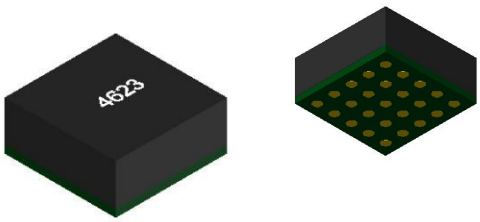
FHT4623

3A Output DC/DC Integrated Plastic-Encapsulated Adjustable Buck Converter Module



1 Features

- **3A output current**
- **Wide input voltage range: 4.2V-20V**
- **Output voltage: 0.6V-5.5V**
- **Switching frequency: 800kHz**
- **Efficiency up to 95%**
- **Soft start**
- **Small size, surface mount package: LGA (6.75mm x 6.75mm x 2.95mm)**

2 Applications

- **PCIe boards, back-powered boards**
- **Telecommunications, Data Communications, Networking, and Industrial Equipment**
- **Card-type and rack-mounted data storage devices**

3 Description

The FHT4623 is an integrated DC/DC buck converter with a 3A output.

It internally integrates components such as chips, inductors, resistors, capacitors, and other elements.

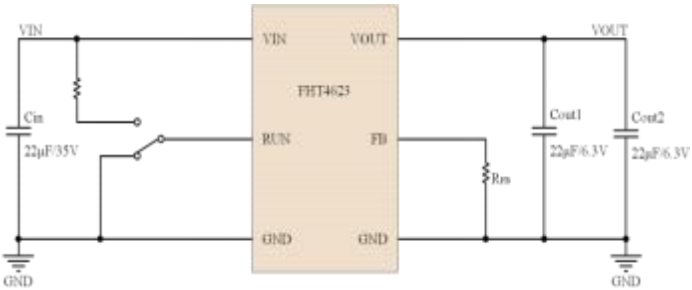
The input voltage range of the FHT4623 is from 4.2V to 20V, and the output voltage range is from 0.6V to 5.5V, with a switching frequency of 800kHz. Only a small number of input and output filter capacitors are required for external configuration to use it.

This product is small in size and can be mounted on space-constrained PCB boards to power load points with high-density installations.

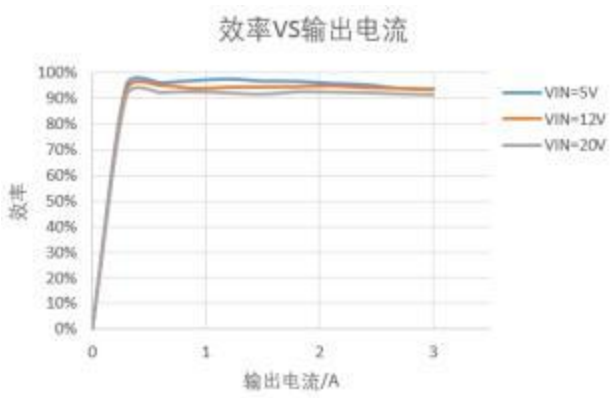
The FHT4623 is encapsulated in a heat-dissipating, compact, and small molded package using an LGA package with dimensions of 6.75mm×6.75mm×2.95mm, suitable for SMT automatic placement.

Typical Applications

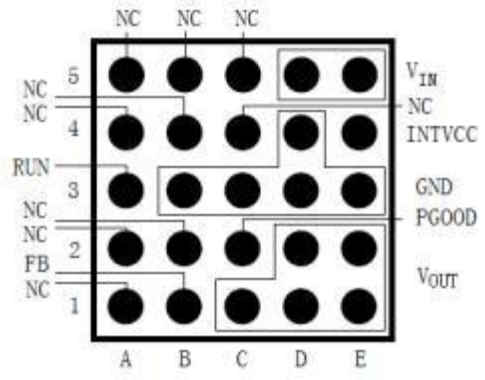
5V/3A Buck Converter Module



Efficiency @Vout=5V



Pin Configuration



TOP VIEW

Pin	Symbol	Description
C1, D1, E1	V_{OUT}	Module voltage output pin.
b3, c3, d3, e3, d4	GND	Input and output GND pins.
D5,E5	V_{IN}	Module voltage input pin.
B1	FB	Output voltage adjustment pin, connect 1% or more accuracy regulator resistor to GND.
C2	PGOOD	Module operating status indication. This pin is an open drain output when the output voltage is within 90% to 120% of the set value.
E4	INTVCC	Internal 5V LDO output. Supplies power to the module's internal analog and driver circuits. Connect a 1μF bypass capacitor to GND.
A3	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, A4, A5 B2, B4, B5 C4,C5	NC	

