200mA LDO
Monolithic IC MM3566 Series

Outline

This IC is a low quiescent current 200mA LDO.
The IC can be stable behavior without Input/Output capacitor.
Therefore the number of external capacitor is reduced.
The IC can be better low quiescent current and load transient by bias boost circuit.
Therefore the IC is ideal for mobile applications.

Features

1.	Maximum operating voltage	6.0V
2.	No load input current	0.9μA typ. (V_O=1.2~3.3V)
3.	Quiescent current (OFF)	0.1μA typ. (Vce=0V)
4.	Output voltage range	1.2~5.0V
5.	Output voltage accuracy	±1.0% (Vo>2V)
6.	Dropout voltage	0.35V typ. (I_O=200mA, V_O=3V)
7.	Line regulation	0.1%/V max.
8.	Load regulation	40mV max. (I_O=1~200mA)
9.	Vout temperature coefficient	±80ppm/°C typ.
10.	Output NMOS ON resistance	10Ω typ.

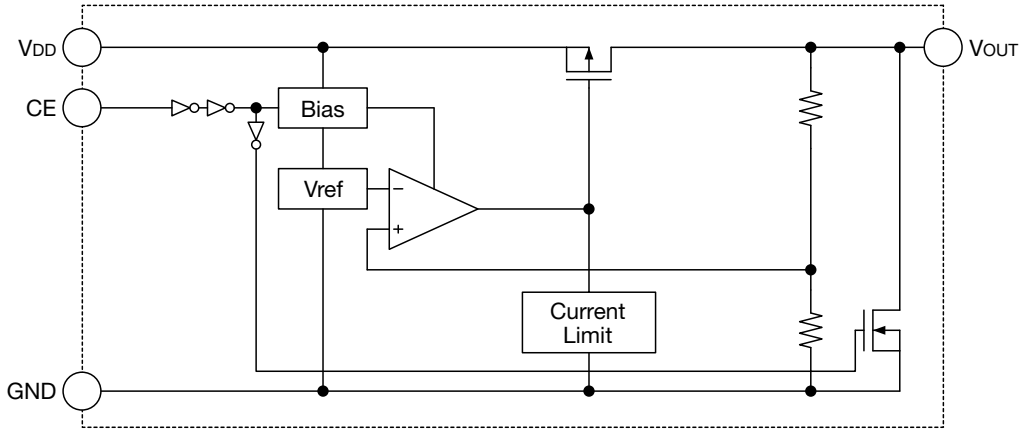
Package

SC-82ABB

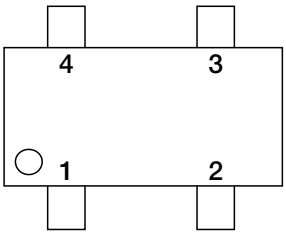
Applications

1. Mobile phone
2. Digital stil camera

Block Diagram



Pin Assignment



SC-82ABB
(TOP VIEW)

1	CE
2	GND
3	VOUT
4	VDD

Note1 : Heat Spreader Bottom with GND.

Pin Description

SC-82ABB

Pin No.	Pin name	Functions
1	CE	ON/OFF-Control pin CE: L → OUTPUT: OFF CE: H → OUTPUT: ON Connect CE pin with V_{DD} pin, when it is not used.
2	GND	GND pin
3	V_{OUT}	Output pin
4	V_{DD}	Voltage-Supply pin

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

Item	Symbol	Ratings	Units
Storage Temperature	Tstg	-55~+150	°C
Junction Temperature	T_{jMAX}	150	°C
Supply Voltage	V_{DD}	-0.3~+7.0	V
CE input Voltage	V_{CE}	-0.3~+7.0	V
Output Voltage	V_{OUT}	-0.3~V_{DD}+0.3	V
Output Current	Iomax	0~250	mA
Power Dissipation 1	Pd1	330(Note2) (SC-82ABB)	mW
Power Dissipation 2	Pd2	650(Note3) (SC-82ABB)	mW

Note2 : With PC Board of glass epoxy 100 × 100 × 1.6mm
Note3 : JEDEC51-7 standard 114.3 × 76.2 × 1.6mm

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

Item	Symbol	Ratings	Units
Operating Ambient Temperature	Topr	-40~+85	°C
Operating Voltage	Vop	1.7~6.0	V
Output Current	Iop	0~200	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_{DDOff}	V_{CE}=0V		0.1	1.0	µA
No-Load Input Current	I_{DD}	1.2V≦V_{OUT}≦3.3V I_{OUT}=0mA		0.9	1.5	µA
		3.4V≦V_{OUT}≦5.0V I_{OUT}=0mA		1.2	2.0	µA
Output Voltage	V_{OUT}	V_{OUT}>2.0V, I_{OUT}=1mA	×0.99		×1.01	V
		V_{OUT}≦2.0V, I_{OUT}=1mA	–20		+20	mV
Line Regulation	V_{LINE}	V_{OUT} (TYP.)+0.5V≦V_{DD}≦6.0V I_O=1mA		0.02	0.10	%/V
Load Regulation	V_{LOAD}	1mA≦I_{OUT}≦200mA		15	40	mV
Dropout Voltage (Note4)	Vio	I_{OUT}=200mA				V
Ripple Rejection (Note5)	RR	f=1kHz, Vripple=0.5V, I_{OUT}=30mA		50		dB
V_{OUT} Temperature Coefficient (Note5)	$\Delta V_{OUT}/\Delta T$	–40≦Top≦+85°C		±80		ppm/°C
Output Short-Circuit Current (Note5)	Ishort	V_{OUT}=0V		100		mA
CE High Threshold Voltage	V_{CEH}		1.5		V_{DD}	V
CE Low Threshold Voltage	V_{CEL}		0		0.3	V
CE Pin Current (Note5)	I_{CEH}			0.3		µA
Output NMOS ON Resistance (Note5)	R_{DON}	V_{CE}=0V, V_{DD}=4V		10		Ω

Note4 : Please refer to another page.

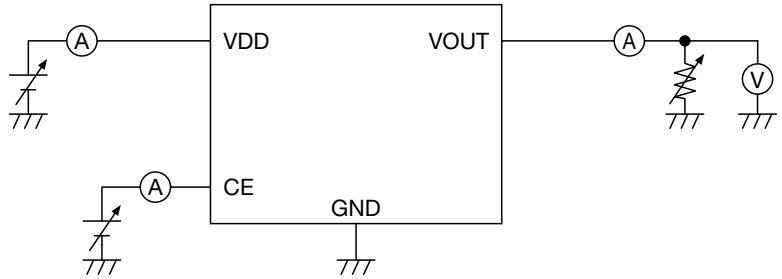
Note5 : The parameter is guaranteed by design.

