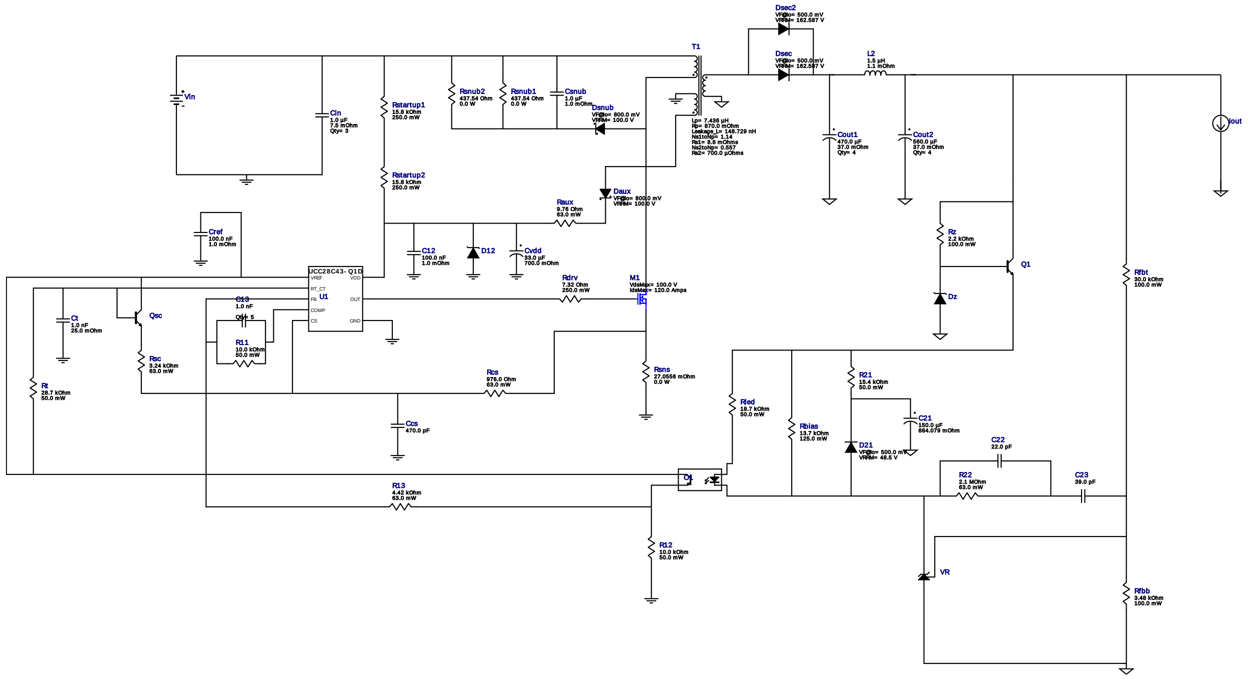
TEXAS INSTRUMENTS

VinMin = 16.0V
VinMax = 36.0V
Vout = 24.0V
Iout = 5.0A

Device = UCC28C43QDRQ1
Topology = Flyback
Created = 2019-06-21 00:47:19.600
BOM Cost = NA
BOM Count = 60
Total Pd = 10.08W

WEBENCH ® Design Report

Design : 12 UCC28C43QDRQ1
UCC28C43QDRQ1 16V-36V to 24.00V @ 5A



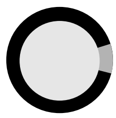
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.View WEBENCH(R) Disclaimer.

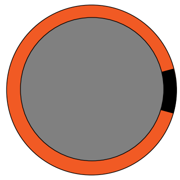
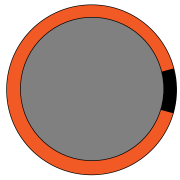
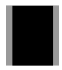
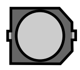
Design Alerts

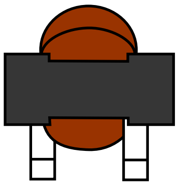
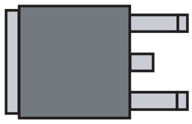
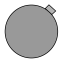
Component Selection Information

The UCC28C43-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.

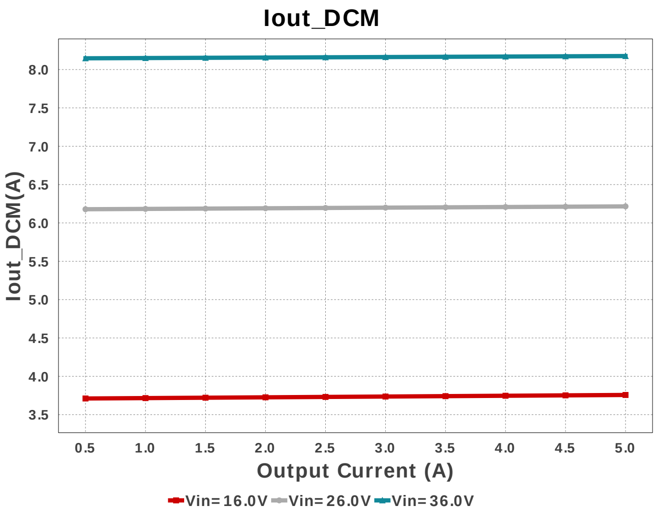
Electrical BOM

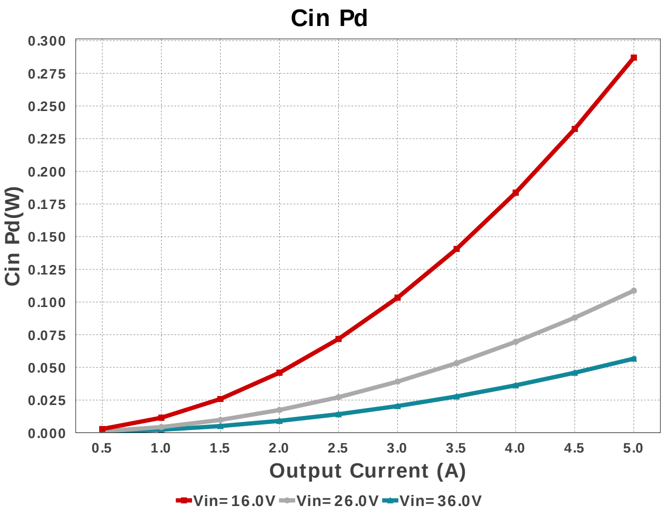
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
C12	MuRata	GRM155R71C104KA88D Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
C13	MuRata	GRM1555C1H102JA01J Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	5	$0.01	0402 3 mm²
C21	Chemi-Con	EKZE500ELL151MJC5S Series= KZE	Cap= 150.0 uF ESR= 884.08 mOhm VDC= 50.0 V IRMS= 979.0 mA	1	$0.17	 Chemi-Con_1000x1250 144 mm²
C22	Yageo	CC0805JRNPO9BN220 Series= C0G/NP0	Cap= 22.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
C23	Yageo	CC0805JRNPO9BN390 Series= C0G/NP0	Cap= 39.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

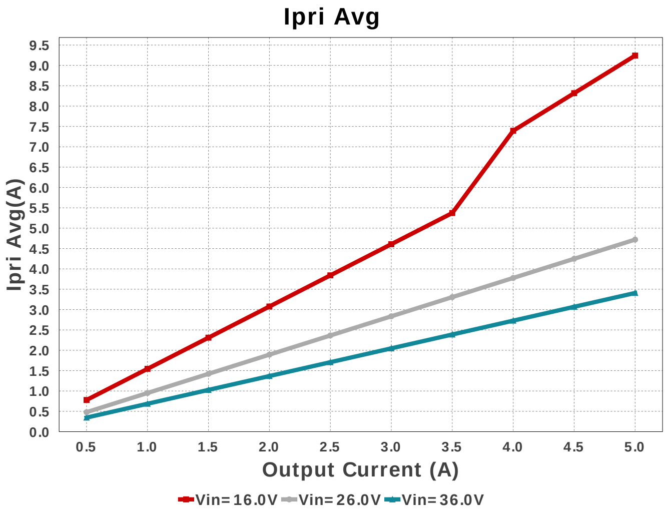
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Ccs	AVX	04025A471JAT2A Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
Cin	TDK	C3216X7R2A105M160AA Series= X7R	Cap= 1.0 uF ESR= 7.5 mOhm VDC= 100.0 V IRMS= 5.9235 A	3	$0.13	 1206 11 mm^2
Cout1	TDK	B41896D6477M000 Series= 2355	Cap= 470.0 uF ESR= 37.0 mOhm VDC= 50.0 V IRMS= 2.28 A	4	$0.65	 B41896_1600x2000 324 mm^2
Cout2	TDK	B41896C6567M000 Series= 2355	Cap= 560.0 uF ESR= 37.0 mOhm VDC= 50.0 V IRMS= 2.28 A	4	$0.76	 B41896_1600x2000 324 mm^2
Cref	MuRata	GRM155R71C104KA88D Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
Csnub	TDK	C5750JB2E105K230KA Series= JB	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 250.0 V IRMS= 0.0 A	1	$0.54	 2220_250 54 mm^2
Ct	Kemet	C0805C102J1GACTU Series= C0G/NP0	Cap= 1.0 nF ESR= 25.0 mOhm VDC= 100.0 V IRMS= 1.71 A	1	$0.09	0805 7 mm^2
Cvdd	Panasonic	EEE-FK1E330UR Series= FK	Cap= 33.0 uF ESR= 700.0 mOhm VDC= 25.0 V IRMS= 160.0 mA	1	$0.09	 SM_RADIAL_C 62 mm^2
D12	ON Semiconductor	MMSZ4705T1G	Zener	1	$0.04	SOD-123 13 mm^2
D21	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 48.5 V	1	NA	CUSTOM 0 mm^2
Daux	Fairchild Semiconductor	SSA210	VF@Io= 800.0 mV VRRM= 100.0 V	1	$0.11	 SMA 37 mm^2
Dsec	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 162.587 V	1	NA	CUSTOM 0 mm^2
Dsec2	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 162.587 V	1	NA	CUSTOM 0 mm^2
Dsnub	Fairchild Semiconductor	SSA210	VF@Io= 800.0 mV VRRM= 100.0 V	1	$0.11	 SMA 37 mm^2
Dz	Micro Commercial Components	3SMAJ5932B-TP	Zener	1	$0.13	 SMA 37 mm^2

