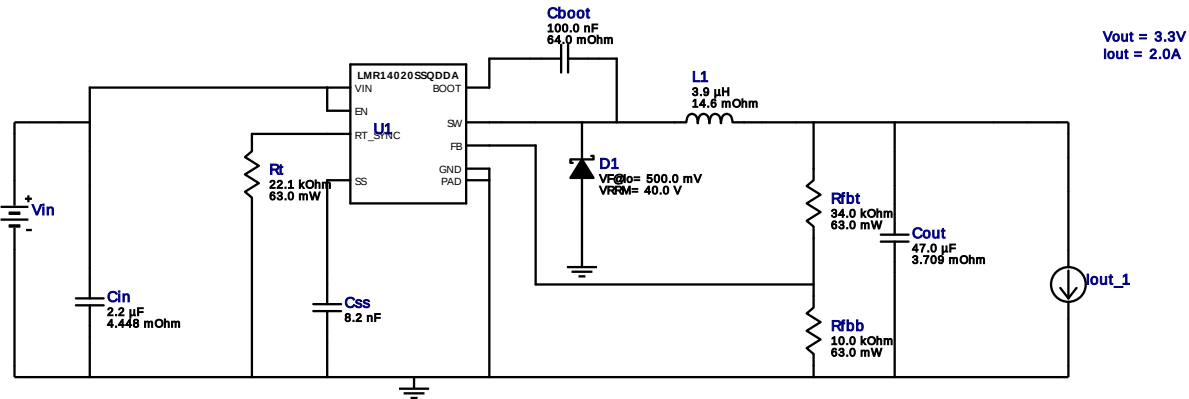


WEBENCH® Design Report

Design : 4748772/2 LMR14020SSQDDARQ1
LMR14020SSQDDARQ1 18.0V-22.0V to 3.30V @ 2.000224999999995A

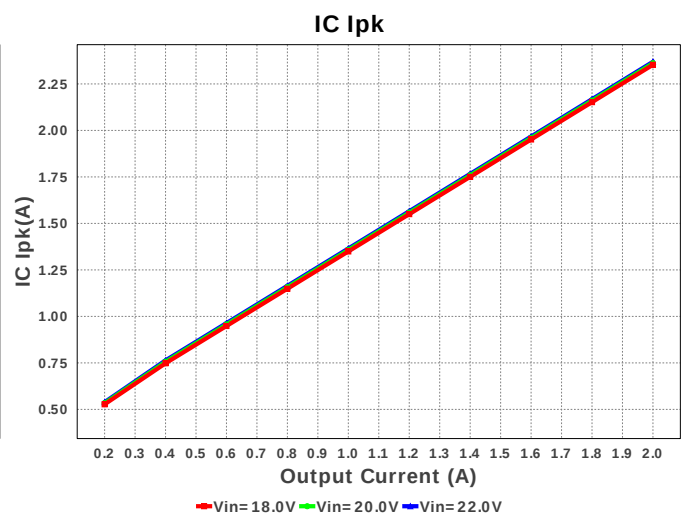
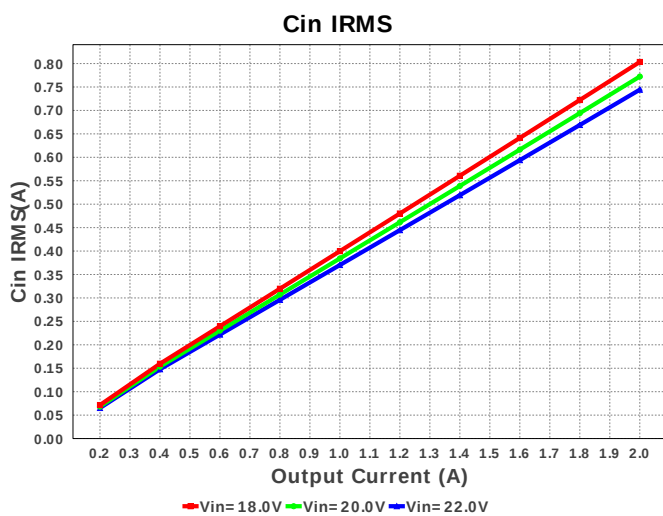
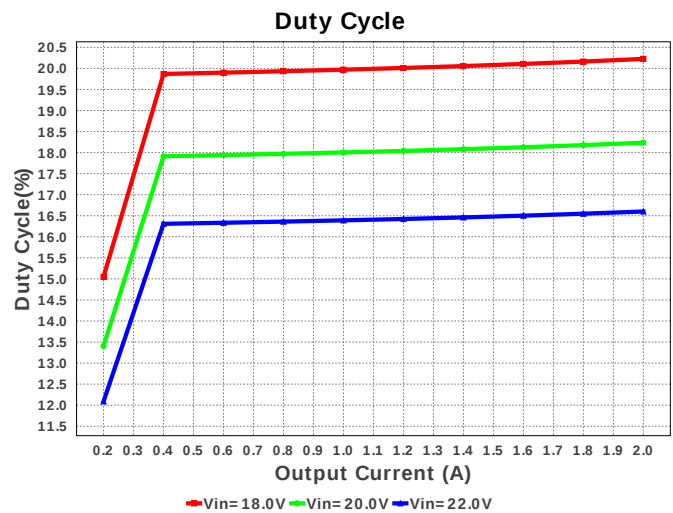
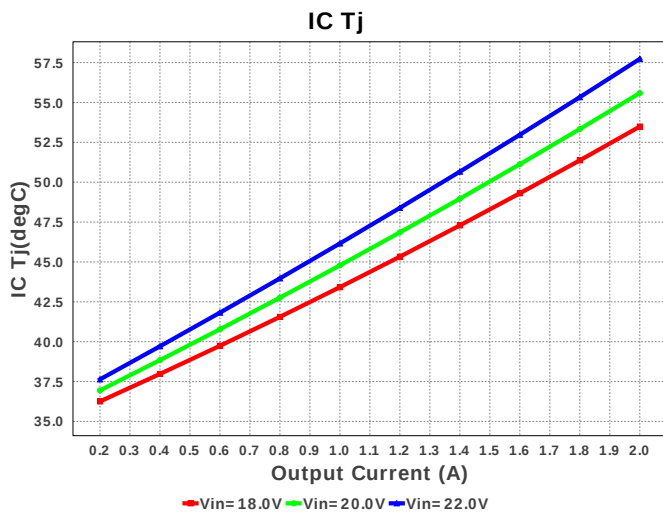


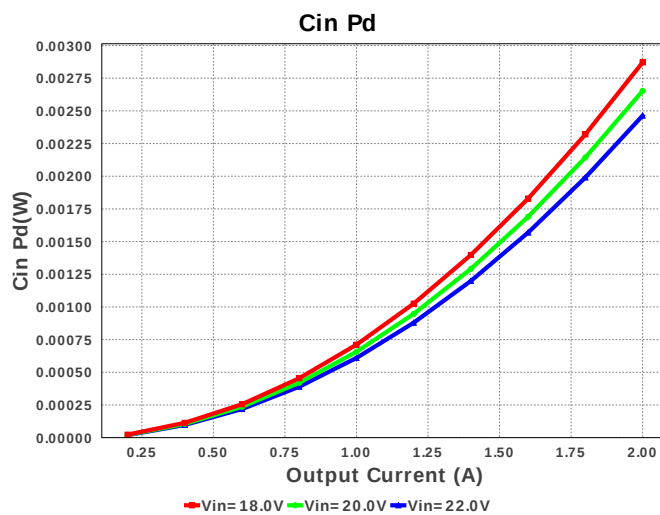
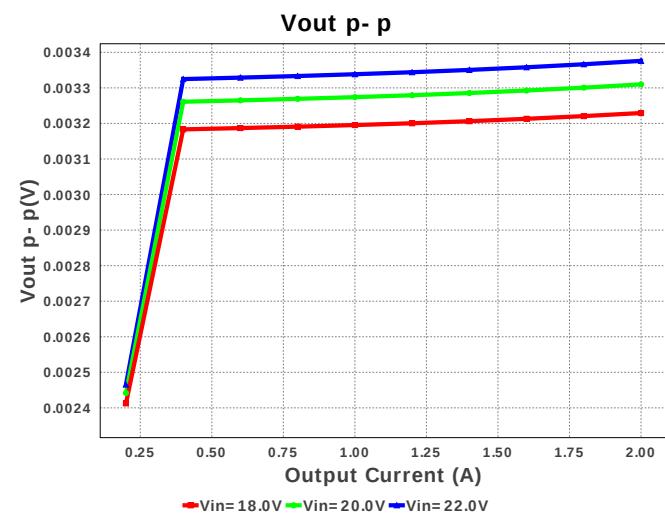
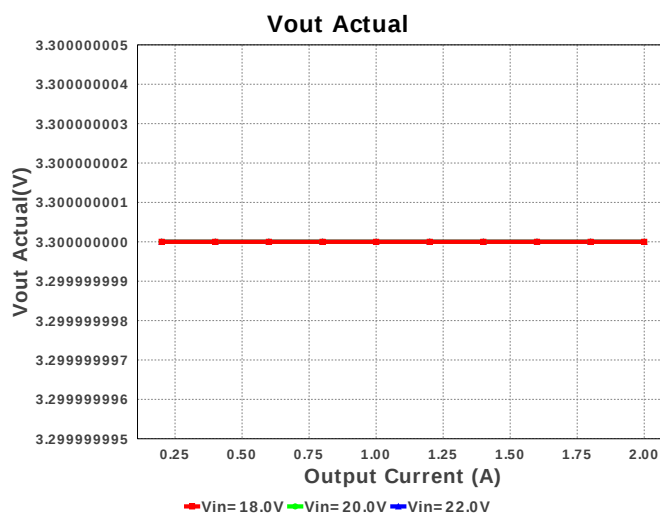
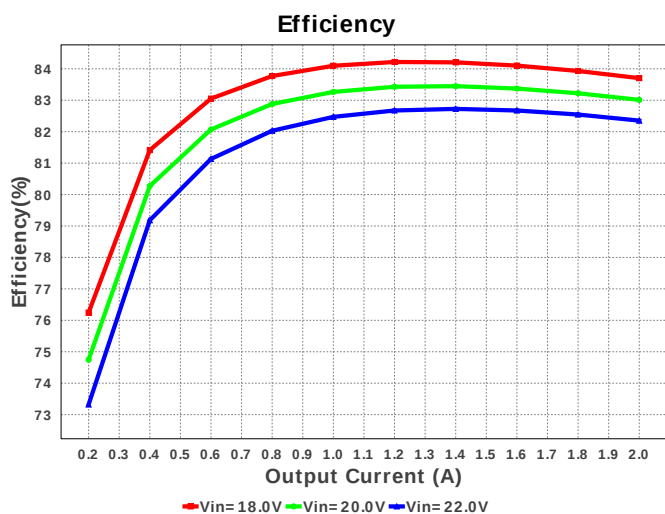
