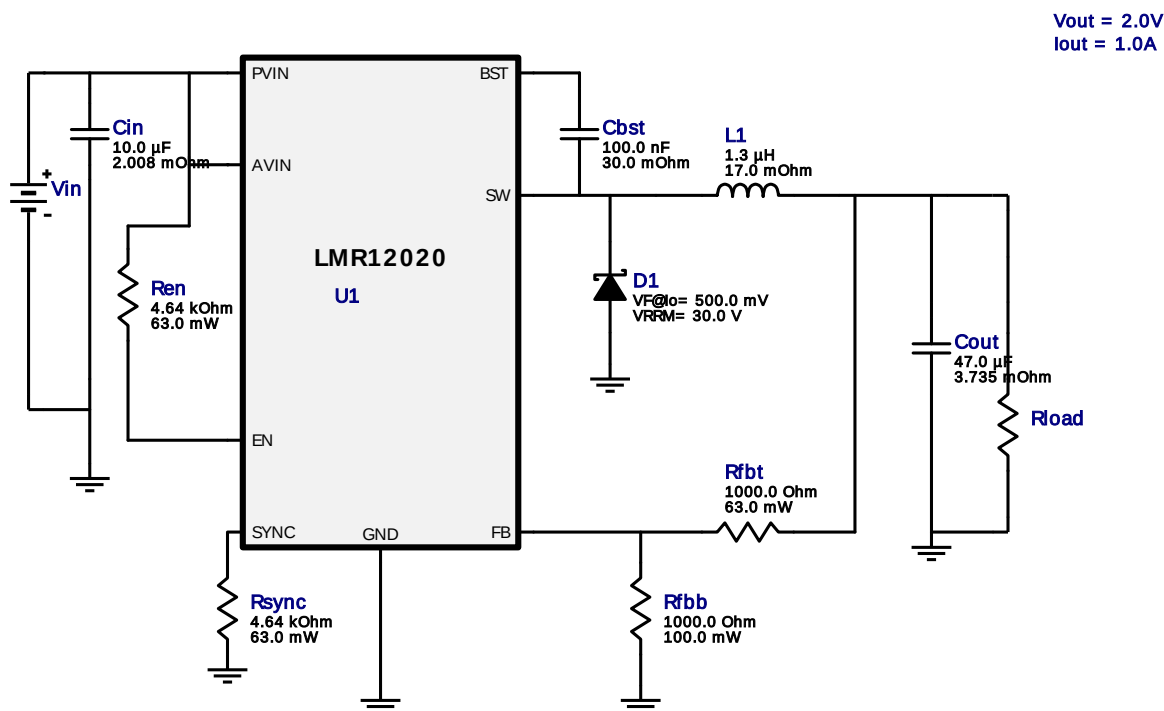


WEBENCH® Design Report

Design : 4728750/5 LMR12020XSD/NOPB
LMR12020XSD/NOPB 10.0V-20.0V to 2.00V @ 1.0A

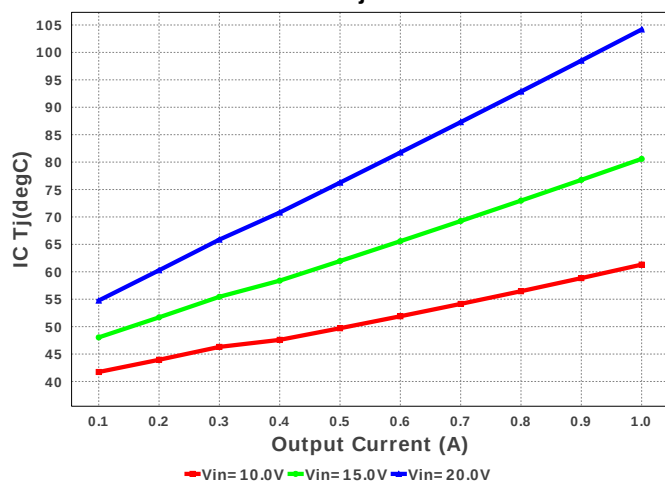


Electrical BOM

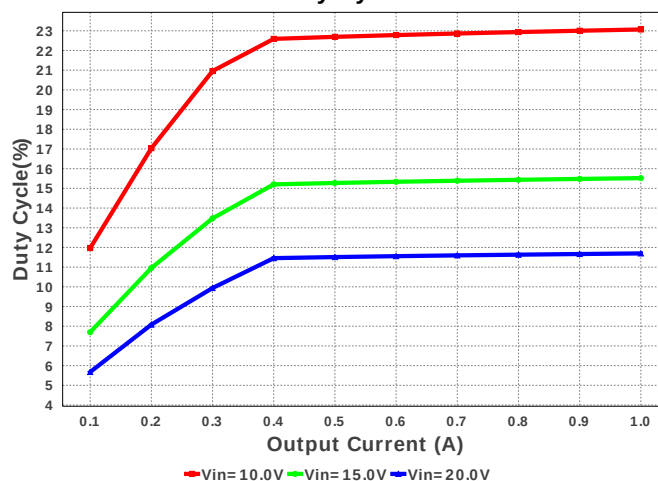
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	MuRata	GRM188R71C104KA01D Series= X7R	Cap= 100.0 nF ESR= 30.0 mOhm VDC= 16.0 V IRMS= 1.7 A	1	\$0.01	0603 5 mm ²
2.	Cin	MuRata	GRM32ER7YA106KA12L Series= X7R	Cap= 10.0 uF ESR= 2.008 mOhm VDC= 35.0 V IRMS= 4.6772 A	1	\$0.22	1210_280 15 mm ²
