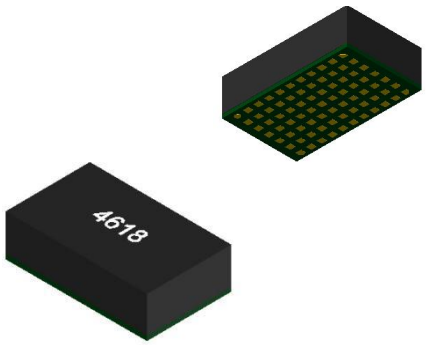
6A Output DC/DC Integrated Plastic-Encapsulated Adjustable Buck Converter Module



1 Features

- **6A output current**
- **Wide input voltage range: 4.5V-24V**
- **Output voltage: 0.6V-5.5V**
- **Switching frequency: 800kHz**
- **Efficiency up to 95%**
- **Soft start**
- **Small size, surface mount package: LGA(15mm×9mm×4.32mm)**

2 Applications

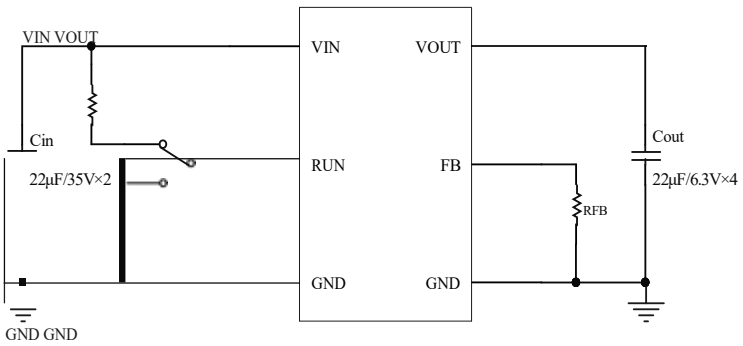
- **ATCA boards**
- **Telecommunications, data communications, networking, and industrial equipment**
- **Card-type and rack-mounted data storage devices**
- **Medical systems**
- **Servers**

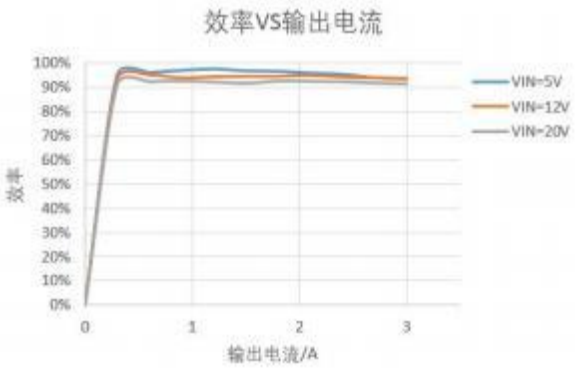
3 Description

The FHT4618 is an integrated 6A DC/DC step-down power supply with an integrated chip, inductors, resistors and capacitors. The FHT4618 has an input voltage range of 4.5V to 24V, an output voltage range of 0.6V to 5.5V, and a switching frequency of 800kHz, and can be used with a small number of input and output filter capacitors.

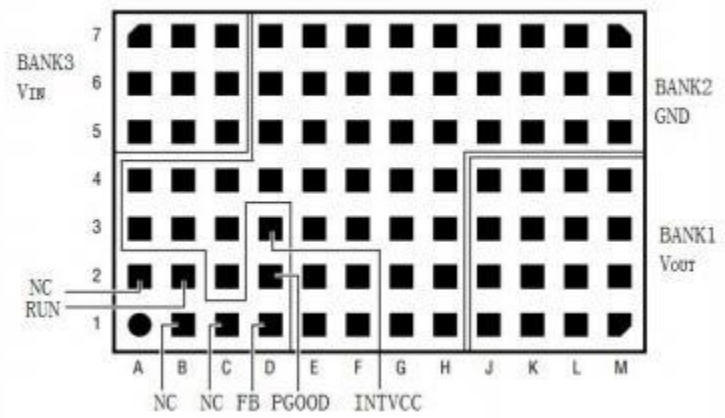
The small size of this product allows it to be mounted on compact PCB boards to supply power to high-density mounted load points.The FHT4618 is packaged in a fast-dissipating, compact, low-profile molded package in an LGA package that measures:15mm×9mm×4.32mm , suitable for SMT auto mounting.

