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DATA SHEET

An ON Semiconductor Company

Monolithic Linear IC

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 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 : 114.3×76.1×1.6mm³, 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

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

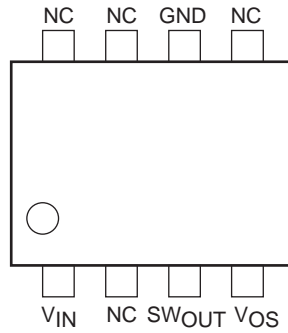* Design target value : No measurement made.

Package Dimensions

unit : mm (typ)
3032D

SANYO : MFP8(225mil)

Pd max – Ta

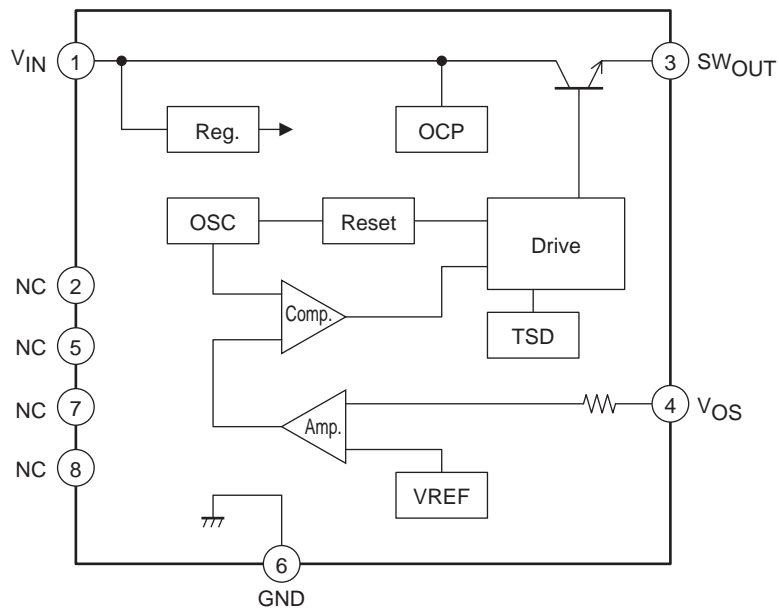## Pin Assignment

