# CCG10-24-xxD

# EVALUATION DATA

# 型式データ

# INDEX



使用記号 Terminology used

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

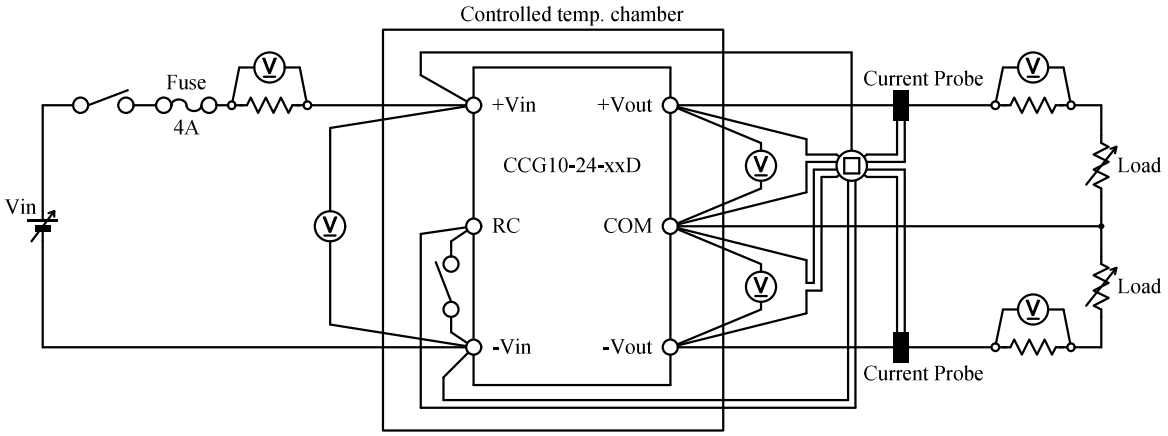
※ 当社測定条件における結果であり、参考値としてお考え願います。
Test results are reference data based on our measurement condition.

## 1. 測定方法 Evaluation Method

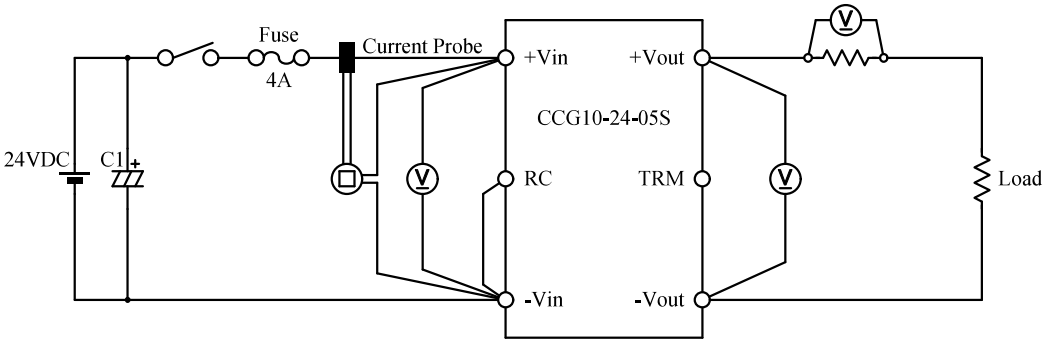
### 1-1. 測定回路 Measurement Circuits

(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



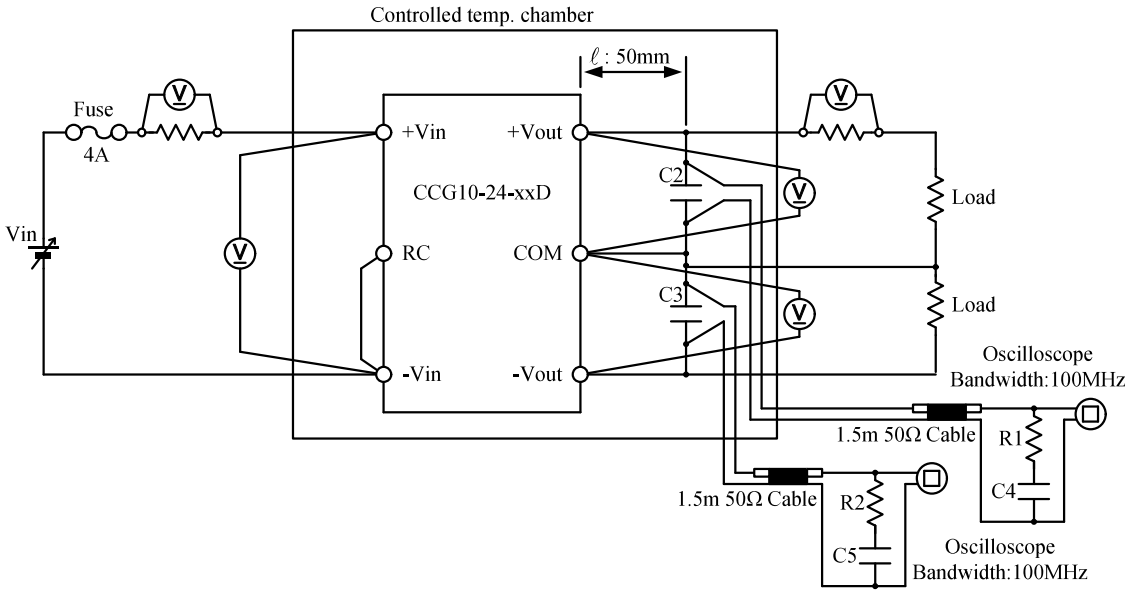

(2) 入力サージ電流（突入電流）波形 Inrush current waveform




CCG10-24-xxDの入力サージ電流特性はCCG10-24-05Sと同等です。

CCG10-24-xxD have the same Inrush current characteristics as CCG10-24-05S data.

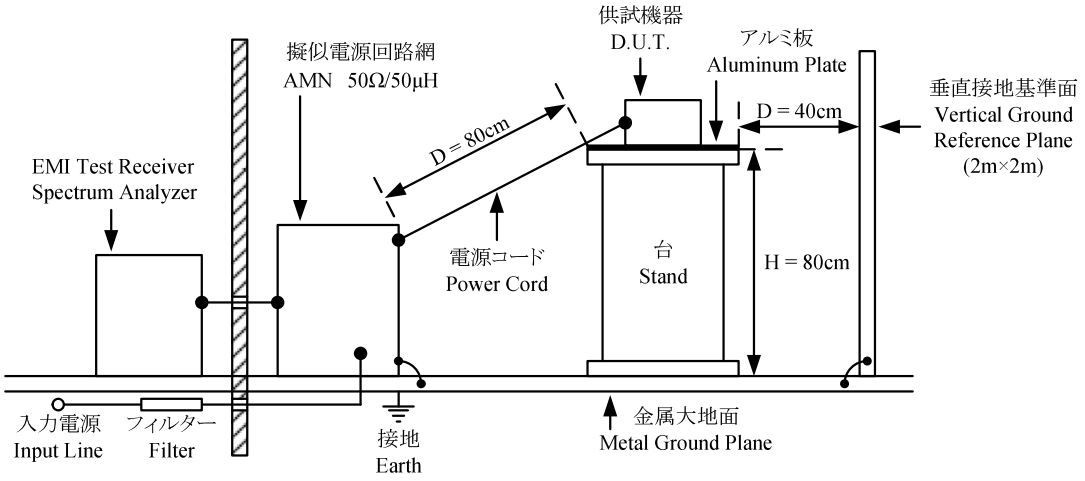
(3) 出力リップルノイズ電圧、波形 Output ripple and noise voltage and waveform



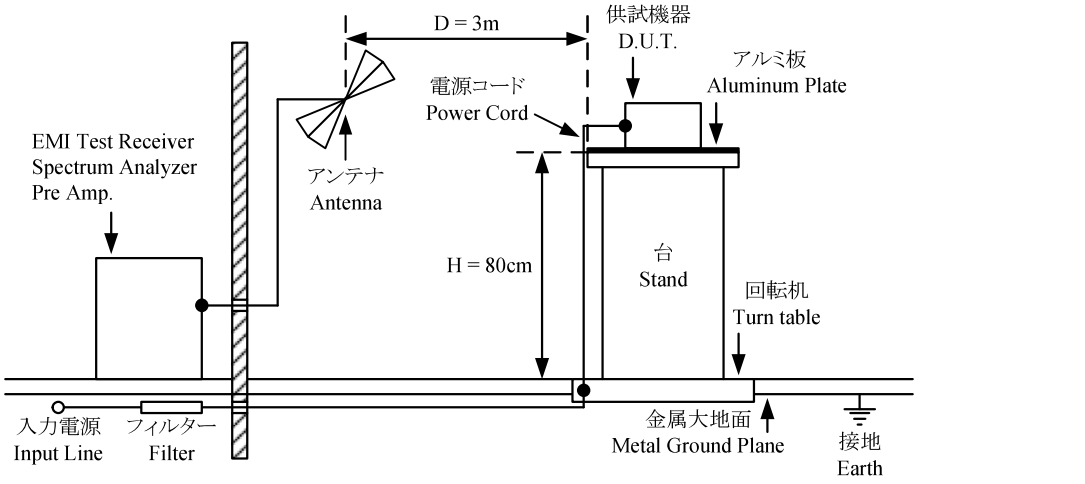

| | | |
|---|---|---|
| C1 | : 4000uF | Electrolytic Capacitor |
| C2,C3 | : 1uF | Ceramic Capacitor |
| C4,C5 | : 4700pF | Ceramic Capacitor |
| R1,R2 | : 50Ω | |

(4) EMI特性　Electro-Magnetic Interference characteristics

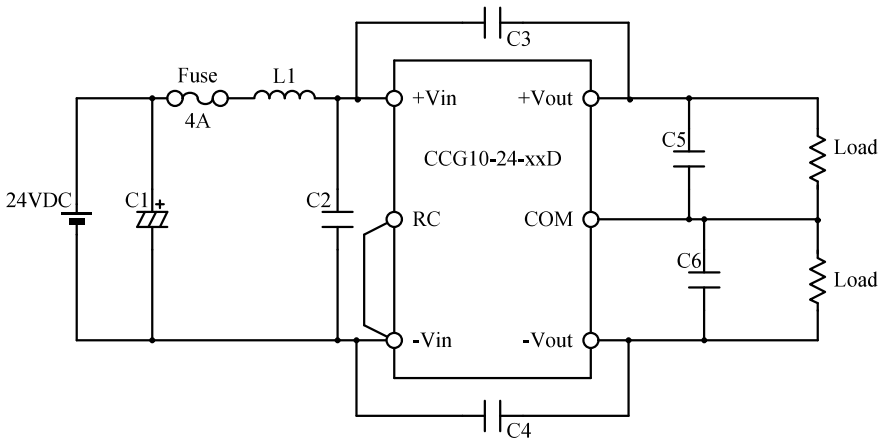
(a) 雑音端子電圧(帰還ノイズ) Conducted Emission Noise




(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




| | | | | | |
|---|---|---|---|---|---|
| C1 | : | 50V | 100uF | Electrolytic Capacitor | (ELXZ500ELL101MH12D,Nippon Chemi-con) |
| C2 | : | 50V | 10uF | Ceramic Capacitor | (C3216X7R1H106KT,TDK) |
| C3 | : | 2kV | 1000pF | Ceramic Capacitor | (C3225X7S3D102K200AA,TDK) |
| C4 | : | 2kV | 1000pF | Ceramic Capacitor | (C3225X7S3D102K200AA,TDK) |
| C5 | : | 25V | 10uF | Ceramic Capacitor | (C3216X7R1E106KT,TDK) |
| C6 | : | 25V | 10uF | Ceramic Capacitor | (C3216X7R1E106KT,TDK) |
| L1 | : | 2A | 10uH | Normal Mode Choke Coil | (LQH5BPN100MT0L,MURATA) |

