

BST14050

1. Product Overview

The BST14050 is a 40V, 5A step-down regulator with an integrated high-side MOSFET. It has a wide input range of 7V to 40V and is suitable for power regulation of unregulated power supplies in a variety of applications from industrial to automotive. The regulator's low quiescent current in sleep mode is suitable for battery-powered systems. The ultra-low current of 1 μ A in shutdown mode further extends battery life. The wide adjustable switching frequency range allows optimization of efficiency and external component size. Internal loop compensation means that users are freed from the tedious task of loop compensation design. This also minimizes the external components of the device. The precision enable input simplifies regulator control and system power sequencing. The device also has built-in protection features such as current limiting, thermal shutdown, and output overvoltage protection.

2. Product Features

- Input voltage range: 7V ~40V.
- 5A continuous output current.
- Low quiescent current.
- Current Mode Control.
- Switching frequency from 500 kHz.
- Frequency synchronization with external clock.
- Easy to use internal compensation.
- Supports high duty cycle operation.
- External Soft-Start.
- Over temperature protection, over voltage protection and short circuit protection.

3. Functional Block Diagram

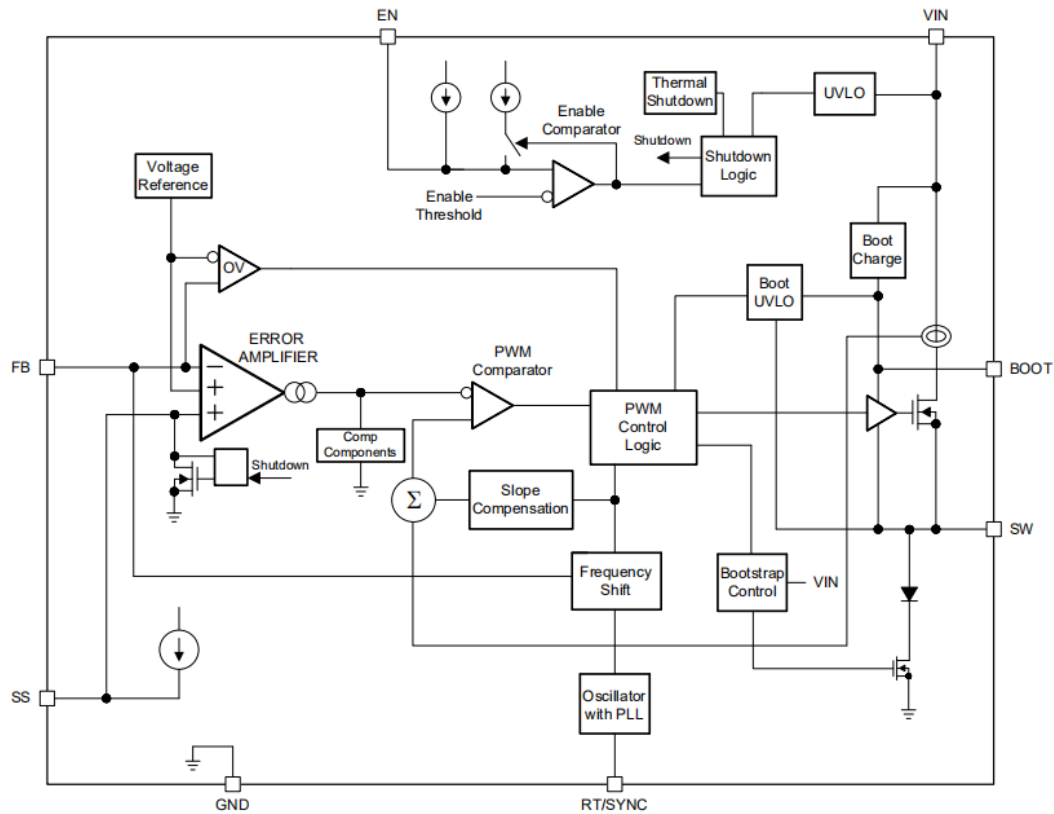


Figure 1. Functional block diagram

4. Pin Information

BST14050 package shape and pin information are shown in Figure 2 and Figure 3:

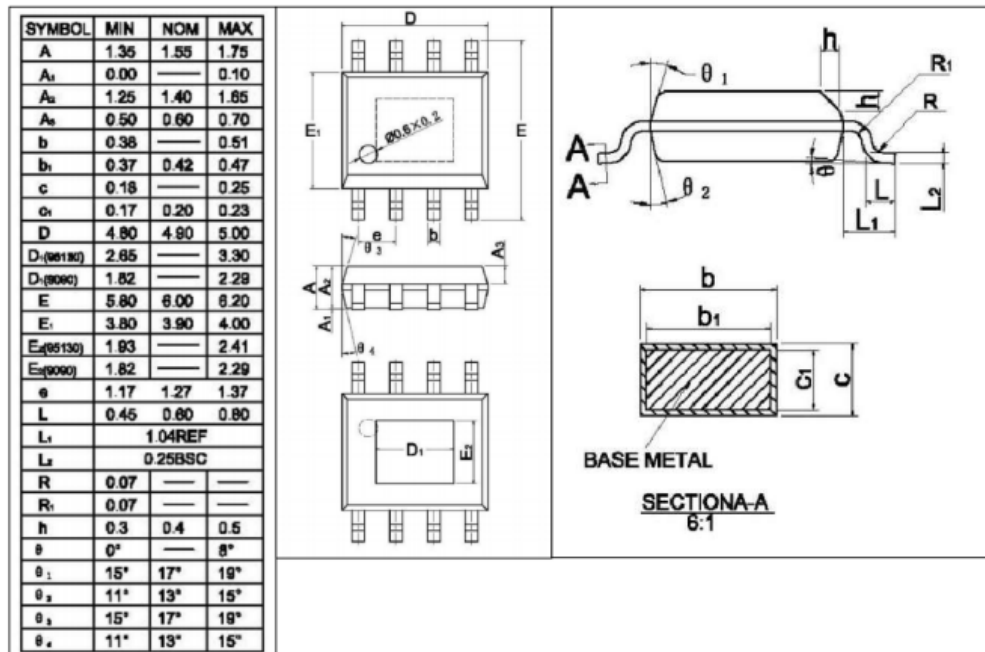


Figure 2. BST14050 package diagram

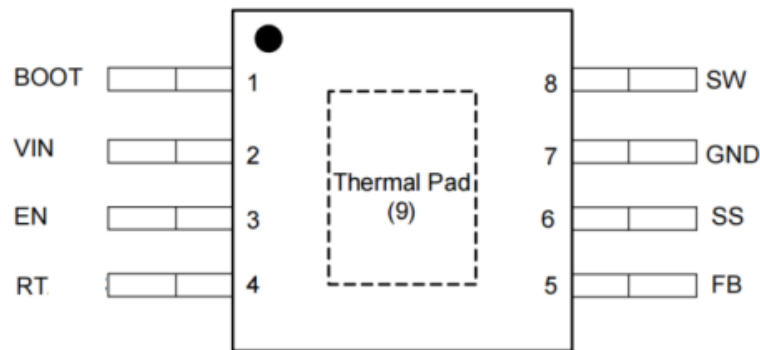


Figure 3. BST14050 top view with pins

Table 1. Pin Function Description

Pinout		Pin Type	describe
name	NO.		
BOOT	1	O	Bootstrap capacitor connection for high-side MOSFET driver. Connect a high-quality 0.1μF capacitor between BOOT and SW.
VIN	2	I	Connect to the power supply and bypass capacitor C _{IN} . The path from the VIN pin to the high-frequency bypass C _{IN} and GND must be as short as possible.
EN	3	I	Enable pin with internal pull-up current source. Pull below 1.2V to disable. Float or tie to VIN to enable. Adjust input undervoltage lockout with two resistors. See the Enabling and Adjusting Undervoltage Lockout section.
RT/SYNC	4	I	Resistor timing or external clock input. When an external resistor to ground is used to set the switching frequency, an internal amplifier holds this pin at a fixed voltage. If the pin is pulled above the PLL upper threshold, a mode change occurs and the pin becomes the sync input. The internal amplifier is disabled and the pin is a high impedance clock input to the internal PLL. If the clock edge stops, the internal amplifier is re-enabled and the mode of operation returns to the frequency programming through the resistor.
FB	5	I	Feedback Input Pin, connected to the feedback voltage divider to set VOUT. Do not short this pin to ground during operation.
SS	6	O	Soft-start control pin. Connect a capacitor to set the soft-start time.
GND	7	G	System ground pin.
SW	8	O	Switching output of the regulator. Internally connected to the high-side power MOSFET. Connected to the power inductor.
Thermal Pad	9	G	The main heat dissipation path for the chip. Must be connected to the ground plane on the PCB.