3.	Cout	MuRata	GRM31CE70G476ME15L Series= X7U	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 4.0 V IRMS= 4.1841 A	1	\$0.10	1206_190 11 mm ²
4.	D1	Diodes Inc.	B230A-13-F	VF@Io= 500.0 mV VRRM= 30.0 V	1	\$0.09	SMA 37 mm ²
5.	L1	Bourns	SRN6045-1R3Y	L= 1.3 uH DCR= 17.0 mOhm	1	\$0.16	SRN6045 64 mm ²
6.	Ren	Vishay-Dale	CRCW04024K64FKED Series= CRCW..e3	Res= 4.64 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	Rfbb	Vishay-Dale	CRCW06031K00FKEA Series= CRCW..e3	Res= 1000.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Rfbt	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
9.	Rsync	Vishay-Dale	CRCW04024K64FKED Series= CRCW..e3	Res= 4.64 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
10.	U1	Texas Instruments	LMR12020XSD/NOPB	Switcher	1	\$0.95	 SDA10A 16 mm²

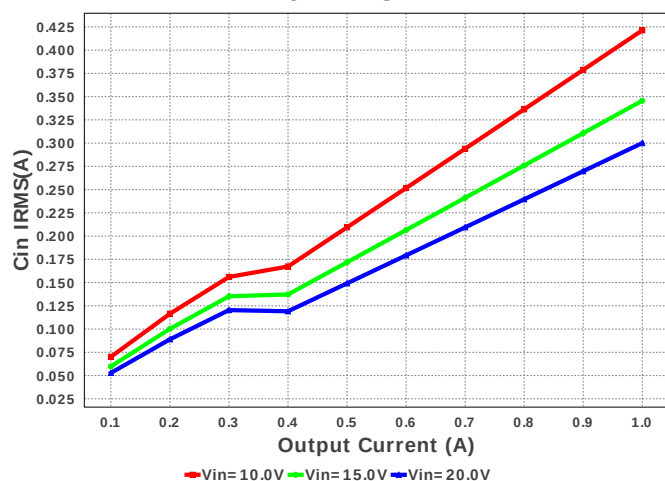
IC Tj



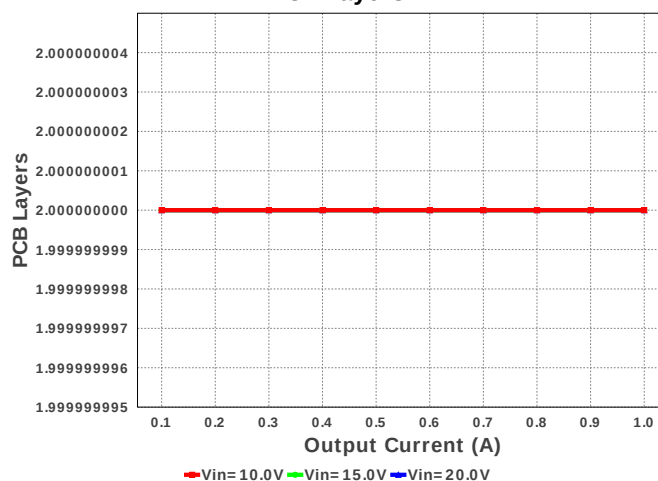
Duty Cycle

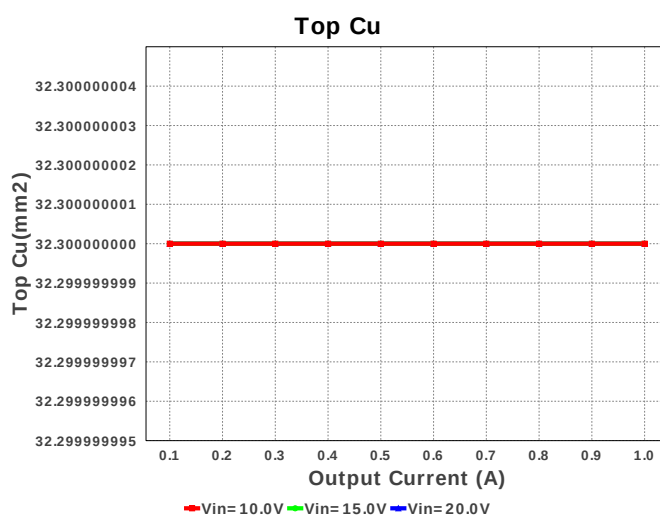
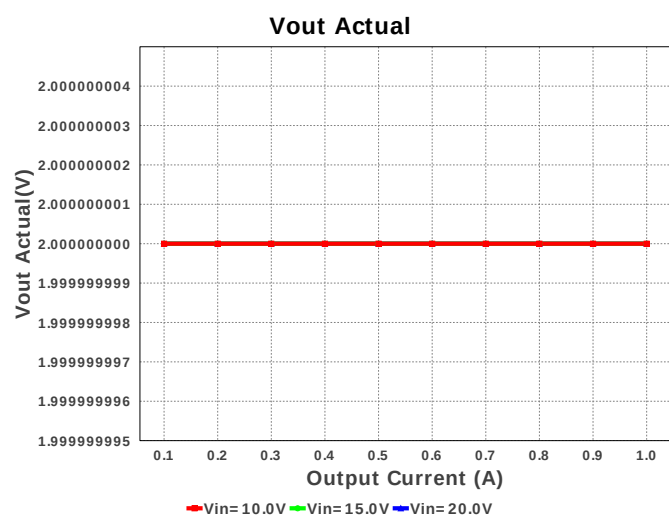
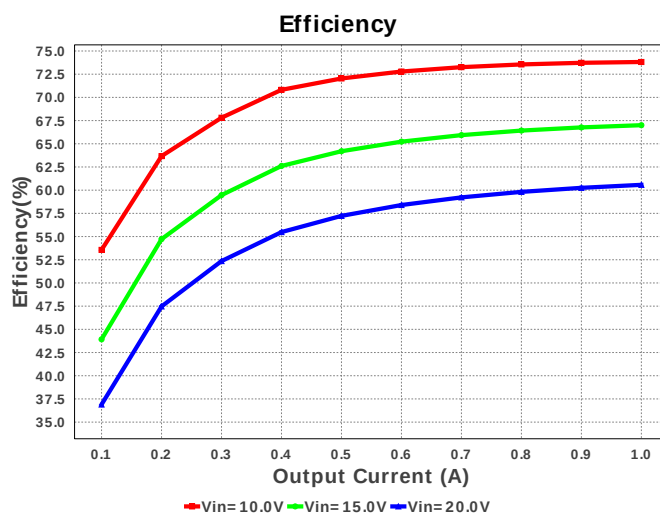
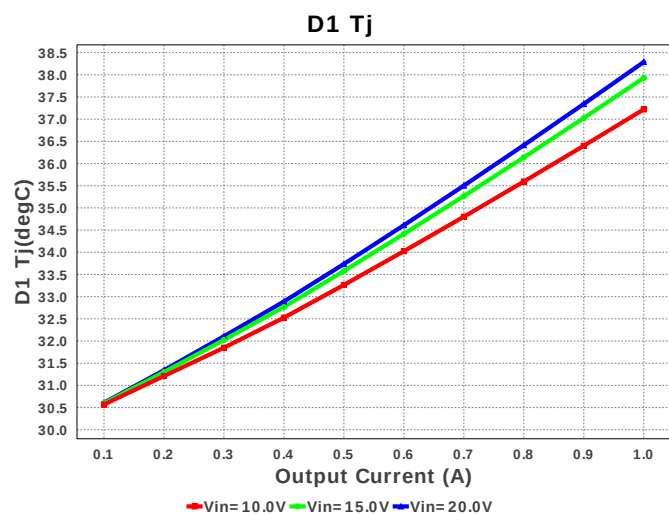
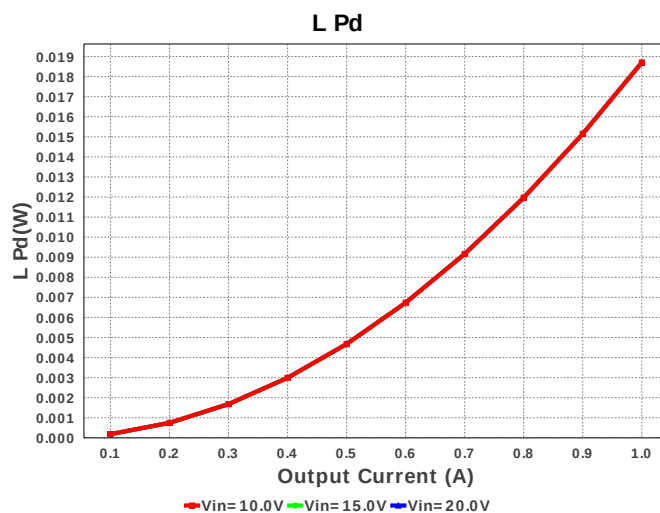
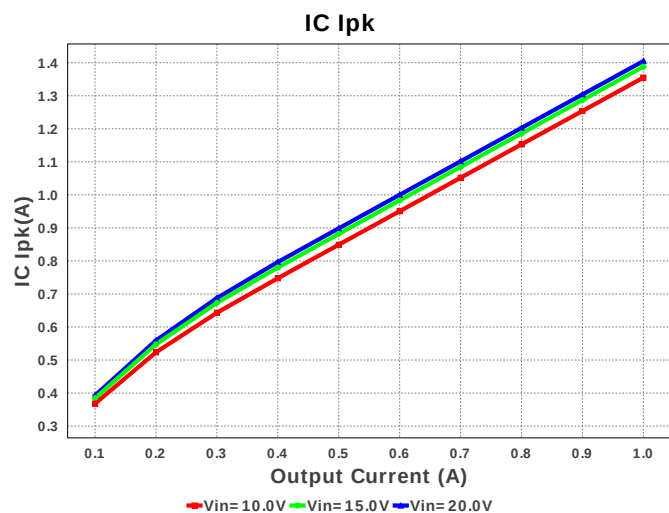


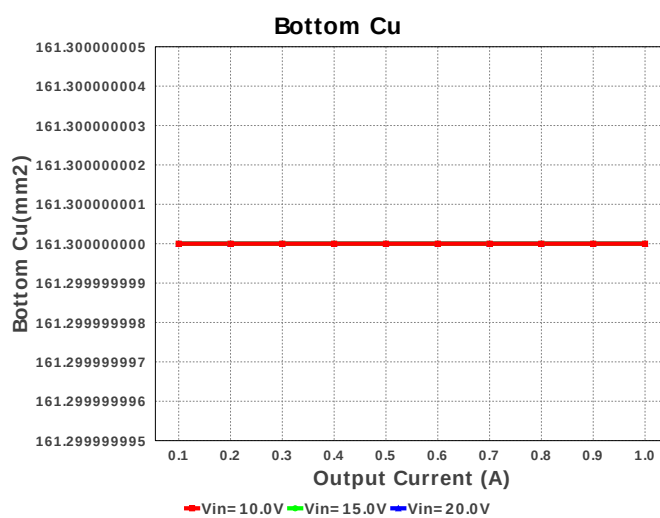
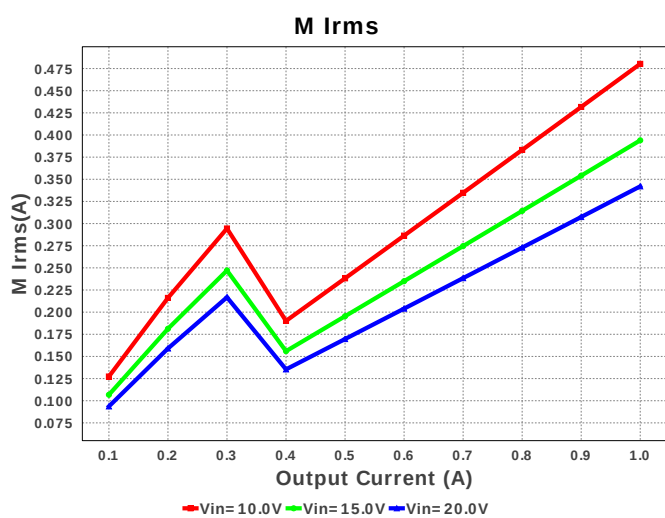
