SUPLET ® **Technical Specification**

DC-DC Converter，1*1 inch

BBJ1N48N12CHGW

18Vdc to 75Vdc Input；12Vdc/1.3A Output

RoHS Compliance

Features

- Delivers up to1.3A output current
- High efficiency 88.5% at full load @48Vin
- Low output ripple and noise
- Exceptional thermal performance
- Industrial standard
- High reliability
- Remote on/off logic
- Fixed switching frequency
- Input under voltage lockout
- Output over current protection
- Output over voltage protection
- Output Short-circuit protection
- Over temperature protection
- Adjustable output voltage : -10%~ 10%Vo(nom)
- Meets IEC60950-1

Applications

- Distributed Power Architectures
- Wireless Networks
- Access and Optical Network Equipment
- Enterprise Networks
- Latest generation IC’s (DSP, FPGA, ASIC) and Microprocessor powered applications.

Description

The BBJ1N48N12CHGW is an isolated DC/DC converter that provides a high efficiency single output. It can operate from 18Vdc to 75Vdc input and 12Vdc/1.3A output. The output can be trimmed from -10% to +10% of normal output voltage. The remote control option is negative logic. The converter turns on when the REM pin is at logic low and turns off when it is at logic high or left open. The output voltage trim logic is negative. The output voltage will increase when the TRIM pin is connected to “Vout-” and decrease when connected to “Vout+”.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect the device reliability.

Parameter	Units	Specifications		Notes & conditions
		Min.	Max.	
Input Voltage	Vdc	0	80	Continuous
		0	100	Transient (100ms)
Operating Temperature	℃	-40	85	Ambient Temperature
Storage Temperature	℃	-55	125	
Humidity	RH(%)	10	90	Non-condensing
Altitude	m	0	3000	

Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and room temperature conditions.

Input Characteristics

Parameter	Units	Specifications			Notes & conditions
		Min.	Typ.	Max.	
Operating Input Voltage	Vdc	18	48	75	Io=0 to Io(max)
Maximum Input Current	A	-	-	1.1	100% load Vin=Vin(min) to Vin(max)
No load Input Current	mA	-	15	50	No load, Full Input Voltage
Stand-by Input Current	mA	-	3	6	REM disabled
Input Reflected Ripple Current Peak-to-Peak	mA	-	8	30	See Figure 1 section

Inrush Transient	A^2S	-	-	0.01	Vin=Vin(min) to Vin(max), Io=0 to Io(max)
Input Fuse	A	-	-	3	

Remote Control Characteristics

Parameter	Units	Specifications			Notes & conditions
		Min.	Typ.	Max.	
Logic Low Voltage	Vdc	-0.7	-	0.8	Converter guaranteed logic high when REM pin is left open
Logic High Voltage	Vdc	2.0	-	18	

Output Characteristics

Parameter	Units	Specifications			Notes & conditions
		Min.	Typ.	Max.	
Output Voltage Set Point	V	11.82	12.00	12.18	
Output Current	A	0	-	1.3	Vin=Vin(min) to Vin(max)
Output Current Limit	A	1.43	-	2.34	
Line regulation	%Vo	-	0.05	0.2	Vin=Vin(min) to Vin(max)
Load Regulation	%Vo	-	0.05	0.2	Io=0 to Io(max)
Output Voltage Precision	%Vo	-	-	3.0	Vin=Vin(min) to Vin(max), Io=0 to Io(max) Full temperature range
Output Voltage Adjustment Range	%Vo	-10	-	10	Rated power Io=0 to Io(max)
Temperature Coefficient	%/℃	-	±0.008	±0.02	Full temperature range
External Load Capacitance	μF	-	-	470	Vin=Vin(min) to Vin(max) Io=0 to Io(max) Full temperature range

Dynamic Response	Recovery Time	μS	-	-	200	25%-50%-25%,50%-75%-50% Io(nom),di/dt=2.5A/μS
	Overshoot	%Vo	-	-	3	
Ripple and Noise		mVp-p	-	50	150	Measured with 10uF Tantalum capacitor and 1uF ceramic capacitor at output.
		mVRMS	-	15	50	
Turn-on Delay Time		ms	-	10	25	Time from instant at which Vin=Vin(Turn-on) until Vo=10% of Vo(nom)
Turn-on Rise Time		ms	-	30	50	Time for Vo to rise from 10% of Vo(nom) to 90% of Vo(nom)
Turn-On Transient : Output Voltage Overshoot		%Vo	-	-	3	Vin=Vin(min) to Vin(max), Io=0 to Io(max) Full temperature range

