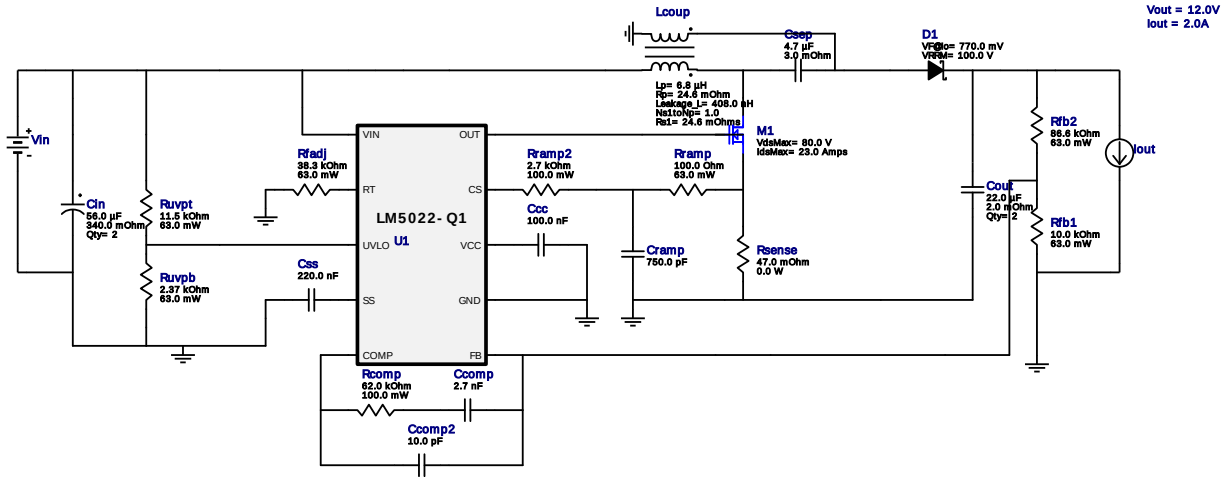
WEBENCH® Design Report

VinMin = 8.0V
VinMax = 20.0V
Vout = 12.0V
Iout = 2.0A

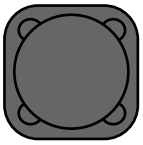
Device = LM5022QDGSTQ1
Topology = SEPIC
Created = 7/12/16 7:31:24 AM
BOM Cost = $0.00
BOM Count = 23
Total Pd = 4.05W

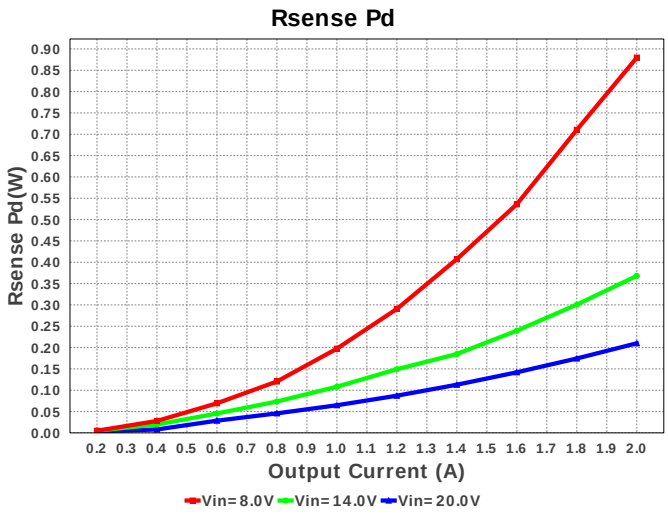
Design : 1194016/2073 LM5022QDGSTQ1
LM5022QDGSTQ1 8.0V-20.0V to 12.00V @ 2.0A

