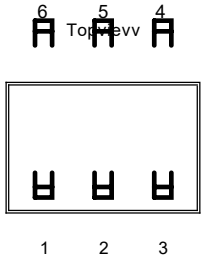
ZS9112T6

■ INTRODUCTION:

The ZS9112T6 is a compact, high-efficiency, fixed frequency, synchronous step-up DC-DC converter.This device provides an easy-to-use power supply solution for applications powered by either one-cell, two-cell or three-cell alkaline, NiCd, NiMH, one-cell Li-Ion or Li-Polymer batteries. A low-voltage technology allows the regulator to start up without high inrush current or output voltage overshoot from a low voltage input. High efficiency is accomplished by integrating the low-resistance N-Channel boost switch and synchronous P-Channel switch. All compensation and protection circuitry are integrated to minimize external components. ZS9112T6 consumes less than 14 μA from battery, while operating at no load (V_{OUT} = 3.3V, V_{IN} = 1.5V). The devices provide a true disconnect from input to output (ZS9112T6A) or an input-to-output bypass (ZS9112T6B), while in shutdown (EN = GND) state. Both options consume less than 0.6 μA from battery. Output voltage is set by a small external resistor divider.

■ PIN CONFIGURATION



■ DEVICE INFORMATION:

PART NUMBER	PACKAGE
ZS9112T6	SOT-23-6L

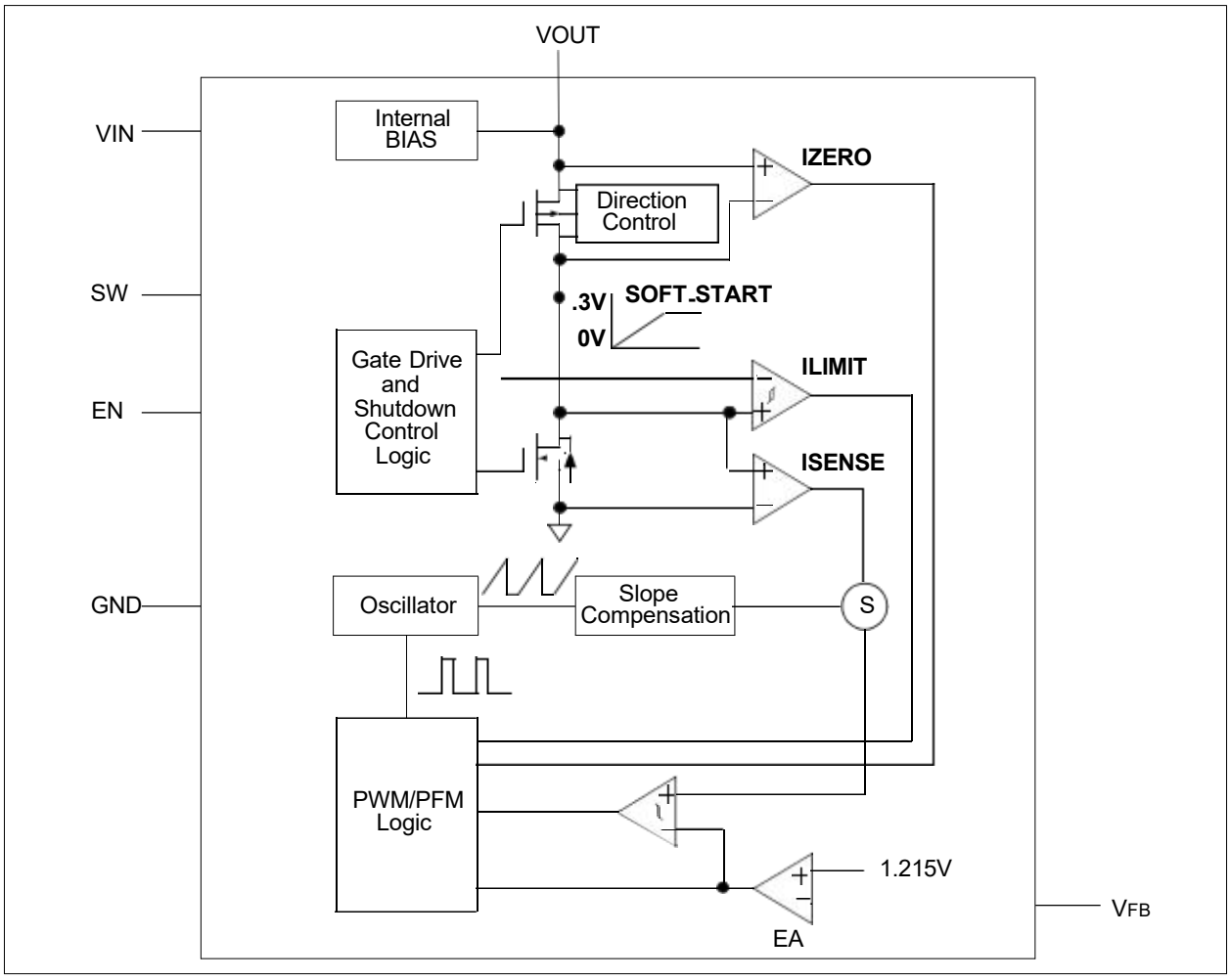
■ FEATURES:

