



1000mA LDO

MM1868 Series

Overview

This IC is a 1.0A LDO with a low saturation voltage.

This device is offered in the PKG TO-252C package featuring high heat dissipation and the small-sized PKG HSOP-8 package. It supports reduction of the implementation space.

It includes a thermal shutdown circuit in addition to an over-current protection circuit for protection, and contributes to the reliability improvement of the product.

Overview

- Over current protection
- Thermal shutdown
- Low output voltage
- Low dropout voltage

Main specifications

- Maximum rating supply voltage : -0.3V to 12V
- Operating voltage range : $V_{OUT}(Typ.)+0.25$ to 10V
- Operating ambient temperature : -40°C to 85°C
- Output current : 1.0A
- Input current (OFF) : Max. 1μA
- No-load input current : Typ. 1mA
- Output voltage range : 0.9V to 5V (0.1V step)
- Output voltage accuracy : ±2% ($V_{OUT} \geq 1.5V$)
±30mV ($V_{OUT} < 1.5V$)
- Line regulation : Typ.10mV ($V_{IN}=V_{OUT}(Typ.)+0.5V$ to $V_{OUT}(typ.)+1.5V$, $I_{OUT}=1mA$)
- Load regulation : Typ. 10mV ($I_{OUT}=0A$ to $1A$)
- Dropout voltage : Typ. 0.18V ($I_{OUT}=1A$)
- PSRR : Typ. 65dB ($f=1kHz$)
- Output capacitor : 1μF (Ceramic capacitor)
- Protection function : Over current protection, Thermal shutdown
- Additional function : ON/OFF control

Packages

- HSOP-8A
- TO-252C

Application

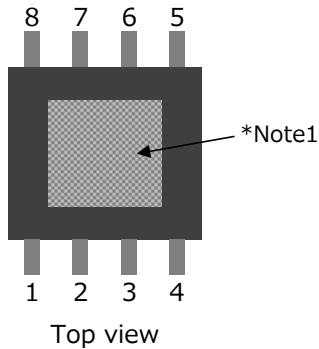
- Audio visual equipment
- Office equipment / Printer
- Home appliance equipment
- CPU Coer power supply





Pin Configuration

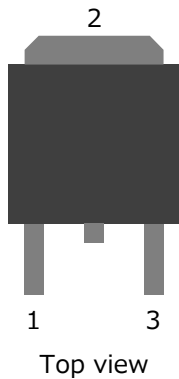
■ HSOP-8A



Pin No.	Pin name	Function
1	V _{OUT}	Output pin
2	NC	No connection
3	GND	GND pin
4	Cn	Noise reduction pin The capacitor is required to connect with input pin more than 1μF. The input pin must be connected by external.
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.

■ TO-252C



Pin No.	Pin name	Function
1	V _{IN}	Voltage supply pin
2	GND	GND pin
3	V _{OUT}	Output pin



Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	
Storage temperature	Tstg	-40	150	°C	
Junction temperature *Note2	T _{JMAX}	-	150	°C	
Supply voltage	V _{IN}	-0.3	12	V	
Cont input voltage	V _{cont}	-0.3	12	V	
Output Voltage	V _{OUT}	-0.3	V _{IN} +0.3	V	
Output current	I _{omax}	0	1.2	A	
Power Dissipation 1*Note3	HSOP-8A TO-252C	Pd1	-	1800	mW
			-	2500	mW
Power Dissipation 2*Note4	HSOP-8A TO-252C	Pd2	-	3500	mW
			-	4900	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
:PC Board of glass epoxy 150mm×100mm t=1.6mm Copper foil area 60% / TO-252C

*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	°C
Operating voltage *Note5	Vop	V _{out(Typ.)} +0.25	10	V
Output Current	Iop	0	1	A

*Note5: The Operating Voltage is (V_{OUT}+0.35V)~10V in the model less than V_{OUT}=1V.

Electrical Characteristics HSOP-8A

(Ta=25°C, V_{IN}=V_{OUT}+0.5V, V_{cont}=0.8V, I_{OUT}=1mA, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
No-Load Input Current	I _{CC}	I _{OUT} =0mA	-	1	2	mA
Input Current(OFF)	I _{CCOFF}	V _{CONT} =0V	-	0	1	μA
Output Voltage *Note6	V _{OUT}	I _{OUT} =1mA	×0.98	-	×1.02	V
Dropout Voltage *Note7	V _{IO}	V _{IN} =V _{OUT} -0.1V I _{OUT} =1A	-	0.18	0.25	V
Line Regulation	V _{LINE}	V _{IN} =V _{OUT} +0.5V to V _{OUT} +1.5V I _{OUT} =1mA	-	10	20	mV
Load Regulation *Note8	V _{LOAD}	I _{OUT} =0A to 1A	-	10	30	mV

*Note6: Please refer to another page.

*Note7: The parameter is not guaranteed in the model less than V_{out}=1.0V.

*Note8: The parameter is guaranteed by design.



