RDS60A-24

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
Vout	・・・・・	出力電圧 Output voltage
Iin	・・・・・	入力電流 Input current
Iout	・・・・・	出力電流 Output current
Ta	・・・・・	周囲温度 Ambient temperature
f	・・・・・	周波数 Frequency
RC	・・・・・	ON／OFFコントロール ON/OFF Control

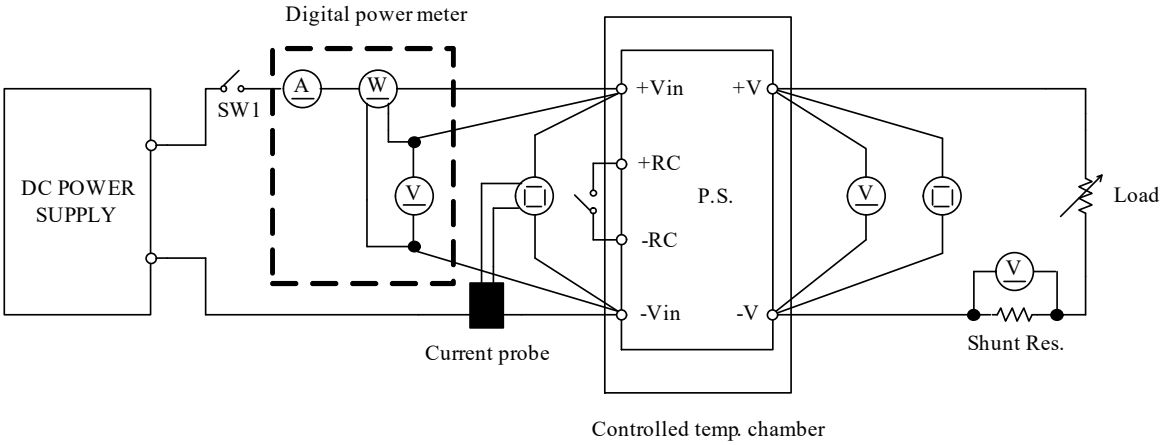
※ 当社測定条件における結果であり、参考値としてお考え願います。
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1-1. 測定回路 Circuit used for determination

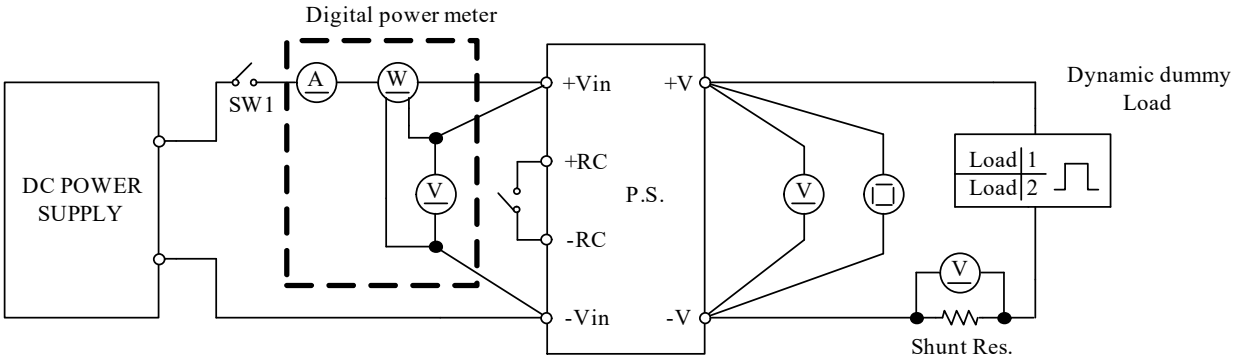
測定回路1 Circuit 1 used for determination

- 静特性 Steady state data
- 通電ドリフト特性 Warm up voltage drift characteristics
- 出力保持時間特性 Hold up time characteristics
- 出力立ち上がり特性 Output rise characteristics
- 出力立ち下がり特性 Output fall characteristics
- 過電流保護特性 Over current protection (OCP) characteristics
- 過電圧保護特性 Over voltage protection (OVP) characteristics
- 入力電流波形 Input current waveform
- ON／OFFコントロール時出力立ち上がり、立下がり特性
  Output rise, fall characteristics with ON/OFF Control

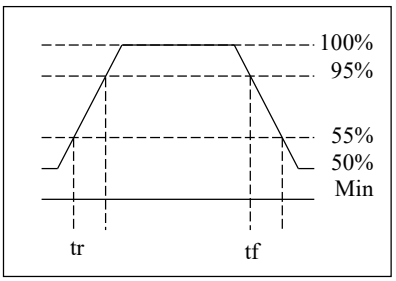


測定回路2 Circuit 2 used for determination

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

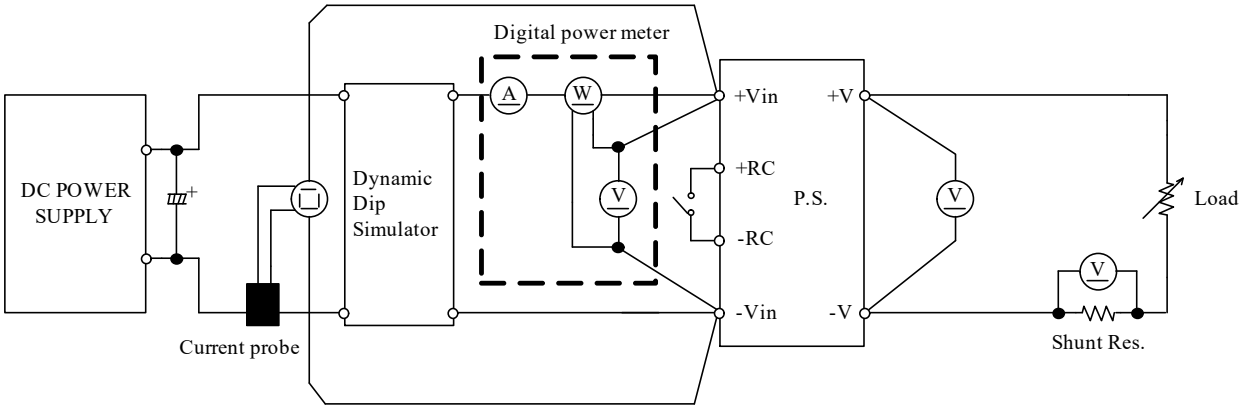


Output current waveform
Iout 50% <==> 100%



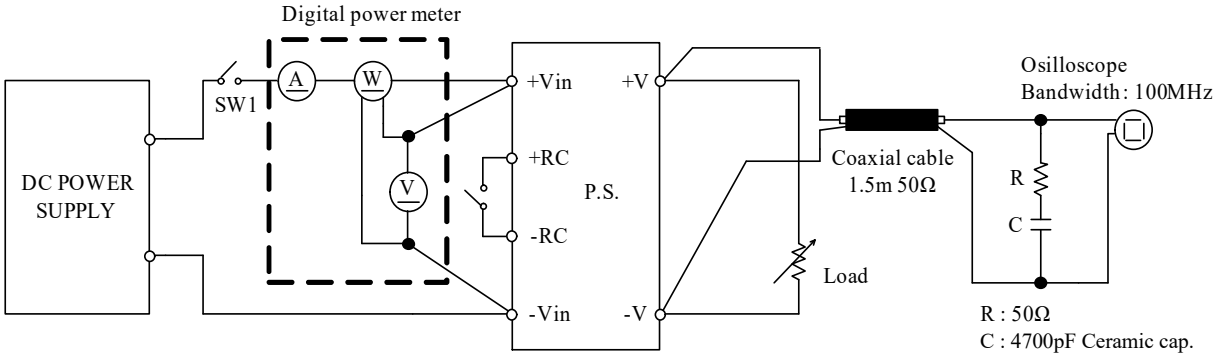
測定回路3　Circuit 3 used for determination

• 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

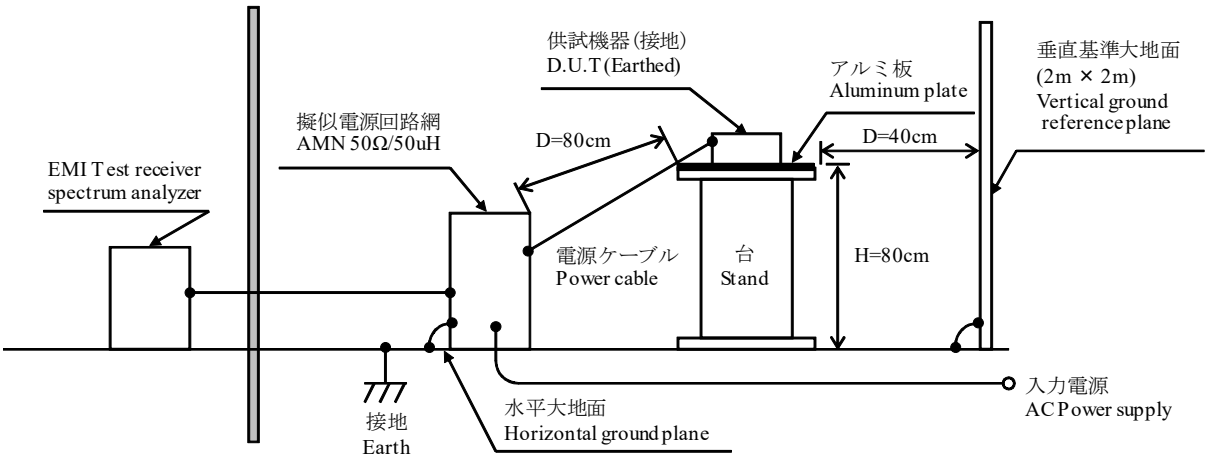
• 出力リップル、ノイズ波形　Output ripple and noise waveform



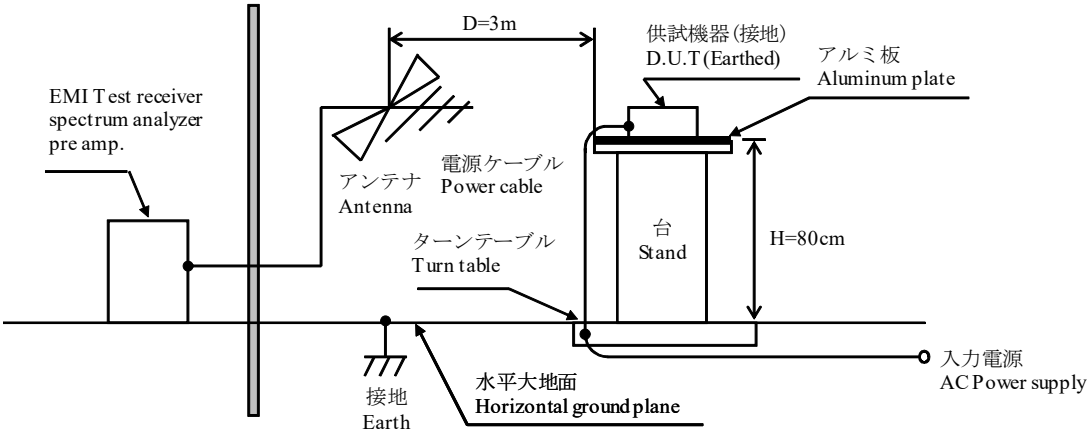
測定構成　Configuration used for determination

