

SANYO Semiconductors DATA SHEET

An ON Semiconductor Company

Bi-CMOS IC

LV5807MX — Step-down Switching Regulator

Overview

LV5807MX is a 1ch step-down switching regulator. 0.12Ω FET is incorporated on the upper side to achieve high-efficiency operation for large output current. Low-heat resistance and compact-package MFP8 (200mil) employed. Current mode control type, with superior load current response and easy phase compensation ON/OFF pin, allowing the standby mode with the current drain of 40µA or less Pulse-by-pulse over-current protection and overheat protection available for protection of load devices Soft start pin to be provided with a capacitance for soft start.

Functions

- 3A 1ch step-down switching regulator
- Wide input dynamic range (8 to 18V)
- High efficiency (90% $I_{OUT} = 1A$, $V_{IN} = 12V$, $V_O = 5V$)
- Standby mode
- Over-current protection

- Thermal shutdown
- Reference voltage: 0.79V
- Fixed frequency: 385kHz
- Soft start
- Compact package: MFP8 (200mil) with Exposed Pad

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input V _{IN} voltage	V _{IN} max		20	V
BOOT pin maximum voltage	V _{BT} max		25	V
SW pin maximum voltage	V _{SW} max		V _{IN} max	V
BOOT pin-SW pin maximum voltage	V _{BS-SW} max		7	V
EN pin maximum voltage	V _{EN max}		20	V
FB, COMP, SS pin maximum voltage	Vfs max		7	V
Allowable power dissipation	Pd max	Mount on a specified board *	2.05	W
Junction temperature	Tj max		150	°C
Operating temperature	Topr		-20 to 80	°C
Storage temperature	Tstg		-40 to 150	°C

^{*} Specified board: 46.4mm × 31.8mm ×1.7mm, glass epoxy both side.

Note: Plan the maximum voltage while including coil and surge voltages, so that the maximum voltage is not exceeded even for an instant.

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Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
V _{IN} pin voltage	V _{IN}		8 to 18	٧
BOOT pin voltage	V _{BT}		-0.3 to 23	٧
SW pin voltage	V _{SW}		-0.4 to V _{IN}	٧
BOOT pin-SW pin maximum voltage	V _{BS-SW}		6.5	V
EN pin maximum voltage	V _{EN}		18	V
FB, COMP, SS pin voltage	V _{FSO}		6	V

Electrical Characteristics at Ta = 25 °C, $V_{\mbox{IN}} = 12 \mbox{V}$, unless otherwise specified.

Parameter	Cumbal	Conditions	Ratings			l lait
Parameter	Symbol	Conditions	min	typ	max	Unit
IC current drain at standby	I _{CC} 1	EN=0V		40		μΑ
IC current drain in operation	I _{CC} 2	EN=5V, FB=1V		3		mA
Efficiency	Effcy	V _{IN} =12V, I _{OUT} =1A, Vo=5V, Design target *1		90		%
Reference voltage	Vref	V _{IN} =8V to 18V (±2%)	0.7742	0.79	0.8058	٧
FB pin bias current	Iref	FB=0.79V application		10	100	nA
High-side ON resistance	RonH	BOOT=5V, I _{OUT} =1A		0.12		Ω
Low-side ON resistance	RonL			5		Ω
Oscillation frequency	fosc		310	385	460	kHz
Oscillation frequency during short-circuit protection	foscs		29	38	47	kHz
EN high-threshold voltage	Venh		1.05	1.57	2.1	٧
EN low-threshold voltage	VenI		0.8	1.23	1.65	V
Maximum ON DUTY	D max			80		%
Current limit peak value	Icl1	SW pin output current, V _{IN} =12V, V _{OUT} =5V, L=10μH	3.8	5		Α
Thermal shutdown temperature	Ttsd	*Design guarantee *2		160		°C
Thermal shutdown temperature hysteresis	Dtsd	*Design guarantee *2		40		°C
Soft start current	ISS	SS=0V	6	10	14	μΑ

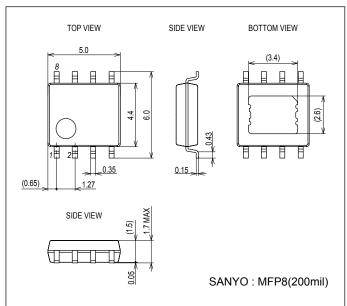
^{*1:} Reference value (not tested before shipment)

