1000mA LDO

MM1877 Series

Overview

This IC is 1A Low dropout regulator IC with ON/OFF control of the output voltage.
The IC applies to various home equipments, for a maximum operating voltage is 14V.

Overview

- Over current protection
- Thermal shutdown

Main specifications

- Maximum rating supply voltage : -0.3V to 15V
- Operating voltage range : VOUT(Typ.)+0.7V to 14V *Note1
- Operating ambient temperature : -40℃ to 85℃
- Output current : 1.0A
- Input current (OFF) : Max. 1μA
- No-load input current : Typ. 2mA
- Output voltage range : 1.5V to 5.0V (0.1V step)
- Output voltage accuracy : ±2% (V_{OUT}≧1.5V)
- Line regulation : Typ.0.05%/V (VIN=VOUT(Typ.)+1.5V to VOUT(typ.)+2.5V, IOUT=1mA)
- Load regulation : Typ. 20mV (IOUT=0Ato1A)
- Dropout voltage : Typ. 0.25V (I_{OUT}=500mA)
- PSRR : Typ. 70dB (f=1kHz)
- Output capacitor : 1uF (Ceramic capacitor)
- Protection function : Over current protection, Thermal shutdown
- Additional function : ON/OFF control

Packages

- HSOP-8A

Application

- Audio visual equipment
- Office equipment / Printer
- Home appliance equipment
- In-vehicle infotainment device

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May, 2024 Rev.1

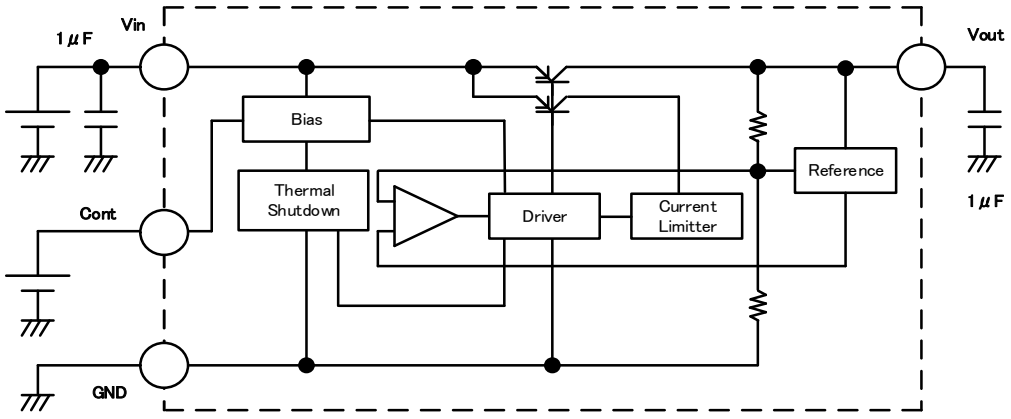
Model Name

M M 1 8 7 7 X X X X X X

Series name (A) (B) (C) (D) (E)

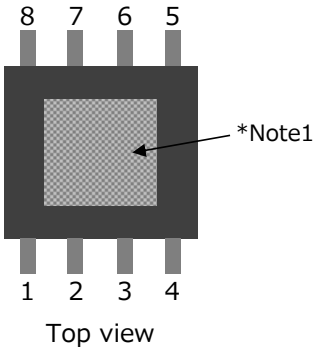
(A)	Function Type	A	Cont=H active、without discharge function
(B)	Output voltage rank	15 ～ 50	Output voltage can be designated in the range from 1.5V(15) to 5.0V(50) in 0.1V steps.
(C)	Package	H	HSOP-8A
(D)	Packing specifications 1	B	B housing (Standard)
		F	F housing
(E)	Packing specifications 2	E	Emboss tape / Halogen contained

Block Diagram



Pin Configuration

- HSOP-8A



Top view

Pin No.	Pin name	Function
1	V_{OUT}	Output pin
2	NC	No connection
3	GND	GND pin
4	NC	No connection
5	Cont	ON/OFF-control pin Connect Cont pin with V_{IN} pin, when it is not used.
6	NC	No connection
7	NC	No connection
8	V_{IN}	Voltage supply pin

*Note1:Heat spreader bottom with GND.

Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Storage temperature	Tstg	-55	150	℃
Junction temperature *Note2	Tj_{MAX}	-	150	℃
Supply voltage	V_{IN}	-0.3	15	V
Cont input voltage	V_{cont}	-0.3	15	V
Output Voltage	V_{OUT}	-0.3	V_{IN}+0.3	V
Output Current	Iomax	0	1.2	A
Power Dissipation 1*Note3	Pd1	-	1800	mW
Power Dissipation 2*Note4	Pd2	-	3500	mW

*Note2:In consideration of product life, please examine the use in less than 80%.

*Note3:PC Board of glass epoxy 37mm×37mm t=1.6mm Copper foil area 80% / HSOP-8A

*Note4:JEDEC51-7 standard 114.3mm×76.2mm t=1.6mm Copper foil area 80%

Recommended Operating Conditions

Item	Symbol	Min.	Max.	Unit
Operating Ambient temperature	Topr	-40	85	℃
Operating voltage *Note5	Vop	V_{OUT}(Typ.)+0.7	14	V
Output Current	Iop	0	1	A

*Note5:The minimum Input Voltage is 2.5V when Vout is less than 2V.

Electrical Characteristics

(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
No-Load Input Current	I_{CCOFF}	V_{CONT}=0V	-	0	1	μA
Input Current(OFF)	I_{CC}	I_{OUT}=0mA	-	2	5	mA
Output Voltage *Note6	V_{OUT}	I_{OUT}=1mA	×0.98	-	×1.02	V
Dropout Voltage *Note7	Vio	V_{IN}=V_{OUT}-0.2V I_{OUT}=500mA	-	0.25	0.50	V
Line Regulation	V_{LINE}	VIN=VOUT+1.5V to VOUT+2.5V I_{OUT}=1mA	-	0.05	0.10	%/V
Load Regulation	V_{LOAD}	IOUT=0A to 1A	-	20	100	mV
VOUT Temperature Coefficient *Note8	ΔV_{OUT} /ΔT	-40≦Ta≦85℃ I_{OUT}=1mA	-	±100	-	ppm/℃
Ripple Rejection *Note8	RR	f=1kHz, Vripple=1.0V I_{OUT}=10mA	-	70	-	dB
Output Noise Voltage *Note8	Vn	fBW=20Hz to 80kHz I_{OUT}=10mA	-	100	-	μVrms

*Note6:Please refer to another page.

*Note7:The parameter is not guaranteed in the model less than Vout=2.0V.

*Note8:The parameter is guaranteed by design.

Electrical Characteristics

(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃, unless otherwise specified)

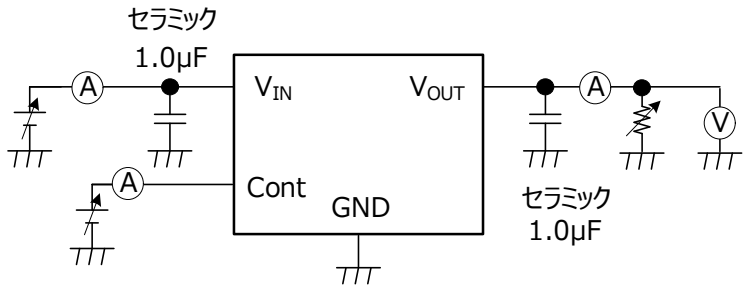
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Cont Pin Input Current	Icont	Vcont=1.6V	10	35	50	μA
Cont Pin High Threshold Voltage	VcontH		1.6	-	14	V
Cont Pin Low Threshold Voltage	VcontL		-0.3	-	0.2	V
Thermal Shutdown Detect Temperature *Note8	TSD		-	150	-	℃
Thermal Shutdown Release Temperature *Note8	TSR		-	100	-	℃

*Note8:The parameter is guaranteed by design.

