Low-Noise Step-Up Current Mode PWM IC

Halogen Free

General Description

The FP6292 is a current mode boost DC-DC converter. Its PWM circuitry with built-in 0.75Ω power MOSFET make this regulator highly power efficient. The internal compensation network also minimizes as much as 5 external component counts. The non-inverting input of error amplifier connects to a 1.24V precision reference voltage and internal soft-start function can reduce the inrush current

The FP6292 is available in the TSOT23-6L / TSOT23-5L package and provides space-saving PCB for the application fields.

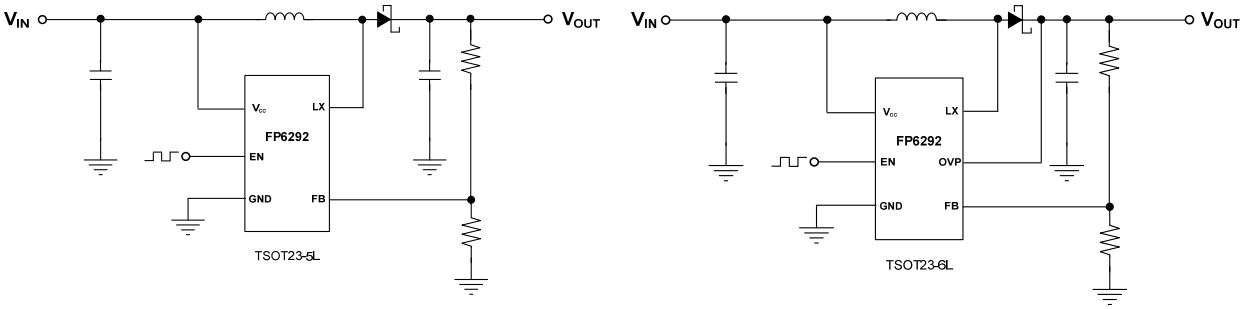
Features

- Precision Feedback Reference Voltage: 1.24V (±4%)
- Under Voltage Lockout Protection
- Over Voltage Protection
- Over Temperature Protection
- Internal Soft-Start
- Zero Shutdown Current
- Adjustable Output up to 24V
- Package: TSOT23-6L / TSOT23-5L

Applications

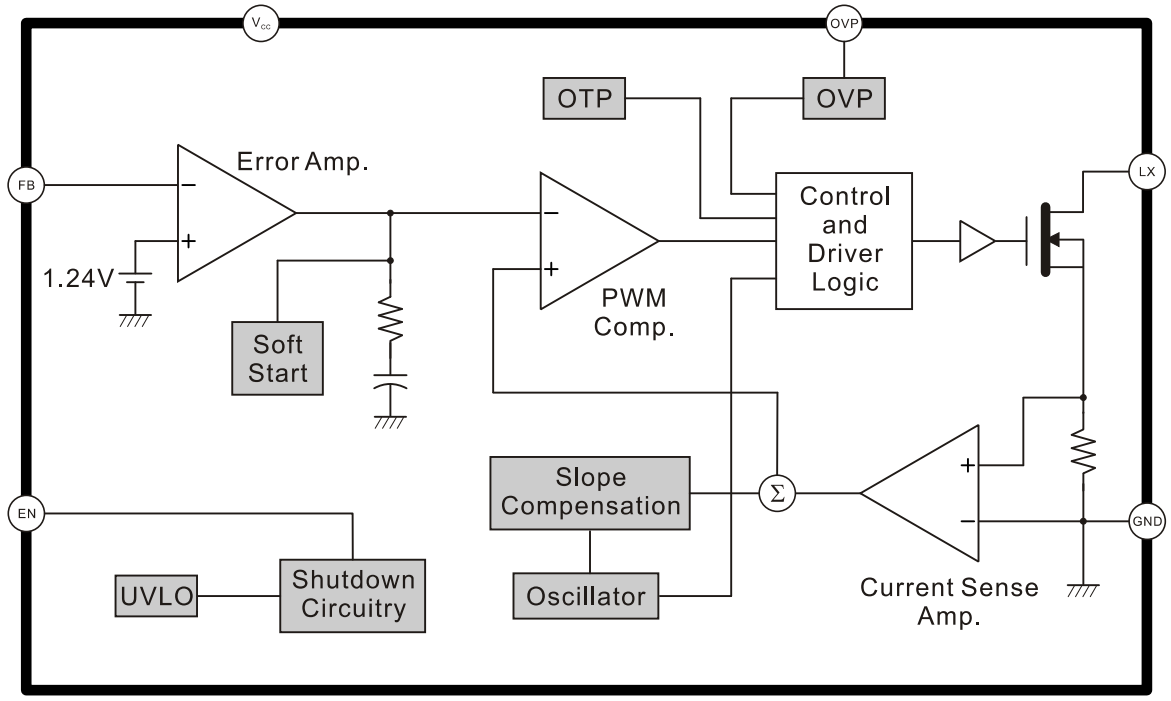
- LCD Displays
- Digital Cameras
- Camcorders

