Ordering number:EN*6107

Thick Film Hybrid IC

STK740-470

5V/5A Single Output Separate Excitation Chopper Regulator

Preliminary

Overview

The STK740-470 is a separate-excitation step-down chopper regulator hybrid IC for the secondstage circuit. This IC incorporates in the package all the necessary circuits for a chopper regulator including power switch, error amplifier, soft start, shutdown type output short protection, low-voltage malfunction prevention, on/off, and snubber circuits. Therefore, external components required are input and output capacitors and a choke coil only and this allows this IC to be used to construct a large-current (5A) chopper regulator as if a 3-pin regulator were used. DC8V to 18V input voltage can be handled and up to 5A of output current is supported.

Applications

- Local power supply for the equipment of which input rating is DC9V to 15V.

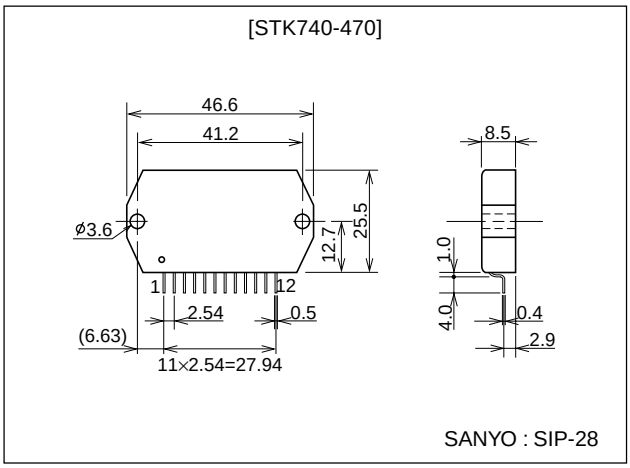
Features

- Adoption of Sanyo IMST ; Insulated Metal Substrate Technology, allows the circuit to be operated without using a heat sink (see “No Fin Output Current Derating” chart in the page 6).
- Typical efficiency of 90% at DC 12V input, 2.5A output.
- Fine adjustment of output voltage enable.
- 50 kHz operating frequency.
- Low-R_{ON} resistance power MOSFET adopted.
- Low-V_F Schottky barrier diode adopted.

Package Dimensions

unit:mm

4170-SIP28



SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Series Construction

This product is listed in a product series due to its property such as output voltage, output current, package, and other similar items. Since some prducts listed in the table below is under development, please refer to your Sanyo sales representative for details.

Type number	Input voltage	Output voltage	Output current	Package dimensions (output pins not included)
* STK740-411	4 to 8V	2.5V	5A	26 × 37 × 4.5mm,12pins
* STK740-420	4 to 8V	2.5V	10A	25.5 × 46.6 × 8.5mm,12pins
STK740-441	4 to 8V	3.3V	5A	26 × 37 × 4.5mm,12pins
STK740-450			10A	25.5 × 46.6 × 8.5mm,12pins
STK740-471	8 to 18V	5.0V	5A	26 × 37 × 4.5mm,12pins
STK740-470			5A	25.5 × 46.6 × 8.5mm,12pins
STK740-480			10A	25.5 × 46.6 × 8.5mm,12pins
STK740-490			15A	25.5 × 46.6 × 8.5mm,12pins

* : Under planning

Specifications

Maximum Ratings at Ta = 25˚C, Tc = 25˚C, unless otherwise specified.

Parameter	Symbol	Conditions	Ratings	Unit
Operating IC substrate temperature	Tc max		+105	˚C
Operating temperature	Topr		–10 to +85	˚C
Storage temperature	Tstg		–30 to +115	˚C
DC input voltage	V_{IN} max	Pins 6, 11, and 12	20	V

