



Product Specification

XBL1507B Series

3A 150KHz 40V PWM Buck DC/DC Converter

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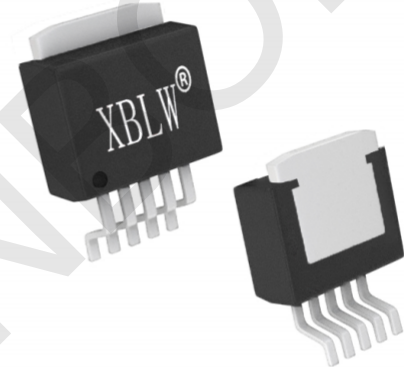
Descriptions

The XBL1507B is a 150 KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 3A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An enable function, an over current protection function is built inside. When second current limit function happens, the operation frequency will be reduced from 150KHz to 50KHz. An internal compensation block is built in to minimize external component count.

Features

- Wide 4.5V to 40V Input Voltage Range
- 3.3V, 5V, 12V, and adjustable versions
- Output Adjustable from 1.23V to 37V
- Maximum Duty Cycle 100%
- Minimum Drop Out 1.0V
- Fixed 150KHz Switching Frequency
- 3A Constant Output Current Capability
- Internal Optimize Power Transistor
- High efficiency
- TTL shutdown capability
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit function
- Built in output short protection function
- Available in TO252-5L packages



TO-252-5L

Applications

- Portable DVD
- LCD Monitor / TV
- Battery Charger
- ADSL Modem
- Telecom / Networking Equipment

Figure 1. Package Types of XBL1507B

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBL1507B-ADJ	TO-252-5L	XBL1507B-ADJ	Tape	2500Pcs/Reel
XBL1507B-3.3	TO-252-5L	XBL1507B-3.3	Tape	2500Pcs/Reel
XBL1507B-5.0	TO-252-5L	XBL1507B-5.0	Tape	2500Pcs/Reel
XBL1507B-12	TO-252-5L	XBL1507B-12	Tape	2500Pcs/Reel

Pin Configuration

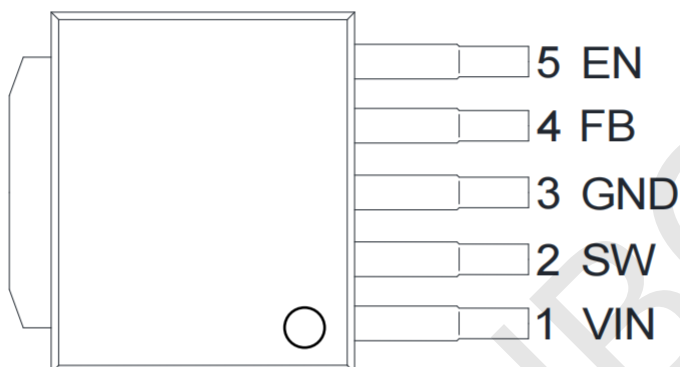


Figure 2 Pin Configuration of XBL1507B(Top View)

Pin Description

Pin Number	Pin Name	Description
1	VIN	Supply Voltage Input Pin. XBL1507B operates from a 4.5V to 40V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
2	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.
3	GND	Ground Pin.
4	FB	Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it. The feedback threshold voltage is 1.23V.
5	EN	Enable Pin. Drive EN pin low to turn on the device, drive it high to turn it off. Floating is default low.
Tab	GND	Ground Pin.

