SY9702

High Efficiency, 1MHz，2A Buck-Boost DC/DC Regulator

General Description

SY9702 is a wide input voltage range, high efficiency, fixed frequency buck-boost converter that operates from input voltage above, below or equal to the output voltage. It provides a power supply for system powered by either a two-cell or three-cell alkaline, Ni-Cd or Ni-MH battery, or a one-cell Li-Ion or Li-polymer battery.

SY9702 can support for 2A load current capability. It is based on a fixed frequency, pulse-width-modulation (PWM) controller using synchronous rectification to obtain maximum efficiency. The output voltage and compensation circuit can be programmed using external resistors and capacitors network. During shutdown, the load is disconnected from the battery. The device is packaged in tight QFN2x3-13.

Ordering Information

SY9702 □(□□)□

- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY9702QOC	QFN2x3-13	----

Features

- Fixed frequency operation with battery voltage above, below or equal to the output.
- Four internal power switches to form true 4-switches buck-boost with single inductor.
- Seamless buck-boost transition.
- 2.6V to 5.5V Input Voltage Range.
- 2A continuous output current capability.
- Output disconnect at shutdown.
- Power good indicator.
- Compact package: QFN2x3-13
- Built in thermal shut down protection, hard short protection.

Applications

- Palmtop Computers
- Handheld Instruments
- MP3/MP4 Players
- Digital Cameras/Camcorders
- Personal Medical Products
- High Power LED's
- All two-cell and three-cell alkaline, Ni-Cd or Ni-MH or signal-cell Li battery powered products

Typical Applications

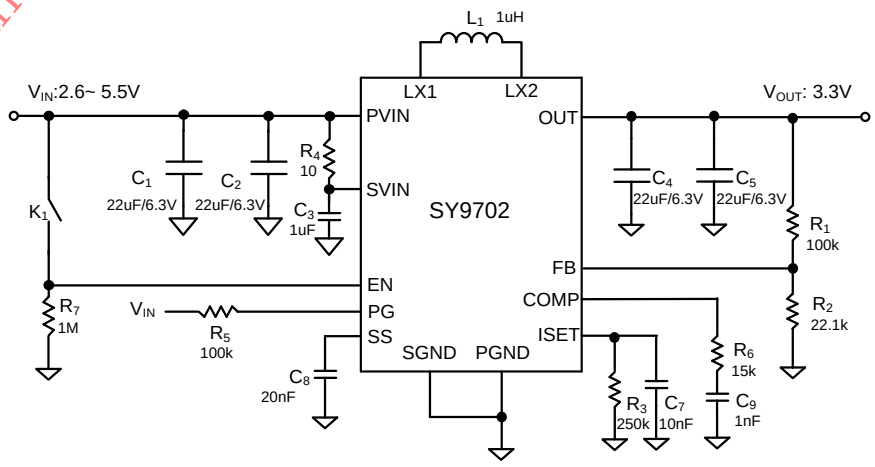

Figure 1. Schematic diagram

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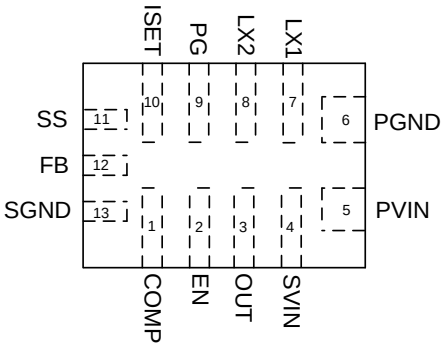
Pinout (top view)



Top Mark: ZN*xyz* (device code: ZN, ***x=year code, y=week code, z= lot number code***)

Pin Name	Pin Number	Description
COMP	1	External compensation for voltage loop.
EN	2	Enable control. Pull high to turn on. Internal integrated with 1MΩ pull down Resistor.
OUT	3	Output of the synchronous rectifier. Decouple this pin to GND with at least 22uF ceramic cap. Minimize the loop area formed by output cap, OUT pin and GND paddles.
SVIN	4	Signal power input pin. Decouple this pin to GND with at least 1uF ceramic cap.
PVIN	5	Power input pin. Decouple this pin to GND with at least 22uF ceramic cap. Minimize the loop area formed by input cap, PVIN pin and GND paddles.
PGND	6	Power ground pin.
LX1	7	Inductor connection 1 Connect this node to the switching node of the inductor.
LX2	8	Inductor connection 2. Connect this node to the switching node of the inductor.
PG	9	Power good indicator.
ISET	10	Apply a resistor and capacitor parallel network to sense the output average current. If V_{ISET} is lower than 0.2V, IC will go into PFM mode. Do not let it floating. Tie to ground for forced PWM operation.
SS	11	Connect this pin to a soft-start capacitor to program soft-start time.
FB	12	Output feedback pin. Connect this pin to the center point of the output resistor divider to program the output voltage.
SGND	13	Signal ground pin.

