

180KHz 60V 5A Switching Current Boost DC/DC Converter

XL6012

Features

- Wide 5V to 40V Input Voltage Range
- Maximum Boost Output Up to 60V
- Current Mode Control Provides Excellent Transient Response
- 1.25V reference adjustable version
- Fixed 180KHz Switching Frequency
- Maximum 5A Switching Current
- SW PIN Built in Over Voltage Protection
- Excellent line and load regulation
- EN PIN TTL shutdown capability
- Internal Optimize Power MOSFET
- High efficiency up to 94%
- Built in Frequency Compensation
- Built in Soft-Start Function
- Built in Thermal Shutdown Function
- Built in Current Limit Function
- Available in TO220-5L package

General Description

The XL6012 regulator is a wide input range, current mode, DC/DC converter which is can be configured as either a boost, flyback, SEPIC or inverting converter. The XL6012 built in high voltage N-channel power MOSFET and fixed frequency oscillator, current-mode architecture results in stable operation over a wide range of supply and output voltages.

The XL6012 regulator is special design for portable electronic equipment applications.

Applications

- EPC / Notebook Car Adapter
- Automotive and Industrial Boost / Buck-Boost/Inverting Converters
- Portable Electronic Equipment

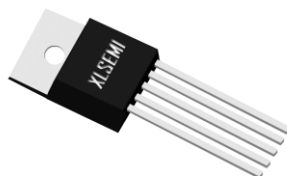


Figure1. Package Type of XL6012

Pin Configurations

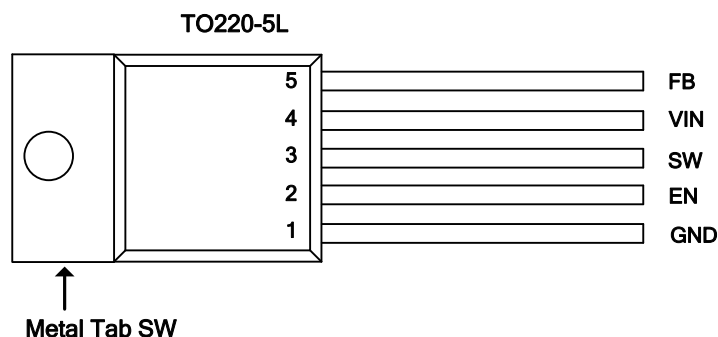


Figure2. Pin Configuration of XL6012 (Top View)

Table 1 Pin Description

Pin Number	Pin Name	Description
1	GND	Ground Pin.
2	EN	Enable Pin. Drive EN pin low to turn off the device, drive it high to turn it on. Floating is default high.
3	SW	Power Switch Output Pin (SW).
4	VIN	Supply Voltage Input Pin. XL6012 operates from a 5V to 40V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
5	FB	Feedback Pin (FB). Through an external resistor divider network, FB senses the output voltage and regulates it. The feedback threshold voltage is 1.25V.

