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# LV5769V

Bi-CMOS IC

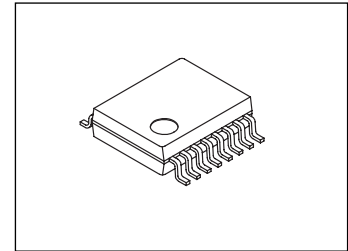
## 1-channel Step-down Switching Regulator

### Overview

The LV5769V is a 1-channel step-down switching regulator.

### Function

- 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



SSOP16(225mil)

### Specifications

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

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		6.0	V
	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	$P_d\ max$	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 × 76.1mm × 1.6mm, glass epoxy board.

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### ORDERING INFORMATION

See detailed ordering and shipping information on page 9 of this data sheet.

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## Recommended Operating Conditions 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	$V_{FB}$		0 to 1.6	V
Oscillatory frequency	$F_{OSC}$		80 to 500	kHz

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
<b>Reference voltage block</b>						
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
<b>Triangular waveform oscillator block</b>						
Oscillation frequency	$F_{OSC}$	$R_T = 220\text{k}\Omega$	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
<b>ON/OFF circuit block</b>						
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
<b>Soft start circuit block</b>						
Soft start source current	$I_{SS\ SC}$	$EN > 3.5\text{V}$	4	5	6	$\mu\text{A}$
Soft start sink current	$I_{SS\ SK}$	$EN < 1\text{V}$ , $V_{DD} = 5\text{V}$		2		mA
<b>UVLO circuit block</b>						
UVLO lock release voltage	$V_{UVLO}$			8		V
UVLO hysteresis	$V_{UVLO\ H}$			0.7		V
<b>Error amplifier</b>						
Input bias current	$I_{EA\ IN}$				100	nA
Error amplifier gain	$G_{EA}$		1000	1400	1800	$\mu\text{A}/\text{V}$
Sink output current	$I_{EA\ OSK}$	FB = 1.0V		-100		$\mu\text{A}$
Source output current	$I_{EA\ OSC}$	FB = 0V		100		$\mu\text{A}$
Current detection amplifier gain	$G_{ISNS}$			1.5		
<b>over current limiter circuit block</b>						
Reference current	$I_{LIM}$		-10%	18.5	+10%	$\mu\text{A}$
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
<b>PWM comparator</b>						
Input threshold voltage ( $F_{OSC} = 125\text{kHz}$ )	$V_t\ max$	Duty cycle = DMAX	0.9	1.0	1.1	V
	$V_{t0}$	Duty cycle = 0%	0.4	0.5	0.6	V
Maximum ON duty	DMAX		86	90	95	%
<b>Output block</b>						
Output stage ON resistance (the upper side)	$R_{ONH}$			5		$\Omega$
Output stage ON resistance (the under side)	$R_{ONL}$			5		$\Omega$
Output stage ON current (the upper side)	$I_{ONH}$		240			mA
Output stage ON current (the under side)	$I_{ONL}$		240			mA

