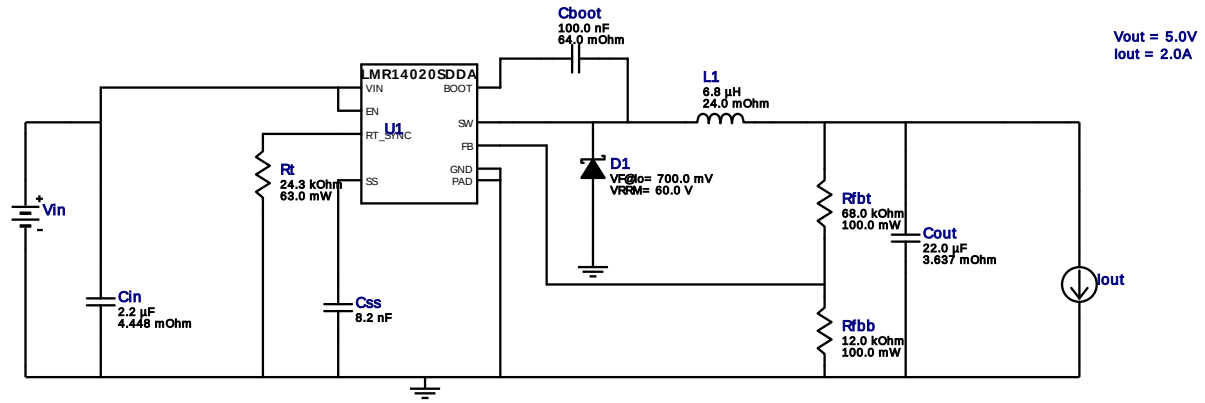
WEBENCH® Design Report

VinMin = 20.0V
VinMax = 30.0V
Vout = 5.0V
Iout = 2.0A

Device = LMR14020SDDAR
Topology = Buck
Created = 7/12/16 11:03:56 PM
BOM Cost = $1.97
BOM Count = 10
Total Pd = 1.63W

Design : 3893481/3 LMR14020SDDAR
LMR14020SDDAR 20.0V-30.0V to 5.00V @ 2.0001874999999996A