- Up to 96% Typical Efficiency
- 1.0A Typical Peak Input Current Limit:
  I_{OUT} > 200mA@V_{OUT}=3.3V, V_{IN}=1.2V
  I_{OUT} > 400mA@V_{OUT}=3.3V, V_{IN}=2.4V
  I_{OUT} > 400mA@V_{OUT}=5.0V, V_{IN}=3.3V
- Low Device Quiescent Current:
  -Output Quiescent Current: < 4 μAtypical, device is not switching (V_{OUT} > V_{IN}, excluding feedback divider current)
  -Input Sleep Current: 1 μA
  -No Load Input Current: 14 μAtypical
- Shutdown Current: 0.6 μAtypical
- Low Start-up Voltage: 0.82V, 1 mA load
- Low Operating Input Voltage: down to 0.65V
- Adjustable Output Voltage Range: 1.8V to 5.5V
- Maximum Input Voltage: V_{OUT} < 5.5V
- Automatic PFM/PWM Operation:
  -PWM Operation: 500 KHz
  -PFM Output Ripple: 150 mV typical
- Feedback voltage: 1.215V
- Inrush Current Limiting and Internal Soft Start (1 ms typical)
- Selectable, Logic Controlled, Shutdown States:
  -True Load Disconnect Option (ZS9112T6A)
  -Input to Output Bypass Option (ZS9112T6B)
- Over temperature Protection
- Output Short Protection

■ APPLICATIONS：

- One, Two and Three Cell Alkaline and NiMH/NiCd Portable Products
- Solar Cell Applications
- Personal Care and Medical Products
- Bias for Status LEDs
- Smartphones, MP3 Players, Digital Cameras
- Remote controllers, Portable Instruments
- Wireless Sensors
- Bluetooth Headsets
- +3.3V to +5.0V Distributed Power Supply

■ BLOCK DIAGRAM

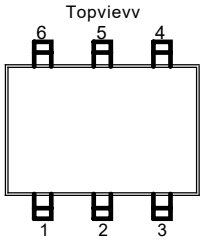


ZS9112T6 Block Diagram

■ ORDER INFORMATION

PART NUMBER	SHUTDOWN STATE
ZS9112T6A	True Load Disconnect
ZS9112T6B	Input to Output Bypass

■ PIN CONFIGURATION



PIN NO.	PIN NAME	FUNCTION
1	SW	Switch Node, Boost Inductor Input Pin
2	GND	Ground Pin
3	V_{FB}	Feedback Voltage Pin
4	EN	Enable Control Input Pin
5	V_{OUT}	Output Voltage Pin
6	V_{IN}	Input Voltage Pin

■ ABSOLUTE MAXIMUM RATINGS(1)

(Unless otherwise specified, T_A=25°C)

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage(2)		V_{IN}	-0.3~ 6	V
SW Voltage(2)			-0.3~ 6	V
CE,FB Voltage(2)			-0.3~ 6	V
V_{OUT} Voltage(2)			-0.3~6	V
Ourput Current Bypass Mode			1000	mA
Power Dissipation	SOT23-6L	P_D	400	mW
Operating Virtual Ambient Temperature Range		T_A	-40~+85	℃
Storage Temperature Range		T_{stg}	-40~+125	℃
Lead Temperature (Soldering, 10 sec)		T_{solder}	260	℃
ESD rating		Human Body Model (HBM)	4000	V
		Machine Model (MM)	400	V

(1) Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods my affect device reliability.