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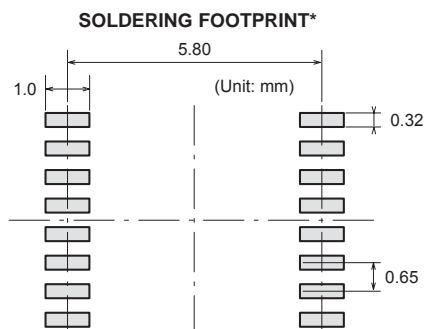
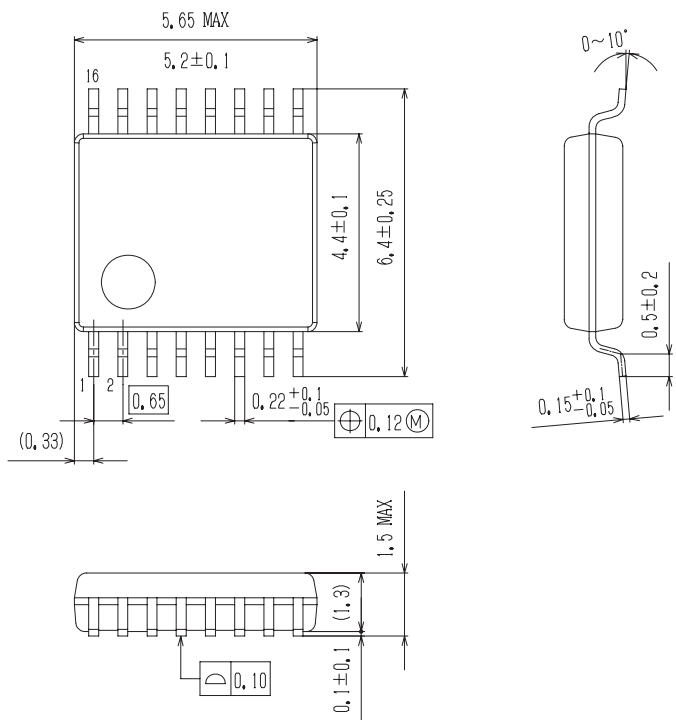
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
The whole device						
Standby current	I <sub>CCS</sub>	EN < 1V			10	μA
Mean consumption current	I <sub>CCA</sub>	EN > 3.5V		3		mA
Security function						
Protection function operating temperature at high temperature	TSD on	* Design certification		170		°C
Protection function hysteresis at high temperature	TSD hys	* Design certification		30		°C

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## Package Dimensions

unit : mm

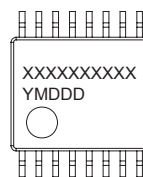
**SSOP16 (225mil)**  
CASE 565AM  
ISSUE A



NOTE: The measurements are not to guarantee but for reference only.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

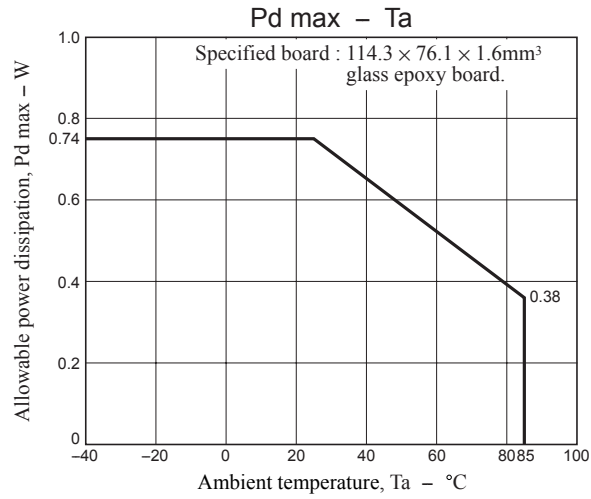
**GENERIC MARKING DIAGRAM\***



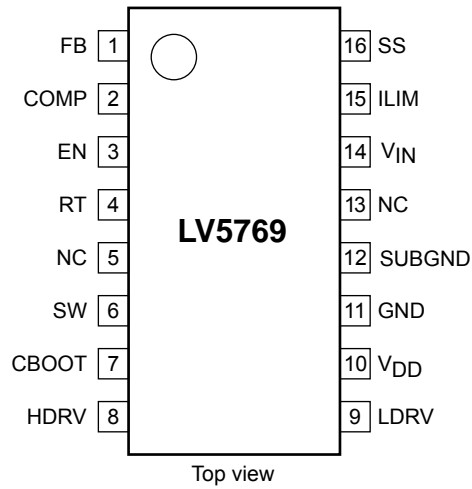
XXXXX = Specific Device Code  
Y = Year  
M = Month  
DDD = Additional Traceability Data

