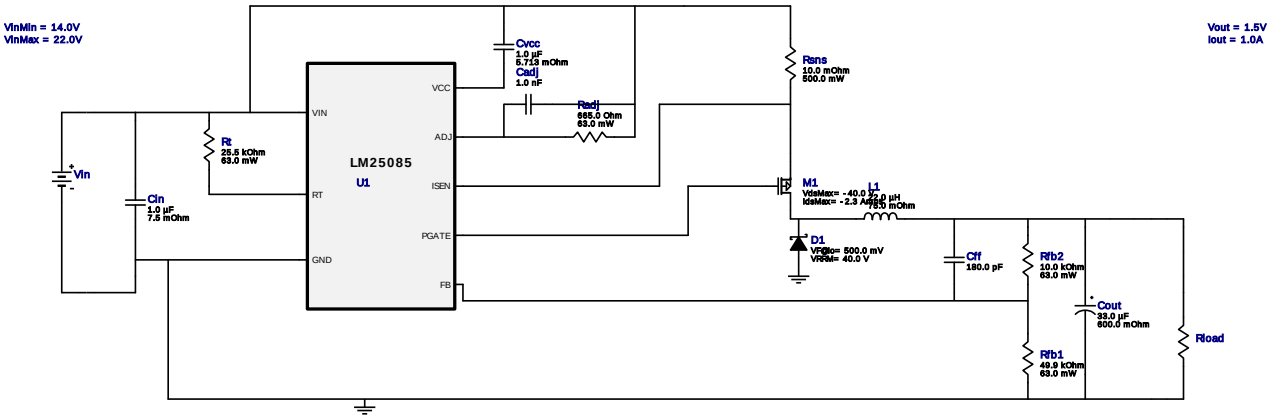
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 1.5V
Iout = 1.0A

Device = LM25085MY/NOPB
Topology = Buck
Created = 6/17/14 2:55:20 AM
BOM Cost = $1.71
Footprint = 247.0mm2
BOM Count = 14
Total Pd = 0.68W

Design : 1961187/17 LM25085MY/NOPB
LM25085MY/NOPB 14.0V-22.0V to 1.5V @ 1.0A



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cadj	Yageo America	CC0805KRX7R9BB102 Series= X7R	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
2.	Cff	MuRata	GRM033R71C181KA01D Series= X7R	Cap= 180.0 pF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2mm2
3.	Cin	TDK	C3216X7R2A105M160AA Series= X7R	Cap= 1.0 µF ESR= 7.5 mOhm VDC= 100.0 V IRMS= 5.923 A	1	$0.11	1206 11mm2
4.	Cout	AVX	TPSA336K006R0600 Series= TPS	Cap= 33.0 µF ESR= 600.0 mOhm VDC= 6.3 V IRMS= 318.0 mA	1	$0.13	3216-18 11mm2
5.	Cvcc	TDK	C1608X5R1C105K Series= 285	Cap= 1.0 µF ESR= 5.713 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	1608 5mm2
6.	D1	Diodes Inc.	B240A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.09	SMA 37mm2
7.	L1	TDK	VLP8040T-220M	L= 22.0 µH DCR= 75.0 mOhm	1	$0.22	VLP8040 113mm2
8.	M1	Vishay-Siliconix	SI2319DS-T1-E3	VdsMax= -40.0 V IdsMax= -2.3 Amps	1	$0.28	SOT-23 14mm2
9.	Radj	Vishay-Dale	CRCW0402665RFKED Series= CRCW..e3	Res= 665.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
10.	Rfb1	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
11.	Rfb2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2

