RDS60A-48

EVALUATION DATA

型式データ

INDEX

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

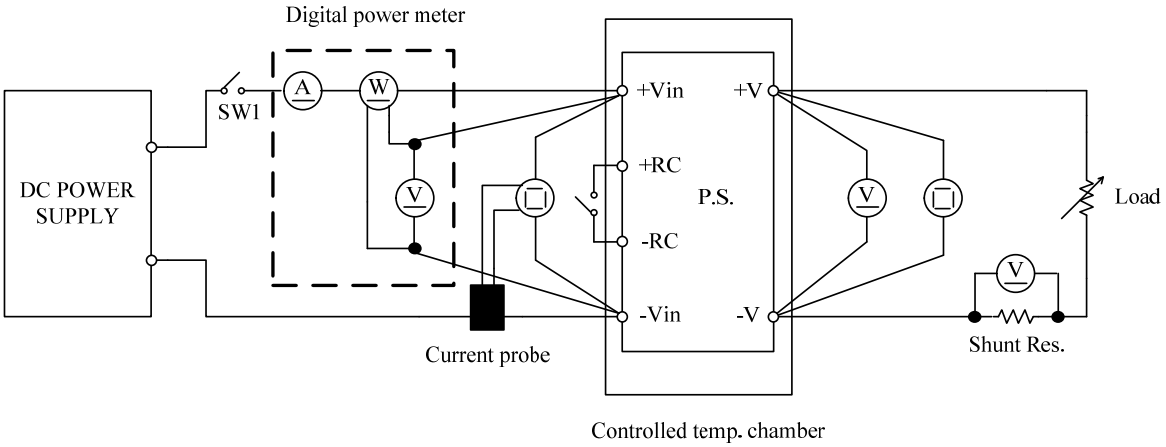
※ 当社測定条件における結果であり、参考値としてお考え願います。
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1-1. 測定回路 Circuit used for determination

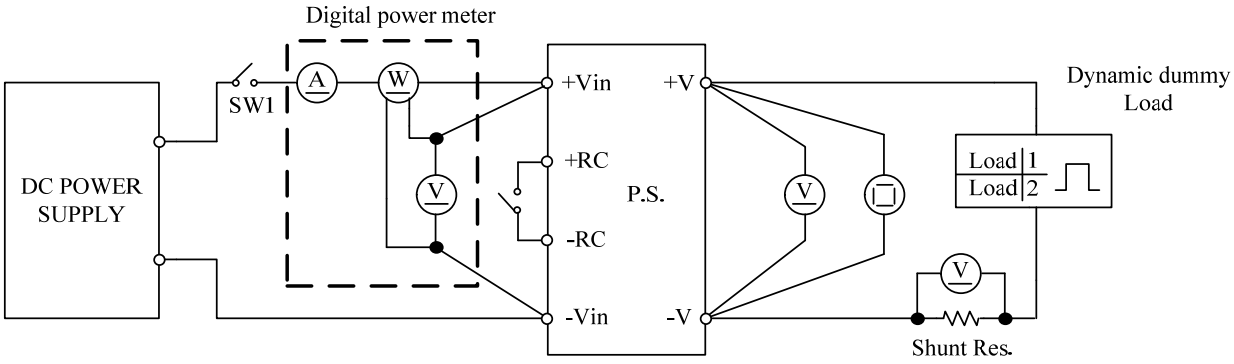
測定回路1 Circuit 1 used for determination

- 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

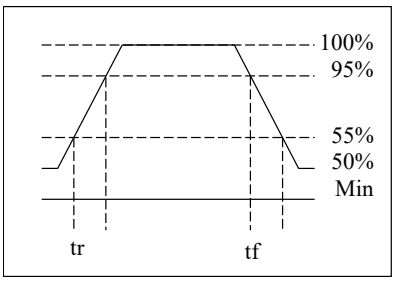


測定回路2 Circuit 2 used for determination

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

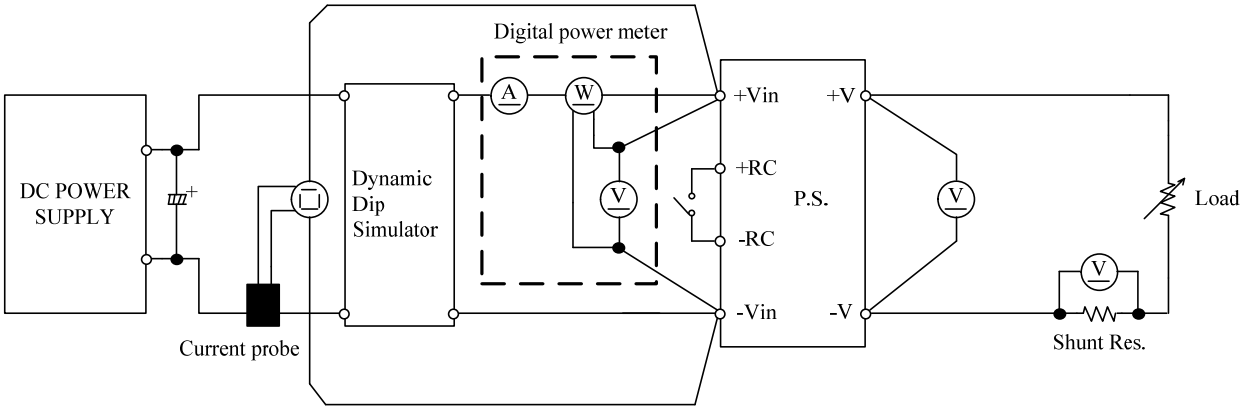


Output current waveform
Iout 50% <==> 100%



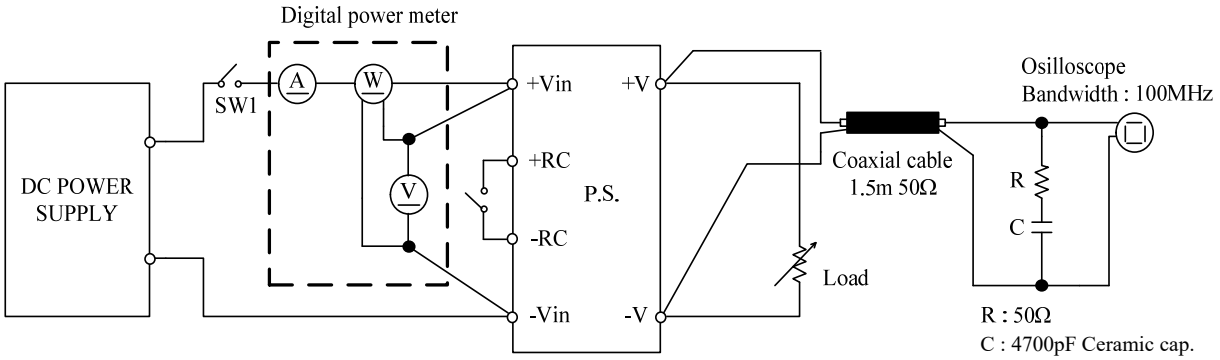
測定回路3　Circuit 3 used for determination

- 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

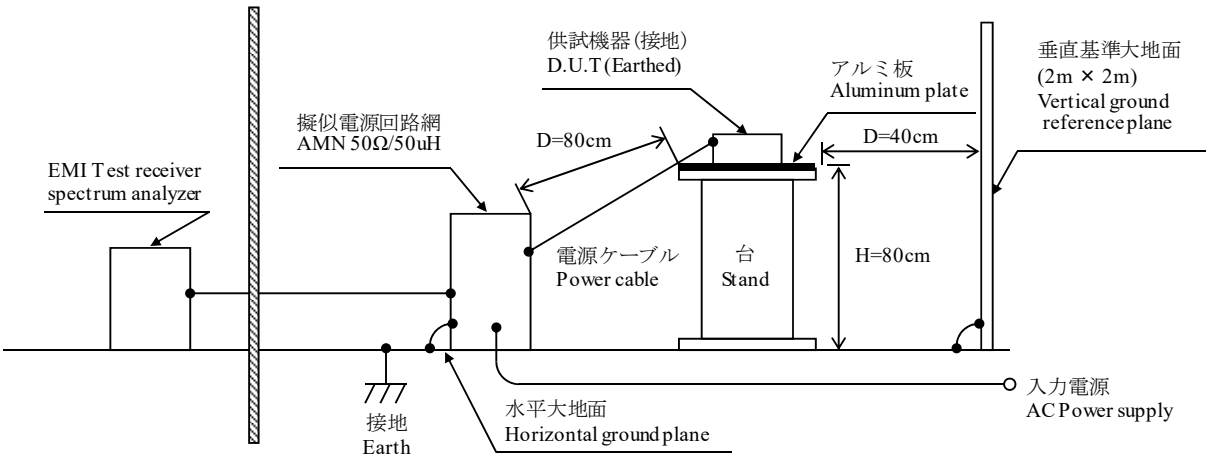
- 出力リップル、ノイズ波形　Output ripple and noise waveform



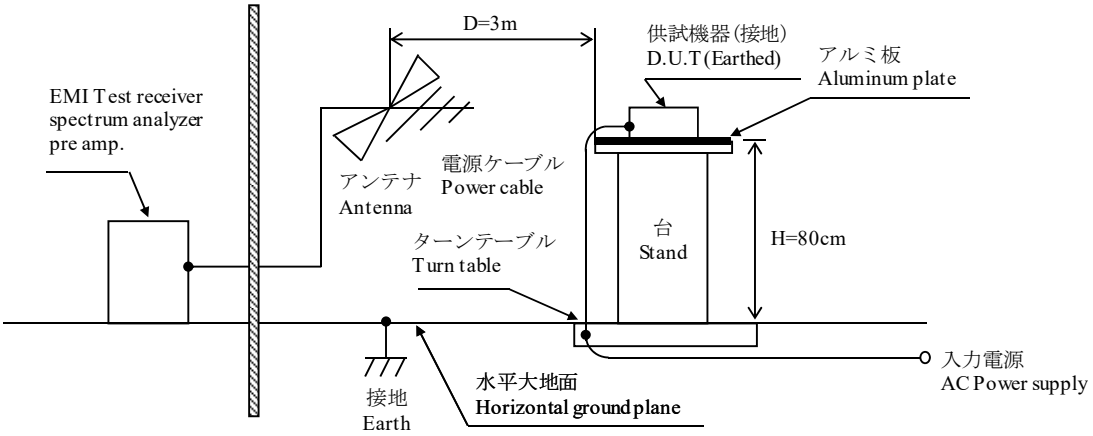
測定構成　Configuration used for determination