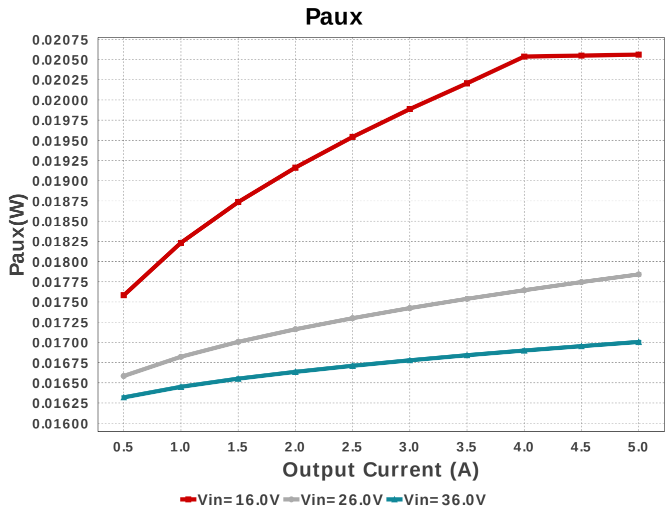
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
L2	Coilcraft	SER1590-152MLB	L= 1.5 µH 1.1 mOhm	1	$1.12	 SER1590 324 mm^2
M1	Infineon Technologies	IPB027N10N3 G	VdsMax= 100.0 V IdsMax= 120.0 Amps	1	NA	 DDPAK 210 mm^2
O1	Fairchild Semiconductor	FOD817A	Optocoupler	1	$0.13	 DIP-4 71 mm^2
Q1	Diodes Inc.	MMBT4401-7-F	Bipolar Transistor	1	$0.02	 SOT-23 14 mm^2
Qsc	STMicroelectronics	2N2222A	Bipolar Transistor	1	$1.11	 TO-18 57 mm^2
R11	Yageo	RC0201FR-0710KL Series= ?	Res= 10.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm^2
R12	Yageo	RC0201FR-0710KL Series= ?	Res= 10.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm^2
R13	Vishay-Dale	CRCW04024K42FKED Series= CRCW..e3	Res= 4.42 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
R21	Yageo	RC0201FR-0715K4L Series= ?	Res= 15.4 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm^2
R22	Vishay-Dale	CRCW04022M10FKED Series= CRCW..e3	Res= 2.1 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Raux	Vishay-Dale	CRCW04029R76FKED Series= CRCW..e3	Res= 9.76 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rbias	Vishay-Dale	CRCW080513K7FKEA Series= CRCW..e3	Res= 13.7 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm^2
Rcs	Vishay-Dale	CRCW0402976RFKED Series= CRCW..e3	Res= 976.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rdrv	Vishay-Dale	CRCW12067R32FKEA Series= CRCW..e3	Res= 7.32 Ohm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm^2
Rfbb	Yageo	RC0603FR-073K48L Series= ?	Res= 3.48 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rfbt	Yageo	RC0603FR-0730KL Series= ?	Res= 30.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rled	Yageo	RC0201FR-0718K7L Series= ?	Res= 18.7 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm^2
Rsc	Vishay-Dale	CRCW04023K24FKED Series= CRCW..e3	Res= 3.24 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2

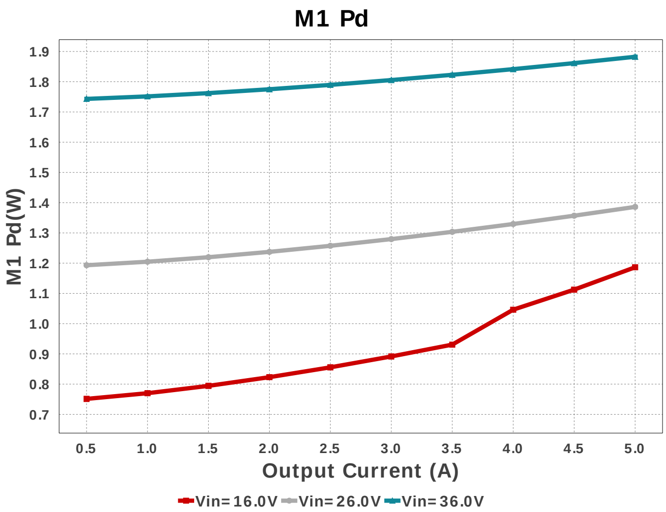
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Rsns	CUSTOM	CUSTOM Series= ?	Res= 27.0556 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
Rsnub1	CUSTOM	CUSTOM Series= ?	Res= 437.54 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
Rsnub2	CUSTOM	CUSTOM Series= ?	Res= 437.54 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
Rstartup1	Vishay-Dale	CRCW120615K8FKEA Series= CRCW..e3	Res= 15.8 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
Rstartup2	Vishay-Dale	CRCW120615K8FKEA Series= CRCW..e3	Res= 15.8 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
Rt	Yageo	RC0201FR-0728K7L Series= ?	Res= 28.7 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm²
Rz	Yageo	RC0603FR-072K2L Series= ?	Res= 2.2 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
T1	CUSTOM	CUSTOM	Lp= 7.436 µH Rp= 870.0 mOhm Leakage_L= 148.729 nH Ns1toNp= 1.14 Rs1= 8.6 mOhms Ns2toNp= 0.557 Rs2= 700.0 µOhms	1	NA	CUSTOM 0 mm²
U1	Texas Instruments	UCC28C43QDRQ1	Switcher	1	$0.68	D0008A 57 mm²
VR	Texas Instruments	TL431AIDBZR	Voltage References	1	$0.08	DBZ0003A 14 mm²

