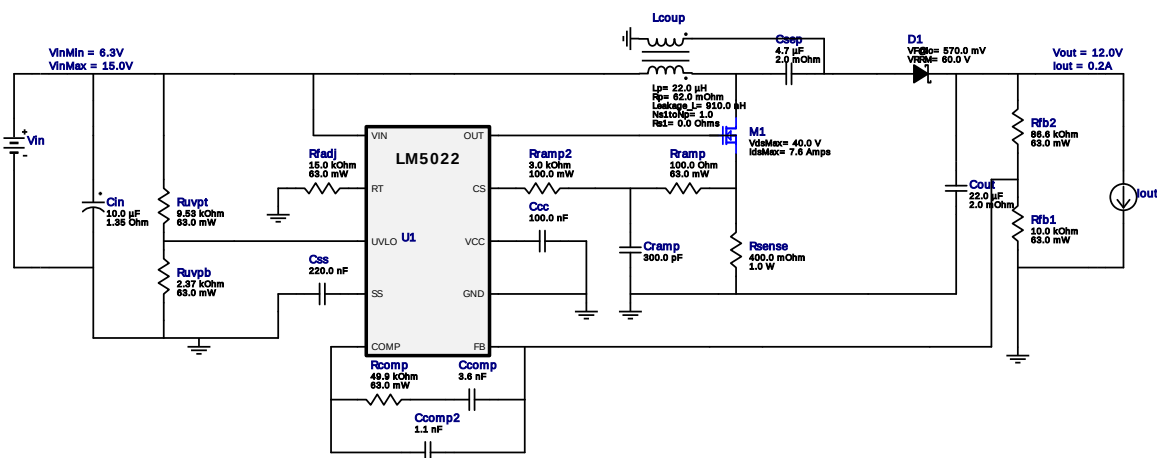


WEBENCH® Design Report

Design : 1982346/13 LM5022MM/NOPB
LM5022MM/NOPB 6.3V-15.0V to 12.0V @ 0.2A

VinMin = 6.3V
VinMax = 15.0V
Vout = 12.0V
Iout = 0.2A

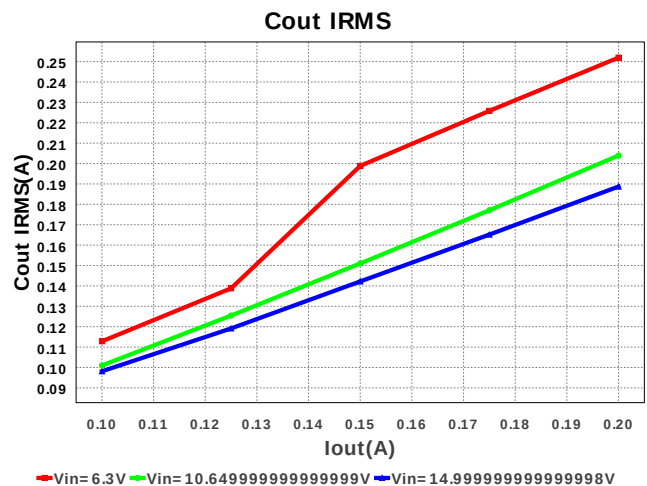
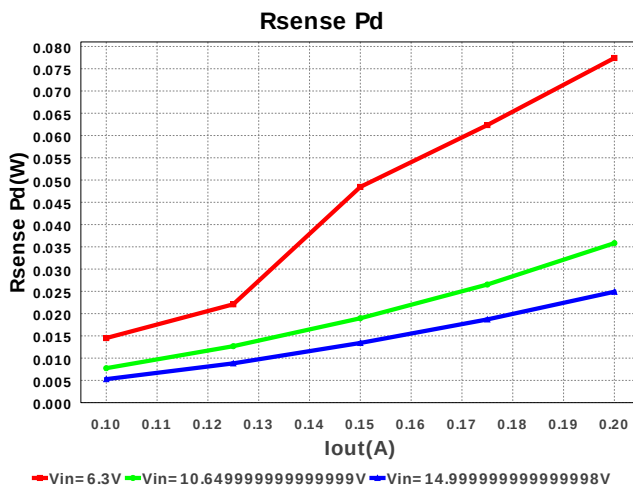
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Topology = SEPIC
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BOM Cost = \$3.66
Total Pd = 0.73W
Footprint = 549.0mm2
BOM Count = 21

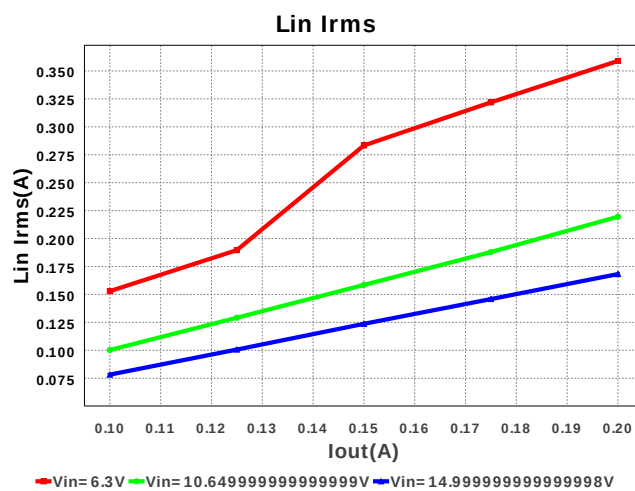
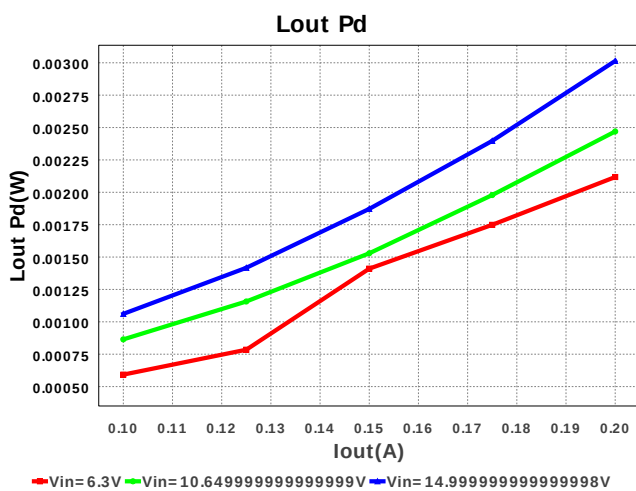
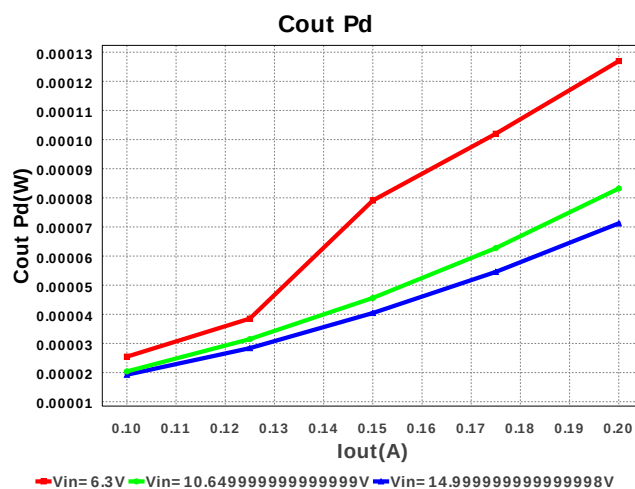
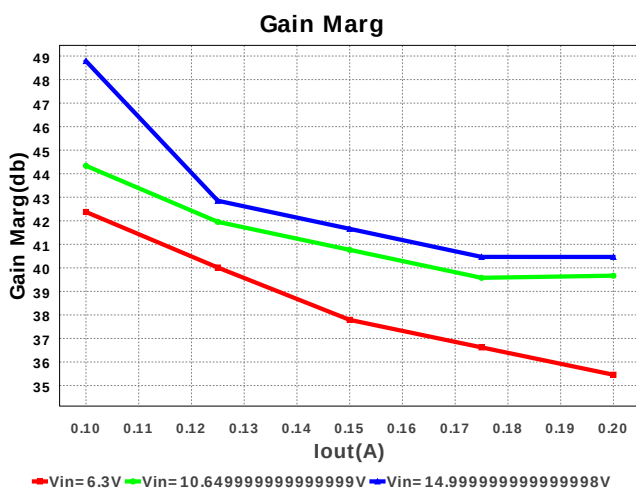
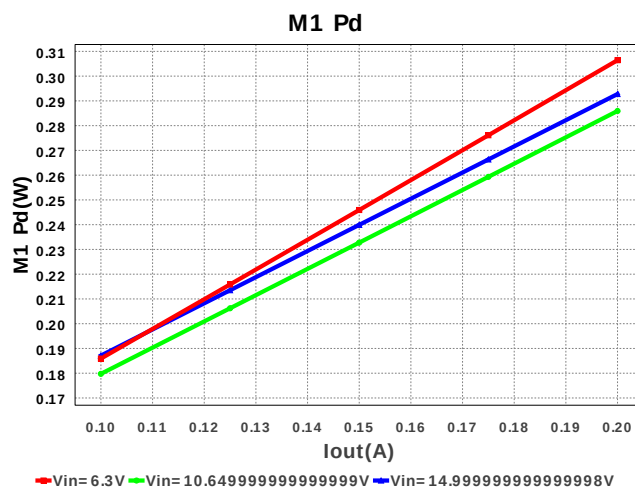
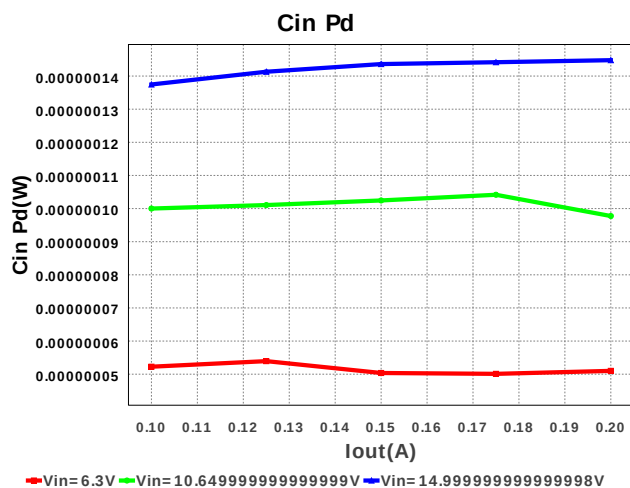


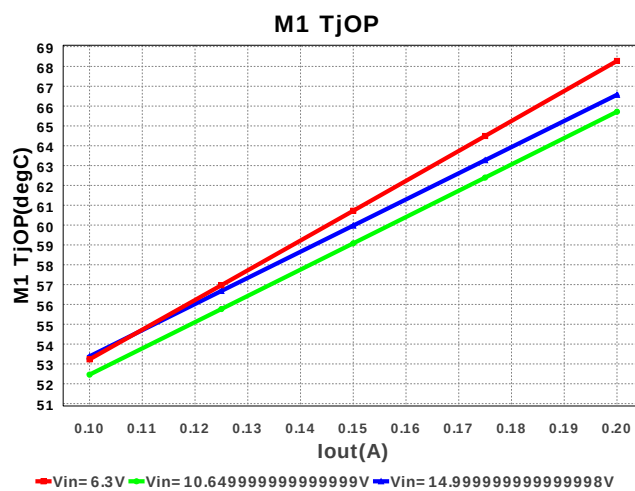
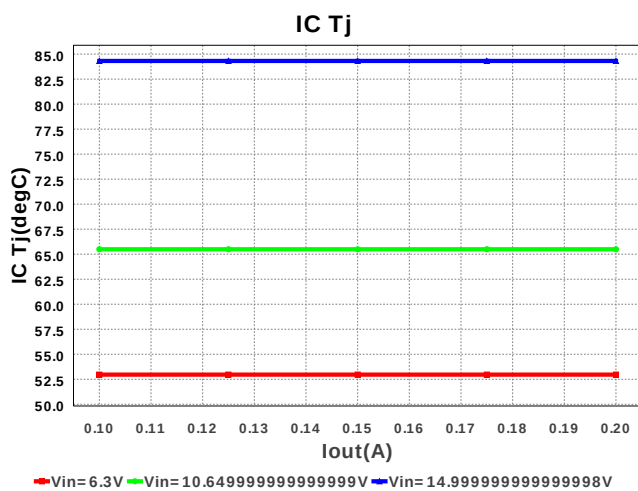
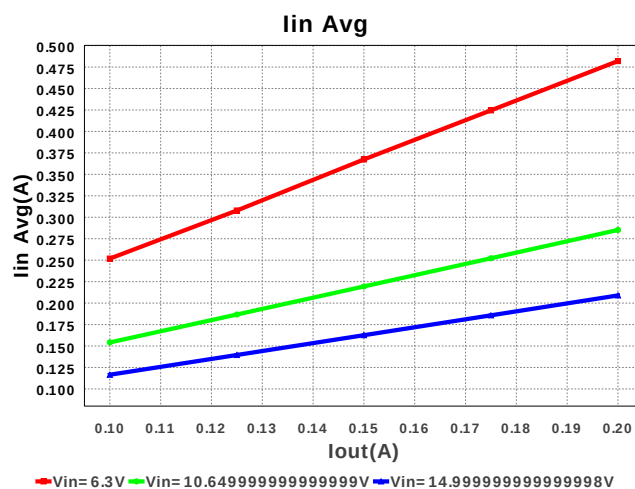
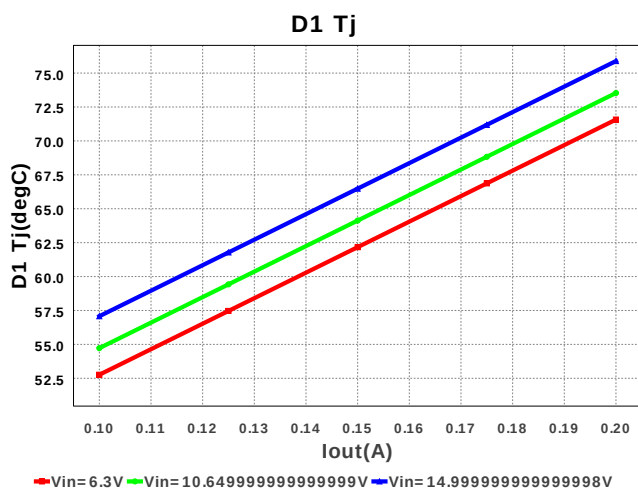
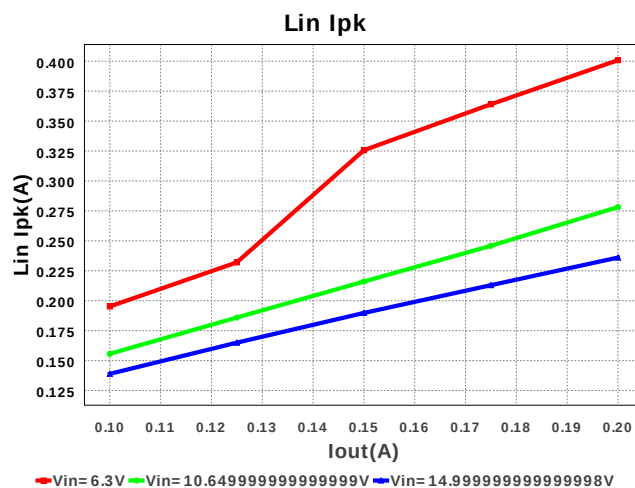
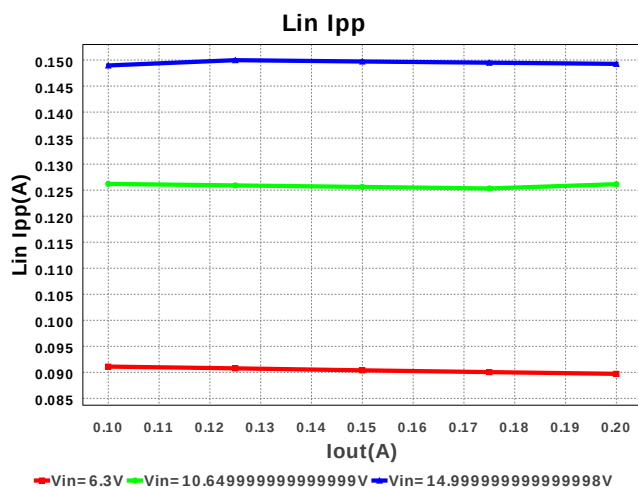
