IC for Regulator+Reset
Monolithic IC MM1688 Series

Outline

This IC is a regulator (2 circuits) + reset IC developed for optical disc drives such as DVD-ROM drives. Regulator output voltage and reset detection voltage are fixed, while regulator output voltage and reset detection voltage are programmable ranging from 1.5V to 5.0V, and 2.7V to 5.0V respectively upon request.

Features

1. Output voltage accuracy ±2%
2. Dropout voltage 0.06V typ. (Io=70mA, regulator 1, 2)
3. Large output current 300mA max.
4. High ripple rejection 80dB typ. (regulator 1, 2)
5. Incorporates thermal shutdown circuit
6. Incorporates current limit circuit
7. Reset detection voltage 1.5 to 5.0V
8. Delay time from voltage detection to reset release can be easily programmed.

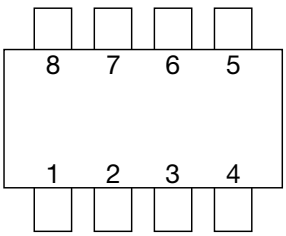
Packages

1. SOP-8D
2. HSOP-8A

Applications

1. CD-ROM drive
2. Optical disc drivers

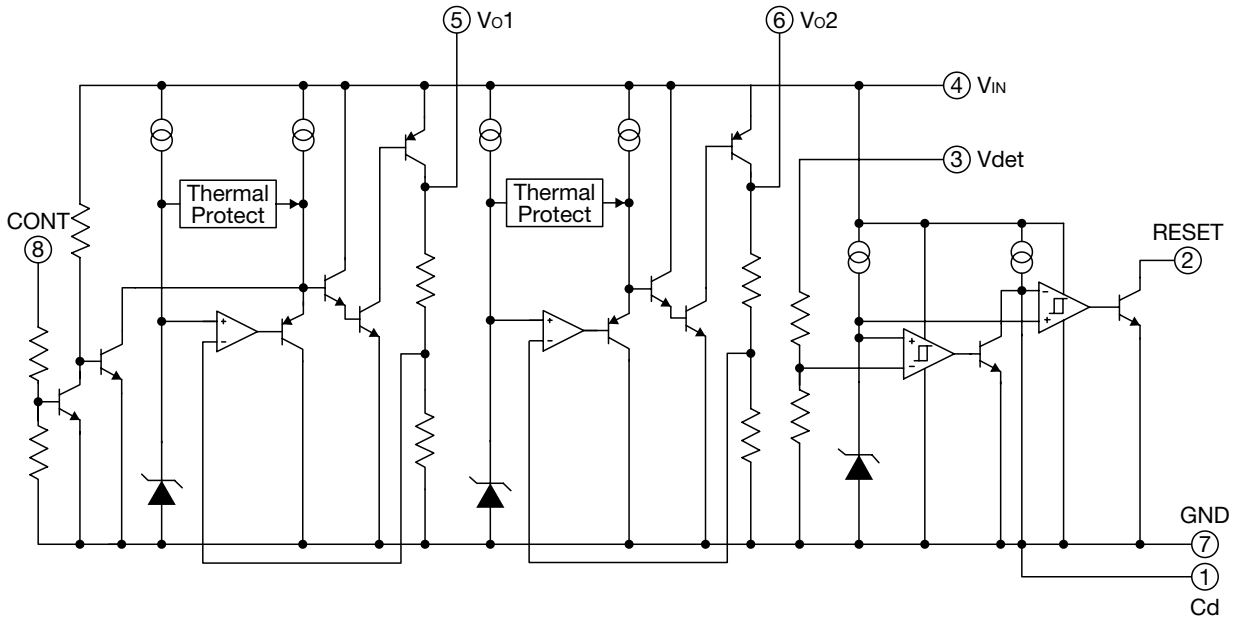
Pin Assignment



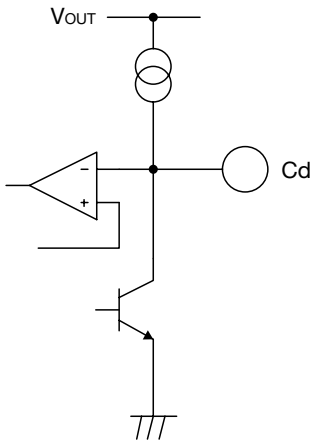
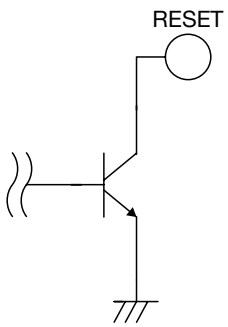
SOP-8D
(TOP VIEW)

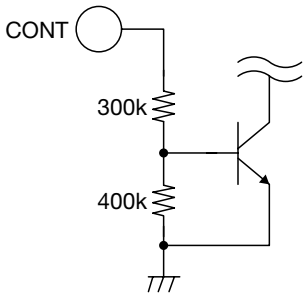
1	Cd
2	Reset
3	Vdet
4	V_{IN}
5	Vo1
6	Vo2
7	GND
8	CONT

Block Diagram



Pin Assignment

Pin No.	Pin name	Function	Internal equivalent circuit diagram
