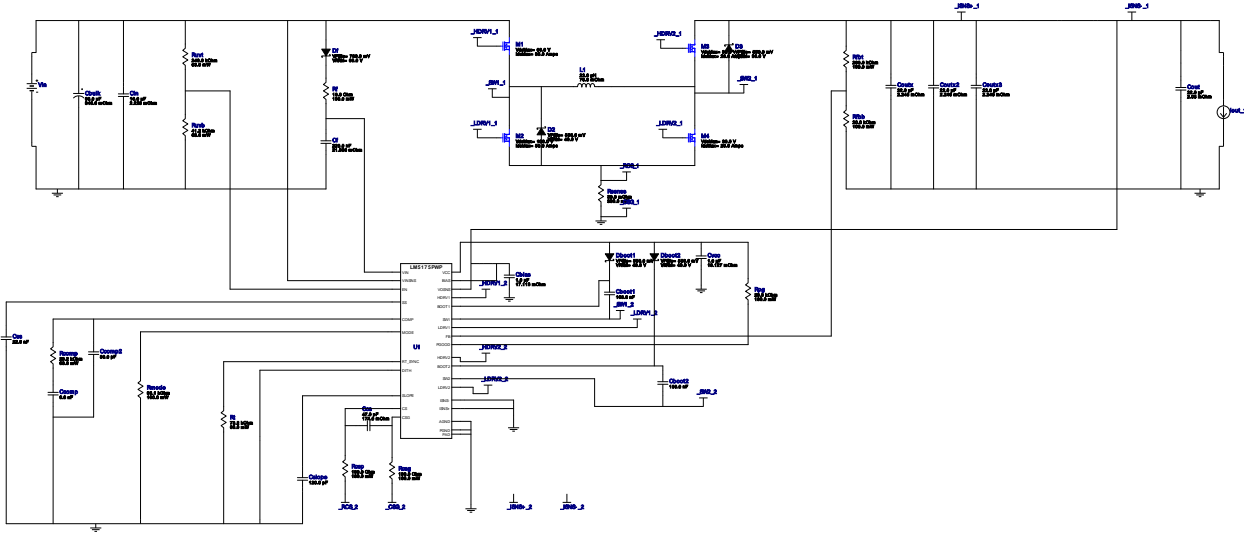


WEBENCH® Design Report





















 Design : 916945/906 LM5175PWPR
 LM5175PWPR 9.0V-32.0V to 12.00V @ 1.0A


My Comments

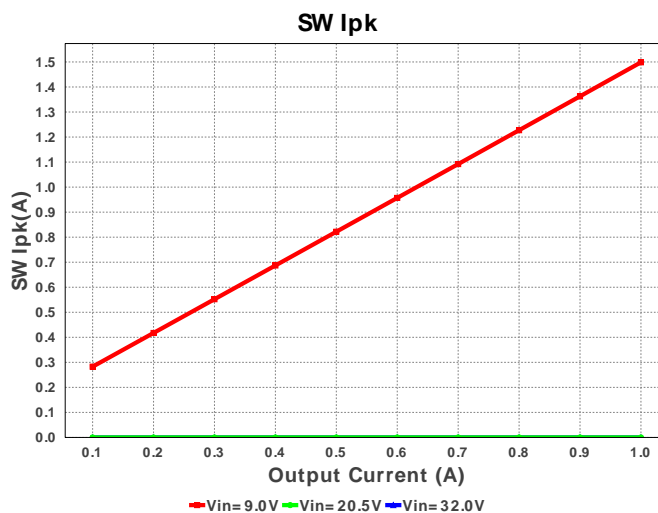
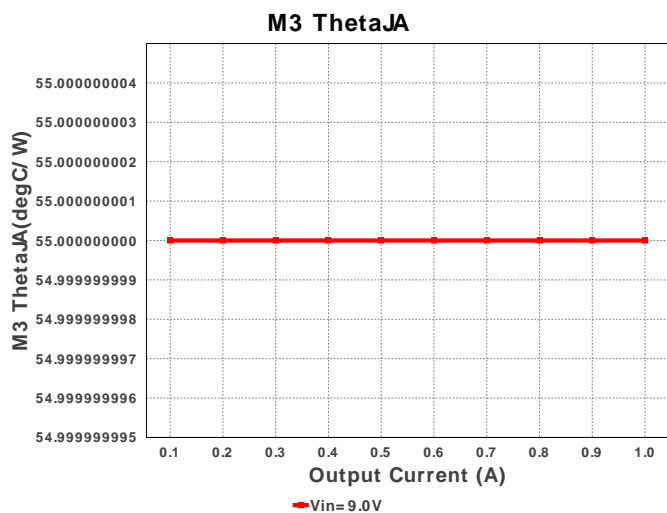
Buck Boost for ELI from e2e Forum

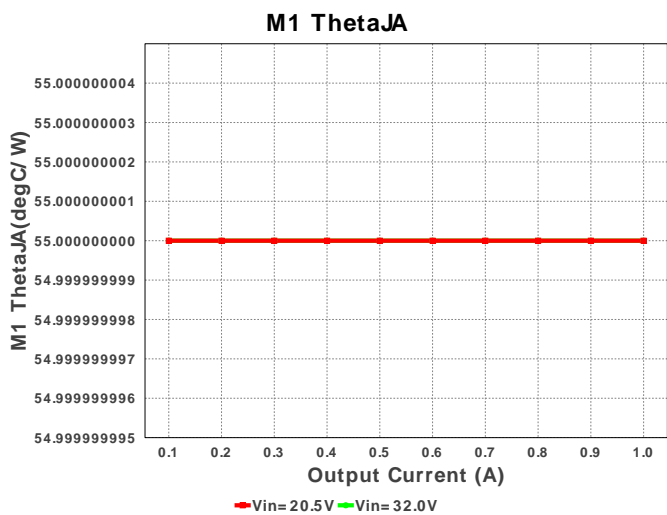
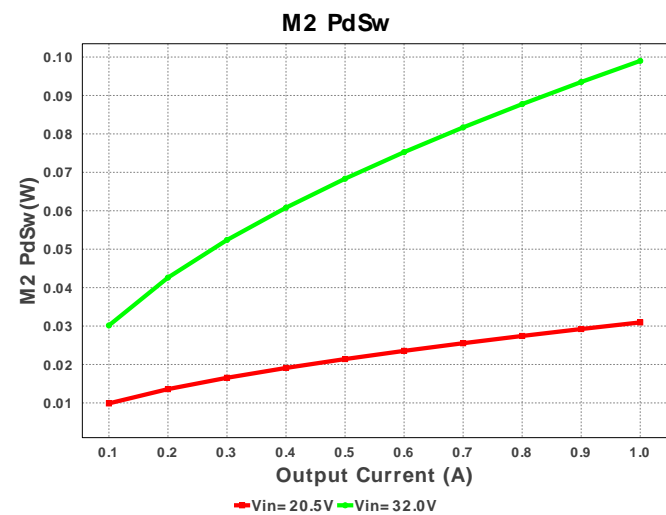
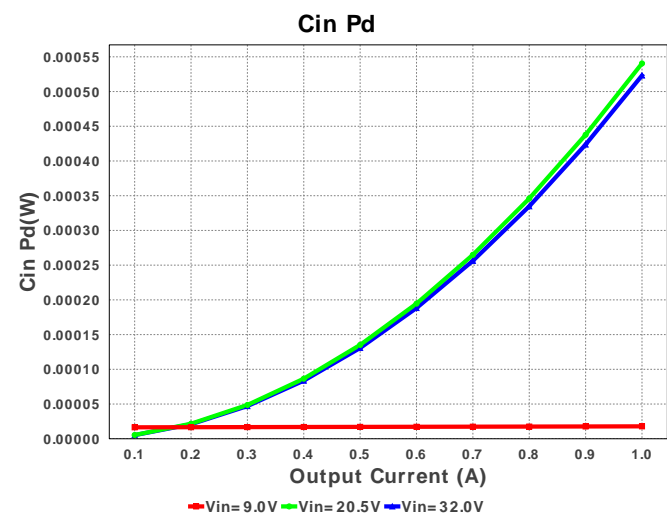
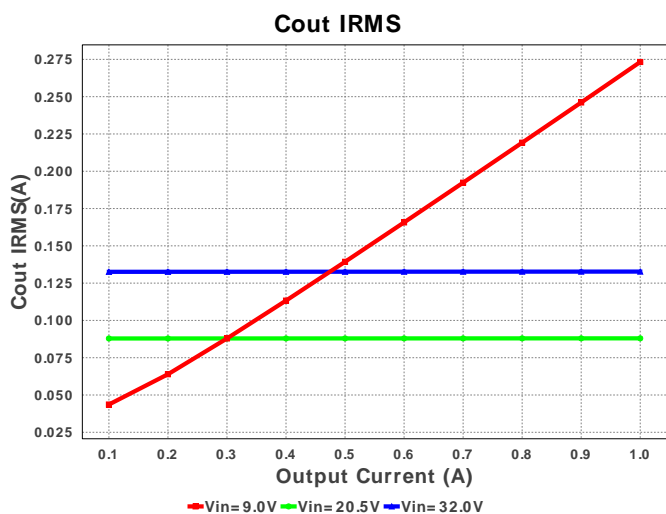
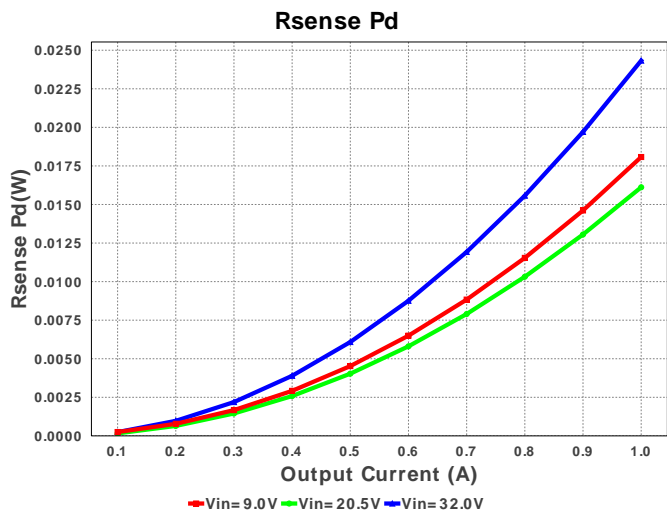
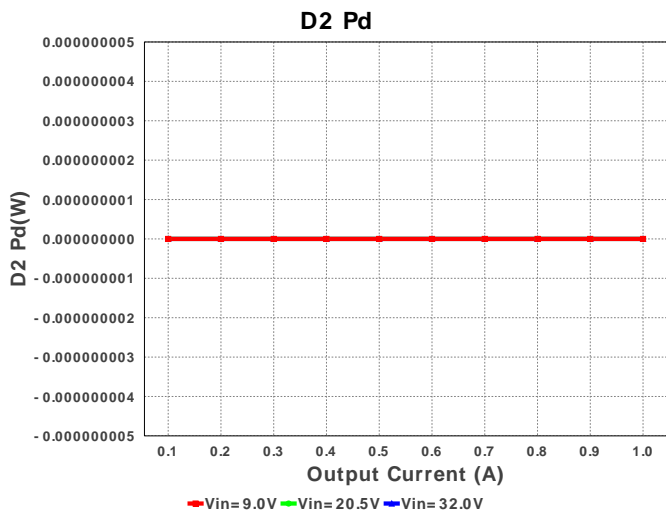
Electrical BOM