Electrical Characteristics HSOP-8A

(Ta=25°C, VIN=VOUT+0.5V, Vcont=0.8V, IOUT=1mA, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
VOUT Temperature Coefficient *Note8	$\Delta V_{OUT} / \Delta T$	-40 ≤ Ta ≤ 85°C	-	±100	-	ppm/°C
Ripple Rejection *Note8	RR	f=1kHz, Vripple=0.5V IOUT=250mA	50	65	-	dB
Output Noise Voltage *Note8	Vn	fBW=20Hz to 80kHz, Cn=0.01μF fBW=20Hz to 80kHz, Cn=OPEN	-	60 150	-	μVrms
Cont Pin Input Current	Icont	Vcont=0.8V	-	0.3	0.6	μA
Cont Pin High Threshold Voltage	VcontH		0.8	-	10	V
Cont Pin Low Threshold Voltage	VcontL		-0.3	-	0.2	V

*Note8: The parameter is guaranteed by design.

Electrical Characteristics TO-252C

(Ta=25°C, VIN=VOUT+0.5V, IOUT=1mA, unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
No-Load Input Current	ICC	IOUT=0mA	-	1	2	mA
Output Voltage *Note6	VOUT	IOUT=1mA	×0.98	-	×1.02	V
Dropout Voltage *Note7	Vio	VIN=VOUT-0.1V IOUT=1A	-	0.18	0.25	V
Line Regulation	VLINE	VIN=VOUT+0.5V to VOUT+1.5V IOUT=1mA	-	10	20	mV
Load Regulation *Note8	VLOAD	IOUT=0A to 1A	-	10	30	mV
VOUT Temperature Coefficient *Note8	$\Delta V_{OUT} / \Delta T$	-40 ≤ Ta ≤ 85°C	-	±100	-	ppm/°C
Ripple Rejection *Note8	RR	f=1kHz, Vripple=0.5V IOUT=250mA	50	65	-	dB
Output Noise Voltage *Note8	Vn	fBW=20Hz to 80kHz, Cn=OPEN	-	150	-	μVrms

*Note6: Please refer to another page.

*Note7: The parameter is not guaranteed in the model less than Vout=1.0V.

*Note8: The parameter is guaranteed by design.



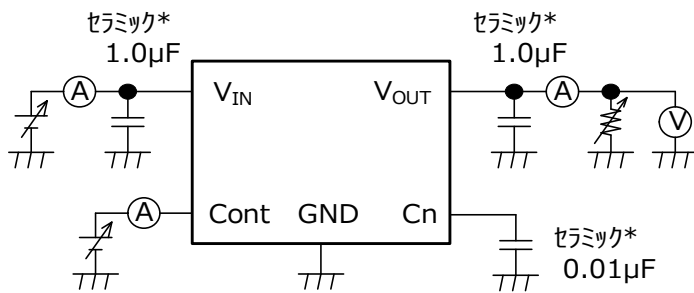
Electrical Characteristics

Model name	Item			
	Output voltage			
	V _{OUT} (V)			
	Conditions	Min.	Typ.	Max.
MM1868A09	V _{IN} =V _{OUT} +0.5V I _{OUT} =1mA	0.870	0.900	0.930
MM1868A10		0.970	1.000	1.030
MM1868A11		1.070	1.100	1.130
MM1868A12		1.170	1.200	1.230
MM1868A13		1.270	1.300	1.330
MM1868A14		1.370	1.400	1.430
MM1868A15		1.470	1.500	1.530
MM1868A16		1.568	1.600	1.632
MM1868A17		1.666	1.700	1.734
MM1868A18		1.764	1.800	1.836
MM1868A19		1.862	1.900	1.938
MM1868A20		1.960	2.000	2.040
MM1868A21		2.058	2.100	2.142
MM1868A22		2.156	2.200	2.244
MM1868A23		2.254	2.300	2.346
MM1868A24		2.352	2.400	2.448
MM1868A25		2.450	2.500	2.550
MM1868A26		2.548	2.600	2.652
MM1868A27		2.646	2.700	2.754
MM1868A28		2.744	2.800	2.856
MM1868A29		2.842	2.900	2.958
MM1868A30		2.940	3.000	3.060
MM1868A31		3.038	3.100	3.162
MM1868A32		3.136	3.200	3.264
MM1868A33		3.234	3.300	3.366
MM1868A34		3.332	3.400	3.468
MM1868A35		3.430	3.500	3.570
MM1868A36		3.528	3.600	3.672
MM1868A37		3.626	3.700	3.774
MM1868A38		3.724	3.800	3.876
MM1868A39	3.822	3.900	3.978	
MM1868A40	3.920	4.000	4.080	
MM1868A41	4.018	4.100	4.182	
MM1868A42	4.116	4.200	4.284	
MM1868A43	4.214	4.300	4.386	
MM1868A44	4.312	4.400	4.488	
MM1868A45	4.410	4.500	4.590	
MM1868A46	4.508	4.600	4.692	
MM1868A47	4.606	4.700	4.794	
MM1868A48	4.704	4.800	4.896	
MM1868A49	4.802	4.900	4.998	
MM1868A50	4.900	5.000	5.100	

