

**CCG15-24-\*\*\*S**

**EVALUATION DATA**

型式データ

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## 使用記号 Terminology used

	定義	Definition
V <sub>in</sub>	..... 入力電圧	Input voltage
V <sub>o</sub>	..... 出力電圧	Output voltage
V <sub>rc</sub>	..... RC電圧	RC voltage
I <sub>in</sub>	..... 入力電流	Input current
I <sub>o</sub>	..... 出力電流	Output current
T <sub>a</sub>	..... 周囲温度	Ambient temperature
f	..... 周波数	Frequency

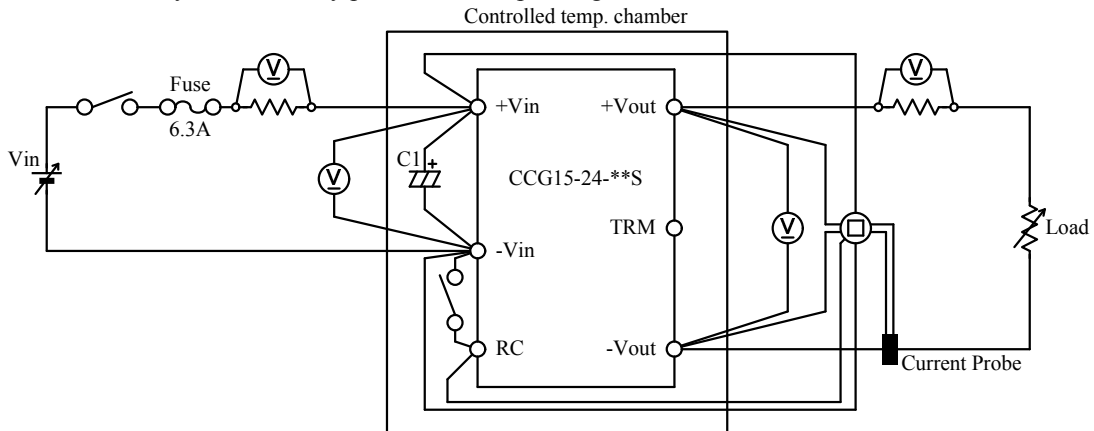
※ 当社測定条件における結果であり、参考値としてお考え願います。  
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

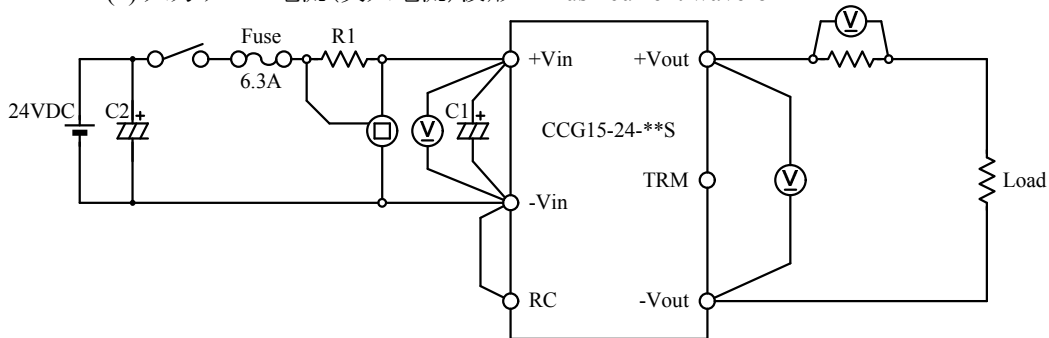
1-1. 測定回路 Measurement Circuits

(1) 静特性、待機電力特性、通電ドリフト特性、その他特性

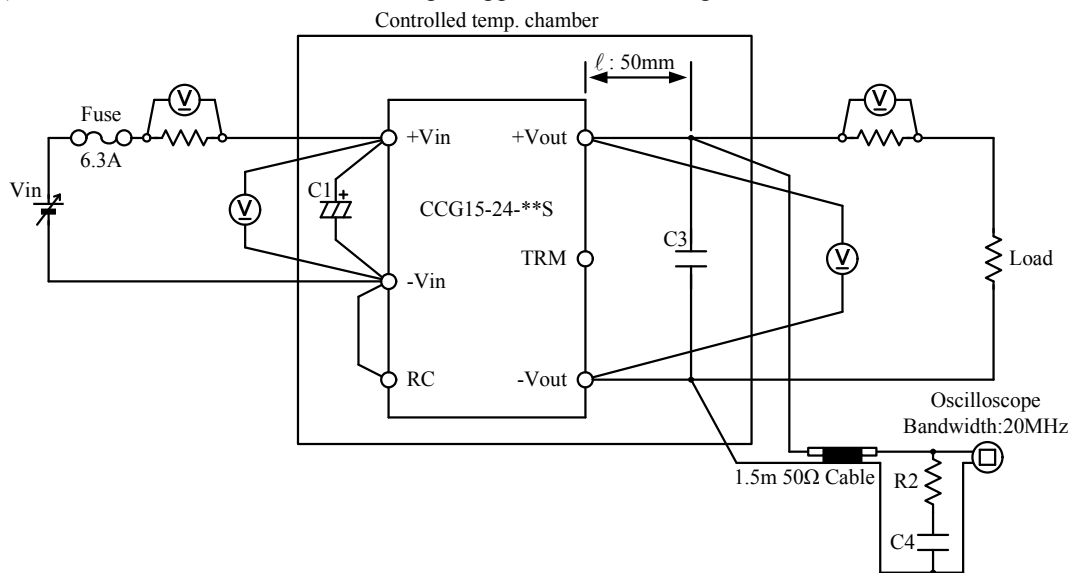
Steady state, Standby power, Warm up voltage drift and Other characteristics



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



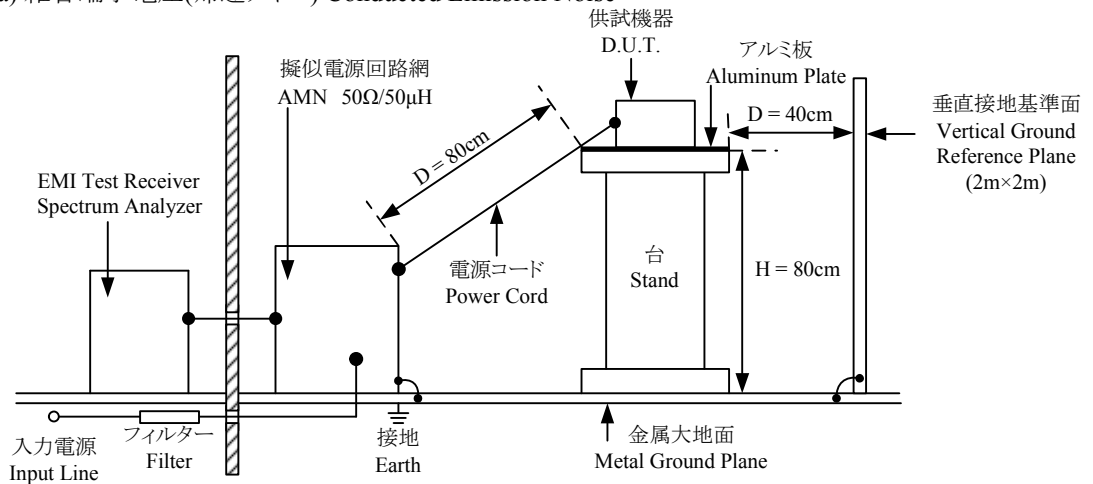
(3) 出力リップル、ノイズ電圧、波形 Output ripple and noise voltage and waveform



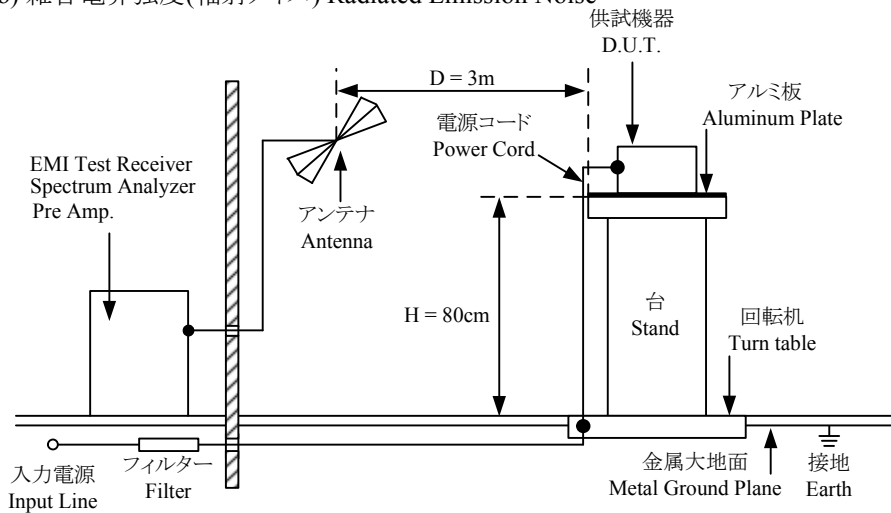
- |                    |                        |
|--------------------|------------------------|
| C1 : 120 $\mu$ F   | Electrolytic Capacitor |
| C2 : 8000 $\mu$ F  | Electrolytic Capacitor |
| C3 : 22 $\mu$ F    | Ceramic Capacitor      |
| C4 : 4700pF        | Ceramic Capacitor      |
| R1 : 0.01 $\Omega$ |                        |
| R2 : 50 $\Omega$   |                        |

(4) EMI特性 Electro-Magnetic Interference characteristics

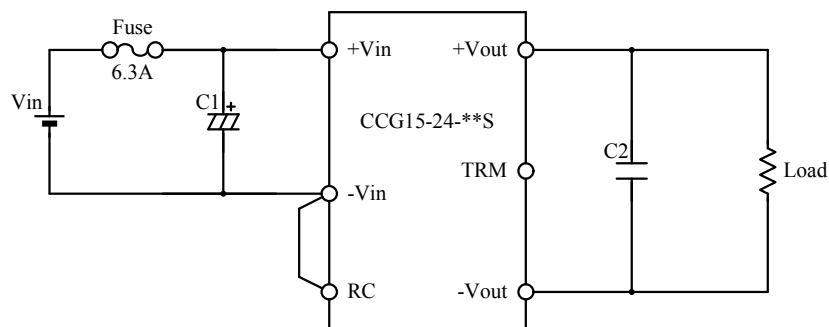
(a) 雑音端子電圧(帰還ノイズ) Conducted Emission Noise



(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 : 120μF  
C2 : 22μF

Electrolytic Capacitor  
Ceramic Capacitor

## 1-2. 使用測定機器 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL1740 / DL1740E
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	TAKASAGO	FK-200L / FK-600L
7	CVCF	TAKASAGO	AA2000XG
8	CVCF	NF	ES1000S / ES10000S
9	DC POWER SUPPLY	TDK-Lambda	Z+100-8
10	CONTROLLED TEMP. CHAMBER	ESPEC	SU-261 / SU-641
11	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCI
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

3.3V
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#### 1. Regulation - line and load

Condition Ta : 25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	3.300V	3.300V	3.299V	3.299V	1mV	0.030%
50%	3.299V	3.299V	3.299V	3.299V	0mV	0.000%
100%	3.298V	3.298V	3.298V	3.297V	1mV	0.030%
Load regulation	2mV	2mV	1mV	2mV		
	0.061%	0.061%	0.030%	0.061%		

#### 2. Temperature drift

Conditions Vin : 24 VDC  
Io : 100 %

Ta	-40°C	25°C	85°C	Temperature stability	
Vo	3.277V	3.298V	3.300V	23mV	0.697%

5V
----

#### 1. Regulation - line and load

Condition Ta : 25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	5.011V	5.012V	5.011V	5.009V	3mV	0.060%
50%	5.011V	5.011V	5.011V	5.009V	2mV	0.040%
100%	5.011V	5.011V	5.010V	5.009V	2mV	0.040%
Load regulation	0mV	1mV	1mV	0mV		
	0.000%	0.020%	0.020%	0.000%		

#### 2. Temperature drift

Conditions Vin : 24 VDC  
Io : 100 %

Ta	-40°C	25°C	85°C	Temperature stability	
Vo	4.978V	5.010V	5.016V	38mV	0.760%

12V
-----

#### 1. Regulation - line and load

Condition Ta : 25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	12.060V	12.061V	12.060V	12.060V	1mV	0.008%
50%	12.059V	12.060V	12.059V	12.059V	1mV	0.008%
100%	12.059V	12.059V	12.059V	12.059V	0mV	0.000%
Load regulation	1mV	2mV	1mV	1mV		
	0.008%	0.017%	0.008%	0.008%		

#### 2. Temperature drift

Conditions Vin : 24 VDC  
Io : 100 %

Ta	-40°C	25°C	85°C	Temperature stability	
Vo	12.067V	12.059V	12.063V	8mV	0.067%

15V
-----

#### 1. Regulation - line and load

Condition Ta : 25 °C

Io \ Vin	9VDC	12VDC	24VDC	36VDC	Line regulation	
0%	15.012V	15.013V	15.013V	15.013V	1mV	0.007%
50%	15.011V	15.012V	15.011V	15.011V	1mV	0.007%
100%	15.011V	15.011V	15.011V	15.010V	1mV	0.007%
Load regulation	1mV	2mV	2mV	3mV		
	0.007%	0.013%	0.013%	0.020%		

#### 2. Temperature drift

Conditions Vin : 24 VDC  
Io : 100 %

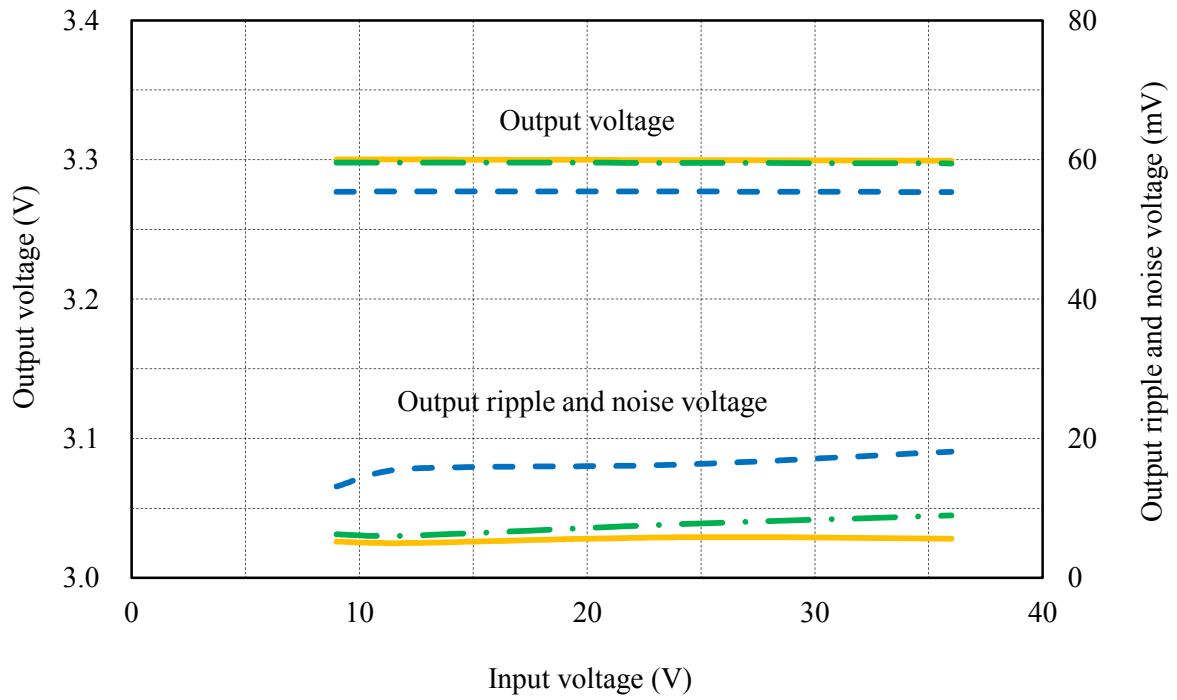
Ta	-40°C	25°C	85°C	Temperature stability	
Vo	15.018V	15.011V	15.016V	7mV	0.047%