Protection Characteristics

Parameter		Units	Specifications			Notes & conditions
			Min.	Typ.	Max.	
Input Under Voltage Lockout	Turn-on	Vdc	16	17	18	Io=0 to Io(max) Full temperature range
	Turn-off	Vdc	15	16	17	
	Hysteresis	Vdc	0.5	1	1.5	
Output Over Current Protection		A	-	Yes	-	Hiccup Mode Automatic recovery
Output Over Voltage Protection		Vdc	13.44	-	18.00	Clamp voltage Mode
Short Circuit Protection			-	Yes	-	Hiccup Mode Automatic recovery
Over Temperature Protection		℃	-	125	-	Automatic recovery See OTP section
Over Temperature Protection Hysteresis		℃	-	10	-	

General Specifications

Parameter	Units	Specifications			Notes & conditions
		Min.	Typ.	Max.	
Efficiency	%	-	88.5	-	Vin=Vin(nom),Io=Io(max)
Switching Frequency	kHz	300	-	350	Switching Frequency
Weight	g	-	9	-	
MTBF	Hour	6,000,000			According to Telcordia SR332, 40℃
FIT		167			10^9/MTBF
Thermal Stability Time	min	-	30	-	
Safety	Compliant to EN60950-1 and GB4943				
Vibration	IEC60068-2-6:10-500Hz sweep,0.75mm excursion,10g acceleration,10minutes in each 3 perpendicular directions				
Transportation	ETS300019-1-2				
Shock	IEC60068-2-27:200g acceleration, duration 3 ms,6 drops in each 3 perpendicular directions				

Isolation Specifications

Parameter		Units	Specifications			Notes & conditions
			Min.	Typ.	Max.	
Isolation Voltage	Input-Output	Vdc	-	-	1500	Test duration 1 minute, leak current less than 10mA,no arcing or breakdown
Isolation Resistance		MΩ	10	-	-	500Vdc
Isolation Capacitance		pF	-	1000	-	

Characteristic Curves

Efficiency

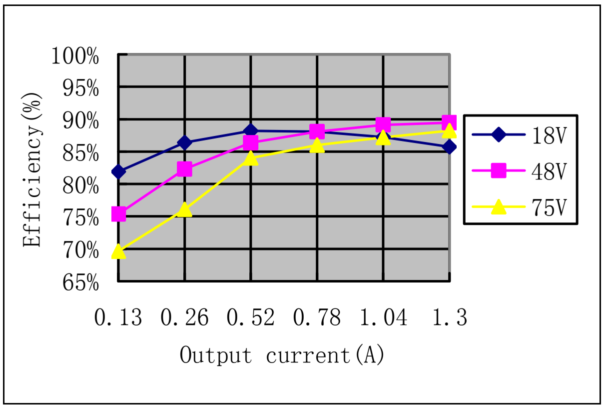


Figure1. Converter Efficiency Vs. Output Current

Derating

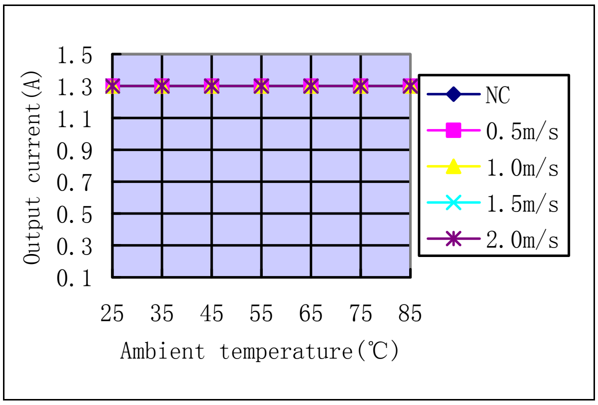


Figure2. Available load current Vs. ambient temperature and airflow for the module mounted horizontally

