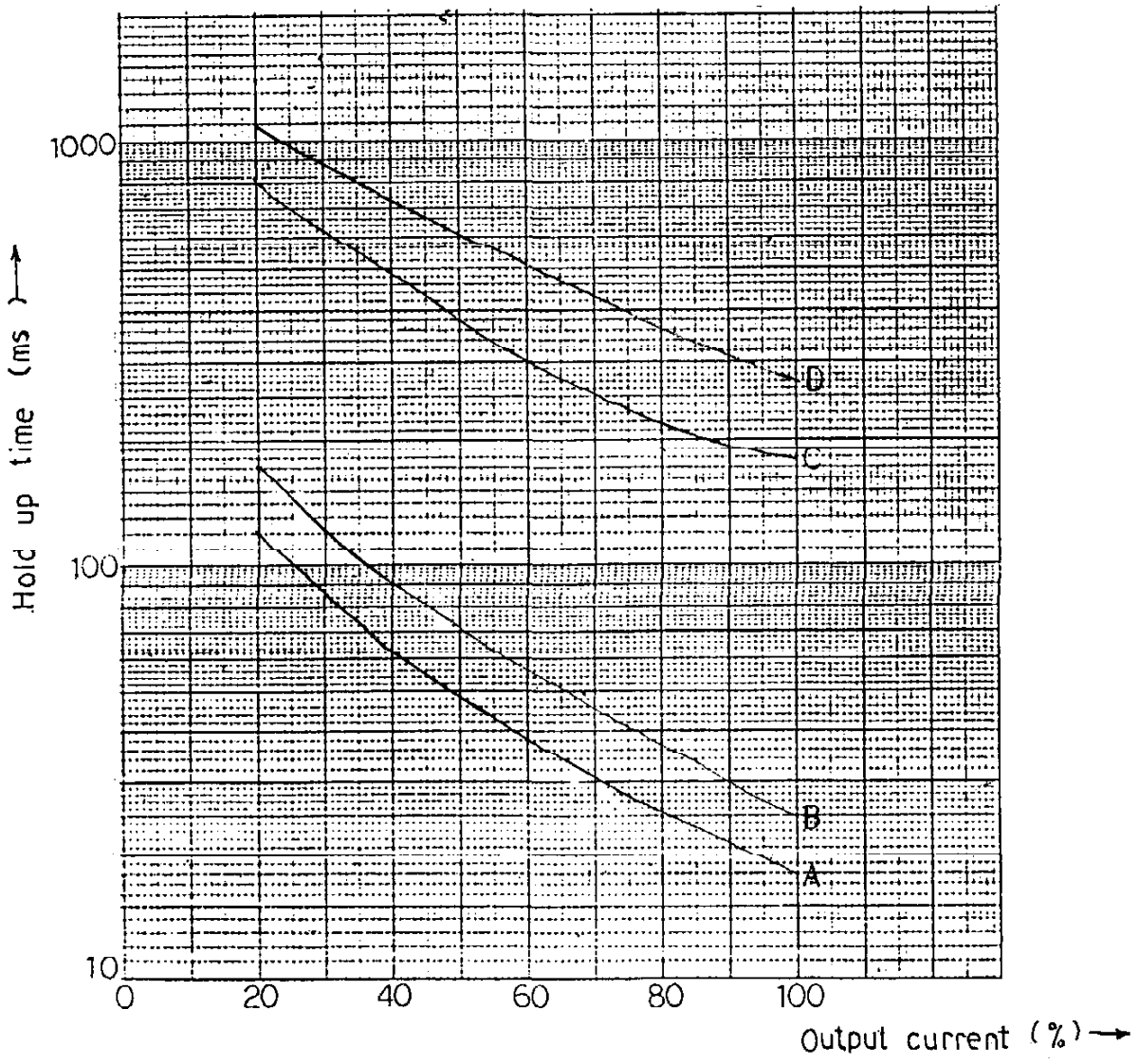
CH1

Conditions

Ta : 25°C

Vin : 85VAC ——— (A)
100VAC ——— (B)
220VAC ——— (C)
265VAC ——— (D)