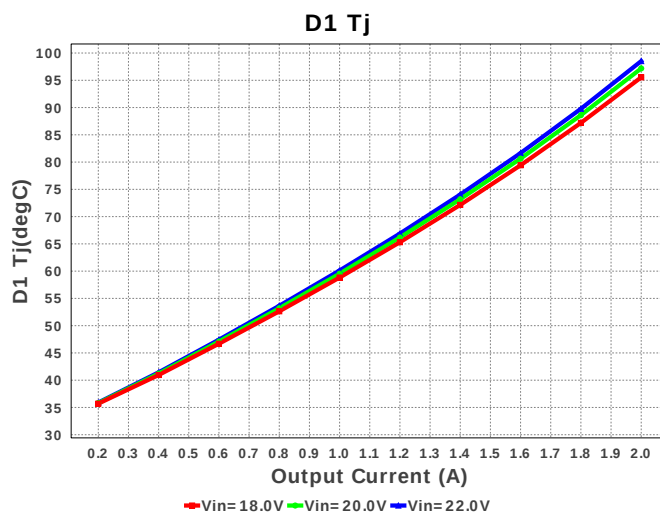
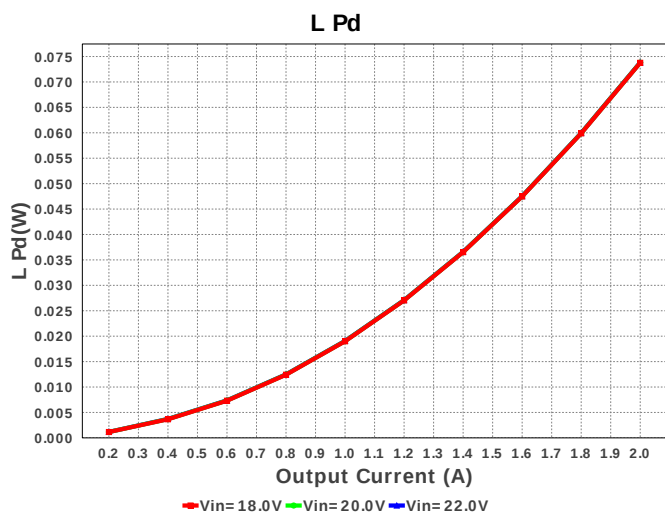
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

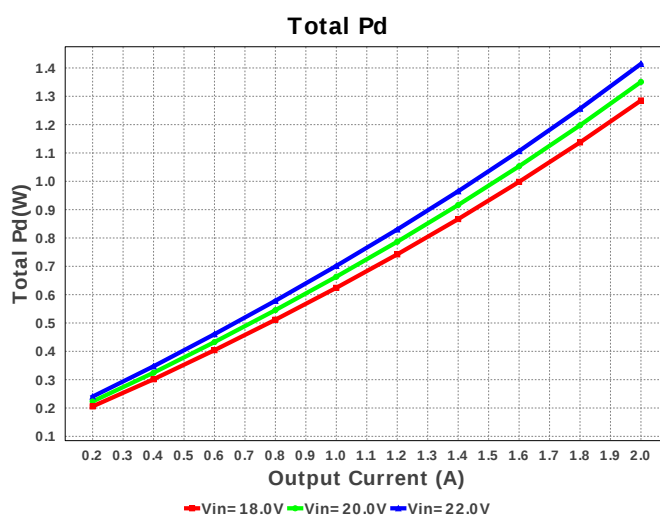
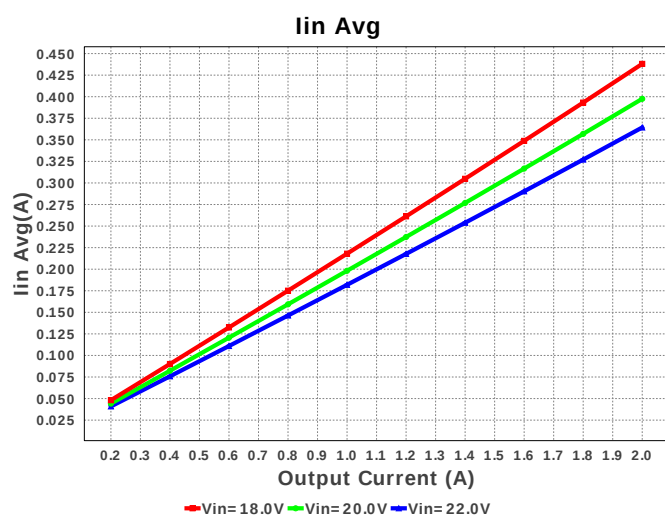
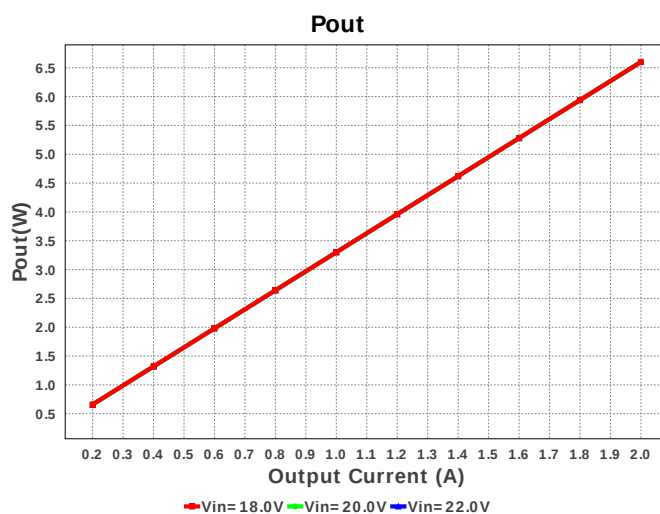
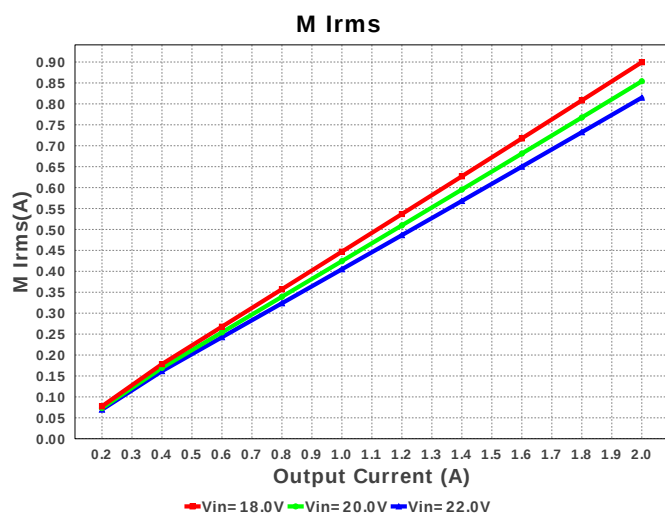
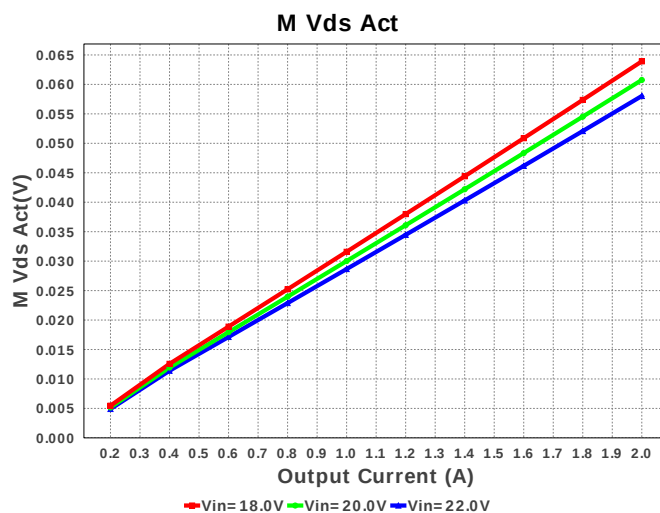
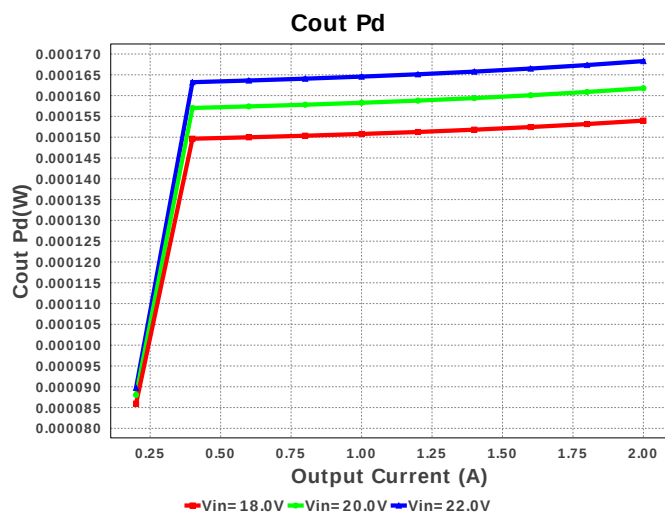
Electrical BOM

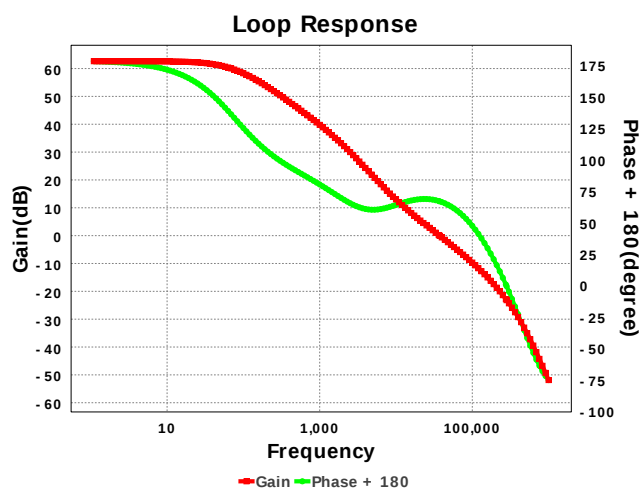
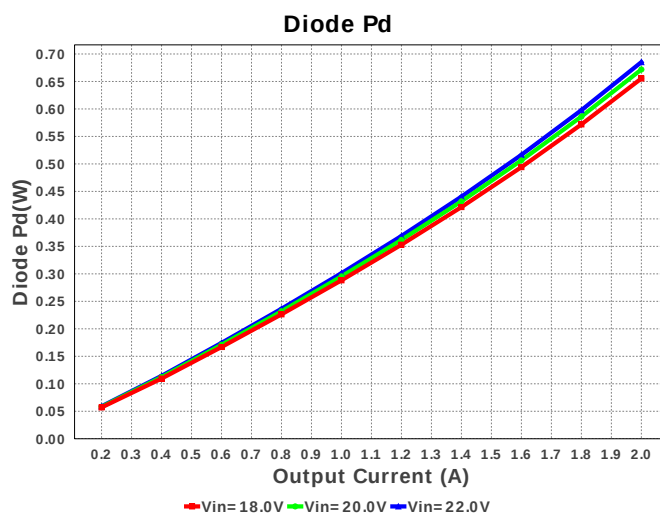