- 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	36VDC	48VDC	63VDC	Line regulation	
0%	5.056V	5.056V	5.056V	0mV	0.000%
50%	5.038V	5.038V	5.038V	0mV	0.000%
100%	5.020V	5.020V	5.020V	0mV	0.000%
Load regulation	36mV	36mV	36mV		
	0.720%	0.720%	0.720%		

2. Temperature drift — Conditions Vin : 48 VDC, Iout : 100 %

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	5.013V	5.020V	5.010V	10mV	0.200%

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

Start up voltage (Vin)	34VDC
Drop out voltage (Vin)	29VDC

12V

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

Iout \ Vin	36VDC	48VDC	63VDC	Line regulation	
0%	11.998V	11.998V	11.998V	0mV	0.000%
50%	11.990V	11.990V	11.990V	0mV	0.000%
100%	11.983V	11.983V	11.983V	0mV	0.000%
Load regulation	15mV	15mV	15mV		
	0.125%	0.125%	0.125%		

2. Temperature drift — Conditions Vin : 48 VDC, Iout : 100 %

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	11.971V	11.983V	12.007V	36mV	0.300%

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

Start up voltage (Vin)	34VDC
Drop out voltage (Vin)	29VDC

24V

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

Iout \ Vin	36VDC	48VDC	63VDC	Line regulation	
0%	24.072V	24.071V	24.072V	1mV	0.004%
50%	24.067V	24.067V	24.067V	0mV	0.000%
100%	24.065V	24.064V	24.064V	1mV	0.004%
Load regulation	7mV	7mV	8mV		
	0.029%	0.029%	0.033%		

2. Temperature drift — Conditions Vin : 48 VDC, Iout : 100 %

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	24.055V	24.064V	24.007V	57mV	0.237%

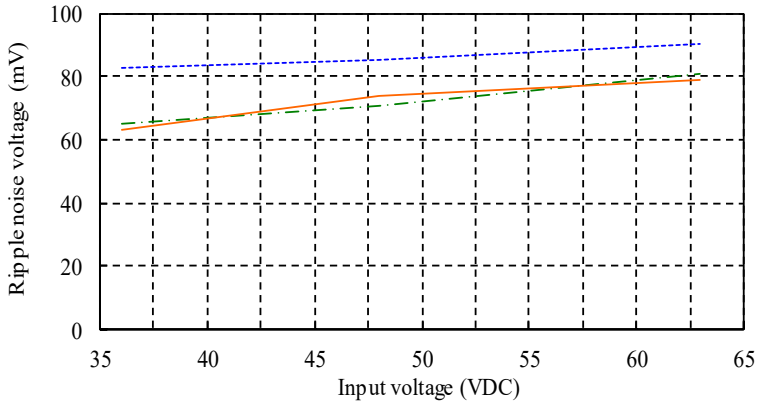
3. Start up voltage and Drop out voltage — Conditions Ta : 25 °C, Iout : 100 %

Start up voltage (Vin)	34VDC
Drop out voltage (Vin)	29VDC

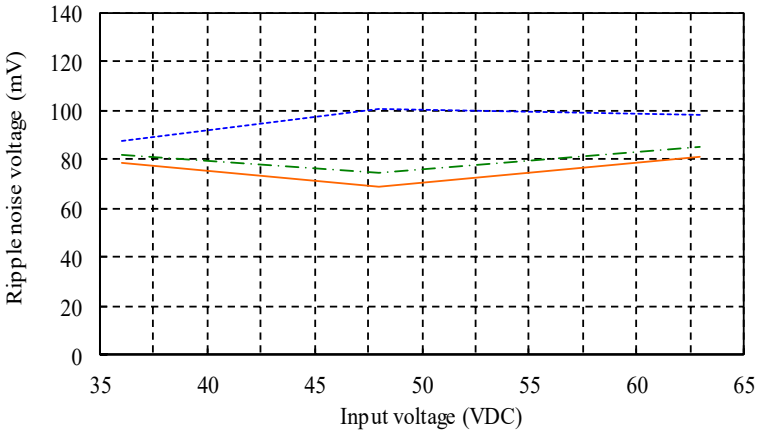
(2) リップルノイズ電圧対入力電圧　Ripple noise voltage vs. Input voltage

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

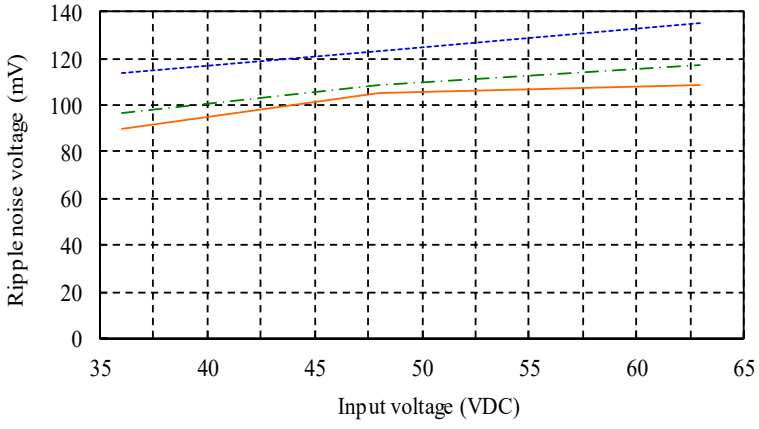
5V



12V



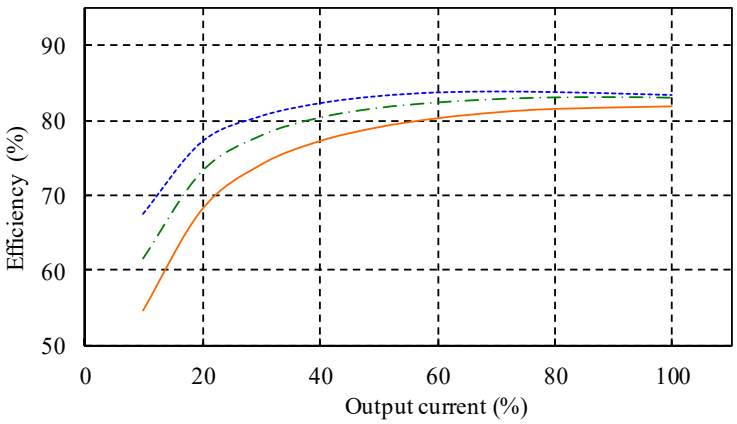
24V



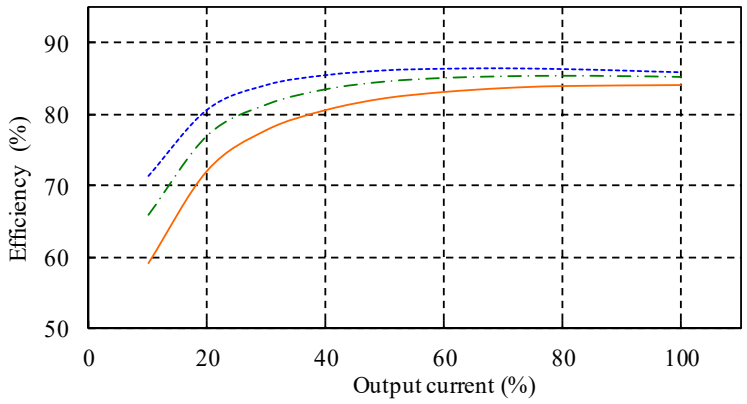
(3) 効率対出力電流 Efficiency vs. Output current

Conditions Vin : 36 VDC
48 VDC
63 VDC
Ta : 25 °C

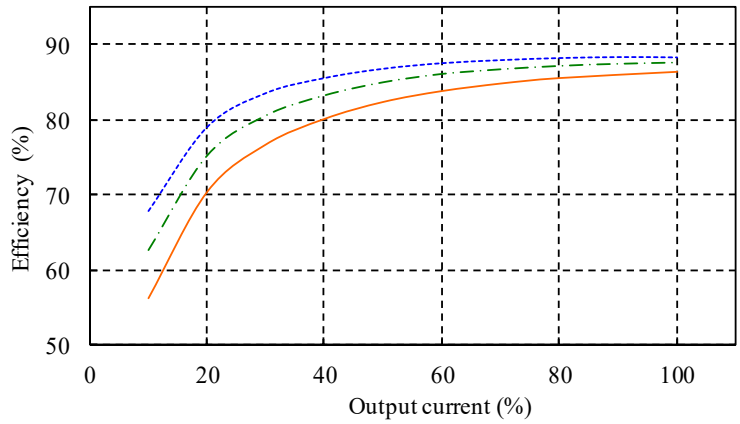
5V



12V



24V



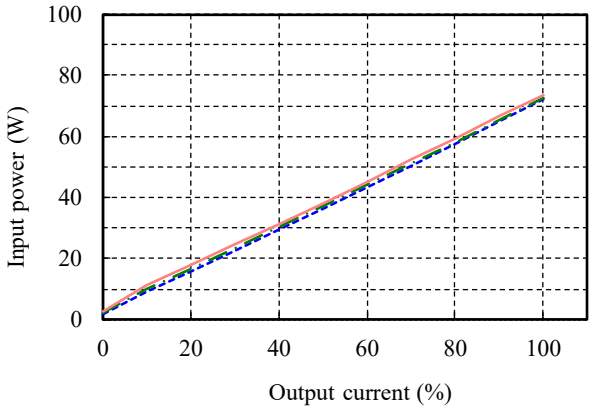
(4) 入力電力対出力電流 Input power vs. Output current

Conditions Vin : 36 VDC
48 VDC
63 VDC
Ta : 25 ℃

5V

Vin	Input power (CNT ON)
	Iout : 0%
36VDC	1.61W
48VDC	2.02W
63VDC	2.74W

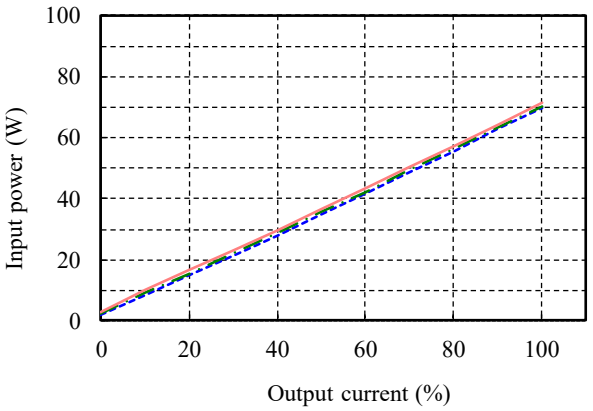
Vin	Input power (CNT OFF)
	Iout : 0%
36VDC	0.26W
48VDC	0.47W
63VDC	0.82W



