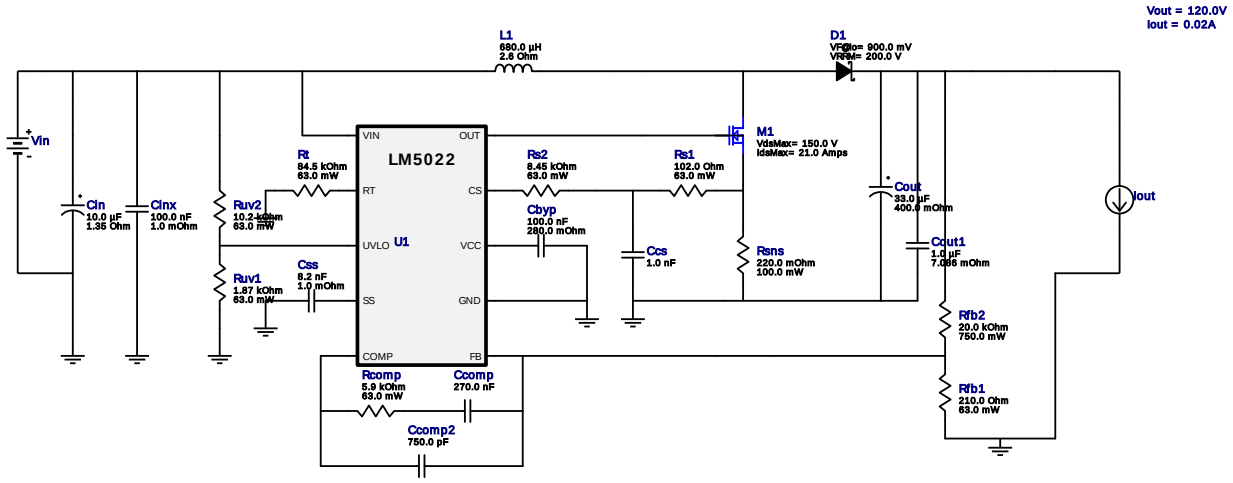
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 16.0V
Vout = 120.0V
Iout = 0.02A

Device = LM5022MM/NOPB
Topology = Boost
Created = 2018-02-03 00:44:16.497
BOM Cost = $5.49
BOM Count = 22
Total Pd = 0.88W

