Low-Saturation voltage 300mA LDO
Monolithic IC MM334x Series

Outline

This IC is a 300mA LDO with an ultra-low saturation voltage.
This device features a 300 mA current capability and high-value ripple rejections of 70dB typ. for protection, it includes an over-current protection circuit and a thermal shutdown circuit.

Features

1. Supply Current	45μA typ. (No-load)
	0.1μA typ. (OFF)
2. Output Voltage Range	1.2V~5.0V
3. Output Voltage accuracy	V_{OUT}±2%
4. Dropout Voltage	0.16V (IO=300mA)
5. Line Regulation	0.02%/V
6. Load Regulation	50mV typ. (I_O=1~300mA)
7. Ripple rejection	70dB typ. (f=1kHz)
8. Thermal shutdown	
9. Dropout capacitor	1μF

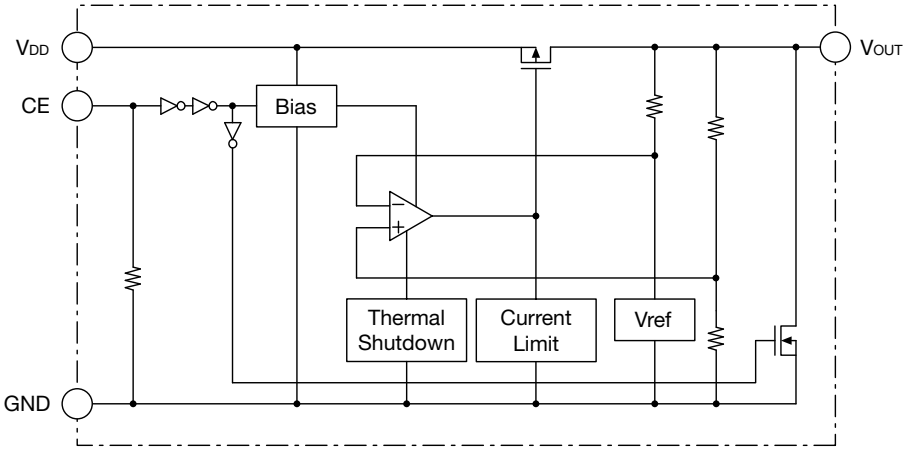
Package

SSON-6A
SOP-8D
SOT-25A

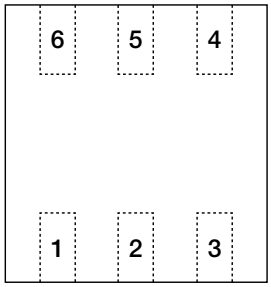
Applications

1. Mobile phones
2. Digital cameras
3. TVs
4. DVD·Blu-ray recorder

Block Diagram

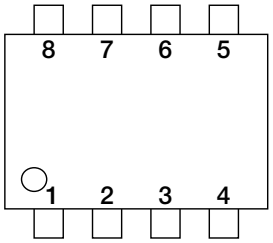


Pin Assignment



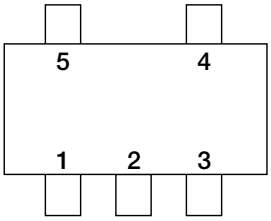
SSON-6A
(TOP VIEW)

1	VDD
2	NC
3	VOUT
4	NC
5	GND
6	CE



SOP-8D
(TOP VIEW)

1	VO
2	NC
3	GND
4	NC
5	CE
6	NC
7	NC
8	VDD



SOT-25A
(TOP VIEW)

1	VDD
2	GND
3	CE
4	NC
5	VOUT

Pin Description

SSON-6A

Pin No.	Pin name	Functions
1	V_{DD}	Voltage-supply pin
2,4	NC	No connection
3	V_{OUT}	Output pin
5	GND	GND pin
6	CE	ON/OFF-Control pin CE: Low = OFF, High = ON Connect CE pin with V_{DD} pin, when it is not used.