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

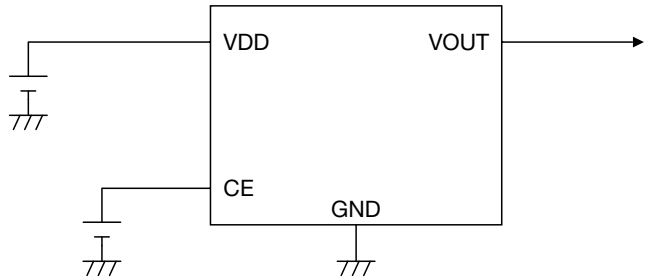
Model No.	Item							
	Output Voltage				Dropout Voltage			
	V_{OUT} (V)				Vio (V)			
	Measurement Conditions	Min.	Typ.	Max.	Measurement Conditions	Min.	Typ.	Max.
MM3566A12	I_{OUT}=1mA	1.180	1.200	1.220	I_{OUT}=200mA 1.2V≦V_{OUT}<2.5V (Note6)		1.01	1.40
MM3566A13		1.280	1.300	1.320				
MM3566A14		1.380	1.400	1.420				
MM3566A15		1.480	1.500	1.520			0.71	1.07
MM3566A16		1.580	1.600	1.620				
MM3566A17		1.680	1.700	1.720			0.59	0.87
MM3566A18		1.780	1.800	1.820				
MM3566A19		1.880	1.900	1.920				
MM3566A20		1.980	2.000	2.020			0.45	0.67
MM3566A21		2.079	2.100	2.121				
MM3566A22		2.178	2.200	2.222				
MM3566A23		2.277	2.300	2.323				
MM3566A24		2.376	2.400	2.424				
MM3566A25		2.475	2.500	2.525	I_{OUT}=200mA 2.5V≦V_{OUT}≦5.0, $V_{DD}=V_{OUT}$ (TYP.) –0.2V		0.42	0.57
MM3566A26		2.574	2.600	2.626				
MM3566A27		2.673	2.700	2.727				
MM3566A28		2.772	2.800	2.828				
MM3566A29		2.871	2.900	2.929				
MM3566A30		2.970	3.000	3.030			0.35	0.50
MM3566A31		3.069	3.100	3.131				
MM3566A32		3.168	3.200	3.232				
MM3566A33		3.267	3.300	3.333				
MM3566A34		3.366	3.400	3.434			0.32	0.45
MM3566A35		3.465	3.500	3.535				
MM3566A36		3.564	3.600	3.636				
MM3566A37		3.663	3.700	3.737				
MM3566A38		3.762	3.800	3.838				
MM3566A39		3.861	3.900	3.939				
MM3566A40		3.960	4.000	4.040				
MM3566A41		4.059	4.100	4.141				
MM3566A42		4.158	4.200	4.242				
MM3566A43		4.257	4.300	4.343				
MM3566A44		4.356	4.400	4.444				
MM3566A45		4.455	4.500	4.545				
MM3566A46		4.554	4.600	4.646				
MM3566A47		4.653	4.700	4.747				
MM3566A48		4.752	4.800	4.848				
MM3566A49		4.851	4.900	4.949				
MM3566A50		4.950	5.000	5.050				

Note6 : Dropout voltage maximum value in the input and it is confirmed that there is no output abnormal voltage impression the 200mA in the model less than V_{OUT}< 2.5V.

Measuring Circuit



Application Circuit



· 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. 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.
3. The wire of VDD and GND is required to print full ground plane for noise and stability.
4. 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.
5. This IC will limit the output current with the overcurrent protection circuit when the overcurrent and the output do short-circuit.
   However, IC generates heat because of the substrate and use conditions and there is a possibility of destroying it exceeding a permissible loss.
   The characteristic changes depending on the substrate condition. Please evaluate IC in the set.
6. Please keep in mind that output voltage may rise by the leakage current of a power transistor if it is used by low load current(Io<10microA) at the time of high temperature.
7. When the terminal VDD(CE) is OFF→ON, the overshoot might be generated.
   The size of the overshoot depends on "output capacity", "output load", a "voltage rank", and "VDD standup speed." and evaluate it enough with a real machine, please.
   Please refer to Output Rise & Rush Current (P13, 18, 23) Turn-ON Transient Response.
8. There is a possibility of becoming load transient response characteristic deteriorates when using it with Dropout voltage less than about 1V. Please evaluate it enough when there is no margin in Dropout voltage.
   Please refer for examples Load Transient response (P12, 17, 22) characteristic.
9. The IC is not an air discharge measures product.
10. The IC does not have the thermal shutdown protection.

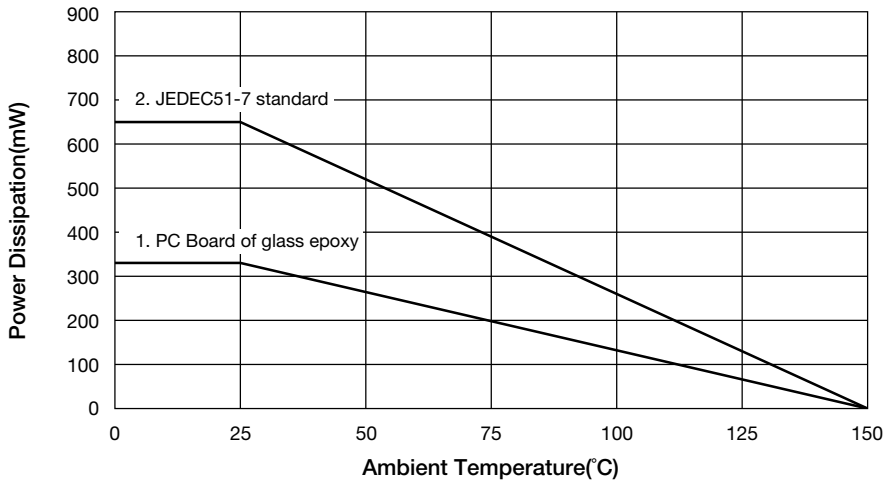
About Power Dissipation

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.

MM3566AxxURE

1. PC Board of glass epoxy
   Board size 100mm×100mm t=1.6mm Copper foil area 10%
   Power dissipation 330mW Ta=25°C

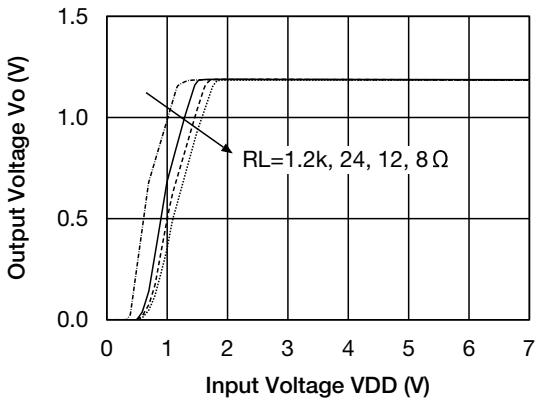
2. JEDEC51-7 standard
   Board size 114.3mm×76.2mm t=1.6mm Copper foil area 80%
   Power dissipation 650mW Ta=25°C (It is reference value measured by JEDEC51-7 standard.)