NC   NC   GND   NC
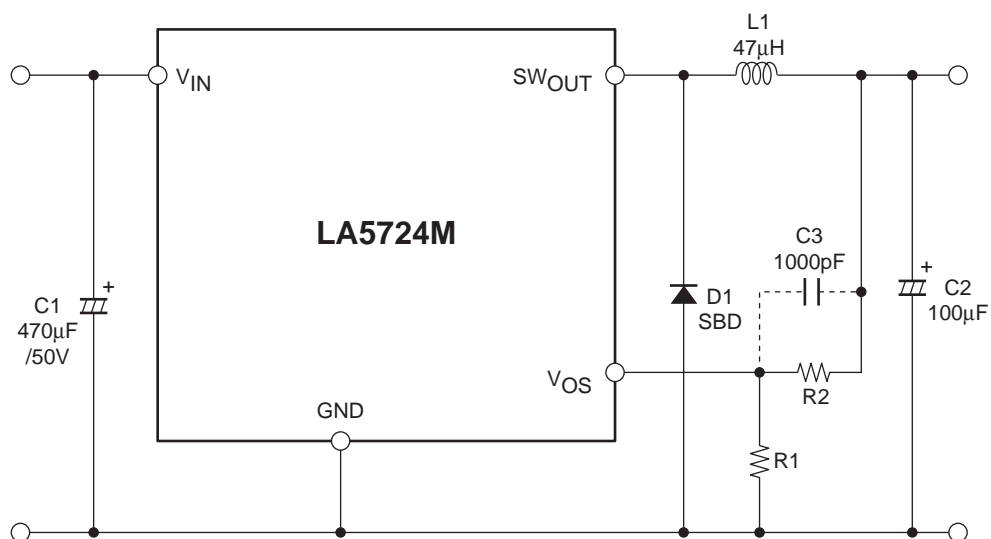
V_{IN} NC SW_{OUT} V_{OS}
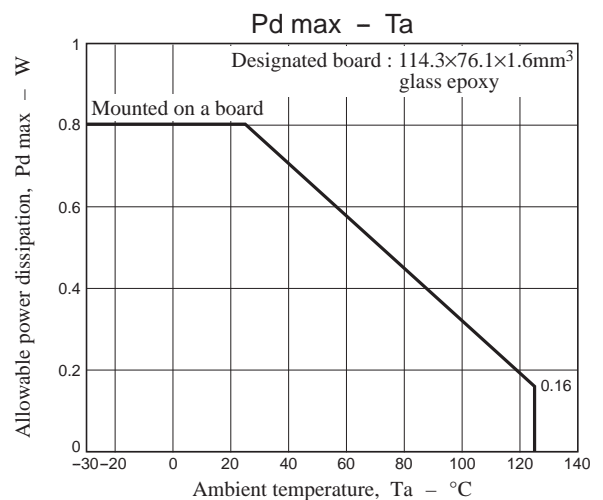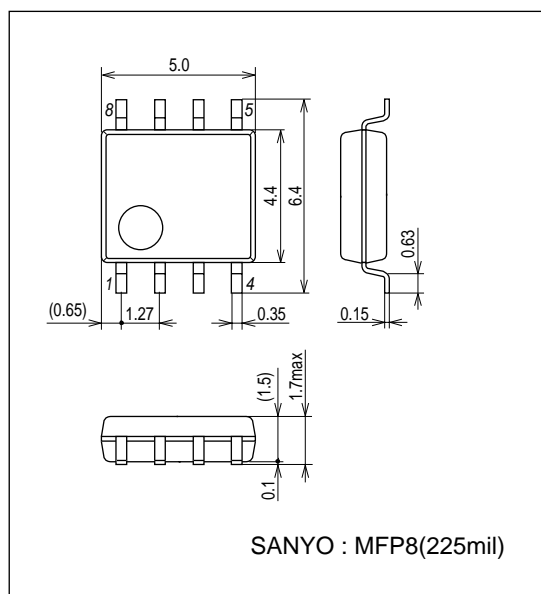
Block Diagram

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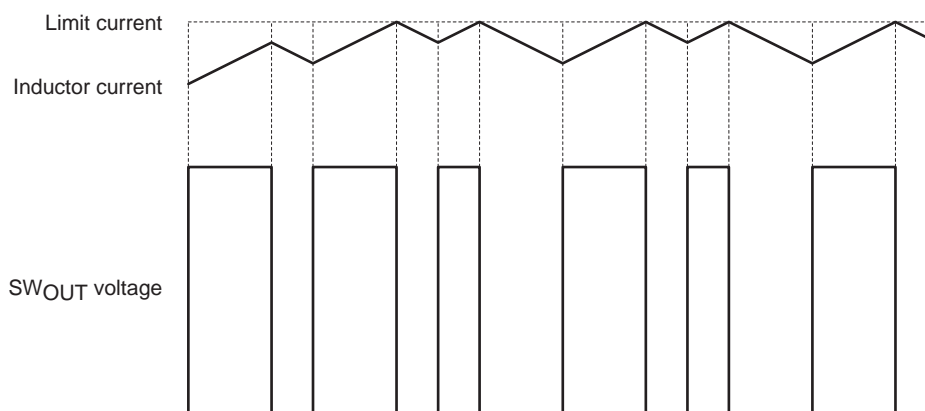
Application Circuit Example

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.

Limit current

Inductor current

SW$_{OUT}$ voltage

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

V_IN voltage

SW_OUT voltage

30kHz

160kHz

1.23V
0.8V
V_OS voltage   0V