

EDCL1500-60

EVALUATION DATA

型式データ

INDEX

PAGE

1. 測定方法 Evaluation Method

1-1. 測定回路 Circuit used for determination

測定回路 1 Circuit 1 used for determination

静特性 Steady state data	4
通電ドリフト特性 Warm up voltage drift characteristics	4
出力電圧立ち上がり、立ち下がり特性 Output voltage rise/fall characteristics ..	4
出力電流立ち上がり、立ち下がり特性 Output current rise/fall characteristics ..	4
過電流保護特性 Over current protection (OCP) characteristics	4
過渡応答負荷急変特性 Dynamic load response characteristics	4
出力リップル、ノイズ電流波形 Output ripple and noise current waveform	4
入力電圧瞬停特性 Response to brown out characteristics	4

測定回路 2 Circuit 2 used for determination

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

測定回路 3 Circuit 3 used for determination

入力サージ電流 (突入電流) 波形 Inrush current waveform	5
---	---

測定回路 4 Circuit 4 used for determination

ON/OFF コントロール時出力立ち上がり、立ち下がり特性 Output rise/fall characteristics with ON/OFF Control	5
---	---

測定回路 5 Circuit 5 used for determination

出力リップル、ノイズ電圧波形 Output ripple and noise voltage waveform	6
---	---

測定回路 6 Circuit 6 used for determination

出力電圧指令応答特性 Output voltage command response characteristics	7
出力電流指令応答特性 Output current command response characteristics	7

測定構成 Configuration used for determination

EMI 特性 Electro-Magnetic Interference characteristics	8
(a) 雑音端子電圧 (帰還ノイズ) Conducted Emission	8
(b) 雑音電界強度 (放射ノイズ) Radiated Emission	8

1-2. 使用測定機器 List of equipment used..... 9

2. 特性データ Characteristics

2-1. 定電圧出力モード Constant voltage output mode

2-1-1. 静特性 Steady state data	10
(1) 入力・負荷・温度変動 Regulation – line and load, Temperature drift	10
(2) リップルノイズ電圧対出力電流 Ripple noise voltage vs. Output current ...	11
(3) 効率対出力電流 Efficiency vs. Output current	12
(4) 入力電力対出力電流 Input power vs. Output current	13

(5) 入力電流対出力電流 Input current vs. Output current.....	14
2-1-2. 通電ドリフト特性 Warm up voltage drift characteristics	15
2-1-3. 出力電圧立ち上がり特性 Output voltage rise characteristics.....	16
2-1-4. 出力電圧立ち下がり特性 Output voltage fall characteristics	17
2-1-5. ON/OFF コントロール時出力立ち上がり、立ち下がり特性 Output rise/fall characteristics with ON/OFF Control	18
2-1-6. 過渡応答 (負荷急変) 特性 Dynamic load response characteristics	20
2-1-7. 出力リップル、ノイズ波形 Output ripple and noise waveform	20
2-1-8. 入力電圧瞬停特性 Response to brown out characteristics.....	21
2-1-9. 出力電圧指令応答特性 Output voltage command response characteristics ..	22
2-2. 定電流出力モード Constant current output mode	
2-2-1. 静特性 Steady state data	
(1) 入力・負荷・温度変動 Regulation – line and load, Temperature drift	23
(2) リップルノイズ電流対出力電圧 Ripple noise current vs. Output voltage ..	24
(3) 効率対出力電圧 Efficiency vs. Output voltage	25
(4) 入力電力対出力電圧 Input power vs. Output voltage.....	26
(5) 入力電流対出力電圧 Input current vs. Output voltage	27
2-2-2. 通電ドリフト特性 Warm up current drift characteristics	28
2-2-3. 出力電流立ち上がり特性 Output current rise characteristics	29
2-2-4. 出力電流立ち下がり特性 Output current fall characteristics.....	30
2-2-5. ON/OFF コントロール時出力立ち上がり、立ち下がり特性 Output rise/fall characteristics with ON/OFF Control	31
2-2-6. 出力リップル、ノイズ波形 Output ripple and noise waveform	32
2-2-7. 入力電圧瞬停特性 Response to brown out characteristics.....	32
2-2-8. 定電流指令応答特性 Constant current command response characteristics ..	33
2-3. 過電流保護特性 Over current protection (OCP) characteristics.....	34
2-4. 過電圧保護特性 Over voltage protection (OVP) characteristics	35
2-5. 入力サージ電流 (突入電流) 波形 Inrush current waveform.....	35
2-6. EMI 特性 Electro Magnetic Interference characteristics.....	36

使用記号 Terminology used

Ta	: 周囲温度 Ambient temperature	f	: 周波数 Frequency
Vin	: 入力電圧 Input voltage	Iin	: 入力電流 Input current
Vout	: 出力電圧 Output voltage	Iout	: 出力電流 Output current
Vaux	: AUX 電圧 AUX voltage	Iaux	: AUX 電流 AUX current
tr	: 立ち上がり時間 Rise time	tf	: 立ち下がり時間 Fall time

※当社測定条件における結果であり、参考値としてお考え願います。

Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1-1. 測定回路 Circuit used for determination

測定回路 1 Circuit 1 used for determination

静特性 Steady state data

通電ドリフト特性 Warm up voltage drift characteristics

出力電圧立ち上がり、立ち下がり特性 Output voltage rise/fall characteristics

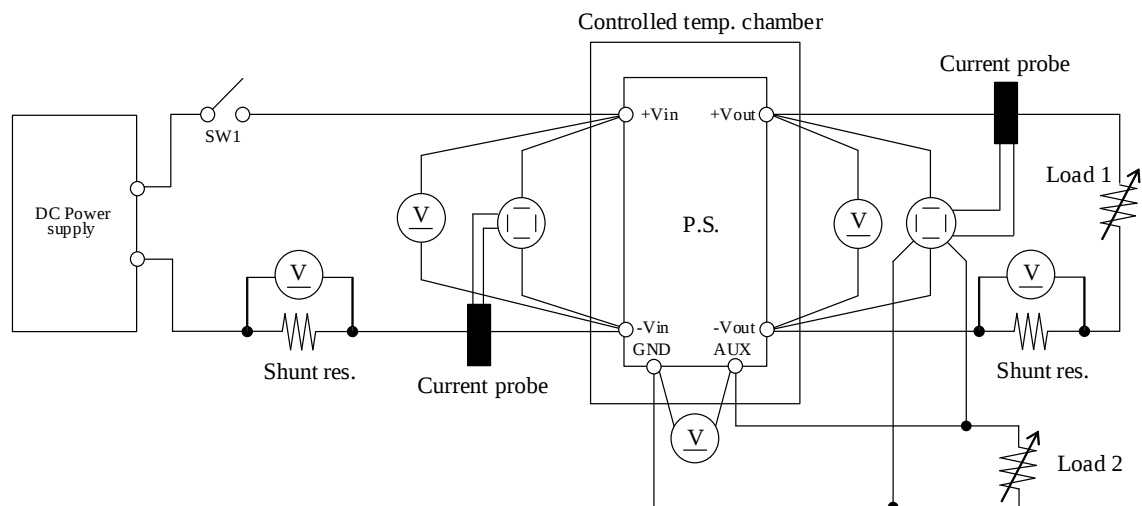
出力電流立ち上がり、立ち下がり特性 Output current rise/fall characteristics

過電流保護特性 Over current protection (OCP) characteristics

過渡応答負荷急変特性 Dynamic load response characteristics

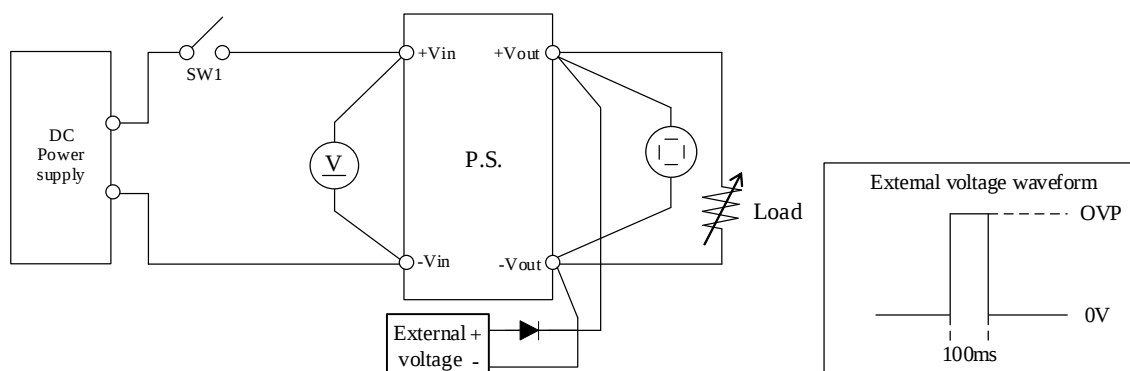
出力リップル、ノイズ電流波形 Output ripple and noise current waveform

入力電圧瞬停特性 Response to brown out characteristics



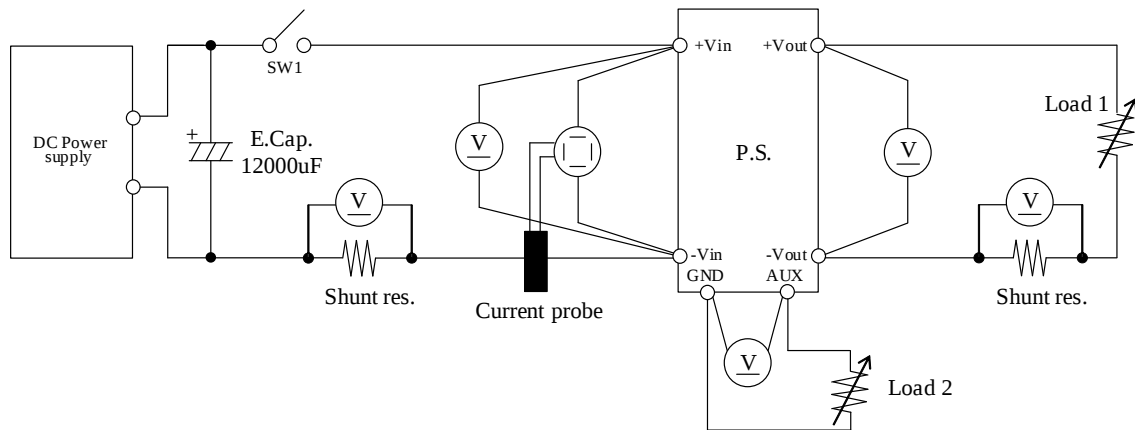
測定回路 2 Circuit 2 used for determination

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



測定回路 3 Circuit 3 used for determination

入力サージ電流 (突入電流) 波形 Inrush current waveform

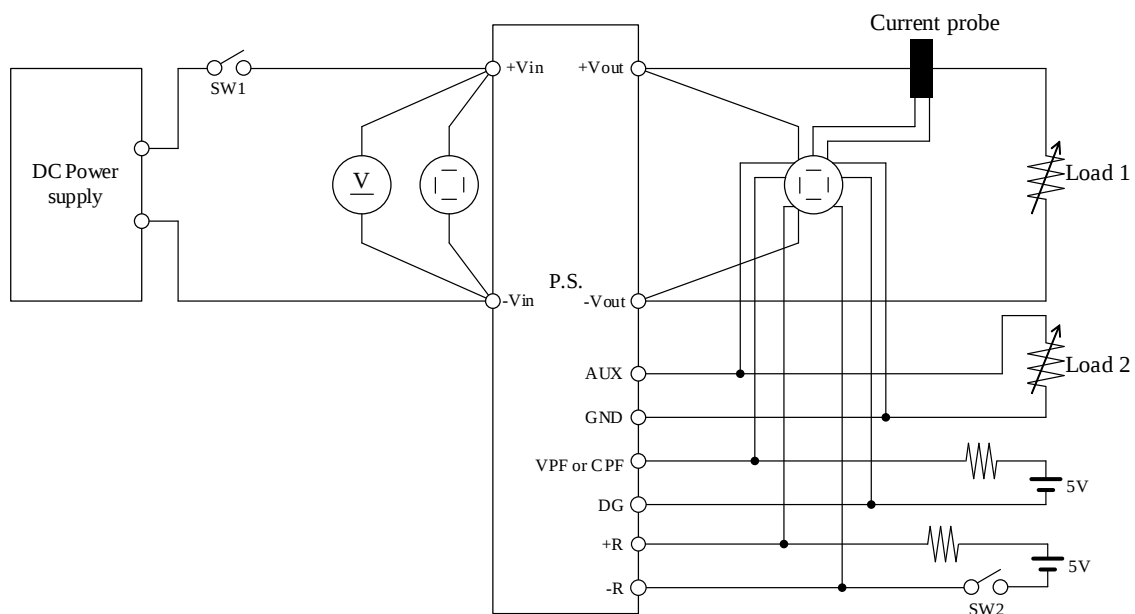
測定回路 4 Circuit 4 used for determination

ON/OFF コントロール時出力立ち上がり、立ち下がり特性

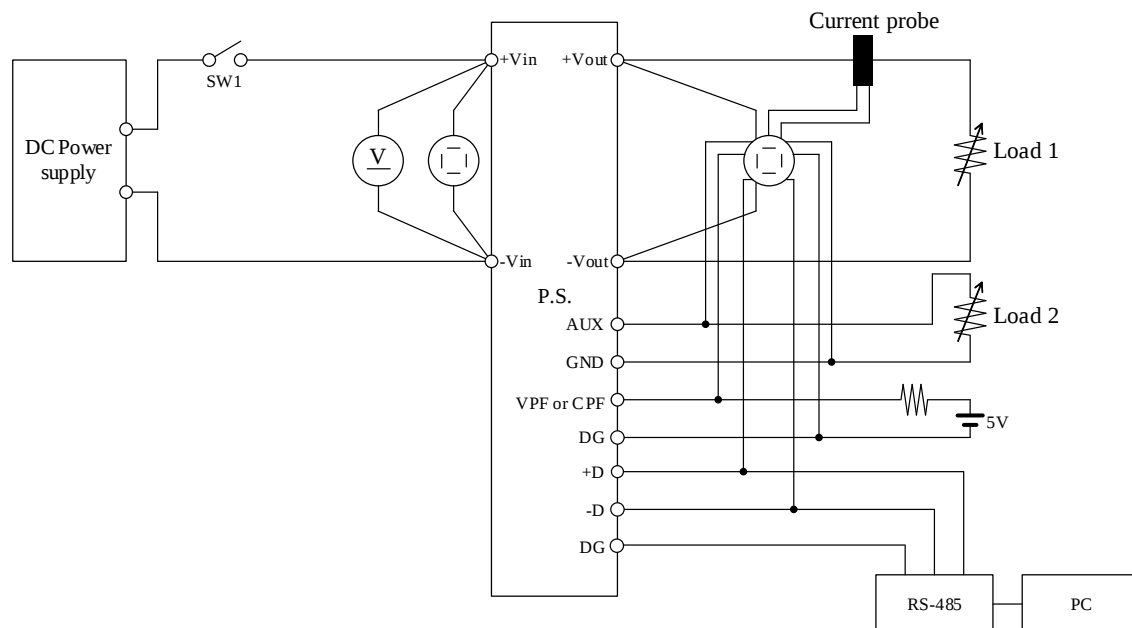
Output rise/fall characteristics with ON/OFF Control

