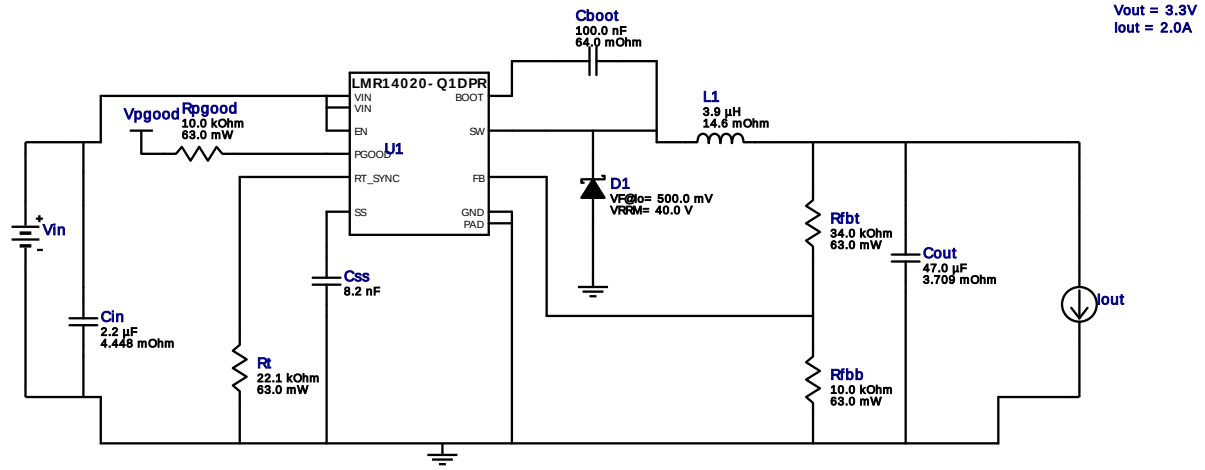
VinMin = 14.0V
VinMax = 22.0V
Vout = 3.3V
Iout = 2.0A

Device = LMR14020QDPRRQ1
Topology = Buck
Created = 7/12/16 2:46:22 AM
BOM Cost = $0.00
BOM Count = 11
Total Pd = 1.41W

WEBENCH® Design Report

Design : 4737567/100 LMR14020QDPRRQ1
LMR14020QDPRRQ1 14.0V-22.0V to 3.30V @ 2.0002249999999995A

