



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## LA5756 — Monolithic Linear IC Separately-excited Step-down Switching Regulator (Variable Type)

### Overview

The LA5756 is a separately-excited step-down switching regulator (variable type).

### Features

- Output smoothing condenser can use a Low ESR condenser for the reliability improvement
- High efficiency
- Four external parts
- Time-base generator (80kHz) incorporated
- Current limiter incorporated
- Thermal shutdown circuit incorporated
- Soft start circuit incorporated

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{IN\ max}$		34	V
Output current	$I_O\ max$		3.5	A
SW pin application reverse	$V_{SW}$		-1	V
Allowable power dissipation	$P_d\ max1$	Infinite heat sink.	7.5	W
	$P_d\ max2$	No heat sink.	1.75	W
Operating temperature	$T_{opr}$		-30 to +125	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		4.5 to 32	V

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# LA5756

## Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_O = 3.3\text{V}$

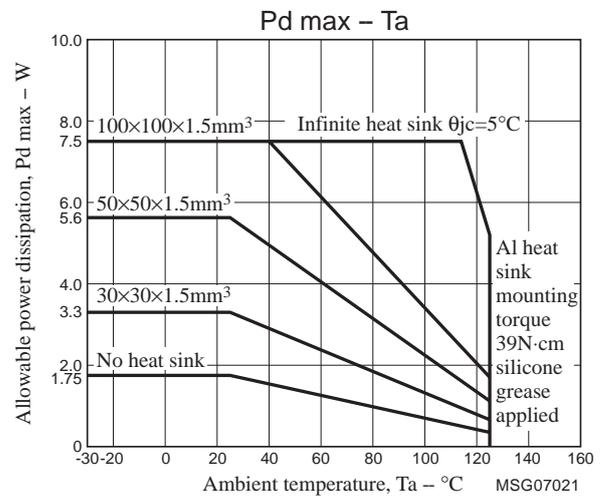
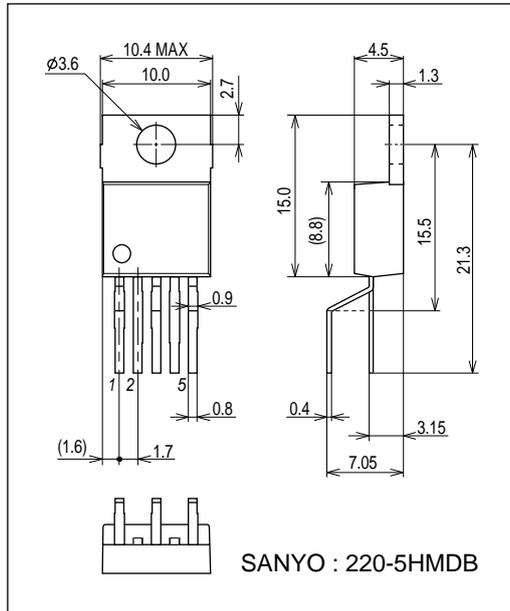
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Reference voltage	$V_{OS}$		1.235	1.26	1.285	V
Efficiency	$\eta$			78		%
Switching frequency	$f$	$V_{IN} = 15\text{V}$ , $I_O = 1.0\text{A}$	60	80	100	kHz
Line regulation	$\Delta V_{O\text{LINE}}$	$V_{IN} = 8 \text{ to } 20\text{V}$ , $I_O = 1.0\text{A}$		40	100	mV
Load regulation	$\Delta V_{O\text{LOAD}}$	$V_{IN} = 15\text{V}$ , $I_O = 0.5 \text{ to } 1.5\text{A}$		10	30	mV
Output voltage temperature coefficient	$\Delta V_O/\Delta T_a$	Designed target value*		$\pm 0.5$		mV/ $^\circ\text{C}$
Ripple attenuation factor	RREJ	$f = 100 \text{ to } 120\text{Hz}$		45		dB
Current limiter operating voltage	$I_S$	$V_{IN} = 15\text{V}$	4.2			A
Thermal shutdown operating temperature	TSD	Designed target value*		165		$^\circ\text{C}$
Thermal shutdown hysteresis width	$\Delta TSD$	Designed target value*		15		$^\circ\text{C}$

\* Designed target value: No measurement made.

## Package Dimensions

unit : mm (typ)