(a) リモート ON/OFF コントロール端子による ON/OFF

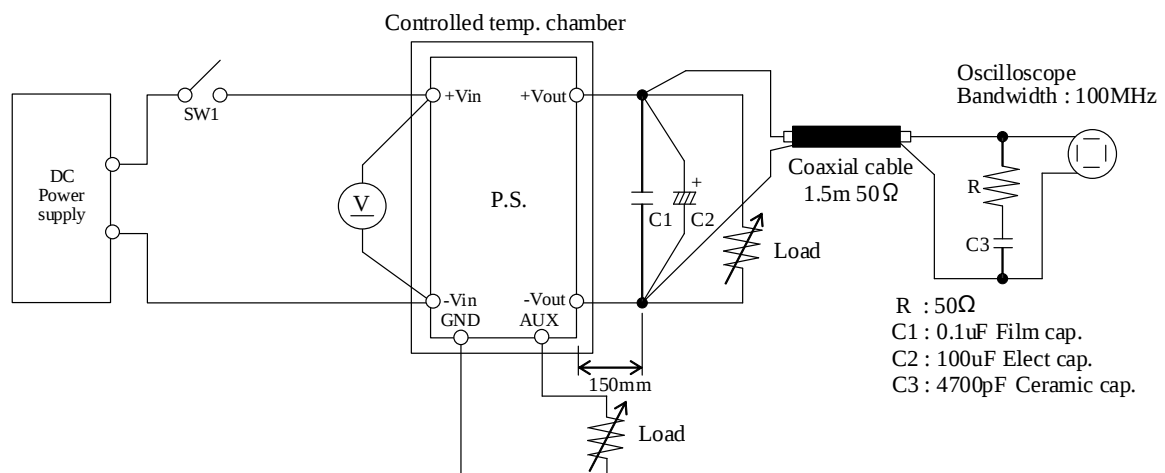
ON/OFF control by remote ON/OFF control terminal



(b) RS-485 通信による ON/OFF ON/OFF control by RS-485

測定回路 5 Circuit 5 used for determination

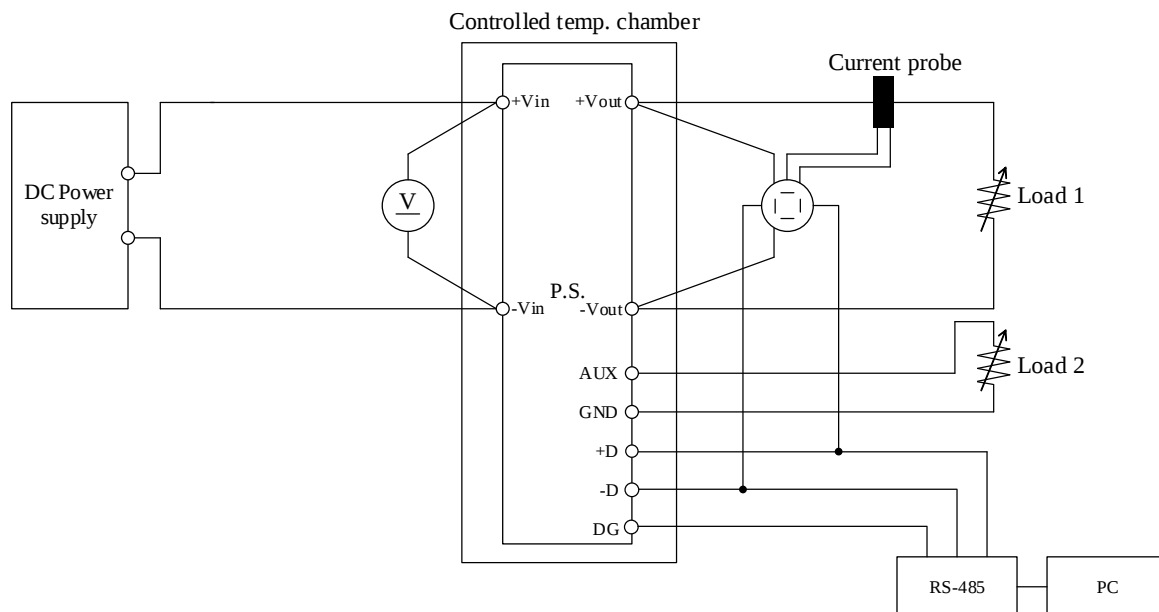
出力リップル、ノイズ電圧波形 Output ripple and noise voltage waveform



測定回路 6 Circuit 6 used for determination

出力電圧指令応答特性 Output voltage command response characteristics

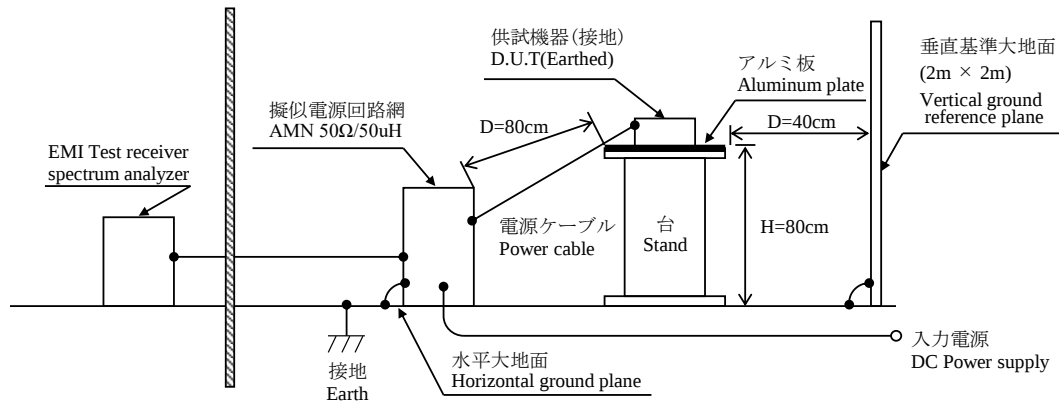
出力電流指令応答特性 Output current command response characteristics



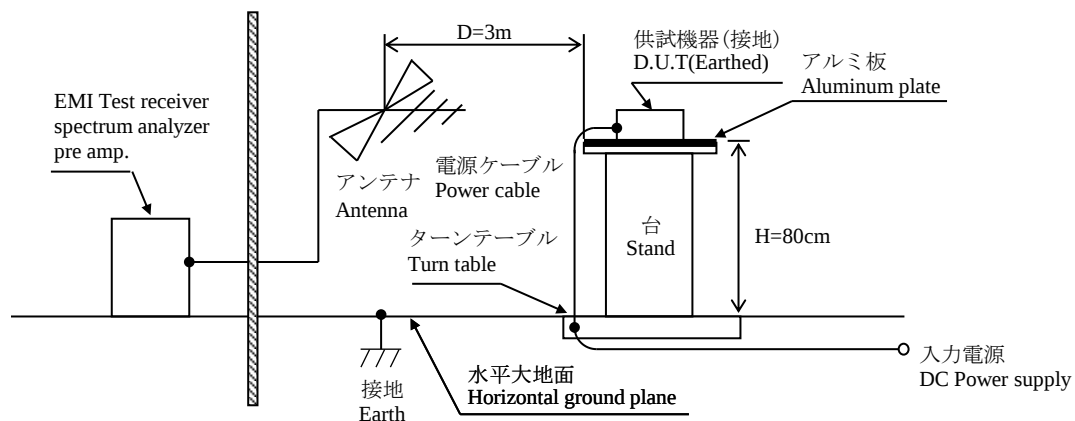
測定構成 Configuration used for determination

EMI 特性 Electro-Magnetic Interference characteristics

(a) 雑音端子電圧(帰還ノイズ) Conducted Emission



(b) 雑音電界強度(放射ノイズ) Radiated Emission



1-2. 使用測定機器 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DLM5054
2	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DLM5058
3	DIGITAL MULTIMETER	KEYSIGHT	34970A
4	DIGITAL MULTIMETER	KEYSIGHT	34401A
5	CURRENT PROBE	YOKOGAWA ELECT.	701930
6	DYNAMIC DUMMY LOAD	KIKUSI	PLZ1004W
7	DYNAMIC DUMMY LOAD BOOSTER	KIKUSI	PLZ2004WB
8	DYNAMIC DUMMY LOAD	CHROMA	63220E-1200-800
9	DYNAMIC DUMMY LOAD	TDK-LAMBDA	SFL120-60-300
10	CVCC	KIKUSUI	PCR18000WEA2R
11	DIRECT CURRENT POWER SUPPLY	KEYSIGHT	N8934A
12	CONTROLLED TEMP. CHAMBER	ESPEC	PL-4J
13	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESR3
14	PRE AMP.	SONOMA	310N
15	AMN	SCHWARZBECK	NNLK8121
16	ANTENNA	TESEQ	CBL6111D

2. 特性データ Characteristics

2-1. 定電圧出力モード Constant voltage output mode

2-1-1. 静特性 Steady state data

(1) 入力・負荷・温度変動 Regulation – line and load, Temperature drift

1. Regulation - line and load

Conditions Ta : 25 °C
 Iout (100%) : 33.3 A (Vin = 70VDC)
 41.7 A (Vin = 80VDC)
 50.0 A (Vin = 90 - 220VDC)

Iout \ Vin	70VDC	80VDC	90VDC	110VDC	220VDC	Line regulation	
0%	60.41V	60.39V	60.40V	60.40V	60.40V	15mV	0.025%
25%	60.01V	59.99V	60.01V	60.00V	60.00V	17mV	0.029%
50%	59.99V	60.00V	60.00V	60.01V	60.01V	17mV	0.029%
Load	416mV	399mV	401mV	395mV	403mV		
regulation	0.693%	0.664%	0.669%	0.658%	0.671%		

Iout \ Vin	70VDC	80VDC	90VDC	110VDC	220VDC	Line regulation	
0%	30.54V	30.54V	30.54V	30.54V	30.55V	12mV	0.020%
50%	30.01V	30.01V	30.02V	30.02V	30.02V	9mV	0.014%
100%	30.02V	30.02V	30.02V	30.02V	30.02V	8mV	0.013%
Load	525mV	523mV	523mV	521mV	533mV		
regulation	0.875%	0.872%	0.872%	0.868%	0.889%		

2. Temperature drift

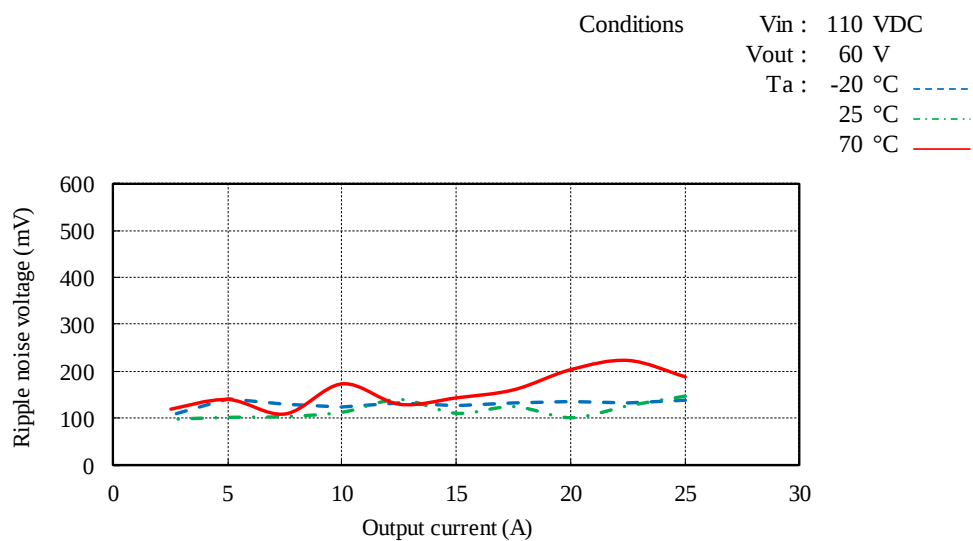
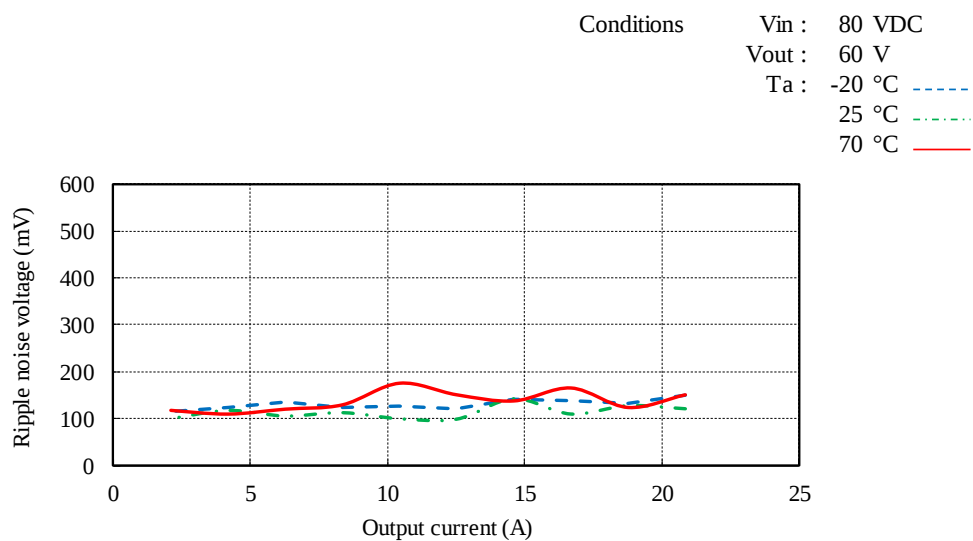
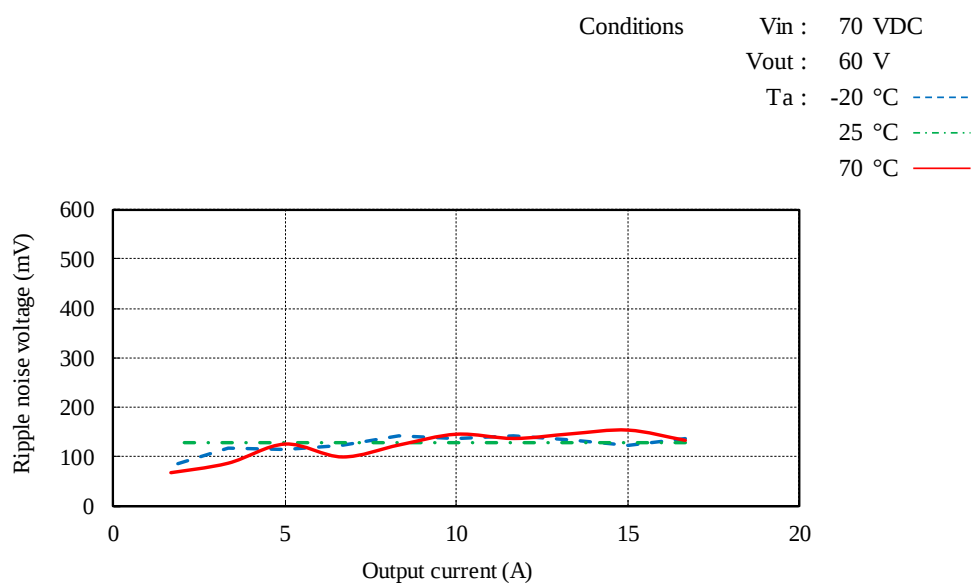
Conditions Vin : 110 VDC
 Iout : 25 A

