

This is the tentative target specification, and the contents as well as the specified values may subject to change without notification

1. **STRUCTURE** Single In-line Package With Coating
2. **PRODUCTS** POWER MODULE
3. **TYPE** BP5722-12
4. **APPLICATION** Power supply
5. **FUNCTION** 12V control, Insulation type switching regulator module.
BP5722-12 is an insulation type switching regulator module employing PWM (fly back) control method.
It is a 12V output control module where a primary side switching circuit and a secondary side control circuit are made as one body.
By a configuration with an external transformer, it can easily configure power supply of output 12W(TYP) at input 217~405VDC(equivalent to 154~286VAC).

6. ABSOLUTE MAXIMUM RATINGS

These are the values which must not be exceed at any time under any application or any test conditions. Please make design keeping enough margins accordingly.

(Ta=25°C)

NO	Parameter	Symbol	Limits	Unit	Conditions
1	11-pin input voltage	VD	800	V	
2	7-, 8-pin input voltage	VDD	25	V	
3	11-pin input current	ID	350	mA	
4	8-pin input current	IDD	3.3	mA	
5	Maximum power	Po	13	W	
6	Withstanding voltage	VI	2.5	kVrms	1 sec (primary - secondary)
7	Allowable maximum surface temperature	Tcmax	105	°C	Ambient temperature + The module self-heating ≤ Tcmax
8	Operating temperature range	Topr	-25 ~ +80	°C	
9	Storage temperature range	Tstg	-40 ~ +105	°C	

7. ELECTRICAL CHARACTERISTICS

Operating characteristics in standard circuit, circuit design value in standard circuit

<Definition of item >

Output current	It is the maximum current value, which can be taken out from a module IC. Please be careful not to exceed this value.
Line regulation	It is the change value of the output voltage against the change in the input voltage.
Load regulation	It is the change value of the output voltage against the change in the statistic output load current.
Output ripple voltage	It measures on PEAK-TO-PEAK of the ripple voltage, and spike noise does not contain.
Power conversion efficiency	It computes by $\eta = \frac{V_o \times I_o}{V_{in} \times I_{in}} \times 100[\%]$.

(Unless otherwise noted, Vi=311V, Ta=25°C)

NO	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test circuit	Conditions
<Input conditions>								
1	11-pin input voltage	VD	-	-	700	V	Fig.1	(Note 3) Io=1000mA
2	Operating power voltage (7-pin)	VDD	8.8	12	20	V	Fig.1	DC, Io=1000mA (Note 1)

Note 1) Operating start voltage is 15.5V~17.5V.

DESIGN	CHECK	APPROVAL	DATE:15/FEB/2005	SPECIFICATION No.: BP5722-12-C-001-E(Lead free)
<i>K. Kitagawa</i>			REV.C	ROHM CO., LTD.

(Unless otherwise noted, $V_i = 311V$, rated load $T_a = 25^\circ C$)

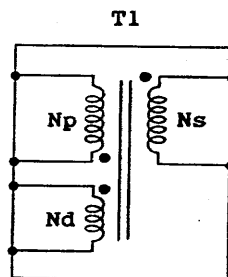
NO	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test circuit	Conditions
<12V output>								
3	Output voltage	V_o	11.4	12.0	12.6	V	Fig.1	
4	Output current	I_o	0	-	1000	mA		Refer to derating curve
5	Line regulation	ΔV_r	-	8	200	mV		$V_i=217V \sim 405VDC$ $I_o=1000mA$
6	Load regulation	ΔV_l	-	30	200	mV		$I_o=50mA \sim 1000mA$
7	Output ripple voltage	$\nu \gamma$	-	200	500	mVpp		(Note 2)
8	Power conversion efficiency	η	75	83	-	%		

(Note 2) Pulse noise not included.

Reference specifications

*** Transformer specifications**

		Inductance (10KHz)	Number of turns
Primary side	N_p coil	$6.1mH \pm 15\%$	148T
Ns shorted	Leakage-L	$138 \mu H_{MAX}$	
Primary side	N_d coil	-	12T
Secondary side	N_s coil	-	11T

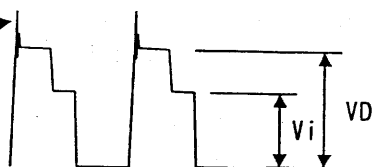


● The mark shows the start of coil turn.

