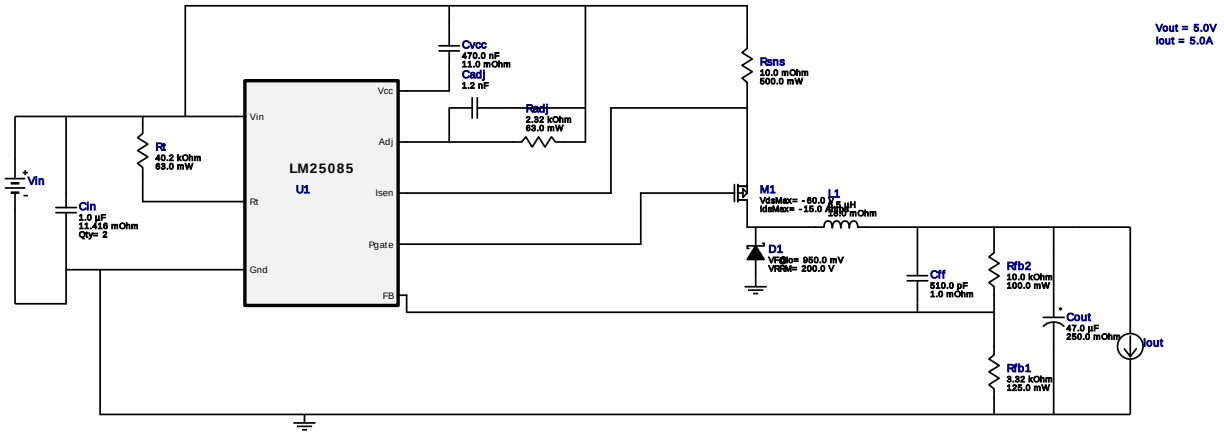
WEBENCH® Design Report

VinMin = 22.0V
VinMax = 26.0V
Vout = 5.0V
Iout = 5.0A

Device = LM25085MY/NOPB
Topology = Buck
Created = 2017-11-11 22:04:13.718
BOM Cost = $1.95
BOM Count = 15
Total Pd = 6.08W

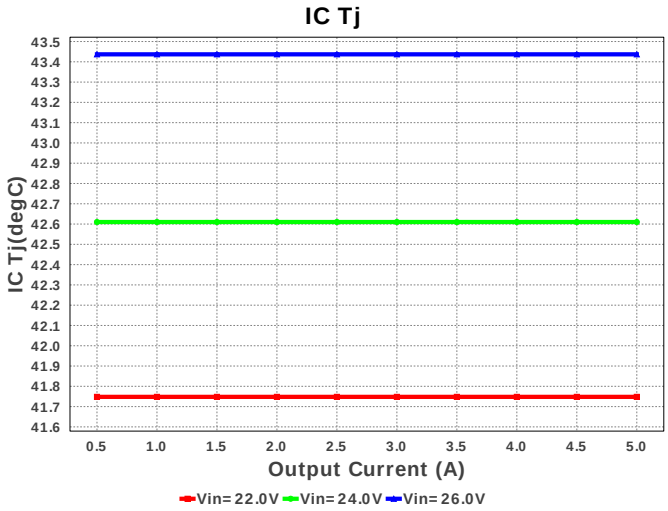
Design : 3559205/11 LM25085MY/NOPB
LM25085MY/NOPB 22.0V-26.0V to 5.00V @ 5.0A