Design : 663314/53 LM5022MM/NOPB
LM5022MM/NOPB 10.0V-16.0V to 120.00V @ 0.015A

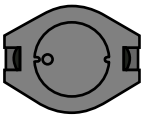


My Comments

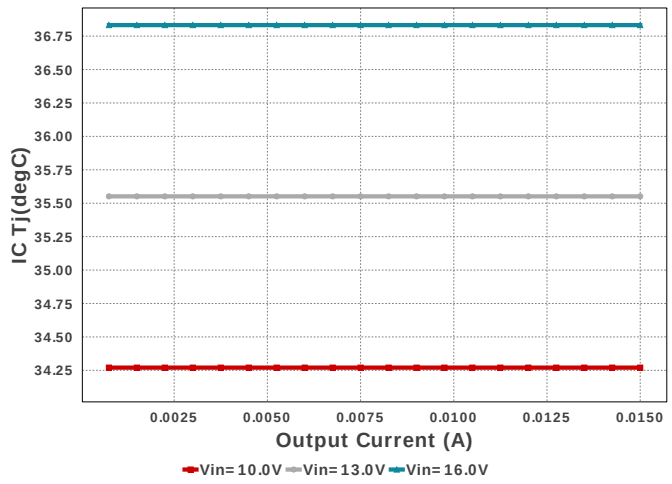
No comments

Electrical BOM

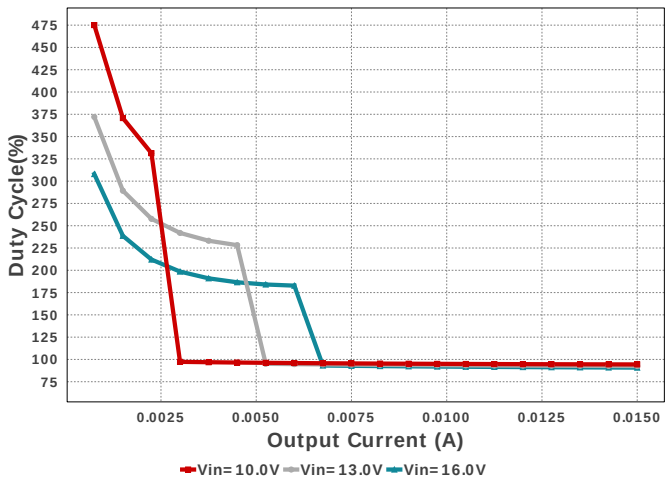
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	Kemet	C2220C274J5GACTU Series= C0G/NP0	Cap= 270.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$1.85	2220 54 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C751JBCNNNC Series= C0G/NP0	Cap= 750.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Ccs	Samsung Electro-Mechanics	CL05C102JB5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
5.	Cin	Panasonic	EEE-FK1E100R Series= FK	Cap= 10.0 uF ESR= 1.35 Ohm VDC= 25.0 V IRMS= 90.0 mA	1	$0.08	SM_RADIAL_B 47 mm²
6.	Cinx	Kemet	C0603C104M3VACTU Series= Y5V	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
7.	Cout	Panasonic	EEV-EB2E330SM Series= ?	Cap= 33.0 uF ESR= 400.0 mOhm VDC= 250.0 V IRMS= 560.0 mA	1	$1.31	EB_K16 483 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Cout1	MuRata	GRM55DR72E105KW01L Series= X7R	Cap= 1.0 uF ESR= 7.086 mOhm VDC= 250.0 V IRMS= 2.0605 A	1	$0.29	 2220_200 54 mm²
9.	Css	MuRata	GRM155R71E822KA01D Series= X7R	Cap= 8.2 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	 0402 3 mm²
10.	D1	SMC Diode Solutions	SK220ATR	VF@Io= 900.0 mV VRRM= 200.0 V	1	$0.04	 SMA 37 mm²
11.	L1	Bourns	SDR1005-681KL	L= 680.0 µH DCR= 2.6 Ohm	1	$0.29	 SDR1005 176 mm²
12.	M1	Infineon Technologies	BSZ520N15NS3 G	VdsMax= 150.0 V IdsMax= 21.0 Amps	1	$0.55	 PG-TSDSON-8 19 mm²
13.	Rcomp	Vishay-Dale	CRCW04025K90FKED Series= CRCW..e3	Res= 5.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
14.	Rfb1	Vishay-Dale	CRCW0402210RFKED Series= CRCW..e3	Res= 210.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rfb2	Vishay-Dale	CRCW201020K0FKEF Series= CRCW..e3	Res= 20.0 kOhm Power= 750.0 mW Tolerance= 1.0%	1	$0.04	 2010 32 mm²
16.	Rs1	Vishay-Dale	CRCW0402102RFKED Series= CRCW..e3	Res= 102.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rs2	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8.45 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
18.	Rsns	Panasonic	ERJ-3RQFR22V Series= ERJ-3R	Res= 220.0 mOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.02	 0603 5 mm²
19.	Rt	Vishay-Dale	CRCW040284K5FKED Series= CRCW..e3	Res= 84.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
20.	Ruv1	Vishay-Dale	CRCW04021K87FKED Series= CRCW..e3	Res= 1.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
21.	Ruv2	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
22.	U1	Texas Instruments	LM5022MM/NOPB	Switcher	1	$0.90	 MUB10A 24 mm²

