250mA LDO with connect error detection

MM1926 Series

Overview

This IC is a secondary 250mA LDO with conection error detection.
The IC supplies the power for external connection equipment of car navigation (GPS/TV/Radio/Microphone/Camera), and detect open/short-circuit of output. Open/Short detection function can be used in stand-alone without ADC and high accuracy detection by individual setting.
It can be easily to configure power supply circuit by the power supply fault protection and short-flag delay function for the rush current.

Features

- Short circuit detection
- Open circuit detection
- ON/OFF control

Main specifications

- Maximum rating supply voltage : -0.3V to 16V
- Maximum rating output voltage : -0.3V to 18V
- Operating voltage range : 2.5V to 14V
- Operating ambient temperature : -40℃ to 85℃
- Output current : 250mA
- Input current (OFF) : Max. 1μA
- No-load input current : Typ. 75μA
- Output voltage range : 3.0V to 10.0V (0.1V step)
- Output voltage accuracy : ±2%(IOUT=1mA)
- Line regulation : Max. 0.1%/V (VIN=VOUT(Typ.)+1V to 14V, IOUT=1mA)
- Load regulation : Typ. 25mV (IOUT=1mA to 250mA)
- Dropout voltage : Typ. 0.25V (IOUT=250mA)
- PSRR : Typ. 70dB (f=1kHz)
- Rop pin current : ±5% (IOUT=5mA, Vrop=1V)
- Rsc pin current : ±10% (IOUT=200mA, Vrsc=1V)
- Error output : Open Error, Shior Error
- Output capacitor : 2.2uF (Ceramic capacitor)
- Protection function : Over current protection, Thermal shutdown, Reverse current protection
- Additional function : ON/OFF control, Connection error detection (open/short flag output)

Packages

- HSOP-8E

Application

- In-vehicle infotainment device
- Power supply for antenna

Mitsumi Electric CO.,LTD.
Semiconductor Business Division
Strategy Engineering Department
tel:+81-46-230-3470

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Model Name

M M 1 9 2 6 X X X X X X

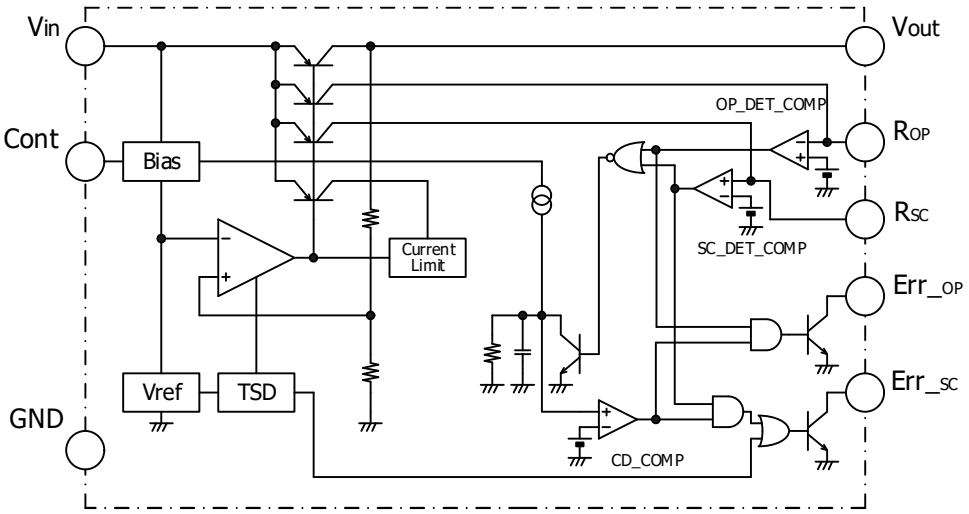
Series name (A) (B) (C) (D) (E)

(A)	Function Type	Fig.1	Cont=H active、without discharge function
(B)	Output voltage rank	30 ～ B0	Output voltage can be designated in the range from 3.0V(30) to 10.0V(B0) in 0.1V steps.
(C)	Package	H	HSOP-8E
(D)	Packing specifications 1	B	B housing (Standard)
		F	F housing
(E)	Packing specifications 2	E	Emboss tape / Halogen free

■ Fig.1 Function Type

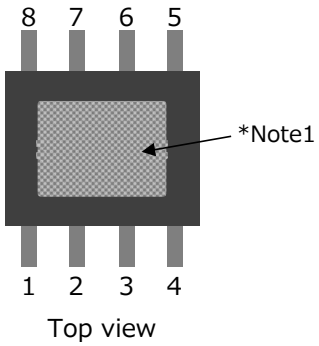
Function Type	Actual load current (Max.)	Output voltage
A	100mA	from 3.00V / 0.1Vstep
B	170mA	from 3.00V / 0.1Vstep
C	60mA	from 3.00V / 0.1Vstep
W		from 3.05V / 0.1Vstep
E	200mA	from 3.00V / 0.1Vstep

Block Diagram



Pin Configuration

- HSOP-8E



Pin No.	Pin name	Function
1	V_{OUT}	Output voltage
2	Rop	Open load detection resistance
3	Rsc	Short-circuit detection resistance
4	GND	Ground
5	Cont	Control input
6	Err_sc	Short-circuit detection output
7	Err_op	Open load detection output
8	V_{IN}	Power supply input

*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	16	V
Output voltage *Note3		V_{OUT}	-0.3	18	V
Cont input voltage		V_{cont}	-0.3	16	V
Output current	Function:A	Iomax	0	350	mA
	Function:B,E		0	400	mA
	Function:C,W		0	150	mA
Err_op/Err_sc voltage		Verr	-0.3	16	V
Err_op/Err_sc current		Ierr	-	5	mA
Power dissipation *Note4	HSOP-8E	Pd1	-	3500	mW

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

*Note3:Battery-short test, t=3min.

*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		Vop	2.5	14.0	V
Output current *Note5	Function:A,B,E	Iop	0	250	mA
	Function:C,W		0	80	mA

*Note5:Please refer to Fig.1

Electrical Characteristics

(V_{IN}=V_{OUT}(Typ.)+1V, Vcont=V_{IN}, Ta=25℃, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
No-Load Input Current	I_{CC}	I_{OUT}=0mA Rpu_op=Rpu_sc=∞	-	200	300	μA
Input Current(OFF)	I_{CCOFF}	V_{CONT}=0V	-	0.1	1	μA
Output Voltage *Note6	V_{OUT}	I_{OUT}=1mA	×0.98	-	×1.02	V

*Note6:Please refer to another page.

Electrical Characteristics (Function:A)

(V_{IN}=V_{OUT}(Typ.)+1V, Vcont=V_{IN}, Ta=25℃, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dropout Voltage	Vio	V_{IN}=V_{OUT}-0.2V I_{OUT}=250mA	-	0.25	0.50	V
Line Regulation	V_{LINE}	V_{IN}=V_{OUT}+1V~14V I_{OUT}=1mA	-	-	0.10	%/V
Load Regulation	V_{LOAD}	I_{OUT}=1mA~250mA	-	25	75	mV
VOUT Temperature Coefficient *Note7	ΔV_{OUT} /ΔT_{OP}	I_{OUT}=1mA -40≦Ta≦85℃	-	±100	-	ppm/℃
Ripple Rejection *Note7	RR	f=1kHz, Vripple=1V I_{OUT}=10mA	-	70	-	dB
Current limit	Io_limit		350	400	-	mA
Cont PIN Input Current	Icont	Vcont=1.6V	-	3	12	μA
Cont Pin High Threshold Voltage	VcontH		1.6	-	-	V
Cont Pin Low Threshold Voltage	VcontL		-	-	0.3	V
Thermal shutdown temperature *Note7	Tsd		-	175	-	℃
Thermal shutdown hysteresis *Note7	Tsd_h		-	65	-	℃
Rop pin current	Iop	I_{OUT}=5mA Vrop=1V	109	115	121	μA
Rsc pin current	Isc	I_{OUT}=200mA Vrsc=1V	1710	1900	2090	μA
Rop pin threshold voltage	Vt_op	Vrop=H→L Verr_op=H→L	0.9	1.0	1.1	V
Rop pin hysteresis voltage	Vth_op	Vrop=L→H Verr_op=L→H	-	175	-	mV
Rsc pin threshold voltage	Vt_sc	Vrsc=L→H Verr_sc=H→L	0.9	1.0	1.1	V
Rsc pin hysteresis voltage	Vth_sc	Vrsc=H→L Verr_sc=L→H	-	230	-	mV
Err_op output voltage	Verr_op	Vrop=L Ierr_op=100μA	-	-	0.2	V
Err_sc output voltage	Verr_sc	Vrsc=H Ierr_sc=100μA	-	-	0.2	V
Err_op Detect Delay Time *Note7	T_{PHL1}	Vrop=H→L Verr_op=H→L	-	25	-	μs
Err_sc Detect Delay Time *Note7	T_{PHL2}	Vrsc=L→H Verr_sc=H→L	-	25	-	μs

*Note7:The parameter is guaranteed by design.

Electrical Characteristics (Function:B)

(V_{IN}=V_{OUT}(Typ.)+1V, Vcont=V_{IN}, Ta=25℃, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dropout Voltage	Vio	V_{IN}=V_{OUT}-0.2V I_{OUT}=250mA	-	0.25	0.50	V
Line Regulation	V_{LINE}	V_{IN}=V_{OUT}+1V~14V I_{OUT}=1mA	-	-	0.10	%/V
Load Regulation	V_{LOAD}	I_{OUT}=1mA~250mA	-	25	75	mV
VOUT Temperature Coefficient *Note7	ΔV_{OUT} /ΔT_{OP}	I_{OUT}=1mA -40≦Ta≦85℃	-	±100	-	ppm/℃
Ripple Rejection *Note7	RR	f=1kHz, Vripple=1V I_{OUT}=10mA	-	70	-	dB
Current limit	Io_limit		350	400	-	mA
Cont PIN Input Current	Icont	Vcont=1.6V	-	3	12	μA
Cont Pin High Threshold Voltage	VcontH		1.6	-	-	V
Cont Pin Low Threshold Voltage	VcontL		-	-	0.3	V
Thermal shutdown temperature *Note7	Tsd		-	175	-	℃
Thermal shutdown hysteresis *Note7	Tsd_h		-	65	-	℃
Rop pin current	Iop	I_{OUT}=5mA Vrop=1V	109	115	121	μA
Rsc pin current	Isc	I_{OUT}=200mA Vrsc=1V	1710	1900	2090	μA
Rop pin threshold voltage	Vt_op	Vrop=H→L Verr_op=H→L	0.9	1.0	1.1	V
Rop pin hysteresis voltage	Vth_op	Vrop=L→H Verr_op=L→H	-	175	-	mV
Rsc pin threshold voltage	Vt_sc	Vrsc=L→H Verr_sc=H→L	0.9	1.0	1.1	V
Rsc pin hysteresis voltage	Vth_sc	Vrsc=H→L Verr_sc=L→H	-	35	-	mV
Err_op output voltage	Verr_op	Vrop=L Ierr_op=100μA	-	-	0.2	V
Err_sc output voltage	Verr_sc	Vrsc=H Ierr_sc=100μA	-	-	0.2	V
Err_op Detect Delay Time *Note7	T_{PHL1}	Vrop=H→L Verr_op=H→L	-	25	-	μs
Err_sc Detect Delay Time *Note7	T_{PHL2}	Vrsc=L→H Verr_sc=H→L	-	25	-	μs

*Note7:The parameter is guaranteed by design.

