CCG60-24-xx

EVALUATION DATA

型式データ

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使用記号 Terminology used

		定義	Definition
Vin	・・・・・	入力電圧	Input voltage
Vo	・・・・・	出力電圧	Output voltage
V_{RC}	・・・・・	RC電圧	RC voltage
Iin	・・・・・	入力電流	Input current
Io	・・・・・	出力電流	Output current
Ta	・・・・・	周囲温度	Ambient temperature
f	・・・・・	周波数	Frequency

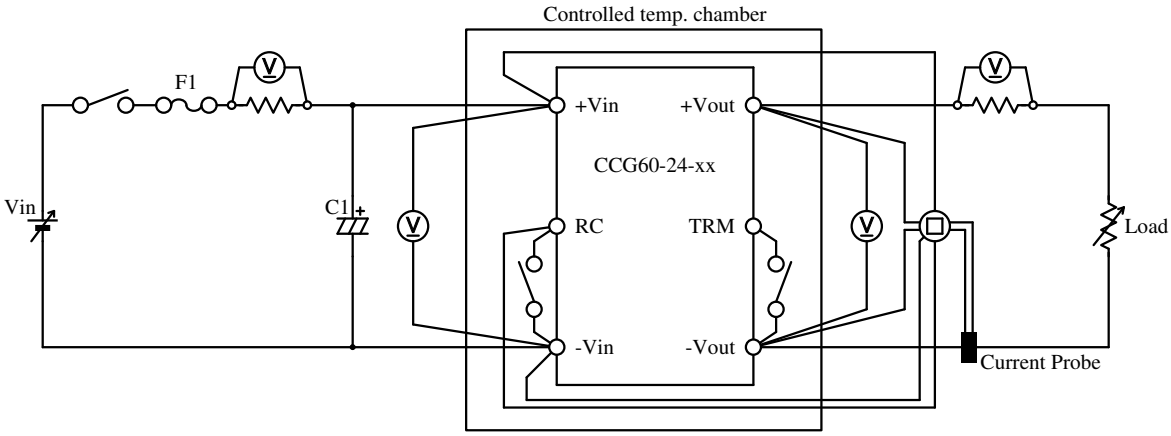
※ 当社測定条件における結果であり、参考値としてお考え願います。
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

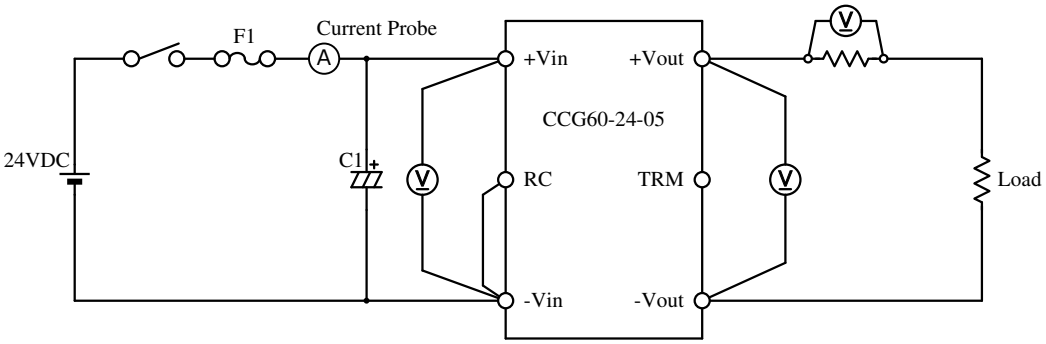
1-1. 測定回路 Measurement Circuits

(1) 静特性 、待機電力特性、通電ドリフト特性、その他特性

Steady state, Standby power, Warm up voltage drift and Other characteristics



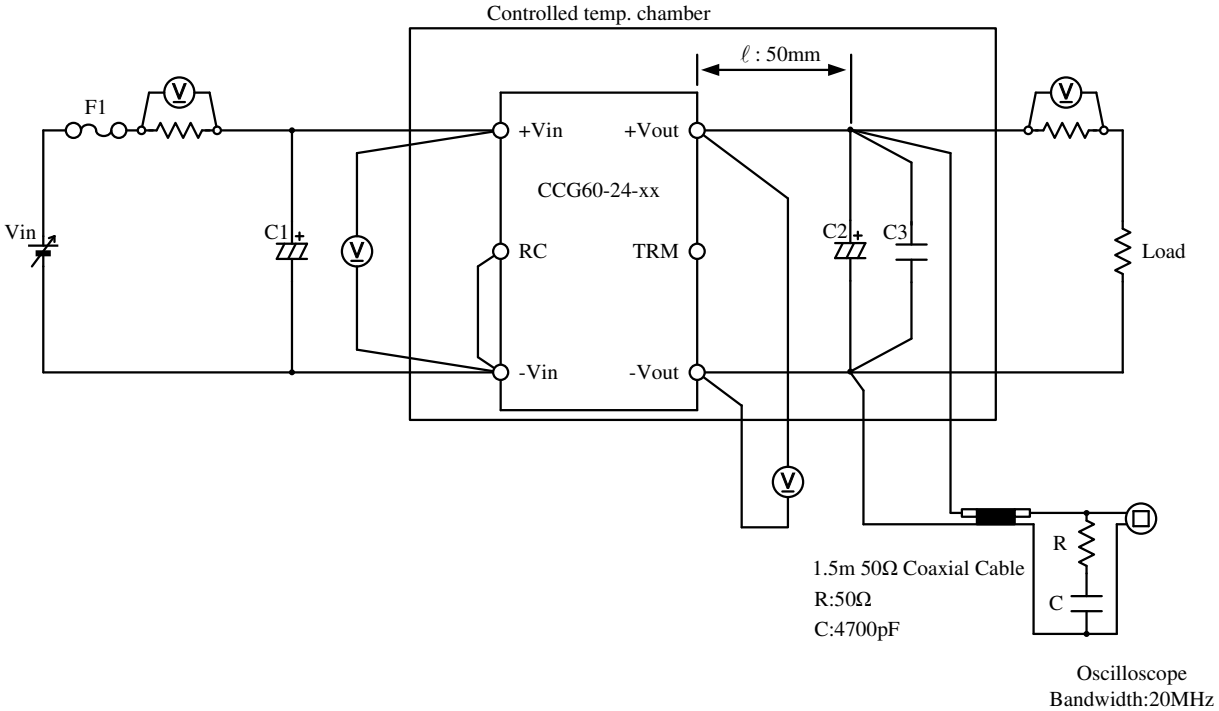
(2) 入力サージ電流（突入電流）波形 Inrush current waveform



CCG60-24-xxの入力サージ電流特性はCCG60-24-05と同等です。

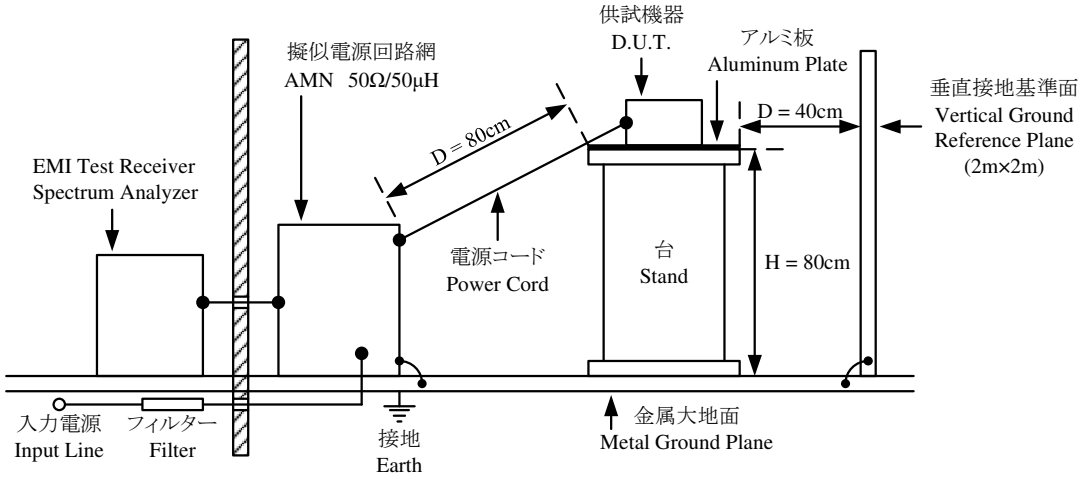
CCG60-24-xx have the same Inrush current characteristics as CCG60-24-05 data.

(3) 出力リップルノイズ電圧、波形 Output ripple and noise voltage and waveform

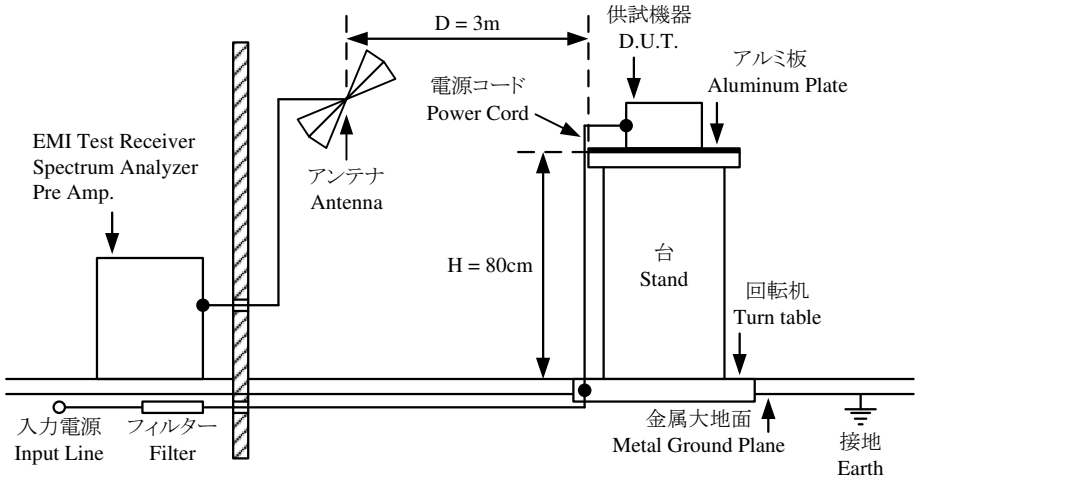


(4) EMI特性　Electro-Magnetic Interference characteristics

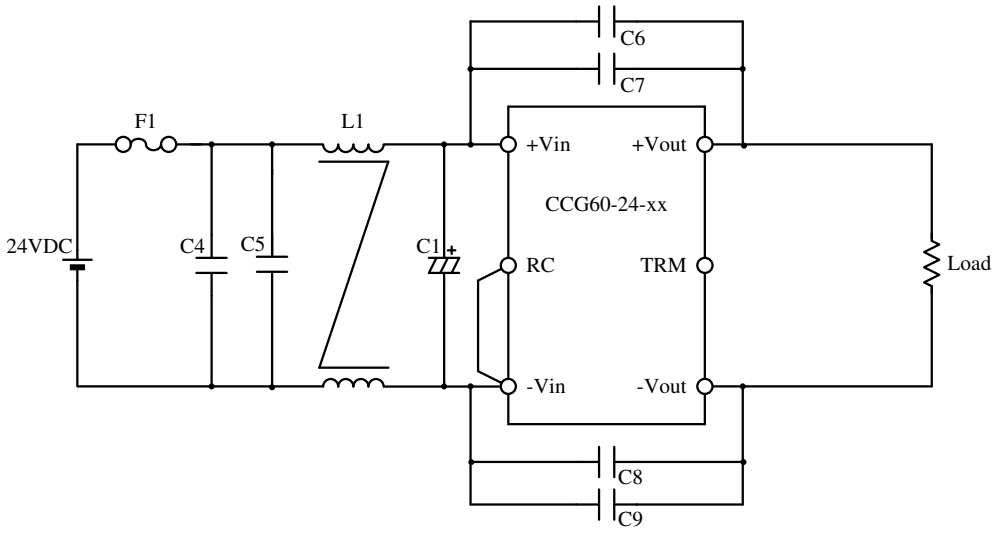
(a) 雑音端子電圧(帰還ノイズ) Conducted Emission Noise



(b) 雑音電界強度(輻射ノイズ) Radiated Emission Noise



VCCI class A 対応アプリケーション　VCCI class A application system



*詳細な周辺パラメータ情報(参照用)

The detailed peripheral parameter information (for reference)

	SYMBOL		PRODUCT TYPE	ITEM DESCRIPTION	NOTE	MANUFACTURE
1	F1		Fuse	25CF18A	72V, 18A	SOC
2	C1		Electrolytic Cap.	EKZM500ELL151MJC5S	50V, 150µF	Nippon Chemi-Con
3	C2	3.3V Model	Electrolytic Cap.	HHXC250ARA471MJC5G	25V, 470µF	Nippon Chemi-Con
4		5V Model	Electrolytic Cap.	HHXC250ARA471MJC5G	25V, 470µF	Nippon Chemi-Con
5		12V Model	Electrolytic Cap.	HHXC350ARA151MJA0G	35V, 150µF	Nippon Chemi-Con
6		15V Model	Electrolytic Cap.	HHXC630GRA101MJC5G	63V, 100µF	Nippon Chemi-Con
7		24V Model	Electrolytic Cap.	HHXC800ARA820MJC5G	80V, 82µF	Nippon Chemi-Con
8	C3		Ceramic Cap.	C3216X7R1H106K	50V, 10µF	TDK
9	C4,C5		Ceramic Cap.	GRM32EC72A106K	100V, 10µF	MURATA
10	C6, C7, C8, C9		Ceramic Cap.	C3225X7S3D222K	2kV, 2200pF	TDK
11	L1		Common Mode Choke Coil	SRF1206A-102Y	12.5µH, 6A	BOURNS

1-2. 使用測定機器 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL1740EL
2	DIGITAL MULTIMETER	AGILENT	34970A
3	CURRENT PROBE	YOKOGAWA ELECT.	701931, 701932
4	SHUNT RESISTER	YOKOGAWA ELECT.	2215
5	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ-164WL
6	DC POWER SUPPLY	KIKUSUI	PWR400L
7	CONTROLLED TEMP. CHAMBER	ESPEC	SU-261
8	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESR3
9	PRE AMP.	SONOMA	310N
10	AMN	KIKUSUI	KNW-242C
11	ANTENNA	SCHWARZBECK	BBA9106/VHA9103
12	ANTENNA	SCHWARZBECK	UHALP9107

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

3.3V　1. Regulation - line and load　　Condition　Ta :　25 ℃

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	3.2967V	3.2971V	3.2970V	3.2968V	0.4mV	0.012%
50%	3.2956V	3.2960V	3.2959V	3.2957V	0.4mV	0.012%
100%	3.2949V	3.2952V	3.2950V	3.2950V	0.3mV	0.009%
Load	1.8mV	1.9mV	2.0mV	1.8mV		
regulation	0.055%	0.058%	0.061%	0.055%		

2. Temperature drift　　Conditions　Vin :　24 VDC
Io :　100 %

Ta	-40°C	25°C	85°C	Temperature stability	
Vo	3.2884V	3.2950V	3.3026V	14.2mV	0.430%

5V　1. Regulation - line and load　　Condition　Ta :　25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	4.9949V	4.9955V	4.9955V	4.9950V	0.6mV	0.012%
50%	4.9936V	4.9942V	4.9941V	4.9937V	0.6mV	0.012%
100%	4.9928V	4.9932V	4.9931V	4.9927V	0.5mV	0.010%
Load	2.1mV	2.3mV	2.4mV	2.3mV		
regulation	0.042%	0.046%	0.048%	0.046%		

2. Temperature drift　　Conditions　Vin :　24 VDC
Io :　100 %

Ta	-40°C	25°C	85°C	Temperature stability	
Vo	4.9882V	4.9931V	4.9993V	11.1mV	0.222%

12V　1. Regulation - line and load　　Condition　Ta :　25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	12.0065V	12.0069V	12.0065V	12.0044V	2.5mV	0.021%
50%	12.0062V	12.0062V	12.0060V	12.0040V	2.2mV	0.018%
100%	12.0058V	12.0055V	12.0054V	12.0035V	2.3mV	0.019%
Load	0.7mV	1.4mV	1.1mV	0.9mV		
regulation	0.006%	0.012%	0.009%	0.007%		

2. Temperature drift　　Conditions　Vin :　24 VDC
Io :　100 %

Ta	-40°C	25°C	85°C	Temperature stability	
Vo	11.9869V	12.0054V	12.0072V	20.3mV	0.169%

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

15V 1. Regulation - line and load Condition Ta : 25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	15.0345V	15.0359V	15.0352V	15.0338V	2.1mV	0.014%
50%	15.0342V	15.0357V	15.0352V	15.0334V	2.3mV	0.015%
100%	15.0345V	15.0357V	15.0351V	15.0335V	2.2mV	0.015%
Load	0.3mV	0.2mV	0.1mV	0.4mV		
regulation	0.002%	0.001%	0.001%	0.003%		

2. Temperature drift Conditions Vin : 24 VDC
Io : 100 %

Ta	-40°C	25°C	85°C	Temperature stability	
Vo	14.9874V	15.0351V	15.0714V	84.0mV	0.560%

24V 1. Regulation - line and load Condition Ta : 25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	24.0176V	24.0170V	24.0153V	24.0130V	4.6mV	0.019%
50%	24.0163V	24.0164V	24.0154V	24.0136V	2.8mV	0.012%
100%	24.0156V	24.0157V	24.0150V	24.0132V	2.5mV	0.010%
Load	2.0mV	1.3mV	0.4mV	0.6mV		
regulation	0.013%	0.009%	0.003%	0.004%		

2. Temperature drift Conditions Vin : 24 VDC
Io : 100 %

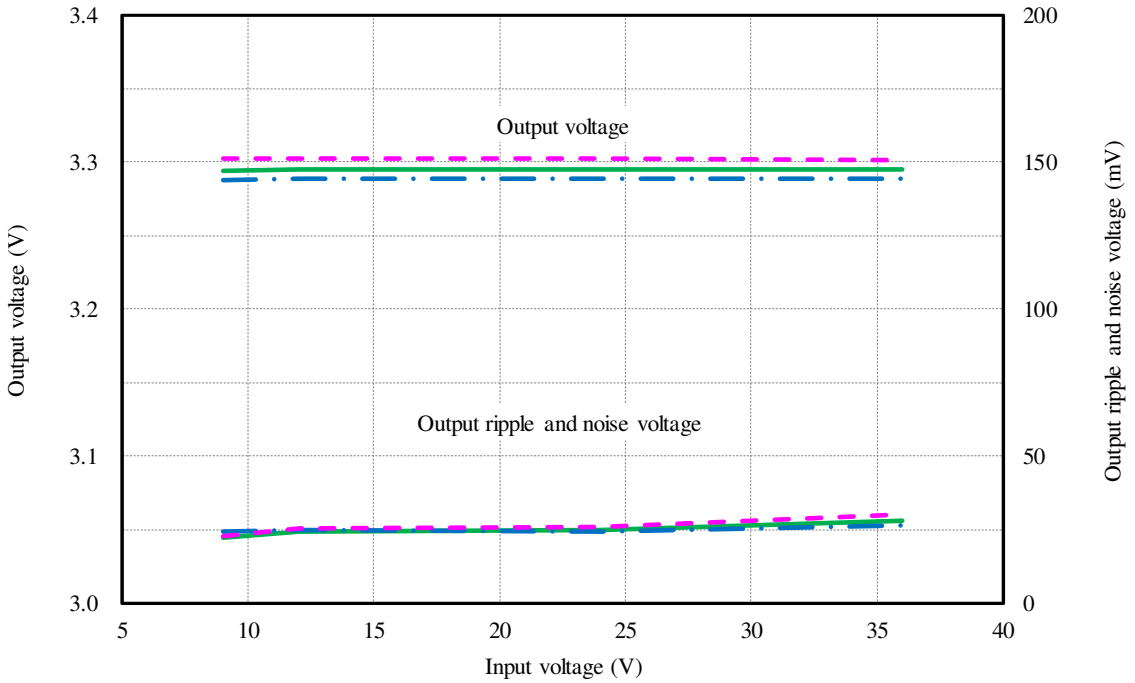
Ta	-40°C	25°C	85°C	Temperature stability	
Vo	23.8782V	24.0150V	24.0117V	136.8mV	0.912%

(2) 出力電圧・出力リップルノイズ電圧 対 入力電圧

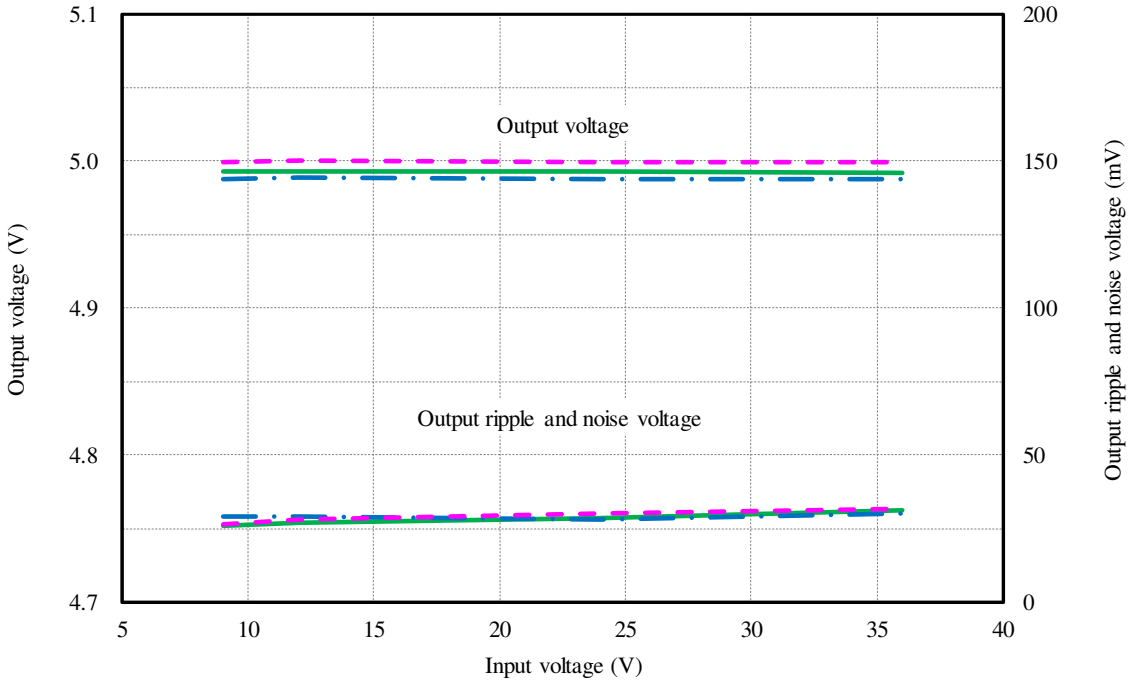
Output voltage and Output ripple and noise voltage vs. Input voltage