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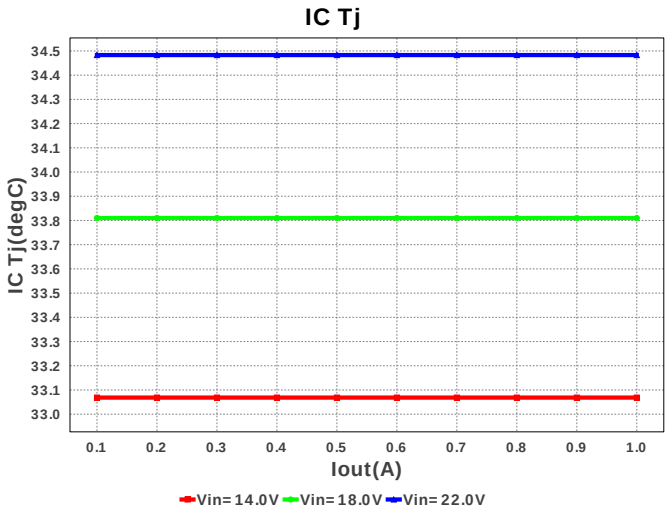
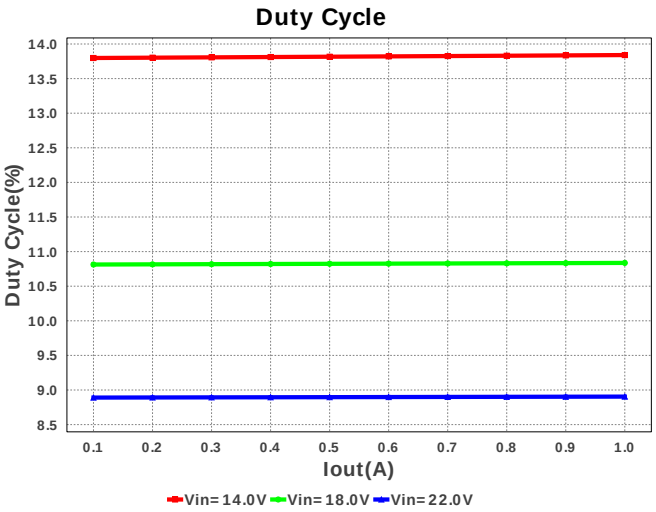
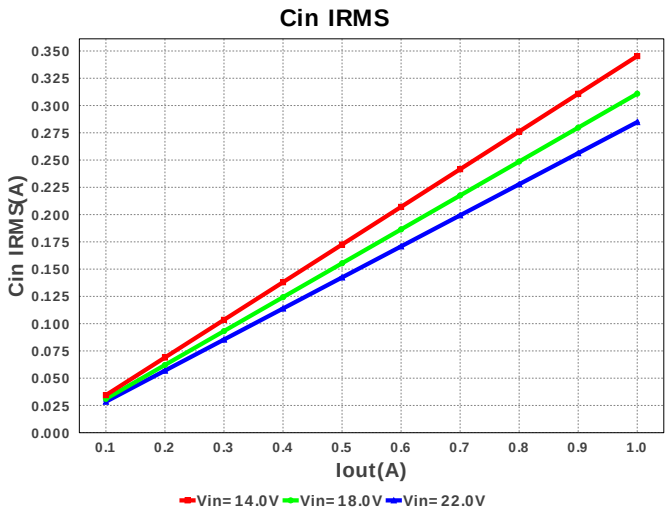
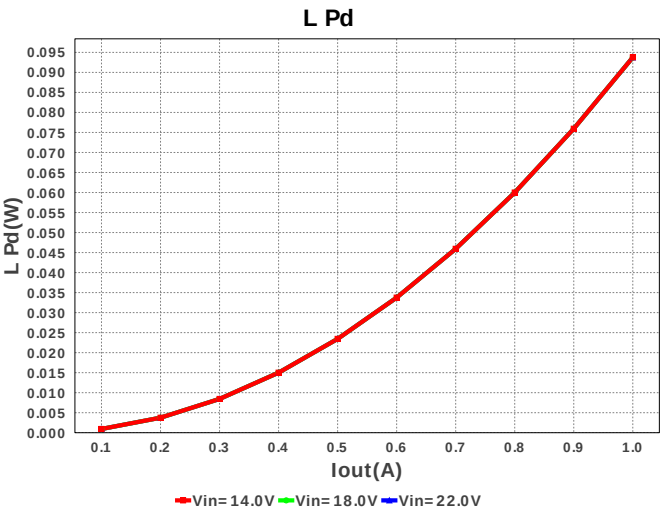
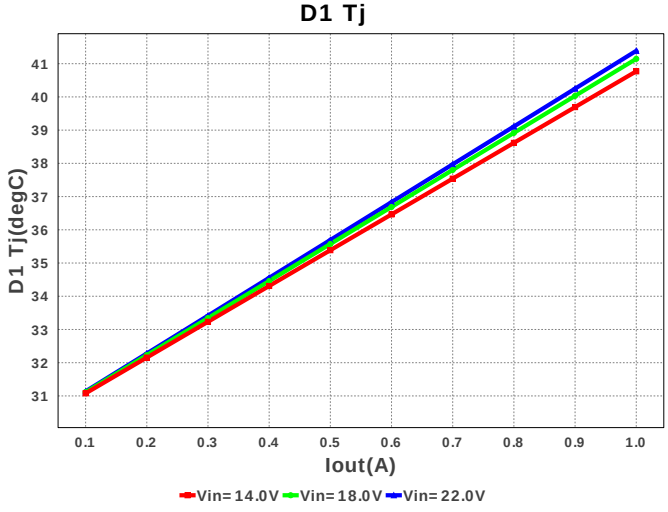
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rsns	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	 1206 11mm2
13.	Rt	Vishay-Dale	CRCW040225K5FKED Series= CRCW..e3	Res= 25.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
14.	U1	Texas Instruments	LM25085MY/NOPB	Switcher	1	$0.70	 MUY08A 24mm2

