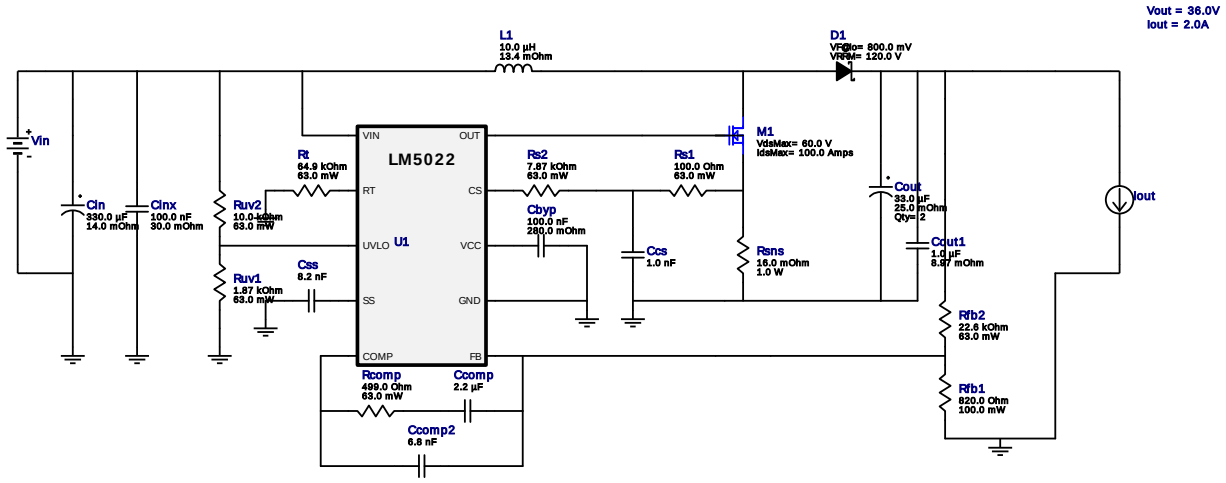
WEBENCH® Design Report

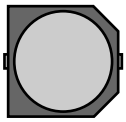
VinMin = 10.0V
VinMax = 14.4V
Vout = 36.0V
Iout = 2.0A

Device = LM5022MM/NOPB
Topology = Boost
Created = 7/11/16 4:29:05 AM
BOM Cost = $7.26
BOM Count = 23
Total Pd = 4.79W

Design : 1641152/105 LM5022MM/NOPB
LM5022MM/NOPB 10.0V-14.4V to 36.00V @ 2.0A



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	Taiyo Yuden	EMK212B7225KG-T Series= X7R	Cap= 2.2 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Ccs	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	Cin	Panasonic	25SVPF330M Series= ?	Cap= 330.0 uF ESR= 14.0 mOhm VDC= 25.0 V IRMS= 5.0 A	1	$0.70	 CAPSMT_62_F12 151 mm²
6.	Cinx	MuRata	GRM188R71E104KA01D Series= X7R	Cap= 100.0 nF ESR= 30.0 mOhm VDC= 25.0 V IRMS= 1.51 A	1	$0.01	0603 5 mm²
7.	Cout	Panasonic	63SXV33M Series= ?	Cap= 33.0 uF ESR= 25.0 mOhm VDC= 63.0 V IRMS= 2.95 A	2	$1.25	 CAPSMT_62_E12 106 mm²
8.	Cout1	TDK	C3216X5R1H105K Series= X5R	Cap= 1.0 uF ESR= 8.97 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.02	 1206 11 mm²
9.	Css	MuRata	GRM155R71E822KA01D Series= X7R	Cap= 8.2 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²

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#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	D1	Vishay-Semiconductor	V12P12-M3/86A	VF@Io= 800.0 mV VRRM= 120.0 V	1	$0.40	 TO-277A 56 mm^2
11.	L1	Coilcraft	XAL1010-103MEB	L= 10.0 µH DCR= 13.4 mOhm	1	$1.71	 XAL1010 160 mm^2
12.	M1	Texas Instruments	CSD18563Q5A	VdsMax= 60.0 V IdsMax= 100.0 Amps	1	$0.68	 TRANS_NexFET_Q5A 55 mm^2
13.	Rcomp	Vishay-Dale	CRCW0402499RFKED Series= CRCW..e3	Res= 499.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
14.	Rfb1	Yageo America	RC0603FR-07820RL Series= ?	Res= 820.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm^2
15.	Rfb2	Vishay-Dale	CRCW040222K6FKED Series= CRCW..e3	Res= 22.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rs1	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.	Rs2	Vishay-Dale	CRCW04027K87FKED Series= CRCW..e3	Res= 7.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
18.	Rsns	Susumu Co Ltd	PRL1632-R016-F-T1 Series= PRL1632	Res= 16.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 0612 11 mm^2
19.	Rt	Vishay-Dale	CRCW040264K9FKED Series= CRCW..e3	Res= 64.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Ruv1	Vishay-Dale	CRCW04021K87FKED Series= CRCW..e3	Res= 1.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
21.	Ruv2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
22.	U1	Texas Instruments	LM5022MM/NOPB	Switcher	1	$0.90	 MUB10A 24 mm^2

