

DRL30-1

EVALUATION DATA

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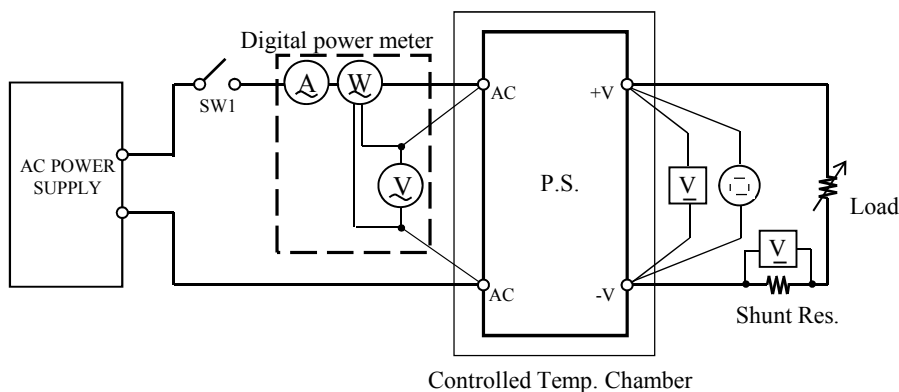
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Vin	Input voltage
Vout	Output voltage
Iin	Input current
Iout	Output current
Ta	Ambient temperature
f	Frequency

1. Evaluation Method

1.1 Circuit used for determination

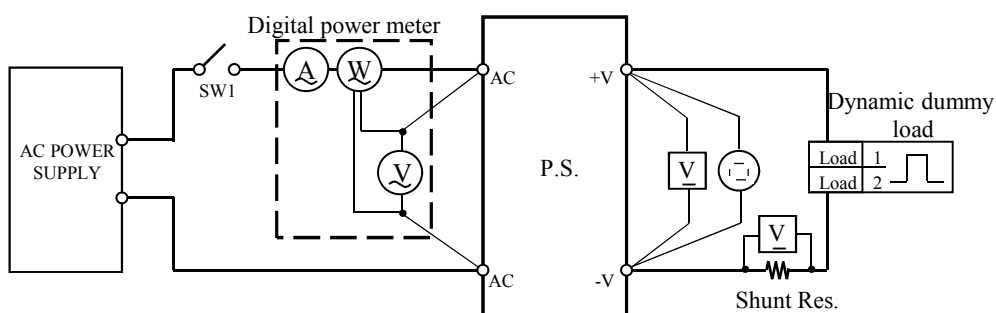
Circuit 1 used for determination

- Steady state data
- Over current protection (OCP) characteristics
- Over voltage protection (OVP) characteristics
- Output rise characteristics
- Output fall characteristics
- Hold up time characteristics

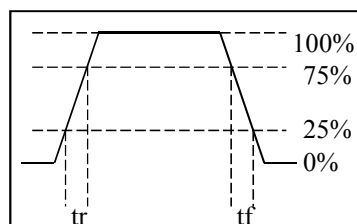


Circuit 2 used for determination

- Dynamic load response characteristics

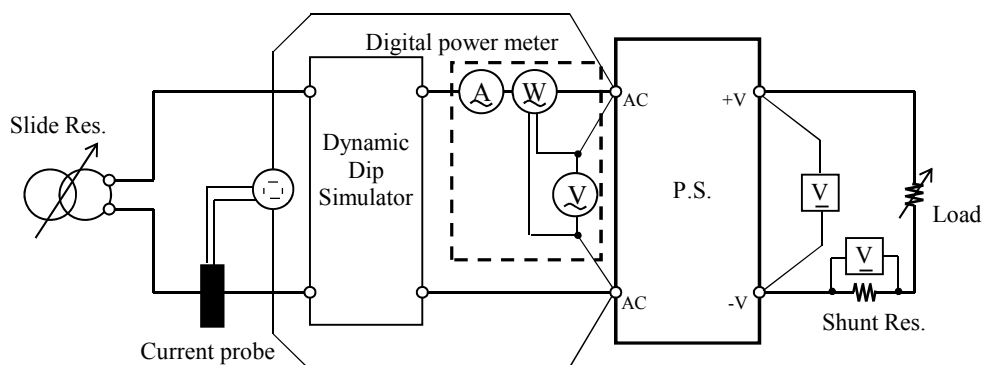


Output current waveform

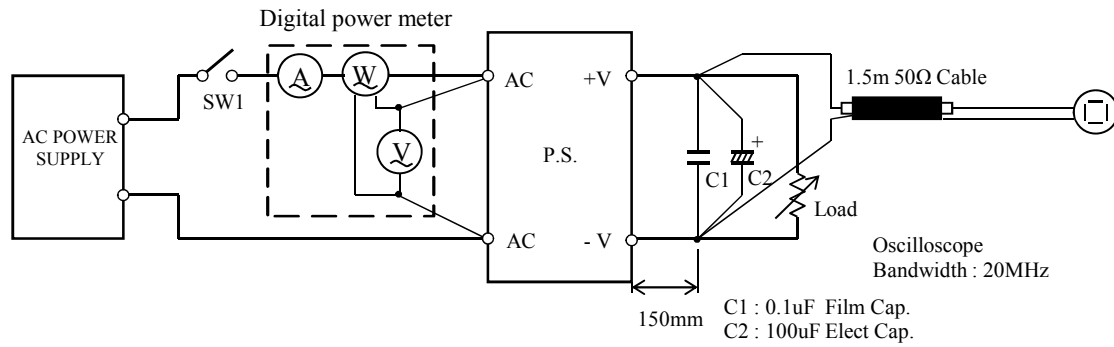


Circuit 3 used for determination

- Inrush current waveform



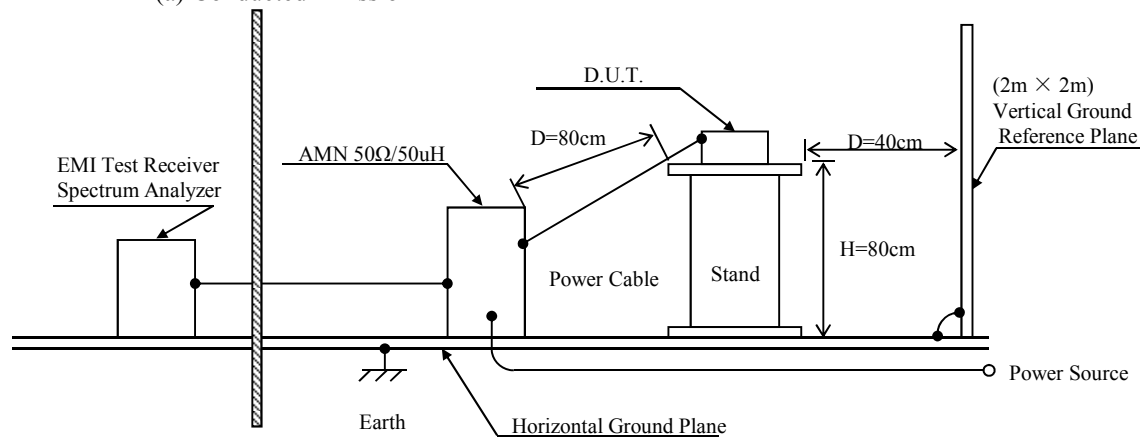
- Output ripple and noise waveform



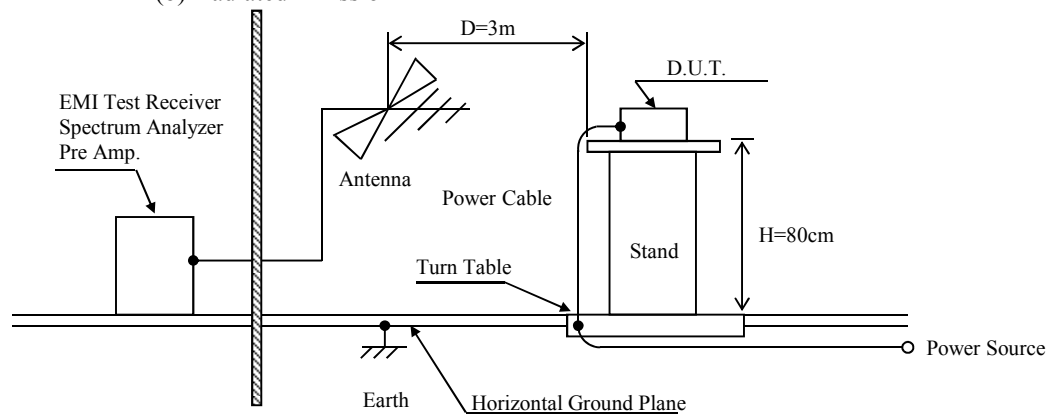
Configuration used for determination

- Electro-Magnetic Interference characteristics

(a) Conducted Emission



(b) Radiated Emission



1.2 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DLM2054/DLM9040
2	DIGITAL MULTIMETER	AGILENT	34970A
3	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
4	CURRENT PROBE	YOKOGAWA ELECT.	701930
5	DYNAMIC DUMMY LOAD	CHROMA	63030/63610
6	AC SOURCE	KIKUSUI	PCR2000L
7	AC SOURCE	CHROMA	61605
8	CONTROLLED TEMP. CHAMBER	TABAI-ESPEC	63203
9	EMI TEST RECEIVER (Conducted Emission)	ROHDE & SCHWARZ	ESCI-03
10	LISN (Conducted Emission)	ROHDE & SCHWARZ	ENV216
11	BICONICAL ANTENNA (Radiated Emission)	ETS•LINDGREN	3142C
12	EMI TEST RECEIVER (Radiated Emission)	ROHDE & SCHWARZ	ESU 26

2. Characteristics

2.1 Steady state data

(1) Regulation - line and load, Temperature drift / Start up voltage and Drop out voltage

12V

1. Regulation - line and load

Condition

Ta : 25 °C

Iout \ Vin	85VAC	115VAC	230VAC	265VAC	line regulation	
0%	12.024V	12.024V	12.024V	12.026V	2mV	0.017%
50%	12.003V	12.003V	12.003V	12.006V	3mV	0.025%
100%	11.983V	11.983V	11.983V	11.985V	2mV	0.017%
load regulation	41mV	41mV	41mV	41mV		
	0.342%	0.342%	0.342%	0.342%		

2. Temperature drift

Conditions

Vin : 115 VAC

Iout : 100 %

Ta	-20°C	+25°C	+71°C	temperature stability	
Vout	11.910V	11.983V	12.004V	94mV	0.783%

3. Start up voltage and Drop out voltage

Conditions

Ta : 25 °C

Iout : 100 %

Start up voltage (Vin)	48.2VAC
Drop out voltage (Vin)	48.0VAC

24V

1. Regulation - line and load

Condition

Ta : 25 °C

Iout \ Vin	85VAC	115VAC	230VAC	265VAC	line regulation	
0%	24.033V	24.034V	24.036V	24.036V	3mV	0.013%
50%	24.021V	24.023V	24.024V	24.024V	3mV	0.013%
100%	24.010V	24.011V	24.012V	24.013V	3mV	0.013%
load regulation	23mV	23mV	24mV	23mV		
	0.096%	0.096%	0.100%	0.096%		

2. Temperature drift

Conditions

Vin : 115 VAC

Iout : 100 %

Ta	-20°C	+25°C	+71°C	temperature stability	
Vout	23.939V	24.011V	24.021V	82mV	0.342%

3. Start up voltage and Drop out voltage

Conditions

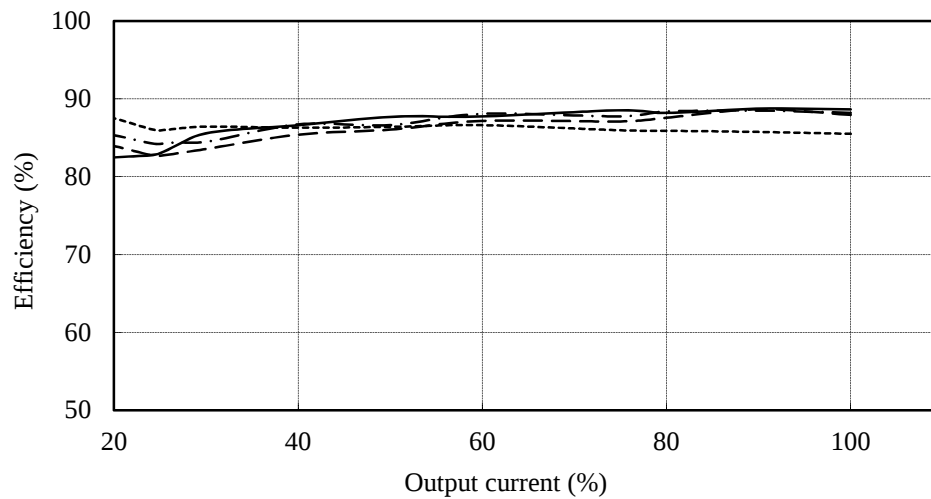
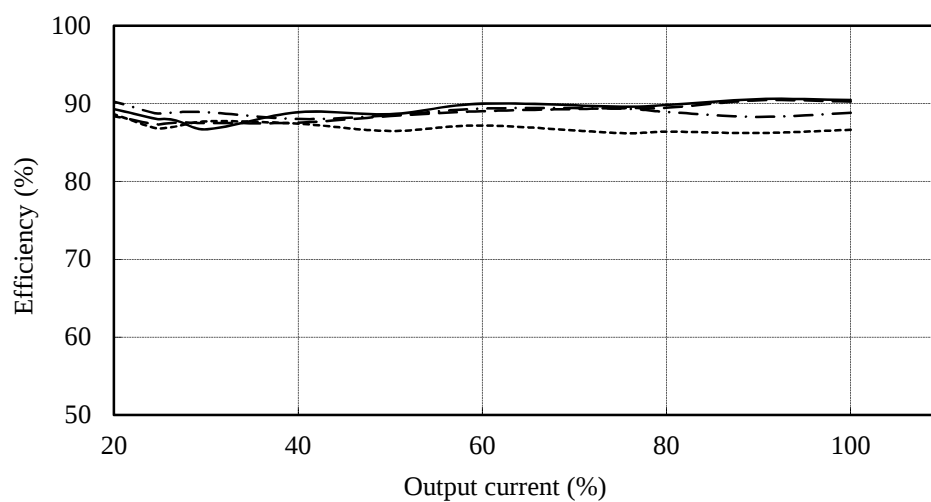
Ta : 25 °C

Iout : 100 %

Start up voltage (Vin)	52.7VAC
Drop out voltage (Vin)	51.9VAC

(2) Efficiency vs. Output current

Conditions Vin : 85 VAC -----
: 115 VAC -.-.-.
: 230 VAC ———
: 265 VAC ----
Ta : 25 °C

12V**24V**

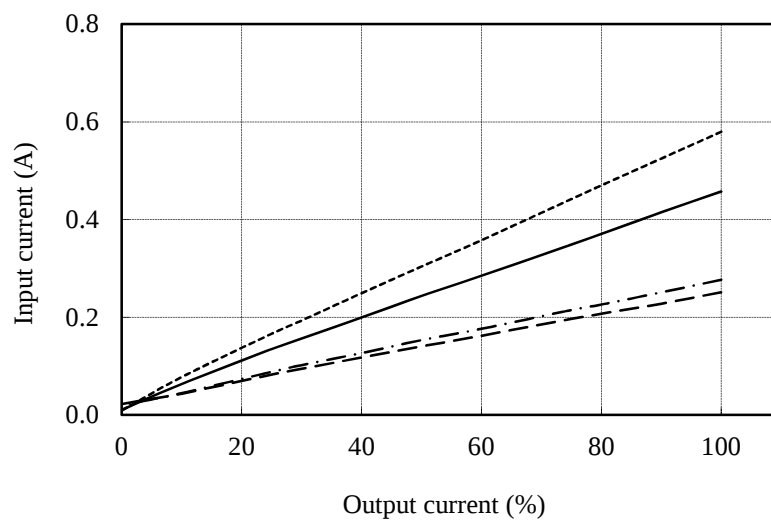
(3) Input current vs. Output current

Conditions Vin : 85 VAC -----
: 115 VAC -.-.-.-
: 230 VAC ————
: 265 VAC - - - -
Ta : 25 °C

12V

Io: 100%

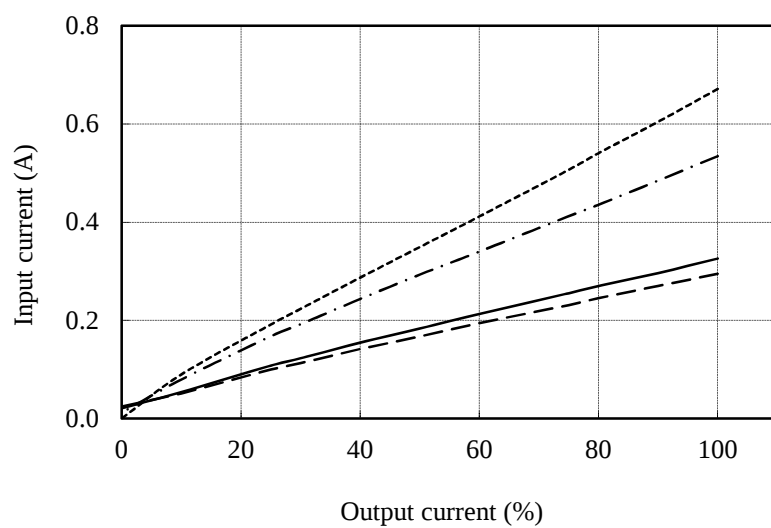
Vin	Input current
85VAC	0.580A
115VAC	0.277A
230VAC	0.458A
265VAC	0.251A



