

16V, 2A Synchronous Buck Converter

1.Description

The FDK1620 devices are synchronous step-down converters optimized for small solution size and high efficiency. The devices integrate switches capable of delivering an output current up to 2A. The devices are based on an adaptive on time with current mode control scheme. Typical operating frequency is 600 KHz at medium to heavy loads. The devices are optimized to achieve very low output voltage ripple even with small external components and feature an excellent load transient response. The low impedance internal MOSFET supports high efficiency operation with wide input voltage range from 4.5V to 16V. Power sequencing is possible by configuring the Enable pin. Other features like over current protection and over temperature protection are built-in. The FDK1620 devices are available in a SOT23-6 pin package.

2.Features

- 4.5V to 16V Input Voltage Range
- 600KHz Typical Switching Frequency
- Output Current up to 2A (Max)
- Adaptive On Time Current Control
- 400 μ A Operating Quiescent Current
- Up to 93% Efficiency
- Over Current Protection
- Excellent Transient Load Response
- Internal Soft Startup of 300 μ s (Typ.)
- Thermal Shutdown Protection

3.Applications

- Portable TV
- LCD/OLED Monitors and TV
- DSL Modems
- IP CAM
- CCTV
- Set Top Boxes (STB)
- Networking

4.Typical Application

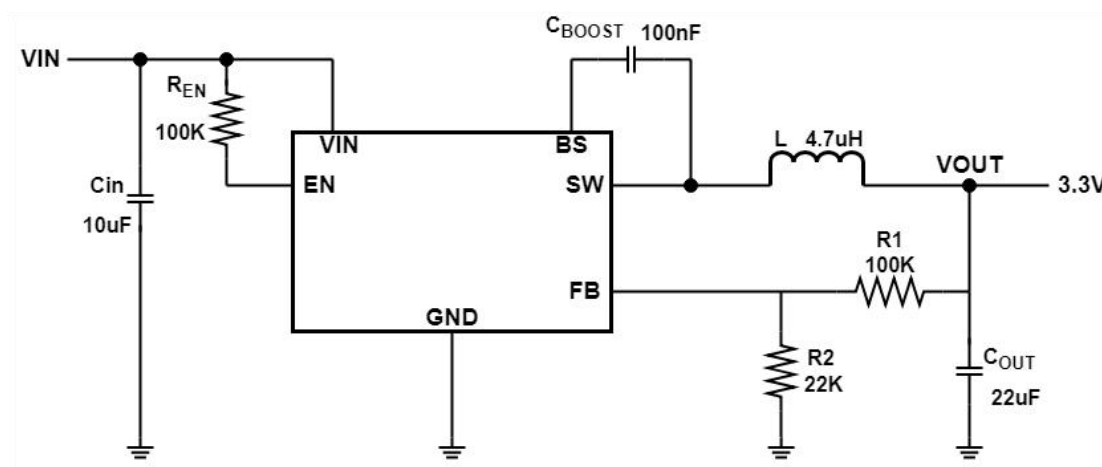


Figure 1. Typical Application for FDK1620

VOUT		R1	R2
$V_{OUT}=V_{FB} \cdot (R1 + R2)/R2$	5.0V	100K	13.6K
	3.3V	100K	22K
	2.5V	68K	21.5K
	1.8V	43.2K	21.5K
	1.5V	33K	22K
	1.2V	22K	22K
	1.0V	15K	22K

5.Order information

Mode	Package	Specified Temperature range	Ordering Number	Packing Option
FDK1620	SOT23-6	-40℃ to +150℃	FDK1620YSOT236G/TR	Tape and Reel,3000