SOT-25A

Pin No.	Pin name	Functions
1	V_{DD}	Voltage-supply pin
2	GND	GND pin
3	CE	ON/OFF-Control pin CE: Low = OFF, High = ON Connect CE pin with V_{DD} pin, when it is not used.
4	NC	No connection
5	V_{OUT}	Output pin

SOP-8D

Pin No.	Pin name	Functions
1	V_{OUT}	Output pin
2,4	NC	No connection
3	GND	GND pin
5	CE	ON/OFF-Control pin CE: Low = OFF, High = ON Connect CE pin with V_{DD} pin, when it is not used.
6,7	NC	No connection
8	V_{DD}	Voltage-supply pin

Absolute Maximum Ratings (Except where noted otherwise Ta=25°C)

Item	Symbol	Ratings		Units
Storage Temperature	T_{STG}	−55~+150		°C
Supply Voltage	V_{DD}	6.5		V
CE input Voltage	V_{CE}	−0.3~V_{DD}+0.3		V
Output Voltage	V_{OUT}	−0.3~V_{DD}+0.3		V
Output Current	Iomax	350		mA
Power Dissipation	Pd	950(Note1)	SOP-8D	mW
		180(Note2)	SSON-6A	
		350(Note3)	SOT-25A	

Note1 : With the double sided PC Board of glass epoxy (Copper plane 80%, 192 × 142 × 1.2^{t}mm)

Note2 : With the double sided PC Board of glass epoxy (Copper plane 80%, 25 × 252 × 1.6^{t}mm)

Note3 : With the double sided PC Board of glass epoxy (Copper plane 60%, 25 × 25 × 1.6^{t}mm)

Recommended Operating Conditions (Except where noted otherwise Ta=25°C)

Item	Symbol	Ratings	Units
Operating Ambient Temperature	T_{JOP}	−40~85	°C
Operating Voltage	V_{OP}	2~6	V
Output Current	I_O	0~300	mA

Electrical Characteristics 1 (Except where noted otherwise $V_{DD}=V_{OUT}$(typ.)+1V, $V_{CE}=V_{DD}$, Ta=25°C)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Input Current(OFF)	I_{DD}off	V_{CE}=0V		0.1	1.0	µA
No-Load Input Current	I_{DD}	I_{OUT}=0mA		45	70	µA
Output Voltage	V_{OUT}	I_{OUT}=30mA	×0.98		×1.02	V
Line Regulation	V_{LINE}	V_{DD}=Vo(typ.)+0.5~6V, I_{OUT}=30mA (V_{OUT}≦1.6V, V_{DD}=2.2~6V)		0.02	0.10	%/V
Load Regulation	V_{LOAD}	1mA≦I_{OUT}≦300mA		50	120	mV
Dropout Voltage	Vio	Please refer to another page				V
Ripple Rejection 1 (Note4)	RR1	f=1kHz, Vripple=0.5V, I_{OUT}=30mA (V_{OUT}≦1.7V, V_{DD}=V_{OUT}+1.2V)		70		dB
Ripple Rejection 2 (Note4)	RR2	f=10kHz, Vripple=0.5V, I_{OUT}=30mA (V_{OUT}≦1.7V, V_{DD}=V_{OUT}+1.2V)		50		dB
V_{OUT} Temperature Coefficient (Note4)	$\Delta V_{OUT}/\Delta T$	I_{OUT}=30mA −40°C≦T_{OP}≦85°C		±100		ppm/°C
Output Noise Voltage (Note4)	Vn	f_{BW}=10~100kHz I_{OUT}=30mA		30		µVrms
Output Short-circuit Current (Note4)	Ilim	V_{OUT}=0V		40		mA
CE Pull-down Resistance	R_{pd}		0.7	2	8	MΩ
CE High Threshold Voltage	V_{CEH}		1.5		V_{DD}	V
CE Low Threshold Voltage	V_{CEL}		0		0.3	V
Output NMOS ON resistance	R_{DON}	V_{CE}=0V V_{DD}=4V(V_{OUT}<3V)		60		Ω

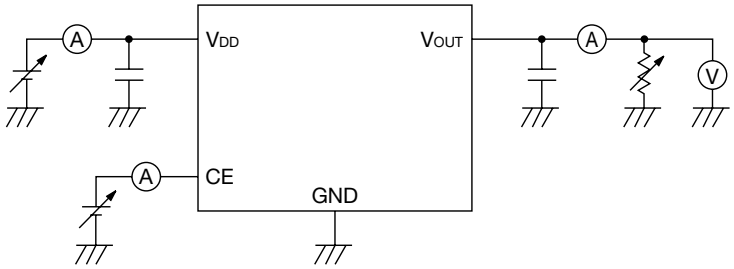
Note4 : The parameter is guaranteed by design.

