PQ2CF1

TO-220 Package, Step Up Output Chopper Regulator

■ Features

- Maximum switching current: 2.5A
- Built-in soft start function
- Built-in oscillation circuit
  (oscillation frequency: TYP. 50kHz)
- Built-in overheat protection,overcurrent protection
  function
- Variable output voltage(4.5 to 35V)
  [Possible to choose step up output / flyback method
  according to external connection circuit]

■ Applications

- Personal computers / Word processors
- Printers
- Switching power supplies
- Facsimiles

■ Outline Dimensions   (Unit : mm)

- ( ) : Typical value
- Radius of lead forming
  portion : R=TYP.1.0
  ① V_{SW}
  ② V_{IN}
  ③ COM
  ④ V_C
  ⑤ O_{ADJ}

■ Absolute Maximum Ratings   (Ta=25°C)

Parameter	Symbol	Rating	Unit
[1] Input voltage	V_{IN}	35	V
[2] Switching voltage	V_{SW}	35	V
Error input voltage	V_{ADJ}	7	V
[3] ON/OFF control voltage	V_C	7	V
Switching current	I_{SW}	2.5	A
Power dissipation (No heat sink)	P_{D1}	1.5	W
Power dissipation (With infinite heat sink)	P_{D2}	15	W
[4] Junction temperature	T_j	150	°C
Operating temperature	T_{opr}	−20 to +80	°C
Storage temperature	T_{stg}	−40 to +150	°C
Soldering temperature	T_{sol}	260 (For 10s)	°C

[1] Voltage between V_{IN} terminal and COM terminal
[2] Voltage between V_{SW} terminal and COM terminal
[3] Voltage between V_C terminal and COM terminal
[4] Overheat protection may operate at 125<=Tj<=150°C.

• Please refer to the chapter " Handling Precautions ".

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■ Electrical Characteristics

(Unless otherwise specified, conditions shall be V_{IN}=5V, I_o=0.2A, V_o=12V, T_a=25°C)

| Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output saturation voltage	V_{SAT}	I_{SW}=2A	—	0.6	1.2	V
Reference voltage	V_{ref}	—	1.235	1.26	1.285	V
Reference voltage temperature fluctuation	ΔV_{ref}	T_j=0 to 125°C	—	±0.5	—	%
Load regulation	$\lvert Reg_L \rvert$	I_o=70 to 570mA	—	0.1	1.5	%
Line regulation	$\lvert Reg_I \rvert$	V_{IN}=3.5 to 10V	—	0.2	1.5	%
Efficiency	η	I_o=0.5A	—	85	—	%
Oscillation frequency	fo	—	40	50	60	kHz
Oscillation frequency temperature fluctuation	Δfo	T_j=0 to 125°C	—	±5	—	%
Maximum duty	D_{MAX}	⑤ terminal is open	90	—	—	%
Over current detecting level	I_L	Duty=50%,	2.7	4.4	5.8	A
Charge current 1	I_{CHG1}	④ terminal=0V, ④ terminal	−80	−50	−20	μA
Charge current 2	I_{CHG2}	④ terminal=0.5V, ④ terminal	−150	−100	−50	μA
Input threshold voltage	V_{THL}	Duty=0%, ④ terminal	0.55	0.75	0.95	V
Vc terminal low level voltage	V_{CH}	① terminal is open, ⑤ terminal=1.1V	1.65	1.85	2.05	V
Vc terminal high level voltage	V_{CL}	① terminal is open, ⑤ terminal=1.4V	0.3	0.45	0.6	V
On threshold voltage	V_{THON}	① terminal is open, ④ terminal	0.1	0.2	0.3	V
Stand-by current	I_{SD}	V_{IN}=35V, ④ terminal=0V, No L, C_o, D, R_1, R_2	—	270	400	μA
Output OFF-state dissipation current	I_{qs}	V_{IN}=35V, ④ terminal=0.5V, No L, C_o, D, R_1, R_2	—	4.0	12	mA

■ Block Diagram
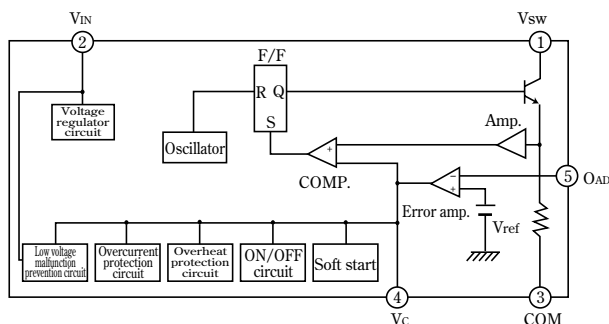
Fig. 1 Test Circuit
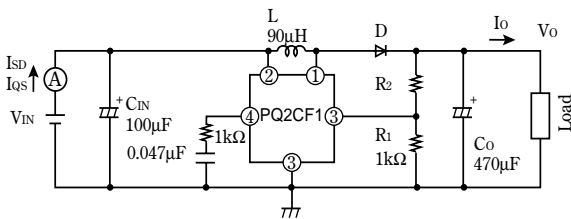
L : HK-12S100-9000 (made by Toho Co.)
D : ERC80-004 (made by Fuji electronics Co.)