6.Pin Configuration

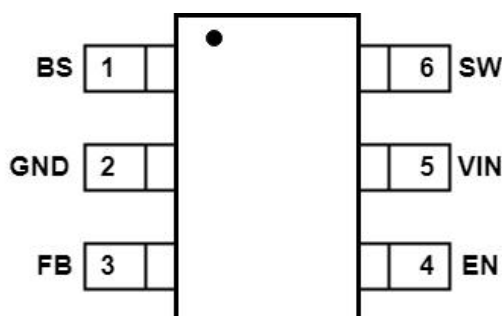


Figure 2. Pin Assignment of FDK1620 Package SOT23-6

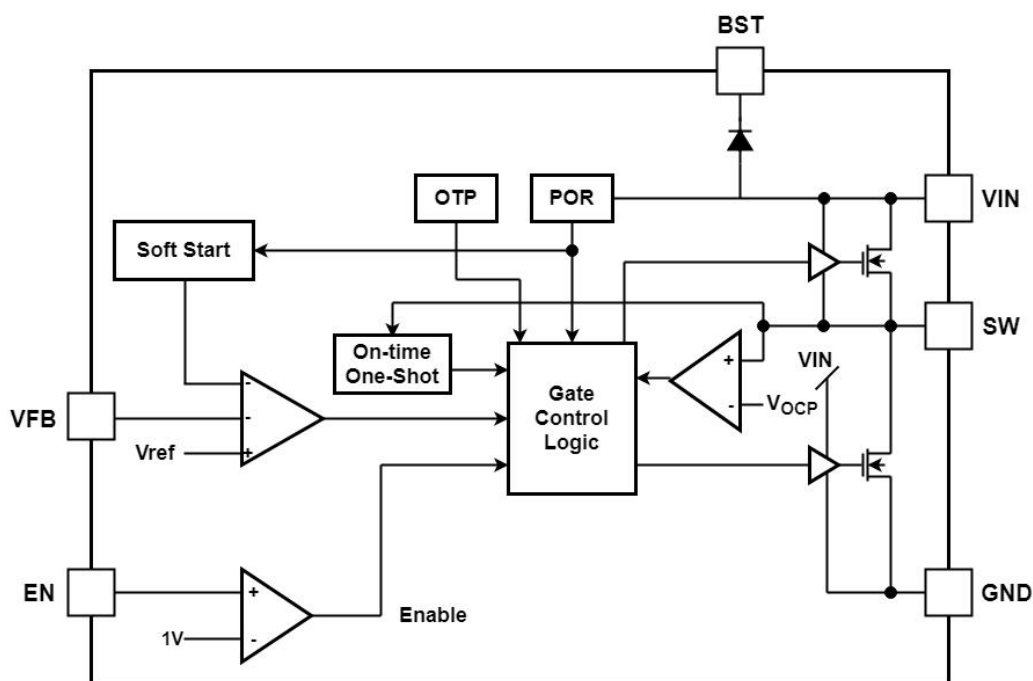
7.Pin Description

Pin Name	Pin No.	Pin Function
BS	1	Boot-Strap Pin. Supply high side gate driver. Connect a 22nF~100nF ceramic capacitor between the BS and LX pins.
GND	2	Ground
FB	3	Feedback pin for the internal control loop. Connect this pin to the external feedback divider.
EN	4	Device enable logic input. Logic HIGH enables the device. Logic LOW disables the device and turns it into shutdown. Do not leave floating.
VIN	5	Power supply voltage input.
SW	6	Feedback pin for the internal control loop. Connect this pin to the external feedback divider.

8. Absolute Maximum Ratings

- VIN-----0.3V to +20V
- LX, EN-----0.3V to VIN+0.3V
- FB, BS-SW-----0.3V to +5V
- Junction Temperature -----125°C
- Lead Temperature (Soldering, 10 sec.) -----300°C
- Storage Temperature ----- -65°C to 150°C

9. Functional Block Diagram



10. Electrical Characteristics

$V_{IN}=12V$, $V_{OUT} = 1.2V$, $L = 2.2\mu H$, $C_{OUT} = 10\mu F$, $T_J=25^{\circ}C$, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input voltage	V_{IN}		4.5		16	V
Quiescent current	I_Q	$I_{OUT} = 0A$, no switching	--	400	--	μA
Under voltage lock out	V_{UVLO}	V_{IN} rising	--	4.3	4.5	V
Under voltage lock out hysteresis	V_{UVLO_HY}	V_{IN} falling	--	0.15	--	V
EN high level voltage	V_{ENH}		1.5	--	--	V
EN low level voltage	V_{ENL}		--	--	0.4	V
Shutdown current	I_{SD}	EN=LOW	--	5	10	μA
Output voltage	V_{OUT}		0.6	--	$D_{MAX} \cdot V_{IN}$	V
Feedback voltage	V_{FB}		0.588	0.6	0.612	V
FB pin current	I_{FB}	$V_{FB} = V_{IN}$	-50		50	nA
High-side switch resistance	$R_{DS(on)H}$	$V_{BS-LX} = 4.8V$	--	120	--	m Ω
Low-side switch resistance	$R_{DS(on)L}$	$V_{IN} = 5V$	--	100	--	m Ω
High-side switch peak current limit	I_{LIM_H}		2.4			A
Switching frequency	f_{SW}		--	520	--	KHZ
Minimum ON-time	t_{ONMIN}		--	50	--	nS
Minimum OFF-time	t_{OFFMIN}		--	100	--	nS
Soft Start time	t_{SS}			300		μS
Thermal shutdown threshold	T_{SDN}		--	150	--	$^{\circ}C$
Thermal Shutdown Hysteresis	T_{SDNHY}		--	30	--	$^{\circ}C$