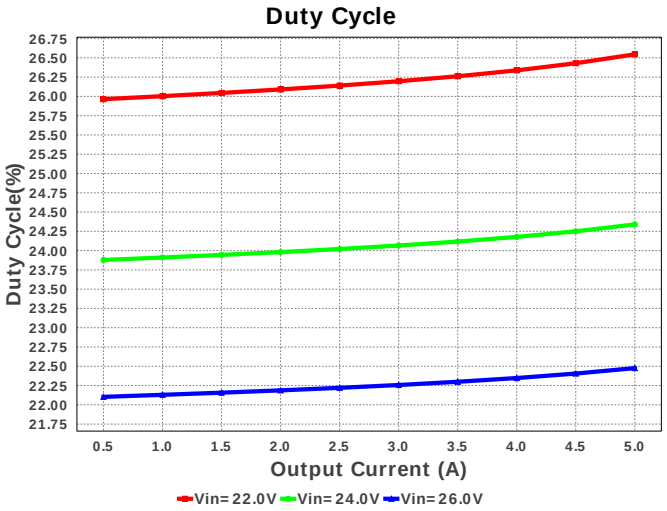


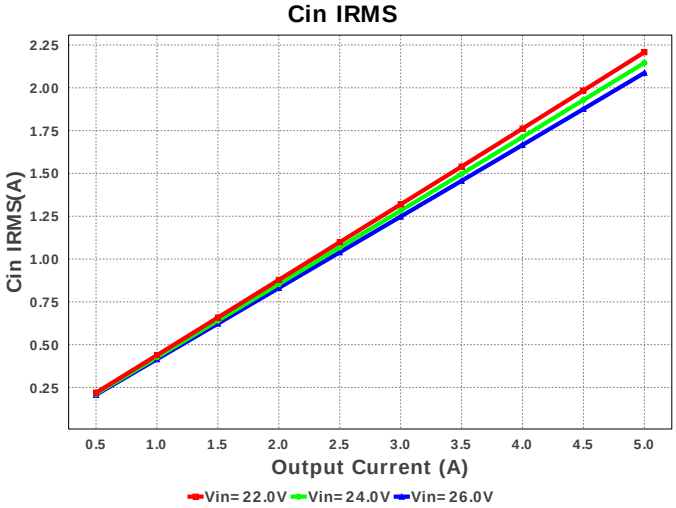
Electrical BOM

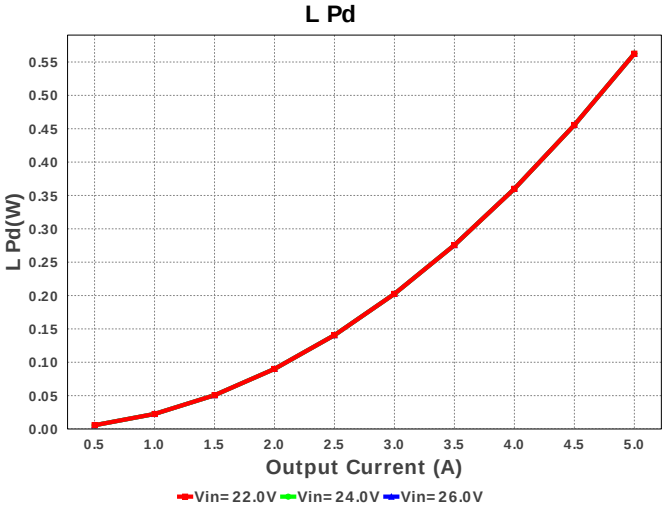
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cadj	Samsung Electro-Mechanics	CL21C122JBFNNWE Series= C0G/NP0	Cap= 1.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cff	MuRata	GRM1555C1E511JA01D Series= C0G/NP0	Cap= 510.0 pF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.02	0402 3 mm²
3.	Cin	TDK	C1005X5R1V105K050BC Series= X5R	Cap= 1.0 uF ESR= 11.416 mOhm VDC= 35.0 V IRMS= 1.483 A	2	$0.03	0402 3 mm²
4.	Cout	AVX	TPSB476K010R0250 Series= TPS	Cap= 47.0 uF ESR= 250.0 mOhm VDC= 10.0 V IRMS= 525.0 mA	1	$0.20	3528-21 17 mm²
5.	Cvcc	AVX	0805YC474KAT2A Series= X7R	Cap= 470.0 nF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
6.	D1	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	$0.11	DPAK 102 mm²
7.	L1	Bourns	SRR1208-6R5ML	L= 6.5 µH DCR= 18.0 mOhm	1	$0.38	SRR1208 216 mm²
8.	M1	Fairchild Semiconductor	FDD5614P	VdsMax= -60.0 V IdsMax= -15.0 Amps	1	$0.30	DPAK 102 mm²

