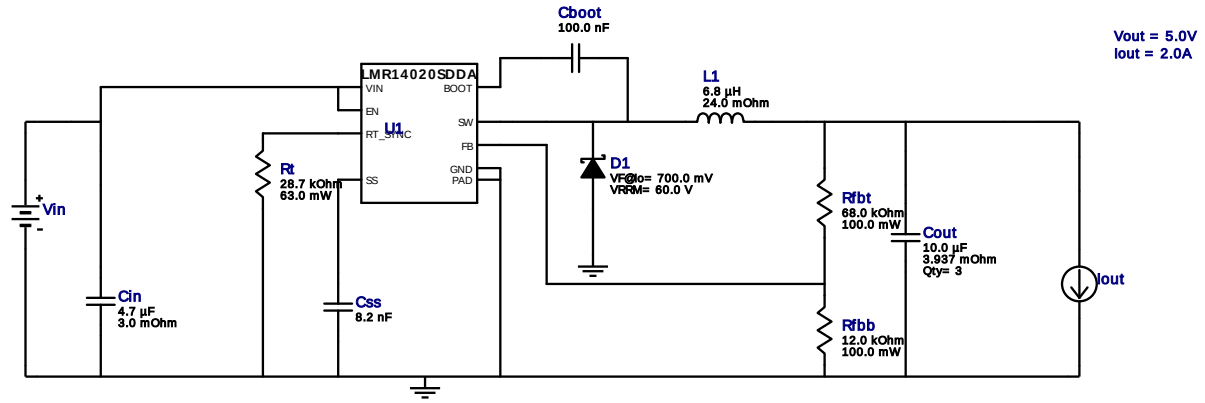
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 6.0V
VinMax = 36.0V
Vout = 5.0V
Iout = 2.0A

Device = LMR14020SDDAR
Topology = Buck
Created = 8/11/16 5:20:02 AM
BOM Cost = $2.03
BOM Count = 12
Total Pd = 1.7W

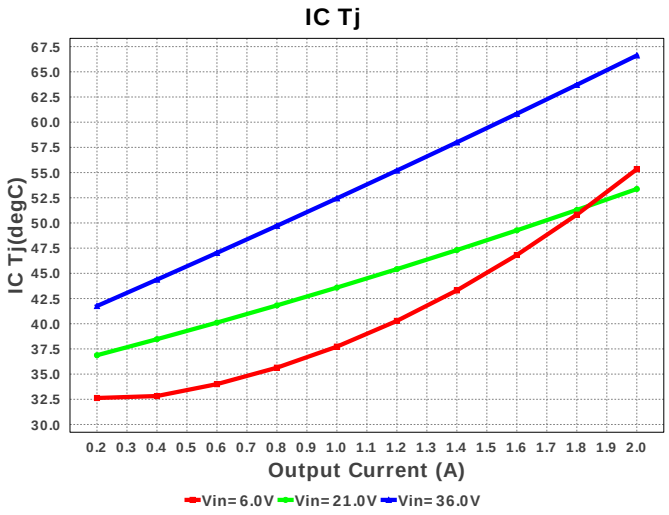
Design : 4085315/4 LMR14020SDDAR
LMR14020SDDAR 6.0V-36.0V to 5.00V @ 2.0001874999999996A