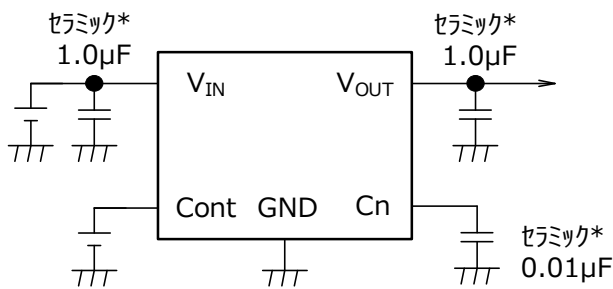




Test Circuit



Application Circuit



(Example of external parts)

- Output capacitor Ceramic capacitor $1.0\mu\text{F}$
- Input Capacitor Ceramic capacitor $1.0\mu\text{F}$
- Cn Capacitor Ceramic capacitor $0.01\mu\text{F}$

*Temperature characteristics : B

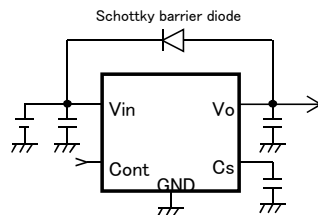
- In the event a problem which may affect industrial property or any other rights of us or a third party is encountered during the use of information described in these circuit, we shall not be liable for any such problem, nor grant a license therefore.





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 1.0 μ F and B temperature characteristics.
6. It is likely to oscillate when the output capacity is larger than the input capacitance.
Please evaluate IC in the set.
7. The wire of Vin and GND is required to print full ground plane for noise and stability.
8. The input capacitor must be connected a distance of less than 1cm from input pin.
9. 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.
10. The overcurrent protection circuit of the fold back type is built into this IC.
11. 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.



12. 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.
13. 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.



About Power Dissipation

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.

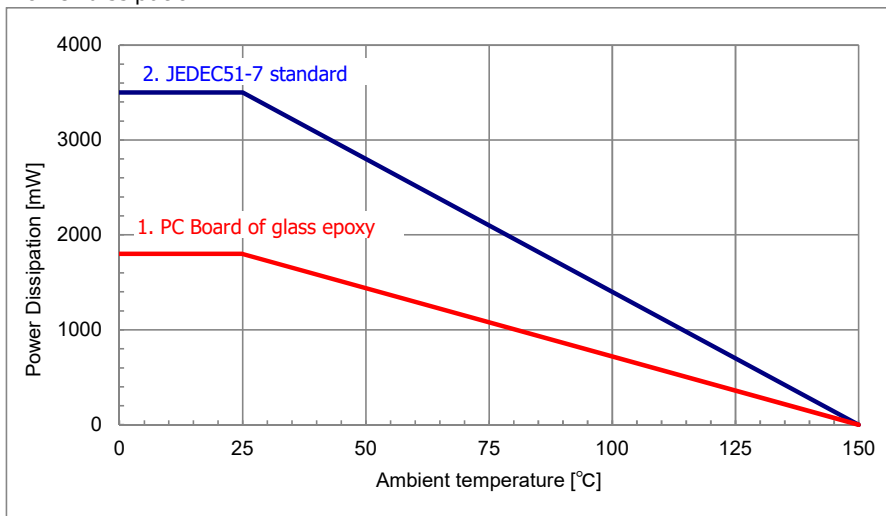
■ HSOP-8A

1. PC Board of glass epoxy

Board size 37mm×37mm t=1.6mm Copper foil area 80%
 Power dissipation 1800mW Ta=25°C

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°C



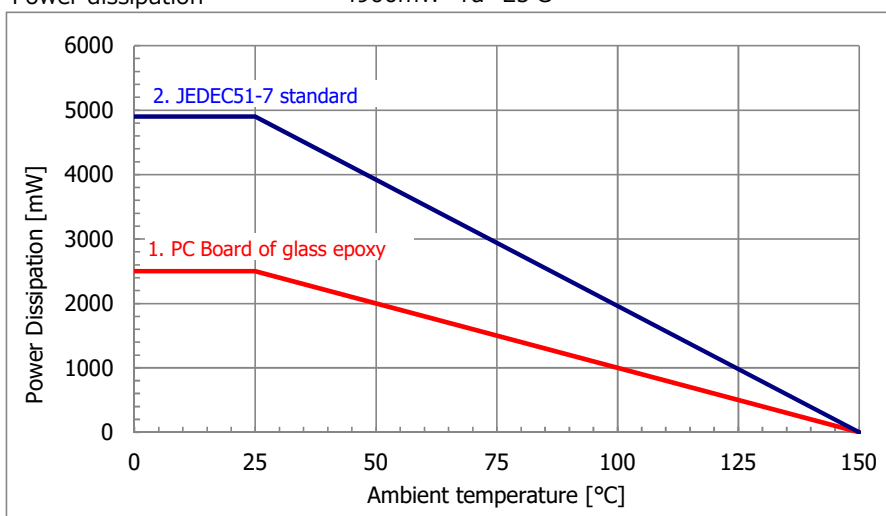
■ TO-252C

1. PC Board of glass epoxy

Board size 150mm×100mm t=1.0mm Copper foil area 80%
 Power dissipation 2500mW Ta=25°C

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

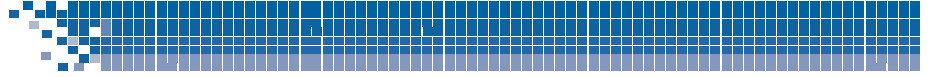
Board size 114.3mm×76.2mm t=1.6mm Copper foil area 80%
 Power dissipation 4900mW Ta=25°C



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 multi-layer substrate).