Electrical Characteristics (Function:E)

(V_{IN}=V_{OUT}(Typ.)+1V, Vcont=V_{IN}, Ta=25℃, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dropout Voltage	Vio	V_{IN}=V_{OUT}-0.2V I_{OUT}=80mA	-	0.12	0.24	V
Line Regulation	V_{LINE}	V_{IN}=V_{OUT}+1V~14V I_{OUT}=1mA	-	-	0.10	%/V
Load Regulation	V_{LOAD}	I_{OUT}=1mA~80mA	-	10	30	mV
VOUT Temperature Coefficient *Note7	ΔV_{OUT} /ΔT_{OP}	I_{OUT}=1mA -40≦Ta≦85℃	-	±100	-	ppm/℃
Ripple Rejection *Note7	RR	f=1kHz, Vripple=1V I_{OUT}=10mA	-	70	-	dB
Current limit	Io_limit		120	150	-	mA
Cont PIN Input Current	Icont	Vcont=1.6V	-	3	12	μA
Cont Pin High Threshold Voltage	VcontH		1.6	-	-	V
Cont Pin Low Threshold Voltage	VcontL		-	-	0.3	V
Thermal shutdown temperature *Note7	Tsd		-	175	-	℃
Thermal shutdown hysteresis *Note7	Tsd_h		-	65	-	℃
Rop pin current	Iop	I_{OUT}=5mA Vrop=1V	109	115	121	μA
Rsc pin current	Isc	I_{OUT}=80mA Vrsc=1V	918	1020	1122	μA
Rop pin threshold voltage	Vt_op	Vrop=H→L Verr_op=H→L	0.9	1.0	1.1	V
Rop pin hysteresis voltage	Vth_op	Vrop=L→H Verr_op=L→H	-	175	-	mV
Rsc pin threshold voltage	Vt_sc	Vrsc=L→H Verr_sc=H→L	0.9	1.0	1.1	V
Rsc pin hysteresis voltage	Vth_sc	Vrsc=H→L Verr_sc=L→H	-	35	-	mV
Err_op output voltage	Verr_op	Vrop=L Ierr_op=100μA	-	-	0.2	V
Err_sc output voltage	Verr_sc	Vrsc=H Ierr_sc=100μA	-	-	0.2	V
Err_op Detect Delay Time *Note7	T_{PHL1}	Vrop=H→L Verr_op=H→L	-	25	-	μs
Err_sc Detect Delay Time *Note7	T_{PHL2}	Vrsc=L→H Verr_sc=H→L	-	25	-	μs

*Note7:The parameter is guaranteed by design.

Electrical Characteristics (Function:C,W)

(V_{IN}=V_{OUT}(Typ.)+1V, Vcont=V_{IN}, Ta=25℃, unless otherwise specified)

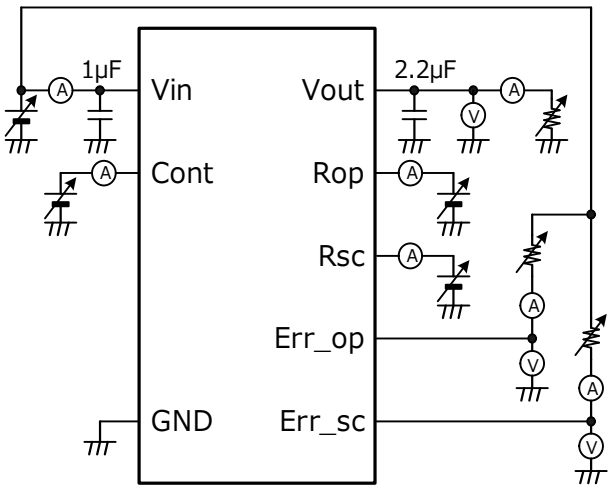
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dropout Voltage	Vio	V_{IN}=V_{OUT}-0.2V I_{OUT}=250mA	-	0.25	0.50	V
Line Regulation	V_{LINE}	V_{IN}=V_{OUT}+1V~14V I_{OUT}=1mA	-	-	0.10	%/V
Load Regulation	V_{LOAD}	I_{OUT}=1mA~250mA	-	25	75	mV
VOUT Temperature Coefficient *Note7	ΔV_{OUT} /ΔT_{OP}	I_{OUT}=1mA -40≦Ta≦85℃	-	±100	-	ppm/℃
Ripple Rejection *Note7	RR	f=1kHz, Vripple=1V I_{OUT}=10mA	-	70	-	dB
Current limit	Io_limit		350	400	-	mA
Cont PIN Input Current	Icont		-	3	12	μA
Cont Pin High Threshold Voltage	VcontH		1.6	-	-	V
Cont Pin Low Threshold Voltage	VcontL		-	-	0.3	V
Thermal shutdown temperature *Note7	Tsd		-	175	-	℃
Thermal shutdown hysteresis *Note7	Tsd_h		-	65	-	℃
Rop pin current	Iop	I_{OUT}=5mA Vrop=1V	109	115	121	μA
Rsc pin current	Isc	I_{OUT}=200mA Vrsc=1V	1786	1900	2014	μA
Rop pin threshold voltage	Vt_op	Vrop=H→L Verr_op=H→L	0.9	1.0	1.1	V
Rop pin hysteresis voltage	Vth_op	Vrop=L→H Verr_op=L→H	-	175	-	mV
Rsc pin threshold voltage	Vt_sc	Vrsc=L→H Verr_sc=H→L	0.95	1.00	1.05	V
Rsc pin hysteresis voltage	Vth_sc	Vrsc=H→L Verr_sc=L→H	-	35	-	mV
Err_op output voltage	Verr_op	Vrop=L Ierr_op=100μA	-	-	0.2	V
Err_sc output voltage	Verr_sc	Vrsc=H Ierr_sc=100μA	-	-	0.2	V
Err_op Detect Delay Time *Note7	T_{PHL1}	Vrop=H→L Verr_op=H→L	-	25	-	μs
Err_sc Detect Delay Time *Note7	T_{PHL2}	Vrsc=L→H Verr_sc=H→L	-	25	-	μs

*Note7:The parameter is guaranteed by design.

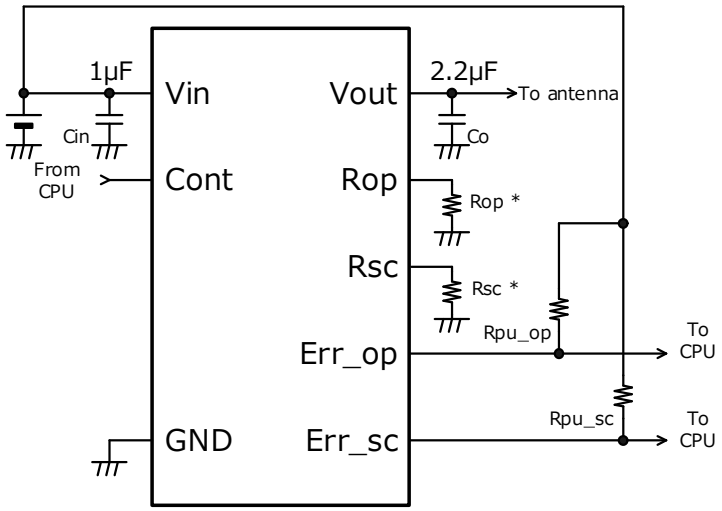
Electrical Characteristics

Model name	Item			
	Output voltage			
	V_{OUT} (V)			
	Conditions	Min.	Typ.	Max.
MM1926A30	Function:A IOUT=1mA	2.940	3.000	3.060
MM1926A33		3.234	3.300	3.366
MM1926A35		3.430	3.500	3.570
MM1926A45		4.410	4.500	4.590
MM1926A46		4.508	4.600	4.692
MM1926A47		4.606	4.700	4.794
MM1926A48		4.704	4.800	4.896
MM1926A49		4.802	4.900	4.998
MM1926A50		4.900	5.000	5.100
MM1926A60		5.880	6.000	6.120
MM1926A66		6.468	6.600	6.732
MM1926A74		7.252	7.400	7.548
MM1926A80		7.840	8.000	8.160
MM1926A95		9.310	9.500	9.690
MM1926AB0		9.800	10.000	10.200
MM1926B60	Function:B IOUT=1mA	5.880	6.000	6.120
MM1926B80		7.840	8.000	8.160
MM1926E60	Function:E IOUT=1mA	5.880	6.000	6.120
MM1926E80		7.840	8.000	8.160
MM1926C46	Function:C IOUT=1mA	4.508	4.600	4.692
MM1926C47		4.606	4.700	4.794
MM1926C48		4.704	4.800	4.896
MM1926C50		4.900	5.000	5.100
MM1926W46	Function:W IOUT=1mA	4.557	4.650	4.743
MM1926W48		4.753	4.850	4.947

Test Circuit



Application Circuit



*constant setting formula (for estimate)
Rop = Vt_op / I_rop
Rsc = Vt_sc / I_rsc

Vt_op:Rop threshold voltage
Vt_sc:Rsc threshold voltage
Io_op:Open circuit detection current
Io_sc:Short circuit detection current

(Example of external parts)

- Output capacitor Ceramic capacitor 2.2μF
- 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. Please use this IC within the stated absolute maximum ratings.
   The IC is liable to malfunction should the ratings be exceeded.

