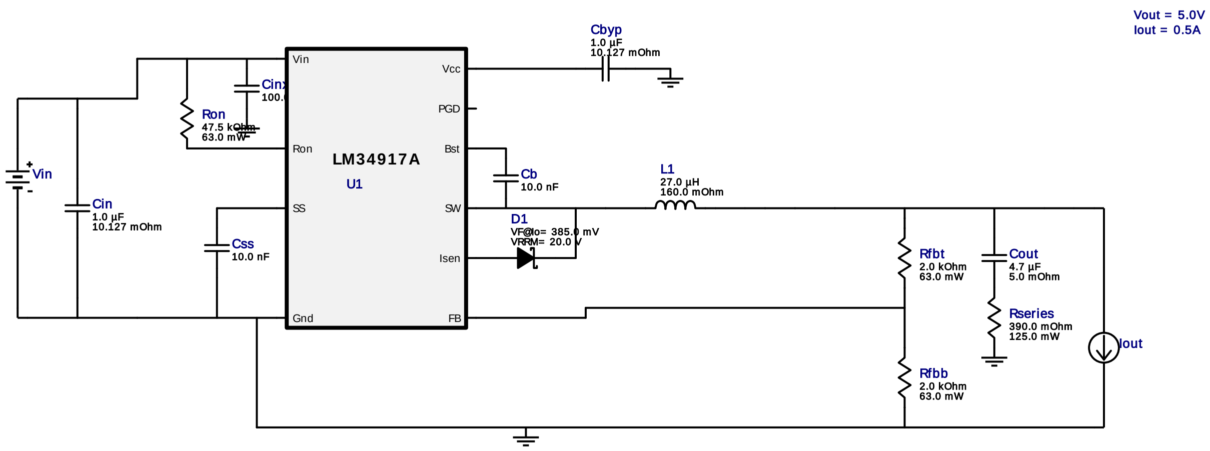
VinMin = 10.0V
VinMax = 12.0V
Vout = 5.0V
Iout = 0.5A

Device = LM34917ATL/NOPB
Topology = Buck
Created = 7/24/16 5:35:05 PM
BOM Cost = $1.84
BOM Count = 15
Total Pd = 0.25W

WEBENCH ® Design Report

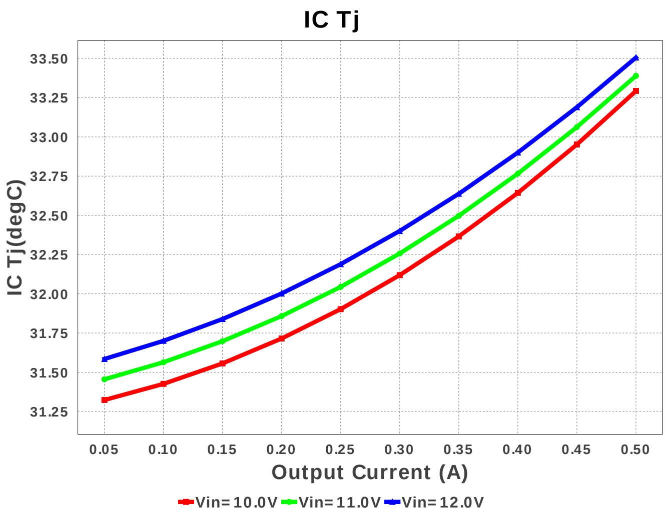
Design : 4742013/264 LM34917ATL/NOPB
LM34917ATL/NOPB 10.0V-12.0V to 5.00V @ 0.5A