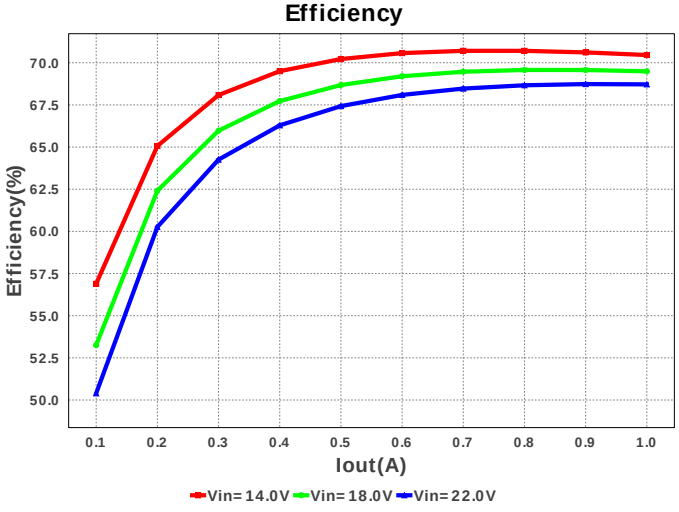












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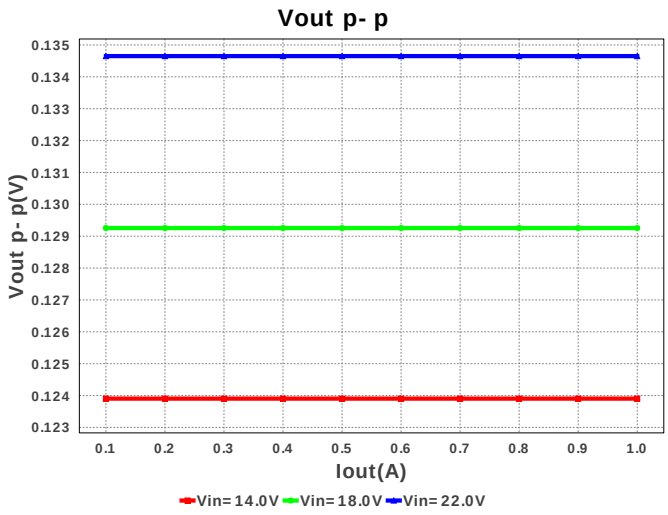

