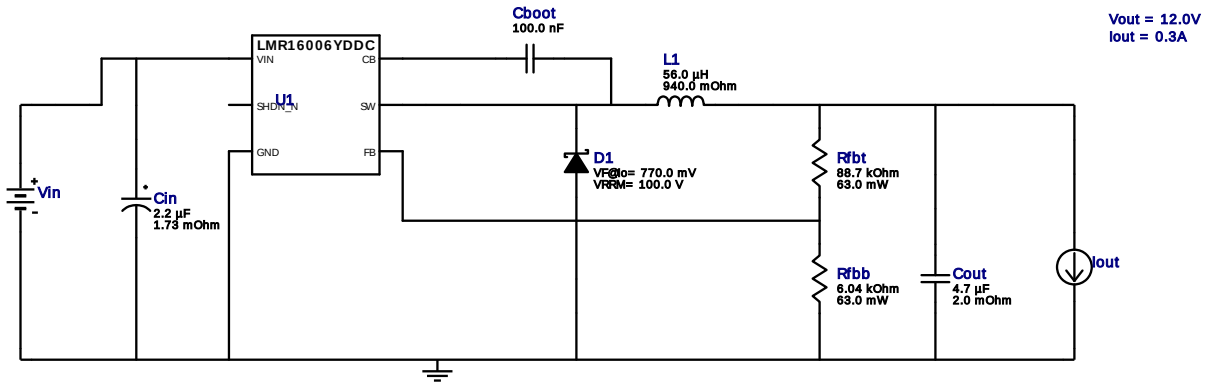
WEBENCH® Design Report

VinMin = 47.0V
VinMax = 49.0V
Vout = 12.0V
Iout = 0.3A

Device = LMR16006YDDCR
Topology = Buck
Created = 1/3/17 11:48:58 AM
BOM Cost = $1.78
BOM Count = 8
Total Pd = 0.49W

