Ordering number : ENA1415

SANYO Semiconductors
DATA SHEET

An ON Semiconductor Company

LA59700MX — Monolithic Linear IC Adjustable Voltage Type Regulator

Overview

LA59700MX is an adjustable voltage regulator which has chip enable function.
The maximum current of 1.0A can be output.

Features

- Adjustable output voltage
- Maximum output current: 1.0A
- Chip enable function
- Build-in over current protection circuit
- Available ceramic capacitors

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		16	V
Maximum input voltage	V_{IN} max		16	V
Allowable power dissipation	Pd max	Mounted on a specified board *1	1.8	W
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

*1. Specified board: 50mm × 50mm × 1.6mm, glass epoxy double side board.

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Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input Voltage ($V_{CC}1$)	$V_{CC}1$		3.5 to 15	V
Input Voltage ($V_{CC}2$)	$V_{CC}2$		*2 (V_{OUT}+V_{DROP}) to 15	V
Input Voltage(EN)	V_{EN}		0 to 15	V
Output Voltage	V_{OUT}		1.5 to ($V_{CC}1$-1.5)	V

*2. V_{DROP}: Dropout voltage

Electrical Characteristics at Ta = 25°C, $V_{CC}1$ = $V_{CC}2$ = 3.5V, V_{EN} = 1.6V, V_{OUT} = 1.5V

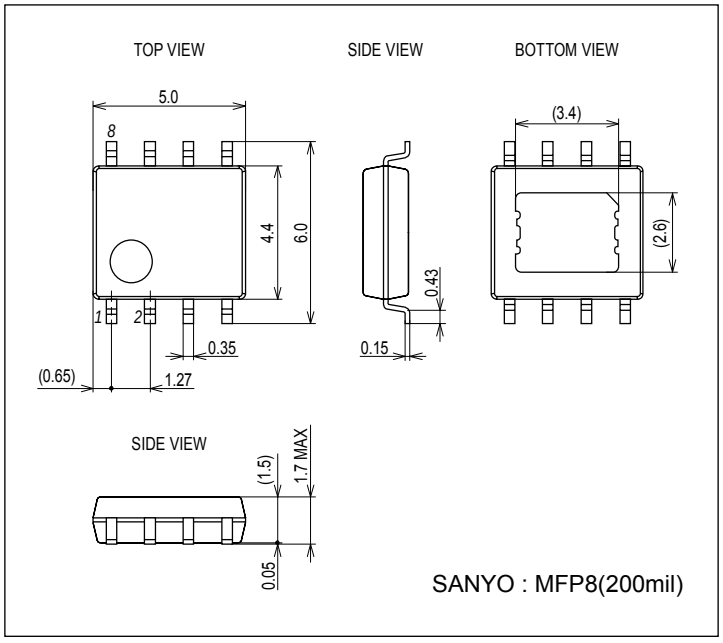
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I_{CC}	V_{EN} = 1.6V		3.5	7	mA
Standby current	I_{STBY}	V_{EN} = 0V			1	μA
Output voltage	V_{OUT}	OUT = ADJ, I_{OUT} = 10mA,	1.225	1.25	1.275	V
Output current	I_{OUT}		1.0			A
Dropout voltage ($V_{CC}2$-V_{OUT})	V_{DROP}	I_{OUT} = 500mA		0.42	0.6	V
		I_{OUT} = 1.0A		0.84	1.2	V
ADJ source current	I_{ADJ}	ADJ = 0V, OUT = Open		160	300	nA
Load regulation	R_{LD}	I_{OUT} = 10mA to 500mA			10	mV
Line regulation	R_{LN}	$V_{CC}1$ = $V_{CC}2$ = 3.5V to 7V, I_{OUT} = 10mA			10	mV
Output voltage temperature coefficient *3	ΔV / ΔT	Ta = -40 to +85°C, I_{OUT} = 10mA		±100		ppm/°C
Ripple rejection *3	R_R	$V_{CC}1$ = $V_{CC}2$ = 4.25V, OUT = ADJ, I_{OUT} = 10mA, VRpp = 1V, f_{RR} = 120Hz C_{OUT} = Ceramic 10μF		65		dB
Chip enable voltage	V_{EN}		1.6			V
Disable voltage	V_{DIS}				0.4	V
EN input current	I_{EN}	V_{EN} = 1.6V		50		μA
Thermal shutdown temperature *3	T_{TSD}	Junction Temperature		170		°C
TSD hysteresis *3	T_{HYS}			30		°C

