150mA Dual Regulator
Monolithic IC MM3248□ Series

Outline

This IC is a 2-circuit type of MM324x series that is a low saturation regulator IC with 150mA output realizing low current consumption, low noise, and high ripple rejection using a CMOS process. The output voltage of the regulator is fixed and can be programmed between 1.5V and 5.0V upon request. it provides a switch pin to control each output and is an ideal IC for the portable equipment.

Features

1. Current consumption (during off-state)	0.02μA
2. High accuracy output voltage	±1.0%
3. Dropout voltage	0.13V typ. (Io=100mA)
4. High ripple rejection	77dB typ.
5. Operating temperature range	−40 to +85°C
6. Output voltage	1.5 to 5.0V (0.1V steps)
7. Output capacitor	0.1μF (Ceramic)

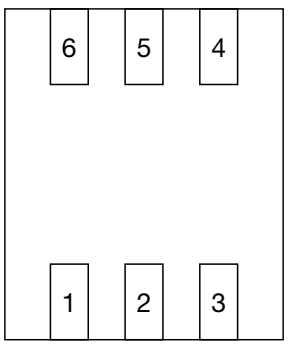
Package

SSON-6

Applications

1. Cordless phones
2. Portable players
3. Digital still cameras
4. Portable game devices
5. PDAs

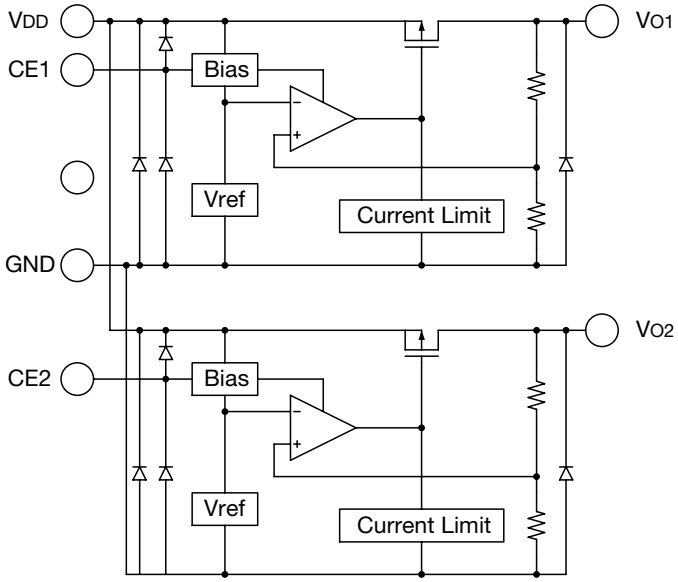
Pin Assignment



SSON-6
(TOP VIEW)

1	V_{O2}
2	V_{DD}
3	V_{O1}
4	GND
5	CE1
6	CE2

Block Diagram



Pin Description

Pin No. SSON-6	Pin name	Function
1	V_{O2}	Output pin 2
2	V_{DD}	Voltage-supply pin
3	V_{O1}	Output pin 1
4	GND	Ground
5, 6	CE1, CE2	ON/OFF-Control pin CE: L → V_{OUT}: OFF; CE: H → V_{OUT}: ON Connect CE pin with V_{DD} pin, when it is not used.

Absolute Maximum Ratings (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~+7.0	V
Output voltage	V_O	−0.3~V_{DD}+0.3	V
Output current	Iomax	200	mA
Power dissipation *1	Pd	1300 *1 180 (Alone)	mW

Note1: *1 With the double sided PC Board of glass epoxy. (25×25×1.6mm copper plane 80%)

Recommended Operating Conditions (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

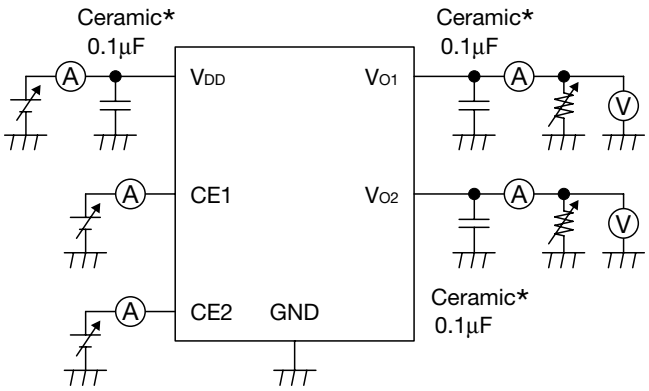
Electrical Characteristics 1 (Except where noted otherwise, Ta=25°C, V_{DD}=V_O (typ.)+1V, V_{CE}=V_{DD})