Note: I stands for input, O stands for output, and G stands for ground.

5. Absolute Maximum Ratings and Recommended Operating Ranges

Table 2. Maximum rated values of port pressure difference

		Minimum	Maximum	unit
Input voltage	VIN, EN to GND	-0.3	44	V
	BOOT to GND	-0.3	4 9	
	SS to GND	-0.3	5	
	FB to GND	-0.3	5	
	RT to GND	-0.3	5	
Output voltage	BOOT to SW	6.5		V
	SW to GND	-3	44	
T _J	Junction temperature	-40	150	°C
T _g	Storage temperature	-65	150	°C

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating conditions for extended periods may affect device reliability and lifetime.

Note 2: This IC includes overtemperature protection to protect the device from momentary overload conditions. When the overtemperature protection is activated, the junction temperature will exceed 150 °C. Continuous operation above the specified maximum operating junction temperature may impair device reliability.

6. Electrical characteristics parameters

Unless otherwise specified, the recommended operating temperature of the chip is -55 °C -125 °C. The minimum and maximum temperature limits are determined by relevant regulations, design, or testing. Typical parameters only represent the results at 25 °C and are for reference only. If not otherwise specified, the following conditions apply: VIN = 4.0V-40V.

Table 3. BST14050 electrical characteristic parameter index

characteristic	symbol	condition (Unless otherwise specified, V = 1 2V, -55 °C ≤ T _A ≤ 125 °C)	Limit value		unit
			Minimum	maximum	
Input voltage	V _{IN}		7	40	V
Undervoltage protection	U _{VLO}	Rising Threshold	3.5	3.9	V
		Hysteresis voltage	-	285	mV
Shutdown current	I _{SHDN}	V _{EN} =0V, T _A =25 °C, 4.0 V ≤ V _{IN} ≤ 40V	-	3.0	μA
Quiescent Current	Q	V _{FB} = 1.0V, T _A =25 °C	-	40	μA
E N Enable Threshold	V _{EN_TH}		1.05	1.38	V
E N Enable port current	I _{EN_PIN}	V _{EN_TH} +50 m V	-	- 4.6	μA
		V _{EN_TH} -50 m V	-	-1.0	
EN hysteresis current	I _{EN_HYS}		-	-3.6	μA
S S port current	I _{SS}	T _A =25 °C	-	3	μA
Feedback voltage	V _{FB}	T _J = - 55°C ~125°C	0.735	0.765	V
High-side MOSFET on-resistance	R _{DS_ON}	V _{IN} = 1 2V, B OOT to S W = 5.8V	-	180	mΩ
Thermal Shutdown Threshold	T _{shut down}		170	-	
Switching frequency	f	RT = 49.9kΩ, 1 % accuracy	400	600	kHz

7. Ordering Information

Table 4. Product Ordering Information

Serial number	Product Model	Package	Packaging materials	Device level	Lead material	Weight (g)	Typical size (mm) (Length × Width × Height)	Detailed specifications
1	BST14050	SOP8	Plastic packaging	Industrial temperature zone				Q / BST50649-2024

Note 1: Industrial temperature range devices meet Q / BST50649-2024 According to the screening requirements of "HUAWEI Industrial Temperature Zone Product General Specifications", the operating environment temperature range should be -40 °C~+85°C.

Note 2: The product ordering information is for our existing products or devices that have been confirmed to be developed. We can develop devices in other packaging forms according to user needs.