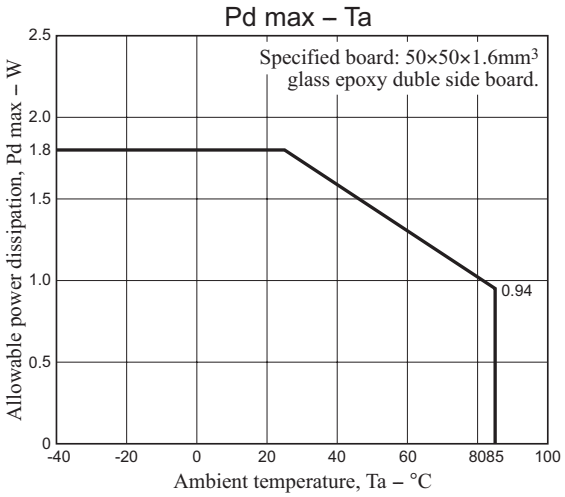
*3. Design guarantee value, Do not measurement.

Package Dimensions

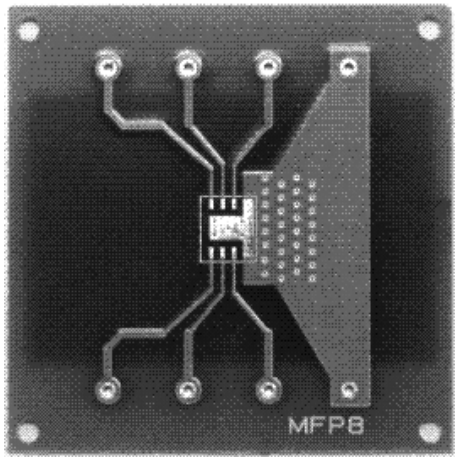
unit : mm (typ)

3372

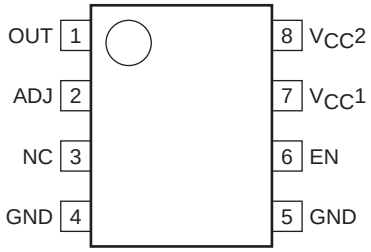




Specified Board (50mm × 50mm × 1.6mm, glass epoxy double side board)

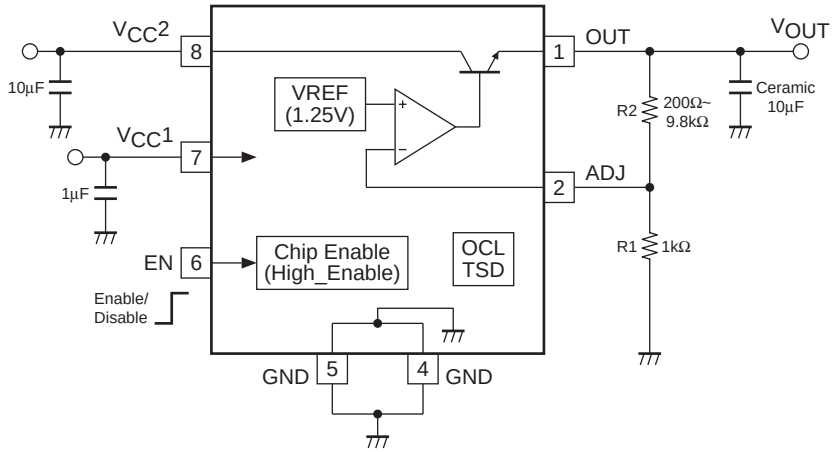


Pin Assignment



Top view

Block Diagram and Application Circuit Example



Formula of Output Voltage Adjustment

V_{OUT} = VADJ (≈1.25V) × (R1+R2)/R1

Note: Set the resistance of R1 and R2 so that a large enough current flows through the two resistors, making the effect on the source current from the ADJ pin negligible.

Startup Method

This IC can be started in one of the following two ways:

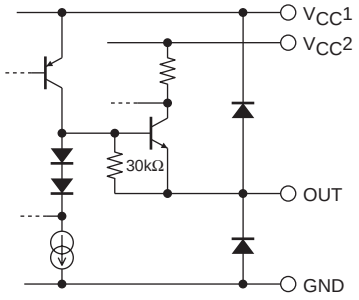
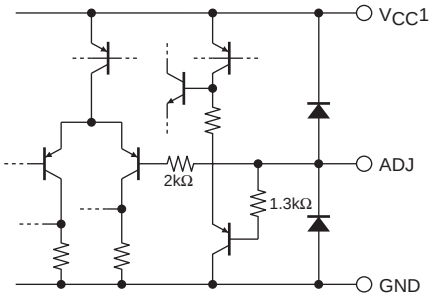
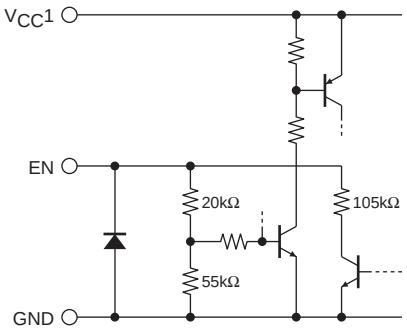
(1) Start the IC by turning on and off the EN pin after applying power to $V_{CC}1$ and $V_{CC}2$.

