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LV5068V

Bi-CMOS IC

Low power consumption and high efficiency Step-down Switching Regulator Controller

Overview

LV5068V is 1ch step-down switching regulator. The operation current is about 80 μ A, and low power consumption is achieved.

Functions

- 1ch SBD rectification controller IC
- Maximum value of light load mode current is 80 μ A.
- Built-in OCP circuit with P-by-P method
- When P-by-P is generated continuously, it shifts to the HICCUP operation.
- If connect C-HICCUP to GND pin, then latch-off when over current.
- The oscillatory frequency can be set by the external pin. The oscillatory frequency is 300 kHz to 2.2MHz
- Built-in UVLO, TSD
- Synchronous driving with external signal

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V _{IN} max		45	V
Allowable pin voltage	PDR,HDRV,RSNS, ILIM,EN,PG		V _{IN}	V
	V _{IN} -PDR		6	V
	REF		6	V
	SS,FB,COMP,RT C-HICCUP,SYNC		REF	V
Allowable power dissipation	Pd max	Specified substrate *1	0.74	W
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

*1: Specified substrate 114.3mm×76.1mm×1.6mm³ glass-epoxy

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	V_{IN}		4.5 to 40	V

Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 15\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage						
Internal reference voltage	V_{ref}		1.241	1.260	1.279	V
Pch drive voltage	V_{PDR}	$I_{OUT}=0$ to -5mA	$V_{IN}-5.5$	$V_{IN}-5.0$	$V_{IN}-4.5$	V
Saw wave oscillator						
Oscillatory frequency	F_{OSC}	$RT=470\text{k}\Omega$	280	330	380	kHz
ON/OFF circuit						
IC start-up voltage	V_{CNT_ON}		1.5		V_{IN}	V
Disable voltage	V_{CNT_OFF}		0		0.3	V
Soft start circuit						
Soft start source current	I_{SS_SC}	$EN>1.5\text{V}$	1.3	2.0	2.7	μA
Soft start sink current	I_{SS_SK}	$EN<0.3\text{V}$, $SS=4\text{V}$	1.0	1.6	2.2	mA
UVLO circuit						
UVLO release voltage	V_{UVLON}	$FB=COMP$	3.3	3.7	4.1	V
UVLO lock voltage	V_{UVLOF}	$FB=COMP$	2.5	2.9	3.3	V
Error amplifier						
Input bias current	I_{EA_IN}		-100	-50	100	nA
Error amplifier gain	G_{EA}		100	250	400	$\mu\text{A}/\text{V}$
Output sink current	I_{EA_OSK}	$FB=1.75\text{V}$	-40	-20	-10	μA
Output source current	I_{ES_OSC}	$FB=0.75\text{V}$	10	20	40	μA
Over current limit circuit						
Reference current	I_{LIM1}		48.4	55	61.6	μA
Over current detection comparator offset voltage	V_{LIM_OFS}		-5		+5	mV
RSNS pin input range	V_{RSNS}		$V_{IN}-0.175$		V_{IN}	V
HICCUP timer start-up cycle	$N_{LCYCLES}$			15		cycle
HICCUP comparator threshold voltage	V_{tHIC}		1.2	1.26	1.32	V
HICCUP timer change current	I_{HIC}		1	2	3	μA
PWM comparator						
Maximum On-duty	D max		95			%
Logic output						
Power good "L" sink current	I_{PWRGD_L}	$PG=5\text{V}$	4	5	6	mA
Power good "H" leakage current	I_{PWRGD_H}	$PG=5\text{V}$	0		1	μA
Power good threshold voltage	V_{tPG}		1.0	1.1	1.2	V
Power good hysteresis	V_{PG_H}		40	50	60	mV
Output						
Output on-resistance (High)	R_{ONH}			3		Ω
Output on-resistance (Low)	R_{ONL}			3		Ω
Output on-current (High)	I_{ONH}		500			mA
Output on-current (Low)	I_{ONL}		500			mA
The entire device						
Stand-by current	I_{CCS}	$EN<0.3\text{V}$	0		1	μA
Light load mode consumption current	I_{SLEEP1}	$EN>1.5\text{V}$, No switching	30	55	80	μA
Thermal shutdown	TSD	*2	150	170	190	$^\circ\text{C}$