(2) All voltages are with respect to network ground terminal.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	MIN.	NOM.	MAX.	UNITS
Supply voltage at V_{IN}	-0.3	-	6	V
Output voltage at V_{OUT}	-0.3	-	6	V
Operating free air temperature range, T_A	-40	-	85	℃

■ ELETRICAL CHARACTERISTICS

V_{IN}=1.5V, C_{OUT}=C_{IN}=10μF, L=4.7μH, V_{OUT}=3.3V, I_{OUT}=0mA，Typical values are at T_A=25℃, unless otherwise specified.

PARAMETER	SYMBOL	CONDITIONS		MIN.	TYP. (1)	MAX.	UNITS
Minimum Start-Up Voltage	V_{IN}	I_{LOAD} =1mA		-	0.82	-	V
Minimum Operating Voltage(2)	V_{IN}	I_{LOAD} =1mA		-	0.65	-	V
Input Voltage Range	V_{IN}			0.82		5.5	V
Feedback Voltage	V_{FB}			1.179	1.215	1.251	V
Feedback Input Bias Current	I_{VFB}			-	10	-	nA
Output Voltage Adjust Range(3)	V_{OUT}	V_{OUT}≥V_{IN}		1.8		5.5	V
Output Voltage	V_{OUT}	EN=0V	ZS9112T6A		0		V
			ZS9112T6B		V_{IN}-0.6V		
Maximum Output Current	I_{OUT}	V_{IN}=1.2V,V_{OUT} = 2V			200	-	mA
		V_{IN}=2.4V,V_{OUT} = 3.3V			400	-	
		V_{IN}=3.3V,V_{OUT} = 5.0V			400	-	
V_{OUT} Quiescent Current(4)	I_{QOUT}	I_{OUT}=0mA, device is not switching, EN= V_{IN}=4V, V_{OUT}=5V		-	4	8	μA
V_{IN} Sleep Current(5)	I_{QIN}	I_{OUT}=0mA, EN=V_{IN}		-	1	2.3	μA
No load Input Current	I_{INO}	I_{OUT} = 0mA, device is switching		-	14	25	μA
Quiescent Current Shutdown	I_{QSHDN}	V_{OUT} = 3.3V		-	0.6	-	μA

(1) Typical numbers are at 25°C and represent the most likely norm.

(2) Minimum V_{IN} operation after start-up is only limited by the battery's ability to provide the necessary power as it enters a deeply discharged state.

(3) For V_{IN} > V_{OUT}, V_{OUT} will not remain in regulation.

(4) I_{QOUT} is measured at V_{OUT}, V_{OUT} is external supplied for V_{OUT} > V_{IN} (device is not switching)

(5) I_{QIN} is measured at VIN pin during Sleep period, no load. Determined by characterization, not production tested.

■ ELETRICAL CHARACTERISTICS

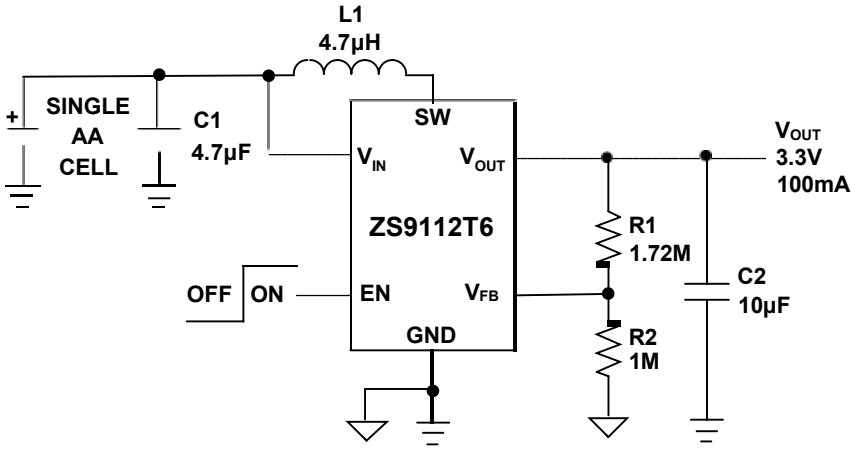
V_{IN}=1.5V, C_{OUT}=C_{IN}=10μF, L=4.7μH, V_{OUT}=3.3V, I_{OUT}=0mA，Typical values are at T_A=25℃, unless otherwise specified.

