150mA LDO with auto power save
Monolithic IC MM336x

Outline

This IC is a 150 mA LDO featuring automatic power-saving.
This device automatically switches between a high-speed operation mode and low-power mode depending on the load current. In the low power mode, current consumption is lowered to 4.5 µA.
This device is suitable for cell-phones which require low power consumption in standby mode and other such applications.

Features

1.	Input voltage range	2~6V
2.	Output voltage range	1.5~5V
3.	Output voltage accuracy	V_{OUT}±1%
4.	Maximum output current	150mA
5.	Supply current	4.5µA typ. (No-load) 0.01µA typ. (OFF)
6.	Output capacitor	1µF
7.	Dropout capacitor	0.14V typ. (V_O=3V, I_O=100mA)
8.	Short current	50mA typ.
9.	Line regulation	0.01%/V
10.	Load regulation	15mV typ. (I_O=1~80mA)
11.	Ripple rejection	70dB typ. (f=1kHz)

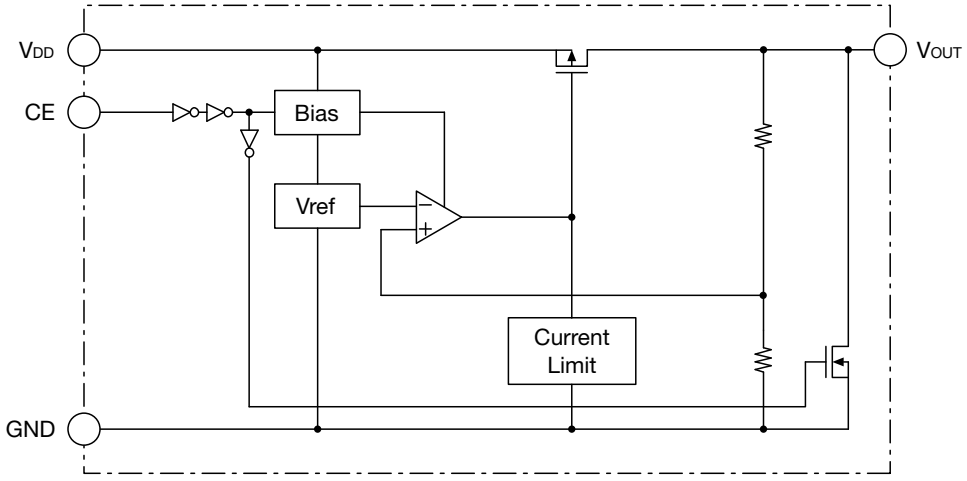
Package

SOT-25A
SSON-4B

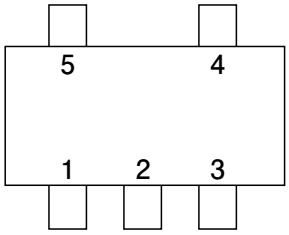
Applications

1. Mobile phones
2. Digital still cameras

Block Diagram

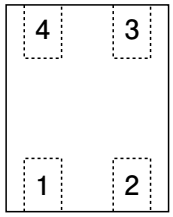


Pin Assignment



SOT-25A
(TOP VIEW)

1	VDD
2	GND
3	CE
4	NC
5	VOUT



SSON-4B
(TOP VIEW)

1	CE
2	VDD
3	VOUT
4	GND

Pin Description

SOT-25A

Pin No.	Pin name	Functions
1	VDD	Voltage-supply pin
2	GND	GND pin
3	CE	ON/OFF-Control pin CE: Low → OUTPUT: OFF; CE: High → OUTPUT: ON Connect CE pin with VDD pin, when it is not used.
4	NC	No connection
5	VOUT	Output pin

SSON-4B

Pin No.	Pin name	Functions
1	CE	ON/OFF-Control pin CE: Low → OUTPUT: OFF; CE: High → OUTPUT: ON Connect CE pin with VDD pin, when it is not used.
2	VDD	Voltage-supply pin
3	VOUT	Output pin
4	GND	GND 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}	−0.3~7.0		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	200		mA
Power Dissipation	Pd	350(Note1)	SOT-25A	mW
		330(Note2)	SSON-4B	

Note1 : With PC Board of glass epoxy (60 × 40 × 1.6^{t}mm)
Note2 : With PC Board of glass epoxy (110 × 40 × 0.8^{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}	2.0~6.0	V
Output Current	I_O	0~150	mA