Function Block

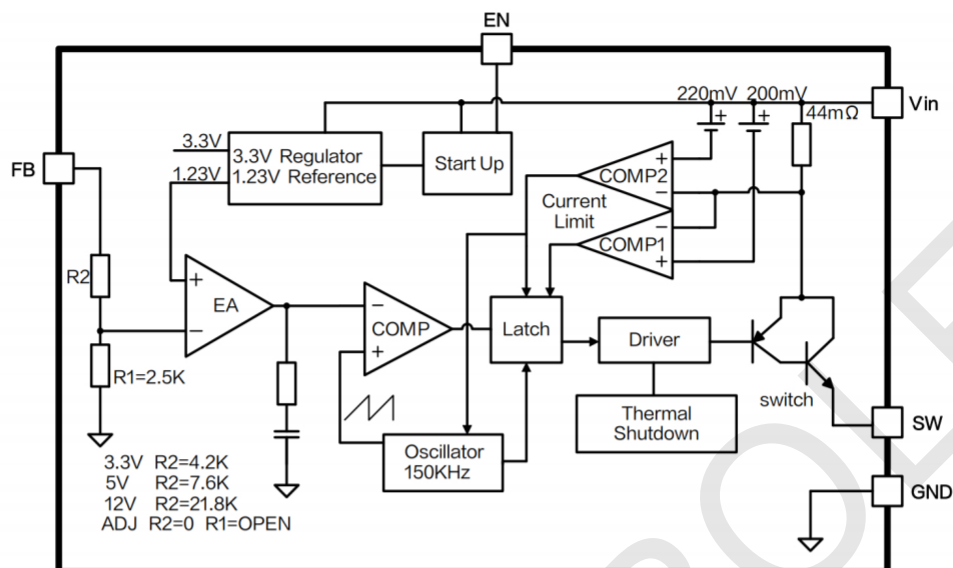


Figure 3 Function Block Diagram of XBL1507B

Typical Application Circuit

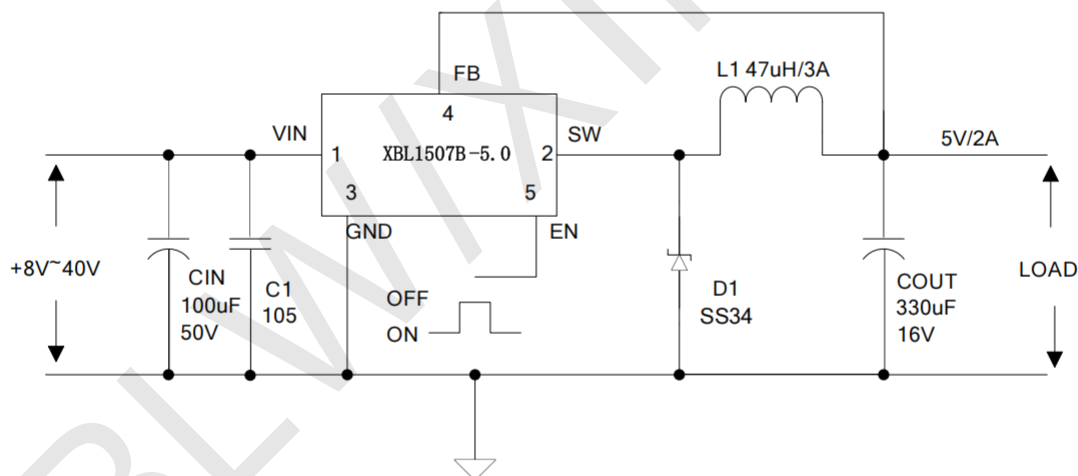


Figure4. XBL1507B Typical Application Circuit (VIN=8V~40V, VOUT=5V/2A)

Absolute Maximum Ratings

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.

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	-0.3 to 45	V
Feedback Pin Voltage	V_{FB}	-0.3 to V_{IN}	V
Enable Pin Voltage	V_{EN}	-0.3 to V_{IN}	V
Switch Pin Voltage	V_{SW}	-0.3 to V_{IN}	V
Power Dissipation	P_D	Internally limited	mW
Operating Junction Temperature	T_J	-40~125	°C
Storage Temperature	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	°C
ESD (HBM)		2000	V
MSL		Level3	
Thermal Resistance-Junction to Ambient	$R_{\theta JA}$	85	°C / W
Thermal Resistance-Junction to Case	$R_{\theta JC}$	45	°C / W