Design : 433359/259 LMR16006YDDCR
LMR16006YDDCR 47.0V-49.0V to 12.00V @ 0.3A



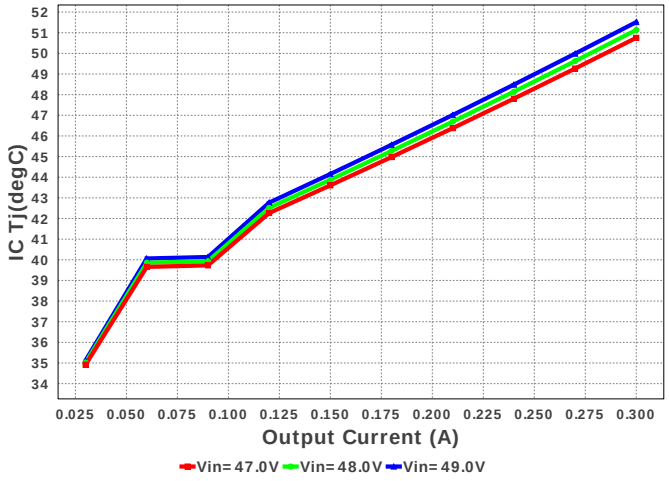
My Comments

No comments

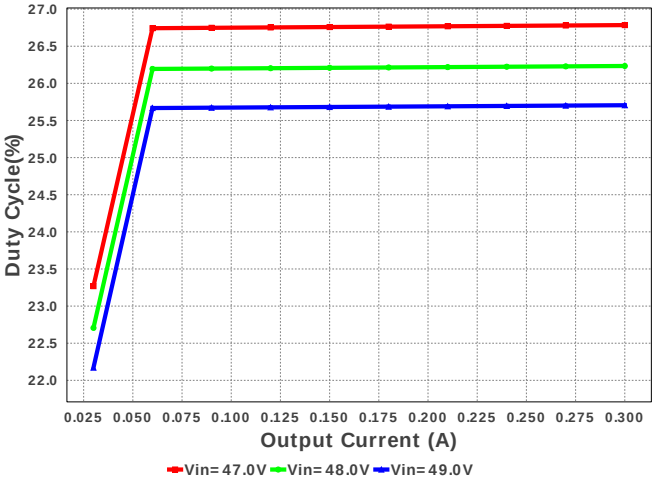
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	HMK212B7104KG-T Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
2.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 1.73 mOhm VDC= 100.0 V IRMS= 5.5932 A	1	$0.19	1210_250 15 mm²
3.	Cout	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	$0.02	0805 7 mm²
4.	D1	Diodes Inc.	DFLS1100-7	VF@Io= 770.0 mV VRRM= 100.0 V	1	$0.14	PowerDI123 13 mm²
5.	L1	Bourns	SDR0403-560KL	L= 56.0 µH DCR= 940.0 mOhm	1	$0.18	SDR0403 28 mm²
6.	Rfbb	Vishay-Dale	CRCW04026K04FKED Series= CRCW..e3	Res= 6.04 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	Rfbt	Vishay-Dale	CRCW040288K7FKED Series= CRCW..e3	Res= 88.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	U1	Texas Instruments	LMR16006YDDCR	Switcher	1	$1.20	DDC0006A 10 mm²