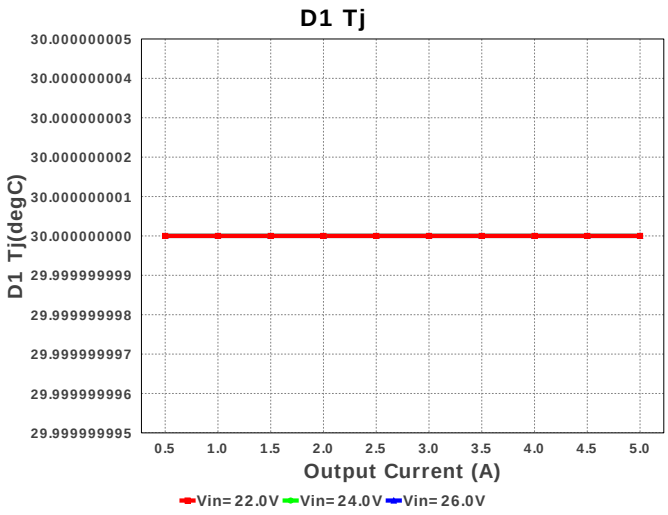
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Radj	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfb1	Panasonic	ERJ-6ENF3321V Series= ERJ-6E	Res= 3.32 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
11.	Rfb2	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 7 mm²
12.	Rsns	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	1206 11 mm²
13.	Rt	Vishay-Dale	CRCW040240K2FKED Series= CRCW..e3	Res= 40.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
14.	U1	Texas Instruments	LM25085MY/NOPB	Switcher	1	$0.70	MUY08A 24 mm²