Iout : 100%
CH1 : 2 A
CH2 : 0.28 A
CH3 : 0.19 A



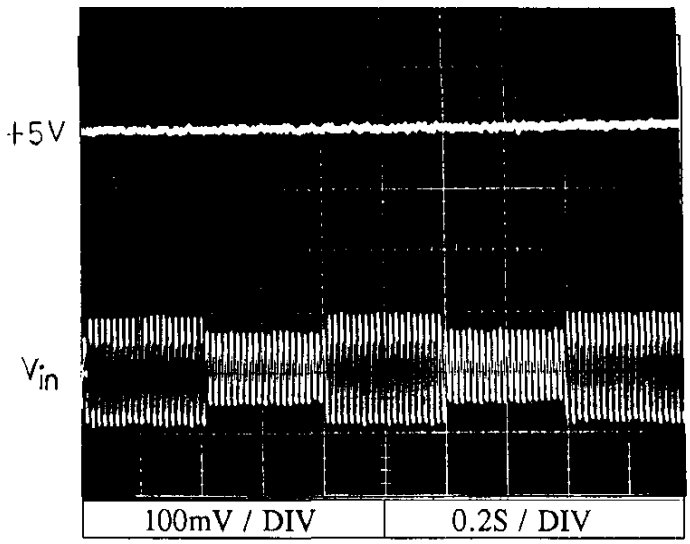
Dynamic Line Response

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

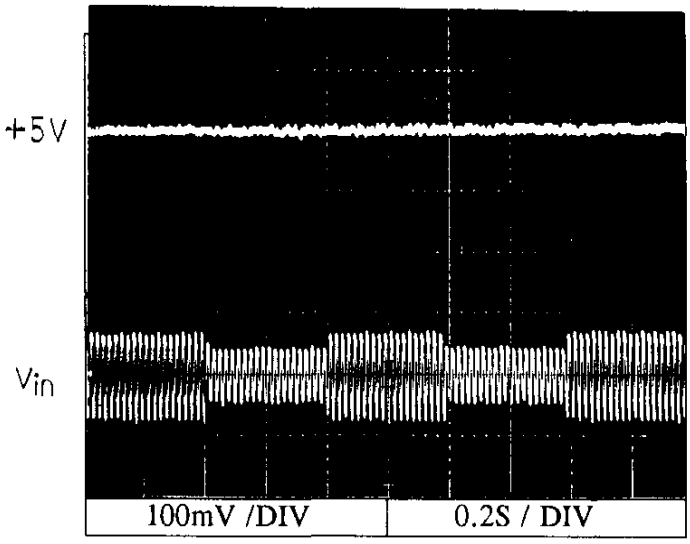
CH1 : 3 A
CH2 : 0.08 A
CH3 : 0.05 A

CH1

Vin : 85VAC ⇌ 132VAC



Vin : 170VAC ⇌ 265VAC



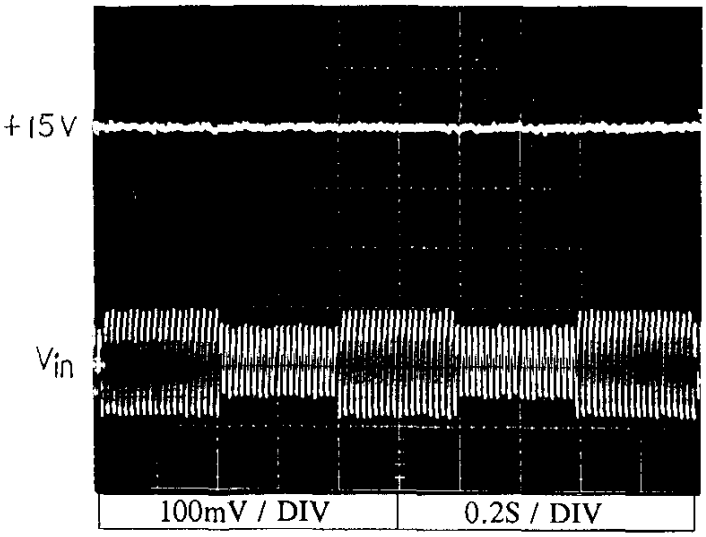
Dynamic Line Response

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

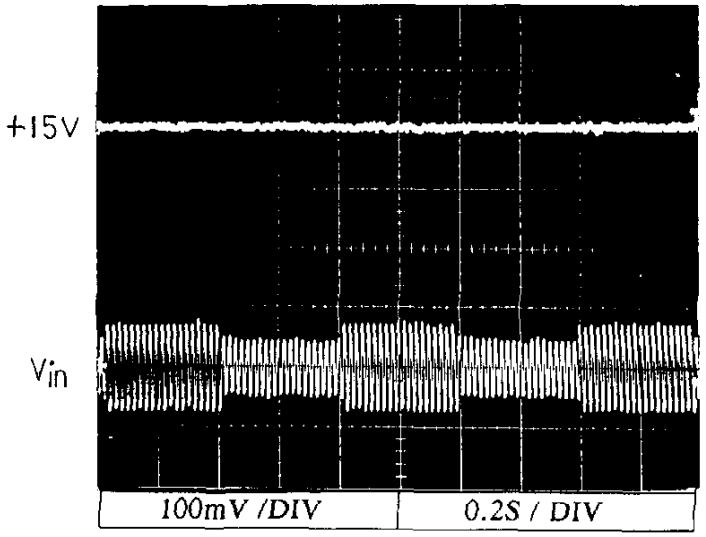
CH1 : 0.5 A
CH2 : 0.6 A
CH3 : 0.4 A

CH2

Vin : 85VAC ⇌ 132VAC



Vin : 170VAC ⇌ 265VAC



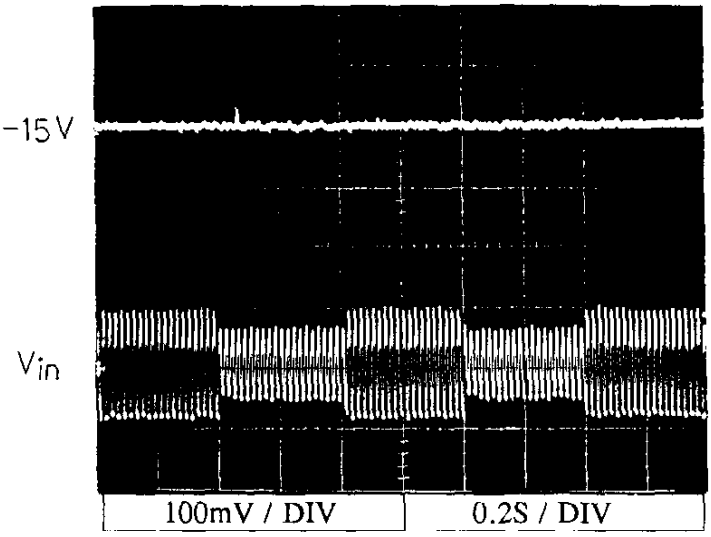
Dynamic Line Response

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

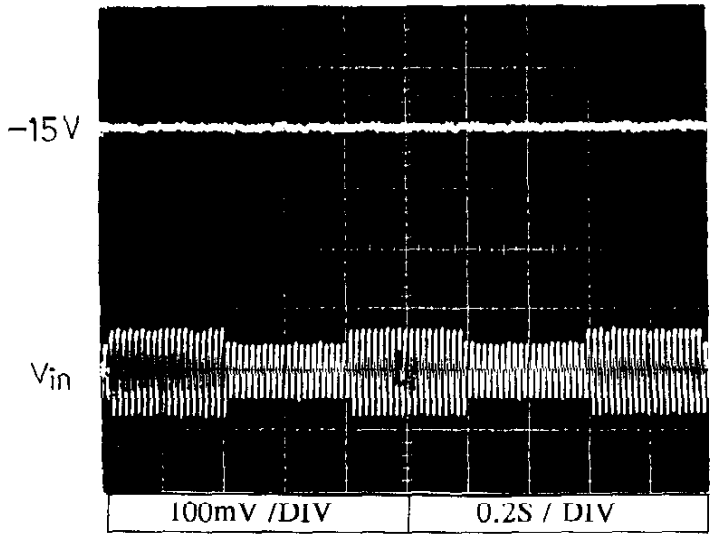
CH1 : 0.5 A
CH2 : 0.6 A