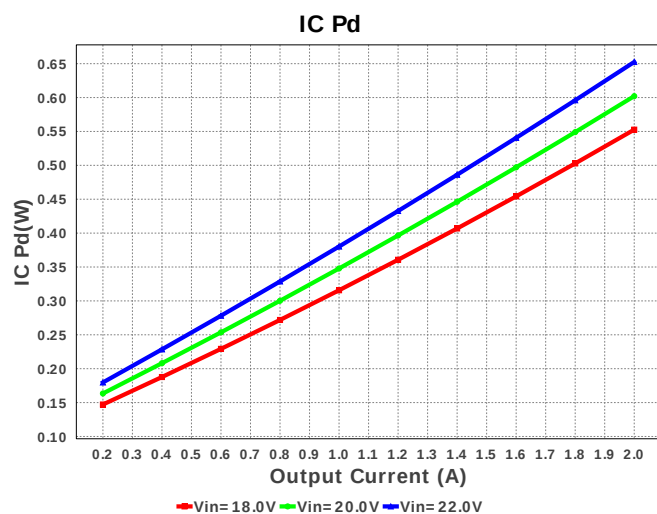
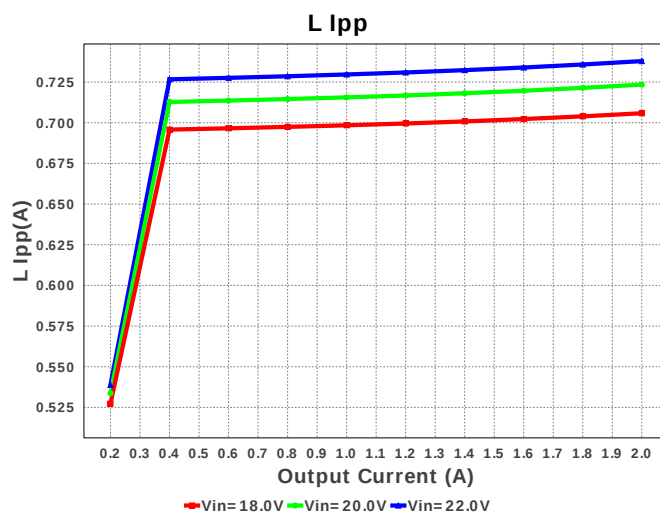
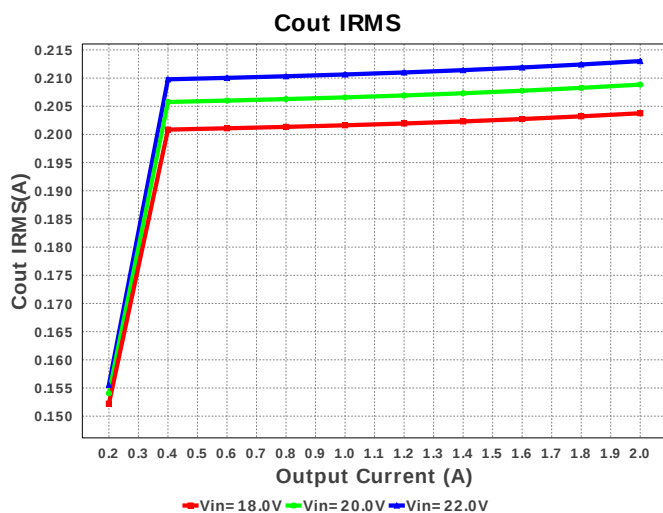
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	0805 7 mm ²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	\$0.05	1206_190 11 mm ²
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 mm ²
4.	Css	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
5.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	\$0.11	SMA 37 mm ²