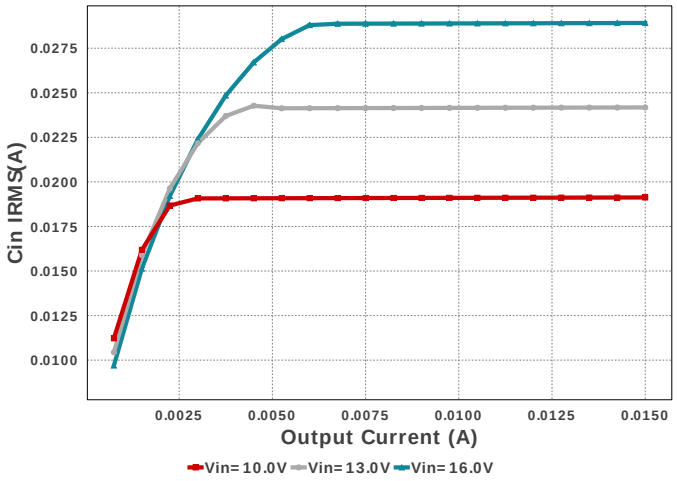
IC Tj



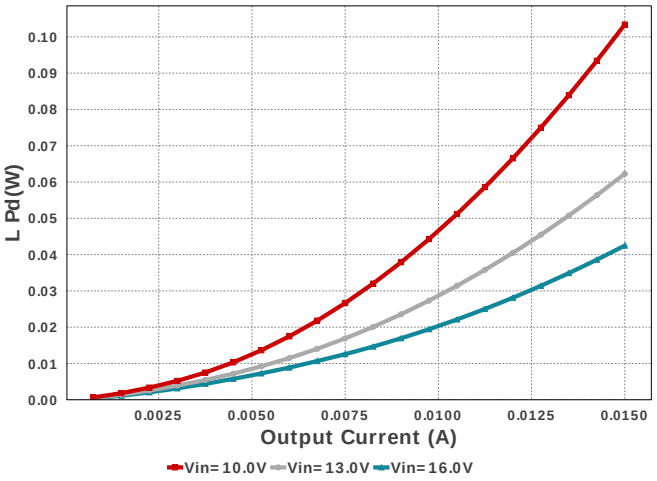
Duty Cycle



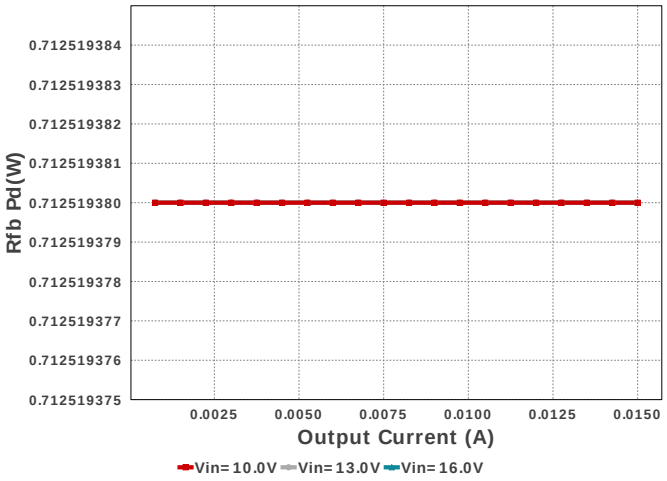
Cin IRMS



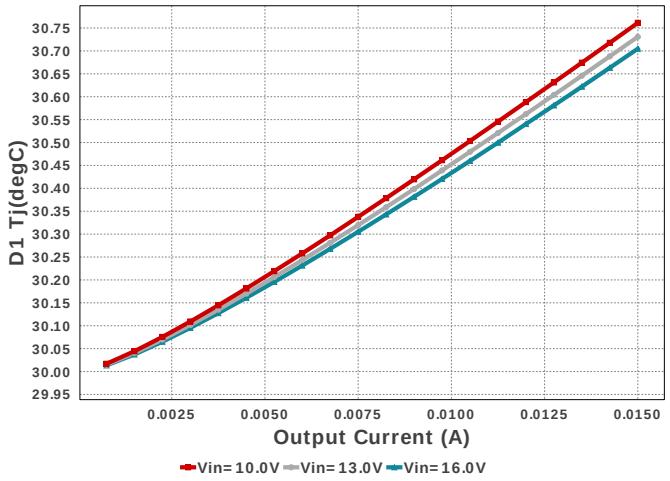
L Pd



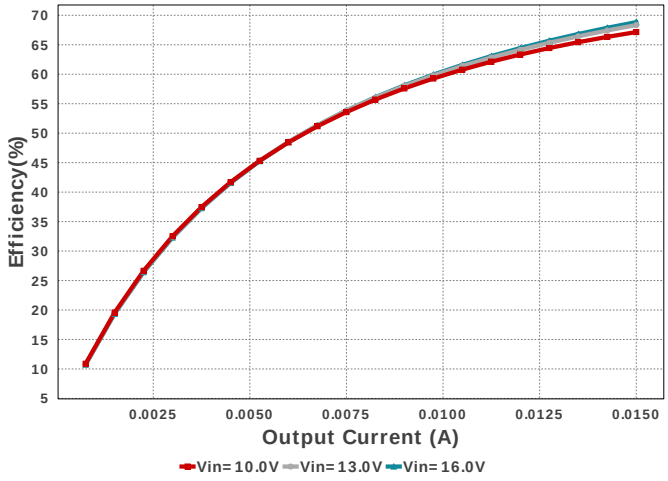
Rfb Pd



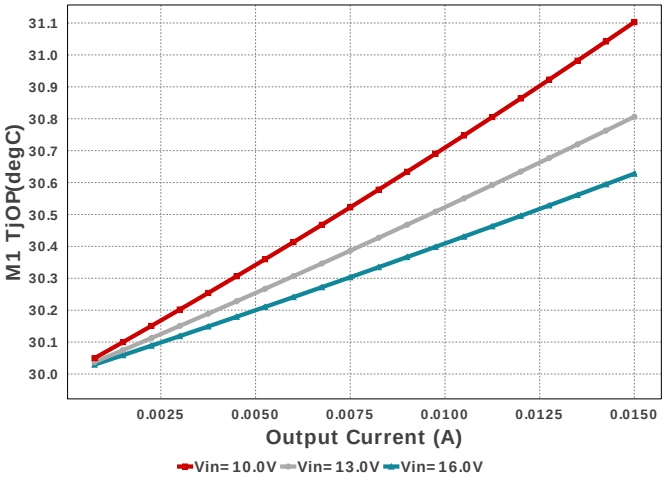
D1 Tj



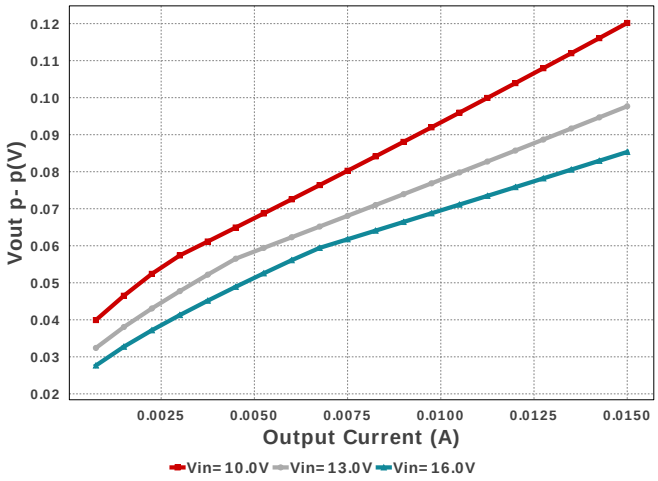
Efficiency



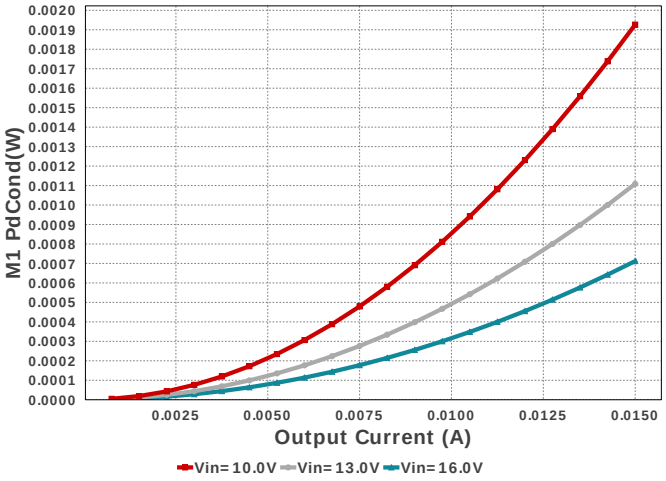
M1 TjOP



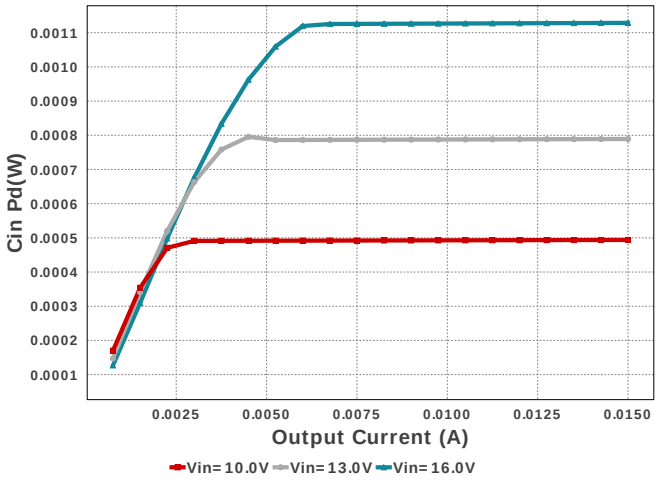
Vout p- p



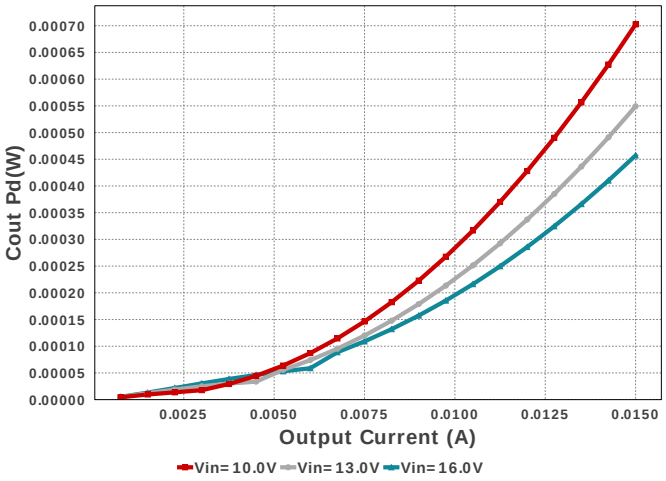
M1 PdCond

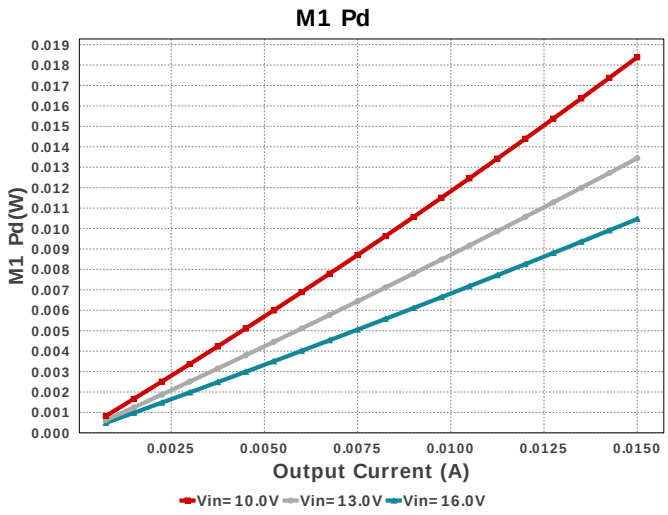


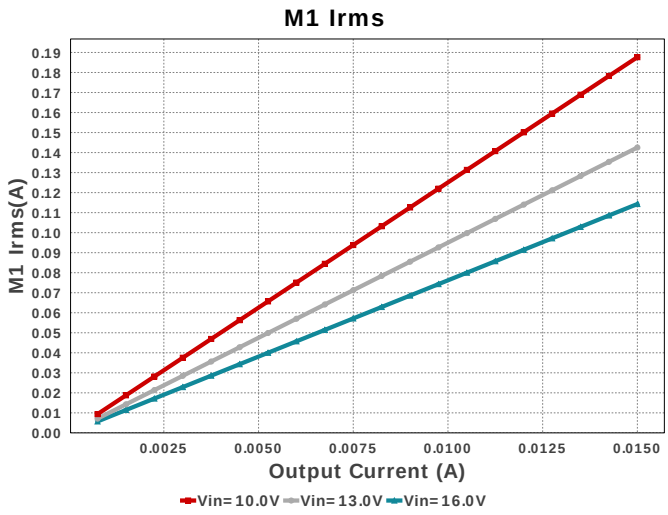
Cin Pd

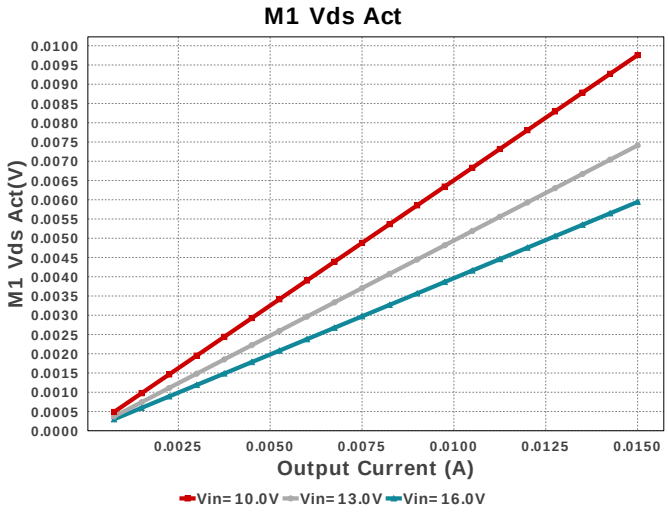