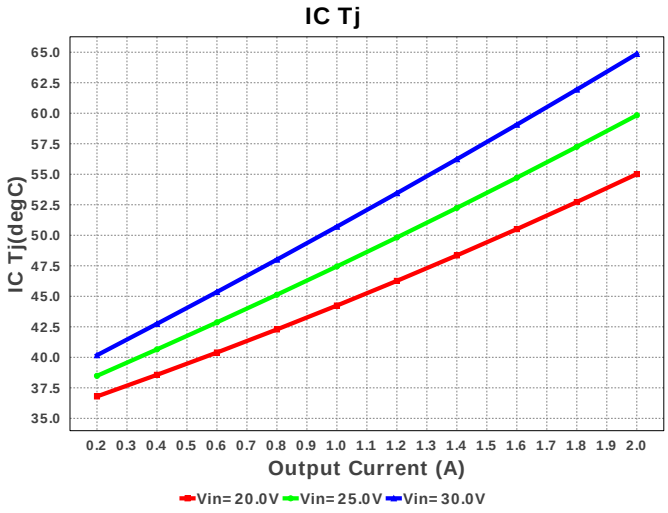
My Comments

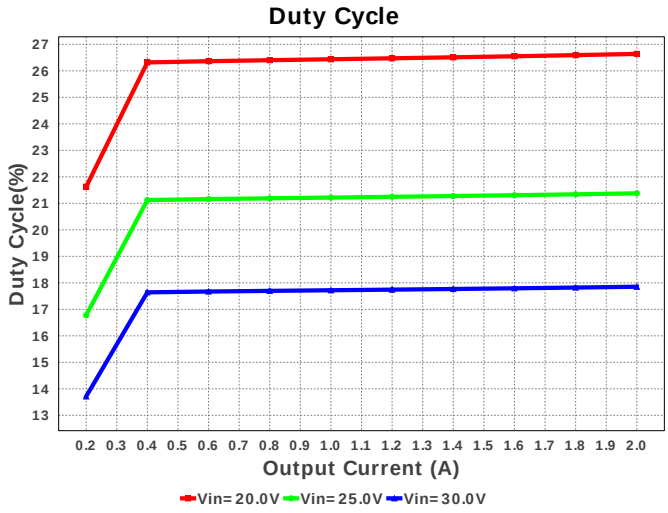
3

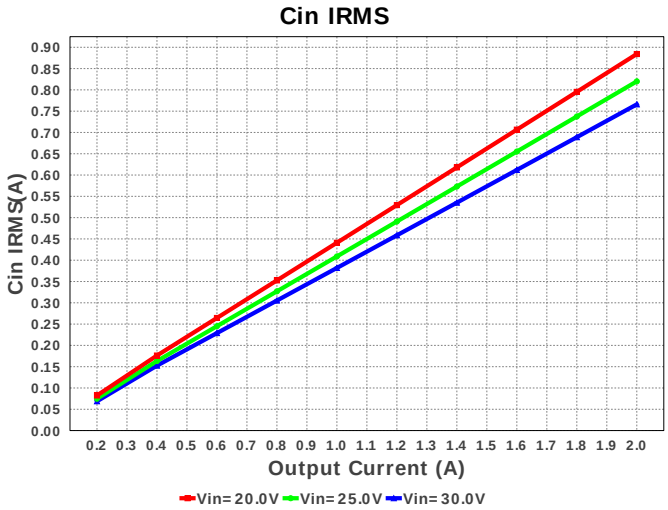
Electrical BOM

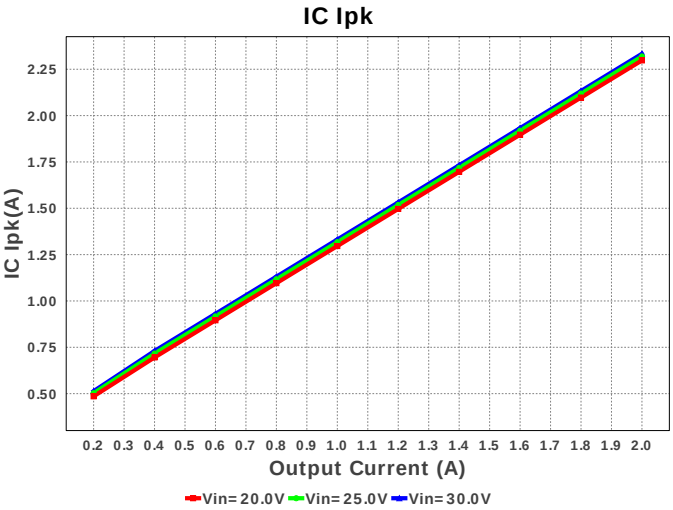
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
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.	B360A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.12	SMA 37 mm²
6.	L1	TDK	VLP8040T-6R8M	L= 6.8 µH DCR= 24.0 mOhm	1	$0.22	VLP8040 113 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	CRCW040224K3FKED Series= CRCW..e3	Res= 24.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

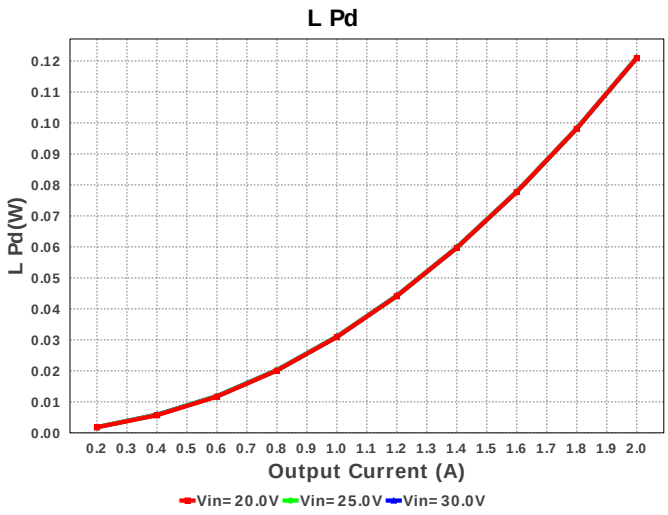
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14020SDDAR	Switcher	1	$1.46	DDA0008E_N 57 mm²