Conditions Io : 100 %
Ta : -40 °C
: 25 °C
: 85 °C

3.3V



5V

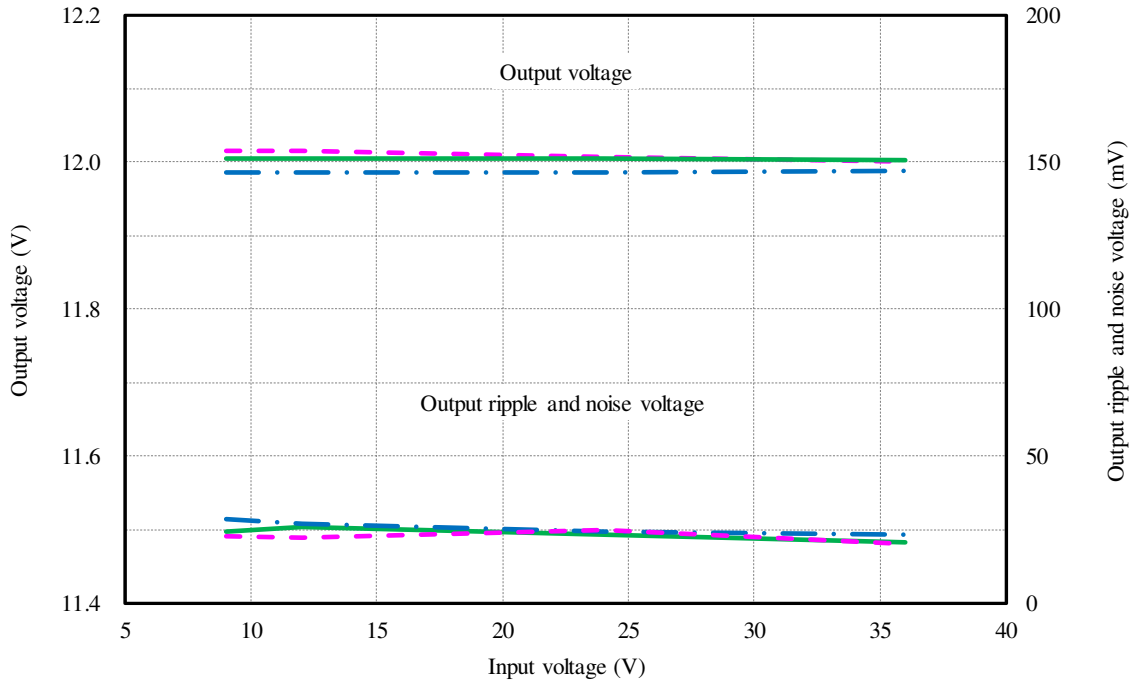


(2) 出力電圧・出力リップルノイズ電圧 対 入力電圧

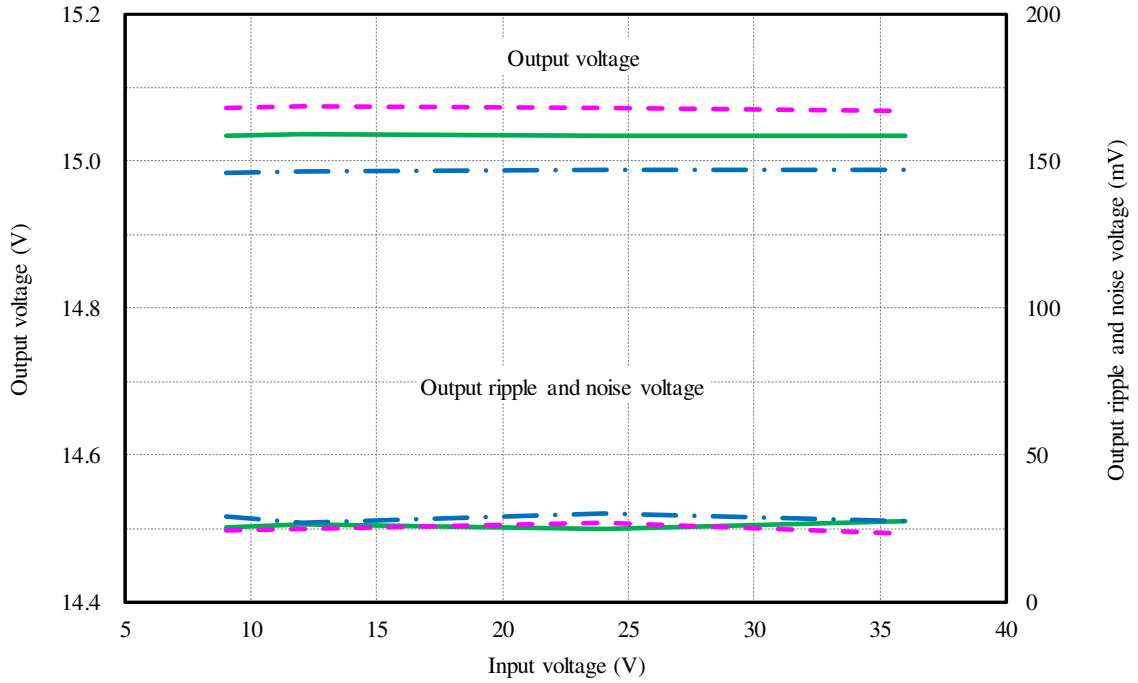
Output voltage and Output ripple and noise voltage vs. Input voltage

Conditions Io : 100 %
Ta : -40 °C
: 25 °C
: 85 °C

12V



15V

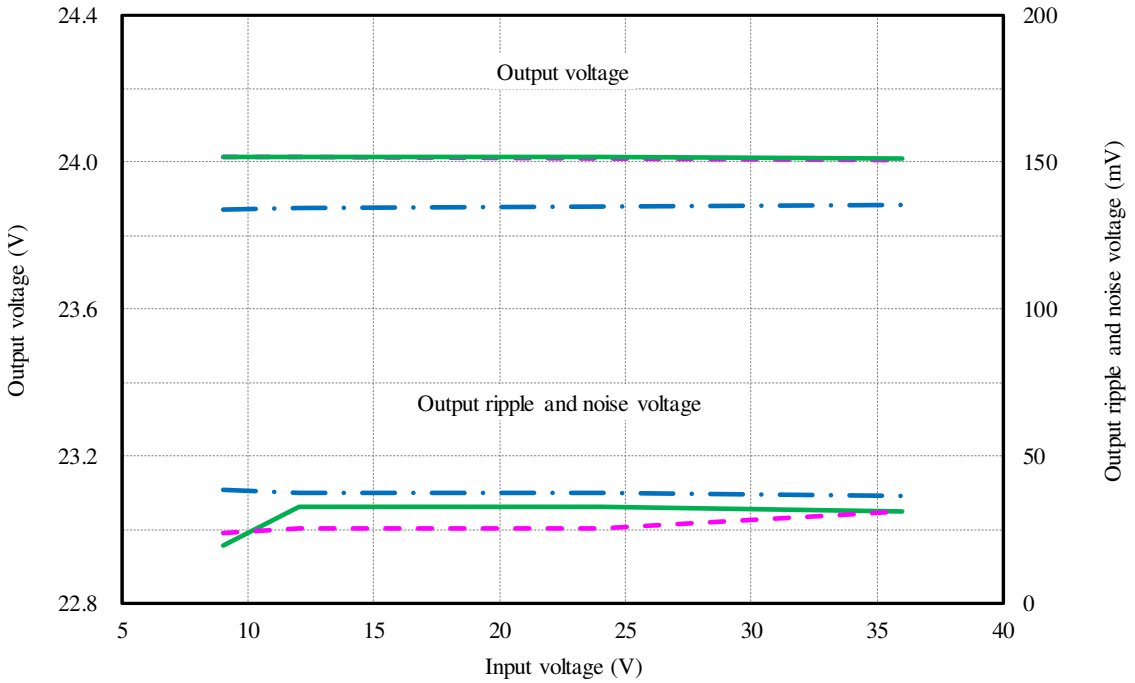


(2) 出力電圧・出力リップルノイズ電圧 対 入力電圧

Output voltage and Output ripple and noise voltage vs. Input voltage

Conditions Io : 100 %
Ta : -40 °C
: 25 °C
: 85 °C

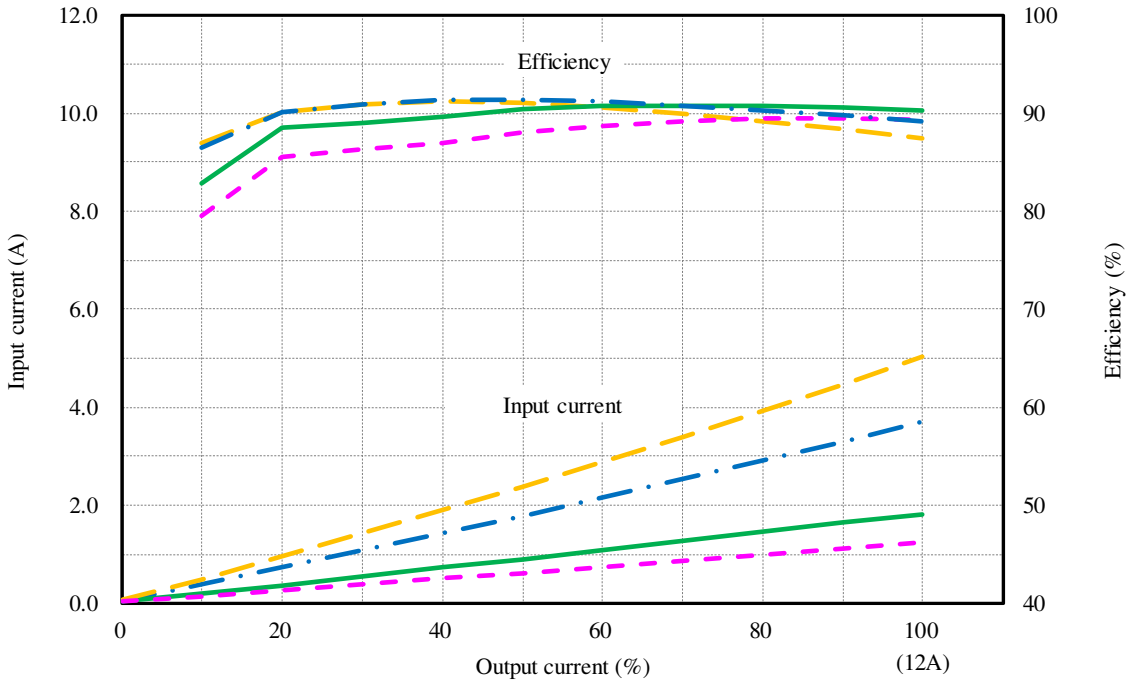
24V



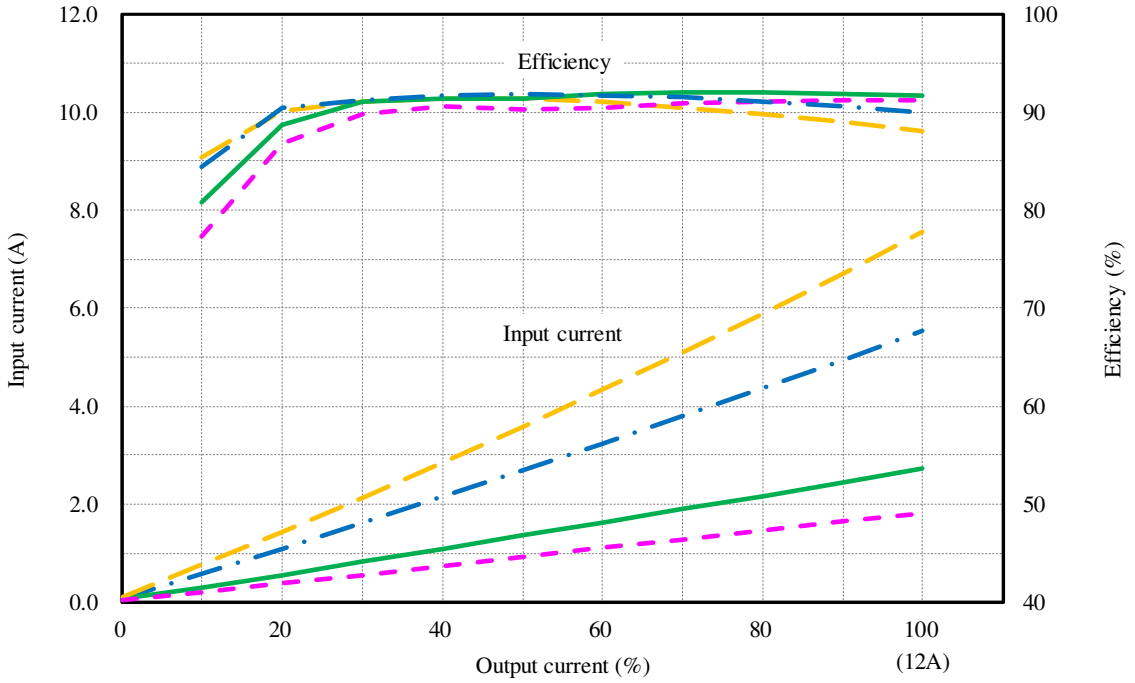
(3) 入力電流・効率 対 出力電流 Input current and Efficiency vs. Output current

Conditions Vin : 9 VDC
: 12 VDC
: 24 VDC
: 36 VDC
Ta : 25 °C

3.3V



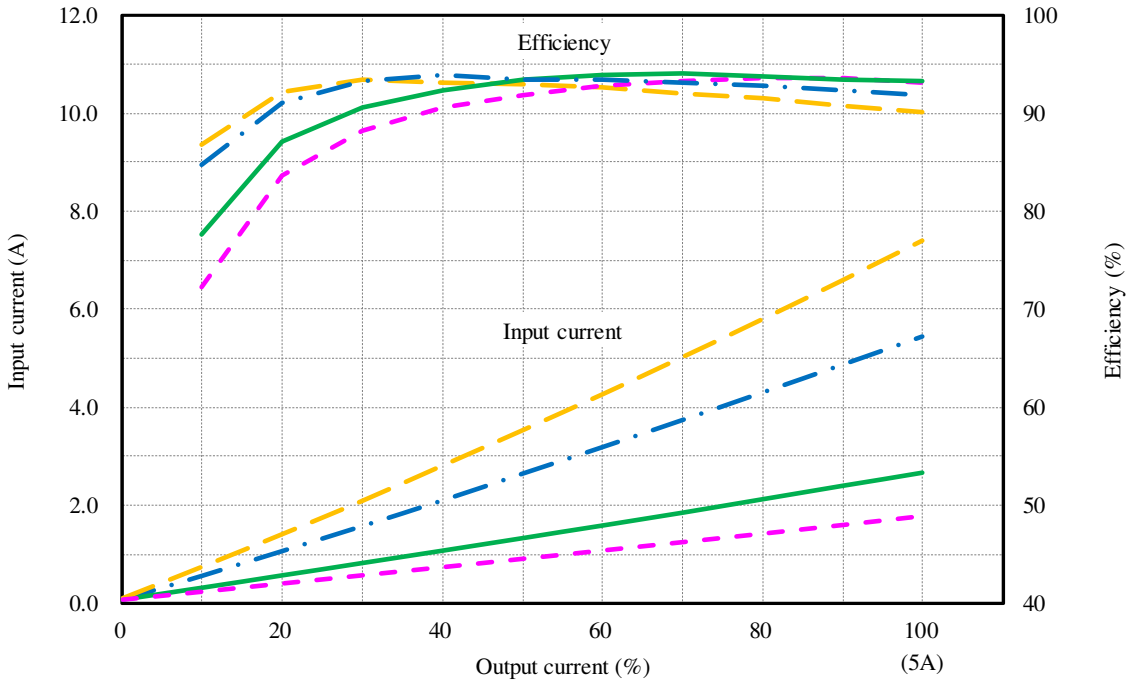
5V



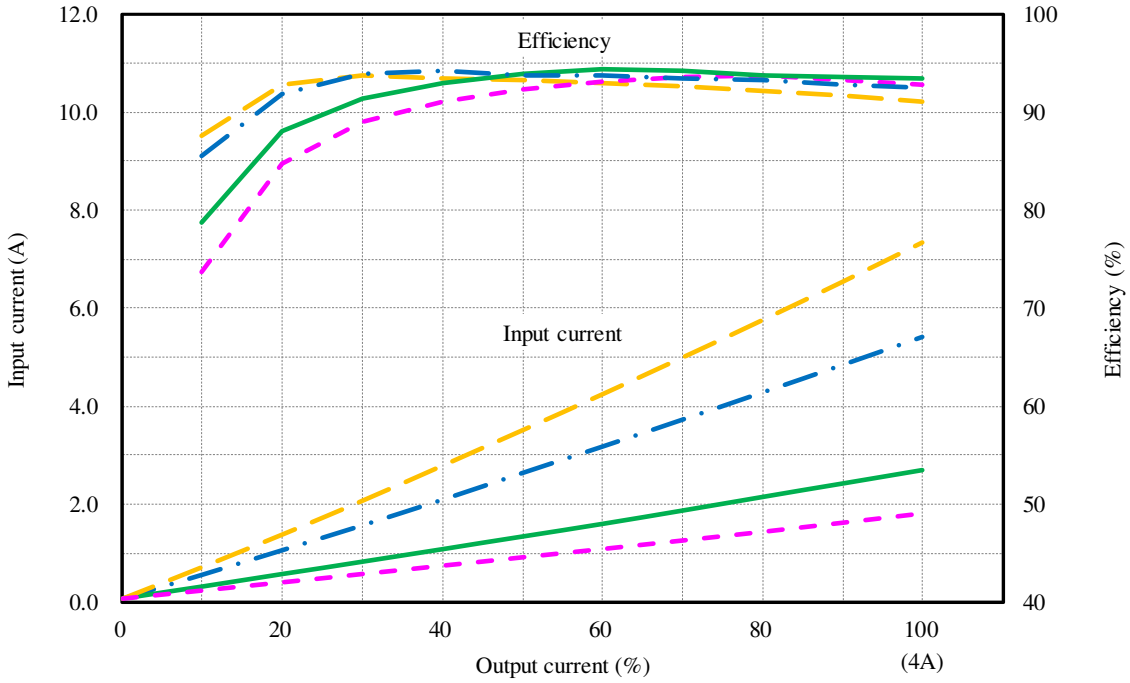
(3) 入力電流・効率 対 出力電流 Input current and Efficiency vs. Output current

Conditions Vin : 9 VDC
: 12 VDC
: 24 VDC
: 36 VDC
Ta : 25 °C

12V



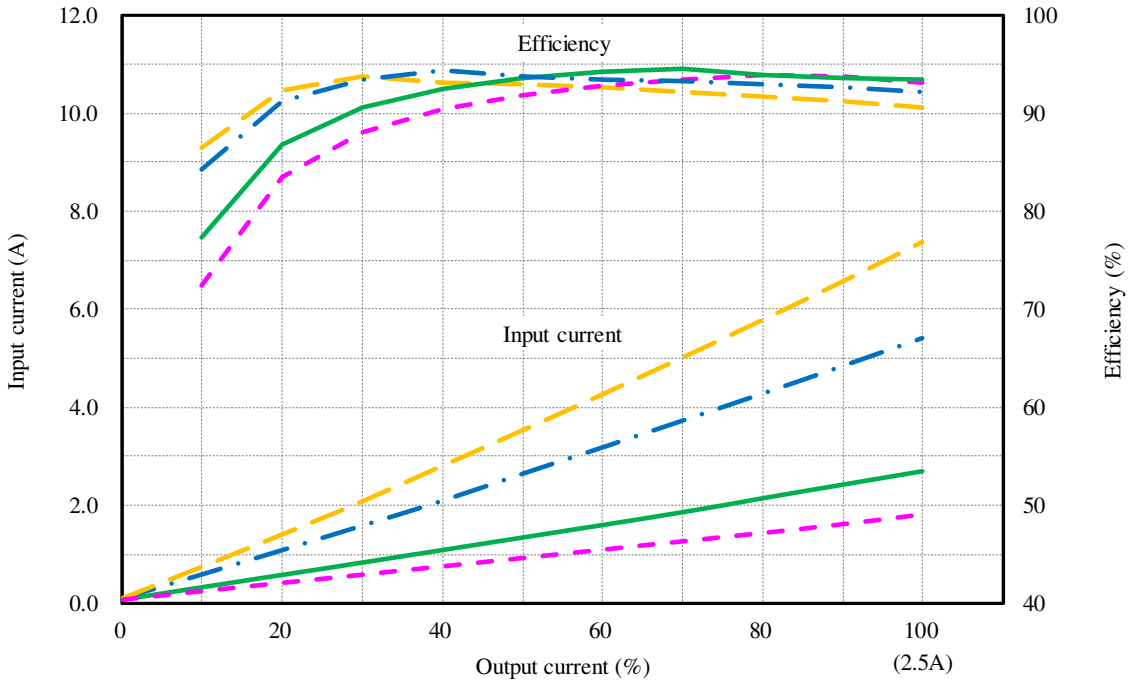
15V



(3) 入力電流・効率 対 出力電流 Input current and Efficiency vs. Output current

Conditions Vin : 9 VDC
: 12 VDC
: 24 VDC
: 36 VDC
Ta : 25 °C

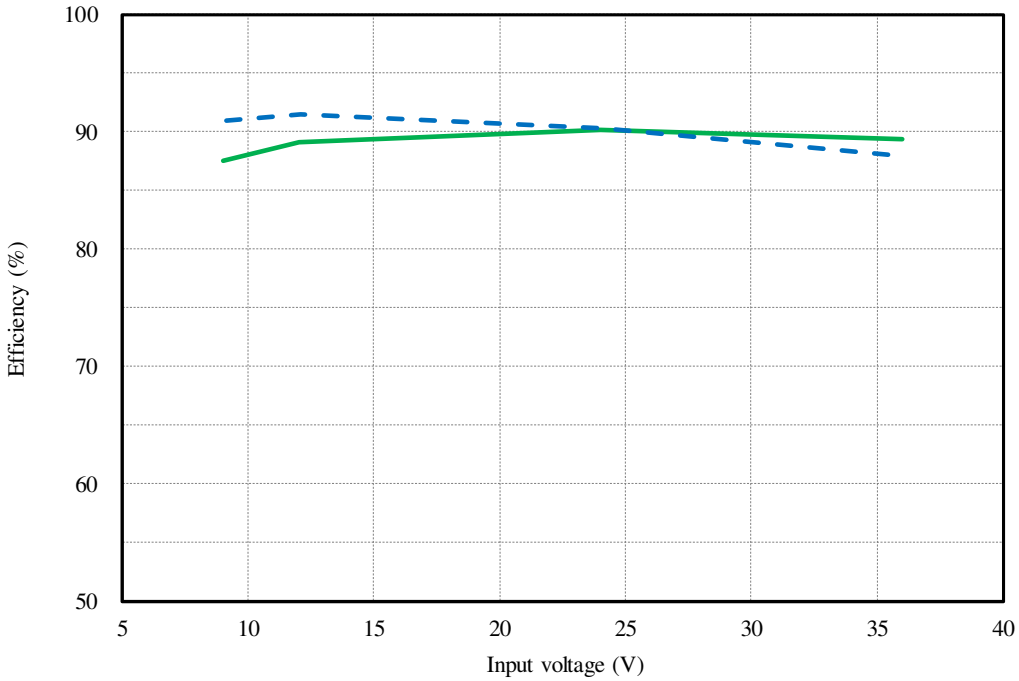
24V



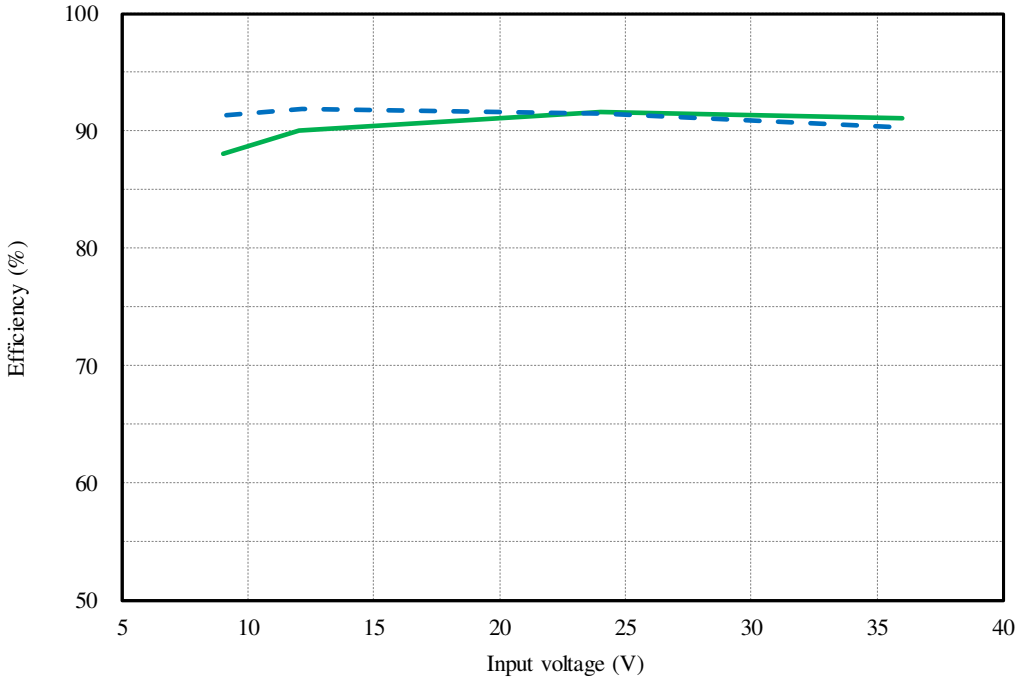
(4) 効率 対 入力電圧 Efficiency vs. Input voltage

