



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.

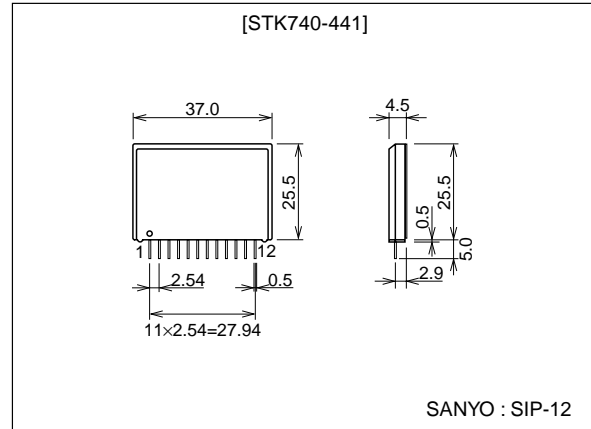
Features

- 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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63099RM (KT) No.6106-1/10

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 |

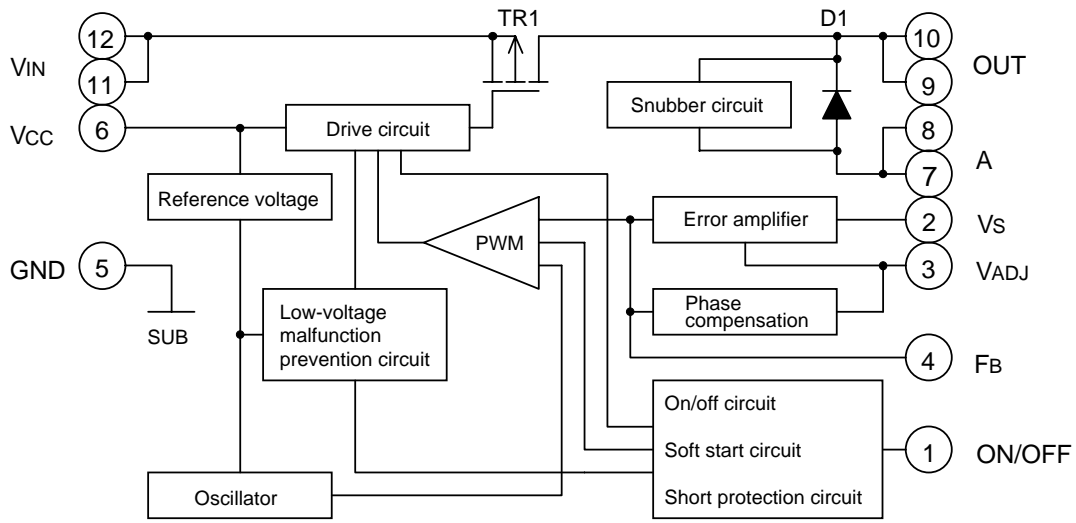
Recommended Operating Conditions at $T_a = 25^\circ\text{C}$

| 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 | ΔV_O | $I_o=1\text{A to }5\text{A}$ | | | 50 | mV |
| Efficiency | η | $I_o=2.5\text{A}$ | | 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} | $T_c=+25 \text{ to } +85^\circ\text{C}$ | | ± 1.7 | | mV/ $^\circ\text{C}$ |

