



SANYO Semiconductors

DATA SHEET

LA5771 — Monolithic Linear IC

Separately-excited Step-down Switching Regulator (3.3V)

Overview

The LA5771 is a separately-excited step-down switching regulator (3.3V).

Features

- High efficiency
- Four external parts
- Time-base generator (160kHz) incorporated
- Current limiter incorporated
- Thermal shutdown circuit incorporated
- Soft start circuit incorporated

Specifications

Absolute 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	A
SW pin application reverse voltage	V_{sw}		-1	V
Allowable power dissipation	P_d max1	No heat sink	1.75	W
	P_d max2	Infinite heat sink	7.5	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}		5.5 to 32	V

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Electrical Characteristics at $T_a = 25^\circ\text{C}$

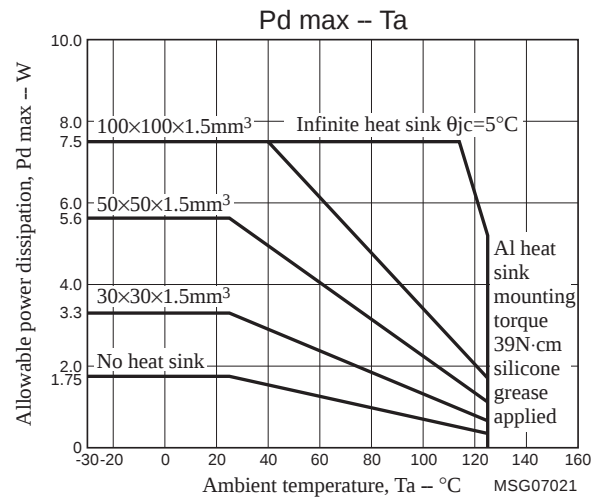
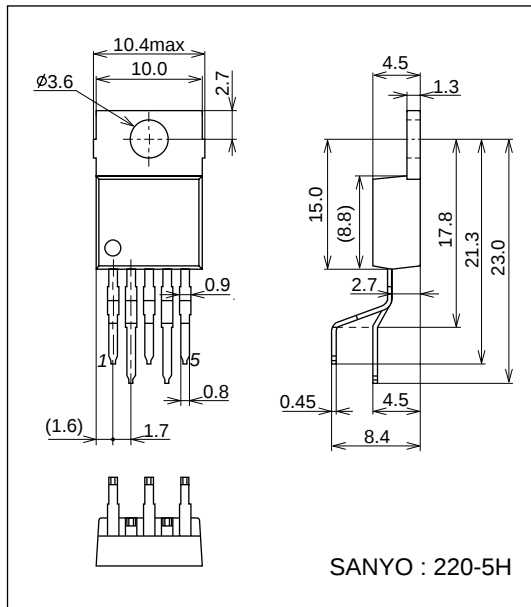
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_O	$V_{IN}=15\text{V}$, $I_O=1.0\text{A}$	3.17	3.30	3.43	V
Efficiency	η	$V_{IN}=15\text{V}$, $I_O=1.0\text{A}$		79		%
Switching frequency	f	$V_{IN}=15\text{V}$, $I_O=1.0\text{A}$	120	160	200	kHz
Line regulation	ΔV_{OLINE}	$V_{IN}=8$ to 20V , $I_O=1.0\text{A}$		25	80	mV
Load regulation	ΔV_{OLOAD}	$V_{IN}=15\text{V}$, $I_O=0.5$ to 1.5A		10	30	mV
Output voltage temperature coefficient	$\Delta V_O/\Delta T_a$			± 0.5		mV/ $^\circ\text{C}$
Ripple attenuation factor	RREJ	$F=100$ to 120Hz		45		dB
Current limiter operating voltage	IS	$V_{IN}=15\text{V}$	3.1			A
Thermal shutdown operating temperature	TSD	Designed target value*		165		$^\circ\text{C}$
Thermal shutdown hysteresis width	ΔTSD	Designed target value*		15		$^\circ\text{C}$

* Designed target value: No measurement made.

