



## STK740-441

### 3.3V/5A Single Output Separate Excitation Chopper Regulator

#### Overview

The STK740-441 is a separate-excitation step-down chopper regulator hybrid IC for the secondstage circuit and optimal as a 3.3V local power supply for use in logic circuit that includes both 5V and 3.3V systems. 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 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.

#### Applications

- 3.3V local power supply for the logic circuit where both 5V and 3.3V systems are constructed together.

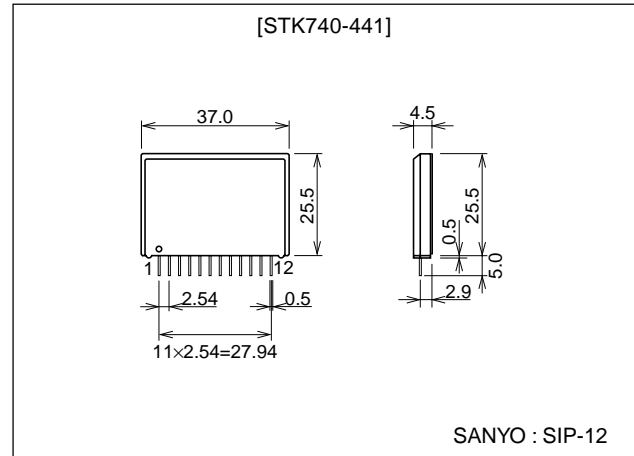
#### Features

- 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).
- Slim package reduces mounting space.
- Typical efficiency of 88% at DC 5V 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

##### 4171-SIP12



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# STK740-441

## 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 products 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  $T_a = 25^\circ\text{C}$ ,  $T_c = 25^\circ\text{C}$ , unless otherwise specified.**

Parameter	Symbol	Conditions	Ratings	Unit
Operating IC substrate temperature	$T_c \text{ max}$		+105	$^\circ\text{C}$
Operating temperature	$T_{opr}$		-10 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-30 to +115	$^\circ\text{C}$
DC input voltage	$V_{IN} \text{ max}$	Pins 6, 11, and 12	10	V

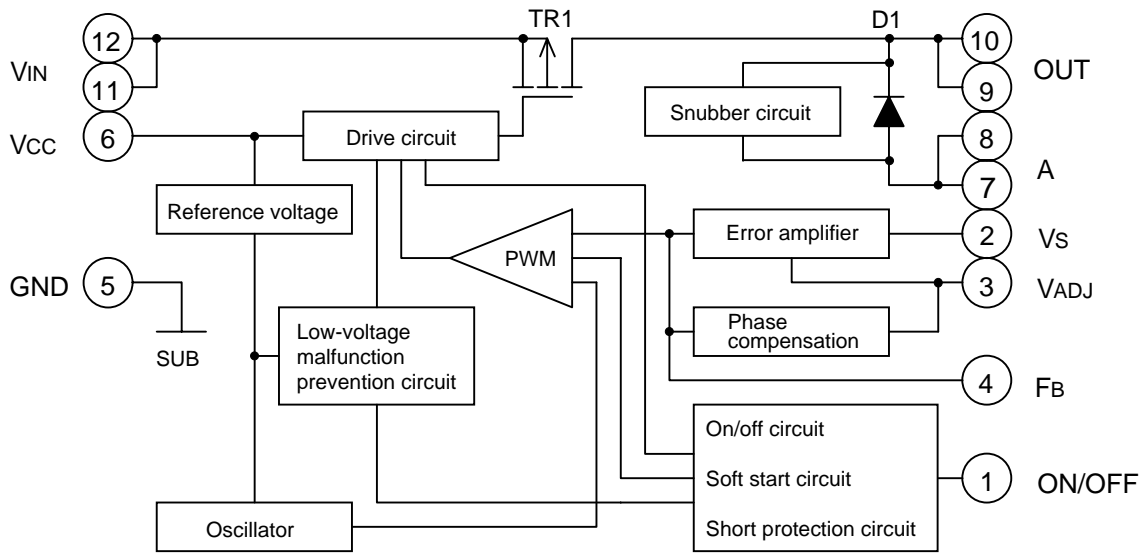
**Recommended Operating Conditions at  $T_a = 25^\circ\text{C}$**