24V

Io: 100%

Vin	Input current
85VAC	0.671A
115VAC	0.535A
230VAC	0.326A
265VAC	0.295A



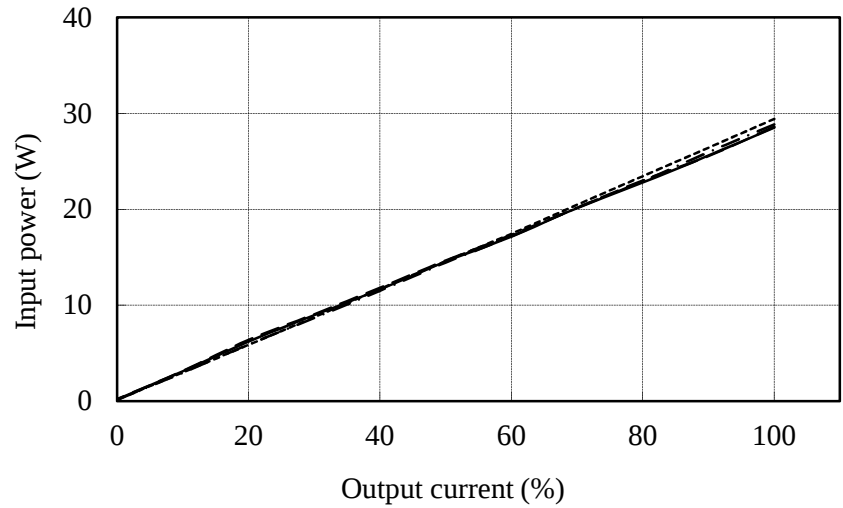
(4) Input power vs. Output current

Conditions Vin : 85 VAC -----
 : 115 VAC -.-.-
 : 230 VAC ———
 : 265 VAC ---
 Ta : 25 °C

12V

Io: 100%

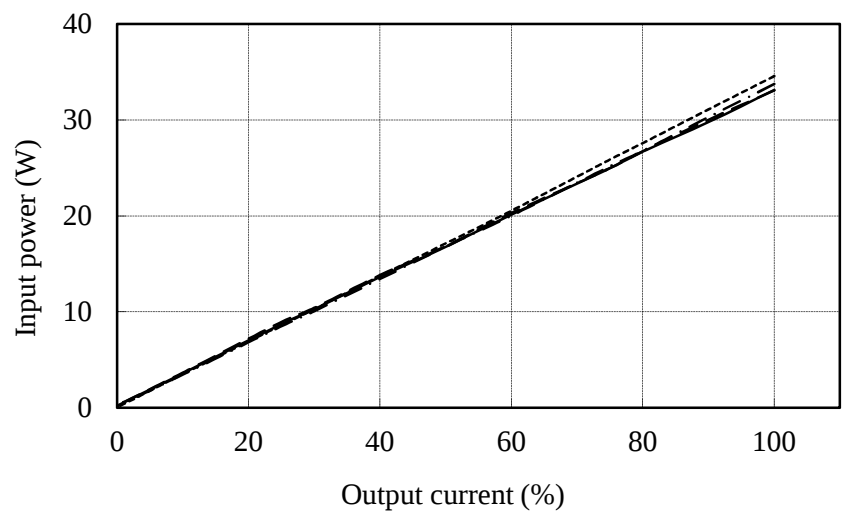
Vin	Input power
85VAC	29.42W
115VAC	28.85W
230VAC	28.52W
265VAC	28.60W



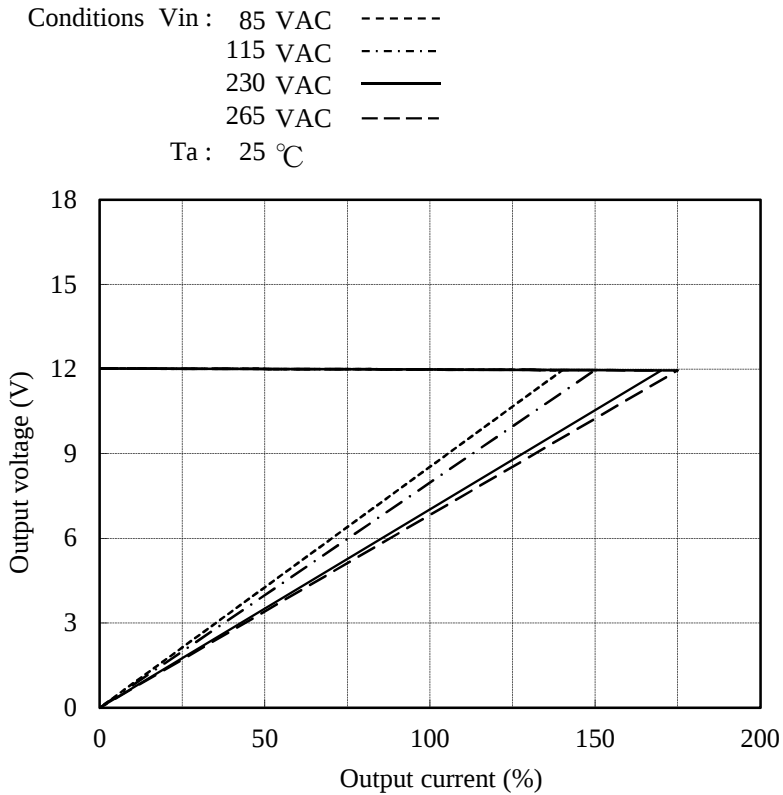
24V

Io: 100%

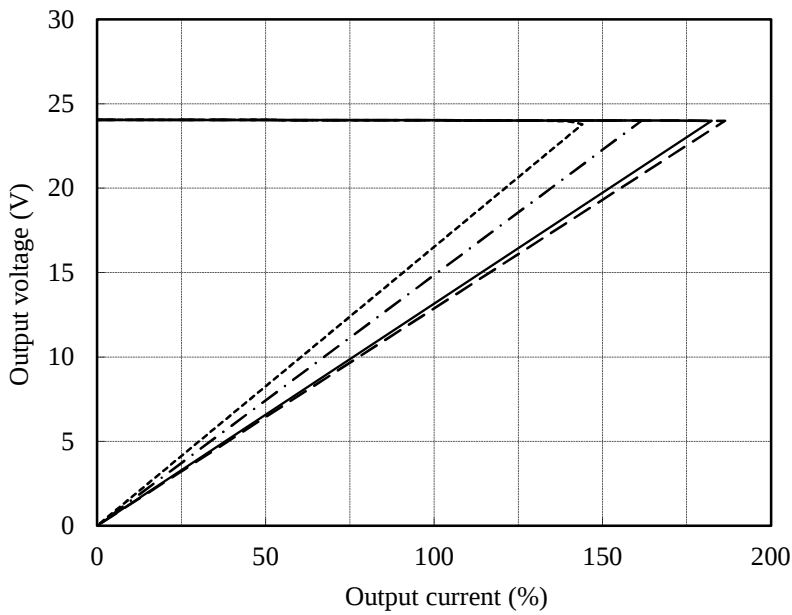
Vin	Input power
85VAC	34.57W
115VAC	33.74W
230VAC	33.12W
265VAC	33.08W



12V

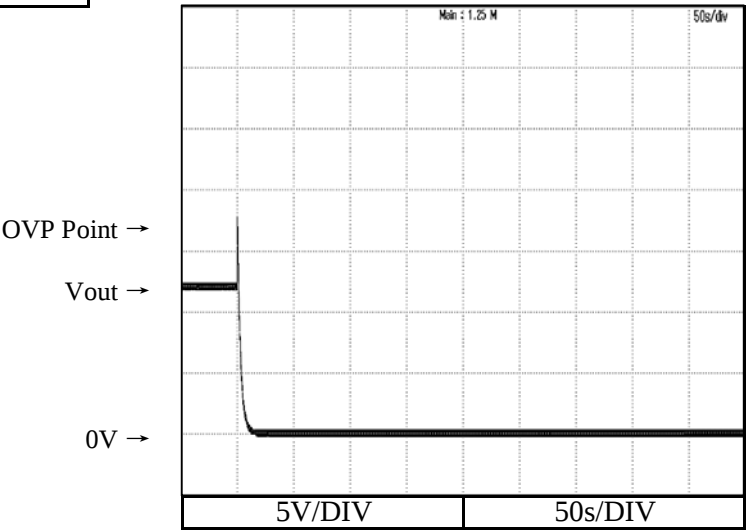


24V

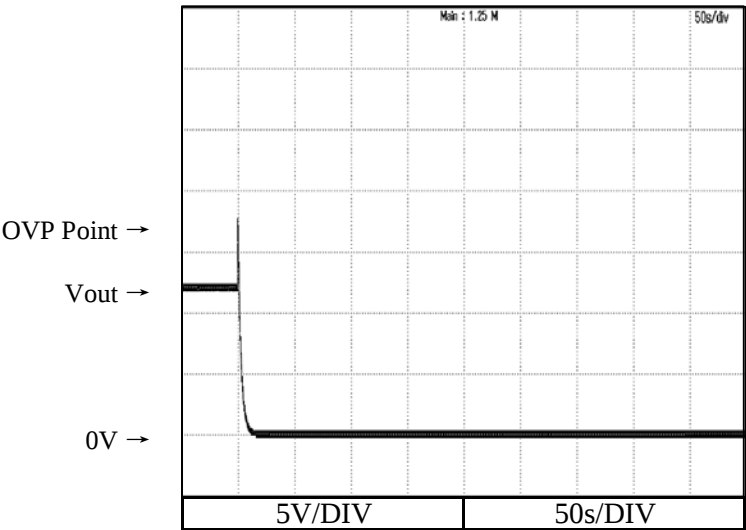


12V

Conditions Vin : 115 VAC
 Iout : 0 %
 Ta : 25 °C

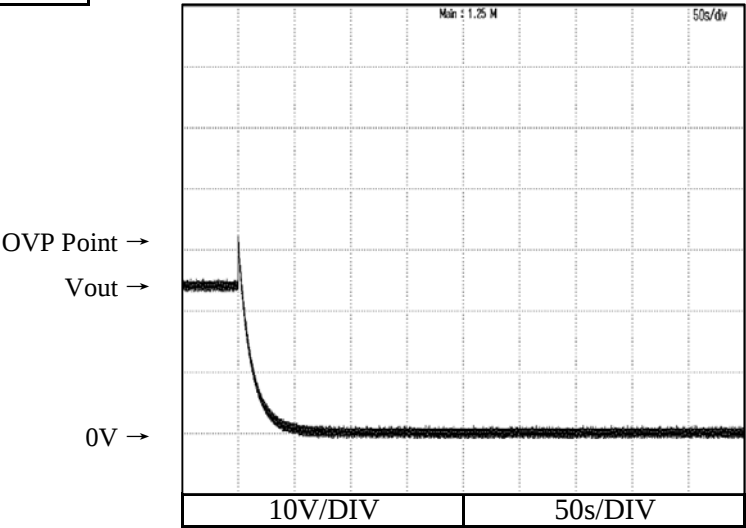


Conditions Vin : 230 VAC
 Iout : 0 %
 Ta : 25 °C

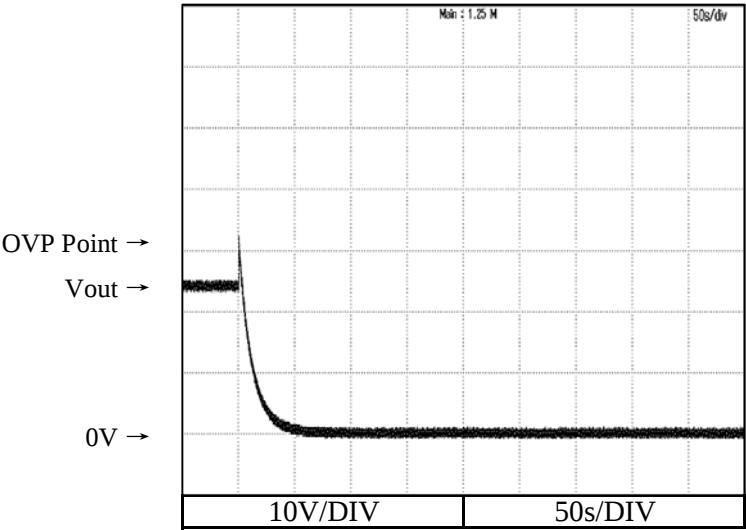


24V

Conditions Vin : 115 VAC
 Iout : 0 %
 Ta : 25 °C



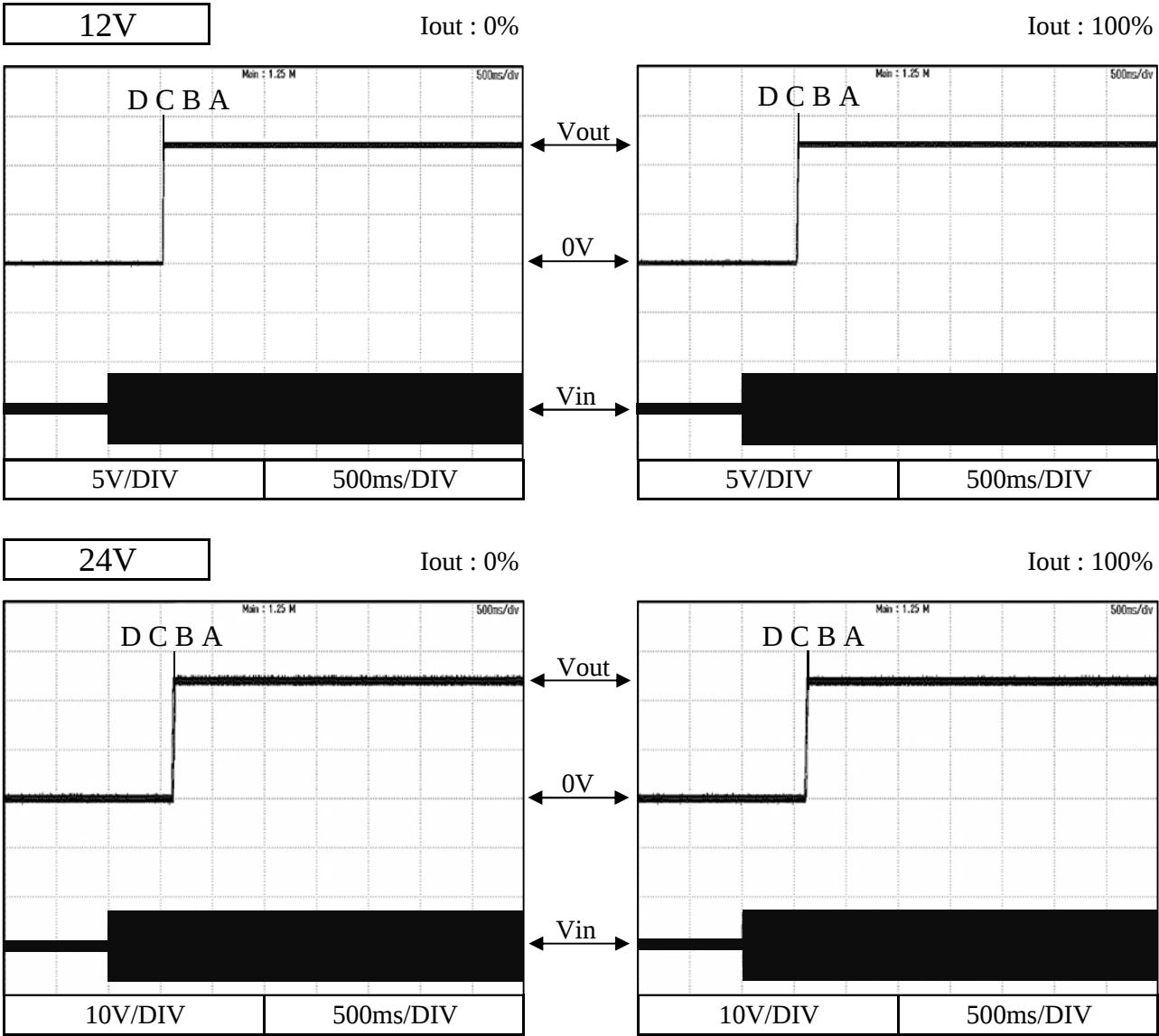
Conditions Vin : 230 VAC
 Iout : 0 %
 Ta : 25 °C



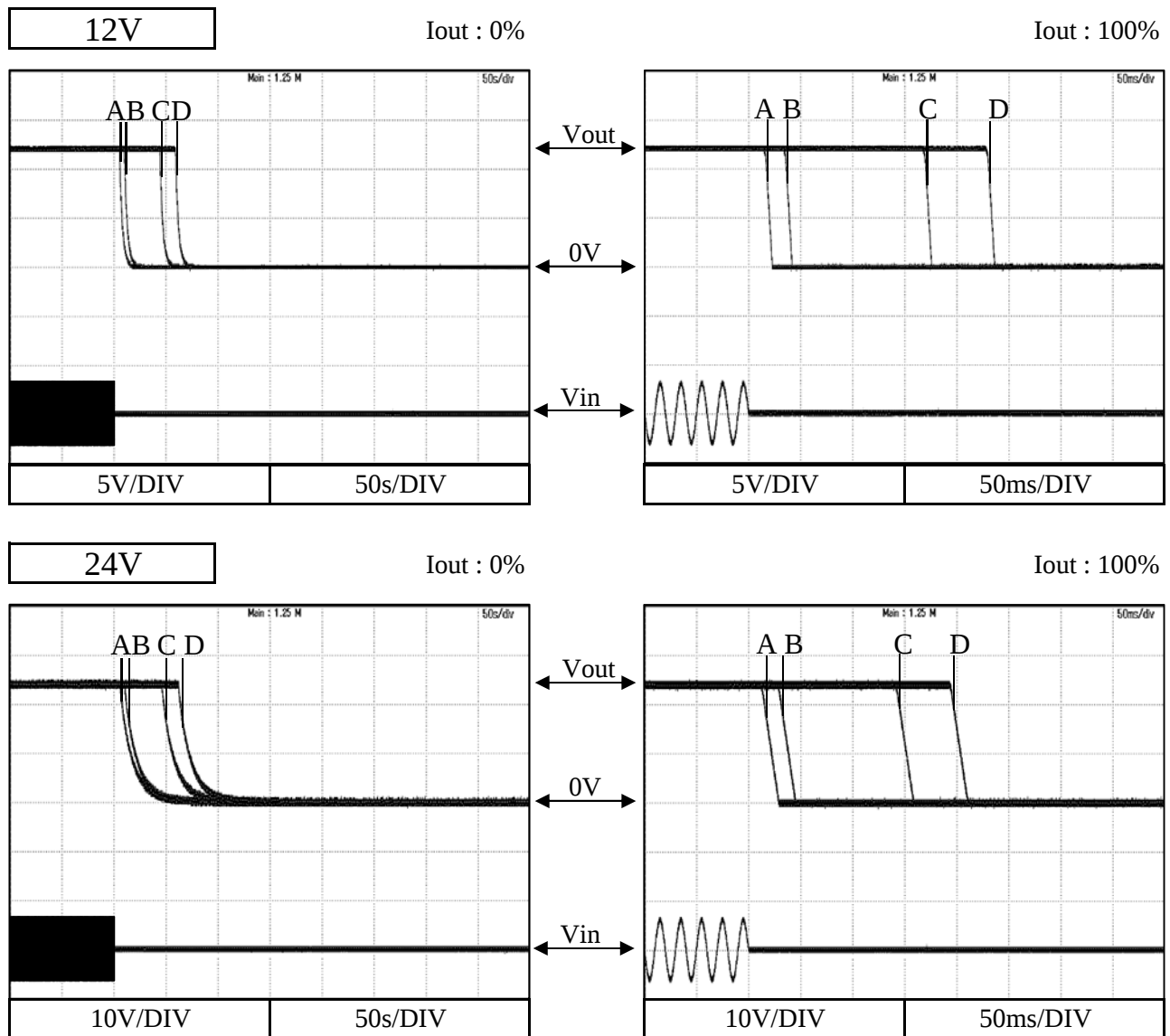
2.4 Output rise characteristics

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Conditions Vin : 85 VAC (A)
 115 VAC (B)
 230 VAC (C)
 265 VAC (D)
 Ta : 25 °C



