Ordering number : ENA1920

SANYO Semiconductors
DATA SHEET

Bi-CMOS LSI

LV5769V/VZ — 1-channel Step-down Switching Regulator

Overview

The LV5769V/VZ 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

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter		Symbol	Conditions	Ratings	Unit
Supply voltage		V_{IN} max		45	V
Allowable pin voltage	V_{IN}, SW			45	V
	HDRV, CBOOT			52	V
	LDRV			6.0	V
	Between CBOOT to SW Between CBOOT to HDRV			6.0	V
	EN, ILIM			V_{IN}+0.3	V
	Between V_{IN} to ILIM			1.0	V
	V_{DD}			6.0	V
	SS, FB, COMP,RT			V_{DD}+0.3	V
Allowable Power dissipation		Pd max	Mounted on a specified board. *	0.74	W
Operating temperature		Topr		-40 to +85	°C
Storage temperature		Tstg		-55 to +150	°C

* Specified board : 114.3mm × 76.1mm × 1.6mm, glass epoxy board.

Recommended Operating Range at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage range	V_{IN}		8.5 to 42	V
Error amplifier input voltage	V_{FB}		0 to 1.6	V
Oscillatory frequency	F_{OSC}		80 to 500	kHz

Electrical Characteristics at Ta = 25°C, V_{IN} = 12V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage block						
Internal reference voltage	Vref	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=220kΩ	110	125	140	kHz
Frequency variation	$F_{OSC\ DV}$	V_{IN} = 8.5 to 32V		1		%
Oscillation frequency fold back detection voltage	$V_{OSC\ FB}$	FB voltage detection after SS ends		0.1		V
Oscillation 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		1.1	1.3	1.5	V
Soft start circuit block						
Soft start source current	I_{SS} SC	EN > 3.5V	4	5	6	μA
Soft start sink current	I_{SS} SK	EN < 1V, V_{DD} = 5V		2		mA
UVLO circuit block						
UVLO lock release voltage	V_{UVLO}			8		V
UVLO hysteresis	$V_{UVLO\ H}$			0.7		V
Error amplifier						
Input bias current	$I_{EA\ IN}$				100	nA
Error amplifier gain	G_{EA}		1000	1400	1800	μA/V
Sink output current	$I_{EA\ OSK}$	FB = 1.0V		-100		μA
Source output current	$I_{EA\ OSC}$	FB = 0V		100		μA
Current detection amplifier gain	GISNS			1.5		
over current limiter circuit block						
Reference current	I_{LIM}		-10%	18.5	+10%	μA
Over current detection comparator offset voltage	$V_{LIM\ OFS}$		-5		+5	mV
Over current detection comparator common mode input range			V_{IN}-0.45		V_{IN}	V
PWM comparator						
Input threshold voltage (F_{OSC}=125kHz)	Vt max	Duty cycle = DMAX	0.9	1.0	1.1	V
	Vt0	Duty cycle = 0%	0.4	0.5	0.6	V
Maximum ON duty	DMAX		86	90	95	%
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 < 1V			10	μA
Mean consumption current	I_{CCA}	EN > 3.5V		3		mA