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Input current 1(OFF)	I_{DD}off1	V_{CE1}=V_{CE2}=0V		0.02	2.0	μA
No-Load input current 1	I_{DD1}	I_{O1}=0mA V_{CE2}=0V		10	18	μA
No-Load input current 2	I_{DD2}	I_{O2}=0mA V_{CE1}=0V		10	18	μA
V_{O1} Block						
Output voltage 1	V_{O1}	I_{O1}=30mA	×0.99		×0.01	V
Line regulation 1	V_{LINE1}	V_{DD}=V_{O1} (Typ.) +0.5~6V, I_{O1}=30mA (V_{O1} ≦ 1.6V, V_{DD}=2.2~6V)		0.01	0.2	%/V
Load regulation 1	V_{LOAD1}	1mA ≦ I_{O1} ≦ 80mA		15	50	mV
Dropout voltage 1	V_{IO1}	Please refer to Electrical Characteristics 2				V
Ripple rejection 1-1	RR_{1-1}	f=1kHz, Vripple=0.5V, I_{O1}=50mA 1.5V ≦ V_{O1} ≦ 5.5V		77		dB
Ripple rejection 1-2	RR_{1-2}	f=10kHz, Vripple=0.5V, I_{O1}=50mA 1.5V ≦ V_{O1} ≦ 5.5V		65		dB
V_{O1} temperature coefficient 1	$\Delta V_{O1}/\Delta T$	I_{O1}=30mA −40 ≦ Top ≦ 85°C		±100		ppm/°C
Output short-circuit current 1	I_{lim1}	V_{O1}=0V		50		mA
CE high threshold voltage 1	V_{CEH1}		1.5			V
CE low threshold voltage 1	V_{CEL1}				0.25	V
CE high threshold current 1	I_{CEH1}		−0.1		0.1	μA
CE low threshold current 1	I_{CEL1}		−0.1		0.1	μA
V_{O2} Block						
Output voltage 2	V_{O2}	I_{O2}=30mA	×0.99		×0.01	V
Line regulation 2	V_{LINE2}	V_{DD}=V_{O2} (Typ.) +0.5~6V, I_{O2}=30mA (V_{O2} ≦ 1.6V, V_{DD}=2.2~6V)		0.01	0.2	%/V
Load regulation 2	V_{LOAD2}	1mA ≦ I_{O2} ≦ 80mA		15	50	mV
Dropout voltage 2	V_{IO2}	Please refer to Electrical Characteristics 2				V
Ripple rejection 2-1	RR_{2-1}	f=1kHz, Vripple=0.5V, I_{O2}=50mA 1.5V ≦ V_{O2} ≦ 5.5V		77		dB
Ripple rejection 2-2	RR_{2-2}	f=10kHz, Vripple=0.5V, I_{O2}=50mA 1.5V ≦ V_{O2} ≦ 5.5V		65		dB
V_{O2} temperature coefficient 2	$\Delta V_{O2}/\Delta T$	I_{O2}=30mA −40 ≦ Top ≦ 85°C		±100		ppm/°C
Output short-circuit current 2	I_{lim2}	V_{O2}=0V		50		mA
CE high threshold voltage 2	V_{CEH2}		1.5			V
CE low threshold voltage 2	V_{CEL2}				0.25	V
CE high threshold current 2	I_{CEH2}		−0.1		0.1	μA
CE low threshold current 2	I_{CEL2}		−0.1		0.1	μA