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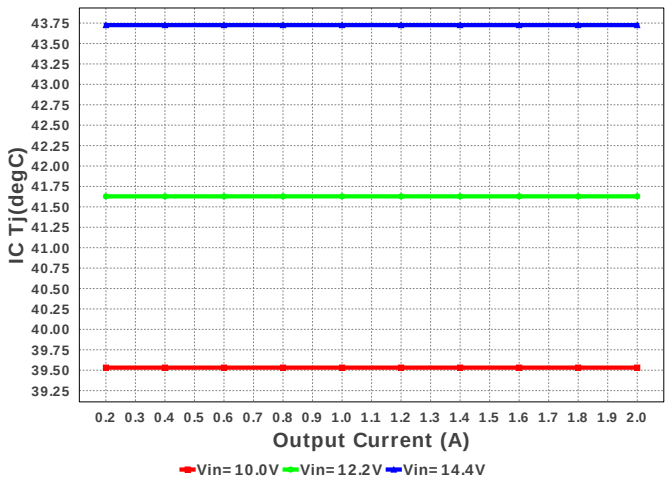
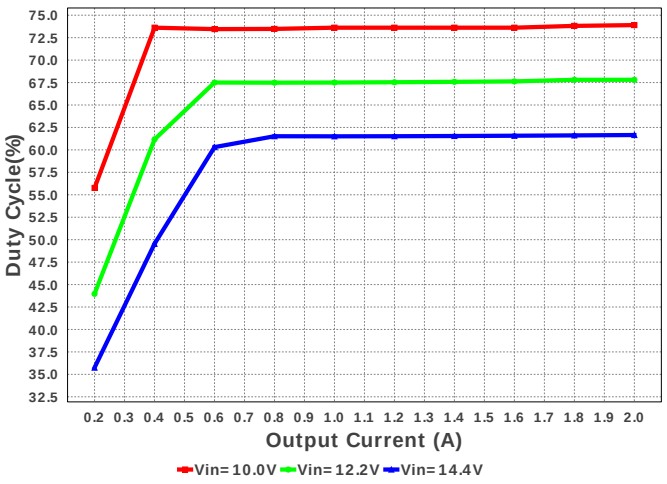
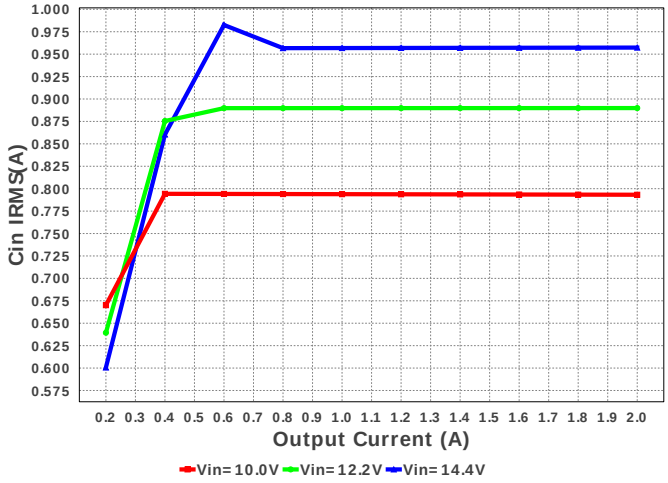
IC Tj