- 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	LECROY	LeCroy LT345
2	DIGITAL STORAGE OSCILLOSCOPE	TEKTRONIX	TDS3014B
3	DIGITAL MULTIMETER	AGILENT	34970A
4	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
5	CURRENT PROBE	TEKTRONIX	TCP-312
6	CURRENT AMP	TEKTRONIX	TCPA-300
7	DYNAMIC DUMMY LOAD	CHROMA	Chroma 63103A
8	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ150U
9	CVCF	TDK LAMBDA	TDK Lambda Z-PLUS
10	CVCF	TDK LAMBDA	TDK Lambda GEN40-38
11	CVCF	KIKUSUI	PCR1000LE
12	CVCF	CHROMA	62012P-80-60
13	CONTROLLED TEMP. CHAMBER	ESPEC	SU-261 / SU-262
14	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESR EMI Test Receiver
15	LISN	ROHDE & SCHWARZ	ENV216
16	FREQUENCY RESPONSE ANALYZER	NF	FRA51615

2. 特性データ Characteristics

2-1. 静特性 Steady state data

(1) 入力・負荷・温度変動／出力起動・遮断電圧

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

5V

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

Iout \ Vin	18VDC	24VDC	32VDC	Line regulation	
0%	5.038V	5.038V	5.038V	0mV	0.000%
50%	5.020V	5.020V	5.020V	0mV	0.000%
100%	5.002V	5.003V	5.002V	1mV	0.020%
Load regulation	36mV	35mV	36mV		
	0.720%	0.700%	0.720%		

2. Temperature drift — Conditions Vin : 24 VDC, Iout : 100 %

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	5.002V	5.003V	5.003V	1mV	0.020%

3. Start up voltage and Drop out voltage — Conditions Ta : 25 °C, Iout : 100 %

Start up voltage (Vin)	17VDC
Drop out voltage (Vin)	15VDC

12V

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

Iout \ Vin	18VDC	24VDC	32VDC	Line regulation	
0%	12.027V	12.026V	12.026V	1mV	0.008%
50%	12.019V	12.018V	12.018V	1mV	0.008%
100%	12.011V	12.011V	12.011V	0mV	0.000%
Load regulation	16mV	15mV	15mV		
	0.133%	0.125%	0.125%		

2. Temperature drift — Conditions Vin : 24 VDC, Iout : 100 %

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	11.986V	12.011V	12.005V	25mV	0.208%

3. Start up voltage and Drop out voltage — Conditions Ta : 25 °C, Iout : 100 %

Start up voltage (Vin)	17VDC
Drop out voltage (Vin)	15VDC

24V

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

Iout \ Vin	18VDC	24VDC	32VDC	Line regulation	
0%	24.014V	24.014V	24.014V	0mV	0.000%
50%	24.010V	24.010V	24.010V	0mV	0.000%
100%	24.008V	24.007V	24.007V	1mV	0.004%
Load regulation	6mV	7mV	7mV		
	0.025%	0.029%	0.029%		

2. Temperature drift — Conditions Vin : 24 VDC, Iout : 100 %

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	24.039V	24.007V	23.924V	115mV	0.479%

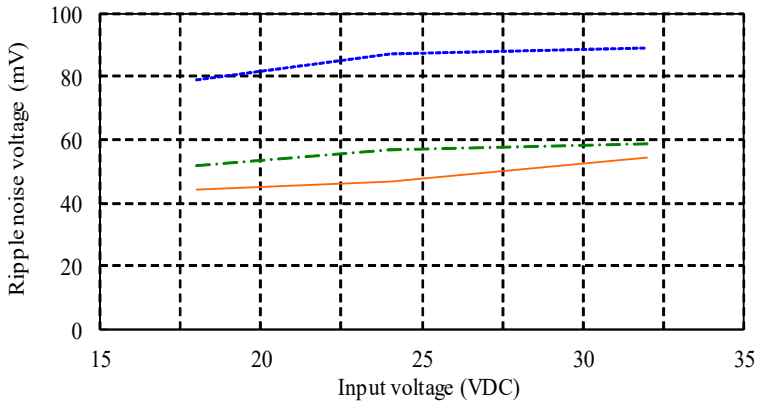
3. Start up voltage and Drop out voltage — Conditions Ta : 25 °C, Iout : 100 %

Start up voltage (Vin)	17VDC
Drop out voltage (Vin)	15VDC

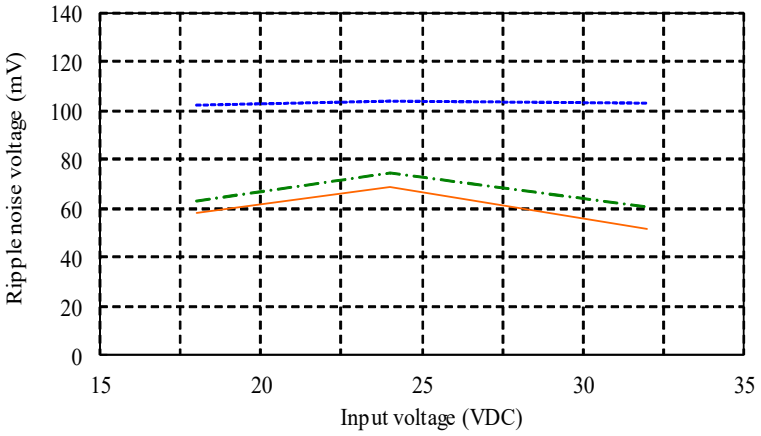
(2) リップルノイズ電圧対入力電圧　Ripple noise voltage vs. Input voltage

Conditions　Iout : 100 %
Ta : -20 °C
25 °C
50 °C

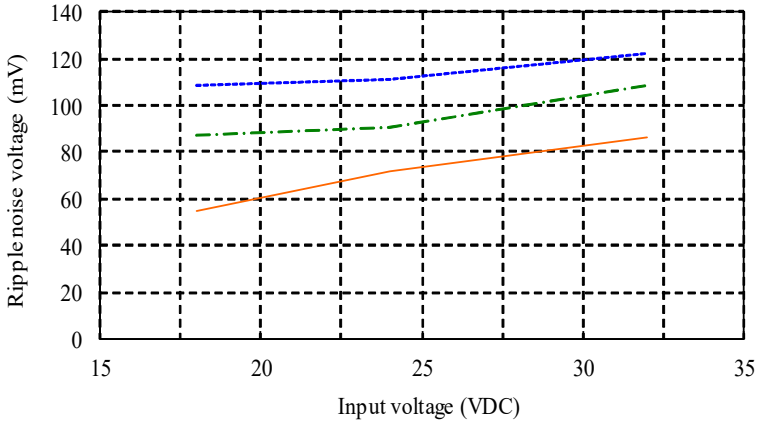
5V



12V



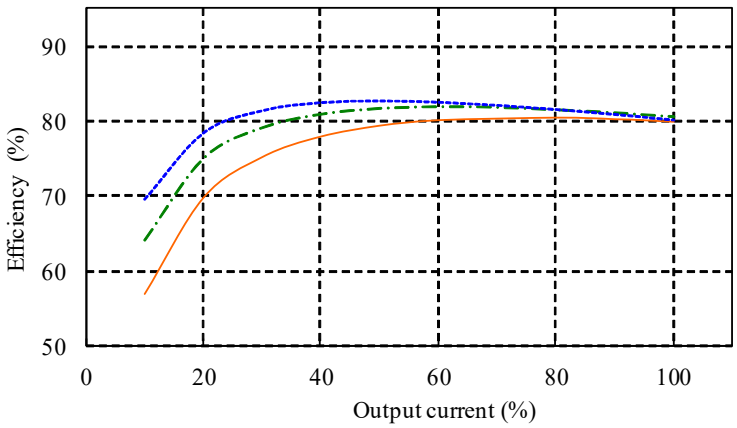
24V



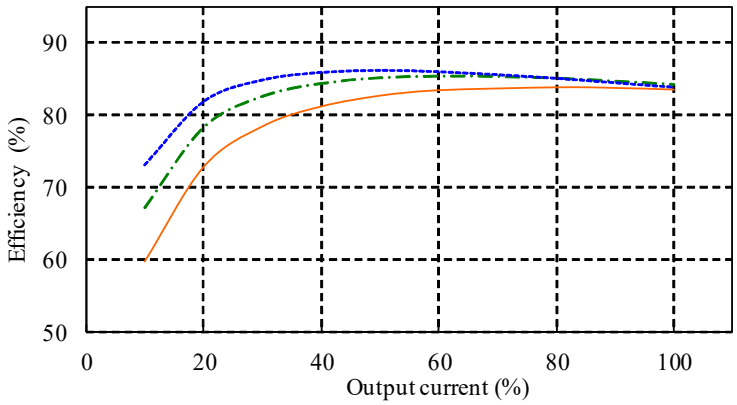
(3) 効率対出力電流 Efficiency vs. Output current

Conditions Vin : 18 VDC
24 VDC
32 VDC
Ta : 25 °C

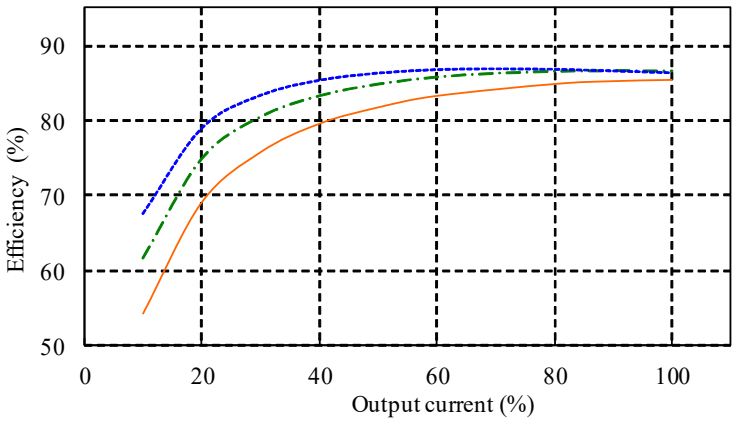
5V



12V



24V



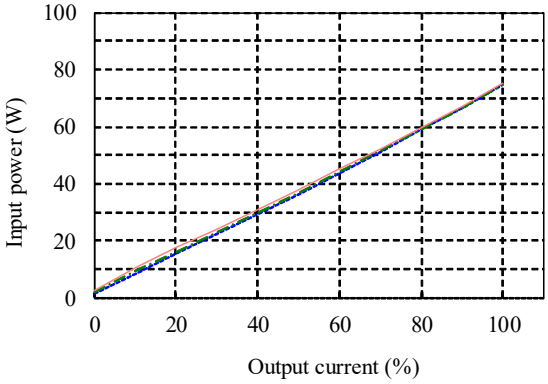
(4) 入力電力対出力電流 Input power vs. Output current