Ta	-20°C	+25°C	+70°C	Temperature stability	
Vout	60.07V	60.01V	59.86V	206mV	0.343%

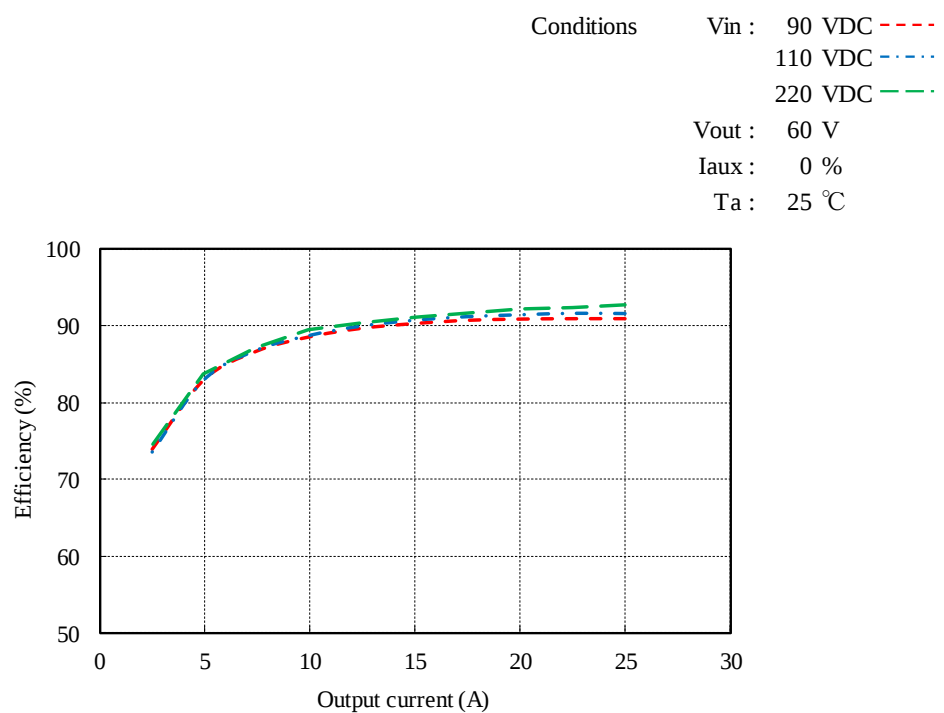
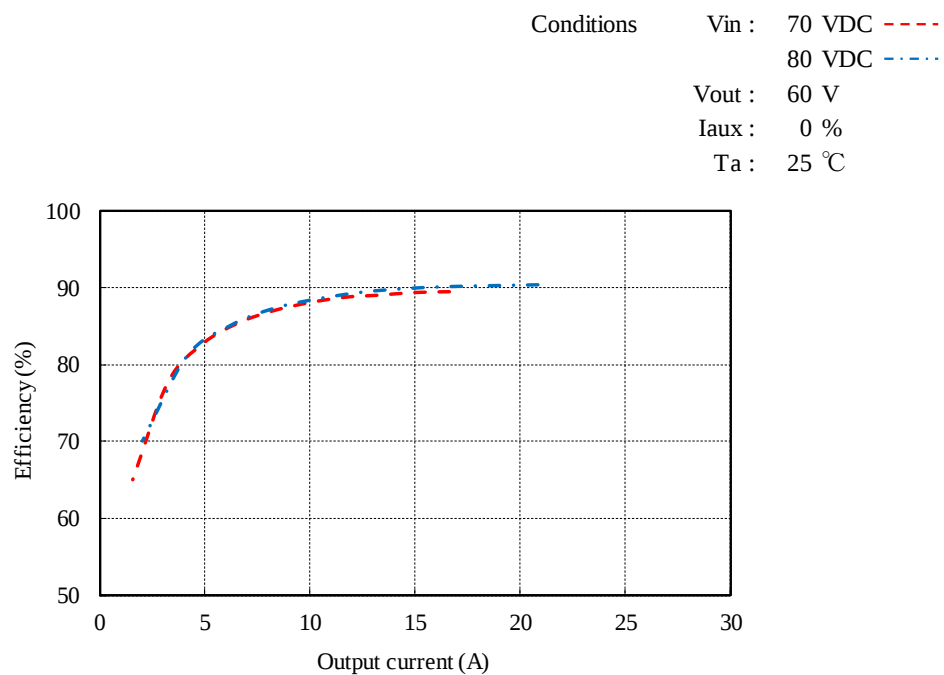
Iout : 50 A

Ta	-20°C	+25°C	+70°C	Temperature stability	
Vout	30.06V	30.02V	29.92V	132mV	0.220%

(2) リプルノイズ電圧対出力電流 Ripple noise voltage vs. Output current

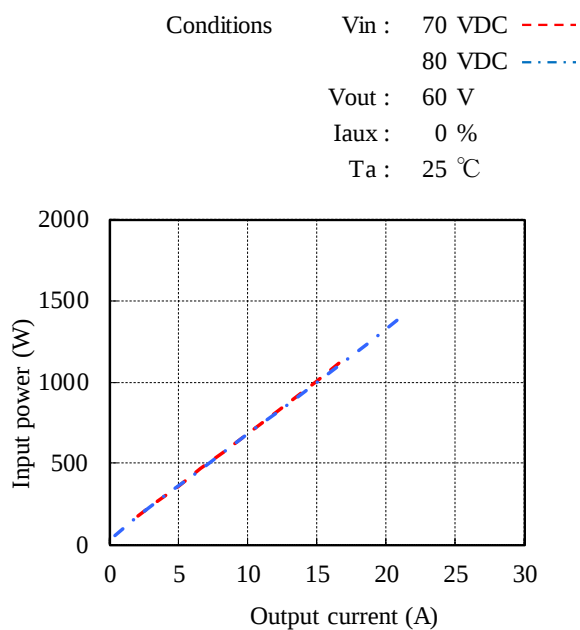


(3) 効率対出力電流 Efficiency vs. Output current

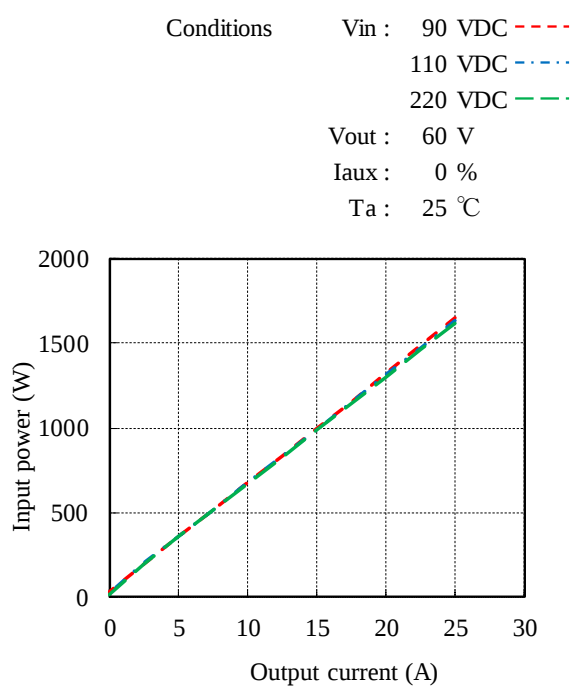


(4) 入力電力対出力電流 Input power vs. Output current

Vin	Input power	
	Iout : 0%	Control OFF
70VDC	25.1W	10.4W
80VDC	27.2W	10.8W

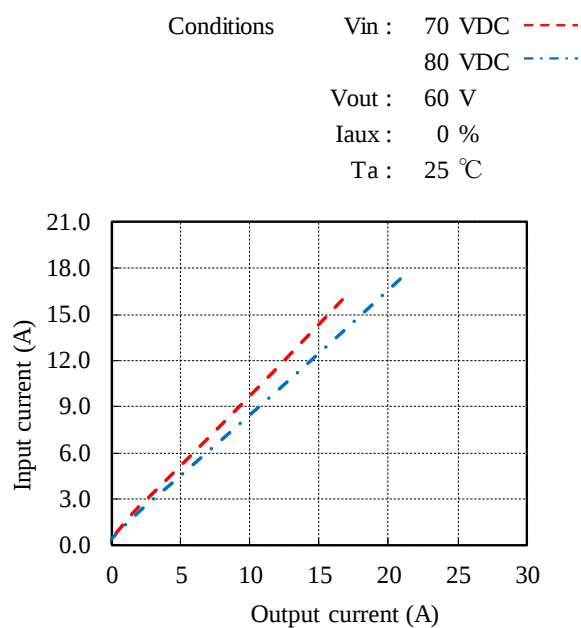


Vin	Input power	
	Iout : 0%	Control OFF
90VDC	27.6W	9.5W
110VDC	27.2W	8.7W
220VDC	17.4W	0.9W

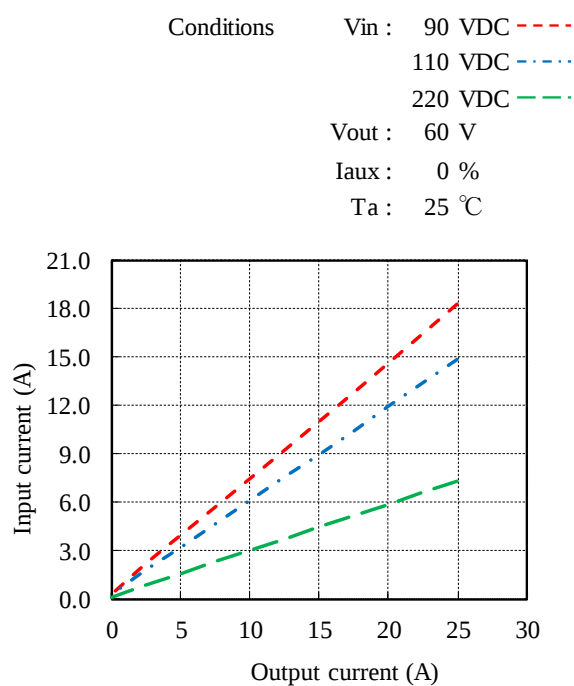


(5) 入力電流対出力電流 Input current vs. Output current

Vin	Input current	
	Iout : 0%	Control OFF
70VDC	0.35A	0.15A
80VDC	0.34A	0.14A

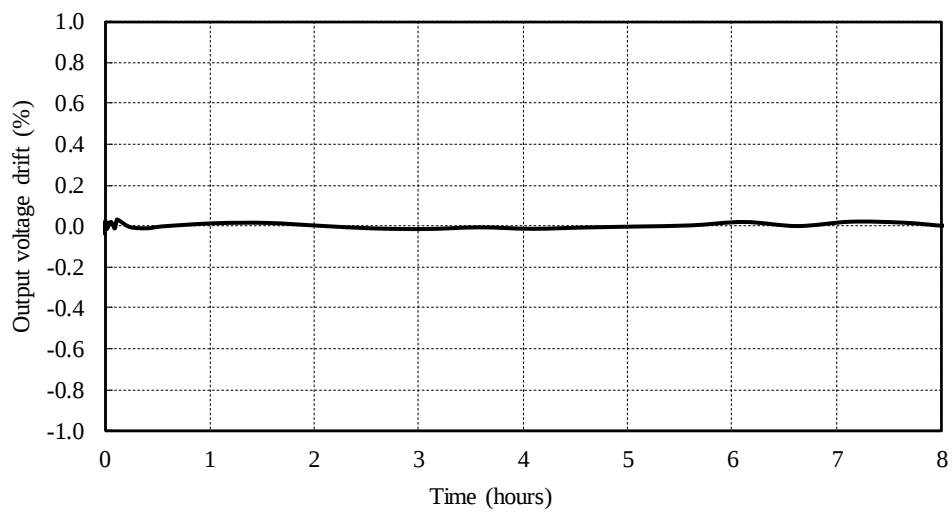


Vin	Input current	
	Iout : 0%	Control OFF
90VDC	0.30A	0.11A
110VDC	0.25A	0.08A
220VDC	0.08A	0.00A