CH3 : 0.4 A

CH3

Vin : 85VAC ⇌ 132VAC



Vin : 170VAC ⇌ 265VAC



Dynamic Load Response

LWT15H-5FF

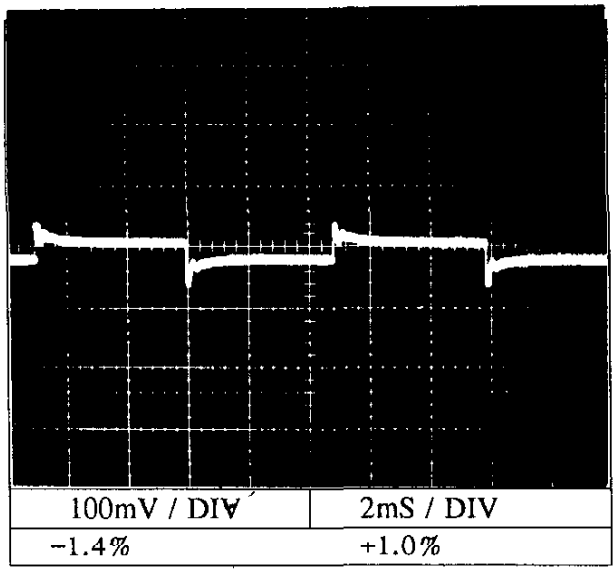
Conditions

Vout : 5V
Vin : AC 100V
Ta : 25°C

Iout { CH2 : 0.08 A
CH3 : 0.05 A

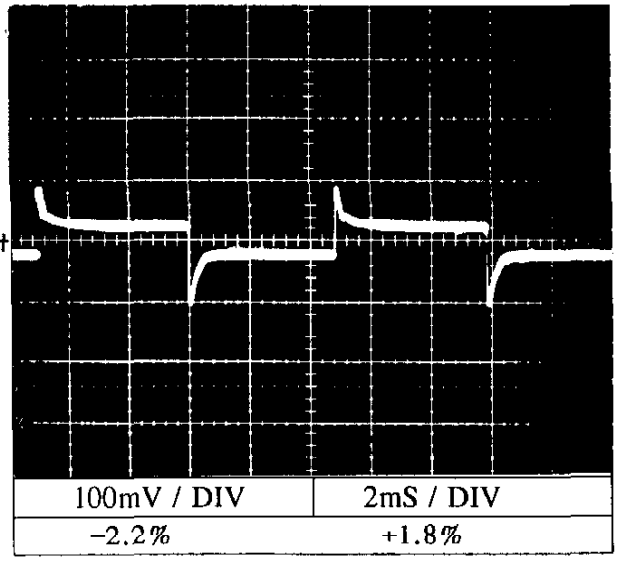
CH1

Iout 50 % <——> 100% f = 100Hz



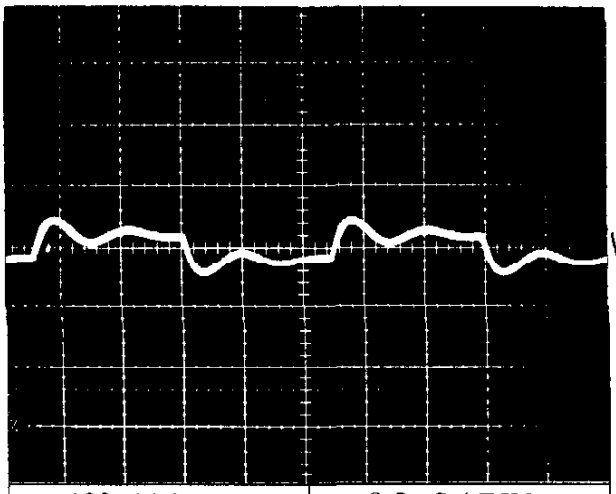
100mV / DIV	2mS / DIV
-1.4%	+1.0%

Iout 17 % <——> 100% f = 100Hz



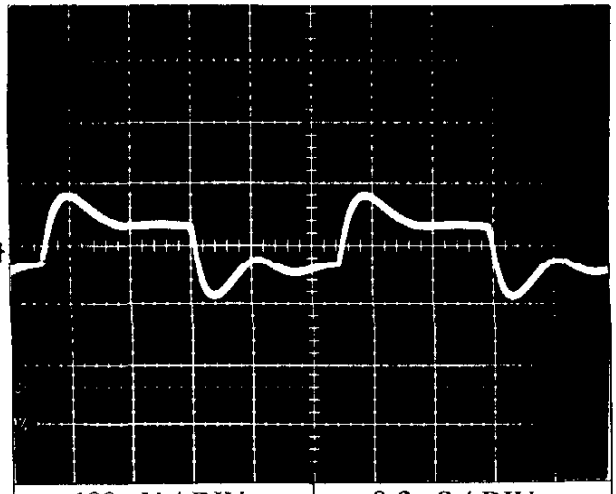
100mV / DIV	2mS / DIV
-2.2%	+1.8%

Iout : 50 % <——> 100% f = 1KHz



100mV / DIV	0.2mS / DIV
-1.0%	+1.0%

Iout : 17 % <——> 100% f = 1KHz



100mV / DIV	0.2mS / DIV
-1.8%	+1.6%

Dynamic Load Response

LWT15H-5FF

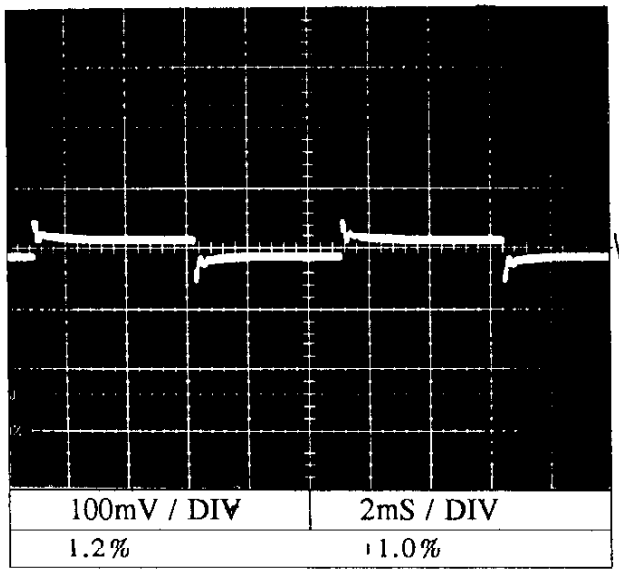
Conditions

Vout : 5V
Vin : AC 220V