1-2. 使用測定機器 List of equipment used

| | EQUIPMENT USED | MANUFACTURER | MODEL NO. |
|---|---|---|---|
| 1 | DIGITAL STORAGE OSCILLOSCOPE | YOKOGAWA ELECT. | DL1740E / DL1740EL |
| 2 | DIGITAL MULTIMETER | AGILENT | 34970A |
| 3 | CURRENT PROBE | YOKOGAWA ELECT. | 701932 |
| 4 | CURRENT PROBE | AGILENT | N2774A |
| 5 | SHUNT RESISTER | YOKOGAWA ELECT. | 2215 |
| 6 | DYNAMIC DUMMY LOAD | KIKUSUI | PLZ-164WL |
| 7 | CVCF | NF | ES10000S |
| 8 | DC POWER SUPPLY | TDK-Lambda | GEN80-9.5 / GENH80-9.5 |
| 9 | DC POWER SUPPLY | TAKASAGO | EX-750H2 |
| 10 | CONTROLLED TEMP. CHAMBER | ESPEC | SU-261 / SU-262 |
| 11 | EMI TEST RECEIVER / SPECTRUM ANALYZER | ROHDE & SCHWARZ | ESR3 |
| 12 | PRE AMP. | SONOMA | 310N |
| 13 | AMN | KIKUSUI | KNW-242C |
| 14 | ANTENNA | SCHWARZBECK | BBA9106/VHA9103 |
| 15 | 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

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

・+Vo

| Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC | Line regulation | |
|---|---|---|---|---|---|---|
| 0% | 12.0105V | 12.0120V | 12.0129V | 12.0135V | 3.0mV | 0.025% |
| 50%(0.21A) | 12.0118V | 12.0137V | 12.0124V | 12.0117V | 2.0mV | 0.017% |
| 100%(0.42A) | 12.0074V | 12.0125V | 12.0157V | 12.0151V | 8.3mV | 0.069% |
| Load | 4.4mV | 1.7mV | 3.3mV | 3.4mV | | |
| regulation | 0.037% | 0.014% | 0.028% | 0.028% | | |

・−Vo

| Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC | Line regulation | |
|---|---|---|---|---|---|---|
| 0% | -12.0255V | -12.0258V | -12.0248V | -12.0239V | 1.9mV | 0.016% |
| 50%(0.21A) | -12.0228V | -12.0219V | -12.0232V | -12.0236V | 1.7mV | 0.014% |
| 100%(0.42A) | -12.0282V | -12.0240V | -12.0204V | -12.0213V | 7.8mV | 0.065% |
| Load | 5.4mV | 3.9mV | 4.4mV | 2.6mV | | |
| regulation | 0.045% | 0.032% | 0.037% | 0.022% | | |

・+Vo to −Vo

| Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC | Line regulation | |
|---|---|---|---|---|---|---|
| 0% | 24.0360V | 24.0378V | 24.0376V | 24.0374V | 1.8mV | 0.007% |
| 50%(0.21A) | 24.0346V | 24.0357V | 24.0357V | 24.0353V | 1.1mV | 0.005% |
| 100%(0.42A) | 24.0356V | 24.0365V | 24.0361V | 24.0364V | 0.9mV | 0.004% |
| Load | 1.4mV | 2.1mV | 1.9mV | 2.1mV | | |
| regulation | 0.006% | 0.009% | 0.008% | 0.009% | | |

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

| Ta | -40°C | 25°C | 60°C | Temperature stability | |
|---|---|---|---|---|---|
| +Vo | 11.9588V | 12.0157V | 12.0106V | 56.9mV | 0.474% |
| -Vo | -11.9619V | -12.0204V | -12.0168V | 58.5mV | 0.488% |
| +Vo to -Vo | 23.9206V | 24.0361V | 24.0274V | 115.5mV | 0.481% |

3. Load Regulation - Unbalance load　　Condition　Ta :　25 °C

・+Vo (-Io : 100%)

| +Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC |
|---|---|---|---|---|
| 20%(0.084A) | 12.1417V | 12.1304V | 12.1304V | 12.1253V |
| 100%(0.42A) | 12.0097V | 12.0141V | 12.0141V | 12.0165V |
| Load | 132.0mV | 116.3mV | 116.3mV | 108.8mV |
| regulation | 1.100% | 0.969% | 0.969% | 0.907% |

・−Vo (+Io : 100%)

| -Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC |
|---|---|---|---|---|
| 20%(0.084A) | -12.1635V | -12.1533V | -12.1533V | -12.1545V |
| 100%(0.42A) | -12.0292V | -12.0244V | -12.0244V | -12.0219V |
| Load | 134.3mV | 128.9mV | 128.9mV | 132.6mV |
| regulation | 1.119% | 1.074% | 1.074% | 1.105% |

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

・+Vo

| Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC | Line regulation | |
|---|---|---|---|---|---|---|
| 0% | 14.9626V | 14.9620V | 14.9627V | 14.9576V | 5.1mV | 0.034% |
| 50%(0.17A) | 14.9713V | 14.9720V | 14.9704V | 14.9694V | 2.6mV | 0.017% |
| 100%(0.34A) | 14.9706V | 14.9725V | 14.9733V | 14.9722V | 2.7mV | 0.018% |
| Load | 8.7mV | 10.5mV | 10.6mV | 14.6mV | | |
| regulation | 0.058% | 0.070% | 0.071% | 0.097% | | |

・−Vo

| Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC | Line regulation | |
|---|---|---|---|---|---|---|
| 0% | -14.9718V | -14.9732V | -14.9730V | -14.9777V | 5.9mV | 0.039% |
| 50%(0.17A) | -14.9617V | -14.9619V | -14.9643V | -14.9641V | 2.6mV | 0.017% |
| 100%(0.34A) | -14.9629V | -14.9620V | -14.9607V | -14.9621V | 2.2mV | 0.015% |
| Load | 10.1mV | 11.3mV | 12.3mV | 15.6mV | | |
| regulation | 0.067% | 0.075% | 0.082% | 0.104% | | |

・+Vo to −Vo

| Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC | Line regulation | |
|---|---|---|---|---|---|---|
| 0% | 29.9344V | 29.9353V | 29.9357V | 29.9353V | 1.3mV | 0.004% |
| 50%(0.17A) | 29.9330V | 29.9339V | 29.9347V | 29.9334V | 1.7mV | 0.006% |
| 100%(0.34A) | 29.9334V | 29.9345V | 29.9340V | 29.9343V | 1.1mV | 0.004% |
| Load | 1.4mV | 1.4mV | 1.7mV | 1.9mV | | |
| regulation | 0.005% | 0.005% | 0.006% | 0.006% | | |

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

| Ta | -40°C | 25°C | 65°C | Temperature stability | |
|---|---|---|---|---|---|
| +Vo | 14.9073V | 14.9733V | 14.9602V | 66.0mV | 0.440% |
| -Vo | -14.8950V | -14.9607V | -14.9489V | 65.7mV | 0.438% |
| +Vo to -Vo | 29.8023V | 29.9340V | 29.9091V | 131.7mV | 0.439% |

3. Load Regulation - Unbalance load Condition Ta : 25 °C

・+Vo (-Io : 100%)

| +Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC |
|---|---|---|---|---|
| 20%(0.068A) | 15.0864V | 15.0776V | 15.0776V | 15.0726V |
| 100%(0.34A) | 14.9729V | 14.9742V | 14.9742V | 14.9730V |
| Load | 113.5mV | 103.4mV | 103.4mV | 99.6mV |
| regulation | 0.757% | 0.689% | 0.689% | 0.664% |

・−Vo (+Io : 100%)

| -Io \ Vin | 9VDC | 12VDC | 24VDC | 36VDC |
|---|---|---|---|---|
| 20%(0.068A) | -15.0792V | -15.0727V | -15.0727V | -15.0755V |
| 100%(0.34A) | -14.9631V | -14.9619V | -14.9619V | -14.9623V |
| Load | 116.1mV | 110.8mV | 110.8mV | 113.2mV |
| regulation | 0.774% | 0.739% | 0.739% | 0.755% |

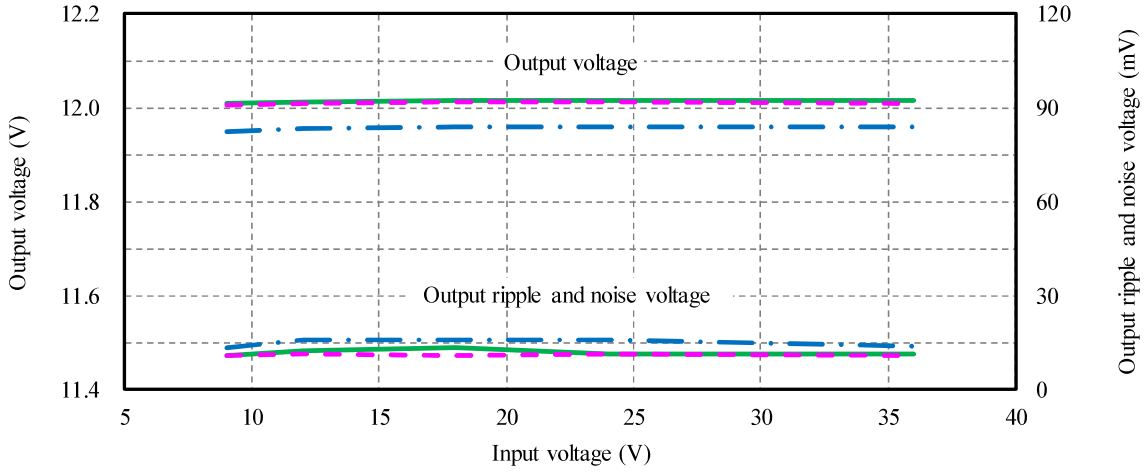
(2) 出力電圧・出力リップルノイズ電圧 対 入力電圧

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

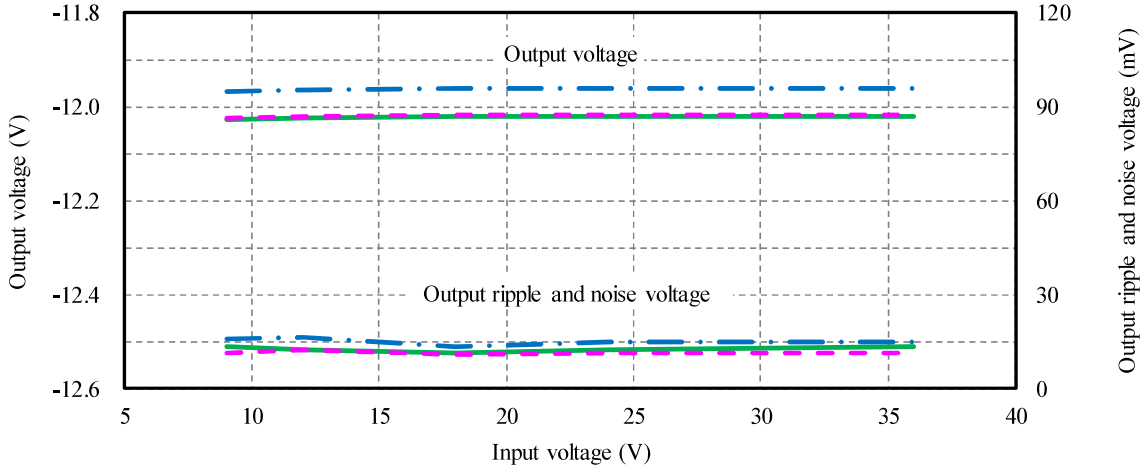
Conditions Io : 100 %
Ta : -40 °C
: 25 °C
: 60 °C

