



SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

LV5761V — Bi-CMOS LSI 1-channel Step-down Switching Regulator

Overview

The LV5761V is a 1-channel step-down switching regulator.

Functions

- 1 channel step-down switching regulator controller.
- Frequency decrease function at pendent.
- Load-independent soft start circuit.
- ON/OFF function.
- Built-in pulse-by-pulse OCP circuit. It is detected by using ON resistance of an external MOS.
- Synchronous rectification.
- Current mode control.
- Synchronous drive by external signal.

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
supply voltage	$V_{IN\ max}$		45	V
Allowable Power dissipation	$P_d\ max$	Mounted on a specified board. *	0.74	W
Operating temperature	T_{opr}		-40 to +85	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

* Specified board: 114.3mm x 76.1mm x 1.6mm, glass epoxy board

Recommended Operating Range at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage range	V_{IN}		8.5 to 42	V
Error amplifier input voltage			0 to 1.6	V

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

SANYO Semiconductor Co., Ltd.

www.semiconductor-sanyo.com/network

LV5761V

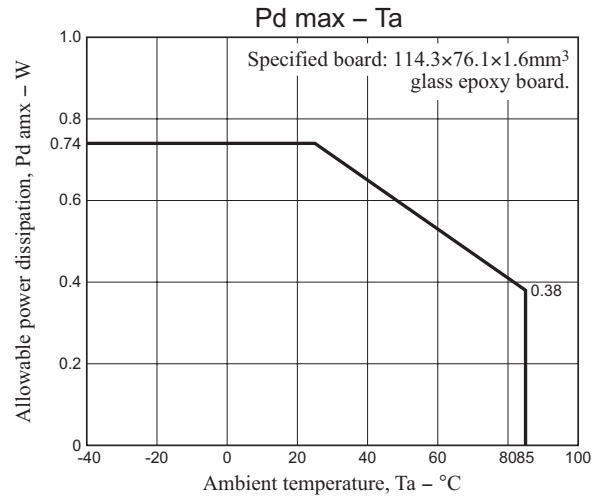
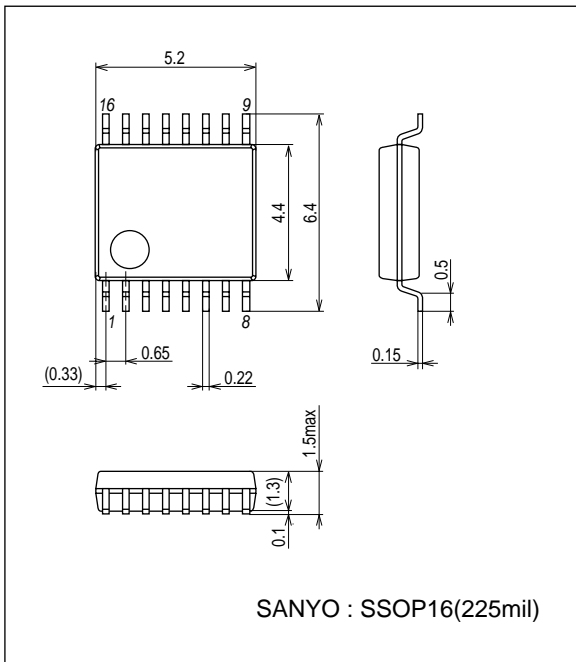
Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 12\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage block						
Internal reference voltage	V_{ref}	Including offset of E/A	0.654	0.67	0.686	V
5V power supply	V_{DD}	$I_{OUT} = 0$ to 5mA	4.7	5.2	5.7	V
Triangular waveform oscillator block						
Oscillation frequency	F_{OSC}	$RT = 220\text{k}\Omega$	110	125	140	kHz
Frequency variation	$F_{OSC DV}$	$V_{IN} = 8$ to 42V		1		%
Oscillation frequency fold back detection voltage	$V_{OSC FB}$	FB voltage detection after SS ends		0.1		V
Oscillatory frequency after fold back	$F_{OSC FB}$			$1/3F_{OSC}$		kHz
ON/OFF circuit block						
IC start-up voltage	$V_{EN on}$		2.5	3.0	3.5	V
IC off voltage	$V_{EN off}$		1.0	1.2	1.4	V
Soft start circuit block						
Soft start source current	$I_{SS SC}$	$EN > 3.5\text{V}$	4	5	6	μA
Soft start sink current	$I_{SS SK}$	$EN < 1\text{V}$, $V_{DD} = 5\text{V}$		2		mA
UVLO circuit block						
UVLO lock release voltage	V_{UVLO}		7.5	8.0	8.5	V
UVLO hysteresis	$V_{UVLO H}$			0.7		V
OCP circuit block						
OCP charge current	I_{OCP}			5		μA
Error amplifier						
Input bias current	$I_{EA IN}$				100	nA
Error amplifier transconductance	G_{EA}		1000	1400	1800	$\mu\text{A/V}$
Sink output current	$I_{EA OSK}$	$FB = 1.0\text{V}$		-100		μA
Source output current	$I_{EA OSC}$	$FB = 0\text{V}$		100		μA
Current detection amplifier gain	G_{ISNS}			1.5		
over current limiter circuit block						
Reference current 1	I_{LIM1}	MODE = L (GND)	-10%	18.5	+10%	μA
Reference current 2	I_{LIM2}	MODE = H (V_{IN})	-10%	37.0	+10%	μA
Over current detection comparator offset voltage	$V_{LIM OFS}$		-5		+5	mA
Over current detection comparator common mode input range			$V_{IN}-0.45$		V_{IN}	V
PWM comparator						
Input threshold voltage ($f_{osc} = 125\text{kHz}$)	$V_t \text{ max}$	Duty cycle = DMAX	0.9	1.0	1.1	V
	$V_t 0$	Duty cycle = 0%	0.4	0.5	0.6	V
Maximum ON duty	DMAX		80	85	90	%
Output block						
Output stage ON resistance (the upper side)	R_{ONH}			5		Ω
Output stage ON resistance (the under side)	R_{ONL}			5		Ω
Output stage ON current (the upper side)	I_{ONH}		240			mA
Output stage ON current (the under side)	I_{ONL}		240			mA
The whole device						
Standby current	I_{CCS}	$EN < 1\text{V}$			10	μA
Mean consumption current	I_{CCA}	$EN > 3\text{V}$		3		mA