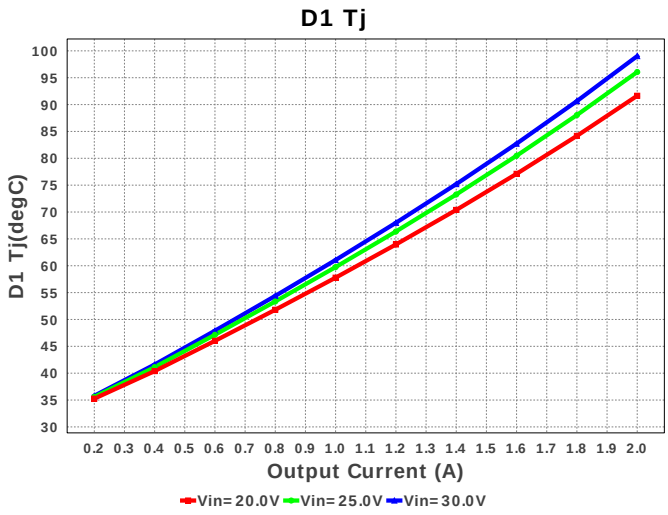


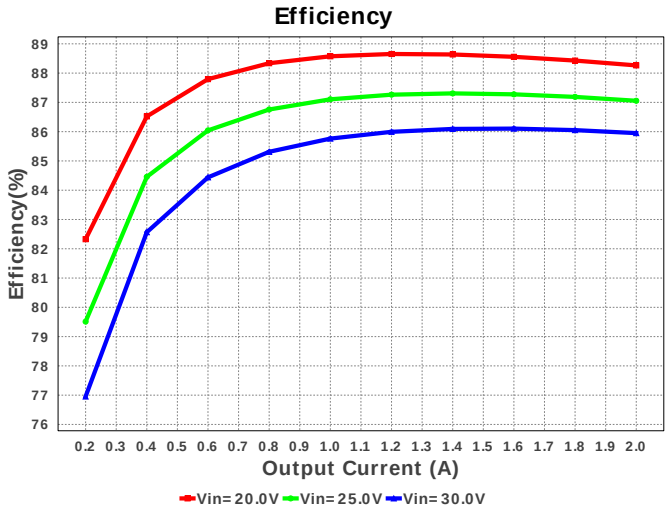


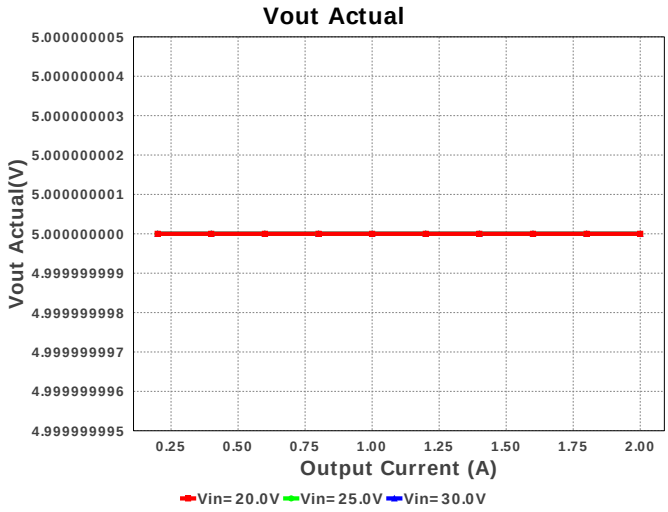


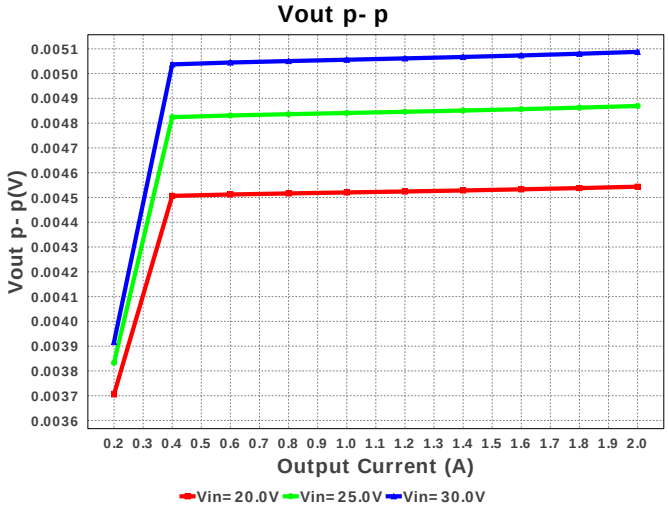


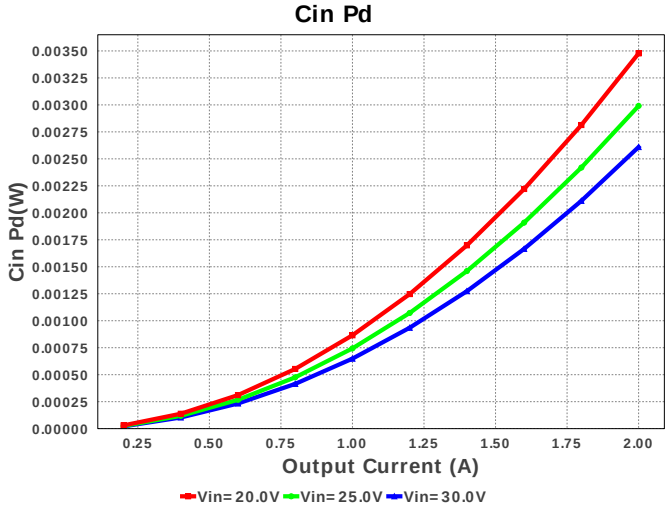


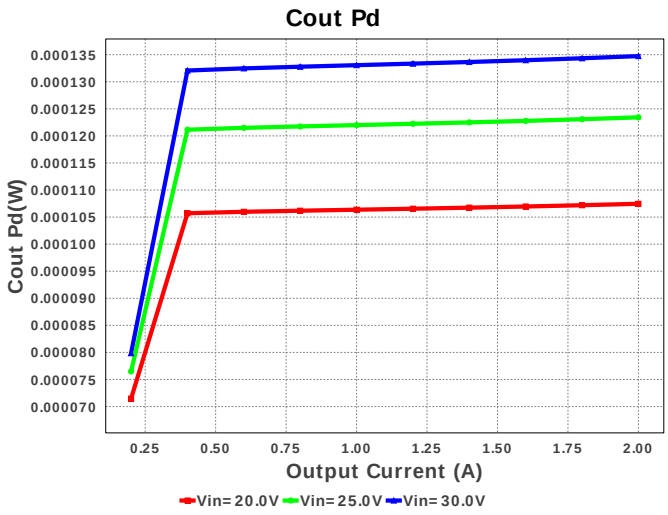


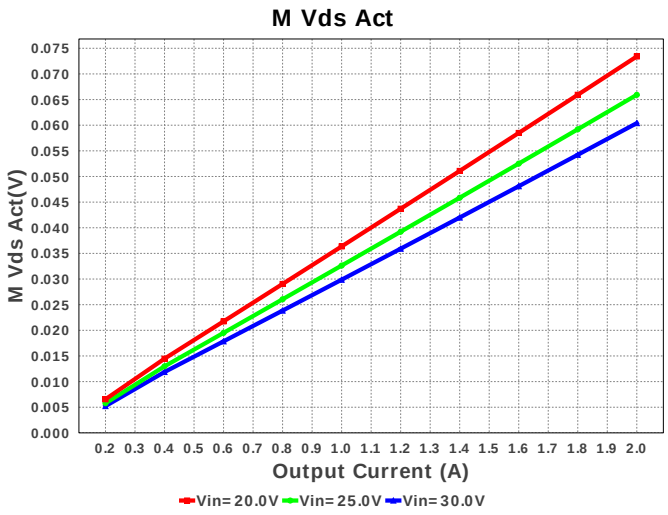


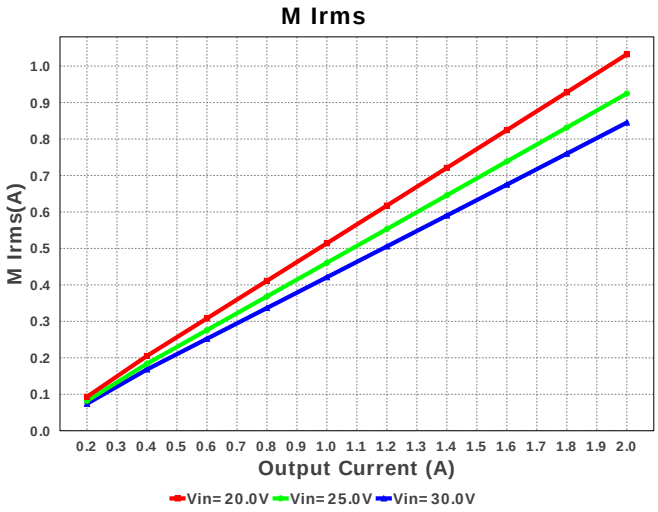


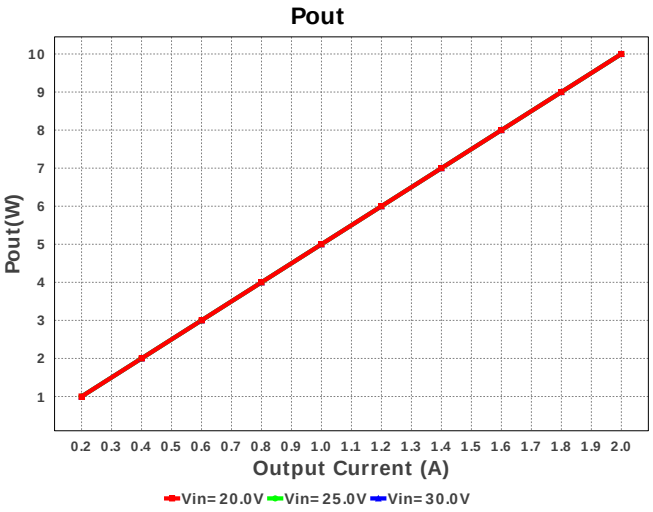


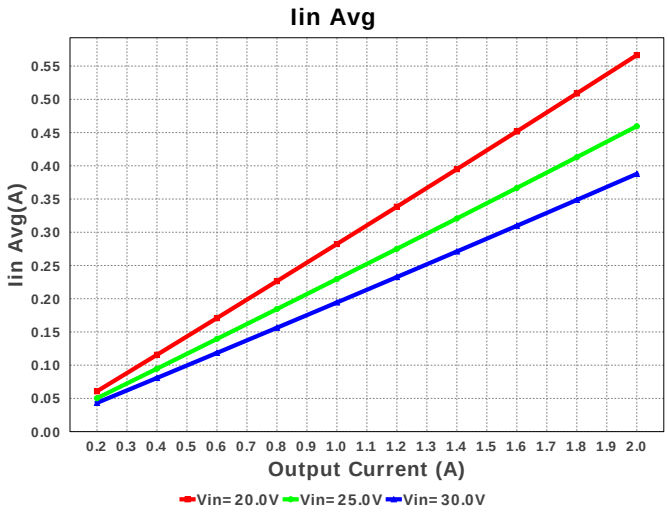


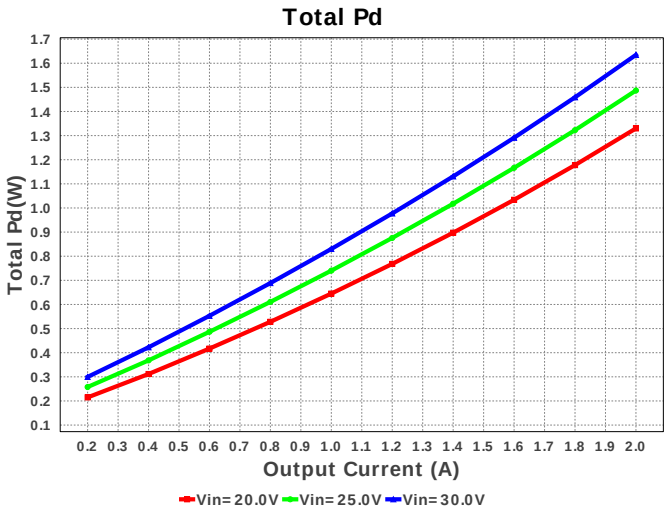