1	Cd	Delay time capacitor pin The delay time of RESET output can be set according to the capacity value connected with Cd. t_{PLH}=450000 · C t_{PLH1}: Delay time (s) C: cd-capacitance (F)	
2	RESET	Reset-output pin RESET Logical table RESET: Vdet<VS → L; Vdet>VS → H When the voltage of VIN decreases to1.6V or less, it is likely to become "L" regardless of Vdet voltage.	

Pin No.	Pin name	Function	Internal equivalent circuit diagram
3	Vdet	Voltage-supply pin (RESET)	
4	V_{IN}	Voltage-supply pin	
5	$V_{OUT}1$	Output pin	
6	$V_{OUT}2$	Output pin	
7	GND	Ground	
8	CONT	ON/OFF Control pin CONT: H = ON, L = OFF CONT pin must be connected with V_{IN} pin, if it is not used.	

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	−55~+150	°C
Output current 1	$I_{OUT}1$	300	mA
Output current 2	$I_{OUT}2$	300	mA
Power dissipation	Pd	780 *1	mW

Note1: *1 Attached on PC board (40 × 40 × 1.6mm).

Recommended Operating Conditions (Ta=25°C)

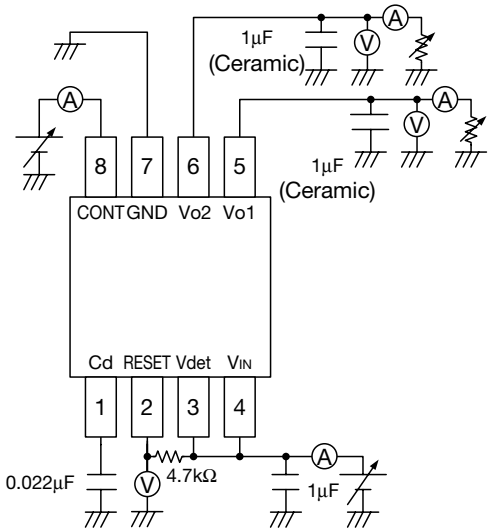
Item	Symbol	Ratings	Units
Operating temperature	T_{OPR}	−40~+85	°C
Supply voltage	V_{IN}	−0.3~+10	V
Output current 1	$I_{OUT}1$	0~300	mA
Output current 2	$I_{OUT}2$	0~300	mA
Operating voltage	V_{OP}	0~10	V

Electrical Characteristics (Except where noted otherwise, Ta=25°C, V_{IN}=5V, Io1=30mA, Io2=30mA, V_{CONT}=1.6V)

