Ordering number : ENA1829A

LV5061V

Bi-CMOS IC

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

ON Semiconductor®

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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×1.6mm^3 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.

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

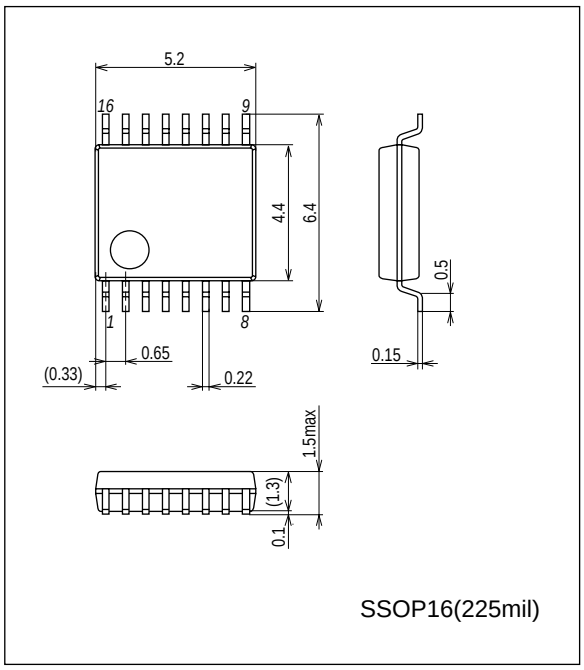
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage						
Internal reference voltage	Vref		1.235	1.260	1.285	V
Pch drive voltage	V_{PDR}	I_{OUT}=0 to -5mA	V_{IN}-5.5	V_{IN}-5.0	V_{IN}-4.5	V
Saw wave oscillator						
Oscillatory frequency	F_{OSC}	RT=470kΩ	280	330	380	kHz
ON/OFF circuit						
IC start-up voltage	V_{CNT_ON}		1.5		V_{IN}	V
Disable voltage	V_{CNT_OFF}				0.3	V
Soft start circuit						
Soft start source current	I_{SS}_SC	EN>1.5V	1.3	2.0	2.7	μA
Soft start sink current	I_{SS}_SK	EN>1.5V, I_{LIM}>RSNS SS=4V at HICCUP	1.2	2.0	2.8	mA
UVLO circuit						
UVLO release voltage	V_{UVLON}	FB=COMP	3.0	3.4	3.8	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	μA/V
Output sink current	I_{EA}_OSK	FB=1.75V	-40	-20	-10	μA
Output source current	I_{ES}_OSC	FB=0.75V	10	20	40	μA
Over current limit circuit						
Reference current	I_{LIM}1		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=5V	4	5	6	mA
Power good “H” leakage current	I_{PWRGD_H}	PG=5V			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)	$R_{ON}H$			3		Ω
Output on-resistance (Low)	$R_{ON}L$			3		Ω
Output on-current (High)	$I_{ON}H$		500			mA
Output on-current (Low)	$I_{ON}L$		500			mA
The entire device						
Stand-by current	I_{CCS}	EN<0.3V			1	μA
Light load mode consumption current	I_{SLEEP}1	EN>1.5V, No switching	50	70	90	μA
Thermal shutdown	TSD	*2		170		˚C