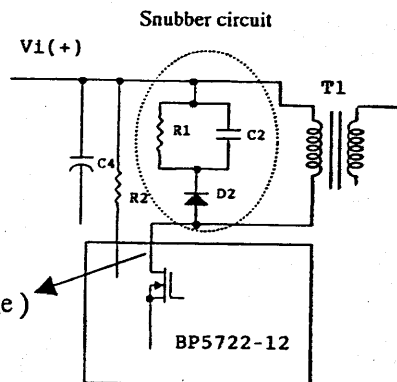
- Design the transformer so that the maximum surface temperature of the module should be $100^\circ C$ or less in the actual conditions.
- Wind the N_d coil so that its binding should become as poor as possible. When the regulation gets bad and exceeds the power supply voltage range of VDD, protection works so as to turn off the switching.

(Note 3) V_D shows the following voltage.

Be sure to make it 750V peak or less with a snubber circuit or the like.



Module 11-pin voltage waveform (built-in FET of drain voltage)



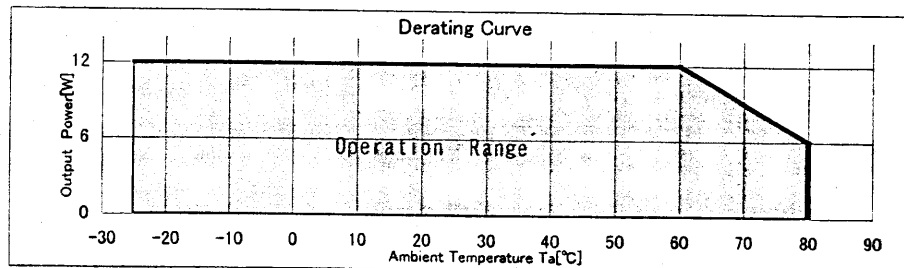
*** Internal power MOS element specifications**