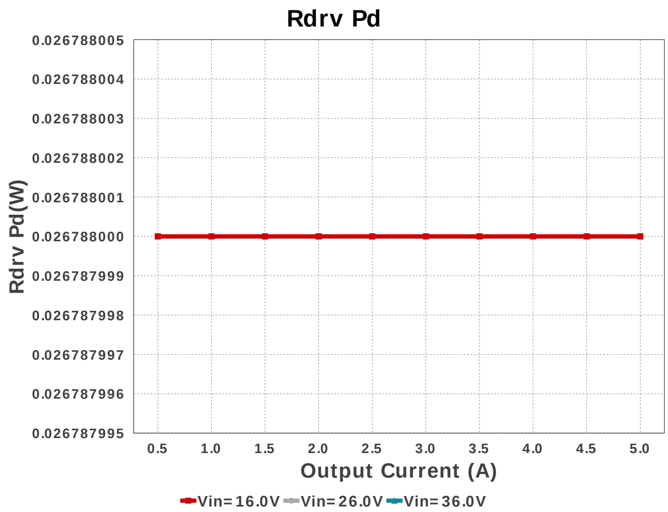


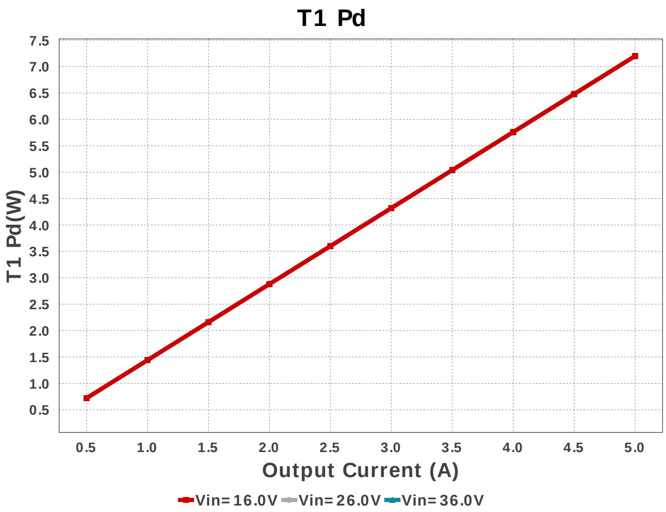


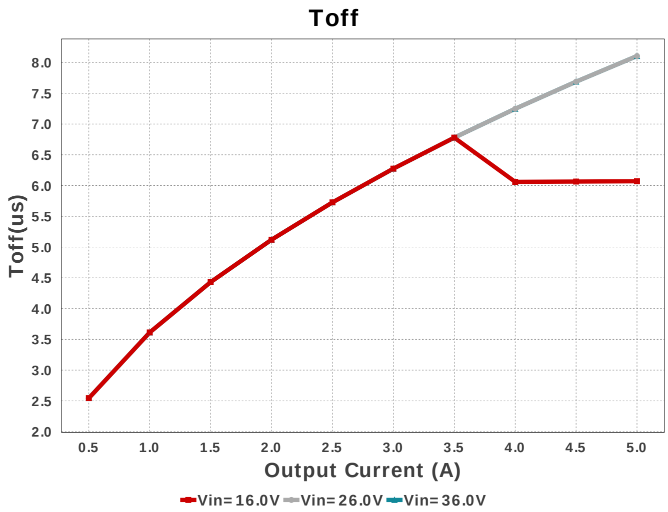

Ipri Avg
Ipri Avg(A)
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V


Paux
Paux(W)
0.02075 0.02050 0.02025 0.02000 0.01975 0.01950 0.01925 0.01900 0.01875 0.01850 0.01825 0.01800 0.01775 0.01750 0.01725 0.01700 0.01675 0.01650 0.01625 0.01600
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V

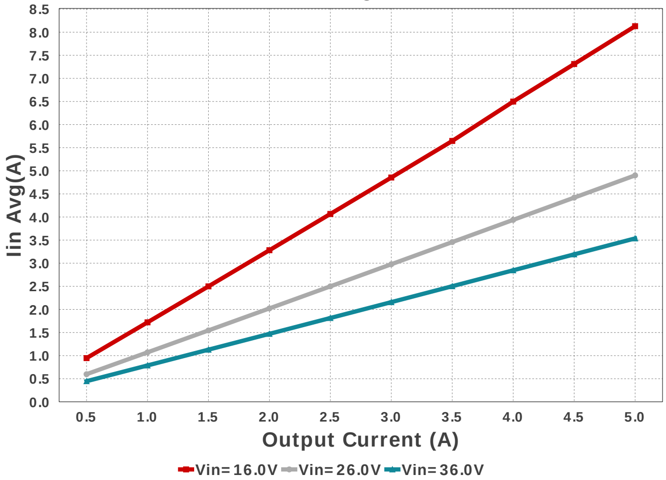

M1 Pd
M1 Pd(W)
1.9 1.8 1.7 1.6 1.5 1.4 1.3 1.2 1.1 1.0 0.9 0.8 0.7
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V


Rdrv Pd
Rdrv Pd(W)
0.026788005 0.026788004 0.026788003 0.026788002 0.026788001 0.026788000 0.026787999 0.026787998 0.026787997 0.026787996 0.026787995
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V

