



SANYO Semiconductors

DATA SHEET

LV5747TT — Bi-CMOS LSI 1-channel Step-down Switching Regulator

Overview

The LV5747TT is a 1-channel step-down switching regulator.

Functions

- 1 channel step-down switching regulator controller.
- Frequency decrease function at pendent.
- Load-independent soft start circuit.
- ON/OFF function.
- Built-in pulse-by-pulse OCP circuit. It is detected by using ON resistance of an external MOS.

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---|---------------------------------|--------------|------------------|
| supply voltage | $V_{IN\ max}$ | | 45 | V |
| Allowable pin voltage | $V_{IN\ SW}$ | | 45 | V |
| | HDRV, CBOOT | | 52 | V |
| | LDRV | | 6.0 | V |
| | Between CBOOT to SW, Between CBOOT to HDRV | | 6.0 | V |
| | EN, ILIM | | $V_{IN}+0.3$ | V |
| | Between V_{IN} to ILIM | | 1.0 | V |
| | V_{DD} | | 6.0 | V |
| | SS, FB, COMP | | $V_{DD}+0.3$ | V |
| Allowable Power dissipation | $P_d\ max$ | Mounted on a specified board. * | 0.75 | W |
| Junction temperature | $T_j\ max$ | | 150 | $^\circ\text{C}$ |
| Operating temperature | T_{opr} | | -40 to +85 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -55 to +150 | $^\circ\text{C}$ |

* Specified board: 35mm x 32mm x 1.6mm, glass epoxy 2-layer board.

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Recommended Operating Ranges at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|-------------------------------|----------|------------|-----------|------|
| Supply voltage range | V_{IN} | | 8.0 to 42 | V |
| Error amplifier input voltage | V_{FB} | | 0 to 1.6 | V |

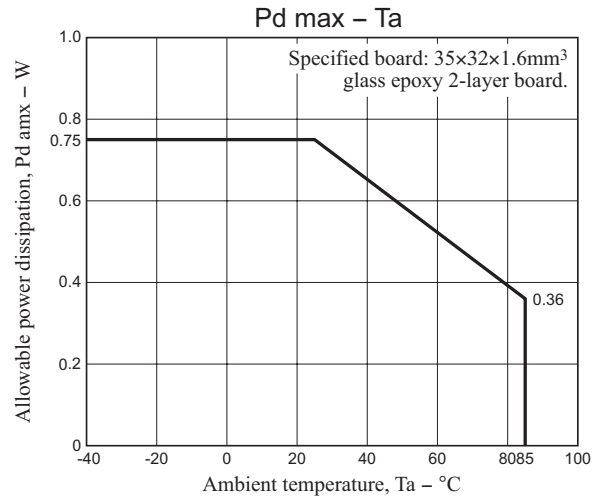
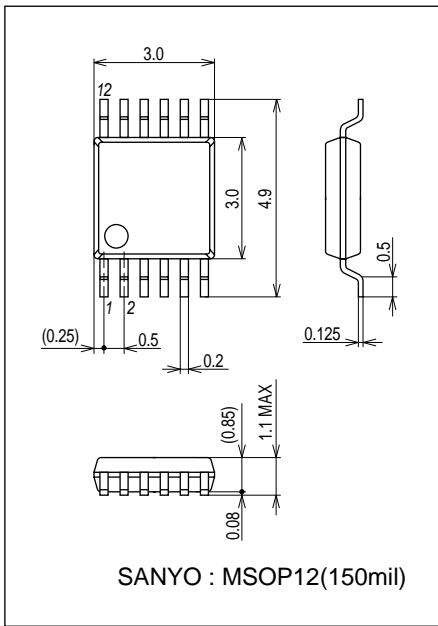
Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 12\text{V}$