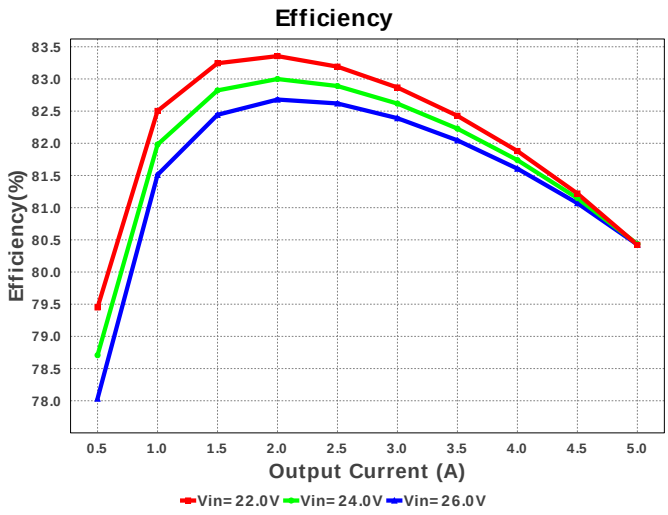


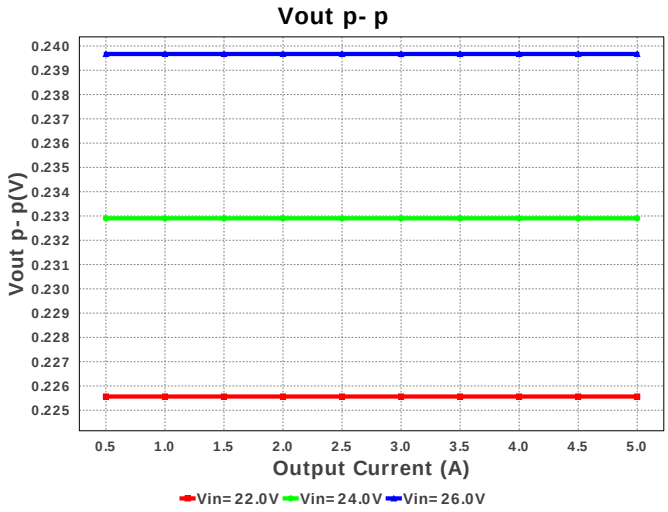


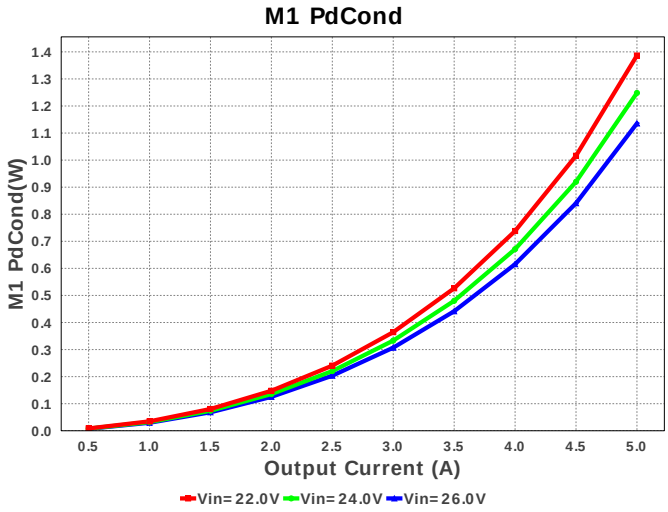


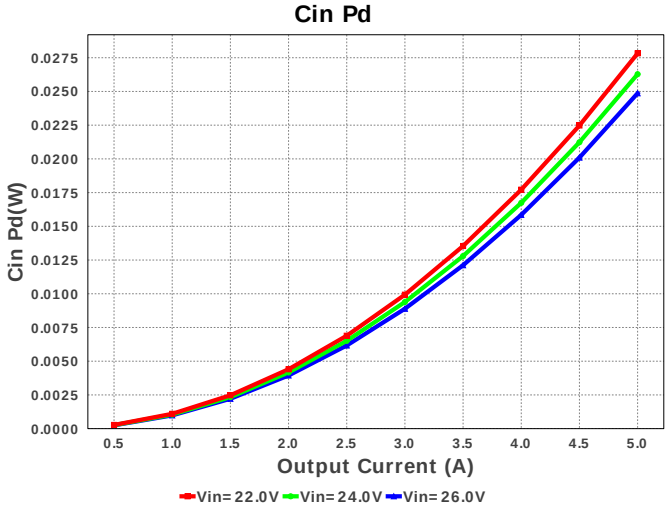


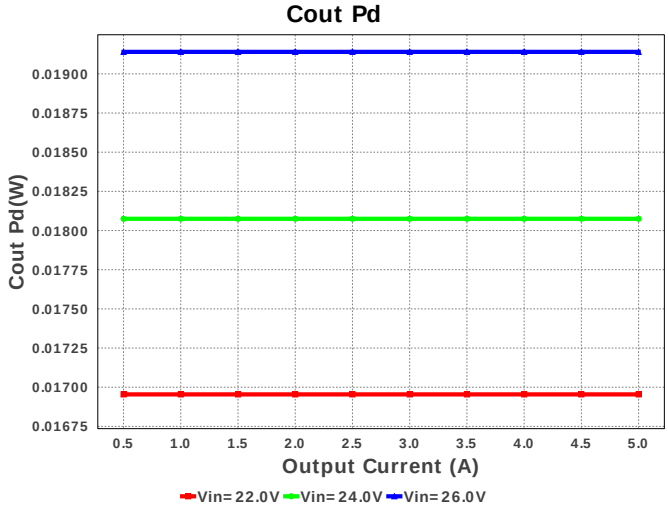


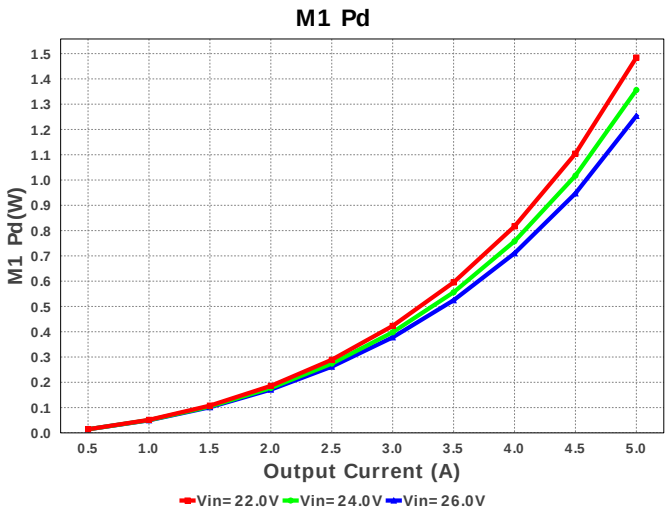


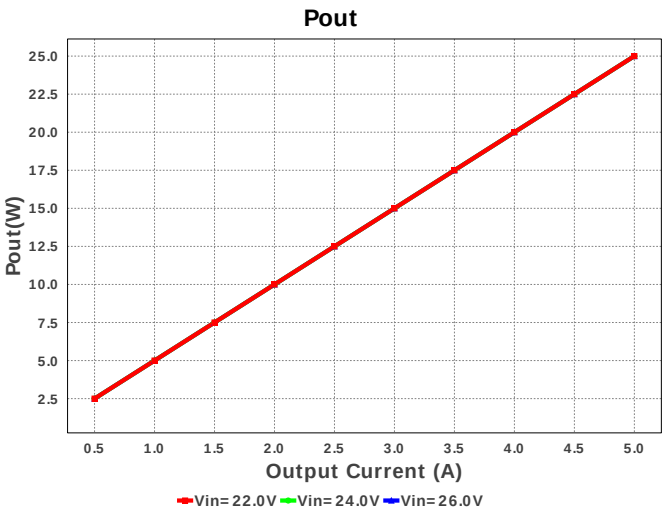


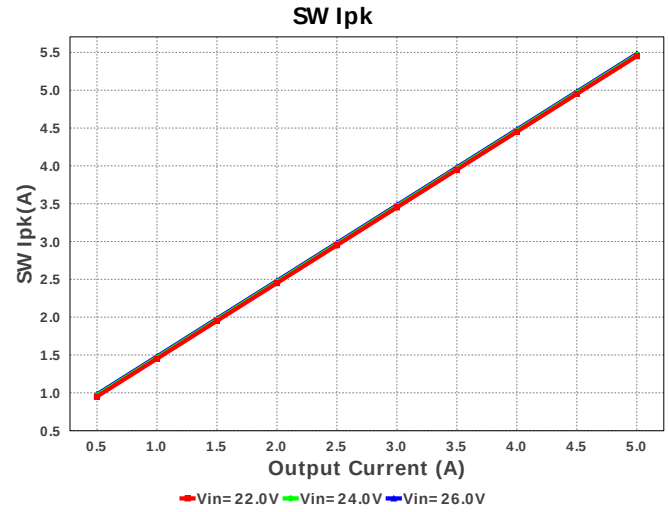


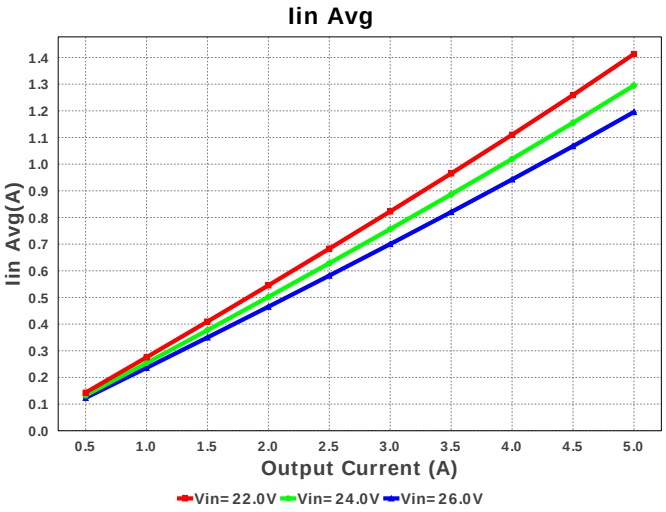


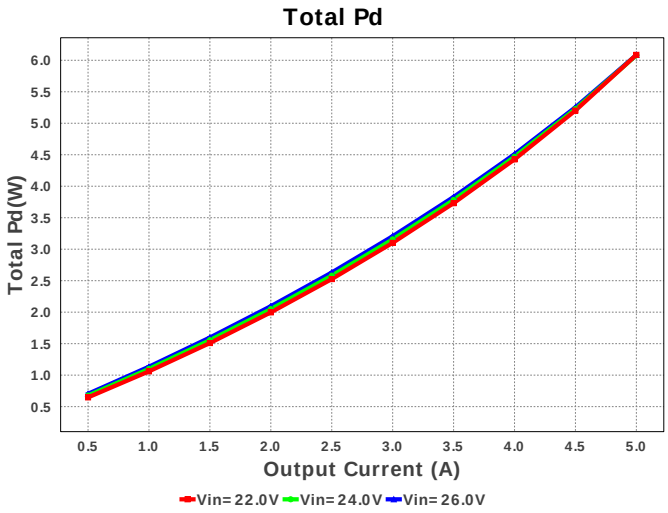


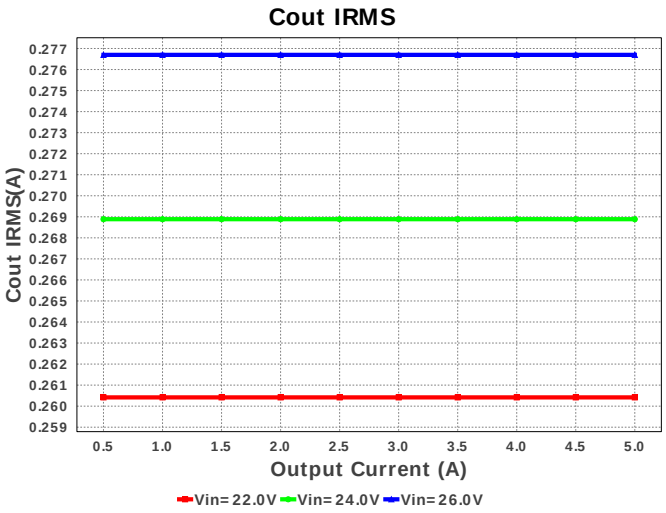


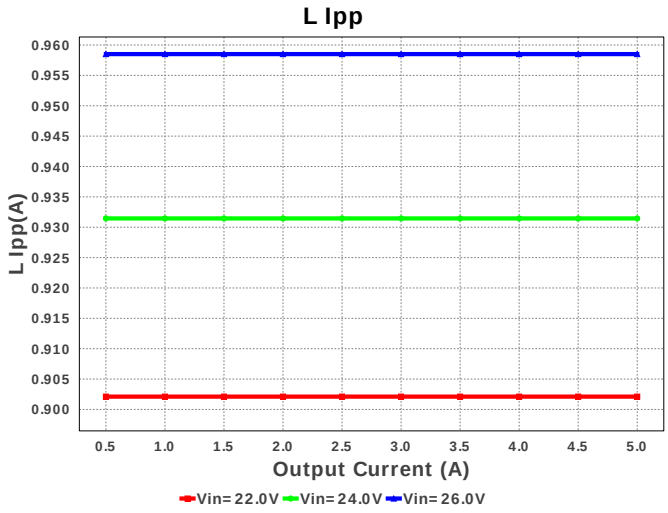


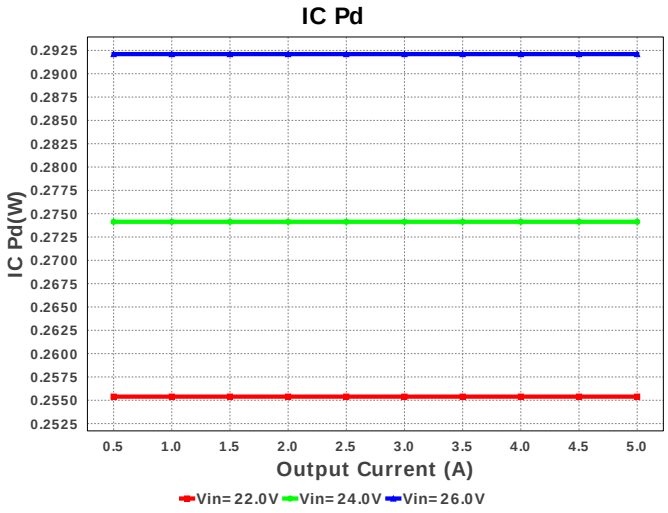


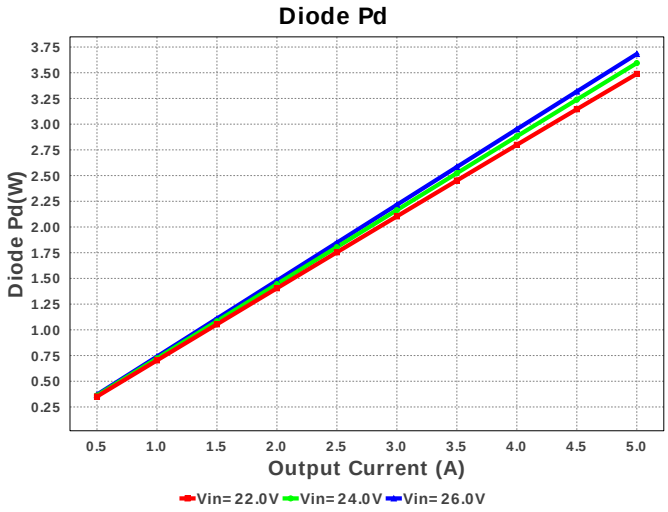


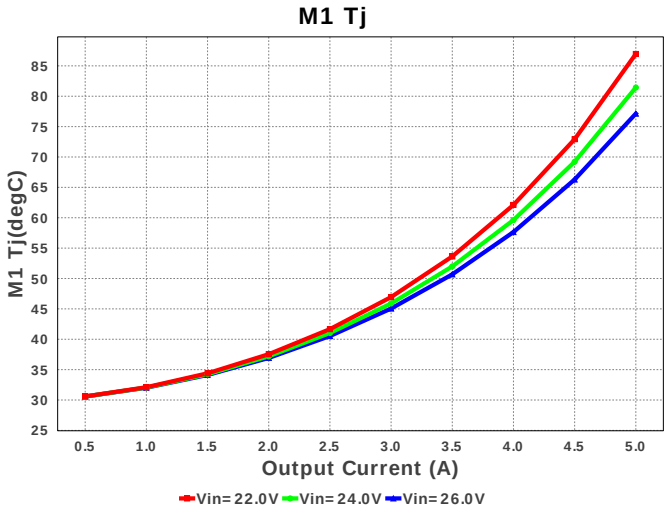


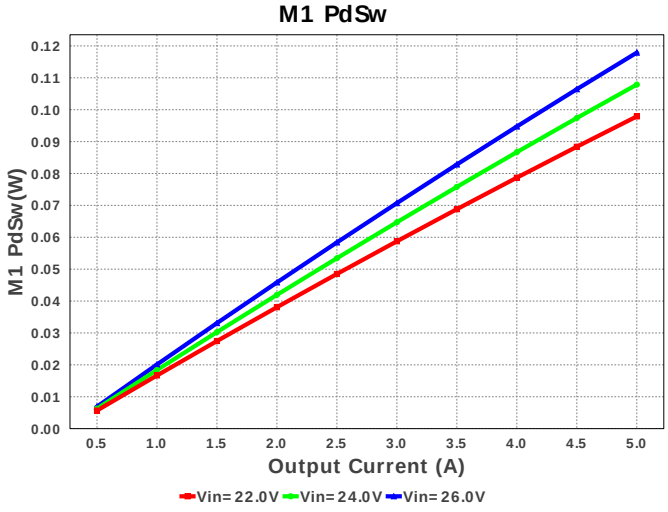