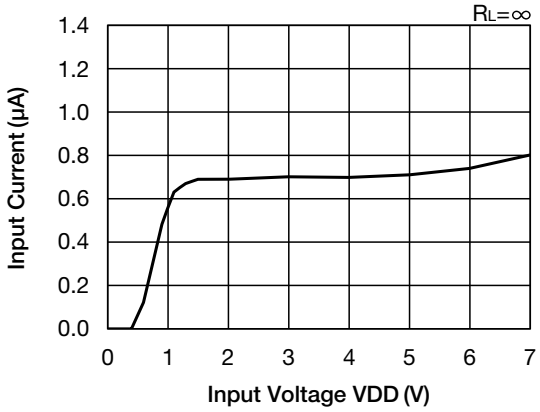
It is recommended to layout the VIA for heat radiation in the GND pattern of reverse (of IC) when there is the GND pattern in the inner layer (in using multiplayer substrate).
By increasing these copper foil pattern area of PCB, Power dissipation improves.

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

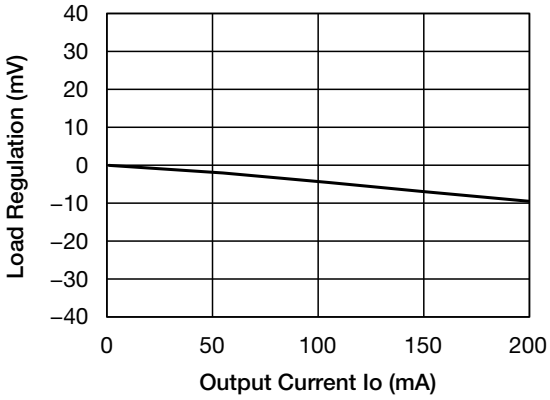
Input Voltage - Output Voltage



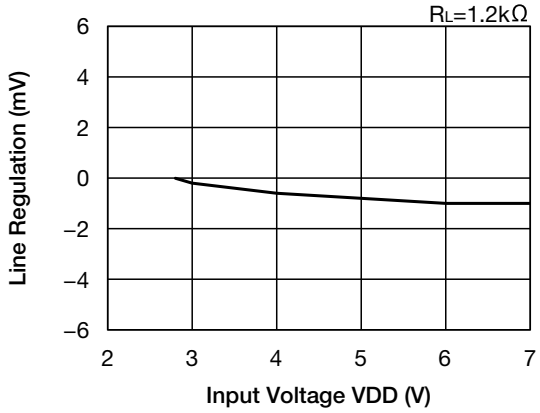
Input Voltage - Input Current



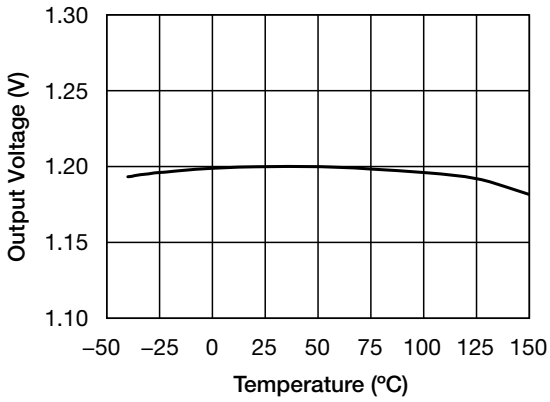
Load Regulation



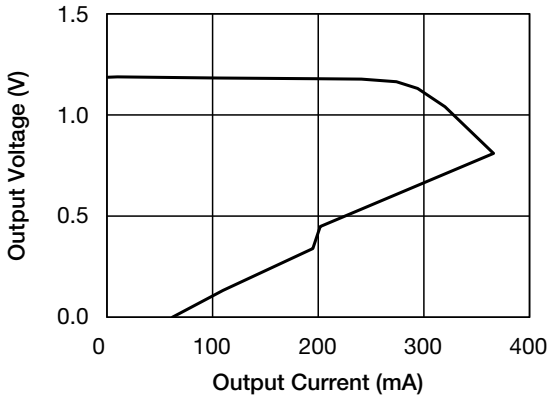
Line Regulation



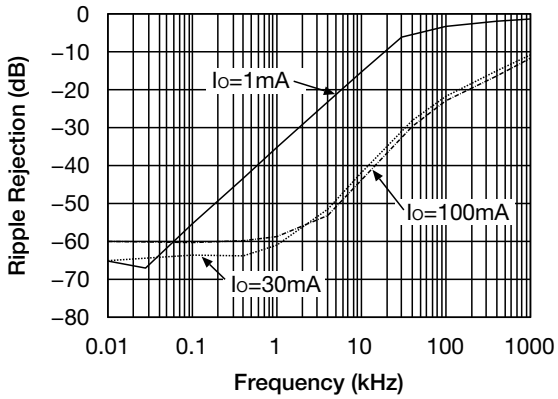
Output Voltage - Temperature



Output Voltage – Output Current

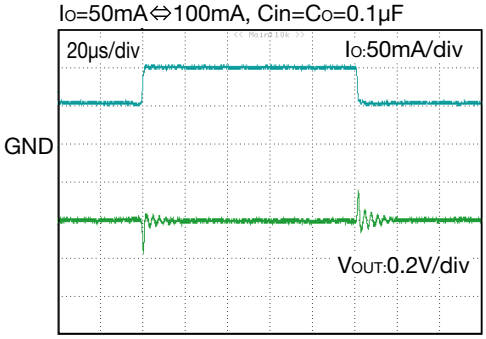


Ripple Rejection

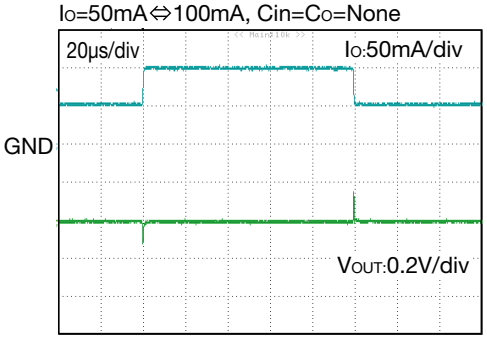


Load Transient response
(V_{DD}=V_{OUT}+1V, V_{CE}=V_{DD})

