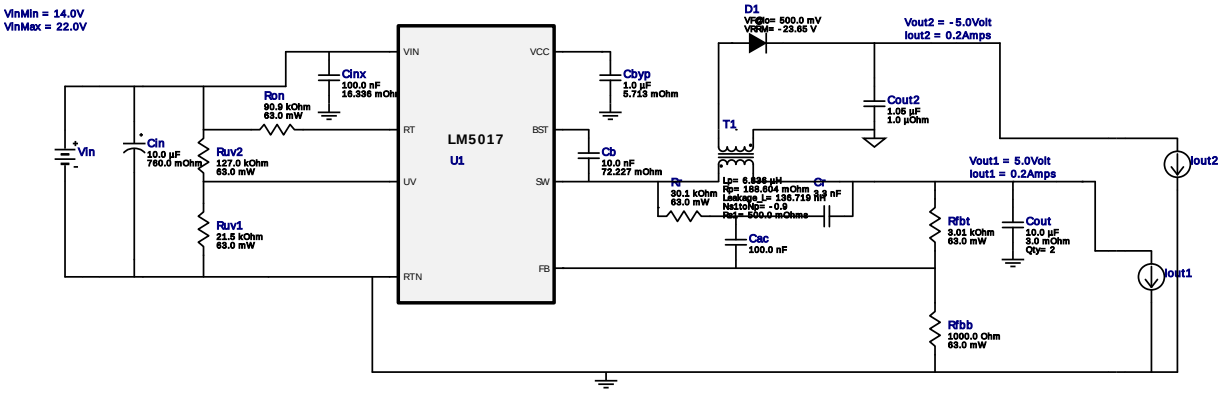
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 5.0V
Iout = 0.2A

Device = LM5017MRE/NOPB
Topology = Flyback
Created = 9/15/14 5:27:26 AM
BOM Cost = $0.00
Footprint = 312.0mm2
BOM Count = 18
Total Pd = 0.35W

Design : 3779120/645 LM5017MRE/NOPB
LM5017MRE/NOPB 14.0V-22.0V to 5.041906533169554V @ 0.020000022499999992A

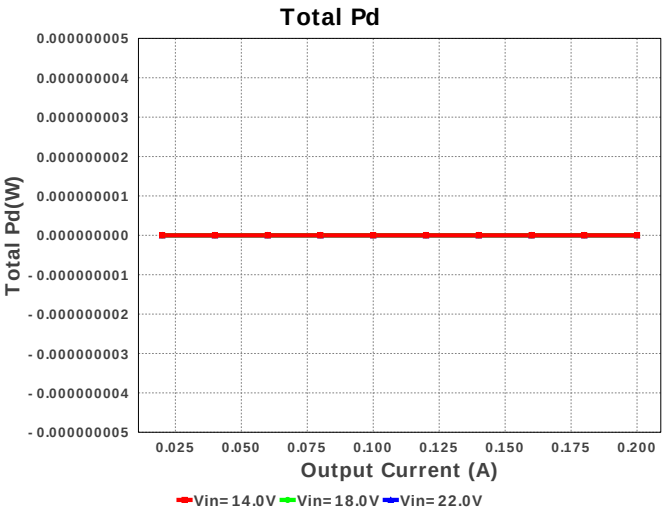


1. Feedback Resistors may need to be further adjusted to get more precise regulation as ripple injection circuit will introduce some amount of DC offset. Use simulation to help adjust.

Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cac	Kemet	C0603C104Z3VACTU Series= Y5V	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5mm2
2.	Cb	TDK	C1005X7R1C103K Series= 285	Cap= 10.0 nF ESR= 72.227 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	1005 3mm2
3.	Cbyp	TDK	C1608X5R1C105K Series= 285	Cap= 1.0 uF ESR= 5.713 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0603 5mm2
4.	Cin	Nichicon	UUD1V100MCL1GS Series= uD	Cap= 10.0 uF ESR= 760.0 mOhm VDC= 35.0 V IRMS= 150.0 mA	1	$0.10	SM_RADIAL_5MM 58mm2
5.	Cinx	TDK	C1608X7R1H104K Series= 285	Cap= 100.0 nF ESR= 16.336 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5mm2
6.	Cout	Kemet	C0805C106K8PACTU Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 10.0 V IRMS= 11.43 A	2	$0.04	0805 7mm2
7.	Cout2	CUSTOM	CUSTOM Series= ?	Cap= 1.05 uF ESR= 1.0 uOhm VDC= -7.7 V IRMS= 254.967 mA	1	NA	CUSTOM 0mm2
8.	Cr	MuRata	GRM033R61A332KA01D Series= X5R	Cap= 3.3 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0201 2mm2
9.	D1	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= -23.65 V	1	NA	CUSTOM 0mm2
10.	Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Rfbt	Vishay-Dale	CRCW04023K01FKED Series= CRCW..e3	Res= 3.01 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
12.	Ron	Vishay-Dale	CRCW040290K9FKED Series= CRCW..e3	Res= 90.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
13.	Rr	Vishay-Dale	CRCW040230K1FKED Series= CRCW..e3	Res= 30.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
14.	Ruv1	Vishay-Dale	CRCW040221K5FKED Series= CRCW..e3	Res= 21.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
15.	Ruv2	Vishay-Dale	CRCW0402127KFKED Series= CRCW..e3	Res= 127.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
16.	T1	CUSTOM	CUSTOM	Lp= 6.836 µH Rp= 188.604 mOhm Leakage_L= 136.719 nH Ns1toNp= -0.9 Rs1= 500.0 mOhms	1	NA	CUSTOM 0mm2
17.	U1	Texas Instruments	LM5017MRE/NOPB	Switcher	1	$1.81	R-PDSO-G8 57mm2



Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	8.498 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	307.875 mA	Current	Output capacitor RMS ripple current
3.	Cout2 IRMS	127.16 mA	Current	Output capacitor2 RMS ripple current
4.	Iin Avg	15.961 mA	Current	Average input current
5.	T1 Iprim RMS	352.129 mA	Current	Transformer Primary RMS Current
6.	T1 Iprim pk	553.255 mA	Current	Transformer Primary Peak Current
7.	T1 Is1 RMS	264.295 mA	Current	Transformer Secondary1 RMS Current
8.	BOM Count	18	General	Total Design BOM count
9.	FootPrint	312.0 mm2	General	Total Foot Print Area of BOM components
10.	Frequency	550.055 kHz	General	Switching frequency
11.	Total BOM	$0.0	General	Total BOM Cost
12.	D1 Tj	30.0 degC	Op_Point	D1 junction temperature
13.	Vout2 OP	-5.038 V	Op_Point	Operational Voltage 2
14.	Duty Cycle	23.648 %	Op_point	Duty cycle
15.	Efficiency	238.68 m%	Op_point	Steady state efficiency
16.	IC Tj	38.478 degC	Op_point	IC junction temperature

#	Name	Value	Category	Description
17.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
18.	IOUT_OP	20.0 mA	Op_point	Iout operating point
19.	VIN_OP	22.0 V	Op_point	Vin operating point
20.	Cin Pd	54.889 µW	Power	Input capacitor power dissipation
21.	Cout Pd	142.181 µW	Power	Output capacitor power dissipation
22.	Cout2 Pd	16.17 nW	Power	Output capacitor2 power dissipation
23.	Diode Pd	100.0 mW	Power	Diode power dissipation
24.	IC Pd	211.953 mW	Power	IC power dissipation
25.	Total Pd	350.304 mW	Power	Total Power Dissipation
26.	Xformer Pd	38.161 mW	Power	Transformer power dissipation
27.	Vout1 OP	5.042 V	Unknown	Operational Voltage 1

Design Inputs

#	Name	Value	Description
1.	Iout	200.0 mA	Maximum Output Current
2.	Iout1	200.0 mAmps	Output Current #1
3.	Iout2	200.0 mAmps	Output Current #2
4.	VinMax	22.0 V	Maximum input voltage
5.	VinMin	14.0 V	Minimum input voltage
6.	Vout	5.0 V	Output Voltage
7.	Vout1	5.0 Volt	Output Voltage #1
8.	Vout2	-5.0 Volt	Output Voltage #2
9.	base_pn	LM5017	Base Product Number
10.	source	DC	Input Source Type
11.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. For a Constant On Time device to be stable, we need to provide a ripple at the feedback comparator. There are various methods to implement the ripple. Depending on the circuit complexity vs. the allowable ripple, we have three options to choose from. The simplest option, 'Low Complexity', would require only a high ESR cap at the output. This means that the BOM count will be small, but the output voltage ripple will be quite large. The 'Optimal Solution' would require a feed-forward cap in parallel with the upper feedback resistor to AC couple the ripple to the feedback node. This increases the BOM count slightly, but now we have more control over the output voltage ripple. If the output voltage requirement is very tight, then the best option is to go for the 'Low Output Ripple' solution. In this option we can go with very low ESR output caps and have very good control over the output voltage ripple.

2. **LM5017** Product Folder : http://www.ti.com/product/lm34927 : contains the data sheet and other resources.