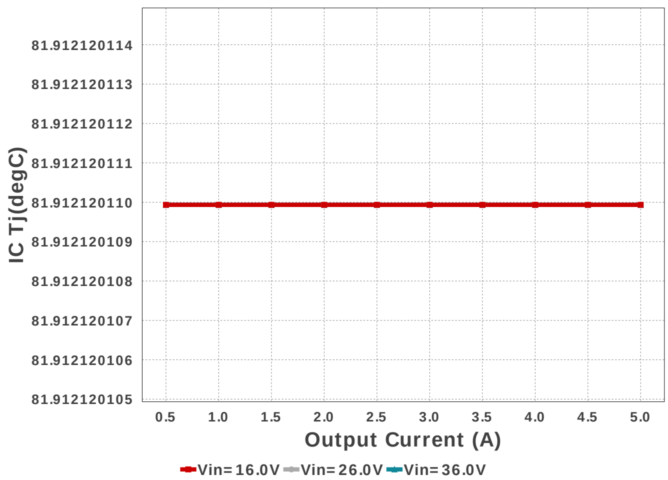

T1 Pd
T1 Pd(W)
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V


Toff
Toff(us)
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V

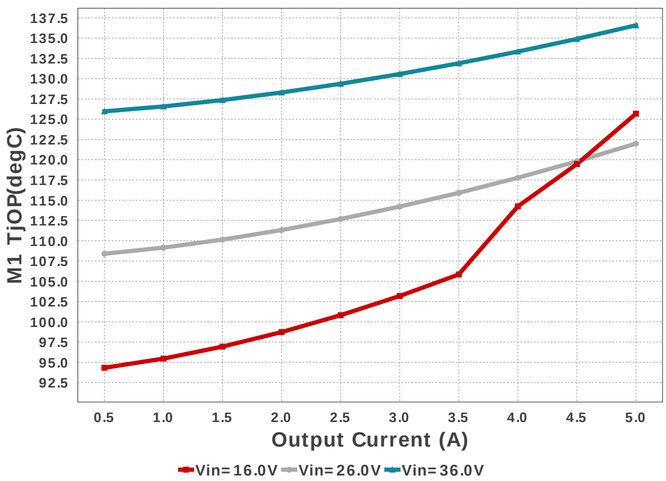
Iin Avg



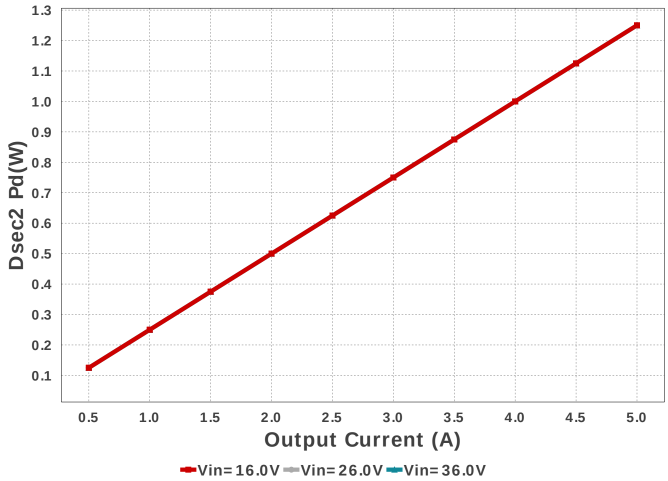
IC Tj



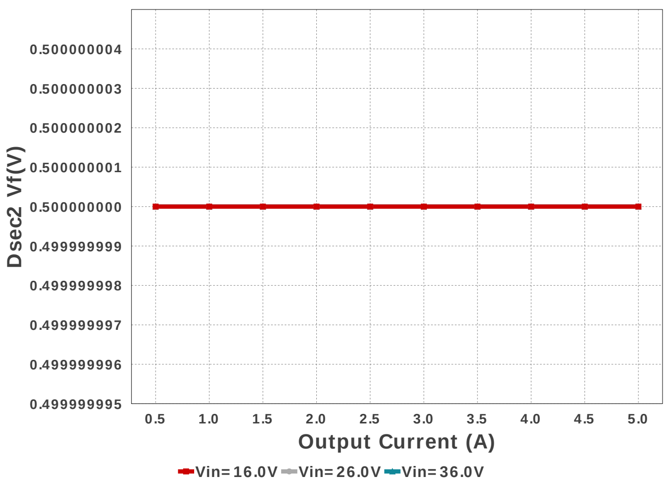
M1 TjOP



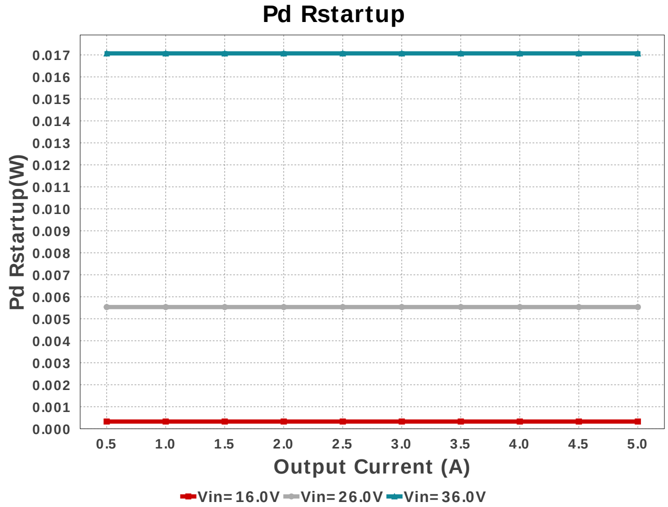
Dsec2 Pd



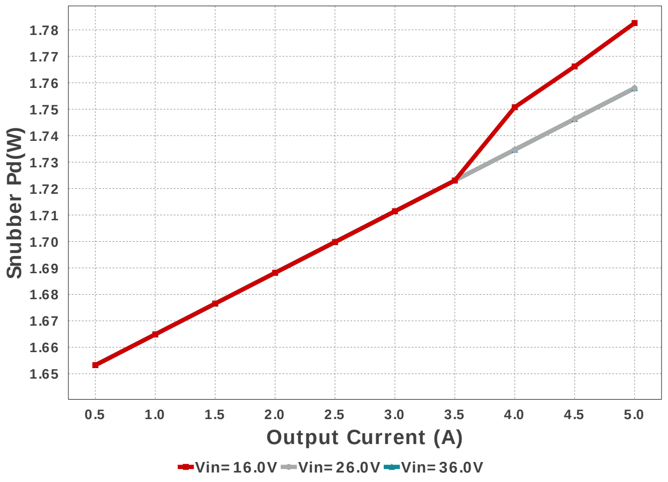
Dsec2 Vf



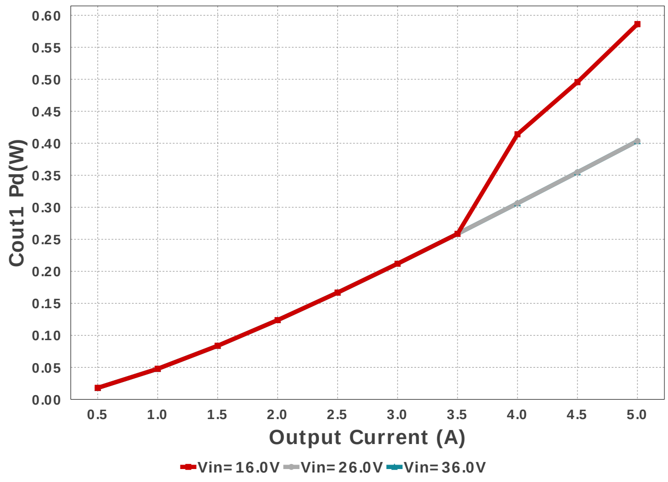
Pd Rstartup



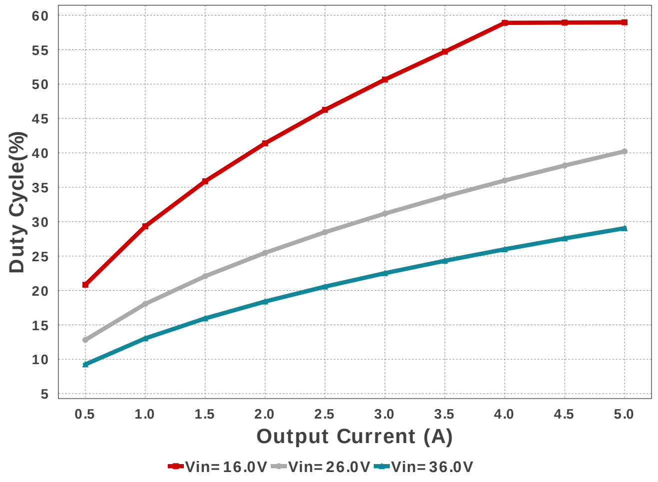
Snubber Pd



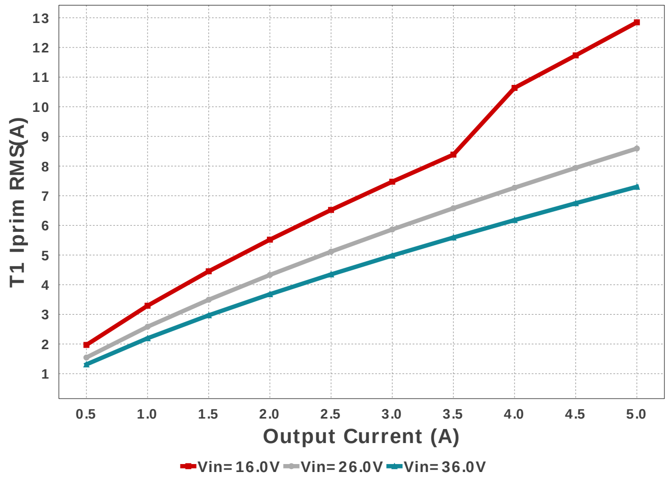
Cout1 Pd



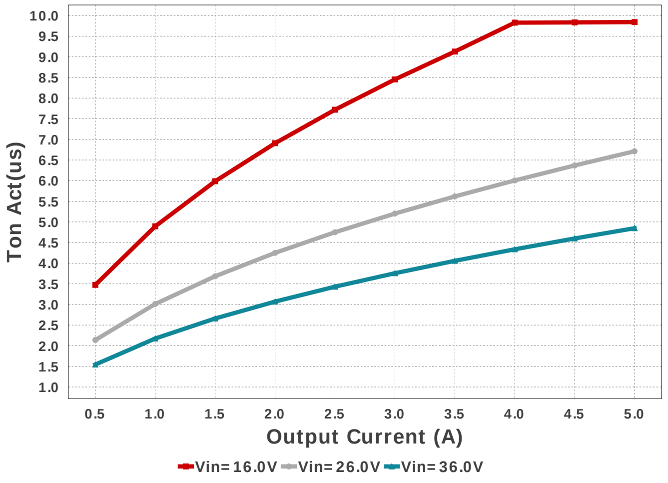
Duty Cycle



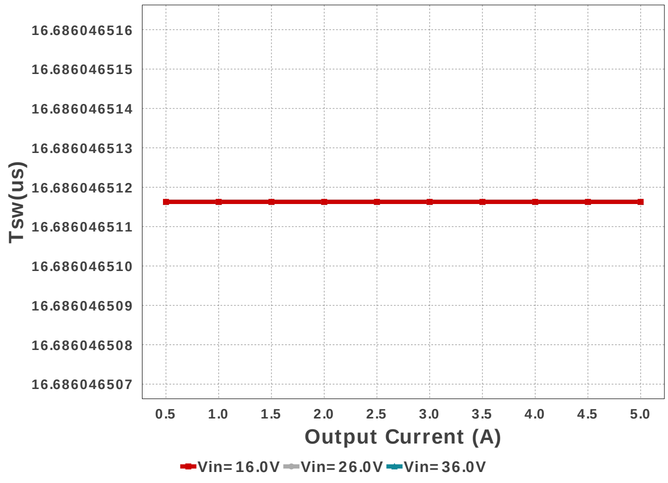
T1 Iprim RMS

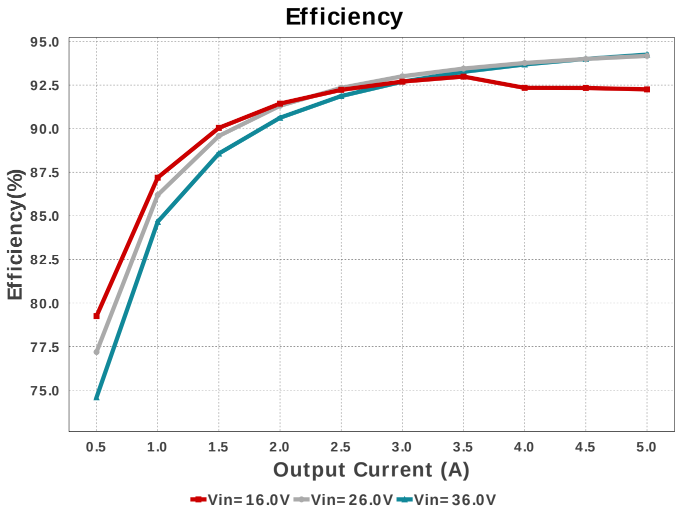


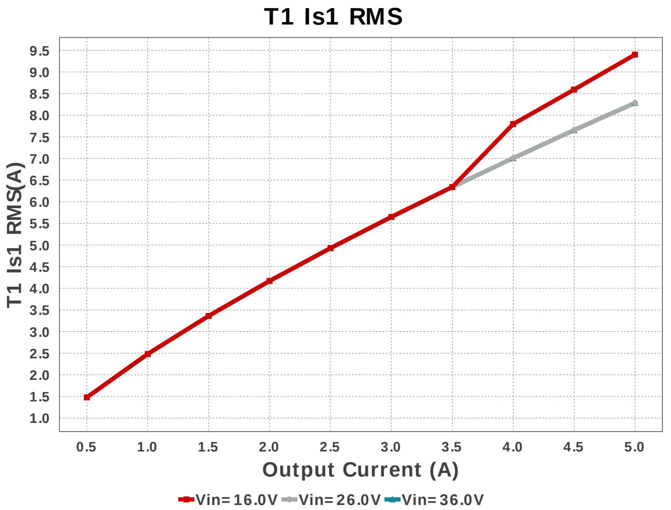
Ton Act

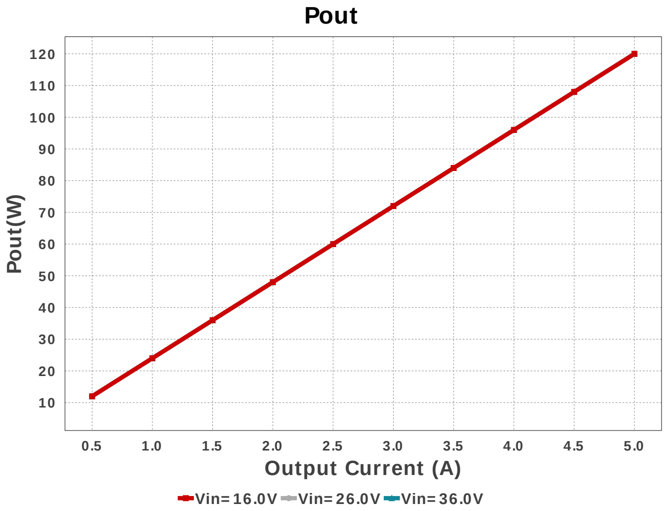