Package Dimensions

unit : mm (typ)

3079C



Pin Assignment

(1)VIN (2)SWOUT (3)GND (4)VOS (5)SS



Description of Functional Settings

1. Start delay function

The SS pin has the internally-connected 22μA (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

$$T_d = \frac{C \times V}{i} = \frac{1\mu \times 0.62}{22\mu} = 28.2 \text{ msec}$$

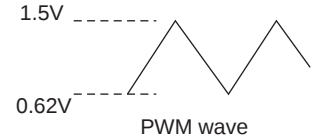
2. Soft start function

The internal PWM waveform has the voltage value as shown in the right.

If down-conversion from the voltage of $V_{IN}=15V$ to 3.3V output to be made, for example, the PWM-ON duty has the value as shown below.

$$PWMduty = \frac{V_{OUT} + V_F}{V_{IN} - V_{sat} + V_F} = 25\%$$

(Note that calculation is made with $V_{sat}=1V$ and $V_F=0.2V$)



The output voltage of error amplifier, which is 3.3V, is the value with PWM=25%, as calculated in the above equation, so that this voltage is determined as follows:

$$V_{er} = (\Delta VPWM) \times PWMduty + VPWML = 0.88V \times 0.25 + 0.62V = 0.84V$$

($\Delta VPWM$ is the PWM amplitude value or 0.88V(typ) while $VPWML$ is the lower limit voltage of PWM waveform or 0.62V(typ))

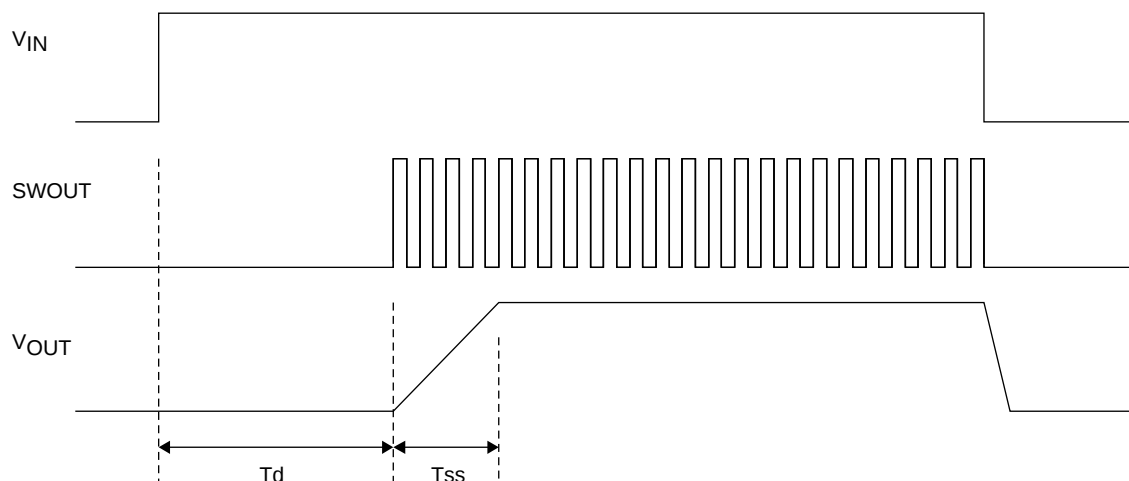
SS pin and error amplifier output voltages are designed to prefer the lower voltages, so that V_{OUT} will reach the designed regulation voltage in timing when the SS pin voltage exceeds the error amplifier output. Therefore, the soft start time is calculated as follows:

$$T_{ss} = \frac{C \times \Delta VPWM \times PWMduty}{i} = \frac{C \times 0.88 \times PWMduty}{22\mu A}$$

For the set conditions of $C=1\mu F$ and $PWMduty=25\%$:

$$T_{ss} = \frac{1\mu \times 0.88V \times 0.25}{22\mu A} = 10msec$$

Timing Chart



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