12V

Vin	Input power (CNT ON)
	Iout : 0%
36VDC	1.85W
48VDC	2.29W
63VDC	3.01W

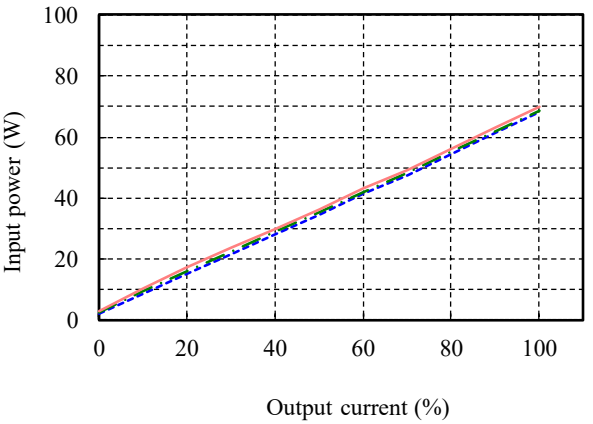
Vin	Input power (CNT OFF)
	Iout : 0%
36VDC	0.26W
48VDC	0.47W
63VDC	0.84W



24V

Vin	Input power (CNT ON)
	Iout : 0%
36VDC	2.05W
48VDC	2.40W
63VDC	3.03W

Vin	Input power (CNT OFF)
	Iout : 0%
36VDC	0.26W
48VDC	0.47W
63VDC	0.84W

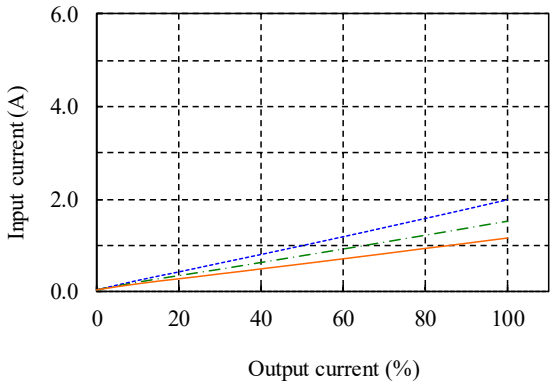


(5) 入力電流対出力電流　Input current vs. Output current

Conditions　Vin : 36 VDC
48 VDC
63 VDC
Ta : 25 °C

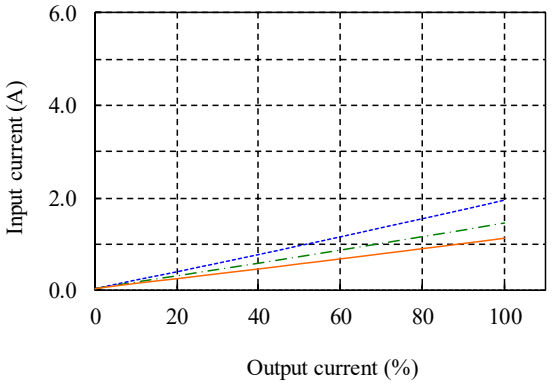
5V

Vin	Input current
	Iout : 0%
36VDC	0.04A
48VDC	0.04A
63VDC	0.04A



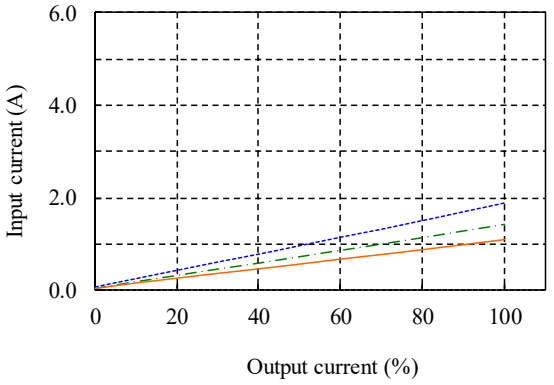
12V

Vin	Input current
	Iout : 0%
36VDC	0.05A
48VDC	0.05A
63VDC	0.05A



24V

Vin	Input current
	Iout : 0%
36VDC	0.06A
48VDC	0.05A
63VDC	0.05A

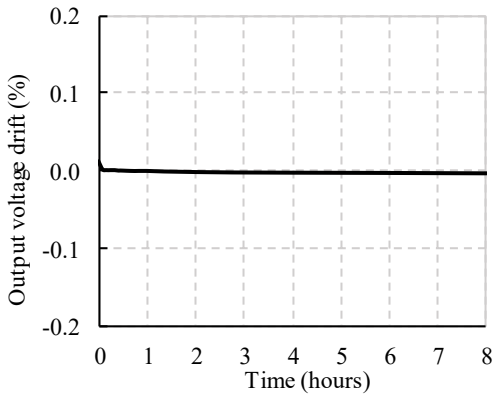


2-2. 通電ドリフト特性

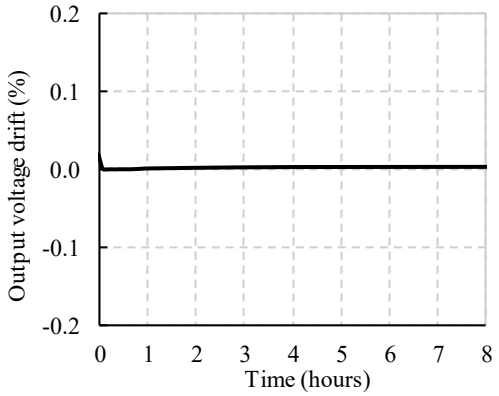
Warm up voltage drift characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 °C