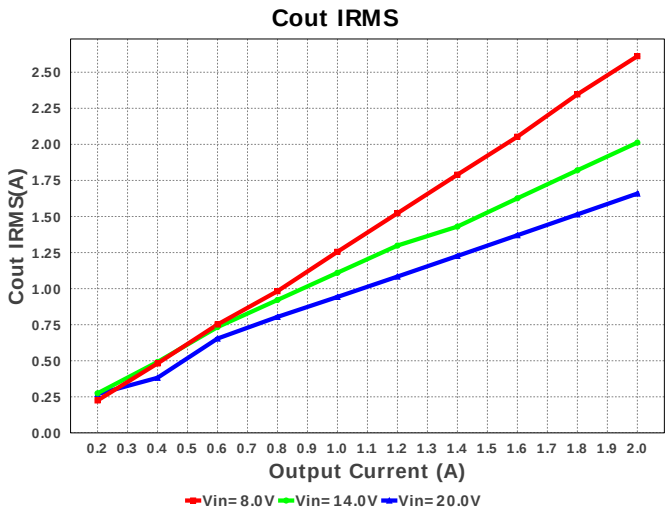


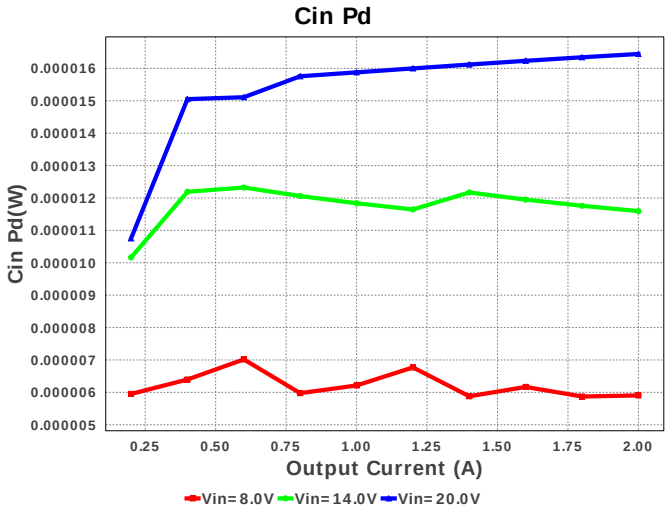
Electrical BOM

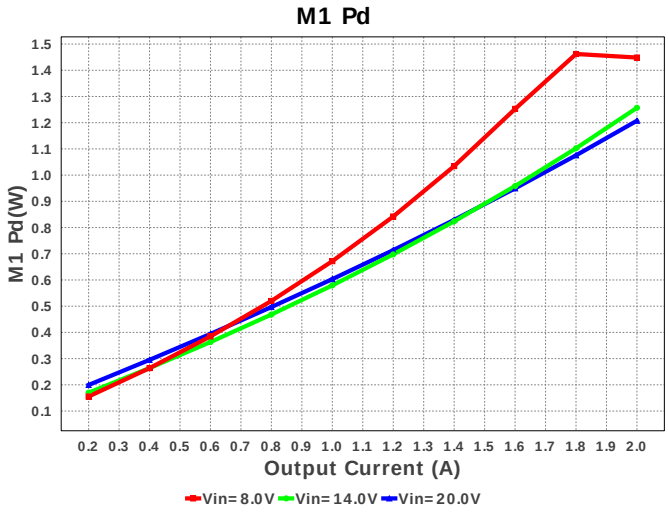
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccc	MuRata	GRM155R61C104KA88D Series= X5R	Cap= 100.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB272 Series= X7R	Cap= 2.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Kemet	C0805C100K5GACTU Series= C0G/NP0	Cap= 10.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Nichicon	UUD1V560MCL1GS Series= uD	Cap= 56.0 uF ESR= 340.0 mOhm VDC= 35.0 V IRMS= 280.0 mA	2	$0.11	SM_RADIAL_6.3BMM 80 mm²
5.	Cout	MuRata	GRM32ER61C226ME20L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 3.68 A	2	$0.12	1210 15 mm²
6.	Cramp	Samsung Electro-Mechanics	CL21C751JBCNNNC Series= C0G/NP0	Cap= 750.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
7.	Csep	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
8.	Css	MuRata	GRM155R71C224KA12D Series= X7R	Cap= 220.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
9.	D1	Vishay-Semiconductor	50WQ10FNPBF	VF@Io= 770.0 mV VRRM= 100.0 V	1	$0.74	DPAK 102 mm²

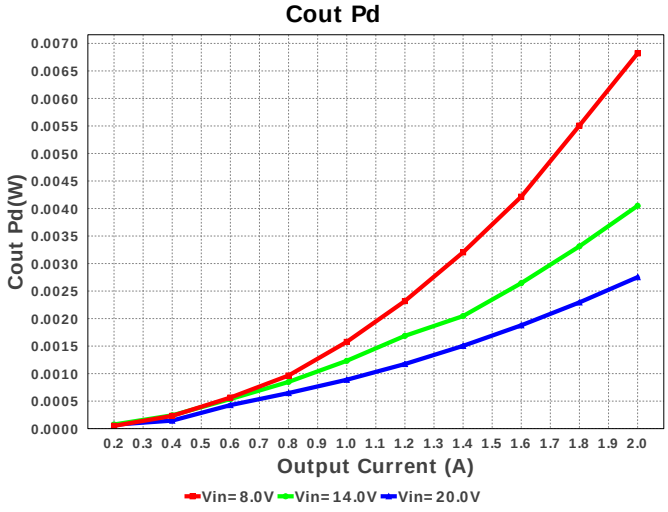
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Lcoup	Coiltronics	DRQ125-6R8-R	Lp= 6.8 µH Rp= 24.6 mOhm Leakage_L= 408.0 nH Ns1toNp= 1.0 Rs1= 24.6 mOhms	1	$0.88	 DRQ125 210 mm^2
11.	M1	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	$0.19	 PG-TDSON-8 55 mm^2
12.	Rcomp	Yageo America	RC0603FR-0762KL Series= ?	Res= 62.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm^2
13.	Rfadj	Vishay-Dale	CRCW040238K3FKED Series= CRCW..e3	Res= 38.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
14.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rfb2	Vishay-Dale	CRCW040286K6FKED Series= CRCW..e3	Res= 86.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
17.	Rramp2	Yageo America	RC0603FR-072K7L Series= ?	Res= 2.7 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm^2
18.	Rsense	CUSTOM	CUSTOM Series= ?	Res= 47.0 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm^2
19.	Ruvpb	Vishay-Dale	CRCW04022K37FKED Series= CRCW..e3	Res= 2.37 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Ruvpt	Vishay-Dale	CRCW040211K5FKED Series= CRCW..e3	Res= 11.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
21.	U1	Texas Instruments	LM5022QDGSTQ1	Switcher	1	$1.04	 MUB10A 24 mm^2

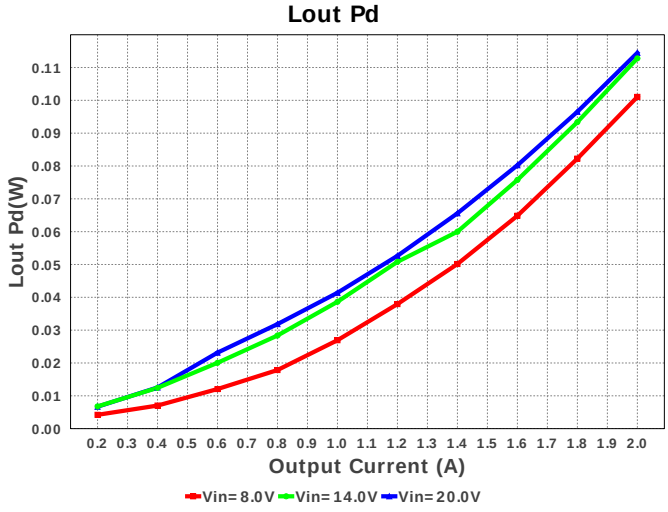












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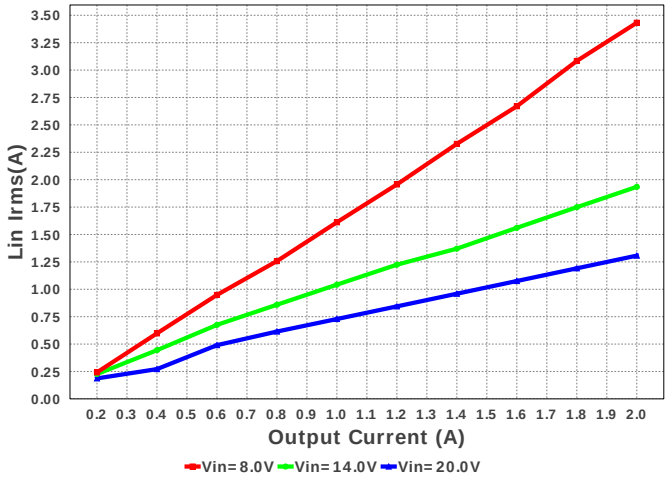
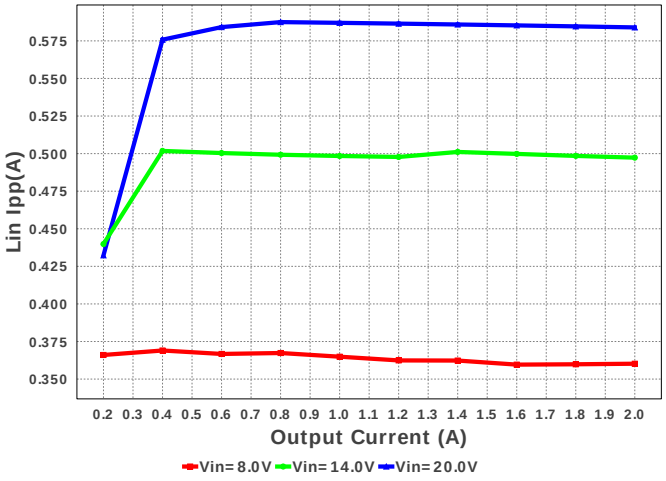