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

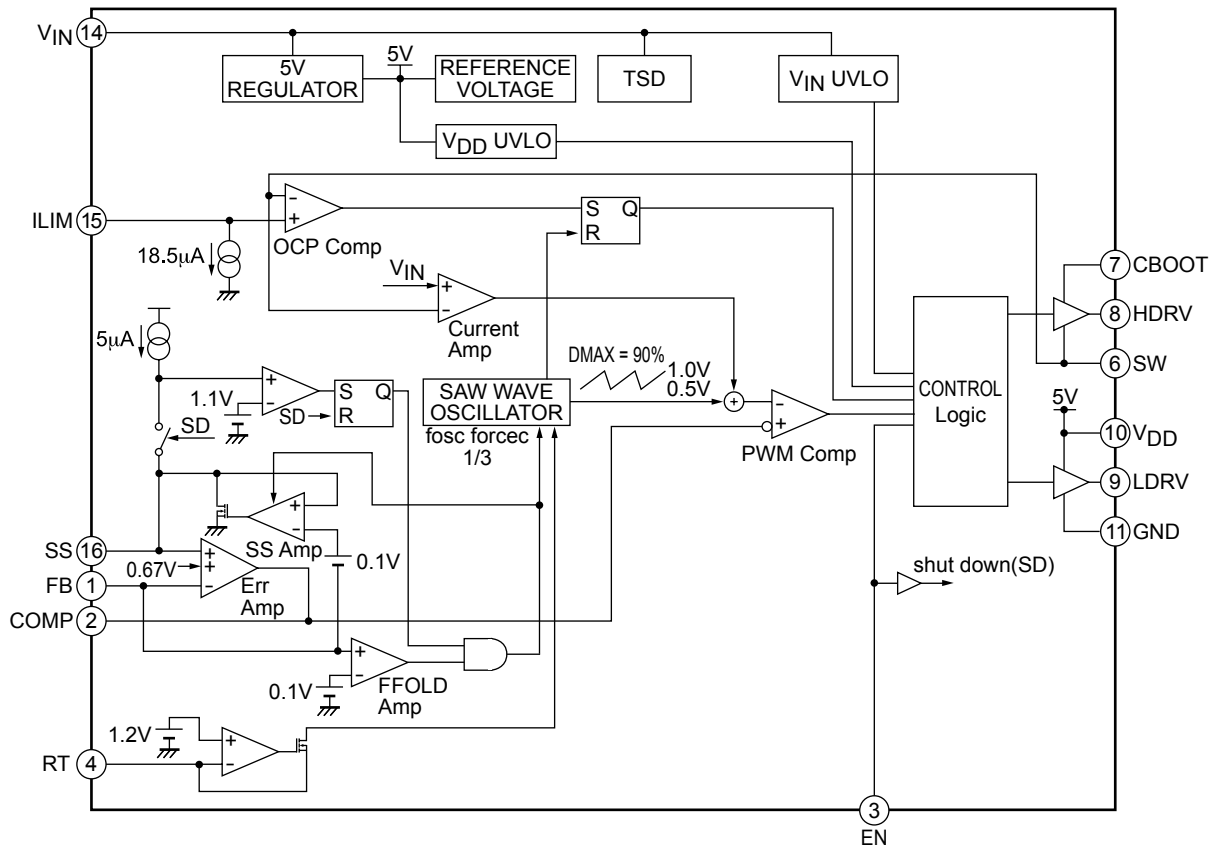
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## Pin Assignment



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 <sub>DD</sub>	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 <sub>IN</sub>	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 <sub>IN</sub> 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.