3376

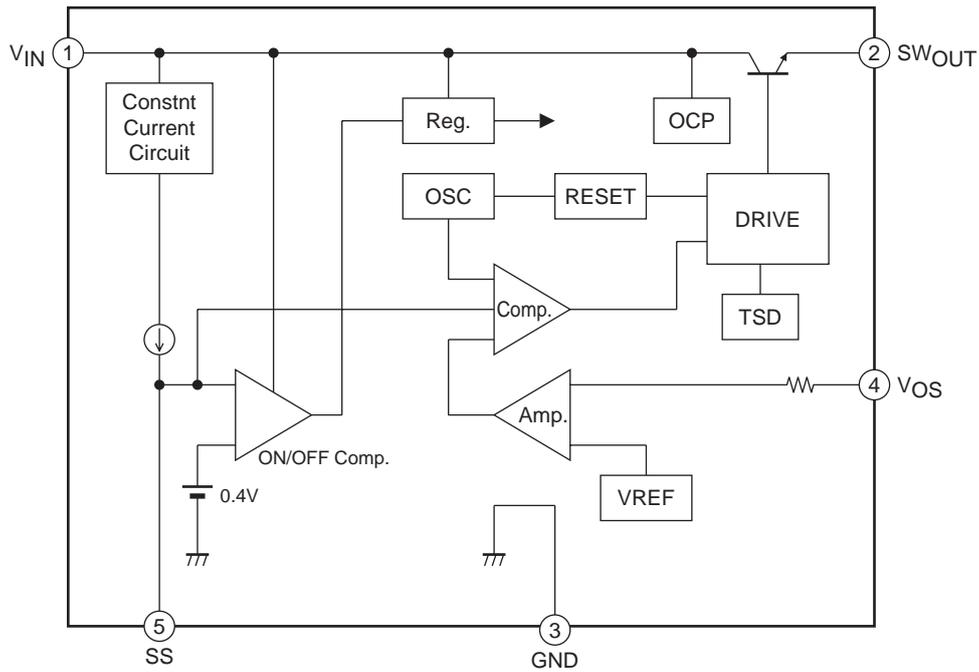


## Pin Assignment

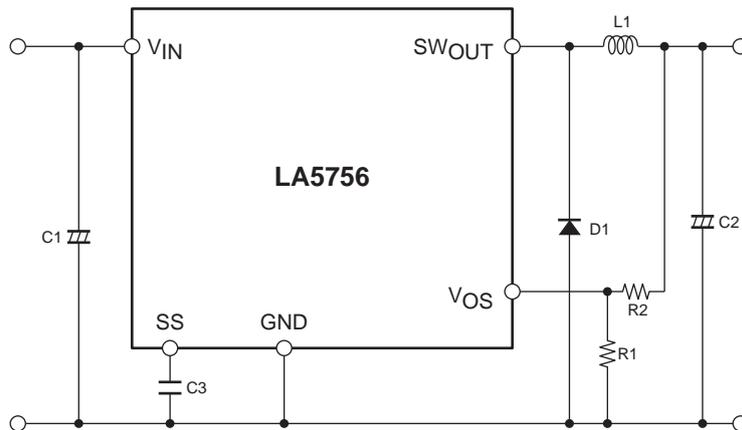
(1) $V_{IN}$  (2) $SW_{OUT}$  (3) $GND$  (4) $V_{OS}$  (5) $SS$

# LA5756

## Block Diagram



## Application Circuit Example



Notes:  $C3$  is for the soft start function. Delete  $C3$  and keep the  $SS$  pin open when the soft function is not necessary.

## 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 1.26V (typ).

The equation to set the output voltage is as follows:

$$V_O = \left(1 + \frac{R2}{R1}\right) \times 1.26V(\text{typ})$$

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

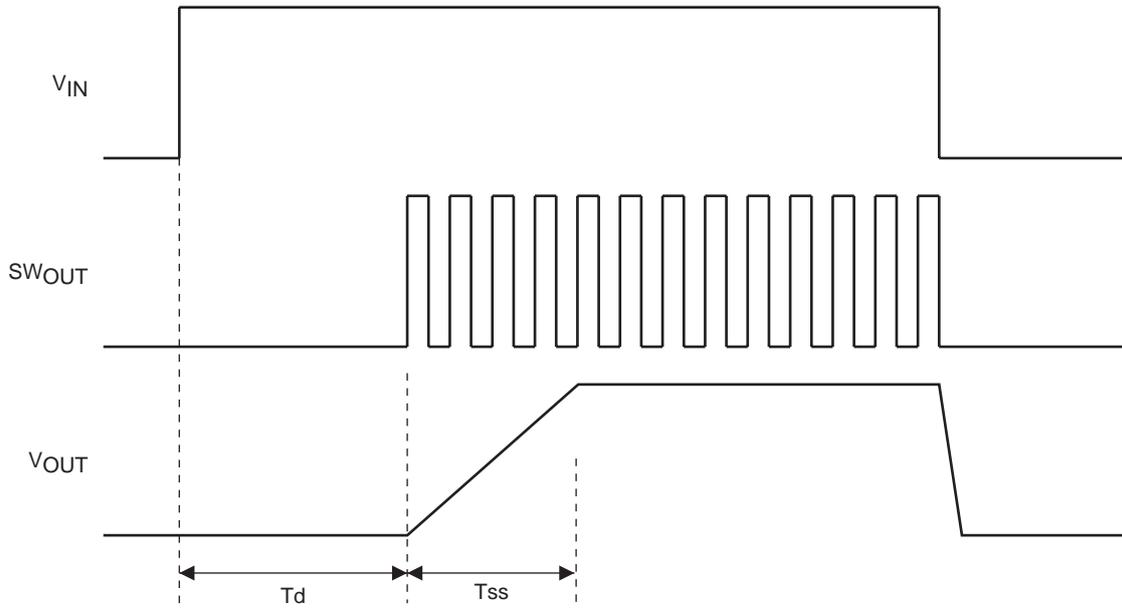
2. Start delay function

The SS pin has the internally-connected 10μA (typ) constant-current supply. When the voltage of SS pin exceeds the threshold voltage, the regulator starts operation. As the threshold is 0.62V(typ), the start delay time can be calculated as follows:

ex. For setting at 1μF

$$T_d = \frac{C \times V}{i} = \frac{1\mu \times 0.4}{10\mu} = 40 \text{ msec}$$

Timing Chart



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