2.5A,20V,1.2MHz Step-Up DC/DC Controller

General Description

The FC1208D is a high efficiency boost regulators targeted for general step-up applications.Its PWM circutargeted with built-in 0.1Ω , 2.5A Power MOSFET make this regulator highly power efficient.

Features

- Wide input range: 2.2V ~ 16V
- Output up to 20V
- 1.2MHz switching frequency
- up to 95% Efficiency
- Adjustable Over Current Protection: 0.5A ~ 2.5A
- Shutdown Current: 0.1μA
- Low $R_{DS(ON)}$: 0.1Ω
- Over Temperature Protection
- Accurate Reference: 0.6V_{REF}
- Compact package: SOT-23-6 pins

Applications

- Chargers
- LCD Displays
- Portable Products
- Networking cards powered from PCI or PCI-express slots

Typical Applications

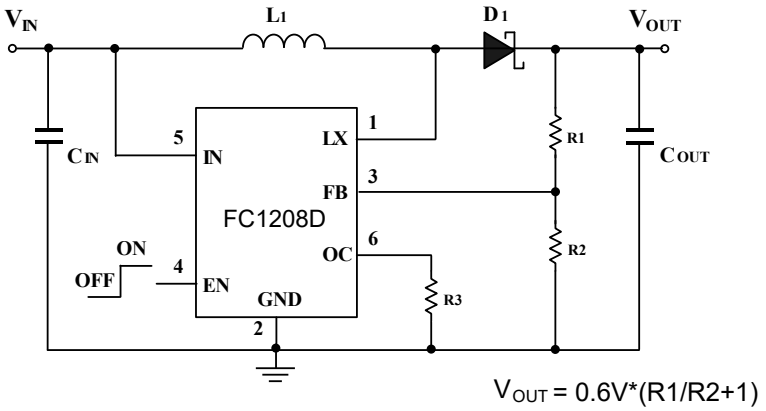


Figure 1 - Schematic Diagram

Function Block Diagram

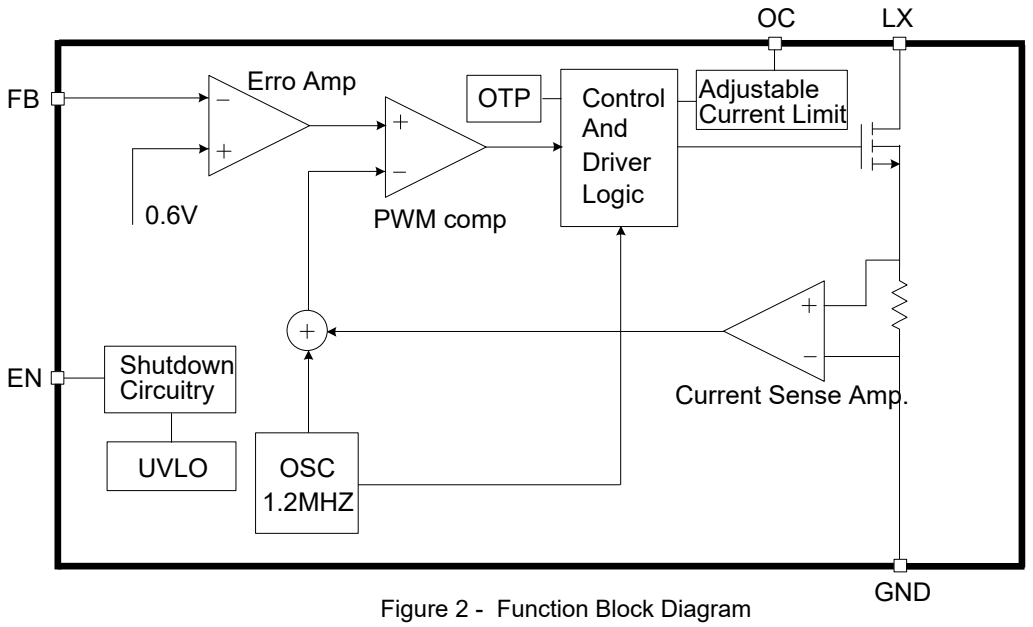
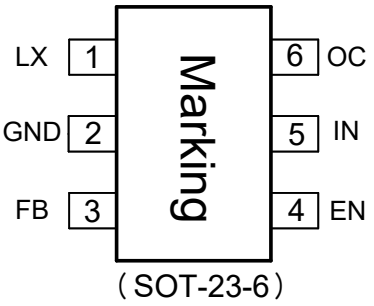