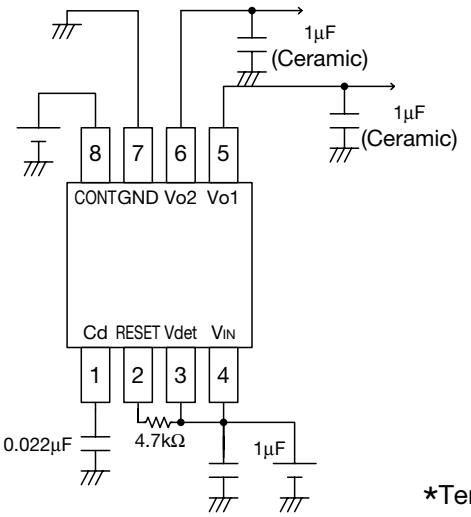
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
V_{IN} input current 1	Iccq1	I_{OUT}1=I_{OUT}2=0mA		1	2	mA
V_{IN} input current 2 (V_{OUT}1-OFF)	Iccq2	V_{CONT}=0.4V I_{OUT}2=0mA		0.6	1.2	mA
Vdet input current	Iccq3	Vdet=5V		20	40	µA
Regulator 1 (Io1=150mA)						
Output voltage 1	V_{O1}		3.23	3.30	3.37	V
Dropout voltage 1	V_{IO1}	V_{IN}=3.1V, I_{OUT}1=70mA		0.06	0.18	V
Line regulation 1	ΔV_1	V_{IN}=4.4~5.5V		1	20	mV
Load regulation 1	ΔV_2	Io1=1~150mA		20	120	mV
Vo Temperature Coefficient 1 *1	$\Delta V_{O1}/\Delta T$	Tj=–40~+85°C		100		ppm/°C
Ripple rejection 1 *1	RR_1	f=1kHz Vripple=1V	50	80		dB
Output noise voltage 1 *1	V_{n1}	f_{BW}=20~80kHz		100		µVrms
CONT terminal current	Ion	Vcont=1.6V		5	10	µA
CONT threshold level	V_{CONTH}		1.6		V_{IN}+0.3	V
CONT threshold level 1	V_{CONTL}		–0.3		0.4	V
Regulator 2 (Io2=150mA)						
Output voltage 2	V_{O2}		3.23	3.30	3.37	V
Dropout voltage 2	V_{IO2}	V_{IN}=3.1V, Io2=70mA		0.06	0.18	V
Line regulation 2	ΔV_2	V_{IN}=4.4~5.5V		10	20	mV
Load regulation 2	ΔV_2	Io2=1~100mA		20	120	mV
Vo Temperature Coefficient 2 *1	$\Delta V_{O2}/\Delta T$	Tj=–40~+85°C		100		ppm/°C
Ripple rejection 2 *1	RR_2	f=1kHz Vripple=1V	50	80		dB
Output noise voltage 2 *1	V_{n2}	f_{BW}=20~80kHz		100		µVrms
Reset						
Detecting voltage	Vs	Vdet=H→L	3.63	3.70	3.77	V
Vs temperature coefficient *1	$\Delta Vs/\Delta T$	Tj=–40~+85°C		100		ppm/°C
Hysteresis voltage	ΔVs	Vdet=H→L→H	100		200	mV
Low-level output voltage	V_{OL}	Vdet=3.5V RL=4.7kΩ		100	200	mV
Output leakage current	I_{OH}	Vdet=5V RL=0kΩ			±0.1	µA
Output current 1	I_{OL}	Vdet=3.5V RL=0kΩ	5			mA
Output current 2	I_{OL}	Vdet=3.5V, RL=0kΩ Ta=–30~+80°C	3			mA
"H" transmission delay time *1	t_{PLH}	Cd Terminal Open		30	90	µs
Delay time *1	t_{PLH1}	Vdet=3.5V→5.0V Cd=0.022µF	5	10	15	ms
"L" transmission delay time *1	t_{PHL}			30	90	µs
Threshold operating voltage	V_{OPL}	V_{OL}=0.4V		0.65	0.85	V

Note 1: *1 The parameter is guaranteed by design.

