

# WEBENCH® Power Architect

## Project Report

Project : 4264827/2 : PA\_Project\_304 (modified from 302)

Created : 2015-06-09 06:12:25.603

Optimize project optFactor=3

### Project Summary

1. Total System Efficiency	80.252 %
2. Total System BOM Count	15.0
3. Total System Footprint	188.0 mm <sup>2</sup>
4. Total System BOM Cost	\$2.70
5. Total System Power Dissipation	406.0 mW

--> Launch WEBENCH Power Architect.

## Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	LMR16006Y	Switcher : SIMPLE SWITCHER Wide Vin Buck Regulator	7.0 V	0.23 A	84.9%	106	\$1.67	11	9
2.	SUPPLY_2	TPS562200	Switcher : 17V, 2A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	3.3 V	0.5 A	93.2%	82	\$1.03	10	4

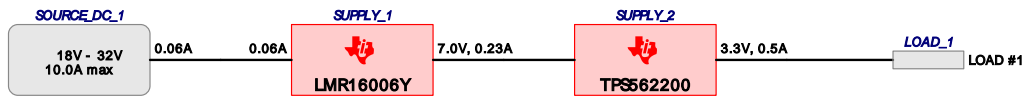
## Power Loads

#	Name	VLoad	ILoad	Description
1.	LOAD #1	3.3 V	0.5 A	VoutRipple=10%



## Project Diagram

WEBENCH® Power Architect Project ID : 2 PA\_Project\_304 (modified from 302) Power Architect 2015-06-09 06:12:25.603





## Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm <sup>2</sup> )
AVX	08053C104KAT2A	0805	1	\$0.01	7
Diodes Inc.	B160-13-F	SMA	1	\$0.06	37
Kemet	C0805C104K5RACTU	0805	1	\$0.01	7
Kemet	C1206C475K4PACTU	1206	1	\$0.05	11
TDK	C3216X5R0J226K	1206	1	\$0.11	11
TDK	C3225X7R2A225K230AB	1210	1	\$0.19	15
Vishay-Dale	CRCW040210K0FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040233K2FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040297K6FKED	0402	1	\$0.01	3
MuRata	GRM32ER61C226KE20L	1210	1	\$0.16	15
Texas Instruments	LMR16006YDDCR	DDC0006A	1	\$1.20	10
Susumu Co Ltd	RR1220P-123-D	0805	1	\$0.01	7
Bourns	SRN3015-470M	SRN3015	1	\$0.14	16
Bourns	SRR4028-3R3Y	SRR4028	1	\$0.26	34
Texas Instruments	TPS562200DDCR	DDC0006A	1	\$0.47	10
<b>Total</b>			<b>15</b>	<b>\$2.70</b>	<b>188</b>



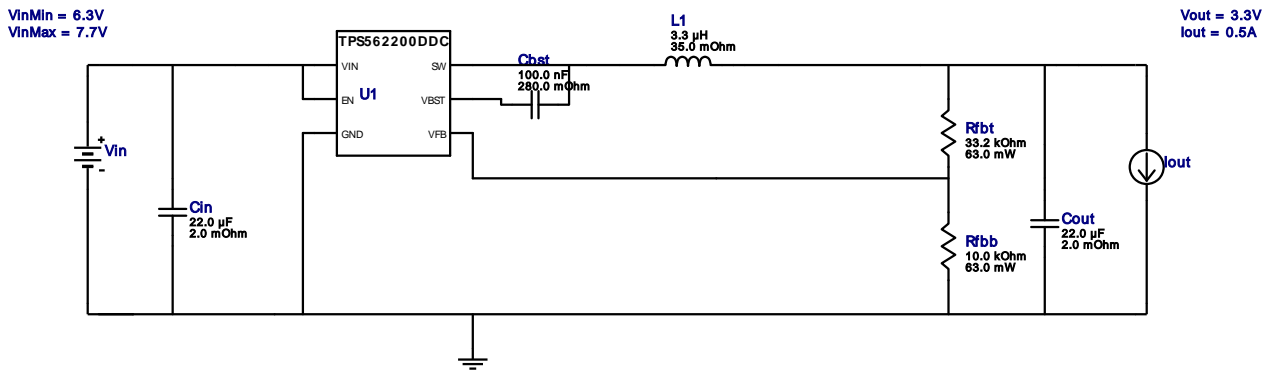


VinMin = 6.3V  
 VinMax = 7.7V  
 Vout = 3.3V  
 Iout = 0.5A








Device = TPS562200DDCR  
 Topology = Buck  
 Created = 6/9/15 6:12:24 AM  
 BOM Cost = \$1.03  
 Footprint = 82.0 mm<sup>2</sup>  
 BOM Count = 7  
 Total Pd = 0.12W

