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# LA5779MP

Monolithic Linear IC

## Separately-excited Step-down Switching Regulator (Variable Type)

### Overview

The LA5779MP is a Separately-excited step-down switching regulator (variable type).

### Functions

- High efficiency.
- Six external parts.
- Time-base generator (160kHz) incorporated.
- Current limiter incorporated.
- Thermal shutdown circuit incorporated.
- ON/OFF function.

### Specifications

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

| Parameter                          | Symbol        | Conditions               | Ratings     | Unit             |
|------------------------------------|---------------|--------------------------|-------------|------------------|
| Maximum Input voltage              | $V_{IN\ max}$ |                          | 30          | V                |
| Maximum Output current             | $I_O\ max$    |                          | 3           | A                |
| SW pin application reverse voltage | $V_{SW}$      |                          | -1          | V                |
| Allowable power dissipation        | $P_d\ max$    | Mounted on a substrate.* | 3.9         | W                |
| Operating temperature              | $T_{opr}$     |                          | -30 to +125 | $^\circ\text{C}$ |
| Storage temperature                | $T_{stg}$     |                          | -40 to +150 | $^\circ\text{C}$ |

\* Specified substrate :  $76.1 \times 114.3 \times 1.6\text{mm}^3$  : Copper foil ratio 60% FR4

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

#### 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    |

# LA5779MP

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

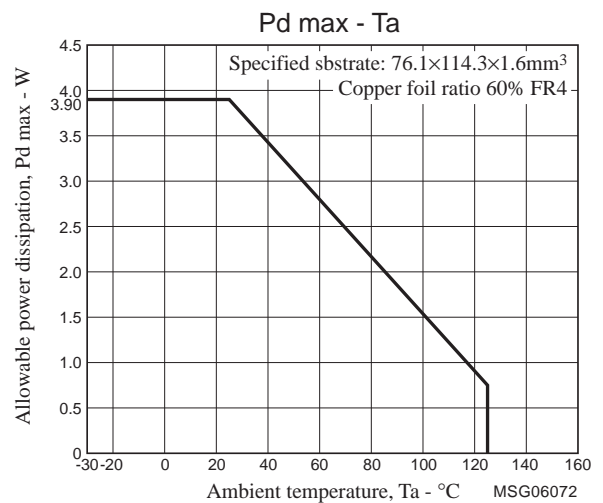
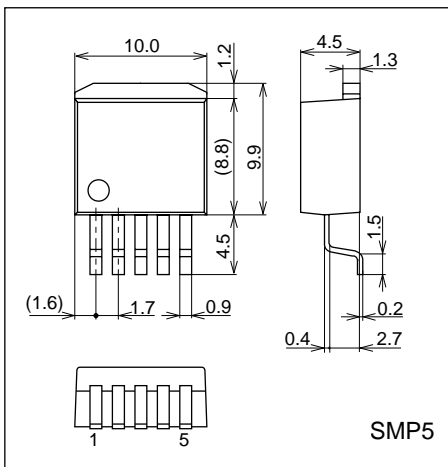
| Parameter   | Symbol                    | Conditions  | Ratings |           |          | Unit                 |
|---|---------------------------|---|---------|-----------|----------|----------------------|
|   |                           |   | min     | typ       | max      |                      |
| Reference voltage   | $V_{OS}$                  | $V_{IN} = 15\text{V}$ , $I_O = 1.0\text{A}$                         | 1.20    | 1.23      | 1.26     | V                    |
| Efficiency  | $\eta$                    | $V_{IN} = 15\text{V}$ , $I_O = 1.0\text{A}$ , Set $V_O = 5\text{V}$ |         | 84        |          | %                    |
| Switching frequency   | f                         | $V_{IN} = 15\text{V}$ , $I_O = 1.0\text{A}$                         | 128     | 160       | 192      | kHz                  |
| Switching frequency when short-circuit protection is active | fshort                    | $V_{IN} = 15\text{V}$ , $V_{OS} = 0\text{V}$                        | 15      | 30        | 45       | kHz                  |
| Line regulation   | $\Delta V_{O\text{LINE}}$ | $V_{IN} = 8$ to $20\text{V}$ , $I_O = 1.0\text{A}$                  |         | 40        | 100      | mV                   |
| Load regulation   | $\Delta V_{O\text{LOAD}}$ | $V_{IN} = 15\text{V}$ , $I_O = 0.5$ 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 to 120Hz  |         | 45        |          | dB                   |
| Output leak current   | $I_{O\text{leak}}$        | $V_{IN} = 15\text{V}$ , $SW_{OUT} = -0.4\text{V}$                   |         |           | 50       | $\mu\text{A}$        |
| Current limiter operating voltage                           | $I_S$                     | $V_{IN} = 15\text{V}$   | 3.1     |           |          | A                    |
| Operating current   | $I_{VIN}$                 | $V_{IN} = 15\text{V}$   |         | 5.6       |          | mA                   |
| Standby current   | $I_{STBY}$                | $V_{IN} = 15\text{V}$ , $ENA = 5\text{V}$                           |         | 50        | 100      | $\mu\text{A}$        |
| ENA pin LOW voltage range                                   | $V_{ENAL}$                |   |         |           | 0.6      | V                    |
| ENA pin HIGH voltage range                                  | $V_{ENAH}$                |   | 2.4     |           | $V_{IN}$ | V                    |
| Thermal shutdown operating temperature                      | TSD                       | Designed target value. *  |         | 165       |          | $^\circ\text{C}$     |
| Thermal shutdown Hysteresis width                           | $\Delta TSD$              | Designed target value. *  |         | 15        |          | $^\circ\text{C}$     |

