

10A Current Mode Non-Synchronous PWM Boost Converter



General Description

The FP6296 is a current mode boost DC-DC converter. It is PWM circuitry with built-in 15mΩ power MOSFET make this regulator highly power efficient. The non-inverting input of error amplifier connects to a 1.2V precision reference voltage. Current mode control and external compensation network make is easy and flexible to stabilize the system.

The FP6296 is available in the SOP-8L(EP) package to fit in space-saving PCB for the application fields.

Features

- Supply Voltage Operating Range: 2.7V to 12V
- Adjustable Output up to 13V
- Internal Fixed PWM frequency: 400KHz
- Precision Feedback Reference Voltage: 1.2V ($\pm 2\%$)
- Internal 15mΩ, 10A, 15V Power MOSFET
- Shutdown Current: 1μA (Max.)
- Over Temperature Protection
- Internal Soft Start Function
- Adjustable Over Current Protection: 2A ~ 10A
- Package: SOP-8L(EP)

Applications

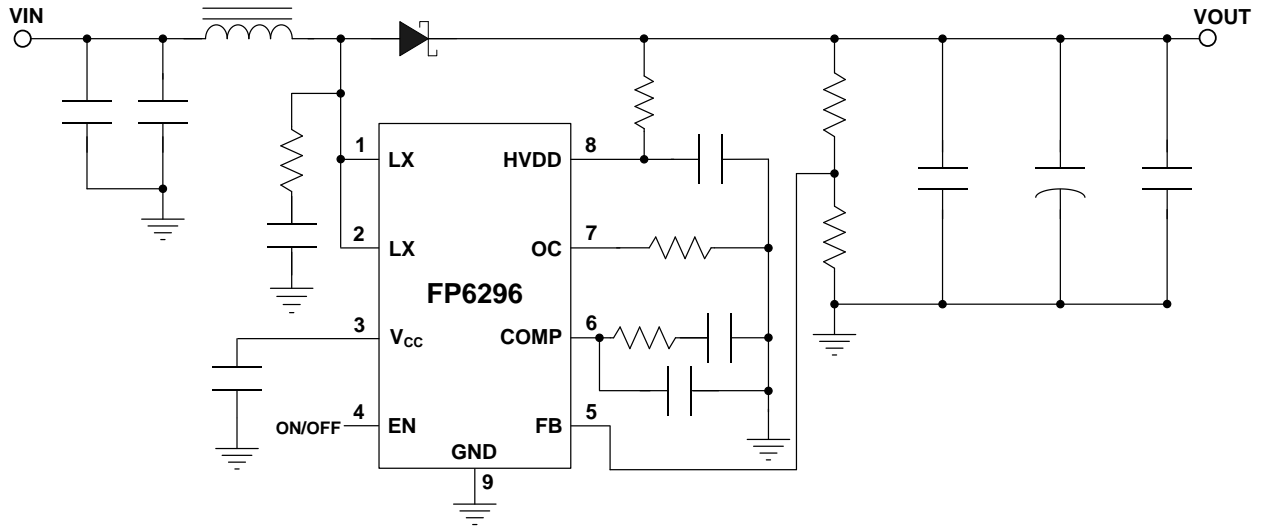
- Chargers
- LCD Displays
- Digital Cameras
- Handheld Devices
- Portable Products
- Power Bank