Lin Ipp



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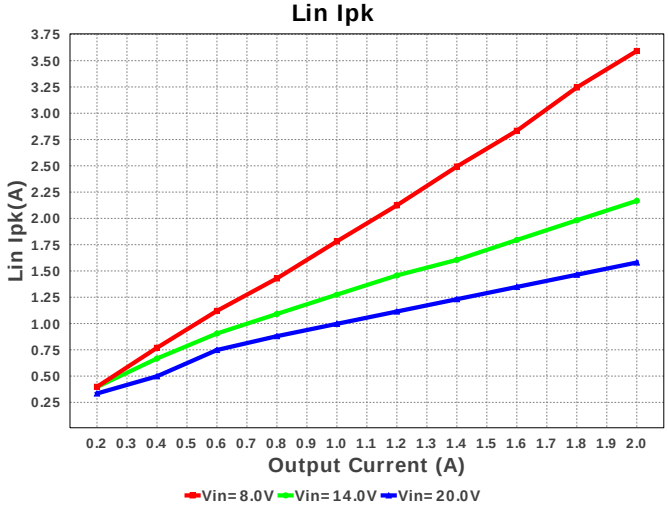
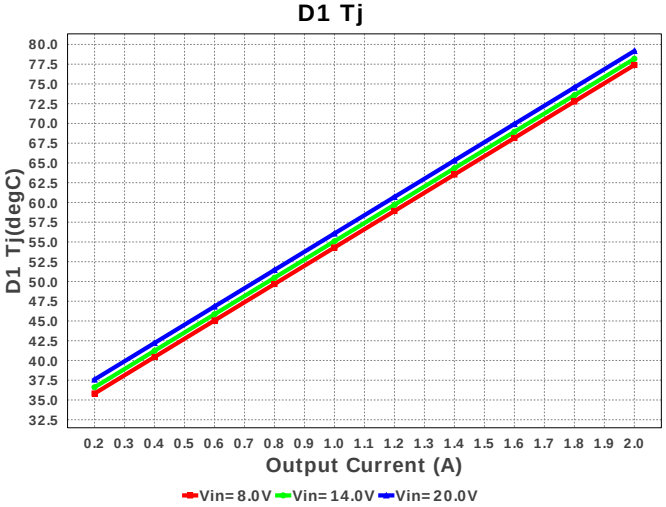
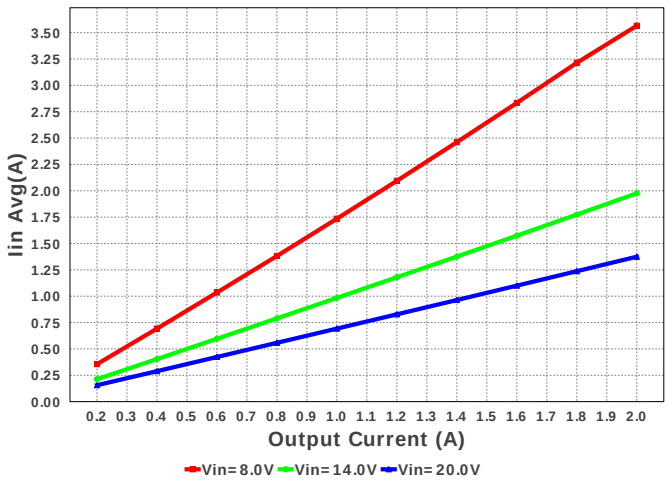


D1 Tj



Iin Avg



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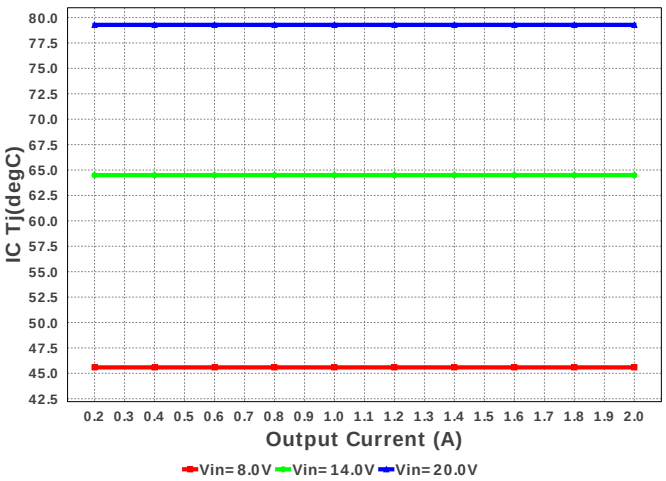

