

EZA2500W-32048

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	4
静特性 Steady state characteristics	
待機電力特性 Standby power characteristics	
通電ドリフト特性 Warm up voltage drift characteristics	
定電流特性 Constant current characteristics	
過電圧保護特性 Over voltage protection (OVP) characteristics	
力行・回生切替特性 Generation and regeneration switching characteristics	
定電流指令応答特性 Constant current command response characteristics	
バッテリー保護特性 Battery protection characteristics	
測定回路2 Circuit 2 used for determination	4
出力立ち上がり、立ち下がり特性 Output rise and fall characteristics	
出力電圧指令応答特性 (外部出力端子/RS-485)	
Output voltage command response characteristics	
(ON/OFF by External terminal and RS-485)	
測定回路3 Circuit 3 used for determination	5
0Vランプアップ起動特性 0V ramp up characteristics	
測定回路4 Circuit 4 used for determination	5
過渡応答(負荷急変)特性 Dynamic load response characteristics	
測定回路5 Circuit 5 used for determination	5
入力サージ電流(突入電流)波形 Inrush current waveform	
測定回路6 Circuit 6 used for determination	6
出力リップル、ノイズ波形 Output ripple and noise waveform	
測定構成 Configuration used for determination	6
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	7

2. 特性データ Characteristics

2-1. 静特性 Steady state characteristics	
(1) 入力・負荷・温度変動	
Regulation - line and load, temperature drift	8
(2) 出力電圧 対 入力電圧、出力リップル 対 入力電圧	
Output voltage vs. Input voltage and Output ripple vs. Input voltage	9
(3) 効率 対 出力電流、入力電流 対 出力電流	
Efficiency vs. Output current and Input current vs. Output current	10
2-2. 無負荷、待機電力特性 No load and standby power characteristics	11
2-3. 通電ドリフト特性 Warm up voltage drift characteristics	12
2-4. 定電流特性 Constant current characteristics	13
2-5. 過電圧保護特性 Over voltage protection (OVP) characteristics	14
2-6. 出力立ち上がり、立ち下がり特性 Output rise and fall characteristics	15-18
2-7. 0Vランプアップ起動特性 0V ramp up characteristics	19-20
2-8. 過渡応答(負荷急変)特性 Dynamic load response characteristics	21
2-9. 入力サージ電流(突入電流)波形 Inrush current waveform	22
2-10. 出力ノイズ波形 Output noise waveform	23-24
2-11. EMI特性 Electro-Magnetic Interference characteristics	25-26
2-12. 力行・回生切替特性 Generation and regeneration switching characteristics	27
2-13. 出力電圧指令応答特性 Output voltage command response characteristics	28
2-14. 定電流指令応答特性 Constant current command response characteristics	29
2-15. バッテリ保護特性 Battery protection characteristics	30-31

使用記号 Terminology used

	定義	Definition
V _{in}	入力電圧	Input voltage
V _{out}	出力電圧	Output voltage
I _{in}	入力電流	Input current
I _o	出力電流	Output current
V _{grid}	グリッド電圧	Grid voltage
V _{bat}	バッテリー電圧	Battery voltage
I _{grid}	グリッド電流	Grid current
I _{bat}	バッテリー電流	Battery current
T _a	周囲温度	Ambient temperature

※ 特記無き特性は、他律CVモードのデータです。

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。

Otherwise stated characteristics are data of manual CV mode.

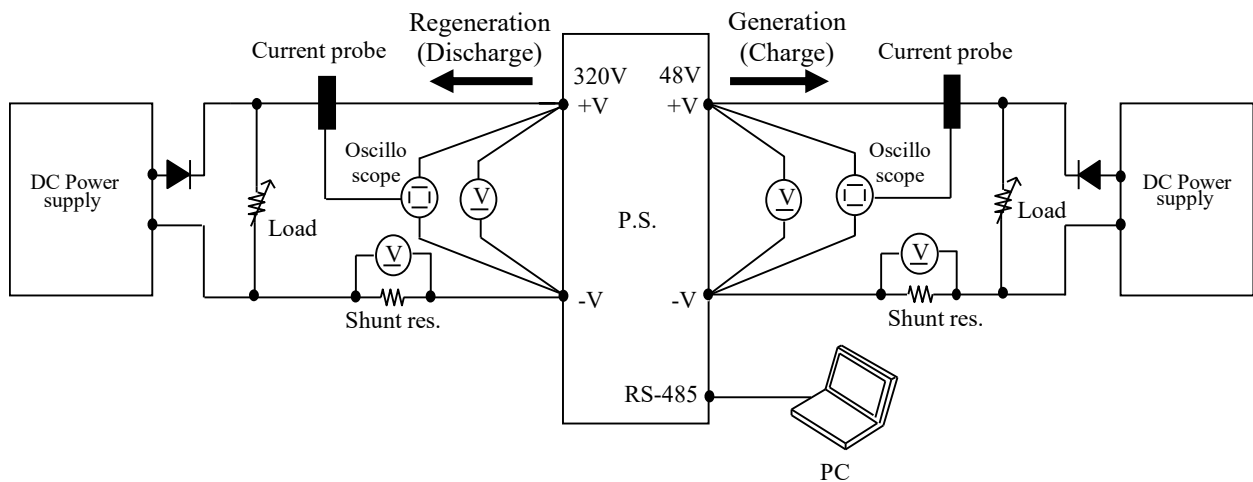
The results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1-1. 測定回路 Circuit used for determination

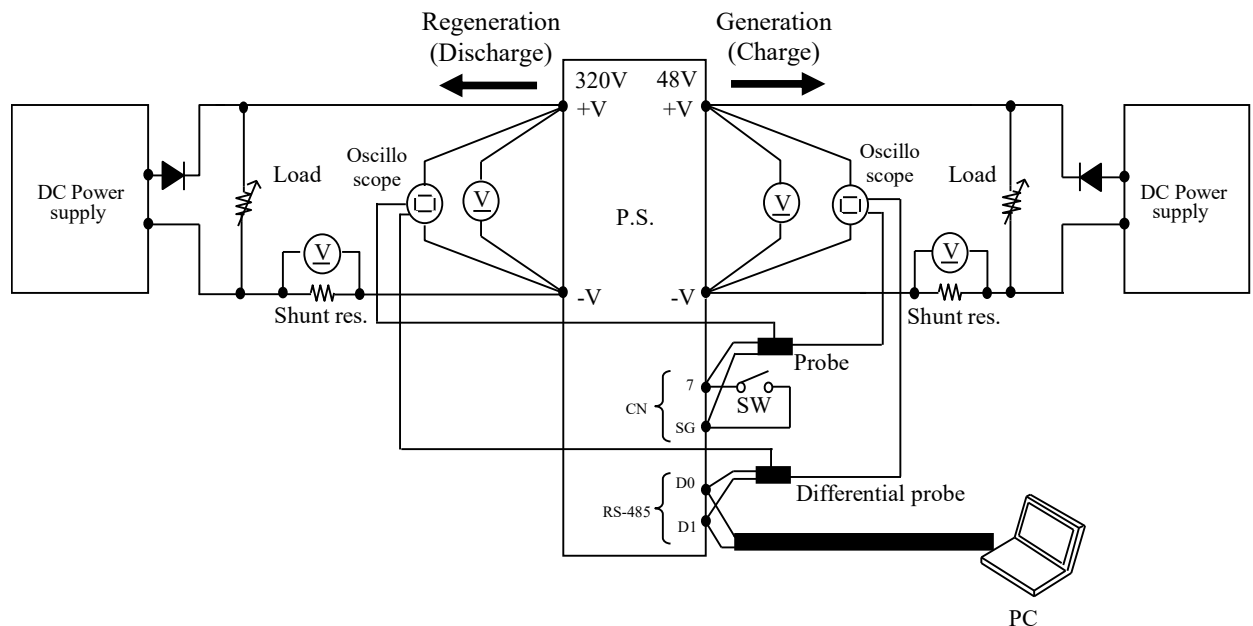
測定回路1 Circuit 1 used for determination

- 静特性 Steady state characteristics
- 待機電力特性 Standby power characteristics
- 通電ドリフト特性 Warm up voltage drift characteristics
- 定電流特性 Constant current characteristics
- 過電圧保護特性 Over voltage protection (OVP) characteristics
- 力行・回生切換え特性 Generation and regeneration switching characteristics
- 定電流指令応答特性 Constant current command response characteristics
- バッテリ保護特性 Battery protection characteristics



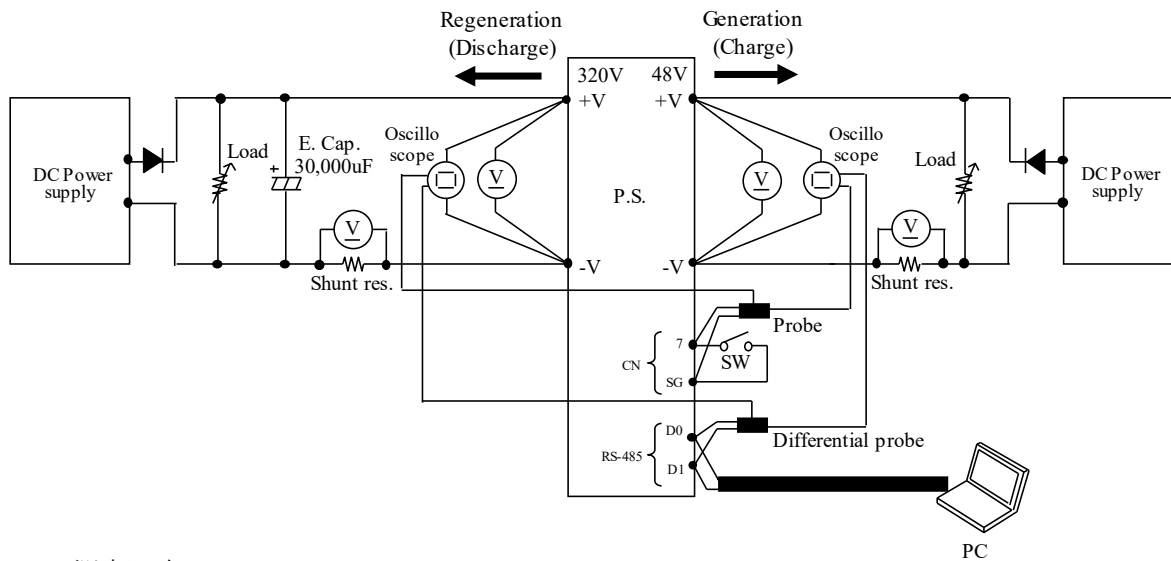
測定回路2 Circuit 2 used for determination

- 出力立ち上がり、立ち下り特性 Output rise & fall characteristics
- 出力電圧指令応答特性(外部出力端子 / RS-485)
Output voltage command response characteristics (External terminal / RS-485)