2. There is a possibility that it becomes impossible to maintain this performance and reliability IC original when using 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 Input 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.
   The ceramic capacitor must be used more than 2.2μF and B temperature characteristics.

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. It is able to an unstable operation when you use the capacitor with intense capacitance change .
   The capacitor has the dependency at the power-supply voltage and the temperature.
   The capacity value changes by the environment used. Please evaluate IC in the set.

9. The over current protection circuit of the vertical type is built into this IC.

10. 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.

11. The hysteresis circuit is not built into the thermal shutdown circuit.
    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.

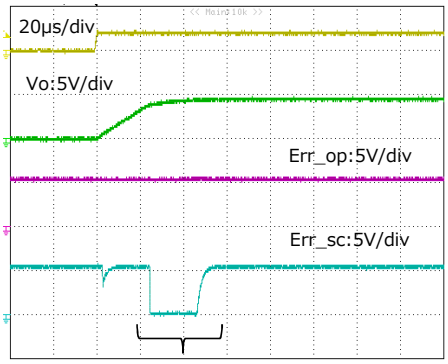
12. The absolute maxmimum ratings of the output voltage is for short-circuit to power supply test.
    In nomal operation, it must be used to Vin>Vout.

Note

13. When establishing an open/short detect current, please consider a release hysteresis.

14. When LDO start up, inrush current occurs.
    When start up, inrush current is detected, and there is a possibility that a short detect.
    Please establish it so that a microcomputer doesn't detect a short flag until LDO starts.

15. When starting by the condition, Err_sc flag reacts.
    This is influence of start up sequence of the inner circuit. It isn't an abnormal reaction.
    When it's a problem, it's possible to take a measure in application with the outside part.
    Please check the application notebook about details.
    ※When doing a inrush current measure of item 14 by a microcomputer, the measure is unnecessary.



Infuluence by Inrush current .

Influence by start up sequence.

16. The total precision of the current detection (Ta=25℃) is decided by following looseness.

	Open	Short
Detect Current	±5%	±10%
comparator Threshold	±10%	±10%
Detect setting Resistance	±α	±α
TTL	15%±α	20%±α

It's necessary to consider the temperature special quality and a supply voltage fluctuation as well as the above.

17. After checking the application notebook about details of item 13-16 ,please setting of detect current.

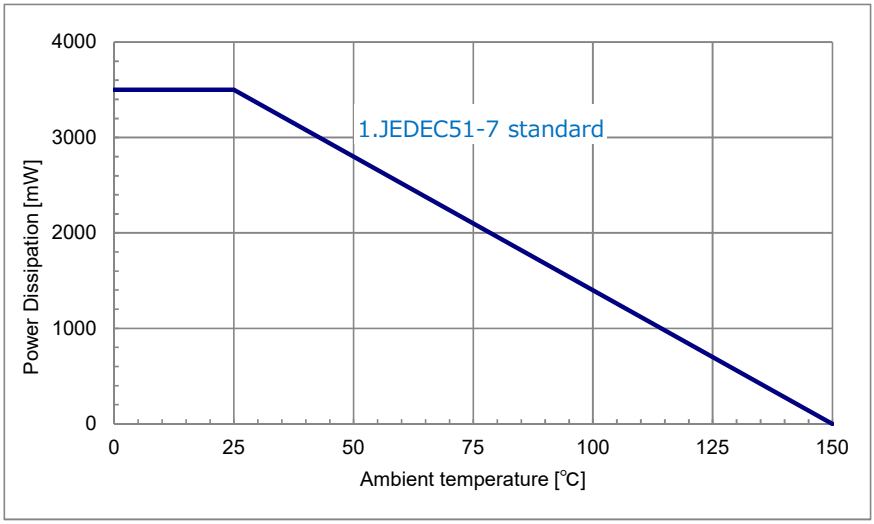
About Power Dissiopation

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-8E

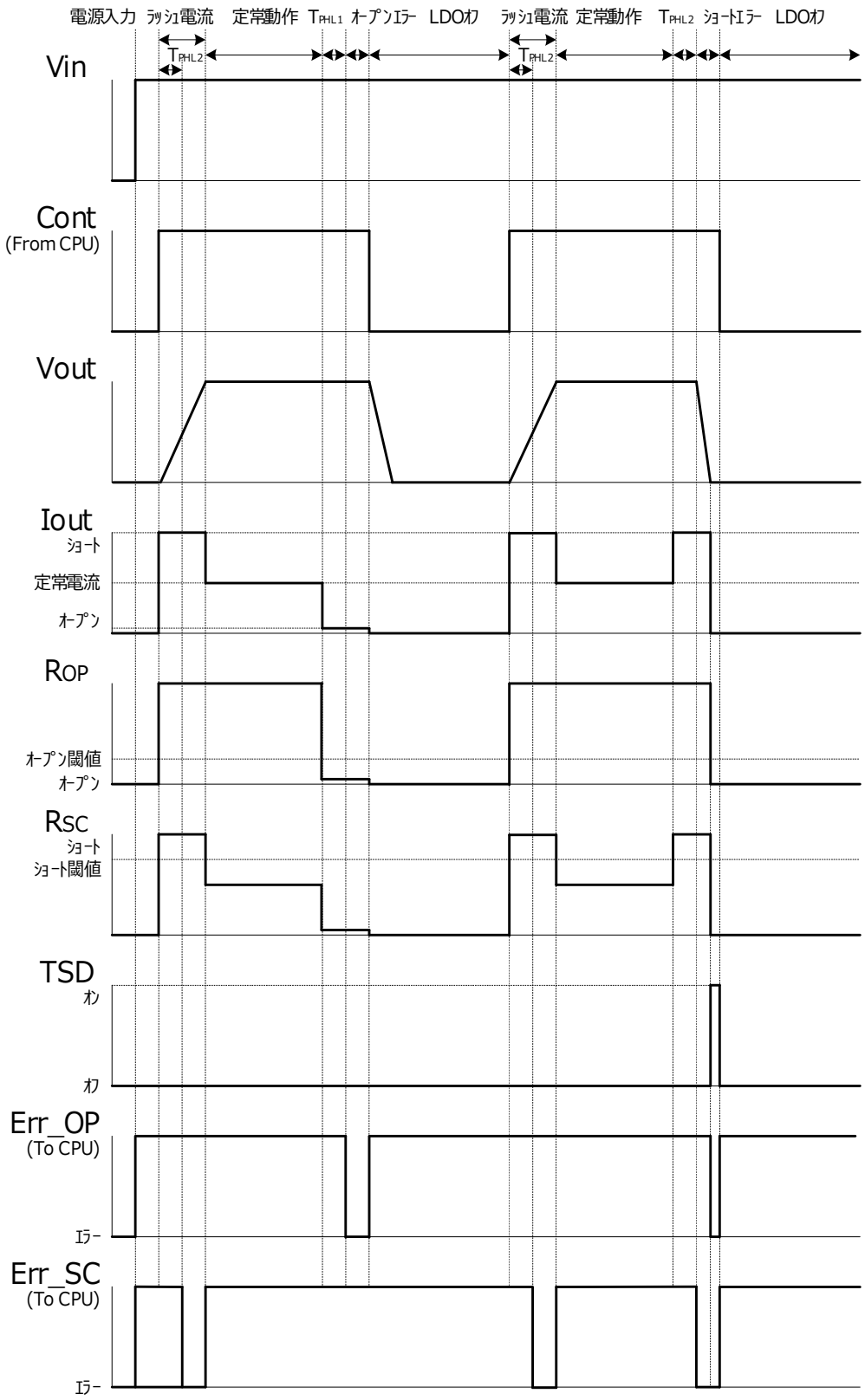
1. JEDEC51-7 standard (4 layer FR-4 board)

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.

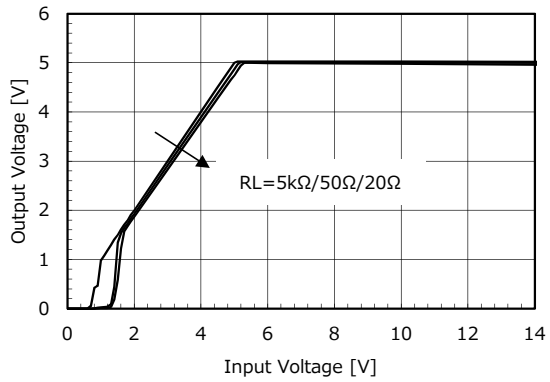
Timing chart



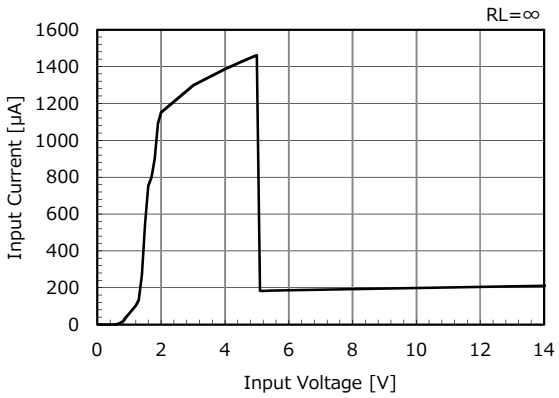
Typical Performance Characteristics (VOUT=5.0V/Function:A)