XBL1507B-3.3 Electrical Characteristics

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
System parameters test circuit figure6						
V_{OUT}	Output Voltage	$V_{in} = 4.75\text{V to } 40\text{V}$ $I_{load}=0.2\text{A to } 3\text{A}$	3.168	3.3	3.432	V
η	Efficiency	$V_{in}=12\text{V}$, $V_{out}=3.3\text{V}$ $I_{out}=3\text{A}$	-	73	-	%

XBL1507B-5.0 Electrical Characteristics

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
System parameters test circuit figure7						
V_{OUT}	Output Voltage	$V_{in} = 7\text{V to } 40\text{V}$, $I_{load}=0.2\text{A to } 3\text{A}$	4.8	5	5.2	V
η	Efficiency	$V_{in}=12\text{V}$, $V_{out}=5\text{V}$, $I_{out}=3\text{A}$	-	80	-	%

XBL1507B-12 Electrical Characteristics

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
System parameters test circuit figure8						
V_{OUT}	Output Voltage	$V_{in} = 15\text{V to } 40\text{V}$, $I_{load}=0.2\text{A to } 3\text{A}$	11.52	12	12.48	V
η	Efficiency	$V_{in}=25\text{V}$, $V_{out}=12\text{V}$, $I_{out}=3\text{A}$	-	90	-	%

XBL1507B-ADJ Electrical Characteristics

Ta = 25°C; unless otherwise specified.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
System parameters test circuit figure9						
VOUT	Output Voltage	Vin = 4.5V to 40V , Iload=0.2A to 3A	1.193	1.23	1.267	V
η	Efficiency	Vin=12V ,Vout=3V , Iout=3A	-	73	-	%

Electrical Characteristics (DC Parameters)

Vin = 12V for the 3.3V,5V,and Adjustable versions and Vin=24V for the 12V version, GND=0V, Vin & GND parallel connect a 220uf/50 V capacitor; Iout=500mA, Ta = 25°C; the others floating unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	Vin		4.5		40	V
Shutdown Supply Current	IS	VEN=5V		50	200	uA
Quiescent Supply Current	Iq	VEN=0V, VFB=Vin		4.5	10	mA
Oscillator Frequency	Fosc		127	150	173	Khz
Switch Current Limit	IL	VFB=0V	3.6	4.8	6.9	A
EN Pin Threshold	VEN	High (Regulator OFF) Low (Regulator ON)		1.5 0.8		V
EN Pin Input Leakage Current	IH	VEN =2.5V (OFF)		8	15	uA
	IL	VEN =0.5V (ON)		0.5	5	uA
Output Saturation Voltage	VCE	VFB=0V Iout=3A		1.5	1.8	V
Max. Duty Cycle	DMAX	VFB=0V		100		%