Ta : 25°C

Iout { CH2 : 0.08 A
CH3 : 0.05 A

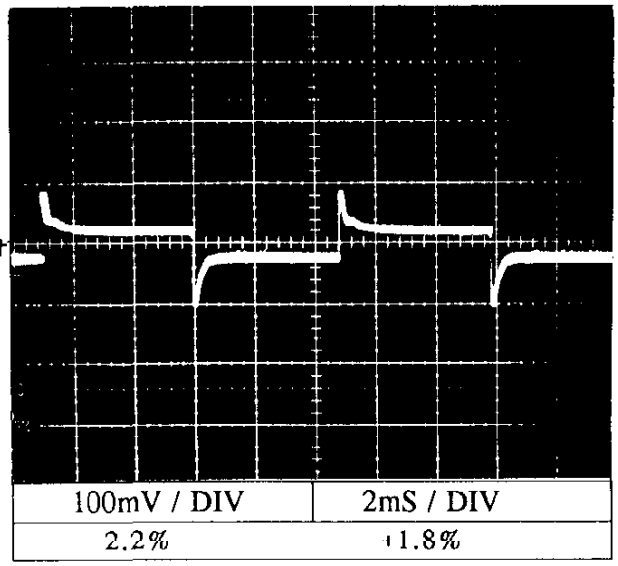
CH1

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



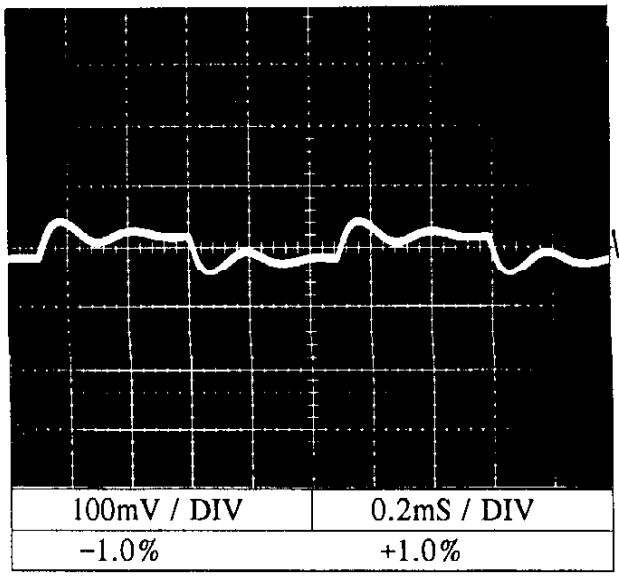
100mV / DIV	2mS / DIV
1.2%	1.0%

Iout 17 % <-----> 100% f = 100Hz



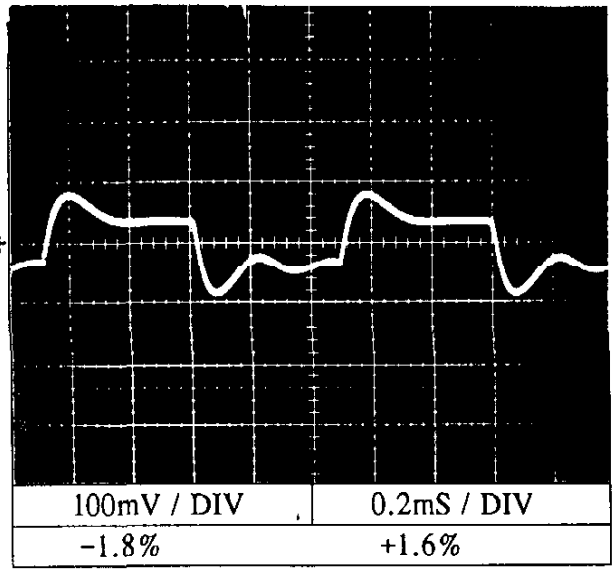
100mV / DIV	2mS / DIV
2.2%	1.8%

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



100mV / DIV	0.2mS / DIV
-1.0%	+1.0%

Iout : 17 % <-----> 100% f = 1KHz

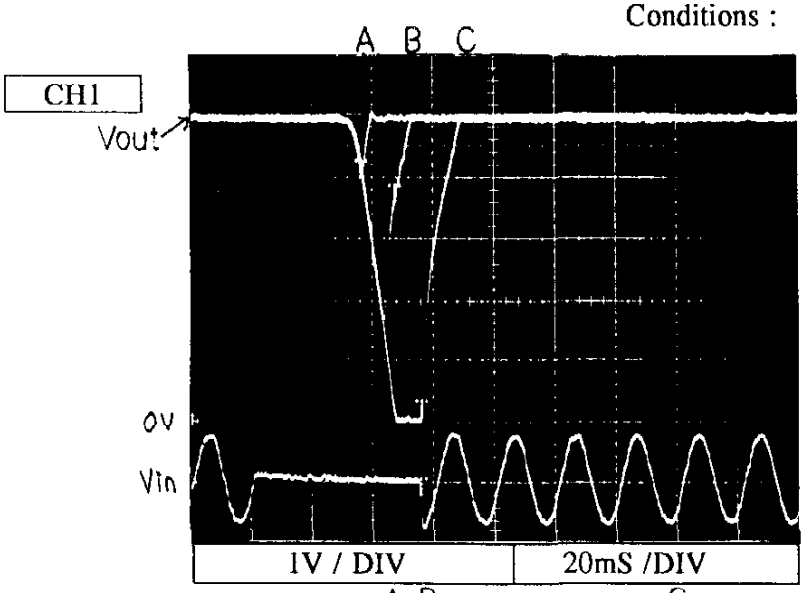


100mV / DIV	0.2mS / DIV
-1.8%	+1.6%

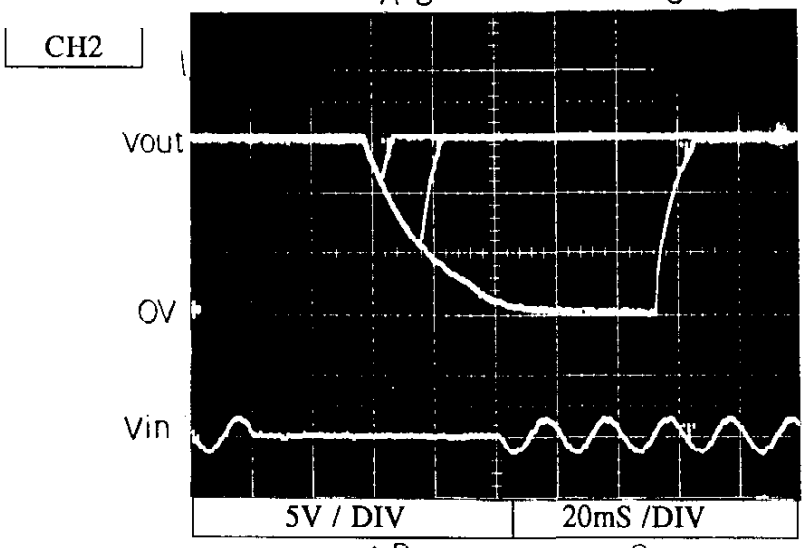
Response To Brown Out

LWT15H-5FF

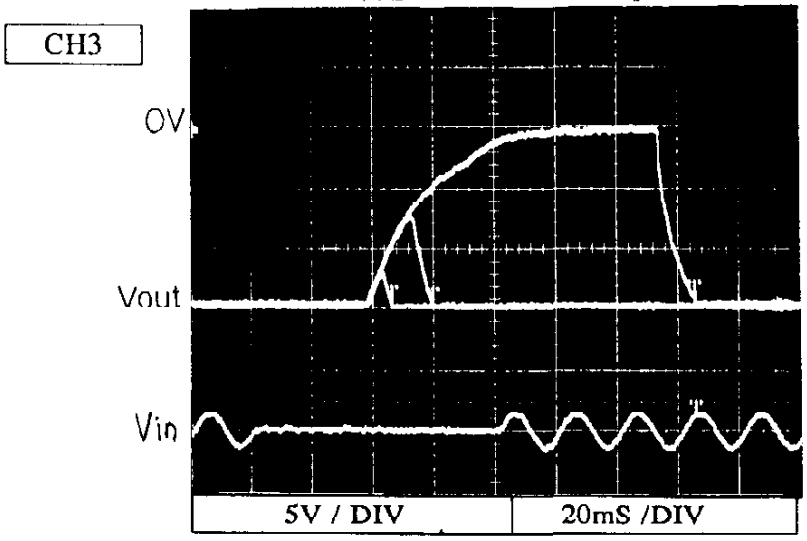
Conditions : Ta : 25°C
Vin : AC100V
Iout : 100%
CH1 : 2A
CH2 : 0.28A
CH3 : 0.19A