Test Configurations

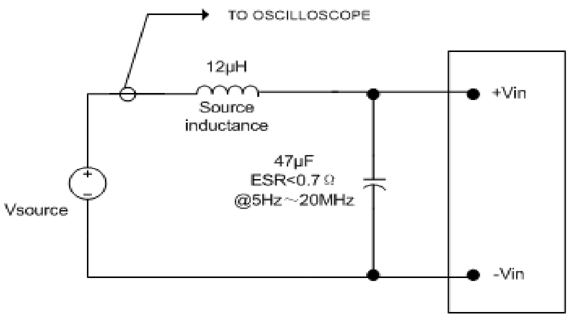


Figure3. Input Reflected Ripple Current Test Setup

Note: Measure input reflected ripple current with a simulated source inductance of 12μH. The measurement points for input reflected ripple current is showed above.

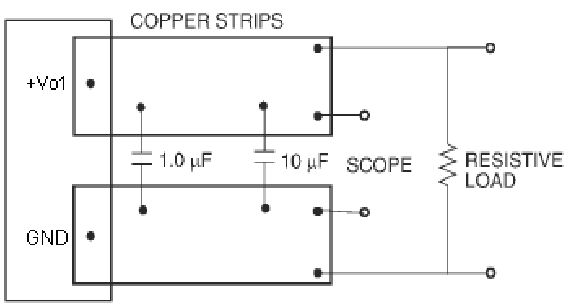


Figure4. Output Ripple and Noise Test Setup

Note: Scope measurements should be made using a BNC socket, with a 1μF ceramic capacitor and a 10 μF tantalum capacitor. Position the oscilloscope probe between 51mm and 76mm (2 inch and 3 inch) from the module.

Design Considerations

Input filtering

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. For the test configuration in Figure3, a 47μF electrolytic capacitor (ESR <0.7Ω,5Hz~20MHz), mounted close to the power module helps ensure stability of the unit.

Safety Considerations

The power module must be installed in compliance with the spacing and separation requirements of the end-user's safety agency standard, i.e., UL60950-1,CAN/CSA-C22.2, No. 60950-1 and EN60950-1:2001(+A11) and IEC60950-1:2005, if the system in which the power module is to be used must meet safety agency requirements.

Basic insulation based on 75 Vdc input is provided between the input and output of the module for the purpose of applying insulation requirements when the input to this DC-to-DC converter is identified as TNV-2 or SELV. An additional evaluation is needed if the source is other than TNV-2 or SELV.

When the input source is SELV circuit, the power module meets SELV (safety extra-low voltage) requirements. If the input source is a hazardous voltage which is greater than 60 Vdc and less than or equal to 75 Vdc, for the module's output to meet SELV requirements, all of the following must be met:

- The input source must be insulated from the ac mains by reinforced or double insulation.
- The input terminals of the module are not operator accessible.
- If the metal baseplate is grounded, one Vi pin and one Vo pin shall also be grounded.
- A SELV reliability test is conducted on the system where the module is used, in combination with the module, to ensure that under a single fault, hazardous voltage does not appear at the module's output.

When installed into a Class II equipment (without grounding), spacing consideration should be given to the end-use installation, as the spacing between the module and mounting surface have not been evaluated.

The power module has extra-low voltage (ELV) outputs when all inputs are ELV.

This power module is not internally fused. To achieve optimum safety and system protection, an input line fuse is highly recommended. The safety agencies require a normal-blow fuse with 3A maximum rating to be installed in the ungrounded lead. A lower rated fuse can be used based on the maximum inrush transient energy and maximum input current.

Feature Descriptions

Remote On/Off

The REM pin is used to turn the power converter remote on or off via a system signal. This power module is negative logic version. When the REM pin is at logic high the power turns off and turns on at logic low.

To turn the power module on and off, the user must supply a switch to control the voltage between the REM pin and -Vin terminal (see Figure 5). A logic low is V_{REM} = -0.7V to 0.8V. The maximum IREM during logic low is 1mA. The switch should maintain a logic low voltage while sinking 1mA.During logic high, the typical maximum V_{REM} voltage is18V.

If not using the remote on/off feature, short REM pin to -Vin.