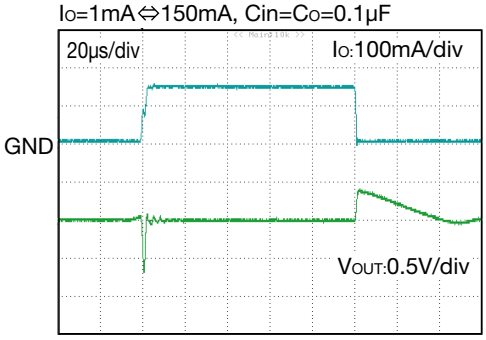
I_O=50mA⇔100mA, Cin=C_O=0.1μF



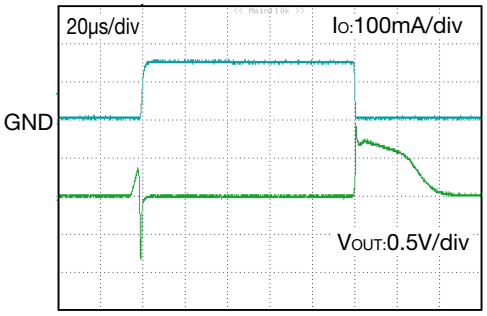
I_O=50mA⇔100mA, Cin=C_O=None



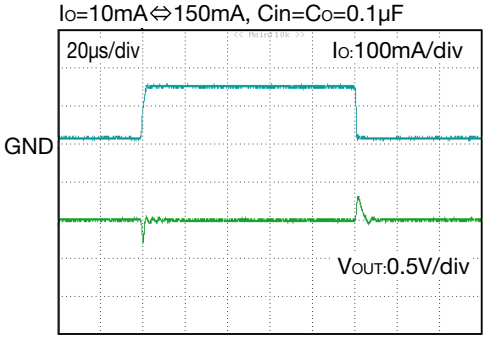
I_O=1mA⇔150mA, Cin=C_O=0.1μF



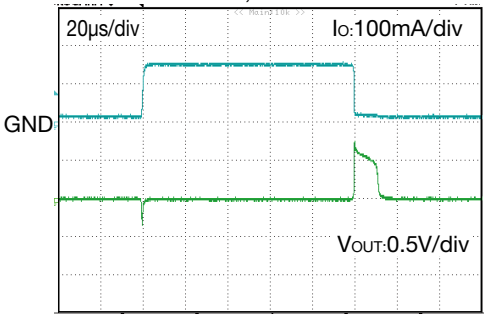
I_O=1mA⇔150mA, Cin=C_O=None



I_O=10mA⇔150mA, Cin=C_O=0.1μF

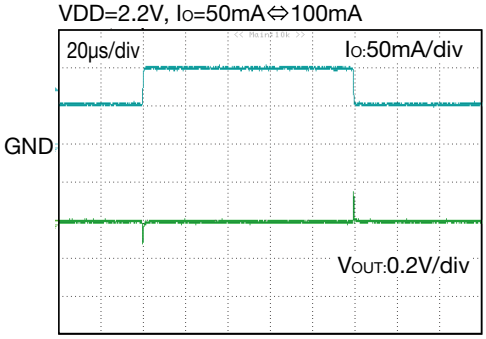


I_O=10mA⇔150mA, Cin=C_O=None

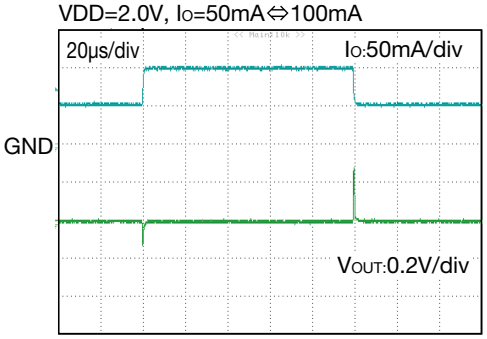


Load Transient response
($V_{DD}=V_{OUT}+1V$, $V_{CE}=V_{DD}$, Cin=Co=none)

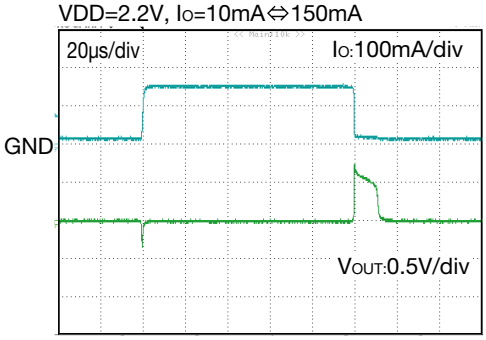
VDD=2.2V, I_O=50mA⇔100mA



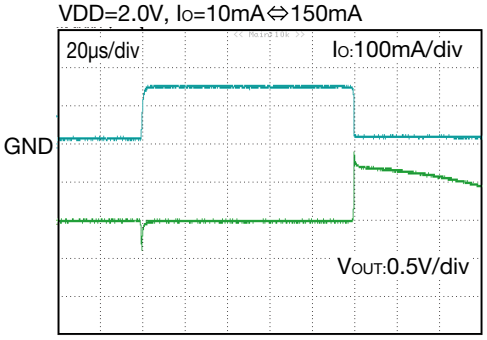
VDD=2.0V, I_O=50mA⇔100mA



VDD=2.2V, I_O=10mA⇔150mA



VDD=2.0V, I_O=10mA⇔150mA

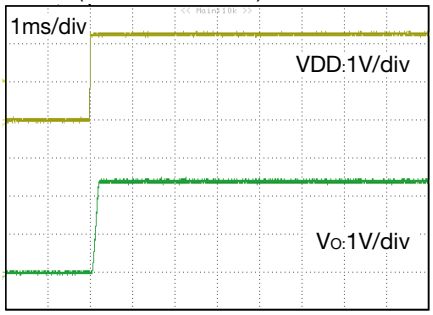


There is a possibility of becoming load transient response characteristic deteriorates when using it with Dropout voltage less than about 1V.
Please evaluate it enough when there is no margin in Dropout voltage.

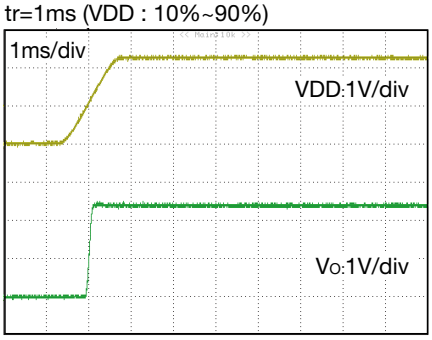
Output Rise & Rush Current

(V_{DD}=0V→2.2V, V_{CE}=V_{DD}, Cin=Co=none, I_O=1mA)

tr=1us (VDD : 10%~90%)

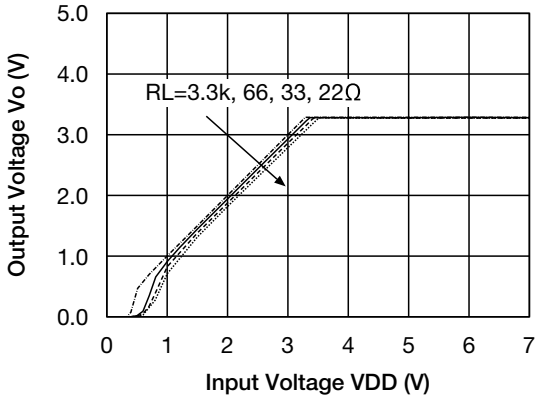


tr=1ms (VDD : 10%~90%)