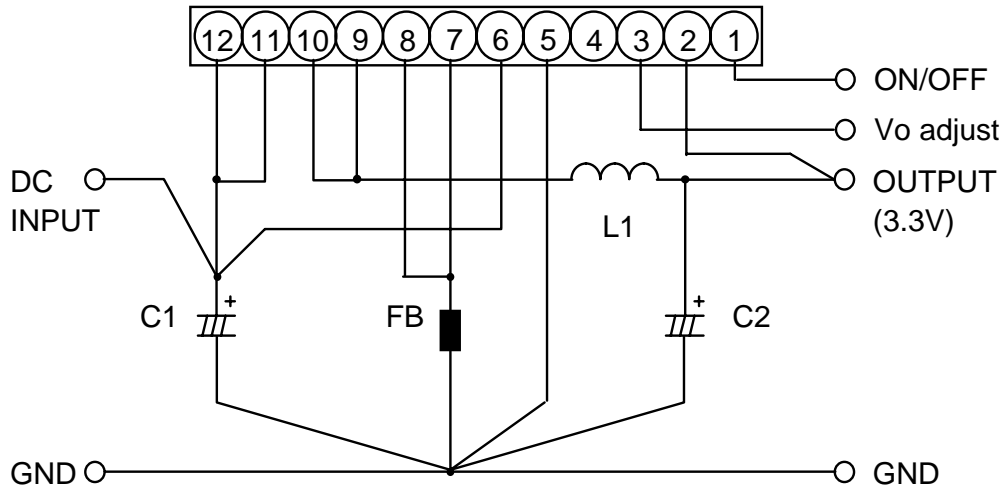
Block Diagram



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 | FB | 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

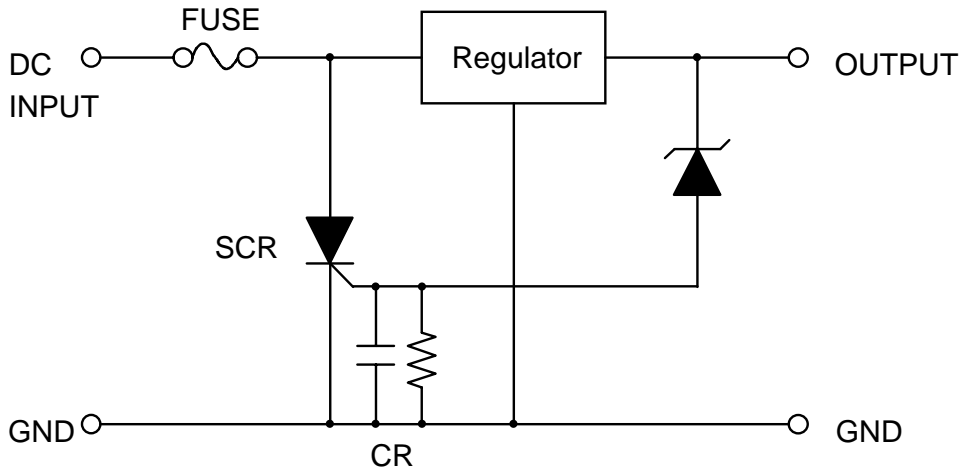


- C1 : 220 μ F/10V (OS capacitor)
- C2 : 2200 μ F/6.3V
- L1 : 30 μ H
- FB : Ferrite-bead core

Overvoltage Protection Circuit

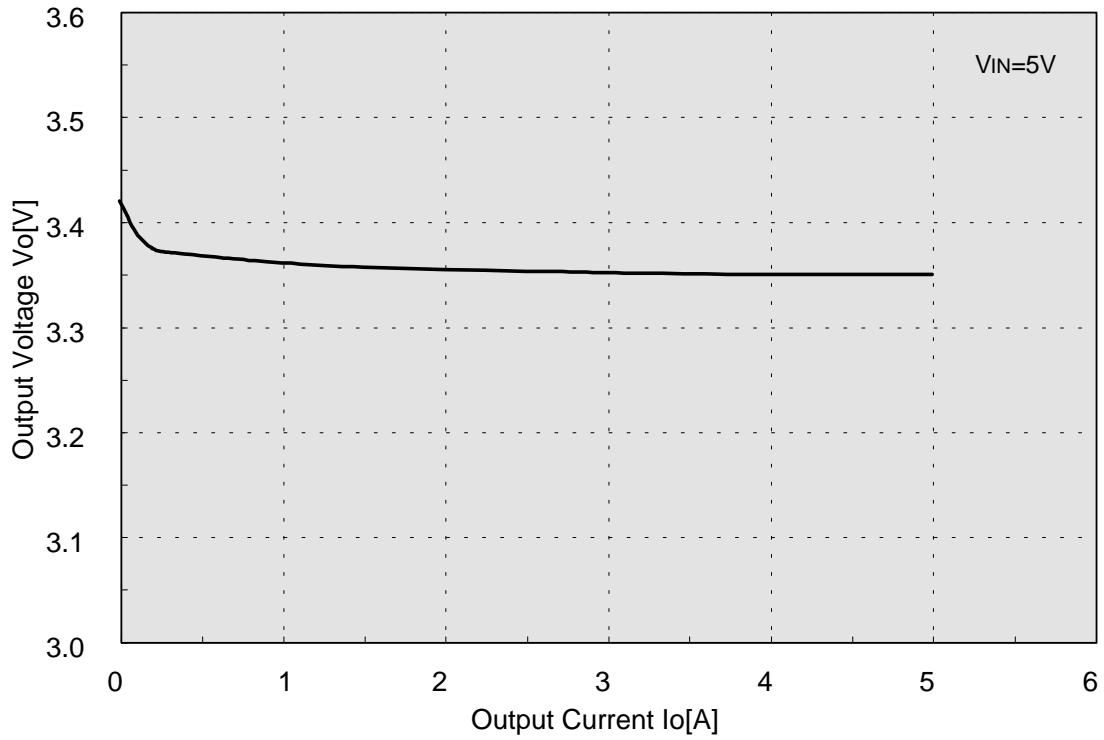
In a constant-voltage power supply circuit output voltage may generally exceed the stipulated rating (equivalent to input voltage) when the circuit is broken down or the IC and the printed circuit board is wrongly soldered. Therefore overvoltage protection circuit is recommended to use to minimize the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