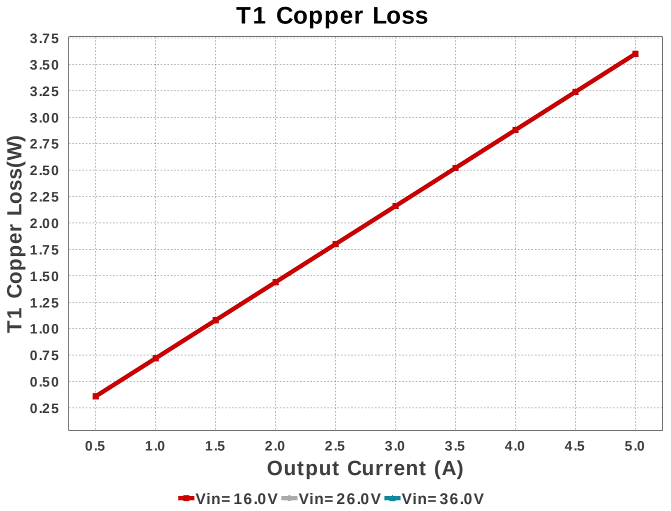
Tsw

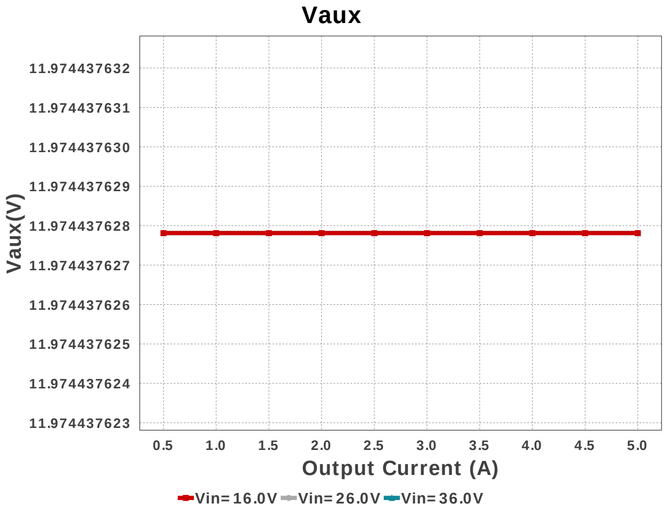


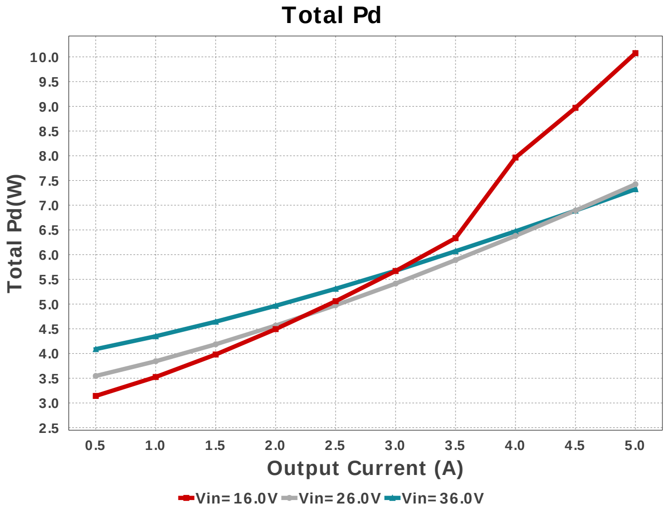

Efficiency
Efficiency(%)
95.0
92.5
90.0
87.5
85.0
82.5
80.0
77.5
75.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Output Current (A)
Vin=16.0V
Vin=26.0V
Vin=36.0V

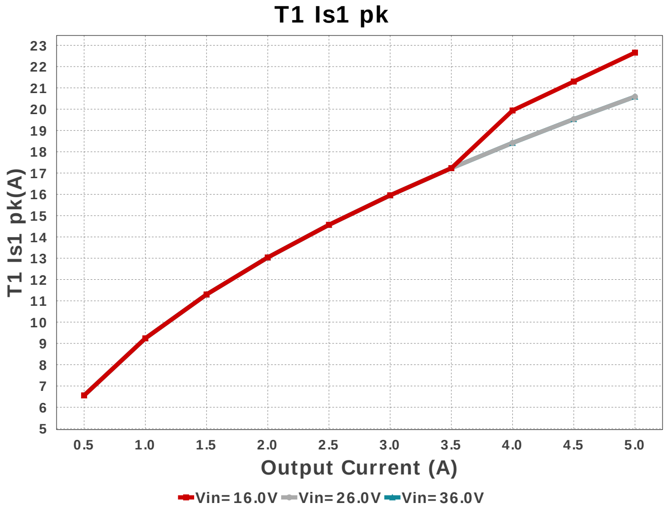

T1 Is1 RMS
T1 Is1 RMS(A)
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Output Current (A)
Vin=16.0V
Vin=26.0V
Vin=36.0V

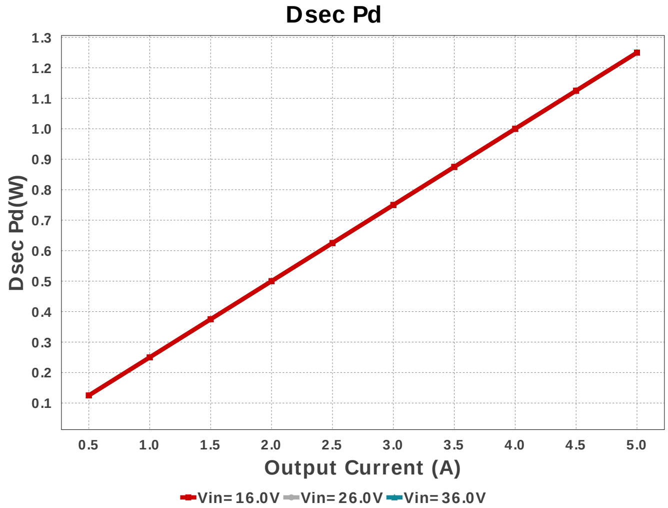

Pout
Pout(W)
120
110
100
90
80
70
60
50
40
30
20
10
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Output Current (A)
Vin=16.0V
Vin=26.0V
Vin=36.0V

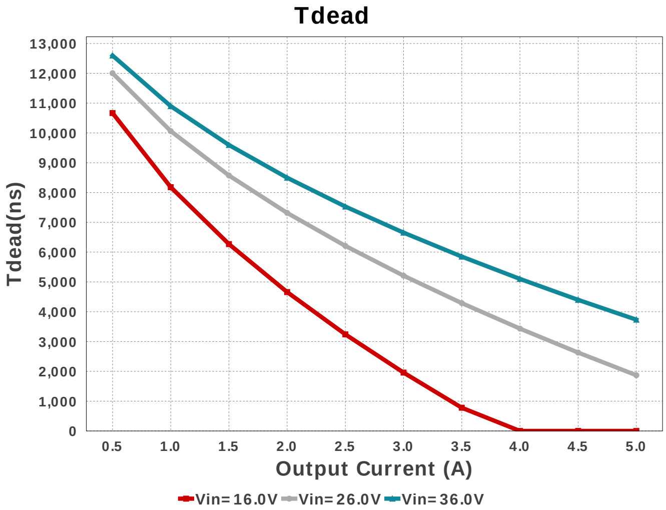

T1 Copper Loss
T1 Copper Loss(W)
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Output Current (A)
Vin=16.0V
Vin=26.0V
Vin=36.0V