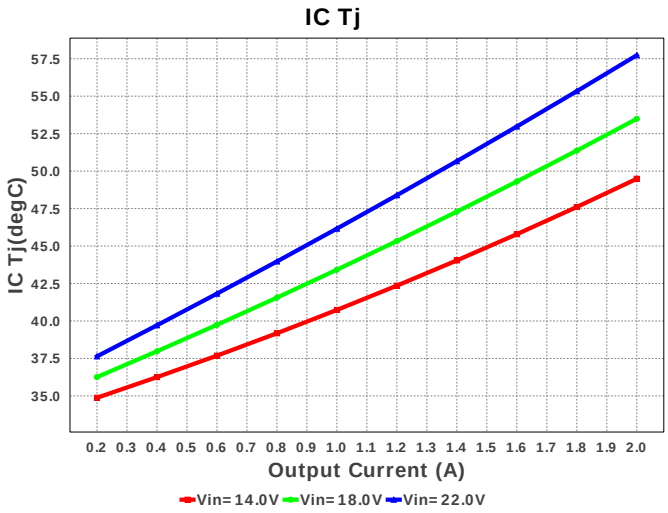


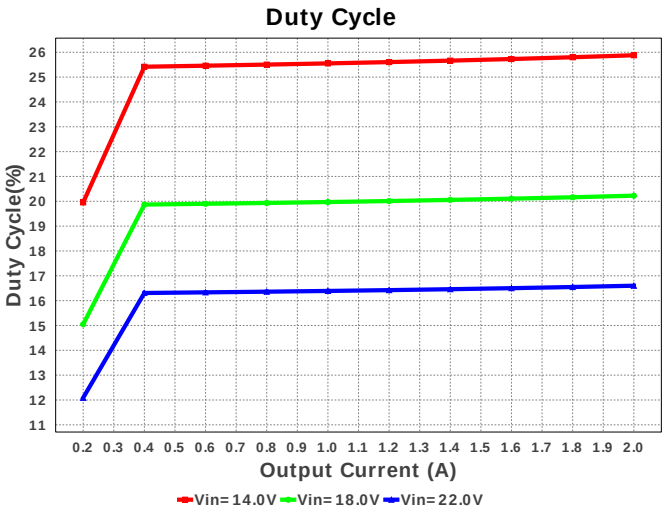
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

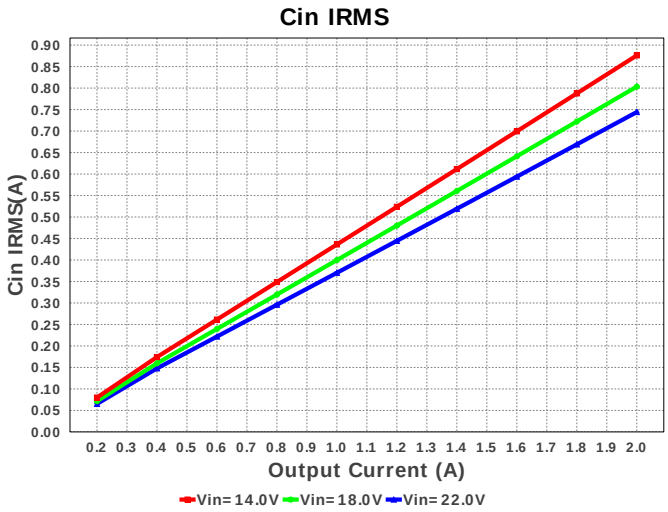
Electrical BOM

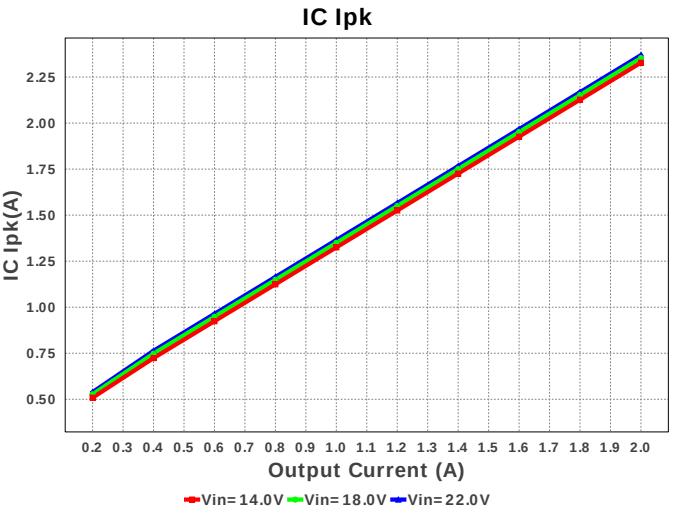
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
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.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.11	SMA 37 mm²
6.	L1	Bourns	SRU8043-3R9Y	L= 3.9 µH DCR= 14.6 mOhm	1	$0.33	SRU8043 100 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.	Rpgood	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

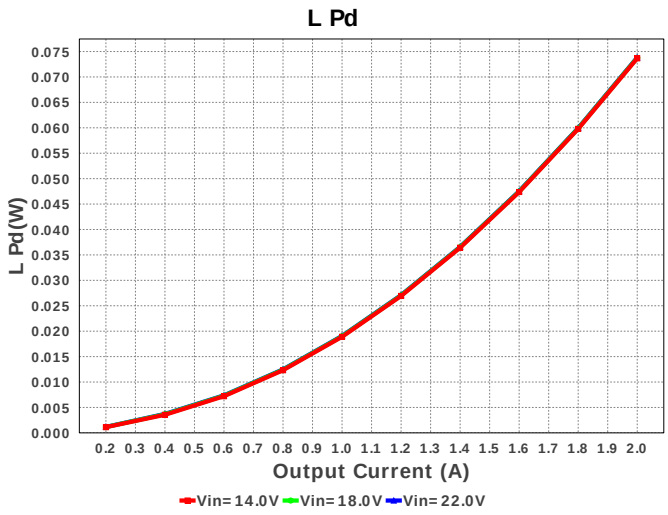
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rt	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	U1	Texas Instruments	LMR14020QDPRRQ1	Switcher	1	NA	DPR0010A 25 mm^2