$R_{DS(ON)}$: 15Ω TYP 20Ω MAX

I_D : 1A

V_{DSS} : 900V

8. DERATING CURVE



GRAPH1. Derating Curve

9. TEST CIRCUIT · BLOCK DIAGRAM

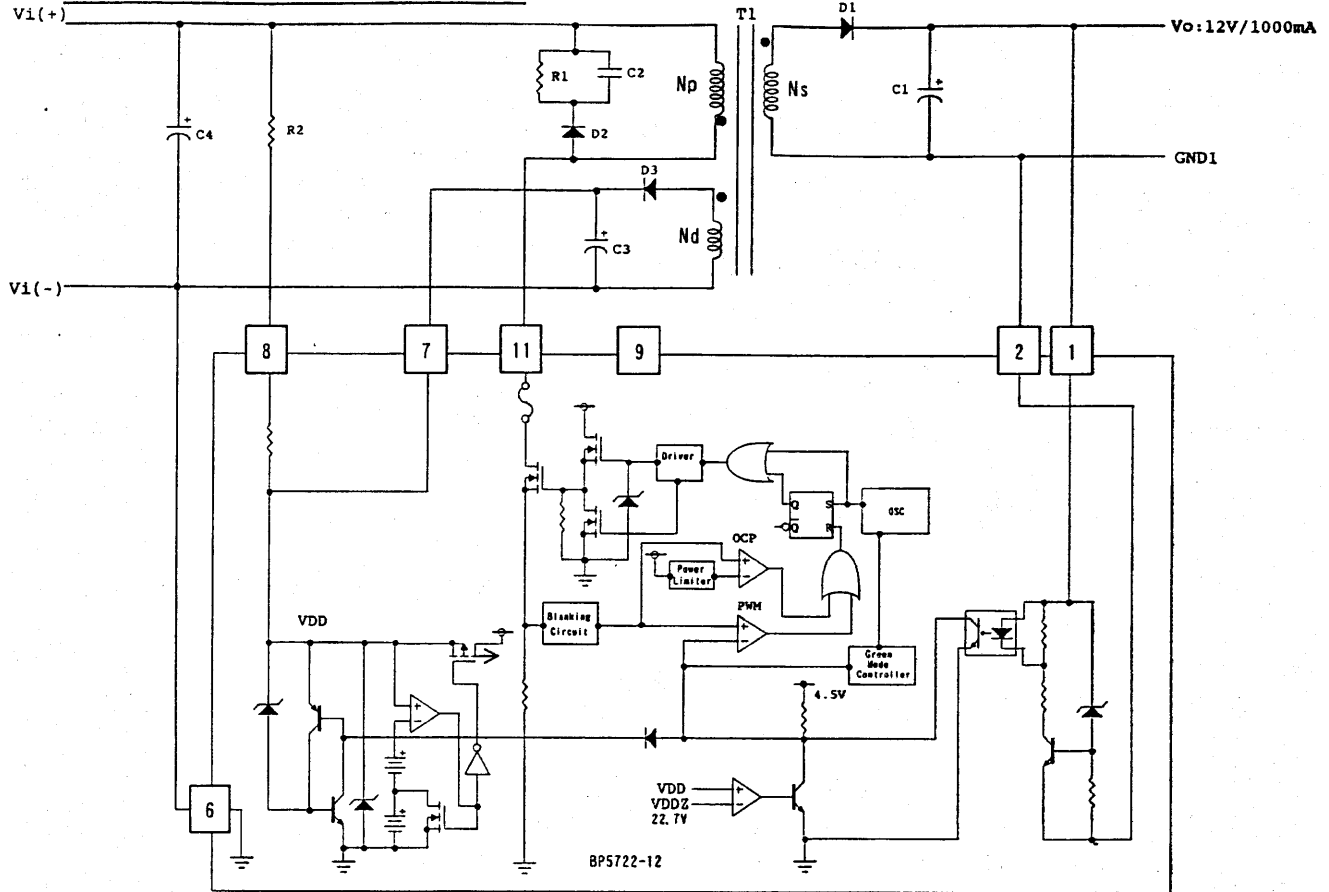


Fig. 1

<External components setting>

Symbol	Function	Component	Recommended parts
*C1	Capacitor for output voltage smoothing	1000 μ F / 35V Low impedance for power supply Rated ripple current 1.4Arms or higher ESR 35m Ω or below	Manufactured by Nichicon UPM1V102M
C2	For noise terminal voltage reduction	2200pF / 1KV	Manufactured by Matsushita ECKA3A222KBP
*C3	Capacitor for output voltage smoothing	10 μ F / 50V Low impedance for power supply	Manufactured by Nichicon UPM1H100M
C4	Capacitor for input voltage smoothing	33 μ F / 450V General purpose one	Manufactured by Rubicon 450YXA33M
D1	Rectifier diode	90V/6A	Manufactured by Rohm RB095B-90
D2	Rectifier diode	1KV/1A	Manufactured by Toshiba 1NU41
D3	Rectifier diode	90V/0.13A	Manufactured by Rohm 1SS133
R1	Resistor	100K Ω \pm 5% 3W Limiting element voltage 300V or higher	
*R2	Resistor	1.5M Ω \pm 5% 0.25W Limiting element voltage 600V or higher	
T1	Switching transformer	Custom one	Manufactured by TDK

*C1,C3,R2: Refer to the notes on use at the section 16 on page 7/7.

● The operating the principle

BP5722-12 can easily structure a power supply by arranging a transformer and a rectifier circuit externally. As for start, voltage is generated on the VDD terminal (pin no.7) via R2, and when this terminal voltage is 15.5 ~ 17.5V, operating start. Thereafter, switching starts and when voltage is generated on the secondary side output Vo, voltage is generated stably on the VDD terminal simultaneously (VDD operating voltage) and gets into normal area. And, BP5722-12 has built-in over current (reset type) · over voltage (latch type) protection function to prevent destruction at abrupt error. As for over current protection characteristics, refer to GRAPH 2. Load Regulation. In the over voltage protection operating, when the output voltage control does not work, the VDD voltage increases as the voltage of the output Vo increases. When this VDD voltage becomes 20V or higher, the latch circuit works and the output is shut down. As for release, after the input smoothing capacitor C4 is discharged, and please resupply the power.