(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

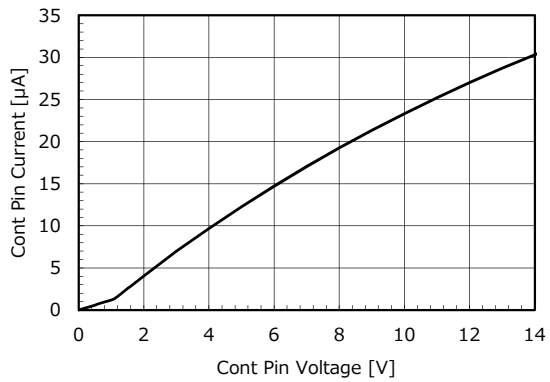
Output Voltage - Input Voltage



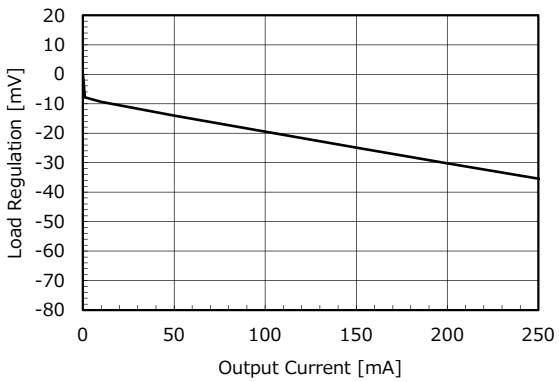
Inputn Current - Input Voltage



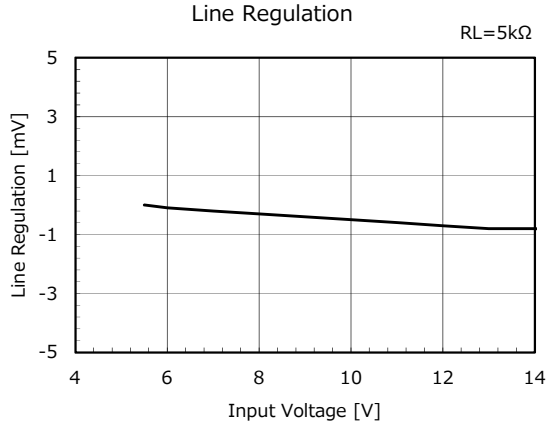
Cont Pin Current - Cont Pin Voltage



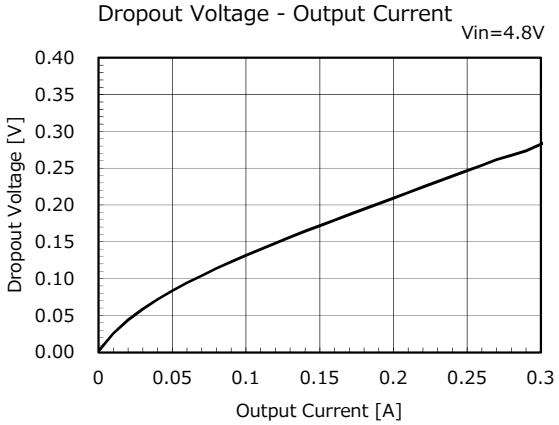
Load Regulation



Line Regulation

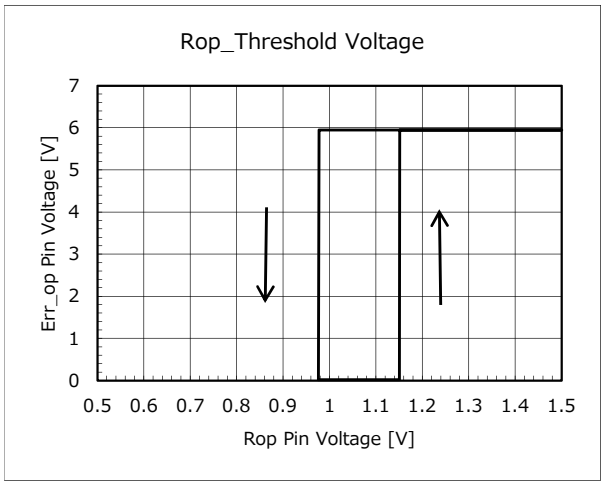


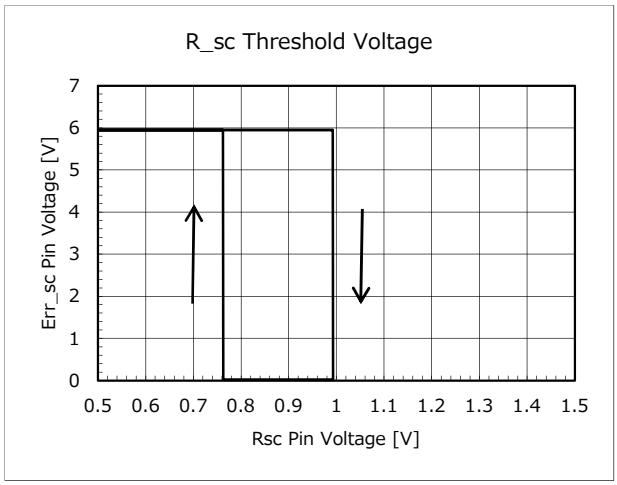
Dropout Voltage - Output Current

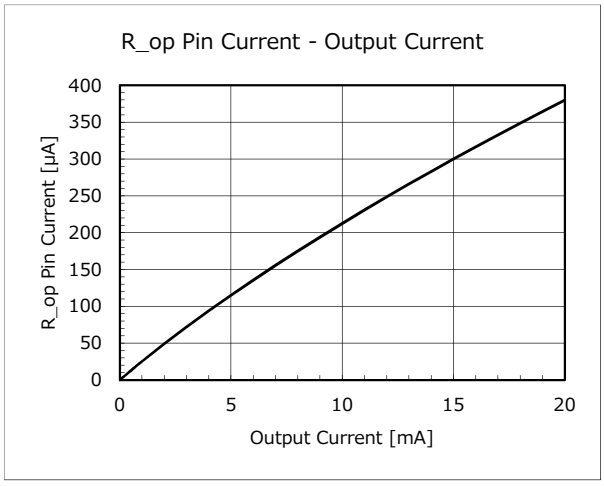


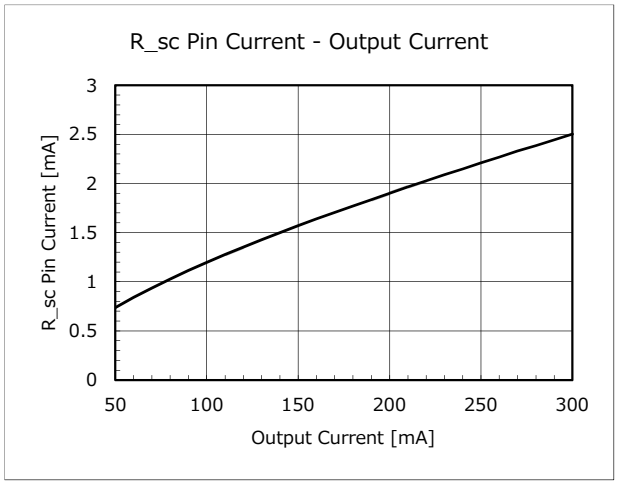
Typical Performance Characteristics (VOUT=5.0V/Function:A)

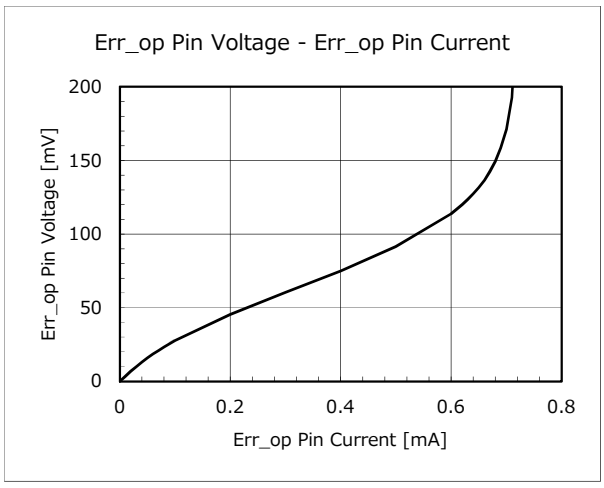
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