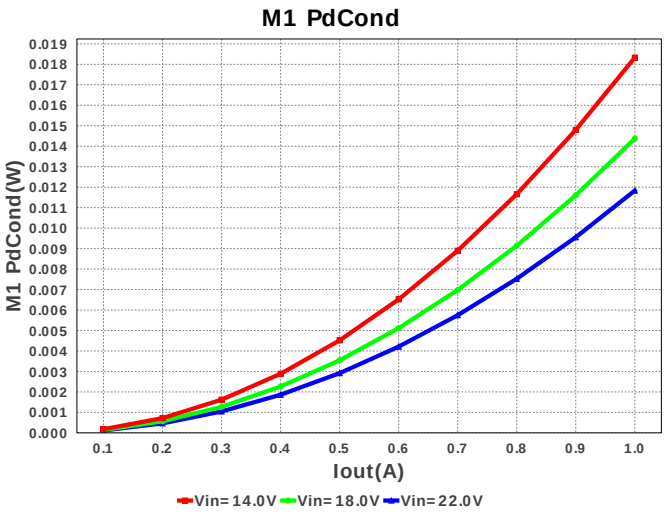

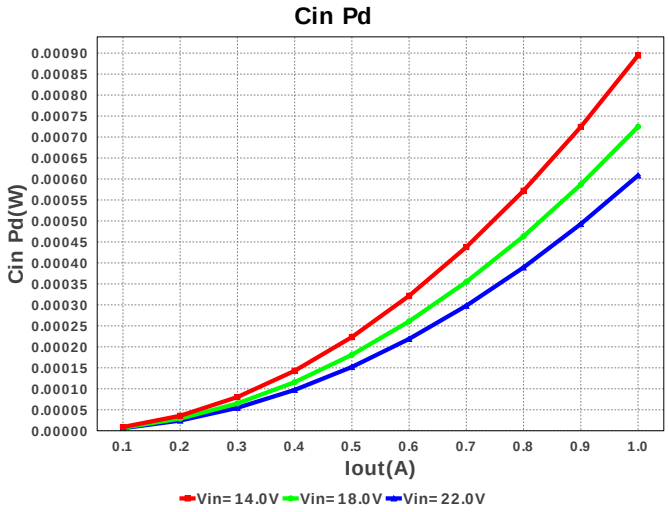

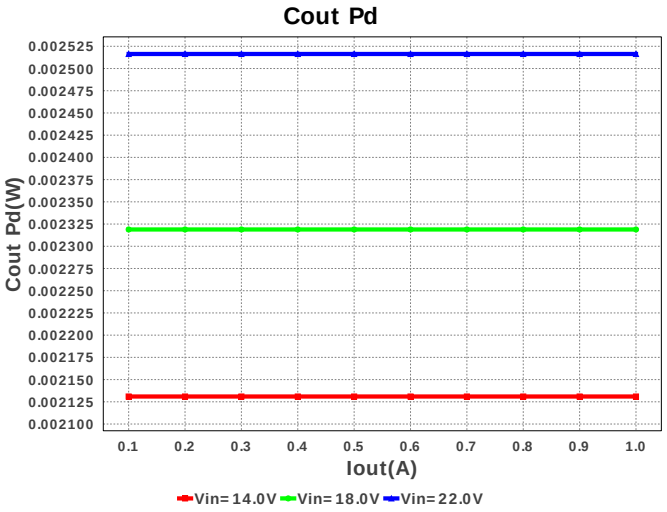

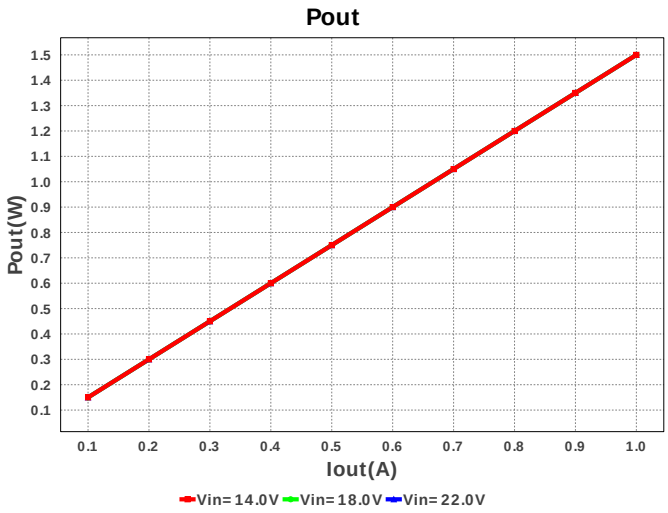