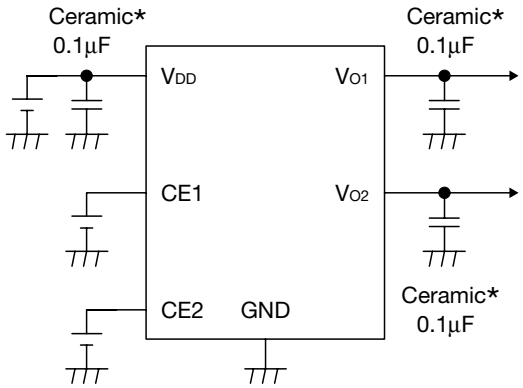
Electrical Characteristics 2 (Except where noted otherwise, Ta=25°C, V_{DD}=Vo (typ.) +1V, V_{CE}=V_{DD})

Output voltage (V)	Item											
	Output voltage				Dropout voltage 1				Dropout voltage 2			
	Vo (V)				V_{IO1} (V)				V_{IO2} (V)			
	Measurement conditions	Min.	Typ.	Max.	Measurement conditions	Min.	Typ.	Max.	Measurement conditions	Min.	Typ.	Max.
1.5	Io=30mA	1.485	1.500	1.515	Io=30mA 1.5V ≦ Vo ≦ 1.9V		0.10	0.15	Io=100mA 1.5V ≦ Vo ≦ 1.9V		0.60	0.80
1.6		1.584	1.600	1.616								
1.7		1.683	1.700	1.717								
1.8		1.782	1.800	1.818								
1.9		1.881	1.900	1.919								
2.0		1.980	2.000	2.020	2.0V ≦ Vo ≦ 2.4V		0.08	0.12	2.0V ≦ Vo ≦ 2.4V		0.24	0.31
2.1		2.079	2.100	2.121								
2.2		2.178	2.200	2.222								
2.3		2.277	2.300	2.323								
2.4		2.376	2.400	2.424								
2.5		2.475	2.500	2.525	2.5V ≦ Vo ≦ 2.9V		0.06	0.08	2.5V ≦ Vo ≦ 2.9V		0.16	0.23
2.6		2.574	2.600	2.626								
2.7		2.673	2.700	2.727								
2.8		2.772	2.800	2.828								
2.85		2.822	2.850	2.879								
2.9		2.871	2.900	2.929								
3.0		2.970	3.000	3.030	3.0V ≦ Vo ≦ 3.2V		0.05	0.07	3.0V ≦ Vo ≦ 3.2V		0.14	0.21
3.1		3.069	3.100	3.131								
3.2		3.168	3.200	3.232								
3.3		3.267	3.300	3.333	3.3V ≦ Vo ≦ 5.0V		0.04	0.06	3.3V ≦ Vo ≦ 5.0V		0.13	0.19
3.4		3.366	3.400	3.434								
3.5		3.465	3.500	3.535								
3.6		3.564	3.600	3.636								
3.7		3.663	3.700	3.737								
3.8		3.762	3.800	3.838								
3.9		3.861	3.900	3.939								
4.0		3.960	4.000	4.040								
4.1		4.059	4.100	4.141								
4.2		4.158	4.200	4.242								
4.3		4.257	4.300	4.343								
4.4		4.356	4.400	4.444								
4.5		4.455	4.500	4.545								
4.6		4.554	4.600	4.646								
4.7		4.653	4.700	4.747								
4.8		4.752	4.800	4.848								
4.9		4.851	4.900	4.949								
5.0		4.950	5.000	5.050								

