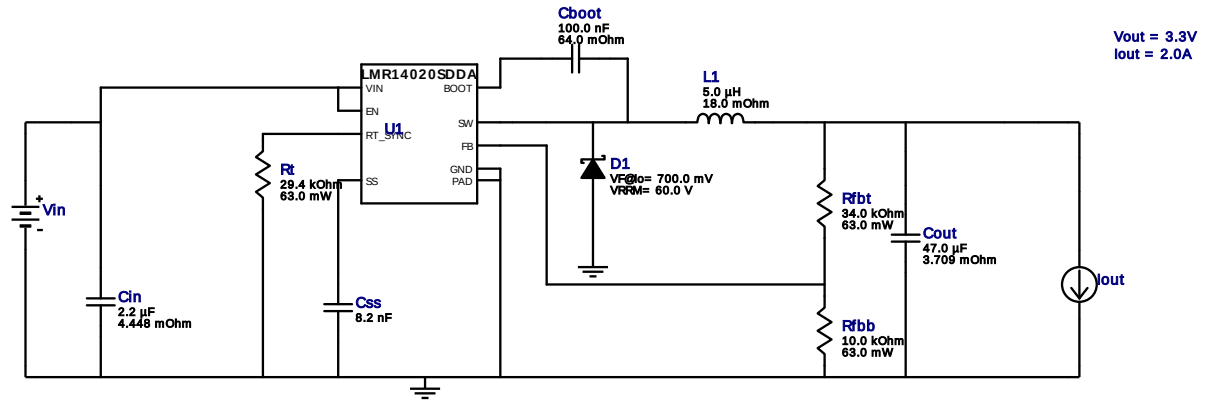
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 30.0V
Vout = 3.3V
Iout = 2.0A

Device = LMR14020SDDAR
Topology = Buck
Created = 8/1/16 3:16:53 AM
BOM Cost = $2.33
BOM Count = 10
Total Pd = 1.54W

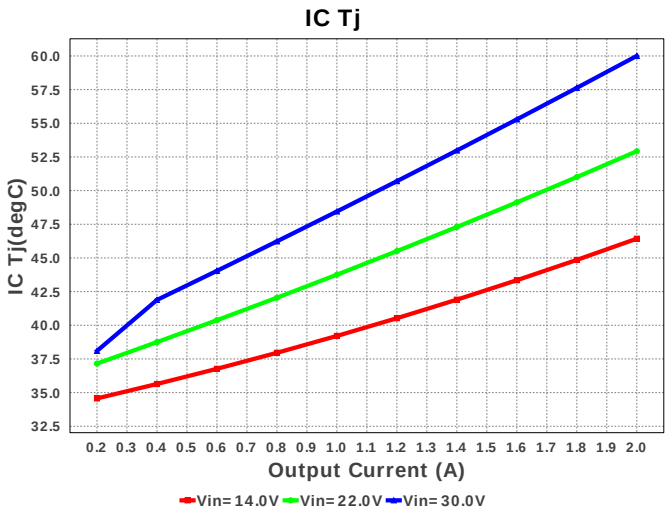
Design : 4756959/2 LMR14020SDDAR
LMR14020SDDAR 14.0V-30.0V to 3.30V @ 2.0002249999999995A