Conditions	Vin :	85 VAC (A)
		115 VAC (B)
		230 VAC (C)
		265 VAC (D)
	Ta :	25 °C

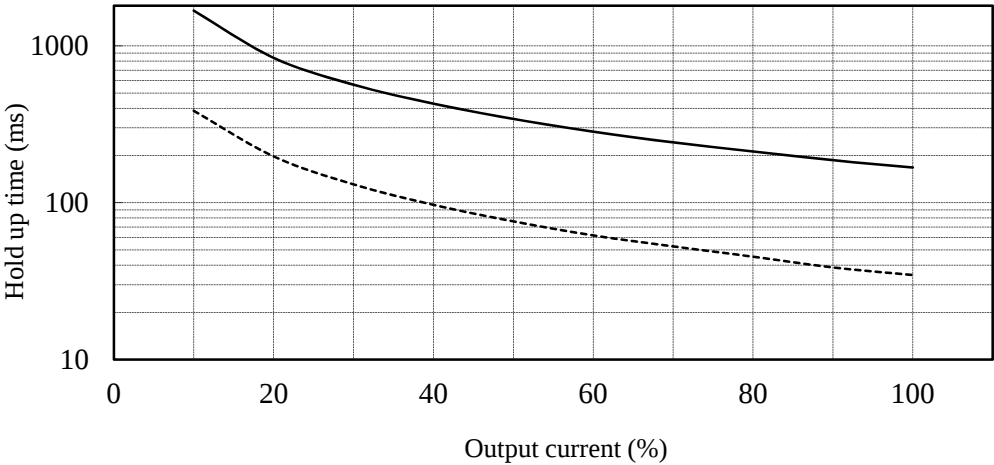


2.6 Hold up time characteristics

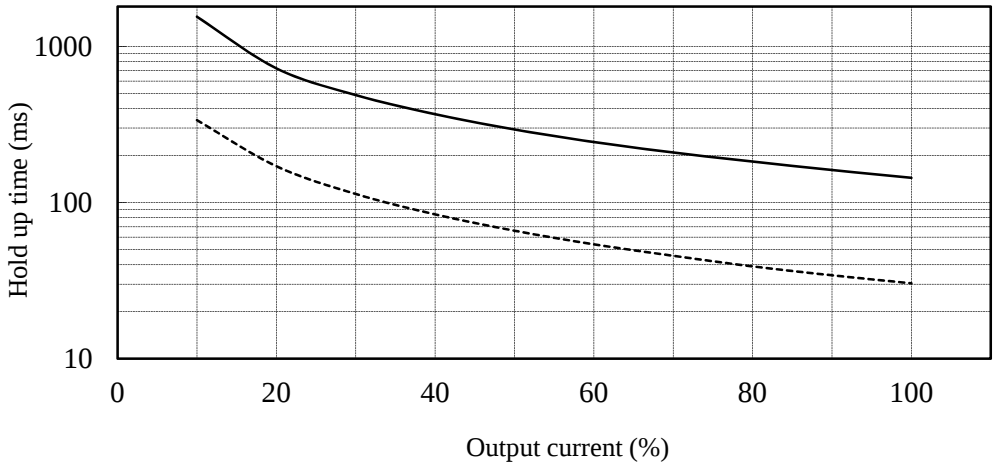
DRL30-1

Conditions Vin : 115 VAC -----
230 VAC ———
Ta : 25 °C

12V



24V



2.7 Dynamic load response characteristics

Conditions

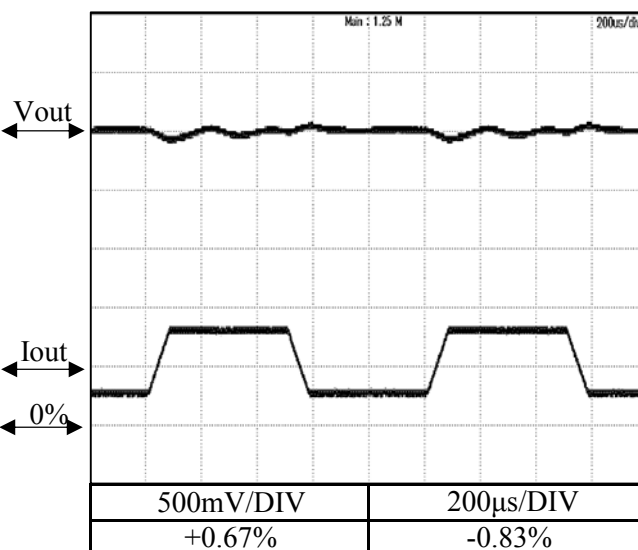
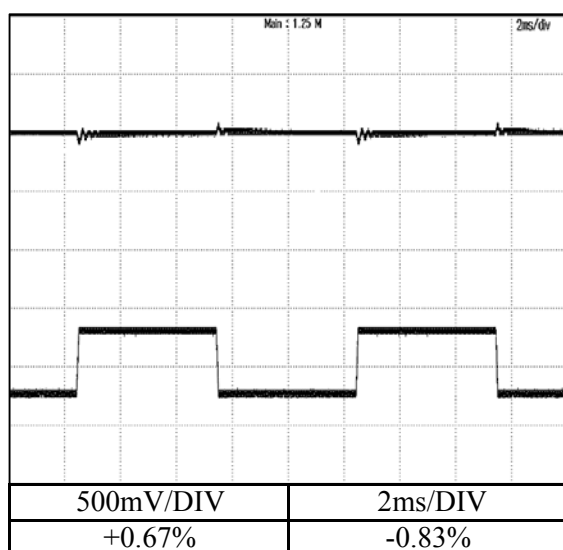
Vin : 115 VAC

Iout : 25 % ↔ 75 %

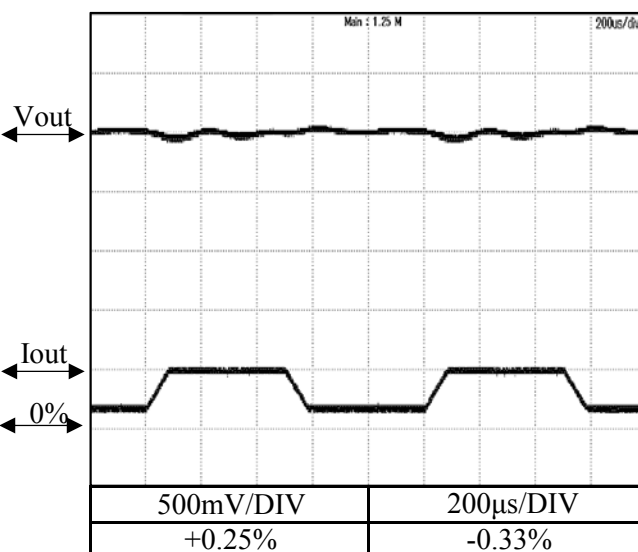
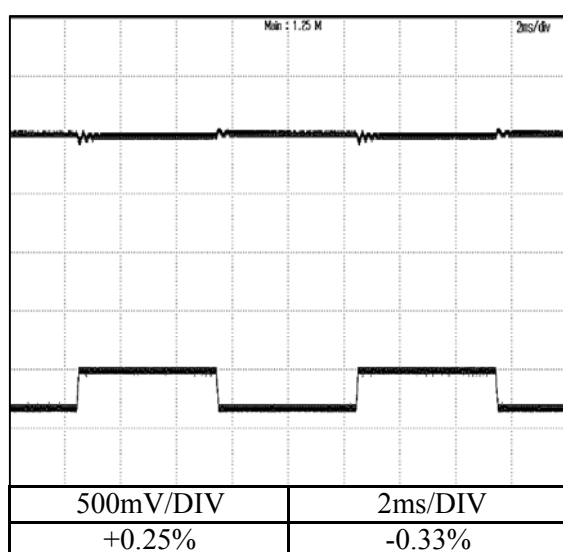
(tr = tf = 75 μ s)

Ta : 25 °C

12V



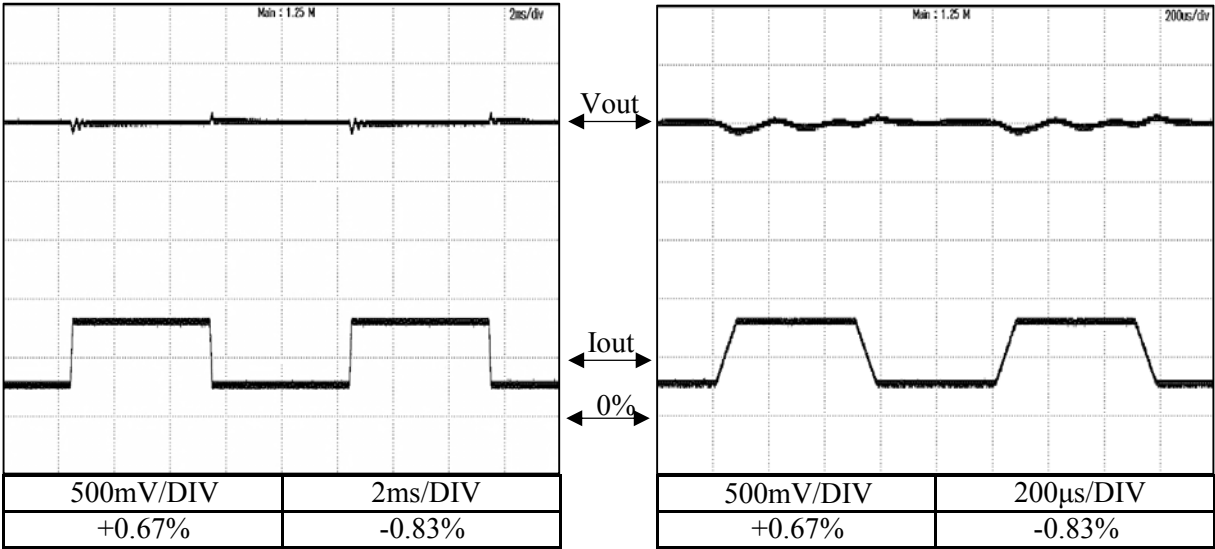
24V



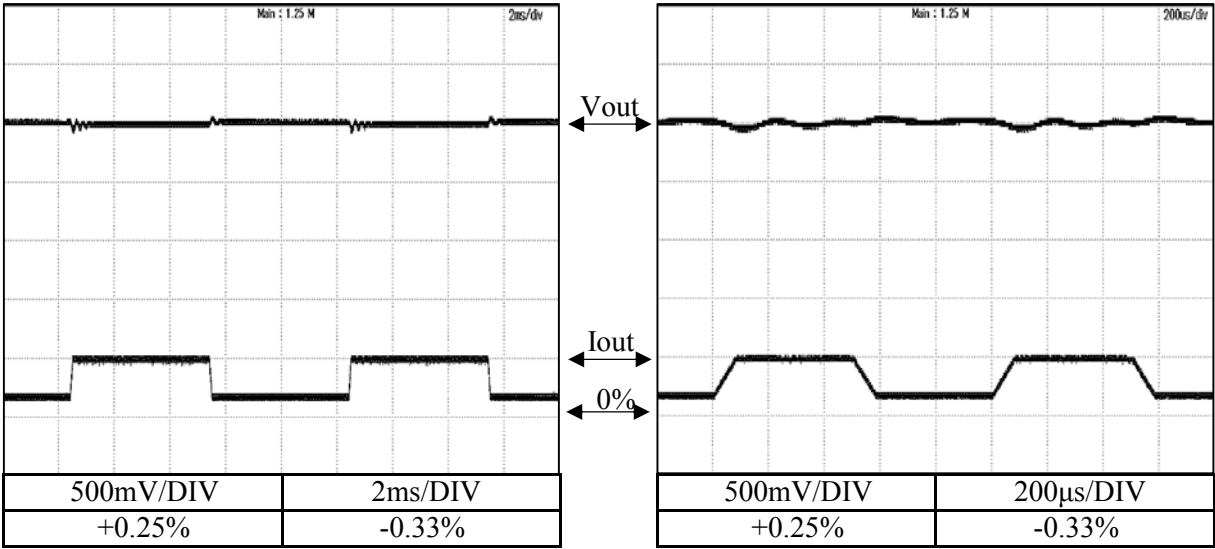
2.7 Dynamic load response characteristics

Conditions Vin : 230 VAC
 Iout : 25 % ↔ 75 %
 (tr = tf = 75us)
 Ta : 25 °C

12V



24V



2.8 Response to brown out characteristics

Conditions Vin : 115 VAC
 Iout : 100 %
 Ta : 25 °C

A : Output voltage does not drop.
 B,C : Output voltage drop down not reaching 0V.
 D : Output voltage drops until 0V.

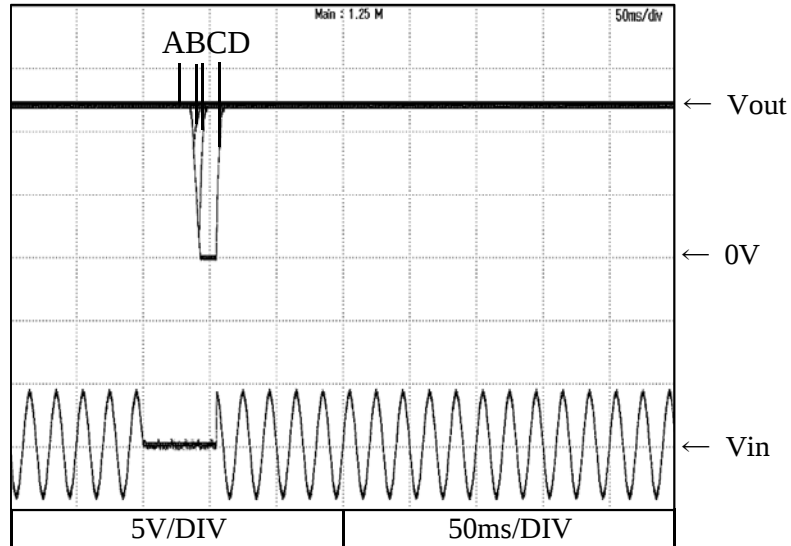
12V

A = 35.0ms

B = 38.0ms

C = 42.0ms

D = 55.0ms



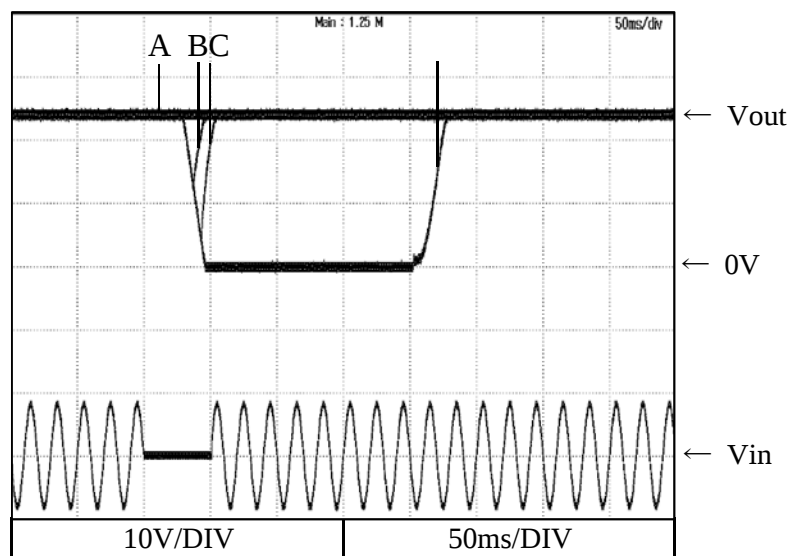
24V

A=28.6ms

B=37.0ms

C=43.0ms

D=51.0ms



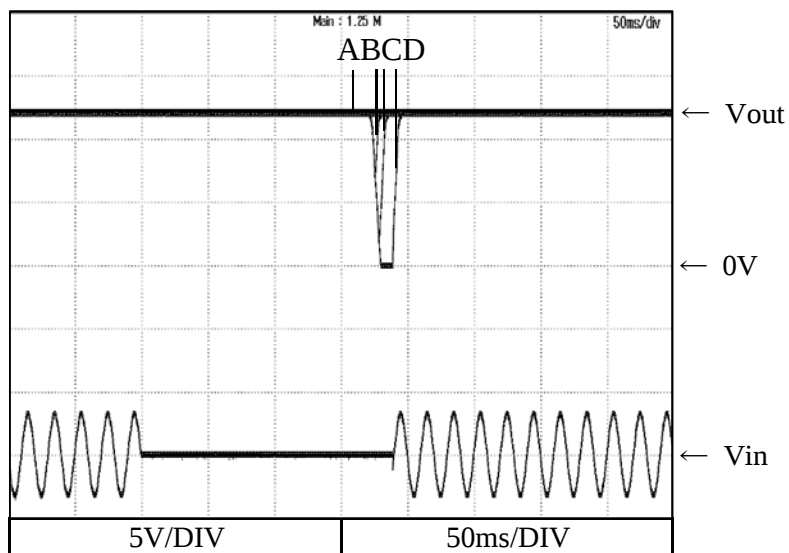
2.8 Response to brown out characteristics

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

A : Output voltage does not drop.
 B,C : Output voltage drop down not reaching 0V.
 D : Output voltage drops until 0V.