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP. (1)	MAX.	UNITS
NMOS Switch Leakage	I_{NLK}	V_{IN}=V_{SW}=5V, V_{OUT} =5.5V, EN=V_{FB}=GND	-	0.15	-	μA
PMOS Switch Leakage	I_{PLK}	V_{IN}=V_{SW}=GND, V_{OUT}=5.5V	-	0.15	-	μA
NMOS Switch On Resistance	$R_{DS(ON)N}$	V_{OUT} = 3.3V, I_{SW}=100mA	-	0.25	-	Ω
PMOS Switch On Resistance	$R_{DS(ON)P}$	V_{OUT} = 3.3V I_{SW}=100mA	-	0.5	-	Ω
NMOS Peak Switch Current Limit(1)	$I_{N(MAX)}$		-	1	-	A
V_{OUT} Accuracy(2)	V_{OUT}%	V_{IN}=1.5V	-3	-	+3	%
Switching Frequency	f_{SW}			500		KHz
EN Input Logic High	V_{IH}	I_{OUT}=1mA	70	-	-	% of V_{IN}
EN Input Logic Low	V_{IL}	I_{OUT}=1mA	-	-	20	% of V_{IN}
EN Input Leakage Current	I_{ENLK}	V_{EN}=5V	-	5	-	nA
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}\ \Delta V_{IN}}$	1.5V≤V_{IN}≤2.8V I_{OUT}=50mA	-0.4	0.3	0.4	%/V
Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	25mA≤I_{OUT}=≤100mA V_{IN}=1.5V	-1.5	0.1	1.5	%
Maximum Duty Cycle(1)	DC_{MAX}		87	89	91	%
Soft Start Time(1)	t_{ss}	EN Low to High 90% of V_{OUT}	-	1	-	ms
Thermal Shutdown Die Temperature	T_{SD}	I_{OUT}==20mA V_{IN}=1.4V	-	160	-	℃
Die Temperature Hysteresis	T_{SDHY}		-	20	-	℃

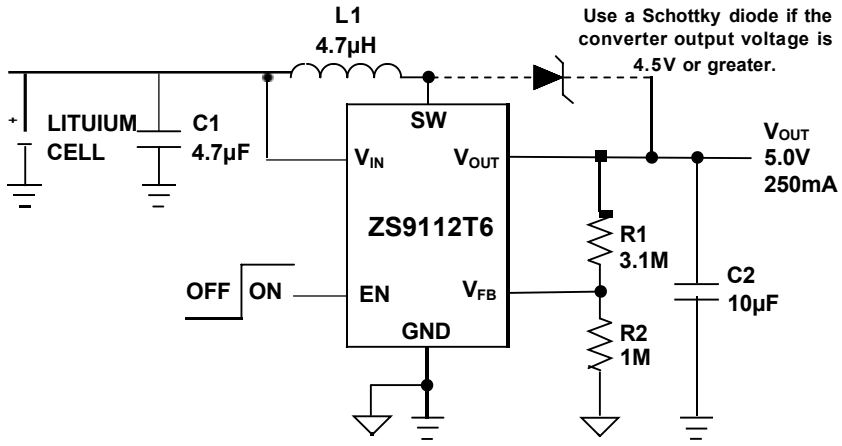
(1) Determined by characterization, not production tested.

