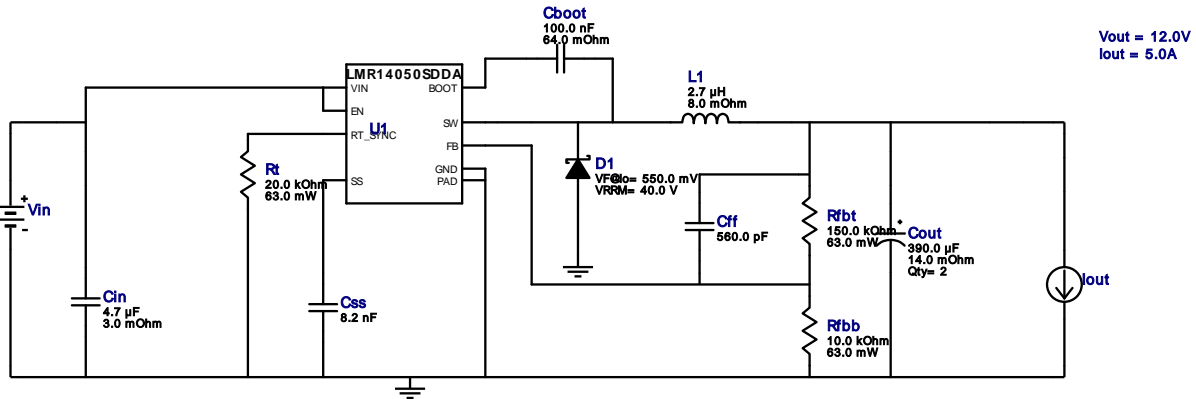



**WEBENCH® Design Report**

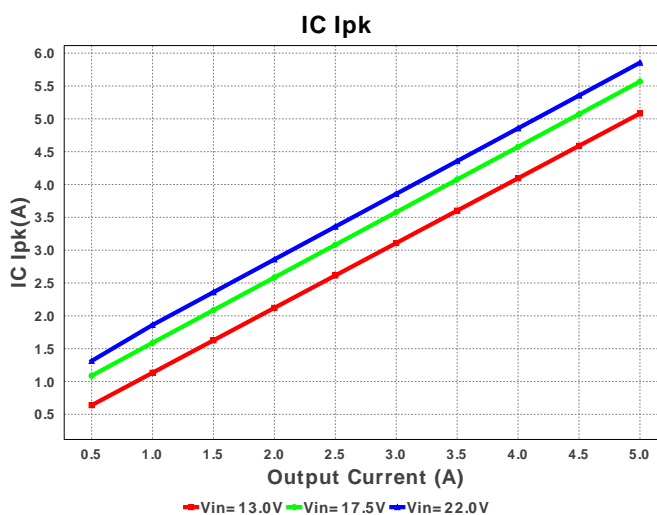
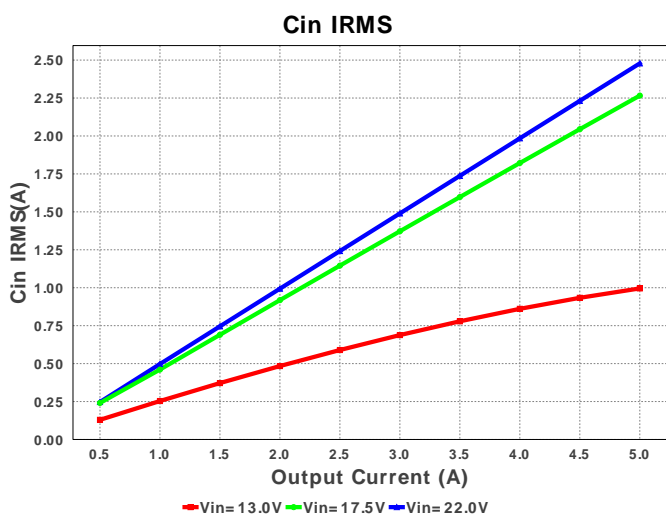
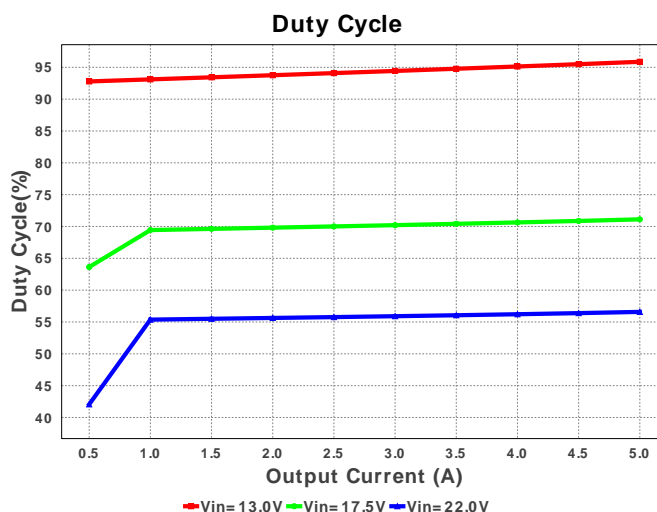
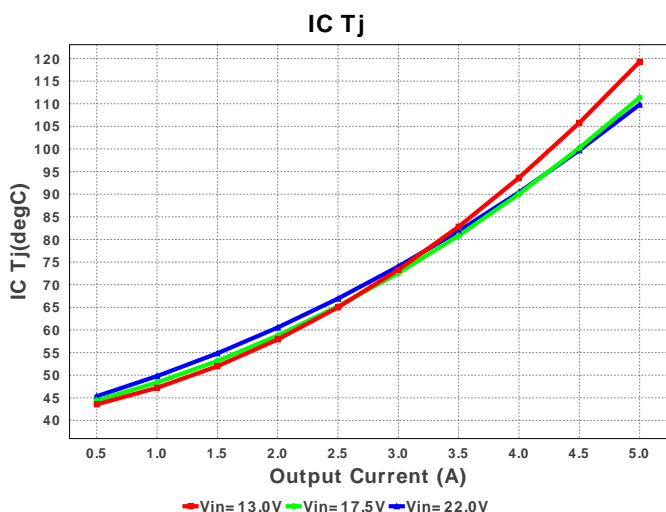
 Design : 1497178/1 LMR14050SDDAR  
 LMR14050SDDAR 13.0V-22.0V to 12.00V @ 5.00015A

**My Comments**

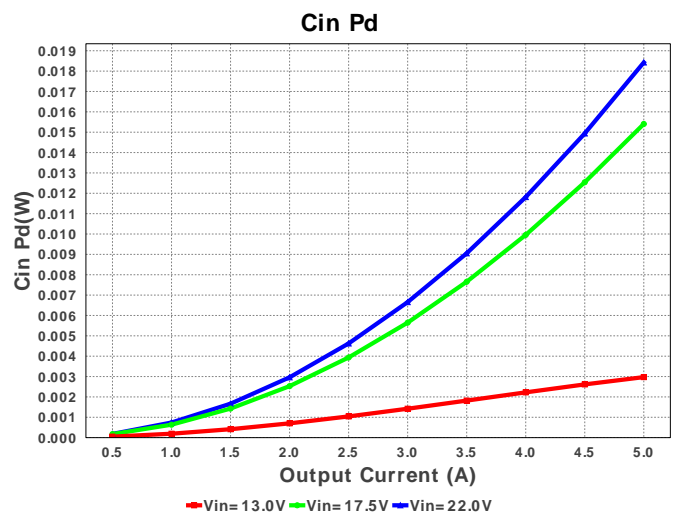
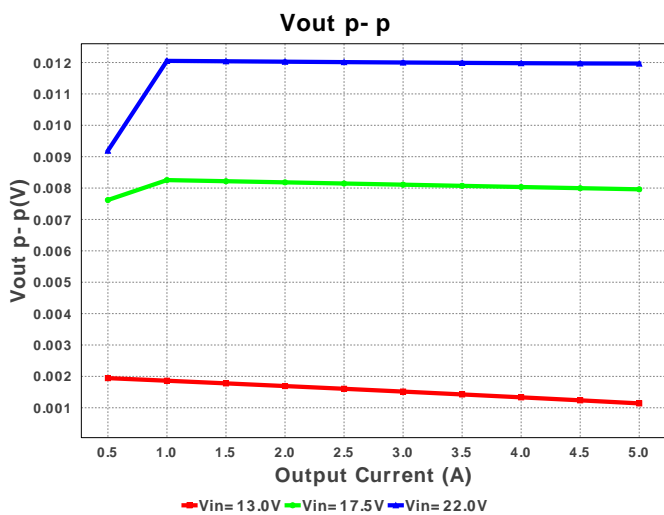
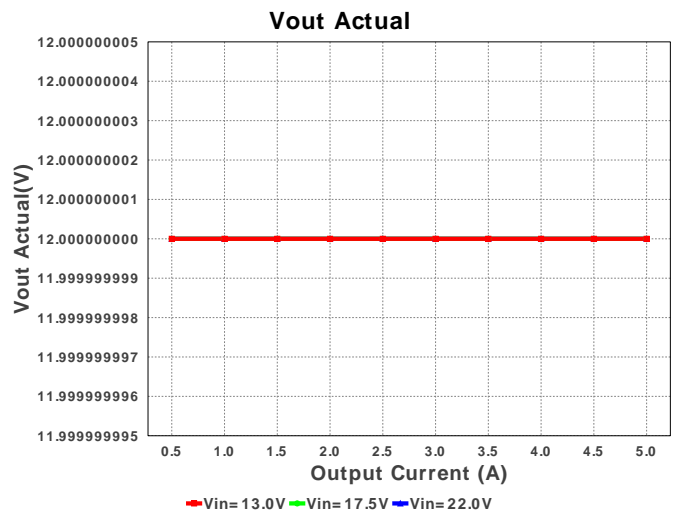
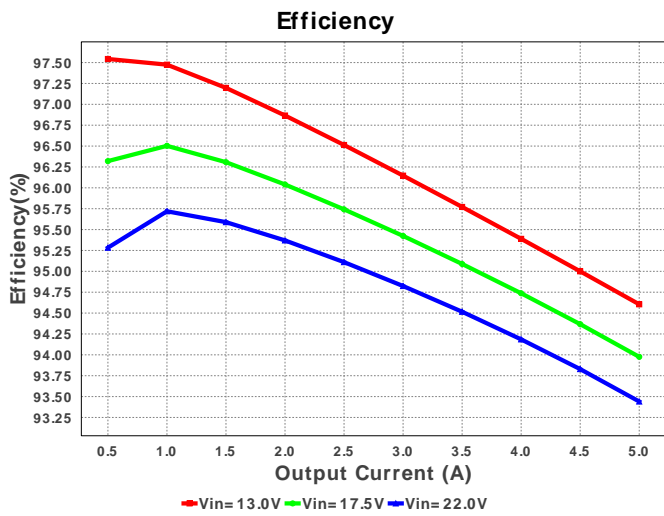
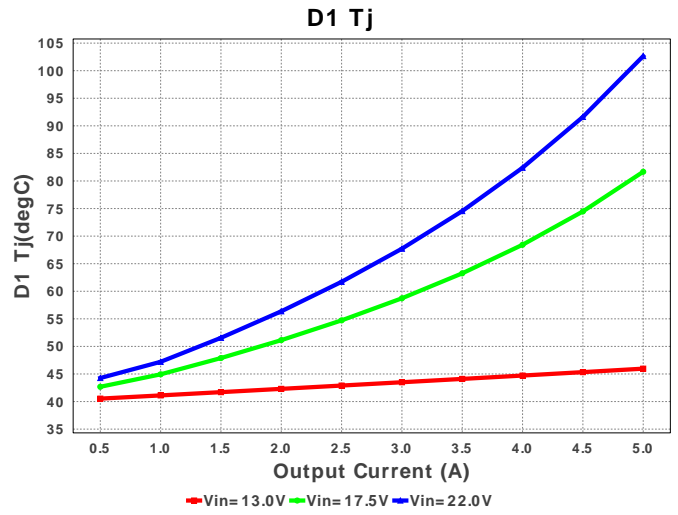
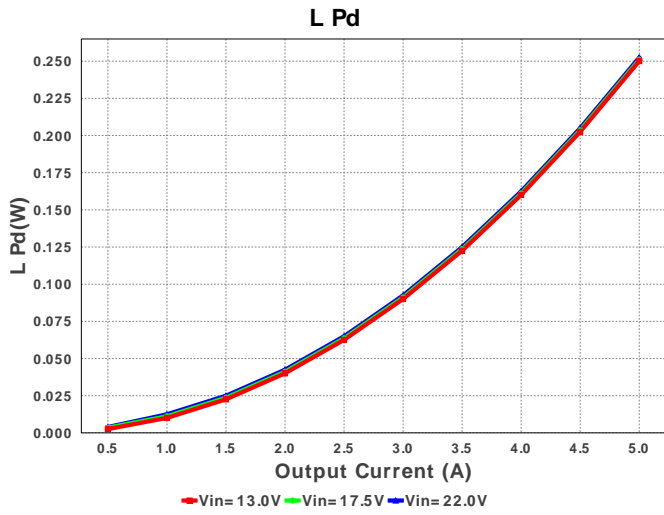
No comments