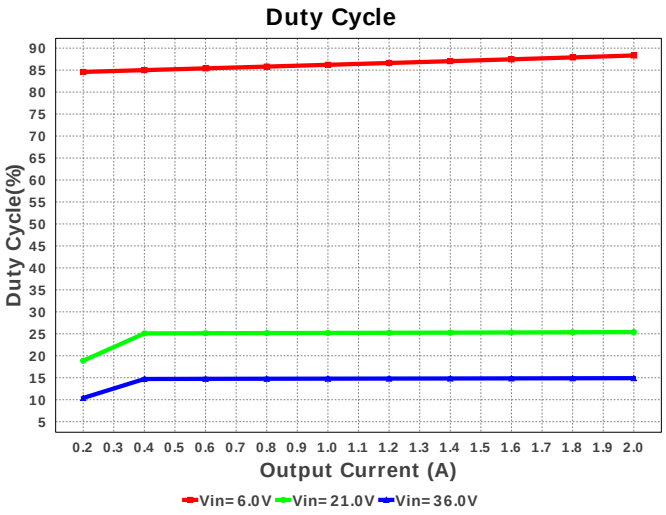


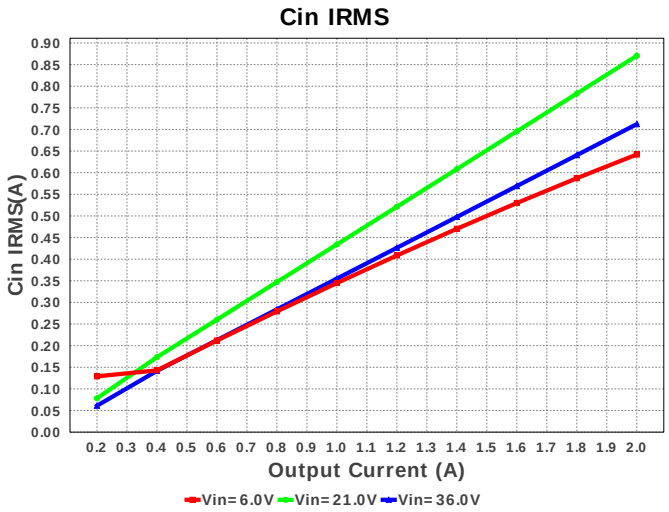
Electrical BOM

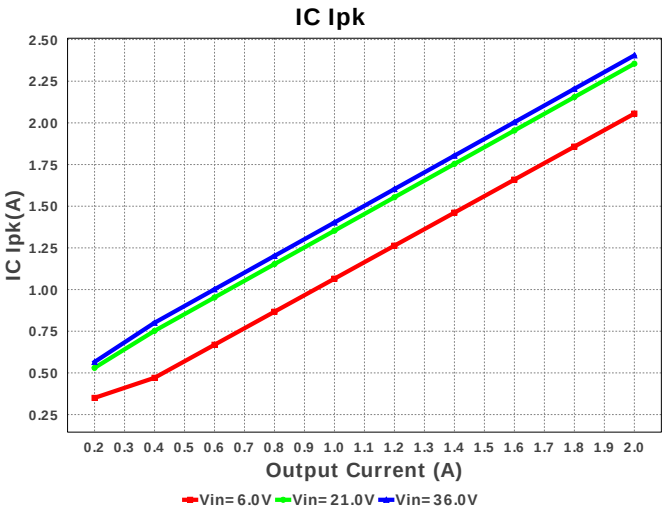
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	HMK212B7104KG-T Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	$0.07	1206 11 mm²
3.	Cout	MuRata	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.	B360A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.12	SMA 37 mm²
6.	L1	TDK	VLP8040T-6R8M	L= 6.8 µH DCR= 24.0 mOhm	1	$0.22	VLP8040 113 mm²
7.	Rfbb	Yageo America	RC0603FR-0712KL Series= ?	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
8.	Rfbt	Yageo America	RC0603FR-0768KL Series= ?	Res= 68.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
9.	Rt	Vishay-Dale	CRCW040228K7FKED Series= CRCW..e3	Res= 28.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

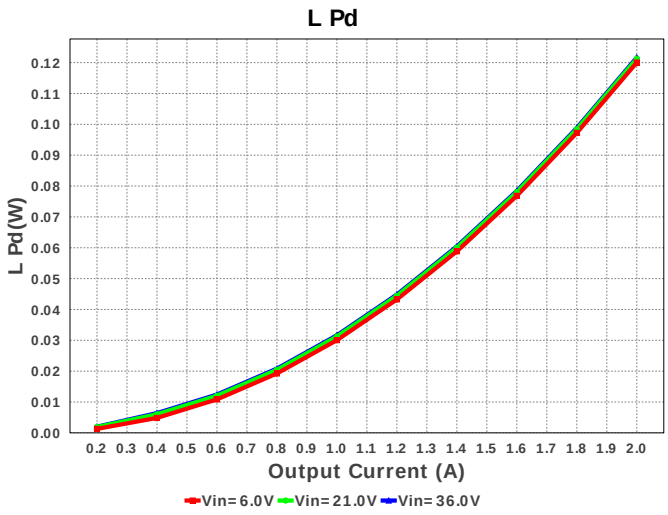
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14020SDDAR	Switcher	1	$1.46	DDA0008E_N 57 mm^2

