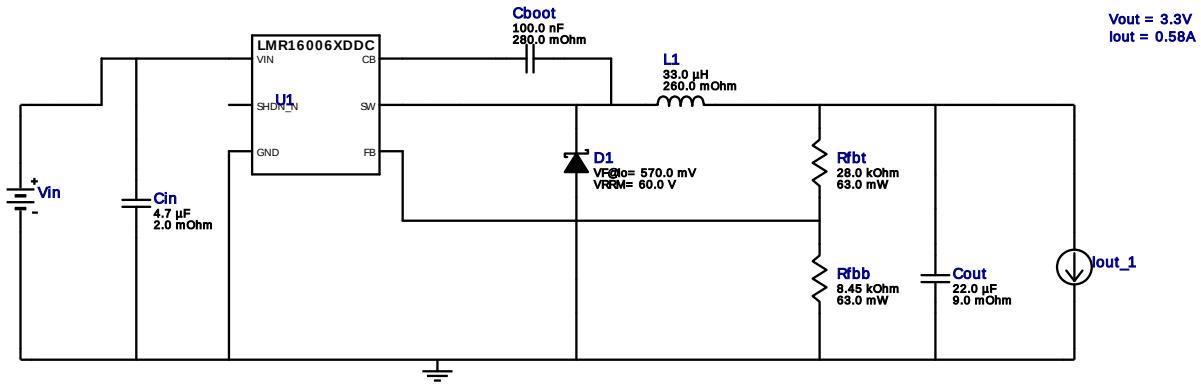
WEBENCH® Design Report

VinMin = 11.0V
VinMax = 13.0V
Vout = 3.3V
Iout = 0.58A

Device = LMR16006XDDCR
Topology = Buck
Created = 5/8/17 3:55:58 AM
BOM Cost = $1.43
BOM Count = 8
Total Pd = 0.39W