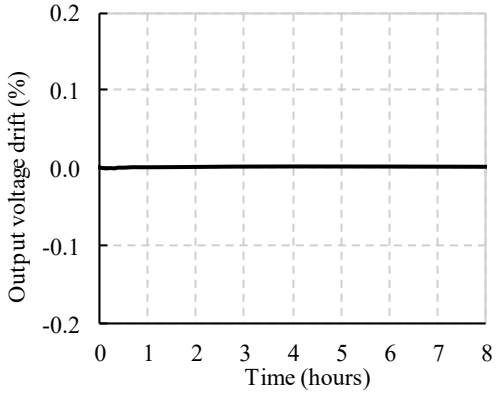
5V



12V



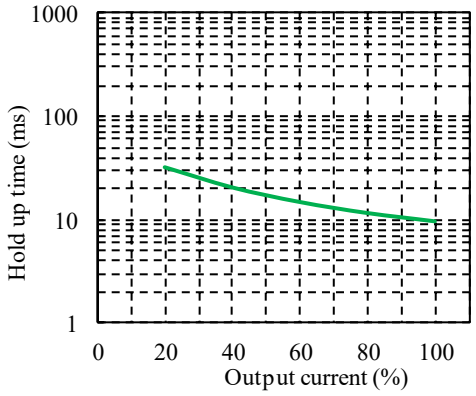
24V

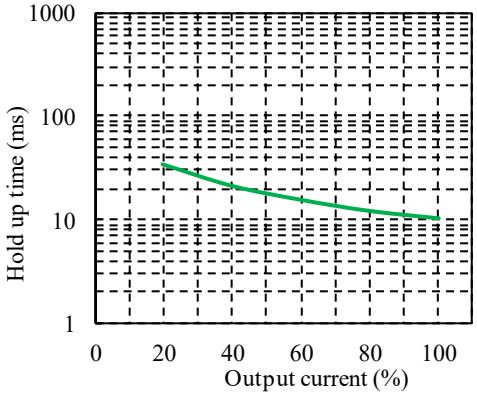


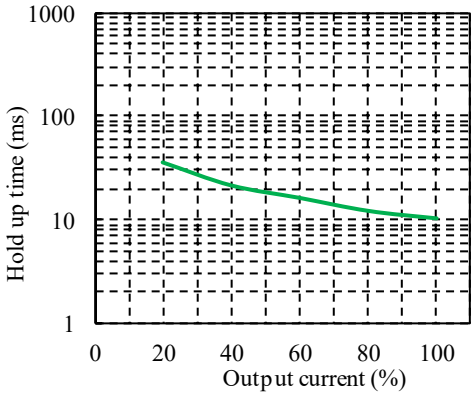
2-3. 出力保持時間特性

Hold up time characteristics

Conditions Vin : 48 VDC
Ta : 25 °C





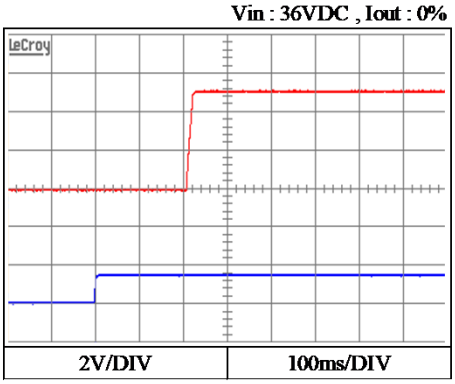


2-4. 出力立ち上がり特性 Output rise characteristics

Condition Ta : 25 °C

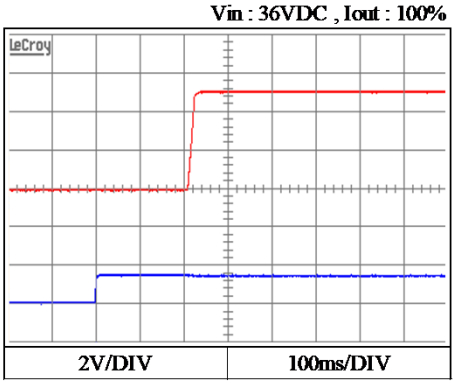
5V

Vin : 36VDC , Iout : 0%

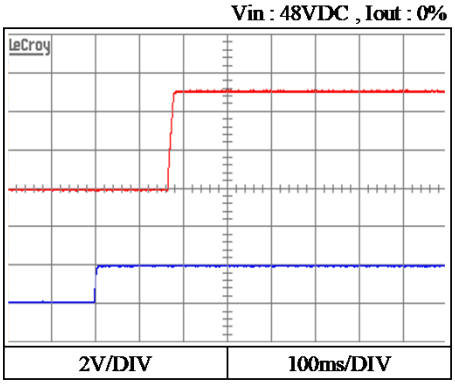


← Vout →
← 0V →
← Vin →

Vin : 36VDC , Iout : 100%

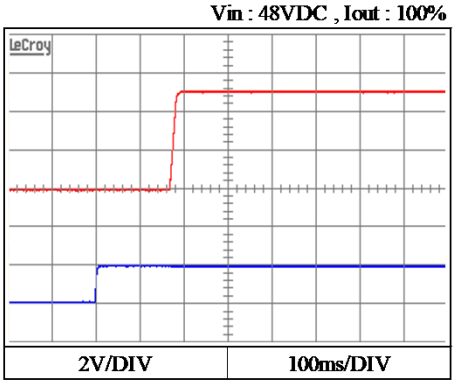


Vin : 48VDC , Iout : 0%

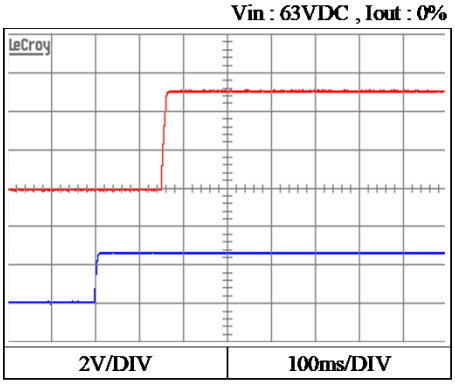


← Vout →
← 0V →
← Vin →

Vin : 48VDC , Iout : 100%

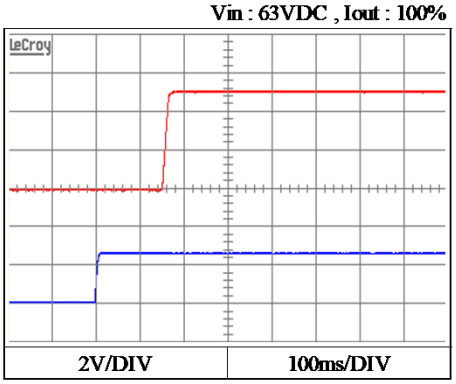


Vin : 63VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 63VDC , Iout : 100%

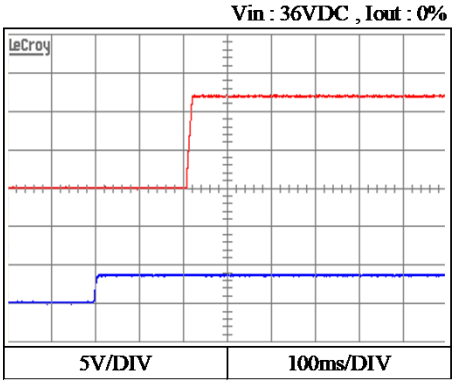


2-4. 出力立ち上がり特性 Output rise characteristics

Condition Ta : 25 °C

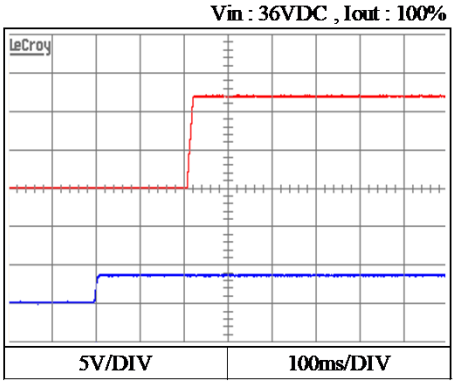
12V

Vin : 36VDC , Iout : 0%

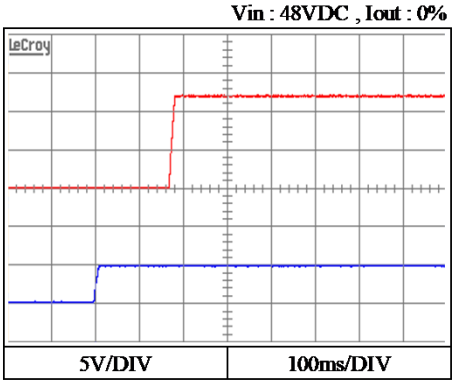


← Vout →
← 0V →
← Vin →

Vin : 36VDC , Iout : 100%

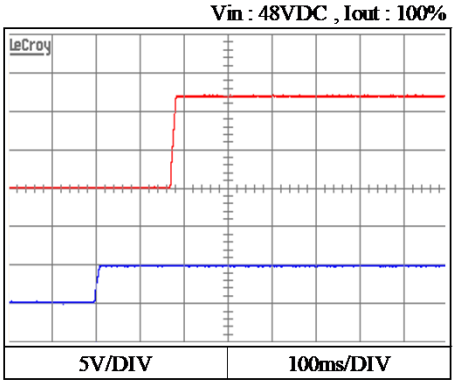


Vin : 48VDC , Iout : 0%

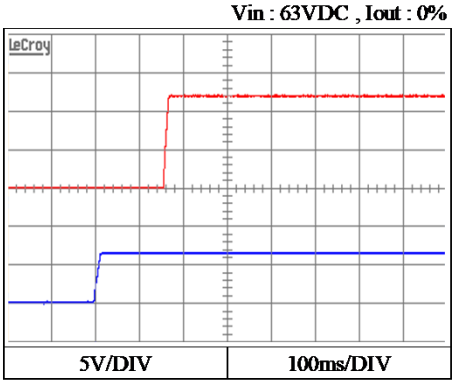


← Vout →
← 0V →
← Vin →

Vin : 48VDC , Iout : 100%

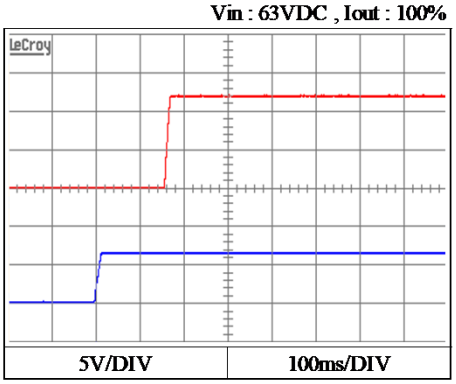


Vin : 63VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 63VDC , Iout : 100%

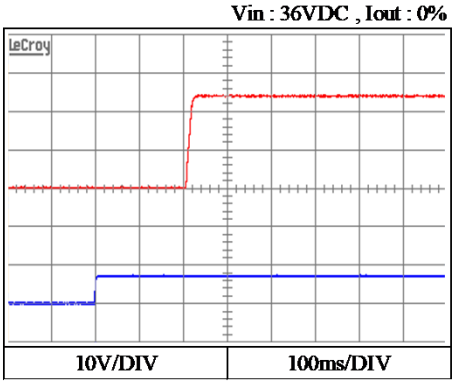


2-4. 出力立ち上がり特性 Output rise characteristics

Condition Ta : 25 °C

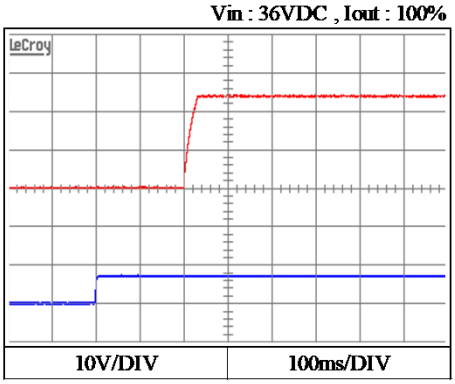
24V

Vin : 36VDC , Iout : 0%

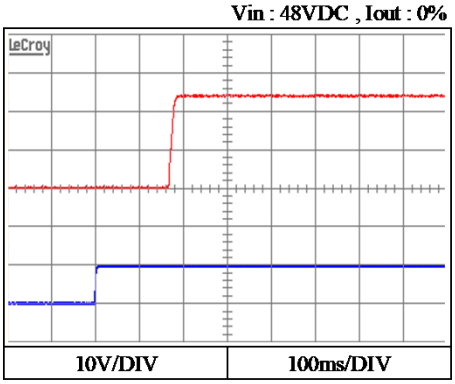


← Vout →
← 0V →
← Vin →

Vin : 36VDC , Iout : 100%

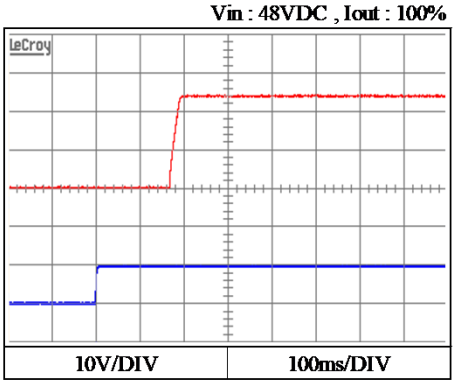


Vin : 48VDC , Iout : 0%

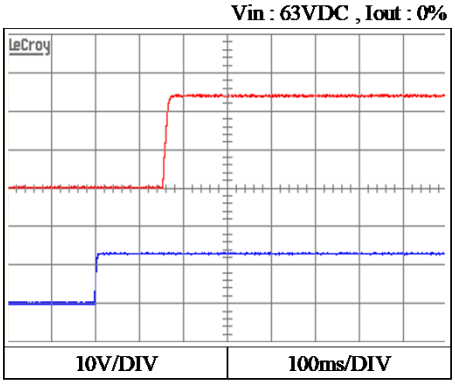


← Vout →
← 0V →
← Vin →

Vin : 48VDC , Iout : 100%

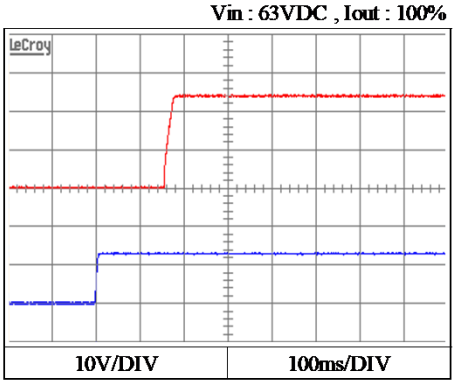


Vin : 63VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 63VDC , Iout : 100%