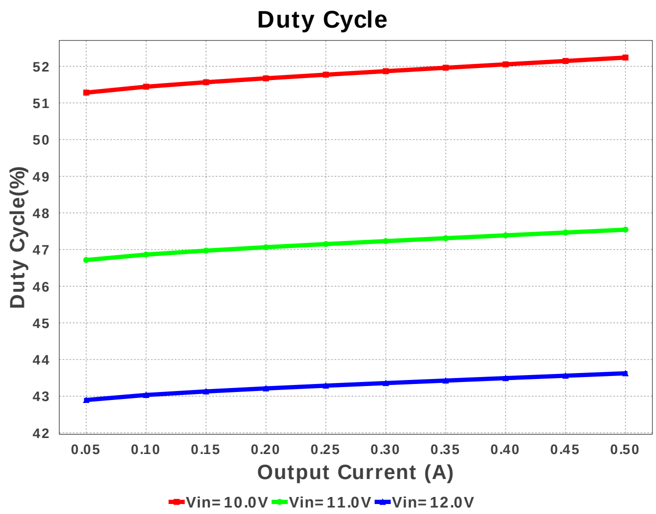


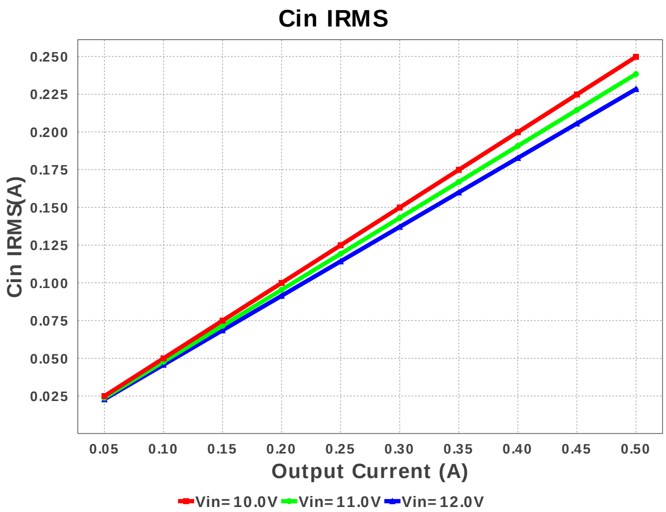
Electrical BOM

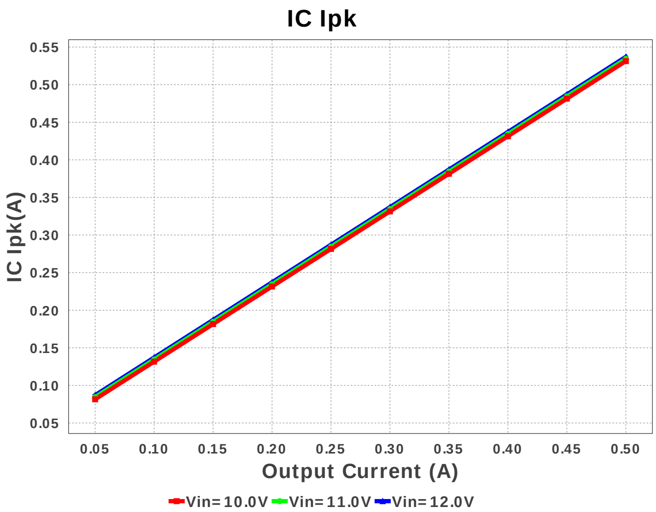
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cb	MuRata	GRM033R60J103KA01D Series= X5R	Cap= 10.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
2.	Cbst	MuRata	GRM033C80J223KE01D Series= X6S	Cap= 22.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
3.	Cbyp	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	$0.01	0603 5 mm²
4.	Cin	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	$0.01	0603 5 mm²
5.	Cinx	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
6.	Cout	MuRata	GRM188R60J475KE19D Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 2.0 A	1	$0.01	0603 5 mm²
7.	Css	MuRata	GRM155R61C103KA01D Series= X5R	Cap= 10.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
8.	Cvcc	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
9.	D1	ON Semiconductor	MBR0520LT1G	VF@Io= 385.0 mV VRRM= 20.0 V	1	$0.06	SOD-123 13 mm²
10.	L1	Bourns	SRR5028-270Y	L= 27.0 µH DCR= 160.0 mOhm	1	$0.26	SRR5028 61 mm²
11.	Rfbb	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rfbt	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	Ron	Vishay-Dale	CRCW040247K5FKED Series= CRCW..e3	Res= 47.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	Rseries	Panasonic	ERJ-2BQFR39X Series= ERJ-2B	Res= 390.0 mOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.06	0402 3 mm^2
15.	U1	Texas Instruments	LM34917ATL/NOPB	Switcher	1	$1.35	TLA12UNA 0 mm^2

