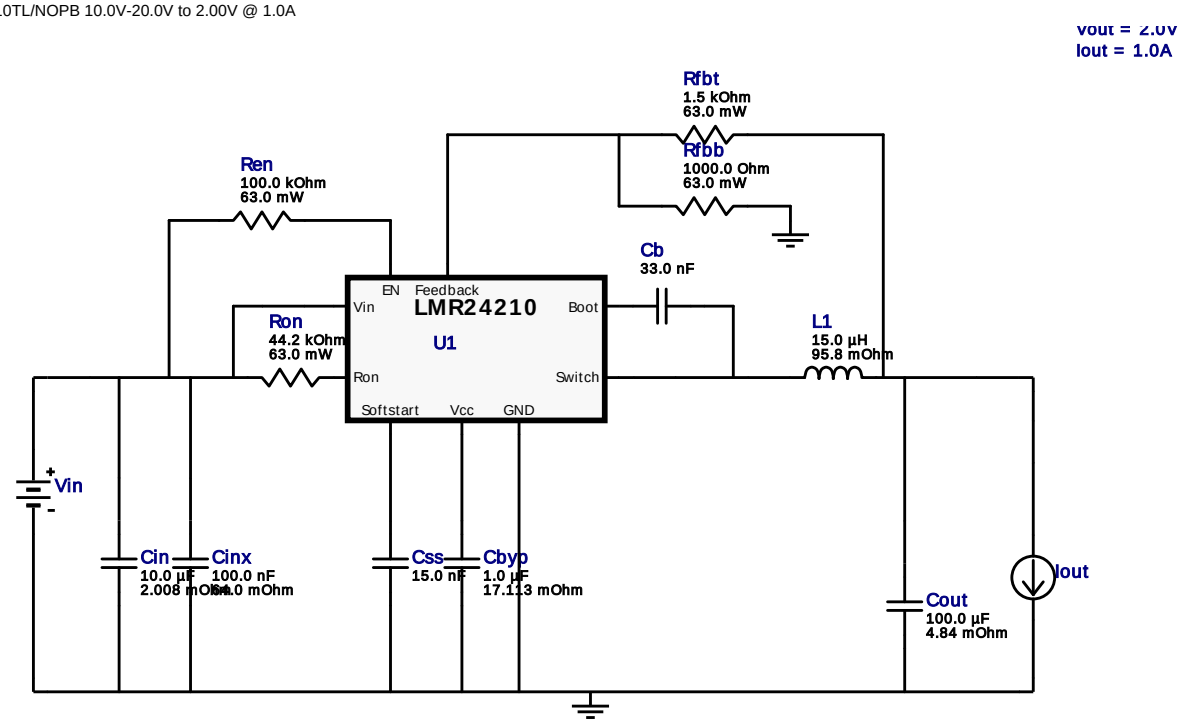
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 20.0V
Vout = 2.0V
Iout = 1.0A

Device = LMR24210TL/NOPB
Topology = Buck
Created = 7/19/16 7:19:23 AM
BOM Cost = $2.33
BOM Count = 12
Total Pd = 0.55W