## WEBENCH® Design Report

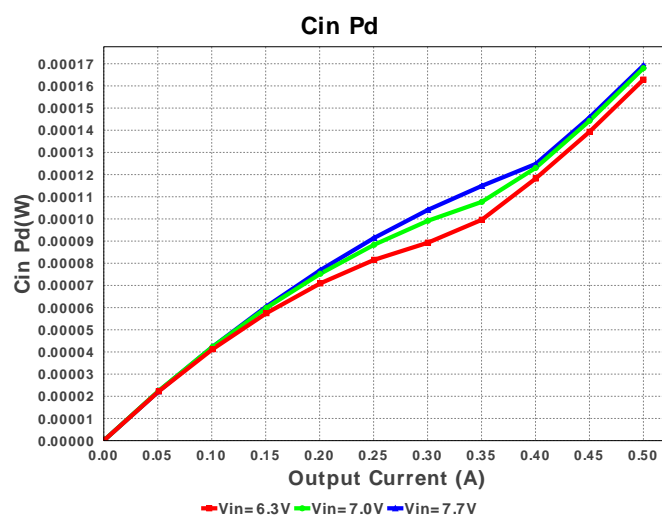
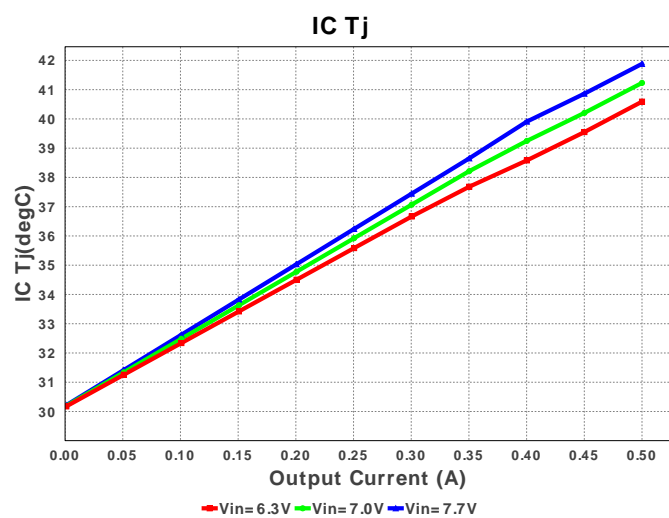
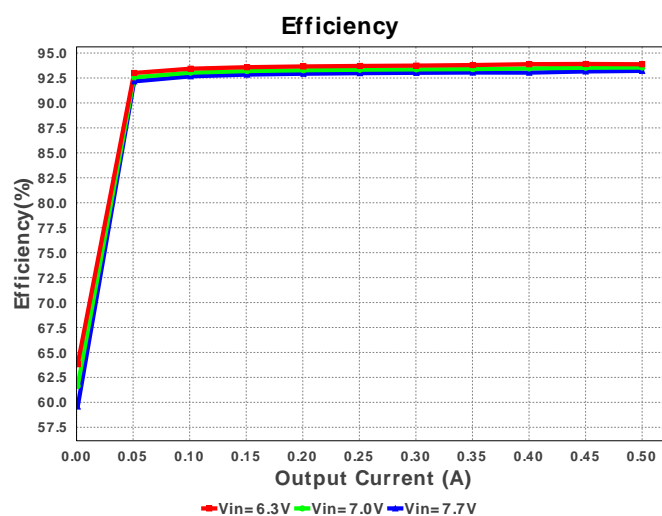
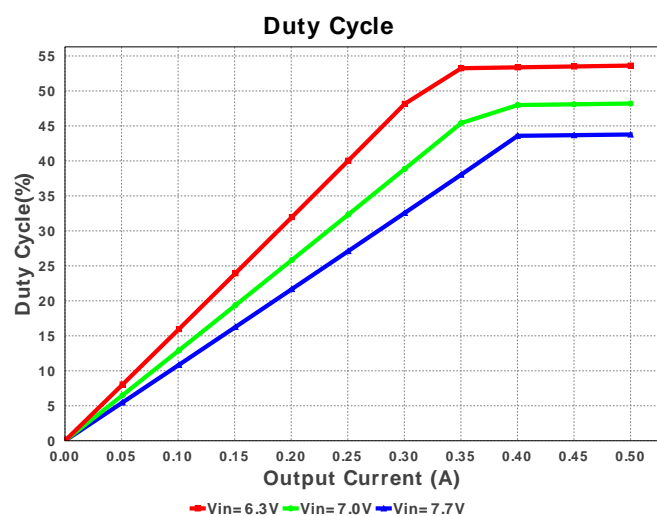
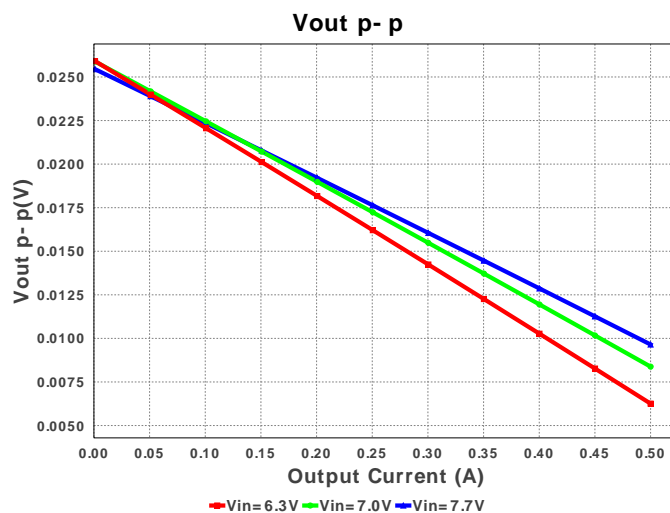
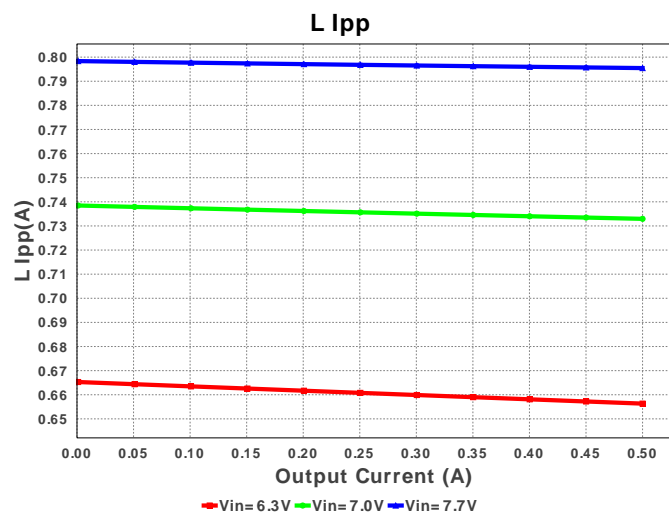
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 TPS562200DDCR 6.3V-7.7V to 3.30V @ 0.5A