Conditions Io : 50 %
: 100 %
Ta : 25 °C

3.3V



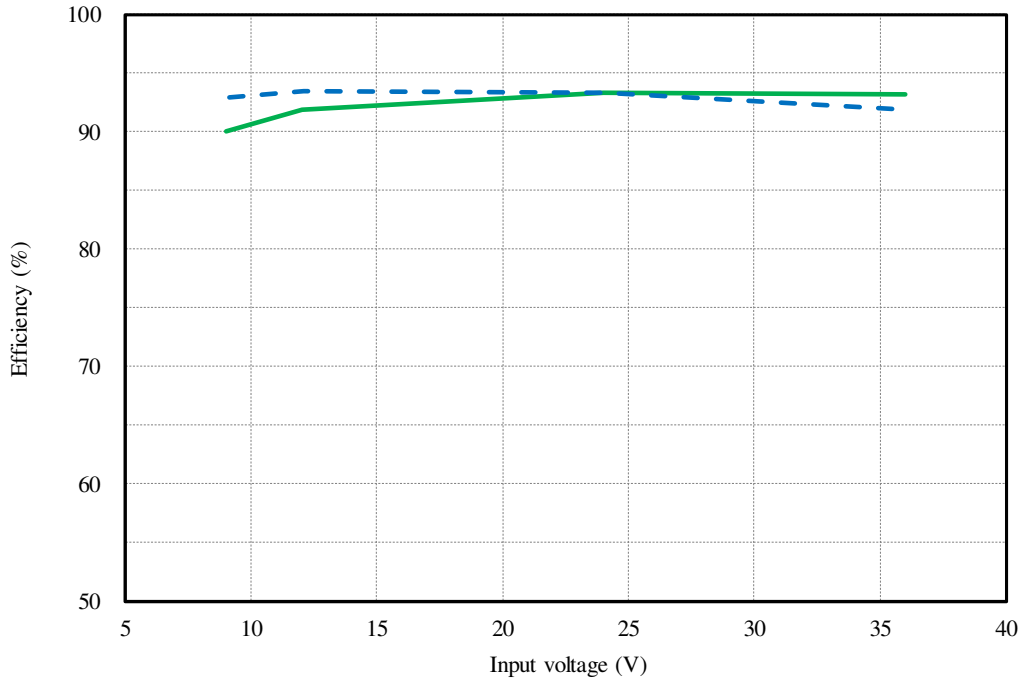
5V



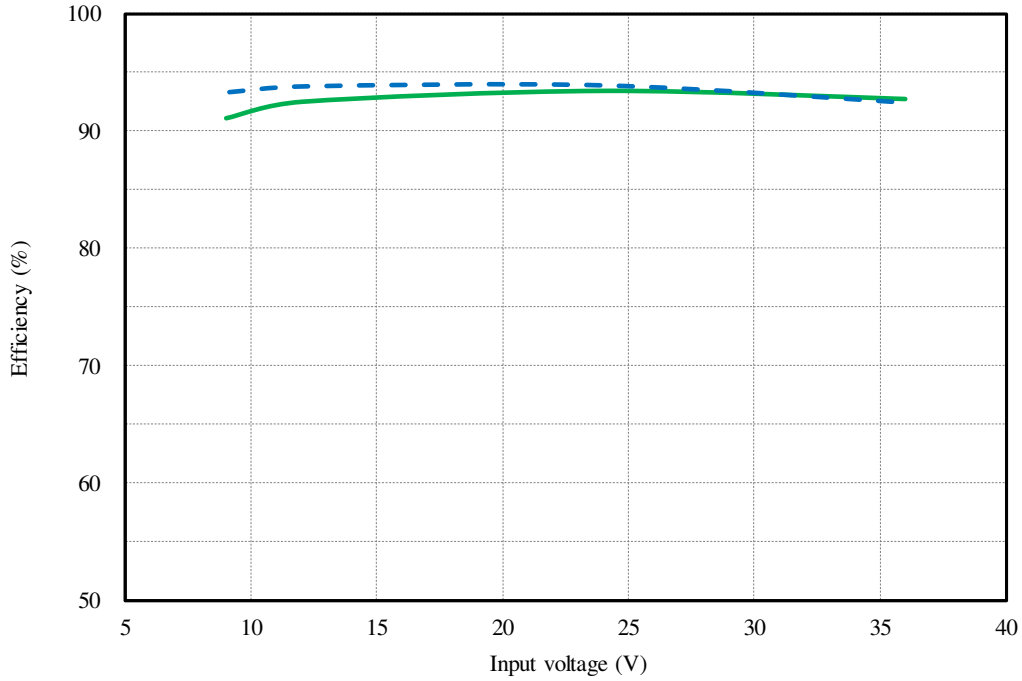
(4) 効率 対 入力電圧 Efficiency vs. Input voltage

Conditions Io : 50 %
: 100 %
Ta : 25 °C

12V



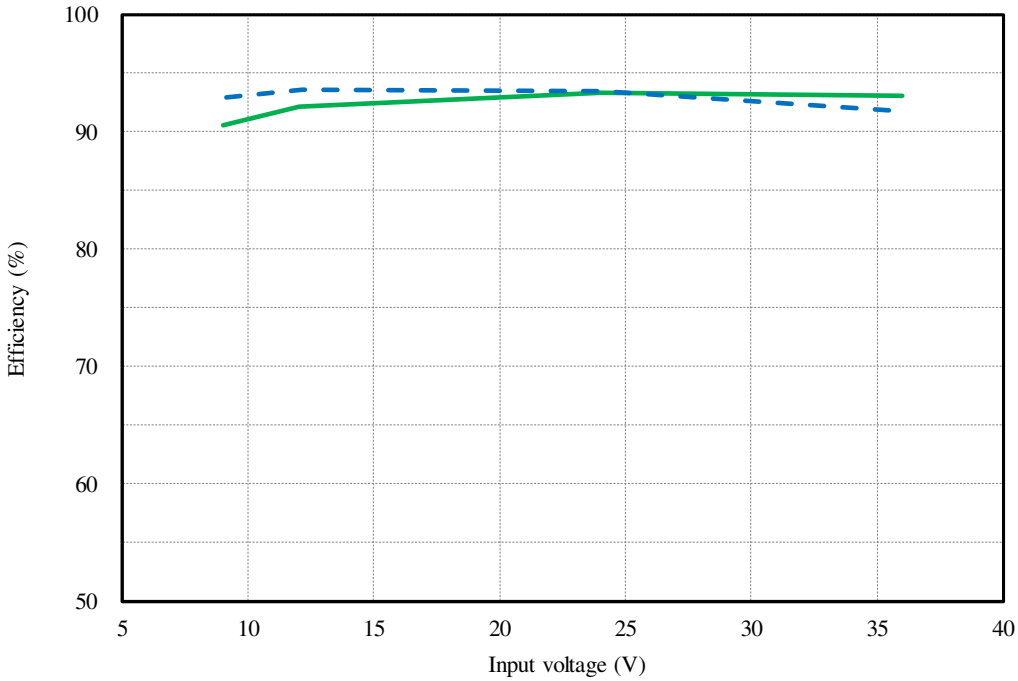
15V



(4) 効率 対 入力電圧 Efficiency vs. Input voltage

Conditions Io : 50 %
: 100 %
Ta : 25 °C

24V



(5) 起動･遮断電圧特性 Start up and Drop out voltage characteristics

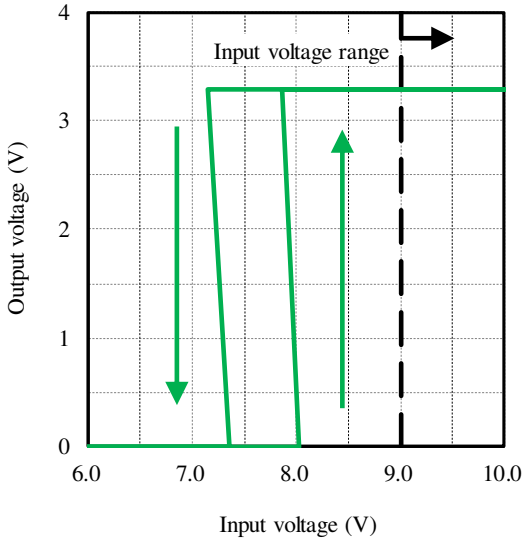
出力電圧 対 入力電圧
Output voltage vs. Input voltage

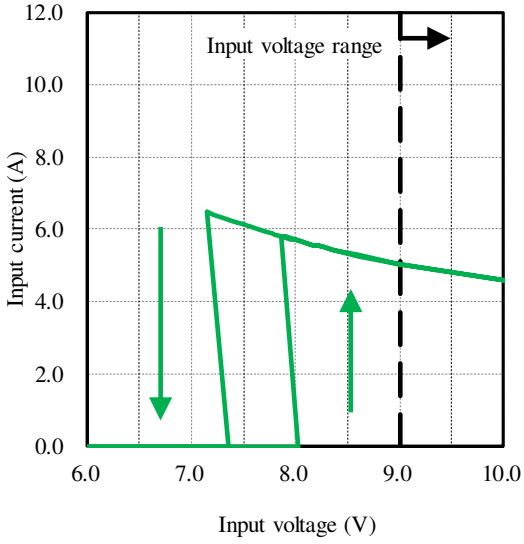
Conditions Io : 100 %
Ta : 25 °C

入力電流 対 入力電圧
Input current vs. Input voltage

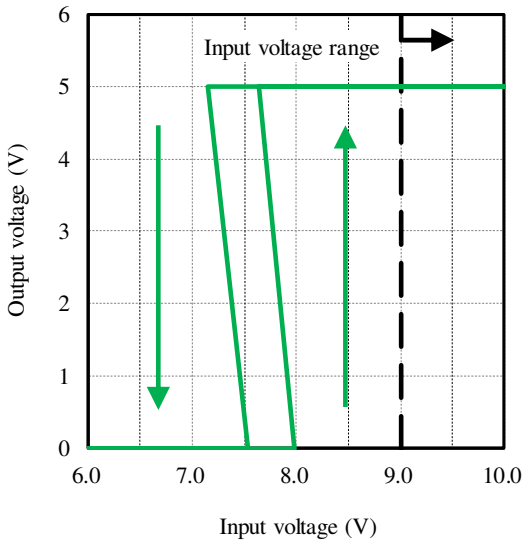
Conditions Io : 100 %
Ta : 25 °C

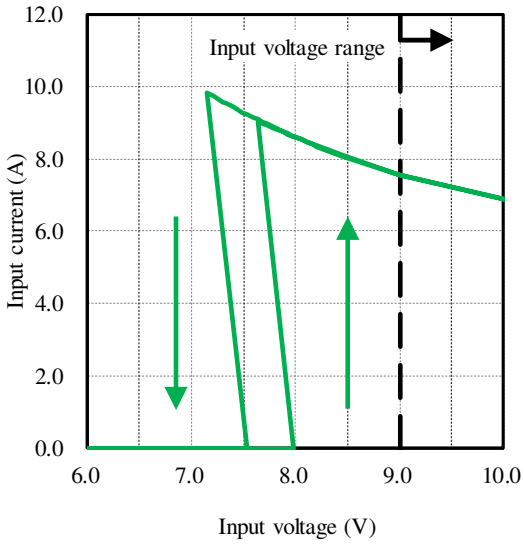
3.3V





5V





(5) 起動･遮断電圧特性 Start up and Drop out voltage characteristics

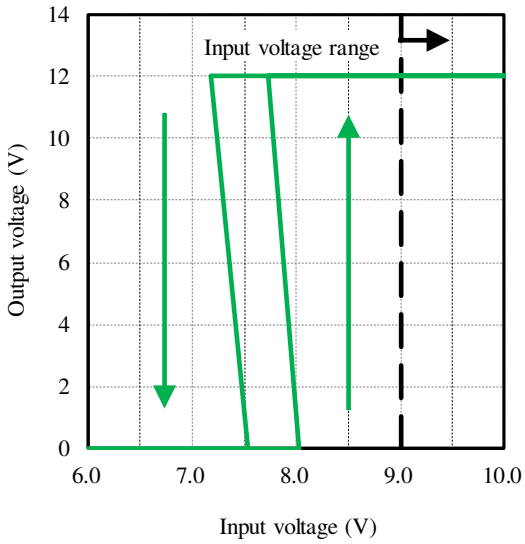
出力電圧 対 入力電圧
Output voltage vs. Input voltage

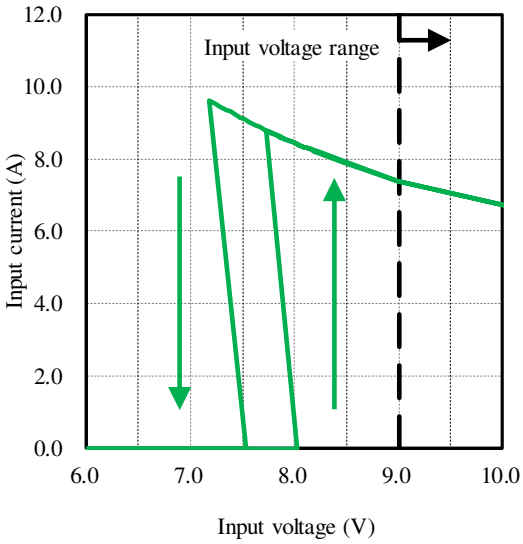
Conditions Io : 100 %
Ta : 25 °C

入力電流 対 入力電圧
Input current vs. Input voltage

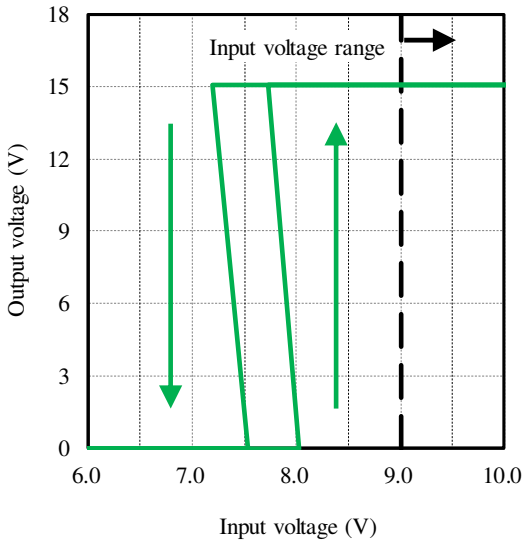
Conditions Io : 100 %
Ta : 25 °C

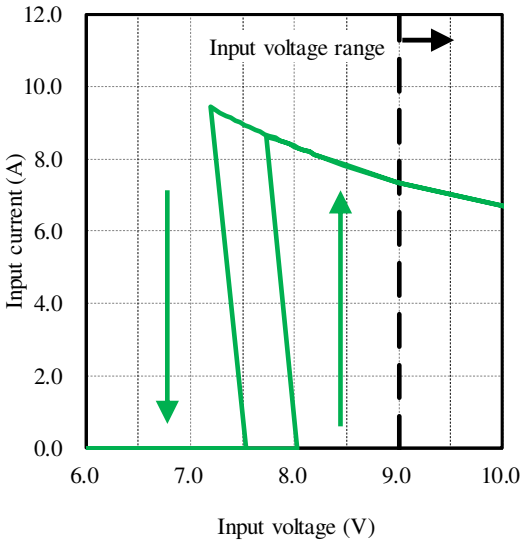
12V





15V

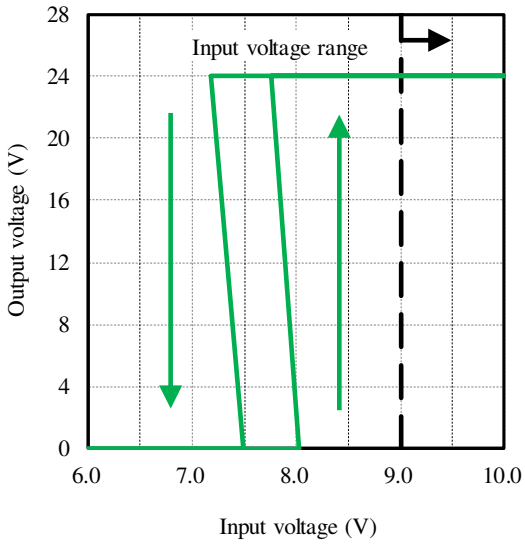




(5) 起動･遮断電圧特性 Start up and Drop out voltage characteristics

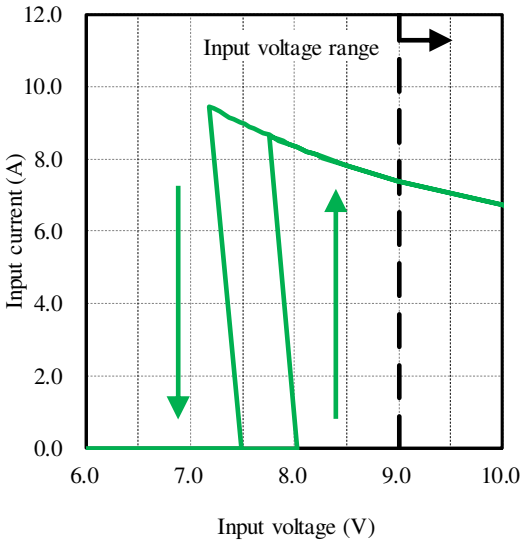
出力電圧 対 入力電圧
Output voltage vs. Input voltage

Conditions Io : 100 %
Ta : 25 °C



入力電流 対 入力電圧
Input current vs. Input voltage

Conditions Io : 100 %
Ta : 25 °C

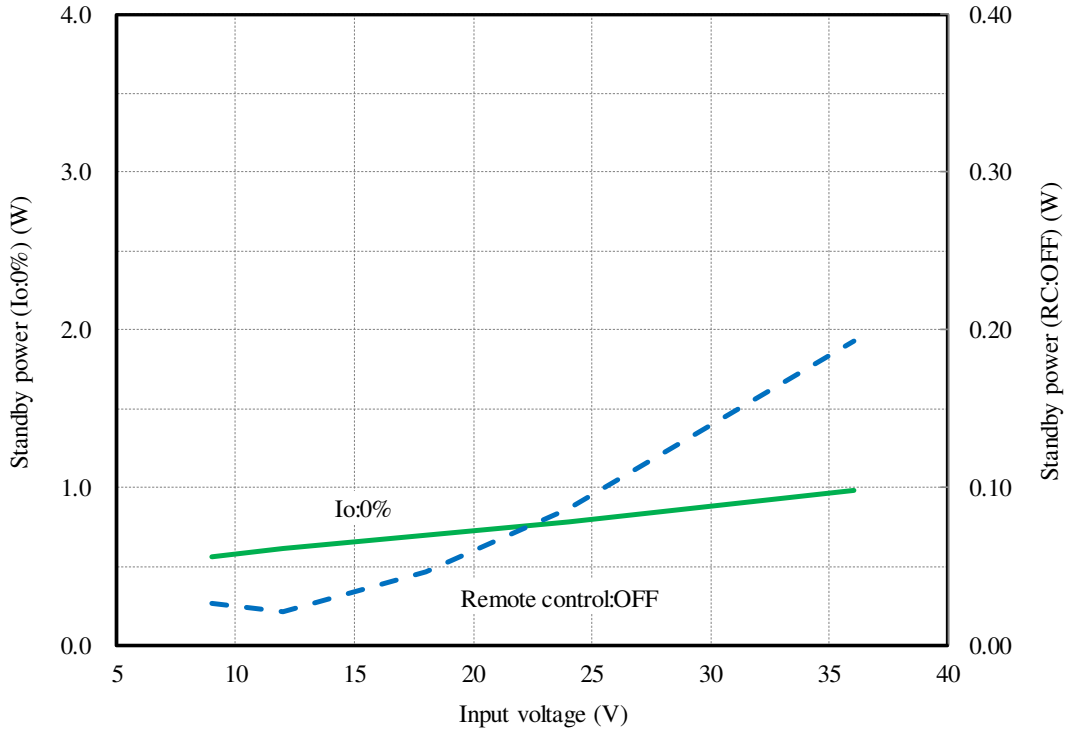


24V

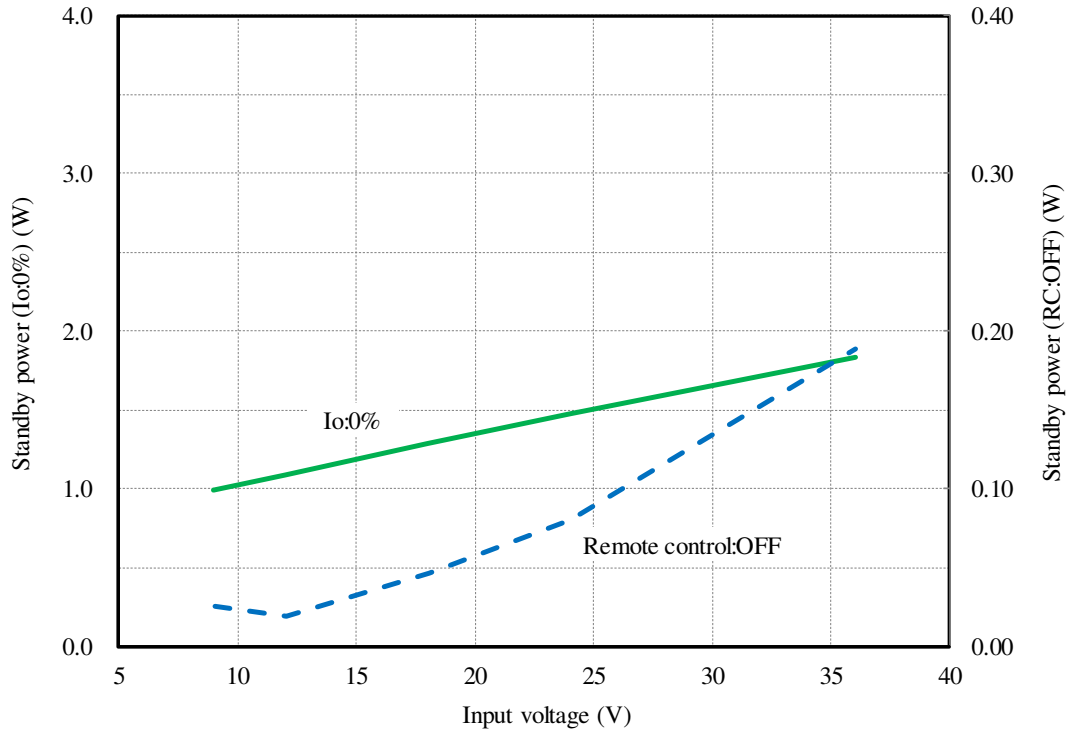
2-2. 待機電力特性 Standby power characteristics

