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DATA SHEET

An ON Semiconductor Company

Bi-CMOS IC

LV5990M —— 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 90μA, 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.

LV5990M

Recommended Operating Conditions at Ta = 25°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	min	typ	max	Unit
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	F_{OSC}		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	V
Soft start circuit						
Soft start source current	I_{SS_SC}	EN>1.5V	1.3	2	3	μA
Soft start sink current	I_{SS_SK}	EN<0.3V, SS=0.4V	120	150	180	μA
UVLO circuit						
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						
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_{EA_OSC}	FB=0.75V	10	20	40	μA
Over current limit circuit						
Current limit peak	I_{CL}		3.2	4.7	6.2	A
HICCUP timer start-up cycle	$N_{LCYCLES}$			15		cycle
HICCUP comparator threshold voltage	V_{tHIC}		1.20	1.26	1.32	V
HICCUP timer charge 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	I_{pwrgd_H}	PG=5V			1	μA
Power good threshold FB voltage	V_{tPG}		1.0	1.1	1.2	V
Power good hysteresis	V_{PG_H}		40	50	60	mV
Power good impedance	R_{PG}			1		kΩ
Output						
Output on-resistance	R_{ON}	I_O=1A		150		mΩ
The entire device						
Standby current	ICCS	EN<0.3V			1	μA
Light load mode consumption current	Isleep1	EN>1.5V, I_{LOAD}=0, No oscillatory -20°C≤Ta≤70°C *	50	70	90	μA
Thermal shutdown	TSD	*		170		°C

*: Design certification

Pin Assignment

SW	1	12	V$_{IN}$
PDR	2	11	EN
GND	3	10	PG
NC	4	9	REF
C-HICCUP	5	8	FB
SS	6	7	COMP

LV5990M

Top view
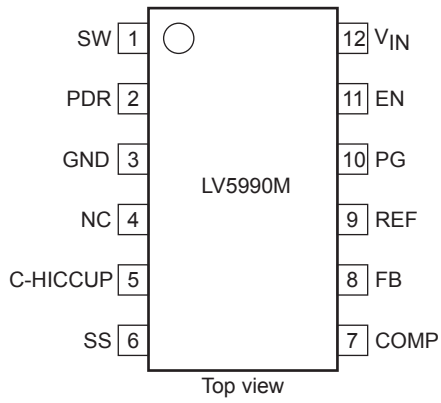
Package Dimensions

unit : mm (typ)

3403

5.0
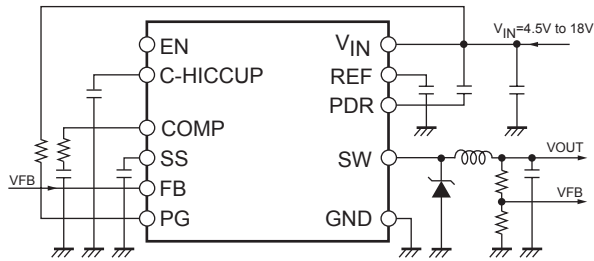
12

4.4

6.4

0.63

1

2

0.3

0.15

0.8

(0.5)

1.7 MAX

(1.5)

0.1

SANYO : MFP12SJ(225mil)