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## I/O pin equivalent circuit chart

Pin No.	Equivalent Circuit
FB, SS V <sub>DD</sub> (10) FB (1) SS (16) GND (11)	<p>Standard voltage 0.67V</p> <p>1.3V</p> <p>0.1V</p> <p>1.1V</p>
COMP V <sub>DD</sub> (10) COMP (2) GND (11)	<p>1.6V</p>
EN V <sub>IN</sub> (14) EN (3) GND (11)	
RT V <sub>DD</sub> (10) RT (4) GND (11)	

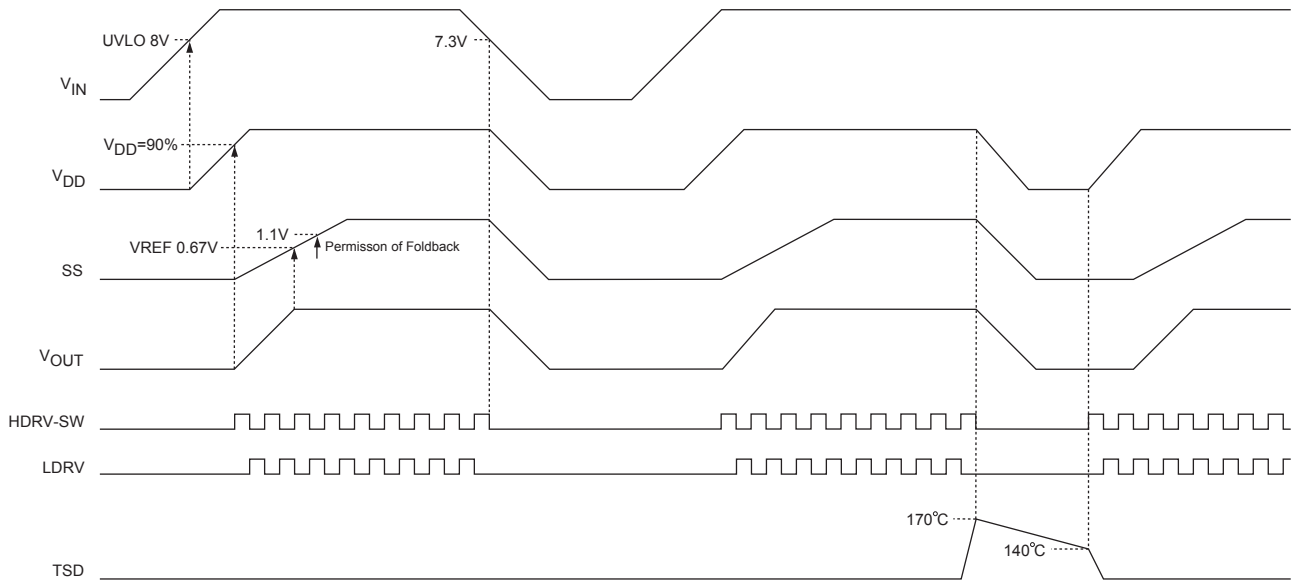
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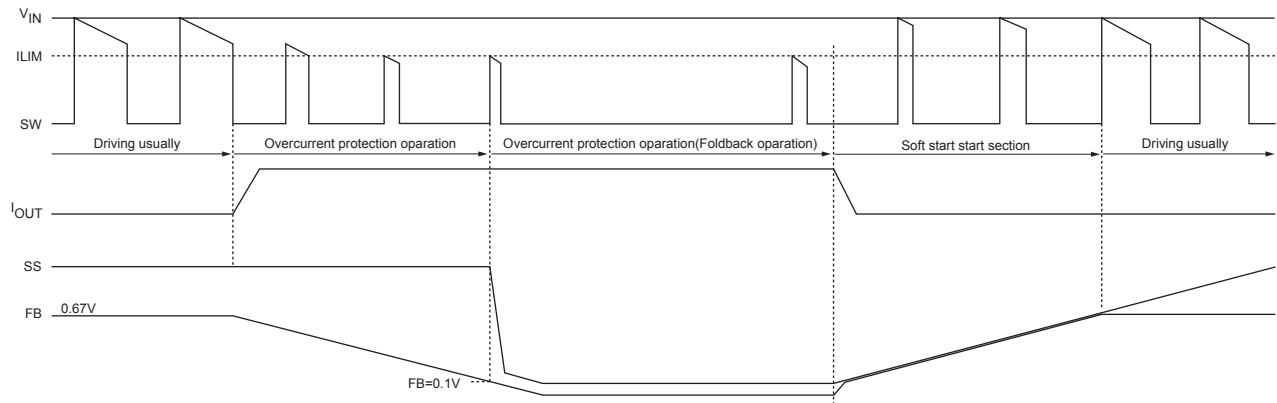
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Pin No.	Equivalent Circuit
SW, CBOOT, HDRV	
LDRV	
VDD	
ILIM	