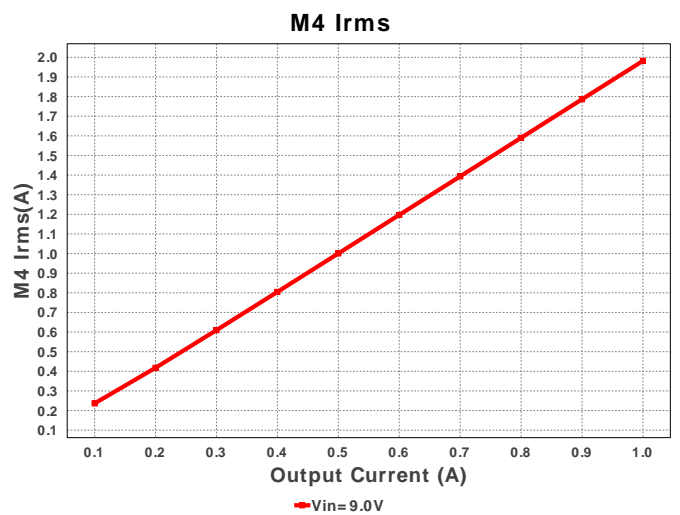
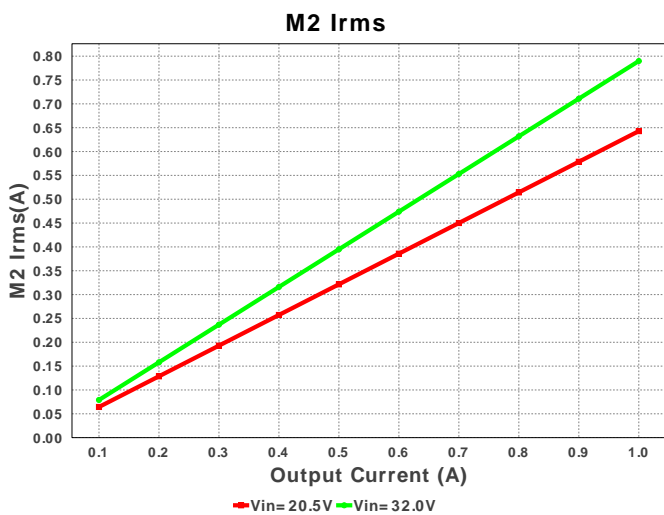
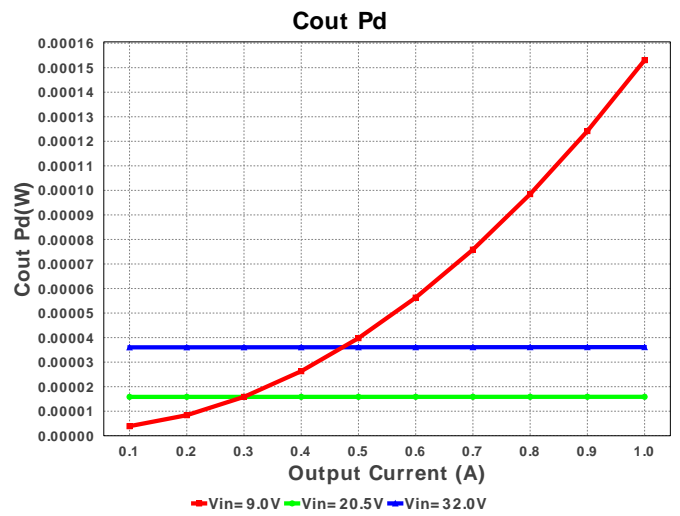
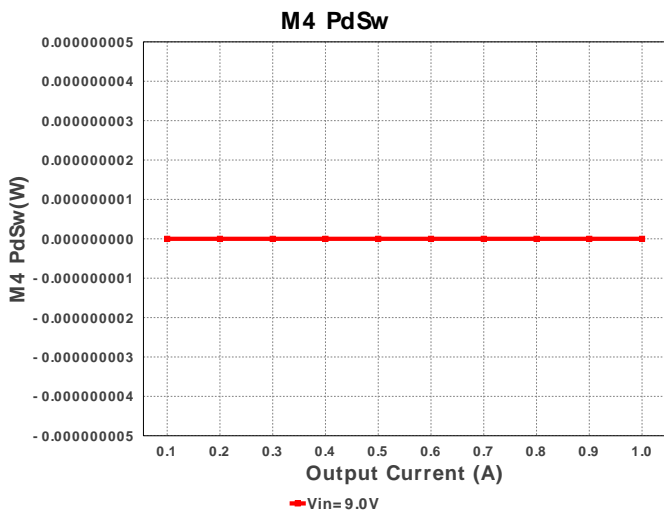
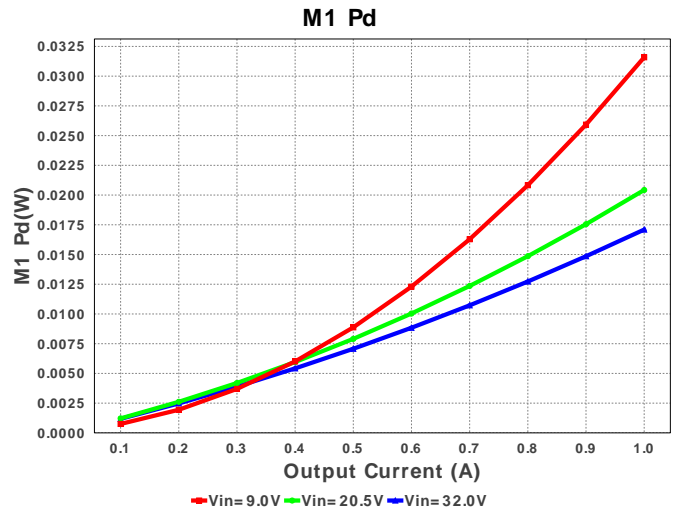
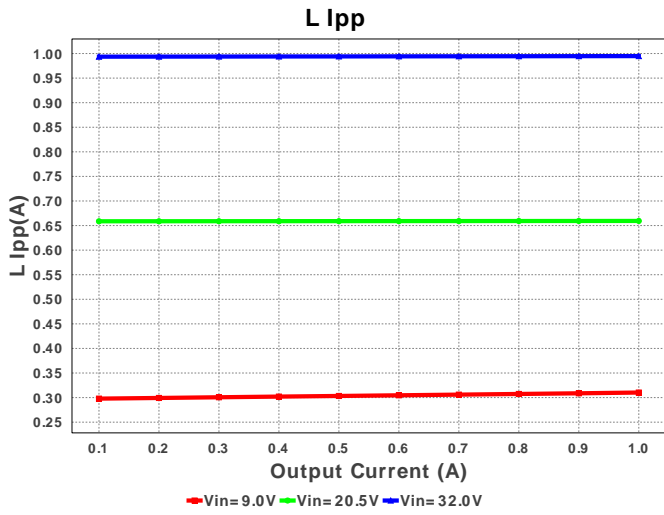
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1.	Cbias	MuRata	GRM188R61E105KA12D Series= X5R	Cap= 1.0 uF ESR= 17.113 mOhm VDC= 25.0 V IRMS= 979.39 mA	1	\$0.01	0603 5 mm ²
2.	Cboot1	Kemet	C0603C104K3RACTU Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
3.	Cboot2	Kemet	C0603C104K3RACTU Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
4.	Cbulk	Nichicon	UUD1H680MNL1GS Series= uD	Cap= 68.0 uF ESR= 340.0 mOhm VDC= 50.0 V IRMS= 300.0 mA	1	\$0.20	 SM_RADIAL_8MM 113 mm ²
5.	Ccomp	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
6.	Ccomp2	Yageo America	CC0805JRNPO9BN390 Series= C0G/NP0	Cap= 39.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
7.	Ccs	AVX	06035A470JAT2A Series= C0G/NP0	Cap= 47.0 pF ESR= 174.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
8.	Cf	TDK	C1608X5R1H224K080AB Series= X5R	Cap= 220.0 nF ESR= 21.699 mOhm VDC= 50.0 V IRMS= 1.125 A	1	\$0.03	0603 5 mm ²