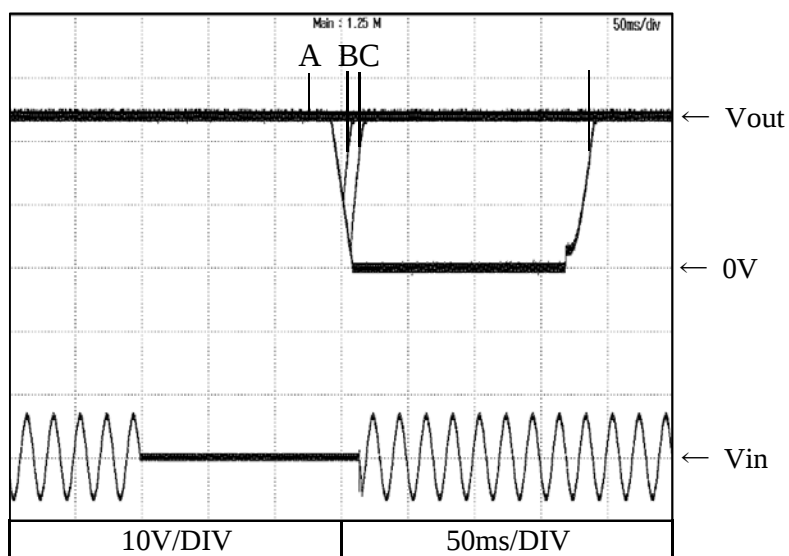
12V

A = 169.0ms
 B = 176.0ms
 C = 179.0ms
 D = 186.0ms



24V

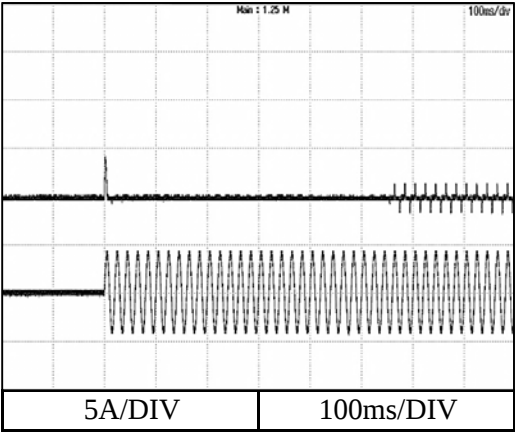
A=143.5ms
 B=152.0ms
 C=159.0ms
 D=165.0ms



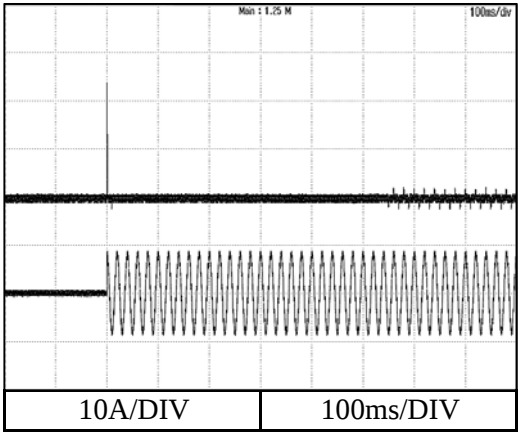
12V

Conditions Vin : 115 VAC
 Iout : 100 %
 Ta : 25 °C
 (Cold start)

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

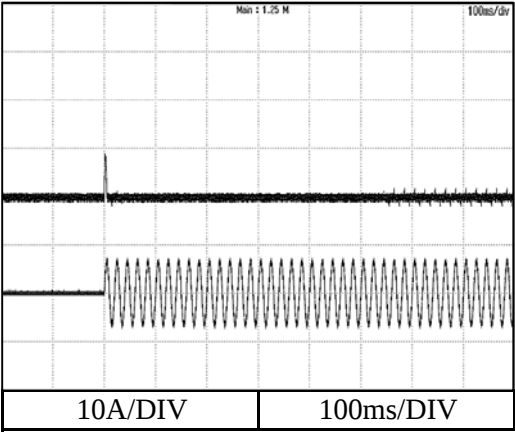


Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

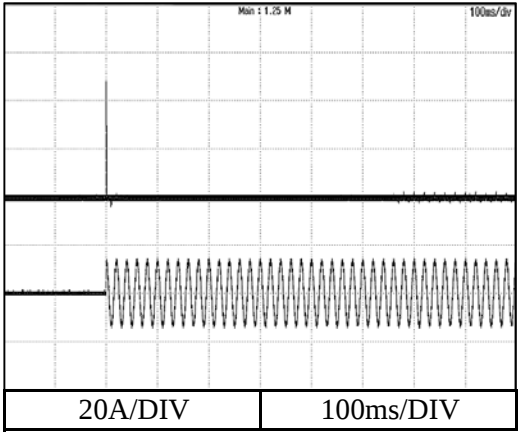


Conditions Vin : 230 VAC
 Iout : 100 %
 Ta : 25 °C
 (Cold start)

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



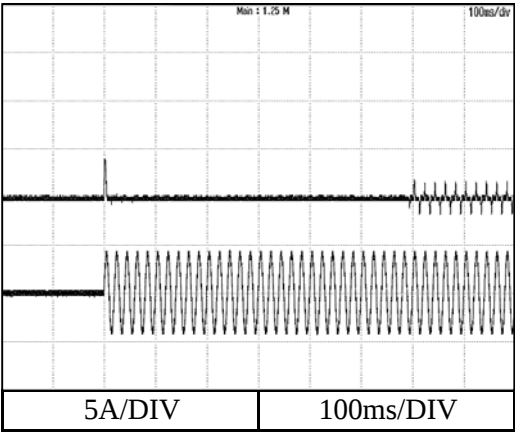
Switch on phase angle of input AC voltage
 $\phi = 90^\circ$



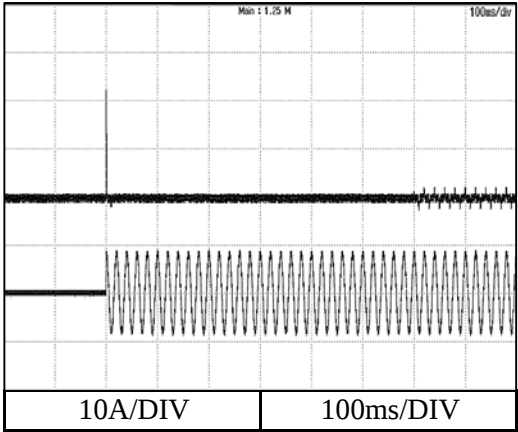
24V

Conditions Vin : 115 VAC
 Iout : 100 %
 Ta : 25 °C
 (Cold start)

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

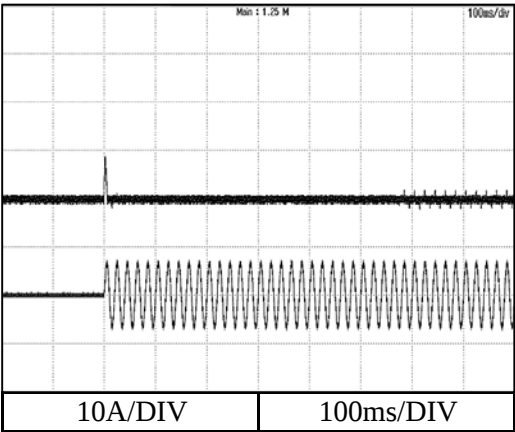


Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

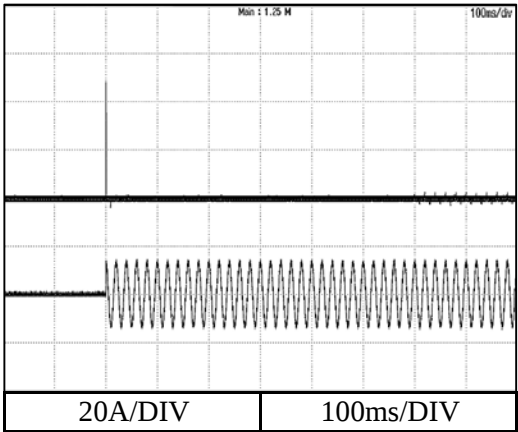


Conditions Vin : 230 VAC
 Iout : 100 %
 Ta : 25 °C
 (Cold start)