Parameter	Symbol	Conditions	Ratings	Unit
Operating IC substrate temperature	$T_c$		0 to +85	$^\circ\text{C}$
DC input voltage	$V_{IN}$	In the recommended circuit	4.5 to 6.5	V
Load current	$I_o$	In the recommended circuit	1 to 5	A

**Electrical Characteristics at  $T_c = 25^\circ\text{C}$ , in the specified circuit,  $V_{IN} = 5\text{V}$ ,  $I_O = 1\text{A}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_o$		3.2	3.3	3.4	V
Load regulation	$\Delta V_O$	$I_o=1\text{A to }5\text{A}$			50	mV
Efficiency	$\eta$	$I_o=2.5\text{A}$		88		%
Operating frequency	$f_{osc}$		45	50	55	kHz
Cutoff current	$I_{CUT}$	6pin, latch mode		1.6		mA
On/off circuit	$V_{off}$	1pin		0.22	0.32	V
Output voltage temperature coefficient	$T_{CVO}$	$T_c=+25 \text{ to } +85^\circ\text{C}$		$\pm 1.7$		mV/ $^\circ\text{C}$

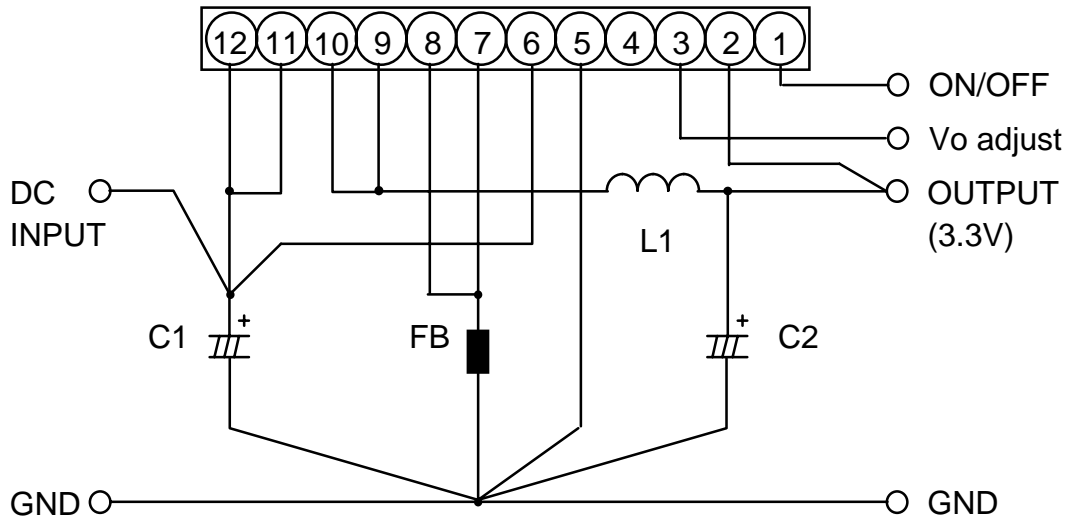
Block Diagram



Pin Descriptions

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

**Test Circuit**

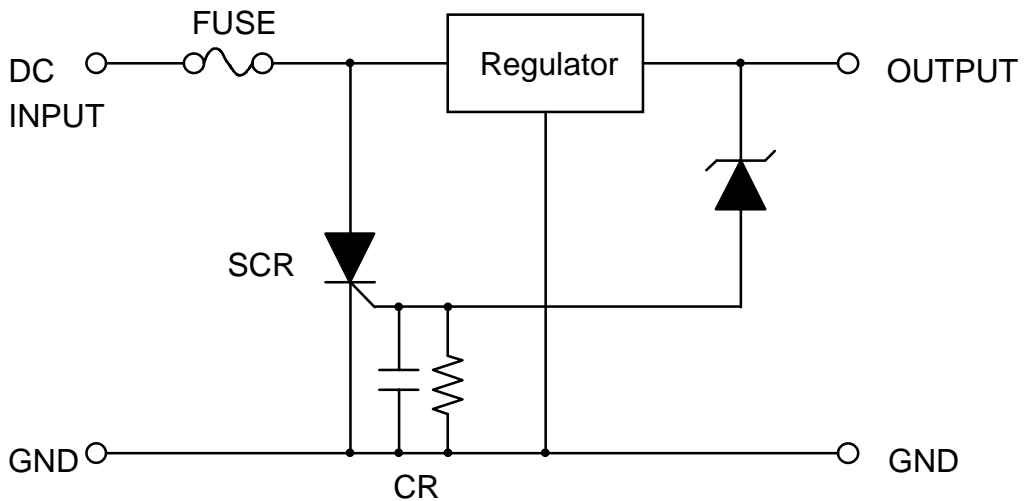


- C1 : 220 $\mu$ F/10V (OS capacitor)
- C2 : 2200 $\mu$ F/6.3V
- L1 : 30 $\mu$ H
- FB : Ferrite-bead core