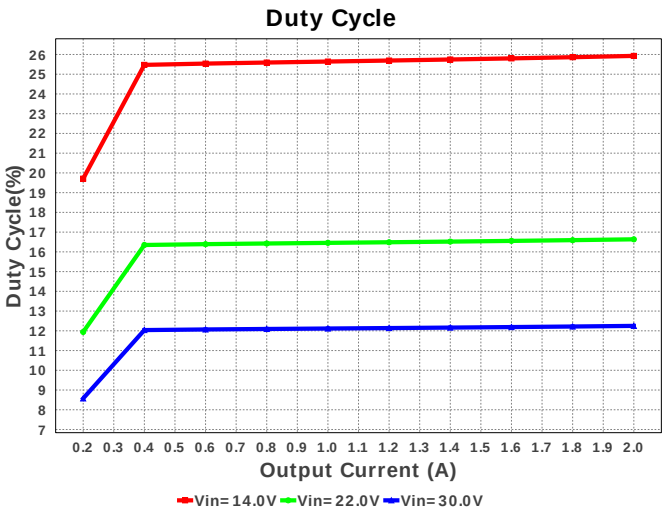


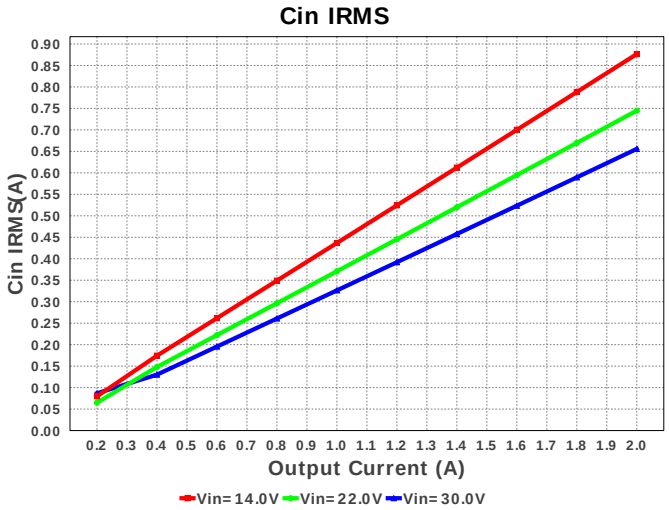
Electrical BOM

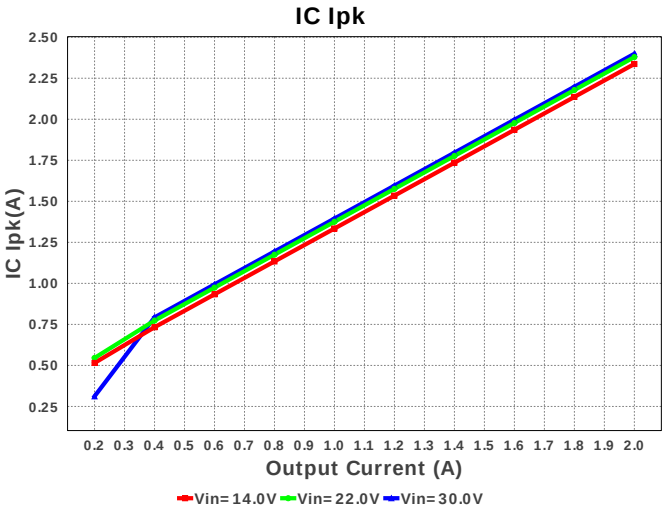
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
3.	Cout	MuRata	GRM31CR61A476KE15L Series= X5R	Cap= 47.0 uF ESR= 3.709 mOhm VDC= 10.0 V IRMS= 4.2862 A	1	$0.15	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	Coilcraft	MSS7341T-502NLB	L= 5.0 µH DCR= 18.0 mOhm	1	$0.50	MSS7341T 83 mm²
7.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	Rfbt	Vishay-Dale	CRCW040234K0FKED Series= CRCW..e3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
9.	Rt	Vishay-Dale	CRCW040229K4FKED Series= CRCW..e3	Res= 29.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

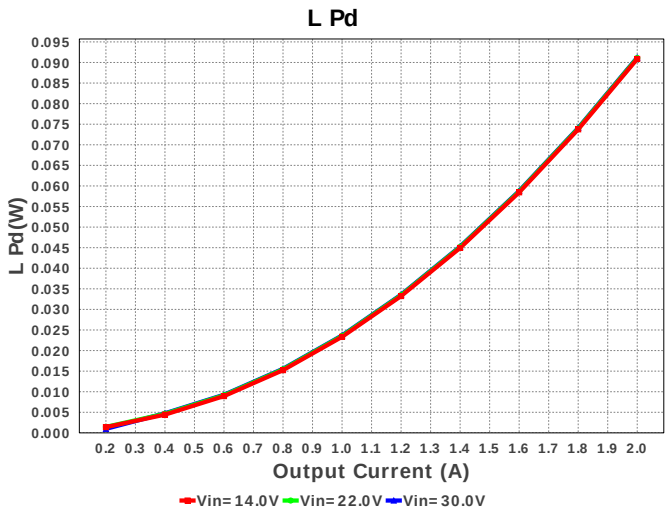
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14020SDDAR	Switcher	1	$1.46	DDA0008E_N 57 mm²