Electrical Characteristics 2 (Except where noted otherwise $V_{DD}=V_O$(typ.)+1V, $V_{CE}=V_{DD}$, Ta=25°C)

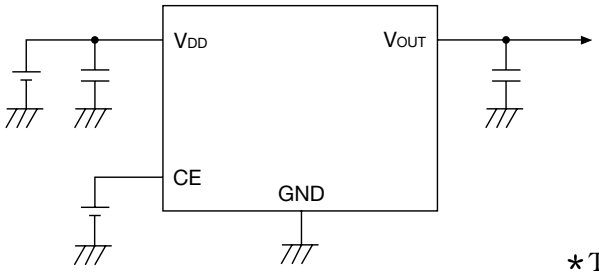
Output Voltage Vo1, Vo2	Item							
	Output Voltage				Dropout Voltage			
	Vo1, Vo2 (V)				Vio1, Vio2 (V)			
	Measurement Conditions	Min.	Typ.	Max.	Measurement Conditions	Min.	Typ.	Max.
1.2V	1mA≦Io≦30mA	1.170	1.200	1.230	SSON-6A(Note5) SOP-8D(Note6) SOT-25A(Note5)			
1.3V		1.270	1.300	1.330				
1.4V		1.370	1.400	1.430				
1.5V		1.470	1.500	1.530	Io=300mA		0.26	0.52
1.6V		1.568	1.600	1.632			0.24	0.46
1.7V		1.666	1.700	1.734			0.22	0.40
1.8V		1.764	1.800	1.836	1.8V≦Vo≦2.0V Io=300mA		0.20	0.30
1.9V		1.862	1.900	1.938				
2.0V		1.960	2.000	2.040				
2.1V		2.058	2.100	2.142	2.1V≦Vo≦2.7V Io=300mA		0.18	0.27
2.2V		2.156	2.200	2.244				
2.3V		2.254	2.300	2.346				
2.4V		2.352	2.400	2.448				
2.5V		2.450	2.500	2.550				
2.6V		2.548	2.600	2.652				
2.7V		2.646	2.700	2.754				
2.8V		2.744	2.800	2.856	2.5V≦Vo≦5.0V Io=300mA		0.16	0.23
2.9V		2.842	2.900	2.958				
3.0V		2.940	3.000	3.060				
3.1V		3.038	3.100	3.162				
3.2V		3.136	3.200	3.264				
3.3V		3.234	3.300	3.366				
3.4V		3.332	3.400	3.468				
3.5V		3.430	3.500	3.570				
3.6V		3.528	3.600	3.672				
3.7V		3.626	3.700	3.774				
3.8V		3.724	3.800	3.876				
3.9V		3.822	3.900	3.978				
4.0V		3.920	4.000	4.080				
4.1V		4.018	4.100	4.182				
4.2V		4.116	4.200	4.284				
4.3V		4.214	4.300	4.386				
4.4V		4.312	4.400	4.488				
4.5V		4.410	4.500	4.590				
4.6V		4.508	4.600	4.692				
4.7V		4.606	4.700	4.794				
4.8V		4.704	4.800	4.896				
4.9V		4.802	4.900	4.998				
5.0V		4.900	5.000	5.100				

Note5 : The parameter is not guaranteed in the model Vo=1.4V or less.
Note6 : The parameter is not guaranteed in the model less than Vo=1.4V.

Measuring Circuit



Application Circuit



∗ Temperature Characteristics : B

(Reference example of external parts)

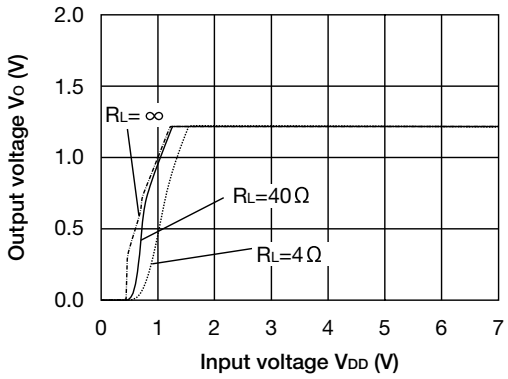
· Output capacitor	Ceramic capacitor 1μF
· Input capacitor	Ceramic capacitor 1μF