Typical Application Circuit



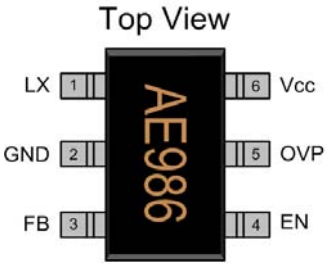
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Function Block Diagram



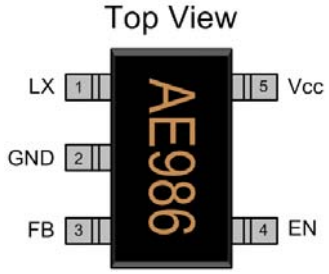
Pin Descriptions

TSOT23-6L



Name	No.	I / O	Description
LX	1	O	Power Switch Output
GND	2	P	IC Ground
FB	3	I	Error Amplifier Inverting Input
EN	4	I	Enable Control (Active High)
OVP	5	O	Over Voltage Protection
V_{CC}	6	P	IC Power Supply

TSOT23-5L

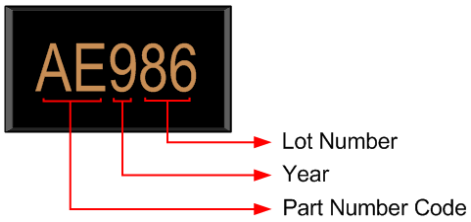


Name	No.	I / O	Description
LX	1	O	Power Switch Output
GND	2	P	Ground
FB	3	I	Error Amplifier Inverting Input
EN	4	I	Enable Control (Active High)
V_{CC}	5	P	IC Power Supply

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Marking Information

TSOT23-6L / TSOT23-5L



Lot Number: Wafer lot number's last two digits

For Example: 132386TB → 86

Year: Production year's last digit

Part Number Code: Part number identification code for this product. It should be always "AE".

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Ordering Information

Part Number	Code	Operating Temperature	Package	MOQ	Description
FP6292iR-G1	AE	-40°C ~ 85°C	TSOT23-5L	3000EA	Tape & Reel
FP6292hR-G1	AE	-40°C ~ 85°C	TSOT23-6L	3000EA	Tape & Reel