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

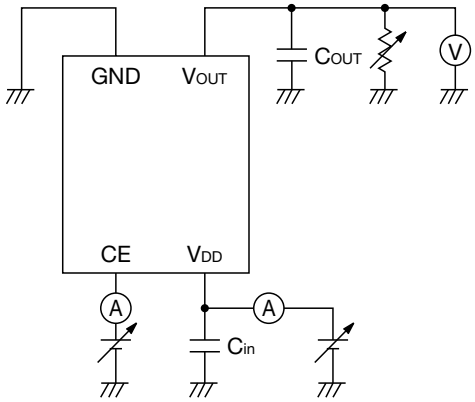
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Input Current(OFF)	I_{DD}off	V_{CE}=0V		0.01	1.0	µA
No-Load Input Current	I_{DD}	I_{OUT}=0mA		4.5	10	µA
GND PIN Current	Ignd	I_{OUT}=5mA	12			µA
Output Voltage	V_{OUT}	I_{OUT}=30mA	×0.99		×1.01	V
Line Regulation	V_{LINE}	V_{DD}=Vo(typ.)+0.5~6V, I_{OUT}=30mA (V_{OUT}≦1.6V, V_{DD}=2.2~6V)		0.01	0.2	%/V
Load Regulation	V_{LOAD}	1mA≦I_{OUT}≦80mA		15	50	mV
Dropout Voltage	Vio	Please refer to another page				V
Ripple Rejection 1 (Note3)	RR1	f=1kHz, Vripple=0.5V, I_{OUT}=30mA 1.5V≦Vout≦4.0V		70		dB
Ripple Rejection 2 (Note3)	RR2	f=10kHz, Vripple=0.5V, I_{OUT}=30mA 1.5V≦Vout≦4.0V		55		dB
Ripple Rejection 3 (Note3)	RR3	f=1kHz, Vripple=0.5V, I_{OUT}=30mA V_{OUT}≧4.0V		45		dB
Ripple Rejection 4 (Note3)	RR4	f=10kHz, Vripple=0.5V, I_{OUT}=30mA V_{OUT}≧4.0V		35		dB
V_{OUT} Temperature Coefficient (Note3)	$\Delta V_{OUT}/\Delta T$	I_{OUT}=30mA −40≦T_{OP}≦85°C		±100		ppm/°C
Output Short-circuit Current	Ilim	V_{OUT}=0V		50		mA
CE High Threshold Voltage	V_{CEH}		1.5			V
CE Low Threshold Voltage	V_{CEL}				0.25	V
CE High Threshold Current	I_{CEH}		−0.1		0.1	µA
CE Low Threshold Current	I_{CEL}		−0.1		0.1	µA

Note3 : The parameter is guaranteed by design.

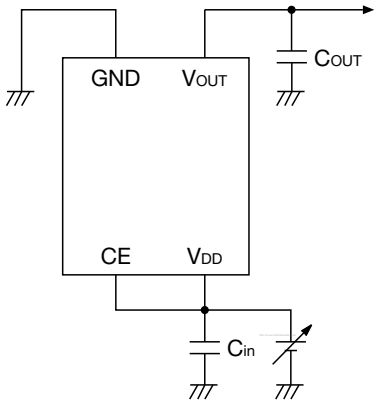
Electrical Characteristics 2 (Except where noted otherwise $V_{DD}=V_{OUT}$(typ.)+1V, $V_{CE}=V_{DD}$, Ta=25°C)

Model No.	Item											
	Output Voltage				Dropout Voltage 1				Dropout Voltage 2			
	V_{OUT} (V)				Vio1 (V)				Vio2 (V)			
	Measurement Conditions	Min.	Typ.	Max.	Measurement Conditions	Min.	Typ.	Max.	Measurement Conditions	Min.	Typ.	Max.
MM3361F	I_{OUT}=30mA	1.485	1.500	1.515	I_{OUT}=30mA 1.5V≦ V_{OUT}≦1.9V		0.1	0.15	I_{OUT}=100mA 1.5V≦ V_{OUT}≦1.9V		0.6	0.8
MM3361G		1.584	1.600	1.616								
MM3361H		1.683	1.700	1.717								
MM3361J		1.782	1.800	1.818								
MM3361K		1.881	1.900	1.919								
MM3362A		1.980	2.000	2.020	2.0V≦ V_{OUT}≦2.4V		0.08	0.12	2.0V≦ V_{OUT}≦2.4V		0.24	0.31
MM3362B		2.079	2.100	2.121								
MM3362C		2.178	2.200	2.222								
MM3362D		2.277	2.300	2.323								
MM3362E		2.376	2.400	2.424								
MM3362F		2.475	2.500	2.525	2.5V≦ V_{OUT}≦2.9V		0.06	0.08	2.5V≦ V_{OUT}≦2.9V		0.16	0.23
MM3362G		2.574	2.600	2.626								
MM3362H		2.673	2.700	2.727								
MM3362J		2.772	2.800	2.828								
MM3362Y		2.822	2.850	2.879								
MM3362K		2.871	2.900	2.929								
MM3363A		2.970	3.000	3.030	3.0V≦ V_{OUT}≦3.2V		0.05	0.07	3.0V≦ V_{OUT}≦3.2V		0.14	0.21
MM3363B		3.069	3.100	3.131								
MM3363C		3.168	3.200	3.232								
MM3363D		3.267	3.300	3.333	3.3V≦ V_{OUT}≦5.0V		0.04	0.06	3.3V≦ V_{OUT}≦5.0V		0.13	0.19
MM3363E		3.366	3.400	3.434								
MM3363F		3.465	3.500	3.535								
MM3363G		3.564	3.600	3.636								
MM3363H		3.663	3.700	3.737								
MM3363J		3.762	3.800	3.838								
MM3363K		3.861	3.900	3.939								
MM3364A		3.960	4.000	4.040								
MM3364B		4.059	4.100	4.141								
MM3364C		4.158	4.200	4.242								
MM3364D		4.257	4.300	4.343								
MM3364E		4.356	4.400	4.444								
MM3364F		4.455	4.500	4.545								
MM3364G		4.554	4.600	4.646								
MM3364H		4.653	4.700	4.747								
MM3364J		4.752	4.800	4.848								
MM3364K		4.851	4.900	4.949								
MM3365A		4.950	5.000	5.050								