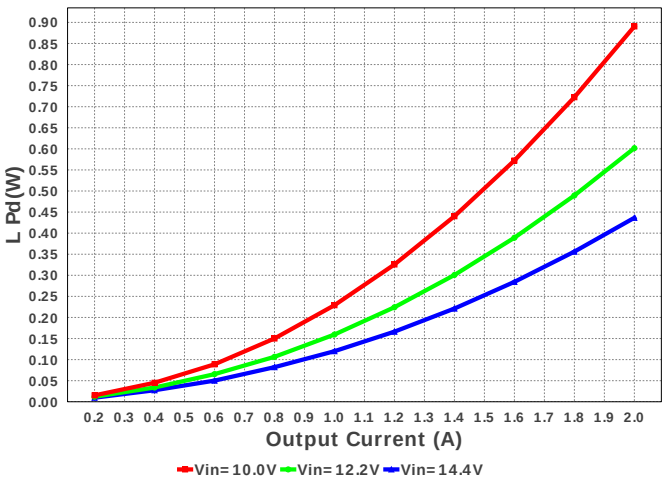
Duty Cycle



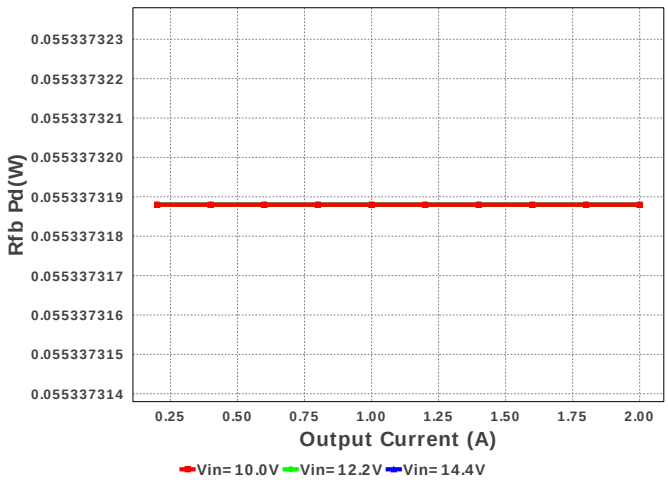
Cin IRMS



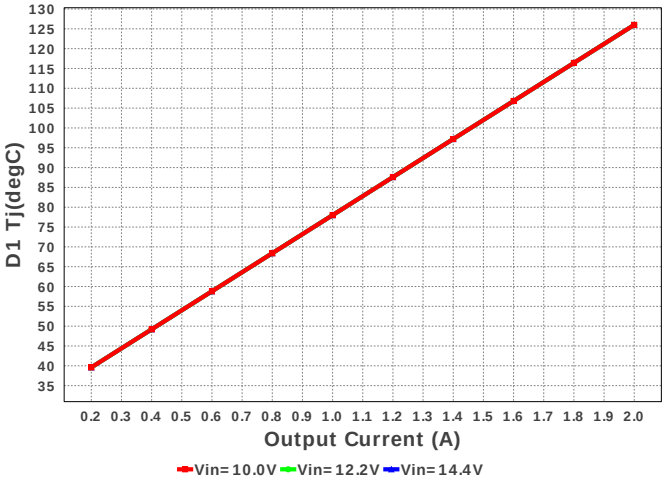
L Pd



Rfb Pd



D1 Tj



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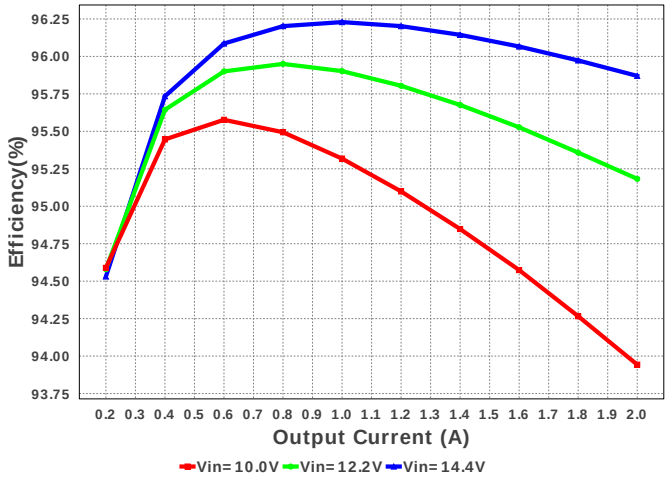
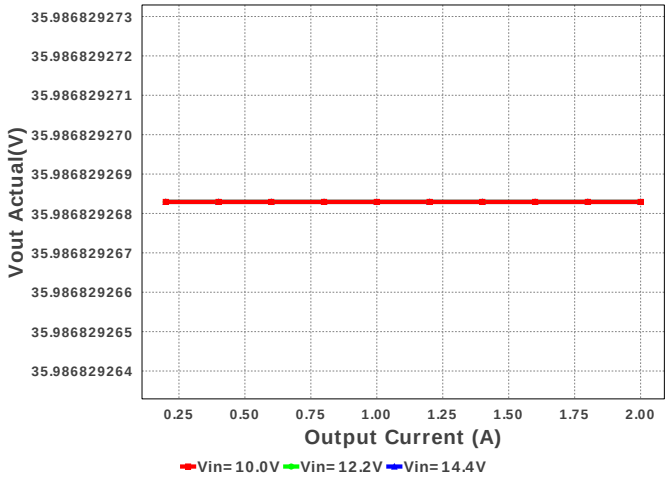
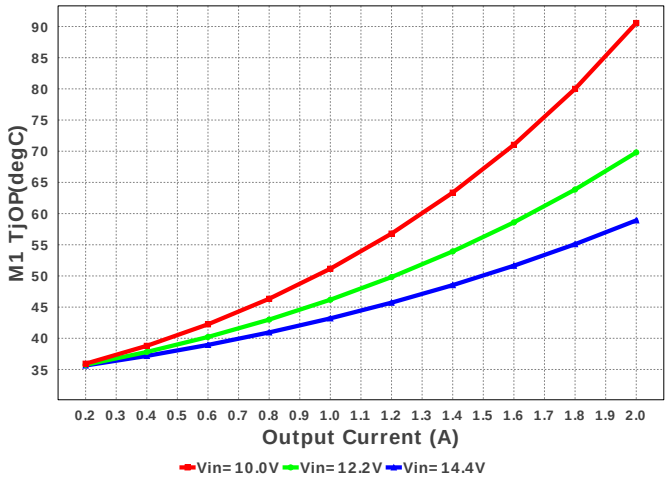
Efficiency