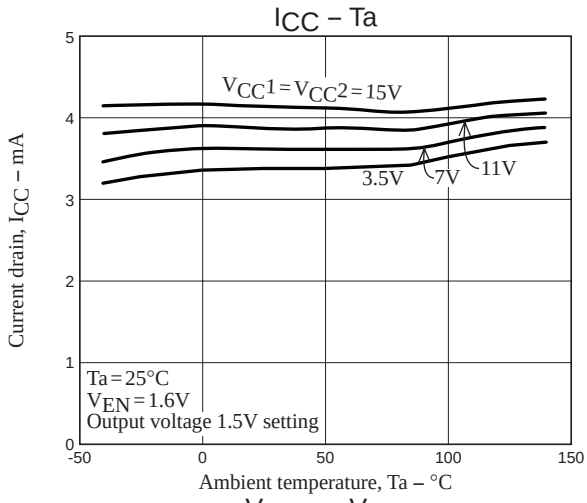
(2) Short-circuit the $V_{CC}1$, $V_{CC}2$, and EN pins.

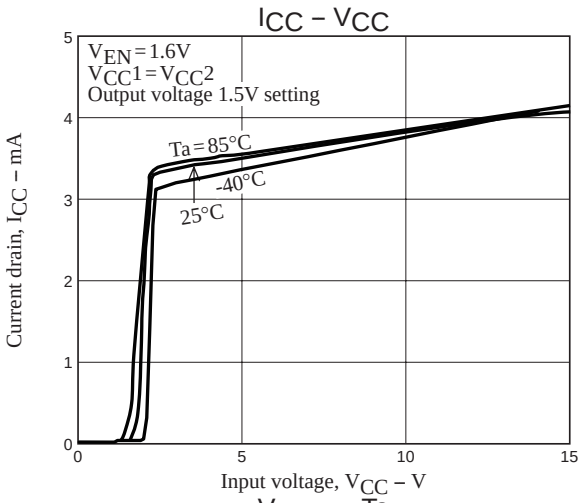
When using method (1), apply power to $V_{CC}1$ and $V_{CC}2$ simultaneously, or in the order of $V_{CC}1$ to $V_{CC}2$, then to the EN pin.

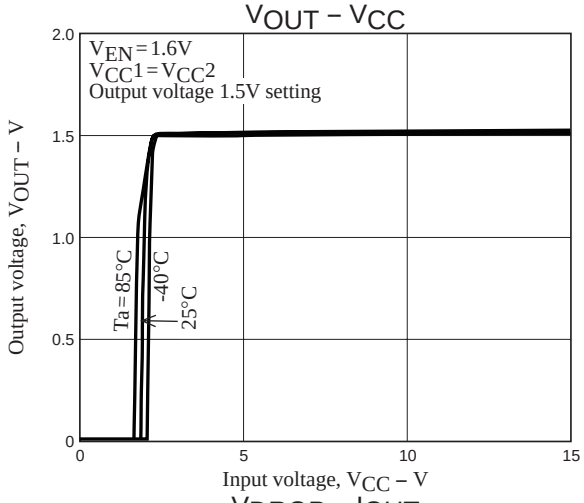
To shutdown the IC, follow the start-up procedure in reverse order.