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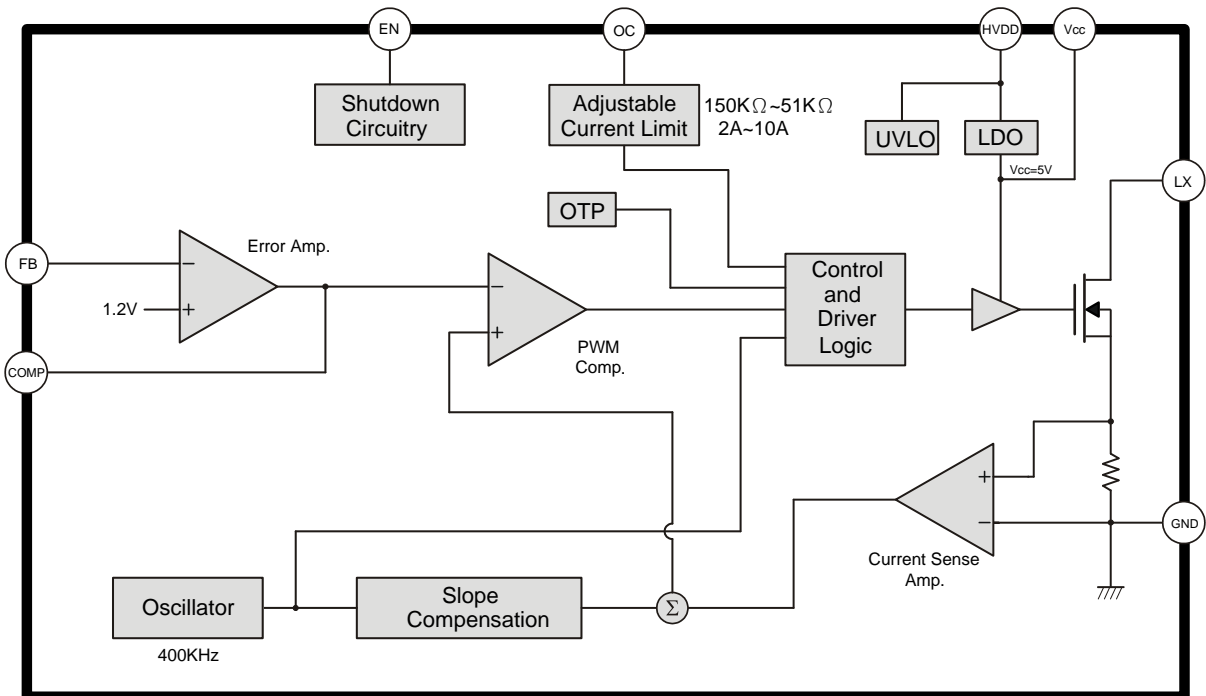
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Typical Application Circuit



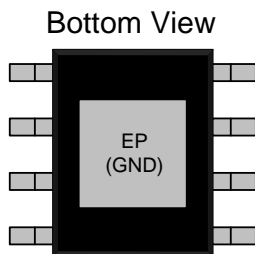
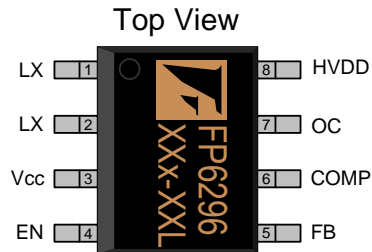
Function Block Diagram



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Pin Descriptions

SOP-8L(EP)



Name	No.	I / O	Description
LX	1	I	Power Switch Output
LX	2	I	Power Switch Output
Vcc	3	P	Power Supply for Internal Control Circuits and Gate Drivers
EN	4	I	Enable Control (Active High)
FB	5	I	Error Amplifier Inverting Input
COMP	6	O	Compensation
OC	7	I	Adjustable Current Limit (Floating Invalid)
HVDD	8	P	IC Power Supply
GND	EP	P	IC Ground (Exposed PAD) – Must Connect to Ground

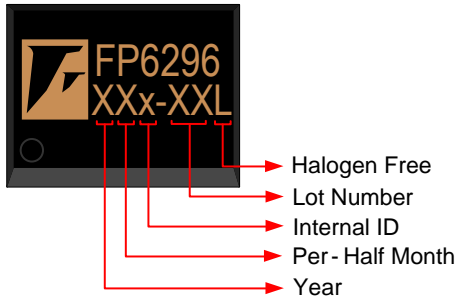
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Marking Information

SOP-8L(EP)



Halogen Free: Halogen free product indicator

Lot Number: Wafer lot number's last two digits

For Example → Lot : 123456 → XXx-56L

Internal ID: Internal Identification Code

Per-Half Month: Production period indicator in half month time unit

For Example : A → First Half Month of January

B → Second Half Month of January

C → First Half Month of February

D → Second Half Month of February

Year: Production year's last digit

Ordering Information

Part Number	Operating Temperature	Package	MOQ	Description
FP6296XR-G1	-40°C ~ 85°C	SOP-8L(EP)	2500EA	Tape & Reel

