



SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

LV5851M — Bi-CMOS IC Step-down Switching Regulator

Overview

LV5851M is a chopper type 1ch step-down regulator incorporating the drive transistor.

For the LO side switch, the 0.03Ω, and HI side switch, the 0.06Ω resistance is incorporated, enabling driving of the output up to 3 A with high efficiency.

Being of a current mode control type, this product ensures satisfactory load current response and simple phase compensation. The fold-back function is provided as the protection in case of output over-current. This function reduces the frequency in case of over-current and thus reduce the inductor current. The overheat protection function is also provided. For the package, MFP8 without exposed-PAD has been employed.

Functions

- 3A 1ch step-down switching regulator
- Input Voltage Range (5-18V)
- High efficiency: Max efficiency over 95%
- Compact package: MFP8 (225mil)
(No backside heat sink)
- Synchronous rectification, Current Mode Operation
- High/Low impedance Switch:
 - High-Side Switch: 60mΩ
 - Low-Side Switch: 30mΩ
- Soft start time 7.5ms
- Over-current protection

Specifications

Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---------------------|------------------------|------------------------------|------|
| Input voltage | V _{IN-abs} | | -0.3 to 20 | V |
| SW pin voltage | V _{SW-abs} | | -0.3 to V _{IN} +0.3 | V |
| EN pin voltage | V _{EN-abs} | | V _{IN-abs} | V |
| FB,COMP pin | | | -0.3 to 7 | V |
| Allowable power dissipation | Pd max | With specified board * | 1.0 | W |
| Junction temperature | Tj max | | 150 | °C |
| Operating temperature | Topr | | -30 to 85 | °C |
| Storage temperature | Tstg | | -40 to 150 | °C |

* Specified board: 31.0mm × 34.0mm × 1.7mm, glass epoxy.

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Recommended Operating Conditions at Ta = 25°C

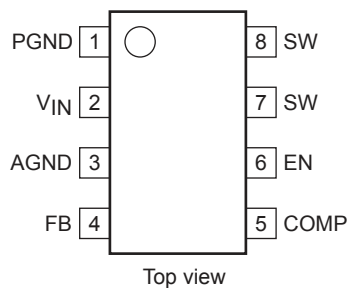
| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------|--------------------|------------|------------------------------|------|
| Input voltage | V _{IN} | | 5 to 18 | V |
| SW pin voltage | V _{SW} | | -0.3 to V _{IN} +0.3 | V |
| Output Voltage Range | | | 0.85 to 0.8V _{IN} | V |
| Maximum Output Current | I _O max | | 3 | A |

Electrical Characteristics at Ta = 25°C, V_{IN} = 12V, V_{OUT}=5V, unless otherwise specified.

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|---------------------|--|---------|-------|-------|------|
| | | | min | typ | max | |
| Supply Voltage | V _{IN} | | 5 | | 18 | V |
| Reference Voltage | V _{FB} | | 0.825 | 0.835 | 0.845 | V |
| Starting input voltage | V _{UVLO1} | | | 4.65 | 4.9 | V |
| Operation stop input voltage | V _{UVLO2} | | 3.8 | 4.3 | | V |
| Feedback Voltage Input Current | I _{FB} | | | 80 | | nA |
| IC operate current | I _{IN} | FB=0.9V | | 3 | | mA |
| EN starting voltage | V _{EN_ON} | | 2 | | | V |
| EN stopping voltage | V _{EN_OFF} | | | | 0.6 | V |
| Load Regulation | | | | 0.5 | | % |
| Line Regulation | | | | 1 | | % |
| Switching frequency | f _{OSC} | V _{IN} =12V, I _O =1.0A | 350 | 500 | 600 | kHz |
| Max Duty cycle | D _{max} | | 80 | | | % |
| Min Duty cycle | D _{min} | | | | 13.5 | % |
| Shut Down current | I _{sd} | | | 180 | | μA |
| Soft Start Time | St | | 5 | 7.5 | 10 | ms |
| Internal MOS FET High Side ON-Resistance | R _{ONH} | V _{IN} =12V | | 60 | 90 | mΩ |
| | | V _{IN} =5V | | 90 | 160 | mΩ |
| Internal MOS FET Low Side ON-Resistance | R _{ONL} | V _{IN} =12V | | 30 | 50 | mΩ |
| | | V _{IN} =5V | | 50 | 90 | mΩ |
| Current limiter operating voltage | I _S | V _{IN} =12V | | 4.5 | | A |
| | | V _{IN} =5V | | 4.0 | | A |
| Thermal shutdown operating temperature | TSD | *Design guarantee | | 160 | | °C |
| Thermal shutdown Hysteresis width | ΔTSD | *Design guarantee | | 50 | | °C |