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



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

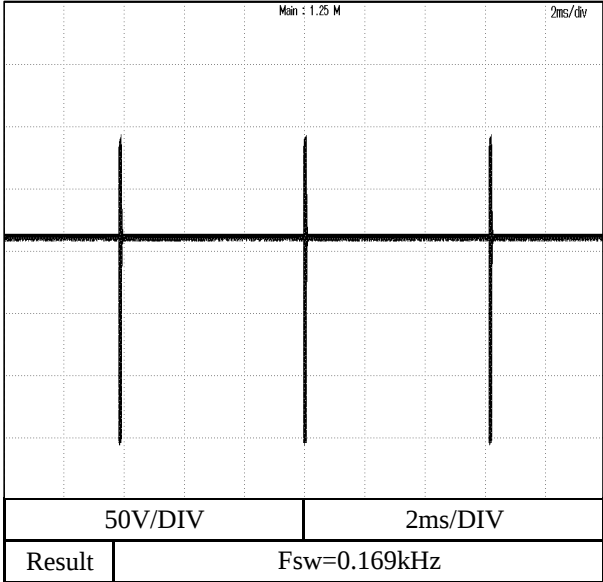


2.10 Switching frequency

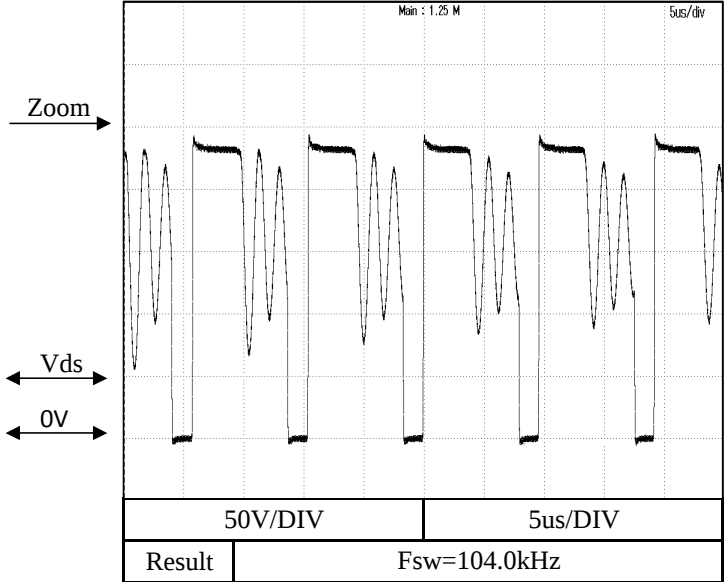
12V

Condition : 25 °C

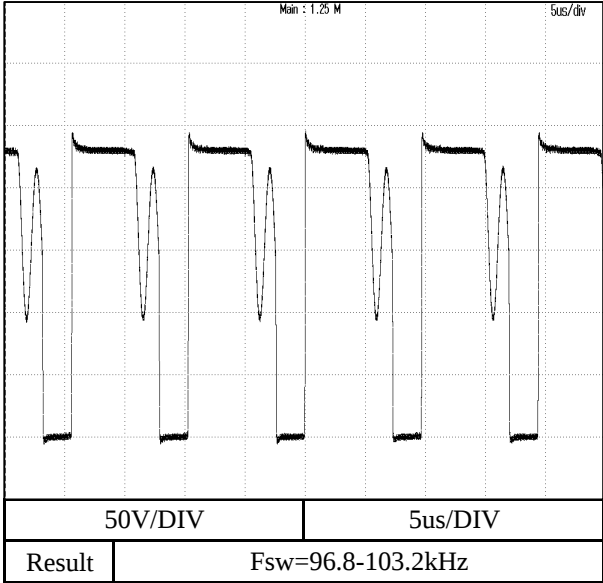
Conditions: Vin = 115Vac, load = 0%



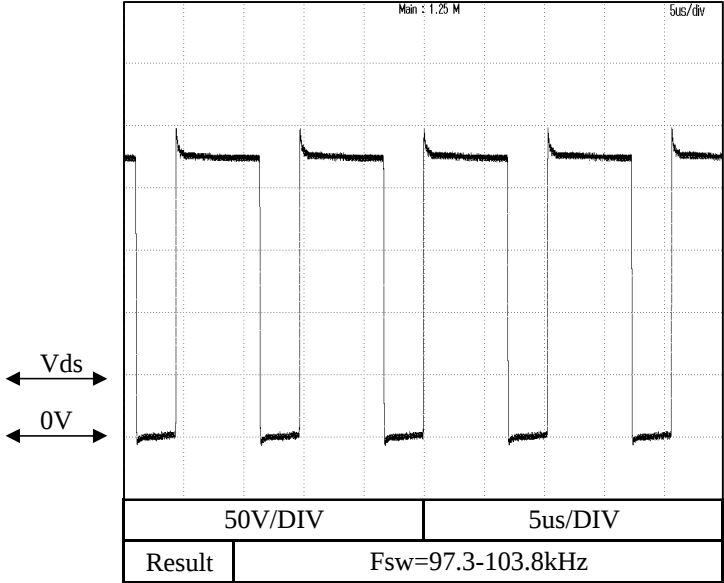
Conditions: Vin = 115Vac, load = 0%



Conditions: Vin = 115Vac, load = 50%



Conditions: Vin = 115Vac, load = 100%

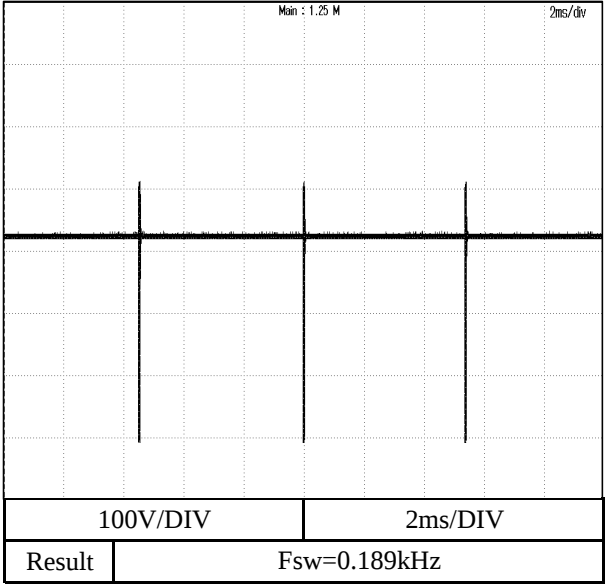


2.10 Switching frequency

12V

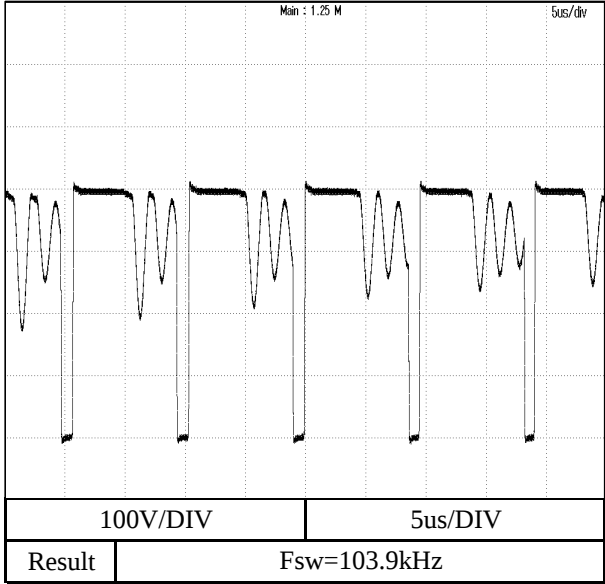
Condition : 25 °C

Conditions: Vin = 230Vac, load = 0%

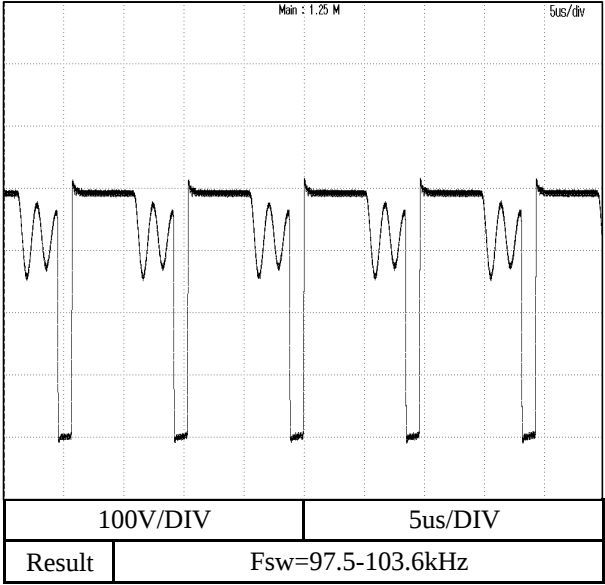


Conditions: Vin = 230Vac, load = 0%

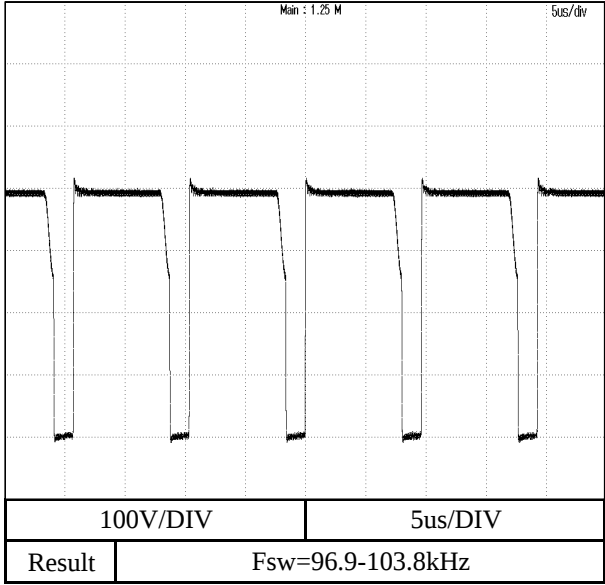
Zoom



Conditions: Vin = 230Vac, load = 50%



Conditions: Vin = 230Vac, load = 100%

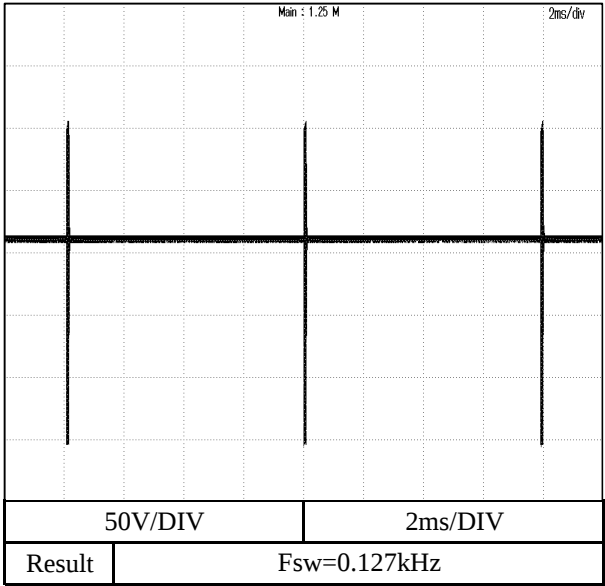


2.10 Switching frequency

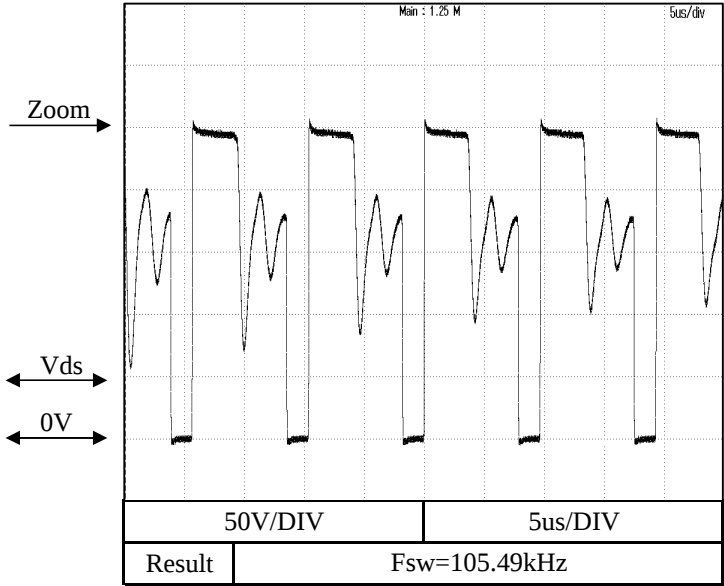
24V

Condition : 25 °C

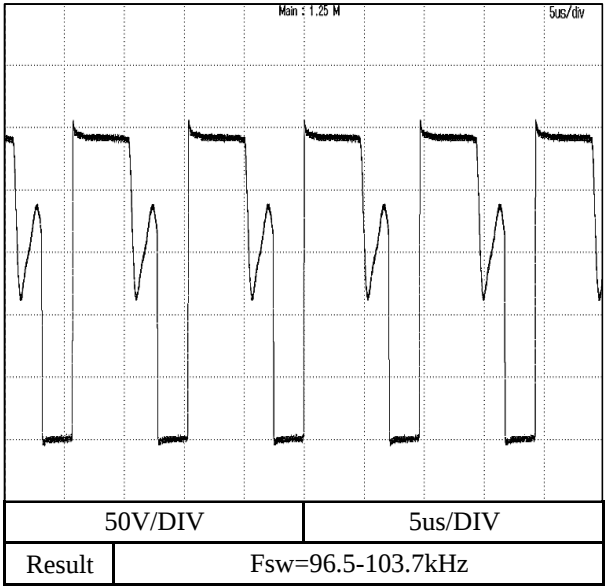
Conditions: Vin = 115Vac, load = 0%



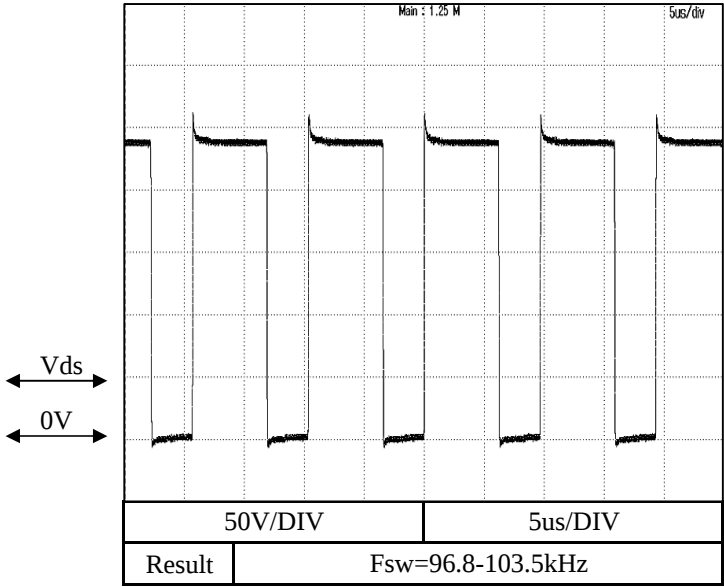
Conditions: Vin = 115Vac, load = 0%



Conditions: Vin = 115Vac, load = 50%



Conditions: Vin = 115Vac, load = 100%

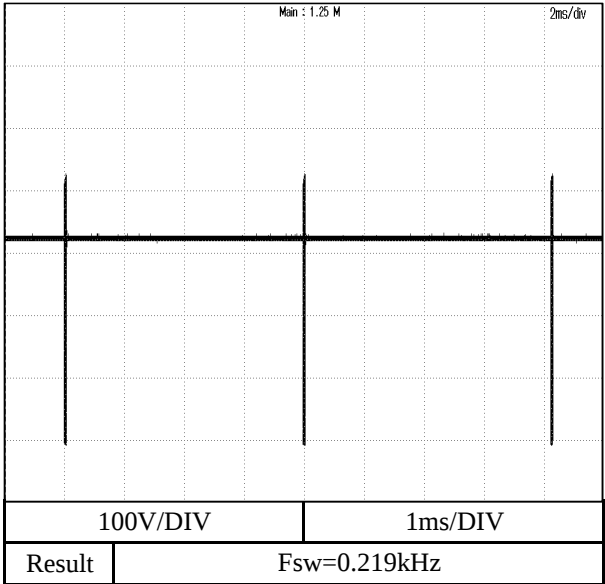


2.10 Switching frequency

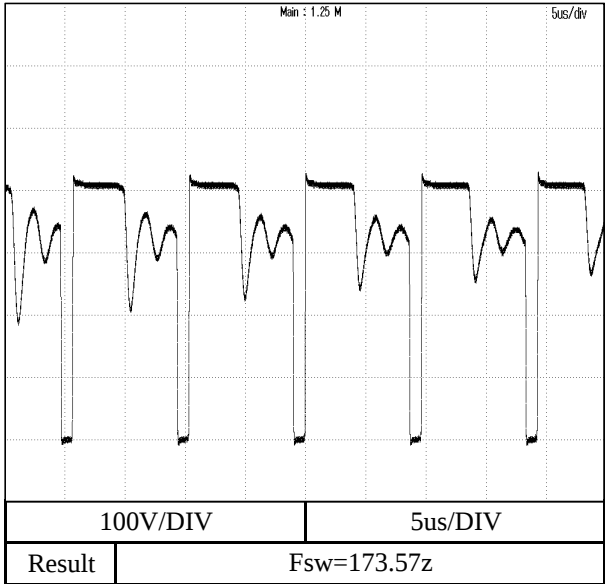
24V

Condition : 25 °C

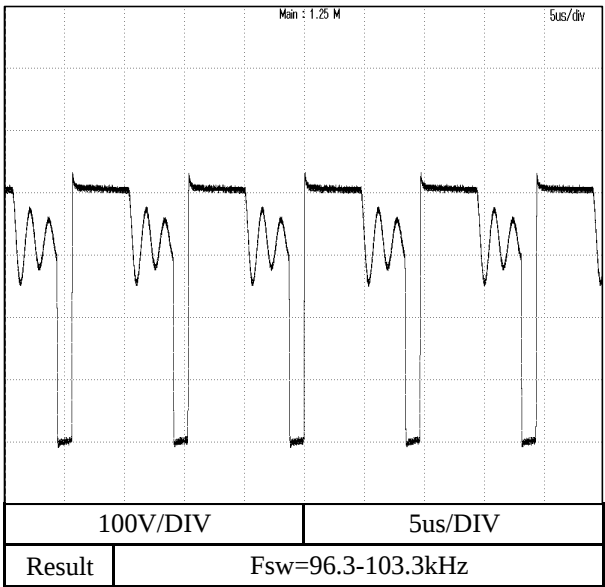
Conditions: Vin = 230Vac, load = 0%



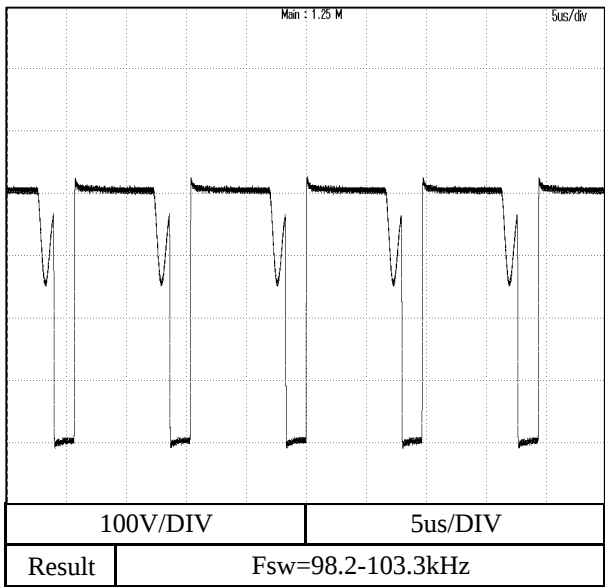
Conditions: Vin = 230Vac, load = 0%



Conditions: Vin = 230Vac, load = 50%



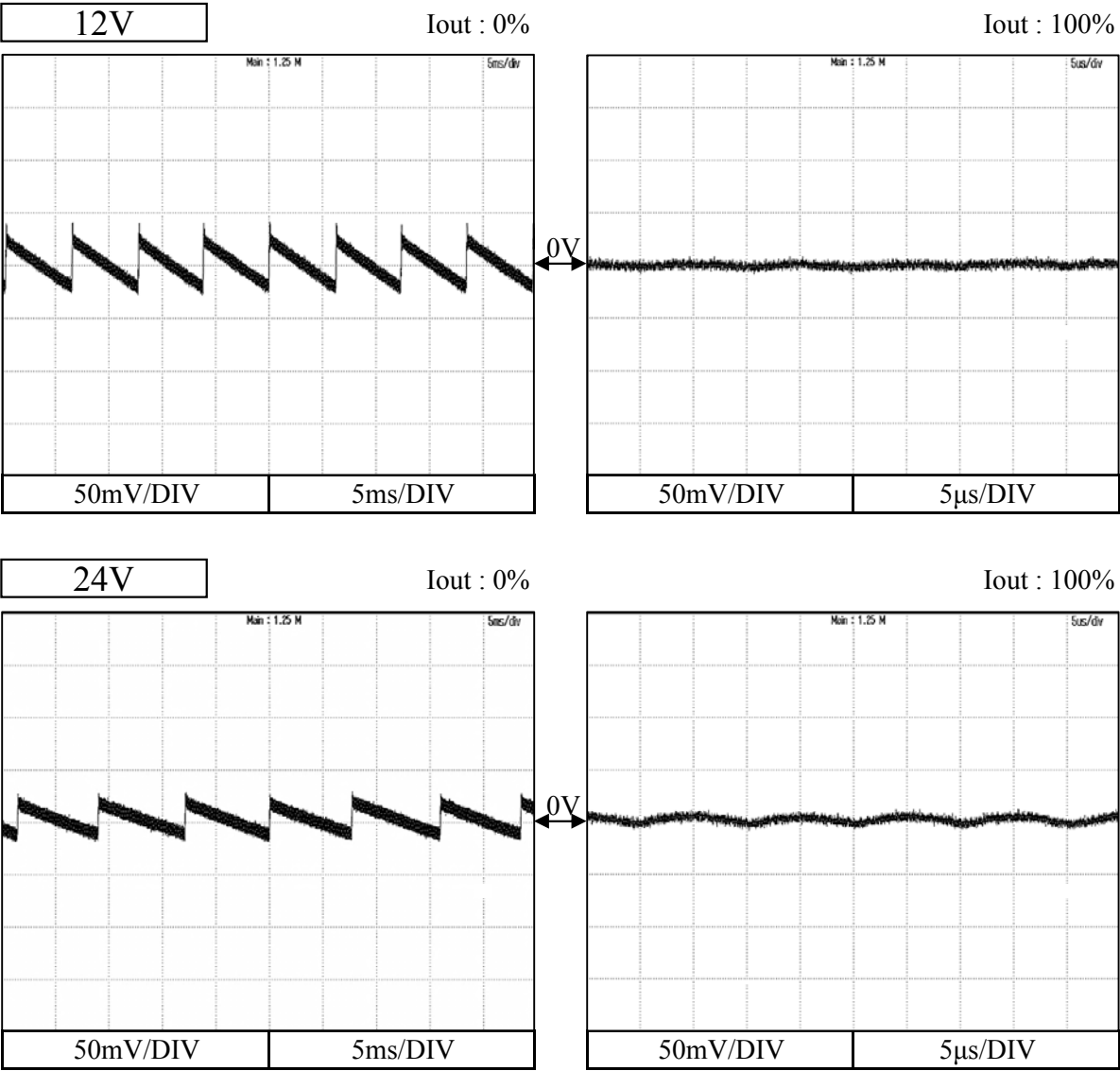
Conditions: Vin = 230Vac, load = 100%



2.11 Output ripple and noise waveform

DRL30-1

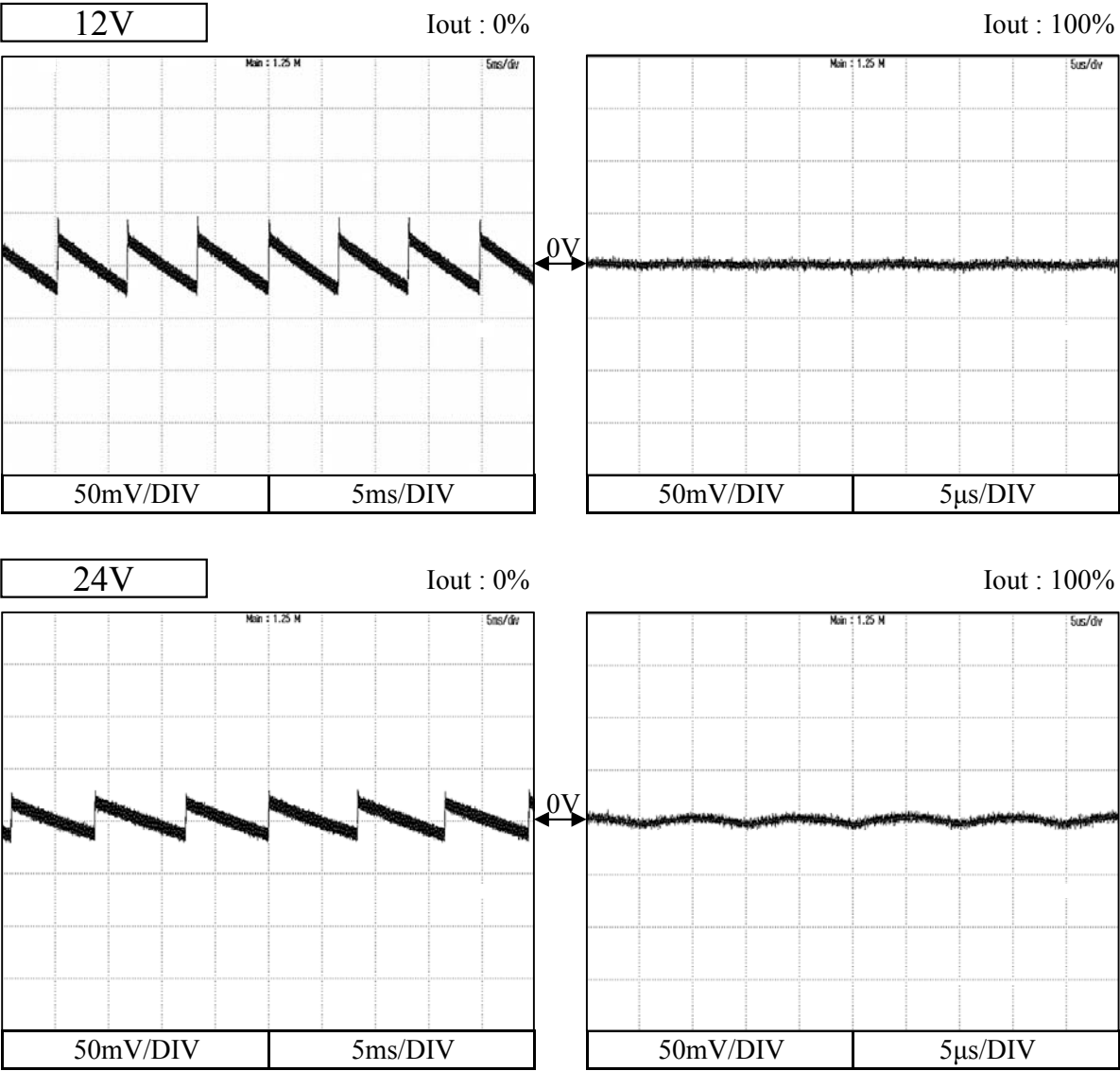
Conditions Vin : 115 VAC
Ta : 25 °C



2.11 Output ripple and noise waveform

DRL30-1

Conditions Vin : 230 VAC
Ta : 25 °C



2.12 Electro-Magnetic Interference characteristics

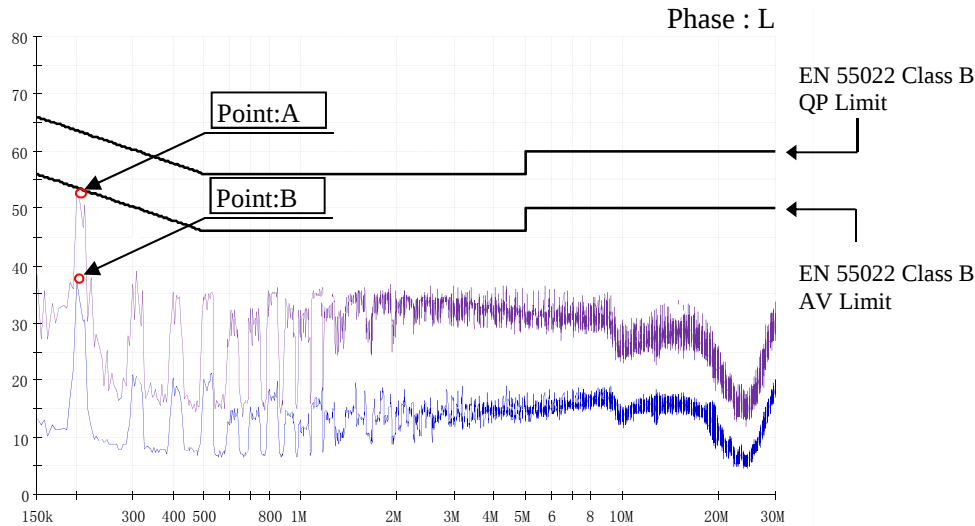
DRL30-1

Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 °C

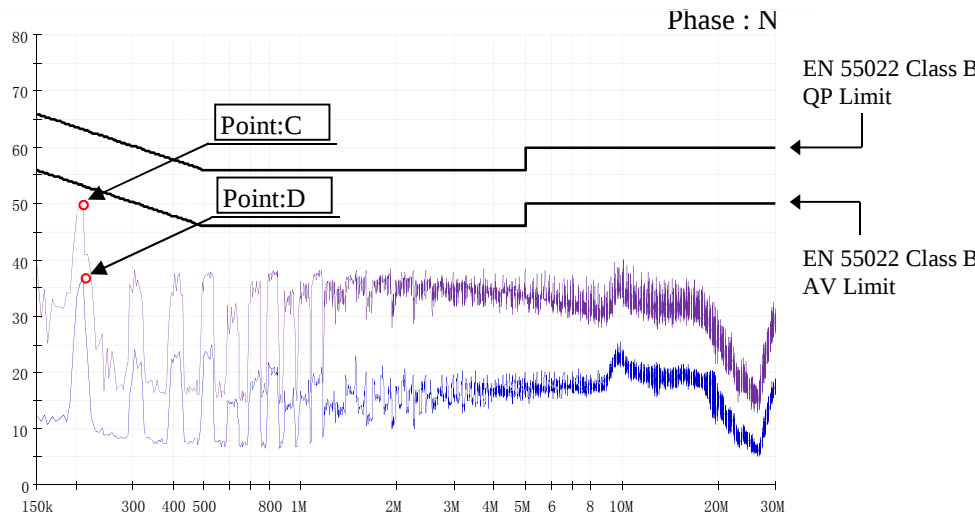
Conducted Emission

12V

Point A(0.200MHz) Point B(0.204MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.6	50.6