Figure 2 - Function Block Diagram

Pinout (top view)



Pin Name	Pin Number	Pin Description
LX	1	Inductor node. Connect an inductor between INpin and LX pin.
GND	2	Ground pin
FB	3	Feedback pin. Connect a resistor R1 between V_{OUT} and FB, and a resistor R2 between FB and GND to program the output voltage: V_{OUT} =0.6V*(R1/R2+1).
EN	4	Enable control. High to turn on the part. Don't leave it floated.
IN	5	Input pin.Must be locally bypassed.
OC	6	Adjustable Current Limit. (Floating Available)

Ordering Information

FC1208D(□□□□) (□□)
- (□□) — Lot Number Code
- (□□□□) — Part Number Code

Temperature Range: -40°C to 85°C

Part Number	Package type	MOQ	Description
FC1208D	SOT-23-6	3000	Tape & Reel

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}		-0.3		16	V
LX Voltage	V_{LX}		-0.3		22	V
EN,FB Voltage			-0.3		6	V
Power Dissipation	P_D	SOT-23-6L @T_A=25℃			600	mW
Thermal Resistance (Note1)	θ_{JA}	SOT-23-6L			+250	°C / W
Junction Temperature	T_J				+160	°C
Operating Temperature	T_{OP}		-40		+85	°C
Storage Temperature	T_{ST}		-65		+150	°C
Lead Temperature		(soldering, 10 sec)			+300	°C
ESD HBM		(Human Body Mode)			2	KV
ESD MM		(Machine Mode)			200	V

Note1:

θ_{JA} is measured in the natural convection at T_A=25°C on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

Recommended Operating Conditions

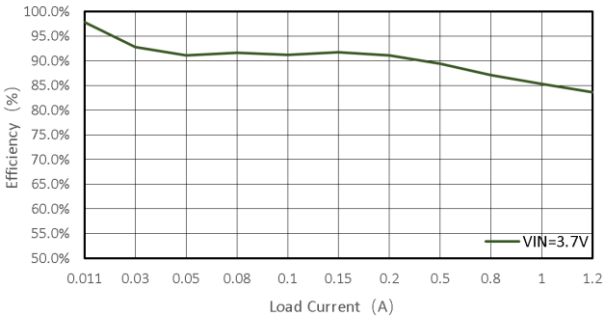
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_N		2.2		16	V
Operating Temperature Range	T_A	Ambient Temperature	-40		+85	℃

DC Electrical Characteristics (V_{CC}=5V, T_A=25°C, unless otherwise specified)

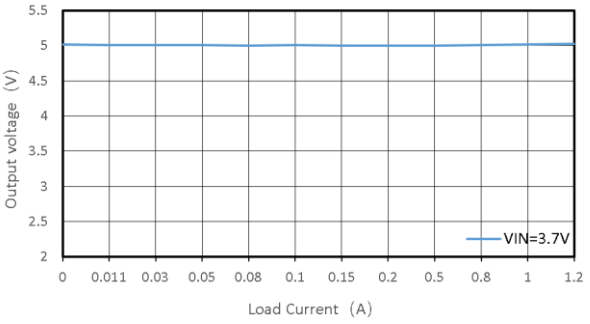
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
System Supply Input						
Input Supply Range	V_{CC}		2.2		16	V
Under Voltage Lockout	V_{UVLO}			2.2		V
UVLO Hysteresis				0.1		V
Quiescent Current	I_{CC}	V_{FB}=0.66V, No switching		0.1	0.2	mA
Average Supply Current	I_{CC}	V_{FB}=0.55V, Switching		1.6	2.2	mA
Shutdown Supply Current	I_{CC}	V_{EN}=GND		0.1		μA
Oscillator						
Operation Frequency	F_{OSC}			1.2		MH_Z
Maximum Duty Cycle	T_{DUTY}			90		%
Reference Voltage						
Reference Voltage	V_{REF}		0.588	0.6	0.612	V
Enable Control						
Enable Voltage	V_{EN}		1.5			V
Shutdown Voltage	V_{EN}				0.6	V
MOSFET						
On Resistance of Driver	$R_{DS\ (ON)}$			0.1		Ω
Protection						
OCP Current	I_{OCP}			2.5		A
Adjustable OCP Current	I_{OCP}	With External Resistor：19k~96k	0.5		2.5	A
OTP Temperature	T_{OTP}			+160		°C

