Ordering number : ENA0586

SANYO Semiconductors
DATA SHEET

# LA5724M — Monolithic Linear IC Separately-Excited Step-Down Switching Regulator (Variable Type)

## Overview

The LA5724M is a separately-excited step-down switching regulator (variable type).

## Functions

- Time-base generator (160kHz) incorporated.
- Current limiter incorporated.
- Thermal shutdown circuit incorporated.

## Specifications

### Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Input voltage | $V_{IN}$ | | 30 | V |
| Maximum output current | $I_O$ max | | 0.6 | A |
| SW pin application reverse voltage | $V_{SW}$ | | -1 | V |
| VOS pin application voltage | $V_{VOS}$ | | -0.2 to 7 | V |
| Allowable power dissipation | Pd max | Mounted on a circuit board.* | 0.8 | W |
| Operating temperature | Topr | | -30 to +125 | °C |
| Storage temperature | Tstg | | -40 to +150 | °C |

* Specified circuit board : 114.3×76.1×1.6mm$^3$, glass epoxy board.

### Recommended Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Input voltage range | $V_{IN}$ | | 4.5 to 28 | V |



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

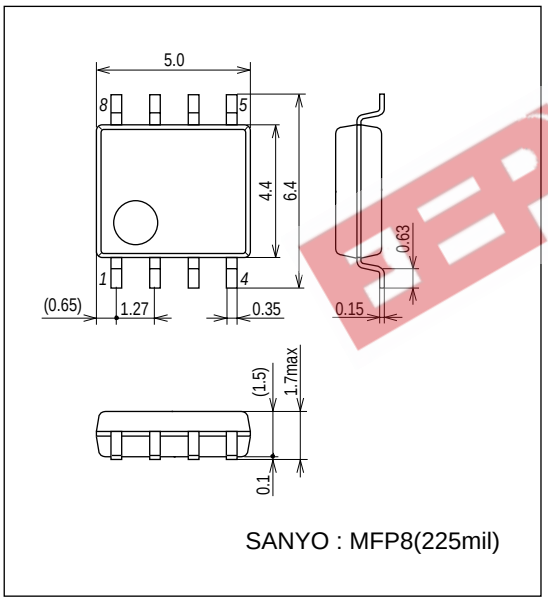
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Reference voltage | $V_{OS}$ | $I_O$ = 0.3A | 1.20 | 1.23 | 1.26 | V |
| Reference pin bias current | $I_{FB}$ | | | 1 | 2 | μA |
| Switching frequency | fosc | | 128 | 160 | 192 | kHz |
| Efficiency | η | $V_{OUT}$ = 5V, $I_O$ = 0.3A | | 82 | | % |
| Short-circuit protection circuit operating switching frequency | fscp | | | 30 | | kHz |
| Saturation voltage | Vsat | $I_{OUT}$ = 0.3A, $V_{OS}$ = 0V | | 1.2 | | V |
| Maximum on duty | D max | $V_{OS}$ = 0V | | 100 | | % |
| Minimum on duty | D min | $V_{OS}$ = 5V | | 0 | | % |
| Output leakage current | Ilk | $SW_{OUT}$ = -1V | | | 200 | μA |
| Supply current | Iin | $V_{OS}$ = 2V | | 5 | 10 | mA |
| Current limiter operating voltage | $I_S$ | $V_{IN}$ = 15V | 0.7 | | | A |
| Thermal shutdown operating temperature | TSD | Designed target value. * | | 165 | | °C |
| Thermal shutdown Hysteresis width | ΔTSD | Designed target value. * | | 15 | | °C |

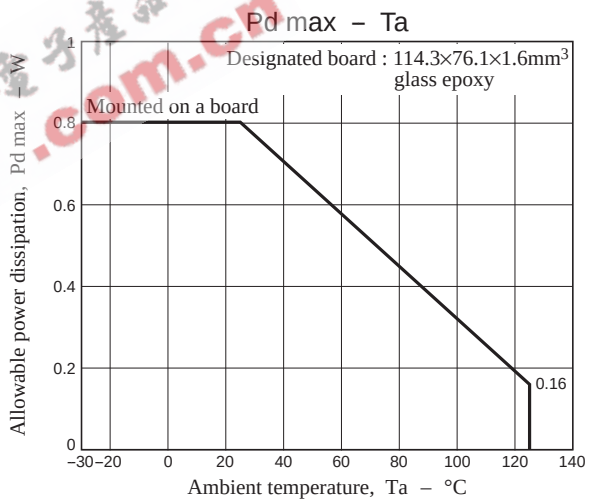
* Design target value : No measurement made.

## Package Dimensions

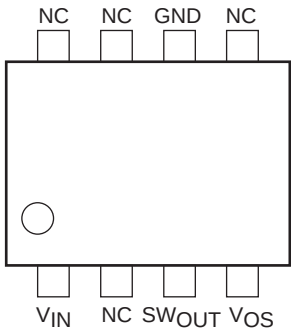
unit : mm (typ)