Test Circuit and Layout guidelines

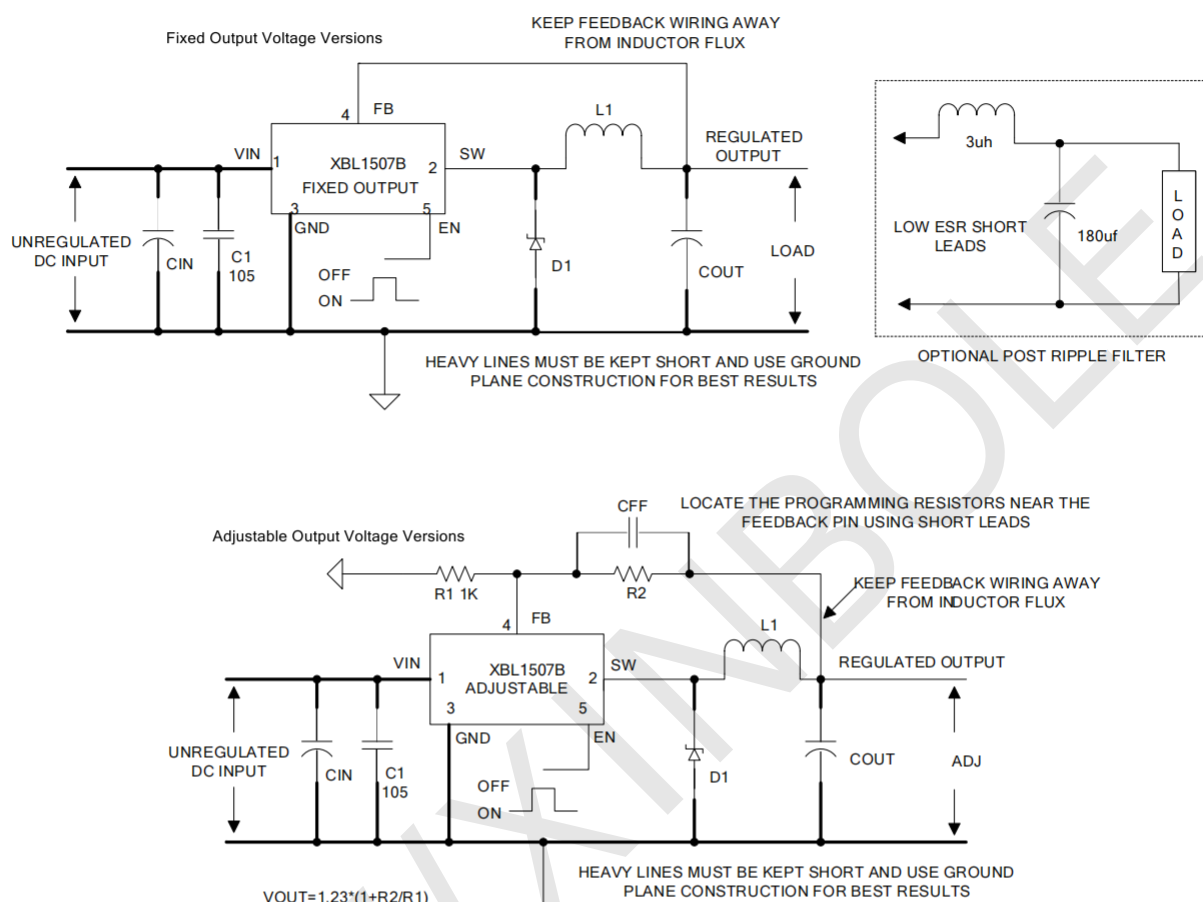


Figure4. Standard Test Circuits and Layout Guides

Select R1 to be approximately 1K, use a 1% resistor for best stability.

C1 and CFF are optional; in order to increase stability and reduce the input power line noise, C1 must be placed near to PIN1 and PIN3;

For output voltages greater than approximately 10V, an additional capacitor CFF is required. The compensation capacitor is typically between 100 pf and 33 nf, and is wired in parallel with the output voltage setting resistor, R2. It provides additional stability for high output voltage, low input-output voltages, and/or very low ESR output capacitors, such as solid tantalum capacitors.

$CFF = 1 / (31 \cdot 1000 \cdot R2)$; This capacitor type can be ceramic, plastic, silver mica, etc. (Because of the unstable characteristics of ceramic capacitors made with Z5U material, they are not recommended.)

