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**SANYO Semiconductors**

**DATA SHEET**

Monolithic Linear IC

An ON Semiconductor Company

**LA5724M**

**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  $T_a = 25^\circ\text{C}$

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	$P_d$ max	Mounted on a circuit board.*	0.8	W
Operating temperature	$T_{opr}$		-30 to +125	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

\* Specified circuit board : 114.3×76.1×1.6mm<sup>3</sup>, glass epoxy board.

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

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

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## LA5724M

### Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{IN} = 15\text{V}$

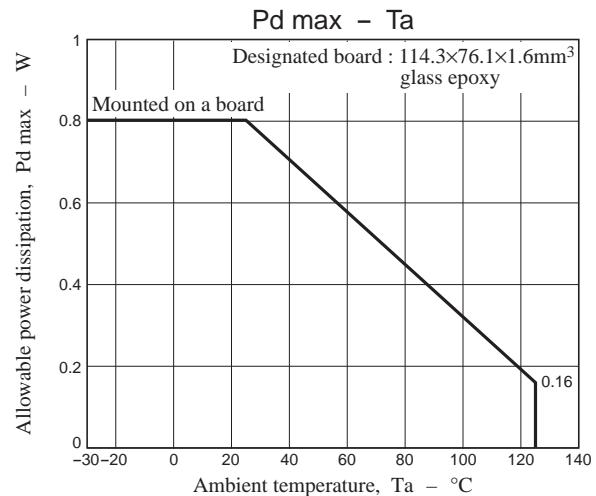
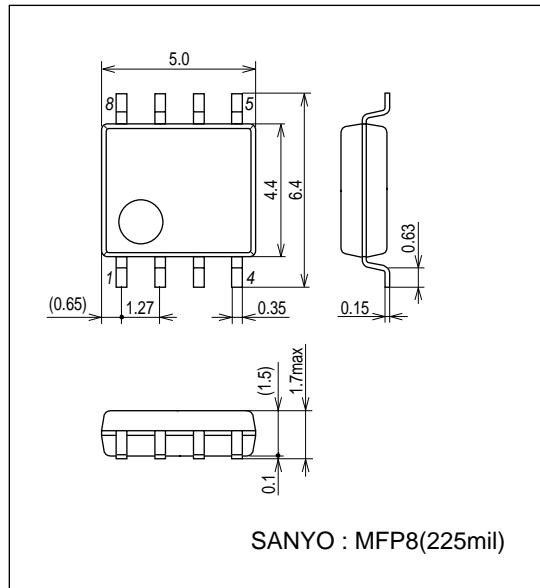
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage	$V_{OS}$	$I_O = 0.3\text{A}$	1.20	1.23	1.26	V
Reference pin bias current	$I_{FB}$			1	2	$\mu\text{A}$
Switching frequency	$f_{osc}$		128	160	192	kHz
Efficiency	$\eta$	$V_{OUT} = 5\text{V}$ , $I_O = 0.3\text{A}$		82		%
Short-circuit protection circuit operating switching frequency	$f_{scp}$			30		kHz
Saturation voltage	$V_{sat}$	$I_{OUT} = 0.3\text{A}$ , $V_{OS} = 0\text{V}$		1.2		V
Maximum on duty	$D_{max}$	$V_{OS} = 0\text{V}$		100		%
Minimum on duty	$D_{min}$	$V_{OS} = 5\text{V}$		0		%
Output leakage current	$I_{lk}$	$V_{OUT} = -1\text{V}$			200	$\mu\text{A}$
Supply current	$I_{in}$	$V_{OS} = 2\text{V}$		5	10	mA
Current limiter operating voltage	$I_S$	$V_{IN} = 15\text{V}$	0.7			A
Thermal shutdown operating temperature	$T_{SD}$	Designed target value. *		165		$^\circ\text{C}$
Thermal shutdown Hysteresis width	$\Delta T_{SD}$	Designed target value. *		15		$^\circ\text{C}$

\* Design target value : No measurement made.