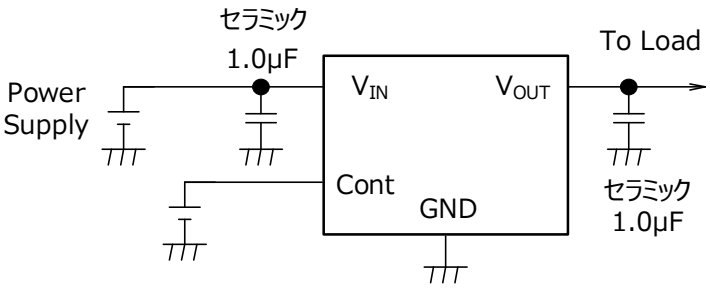
Electrical Characteristics

Model name	Item			
	Output voltage			
	V_{OUT} (V)			
	Conditions	Min.	Typ.	Max.
MM1877A15	V_{IN}=V_{OUT} (Typ.) +2V	1.470	1.500	1.530
MM1877A16	I_{OUT}=1mA	1.568	1.600	1.632
MM1877A17		1.666	1.700	1.734
MM1877A18		1.764	1.800	1.836
MM1877A19		1.862	1.900	1.938
MM1877A20		1.960	2.000	2.040
MM1877A21		2.058	2.100	2.142
MM1877A22		2.156	2.200	2.244
MM1877A23		2.254	2.300	2.346
MM1877A24		2.352	2.400	2.448
MM1877A25		2.450	2.500	2.550
MM1877A26		2.548	2.600	2.652
MM1877A27		2.646	2.700	2.754
MM1877A28		2.744	2.800	2.856
MM1877A29		2.842	2.900	2.958
MM1877A30		2.940	3.000	3.060
MM1877A31		3.038	3.100	3.162
MM1877A32		3.136	3.200	3.264
MM1877A33		3.234	3.300	3.366
MM1877A34		3.332	3.400	3.468
MM1877A35		3.430	3.500	3.570
MM1877A36		3.528	3.600	3.672
MM1877A37		3.626	3.700	3.774
MM1877A38		3.724	3.800	3.876
MM1877A39		3.822	3.900	3.978
MM1877A40		3.920	4.000	4.080
MM1877A41		4.018	4.100	4.182
MM1877A42		4.116	4.200	4.284
MM1877A43		4.214	4.300	4.386
MM1877A44		4.312	4.400	4.488
MM1877A45		4.410	4.500	4.590
MM1877A46		4.508	4.600	4.692
MM1877A47		4.606	4.700	4.794
MM1877A48		4.704	4.800	4.896
MM1877A49		4.802	4.900	4.998
MM1877A50		4.900	5.000	5.100

Test Circuit



Application Circuit



(外付け部品参考例)

- Output capacitor　Ceramic capacitor　1.0μF
- Input Capacitor　Ceramic capacitor　1.0μF　*Temperature characteristics : B

- In the event a problem which may affect industrial property or any other rights of us or a third party is encountered during the use of information described in these circuit, we shall not be liable for any such problem, nor grant a license therefore.

Note

1. There is a possibility with deterioration and destruction of IC when using it exceeding the absolute maximum rating. The absolute maximum rating , Never exceed it. The functional operation is not assured.

2. There is a possibility that it becomes impossible to maintain this performance and reliability IC original when using it exceeding recommended operation voltage. Please use it in recommended operation voltage.

3. Due to restrictions on the package power dissipation, the output current value may not be satisfied.Attention should be paid to the power dissipation of the package when the output current is large or the voltage between Iinput and Output is high. .

4. The output capacitor is required between output and GND to prevent oscillation.

5. The ESR of capacitor must be defined in ESR stability area. It is possible to use a ceramic capacitor without ESR resistance for output.

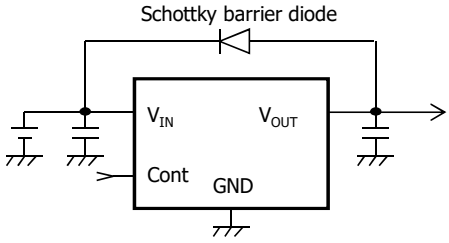
6. The wire of Vin and GND is required to print full ground plane for noise and stability.

7. The input capacitor must be connected a distance of less than 1cm from input pin.

8. The capacitor has dependency by the supply voltage and temperature. It is able to unstable operation when you use the capacitor with intense capacitance change such as micro. Please use the effective capacity to exceed 0.47μF, because the value changes by the environment used.

9. The overcurrent protection circuit of f oldback current limit type is built into this IC.

10. In case the output voltage is above the input voltage, the overcurrent flow by internal parastic diode from output to input.In such application, the external bypass diode must be connected between output and input pin.



11. There is a possibility that IC generates heat when the output terminal is short-circuited. However, the thermal shutdown circuit operates, and it will do operation that protects IC. The thermal shutdown circuit is designed only to shut the IC off to prevent thermal runaway. Do not continue to use the IC in an environment where the operation of this circuit is assumed. The characteristic changes depending on the substrate condition. Please evaluate IC in the set.

12. It returns automatically in temperature returned after it shuts down by self-generation of heat. After it returns, it shuts down again by self-generation of heat. It is necessary to change the environment used (IC consumption,temperature) if it operates in upper cycle.

Note

13. It is possible to increase output voltage
    if the condition is low output current(under 1mA) and high temperature.
    The provision is to add load(over 1mA).

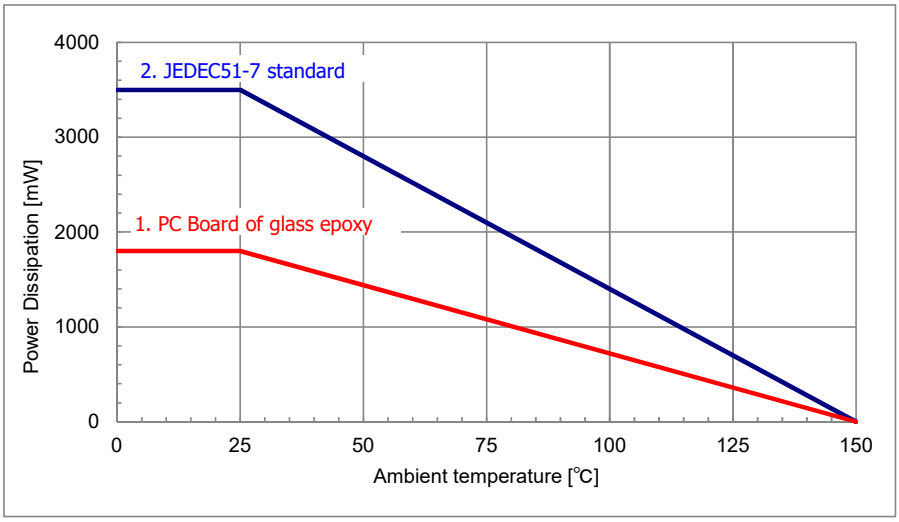
14. If negative voltage over maximum rating for VOUT,
    Connected schottky barrier diode between VOUT-GND, and the voltage is in within rating.

15. It is possible to unstable when this IC is used in high electromagnetic field.
    Please evaluate IC on the set.

About Power Dissiopation

The Power dissipation change if board to mount IC change because radiative heat fix at board.
It is reference data below, Evaluate IC in the set.