XBL1507B Series Buck Regulator Design Procedure (Fixed Output)

Conditions			Inductor (L1) Inductance (uH)	Output Capacitor (COUT)			
Output Voltage (V)	Load Current (A)	Max Input Voltage (V)		Through Hole Electrolytic		Surface Mount Tantalum	
				Panasonic HFQ Series (uF/V)	Nichicon PL Series (uF/V)	AVX TPS Series (uF/V)	Sprague 595D Series (uF/V)
3.3	3	5	22	470/25	560/16	330/6.3	390/6.3
		7	22	560/35	560/35	330/6.3	390/6.3
		10	22	680/35	680/35	330/6.3	390/6.3
		40	33	560/35	470/35	330/6.3	390/6.3
	2	6	22	470/25	470/35	330/6.3	390/6.3
		10	33	330/35	330/35	330/6.3	390/6.3
		40	47	330/35	270/50	220/10	330/10
5	3	8	22	470/25	560/16	220/10	330/10
		10	22	560/25	560/25	220/10	330/10
		15	33	330/35	330/35	220/10	330/10
		40	47	330/35	270/35	220/10	330/10
	2	9	22	470/25	560/16	220/10	330/10
		20	68	180/35	180/35	100/10	270/10
		40	68	180/35	180/35	100/10	270/10
12	3	15	22	470/25	470/25	100/16	180/16
		18	33	330/25	330/25	100/16	180/16
		30	68	180/25	180/25	100/16	120/20
		40	68	180/35	180/25	100/16	120/20
	2	15	33	330/25	330/25	100/16	180/16
		20	68	180/25	180/25	100/16	120/20
		40	150	82/25	82/25	68/20	68/25

XBL1507B Series Buck Regulator Design Procedure (Adjustable Output)

Output Voltage (V)	Through Hole Output Electrolytic			Surface Mount Output Capacitor		
	Panasonic HFQ Series (uF/V)	Nichicon PL Series (uF/V)	Feedforward Capacitor	AVX TPS Series (uF/V)	Sprague 595D Series (uF/V)	Feedforward Capacitor
2	820/35	820/35	33nF	330/6.3	470/4	33nF
4	560/35	470/35	10nF	330/6.3	390/6.3	10nF
6	470/25	470/35	3.3nF	220/10	330/10	3.3nF
9	330/25	330/25	1.5nF	100/16	180/16	1.5nF
12	330/25	330/25	1nF	100/16	180/16	1nF
15	220/25	220/35	680pF	68/20	120/20	680pF
24	220/35	150/35	560pF	33/25	33/25	220pF
28	100/50	100/50	390pF	10/35	15/50	220pF

Schottky Diode Selection Table

Current	Surface Mount	Through Hole	VR (The same as system maximum input voltage)		
			20V	30V	40V
1A		✓	1N5817	1N5818	1N5819
3A		✓	1N5820	1N5821	1N5822
		✓	MBR320	MBR330	MBR340
	✓		SK32	SK33	SK34
	✓			30WQ03	30WQ04
		✓		31DQ03	31DQ04
		✓	SR302	SR303	SR304