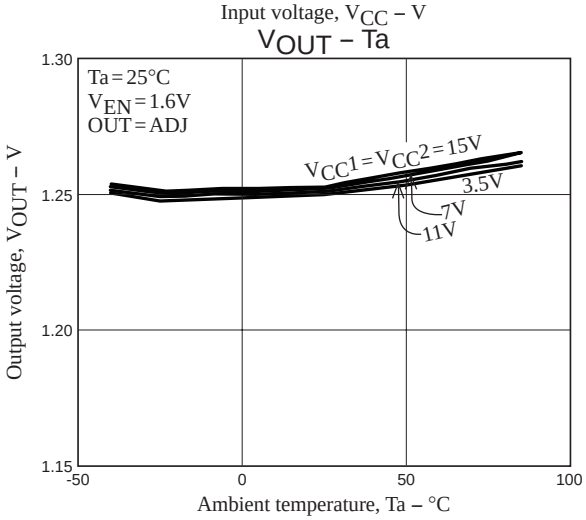
Pin Function

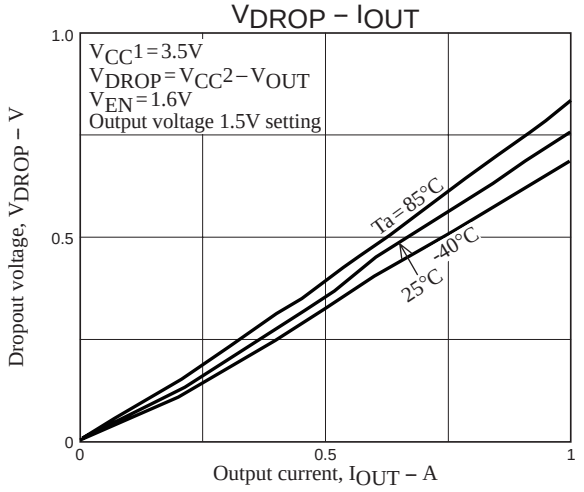
Pin No.	Pin name	Function	Equivalent circuit
1	OUT	Output.	
2	ADJ	Adjustable input.	
3	NC	No connection.	
4	GND	Ground. Connect to Pin 5 internally.	
5	GND	Ground. Connect to Pin 4 internally.	
6	EN	Chip Enable. (High Enable)	
7	$V_{CC}1$	Analog power supply.	
8	$V_{CC}2$	Output power supply.	

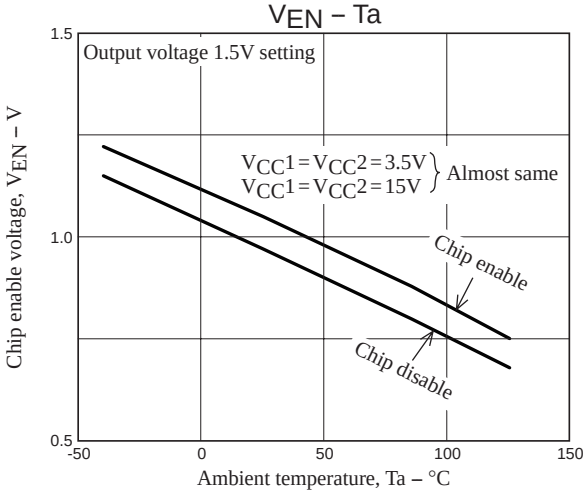

ICC – Ta
VCC1 = VCC2 = 15V
3.5V
7V
11V
Ta = 25°C
VEN = 1.6V
Output voltage 1.5V setting
Current drain, ICC – mA
Ambient temperature, Ta – °C

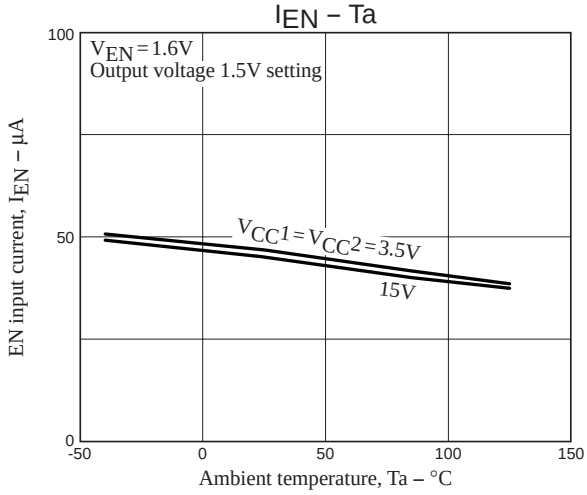

ICC – VCC
VEN = 1.6V
VCC1 = VCC2
Output voltage 1.5V setting
Ta = 85°C
-40°C
25°C
Current drain, ICC – mA
Input voltage, VCC – V

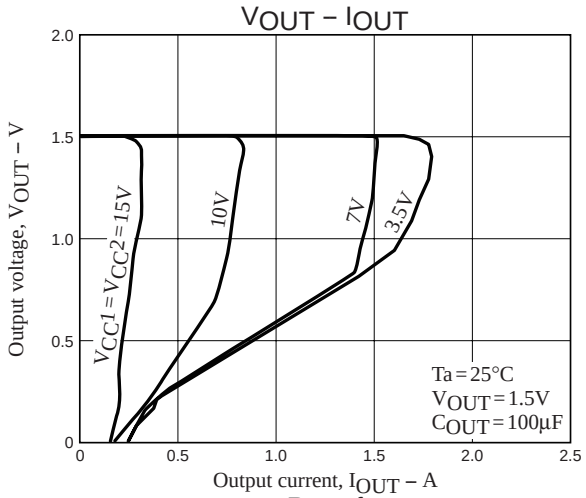

VOUT – VCC
VEN = 1.6V
VCC1 = VCC2
Output voltage 1.5V setting
Ta = 85°C
-40°C
25°C
Output voltage, VOUT – V
Input voltage, VCC – V