Measuring Circuit



Application Circuit

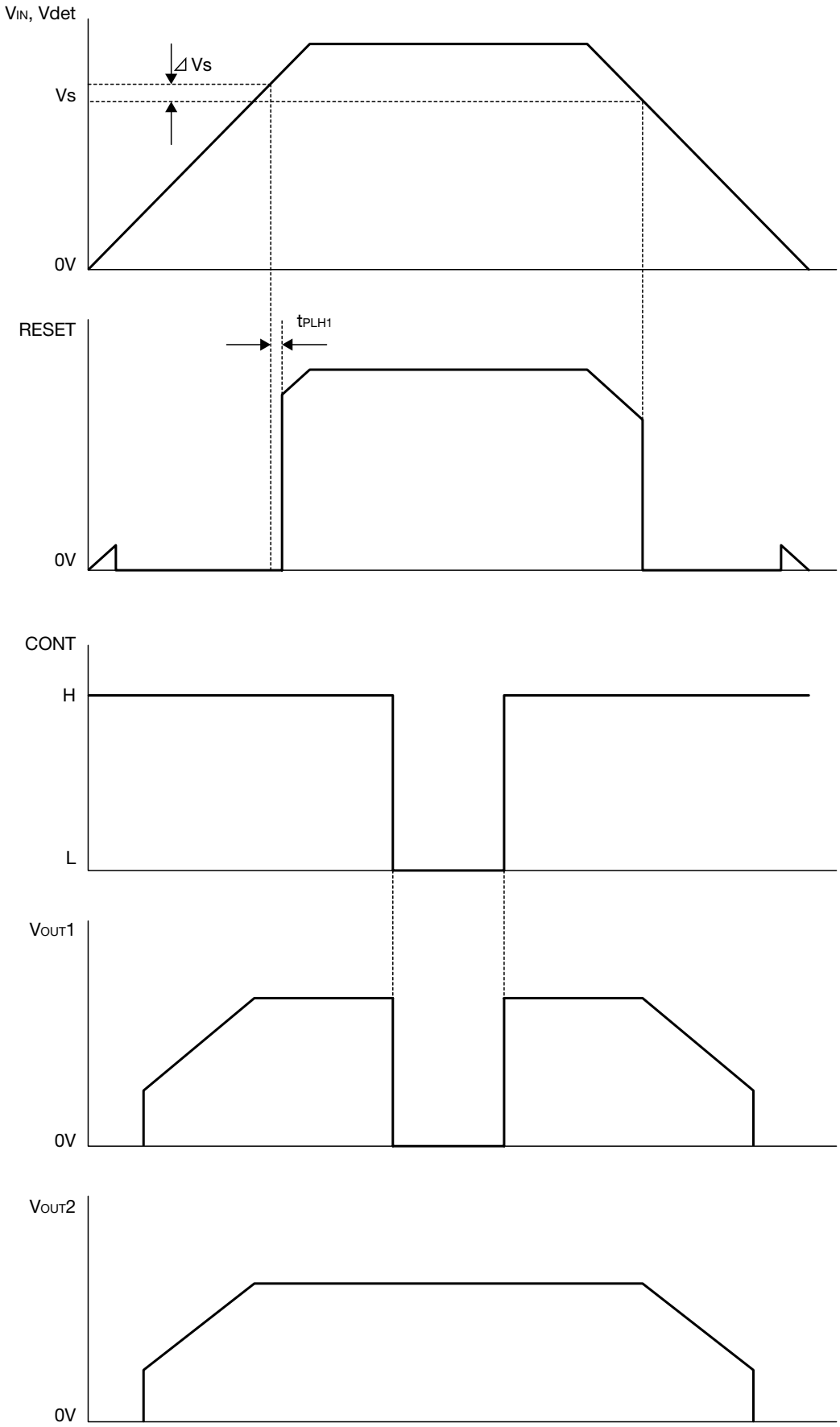


*Temperature Characteristics: B Type

Note

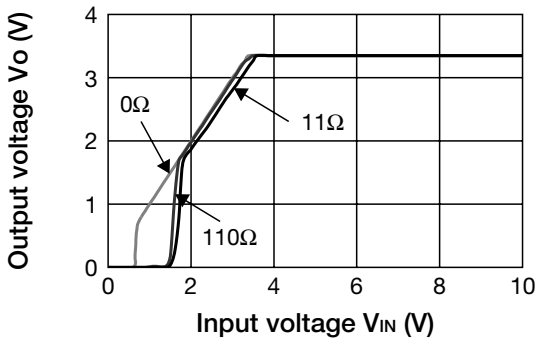
1. The output capacitor is required between output and GND to prevent oscillation.
2. The output capacitor must be used in ESR stable area.
   It is possible to use a ceramic capacitor without ESR resistance for output.
   The ceramic capacitor must be used more than 1µF and B type temperature characteristics.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

Timing Chart

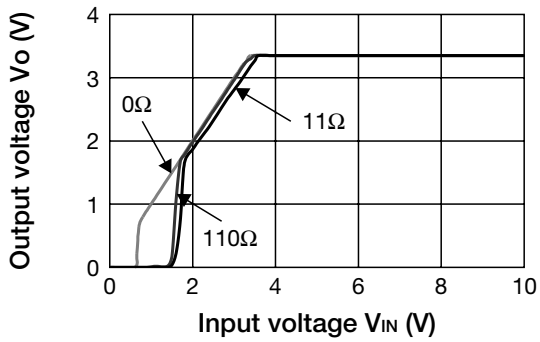


Characteristics (Except where noted otherwise, Ta=25°C, V_{IN}=Vo+1V, V_{CONT}=1.6V, C_{IN}=1µF, Co=1µF, Cd=0.022µF)