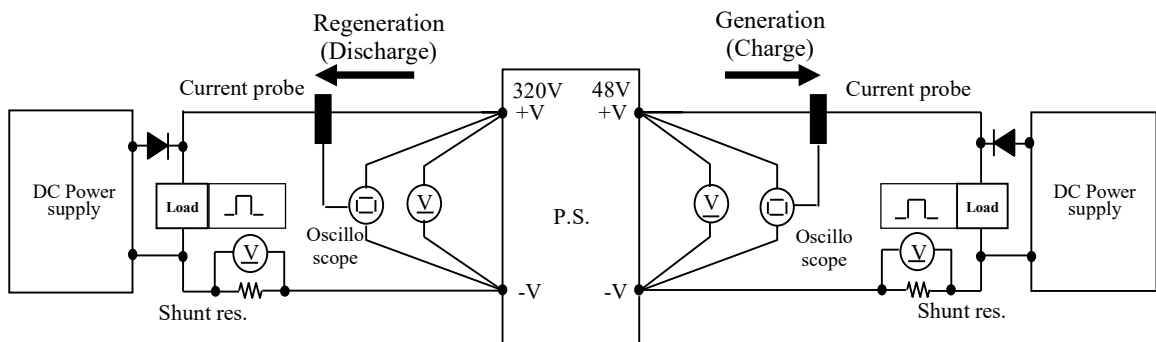
測定回路3 Circuit 3 used for determination

- 0Vランプアップ起動特性 0V ramp up characteristics

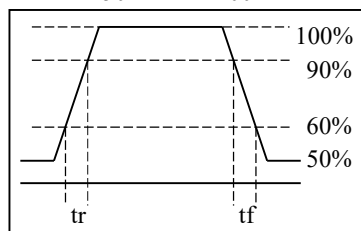


測定回路4 Circuit 4 used for determination

- 負荷急変特性 Dynamic load response characteristics

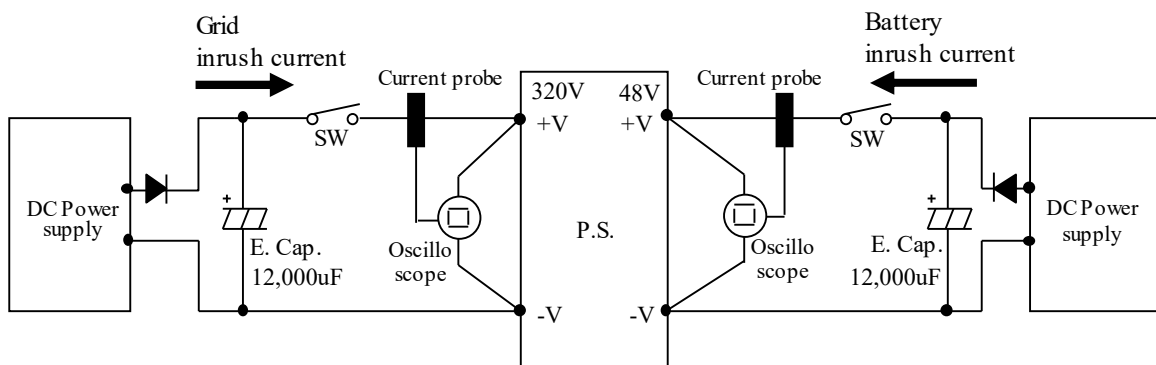


Output current waveform
Iout 50% <==> 100%



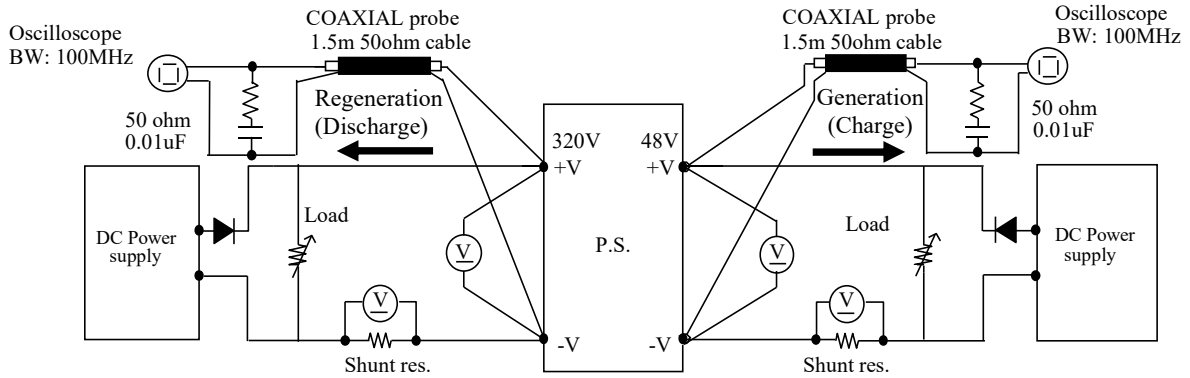
測定回路5 Circuit 5 used for determination

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



測定回路6 Circuit 6 used for determination

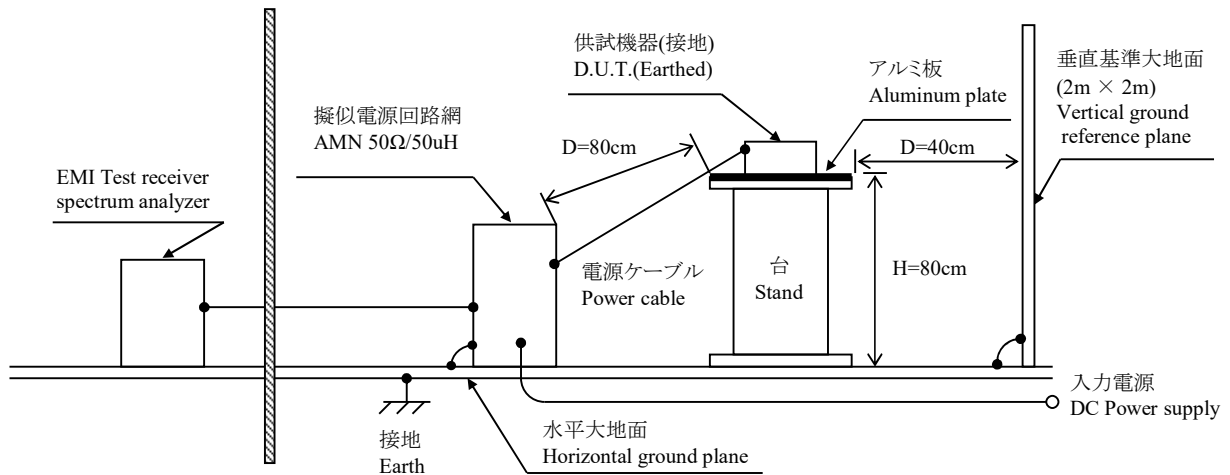
- 出力リップル・ノイズ波形 Output ripple and noise waveform



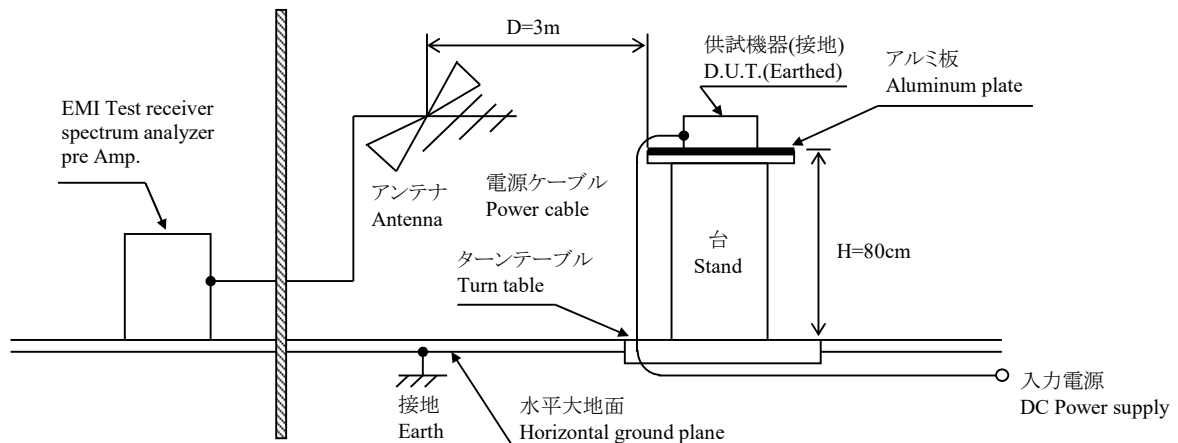
測定構成 Configuration used for determination

- 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.	DL9040L
2	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DLM2054
3	DIGITAL MULTIMETER	KEYSIGHT	34401A
4	DATA ACQUISITION / SWITCH UNIT	KEYSIGHT	34970A
5	CURRENT PROBE	YOKOGAWA ELECT.	701928
6	CURRENT PROBE	YOKOGAWA ELECT.	701930
7	SHUNT RESISTER	YOKOGAWA ELECT.	2215
8	CONTROLLED TEMP. CHAMBER	ESPEC CORP.	PL-4KP
9	SPECTRUM ANALYZER / EMI TEST RECEIVER	ROHDE & SCHWARZ	ESR3
10	AMN	ROHDE & SCHWARZ	NNLK8121
11	ANTENNA	TESEQ	CBL6111D
12	DYNAMIC DUMMY LOAD	TAKASAGO	FK-1000H
13	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ1004W
14	DC POWER SUPPLY	TDK-LAMBDA	GEN60-85
15	DC POWER SUPPLY	TDK-LAMBDA	GEN600-8.5
16	FEEDTHRU TERMINATION	KEISOKU GIKEN	TRC-50F2

2. 特性データ Characteristics

2-1. 静特性 Steady state characteristics

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

(a) 力行 Generation mode

$$V_o = 48\text{VDC}$$

1. Regulation - line and load				Condition Ta : 25°C	
Iout \ Vin	260V	320V	400V	Line regulation	
0%	47.920V	48.003V	48.029V	109mV	0.227%
50%	47.835V	47.880V	47.886V	51mV	0.106%
100%	47.759V	47.763V	47.742V	21mV	0.044%
Load regulation	161mV	240mV	287mV		
	0.335%	0.500%	0.598%		

2. Temperature drift

Condition Vin = 320VDC
Iout = 52A

Ta	-10°C	+25°C	+40°C	Temperature stability	
Vout	47.640V	47.763V	47.800V	160mV	0.333%

(b) 回生 Regeneration mode

$$V_o = 320\text{VDC}$$

1. Regulation - line and load				Condition Ta : 25°C	
Iout \ Vin	36V	48V	65V	Line regulation	
0%	320.293V	320.025V	320.159V	268mV	0.084%
50%	319.852V	319.577V	319.751V	275mV	0.086%
100%	319.657V	319.084V	319.334V	573mV	0.179%
Load regulation	636mV	941mV	825mV		
	0.199%	0.294%	0.258%		

2. Temperature drift

Condition Vin = 48VDC
Iout = 7.8A

Ta	-10°C	+25°C	+40°C	Temperature stability	
Vout	318.485V	319.084V	319.351V	866mV	0.271%

2-1. 静特性 Steady state characteristics

(2) 出力電圧・出力リップル 対 入力電圧

Output voltage and ripple vs. Input voltage

(a) 力行 Generation mode

$V_o = 48VDC$

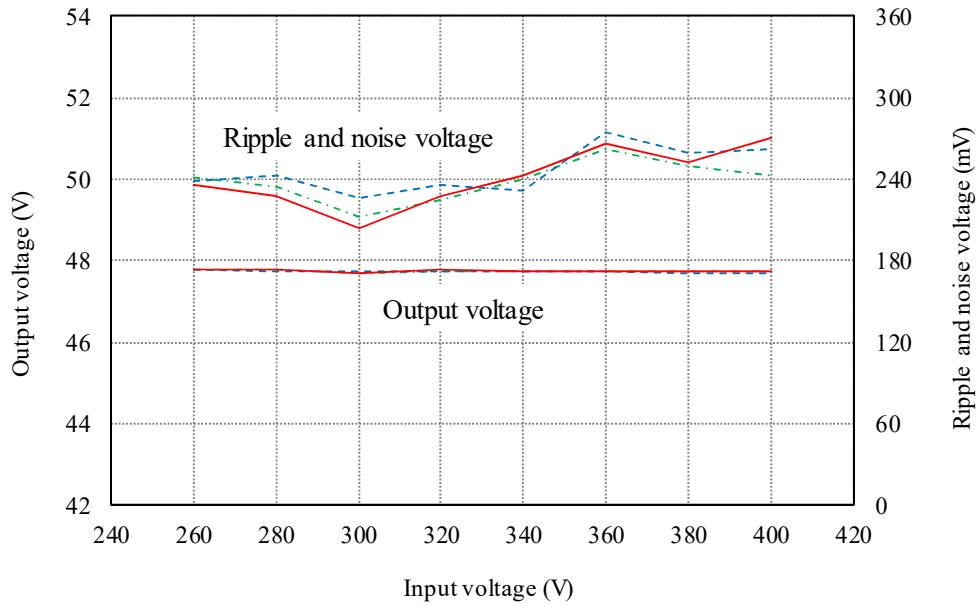
Conditions

Po : 100%

Ta : -10 °C

25 °C

40 °C



(b) 回生 Regeneration mode

$V_o = 320VDC$

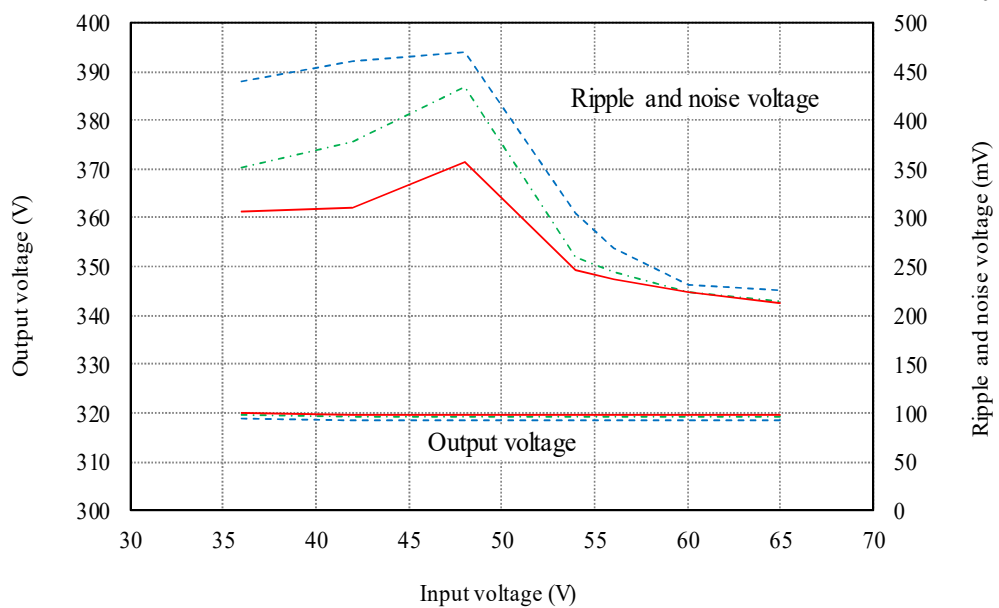
Conditions

Po : 100%

Ta : -10 °C

25 °C

40 °C



2-1. 静特性 Steady state characteristics

(3) 効率 対 出力電流、入力電流 対 出力電流

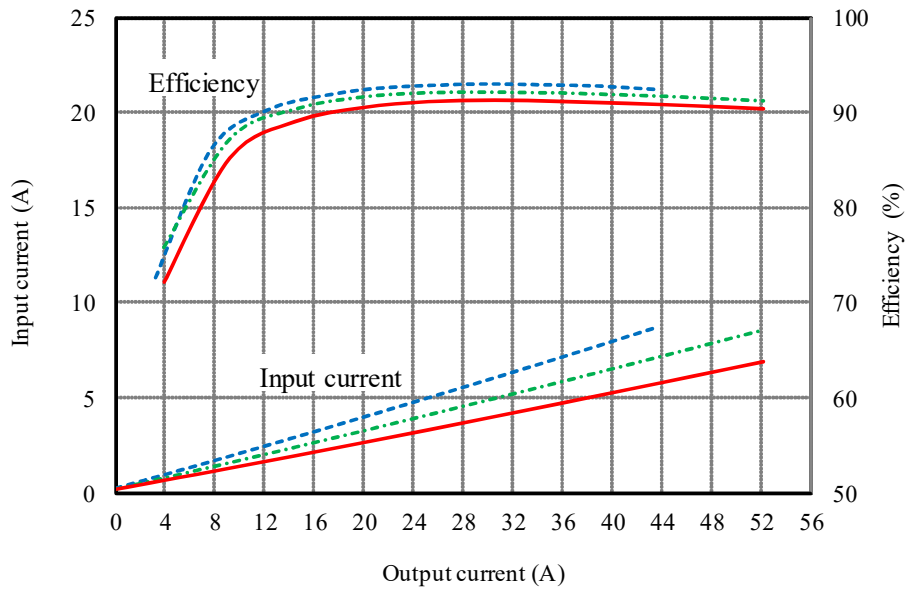
Efficiency vs. Output current and Input current vs. Output current