Fig. 2 Power Dissipation vs. Ambient Temperature
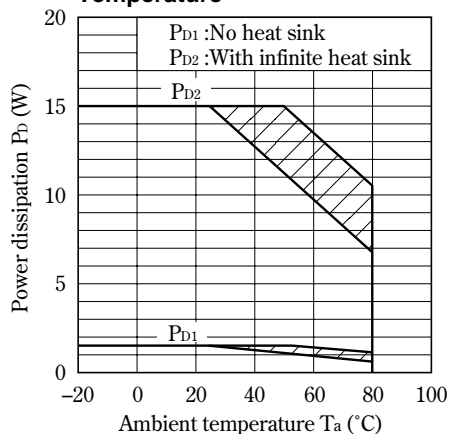
Note) Oblique line portion : Overheat protection may operate in this area.
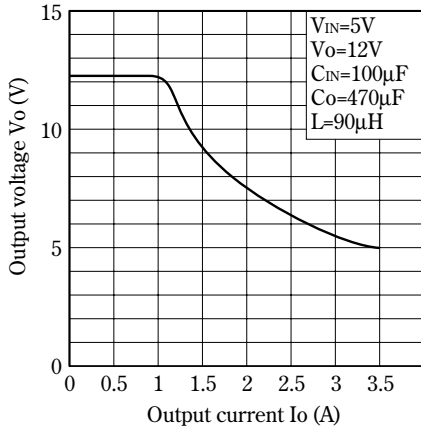
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Fig. 3 Overcurrent Protection Characteristics

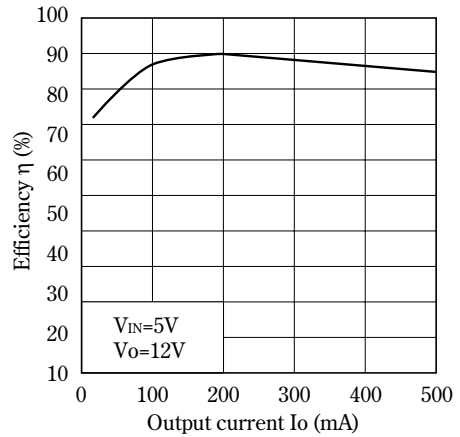Output voltage Vo (V) vs. Output current Io (A)

$V_{IN}=5V$
$Vo=12V$
$C_{IN}=100\mu F$
$Co=470\mu F$
$L=90\mu H$

Fig. 4 Efficiency vs. Input Voltage

Efficiency η (%) vs. Output current Io (mA)

$V_{IN}=5V$
$Vo=12V$

Fig. 5 Reference Voltage Fluctuation vs. Junction Temperature

Reference voltage fluctuation (mV) vs. Junction temperature T_j (°C)

$C_{IN}=100\mu F$, $Co=470\mu F$
$L=90\mu H$, $V_{IN}=5V$
$Vo=12V$, $Io=0.2A$
$C=0.47\mu F$, $R=1k\Omega$
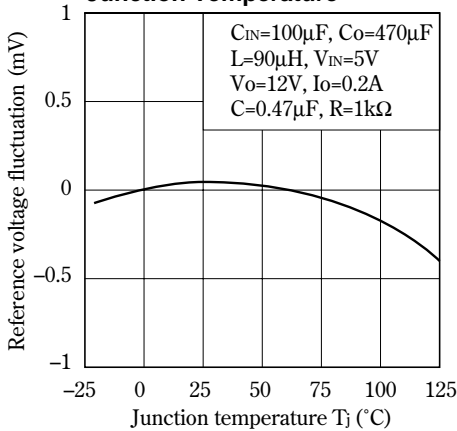
Fig. 6 Load Regulation vs. Output current

Load regulation RegL (%) vs. Output current Io (A)