Condition Ta : 25 °C

3.3V



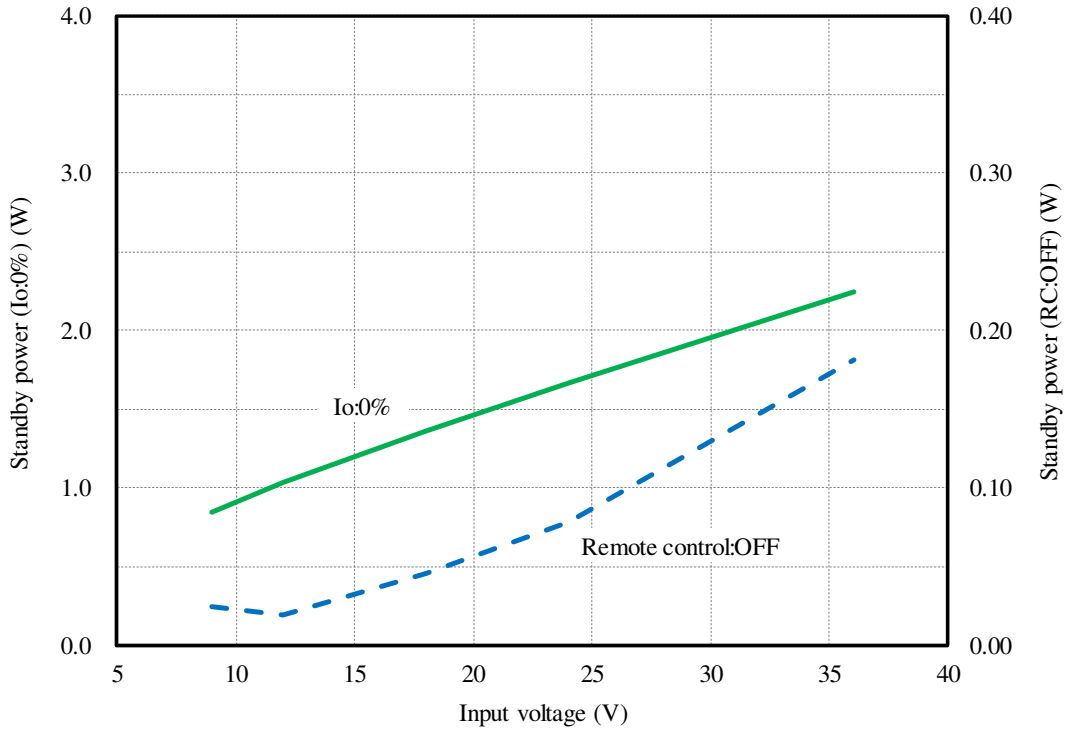
5V



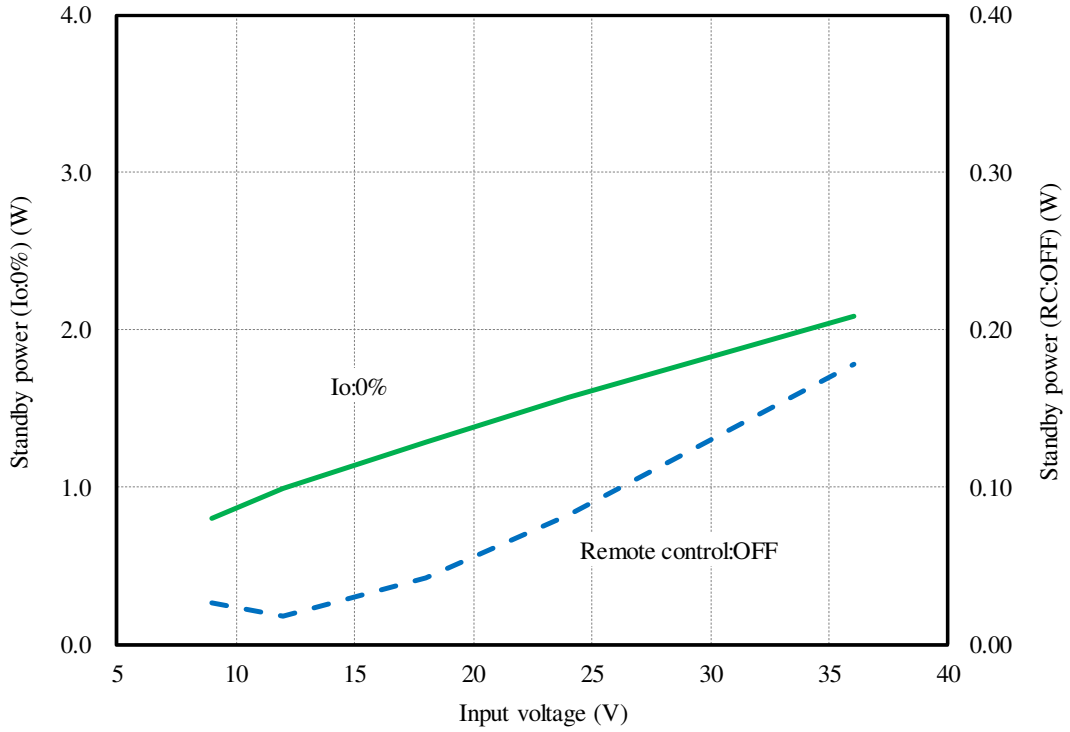
2-2. 待機電力特性 Standby power characteristics

Condition Ta : 25 °C

12V



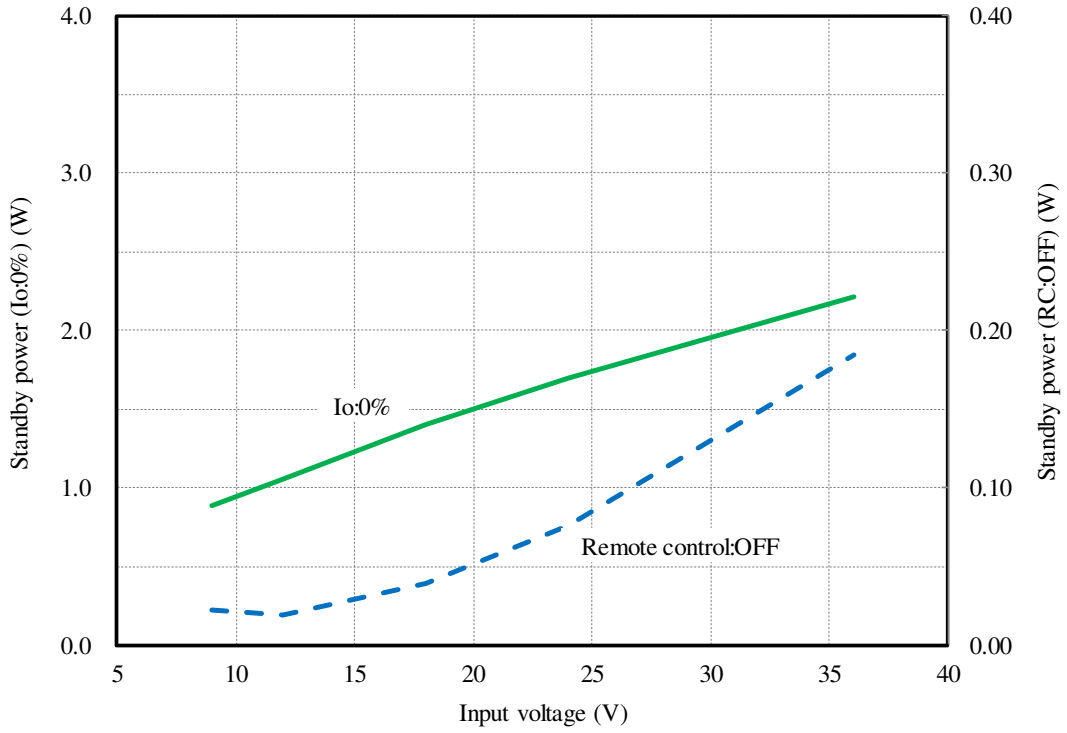
15V



2-2. 待機電力特性 Standby power characteristics

Condition Ta : 25 °C

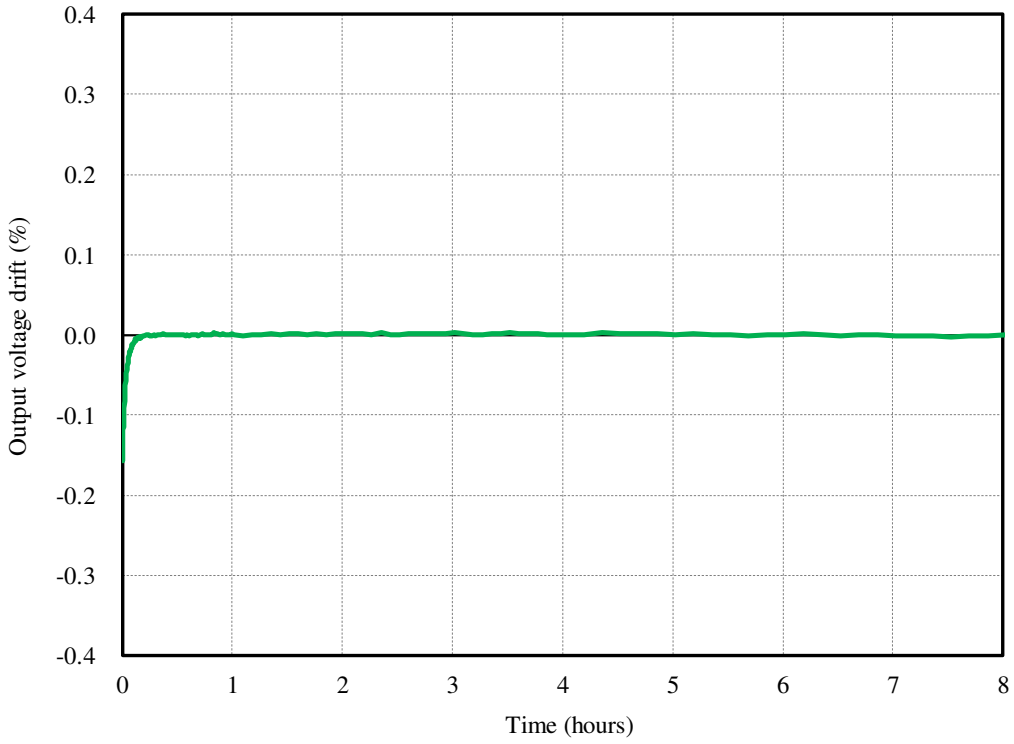
24V



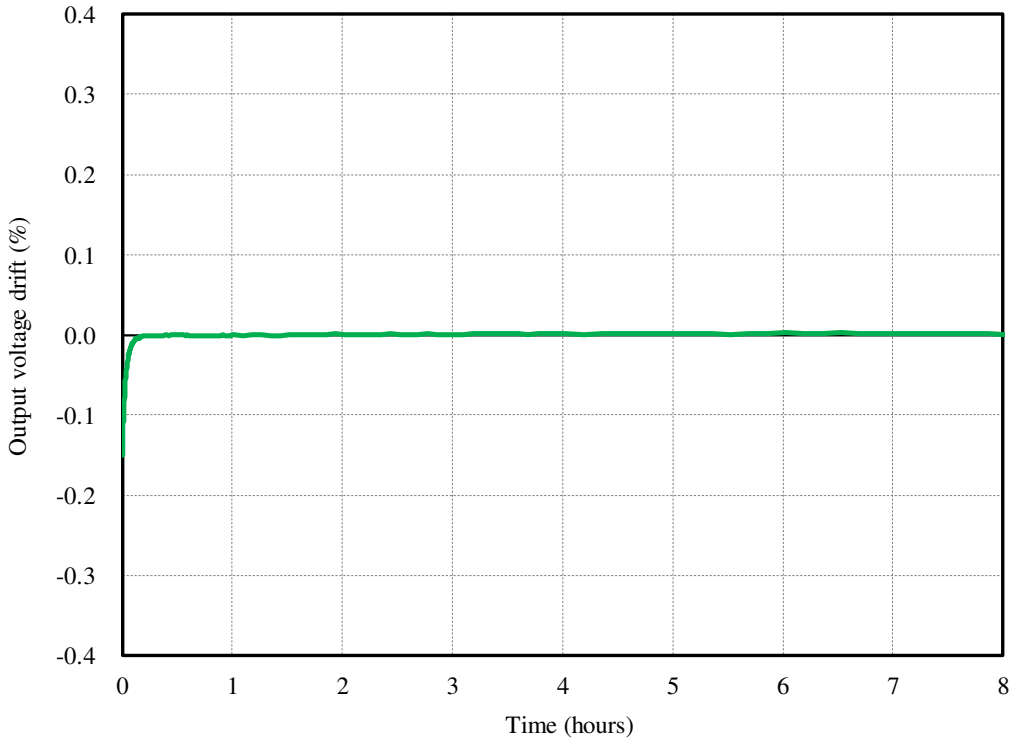
2-3. 通電ドリフト特性 Warm up voltage drift characteristics

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

3.3V



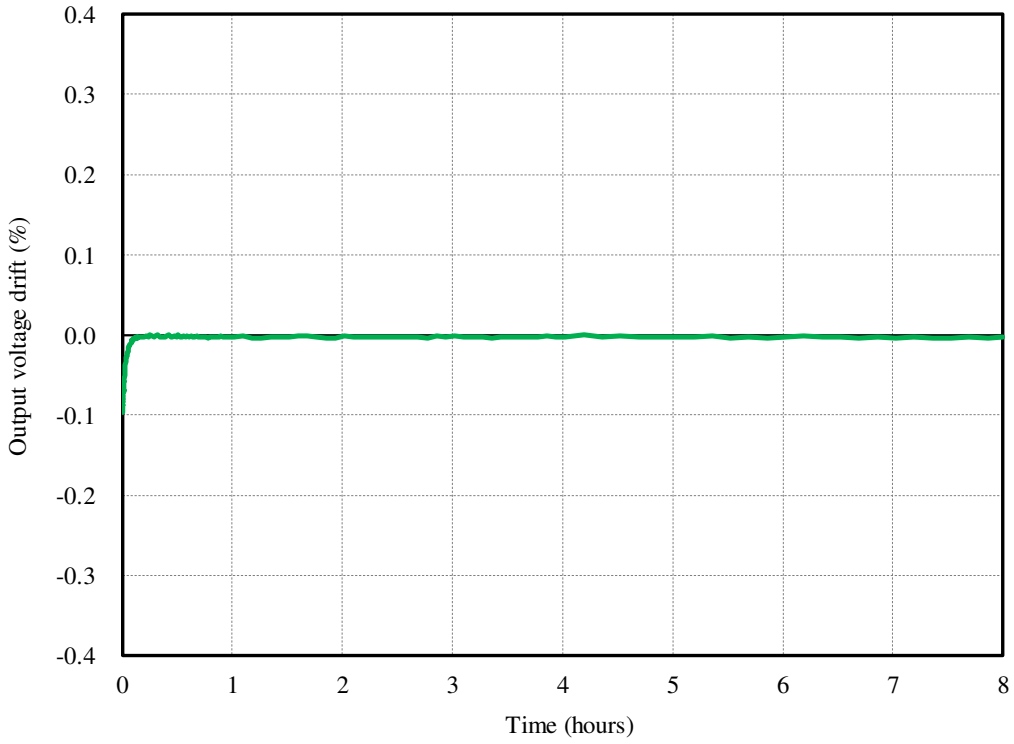
5V



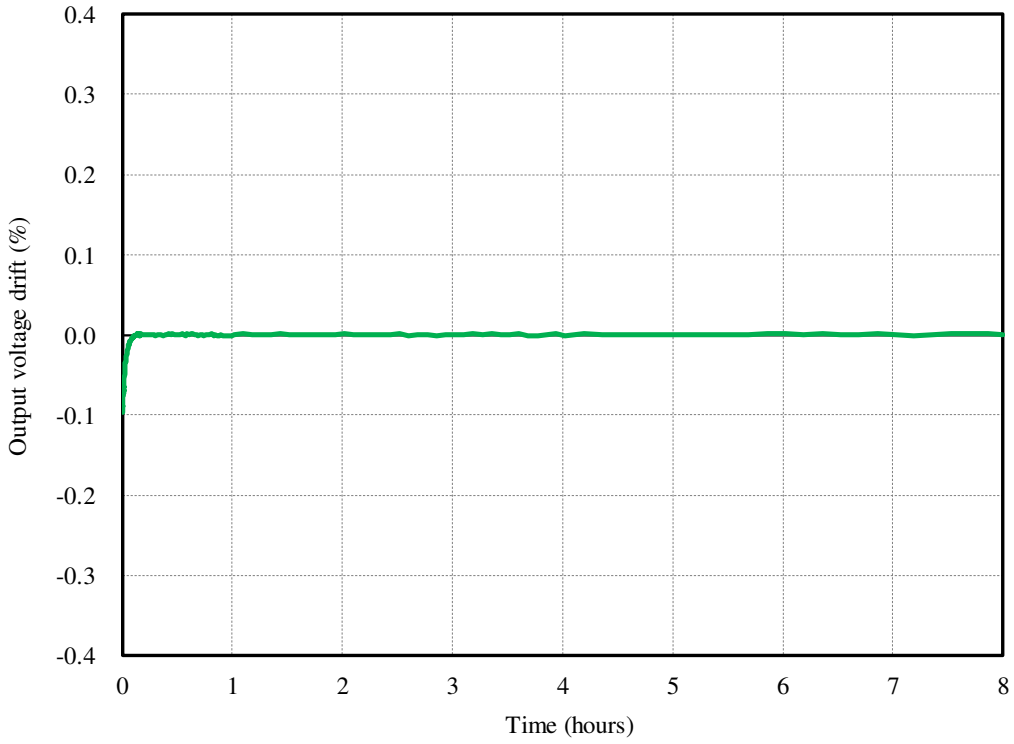
2-3. 通電ドリフト特性 Warm up voltage drift characteristics

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

12V



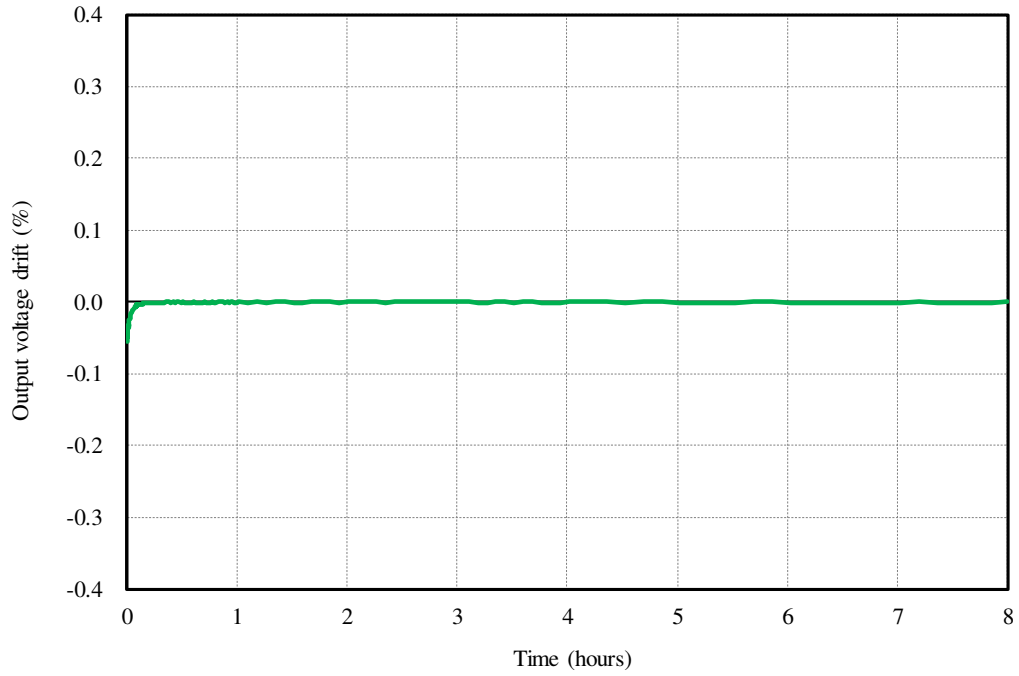
15V



2-3. 通電ドリフト特性 Warm up voltage drift characteristics

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

24V



2-4. 過電流保護特性 Over current protection (OCP) characteristics

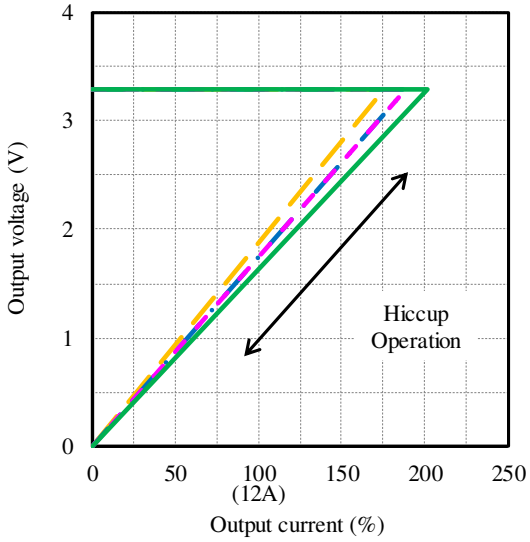
入力電圧依存性
Input voltage dependence

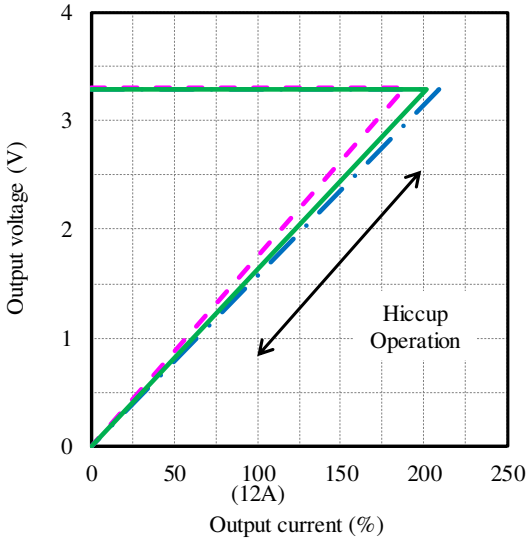
Conditions Vin : 9 VDC
: 12 VDC
: 24 VDC
: 36 VDC
Ta : 25 °C