Conditions Vin : 18 VDC
24 VDC
32 VDC
Ta : 25 °C

5V

Vin	Input power (CNT ON)
	Iout : 0%
18VDC	1.40W
24VDC	1.91W
32VDC	2.78W

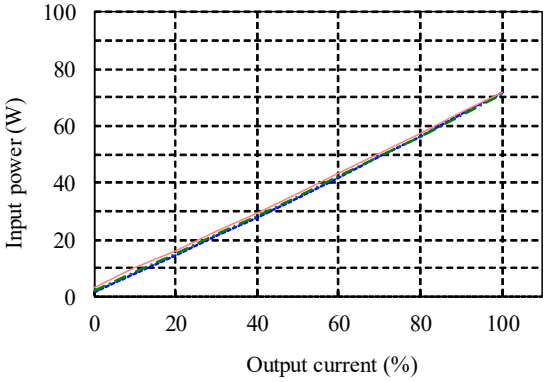
Vin	Input power (CNT OFF)
	Iout : 0%
18VDC	0.19W
24VDC	0.48W
32VDC	1.02W



12V

Vin	Input power (CNT ON)
	Iout : 0%
18VDC	1.55W
24VDC	2.14W
32VDC	3.20W

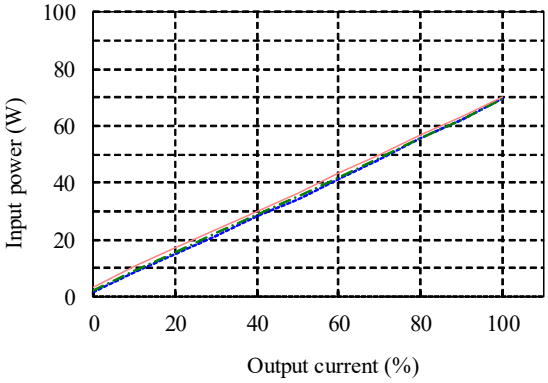
Vin	Input power (CNT OFF)
	Iout : 0%
18VDC	0.20W
24VDC	0.48W
32VDC	1.02W



