BST4620

1. Product Overview

The BST4620 is a complete dual-channel 13A output switch mode DC/DC power supply. The switch controller, power FETs, inductor and all supporting components are built into the package. The BST4620 operates over an input voltage range of 4.5V to 16V and supports two output voltages ranging from 0.6V to 2.5V (set by a single external resistor). The device's high efficiency design is capable of providing 13A of continuous current to each output. Only a small amount of input and output capacitors are required.

The device supports frequency synchronization, multi-phase operation, burst mode operation, and output voltage tracking for power rail sequencing, and has a built-in temperature diode to monitor device temperature. The use of high switching frequency and a current architecture enables fast transient response to line and load changes without sacrificing stability.

Fault protection features include overvoltage and overcurrent protection. The power module is available in a proprietary space-saving and thermally enhanced 15mm×15mm×4.41mm LGA package and 15mm×15mm×4.41mm BGA package with an integrated top heat sink. The BST4620 has a SnPb (BGA) or RoHS compliant pin finish.

2. Product Features

- Complete Standalone Dual-Output Power Supply.
- Dual channel 13A or single channel 26A output.
- Wide input voltage range: 4.5V to 16V.
- Output voltage range: 0.6V to 2.5V.
- ±1.5% maximum total DC output error.
- Using multiple BST4620s can achieve multi-phase current sharing (100A).
- Differential Remote Sense Amplifier.
- Current Mode Control/Fast Transient Response.
- Adjustable switching frequency.
- Overcurrent Foldback Protection.
- Frequency synchronization.
- Internal temperature sensing diode output.
- Output overvoltage protection.
- Heat-resistant enhanced (15mm×15mm×4.41mm) LGA package (15mm×15mm×4.41mm) BGA package.