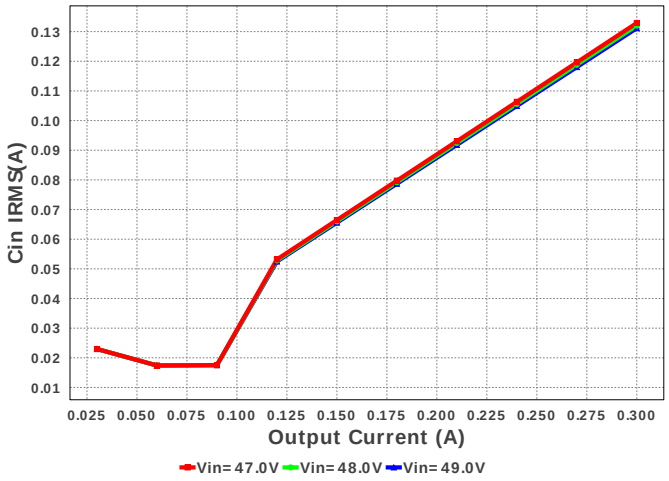
IC Tj



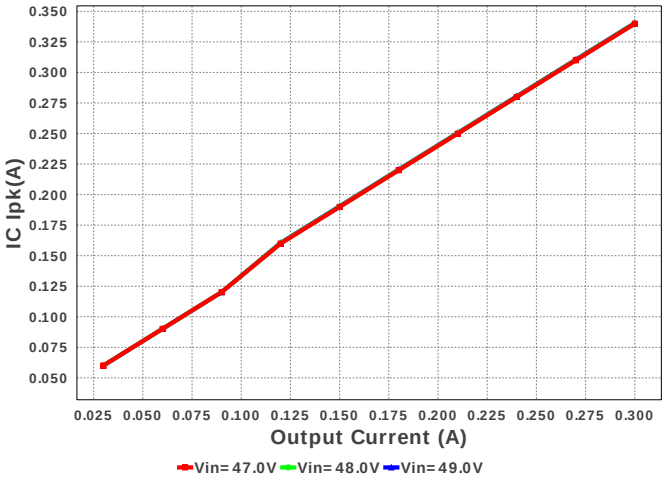
Duty Cycle



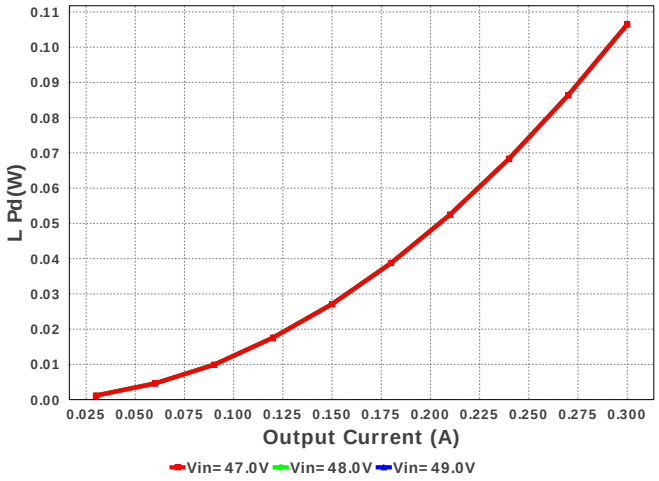
Cin IRMS



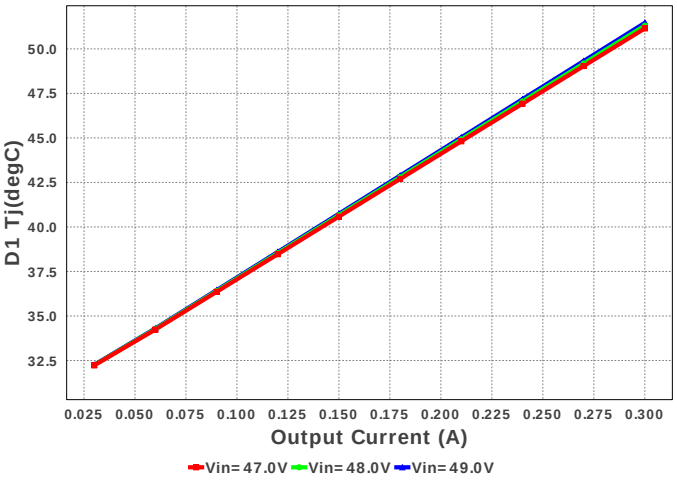
IC Ipk

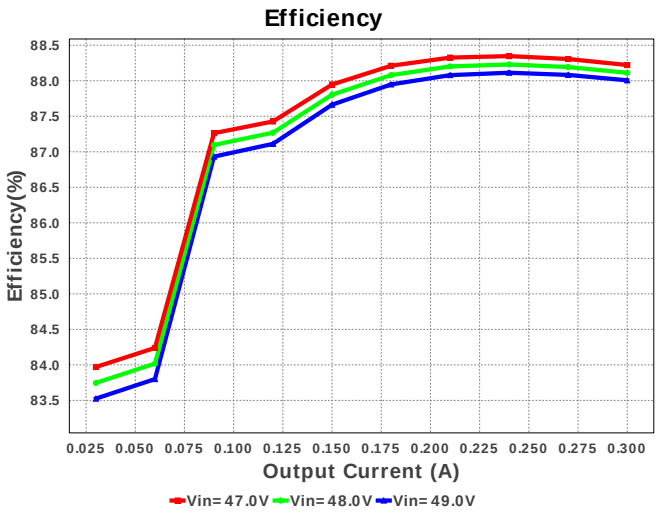


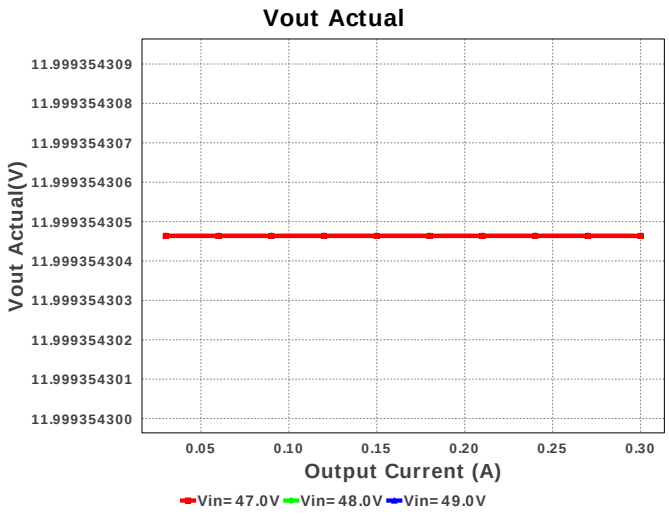
L Pd

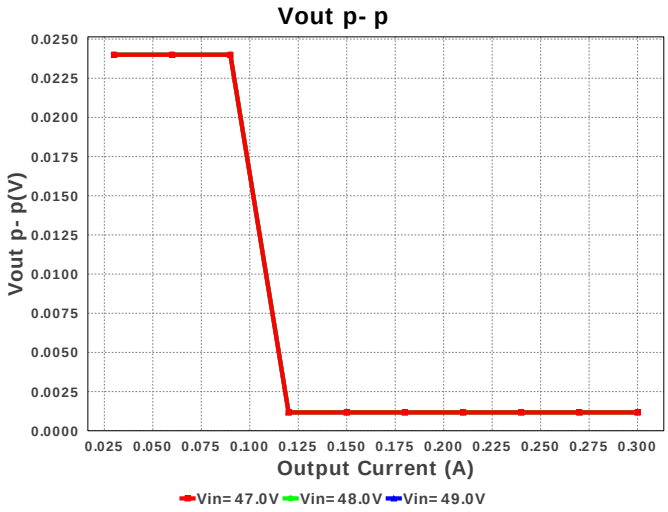


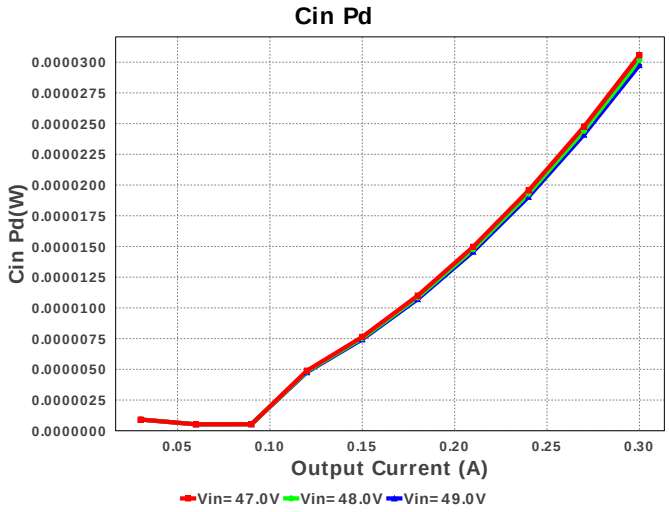
D1 Tj

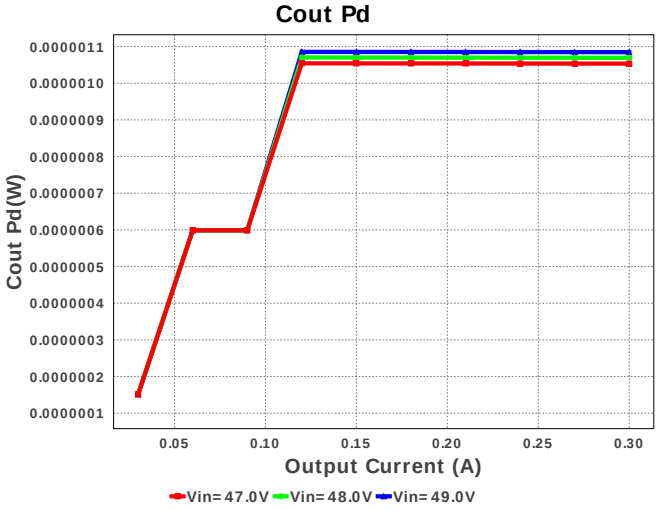


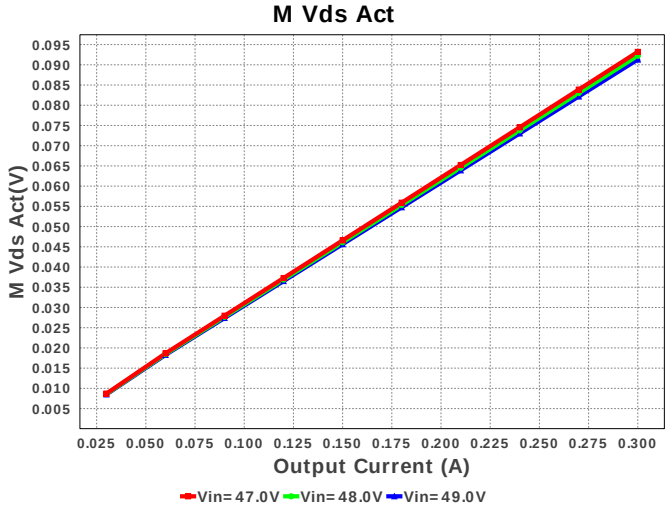


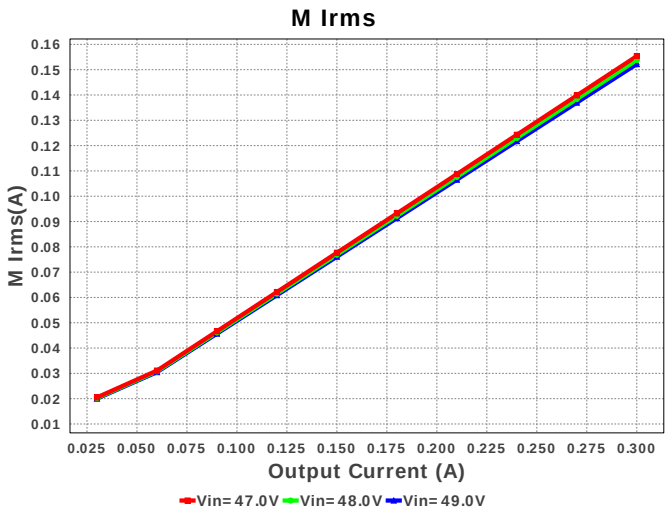


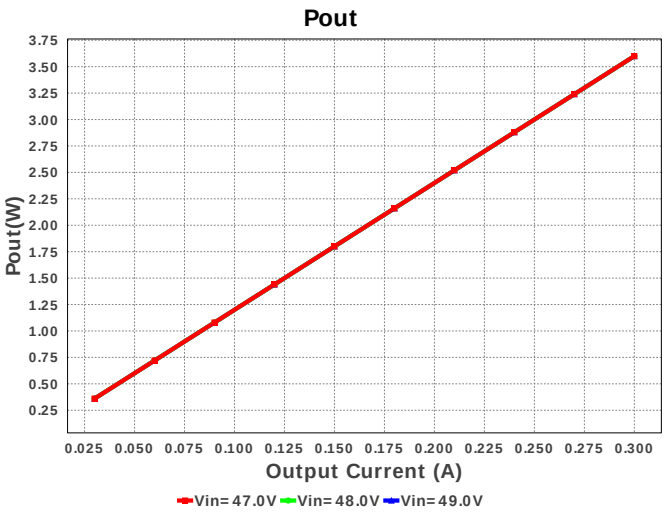


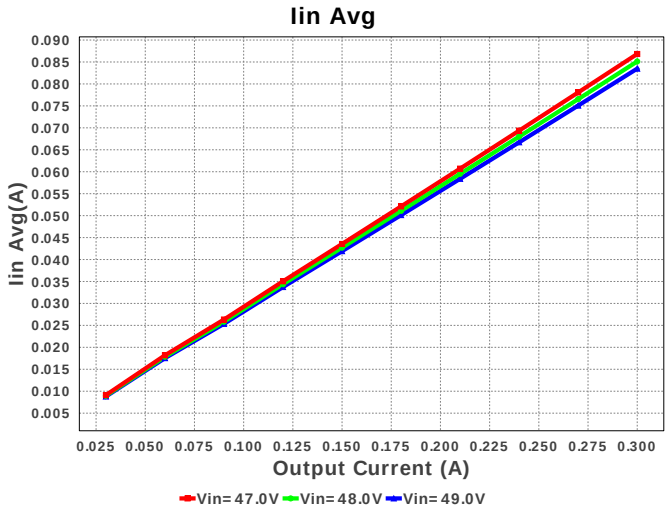