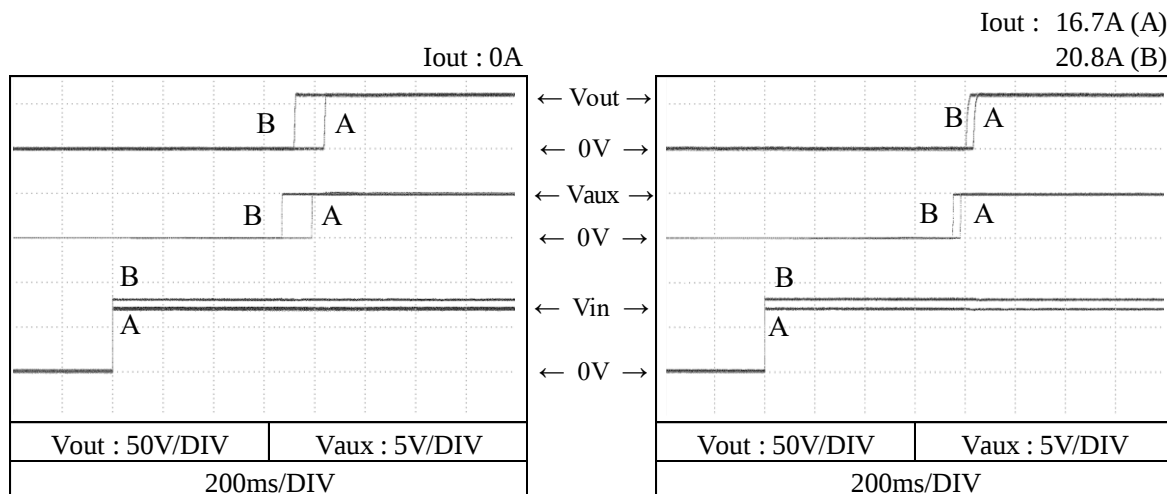
2-1-2. 通電ドリフト特性 Warm up voltage drift characteristics

Conditions V_{in} : 110 VDC
 V_{out} : 60 V
 I_{out} : 25 A
 T_a : 25 °C

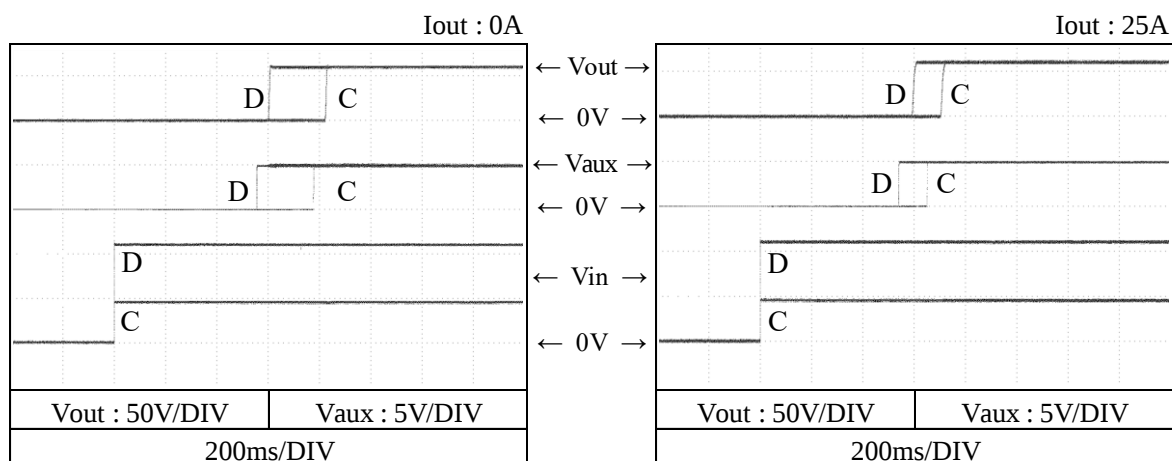


2-1-3. 出力電圧立ち上がり特性 Output voltage rise characteristics

Conditions Vin : 70 VDC (A)
 80 VDC (B)
 Iaux : 100 %
 Ta : 25 °C

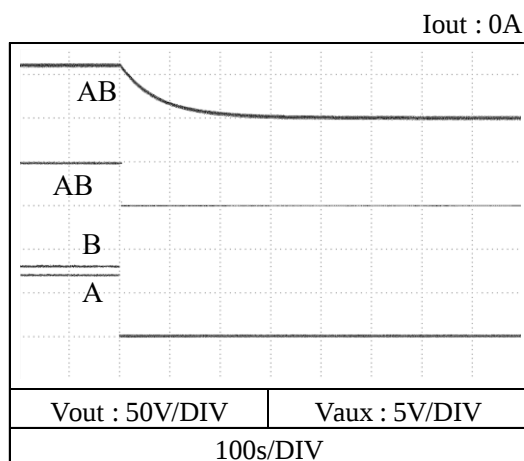


Conditions Vin : 90 VDC (C)
 220 VDC (D)
 Iaux : 100 %
 Ta : 25 °C

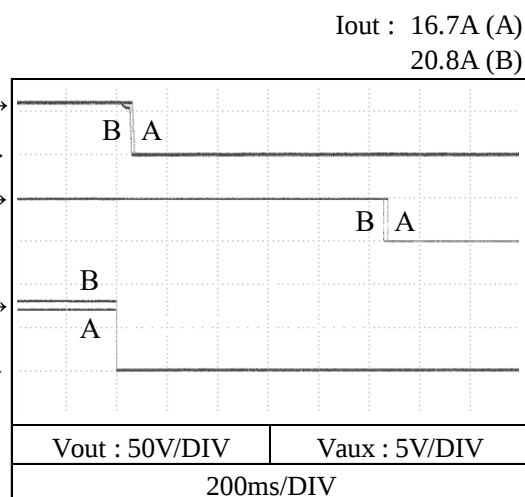


2-1-4. 出力電圧立ち下がり特性 Output voltage fall characteristics

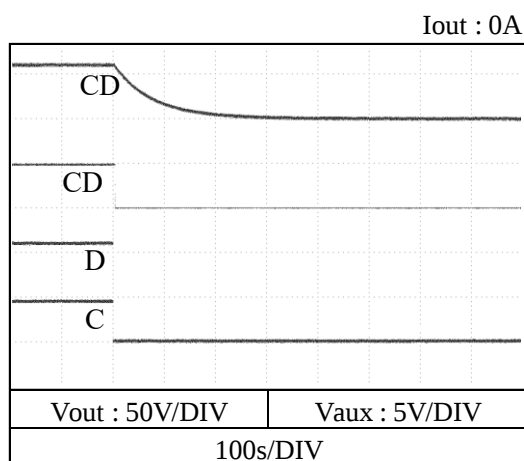
Conditions Vin : 70 VDC (A)
 80 VDC (B)
 Iaux : 100 %
 Ta : 25 °C



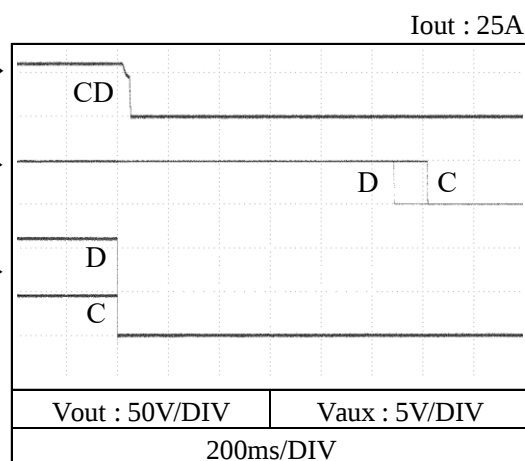
← Vout →
 ← 0V →
 ← Vaux →
 ← 0V →
 ← Vin →
 ← 0V →



Conditions Vin : 90 VDC (C)
 220 VDC (D)
 Iaux : 100 %
 Ta : 25 °C



← Vout →
 ← 0V →
 ← Vaux →
 ← 0V →
 ← Vin →
 ← 0V →

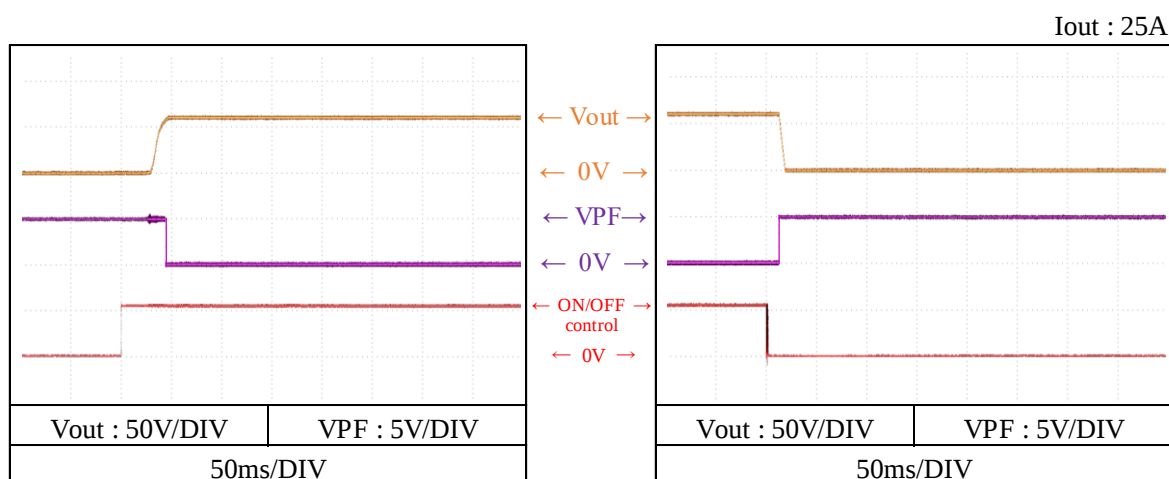
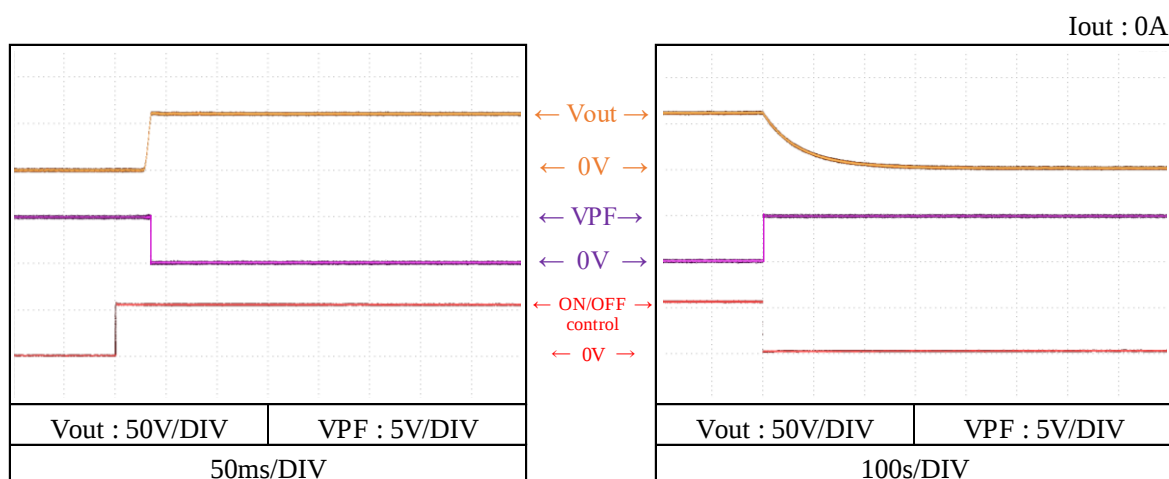