Design : 4728750/9 LMR24210TL/NOPB
LMR24210TL/NOPB 10.0V-20.0V to 2.00V @ 1.0A

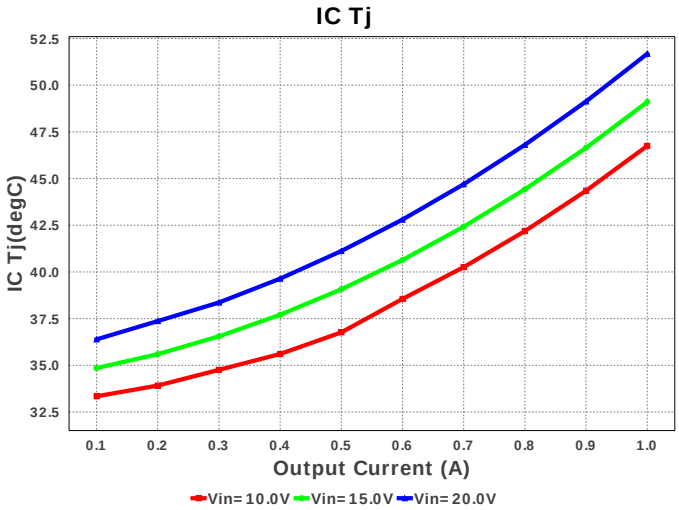


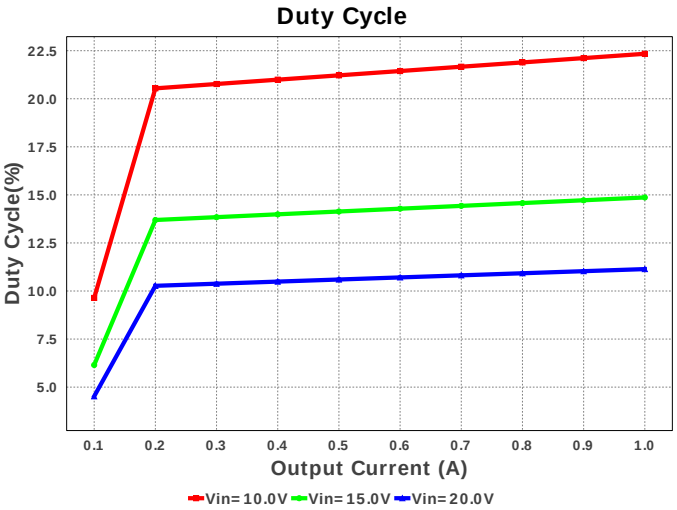
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.View WEBENCH(R) Disclaimer.