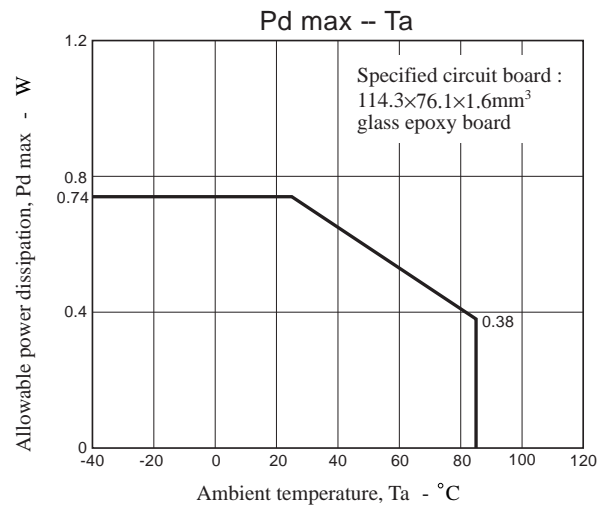
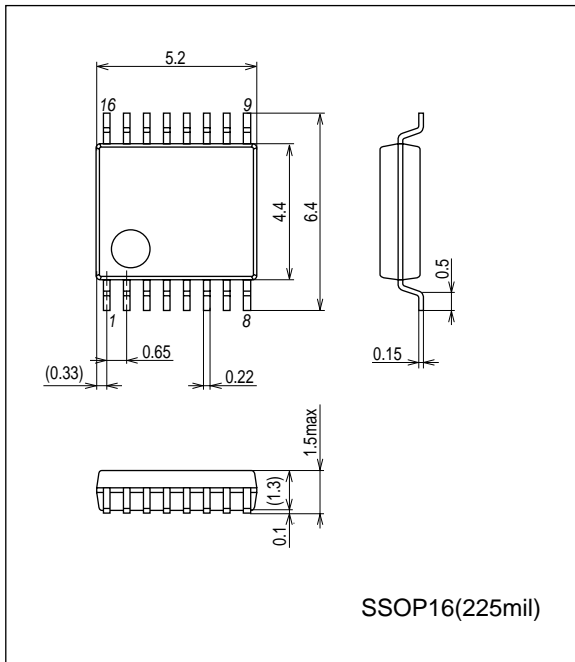
*2: Design certification

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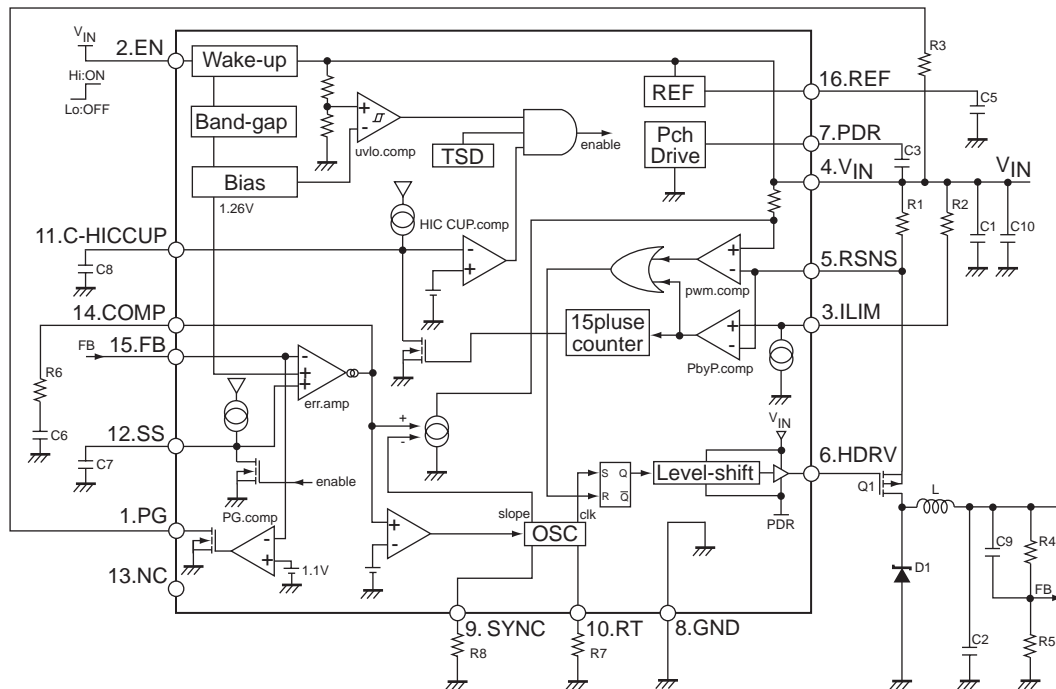
Package Dimensions