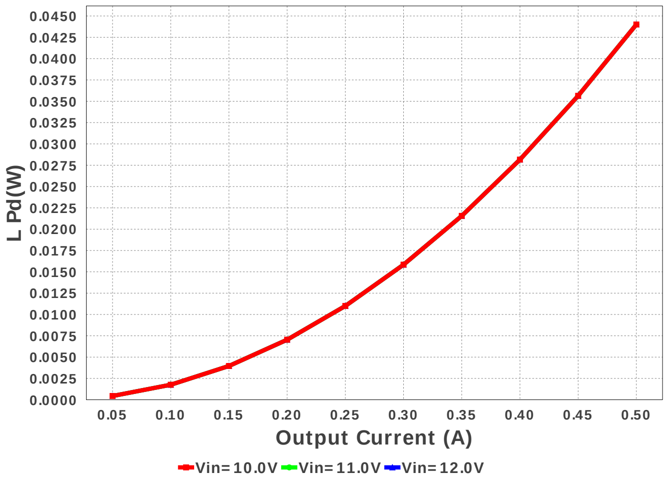




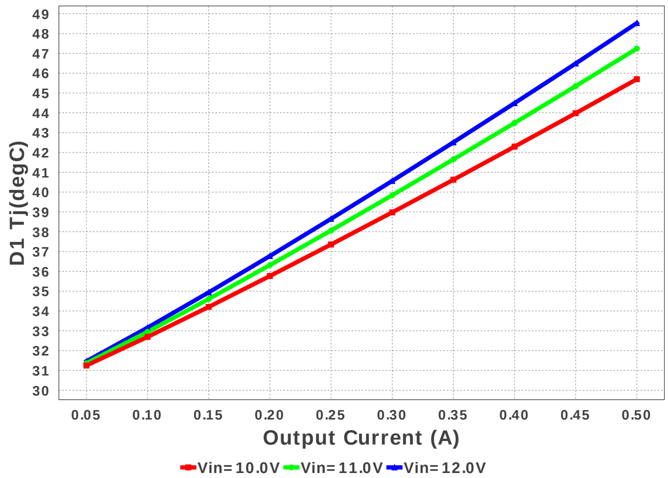




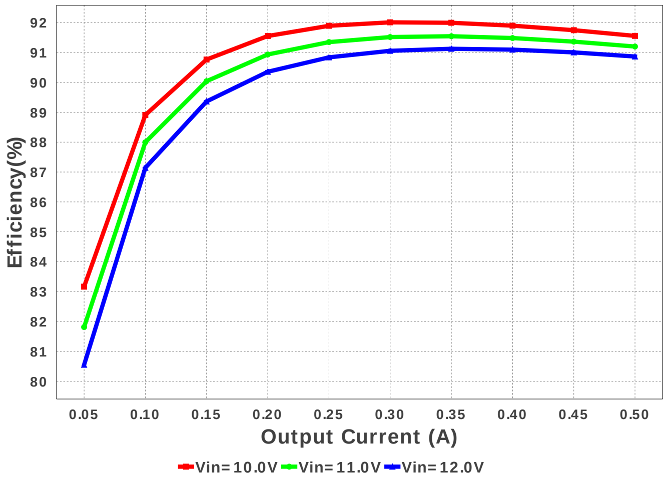
L Pd



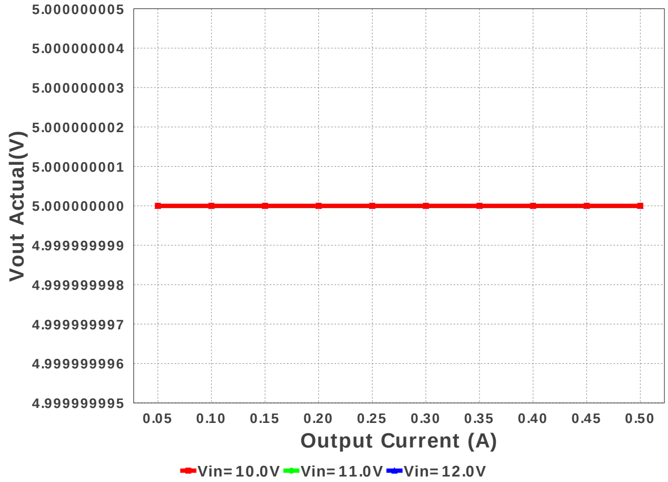
D1 Tj



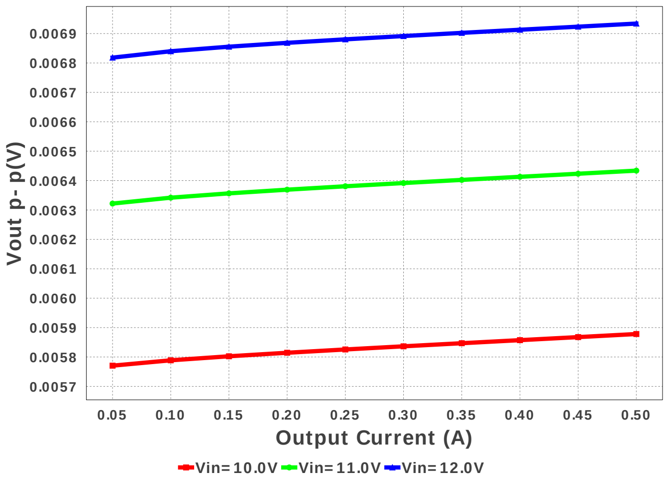
Efficiency



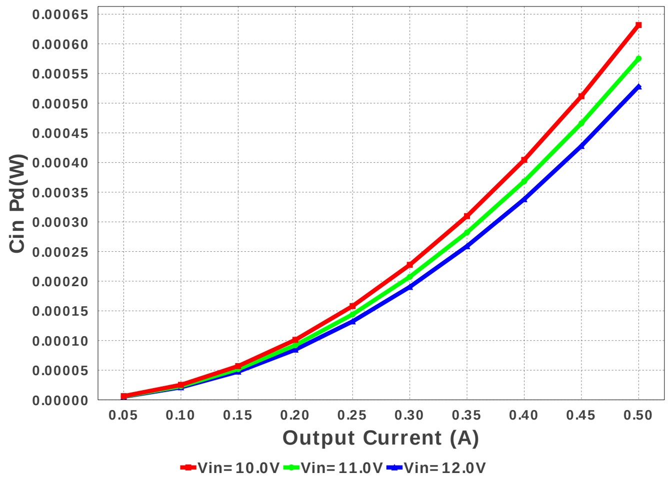
Vout Actual

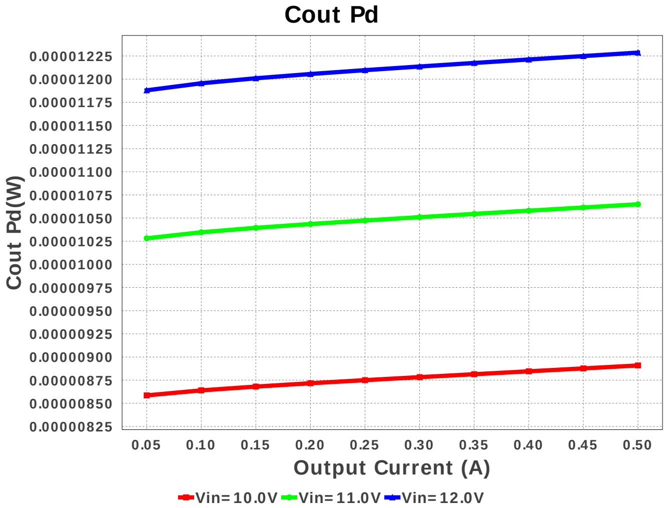


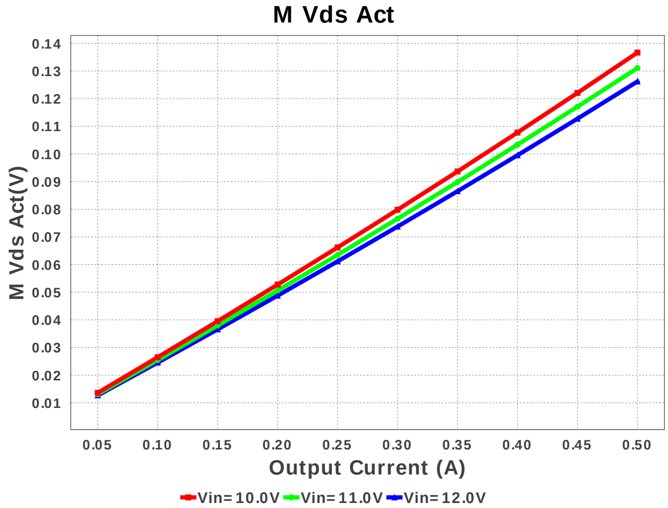
Vout p- p

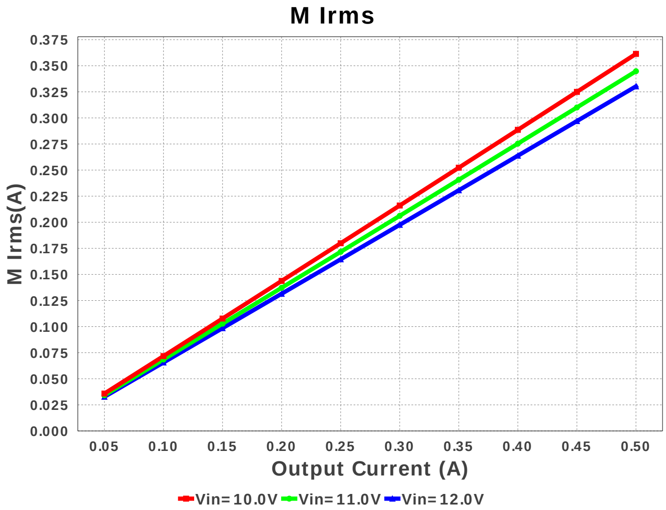


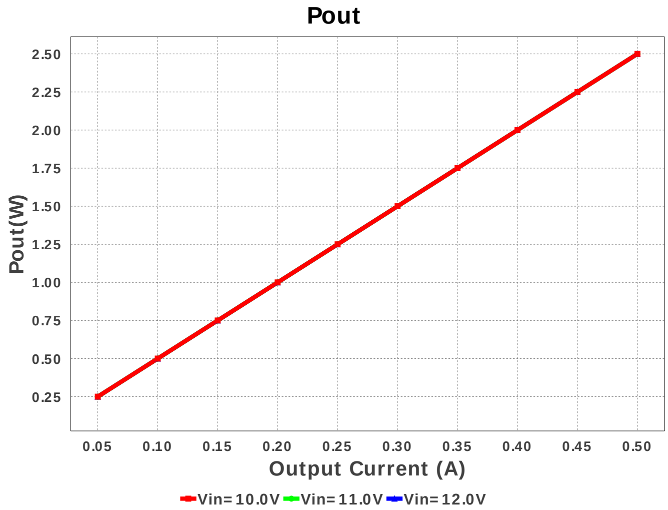
Cin Pd

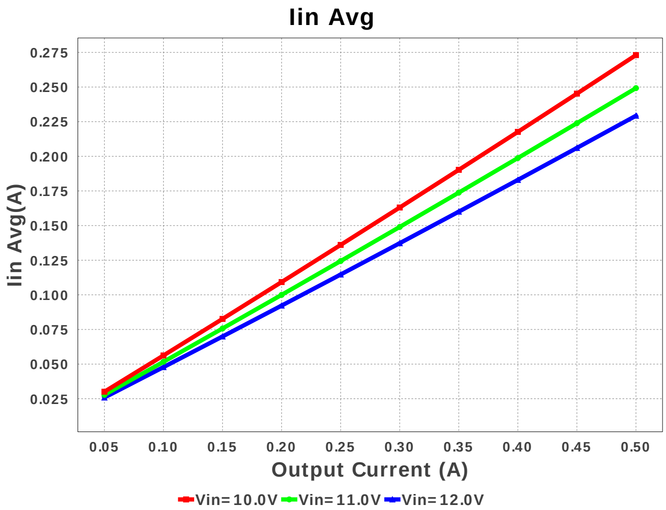


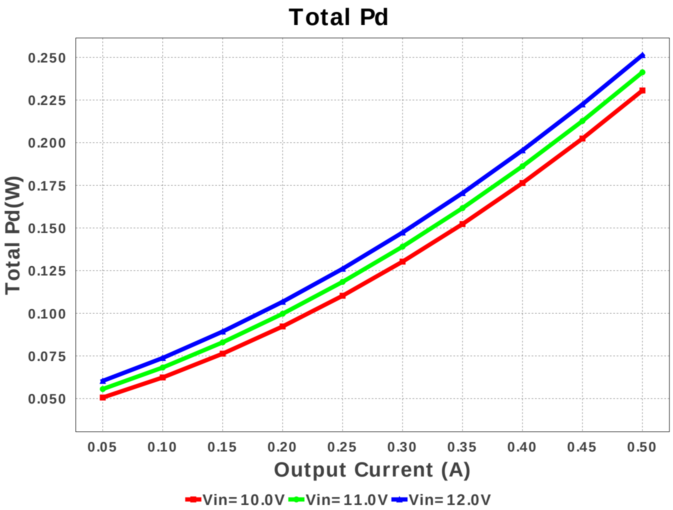

Cout Pd
Cout Pd(W)
Output Current (A)