(2) 出力電圧・出力リップルノイズ電圧 対 入力電圧

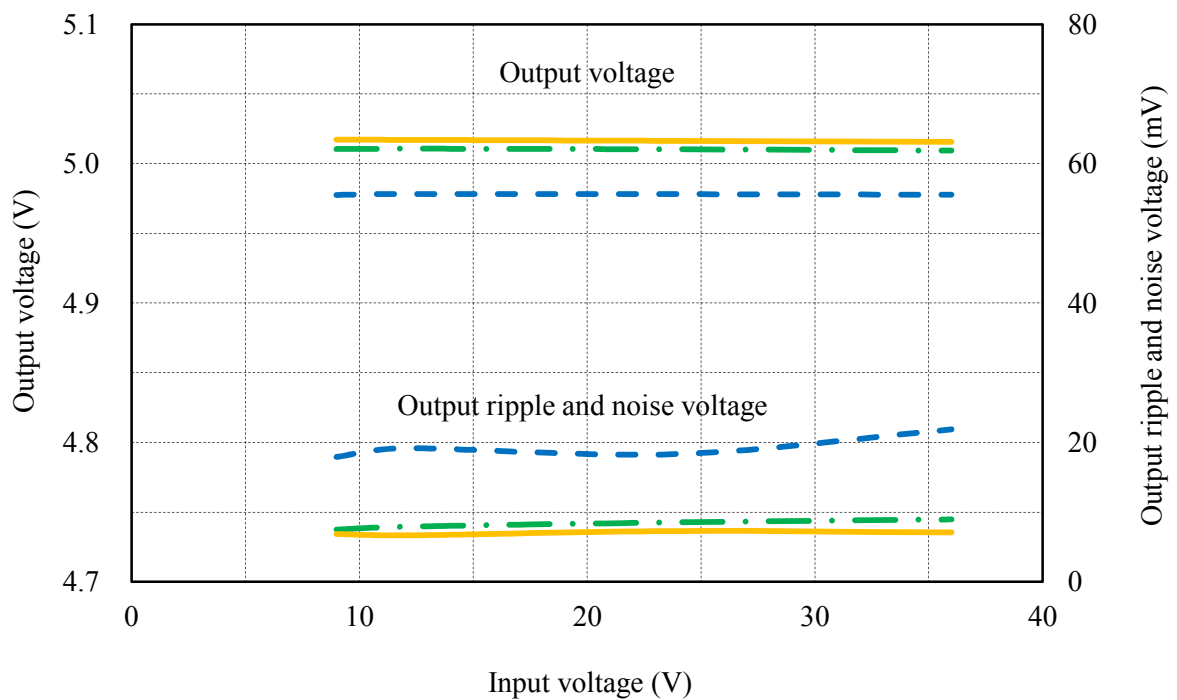
Output voltage and Output ripple and noise voltage vs. Input voltage

Conditions I<sub>o</sub> : 100 %  
 Ta : -40 °C  
 : 25 °C  
 : 85 °C

3.3V



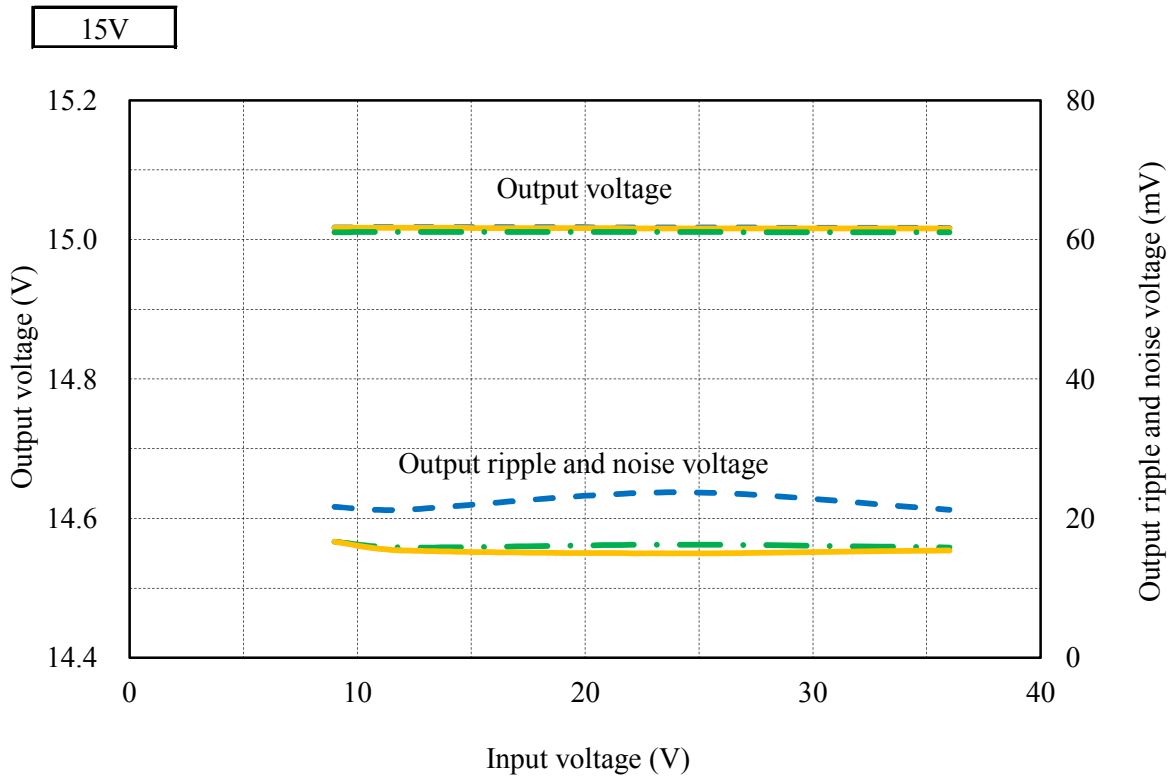
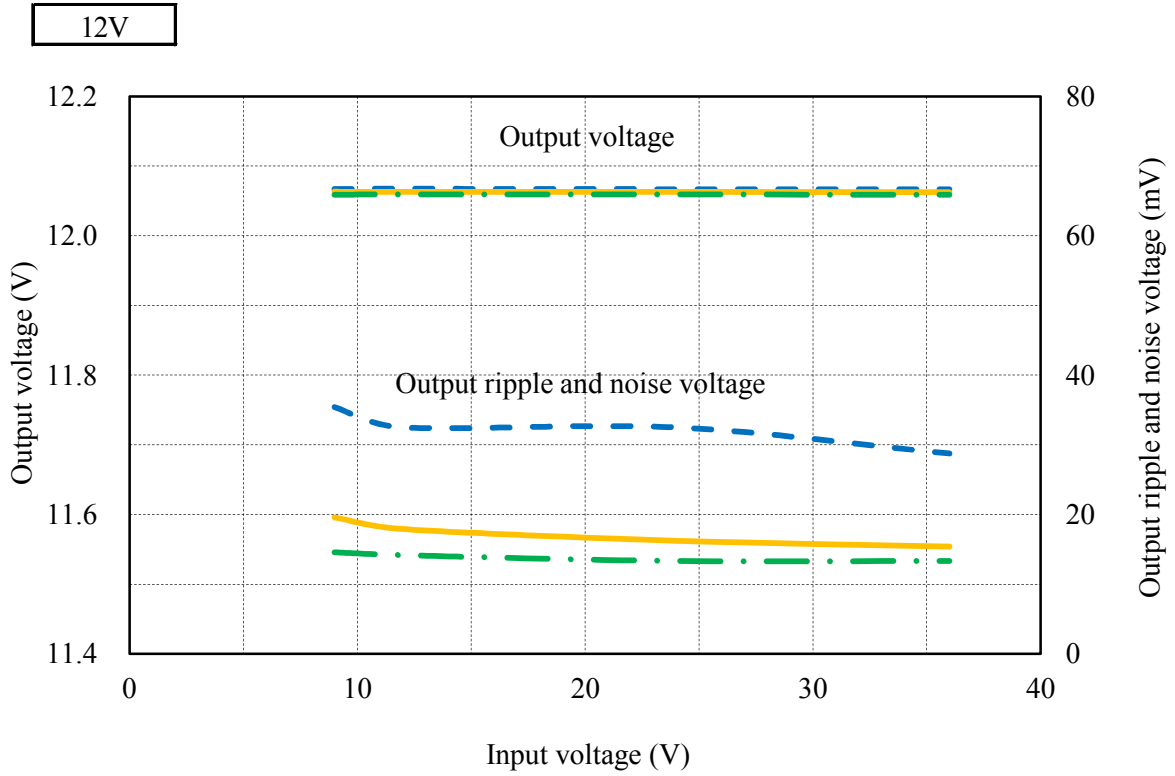
5V



(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

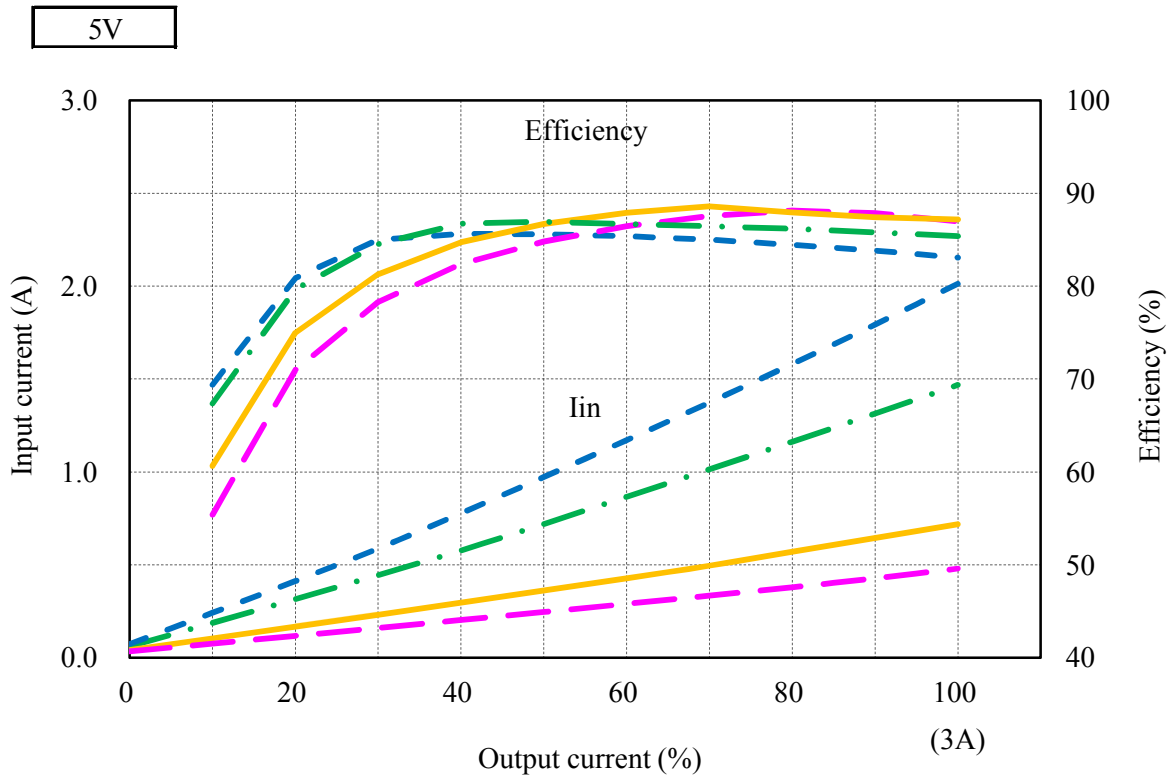
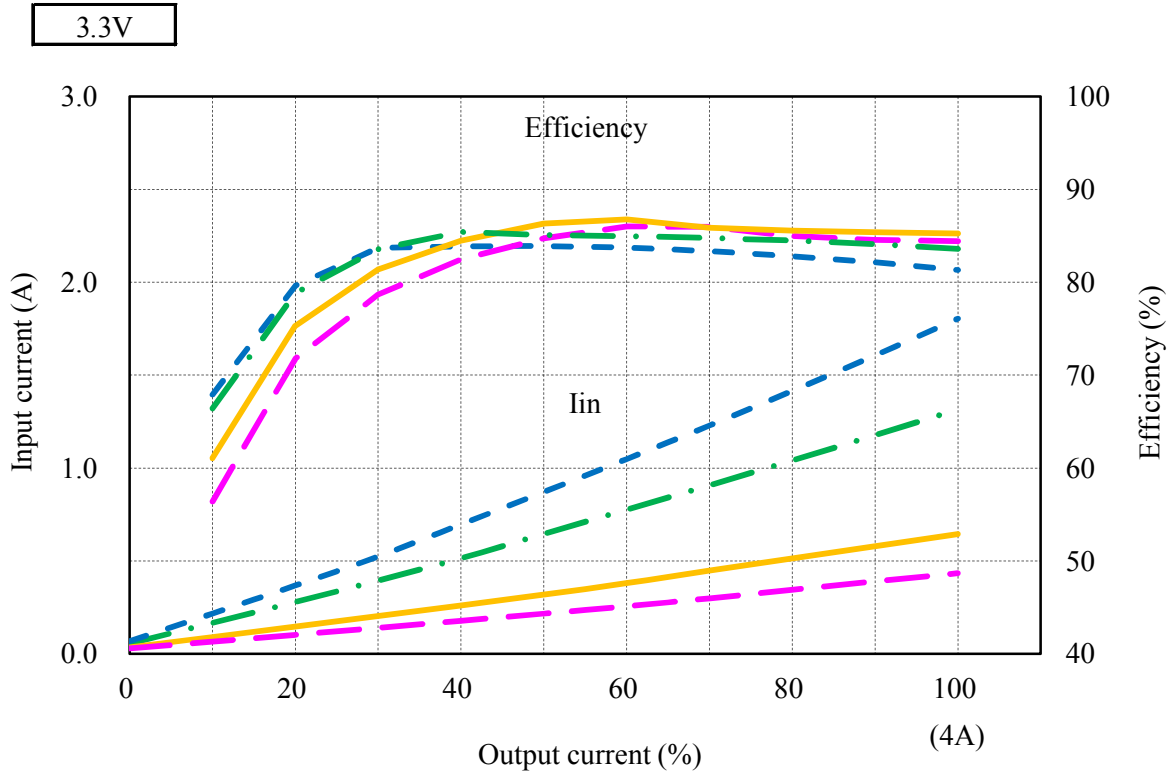
Conditions Io : 100 %  
 Ta : -40 °C  
 : 25 °C  
 : 85 °C





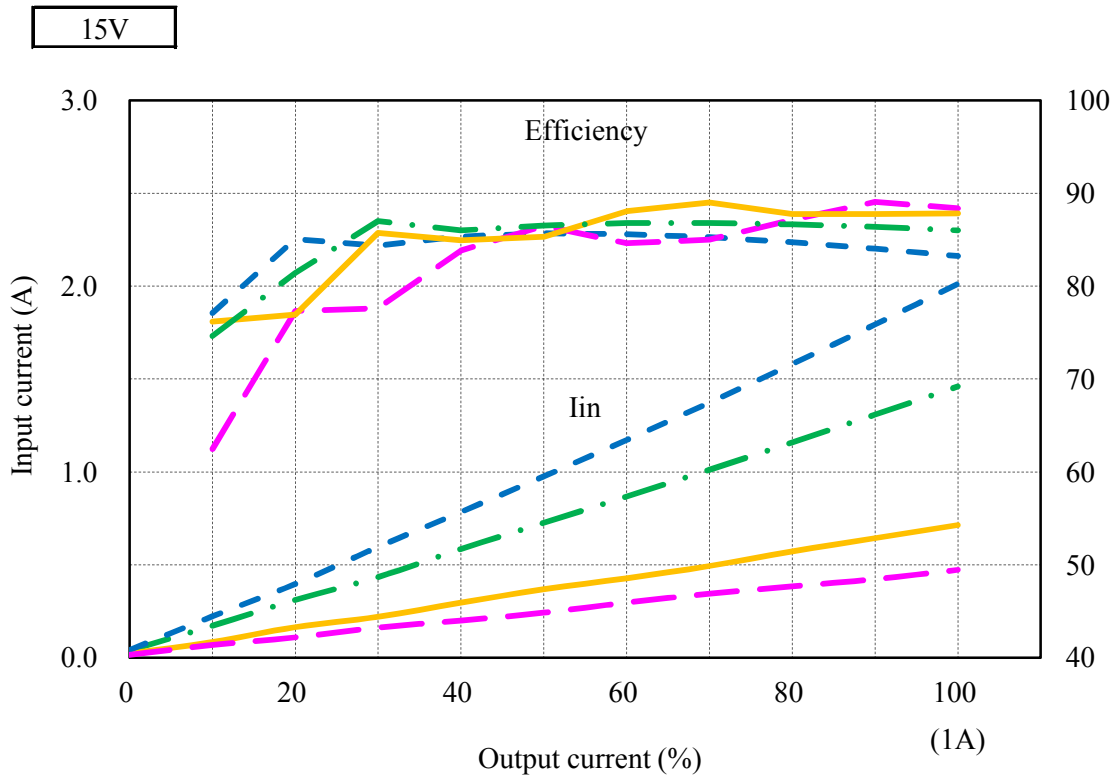
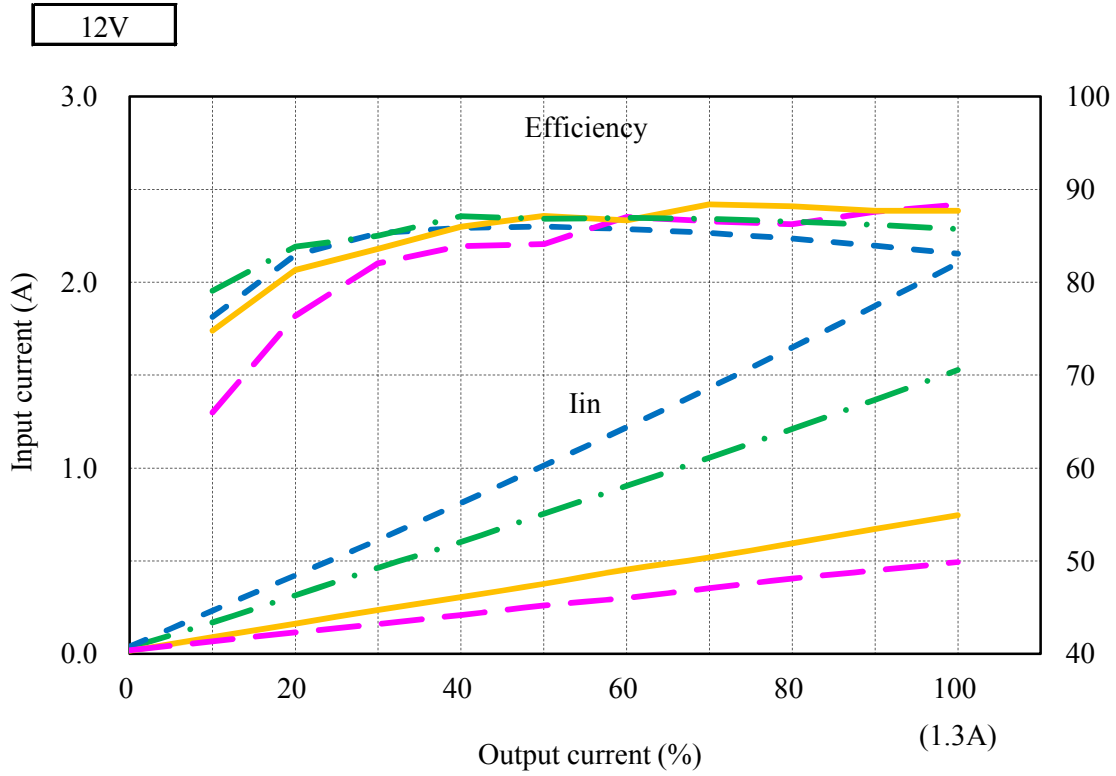
(3) 入力電流・効率 対 出力電流 Input current and Efficiency vs. Output current