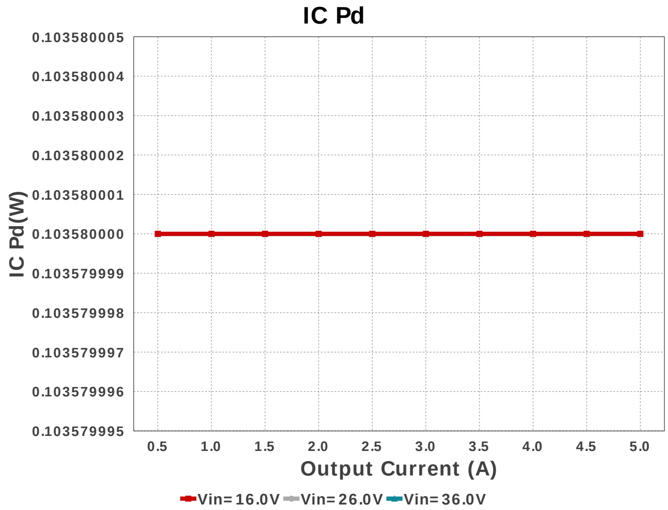

Vaux
Vaux(V)
11.974437632
11.974437631
11.974437630
11.974437629
11.974437628
11.974437627
11.974437626
11.974437625
11.974437624
11.974437623
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Output Current (A)
Vin=16.0V
Vin=26.0V
Vin=36.0V

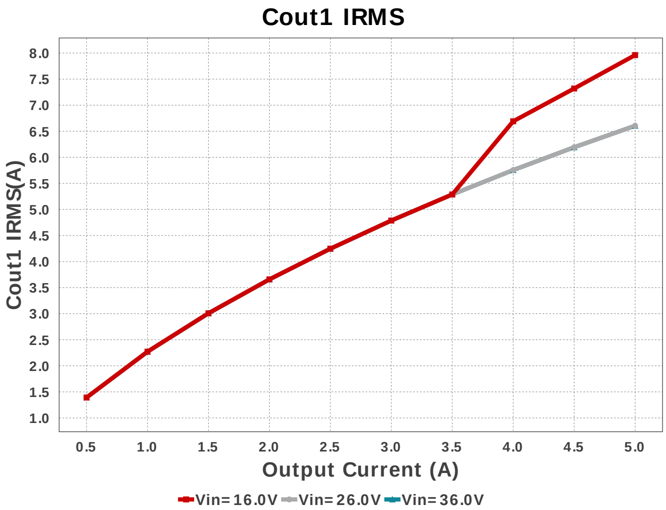

Total Pd
Total Pd(W)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Output Current (A)
Vin=16.0V
Vin=26.0V
Vin=36.0V

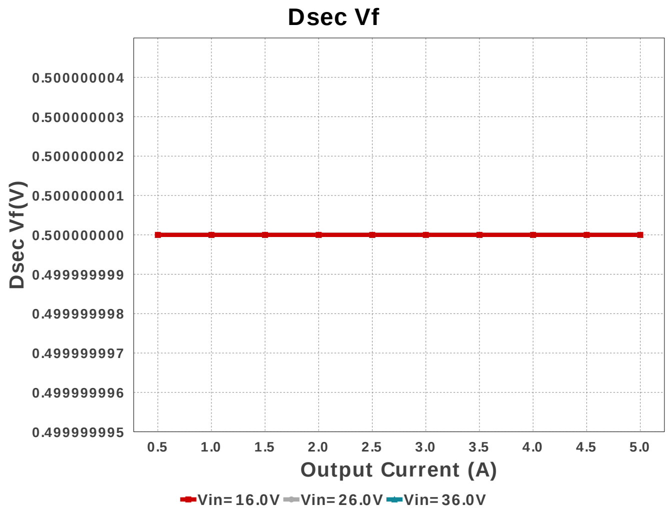

T1 Is1 pk
T1 Is1 pk(A)
23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V


Dsec Pd
Dsec Pd(W)
1.3 1.2 1.1 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V

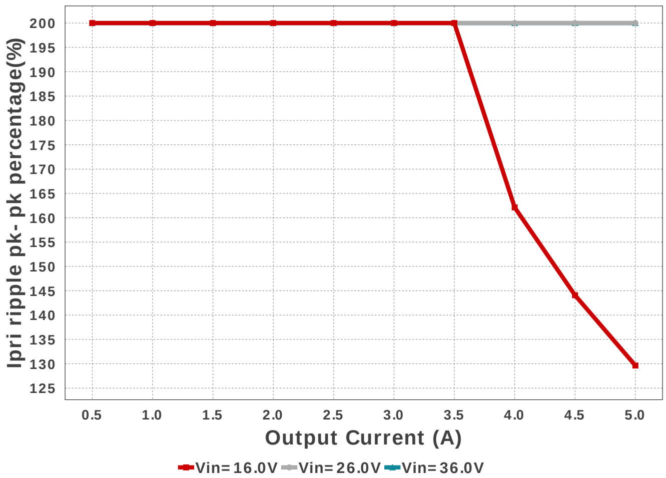

Tdead
Tdead(ns)
13,000 12,000 11,000 10,000 9,000 8,000 7,000 6,000 5,000 4,000 3,000 2,000 1,000 0
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V


IC Pd
IC Pd(W)
0.103580005 0.103580004 0.103580003 0.103580002 0.103580001 0.103580000 0.103579999 0.103579998 0.103579997 0.103579996 0.103579995
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V

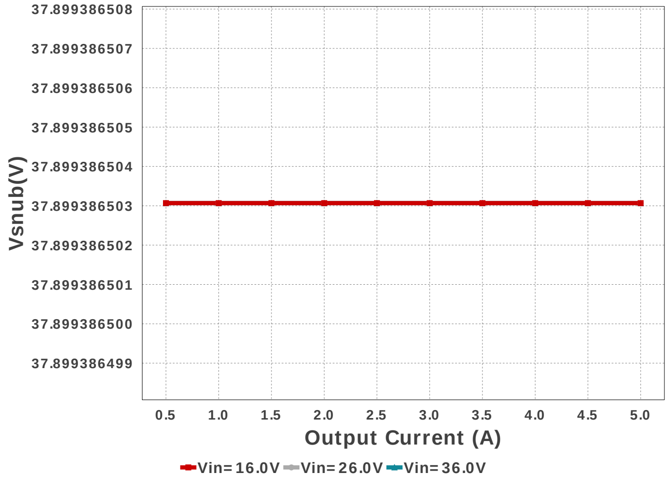

Cout1 IRMS
Cout1 IRMS(A)
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V


Dsec Vf
Dsec Vf(V)
0.500000004 0.500000003 0.500000002 0.500000001 0.500000000 0.499999999 0.499999998 0.499999997 0.499999996 0.499999995
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=16.0V Vin=26.0V Vin=36.0V