Typical Applications





Pin Configuration



TOP VIEW

Pin	Symbol	Description
BANK1	VOUT	Module voltage output pin.
BANK2	GND	Input and output GND pins.
BANK3	VIN	Module voltage input pin.
D1	FB	Output Voltage Regulation Pin , connect a voltage regulator with 1% or more accuracy to GND.
D2	PGOOD	Module operating status indication. When the output voltage is within 90% to 120% of the set value, this pin is an open drain output.
D3	INTVCC	Internal 5V LDO output. Supplies power to the module's internal analog and driver circuits. Connect a 1μF bypass capacitor to GND.
B2	RUN	Control pin , Ground shuts down the module. Connecting this pin to 1.4V or higher will result in normal operation. If the shutdown function is not used, connect this pin to the VIN pin via a pull-up resistor.
A1, A2, B1, C1	NC	

Ordering Information

Product model	Input		Output	Dimensions and Packaging	Packing
	Input Range	Nominal Input			
FHT4618	4.2V~24V	--	0.6V~5.5V	9mm x 15mm x 4.32mm (LGA)	Tray

Electrical Characteristics

Absolute Maximum Ratings	Condition	Minimum value	Nominal value	Maximum value	Unit
Input Voltage **VIN**				24	V
Output Voltage **VOUT**				5.5	V
RUN pin voltage		-0.3		24	V
FB pin voltage		-0.3		6	V
Storage temperature		-55		+125	℃
Reflow temperature				+245	℃
Input Characteristics	**Condition**	**Minimum value**	**Nominal value**	**Maximum value**	**Unit**
Input Voltage Range		4.5		24	V
Input Undervoltage Lockout Threshold (rising)				4.2	V
Input Undervoltage Lockout threshold (falling)				3.9	V
Minimum starting voltage		4.5			V
Input Current	V_{IN} =20V , V_{OUT} =5V , I_{OUT} =6A		1.71		A
	V_{IN} =7V , V_{OUT} =5V , I_{OUT} =6A		4.65		A
	V_{IN} =20V , V_{OUT} =5V , I_{OUT} =0A		110		μA
	V_{IN} =20V , ON/OFF=OFF		11		μA
General Requirements	**Condition**	**Minimum Value**	**Nominal Value**	**Maximum Value**	**Unit**
Switching Frequency		700	800	900	KHz
Efficiency	V_{IN} =12V , V_{OUT} =5V , I_{OUT} =6A		93%		%
Functionality	**Condition**	**Minimum value**	**Nominal value**	**Maximum value**	**Unit**
RUN enable voltage (rising)		0.8			V
RUN enable voltage (falling)				0.4	V
Output Characteristics	**Condition**	**Minimum value**	**Nominal value**	**Maximum value**	**Unit**
Output voltage	Adjusted by FB to GND resistance	0.6		5.5	V
Linear Regulation	V_{OUT} = 3.3V , 5V < V_{IN} < 24V , I_{LOAD} = 6A			±1	%
Load Regulation	V_{IN} =12V , V_{OUT} =5V,0A < I_{LOAD} ≤ 6A			±2	%
Ripple and Noise	V_{IN} =12V, V_{OUT} =5V, I_{OUT}=6A, Cout=22uF×4, 20MHz bandwidth		30		mV
Output Characteristics	**Condition**	**Minimum value**	**Nominal value**	**Maximum value**	**Unit**
Dynamic Load Response	50-100% ILOAD, di/dt = 2A/μS Cout =22 uF×4		520		mV