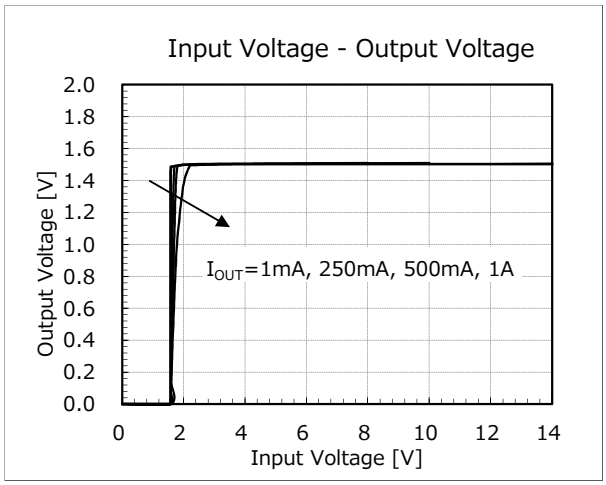
- HSOP-8A
  1. PC Board of glass epoxy
     Board size 37mm×37mm t=1.6mm Copper foil area 80%
     Power dissipation 1800mW Ta=25℃
  2. JEDEC51-7 standard (4 layer FR-4 board)
     Board size 114.3mm×76.2mm t=1.6mm Copper foil area 80%
     Power dissipation 3500mW Ta=25℃

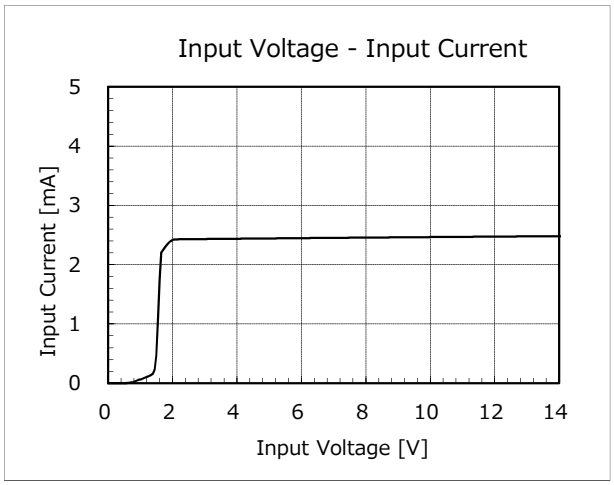


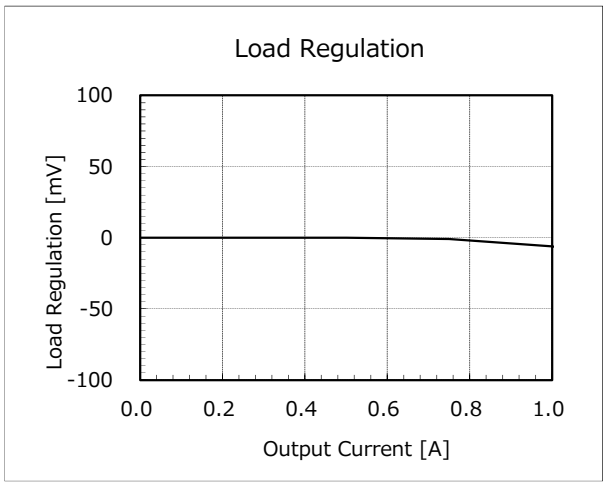
It is recommended to layout the VIA for heat radiation in the GND pattern of reverse (of IC) when there is the GND pattern in the inner layer (in using multiplayer substrate).
By increasing these copper foil pattern area of PCB, Power dissipation improves.

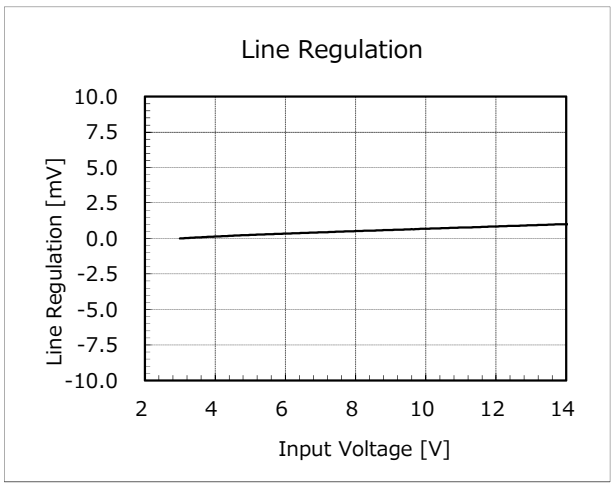
Typical Performance Characteristics (V_{OUT}=1.5V)

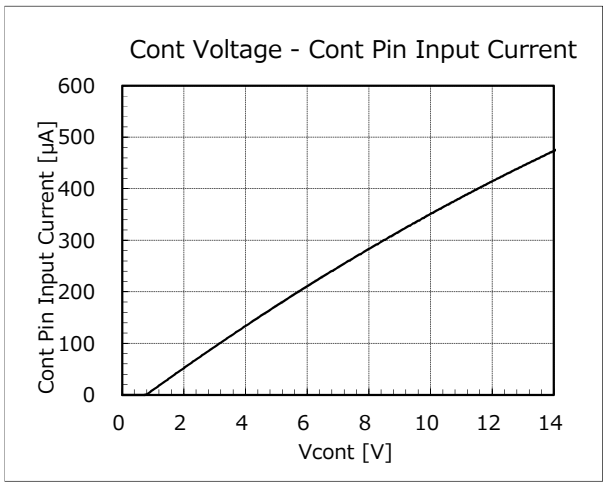
(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)

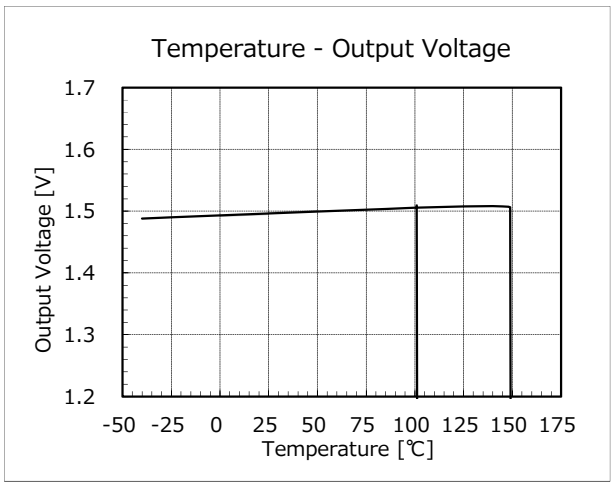






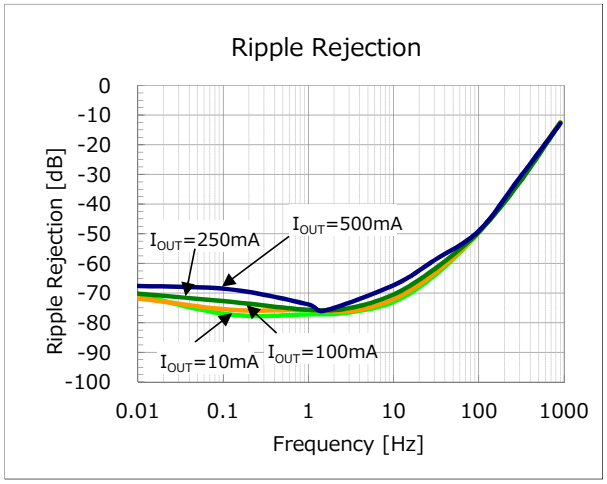


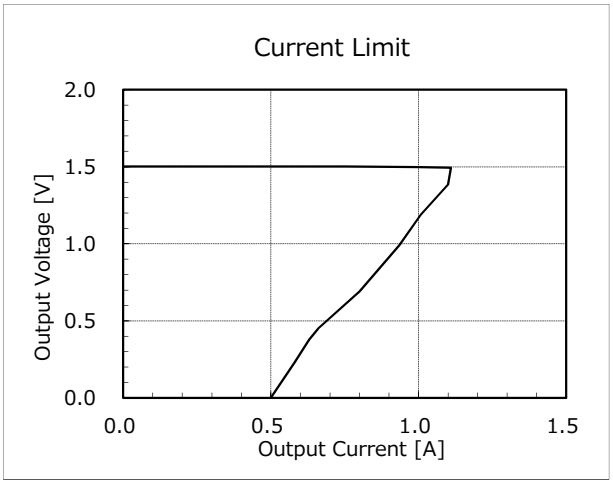


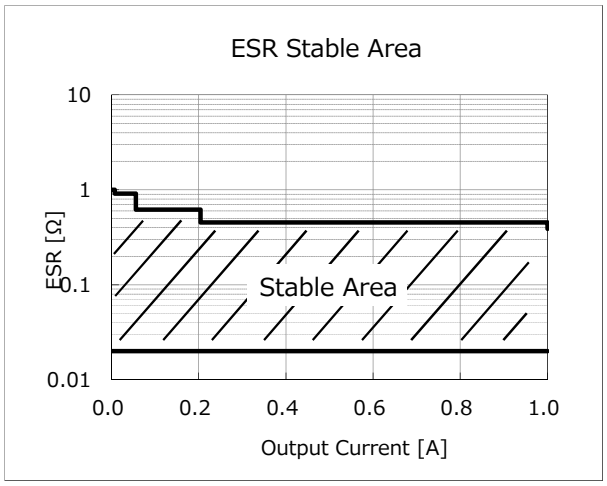


Typical Performance Characteristics (V_{OUT}=1.5V)