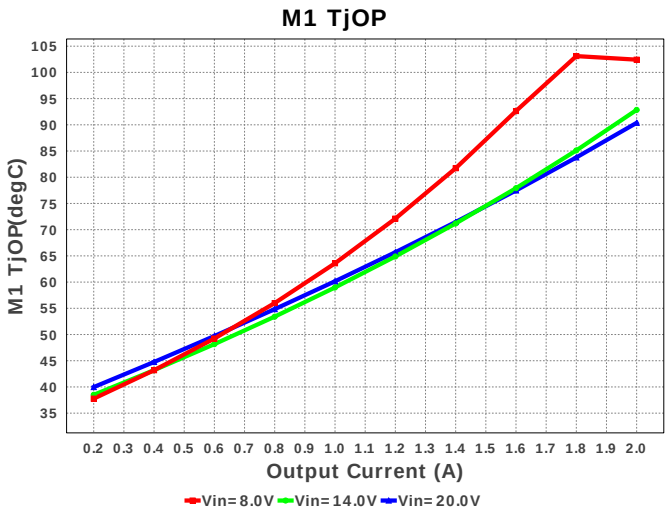

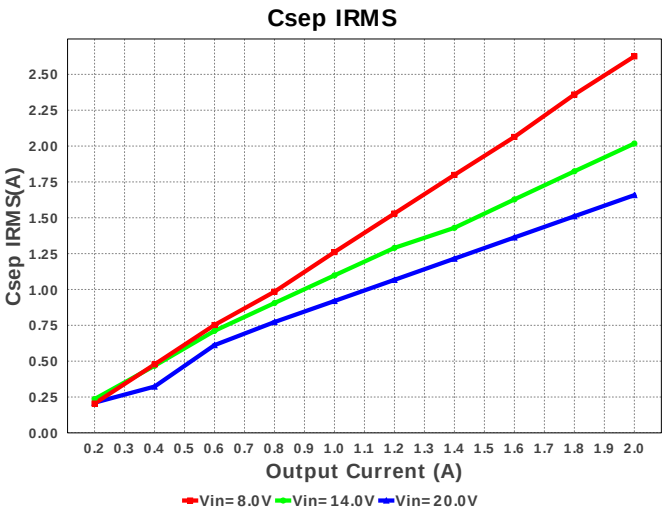

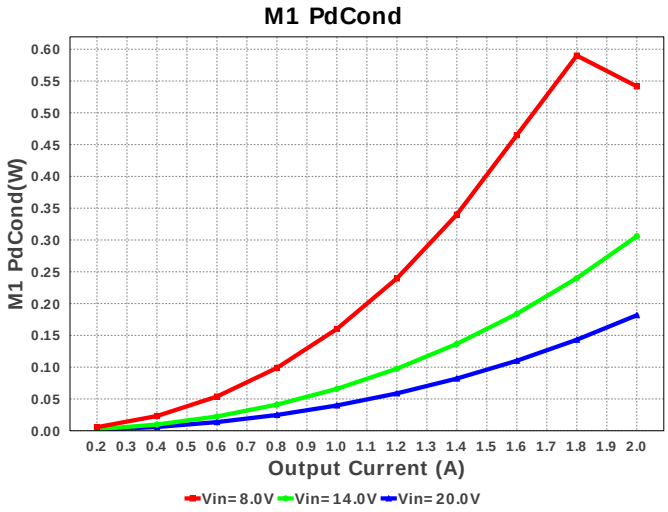

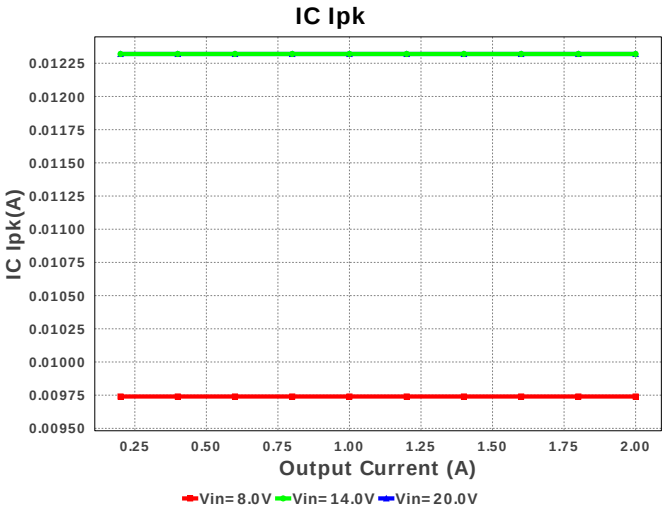

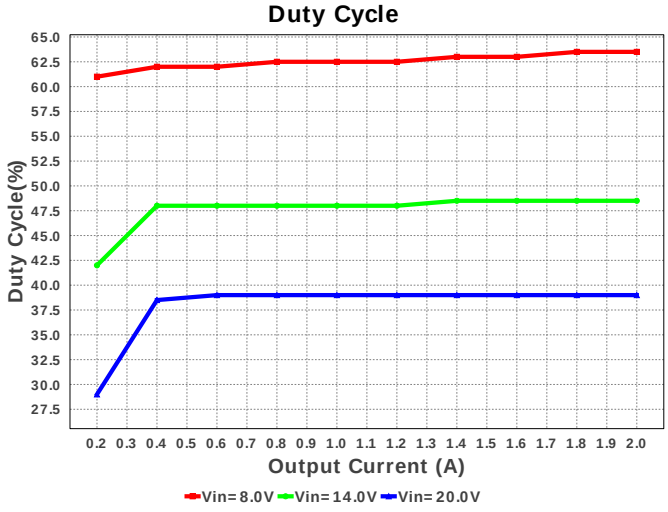

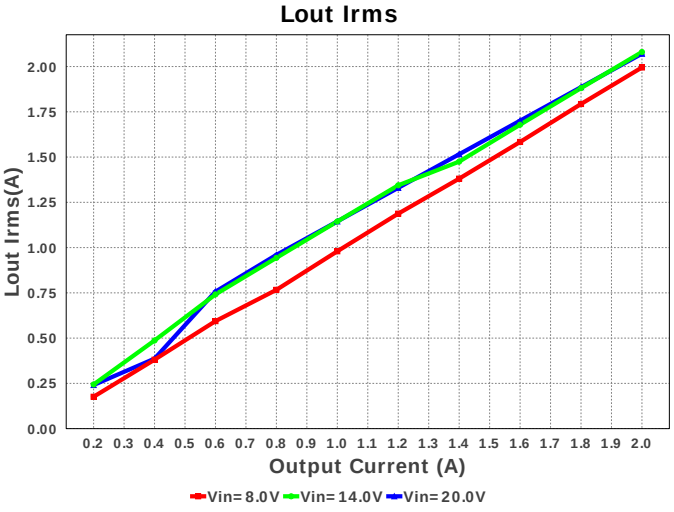

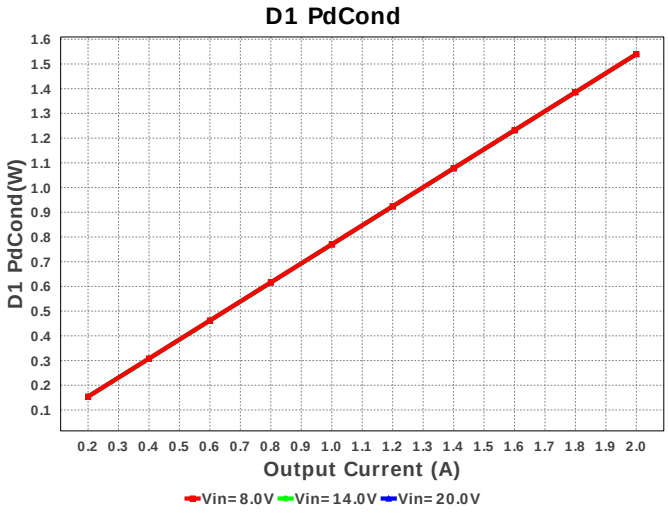

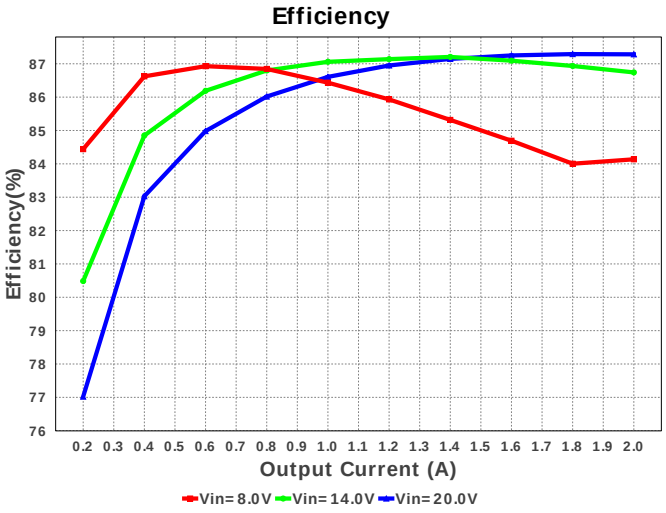

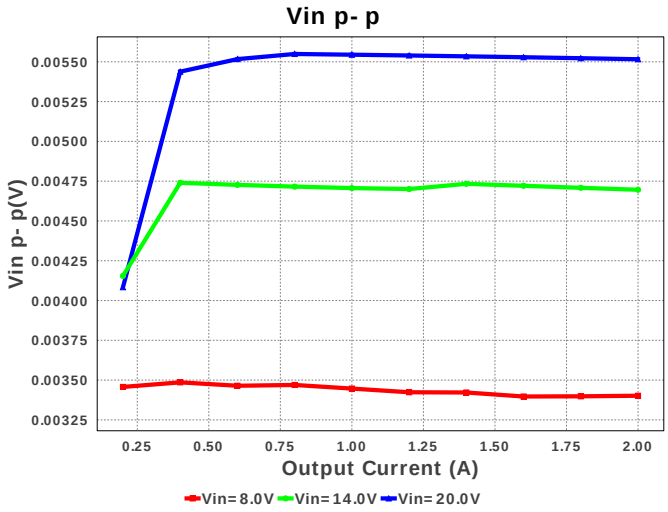

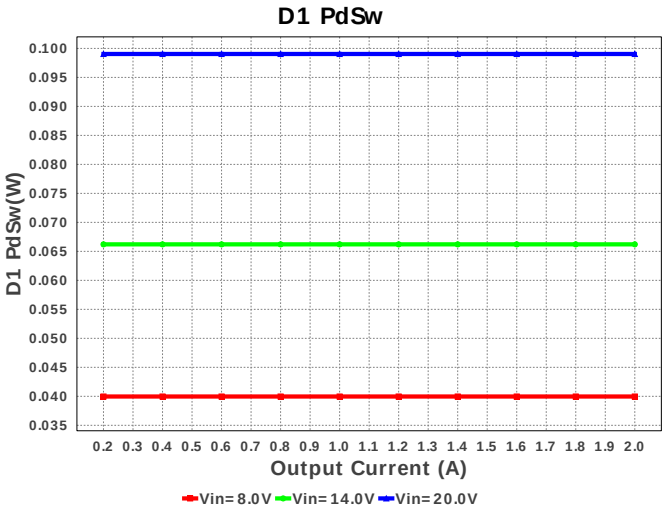

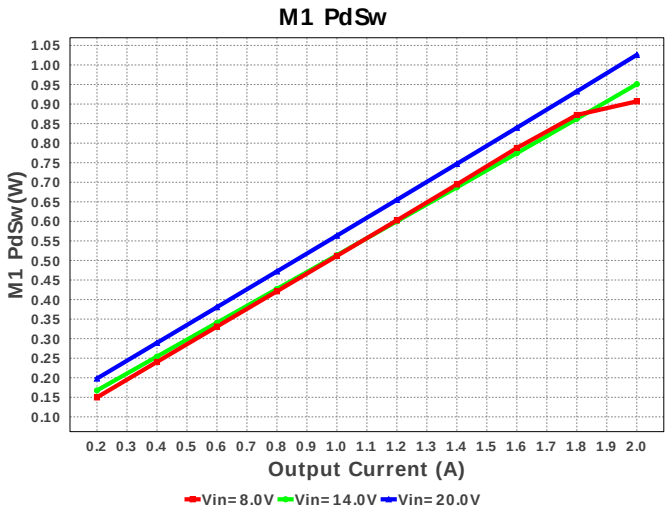

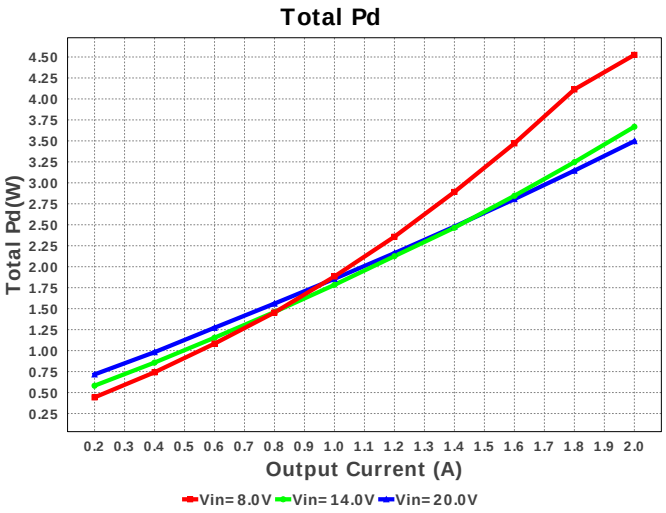

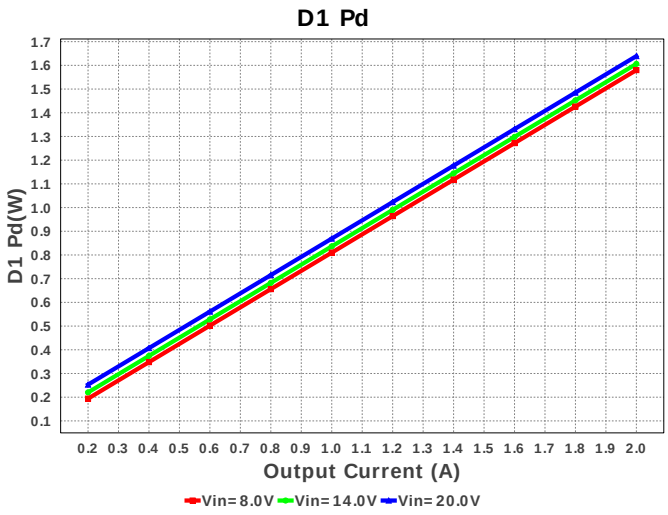

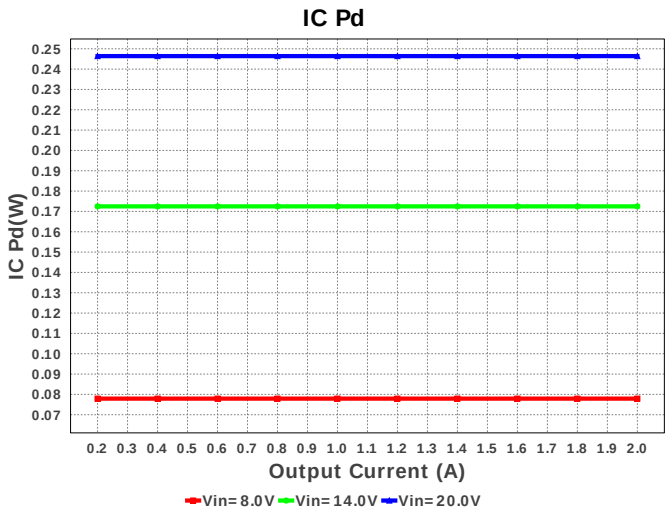

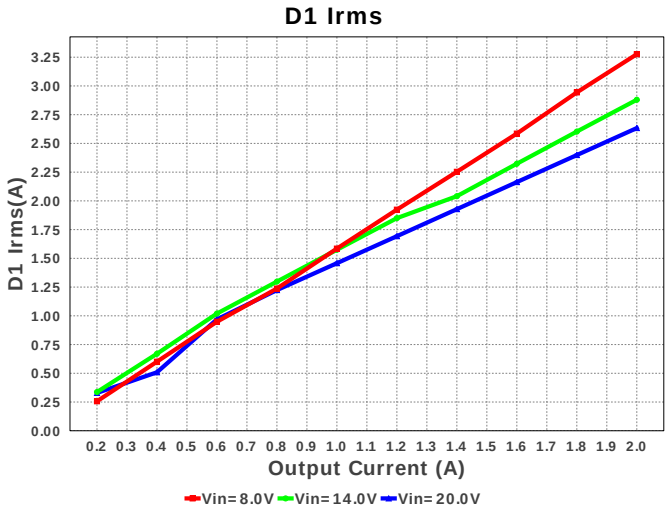

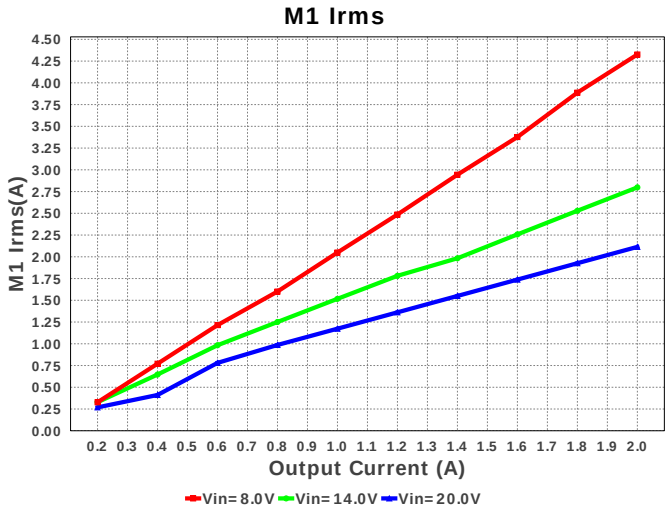

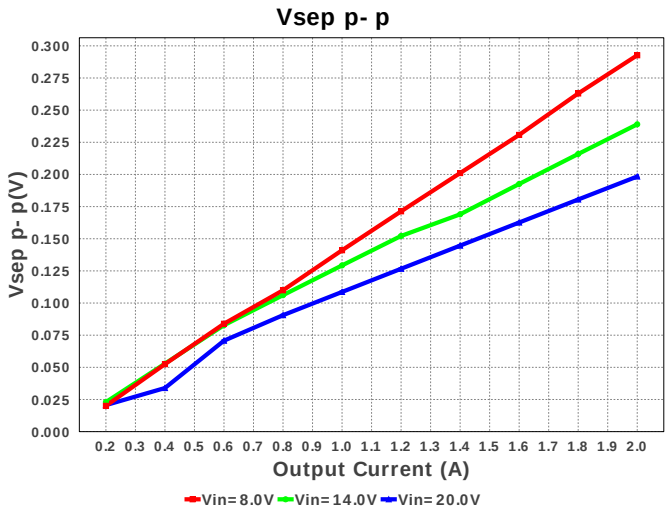

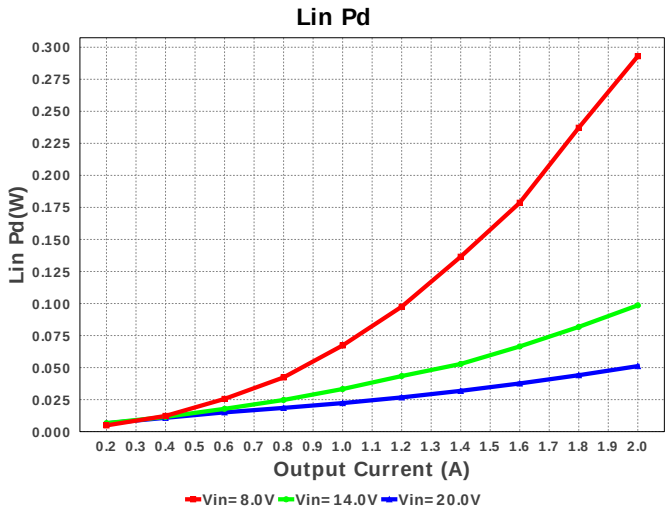

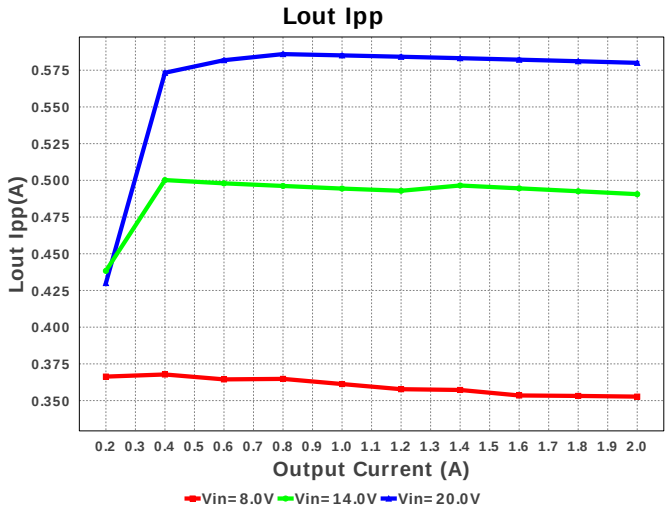

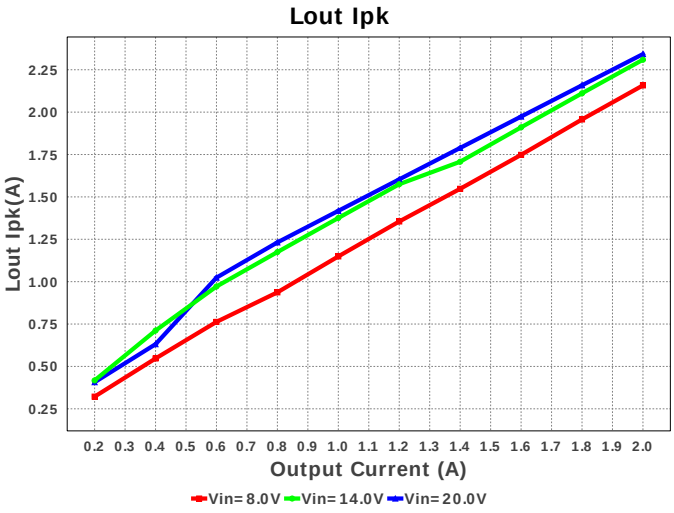