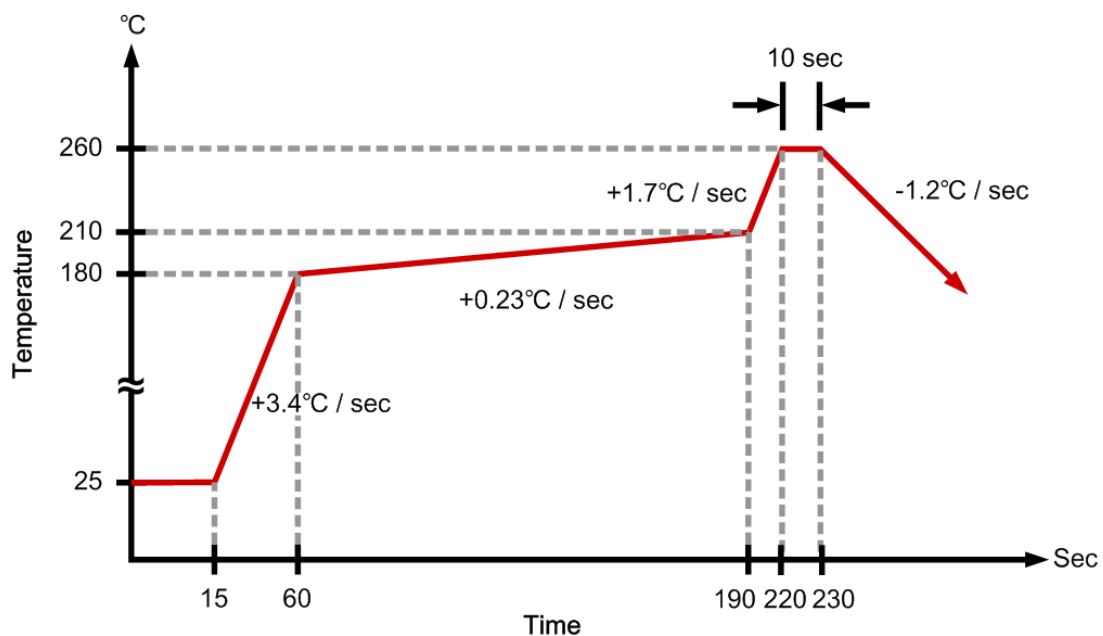
Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	HVDD		0		14	V
LX Voltage	V _{LX}		0		15	V
Others Pin Voltage			0		6	V
Thermal Resistance (Junction to Ambient)	θ_{JA}				+60	°C / W
Thermal Resistance (Junction to Case)	θ_{JC}				+10	°C / W
Junction Temperature	T _J				+150	°C
Operating Temperature	T _{OP}		-40		+85	°C
Storage Temperature	T _{ST}		-65		+150	°C
Lead Temperature		(soldering, 10 sec)			+260	°C

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.

IR Re-flow Soldering Curve



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Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	HVDD		2.7		12	V
Operating Temperature Range	T _A	Ambient Temperature	-40		85	°C

