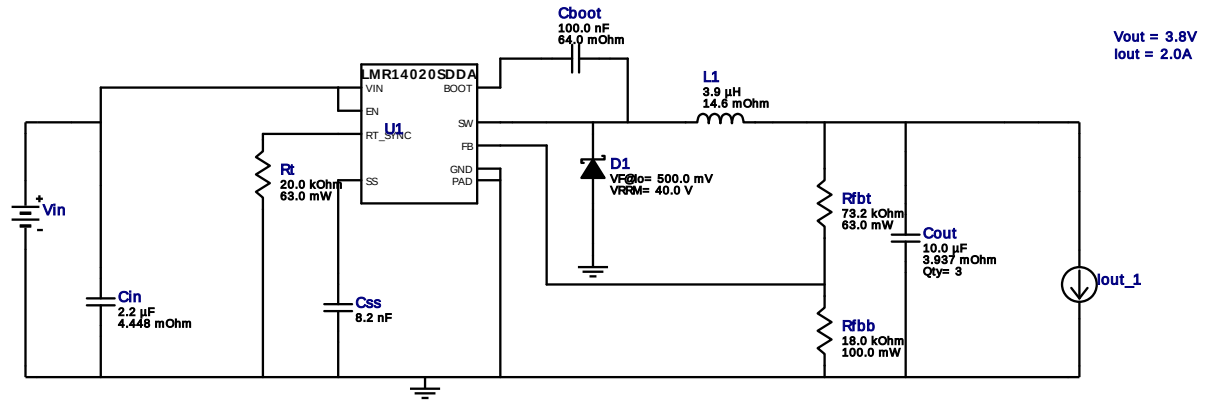
WEBENCH® Design Report

VinMin = 18.0V
VinMax = 22.0V
Vout = 3.8V
Iout = 2.0A

Device = LMR14020SDDAR
Topology = Buck
Created = 9/15/16 5:23:17 AM
BOM Cost = $2.09
BOM Count = 12
Total Pd = 1.45W

Design : 4794696/4 LMR14020SDDAR
LMR14020SDDAR 18.0V-22.0V to 3.80V @ 2.000125A



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	GRM219R61A106KE44D Series= X5R	Cap= 10.0 uF ESR= 3.937 mOhm VDC= 10.0 V IRMS= 2.7713 A	3	$0.03	0805 7 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	Yageo America	RC0603FR-0718KL Series= ?	Res= 18.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
8.	Rfbt	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 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