Design : 4920221/6 LMR16006XDDCR
LMR16006XDDCR 11.0V-13.0V to 3.30V @ 0.585A

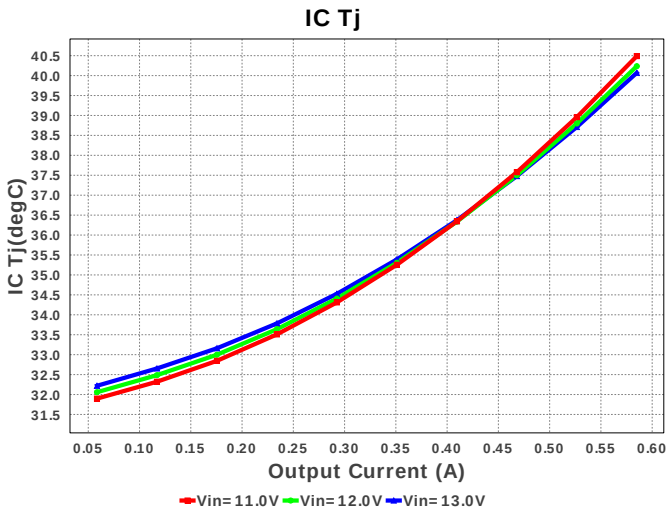


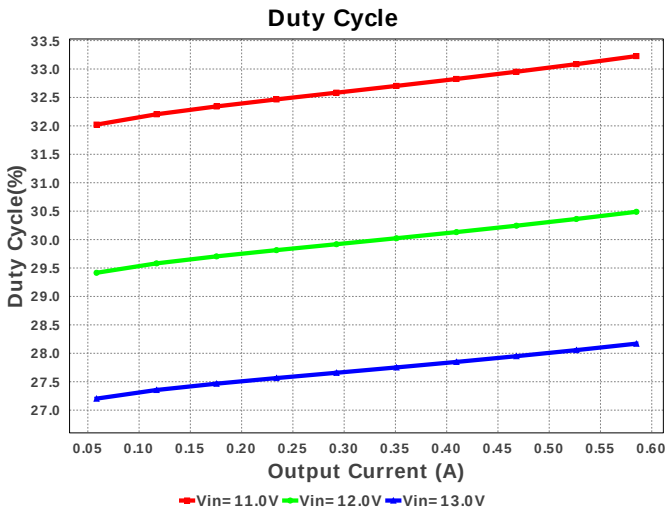
My Comments

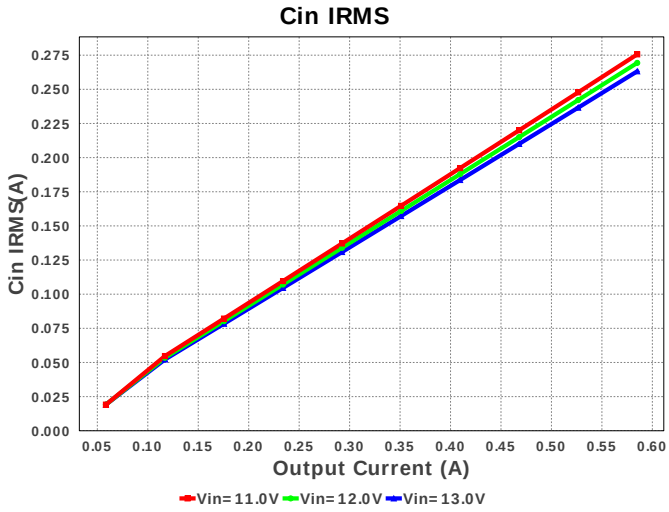
No comments

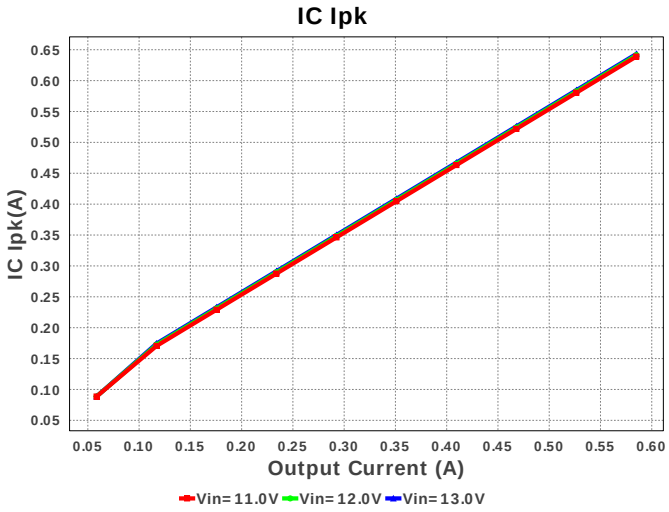
Electrical BOM

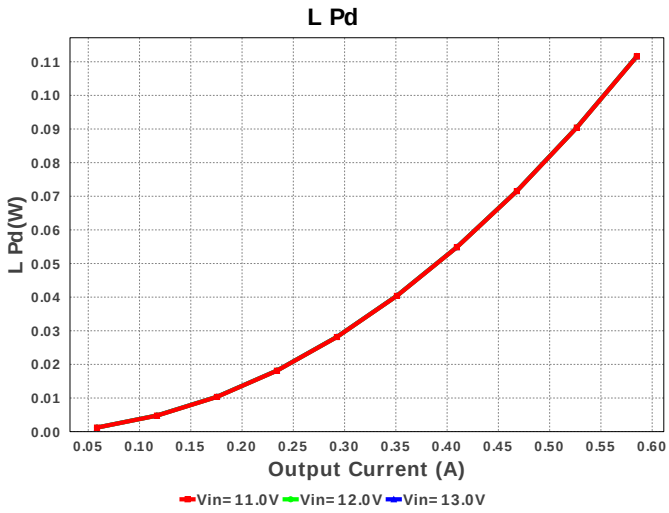
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	$0.02	0805 7 mm²
3.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1	$0.05	0805 7 mm²
4.	D1	Nexperia	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	SOD-123F 12 mm²
5.	L1	NIC Components	NPI54C330KTRF	L= 33.0 µH DCR= 260.0 mOhm	1	$0.09	IND_NPI54C 61 mm²
6.	Rfbb	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8.45 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	Rfbt	Vishay-Dale	CRCW040228K0FKED Series= CRCW..e3	Res= 28.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	U1	Texas Instruments	LMR16006XDDCR	Switcher	1	$1.20	DDC0006A 10 mm²