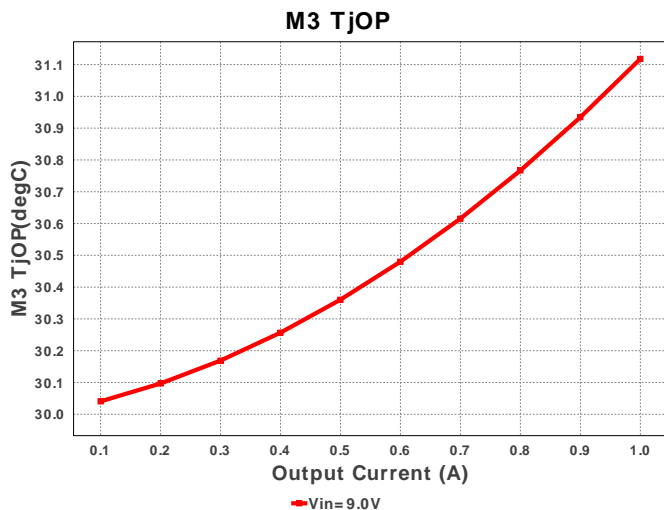
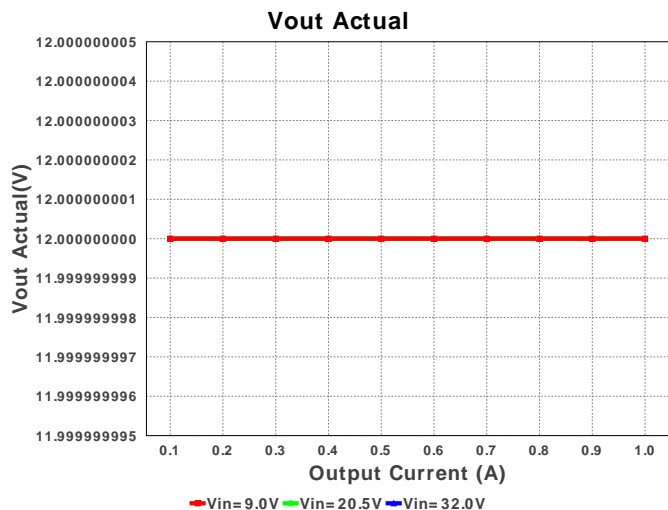
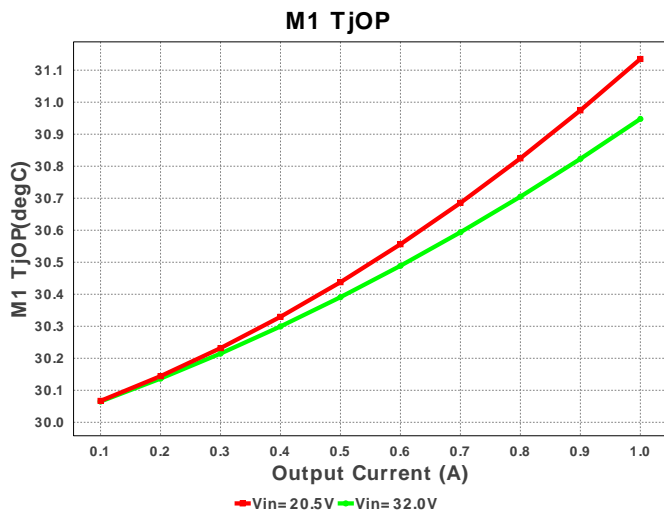
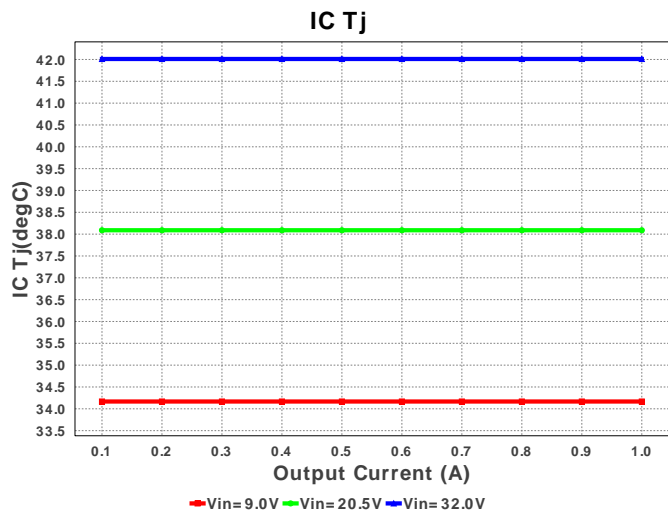
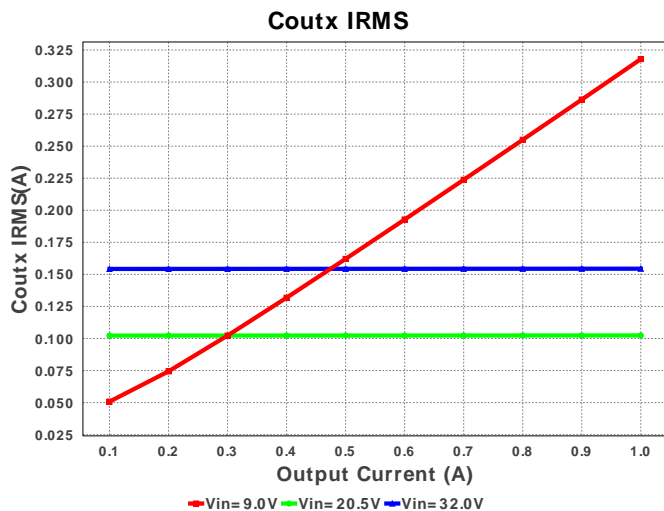
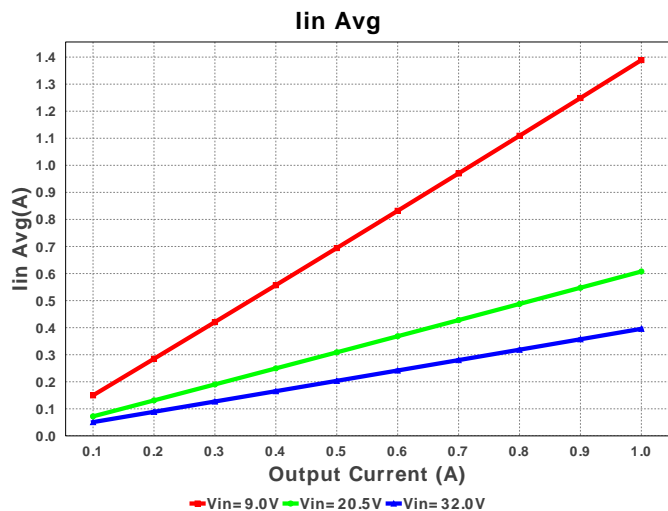
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9.	Cin	TDK	C3216X5R1H106K160AB Series= X5R	Cap= 10.0 uF ESR= 2.229 mOhm VDC= 50.0 V IRMS= 4.8593 A	1	\$0.20	 1206_180 11 mm ²
10.	Cout	TDK	C2012X6S1C226M125AC Series= X6S	Cap= 22.0 uF ESR= 2.05 mOhm VDC= 16.0 V IRMS= 4.5559 A	1	\$0.18	 0805 7 mm ²
11.	Coutx	TDK	C3216JB1E226M Series= JB	Cap= 22.0 uF ESR= 2.246 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.55	 1206 11 mm ²
12.	Coutx2	TDK	C3216JB1E226M Series= JB	Cap= 22.0 uF ESR= 2.246 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.55	 1206 11 mm ²
13.	Coutx3	TDK	C3216JB1E226M Series= JB	Cap= 22.0 uF ESR= 2.246 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.55	 1206 11 mm ²
14.	Cslope	Yageo America	CC0603JRNPO9BN121 Series= C0G/NP0	Cap= 120.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
15.	Css	Kemet	C0603C223K3RACTU Series= X7R	Cap= 22.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
16.	Cvcc	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	\$0.01	 0603 5 mm ²
17.	D2	Fairchild Semiconductor	SS14FL	VF@Io= 550.0 mV VRRM= 40.0 V	1	\$0.06	 SOD-123F 12 mm ²
18.	D3	Panasonic	DB2S31600L	VF@Io= 550.0 mV VRRM= 30.0 V	1	\$0.04	 SOD-523 5 mm ²
19.	Dboot1	Fairchild Semiconductor	SS14FL	VF@Io= 550.0 mV VRRM= 40.0 V	1	\$0.06	 SOD-123F 12 mm ²
20.	Dboot2	Fairchild Semiconductor	SS14FL	VF@Io= 550.0 mV VRRM= 40.0 V	1	\$0.06	 SOD-123F 12 mm ²
21.	Df	Fairchild Semiconductor	SS26FL	VF@Io= 700.0 mV VRRM= 60.0 V	1	\$0.09	 SOD-123F 12 mm ²
22.	L1	TDK	SLF7055T-220M1R7-3PF	L= 22.0 uH DCR= 76.8 mOhm	1	\$0.46	 SLF7055 81 mm ²
23.	M1	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	\$0.27	 DNH0008A 18 mm ²
24.	M2	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	\$0.41	 DQG0008A 18 mm ²
25.	M3	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	\$0.17	 DNH0008A 18 mm ²
26.	M4	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	\$0.17	 DNH0008A 18 mm ²
27.	Rcomp	Vishay-Dale	CRCW040223K2FKED Series= CRCW..e3	Res= 23.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
28.	Rcsg	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²