±12V

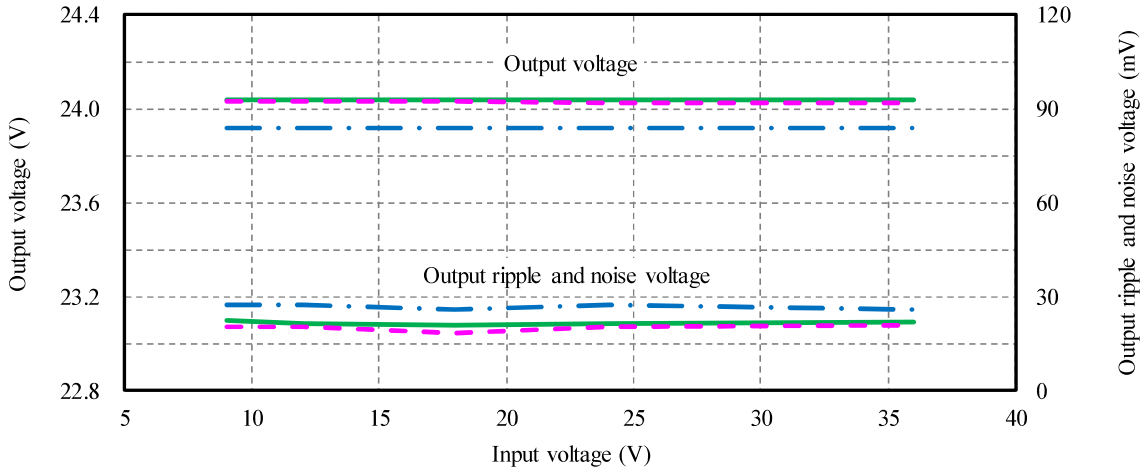
・+Vo




・−Vo



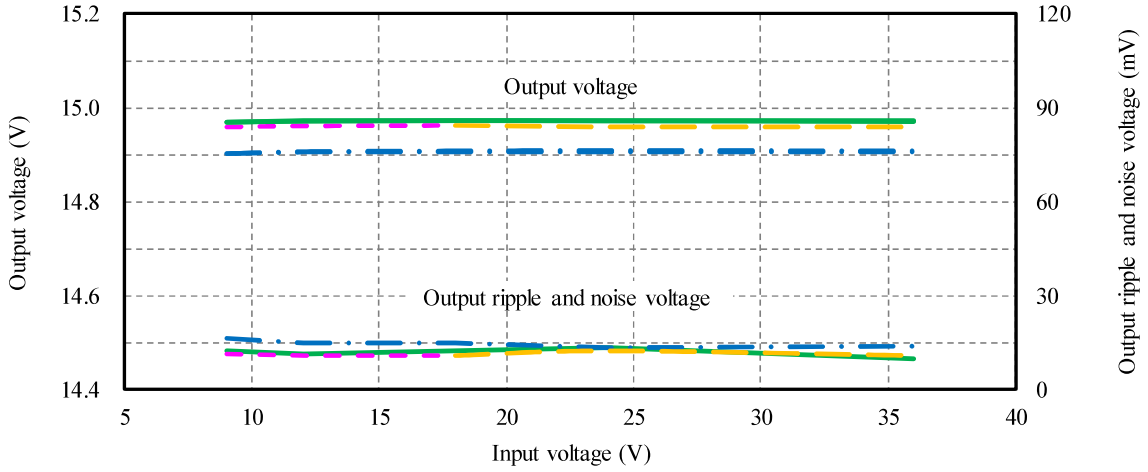

・+Vo to -Vo



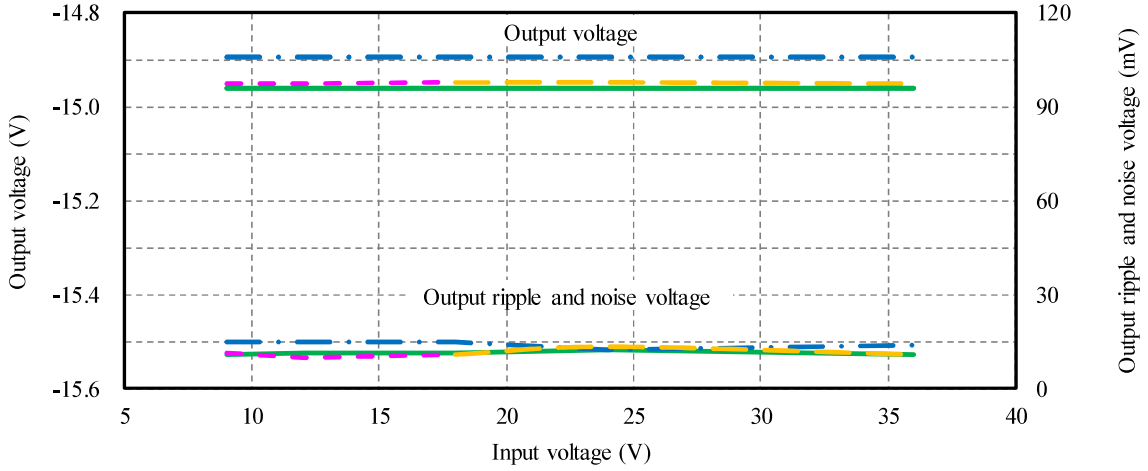
Conditions Io : 100 %
Ta : -40 °C
: 25 °C
: 60 °C
: 65 °C

±15V

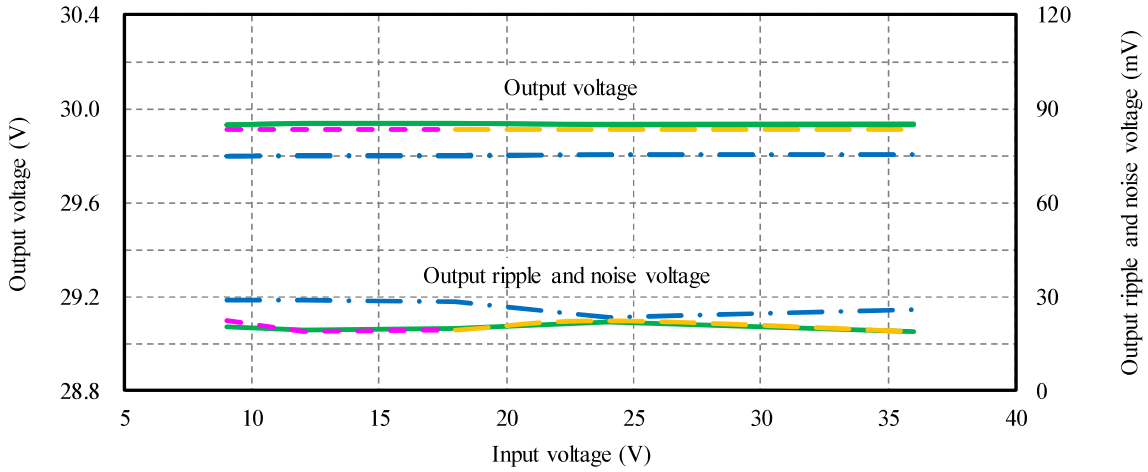
・+Vo




・−Vo



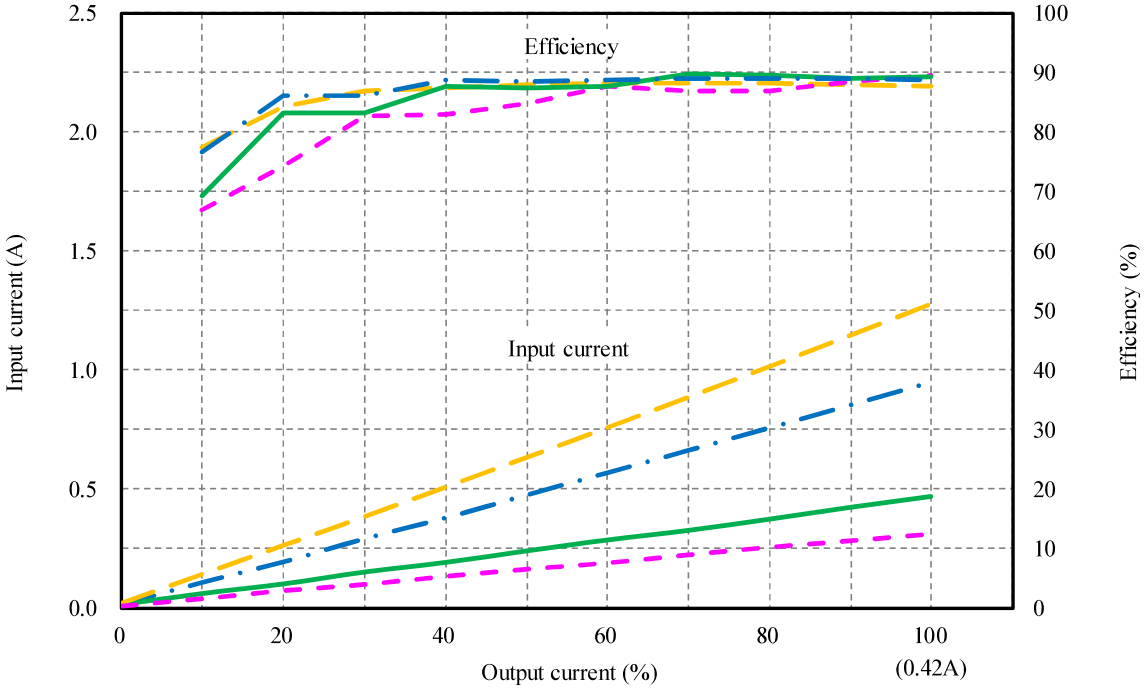

・+Vo to -Vo



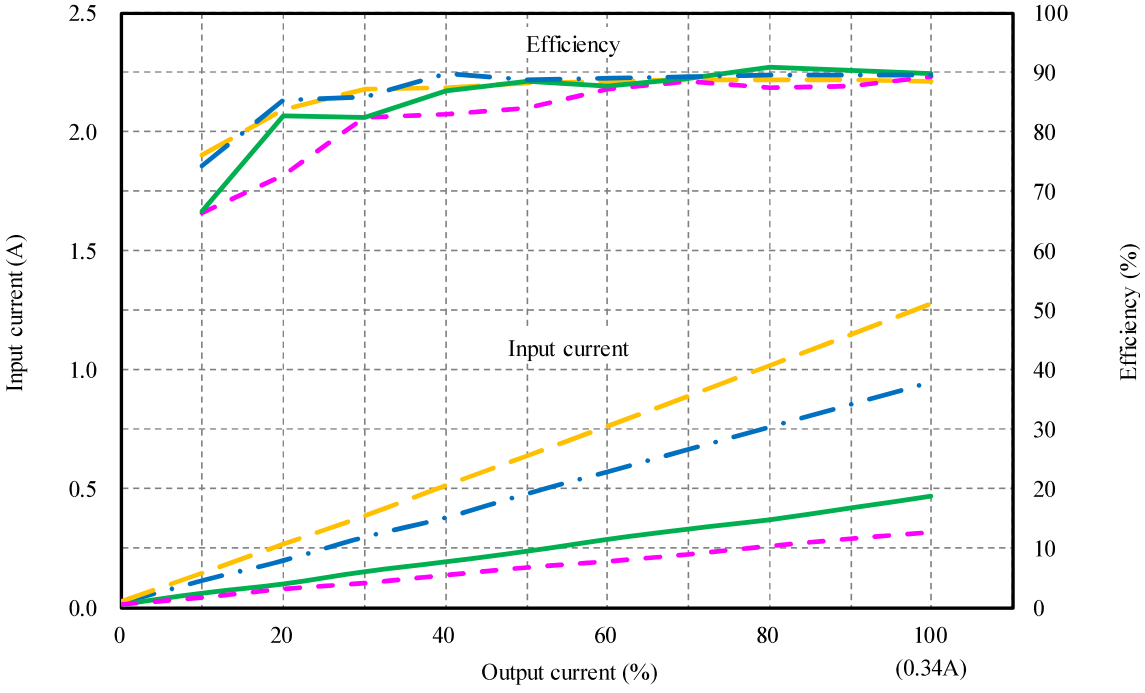
(3) 入力電流・効率 対 出力電流 Input current and Efficiency vs. Output current