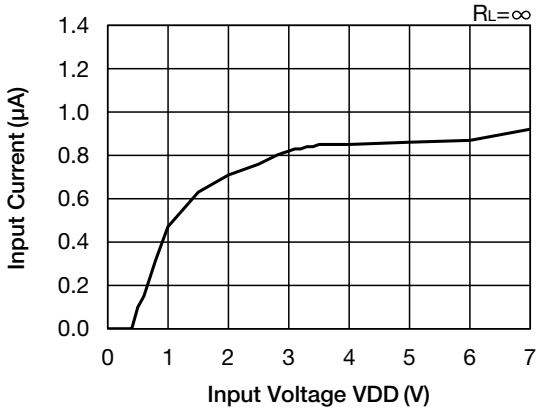


Characteristics (V_{OUT}=3.3V) (Except where noted otherwise $V_{DD}=V_{OUT}$(TYP.)+1V, $V_{CE}=V_{DD}$, Ta=25°C)

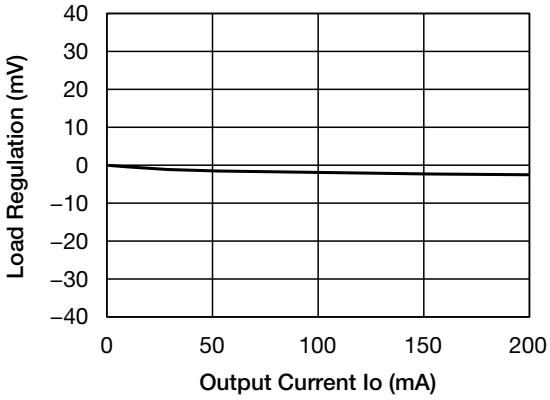
Input Voltage - Output Voltage



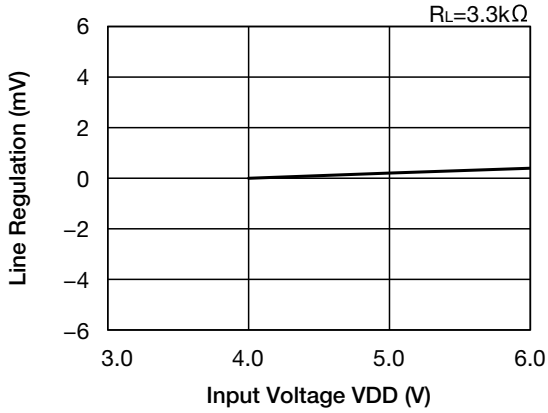
Input Voltage - Input Current



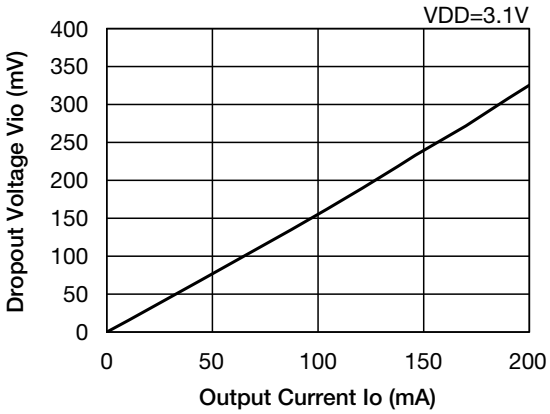
Load Regulation



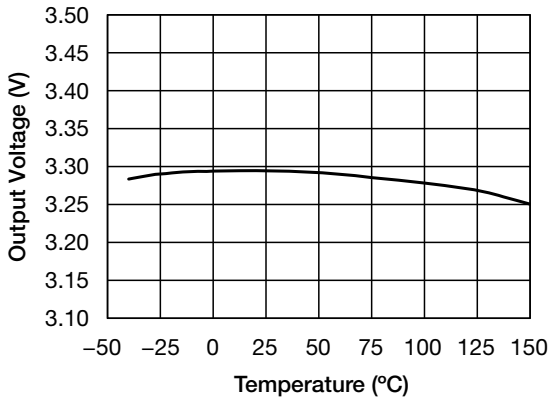
Line Regulation



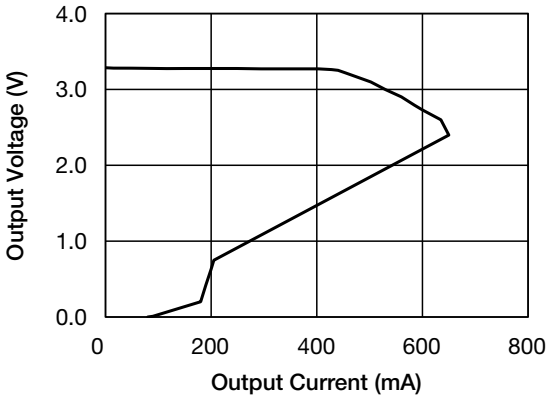
Dropout Voltage



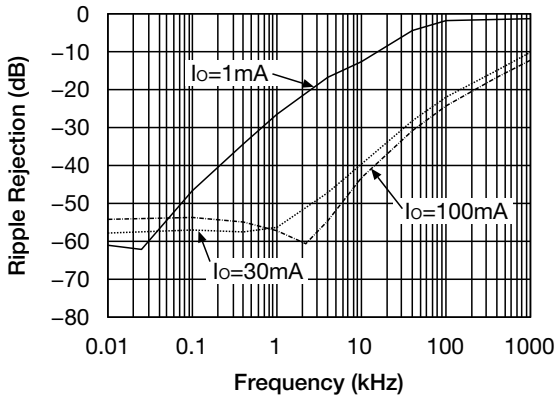
Output Voltage - Temperature



Output Voltage - Output Current

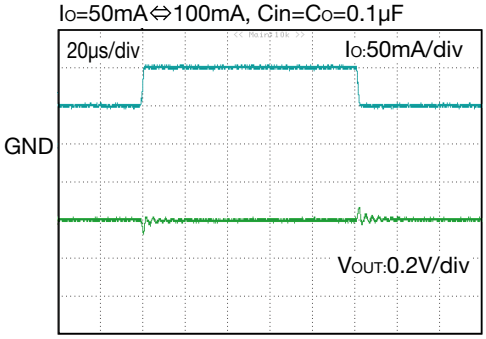


Ripple Rejection

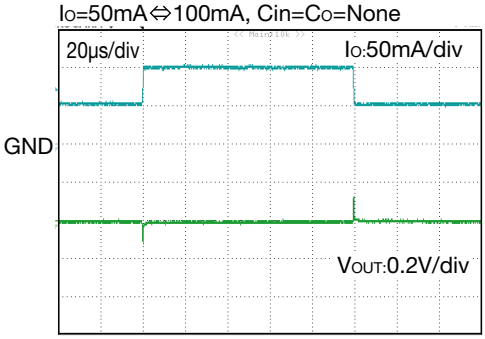


Load Transient response
($V_{DD}=V_{OUT}+1V$, $V_{CE}=V_{DD}$)