Sample the overvoltage protection circuit

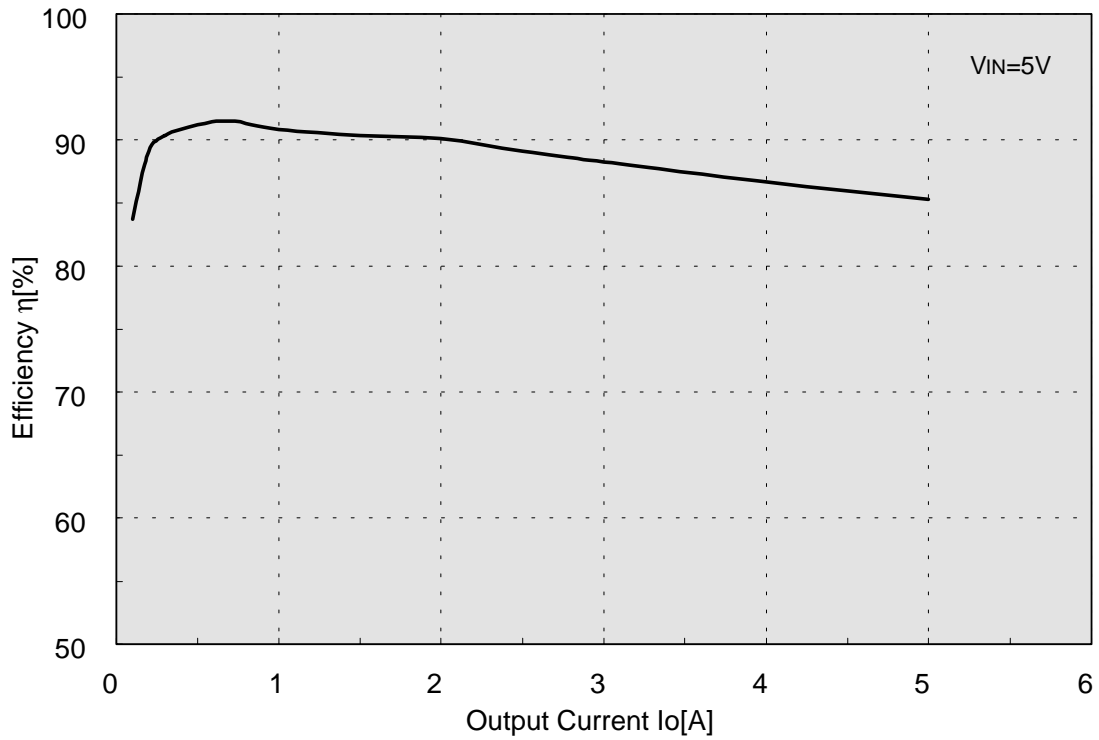


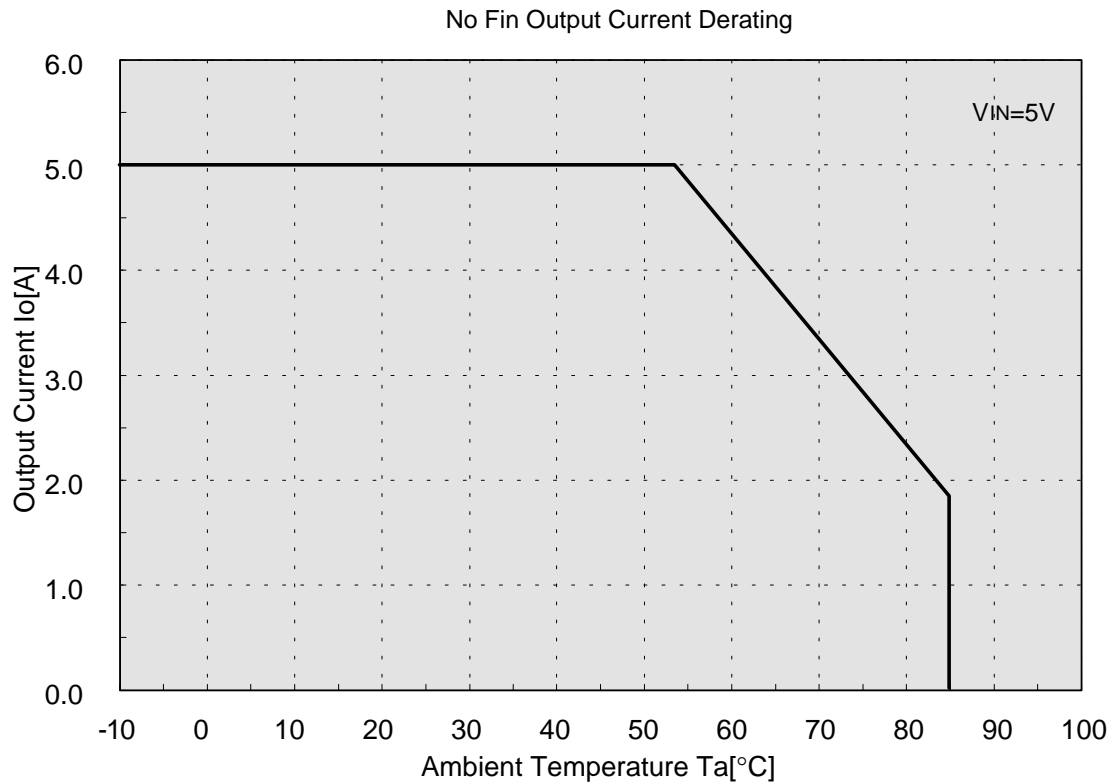