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



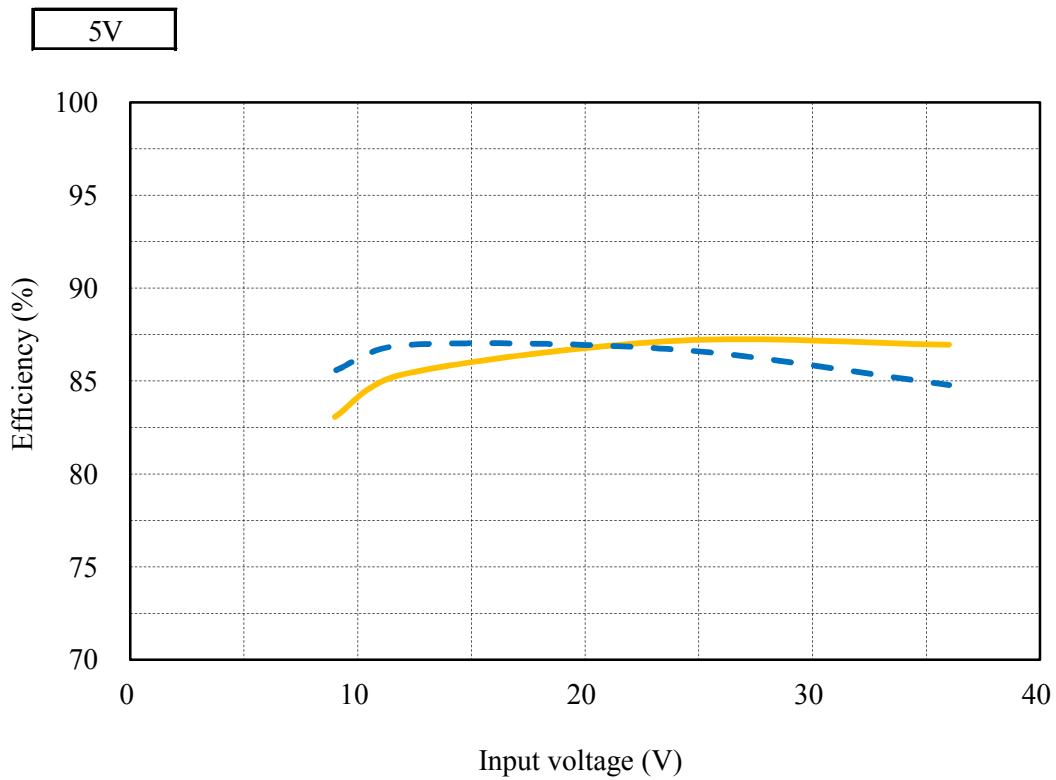
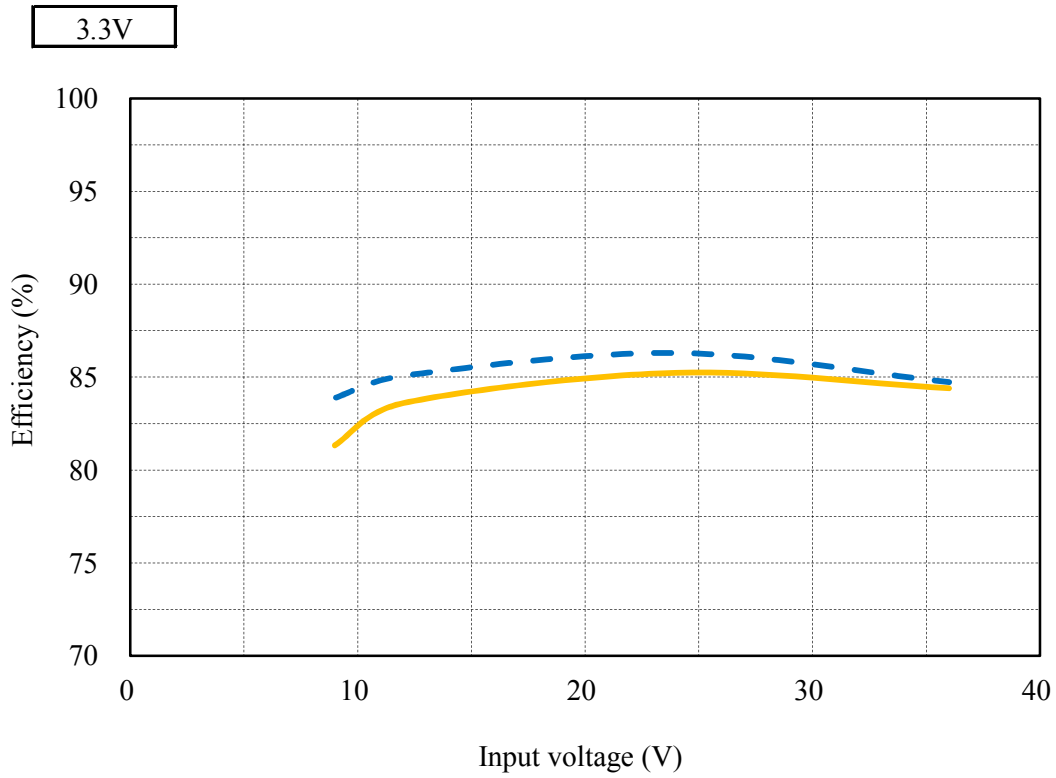
(3) 入力電流・効率 対 出力電流 Input current and Efficiency vs. Output current

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



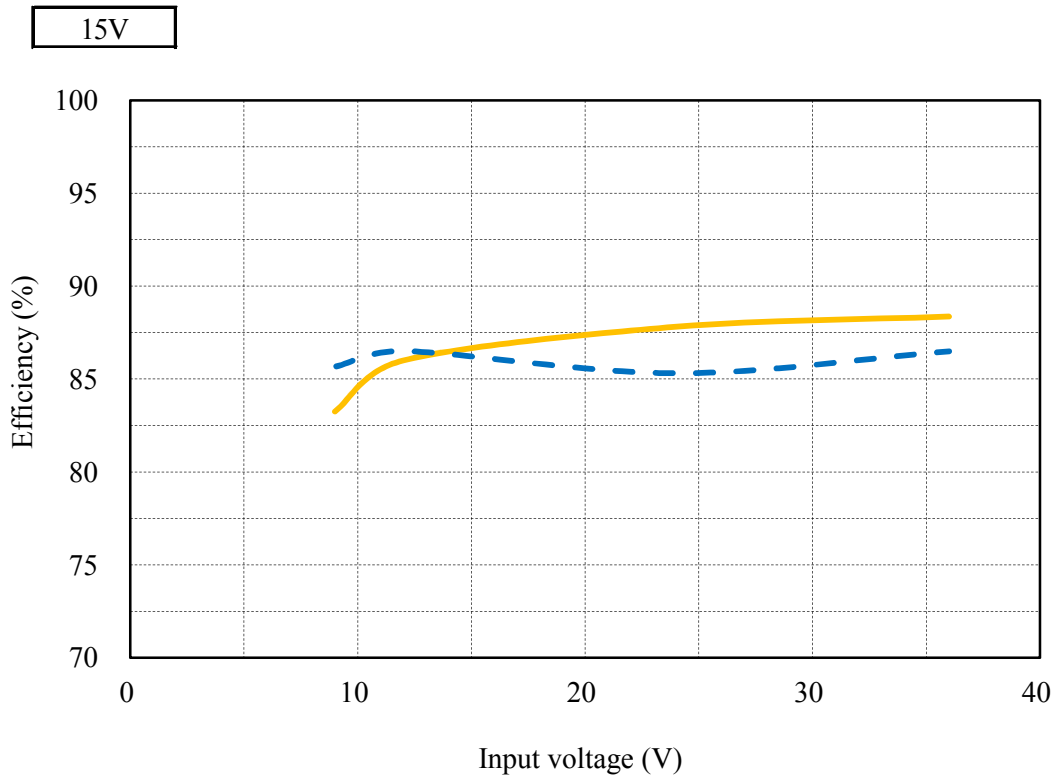
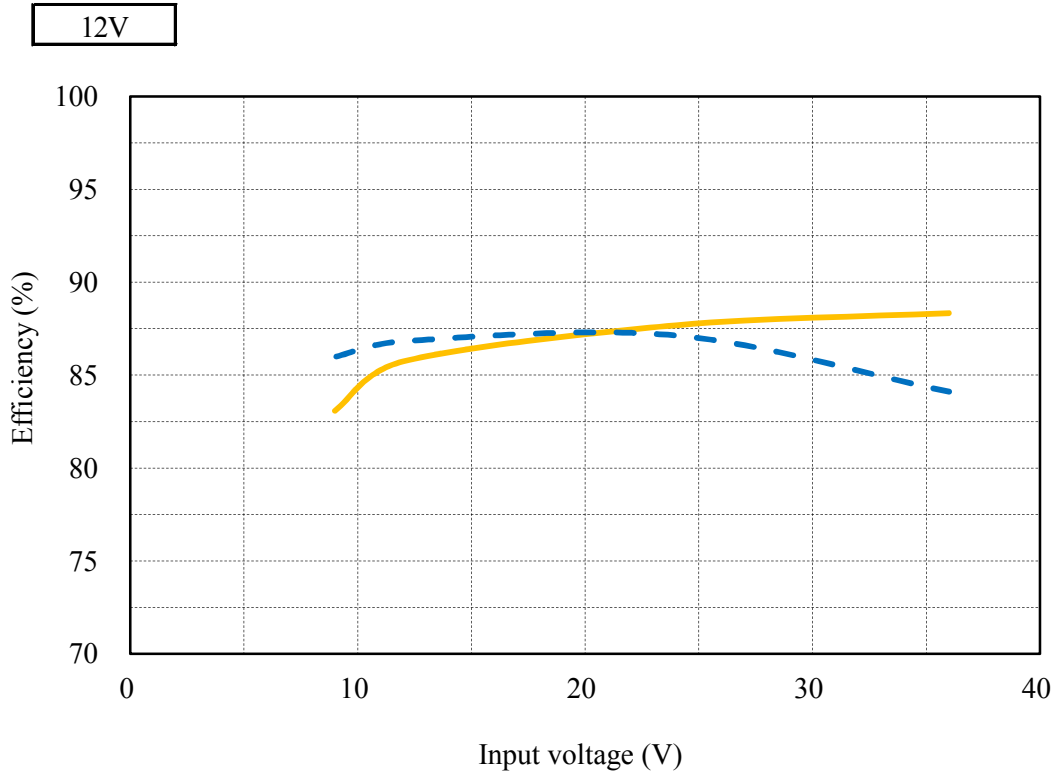
(4) 効率 対 入力電圧 Efficiency vs. Input voltage

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



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

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

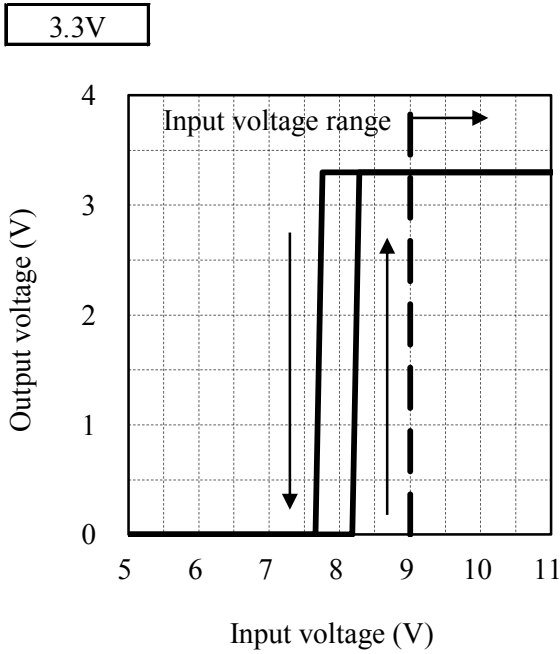


(5) 起動・遮断電圧特性 Start up and Drop out voltage characteristics

出力電圧 対 入力電圧

Output voltage vs. Input voltage

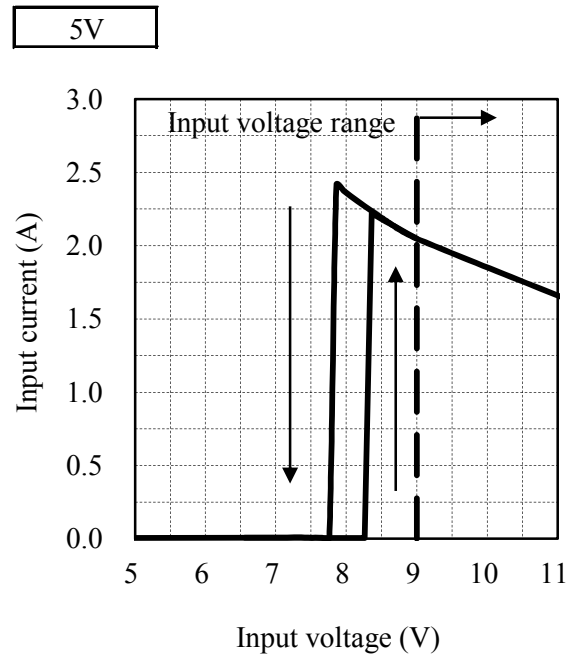
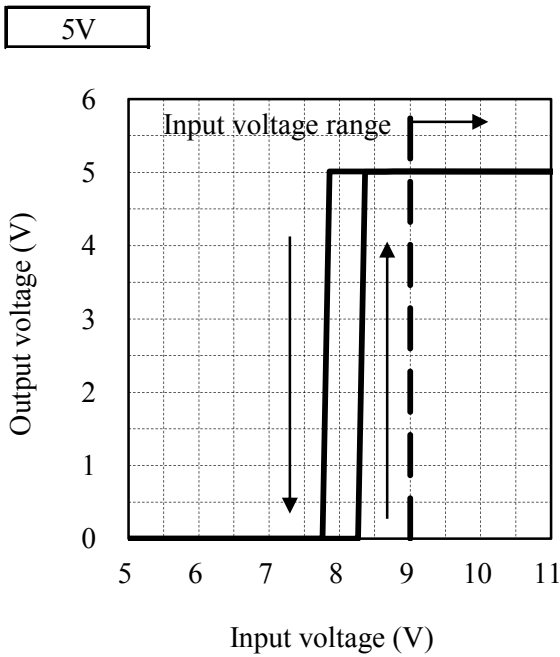
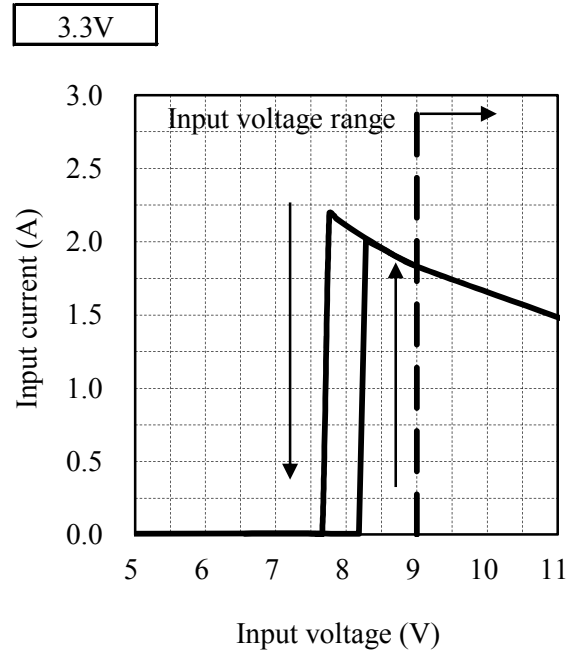
Conditions  $I_o$  : 100 %  
 $T_a$  : 25 °C