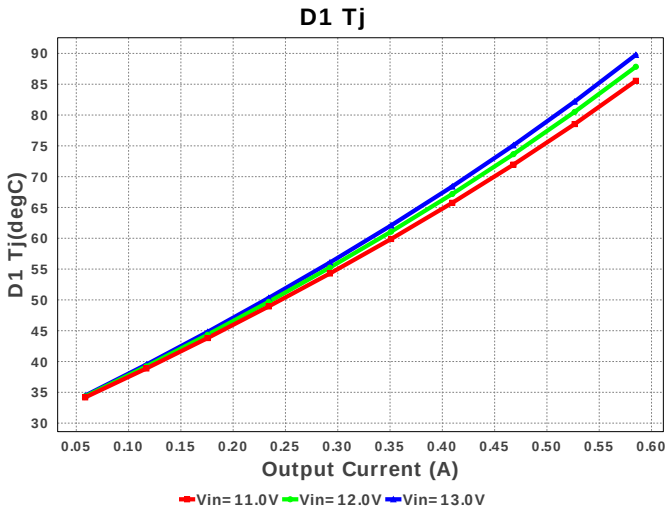




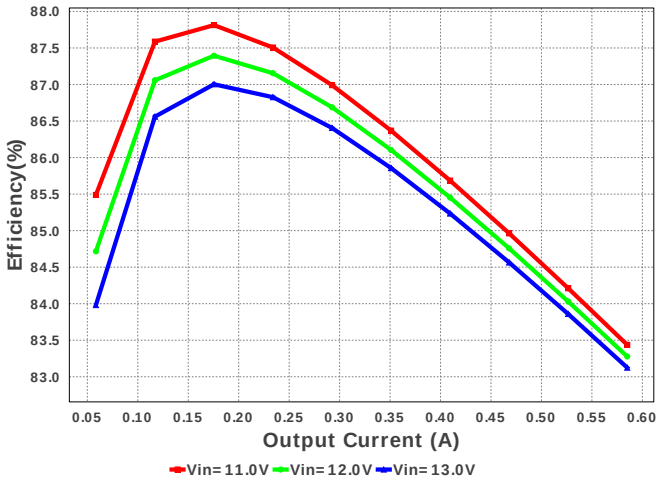




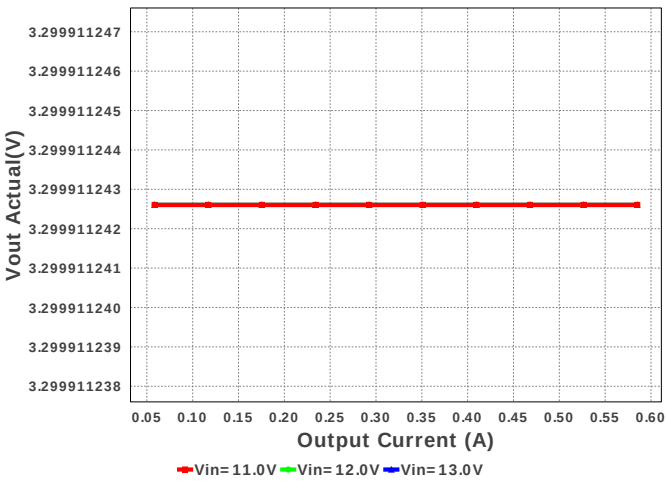




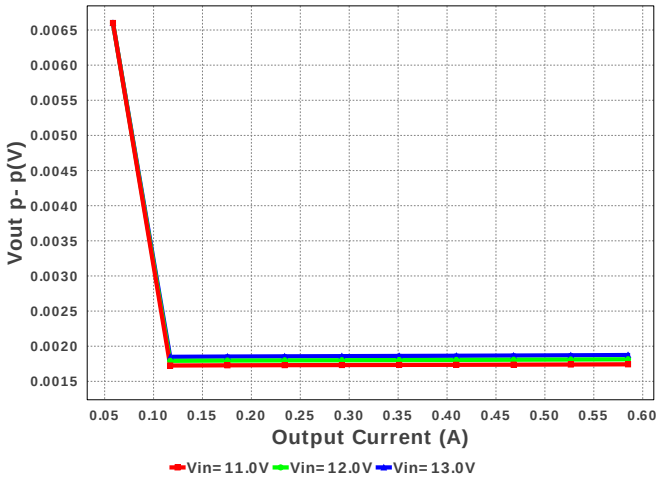