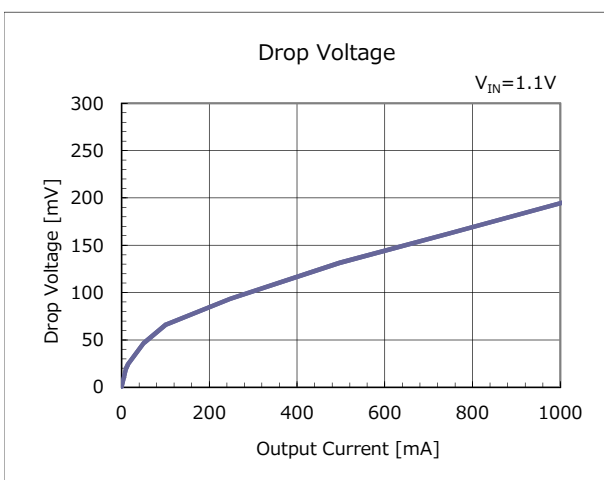
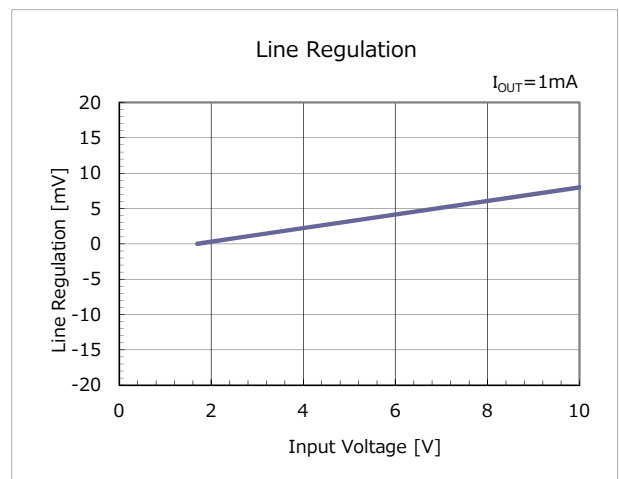
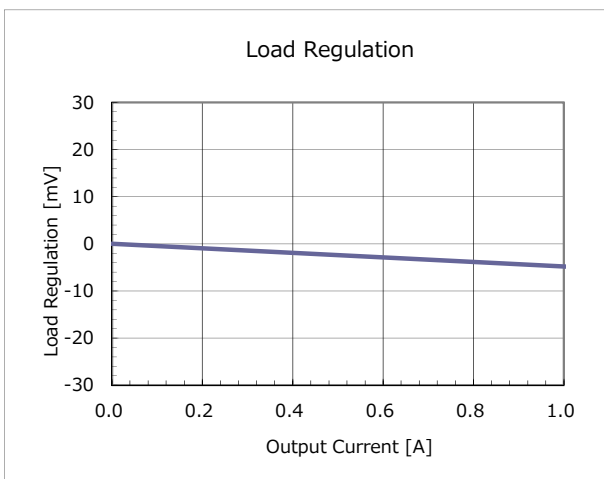
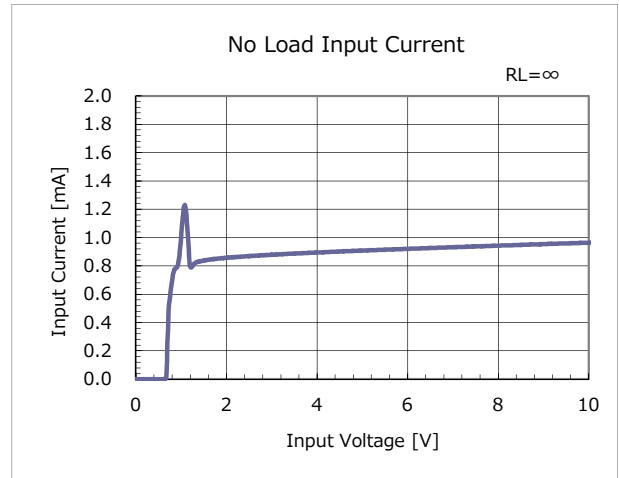
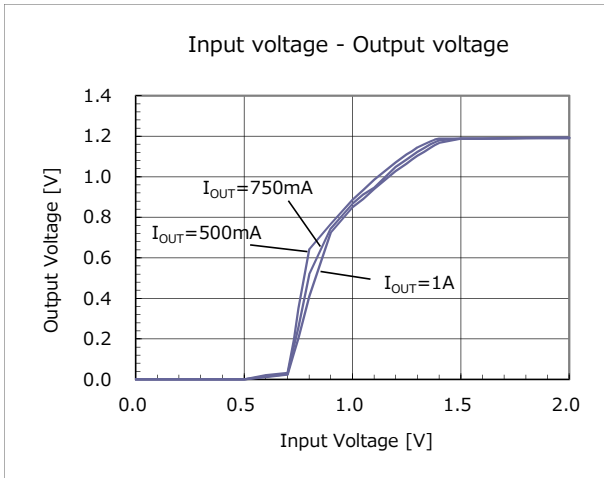
By increasing these copper foil pattern area of PCB, Power dissipation improves.