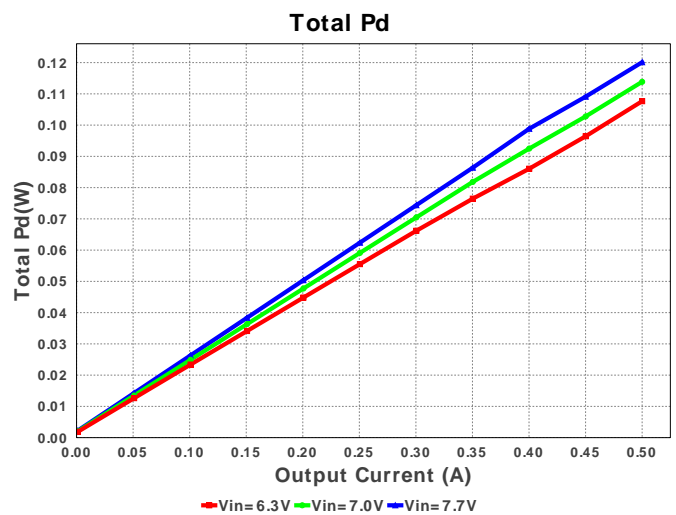
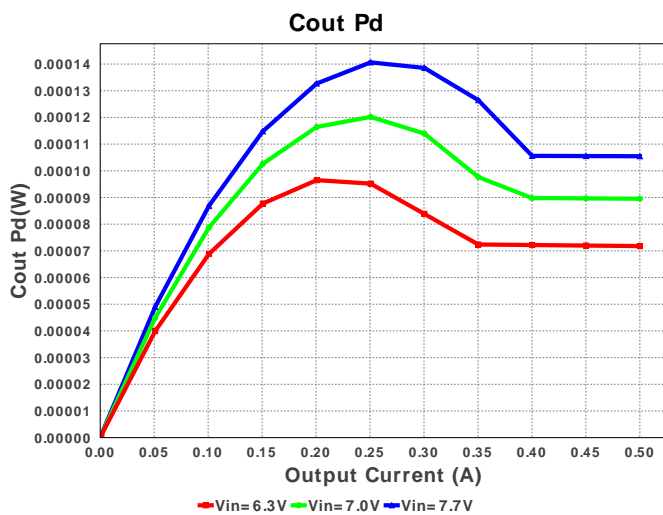
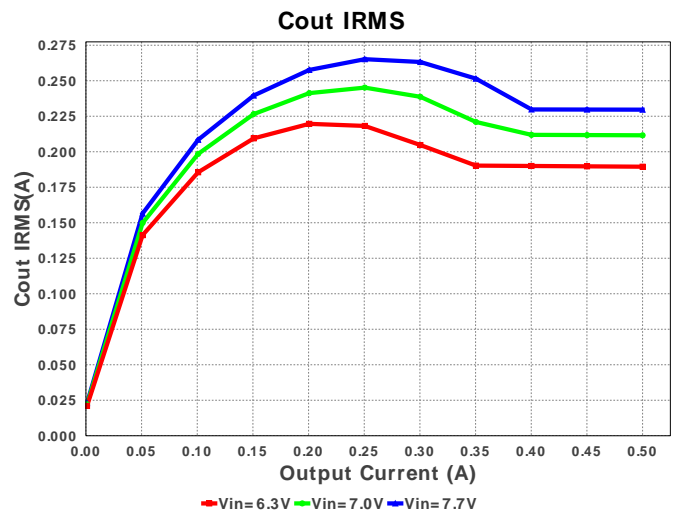
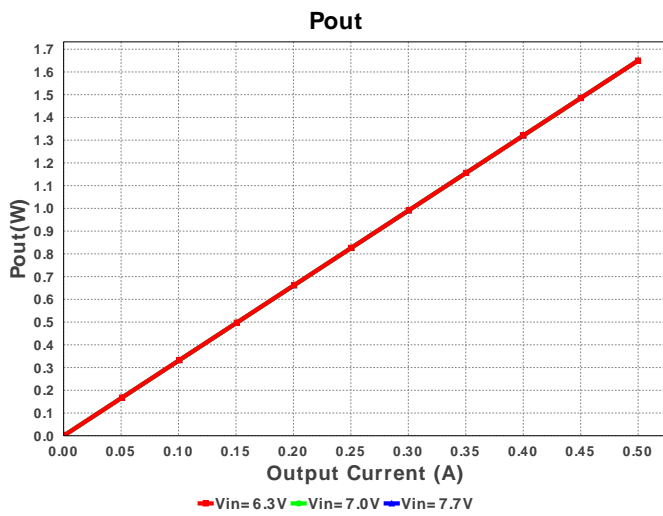
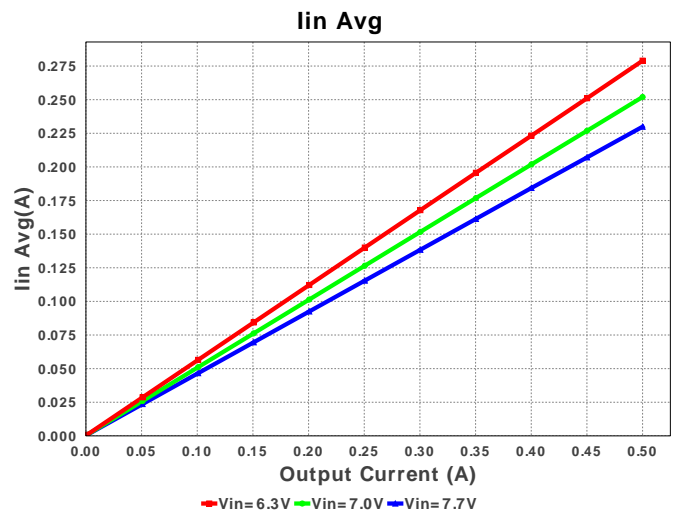
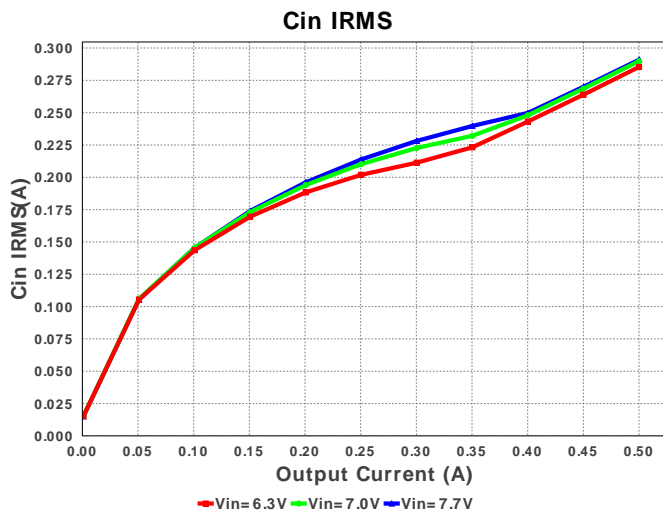
## Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	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 mm <sup>2</sup>
2.	Cin	MuRata	GRM32ER61C226KE20L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 3.68 A	1	\$0.16	 1210 15 mm <sup>2</sup>
3.	Cout	TDK	C3216X5R0J226K Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 3.62 A	1	\$0.11	 1206 11 mm <sup>2</sup>
4.	L1	Bourns	SRR4028-3R3Y	L= 3.3 uH DCR= 35.0 mOhm	1	\$0.26	 SRR4028 34 mm <sup>2</sup>
5.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
6.	Rfht	Vishay-Dale	CRCW040233K2FKED Series= CRCW..e3	Res= 33.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
7.	U1	Texas Instruments	TPS562200DDCR	Switcher	1	\$0.47	 DDC0006A 10 mm <sup>2</sup>