入力電流 対 入力電圧

Input current vs. Input voltage

Conditions  $I_o$  : 100 %  
 $T_a$  : 25 °C

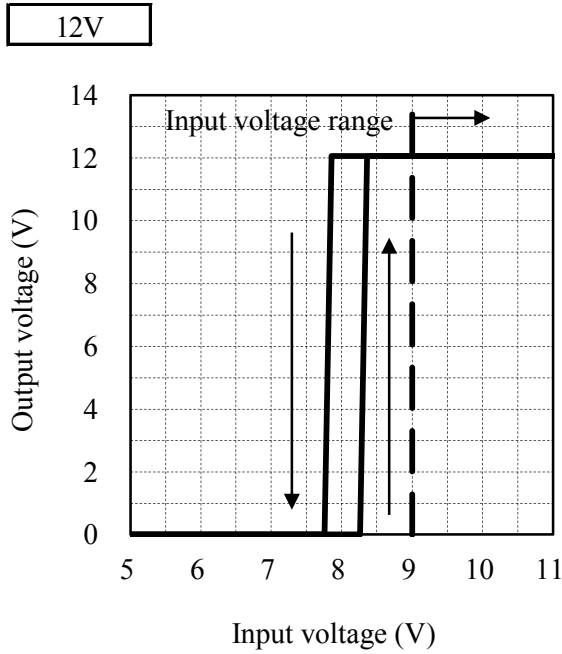


(5) 起動・遮断電圧特性 Start up and Drop out voltage characteristics

出力電圧 対 入力電圧

Output voltage vs. Input voltage

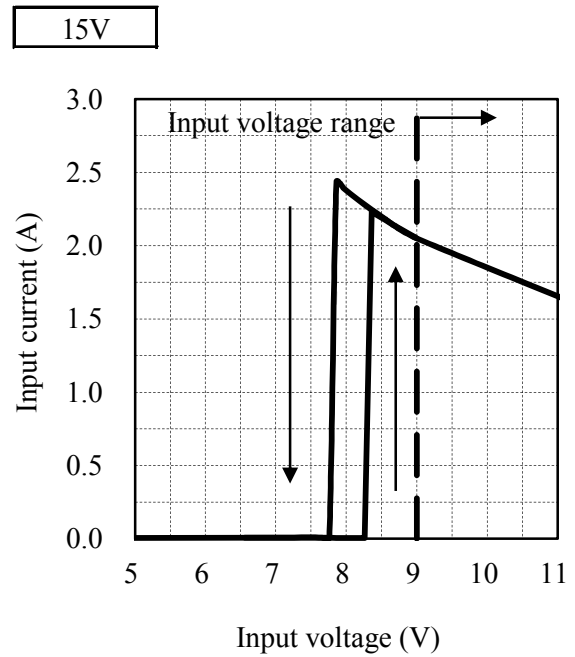
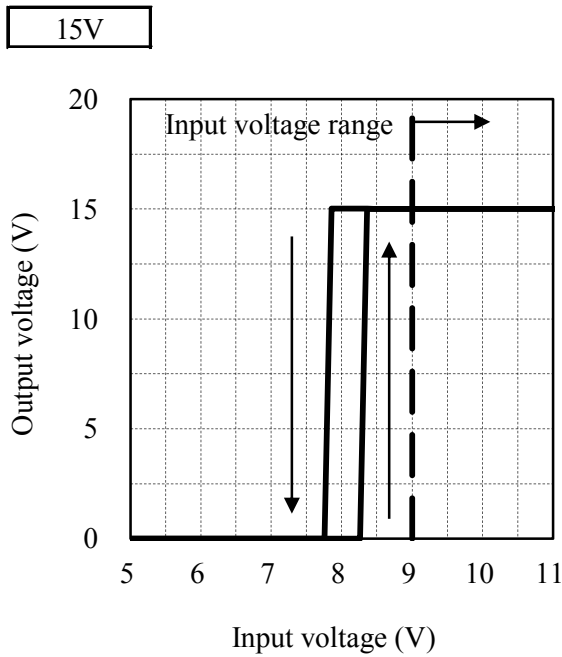
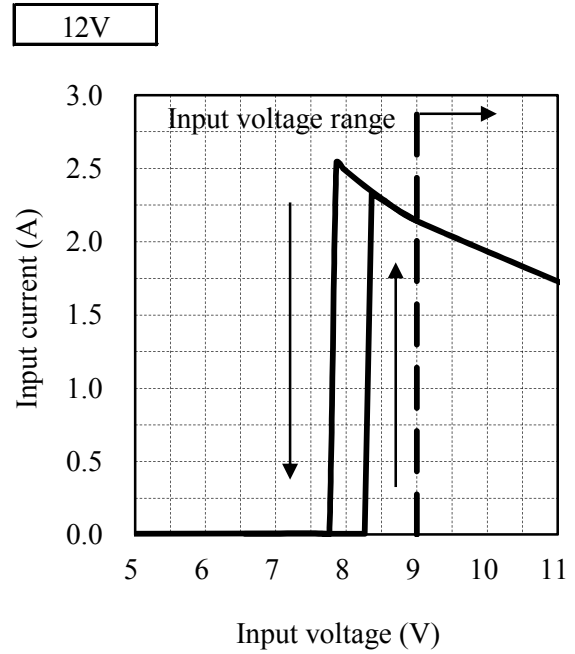
Conditions  $I_o$  : 100 %  
 $T_a$  : 25 °C



入力電流 対 入力電圧

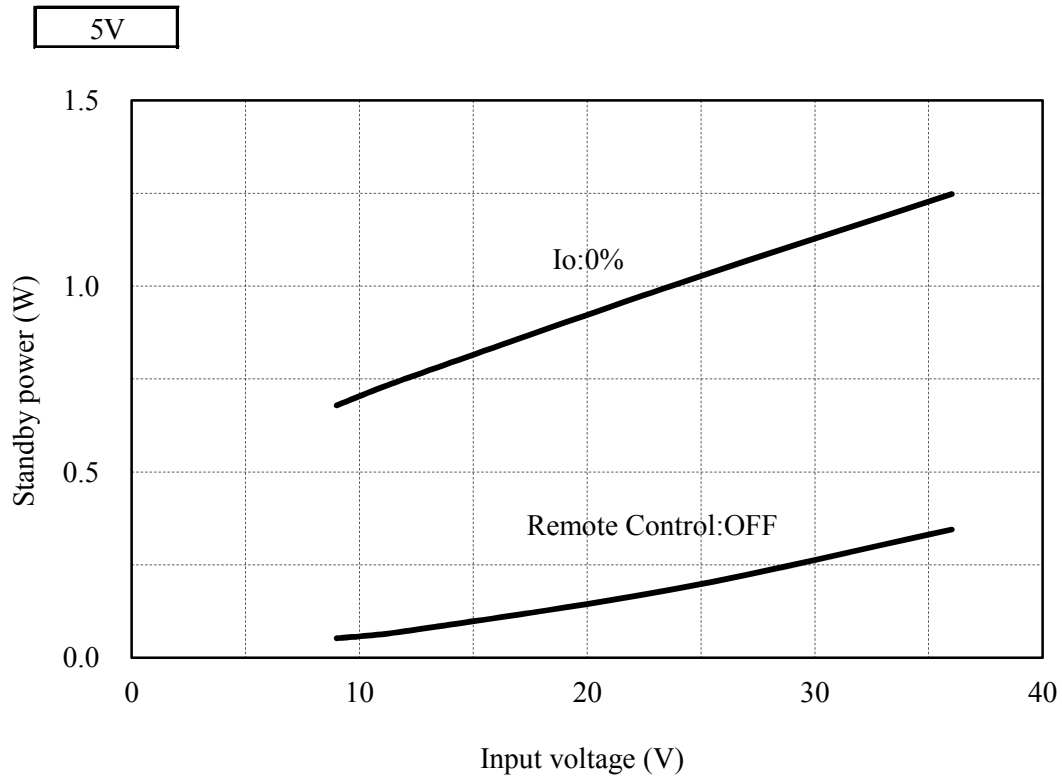
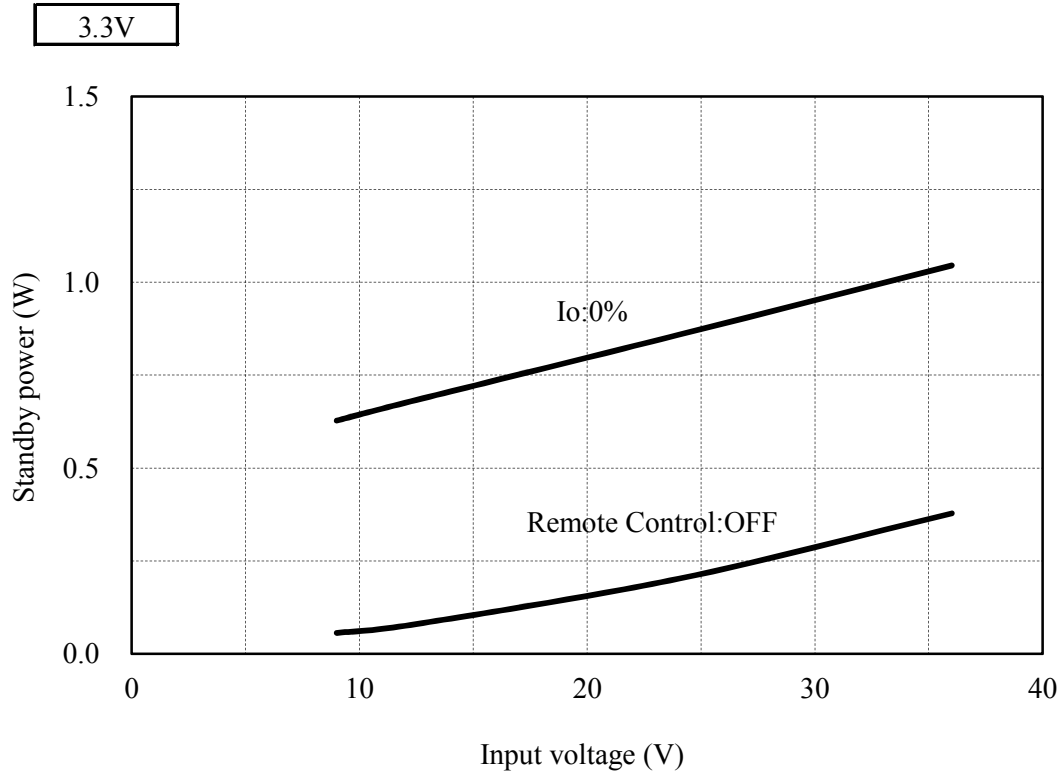
Input current vs. Input voltage

Conditions  $I_o$  : 100 %  
 $T_a$  : 25 °C



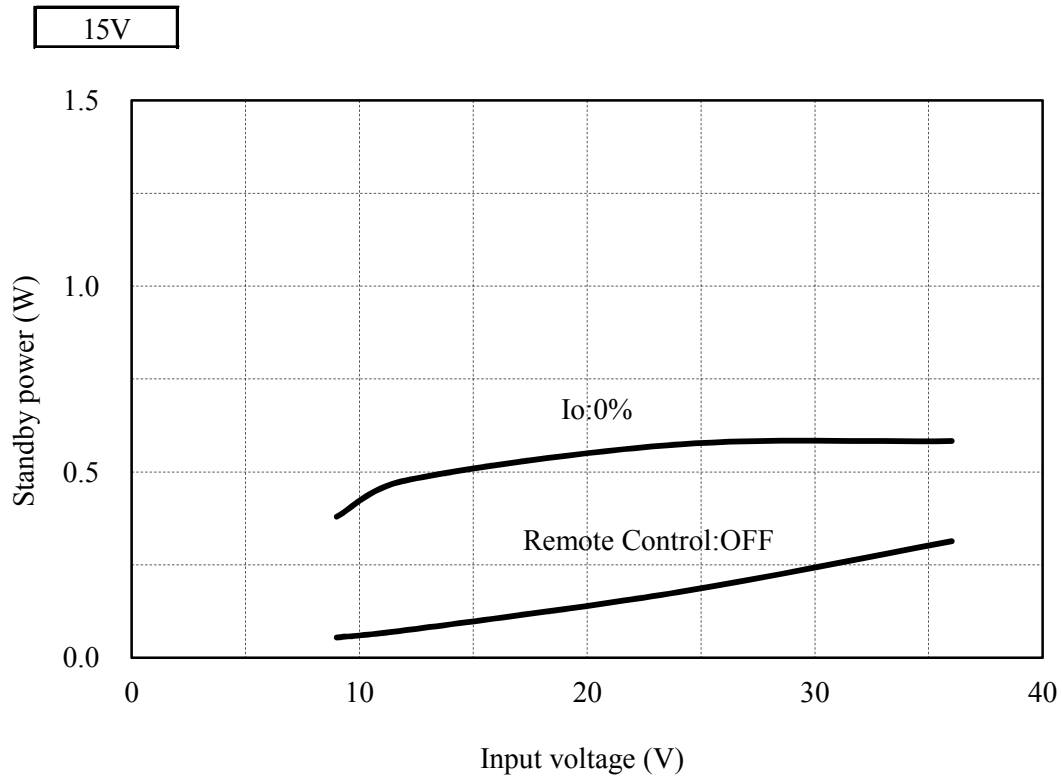
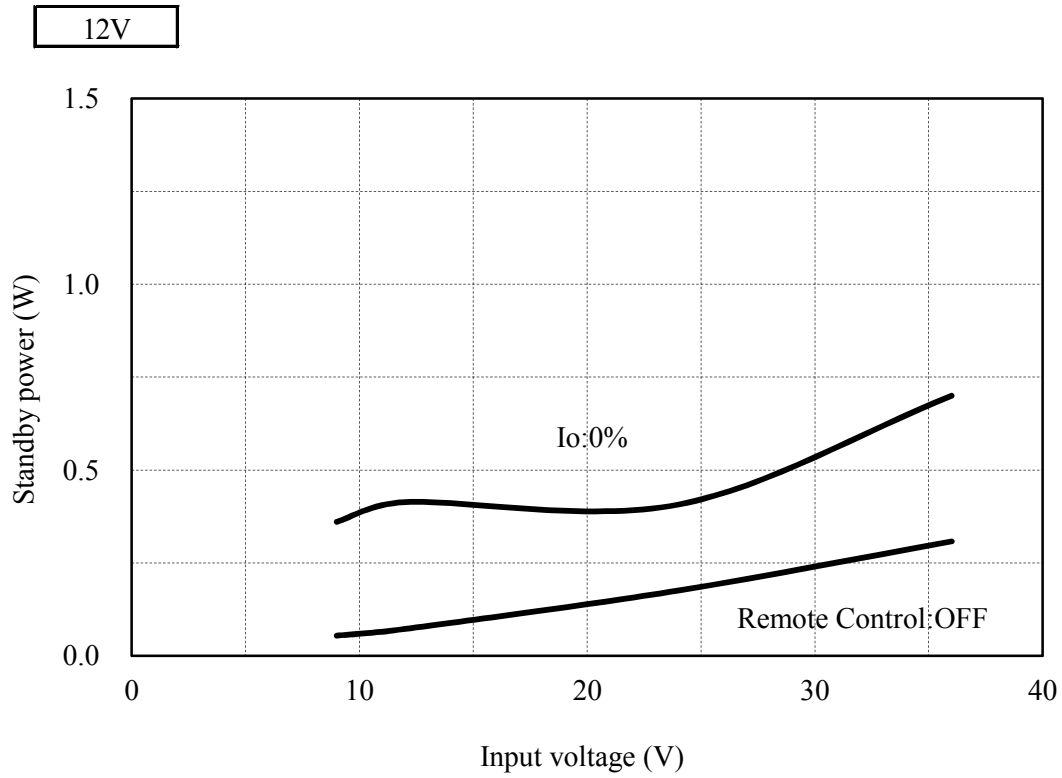
2-2. 待機電力特性 Standby power characteristics