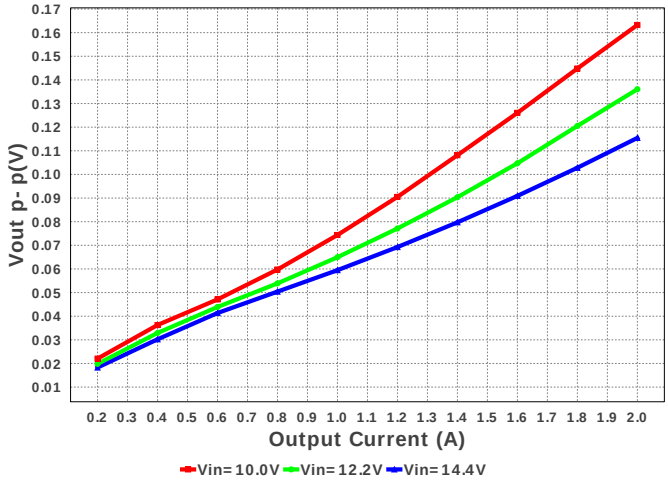
Vout Actual



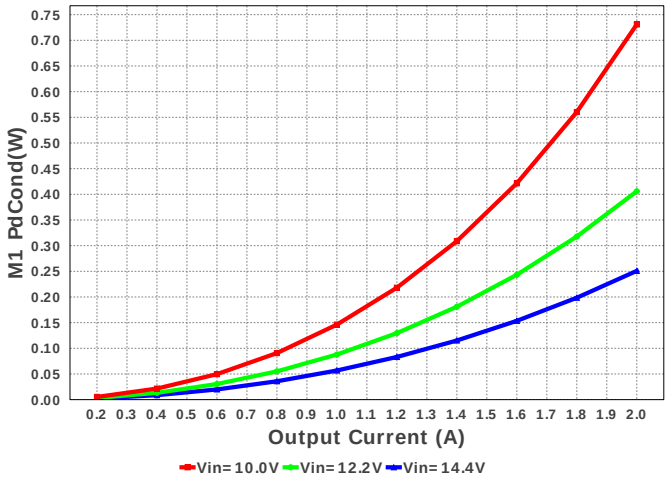
M1 TjOP



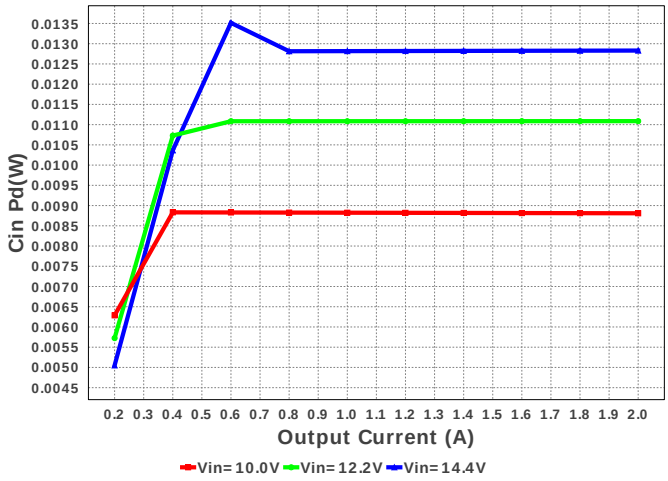
Vout p- p



M1 PdCond



Cin Pd



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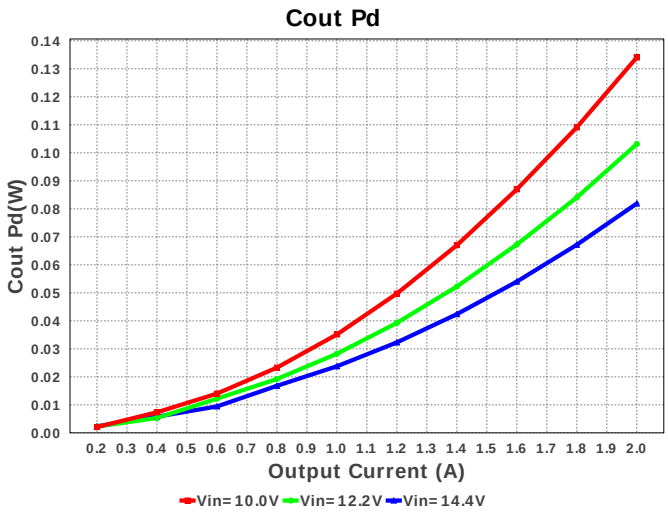

