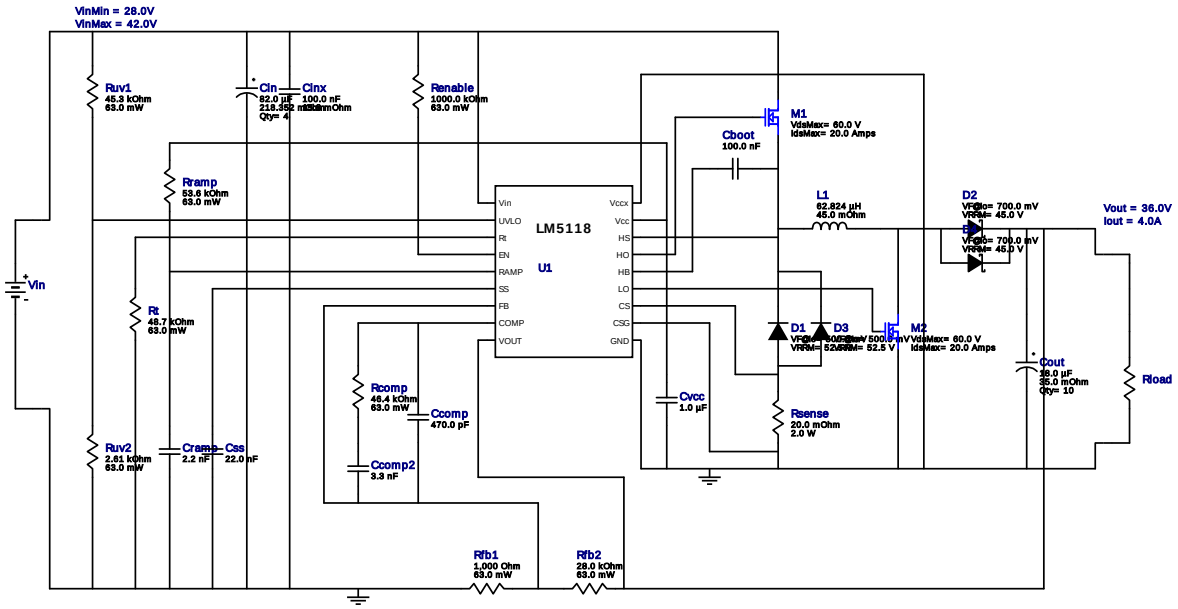
WEBENCH® Design Report

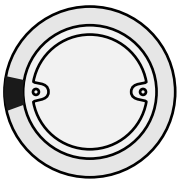
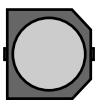
VinMin = 28.0V
VinMax = 42.0V
Vout = 36.0V
Iout = 4.0A

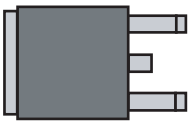
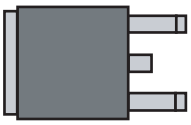
Device = LM5118MH/NOPB
Topology = Buck_Boost
Created = 8/12/13 6:17:38 PM
BOM Cost = $0.00
Total Pd = 9.35W
Footprint = 3,412.0mm2
BOM Count = 38

