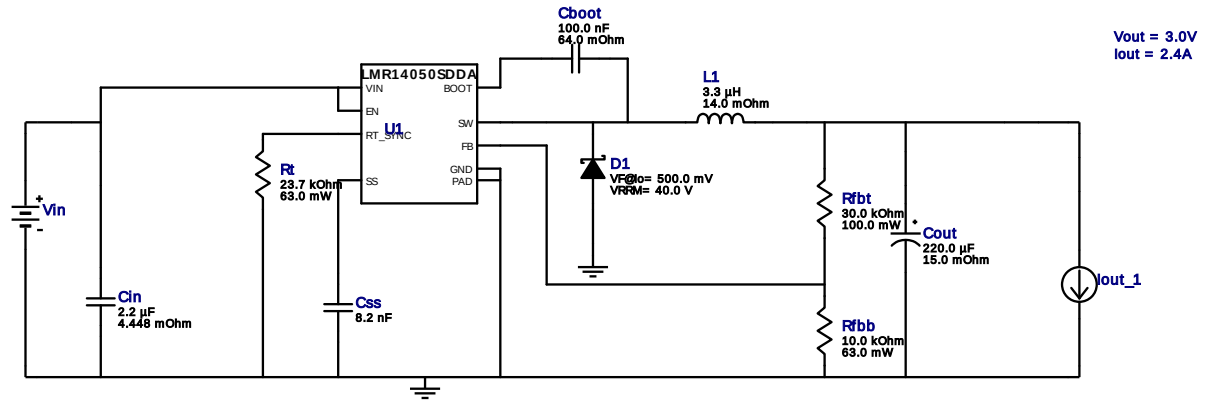
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 3.0V
Iout = 2.4A

Device = LMR14050SDDAR
Topology = Buck
Created = 9/17/16 5:47:51 AM
BOM Cost = $2.85
BOM Count = 10
Total Pd = 1.68W

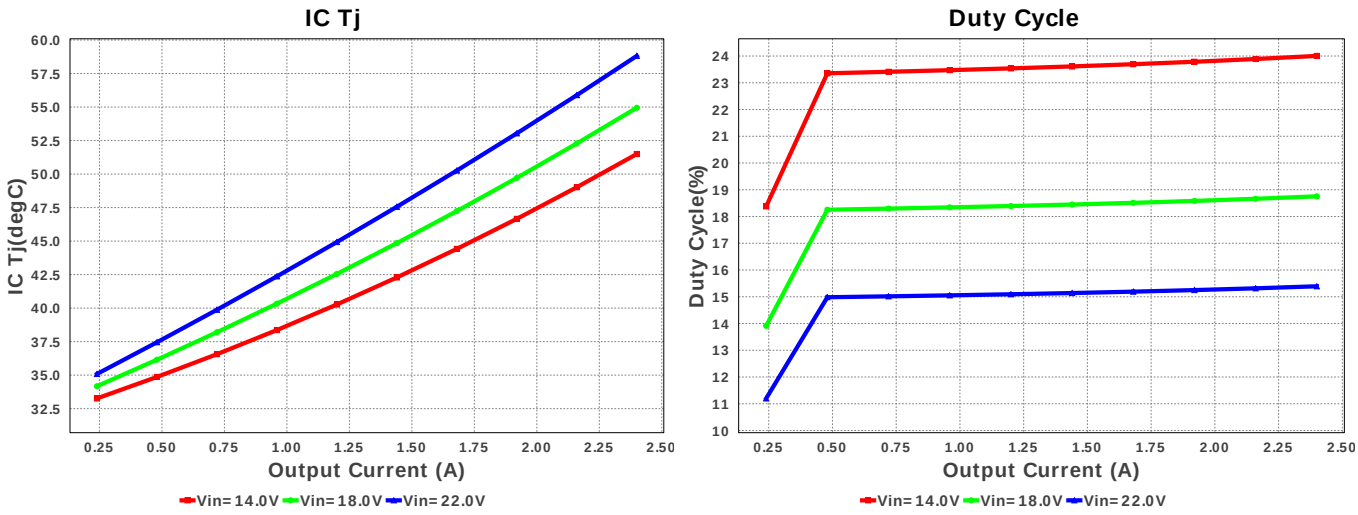
Design : 1913968/1493 LMR14050SDDAR
LMR14050SDDAR 14.0V-22.0V to 3.00V @ 2.4002249999999994A