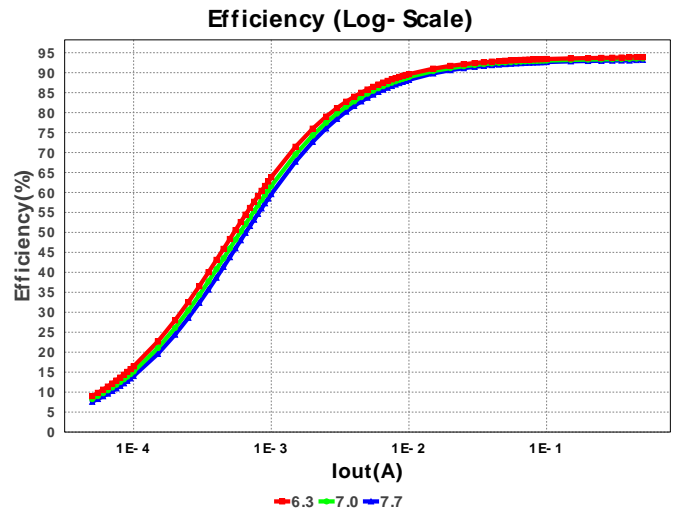
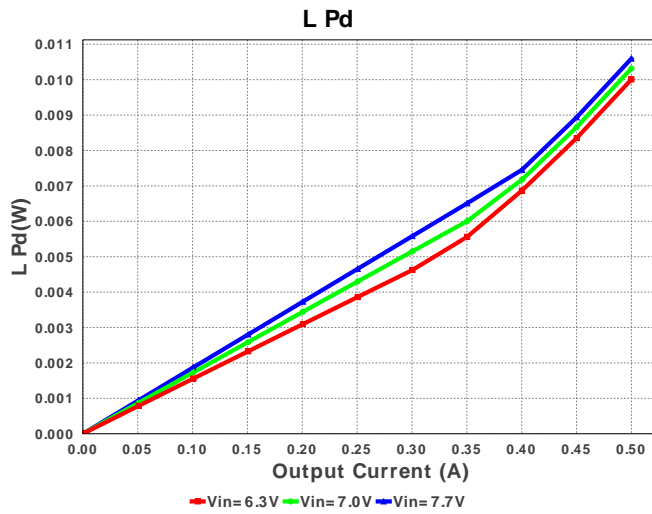
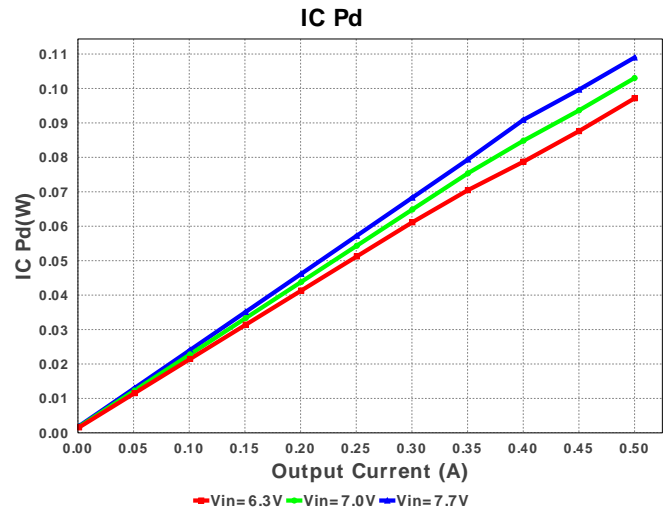
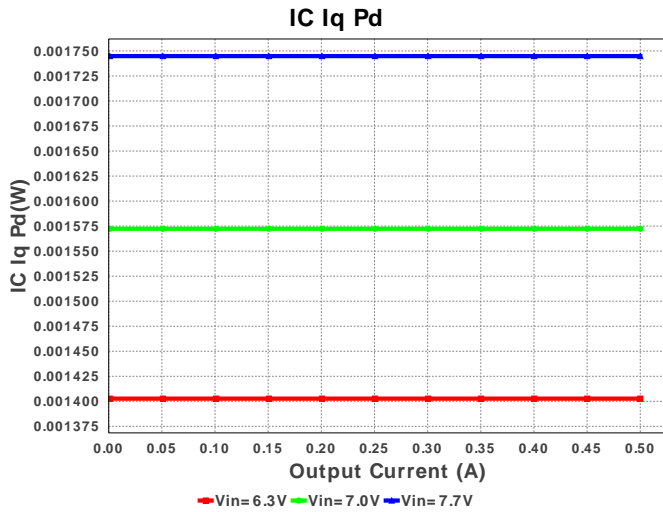












## Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	290.882 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	229.629 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	229.89 mA	Current	Average input current
4.	L Ipp	795.46 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	7	General	Total Design BOM count
6.	FootPrint	82.0 mm <sup>2</sup>	General	Total Foot Print Area of BOM components
7.	Frequency	714.353 kHz	General	Switching frequency
8.	Pout	1.65 W	General	Total output power
9.	Total BOM	\$1.03	General	Total BOM Cost
10.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
11.	Duty Cycle	43.774 %	Op_point	Duty cycle
12.	Efficiency	93.214 %	Op_point	Steady state efficiency
13.	IC Tj	41.881 degC	Op_point	IC junction temperature
14.	ICThetaJA	109.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
15.	IOUT_OP	500.0 mA	Op_point	Iout operating point
16.	VIN_OP	7.7 V	Op_point	Vin operating point
17.	Vout p-p	7.505 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	169.225 $\mu$ W	Power	Input capacitor power dissipation
19.	Cout Pd	105.459 $\mu$ W	Power	Output capacitor power dissipation
20.	IC Iq Pd	1.745 mW	Power	IC Iq Pd
21.	IC Pd	109.003 mW	Power	IC power dissipation
22.	L Pd	10.596 mW	Power	Inductor power dissipation
23.	Total Pd	120.123 mW	Power	Total Power Dissipation

## Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	Iout1	500.0 m	Output Current #1
3.	VinMax	7.7	Maximum input voltage
4.	VinMin	6.3	Minimum input voltage



#	Name	Value	Description
5.	Vout	3.3	Output Voltage
6.	Vout1	3.3	Output Voltage #1
7.	base_pn	TPS562200	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0	Ambient temperature

## Design Assistance

1. **TPS562200** Product Folder : <http://www.ti.com/product/TPS562200> : contains the data sheet and other resources.



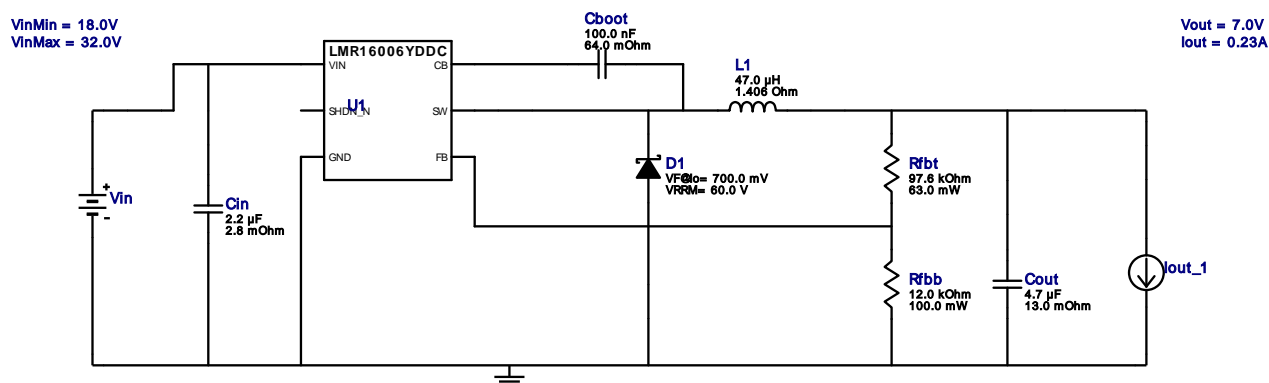


VinMin = 18.0V  
 VinMax = 32.0V  
 Vout = 7.0V  
 Iout = 0.23A

Device = LMR16006YDDCR  
 Topology = Buck  
 Created = 6/9/15 6:12:25 AM  
 BOM Cost = \$1.67  
 Footprint = 106.0 mm<sup>2</sup>  
 BOM Count = 8  
 Total Pd = 0.29W