These protection functions are effective for prevention against destruction owing to abrupt accident, therefore, avoid using them for continuous protection circuit operating, or at transition

10. APPLICATION CIRCUIT EXAMPLE

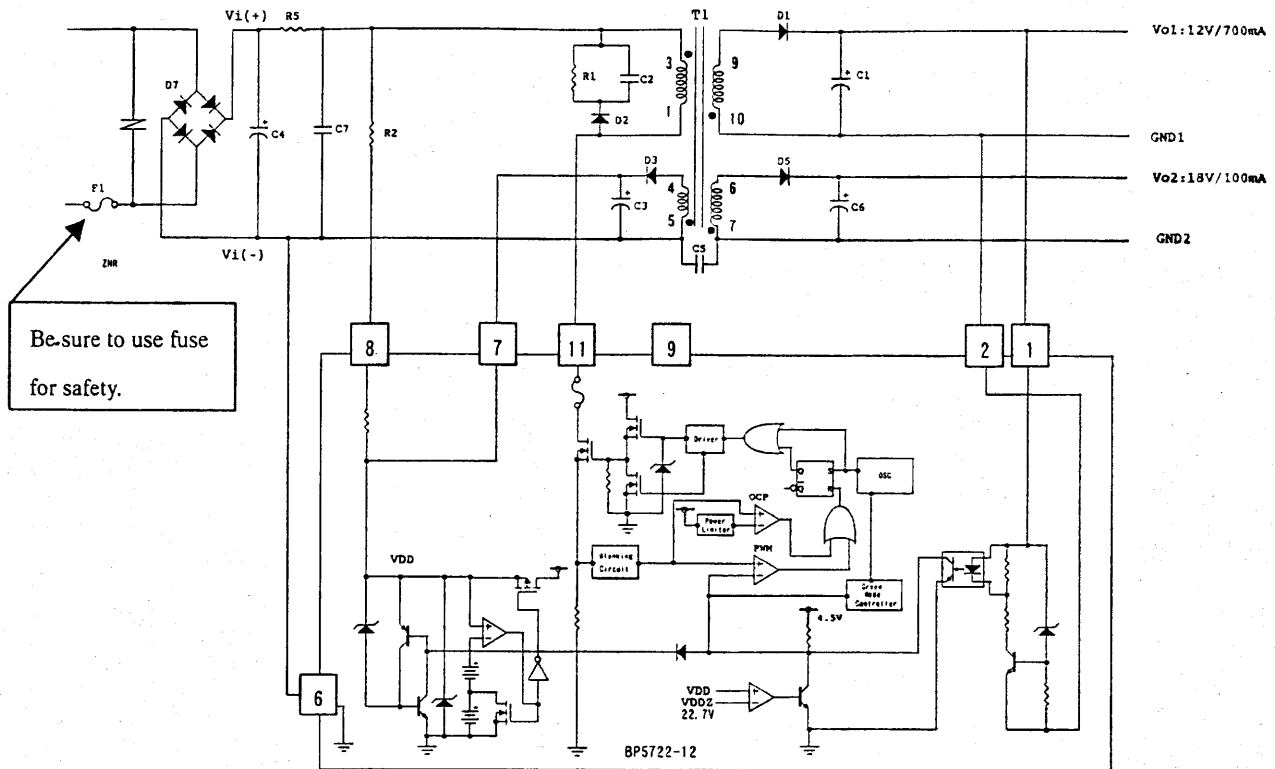


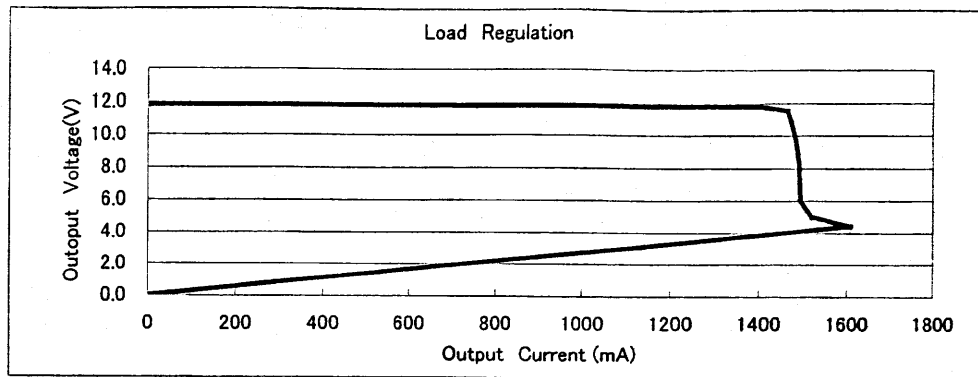
Fig. 2

< External components setting >

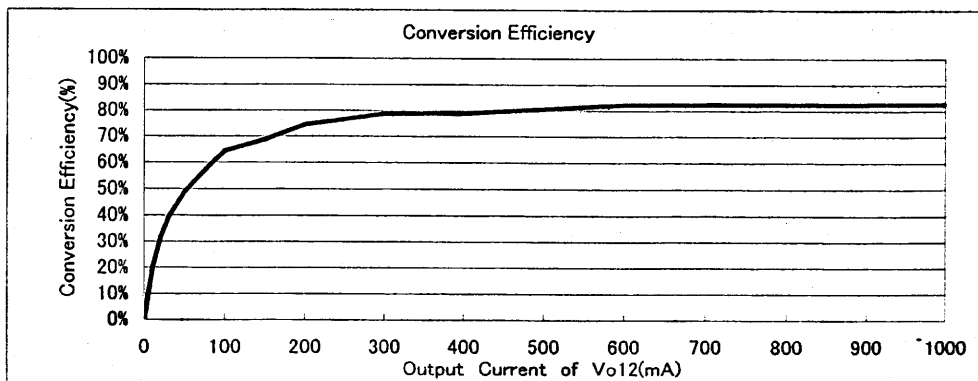
Symbol	Function	Component	Recommended parts
*C1	Capacitor for output voltage smoothing	1000 μ F / 35V Low impedance for power supply	Manufactured by Nichicon UPM1V102M
C2	For noise terminal voltage reduction	4700pF / 400V or higher	Manufactured by Matsushita ECKA3A472KBP
*C3	Capacitor for output voltage smoothing	10 μ F / 50V Low impedance for power supply	Manufactured by Nichicon UPM1H100M
C4	Capacitor for input voltage smoothing	33 μ F / 450V	Manufactured by Rubicon 450YXA33M
C5	For noise terminal voltage reduction	Please set it, if necessary	Manufactured by TDK CS11-E2GA222MYNS
C6	Capacitor for output voltage smoothing	100 μ F / 35V Low impedance for power supply	Manufactured by Nichicon UPW1V101M