*: Design guarantee (value guaranteed by design and not tested before shipment)

Pin Assignment

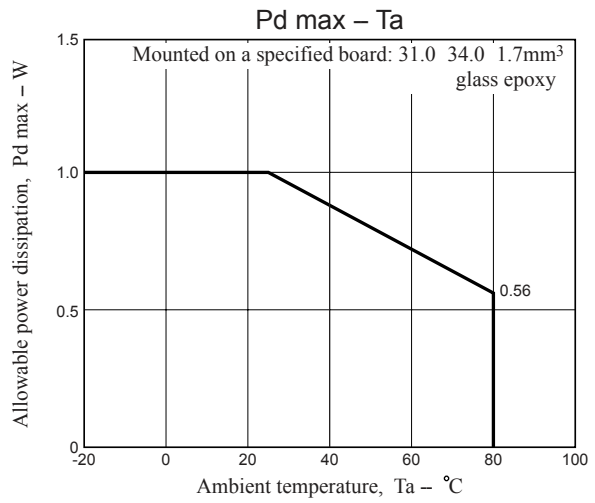
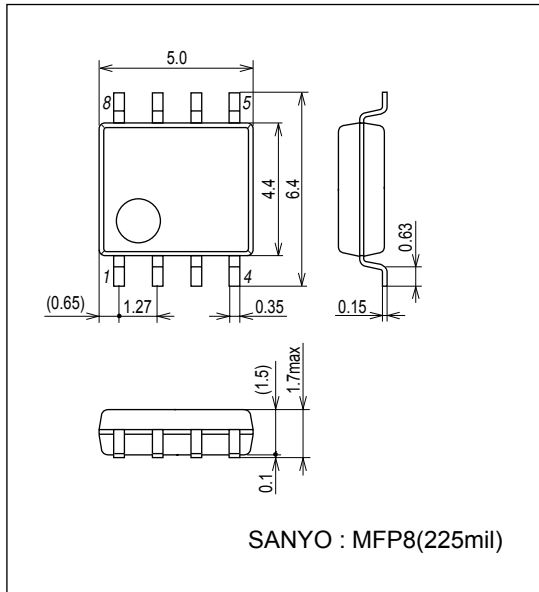