Brown Out Time
A – 35mS
B – 41mS
C – 54mS



Brown Out Time
A – 38mS
B – 44mS
C – 80mS

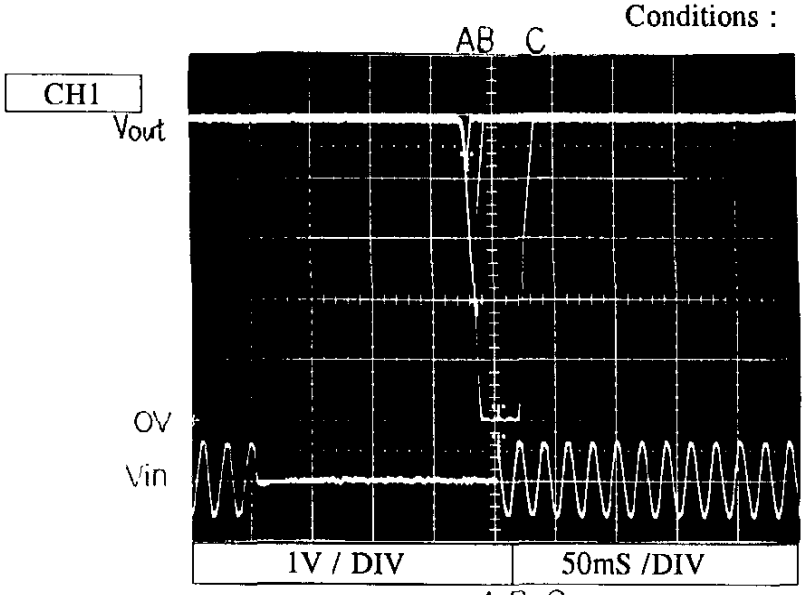


Brown Out Time
A – 38mS
B – 44mS
C – 80mS

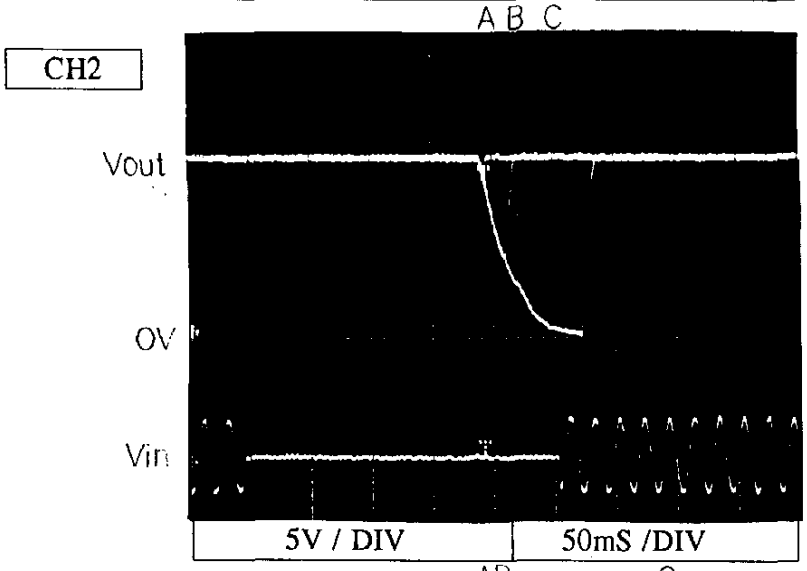
Response To Brown Out

LWT15H-5FF

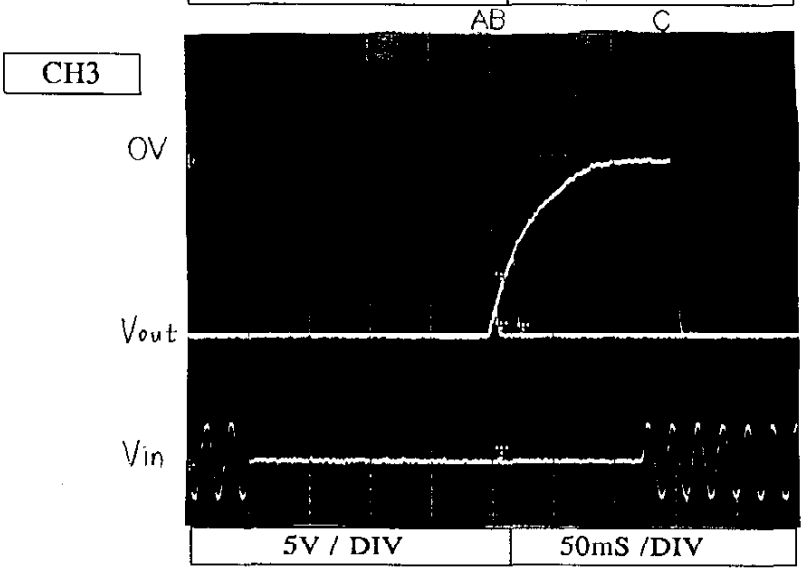
Conditions : Ta : 25°C
Vin:AC 220V
Iout : 100%
CH1 : 2A
CH2 : 0.28A
CH3 : 0.19A