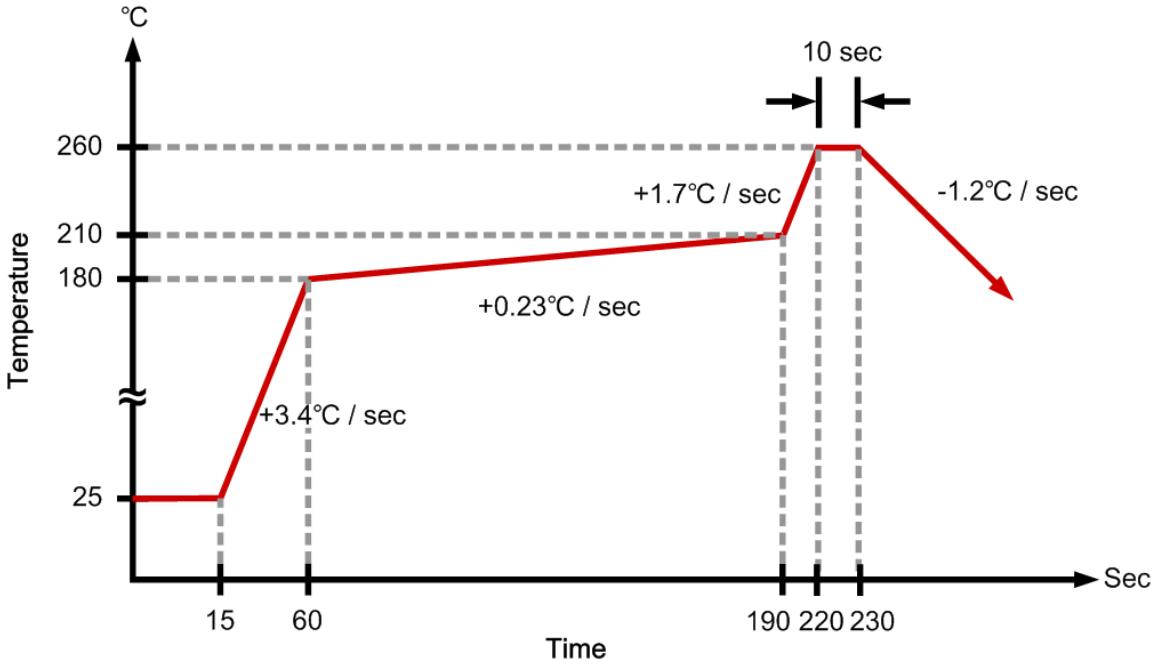
Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}		0		6	V
OVP Voltage	V_{OVP}		0		25	V
LX Input Voltage	V_{LX}		0		25	V
EN,FB Voltage			0		6	V
Power Dissipation	P_D	TSOT23-5L @T_A=25°C			455	mW
		TSOT23-6L @T_A=25°C			455	
Thermal Resistance (Note1)	θ_{JA}	TSOT23-5L			+220	°C / W
		TSOT23-6L			+220	
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 (Note 1)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Junction Temperature Range	T_J		-40		+125	°C
Operating Temperature Range	T_A		-40		+85	°C

Note 1:

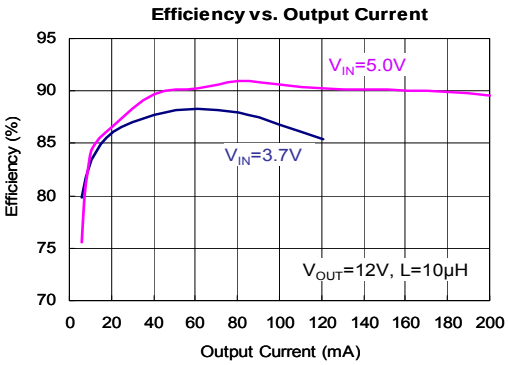
The device is not guaranteed to function outside its operating conditions.

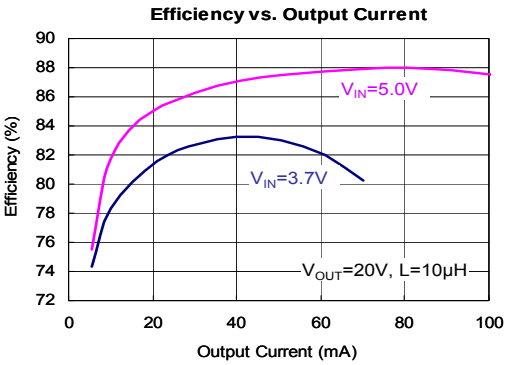
DC Electrical Characteristics (V_{CC}=3.7V, T_A=25°C,unless otherwise specified)