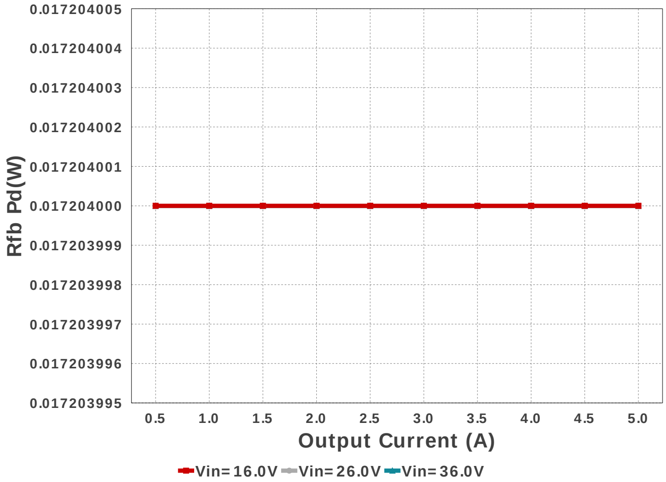
Ipri ripple pk- pk percentage



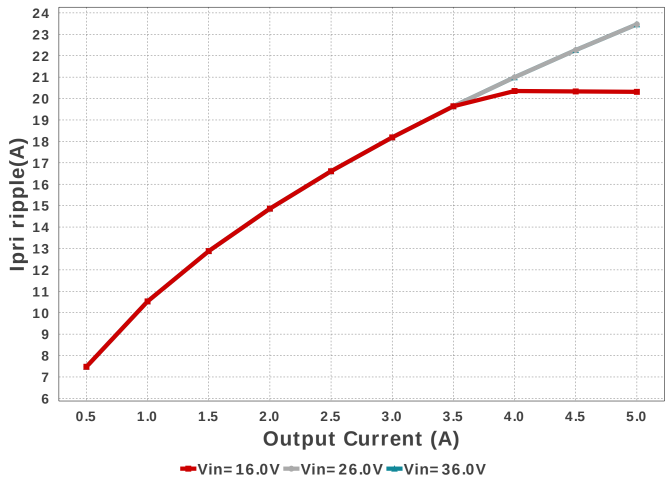
Vsnub



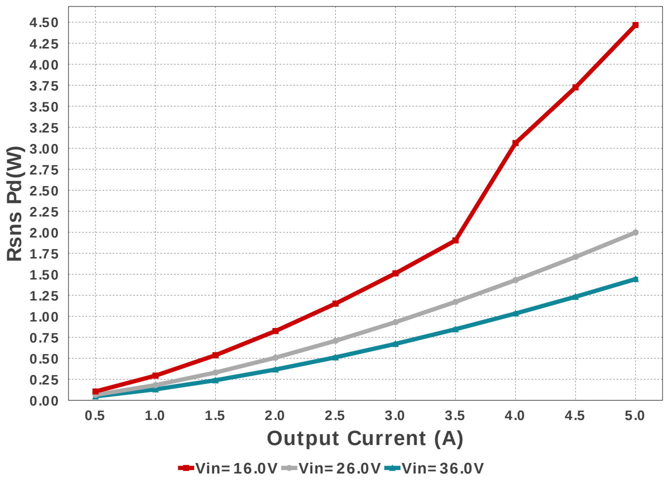
Rfb Pd



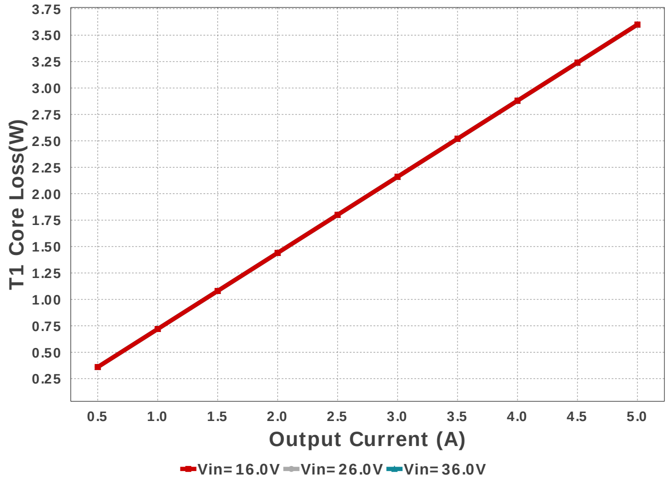
Ipri ripple

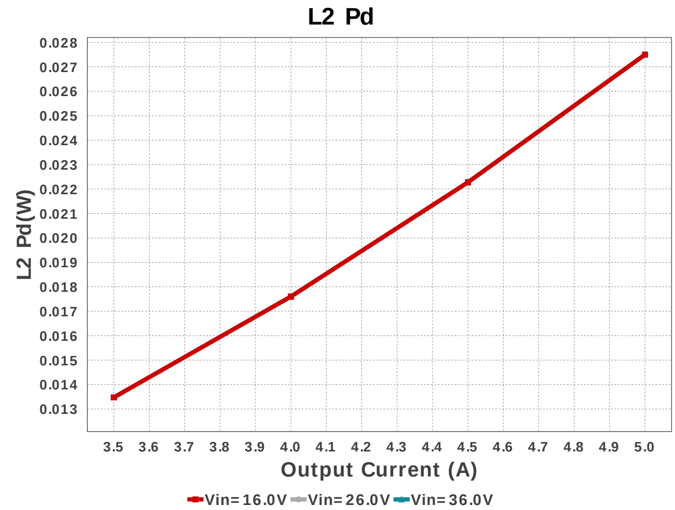


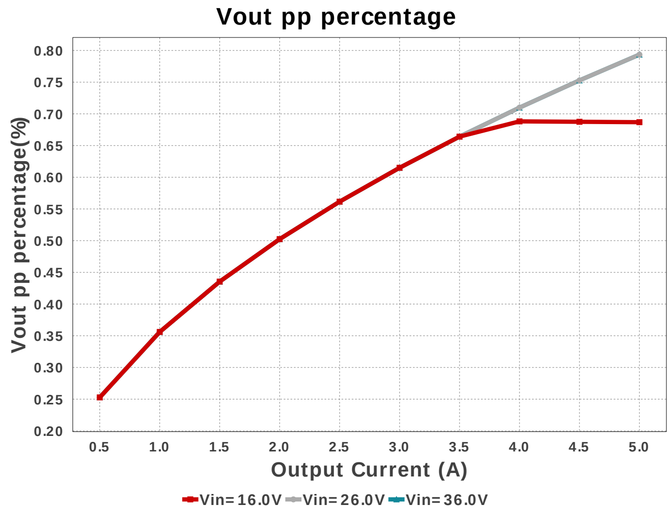
Rsns Pd

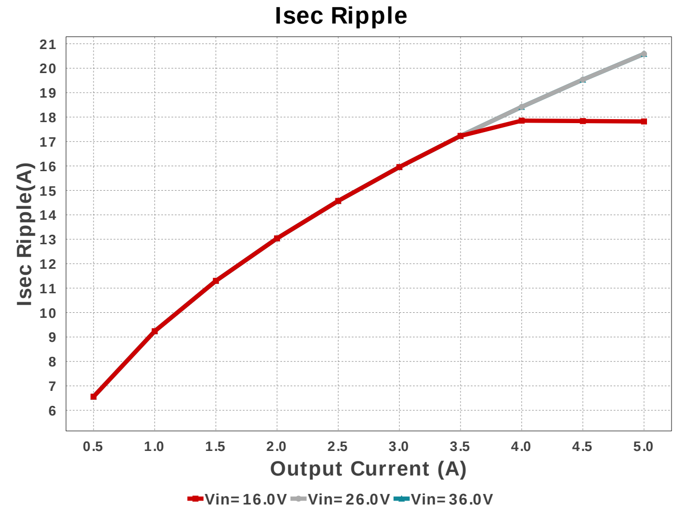


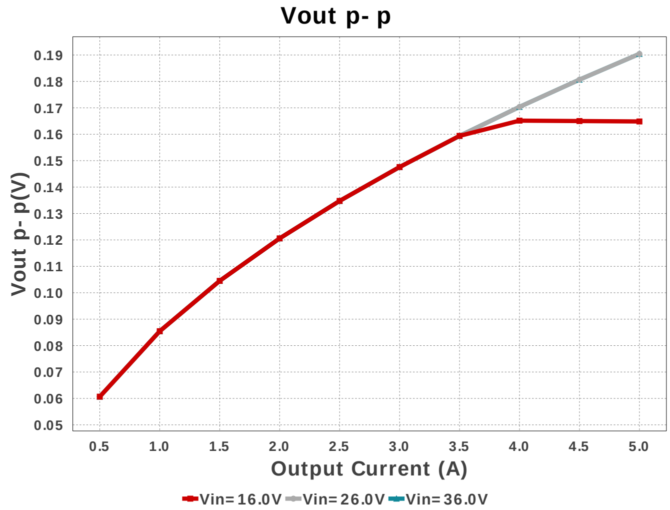
T1 Core Loss

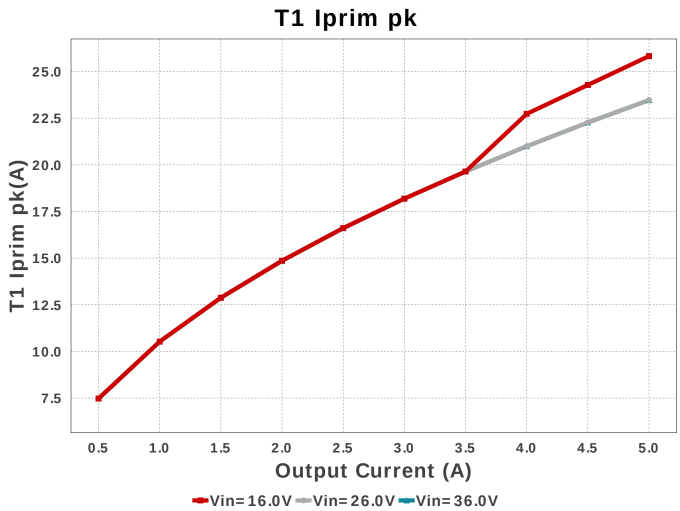












Operating Values

#	Name	Value	Category	Description
1.	Cin Pd	286.99 mW	Capacitor	Input capacitor power dissipation
2.	Cout1 IRMS	7.96 A	Capacitor	Output capacitor1 RMS ripple current
3.	Cout1 Pd	586.17 mW	Capacitor	Output capacitor1 power dissipation
4.	Daux trr	8.02 ns	Diode	Auxiliary Diode Reverse Recovery Time
5.	Dsec Pd	1.25 W	Diode	Secondary Diode Power Dissipation
6.	Dsec Vf	500.0 mV	Diode	Effective Forward Voltage Drop at the Operating Current
7.	Dsec trr	0.0 ns	Diode	Output Diode Reverse Recovery Time
8.	Dsec2 Pd	1.25 W	Diode	Secondary Diode Power Dissipation
9.	Dsec2 Vf	500.0 mV	Diode	Effective Forward Voltage Drop at the Operating Current
10.	Dsnub trr	8.02 ns	Diode	Snubber Diode Reverse Recovery Time
11.	IC Pd	103.58 mW	IC	IC power dissipation

