

WEBENCH[®] Power Architect

Project Report

Project : 4320088/2 : PA_Project_303 (modified from 301)
 Created : 2015-08-11 22:17:45.523
 Optimize project optFactor=3

Project Summary

- | | |
|-----------------------------------|-----------------------|
| 1. Total System Efficiency | 57.586 % |
| 2. Total System BOM Count | 17.0 |
| 3. Total System Footprint | 418.0 mm ² |
| 4. Total System BOM Cost | \$2.92 |
| 5. Total System Power Dissipation | 3.057 W |

--> Launch WEBENCH Power Architect.

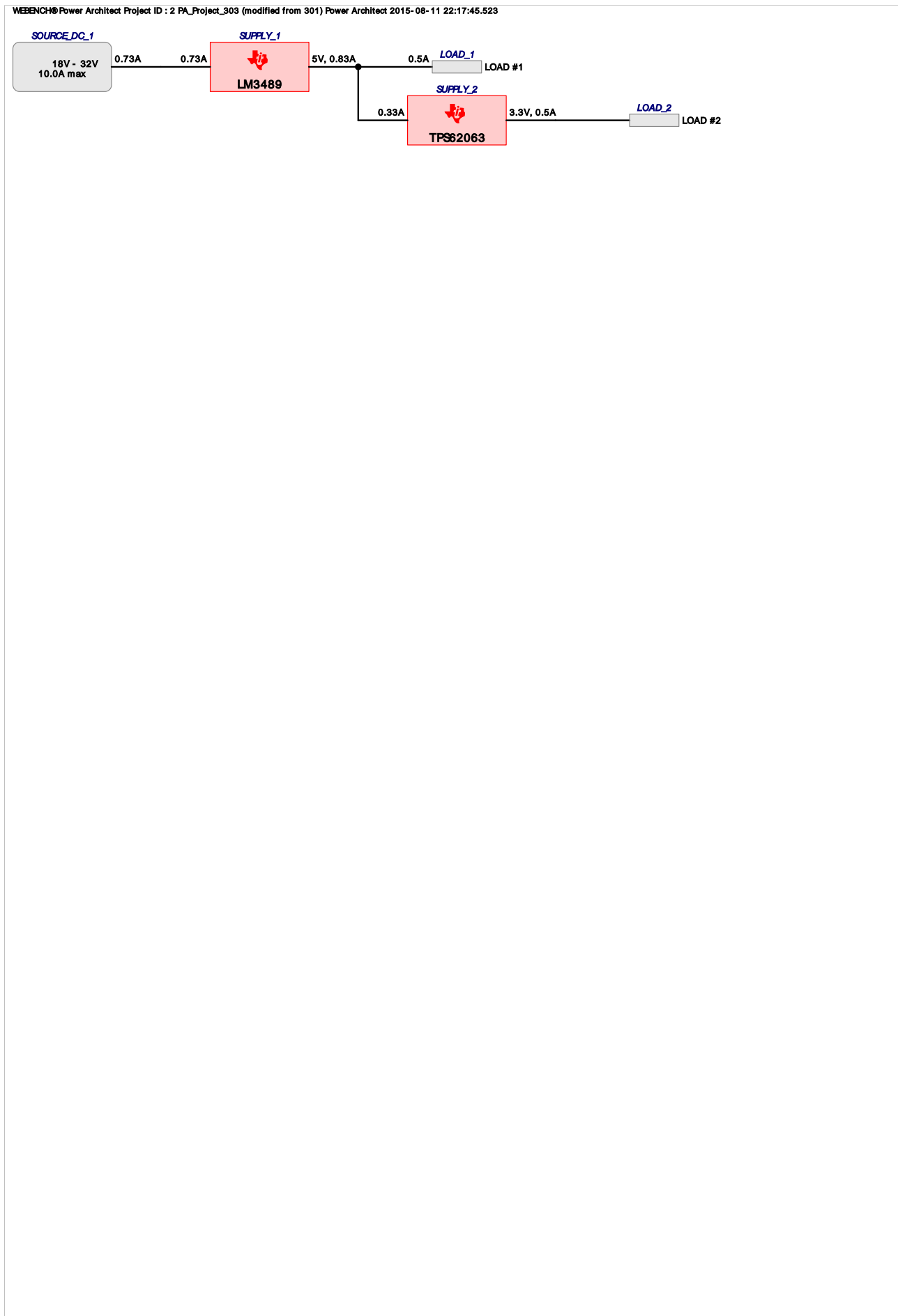
Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	LM3489	Switcher : Hysteretic controller	5 V	0.826 A	87.5%	335	\$1.93	22	8
2.	SUPPLY_2	TPS62063	Switcher : 3MHz, 1.6A, Buck Converter with Fixed Output Voltage	3.3 V	0.5 A	91.9%	83	\$0.99	21	4

Power Loads

#	Name	VLoad	ILoad	Description
1.	LOAD #1	5 V	0.5 A	VoutRipple=10%
2.	LOAD #2	3.3 V	0.5 A	VoutRipple=8%

Project Diagram



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
Panasonic	16SVP180M	SM_RADIAL_8MM	1	\$0.29	113
Diodes Inc.	B160-13-F	SMA	1	\$0.06	37
Kemet	C0805C104K5RACTU	0805	1	\$0.01	7
Yageo America	CC0805JRNPO9BN102	0805	1	\$0.01	7
Yageo America	CC0805JRNPO9BN560	0805	1	\$0.01	7
Samsung Electro-Mechanics	CL10A106MQ8NNNC	0603	1	\$0.02	5
Vishay-Dale	CRCW040220K0FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW0402267RFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040252K3FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040260K4FKED	0402	1	\$0.01	3
Panasonic	EEHZA1V220R	SM_RADIAL_5MM	1	\$0.53	58
MuRata	GRM21BR61A475KA73L	0805	1	\$0.03	7
Texas Instruments	LM3489MM/NOPB	mpds028d	1	\$0.54	16
Vishay-Siliconix	SI2319DS-T1-E3	SOT-23	1	\$0.28	14
Bourns	SRN3015-1R0Y	SRN3015	1	\$0.14	16
Bourns	SRN6045-100M	SRN6045	1	\$0.16	64
Texas Instruments	TPS62063DSGR	DSG0008A	1	\$0.80	55
Total			17	\$2.92	418

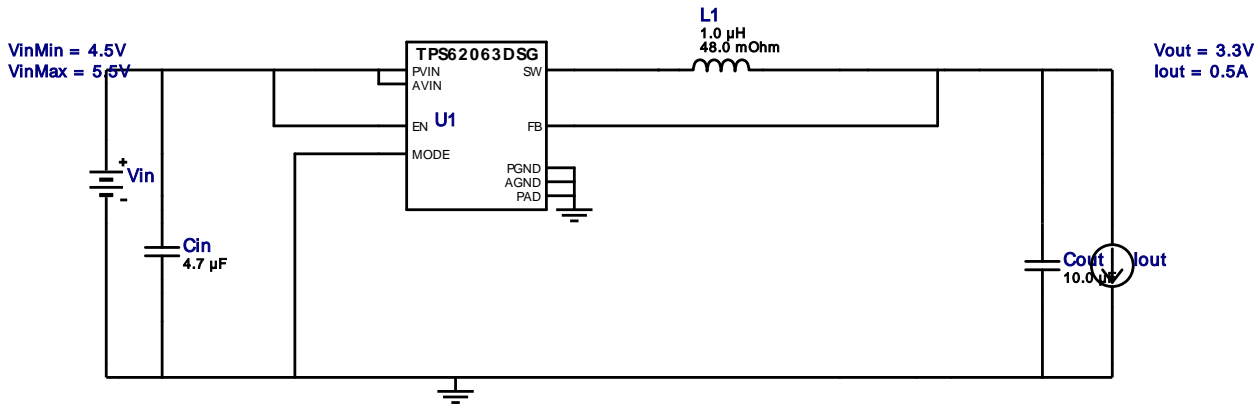


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 VinMax = 5.5V
 Vout = 3.3V
 Iout = 0.5A

