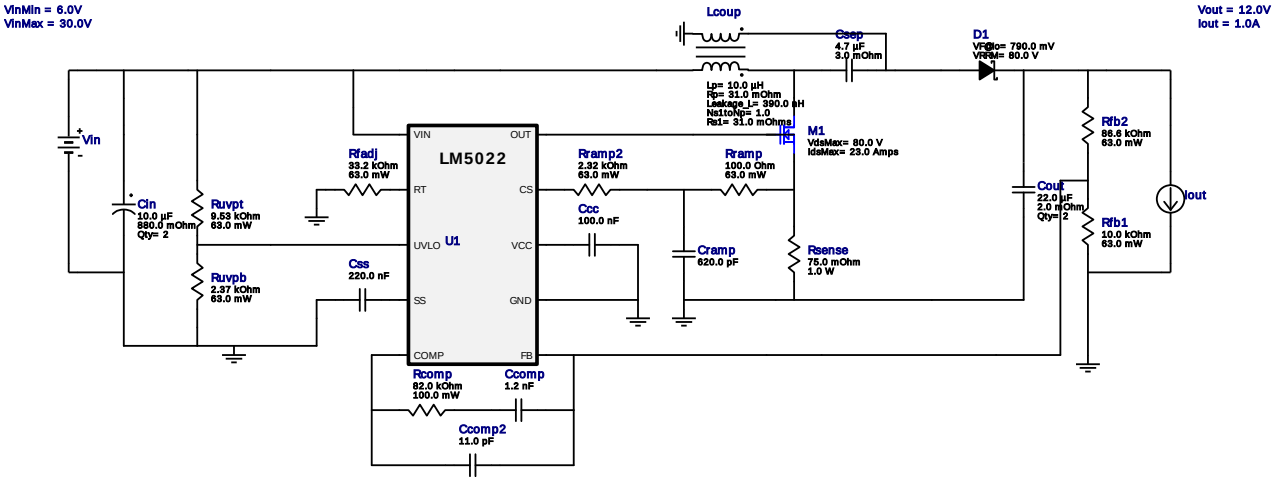
WEBENCH® Design Report

VinMin = 6.0V
VinMax = 30.0V
Vout = 12.0V
Iout = 1.0A

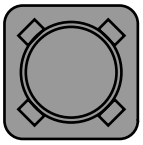
Device = LM5022MM/NOPB
Topology = SEPIC
Created = 9/21/15 5:45:49 AM
BOM Cost = $4.17
Footprint = 612.0 mm^2
BOM Count = 23
Total Pd = 2.66W

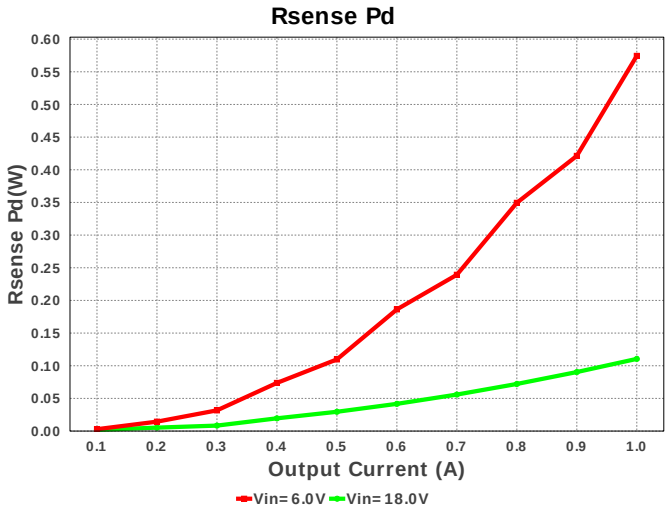
Design : 4387940/10 LM5022MM/NOPB
LM5022MM/NOPB 6.0V-30.0V to 12.00V @ 1.0A