**Overvoltage Protection Circuit**

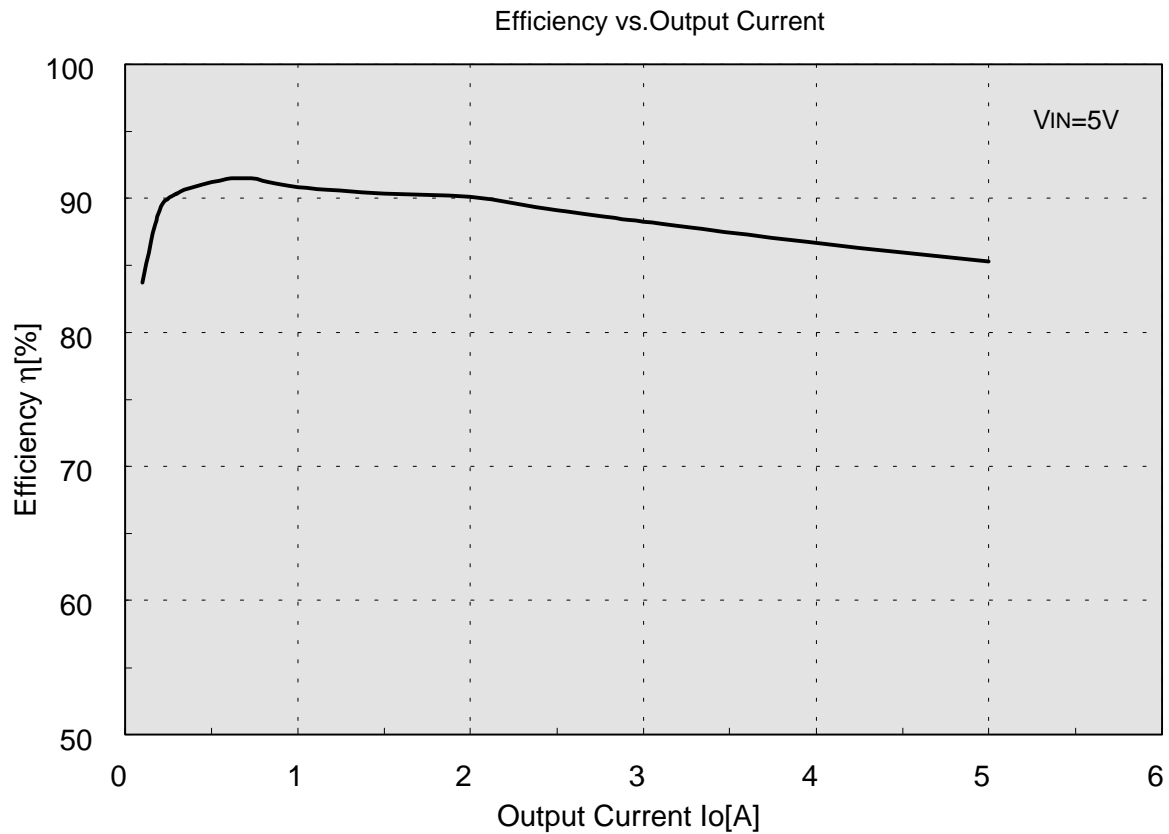
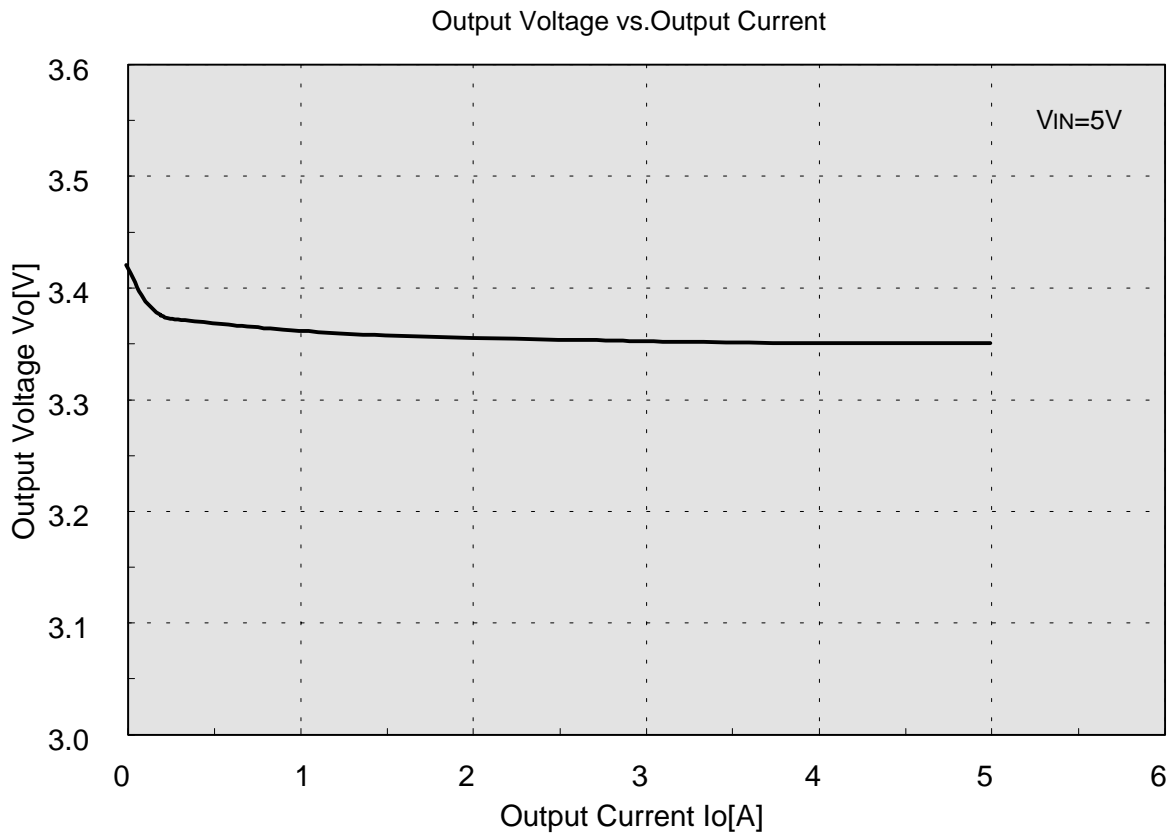
In a constant-voltage power supply circuit output voltage may generally exceed the stipulated rating (equivalent to input voltage) when the circuit is broken down or the IC and the printed circuit board is wrongly soldered. Therefore overvoltage protection circuit is recommended to use to minimize the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