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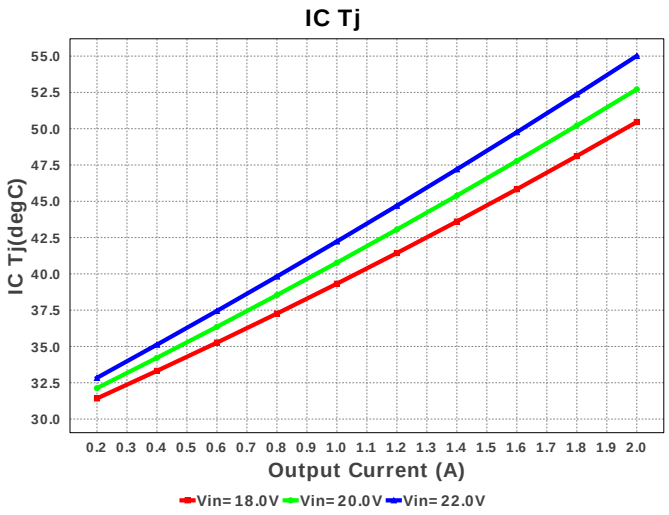
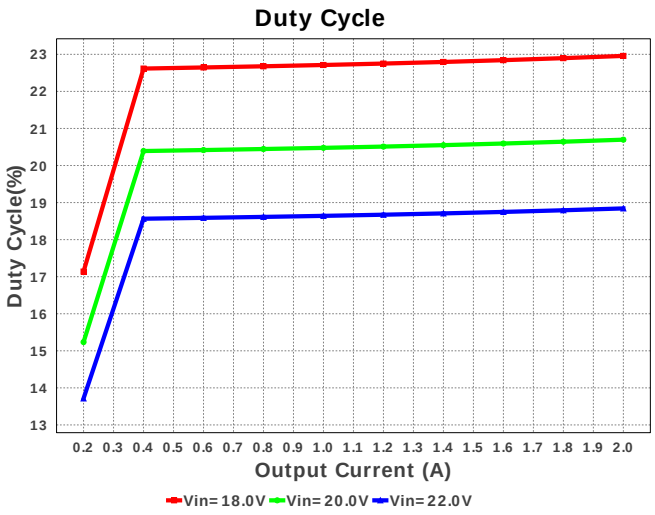
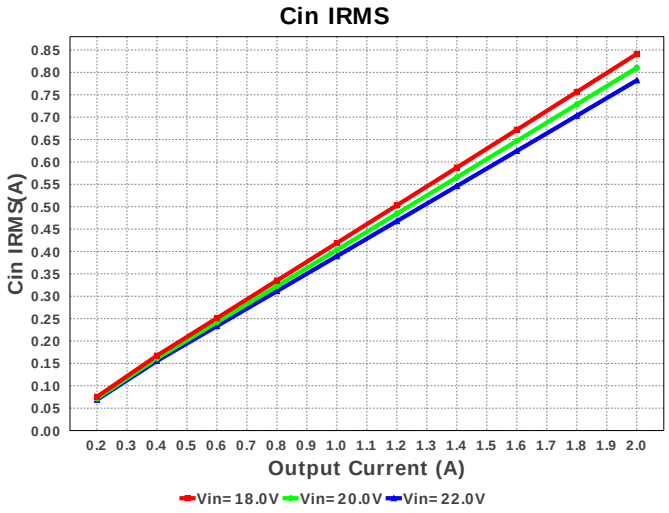
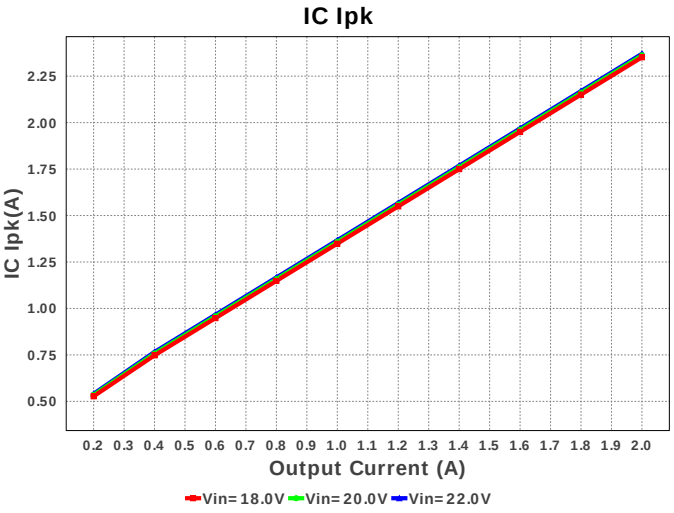
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14020SDDAR	Switcher	1	$1.46	DDA0008E_N 57 mm²









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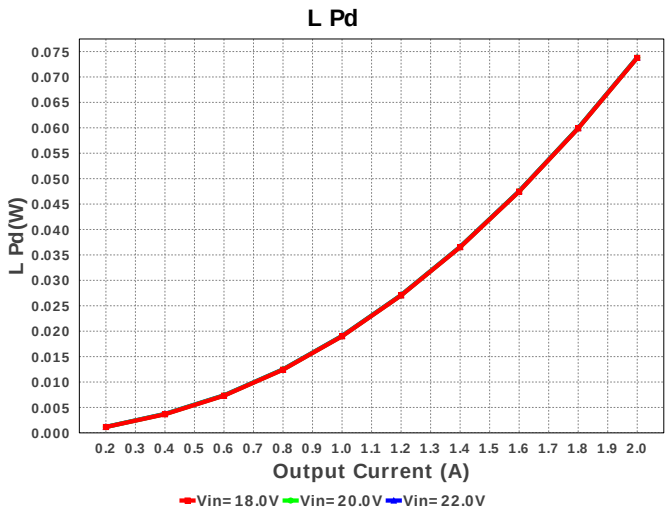