Measuring Circuit



Application Circuit



∗ Temperature Characteristics : B

(Reference example of external parts)

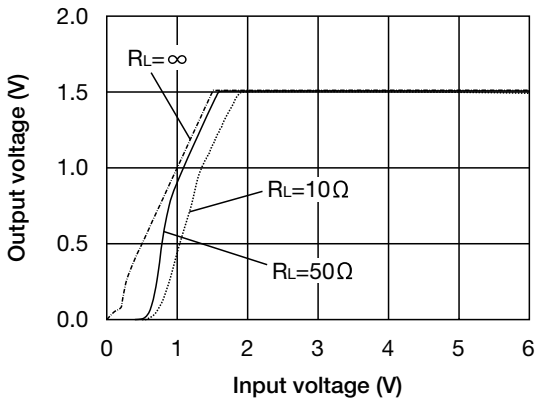
· Output capacitor	Ceramic capacitor 1µF
· Input capacitor	Ceramic capacitor 1µF

· Note

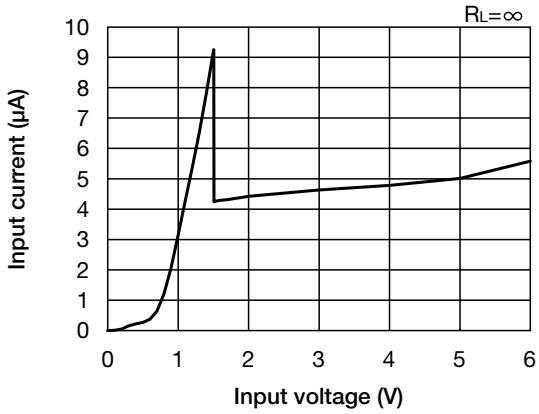
1. The output capacitor is required between output and GND to prevent oscillation.
2. The ESR of capacitor must be defined in ESR stability area.
   It is possible to use a ceramic capacitor without ESR resistance for output.
   The ceramic capacitor must be used more than 1µF and B temperature characteristics.
3. The wire of Vcc 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=1.5V) (Except where noted otherwise V_{DD}=V_{OUT} (typ.) +1V, V_{CE}=V_{DD}, Ta=25°C)