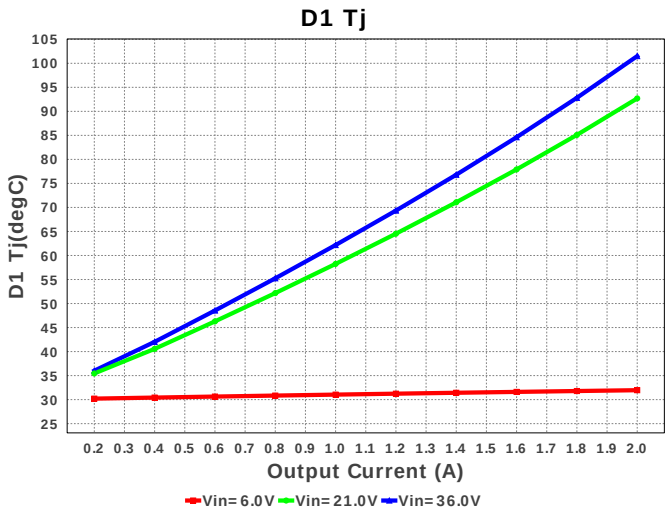


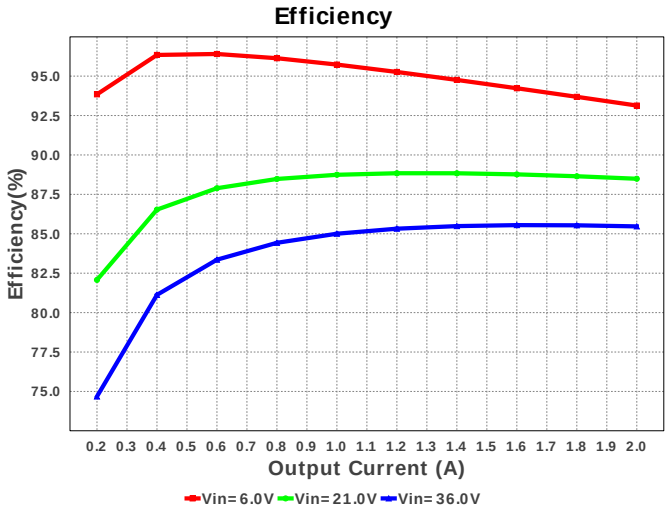


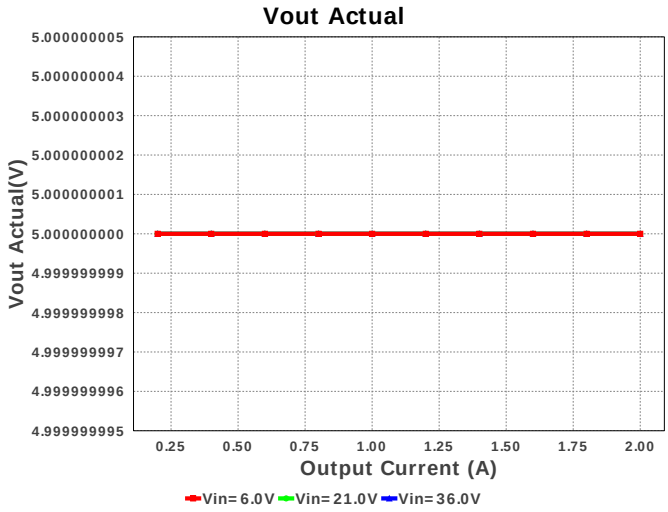


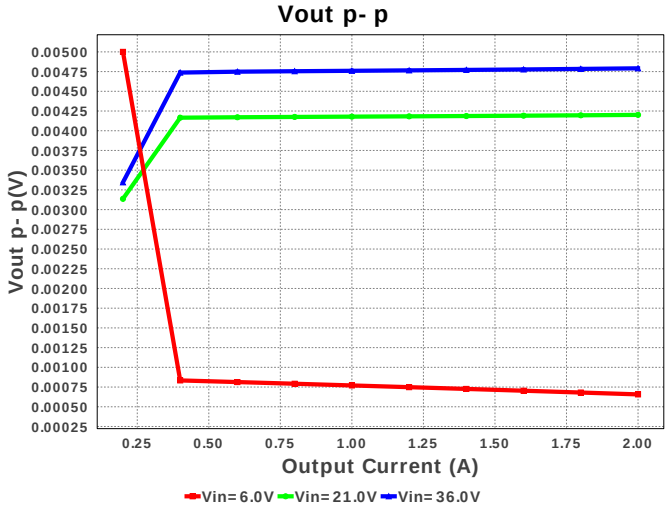


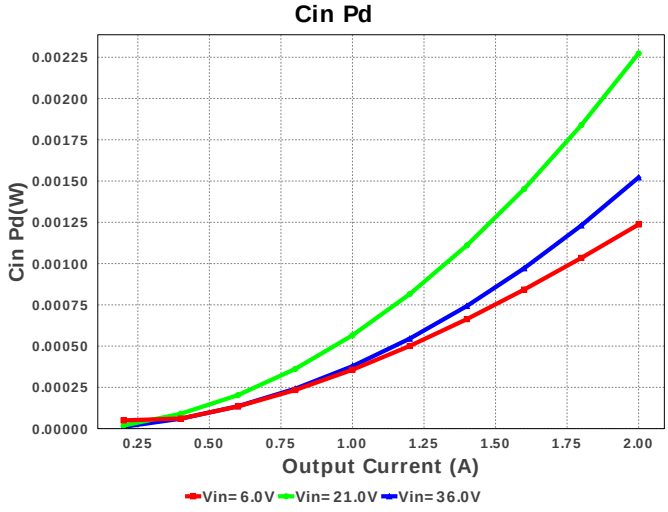


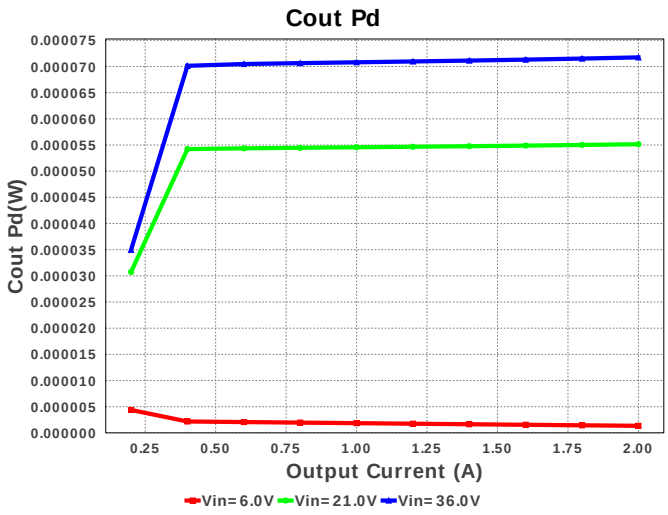


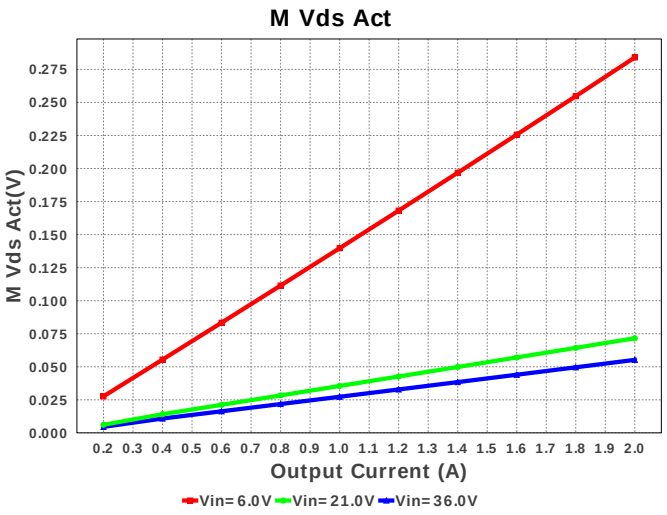


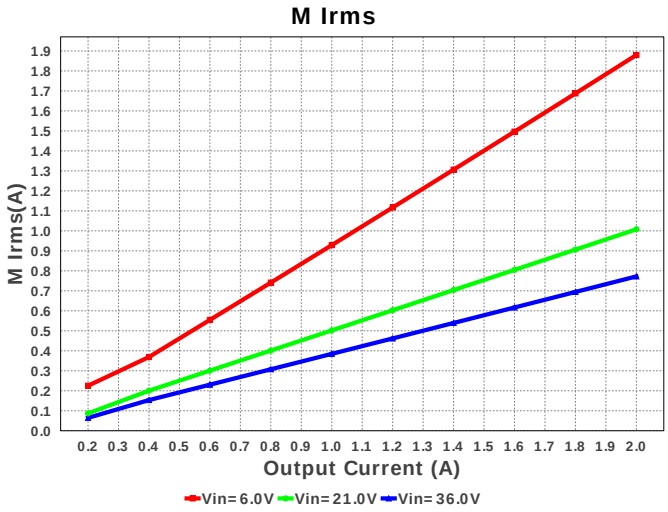


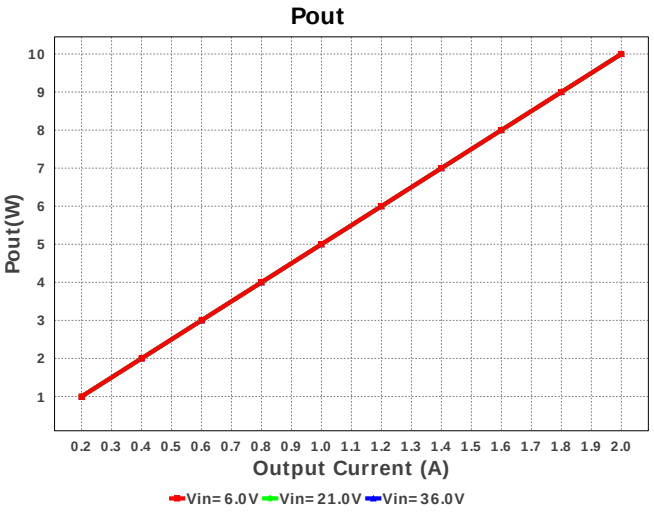


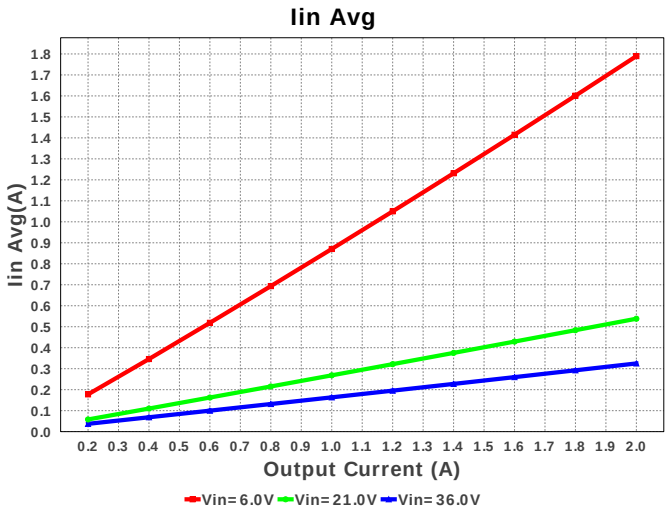


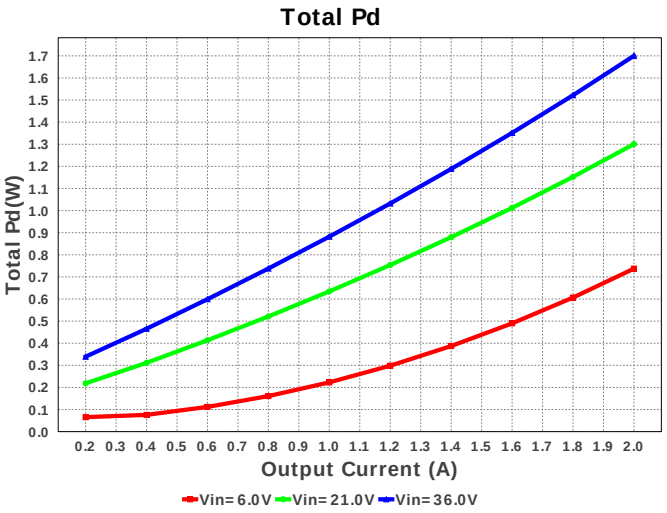


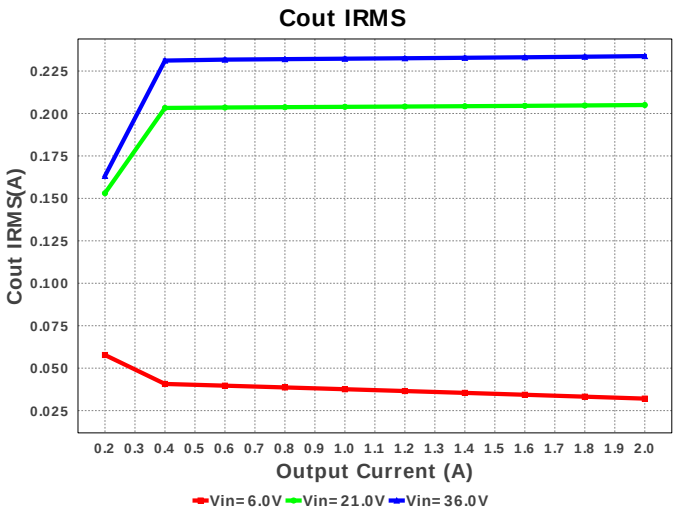