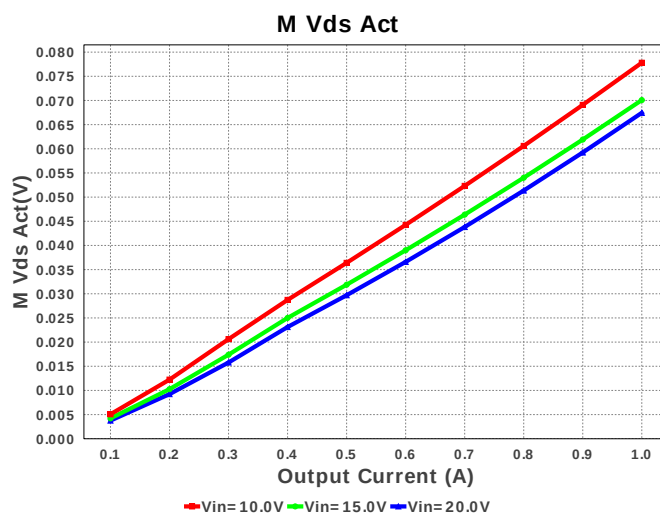
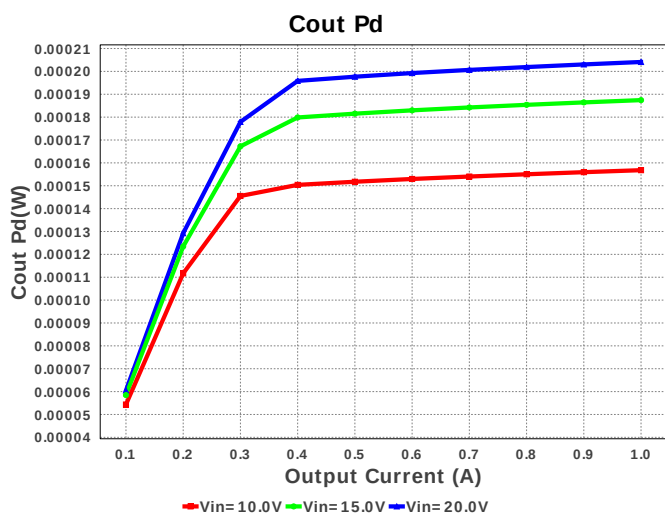
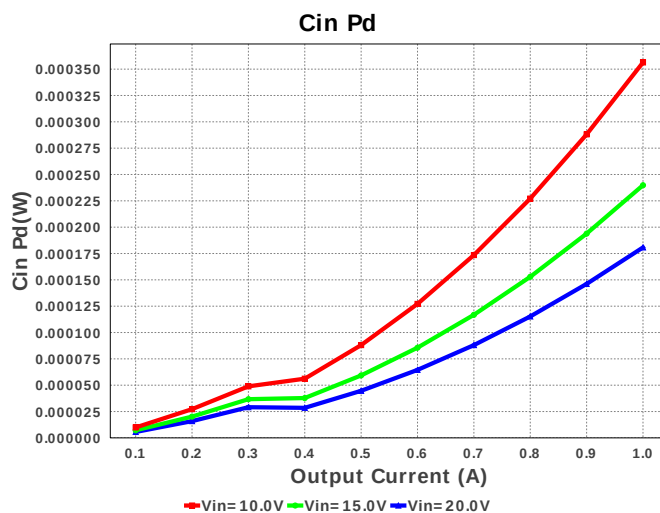
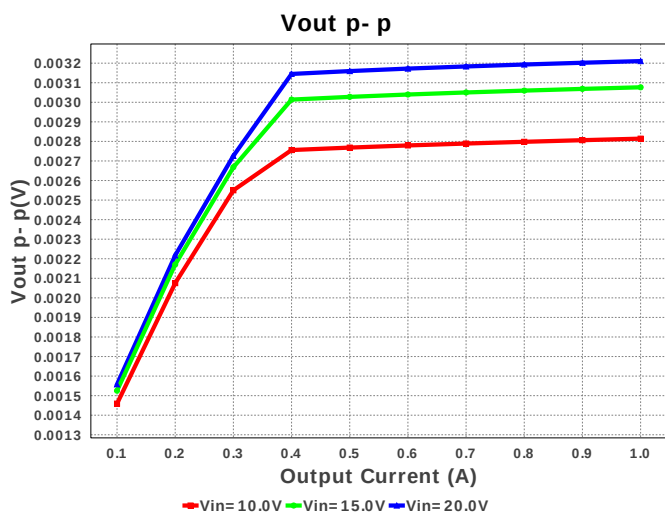
Cin IRMS

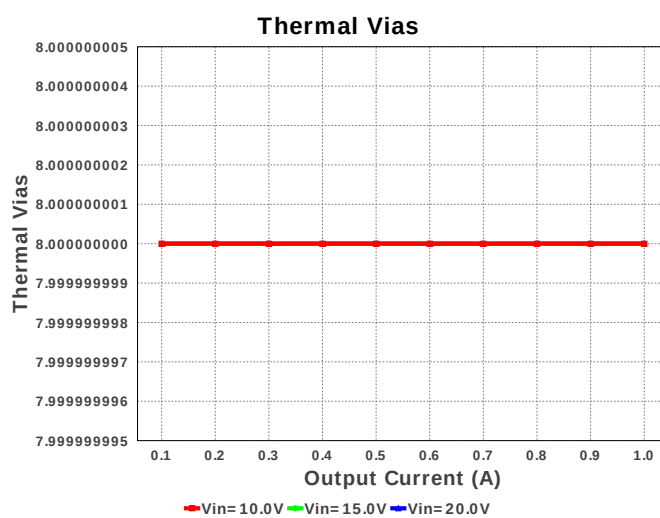
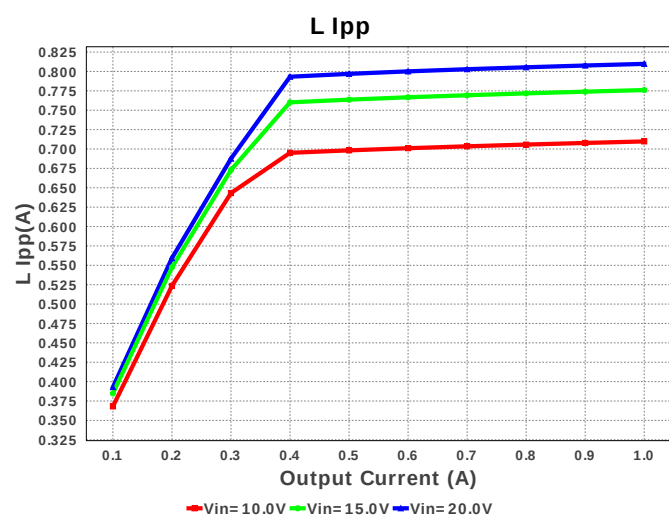
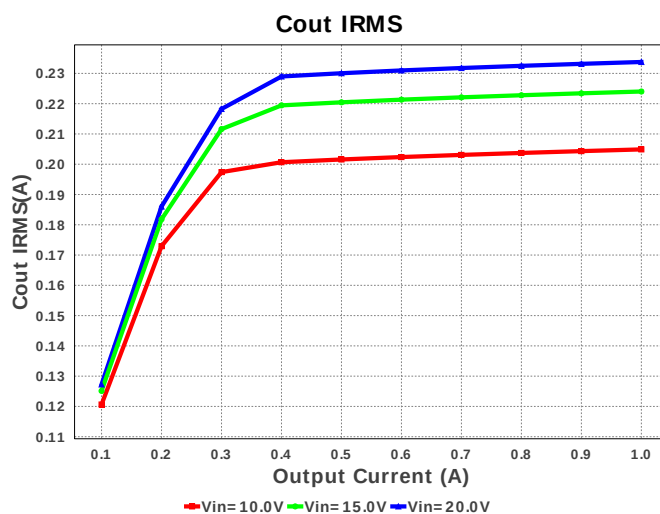
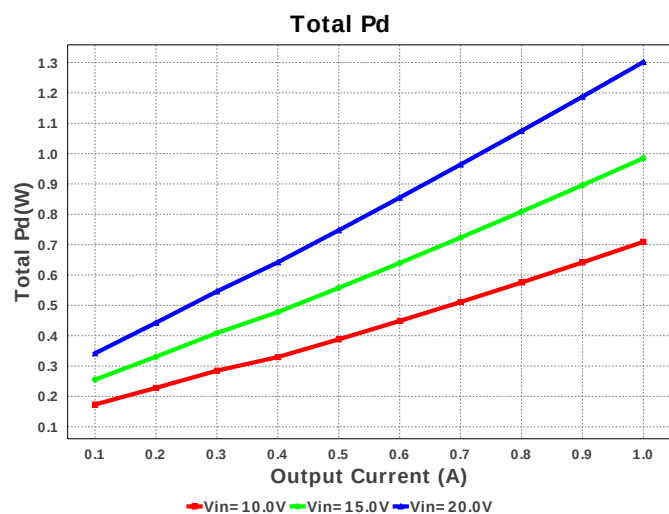
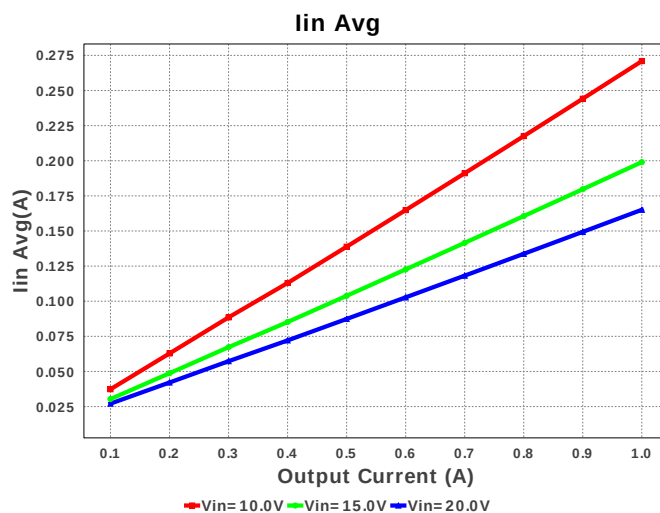
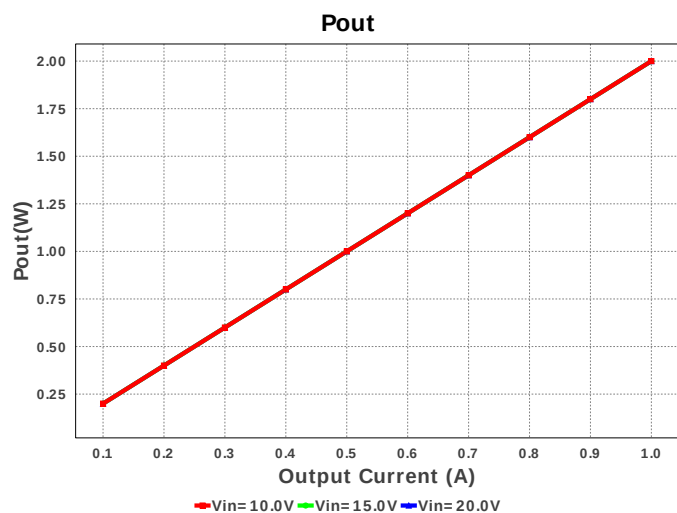


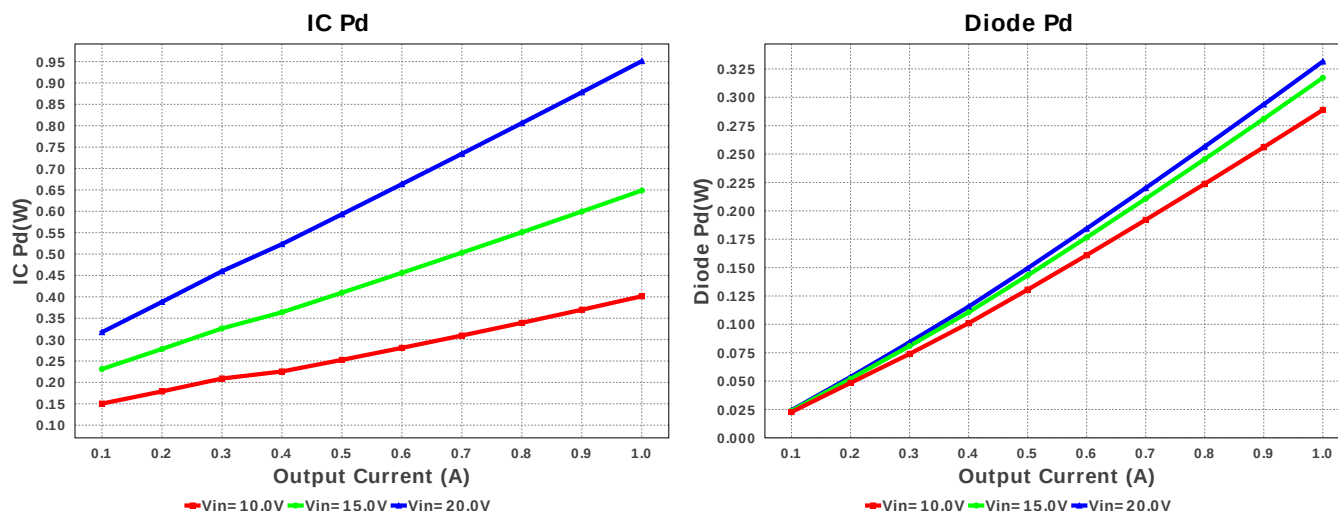
PCB Layers











Operating Values

#	Name	Value	Category	Description
1.	Bottom Cu	161.3 mm ²	Board_Layout	Recommended minimum area of bottom layer copper connected to DAP