Device = TPS62063DSGR
 Topology = Buck
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 BOM Cost = \$0.99
 Footprint = 83.0 mm²
 BOM Count = 4
 Total Pd = 0.15W

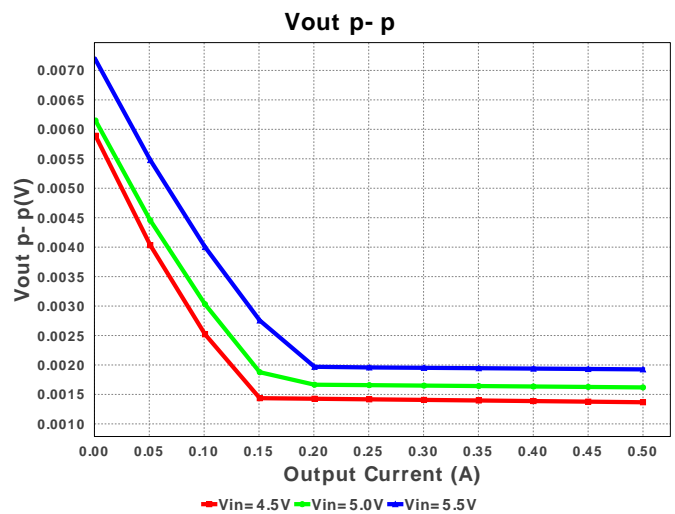
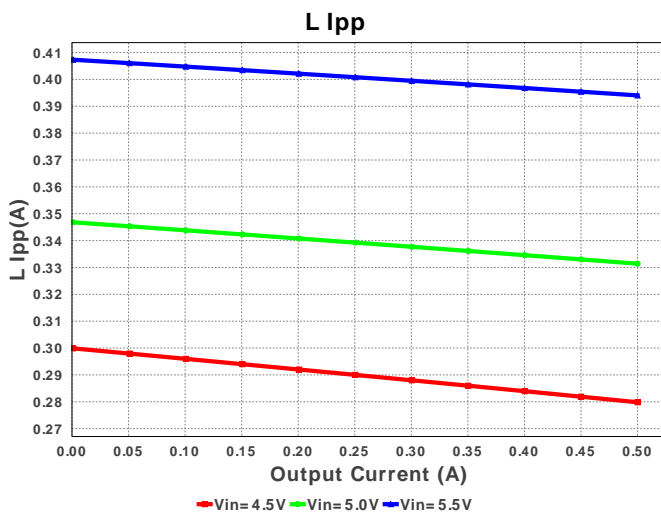
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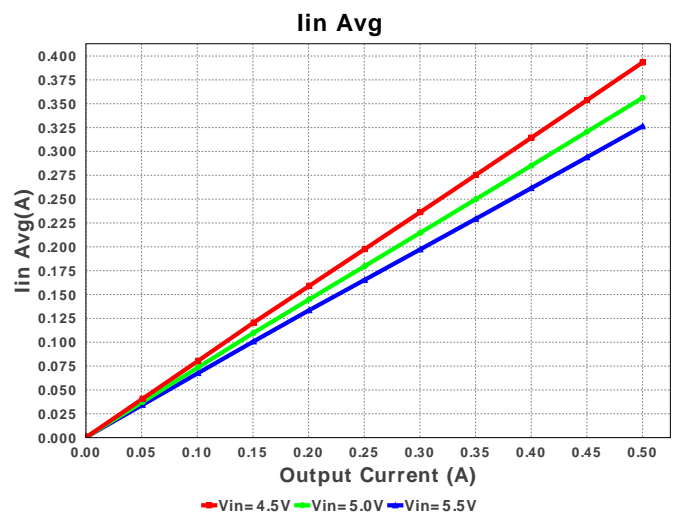
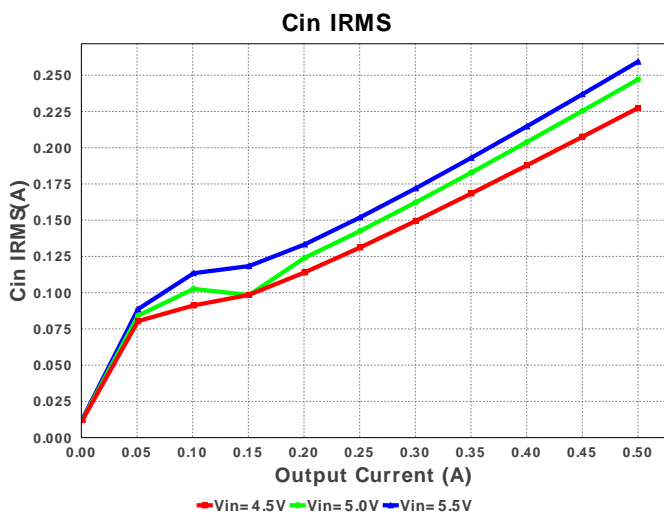
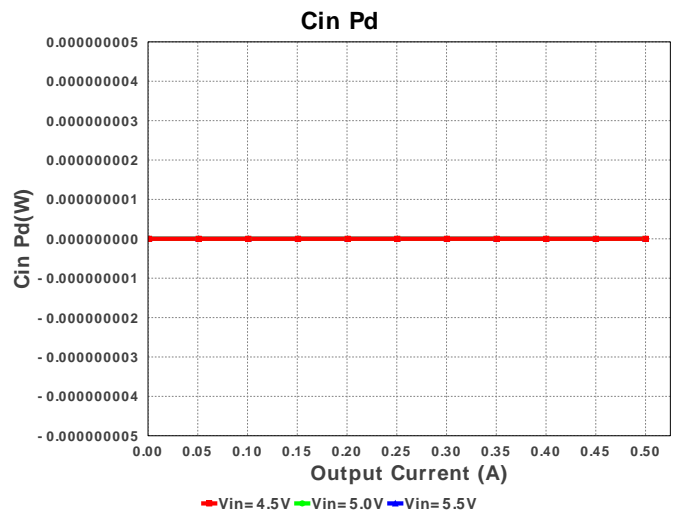
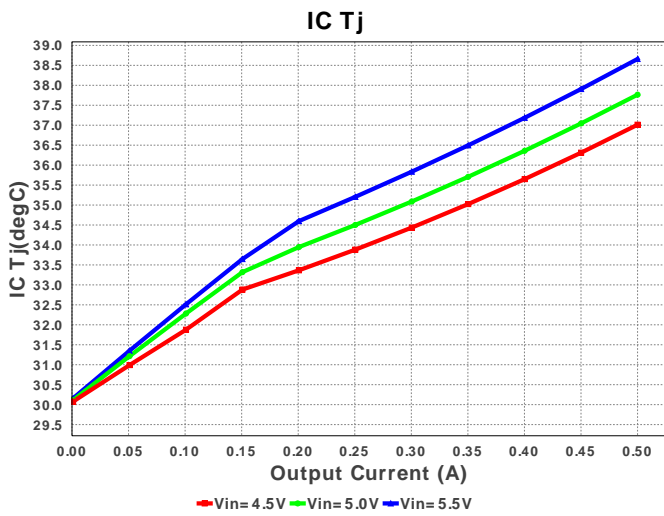
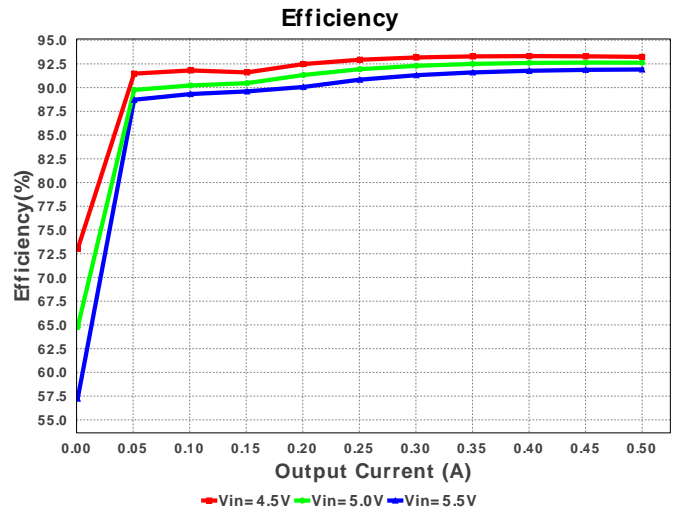
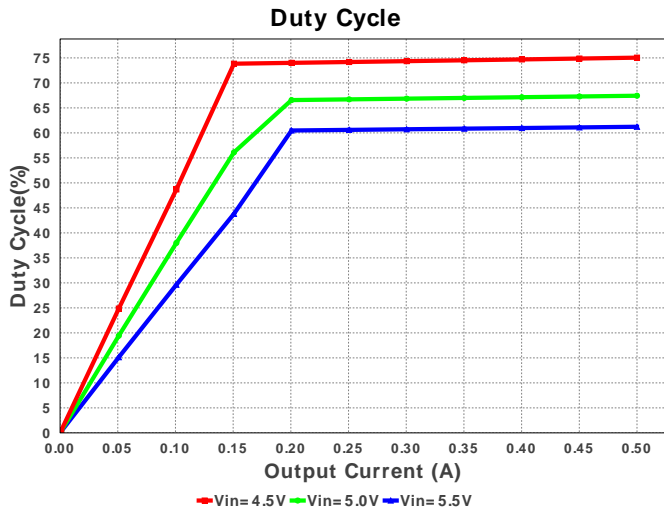
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 TPS62063DSGR 4.5V-5.5V to 3.30V @ 0.5A