24V

Vin	Input power (CNT ON)
	Iout : 0%
18VDC	1.81W
24VDC	2.45W
32VDC	3.46W

Vin	Input power (CNT OFF)
	Iout : 0%
18VDC	0.19W
24VDC	0.47W
32VDC	1.02W

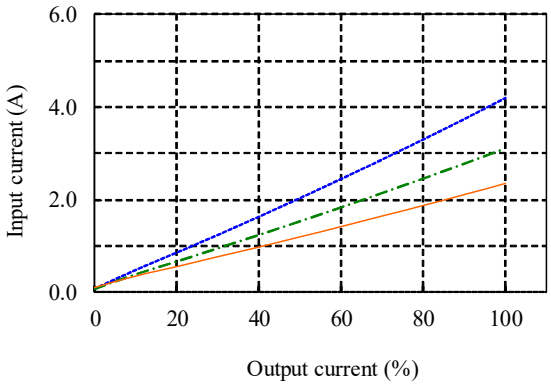


(5) 入力電流対出力電流 Input current vs. Output current

Conditions Vin : 18 VDC
24 VDC
32 VDC
Ta : 25 °C

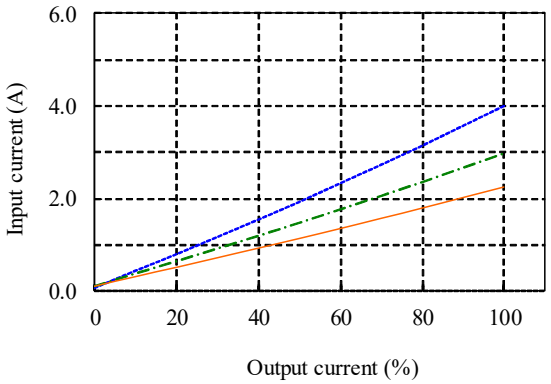
5V

Vin	Input current
	Iout : 0%
18VDC	0.08A
24VDC	0.08A
32VDC	0.09A



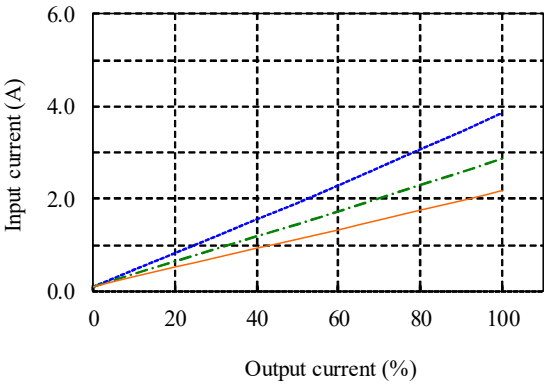
12V

Vin	Input current
	Iout : 0%
18VDC	0.09A
24VDC	0.09A
32VDC	0.10A



24V

Vin	Input current
	Iout : 0%
18VDC	0.10A
24VDC	0.10A
32VDC	0.11A

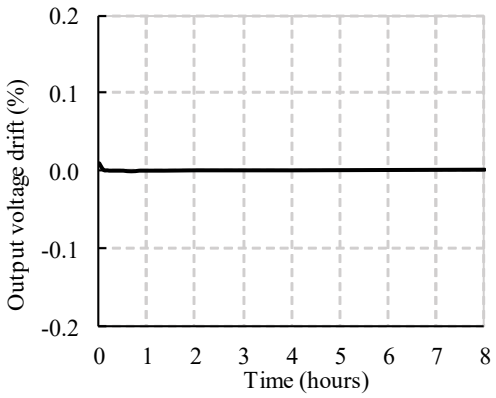


2-2. 通電ドリフト特性

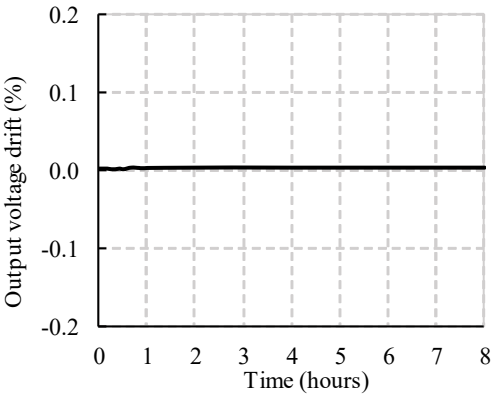
Warm up voltage drift characteristics

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

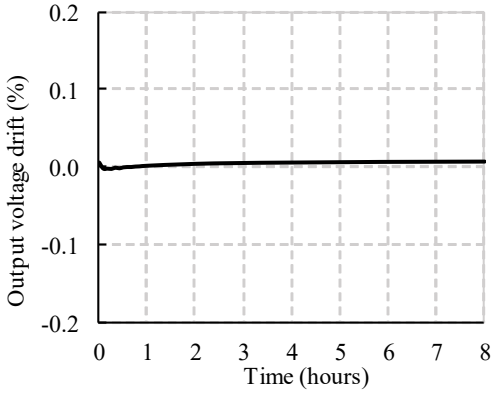
5V



12V



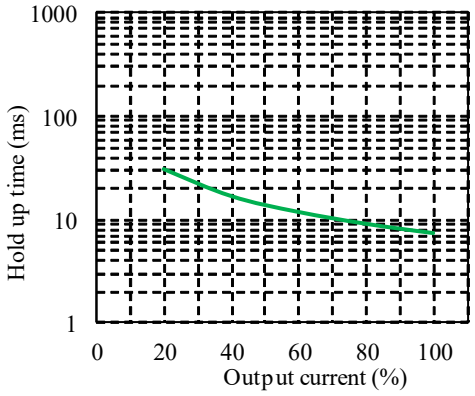
24V

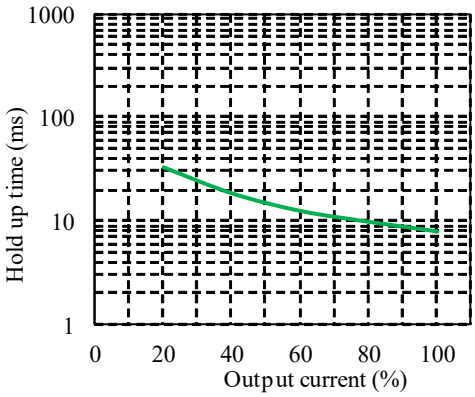


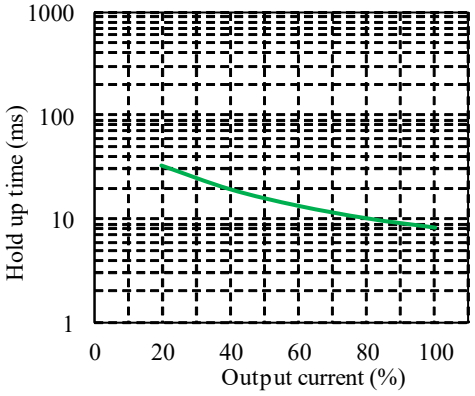
2-3. 出力保持時間特性

Hold up time characteristics

Conditions Vin : 24 VDC
Ta : 25 °C





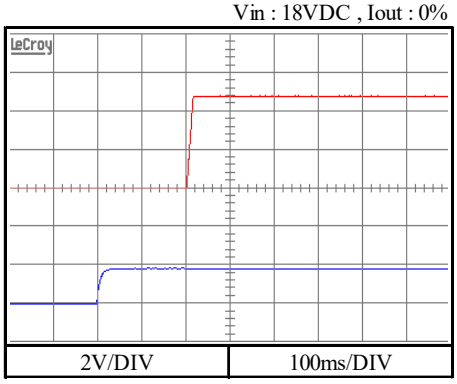


2-4.　出力立ち上がり特性　Output rise characteristics

Condition　Ta :　25 °C

5V

Vin : 18VDC , Iout : 0%

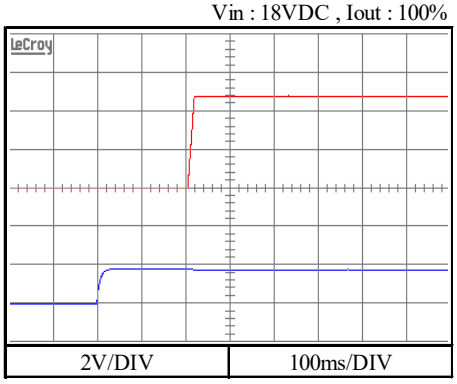


← Vout →

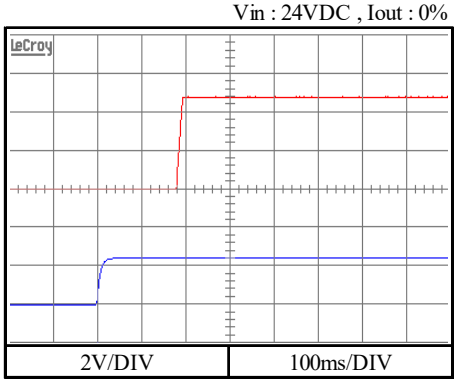
← 0V →

← Vin →

Vin : 18VDC , Iout : 100%



Vin : 24VDC , Iout : 0%

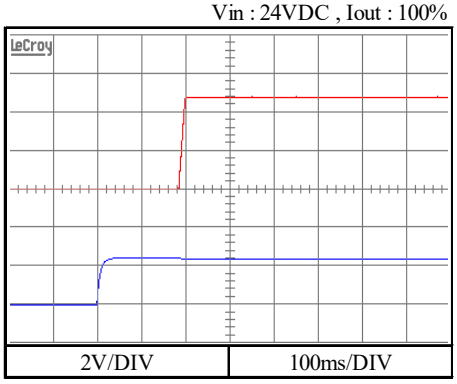


← Vout →

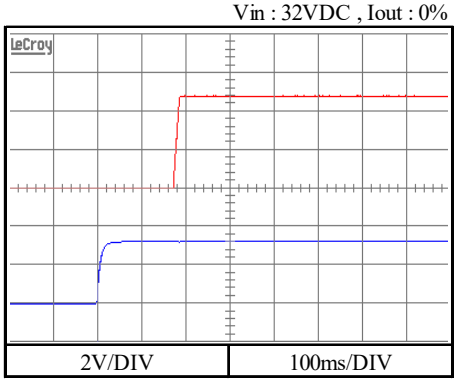
← 0V →

← Vin →

Vin : 24VDC , Iout : 100%



Vin : 32VDC , Iout : 0%

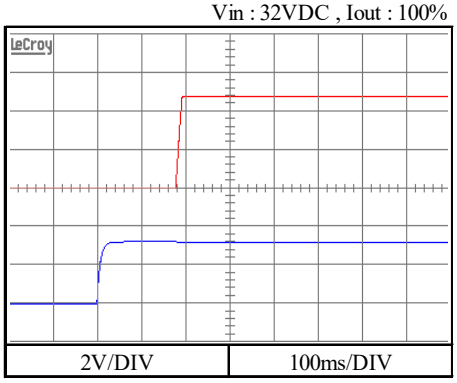


← Vout →

← 0V →

← Vin →

Vin : 32VDC , Iout : 100%

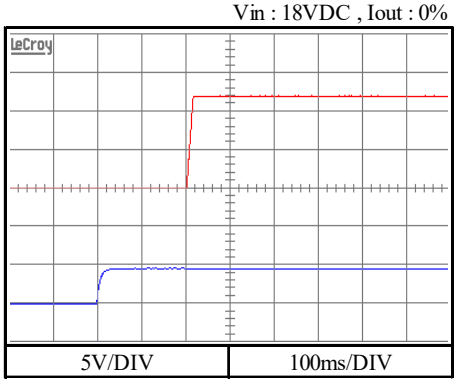


2-4. 出力立ち上がり特性 Output rise characteristics

Condition Ta : 25 °C

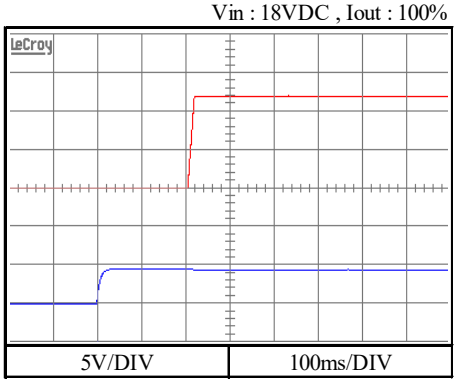
12V

Vin : 18VDC , Iout : 0%

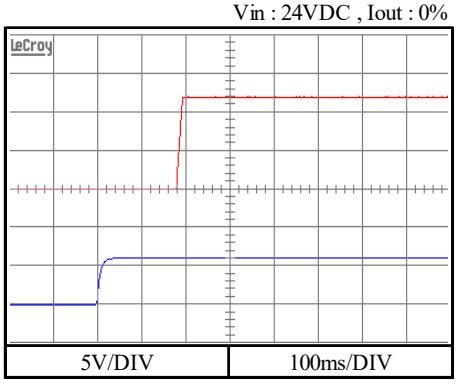


← Vout →
← 0V →
← Vin →

Vin : 18VDC , Iout : 100%

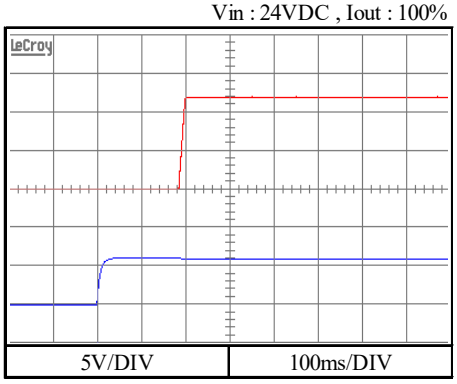


Vin : 24VDC , Iout : 0%

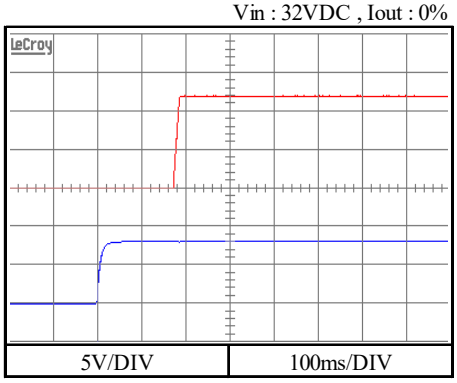


← Vout →
← 0V →
← Vin →

Vin : 24VDC , Iout : 100%

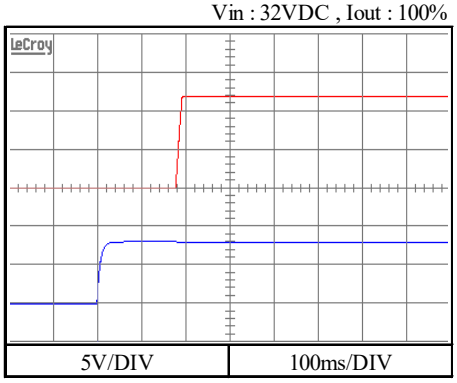


Vin : 32VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 32VDC , Iout : 100%