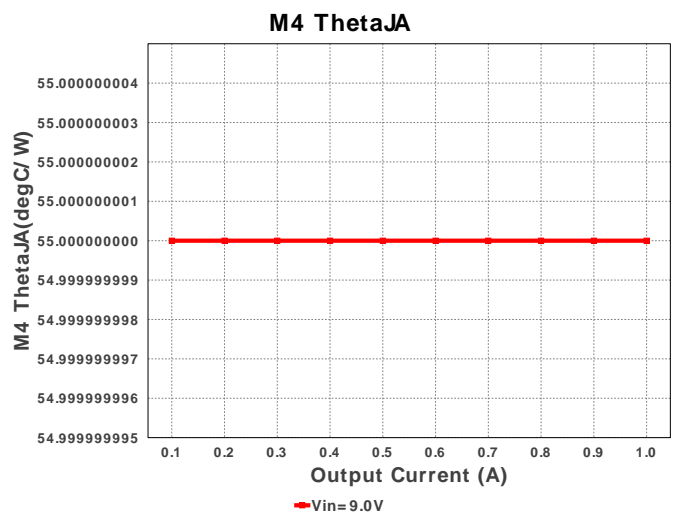
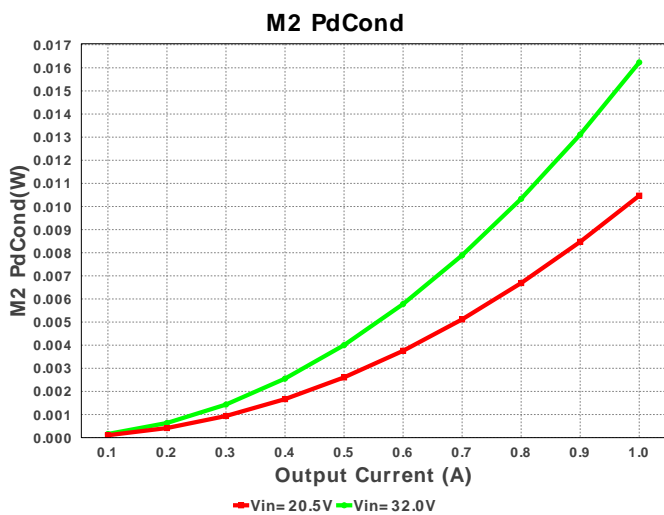
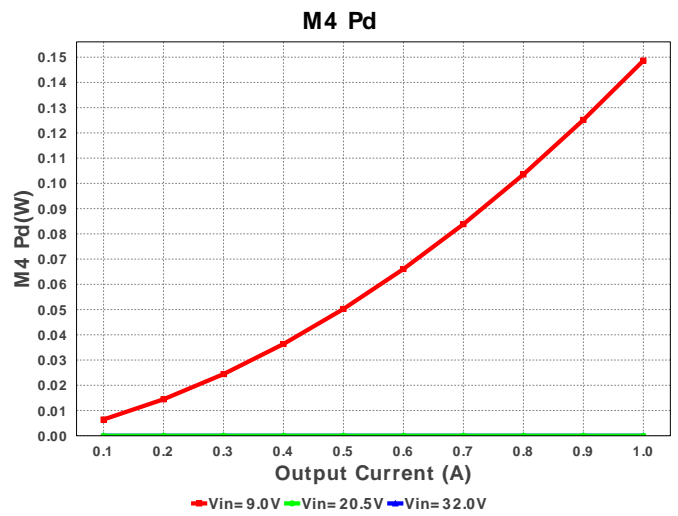
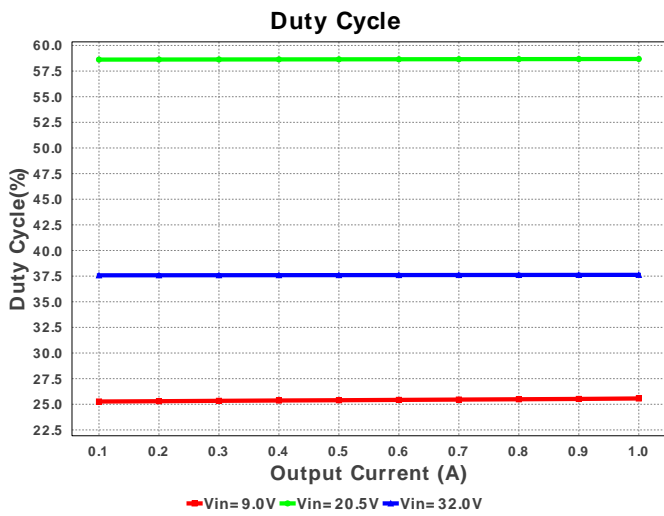
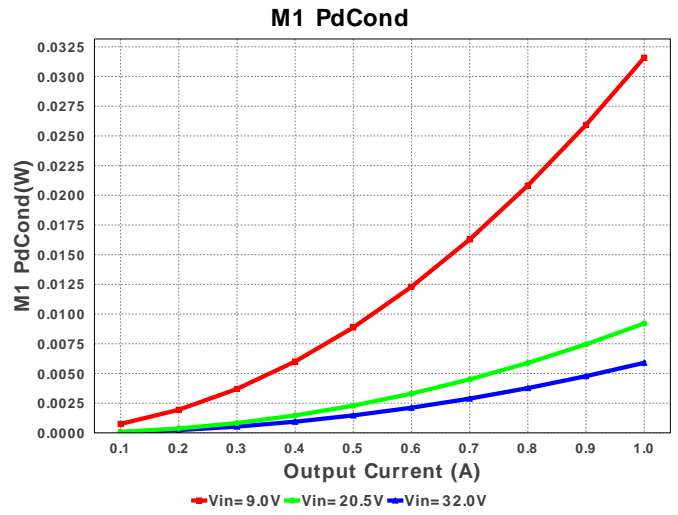
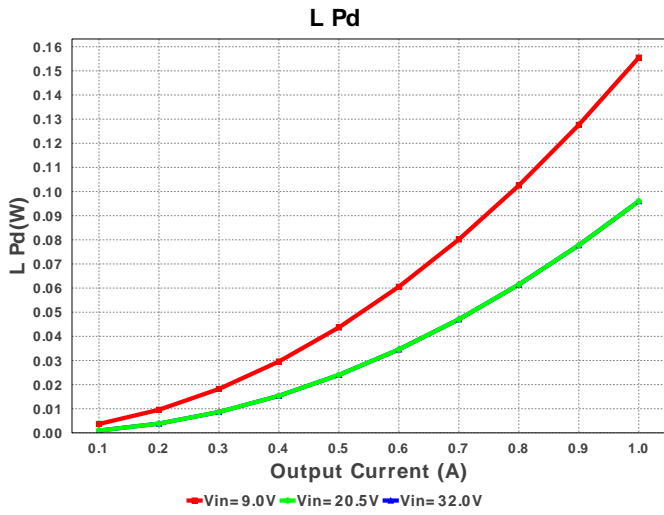
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29.	Rcsp	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
30.	Rf	Vishay-Dale	CRCW060310R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
31.	Rfbb	Vishay-Dale	CRCW060320K0FKEA Series= CRCW..e3	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
32.	Rfbb	Vishay-Dale	CRCW0603280KFKEA Series= CRCW..e3	Res= 280.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
33.	Rmode	Vishay-Dale	CRCW060393K1FKEA Series= CRCW..e3	Res= 93.1 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
34.	Rpg	Vishay-Dale	CRCW060320K0FKEA Series= CRCW..e3	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
35.	Rsense	Panasonic	ERJ-L14KF39MU Series= ERJ-L14	Res= 39.0 mOhm Power= 330.0 mW Tolerance= 1.0%	1	\$0.10	1210 15 mm ²
36.	Rt	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
37.	Ruvb	Vishay-Dale	CRCW040241K2FKED Series= CRCW..e3	Res= 41.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
38.	Ruvt	Vishay-Dale	CRCW0402249KFKED Series= CRCW..e3	Res= 249.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
39.	U1	Texas Instruments	LM5175PWPR	Switcher	1	\$3.10	 PWP0028F_N 98 mm ²