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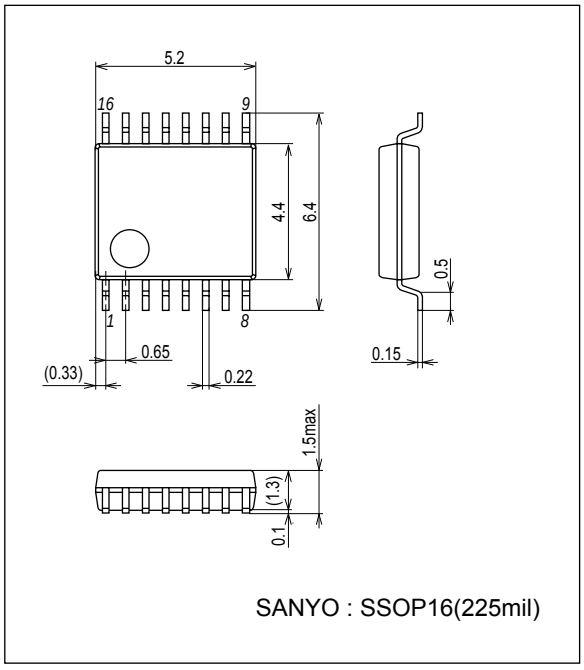
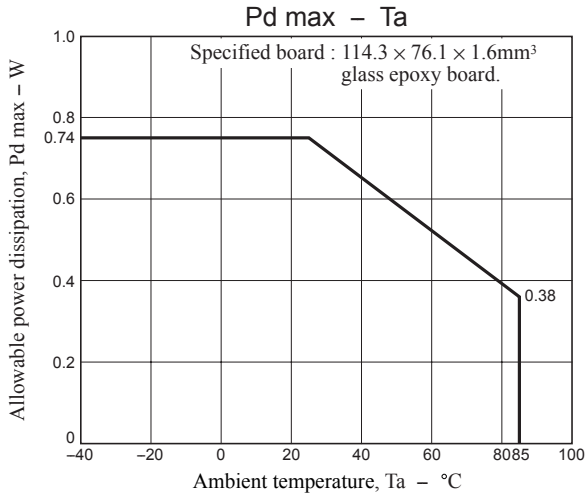
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Security function						
Protection function operating temperature at high temperature	TSD on	* Design certification		170		°C
Protection function hysteresis at high temperature	TSD hys	* Design certification		30		°C

Package Dimensions

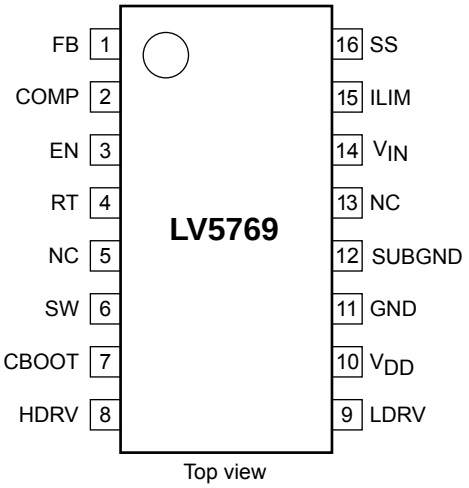
unit : mm (typ)