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.087 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	276.697 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.195 A	Current	Average input current
4.	L Ipp	958.51 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	5.479 A	Current	Peak switch current
6.	BOM Count	15	General	Total Design BOM count
7.	FootPrint	513.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	554.712 kHz	General	Switching frequency
9.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
10.	Mode	CCM	General	Conduction Mode
11.	Pout	25.0 W	General	Total output power

#	Name	Value	Category	Description
12.	Total BOM	$1.95	General	Total BOM Cost
13.	D1 Tj	30.0 degC	Op_Point	D1 junction temperature
14.	Vout Actual	5.015 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
16.	Duty Cycle	22.475 %	Op_point	Duty cycle
17.	Efficiency	80.434 %	Op_point	Steady state efficiency
18.	IC Tj	43.437 degC	Op_point	IC junction temperature
19.	ICThetaJA	46.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	5.0 A	Op_point	Iout operating point
21.	M1 Tj	77.135 degC	Op_point	M1 MOSFET junction temperature
22.	VIN_OP	26.0 V	Op_point	Vin operating point
23.	Vout p-p	239.671 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	24.864 mW	Power	Input capacitor power dissipation
25.	Cout Pd	19.14 mW	Power	Output capacitor power dissipation
26.	Diode Pd	3.682 W	Power	Diode power dissipation
27.	IC Pd	292.105 mW	Power	IC power dissipation
28.	L Pd	562.5 mW	Power	Inductor power dissipation
29.	M1 Pd	1.25 W	Power	M1 MOSFET total power dissipation
30.	M1 PdCond	1.133 W	Power	M1 MOSFET conduction losses
31.	M1 PdSw	117.894 mW	Power	M1 MOSFET switching losses
32.	Total Pd	6.081 W	Power	Total Power Dissipation
33.	Vout Tolerance	3.16 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	5.0	Maximum Output Current
2.	VinMax	26.0	Maximum input voltage
3.	VinMin	22.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LM25085	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	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.