Design : 1228027/300 LM5118MH/NOPB
LM5118MH/NOPB 28.0V-42.0V to 36.0V @ 4.0A

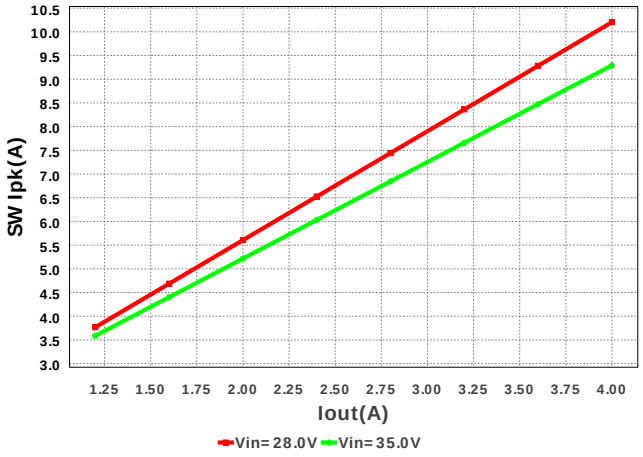


Electrical BOM

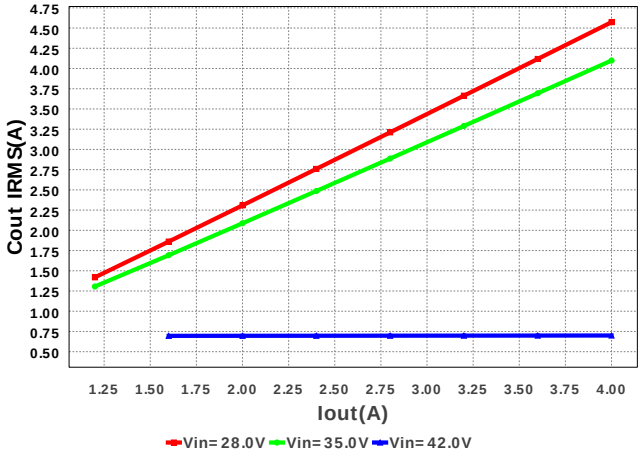
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
2.	Ccomp	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
3.	Ccomp2	Yageo America	CC0805KRX7R9BB332 Series= X7R	Cap= 3.3 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
4.	Cin	Panasonic	EEUED2E820 Series= 286	Cap= 82.0 µF ESR= 218.352 mOhm VDC= 250.0 V IRMS= 1.2 A	4	$0.51	 CAPPR7.5-16X25 324mm2
5.	Cinx	TDK	C2012X7R2A104K Series= X7R	Cap= 100.0 nF ESR= 15.8 mOhm VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0805 13mm2
6.	Cout	Sanyo	50SVPF18M Series= 1273	Cap= 18.0 µF ESR= 35.0 mOhm VDC= 50.0 V IRMS= 2.7 A	10	NA	 CAPSMT_62_E7 106mm2
7.	Cramp	Yageo America	CC0805KRX7R9BB222 Series= X7R	Cap= 2.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
8.	Css	Yageo America	CC0805KRX7R9BB223 Series= X7R	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cvcc	MuRata	GRM155R61A105KE15D Series= X5R	Cap= 1.0 µF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	 0402 8mm2
10.	D1	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 52.5 V	1	NA	CUSTOM 0mm2
11.	D2	Vishay-Semiconductor	MBRB745PBF	VF@Io= 700.0 mV VRRM= 45.0 V	1	$0.67	 DDPAK 210mm2
12.	D3	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 52.5 V	1	NA	CUSTOM 0mm2
13.	D4	Vishay-Semiconductor	MBRB745PBF	VF@Io= 700.0 mV VRRM= 45.0 V	1	$0.67	 DDPAK 210mm2
14.	L1	CUSTOM	CUSTOM	L= 62.824 µH DCR= 45.0 mOhm	1	NA	CUSTOM 0mm2
15.	M1	AOS	AON7244	VdsMax= 60.0 V IdsMax= 20.0 Amps	1	$0.51	 TRANS_AOS_DFN3.3X3.328mm2
16.	M2	AOS	AON7244	VdsMax= 60.0 V IdsMax= 20.0 Amps	1	$0.51	 TRANS_AOS_DFN3.3X3.328mm2
17.	Rcomp	Vishay-Dale	CRCW040246K4FKED Series= CRCW..e3	Res= 46.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
18.	Renable	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
19.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1,000 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
20.	Rfb2	Vishay-Dale	CRCW040228K0FKED Series= CRCW..e3	Res= 28.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
21.	Rramp	Vishay-Dale	CRCW040253K6FKED Series= CRCW..e3	Res= 53.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
22.	Rsense	Stackpole Electronics Inc	CSRN2512FK20L0 Series= ?	Res= 20.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	$0.15	 2512 43mm2
23.	Rt	Vishay-Dale	CRCW040248K7FKED Series= CRCW..e3	Res= 48.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
24.	Ruv1	Vishay-Dale	CRCW040245K3FKED Series= CRCW..e3	Res= 45.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
25.	Ruv2	Vishay-Dale	CRCW04022K61FKED Series= CRCW..e3	Res= 2.61 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
26.	U1	Texas Instruments	LM5118MH/NOPB	Switcher	1	$2.38	 MXA20A 71mm2