Condition Ta : 25 °C



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

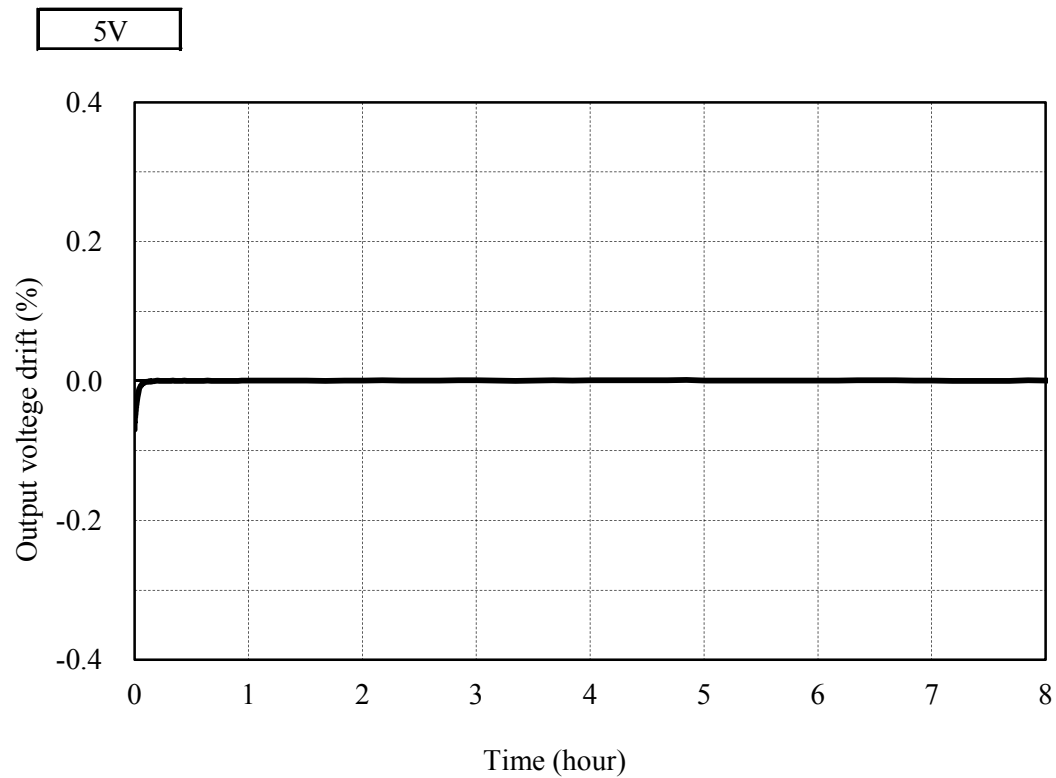
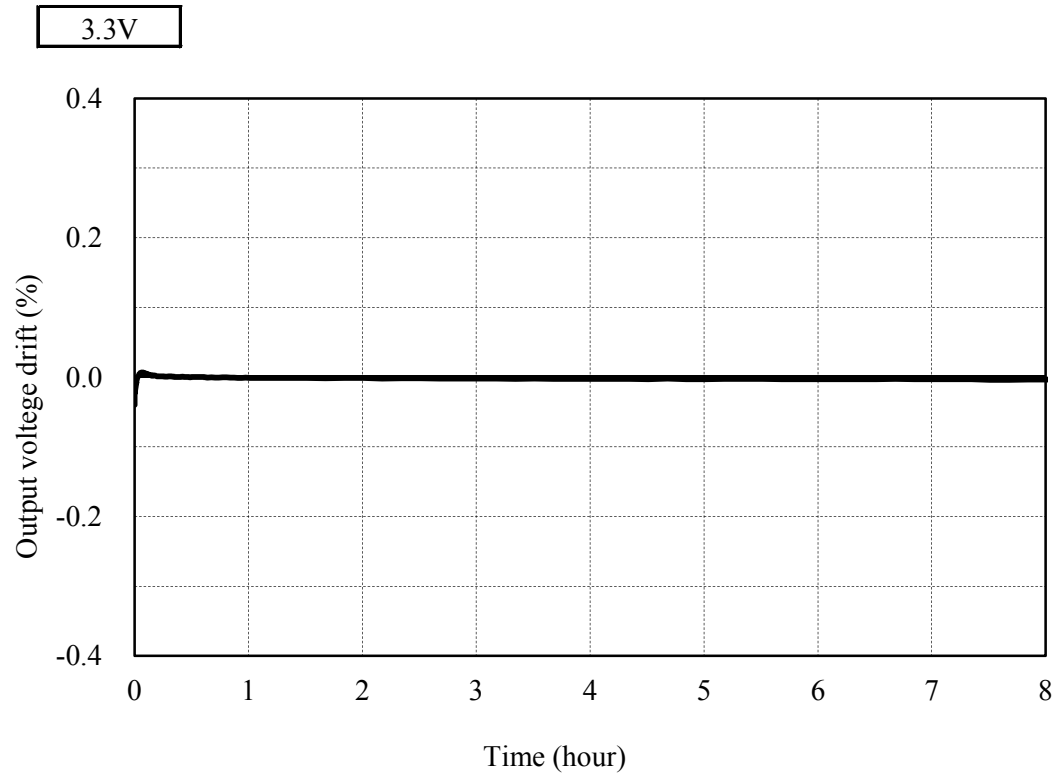
Condition Ta : 25 °C





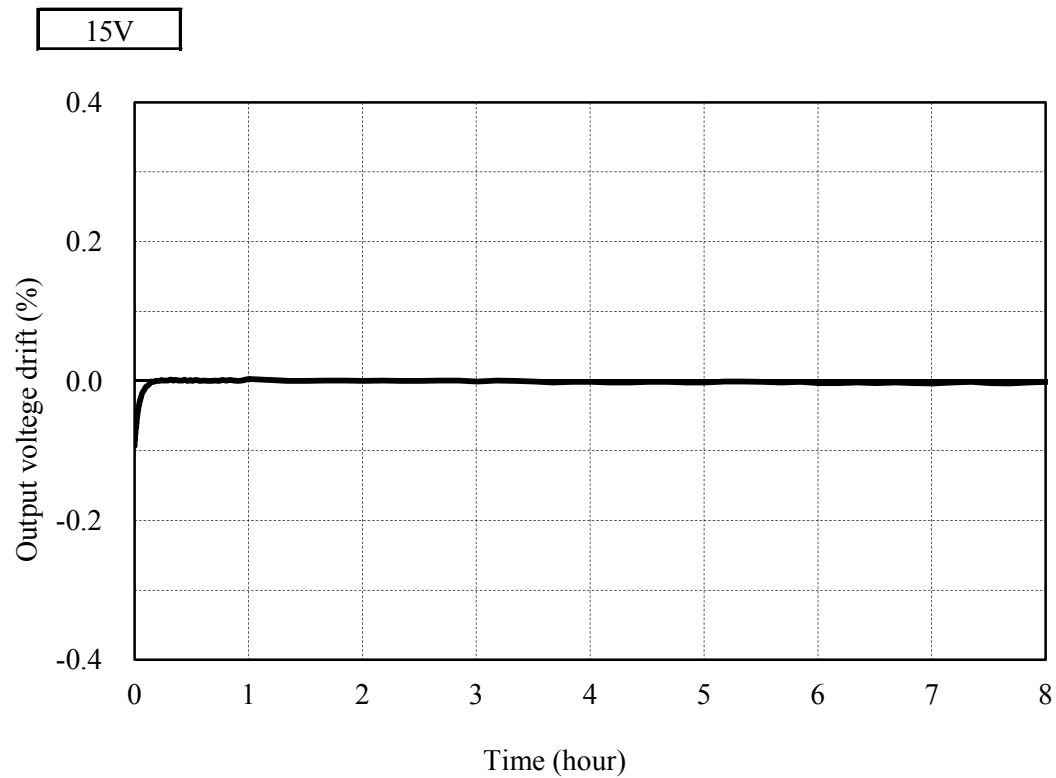
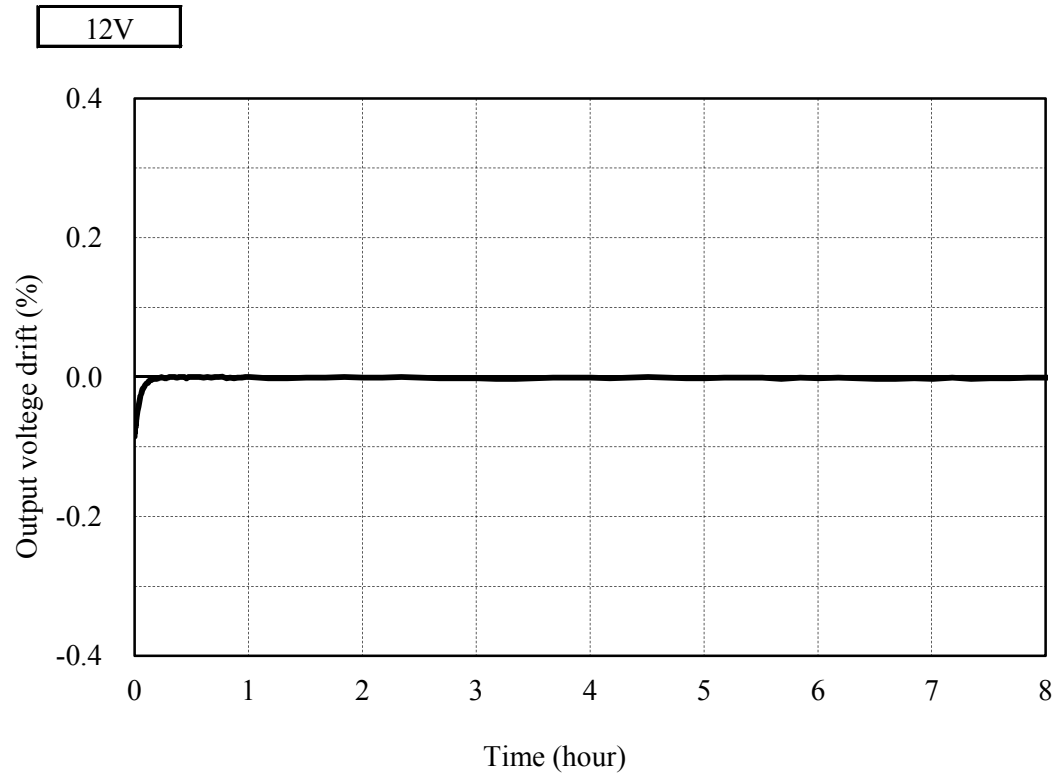
2-3. 通電ドリフト特性 Warm up voltage drift characteristics

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



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

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



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

入力電圧依存性

Input voltage dependence

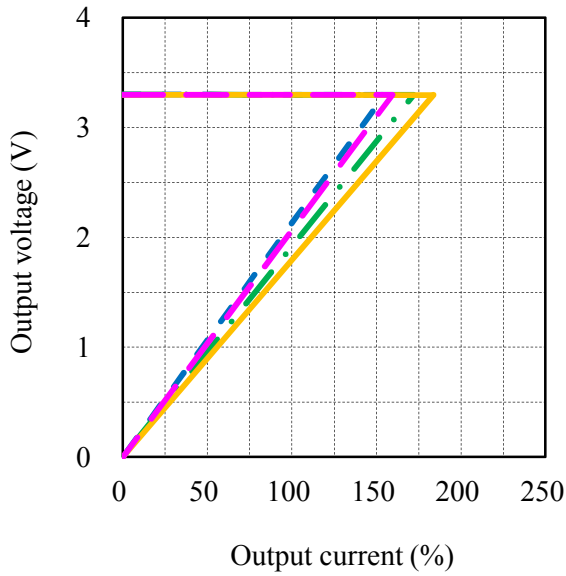
Conditions Vin : 9 VDC — — — —  
 : 12 VDC - - - - -  
 : 24 VDC —————  
 : 36 VDC ————  
 Ta : 25 °C

周囲温度依存性

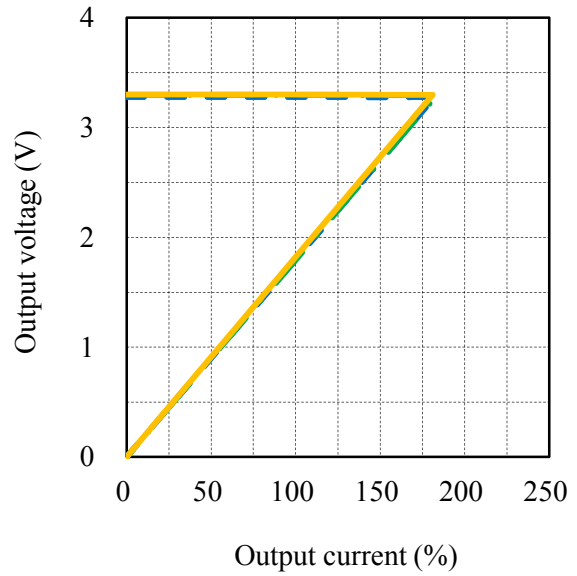
Ambient temperature dependence

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

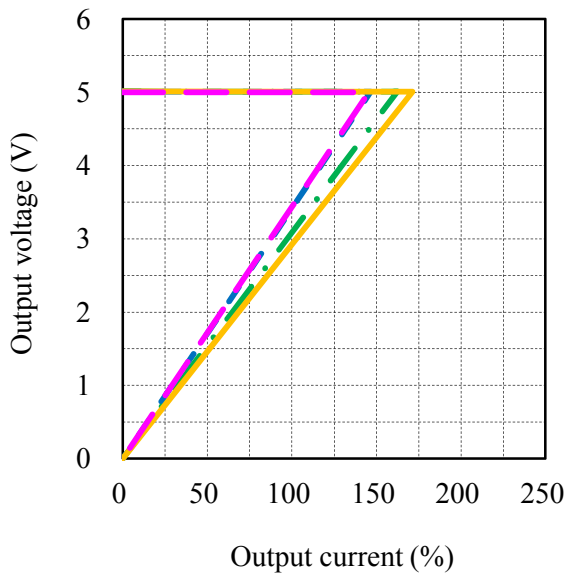
3.3V



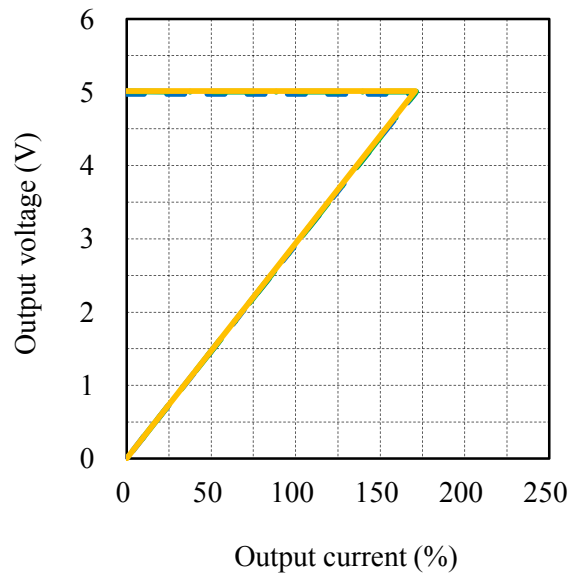
3.3V



5V



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

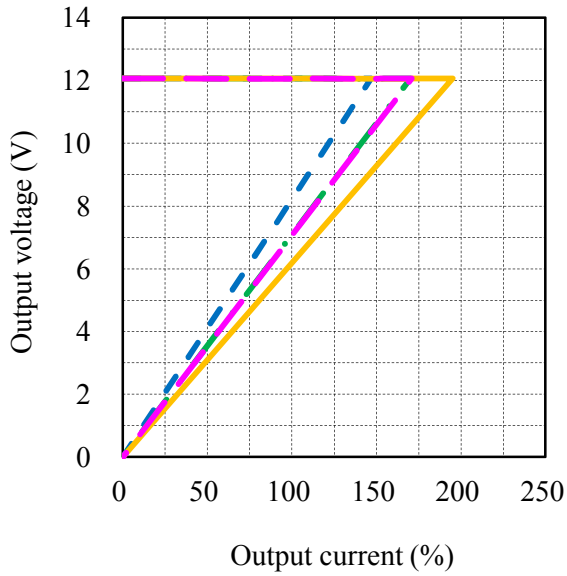
Conditions Vin : 9 VDC — — — —  
 : 12 VDC - · - · - ·  
 : 24 VDC —————  
 : 36 VDC ————  
 Ta : 25 °C

