

## 1.5MHz, 1.2A Synchronous Step-Down Converter

### FEATURES

- High Efficiency - Up to 95%
- Guaranteed 900mA Output Current
- 2.5V to 5.5V Input Voltage Range
- 1.5MHz Constant Frequency Operation
- No external Schottky Diode Needed
- Adjustable Output Voltages From 0.6V to VIN
- Fixed Output Voltage Options Available
- 100% Duty Cycle Low-Dropout Operation
- 0.1µA Shutdown Current
- TDFN3x3-10 Package

### TYPICAL APPLICATIONS

- Cellular phones
- DSP Core Supplies
- XDSL Applications
- USB Powered Modems
- Digital Still Cameras
- Portable Instruments
- PC Cards and Notebooks

### DESCRIPTION

The FT442 is a 1.5MHz constant frequency, slope compensated current mode step down converter. It is ideal for portable equipment requiring very high current up to 1.2A from single-cell Lithium-ion batteries while still achieving over 90% efficiency during peak load conditions.

The FT442 integrates a main switch and a synchronous rectifier for high efficiency without an external Schottky diode. The FT442 automatically turns off the synchronous rectifier to increase efficiency while enters discontinuous PWM mode.

The FT442 can run at 100% duty cycle for low dropout operation, maximizing battery life in portable application. FT442 consumes less than 1µA when enter shutdown mode.

The FT442 is available in a fixed output voltages of 1.2V, 1.5V, and 1.8V, and is also available in an adjustable output voltage version capable of generating output voltages from 0.6V to VIN .The FT442 is available in a TDFN3x3-10 package.

## TYPICAL APPLICATION CIRCUIT

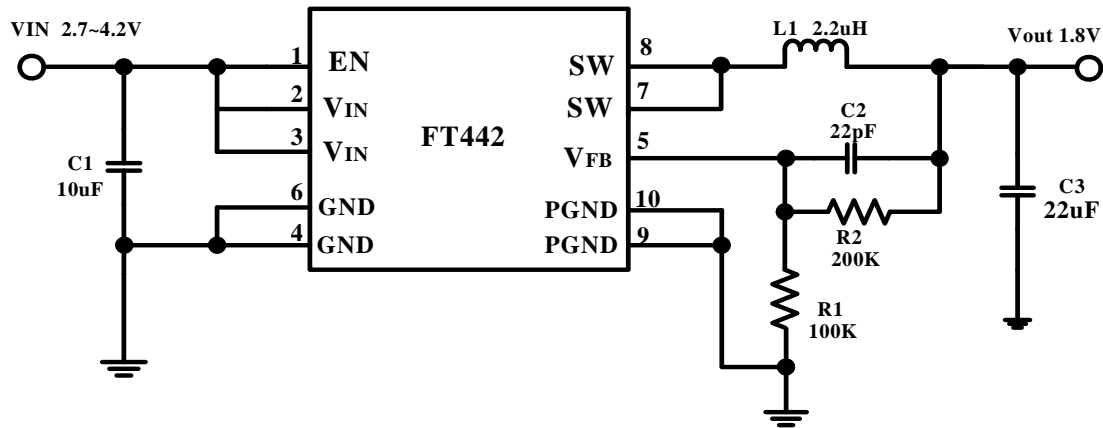


Figure 1: Typical Application Circuit

## ABSOLUTE MAXIMUM RATINGS

VIN to GND/PGND.....	-0.3V to 6V
EN to GND/PGND.....	-0.3V to (VIN+0.3)
VFB to GND/PGND.....	-0.3V to (VIN+0.3)
SW to GND/PGND.....	-0.3V to (VIN+0.3)
Peak SW Sink and Source Current.....	Internally Limited
Junction to Ambient Thermal Resistance ( $\theta_{JA}$ ).....	45°C/W
Operating Temperature Range.....	-40°C to +85°C
Junction Temperature.....	-40°C to +150°C
Storage Temperature Range .....	-55°C to +150°C
Lead Temperature (Soldering, 10sec) .....	300°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