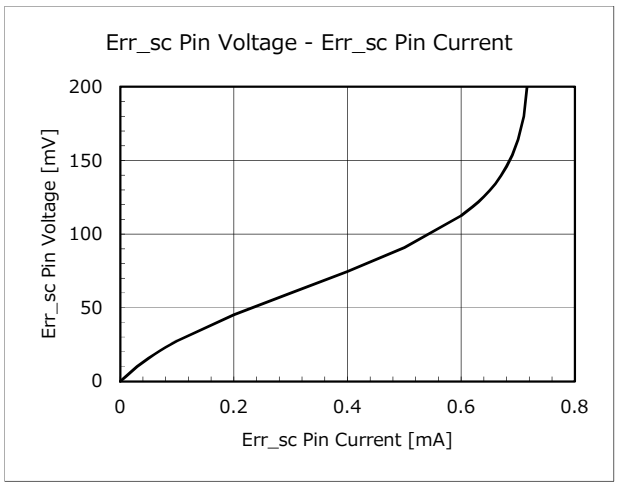






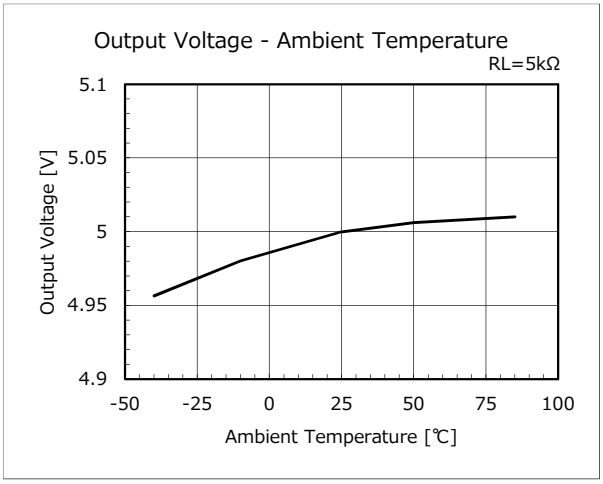


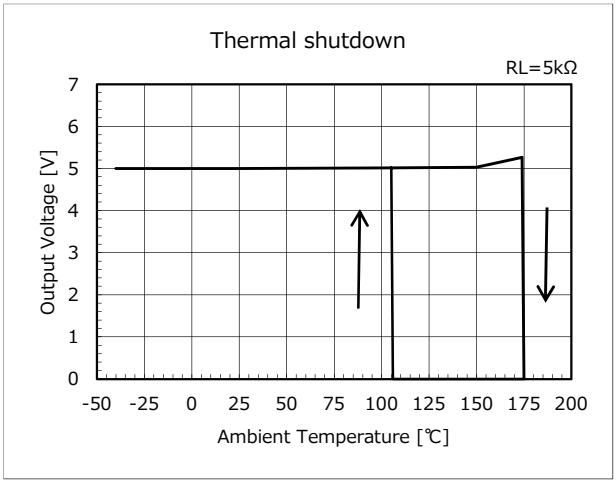


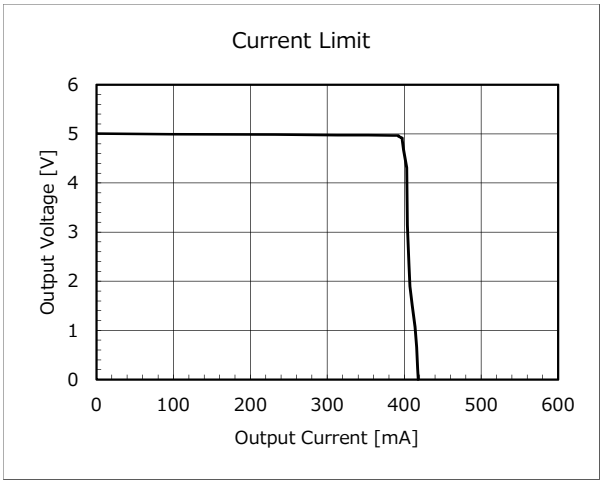


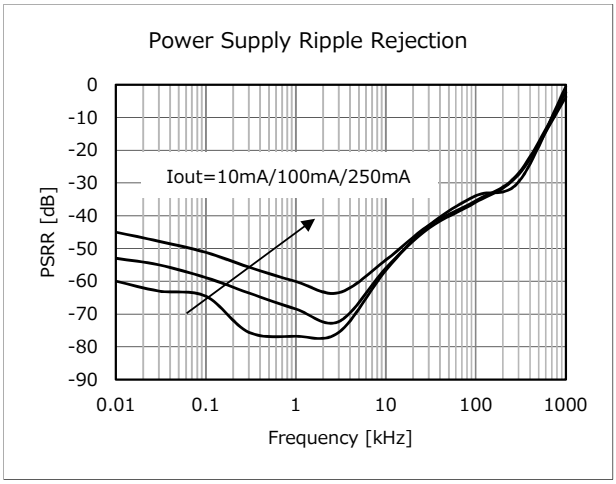
Typical Performance Characteristics (VOUT=5.0V/Function:A)

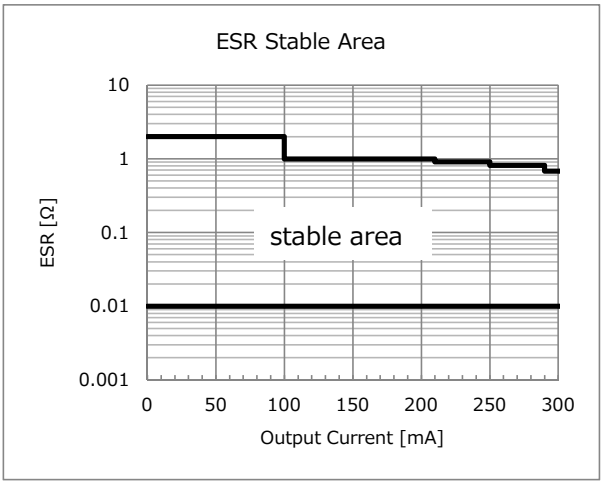
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

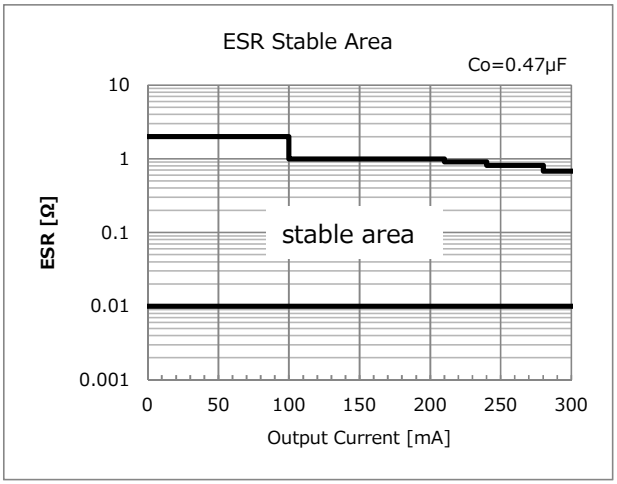










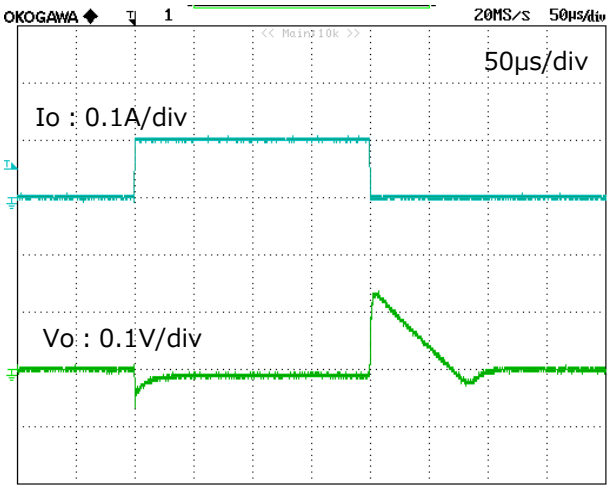


Typical Performance Characteristics (VOUT=5.0V/Function:A)

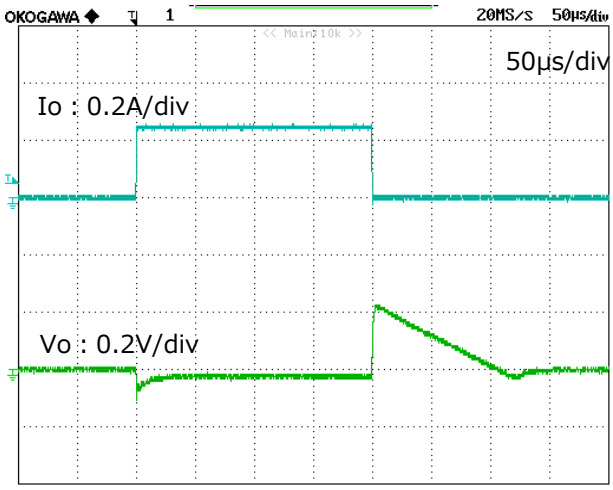
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

- Load transient response

Iout=1mA⇔100mA

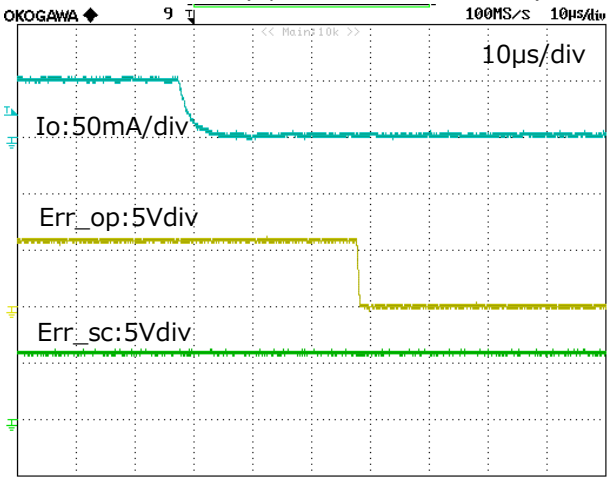


Iout=1mA⇔250mA



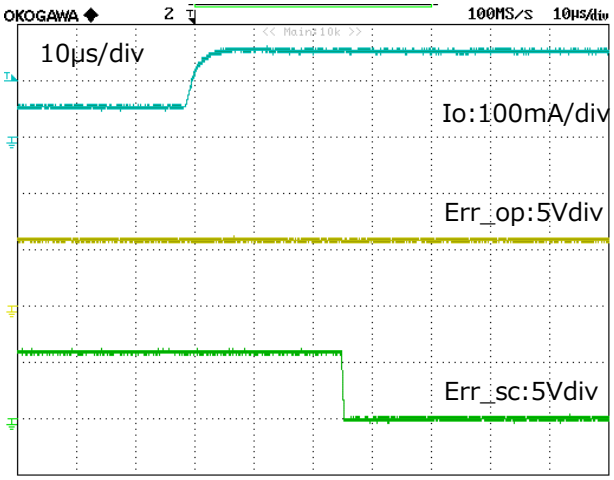
- Open Detect Wave Form

Iout=50mA→1mA(Open Dretct Current:5mA)



- Short Detect Wave Form

Iout=50mA→150mA(Short Detce Current 120mA)



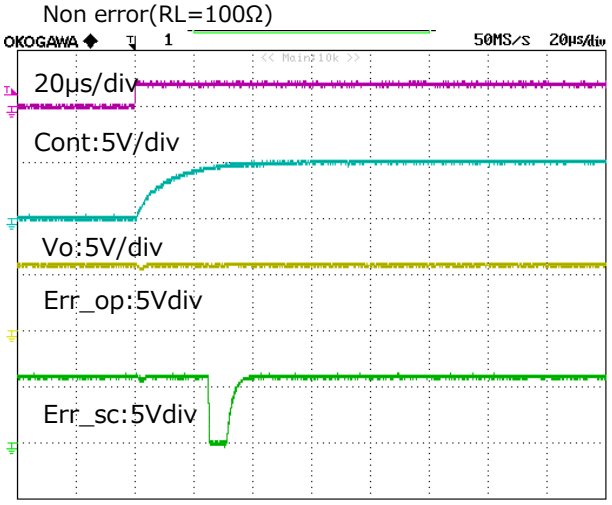
Typical Performance Characteristics (VOUT=5.0V/Function:A)

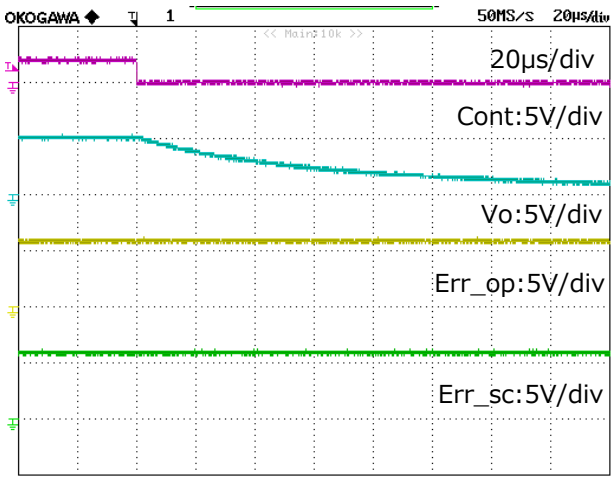
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

