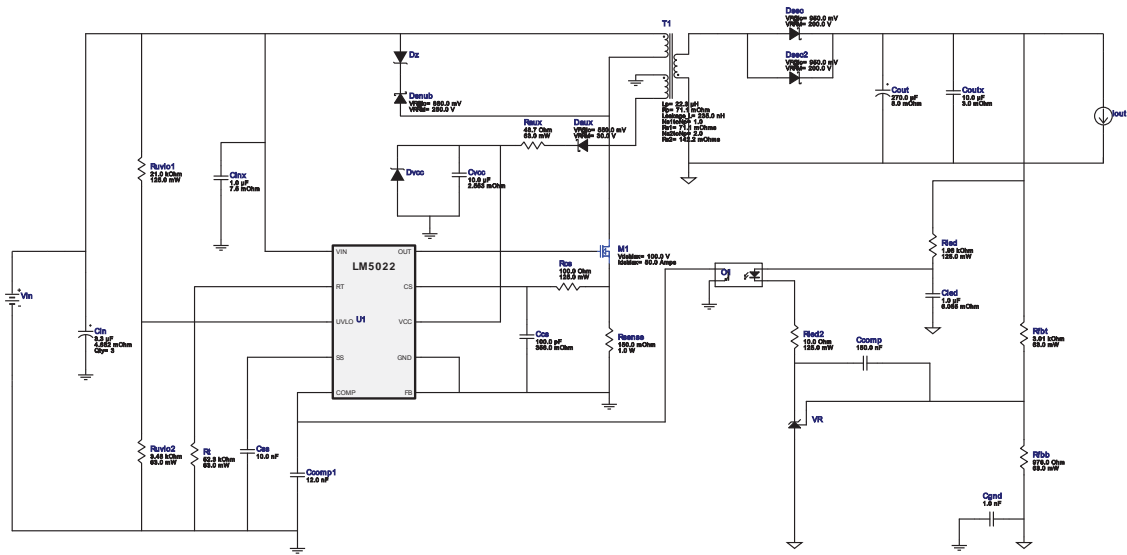




















WEBENCH® Design Report

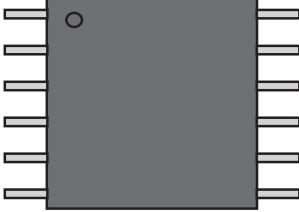


 Design : 916945/917 LM5022MM/NOPB
 LM5022MM/NOPB 9.0V-48.0V to 5.00V @ 1.4A

My Comments

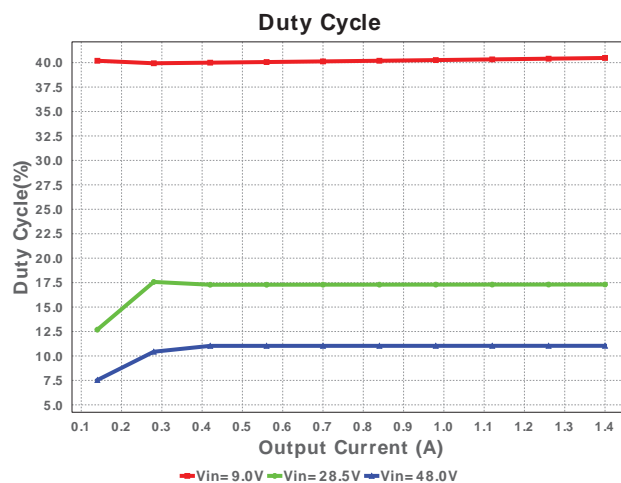
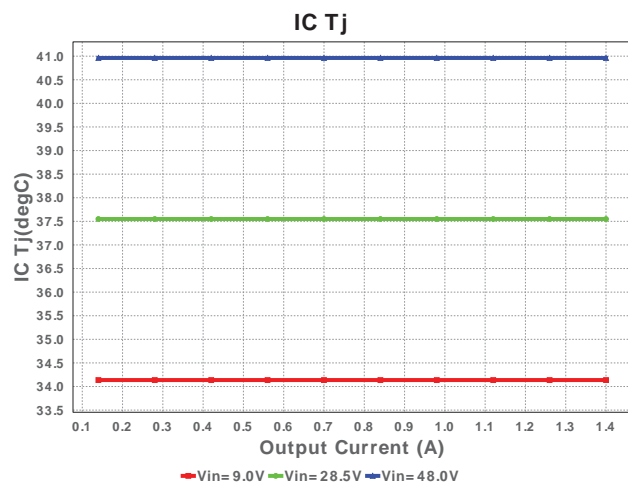
Best device for wide range isolated DC / DC

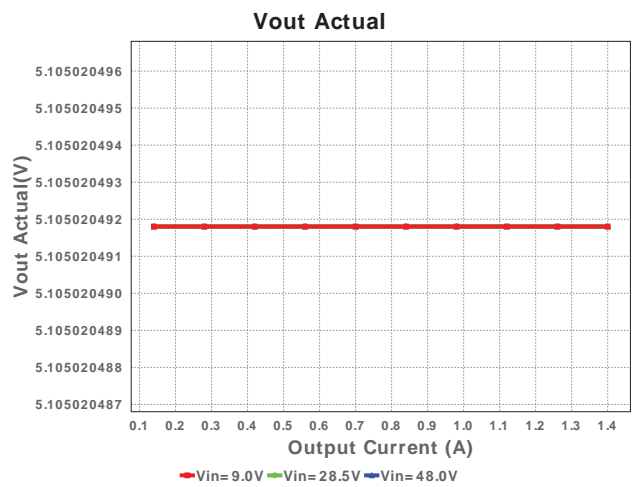