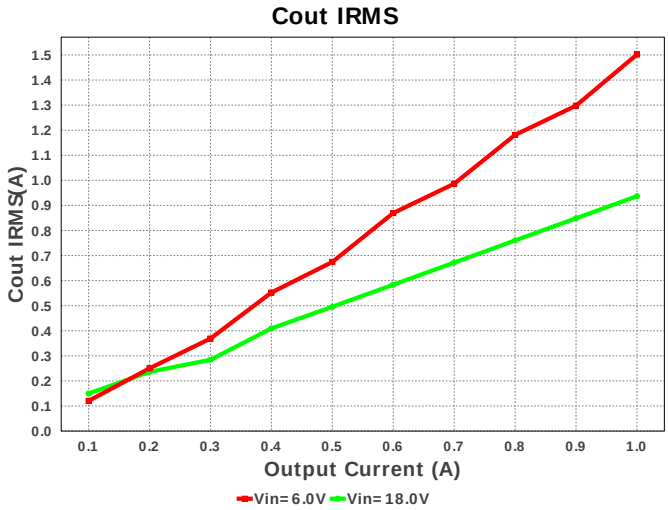


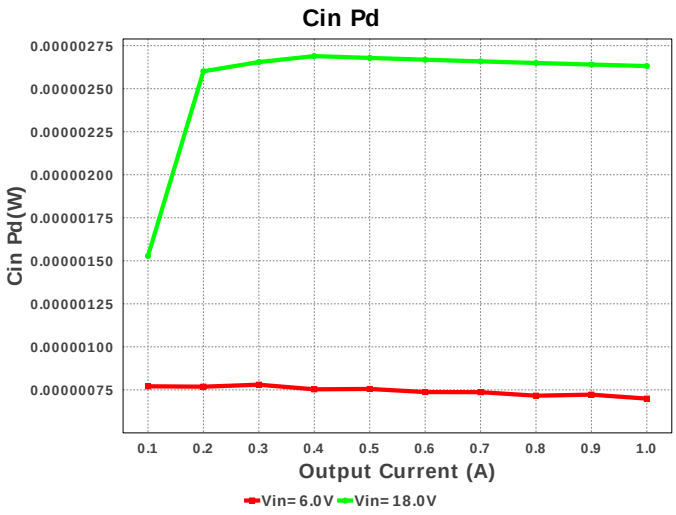
Electrical BOM

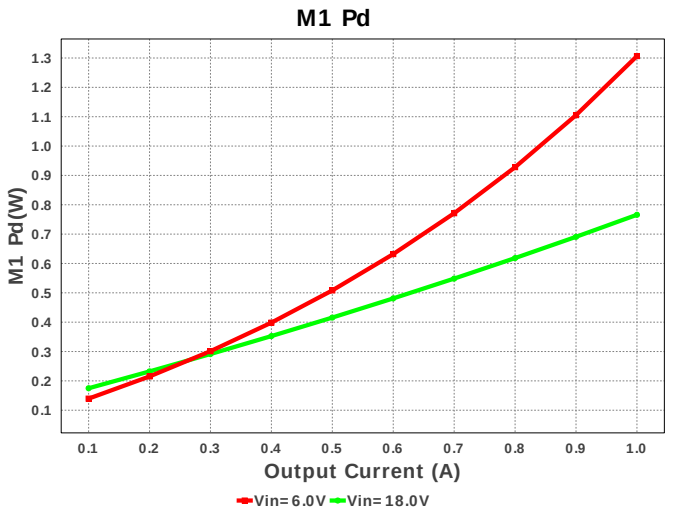
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccc	MuRata	GRM155R61C104KA88D Series= X5R	Cap= 100.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
2.	Ccomp	Samsung Electro-Mechanics	CL21C122JBFNNWE Series= C0G/NP0	Cap= 1.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
3.	Ccomp2	TDK	C0603C0G1E110G Series= C0G/NP0	Cap= 11.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm^2
4.	Cin	Nichicon	UUD1H100MCL1GS Series= uD	Cap= 10.0 uF ESR= 880.0 mOhm VDC= 50.0 V IRMS= 165.0 mA	2	$0.10	SM_RADIAL_6.3AMM 80 mm^2
5.	Cout	MuRata	GRM32ER61C226KE20L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 3.68 A	2	$0.16	1210 15 mm^2
6.	Cramp	Samsung Electro-Mechanics	CL21C621JBCNNNC Series= C0G/NP0	Cap= 620.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
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 mm^2
8.	Css	MuRata	GRM155R71C224KA12D Series= X7R	Cap= 220.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
9.	D1	Diodes Inc.	B280-13-F	VF@Io= 790.0 mV VRRM= 80.0 V	1	$0.13	SMB 44 mm^2

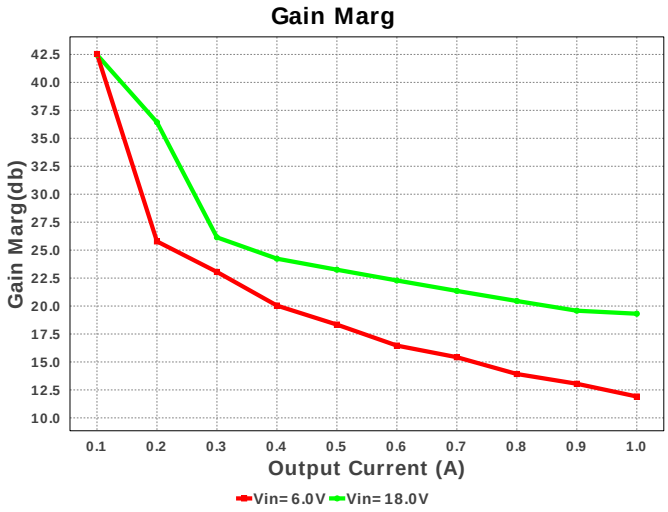
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Lcoup	Wurth Elektronik	744873100	Lp= 10.0 µH Rp= 31.0 mOhm Leakage_L= 390.0 nH Ns1toNp= 1.0 Rs1= 31.0 mOhms	1	$2.02	 WE-DD-XL 210 mm²
11.	M1	Infineon Technologies	BSC340N08NS3 G	VdsMax= 80.0 V IdsMax= 23.0 Amps	1	$0.26	 PG-TDSON-8 55 mm²
12.	Rcomp	Yageo America	RC0603FR-0782KL Series= ?	Res= 82.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
13.	Rfadj	Vishay-Dale	CRCW040233K2FKED Series= CRCW..e3	Res= 33.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
14.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rfb2	Vishay-Dale	CRCW040286K6FKED Series= CRCW..e3	Res= 86.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rramp2	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
18.	Rsense	Stackpole Electronics Inc	CSRN2010FK75L0 Series= ?	Res= 75.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.14	 2010 32 mm²
19.	Ruvpb	Vishay-Dale	CRCW04022K37FKED Series= CRCW..e3	Res= 2.37 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
20.	Ruvpt	Vishay-Dale	CRCW04029K53FKED Series= CRCW..e3	Res= 9.53 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
21.	U1	Texas Instruments	LM5022MM/NOPB	Switcher	1	$0.90	 MUB10A 24 mm²