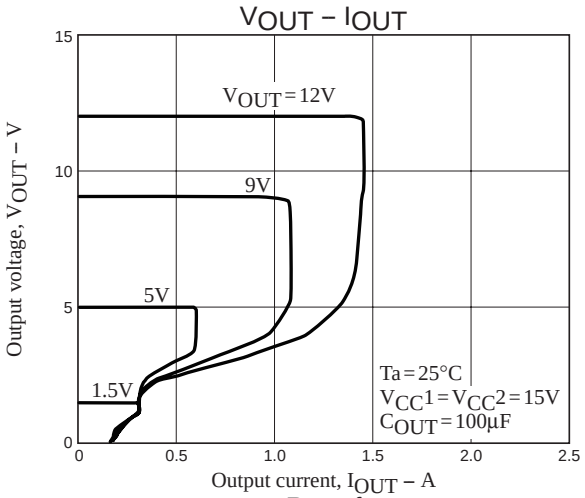

VOUT – Ta
Ta = 25°C
VEN = 1.6V
OUT = ADJ
VCC1 = VCC2 = 15V
3.5V
7V
11V
Output voltage, VOUT – V
Ambient temperature, Ta – °C

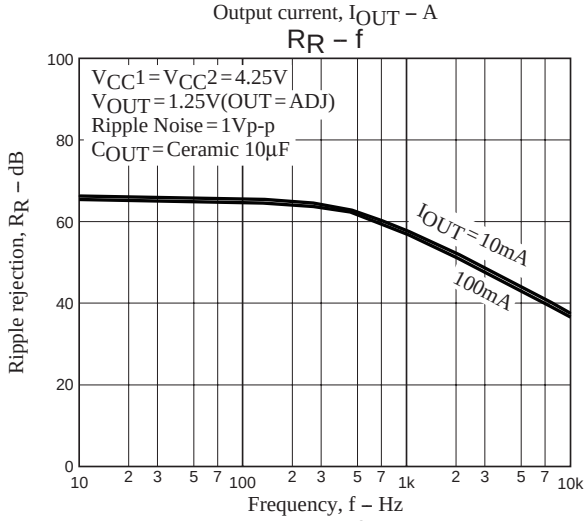

VDROP – IOUT
VCC1 = 3.5V
VDROP = VCC2 – VOUT
VEN = 1.6V
Output voltage 1.5V setting
Ta = 85°C
-40°C
25°C
Dropout voltage, VDROP – V
Output current, IOUT – A

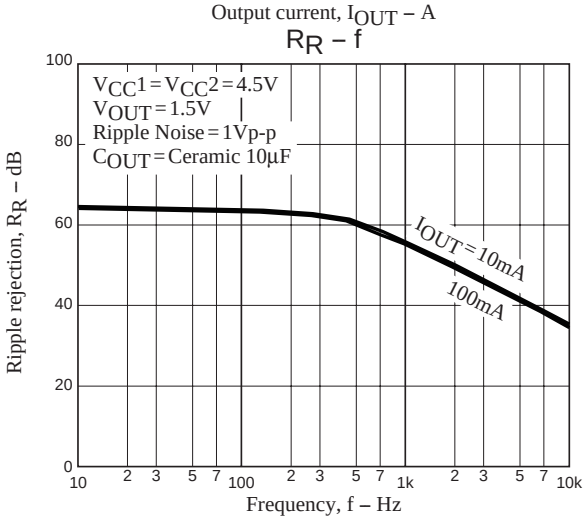

VEN – Ta
Output voltage 1.5V setting
VCC1 = VCC2 = 3.5V
VCC1 = VCC2 = 15V
Almost same
Chip enable
Chip disable
Chip enable voltage, VEN – V
Ambient temperature, Ta – °C

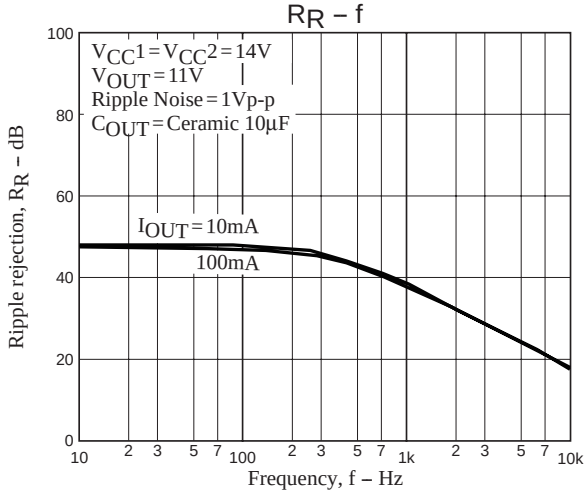

IEN – Ta
VEN = 1.6V
Output voltage 1.5V setting
VCC1 = VCC2 = 3.5V
15V
EN input current, IEN – µA
Ambient temperature, Ta – °C