2-1-5. ON/OFF コントロール時出力立ち上がり、立ち下がり特性

Output rise/fall characteristics with ON/OFF Control

(a) リモート ON/OFF コントロール端子による ON/OFF

ON/OFF control by remote ON/OFF control terminal

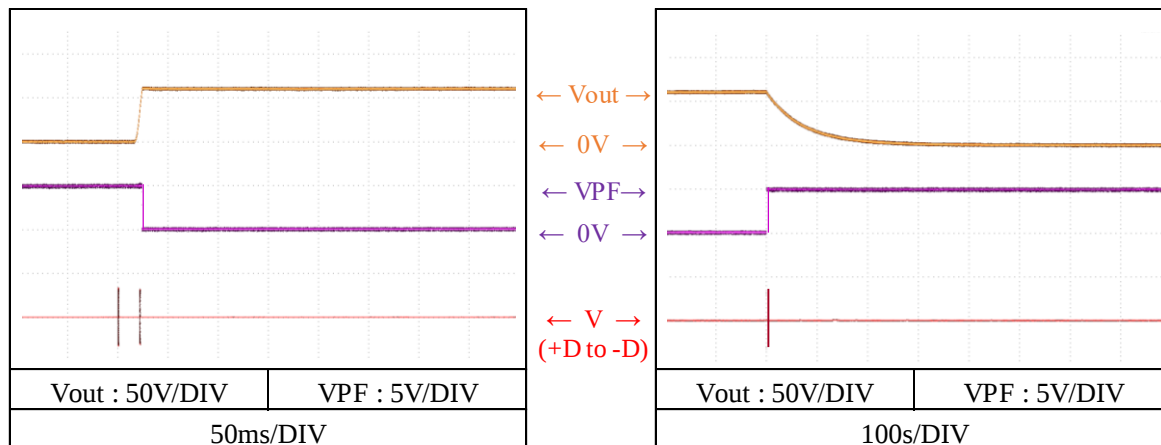
Conditions V_{in} : 110 VDC T_a : 25 °C

(b) RS-485 通信による ON/OFF ON/OFF control by RS-485

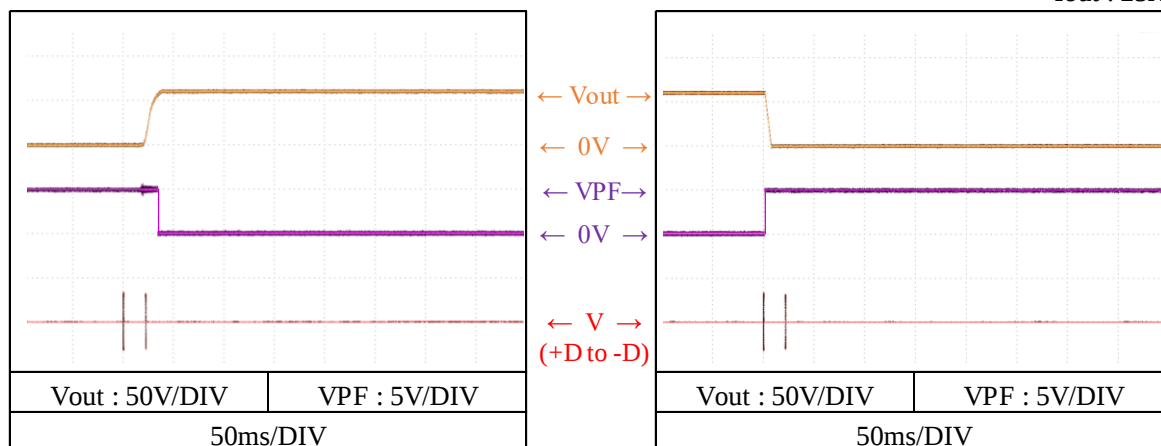
Conditions Vin : 110 VDC

Ta : 25 °C

Iout : 0A

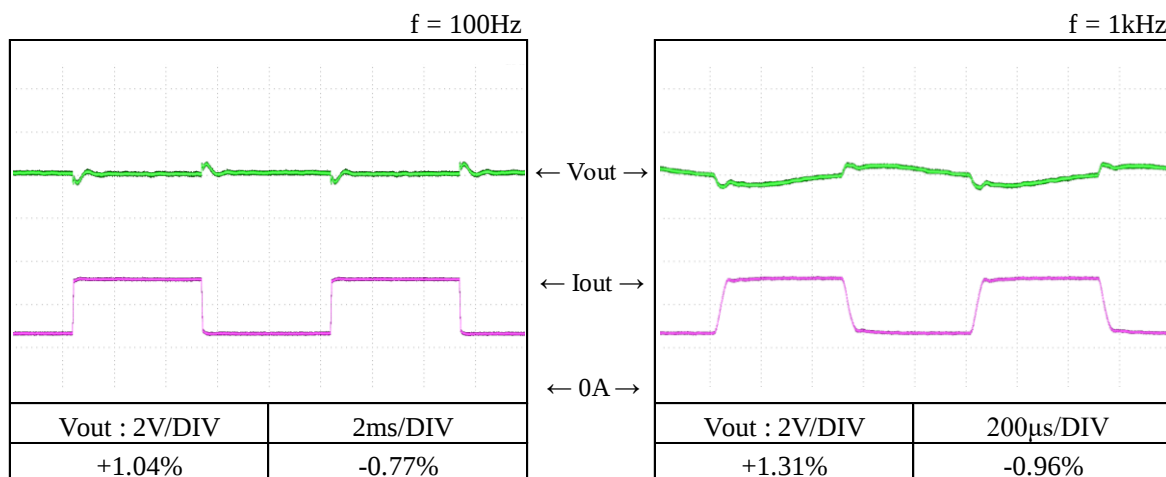


Iout : 25A



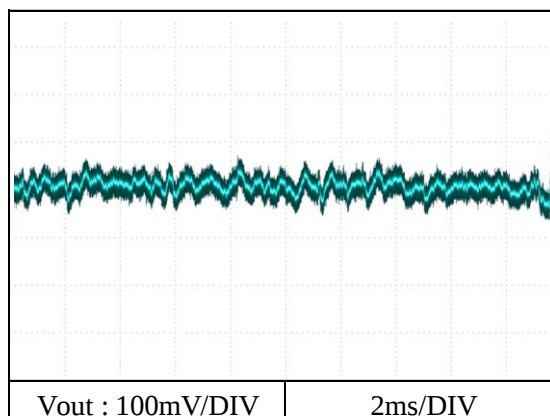
2-1-6. 過渡応答 (負荷急変) 特性 Dynamic load response characteristics

Conditions V_{in} : 110 VDC
 I_{out} : 12.5A $\leftrightarrow$ 25A
(tr = tf = 50 μ s)
 T_a : 25 $^{\circ}$ C



2-1-7. 出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions V_{in} : 110 VDC
 V_{out} : 60 V
 I_{out} : 25 A
 T_a : 25 $^{\circ}$ C



2-1-8. 入力電圧瞬停特性 Response to brown out characteristics

瞬停時間 Interruption time

A: 出力電圧の低下なし Output voltage does not drop.

B: 出力電圧の低下が 0V までいかない Output voltage drop down not reaching 0V.

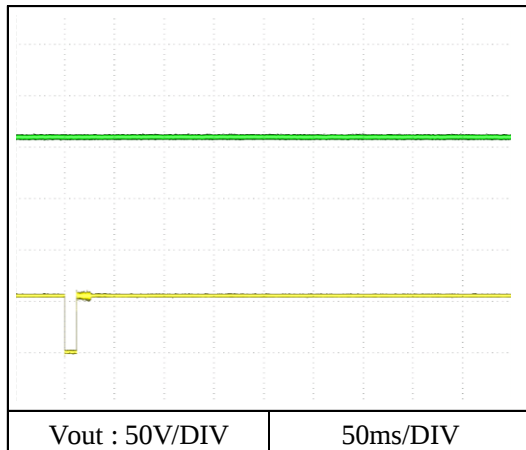
C: 出力電圧が 0V まで低下 Output voltage drops until 0V.

Conditions V_{in} : 110 VDC

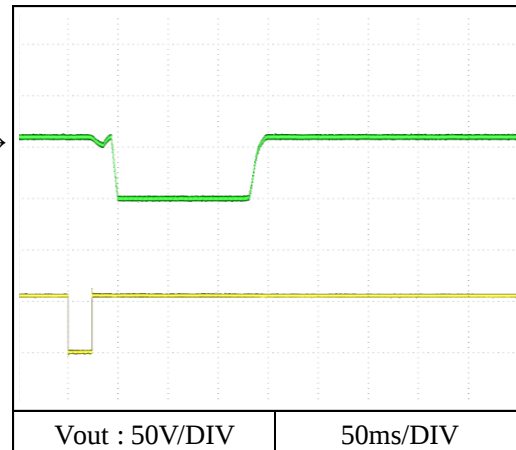
I_{out} : 25 A

T_a : 25 °C

A = 12ms

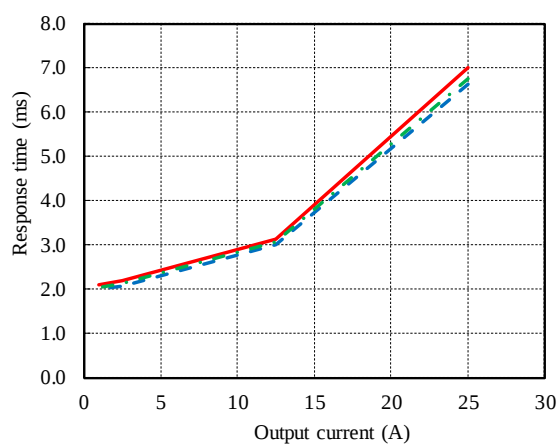
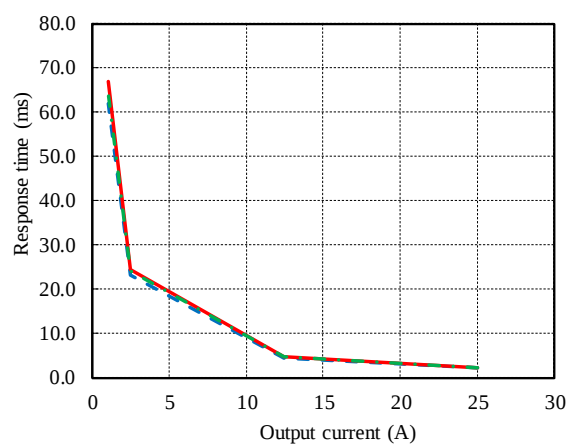


C = 24ms

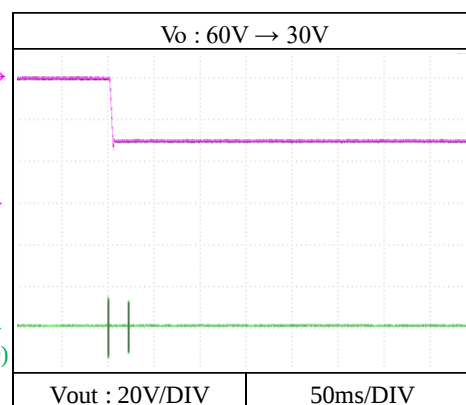
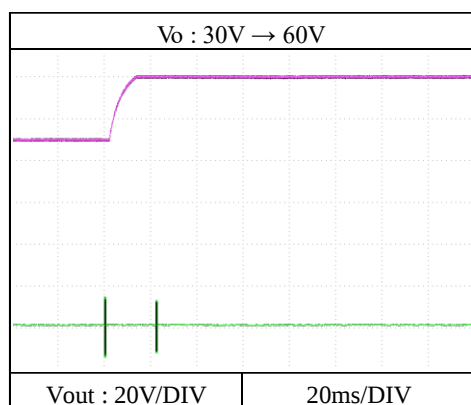


2-1-9. 出力電圧指令応答特性 Output voltage command response characteristics

Conditions V_{in} : 110 VDC
 T_a : -20 °C ----
 25 °C ----
 70 °C ----

 V_o : 30V → 60V V_o : 60V → 30V

Conditions V_{in} : 110 VDC
 I_{out} : 25 A
 T_a : 25 °C



2-2. 定電流出力モード Constant current output mode

2-2-1. 静特性 Steady state data

(1) 入力・負荷・温度変動 Regulation – line and load, Temperature drift

1. Regulation - line and load

Conditions Ta : 25 °C
 Vout (100%) : 40 V (Vin = 70VDC)
 50 V (Vin = 80VDC)
 60 V (Vin = 90 - 220VDC)

Vout \ Vin	70VDC	80VDC	90VDC	110VDC	220VDC	Line regulation	
5%	49.98A	50.00A	50.00A	50.00A	49.99A	22mA	0.045%
25%	49.99A	49.98A	49.97A	49.98A	49.97A	14mA	0.028%
50%	49.96A	49.97A	49.96A	49.96A	49.95A	16mA	0.033%
Load	22mA	27mA	35mA	33mA	37mA		
regulation	0.045%	0.054%	0.070%	0.066%	0.075%		

Vout \ Vin	70VDC	80VDC	90VDC	110VDC	220VDC	Line regulation	
10%	25.00A	25.00A	25.00A	25.00A	25.00A	8mA	0.016%
50%	24.98A	24.97A	24.98A	24.98A	24.97A	12mA	0.025%
100%	24.98A	24.98A	24.99A	24.99A	24.99A	17mA	0.034%
Load	20mA	31mA	18mA	28mA	28mA		
regulation	0.040%	0.061%	0.036%	0.055%	0.055%		

2. Temperature drift

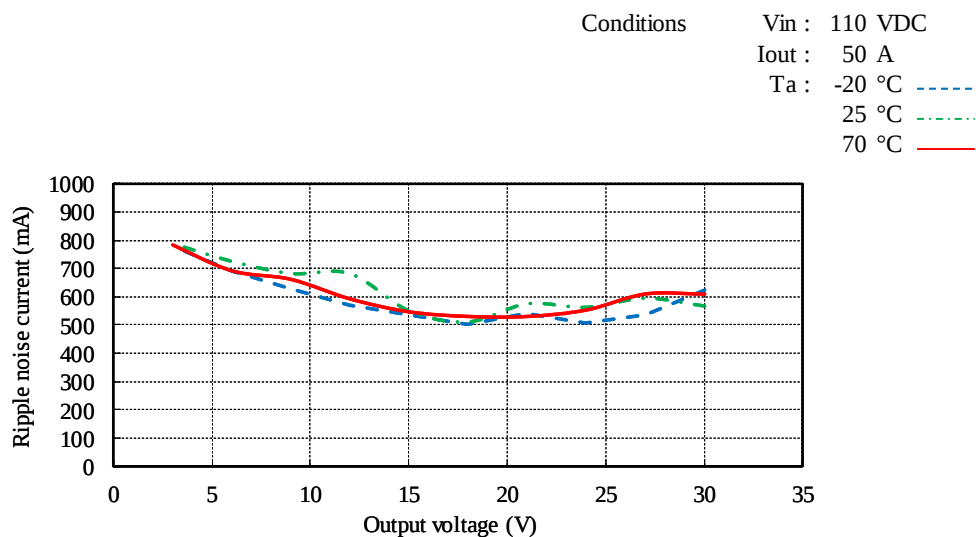
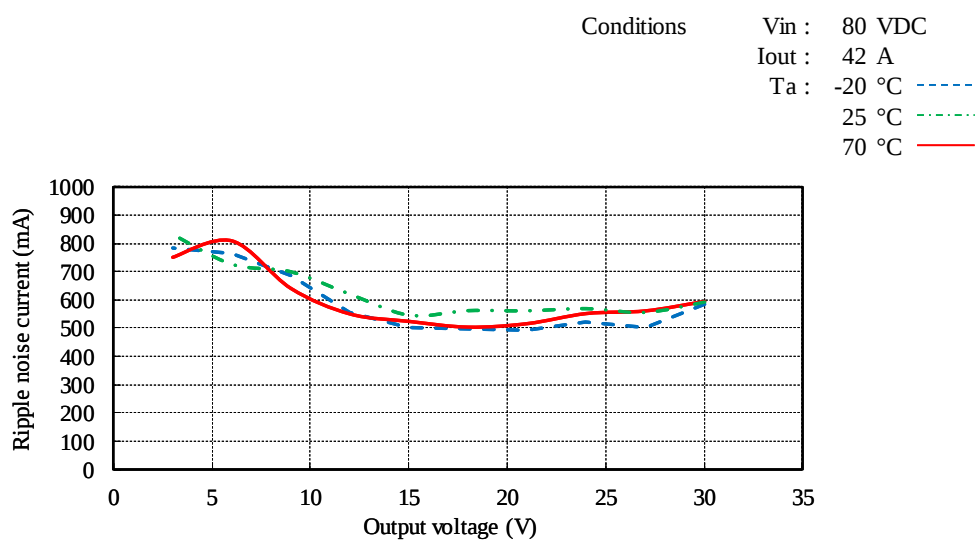
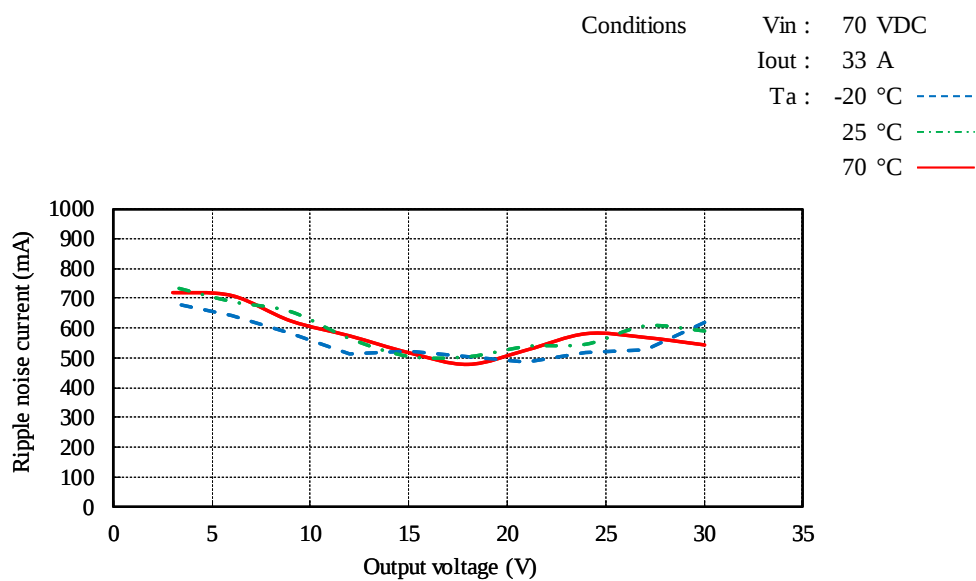
Conditions Vin : 110 VDC
 Vout : 30 V