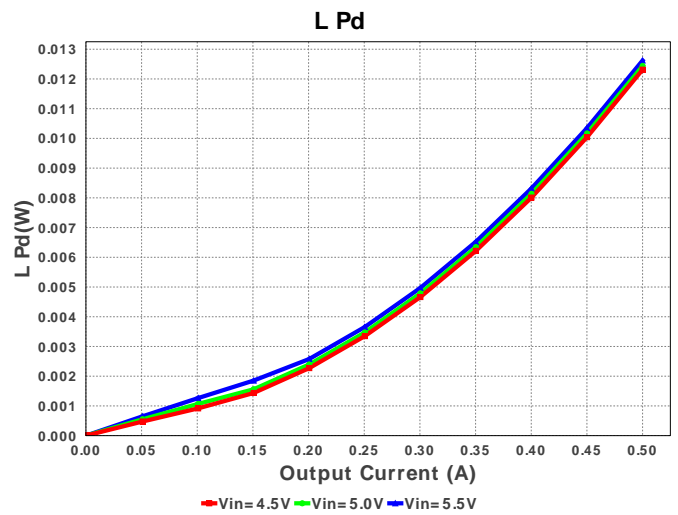
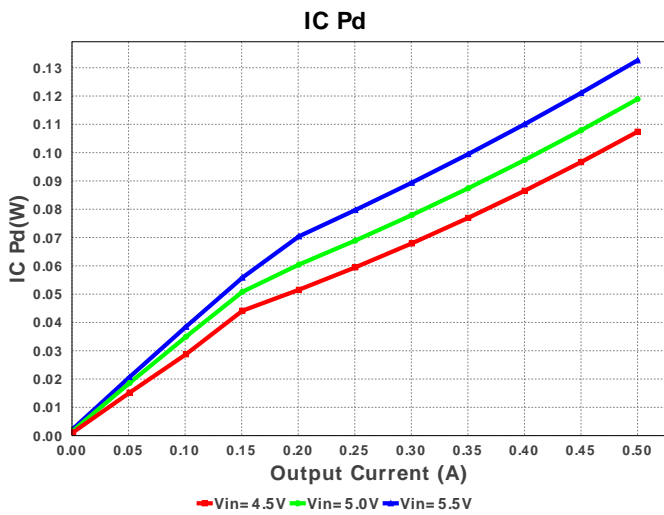
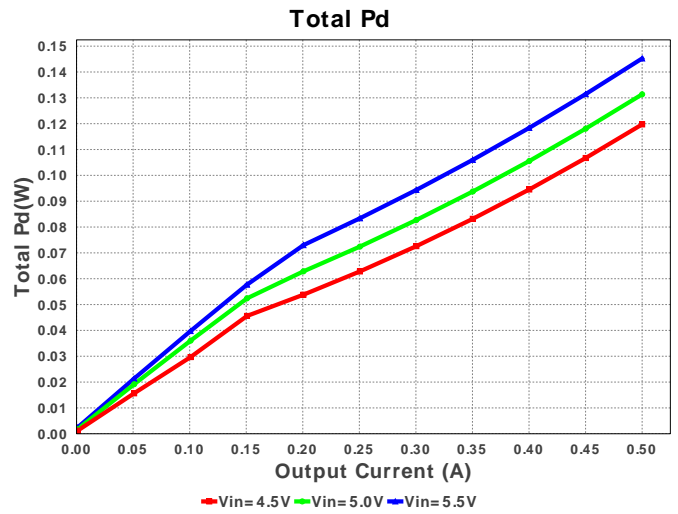
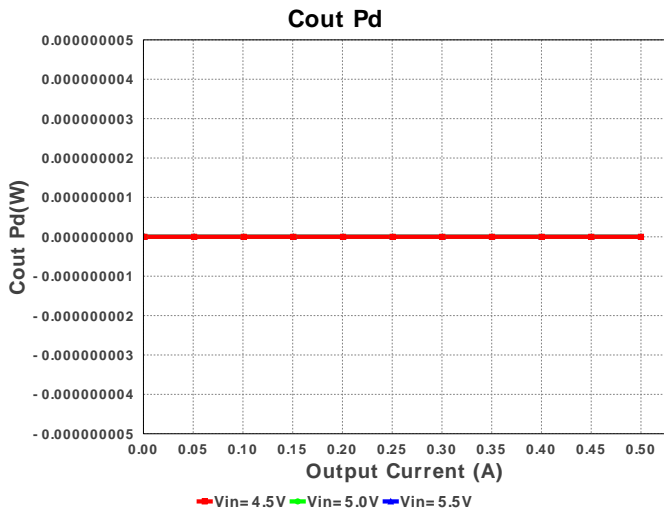
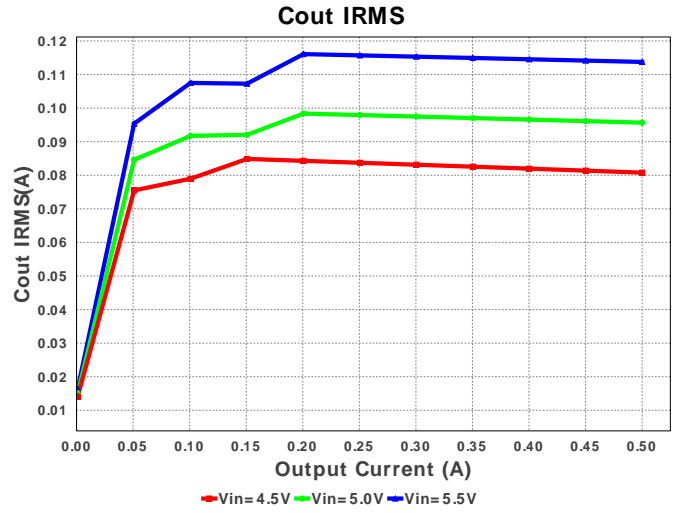
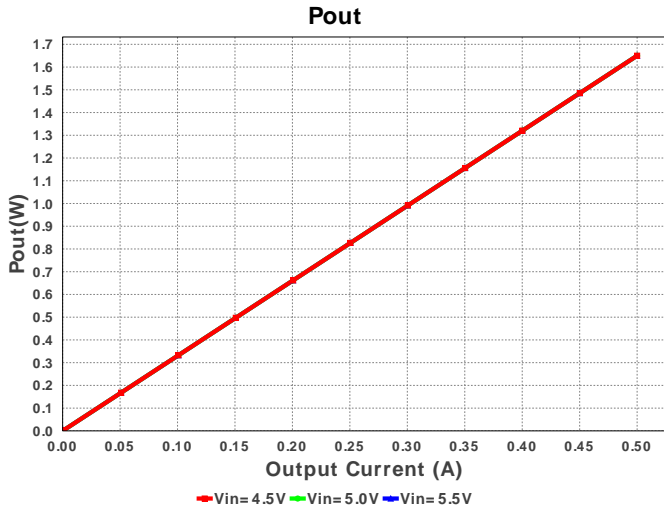