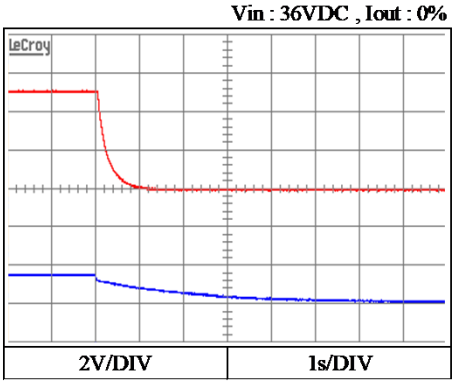


2-5. 出力立ち下がり特性 Output fall characteristics

Condition Ta : 25 ℃

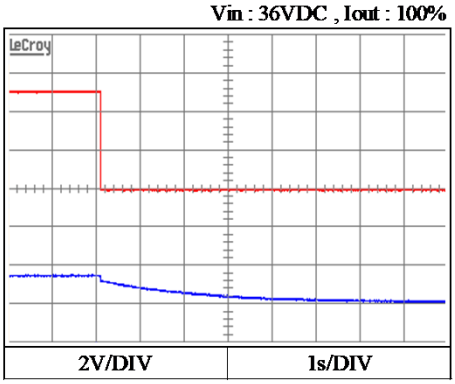
5V

Vin : 36VDC , Iout : 0%

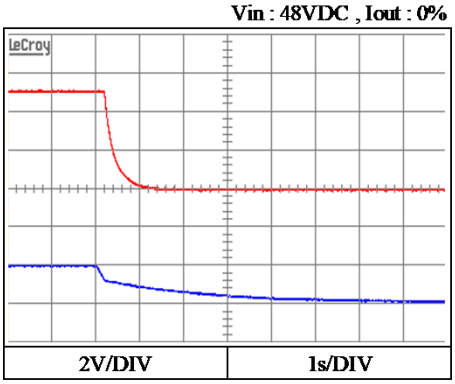


← Vout →
← 0V →
← Vin →

Vin : 36VDC , Iout : 100%

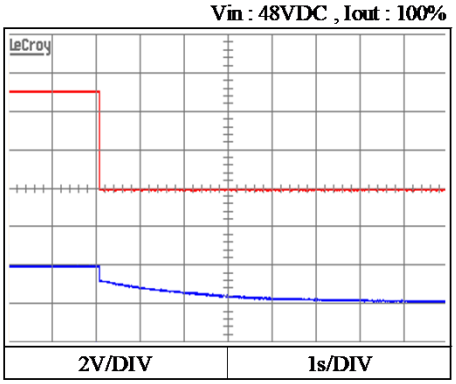


Vin : 48VDC , Iout : 0%

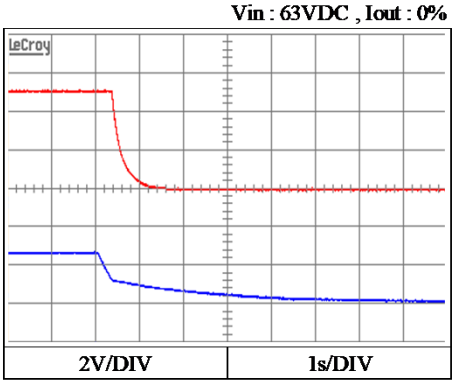


← Vout →
← 0V →
← Vin →

Vin : 48VDC , Iout : 100%

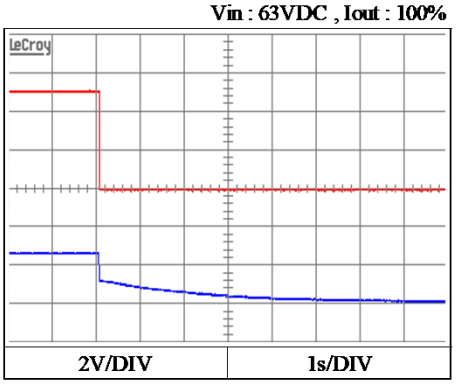


Vin : 63VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 63VDC , Iout : 100%

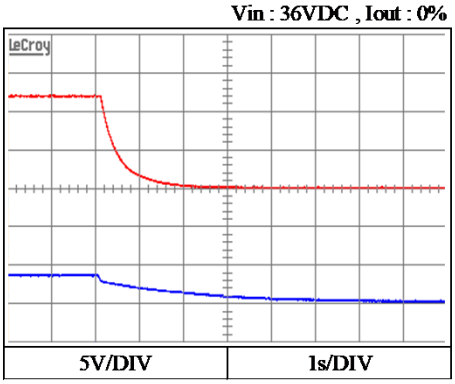


2-5. 出力立ち下がり特性 Output fall characteristics

Condition Ta : 25 °C

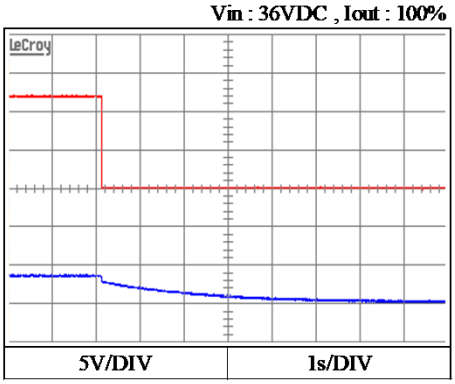
12V

Vin : 36VDC , Iout : 0%

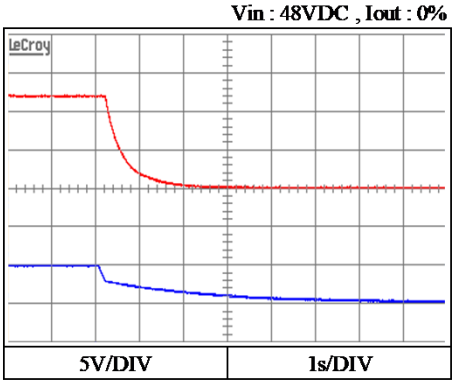


← Vout →
← 0V →
← Vin →

Vin : 36VDC , Iout : 100%

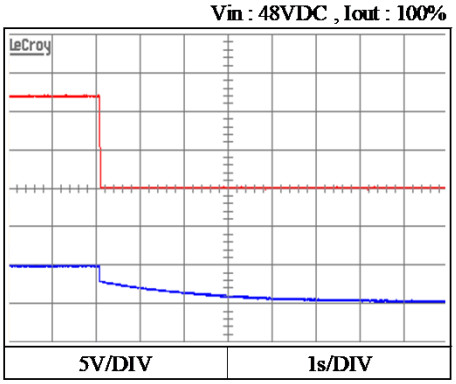


Vin : 48VDC , Iout : 0%

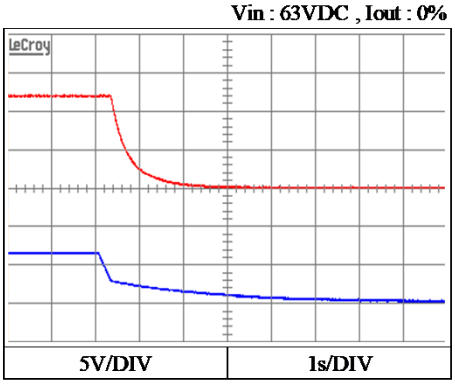


← Vout →
← 0V →
← Vin →

Vin : 48VDC , Iout : 100%

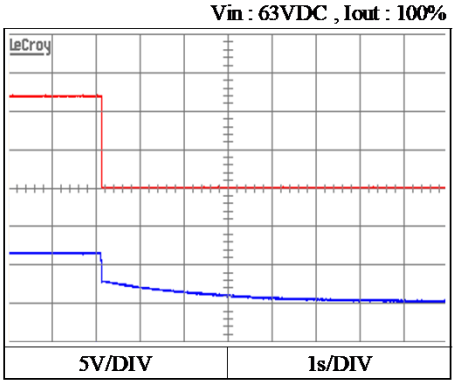


Vin : 63VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 63VDC , Iout : 100%