(a) 力行 Generation mode

$V_o=48VDC$

Conditions

- V_{in} : 260VDC ---
- 320VDC ---
- 400VDC ---
- T_a : 25 °C

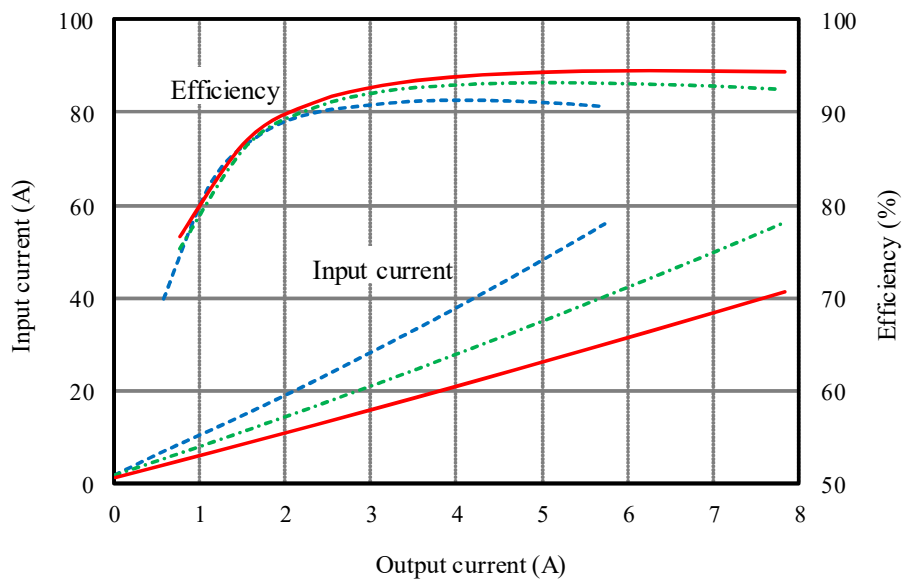


(b) 回生 Regeneration mode

$V_o=320VDC$

Conditions

- V_{in} : 36VDC ---
- 48VDC ---
- 65VDC ---
- T_a : 25 °C



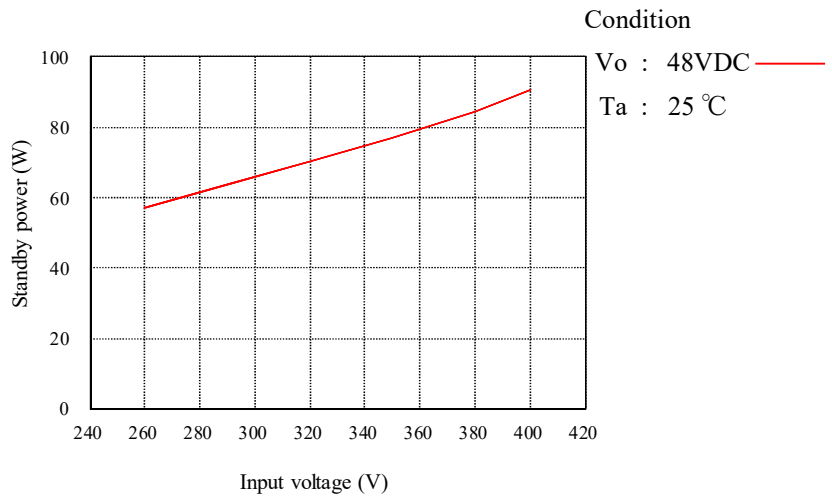
2-2. 無負荷、待機電力特性

No load and standby power characteristics

(a) 力行時、無負荷電力 Generation mode, No load

$V_o = 48\text{VDC}$, $I_o = 0\text{A}$

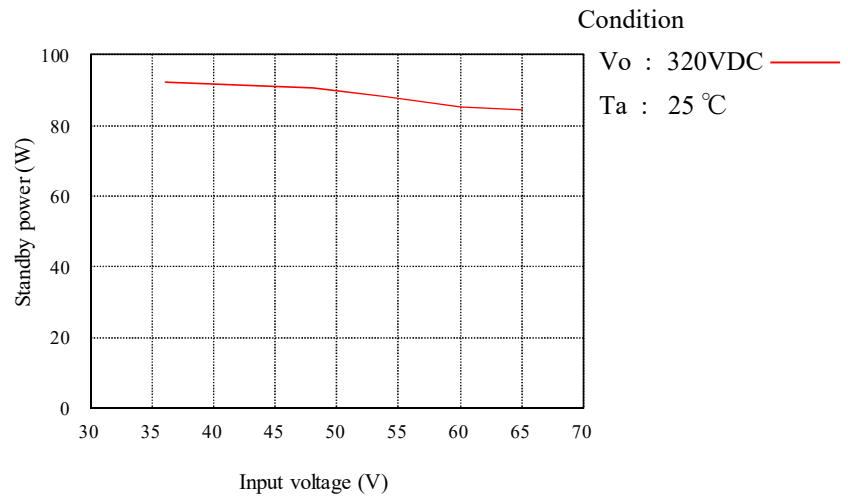
V_{in} [V]	I_{in} [A]	P_{in} [W]
260	0.22	57.22
290	0.22	63.51
320	0.22	70.41
350	0.22	77.02
380	0.22	84.36
400	0.23	90.81



(b) 回生時、無負荷電力 Regeneration mode, No load

$V_o = 320\text{VDC}$, $I_o = 0\text{A}$

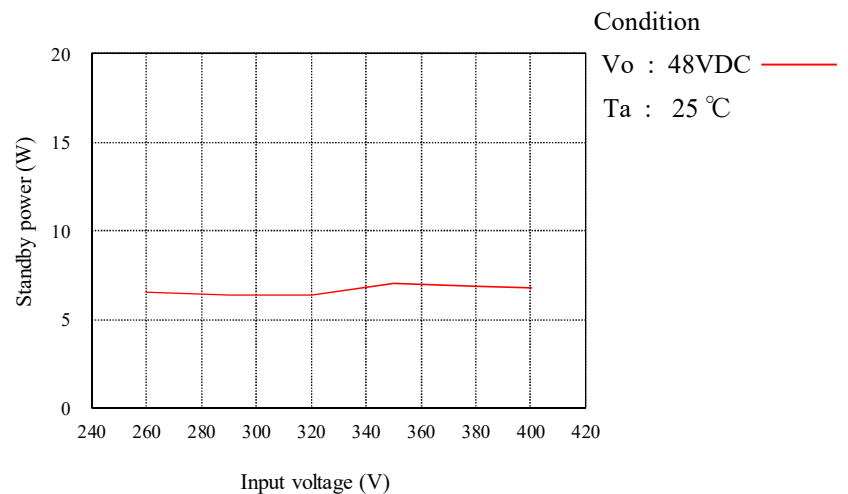
V_{in} [V]	I_{in} [A]	P_{in} [W]
36	2.56	92.21
42	2.18	91.58
48	1.89	90.74
54	1.63	88.05
60	1.42	85.27
65	1.30	84.53



(c) 待機電力 Standby power

$V_o = 48\text{VDC}$, $I_o = 0\text{A}$

V_{in} [V]	I_{in} [A]	P_{in} [W]
260	0.025	6.50
290	0.022	6.38
320	0.020	6.40
350	0.020	7.00
380	0.018	6.84
400	0.017	6.80



2-3. 通電ドリフト特性

Warm up voltage drift characteristics

(a) 力行 Generation mode

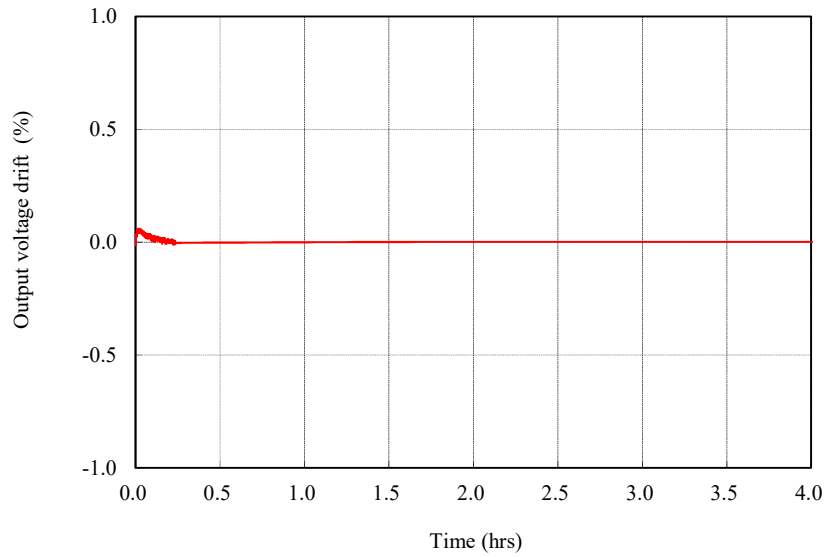
$V_o = 48\text{VDC}$

Condition

$V_{in} : 320\text{VDC}$

$I_o : 52\text{A}$

$T_a : 25^\circ\text{C}$



(b) 回生 Regeneration mode

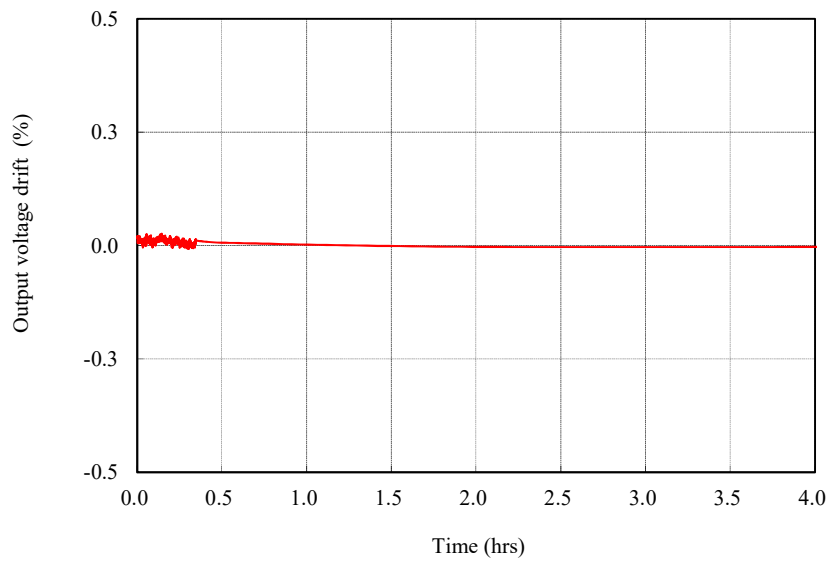
$V_o = 320\text{VDC}$

Condition

$V_{in} : 48\text{VDC}$

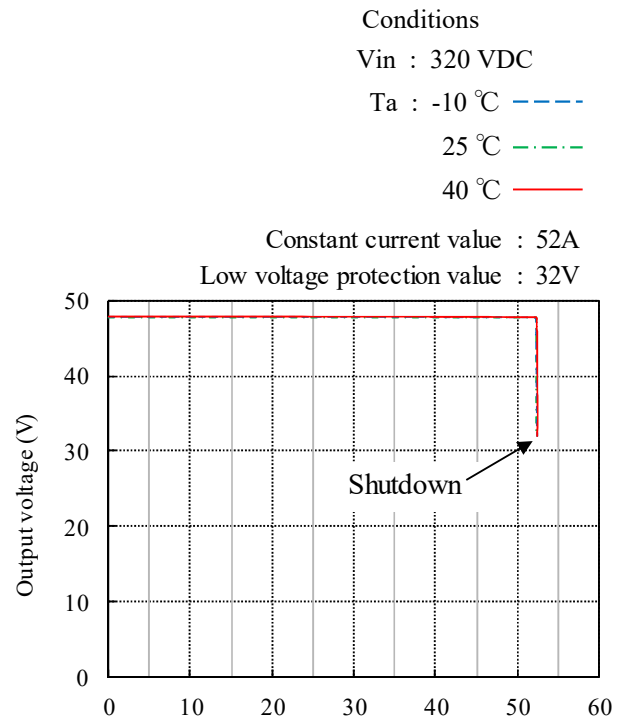
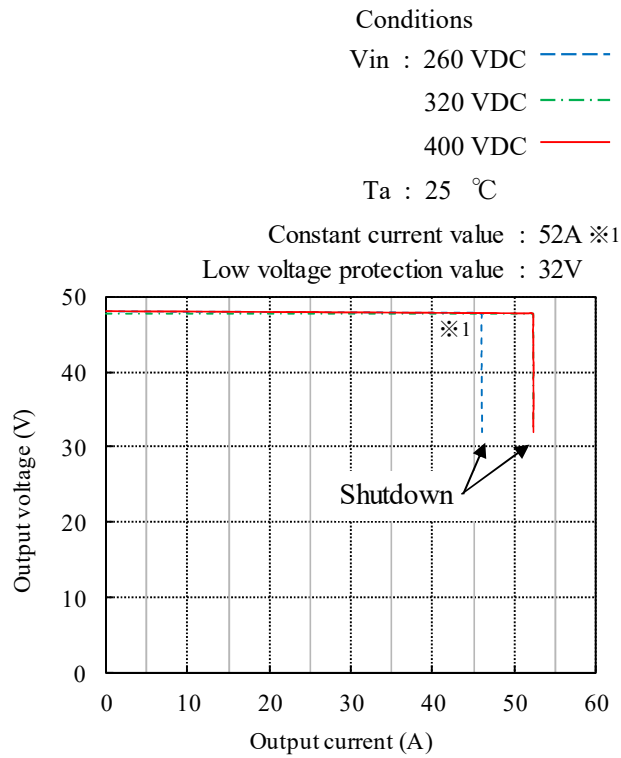
$I_o : 7.8\text{A}$

$T_a : 25^\circ\text{C}$



2-4. 定電流特性 Constant current characteristics

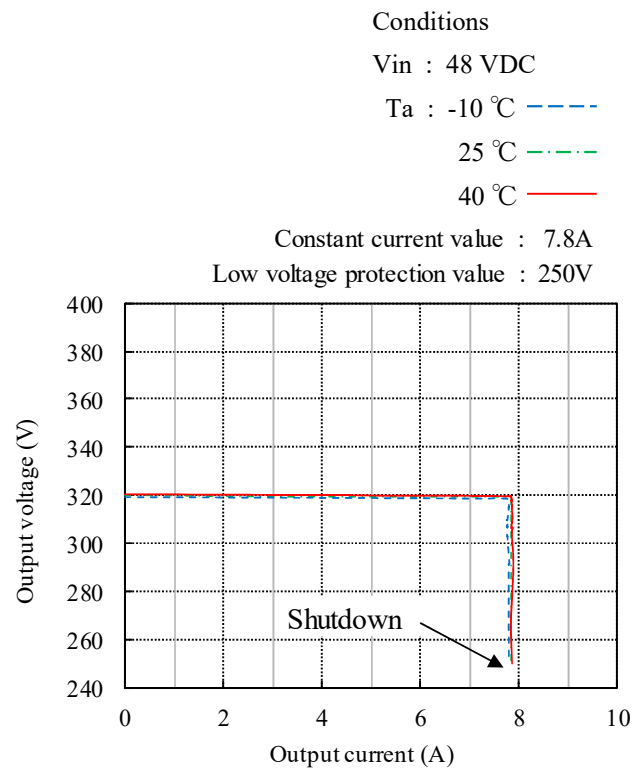
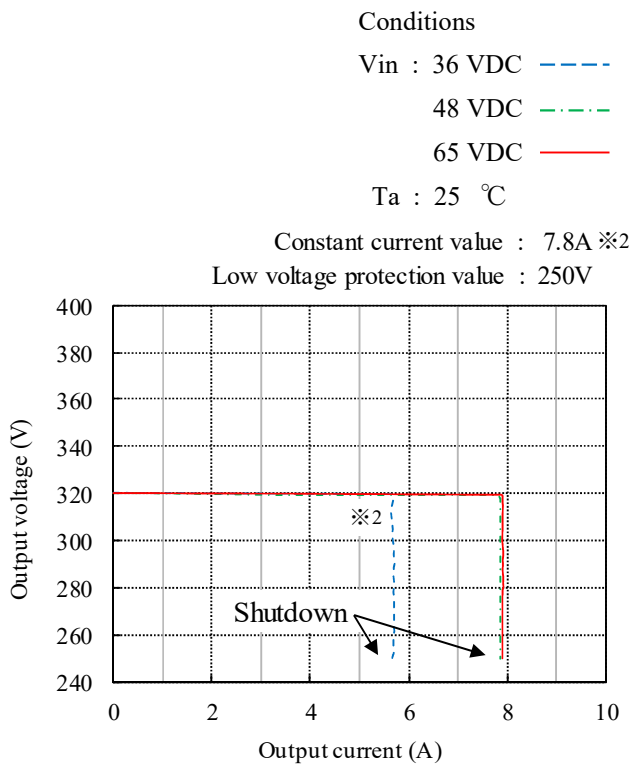
(a) 力行 Generation mode



※1 グリッド電流は最大8.5Aで制限されるため、電圧条件により最大出力電流が異なります。

Maximum grid current (I_{grid}) is limited to 8.5A, Therefore, Maximum output current depends on voltage conditions.