Electrical BOM

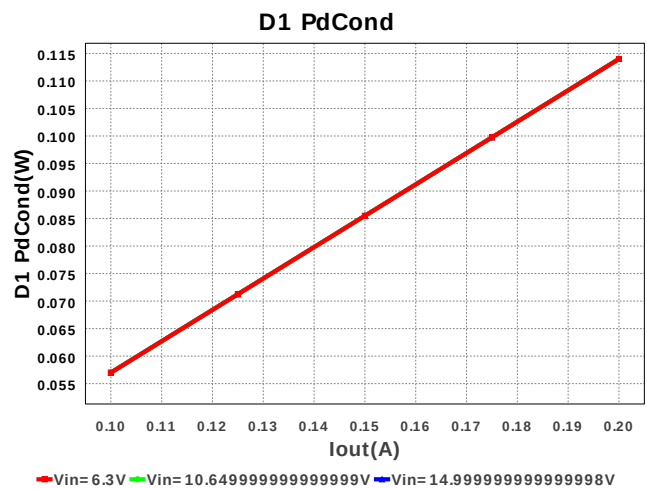
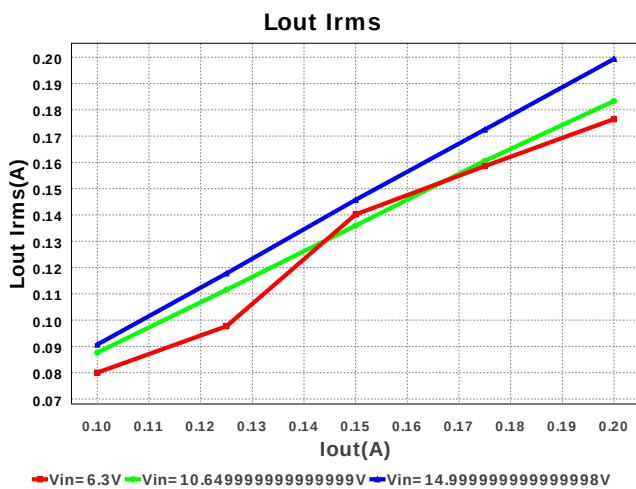
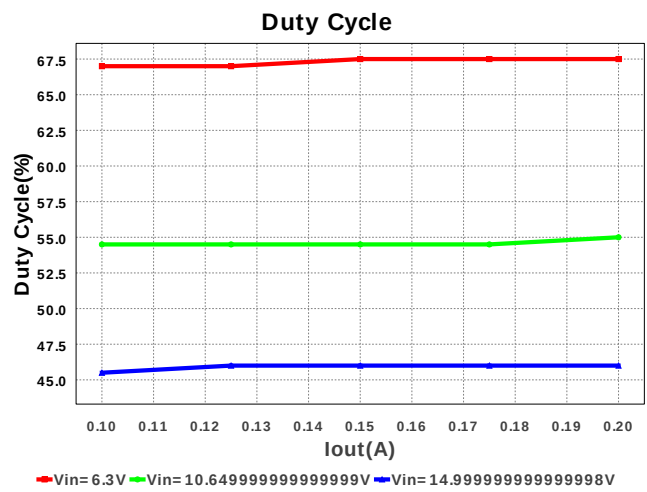
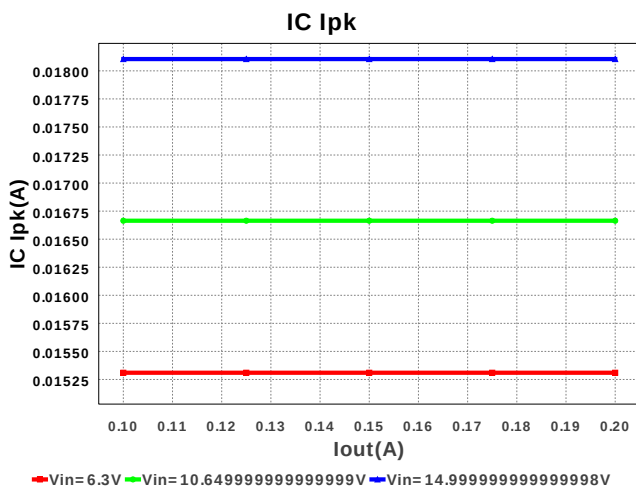
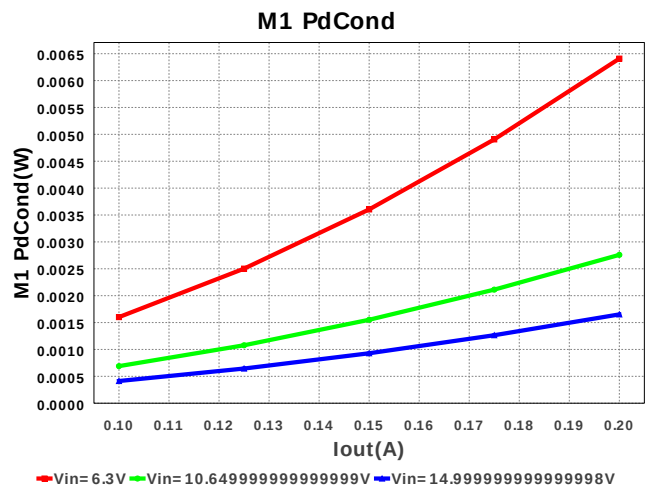
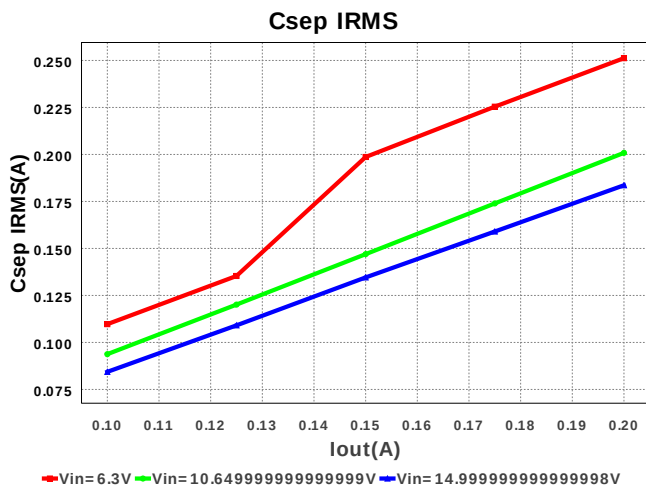
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccc	Kemet	C0603C104Z4VACTU Series= Y5V	Cap= 100.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	0603 10mm2
2.	Ccomp	MuRata	GRM1885C1H362JA01D Series= C0G/NP0	Cap= 3.6 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.02	0603 10mm2
3.	Ccomp2	MuRata	GRM1885C1H112JA01D Series= C0G/NP0	Cap= 1.1 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.02	0603 10mm2
4.	Cin	Panasonic	EEE-FK1E100R Series= FK	Cap= 10.0 µF ESR= 1.35 Ohm VDC= 25.0 V IRMS= 90.0 mA	1	\$0.09	SM_RADIAL_B 47mm2
5.	Cout	TDK	C3225X7R1C226M Series= X7R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 8.11 A	1	\$0.22	1210 23mm2