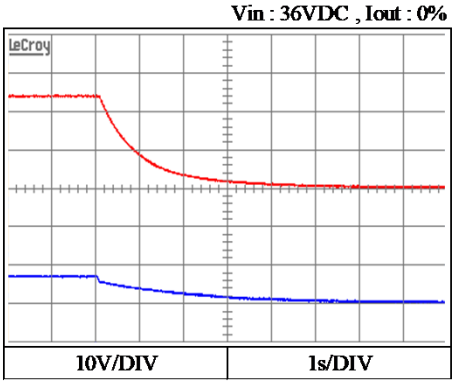


2-5. 出力立ち下がり特性 Output fall characteristics

Condition Ta : 25 ℃

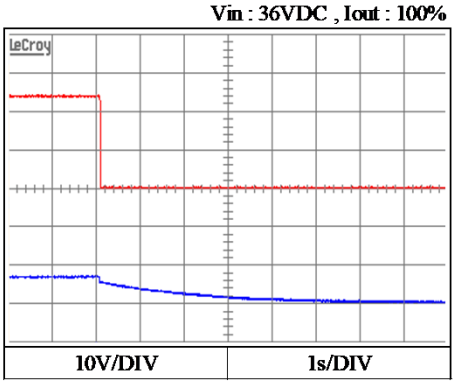
24V

Vin : 36VDC , Iout : 0%

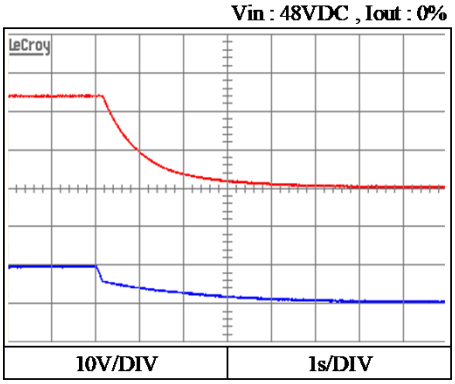


← Vout →
← 0V →
← Vin →

Vin : 36VDC , Iout : 100%

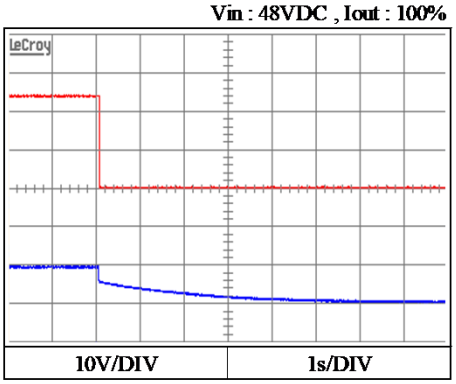


Vin : 48VDC , Iout : 0%

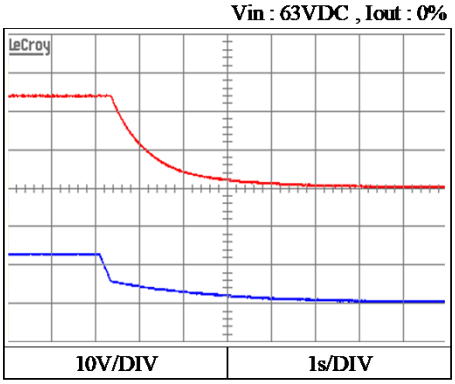


← Vout →
← 0V →
← Vin →

Vin : 48VDC , Iout : 100%

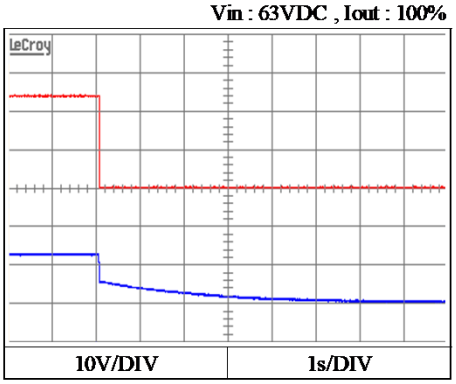


Vin : 63VDC , Iout : 0%



← Vout →
← 0V →
← Vin →

Vin : 63VDC , Iout : 100%

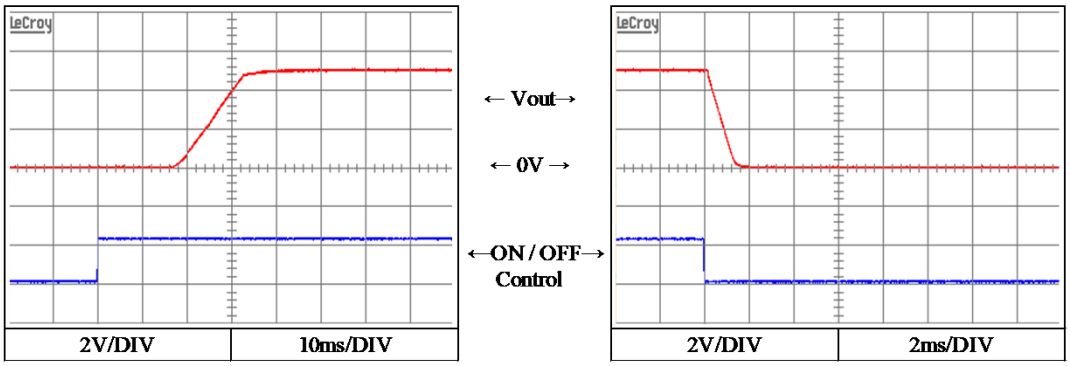


2-6. ON／OFFコントロール時出力立ち上がり、立下がり特性

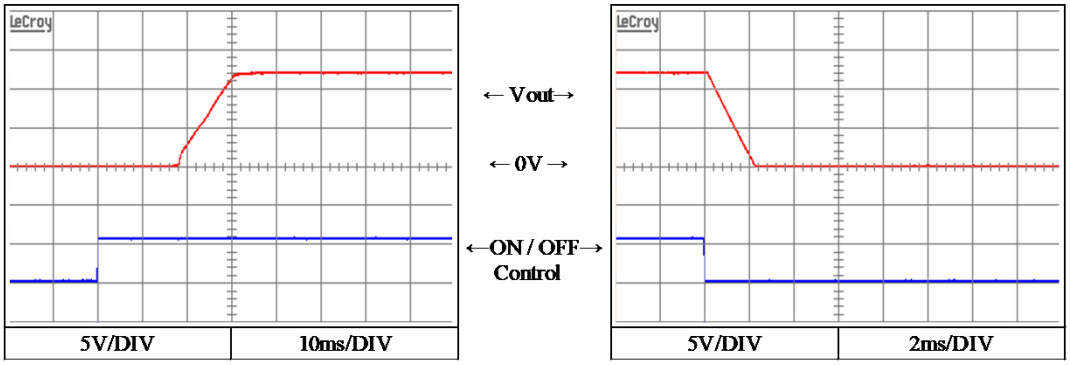
Output rise, fall characteristics with ON/OFF RC Control

Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

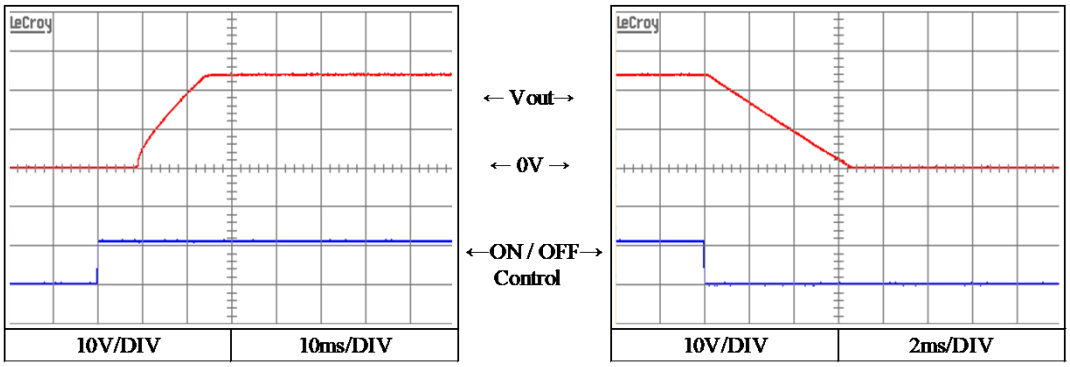
5V



12V



24V

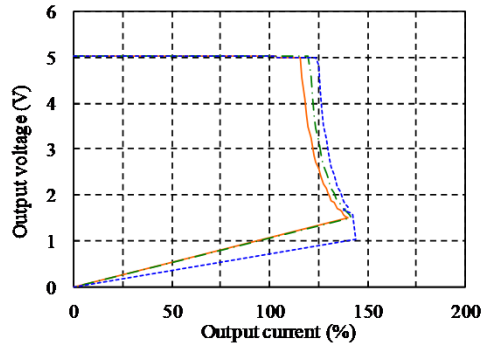


2-7. 過電流保護特性

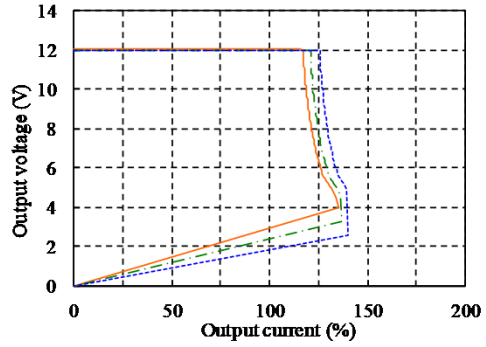
Over current protection (OCP) characteristics