Typical System Application for 3.3V Version

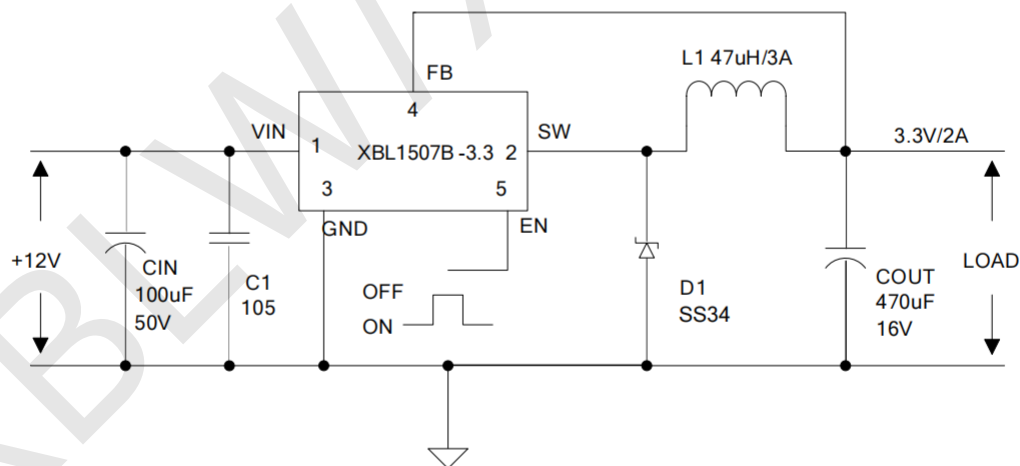


Figure5. XBL1507B-3.3 System Parameters Test Circuit

Typical System Application for 5V Version

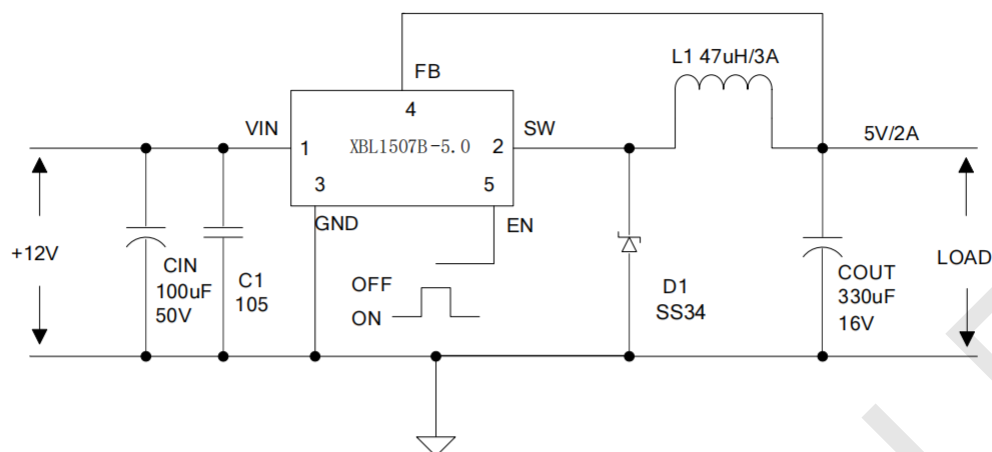


Figure6. XBL1507B-5.0 System Parameters Test Circuit

Typical System Application for 12V Version

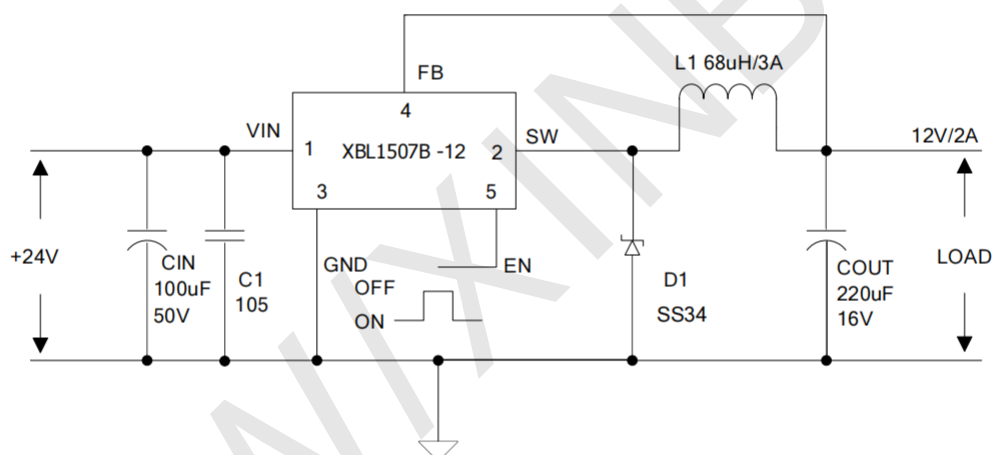


Figure7. XBL1507B-12 System Parameters Test Circuit