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

±12V



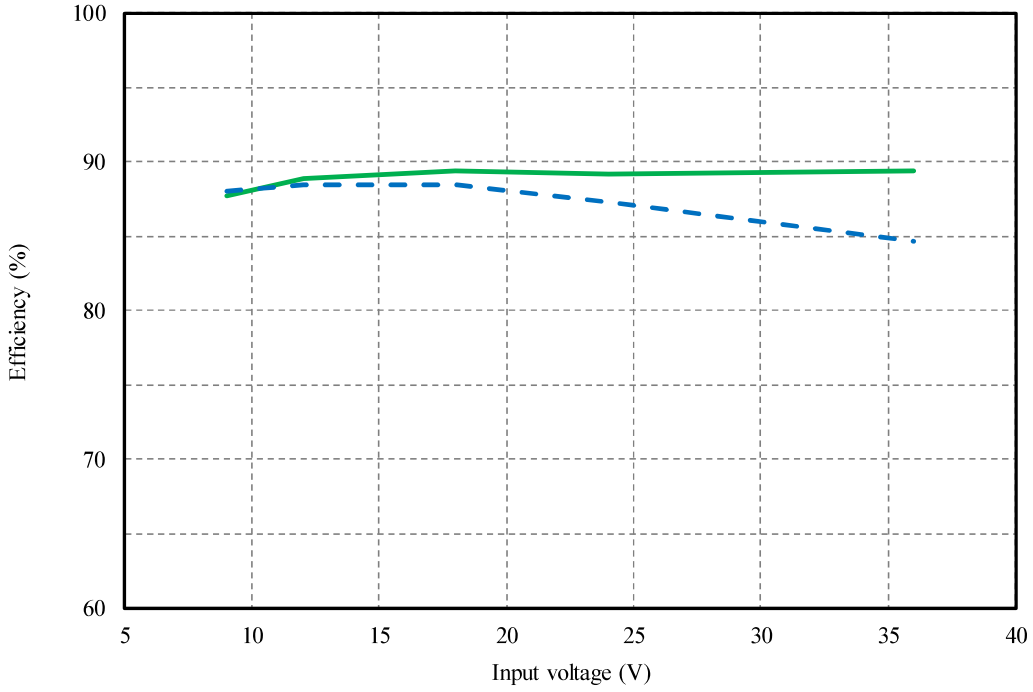

±15V



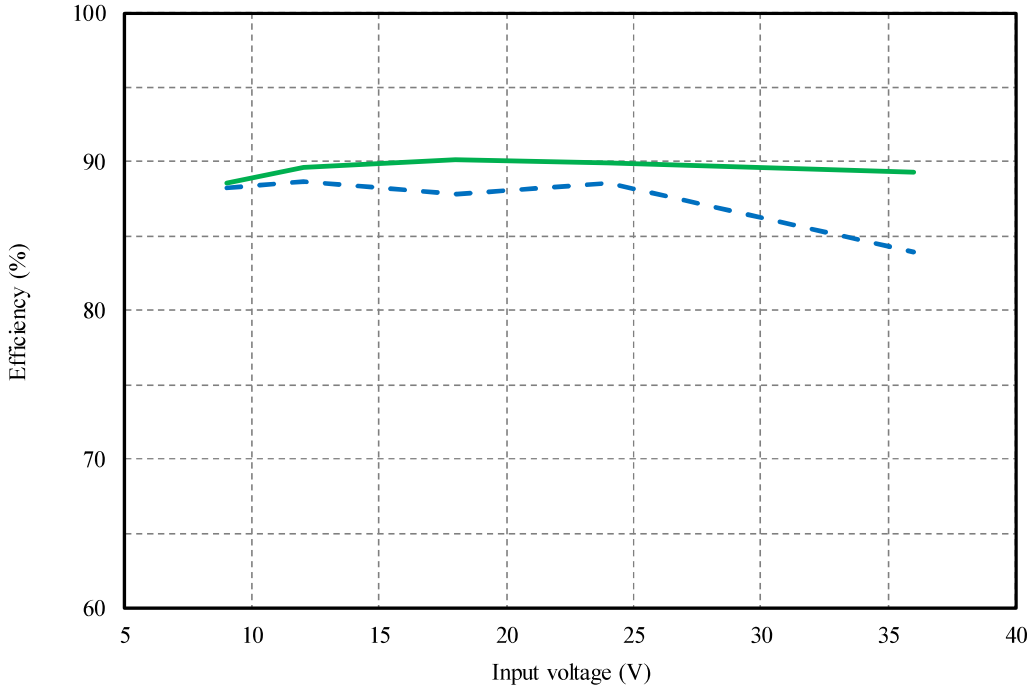
(4) 効率 対 入力電圧 Efficiency vs. Input voltage

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

±12V




±15V



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

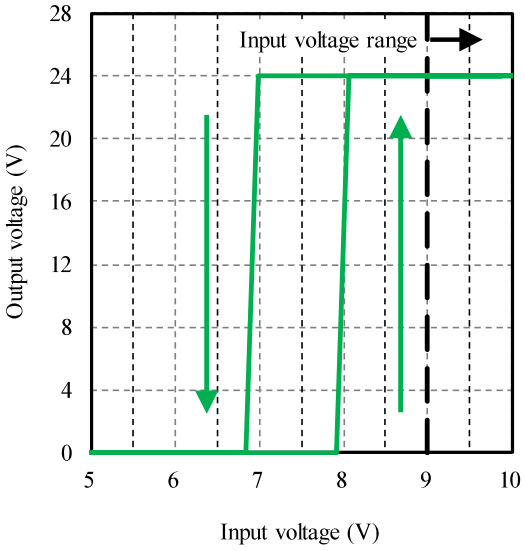
出力電圧 対 入力電圧
Output voltage vs. Input voltage

