

GENERAL DESCRIPTION

The BCT1583S is a step down monolithic regulator with a built in internal power MOSFET, capable of driving up to 3A continuous output current with excellent line and load regulation. The output voltage can be set from **1.22 to 18V**.

Requiring a minimum number of external components, it offers simple to use, but high efficiency and advanced protection features including pulse-by-pulse current limiting and thermal shutdown. Adjustable soft-start reduces the stress on the input source at turn-on and the regulator draws only 20uA in shutdown mode.

BCT1583S is available in a Pb-Free SOIC8 with Exposed Pad package.

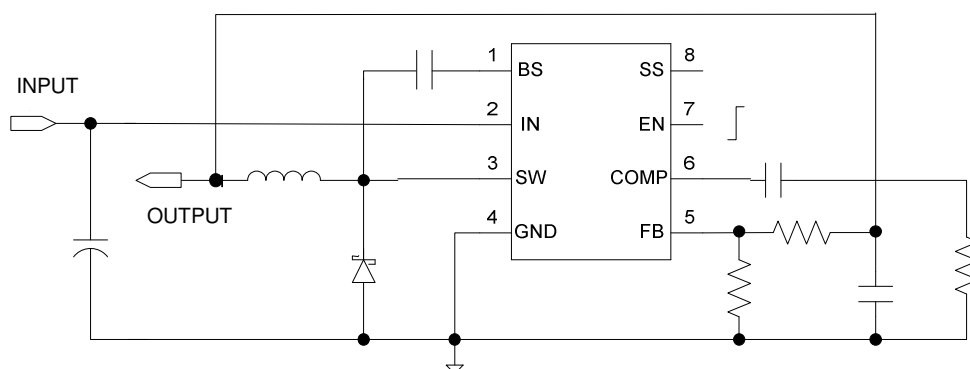
FEATURES

- Wide Vin Range: **4.5 to 20V**
- 3A Output Current
- High Efficiency up to 95%
- Output Adjustable from **1.22 to 18V**
- 385KHz Fixed Frequency internal oscillator
- 20uA Shutdown Mode
- Pulse-to-Pulse Over Current Protection
- Thermal Shutdown
- Automatic Soft Start
- Compact SOIC8 with Exposed Pad

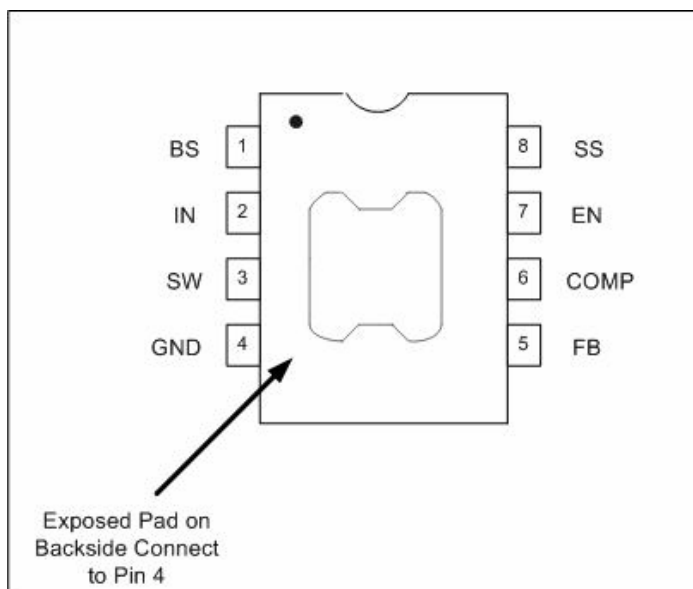
APPLICATIONS

- Simple High Efficiency Step-down
- Consumer: TV, STB, DVD, VCR
- Car Audio/TV/Navigation
- Battery Charger
- Pre-Regulator for Linear Regulators