## WEBENCH® Design Report

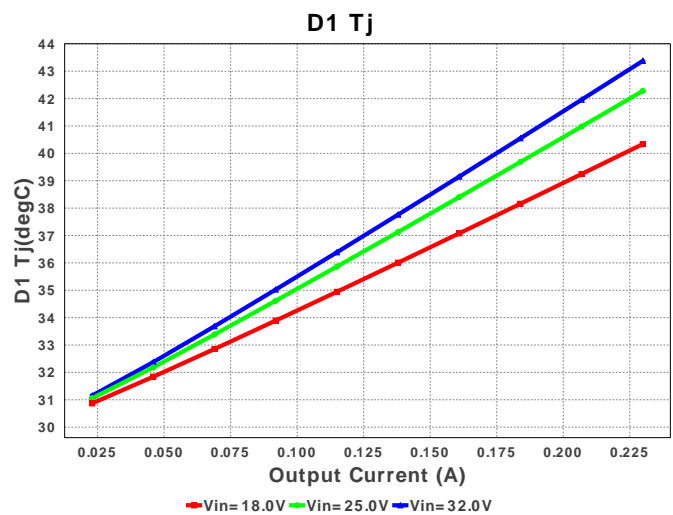
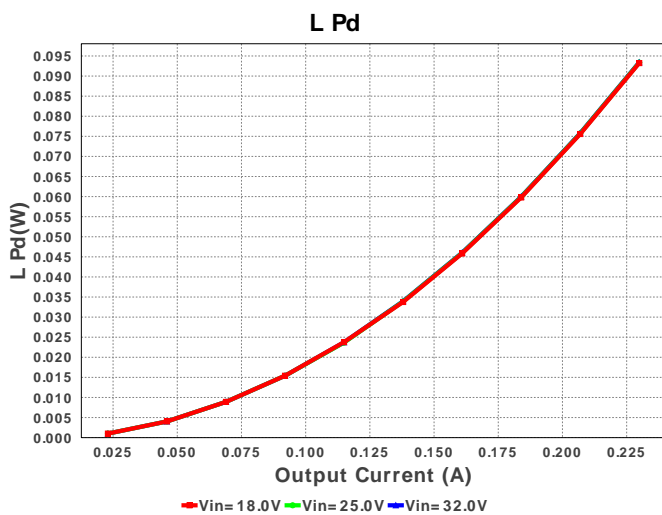
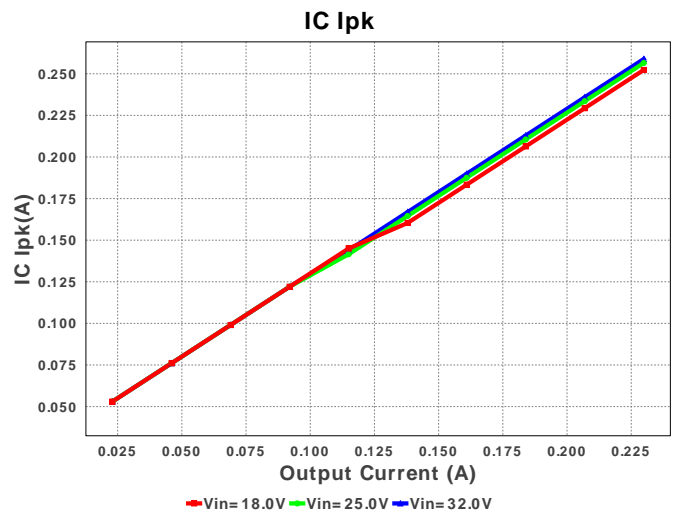
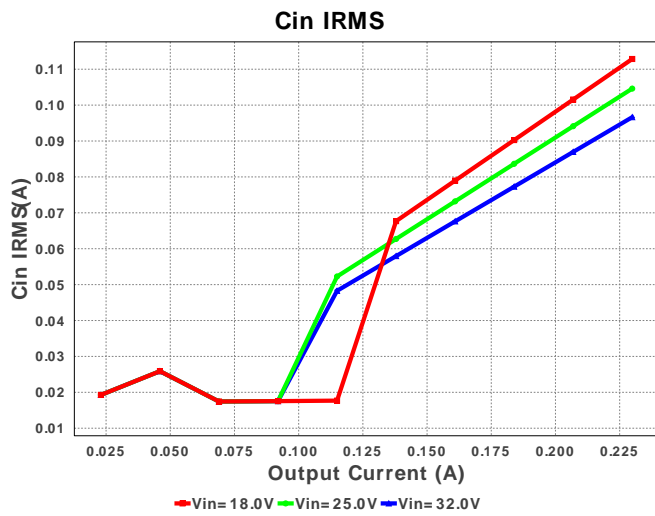
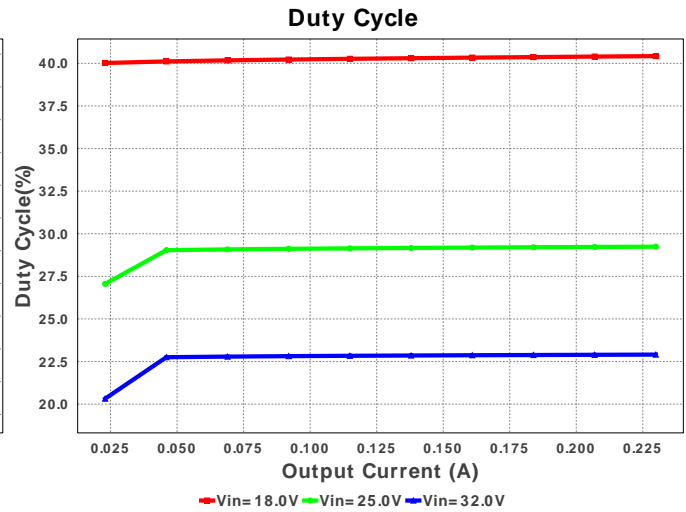
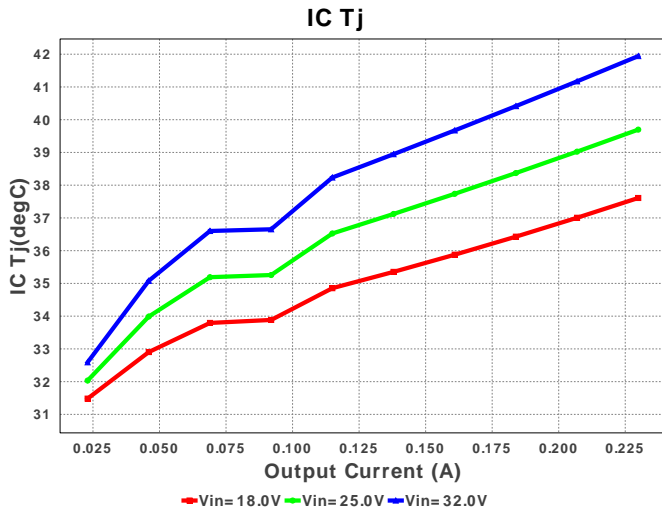
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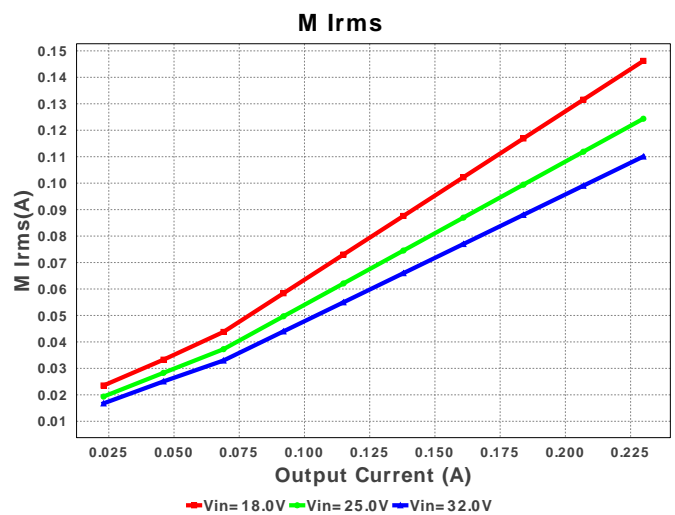
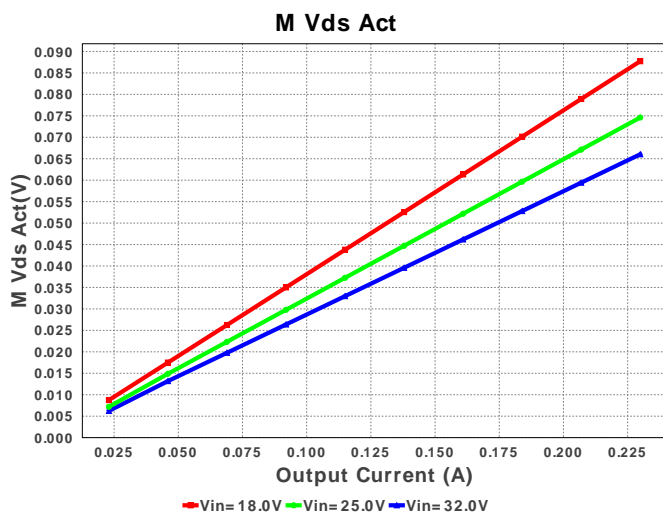
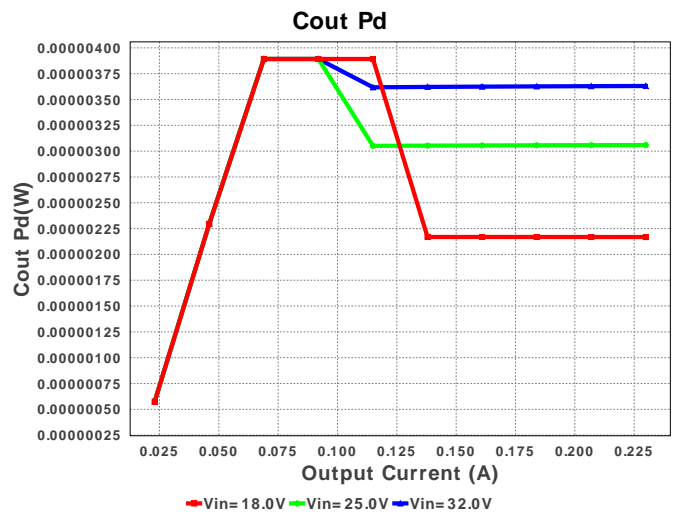
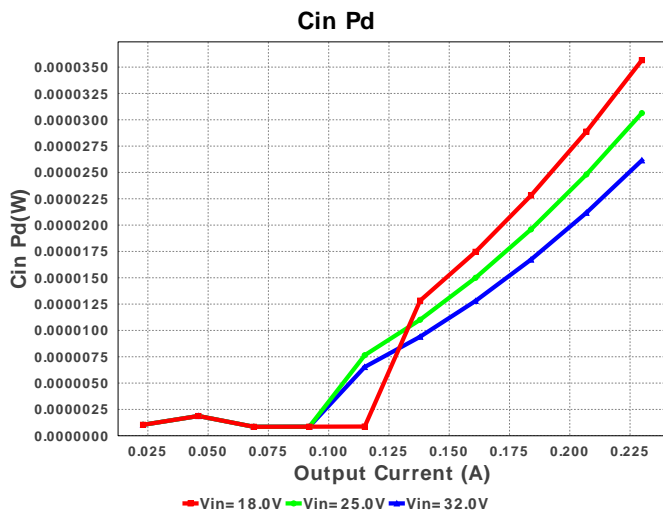
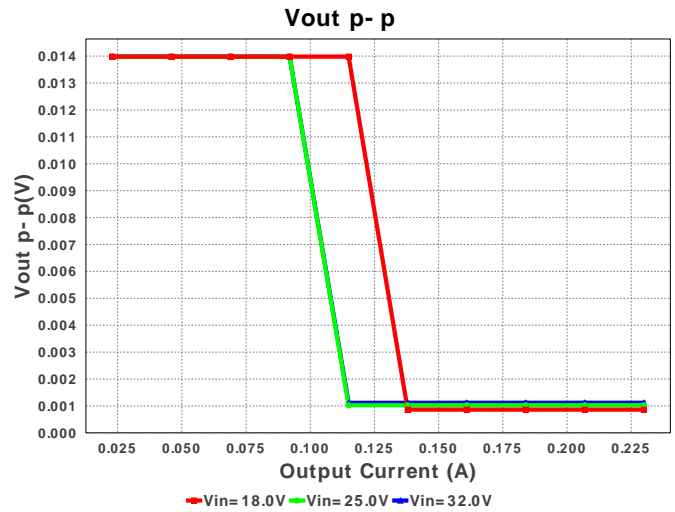
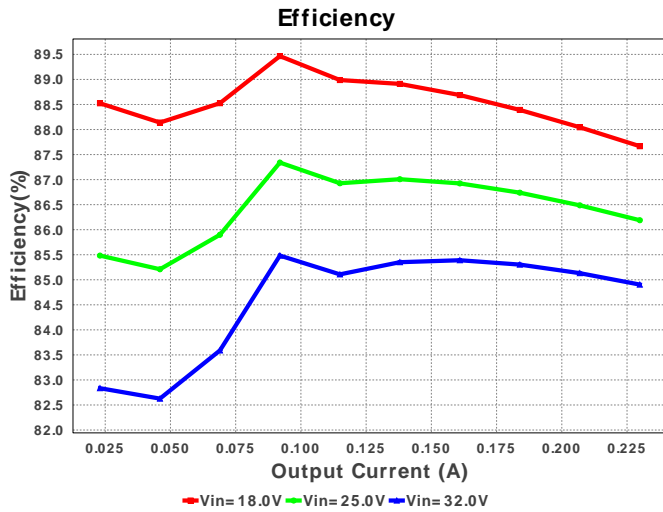
## Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	 0805 7 mm <sup>2</sup>
2.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 2.8 mOhm VDC= 100.0 V IRMS= 9.8247 A	1	\$0.19	 1210 15 mm <sup>2</sup>
3.	Cout	Kemet	C1206C475K4PACTU Series= X5R	Cap= 4.7 uF ESR= 13.0 mOhm VDC= 16.0 V IRMS= 4.9 A	1	\$0.05	 1206 11 mm <sup>2</sup>
4.	D1	Diodes Inc.	B160-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	\$0.06	 SMA 37 mm <sup>2</sup>
5.	L1	Bourns	SRN3015-470M	L= 47.0 µH DCR= 1.406 Ohm	1	\$0.14	 SRN3015 16 mm <sup>2</sup>
6.	Rfbb	Susumu Co Ltd	RR1220P-123-D Series= 264	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm <sup>2</sup>
7.	Rfbs	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
8.	U1	Texas Instruments	LMR16006YDDCR	Switcher	1	\$1.20	 DDC0006A 10 mm <sup>2</sup>