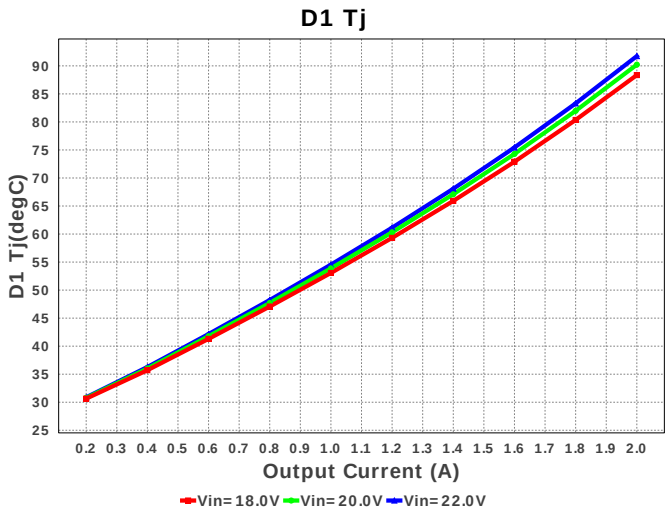

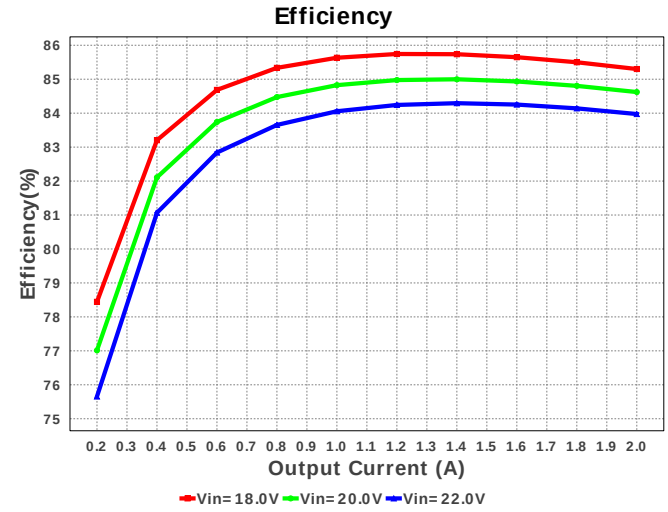

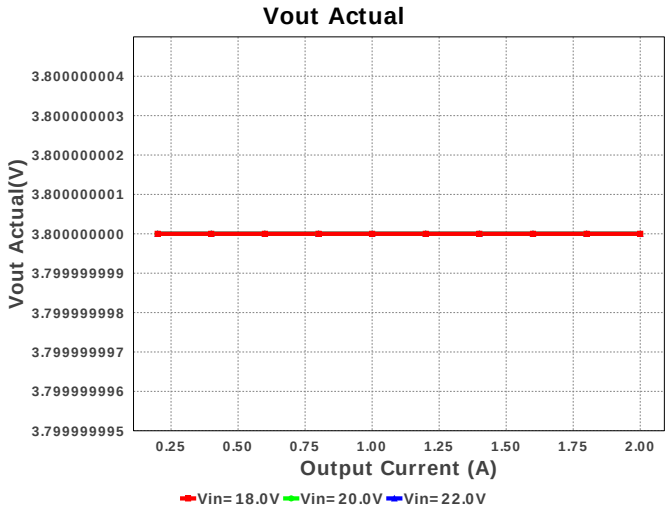

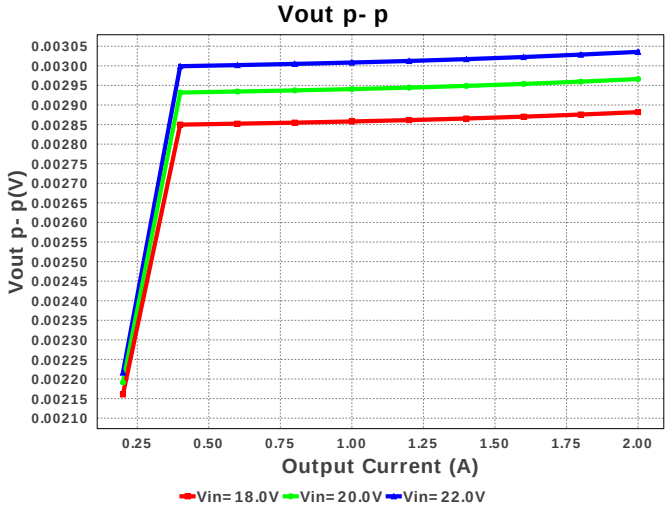