VOUT – IOUT
Output voltage, VOUT – V
Output current, IOUT – A
VCC1 = VCC2 = 15V
10V
7V
3.5V
Ta = 25°C
VOUT = 1.5V
COUT = 100µF

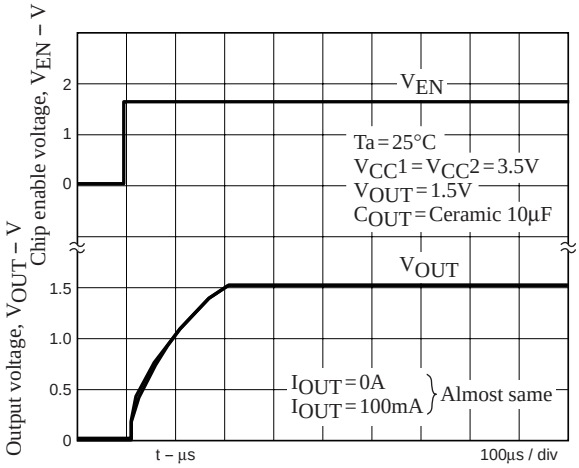

VOUT – IOUT
Output voltage, VOUT – V
Output current, IOUT – A
VOUT = 12V
9V
5V
1.5V
Ta = 25°C
VCC1 = VCC2 = 15V
COUT = 100µF

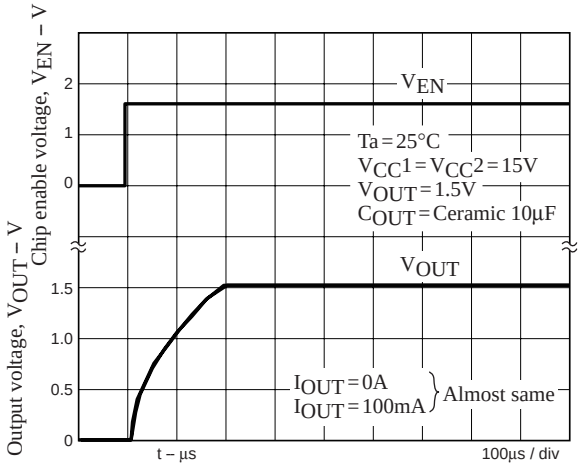

RR – f
Ripple rejection, RR – dB
Frequency, f – Hz
VCC1 = VCC2 = 4.25V
VOUT = 1.25V(OUT = ADJ)
Ripple Noise = 1Vp-p
COUT = Ceramic 10µF
IOUT = 10mA
100mA

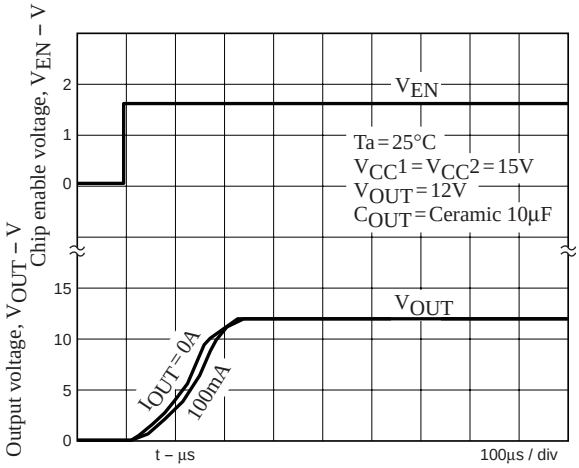

RR – f
Ripple rejection, RR – dB
Frequency, f – Hz
VCC1 = VCC2 = 4.5V
VOUT = 1.5V
Ripple Noise = 1Vp-p
COUT = Ceramic 10µF
IOUT = 10mA
100mA

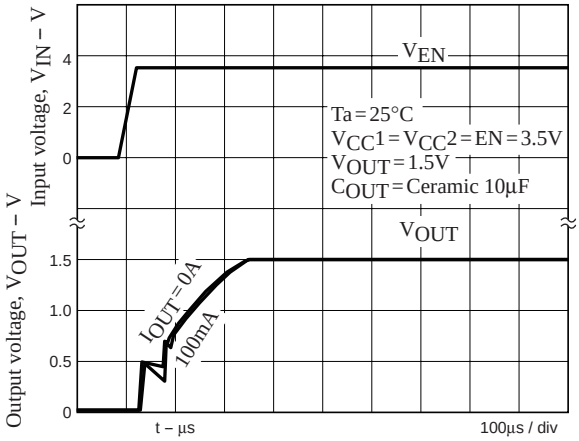

RR – f
Ripple rejection, RR – dB
Frequency, f – Hz
VCC1 = VCC2 = 14V
VOUT = 11V
Ripple Noise = 1Vp-p
COUT = Ceramic 10µF
IOUT = 10mA
100mA