11. Typical Performance Characteristics

$V_{IN}=12V$, $V_{OUT} = 3.3V$, $L = 4.7\mu H$, $C_{OUT} = 22\mu F$, $T_J=25^{\circ}C$, unless otherwise specified

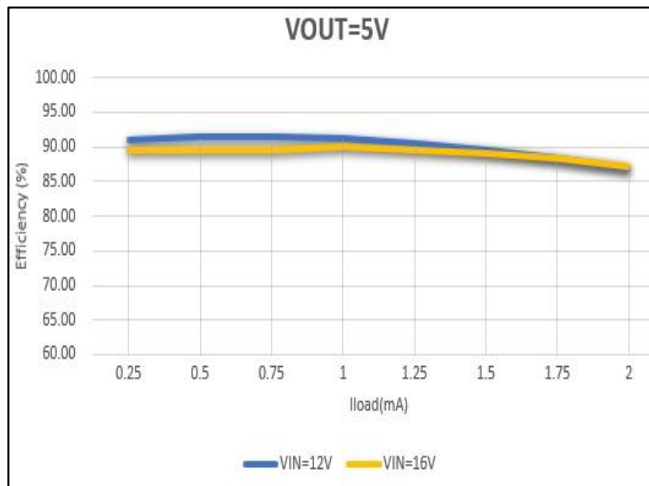


Fig 1 Efficiency vs Load

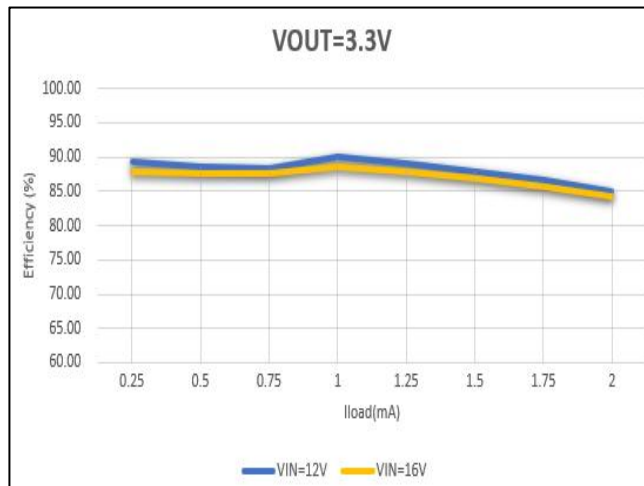


Fig 2 Efficiency vs Load

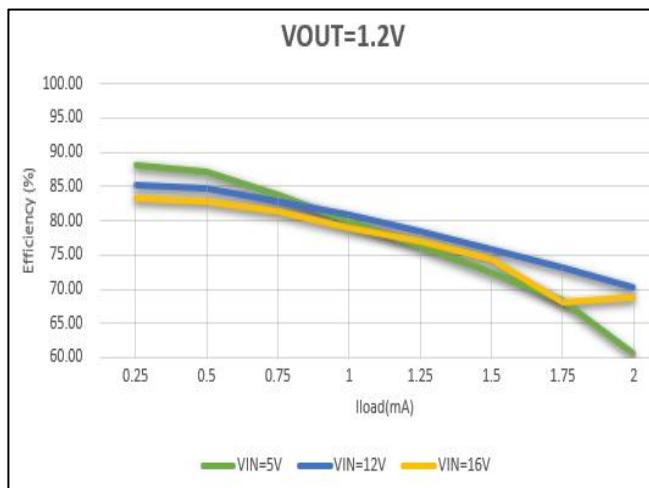


Fig 3 Efficiency vs Load

12. Operating Waveforms

$V_{IN}=12V$, $V_{OUT}=3.3V$, $L=4.7\mu H$, $C_{OUT}=22\mu F$, $T_J=25^{\circ}C$, unless otherwise specified