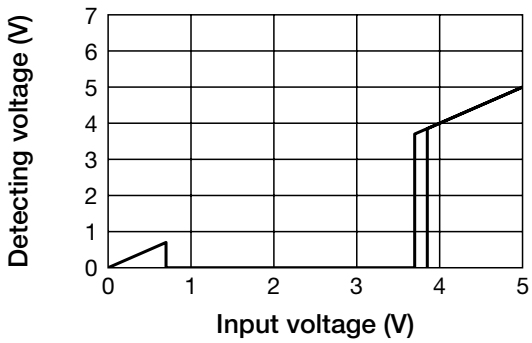
Output Voltage 1-Input Voltage



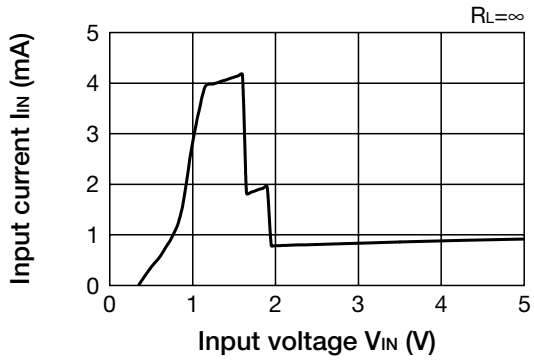
Output Voltage 2-Input Voltage



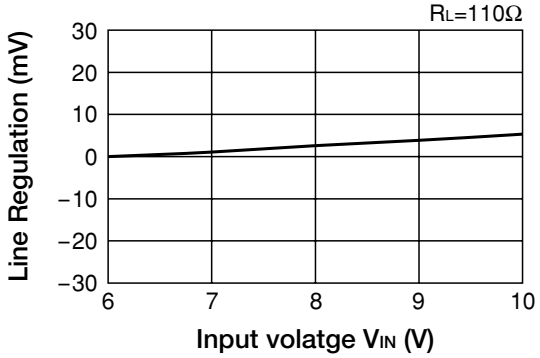
Detecting Voltage



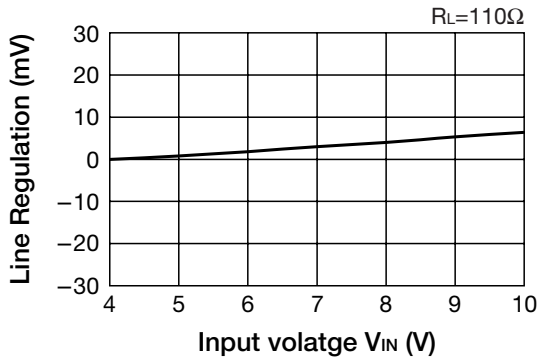
Input current-Input Voltage



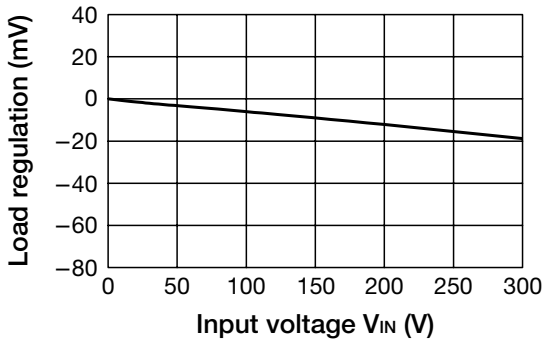
Line Regulation Vo1



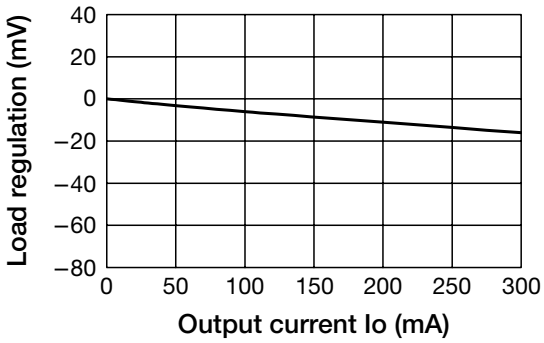
Line Regulation Vo2



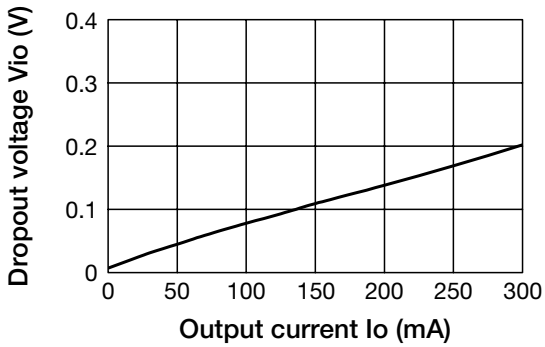
Load Regulation Vo1



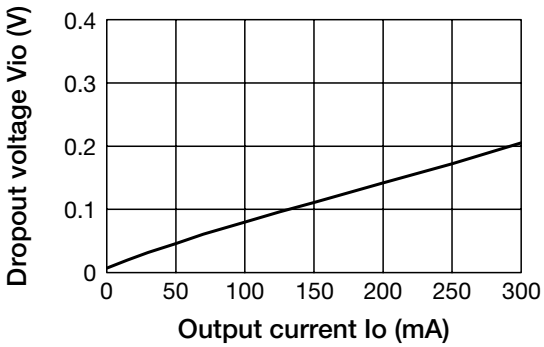
