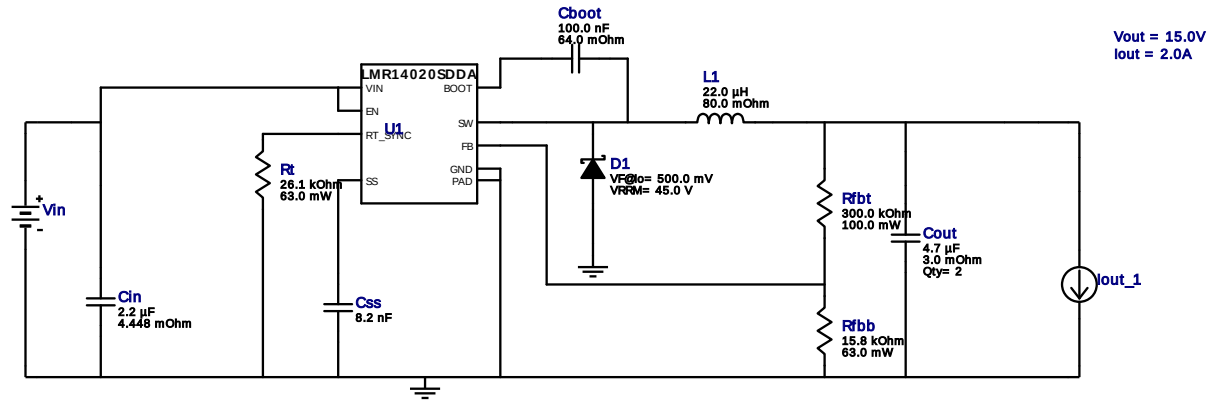
WEBENCH® Design Report

VinMin = 22.0V
VinMax = 30.0V
Vout = 15.0V
Iout = 2.0A

Device = LMR14020SDDAR
Topology = Buck
Created = 7/17/16 8:13:39 AM
BOM Cost = $2.09
BOM Count = 11
Total Pd = 1.77W

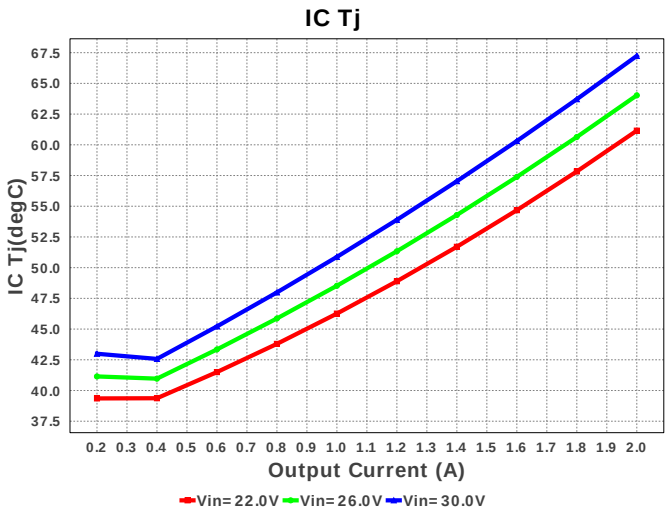
Design : 4352199/32 LMR14020SDDAR
LMR14020SDDAR 22.0V-30.0V to 14.99V @ 2.000142400253325A

