

SANYO Semiconductors DATA SHEET

An ON Semiconductor Company

LV5990M

Bi-CMOS IC

Low power consumption and high efficiency Step-down Switching Regulator

Overview

LV5990M is 1ch DC-DC converter with built-in power Pch MOS transistor. The recommended operating range is 4.5V to 18V. The maximum current is 3A. The operating current is about $90\mu A$, and low power consumption is achieved.

Functions

- 1ch SBD rectification DC-DC converter IC with built-in power Pch MOS transistor
- 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 is 360kHz.
- UVLO and built-in TSD

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V _{IN} -max		22	V
Allowable pin voltage	SW		30	V
	EN, PG		V _{IN}	V
	PDR		V _{IN} -6	V
	REF		6	V
	SS,FB,COMP C-HICCUP		REF	V
Allowable power dissipation	Pd max	specified substrate *	1.05	W
Operating temperature	Topr		-40 to 85	°C
Storage temperature	Tstg		-55 to 150	°C

^{*} Specified board: 40.0mm × 30.0mm × 1.6mm, glass epoxy.

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

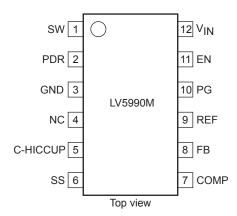
Parameter	Symbol	Conditions	Ratings	Unit
Input voltage renge	V _{IN}		4.5 to 18	V

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

Parameter	Symbol	Conditions	Ratings			Unit
Falanietei	Symbol	Conditions	min	typ	max	Offic
Reference voltage						
Internal reference voltage	VREF		1.235	1.260	1.285	V
Pch drive voltage	VPDR	I _{OUT} =0 to -5mA	V _{CC} -5.5	V _{CC} -5.0	V _{CC} -4.5	V
Saw wave oscillator						
Oscillatory frequency	Fosc		300	360	420	kHz
ON/OFF circuit	•					•
IC startup voltage (EN pin)	V _{CNT} ON		1.5		V _{IN}	V
Disable voltage (EN pin)	V _{CNT} _OFF				0.3	٧
Soft start circuit			'			
Soft start source current	I _{SS} _SC	EN>1.5V	1.3	2	3	μА
Soft start sink current	I _{SS} _SK	EN<0.3V, SS=0.4V	120	150	180	μΑ
UVLO circuit			'			l.
UVLO release voltage	V _{UVLO} N	FB=COMP	3.0	3.4	3.8	V
UVLO lock voltage	V _{UVLO} F	FB=COMP	2.5	2.9	3.3	V
Error amplifier			'			l.
Input bias current	I _{EA} _IN		-100	-50	100	nA
Error amplifier gain	GEA		100	250	400	μ A /V
Output sink current	I _{EA} _OSK	FB=1.75V	-40	-20	-10	μΑ
Output source current	I _{EA_} OSC	FB=0.75V	10	20	40	μА
Over current limit circuit			U.			I
Current limit peak	I _{CL}		3.2	4.7	6.2	Α
HICCUP timer start-up cycle	NLCYCLES			15		cycle
HICCUP comparator threshold voltage	V _{tHIC}		1.20	1.26	1.32	V
HICCUP timer charge current	IHIC		1	2	3	μА
PWM comparator			U.			I
Maximum on-duty	D _{MAX}		95			%
Logic output	1		U.			I
Power good "L" sink current	lpwrgd_L	PG=5V	4	5	6	mA
Power good "H" leakage current	I _{pwrgd} H	PG=5V			1	μА
Power good threshold FB voltage	V _{tPG}		1.0	1.1	1.2	٧
Power good hysteresis	V _{PG} _H		40	50	60	mV
Power good impedance	R _{PG}			1		kΩ
Output						
Output on-resistance	RON	I _O =1A		150		mΩ
The entire device						
Standby current	lccs	EN<0.3V			1	μА
Light load mode consumption current	l _{sleep1}	EN>1.5V, I _{LOAD} =0, No oscillatory -20°C≤Ta≤70°C *	50	70	90	μА
Thermal shutdown	TSD	*		170		°C

^{*:} Design certification

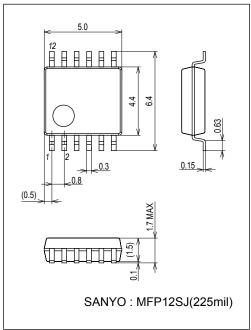
Pin Assignment

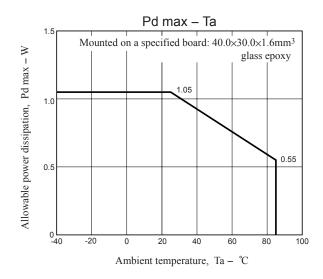


Package Dimensions

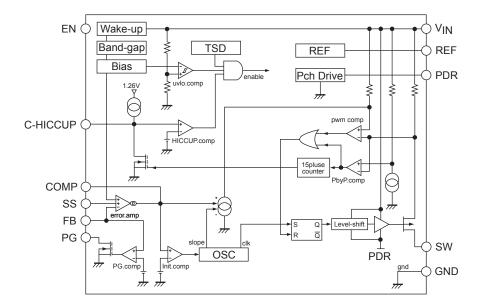
unit: mm (typ)

3403

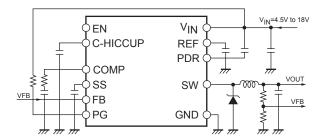




Block Diagram



Application Circuit



LV5990M

Pin Function

Pin No.	Pin name	Eunation	Equivalent circuit
	Pin name	Function High side Peh MOSEET drain pin	Equivalent circuit
1	SW	High-side Pch MOSFET drain pin	VIN
2	PDR	Pch MOSFET gate drive voltage The bypass capacitor is necessarily connected between this pin and V _{IN} .	VIN 1.3MΩ \$ 1.5MΩ \$ 10kΩ \$ 10kΩ \$ The state of the
3	GND	Ground pin. Ground pin voltage is reference voltage.	V _{IN}
12	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.	GND
5	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.	C-HICCUP W GND
6	SS	Capacitor connection pin for soft start. About 2μA current charges the soft start capacitor.	VIN $1k\Omega$ $10k\Omega$ $10k\Omega$ $10k\Omega$
7	COMP	Error amplifier output pin. The phase compensation network is connected between GND pin and COMP pin.	$\begin{array}{c} V_{\text{IN}} \\ \hline \\ 70 \text{k}\Omega \\ \hline \\ \text{GND} \\ \end{array}$
8	FB	Error amplifier reverse input pin. ICs make its voltage keep 1.26V. Output voltage is divided by external resistances and it across FB.	VIN 10k Ω 1k Ω 1k Ω 1k Ω

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Pin No.	Pin name	Function	Equivalent circuit
9	REF	Reference voltage	V_{IN} 10Ω 1
10	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.	PG ↓ ↑ 1kΩ ↑
11	EN	ON/OFF pin.	VIN 4.8MΩ

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