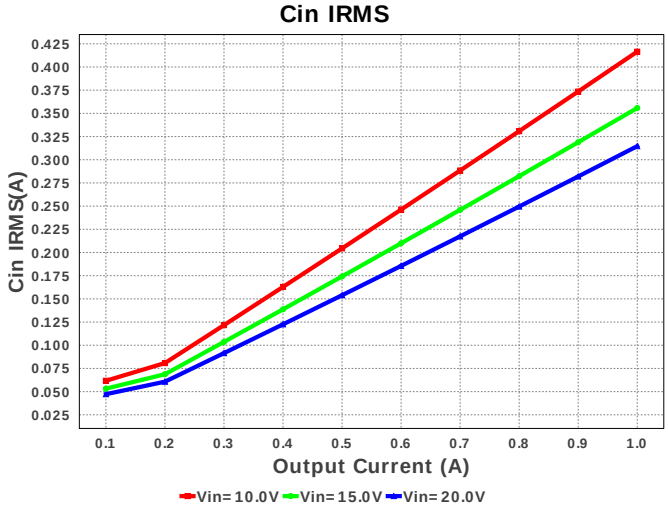
Electrical BOM

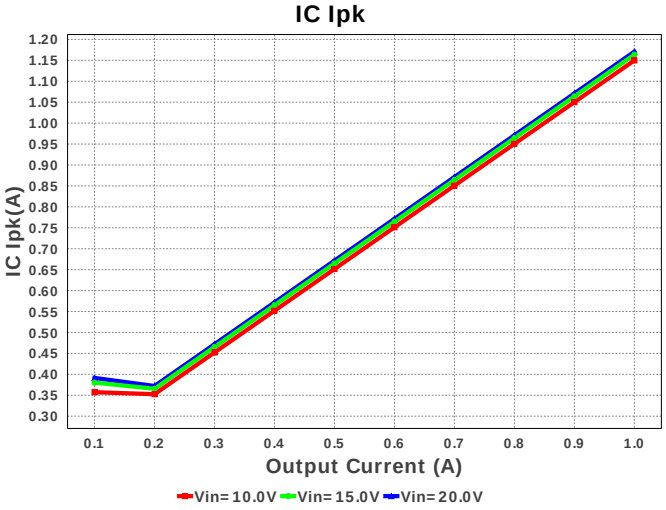
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cb	MuRata	GRM155R71E333KA88D Series= X7R	Cap= 33.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Cbyp	MuRata	GRM188R61E105KA12D Series= X5R	Cap= 1.0 uF ESR= 17.113 mOhm VDC= 25.0 V IRMS= 979.39 mA	1	$0.01	0603 5 mm²
3.	Cin	MuRata	GRM32ER7YA106KA12L Series= X7R	Cap= 10.0 uF ESR= 2.008 mOhm VDC= 35.0 V IRMS= 4.6772 A	1	$0.22	1210_280 15 mm²
4.	Cinx	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
5.	Cout	MuRata	GRM31CD80G107ME39L Series= X6T	Cap= 100.0 uF ESR= 4.84 mOhm VDC= 4.0 V IRMS= 4.3381 A	1	$0.14	1206_190 11 mm²
6.	Css	MuRata	GRM155R71E153KA61D Series= X7R	Cap= 15.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
7.	L1	Bourns	SRN6045-150M	L= 15.0 µH DCR= 95.8 mOhm	1	$0.16	SRN6045 64 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Ren	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
9.	Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
10.	Rfbt	Vishay-Dale	CRCW04021K50FKED Series= CRCW..e3	Res= 1.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	Ron	Vishay-Dale	CRCW040244K2FKED Series= CRCW..e3	Res= 44.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	U1	Texas Instruments	LMR24210TL/NOPB	Switcher	1	$1.73	TLC28VFA 16 mm^2