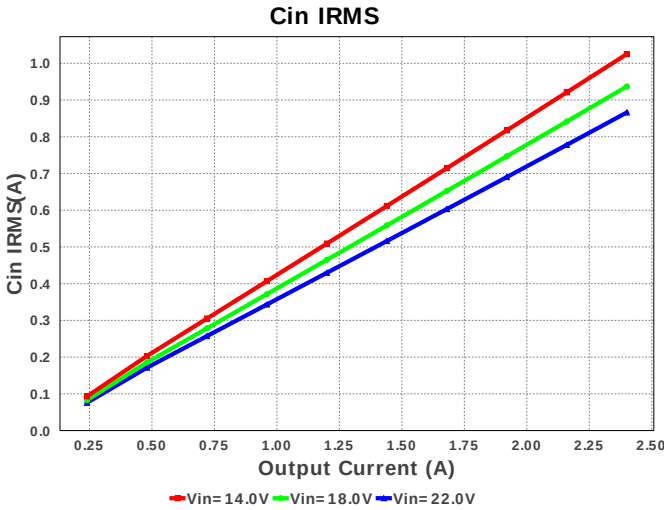


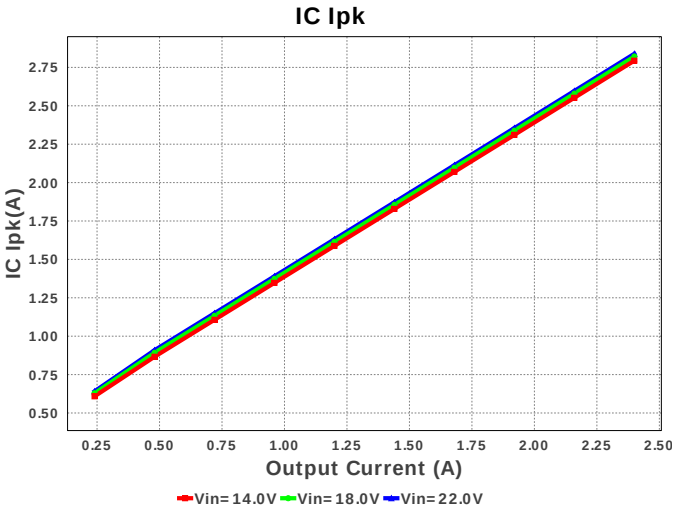
Electrical BOM

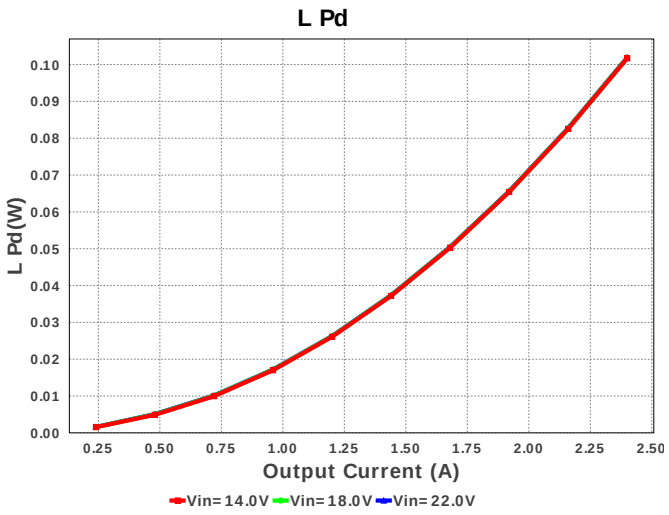
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
3.	Cout	Panasonic	6SVPE220MW Series= SVPE	Cap= 220.0 uF ESR= 15.0 mOhm VDC= 6.3 V IRMS= 3.15 A	1	$0.20	CAPSMT_62_E61 53 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.	B340-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.10	SMC 83 mm²
6.	L1	Coilcraft	MSS7341T-332NLB	L= 3.3 µH DCR= 14.0 mOhm	1	$0.50	MSS7341T 83 mm²
7.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	Rfbt	Yageo America	RC0603FR-0730KL Series= ?	Res= 30.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
9.	Rt	Vishay-Dale	CRCW040223K7FKED Series= CRCW..e3	Res= 23.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