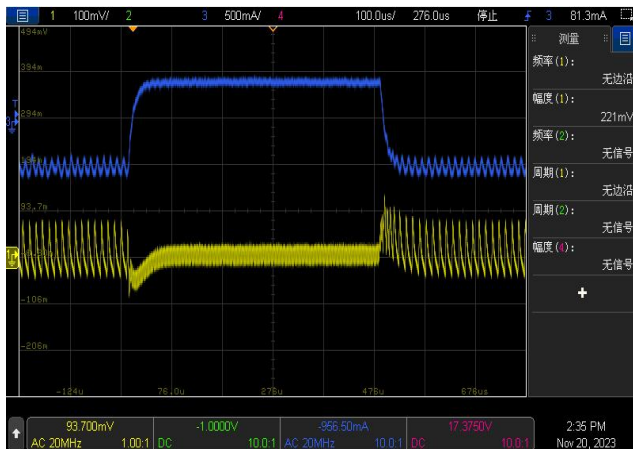


Fig 5 Load Transient ($V_{in}=12V$, $V_{out}=3.3V$, $I_{LOAD}=0.1-1A$)

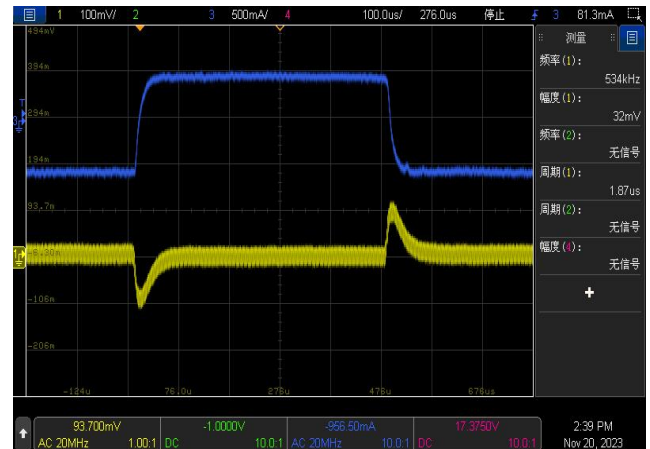


Fig 6 Load Transient ($V_{in}=12V$, $V_{out}=3.3V$, $I_{LOAD}=1-2A$)

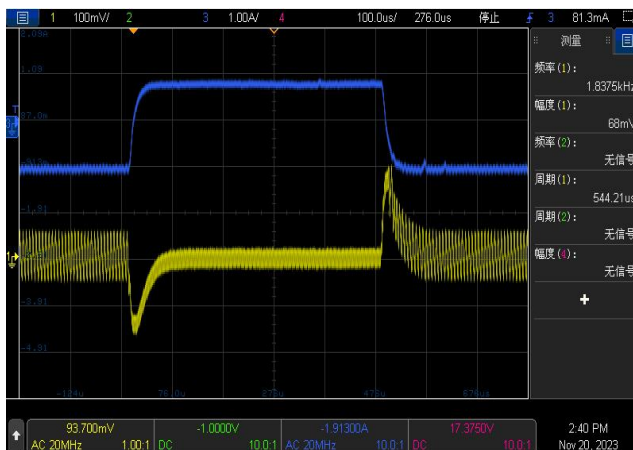


Fig 7 Load Transient ($V_{in}=12V$, $V_{out}=3.3V$, $I_{LOAD}=0.2-2A$)

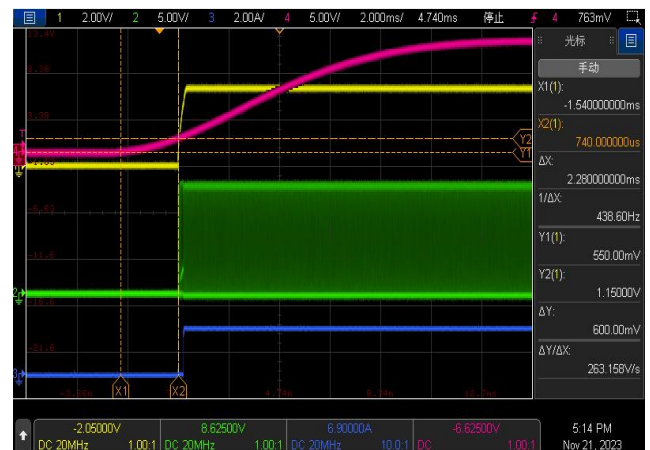


Fig 8 Enable Start up ($V_{in}=12V$, $V_{out}=3.3V$, $I_{LOAD}=2A$)