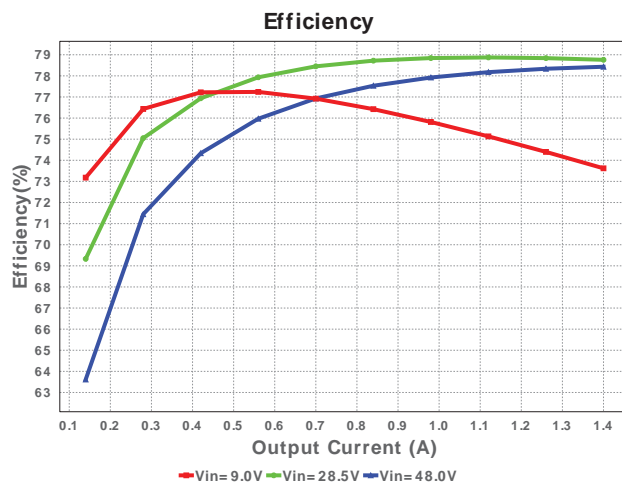
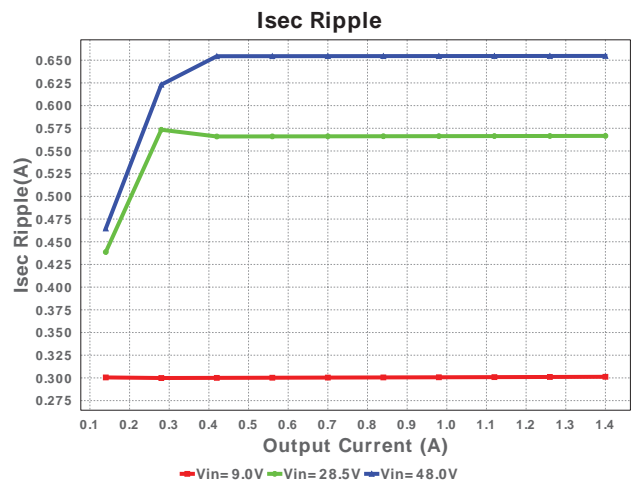
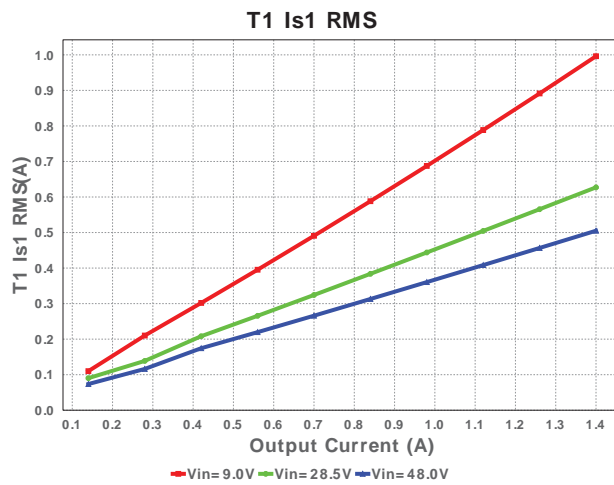
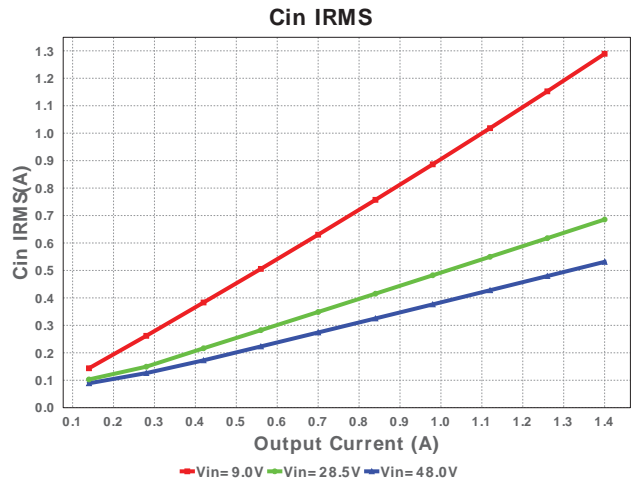
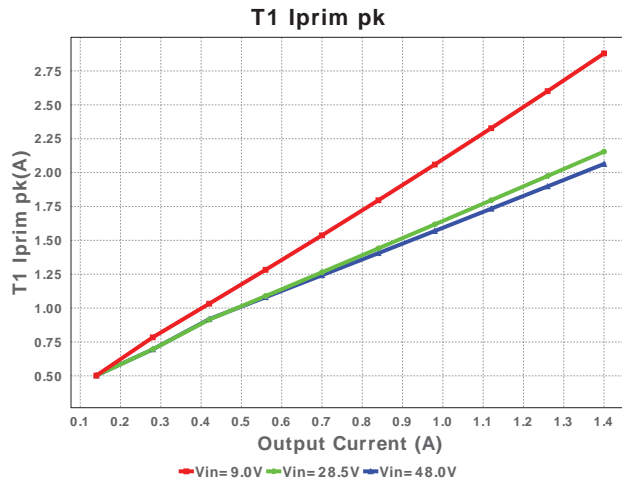
Electrical BOM

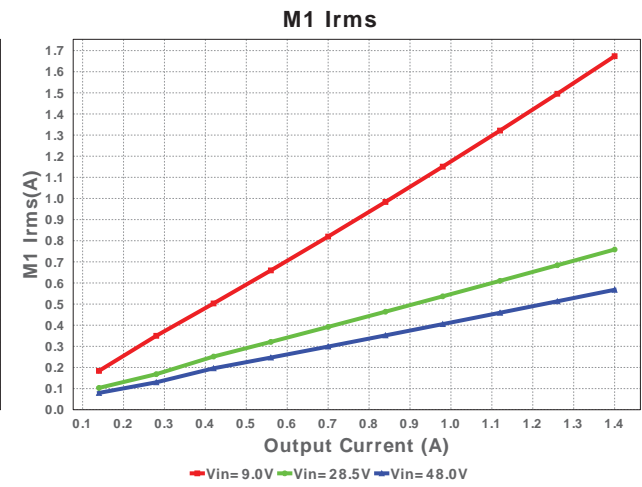
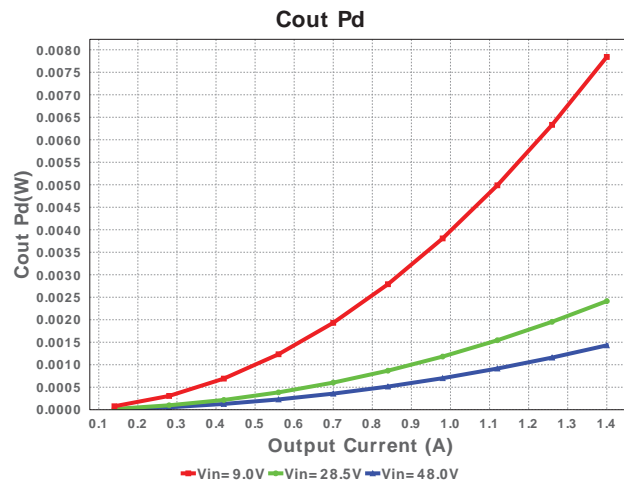
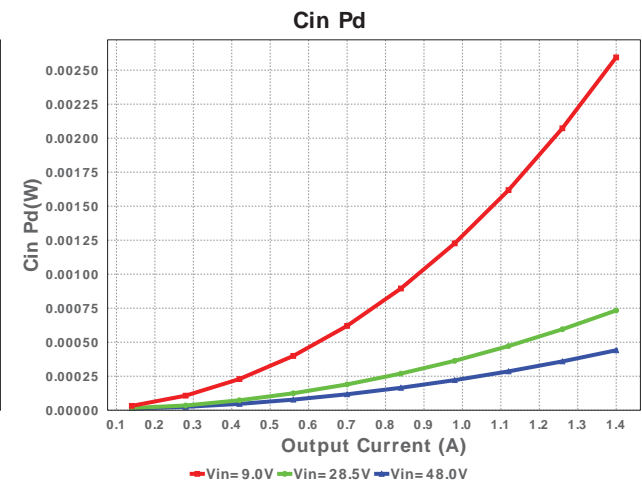
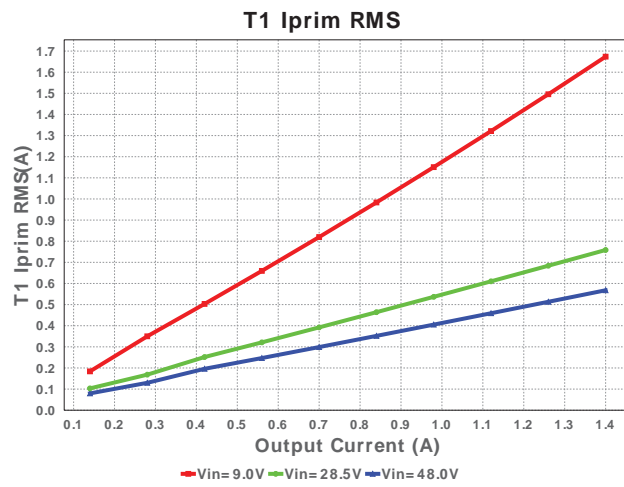
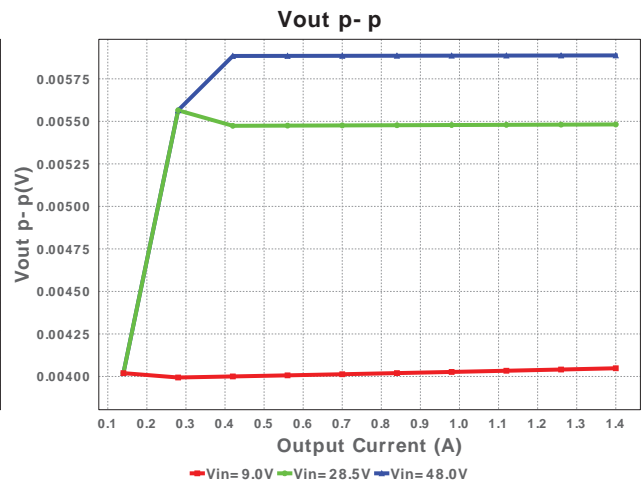