Typical Application



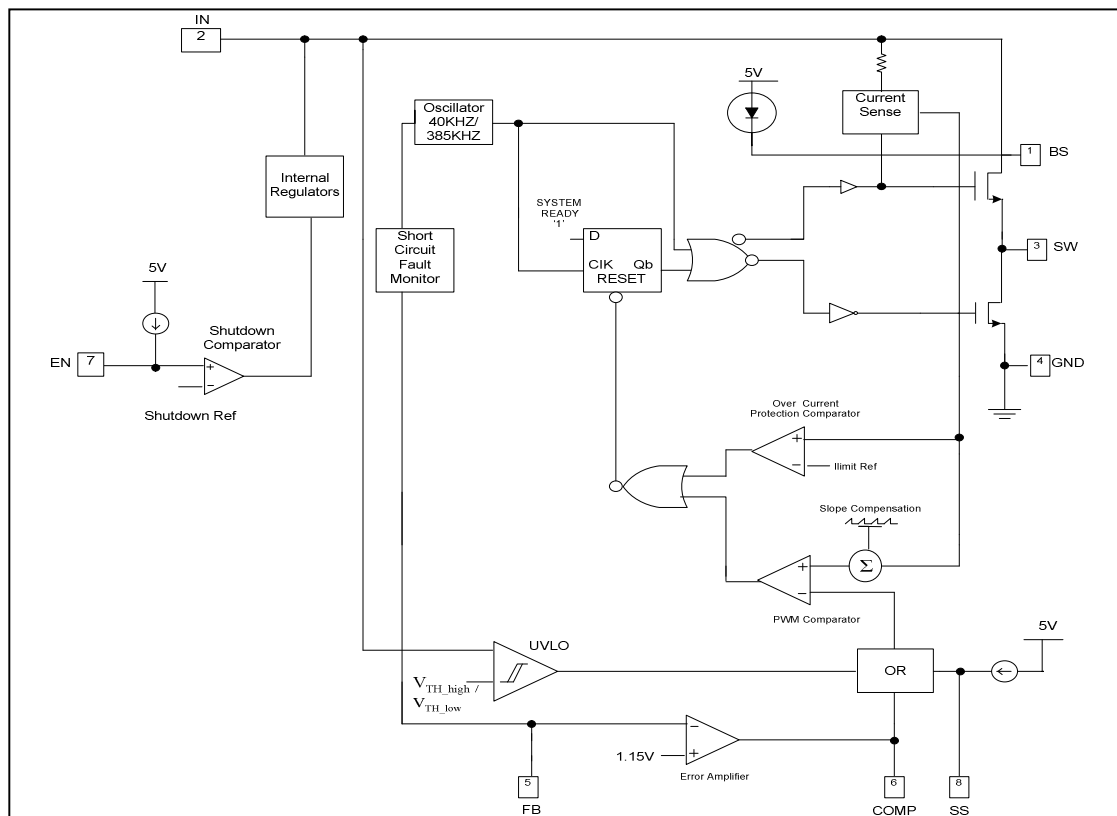
Pin Assignment



Pin Descriptions

Pin #	Pin Name	Description
1	BS	High Side Gate Drive Boost Input
2	IN	Power Input
3	SW	Power Switching Output
4	GND	Ground
5	FB	Feedback Input
6	COMP	Compensation Node
7	EN	Enable Input (H : Step-down Operation, L : All circuits deactivated)
8	SS	Soft Start Control Input

Block Diagram



Absolute Maximum Specifications

Rating	Symbol	Value	Unit
Supply Voltage Range	V_{IN}	-0.3 to 28	Volts
Switch Voltage Range	V_{SW}	-1 to $V_{IN}+0.3$	Volts
Boost Voltage Range	V_{BS}	$V_{sw}-0,3$ to $V_{sw}+6$	Volts
All Other Pins		-0.3 to 6	Volts
Storage Temperature Range	T_{STR}	-65 to 150	$^{\circ}C$
Maximum Operating Junction Temp	T_J	150	$^{\circ}C$

Recommended Operating Ratings

Rating	Symbol	Value	Unit
Supply Voltage Range	V_{IN}	-4.5 to 20	Volts
Ambient Operating Temperature	T_{OP}	-40 to 85	$^{\circ}C$