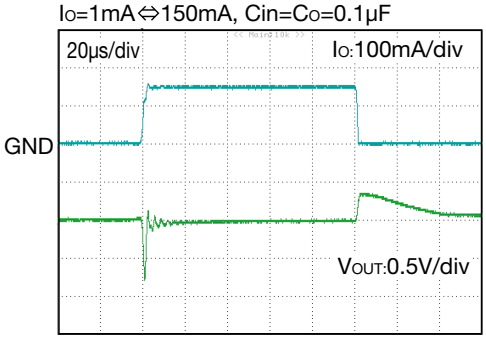
I_O=50mA⇔100mA, Cin=C_O=0.1μF



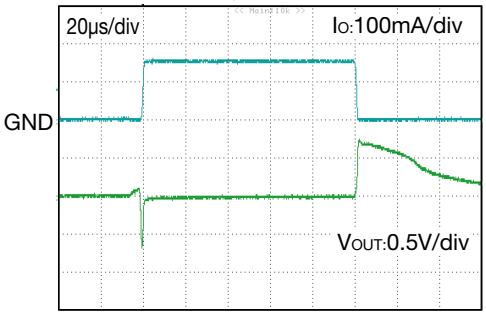
I_O=50mA⇔100mA, Cin=C_O=None



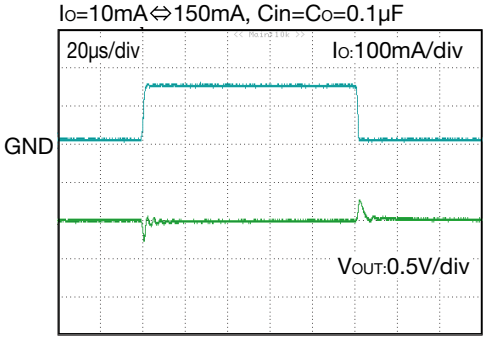
I_O=1mA⇔150mA, Cin=C_O=0.1μF



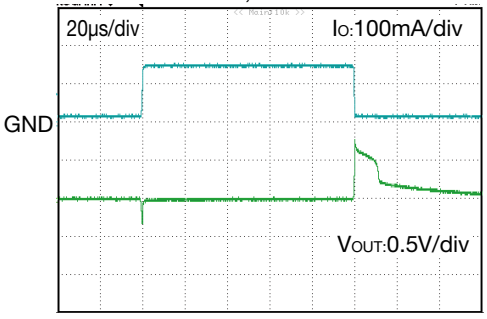
I_O=1mA⇔150mA, Cin=C_O=None



I_O=10mA⇔150mA, Cin=C_O=0.1μF

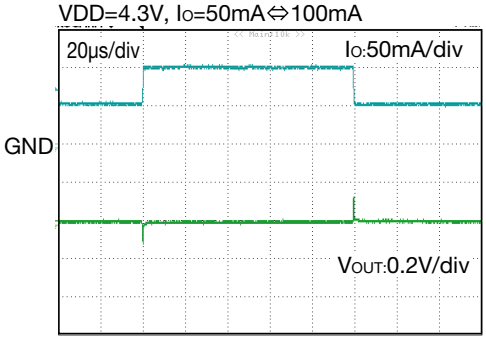


I_O=10mA⇔150mA, Cin=C_O=None

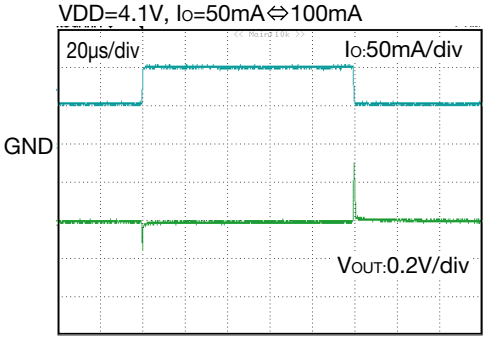


Load Transient response
($V_{DD}=V_{OUT}+1V$, $V_{CE}=V_{DD}$, Cin=Co=none)

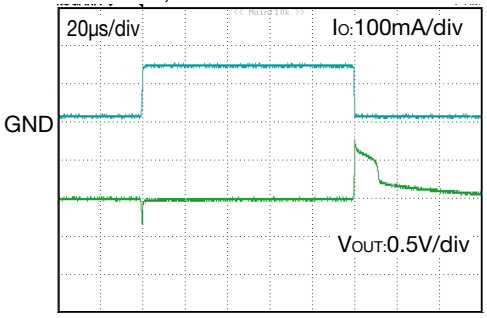
VDD=4.3V, I_O=50mA⇔100mA



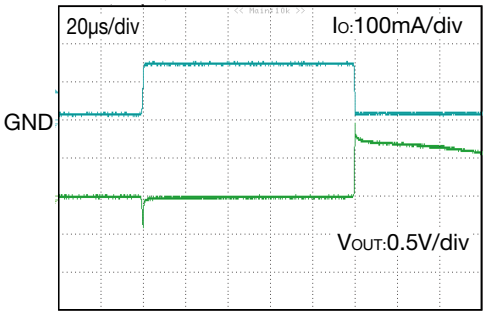
VDD=4.1V, I_O=50mA⇔100mA



VDD=4.3V, I_O=10mA⇔150mA



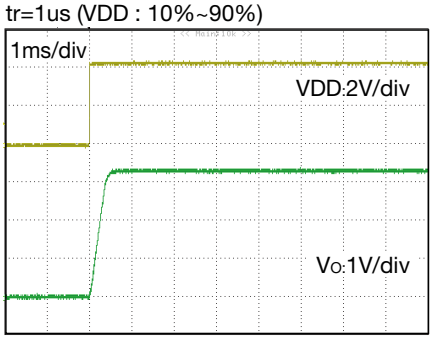
VDD=4.1V, I_O=10mA⇔150mA



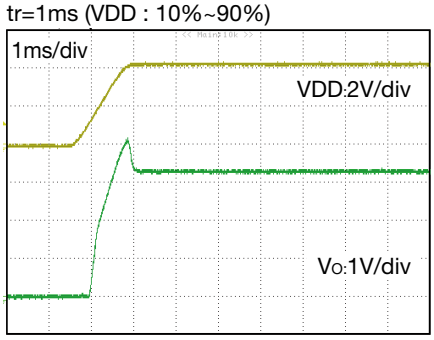
There is a possibility of becoming load transient response characteristic deteriorates when using it with Dropout voltage less than about 1V.
Please evaluate it enough when there is no margin in Dropout voltage.