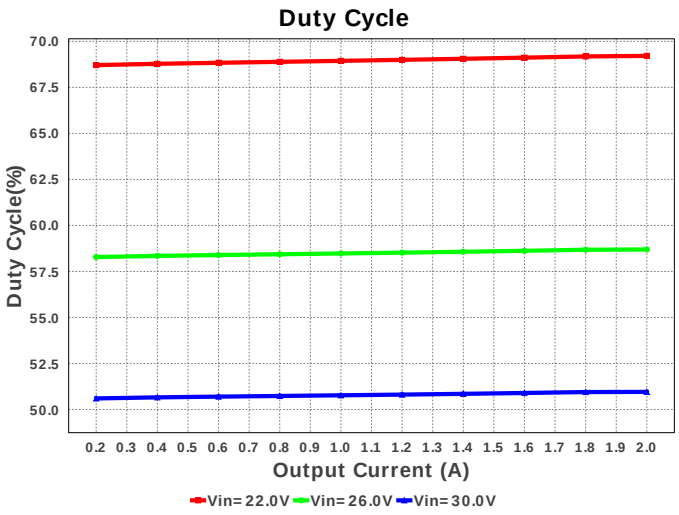


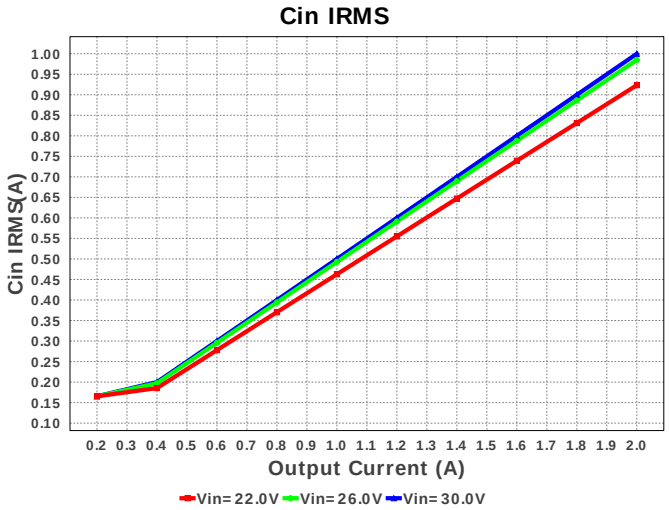
Electrical BOM

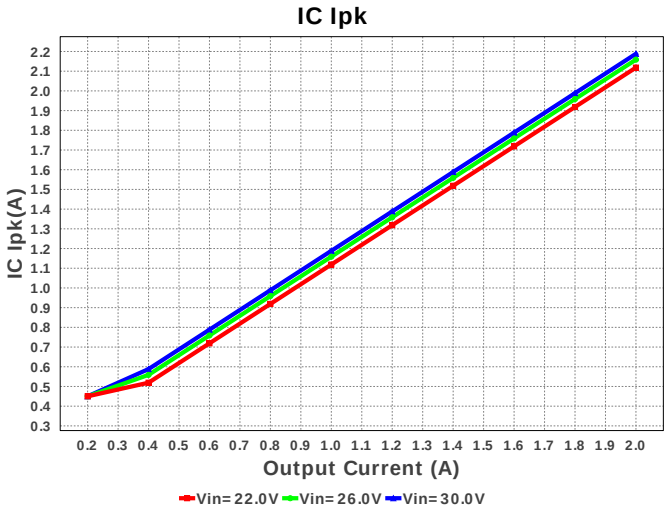
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
3.	Cout	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	2	$0.07	1206 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	Vishay-Semiconductor	BYS10-45-E3/TR	VF@Io= 500.0 mV VRRM= 45.0 V	1	$0.10	SMA 37 mm²
6.	L1	Bourns	SDR1105-220ML	L= 22.0 µH DCR= 80.0 mOhm	1	$0.29	SDR1105 157 mm²
7.	Rfbb	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	Rfbt	Yageo America	RC0603FR-07300KL Series= ?	Res= 300.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
9.	Rt	Vishay-Dale	CRCW040226K1FKED Series= CRCW..e3	Res= 26.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

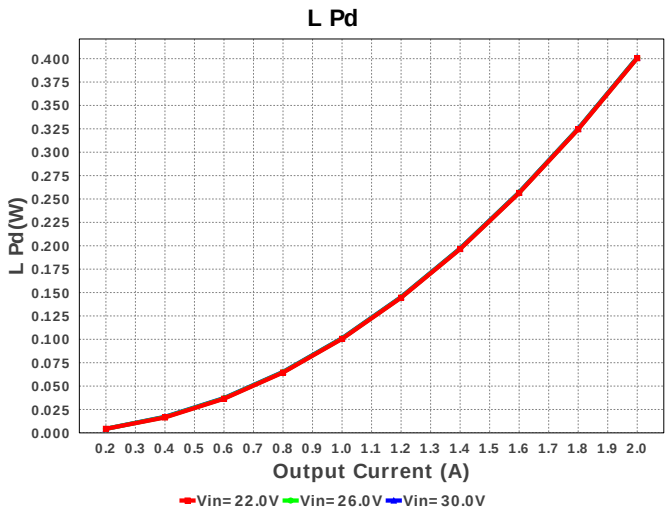
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14020SDDAR	Switcher	1	$1.46	DDA0008E_N 57 mm²