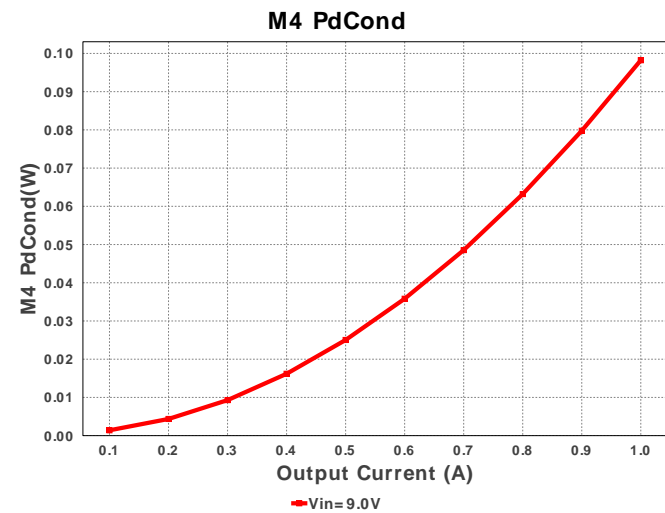
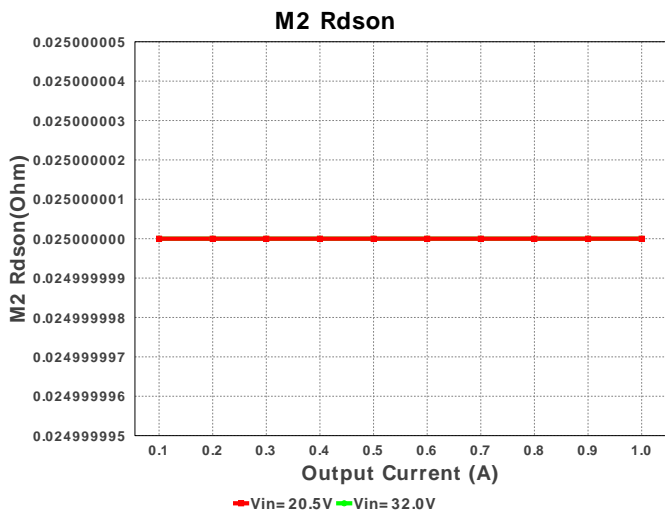
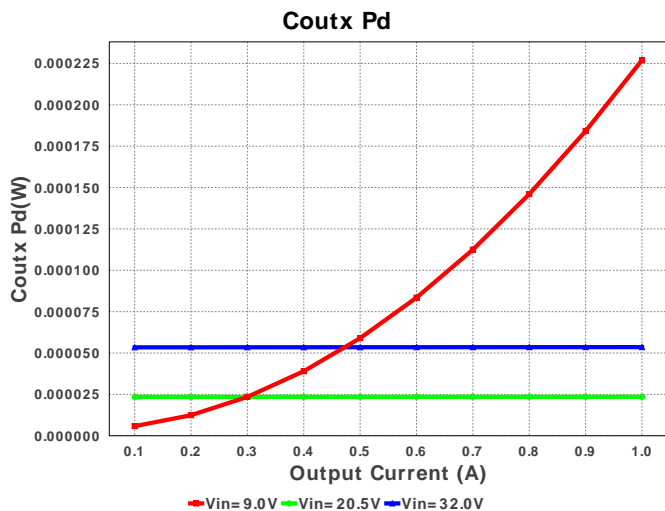
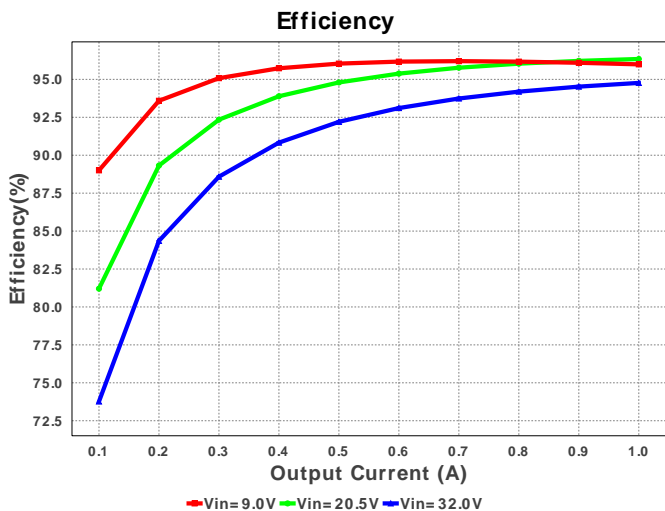
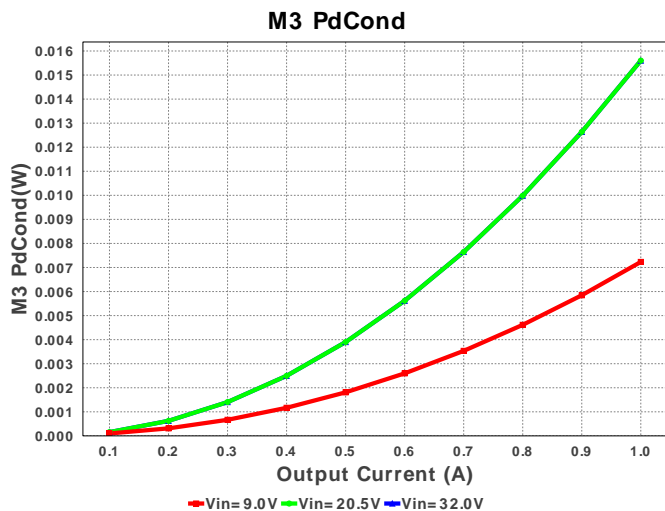
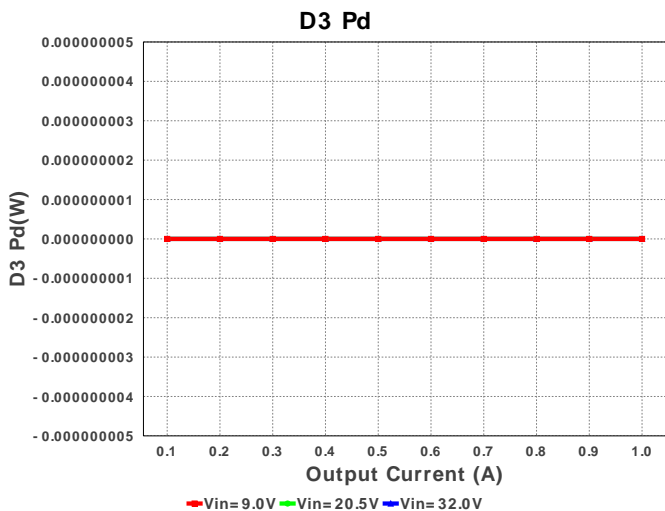