· Note

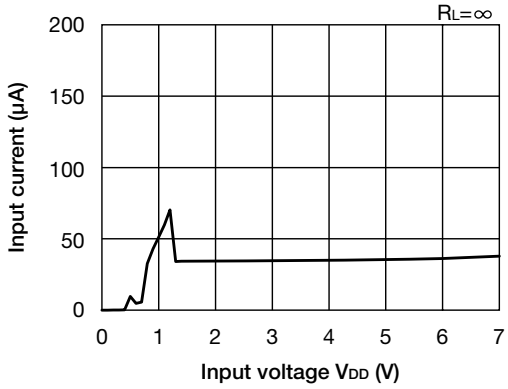
1. The output capacitor is required between output and GND to prevent oscillation.
2. The ESR of capacitor must be defined in ESR stability area.
   It is possible to use a ceramic capacitor without ESR resistance for output.
   The ceramic capacitor must be used more than 1.0μF or and B temperature characteristics.
3. The wire of V_{CC} and GND is required to print full ground plane for noise and stability.
4. The input capacitor must be connected a distance of less than 1cm from input pin.
5. In case the output voltage is above the input voltage, the overcurrent flow by internal parastic diode from output to input.

Characteristics (Vo=1.2V) (Except where noted otherwise V_{DD}=V_{OUT} (typ.) +1V, V_{CE}=V_{DD}, Ta=25°C)