周囲温度依存性
Ambient temperature dependence

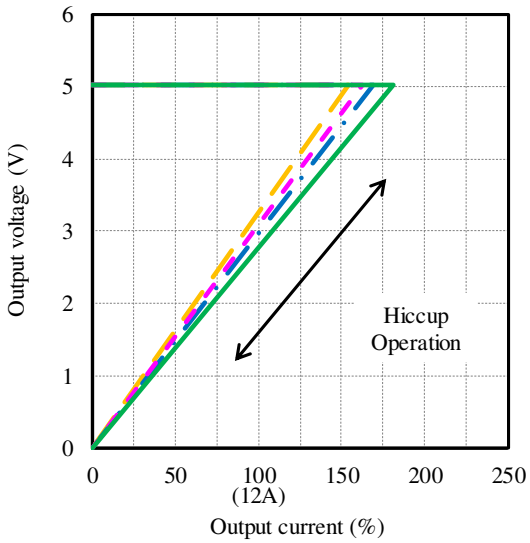
Conditions Vin : 24 VDC
Ta : -40 °C
: 25 °C
: 85 °C

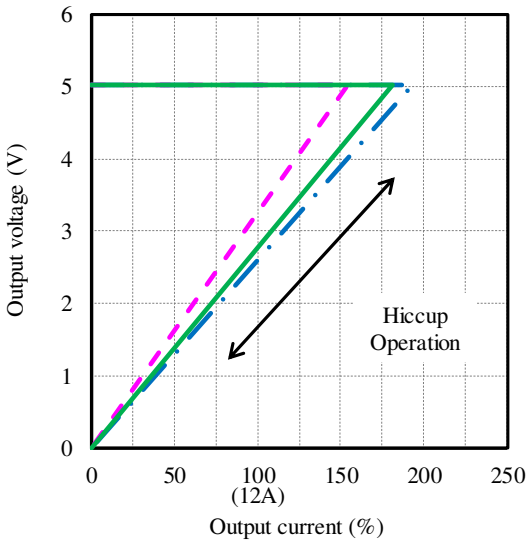
3.3V





5V





2-4. 過電流保護特性 Over current protection (OCP) characteristics

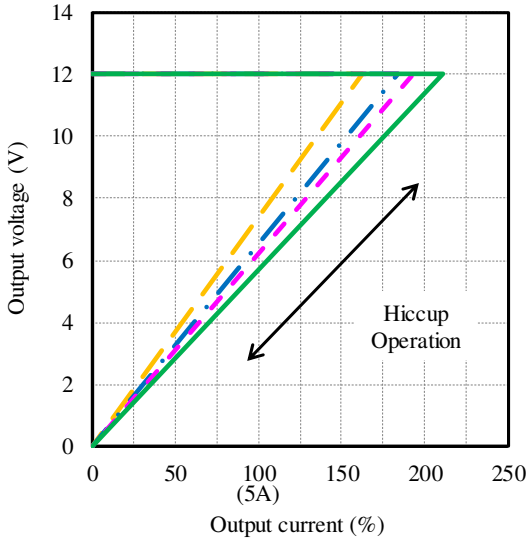
入力電圧依存性
Input voltage dependence

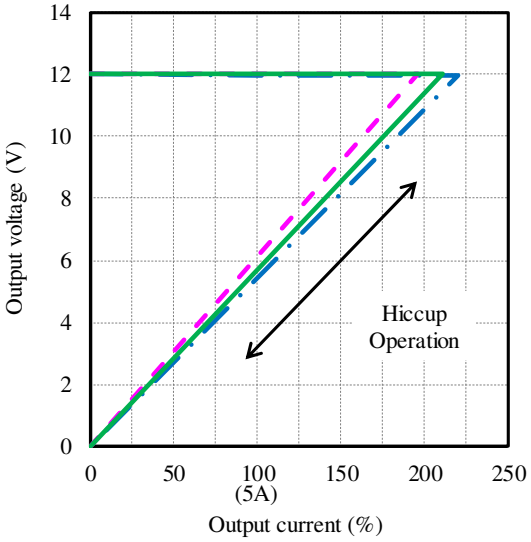
Conditions Vin : 9 VDC
: 12 VDC
: 24 VDC
: 36 VDC
Ta : 25 °C

周囲温度依存性
Ambient temperature dependence

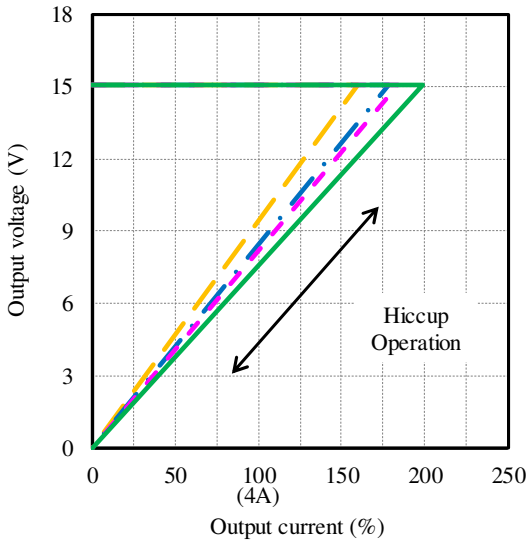
Conditions Vin : 24 VDC
Ta : -40 °C
: 25 °C
: 85 °C

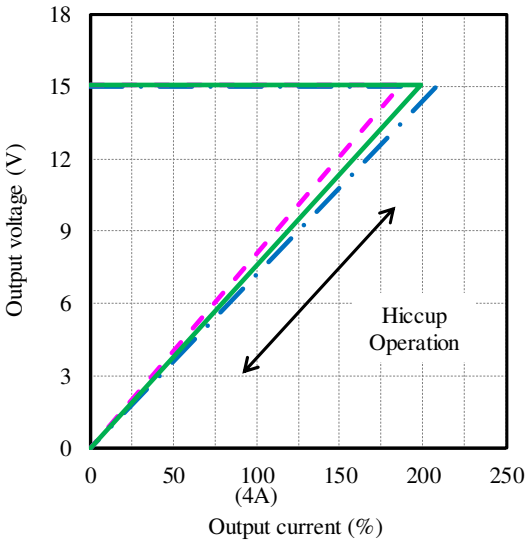
12V





15V





2-4. 過電流保護特性 Over current protection (OCP) characteristics

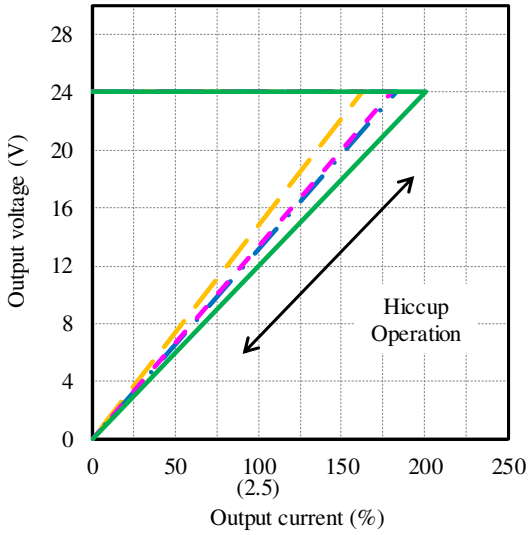
入力電圧依存性
Input voltage dependence

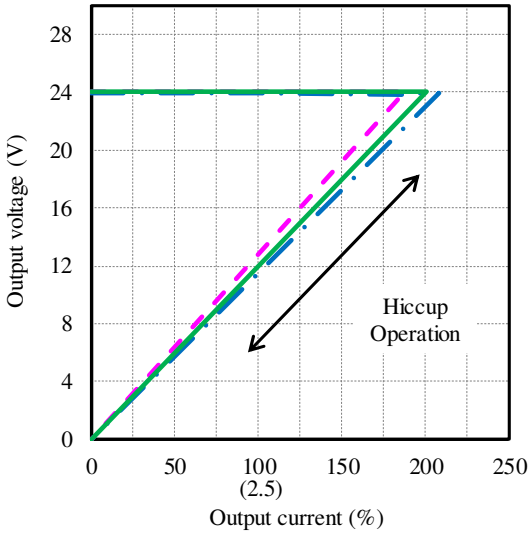
Conditions Vin : 9 VDC
: 12 VDC
: 24 VDC
: 36 VDC
Ta : 25 °C

周囲温度依存性
Ambient temperature dependence

Conditions Vin : 24 VDC
Ta : -40 °C
: 25 °C
: 85 °C

24V

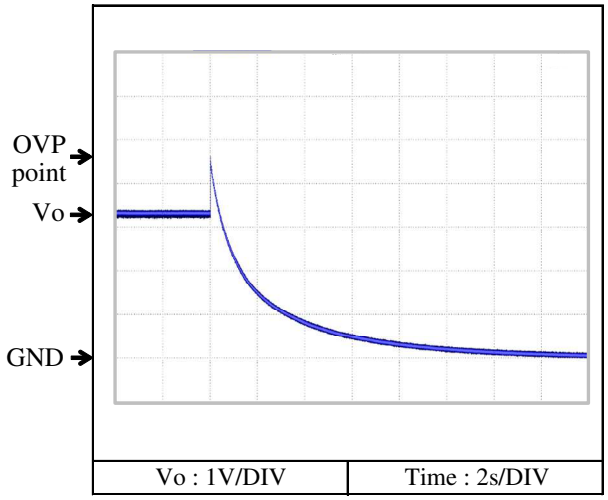




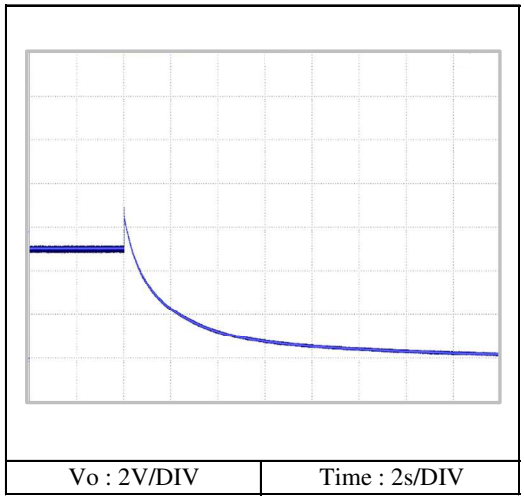
2-5. 過電圧保護特性 Over voltage protection (OVP) characteristics

Conditions Vin : 24 VDC
Io : 0 %
Ta : 25 °C

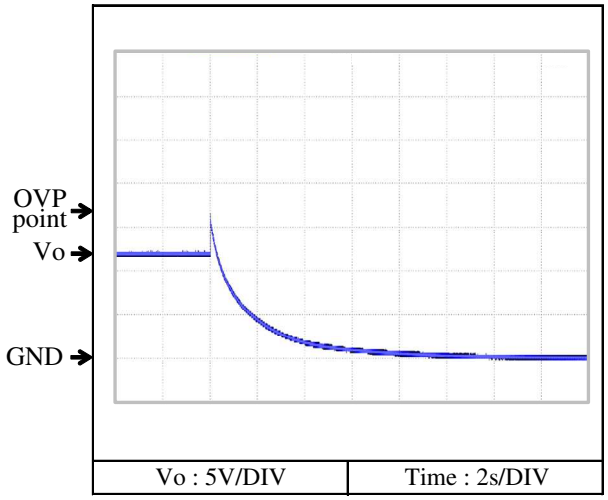
3.3V



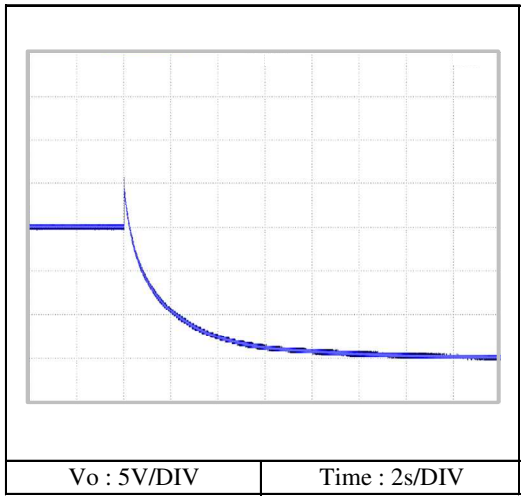
5V



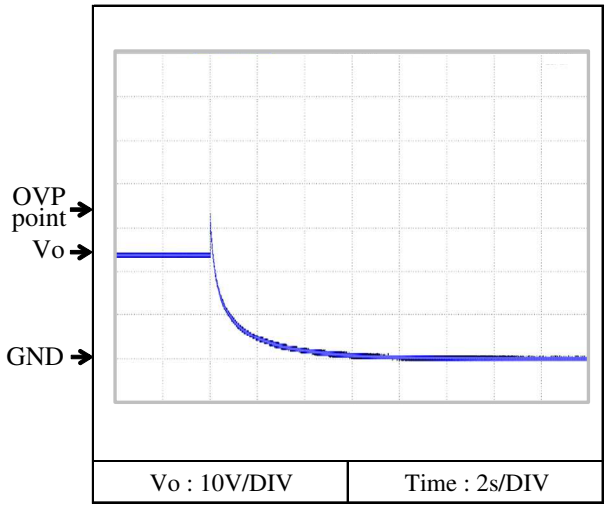
12V



15V



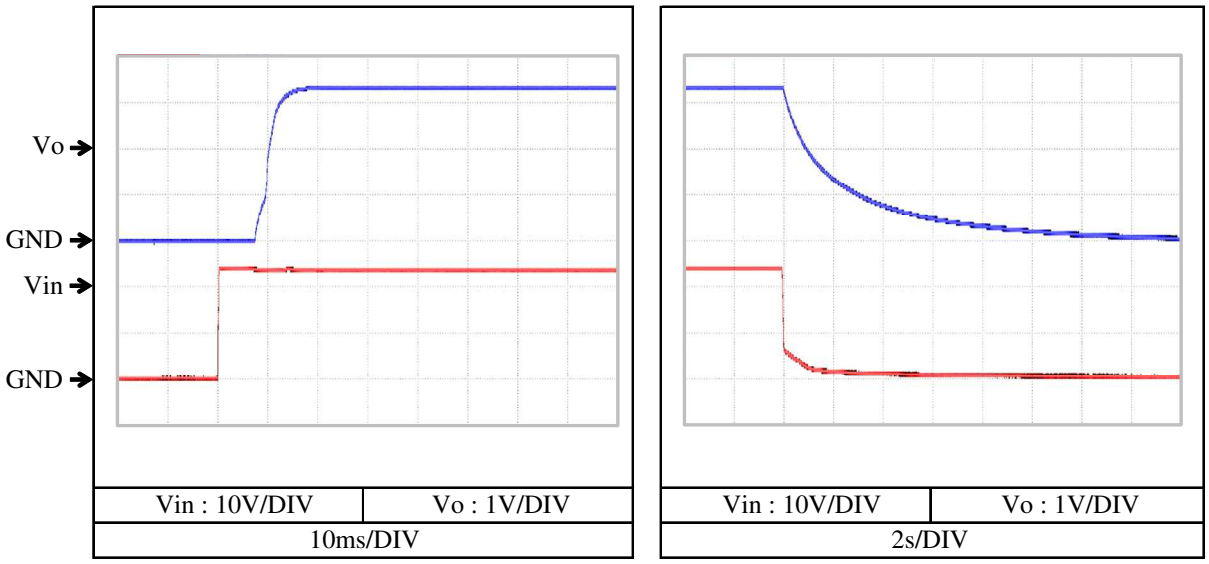
24V



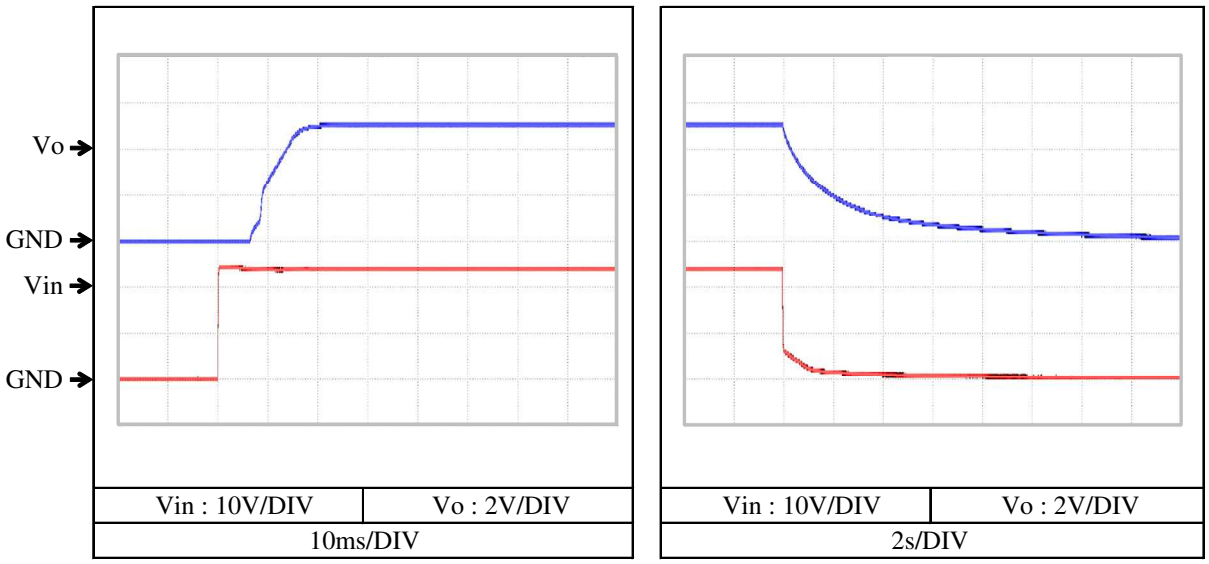
2-6. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

Conditions Vin : 24 VDC
Io : 0 %
Ta : 25 °C

3.3V



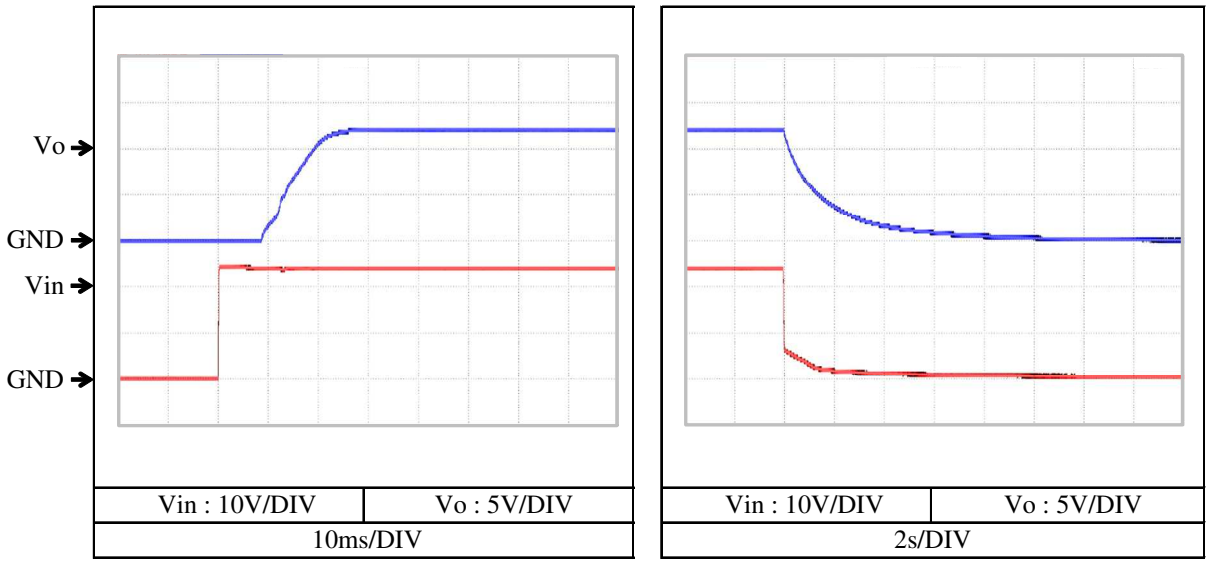
5V



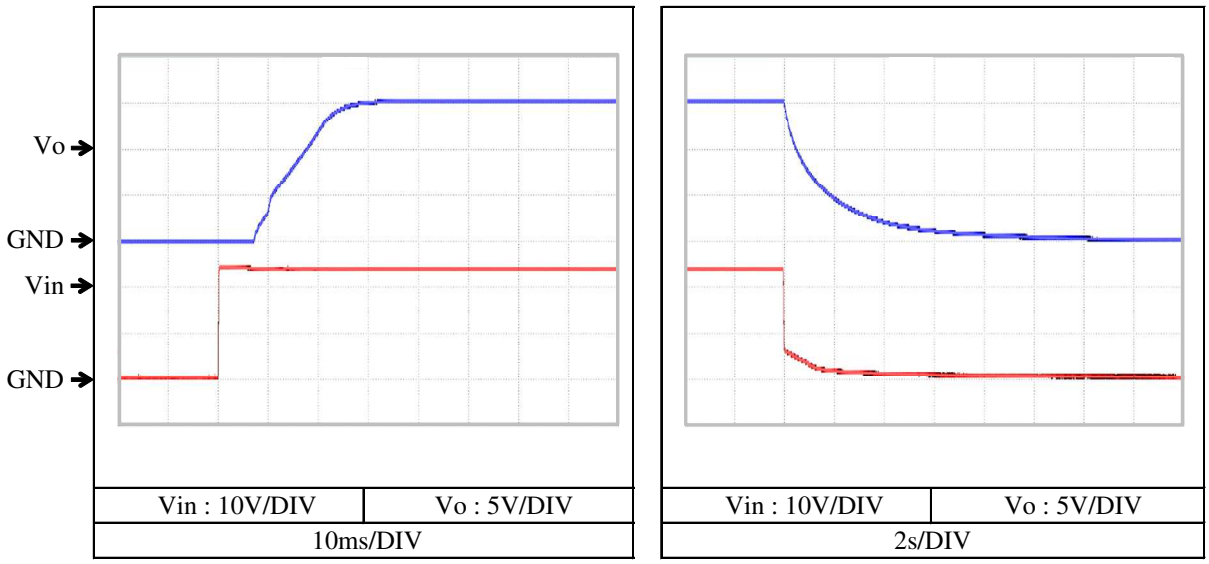
2-6. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