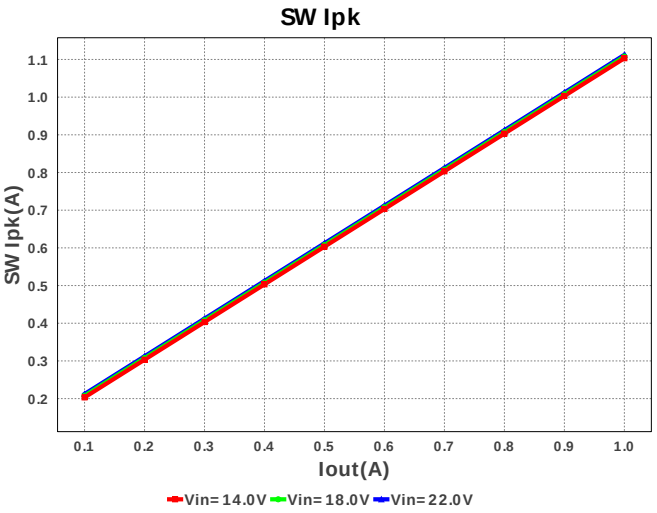

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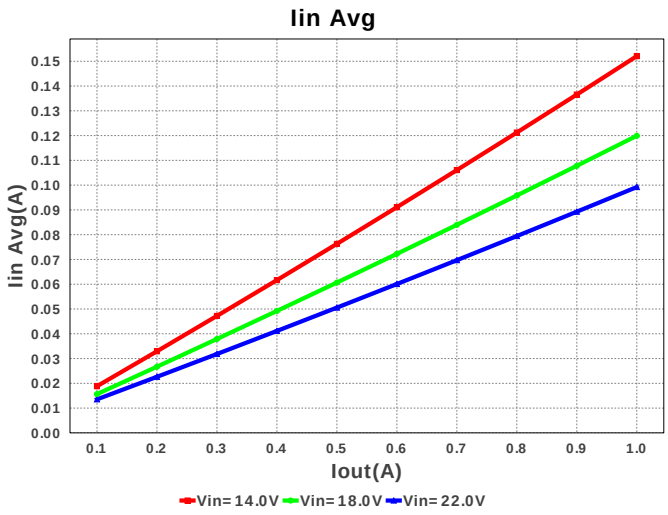