Load Regulation Vo2



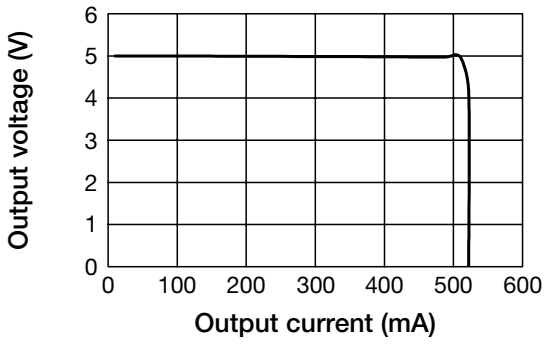
Dropout Voltage Vo1-Output Current



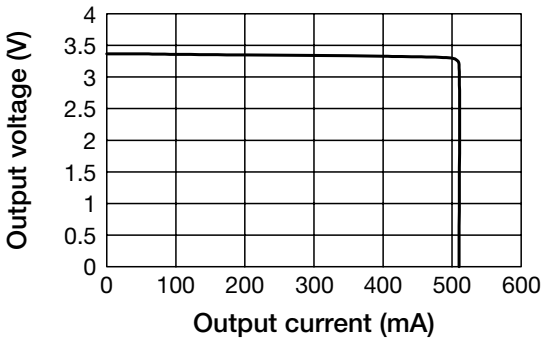
Dropout Voltage Vo2-Output Current



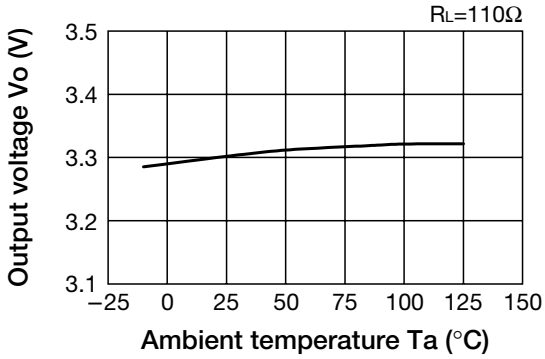
Current Limit Vo1



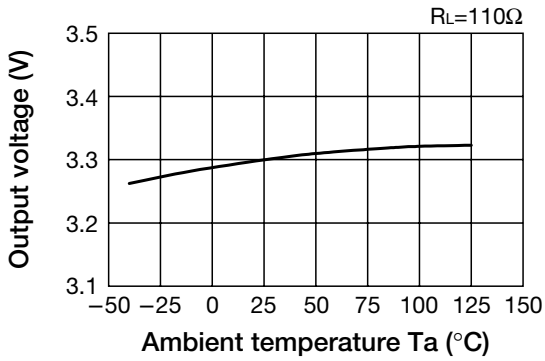
Current Limit Vo2



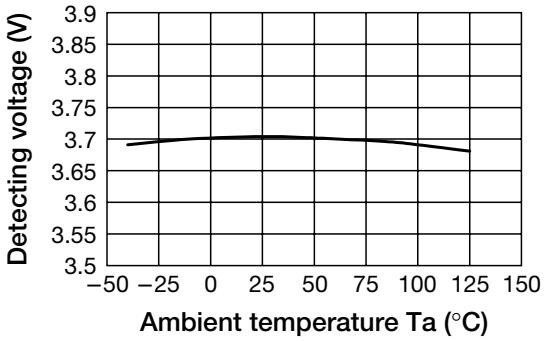
Output Voltage Vo1-Ambient Temperature



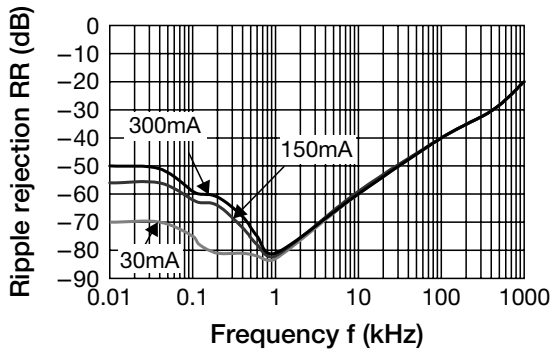
Output Voltage Vo2-Ambient Temperature



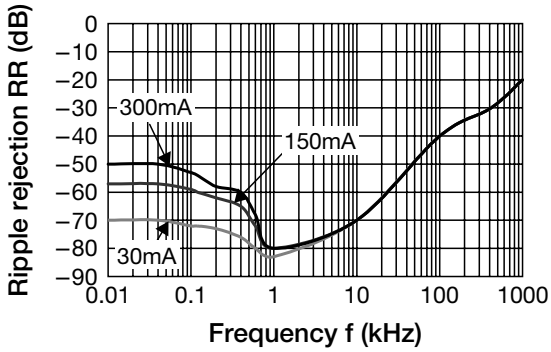