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Absolute Maximum Ratings (Note 1)

OUT ---------- 4 V
All Other Pins---------- 6V
Power Dissipation, P_D @ T_A = 25°C ---------- 3W
Package Thermal Resistance (Note 2)
θ_{JA} ---------- 40°C/W
θ_{JC} ---------- 18°C/W
Junction Temperature Range ---------- 150°C

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Lead Temperature (Soldering, 10 sec.) ---------- 260°C
Storage Temperature Range ---------- -65°C to 150°C

Recommended Operating Conditions (Note 3)

Supply Input Voltage ---------- 2.6V to 5.5V
Output Voltage ---------- 2.6V to 3.8V
Junction Temperature Range ---------- -40°C to 125°C
Ambient Temperature Range ---------- -40°C to 85°C

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Electrical Characteristics

(V_{IN} = 4.2V, V_{OUT} = 3.3V, L =1μH, C_{OUT} = 22uFx2, T_A = 25°C, I_{OUT} = 1A unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		2.6		5.5	V
Output Voltage Range	V_{OUT}		2.6		3.8	V
Quiescent Current	I_Q	I_{OUT}=0, EN=1, ISET=250kΩ, FB=105%*V_{REF}		60	100	μA
Shutdown Current	I_{SHDN}	EN=0		0.1	1	μA
Feedback Reference Voltage	V_{REF}		0.591	0.6	0.609	V
NFET $R_{DS(ON)}$	$R_{DS(ON)1}$			50		mΩ
PFET $R_{DS(ON)}$	$R_{DS(ON)2}$			50		mΩ
Input Peak Current Limit	I_{LIM}		4.5	5		A
Output Negative Current Limit	I_{NEG}			-1		A
Soft-start current	I_{SS}	Soft-start time: $t_{ss} = \frac{0.7V}{I_{ss}} \times C_{ss}$		5		μA
EN rising threshold	V_{ENH}		1.5			V
EN falling threshold	V_{ENL}				0.4	V
Input UVLO rising threshold	V_{UVLO}			2.45	2.55	V
UVLO hysteresis	V_{HYS}			0.2		V
PG rising threshold	$V_{FB,HV}$			0.48		V
PG under-voltage threshold	$V_{FB,LV}$			0.48		V
PG over voltage threshold	$V_{FB,OV}$			0.72		V
Output current sense	I_{SET}	I_{OUT}=1A		5		μA
Output Voltage Over Protection	V_{OVP}			125		%
OVP protection delay time	T_{OVP_delay}			16		μs
ISET pin threshold for PFM mode	V_{PFM}			0.2		V
Oscillator Frequency	F_{OSC}	I_{OUT}=1.0A	0.8	1.0	1.2	MHz
Min Duty Cycle		Boost & Buck		10		%
Max Duty Cycle		Boost & Buck		90		%
Thermal Shutdown Temperature	T_{SD}			150		°C
Thermal Shutdown Hysteresis	T_{HYS}			15		°C

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Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: θ_{JA} is measured in the natural convection at T_A = 25°C on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard. Paddle of QFN2x3-13 package is the case position for θ_{JC} measurement.

Note 3: The device is not guaranteed to function outside its operating conditions.

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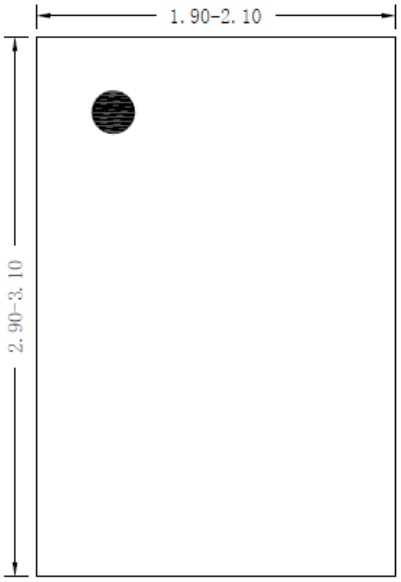
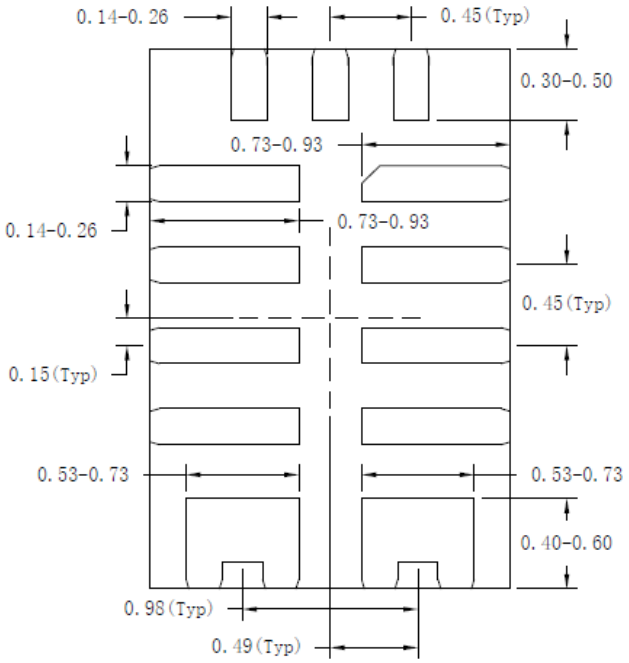
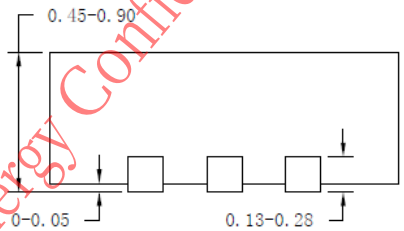
QFN2x3-13 Package Outline Drawing