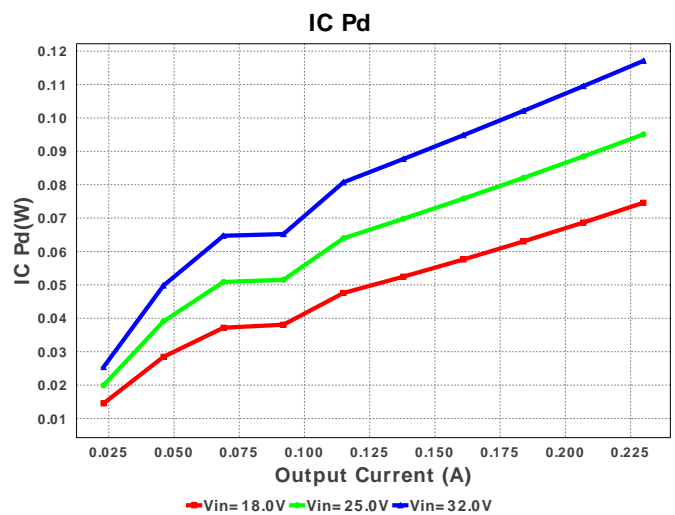
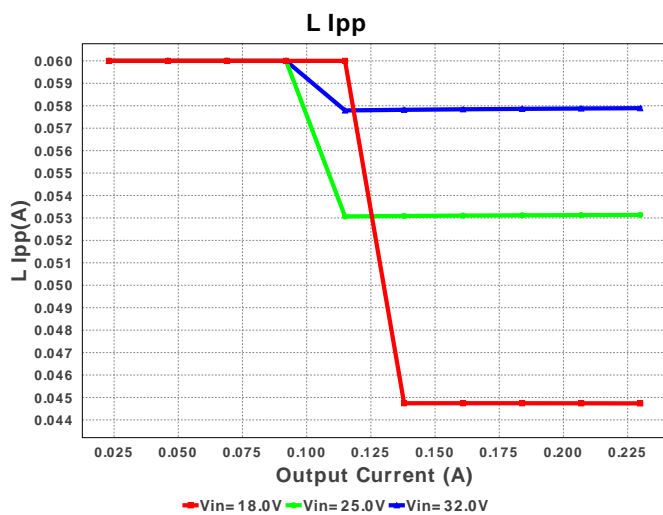
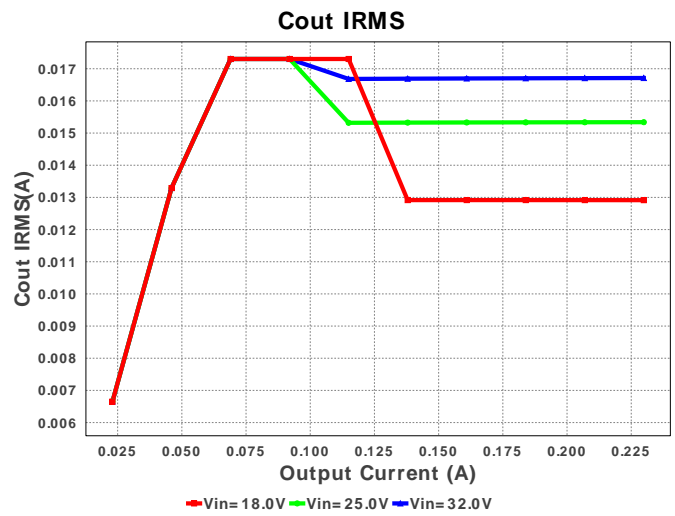
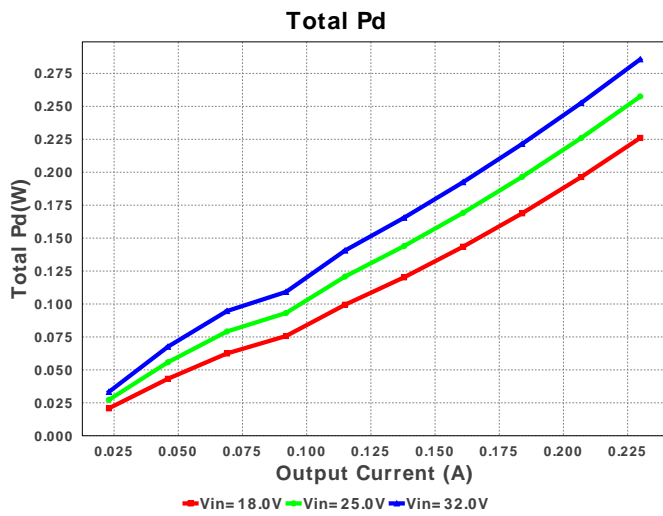
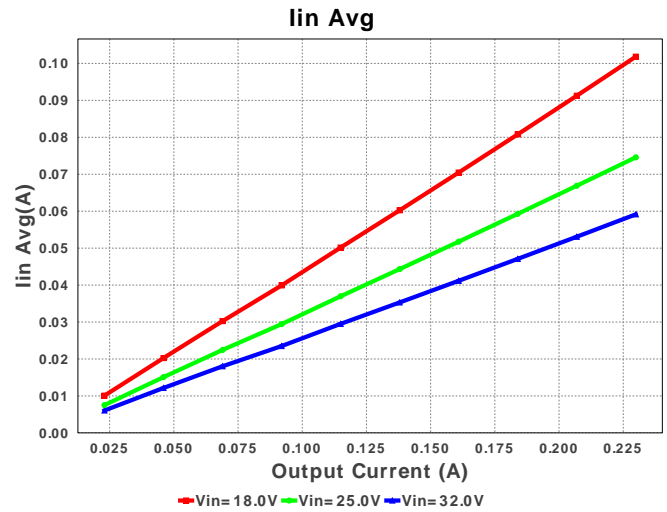
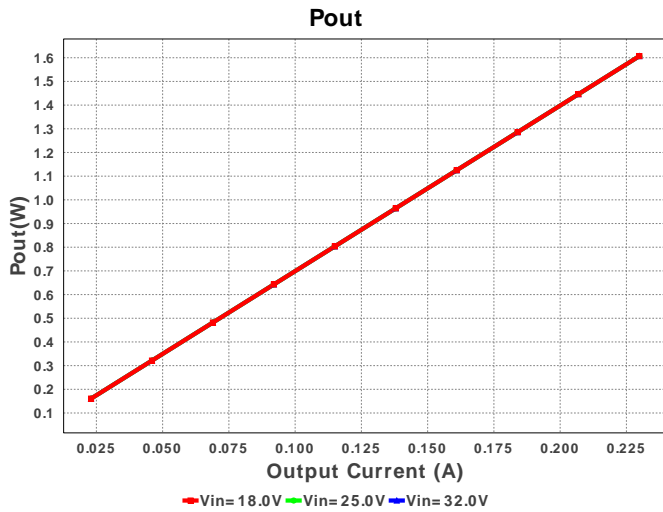