(2) Includes Line and Load Regulation

■ TYPICAL APPLICATION CIRCUITS



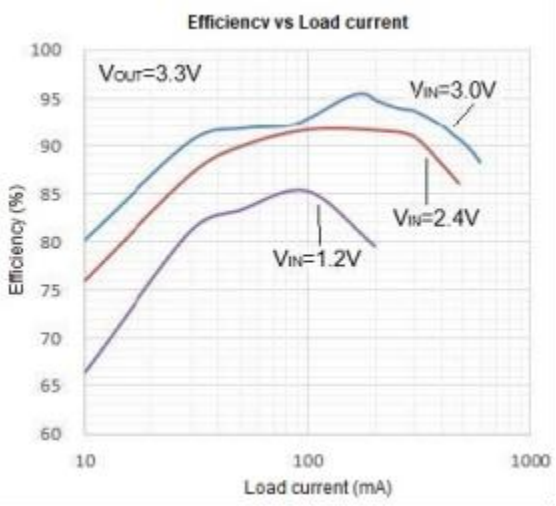
Circuit 1

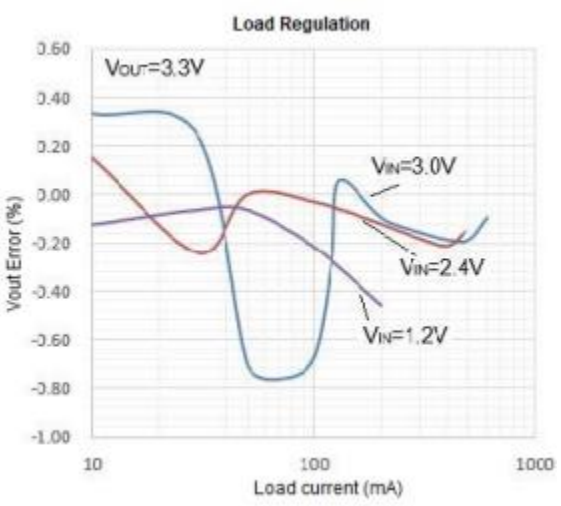


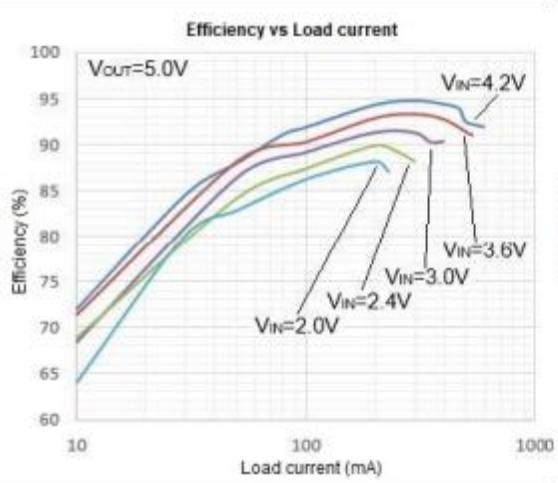
Circuit 2

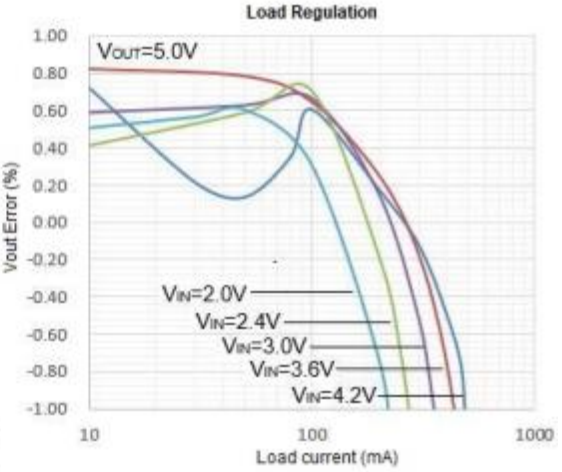
Typical Characteristics

(T_A=25℃, unless otherwise specified)

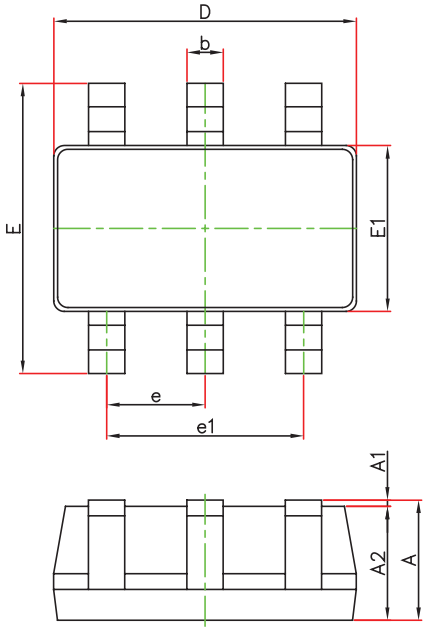


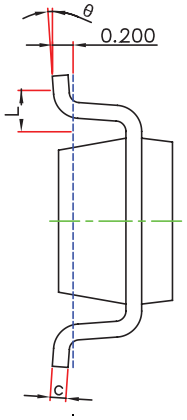






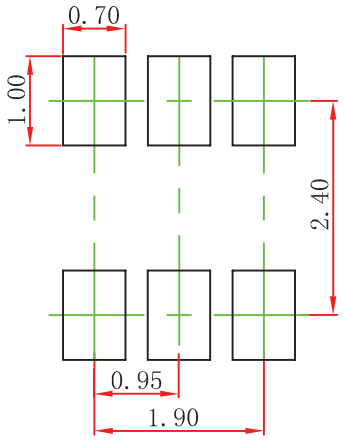
SOT-23-6L Package Outline Dimensions





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.650	2.950	0.104	0.116
E1	1.500	1.700	0.059	0.067
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT-23-6L Suggested pad Layout



Note:
1.Controlling dimension:In millimeters.
2.General tolerance:±0.05mm.
3.The pad layout is for reference purposes only.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

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