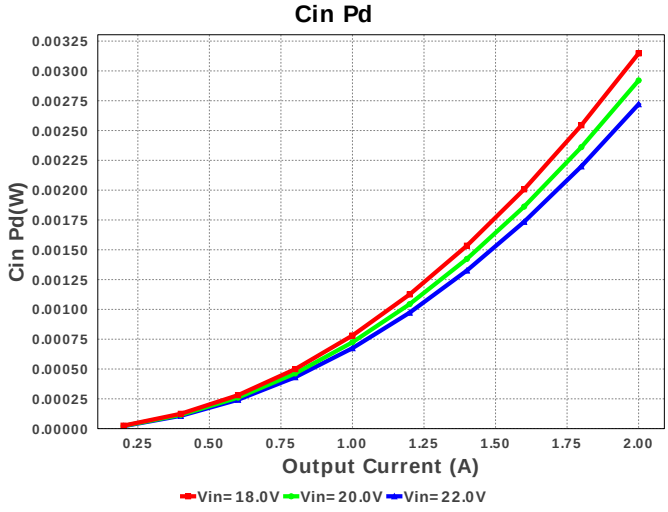

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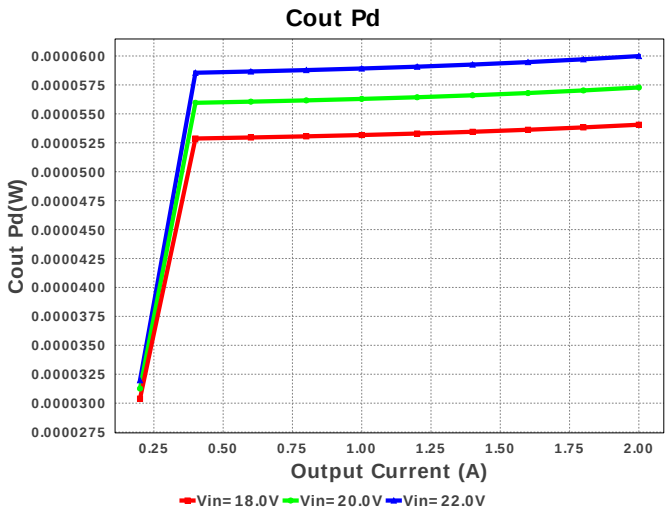