C7	Noise terminal voltage countermeasure capacitor	Please set it, if necessary Limiting element voltage DC 630V or higher 0.1 ~ 0.22 μ F	Manufactured by Matsushita ECQE6224M
D1	Rectifier diode	90V/6A	Manufactured by Rohm RB095B-90
D2	Rectifier diode	1KV/1A	Manufactured by Toshiba 1NU41
D3	Rectifier diode	90V/0.13A	Manufactured by Rohm 1SS133
D5	Rectifier diode	100V or higher/1A	Manufactured by Shindengen DINL20
D7	Diode bridge	800V/1A	Manufactured by Shindengen DIUBA80
R1	Resistor	100K Ω \pm 5% 3W Limiting element voltage 300V or higher	Manufactured by KOA MOS3-104J
R2	Resistor	1.53M Ω \pm 5% 0.25W Limiting element voltage 600V or higher	Manufactured by Rohm MCR18EZHJ514 \times 3
R5	Noise terminal voltage countermeasure resistor	Please set it, if necessary 1W or higher 10 ~ 22 Ω	Manufactured by KOA MOSX1-220J
T1	Switching transformer		Manufactured by TDK SRW25ES
F1	Fuse	Be sure to use this for safety.	
ZNR	Varistor	Must be use. It protects this part from lightning surge and static electricity.	

*C1, C3: Refer to the notes on use at the section 16 on page 7/7.