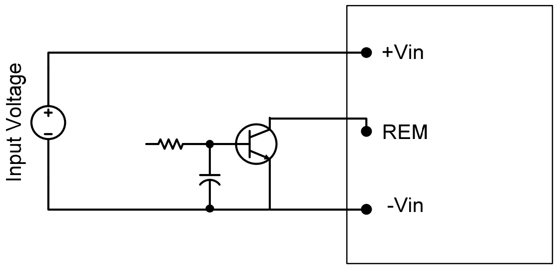


Figure5. Remote On/Off Implementation

Output Voltage Programming

Output voltage trim allows the user to increase or decrease the output voltage set point of a module. This is accomplished by connecting an external resistor between the TRIM pin and either the Vout+ or Vout- pins. If not using the trim feature, leave the TRIM pin open. To increase the output voltage, refer to Figure 6. A trim resistor, Rtrimup, connected between the TRIM and Vout-. The following equation determines the external resistor value to obtain an output voltage change from Vo, nom to the desired Vo, adj:

$$Rtrimup = \frac{2.5 \cdot 10000}{Vo\_adj - 12} - 5110$$

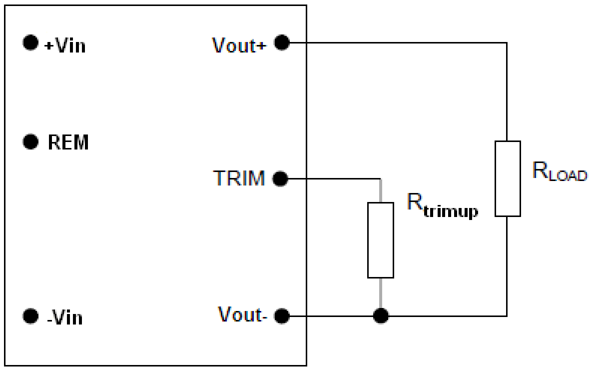


Figure6. Circuit Configuration to Increase Output Voltage

Trimming beyond 110% of the rated output voltage is not an acceptable design practice, as this condition could cause unwanted triggering of the output over voltage protection (OVP) circuit. When trimming up, care must be taken not to exceed the converter's maximum allowable output power.

To decrease the output voltage, refer to Figure 7. A trim resistor, Rtrimdown, connected between the TRIM and Vout+. The following equation determines the external resistor value to obtain an output voltage change from Vo, nom to the desired Vo, adj:

$$Rtrimdown = \frac{(Vo\_adj - 2.5) \cdot 10000}{12 - Vo\_adj} - 5110$$

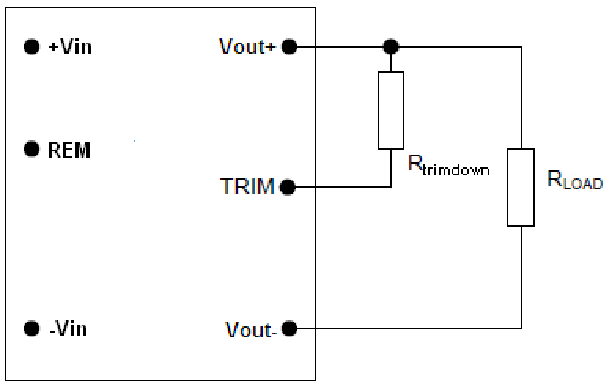


Figure7. Circuit C onfiguration to D ecrease Ou tput Voltage

Protection Features

Over Current Protection

To provide protection in an output overload fault condition, the module is equipped with internal current limiting circuitry, and can endure current limiting continuously.

At the point of current limit inception, the unit enters hiccup mode. The unit is configured with the auto-restart function, it will remain in the hiccup mode as long as the over current condition exists; it operates normally once the output current is reduced back into its specified range.

Output Over Voltage Protection

The output overvoltage protection consists of circuitry that monitors the voltage on the output terminals. If the output voltage exceeds the overvoltage protection threshold, the converter will clamp the output voltage.

Over Temperature Protection

To provide protection under certain fault conditions, the module is equipped with a thermal shutdown circuit. The module will shutdown when the Tref temperature exceeds OTP set value, but the thermal shutdown is not intended as a guarantee that the module will survive when the temperature beyond its rating. The module will automatically restarts after it cools down.