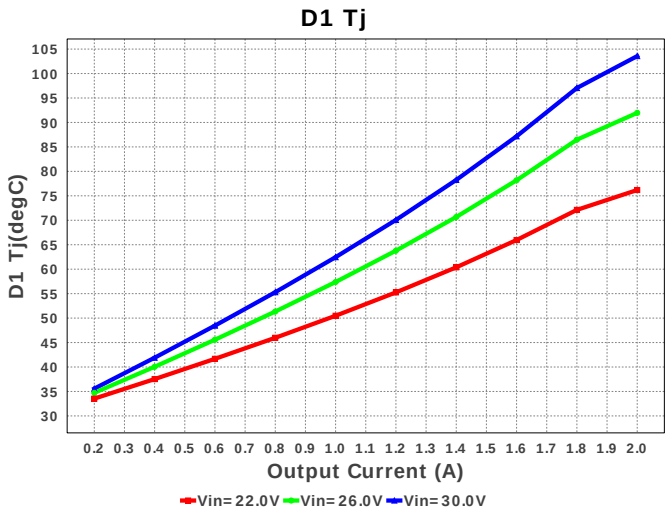


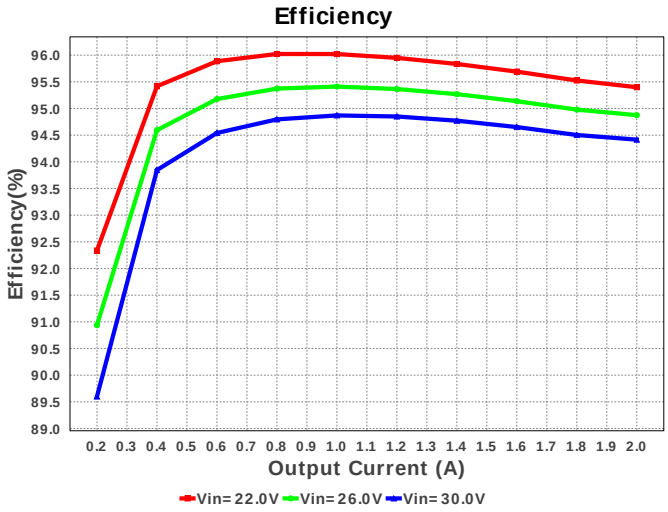


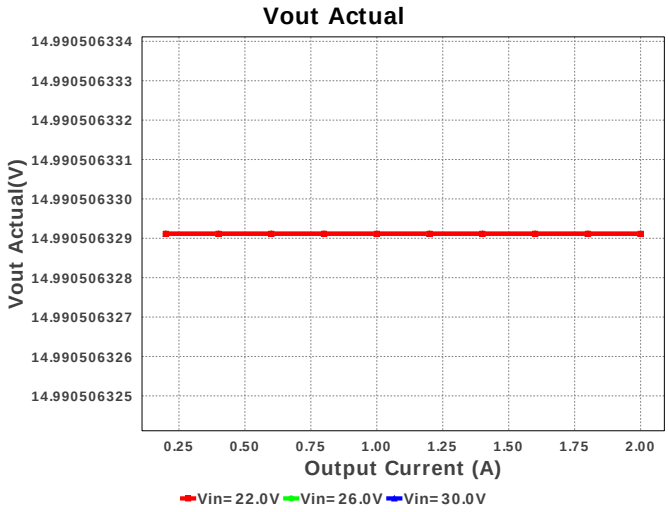


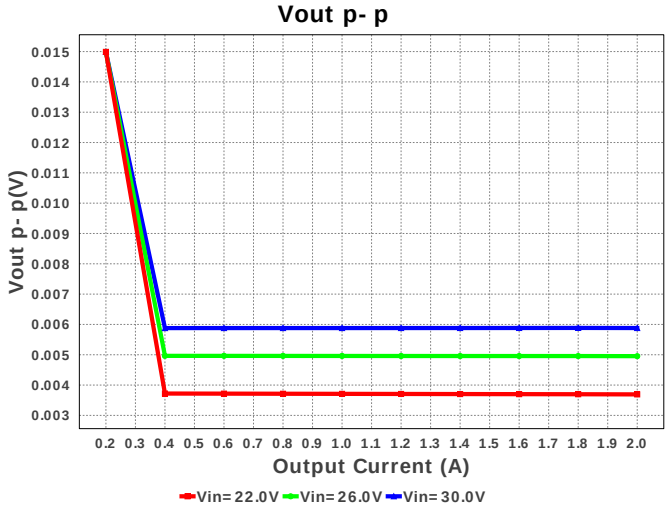


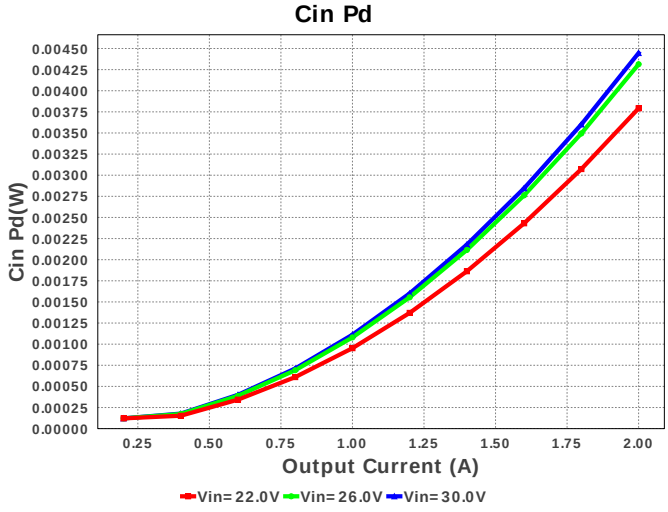


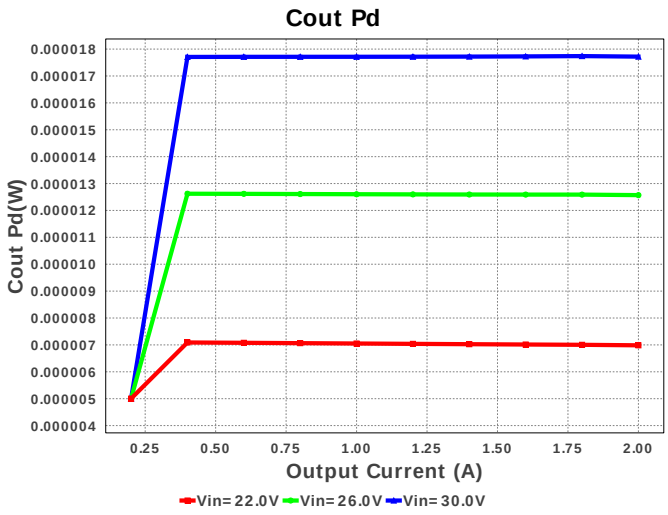


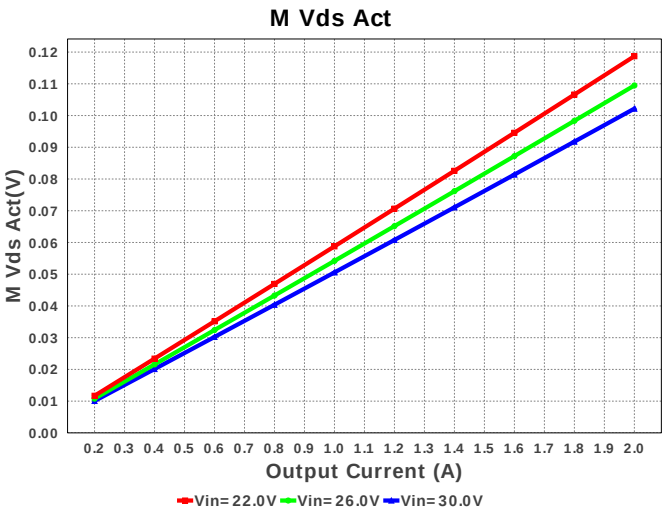


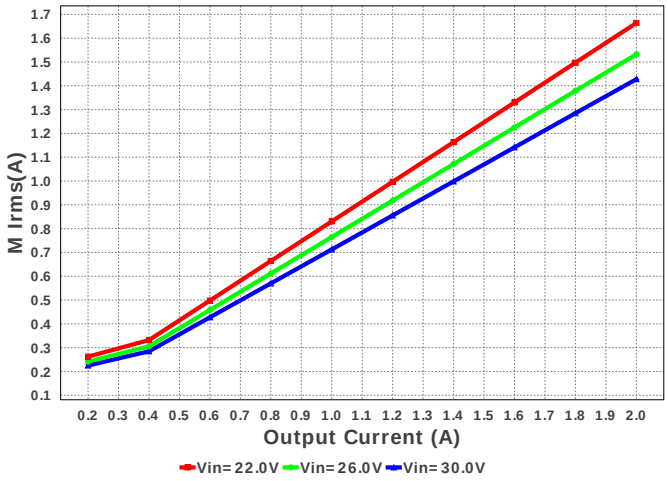


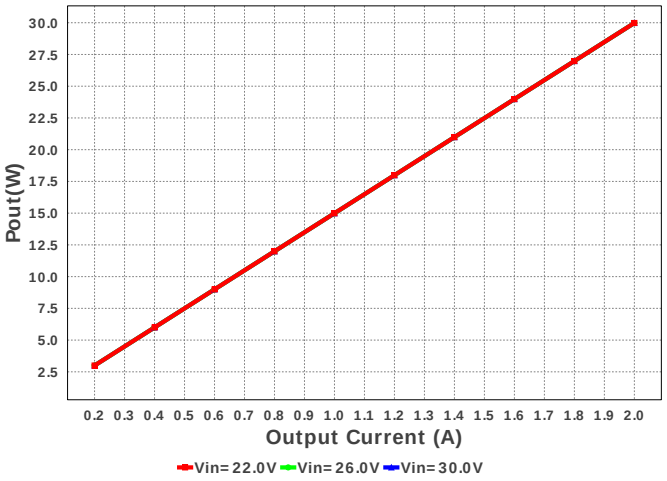


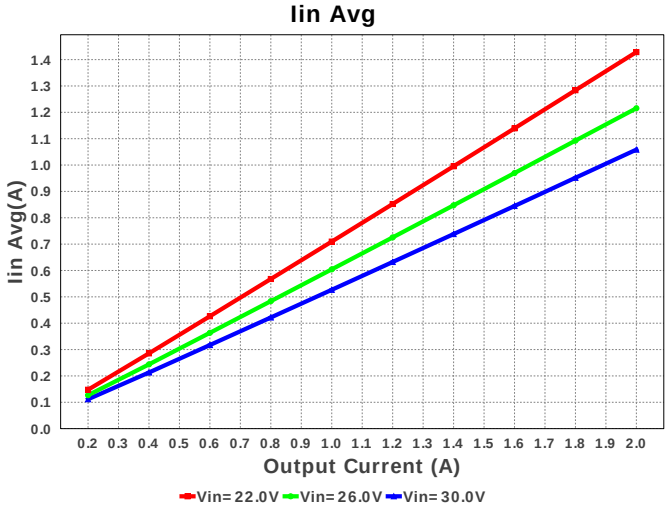


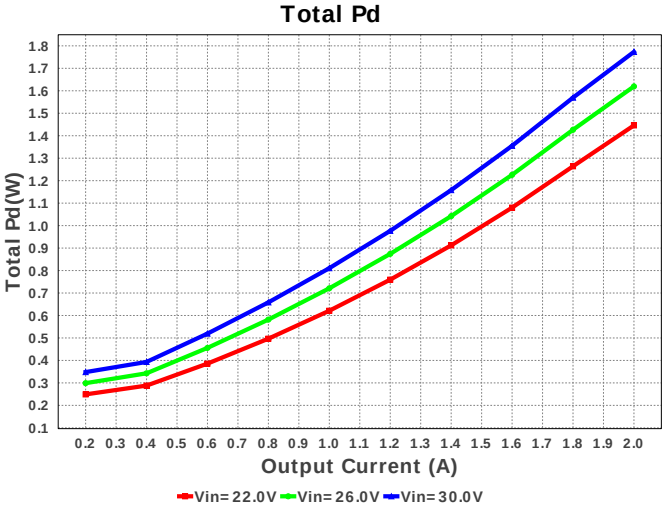


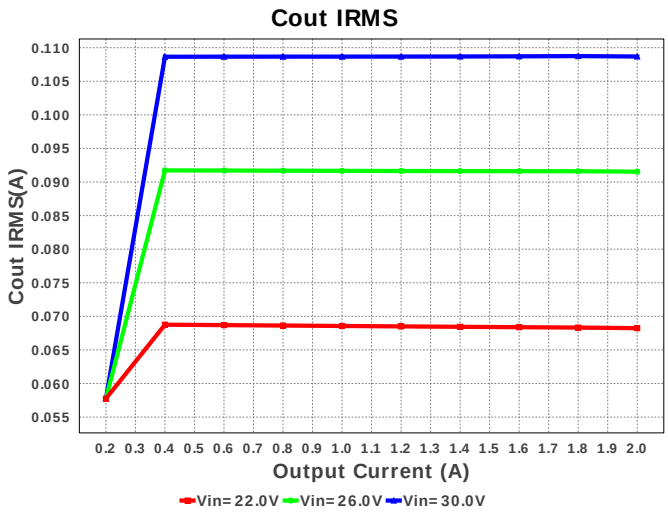