## PIN COMFIGURATION

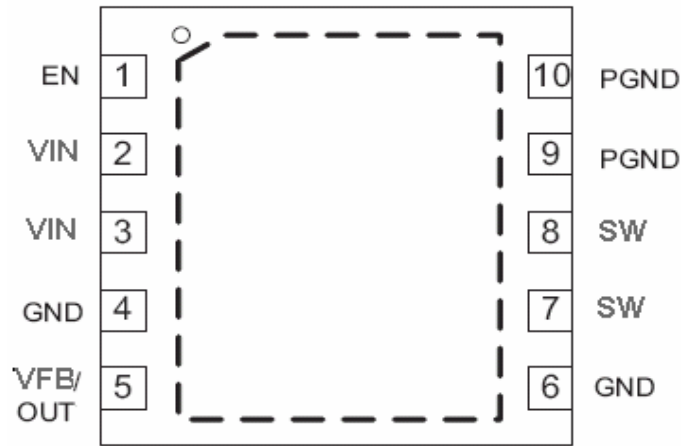


Figure 2: Package Top View

## TERMINAL DEFINITION

Pin	Name	Description
1	EN	Enable control input.
2, 3	VIN	Power input.
4, 6	GND	Analog Ground.
5	VFB/Out	Feedback node. VFB for adjustable version, and Out for fixed output version
7, 8	SW	Switching Node. Connect the output inductor to this pin.
9, 10	PGND	Power Ground.