Ordering Information

Product model	Input		Output	Dimensions and Packaging	Packing
	Input Range	Nominal Input			
FHT4623	4.2V~20V	--	0.6V~5.5V	6.75mm × 6.75mm × 2.95mm (LGA)	Tray

Electrical Characteristics

Absolute Maximum Ratings	Condition	Minimum value	Nominal value	Maximum value	Unit
Input Voltage **VIN**				24	V
Output Voltage **VOUT**				24	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		4.2		20	V
Input Undervoltage Lockout Threshold (rising)				4.2	V
Input under-voltage Lockout Threshold (falling)				3.9	V
Minimum starting voltage		4.2			V
Input Current	V_{IN} =20V , V_{OUT} =3.3V , I_{OUT}=3A		0.55		A
	V_{IN} =5V , V_{OUT} =3.3V , I_{OUT}=3A		2.14		A
	V_{IN} =20V , V_{OUT} =3.3V , I_{OUT}=0A		105		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} =5V , V_{OUT} =3.3V , I_{OUT}=3A			97	%
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} < 20V , I_{LOAD} = 3A			±1	%
Load Regulation	V_{IN} =12V , V_{OUT} =12V,0A < I_{LOAD} ≤ 3A			±1.5	%
Ripple and Noise	V_{IN} =12V , V_{OUT} =3.3V , I_{OUT} =3A, C_{out} =22uF×2, 20MHz bandwidth		30		mV
Dynamic Load Response	50-100% ILOAD , di/dt = 2A/μS C_{out} =22 uF×2		520		mV

Electrical Characteristics

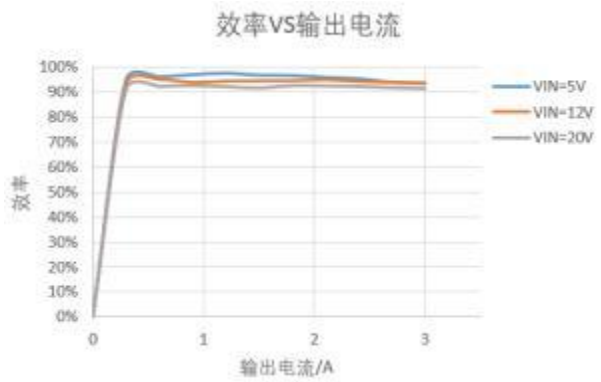
Structural Characteristics	Conditions	Minimum Value	Nominal value	Maximum value	Unit
Size	6.75 x 6.75 x 2.95				mm
Weight			2		g
Environmental Adaptability	**Condition**	**Minimum value**	**Nominal value**	**Maximum value**	**Unit**
Operating temperature (operating junction temperature)		-40		125	℃
High temperature storage (ambient temperature)	+125℃ , 48h			125	℃
High temperature operation (ambient temperature)	+85°C , 24h; Input low, standard and high pressure for 8h each; V_{IN} =60V , V_{OUT} =12V , I_{OUT} =2.4A			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	℃
Thermal shock	High temperature 125 ℃, low temperature -55 ℃, high and low temperatures of one 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 life of the device.

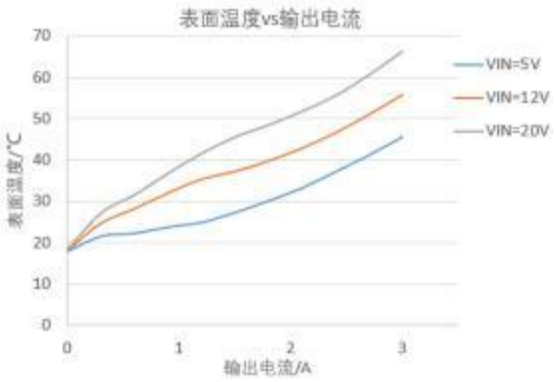
Note 2: The maximum continuous output current may be derated due to the FHT4623 junction temperature.

Note 3: The performance specifications of the FHT4623 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, the rated thermal resistance of the package, and other environmental factors.

