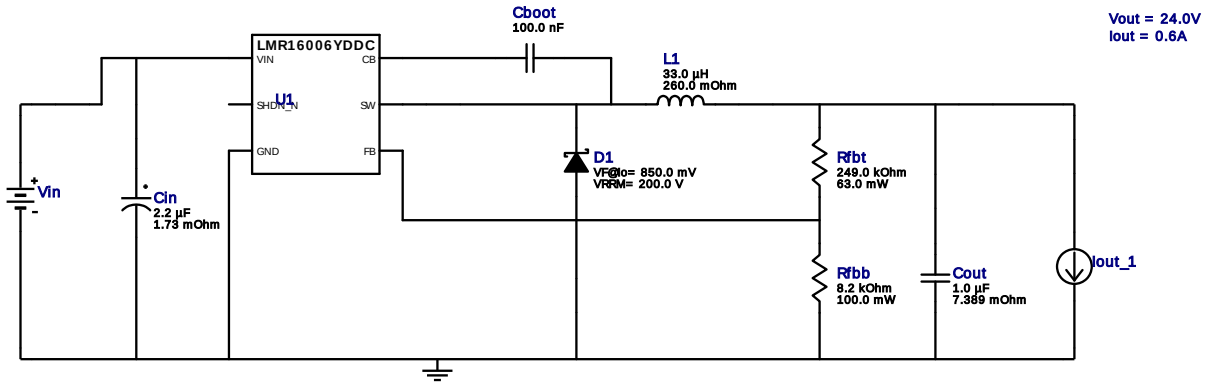
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 30.0V
VinMax = 48.0V
Vout = 24.0V
Iout = 0.6A

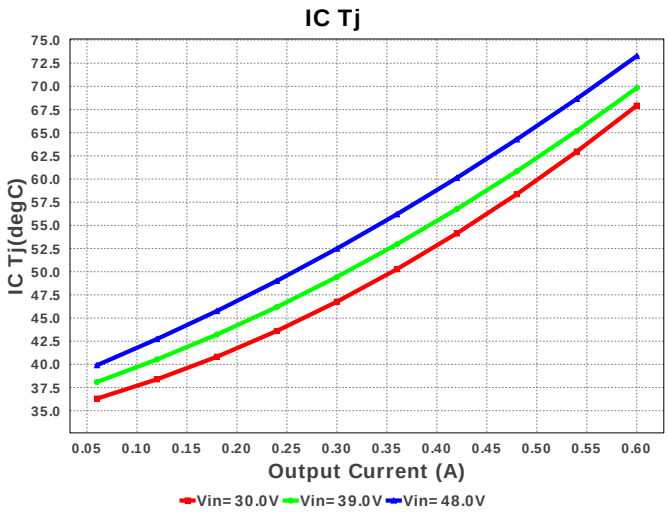
Device = LMR16006YDDCR
Topology = Buck
Created = 9/15/16 8:47:15 AM
BOM Cost = $1.77
BOM Count = 8
Total Pd = 0.73W

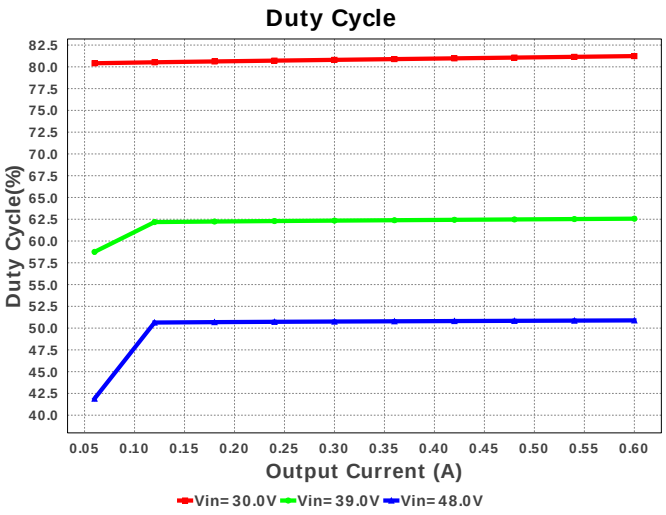
Design : 4551144/151 LMR16006YDDCR
LMR16006YDDCR 30.0V-48.0V to 23.99V @ 0.6A