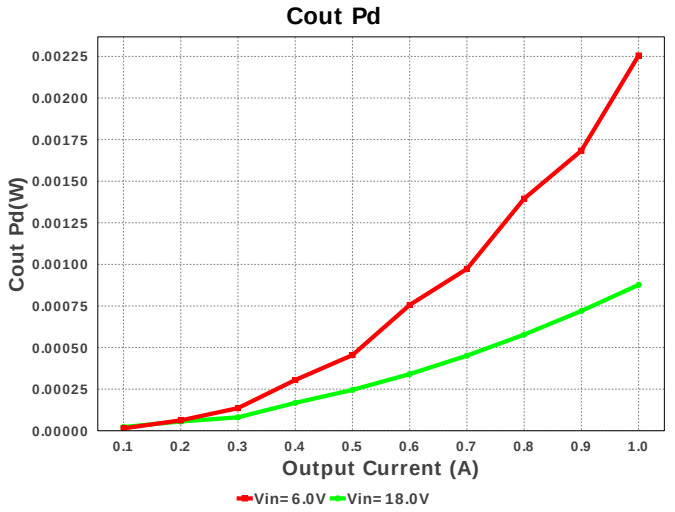


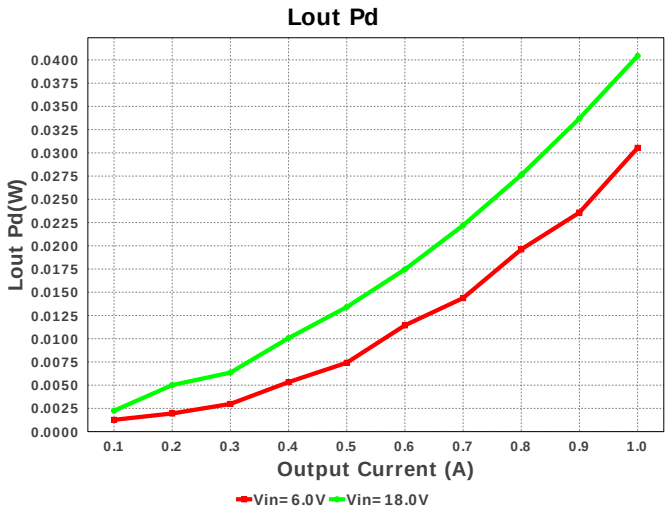


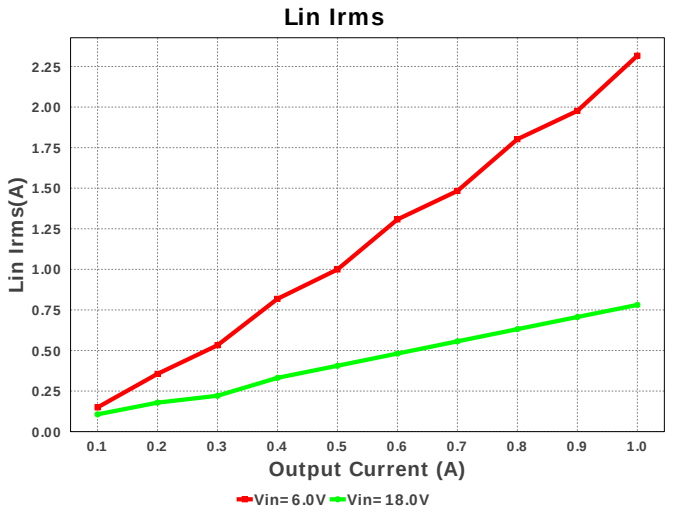


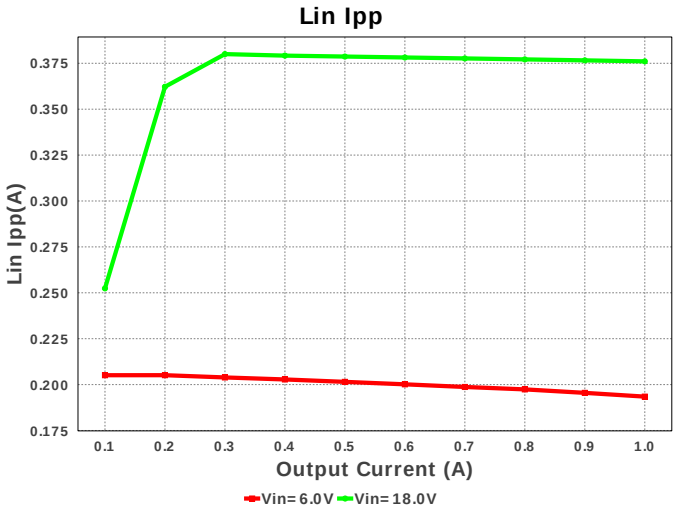


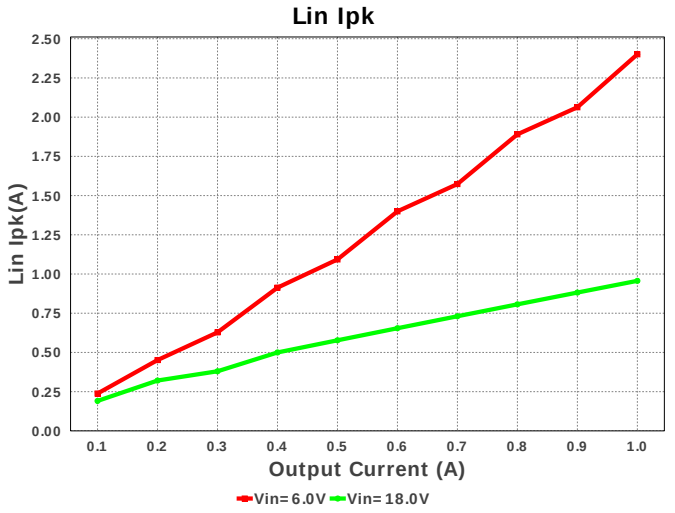


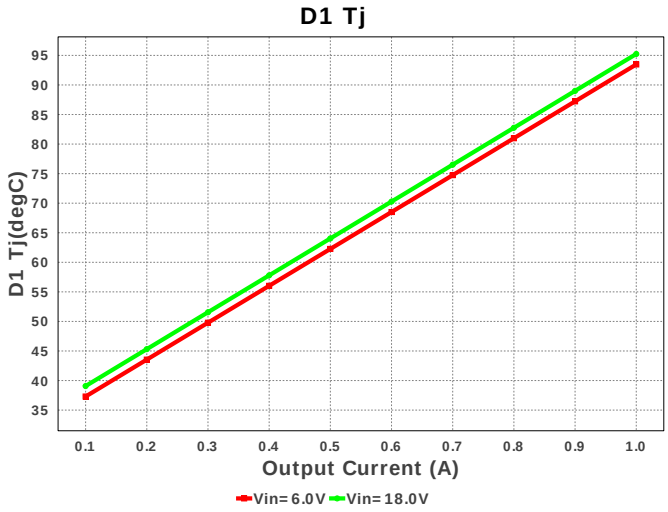


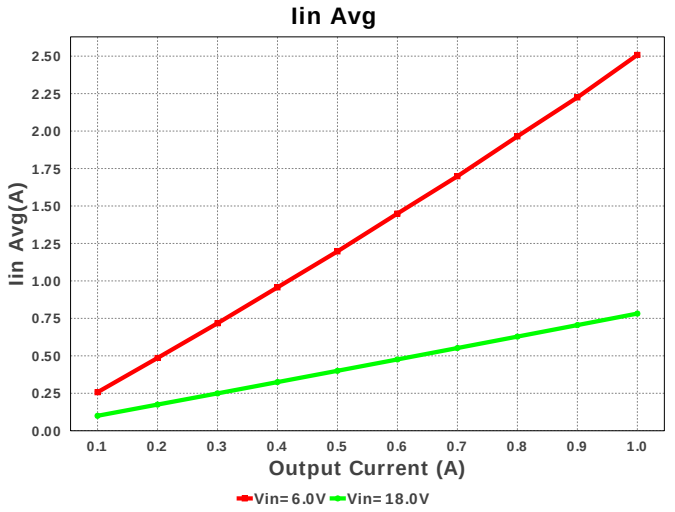


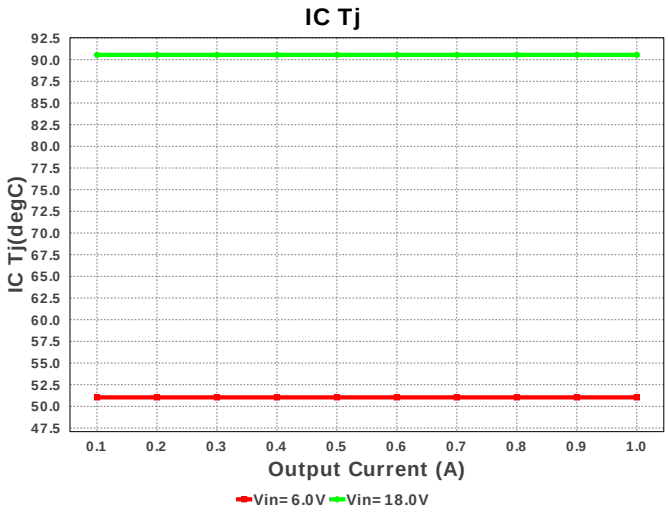


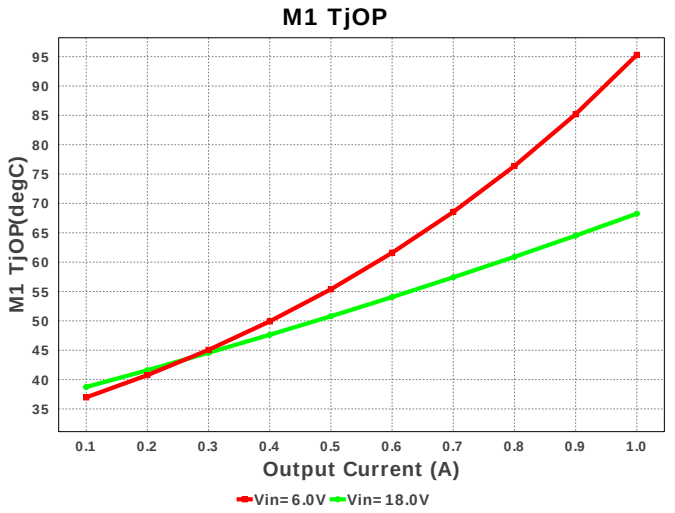


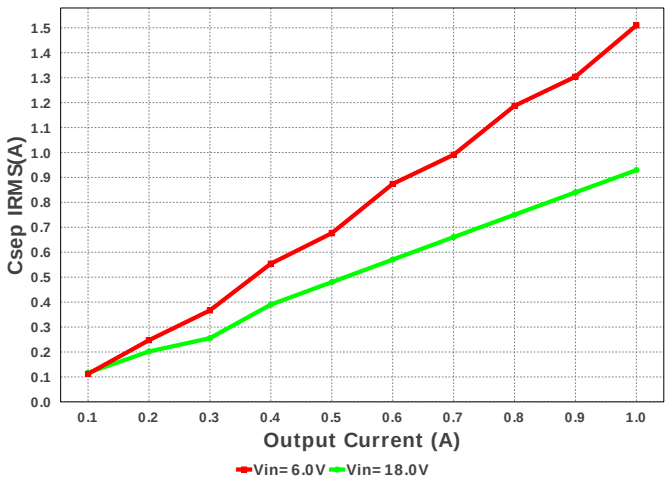


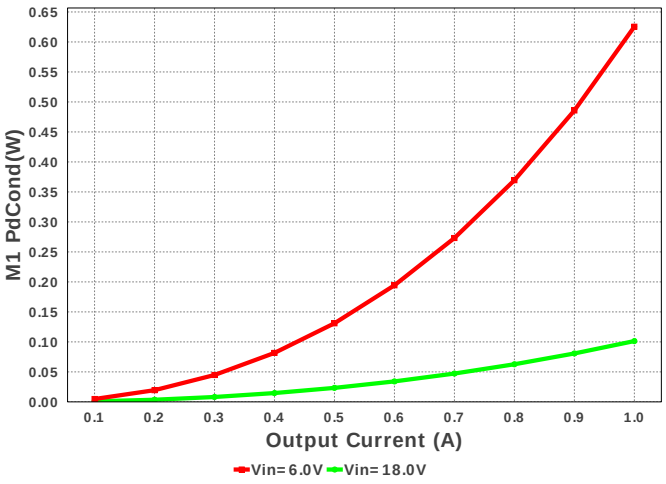


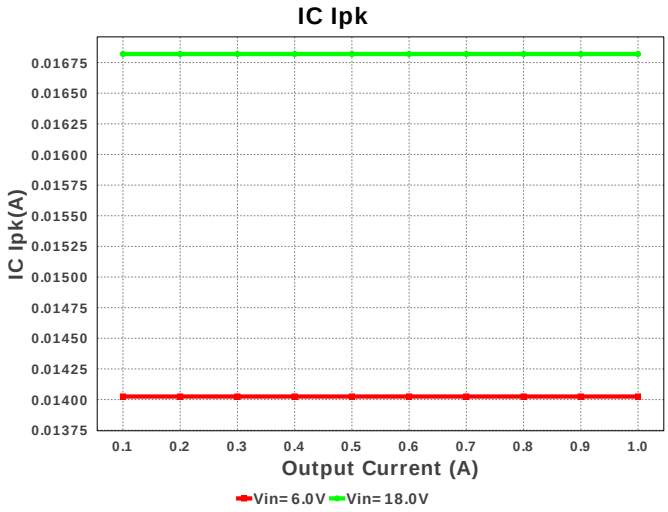


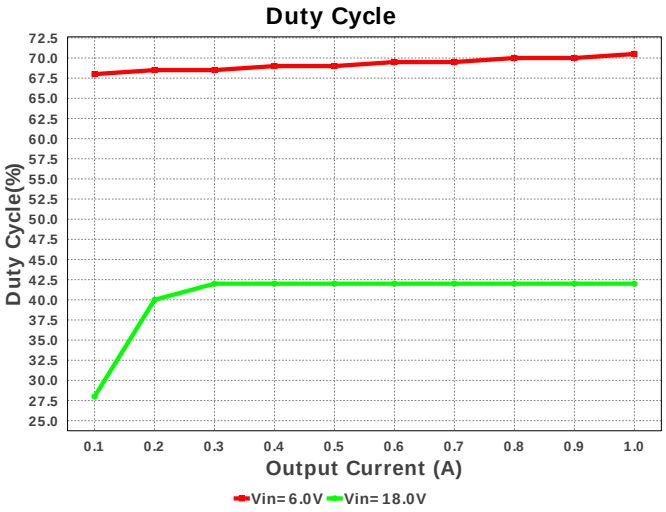


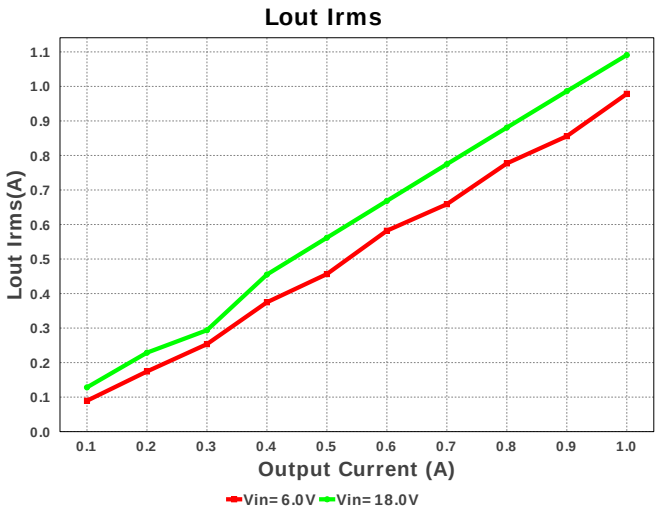


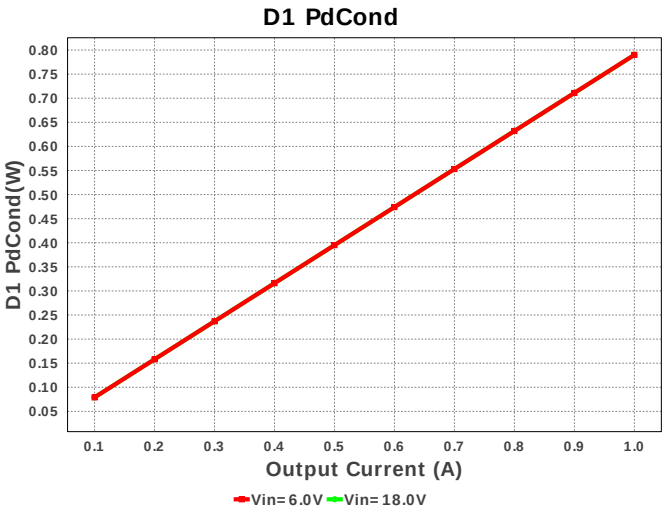


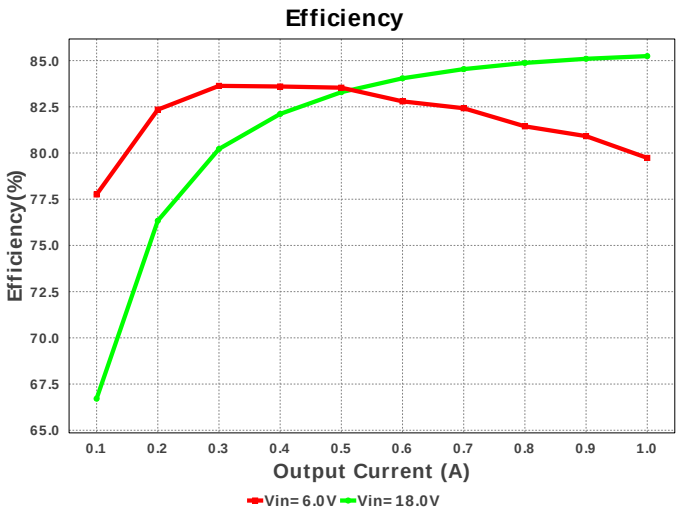


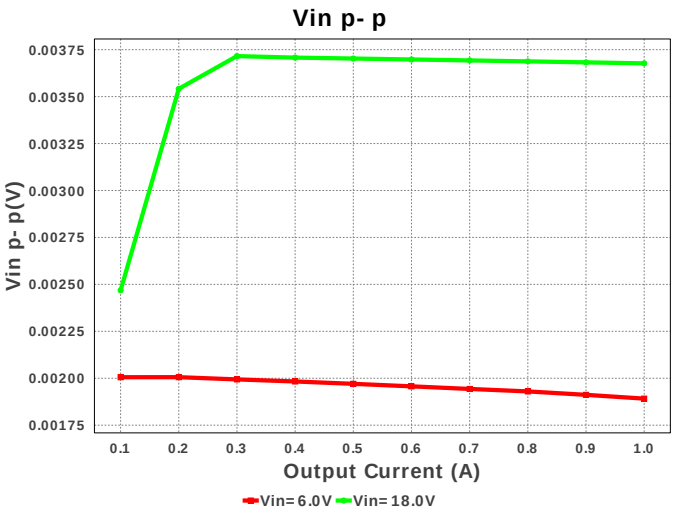


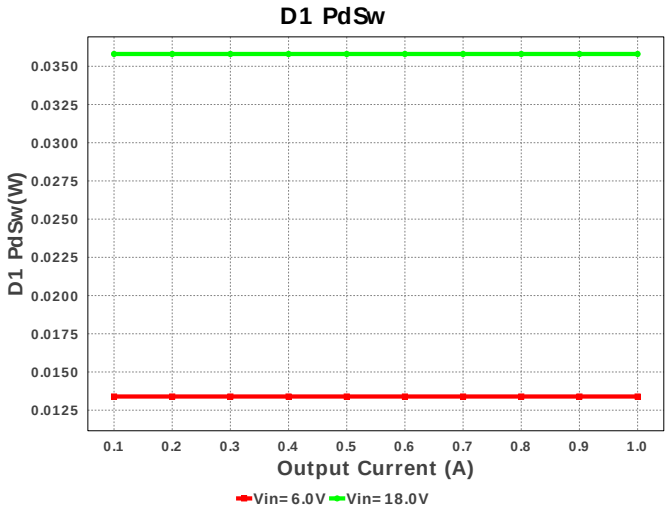