(b) 回生 Regeneration mode



※2 バッテリ電流は最大56Aで制限されるため、電圧条件により最大出力電流が異なります。

Maximum battery current (I_{bat}) is limited to 56A, Therefore, Maximum output current depends on voltage conditions.

2-5. 過電圧保護特性

Over voltage protection (OVP) characteristics

(a) 力行 Generation mode

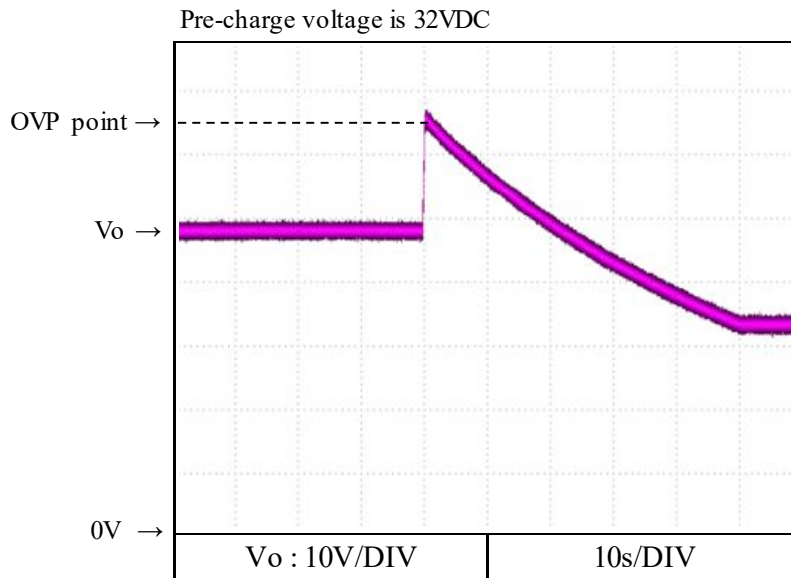
Condition

Vin : 320VDC

Io : 0A

Ta : 25°C

Over voltage protection value : 65VDC



(b) 回生 Regeneration mode

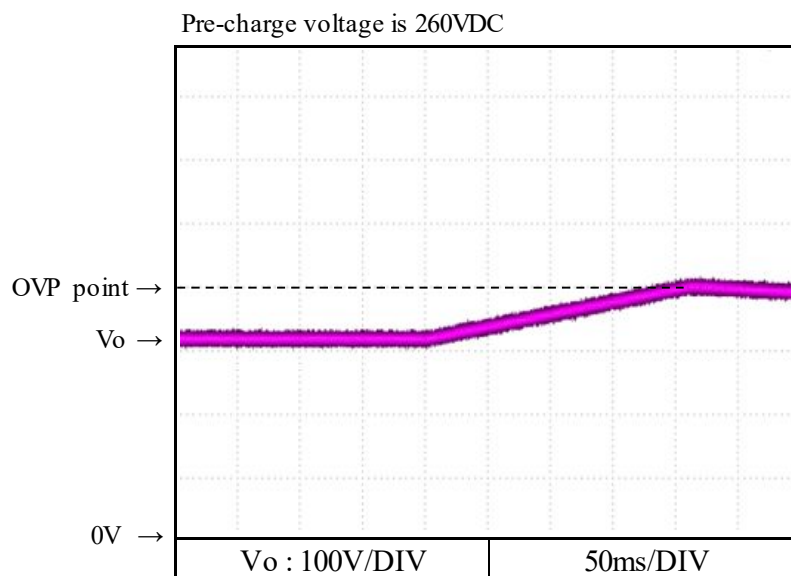
Condition

Vin : 48VDC

Io : 0A

Ta : 25°C

Over voltage protection value : 400VDC



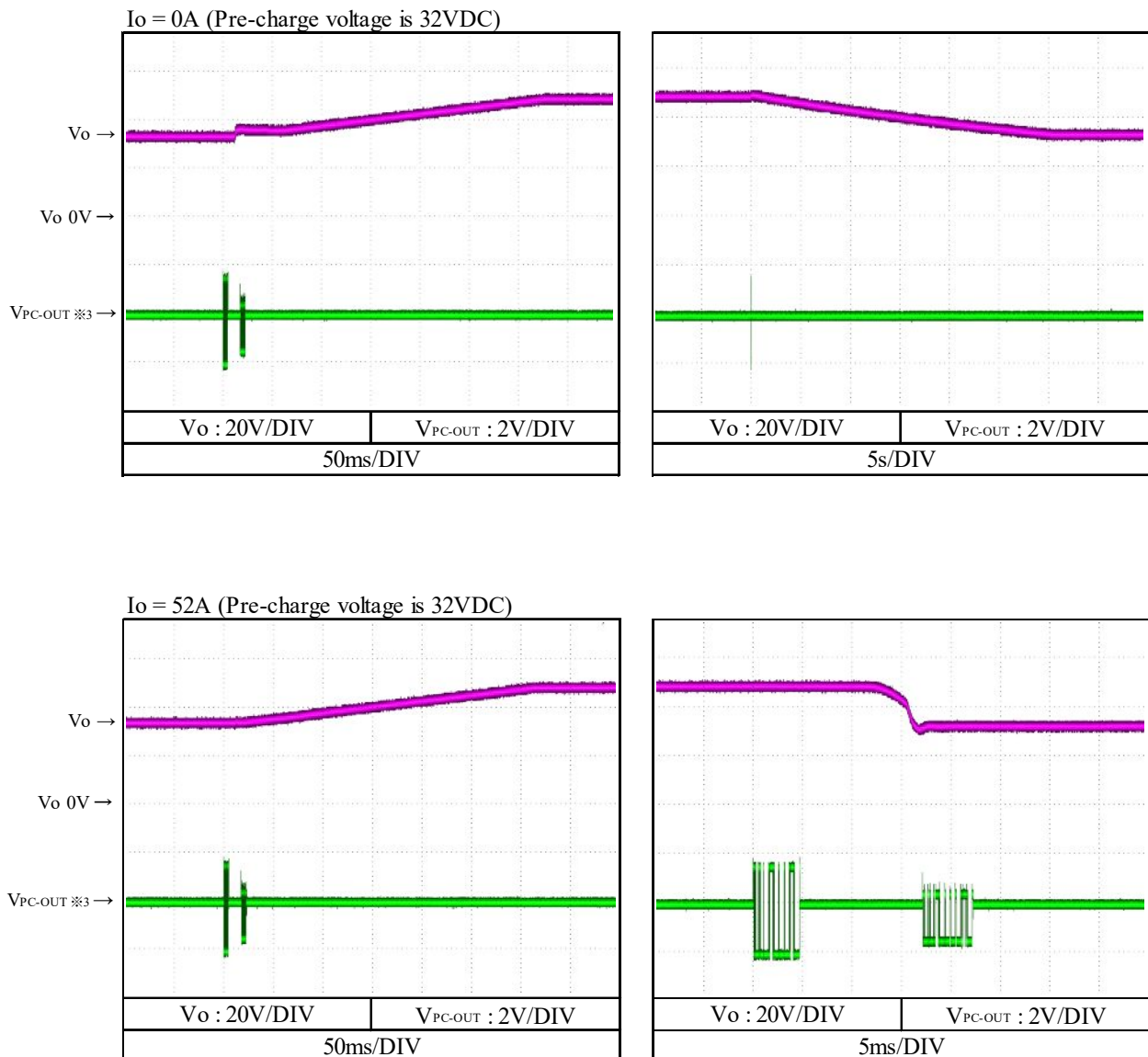
2-6. 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

(a) 力行 Generation mode

(a-1) RS-485通信によるON/OFF
ON/OFF control by RS-485

Condition
Vin : 320VDC
Ta : 25°C

Vo = 48VDC



※3 半2重通信方式のため、送信信号に対し応答信号が現れます。

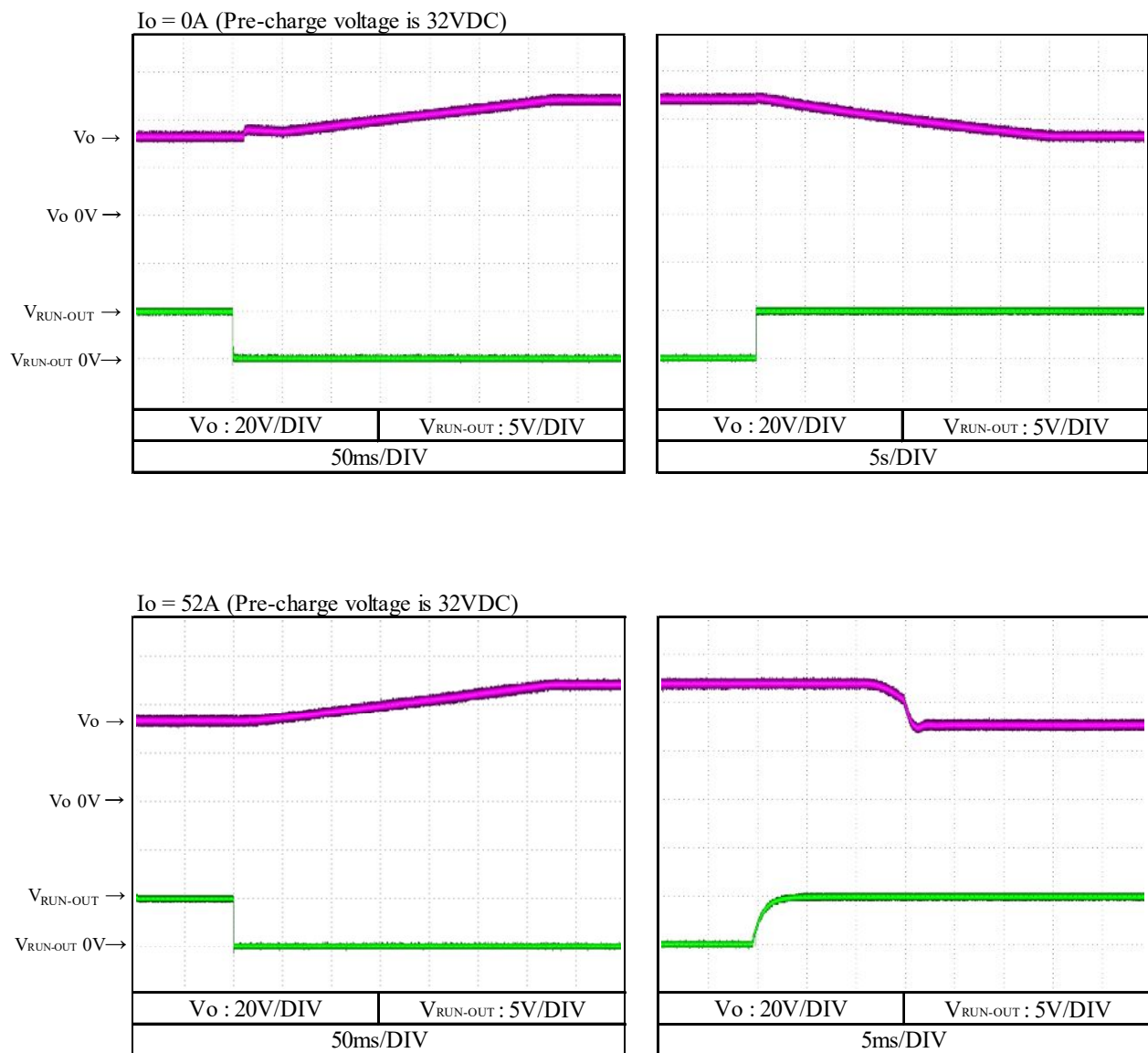
By half-duplex communication system, response signal and transmitted signal are output.