\* Design target value: No measurement made.

## Package Dimensions

unit : mm (typ)

3275

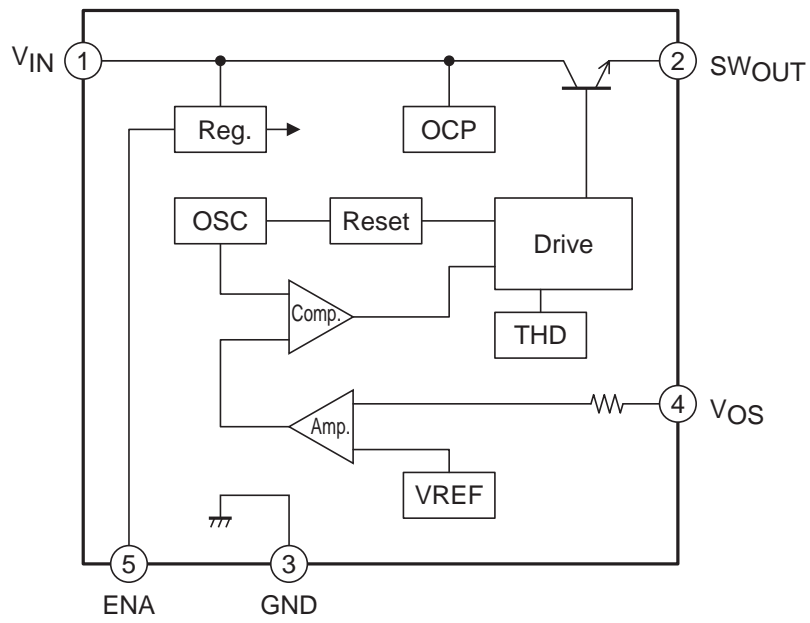


## Pin Assignment

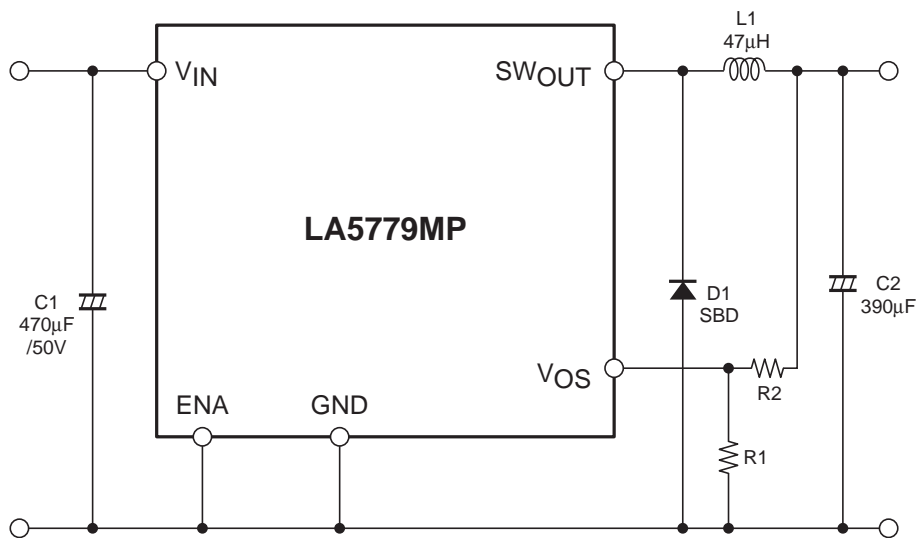
(1)  $V_{IN}$  (2)  $SW_{OUT}$  (3) GND (4)  $V_{OS}$  (5) ENA

# LA5779MP

## Block Diagram



## Application Circuit Example



## Description of Functional Settings

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 1 $\mu$ A (typ). Therefore, the error becomes larger when R1 and R2 resistance values are large.

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