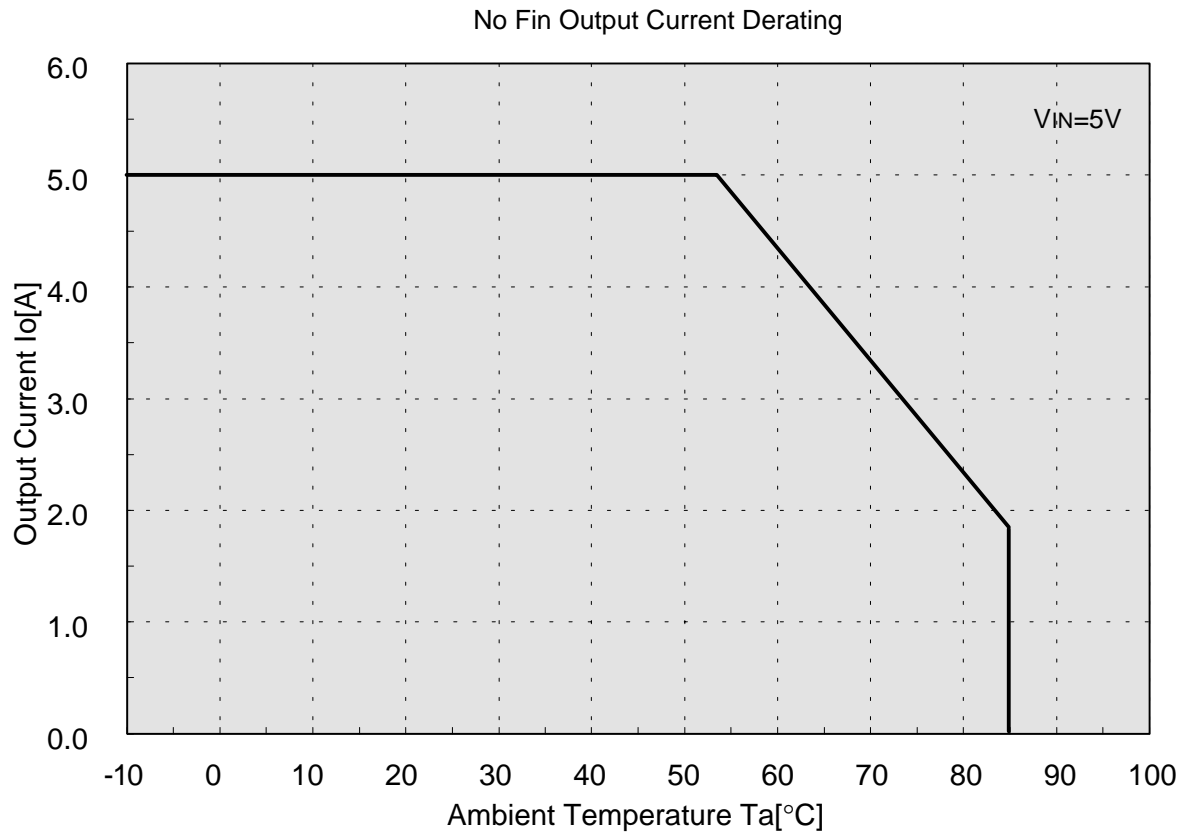
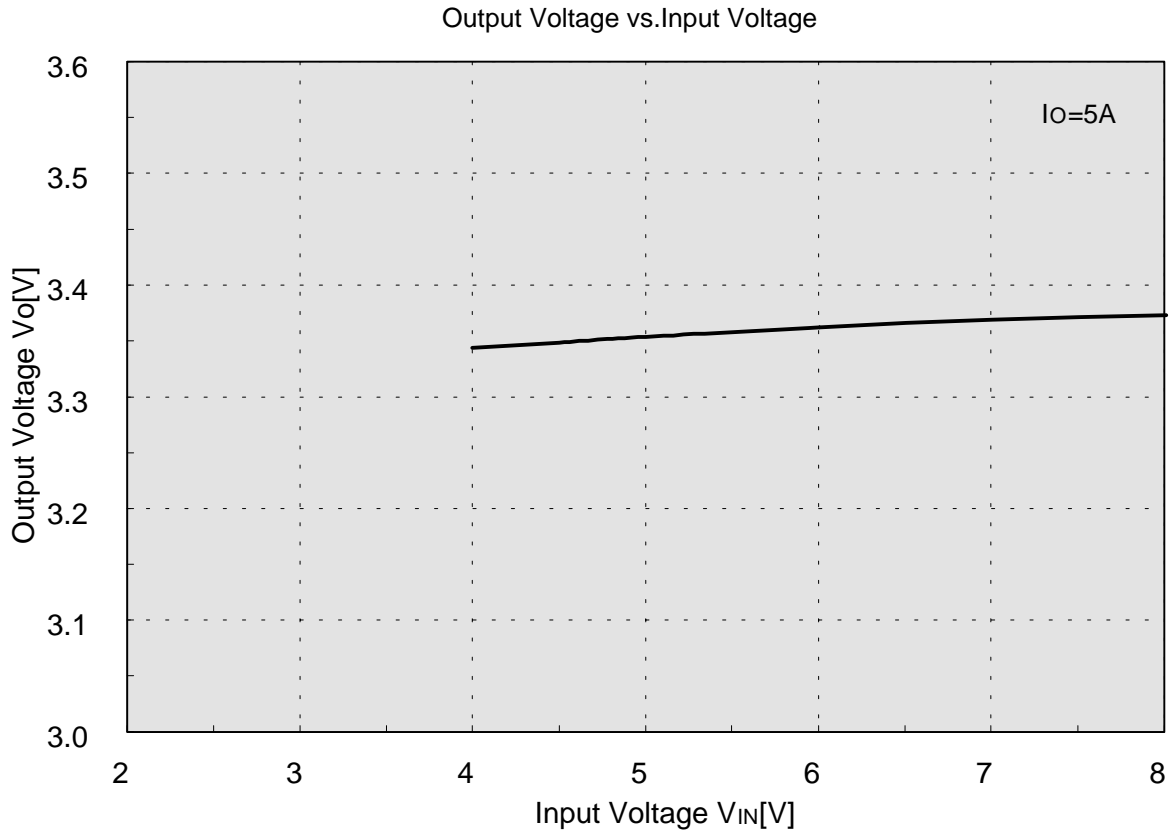
Sample the overvoltage protection circuit