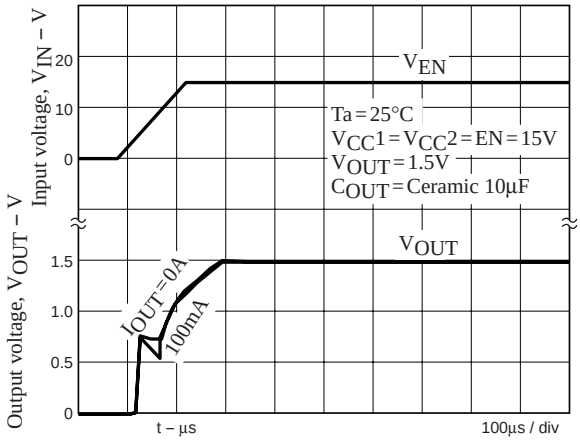
V_{OUT} Startup Characteristic



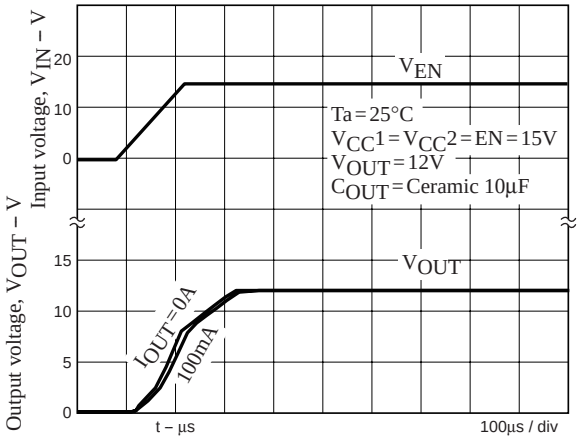




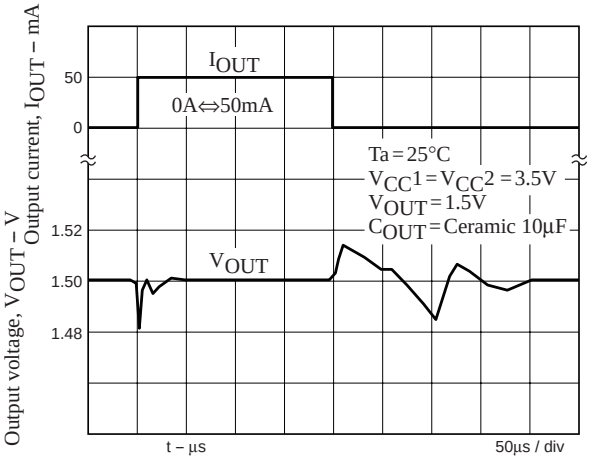


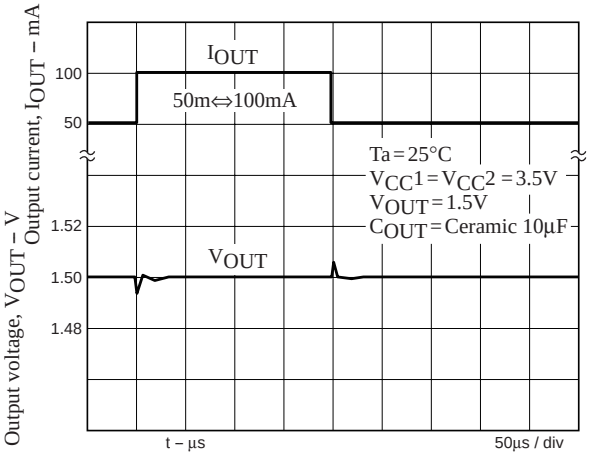


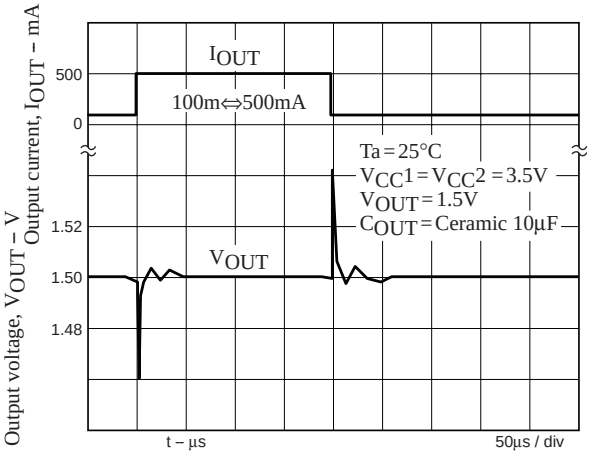
Note: The output voltage (V_{OUT}) may overshoot when V_{IN} starts up with slew rate of a voltage of 0.1V/µs or over.