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Function Block

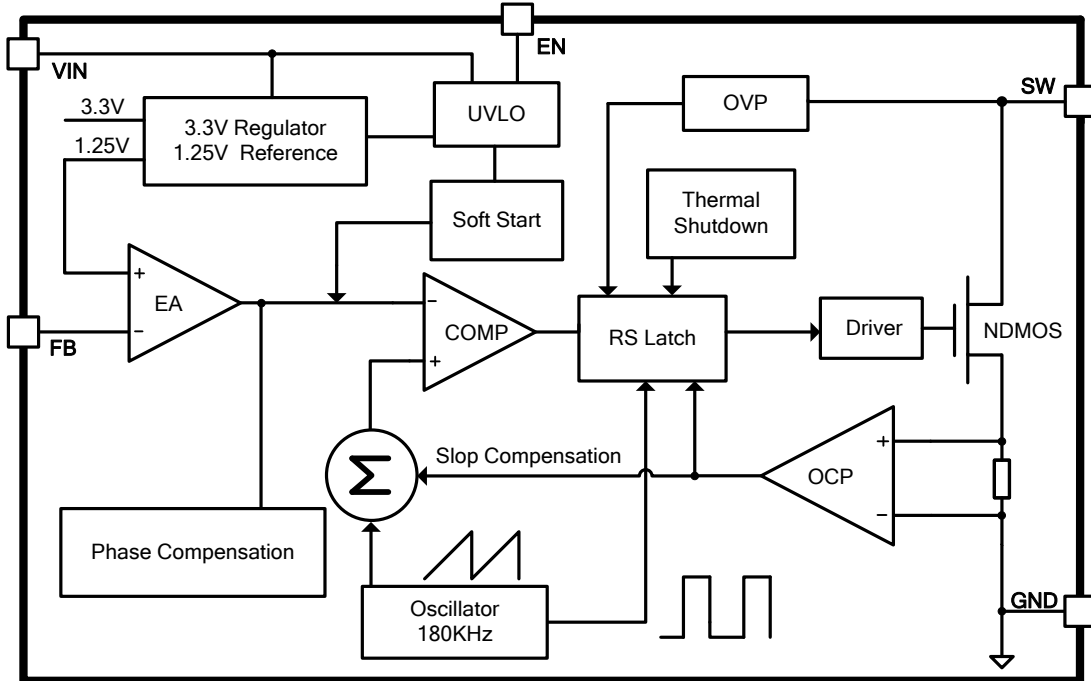


Figure3. Function Block Diagram of XL6012

Typical Application Circuit

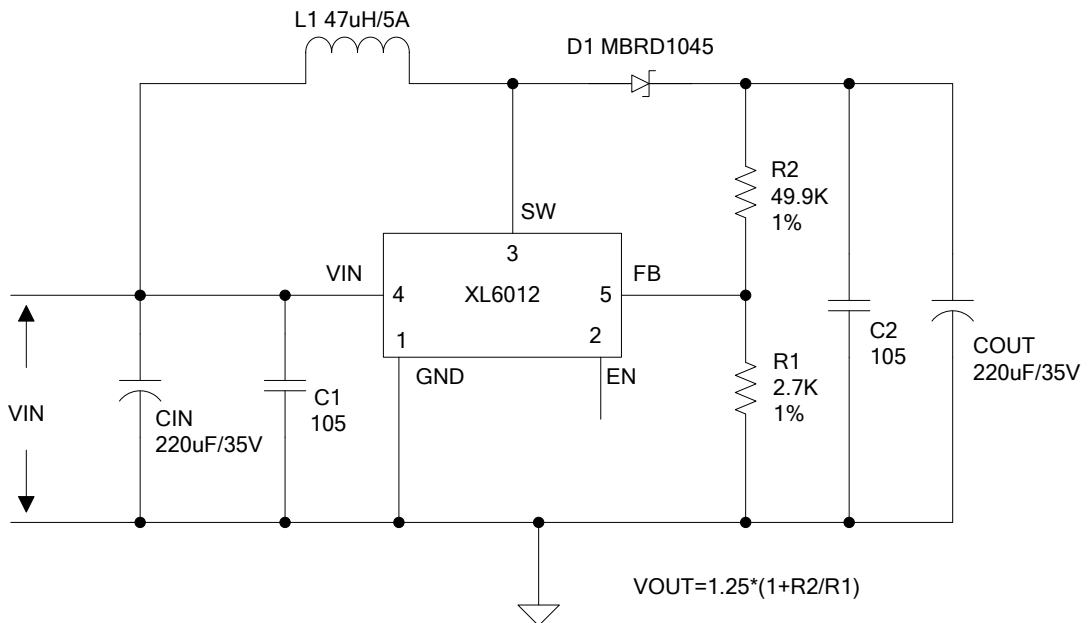


Figure4. XL6012 Typical Application Circuit

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Ordering Information

Order Information	Marking ID	Package Type	Packing Type Supplied As
XL6012E1	XL6012E1	TO220-5L	50 Units Per Tube/ 1000 Units Per Box

XLSEMI Pb-free products, as designated with “E1” suffix in the par number, are RoHS compliant.

Absolute Maximum Ratings (Note1)

Parameter	Symbol	Value	Unit
Input Voltage	V_{in}	-0.3 to 45	V
Feedback Pin Voltage	V_{FB}	-0.3 to V_{in}	V
EN Pin Voltage	V_{EN}	-0.3 to V_{in}	V
Output Switch Pin Voltage	V_{SW}	-0.3 to 60	V
Power Dissipation	P_D	Internally limited	mW
Thermal Resistance (TO220-5L) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	30	°C/W
Maximum Junction Temperature	T_J	-40 to 150	°C
Operating Junction Temperature	T_J	-40 to 125	°C
Storage Temperature	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	°C
ESD (HBM)		>2000	V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

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XL6012 Electrical Characteristics

$T_a = 25^{\circ}\text{C}$; unless otherwise specified.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
System parameters test circuit figure4						
VFB	Feedback Voltage	$V_{in} = 12\text{V to } 20\text{V}, V_{out}=24\text{V}$ $I_{load}=0.1\text{A to } 1\text{A}$	1.213	1.25	1.287	V
η	Efficiency	$V_{in}=12\text{V}, V_{out}=24\text{V}$ $I_{out}=1\text{A}$	-	93	-	%

Electrical Characteristics (DC Parameters)

$V_{in} = 12\text{V}$, $GND=0\text{V}$, V_{in} & GND parallel connect a $220\mu\text{f}/50\text{V}$ capacitor; $I_{out}=0.1\text{A}$, $T_a = 25^{\circ}\text{C}$; the others floating unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	V_{in}		5		40	V
Shutdown Supply Current	I_s	$V_{EN}=0\text{V}$		70	100	μA
Quiescent Supply Current	I_q	$V_{EN} = 2\text{V},$ $V_{FB} = V_{in}$		3.5	5	mA
Oscillator Frequency	F_{osc}		144	180	216	KHz
SW OVP	V_{SW}	$V_{FB} = 0\text{V}$		60		V
Switch Current Limit	I_L	$V_{FB} = 0\text{V}$		5		A
Output Power NMOS	R_{dson}	$V_{in}=12\text{V},$ $I_{SW}=5\text{A}$		35	40	mohm
EN Pin Threshold	V_{EN}	High (Regulator ON)		1.4		V
		Low (Regulator OFF)		0.8		
EN Pin Input Leakage Current	I_H	$V_{EN} = 2\text{V (ON)}$		3	10	μA
	I_L	$V_{EN} = 0\text{V (OFF)}$		3	10	μA
Max. Duty Cycle	D_{MAX}	$V_{FB}=0\text{V}$		90		%

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Typical System Application (Recommend output current safe work range)