周囲温度依存性

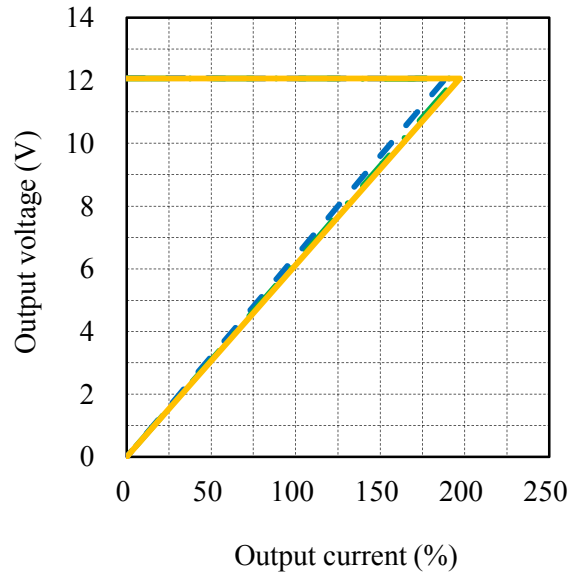
Ambient temperature dependence

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

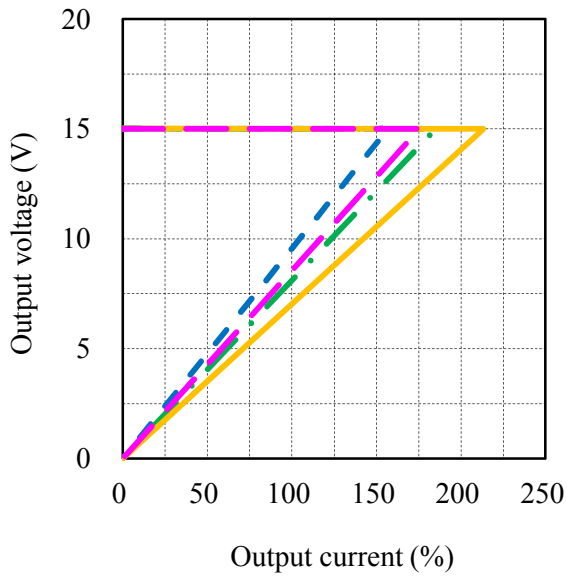
12V



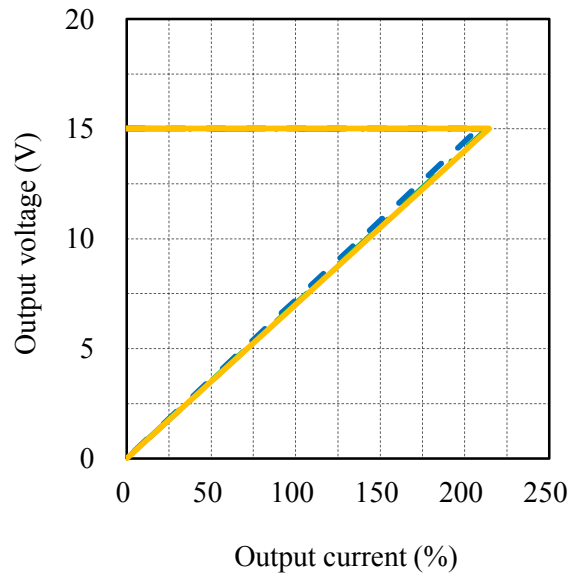
12V



15V



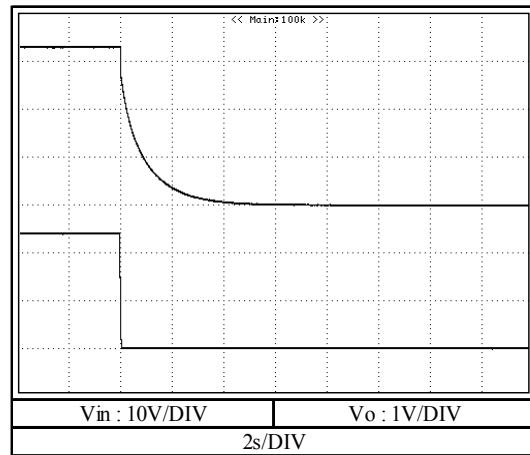
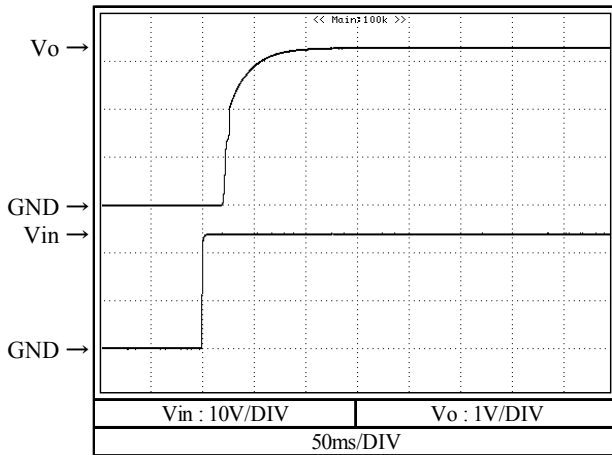
15V



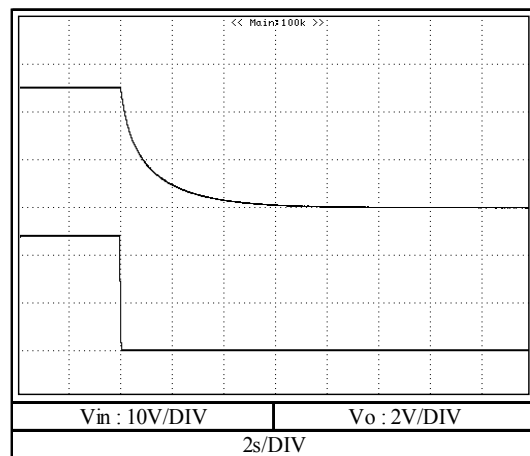
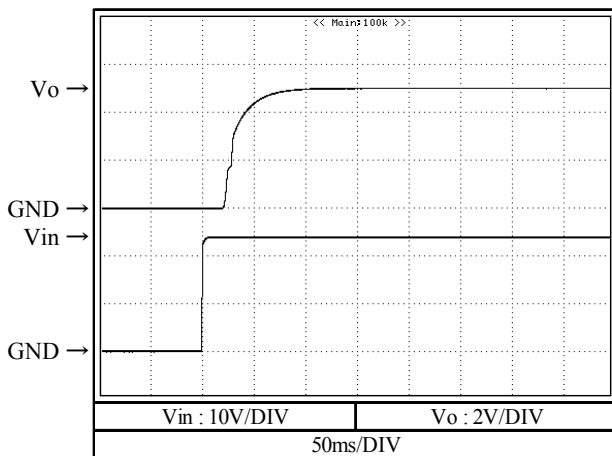
2-5. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

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

3.3V



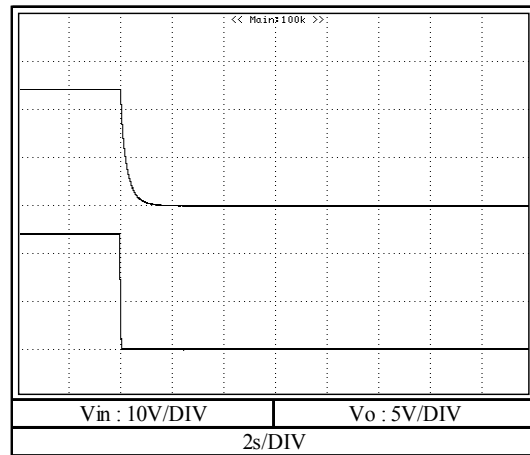
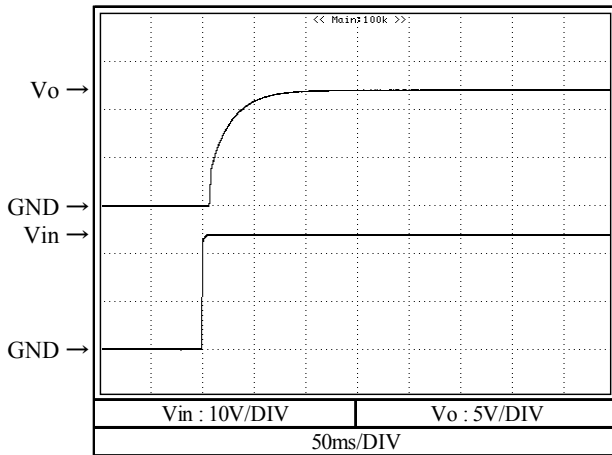
5V



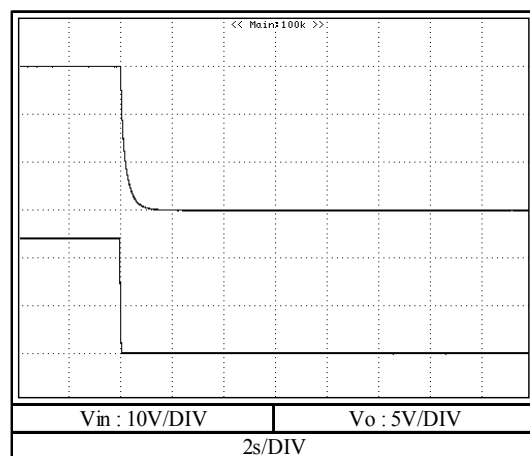
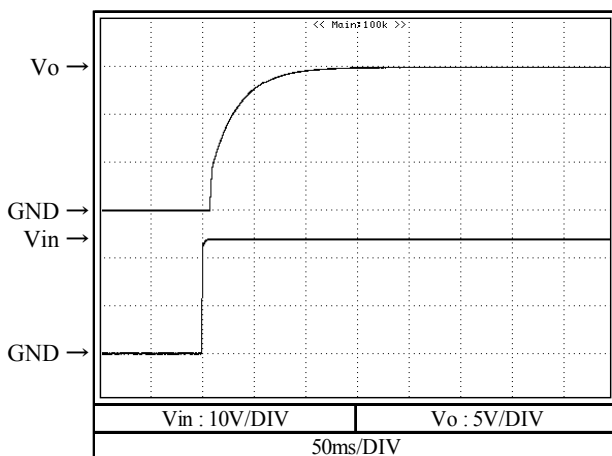
2-5. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

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

12V



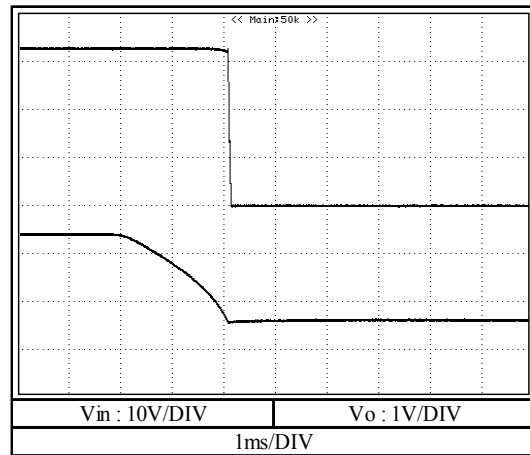
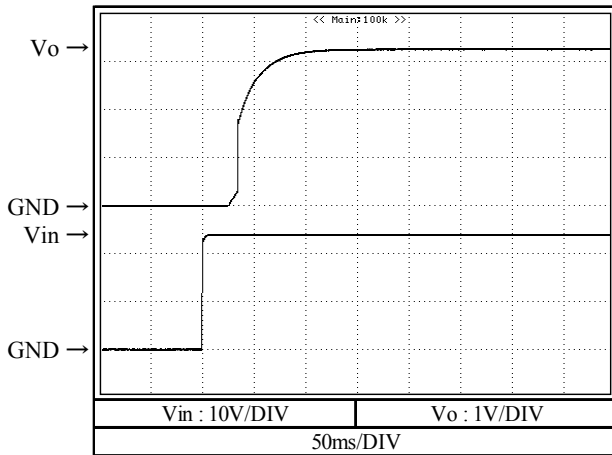
15V



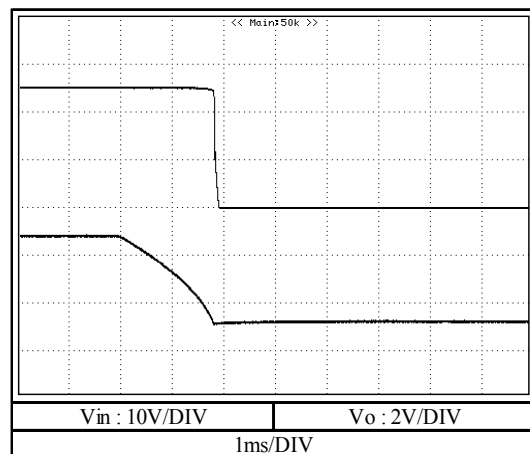
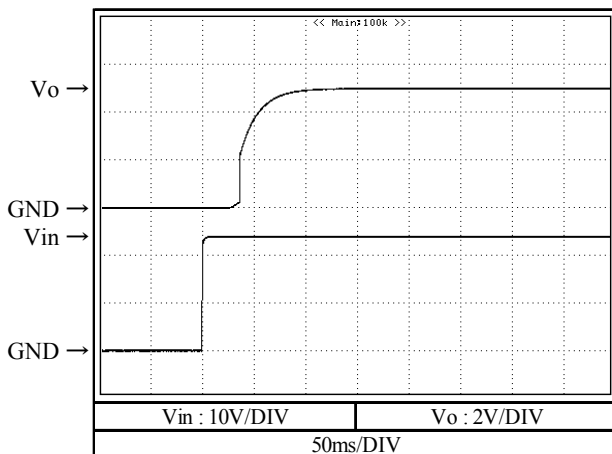
2-5. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

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

3.3V



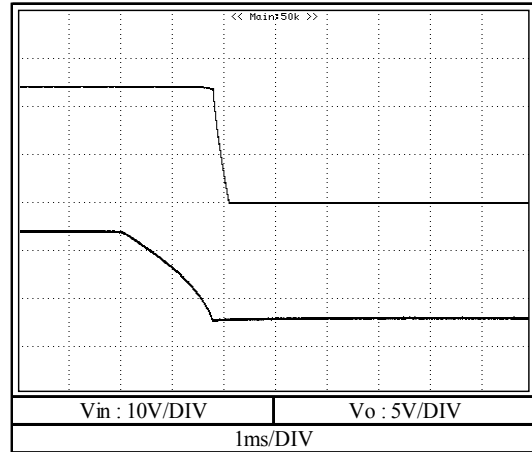
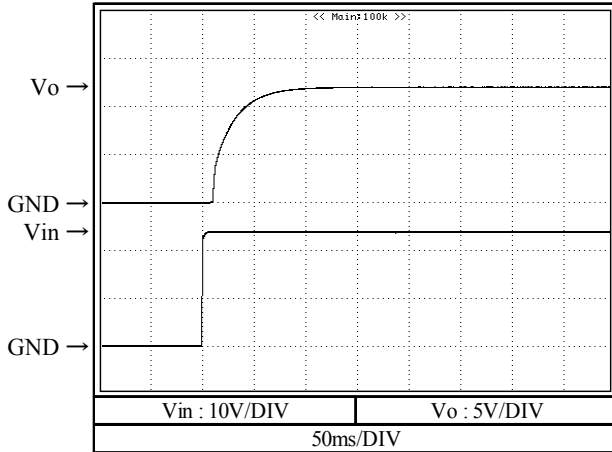
5V



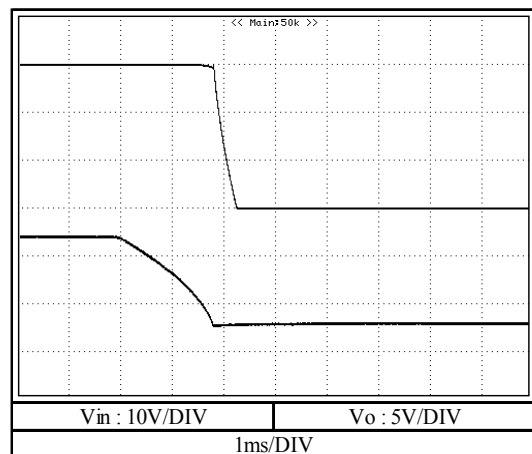
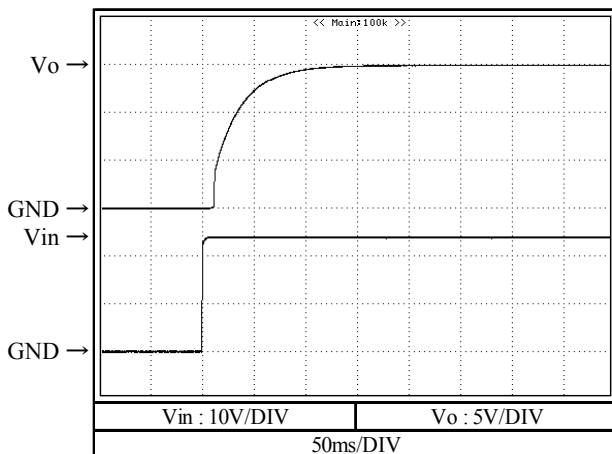
2-5. 出力立ち上がり・立ち下がり特性 Output rise and fall characteristics

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)

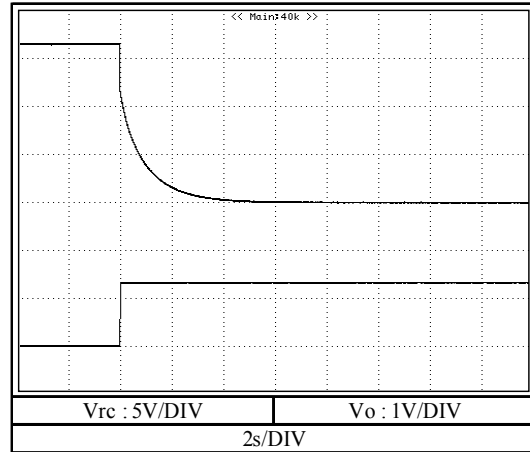
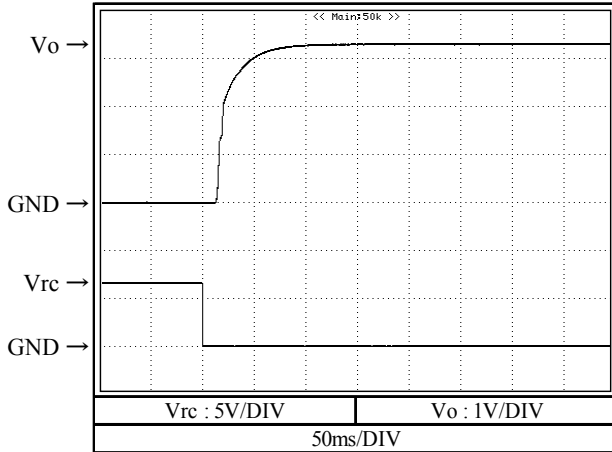
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions  $V_{in}$  : 24 VDC