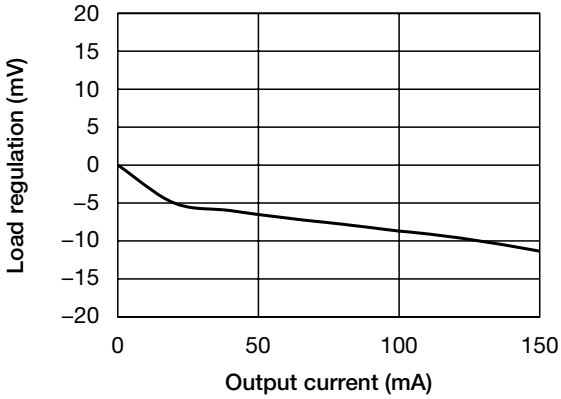
Output - Input voltage



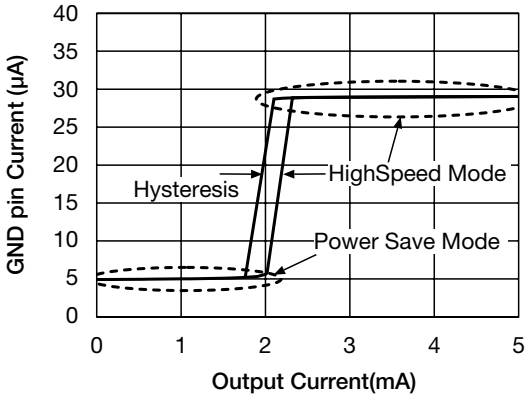
Input current - Input voltage



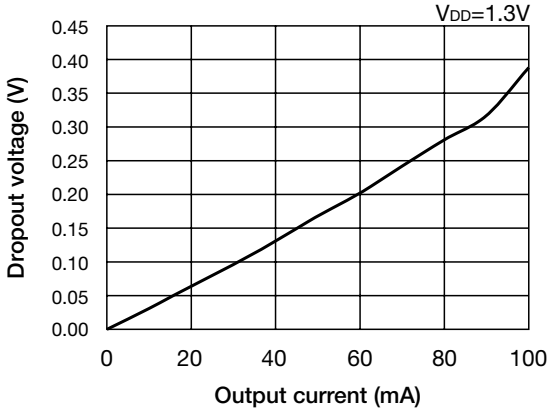
Load regulation



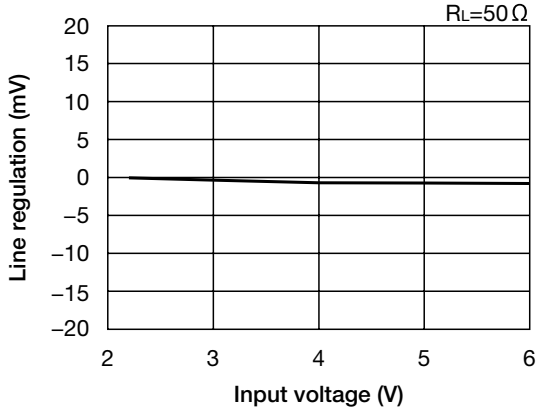
GND PIN Current



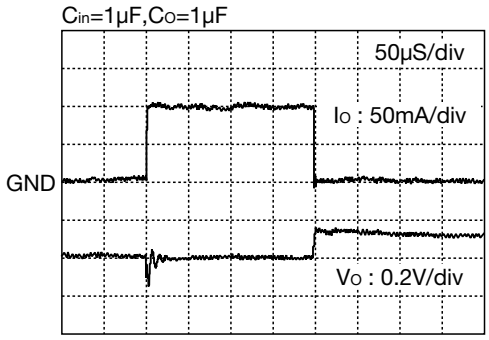
Dropout voltage - Output current



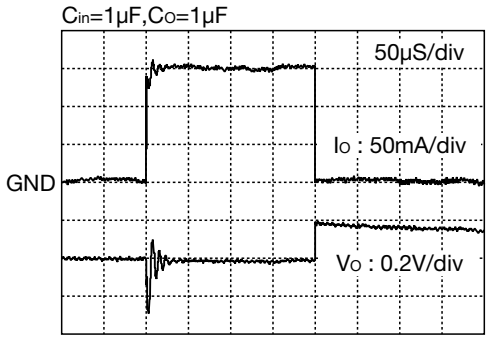
Line regulation



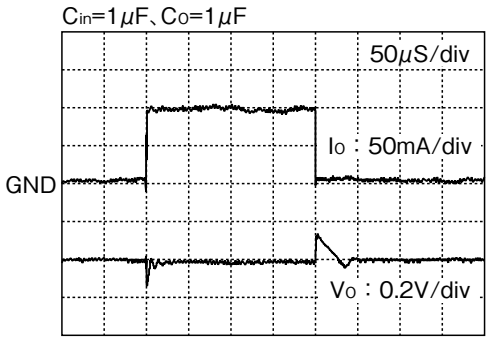
Load transient response (Io=0.1→100mA)



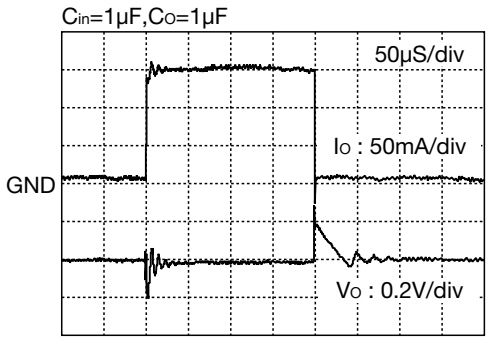
Load transient response (Io=0.1→150mA)



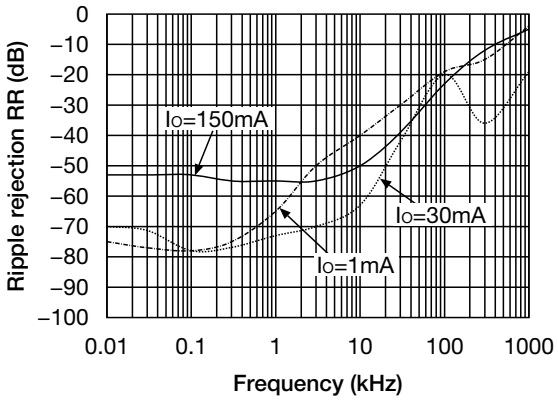
Load transient response (Io=5→100mA)