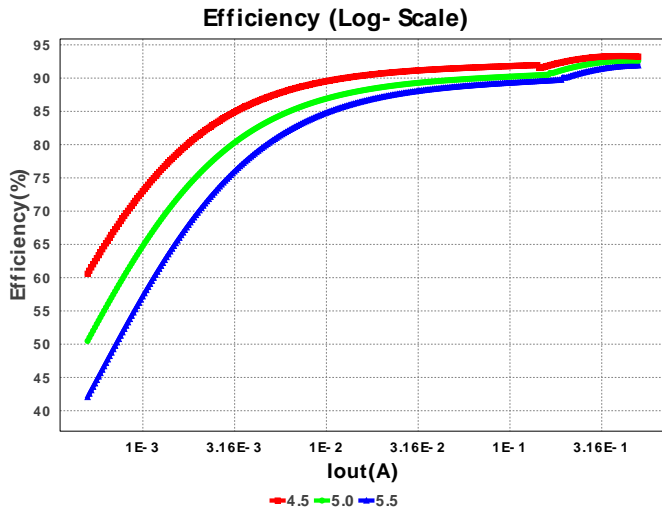
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM21BR61A475KA73L Series= X5R	Cap= 4.7 uF VDC= 10.0 V IRMS= 0.0 A	1	\$0.03	0805 7 mm ²
2.	Cout	Samsung Electro-Mechanics	CL10A106MQ8NNNC Series= X5R	Cap= 10.0 uF VDC= 6.3 V IRMS= 0.0 A	1	\$0.02	0603 5 mm ²
3.	L1	Bourns	SRN3015-1R0Y	L= 1.0 uH DCR= 48.0 mOhm	1	\$0.14	SRN3015 16 mm ²
4.	U1	Texas Instruments	TPS62063DSGR	Switcher	1	\$0.80	DSG0008A 55 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	259.369 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	113.753 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	326.41 mA	Current	Average input current
4.	L Ipp	394.05 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	4	General	Total Design BOM count
6.	FootPrint	83.0 mm ²	General	Total Foot Print Area of BOM components
7.	Frequency	3.0 MHz	General	Switching frequency
8.	Pout	1.65 W	General	Total output power
9.	Total BOM	\$0.99	General	Total BOM Cost
10.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
11.	Duty Cycle	61.225 %	Op_point	Duty cycle
12.	Efficiency	91.91 %	Op_point	Steady state efficiency
13.	IC Tj	38.659 degC	Op_point	IC junction temperature
14.	ICThetaJA	65.3 degC/W	Op_point	IC junction-to-ambient thermal resistance
15.	IOUT_OP	500.0 mA	Op_point	Iout operating point
16.	VIN_OP	5.5 V	Op_point	Vin operating point
17.	Vout p-p	1.642 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	0.0 W	Power	Input capacitor power dissipation
19.	Cout Pd	0.0 W	Power	Output capacitor power dissipation
20.	IC Pd	132.609 mW	Power	IC power dissipation
21.	L Pd	12.621 mW	Power	Inductor power dissipation
22.	Total Pd	145.236 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	5.5	Maximum input voltage
4.	VinMin	4.5	Minimum input voltage
5.	Vout	3.3	Output Voltage
6.	Vout1	3.3	Output Voltage #1
7.	base_pn	TPS62063	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0	Ambient temperature

Design Assistance

1. TPS62063 Product Folder : <http://www.ti.com/product/TPS62063> : contains the data sheet and other resources.

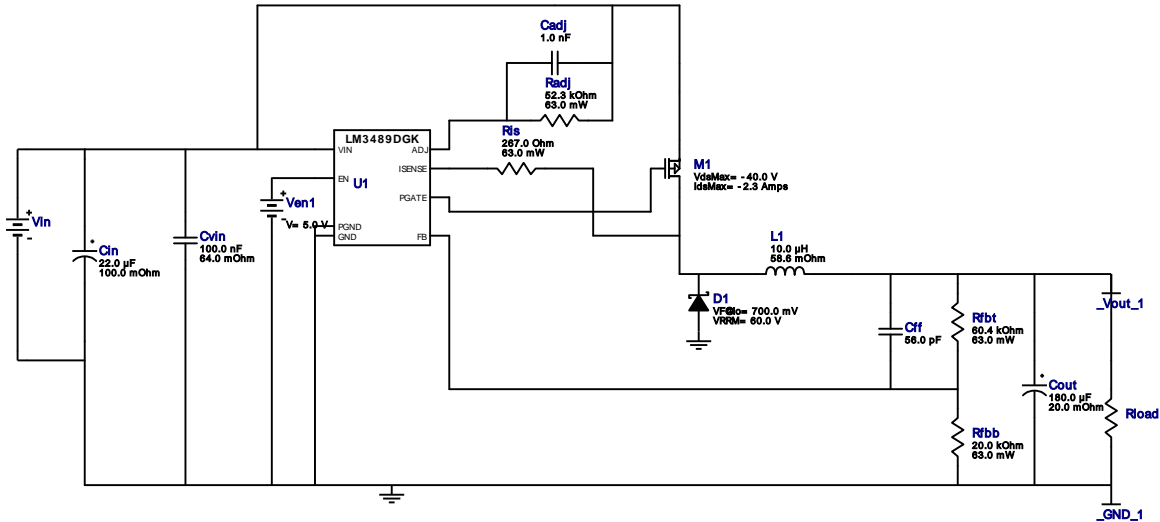


VinMin = 18.0V
 VinMax = 32.0V
 Vout = 5.0V
 Iout = 0.83A


Device = LM3489MM/NOPB
 Topology = Buck
 Created = 8/11/15 10:17:45 PM
 BOM Cost = \$1.93
 Footprint = 335.0 mm²
 BOM Count = 13
 Total Pd = 2.91W