unit : mm (typ)

3178B

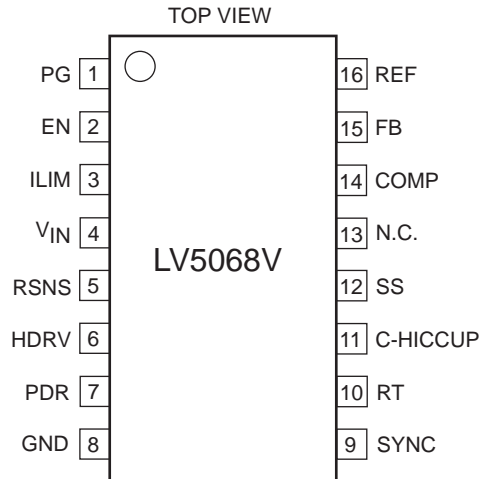


Block Diagram



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Pin Assignment



Pin Descriptions

Pin No.	Pin name	Descriptions	Equivalent circuit
1	PG	Power good pin. Connect to open drain of MOS-FET in ICs inside. Setting output voltage to "L", when FB voltage is 1.05V or less	
2	EN	ON/OFF pin	
3	ILIM	For current detection. Sink current is about 55μA. The current limiter comparator works when an external resistor is connected between this pin and V _{IN} , and if the voltage of this resistor is less than the voltage of RSNS then Pch MOS is turned off. This operation is reset each PWM pulse.	
4	V _{IN}	Supply voltage pin. It is observed by the UVLO function. When its voltage becomes 3.7V or more, ICs startup in soft start.	
5	RSNS	Current detection resistor connection pin. Resistor is connected between V _{IN} and this pin, and the current flows to MOSFET are measured.	

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Pin No.	Pin name	Descriptions	Equivalent circuit
6	HDRVV	The external high-side MOSFET gate drive pin.	
7	PDR	Gate drive voltage of the external Pch MOSFET. Meanwhile, the bypass capacitor is connected between V_{IN} and this pin.	
8	GND	Ground Pin. Ground pin voltage is reference voltage.	
9	SYNC	Pin of using combined of external synchronous signal input pin	
10	RT	Oscillation frequency setting pin. Resistor is connected between this pin and GND.	
11	C-HICCUP	It is capacitor connection pin for setting re-startup cycle in HICCUP mode. If connect it to GND pin, then latch-off when over current.	
12	SS	Capacitor connection pin for soft start. About $2\mu\text{A}$ current charges the soft start capacitor.	
13	NC	NC pin.	

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Pin No.	Pin name	Descriptions	Equivalent circuit
14	COMP	<p>Error Amplifier Output Pin.</p> <p>The phase compensation network is connected between GND pin and COMP pin.</p> <p>Thanks to current-mode control, COMP pin voltage would tell you the output current amplitude. COMP pin is connected internally to an int.comparator which comparators with 0.9V reference. If COMP pin voltage is larger than 0.9V, IC operates in "continuous mode". If COMP pin voltage is smaller than 0.9V, IC operates in "discontinuous mode (low consumption mode)".</p>	
15	FB	<p>Error amplifier reverse input pin.</p> <p>ICs make its voltage keep 1.26V. Output voltage is divided by external resistors and it across FB.</p>	
16	REF	<p>Reference voltage.</p>	

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