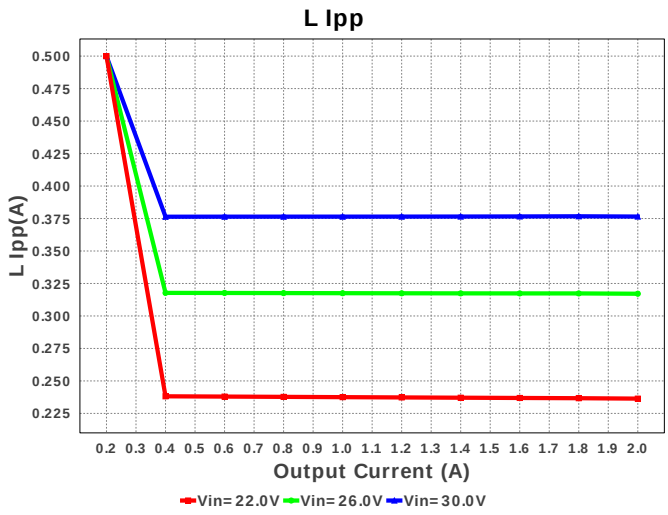


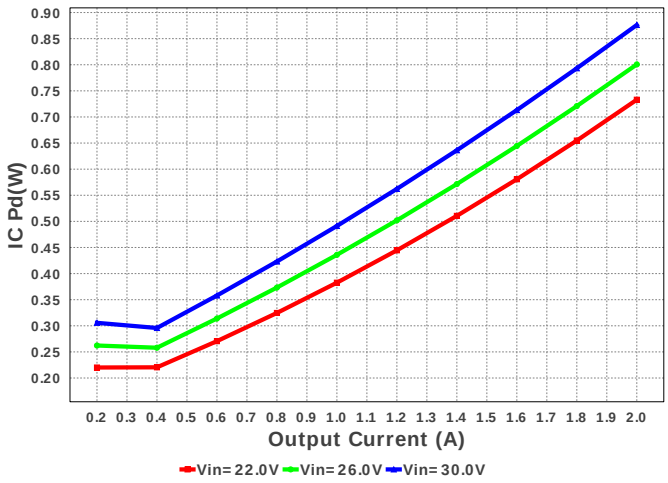


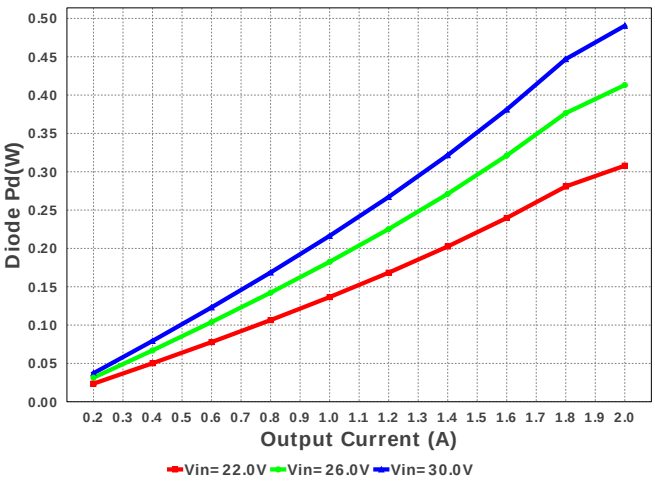


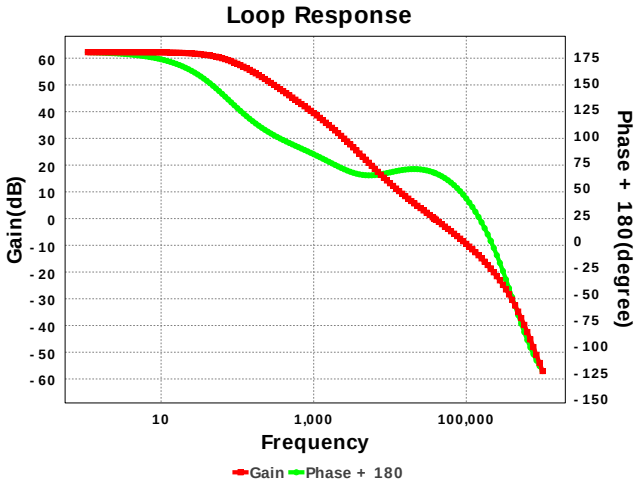












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	999.84 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	108.688 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.188 A	Current	Peak switch current in IC
4.	Iin Avg	1.058 A	Current	Average input current
5.	L Ipp	376.51 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	1.428 A	Current	Q Iavg