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---------------|---|---------------|-------|----------|-----------------|
| | | | min | typ | max | |
| Reference voltage block | | | | | | |
| Internal reference voltage | V_{ref} | Including offset of E/A | 0.698 | 0.708 | 0.718 | V |
| 5V power supply | V_{DD} | $I_{OUT} = 0$ to 5mA | 4.7 | 5.2 | 5.7 | V |
| Triangular waveform oscillator block | | | | | | |
| Oscillation frequency | F_{OSC} | | 335 | 385 | 435 | kHz |
| Frequency variation | $F_{OSC DV}$ | $V_{IN} = 8$ to 42V | | 1 | | % |
| Oscillation frequency fold back detection voltage | $V_{OSC FB}$ | FB voltage detection after SS ends | | 0.5 | | V |
| Oscillatory frequency after fold back | $F_{OSC FB}$ | $V_{FB} = 0\text{V}$ | 25 | 45 | 60 | kHz |
| ON/OFF circuit block | | | | | | |
| IC start-up voltage | $V_{EN on}$ | $V_{IN} = 8$ to 42V | | 3.4 | 4.3 | V |
| start-up voltage hysteresis | $V_{EN hys}$ | | 1.0 | 1.2 | | V |
| Soft start circuit block | | | | | | |
| Soft start source current | $I_{SS SC}$ | $EN > 4.3\text{V}$ | 4 | 5 | 6 | μA |
| Soft start sink current | $I_{SS SK}$ | $EN < 1\text{V}$, $V_{DD} = 5\text{V}$ | | 2 | | mA |
| Soft start end voltage | $V_{SS END}$ | | 0.9 | 1.1 | 1.3 | V |
| UVLO circuit block | | | | | | |
| UVLO lock release voltage | V_{UVLO} | | 7.0 | 7.4 | 7.8 | V |
| UVLO hysteresis | $V_{UVLO H}$ | | | 0.6 | | V |
| Error amplifier | | | | | | |
| Input bias current | $I_{EA IN}$ | | | | 100 | nA |
| Error amplifier gain | G_{EA} | | 1000 | 1400 | 1800 | $\mu\text{A/V}$ |
| Common mode input range | $V_{EA R}$ | $V_{IN} = 8$ to 42V | 0.0 | | 1.6 | V |
| Sink output current | $I_{EA OSK}$ | FB = 1.0V | | -100 | | μA |
| Source output current | $I_{EA OSC}$ | FB = 0V | | 100 | | μA |
| Current detection amplifier gain | G_{ISNS} | | | 1.3 | | |
| over current limiter circuit block | | | | | | |
| Reference current | I_{LIM} | | -10% | 20 | +10% | μA |
| Over current detection comparator offset voltage | $V_{LIM OFS}$ | | -5 | | +5 | mA |
| Over current detection comparator common mode input range | | | $V_{IN}-0.45$ | | V_{IN} | V |
| PWM comparator | | | | | | |
| Input threshold voltage | $V_{t max}$ | Duty cycle = DMAX, SW = V_{IN} | 1.0 | 1.1 | 1.2 | V |
| | V_{t0} | Duty cycle = 0%, SW = V_{IN} | 0.4 | 0.5 | 0.6 | V |
| Maximum ON duty | DMAX | | 85 | 90 | 95 | % |
| Output block | | | | | | |
| Output stage ON resistance (the upper side) | R_{ONH} | | | 5 | | Ω |
| Output stage ON resistance (the under side) | R_{ONL} | | | 5 | | Ω |
| Output stage ON current (the upper side) | I_{ONH} | | 240 | | | mA |
| Output stage ON current (the under side) | I_{ONL} | | 240 | | | mA |
| The whole device | | | | | | |
| Standby current | I_{CCS} | $EN < 1\text{V}$ | | | 60 | μA |
| Mean consumption current | I_{CCA} | $EN > 4.3\text{V}$ | | 3.3 | | mA |