### Package Dimensions

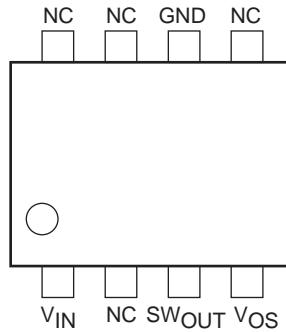
unit : mm (typ)

3032D

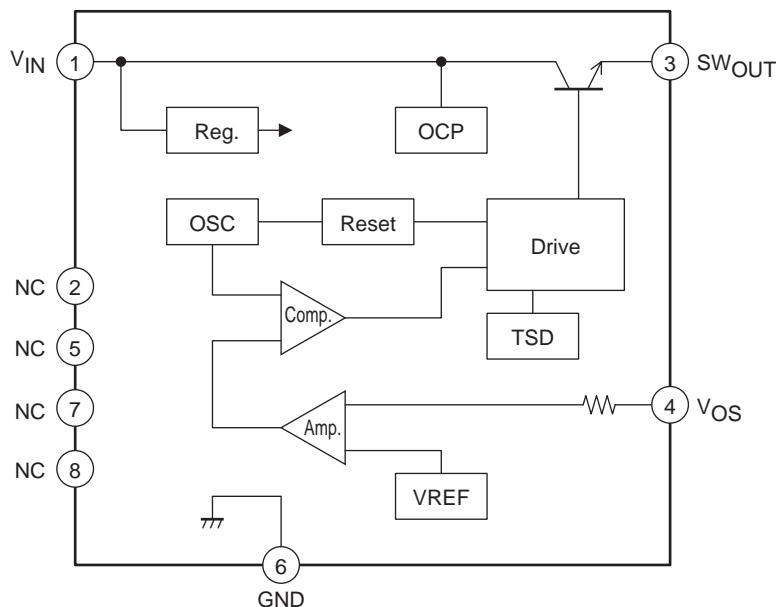


## LA5724M

### Pin Assignment

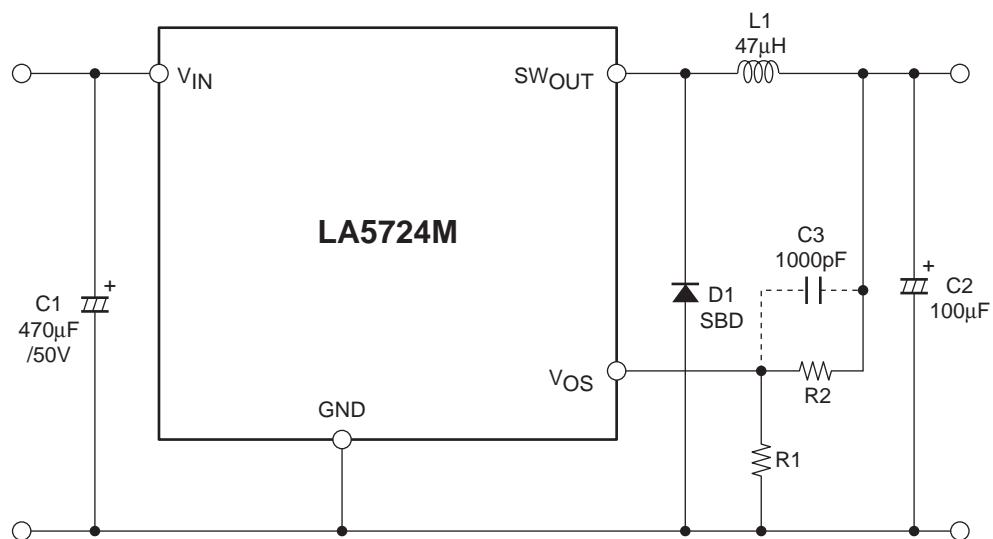


### Block Diagram



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

### Application Circuit Example

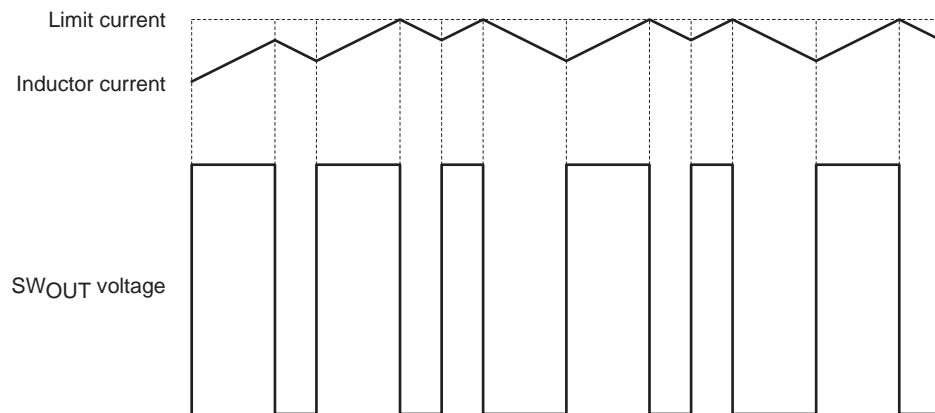


## LA5724M

### 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<sub>OS</sub> pin voltage falls below 0.8V.

Note : Since the switching frequency becomes 30kHz when the V<sub>OS</sub> pin voltage falls