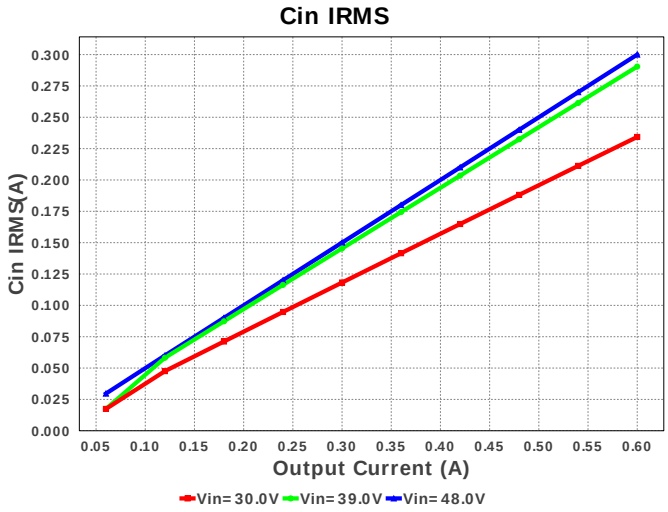


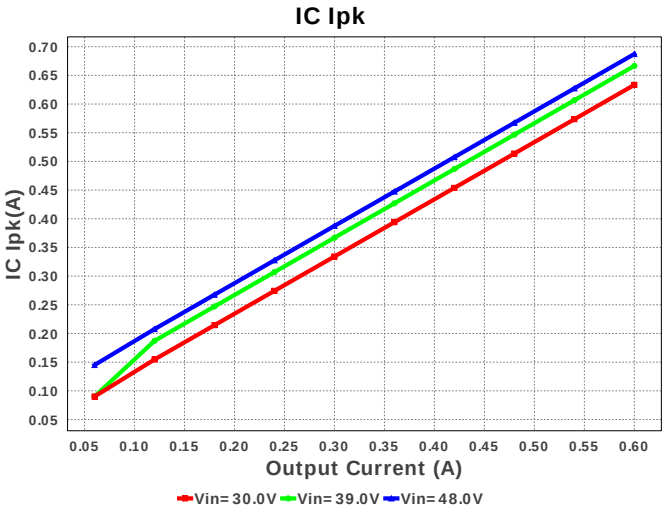
Electrical BOM

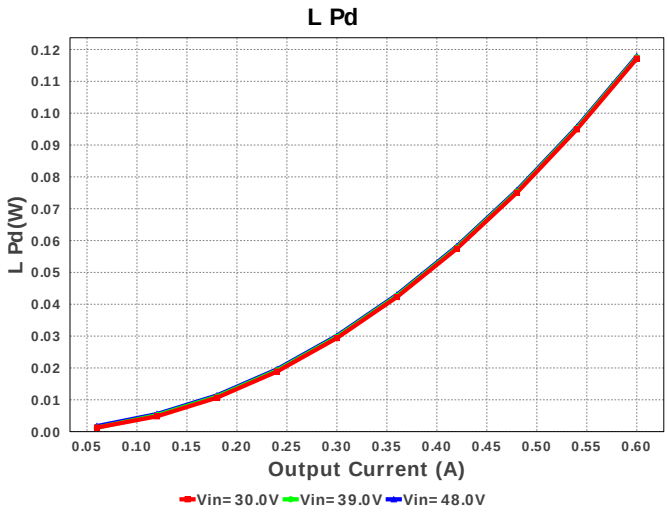
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	HMK212B7104KG-T Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
2.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 1.73 mOhm VDC= 100.0 V IRMS= 5.5932 A	1	$0.19	1210_250 15 mm²
3.	Cout	MuRata	GRM31MR71H105KA88L Series= X7R	Cap= 1.0 uF ESR= 7.389 mOhm VDC= 50.0 V IRMS= 979.22 mA	1	$0.03	1206 11 mm²
4.	D1	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	PowerDI123 13 mm²
5.	L1	NIC Components	NPI54C330KTRF	L= 33.0 µH DCR= 260.0 mOhm	1	$0.09	IND_NPI54C 61 mm²
6.	Rfbb	Yageo America	RC0603FR-078K2L Series= ?	Res= 8.2 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
7.	Rfbt	Vishay-Dale	CRCW0402249KFKED Series= CRCW..e3	Res= 249.0 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