- Turn On/Off Transient Response

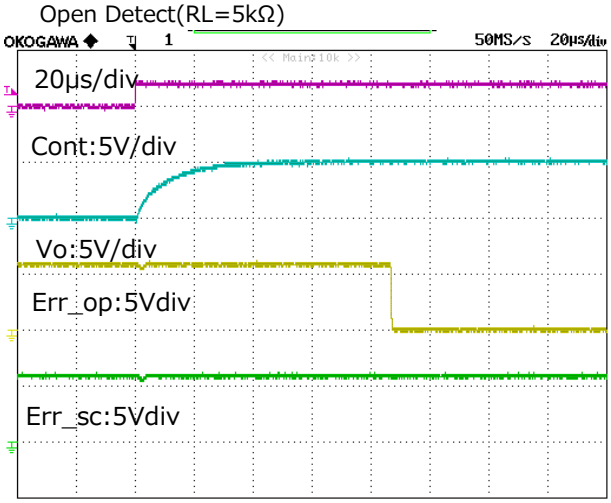
  Open Detect Current=5mA,Short Detect Current=120mA

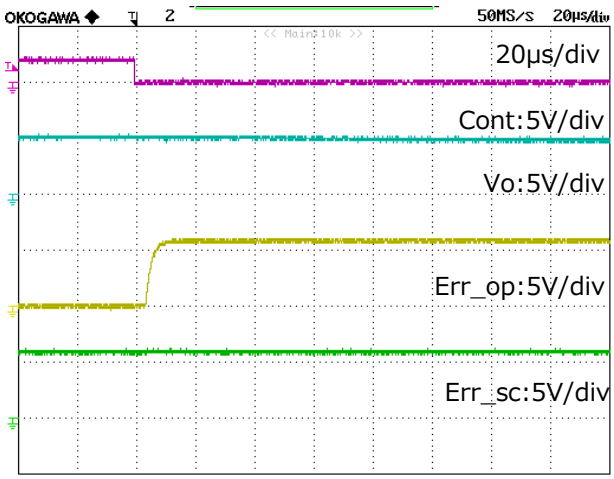
Non error(RL=100Ω)



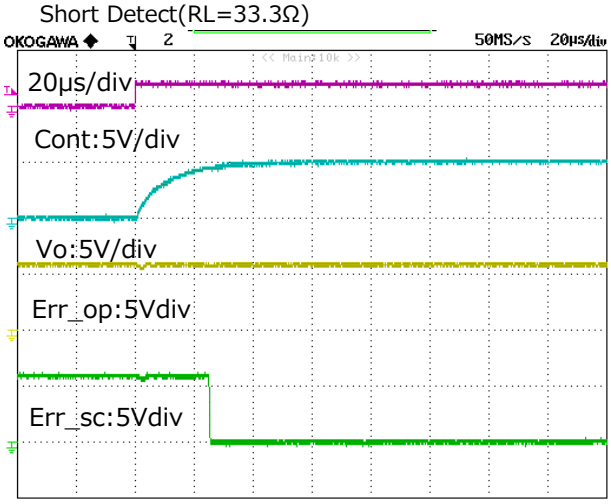


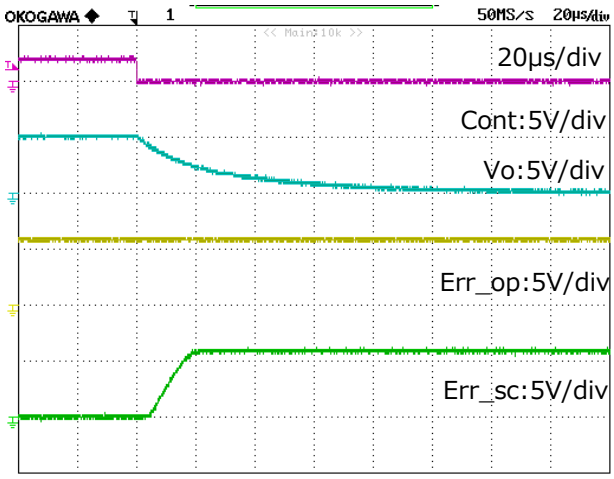
Open Detect(RL=5kΩ)





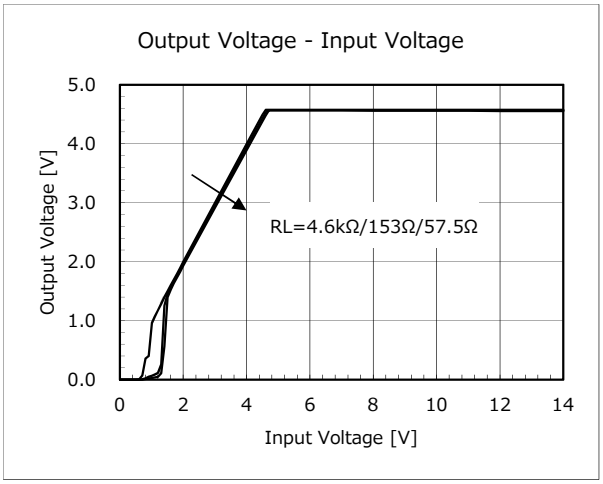
Short Detect(RL=33.3Ω)

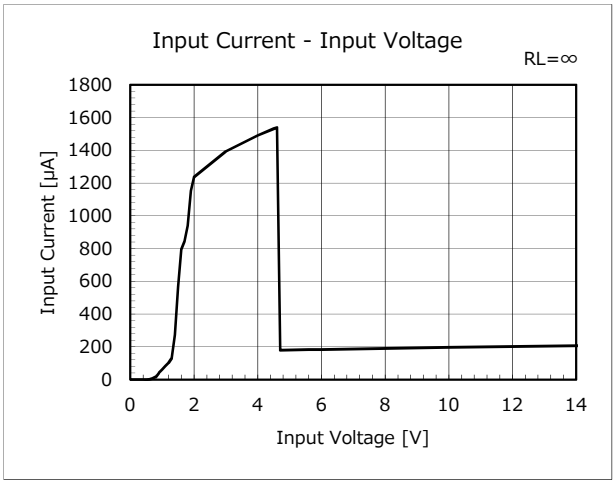


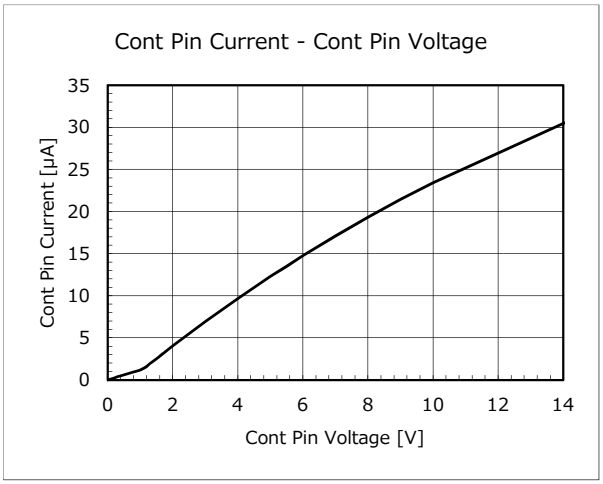


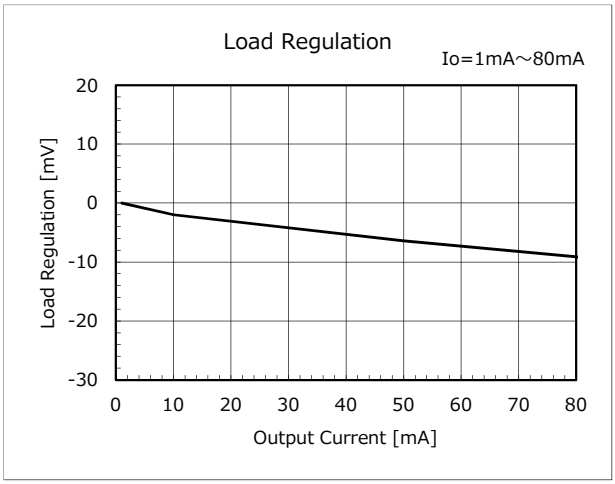
Typical Performance Characteristics (VOUT=4.6V/Function:C)

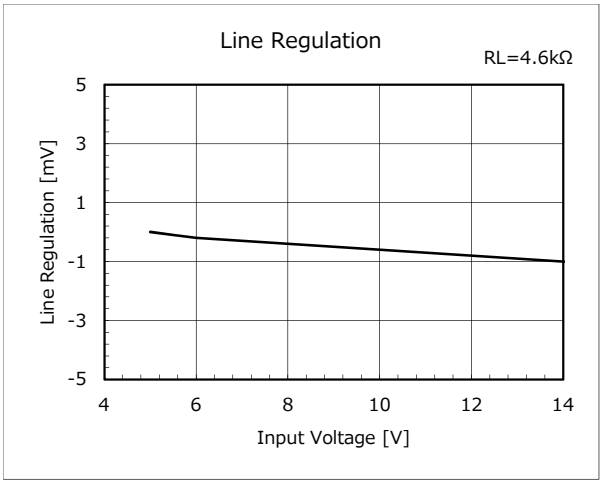
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