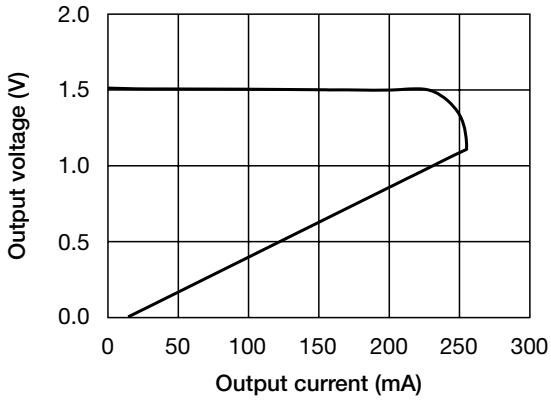
Load transient response (Io=5→150mA)



Ripple Rejection

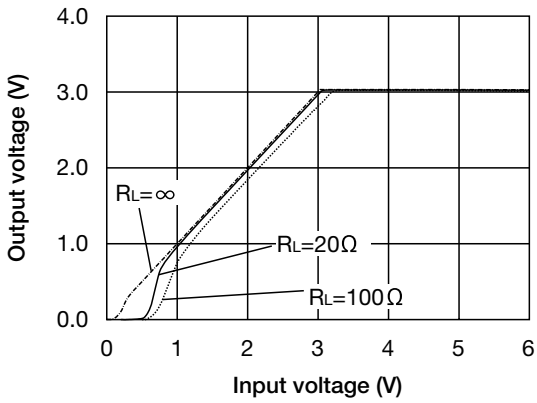


Current limit

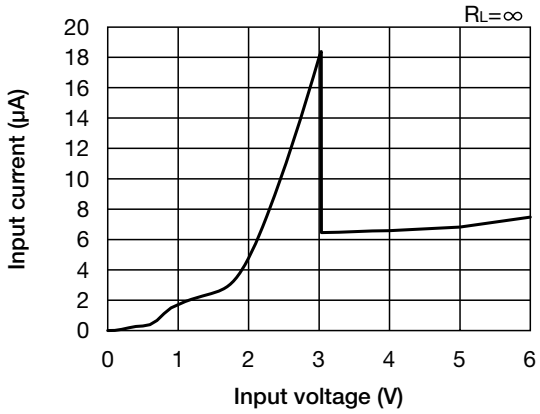


Characteristics (Vo=3.0V) (Except where noted otherwise $V_{DD}=V_{OUT}$ (typ.) +1V, $V_{CE}=V_{DD}$, Ta=25°C)