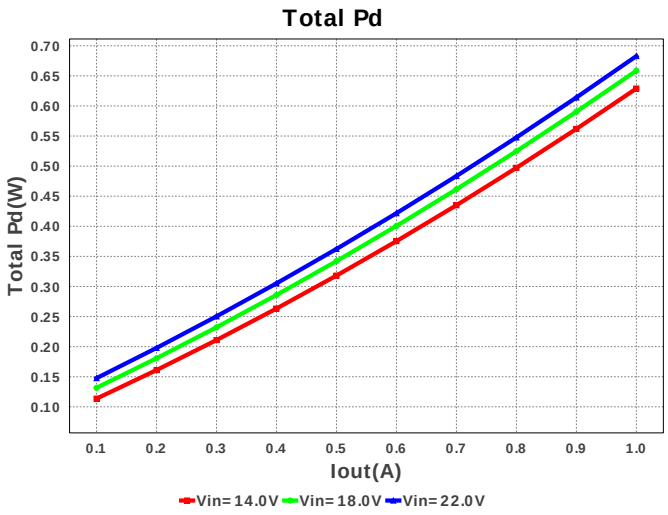

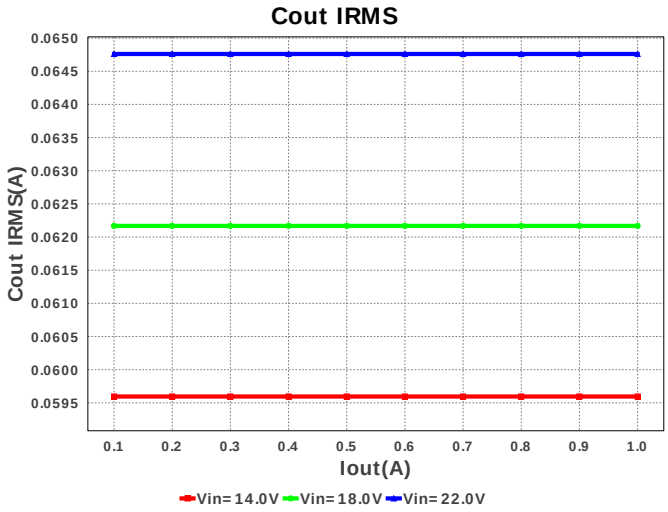

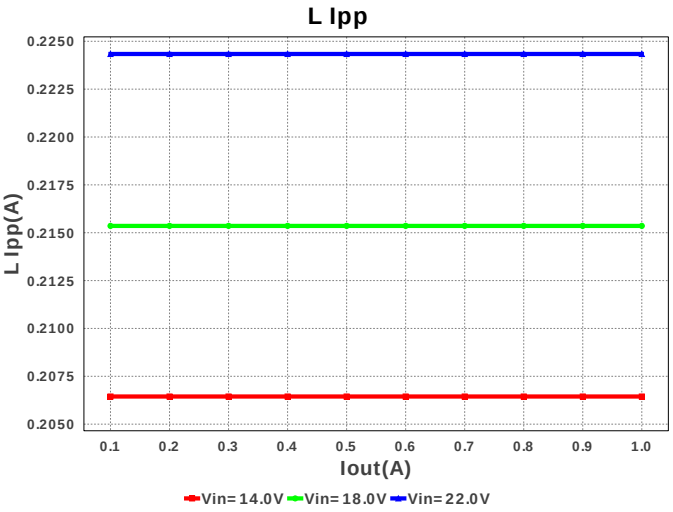

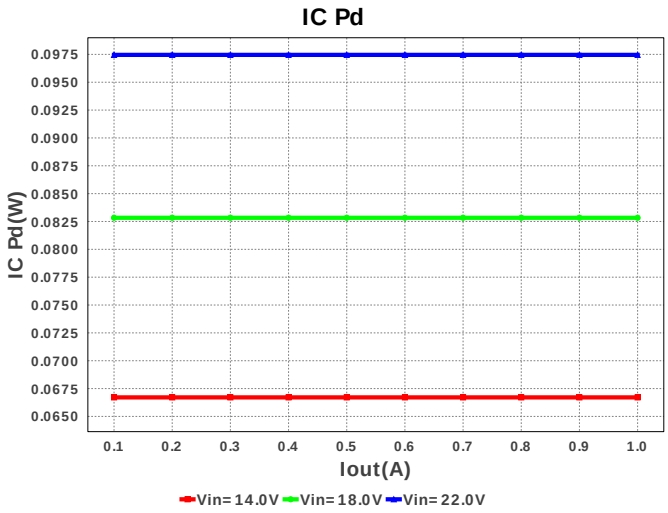