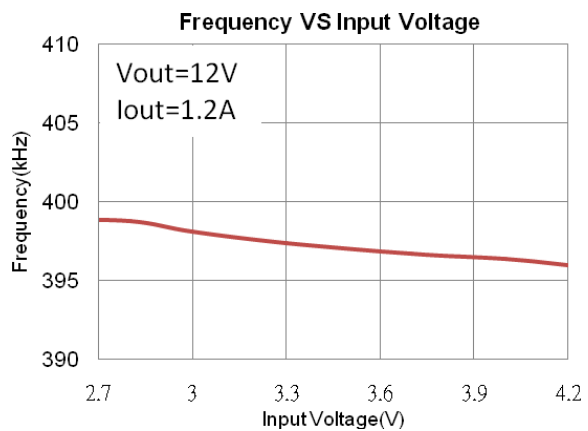
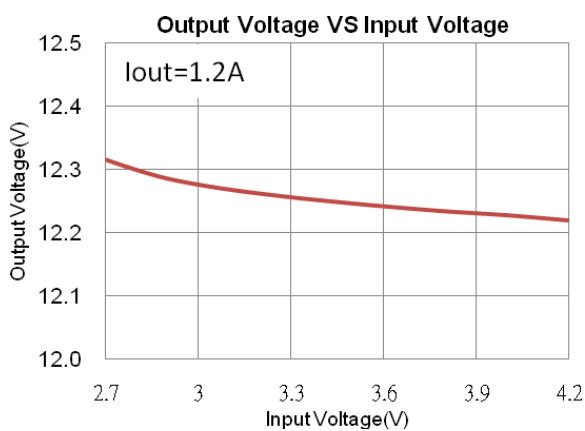
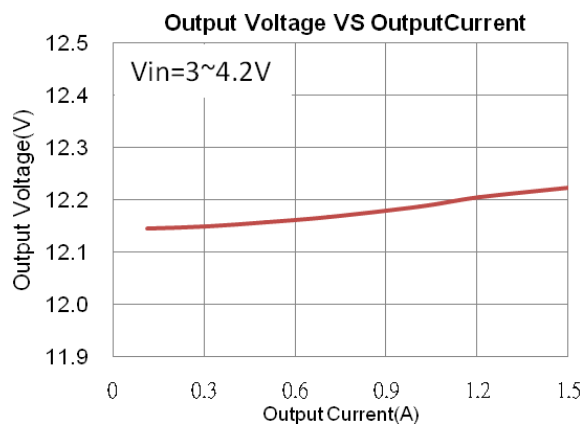
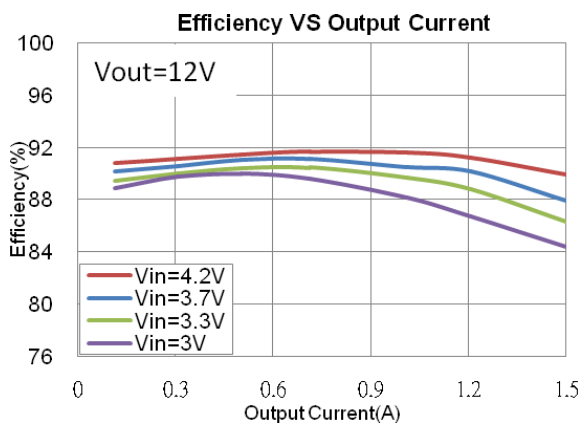
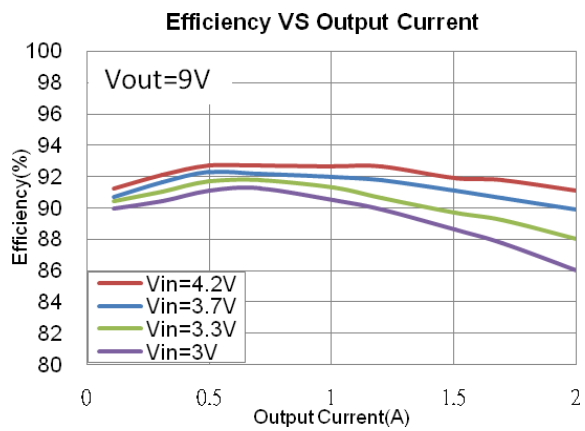
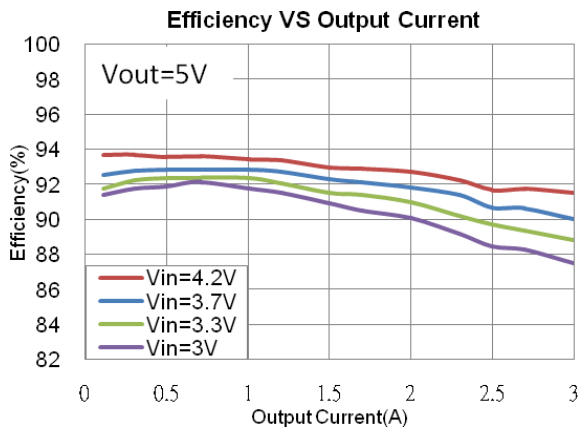
DC Electrical Characteristics (HVDD=12V, T_A=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
System Supply Input						
Input Supply Range	HVDD		2.7		12	V
Under Voltage Lockout	V _{UVLO}			2.2		V
UVLO Hysteresis				0.1		V
Quiescent Current	I _{DD}	V _{FB} =1.3V, No switching		0.45		mA
Average Supply Current	I _{DD}	V _{FB} =1.1V, Switching		4		mA
Shutdown Supply Current	I _{DD}	V _{EN} =GND			1	μA
Input Supply Voltage	V _{CC}	HVDD=12V, V _{CC} no current	4.75	5	5.25	V
Oscillator						
Operation Frequency	F _{OSC}		340	400	460	KHz
Frequency Change with Voltage	Δ f / Δ V	HVDD=2.5V to 12V		5		%
Maximum Duty Cycle	T _{DUTY}			90		%
Reference Voltage						
Reference Voltage	V _{REF}		1.176	1.2	1.224	V
Line Regulation		HVDD=2.5V ~ 12V		0.2		% / V
Error Amplifier						
COMP Pin Sink Current	I _{SINK}			45		μA
COMP Pin Source Current	I _{SOURCE}			45		μA
Enable Control						
Enable Voltage	V _{EN}		1.1			V
Shutdown Voltage	V _{EN}				0.6	V
MOSFET						
On Resistance of Driver	R _{DS(ON)}	V _{CC} =5V, I _{LX} =0.5A		15		mΩ
Protection						
OCP Current	I _{OCP}			10		A
Adjustable OCP Current	I _{OCP}	Duty Cycle=75%, External Resistor :100KΩ	2.5		5	A
OTP Temperature	T _{OTP}			+150		°C

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Typical Operating Characteristics

($T_A=25^{\circ}\text{C}$, unless otherwise specified)