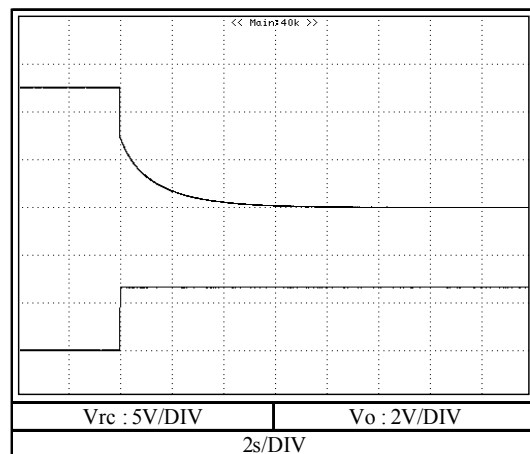
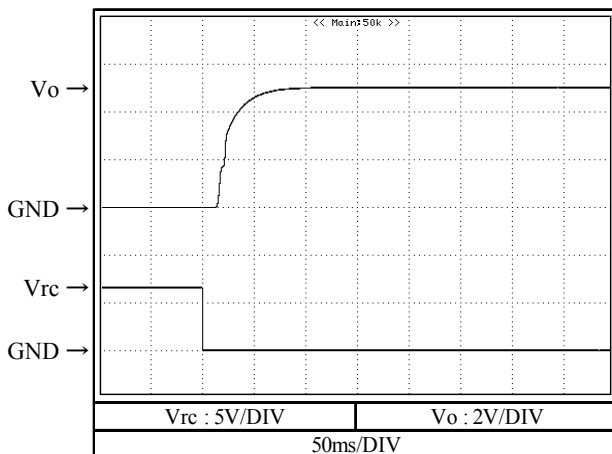
$I_o$  : 0 %

$T_a$  : 25 °C

3.3V



5V



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)

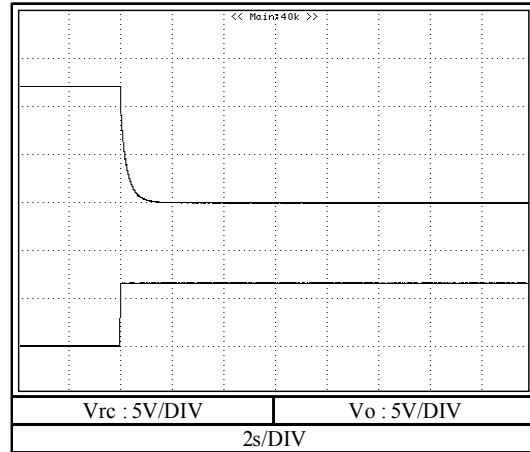
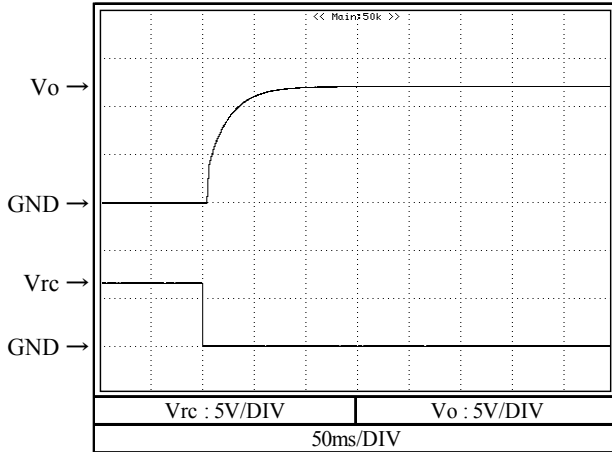
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC

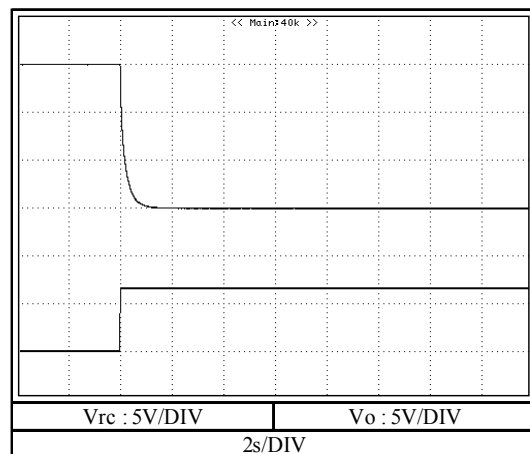
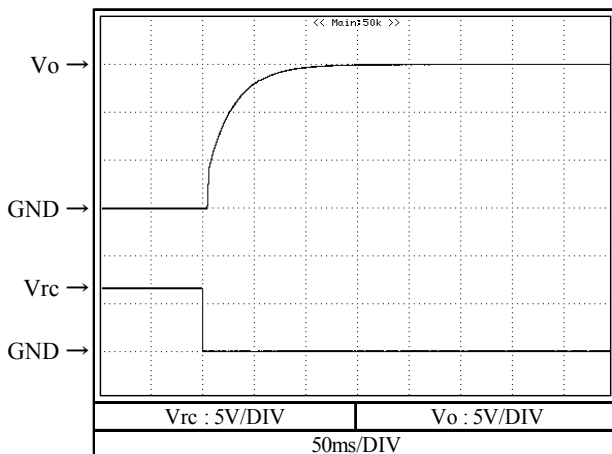
Io : 0 %

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)

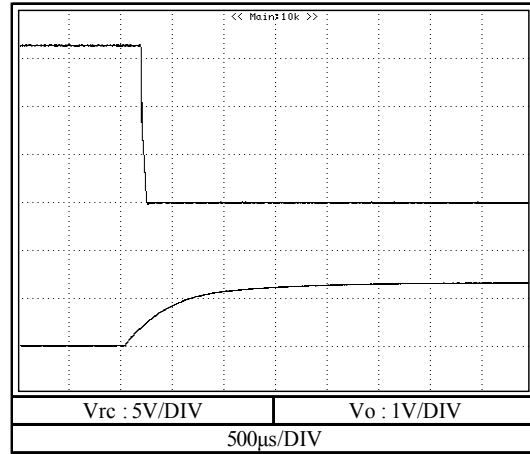
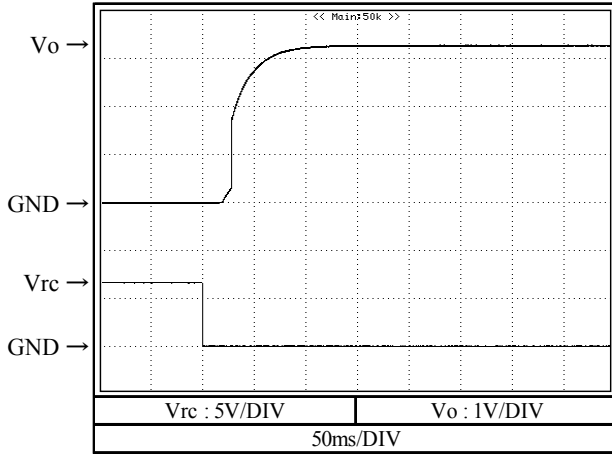
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC

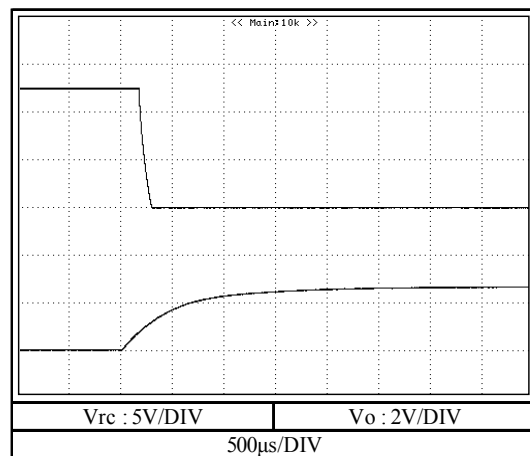
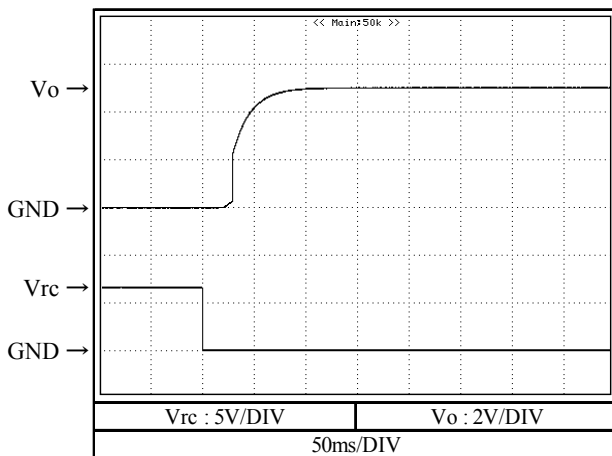
Io : 100 %

Ta : 25 °C

3.3V



5V



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)

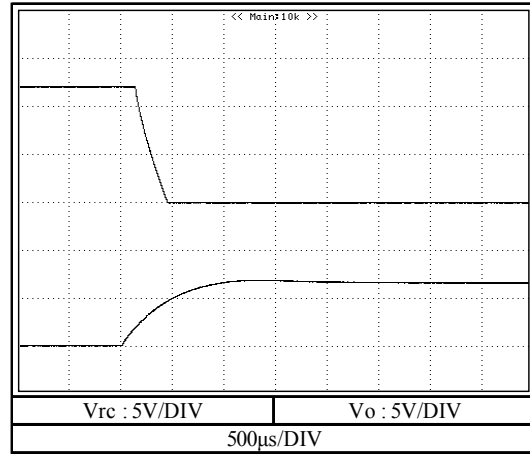
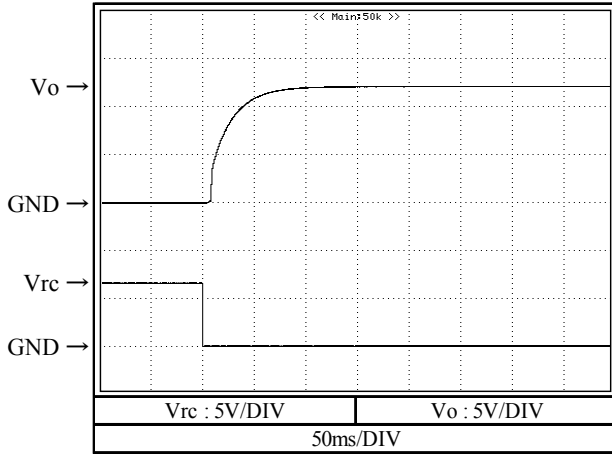
Output rise and fall characteristics with REMOTE ON/OFF CONTROL

Conditions Vin : 24 VDC

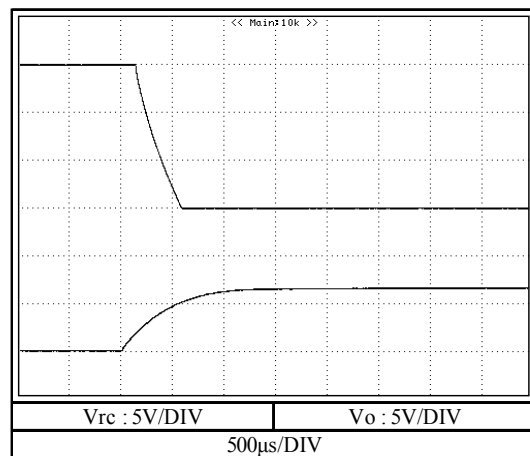
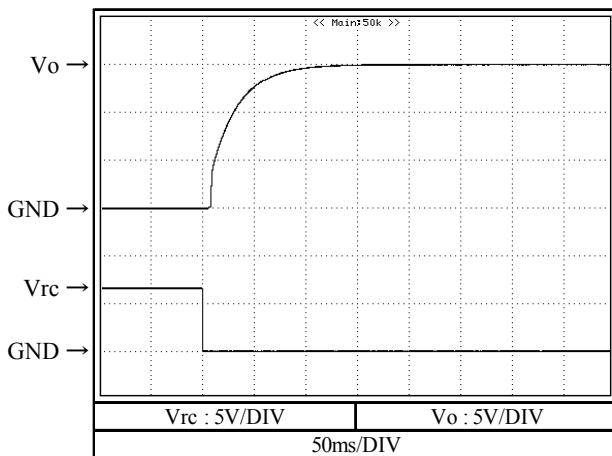
Io : 100 %

Ta : 25 °C

12V

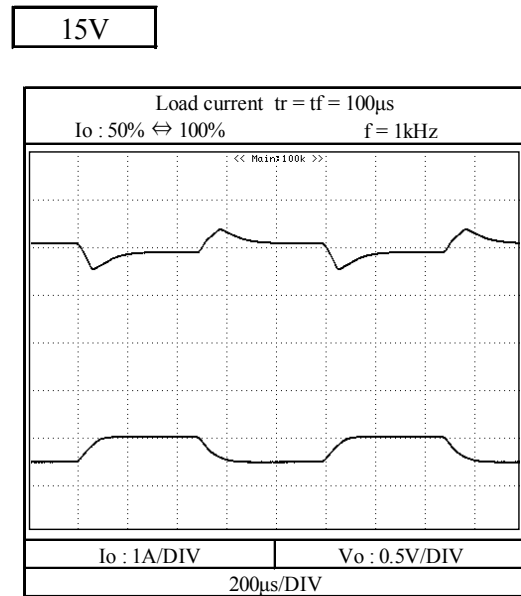
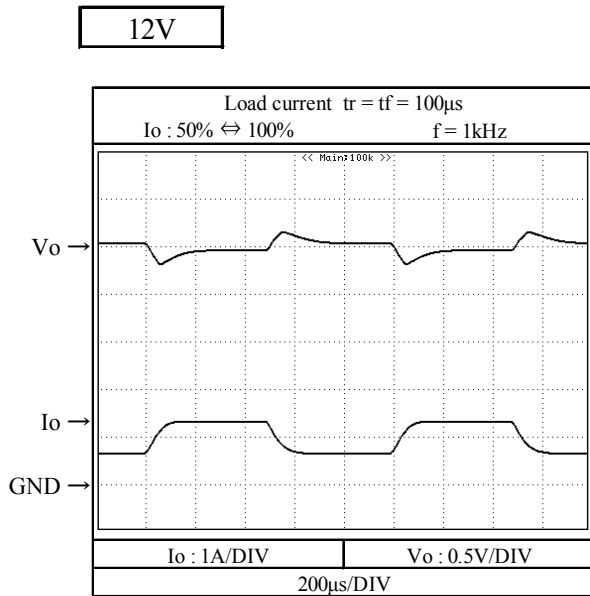
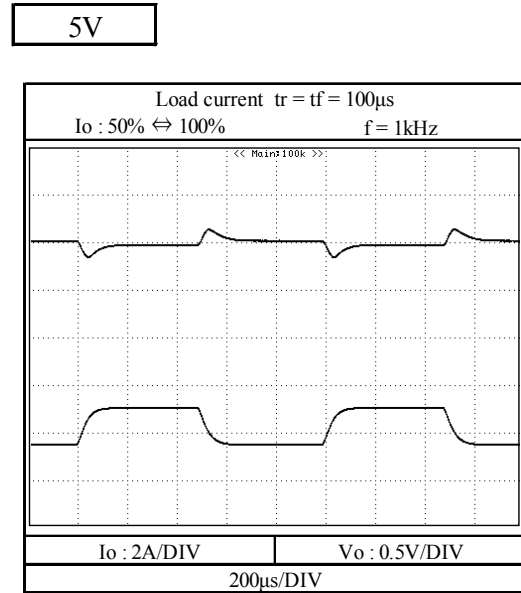
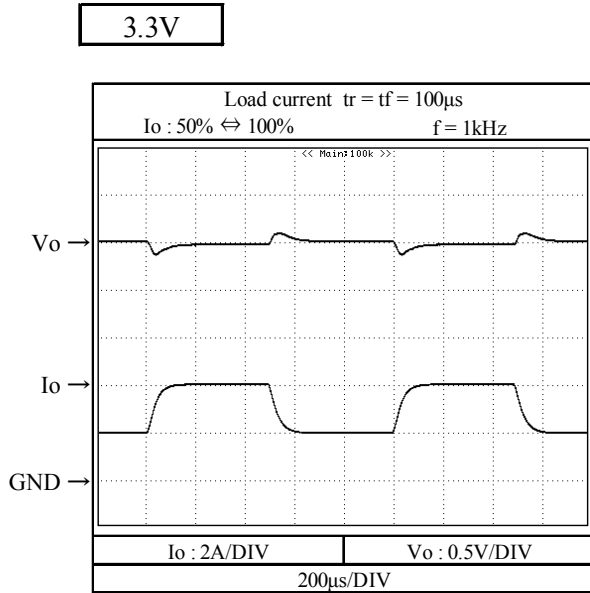


15V



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

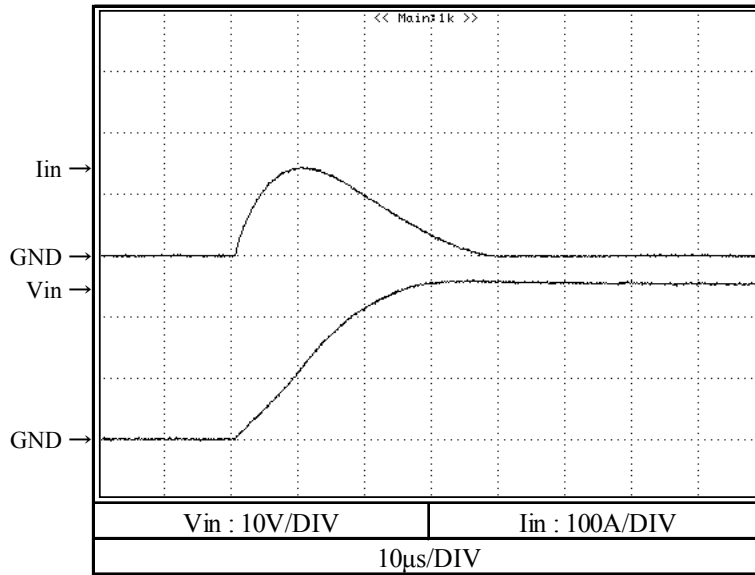
Conditions  $V_{in}$  : 24 VDC  
 $I_o$  : 100 %  
 $T_a$  : 25 °C