2-6. 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

- (a) 力行 Generation mode
 - (a-2) 外部RUN信号によるON/OFF
ON/OFF control by external terminal

Condition
 V_{in} : 320VDC
 T_a : 25°C

$V_o = 48VDC$



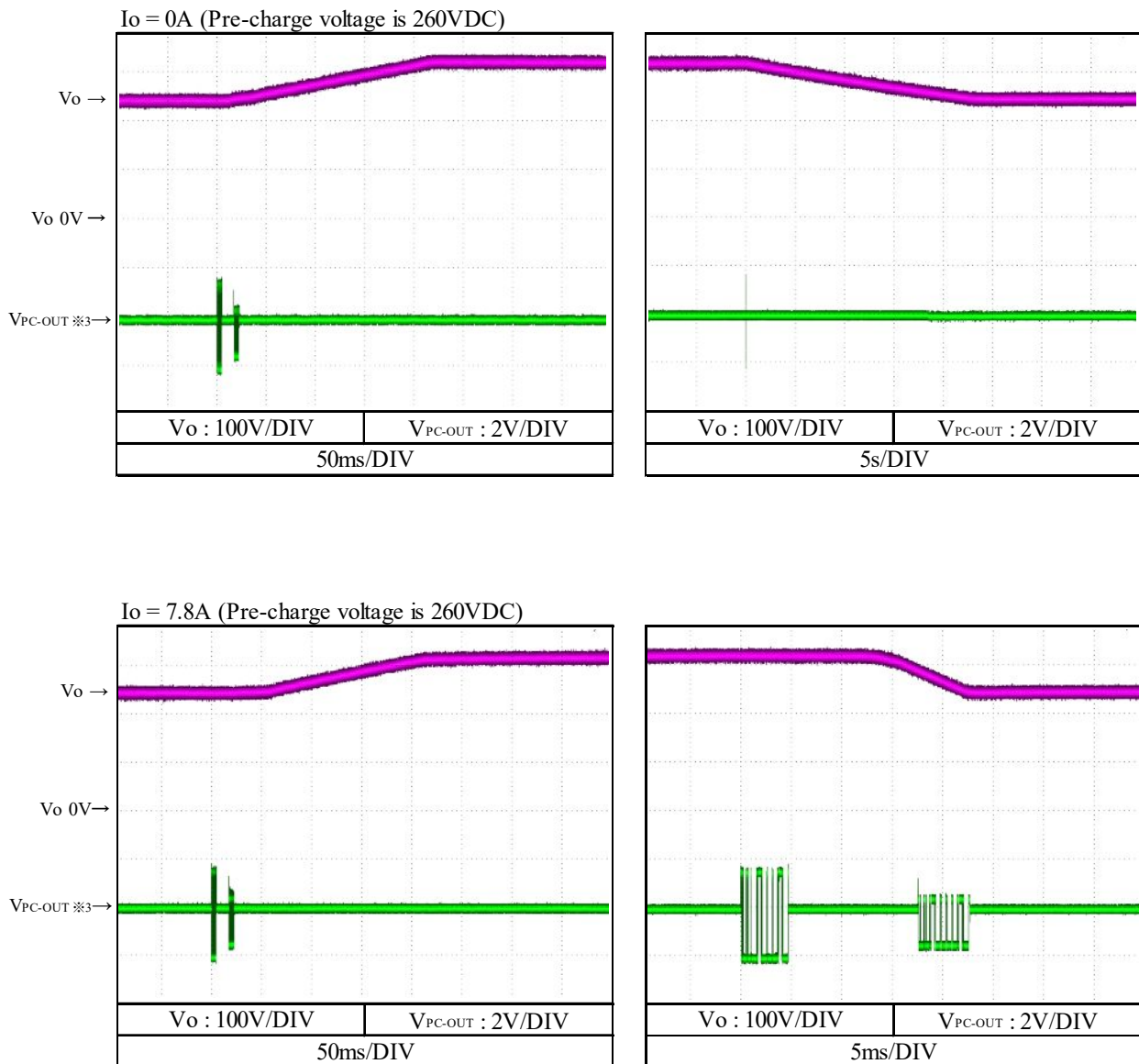
2-6. 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

(b) 回生 Regeneration mode

(b-1) RS-485通信によるON/OFF
ON/OFF control by RS-485

Condition
 V_{in} : 48VDC
 T_a : 25°C

$V_o = 320VDC$



※3 半2重通信方式のため、送信信号に対し応答信号が現れます。
 By half-duplex communication system, response signal and transmitted signal are output.

2-6. 出力立ち上がり、立ち下がり特性
Output rise and fall characteristics

(b) 回生 Regeneration mode

(b-2) 外部RUN信号によるON/OFF

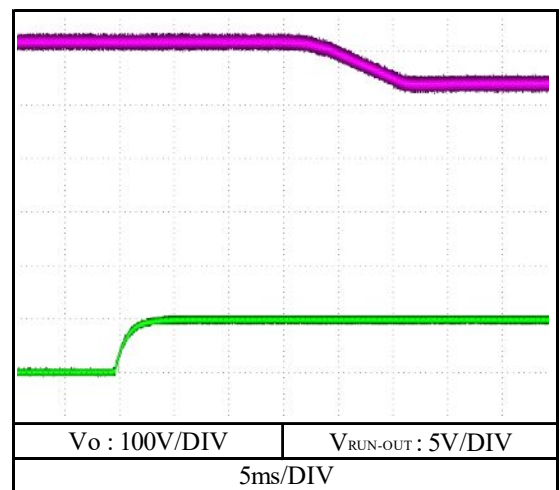
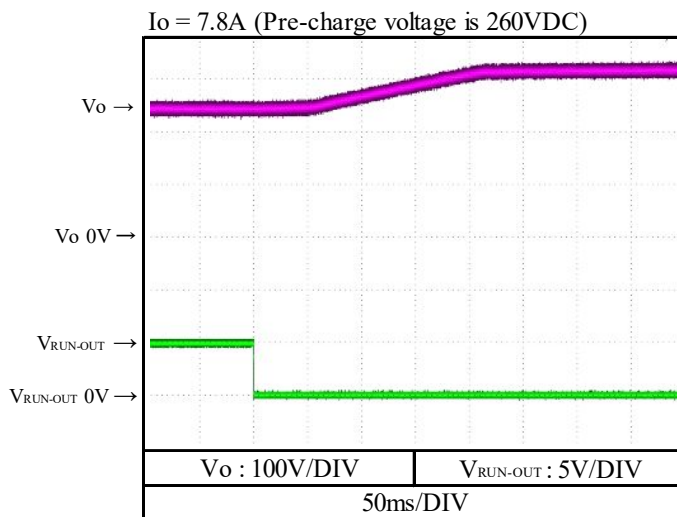
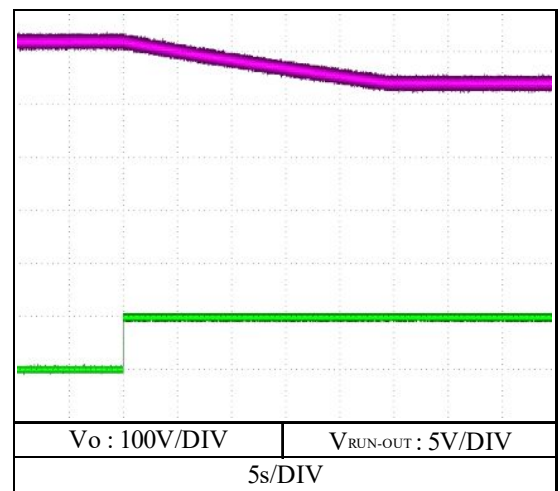
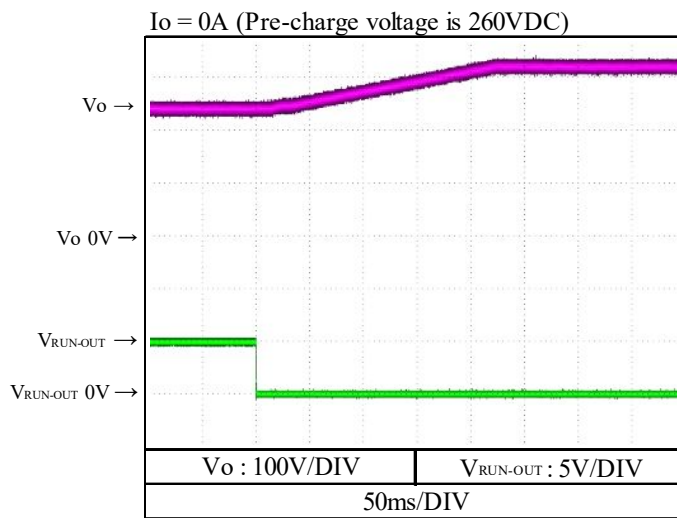
ON/OFF control by external terminal

Condition

V_{in} : 48VDC

T_a : 25°C

V_o = 320VDC



2-7. 0Vランプアップ起動特性
0V ramp up characteristics

(a) 力行 Generation mode

(a-1) RS-485通信によるON/OFF

ON/OFF control by RS-485

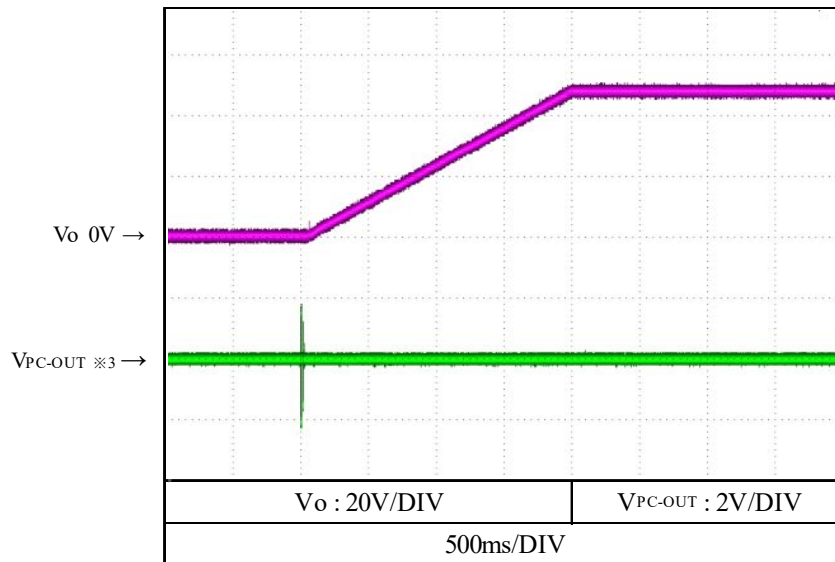
$V_o = 48\text{VDC}$

Condition

$V_{in} : 320\text{VDC}$

$I_o : 52\text{A}$

$T_a : 25^\circ\text{C}$



※3 半2重通信方式のため、送信信号に対し応答信号が現れます。

By half-duplex communication system, response signal and transmitted signal are output.

(a-2) 外部RUN信号によるON/OFF

ON/OFF control by external terminal

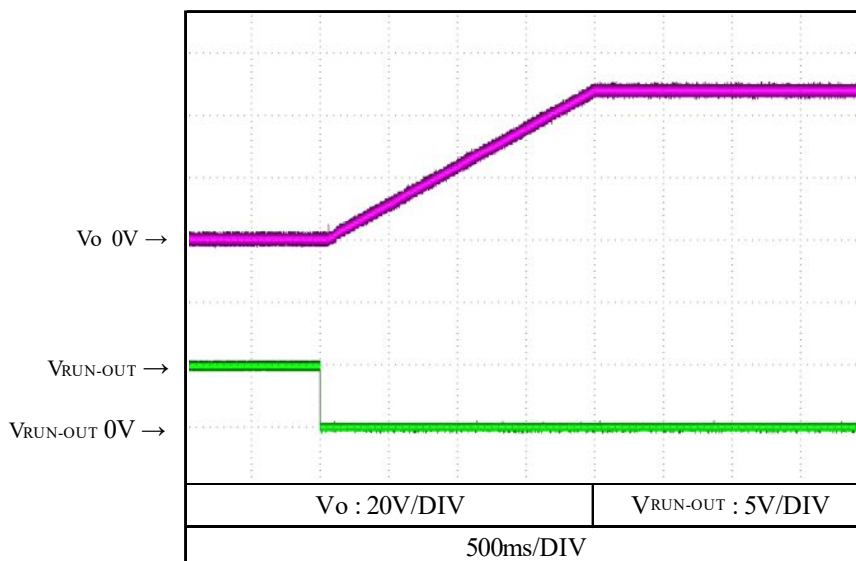
$V_o = 48\text{VDC}$

Condition

$V_{in} : 320\text{VDC}$

$I_o : 52\text{A}$

$T_a : 25^\circ\text{C}$



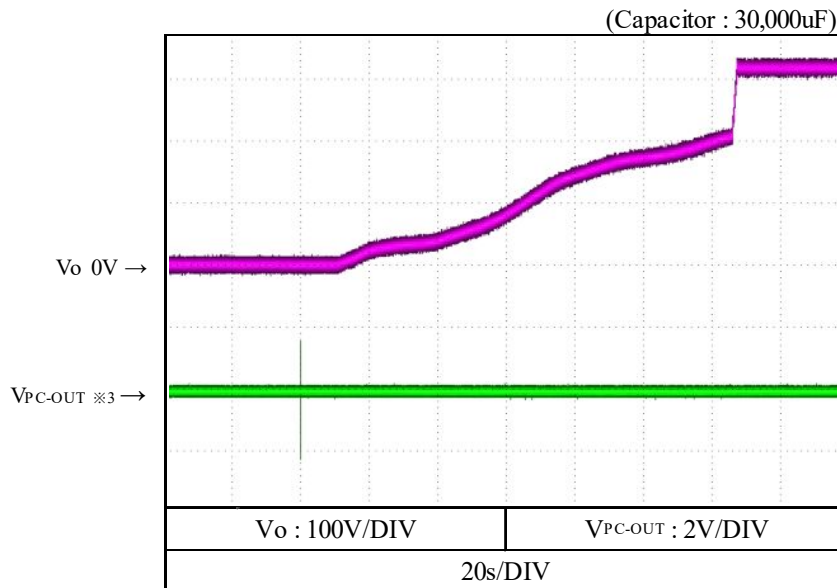
2-7. 0Vランプアップ起動特性
0V ramp up characteristics

(b) 回生 Regeneration mode

(b-1) RS-485通信によるON/OFF
ON/OFF control by RS-485

$V_o = 320\text{VDC}$

Condition
 $V_{in} : 48\text{VDC}$
 $I_o : 0\text{A}$
 $T_a : 25^\circ\text{C}$

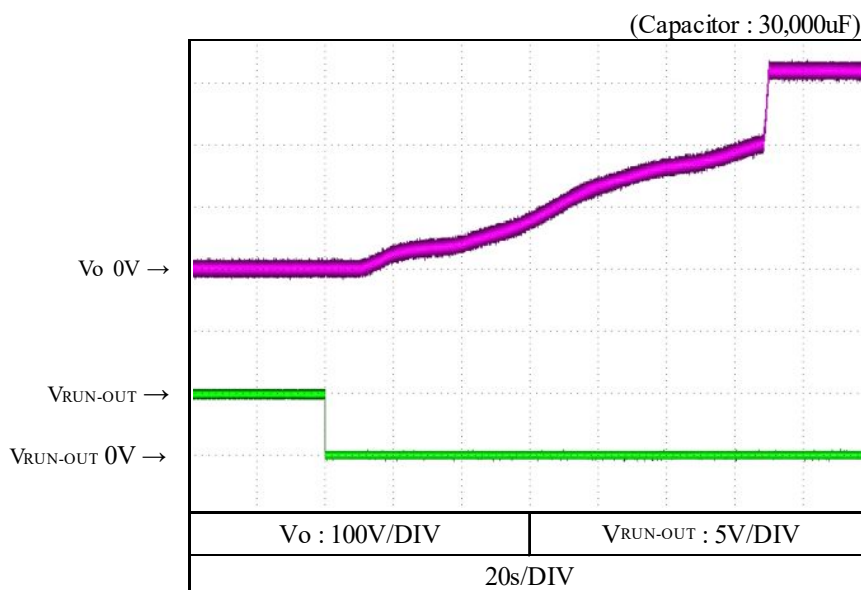


※3 半2重通信方式のため、送信信号に対し応答信号が現れます。
By half-duplex communication system, response signal and transmitted signal are output.