(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)

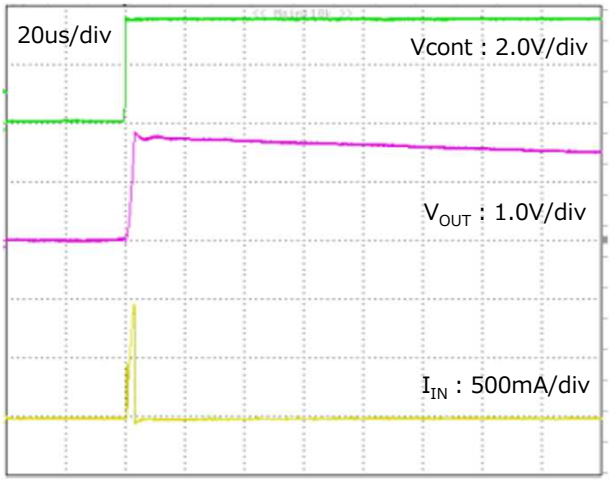






■ Turn - On Transient response

Vcont=0V→3.5V

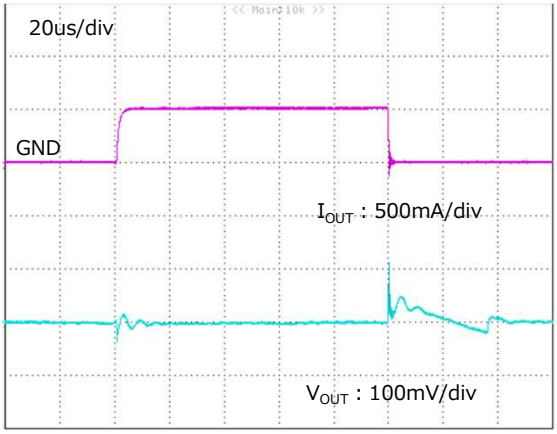


Typical Performance Characteristics (V_{OUT}=1.5V)

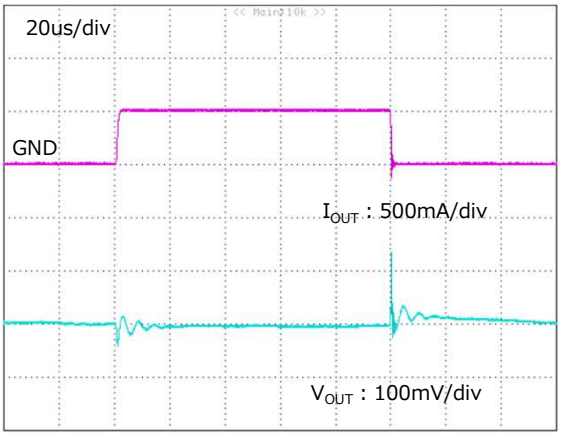
(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)

■ Load Transient response

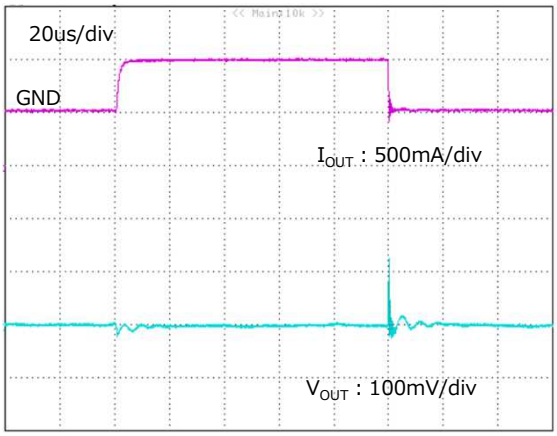
C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=1mA→500mA



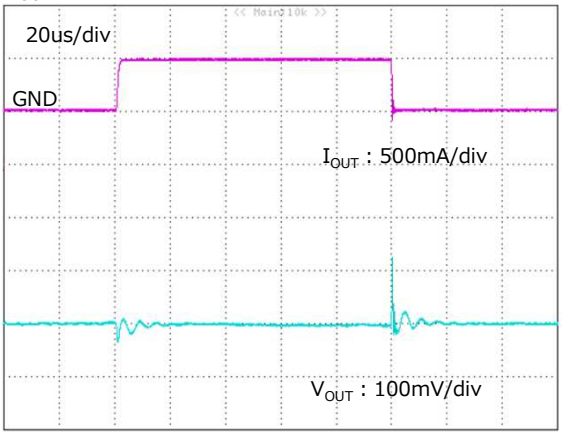
C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=1mA→500mA



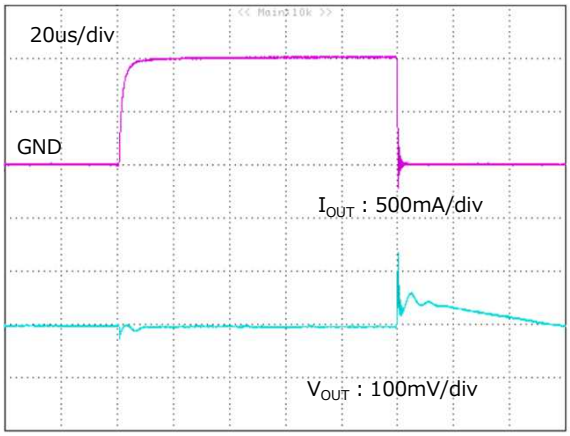
C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=500mA→1000mA



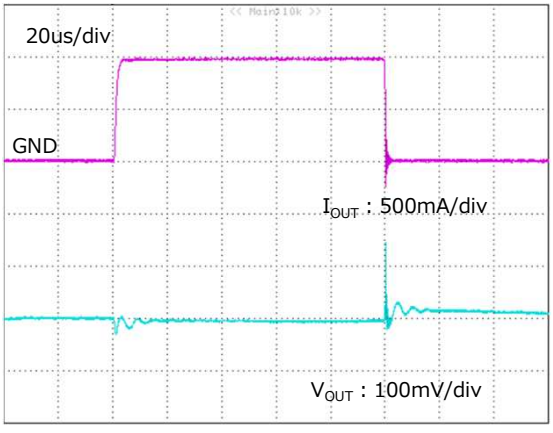
C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=500mA→1000mA