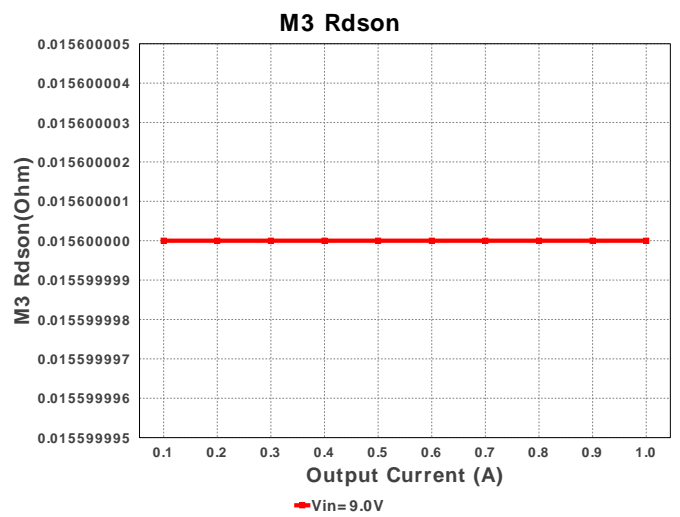
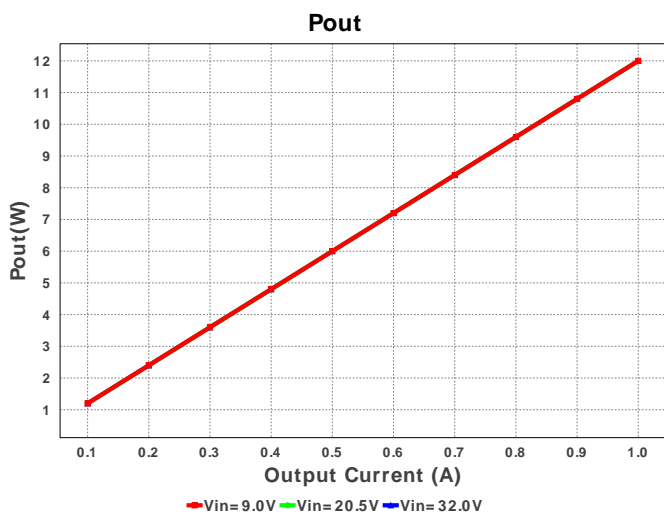
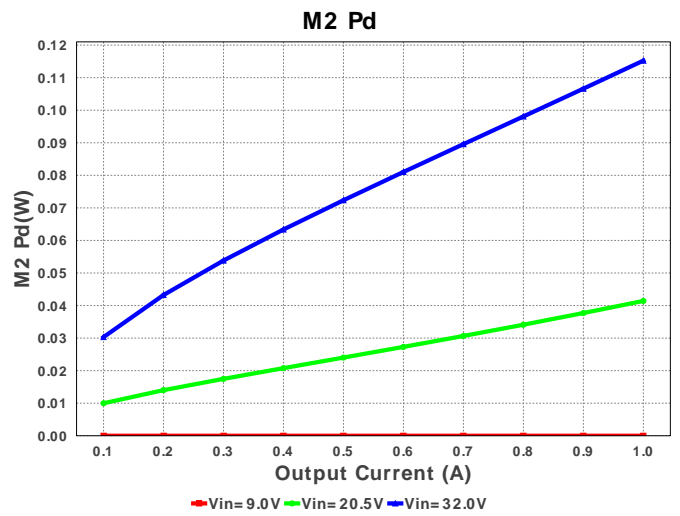
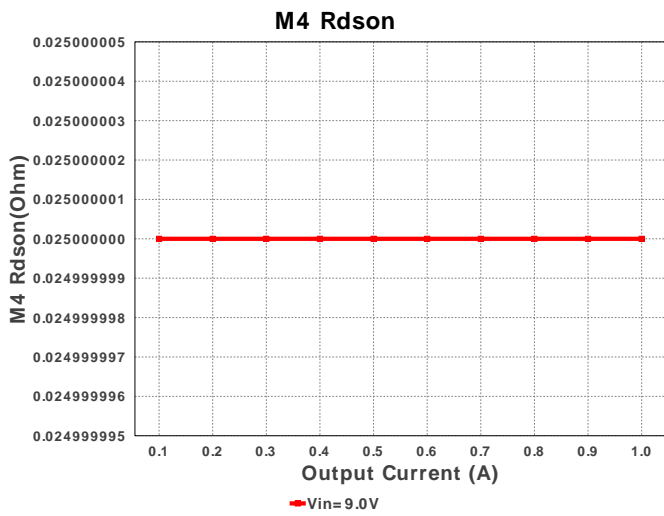
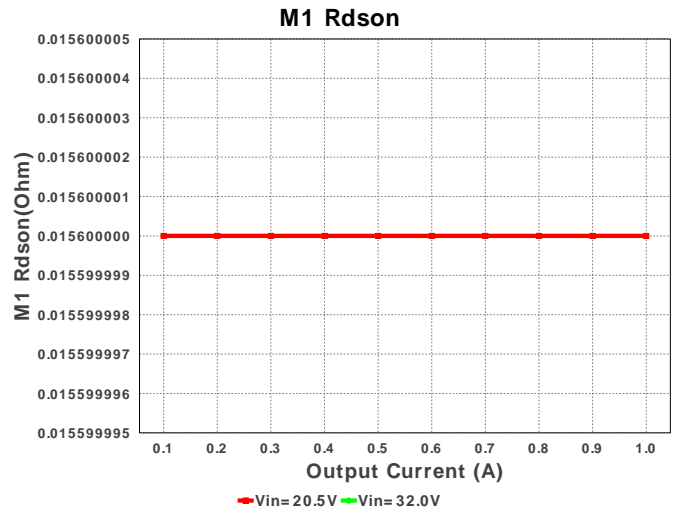
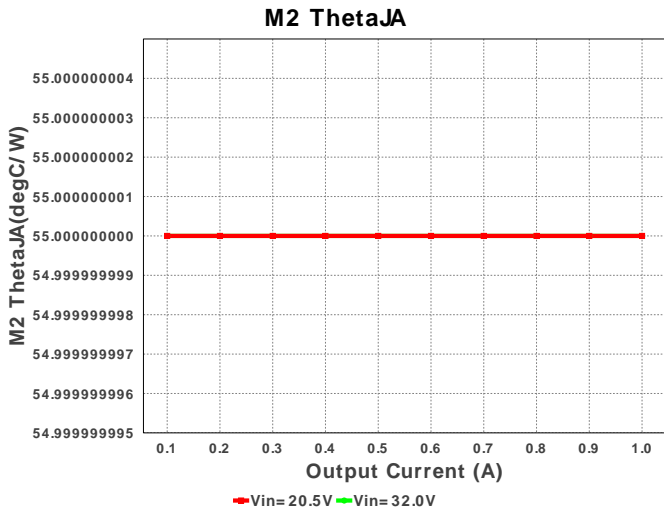