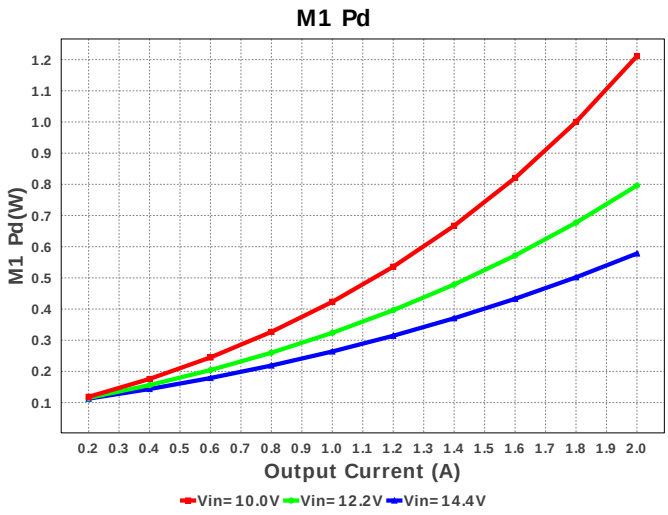

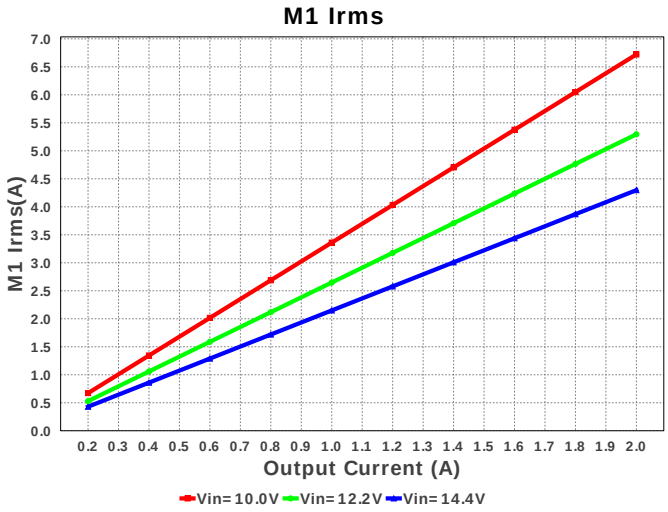

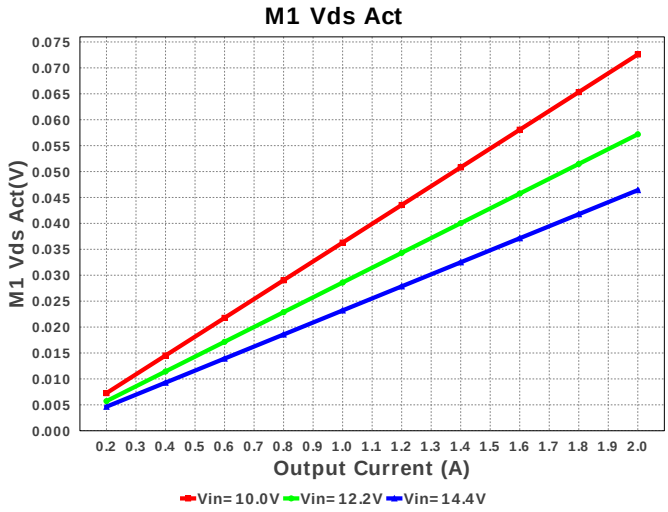

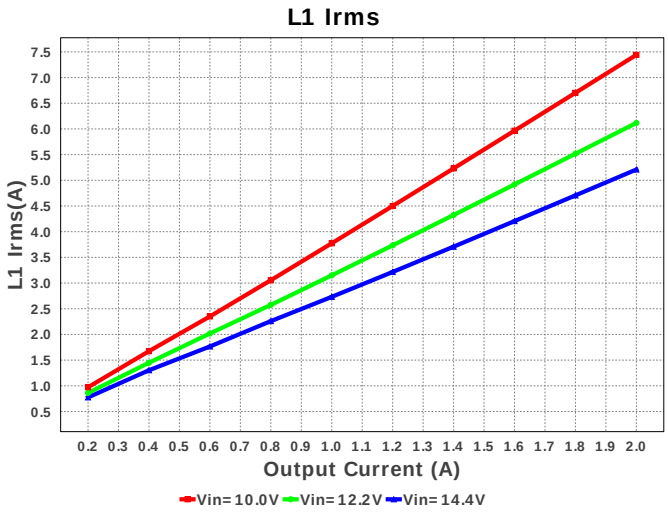

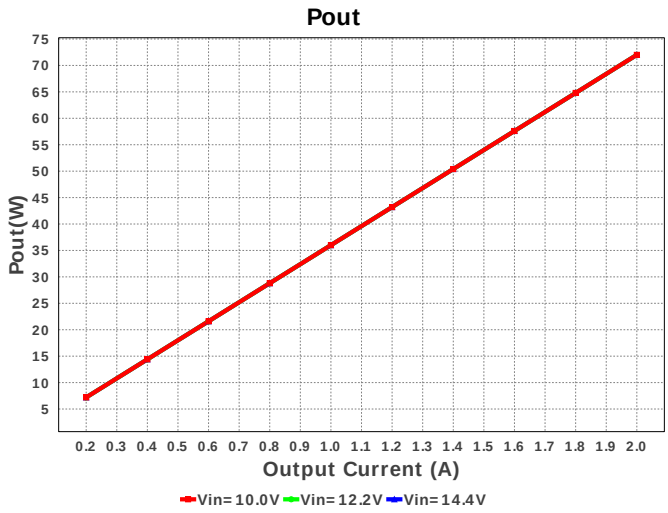

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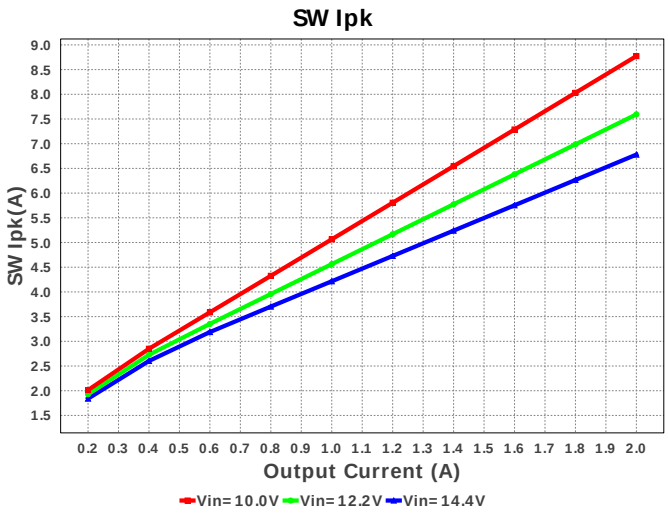