Detecting Voltage-Ambient Temperature



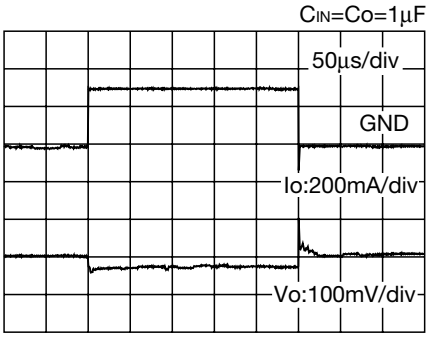
Ripple Rejection Vo1



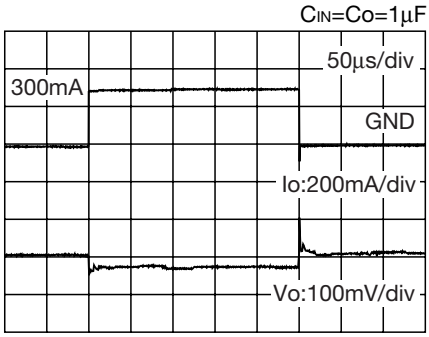
Ripple Rejection Vo2



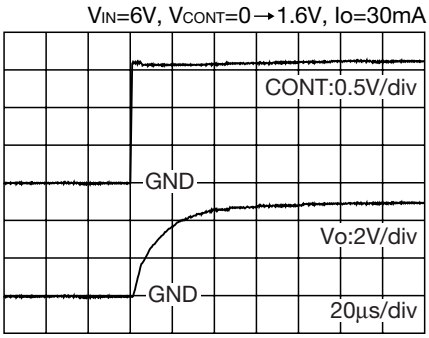
Load transient response Vo1 (Io=1→300mA)



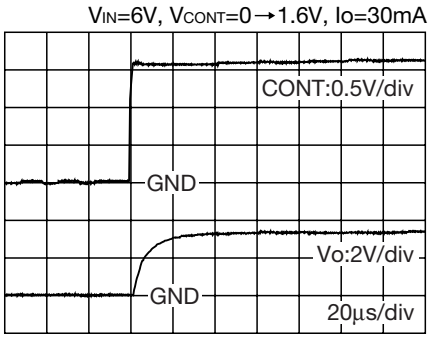
Load transient response Vo2 (Io=1→300mA)



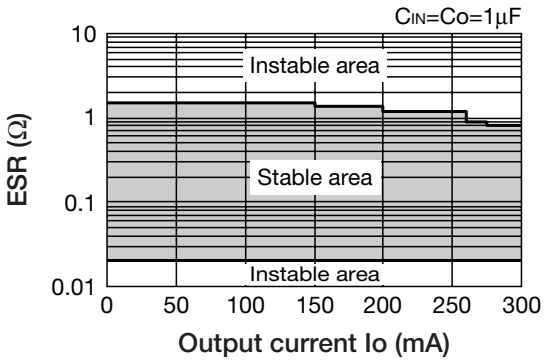
Turn-On Transient Respones Vo1



Turn-On Transient Respones Vo2



ESR Stable Area Vo1



ESR Stable Area Vo2