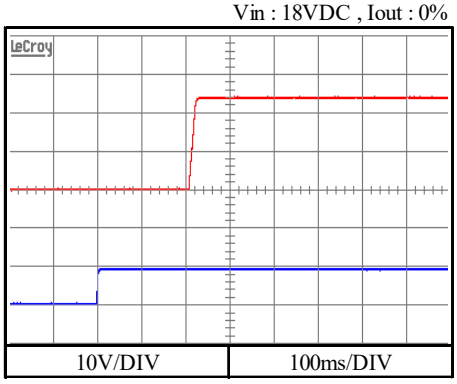


2-4. 出力立ち上がり特性 Output rise characteristics

Condition Ta : 25 °C

24V

Vin : 18VDC , Iout : 0%

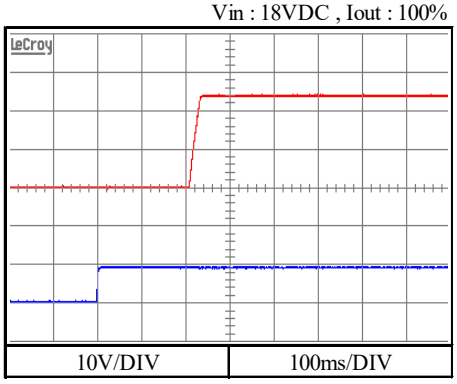


← Vout →

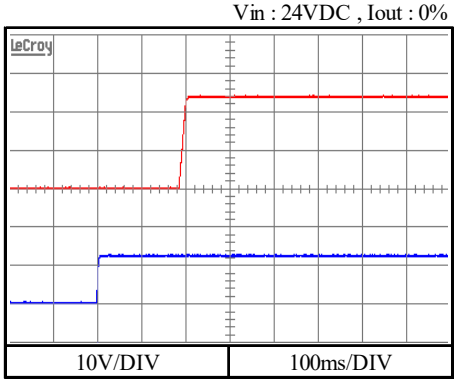
← 0V →

← Vin →

Vin : 18VDC , Iout : 100%



Vin : 24VDC , Iout : 0%

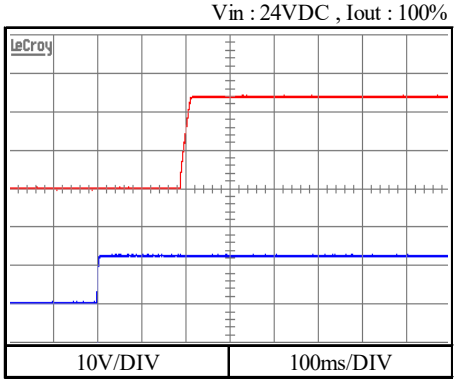


← Vout →

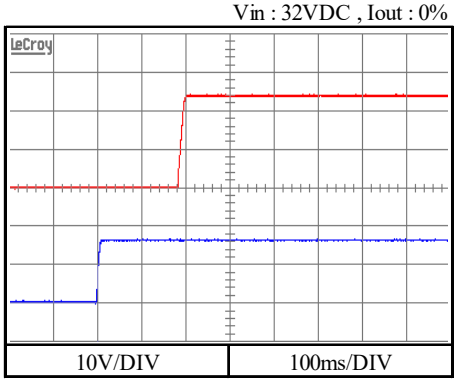
← 0V →

← Vin →

Vin : 24VDC , Iout : 100%



Vin : 32VDC , Iout : 0%

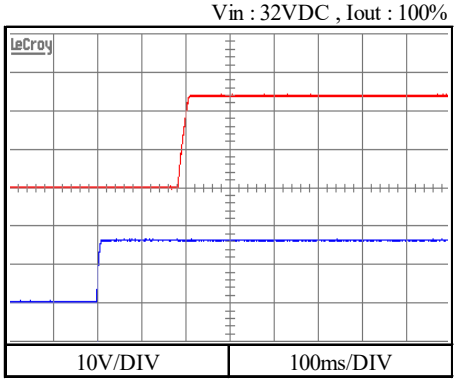


← Vout →

← 0V →

← Vin →

Vin : 32VDC , Iout : 100%

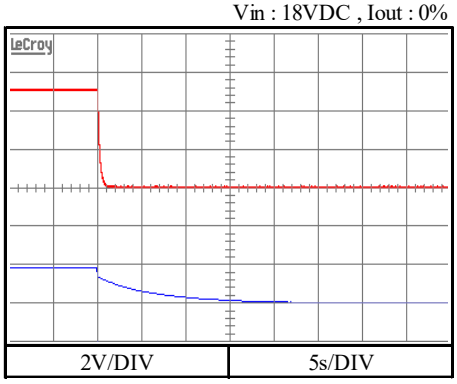


2-5. 出力立ち下がり特性 Output fall characteristics

Condition Ta : 25 °C

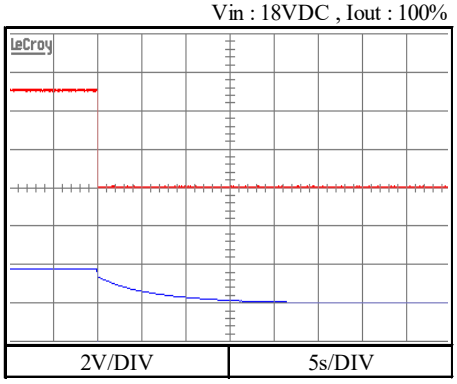
5V

Vin : 18VDC , Iout : 0%

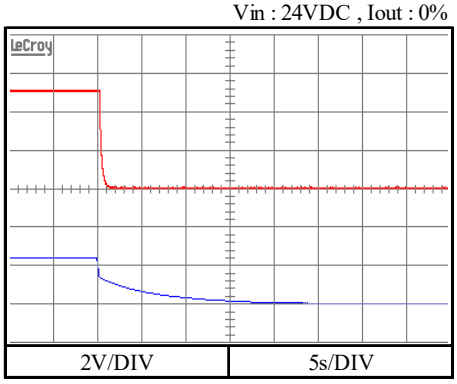


← Vout →
← 0V →
← Vin →

Vin : 18VDC , Iout : 100%

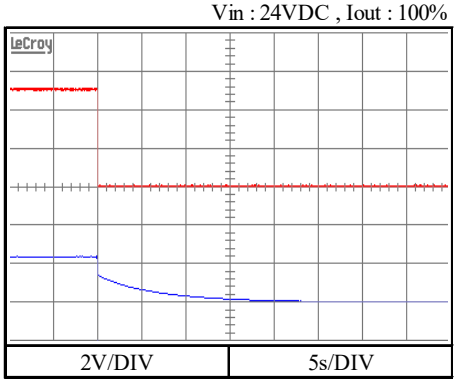


Vin : 24VDC , Iout : 0%

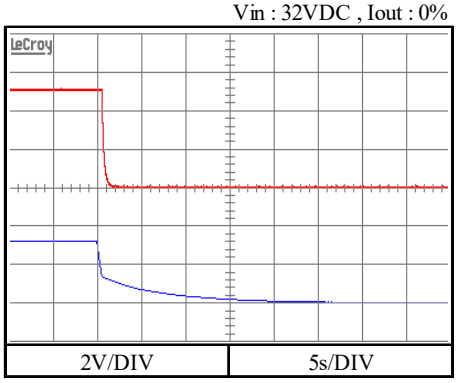


← Vout →
← 0V →
← Vin →

Vin : 24VDC , Iout : 100%

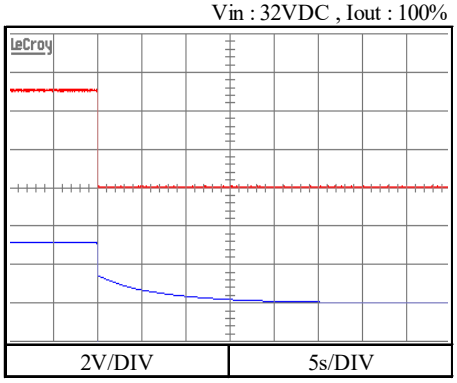


Vin : 32VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 32VDC , Iout : 100%

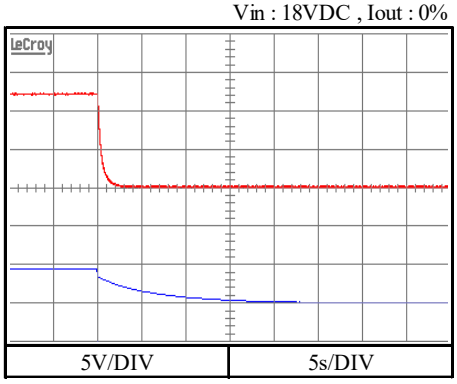


2-5. 出力立ち下がり特性 Output fall characteristics

Condition Ta : 25 °C

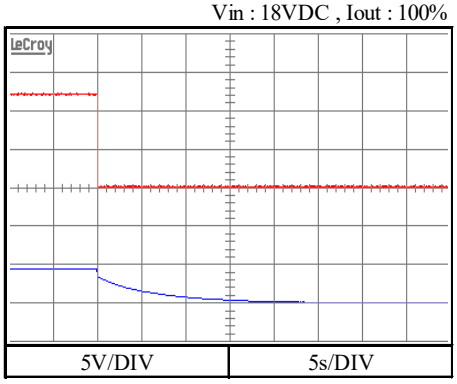
12V

Vin : 18VDC , Iout : 0%

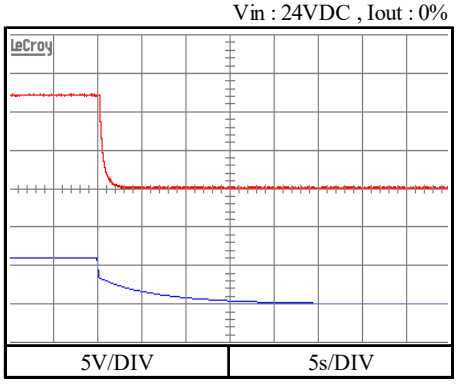


← Vout →
← 0V →
← Vin →

Vin : 18VDC , Iout : 100%

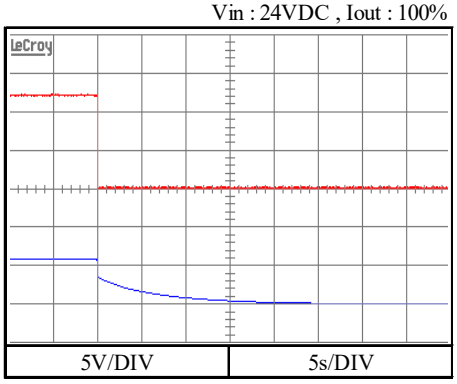


Vin : 24VDC , Iout : 0%

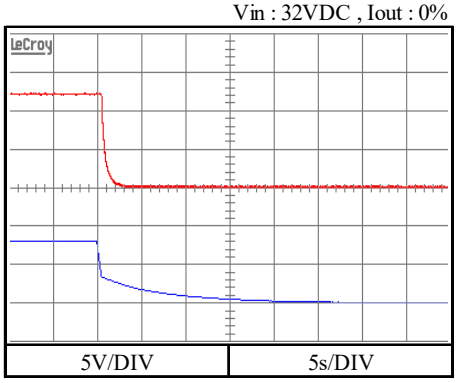


← Vout →
← 0V →
← Vin →

Vin : 24VDC , Iout : 100%

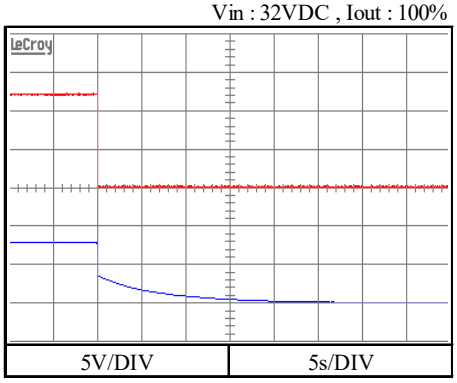


Vin : 32VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 32VDC , Iout : 100%