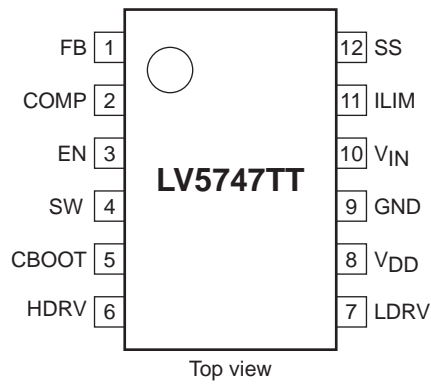
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Package Dimensions

unit : mm (typ)
3375

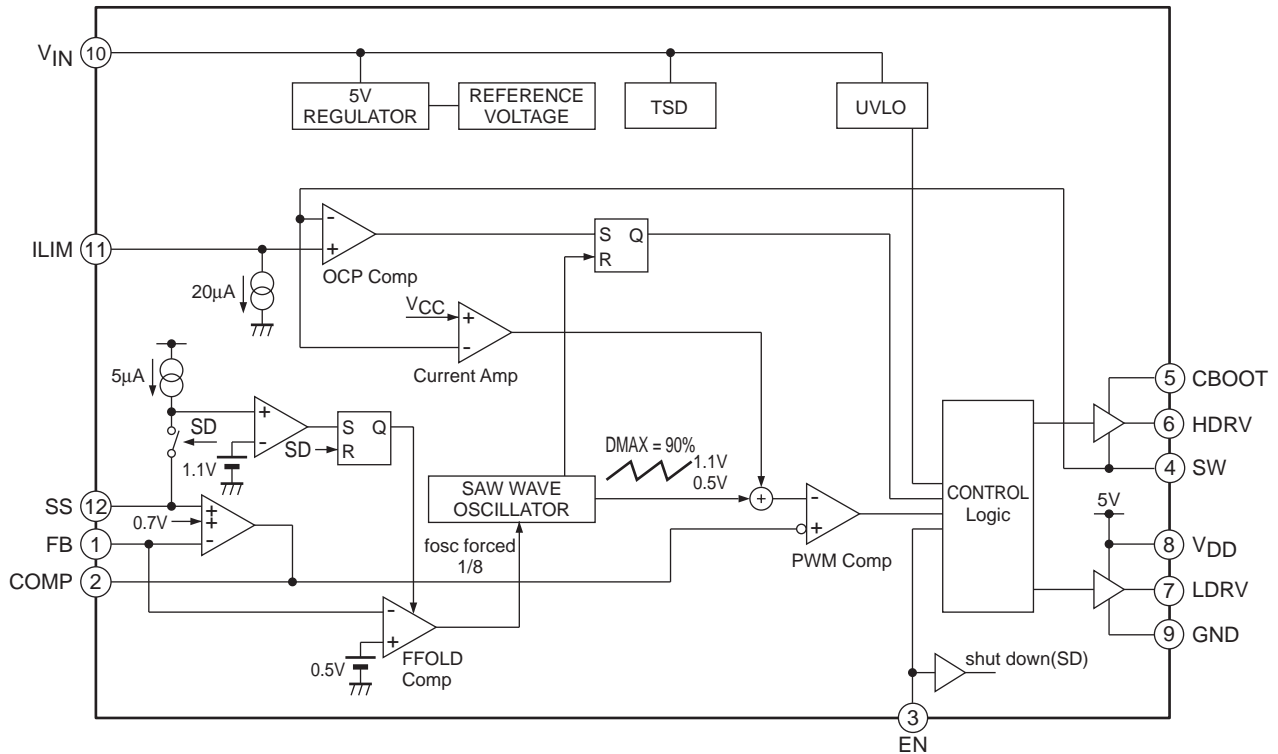


Pin Assignment



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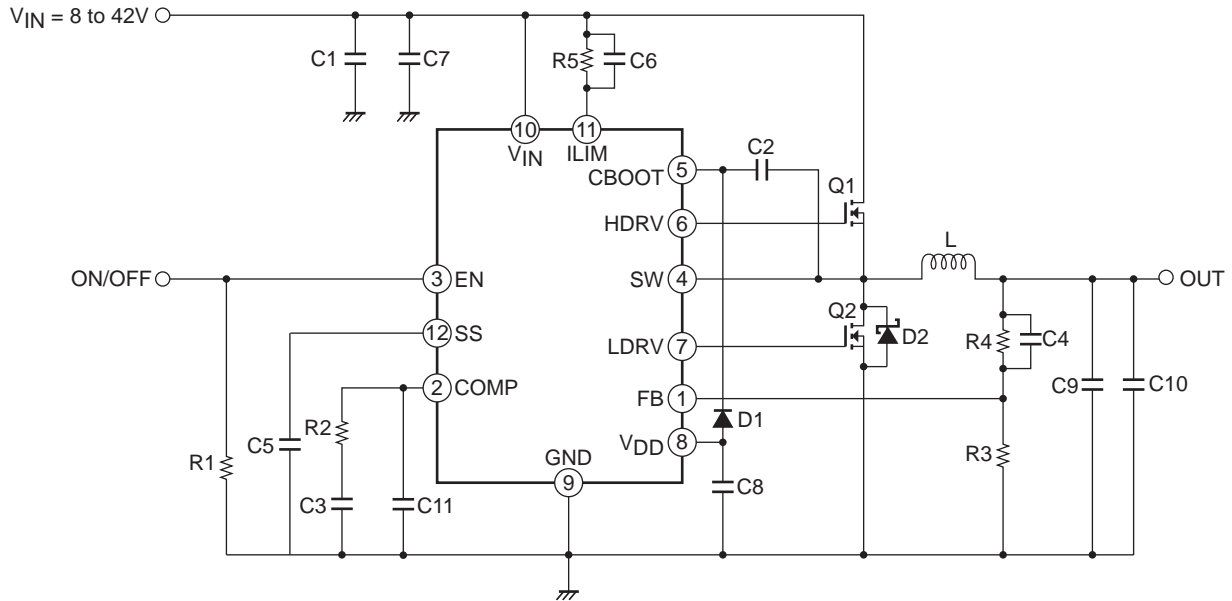
Block Diagram



Pin Function

| Pin No. | Pin name | Description |
|---------|-----------------|--|
| 1 | FB | Error amplifier reverse input pin. By operating the converter, the voltage of this pin becomes 0.708V. The voltage in which the output voltage is divided by an external resistance is applied to this pin. Moreover, when this pin voltage becomes 0.5V or less after a soft start ends, the frequency fold back function operations, and the oscillating frequency is falling with the FB voltage. |
| 2 | COMP | Error amplifier output pin. Connect a phase compensation circuit between this pin and GND. |
| 3 | EN | ON/OFF pin. |
| 4 | SW | Pin to connect with switching node. The source of NchMOSFET connects to this pin. |
| 5 | CBOOT | Bootstrap capacity connection pin. This pin becomes a GATE drive power supply of an external NchMOSFET. Connect a bypath capacitor between CBOOT and SW. |
| 6 | HDRVV | An external the upper MOSFET gate drive pin. |
| 7 | LDRV | An external the lower MOSFET gate drive pin. |
| 8 | V _{DD} | Power supply pin for an external the lower MOS-FET gate drive. |
| 9 | GND | Ground pin. Each reference voltage is based on the voltage of the ground pin. |
| 10 | V _{IN} | Power supply pin. This pin is monitored by UVLO function. When the voltage of this pin becomes 7.8V or more by UVLO function, The IC starts and the soft start function operates. |
| 11 | ILIM | Reference current pin for current detection. The sink current of about 20µA flows to this pin. When a resistance is connected between this pin and V _{IN} outside and the voltage applied to the SW pin is lower than the voltage of the terminal side of the resistance, the upper NchMOSFET is off by operating the current limiter comparator. This operation is reset with respect to each PWM pulse. |
| 12 | SS | Pin to connect a capacitor for soft start. A capacitor for soft start is charged by using the voltage of about 5µA. This pin ends the soft start period by using the voltage of about 1.1V and the frequency fold back function becomes active. |

Sample Application Circuit



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