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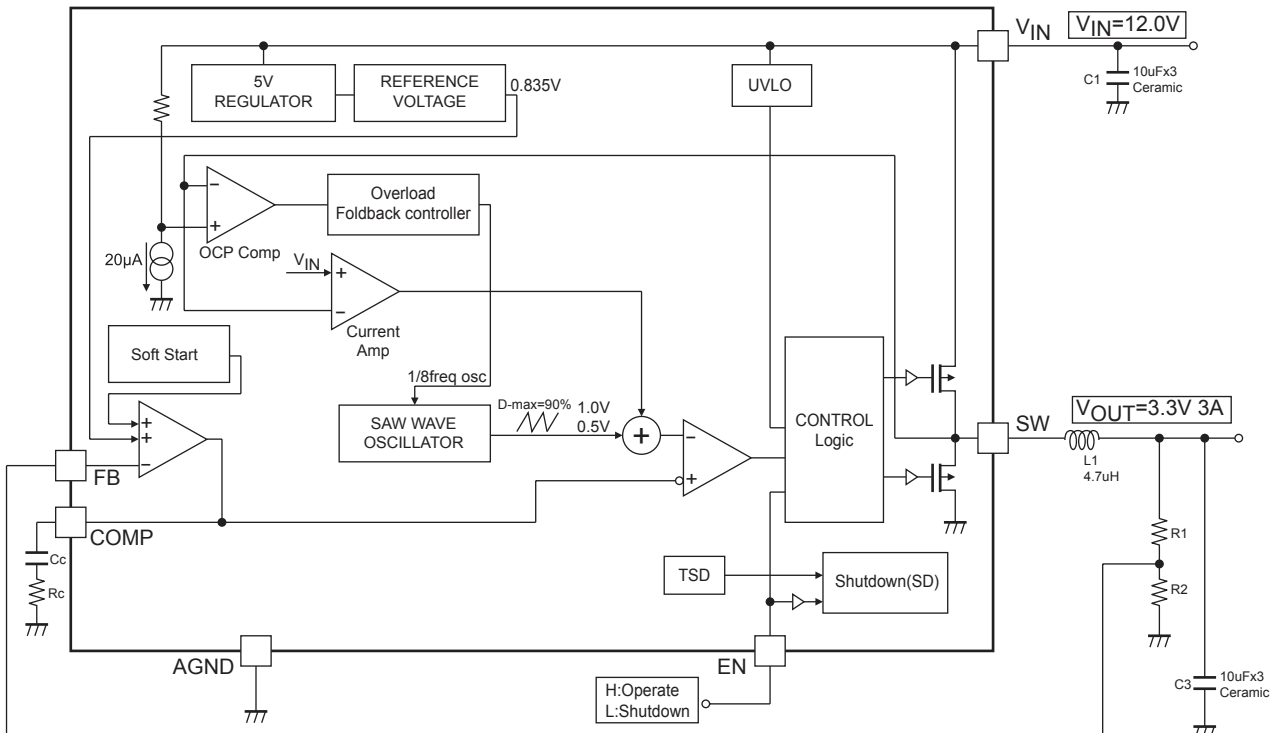
Package Dimensions

unit : mm (typ)

3032D



Block Diagram and Sample Application Circuit



LV5851M

Pin Function

| Pin No. | Pin name | Function | Equivalent circuit |
|---------|-----------------|---|--------------------|
| 1 | PGND | Power Ground pin. Connect to AGND electrically. | |
| 2 | V _{IN} | Power supply pin. Connect the sufficiently large capacitance (10μF x 3 parallel or more recommended for the output current of 3 A or more between this pin and GND). With the pin voltage of 4.65V or more, the soft start function is activated and IC starts up slowly. When the pin voltage drops to 4.3 V or less, IC stops operation. | |
| 7, 8 | SW | Power Switching Output. Connect Inductor to this pin. | |
| 3 | AGND | Each reference voltage is based on the voltage of the AGND pin. | |
| 4 | FB | Error amplifier reverse input pin. By operating the converter, the voltage of this pin becomes 0.835V. The voltage in which the output voltage is divided by an external resistance is applied to this pin. The output voltage is determined as the follow formula. $V_{OUT} = V_{ref} \times \left\{ 1 + \frac{R1}{R2} \right\}, \quad V_{ref} = 0.835V$ Example: 3.3V Output voltage (Refer to the Block Diagram and Sample Application Circuit) $V_{OUT} = 0.835V \times \left\{ 1 + \frac{3.0k}{1.0k} \right\} = 3.340V$ | |
| 5 | COMP | External loop compensation pin. Connect with the phase compensation external capacitance and resistance of DC / DC converter close loop. | |
| 6 | EN | ON / OFF pin [High : Operating / Low : Shutdown Open: forbidden] Operate voltage: ≥ 2V Shutdown voltage : ≥ 0.6V | |

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