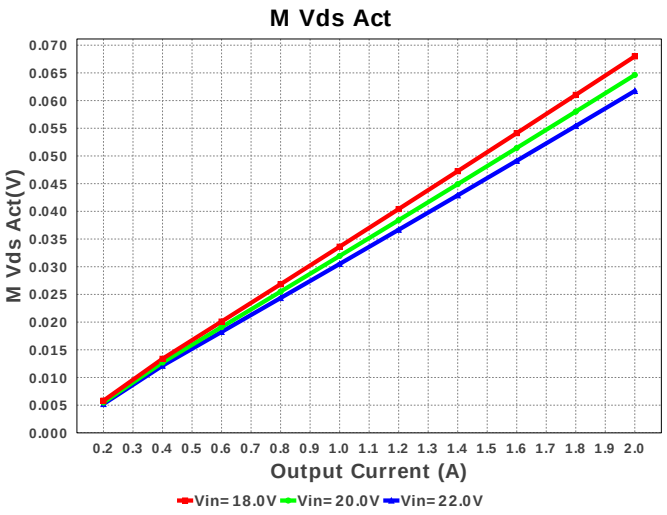

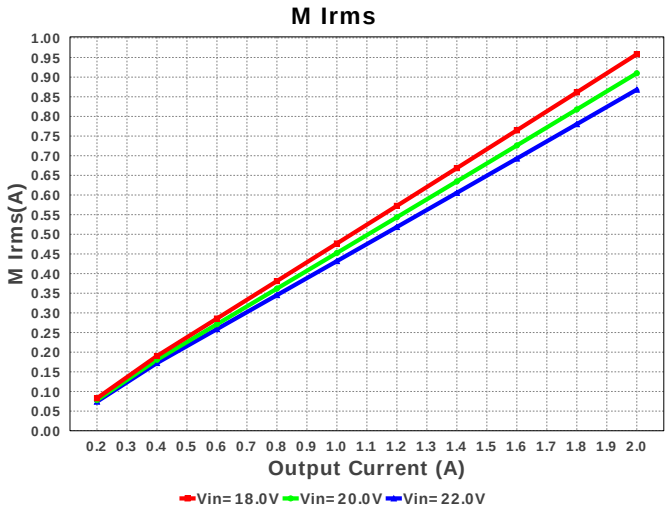

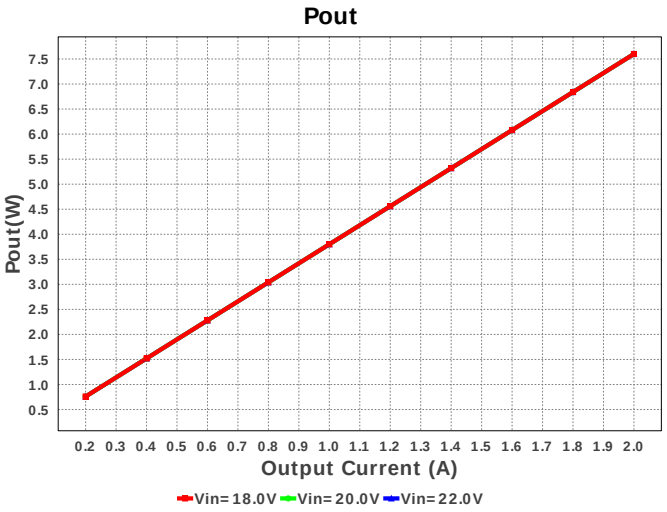

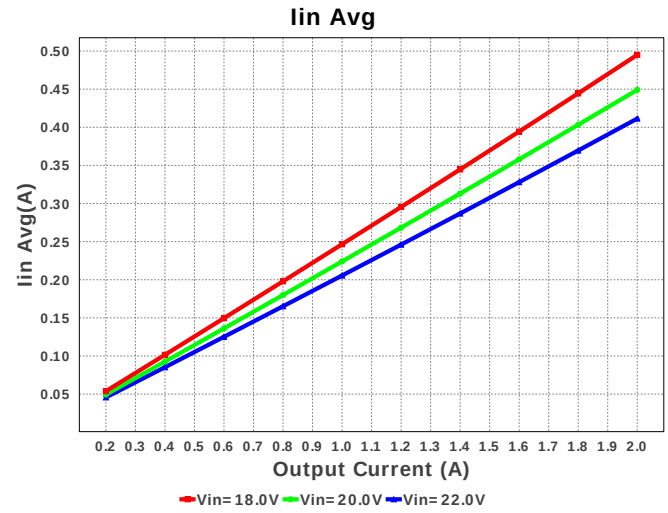