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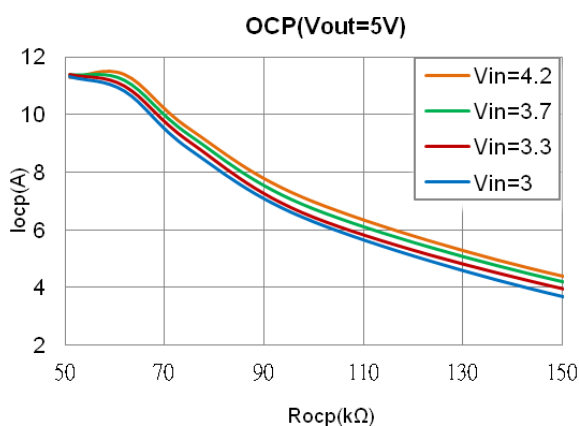
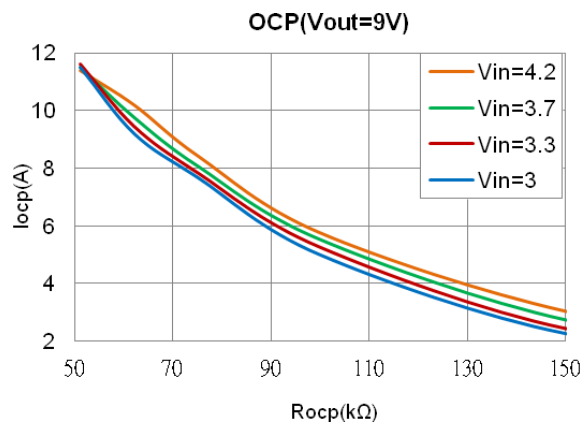
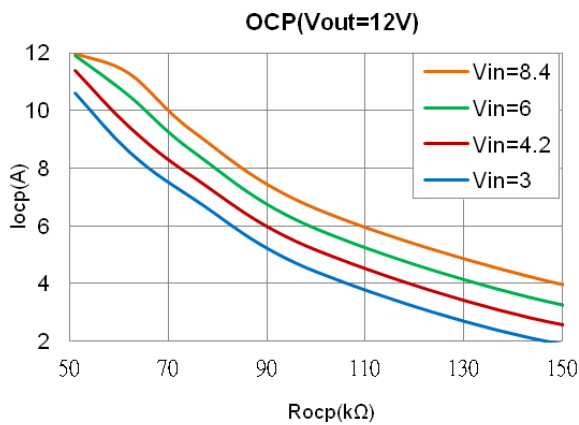
Function Description

Operation

The FP6296 is a current mode boost converter. The switching frequency is 400KHz and operates with pulse width modulation (PWM). Build-in 15V / 10A 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%.

Current Limit Program

A resistor between OC and GND pin programs peak switch current. The resistor value should be between 150K to 51KΩ. The current limit will be set from 2A to 10A. Keep traces at this pin as short as possible. Do not put capacitance at this pin.



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Over Temperature Protection (OTP)

FP6296 will turn off the power MOSFET automatically when the internal junction temperature is over 150°C. The power MOSFET wake up when the junction temperature drops 20°C under the OTP threshold temperature.

Enable Mode / Shutdown Mode

Drive the EN pin to ground to shutdown the IC. Shutdown mode forces to turn off all internal circuitry, and reduces the HVDD supply current to 1uA (max). The EN pin rising threshold is 1.1V.

Application Information

Inductor Selection

Inductance value is decided based on different condition. 3.3uH to 10uH inductor value is recommended for general application circuit. There are three important inductor specifications, DC resistance, saturation current and core loss. Low DC resistance has better power efficiency.

Capacitor Selection

The output capacitor is required to maintain the DC voltage. Low ESR capacitors are preferred to reduce the output voltage ripple. Ceramic capacitor of X5R and X7R are recommended, which have low equivalent series resistance (ESR) and wider operation temperature range.

Diode Selection

Schottky diodes with fast recovery times and low forward voltages are recommended. Ensure the diode average and peak current rating exceed the average output current and peak inductor current. In addition, the diode's reverse breakdown voltage must exceed the output voltage.

Output Voltage Programming

The output voltage is set by a resistive voltage divider from the output voltage to FB. The output voltage is:

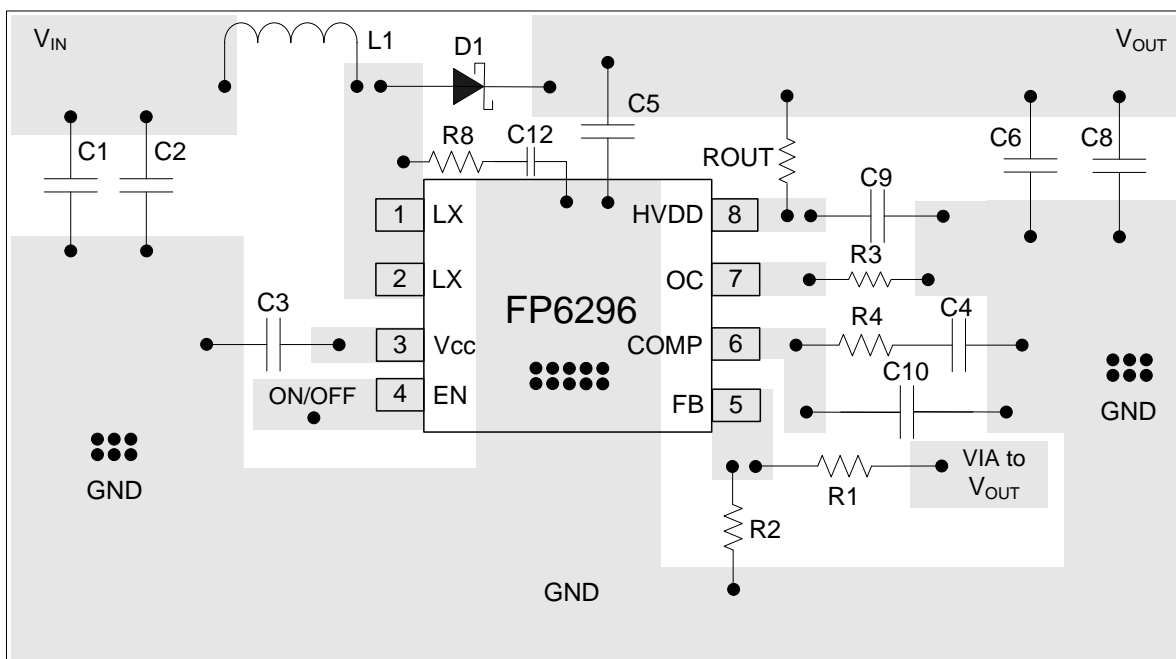
$$V_{OUT} = 1.2V \left(1 + \frac{R1}{R2} \right)$$

Resistor Selection for Common Output Voltages

Vout	R1 (KΩ)	R2 (KΩ)
5V	200 (1%)	62 (1%)
9V	200 (1%)	30 (1%)
12V	200 (1%)	22 (1%)

Layout Considerations

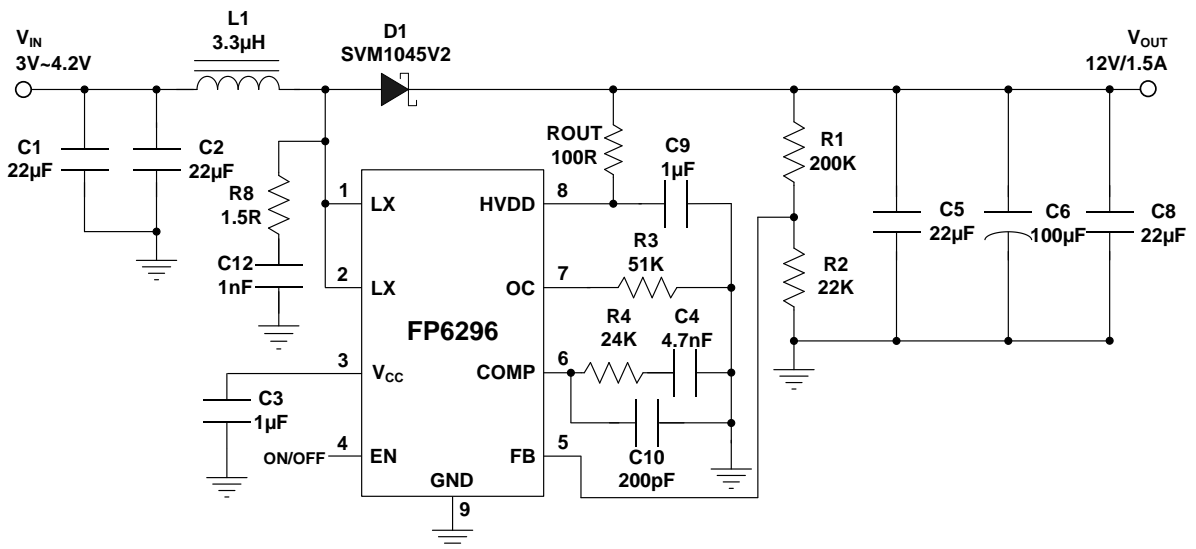
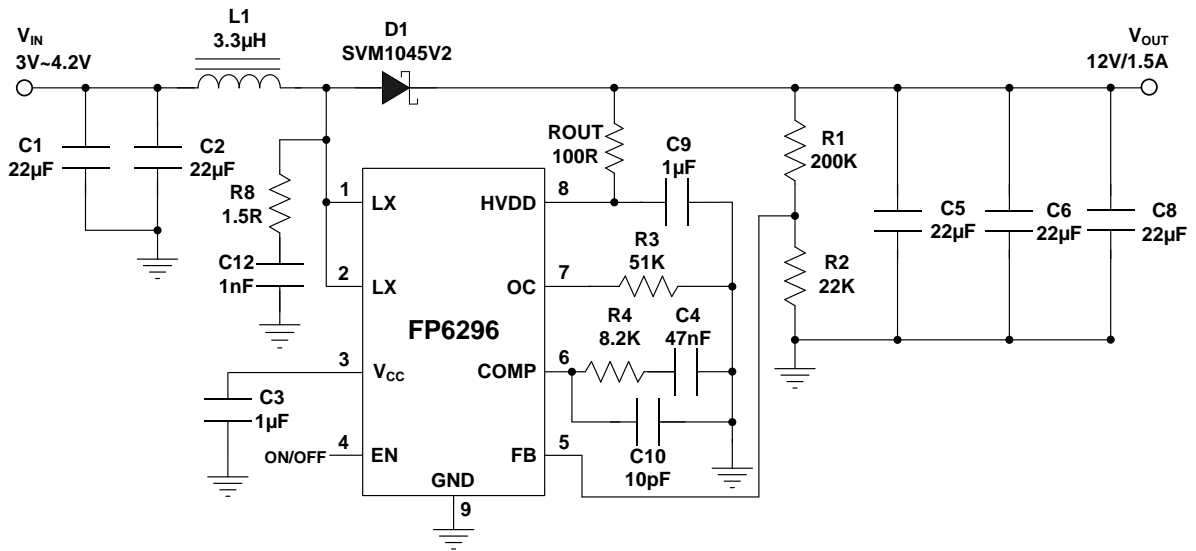
1. The power traces, consisting of the GND trace, the LX trace and the V_{IN} trace should be kept short, direct and wide.
2. LX, L1 and D1 switching node, wide and short trace to reduce EMI.
3. The resistive divider R1 and R2 must be connected to FB pin directly as closely as possible.
4. FB is a sensitive node. Please keep it away from switching node, LX.
5. The GND of the IC, C_{IN} and C_{OUT} should be connected close together directly to a ground plane.
6. The ground of C_{OUT} should be connected close and together directly to IC's GND pin.



