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LV5061V

Bi-CMOS IC

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

Overview

LV5061V is 1ch step-down switching regulator. The operation current is about 90μA, and low power consumption is achieved.

Functions

- 1ch SBD rectification controller IC
- Maximum value of light load mode current is 90μA.
- 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

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V _{IN} max		22	V
Allowable pin voltage	PDR,HDRV,RSNS, ILIM,EN,PG		V _{IN}	V
	V _{IN} -PDR		6	V
	REF		6	V
	SS,FB,COMP, C-HICCUP,RT		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 Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	V _{IN}		4.5 to 18	V

Electrical Characteristics at Ta = 25°C, V_{IN} = 15V

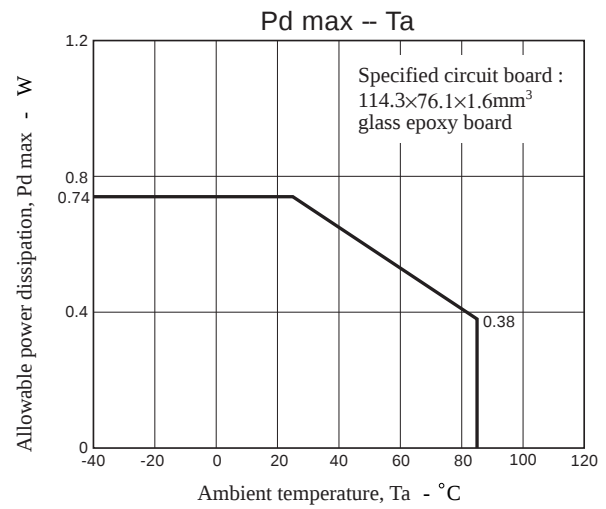
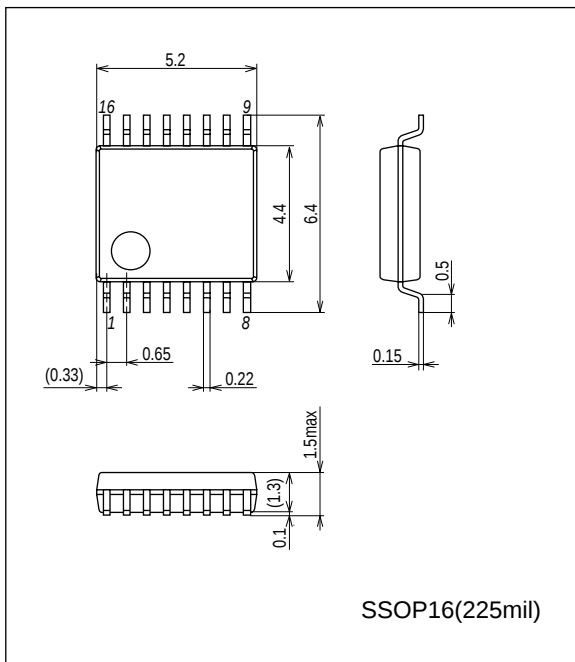
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage						
Internal reference voltage	Vref		1.235	1.260	1.285	V
Pch drive voltage	VPDR	IOUT=0 to -5mA	VIN-5.5	VIN-5.0	VIN-4.5	V
Saw wave oscillator						
Oscillatory frequency	FOSC	RT=470kΩ	280	330	380	kHz
ON/OFF circuit						
IC start-up voltage	VCNT_ON		1.5		VIN	V
Disable voltage	VCNT_OFF				0.3	V
Soft start circuit						
Soft start source current	ISS_SC	EN>1.5V	1.3	2.0	2.7	μA
Soft start sink current	ISS_SK	EN>1.5V, ILIM>RSNS SS=4V at HICCUP	1.2	2.0	2.8	mA
UVLO circuit						
UVLO release voltage	VUVLON	FB=COMP	3.0	3.4	3.8	V
UVLO lock voltage	VUVLOF	FB=COMP	2.5	2.9	3.3	V
Error amplifier						
Input bias current	IEA_IN		-100	-50	100	nA
Error amplifier gain	GEA		100	250	400	μA/V
Output sink current	IEA_OSK	FB=1.75V	-40	-20	-10	μA
Output source current	IES_OSC	FB=0.75V	10	20	40	μA
Over current limit circuit						
Reference current	ILIM1		48.4	55	61.6	μA
Over current detection comparator offset voltage	VLIM_OFS		-5		+5	mV
RSNS pin input range	VRSNS		VIN-0.175		VIN	V
HICCUP timer start-up cycle	NLCYCLES			15		cycle
HICCUP comparator threshold voltage	VtHIC		1.2	1.26	1.32	V
HICCUP timer change current	IHIC		1	2	3	μA
PWM comparator						
Maximum On-duty	D max		95			%
Logic output						
Power good “L” sink current	IPWRGD_L	PG=5V	4	5	6	mA
Power good “H” leakage current	IPWRGD_H	PG=5V			1	μA
Power good threshold voltage	VtPG		1.0	1.1	1.2	V
Power good hysteresis	VPG_H		40	50	60	mV
Output						
Output on-resistance (High)	RONH			3		Ω
Output on-resistance (Low)	RONL			3		Ω
Output on-current (High)	IONH		500			mA
Output on-current (Low)	IONL		500			mA
The entire device						
Stand-by current	ICCS	EN<0.3V			1	μA
Light load mode consumption current	ISLEEP1	EN>1.5V, No switching	50	70	90	μA
Thermal shutdown	TSD	*2		170		°C