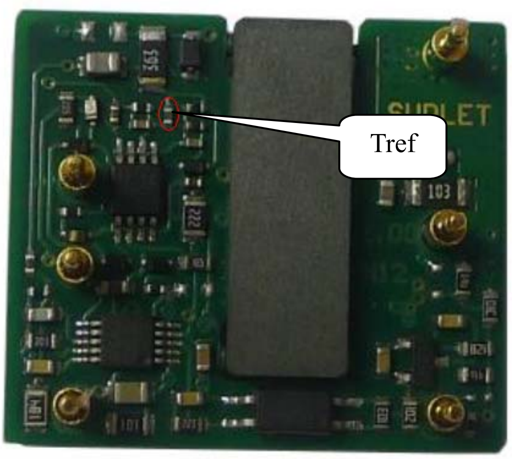


Figure8.Tref Temperature Measurement Location

Input Under Voltage Lockout

Input undervoltage lockout is standard with this converter, when input voltages below the input undervoltage lockout limit, the module operation is disabled. It will only begin to operate once the input voltage is raised above the undervoltage lockout turn-on threshold.

Thermal Considerations

The power modules operate in a variety of thermal environments; however, sufficient cooling should be provided to help ensure reliable operation of the unit.
Considerations include ambient temperature, airflow, module power dissipation, and the need for increased reliability. A reduction in the operating temperature of the module will result in an increase in reliability.

Heat Transfer via Convection

Increasing airflow over the module enhances the heat transfer via convection. Derating curve showing the maximum output current that can be delivered by module versus local ambient temperature for natural convection.

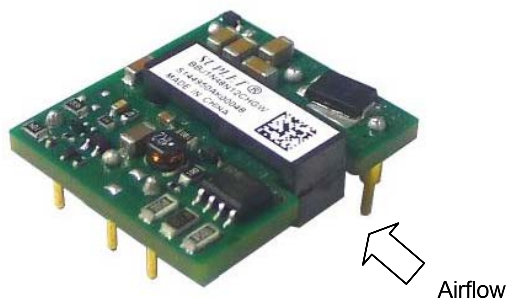


Figure9. Recommended Airflow Direction

Soldering Information （Surface mounting Version）

Reflow Soldering Information

These power modules are large mass, low thermal resistance devices and typically heat up slower than other SMT components. It is recommended that the customer review data sheets in order to customize the solder reflow profile for each application board assembly.
The following instructions must be observed when SMT

soldering these units. Failure to observe these instructions may result in the failure of or cause damage to the modules, and can adversely affect long-term reliability.

Typically, the eutectic solder melts at 217℃ for Pb-free solder process and 183℃ for SnPb solder process, wets the land, and subsequently wicks the device connection. Sufficient time must be allowed to fuse the plating on the connection to ensure a reliable solder joint. There are several types of SMT reflow technologies currently used in the industry. These surface mount power modules can be reliably soldered using natural forced convection, IR (radiant infrared), or a combination of convection/IR. For reliable soldering the solder reflow profile should be established by accurately measuring the modules pin connector temperatures.

Lead-free (Pb-free) solder processes

For Pb-free solder processes, a pin temperature (T_{PIN}) in excess of the solder melting temperature (T_L, +217 to +221°C for Sn/Ag/Cu solder alloys) for more than 30 seconds, and a peak temperature of +235°C on all solder joints is recommended to ensure a reliable solder joint.

For Pb-free solder processes, the product is qualified for MSL 3 according to IPC/JEDEC standard J-STD-020C. During reflow, T_P must not exceed +260°C at any time.

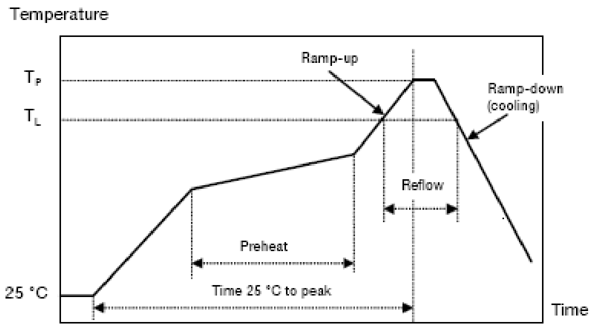


Figure10. Recommended reflow profile.