2.	PCB Layers	2.0	Board_Layout	Recommended number of PCB layers for the necessary IC Thermal Resistance
3.	Thermal Vias	8.0	Board_Layout	Recommended number of 10 mil thermal vias under the IC
4.	Top Cu	32.3 mm ²	Board_Layout	Recommended minimum area of top layer copper connected to DAP
5.	Cin IRMS	300.446 mA	Current	Input capacitor RMS ripple current
6.	Cout IRMS	234.623 mA	Current	Output capacitor RMS ripple current
7.	IC Ipk	1.406 A	Current	Peak switch current in IC
8.	Iin Avg	165.44 mA	Current	Average input current
9.	L Ipp	812.76 mA	Current	Peak-to-peak inductor ripple current
10.	M1 Irms	342.635 mA	Current	Q Iavg
11.	BOM Count	10	General	Total Design BOM count
12.	FootPrint	161.0 mm ²	General	Total Foot Print Area of BOM components
13.	Frequency	2.0 MHz	General	Switching frequency
14.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
15.	M Vds Act	60.806 mV	General	Voltage drop across the MosFET
16.	Pout	2.0 W	General	Total output power
17.	Total BOM	\$1.57	General	Total BOM Cost
18.	D1 Tj	38.521 degC	Op_Point	D1 junction temperature
19.	Vout Actual	2.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	2.0 V	Op_Point	Operational Output Voltage
21.	Duty Cycle	11.74 %	Op_point	Duty cycle
22.	Efficiency	60.446 %	Op_point	Steady state efficiency
23.	IC Tj	80.288 degC	Op_point	IC junction temperature
24.	ICThetaJA	53.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	1.0 A	Op_point	Iout operating point
26.	VIN_OP	20.0 V	Op_point	Vin operating point
27.	Vout Act	2.0 V	Op_point	Achieved Vout with feedback resistor pair
28.	Vout p-p	3.222 mV	Op_point	Peak-to-peak output ripple voltage
29.	Cin Pd	181.258 μW	Power	Input capacitor power dissipation
30.	Cout Pd	205.604 μW	Power	Output capacitor power dissipation
31.	Diode Pd	340.83 mW	Power	Diode power dissipation
32.	IC Pd	948.834 mW	Power	IC power dissipation
33.	L Pd	18.7 mW	Power	Inductor power dissipation
34.	Total Pd	1.309 W	Power	Total Power Dissipation
35.	Vout Tolerance	2.02 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	20.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	2.0	Output Voltage
5.	base_pn	LMR12020	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR12020** Product Folder : <http://www.ti.com/product/LMR12020> : contains the data sheet and other resources.

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