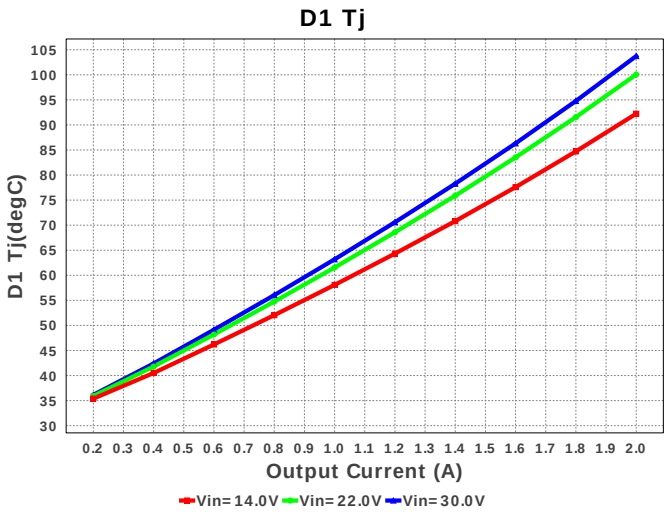


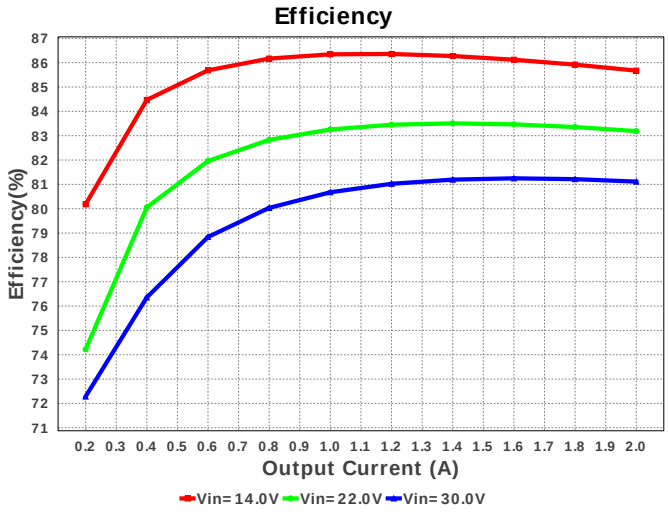


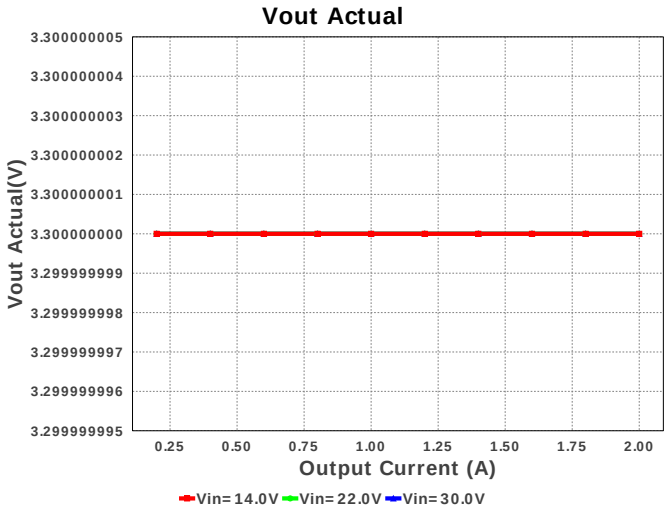


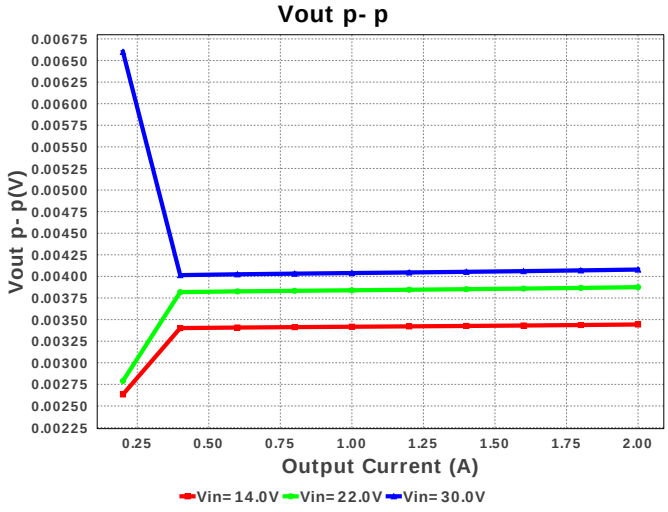


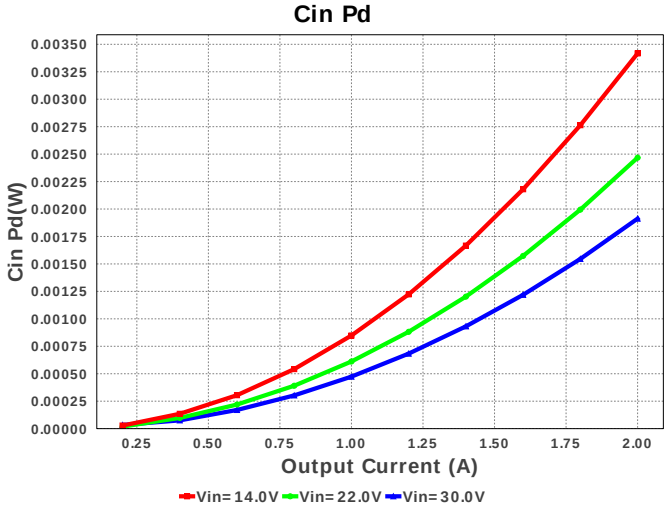


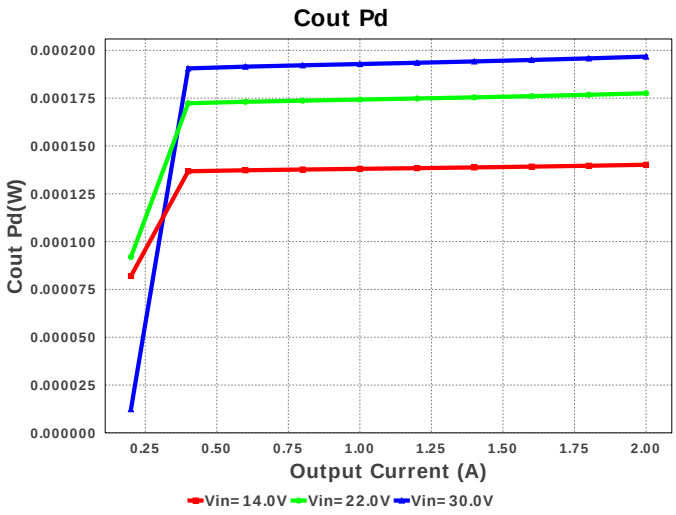


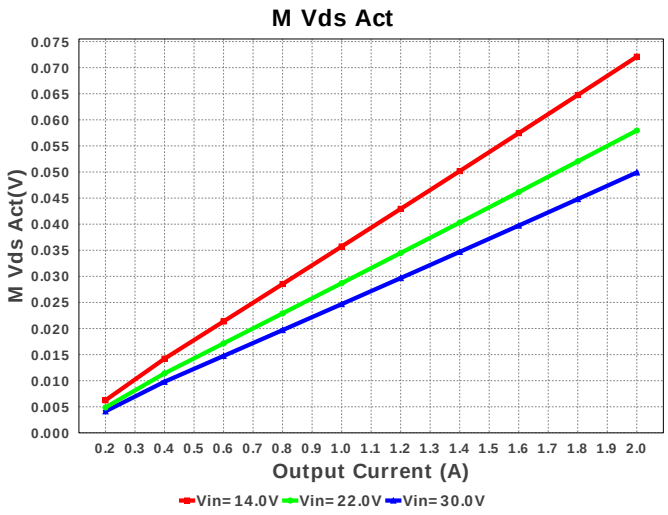


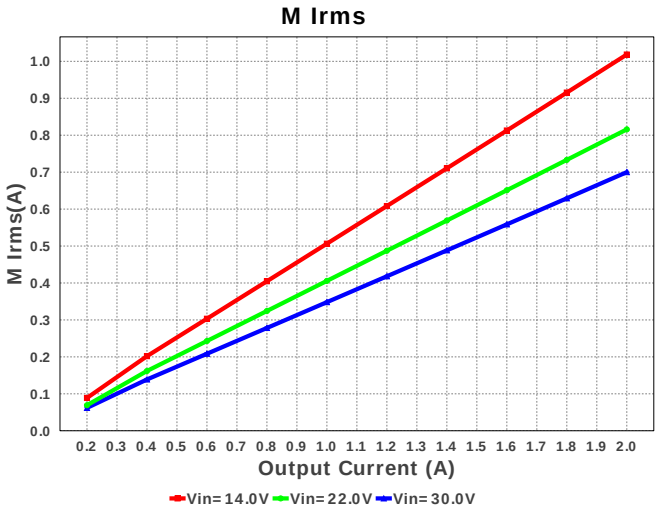


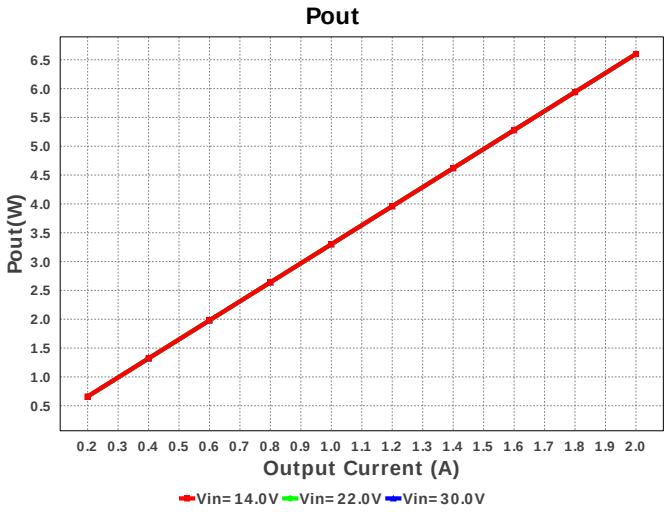


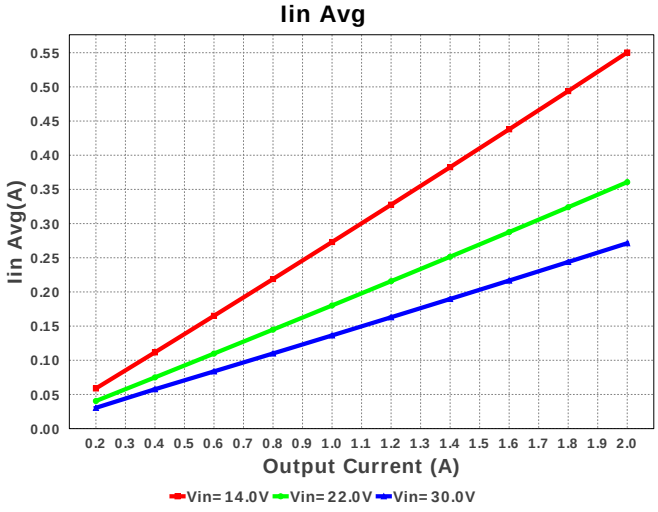


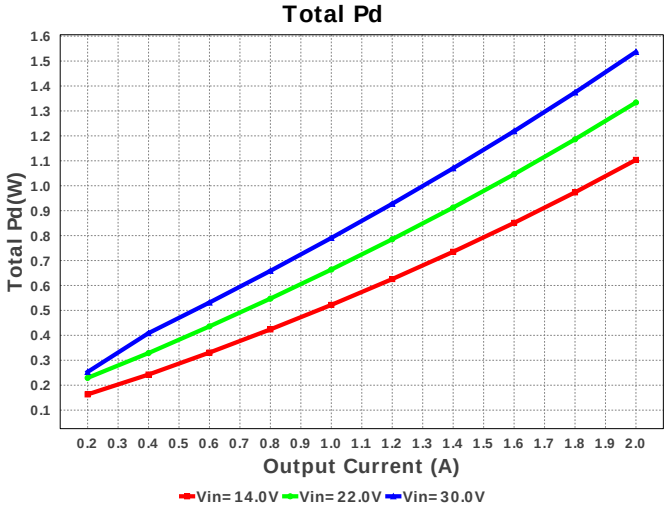