Electrical Specifications

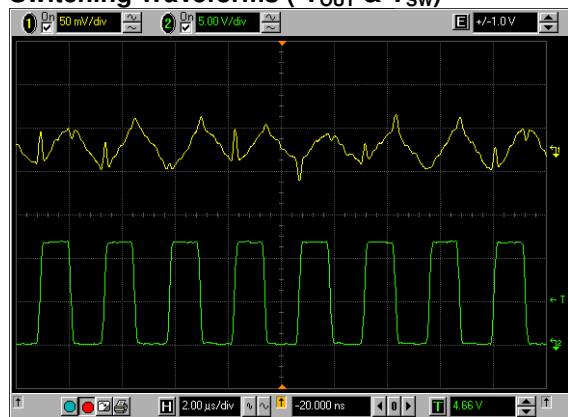
All electrical specifications are specified at $T_{AMBIENT} = 25^{\circ}C$, $V_{IN} = 12V$, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
	Shutdown Supply Current	$V_{EN}=0V$		20		μA
	Supply Current	$V_{EN}=4V$		1.0		mA
V_{FB}	Feedback Voltage (Simulated over all corners and temperature)	$4.5V \leq V_{IN} \leq 20V$	1.150	1.222	1.290	V
A_{EA}	Error Amplifier Voltage Gain			1000		V/V
G_{EA}	Error Amplifier Transconductance	$\Delta I_{COMP} = \pm 10\mu A$		800		$\mu A/V$
$R_{DS(ON)1}$	High Side Switch-On Resistance			100		m Ω
$R_{DS(ON)2}$	Low Side Switch-On Resistance			10		Ω
	High Side Switch Leakage Current	$V_{EN}=0V$, $V_{SW}=0V$		0	10	μA
	Upper Switch Current Limit			5.5		A
G_{CS}	Current Sense to COMP Transconductance			3.8		A/V
F_{OSC1}	Oscillation Frequency			385		KHz

F _{OSC2}	Short Circuit Oscillation Frequency	V _{FB} =0V		40		KHz
D _{MAX}	Maximum Duty Cycle	V _{FB} =1.0V		90		%
D _{MIN}	Minimum Duty Cycle	V _{FB} =1.5V			0	%
	EN Threshold Voltage			3.1		V
	EN Pull-up Current	V _{EN} =0V		1.9		μA
	Under-Voltage Lockout Threshold	Rising V _{IN}		3.4		V
	Under-Voltage Lockout Threshold Hysteresis			600		mV
	Soft Start Period	C _{SS} =0.1μF		10		mS
	Thermal Shutdown			160		°C

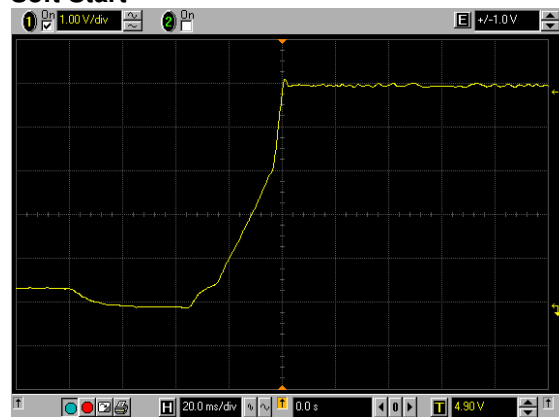
Performance Characteristics

Switching Waveforms (V_{OUT} & V_{SW})



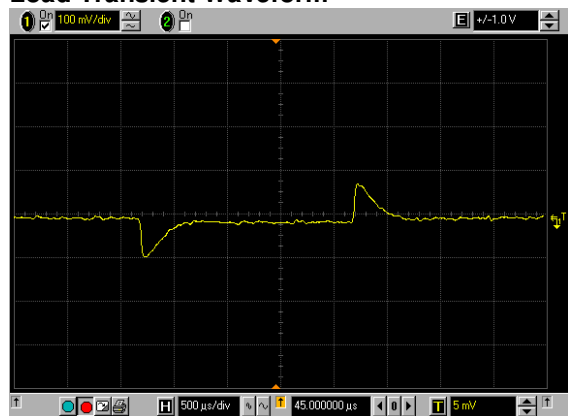
$V_{IN}/V_{OUT} = 12V/5V$ at Load Current 2A