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

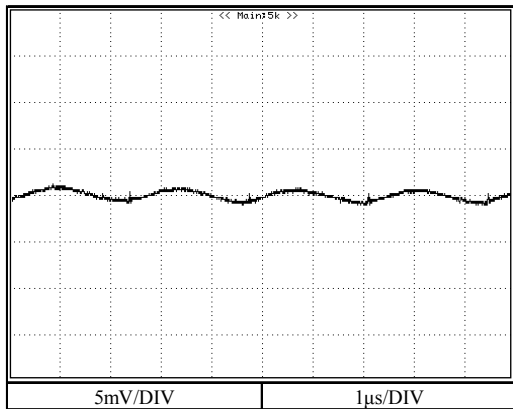
5V



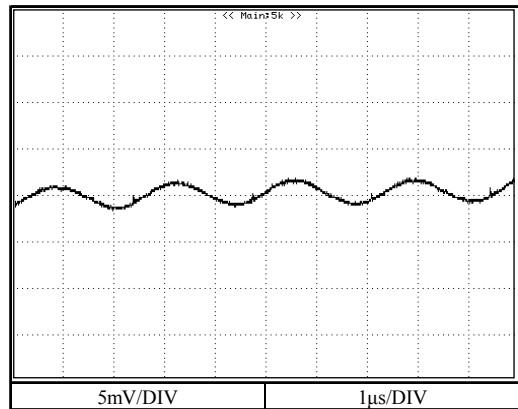
2-8. 出力リップル、ノイズ波形 Output ripple and noise waveform

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

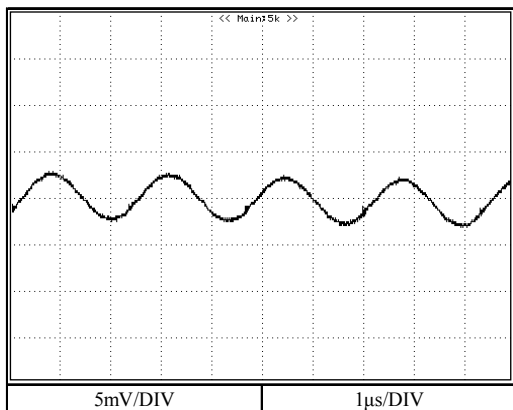
3.3V



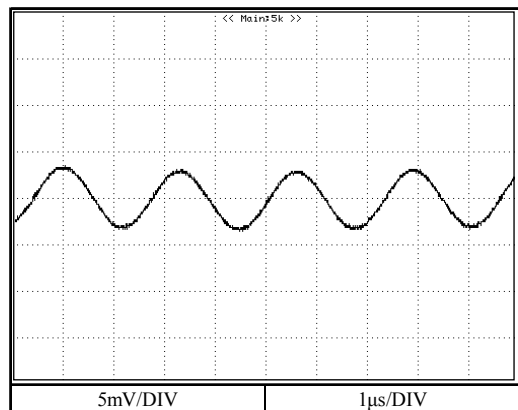
5V



12V



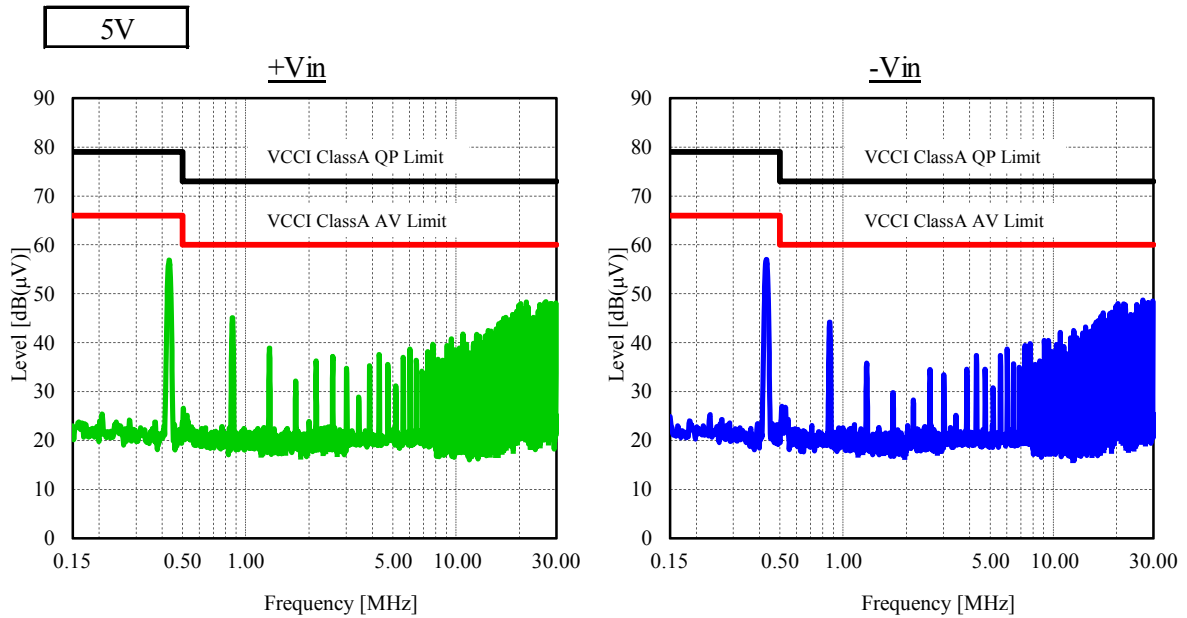
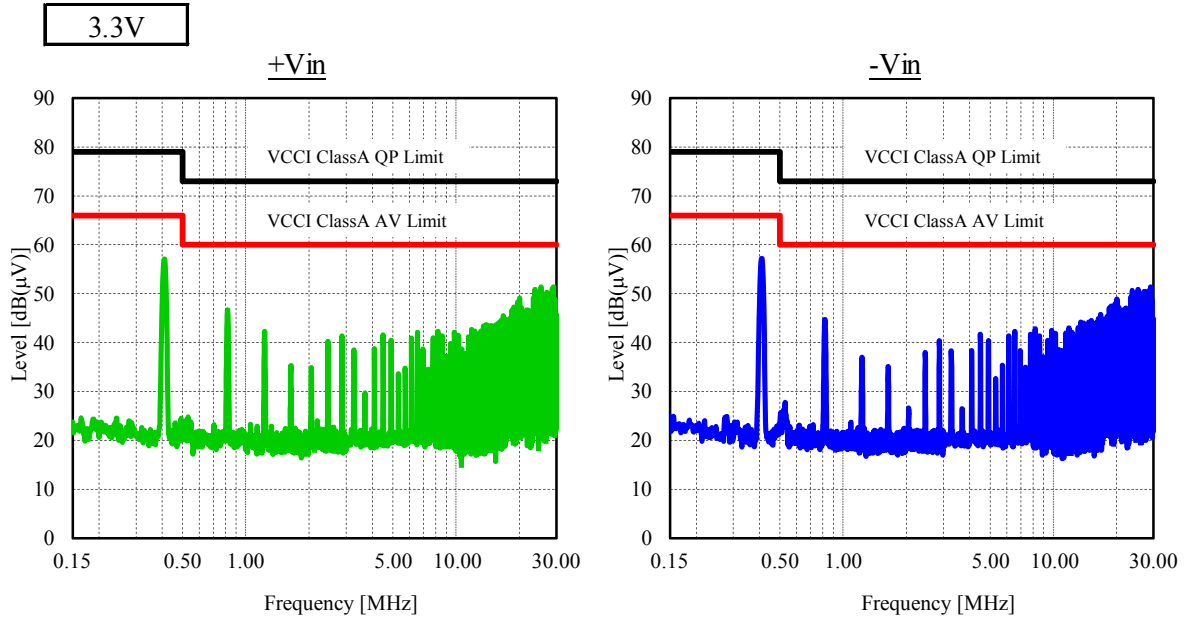
15V



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  $V_{in}$  : 24 VDC  
 $I_o$  : 100 %  
 $T_a$  : 25 °C

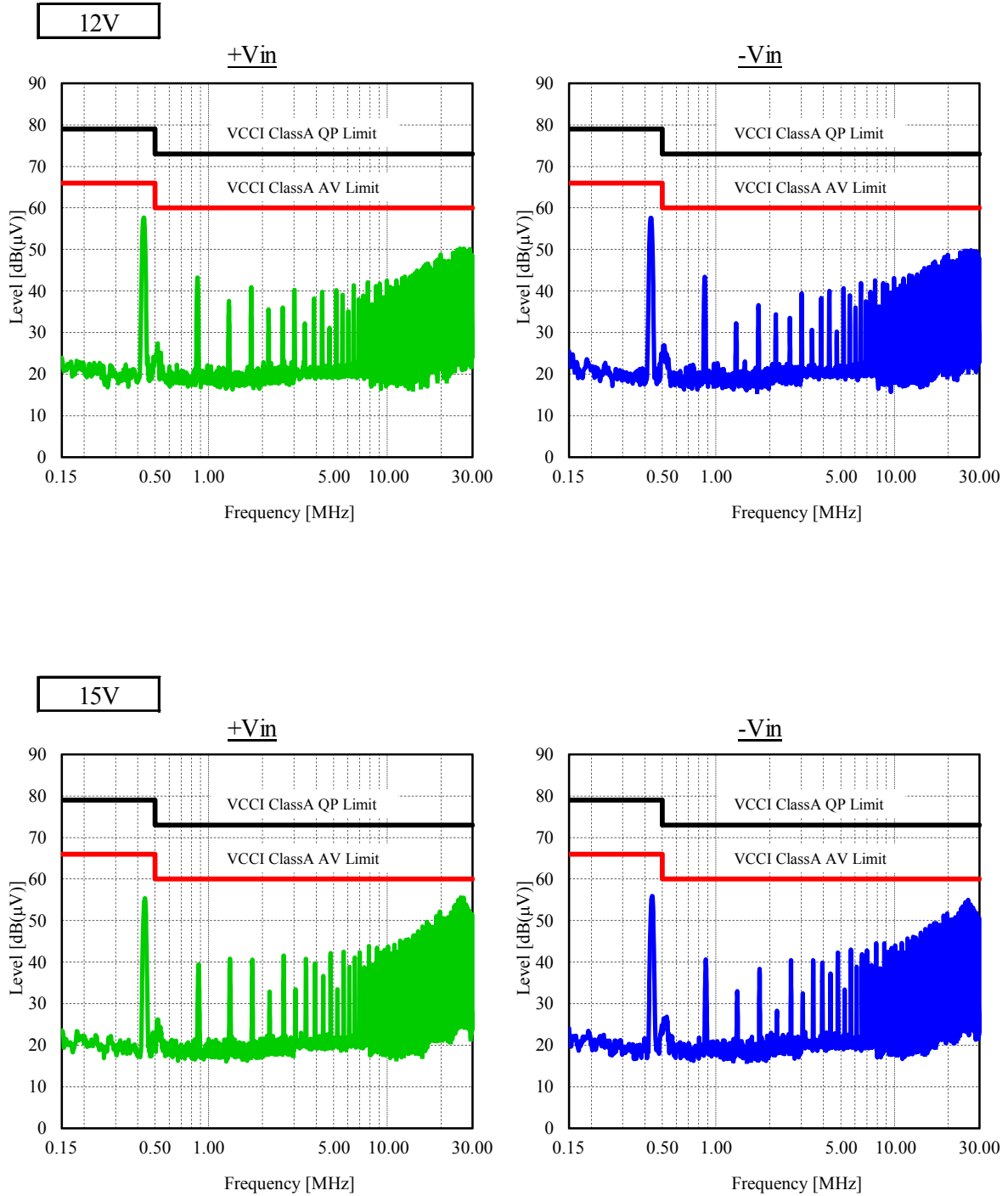




2-9. EMI特性 Electro-Magnetic Interference characteristics

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

Conditions  $V_{in}$  : 24 VDC  
 $I_o$  : 100 %  
 $T_a$  : 25 °C



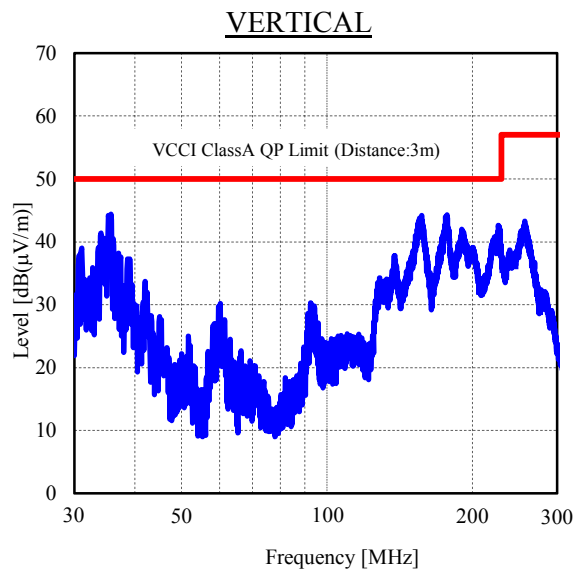
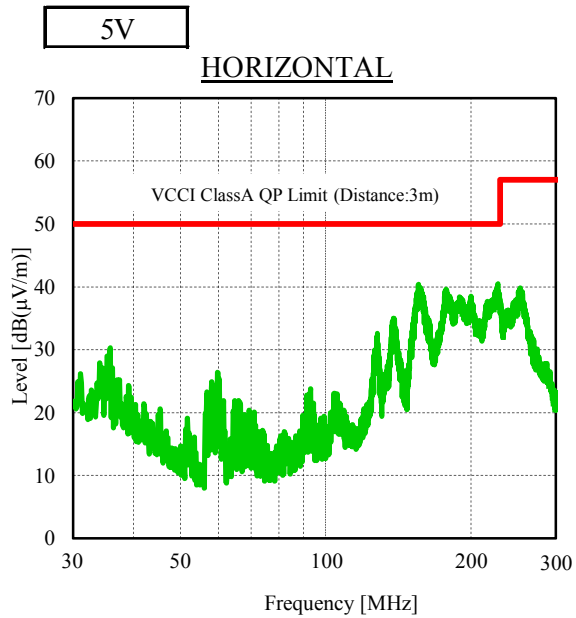
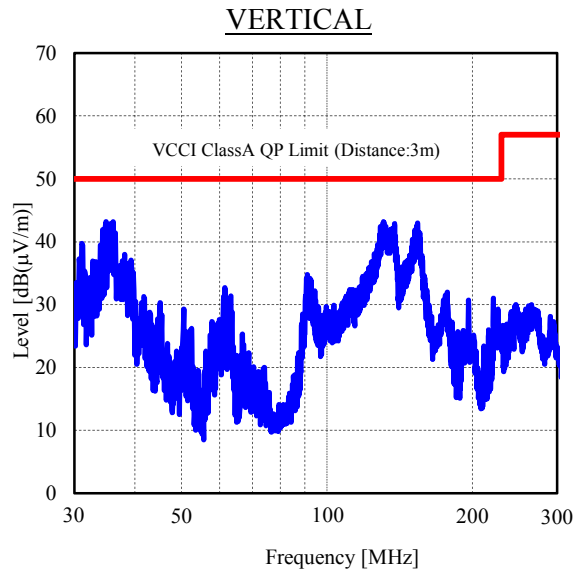
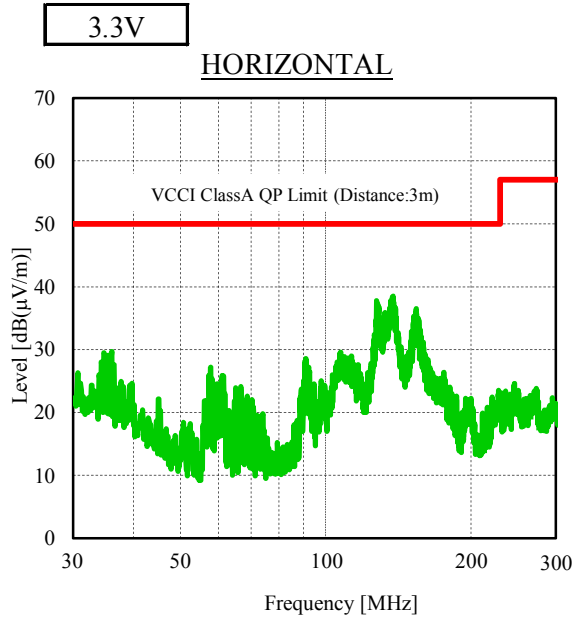
2-9. EMI特性 Electro-Magnetic Interference characteristics

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

Conditions  $V_{in}$  : 24 VDC

$I_o$  : 100 %

$T_a$  : 25 °C



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 °C