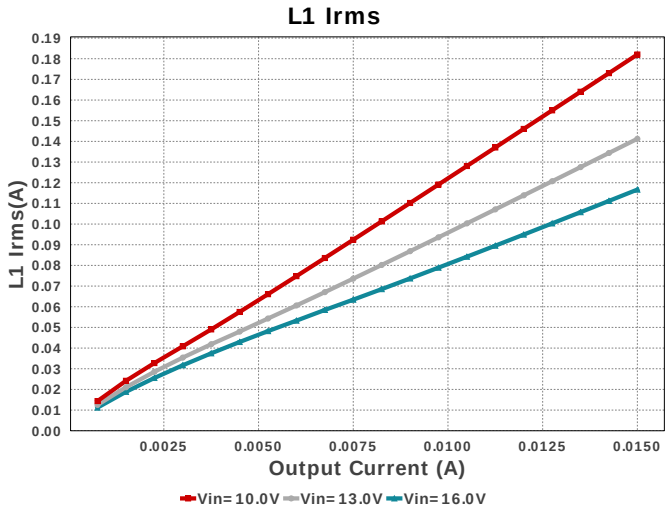
Cout Pd

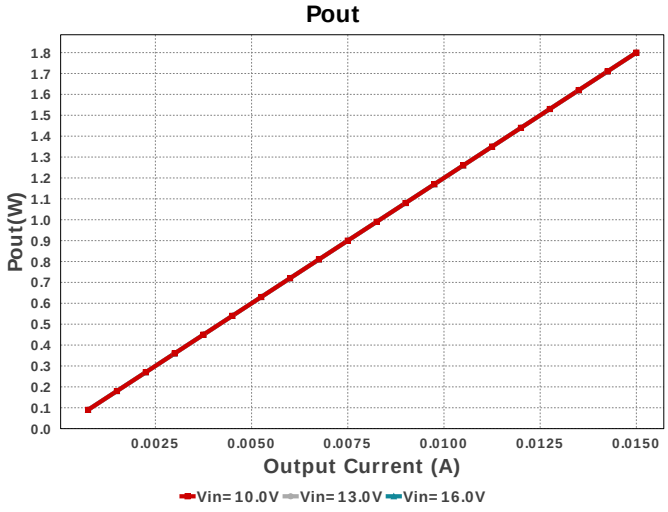


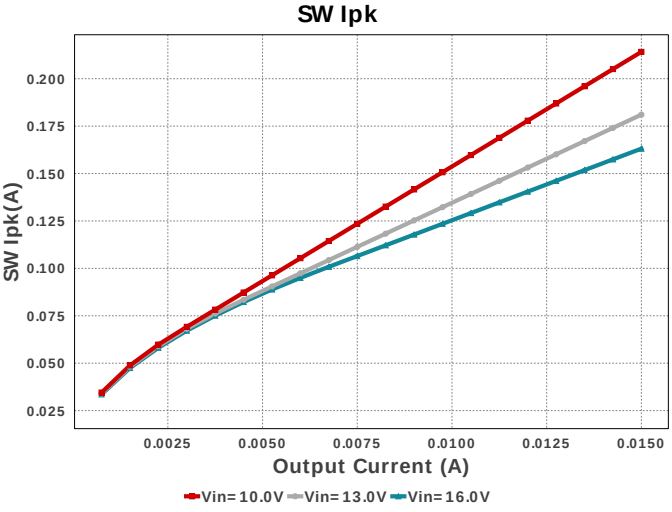


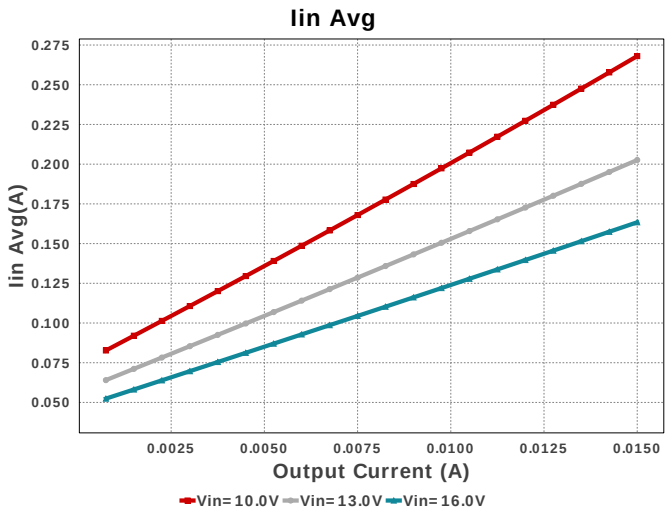


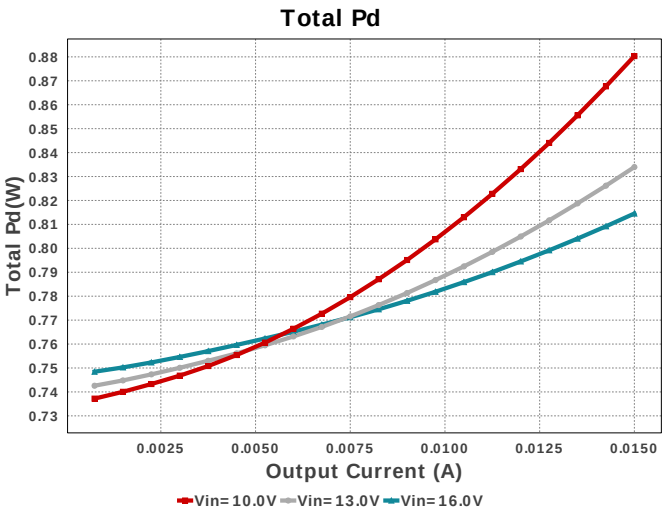


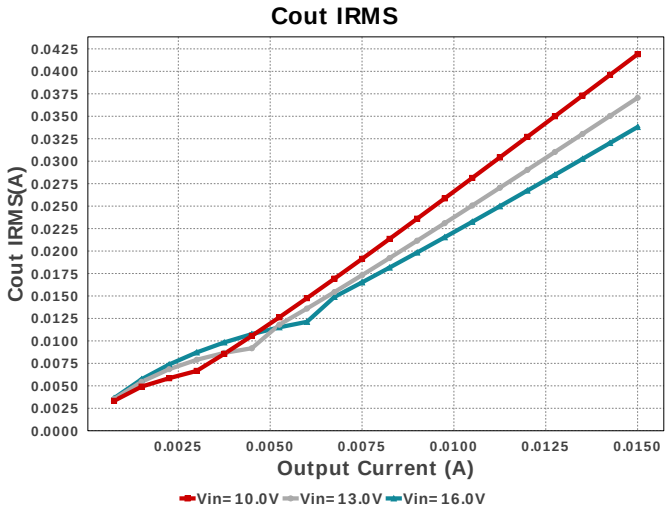


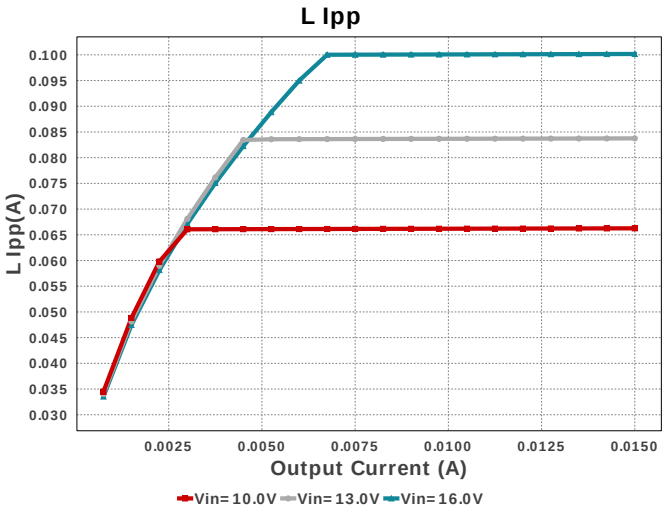


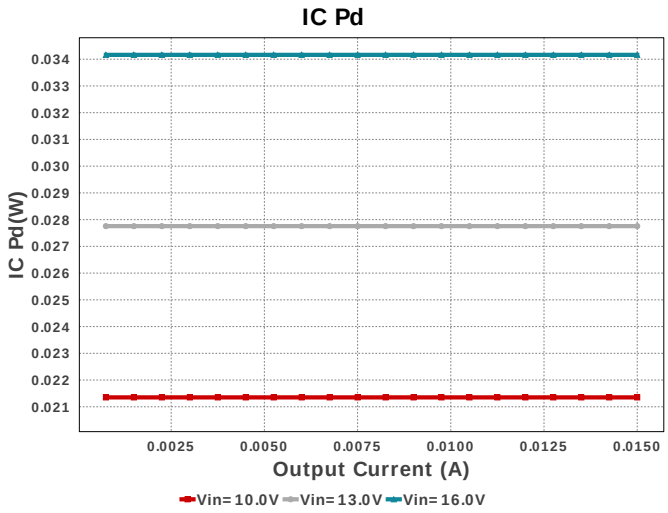


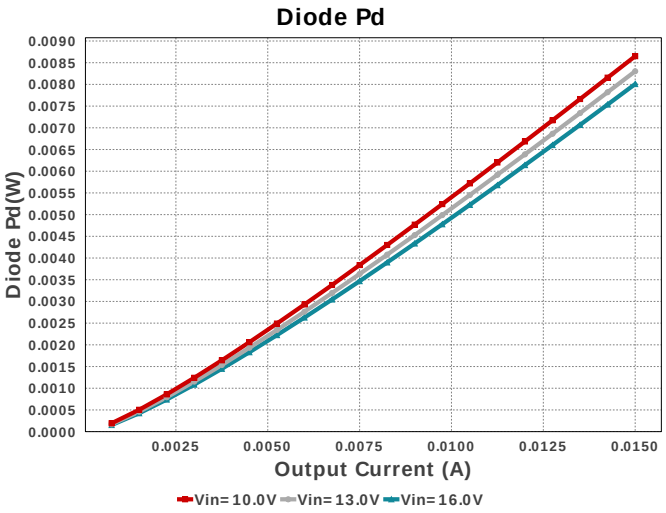


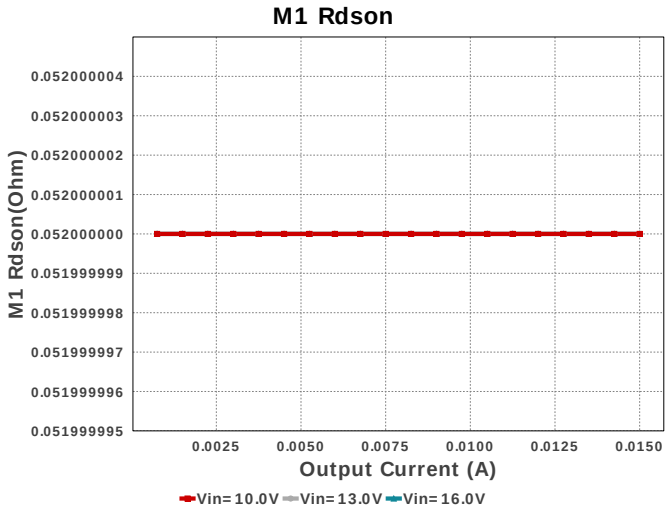


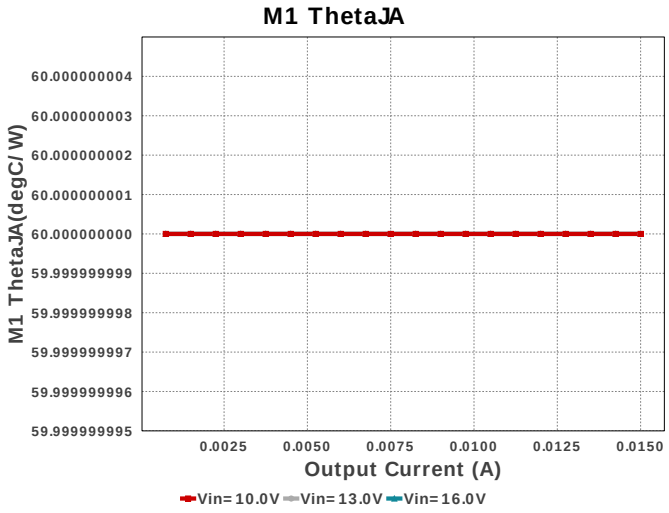


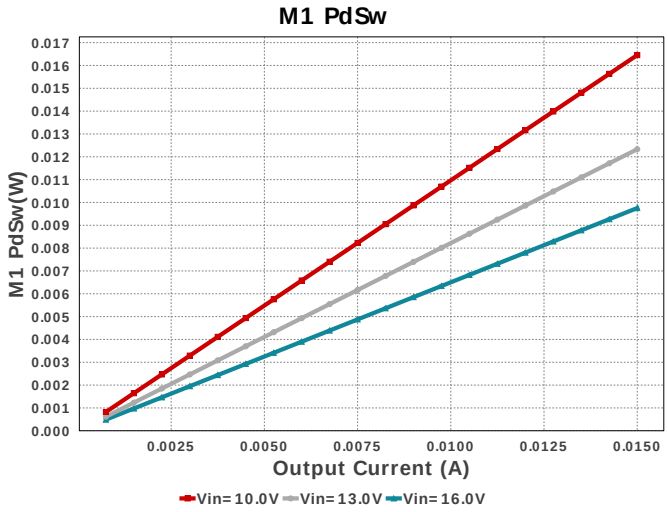


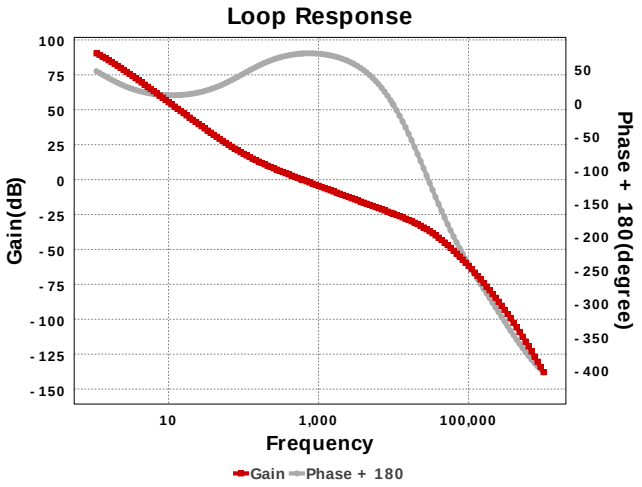