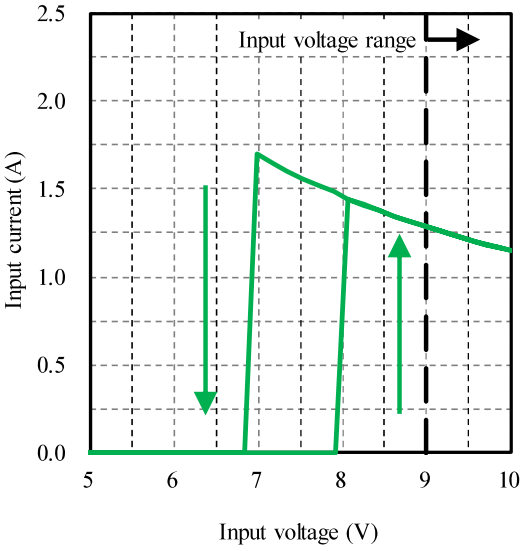
Conditions Io : 100 %
Ta : 25 °C

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

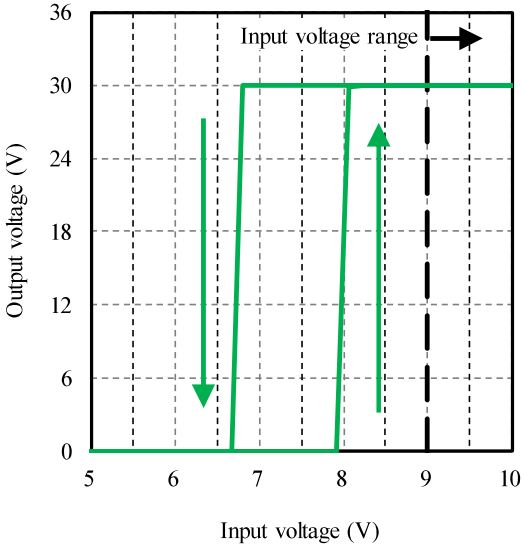
Conditions Io : 100 %
Ta : 25 °C

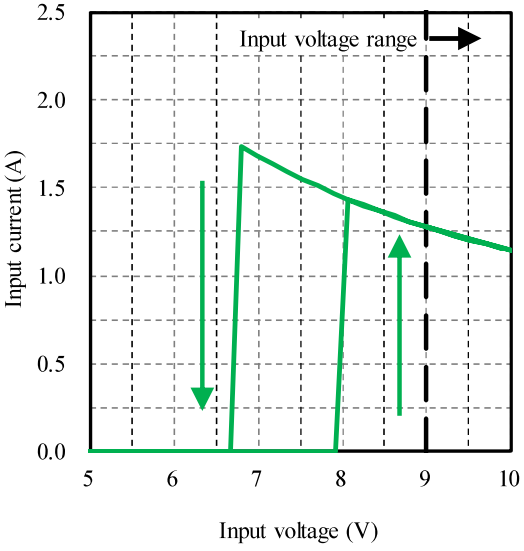
±12V




±15V

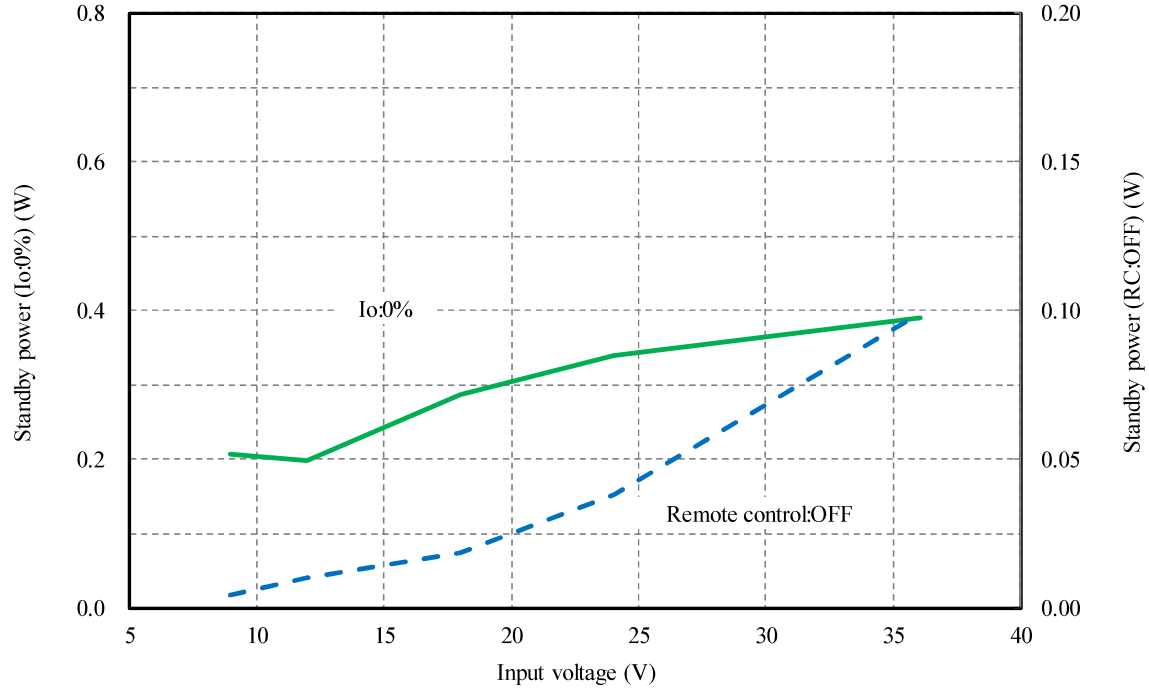


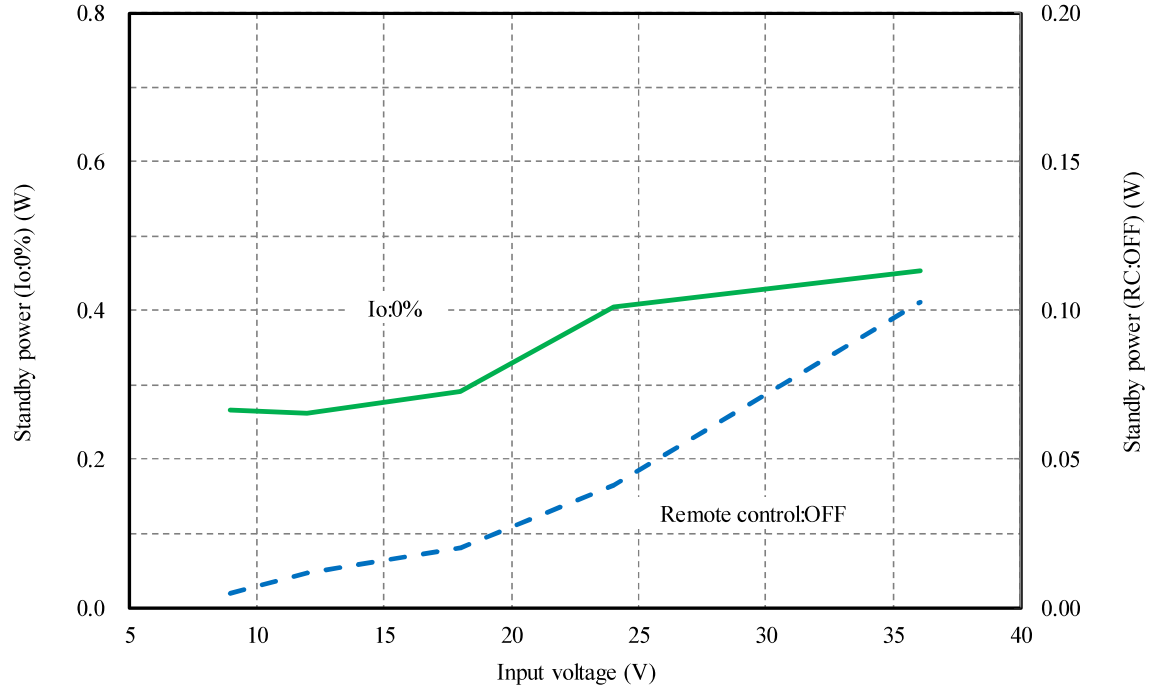
2-2. 待機電力特性 Standby power characteristics

Condition Ta : 25 °C

±12V



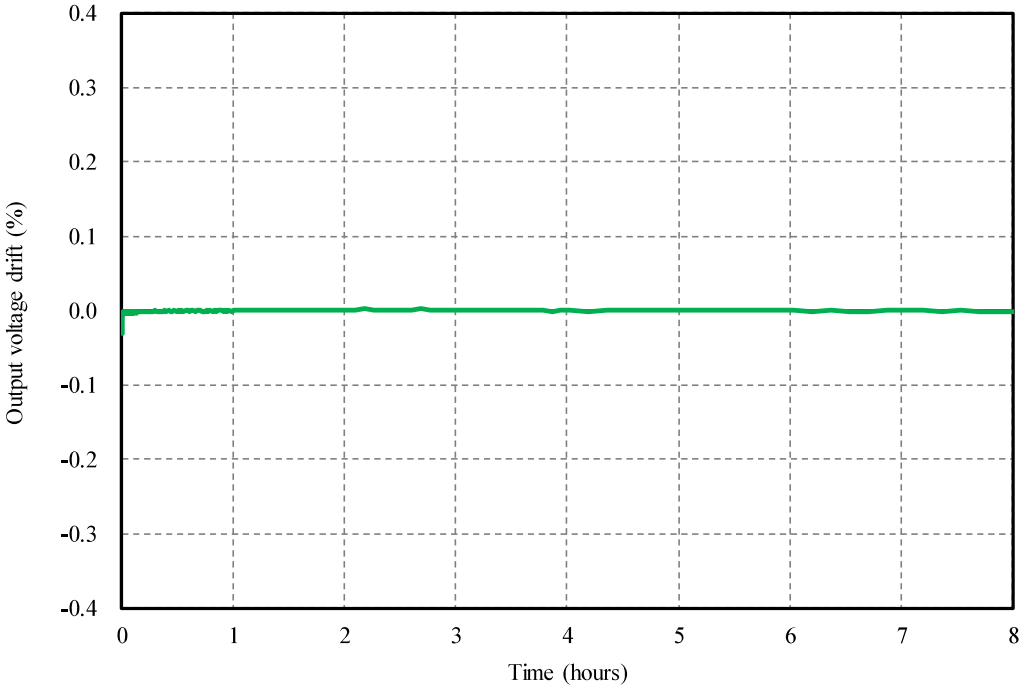

±15V



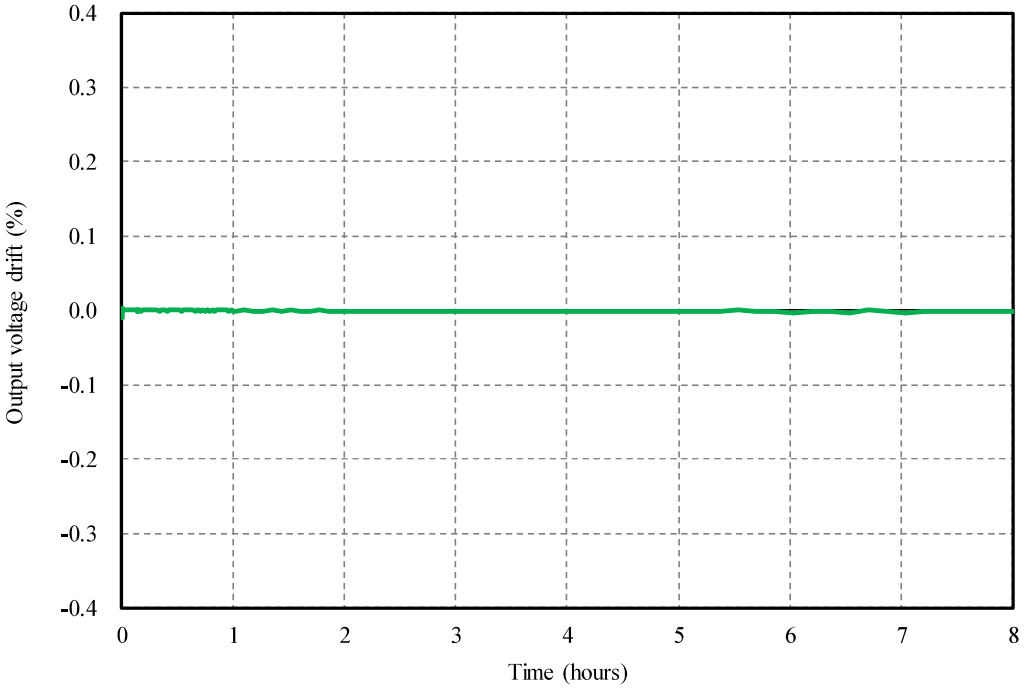
2-3. 通電ドリフト特性 Warm up voltage drift characteristics

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

±12V




±15V



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

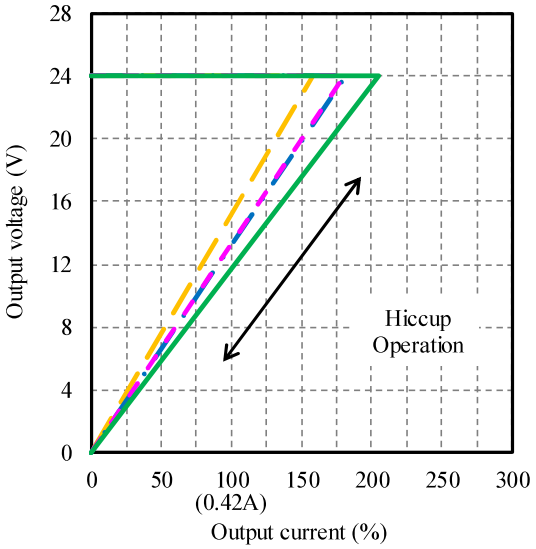
入力電圧依存性
Input voltage dependence

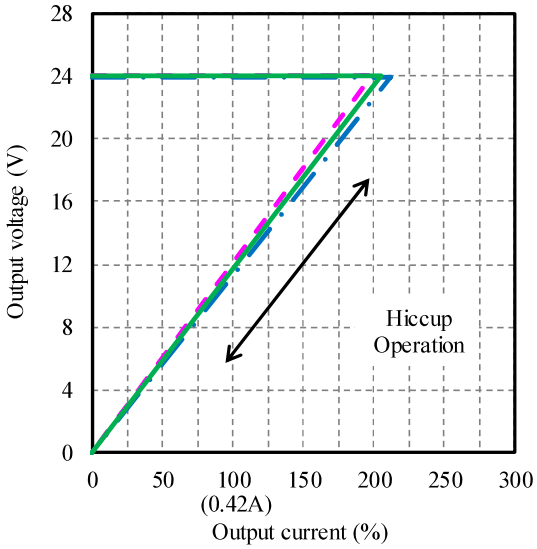
Conditions Vin : 9 VDC
: 12 VDC
: 24 VDC
: 36 VDC
Ta : 25 °C