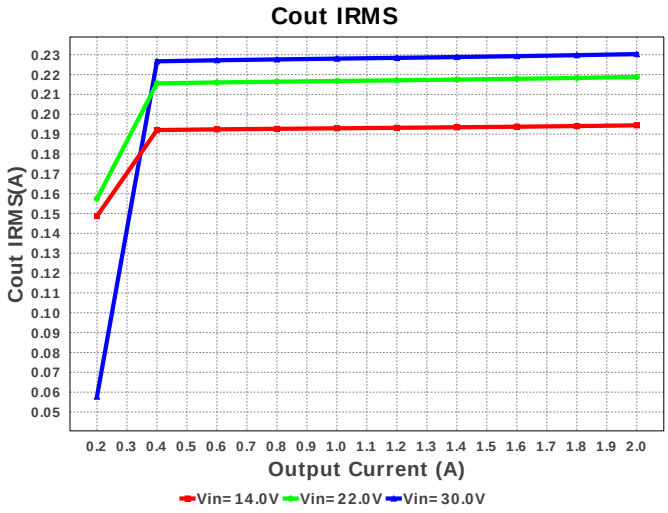


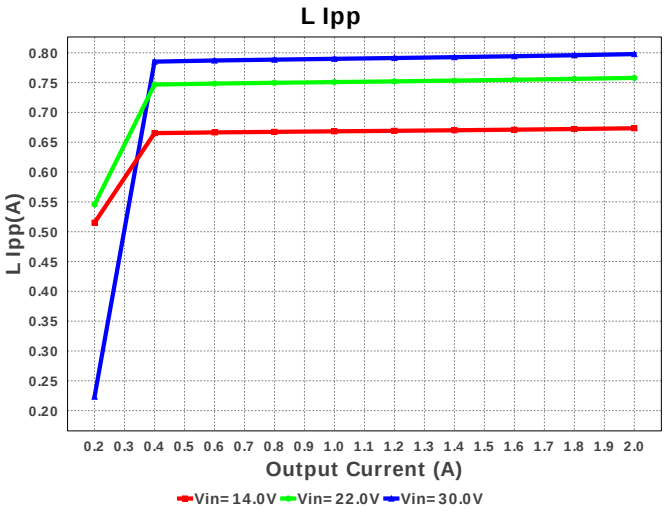


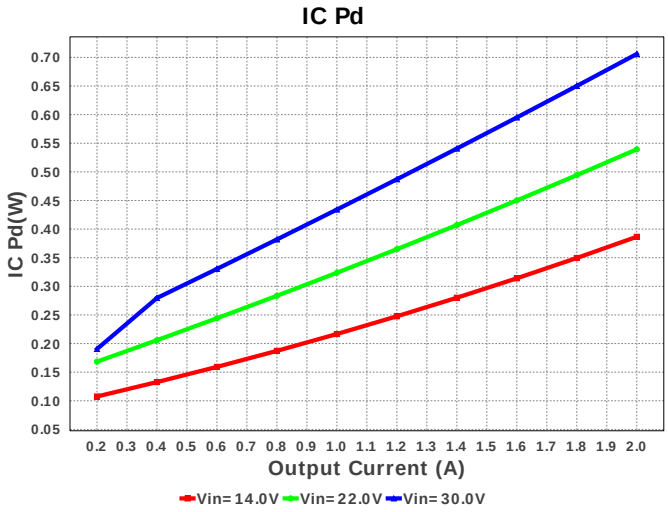


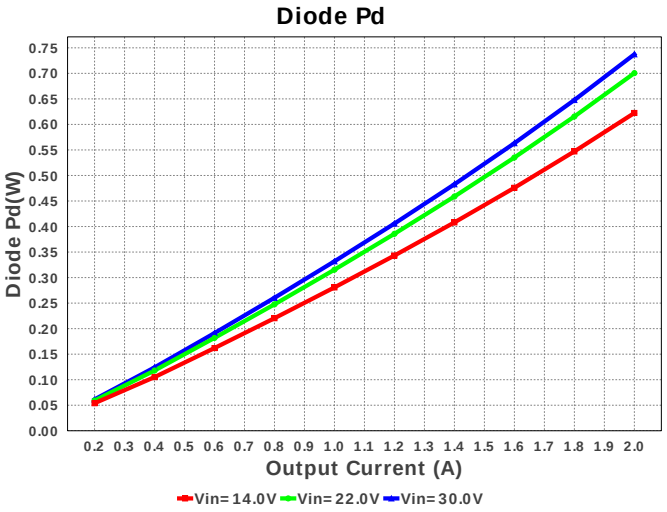


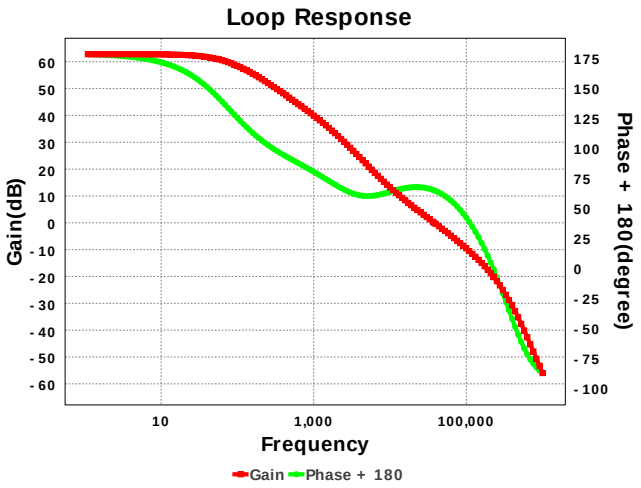












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	655.731 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	230.302 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.399 A	Current	Peak switch current in IC
4.	Iin Avg	271.24 mA	Current	Average input current
5.	L Ipp	797.79 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	700.003 mA	Current	Q Iavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	218.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	818.366 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	49.898 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	6.6 W	General	Total output power
13.	Total BOM	$2.33	General	Total BOM Cost
14.	D1 Tj	103.732 degC	Op_Point	D1 junction temperature
15.	Vout Actual	3.3 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
17.	Cross Freq	38.039 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	12.249 %	Op_point	Duty cycle
19.	Efficiency	81.113 %	Op_point	Steady state efficiency
20.	IC Tj	59.651 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	65.495 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	30.0 V	Op_point	Vin operating point
25.	Vout p-p	4.079 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	1.913 mW	Power	Input capacitor power dissipation
27.	Cout Pd	196.722 µW	Power	Output capacitor power dissipation
28.	Diode Pd	737.322 mW	Power	Diode power dissipation
29.	IC Pd	705.967 mW	Power	IC power dissipation
30.	L Pd	91.2 mW	Power	Inductor power dissipation
31.	Total Pd	1.537 W	Power	Total Power Dissipation
32.	Vout Tolerance	3.998 %		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	14.0	Minimum input voltage
4.	Vout	3.3	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.