3. Functional Block Diagram

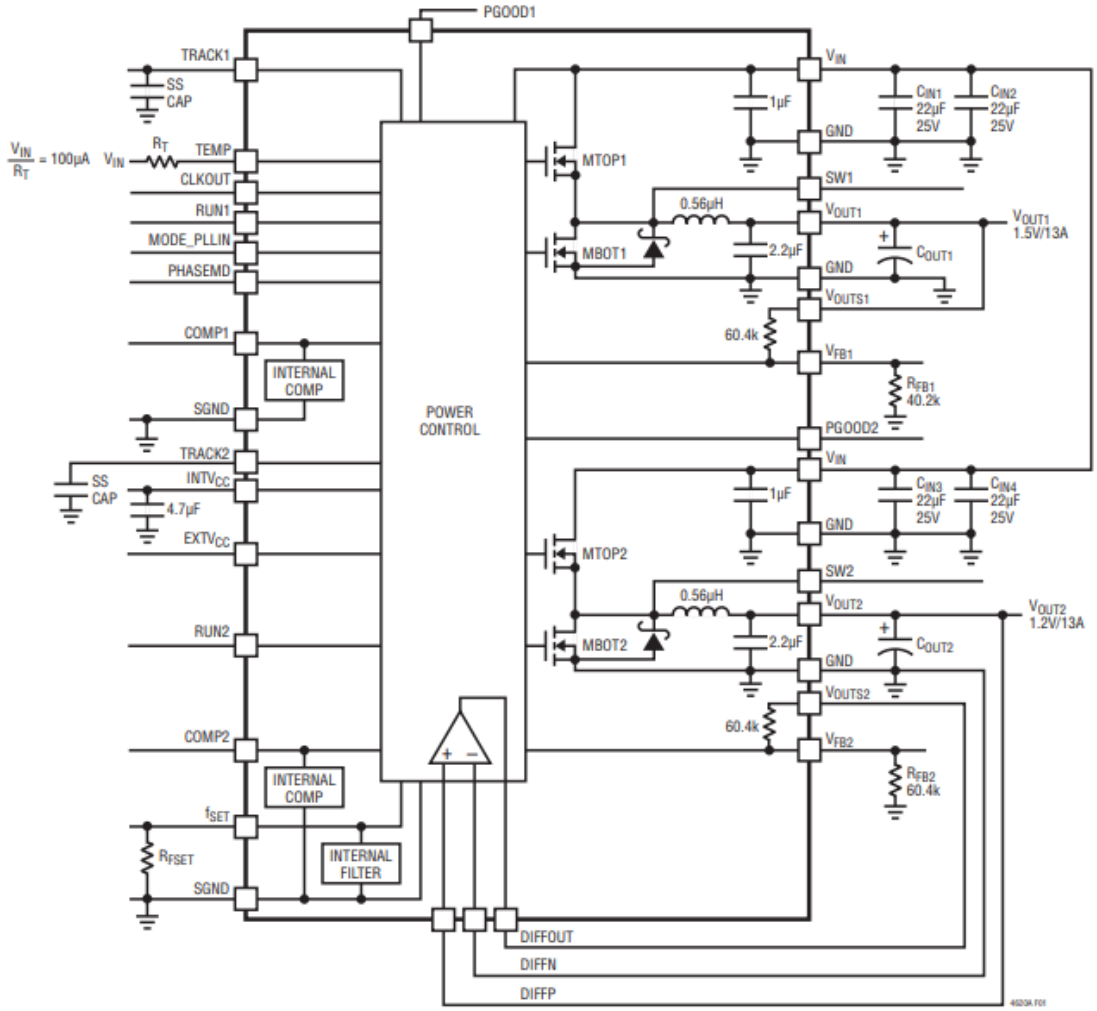

Figure 1Functional block diagram

4. Pin Information

Pin Assignment

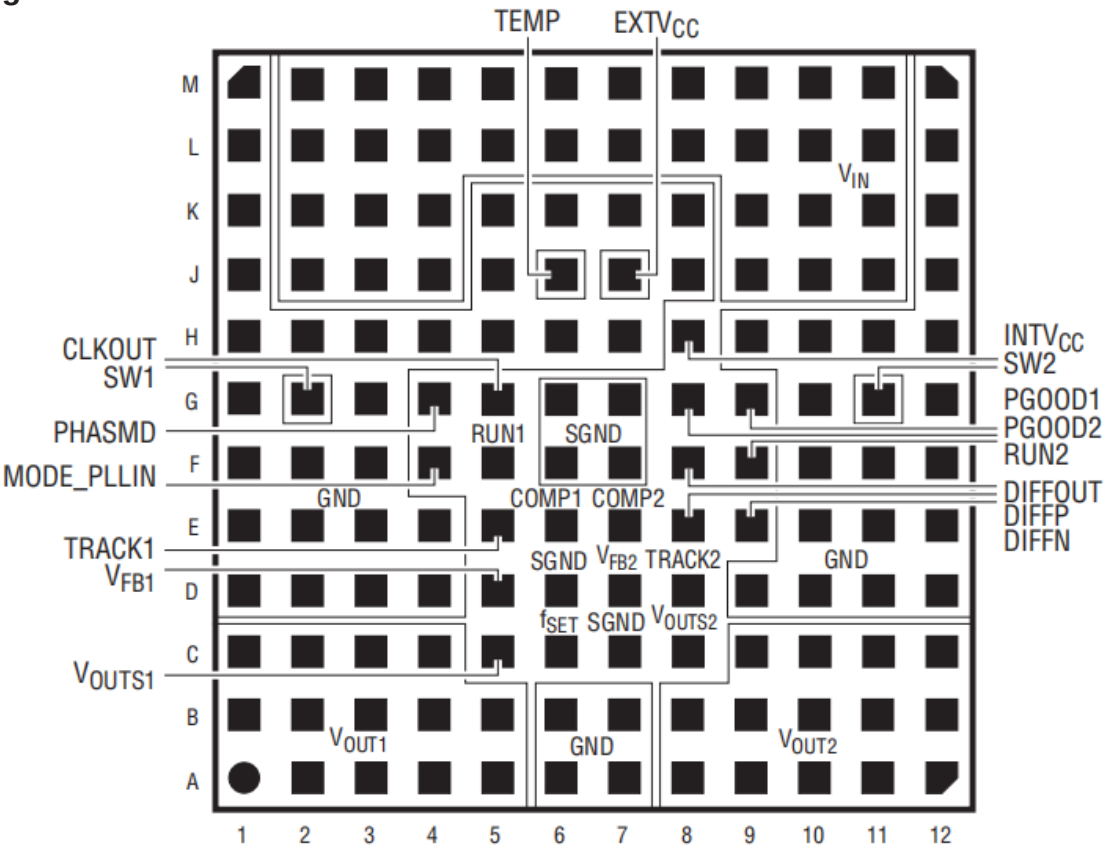

Figure 2BST4620 pinout

Pin Description

Table 1Pin Description

Pin number	Pin Symbols	Functional Description
A1 A2 A3 A4 A5 B1 B2 B3 B4 B5 C1 C2 C3 C4	VOUT1	1 channel output
A6 A7 B6 B7 D1 D2 D3 D4 D9 D10 D11 D12 E1 E2 E3 E4 E10 E11 E12 F1 F2 F3 F10 F11 F12 G1 G3 G10 G12 H1 H2 H3 H4 H5 H6 H7 H9 H10 H11 H12 J1 J5 J8 J12 K1 K5 K6 K7 K8 K12 L1 L12 M1 M12	GND	Power ground pin
A8 A9 A10 A11 A12 B8 B9 B10 B11 B12 C9 C10 C11 C12	VOUT2	2 channel output
E9	DIFFN	The negative input of the differential amplifier
E8	DIFFP	The positive input of the differential amplifier
F8	DIFFOUT	Differential amplifier output
F9	RUN2	2-channel enable control
G8	PGOOD2	2-channel power good indicator
G9	PGOOD1	1-channel power good indicator
G11	SW2	2-channel SW terminal
H8	INTVCC	Internal regulator output
J2 J3 J4 J9 J10 J11 K2 K3 K4 K9 K10 K11 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 M2 M3 M4 M5 M6 M7 M8 M9 M10 M11	VIN	Input Power
J7	EXTVCC	External power input
J6	TEMP	Temperature sensor comparator input
G5	CLKOUT	Clock output
G2	SW1	1 channel SW terminal
G4	PHASMD	Clock phase difference control terminal
F4	MODE_PLLIN	Operating mode selection and external clock
