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SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

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

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V_{IN}		30	V
Maximum output current	$I_O \text{ max}$		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	$P_d \text{ max}$	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 : 114.3×76.1×1.6mm³, 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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Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 15\text{V}$

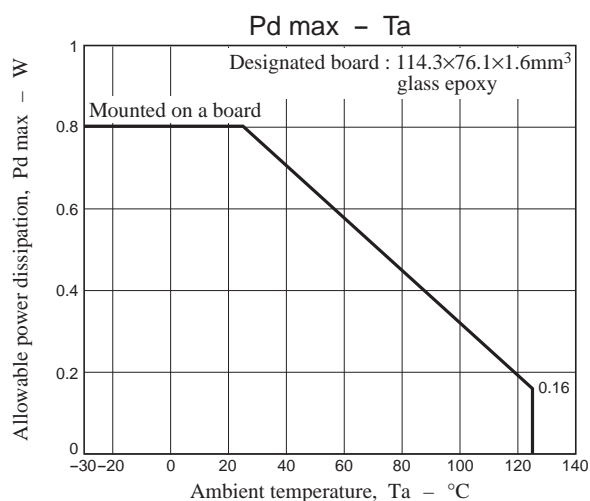
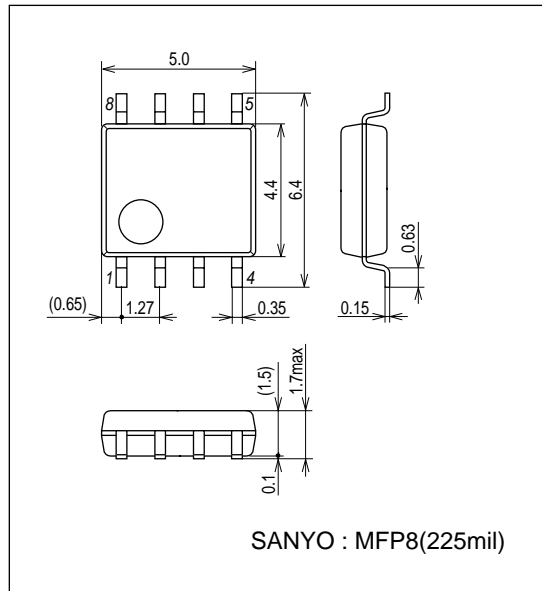
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage	V_{OS}	$I_O = 0.3\text{A}$	1.20	1.23	1.26	V
Reference pin bias current	I_{FB}			1	2	μA
Switching frequency	f_{osc}		128	160	192	kHz
Efficiency	η	$V_{OUT} = 5\text{V}$, $I_O = 0.3\text{A}$		82		%
Short-circuit protection circuit 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}	$SW_{OUT} = -1\text{V}$			200	μA
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	TSD	Designed target value. *		165		$^\circ\text{C}$
Thermal shutdown Hysteresis width	ΔTSD	Designed target value. *		15		$^\circ\text{C}$

* Design target value : No measurement made.

Package Dimensions

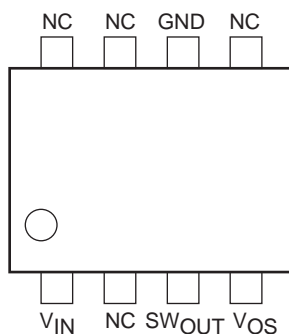
unit : mm (typ)