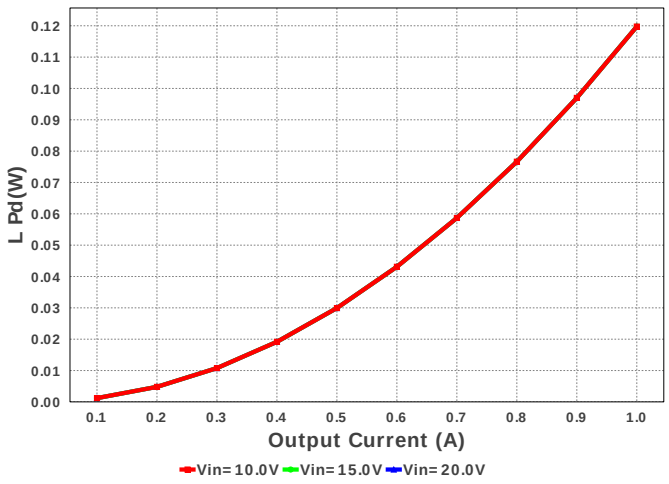




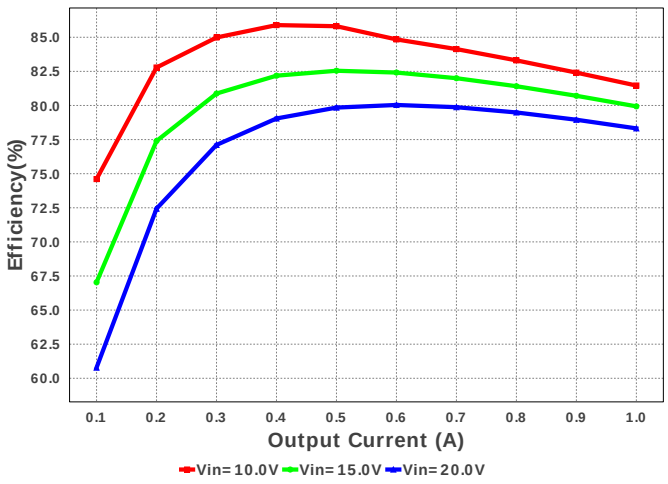




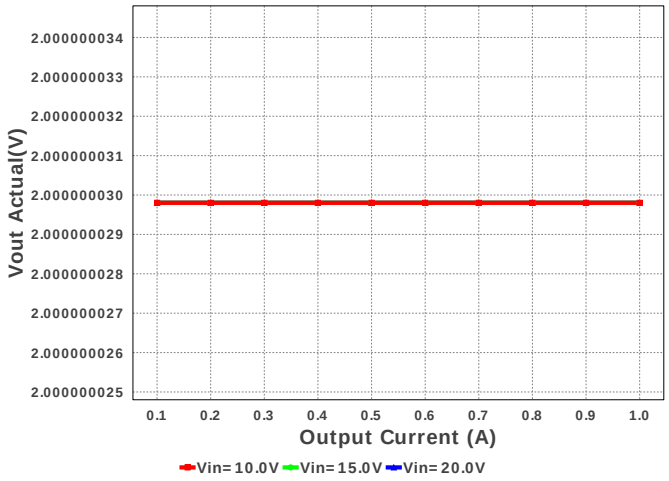
L Pd



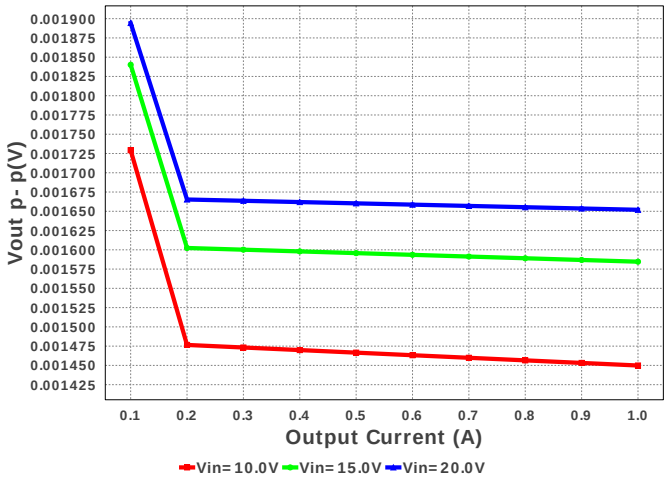
Efficiency



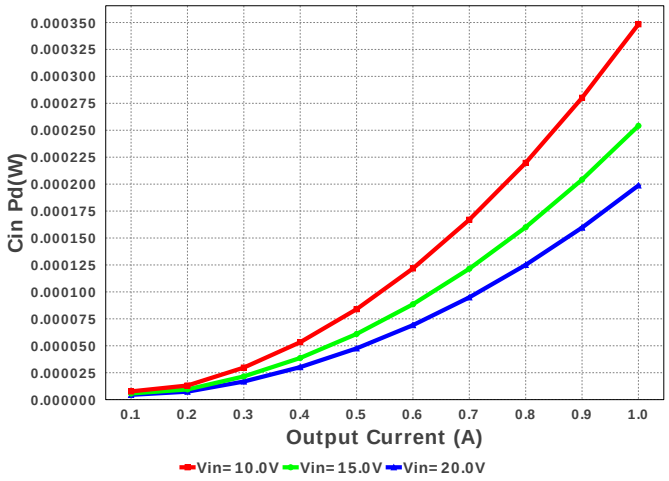
Vout Actual



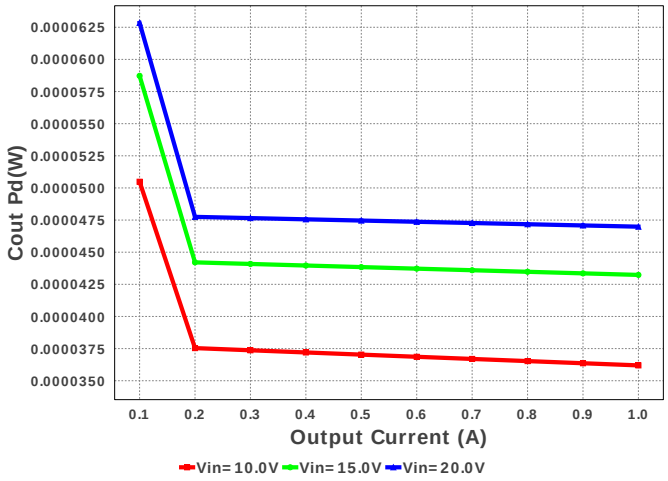
Vout p- p

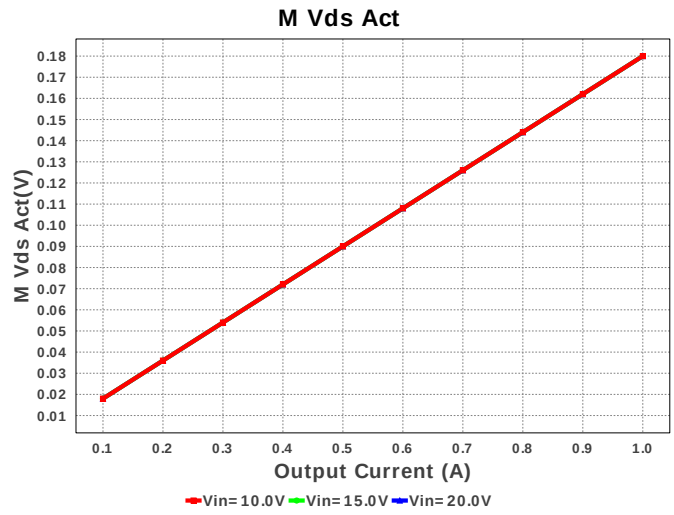


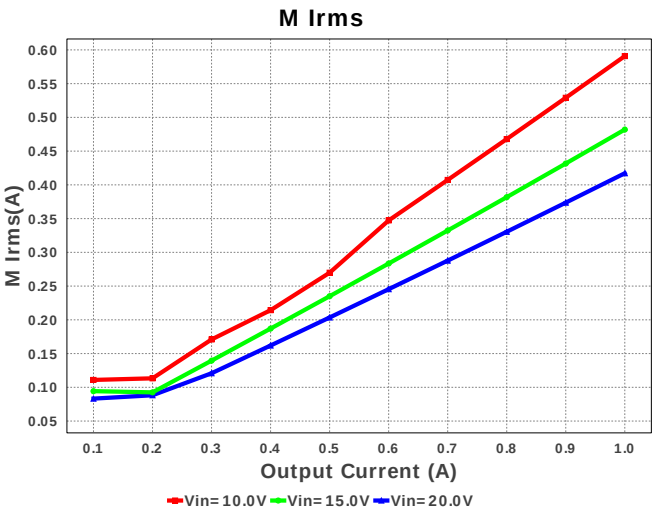
Cin Pd

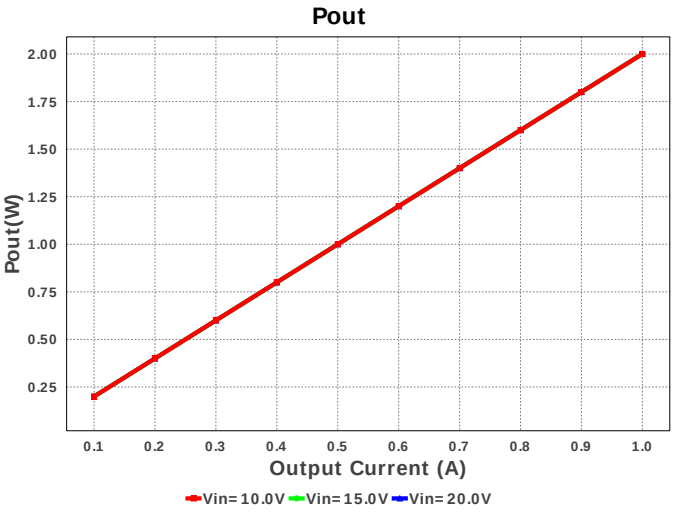


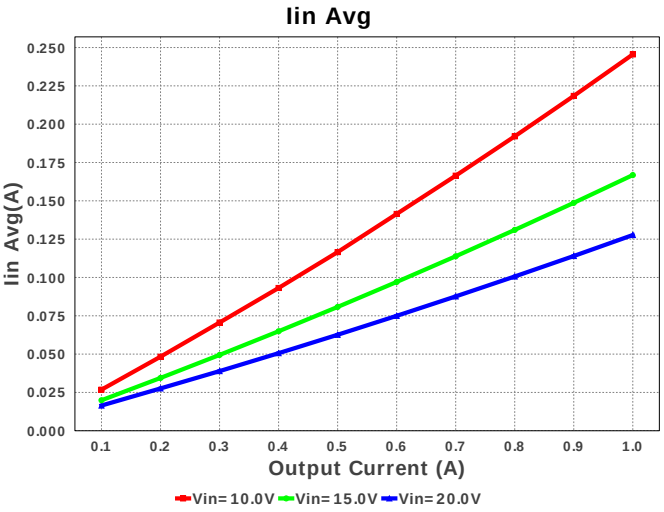
Cout Pd

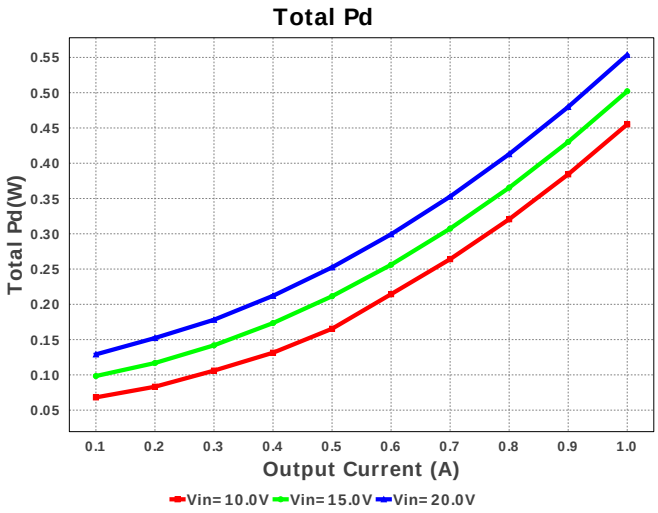


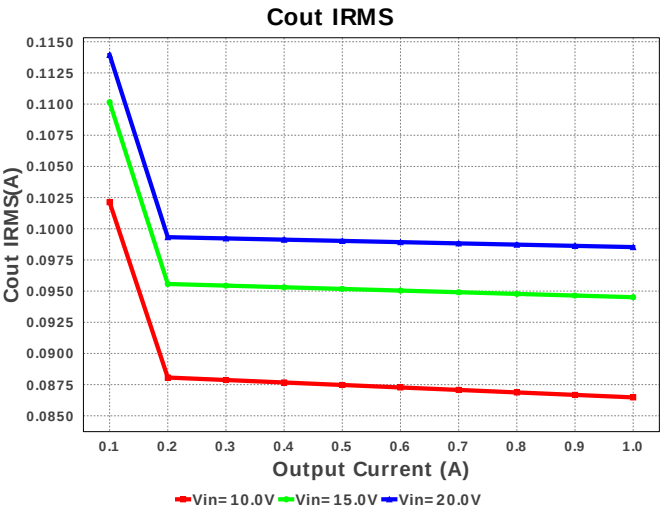


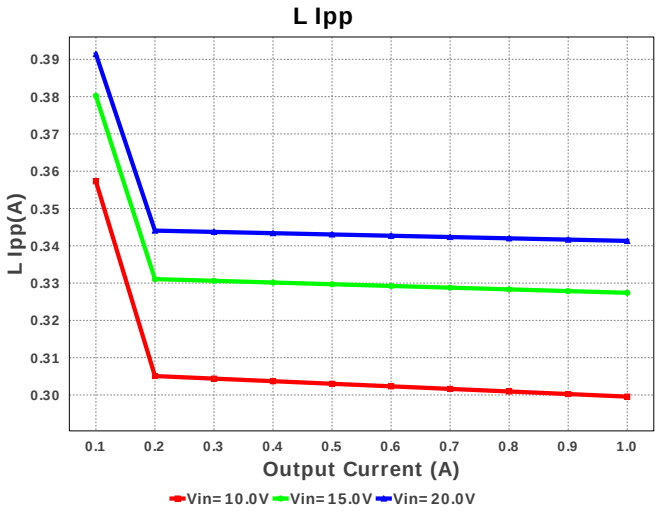