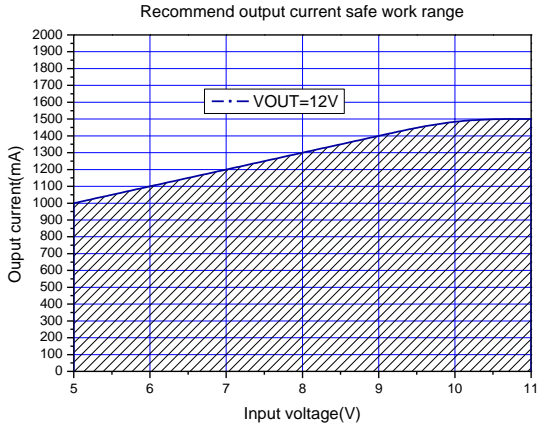


Figure5.Max output current (VOUT=12V)

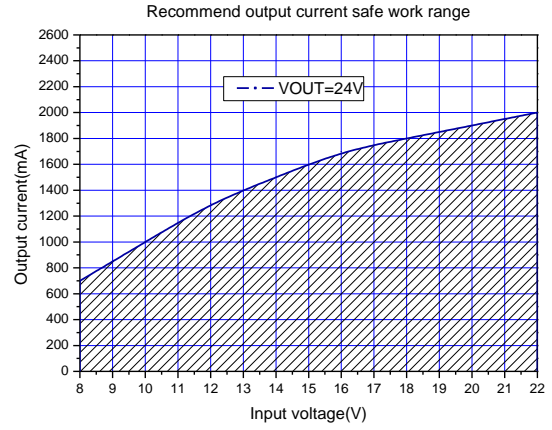


Figure6.Max output current (VOUT=24V)

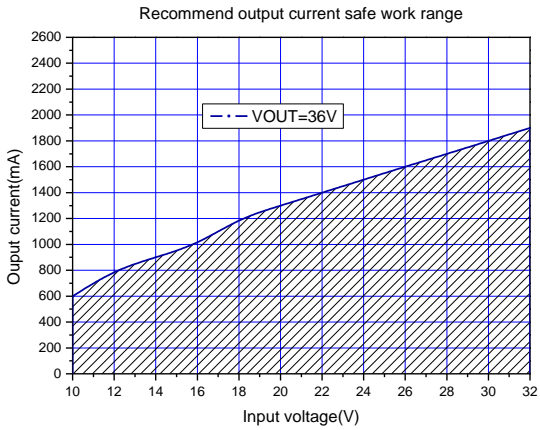


Figure7.Max output current (VOUT=36V)

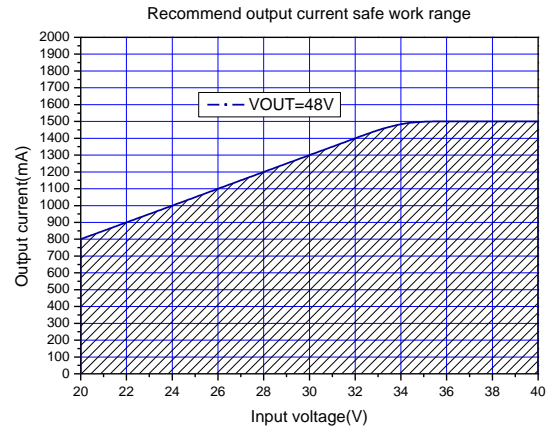


Figure8.Max output current(VOUT=48V)

Typical Performance Characteristics

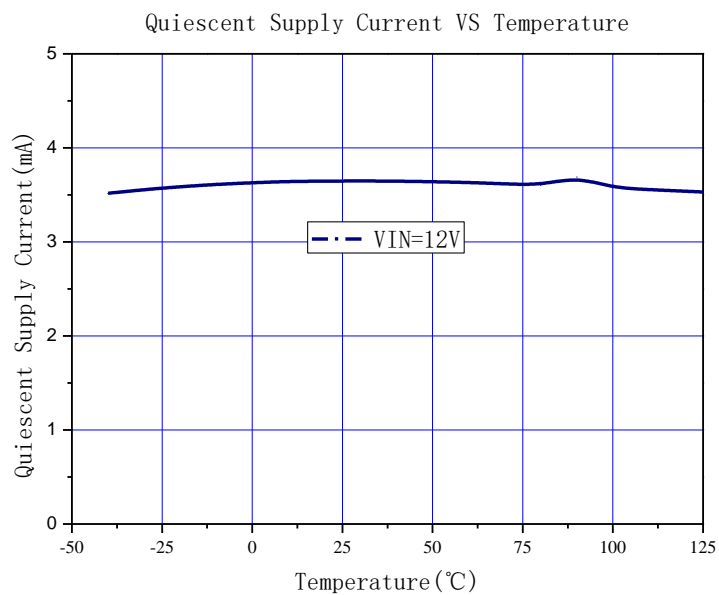


Figure9. Quiescent Current Curve

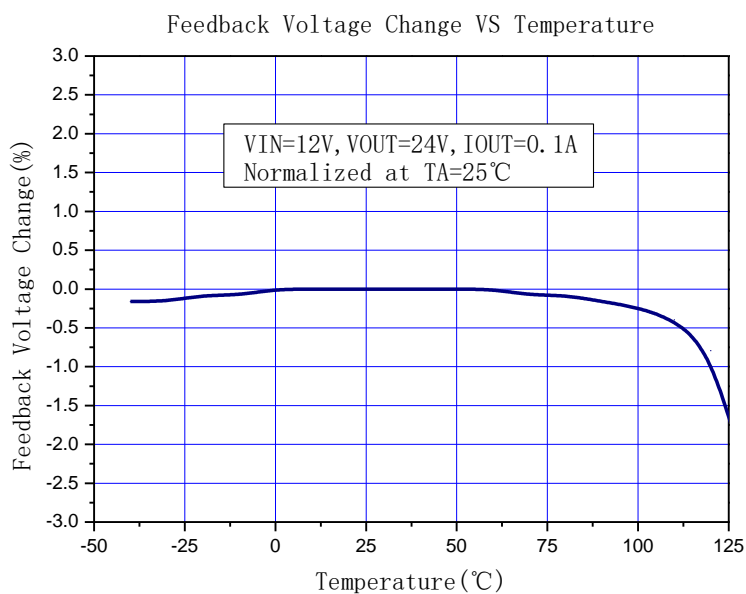


Figure10. Feedback Voltage Curve

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Typical System Application(VIN=12V,VOUT=24V)