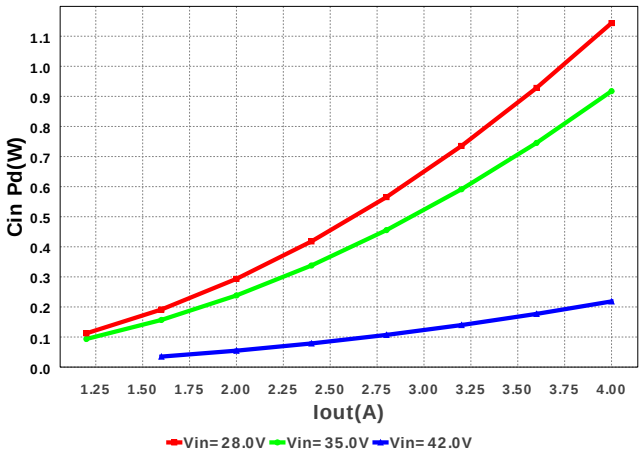
SW Ipk



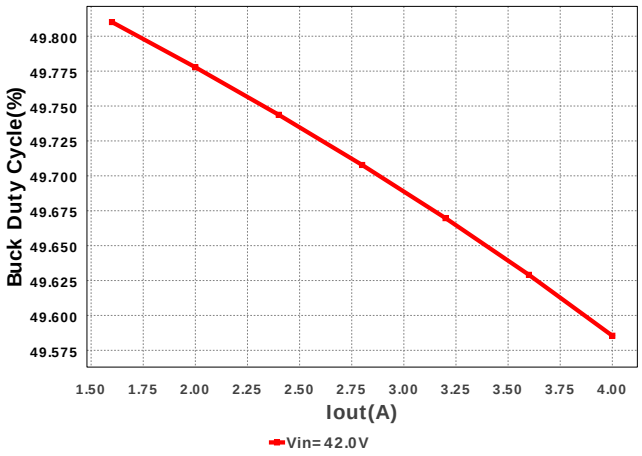
Cout IRMS



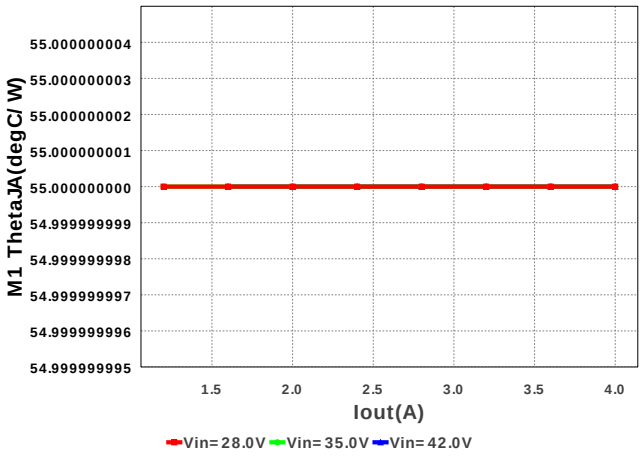
Cin Pd



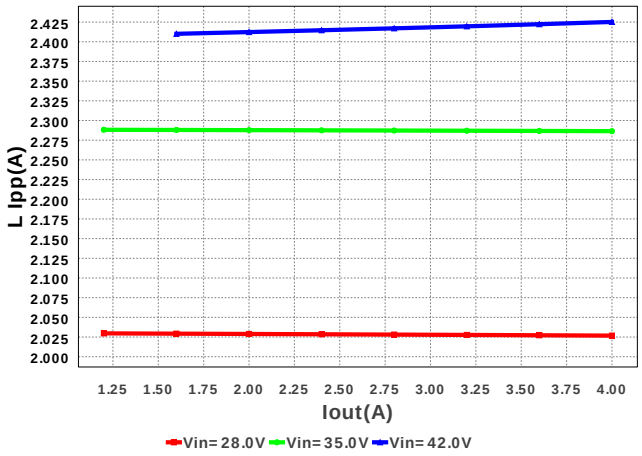
Buck Duty Cycle

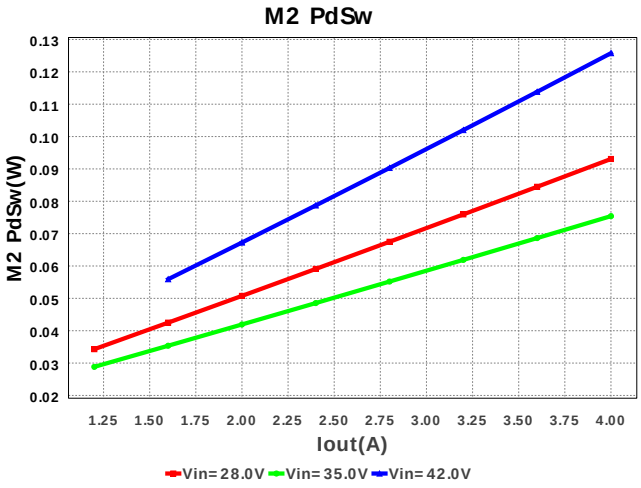


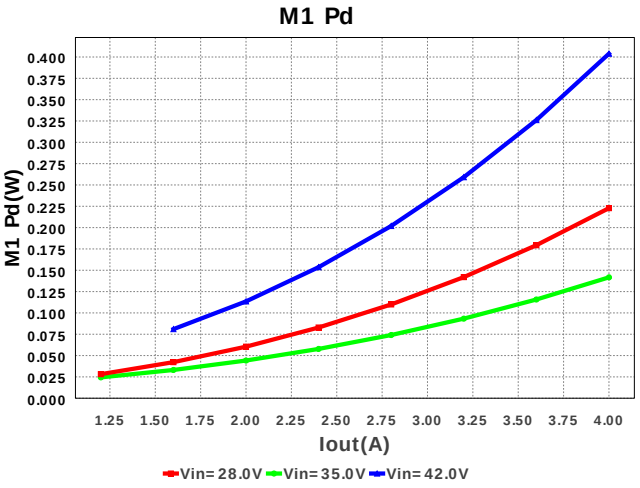
M1 ThetaJA

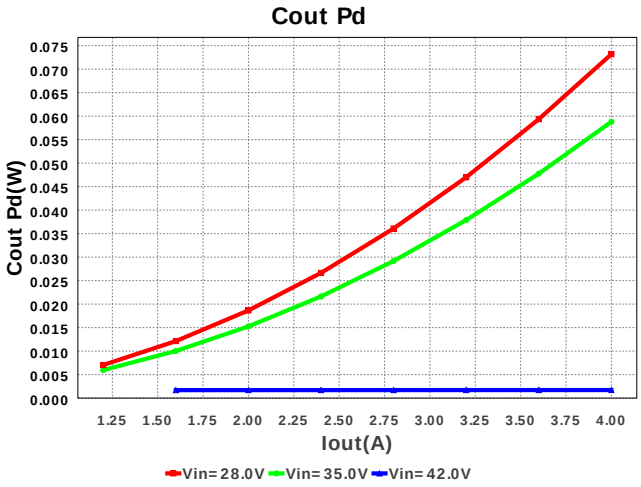


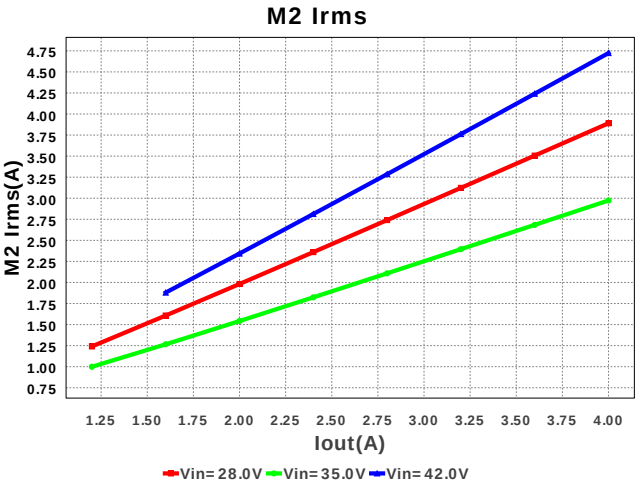
L Ipp

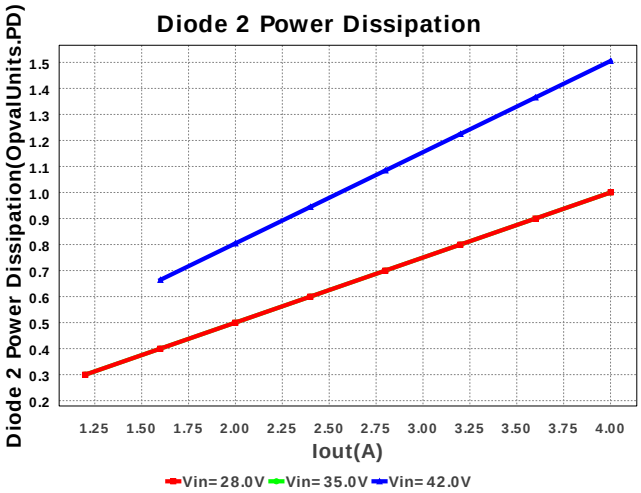


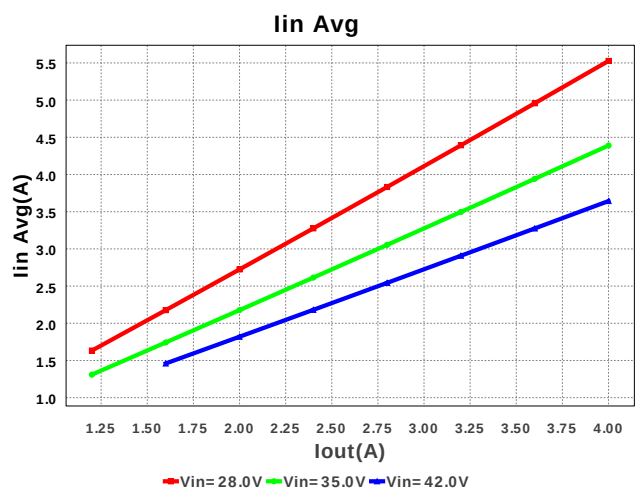




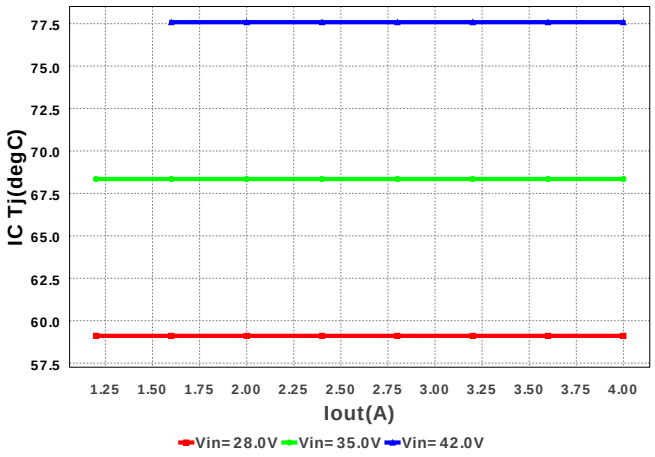




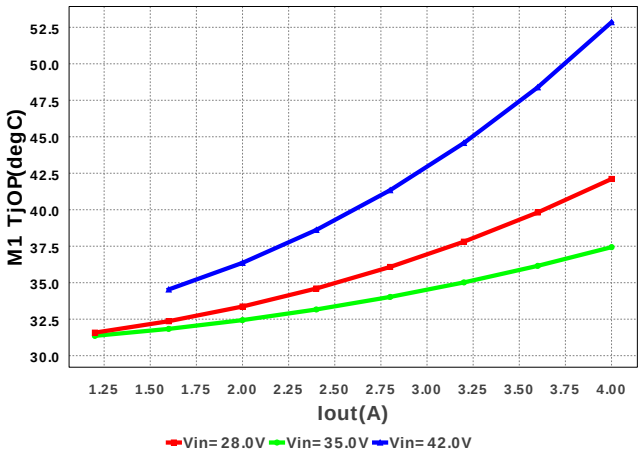




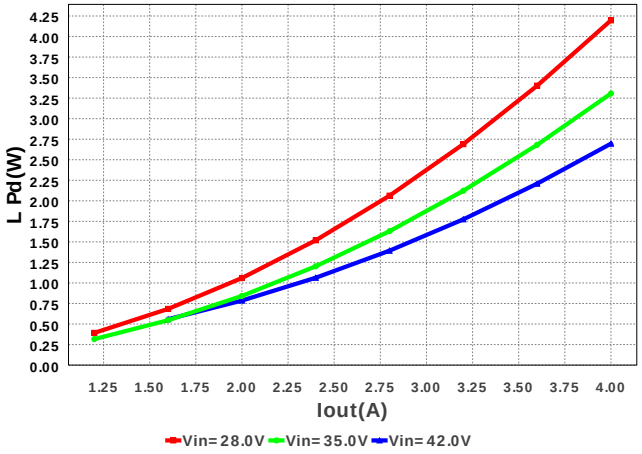
IC Tj



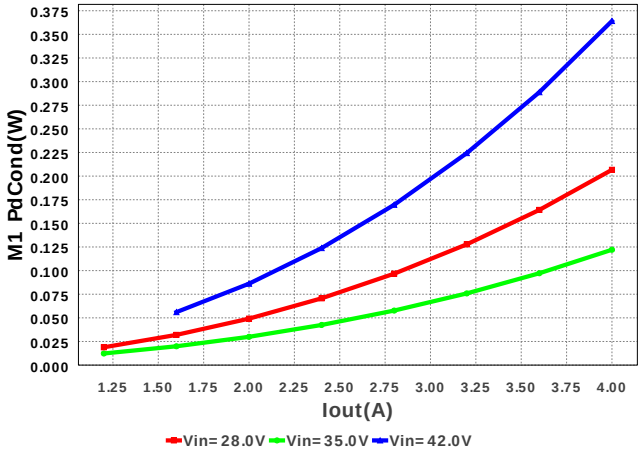
M1 TjOP



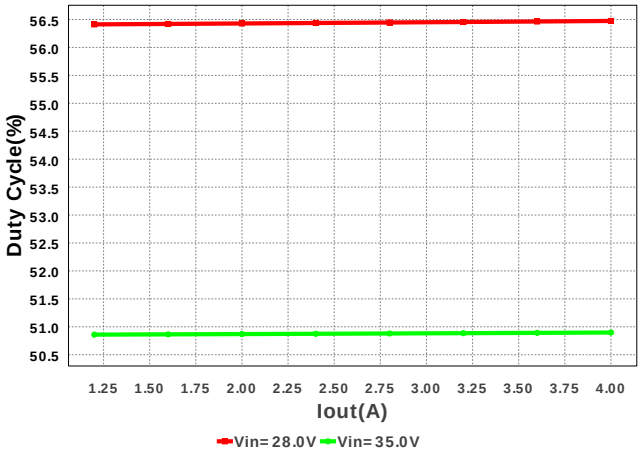
L Pd



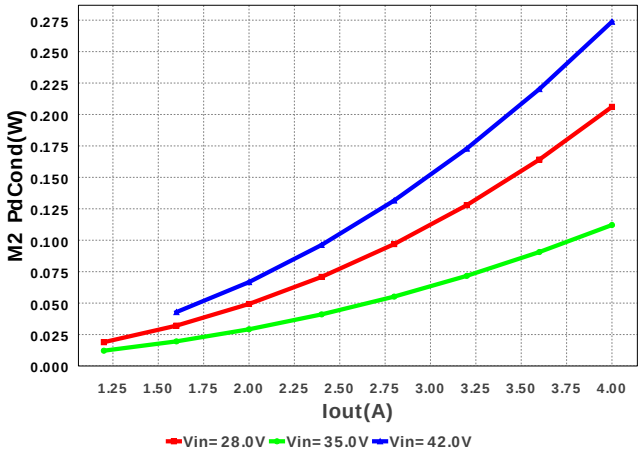
M1 PdCond

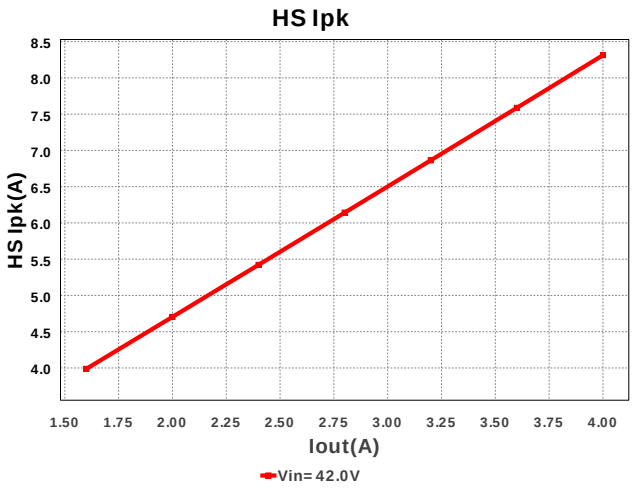


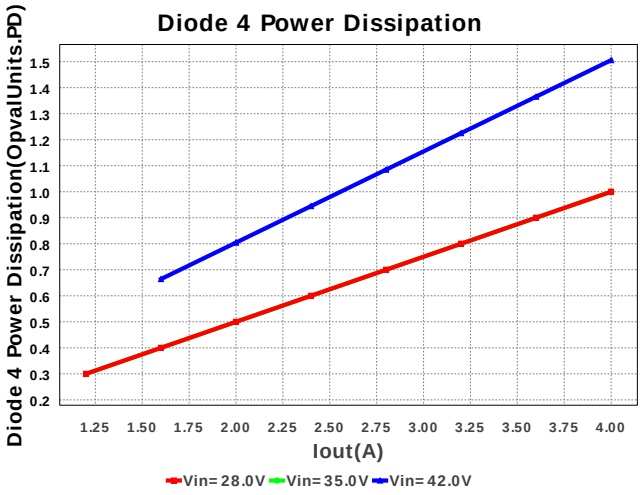
Duty Cycle