Conditions Vin : 24 VDC
Io : 0 %
Ta : 25 °C

12V



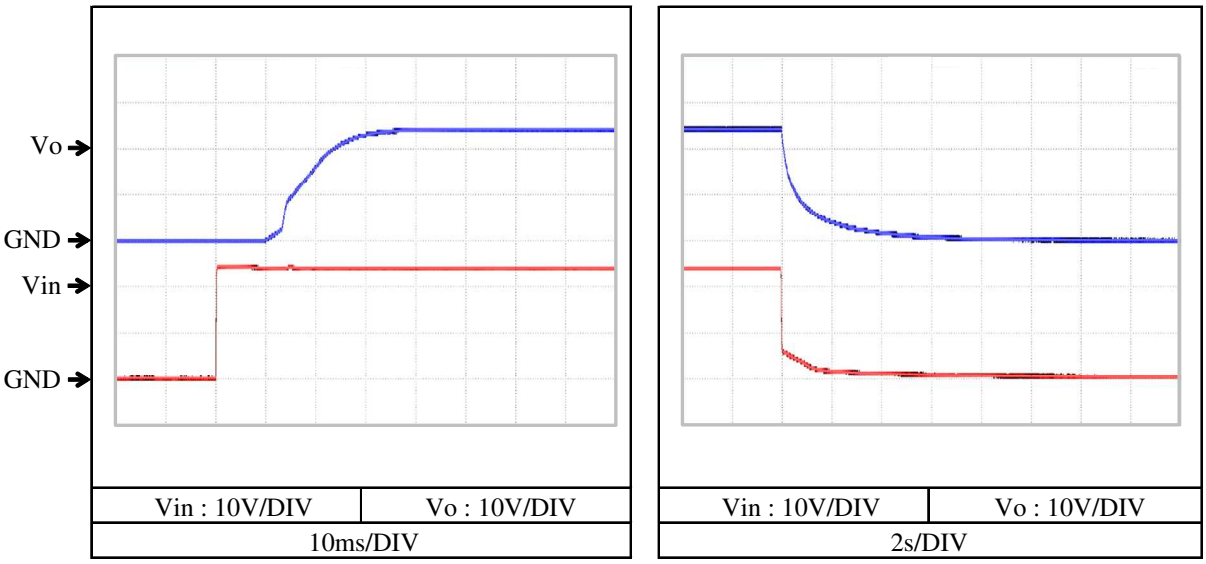
15V



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

Conditions Vin : 24 VDC
Io : 0 %
Ta : 25 °C

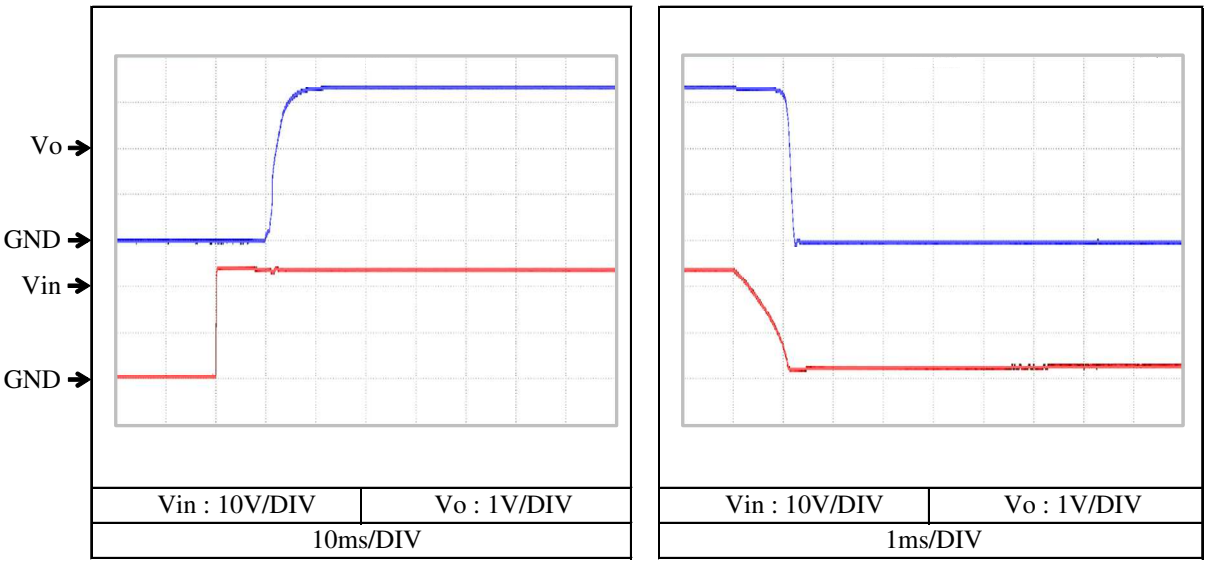
24V



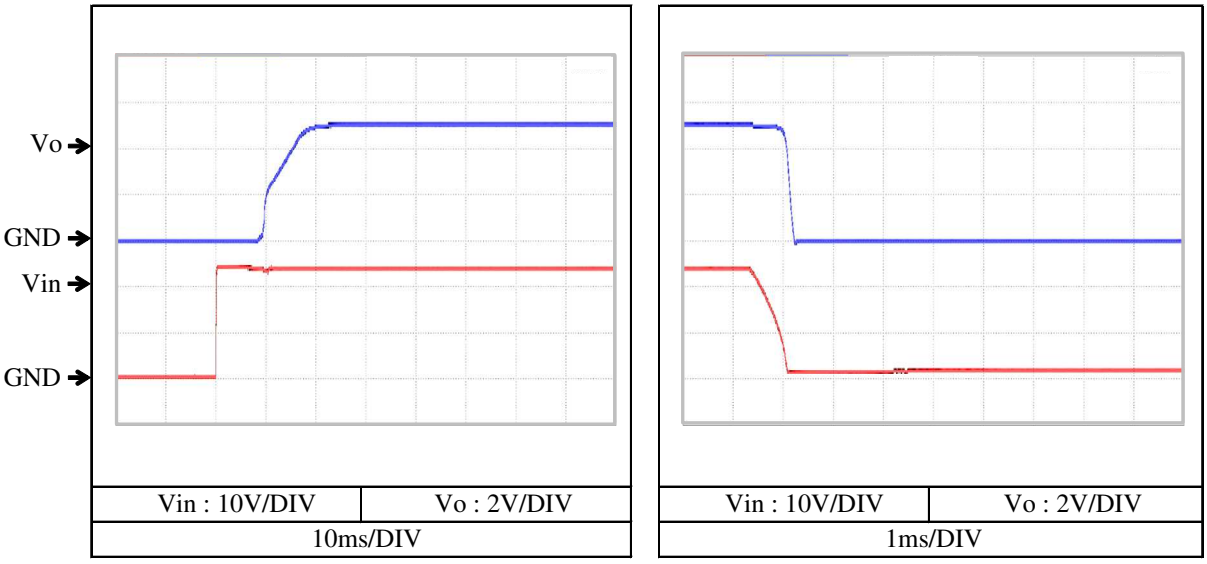
2-6. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

3.3V



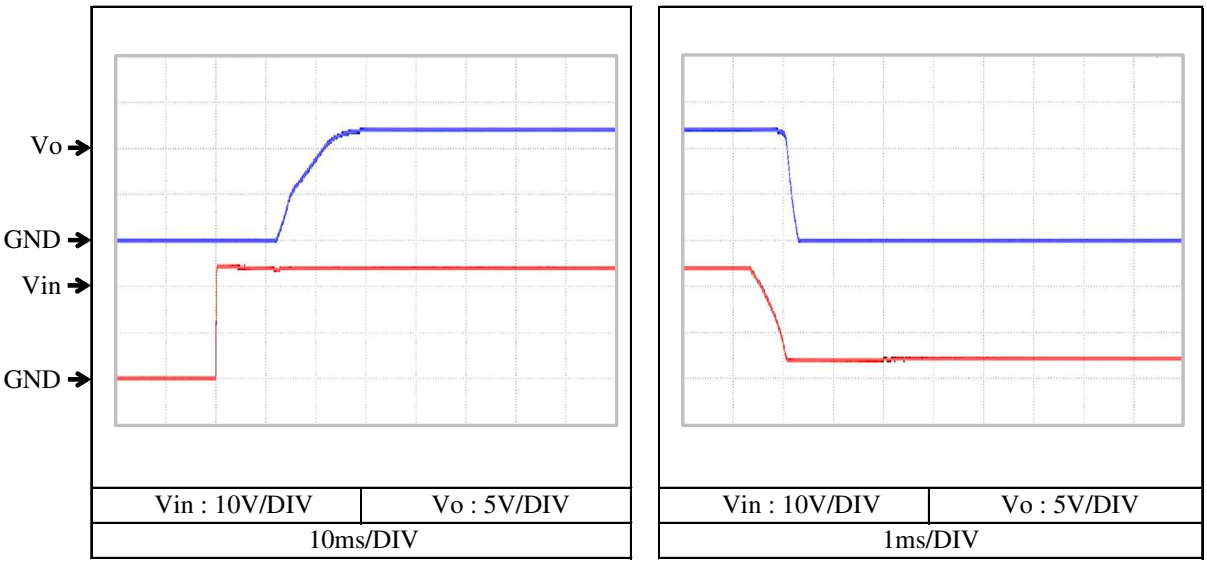
5V



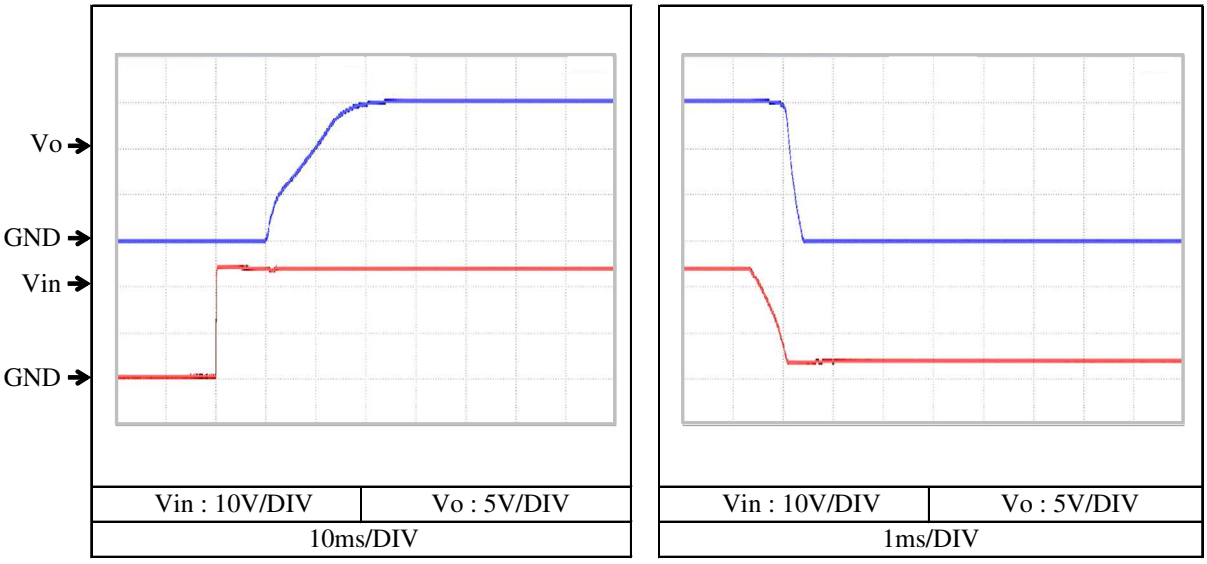
2-6. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

12V



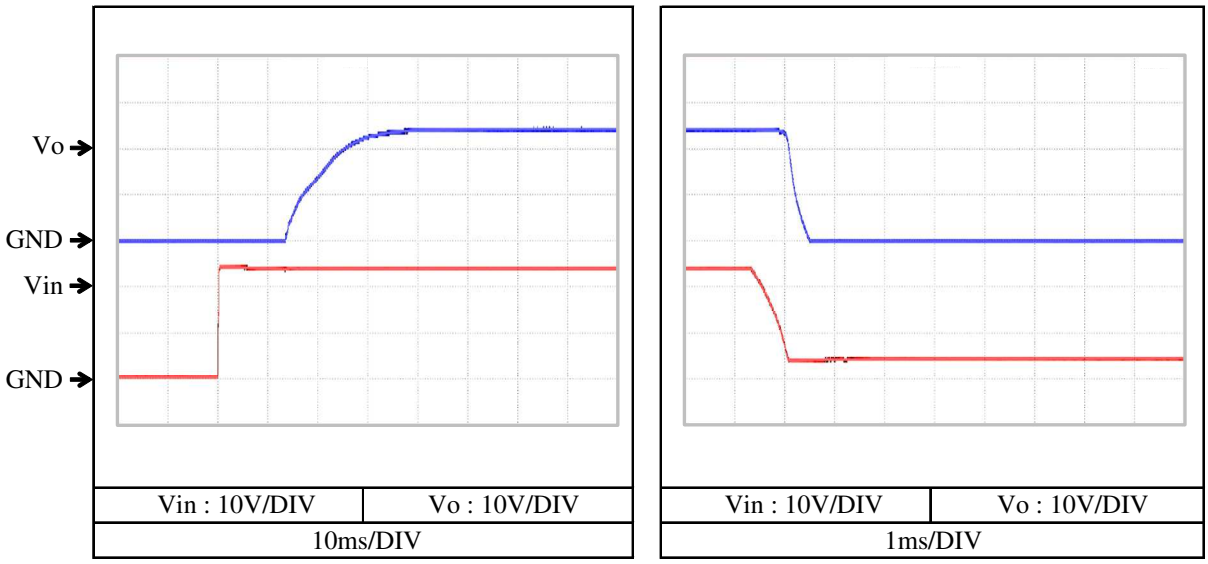
15V



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

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

24V

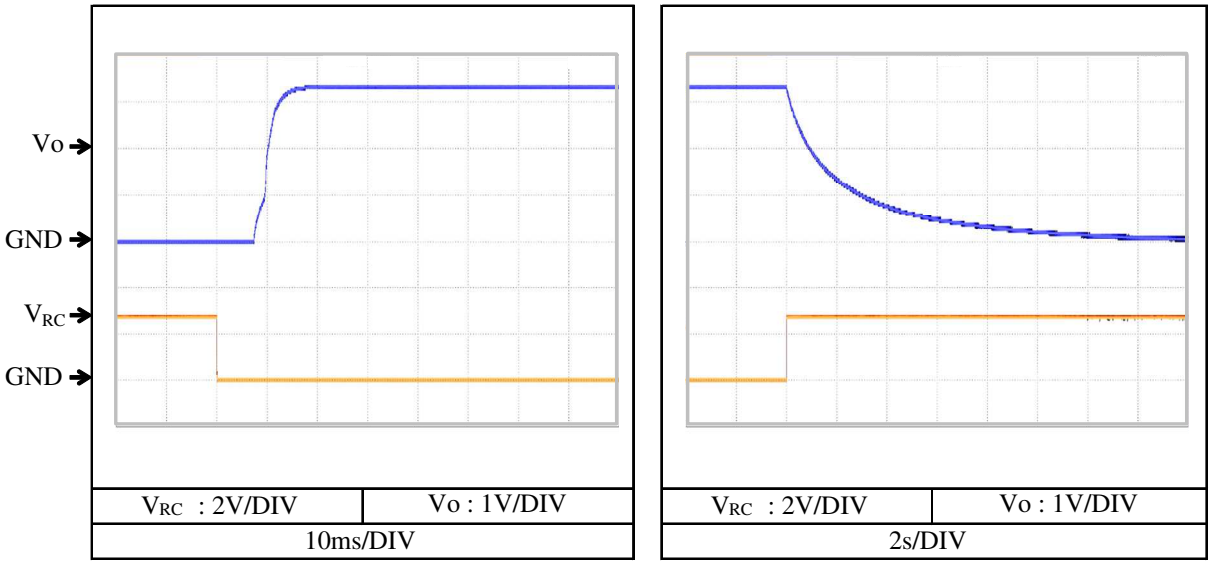


2-6. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

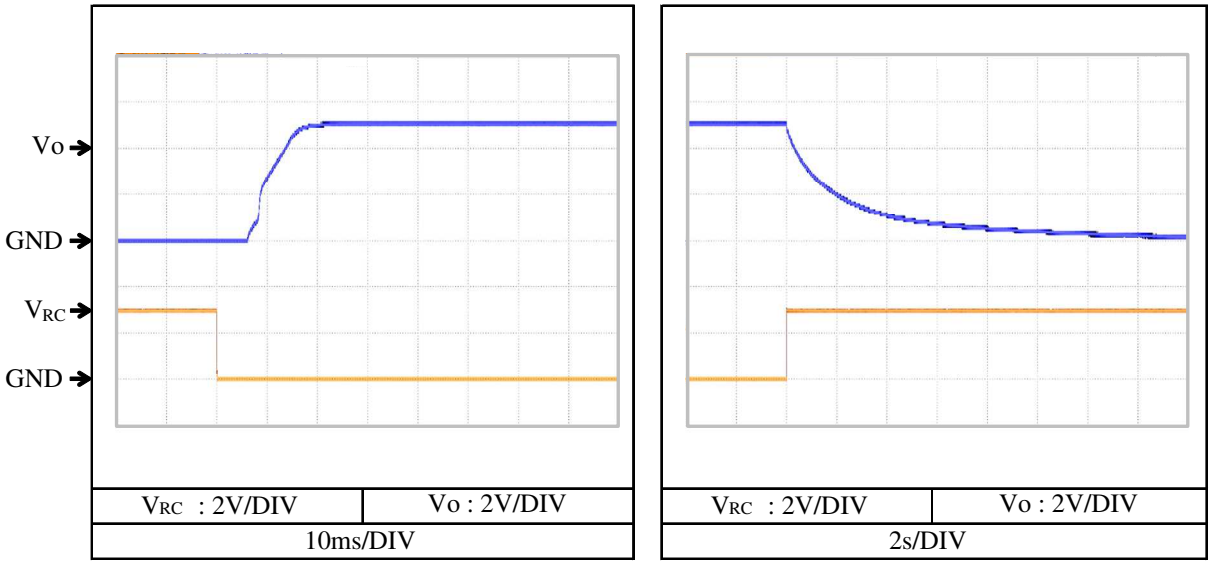
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC
Io : 0 %
Ta : 25 °C

3.3V



5V

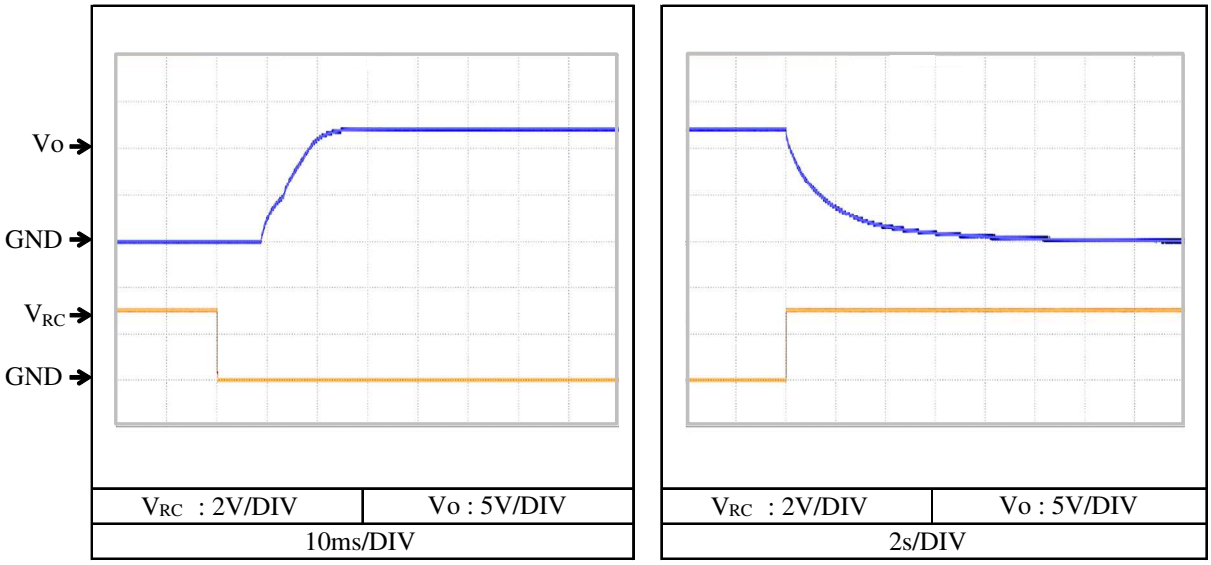


2-6. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

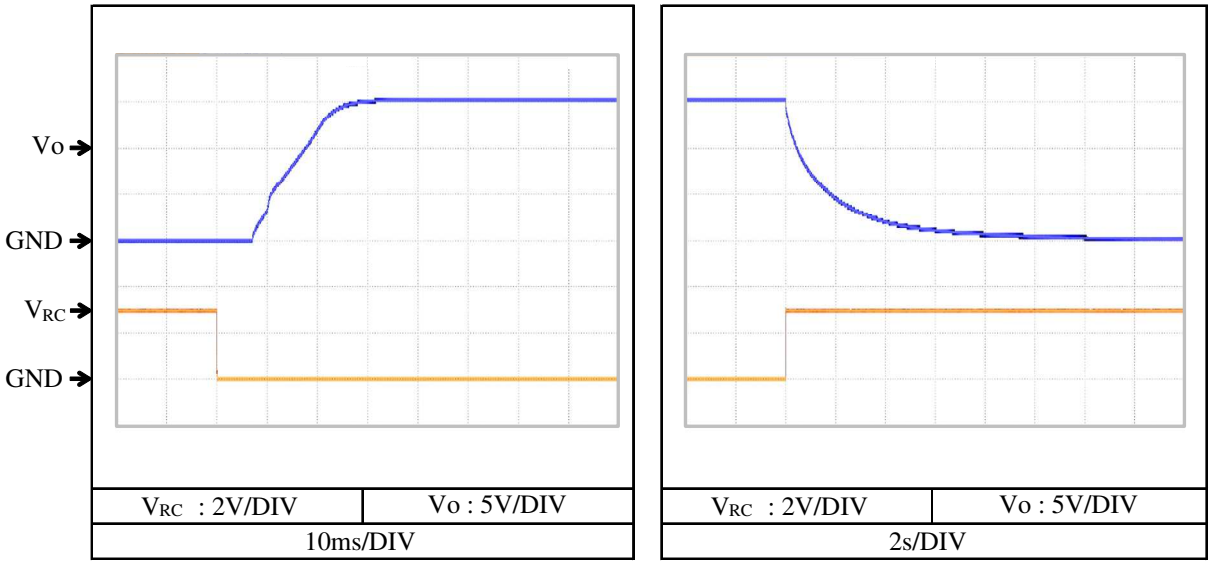
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC
Io : 0 %
Ta : 25 °C