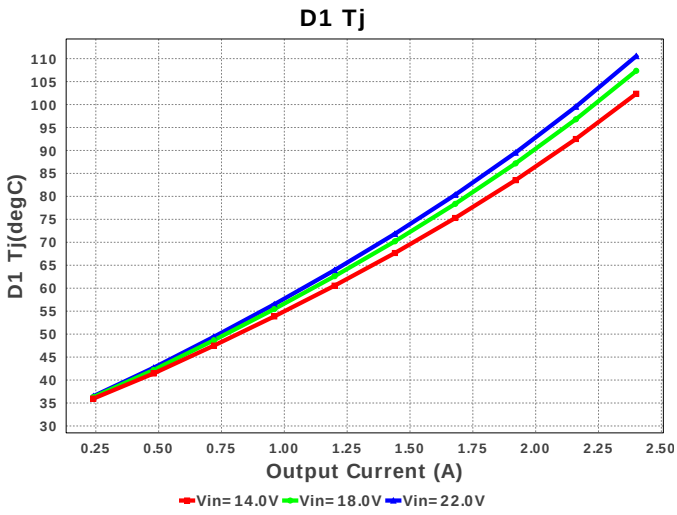
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14050SDDAR	Switcher	1	$1.95	DDA0008E_N 57 mm²