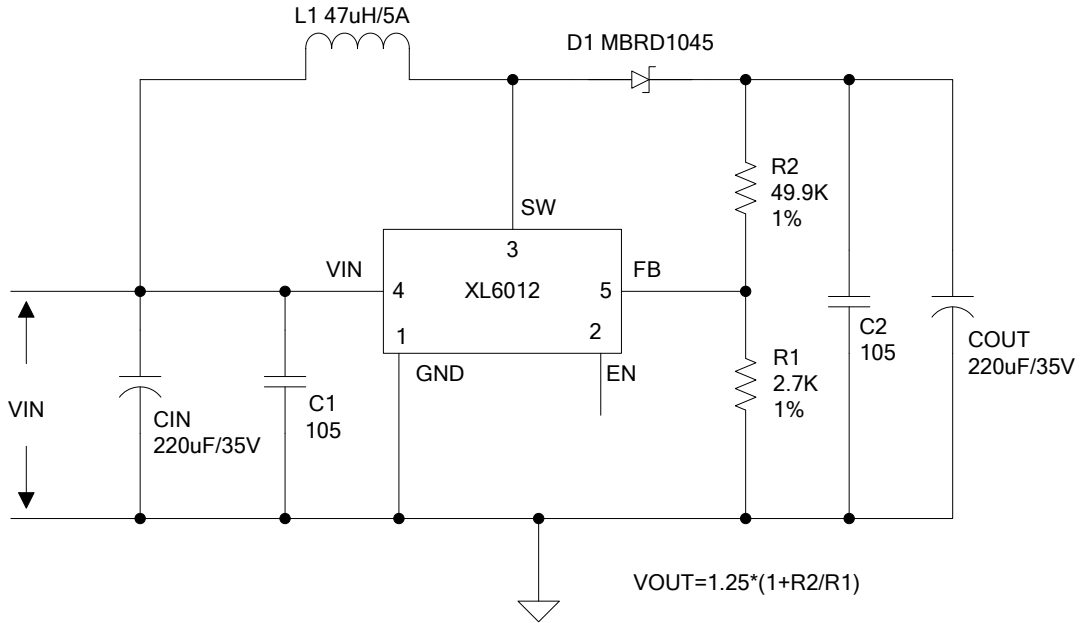


Figure11. XL6012 Typical System Application(VIN=12V, VOUT=24V)

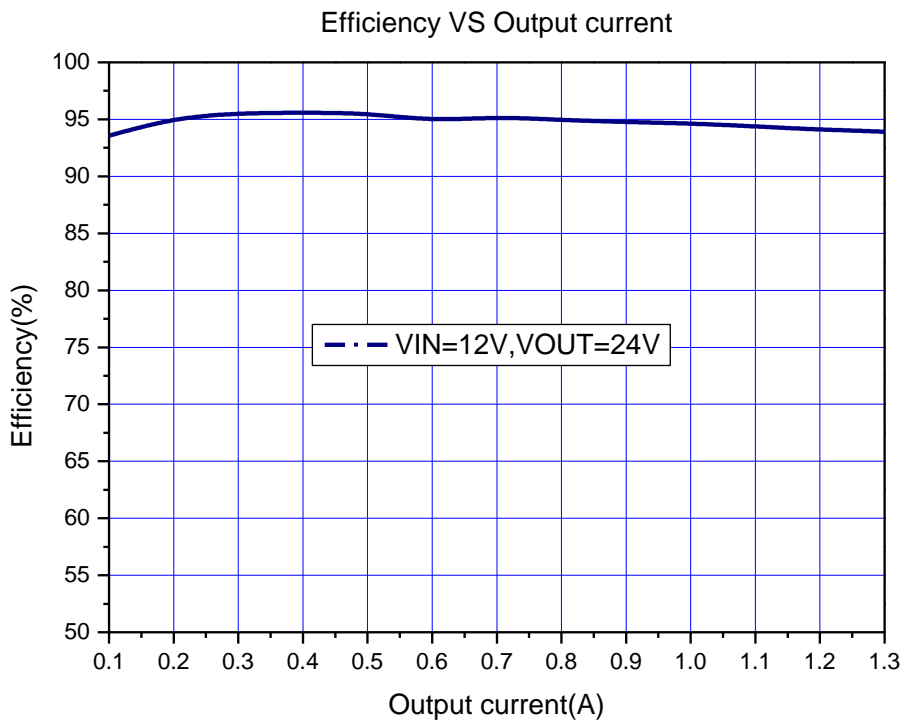


Figure12. XL6012 System Efficiency Curve (VIN=12V, VOUT=24V)

Typical System Application(VIN=5V,VOUT=12V)