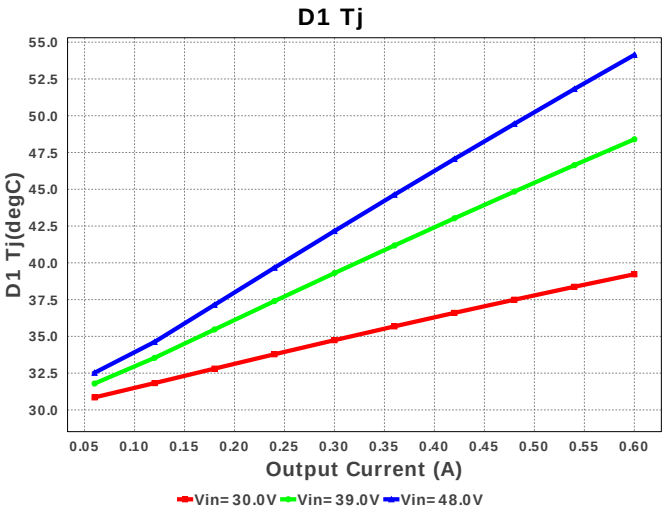




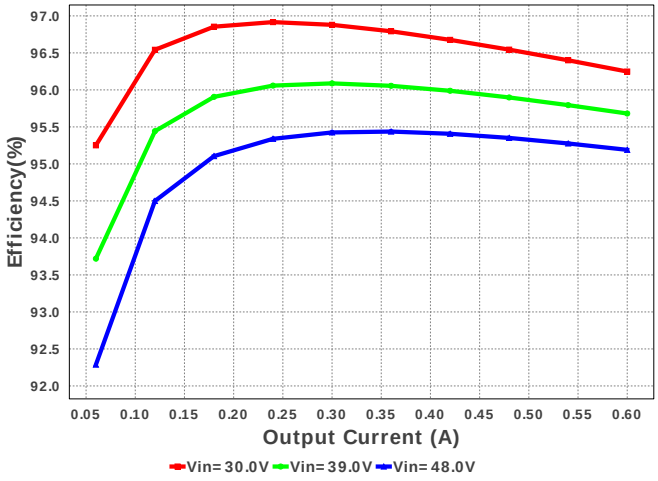




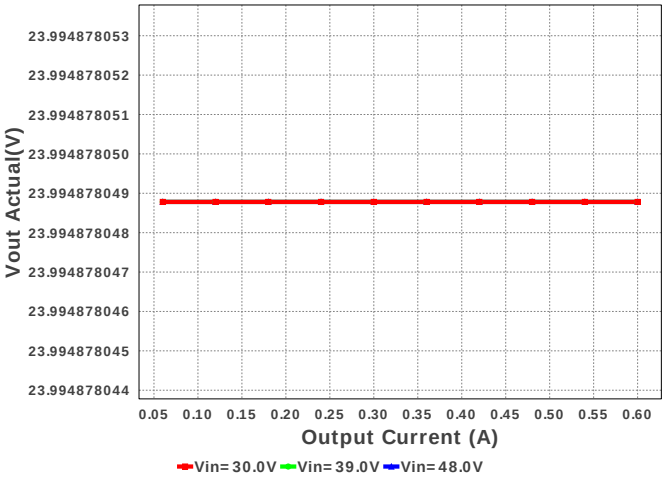




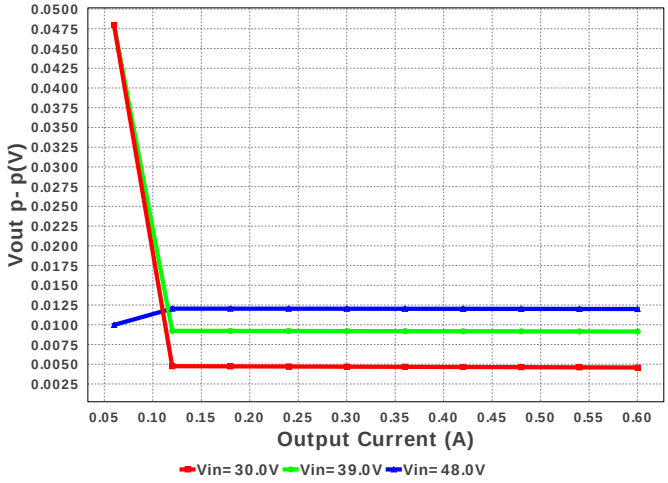
Efficiency



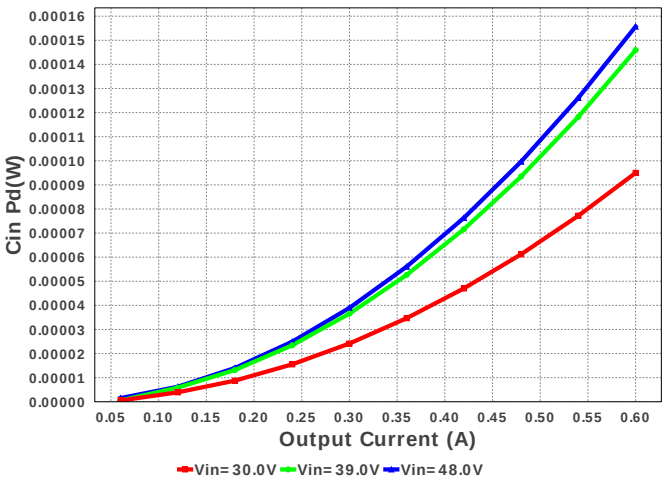
Vout Actual



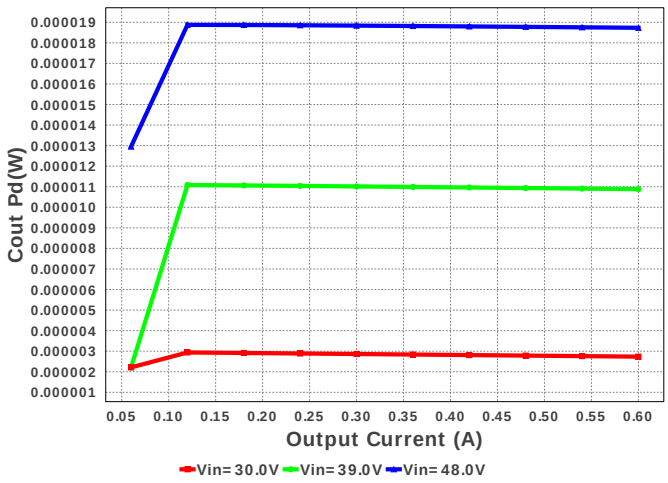
Vout p- p



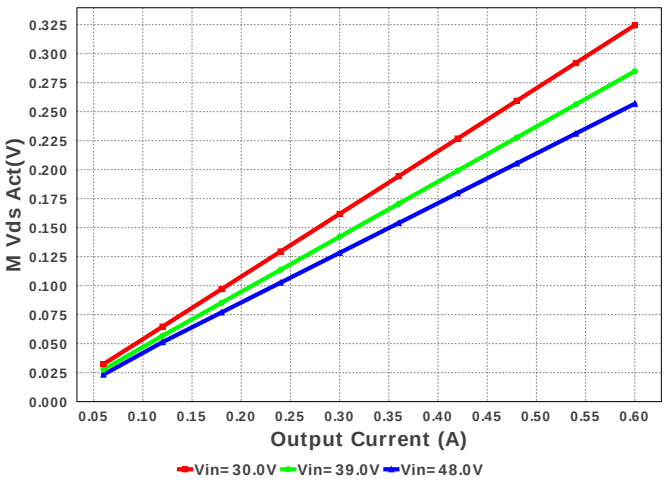
Cin Pd

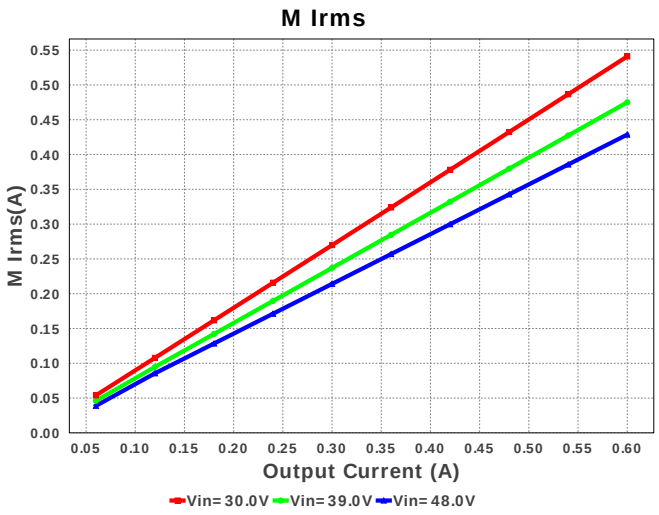


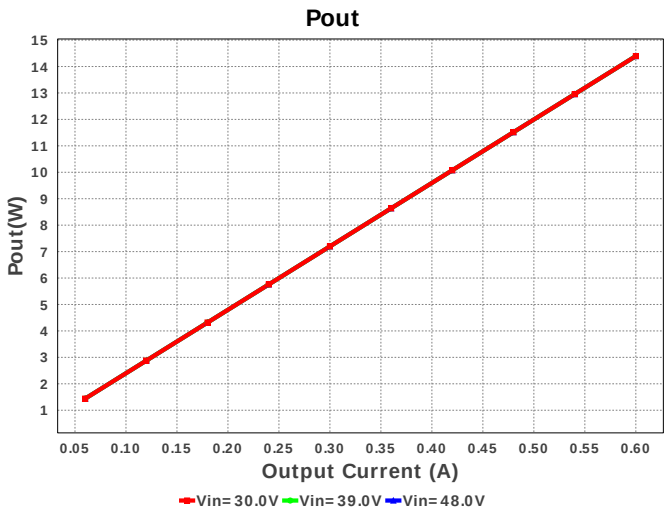
Cout Pd

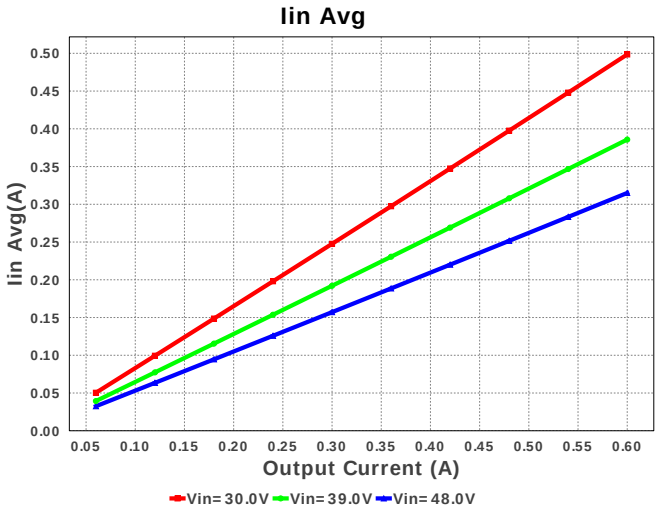


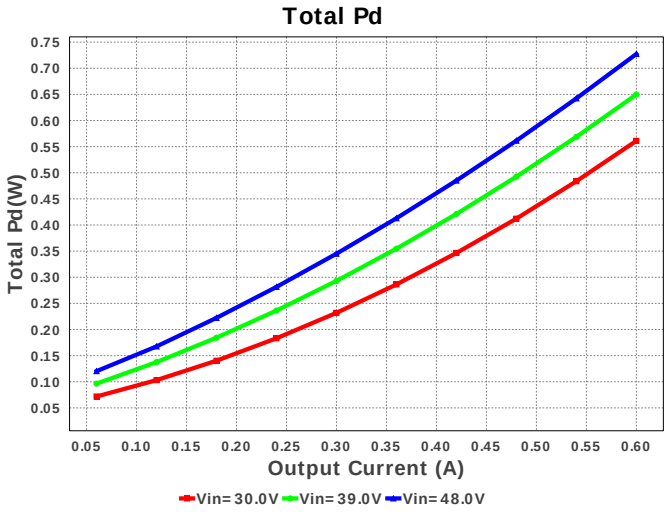
M Vds Act