Measuring Circuit



Application Circuit



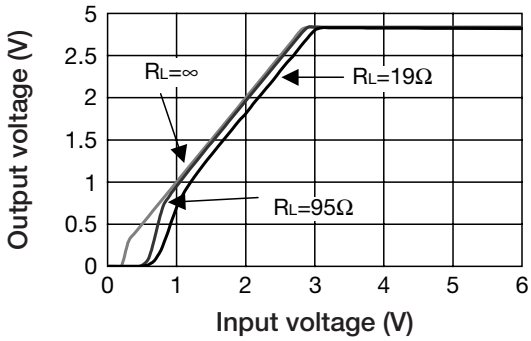
*Temperature Characteristics : B

Note

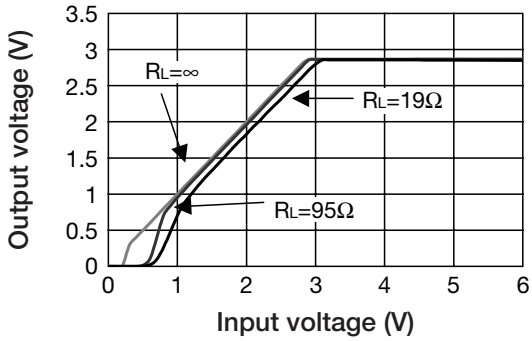
1. The output capacitor is required between output and GND to prevent the oscillation.
2. The output capacitor must be used in ESR stable area.
   It is possible to use a ceramic capacitor without ESR resistance for output.
   The ceramic capacitor must be used more than 0.1µF and B temperature characteristics.
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 in 1cm from input pin.
5. In case the output voltage is above the input voltage, the overcurrent flows by internal parastic diode from output to input.