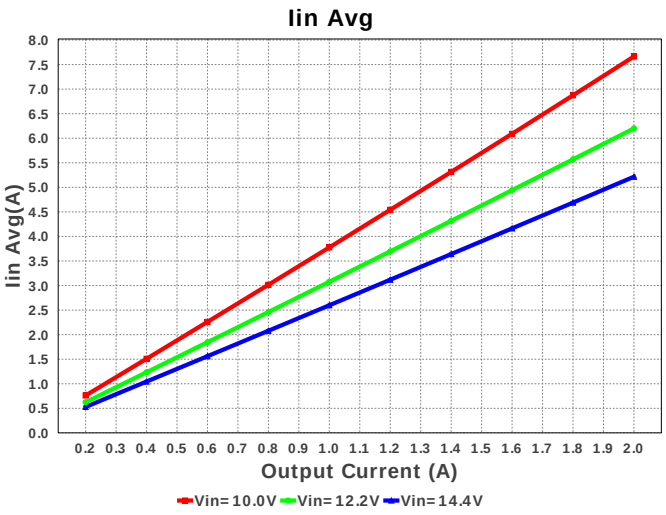

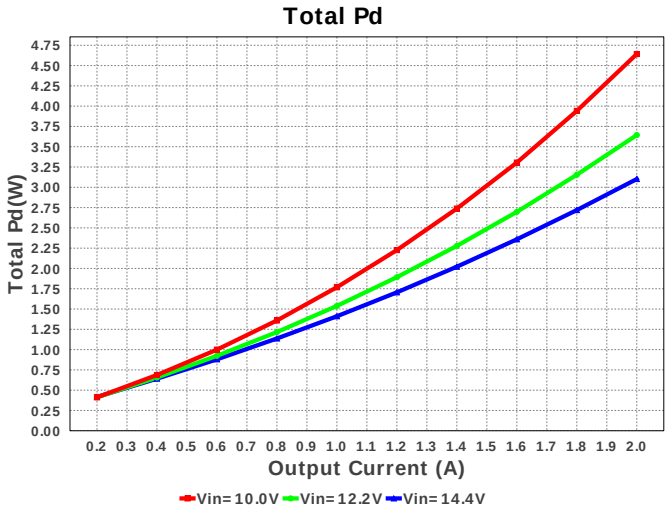

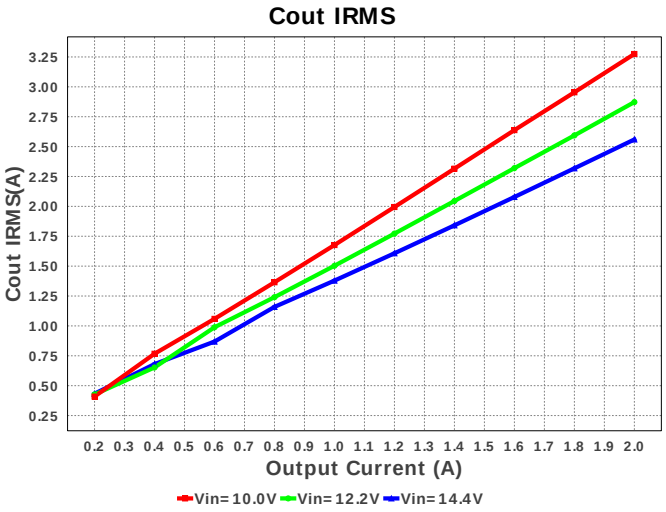

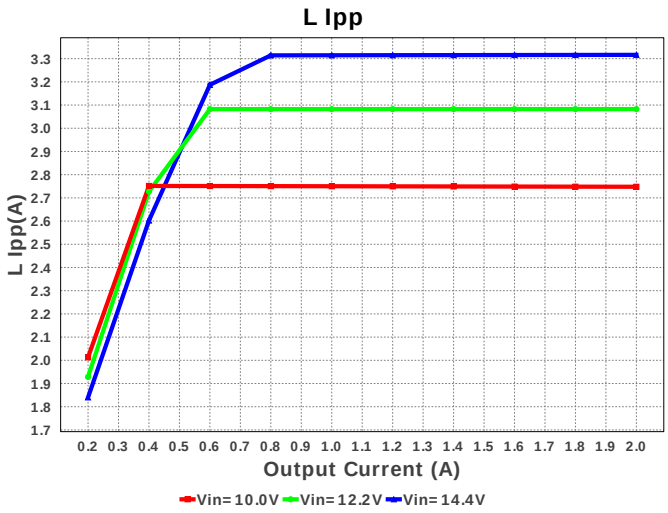

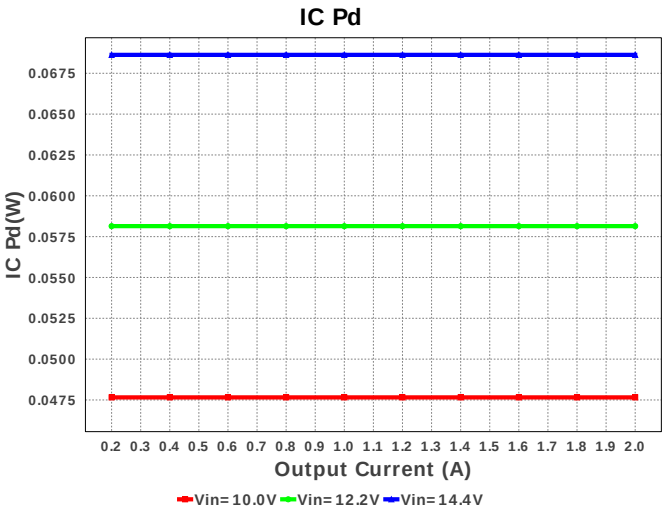

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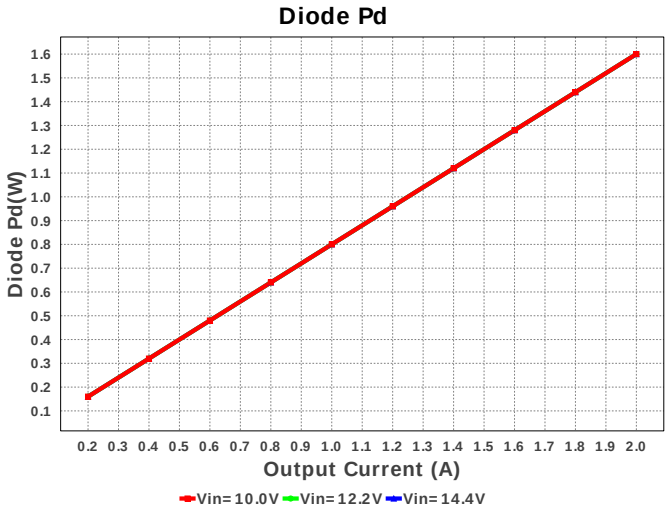