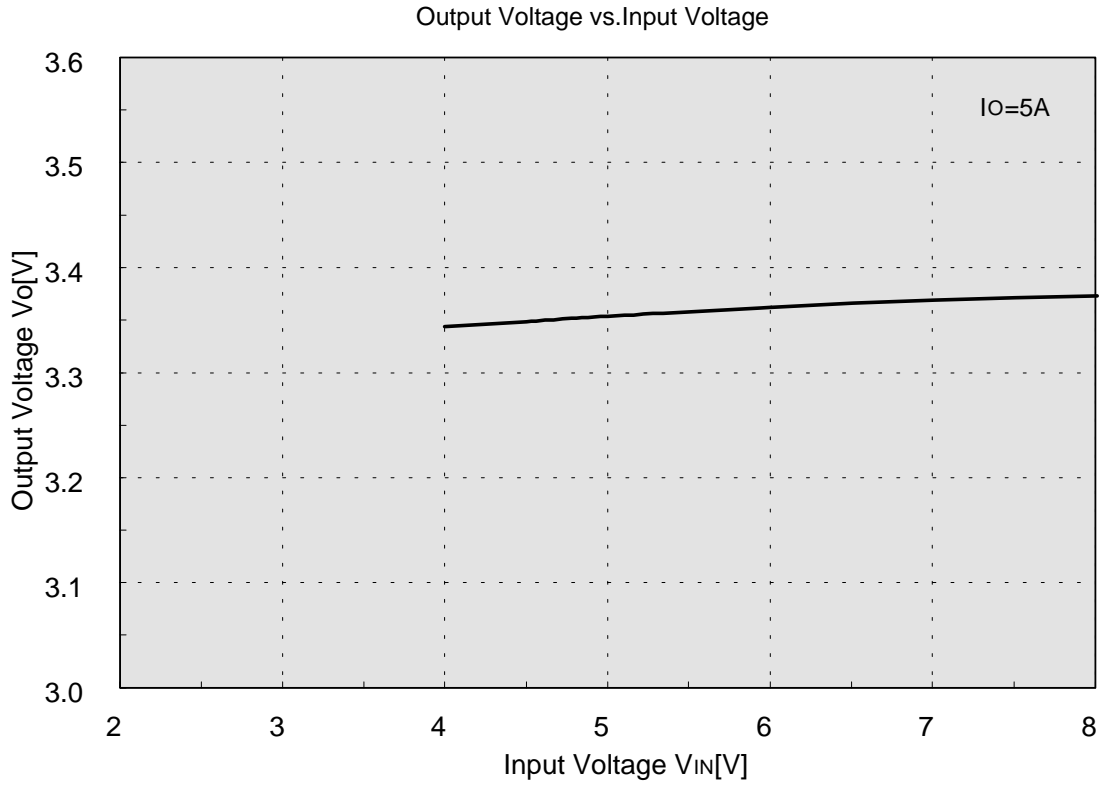
Sample Characteristics at $T_a = 25^\circ\text{C}$, in the test circuit