Typical Performance Characteristics

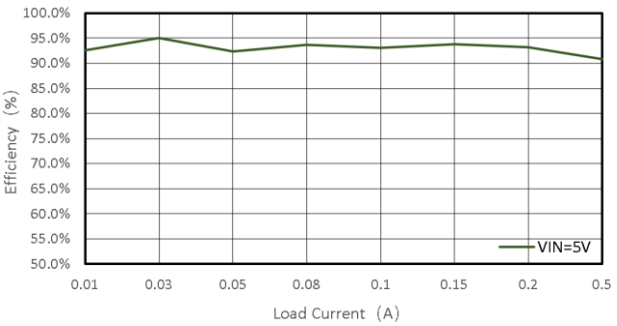
Efficiency @ Vout=5V



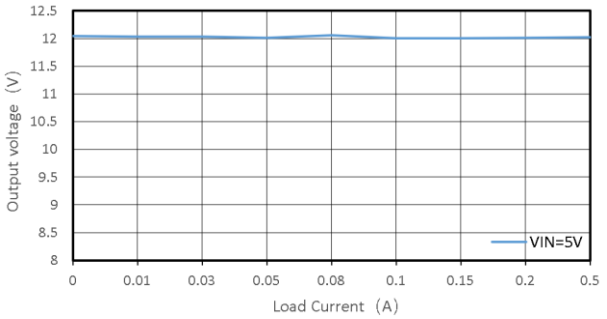
Load Regulation @ Vout=5V



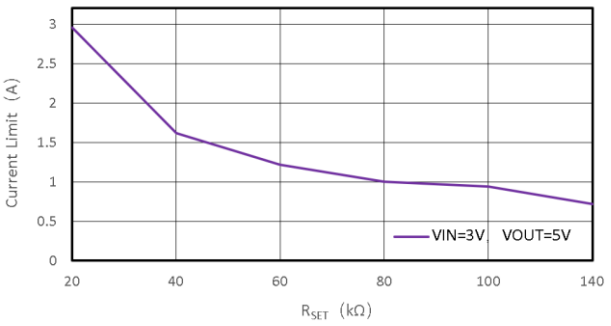
Efficiency @ Vout=12V



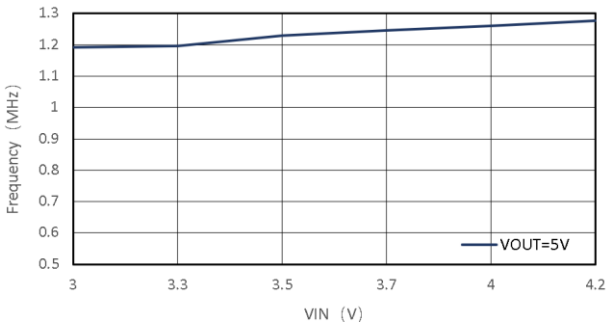
Load Regulation @ Vout=12V



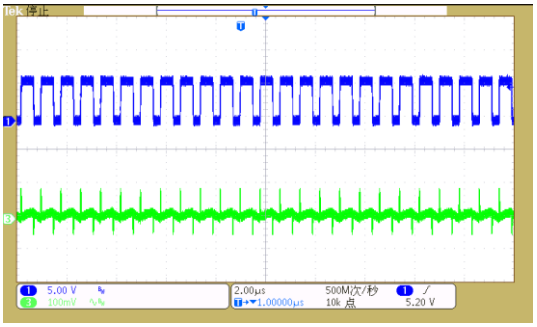
Current Limit vs External Resistor



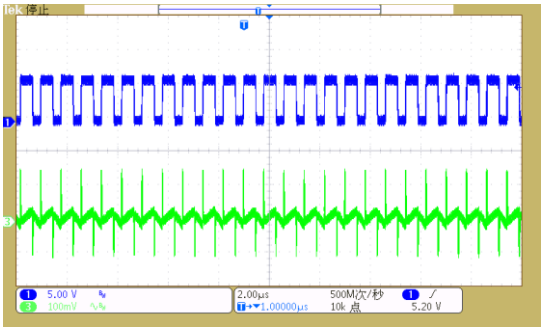
Frequency vs VIN



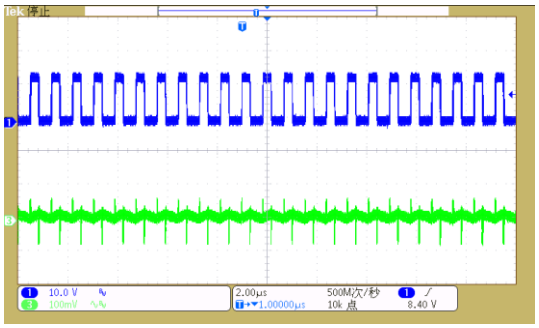
V_{IN}=3.7V,V_{OUT}=5V,I_{LOAD}=0.5A



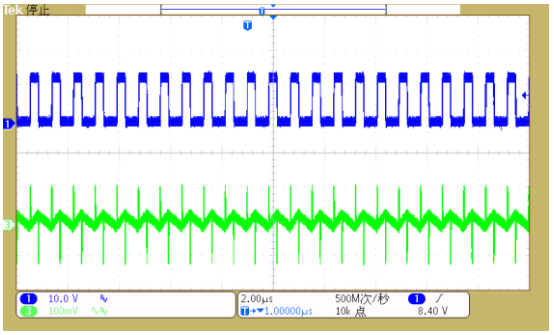
V_{IN}=3.7V V_{OUT}=5V I_{LOAD}=1A