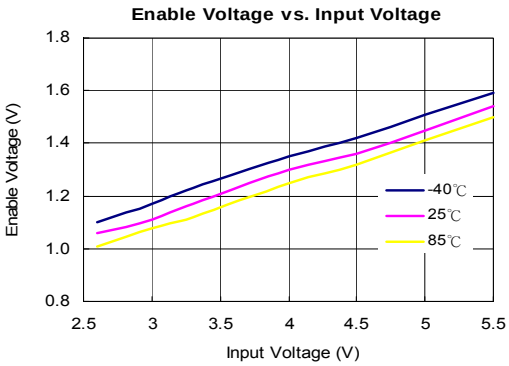
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
System Supply Input						
Input Supply Range	V_{CC}		2.7		5.5	V
Under Voltage Lockout	V_{UVLO}			2.2		V
Quiescent Current	I_{CC}	V_{FB}=1.3V, No switching		0.3		mA
Average Supply Current	I_{CC}	V_{FB}=1.0V, Switching		0.5		mA
Shutdown Supply Current	I_{CC}	V_{EN}=GND		0.1		μA
Oscillator						
Operation Frequency	F_{OSC}	V_{FB}=1.0V	0.9	1.2	1.5	MH_Z
Frequency Change with Voltage	△f / △V	V_{CC}=2.7V to 5.5V		2		%
Frequency Change with Temperature	△f / △T	T_A=-40°C to 85°C		10		%
Maximum Duty Cycle	T_{DUTY}		85			%
Reference Voltage						
Feedback Voltage	V_{REF}		1.19	1.24	1.29	V
Feedback Voltage Change with Temperature	$\triangle V_{REF}$ / △T	T_A=-40°C to 25°C		1.5		%
		T_A=25°C to 85°C		1.5		
Line Regulation		V_{CC}=2.7V ~ 5.5V		0.01		% / V
MOSFET						
On Resistance of Driver	$R_{DS\ (ON)}$	I_{LX}=0.1A		0.75		Ω
Protection						
OVP Threshold Voltage	V_{OVP}			24		V
OVP Sink Current	I_{SINK}			5		μA
OCP Current	I_{OCP}			750		mA
OTP Temperature	T_{OTP}			+150		°C
Enable Voltage	V_{EN}		1.5			V
Shutdown Voltage	V_{EN}				0.4	V

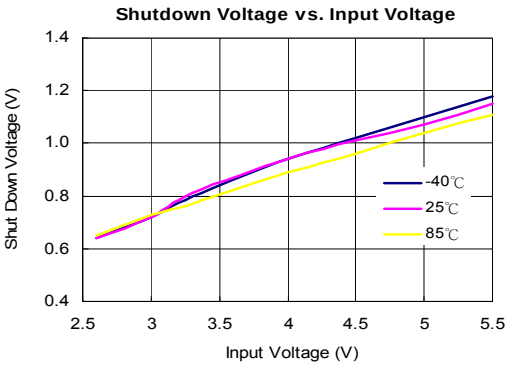
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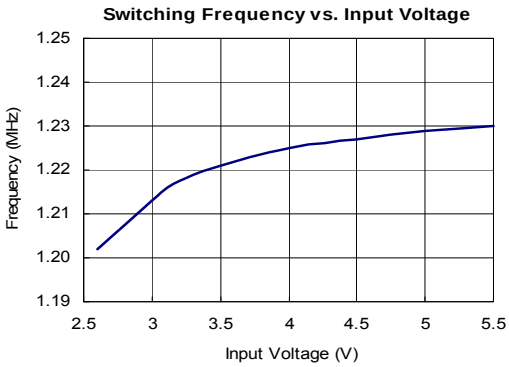
Typical Operating Characteristics