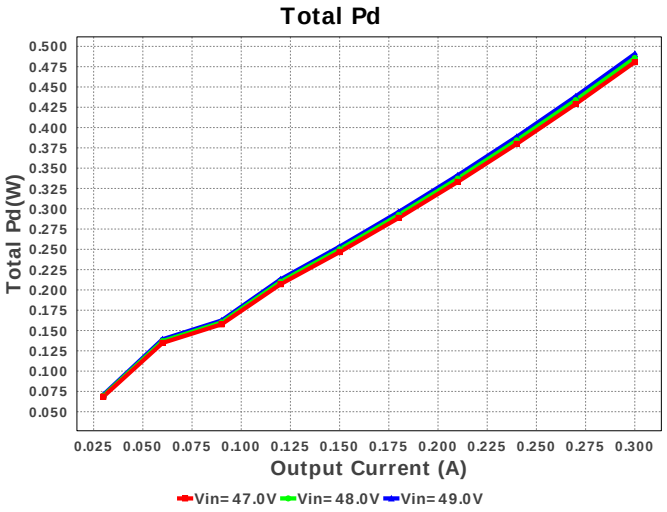


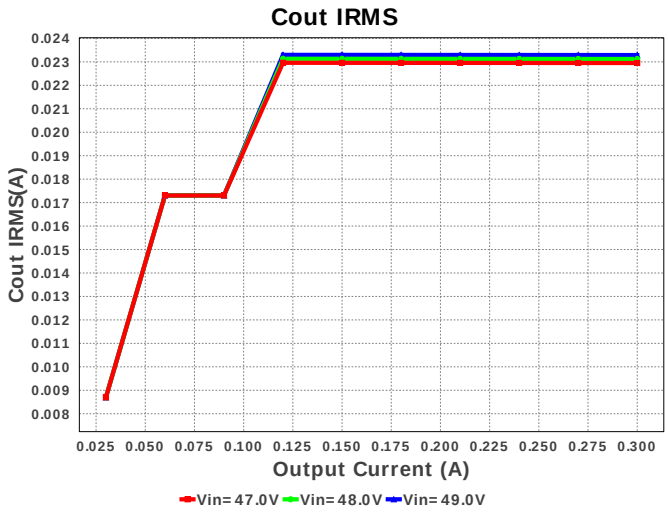


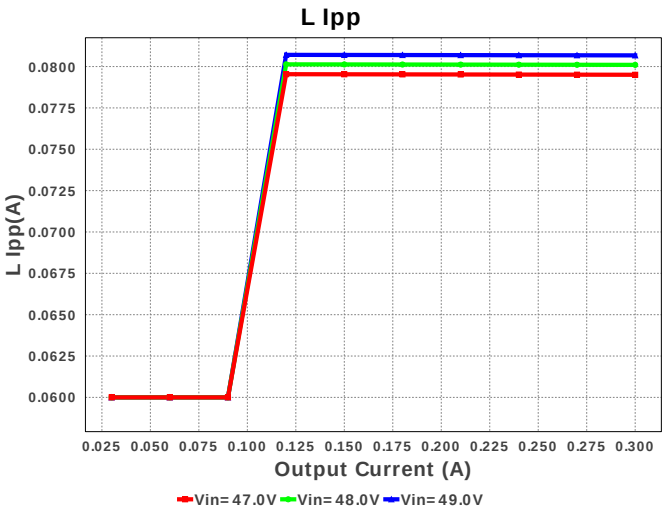


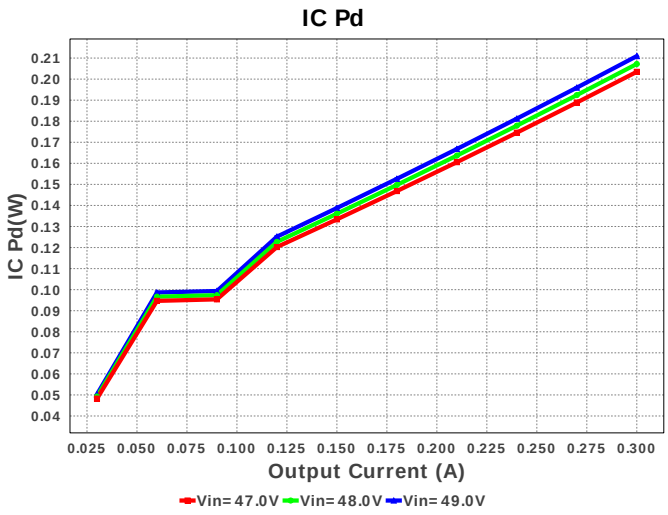


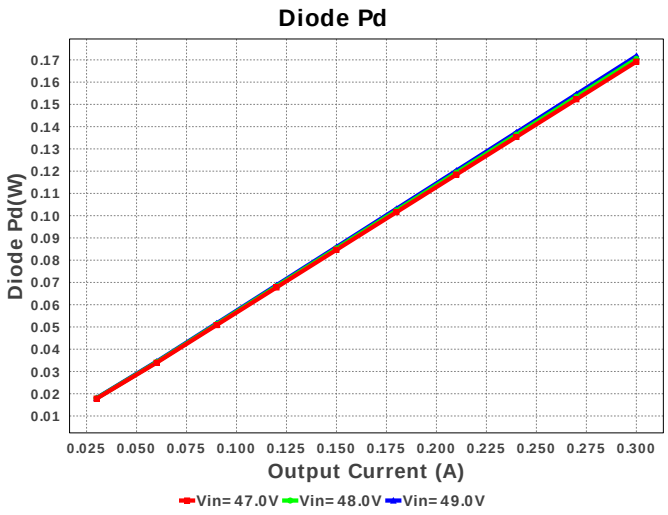


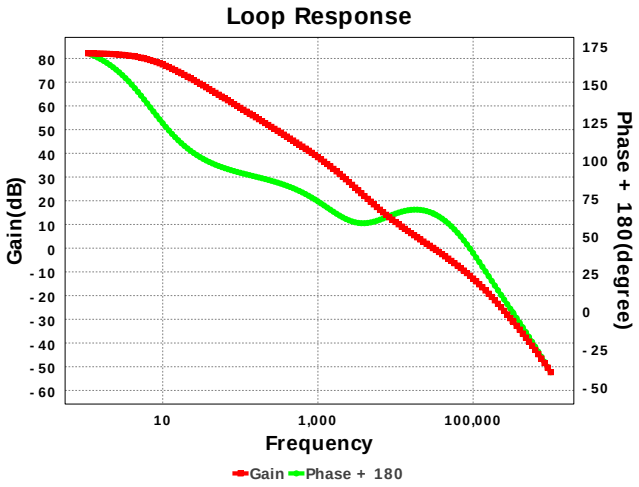












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	131.158 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	23.289 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	340.464 mA	Current	Peak switch current in IC
4.	Iin Avg	83.483 mA	Current	Average input current