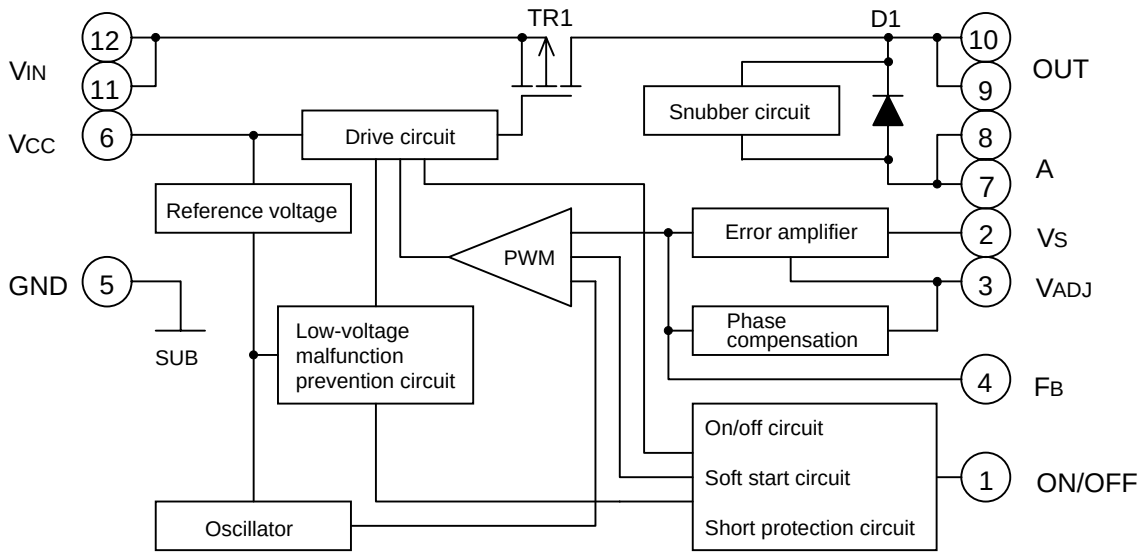
Recommended Operating Conditions at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Operating IC substrate temperature	Tc		0 to +85	˚C
DC input voltage	V_{IN}	In the recommended circuit	8 to 16	V
Load current	Io	In the recommended circuit	1 to 5	A

Electrical Characteristics at Tc = 25˚C, in the specified circuit, V_{IN} = 12V, I_O = 1A, unless othrwise specified

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	Vo		4.9	5.0	5.1	V
Line regulation	ΔVL	V_{IN}=8V to 16V	–	100	–	mV
Load regulation	ΔVO	Io=1A to 5A	–	100	–	mV
Efficiency	η	Io=2.5A	–	90	–	%
Operating frequency	fosc		45	50	55	kHz
Cutoff current	I_{CUT}	6pin, latch mode	–	1.6	–	mA
On/off circuit	Voff	1pin	–	0.22	0.32	V
Output voltage temperature coefficient	T_{CVO}	Tc=+25 to +85˚C	–	±1.7	–	mV/˚C

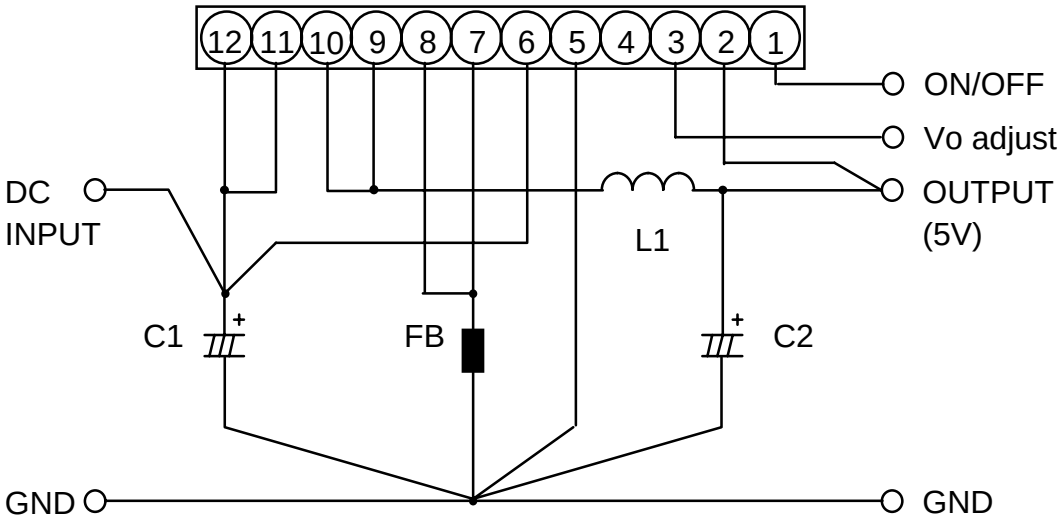
Block Diagram



Pin Descriptions

Number	Pin name	Description
1	ON/OFF	Remote on/off switching
2	V_S	Output voltage sensing
3	V_{ADJ}	Output voltage fine adjustment
4	F_B	Feedback (error amplifier output), phase compensation
5	GND	Ground
6	V_{CC}	Power supply for control block
7, 8	A	Flywheel diode anode
9, 10	OUT	Output
11, 12	V_{IN}	Input supply voltage