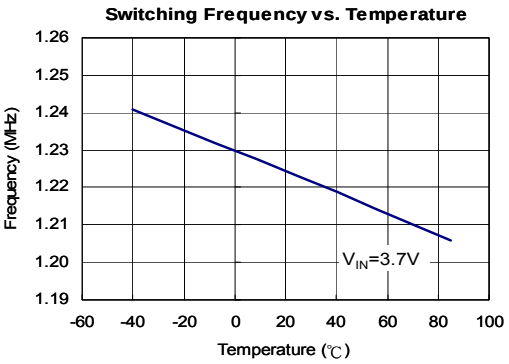


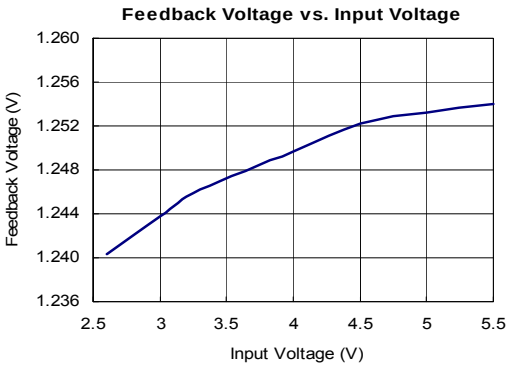


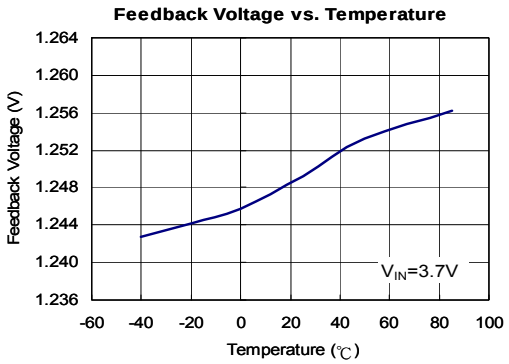






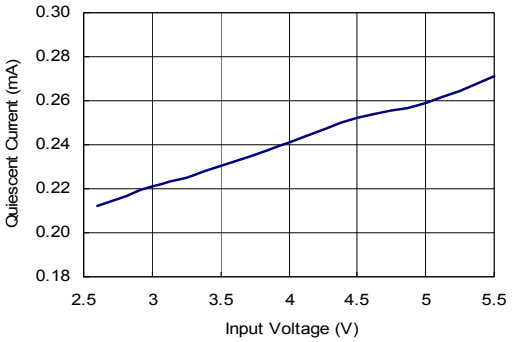




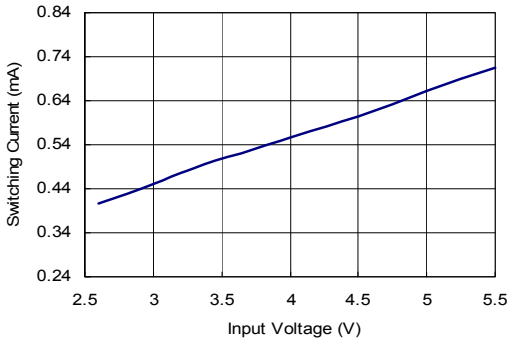


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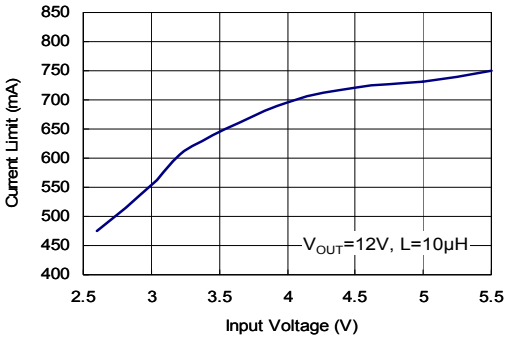
Quiescent Current vs. Input Voltage