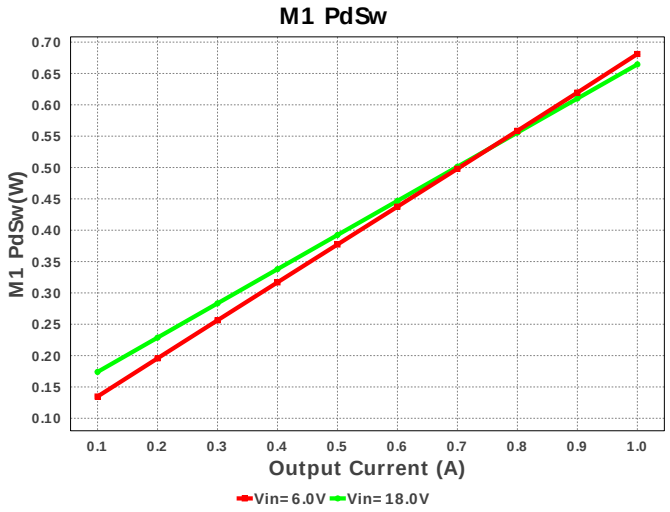


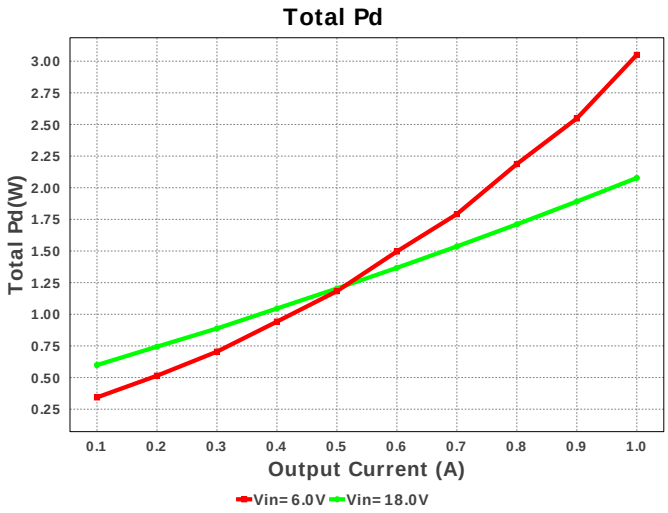


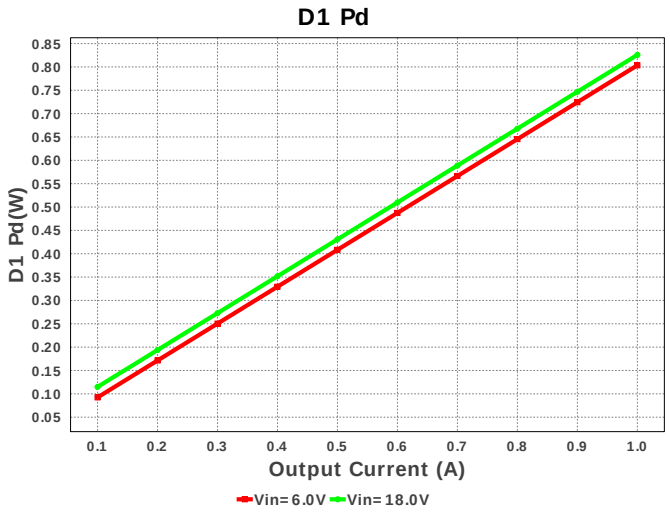




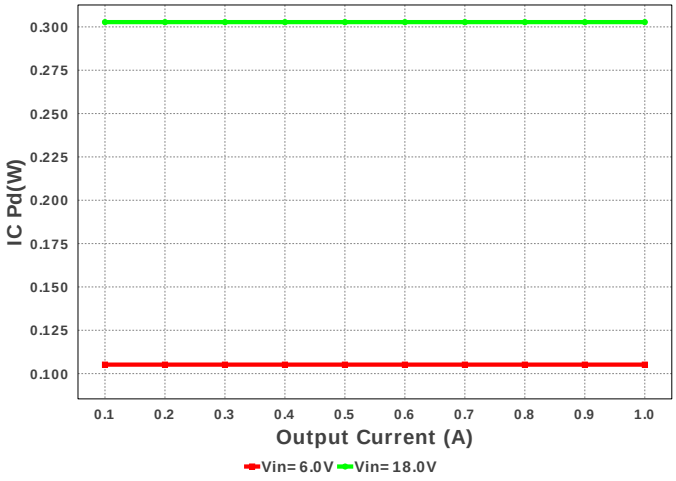




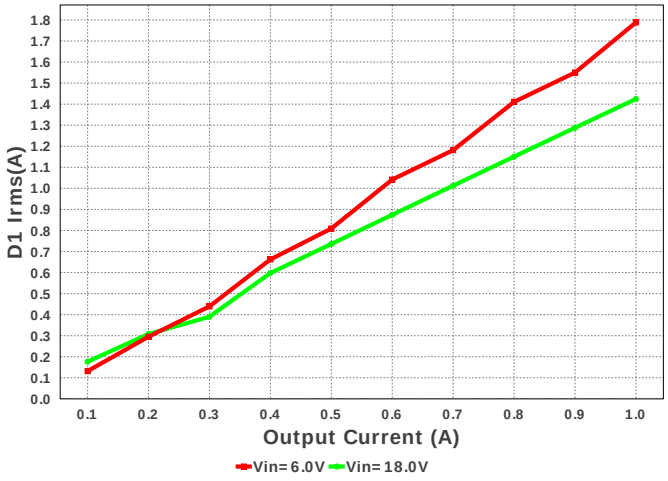




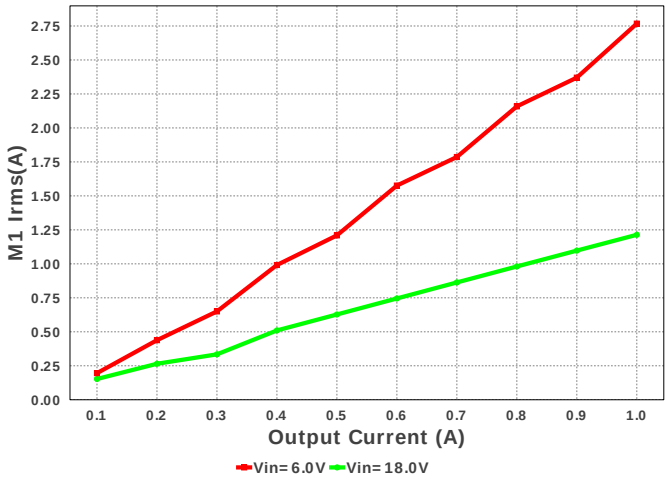
IC Pd



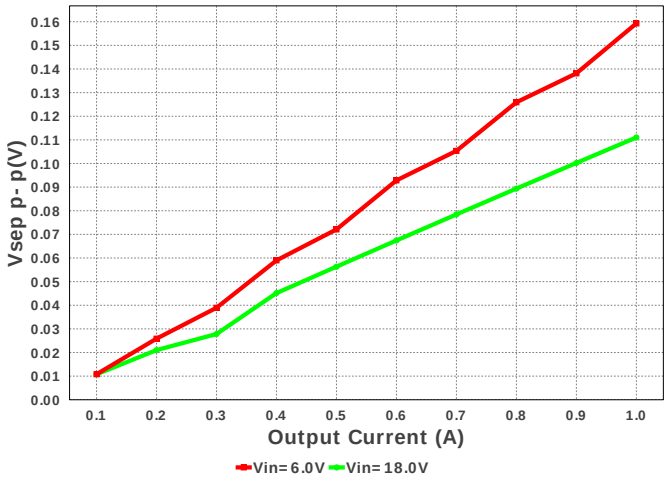
D1 Irms



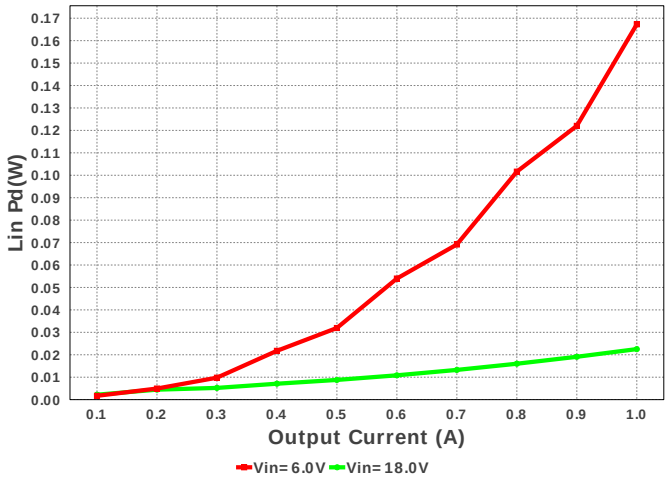
M1 Irms



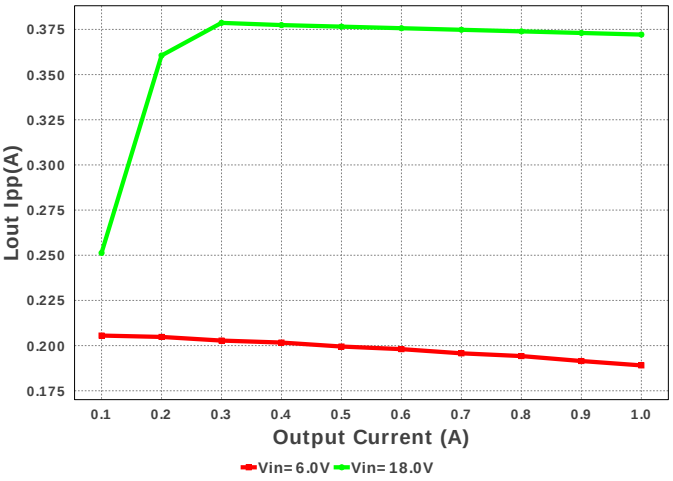
Vsep p- p

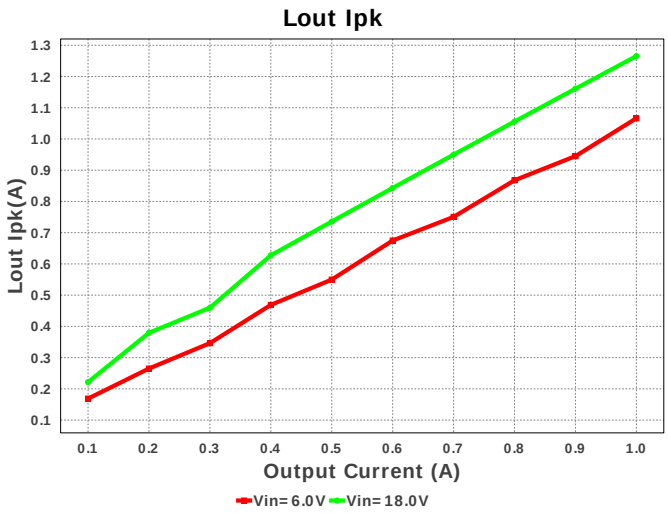


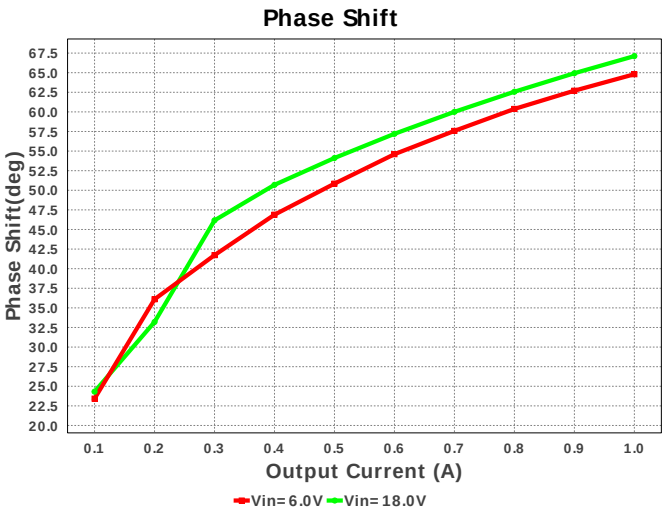
Lin Pd

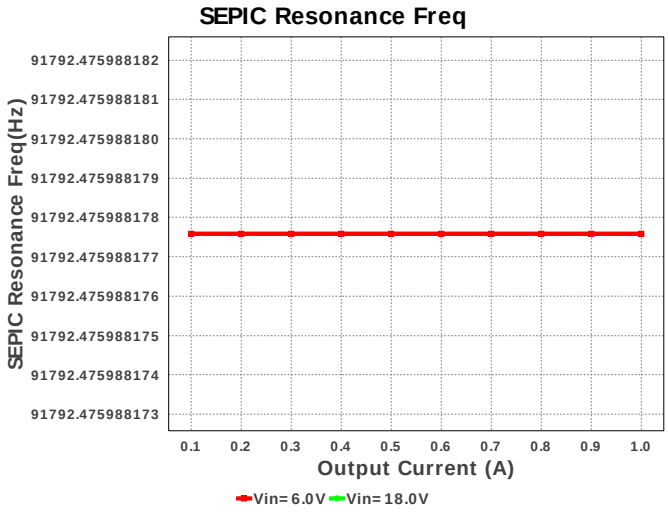


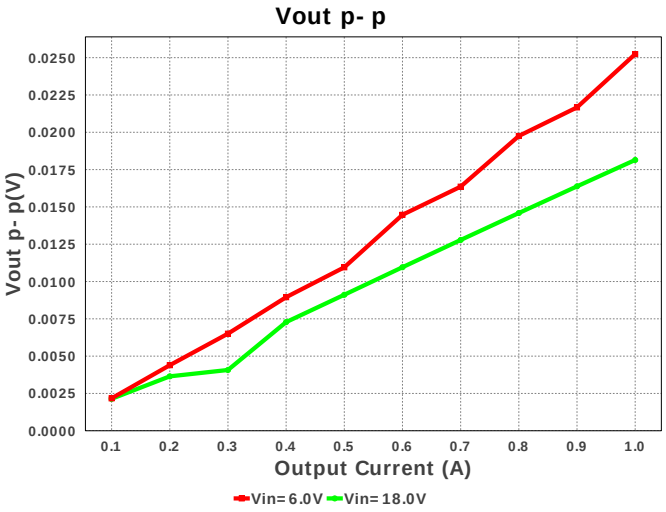
Lout Ipp

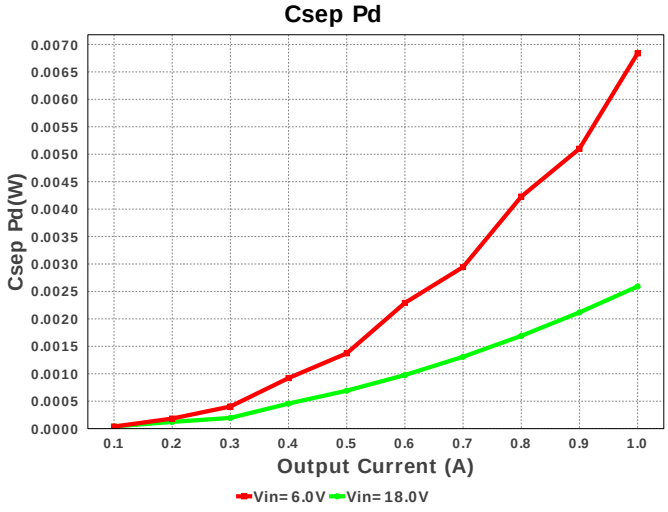


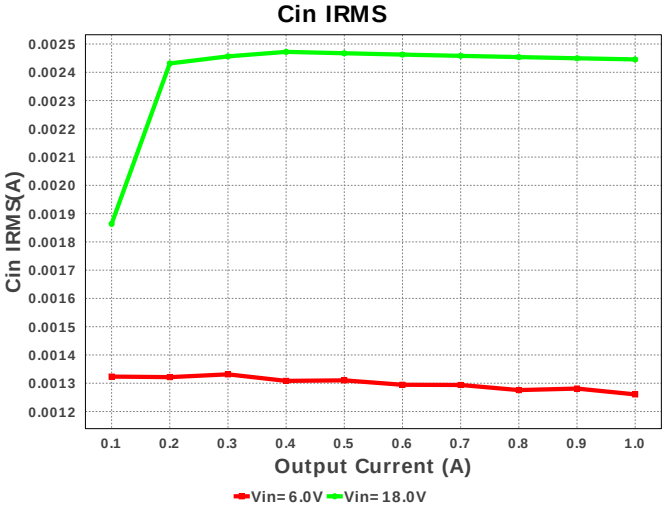


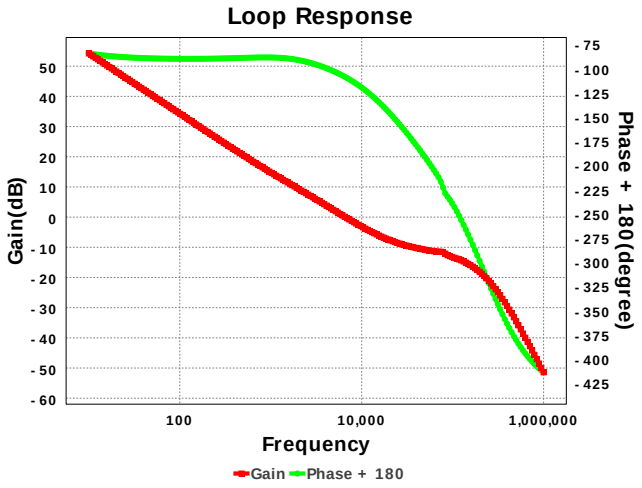