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

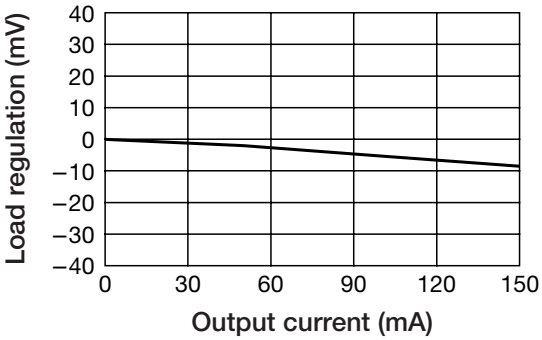
Output-Input Voltage Vo1



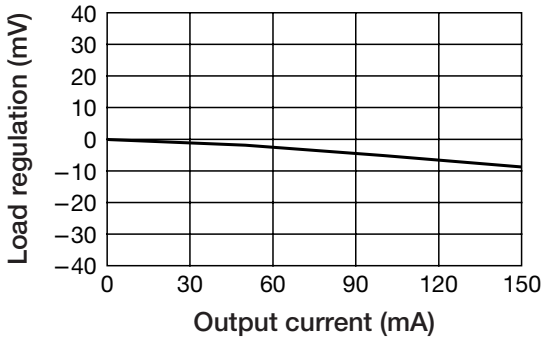
Output-Input Voltage Vo2



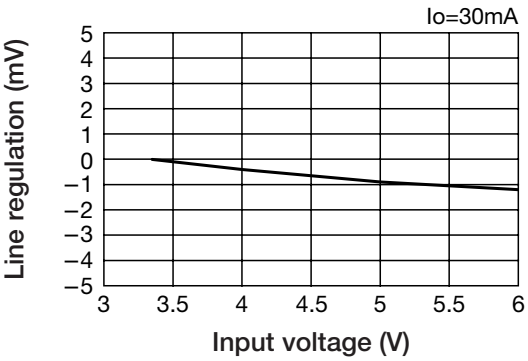
Load regulation Vo1



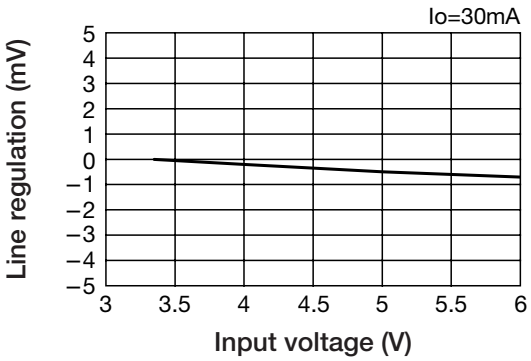
Load regulation Vo2



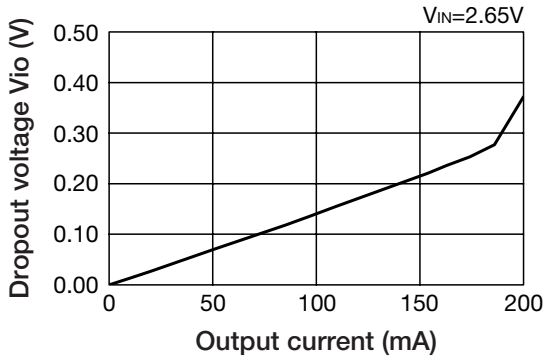
Line Regulation Vo1



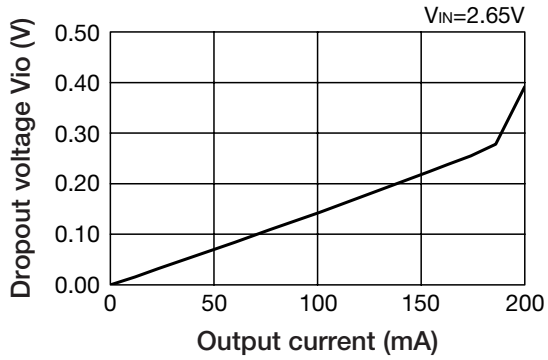
Line Regulation Vo2



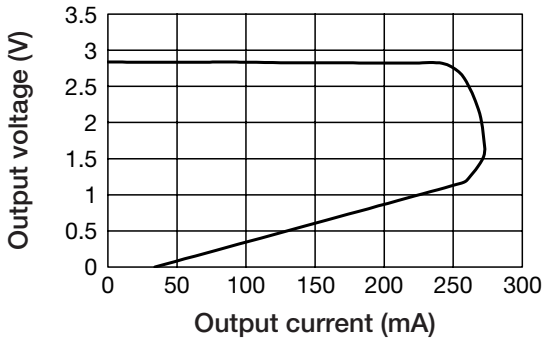
Dropout Voltage-Output Current Vo1



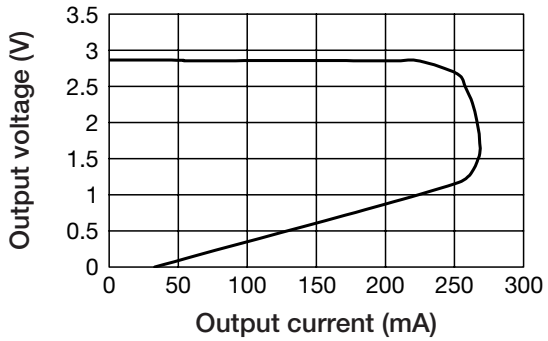
Dropout Voltage-Output Current Vo2



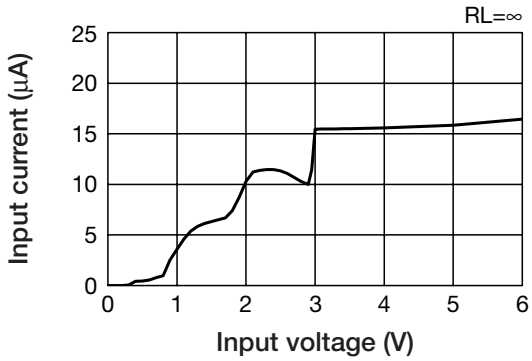
Current Limit Vo1



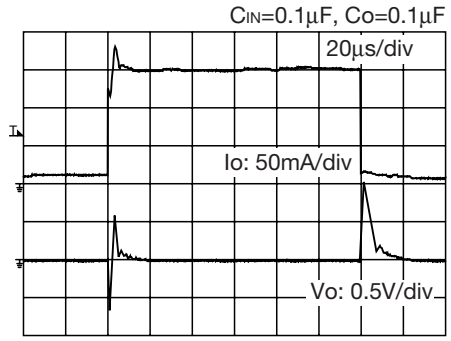