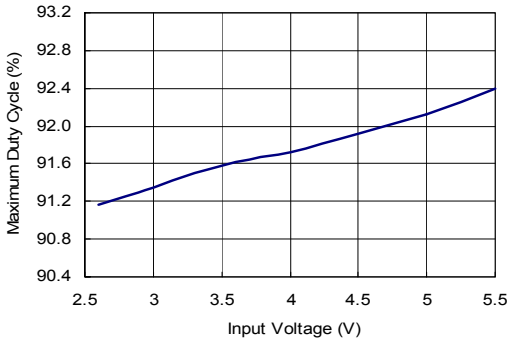
Switching Current vs. Input Voltage



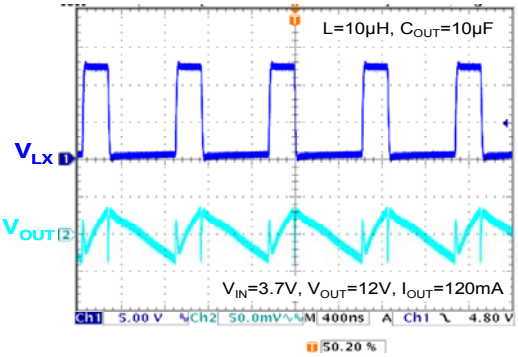
Current Limit vs. Input Voltage



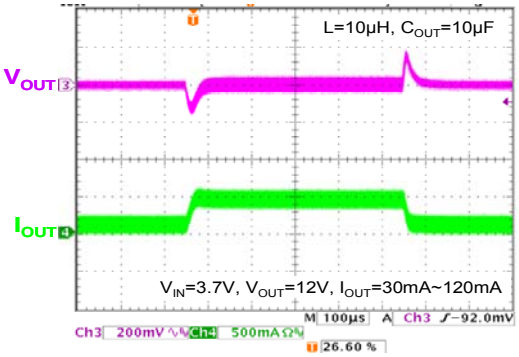
Maximum Duty Cycle vs. Input Voltage



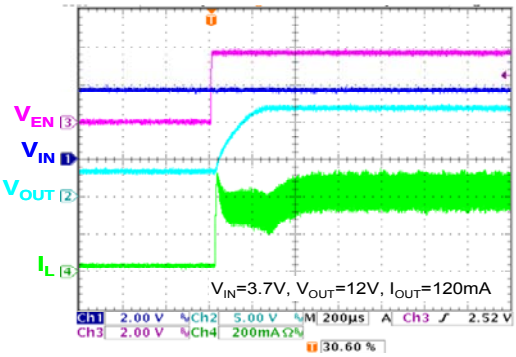
Output Ripple



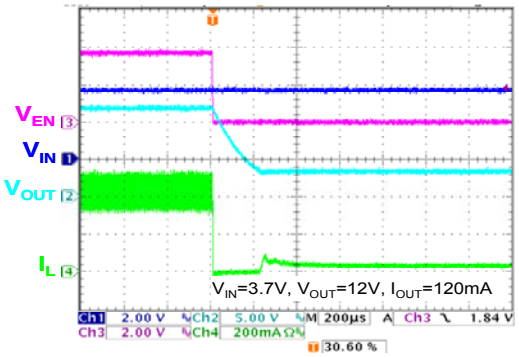
Load Transient Response



Power On from EN



Power Off from EN



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Function Description

Operation

The FP6292 is a current mode boost converter. The constant switching frequency is 1.2MHz and operates with pulse width modulation (PWM). Build-in 24V / 0.75A 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 FP6292 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.

Over Voltage Protection (OVP)

In some condition, the resistive divider may be unconnected, which will cause PWM signal to operate with maximum duty cycle and output voltage is boosted higher and higher. The power MOSFET will be turned off immediately, when the output voltage exceeds the OVP threshold level. The FP6292's OVP threshold is 24V.

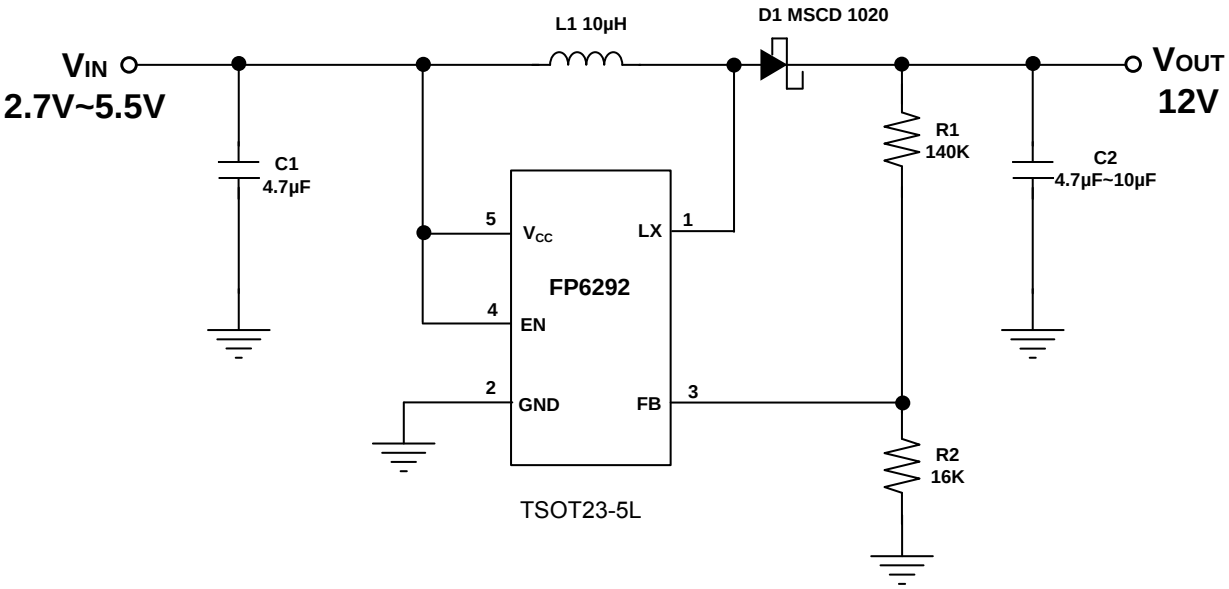
Over Temperature Protection (OTP)

FP6292 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 30°C under the OTP threshold temperature.