Reflow process specifications		Pb-free
Average ramp-up rate		3°C/s max
Solder melting temperature (lim)	T_L	+217°C
Time above T_L		30 s~90s
Minimum pin temperature	T_{pin}	+235°C
Peak product temperature	T_p	+260°C
Average ramp-down rate		6°C/s max
Time 25°C to peak		6 minutes max

Soldering Information （Through-Hole Version）

The product is intended for through-hole mounting in a PCB. When SnPb wave soldering is used, the temperature on the pins is specified to maximum 260°C for maximum 10 seconds while the lead-free solder pot is 270°C max.

Maximum preheat rate of 4°C/s and temperature of max 150°C is suggested. Hands soldering care should be taken to avoid direct contact between the hot soldering iron tip and the pins for more than a few seconds in order to prevent overheating.

When PIP(Pin in Paste) Soldering is used, please refer to “Lead-free (Pb-free) solder processes” section for surface mounting version.

A no-clean (NC) flux is recommended to avoid entrapment of cleaning fluids in cavities inside of the DC/DC power module. The residues may affect long time reliability and isolation voltage.

Storage and Handling

The recommended storage environment and handling procedures for moisture-sensitive surface mount packages are detailed in J-STD-033 Rev. B (Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices). Moisture barrier bags (MBB) with desiccant are required for max. MSL1 condition. These sealed packages should not be broken until time of use. Once the original package is broken, the floor life of the product at conditions of ≤ 30°C and 60% relative humidity varies according to the MSL rating (see J-STD-033B).The shelf life for dry packed SMT packages will be a minimum of 12 months from the bag seal date, when stored at the following conditions: < 40° C, < 90% relative humidity.

Post Solder Cleaning and Drying Considerations

Post solder cleaning is usually the final circuit-board assembly process prior to electrical board testing. The result of inadequate cleaning and drying can affect both the reliability of a power module and the testability of the finished circuit-board assembly.

Electromagnetic Compatibility (EMC)

The Figure 11 shows a suggested configuration to meet the conducted emission limits of EN55022 Class A.

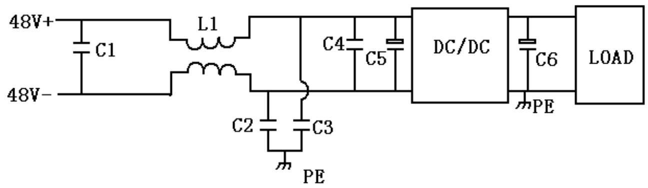


Figure11. Recommended EMC application

Component	Specifications
C1	SMD ceramic capacitor-1uF
C4	SMD ceramic capacitor-0.1uF
L1	Magnetic material-1320uH-+-25%
C2 C3	Film through-hole mounted safety capacitor-0.1uF
C5	Electrolytic capacitor-100uF
C6	Electrolytic capacitor-470uF

Outline Diagram

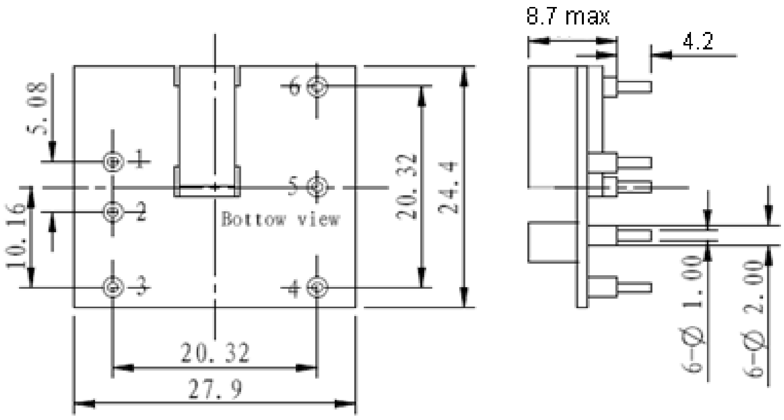


Figure12. Outline Diagram

Dimensions are in millimeters.