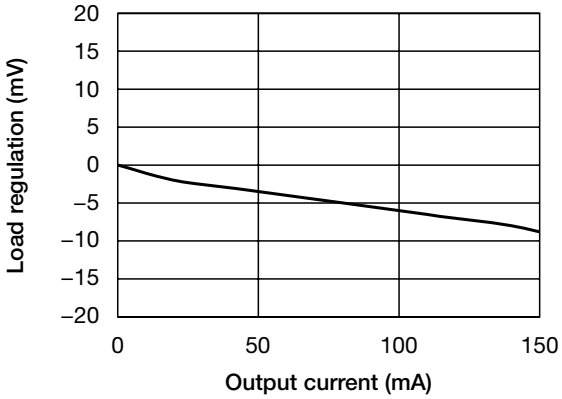
Output - Input voltage



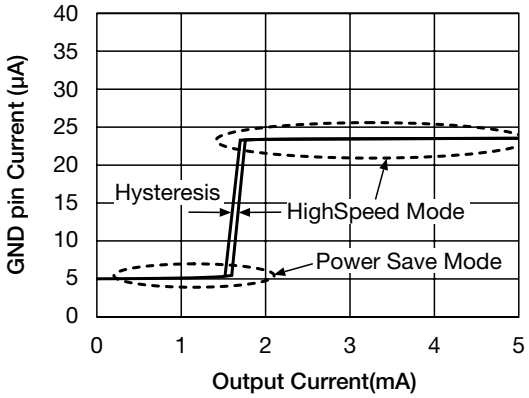
Input current - Input voltage



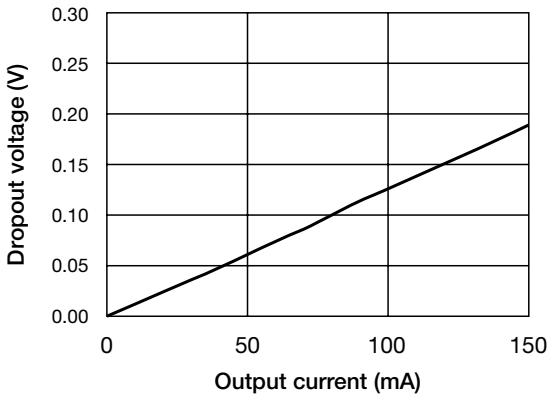
Load regulation



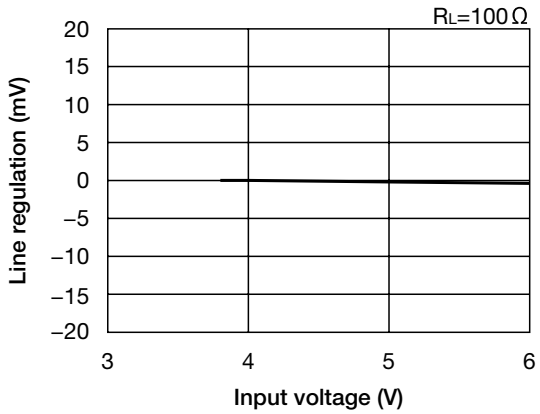
GND PIN Current



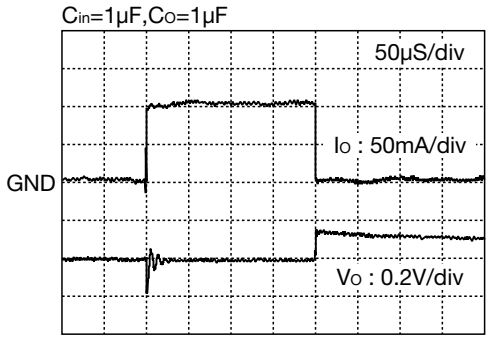
Dropout voltage - Output current



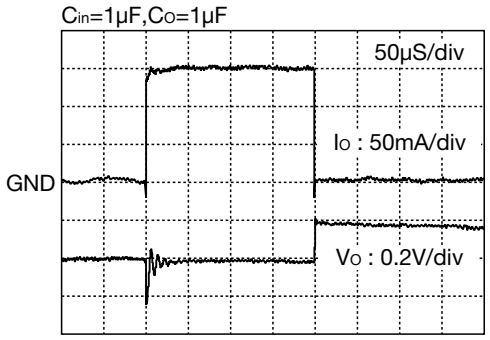
Line regulation



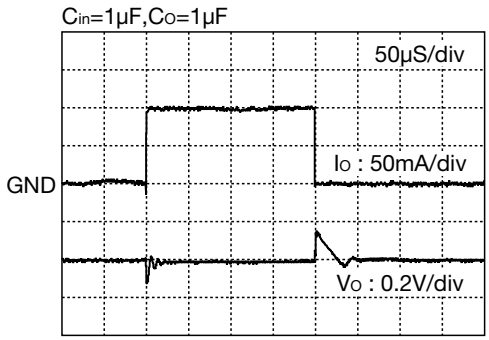
Load transient response (Io=0.1→100mA)



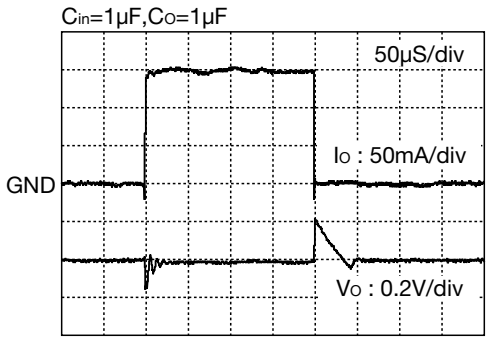
Load transient response (Io=0.1→150mA)



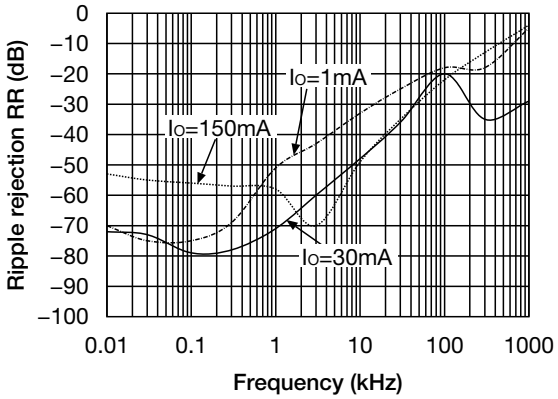
Load transient response (Io=5→100mA)



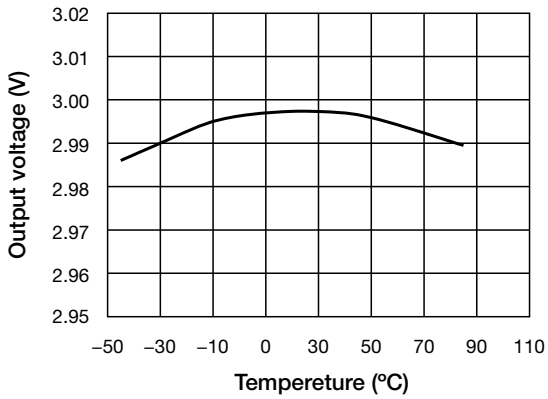
Load transient response (Io=5→150mA)