E5	TRACK1	Regulator 1 soft-start input and output voltage tracking
D5	VFB1	1 channel feedback voltage
D7	VFB2	2-channel feedback voltage
C5	VOUTS1	1 channel output
C6	fSET	Frequency setting port
C7 D6 F6 F7 G6 G7	SGND	Signal Ground
C8	VOUTS2	2 channel output
D8	TRACK2	Regulator 2 soft-start input and output voltage tracking
E6	COMP1	1-channel error amplifier output
E7	COMP2	2-channel error amplifier output
F5	RUN1	1 channel enable control terminal
F9	RUN2	2 channel enable control terminal

5. Absolute Maximum Ratings and Recommended Operating Ranges

Absolute Maximum Ratings

Power supply voltage (V_{IN})..... -0.3 V～18 V
VSW1, VSW2 voltage to ground (V_{SW})..... -1 V～18 V
PGOOD1, PGOOD1, RUN1, RUN2, $INTV_{CC}$, $EXTV_{CC}$ to ground voltage ..... -0.3V～6V
MODE_PLLIN, f_{SET}, TRACK1, TRACK2, DIFFOUT, PHASMD ..... -0.3V～+$INTV_{CC}$
V_{OUT1}, V OUT2, V_{OUTS1}, V_{OUTS2} ..... -0.3V～6V
DIFFP, DIFFN voltage to ground .....-0.3V～+$INTV_{CC}$
COMP1, COMP2, V_{FB1}, V_{FB2} voltage to ground .....-0.3V～2.7V
$INTV_{CC}$ peak output current 100mA
Internal operating temperature range.....-45°C～125°C
Maximum package temperature..... 245°C

6. Electrical characteristics parameters

Table 2Electrical characteristics
(VIN = 12V, VRUN1, VRUN2 = 5V, TA = +25°C, unless otherwise specified)