Test Circuit

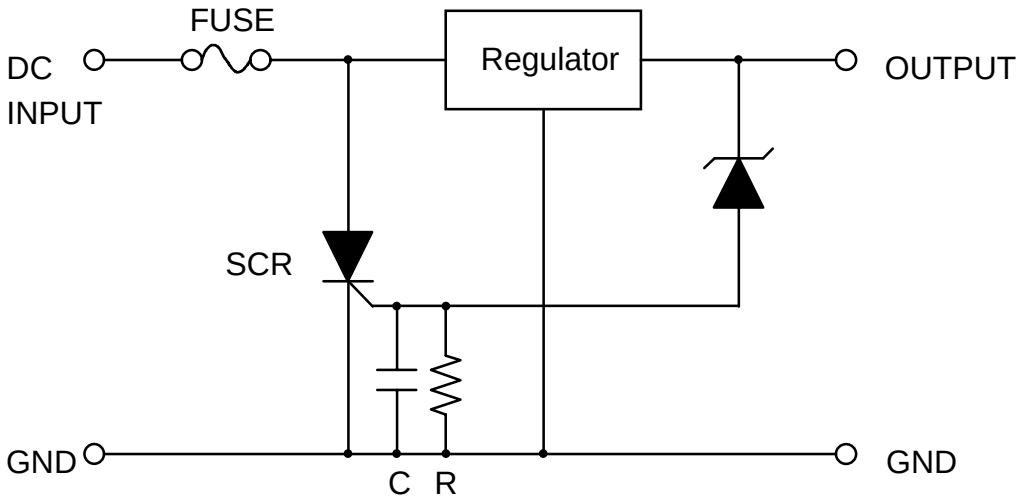


C1 : 47μF/25V (OS capacitor)
C2 : 1000μF/16V×2
L1 : 30μH
FB : Ferrite-bead core

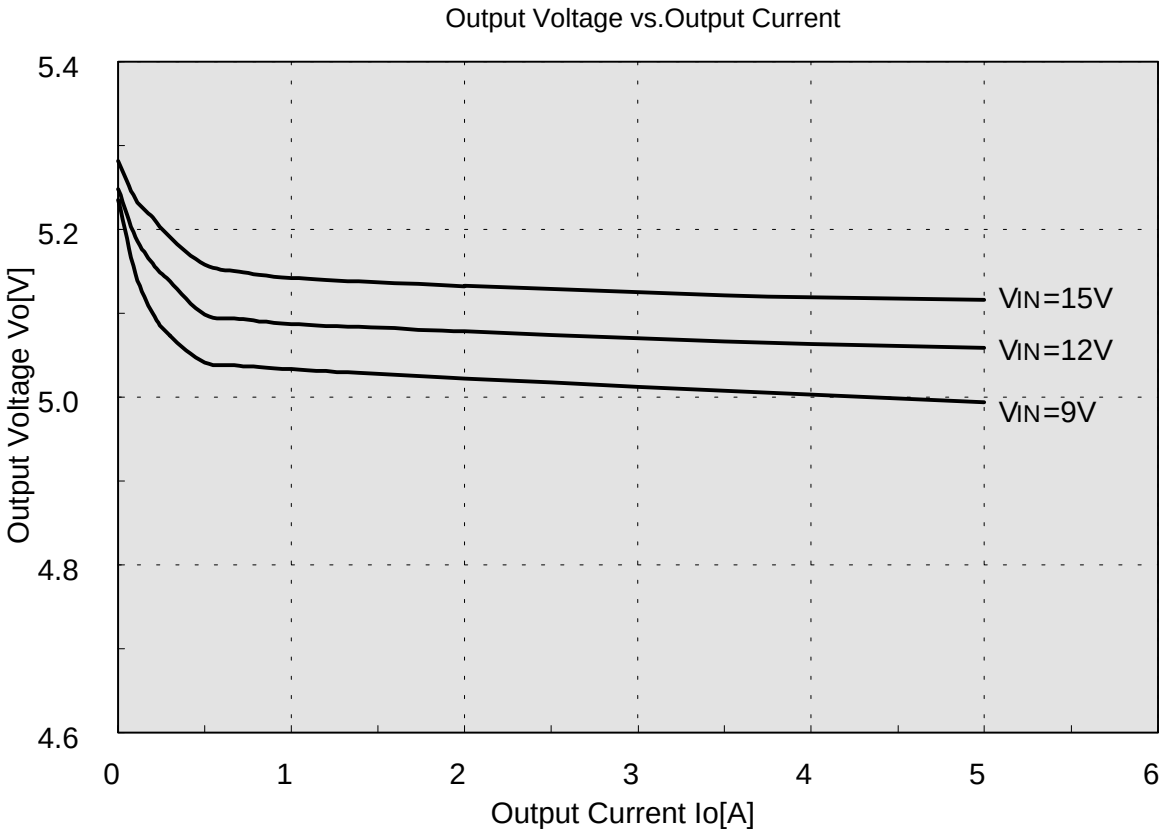
Overvoltage Protection Circuit

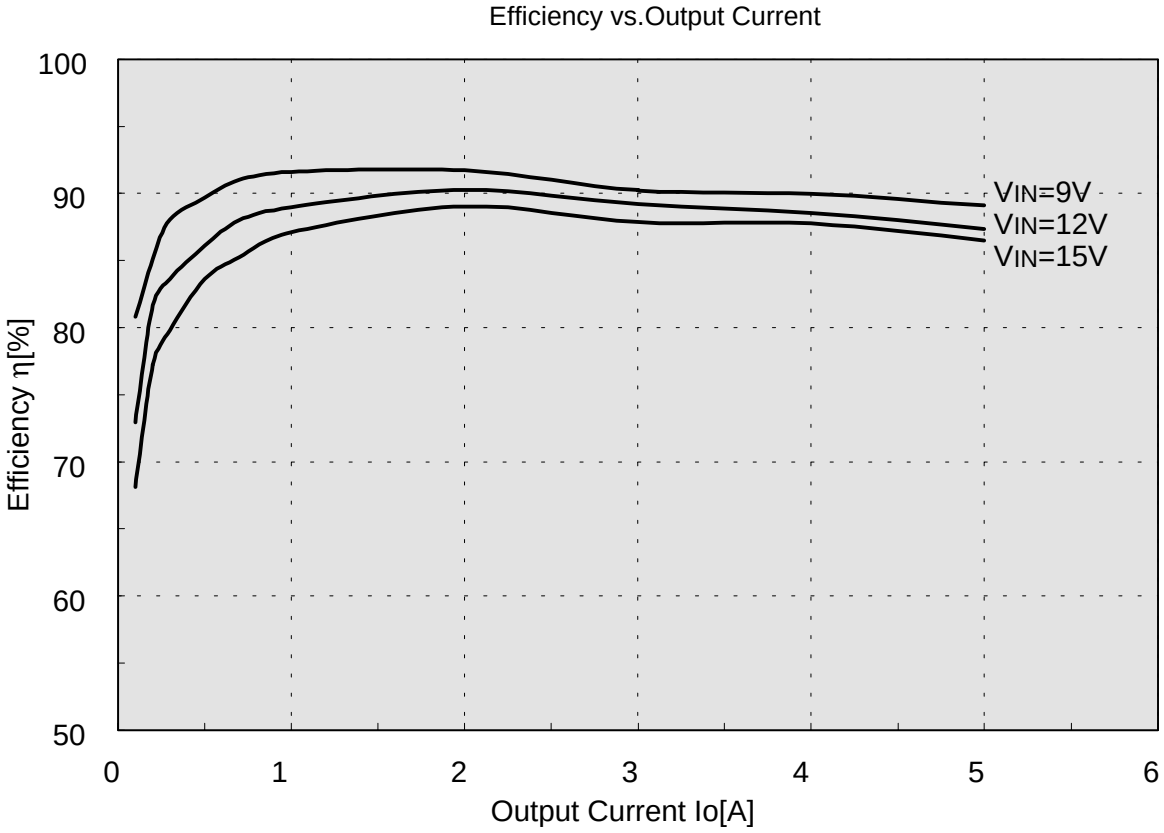
In a constant-voltage power supply circuit output voltage may generally exceed the stipulated rating (equivalent to input voltage) when the circuit is broken down or the IC and the printed circuit board is wrongly soldered. Therefore overvoltage protection circuit is recommended to use to minimize the damages caused by the overvoltage.