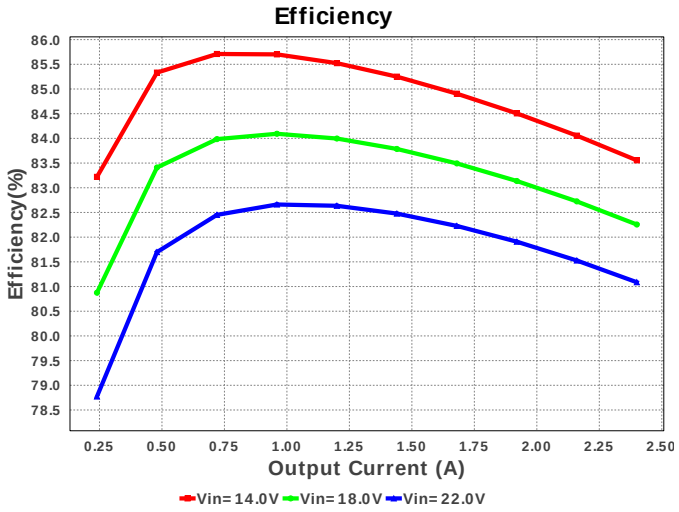


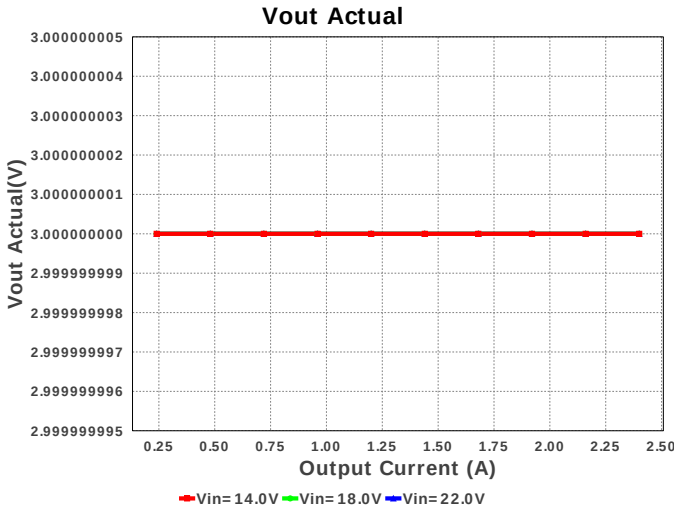


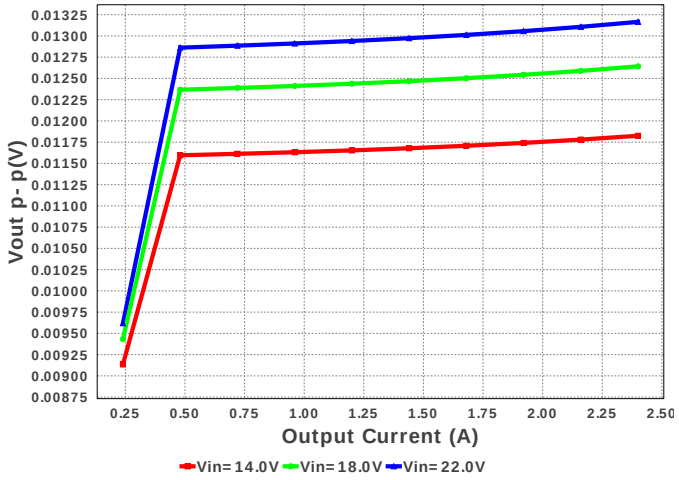


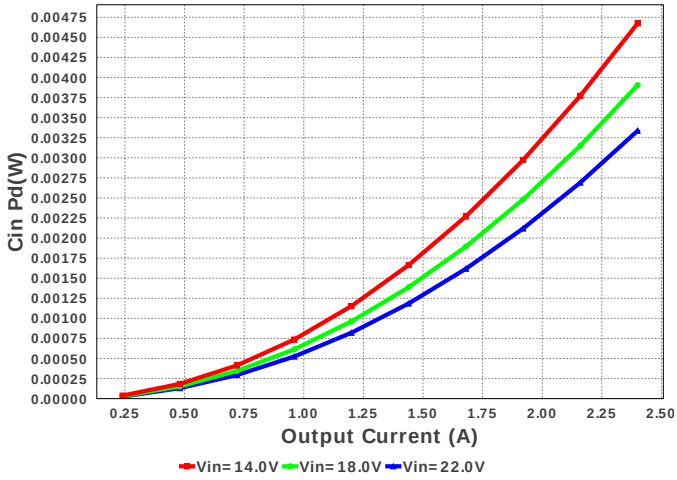


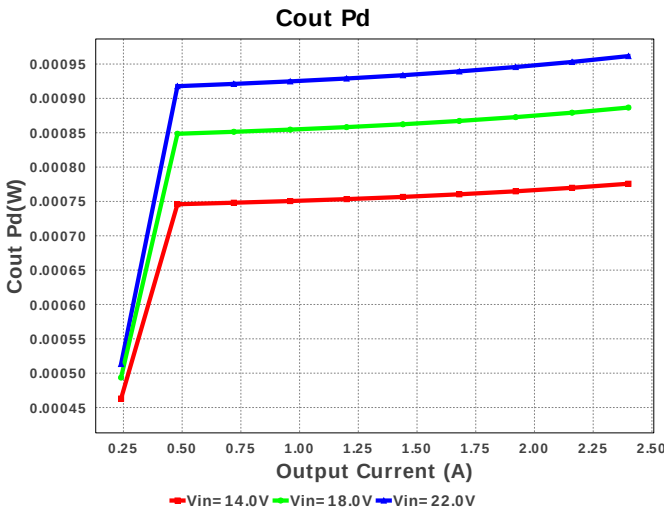


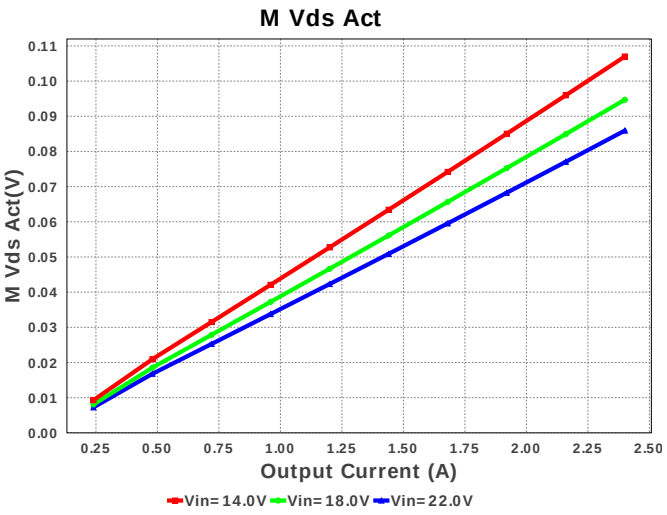


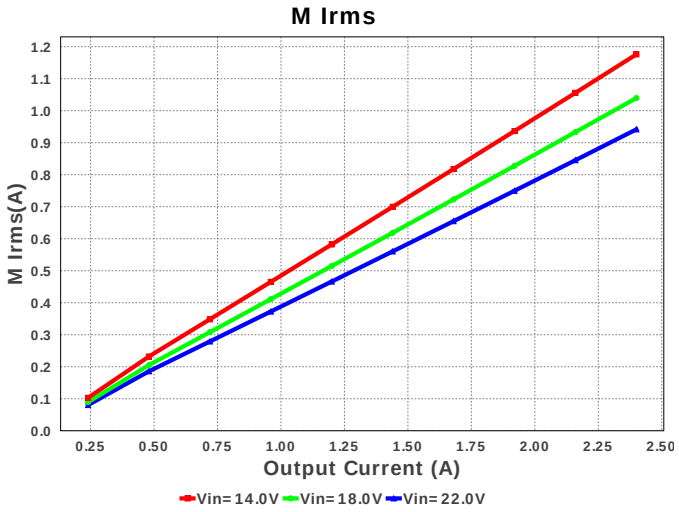


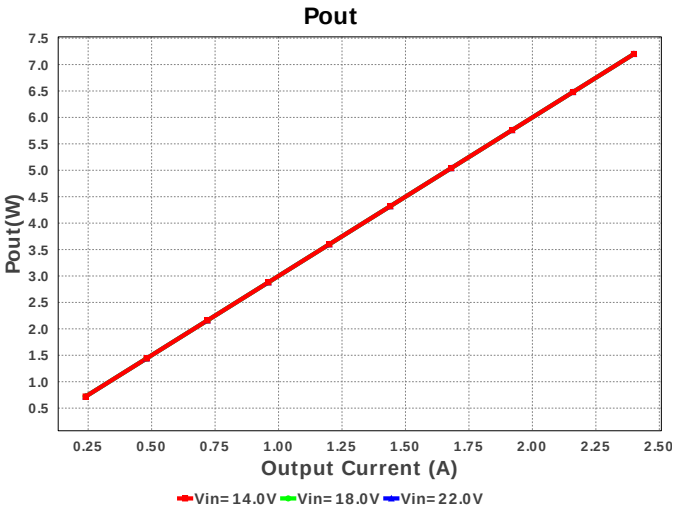


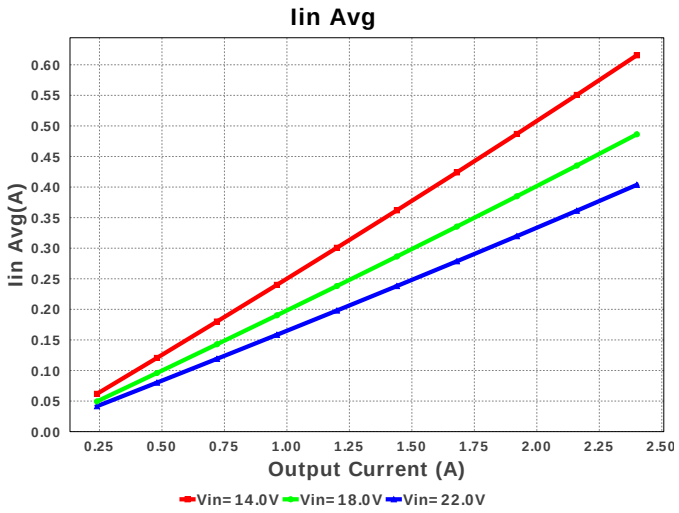


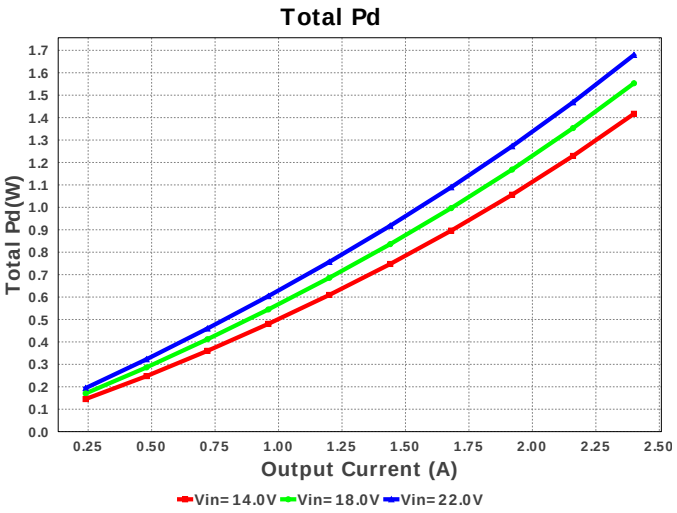


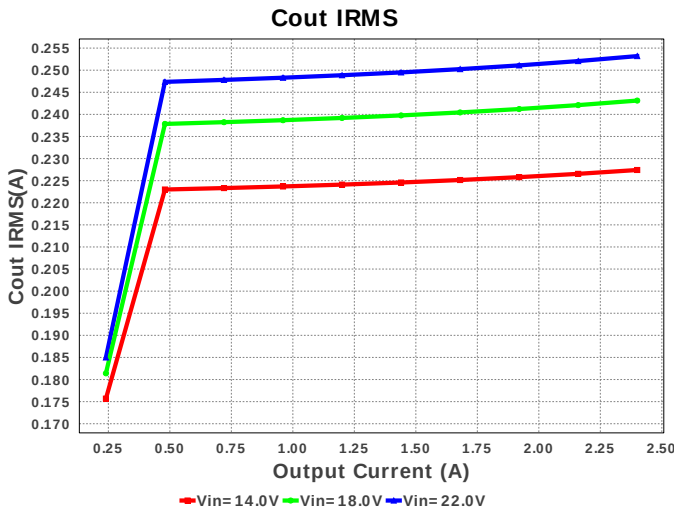


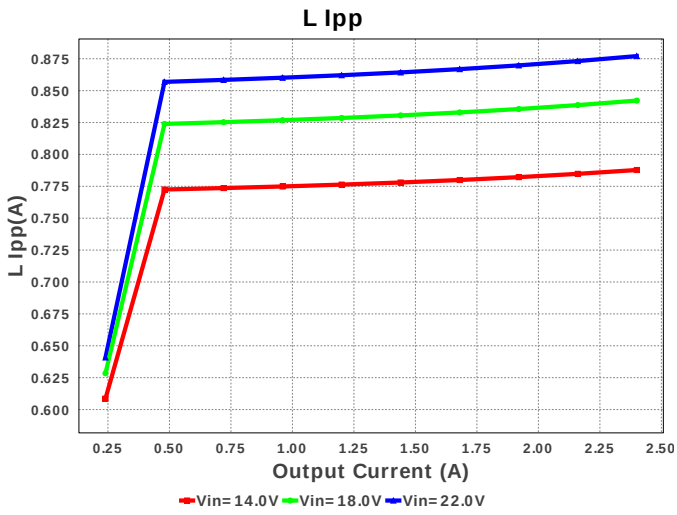


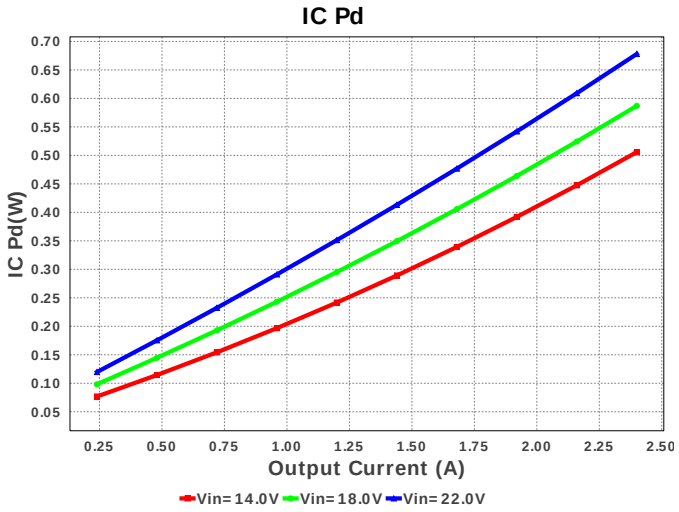


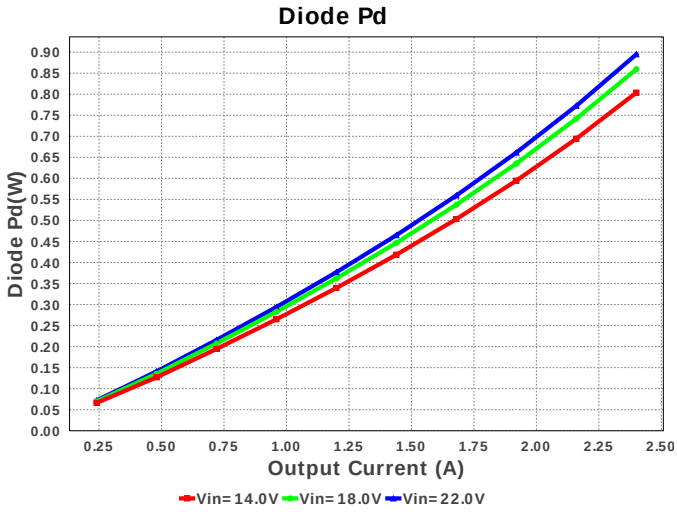


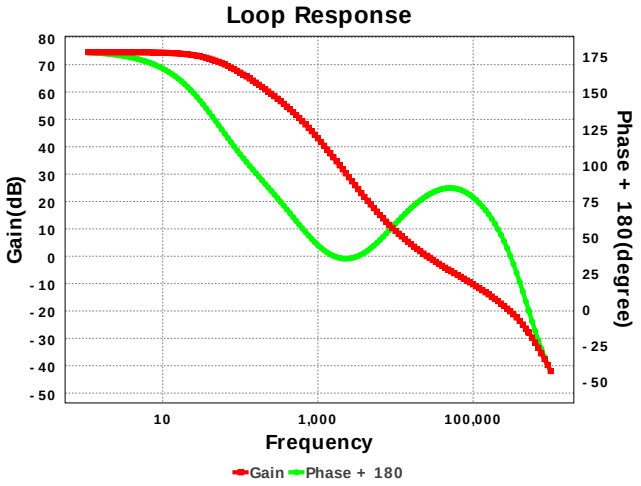