Efficiency



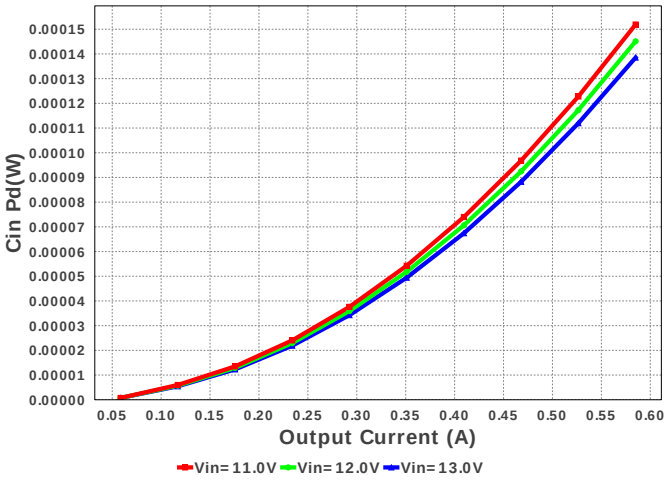
Vout Actual



Vout p- p



Cin Pd



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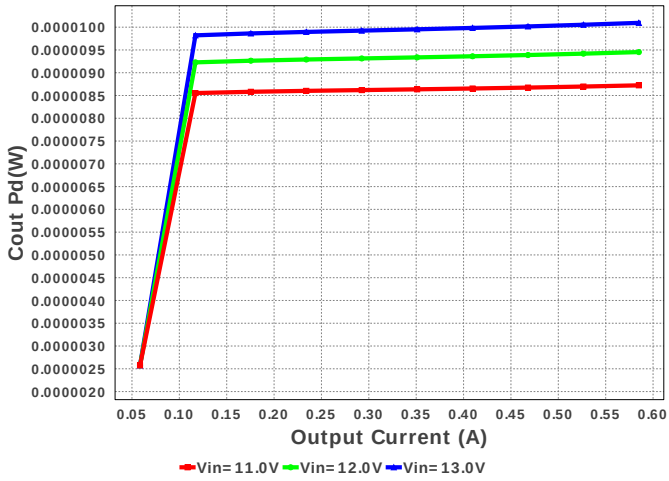