Sample the overvoltage protection circuit

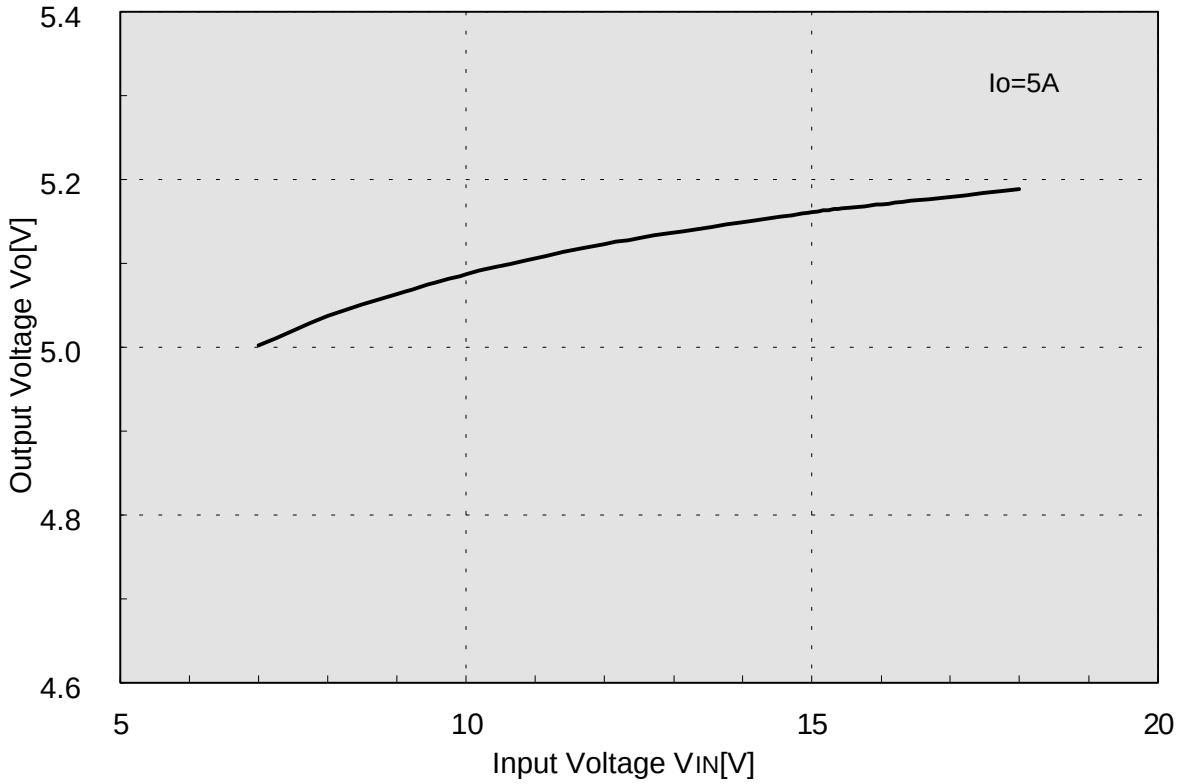


Sample Characteristics at Ta = 25˚C, in the test circuit

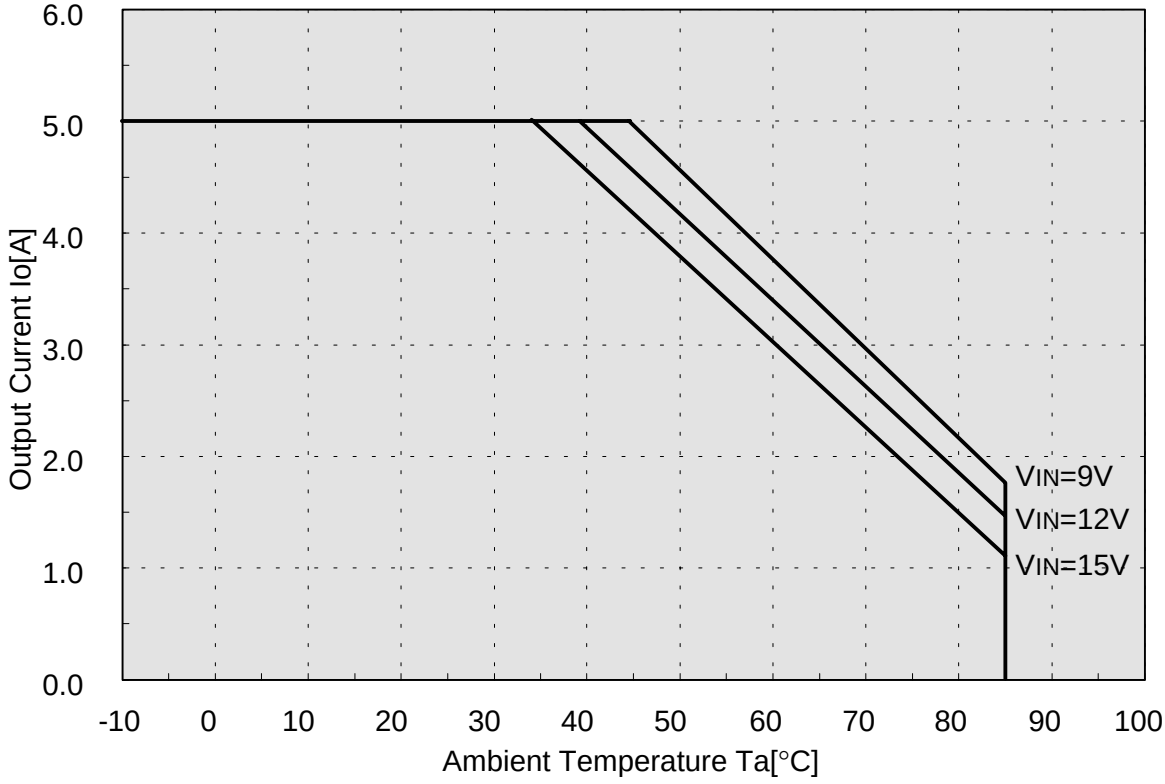




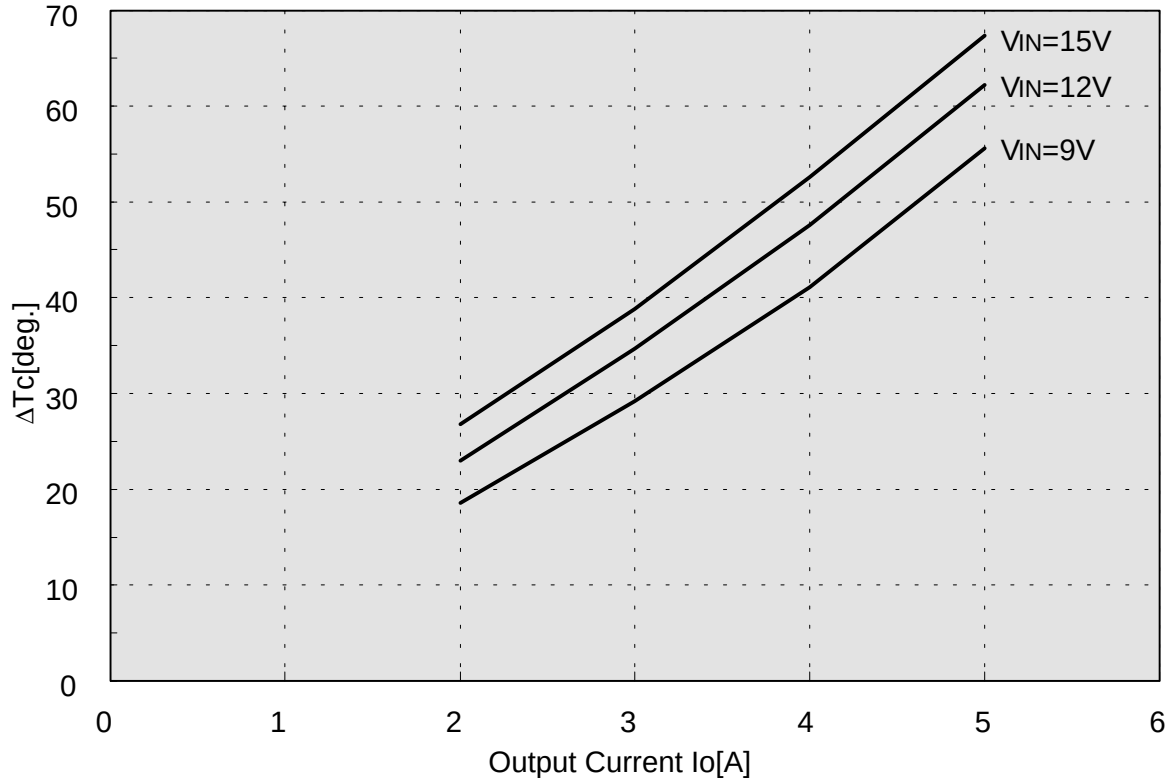
Output Voltage vs.Input Voltage



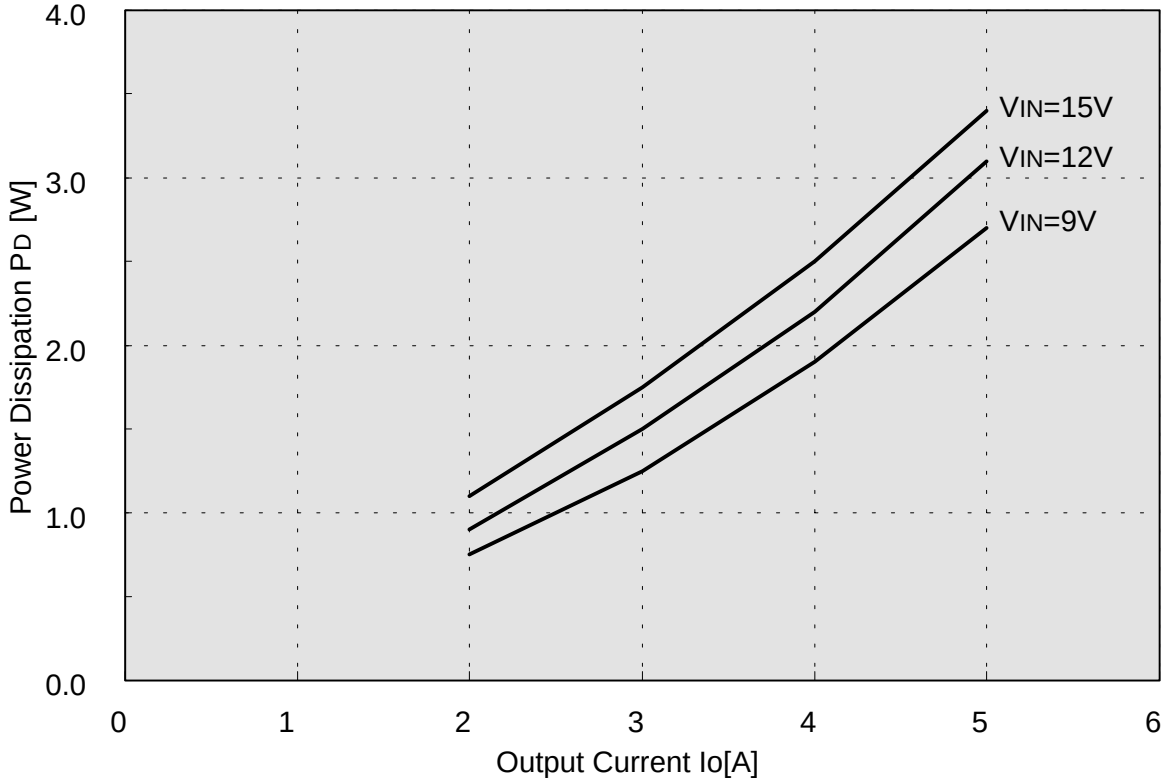
No Fin Output Current Derating



No Fin ΔTc vs.Output Current



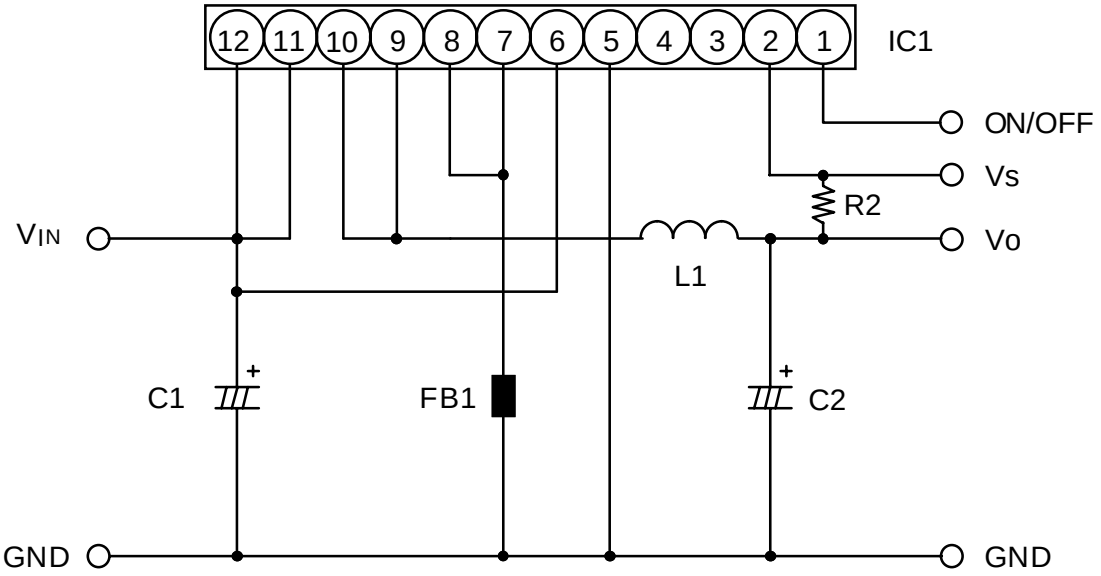
Power Dissipation vs Output Current