5.	L Ipp	80.676 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	152.206 mA	Current	Q Iavg
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	85.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	2.1 MHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	91.299 mV	General	Voltage drop across the MosFET
12.	Mode	CCM	General	Conduction Mode
13.	Pout	3.6 W	General	Total output power
14.	Total BOM	$1.78	General	Total BOM Cost
15.	D1 Tj	51.462 degC	Op_Point	D1 junction temperature
16.	Vout Actual	11.999 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
18.	Cross Freq	30.7 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	25.705 %	Op_point	Duty cycle
20.	Efficiency	88.006 %	Op_point	Steady state efficiency
21.	IC Tj	51.515 degC	Op_point	IC junction temperature
22.	ICThetaJA	102.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	300.0 mA	Op_point	Iout operating point
24.	Phase Marg	65.158 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	49.0 V	Op_point	Vin operating point
26.	Vout p-p	1.185 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	29.76 µW	Power	Input capacitor power dissipation
28.	Cout Pd	1.085 µW	Power	Output capacitor power dissipation
29.	Diode Pd	171.693 mW	Power	Diode power dissipation
30.	IC Pd	210.932 mW	Power	IC power dissipation
31.	L Pd	106.477 mW	Power	Inductor power dissipation

#	Name	Value	Category	Description
32.	Total Pd	490.635 mW	Power	Total Power Dissipation
33.	Vout Tolerance	4.289 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	300.0 m	Maximum Output Current
2.	VinMax	49.0	Maximum input voltage
3.	VinMin	47.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LMR16006Y	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR16006Y** Product Folder : http://www.ti.com/product/LMR16006 : contains the data sheet and other resources.