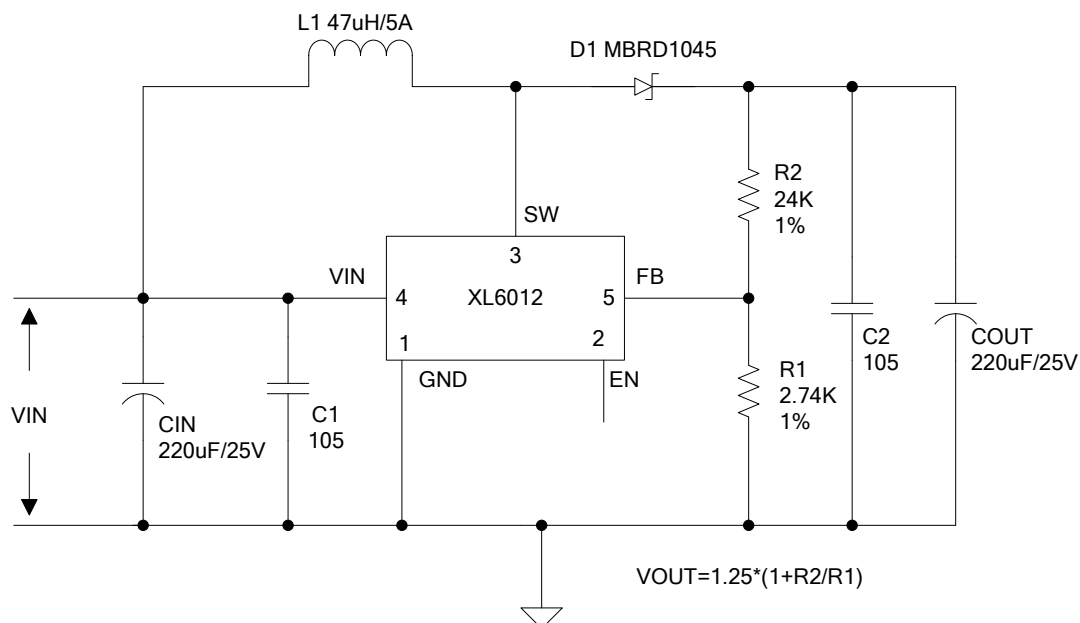


Figure13. XL6012 Typical System Application (VIN=5V,VOUT=12V)

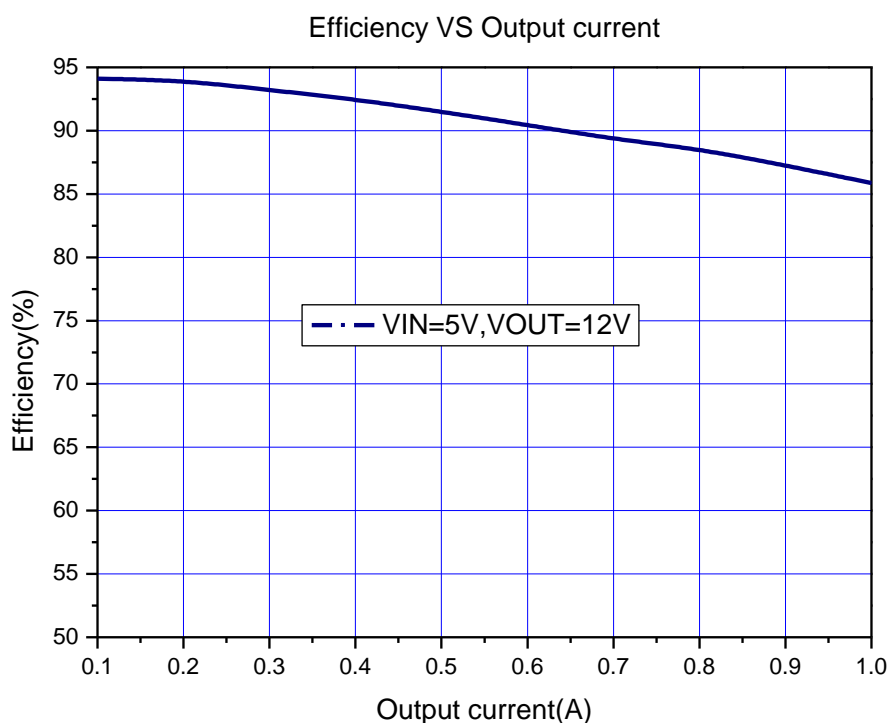


Figure14. XL6012 System Efficiency Curve (VIN=5V, VOUT=12V)

Typical System Application(VIN=10~32V,VOUT=36V)