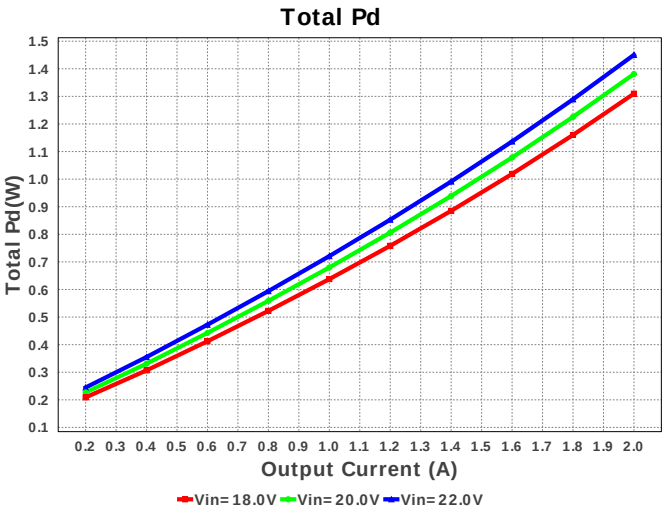

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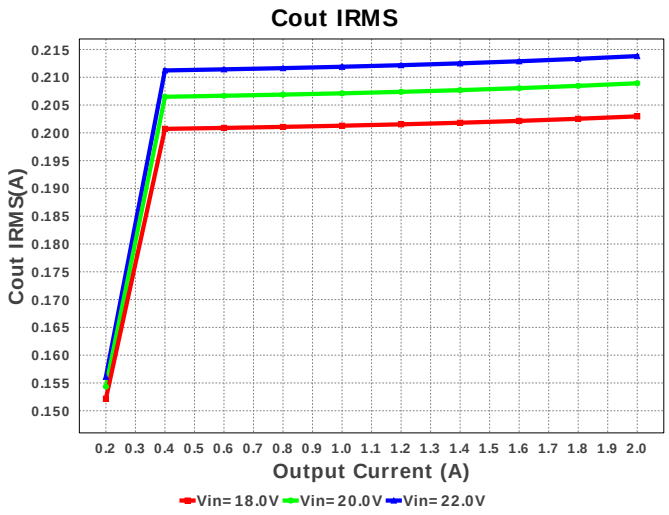