6.	Cramp	MuRata	GRM1555C1E301JA01D Series= C0G/NP0	Cap= 300.0 pF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0402 8mm2
7.	Csep	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 µF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	\$0.06	0805 13mm2
8.	Css	Kemet	C0603C224Z4VACTU Series= Y5V	Cap= 220.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	0603 10mm2
9.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	\$0.11	SOD-123F 20mm2
10.	Lcoup	Würth Elektronik eiSos	744870220	Lp= 22.0 µH Rp= 62.0 mOhm Leakage_L= 910.0 nH Ns1toNp= 1.0 Rs1= 0.0 Ohms	1	\$1.79	WE-DD-XL 210mm2

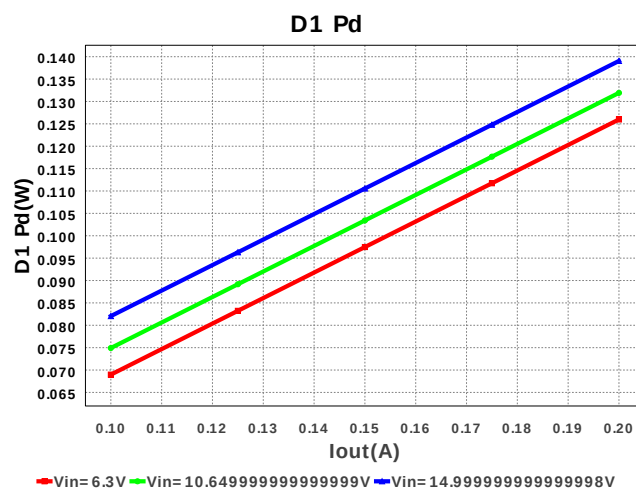
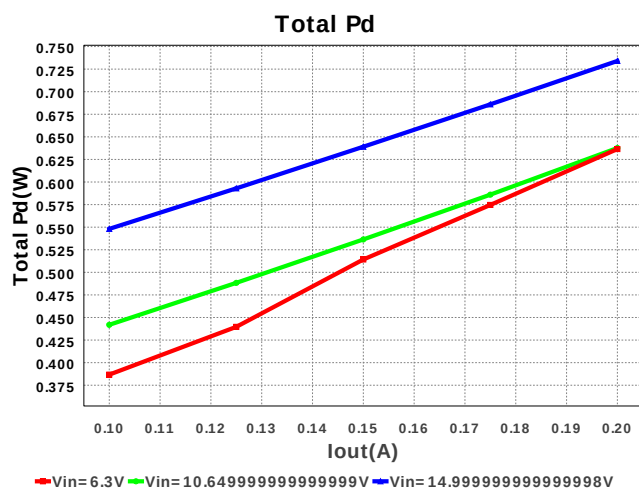
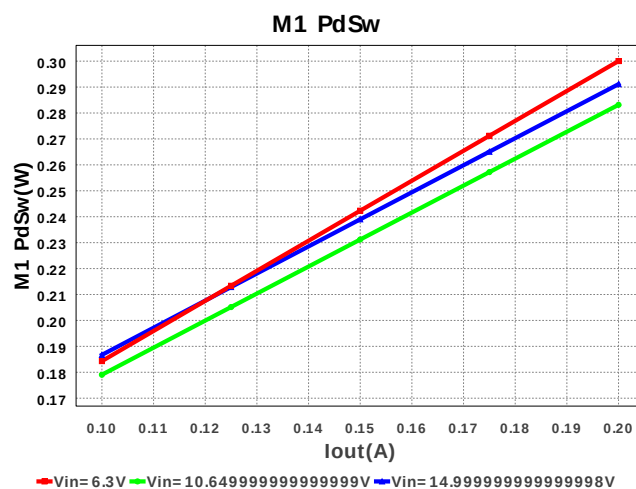
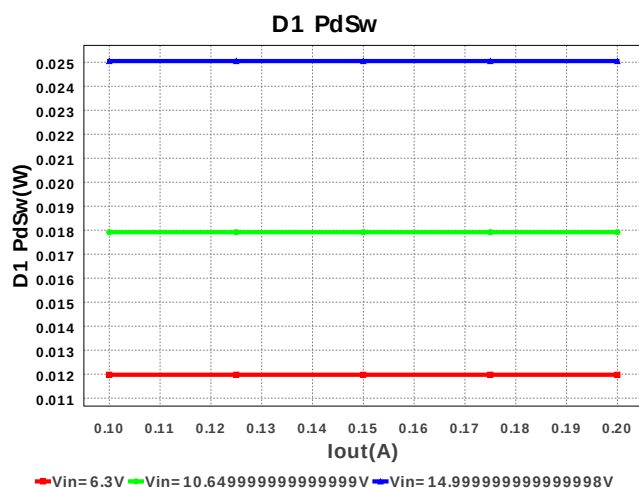
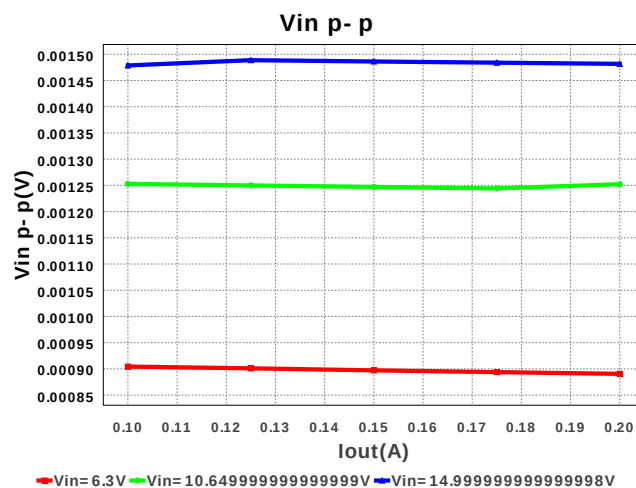
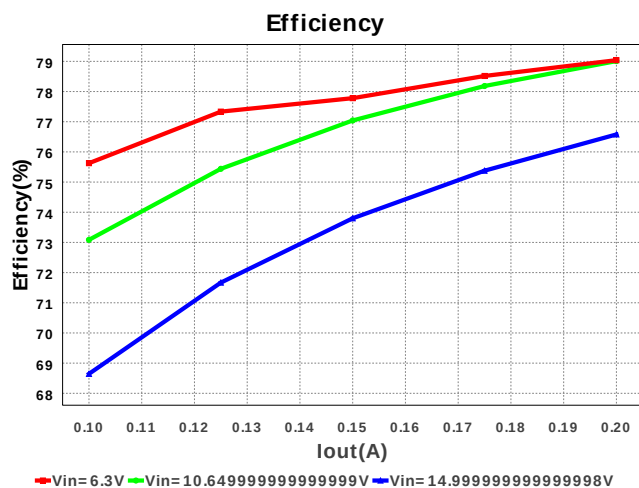
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	M1	Fairchild Semiconductor	FDS8449	VdsMax= 40.0 V IdsMax= 7.6 Amps	1	\$0.23	 SOIC-8 55mm2