3178B

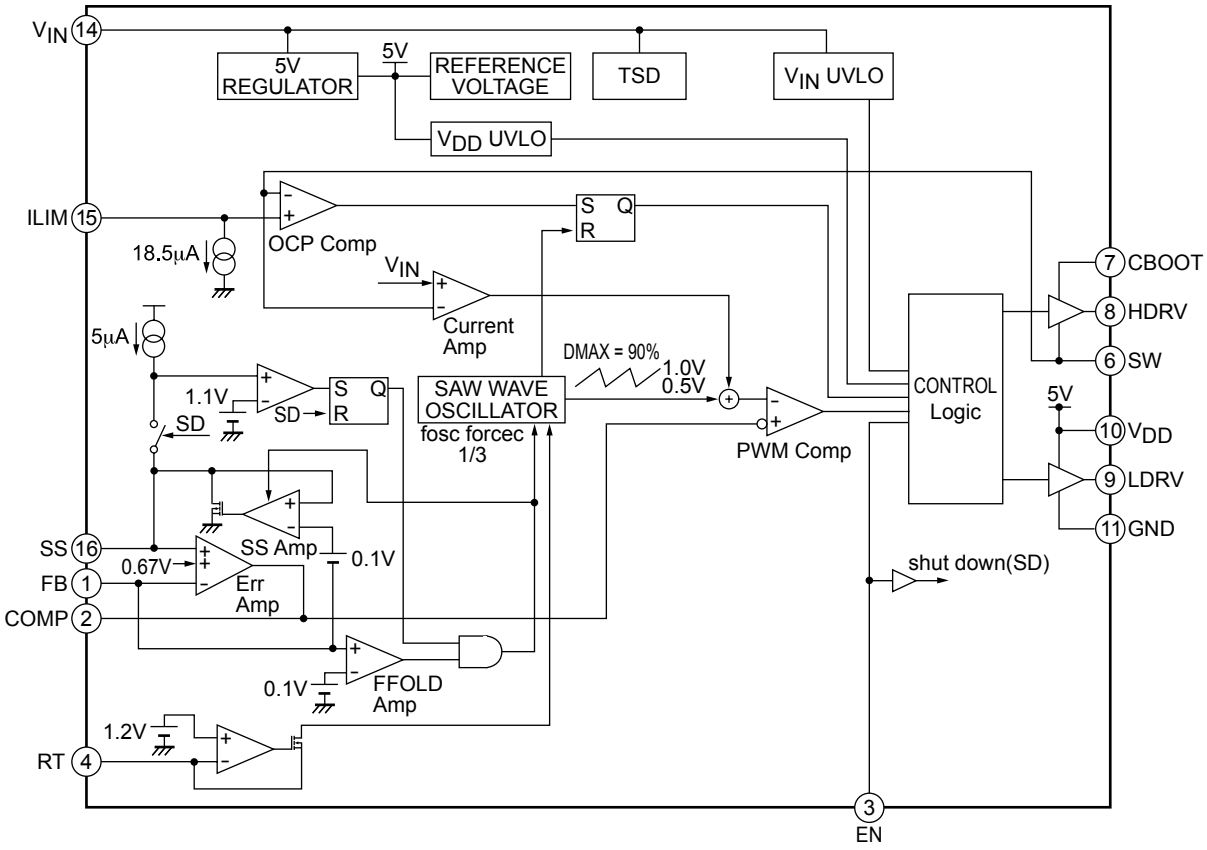




Pin Assignment



Block Diagram



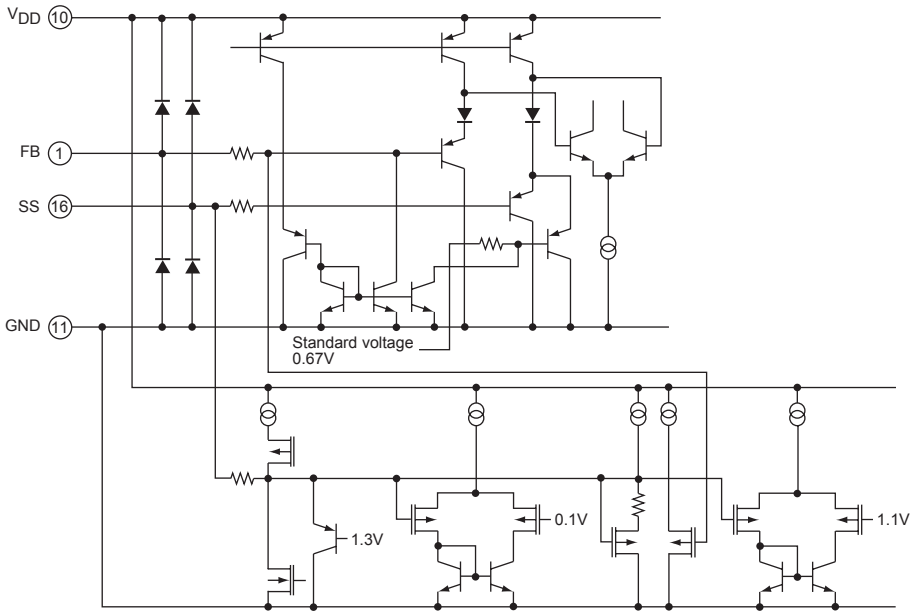
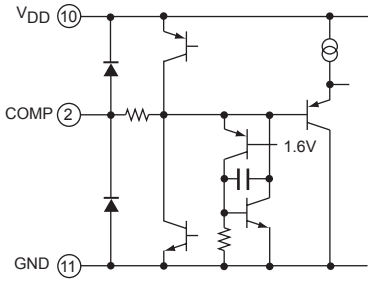
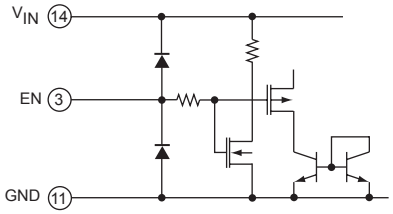
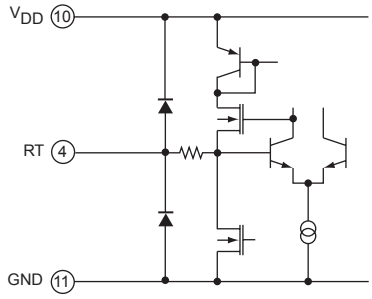
Pin Function