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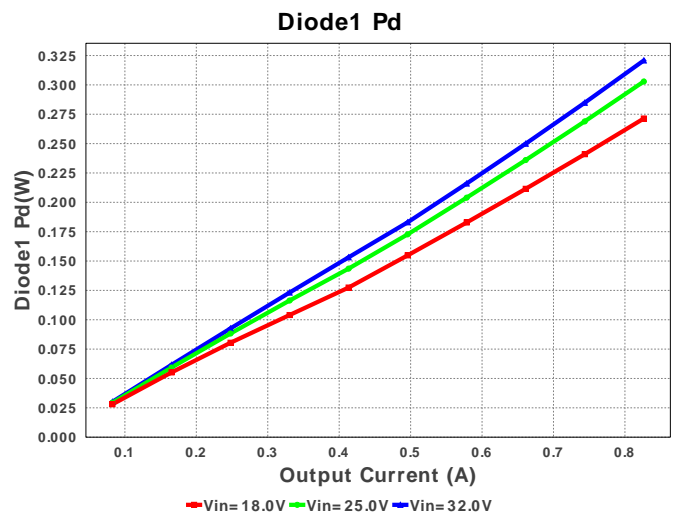
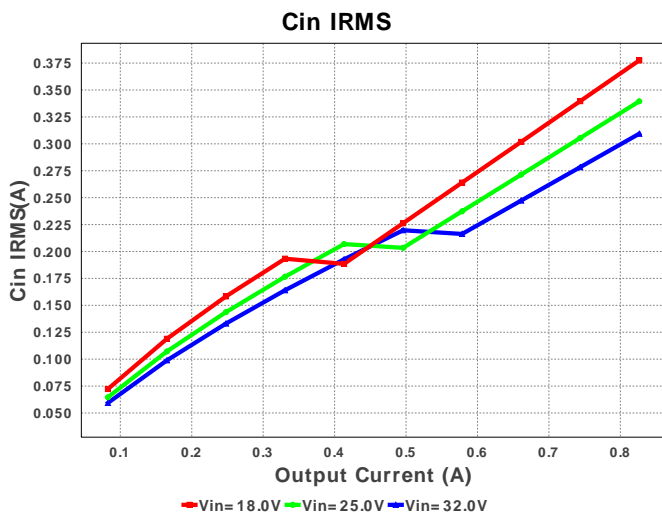
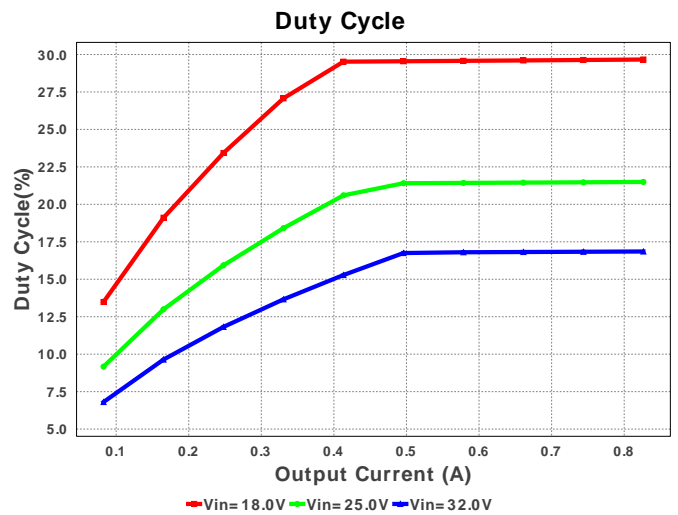
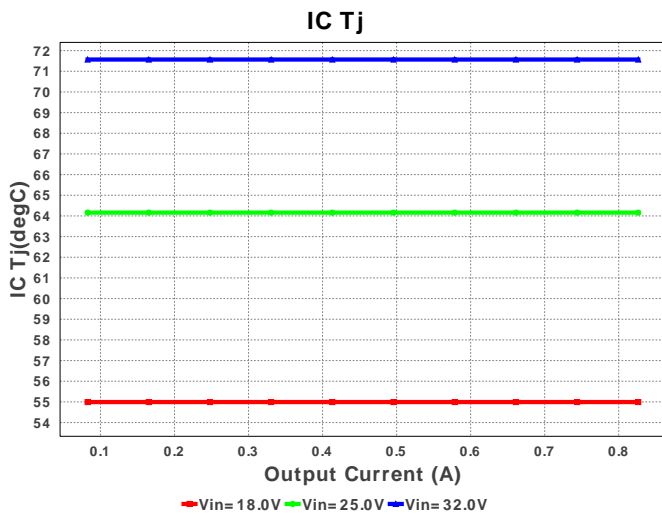
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 LM3489MM/NOPB 18.0V-32.0V to 5.00V @ 0.82641A