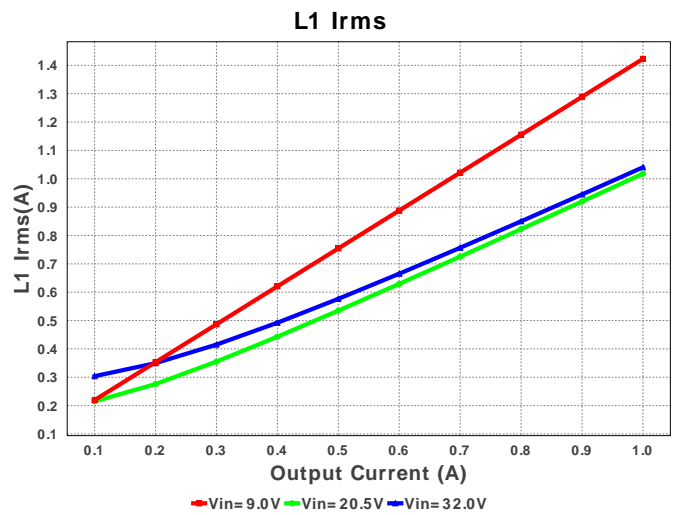
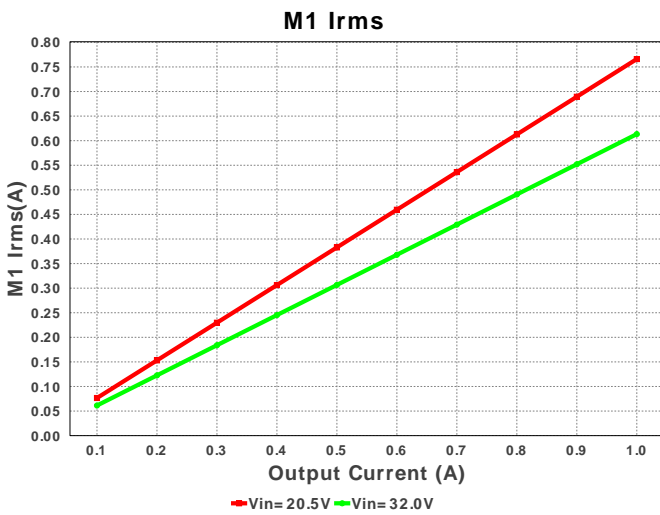
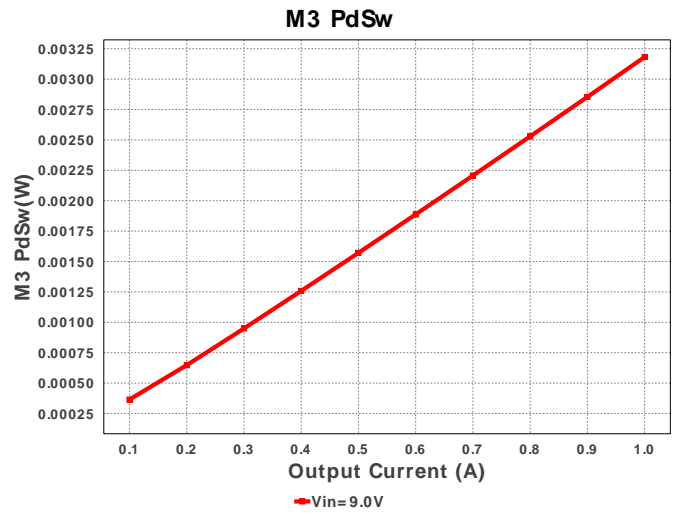
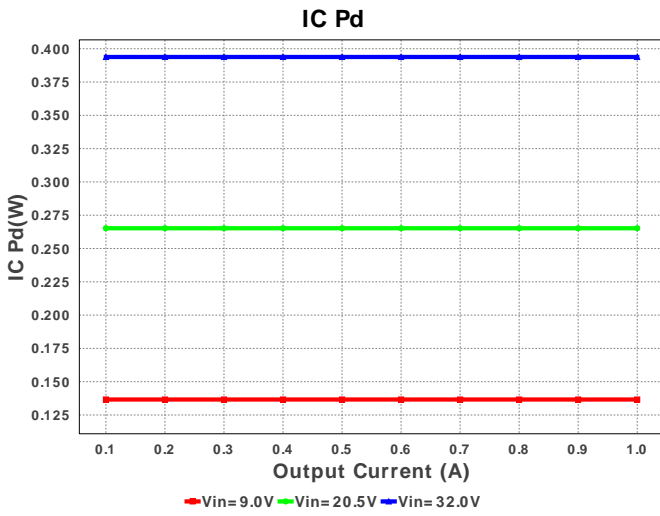
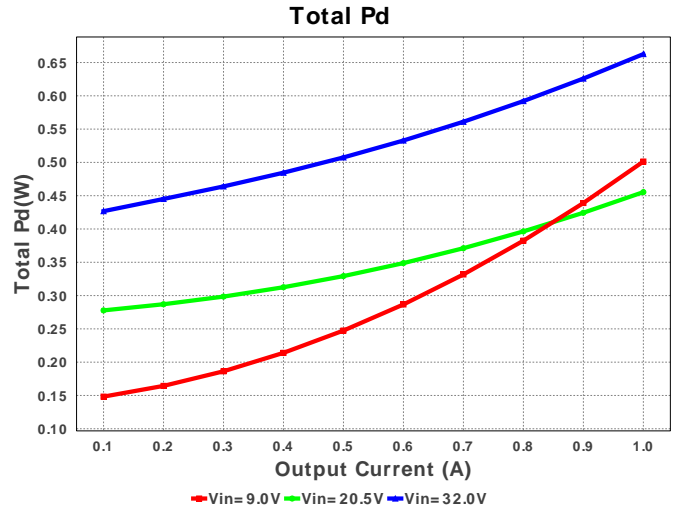
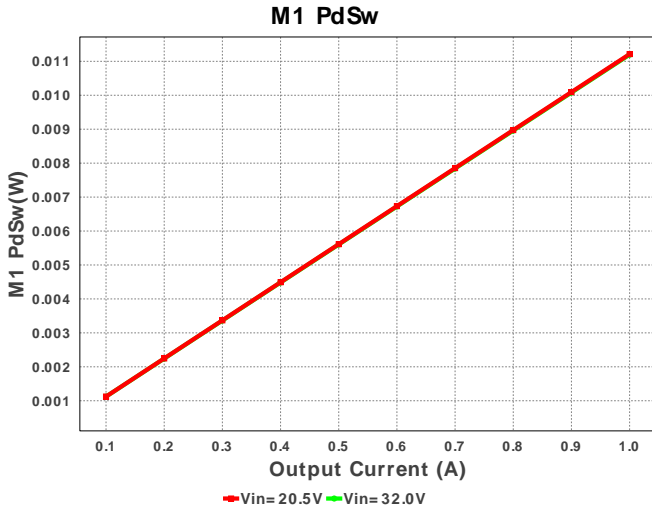