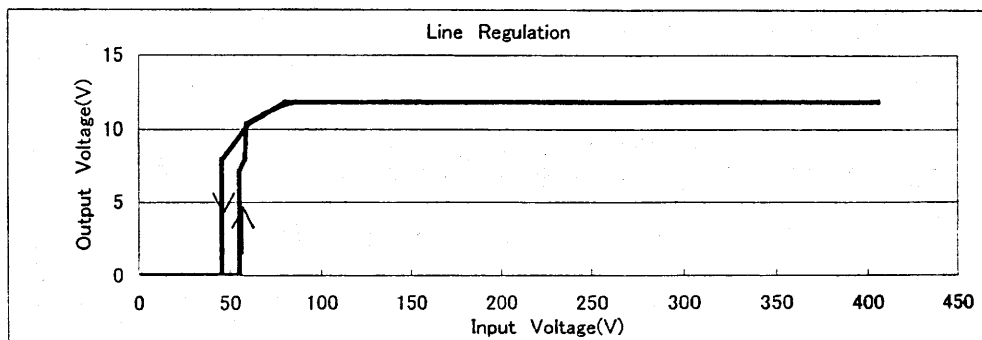
11. ELECTRICAL CHARACTERISTICS CURVES (Ta=25°C) REFERENCE DATA



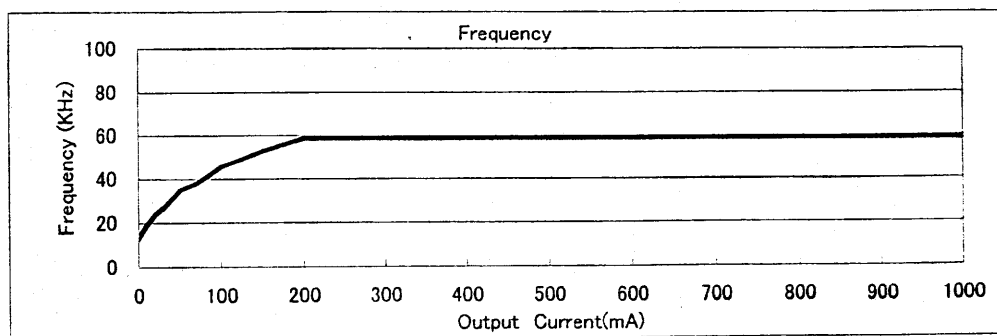
GRAPH2.Load Regulation(Vi=311V)



GRPH3.Conversion Efficiency(Vi=311V)



GRAPH4.Line Regulation(Io=1A)



GRAPH5.Switching Frequency(Vi=311V)

12. DIMENSIONS (UNIT:mm)

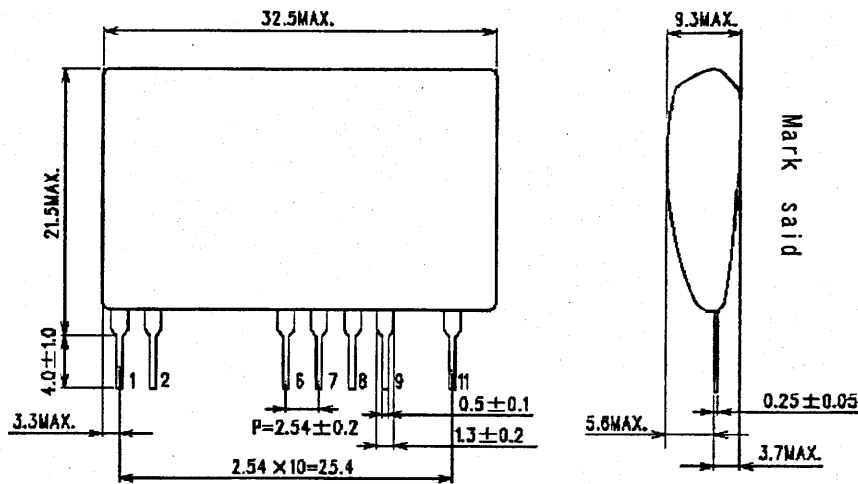


Fig.3 DIMENSIONS

Pin No.3, 4, 5, 10 pin is not used.

* As for painting, parts may be exposed partially, but there is no problem in electrical characteristics and reliability.

● Marking contents

- : 1 pin side mark
- BP5722-12 : Type name
- 0324S : Production lot number
(Manufactured in the 24th week of 2003)

→ S : Rohm Electronic Dalian Corporation
None : Rohm Amagi Co., Ltd.

* External appearance inspection standards shall be Rohm standards.