Electrical Characteristics

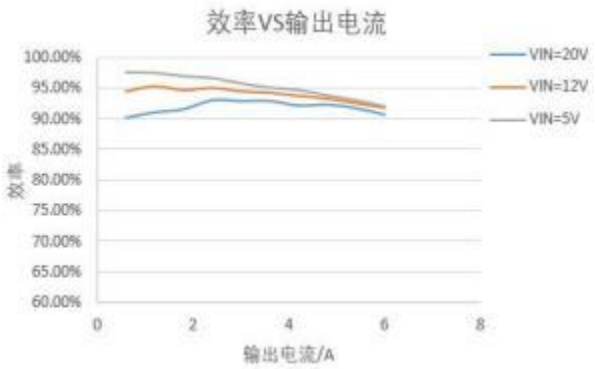
Structural Characteristics	Conditions	Minimum Value	Nominal value	Maximum value	Unit
Size	9×15×4.32				mm
Weight			2		g
Environmental Adaptability	**Condition**	**Minimum value**	**Nominal value**	**Maximum value**	**Unit**
Operating temperature (operating junction temperature)		-40		125	℃
High temperature storage (ambient temperature)	+125℃ , 48h			125	℃
High temperature operation (ambient temperature)	+85°C , 24h; Input low, standard and high voltage 8h each; V_{IN} =24V , V_{OUT} =5V , I_{OUT} =3A			85	℃
Low temperature storage (ambient temperature)	-55°C, 24h	-55			℃
Low temperature operation (ambient temperature)	-40°C , 24h; Input low pressure, standard pressure, high pressure each 8h	-40			℃
Damp heat	High temperature and high humidity stage: 60℃, 95%; Low temperature and high humidity stage: 30℃, 95%; 10 cycles, each cycle is 24h.	30		60	℃
Temperature shock	High temperature 125 ℃, low temperature -55 ℃, high and low temperature of an hour for a cycle, a total of 32 cycles of the test	-55		125	℃

Note 1: Stresses above the values listed in the "Limit Values" section may cause permanent damage to the device. Prolonged exposure to any of the absolute maximum ratings may affect the reliability and service life of the device.

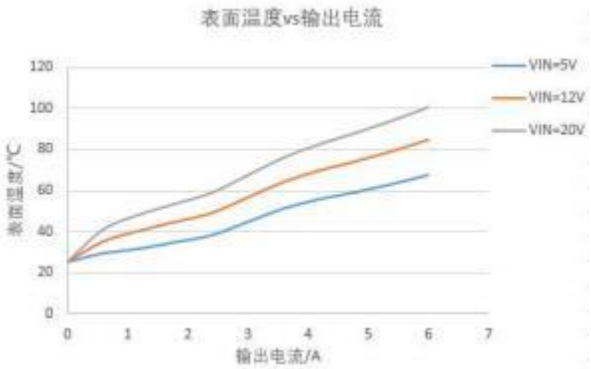
Note 2: The maximum continuous output current may be derated due to the junction temperature of the FHT3860.

Note 3: The performance specifications of the FHT3860 are guaranteed over the full -40°C to 125°C internal operating stability range. Note that the maximum internal temperature is determined by specific operating conditions in conjunction with the board layout, rated thermal resistance of the package, and other environmental factors.