Ta	-20°C	+25°C	+70°C	Temperature stability	
Iout	50.06A	49.96A	49.90A	166mA	0.332%

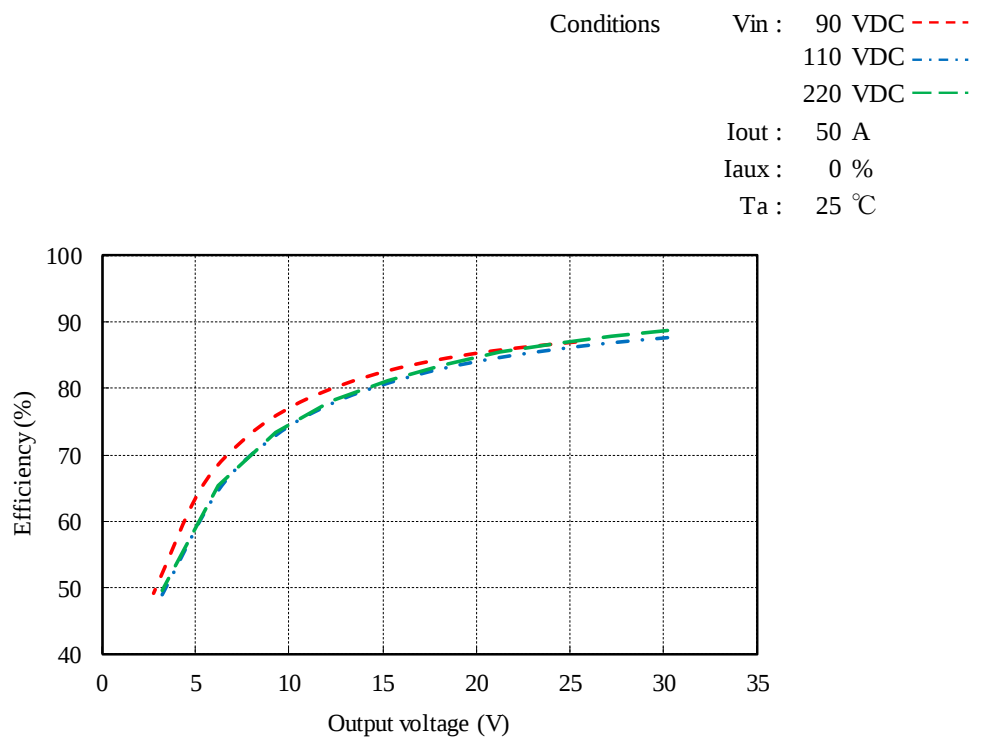
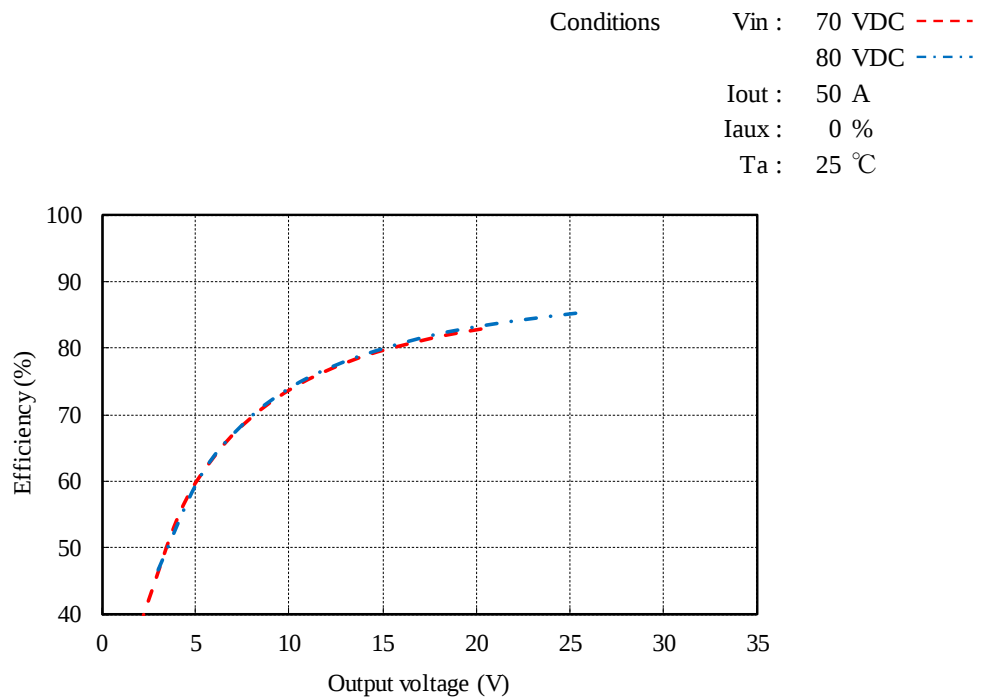
Vout : 60 V

Ta	-20°C	+25°C	+70°C	Temperature stability	
Iout	25.05A	24.99A	24.95A	101mA	0.202%

(2) リップルノイズ電流対出力電圧 Ripple noise current vs. Output voltage

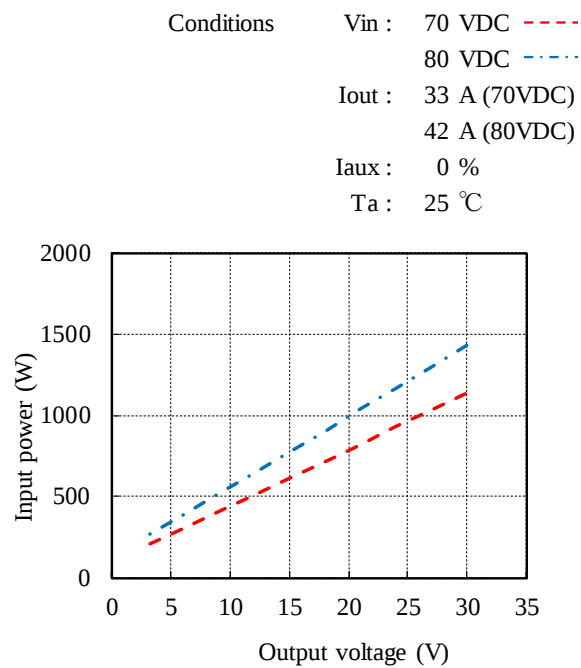


(3) 効率対出力電圧 Efficiency vs. Output voltage

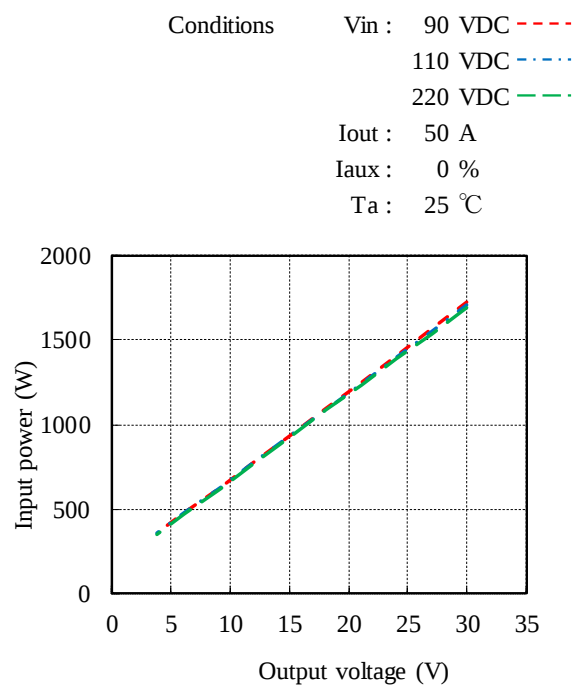


(4) 入力電力対出力電圧 Input power vs. Output voltage

Vin	Input power
	Control OFF
70VDC	10.4W
80VDC	10.8W



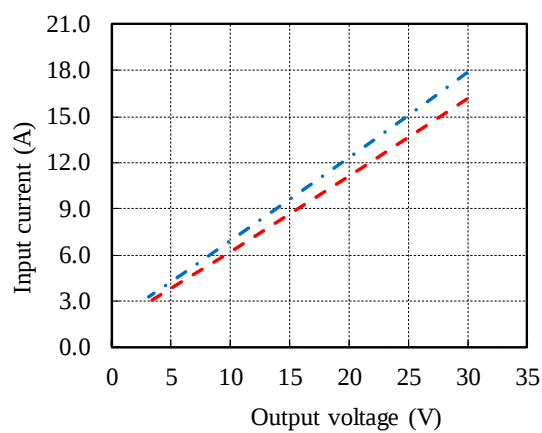
Vin	Input power
	Control OFF
90VDC	9.5W
110VDC	8.7W
220VDC	0.9W



(5) 入力電流対出力電圧 Input current vs. Output voltage

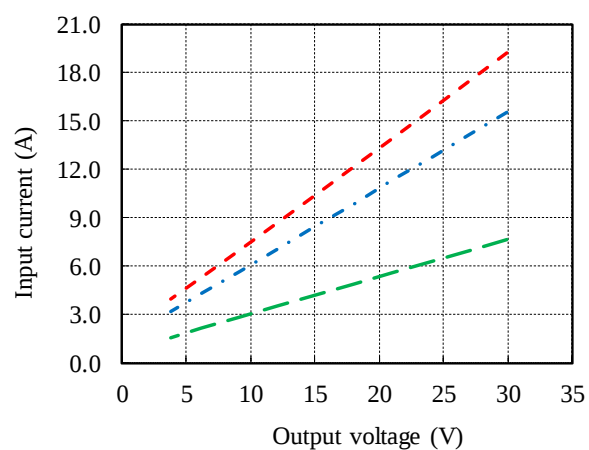
Vin	Input current
	Control OFF
70VDC	0.15A
80VDC	0.14A

Conditions Vin : 70 VDC ---
80 VDC -.-
Iout : 33 A (70VDC)
42 A (80VDC)
Iaux : 0 %
Ta : 25 °C



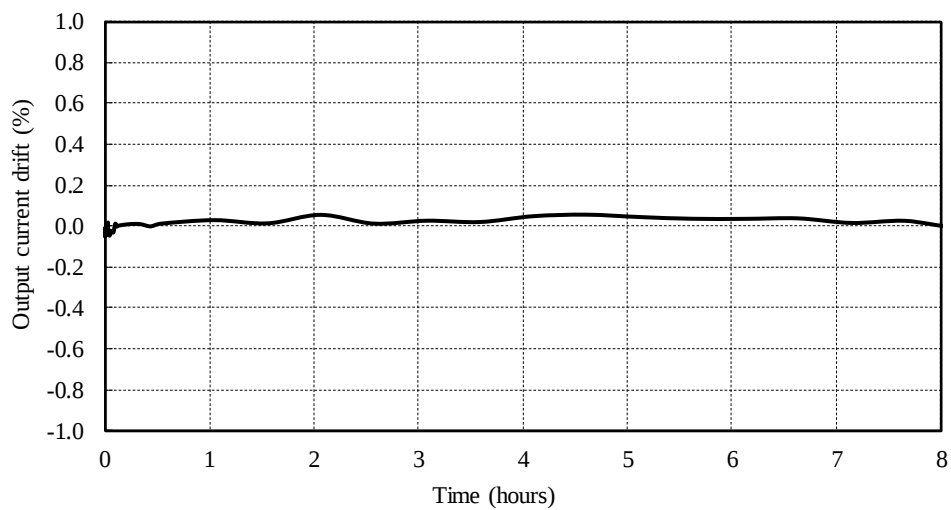
Vin	Input current
	Control OFF
90VDC	0.11A
110VDC	0.08A
220VDC	0.00A

Conditions Vin : 90 VDC ---
110 VDC -.-
220 VDC -.-
Iout : 50 A
Iaux : 0 %
Ta : 25 °C



2-2-2.通電ドリフト特性 Warm up current drift characteristics

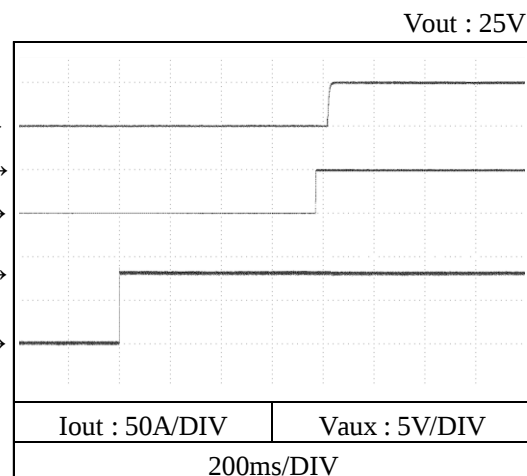
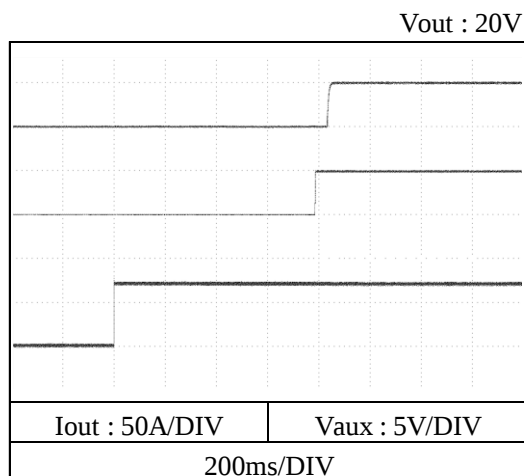
Conditions V_{in} : 110 VDC
 V_{out} : 30 V
 I_{out} : 50 A
 T_a : 25 °C