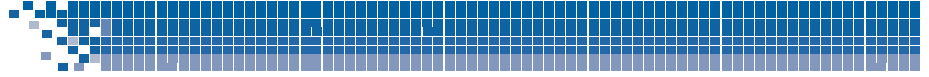




Typical Performance Characteristics ($V_{OUT}=1.2V$)

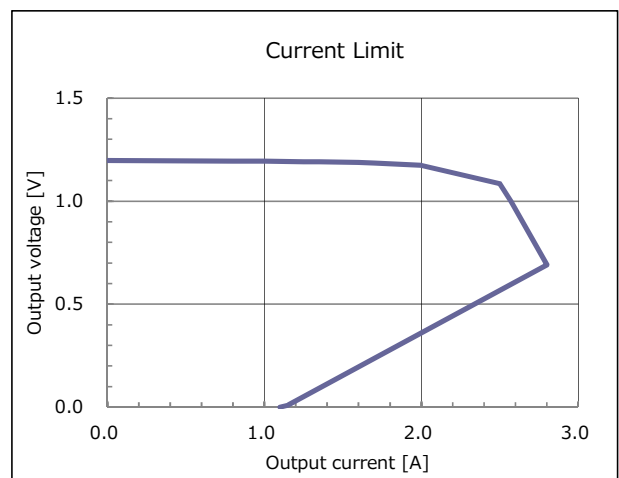
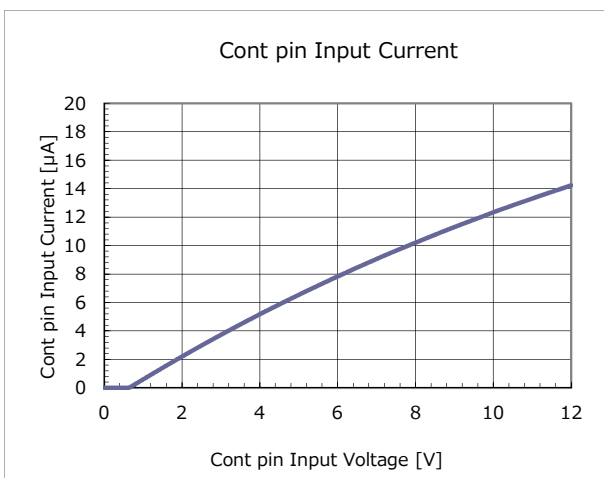
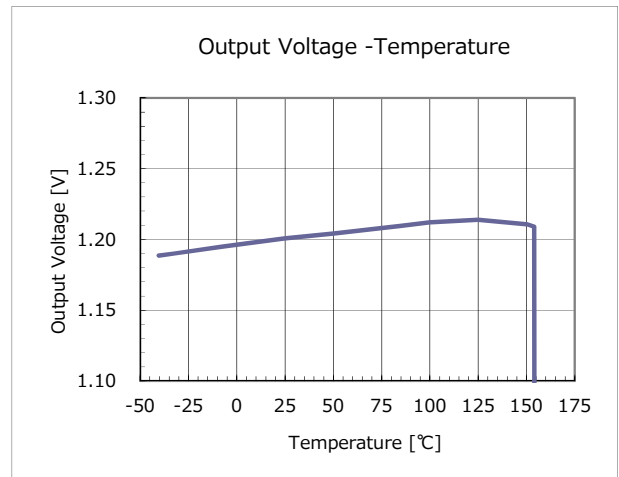
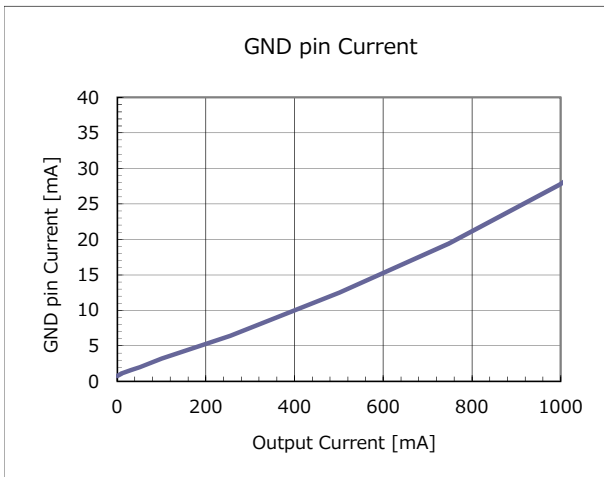
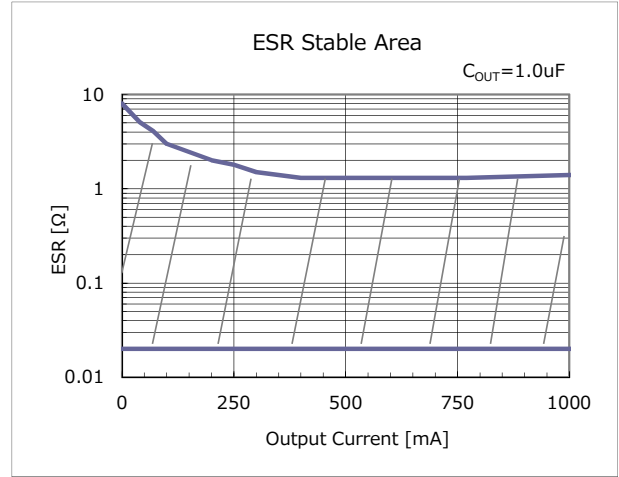
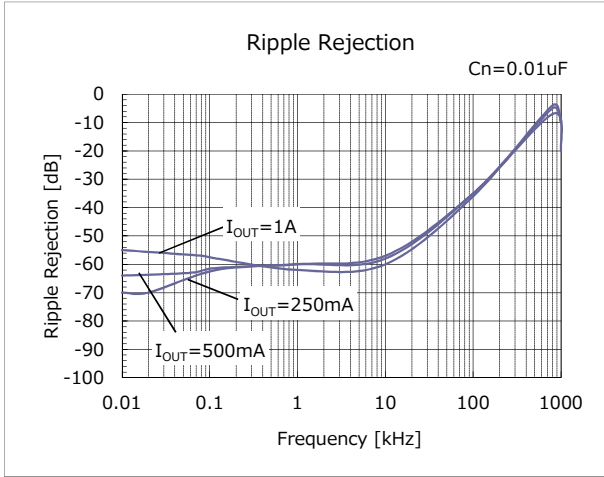
($T_a=25^\circ C$, $V_{IN}=V_{OUT}+0.5V$, $V_{cont}=0.8V$, $I_{OUT}=1mA$, unless otherwise specified)