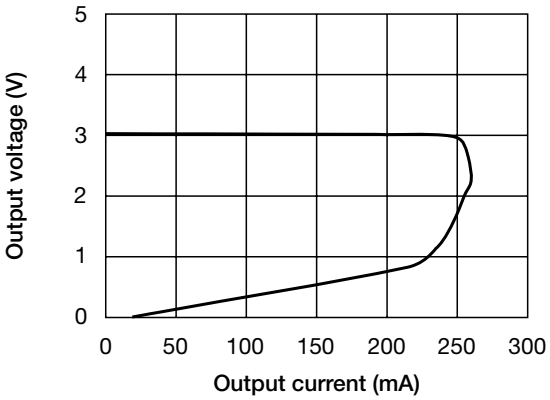
Ripple Rejection



Output voltage - Temperature

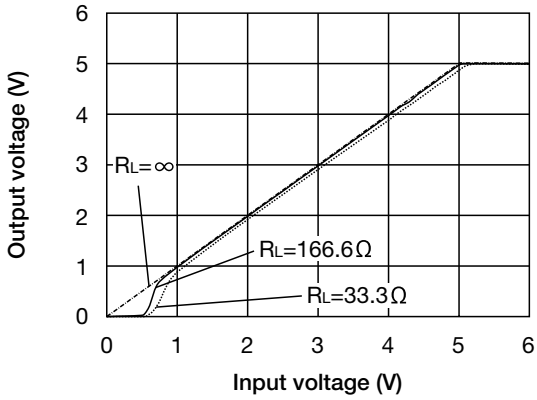


Current limit

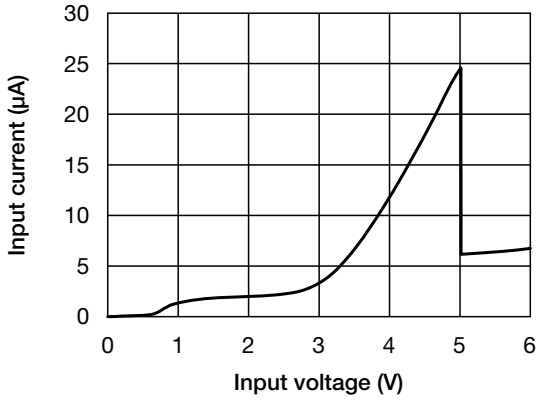


Characteristics (Vo=5.0V) (Except where noted otherwise V_{DD}=V_{OUT} (typ.) +1V, V_{CE}=V_{DD}, Ta=25°C)