Vin=10.0V Vin=11.0V Vin=12.0V

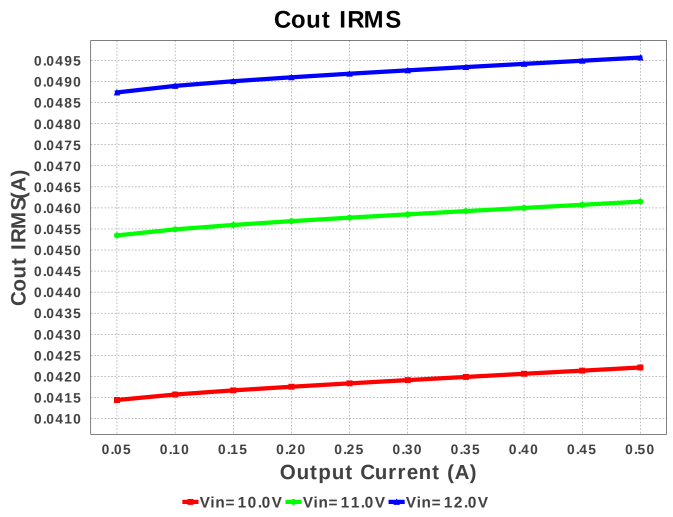

M Vds Act
M Vds Act(V)
Output Current (A)
Vin=10.0V Vin=11.0V Vin=12.0V

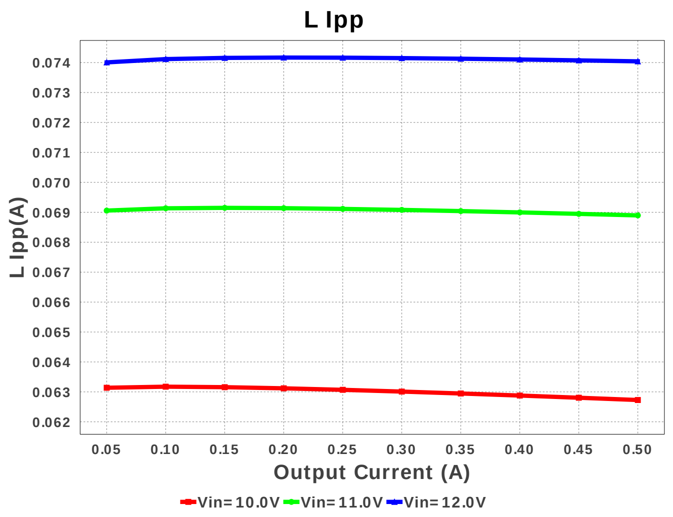

M Irms
M Irms(A)
Output Current (A)
Vin=10.0V Vin=11.0V Vin=12.0V

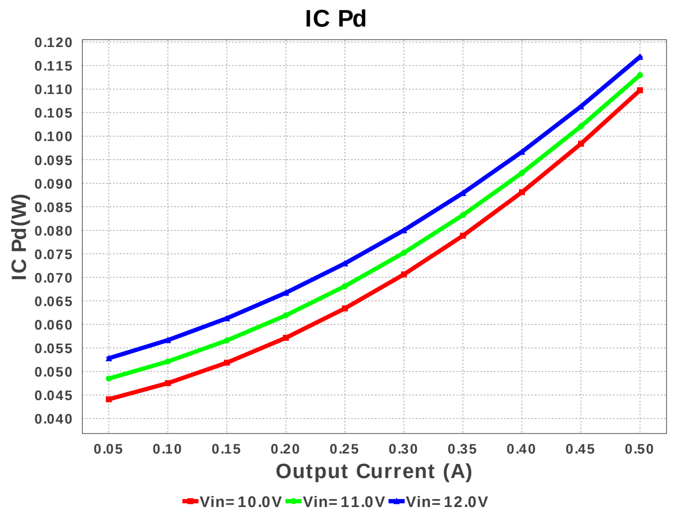

Pout
Pout(W)
Output Current (A)
Vin=10.0V Vin=11.0V Vin=12.0V

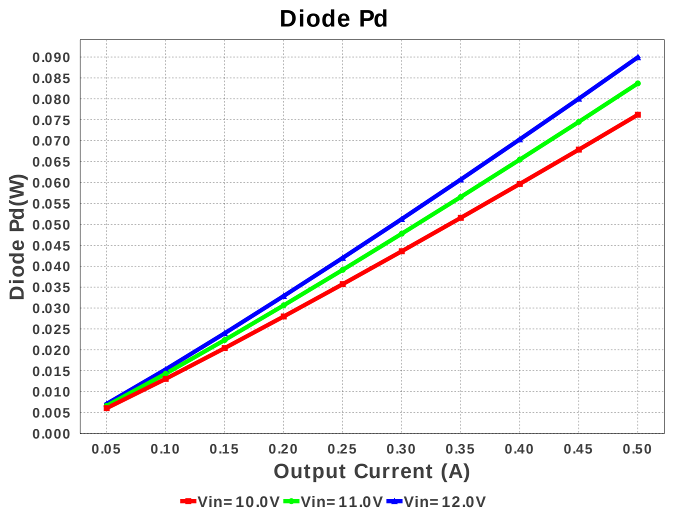

Iin Avg
Iin Avg(A)
Output Current (A)
Vin=10.0V Vin=11.0V Vin=12.0V


Total Pd
Total Pd(W)
Output Current (A)
Vin=10.0V Vin=11.0V Vin=12.0V