#	Name	Value	Category	Description
12.	IC Tj	81.912 degC	IC	IC junction temperature
13.	ICThetaJA	115.0 degC/W	IC	IC junction-to-ambient thermal resistance
14.	Iin Avg	8.13 A	IC	Average input current
15.	L2 Pd	27.5 mW	Inductor	Average Power Dissipation in the Inductor Over the AC Line Period
16.	M1 Pd	1.186 W	Mosfet	M1 MOSFET total power dissipation
17.	M1 TjOP	125.675 degC	Mosfet	M1 MOSFET junction temperature
18.	Cin Pd	286.99 mW	Power	Input capacitor power dissipation
19.	Cout1 Pd	586.17 mW	Power	Output capacitor1 power dissipation
20.	Dsec Pd	1.25 W	Power	Secondary Diode Power Dissipation
21.	Dsec2 Pd	1.25 W	Power	Secondary Diode Power Dissipation
22.	IC Pd	103.58 mW	Power	IC power dissipation
23.	L2 Pd	27.5 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
24.	M1 Pd	1.186 W	Power	M1 MOSFET total power dissipation
25.	Paux	20.561 mW	Power	Power Dissipation in Raux and Daux
26.	Pd Rstartup	329.25 µW	Power	Power Dissipation in Rstartup1 and Rstartup2
27.	Rdrv Pd	26.788 mW	Power	Power Dissipation in Gate Drive Resistor
28.	Rfb Pd	17.204 mW	Power	Rfb Power Dissipation
29.	Rsns Pd	4.466 W	Power	Current Limit Sense Resistor Power Dissipation
30.	Snubber Pd	1.783 W	Power	Snubber Power Dissipation
31.	T1 Copper Loss	3.6 W	Power	Transformer Copper Loss Power Dissipation
32.	T1 Core Loss	3.6 W	Power	Transformer Core Loss Power Dissipation
33.	T1 Pd	7.2 W	Power	Estimated Losses in Transformer
34.	Total Pd	10.076 W	Power	Total Power Dissipation
35.	Pd Rstartup	329.25 µW	Resistor	Power Dissipation in Rstartup1 and Rstartup2
36.	Rdrv Pd	26.788 mW	Resistor	Power Dissipation in Gate Drive Resistor
37.	Rfb Pd	17.204 mW	Resistor	Rfb Power Dissipation
38.	Rsns Pd	4.466 W	Resistor	Current Limit Sense Resistor Power Dissipation
39.	BOM Count	60	System Information	Total Design BOM count
40.	Duty Cycle	58.978 %	System Information	Duty cycle
41.	Efficiency	92.254 %	System Information	Steady state efficiency
42.	FootPrint	4.01 k mm^2	System Information	Total Foot Print Area of BOM components
43.	Frequency	59.93 kHz	System Information	Switching frequency
44.	Iout	5.0 A	System Information	Iout operating point
45.	Iout_DCM	3.757 A	System Information	Approximate Current below which DCM mode of operation will begin
46.	Mode	CCM	System Information	Conduction Mode
47.	Pout	120.0 W	System Information	Total output power
48.	Tdead	0.0 ns	System Information	Approximate Dead Time of the Regulator
49.	Toff	6.069 us	System Information	Approximate Converter Off Time
50.	Ton Act	9.841 us	System Information	Approximate Converter On Time
51.	Total BOM	NA	System Information	Total BOM Cost
52.	Tsw	16.686 us	System Information	Switching Time Period
53.	Vin	16.0 V	System Information	Vin operating point
54.	Vout	24.0 V	System Information	Operational Output Voltage
55.	Vout Actual	24.004 V	System Information	Vout Actual calculated based on selected voltage divider resistors
56.	Vout Tolerance	2.137 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
57.	Vout p-p	164.845 mV	System Information	Peak-to-peak output ripple voltage
58.	Vout pp percentage	686.852 m%	System Information	Output Voltage ripple percentage
59.	Vsnub	37.899 V	System Information	Voltage Across the Snubber
60.	Ipri Avg	9.241 A	Transformer	Average Current in Primary Winding over the complete Switching Period
61.	Ipri ripple	20.313 A	Transformer	Ripple Current in the Primary Winding
62.	Ipri ripple pk-pk percentage	129.645 %	Transformer	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
63.	Isec Ripple	17.821 A	Transformer	Ripple Current in the Secondary Winding
64.	Paux	20.561 mW	Transformer	Power Dissipation in Raux and Daux

#	Name	Value	Category	Description
65.	T1 Copper Loss	3.6 W	Transformer	Transformer Copper Loss Power Dissipation
66.	T1 Core Loss	3.6 W	Transformer	Transformer Core Loss Power Dissipation
67.	T1 Iprim RMS	12.848 A	Transformer	Transformer Primary RMS Current
68.	T1 Iprim pk	25.825 A	Transformer	Transformer Primary Peak Current
69.	T1 Is1 RMS	9.4 A	Transformer	Transformer Secondary1 RMS Current
70.	T1 Is1 pk	22.657 A	Transformer	Transformer Secondary1 Peak Current
71.	T1 Pd	7.2 W	Transformer	Estimated Losses in Transformer
72.	Vaux	11.974 V	Transformer	Auxiliary Voltage

Design Inputs

Name	Value	Description
Iout	5.0	Maximum Output Current
VinMax	36.0	Maximum input voltage
VinMin	16.0	Minimum input voltage
Vout	24.0	Output Voltage
base_pn	UCC28C43-Q1	Base Product Number
source	DC	Input Source Type
Ta	70.0	Ambient temperature

WEBENCH® Assembly

Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

Soldering Component to Board

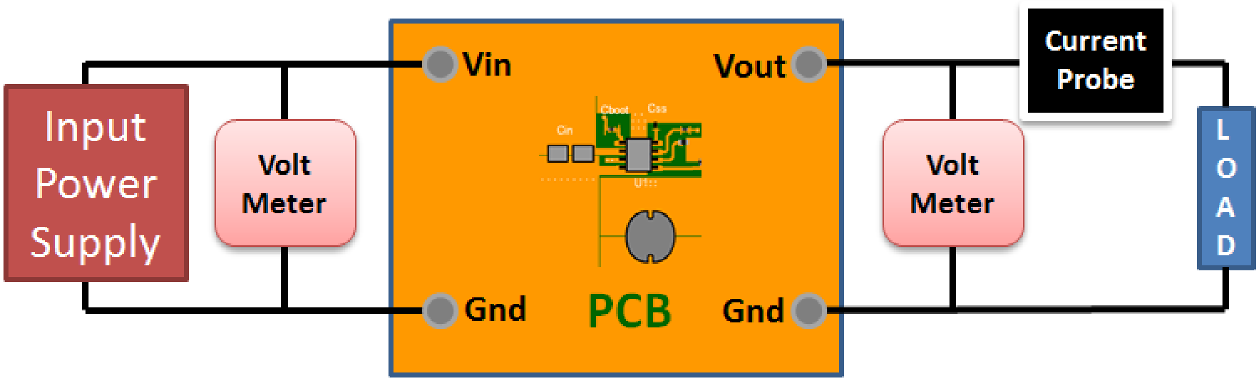
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 16.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum Iout of the design from Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated output power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.



Design Assistance

1. Feature Highlights: This device provides the features that are necessary to implement off-line or dc-to-dc fixed-frequency current-mode control schemes, with a minimum number of external components.

2. The UCC28C43-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application

3. Master key : 6FA81D8C70BA570B[v1]

4. **UCC28C43-Q1** Product Folder : http://www.ti.com/product/UCC28C43%2DQ1 : contains the data sheet and other resources.

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