Typical System Application for ADJ Version

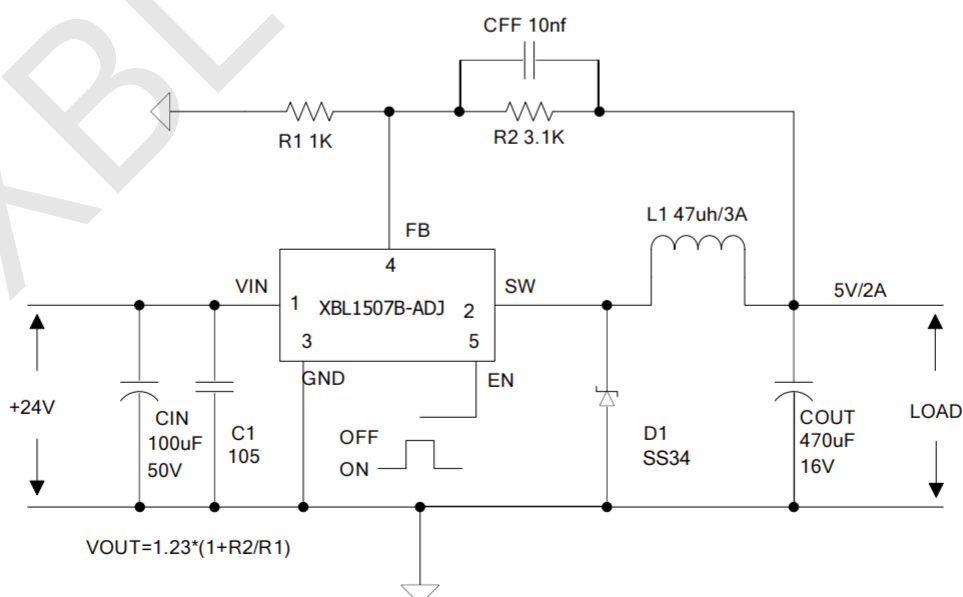


Figure8. XBL1507B-ADJ System Parameters Test Circuit

High Power Application Circuit

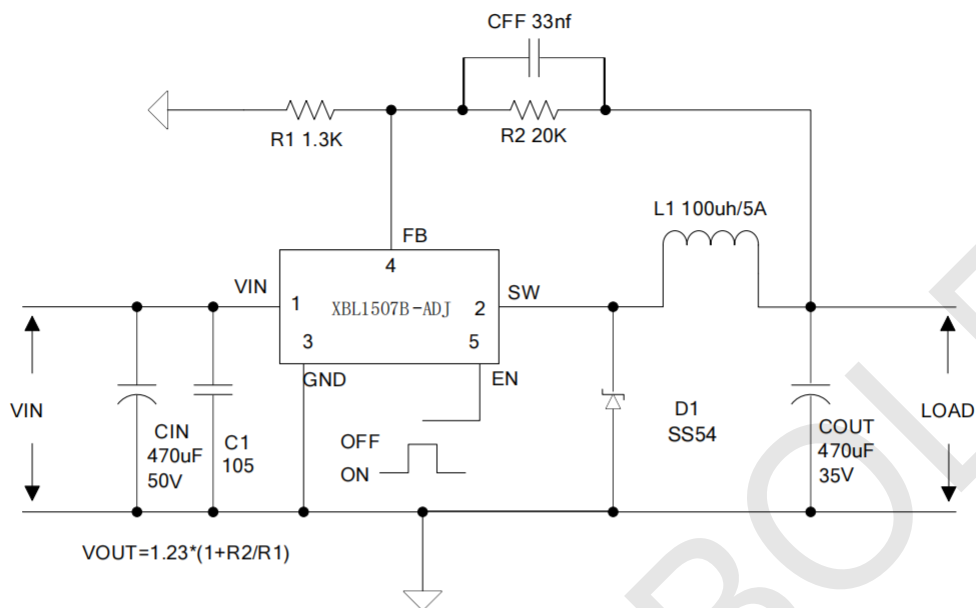
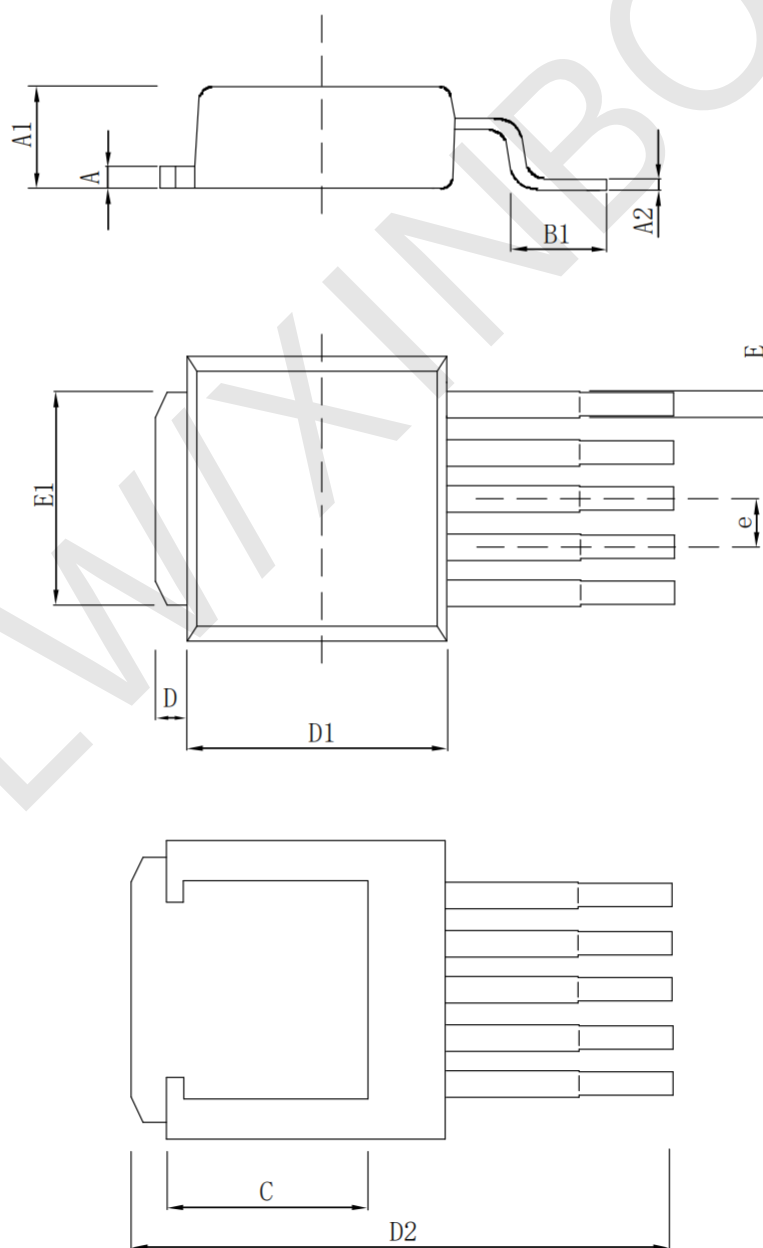


Figure9. XBL1507B-ADJ High Power Application Circuit (VIN=24V,VOUT=20V,IOUT=0.5A)

Package Information

· T0-252-5L

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	0.470	0.530	A	0.018	0.021
A1	2.180	2.400	A1	0.085	0.094
A2	0.250	0.350	A2	0.009	0.013
B1	1.100	1.300	B1	0.043	0.051
C	5.200	5.600	C	0.204	0.220
D	1.000	1.200	D	0.039	0.047
D1	6.000	6.200	D1	0.236	0.245
D2	9.800	10.10	D2	0.385	0.397
E	0.630	0.770	E	0.024	0.031
E1	6.450	6.750	E1	0.253	0.266
e	1.270 (BSC)		e	0.050 (BSC)	



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