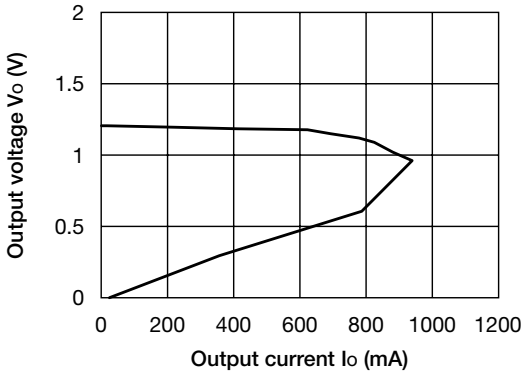
Output – Input voltage



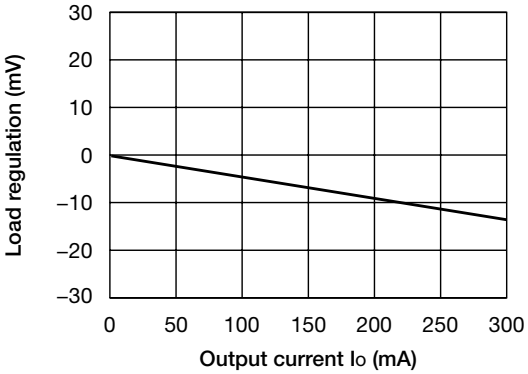
Input current - Input voltage



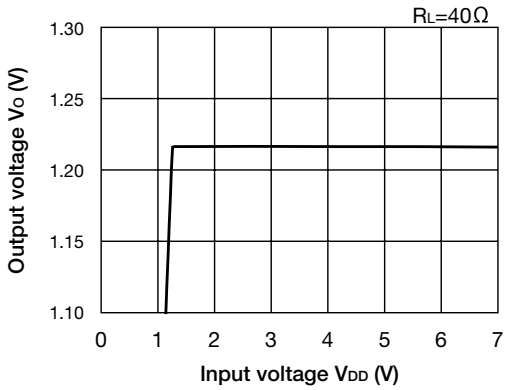
Output voltage - Output current



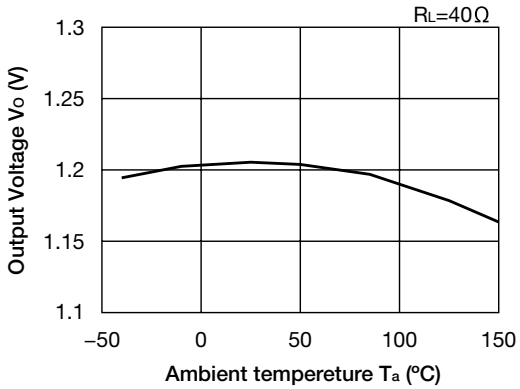
Load regulation



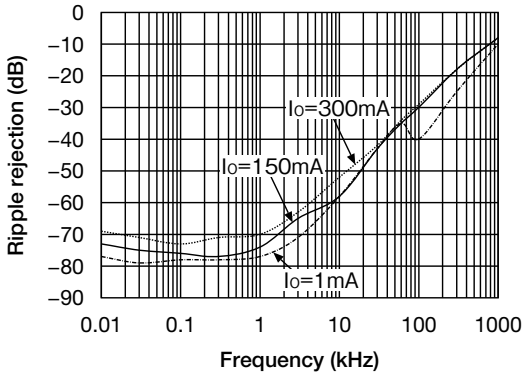
Line regulation



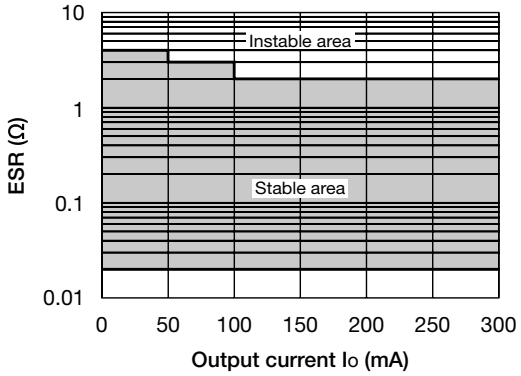
Output voltage - Ambient tempereture



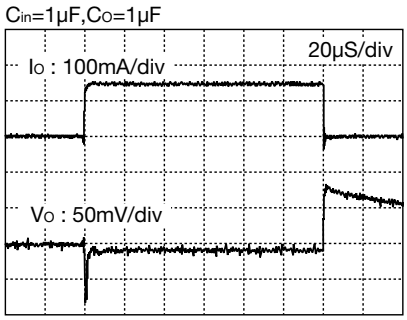
Ripple Rejection



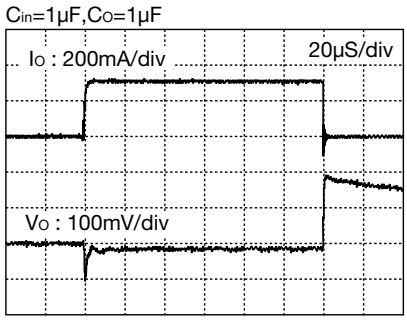
ESR Stable area

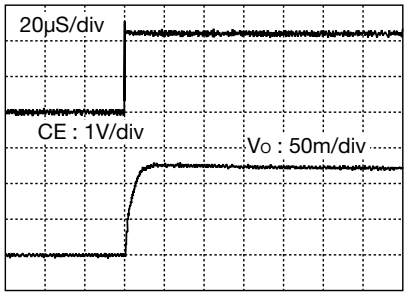


Load transient response (Io=1→150mA)



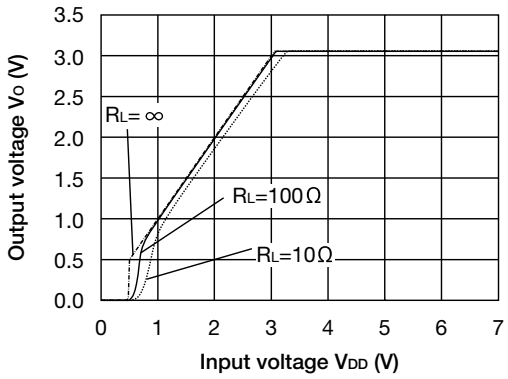
Load transient response (Io=1→300mA)



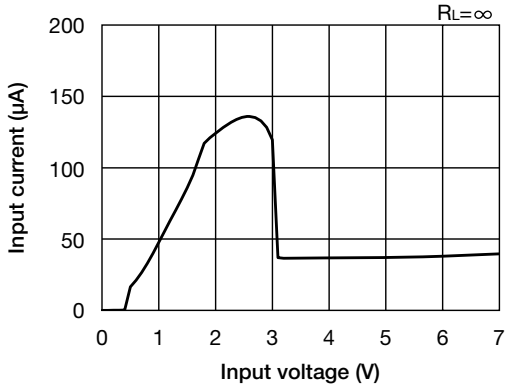


Characteristics (Vo=3.0V) (Except where noted otherwise V_{DD}=V_{OUT} (typ.) +1V, V_{CE}=V_{DD}, Ta=25°C)