CH1: V_{OUT} , 2V/Div, DC; CH2: V_{SW} , 5V/Div, DC

CH3: I_{OUT} , 2A/Div, DC; CH4: EN, 5V/Div, DC

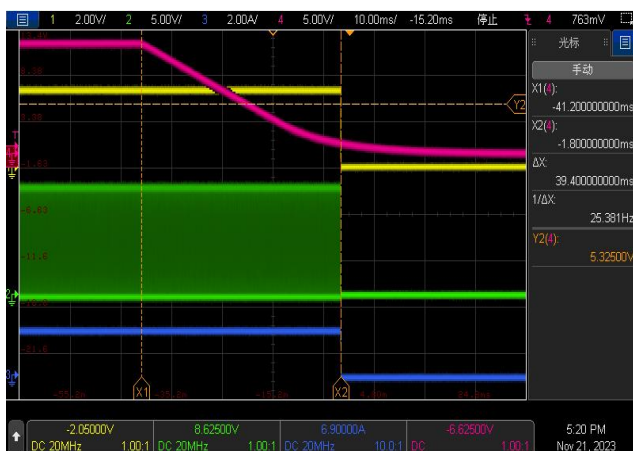


Fig 9 Shutdown ($V_{in}=12V$, $V_{out}=3.3V$, $I_{LOAD}=2A$)

CH1: V_{OUT} , 2V/Div, DC; CH2: V_{SW} , 5V/Div, DC

CH3: I_{OUT} , 2A/Div, DC; CH4: EN, 5V/Div, DC

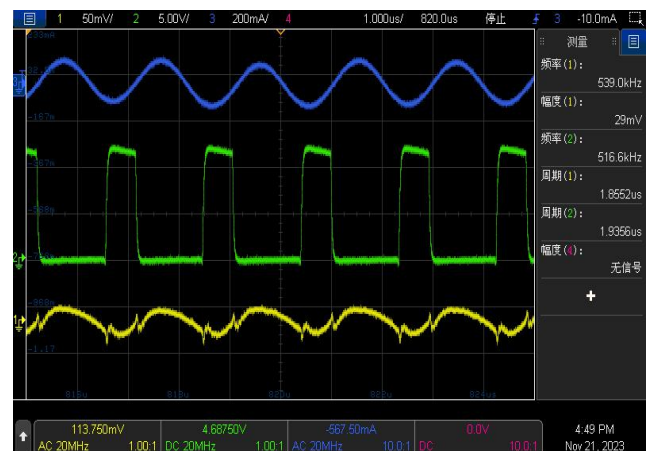


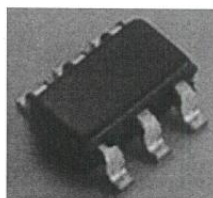
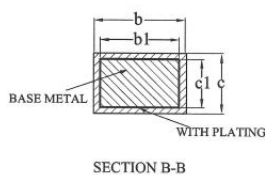
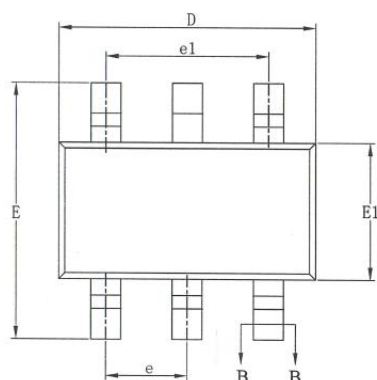
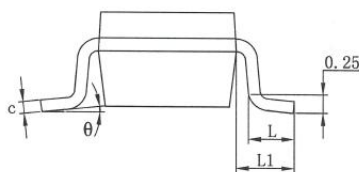
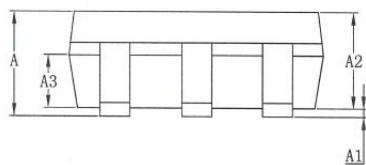
Fig 10 Output Ripple ($V_{in}=12V$, $V_{out}=3.3V$, $I_{LOAD}=2A$)

CH1: V_{OUT} , 50mV/Div, AC; CH2: V_{SW} , 5V/Div, DC

CH3: I_{peak} , 200mA/Div, AC;

13.Package Outline Dimensions(All dimensions in mm.)

Package Type: SOT23-6



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.25
A1	0.04	—	0.10
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	—	0.41
b1	0.32	0.35	0.38
c	0.15	—	0.19
c1	0.14	0.15	0.16
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95BSC		
e1	1.90BSC		
L	0.30	—	0.60
L1	0.60REF		
θ	0	—	8°

14.Important Notice And Disclaimer

- We reserves the right to change the instruction manual without prior notice.
- Any semiconductor product has a certain possibility of failure or malfunction under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design and overall manufacturing to avoid potential failure risks that may cause personal injury or property damage.
- The improvement of product quality is endless, our company will be dedicated to provide customers with better products.

15.Version Modification Record

Version Number	Revision
first edition	/
V1.0	1. Update the order information on page 2.
V2.0	1. Update the Important Notice And Disclaimer on page 8.