Brown Out Time
A – 178mS
B – 183mS
C – 196mS



Brown Out Time
A – 190mS
B – 198mS
C – 250mS

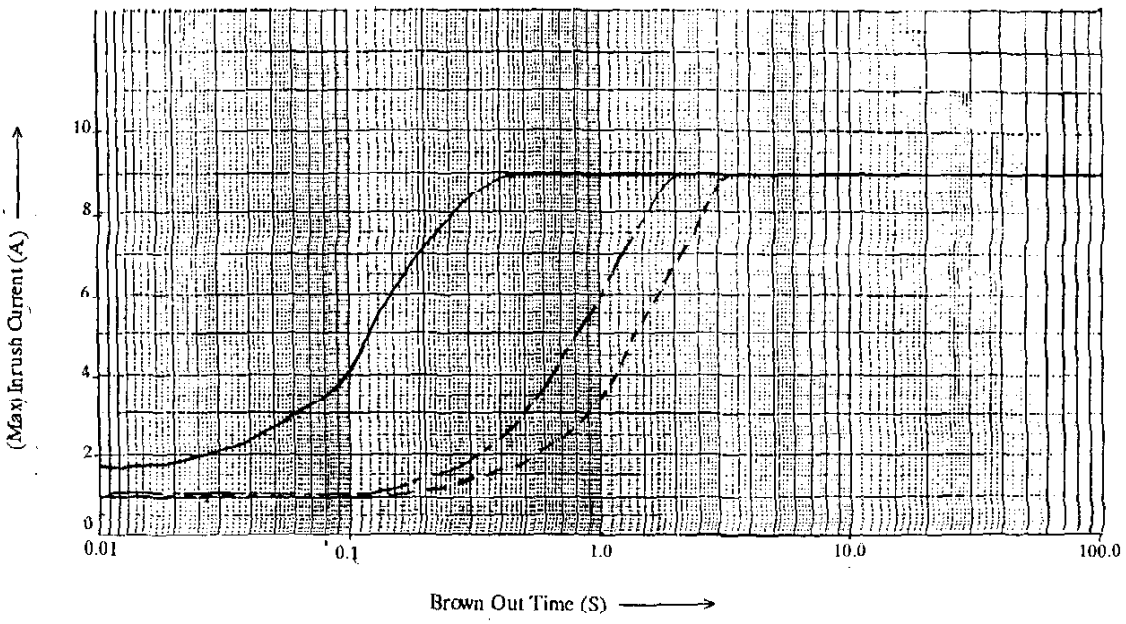


Brown Out Time
A – 190mS
B – 198mS
C – 320mS

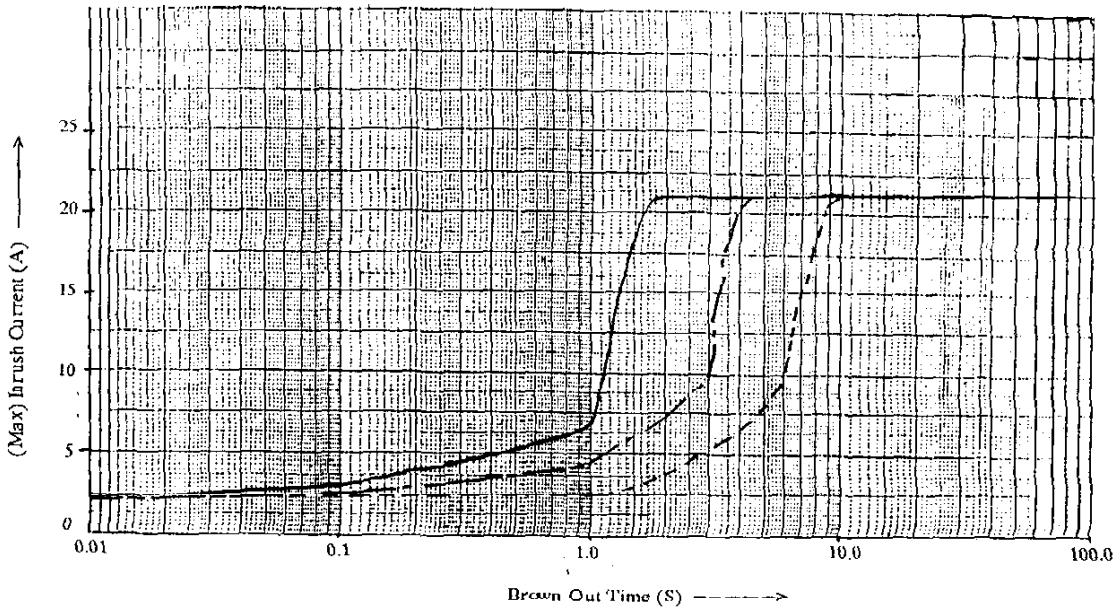
LWT15H-5FF

Inrush Current Characteristic

Conditions Vin : AC100V
Iout : 17% — · — · —
50% — — — —
100% ———
Ta : 25°C



Conditions Vin : AC230V
Iout : 17% — — — —
50% — — — —
100% ———
Ta : 25°C



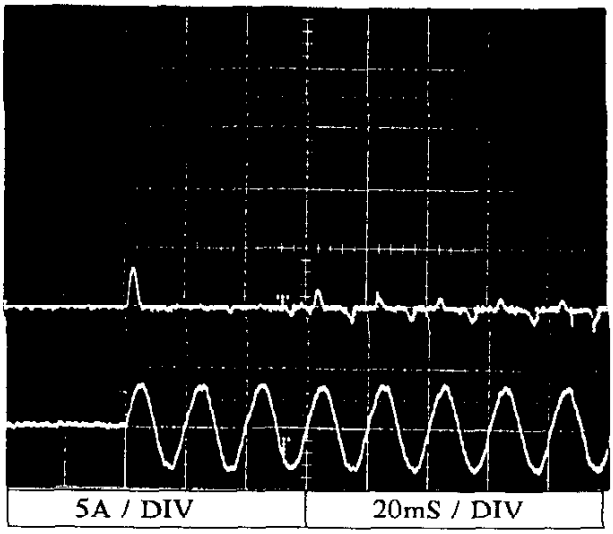
Inrush current waveform

LWT15H-5FF

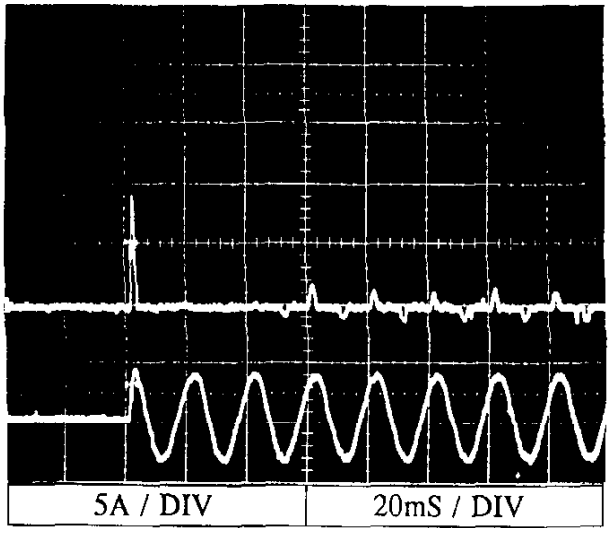
Conditions

Ta : 25°C
Vin : 100VAC
Iout : 100%

CH1 : 2 A