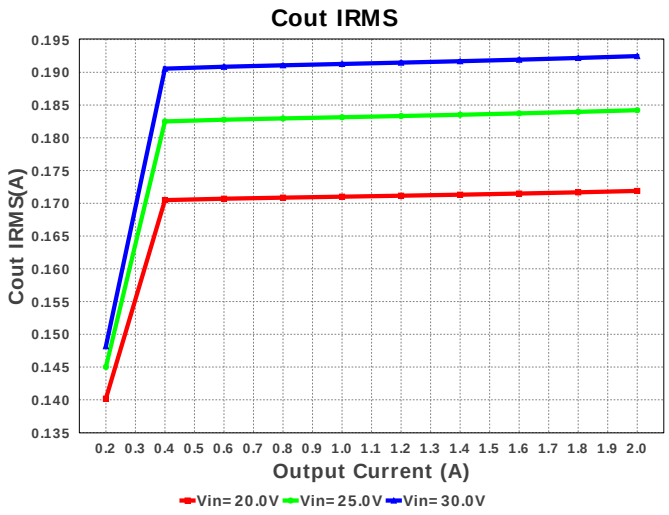


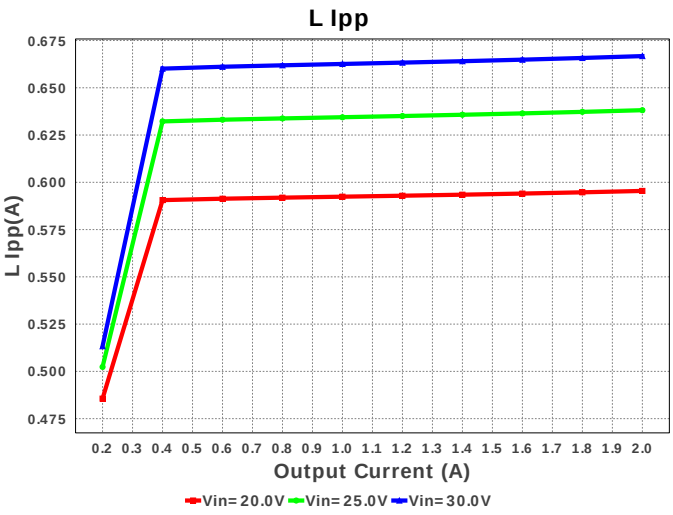


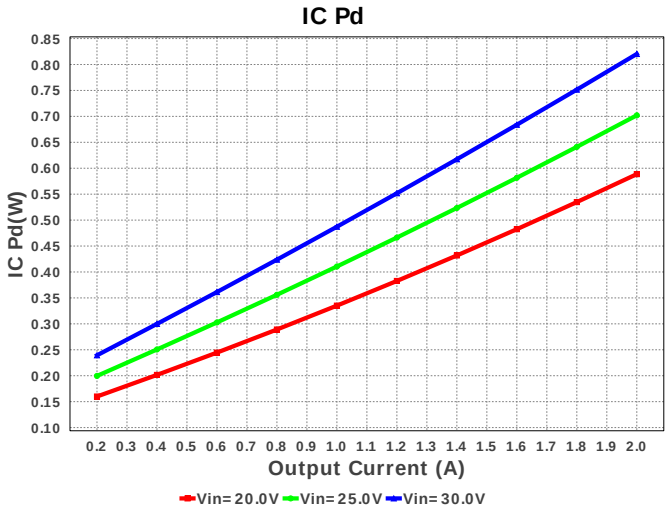


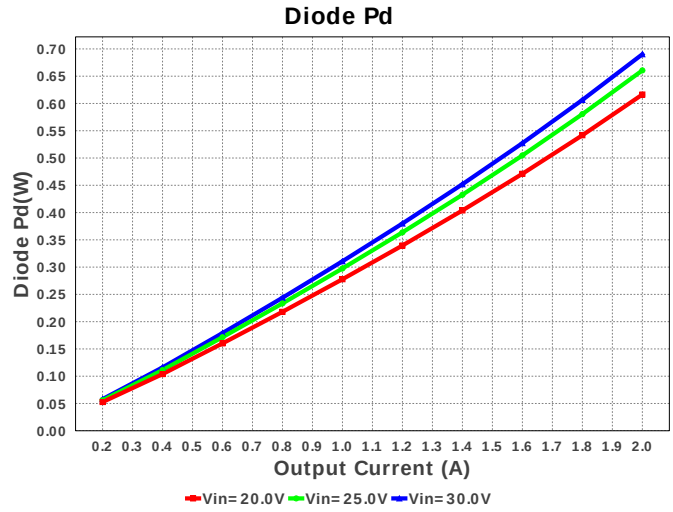


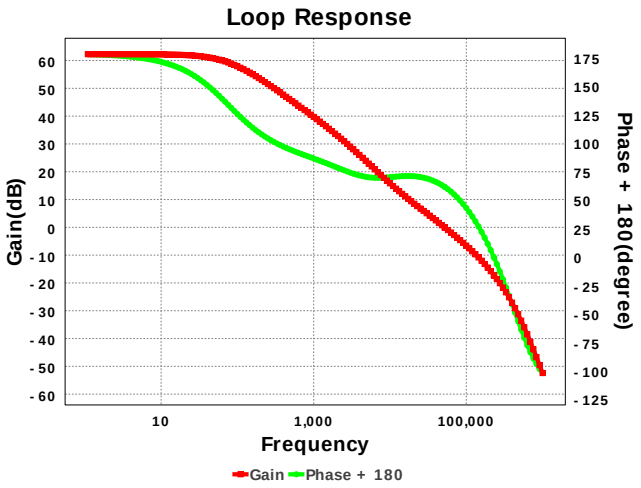












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	765.94 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	192.475 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.333 A	Current	Peak switch current in IC
4.	Iin Avg	387.83 mA	Current	Average input current
5.	L Ipp	666.75 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	845.082 mA	Current	Q Iavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	252.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	982.032 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	60.389 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	10.0 W	General	Total output power
13.	Total BOM	$1.97	General	Total BOM Cost
14.	D1 Tj	99.023 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	51.934 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	17.853 %	Op_point	Duty cycle
19.	Efficiency	85.95 %	Op_point	Steady state efficiency
20.	IC Tj	64.451 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	62.634 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	30.0 V	Op_point	Vin operating point
25.	Vout p-p	5.088 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	2.609 mW	Power	Input capacitor power dissipation
27.	Cout Pd	134.739 µW	Power	Output capacitor power dissipation
28.	Diode Pd	690.232 mW	Power	Diode power dissipation
29.	IC Pd	820.271 mW	Power	IC power dissipation
30.	L Pd	121.119 mW	Power	Inductor power dissipation
31.	Total Pd	1.635 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	30.0	Maximum input voltage
3.	VinMin	20.0	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.