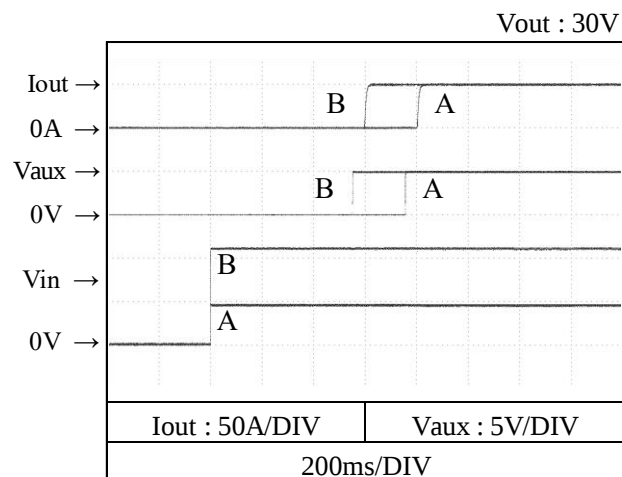
2-2-3.出力電流立ち上がり特性 Output current rise characteristics

Conditions Vin : 70 VDC
 Iaux : 100 %
 Ta : 25 °C

Conditions Vin : 80 VDC
 Iaux : 100 %
 Ta : 25 °C



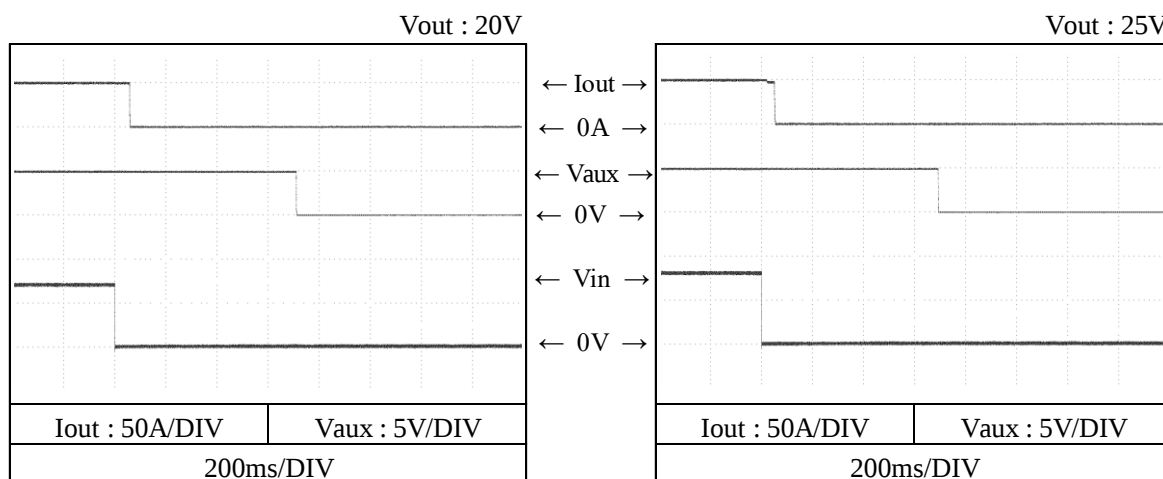
Conditions Vin : 90 VDC (A)
 220 VDC (B)
 Iaux : 100 %
 Ta : 25 °C



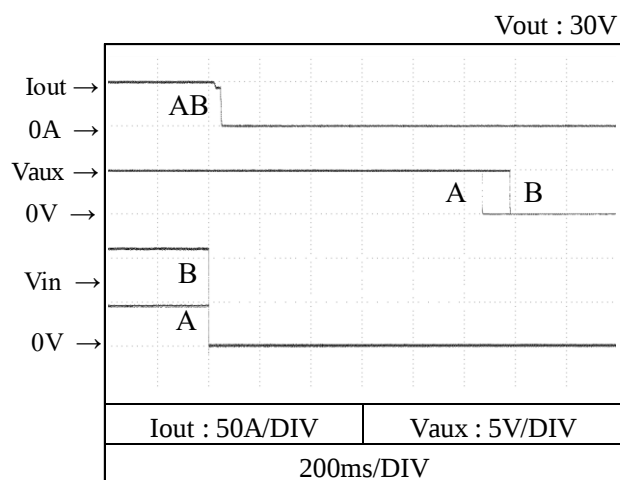
2-2-4.出力電流立ち下がり特性 Output current fall characteristics

Conditions Vin : 70 VDC
 Iaux : 100 %
 Ta : 25 °C

Conditions Vin : 80 VDC
 Iaux : 100 %
 Ta : 25 °C



Conditions Vin : 90 VDC (A)
 220 VDC (B)
 Iaux : 100 %
 Ta : 25 °C



2-2-5.ON/OFF コントロール時出力立ち上がり、立ち下がり特性

Output rise/fall characteristics with ON/OFF Control

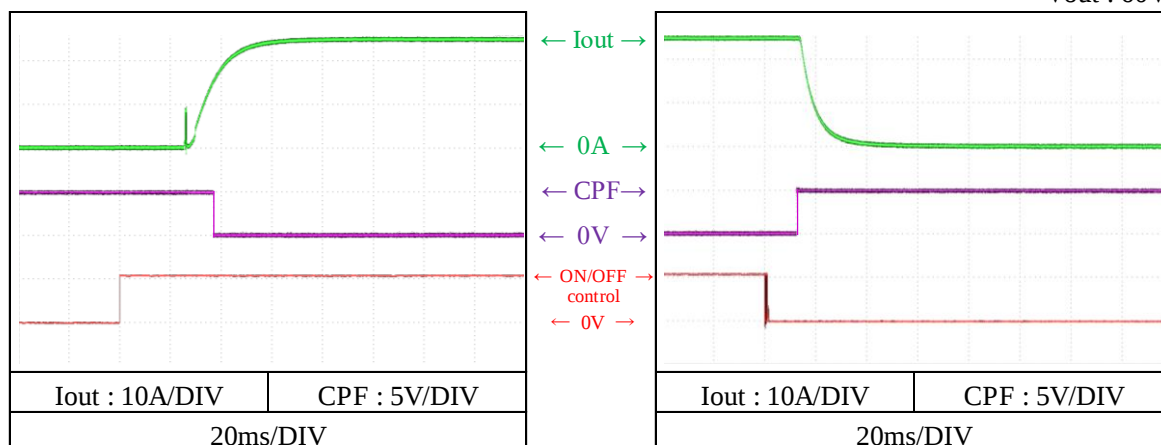
(a) リモート ON/OFF コントロール端子による ON/OFF

ON/OFF control by remote ON/OFF control terminal

Conditions Vin : 110 VDC

Ta : 25 °C

Vout : 60V

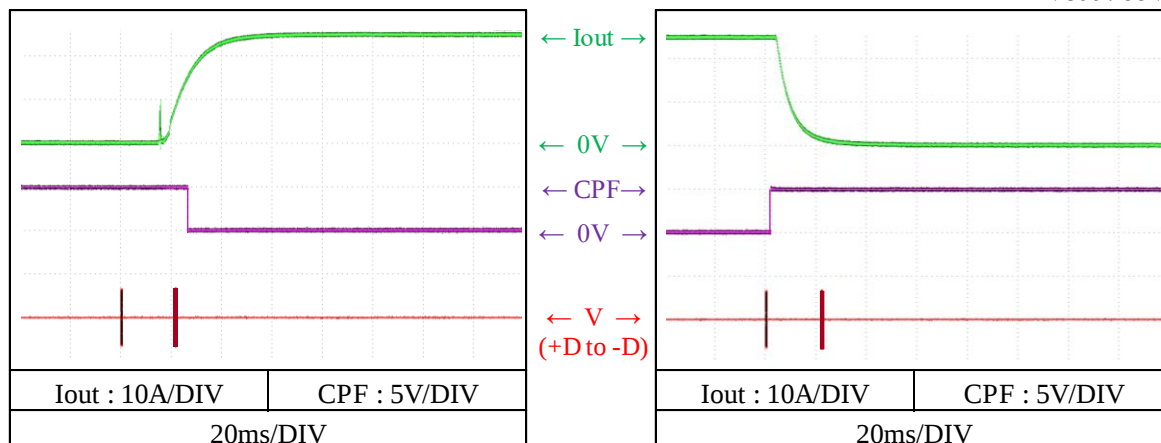


(b) RS-485 通信による ON/OFF ON/OFF control by RS-485

Conditions Vin : 110 VDC

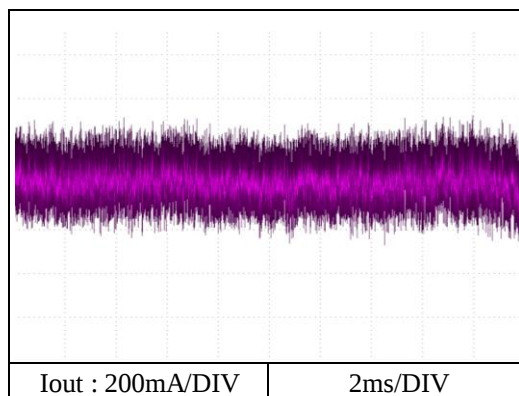
Ta : 25 °C

Vout : 60V



2-2-6.出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions	Vin : 110 VDC
	Vout : 30 V
	Iout : 50 A
	Ta : 25 °C



2-2-7.入力電圧瞬停特性 Response to brown out characteristics

瞬停時間 Interruption time

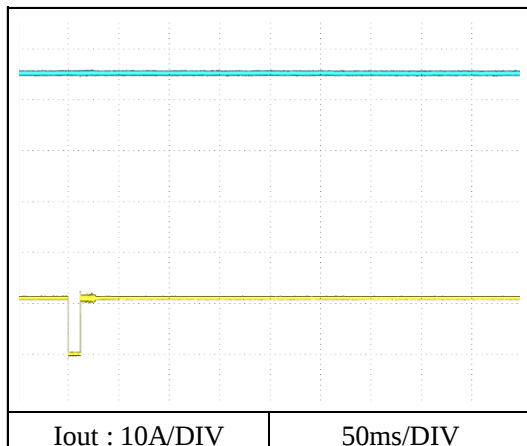
A:出力電流の低下なし Output current does not drop.

B:出力電流の低下が 0A までいかない Output current drop down not reaching 0A.

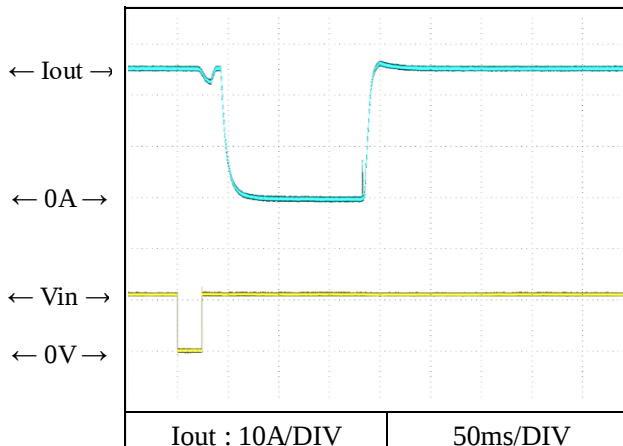
C:出力電流が 0A まで低下 Output current drops until 0A.

Conditions	Vin : 110 VDC
	Vout : 60 V
	Ta : 25 °C

A = 12ms



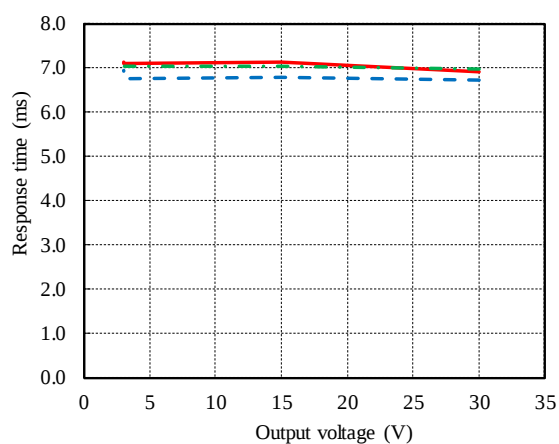
C = 24ms



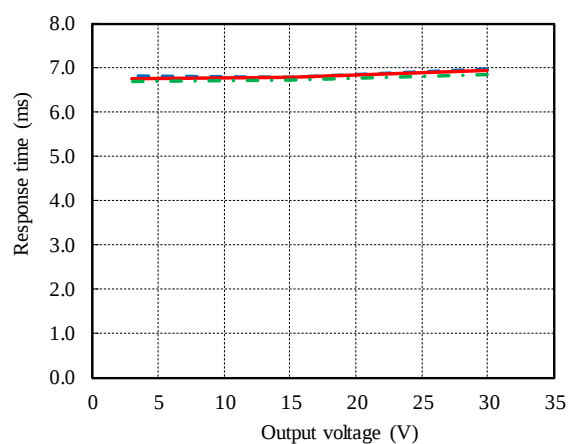
2-2-8. 定電流指令応答特性 Constant current command response characteristics

Conditions V_{in} : 110 VDC
 T_a : -20 °C ---
 25 °C ---
 70 °C ---

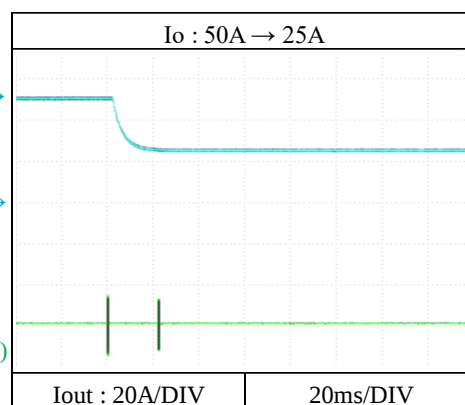
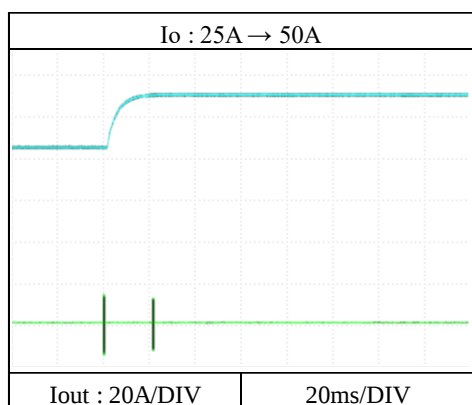
I_o : 25A → 50A