CH2 : 0.28 A
CH3 : 0.19 A



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



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

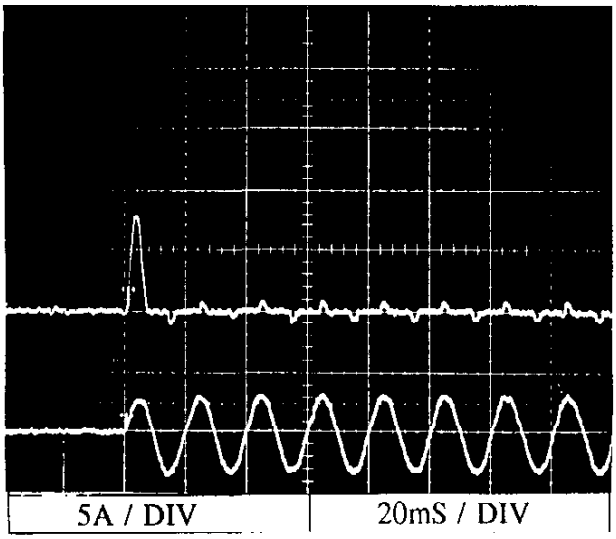
Inrush current waveform

LWT15H-5FF

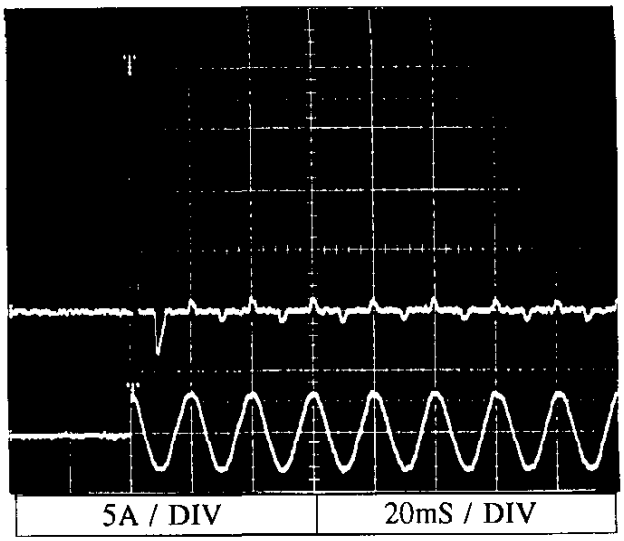
Conditions

Ta : 25°C
Vin : 230VAC
Iout : 100%

CH1 : 2 A
CH2 : 0.28 A
CH3 : 0.19 A



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

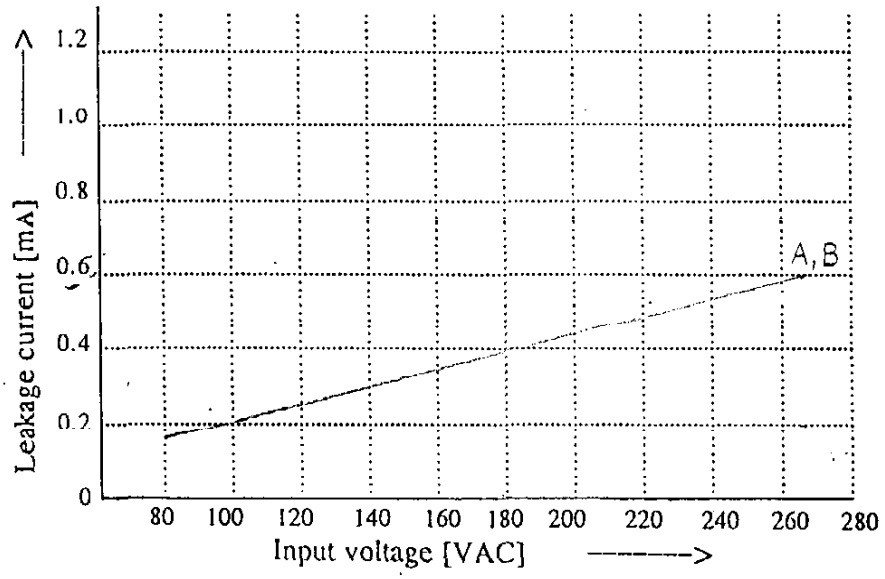


Switch on phase angle of input AC voltage
$\phi = 90°$

LWT15H-5FF

Leakage current

Conditions Vin : 85 – 265VAC
Ta : 25°C
Iout : 100% _____ (A)
MIN ——— (B)