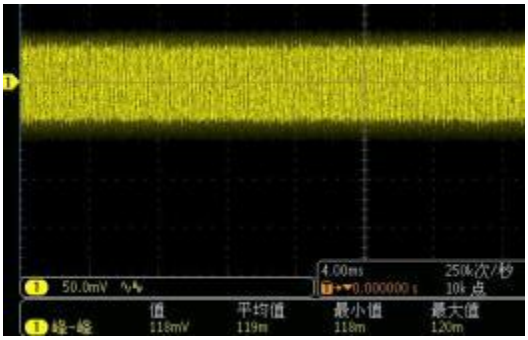
Efficiency VS Output V_{OUT} = 5V



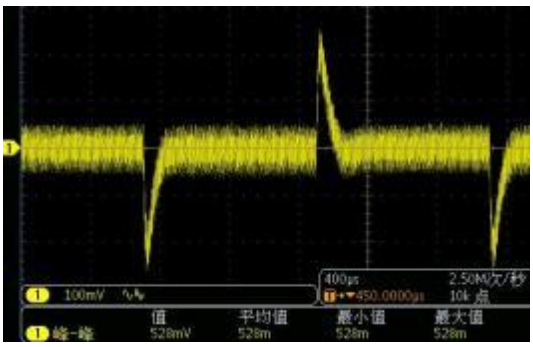
Temperature rise VS V_{OUT} = 3.3V



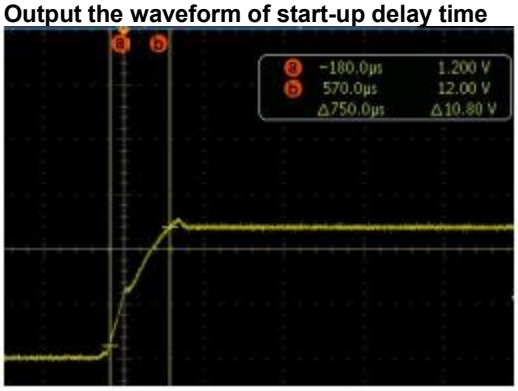
Output ripple and noise (V_{IN} =20V , V_{OUT} =5V , I_{OUT} = 6A, C_{out} 22uF x 4)



Dynamic load response (V_{IN} =20V , V_{OUT} =5V , I_{OUT} =3A to 6A, 2A/uS)



Output the waveform of start-up delay time



Overview

The FHT4618 is a standalone, non-isolated buck switching DC/DC power module with an input range of 4.5V to 24V, capable of providing an output current up to 6A. This power module offers ultra-high conversion efficiency and precisely adjustable output voltage ranging from 0.6V to 5.5V. Since the FHT4618 is a buck converter, please ensure that the input voltage is sufficiently high to support the required output voltage and load current.

Selection of Input Capacitance

It is recommended to choose a ceramic capacitor with a capacitance of 10μF, a voltage rating of 35V, and an X5R or higher specification. Ceramic capacitors are characterized by their small size, high reliability, and very low Equivalent Series Resistance (ESR). X5R and X7R ceramic capacitors maintain stable performance over a wide range of temperatures and voltages, effectively reducing input voltage ripple.

Selection of Output Capacitance

It is recommended to choose a ceramic capacitor with a capacitance of 100μF, a voltage rating of 6.3V, and an X5R or higher specification for the output capacitor. It is advisable to use multiple capacitors in parallel, with a total capacitance of 100μF or more. Connecting multiple ceramic capacitors in parallel can reduce their equivalent ESR (Equivalent Series Resistance) and ESL (Equivalent Series Inductance), thereby effectively lowering the output voltage ripple.

Output Voltage Setting

The output voltage of the module can be set by the external GND resistor R_{FB} on the FB pin, and the reference formula is as follows:

$$R_{FB} = \frac{0.6V}{V_{OUT} - 0.6V} \cdot 60.4k$$

Note: It is recommended that two resistor positions be reserved for precise adjustment of the output voltage.The resistance value of R_{FB} is adjusted according to the customer's requirement, where R_{FB} is in kΩ.

PFM model

At light load, the FHT4618 operates in PFM mode, and to improve the efficiency at light load, the switching frequency decreases as the load current decreases.

This reduces switching losses. When the load is increased, the switching frequency increases and the ripple decreases.