Typical Performance Characteristics ($V_{OUT}=1.2V$)

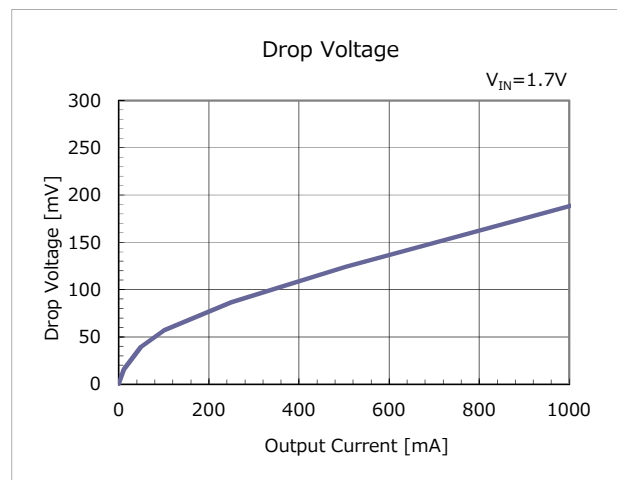
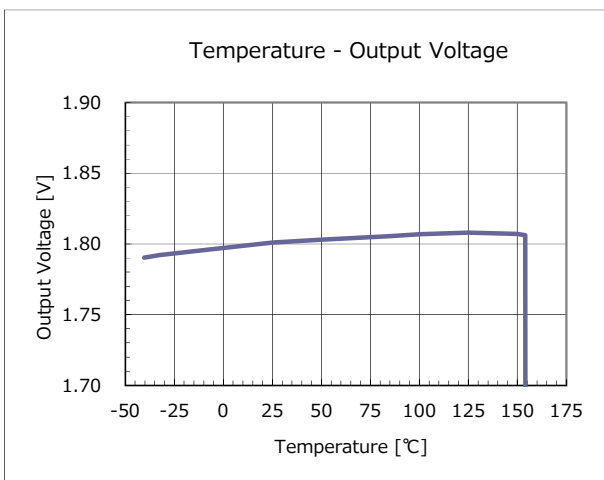
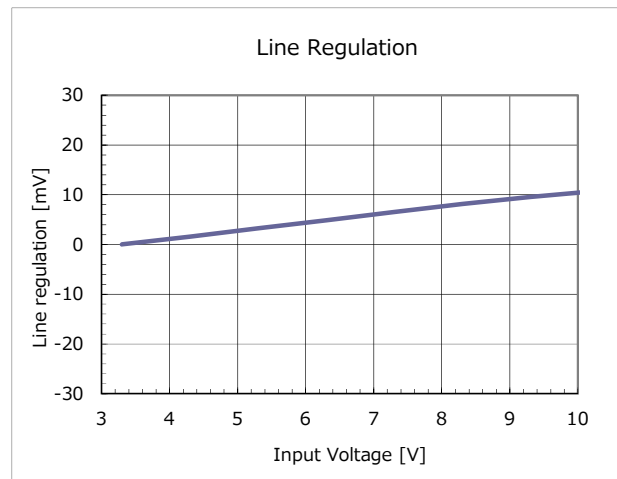
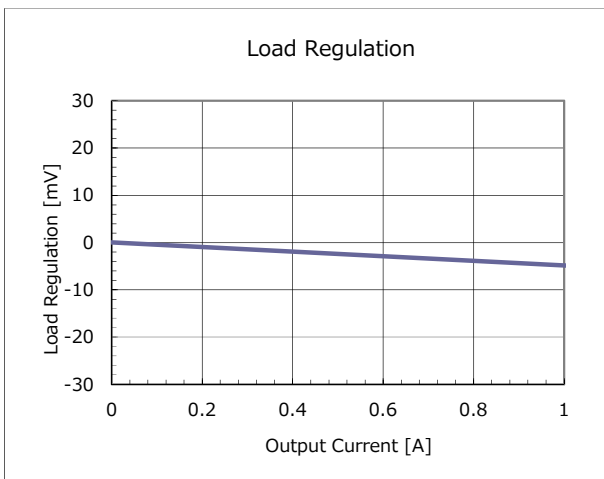
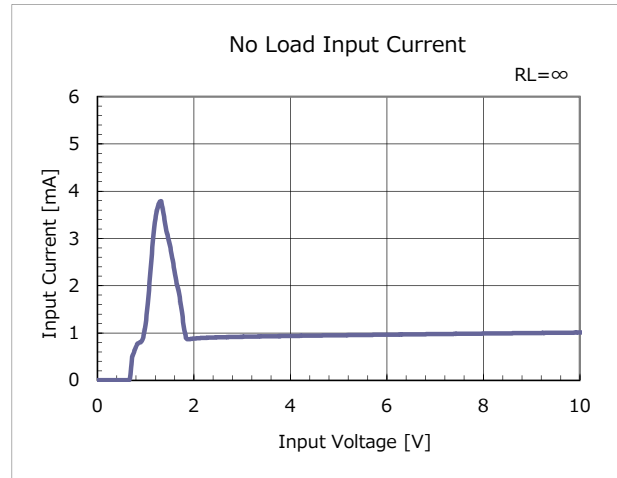
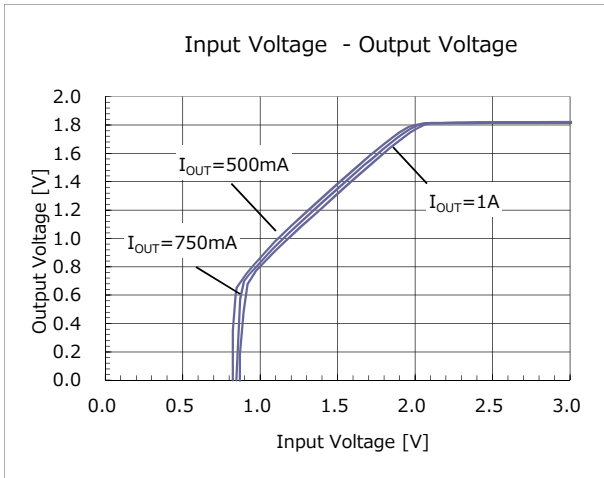
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Typical Performance Characteristics ($V_{OUT}=1.8V$)