parameter	symbol	condition	standard	unit
Input voltage	V_{IN}		4.5~16	V
Output voltage	*VOUT*		0.6~5.3	V
Under load, the output voltage changes linearly	$V_{OUT1(DC)}$, $V_{OUT2(DC)}$	CIN = 22μF × 3, COUT = 100μF × 1 Ceramic, 220μF POSCAP	1.5	V
RUN pin switching threshold	V_{RUN1}, V_{RUN2}	RUN Rising	1.25	V
RUN pin hysteresis voltage	$V_{RUN1HYS}$, $V_{RUN2HYS}$		150	mV
Starting instantaneous current	$I_{INRUSH(VIN)}$	IOUT = 0A, CIN = 22μF ×3, CSS = 0.01μF, COUT = 100μF ×3, VOUT1 = 1.5V, VOUT2 = 1.5V, VIN = 12V	1	A
Input bias current	$I_{Q(VIN)}$	VIN=12V,VOUT=1.5V, Burst Mode Operation	5	mA
		VIN=12V,VOUT=1.5V, Pulse-Skipping Mode	15	mA
		VIN=12V,VOUT=1.5V, Switching Continuous	65	mA
		Shutdown, RUN=0, VIN=12V	50	uA
Input Current	$I_{S(VIN)}$	VIN=5V,VOUT=1.5V,IOUT=13A	4.6	A
		VIN=12V,VOUT=1.5V,IOUT=13A	1.853	A
Output continuous current range	$I_{OUT1(DC)}$ $I_{OUT2(DC)}$	VIN=12V,VOUT=1.5V		A
Linear regulation accuracy	$\Delta V_{OUT1(LINE)}$ / *VOUT1* $\Delta V_{OUT2(LINE)}$ / *VOUT2*	VOUT= 1.5V, VIN from 4.75V to 16V IOUT = 0A for Each Output	0.01	%V
Load regulation accuracy	ΔV_{OUT1} / V_{OUT1} ΔV_{OUT2} / V_{OUT2}	For Each Output, VOUT=1.5V, 0A to 13A,VIN = 12V	0.35	%
Output ripple voltage	$V_{OUT1(AC)}$ $V_{OUT2(AC)}$	For Each Output, IOUT = 0A, COUT = 100μF×3/X7R/Ceramic, 470μF POSCAP, VIN = 12V, VOUT = 1.5V, Frequency = 400kHz	15	mV_{PP}
Output ripple voltage frequency	f_S (single channel)	VIN=12V,VOUT=1.5V,fSET=1.25V	500	kHz

parameter	symbol	condition	standard	unit
SYNC capture frequency range	f_{SYNC} (single channel)			kHz
Turn on overshoot voltage	$\Delta V_{OUTSTART}$ (Single channel)	COUT= 100µF/X5R/Ceramic, 470µF POSCAP	10	mV
		VOUT=1.5V, IOUT=0A VIN=12V	10	mV
Opening time	t_{START} (single channel)	COUT = 100µF/X5R/Ceramic, 470µF POSCAP	5	ms
		No Load, TRACK/SS with 0.01µF to GND,VIN = 12V	5	ms
Peak deviation under dynamic load	$\Delta V_{OUT(LS)}$ (Single channel)	Load: 0% to 50% to 0% of Full Load COUT=22µF×3/X5R/Ceramic, 470µF POSCAP VIN = 12V, VOUT = 1.5V	30	mV
Step settling time under dynamic load	t_{SETTLE} (Single channel)	Load: 0% to 50% to 0% of Full Load, VIN=12V, COUT=100µF, 470µF POSCAP	20	us
Output current limit	$\Delta V_{OUT(LS)}$ (Single channel)	VIN = 12V, VOUT = 1.5V	20	A
Regulated feedback voltage	*VFB1, VFB2*	IOUT=0A,VOUT=1.5V	0.600	V
	I_{FB}		-5	nA
Feedback overvoltage lockout	V_V		0.66	V
Track pin soft-start pull-up current	*TRACK1(I) TRACK2(I)*	TRACK1 (I),TRACK2 (I) Start at 0V	1.25	uA
Undervoltage Lockout	UVLO	VIN Falling	3.3	V
		VIN Rising	3.9	V
Undervoltage Lockout Hysteresis	UVLOHYS		0.6	V
between VOUTS1, VOUTS2, and VFB1, VFB2 outputs	*RFBHI1, RFBHI2*		60.4	kΩ
PGOOD pin low level	V_{PGOOD1}, V_{PGOOD2} Low	IPGOOD = 2mA	0.1	V
PGOOD Pin Leakage Current	I_{PGOOD}	VPGOOD = 5V		uA
PGOOD Trip Level	V_{PGOOD}	VFB with Respect to Set Output Voltage		
		VFB Ramping Negative	-10	%
		VFB Ramping Positive	-10	%
Internal VCC voltage	V_{INTVCC}	6V < VIN < 16V	5	V
INTVCC load regulation	V_{INTVCC} Load Regulation	ICC = 0mA to 50mA	0.5	%
EXTVCC switching voltage	V_{EXTVCC}	EXTVCC Ramping Positive	4.7	V
EXTVCC Pull-Down	$V_{EXTVCC(DROP)}$	ICC = 20mA, VEXTVCC = 5V	50	mV
EXTVCC Hysteresis	$V_{EXTVCC(HYST)}$		200	mV
Normal frequency	Frequency Nominal	fSET = 1.2V	500	kHz
Minimum frequency	Frequency Low	fSET = 0V	250	kHz
Maximum frequency	Frequency High	fSET > 2.4V, Up to INTVCC	780	kHz
Frequency setting current	fSET		10	uA
MODE_PLLIN input resistance	R_{MODE_PLLIN}		250	kΩ
VOUT1 Phase	CLKOUT	PHASMD = GND	60	Deg
		PHASMD = Float	90	Deg
		PHASMD = INTVCC	120	Deg
Clock high level	CLK High			V
Clock low level	CLK Low			V