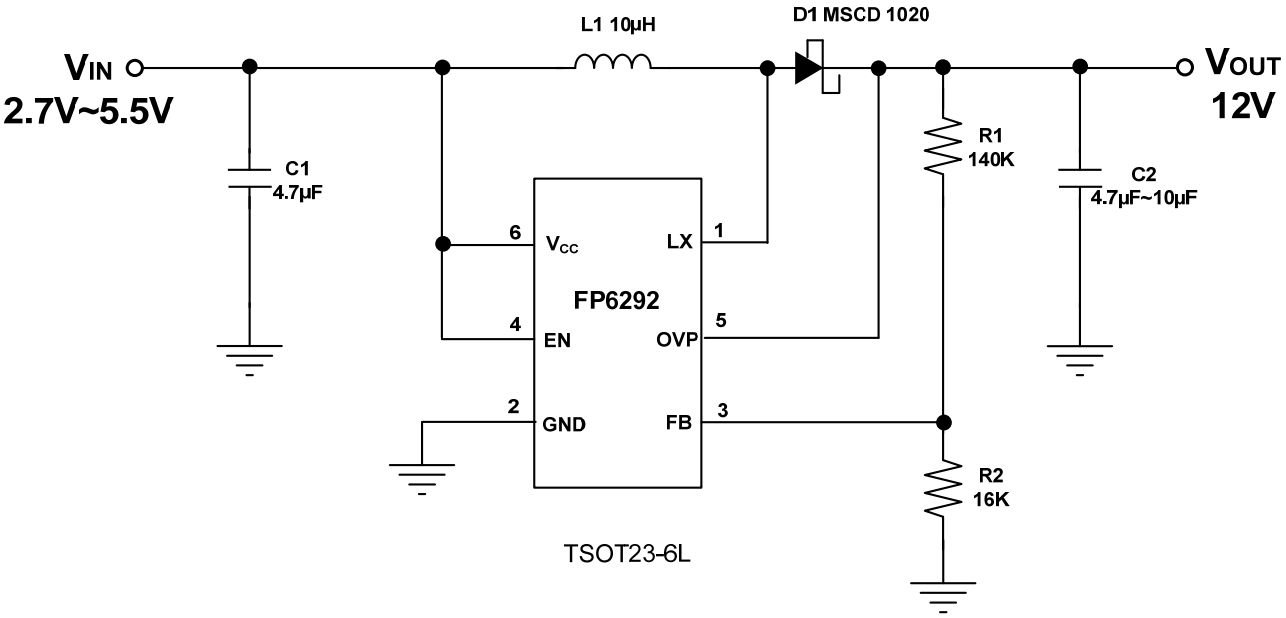
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Application Information

General Application Circuit



TSOT23-5L



TSOT23-6L

Inductor Selection

Inductance value is decided based on different condition. 4.7 to 22μH 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. Also, it avoid inductor saturation which will cause circuit system unstable and lower core loss at 1.2MHz.

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:

$$V_{OUT} = 1.24V\left(1+\frac{R1}{R2}\right)$$

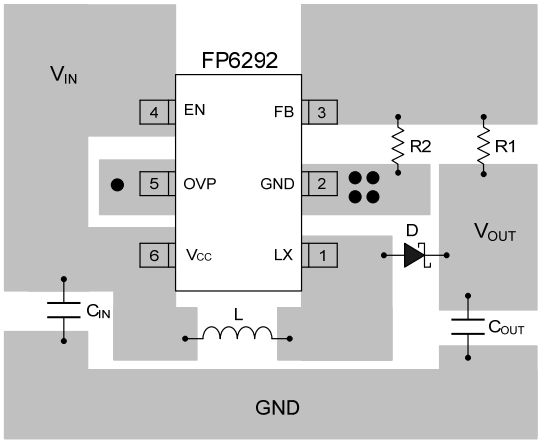
The recommended resistor value is summarized below:

V_{OUT} (V)	R_1 (kΩ)	R_2 (kΩ)
5	140	46
12	140	16
15	145	13
18	150	11

Layout Considerations

1. The power traces, consisting of the GND trace, the LX trace and the V_{CC} trace should be kept short, direct and wide.
2. LX、L and D switching node, wide and short trace to reduce EMI.
3. Place C_{IN} near V_{CC} pin as closely as possible to maintain input voltage steady and filter out the pulsing input current.
4. The resistive divider R1and R2 must be connected to FB pin directly as closely as possible.
5. FB is a sensitive node. Please keep it away from switching node, LX.
6. The GND of the IC, C_{IN} and C_{OUT} should be connected close together directly to a ground plane.