Output Rise & Rush Current
(V_{DD}=0V→4.3V, V_{CE}=V_{DD}, Cin=Co=none, I_O=1mA)

tr=1us (VDD : 10%~90%)

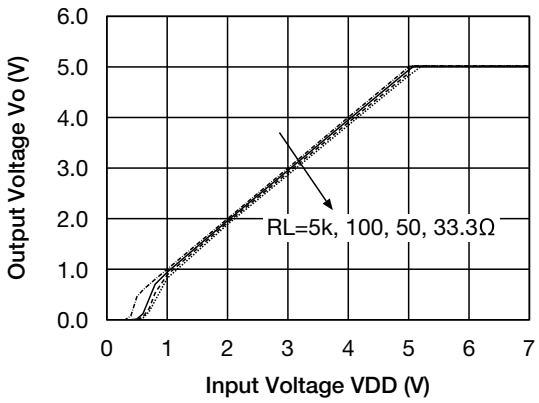


tr=1ms (VDD : 10%~90%)

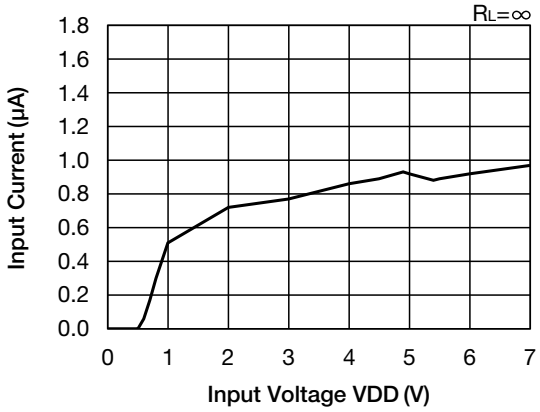


Characteristics (V_{OUT}=5.0V) (Except where noted otherwise V_{DD}=V_{OUT}(TYP.)+1V, V_{CE}=V_{DD}, Ta=25°C)

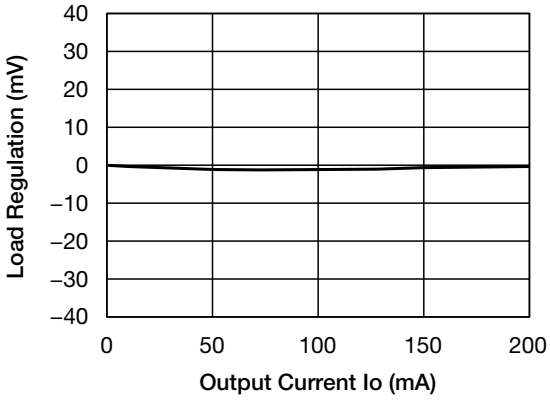
Input Voltage - Output Voltage



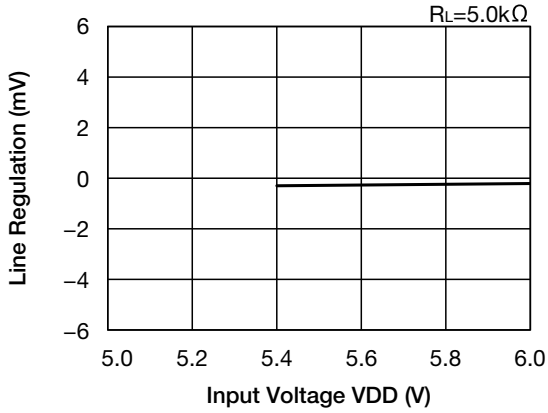
Input Voltage - Input Current



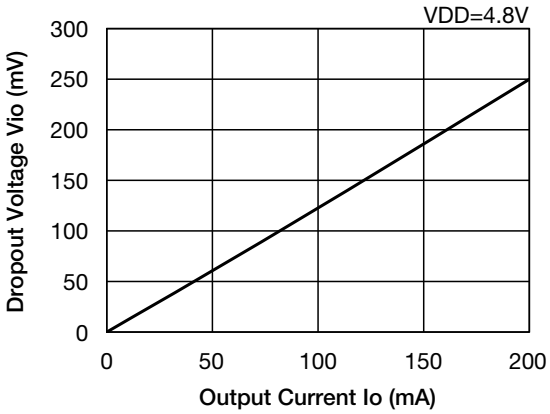
Load Regulation



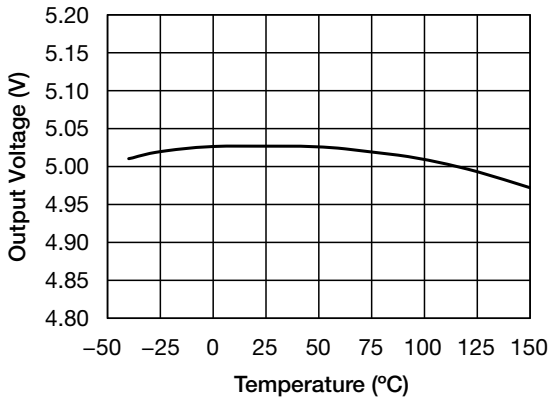
Line Regulation



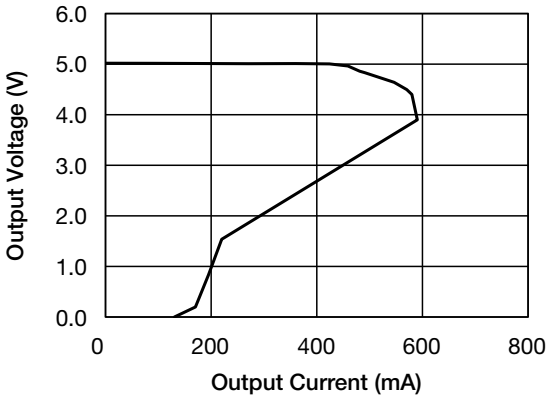
Dropout Voltage



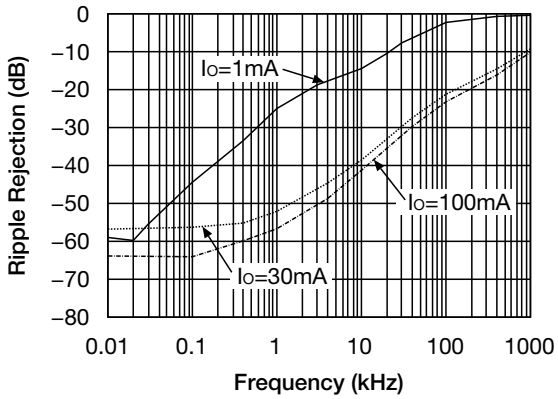
Output Voltage - Temperature



Output Voltage – Output Current

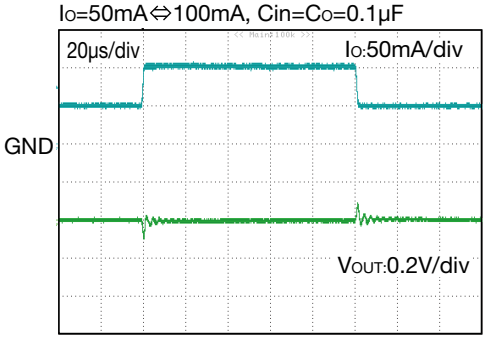


Ripple Rejection

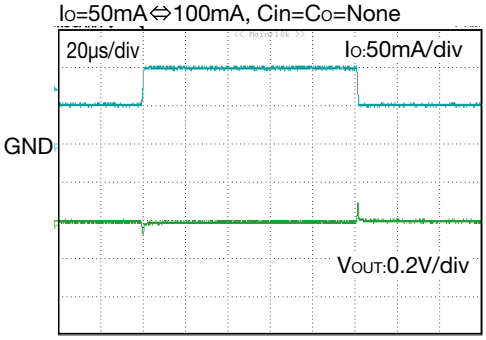


Load Transient response
(V_{DD}=V_{OUT}+1V, V_{CE}=V_{DD})