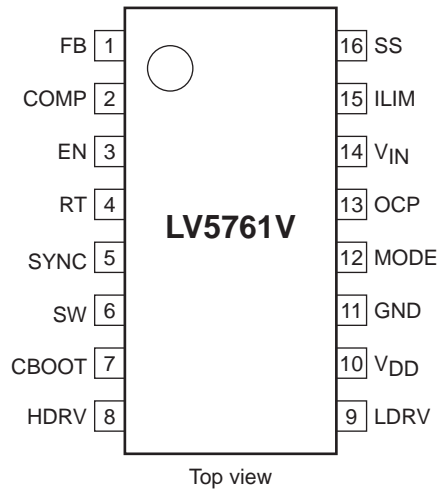
LV5761V

Package Dimensions

unit : mm (typ)
3178B

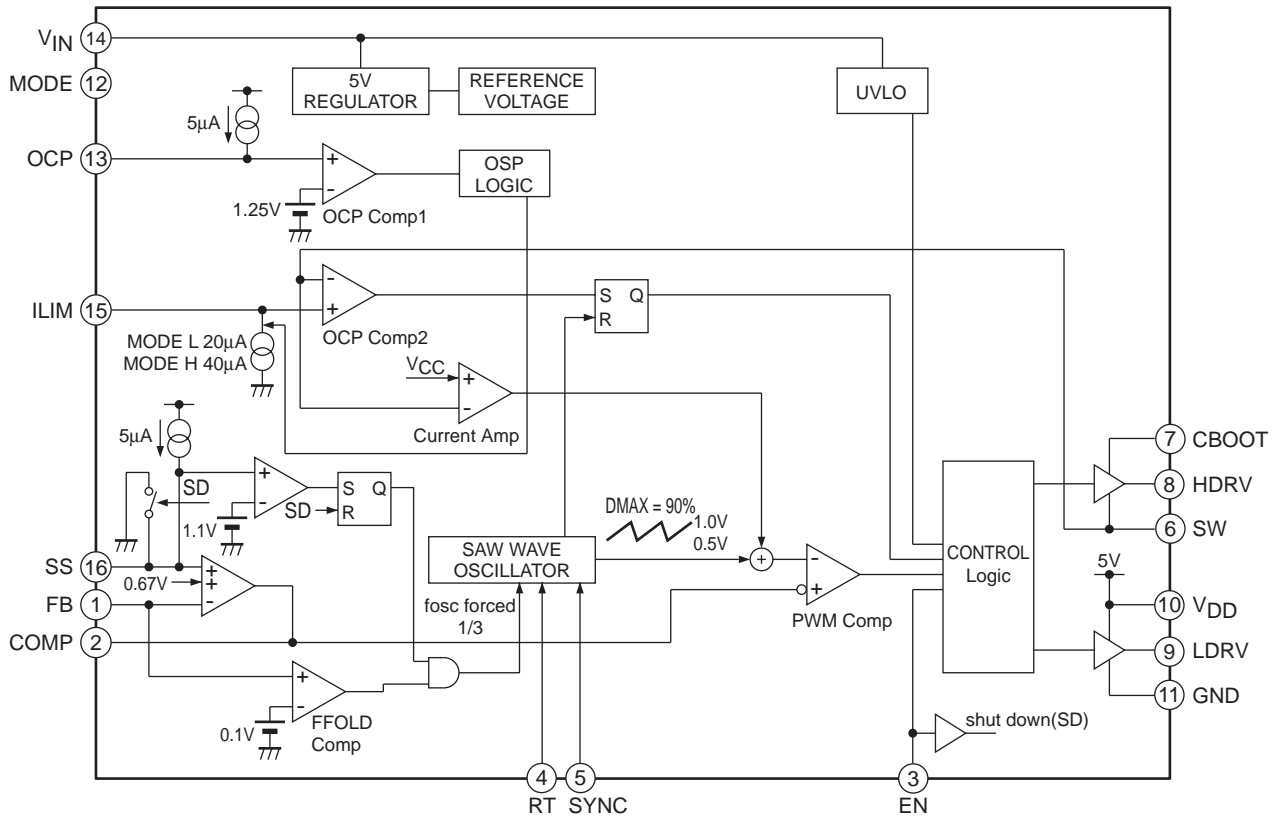


Pin Assignment



LV5761V

Block Diagram



Pin Function

Pin No.	Pin name	Description
14	V _{IN}	Power supply pin. This pin is monitored by UVLO function. When the voltage of this pin becomes 8V or more by UVLO function, The IC starts and the soft start function operates.
11	GND	Ground pin. Each reference voltage is based on the voltage of the ground pin.
10	V _{DD}	Power supply pin for an external the lower MOS-FET gate drive.
7	CBOOT	Bootstrap capacity connection pin. This pin becomes a GATE drive power supply of an external NchMOSFET. Connect a bypath capacitor between CBOOT and SW.
6	SW	Pin to connect with switching node. The source of NchMOSFET connects to this pin.
5	SYNC	External synchronous signal input pin.
9	LDRV	An external the lower MOSFET gate drive pin.
8	HDRV	An external the upper MOSFET gate drive pin.
1	FB	Error amplifier reverse input pin. By operating the converter, the voltage of this pin becomes 0.67V. The voltage in which the output voltage is divided by an external resistance is applied to this pin. Moreover, when this pin voltage becomes 0.1V or less after a soft start ends, the oscillatory frequency becomes 1/3.
2	COMP	Error amplifier output pin. Connect a phase compensation circuit between this pin and GND.