C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=1mA→1000mA

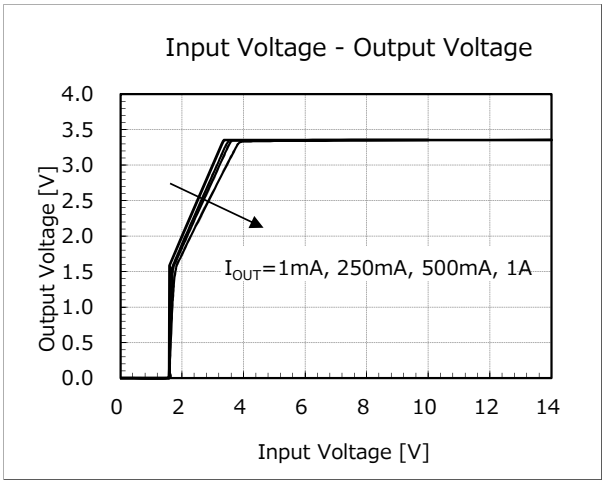


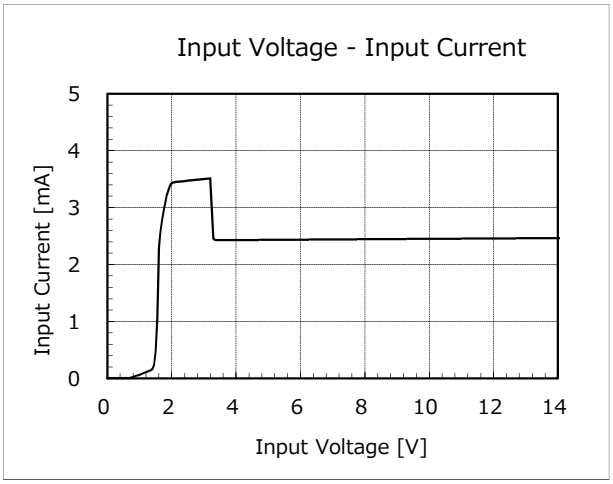
C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=1mA→1000mA

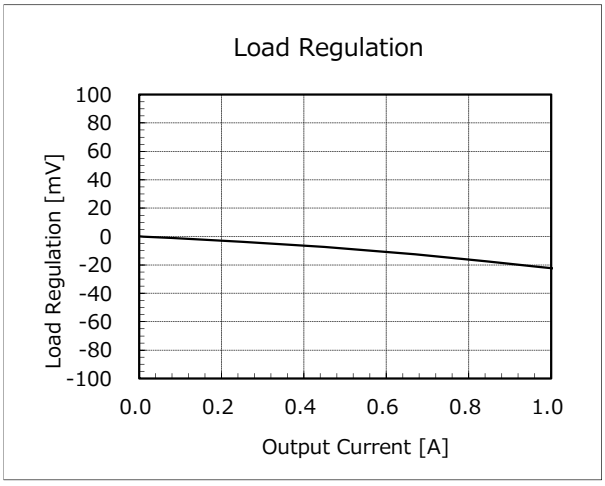


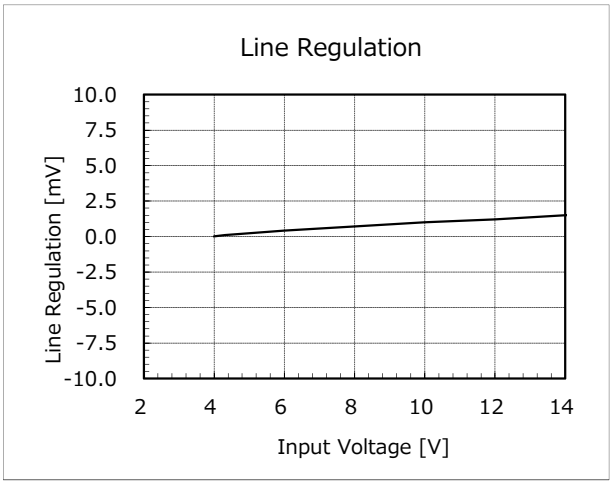
Typical Performance Characteristics (V_{OUT}=3.3V)

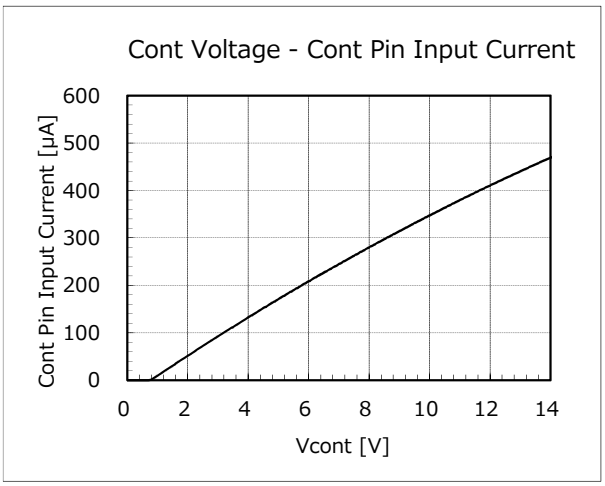
(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)