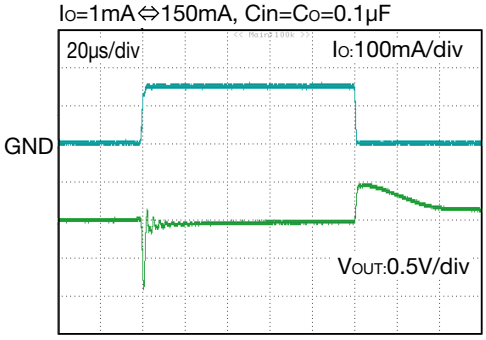
I_O=50mA⇔100mA, Cin=C_O=0.1μF



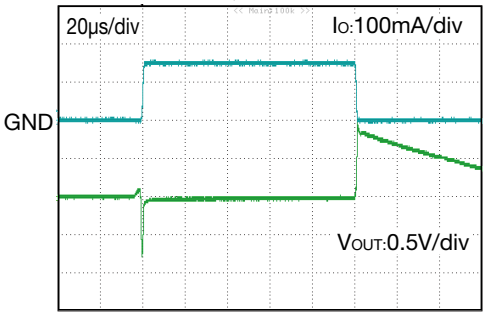
I_O=50mA⇔100mA, Cin=C_O=None



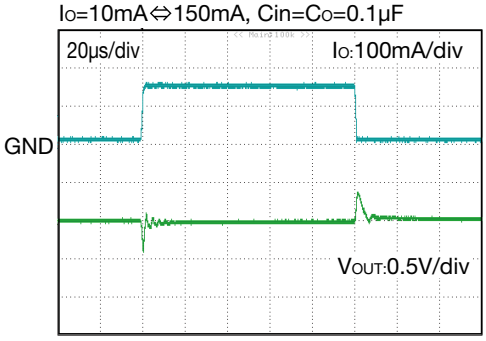
I_O=1mA⇔150mA, Cin=C_O=0.1μF



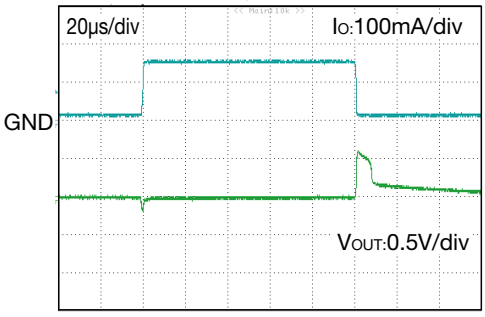
I_O=1mA⇔150mA, Cin=C_O=None



I_O=10mA⇔150mA, Cin=C_O=0.1μF

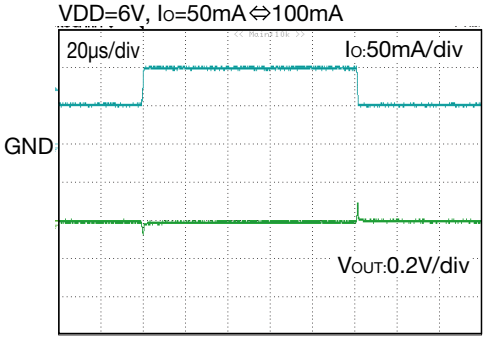


I_O=10mA⇔150mA, Cin=C_O=None

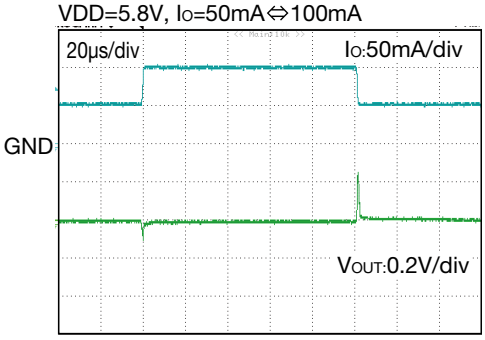


Load Transient response
($V_{DD}=V_{OUT}+1V$, $V_{CE}=V_{DD}$, Cin=Co=none)

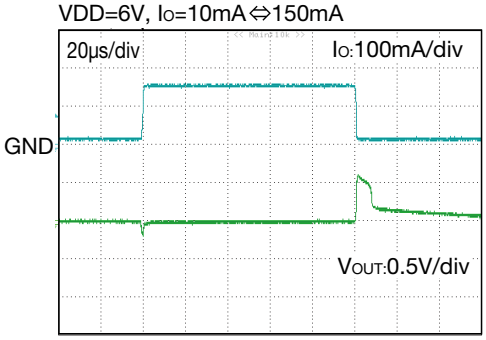
VDD=6V, I_O=50mA⇔100mA



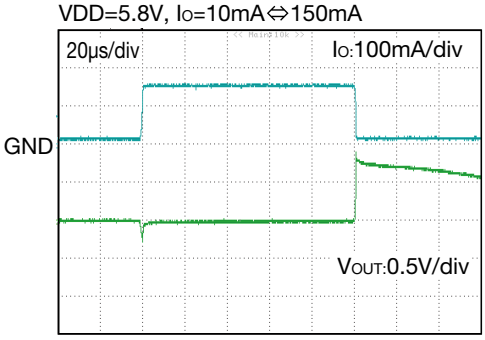
VDD=5.8V, I_O=50mA⇔100mA



VDD=6V, I_O=10mA⇔150mA



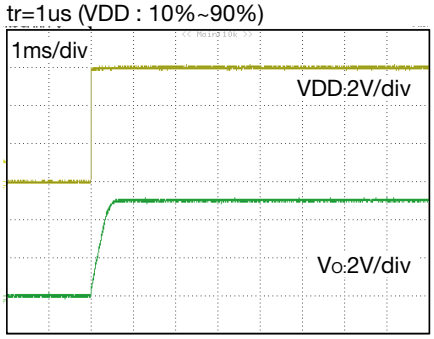
VDD=5.8V, I_O=10mA⇔150mA



There is a possibility of becoming load transient response characteristic deteriorates when using it with Dropout voltage less than about 1V.
Please evaluate it enough when there is no margin in Dropout voltage.

Output Rise & Rush Current
(V_{DD}=0V→6.0V, V_{CE}=V_{DD}, Cin=Co=none, I_O=1mA)

tr=1us (VDD : 10%~90%)



tr=1ms (VDD : 10%~90%)