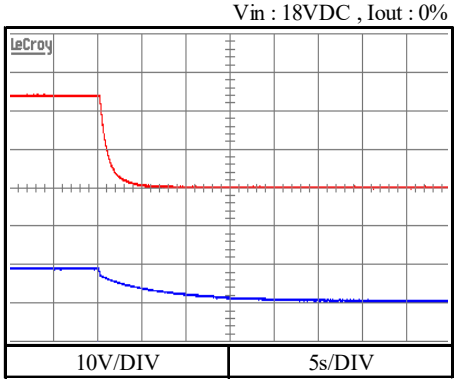


2-5. 出力立ち下がり特性 Output fall characteristics

Condition Ta : 25 °C

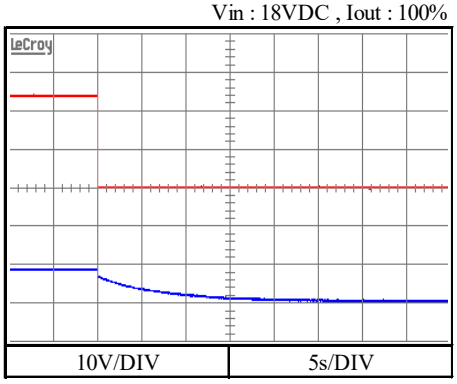
24V

Vin : 18VDC , Iout : 0%

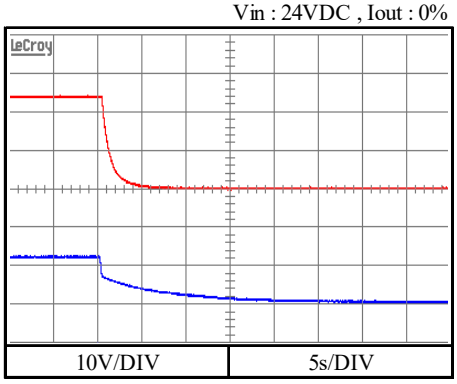


← Vout →
← 0V →
← Vin →

Vin : 18VDC , Iout : 100%

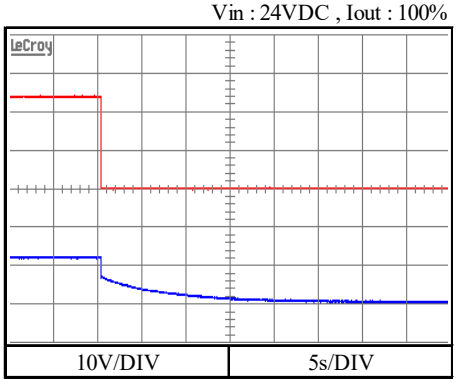


Vin : 24VDC , Iout : 0%

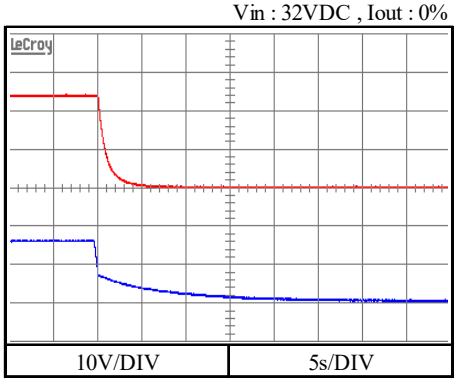


← Vout →
← 0V →
← Vin →

Vin : 24VDC , Iout : 100%

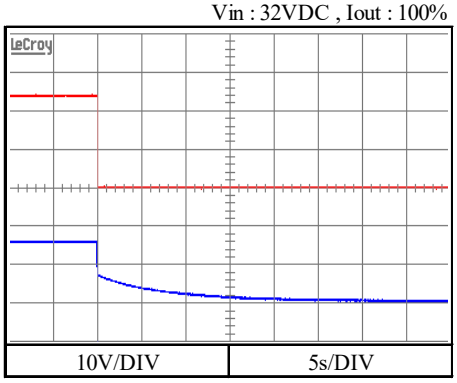


Vin : 32VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 32VDC , Iout : 100%

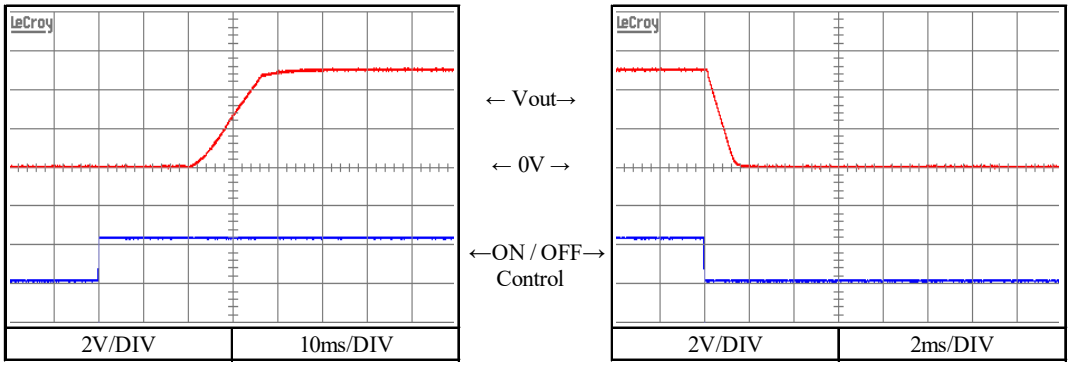


2-6. ON／OFFコントロール時出力立ち上がり、立下がり特性

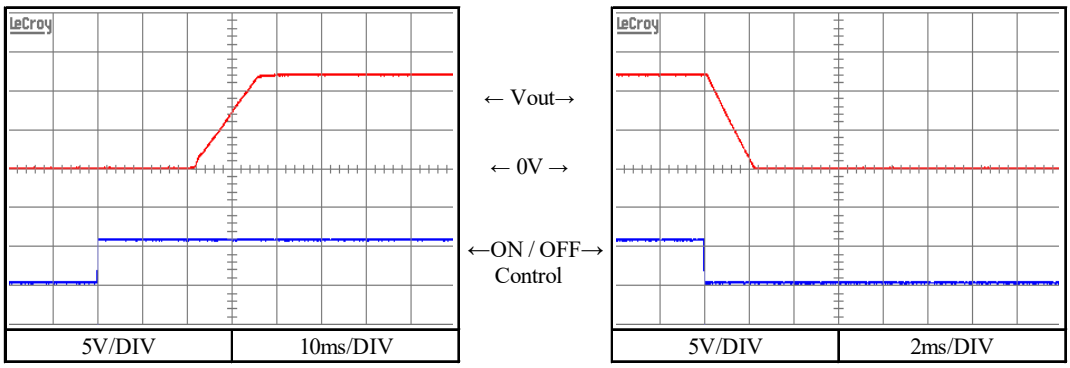
Output rise, fall characteristics with ON/OFF RC Control

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

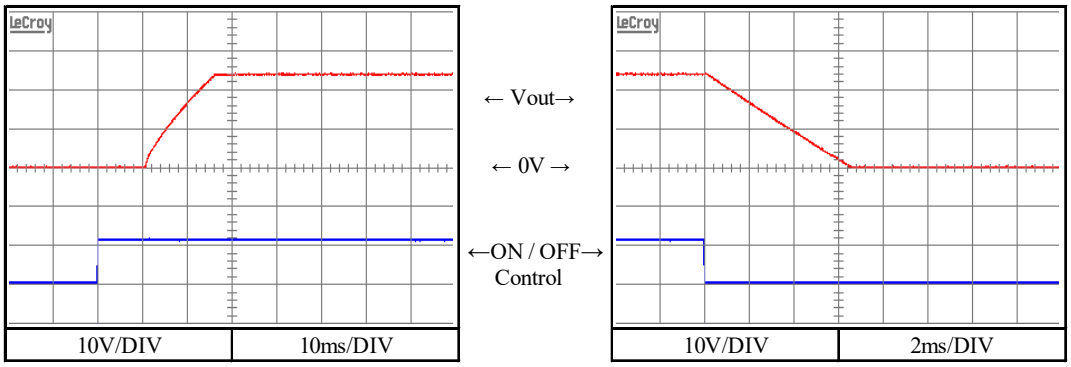
5V



12V



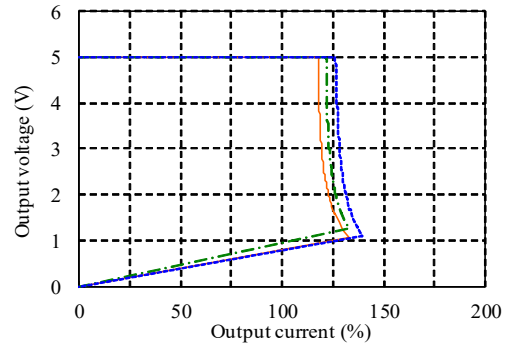
24V



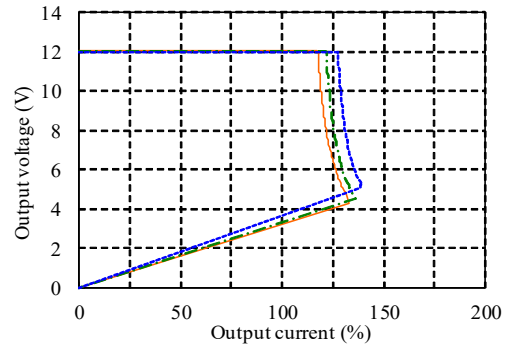
2-7. 過電流保護特性
Over current protection (OCP) characteristics

