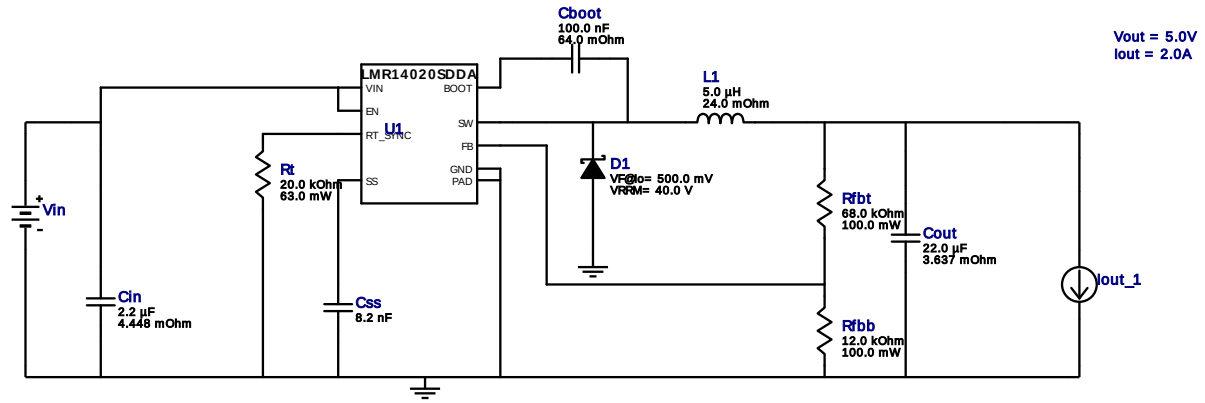
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 22.0V
Vout = 5.0V
Iout = 2.0A

Device = LMR14020SDDAR
Topology = Buck
Created = 8/9/16 12:09:11 AM
BOM Cost = $2.00
BOM Count = 10
Total Pd = 1.47W

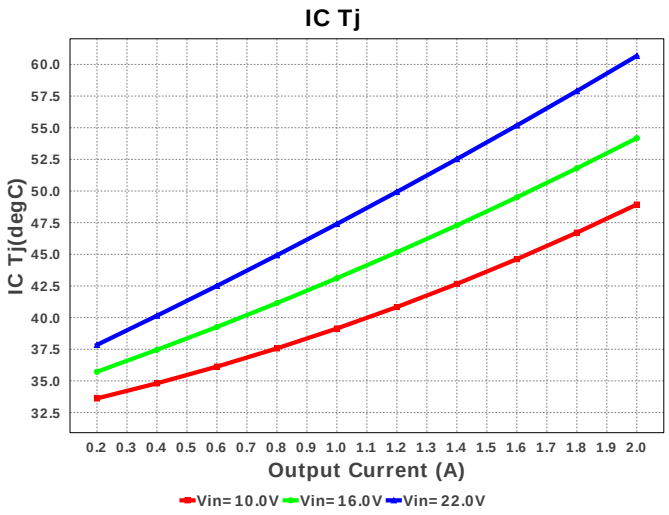
Design : 4763437/1 LMR14020SDDAR
LMR14020SDDAR 10.0V-22.0V to 5.00V @ 2.0001874999999996A