Suggested Layout

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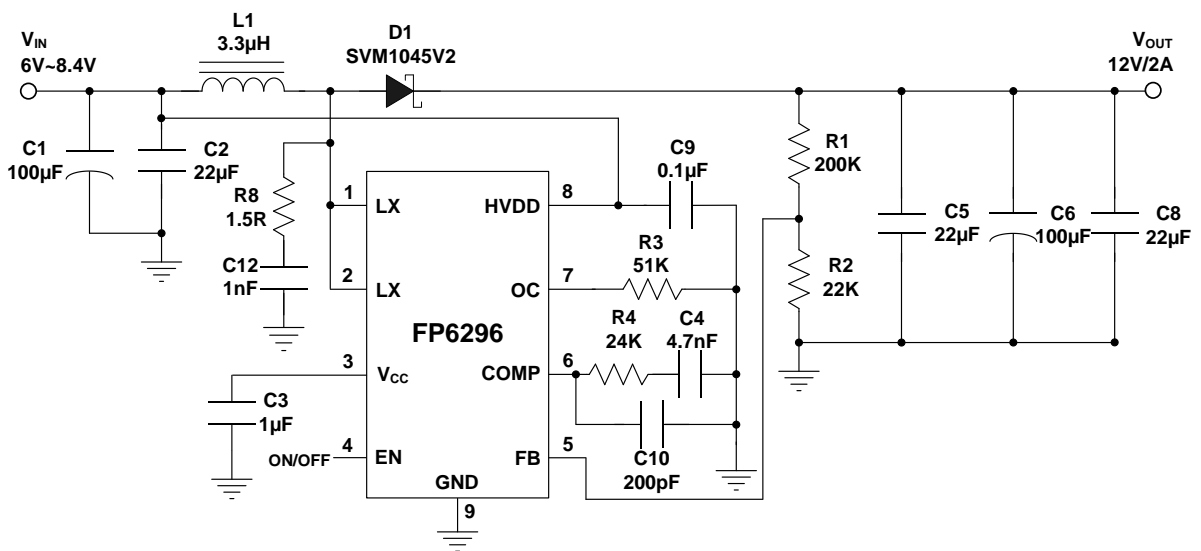
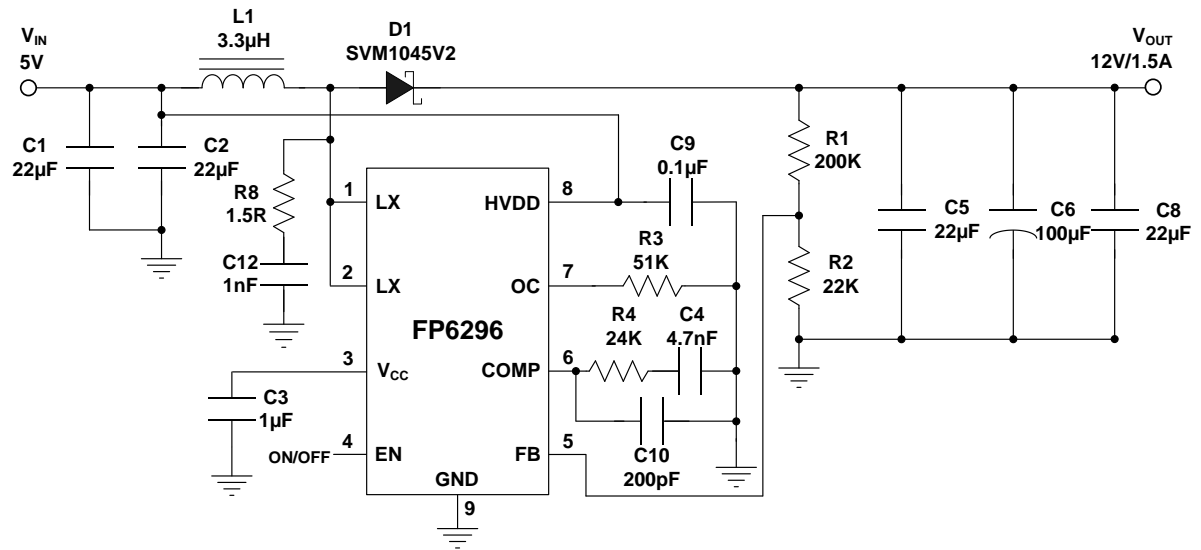
Typical Application