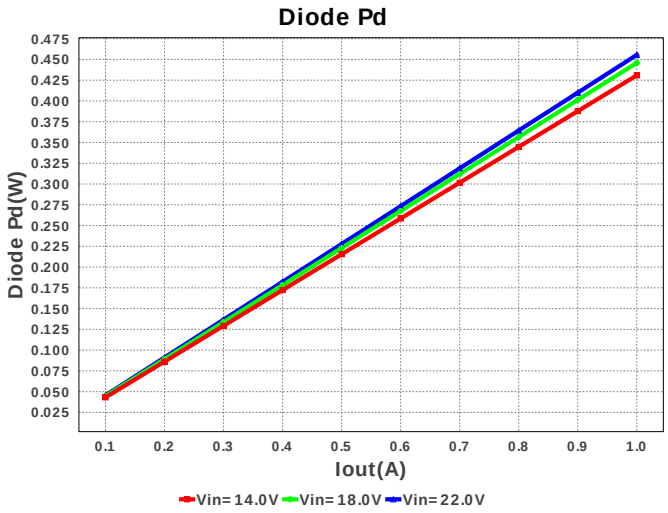

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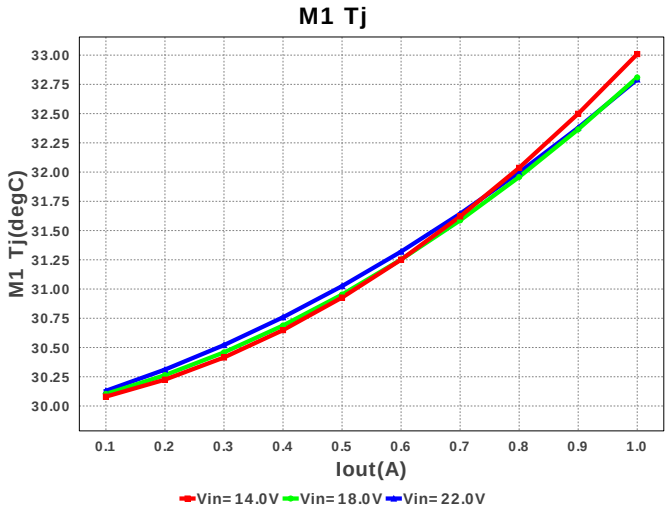