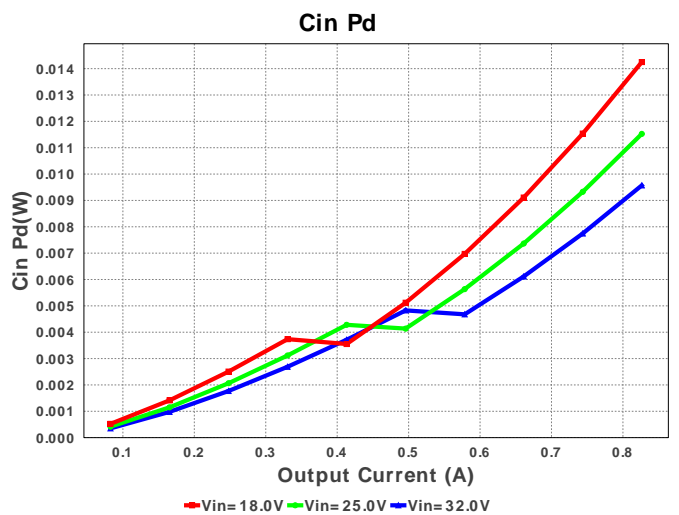
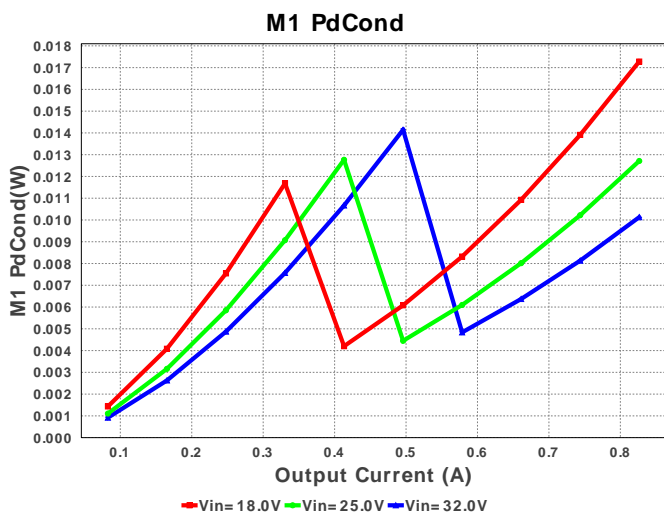
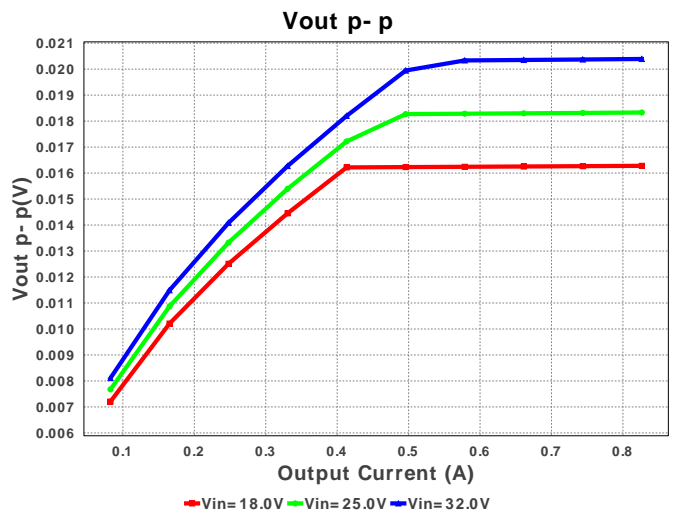
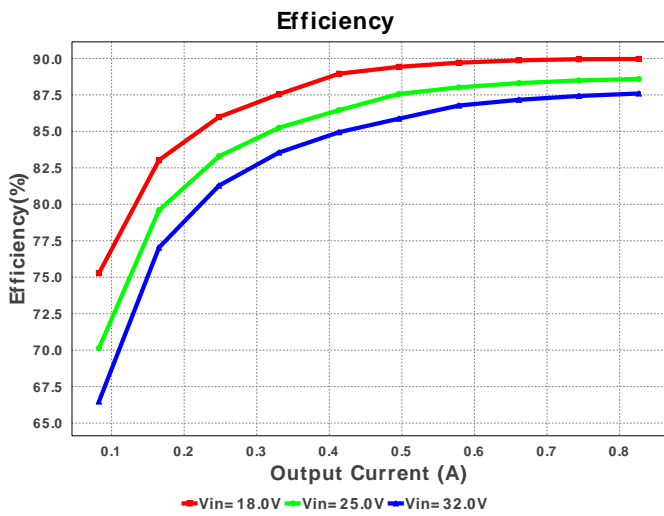
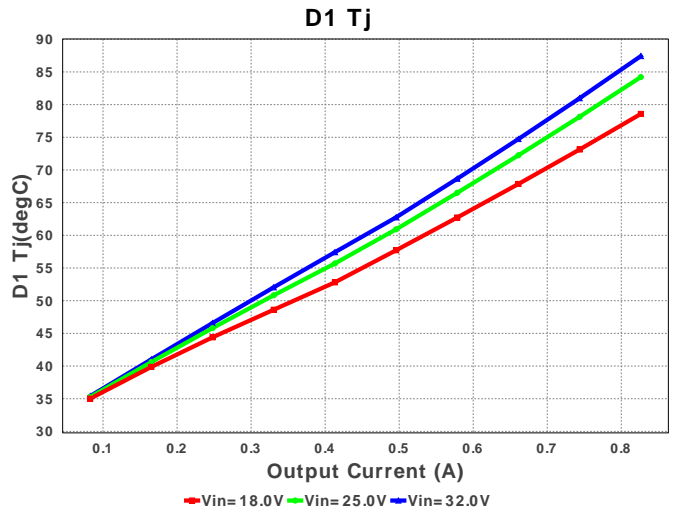
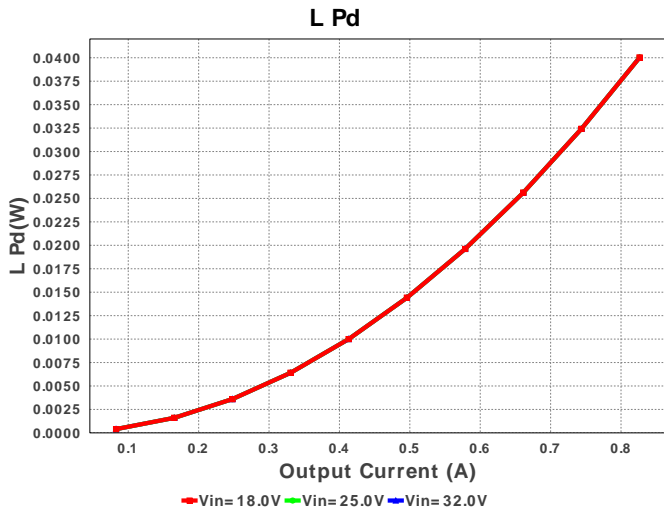