12.	Rcomp	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
13.	Rfadj	Vishay-Dale	CRCW040215K0FKED Series= CRCW..e3	Res= 15.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
14.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
15.	Rfb2	Vishay-Dale	CRCW040286K6FKED Series= CRCW..e3	Res= 86.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
16.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
17.	Rramp2	Susumu Co Ltd	RR1220P-302-D Series= 264	Res= 3.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 13mm2
18.	Rsense	Stackpole Electronics Inc	CSRN2010FKR400 Series= ?	Res= 400.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	\$0.11	 2010 32mm2
19.	Ruvpb	Vishay-Dale	CRCW04022K37FKED Series= CRCW..e3	Res= 2.37 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
20.	Ruvpt	Vishay-Dale	CRCW04029K53FKED Series= CRCW..e3	Res= 9.53 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
21.	U1	Texas Instruments	LM5022MM/NOPB	Switcher	1	\$0.90	 MUB10A 34mm2

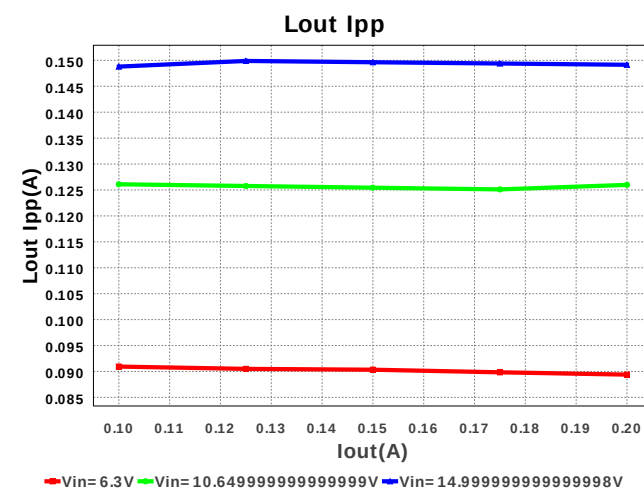
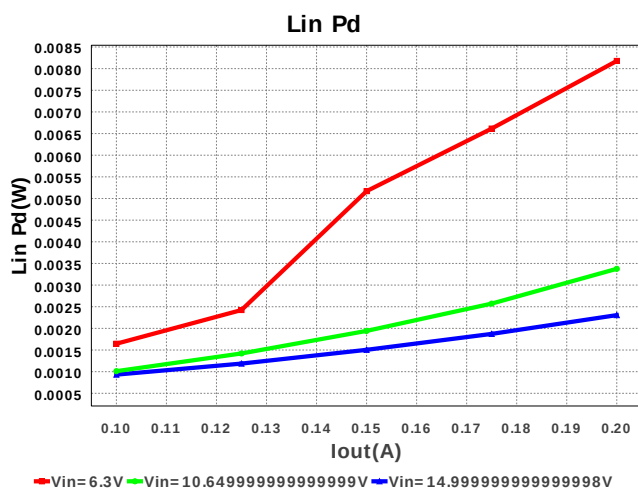
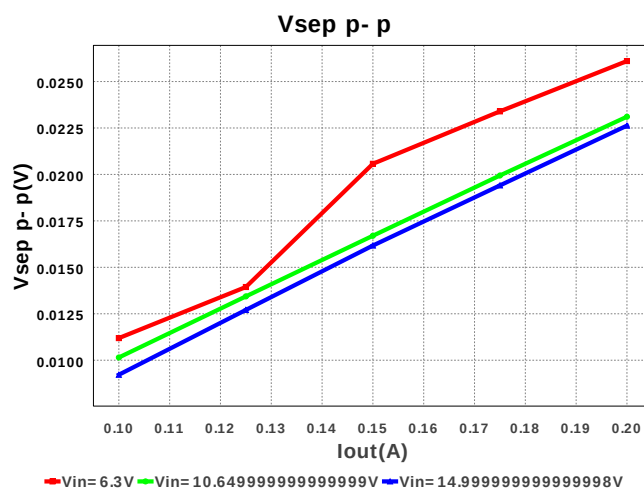
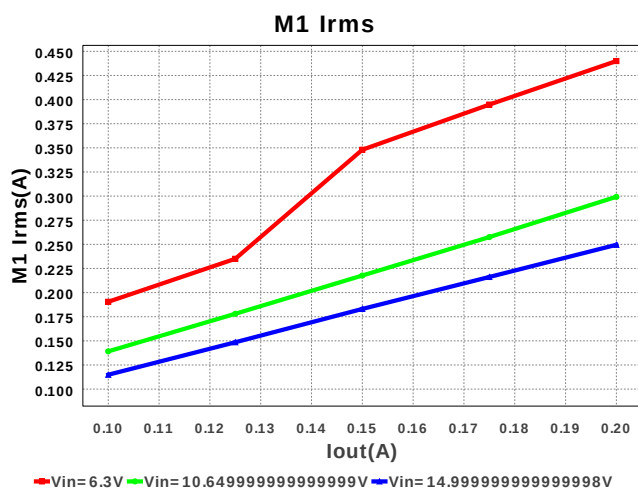
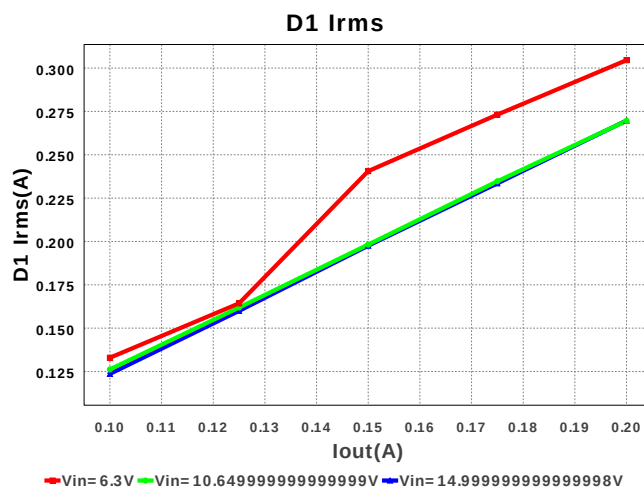
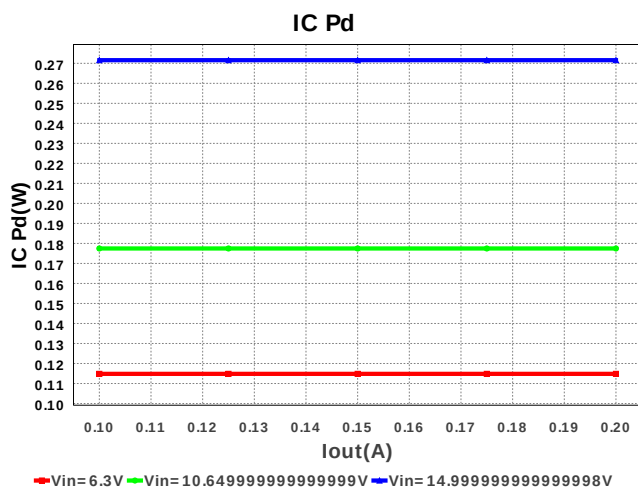


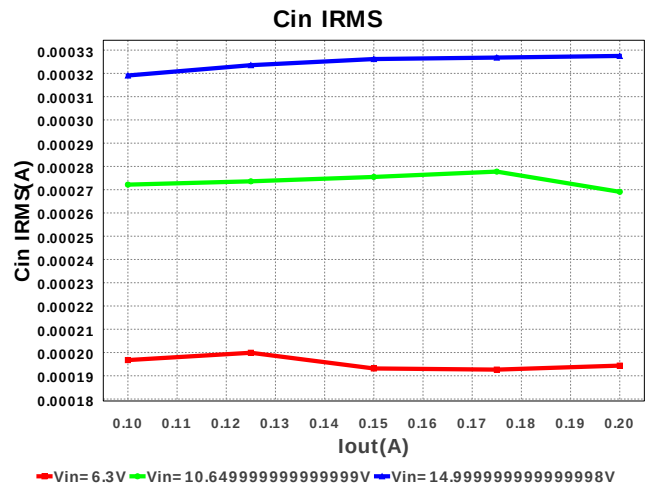
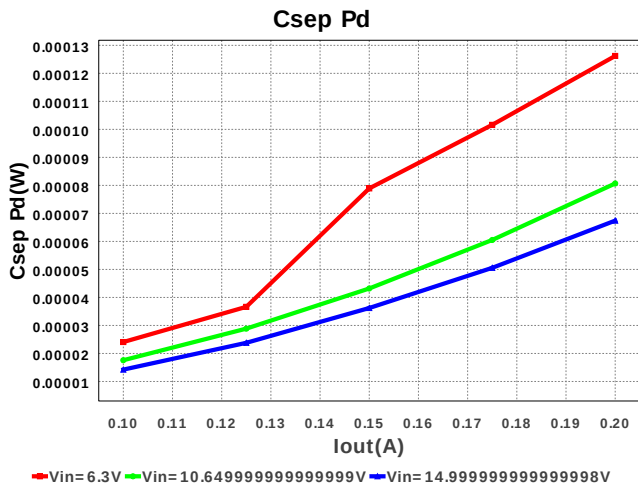
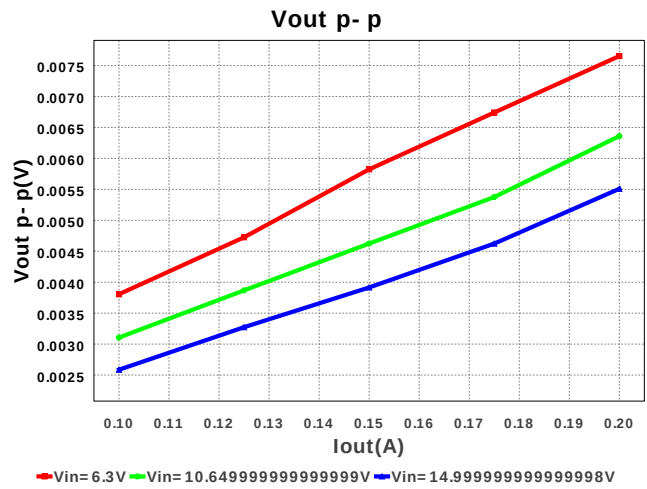
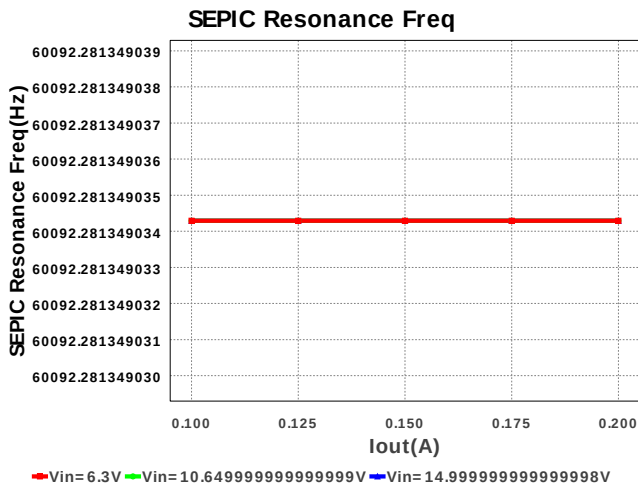
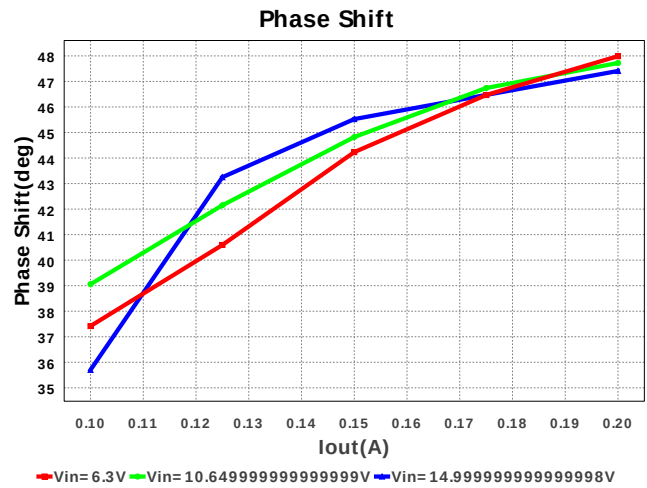
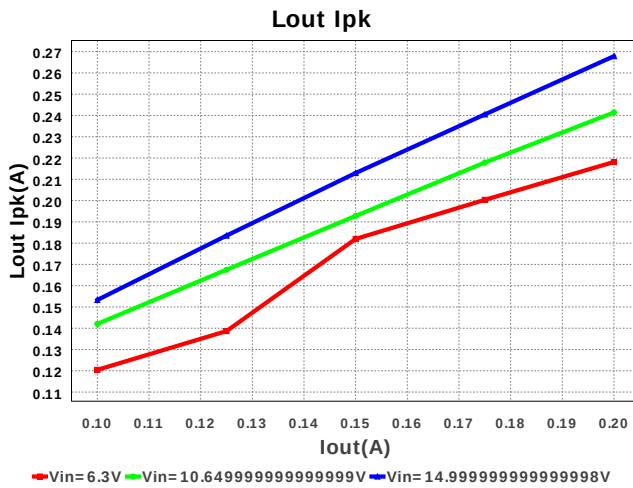


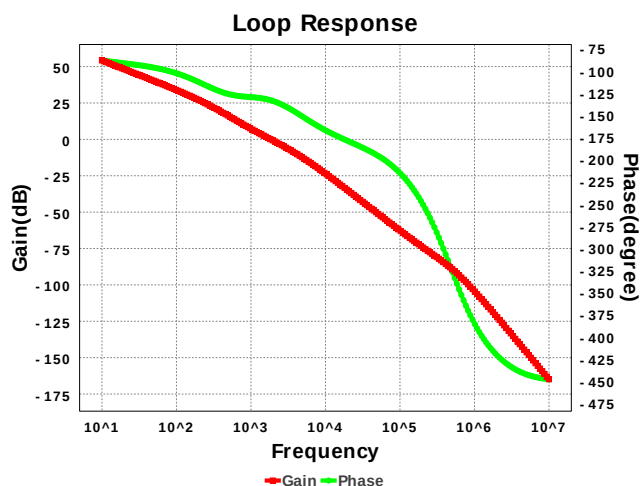












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	327.498 μ A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	188.725 mA	Current	Output capacitor RMS ripple current
3.	Csep IRMS	183.604 mA	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	269.734 mA	Current	D1 Irms
5.	IC Ipk	18.105 mA	Current	Peak switch current in IC