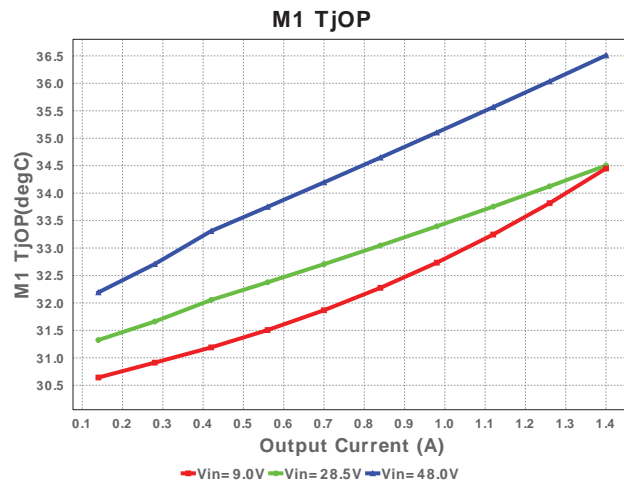
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccomp	MuRata	GRM155R60J154KE01D Series= X5R	Cap= 150.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.02	0402 3 mm ²
2.	Ccomp1	MuRata	GRM033C80J123KE01D Series= X6S	Cap= 12.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	0201 2 mm ²