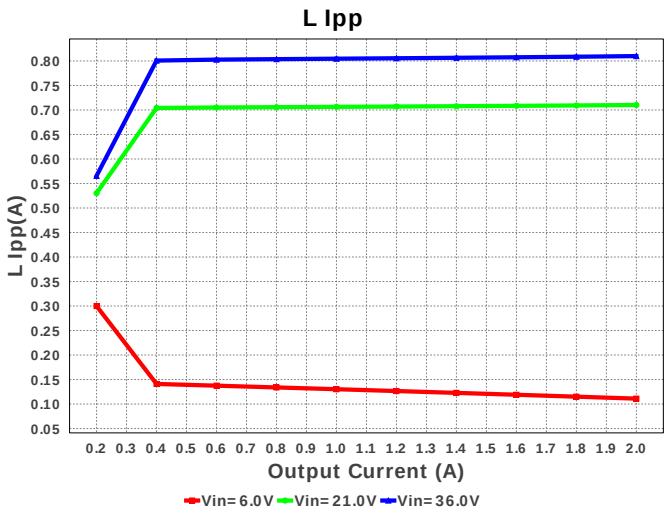


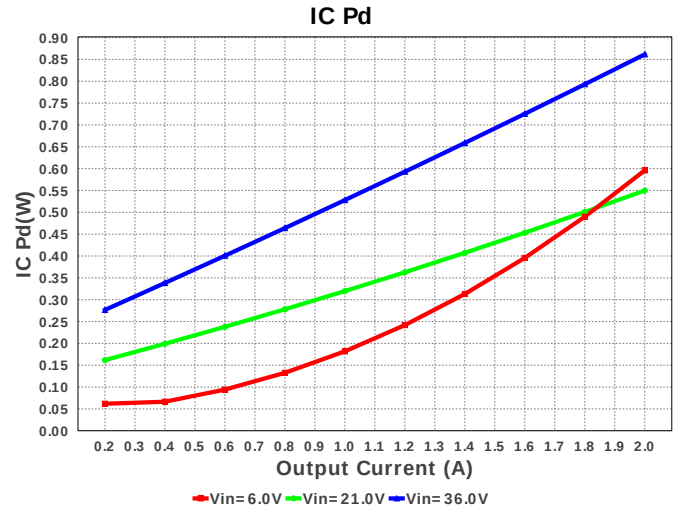


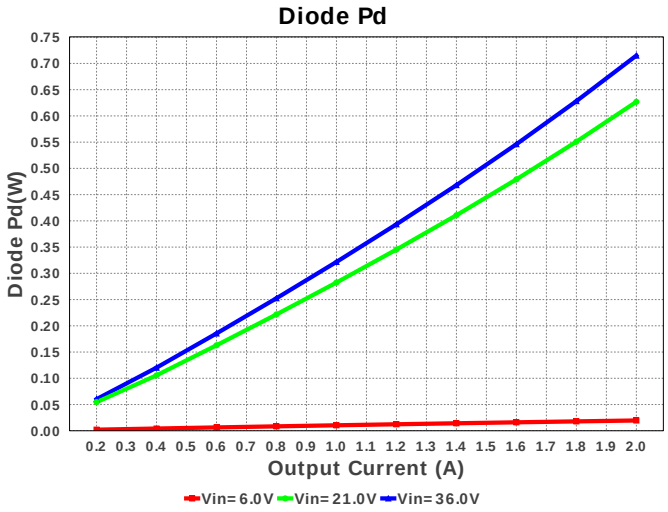


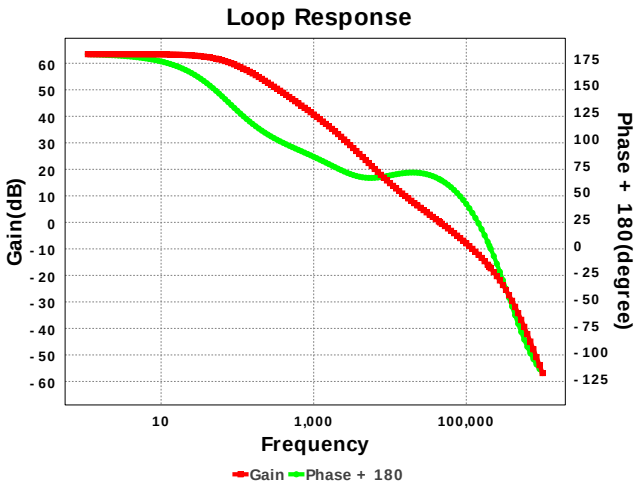












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	712.294 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	233.804 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.405 A	Current	Peak switch current in IC
4.	Iin Avg	325.01 mA	Current	Average input current