16	SS	Pin to connect a capacitor for soft start. A capacitor for soft start is charged by using the voltage of about 5μA. This pin ends the soft start period by using the voltage of about 1.1V and the frequency fold back function becomes active.
15	ILIM	Reference current pin for current detection. The sink current of about 20μA flows to this pin when Low level (GND) is set to the MODE pin. Also, the sink current of about 40μA flows to this pin when High level (V _{IN}) is set to the MODE pin. When a resistance is connected between this pin and V _{IN} outside and the voltage applied to the SW pin is lower than the voltage of the terminal side of the resistance, the upper NchMOSFET is off by operating the current limiter comparator. This operation is reset with respect to each PWM pulse.
3	EN	ON/OFF pin.
13	OCP	Pin to set the time of the timer (during double the over current detection point) Connect a capacitor between this pin and GND. OCP charge current : 5μA
4	RT	Pin to set the oscillation frequency. Connect a resistance between this pin and GND.
12	MODE	Pin to switch the over current detection point. Set by the low level (GND) of the ILIM pin. Set by the high level (V _{IN}) of the OCP pin. When this MODE pin is set to the high level and the point of the over current detection is set by using the ILIM pin is exceeded, the value becomes double the original value. Also, when the MODE pin is set to the low level, the point of the over current detection remains an original value.