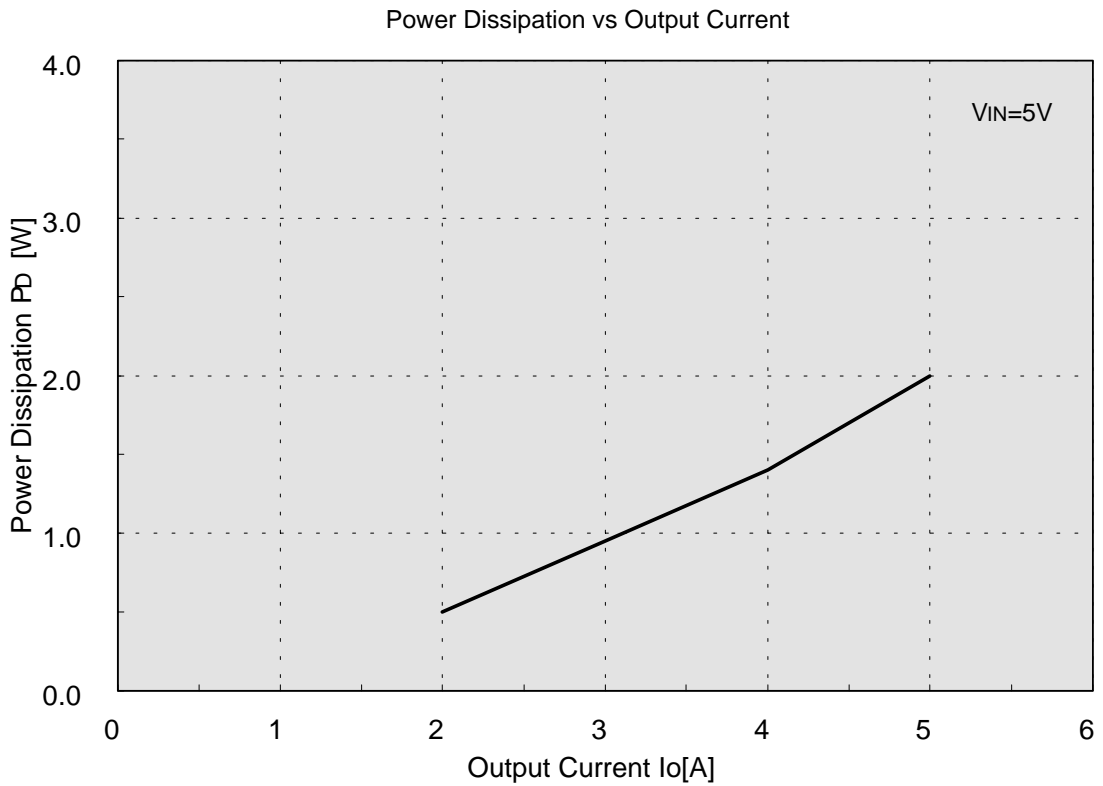
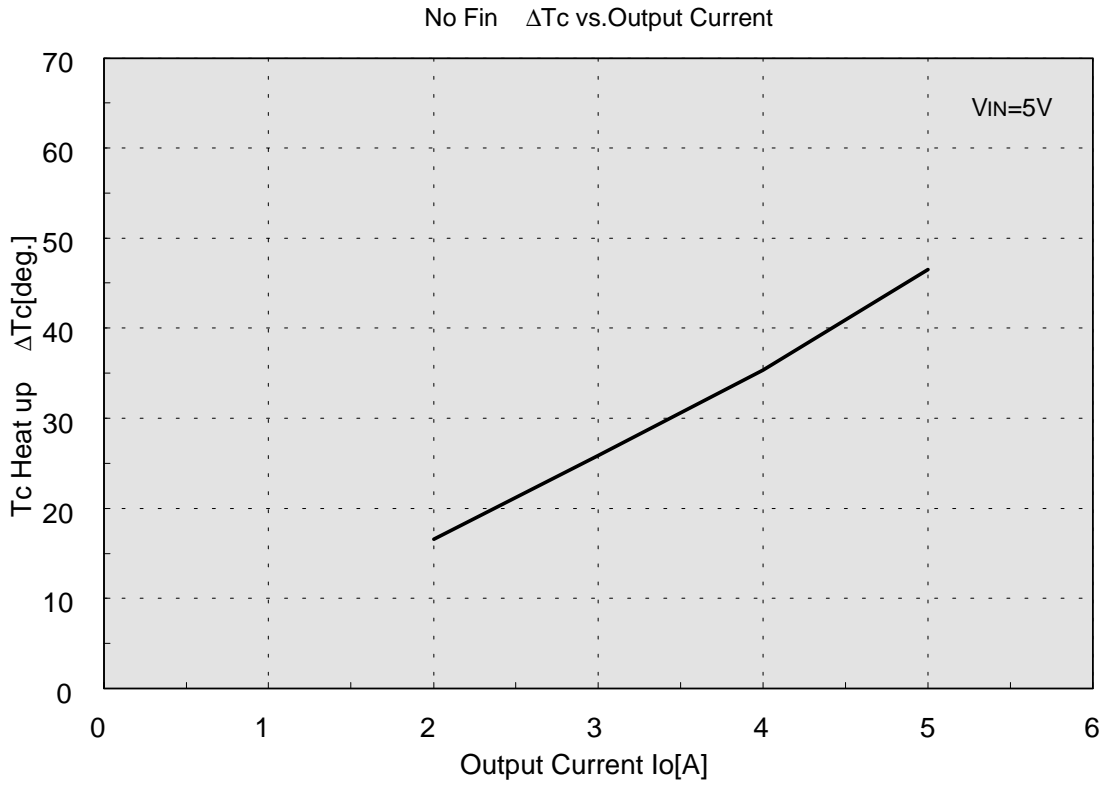
Output Voltage vs. Output Current