5.	L Ipp	809.92 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	772.158 mA	Current	MOSFET RMS current
7.	BOM Count	12	General	Total Design BOM count
8.	FootPrint	261.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	837.457 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	55.228 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	10.0 W	General	Total output power
14.	Total BOM	$2.03	General	Total BOM Cost
15.	D1 Tj	101.5 degC	Op_Point	D1 junction temperature
16.	Vout Actual	5.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
18.	Cross Freq	45.273 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	14.905 %	Op_point	Duty cycle
20.	Efficiency	85.469 %	Op_point	Steady state efficiency
21.	IC Tj	66.189 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	61.848 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	36.0 V	Op_point	Vin operating point
26.	Vout p-p	4.791 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	1.522 mW	Power	Input capacitor power dissipation
28.	Cout Pd	71.738 µW	Power	Output capacitor power dissipation
29.	Diode Pd	715.004 mW	Power	Diode power dissipation
30.	IC Pd	861.632 mW	Power	IC power dissipation
31.	L Pd	121.647 mW	Power	Inductor power dissipation
32.	Total Pd	1.7 W	Power	Total Power Dissipation
33.	Vout Tolerance	4.158 %		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	36.0	Maximum input voltage
3.	VinMin	6.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LMR14020S	Texas Instruments Base Part 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.