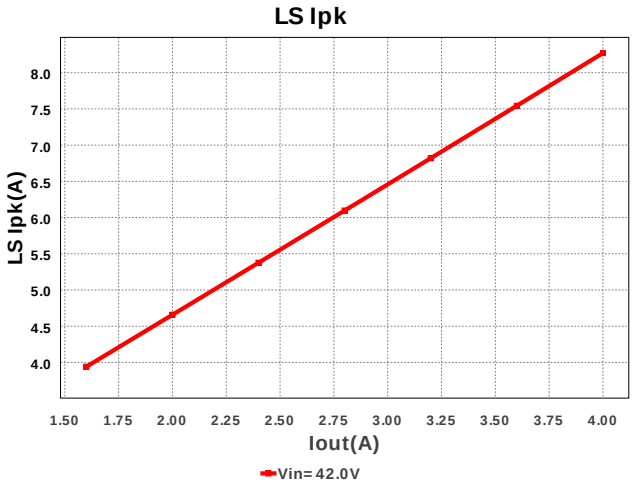


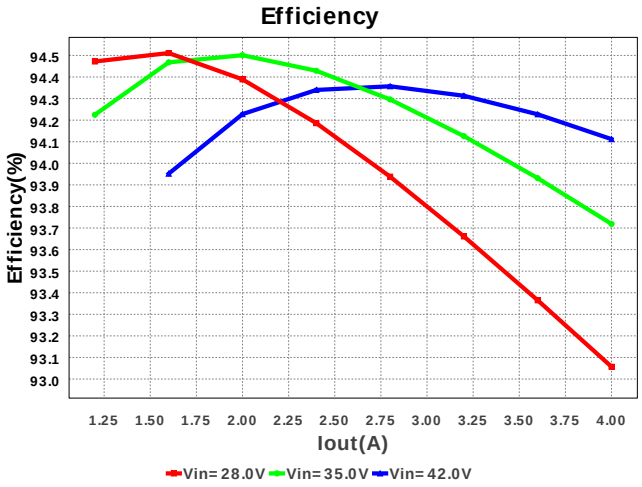
M2 PdCond

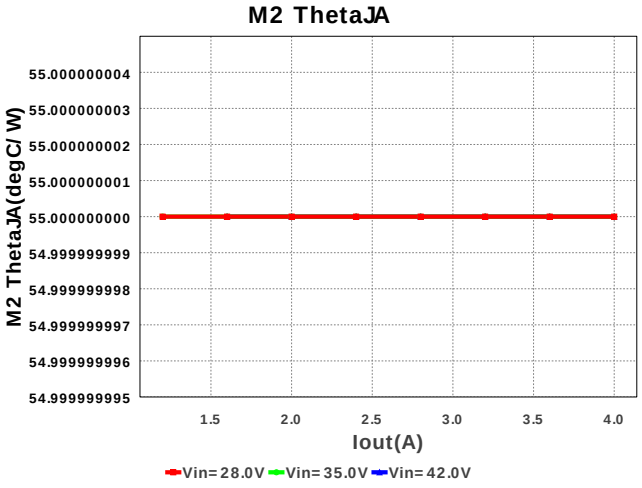


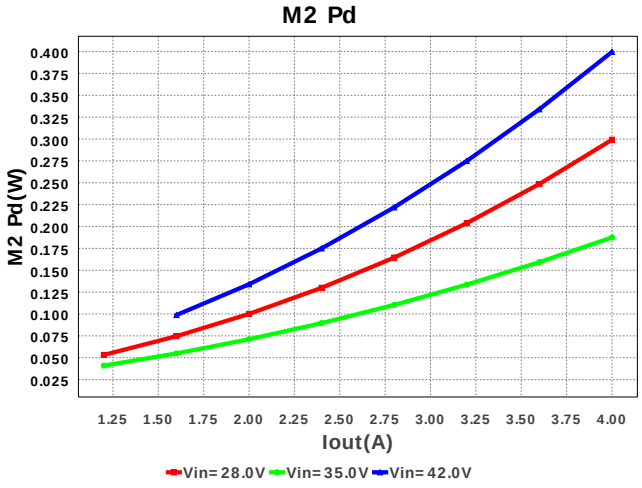


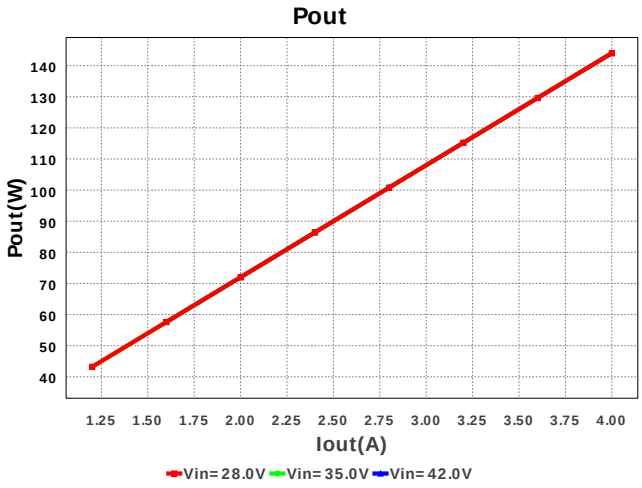


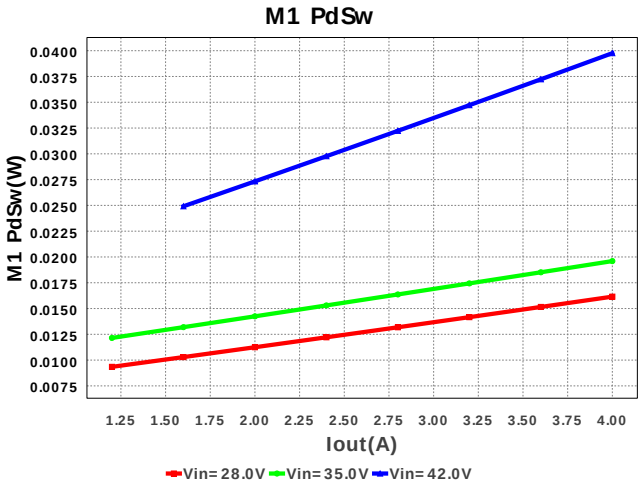


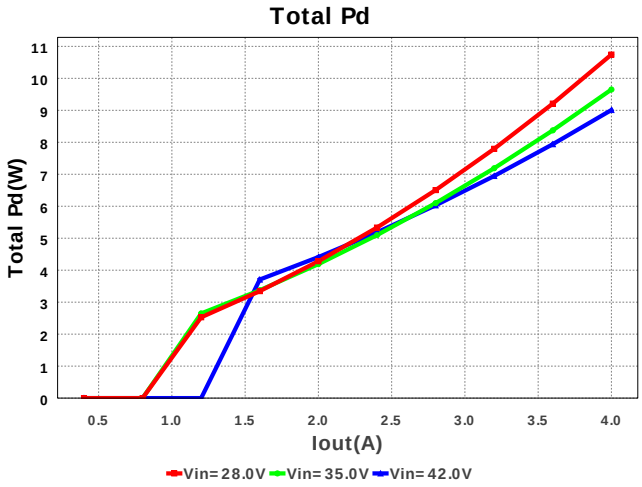


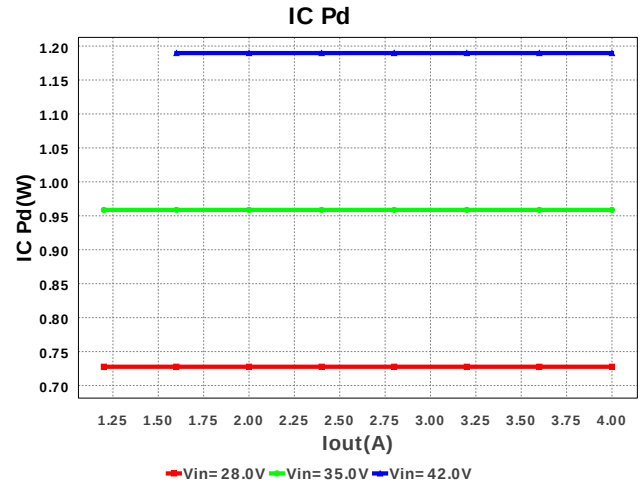


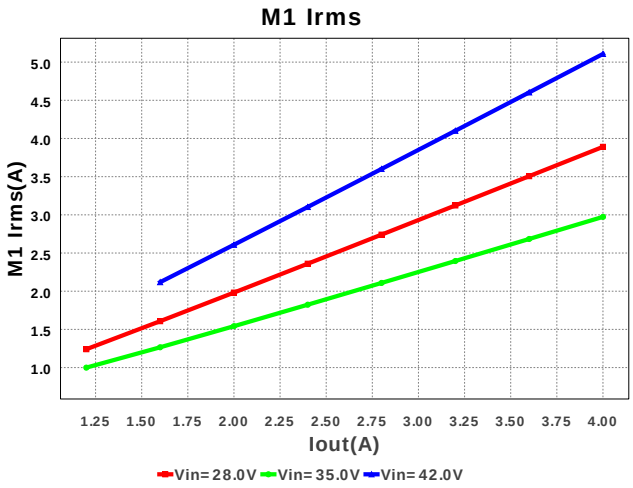


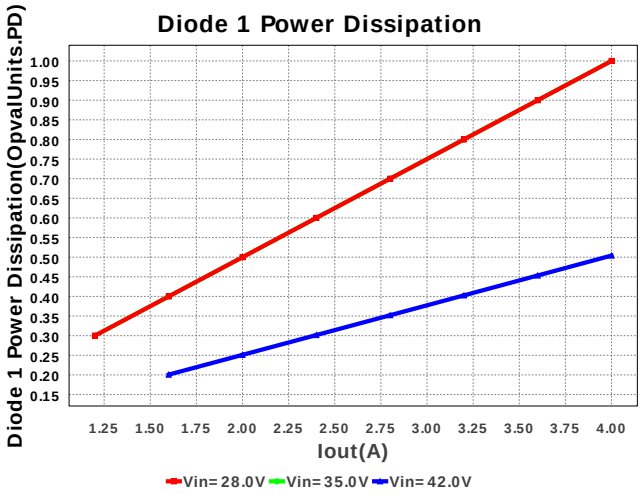




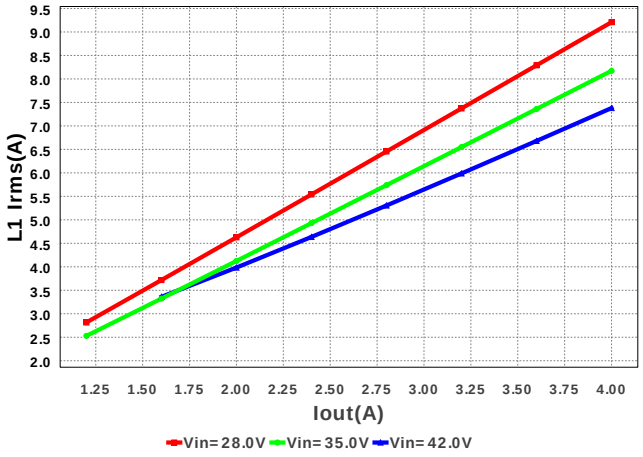




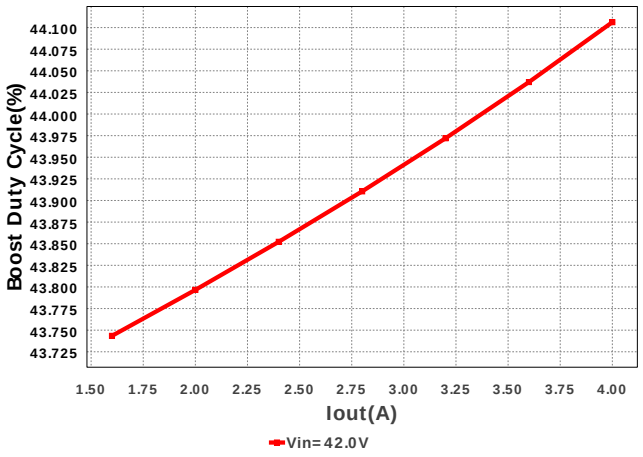




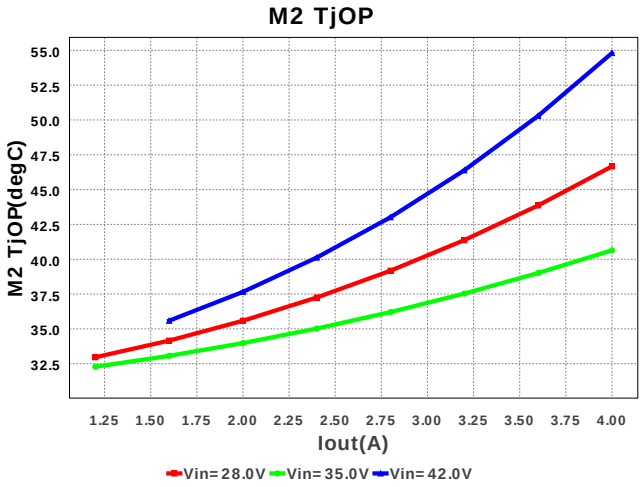
L1 Irms



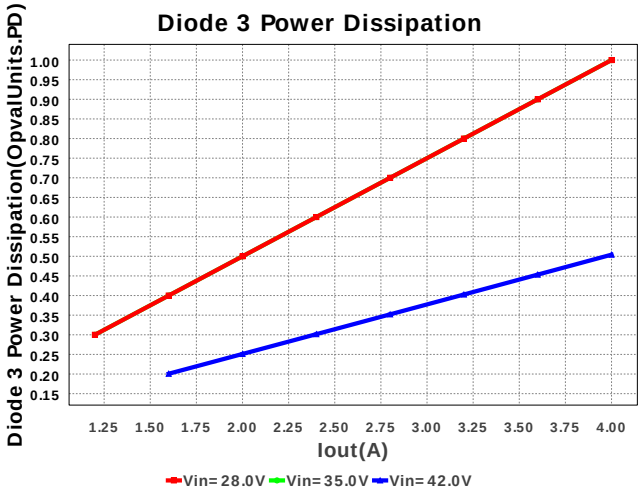
Boost Duty Cycle



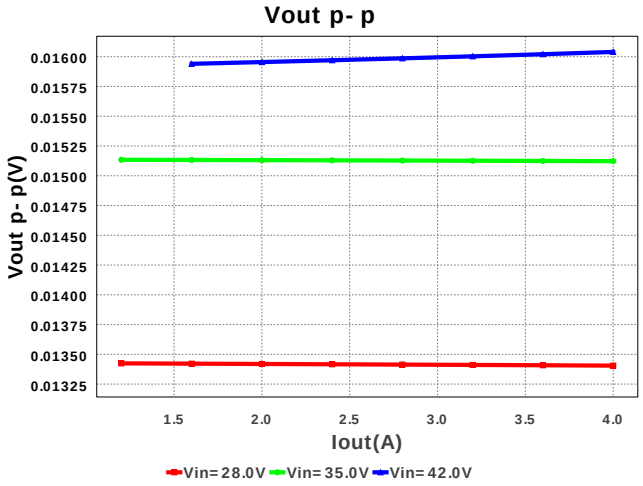
M2 TjOP



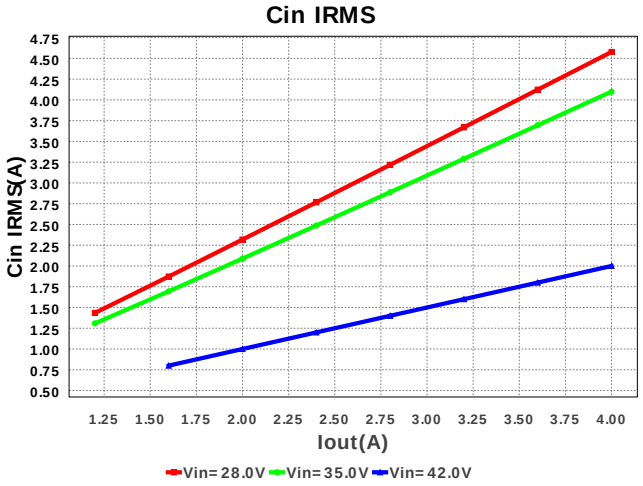
Diode 3 Power Dissipation

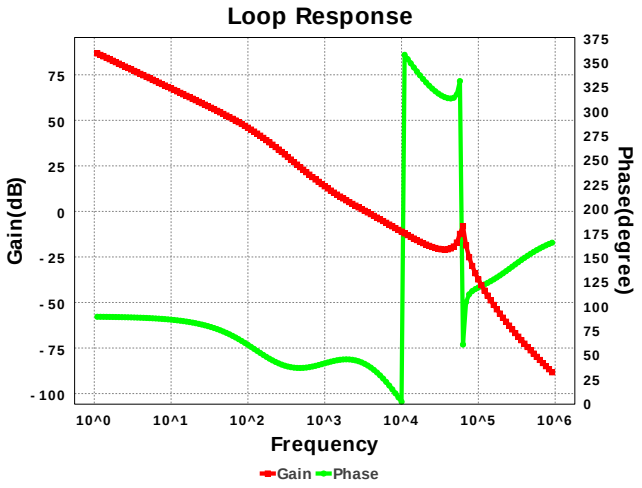


Vout p- p



Cin IRMS





Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.0 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	690.342 mA	Current	Output capacitor RMS ripple current
3.	HS Ipk	8.331 A	Current	Peak switch current in IC
4.	Iin Avg	3.651 A	Current	Average input current
5.	L Ipp	2.391 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	7.404 A	Current	Inductor ripple current
7.	LS Ipk	8.292 A	Current	Peak switch current in IC
8.	M1 Irms	5.117 A	Current	MOSFET RMS ripple current
9.	M2 Irms	4.76 A	Current	MOSFET RMS ripple current
10.	BOM Count	38	General	Total Design BOM count
11.	FootPrint	3.412 kmm2	General	Total Foot Print Area of BOM components
12.	Frequency	126.0 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	Pout	144.0 W	General	Total output power
17.	Total BOM	$0.0	General	Total BOM Cost
18.	Boost Duty Cycle	44.341 %	Op_point	Boost Duty cycle
19.	Buck Duty Cycle	49.451 %	Op_point	Buck Duty cycle
20.	Cross Freq	2.993 kHz	Op_point	Bode plot crossover frequency
21.	Efficiency	93.904 %	Op_point	Steady state efficiency
22.	IC Tj	77.597 degC	Op_point	IC junction temperature
23.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
24.	IOUT_OP	4.0 A	Op_point	Iout operating point
25.	M1 TjOP	52.989 degC	Op_point	MOSFET junction temperature
26.	M2 TjOP	55.252 degC	Op_point	MOSFET junction temperature
27.	Operating Topology	Transition	Op_point	The current operating topology of the device
28.	Phase Marg	31.825 deg	Op_point	Bode Plot Phase Margin
29.	VIN_OP	42.0 V	Op_point	Vin operating point
30.	Vout p-p	15.613 mV	Op_point	Peak-to-peak output ripple voltage
31.	Cin Pd	218.326 mW	Power	Input capacitor power dissipation
32.	Cout Pd	1.668 mW	Power	Output capacitor power dissipation
33.	IC Pd	1.19 W	Power	IC power dissipation
34.	L Pd	2.713 W	Power	Inductor power dissipation
35.	M1 Pd	554.93 mW	Power	MOSFET power dissipation