3.	Ccs	AVX	08055A101JAT2A Series= C0G/NP0	Cap= 100.0 pF ESR= 356.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Cgnd	MuRata	GRM21AR72E102KW01D Series= X7R	Cap= 1.0 nF VDC= 250.0 V IRMS= 0.0 A	1	\$0.02	0805 7 mm ²
5.	Cin	TDK	C3225X7S2A335K200AB Series= X7S	Cap= 3.3 uF ESR= 4.682 mOhm VDC= 100.0 V IRMS= 3.39944 A	3	\$0.25	1210 15 mm ²

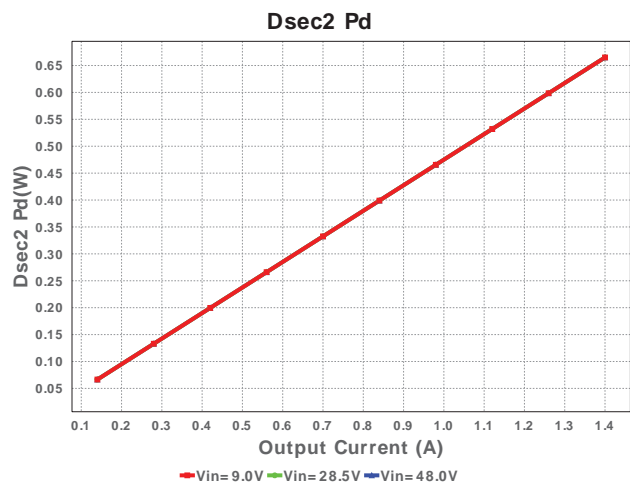
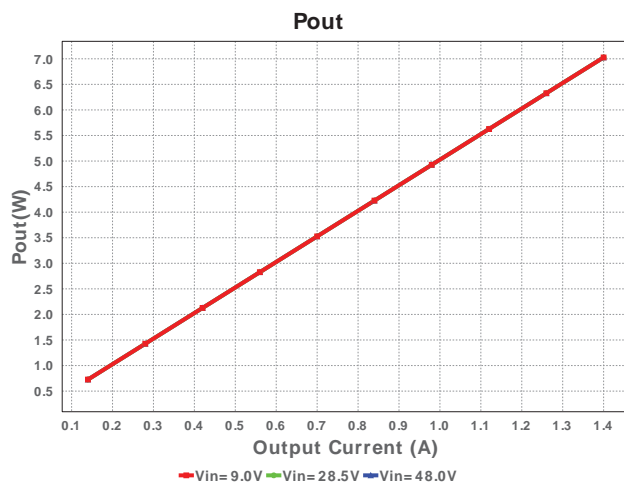
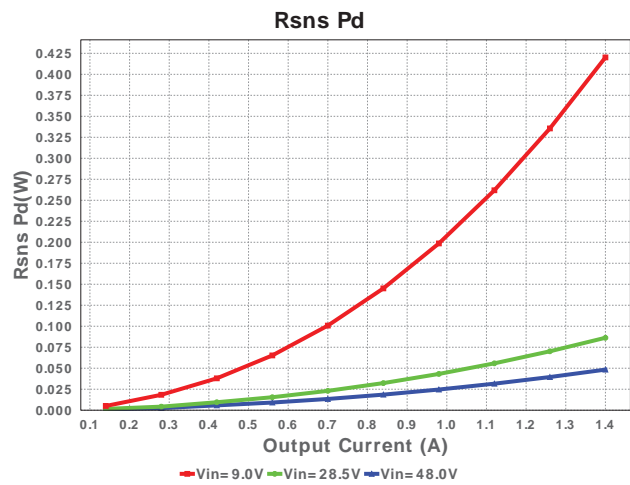