周囲温度依存性
Ambient temperature dependence

Conditions Vin : 24 VDC
Ta : -40 °C
: 25 °C
: 60 °C

±12V

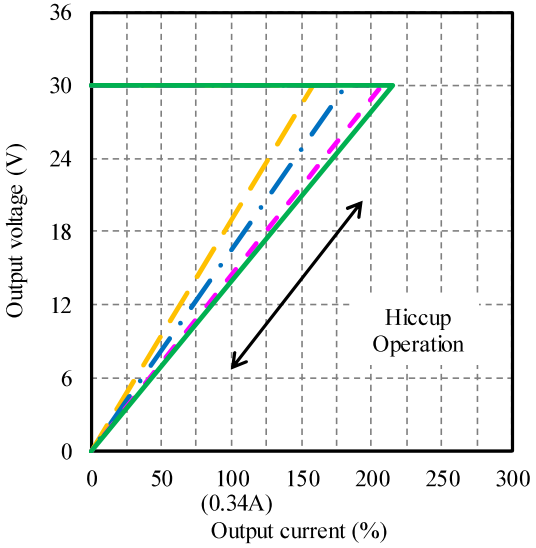


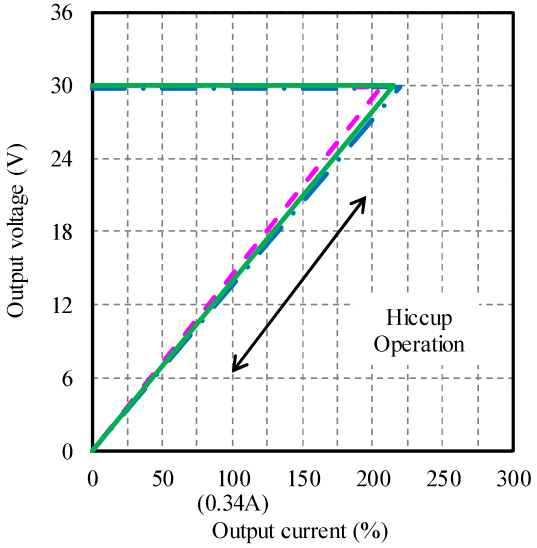




Conditions Vin : 24 VDC
: 24 VDC
: 24 VDC
: 24 VDC
Ta : 25 °C

Conditions Vin : 24 VDC
Ta : -40 °C
: 25 °C
: 65 °C

±15V

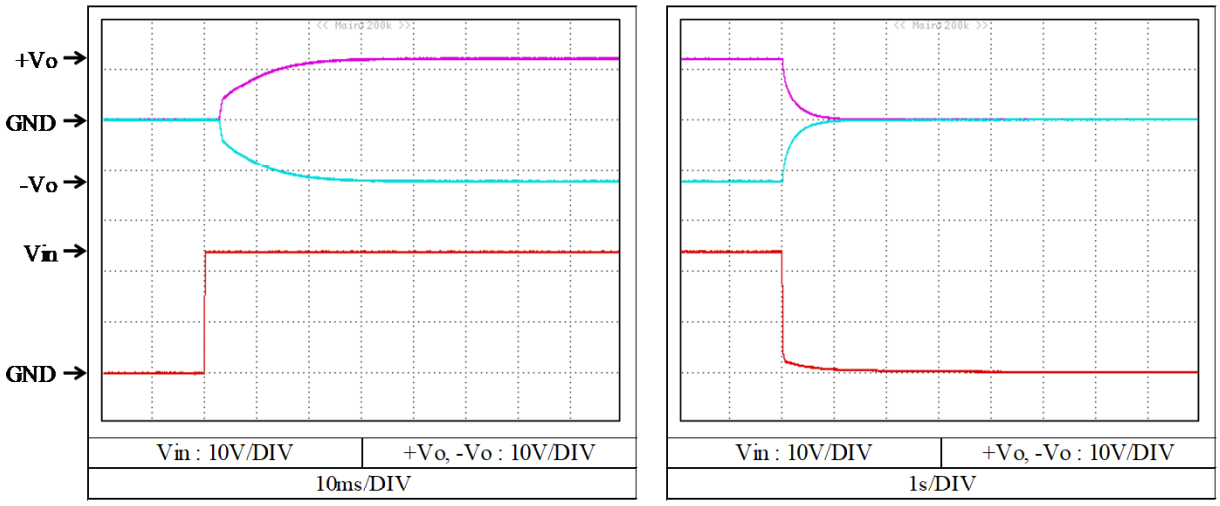


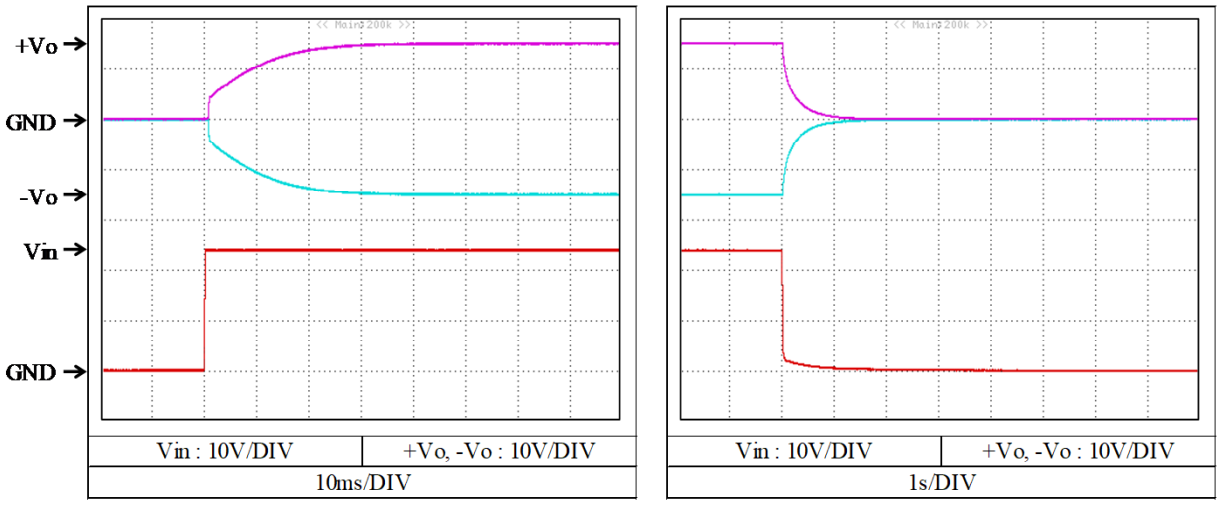
2-5. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

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

±12V



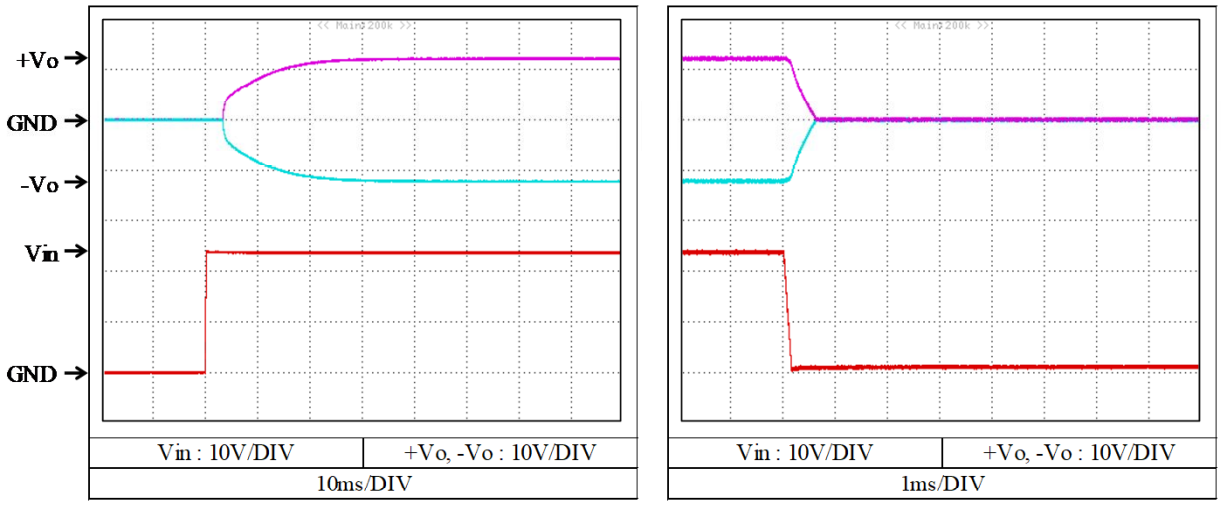

+15V



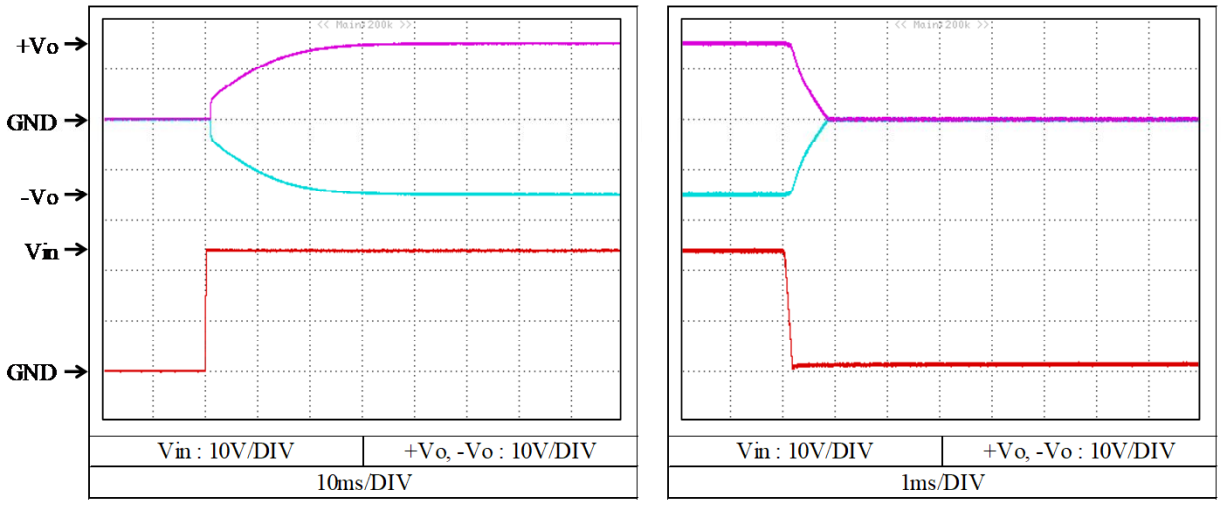
2-5. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