<Terminal function>

Pin No	Terminal name	Terminal function
1	Vo	This is the secondary side 12V output voltage control terminal. Insert the output smoothing capacitor 1000 μ F between GND.
2	GND	This is the GND terminal for the secondary side 12V output.
6	Vin(-)	This is the primary side input minus terminal.
7	VDD	This is the internal circuit power supply terminal.
8	Vs	This is the start terminal. Connect this via the external resister (1.5M Ω) to Vi (+).
9	NC	This is the NC pin.
11	VD	This is the built-in FET of drain terminal. The primary coil minus side of the external transformer, and the snubber circuit for noise reduction are connected to this.

13. PACKAGE SPEC

In principle, 25 pieces are packed on the package tray, and they are piled in 4 stages to be 100 pieces, and a stage of an empty tray is piled on them.

The number of piled stages is subject to change without prior notice according to shipment quantity.

14. MANUFACTURING SITES

Rohm Amagi Co., Ltd. (Fukuoka prefecture, Japan)
Rohm Electronic Dalian Corporation (China)

15. STRUCTURE

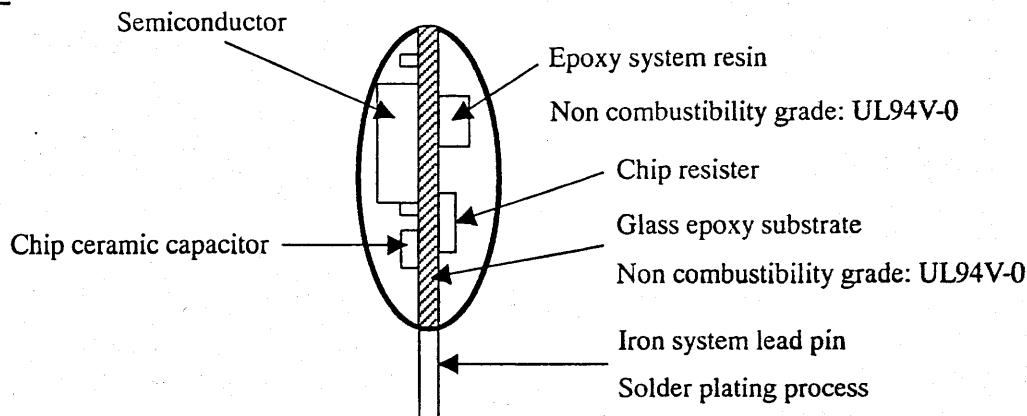


Fig.4 STRUCTURE

• Soldering conditions

Flow soldering	260°C	Within	10 seconds
Manual soldering	380°C	Within	3 seconds

• Recommended cleaning conditions

Washing liquid Water and alcoholic system (excluding special one)

• Recommended land dimensions

Hole diameter	0.9mm
Land diameter	2mm

16. NOTES ON USE

- When the capacity of the output smoothing electrolytic capacitor C1 is made large, output may not rise. 1000 μ F~2200 μ F is recommended. Set the rise time within 10msec.
 - Set the VDD electrolytic capacitor C3 to 10 μ F. When the capacity is made small, start may not be made. Start time is $t(\text{sec}) \cong -R2 * C3 * \ln(1 - 17 / (Vi - 30 \mu\text{A} * R2))$. Vi : DC voltage after smoothing.
 - Be sure to use the VDD terminal voltage within the operating voltage range. When the upper limit is exceeded, over voltage protection works and output may be shut down. And when the lower limit is exceeded, UVLO works to carry out restart operating.
 - Set the external starting resistor R2 to 1.5M Ω . When the resistance value is made small, start may not be made.
 - This product has built-in over current (reset type) • over voltage (latch type) protection function to prevent destruction at abrupt error. As for over current protection characteristics, refer to GRAPH 2. Load Regulation. In the over voltage protection operating, when the output voltage control does not work, the VDD voltage increases as the voltage of the output Vo increases. When this VDD voltage becomes 20V or higher, the latch circuit works and the output is shut down. As for release, after the input smoothing capacitor C4 is discharged, and please resupply the power.
- These protection functions are effective for prevention against destruction owing to abrupt accident, therefore, avoid using them for continuous protection circuit operating, or at transition