Efficiency vs. Output Current



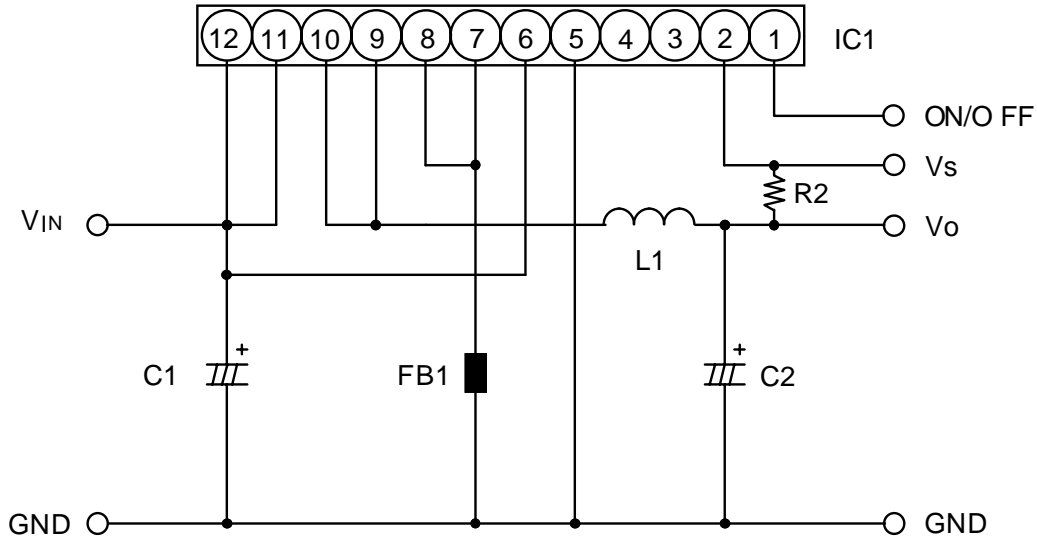




Evaluation Board

The evaluation board is provided to evaluate this hybrid IC

◆ Equivalent Circuit



◆ Parts Table

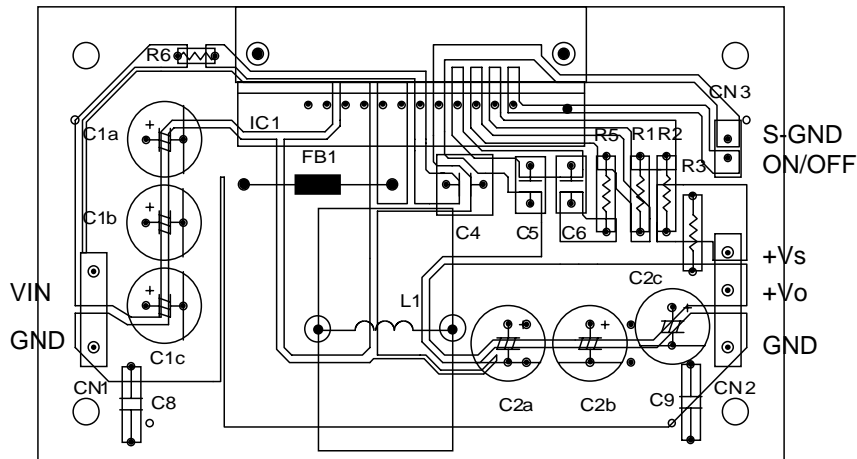
| | Part name | Requirements | Number | Manufacturer | Notes |
|-----|------------------------|-------------------|--------|--|--------------------|
| C1 | Electrolytic capacitor | 220 μ F/10V | 1 | Sanyo Electronic component co., ltd. | OS capacitor |
| C2 | Electrolytic capacitor | 2200 μ F/6.3V | 1 | Sanyo Electronic component co., ltd. | Low impedance (CG) |
| R2 | Resistor | 100 Ω | 1 | | |
| R3 | Jumper | | 1 | | |
| R6 | Jumper | | 1 | Use a fuse resistor (20 to 30 Ω) 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 μ H, 5A |

◆ Notes on pattern designing

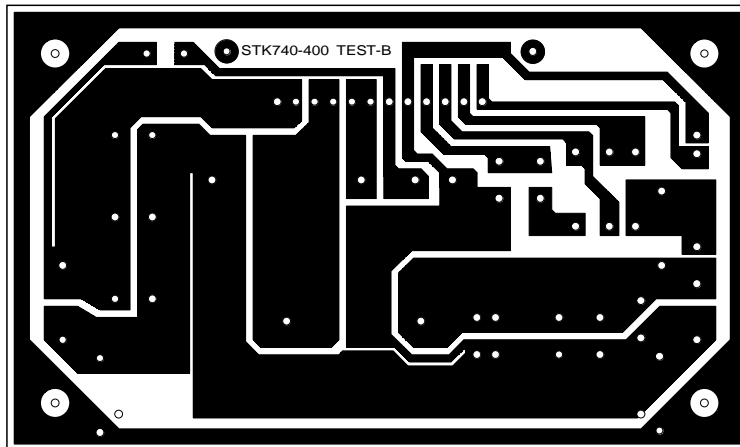
- 1 Place V_{CC} pin (pin 6) and V_{IN} pins (pin 11 and 12) lines separately and use an input capacitor (+) for connection.
- 2 Place GND pin (pin 5) and A pin (pins 7 and 8) lines separately.
- 3 Connect A pin (pins 7 and 8) with the input capacitor (-) through a Ferrite-bead core.
- 4 Connect GND 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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