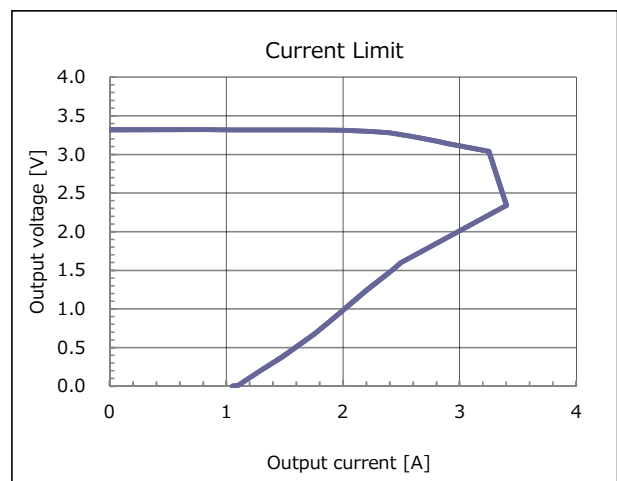
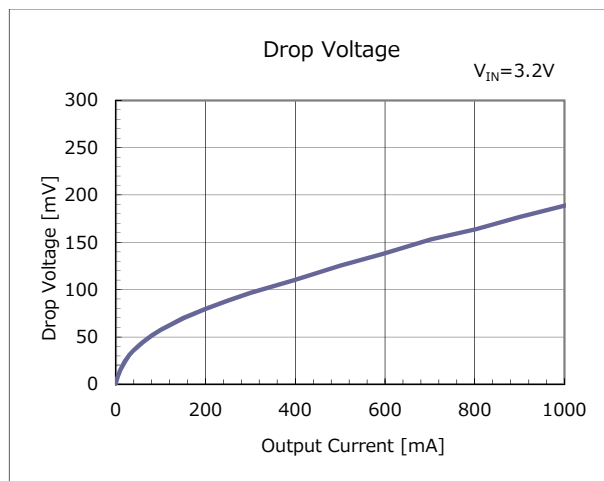
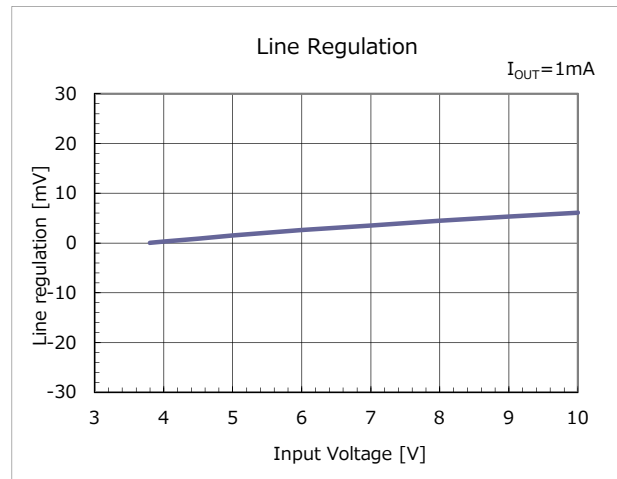
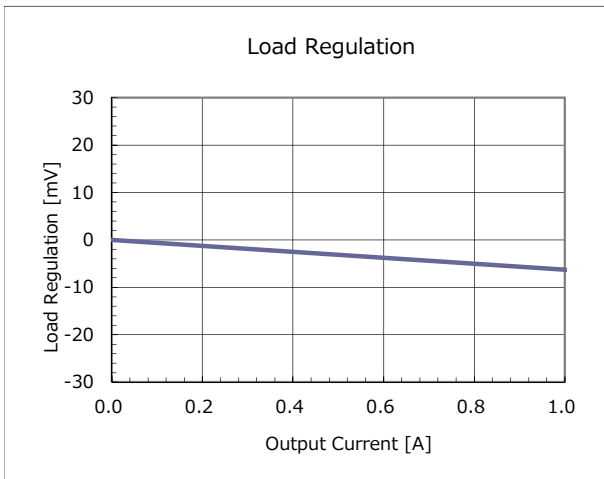
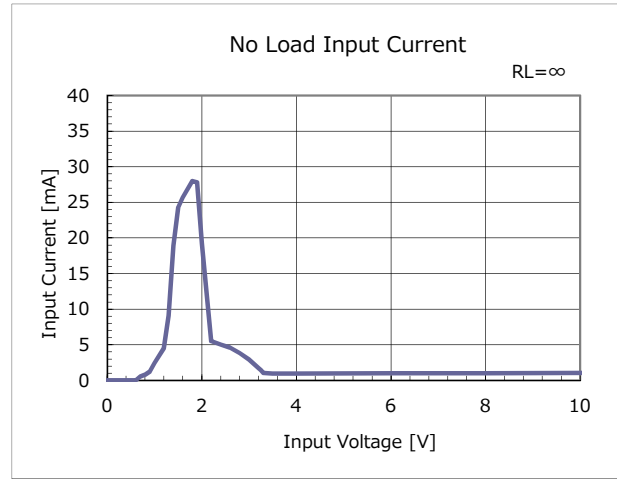
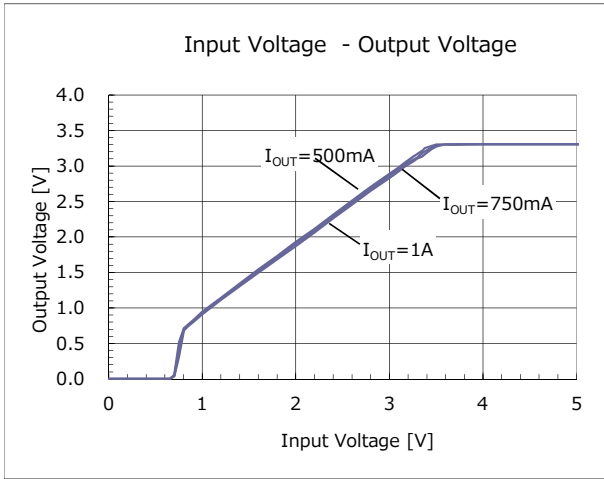
($T_a=25^\circ C$, $V_{IN}=V_{OUT}+0.5V$, $V_{cont}=0.8V$, $I_{OUT}=1mA$, unless otherwise specified)





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

($T_a=25^\circ C$, $V_{IN}=V_{OUT}+0.5V$, $V_{cont}=0.8V$, $I_{OUT}=1mA$, unless otherwise specified)





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

($T_a=25^{\circ}C$, $V_{IN}=V_{OUT}+0.5V$, $V_{cont}=0.8V$, $I_{OUT}=1mA$, unless otherwise specified)