Pd max – Ta

1.5

Mounted on a specified board: 40.0×30.0×1.6mm^3
glass epoxy

1.05

1.0

0.5

0.55

0

-40   -20   0   20   40   60   80   100

Allowable power dissipation, Pd max – W

Ambient temperature, Ta – ℃
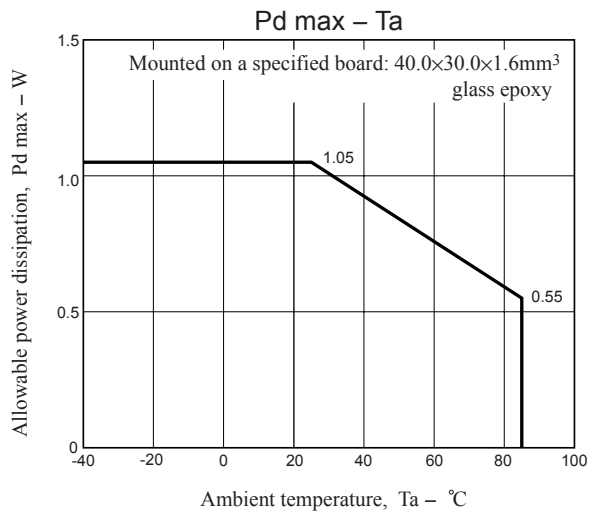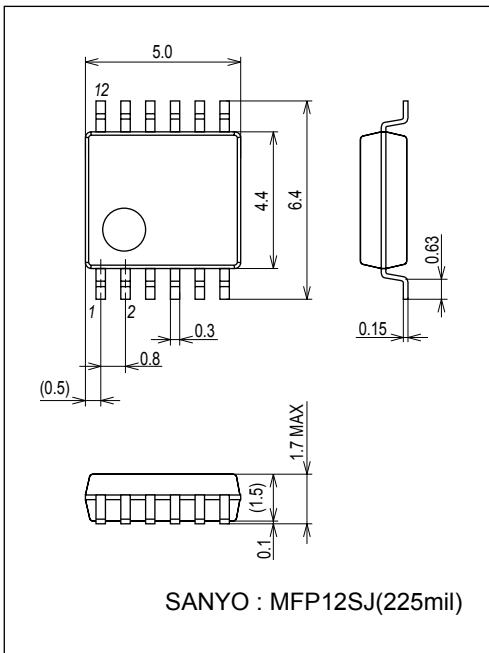
Block Diagram
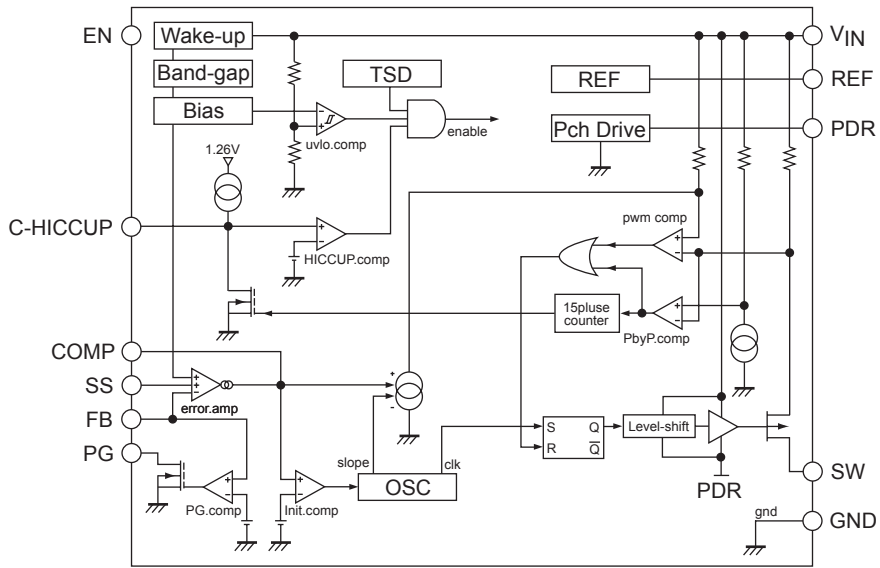
Application Circuit

Pin Function

Pin No.	Pin name	Function	Equivalent circuit
1	SW	High-side Pch MOSFET drain pin	
2	PDR	Pch MOSFET gate drive voltage The bypass capacitor is necessarily connected between this pin and V_{IN}.	
3	GND	Ground pin. Ground pin voltage is reference voltage.	
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.	
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.	
6	SS	Capacitor connection pin for soft start. About 2μA current charges the soft start capacitor.	
7	COMP	Error amplifier output pin. The phase compensation network is connected between GND pin and COMP pin.	
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.	

Continued from preceding page.

Pin No.	Pin name	Function	Equivalent circuit
9	REF	Reference voltage	V_IN, 10Ω, 10Ω, REF, 51kΩ, 1MΩ, 450kΩ, GND
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, GND
11	EN	ON/OFF pin.	V_IN, 4.8MΩ, EN, GND

This catalog provides information as of October, 2010. Specifications and information herein are subject to change without notice.

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