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

±12V




+15V

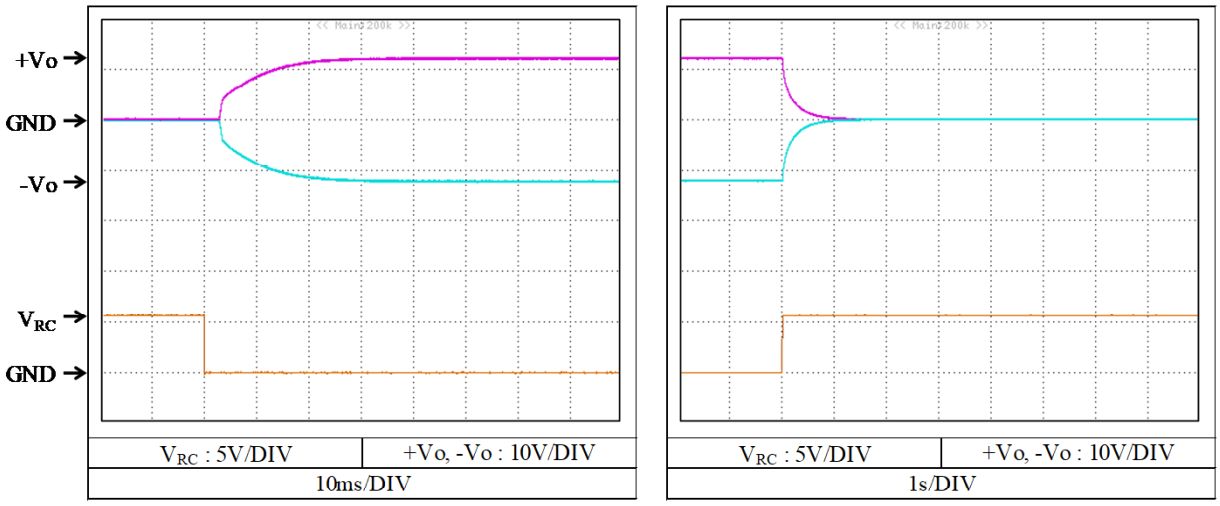


2-5. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

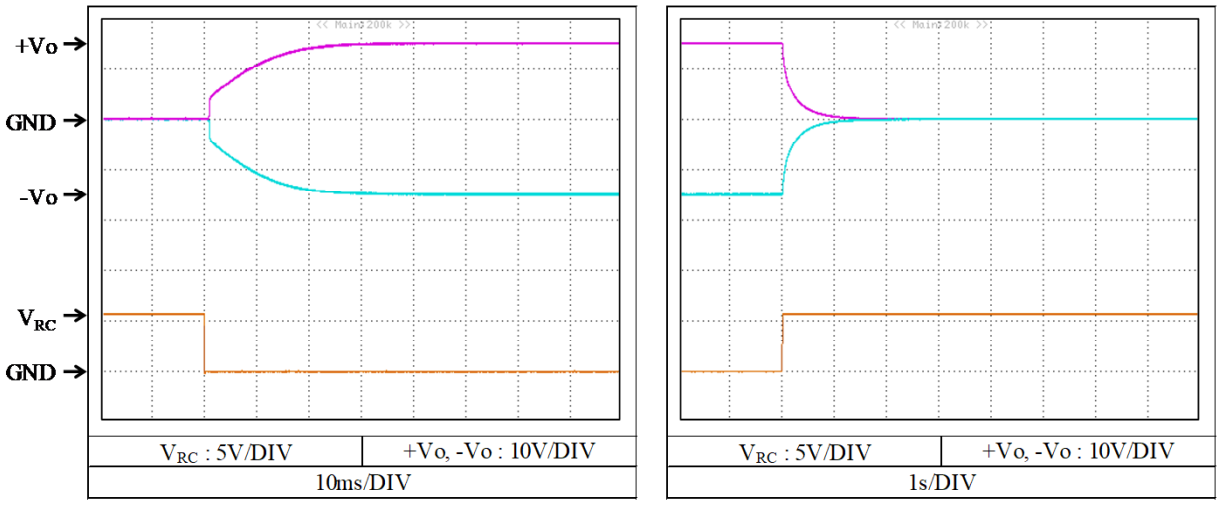
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

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

±12V




+15V

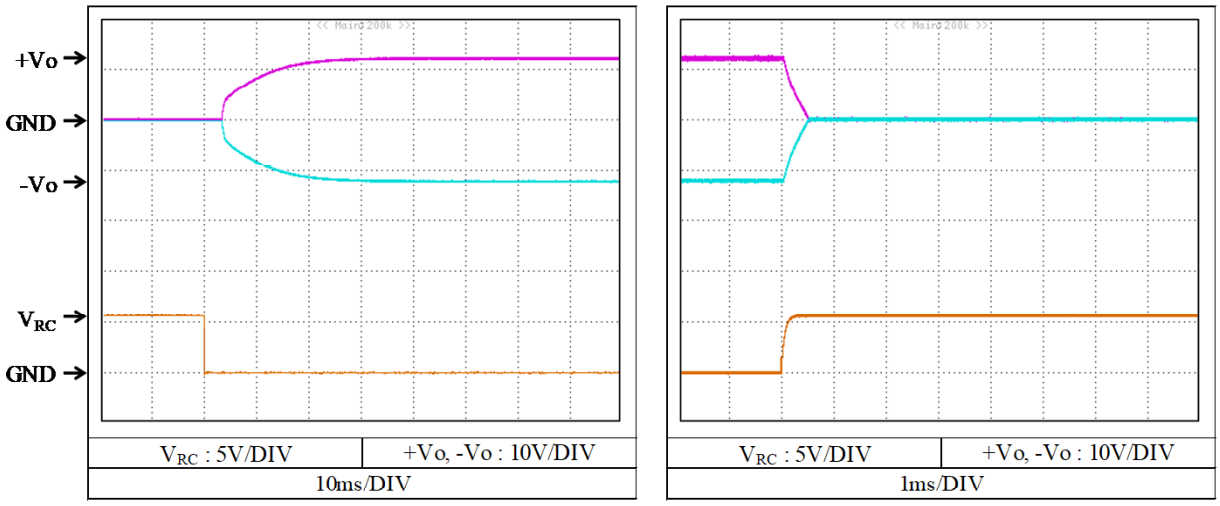


2-5. 出力立ち上がり・立ち下がり特性 (リモートON/OFFコントロール時)

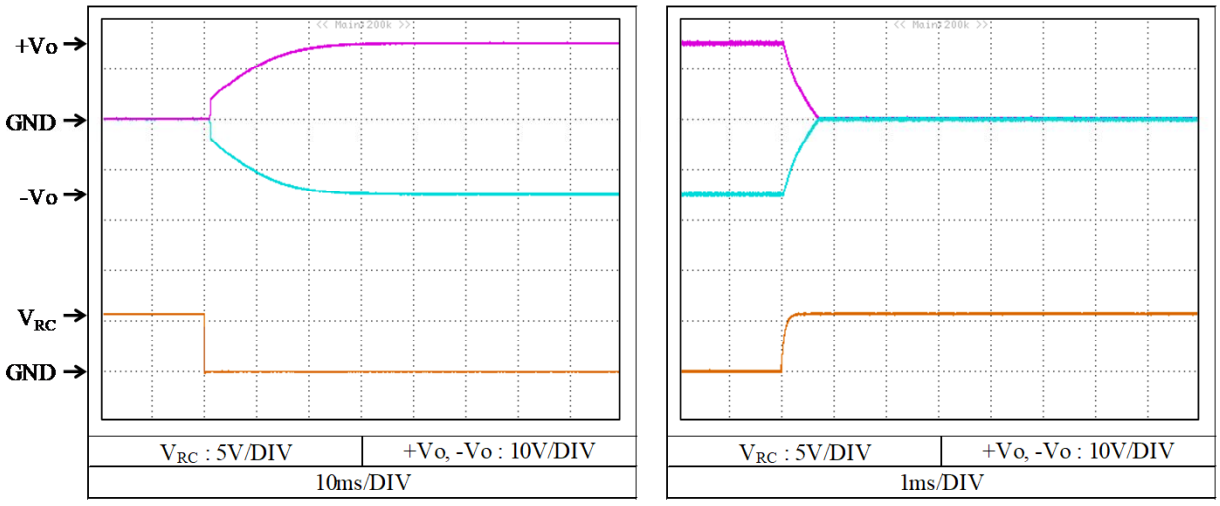
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

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

±12V



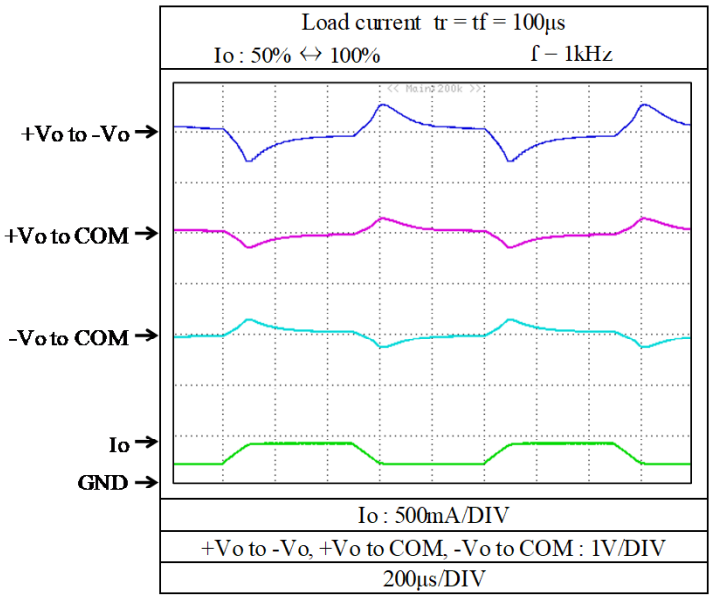

+15V



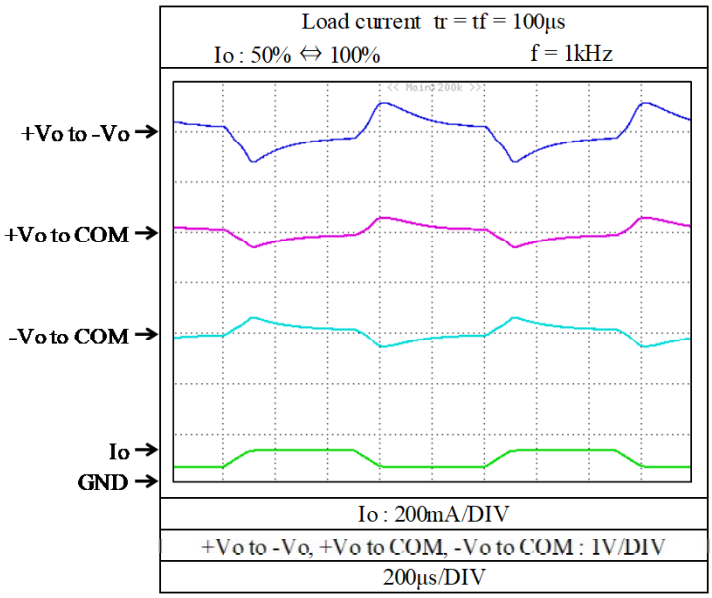
2-6. 過渡応答(負荷急変)特性 Dynamic load response characteristics

Conditions Vin : 24 VDC
Ta : 25 °C

±12V



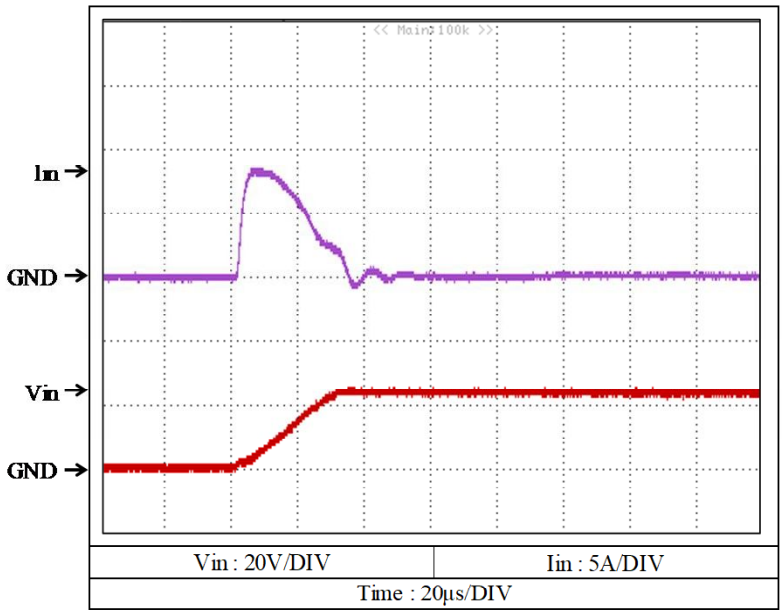

+15V



## 2-7. 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

CCG10-24-05S

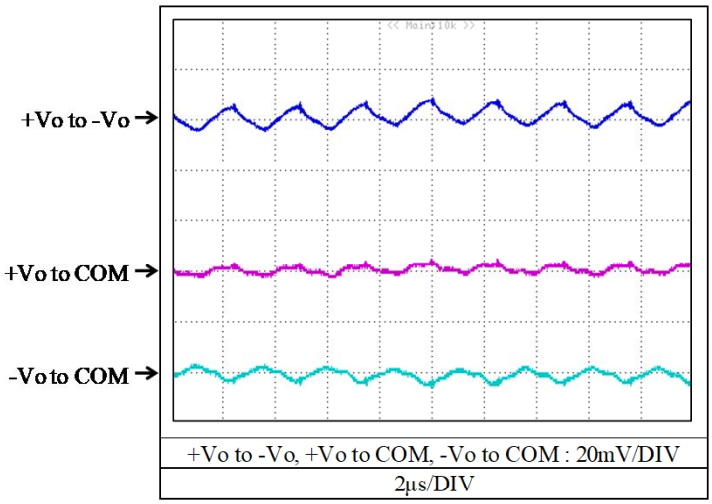



CCG10-24-xxDの入力サージ電流特性は CCG10-24-05S と同等です。
CCG10-24-xxD have the same Inrush current characteristics as CCG10-24-05S data.