Tolerances: x.x mm ± 0.5 mm [unless otherwise indicated]

x.xx mm ± 0.25 mm

Pin Designations

Pin No.	Symbol	Function
1	+Vin	Positive input voltage
2	-Vin	Negative input voltage
3	REM	Remote control
4	Vout-	Negative output voltage
5	TRIM	Output voltage trim
6	Vout+	Positive output voltage

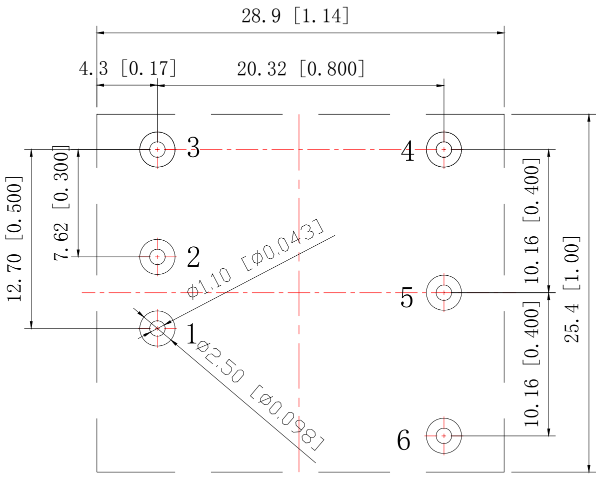


Figure13. Recommended Pad Layout

Dimensions are in millimeters and (inches).

Tolerances: x.x mm ± 0.5 mm (x.xx in. ± 0.02 in.) [unless otherwise indicated]

x.xx mm ± 0.25 mm (x.xxx in. ± 0.010 in)

Packaging Details

The modules are supplied in tape & reel or in trays as an option.

Tray Specifications

Material	PPE ,antistatic
Surface resistance	<10^{10}Ohm
Bankability	The trays can be baked at maximum125℃ for 48 hours maximum
Tray capacity	66products/tray
Box capacity	330 products 5 full trays/box