Efficiency VS Output V_{OUT} = 3.3V

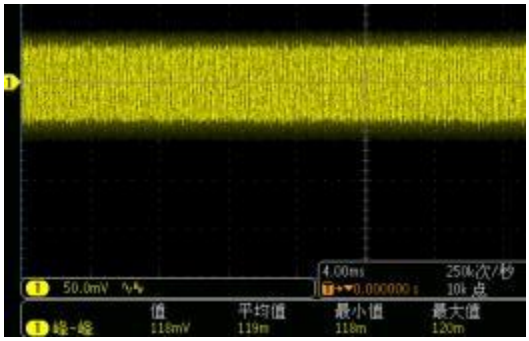


Temperature rise VS V_{OUT} = 3.3V



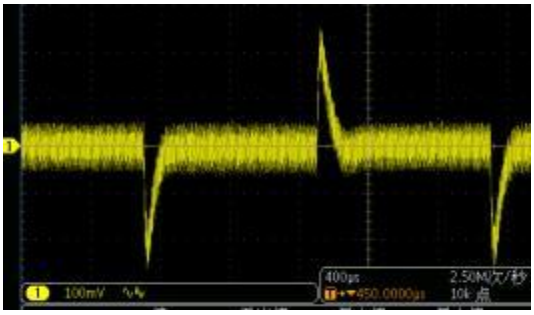
Output ripple and noise

(V_{IN} =20V , V_{OUT} =5V , I_{OUT} = 3A , C_{out1} =C_{out2} =22uF)

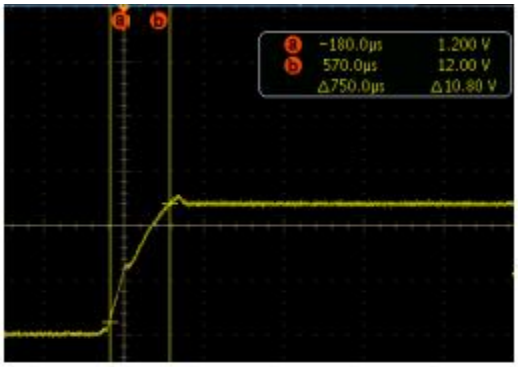


Dynamic Load Response

(V_{IN} =20V, V_{OUT} =5V, I_{OUT} =1.5A to 3A, 2A/uS)



Output startup delay time waveform



Operation

The FHT4623 is a self-contained, non-isolated, step-down switching DC/DC power supply module with an input range of 4.2V to 20V, capable of delivering up to 3A of output current. The module offers high conversion efficiency and a precisely adjustable output voltage from 0.6V to 5.5V. Since the FHT4623 is a step-down converter, make sure the input voltage is high enough to support the required output voltage and load current.

Selection of Input Capacitance

Input capacitors of 10μF/35V/X5R and above are recommended. Ceramic capacitors have the characteristics of small size, high reliability, very low ESR, etc. X5R, X7R type ceramic capacitors can maintain stable performance in a wide range of temperature and voltage, which can effectively reduce the input voltage ripple.

Selection of Output Capacitance

The recommended output capacitor is a 47μF/6.3V/X5R or higher ceramic capacitor. It is recommended that multiple capacitors be connected in parallel with a total capacitance of 47μF or more. Parallel connection of multiple ceramic capacitors can reduce the equivalent ESR and ESL, thus effectively reducing 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 requirements, where R_{FB} is in kΩ.

PFM model

During light load, the FHT4623 operates in PFM mode, and the switching frequency decreases as the load current decreases in order to improve the efficiency during light load.

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

Over-current protection

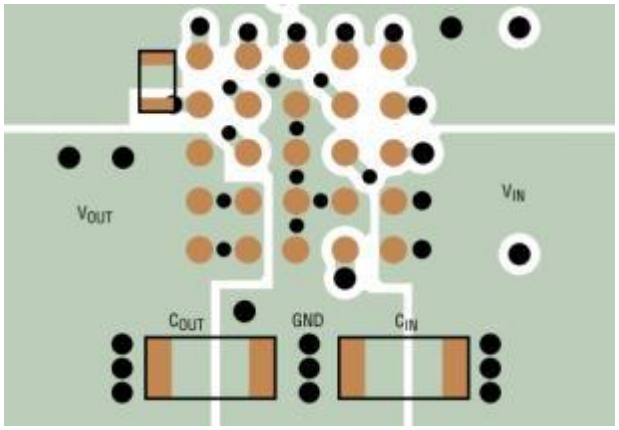
When the output current is greater than 6A, the module triggers hiccup overcurrent protection

Input Under-Voltage Protection

Input undervoltage protection is triggered and locked when the input voltage drops below 3.9V; the module starts when the input voltage rises above 4.2V and the RUN pin voltage is above 0.8V.

PCB Layout

Due to the high integration of components required for power conversion in the FHT4623, 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 level of integration, good grounding and heat dissipation are still essential when using the module. The recommended layout diagram is shown in the following figure:



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.

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 FHT4623.

3.Locate the Cout capacitor as close as possible to the Vout and GND connections of the FHT4623.