3032D

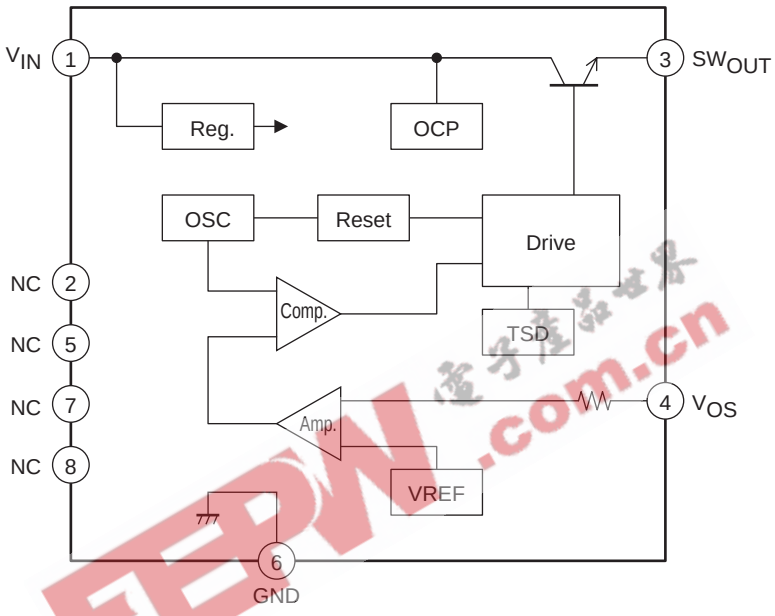


## Pin Assignment

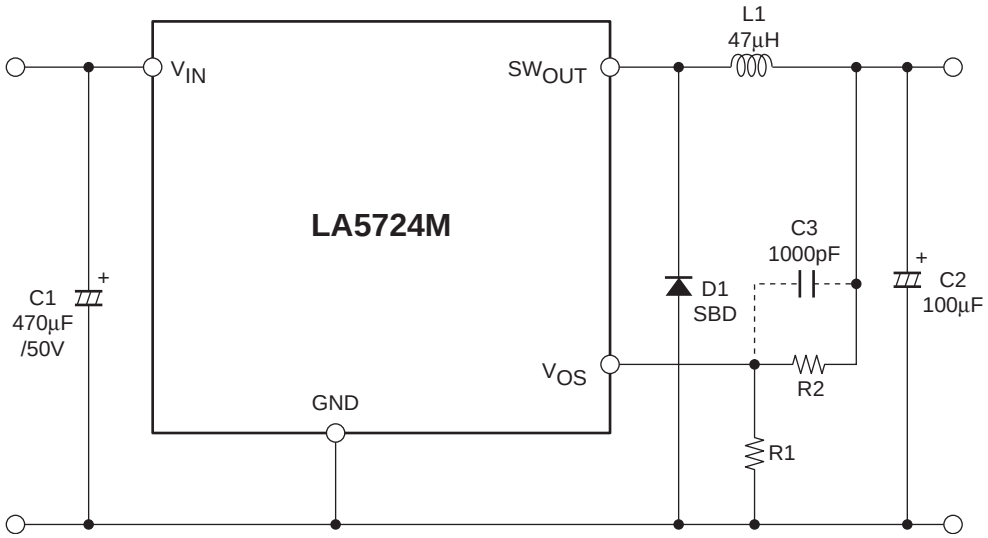



## Block Diagram



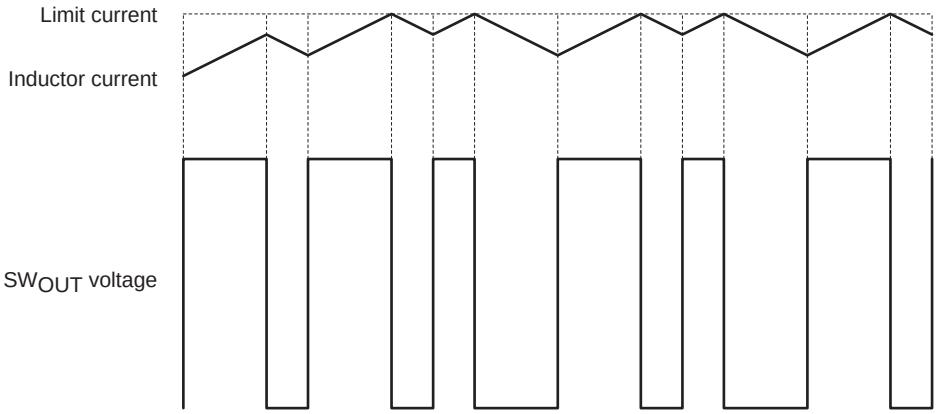

Note : Since the NC pins are not connected within the IC package, they can be used as connection points.

## Application Circuit Example



## Protection Circuit Functional Descriptions

1. Overcurrent protection function
   The overcurrent protection function detects, on a cycle-by-cycle basis, the output transistor current and turns off that output transistor current if it exceeds 0.7A in a cycle-by-cycle manner.




2. Short circuit protection function
   This IC prevents the current from increasing when the outputs are shorted by setting the switching frequency to 30kHz if the $V_{OS}$ pin voltage falls below 0.8V.

   Note : Since the switching frequency becomes 30kHz when the $V_{OS}$ pin voltage falls under 0.8V, the current capacity is reduced. If a load is applied with the $V_{OS}$ pin voltage over 0.8V, the inductance value operates at 47μH. If a load is to be applied when this voltage is under 0.8V, the inductance value must be increased.

## Description of Functional Settings

1. Calculation equation to set the output voltage
   This IC controls the switching output so that the $V_{OS}$ pin voltage becomes 1.23V (typ).
   The equation to set the output voltage is as follows :

$$V_O = \left(1 + \frac{R2}{R1}\right) \times 1.23V(typ)$$

   The $V_{OS}$ pin has the inrush current of 1μA (typ). Therefore, the error becomes larger when R1 and R2 resistance values are large.

## Timing Chart