parameter	symbol	condition	standard	unit
Gain	A_V Differential Amplifier		1	V
Input resistance	R_{IN}	Measured at DIFFP Input	80	kΩ
Offset voltage	V_{OS}	VDIFFP=VDIFFOUT=1.5V, IDIFFOUT = 100μA		mV
Power Supply Rejection Ratio	PSRR Differential Amplifier	5V < VIN < 16V	90	dB
Maximum output current	I_{CL}		2	mA
Maximum output voltage	$V_{OUT(MAX)}$	IDIFFOUT = 300μA		V
Gain Bandwidth	GBW		3	MHz
PNP connected diode	V_{TEMP}	I = 100μA	0.6	V
Temperature coefficient	TC		2.2	mV/C

7. Dimensions

LGA 144-LEAD

This chip adopts LGA 144-LEAD package, with the size of 15mm×15mm×4.41mm. The product dimensions are as follows:

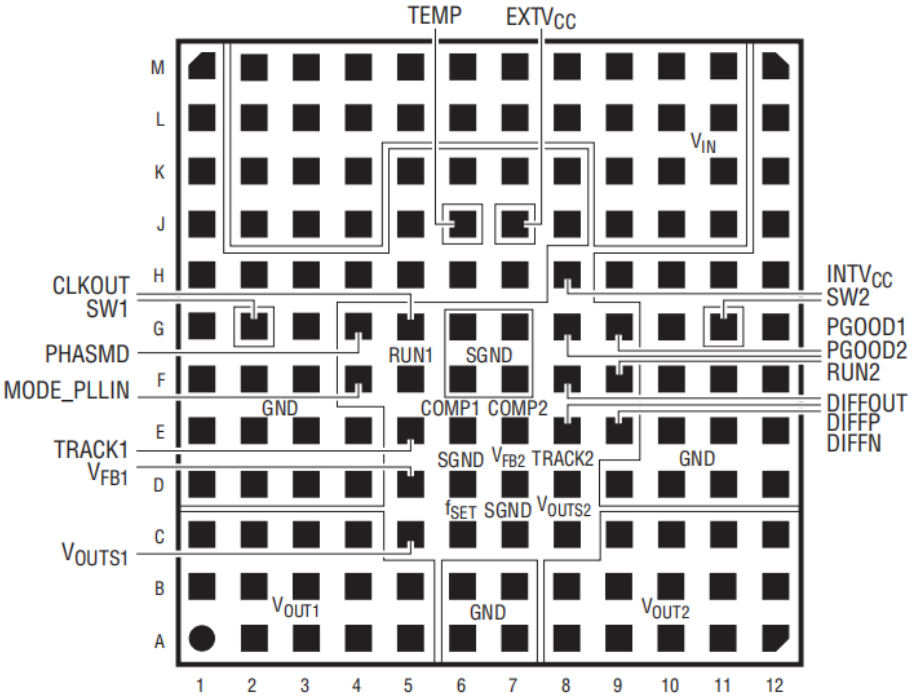

Figure 3Schematic diagram of the bottom surface of the LGA package

8. Ordering Information

Table 3Product ordering information

model	Package	Packaging materials	Quality Grade	Detailed specifications	Product Status
BST4620	LGA 144-LEAD				