V_{IN}=5V,V_{OUT}=12V,I_{LOAD}=0.2A



V_{IN}= 5V,V_{OUT}= 12V,I_{LOAD}=0.5A



Typical Application

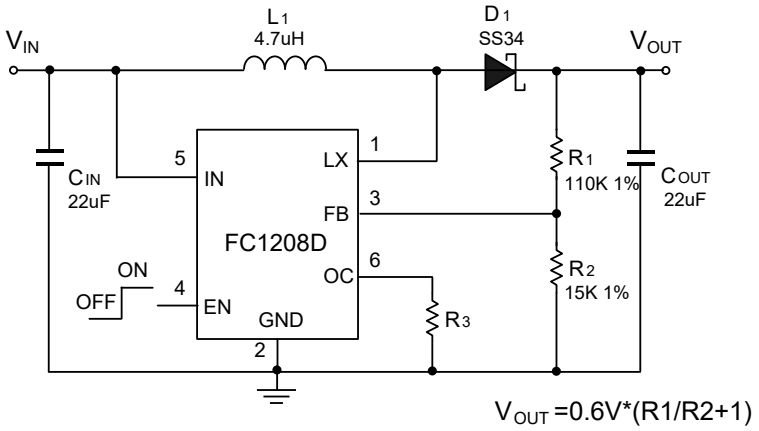


Figure 3 - General Boost Converter

Function Description

Operation

The FC1208D is a current mode boost converter.The constant switching frequency is 1.2MHz and operates with pulse width modulation (PWM). Build-in 0.1Ω ,2.5A MOSFET provides a high output voltage. The control loop architecture is peak current mode control; therefore slope compensation circuit is added to the current signal to allow stable operation for duty cycles larger than 50%.