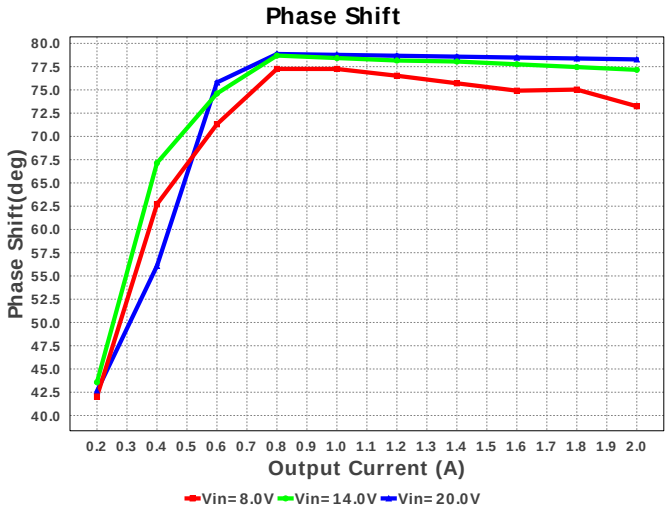

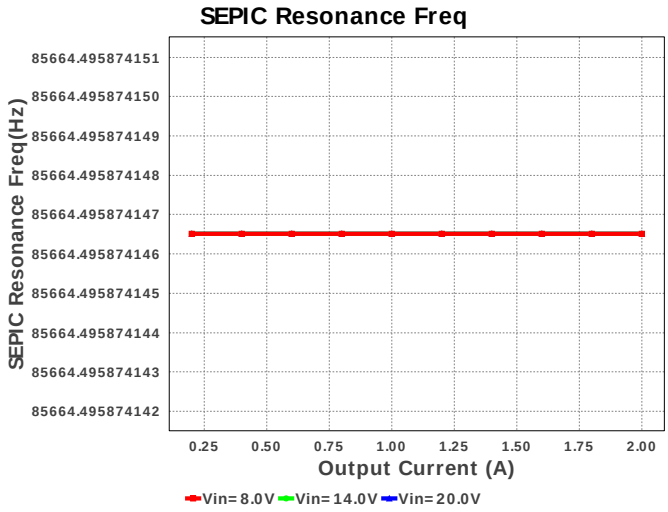

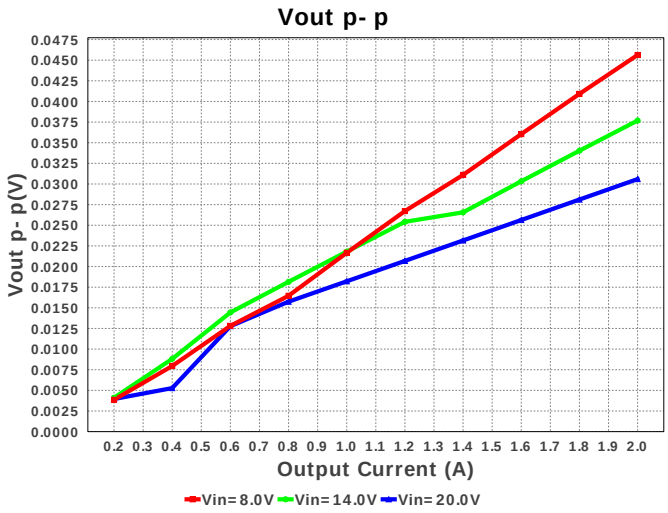

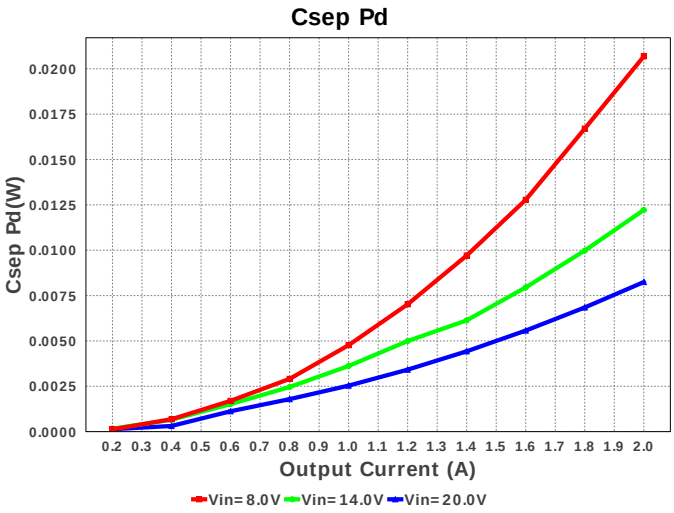

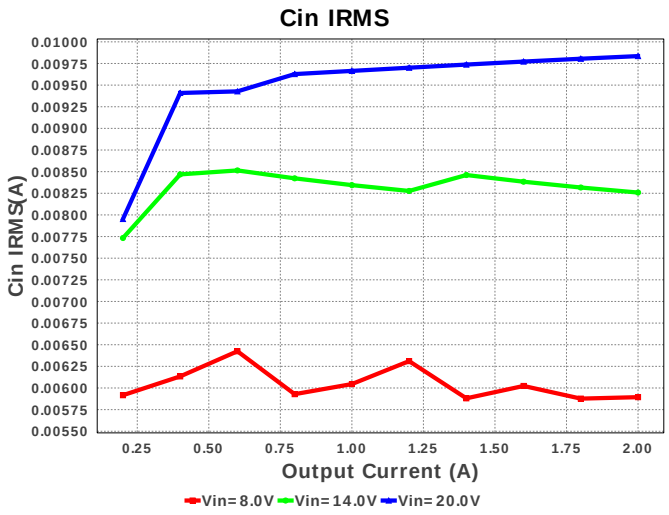

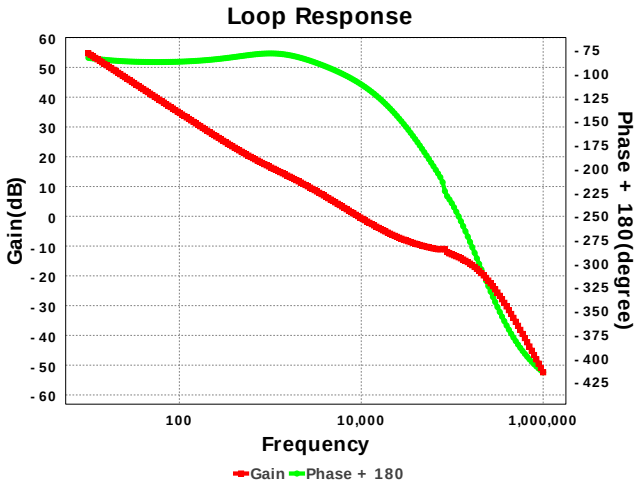

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	13.609 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.513 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	2.58 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	3.159 A	Current	D1 Irms
5.	IC Ipk	11.032 mA	Current	Peak switch current in IC
6.	Iin Avg	3.507 A	Current	Average input current
7.	Lin Ipk	3.637 A	Current	Lin peak current
8.	Lin Ipp	806.065 mA	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	3.262 A	Current	Lin ripple current
10.	Lout Ipk	2.315 A	Current	Lout peak current