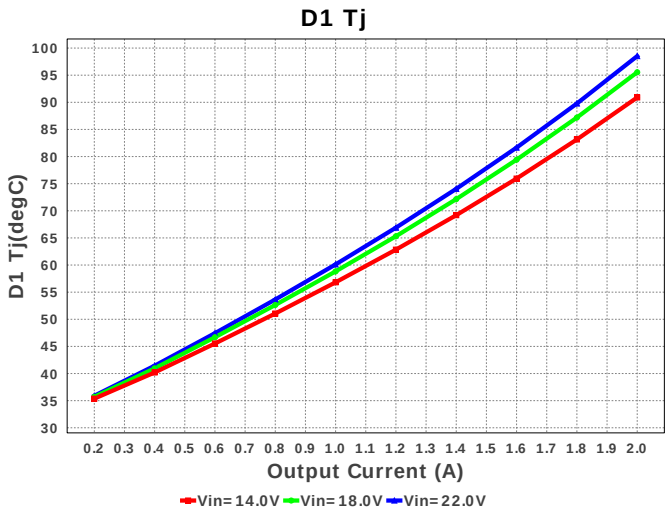


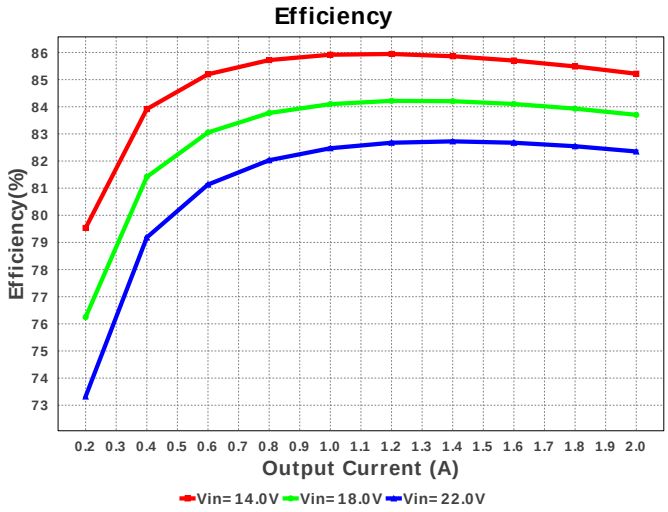


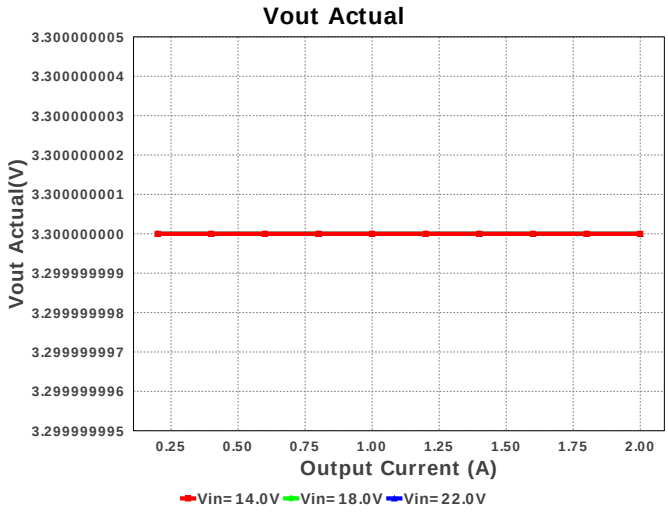


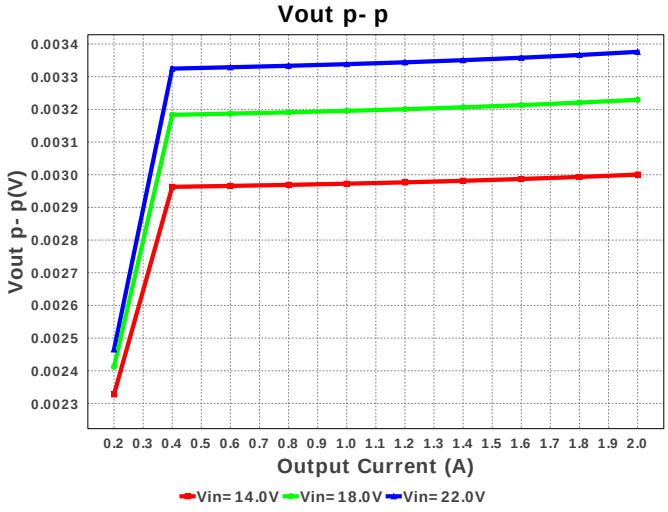


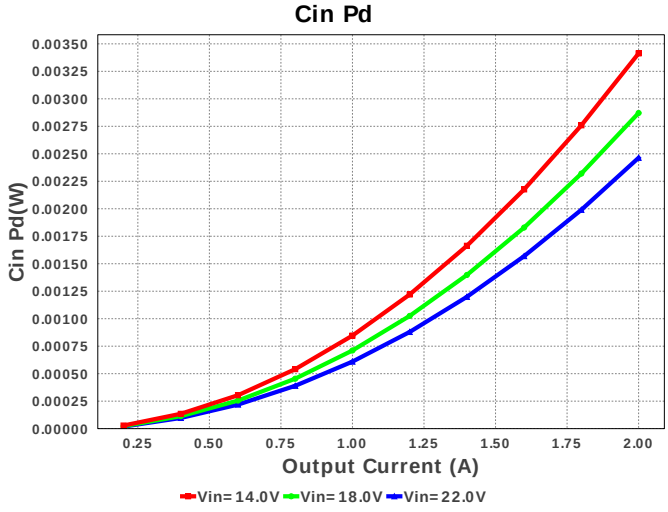


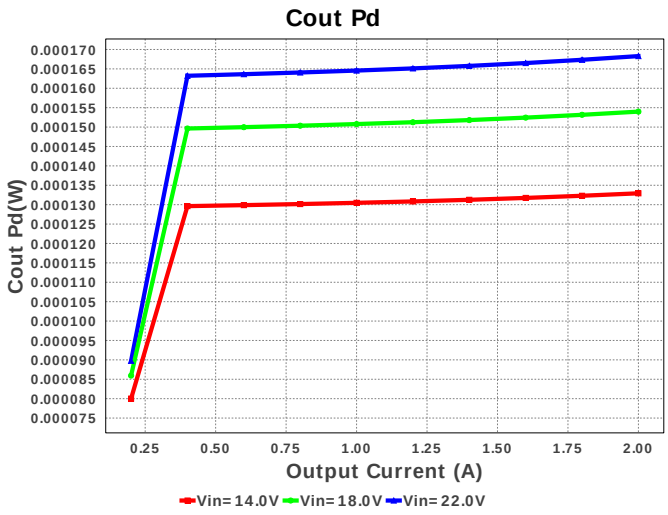


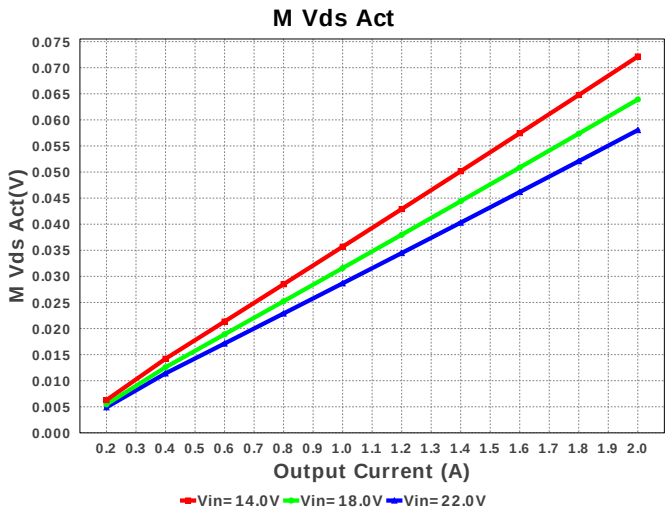


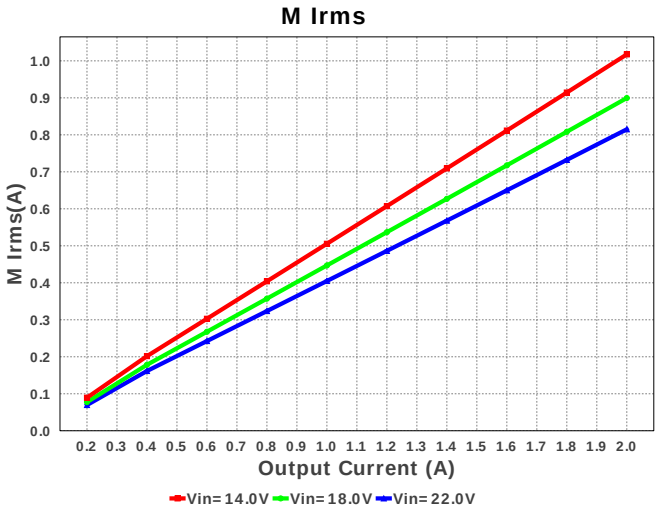


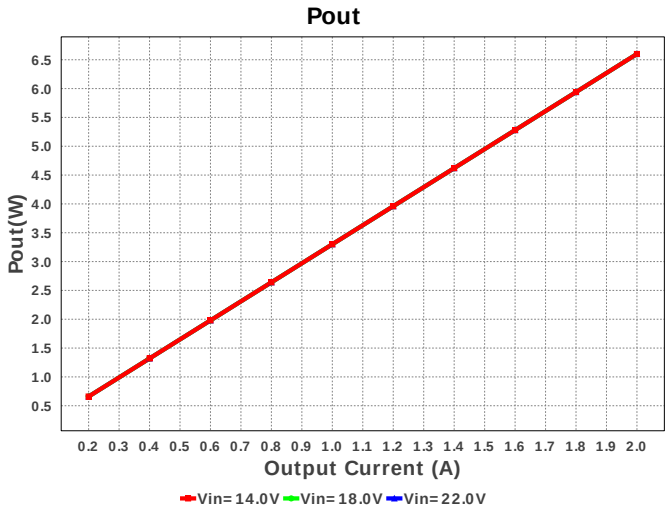


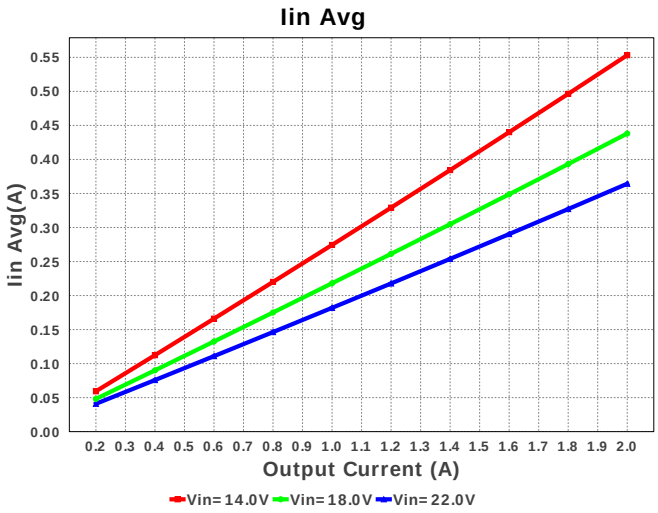


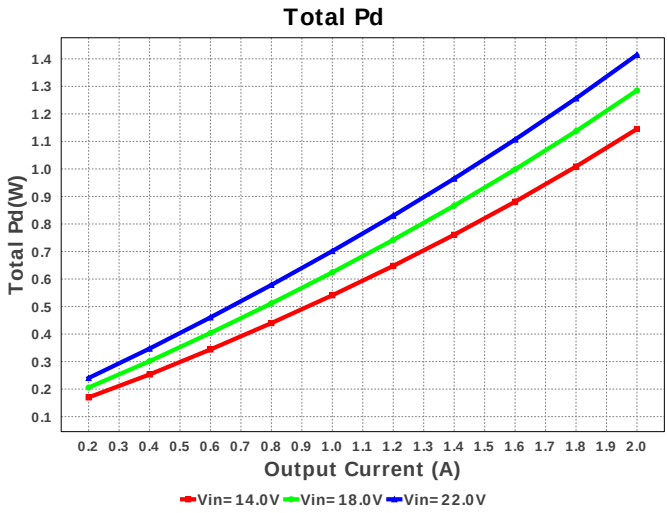


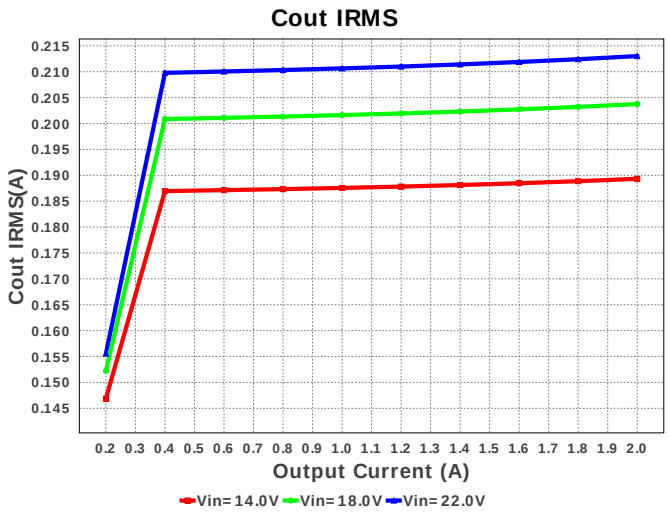