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.591 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.533 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	1.565 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	1.825 A	Current	D1 Irms
5.	IC Ipk	13.42 mA	Current	Peak switch current in IC
6.	Iin Avg	2.444 A	Current	Average input current
7.	Lin Ipk	2.542 A	Current	Lin peak current
8.	Lin Ipp	386.432 mA	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	2.365 A	Current	Lin ripple current
10.	Lout Ipk	1.181 A	Current	Lout peak current
11.	Lout Ipp	380.332 mA	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	1.003 A	Current	Lout ripple current
13.	M1 Irms	2.829 A	Current	M1 MOSFET Irms
14.	BOM Count	23	General	Total Design BOM count
15.	FootPrint	612.0 mm^2	General	Total Foot Print Area of BOM components
16.	Frequency	500.0 kHz	General	Switching frequency
17.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
18.	Total BOM	$4.17	General	Total BOM Cost
19.	D1 Tj	92.939 degC	Op_Point	D1 junction temperature
20.	SEPIC Resonance Freq	91.792 kHz	Op_Point	SEPIC Resonance Frequency
21.	Vin p-p	3.778 mV	Op_Point	Peak-to-peak input voltage
22.	Vsep p-p	319.457 mV	Op_Point	Peak-to-peak sepic voltage
23.	Cross Freq	5.805 kHz	Op_point	Bode plot crossover frequency
24.	Duty Cycle	70.5 %	Op_point	Duty cycle
25.	Efficiency	81.837 %	Op_point	Steady state efficiency
26.	Gain Marg	11.419 db	Op_point	Bode Plot Gain Margin
27.	IC Tj	110.52 degC	Op_point	IC junction temperature
28.	IOUT_OP	1.0 A	Op_point	Iout operating point