Pin No.	Pin name	Description
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.
3	EN	ON/OFF pin.
4	RT	Oscillation frequency setting pin. Resistance is connected with this pin between GND.
5,13	N.C.	No connection *2
6	SW	Pin to connect with switching node. Upper part NchMOSFET external a source is connected with lower side NchMOSFET external a drain.
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.
8	HDRV	An external the upper MOSFET gate drive pin.
9	LDRV	An external the lower MOSFET gate drive pin.
10	V_{DD}	Power supply pin for an external the lower MOS-FET gate drive.
11	GND	Ground pin. Each reference voltage is based on the voltage of the ground pin.
12	SUBGND	It is connected with the GND pin of 11pin internally. *3
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.
15	ILIM	Reference current pin for current detection. The sink current of about 18.5μA flows to this 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.
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.

*2: There is no problem even if it connects it with GND.

*3: Short-circuited and use 11pin and 12pin as GND.

I/O pin equivalent circuit chart

Pin No.	Equivalent Circuit
FB, SS	
COMP	
EN	
RT	

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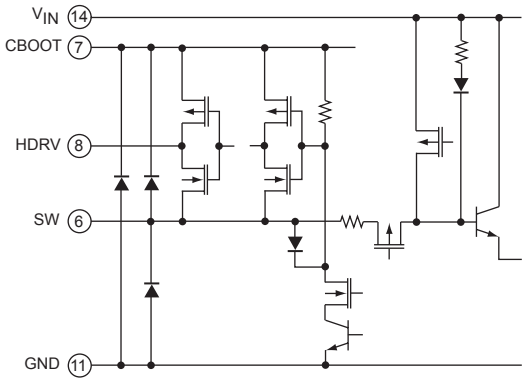
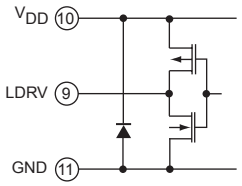
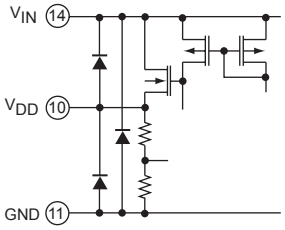
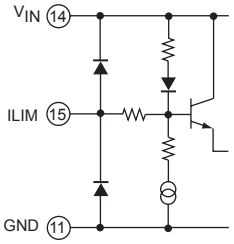
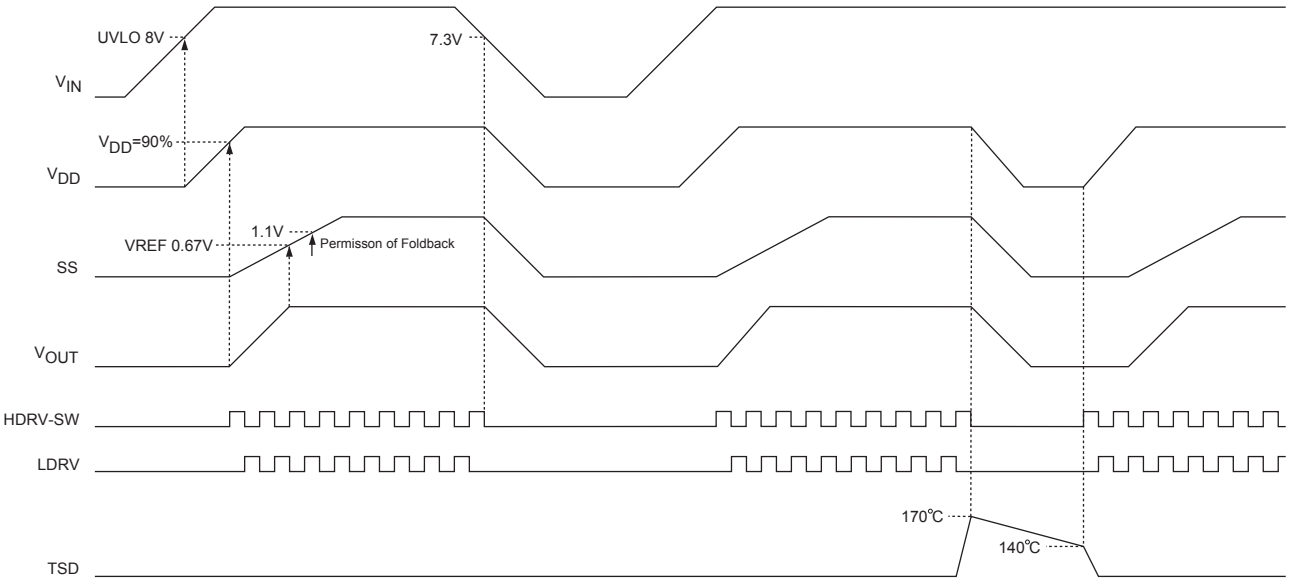
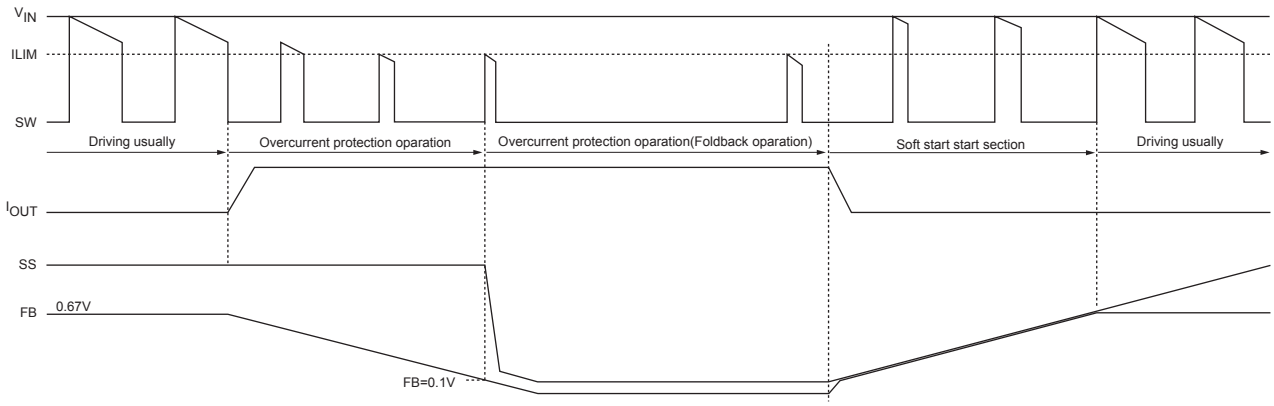
Pin No.	Equivalent Circuit
SW, CBOOT, HDRV	
LDRV	
V_{DD}	
ILIM	

Boot sequence, UVLO, and TSD operation



Sequence of overcurrent protection



Sample Application Circuit