Table 1

BLOCK DIAGRAM

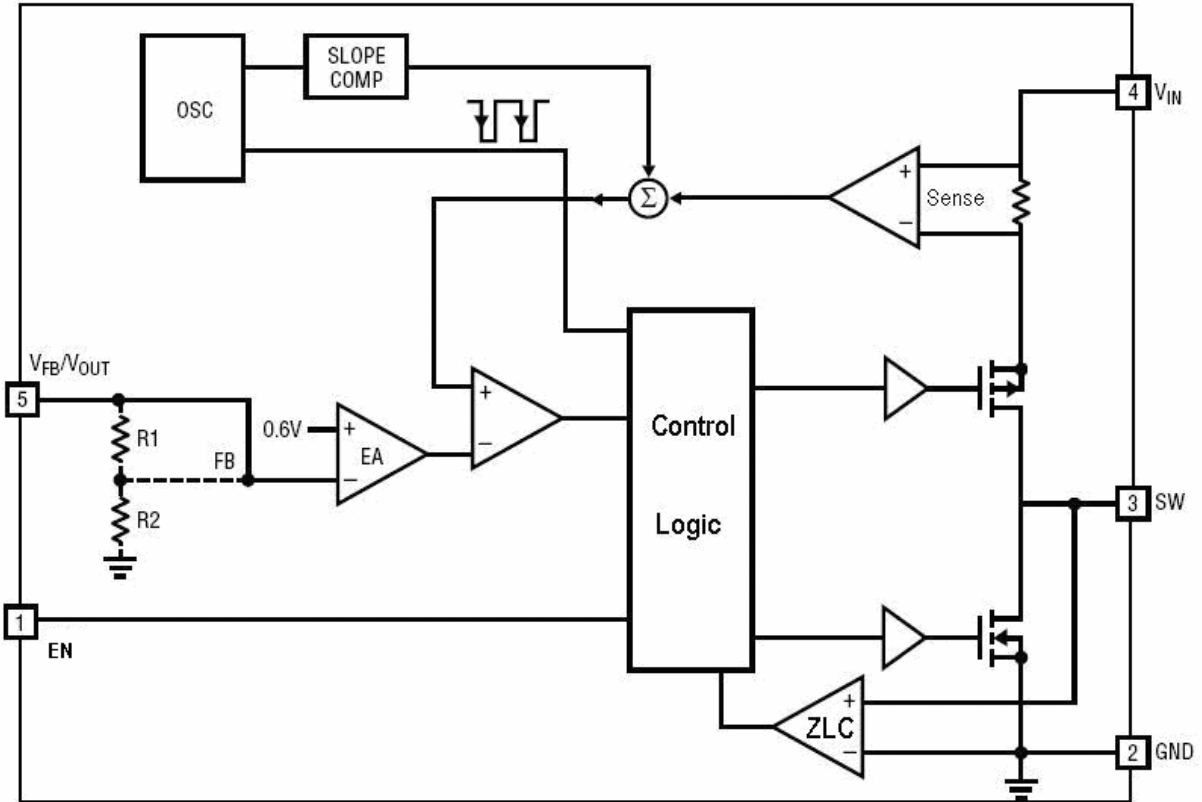


Figure 4: FT442 Block Diagram

### ELECTRICAL CHARACTERISTICS

( $V_{IN} = V_{EN} = 3.6V$ ,  $T_A = 25^\circ C$  unless otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	$V_{IN}$		2.5		5.5	V
Under Voltage Lockout Threshold	$V_{UVLO}$	$V_{IN}$ rising	2.2	2.35	2.5	V
Operating Supply Current		$V_{FB}=0.5$ or $V_{out}=90\%$		300	500	$\mu A$
Shutdown Supply Current		$V_{EN} = 0V$ , $V_{IN} = 4.2V$		0.1	1	$\mu A$
Adjustable Version Regulation Voltage	$V_{FB}$	$T_A = 25^\circ C$	0.588	0.6	0.612	V
		$0 < T_A < 85^\circ C$	0.585	0.6	0.615	
		$-40^\circ C < T_A < 85^\circ C$	0.582	0.6	0.618	
Fixed Output Regulation Voltage	$V_{OUT}$	FT442UC120	1.164	1.2	1.236	
		FT442UC150	1.455	1.5	1.545	
		FT442UC180	1.746	1.8	1.854	
Output Voltage Line Regulation		$V_{IN} = 2.5V$ to $5.5V$		0.04	0.4	%/V
Output Voltage Load Regulation		$I_{OUT} = 0mA$ to $600mA$		0.5		%
Inductor Current Limit	$I_{LIM}$	$V_{IN} = 3.6V$ , $V_{FB} = 0.5V$ or $V_{out}=90\%$	1.6	2	2.4	A
Oscillator Frequency	$f_{SW}$	$V_{FB}=0.6$ or $V_{out}=100\%$	1.2	1.5	1.8	MHz
		$V_{FB}=0$ or $V_{out}=0$		300		KHz
PMOS On Resistance	$R_{ONP}$	$I_{SW} = -100mA$		150	250	$m\Omega$
NMOS On Resistance	$R_{ONN}$	$I_{SW} = 100mA$		100	180	$m\Omega$
SW Leakage Current		$EN = 0$ , $V_{IN} = 5.5V$ , $V_{SW} = 5.5V$ or $0V$			1	$\mu A$
EN Threshold	$V_{IH}$	$V_{IN} = 2.5V$ to $5.5V$	0.3	1	1.5	V
EN Leakage Current	$I_{EN}$	$V_{IN} = 5.5V$ , $EN = V_{IN}$		0.01	1	$\mu A$

Table 4

## APPLICATION INFORMATION

Figure5 below shows the typical application circuit with FT442 fixed output versions.