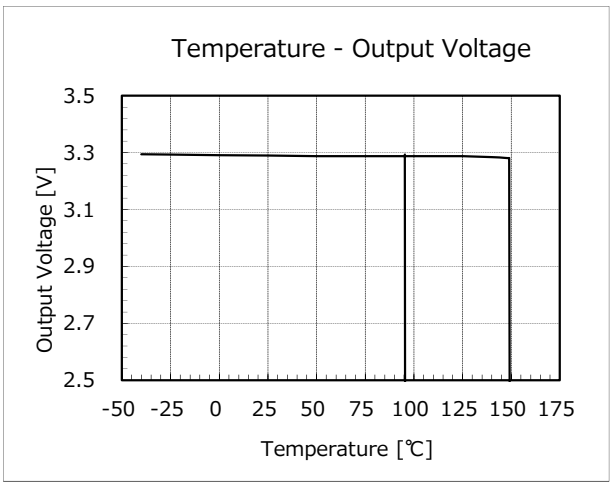






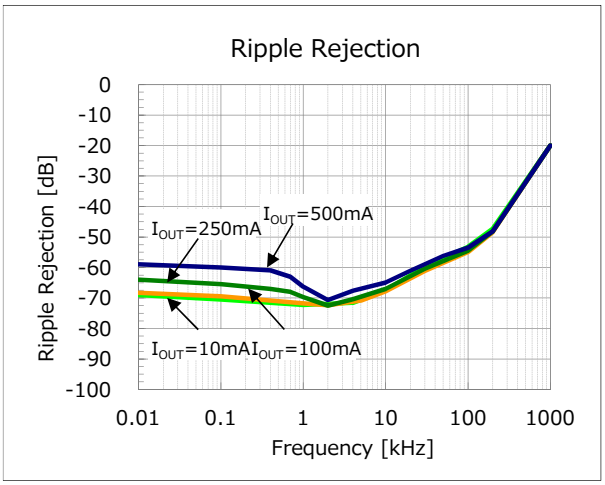


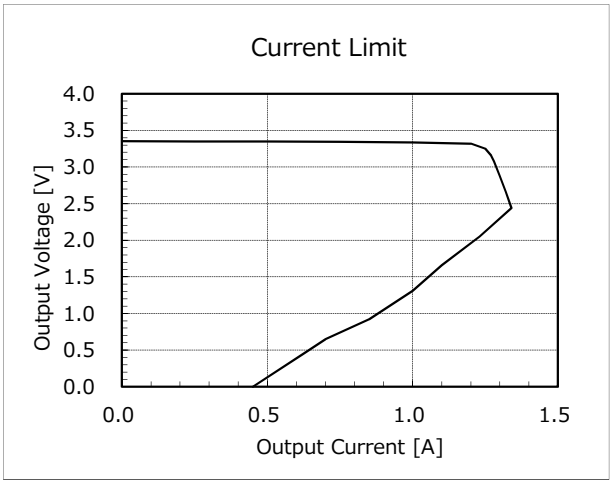


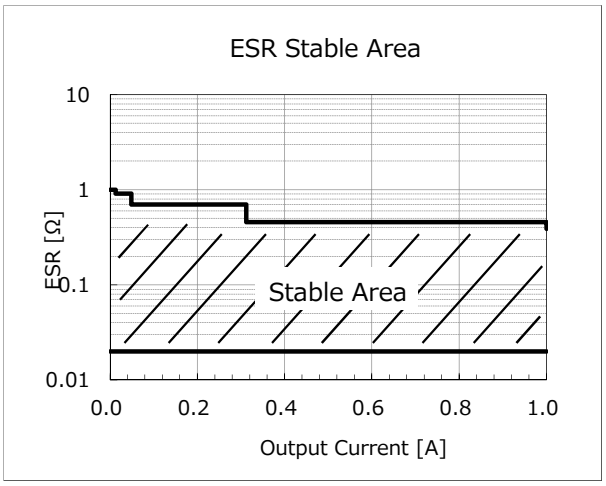


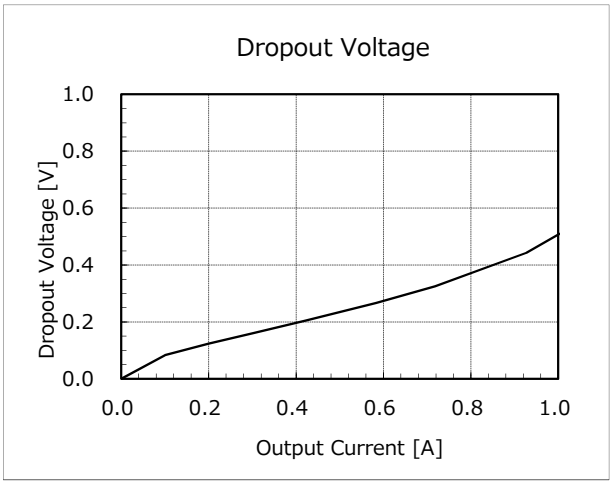
Typical Performance Characteristics (V_{OUT}=3.3V)

(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)



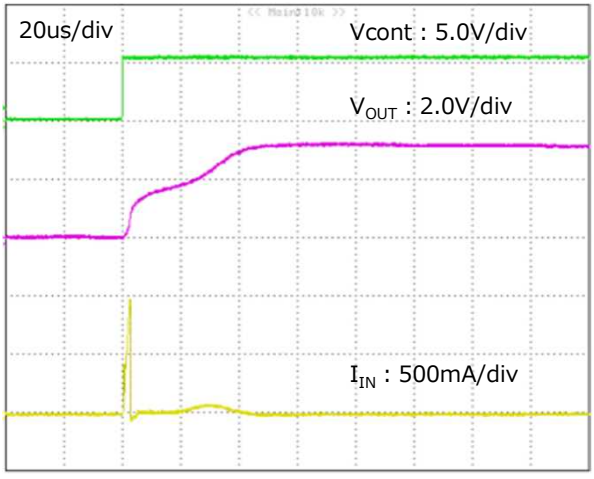






■ Turn - On Transient response

Vcont=0V→3.5V

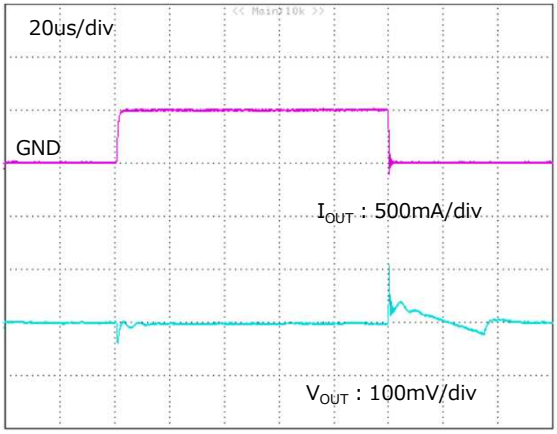


Typical Performance Characteristics (V_{OUT}=3.3V)

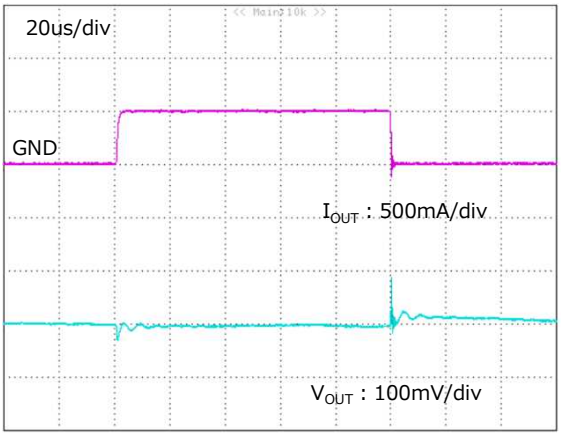
(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)

■ Load Transient response

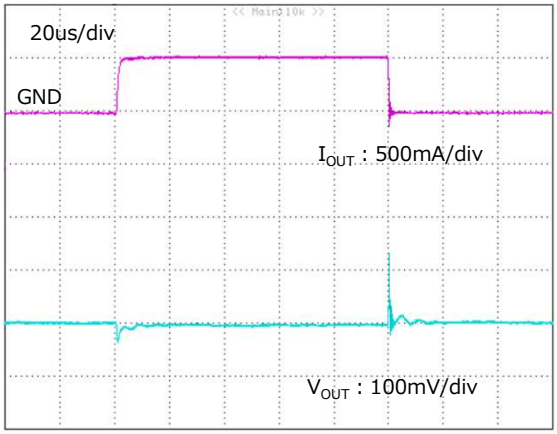
C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=1mA→500mA



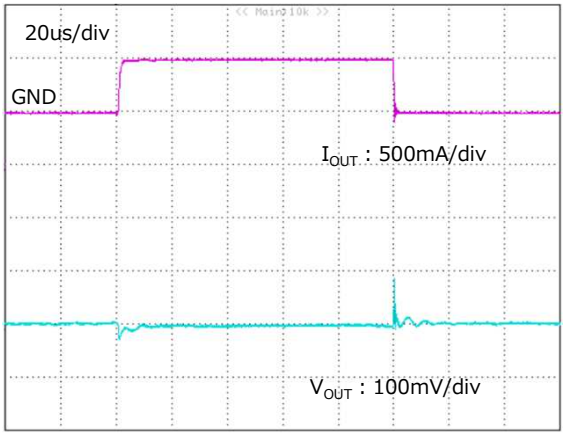
C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=1mA→500mA



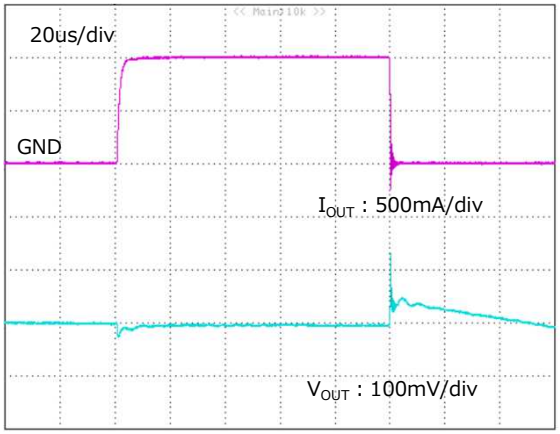
C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=500mA→1000mA



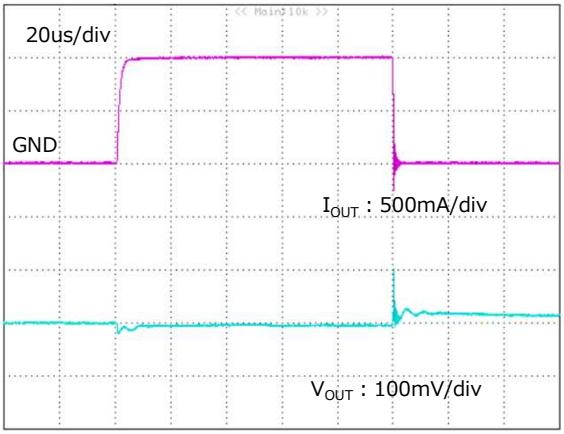
C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=500mA→1000mA