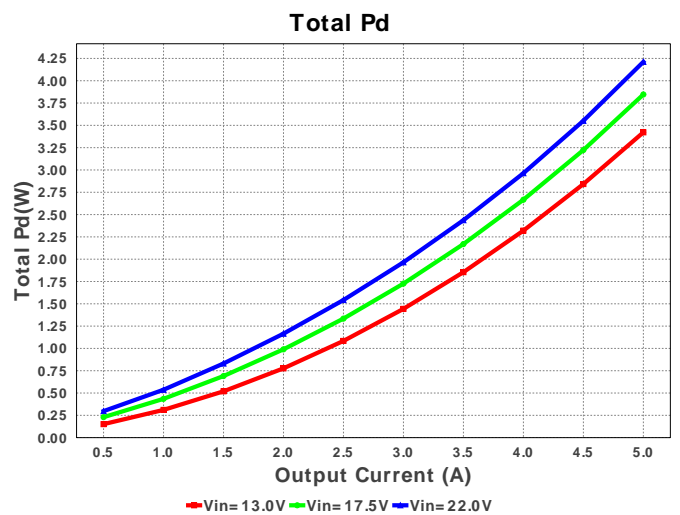
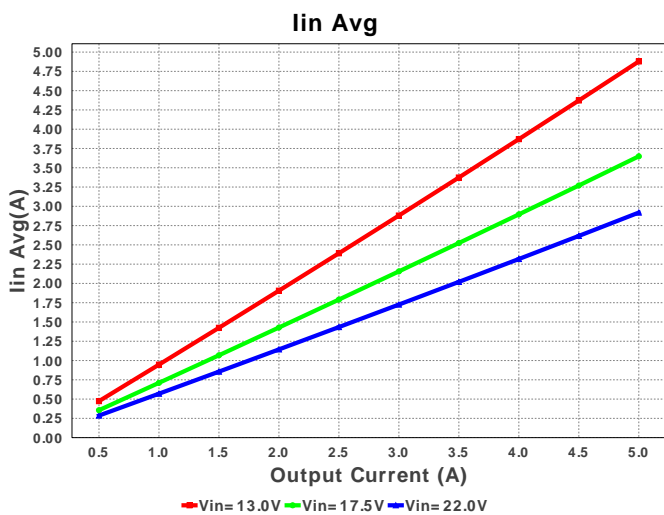
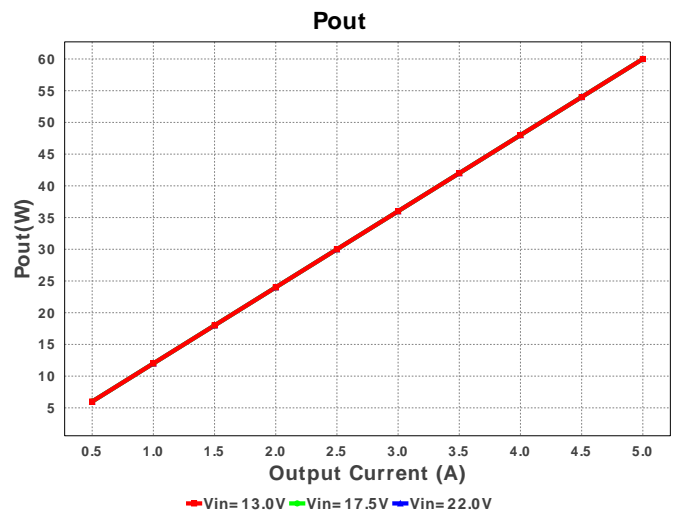
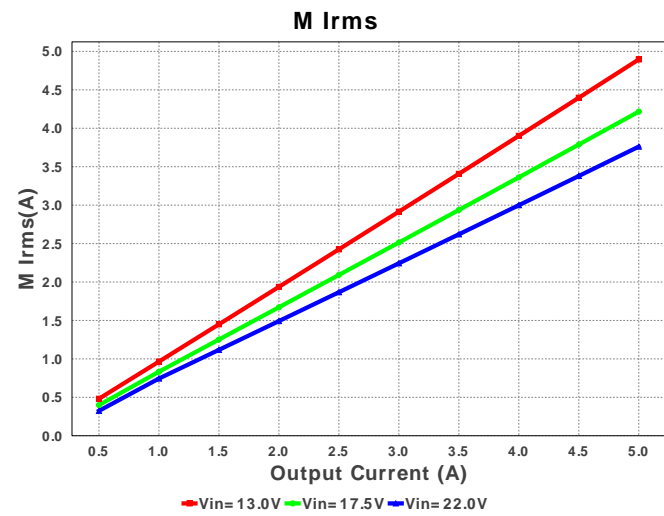
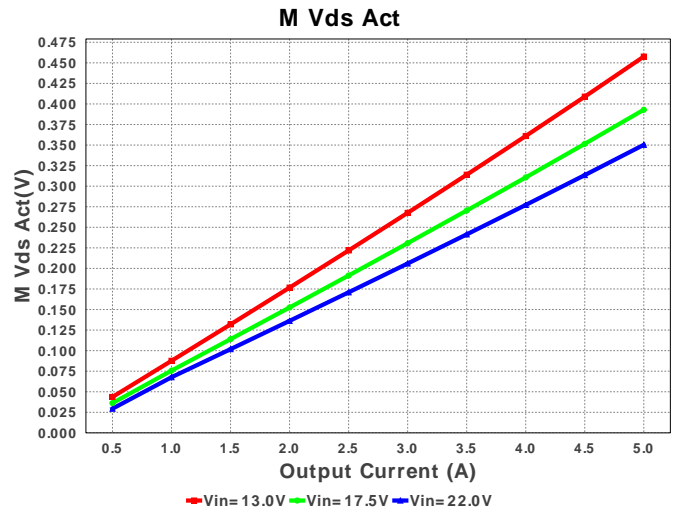
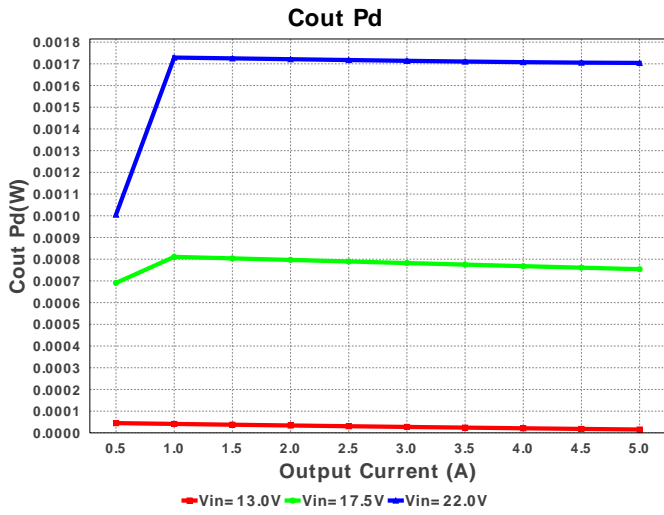
**Electrical BOM**

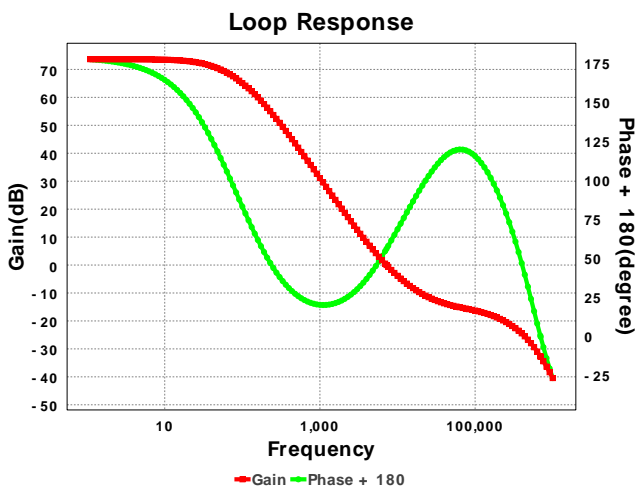
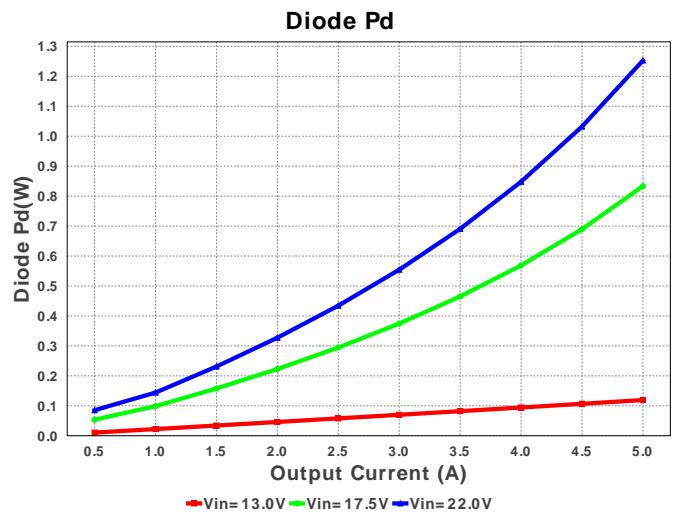
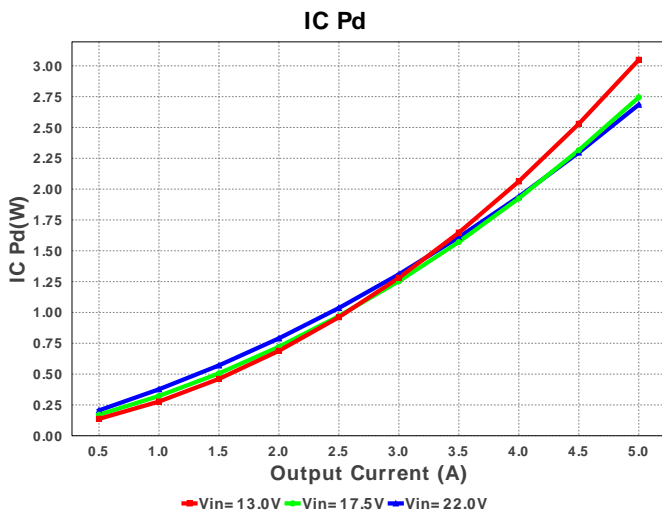
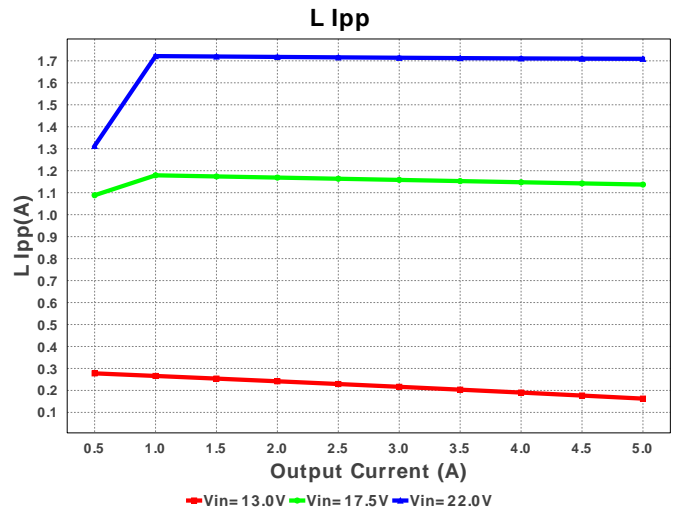
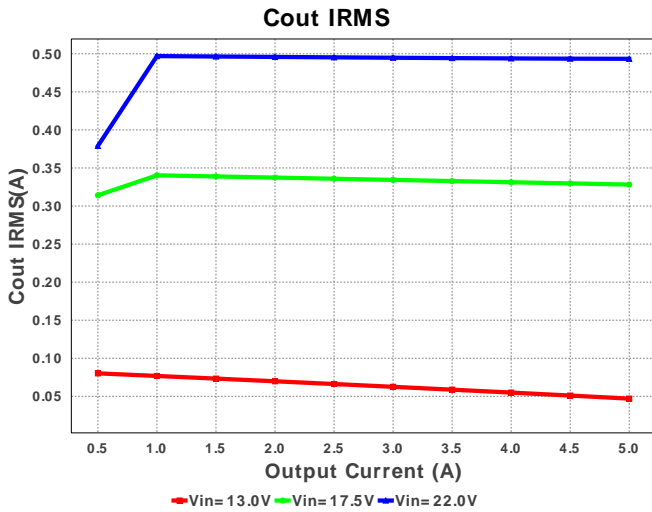
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	 0805 7 mm <sup>2</sup>
2.	Cff	MuRata	GRM033R71E561KA01D Series= X7R	Cap= 560.0 pF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm <sup>2</sup>