Boot sequence, UVLO, and TSD operation

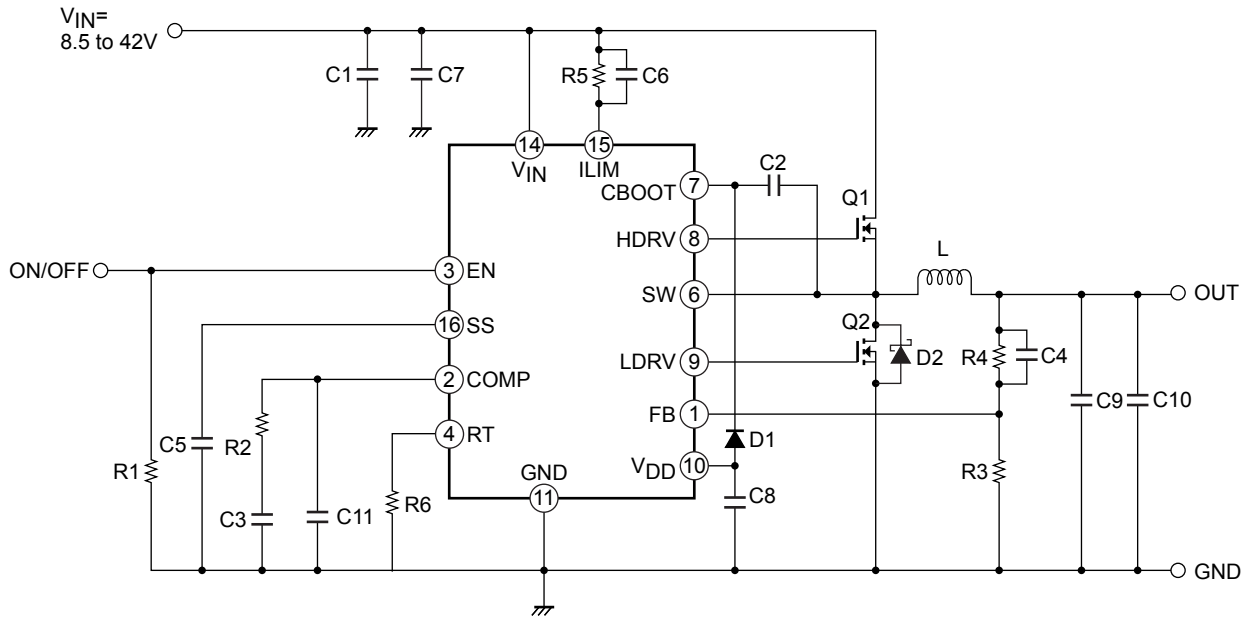


Sequence of overcurrent protection





Sample Application Circuit



ORDERING INFORMATION

Device	Package	Shipping (Qty / Packing)
LV5769V-MPB-E	SSOP16 (225mil) (Pb-Free / Halogen Free)	90 / Fan-Fold
LV5769VZ-MPB-E	SSOP16 (225mil) (Pb-Free / Halogen Free)	90 / Fan-Fold
LV5769VZ-TLM-E	SSOP16 (225mil) (Pb-Free / Halogen Free)	2000 / Tape & Reel

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