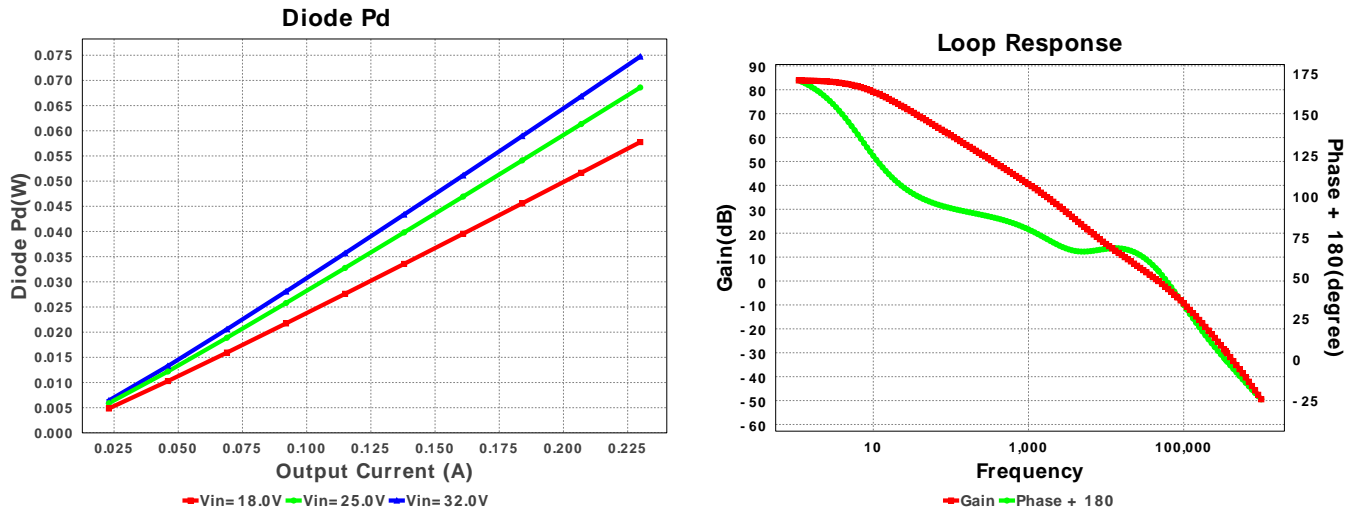












## Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	96.638 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	16.714 mA	Current	Output capacitor RMS ripple current
3.	IC IpK	258.903 mA	Current	Peak switch current in IC
4.	Iin Avg	59.151 mA	Current	Average input current
5.	L Ipp	57.898 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	110.08 mA	Current	Q lavg
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	106.0 mm <sup>2</sup>	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	66.039 mV	General	Voltage drop across the MosFET
12.	Pout	1.607 W	General	Total output power
13.	Total BOM	\$1.67	General	Total BOM Cost
14.	D1 Tj	43.413 degC	Op_Point	D1 junction temperature
15.	Vout OP	6.99 V	Op_Point	Operational Output Voltage
16.	Cross Freq	46.879 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	22.909 %	Op_point	Duty cycle
18.	Efficiency	84.895 %	Op_point	Steady state efficiency
19.	IC Tj	41.942 degC	Op_point	IC junction temperature
20.	ICThetaJA	102.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	229.89 mA	Op_point	Iout operating point
22.	Phase Marg	54.654 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	32.0 V	Op_point	Vin operating point
24.	Vout p-p	1.118 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	26.149 μW	Power	Input capacitor power dissipation
26.	Cout Pd	3.631 μW	Power	Output capacitor power dissipation
27.	Diode Pd	74.934 mW	Power	Diode power dissipation
28.	IC Pd	117.082 mW	Power	IC power dissipation
29.	L Pd	93.425 mW	Power	Inductor power dissipation
30.	Total Pd	285.912 mW	Power	Total Power Dissipation

## Design Inputs

#	Name	Value	Description
1.	Iout	229.89 m	Maximum Output Current
2.	Iout1	229.89 m	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	18.0	Minimum input voltage
5.	Vout	7.0	Output Voltage
6.	Vout1	7.0	Output Voltage #1
7.	base_pn	LMR16006Y	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0	Ambient temperature

## Design Assistance

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



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