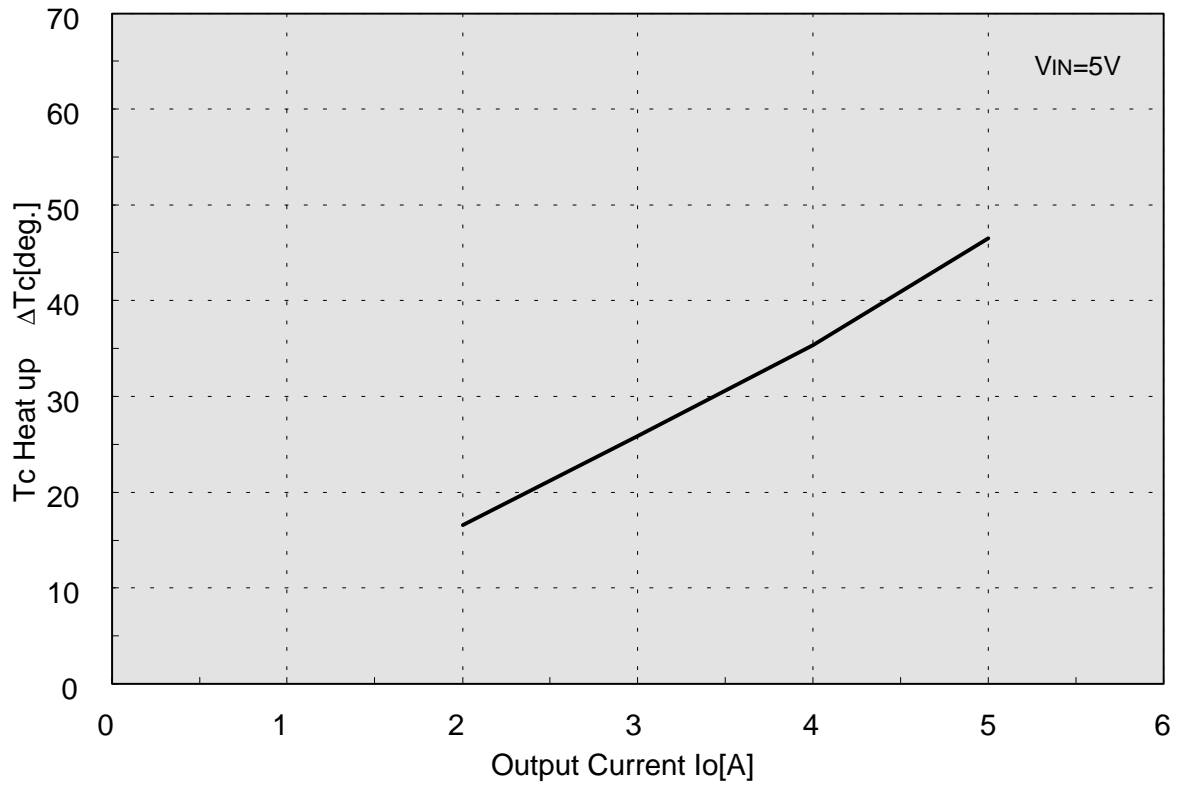
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Sample Characteristics at  $T_a = 25^\circ\text{C}$ , in the test circuit