Current Limit Vo2



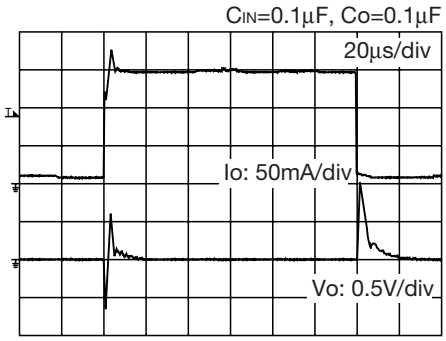
Input Current-Input Voltage



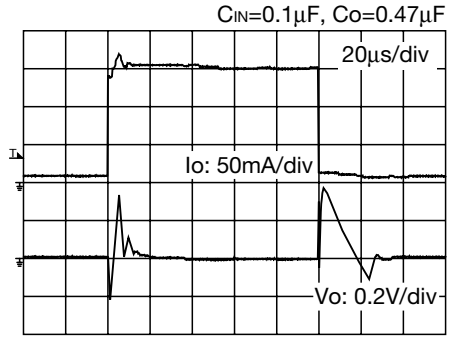
Load transient response Vo1 (Io=10→150mA)



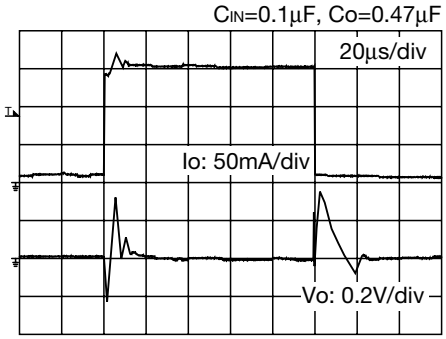
Load transient response Vo2 (Io=10→150mA)



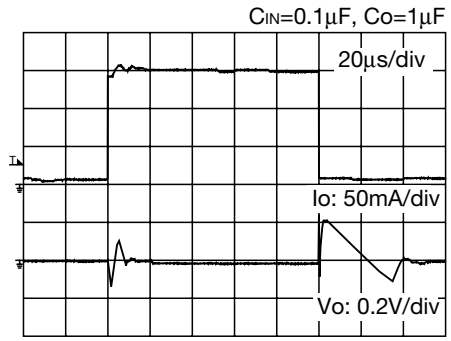
Load transient response Vo1 (Io=10→150mA)



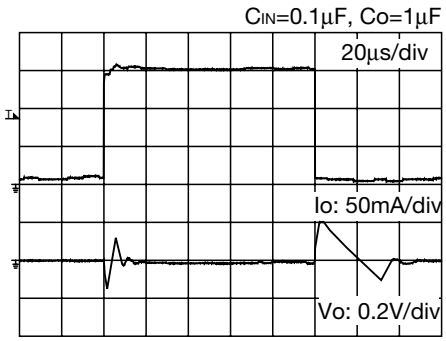
Load transient response Vo2 (Io=10→150mA)



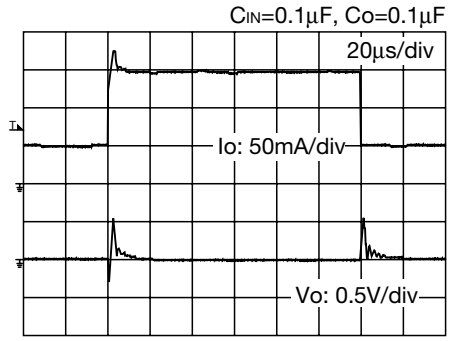
Load transient response Vo1 (Io=10→150mA)



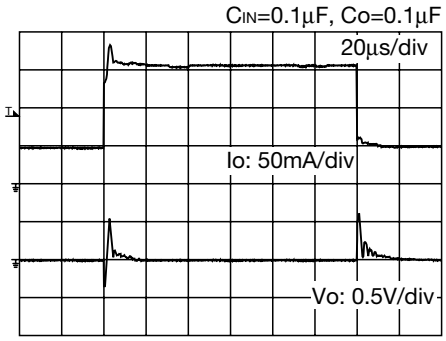
Load transient response Vo2 (Io=10→150mA)



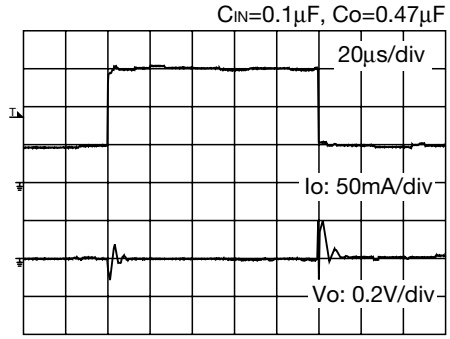
Load transient response Vo1 (Io=50→150mA)



