

Power Supply IC for LCD Panels

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1. Introduction

With the widespread popularization of multimedia, electronic devices are increasing being required to be smaller, lighter, thinner and to have lower power consumption. Liquid crystal displays (LCDs), having these merits, account for the majority of display devices.

Three voltages are required in general for driving LCD panels. Among these voltages, the input voltage to the LCD panels, the voltage configuration required for driving them and the power supply sequence are various and depend upon the particular supplier and kind of panel.

Furthermore, to reduce the size of the power supply circuits, it is especially necessary to reduce the size of transformers and coils, which requires operating the power supply circuit at higher frequency.

Fuji Electric has successfully developed power supply ICs (integrated circuits) for LCD panels in the past, and has newly developed the FA3686V and FA3687V PWM (pulse width modulation) switching power supply controller ICs with 2 channels. An overview of this new series is introduced below.

2. Product Outline

Use of the newly developed FA3686V or FA3687V, both power supply ICs for LCD panels, can be selected according to the different power supply configurations and applications required for the LCD panels.

Features common to both of these devices are as follows:

- (1) TSSOP (thin shrink small out-line package) : 16-pin packages are used.
- (2) Operating voltage: 2.5 to 18 V
- (3) Oscillation frequency : 300 kHz to 1.5 MHz, can be set with externally mounted resistor only
- (4) Accuracy of reference voltage and regulated voltage for internal control blocks : $\pm 1\%$
- (5) Built-in PWM control output with 2 channels
- (6) Built-in timer and latch type short circuit protection, undervoltage lockout circuit and soft start circuit

Table 1 Common ratings of the FA3686V and FA3687V

Item	Condition	Minimum	Typical	Maximum	Unit
Power supply voltage		2.5		18	V
Reference voltage		0.99	1.00	1.01	V
Regulated voltage for internal control blocks		2.178	2.200	2.222	V
Oscillation frequency	$RT = 12\text{ k}\Omega$	435	500	565	kHz
Undervoltage lockout operating voltage		2.00	2.20	2.35	V
OUT1, 2 H-level on-state resistance	$I_{\text{out}} = 50\text{ mA}$		10	20	Ω
OUT1, 2 L-level on-state resistance	$I_{\text{out}} = -50\text{ mA}$		5	10	Ω

Note: The ratings are for the power supply voltage of 3.3 V and room temperature (25°C) unless otherwise specified

- (7) The externally mounted switching element can directly drive either a MOSFET (metal oxide semiconductor field effect transistor) or a bipolar transistor.

The main characteristics common to both the FA3686V and FA3687V are shown in Table 1.

3. Characteristics of FA3686V

The FA3686V is distinguished among power supply ICs for LCD panels as a device especially suited for use in power supplies with 3 outputs. It is designed so as to enable the easy configuration of a series regulator by adding an error amplifier in addition to a 2-channel PWM control block.

Figure 1 shows the internal circuit of the FA3686V. The features of the FA3686V are described below.

3.1 PWM control blocks

The non-inverted input to the error amplifier for each of channel 1 and channel 2 is connected to the reference voltage (1.00 V $\pm 1\%$) internally. The output of channel 1 can configure a boost converter at the n-



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