Conditions Vin : 24 VDC
Ta : -20 ℃
25 ℃
50 ℃

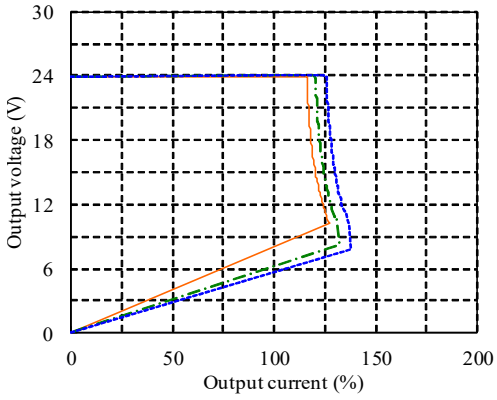
5V



12V

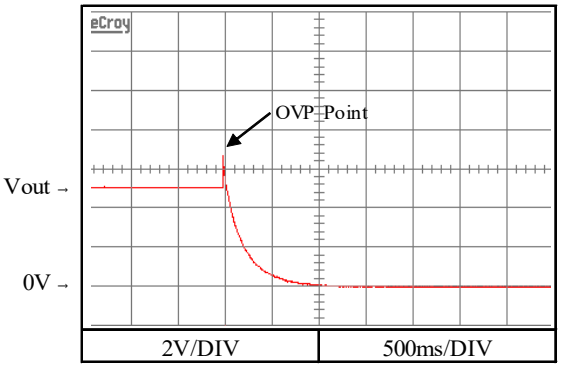


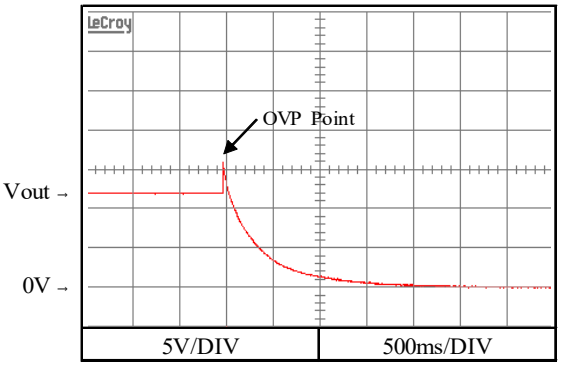
24V

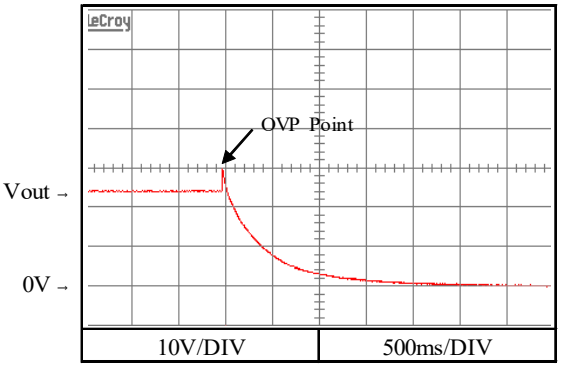


2-8. 過電圧保護特性
Over voltage protection (OVP) characteristics

Conditions Vin : 24 VDC
Iout : 0 %
Ta : 25 ℃





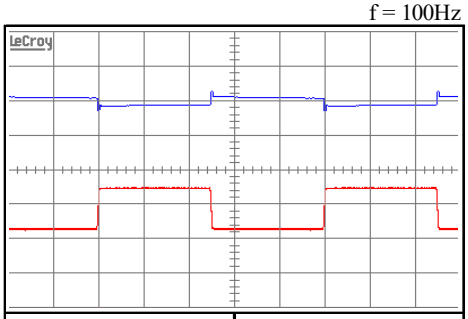


2-9. 過渡応答(負荷急変)特性 Dynamic load response characteristics

Conditions Vin : 24 VDC
Iout : 50 % ↔ 100 %
(tr = tf = 100μs)
Ta : 25 ℃

5V

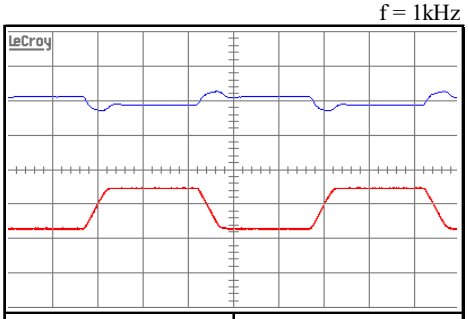
f = 100Hz



100mV/DIV	2ms/DIV
+0.62%	-0.66%

← Vout→
← Iout→
← Iout:0%→

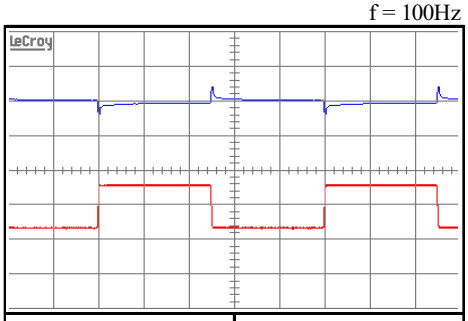
f = 1kHz



100mV/DIV	200μs/DIV
+0.58%	-0.58%

12V

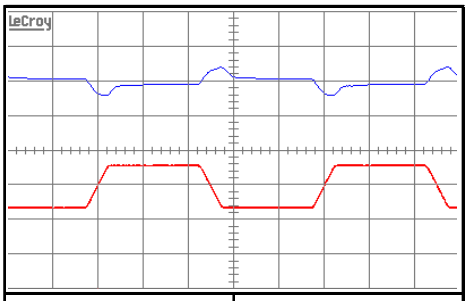
f = 100Hz



100mV/DIV	2ms/DIV
+0.35%	-0.35%

← Vout→
← Iout→
← Iout:0%→

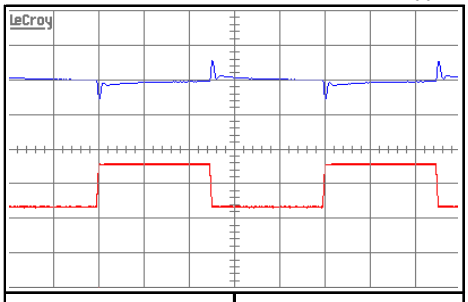
f = 1kHz



100mV/DIV	200μs/DIV
+0.35%	-0.34%

24V

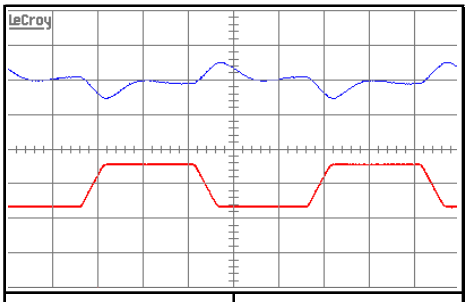
f = 100Hz



100mV/DIV	2ms/DIV
+0.23%	-0.24%

← Vout→
← Iout→
← Iout:0%→

f = 1kHz

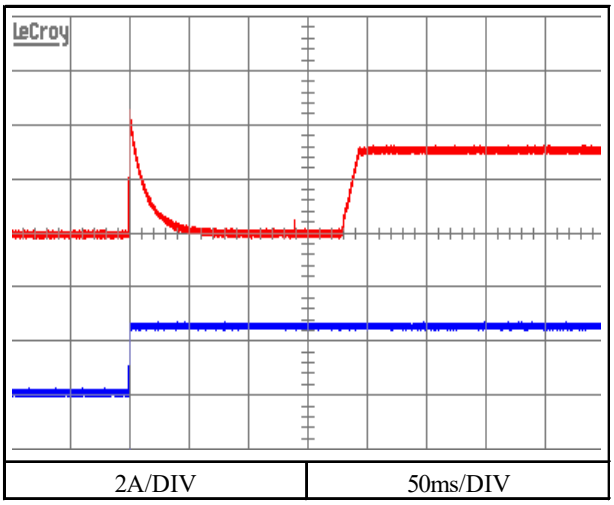


100mV/DIV	200μs/DIV
+0.22%	-0.22%

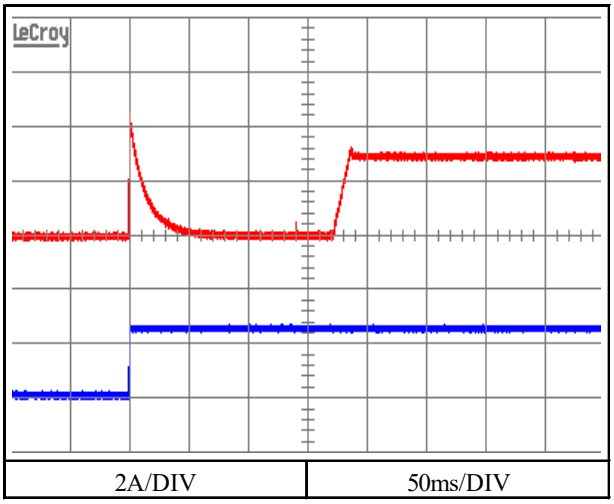
2-11. 入力サージ電流(突入電流)波形 Inrush current waveform

Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 ℃

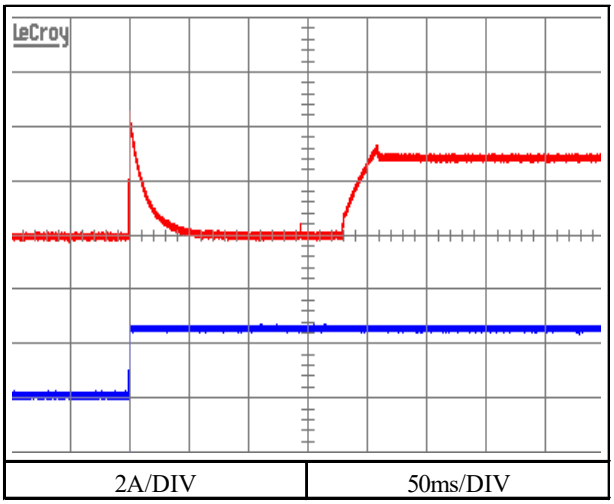
5V



12V



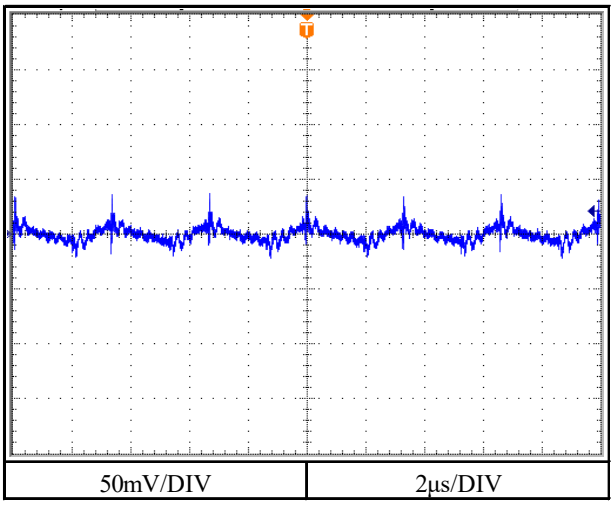
24V



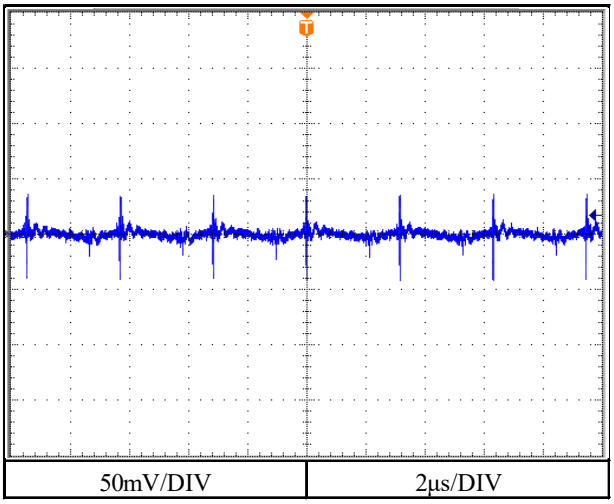
2-12. 出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 ℃

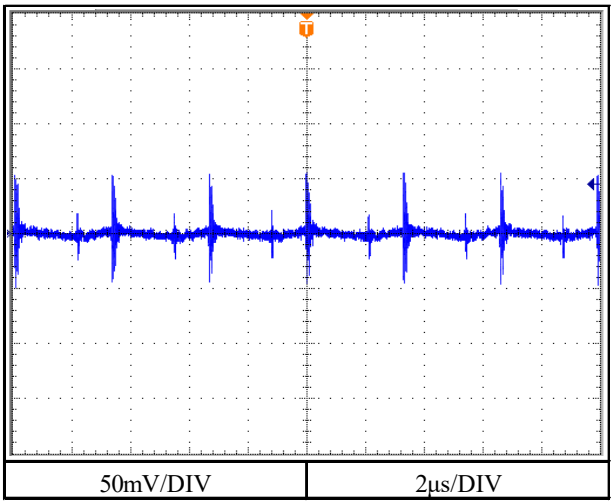
5V



12V



24V



2-13. EMI特性 Electro-Magnetic Interference characteristics

Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 ℃

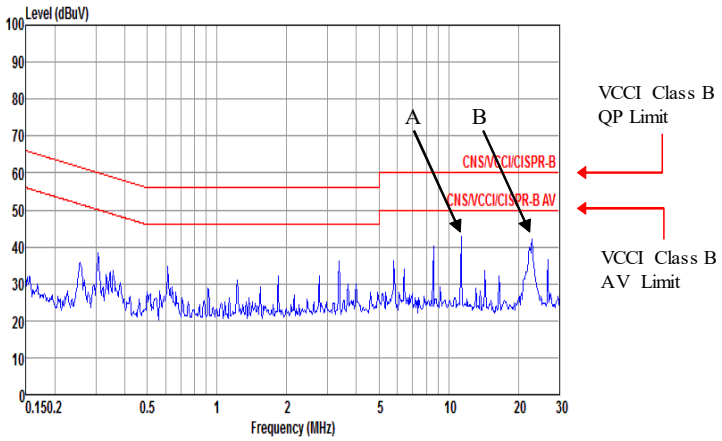
雑音端子電圧
Conducted Emission

5V

Ref. Data	Point A (11.37MHz) Limit (dB)	Measure (dB)
QP	60.0	43.11
AV	50.0	42.96

Ref. Data	Point B (22.74MHz) Limit (dB)	Measure (dB)
QP	60.0	39.3
AV	50.0	34.5

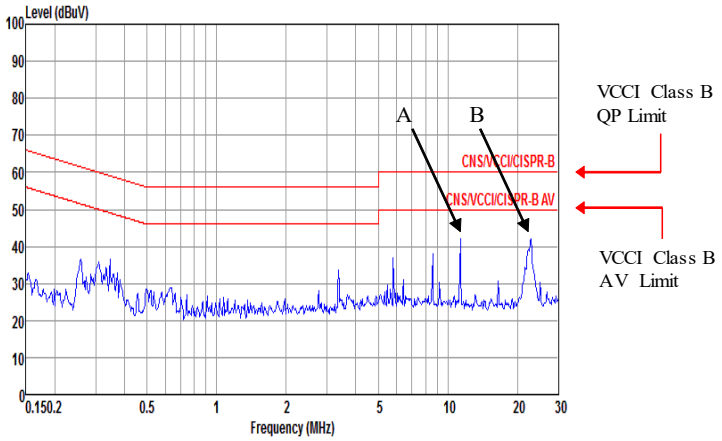
Phase : N (-Vin side)