3.	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 mm <sup>2</sup>
4.	Cout	Panasonic	20SVPF390M Series= ?	Cap= 390.0 uF ESR= 14.0 mOhm VDC= 20.0 V IRMS= 4.95 A	2	\$0.63	 CAPSMT_62_E12 106 mm <sup>2</sup>
5.	Css	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm <sup>2</sup>
6.	D1	Diodes Inc.	B540C-13-F	VF@Io= 550.0 mV VRRM= 40.0 V	1	\$0.17	 SMC 83 mm <sup>2</sup>
7.	L1	Bourns	SDR1307-2R7ML	L= 2.7 uH DCR= 8.0 mOhm	1	\$0.35	 SDR1307 227 mm <sup>2</sup>
8.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Rfbt	Vishay-Dale	CRCW0402150KFKED Series= CRCW..e3	Res= 150.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
10.	Rt	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
11.	U1	Texas Instruments	LMR14050SDDAR	Switcher	1	\$1.95	 DDA0008E_N 57 mm <sup>2</sup>









### Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.478 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	493.406 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	5.855 A	Current	Peak switch current in IC
4.	Iin Avg	2.919 A	Current	Average input current
5.	L Ipp	1.709 A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	3.761 A	Current	Q Iavg
7.	BOM Count	12	General	Total Design BOM count