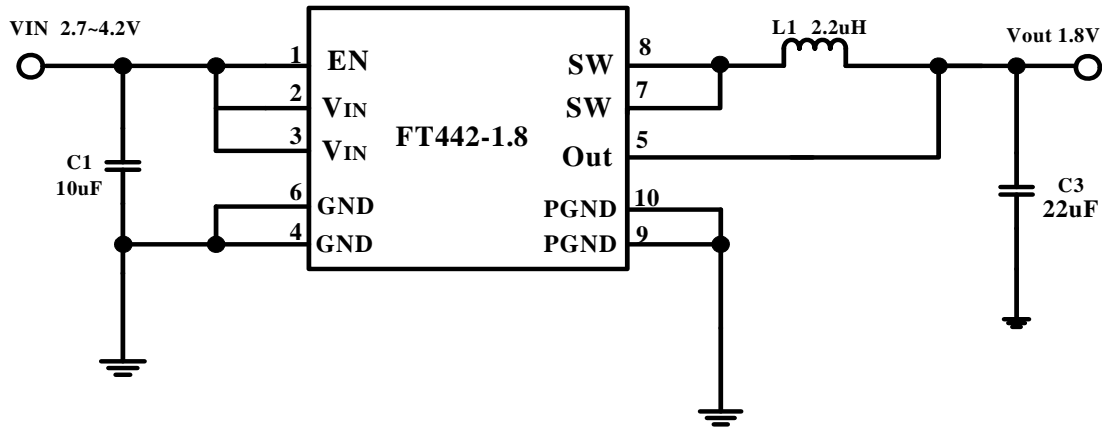


Figure 5: Typical Application Circuit with fixed output versions

### Inductor Selection

Under normal operation, the inductor maintains continuous current to the output. Its value is chosen based on the desired ripple current. Large value inductors lower ripple current, and small value inductors result in higher ripple currents. The inductor value can be derived from the following equation:

$$L = \frac{V_{out} \times (V_{IN} - V_{out})}{V_{IN} \times \Delta I_L \times f_{osc}}$$

Where  $\Delta I_L$  is inductor ripple current.

### Input Capacitor Selection

The input capacitor reduces input voltage ripple to the converter; a 10uF ceramic capacitor is recommended for most applications.

### Output Capacitor Selection

The output capacitor is required to keep the output voltage ripple small and to ensure regulation loop stability. The output capacitor must have low impedance at the switching frequency. The output ripple  $\Delta V_{out}$  approximately:

$$\Delta V_{OUT} \cong \Delta I_L \times \left( ESR + \frac{1}{8fC_{OUT}} \right)$$

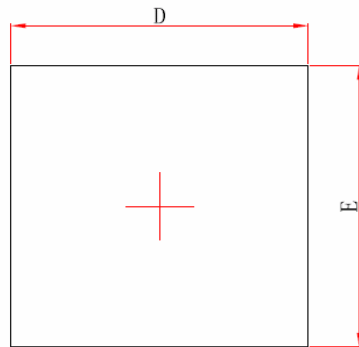
### Output Voltage Programming

Figure1 above shows the typical application with FT442 adjustable version. The external resistor sets the output voltage according to following equation:

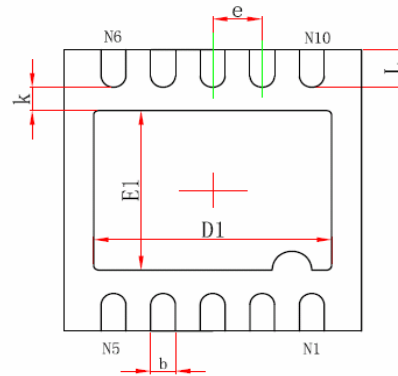
$$V_{OUT} = 0.6V \times \left( 1 + \frac{R2}{R1} \right)$$

### PACKAGE INFORMATION

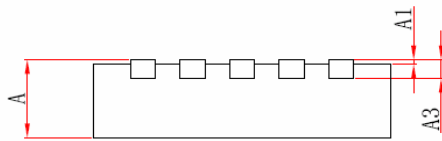
#### DFN3x3-10 Package



**Top View**



**Bottom View**



**Side View**

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
D1	2.300	2.500	0.091	0.098
E1	1.600	1.800	0.063	0.071
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.500TYP.		0.020TYP.	
L	0.300	0.500	0.012	0.020