Ref. Data	Point A (11.37MHz) Limit (dB)	Measure (dB)
QP	60.0	41.0
AV	50.0	41.13

Ref. Data	Point B (22.74MHz) Limit (dB)	Measure (dB)
QP	60.0	40.2
AV	50.0	36.3

Phase : L (+Vin side)



EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.
表示はピーク値
Indication is peak values.

Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 ℃

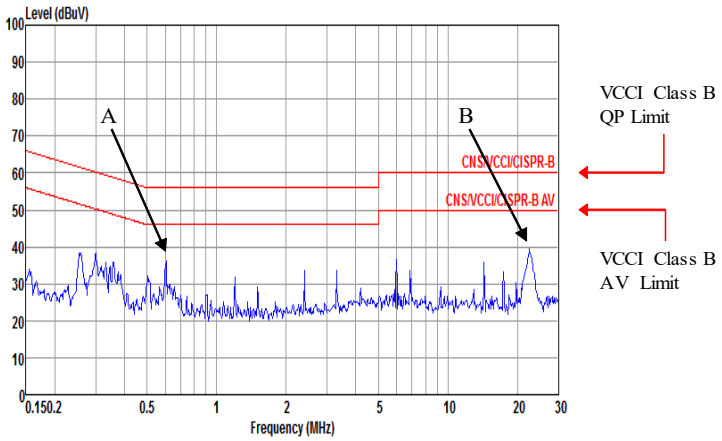
雑音端子電圧
Conducted Emission

12V

Ref. Data	Point A (0.6MHz) Limit (dB)	Measure (dB)
QP	56.0	34.45
AV	46.0	33.74

Ref. Data	Point B (22.72MHz) Limit (dB)	Measure (dB)
QP	60.0	37.4
AV	50.0	32.4

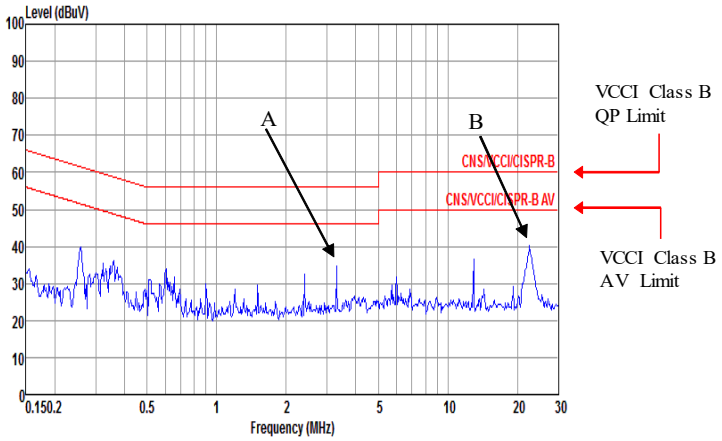
Phase : N (-Vin side)



Ref. Data	Point A (3.31MHz) Limit (dB)	Measure (dB)
QP	56.0	32.73
AV	46.0	32.82

Ref. Data	Point B (22.56MHz) Limit (dB)	Measure (dB)
QP	60.0	36.0
AV	50.0	30.4

Phase : L (+Vin side)



EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.
表示はピーク値
Indication is peak values.

Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 ℃

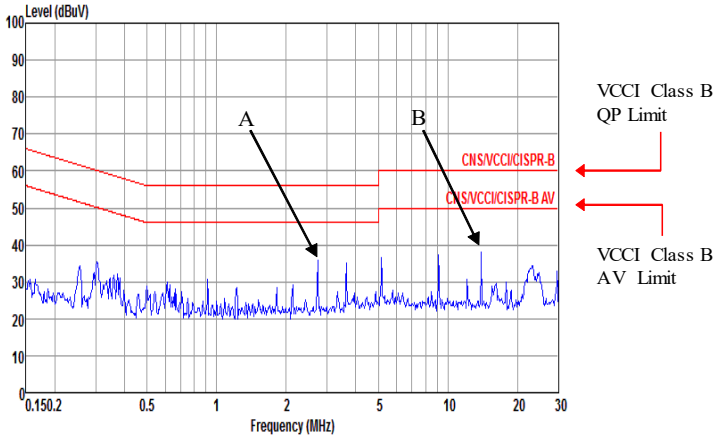
雑音端子電圧
Conducted Emission

24V

Phase : N (-Vin side)

Ref. Data	Point A (2.74MHz) Limit (dB)	Measure (dB)
QP	56.0	34.06
AV	46.0	34.18

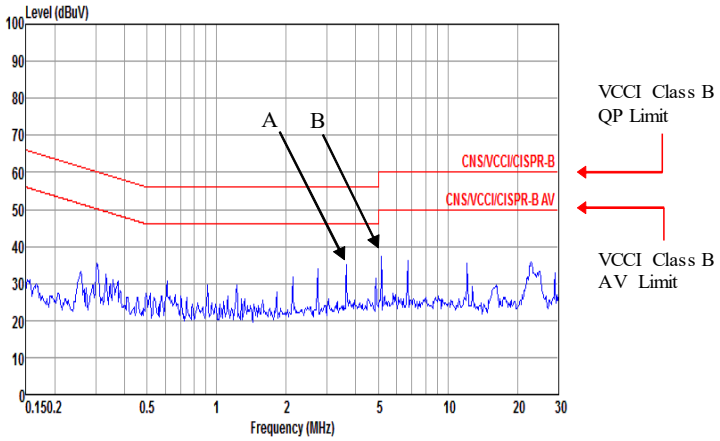
Ref. Data	Point B (14.01MHz) Limit (dB)	Measure (dB)
QP	60.0	35.8
AV	50.0	35.9



Phase : L (+Vin side)

Ref. Data	Point A (3.66MHz) Limit (dB)	Measure (dB)
QP	56.0	33.25
AV	46.0	33.16

Ref. Data	Point B (5.18MHz) Limit (dB)	Measure (dB)
QP	60.0	34.2
AV	50.0	33.9

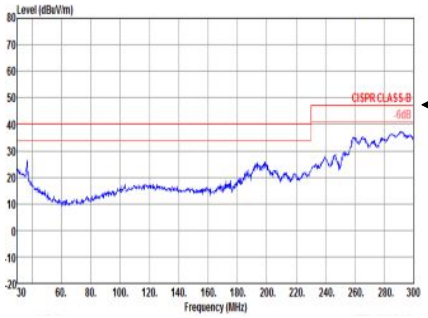


EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.
表示はピーク値
Indication is peak values.

Conditions Vin : 24 VDC
Iout : 100 %
Ta : 25 ℃

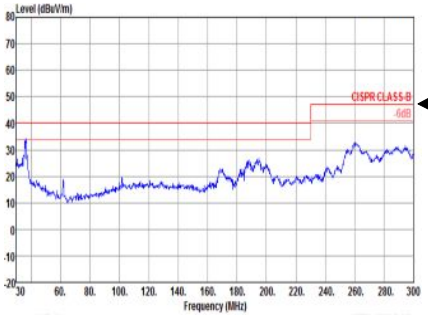
雑音電界強度
Radiated Emission

5V HORIZONTAL



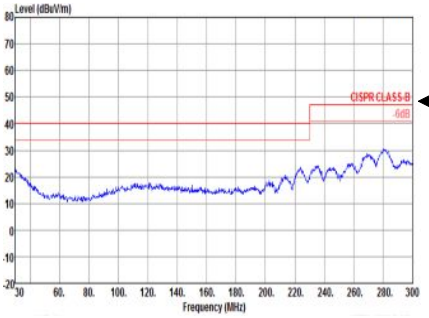
← QP Limit

VERTICAL



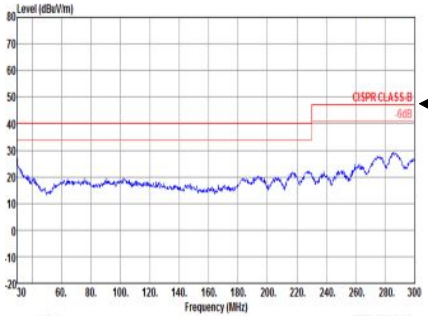
← QP Limit

12V HORIZONTAL



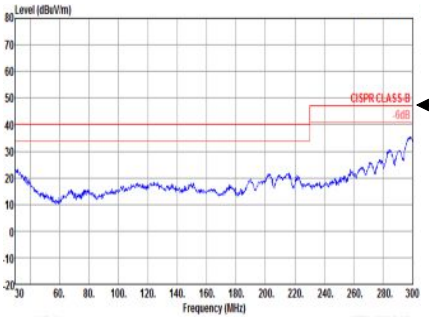
← QP Limit

VERTICAL



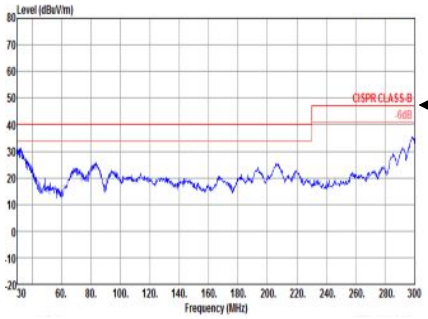
← QP Limit

24V HORIZONTAL



← QP Limit

VERTICAL



← QP Limit

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Limit of EN55011-B,EN55032-B are same as its VCCI class B.
表示はピーク値
Indication is peak values.