12V



15V

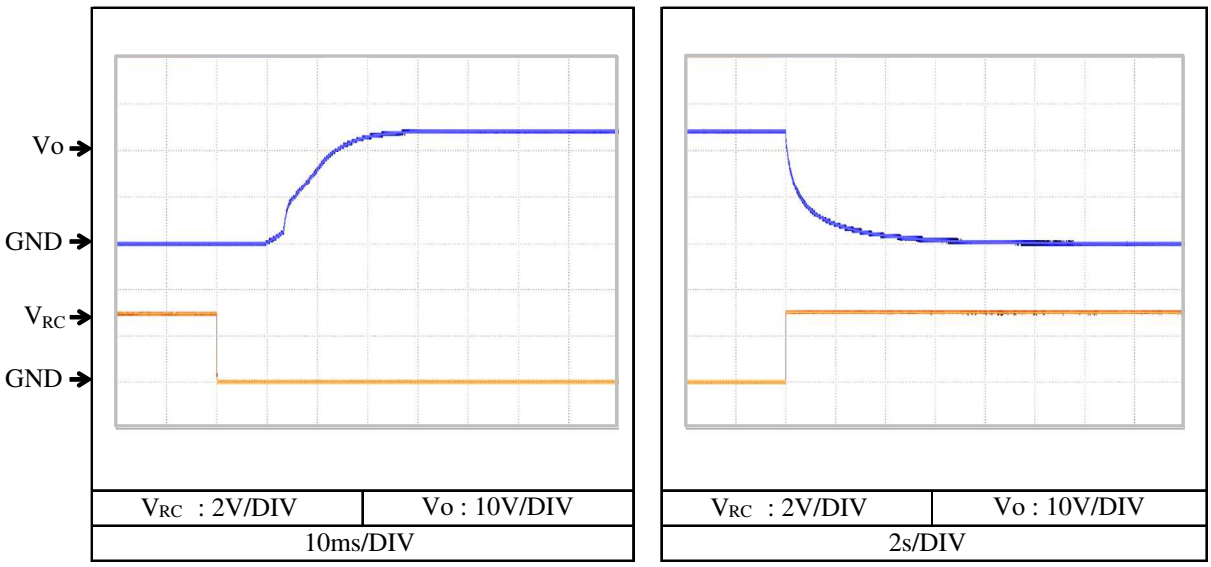


2-6. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC
Io : 0 %
Ta : 25 °C

24V

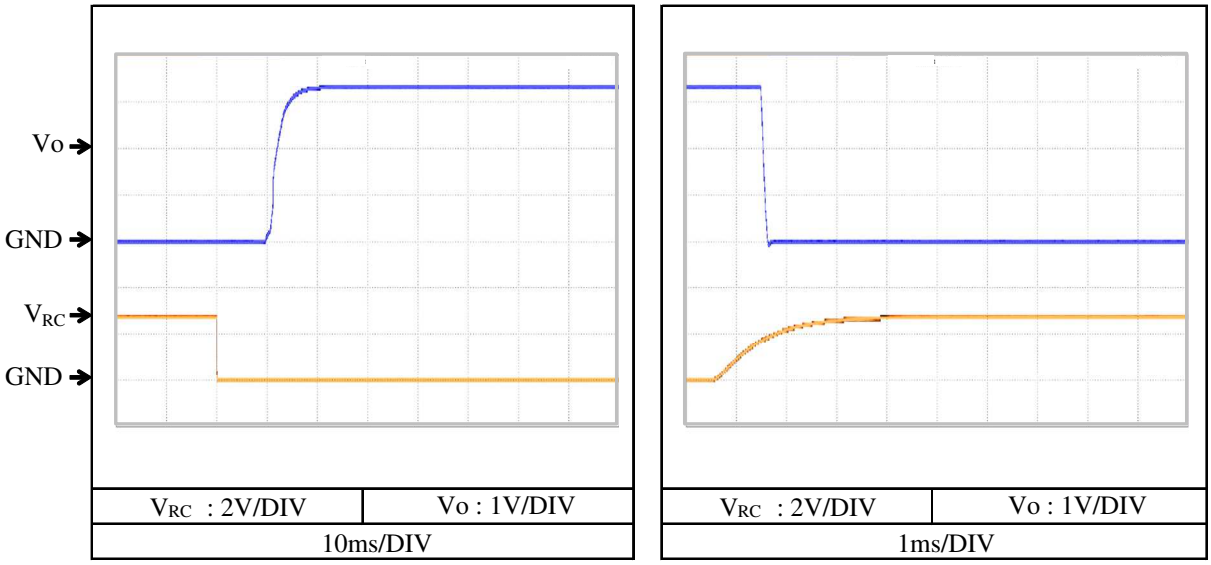


2-6. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

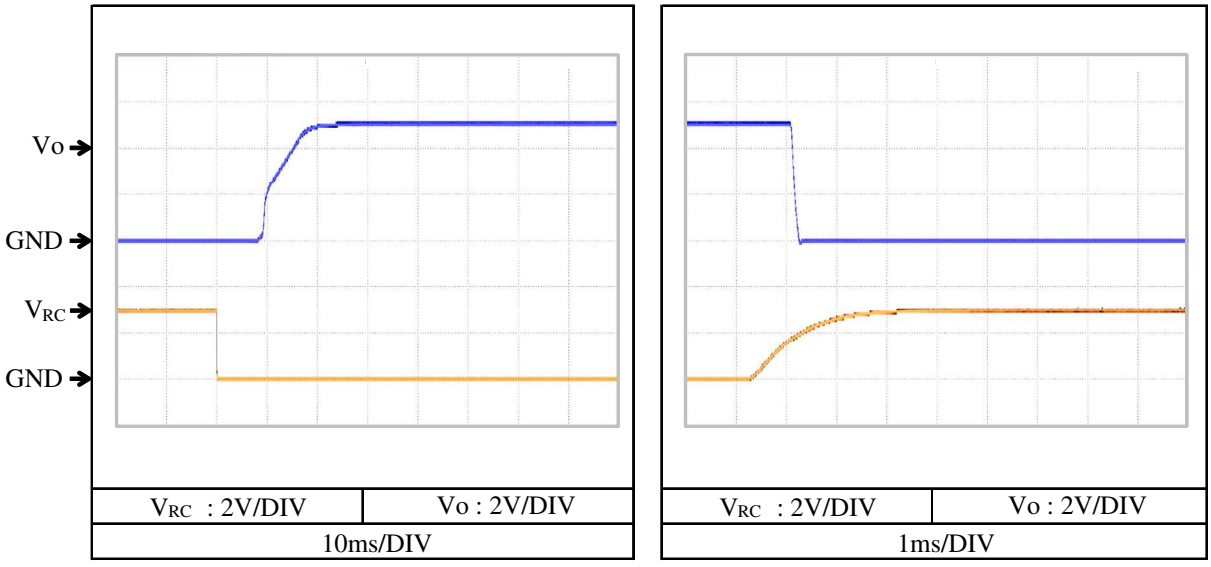
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

3.3V



5V

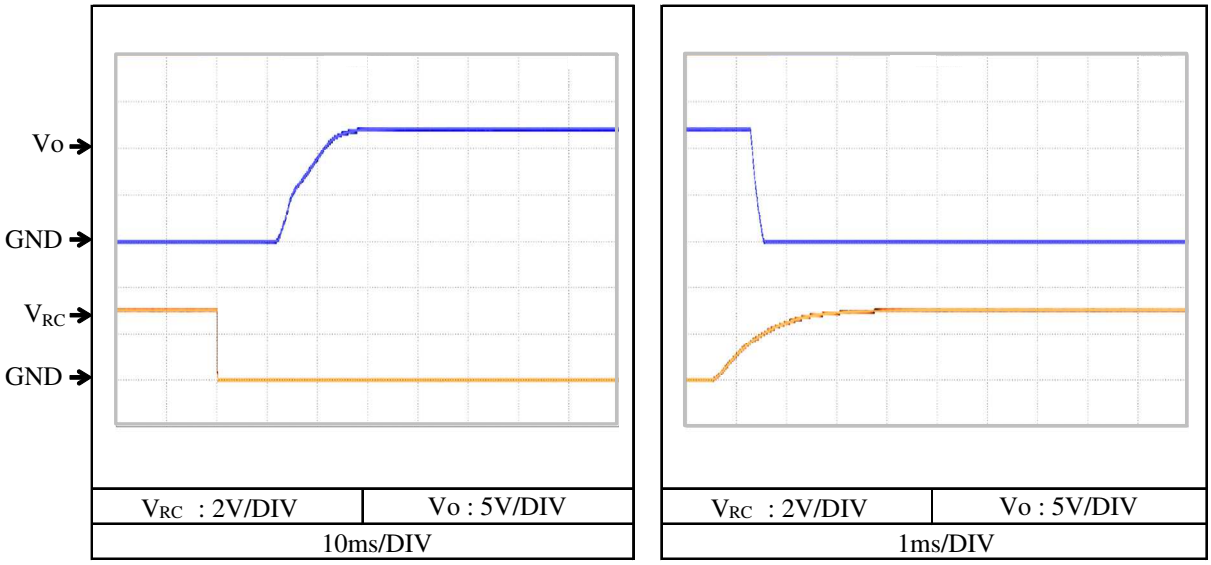


2-6. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

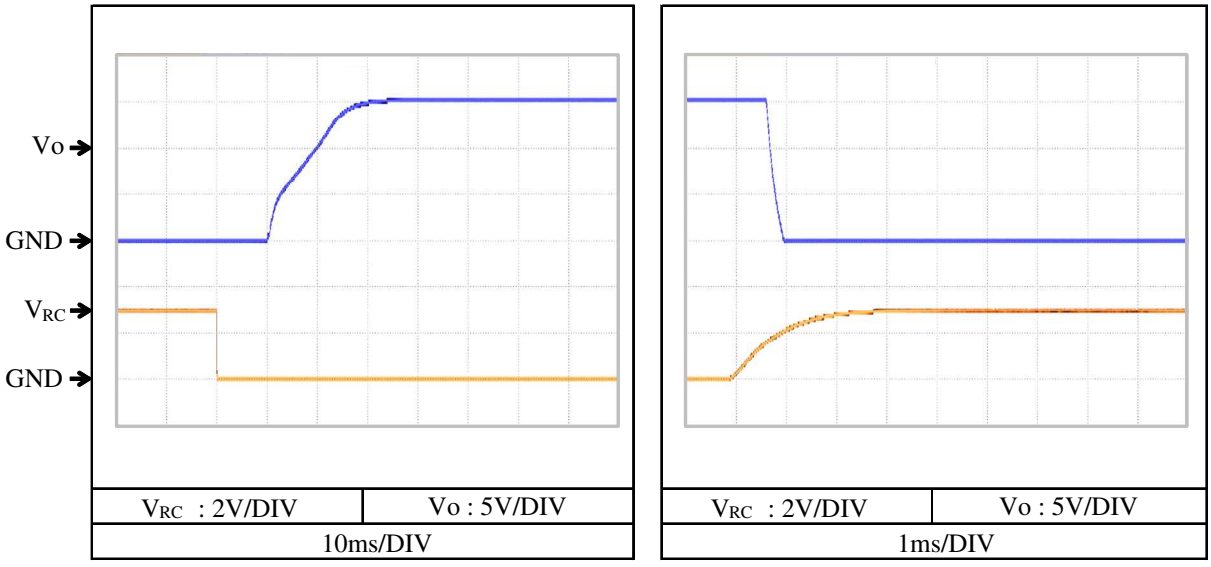
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

12V



15V

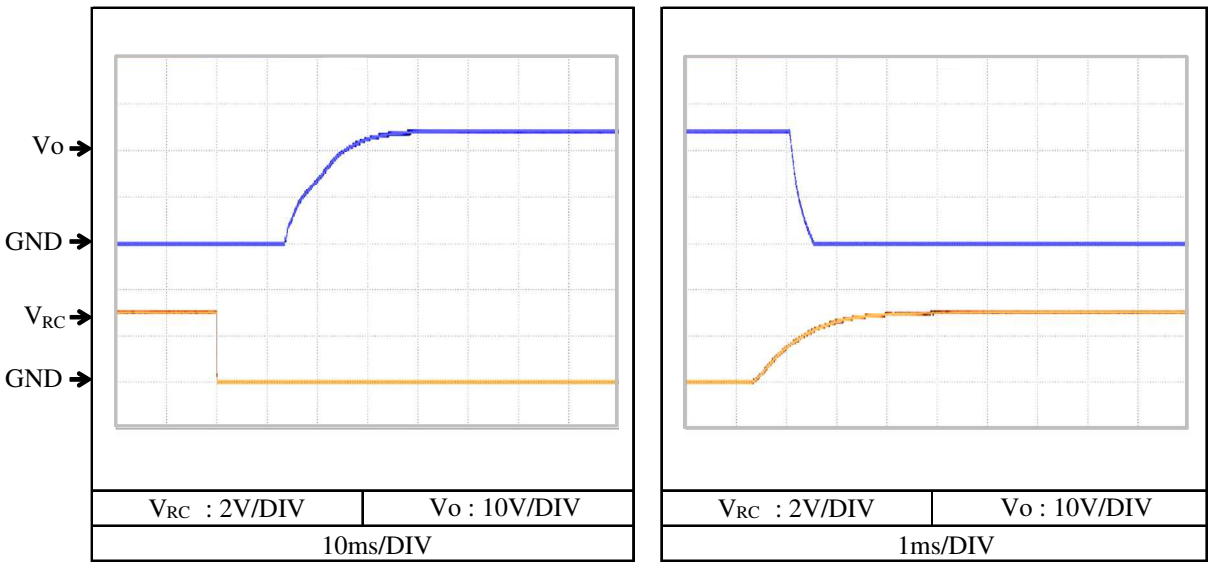


2-6. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

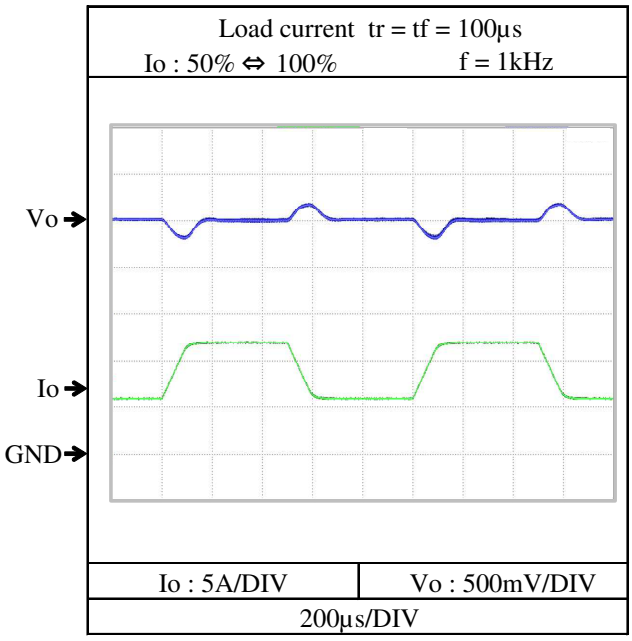
24V



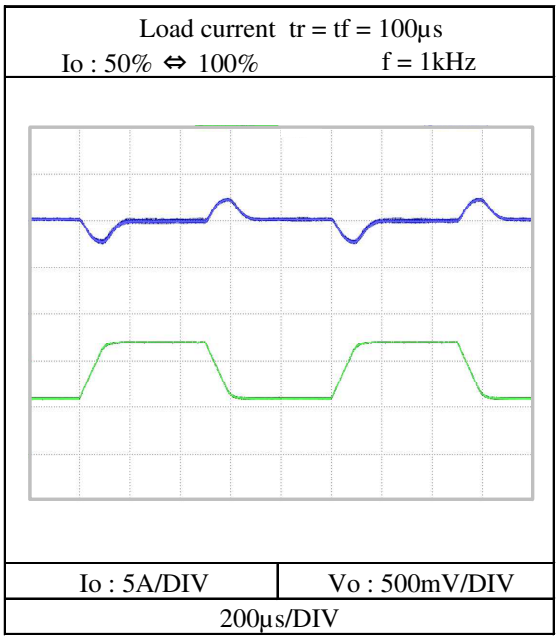
2-7. 過渡応答(負荷急変)特性 Dynamic load response characteristics

Conditions Vin : 24 VDC
Ta : 25 °C

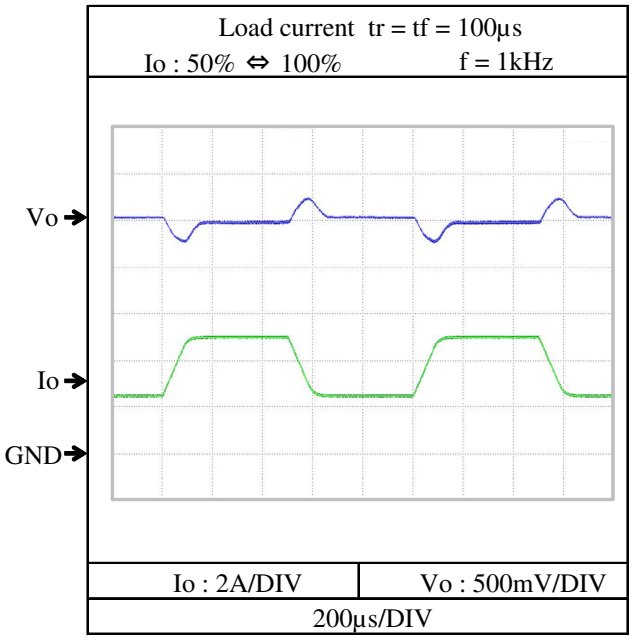
3.3V



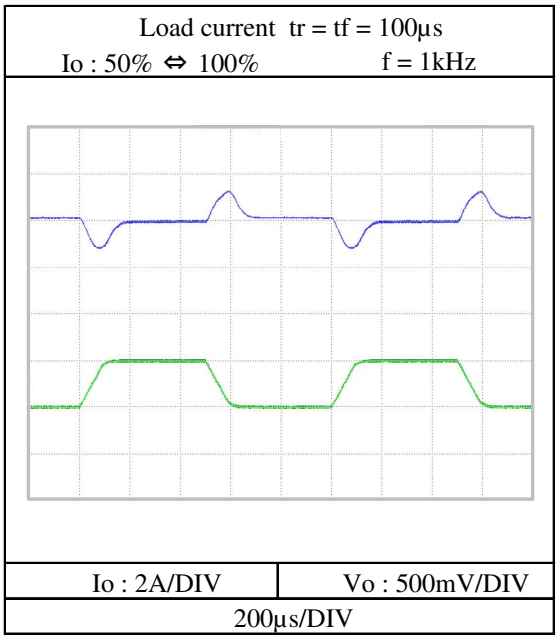
5V



12V



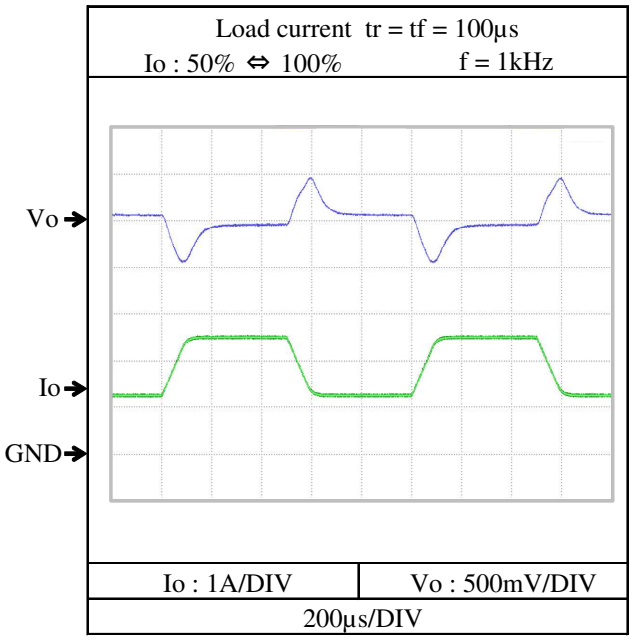
15V



2-7. 過渡応答(負荷急変)特性 Dynamic load response characteristics

Conditions Vin : 24 VDC
Ta : 25 °C

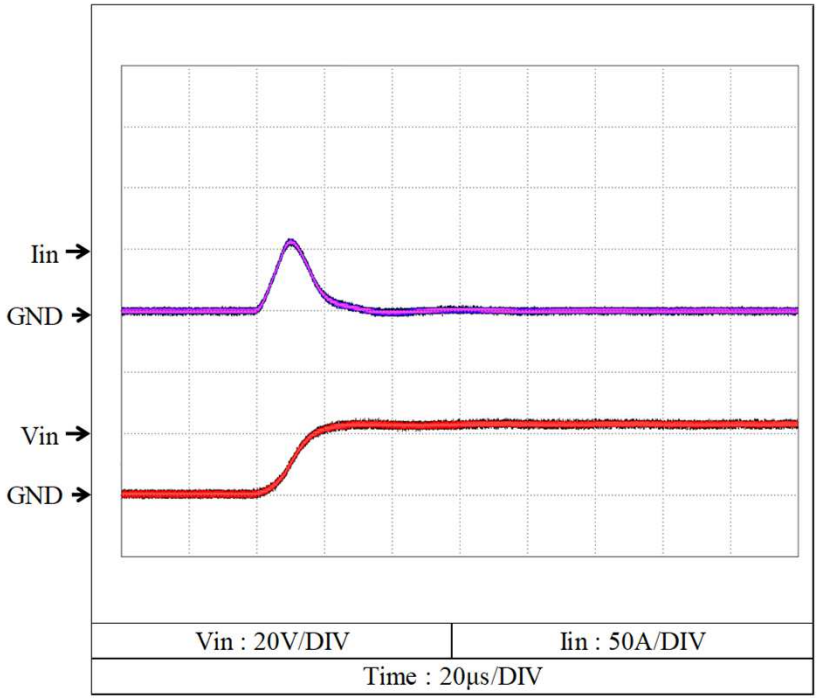
24V



2-8. 入力サージ電流(突入電流)特性 Inrush current characteristics

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

CCG60-24-05

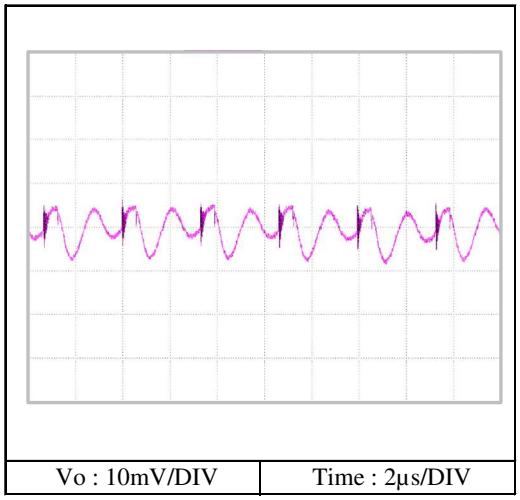


CCG60-24-xxの入力サージ電流特性は CCG60-24-05 と同等です。
CCG60-24-xx have the same Inrush current characteristics as CCG60-24-05 data.