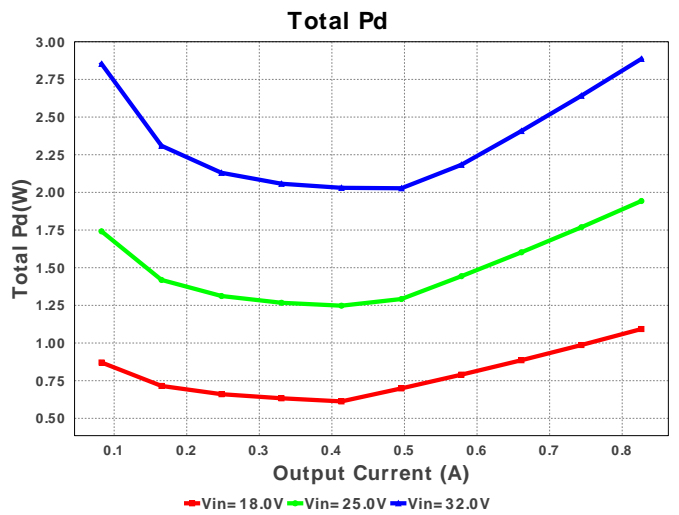
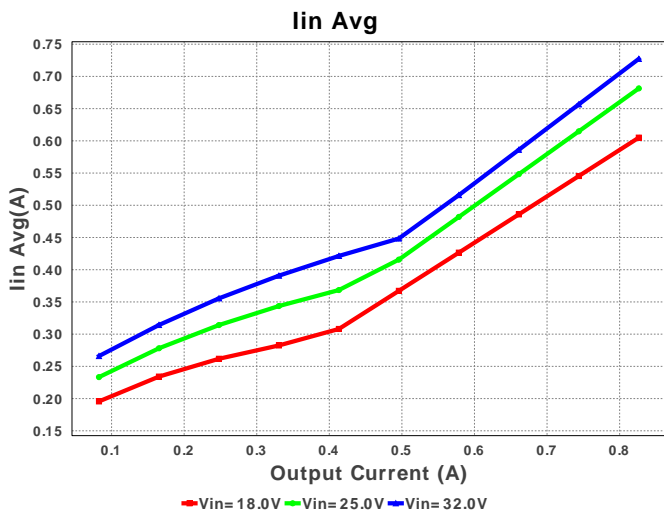
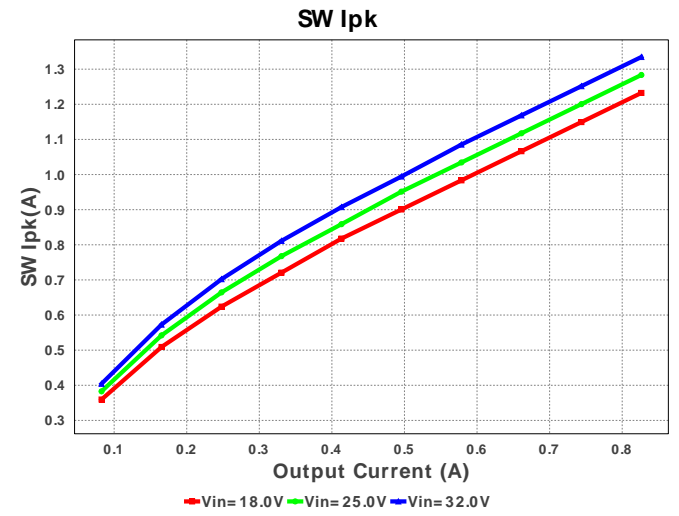
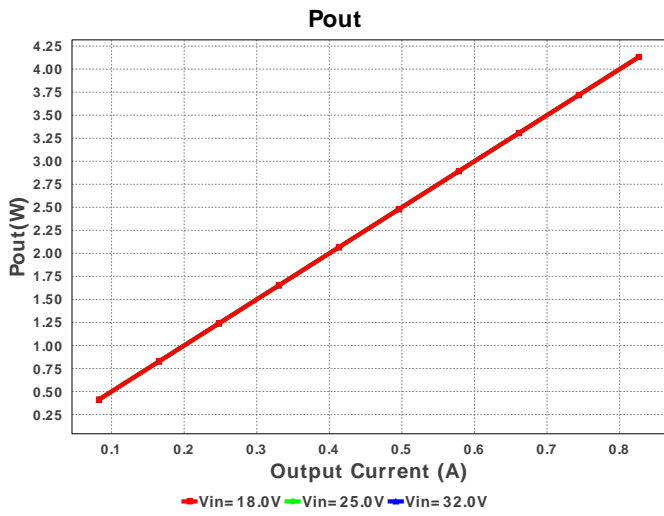
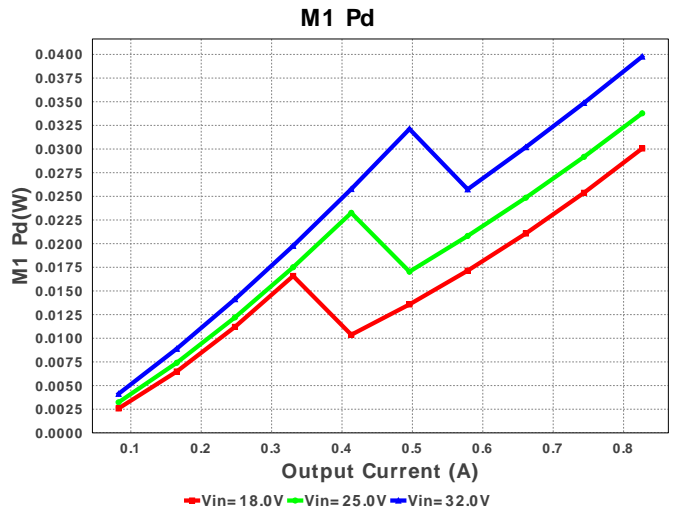
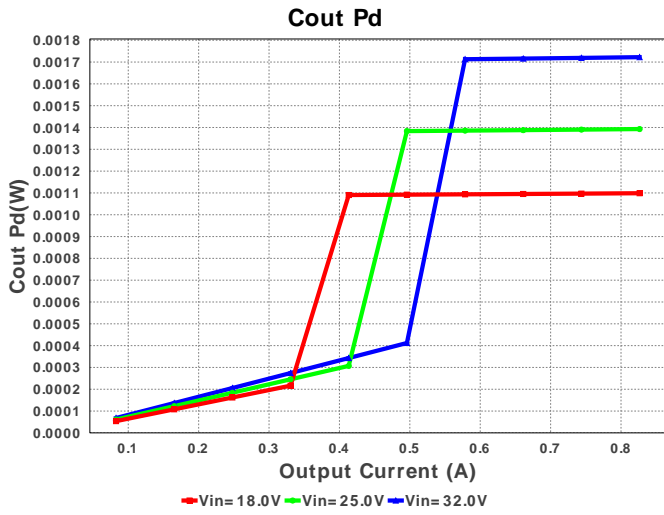
Electrical BOM