C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=1mA→1000mA

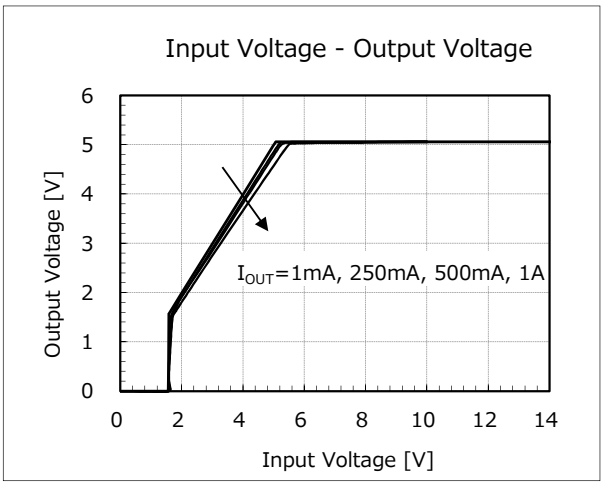


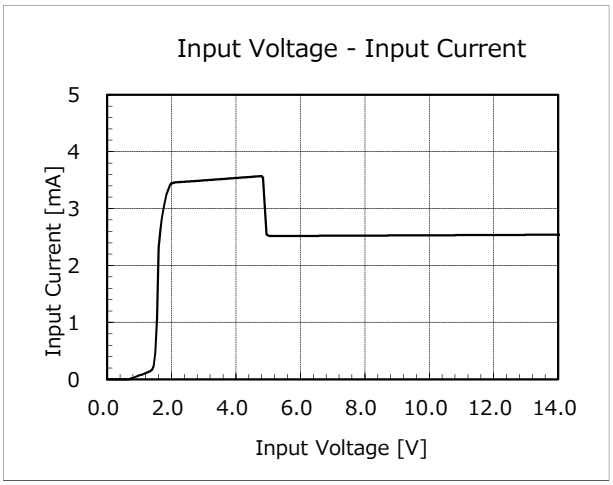
C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=1mA→1000mA

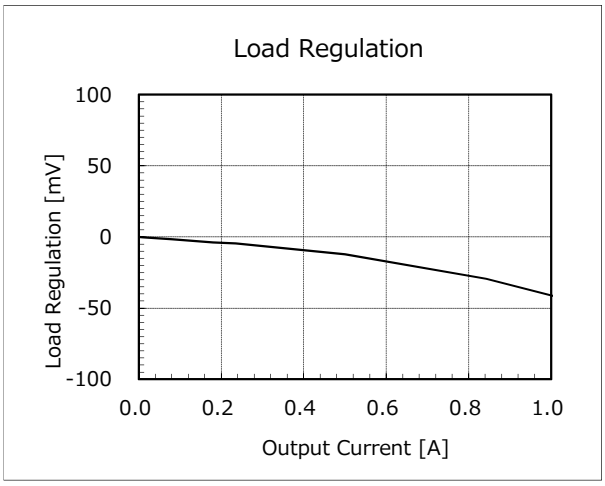


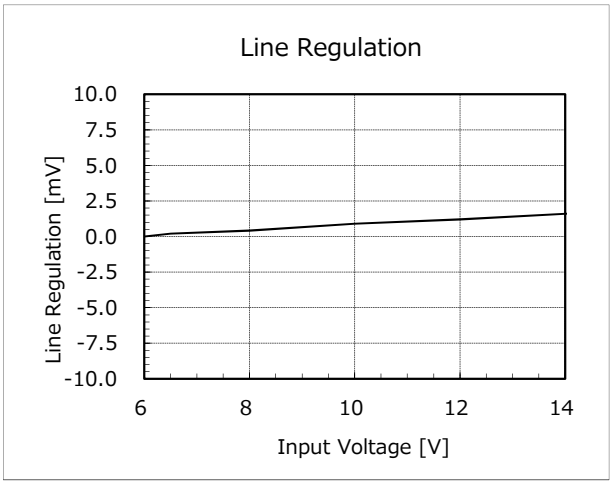
Typical Performance Characteristics (V_{OUT}=5.0V)

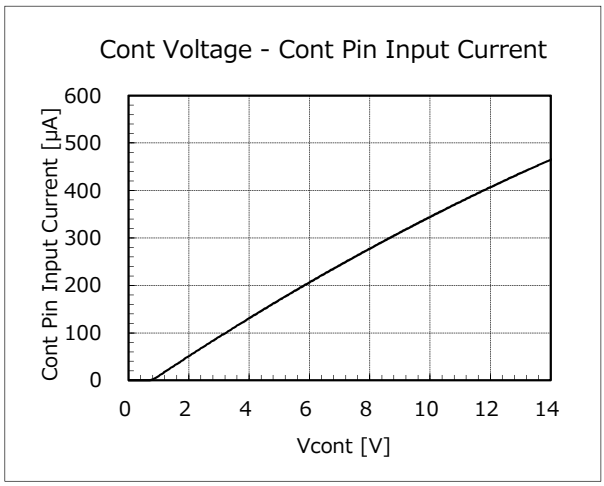
(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)