2-9. 出力リップルノイズ波形 Output ripple and noise waveform

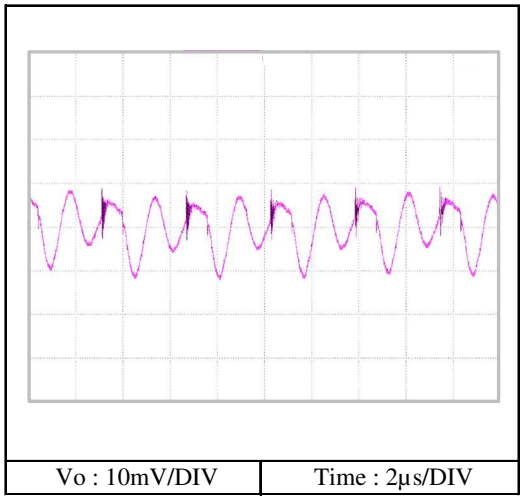
Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

3.3V



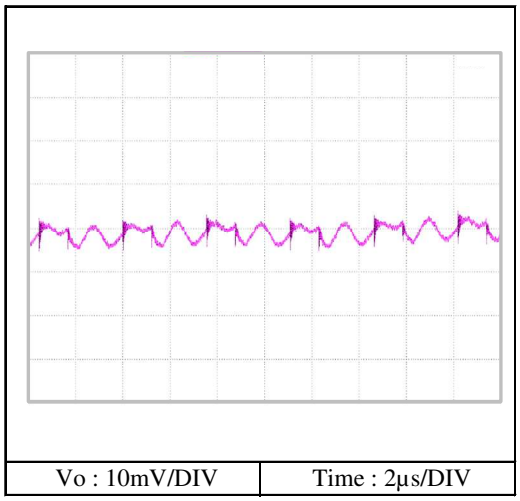
Vo : 10mV/DIV	Time : 2µs/DIV

5V



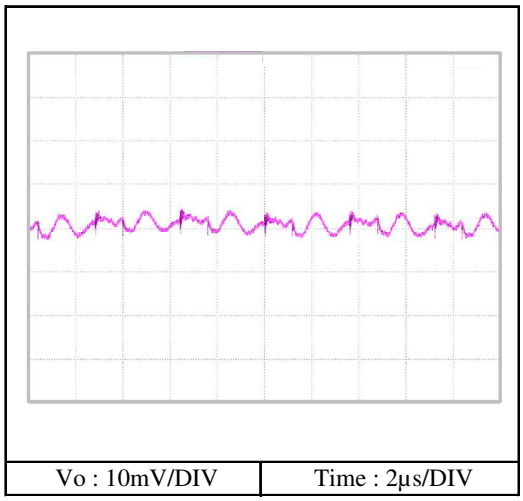
Vo : 10mV/DIV	Time : 2µs/DIV

12V



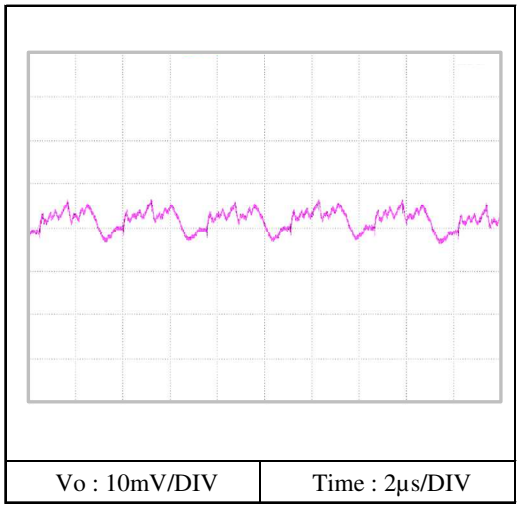
Vo : 10mV/DIV	Time : 2µs/DIV

15V



Vo : 10mV/DIV	Time : 2µs/DIV

24V



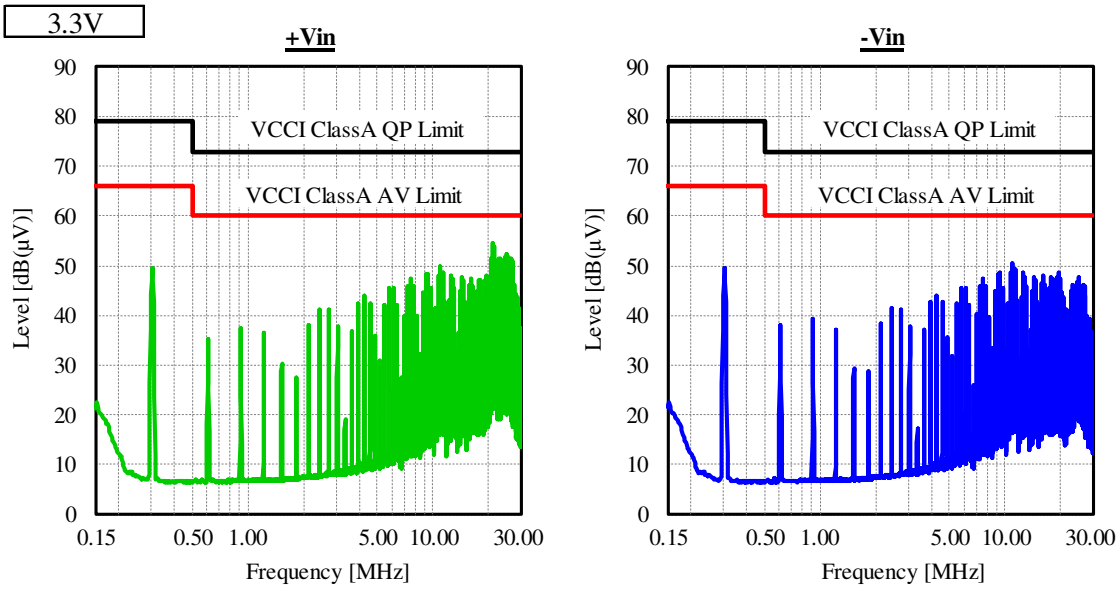
Vo : 10mV/DIV	Time : 2µs/DIV

2-10. EMI特性 Electro-Magnetic Interference characteristics

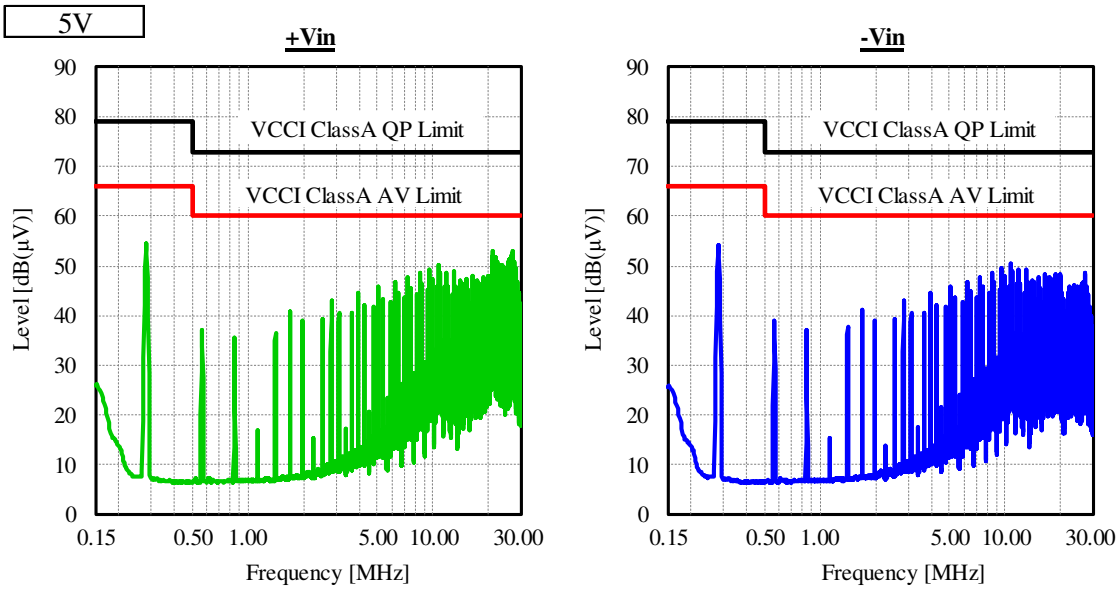
(a) 雑音端子電圧 (帰還ノイズ) Conducted Emission Noise

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

3.3V



5V



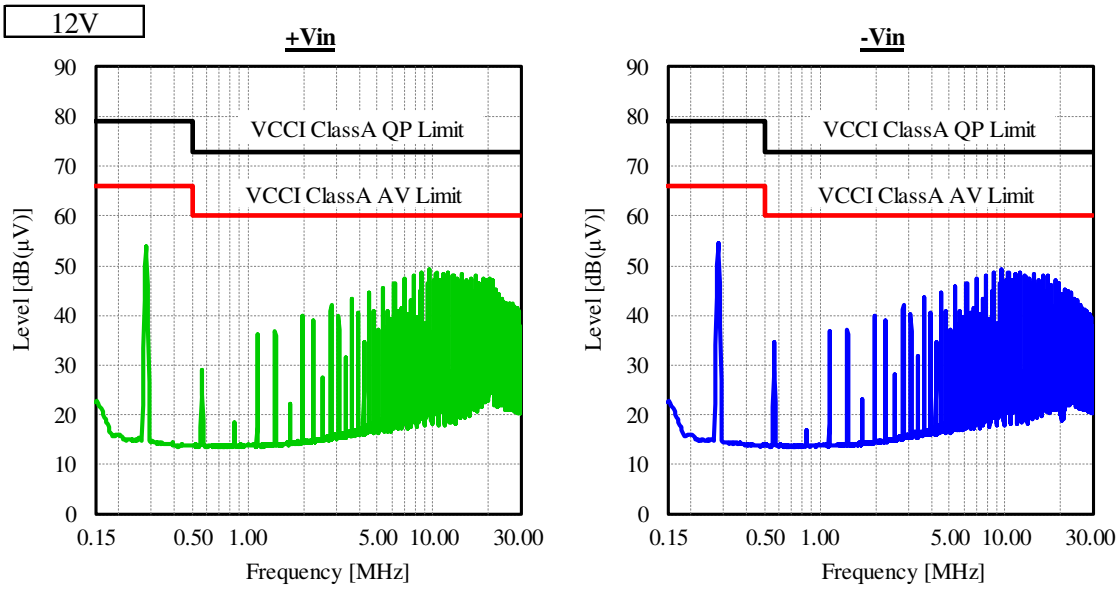
表示はQP値
Indication is QP values.

2-10. EMI特性 Electro-Magnetic Interference characteristics

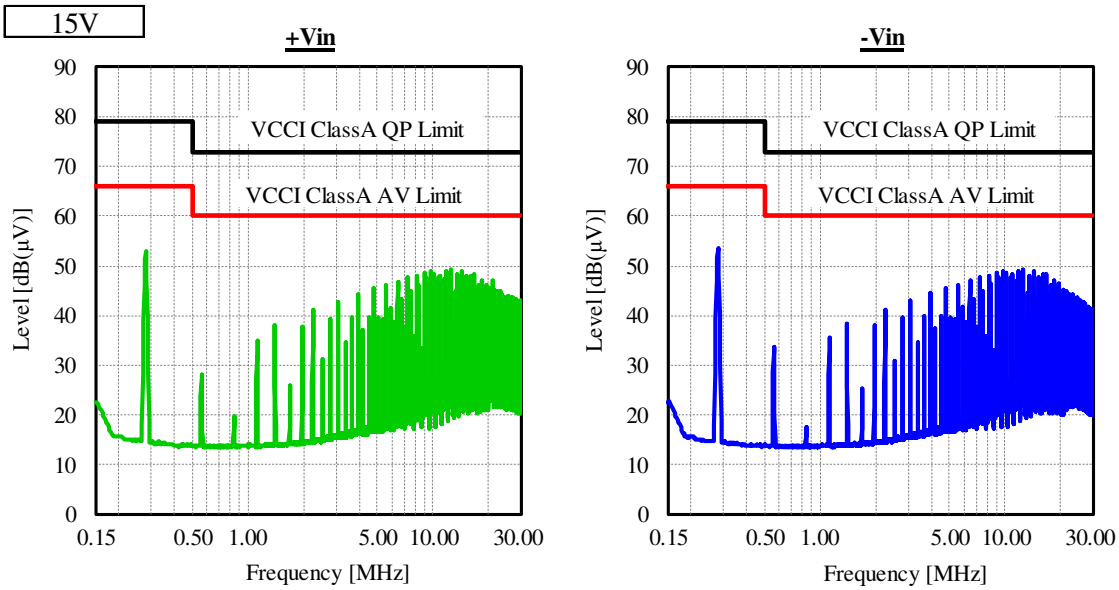
(a) 雑音端子電圧 (帰還ノイズ) Conducted Emission Noise

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

12V



15V



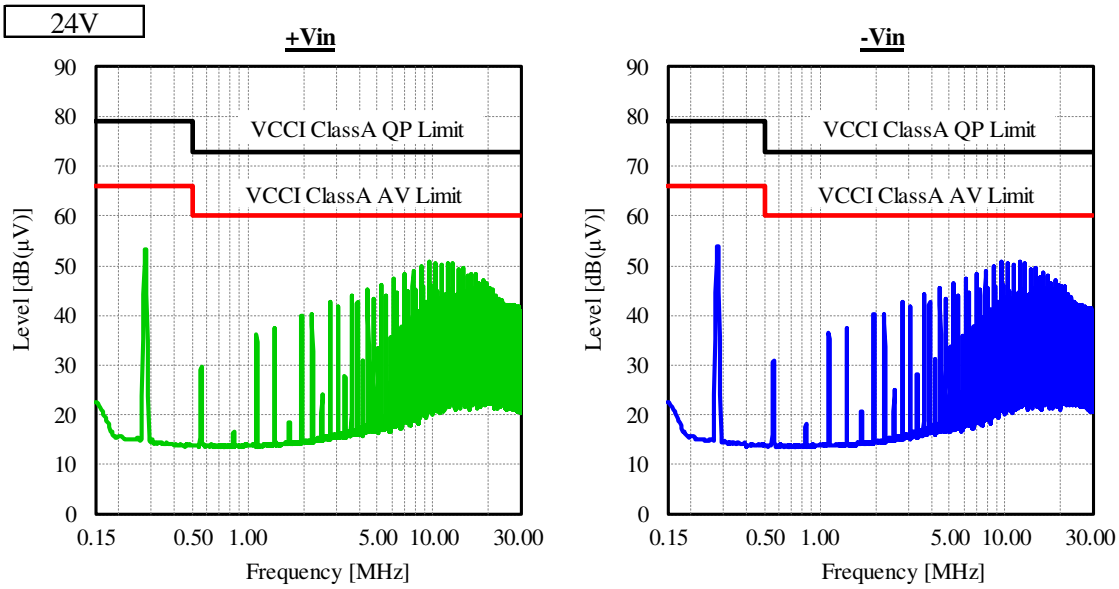
表示はQP値
Indication is QP values.

2-10. EMI特性 Electro-Magnetic Interference characteristics

(a) 雑音端子電圧 (帰還ノイズ) Conducted Emission Noise

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

24V



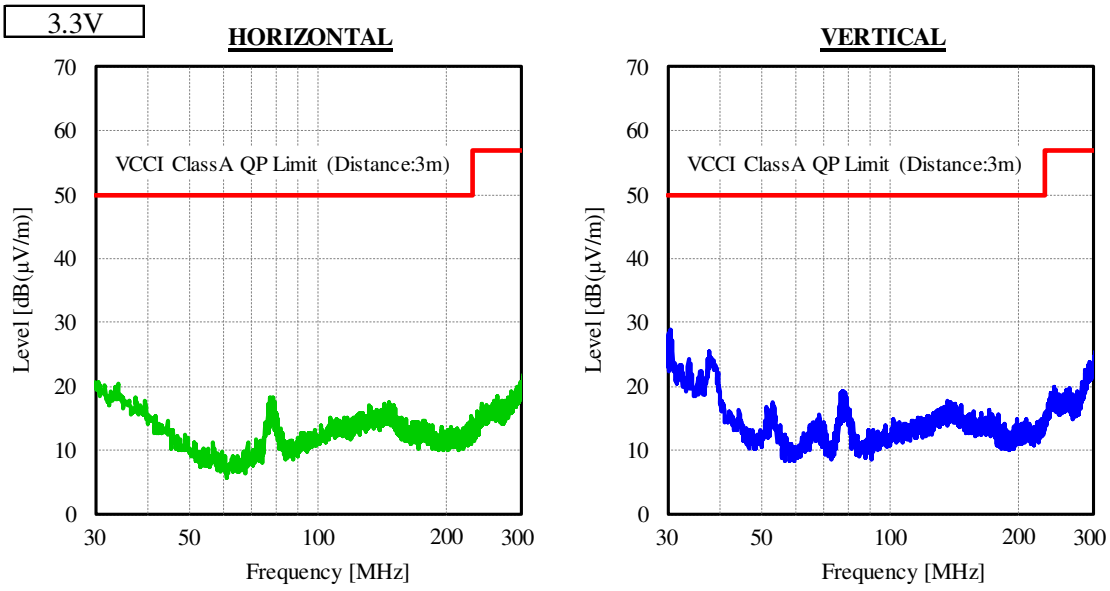
表示はQP値
Indication is QP values.

2-10. EMI特性 Electro-Magnetic Interference characteristics

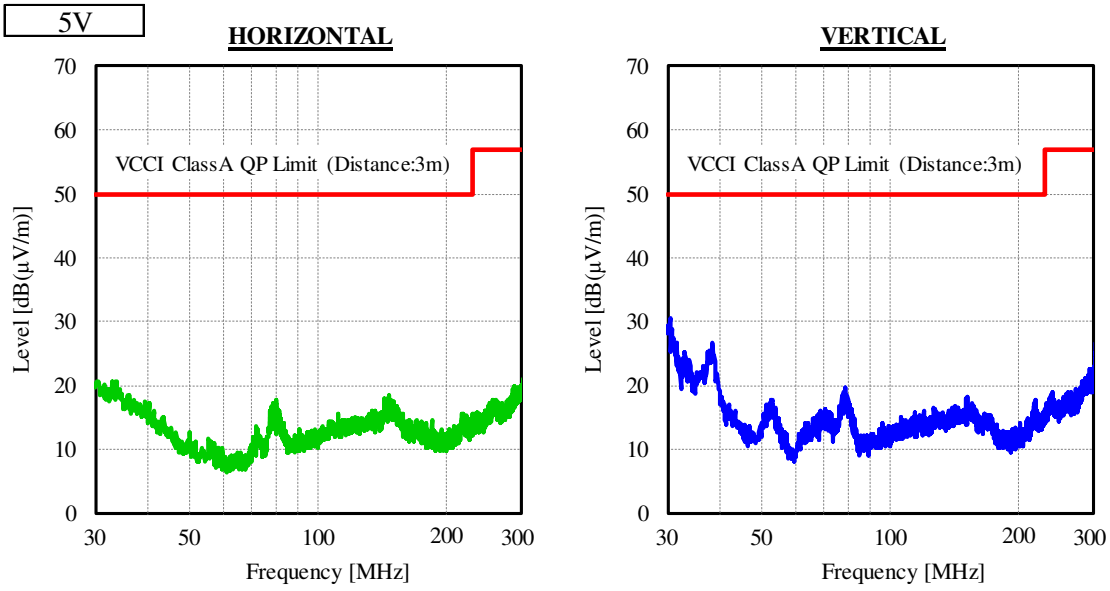
(b) 雑音電界強度 (輻射ノイズ) Radiated Emission Noise

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

3.3V



5V



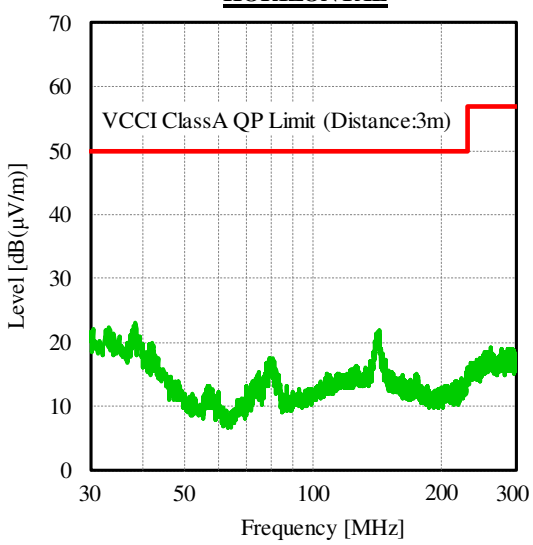
表示はピーク値
Indication is peak values.

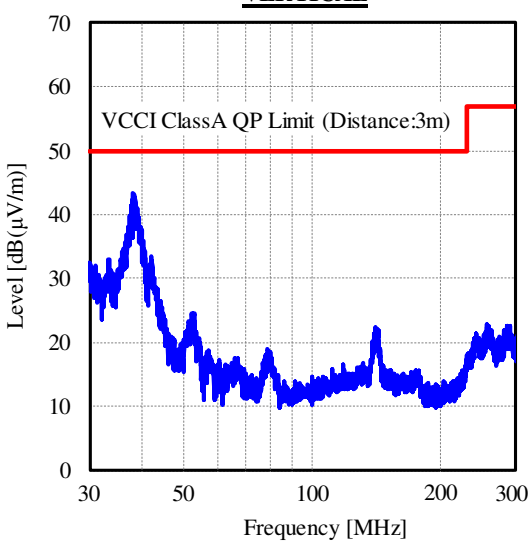
2-10. EMI特性 Electro-Magnetic Interference characteristics

(b) 雑音電界強度 (輻射ノイズ) Radiated Emission Noise

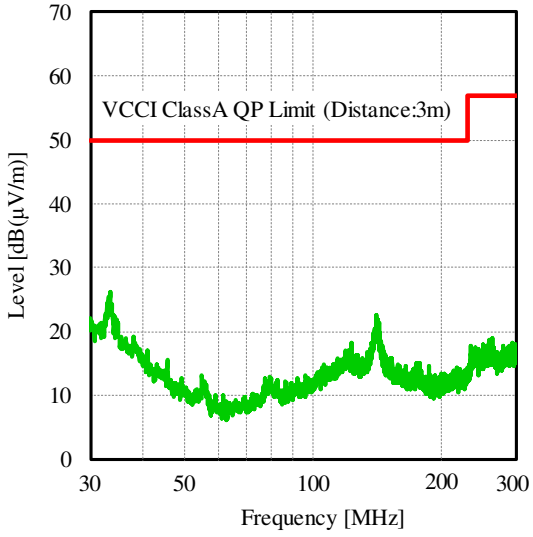
Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

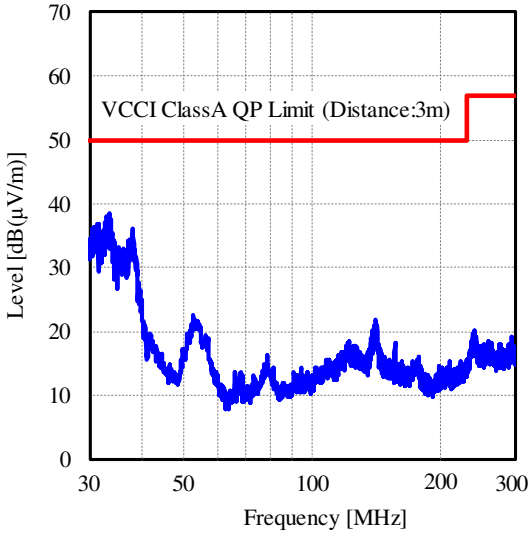
12V





15V





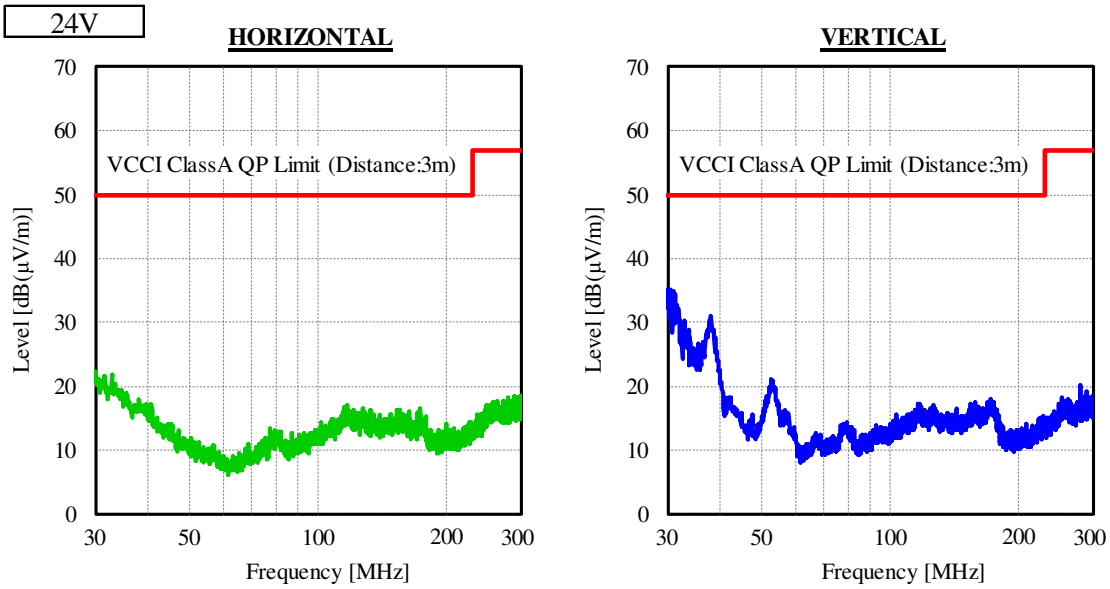
表示はピーク値
Indication is peak values.

2-10. EMI特性 Electro-Magnetic Interference characteristics

(b) 雑音電界強度 (輻射ノイズ) Radiated Emission Noise

Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 °C

24V



表示はピーク値
Indication is peak values.