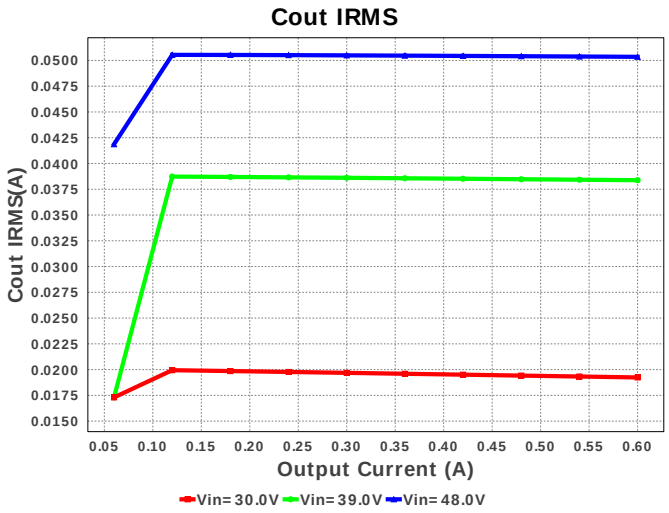


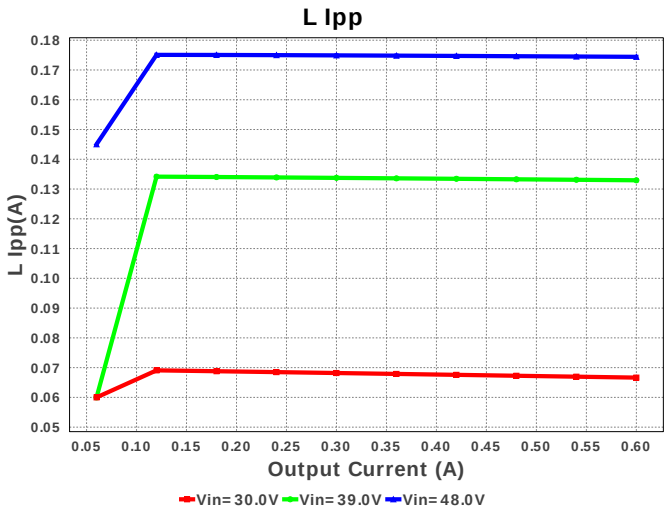


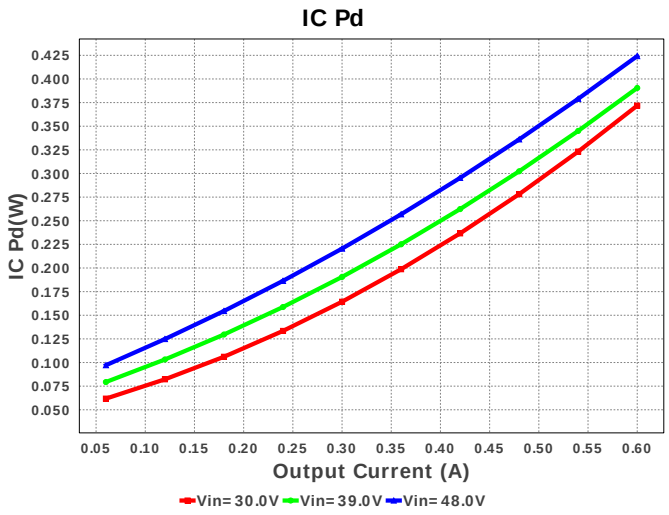


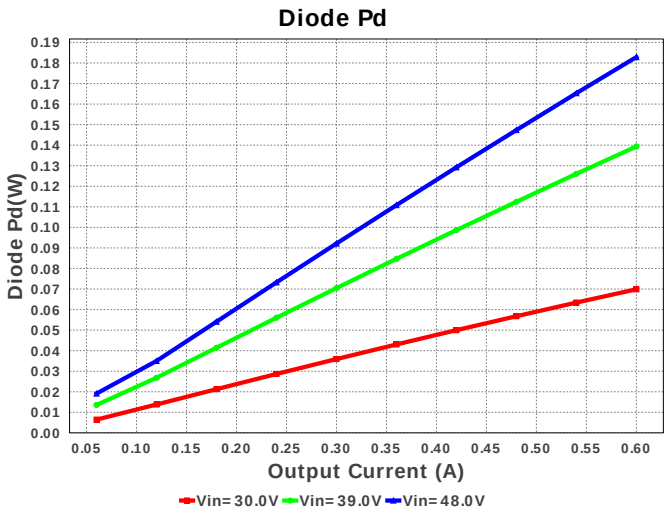


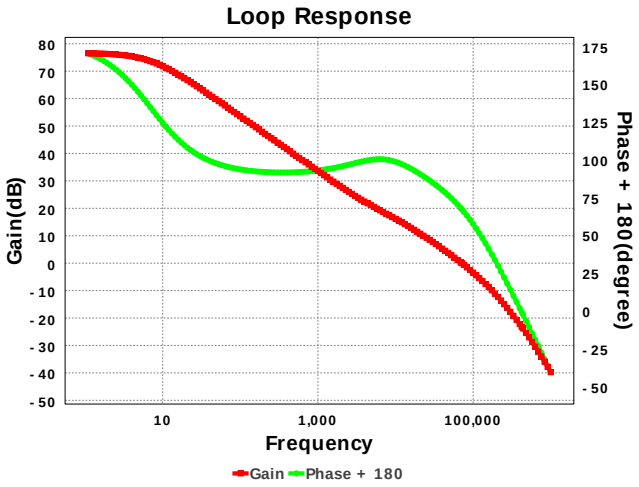












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	299.999 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	50.35 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	687.302 mA	Current	Peak switch current in IC
4.	Iin Avg	315.03 mA	Current	Average input current
5.	L Ipp	174.42 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	428.617 mA	Current	MOSFET RMS current