under 0.8V, the current capacity is reduced. If a load is applied with the V<sub>OS</sub> 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<sub>OS</sub> pin voltage becomes 1.23V (typ).

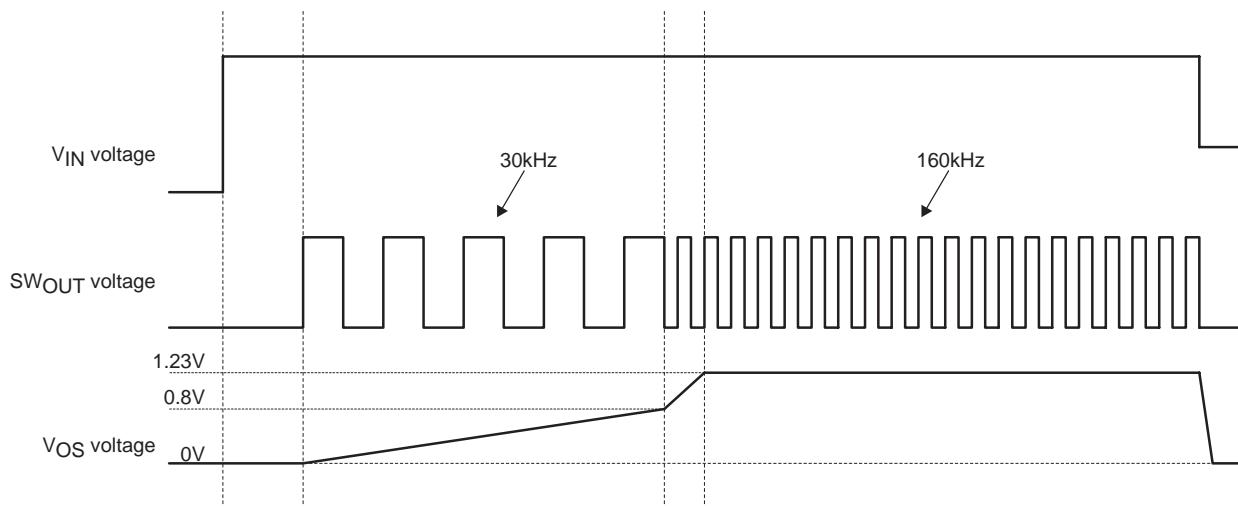
The equation to set the output voltage is as follows :

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

The V<sub>OS</sub> pin has the inrush current of 1μA (typ). Therefore, the error becomes larger when R1 and R2 resistance values are large.

## LA5724M

### Timing Chart



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