Soft Start



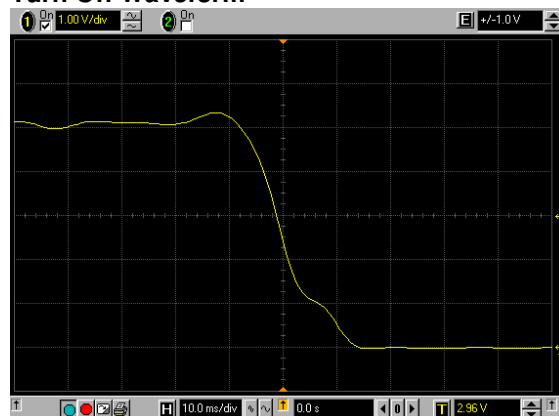
$V_{IN}/V_{OUT} = 12V/5V$ with a 1μF cap

Load Transient Waveform



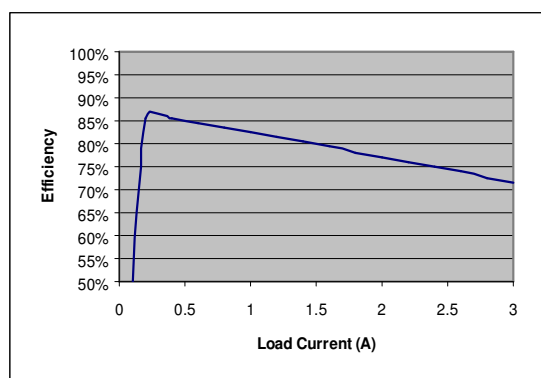
$V_{IN}/V_{OUT} = 12V/5V$, 1A-2A Step

Turn Off Waveform

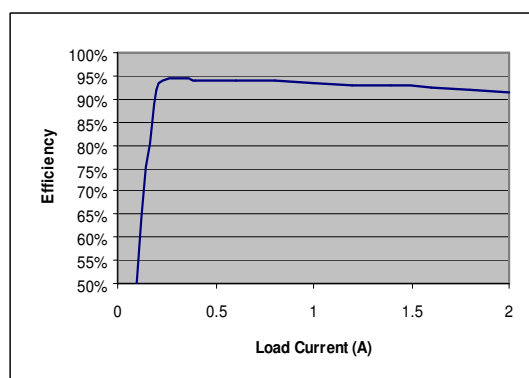


$V_{IN}/V_{OUT} = 12V/5V$ at Load Current 2A

Efficiency at $V_{IN}/V_{OUT} = 5.0V/1.8V$



Efficiency at $V_{IN}/V_{OUT} = 10V/5.0V$



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Configuration Table

VOUT	R5	R3	C9	L1
1.8 V	7.15 kΩ	3 kΩ	4.7 nF	4.7 μH
2.5 V	15.4 kΩ	3.9 kΩ	5.6 nF	4.7 – 6.8 μH
3.3 V	26.1 kΩ	5.6 kΩ	8.2 nF	6.8 – 10 μH
5 V	46.4 kΩ	7.5 kΩ	10 nF	10 – 15 μH
12 V	133 kΩ	10 kΩ	3.3 nF	15 – 22 μH

Design Note

1. The voltage divider network formed by R4 and R5 sets the output voltage regulation point. It is calculated by the equation below:

$$R5 = R4 \cdot \frac{VOUT - VREF}{VREF} \quad \text{Where: } VREF = 1.22 \text{ V}$$

From this equation the closest standard (E48) resistance values were chosen. VOUT can be further trimmed by adding a resistor across R5. Metal film resistors with 1% or less tolerance are recommended.