Eveluation Board

The evaluation board is provided to evaluate this hybrid IC

♦ Equivalent Circuit



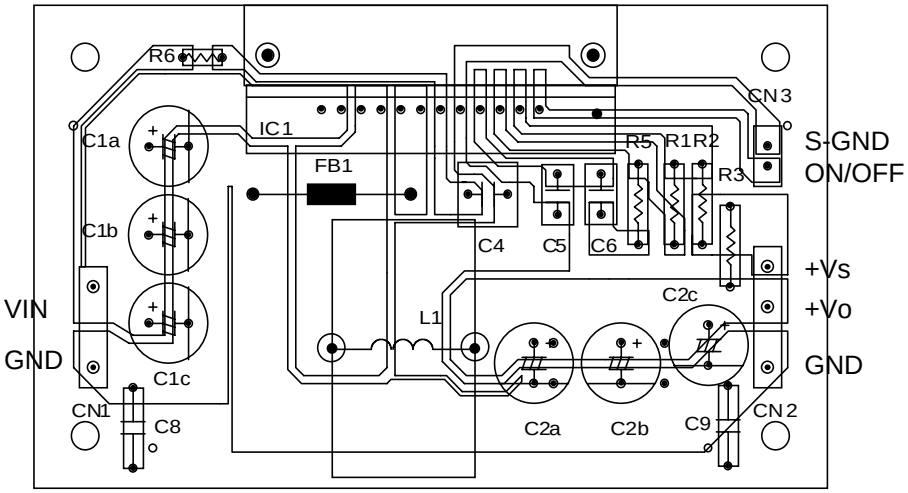
♦ Parts Table

	Part name	Requirements	Number	Manufacturer	Notes
C1	Electrolytic capacitor	47μF/25V	1	Sanyo Electronic component co., ltd.	OS capacitor
C2	Electrolytic capacitor	1000μF/16V	2	Sanyo Electronic component co., ltd.	Low impedance (CG)
R2	Resistor	100Ω	1		
R3	Jumper		1		
R6	Jumper		1	Use a fuse resistor (20 to 30Ω) when needed	
FB1	Ferrite-bead core	BL02RN1-R62	1	Murata manufacturing co., ltd.	
L1	Choke coil	HK-10S100-4500	1	Toho zinc co., ltd.	45μH, 5A

♦ Notes on pattern designing

1 Place V_{CC} pin (pin 6) and V_{IN} pins (pin 11 and 12) lines separately and use an input capacitor (+) for connection.
2 Place GND pin (pin 5) and A pin (pins 7 and 8) lines separately.
3 Connect A pin (pins 7 and 8) with the input capacitor (–) through a Ferrite-bead core.
4 Connect GND pin (pin 5) with the input capacitor (–) or the output capacitor (–). However, connect with the output capacitor (–) unless otherwise specified.
5 Shorten the length of the line between the input capacitor (–) and the output capacitor (–) as well as possible.
6 Connect V_S pin (pin 2) with the output capacitor (+).

♦ Perspective Wiring Layout (from soldered side)



♦ Circuit Pattern (soldered side)