(b-2) 外部RUN信号によるON/OFF
ON/OFF control by external terminal

$V_o = 320\text{VDC}$

Condition
 $V_{in} : 48\text{VDC}$
 $I_o : 0\text{A}$
 $T_a : 25^\circ\text{C}$



2-8. 過渡応答(負荷急変)特性

Dynamic load response characteristics

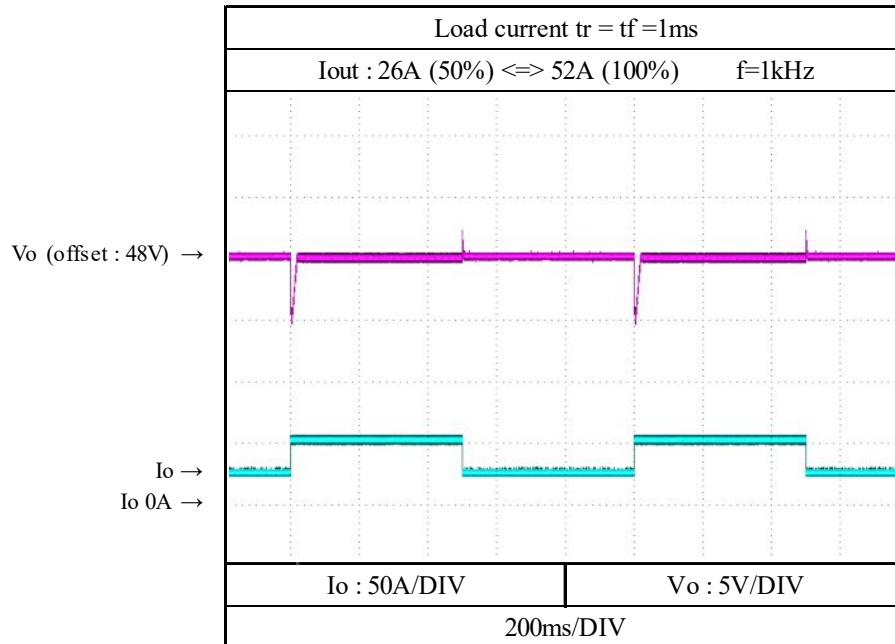
(a) 力行 Generation mode

$V_o = 48VDC$

Condition

$V_{in} : 320VDC$

$T_a : 25^{\circ}C$



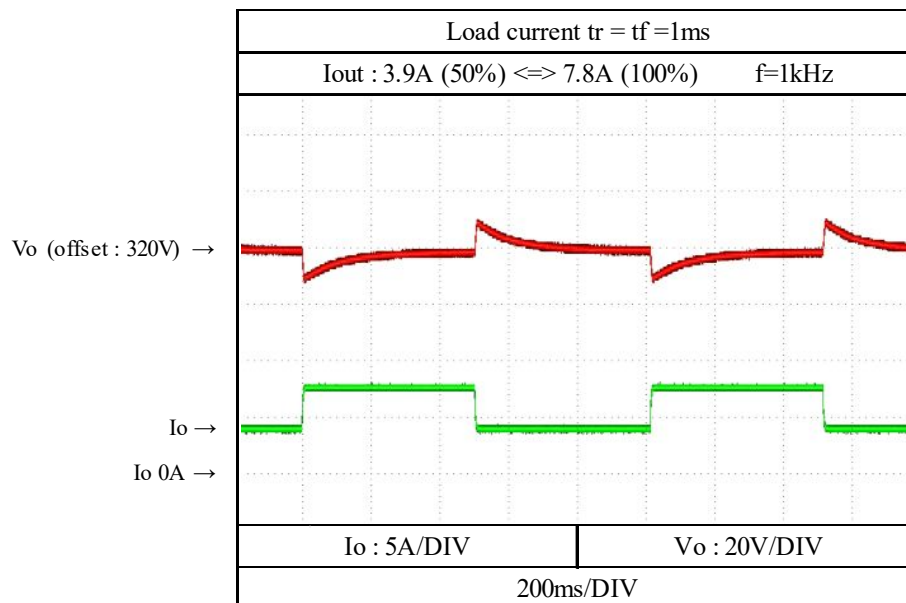
(b) 回生 Regeneration mode

$V_o = 320VDC$

Condition

$V_{in} : 48VDC$

$T_a : 25^{\circ}C$



2-9. 入力サージ電流(突入電流)特性

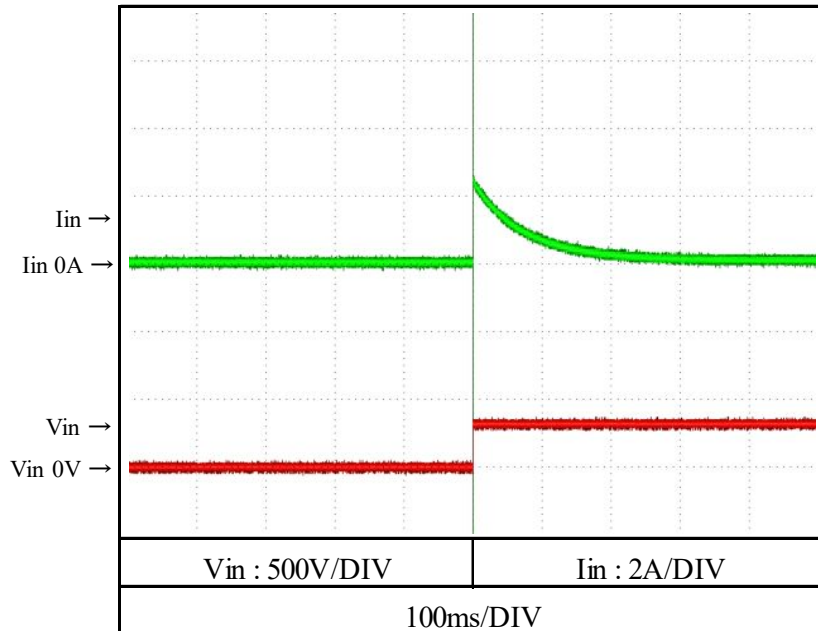
Inrush current characteristics

(a) グリッド側 Grid side

Condition

V_{in} : 320VDC

T_a : 25°C

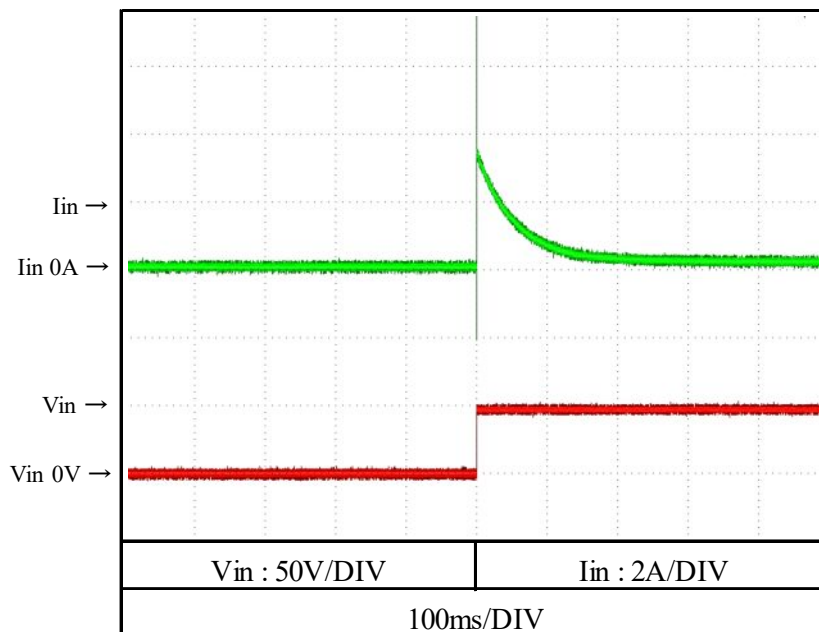


(b) バッテリー側 Battery side

Condition

V_{in} : 48VDC

T_a : 25°C



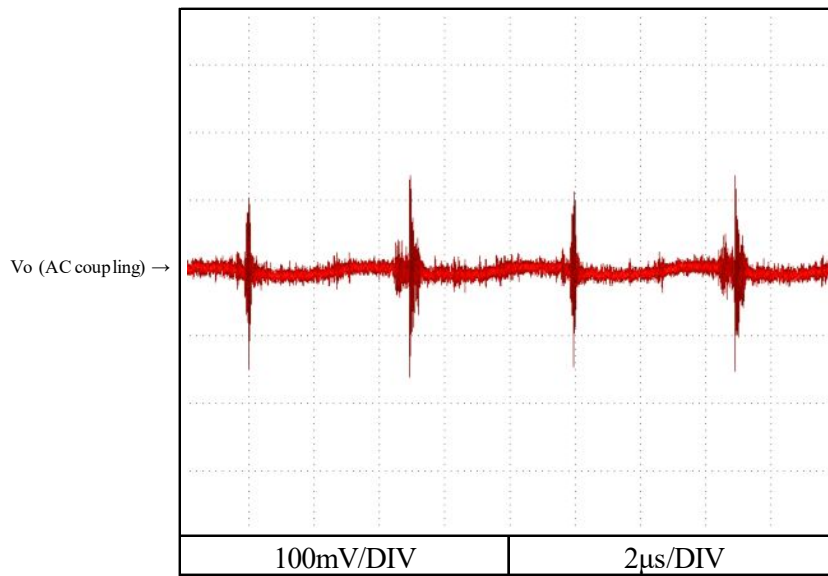
2-10. 出力ノイズ波形

Output noise waveform

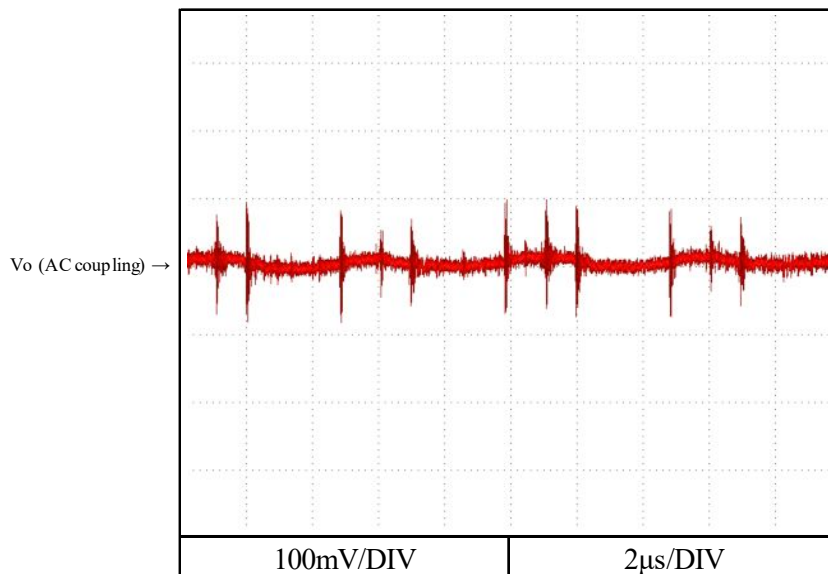
(a) 力行 Generation mode

Condition
Vin : 320VDC
Vo : 48VDC
Ta : 25°C

$I_o = 0A$



$I_o = 52A$



2-10. 出力ノイズ波形

Output noise waveform

(b) 回生 Regeneration mode

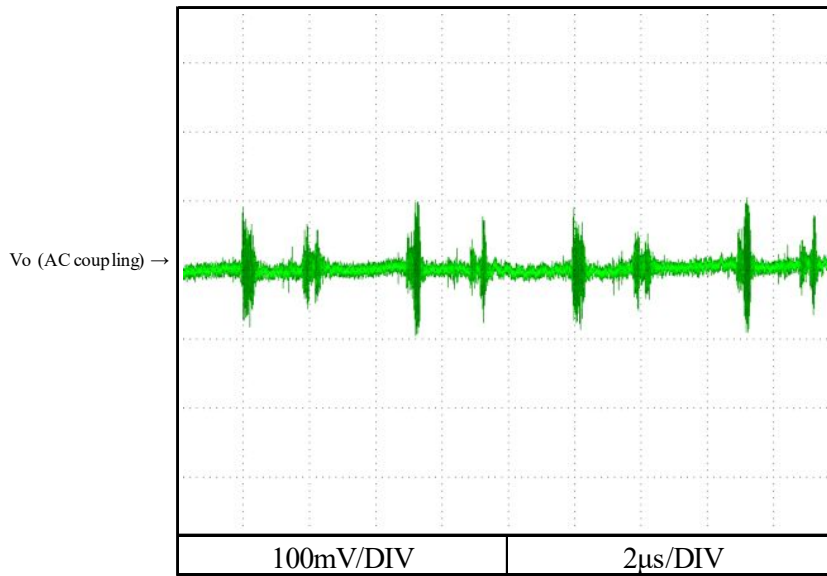
Condition

Vin : 48VDC

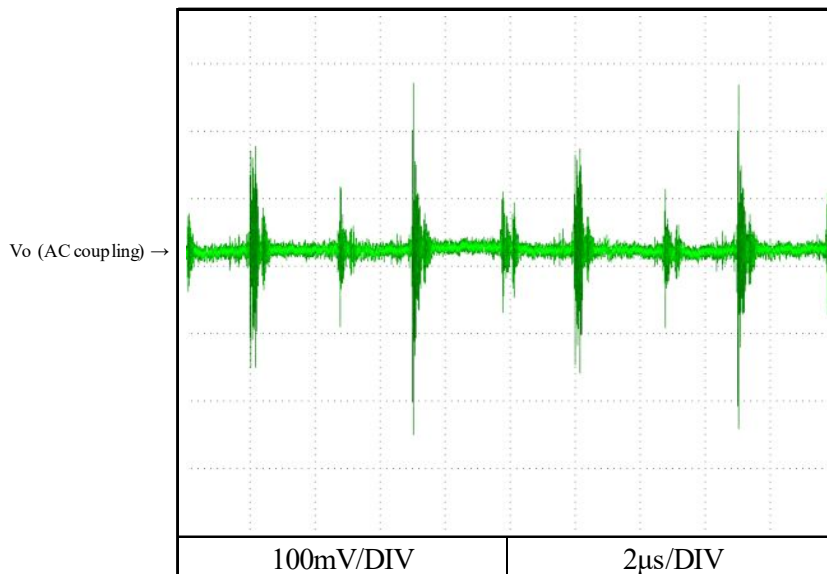
Vo : 320VDC

Ta : 25°C

$I_o = 0A$



$I_o = 7.8A$



2-11. EMI特性 Electro-Magnetic Interference characteristics

(a) 雑音端子電圧 Conducted Emission

力行 Generation mode

Condition

Vin : 320VDC

Io : 52A

Ta : 25°C

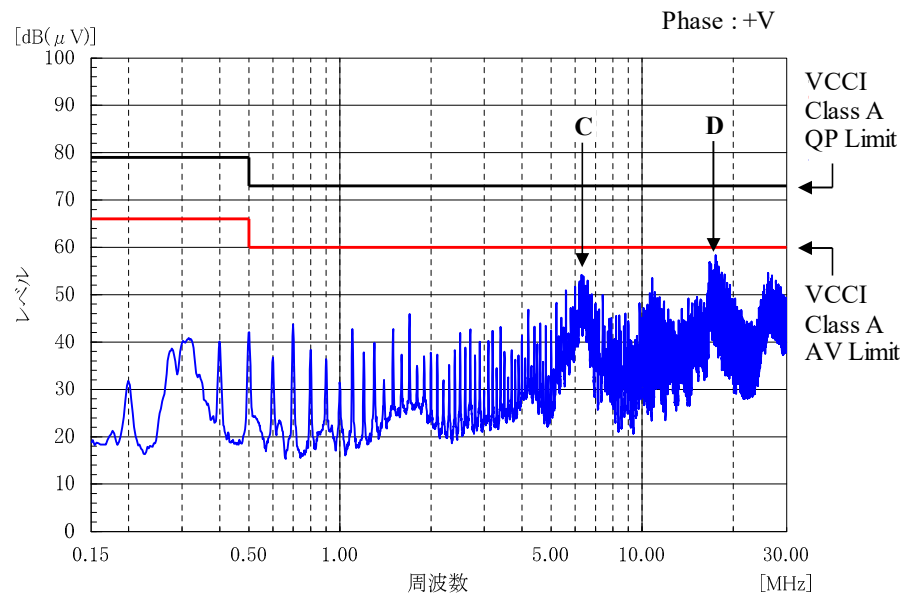
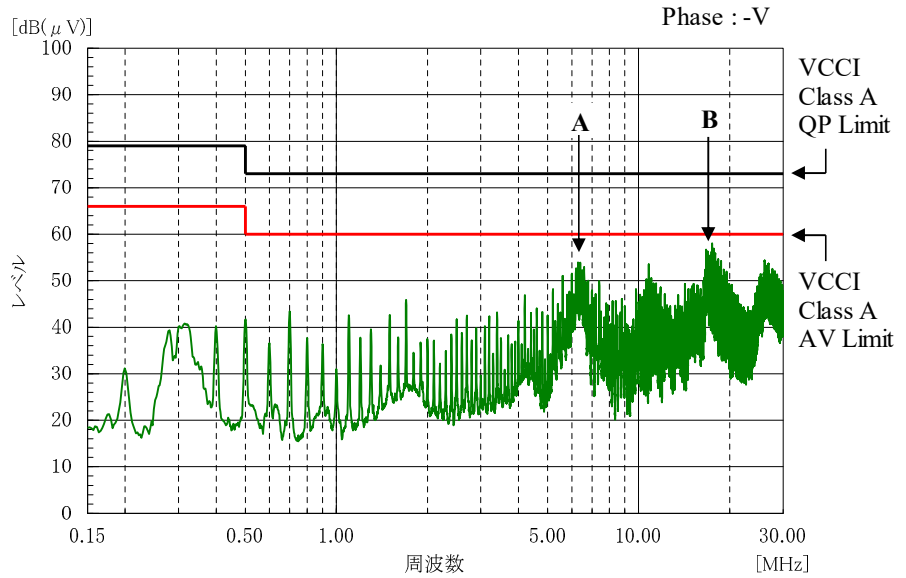
$V_o = 48VDC$

Point A (6.3MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	73.0	51.9
AV	60.0	51.5