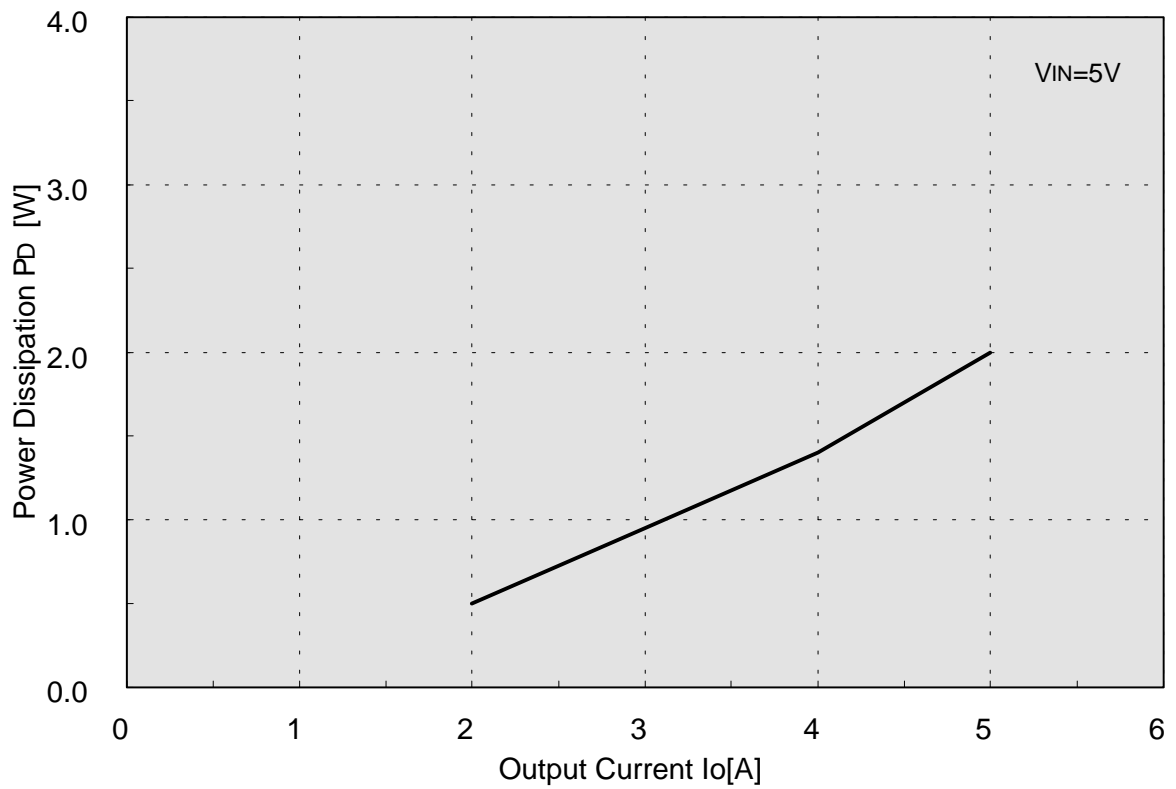




No Fin  $\Delta T_c$  vs. Output Current



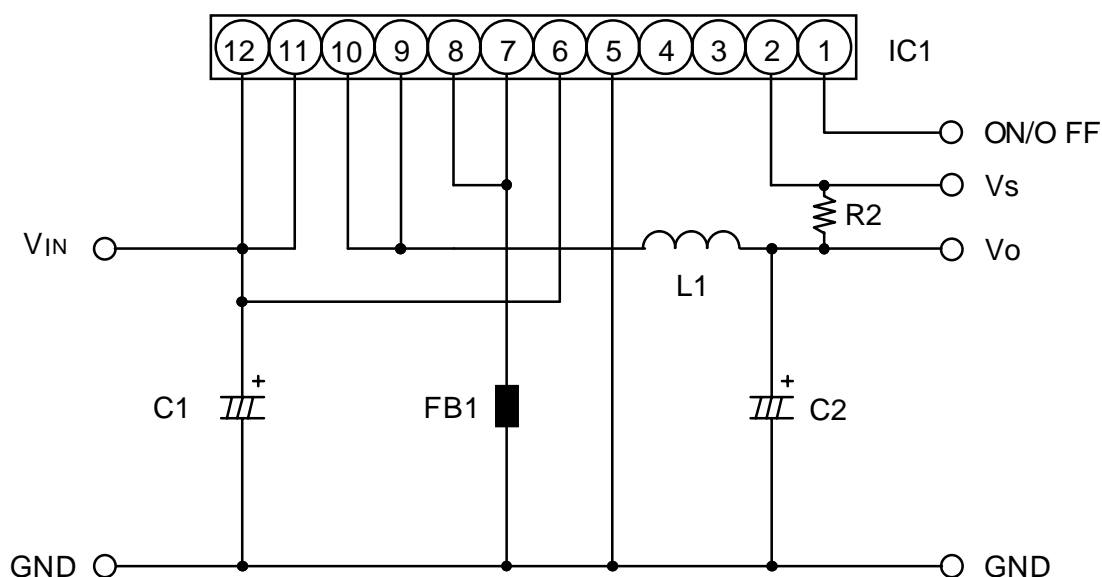
Power Dissipation vs Output Current



## Evaluation Board

The evaluation board is provided to evaluate this hybrid IC

### ◆ Equivalent Circuit



### ◆ Parts Table

	Part name	Requirements	Number	Manufacturer	Notes
C1	Electrolytic capacitor	220 $\mu$ F/10V	1	Sanyo Electronic component co., ltd.	OS capacitor
C2	Electrolytic capacitor	2200 $\mu$ F/6.3V	1	Sanyo Electronic component co., ltd.	Low impedance (CG)
R2	Resistor	100 $\Omega$	1		
R3	Jumper		1		