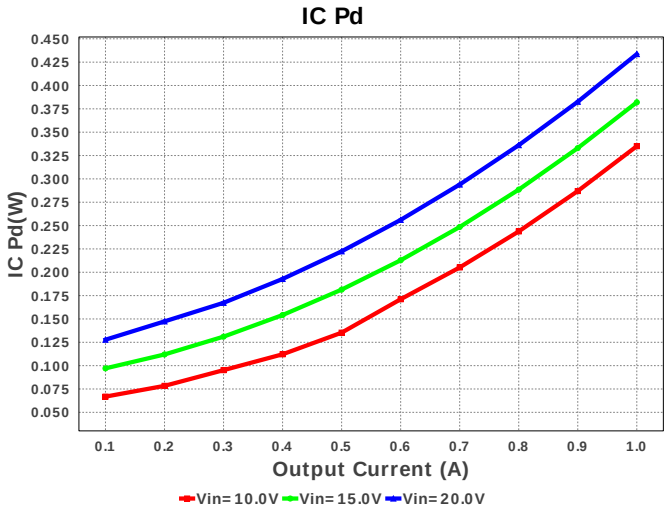












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	314.621 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	98.528 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.171 A	Current	Peak switch current in IC
4.	Iin Avg	127.68 mA	Current	Average input current
5.	L Ipp	341.31 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	417.199 mA	Current	Q Iavg
7.	BOM Count	12	General	Total Design BOM count
8.	FootPrint	135.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	348.068 kHz	General	Switching frequency
10.	IC Tolerance	16.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	180.0 mV	General	Voltage drop across the MosFET
12.	Pout	2.0 W	General	Total output power
13.	Total BOM	$2.33	General	Total BOM Cost
14.	Vout Actual	2.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Vout OP	2.0 V	Op_Point	Operational Output Voltage
16.	Duty Cycle	11.139 %	Op_point	Duty cycle
17.	Efficiency	78.32 %	Op_point	Steady state efficiency
18.	IC Tj	51.681 degC	Op_point	IC junction temperature
19.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	1.0 A	Op_point	Iout operating point
21.	VIN_OP	20.0 V	Op_point	Vin operating point
22.	Vout p-p	1.652 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	198.764 µW	Power	Input capacitor power dissipation
24.	Cout Pd	46.986 µW	Power	Output capacitor power dissipation
25.	IC Pd	433.619 mW	Power	IC power dissipation
26.	L Pd	119.75 mW	Power	Inductor power dissipation
27.	Total Pd	553.62 mW	Power	Total Power Dissipation
28.	Vout Tolerance	3.236 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	20.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	2.0	Output Voltage
5.	base_pn	LMR24210	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR24210** Product Folder : http://www.ti.com/product/LMR24210 : contains the data sheet and other resources.