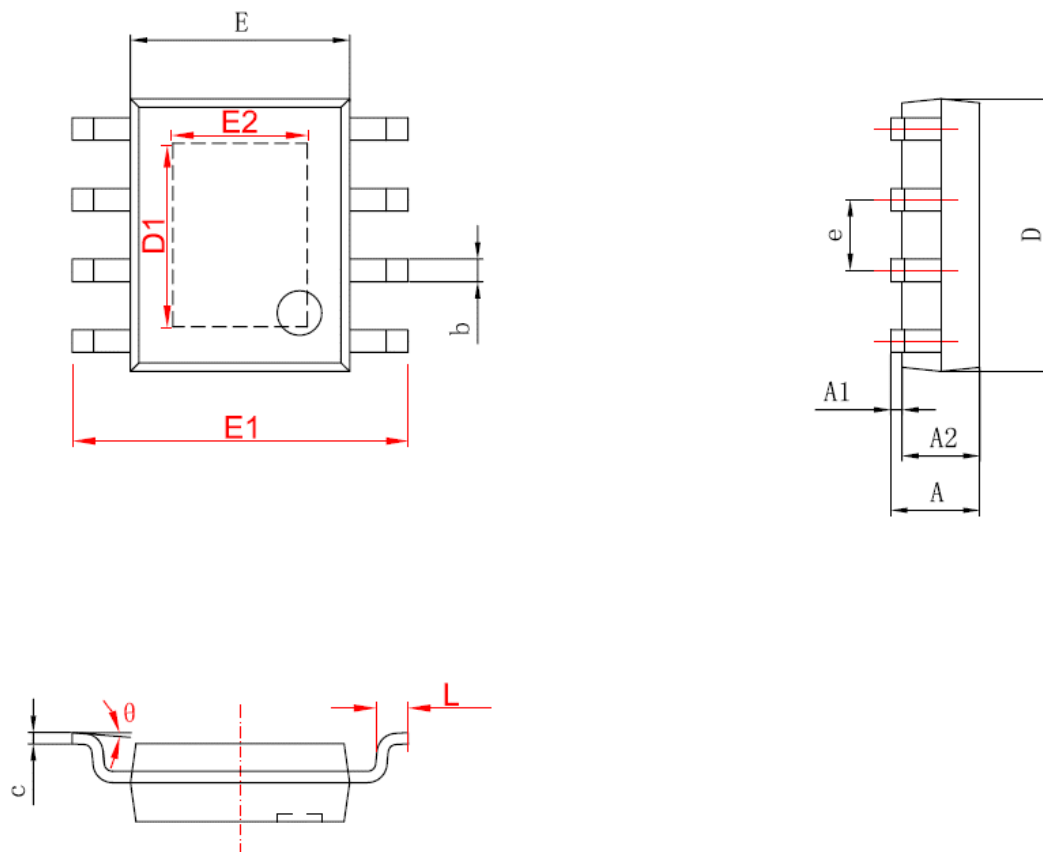
2. The EN pin provides an enabling feature and has the following turn-on/off characteristic:

ON Threshold = 3.1 V
OFF Threshold = 0.7 V

To avoid intermittent turn-on/off, an Under Voltage Lock Out (UVLO) function is implemented by R1 & R2. VIN_{uvlo} is the selected turn-on threshold of the device. Use this formula:

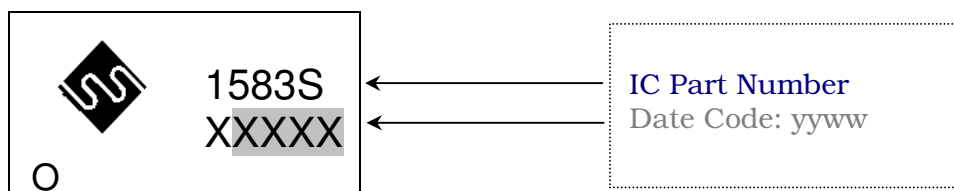
$$VIN_{uvlo} = \left(1 + \frac{R1}{R2} \right) \cdot VEN \quad \text{Where: } VEN = 3.1 \text{ V}$$

Package Information: SO8 (Exposed Pad)



SYMBOL	MIN (Millimeter)	MAX (Millimeter)
A	1.350	1.750
A1	0.050	0.150
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
D1	3.202	3.402
E	3.800	4.000
E1	5.840	6.240
E2	2.313	2.513
e	1.270 (BSC)	
L	0.400	1.270
θ	0°	8°

Marking Notation



Sales Offices

Malaysia

BCT Technology Bhd (HQ)

Lot G4 Incubator 3
Technology Park Maysia
Bukit Jalil, 57000
Kuala Lumpur, Malaysia

Tel : 603 8996 8088
Fax : 603 8996 8087

Singapore

BlueChips Technology Pte Ltd

3 International Business Park
#03-18/19/20
Nordic European Centre
Singapore 609927

Tel : 65 6890 6938
Fax : 65 6896 0928

Hong Kong

BlueChips Technology Pte Ltd

Unit 906-911, 9/F., Stanhope House
734-738 King's Road,
North Point, Hong Kong

Tel : 852 2776 7968
Fax : 852 2776 8997



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