6.	Iin Avg	208.94 mA	Current	Average input current
7.	Lin Ipk	236.024 mA	Current	Lin peak current
8.	Lin Ipp	149.264 mA	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	168.205 mA	Current	Lin ripple current
10.	Lout Ipk	267.865 mA	Current	Lout peak current
11.	Lout Ipp	149.145 mA	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	199.342 mA	Current	Lout ripple current
13.	M1 Irms	249.55 mA	Current	M1 MOSFET Irms
14.	BOM Count	21	General	Total Design BOM count
15.	FootPrint	549.0 mm ²	General	Total Foot Print Area of BOM components
16.	Frequency	1.05 MHz	General	Switching frequency
17.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
18.	Mode	CCM	General	Conduction Mode
19.	Total BOM	\$3.66	General	Total BOM Cost
20.	D1 Tj	75.887 degC	Op_Point	D1 junction temperature
21.	SEPIC Resonance Freq	60.092 kHz	Op_Point	SEPIC Resonance Frequency
22.	Vin p-p	1.482 mV	Op_Point	Peak-to-peak input voltage
23.	Vsep p-p	22.626 mV	Op_Point	Peak-to-peak sepic voltage
24.	Cross Freq	1.825 kHz	Op_point	Bode plot crossover frequency
25.	Duty Cycle	46.0 %	Op_point	Duty cycle
26.	Efficiency	76.578 %	Op_point	Steady state efficiency
27.	Gain Marg	38.128 db	Op_point	Bode Plot Gain Margin
28.	IC Tj	84.315 degC	Op_point	IC junction temperature
29.	IOUT_OP	200.0 mA	Op_point	Iout operating point
30.	M1 TjOP	66.571 degC	Op_point	M1 MOSFET junction temperature
31.	Phase Marg	47.697 deg	Op_point	Bode Plot Phase Margin
32.	Phase Shift	48.378 deg	Op_point	Bode Plot Phase Shift
33.	VIN_OP	15.0 V	Op_point	Vin operating point
34.	Vout p-p	5.509 mV	Op_point	Peak-to-peak output ripple voltage
35.	Cin Pd	144.794 nW	Power	Input capacitor power dissipation
36.	Cout Pd	71.235 μ W	Power	Output capacitor power dissipation
37.	Csep Pd	67.421 μ W	Power	SEPIC capacitor power dissipation
38.	D1 Pd	139.05 mW	Power	Diode power dissipation
39.	D1 PdCond	114.0 mW	Power	Diode conduction losses
40.	D1 PdSw	25.05 mW	Power	Diode switching losses
41.	IC Pd	271.575 mW	Power	IC power dissipation
42.	Lin Pd	2.306 mW	Power	Lin power dissipation
43.	Lout Pd	3.014 mW	Power	Lout power dissipation
44.	M1 Pd	292.768 mW	Power	M1 MOSFET total power dissipation
45.	M1 PdCond	1.652 mW	Power	M1 MOSFET conduction losses
46.	M1 PdSw	291.116 mW	Power	M1 MOSFET switching losses
47.	Rsense Pd	24.91 mW	Power	LED Current Rsns Power Dissipation
48.	Total Pd	734.044 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	200.0 mA	Maximum Output Current
2.	Iout1	200.0 mAmps	Output Current #1
3.	VinMax	15.0 V	Maximum input voltage
4.	VinMin	6.3 V	Minimum input voltage
5.	Vout	12.0 V	Output Voltage
6.	Vout1	12.0 Volt	Output Voltage #1
7.	base_pn	LM5022	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **LM5022** Product Folder : <http://www.ti.com/product/lm5022> : contains the data sheet and other resources.

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