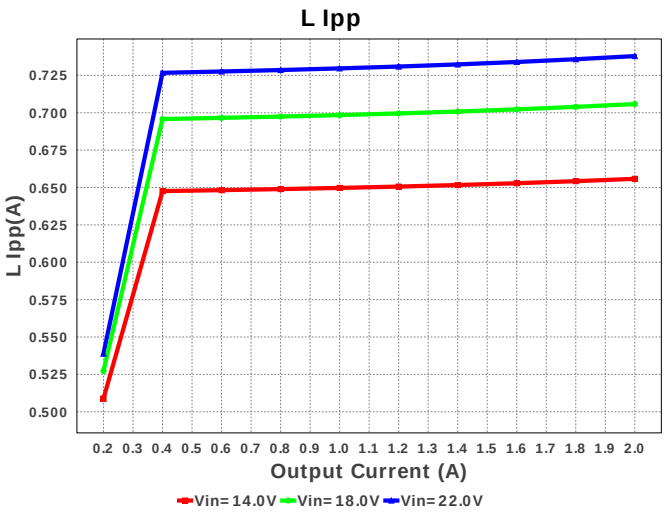


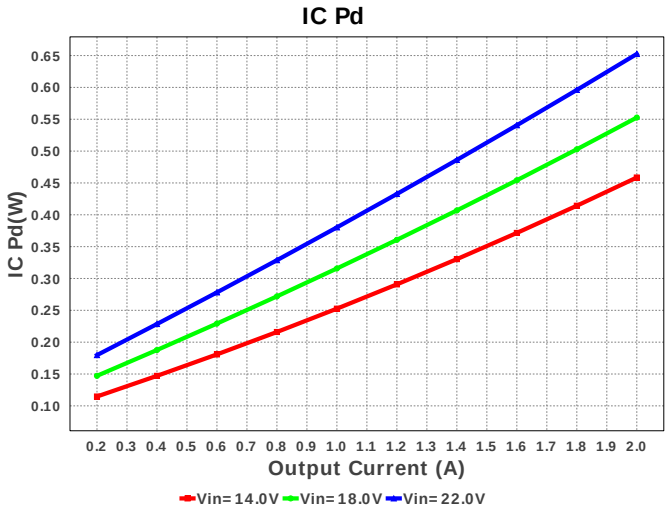


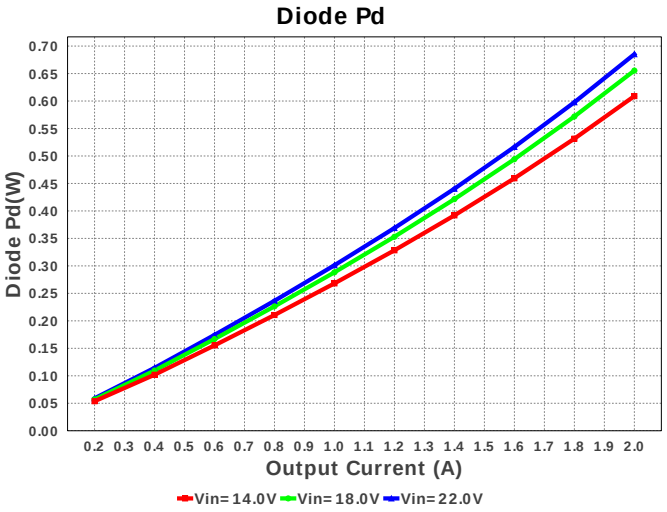


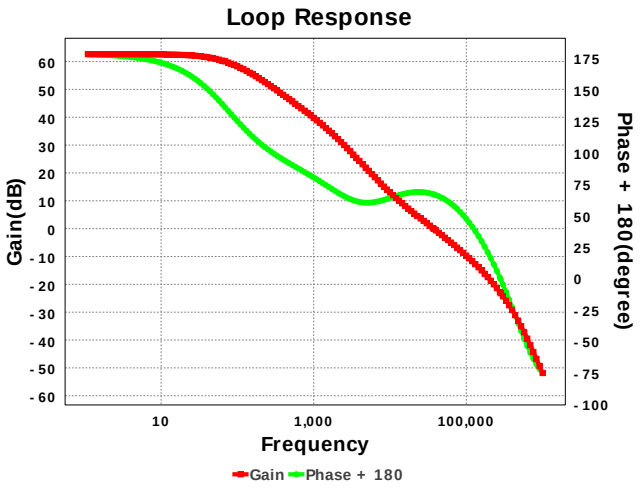












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	744.203 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	213.013 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.369 A	Current	Peak switch current in IC
4.	Iin Avg	364.29 mA	Current	Average input current
5.	L Ipp	737.9 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	814.911 mA	Current	Q Iavg