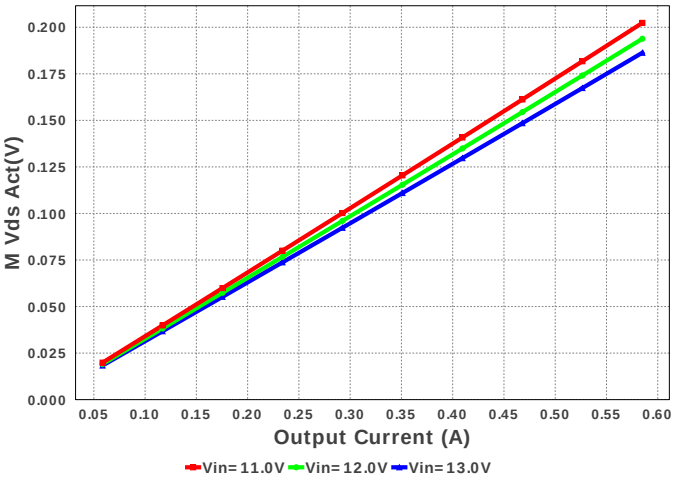
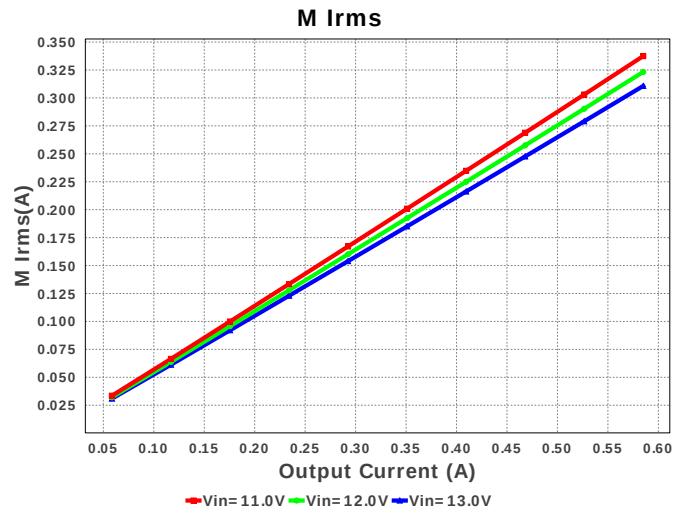
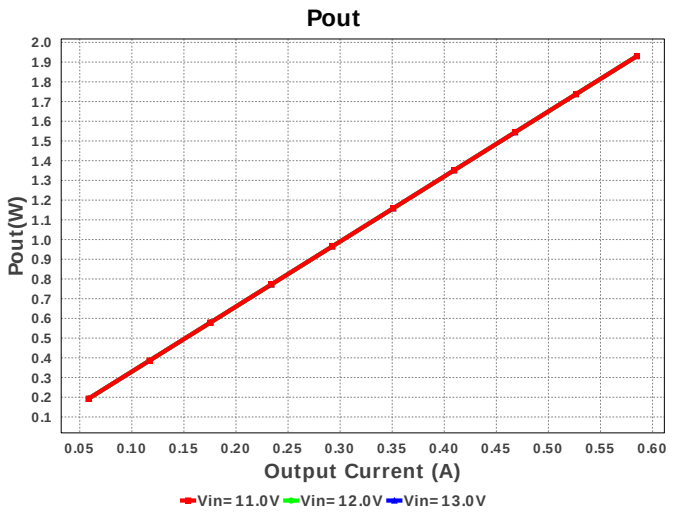
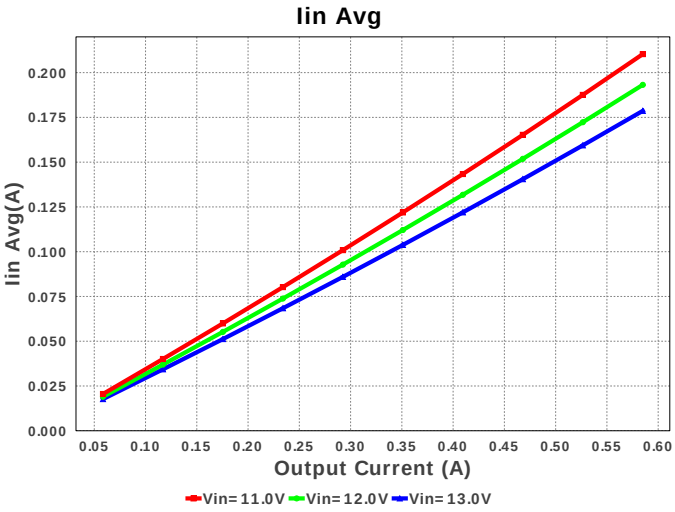