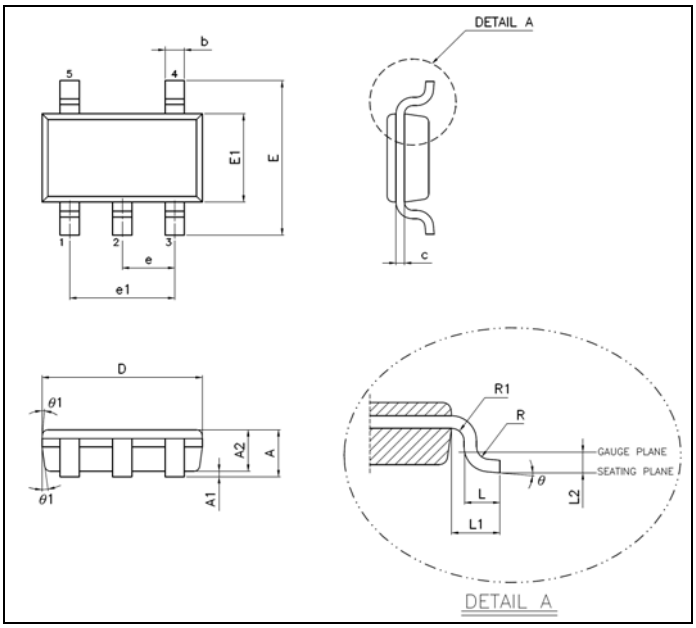
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Package Outline

TSOT23-5L



Unit: mm

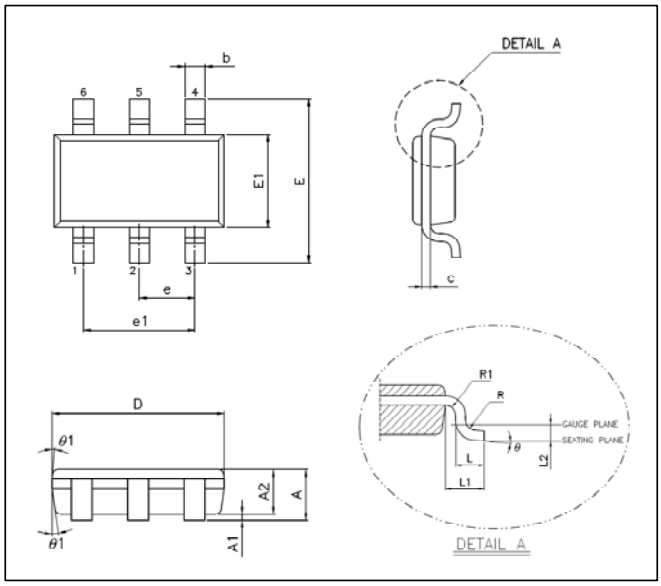
Symbols	Min. (mm)	Max. (mm)
A	0.750	0.800
A1	0.000	0.050
A2	0.700	0.775
b	0.350	0.500
c	0.100	0.200
D	2.800	3.000
E	2.600	3.000
E1	1.500	1.700
e	0.950 BSC	
e1	1.900 BSC	
L	0.370	0.600
L1	0.600 REF	
L2	0.250 BSC	
R	0.100	
R1	0.100	0.250
θ°	0°	8°
θ1	4°	12°

Note:

1. Dimension “D” does not include molding flash, protrusions or gate burrs.
2. Dimension “E1” does not include inter-lead flash or protrusions.

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TSOT23-6L



Unit: mm

Symbols	Min. (mm)	Max. (mm)
A	0.750	0.800
A1	0.000	0.050
A2	0.700	0.775
b	0.350	0.500
c	0.100	0.200
D	2.800	3.000
E	2.600	3.000
E1	1.500	1.700
e	0.950 BSC	
e1	1.900 BSC	
L	0.370	0.600
L1	0.600 REF	
L2	0.250 BSC	
R	0.100	
R1	0.100	0.250
θ°	0°	8°
θ1	4°	12°

Note:

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