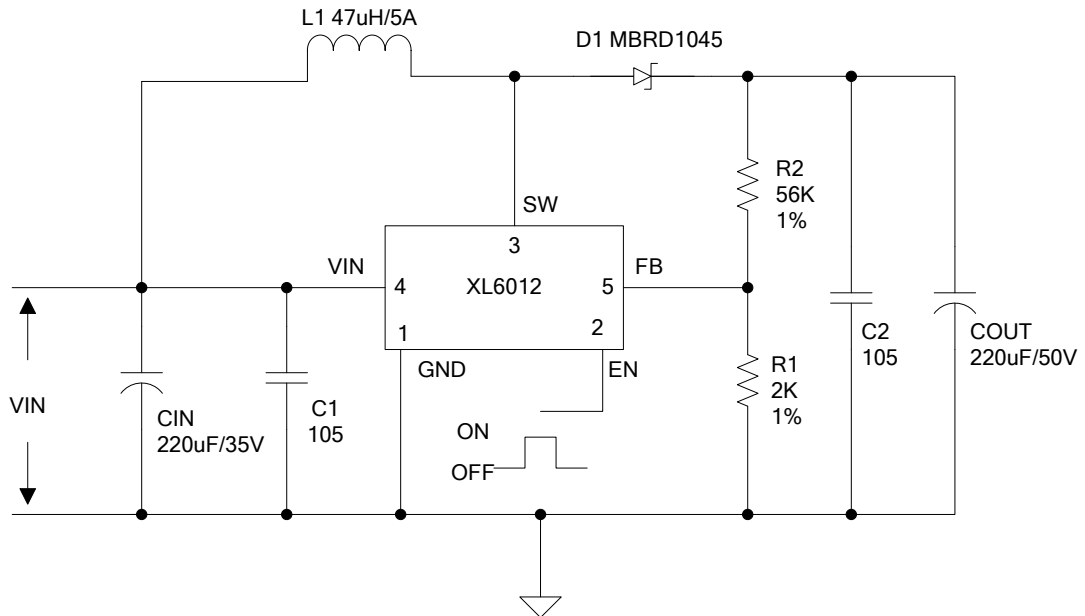


Figure15. XL6012 Typical System Application (VIN=10~32V,VOUT=36V)

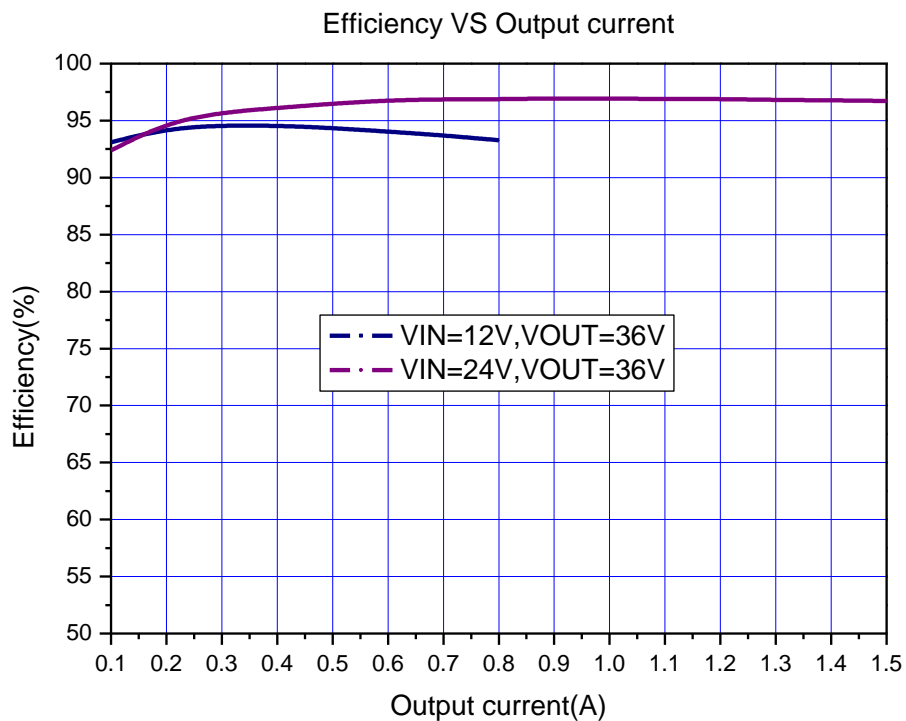


Figure16. XL6012 System Efficiency Curve (VIN=10~32V, VOUT=36V)

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Typical System Application(VIN=20~40V,VOUT=48V)

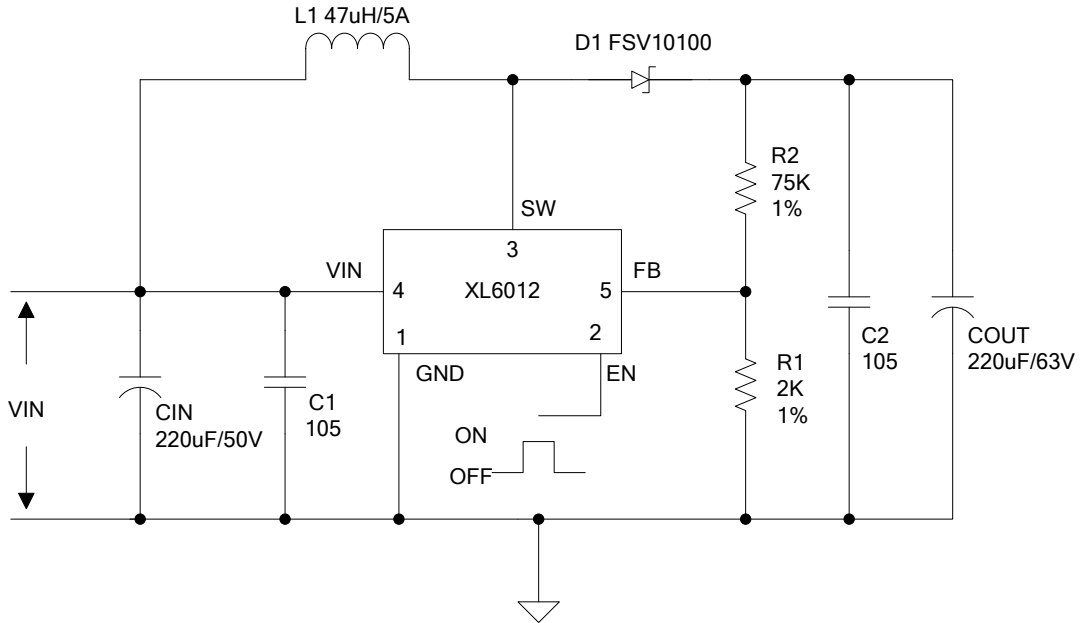


Figure17. XL6012 Typical System Application (VIN=20~40V,VOUT=48V)