4.When placing the Cin and Cout capacitors, ensure that their grounding currents flow directly near or underneath the FHT4623.

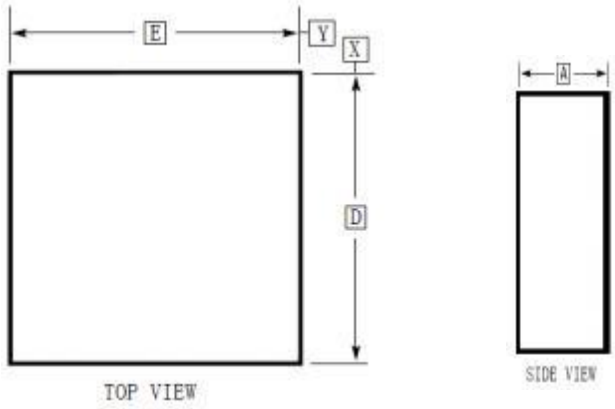
5.Connect all GNDs to the largest possible copper pour area on the top layer, avoiding any breaks in the grounding connection between external components and the FHT4623.

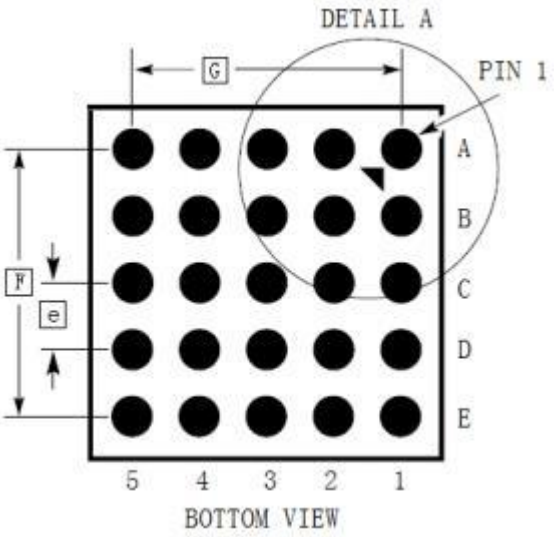
For effective heat dissipation, use vias to connect the GND copper pour area to the internal grounding plane of the circuit board, providing both a good grounding connection and a thermal path to the internal plane of the board. Since they are close to the internal power processing components, the FHT4623 can benefit from these vias connecting to the internal GND plane of the PCB for heat dissipation. The optimal number of thermal

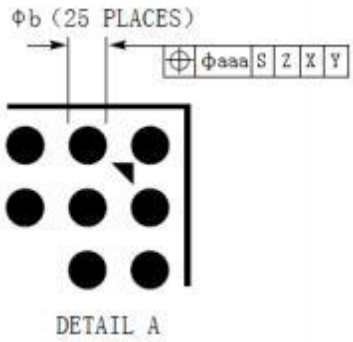
Package Description

LGA package

25 pins (6.75mm x 6.75mm x 2.95mm)



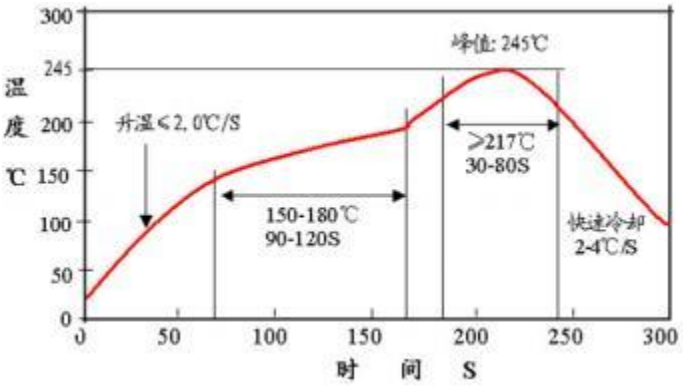




DIMENSIONS			
SYMBOL	**MIN**	**NOM**	**MAX**
A	1.72	1.82	1.92
b	0.6	0.63	0.66
D	6.55	6.75	6.95
E	6.55	6.75	6.95
e		1.27	
F		5.08	
G		5.08	
aaa			0.15

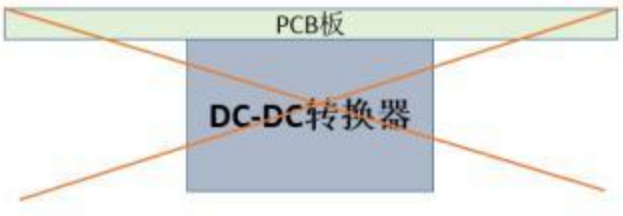
Soldering and Storage Precautions

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.