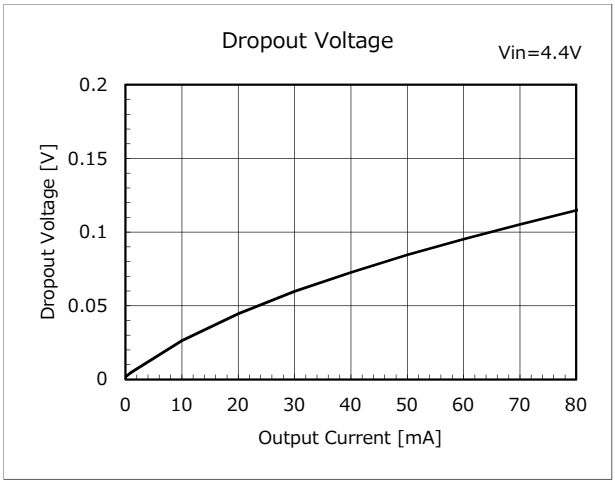






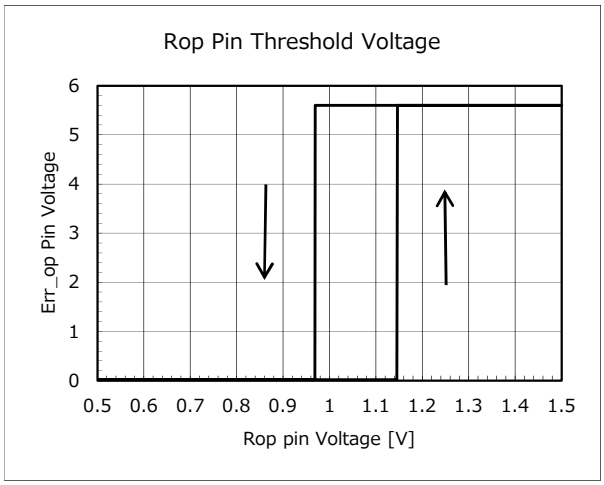


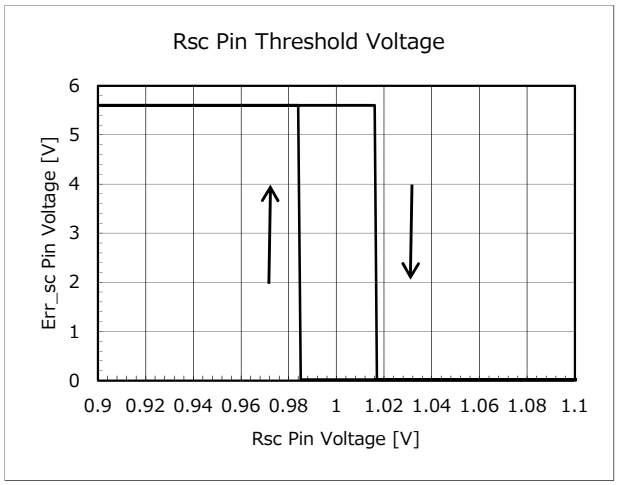


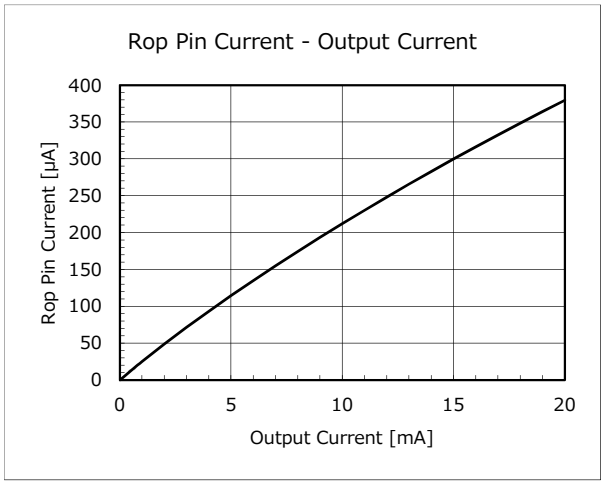


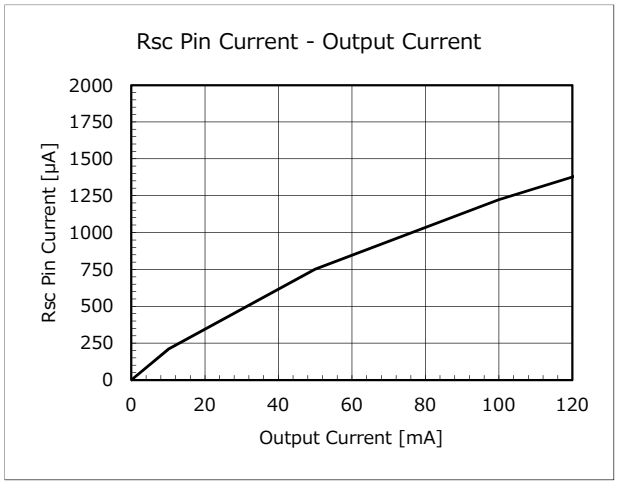
Typical Performance Characteristics (VOUT=4.6V/Function:C)

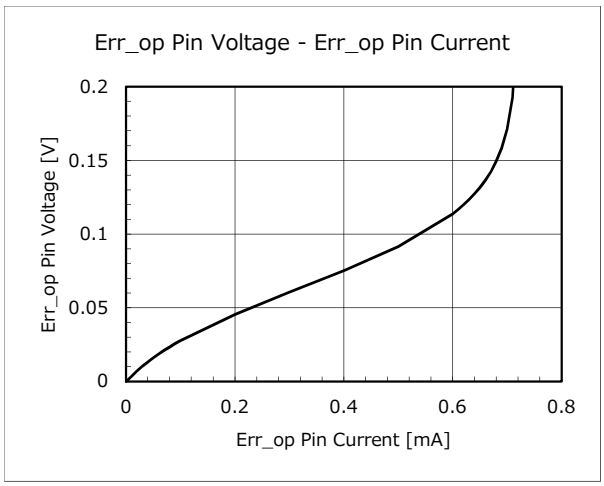
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

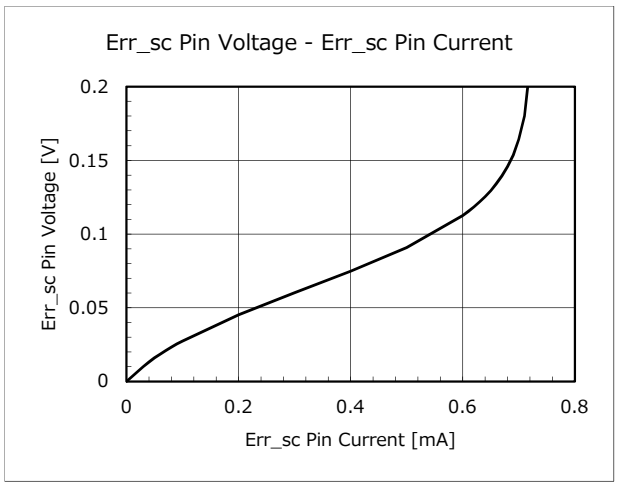








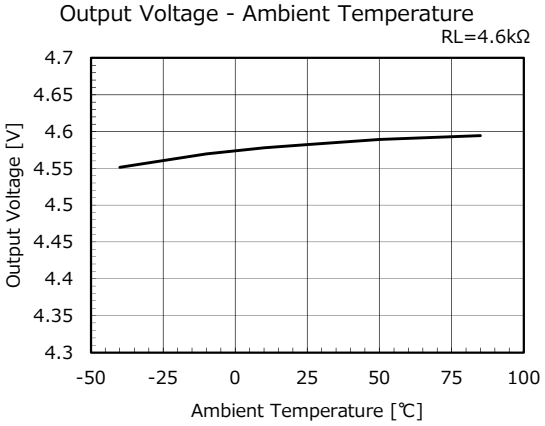




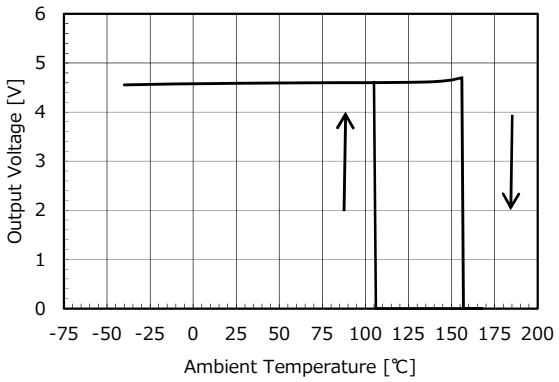
Typical Performance Characteristics (VOUT=4.6V/Function:C)