AV	53.4	35.2



Point C(0.209MHz) Point D(0.213MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.1	46.2
AV	53.3	35.9



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.12 Electro-Magnetic Interference characteristics

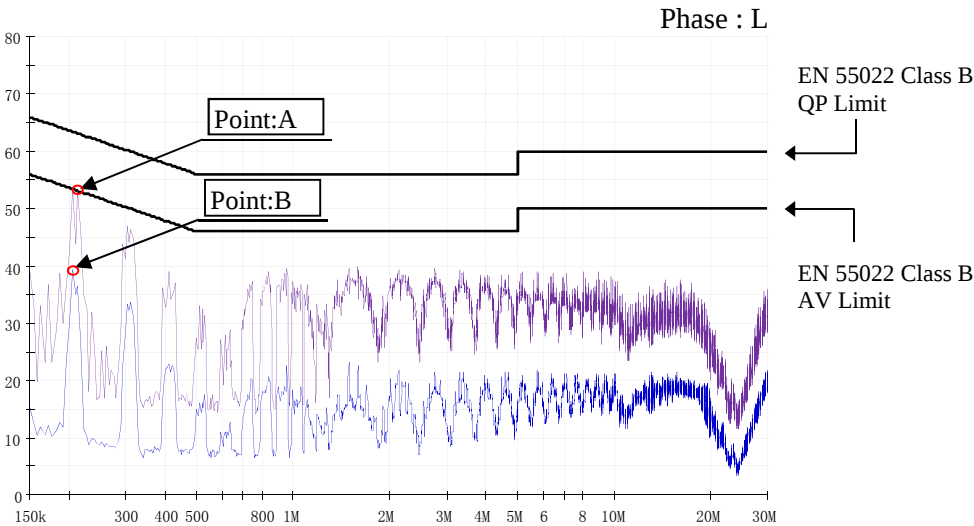
DRL30-1

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

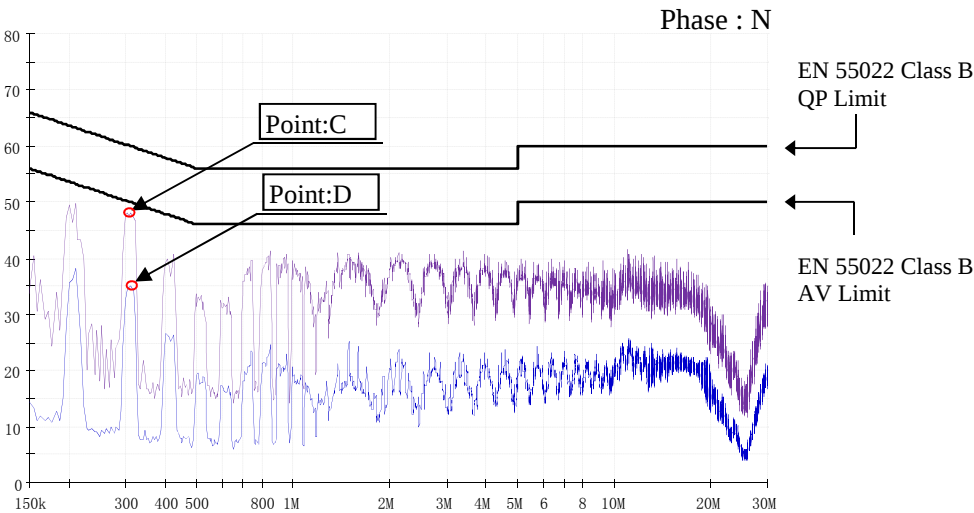
Conducted Emission

12V

Point A(0.209MHz) Point B(0.204MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.3	50.7
AV	53.4	35.6



Point C(0.312MHz) Point D(0.312MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	59.9	45.7
AV	49.9	35.4



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.12 Electro-Magnetic Interference characteristics

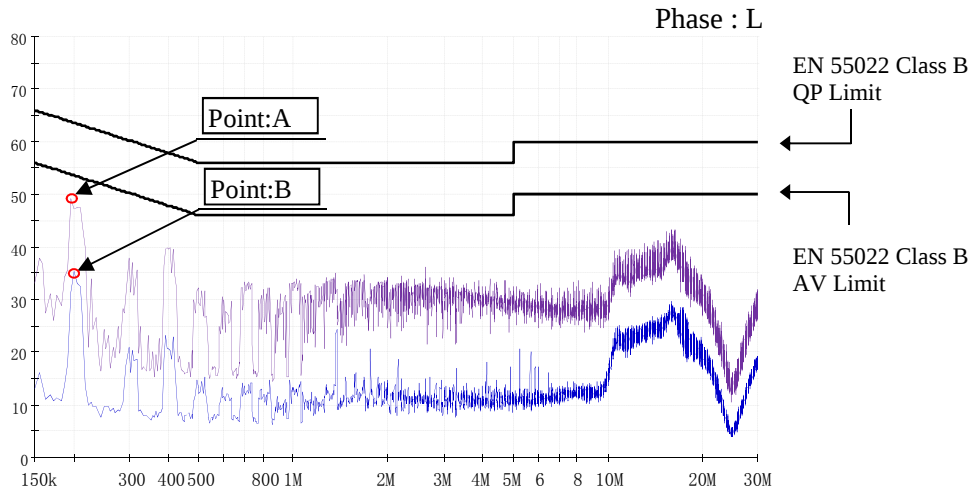
DRL30-1

Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 °C

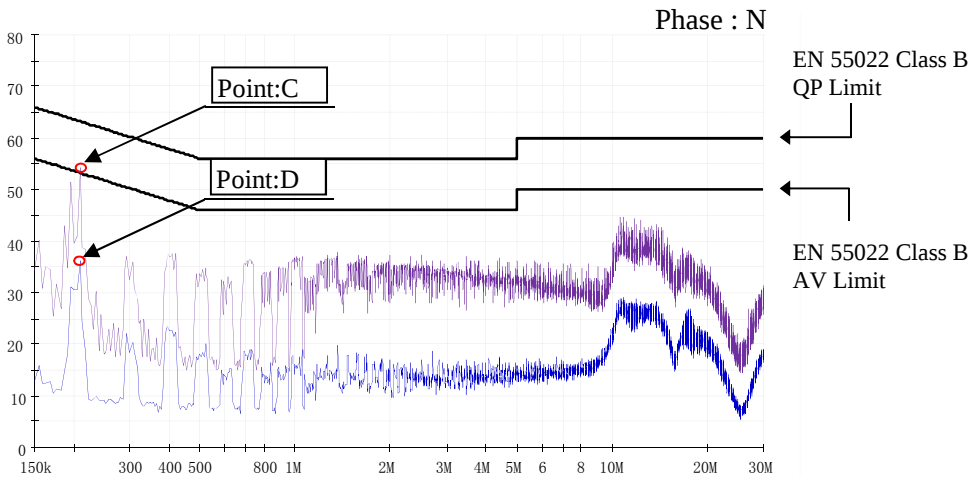
Conducted Emission

24V

Ref. Data	Point A(0.195MHz) Point B(0.200MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.8	47.9
AV	53.6	34.8



Ref. Data	Point C(0.204MHz) Point D(0.204MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.4	52.0
AV	53.4	36.8



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.12 Electro-Magnetic Interference characteristics

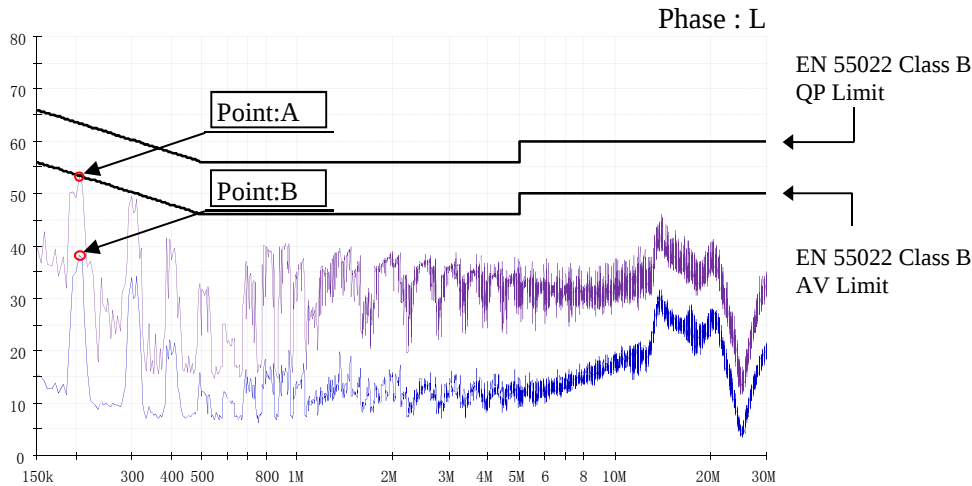
DRL30-1

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

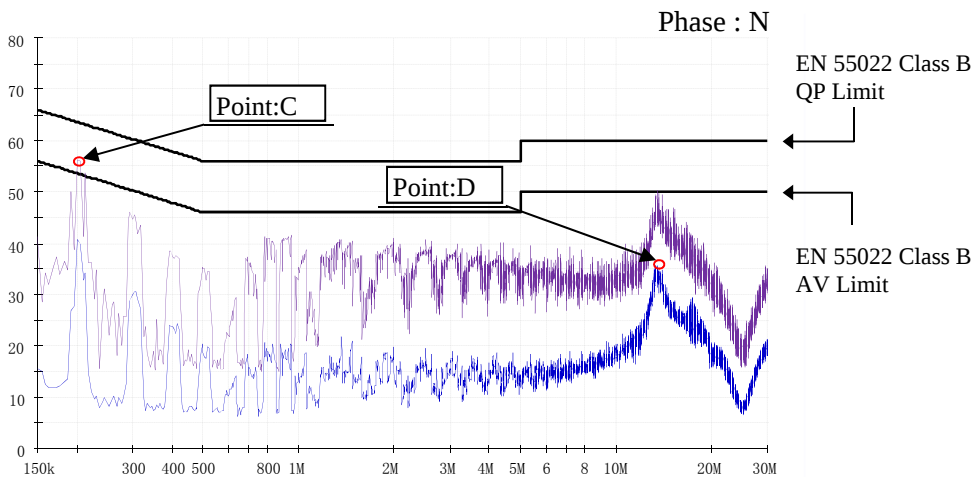
Conducted Emission

24V

Ref. Data	Point A(0.209MHz) Point B(0.200MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.3	50.9
AV	53.6	36.8



Ref. Data	Point C(0.200MHz) Point D(13.45MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.6	53.8
AV	50.0	33.8



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.12 Electro-Magnetic Interference characteristics

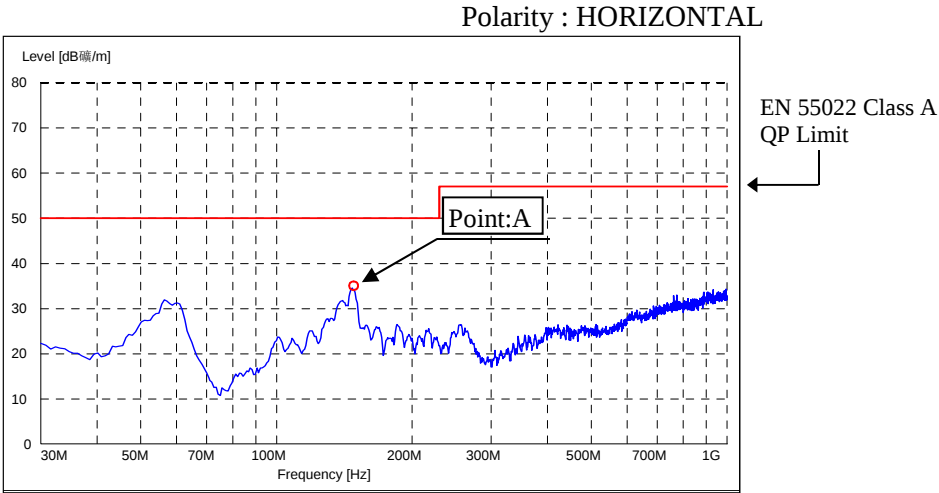
DRL30-1

Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 °C

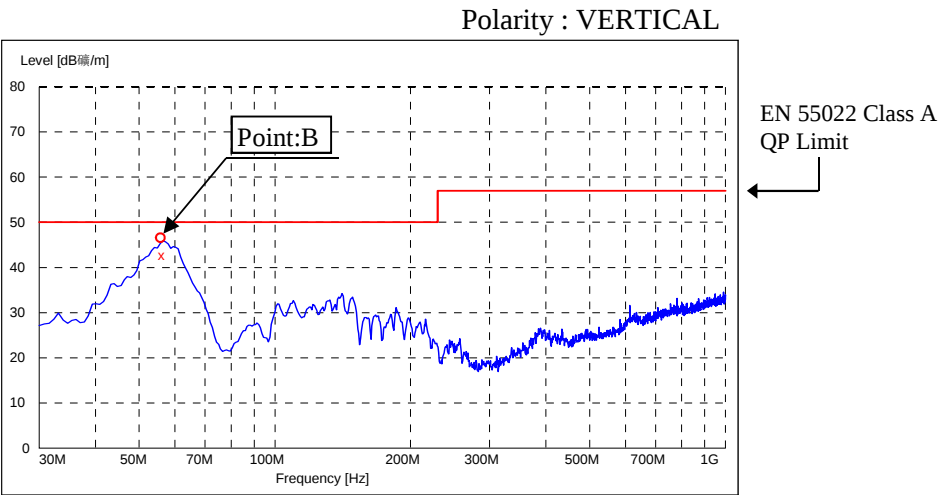
Radiated Emission

12V

Ref. Data	Point A (145.00MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	50.0	34.5



Ref. Data	Point B (56.38MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	50.0	42.6



Limit of EN55011-A,VCCI-A,FCC-A are same as its EN55022 class A.