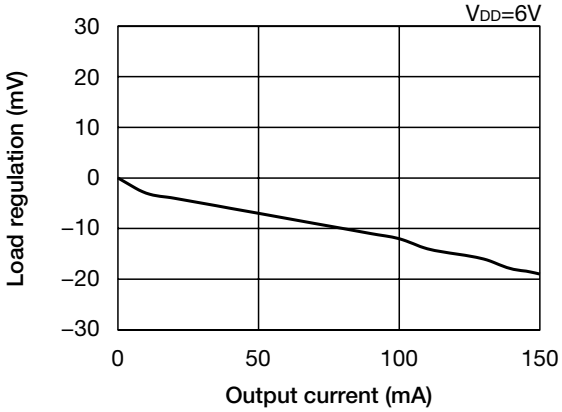
Output - Input voltage



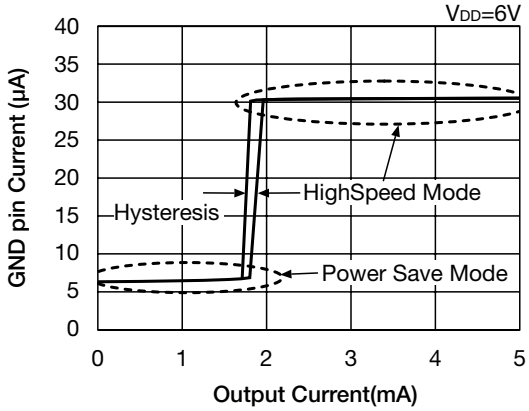
Input current - Input voltage



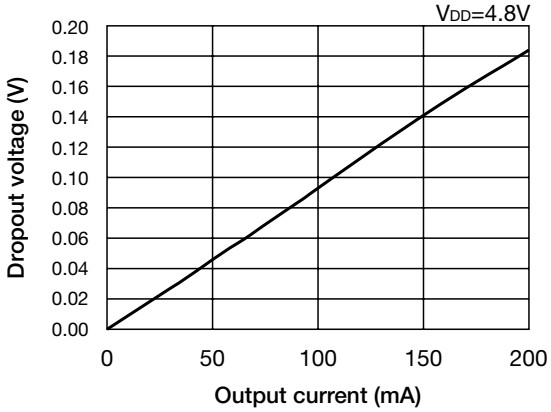
Load regulation



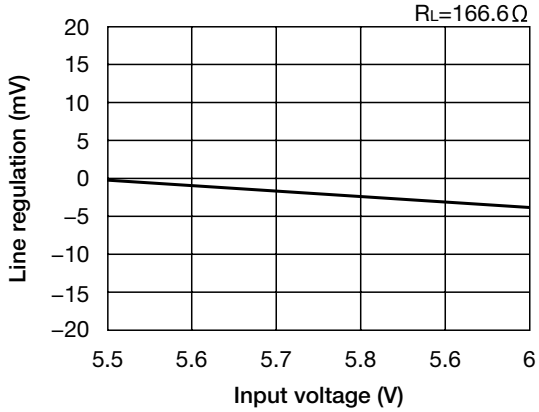
GND PIN Current



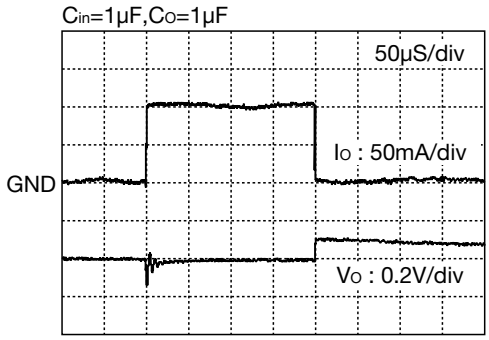
Dropout voltage - Output current



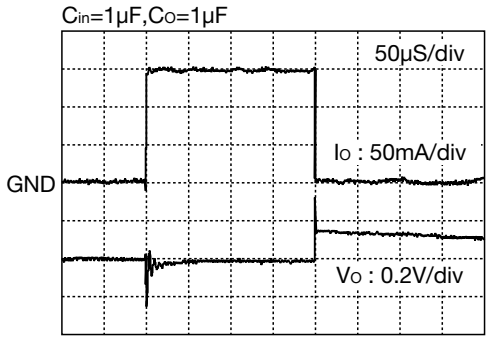
Line regulation



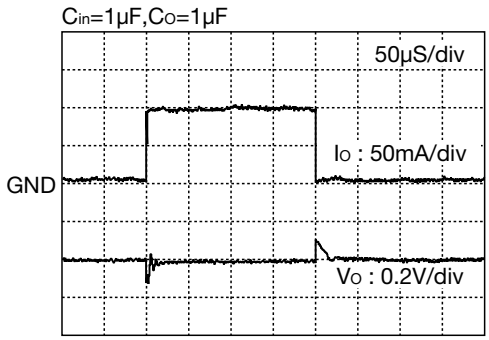
Load transient response (Io=0.1→100mA)



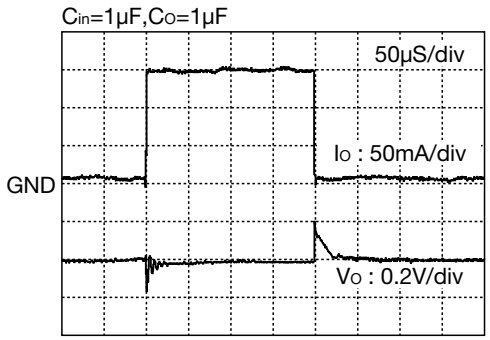
Load transient response (Io=0.1→150mA)



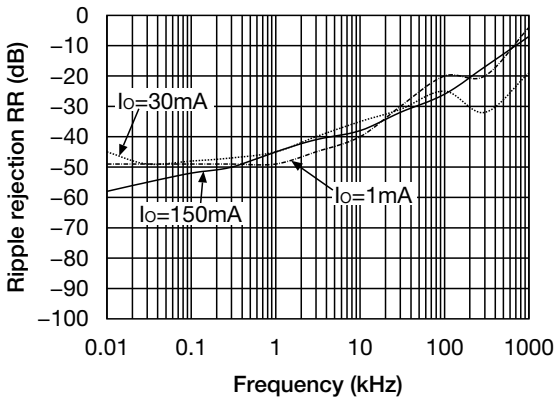
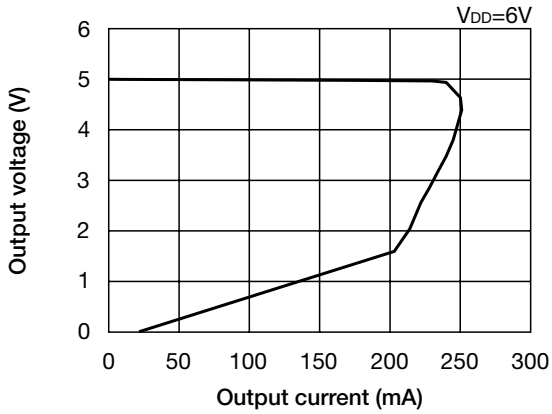
Load transient response (Io=5→100mA)



Load transient response (Io=5→150mA)



Ripple Rejection



Current limit