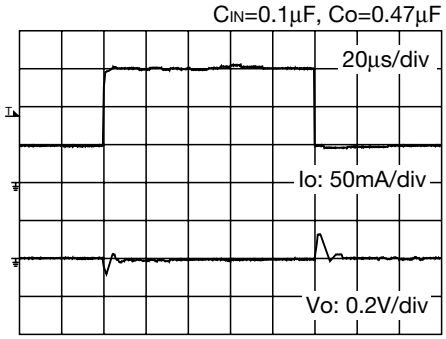
Load transient response Vo2 (Io=50→150mA)



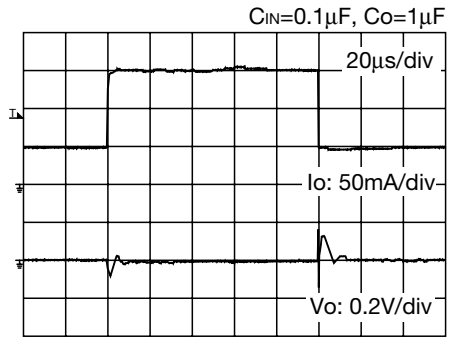
Load transient response Vo1 (Io=50→150mA)



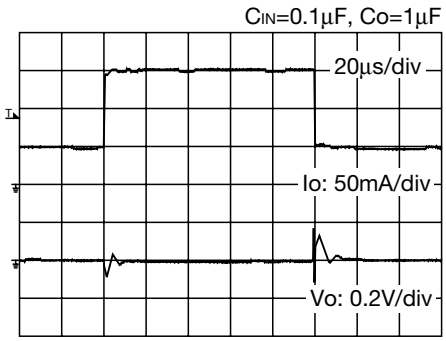
Load transient response Vo2 (Io=50→150mA)



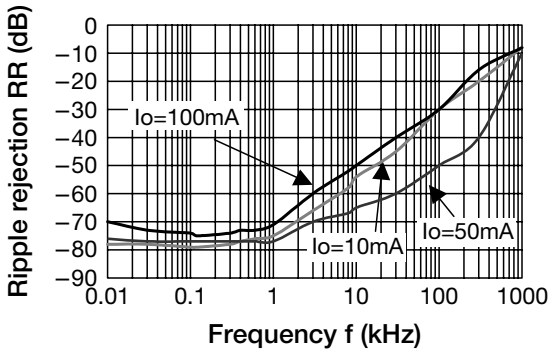
Load transient response Vo1 (Io=50→150mA)



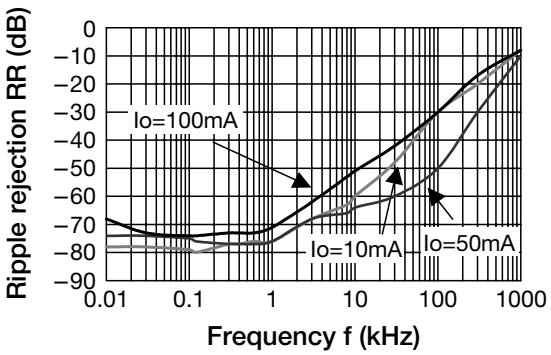
Load transient response Vo2 (Io=50→150mA)



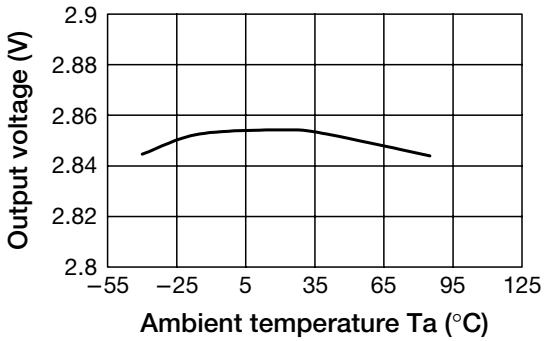
Ripple Rejection Vo1



Ripple Rejection Vo2



Output Voltage Vo1-Temperature



Output Voltage Vo2-Temperature