6.	L1	Bourns	SRU8043-3R9Y	L= 3.9 uH DCR= 14.6 mOhm	1	\$0.33	SRU8043 100 mm ²
7.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
8.	Rfbs	Vishay-Dale	CRCW040234K0FKED Series= CRCW..e3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
9.	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

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10. U1		Texas Instruments	LMR14020SSQDDARQ1	Switcher	1	\$1.87	 DDA0008E_N 57 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	744.207 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	364.3 mA	Current	Average input current
5.	L Ipp	737.9 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	814.917 mA	Current	Q lavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	235.0 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	58.021 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	6.6 W	General	Total output power
13.	Total BOM	\$2.56	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	82.353 %	Op_point	Steady state efficiency
20.	IC Tj	57.404 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	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	168.294 μ W	Power	Output capacitor power dissipation
28.	Diode Pd	685.192 mW	Power	Diode power dissipation
29.	IC Pd	652.47 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	18.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LMR14020SS-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR14020SS-Q1** Product Folder : <http://www.ti.com/product/LMR14020%2DQ1> : contains the data sheet and other resources.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.

Use of Texas Instruments' WEBENCH simulation tools is subject to [Texas Instruments' Site Terms and Conditions of Use](#). Prototype boards based on WEBENCH created designs are provided AS IS without warranty of any kind for evaluation and testing purposes and are subject to the terms of the [Evaluation License Agreement](#).