11.	Lout Ipp	793.866 mA	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	1.944 A	Current	Lout ripple current
13.	M1 Irms	4.134 A	Current	M1 MOSFET Irms
14.	BOM Count	23	General	Total Design BOM count
15.	FootPrint	650.0 mm^2	General	Total Foot Print Area of BOM components
16.	Frequency	440.0 kHz	General	Switching frequency
17.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
18.	Total BOM	$0.0	General	Total BOM Cost
19.	D1 Tj	76.728 degC	Op_Point	D1 junction temperature
20.	SEPIC Resonance Freq	85.664 kHz	Op_Point	SEPIC Resonance Frequency
21.	Vin p-p	7.61 mV	Op_Point	Peak-to-peak input voltage
22.	Vsep p-p	633.264 mV	Op_Point	Peak-to-peak sepic voltage
23.	Cross Freq	9.222 kHz	Op_point	Bode plot crossover frequency
24.	Duty Cycle	63.0 %	Op_point	Duty cycle
25.	Efficiency	85.551 %	Op_point	Steady state efficiency
26.	Gain Marg	10.051 db	Op_point	Bode Plot Gain Margin
27.	IC Tj	74.128 degC	Op_point	IC junction temperature
28.	IOUT_OP	2.0 A	Op_point	Iout operating point
29.	M1 TjOP	86.229 degC	Op_point	M1 MOSFET junction temperature
30.	Phase Marg	70.911 deg	Op_point	Bode Plot Phase Margin
31.	Phase Shift	72.369 deg	Op_point	Bode Plot Phase Shift
32.	VIN_OP	8.0 V	Op_point	Vin operating point
33.	Vout p-p	92.911 mV	Op_point	Peak-to-peak output ripple voltage
34.	Cin Pd	31.487 µW	Power	Input capacitor power dissipation
35.	Cout Pd	6.314 mW	Power	Output capacitor power dissipation
36.	Csep Pd	19.967 mW	Power	SEPIC capacitor power dissipation
37.	D1 Pd	1.558 W	Power	Diode power dissipation
38.	D1 PdCond	1.54 W	Power	Diode conduction losses
39.	D1 PdSw	17.586 mW	Power	Diode switching losses
40.	IC Pd	220.64 mW	Power	IC power dissipation
41.	Lin Pd	268.394 mW	Power	Lin power dissipation
42.	Lout Pd	99.508 mW	Power	Lout power dissipation
43.	M1 Pd	1.125 W	Power	M1 MOSFET total power dissipation
44.	M1 PdCond	707.39 mW	Power	M1 MOSFET conduction losses
45.	M1 PdSw	417.18 mW	Power	M1 MOSFET switching losses
46.	Rsense Pd	803.065 mW	Power	LED Current Rsns Power Dissipation
47.	Total Pd	4.053 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	Iout1	2.0	Output Current #1
3.	VinMax	20.0	Maximum input voltage
4.	VinMin	8.0	Minimum input voltage
5.	Vout	12.0	Output Voltage
6.	Vout1	12.0	Output Voltage #1
7.	Vout2	5.0	Output Voltage #2
8.	base_pn	LM5022-Q1	Base Product Number
9.	source	DC	Input Source Type
10.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM5022-Q1** Product Folder : http://www.ti.com/product/LM5022 : contains the data sheet and other resources.