$C_{IN}=100\mu F$, $Co=470\mu F$
$L=90\mu H$, $V_{IN}=5V$
$Vo=12V$, $C=0.47\mu F$
$R=1k\Omega$
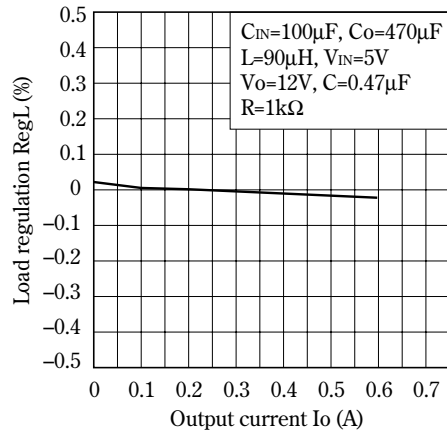
Fig. 7 Line Regulation vs. Input Voltage

Line regulation RegI (%) vs. Input voltage V_{IN} (V)

$C_{IN}=100\mu F$, $Co=470\mu F$
$L=90\mu H$, $Io=0.2A$,
$C=0.47\mu F$, $R=1k\Omega$

$Vo=12V$
$Vo=24V$

Fig. 8 Oscillation Frequency Fluctuation vs. Junction Temperature

Oscillation frequency fluctuation (%) vs. Junction temperature T_j (°C)

$C_{IN}=100\mu F$, $Co=470\mu F$
$L=90\mu H$, $V_{IN}=5V$
$Vo=12V$, $Io=0.2A$
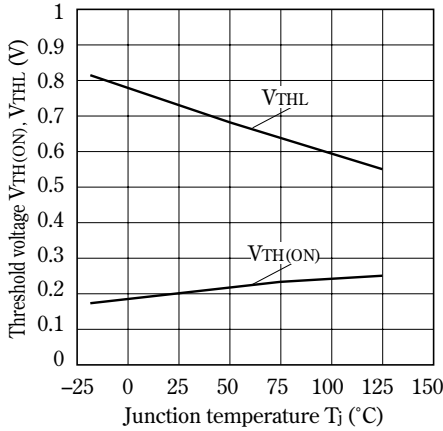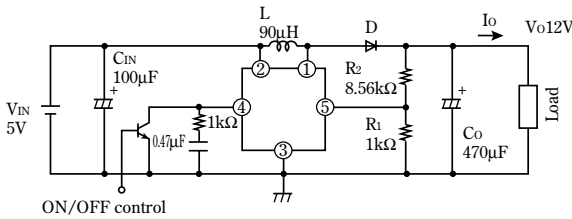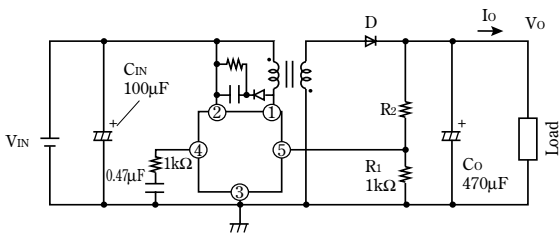$C=1\mu F$, $R=1k\Omega$

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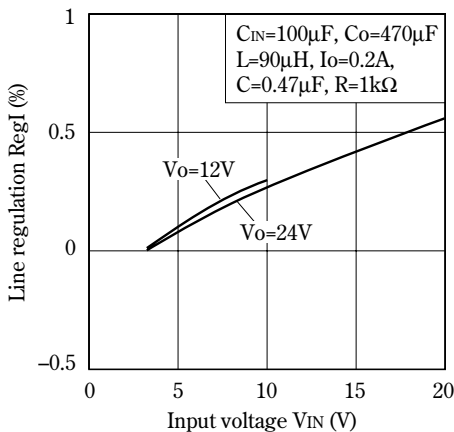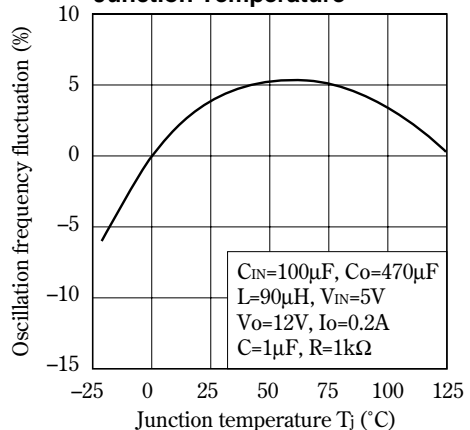
Fig. 9 Threshold Voltage vs. Junction Temperature

■ **Step - Up Type Circuit Diagram (12V Output)**

■ **Flyback Method Circuit Diagram**

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--- Office automation equipment
--- Telecommunication equipment [terminal]
--- Test and measurement equipment
--- Industrial control
--- Audio visual equipment
--- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
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--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

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