2.12 Electro-Magnetic Interference characteristics

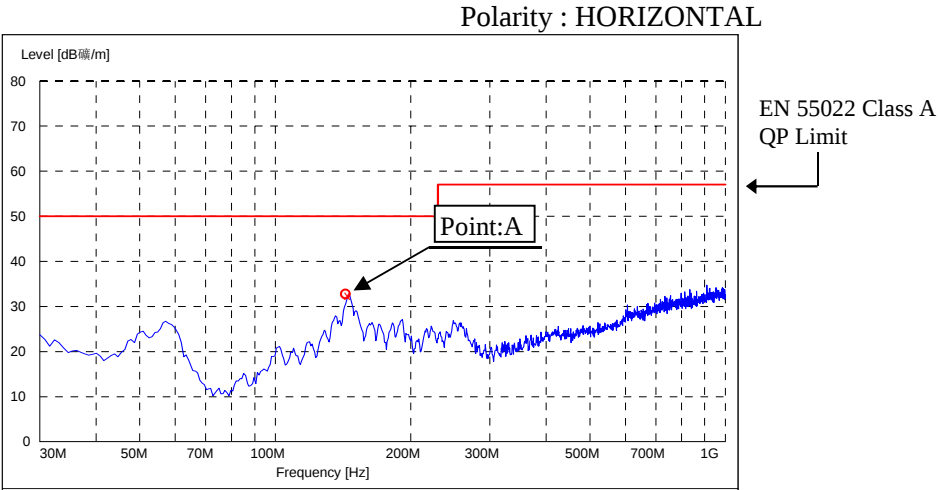
DRL30-1

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

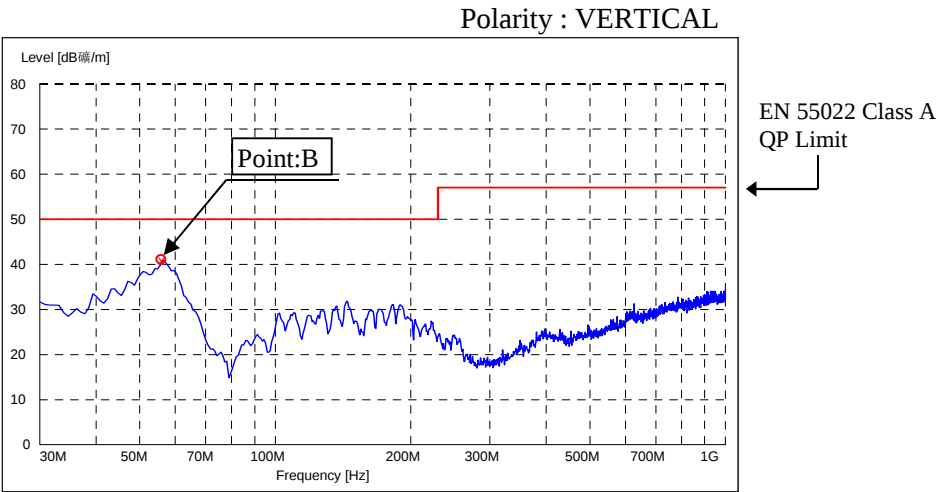
Radiated Emission

12V

Ref. Data	Point A (145.62MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	50.0	32.6



Ref. Data	Point B (56.38MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	50.0	41.0



Limit of EN55011-A,VCCI-A,FCC-A are same as its EN55022 class A.

2.12 Electro-Magnetic Interference characteristics

DRL30-1

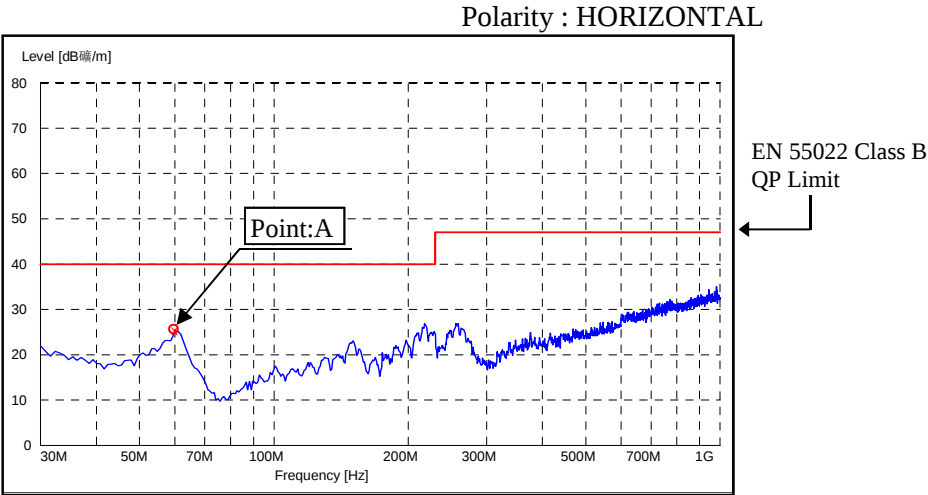
Conditions Vin : 115 VAC
 Iout : 100 %
 Ta : 25 °C

Radiated Emission

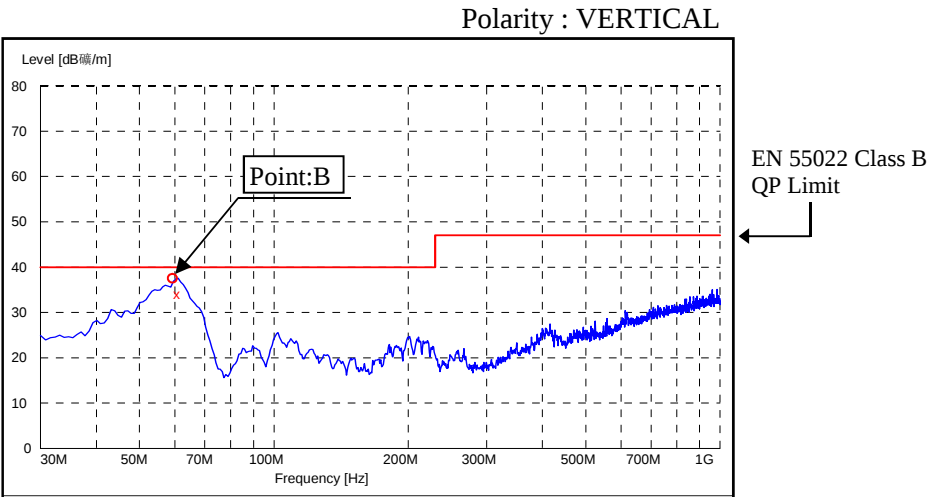
External coil :
Input : H18.5*9.7*7.4P DN80H(DMEGC) , 4 Turns

12V

Point A (60.264MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	40.0	25.3



Point B (61.016MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	40.0	34.1



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.12 Electro-Magnetic Interference characteristics

DRL30-1

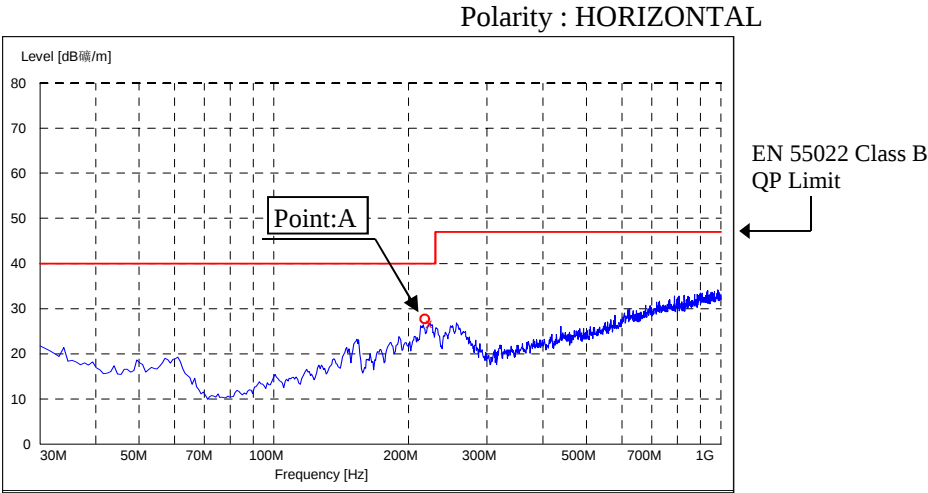
Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 °C

Radiated Emission

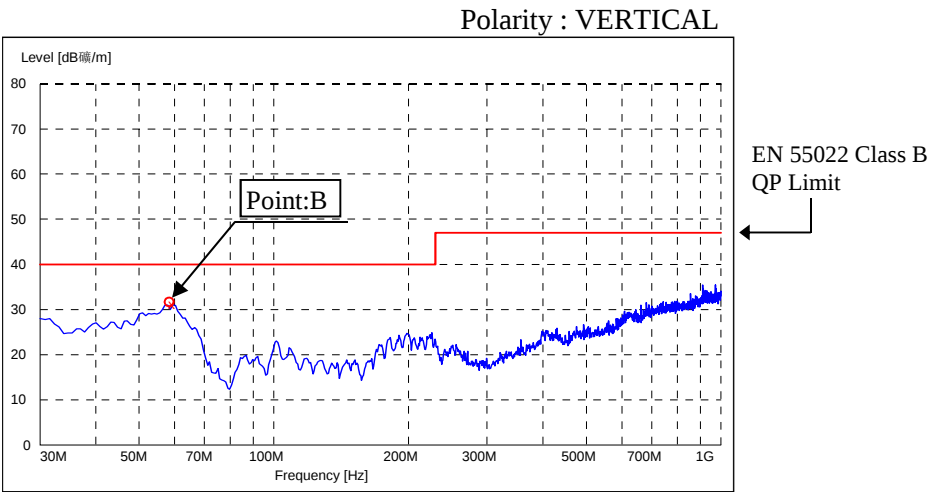
External coil :
Input : H18.5*9.7*7.4P DN80H(DMEGC) , 4 Turns

12V

Ref. Data	Point A (200MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	40.0	26.7



Ref. Data	Point B (59.488MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	40.0	31.1



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.12 Electro-Magnetic Interference characteristics

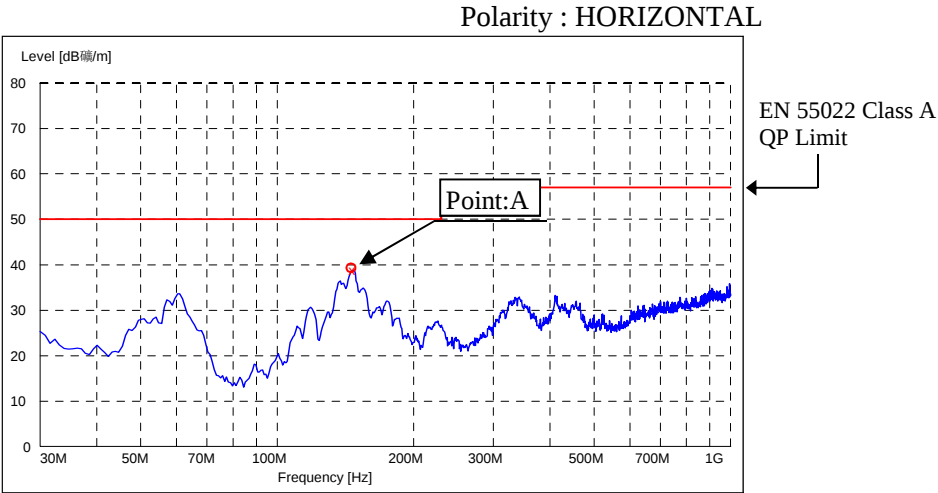
DRL30-1

Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 °C

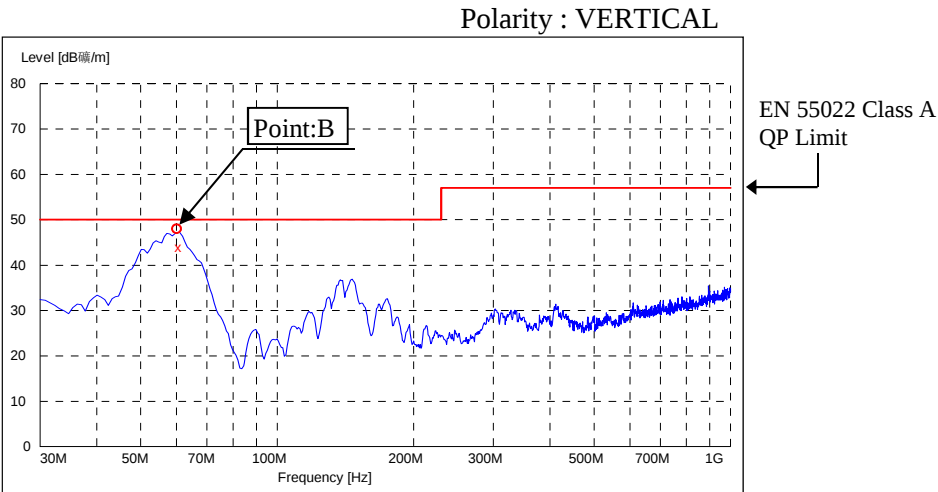
Radiated Emission

24V

Point A (147.176MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	50.0	38.8



Point B (60.901MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	50.0	44.0



Limit of EN55011-A,VCCI-A,FCC-A are same as its EN55022 class A.

2.12 Electro-Magnetic Interference characteristics

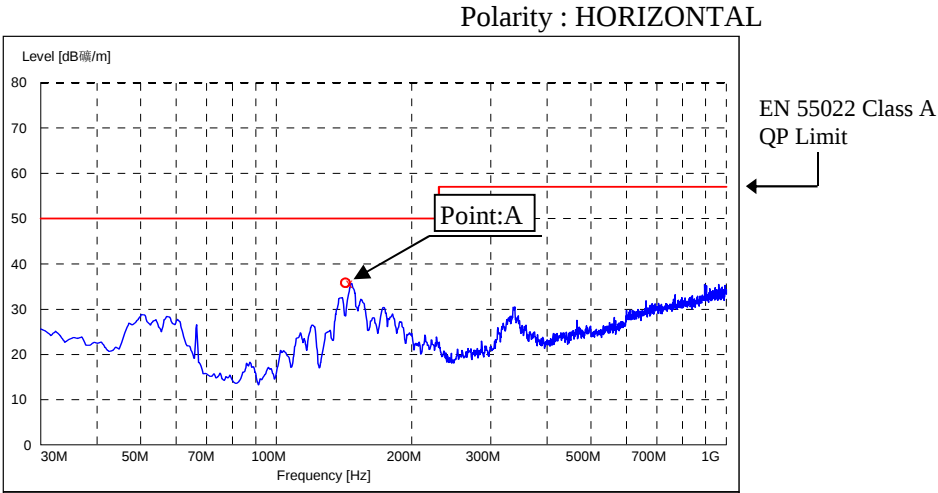
DRL30-1

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

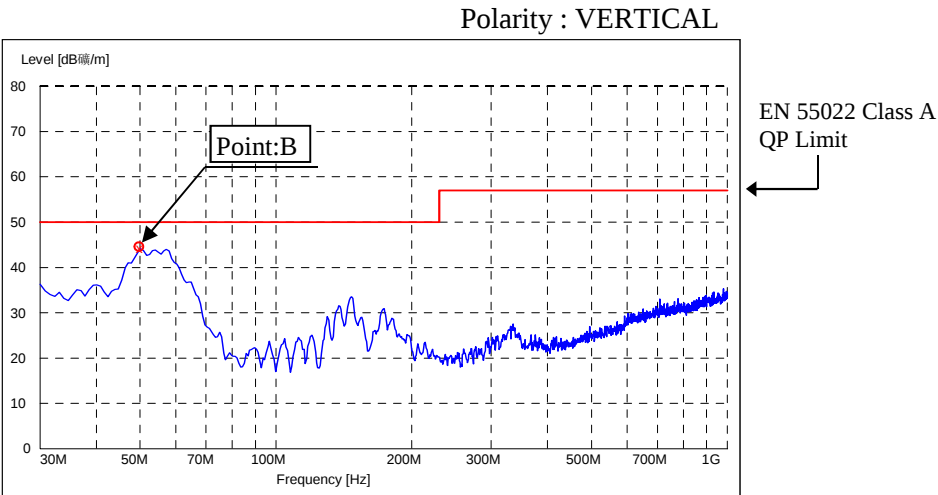
Radiated Emission

24V

Ref. Data	Point A (146.400MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	50.0	35.7



Ref. Data	Point B (50.176MHz)	
	Limit (dBuV)	Measure (dBuV)
QP	50.0	43.6



Limit of EN55011-A,VCCI-A,FCC-A are same as its EN55022 class A.