Soft Start Function

Soft start circuitry is integrated into FC1208D to avoid inrush current during power on. After the IC is enabled, the output of error amplifier is clamped by the internal soft-start function, which causes PWM pulse width increasing slowly and thus reducing input surge current.

Current Limit Program

A resistor between OC and GND pin programs peak switch current. The resistor value should be between 19k and 96k. The current limit will be set from 2.5A to 0.5A. Keep traces at this pin as short as possible. Do not put capacitance at this pin. To set the over current trip point according to the following equation:

$$I_{OCP} = \frac{48000}{R3}$$

Over Temperature Protection (OTP)

FC1208D will turn off the power MOSFET automatically when the internal junction temperature is over 160°C. The power MOSFET wake up when the junction temperature drops 25°C under the OTP threshold temperature.

Output Voltage Programming

In the adjustable version, the output voltage is set by a resistive divider according to the following equation:

$$V_{OUT}=0.6V*(R1/R2+1)$$

Inductor Selection

In normal operation, the inductor maintains continuous current to the output. The inductor current has a ripple that is dependent on the inductance value. The high inductance reduces the ripple current. The recommended values of inductor are 4.7 to 22uH.

Input Capacitor Selection

The input capacitor reduces input voltage ripple to the converter, low ESR ceramic capacitor is highly recommended. For most applications, a 22uF capacitor is used. The input capacitor should be placed as close as possible to VIN and GND.

Output Capacitor Selection

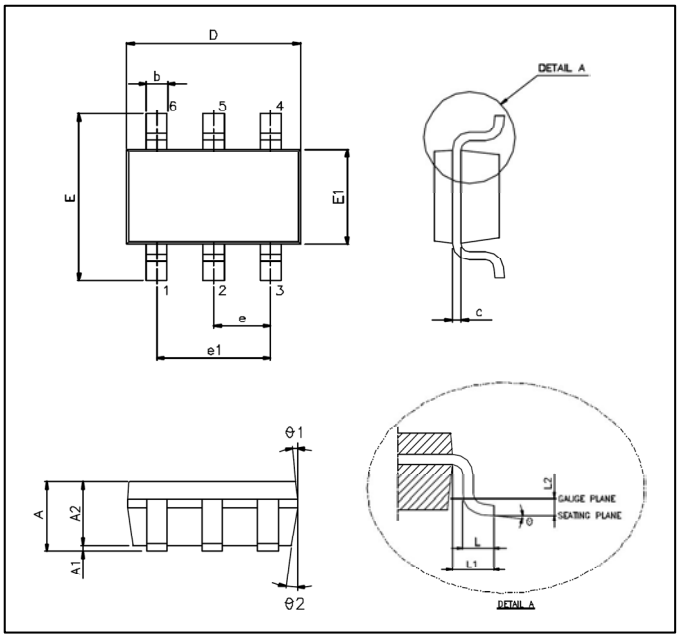
A low ESR output capacitor is required in order to maintain low output voltage ripple. In the case of ceramic output capacitors, capacitor ESR is very small and does not contribute to the ripple, so a lower capacitance value is acceptable when ceramic capacitors are used. A 22uF ceramic output capacitor is suitable for most applications.

Diode Selection

According to max Iout and max Vout, you can select suitable diode. Normally we select diode If=(1.5~2)*Ioutmax and VR=(1.5~2)*Voutmax. For high efficiency suggest that you select low Vf Schottky diode.

Package Outline

SOT-23-6L



Unit: mm

Symbols	Min. (mm)	Max. (mm)
A	1.050	1.450
A1	0.050	0.150
A2	0.900	1.300
b	0.300	0.500
c	0.080	0.220
D	2.900 BSC	
E	2.800 BSC	
E1	1.600 BSC	
e	0.950 BSC	
e1	1.900 BSC	
L	0.300	0.600
L1	0.600 REF	
L2	0.250 BSC	
θ°	0°	8°
θ1°	3°	7°
θ2°	6°	15°

Note:

1. Package dimensions are in compliance with JEDEC outline: MO-178 AB.
2. Dimension “D” does not include molding flash, protrusions or gate burrs.
3. Dimension “E1” does not include inter-lead flash or protrusions.