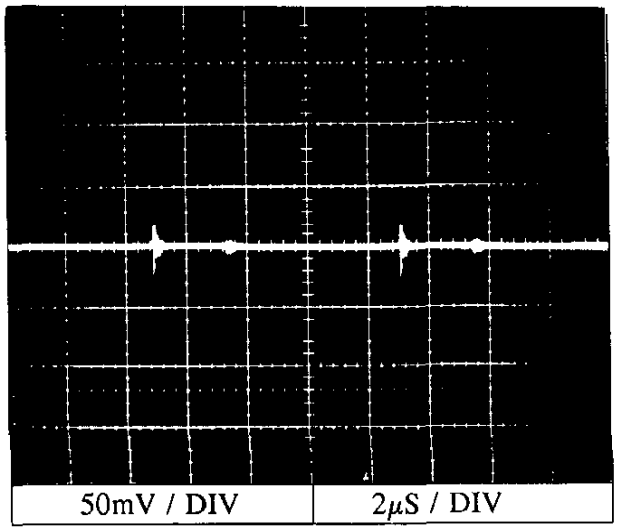
Output Ripple, Noise

LWT15H-5FF

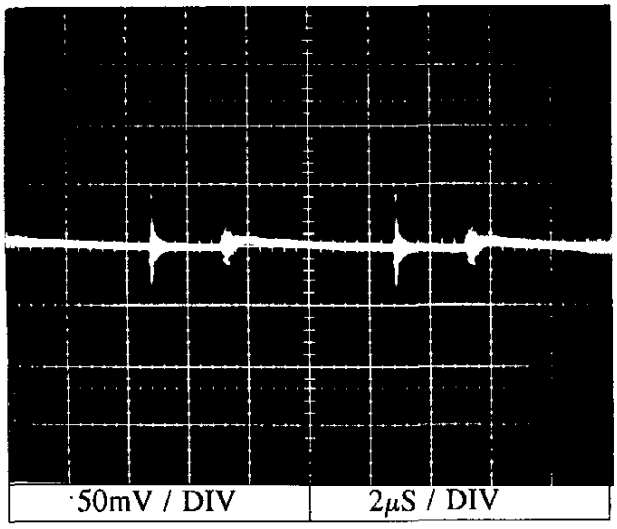
NORMAL MODE

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

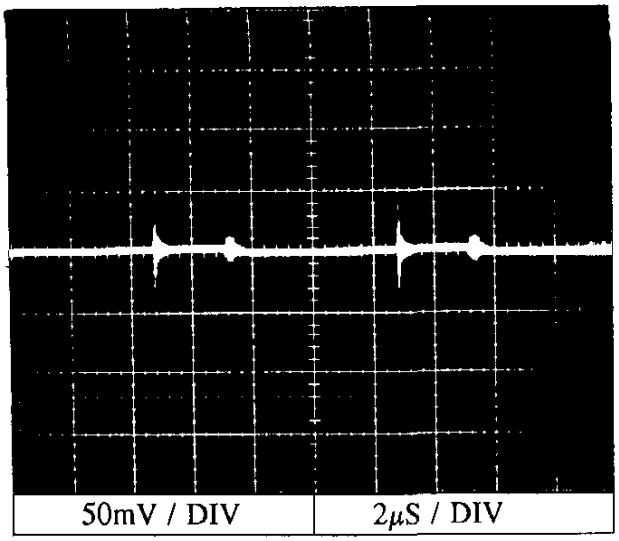
CH1



CH2



CH3



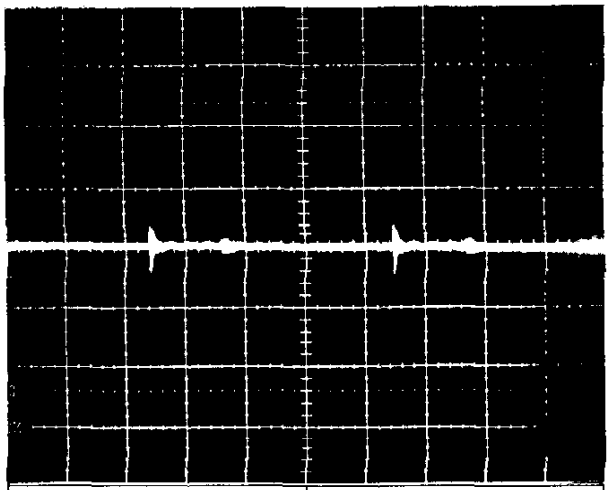
Output Ripple, Noise

LWT15H-5FF

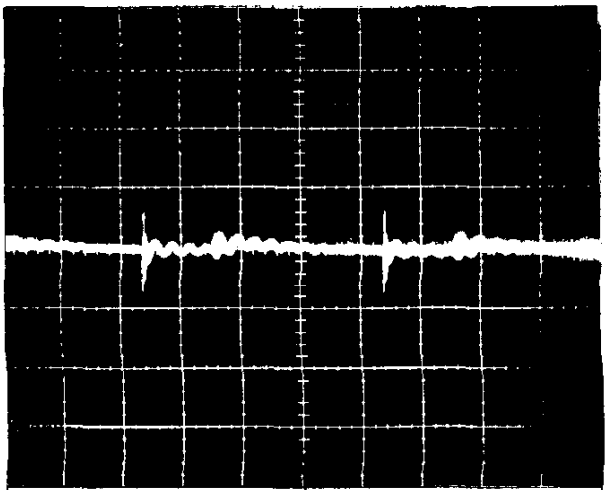
COMMON+NORMAL MODE

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

CH1



CH2



CH3