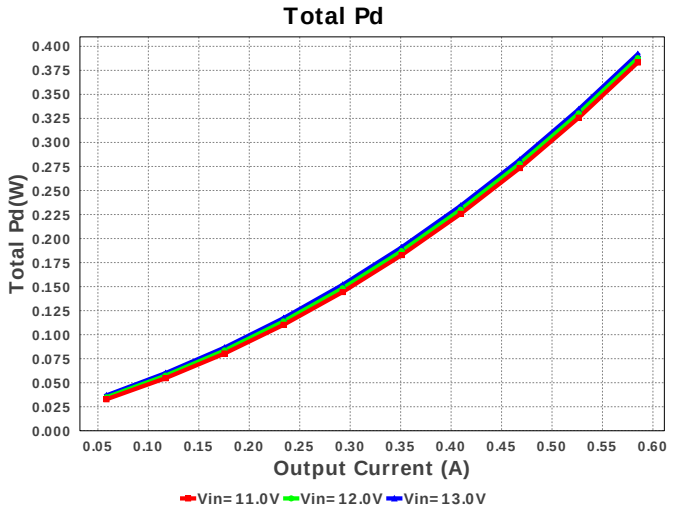
M Vds Act

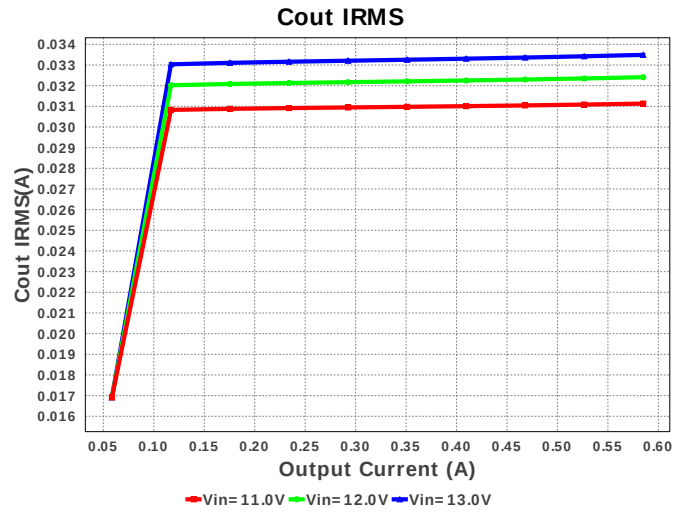


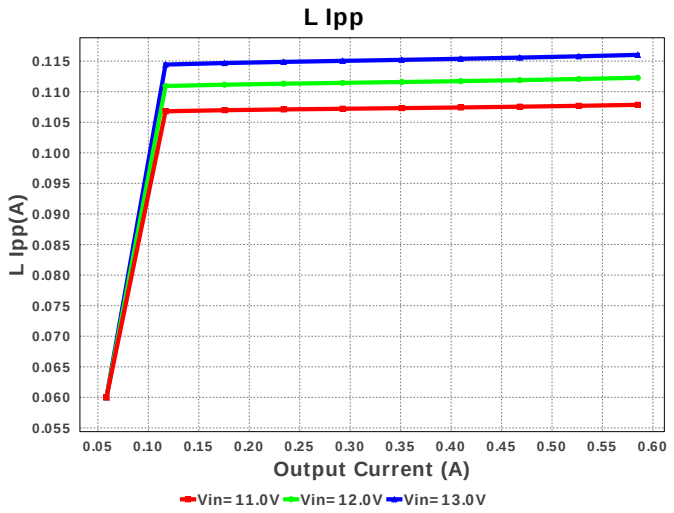


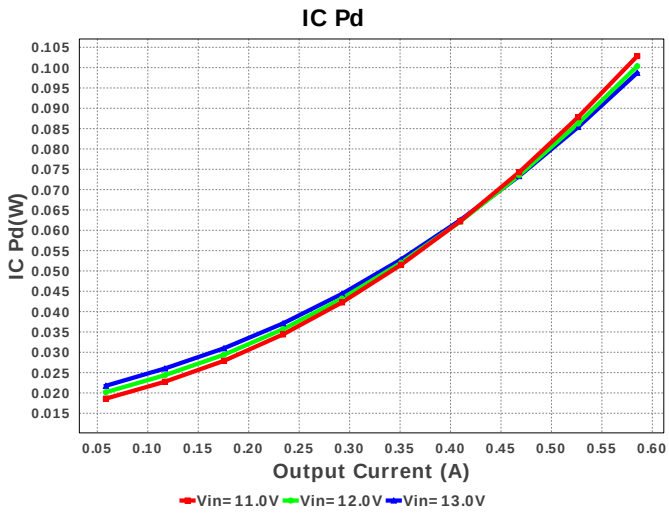


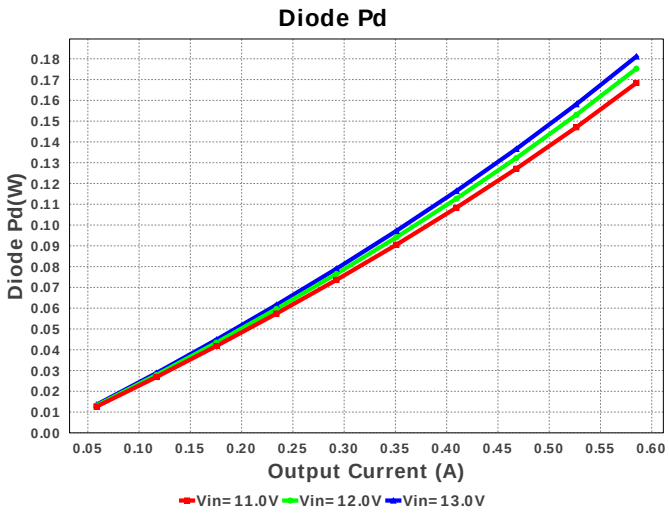


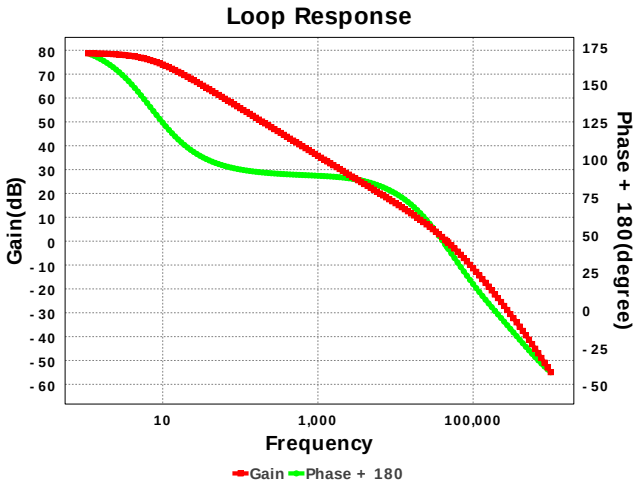












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	263.188 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	33.491 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	643.098 mA	Current	Peak switch current in IC
4.	Iin Avg	178.65 mA	Current	Average input current
5.	L Ipp	116.01 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	310.71 mA	Current	Q Iavg
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	109.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	700.0 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	186.325 mV	General	Voltage drop across the MosFET
12.	Mode	CCM	General	Conduction Mode
13.	Pout	1.93 W	General	Total output power
14.	Total BOM	$1.43	General	Total BOM Cost
15.	D1 Tj	89.765 degC	Op_Point	D1 junction temperature
16.	Vout Actual	3.3 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
18.	Cross Freq	45.848 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	28.169 %	Op_point	Duty cycle
20.	Efficiency	83.125 %	Op_point	Steady state efficiency
21.	IC Tj	40.07 degC	Op_point	IC junction temperature
22.	ICThetaJA	102.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	585.0 mA	Op_point	Iout operating point
24.	Phase Marg	42.524 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	13.0 V	Op_point	Vin operating point
26.	Vout p-p	1.875 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	138.536 µW	Power	Input capacitor power dissipation
28.	Cout Pd	10.095 µW	Power	Output capacitor power dissipation
29.	Diode Pd	181.107 mW	Power	Diode power dissipation
30.	IC Pd	98.722 mW	Power	IC power dissipation
31.	L Pd	111.622 mW	Power	Inductor power dissipation

#	Name	Value	Category	Description
32.	Total Pd	391.913 mW	Power	Total Power Dissipation
33.	Vout Tolerance	3.941 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	585.0 m	Maximum Output Current
2.	VinMax	13.0	Maximum input voltage
3.	VinMin	11.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LMR16006X	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR16006X** Product Folder : http://www.ti.com/product/LMR16006 : contains the data sheet and other resources.