Note:

1. EN voltage must be less than HVDD and 5V.

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Note:

1. EN voltage must be less than HVDD and 5V.

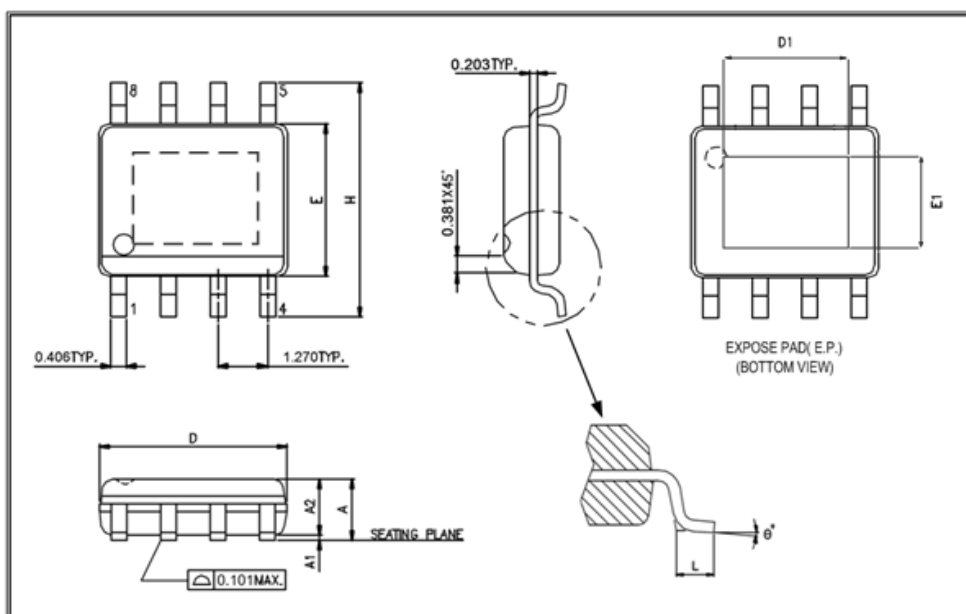
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Package Outline

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UNIT: mm

Symbols	Min. (mm)	Max. (mm)
A	1.30	1.70
A1	0	0.15
A2	1.25	1.55
D	4.70	5.10
E	3.80	4.00
H	5.80	6.20
L	0.40	1.27

Exposed PAD Dimensions:

Symbols	Min. (mm)	Max. (mm)
D1	2.60	3.45
E1	1.90	2.56

Note:

1. Package dimensions are in compliance with JEDEC outline: MS-012 AA.
2. Dimension "D" does not include molding flash, protrusions or gate burrs.
3. Dimension "E" does not include inter-lead flash or protrusions.

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