Over-current protection

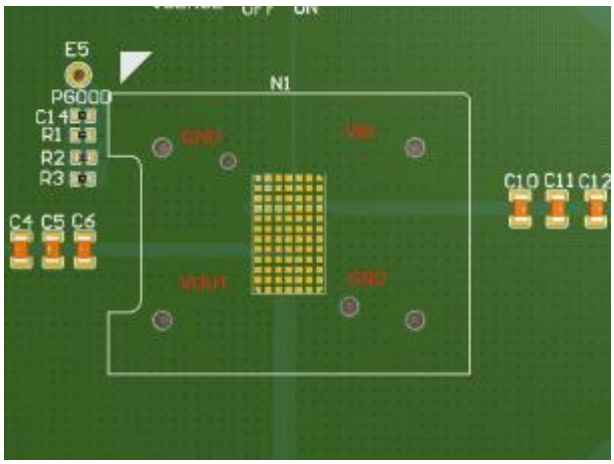
When the output current exceeds 9A, the module triggers hiccup over-current protection.

Input Under-Voltage Protection

The input under-voltage protection is triggered and locked when the input voltage drops below 4.2V. The module will start up when the input voltage rises above 4.5V and the voltage at the RUN pin is above 0.8V.

PCB Layout

Due to the high integration of components required for power conversion in the FHT4618, it eliminates most of the tricky issues related to PCB layout. However, it is still necessary to optimize the PCB routing as much as possible to ensure its proper operation. Even with its high integration, good grounding and heat dissipation are still essential when using the module. The recommended layout diagram is shown below:

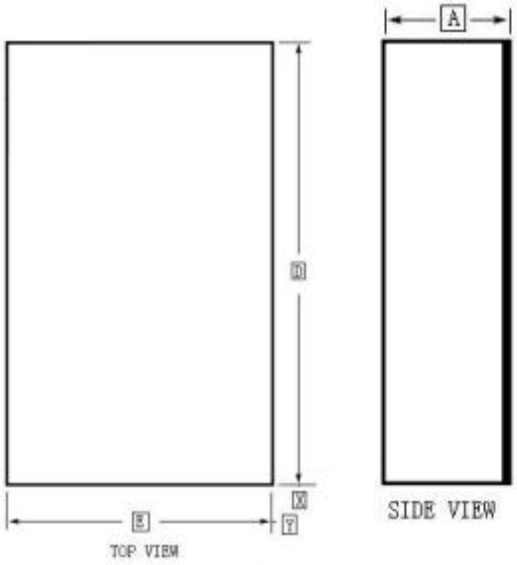


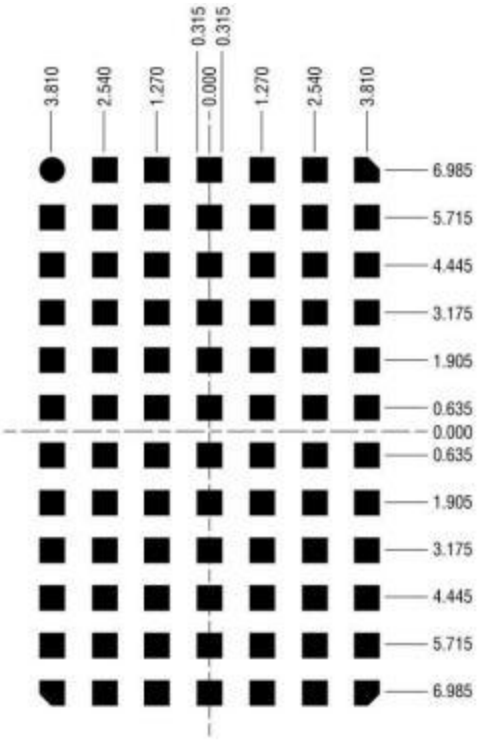
1. Place the R_{FB} resistor as close as possible to its corresponding pin.
2. Position the **Cin** capacitor as close as possible to the **Vin** and **GND** connections of the **FHT4618**.
3. Locate the **Cout** capacitor as close as possible to the **Vout** and **GND** connections of the **FHT4618.**
4. When placing the **Cin** and **Cout** capacitors, ensure that their grounding currents flow directly near or underneath the **FHT4618**.
5. Connect all **GND**s to the largest possible copper pour area on the top layer, avoiding any breaks in the grounding connection between external components and the **FHT4618.**
6. For effective heat dissipation, use vias to connect the GND copper pour area to the internal grounding plane of the circuit board, providing both a good grounding connection and a thermal path to the internal plane of the board. Since they are close to the internal power processing components, the FHT4618 can benefit from these vias connecting to the internal **GND** plane of the **PCB** for heat dissipation. The optimal number of thermal vias depends on the **PCB** design. For example, if the board uses very small vias, more thermal vias may be required to ensure adequate heat dissipation.