(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

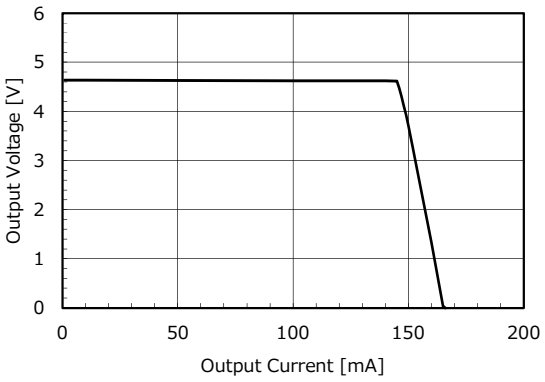
Output Voltage - Ambient Temperature



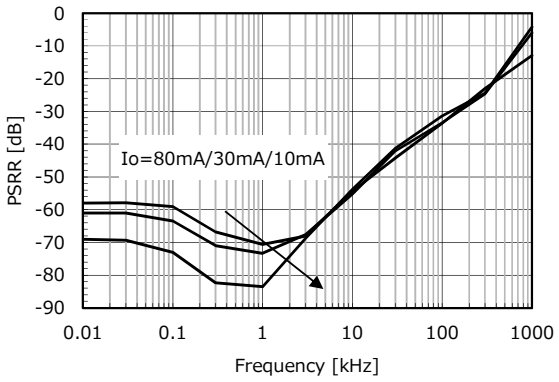
Thermal shutdown



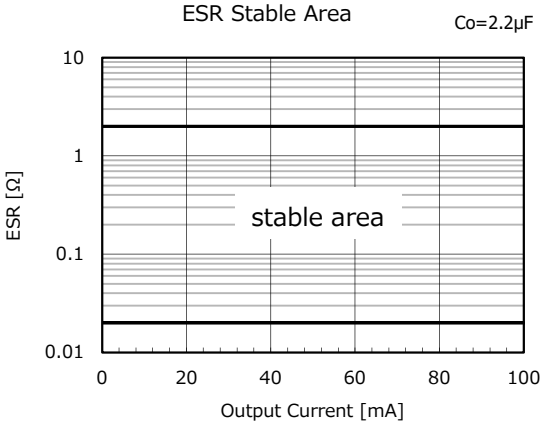
Current Limit



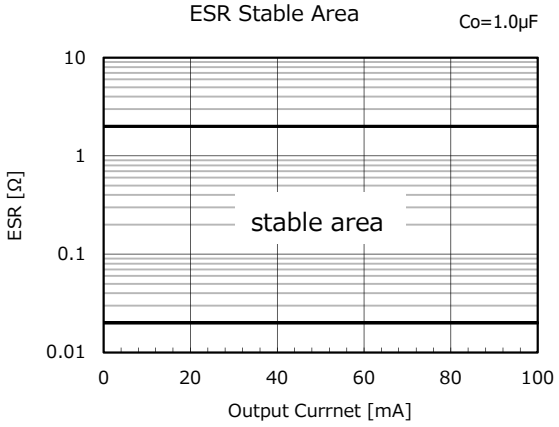
Power Supply Ripple Rejection



ESR Stable Area



ESR Stable Area

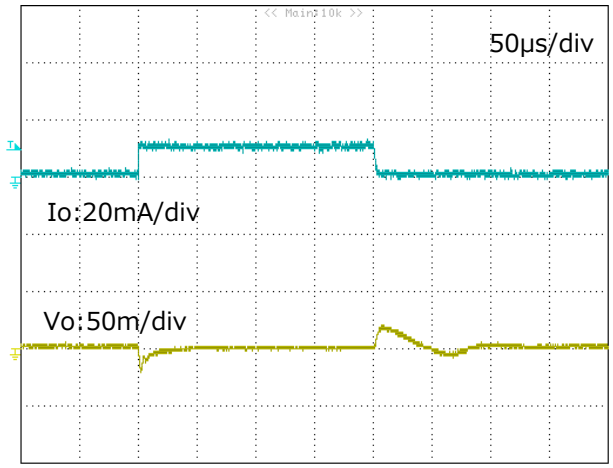


Typical Performance Characteristics (VOUT=4.6V/Function:C)

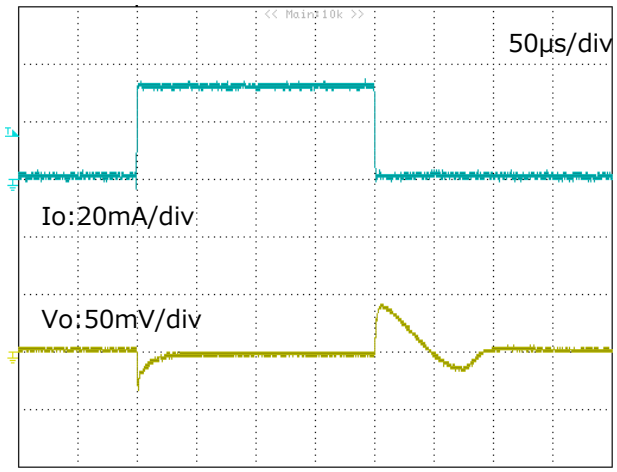
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

■ Load transient response

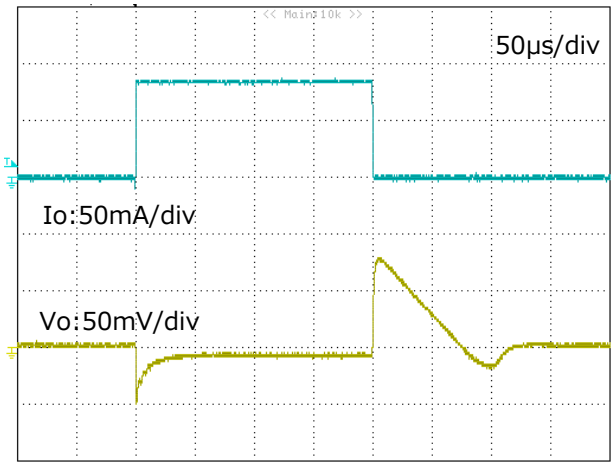
Iout=1mA⇔10mA



Iout=1mA⇔30mA

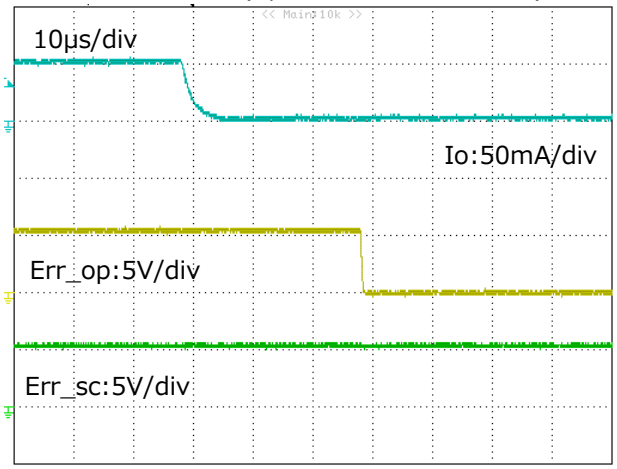


Iout=1mA⇔80mA



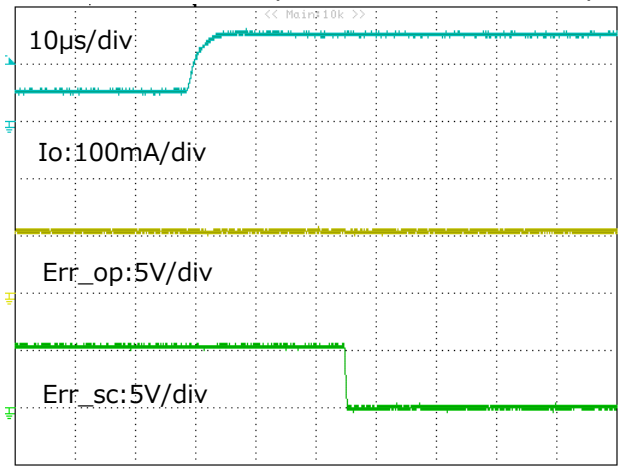
■ Open Detect Wave Form

Iout=50mA→1mA(Open Dretct Current:5mA)



■ Short Detect Wave Form

Iout=50mA→140mA(Short Detce Current 120mA)



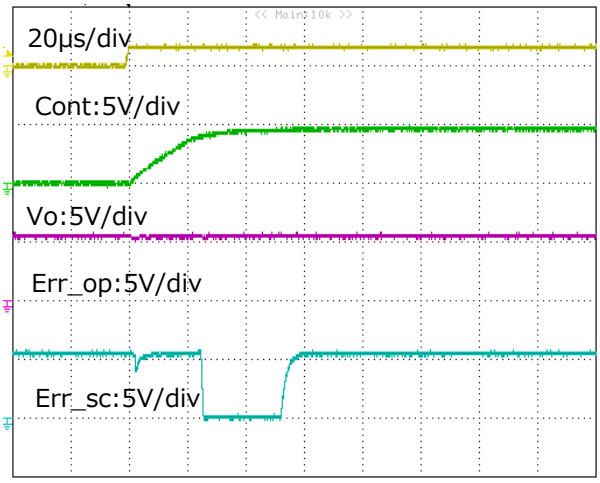
Typical Performance Characteristics (VOUT=4.6V/Function:C)

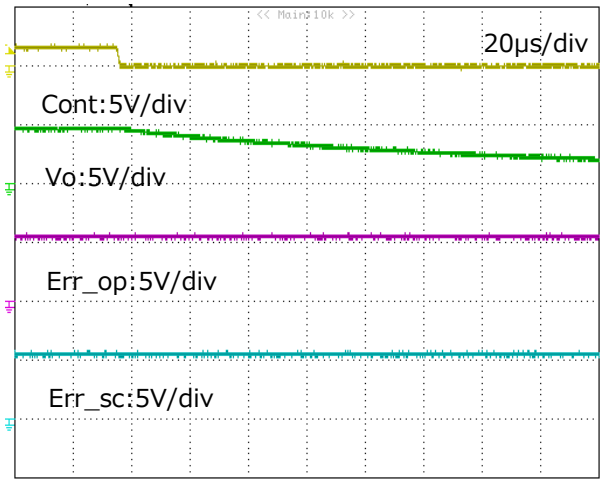
(VIN=VOUT(Typ.)+1V, Vcont=VIN, Ta=25℃ unless otherwise specified)

- Turn On/Off Transient Response

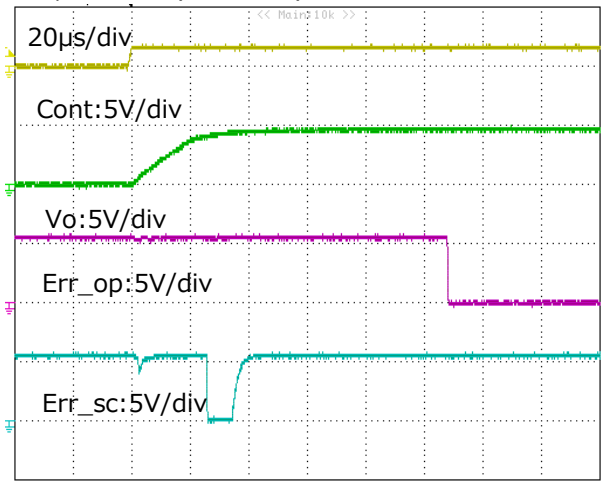
  Open Detect Current=5mA,Short Detect Current=80mA

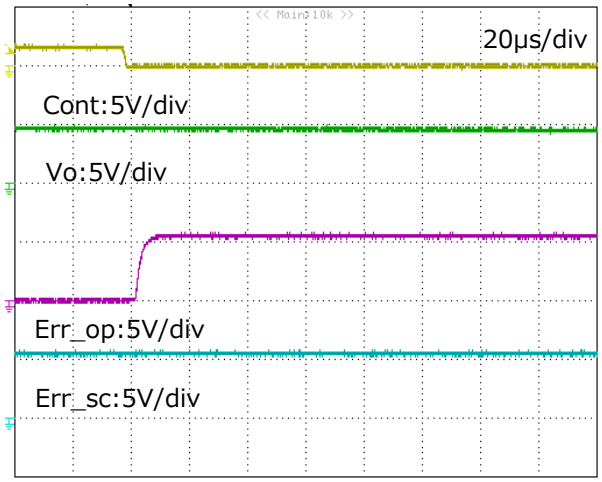
Non error (RL=92Ω)





Open Detect(RL=4.6kΩ)





Short Detect(RL=46Ω)