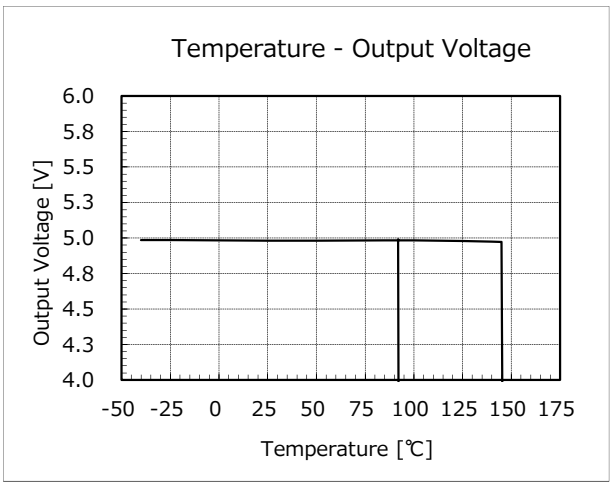






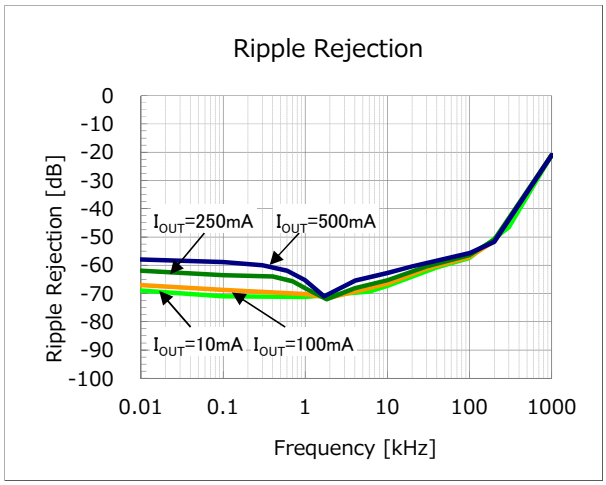


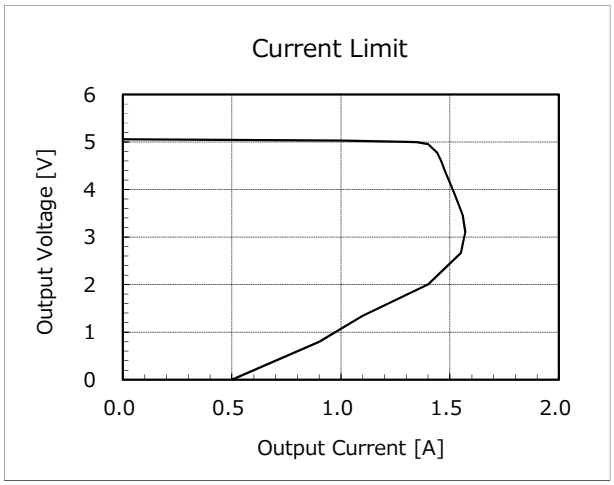


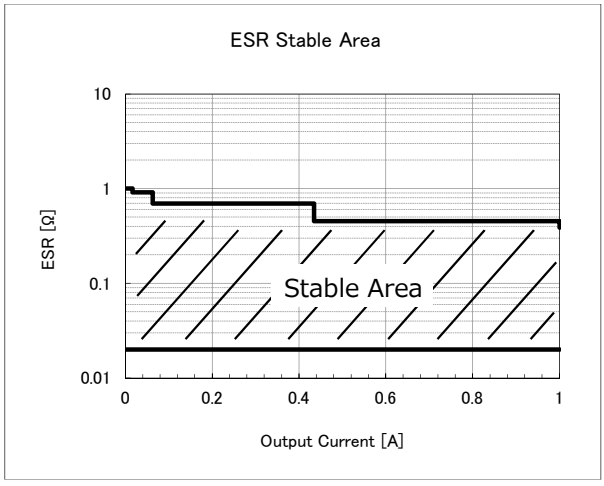


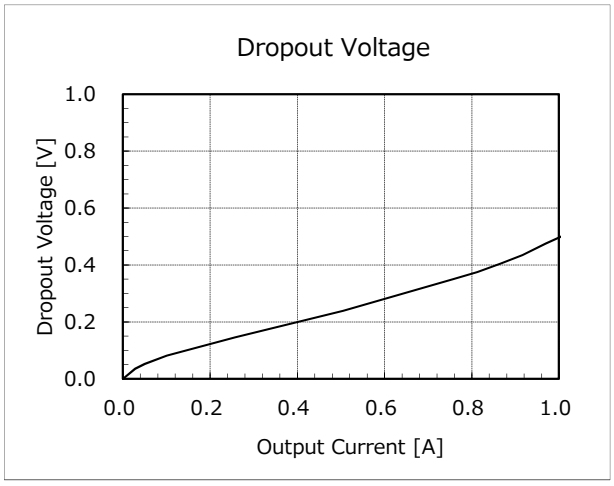
Typical Performance Characteristics (V_{OUT}=5.0V)

(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)



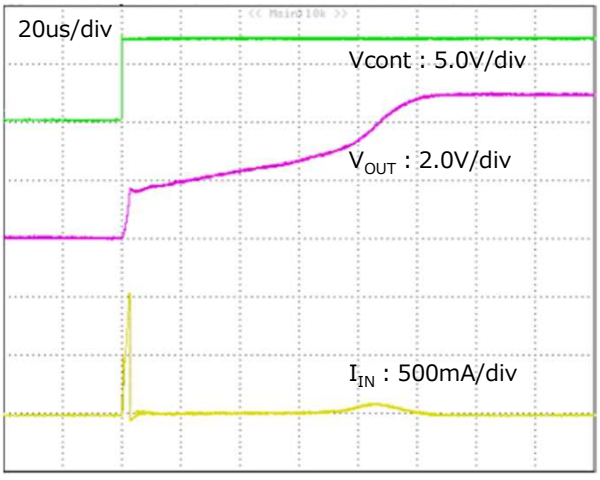






■ Turn - On Transient response

Vcont=0V→3.5V

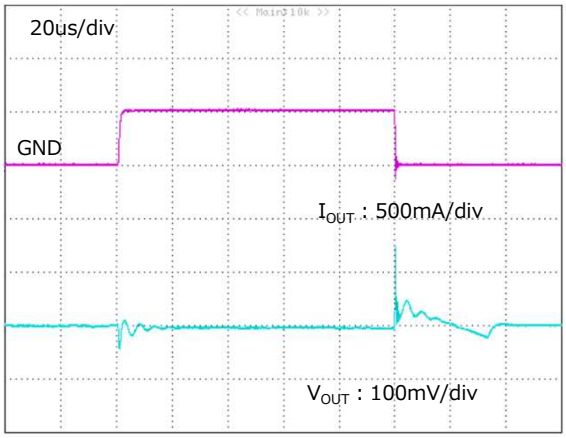


Typical Performance Characteristics (V_{OUT}=5.0V)

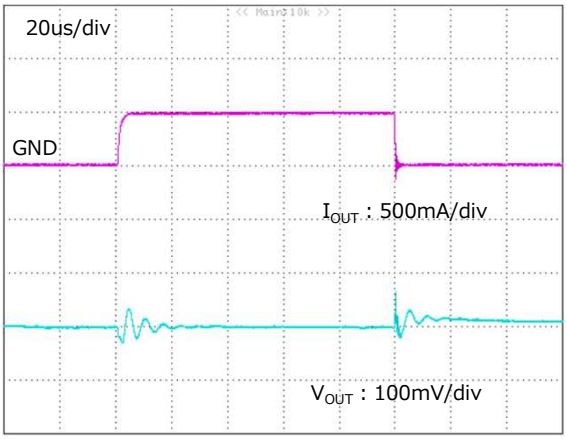
(V_{IN}=V_{OUT}(Typ.)+2V, Vcont=V_{IN}, Ta=25℃ unless otherwise specified)

■ Load Transient response

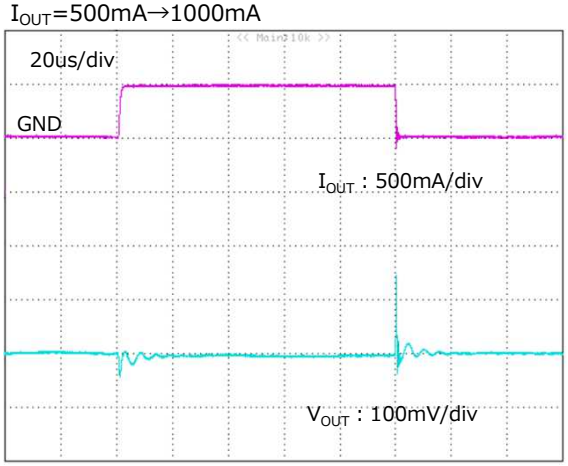
C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=1mA→500mA



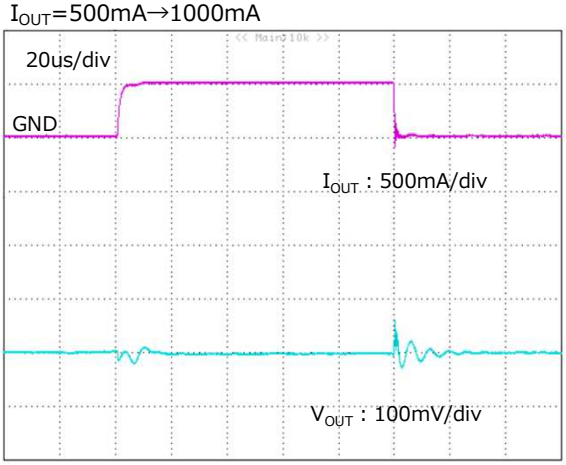
C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=1mA→500mA



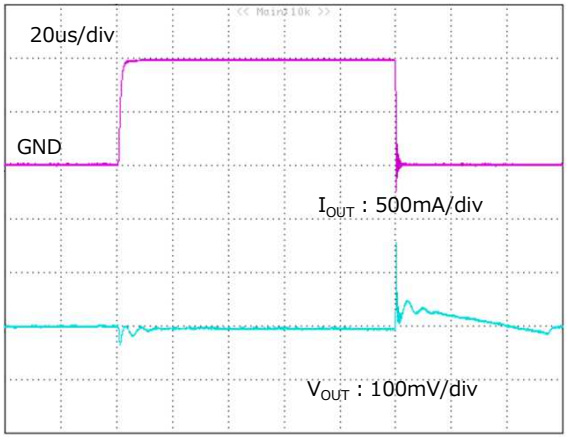
C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=500mA→1000mA



C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=500mA→1000mA



C_{IN}=1μF,C_{OUT}=1μF
I_{OUT}=1mA→1000mA



C_{IN}=1μF,C_{OUT}=10μF
I_{OUT}=1mA→1000mA