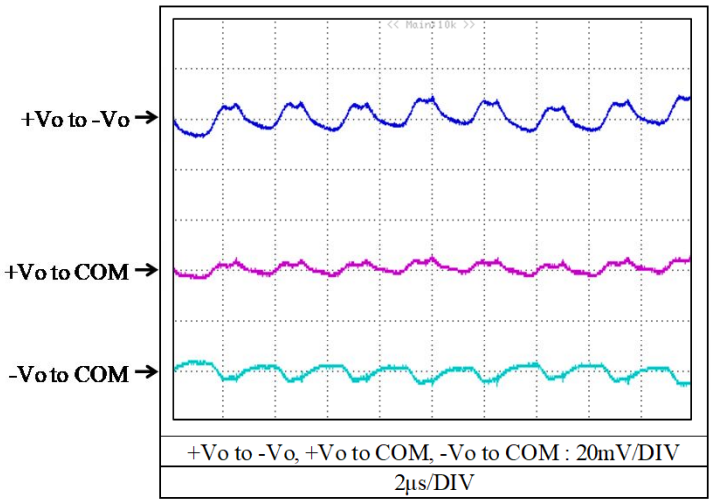
2-8. 出力リップルノイズ波形 Output ripple and noise waveform

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

±12V




+15V

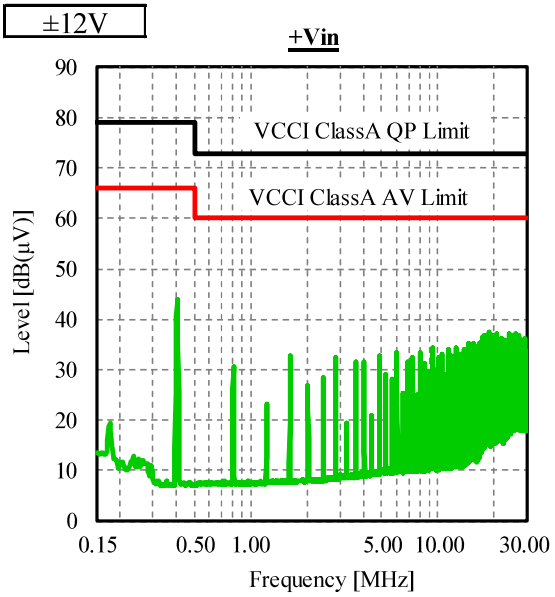


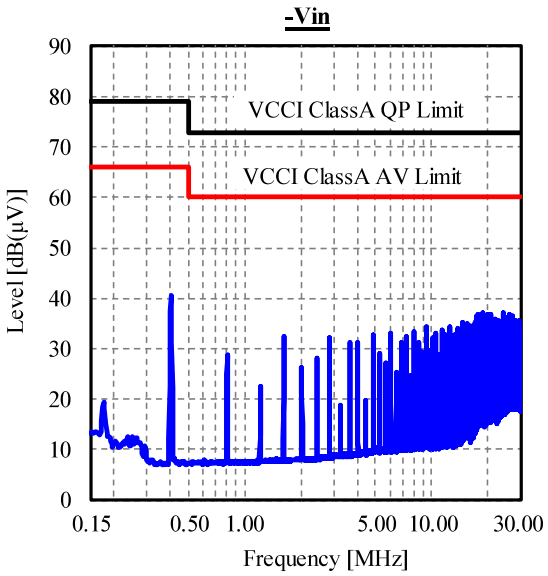
2-9. EMI特性 Electro-Magnetic Interference characteristics

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

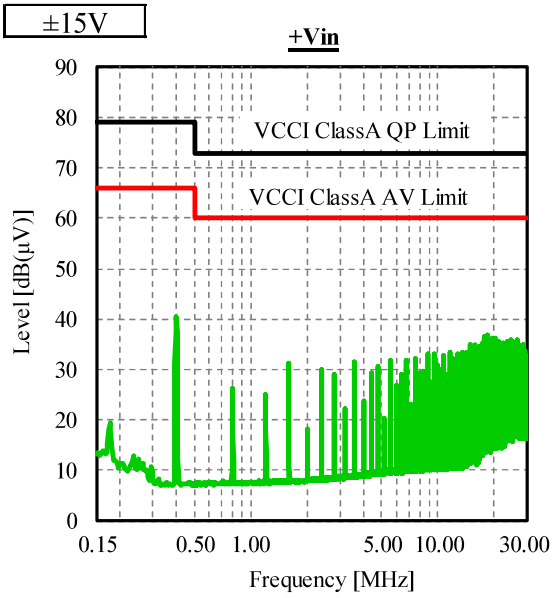
Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 ℃

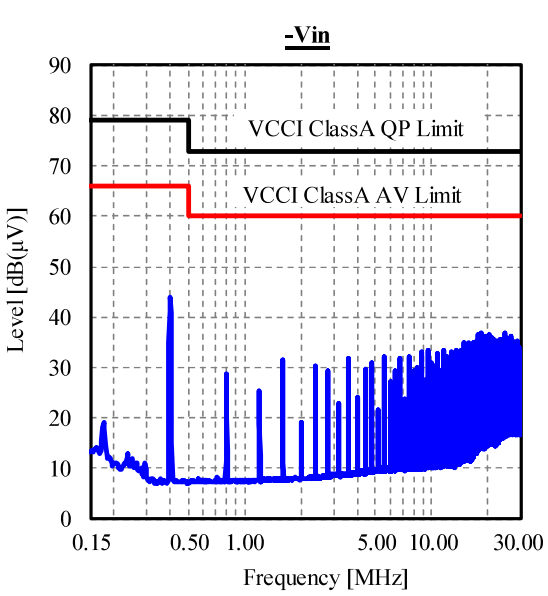
±12V




±15V



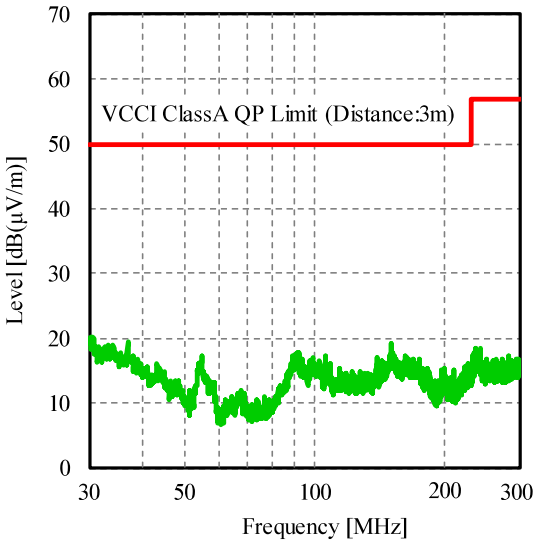

表示はQP値
Indication is QP values.

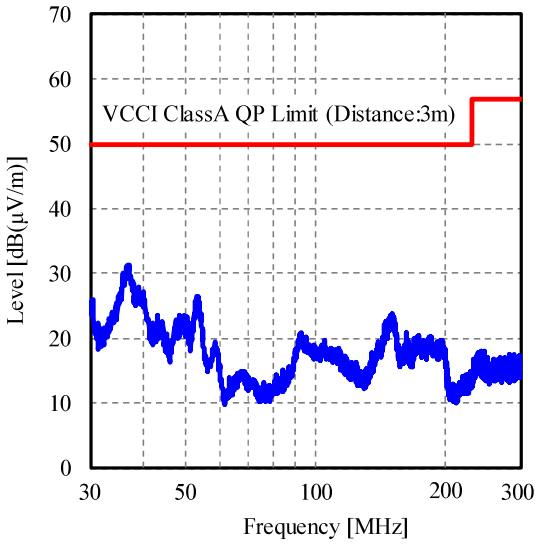
2-9. EMI特性 Electro-Magnetic Interference characteristics

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

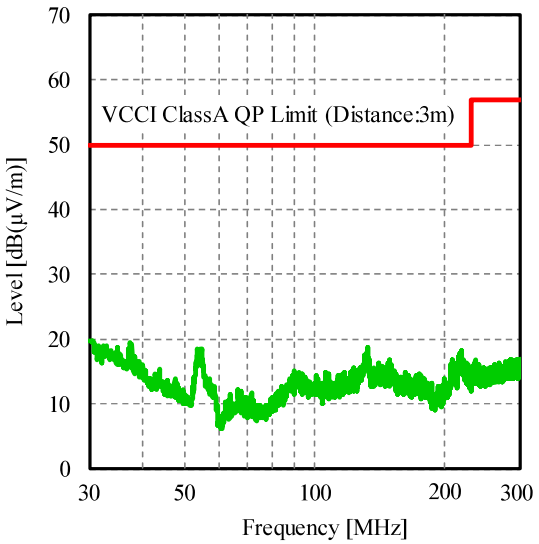
Conditions Vin : 24 VDC
Io : 100 %
Ta : 25 ℃

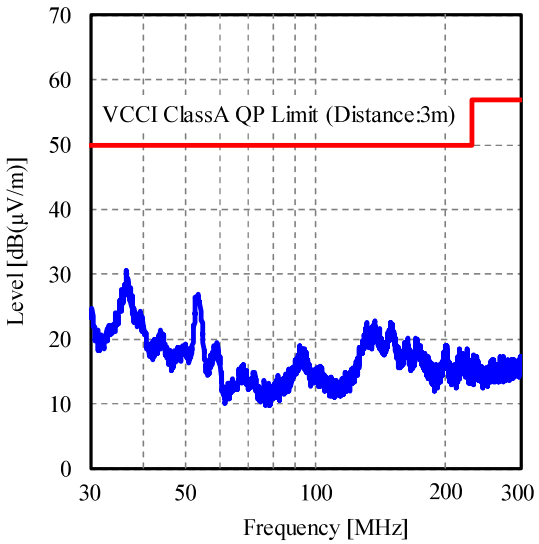
±12V




±15V




表示はピーク値
Indication is peak values.