29.	M1 TjOP	75.656 degC	Op_point	M1 MOSFET junction temperature
30.	Phase Marg	63.544 deg	Op_point	Bode Plot Phase Margin
31.	Phase Shift	64.143 deg	Op_point	Bode Plot Phase Shift
32.	VIN_OP	6.0 V	Op_point	Vin operating point
33.	Vout p-p	48.455 mV	Op_point	Peak-to-peak output ripple voltage
34.	Cin Pd	2.954 µW	Power	Input capacitor power dissipation
35.	Cout Pd	2.351 mW	Power	Output capacitor power dissipation
36.	Csep Pd	7.345 mW	Power	SEPIC capacitor power dissipation
37.	D1 Pd	796.698 mW	Power	Diode power dissipation
38.	D1 PdCond	790.0 mW	Power	Diode conduction losses
39.	D1 PdSw	6.698 mW	Power	Diode switching losses
40.	IC Pd	402.6 mW	Power	IC power dissipation
41.	Lin Pd	175.043 mW	Power	Lin power dissipation
42.	Lout Pd	32.83 mW	Power	Lout power dissipation
43.	M1 Pd	913.349 mW	Power	M1 MOSFET total power dissipation
44.	M1 PdCond	575.531 mW	Power	M1 MOSFET conduction losses
45.	M1 PdSw	337.817 mW	Power	M1 MOSFET switching losses
46.	Rsense Pd	600.046 mW	Power	LED Current Rsns Power Dissipation
47.	Total Pd	2.663 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	Iout1	1.0	Output Current #1
3.	SoftStart	3.0 ms	Soft Start Time (ms)
4.	VinMax	30.0	Maximum input voltage
5.	VinMin	6.0	Minimum input voltage
6.	Vout	12.0	Output Voltage
7.	Vout1	12.0	Output Voltage #1
8.	base_pn	LM5022	Base Product Number
9.	source	DC	Input Source Type
10.	Ta	30.0	Ambient temperature
11.	UserFsw	500.0 k	Customer Selected Frequency

Design Assistance

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