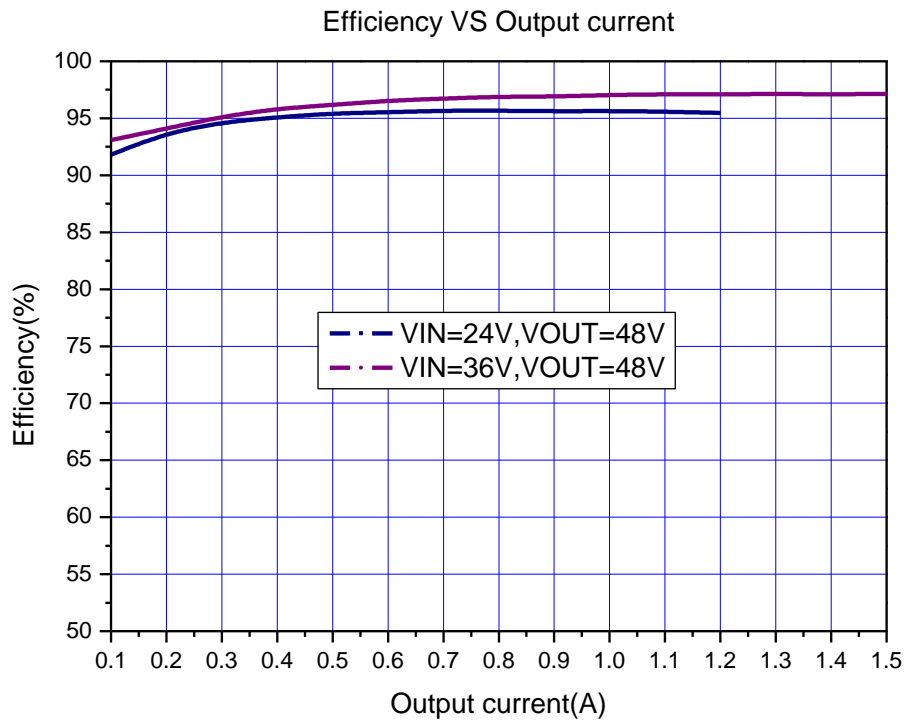


Figure18. XL6012 System Efficiency Curve (VIN=20~40V, VOUT=48V)

Typical System Application – SEPIC (VIN=10~30V, VOUT=12V)

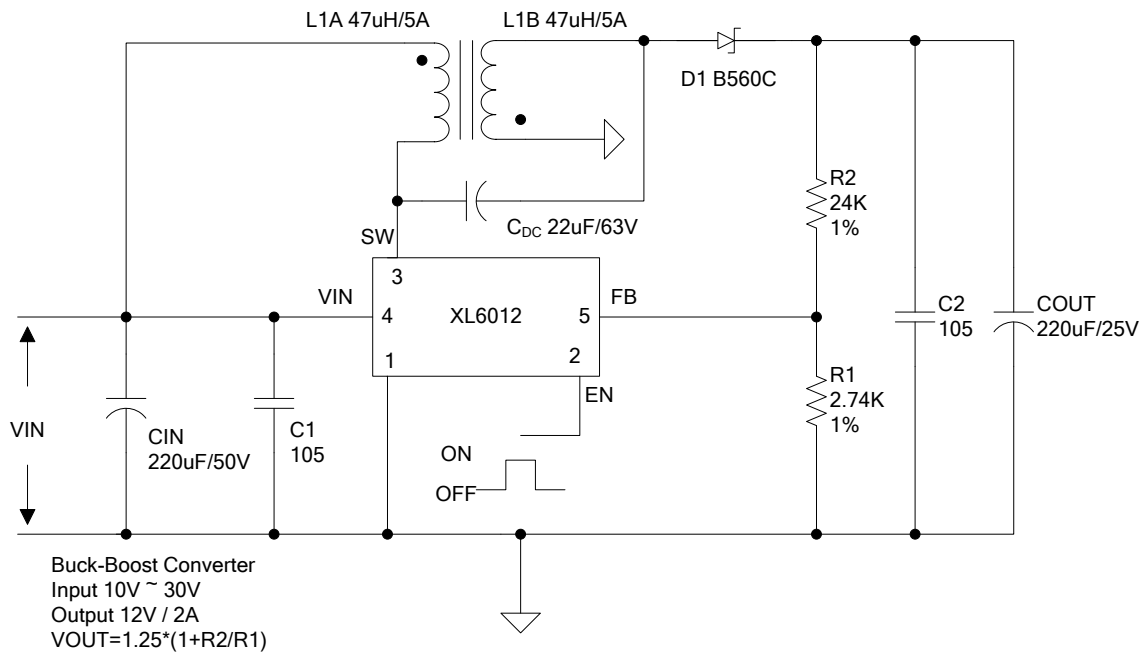


Figure19. XL6012 Typical System Application (VIN=10~30V, VOUT=12V)