36.	M1 PdCond	514.519 mW	Power	M1 MOSFET conduction losses
37.	M1 PdSw	40.411 mW	Power	M1 MOSFET switching losses
38.	M2 Pd	568.128 mW	Power	MOSFET power dissipation
39.	M2 PdCond	440.103 mW	Power	M2 MOSFET conduction losses
40.	M2 PdSw	128.025 mW	Power	M2 MOSFET switching losses
41.	Total Pd	9.348 W	Power	Total Power Dissipation
42.	Diode 1 Power Dissipation	505.487 mOpvalUnits.PD	Unknown	Power dissipation in the diode
43.	Diode 2 Power Dissipation	1.505 OpvalUnits.PD	Unknown	Power dissipation in the diode
44.	Diode 3 Power Dissipation	505.487 mOpvalUnits.PD	Unknown	Power dissipation in the diode
45.	Diode 4 Power Dissipation	1.505 OpvalUnits.PD	Unknown	Power dissipation in the diode

Design Inputs

#	Name	Value	Description
1.	Iout	4.0 A	Maximum Output Current
2.	Iout1	4.0 Amps	Output Current #1
3.	VinMax	42.0 V	Maximum input voltage
4.	VinMin	28.0 V	Minimum input voltage
5.	Vout	36.0 V	Output Voltage
6.	Vout1	36.0 Volt	Output Voltage #1
7.	base_pn	LM5118	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. The LM5118 is a wide range buck-boost controller which is operable in an ultra wide input range of 3 to 75V. A buck-boost regulator can maintain regulation for input voltages either higher or lower than the output voltage. The challenge is that buck-boost power converters are not as efficient as buck regulators. The LM5118 has been designed as a dual mode controller whereby the power converter acts as a buck regulator while the input voltage is above the output. As the input voltage approaches the output voltage, a gradual transition to the buck-boost mode occurs. This gradual transition between modes eliminates disturbances at the output during transitions.

2. **LM5118** Product Folder : http://www.ti.com/product/lm5118 : contains the data sheet and other resources.