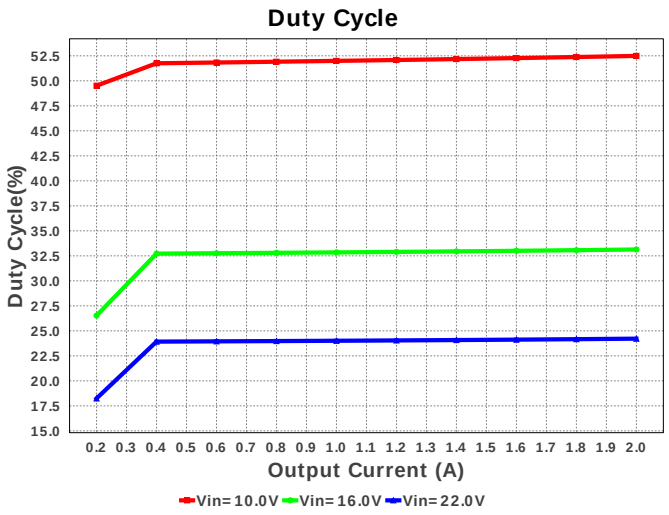


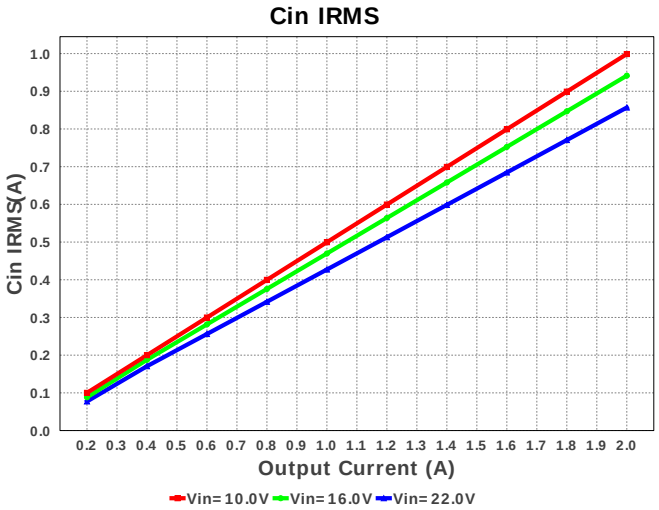
Electrical BOM

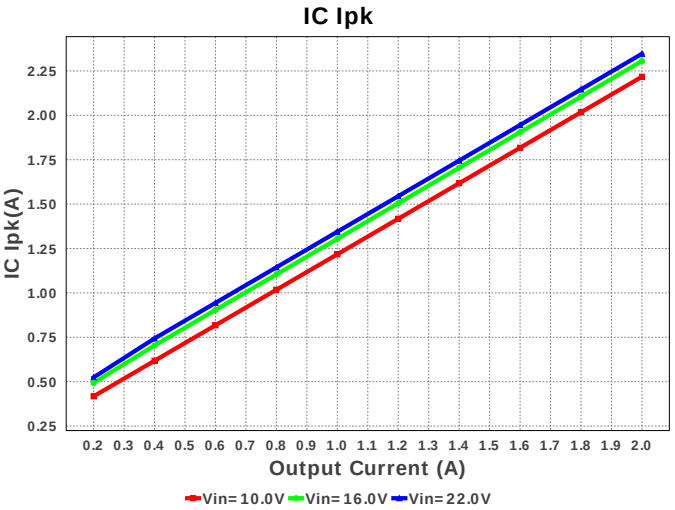
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
3.	Cout	MuRata	GRM31CR61A226KE19L Series= X5R	Cap= 22.0 uF ESR= 3.637 mOhm VDC= 10.0 V IRMS= 3.56456 A	1	$0.07	1206_190 11 mm²
4.	Css	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
5.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.11	SMA 37 mm²
6.	L1	Bourns	SRR6038-5R0Y	L= 5.0 µH DCR= 24.0 mOhm	1	$0.26	SRR6038 77 mm²
7.	Rfbb	Yageo America	RC0603FR-0712KL Series= ?	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
8.	Rfbt	Yageo America	RC0603FR-0768KL Series= ?	Res= 68.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
9.	Rt	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

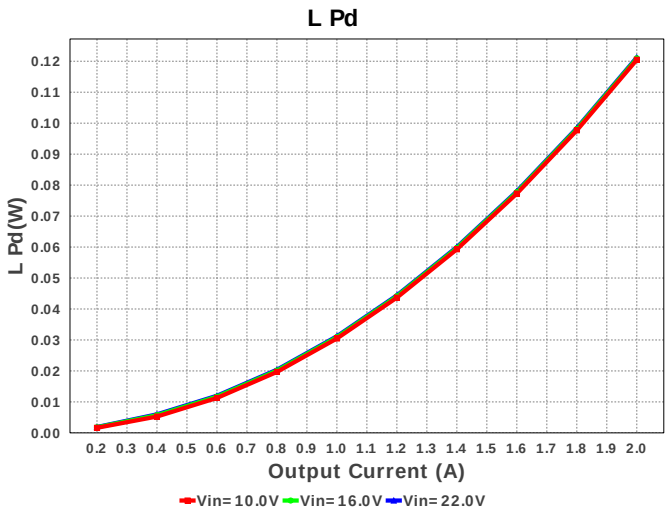
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14020SDDAR	Switcher	1	$1.46	DDA0008E_N 57 mm^2