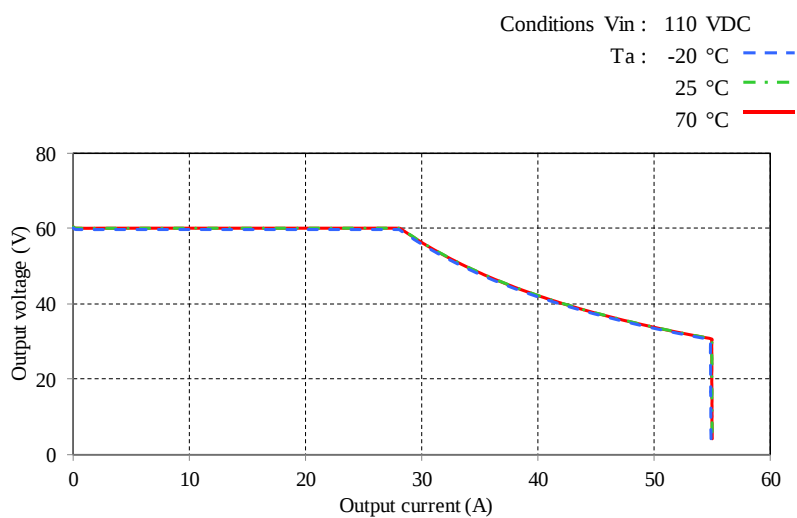
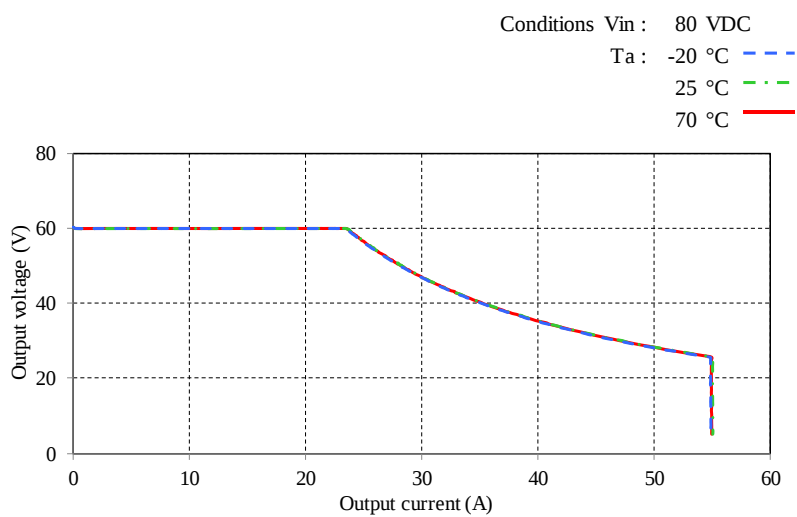
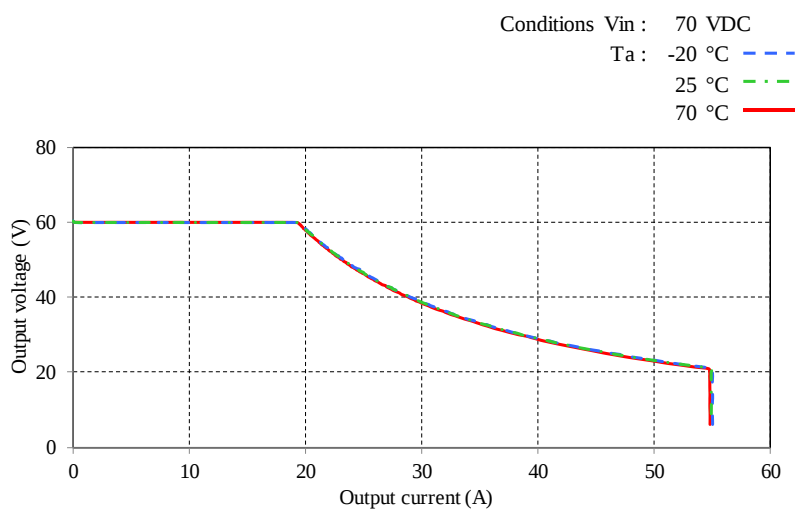
I_o : 50A → 25A



Conditions V_{in} : 110 VDC
 V_{out} : 30 V
 T_a : 25 °C

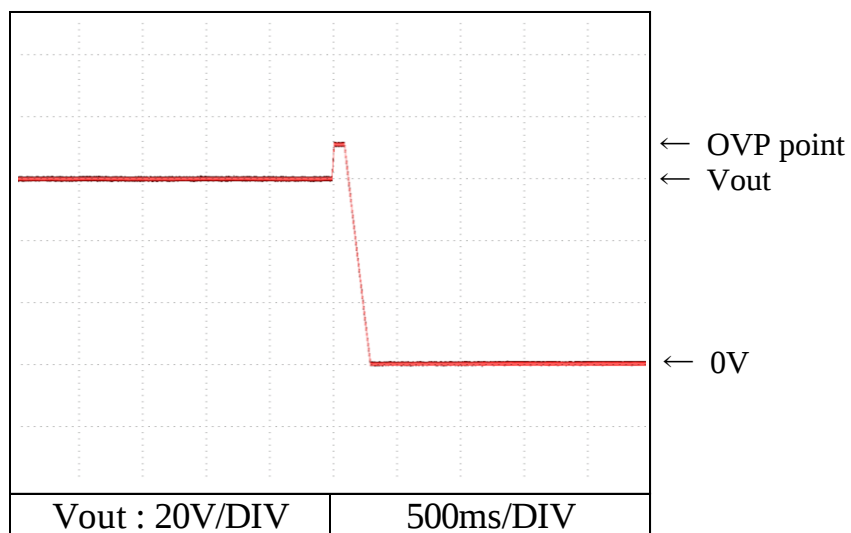


2-3. 過電流保護特性 Over current protection (OCP) characteristics



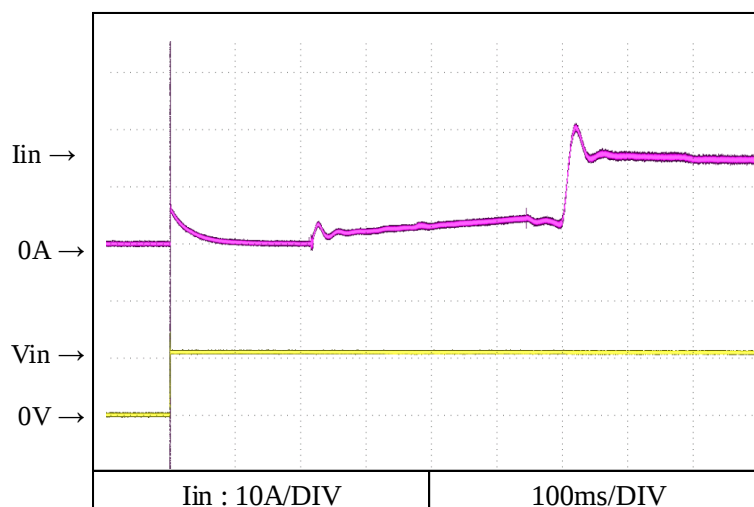
2-4. 過電圧保護特性 Over voltage protection (OVP) characteristics

Conditions Vin : 110 VDC
Iout : 1 A
Ta : 25 °C



2-5. 入力サージ電流(突入電流)波形 Inrush current waveform

Conditions Vin : 110 VDC
Vout : 60 V
Iout : 25 A
Ta : 25 °C



2-6. EMI 特性 Electro Magnetic Interference characteristics

雑音端子電圧
Conducted Emission

Conditions Vin : 110 VDC

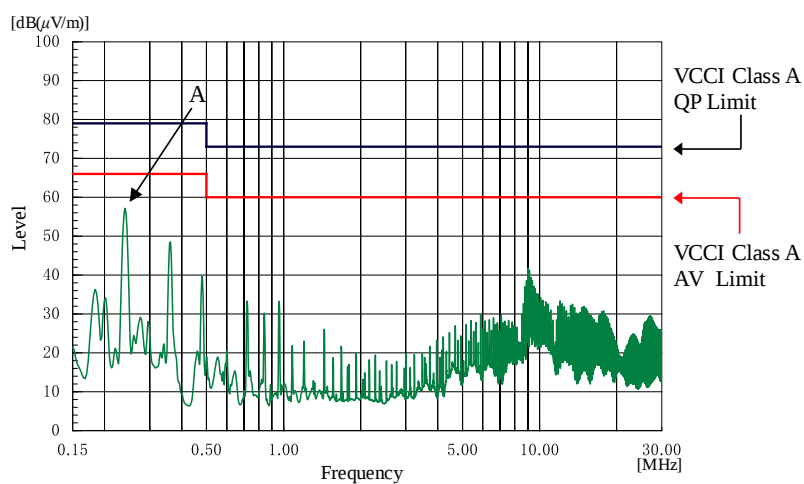
Iout : 25 A

Iaux : 100 %

Ta : 25 °C

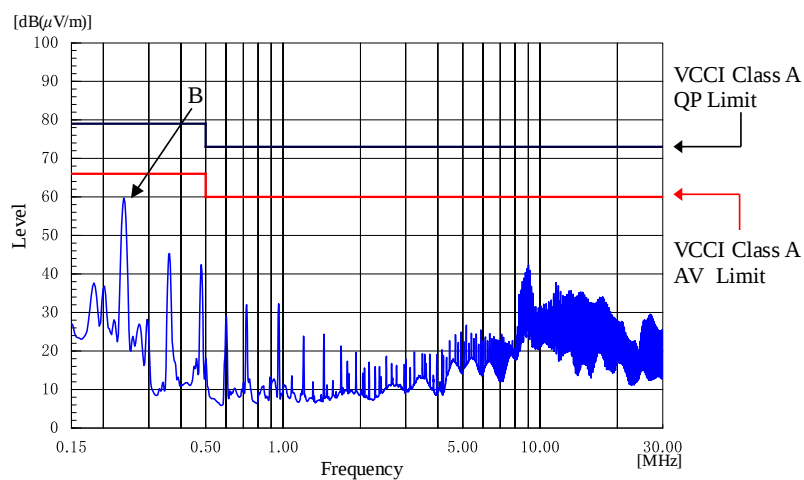
Phase : -Vin

Point A (0.24MHz)		
Ref.	Limit	Measure
Data	(dB)	(dB)
QP	79.0	56.9
AV	66.0	57.0



Phase : +Vin

Point B (0.24MHz)		
Ref.	Limit	Measure
Data	(dB)	(dB)
QP	79.0	59.8
AV	66.0	59.8



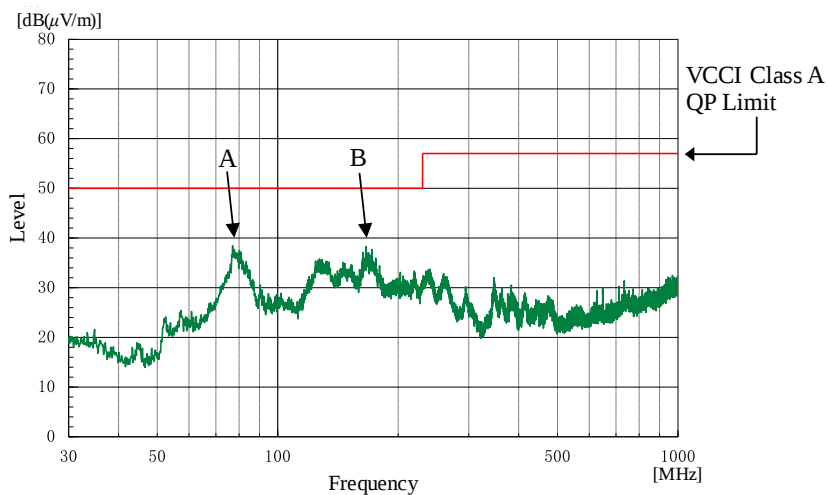
雑音電界強度
Radiated Emission

Conditions Vin : 110 VDC
Iout : 25 A
Iaux : 100 %
Ta : 25 °C

HORIZONTAL

Point A (78MHz)		
Ref.	Limit	Measure
Data	(dB)	(dB)
QP	50.0	35.6

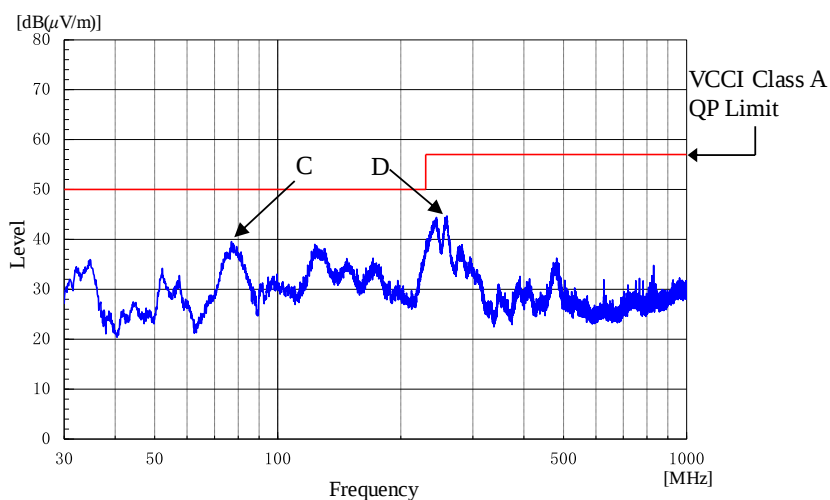
Point B (168MHz)		
Ref.	Limit	Measure
Data	(dB)	(dB)
QP	50.0	34.0



VERTICAL

Point C (137MHz)		
Ref.	Limit	Measure
Data	(dB)	(dB)
QP	50.0	36.6

Point D (258MHz)		
Ref.	Limit	Measure
Data	(dB)	(dB)
QP	57.0	41.7



EN55011-A, EN55032-A, FCC-Aの限界値はVCCI Class Aの限界値と同じ

Limit of EN55011-A, EN55032-A, FCC-A are same as its VCCI Class A.

波形はピーク値

Waveform is peak values.