Point B (17.5MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	73.0	56.1
AV	60.0	53.8

Point C (6.3MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	73.0	52.0
AV	60.0	51.6

Point D (17.5MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	73.0	55.7
AV	60.0	53.4



EN55011-A,EN55022-Aの限界値はVCCI class Aの限界値と同じ

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

2-11. EMI特性 Electro-Magnetic Interference characteristics

(b) 雑音電界強度 Radiated Emission

力行 Generation mode

$V_o = 48VDC$

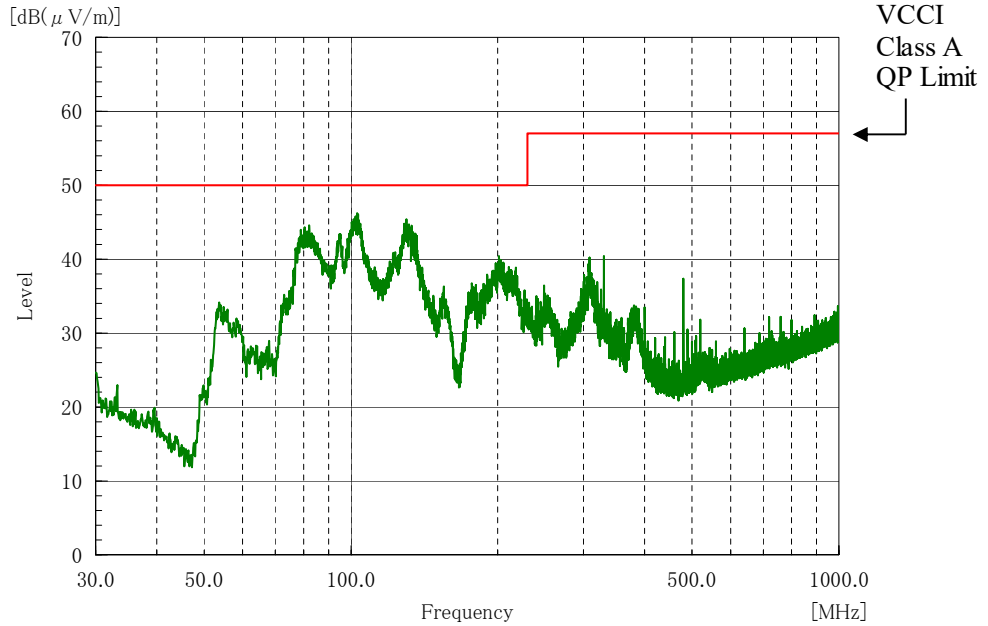
Condition

$V_{in} : 320VDC$

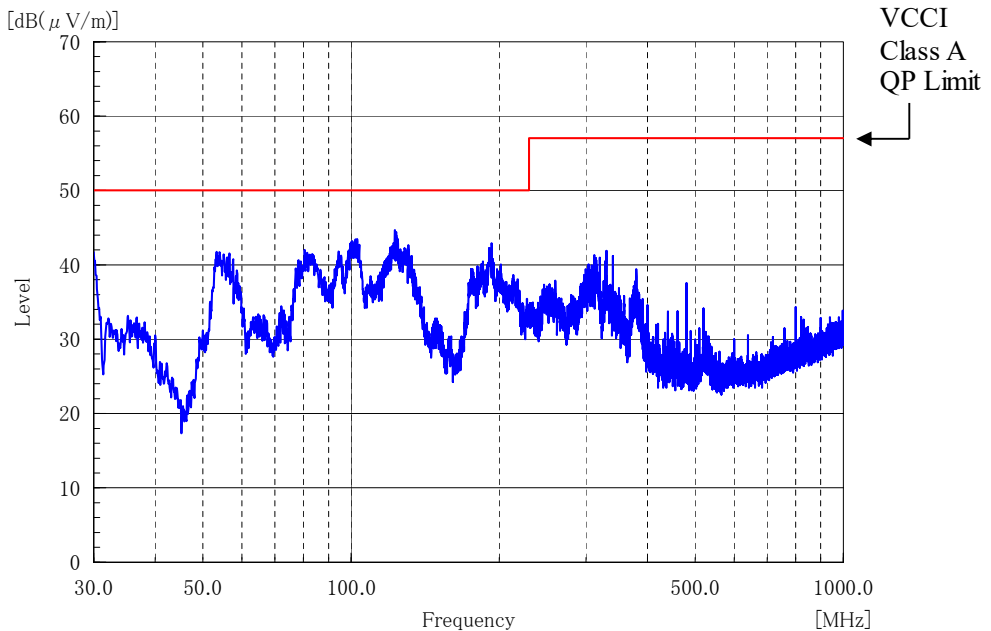
$I_o : 52A$

$T_a : 25^{\circ}C$

HORIZONTAL



VERTICAL



EN55011-A,EN55022-Aの限界値はVCCI class Aの限界値と同じ

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

表示はピーク値

Indication is peak values.

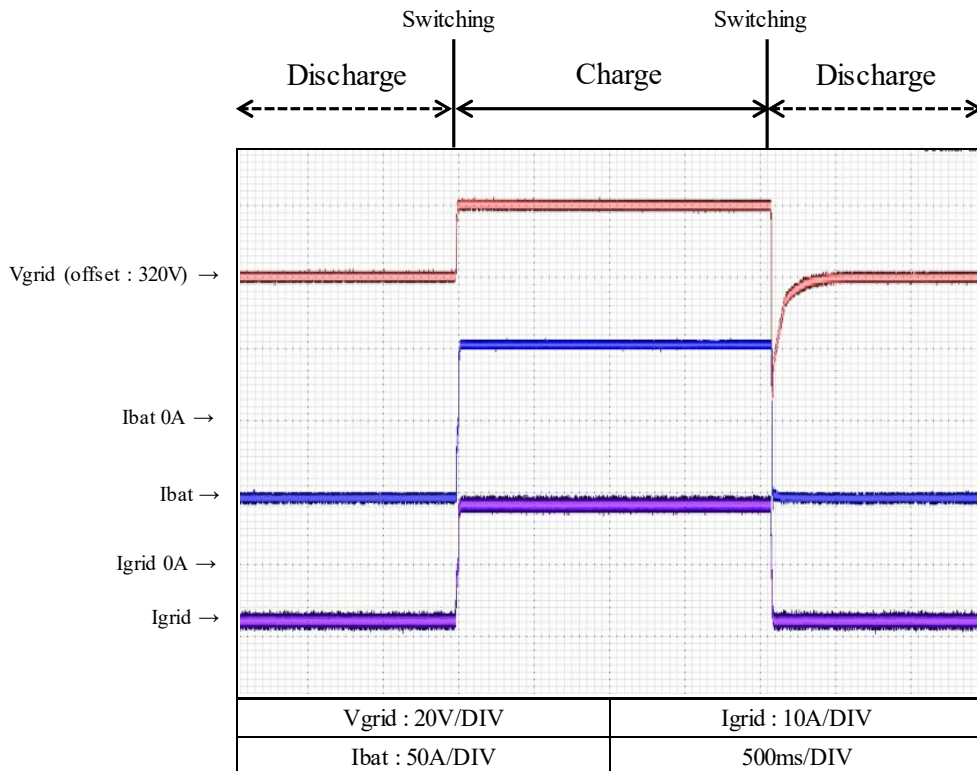
2-12. 力行・回生切替特性

Generation and Regeneration switching characteristics

グリッド自律CV バッテリCCモード

Automatic grid CV with battery CC mode

	Charge	Discharge
V_{in}	340VDC	48VDC
V_o	48VDC	320VDC
I_o	52A	7.8A
T_a	25°C	



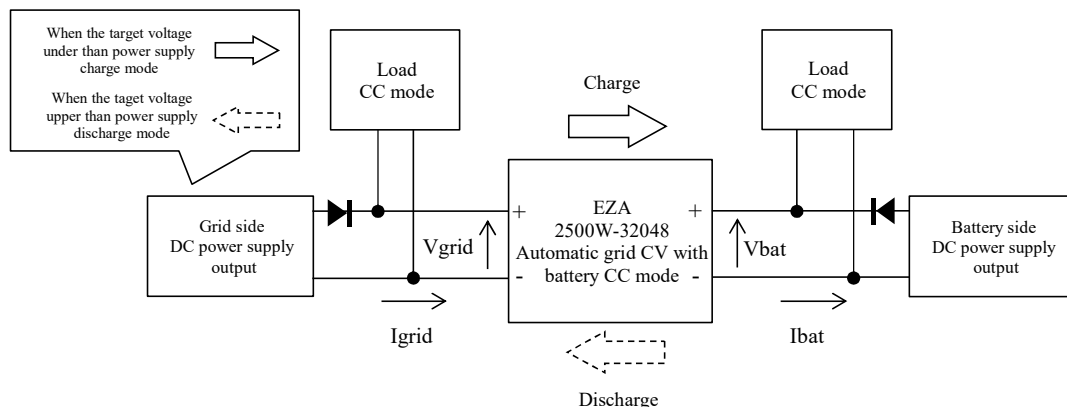
I_{grid} , I_{bat} の矢印の向きが電流の正です。EZA2500W-32048をグリッド自律モードで動作させています。

力行 ⇒ 回生 (回生 ⇒ 力行) の切り替えは、グリッド側に接続されているDC電源の出力をEZA2500W-32048のグリッド電圧指令値に対し、高く(低く)することで行っています。

I_{grid} , I_{bat} 's arrow direction is positive current. EZA2500W is operated automatic grid CV mode.

Switching between Generation mode ⇒ Regeneration mode (Regeneration mode ⇒ Generation mode)

is done by increasing (decreasing) the output of DC power supply connected to the grid side to the voltage command value of EZA2500W.