R6	Jumper		1	Use a fuse resistor (20 to 30 $\Omega$ ) when needed	
FB1	Ferrite-bead core	BL02RN1-R62	1	Murata manufacturing co., ltd.	
L1	Choke coil	HK-10S100-4500	1	Toho zinc co., ltd.	45 $\mu$ H, 5A

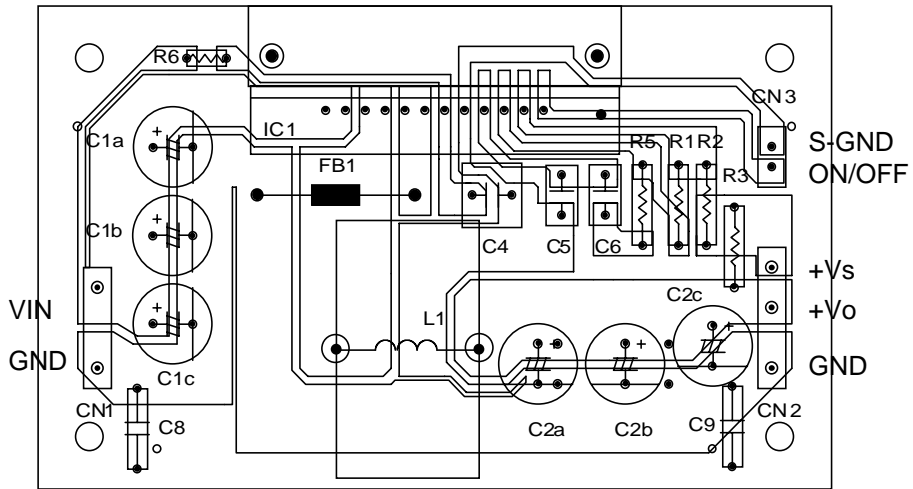
### ◆ Notes on pattern designing

- 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 (+).

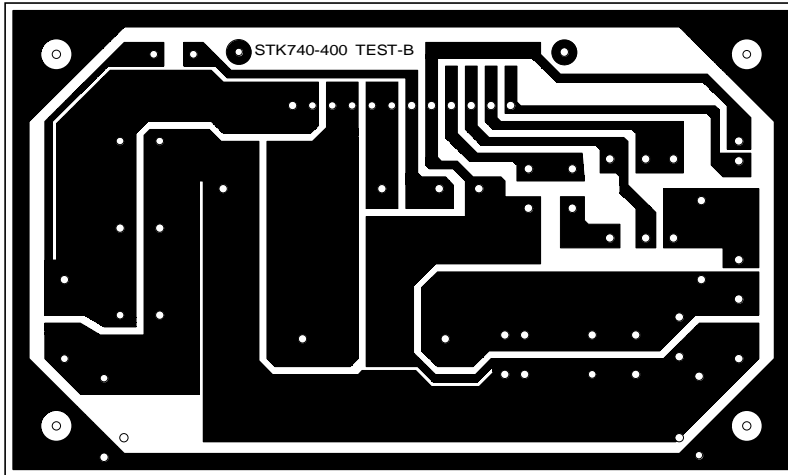


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## ◆ Perspective Wiring Layout (from soldered side)



## ◆ Circuit Pattern (soldered side)



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