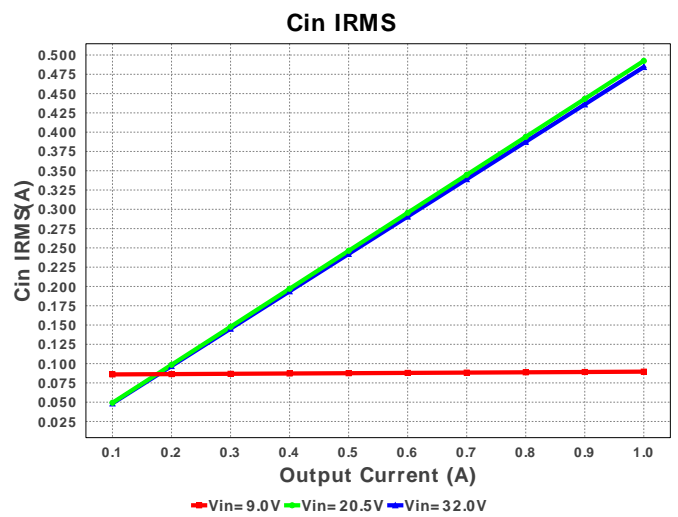
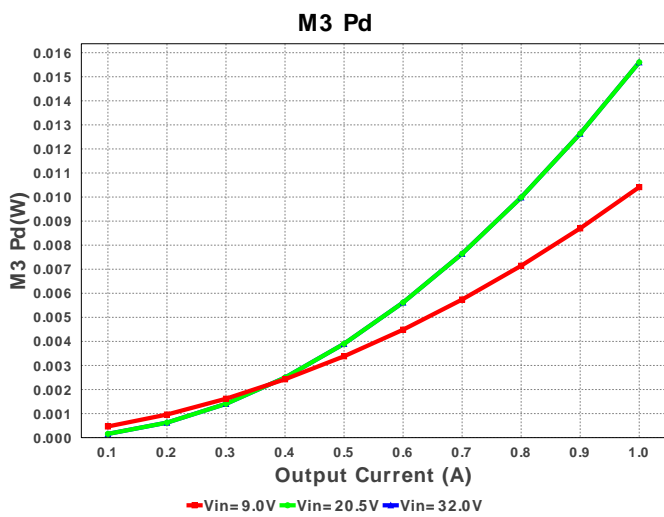
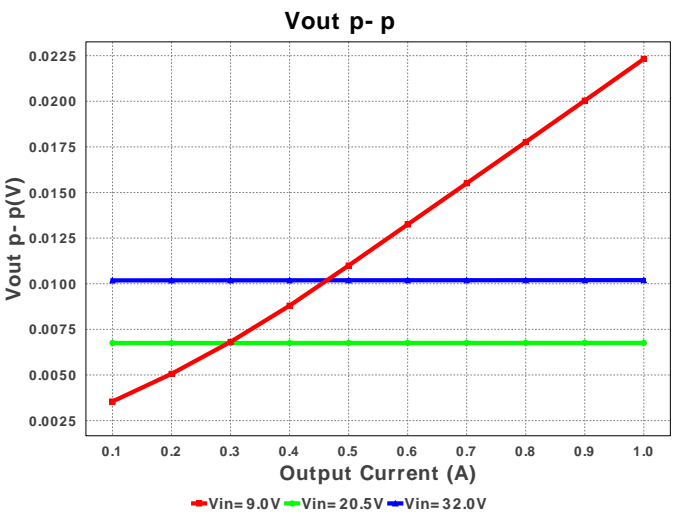
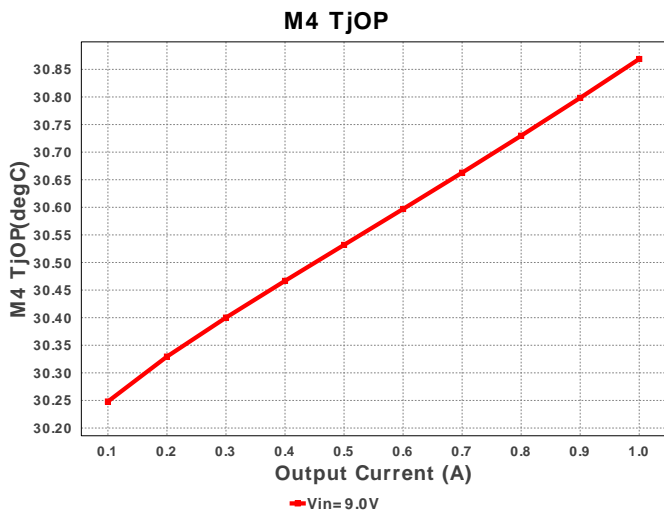
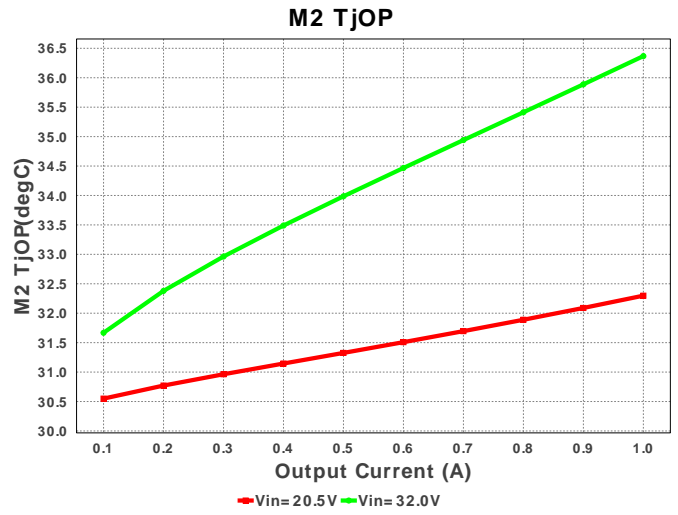
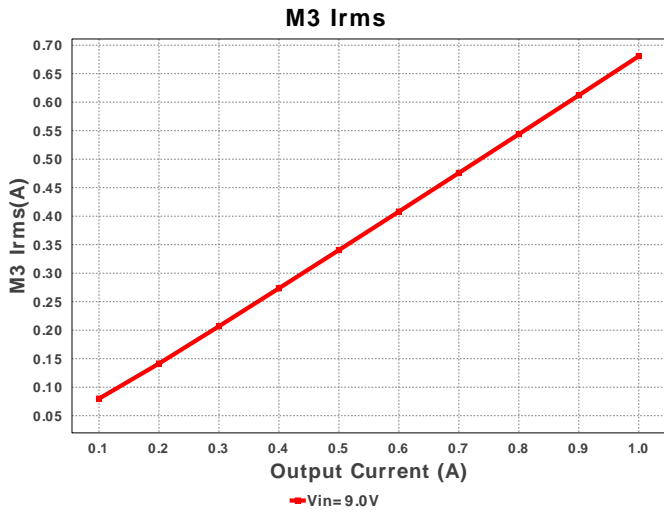


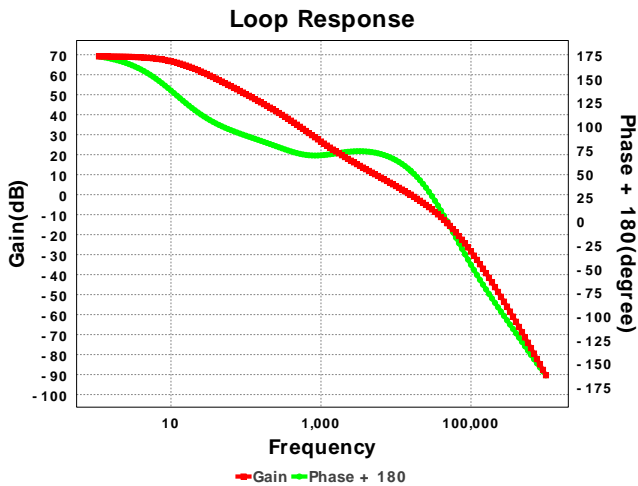












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	484.44 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	76.065 mA	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	88.495 mA	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	394.47 mA	Current	Average input current
5.	L Ipp	570.05 mA	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	1.013 A	Current	Inductor ripple current
7.	M1 Irms	613.38 mA	Current	MOSFET RMS ripple current
8.	M2 Irms	789.788 mA	Current	MOSFET RMS ripple current
9.	SW Ipk	0.0 A	Current	Peak switch current
10.	BOM Count	39	General	Total Design BOM count
11.	FootPrint	579.0 mm ²	General	Total Foot Print Area of BOM components
12.	Frequency	343.83 kHz	General	Switching frequency
13.	IC Tolerance	0.0 V	General	IC Feedback Tolerance
14.	M1 Rdson	15.6 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	M2 Rdson	25.0 mOhm	General	Drain-Source On-resistance
17.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
18.	Mode	CCM	General	Conduction Mode
19.	Pout	12.0 W	General	Total output power
20.	Total BOM	\$7.46	General	Total BOM Cost
21.	Low Freq Gain	69.138 dB	Op_Point	Gain at 10Hz
22.	Vout Actual	12.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
23.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
24.	Cross Freq	15.619 kHz	Op_point	Bode plot crossover frequency
25.	Duty Cycle	37.623 %	Op_point	Duty cycle
26.	Efficiency	95.063 %	Op_point	Steady state efficiency
27.	Gain Marg	-14.32 dB	Op_point	Bode Plot Gain Margin
28.	IC Tj	42.011 degC	Op_point	IC junction temperature
29.	ICThetaJA	30.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
30.	IOUT_OP	1.0 A	Op_point	Iout operating point
31.	M1 TjOP	31.237 degC	Op_point	MOSFET junction temperature
32.	M2 TjOP	33.909 degC	Op_point	MOSFET junction temperature
33.	Operating Topology	Buck	Op_point	The current operating topology of the device
34.	Phase Marg	54.204 deg	Op_point	Bode Plot Phase Margin
35.	VIN_OP	32.0 V	Op_point	Vin operating point
36.	Vout p-p	5.843 mV	Op_point	Peak-to-peak output ripple voltage
37.	Cin Pd	523.106 μW	Power	Input capacitor power dissipation
38.	Cout Pd	11.861 μW	Power	Output capacitor power dissipation
39.	Coutx Pd	17.589 μW	Power	Output capacitor_x power loss
40.	D2 Pd	0.0 W	Power	Diode power dissipation
41.	D3 Pd	0.0 W	Power	Diode power dissipation
42.	IC Pd	393.805 mW	Power	IC power dissipation
43.	L Pd	96.0 mW	Power	Inductor power dissipation
44.	M1 Pd	22.369 mW	Power	MOSFET power dissipation
45.	M1 PdCond	5.92 mW	Power	M1 MOSFET conduction losses
46.	M1 PdSw	16.45 mW	Power	M1 MOSFET switching losses
47.	M2 Pd	70.529 mW	Power	MOSFET power dissipation
48.	M2 PdCond	15.981 mW	Power	M2 MOSFET conduction losses
49.	M2 PdSw	54.548 mW	Power	M2 MOSFET switching losses
50.	M3 Pd	15.6 mW	Power	M3 MOSFET total power dissipation
51.	M3 PdCond	15.6 mW	Power	M3 MOSFET conduction losses
52.	M4 Pd	0.0 W	Power	M4 MOSFET total power dissipation

#	Name	Value	Category	Description
53.	Rsense Pd	24.327 mW	Power	LED Current Rsns Power Dissipation
54.	Total Pd	623.199 mW	Power	Total Power Dissipation
55.	Vout Tolerance	1.886 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	32.0	Maximum input voltage
3.	VinMin	9.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM5175	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Tip: Snubbers and/or gate resistors may be required to limit the SW1,2 node switching spikes below the IC and FET abs max ratings.
2. Tip: Slope Capacitor: smaller slope capacitors provide better transition region behavior.
3. **LM5175** Product Folder : <http://www.ti.com/product/LM5175> : contains the data sheet and other resources.

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