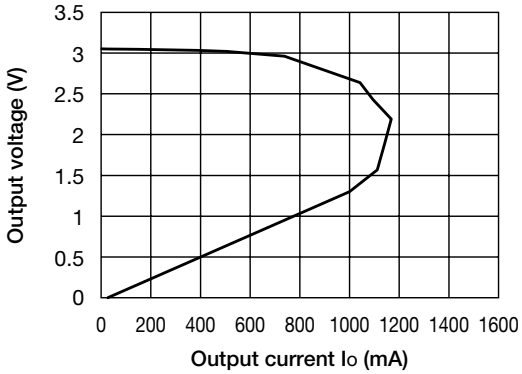
Output – Input voltage



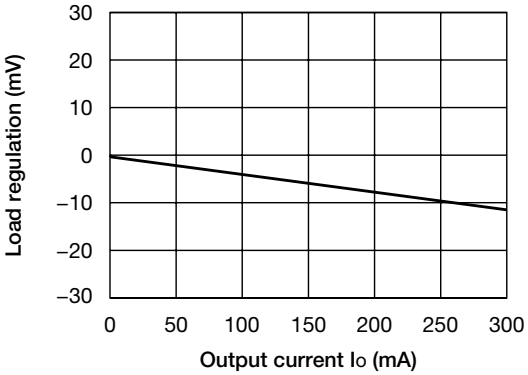
Input current - Input voltage



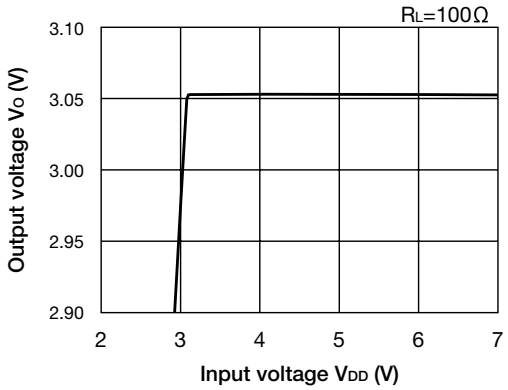
Output voltage - Output current



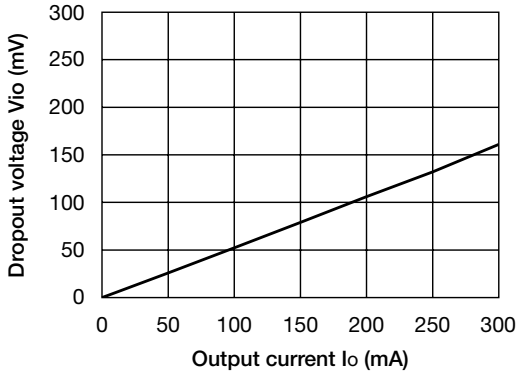
Load regulation



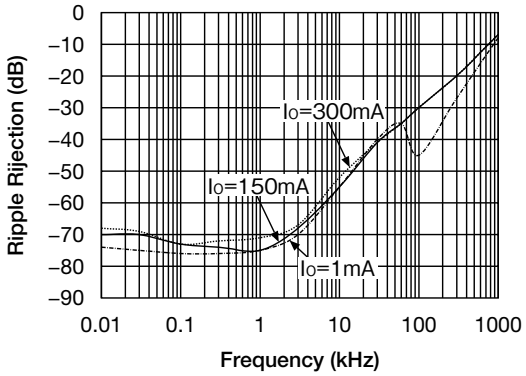
Line regulation



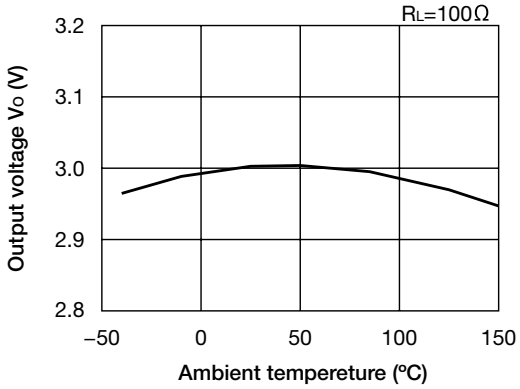
Dropout voltage



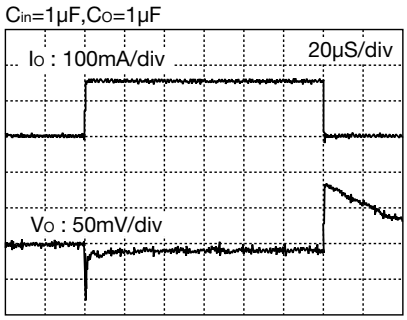
Ripple Rejection