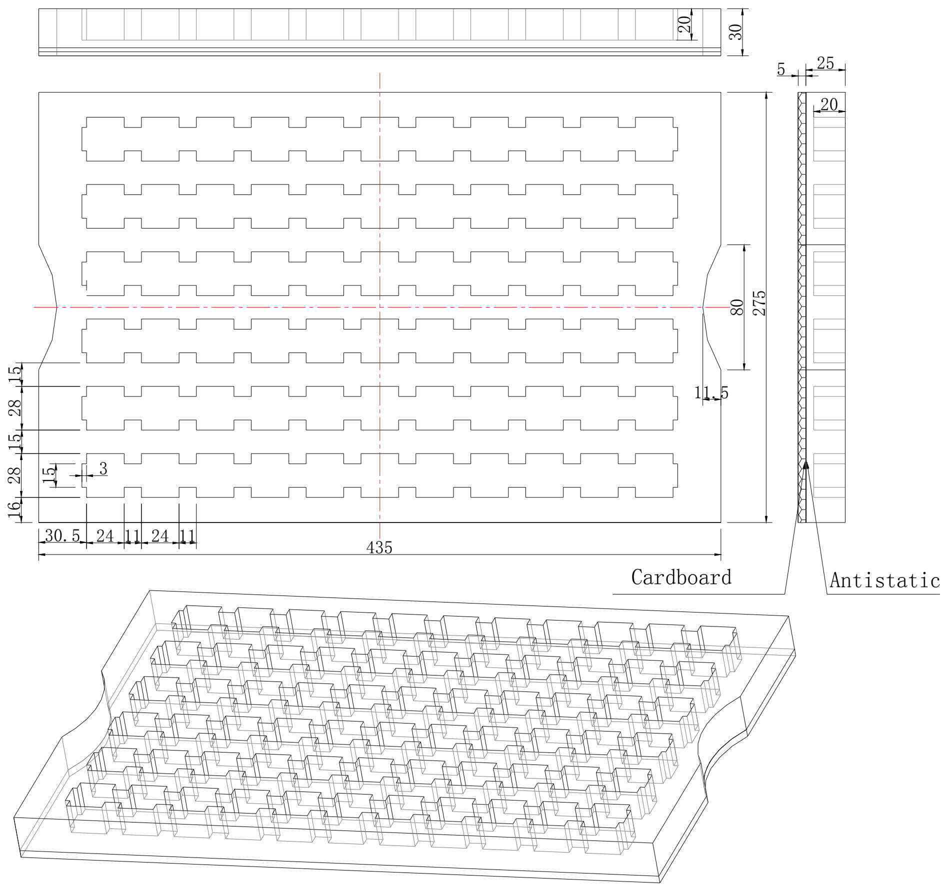
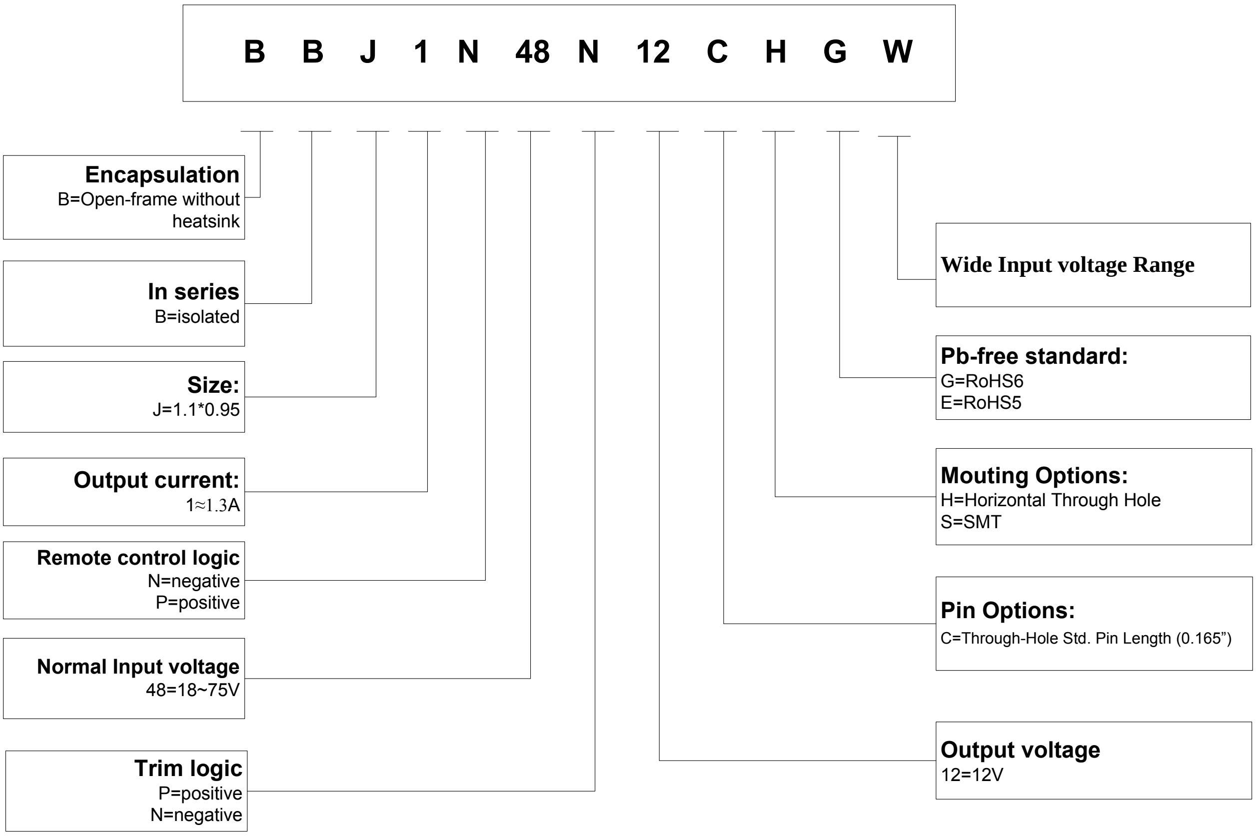


Figure14. Packaging Tray Diagram

Naming Rules on Models



For more information please contact SUPLET Co., Ltd.

1-6/F, No.5 Bldg.,2nd Area
South Zhongguan Honghualing Industrial Park,
Liuxian Road No.1213, Taoyuan Subdistrict, Nanshan,
Shenzhen, Guangdong, China
Tel: +86(755)-86000600 Fax: +86(755)-86001330
E-mail: postmaster@suplethic.com

Web: http://www.suplet.com