High Power Application Circuit

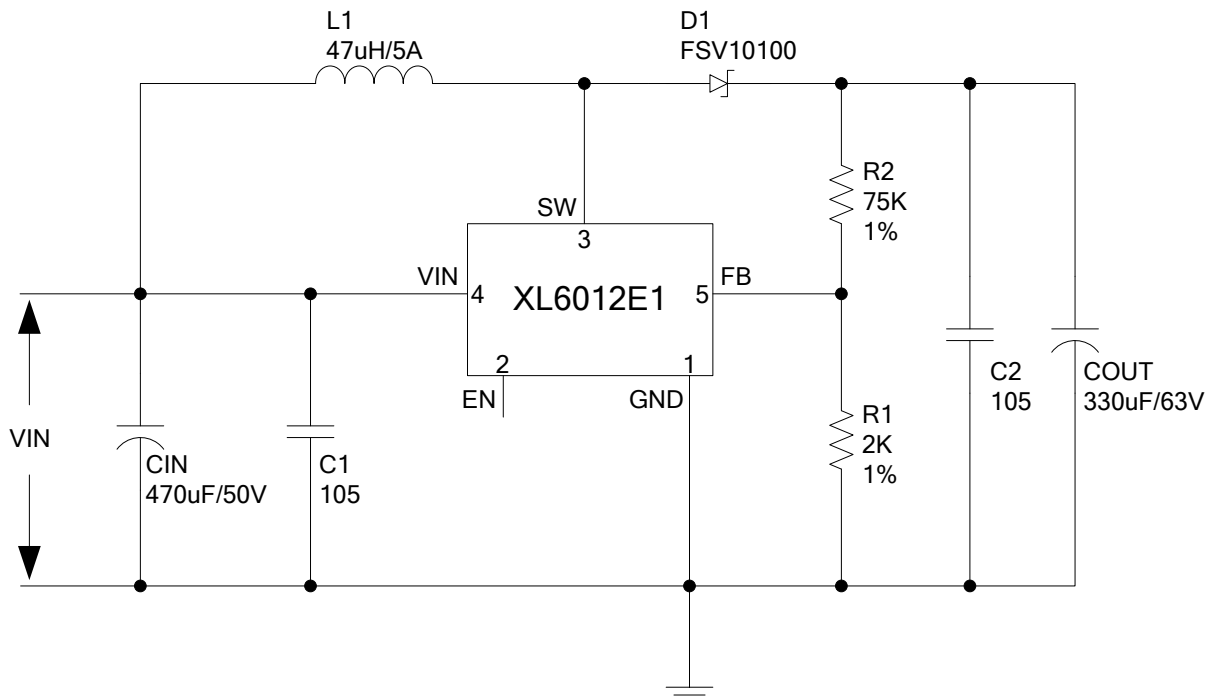
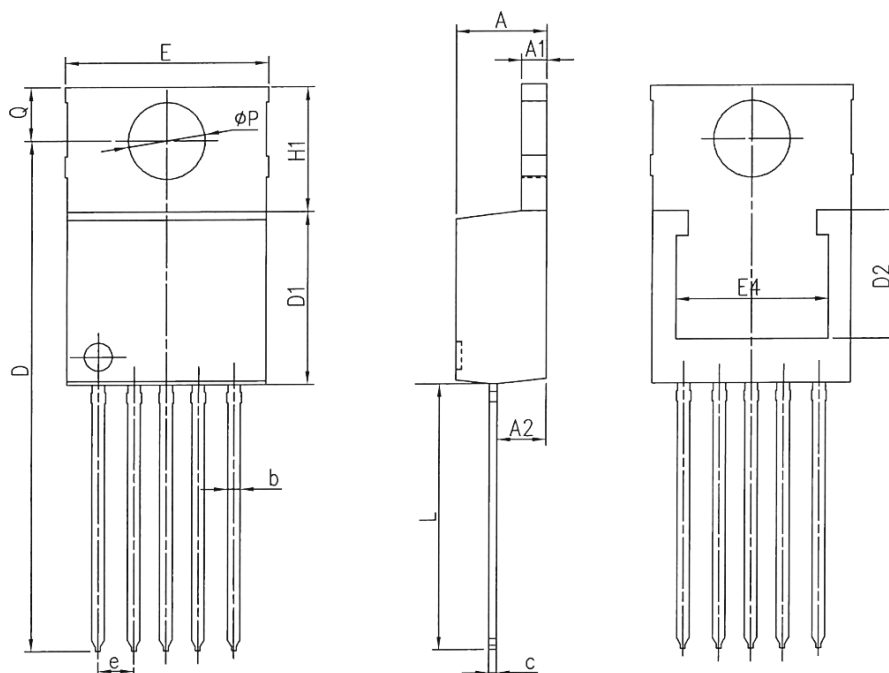


Figure20. XL6012 High Power Application Circuit (VIN=36V, VOUT=48V, IOU=2.1A)

Package Information

TO220-5L



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.37	4.57	4.77	0.172	0.180	0.188
A1	1.17	1.27	1.42	0.046	0.050	0.056
A2	2.47	2.67	2.87	0.097	0.105	0.113
b	0.76	0.89	1.02	0.030	0.035	0.040
c	0.33	0.38	0.64	0.013	0.015	0.025
D	25.65	26.00	26.35	1.009	1.023	1.037
D1	8.38	8.70	9.00	0.330	0.342	0.354
D2	5.50	5.84	6.14	0.216	0.230	0.242
E	9.86	10.26	10.39	0.388	0.404	0.409
E4	7.30	8.33	9.30	0.287	0.328	0.366
e	1.55	1.70	1.85	0.061	0.067	0.073
H1	6.10	6.35	6.60	0.240	0.250	0.260
L	13.34	13.74	14.10	0.525	0.541	0.555
ΦP	3.70	3.84	3.95	0.146	0.151	0.156
Q	2.54	2.75	3.05	0.100	0.108	0.120

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