*2: Design certification

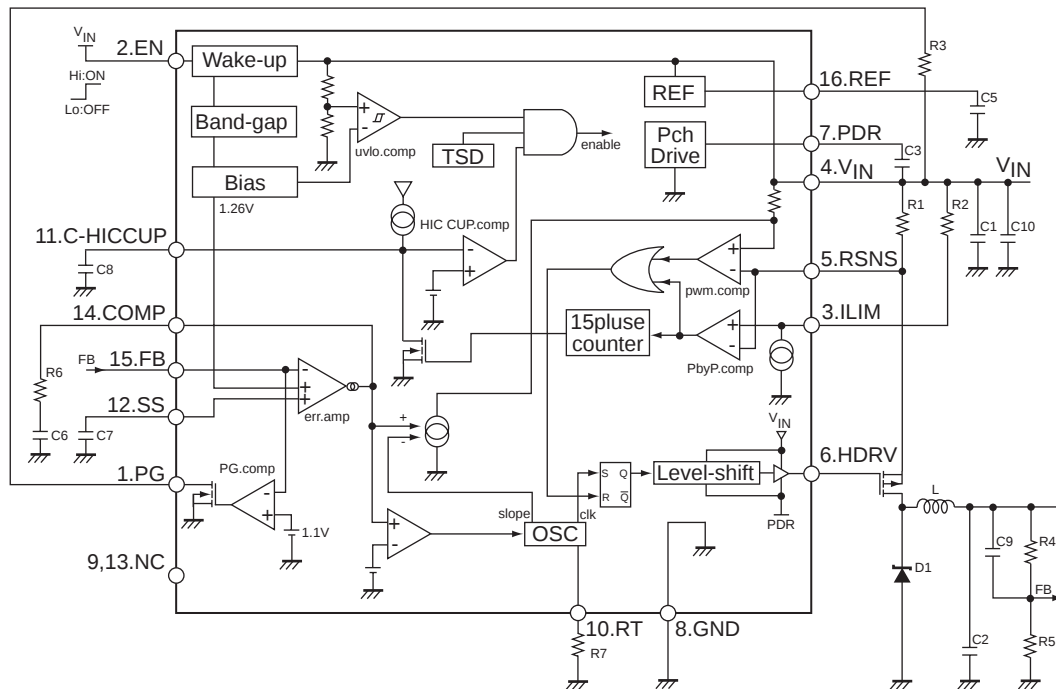
Package Dimensions

unit : mm (typ)

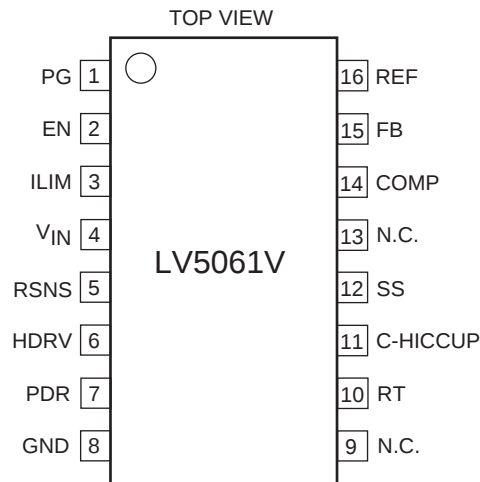
3178B



Block Diagram



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 3.4V 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	HDRV	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	NC	N.C. 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 2μA current charges the soft start capacitor.	
13	NC	NC pin.	
14	COMP	Error Amplifier Output Pin. The phase compensation network is connected between GND pin and COMP pin. 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)".	

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Pin No.	Pin name	Descriptions	Equivalent circuit
15	FB	Error amplifier reverse input pin. ICs make its voltage keep 1.26V. Output voltage is divided by external resistors and it across FB.	
16	REF	Reference voltage.	

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