8.	FootPrint	611.0 mm <sup>2</sup>	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	350.308 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	60.0 W	General	Total output power
14.	Total BOM	\$3.86	General	Total BOM Cost
15.	D1 Tj	102.646 degC	Op_Point	D1 junction temperature
16.	Low Freq Gain	73.657 dB	Op_Point	Gain at 10Hz
17.	Vout Actual	12.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
18.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
19.	Cross Freq	383.872 kHz	Op_point	Bode plot crossover frequency
20.	Duty Cycle	56.585 %	Op_point	Duty cycle
21.	Efficiency	93.441 %	Op_point	Steady state efficiency
22.	Gain Marg	-9.31 dB	Op_point	Bode Plot Gain Margin
23.	IC Tj	109.814 degC	Op_point	IC junction temperature
24.	ICThetaJA	26.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	5.0 A	Op_point	Iout operating point
26.	Phase Marg	54.395 deg	Op_point	Bode Plot Phase Margin
27.	VIN_OP	22.0 V	Op_point	Vin operating point
28.	Vout p-p	11.967 mV	Op_point	Peak-to-peak output ripple voltage
29.	Cin Pd	18.425 mW	Power	Input capacitor power dissipation
30.	Cout Pd	1.704 mW	Power	Output capacitor power dissipation
31.	Diode Pd	1.253 W	Power	Diode power dissipation
32.	IC Pd	2.685 W	Power	IC power dissipation
33.	L Pd	252.442 mW	Power	Inductor power dissipation
34.	Total Pd	4.212 W	Power	Total Power Dissipation
35.	Vout Tolerance	4.339 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

## Design Inputs

#	Name	Value	Description
1.	Iout	5.0	Maximum Output Current
2.	VinMax	22.0	Maximum input voltage
3.	VinMin	13.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LMR14050S	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	40.0	Ambient temperature

## Design Assistance

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

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