2-13. 出力電圧指令応答特性

Output voltage command response characteristics

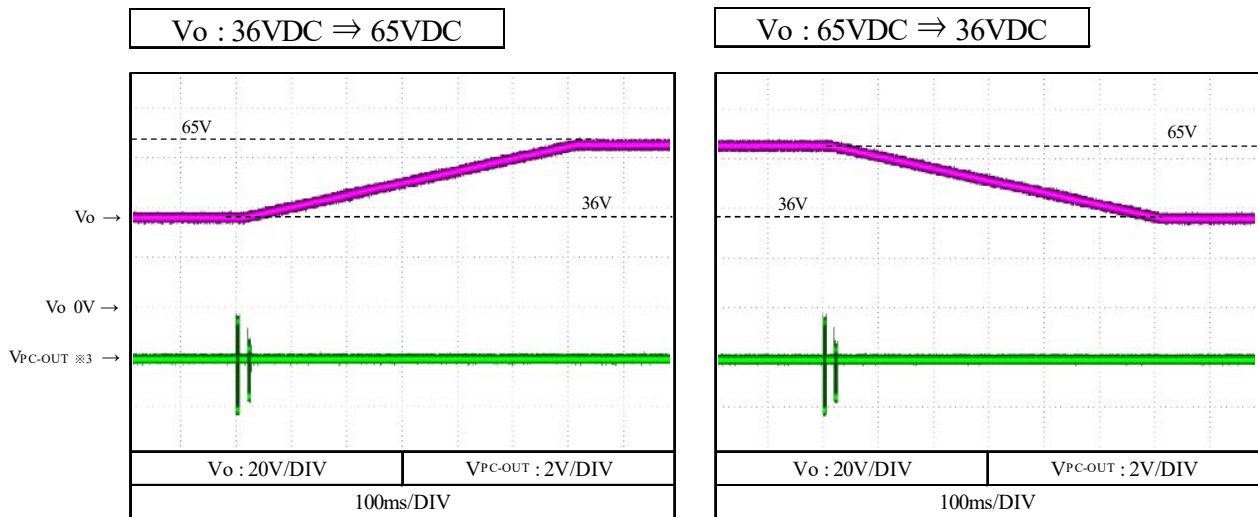
(a) 力行 Generation mode

Condition

Vin : 320VDC

Io : 38.5A

Ta : 25°C



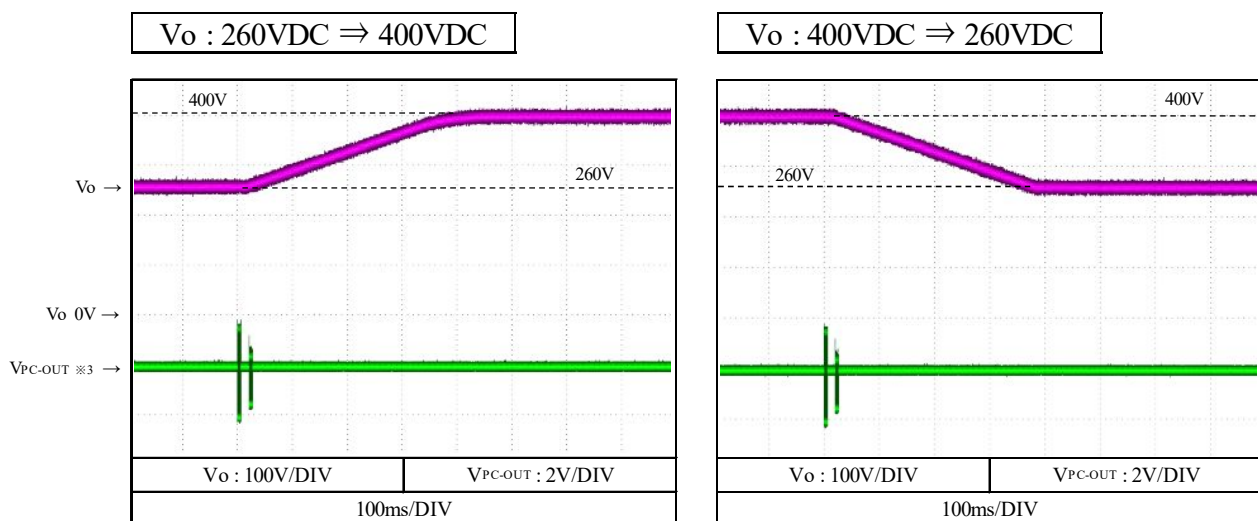
(b) 回生 Regeneration mode

Condition

Vin : 48VDC

Io : 6.2A

Ta : 25°C



※3 半2重通信方式のため、送信信号に対し応答信号が現れます。

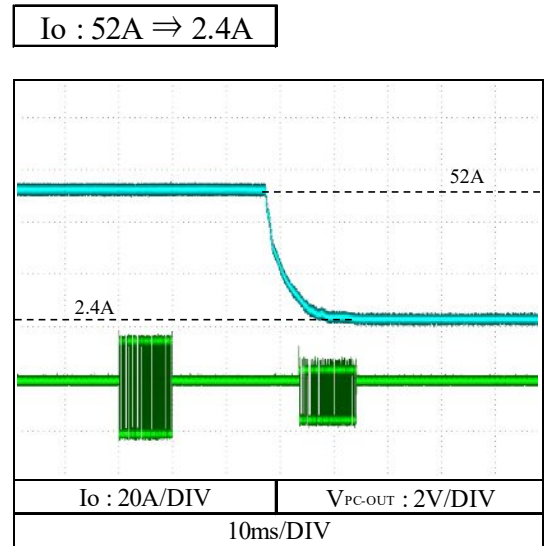
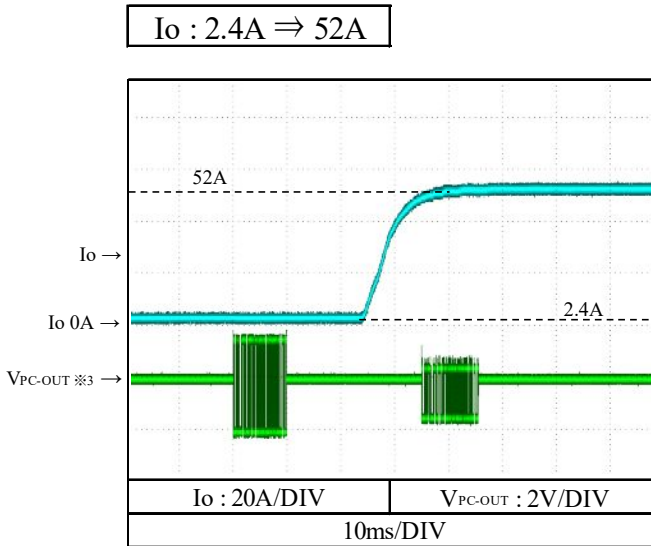
By half-duplex communication system, response signal and transmitted signal are output.

2-14. 定電流指令応答特性

Constant current command response characteristics

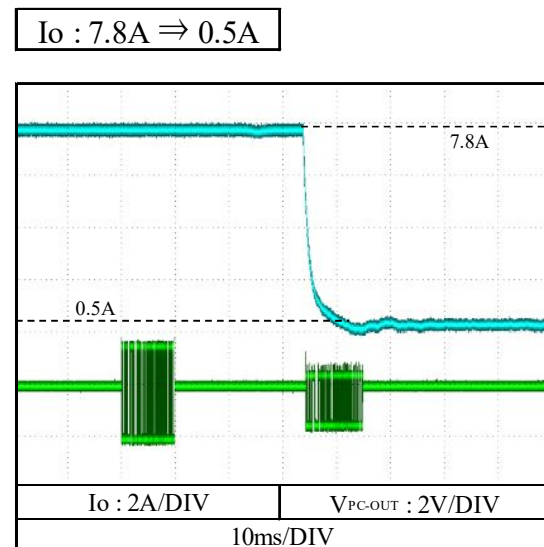
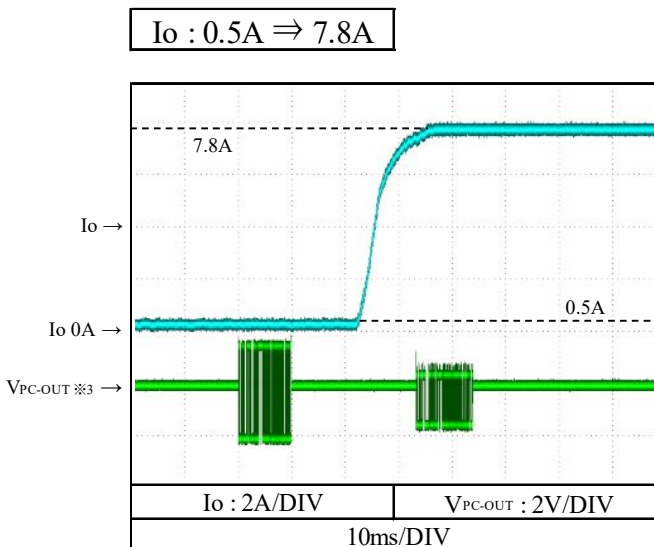
(a) 力行 Generation mode

Condition
 Vin : 320VDC
 Vo : 48VDC
 Ta : 25°C



(b) 回生 Regeneration mode

Condition
 Vin : 48VDC
 Vo : 320VDC
 Ta : 25°C



※3 半2重通信方式のため、送信信号に対し応答信号が現れます。

By half-duplex communication system, response signal and transmitted signal are output.

2-15. バッテリー保護特性

Battery protection characteristics

(a) グリッド自律CVバッテリーCCモード【充電】

Automatic grid CV with battery CC mode [charge]

Condition

V_{in} : 320VDC

V_o : 48VDC \Rightarrow 65VDC

T_a : 25°C

Battery voltage[Vbat] : 48VDC \Rightarrow 65VDC

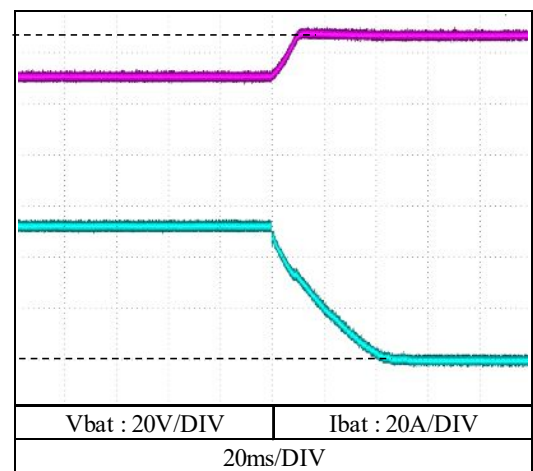
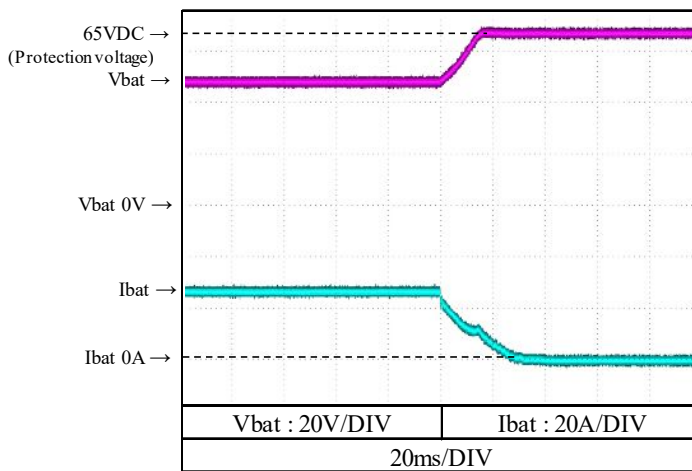
Charge current[Ibat] : 26A

Battery over charge protection voltage : 65VDC

Battery voltage[Vbat] : 48VDC \Rightarrow 65VDC

Charge current[Ibat] : 52A

Battery over charge protection voltage : 65VDC



充電電流は上記波形では正方向になります。

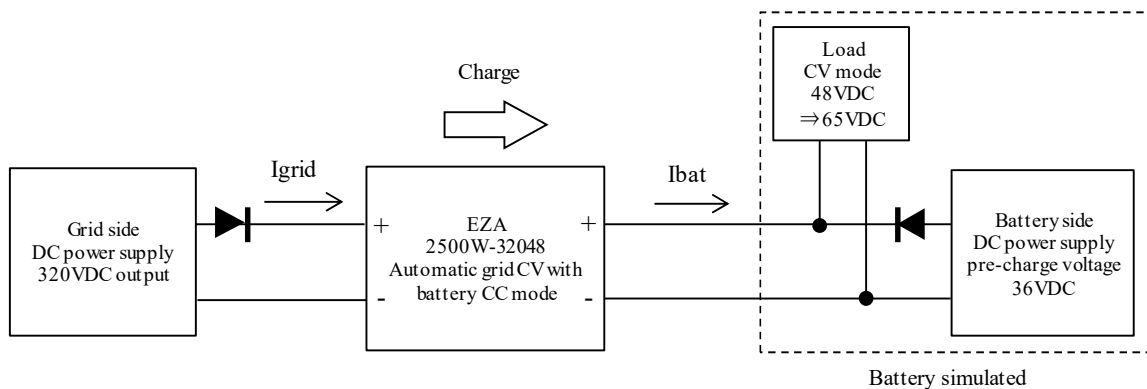
バッテリー電圧Vbatがバッテリー充電上限電圧設定値まで上昇すると、充電電流Ibatを制限し、

バッテリー電圧が設定電圧以上にならないよう動作します。

Charge current is positive current in the above waveform.

When battery voltage reaches to over charging protection voltage,

EZA limits charge current and keeps battery voltage under protection voltage.



2-15. バッテリー保護特性

Battery protection characteristics

(b) グリッド自律CVバッテリーCCモード【放電】

Automatic grid CV with battery CC mode [discharge]

Condition

V_{in} : 48VDC \Rightarrow 36VDC

V_o : 320VDC

T_a : 25°C

Battery voltage[Vbat] : 48VDC \Rightarrow 36VDC

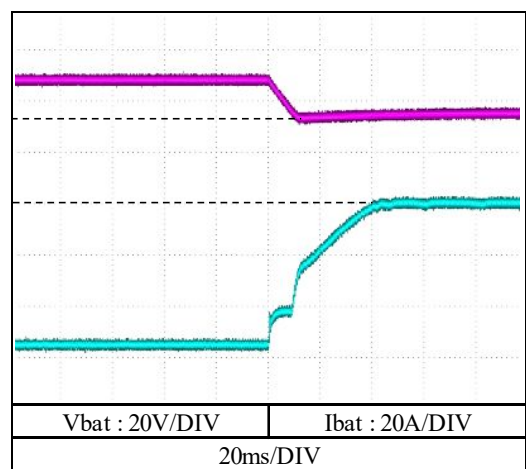
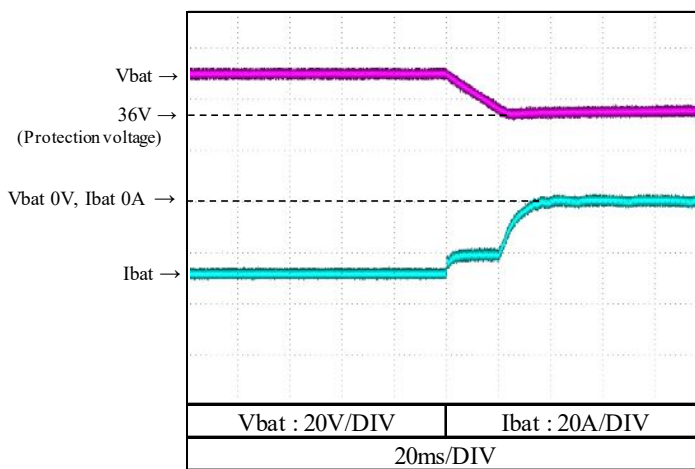
Discharge current[Ibat] : 28A

Battery over discharge protection voltage : 36VDC

Battery voltage[Vbat] : 48VDC \Rightarrow 36VDC

Discharge current[Ibat] : 56A

Battery over discharge protection voltage : 36VDC



放電電流は上記波形では負方向になります。

バッテリー電圧Vbatがバッテリー放電終止電圧設定値まで下降すると、放電電流Ibatを制限し、バッテリー電圧が設定電圧以下にならないよう動作します。

Discharge current is negative current in the above waveform.

When battery voltage reaches to over discharging protection voltage,

EZA limits discharge current and keeps battery voltage under protection voltage.