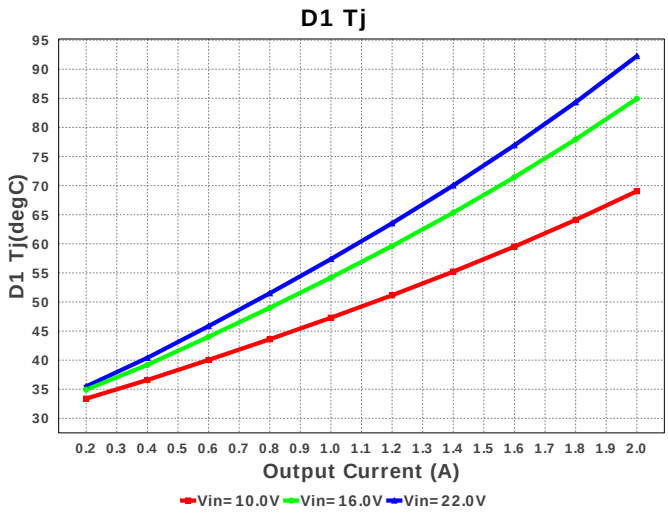


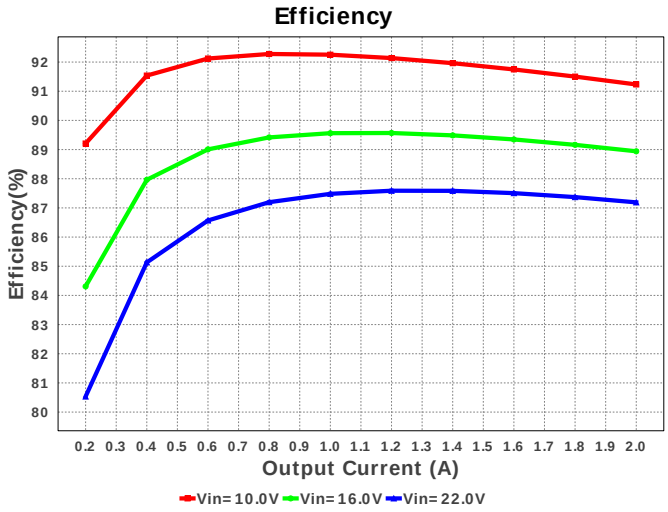


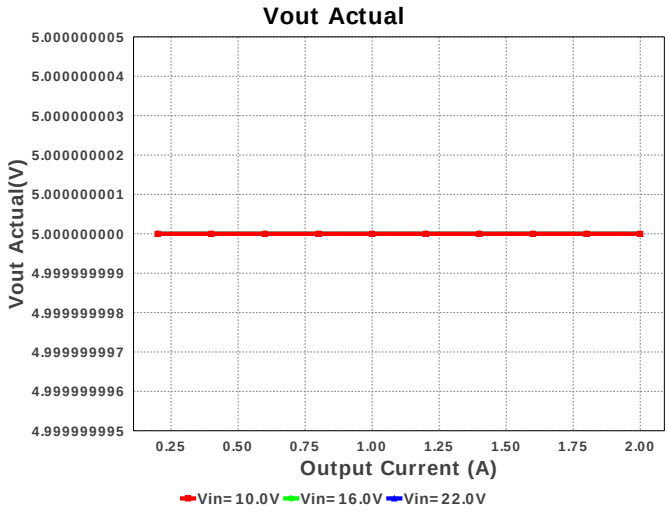


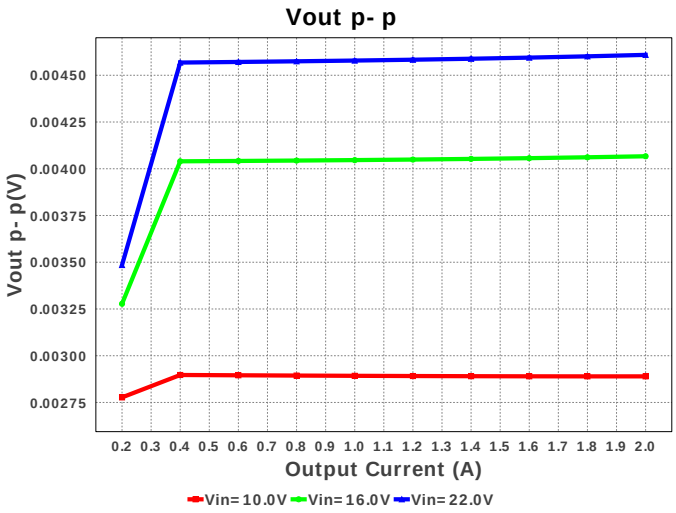


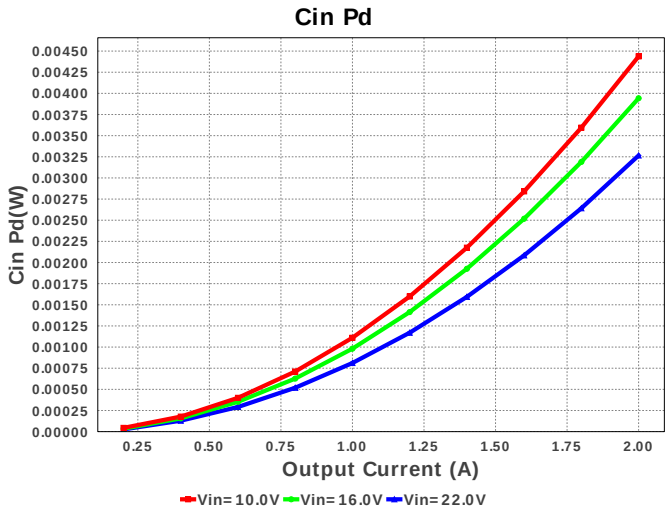


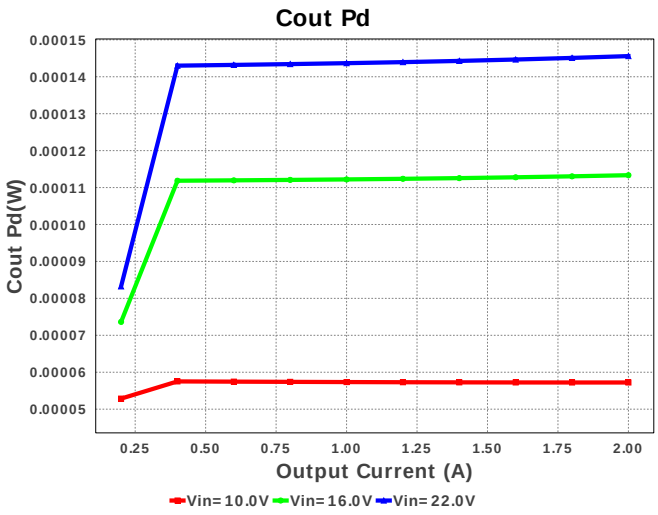


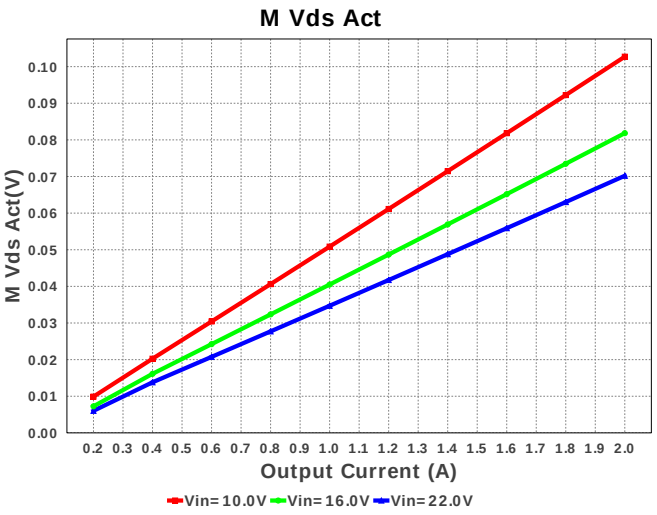


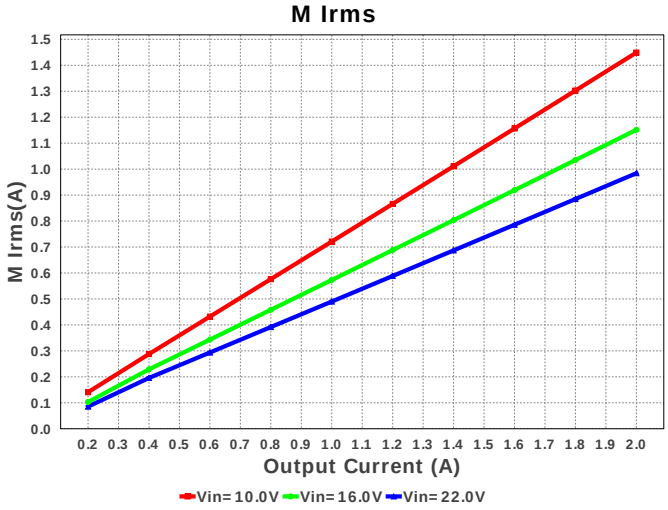


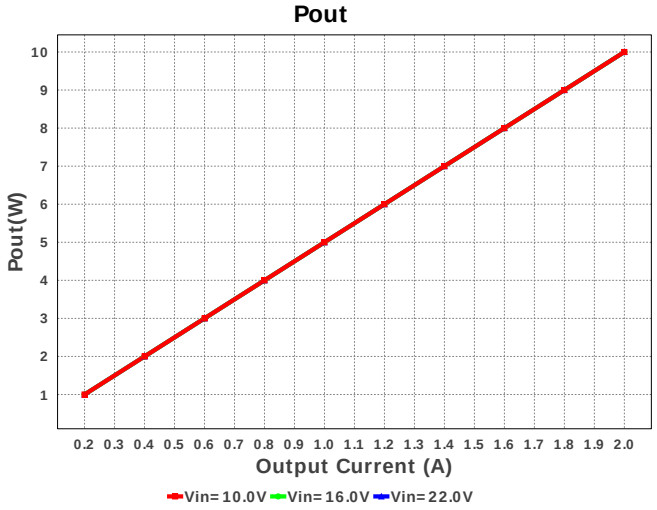


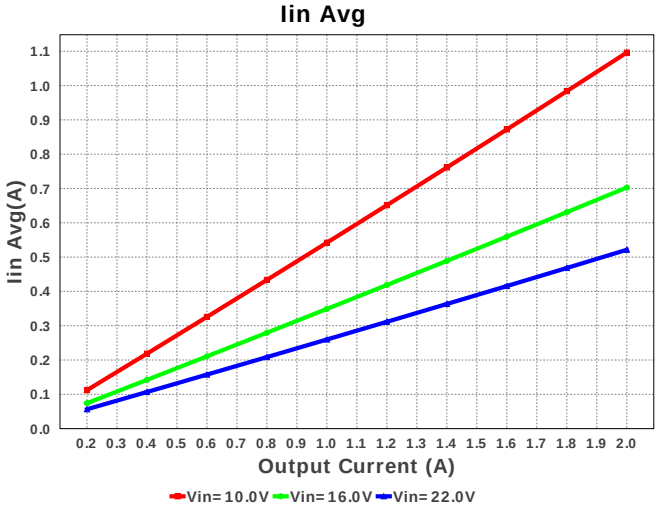


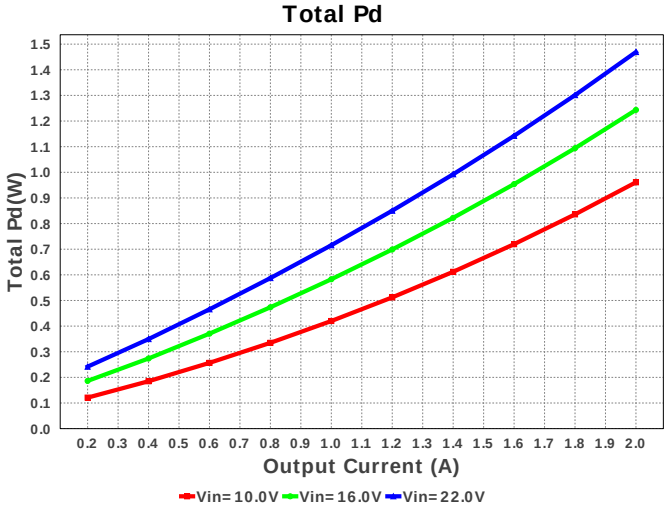


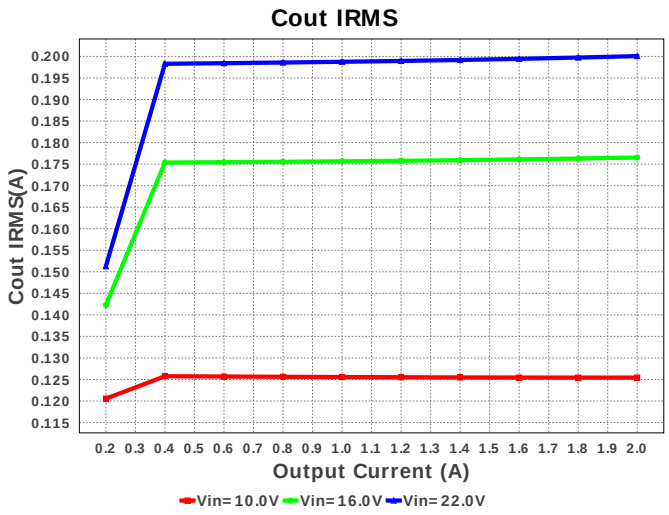