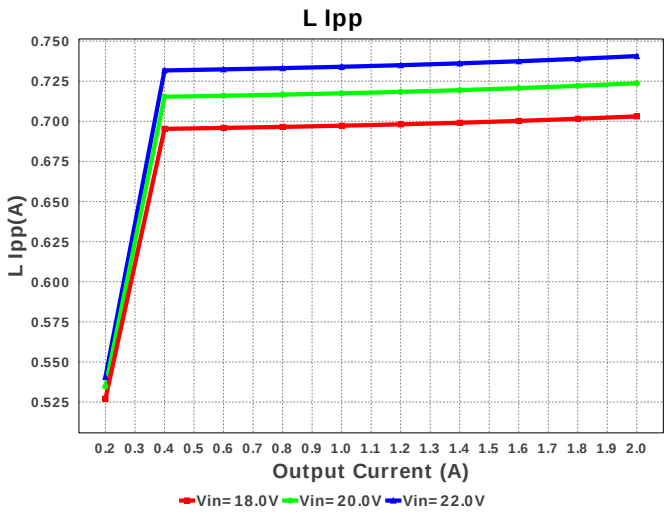

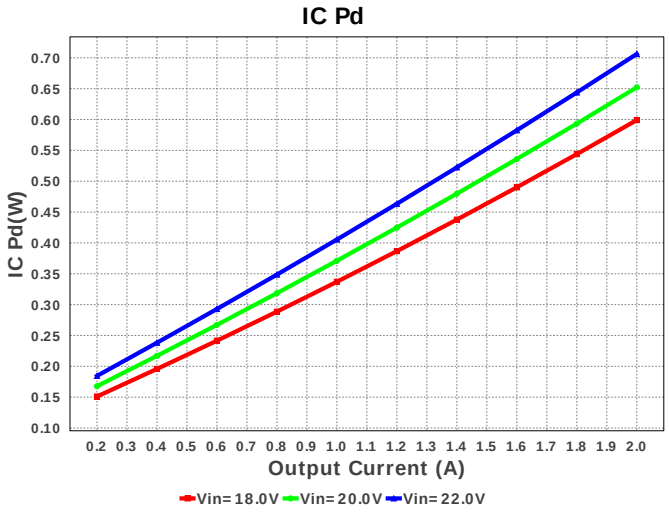

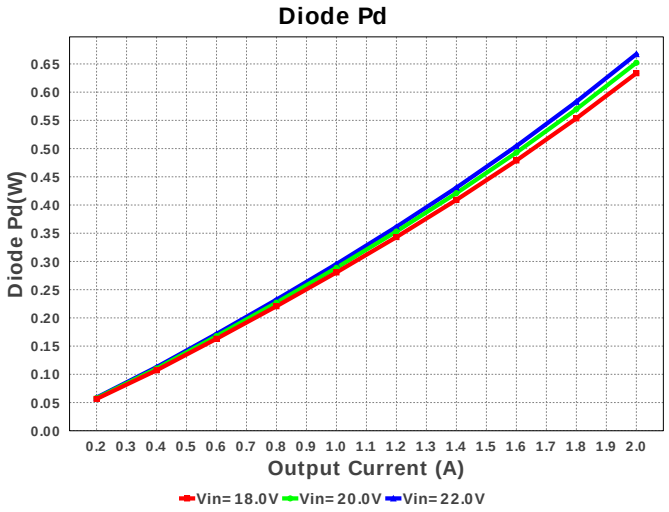

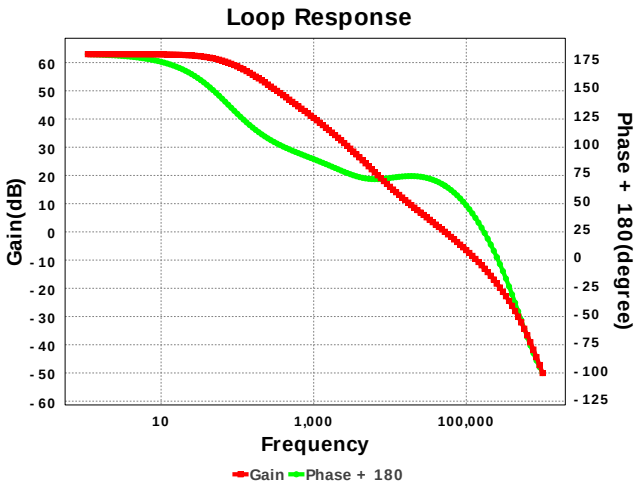

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	782.117 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	213.805 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.37 A	Current	Peak switch current in IC
4.	Iin Avg	411.39 mA	Current	Average input current
5.	L Ipp	740.64 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	868.175 mA	Current	Q Iavg
7.	BOM Count	12	General	Total Design BOM count
8.	FootPrint	246.0 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	61.725 mV	General	Voltage drop across the MosFET

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#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	7.6 W	General	Total output power
14.	Total BOM	$2.09	General	Total BOM Cost
15.	D1 Tj	91.742 degC	Op_Point	D1 junction temperature
16.	Vout Actual	3.8 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	3.8 V	Op_Point	Operational Output Voltage
18.	Cross Freq	52.441 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	18.842 %	Op_point	Duty cycle
20.	Efficiency	83.974 %	Op_point	Steady state efficiency
21.	IC Tj	54.661 degC	Op_point	IC junction temperature
22.	ICThetaJA	42.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	2.0 A	Op_point	Iout operating point
24.	Phase Marg	63.137 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	22.0 V	Op_point	Vin operating point
26.	Vout p-p	3.036 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	2.721 mW	Power	Input capacitor power dissipation
28.	Cout Pd	59.99 µW	Power	Output capacitor power dissipation
29.	Diode Pd	667.421 mW	Power	Diode power dissipation
30.	IC Pd	706.209 mW	Power	IC power dissipation
31.	L Pd	73.837 mW	Power	Inductor power dissipation
32.	Total Pd	1.45 W	Power	Total Power Dissipation
33.	Vout Tolerance	4.06 %		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	3.8	Output Voltage
5.	base_pn	LMR14020S	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	25.0	Ambient temperature

Design Assistance

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

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