7.	BOM Count	11	General	Total Design BOM count
8.	FootPrint	206.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.075 MHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	57.706 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	6.6 W	General	Total output power
13.	Total BOM	$0.0	General	Total BOM Cost
14.	D1 Tj	98.519 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	37.195 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	16.601 %	Op_point	Duty cycle
19.	Efficiency	82.355 %	Op_point	Steady state efficiency
20.	IC Tj	46.958 degC	Op_point	IC junction temperature
21.	ICThetaJA	26.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	2.0 A	Op_point	Iout operating point
23.	Phase Marg	67.657 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	22.0 V	Op_point	Vin operating point
25.	Vout p-p	3.376 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	2.463 mW	Power	Input capacitor power dissipation
27.	Cout Pd	168.295 µW	Power	Output capacitor power dissipation
28.	Diode Pd	685.194 mW	Power	Diode power dissipation
29.	IC Pd	652.213 mW	Power	IC power dissipation
30.	L Pd	73.834 mW	Power	Inductor power dissipation
31.	Total Pd	1.414 W	Power	Total Power Dissipation
32.	Vout Tolerance	3.999 %		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	14.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LMR14020SDPR-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR14020SDPR-Q1** Product Folder : http://www.ti.com/product/LMR14020%2DQ1 : contains the data sheet and other resources.