Conditions Vin : 48 VDC
Ta : -20 ℃
25 ℃
50 ℃

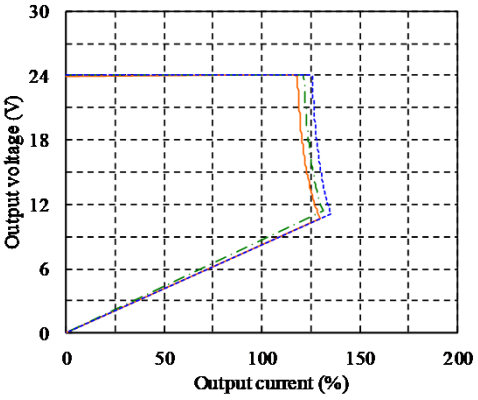
5V



12V



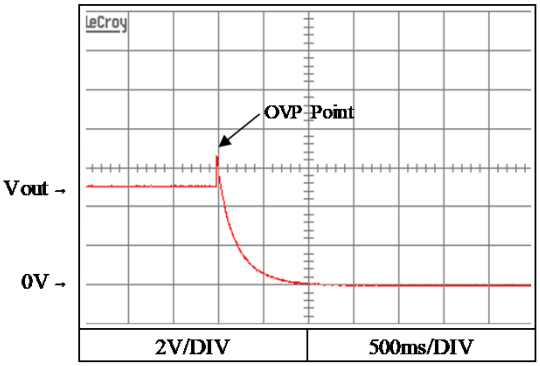
24V

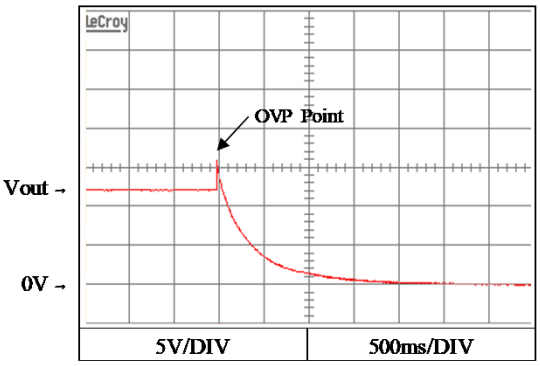


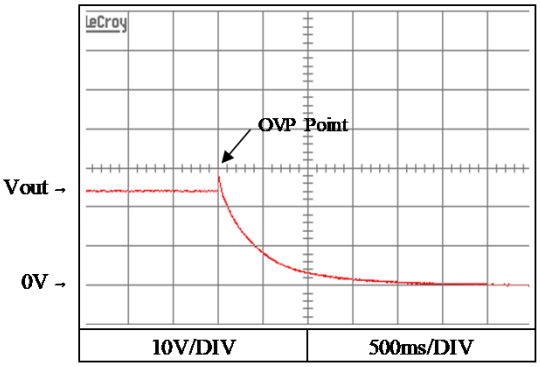
2-8. 過電圧保護特性

Over voltage protection (OVP) characteristics

Conditions Vin : 48 VDC
Iout : 0 %
Ta : 25 ℃





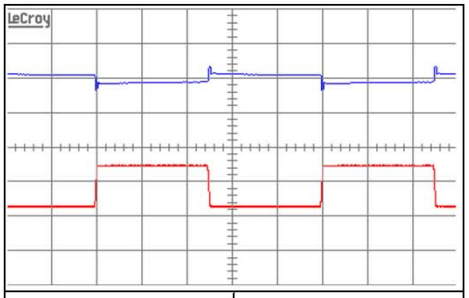


2-9. 過渡応答(負荷急変)特性 Dynamic load response characteristics

Conditions Vin : 48 VDC
Iout : 50 % ↔ 100 %
(tr = tf = 100μs)
Ta : 25 ℃

5V

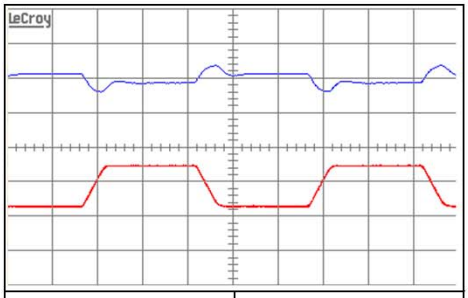
f = 100Hz



100mV/DIV	2ms/DIV
+0.74%	-0.78%

← Vout→
← Iout→
← Iout:0%→

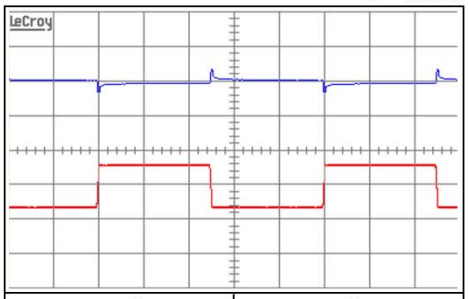
f = 1kHz



100mV/DIV	200μs/DIV
+0.78%	-0.80%

12V

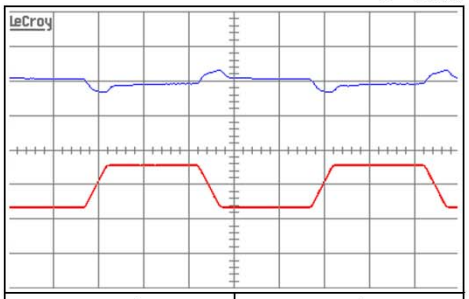
f = 100Hz



100mV/DIV	2ms/DIV
+0.30%	-0.30%

← Vout→
← Iout→
← Iout:0%→

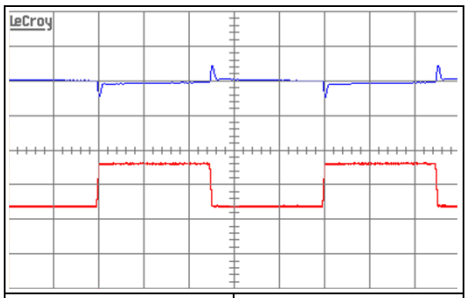
f = 1kHz



100mV/DIV	200μs/DIV
+0.28%	-0.27%

24V

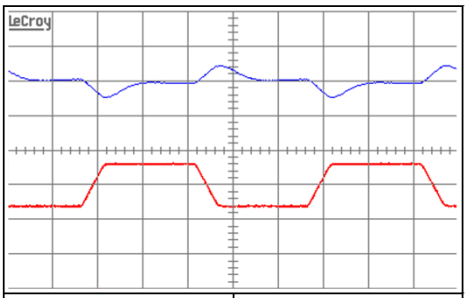
f = 100Hz



100mV/DIV	2ms/DIV
+0.20%	-0.20%

← Vout→
← Iout→
← Iout:0%→

f = 1kHz

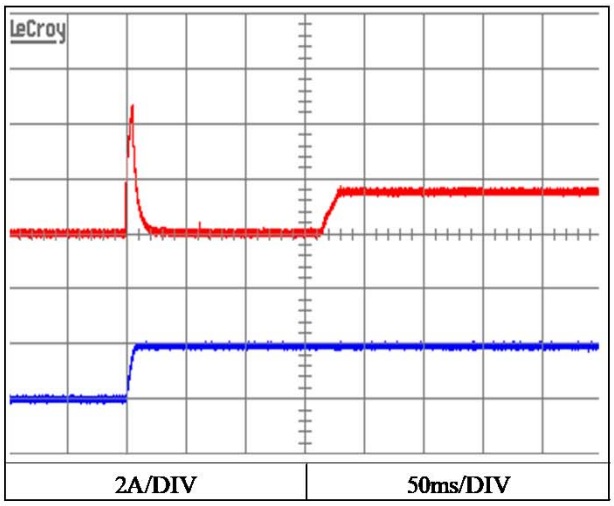


100mV/DIV	200μs/DIV
+0.19%	-0.19%

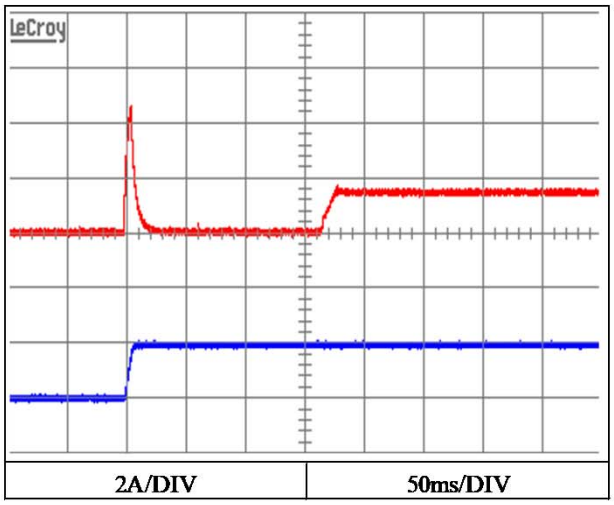
2-10. 入力サージ電流(突入電流)波形 Inrush current waveform

Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

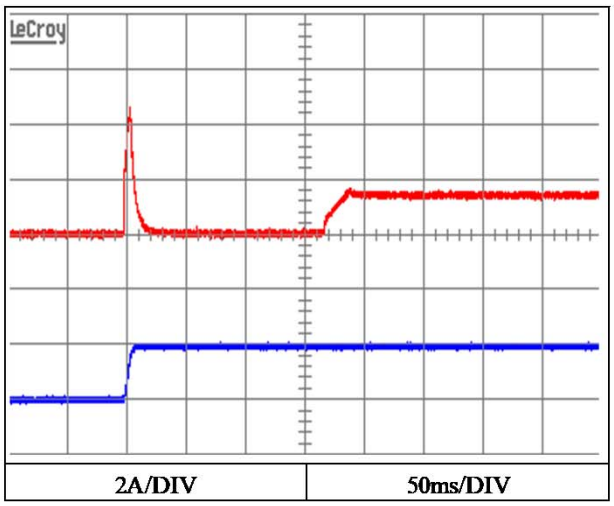
5V



12V



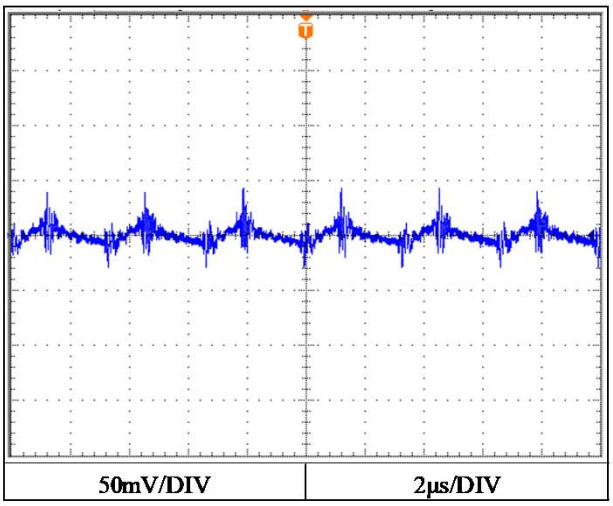
24V



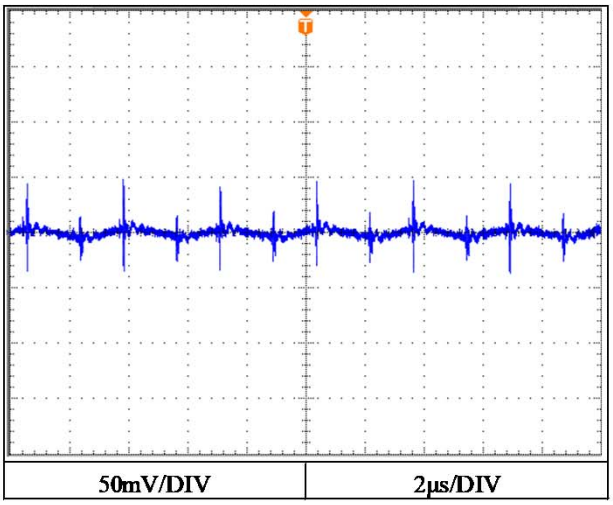
2-11. 出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

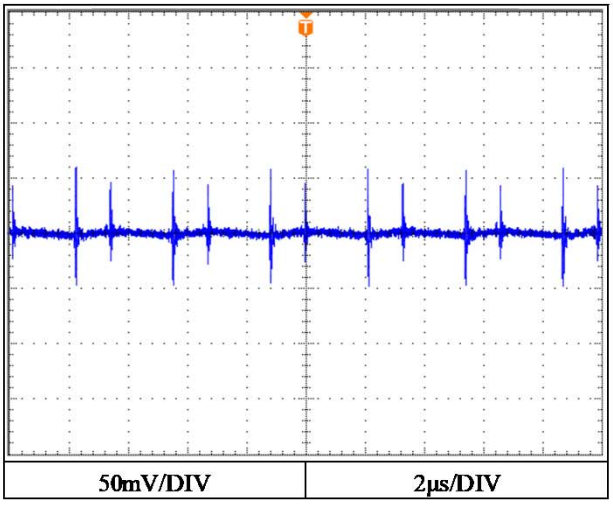
5V



12V



24V



2-12. EMI特性 Electro-Magnetic Interference characteristics

Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

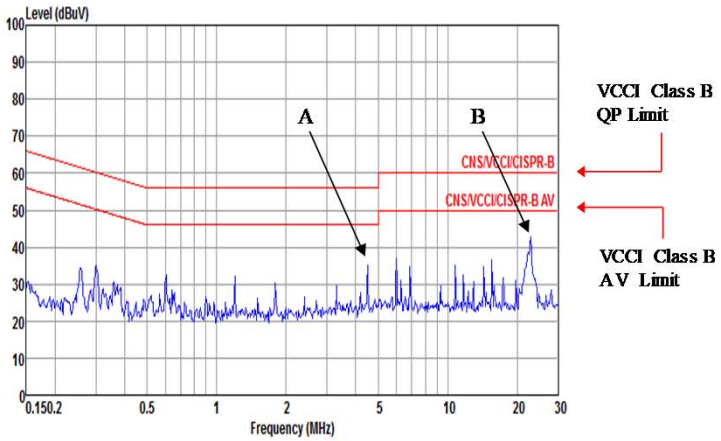
雑音端子電圧
Conducted Emission

5V

Ref. Data	Point A (4.51MHz) Limit (dB)	Measure (dB)
QP	56.0	36.6
AV	46.0	36.7

Ref. Data	Point B (22.46MHz) Limit (dB)	Measure (dB)
QP	60.0	40.6
AV	50.0	37.5

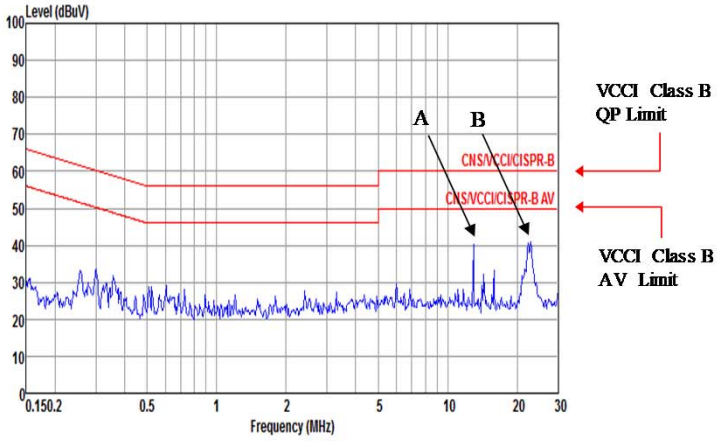
Phase : N (-Vin side)