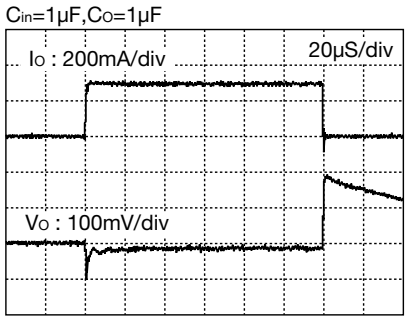
Output voltage - Ambient tempereture



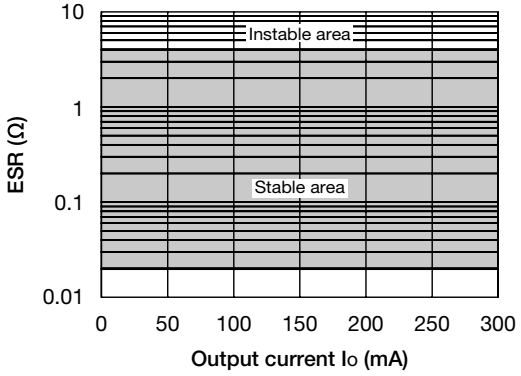
Load transient response (Io=1→150mA)

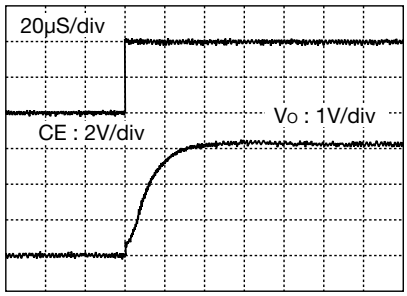


Load transient response (Io=1→300mA)



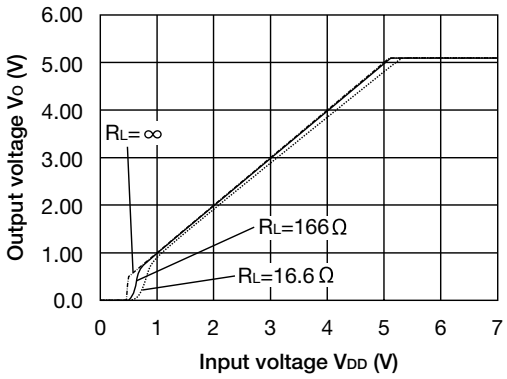
ESR Stable area



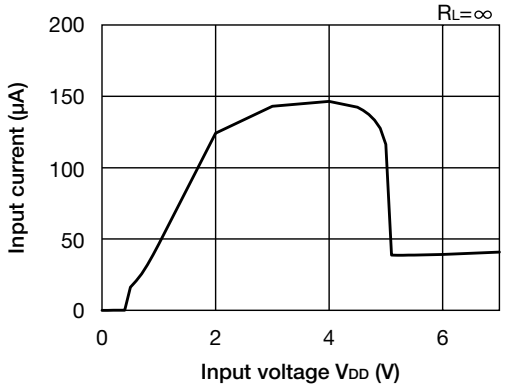


Characteristics (Vo=5.0V) (Except where noted otherwise $V_{DD}=V_{OUT}$ (typ.) +1V, $V_{CE}=V_{DD}$, Ta=25°C)