3032D

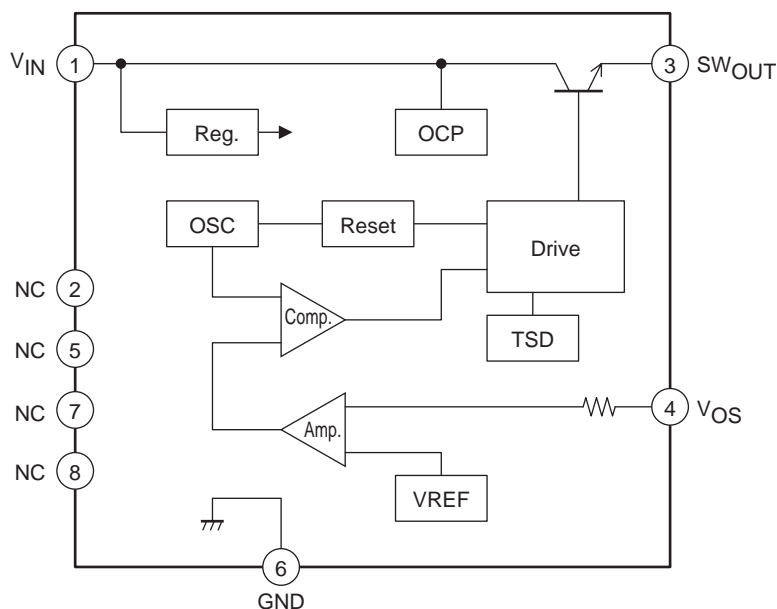


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Pin Assignment

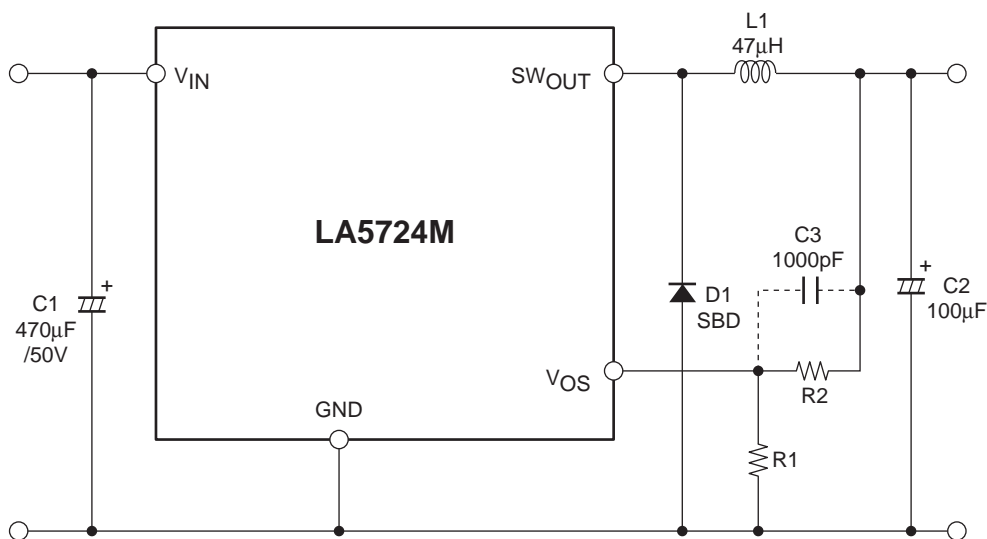


Block Diagram



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

Application Circuit Example

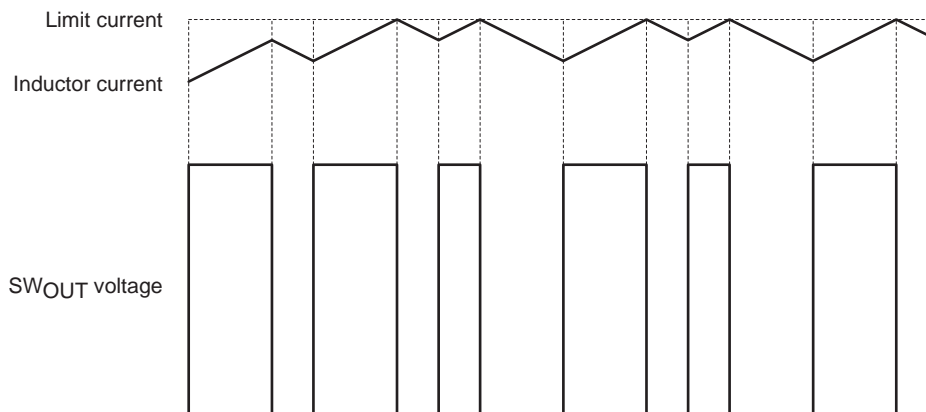


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Protection Circuit Functional Descriptions

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).

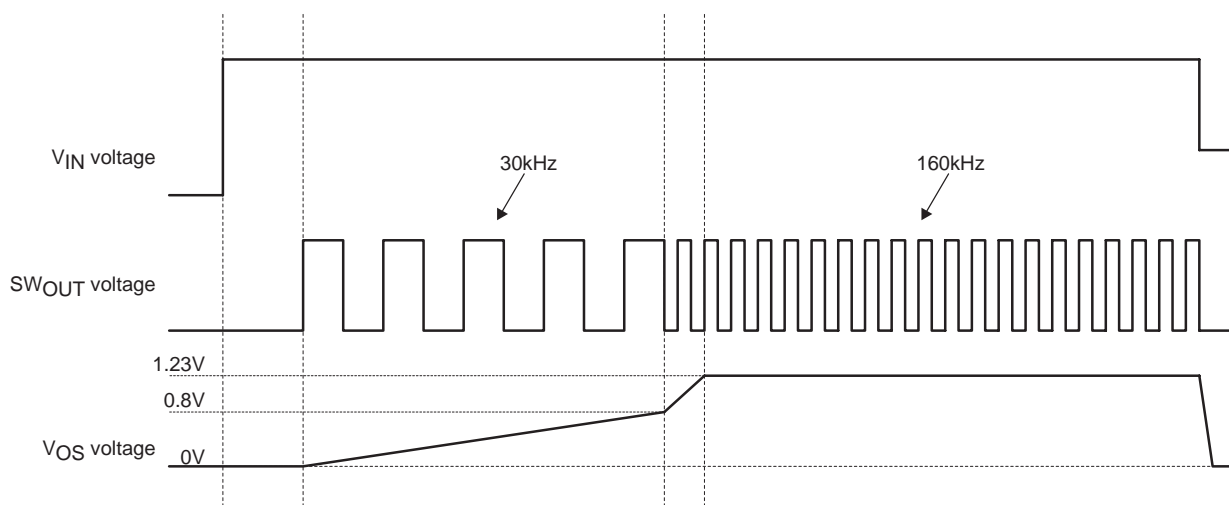
The equation to set the output voltage is as follows :

$$V_O = \left(1 + \frac{R_2}{R_1}\right) \times 1.23V(\text{typ})$$

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

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Timing Chart



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