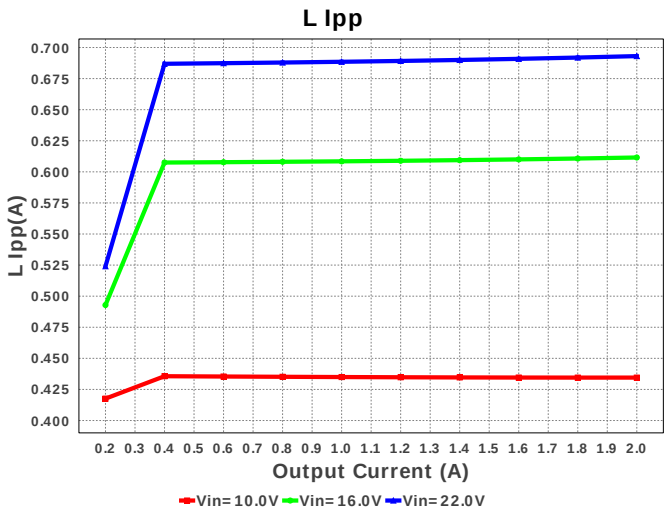


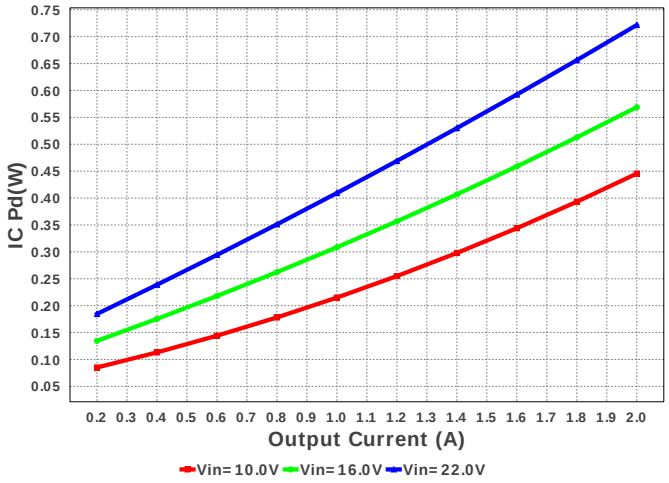


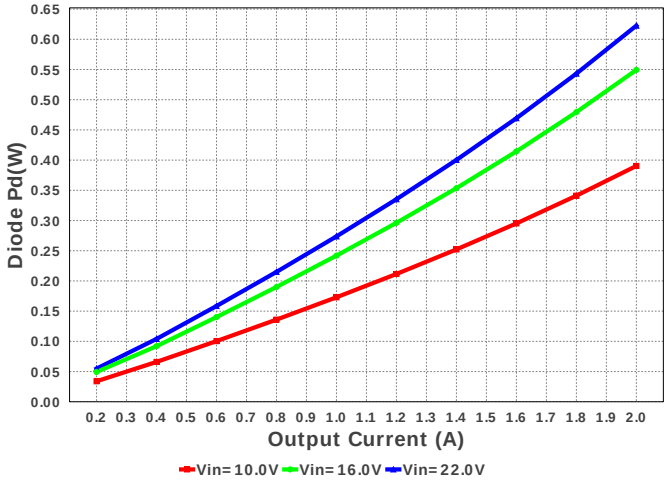


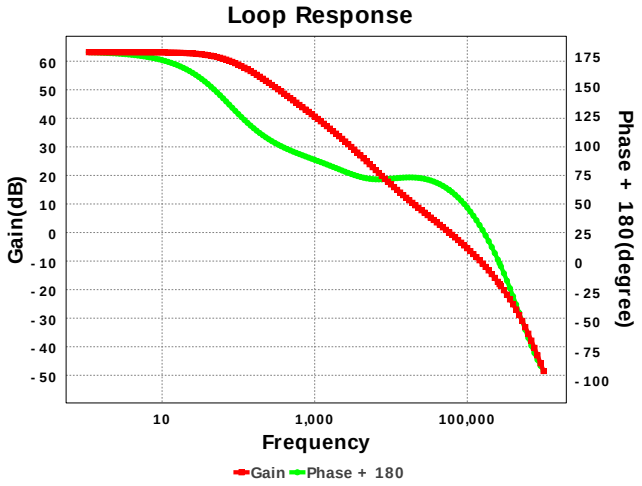












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	856.85 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	200.077 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.347 A	Current	Peak switch current in IC
4.	Iin Avg	521.34 mA	Current	Average input current
5.	L Ipp	693.09 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	984.297 mA	Current	Q Iavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	216.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.183 MHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	70.187 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	10.0 W	General	Total output power
13.	Total BOM	$2.0	General	Total BOM Cost
14.	D1 Tj	92.26 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.	Cross Freq	58.015 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	24.219 %	Op_point	Duty cycle
19.	Efficiency	87.19 %	Op_point	Steady state efficiency
20.	IC Tj	60.312 degC	Op_point	IC junction temperature
21.	ICThetaJA	42.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	2.0 A	Op_point	Iout operating point
23.	Phase Marg	62.213 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	22.0 V	Op_point	Vin operating point
25.	Vout p-p	4.609 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	3.266 mW	Power	Input capacitor power dissipation
27.	Cout Pd	145.592 µW	Power	Output capacitor power dissipation
28.	Diode Pd	622.596 mW	Power	Diode power dissipation
29.	IC Pd	721.711 mW	Power	IC power dissipation
30.	L Pd	121.208 mW	Power	Inductor power dissipation
31.	Total Pd	1.469 W	Power	Total Power Dissipation
32.	Vout Tolerance	4.158 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	22.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LMR14020S	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR14020S** Product Folder : http://www.ti.com/product/LMR14020 : contains the data sheet and other resources.