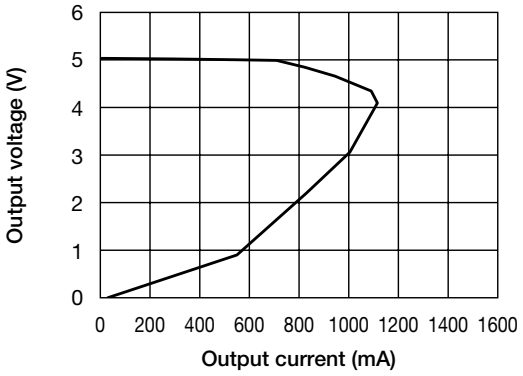
Output – Input voltage



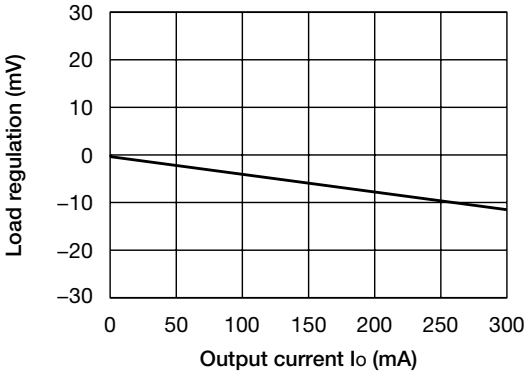
Input current - Input voltage



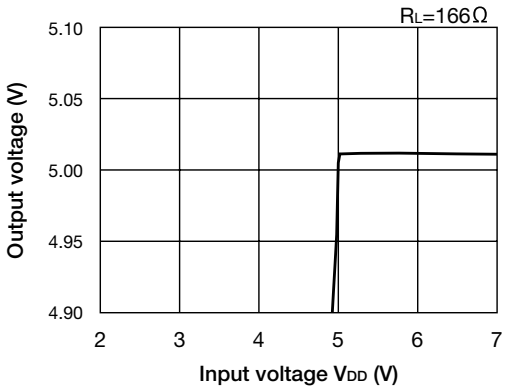
Output voltage - Output current



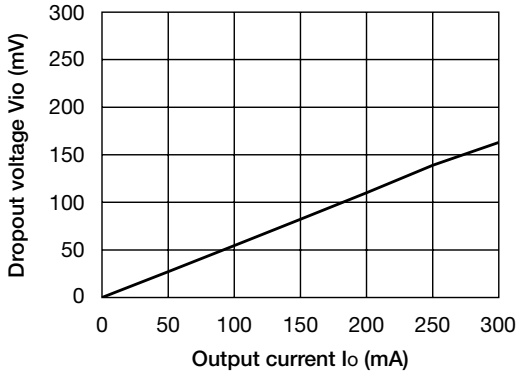
Load regulation



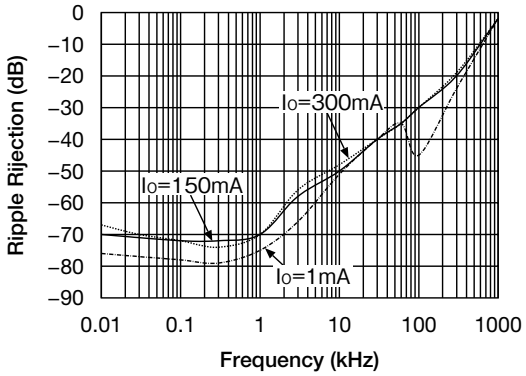
Line regulation



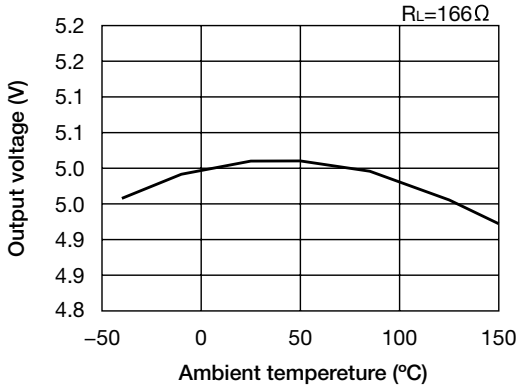
Dropout voltage



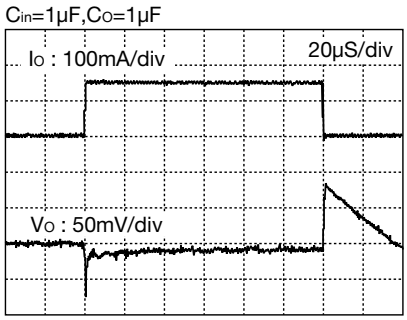
Ripple Rejection



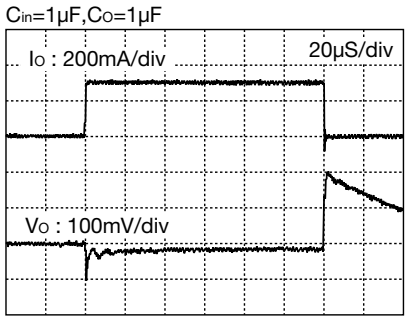
Output voltage - Ambient tempereture



Load transient response (Io=1→150mA)



Load transient response (Io=1→300mA)



ESR Stable area