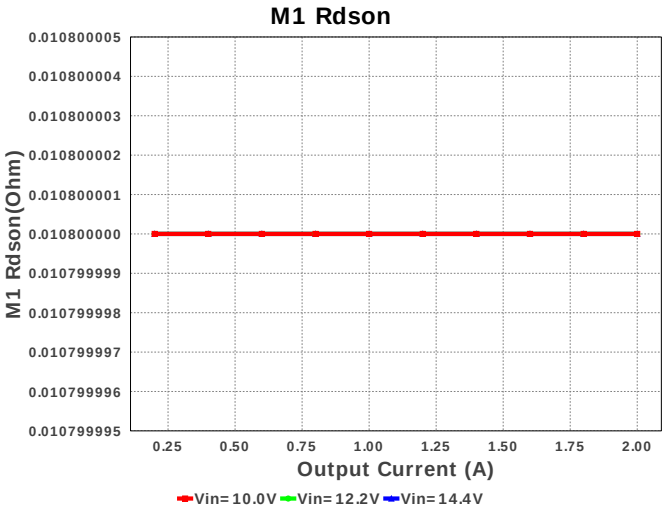

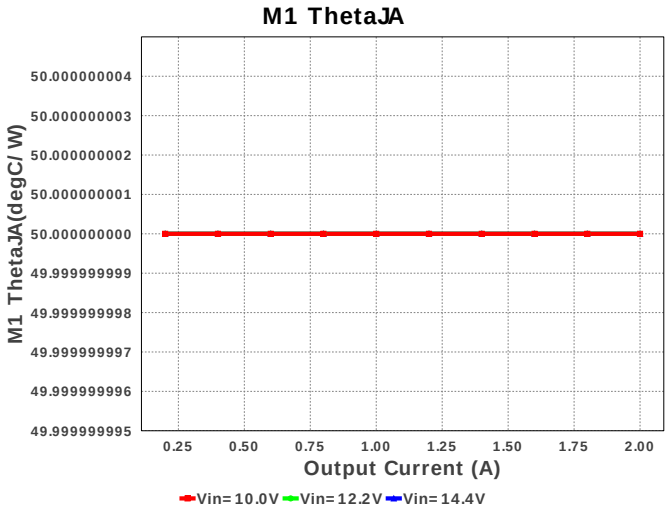

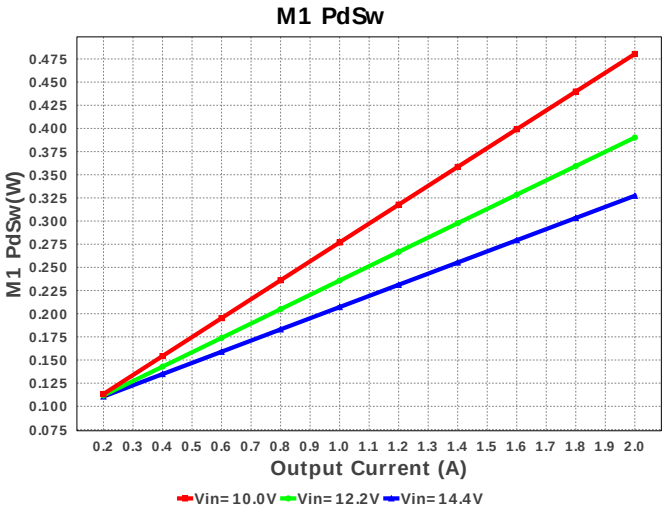

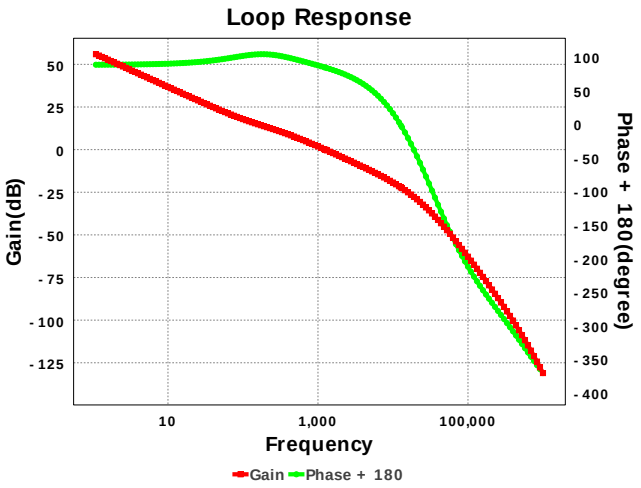

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	798.995 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	3.273 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	7.679 A	Current	Average input current
4.	L Ipp	2.768 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	7.442 A	Current	Inductor ripple current
6.	M1 Irms	6.721 A	Current	M1 MOSFET Irms
7.	SW Ipk	8.783 A	Current	Peak switch current
8.	BOM Count	23	General	Total Design BOM count
9.	FootPrint	740.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	262.694 kHz	General	Switching frequency
11.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance

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#	Name	Value	Category	Description
12.	M1 Rdson	10.8 mOhm	General	Drain-Source On-resistance
13.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
14.	Pout	72.0 W	General	Total output power
15.	Total BOM	$7.26	General	Total BOM Cost
16.	D1 Tj	126.0 degC	Op_Point	D1 junction temperature
17.	Low Freq Gain	52.598 dB	Op_Point	Gain at 10Hz
18.	Vout Actual	35.987 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
19.	Vout OP	36.0 V	Op_Point	Operational Output Voltage
20.	Cross Freq	835.124 Hz	Op_point	Bode plot crossover frequency