7.	BOM Count	11	General	Total Design BOM count
8.	FootPrint	305.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	917.123 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	102.149 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	29.98 W	General	Total output power
13.	Total BOM	$2.09	General	Total BOM Cost
14.	D1 Tj	103.565 degC	Op_Point	D1 junction temperature
15.	Vout Actual	14.991 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	14.99 V	Op_Point	Operational Output Voltage
17.	Cross Freq	38.253 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	50.958 %	Op_point	Duty cycle
19.	Efficiency	94.417 %	Op_point	Steady state efficiency
20.	IC Tj	66.797 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	64.734 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	30.0 V	Op_point	Vin operating point
25.	Vout p-p	5.881 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	4.447 mW	Power	Input capacitor power dissipation
27.	Cout Pd	17.72 µW	Power	Output capacitor power dissipation
28.	Diode Pd	490.436 mW	Power	Diode power dissipation
29.	IC Pd	876.127 mW	Power	IC power dissipation
30.	L Pd	401.2 mW	Power	Inductor power dissipation
31.	Total Pd	1.773 W	Power	Total Power Dissipation
32.	Vout Tolerance	4.365 %		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	30.0	Maximum input voltage
3.	VinMin	22.0	Minimum input voltage
4.	Vout	15.0	Output Voltage
5.	base_pn	LMR14020S	Base Product 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.