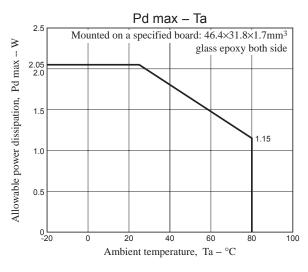
^{*2:} Design guarantee (value guaranteed by design and not tested before shipment)

Package Dimensions

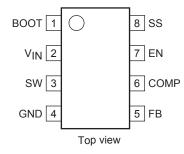
unit: mm (typ)

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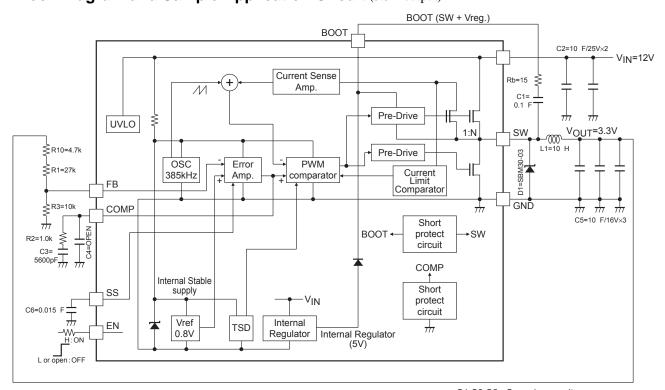




Pin Assignment



Block Diagram and Sample Application Circuit (3.3V output)



•C1,C2,C5 = Ceramic capacitor •L1 = CDRH105RNP-100NC (sumida)

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Pin Function

Pin No.	Pin name	Function	Equivalent circuit
1	BOOT	Upper MOS transistor boot strap capacitance connection pin. Connect the boot capacitance of about $0.1\mu\text{F}$ between SW pins. To protect the SW pin's absolute maximum rating, to ensure stable operation, and to eliminate noise, the boot capacitance serial resistance (about 15Ω) Rb proves effective.	Short protection BOOT
2	V _{IN}	Input voltage pin. Connect substantially large (10µF 2 parallel or more) capacitance between this pin and GND.	Hi side MOS 0.12Ω
3	SW	Power switch pin. Connect the output LC filter. Connect the above capacitance between this pin and BOOT pin.	SW Low side MOS 5Ω GND
4	GND	Ground pin.	
5	FB	Feedback pin. Sets the output voltage by means of split resistor in the section of the output voltage V_{OUT} - FB - GND. V_{OUT} setting is made as calculated below: $V_{OUT} = Vref \times \{1 + \frac{(R1 + R10)}{R3}\}$ $Vref = 0.79V$ Example: 3.3V output voltage (See Block Diagram and Sample Application Circuit) $V_{OUT} = 0.79 \times \{1 + \frac{(27k + 4.7k)}{10k}\}$ $= 3.294V$	VIN Internal regulation line
8	SS	Soft start pin. Sets the soft start time by means of the built-in $10\mu A$ source voltage and external soft start capacity. The soft start capacity C6 can be set as follows: $C6 = 10\mu A \times \frac{Tss}{Vref}$ Where, Tss is the soft start time and Vref is the reference voltage. Example: $1.2ms$ soft start time achieved $C6 = 10\mu A \times \frac{1.2ms}{0.79\ V} = 0.015\mu F$	SS W FB
6	COMP	Phase compensation pin. Connects with the phase compensation external capacitance and resistance of DC/DC converter close loop.	VIN Internal regulation line COMP
7	EN	Enable pin. Converter enabled when set to the HIGH voltage and disabled when LOW voltage or OPEN state.	V _{IN} 5μA 1kΩ 183kΩ 2pF 183kΩ 217

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Considerations for the design

Insertion of serial beads in the Schottky diode for removal of noise may cause generation of the negative voltage deviating from the absolute maximum rating at the SW pin, resulting in failure of normal operation. In such an event, do not insert beads as above described and, instead, remove noise by means of the BOOT resistance Rb.

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