Ref. Data	Point A (12.94MHz) Limit (dB)	Measure (dB)
QP	60.0	37.9
AV	50.0	37.7

Ref. Data	Point B (22.97MHz) Limit (dB)	Measure (dB)
QP	60.0	38.6
AV	50.0	34.7

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 : 48 VDC
Iout : 100 %
Ta : 25 ℃

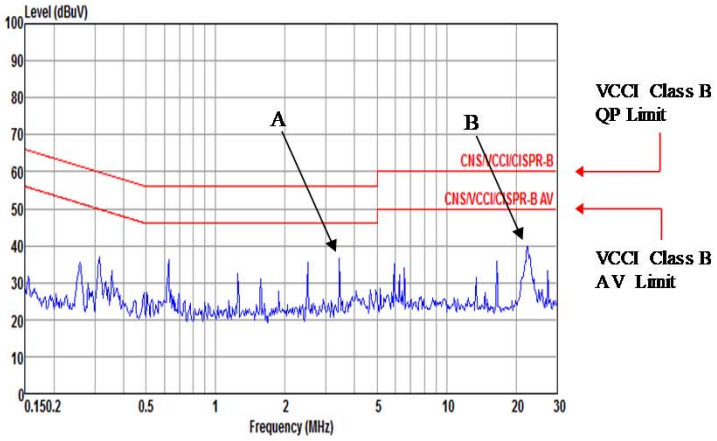
雑音端子電圧
Conducted Emission

12V

Ref. Data	Point A (3.44MHz) Limit (dB)	Measure (dB)
QP	56.0	34.60
AV	46.0	34.67

Ref. Data	Point B (22.55MHz) Limit (dB)	Measure (dB)
QP	60.0	42.7
AV	50.0	38.3

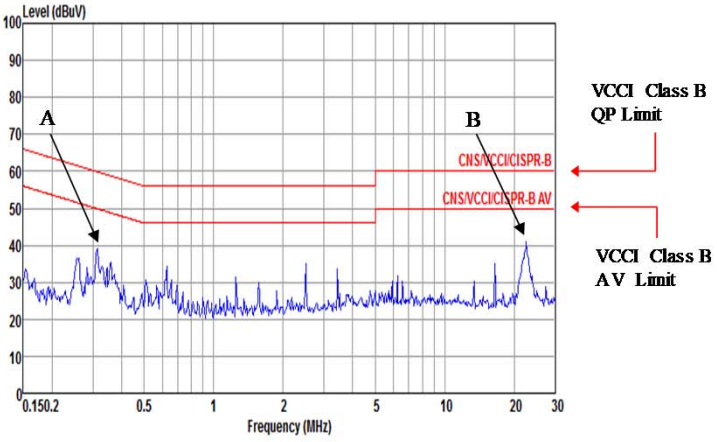
Phase : N (-Vin side)



Ref. Data	Point A (0.31MHz) Limit (dB)	Measure (dB)
QP	56.0	38.8
AV	56.0	44.5

Ref. Data	Point B (22.55MHz) Limit (dB)	Measure (dB)
QP	60.0	42.8
AV	50.0	38.5

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 : 48 VDC
Iout : 100 %
Ta : 25 ℃

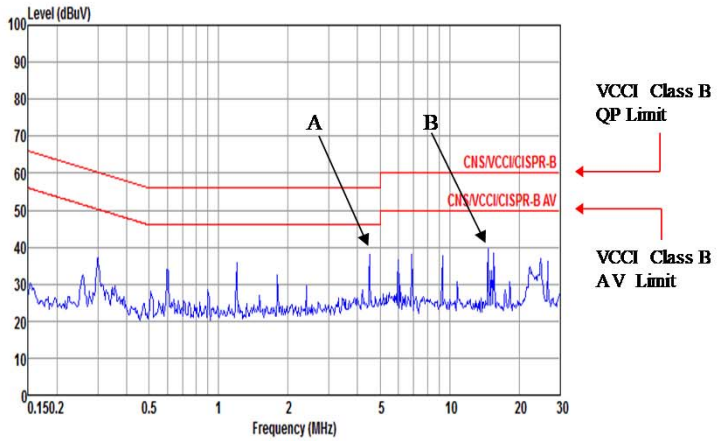
雑音端子電圧
Conducted Emission

24V

Ref. Data	Point A (4.51MHz) Limit (dB)	Measure (dB)
QP	56.0	37.0
AV	46.0	37.1

Ref. Data	Point B (14.73MHz) Limit (dB)	Measure (dB)
QP	60.0	37.8
AV	50.0	37.4

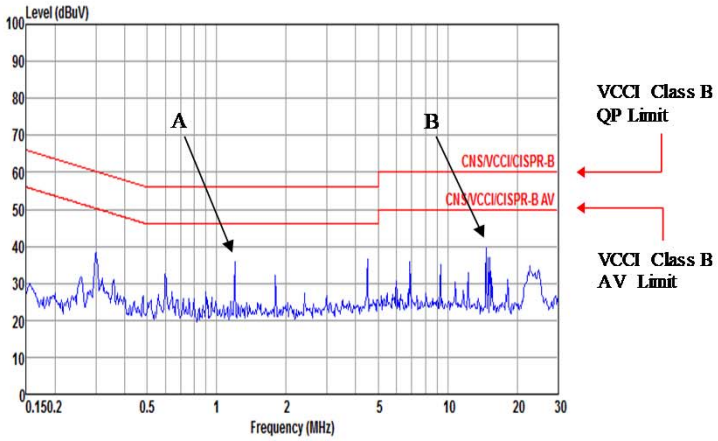
Phase : N (-Vin side)



Ref. Data	Point A (1.2MHz) Limit (dB)	Measure (dB)
QP	56.0	34.6
AV	46.0	34.6

Ref. Data	Point B (14.73MHz) Limit (dB)	Measure (dB)
QP	60.0	38.1
AV	50.0	37.2

Phase : L (+Vin side)



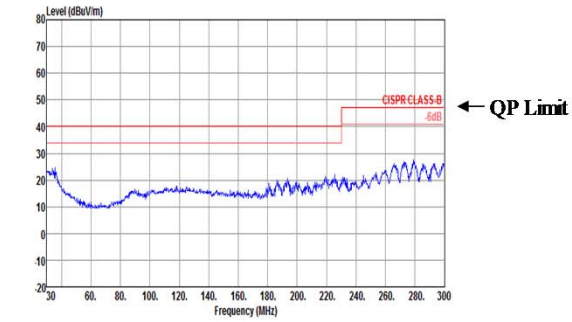
EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.
表示はピーク値
Indication is peak values.

Conditions Vin : 48 VDC
Iout : 100 %
Ta : 25 ℃

雑音電界強度
Radiated Emission

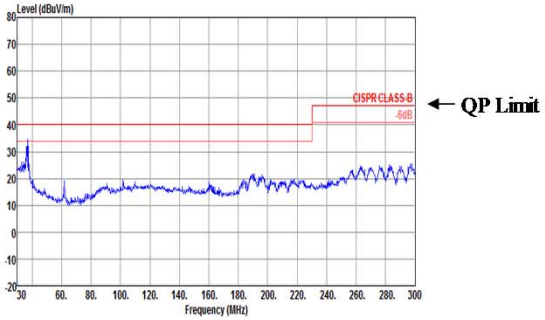
5V

HORIZONTAL



← QP Limit

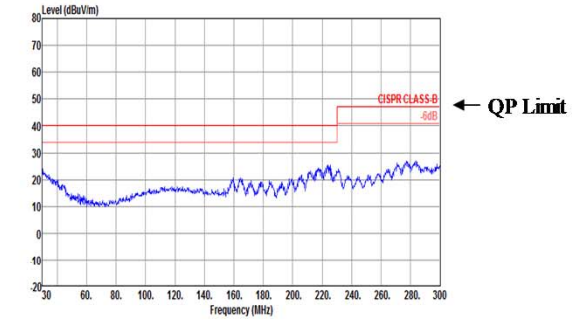
VERTICAL



← QP Limit

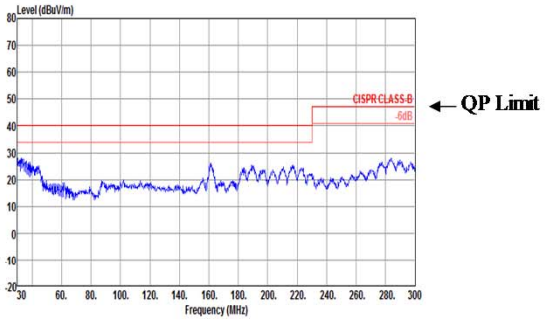
12V

HORIZONTAL



← QP Limit

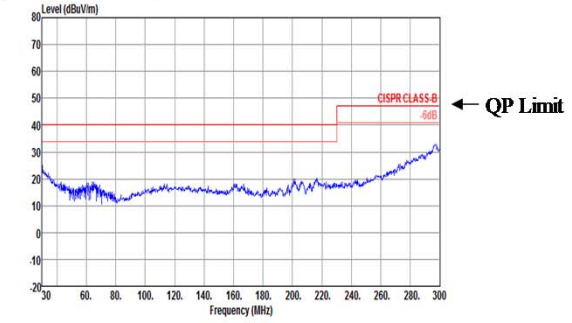
VERTICAL



← QP Limit

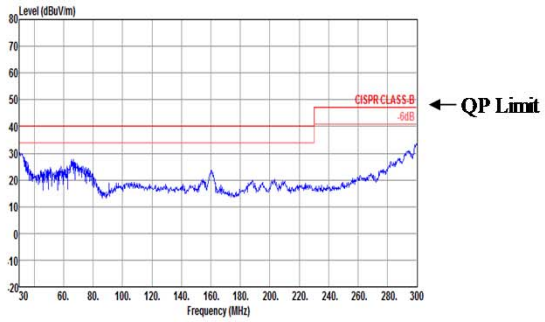
24V

HORIZONTAL



← QP Limit

VERTICAL



← QP Limit

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