Package Description

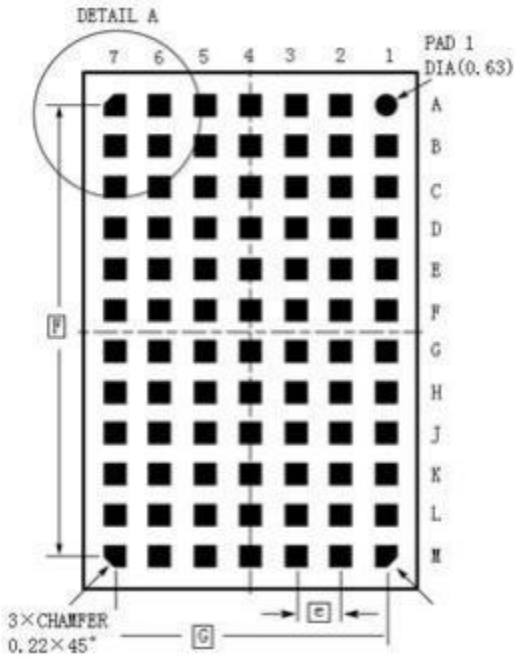
LGA package

84 pins (9mm x 15mm x 4.32mm)





TOP VIEW

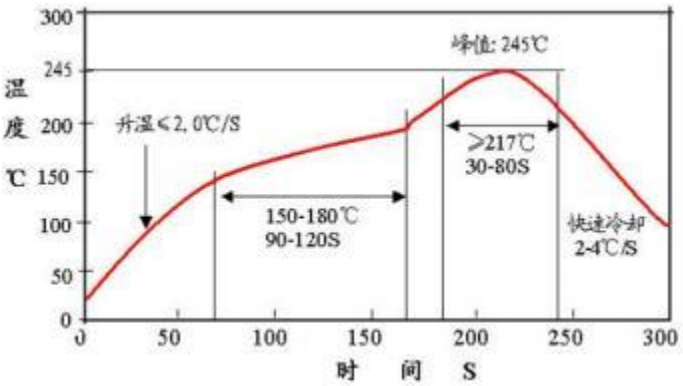


BOTTOM VIEW

DIMENSIONS			
SYMBOL	**MIN**	**NOM**	**MAX**
A	4.12	4.32	4.52
b	0.6	0.63	0.66
D		15	
E		9	
e		1.27	
F		13.97	
G		7.62	

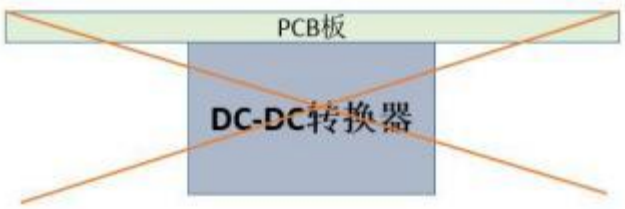
Soldering and Storage Precautions

Recommended reflow soldering profile



Caution:

1. Due to the large size of the module, please do not place the module under the board for reflow soldering to avoid falling off.



2. For bulk products and those that have been taken out of their original packaging, they should be stored in a desiccator (with a relative humidity of less than 10% inside). For products still in their original packaging, they should also be stored in a desiccator whenever possible.

3. Before mounting on the board, it is necessary to strictly follow the baking conditions to dry the samples: bake at 125°C for more than 48 hours, and control the reflow soldering temperature within 245°C.