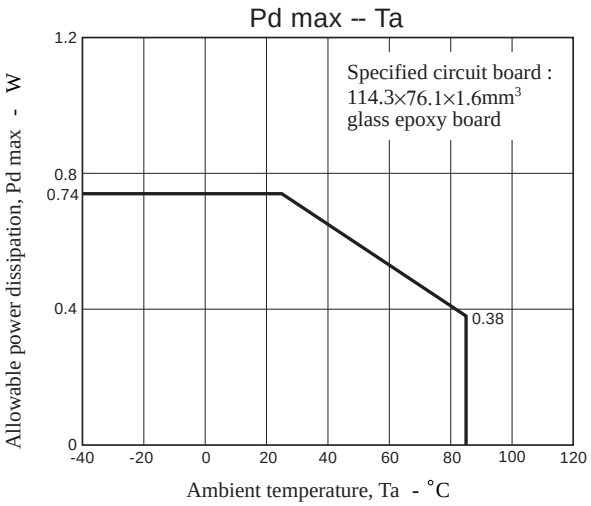
*2: Design certification

Package Dimensions

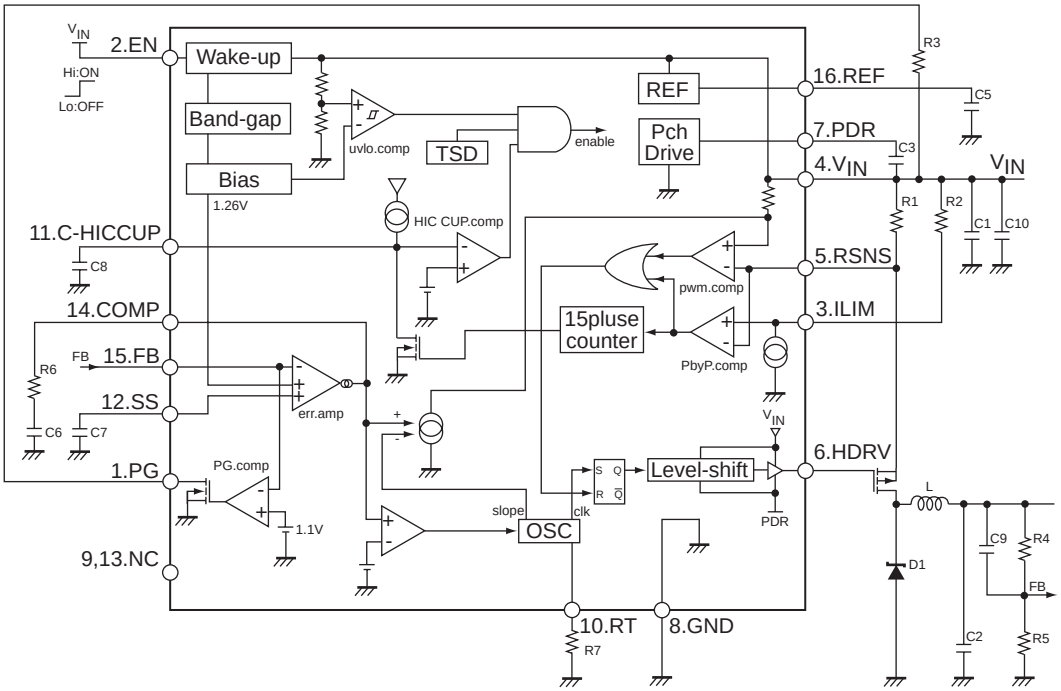
unit : mm (typ)

3178B

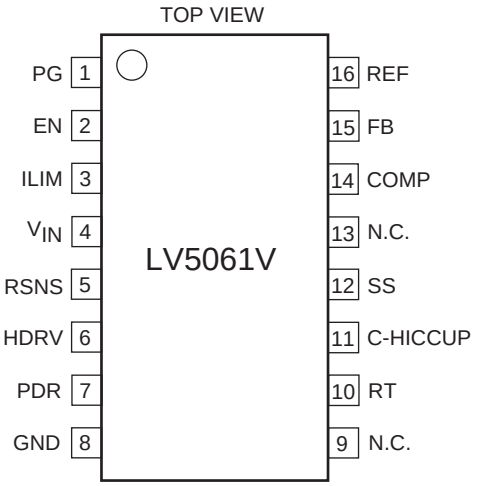




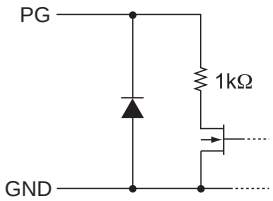
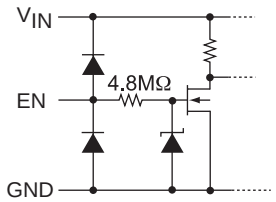
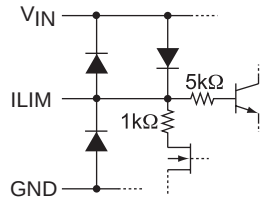
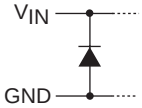
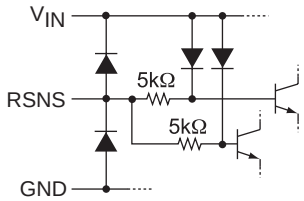
Block Diagram



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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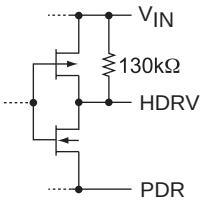
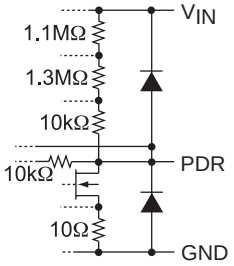
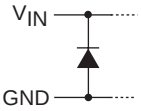
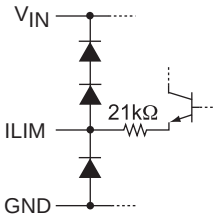
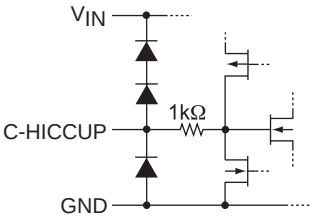
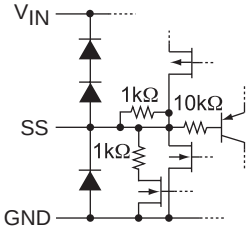
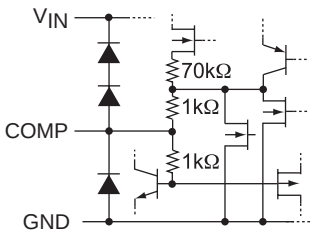
Pin No.	Pin name	Descriptions	Equivalent circuit
6	HDRV	The external high-side MOSFET gate drive pin.	
7	PDR	Gate drive voltage of the external Pch MOSFET. Meanwhile, the bypass capacitor is connected between V_{IN} and this pin.	
8	GND	Ground Pin. Ground pin voltage is reference voltage.	
9	NC	N.C. 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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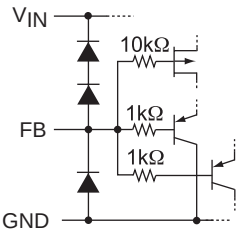
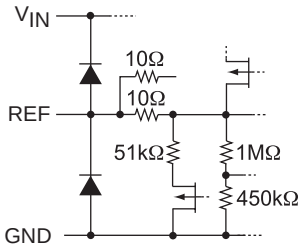
Pin No.	Pin name	Descriptions	Equivalent circuit
15	FB	Error amplifier reverse input pin. ICs make its voltage keep 1.26V. Output voltage is divided by external resistors and it across FB.	
16	REF	Reference voltage.	

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