2.12 Electro-Magnetic Interference characteristics

DRL30-1

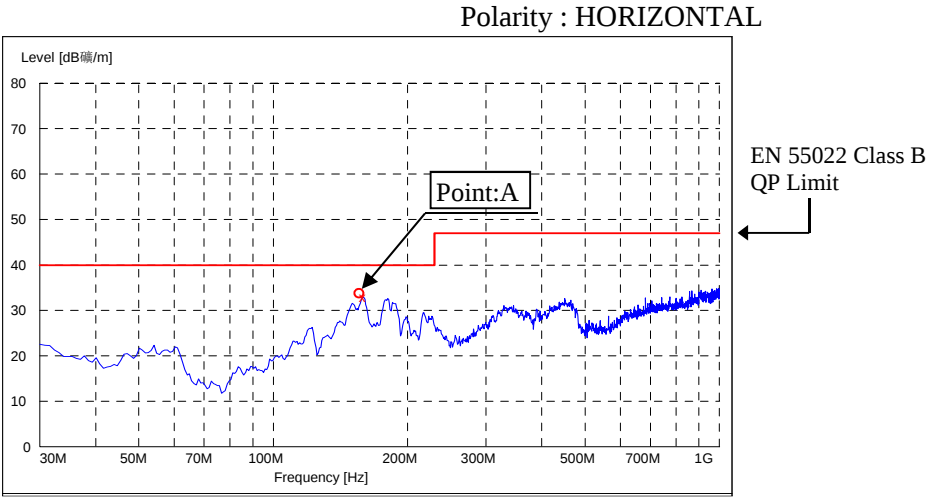
Conditions Vin : 115 VAC
Iout : 100 %
Ta : 25 °C

Radiated Emission

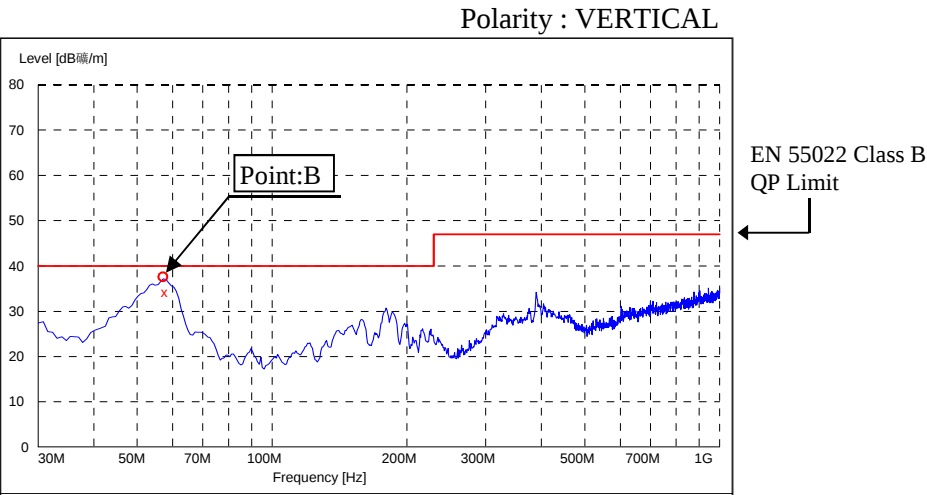
External coil :
Input : H18.5*9.7*7.4P DN80H(DMEGC) , 4 Turns

24V

Point A (159.59MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	40.0	32.9



Point B (57.79MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	40.0	34.2



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.12 Electro-Magnetic Interference characteristics

DRL30-1

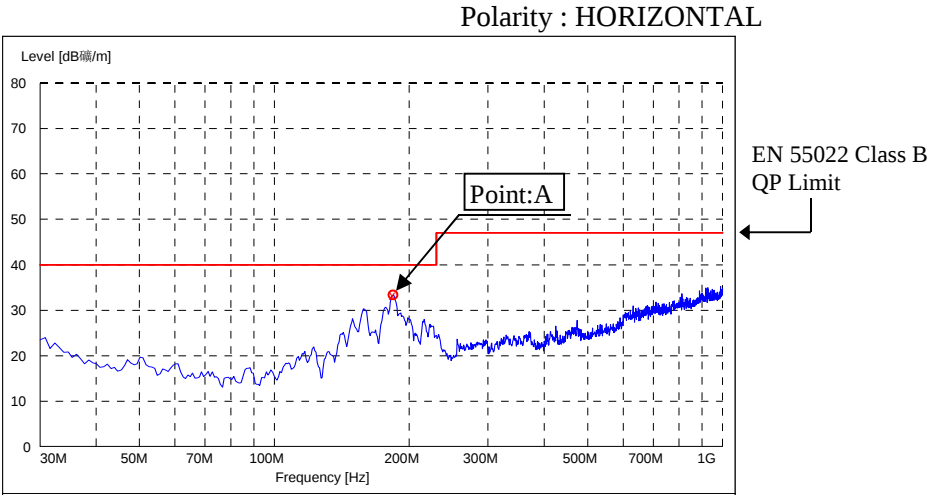
Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 °C

Radiated Emission

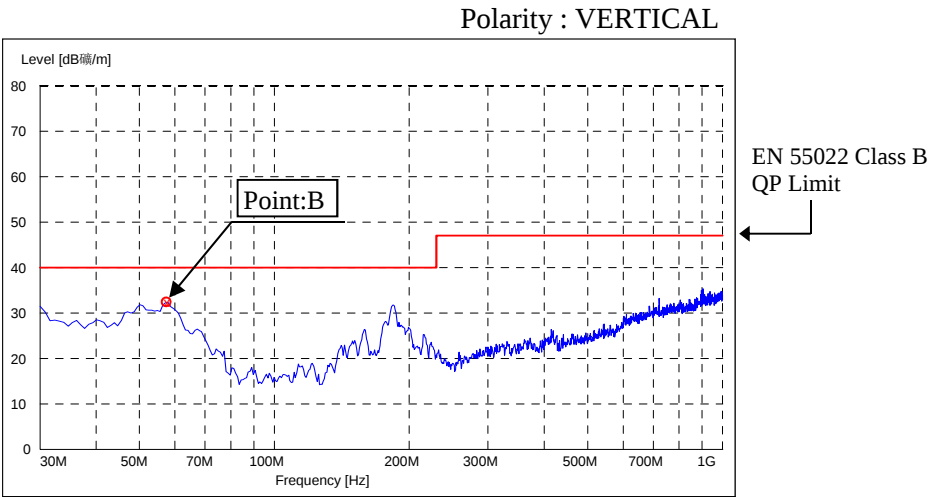
External coil :
Input : H18.5*9.7*7.4P DN80H(DMEGC) , 4 Turns

24V

Point A (184.42MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	40.0	33.4



Point B (57.94MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	40.0	32.3



Limit of EN55011-B,VCCI-B,FCC-B are same as its EN55022 class B.

2.13 Limit power source (UL1310 class2)

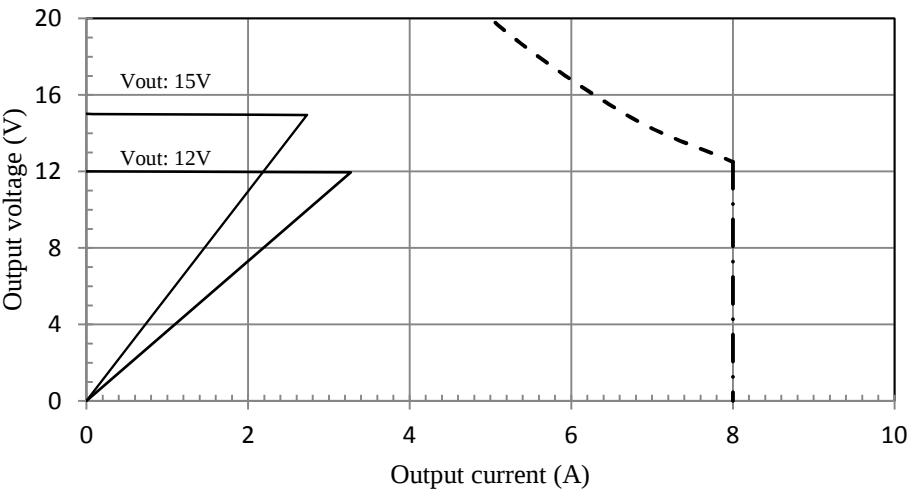
DRL30-1

Conditions Vin : 115 VAC
 Ta : 25 °C

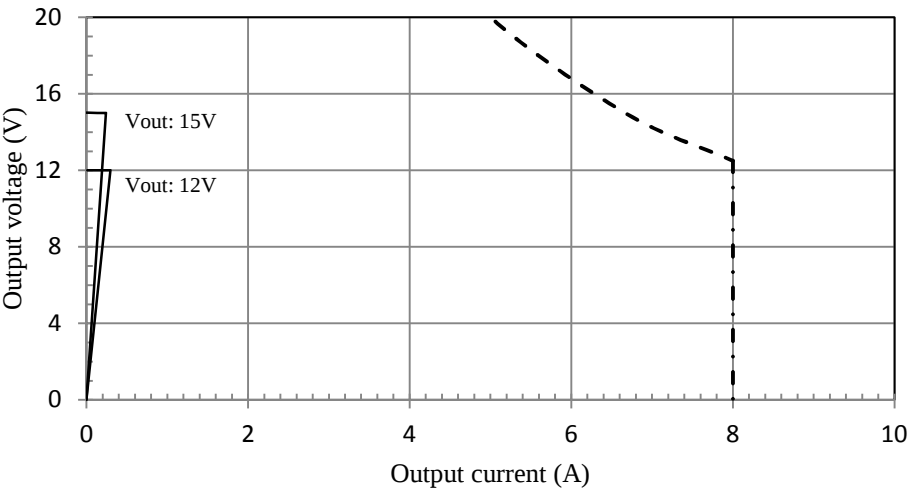
12V

— — — — — Limit of 100W
- . - . - . - . Limit of 8A
————— Output voltage vs. Output current

O.C.P condition
Basic protection function - Over current protection.



Single fault condition
Disable over current protection function by shorting the current sense resistor.



2.13 Limit power source (UL1310 class2)

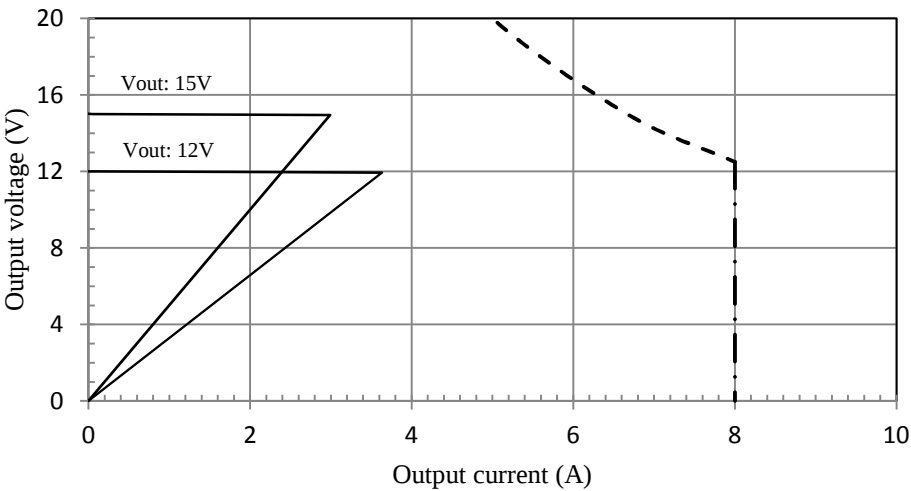
DRL30-1

Conditions Vin : 230 VAC
 Ta : 25 °C

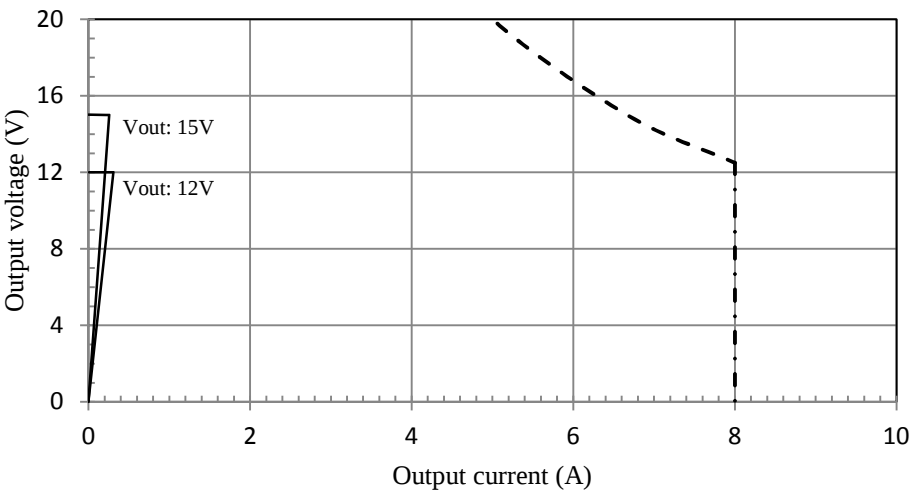
12V

— — — — — Limit of 100W
- . - . - . - . Limit of 8A
————— Output voltage vs. Output current

O.C.P condition
Basic protection function - Over current protection.



Single fault condition
Disable over current protection function by shorting the current sense resistor.



2.13 Limit power source (UL1310 class2)

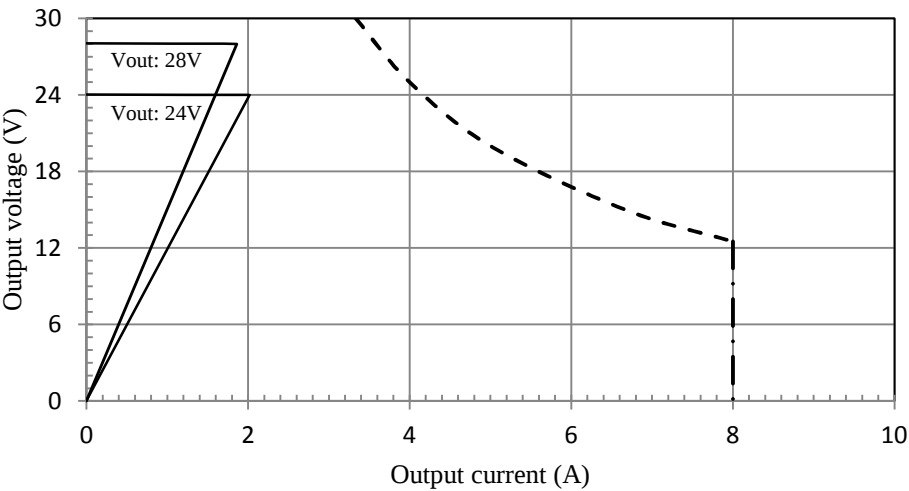
DRL30-1

Conditions Vin : 115 VAC
 Ta : 25 °C

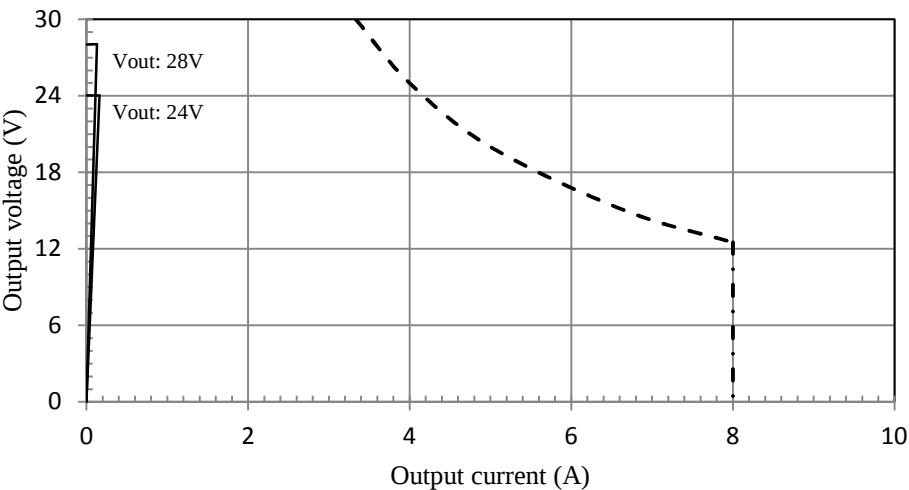
24V

— — — — — Limit of 100W
- - - - - Limit of 8A
————— Output voltage vs. Output current

O.C.P condition
Basic protection function - Over current protection.



Single fault condition
Disable over current protection function by shorting the current sense resistor.



2.13 Limit power source (UL1310 class2)

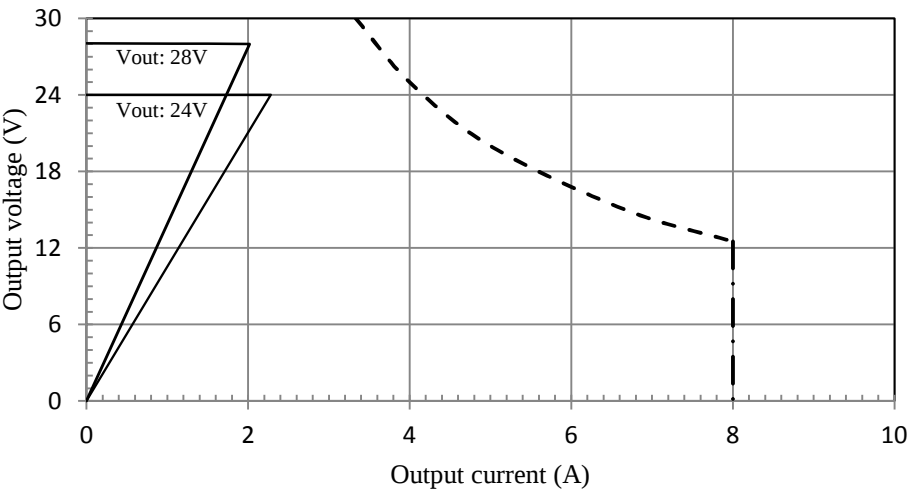
DRL30-1

Conditions Vin : 230 VAC
 Ta : 25 °C

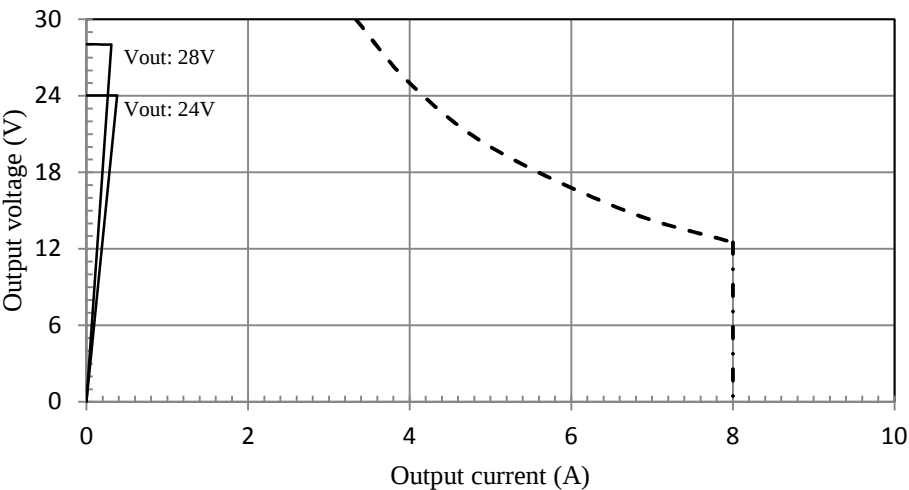
24V

— — — — — Limit of 100W
- - - - - Limit of 8A
————— Output voltage vs. Output current

O.C.P condition
Basic protection function - Over current protection.



Single fault condition
Disable over current protection function by shorting the current sense resistor.



2.14 Harmonic current characteristics

DRL30-1

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