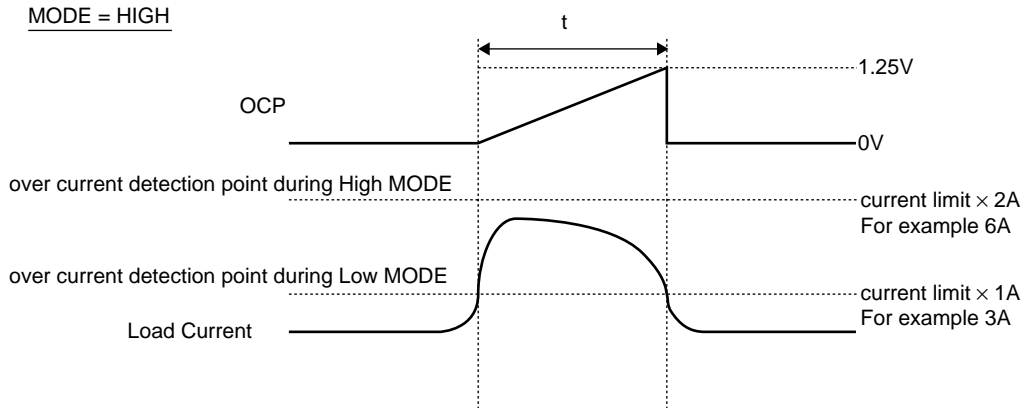
LV5761V

Timing Chart

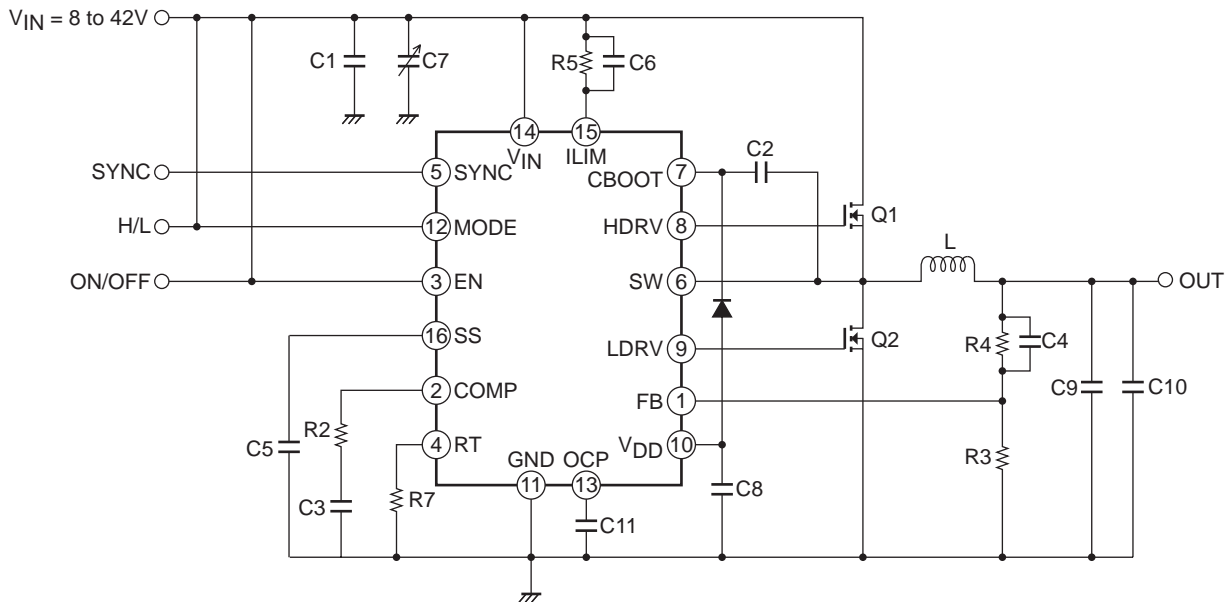
When the MODE pin is set to the high level and the point of the over current detection is set by using the ILIM pin is exceeded, the value becomes double the original value.

Also, when the MODE pin is set to the low level, the point of over current detection remains an original value.

Timing chart of the over current detection point switching is as below.



Sample Application Circuit



- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of September, 2009. Specifications and information herein are subject to change without notice.