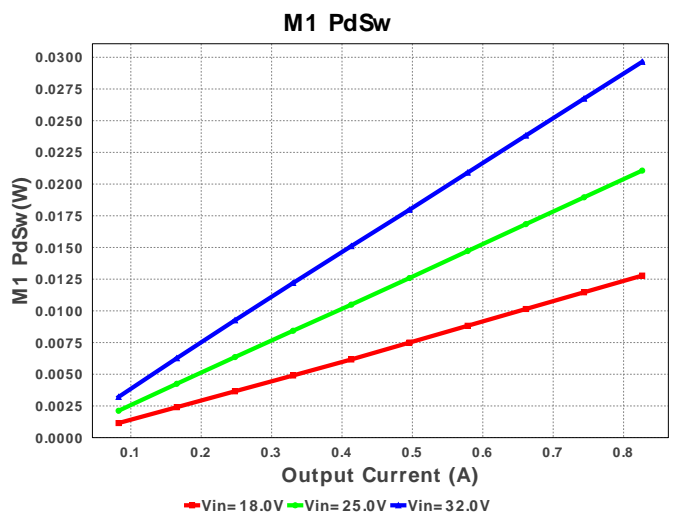
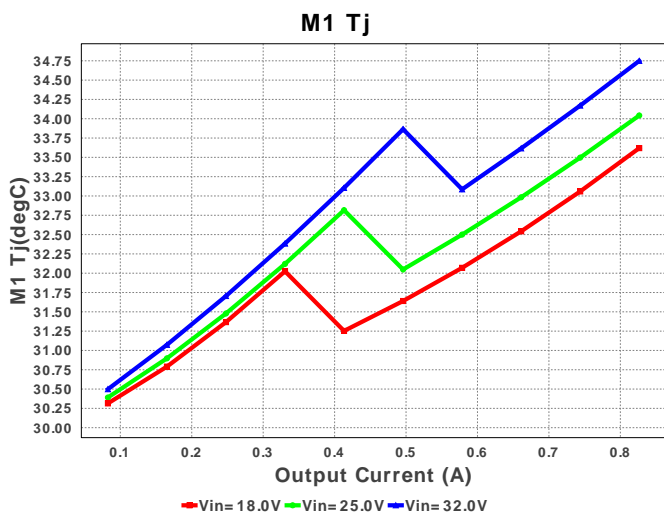
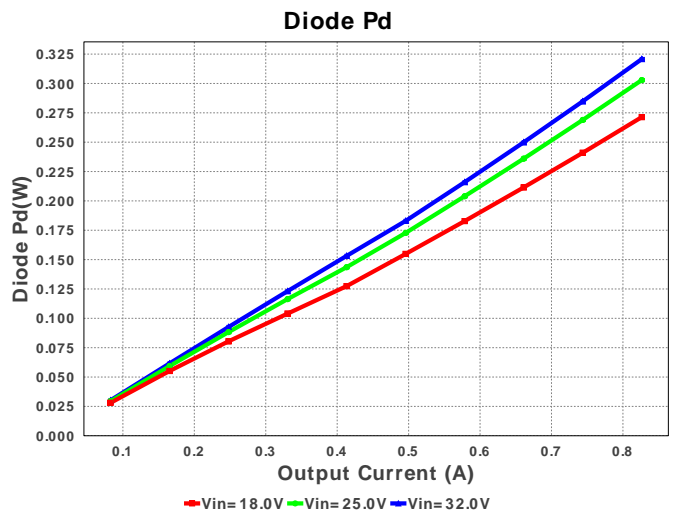
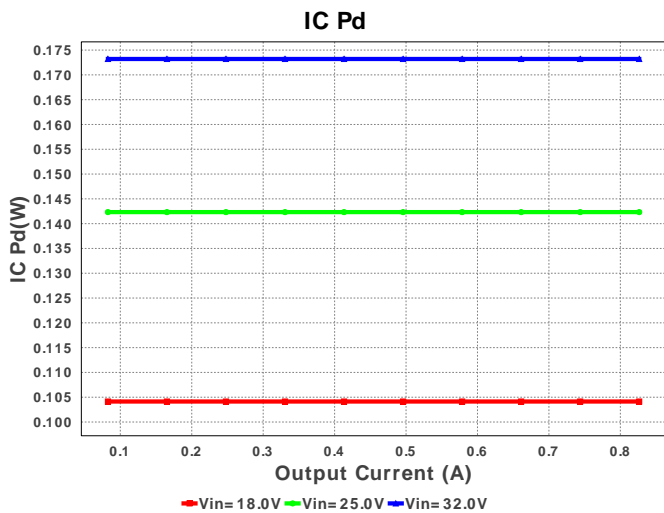
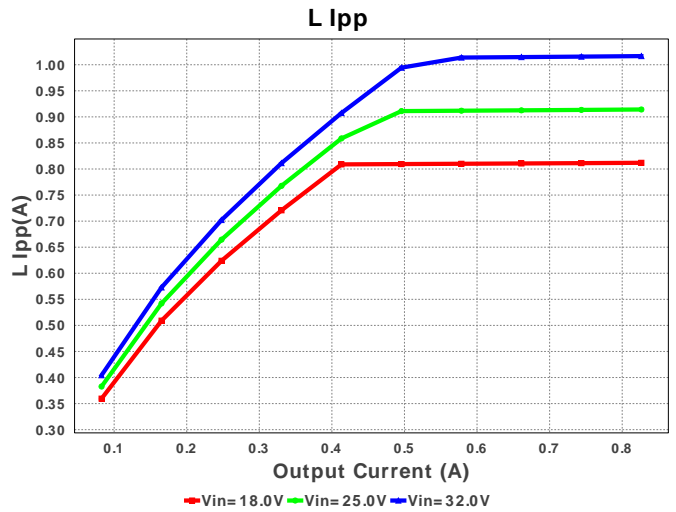
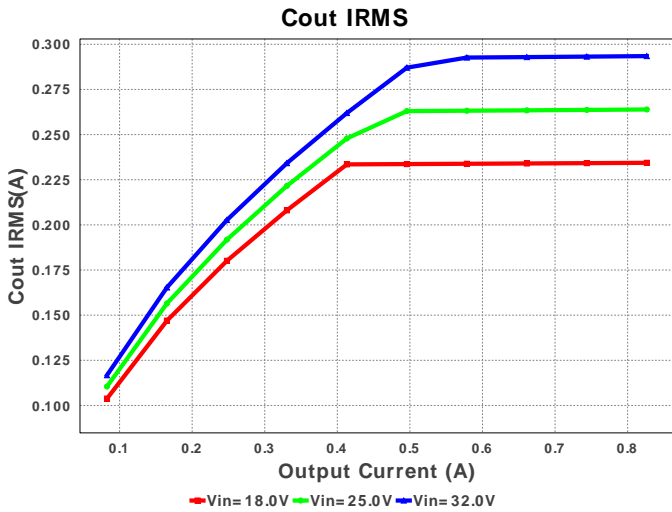
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cadj	Yageo America	CC0805JRNPO9BN102 Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
2.	Cff	Yageo America	CC0805JRNPO9BN560 Series= C0G/NP0	Cap= 56.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
3.	Cin	Panasonic	EEHZA1V220R Series= ZA	Cap= 22.0 uF ESR= 100.0 mOhm VDC= 35.0 V IRMS= 900.0 mA	1	\$0.53	 SM_RADIAL_5MM 58 mm ²
4.	Cout	Panasonic	16SVP180M Series= SVP	Cap= 180.0 uF ESR= 20.0 mOhm VDC= 16.0 V IRMS= 3.64 A	1	\$0.29	 SM_RADIAL_8MM 113 mm ²
5.	Cvin	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 ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	D1	Diodes Inc.	B160-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	\$0.06	 SMA 37 mm ²
7.	L1	Bourns	SRN6045-100M	L= 10.0 µH DCR= 58.6 mOhm	1	\$0.16	 SRN6045 64 mm ²
8.	M1	Vishay-Siliconix	SI2319DS-T1-E3	VdsMax= -40.0 V IdsMax= -2.3 Amps	1	\$0.28	 SOT-23 14 mm ²
9.	Radj	Vishay-Dale	CRCW040252K3FKED Series= CRCW..e3	Res= 52.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
10.	Rfbb	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
11.	Rfbt	Vishay-Dale	CRCW040260K4FKED Series= CRCW..e3	Res= 60.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
12.	Ris	Vishay-Dale	CRCW0402267RFKED Series= CRCW..e3	Res= 267.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
13.	U1	Texas Instruments	LM3489MM/NOPB	Switcher	1	\$0.54	 mpds028d 16 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	309.527 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	289.329 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	726.98 mA	Current	Average input current
4.	L Ipp	1.002 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	1.328 A	Current	Peak switch current
6.	BOM Count	13	General	Total Design BOM count
7.	FootPrint	335.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	454.215 kHz	General	Switching frequency
9.	IC Tolerance	16.0 mV	General	IC Feedback Tolerance
10.	Pout	4.132 W	General	Total output power
11.	Total BOM	\$1.93	General	Total BOM Cost

#	Name	Value	Category	Description
12.	D1 Tj	88.491 degC	Op_Point	D1 junction temperature
13.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
14.	Duty Cycle	16.877 %	Op_point	Duty cycle
15.	Efficiency	87.485 %	Op_point	Steady state efficiency
16.	IC Tj	71.569 degC	Op_point	IC junction temperature
17.	ICThetaJA	240.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
18.	IOUT_OP	826.41 mA	Op_point	Iout operating point
19.	M1 Tj	34.752 degC	Op_point	M1 MOSFET junction temperature
20.	VIN_OP	32.0 V	Op_point	Vin operating point
21.	Vout p-p	20.104 mV	Op_point	Peak-to-peak output ripple voltage
22.	Cin Pd	9.581 mW	Power	Input capacitor power dissipation
23.	Cout Pd	1.674 mW	Power	Output capacitor power dissipation
24.	Diode Pd	326.767 mW	Power	Diode power dissipation
25.	Diode Pd	326.767 mW	Power	Diode power dissipation
26.	Diode1 Pd	326.767 mW	Power	Diode1 power dissipation
27.	IC Pd	173.204 mW	Power	IC power dissipation
28.	L Pd	40.021 mW	Power	Inductor power dissipation
29.	L Pd	40.021 mW	Power	Inductor power dissipation
30.	M1 Pd	39.877 mW	Power	M1 MOSFET total power dissipation
31.	M1 PdCond	10.225 mW	Power	M1 MOSFET conduction losses
32.	M1 PdSw	29.652 mW	Power	M1 MOSFET switching losses
33.	Total Pd	2.911 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	826.41 m	Maximum Output Current
2.	Iout1	826.41 m	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	18.0	Minimum input voltage
5.	Vout	5.0	Output Voltage
6.	Vout1	5.0	Output Voltage #1
7.	base_pn	LM3489	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0	Ambient temperature

Design Assistance

1. Outline The LM3489 is a hysteretic PFET controller. The hysteretic control architecture provides for a stable design without the use of a control loop. The switching frequency depends on the inductance value, output capacitor ESR, and the input voltage. Therefore depending on the chosen BOM, the frequency at different input voltages would vary.

2. LM3489 Product Folder : <http://www.ti.com/product/LM3489> : contains the data sheet and other resources.

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