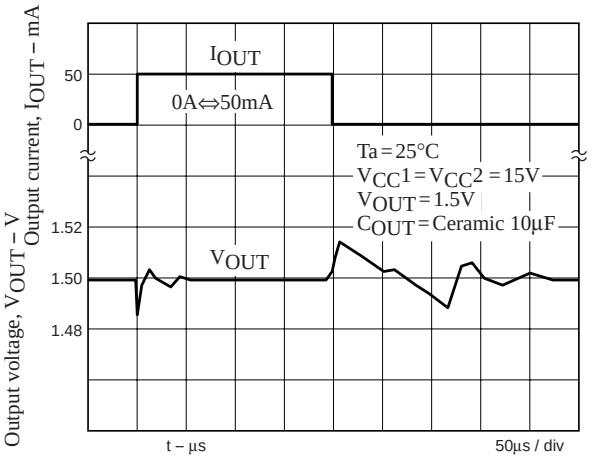


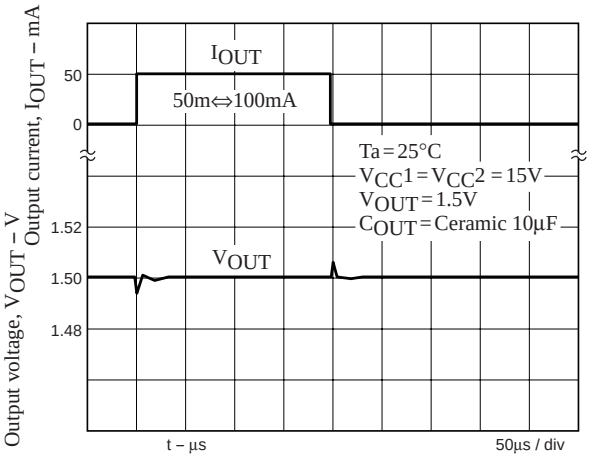
Load Transient Response Characteristics

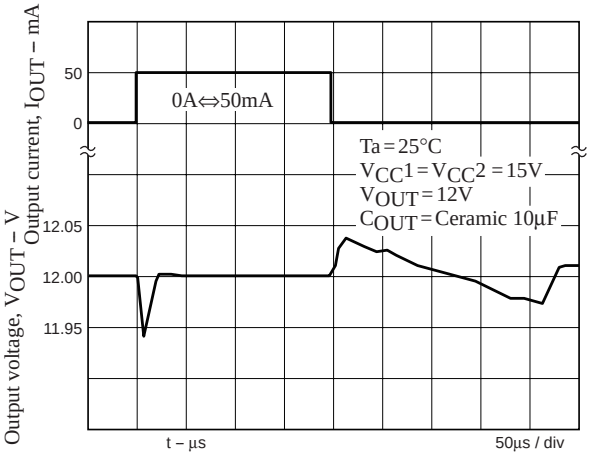


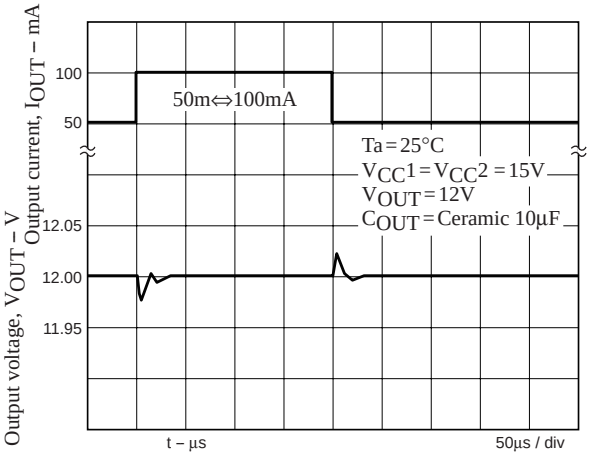


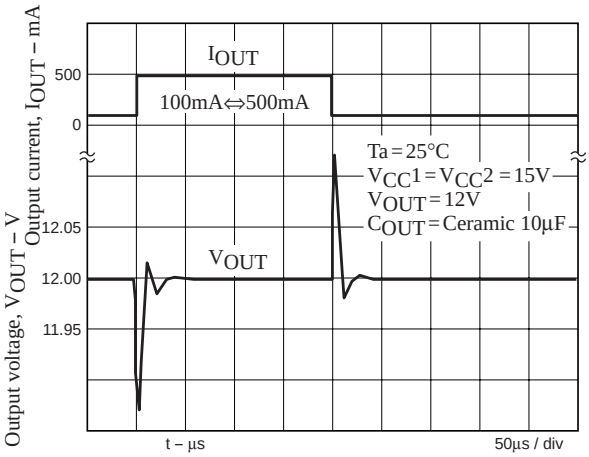












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