21.	Duty Cycle	73.949 %	Op_point	Duty cycle
22.	Efficiency	93.76 %	Op_point	Steady state efficiency
23.	Gain Marg	-22.735 dB	Op_point	Bode Plot Gain Margin
24.	IC Tj	41.72 degC	Op_point	IC junction temperature
25.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
26.	IOUT_OP	2.0 A	Op_point	Iout operating point
27.	M1 TjOP	97.338 degC	Op_point	M1 MOSFET junction temperature
28.	Phase Marg	90.724 deg	Op_point	Bode Plot Phase Margin
29.	VIN_OP	10.0 V	Op_point	Vin operating point
30.	Vout p-p	163.97 mV	Op_point	Peak-to-peak output ripple voltage
31.	Cin Pd	8.938 mW	Power	Input capacitor power dissipation
32.	Cout Pd	133.916 mW	Power	Output capacitor power dissipation
33.	Diode Pd	1.6 W	Power	Diode power dissipation
34.	IC Pd	58.6 mW	Power	IC power dissipation
35.	L Pd	890.613 mW	Power	Inductor power dissipation
36.	M1 Pd	1.347 W	Power	M1 MOSFET total power dissipation
37.	M1 PdCond	756.029 mW	Power	M1 MOSFET conduction losses
38.	M1 PdSw	590.728 mW	Power	M1 MOSFET switching losses
39.	Rfb Pd	55.337 mW	Power	Rfb Power Dissipation
40.	Total Pd	4.792 W	Power	Total Power Dissipation
41.	M1 Vds Act	72.585 mV		M Vds
42.	Vout Tolerance	3.972 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	14.4	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	36.0	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.

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