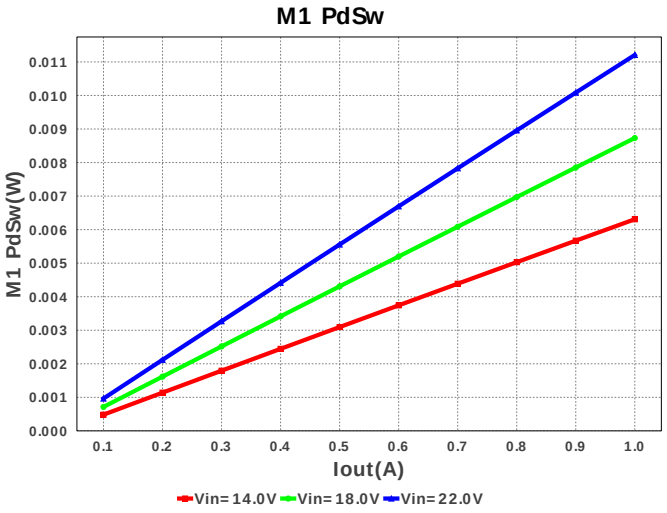

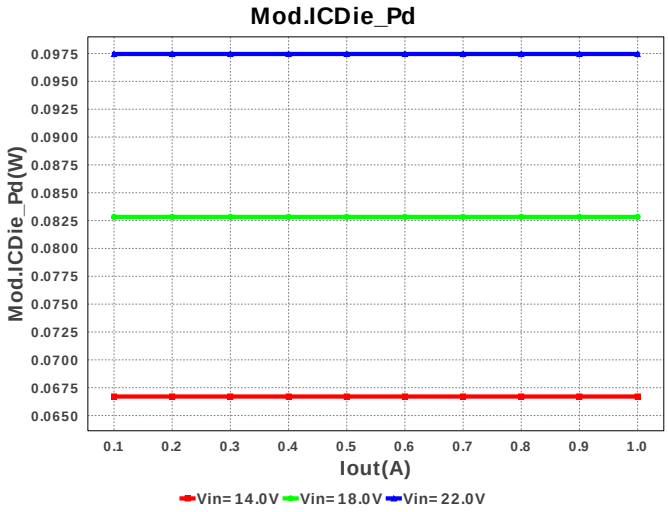

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	284.81 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	64.76 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	99.221 mA	Current	Average input current
4.	L Ipp	224.337 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	1.112 A	Current	Peak switch current
6.	BOM Count	14	General	Total Design BOM count
7.	FootPrint	247.0 mm2	General	Total Foot Print Area of BOM components
8.	Frequency	234.502 kHz	General	Switching frequency
9.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
10.	Pout	1.5 W	General	Total output power
11.	Total BOM	$1.71	General	Total BOM Cost
12.	D1 Tj	41.387 degC	Op_Point	D1 junction temperature
13.	Vout OP	1.5 V	Op_Point	Operational Output Voltage
14.	Duty Cycle	8.905 %	Op_point	Duty cycle
15.	Efficiency	68.717 %	Op_point	Steady state efficiency
16.	IC Tj	34.483 degC	Op_point	IC junction temperature
17.	ICThetaJA	46.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
18.	IOUT_OP	1.0 A	Op_point	Iout operating point
19.	M1 Tj	32.792 degC	Op_point	M1 MOSFET junction temperature
20.	VIN_OP	22.0 V	Op_point	Vin operating point
21.	Vout p-p	134.651 mV	Op_point	Peak-to-peak output ripple voltage
22.	Cin Pd	608.375 µW	Power	Input capacitor power dissipation
23.	Cout Pd	2.516 mW	Power	Output capacitor power dissipation
24.	Diode Pd	455.477 mW	Power	Diode power dissipation
25.	IC Pd	97.457 mW	Power	IC power dissipation
26.	L Pd	93.75 mW	Power	Inductor power dissipation
27.	M1 PdCond	11.837 mW	Power	M1 MOSFET conduction losses
28.	M1 PdSw	11.208 mW	Power	M1 MOSFET switching losses
29.	Total Pd	682.865 mW	Power	Total Power Dissipation

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Design Inputs

#	Name	Value	Description
1.	Iout	1.0 A	Maximum Output Current
2.	Iout1	1.0 Amps	Output Current #1
3.	VinMax	22.0 V	Maximum input voltage
4.	VinMin	14.0 V	Minimum input voltage
5.	Vout	1.5 V	Output Voltage
6.	Vout1	1.5 Volt	Output Voltage #1
7.	base_pn	LM25085	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. For a Constant On Time device to be stable, we need to provide a ripple at the feedback comparator. There are various methods to implement the ripple. Depending on the circuit complexity vs. the allowable ripple, we have three options to choose from. The simplest option, 'Low Complexity', would require only a high ESR cap at the output. This means that the BOM count will be small, but the output voltage ripple will be quite large. The 'optimal solution' would require a feed-forward cap in parallel with the upper feedback resistor to AC couple the ripple to the feedback node. This increases the BOM count slightly, but now we have more control over the output voltage ripple. If the output voltage requirement is very tight, then the best option is to go for the 'Low Output Ripple' solution. In this option we can go with very low ESR output caps and have very good control over the output voltage ripple

2. **LM25085** Product Folder : http://www.ti.com/product/lm25085 : contains the data sheet and other resources.

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