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	866.101 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	253.19 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.839 A	Current	Peak switch current in IC
4.	Iin Avg	403.6 mA	Current	Average input current
5.	L Ipp	877.07 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	941.588 mA	Current	Q Iavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	308.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.006 MHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	85.531 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	7.2 W	General	Total output power
14.	Total BOM	$2.85	General	Total BOM Cost
15.	D1 Tj	110.549 degC	Op_Point	D1 junction temperature
16.	Vout Actual	3.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	3.0 V	Op_Point	Operational Output Voltage
18.	Cross Freq	25.721 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	15.391 %	Op_point	Duty cycle
20.	Efficiency	81.09 %	Op_point	Steady state efficiency
21.	IC Tj	47.618 degC	Op_point	IC junction temperature
22.	ICThetaJA	26.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	2.4 A	Op_point	Iout operating point
24.	Phase Marg	79.203 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	22.0 V	Op_point	Vin operating point
26.	Vout p-p	13.165 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	3.337 mW	Power	Input capacitor power dissipation
28.	Cout Pd	961.575 µW	Power	Output capacitor power dissipation
29.	Diode Pd	894.986 mW	Power	Diode power dissipation
30.	IC Pd	677.619 mW	Power	IC power dissipation
31.	L Pd	101.928 mW	Power	Inductor power dissipation
32.	Total Pd	1.679 W	Power	Total Power Dissipation
33.	Vout Tolerance	3.952 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.4	Maximum Output Current
2.	VinMax	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	3.0	Output Voltage
5.	base_pn	LMR14050S	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR14050S** Product Folder : http://www.ti.com/product/LMR14050 : contains the data sheet and other resources.