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	228.36 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	49.571 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	584.312 mA	Current	Peak switch current in IC
4.	Iin Avg	229.28 mA	Current	Average input current
5.	L Ipp	168.62 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	330.244 mA	Current	Q Iavg
7.	BOM Count	15	General	Total Design BOM count
8.	FootPrint	146.0 mm²	General	Total Foot Print Area of BOM components
9.	Frequency	658.637 kHz	General	Switching frequency
10.	IC Tolerance	50.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	126.189 mV	General	Voltage drop across the MosFET
12.	Pout	2.5 W	General	Total output power
13.	Total BOM	$1.84	General	Total BOM Cost
14.	D1 Tj	48.529 degC	Op_Point	D1 junction temperature
15.	Vout Actual	5.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
17.	Duty Cycle	43.625 %	Op_point	Duty cycle
18.	Efficiency	90.865 %	Op_point	Steady state efficiency
19.	IC Tj	33.506 degC	Op_point	IC junction temperature
20.	ICThetaJA	30.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	500.0 mA	Op_point	Iout operating point
22.	VIN_OP	12.0 V	Op_point	Vin operating point
23.	Vout p-p	72.697 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	528.107 µW	Power	Input capacitor power dissipation
25.	Cout Pd	12.286 µW	Power	Output capacitor power dissipation
26.	Diode Pd	89.946 mW	Power	Diode power dissipation
27.	IC Pd	116.859 mW	Power	IC power dissipation
28.	L Pd	44.0 mW	Power	Inductor power dissipation
29.	Total Pd	251.337 mW	Power	Total Power Dissipation
30.	Vout Tolerance	3.03 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	VinMax	12.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LM34917A	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	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. **LM34917A** Product Folder : http://www.ti.com/product/LM34917A : contains the data sheet and other resources.