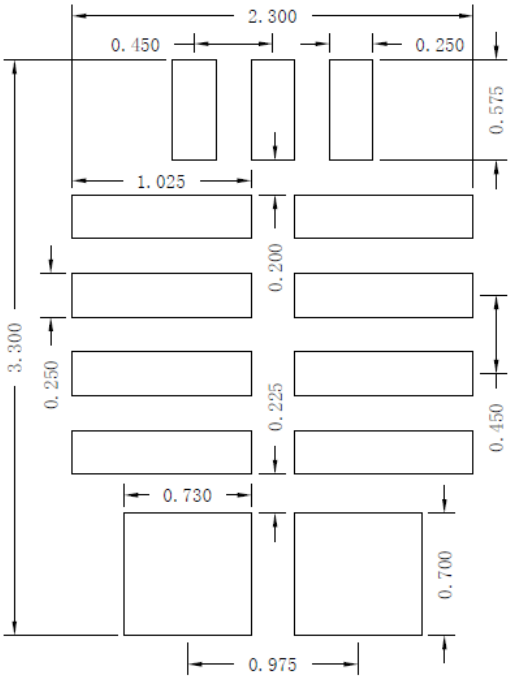
Top View



Bottom View



Side View



Recommended PCB layout
(Reference Only)

Notes: **All dimension in millimeter and exclude mold flash & metal burr.**

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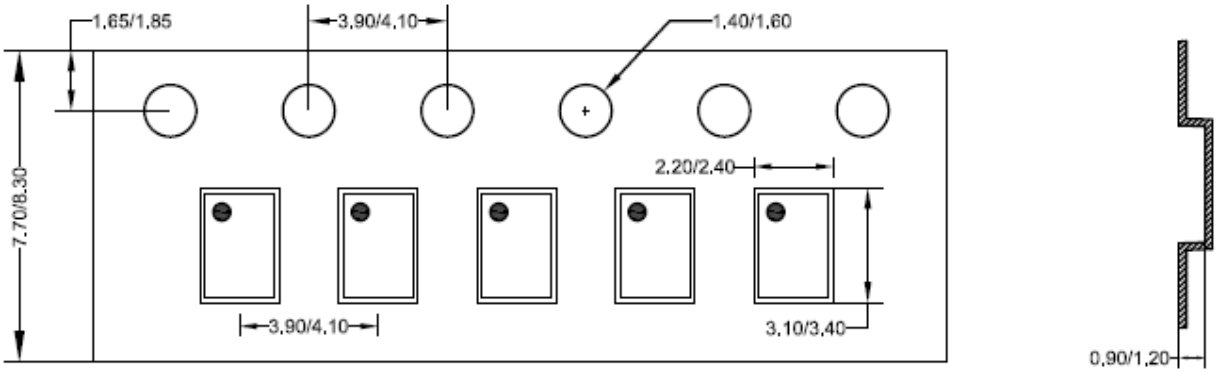
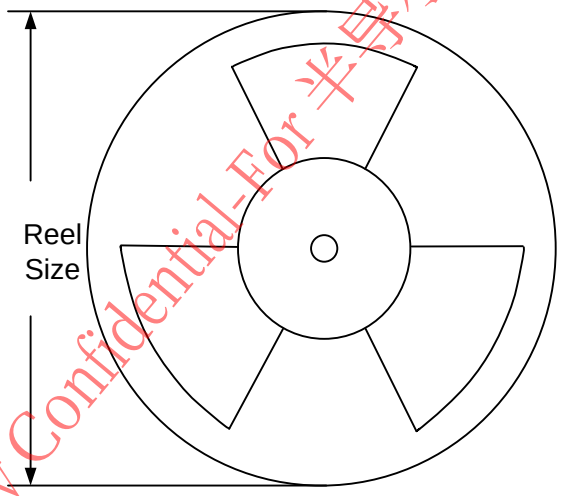
Taping & Reel Specification

1. QFN2x3-13 taping orientation



Feeding direction ⟶

2. Carrier Tape & Reel specification for packages



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Package type	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
QFN2x3	8	4	7"	400	160	3000

3. Others: NA

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