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	19.497 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	41.921 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	267.99 mA	Current	Average input current
4.	L Ipp	67.538 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	182.074 mA	Current	Inductor ripple current
6.	M1 Irms	187.256 mA	Current	M1 MOSFET Irms
7.	SW Ipk	214.796 mA	Current	Peak switch current
8.	BOM Count	22	General	Total Design BOM count
9.	FootPrint	976.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	200.354 kHz	General	Switching frequency
11.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
12.	M1 Rdson	52.0 mOhm	General	Drain-Source On-resistance
13.	M1 ThetaJA	60.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
14.	Mode	CCM	General	Conduction Mode
15.	Pout	1.8 W	General	Total output power
16.	Total BOM	$5.49	General	Total BOM Cost
17.	D1 Tj	30.761 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	86.124 dB	Op_Point	Gain at 1Hz
19.	Vout Actual	121.26 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	120.0 V	Op_Point	Operational Output Voltage
21.	Cross Freq	375.655 Hz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	94.387 %	Op_point	Duty cycle
23.	Efficiency	67.167 %	Op_point	Steady state efficiency
24.	Gain Marg	-22.513 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	34.197 degC	Op_point	IC junction temperature
26.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	15.0 mA	Op_point	Iout operating point
28.	M1 TjOP	31.094 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	69.452 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	10.0 V	Op_point	Vin operating point
31.	Vout p-p	120.411 mV	Op_point	Peak-to-peak output ripple voltage

#	Name	Value	Category	Description
32.	Cin Pd	513.162 µW	Power	Input capacitor power dissipation
33.	Cout Pd	702.951 µW	Power	Output capacitor power dissipation
34.	Diode Pd	8.65 mW	Power	Diode power dissipation
35.	IC Pd	20.984 mW	Power	IC power dissipation
36.	L Pd	103.43 mW	Power	Inductor power dissipation
37.	M1 Pd	18.239 mW	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	1.918 mW	Power	M1 MOSFET conduction losses
39.	M1 PdSw	16.321 mW	Power	M1 MOSFET switching losses
40.	Rfb Pd	712.519 mW	Power	Rfb Power Dissipation
41.	Total Pd	879.892 mW	Power	Total Power Dissipation
42.	M1 Vds Act	9.737 mV		M Vds
43.	Vout Tolerance	4.023 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	15.0 m	Maximum Output Current
2.	VinMax	16.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	120.0	Output Voltage
5.	base_pn	LM5022	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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