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	124.0 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	256.845 mV	General	Voltage drop across the MosFET
12.	Mode	CCM	General	Conduction Mode
13.	Pout	14.394 W	General	Total output power
14.	Total BOM	$1.77	General	Total BOM Cost
15.	D1 Tj	54.138 degC	Op_Point	D1 junction temperature
16.	Vout Actual	23.995 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	23.99 V	Op_Point	Operational Output Voltage
18.	Cross Freq	71.173 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	50.886 %	Op_point	Duty cycle
20.	Efficiency	95.19 %	Op_point	Steady state efficiency
21.	IC Tj	73.267 degC	Op_point	IC junction temperature
22.	ICThetaJA	102.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	600.0 mA	Op_point	Iout operating point
24.	Phase Marg	68.009 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	48.0 V	Op_point	Vin operating point
26.	Vout p-p	11.996 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	155.699 µW	Power	Input capacitor power dissipation
28.	Cout Pd	18.732 µW	Power	Output capacitor power dissipation
29.	Diode Pd	182.863 mW	Power	Diode power dissipation
30.	IC Pd	424.185 mW	Power	IC power dissipation
31.	L Pd	117.86 mW	Power	Inductor power dissipation

#	Name	Value	Category	Description
32.	Total Pd	727.341 mW	Power	Total Power Dissipation
33.	Vout Tolerance	4.355 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	600.0 m	Maximum Output Current
2.	VinMax	48.0	Maximum input voltage
3.	VinMin	30.0	Minimum input voltage
4.	Vout	24.0	Output Voltage
5.	base_pn	LMR16006Y	Texas Instruments Base Part 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.