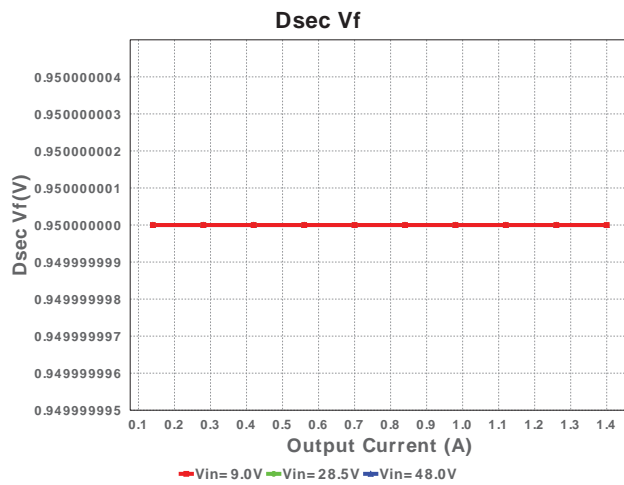
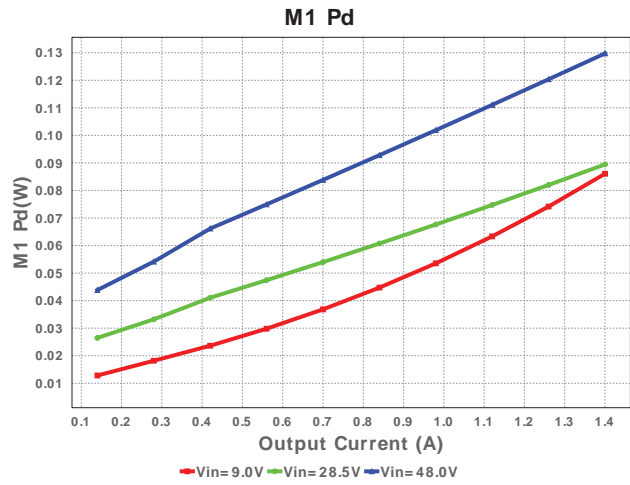
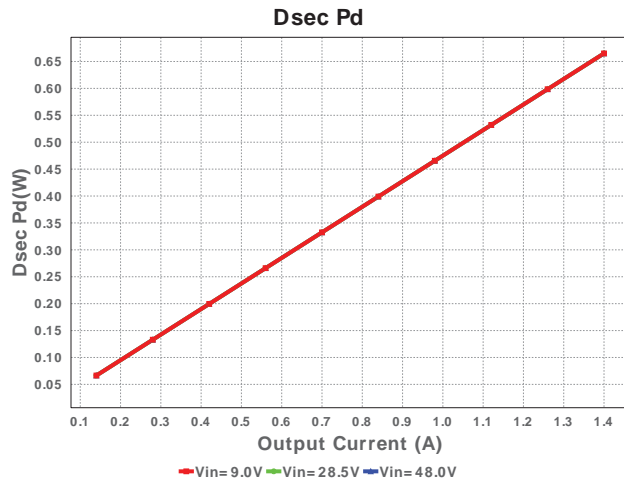
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6.	Cinx	TDK	C3216X7R2A105M160AA Series= X7R	Cap= 1.0 uF ESR= 7.5 mOhm VDC= 100.0 V IRMS= 5.9235 A	1	\$0.12	 1206 11 mm ²
7.	Cled	MuRata	GRM188R61A105KA61D Series= X5R	Cap= 1.0 uF ESR= 6.065 mOhm VDC= 10.0 V IRMS= 1.30675 A	1	\$0.01	 0603 5 mm ²
8.	Cout	Panasonic	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	1	\$0.68	 CAPSMT_62_C10 74 mm ²
9.	Coutx	Kemet	C0805C106K8PACTU Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 10.0 V IRMS= 11.43 A	1	\$0.02	 0805 7 mm ²
10.	Css	MuRata	GRM155R71E103KA01D Series= X7R	Cap= 10.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
11.	Cvcc	TDK	C3216X6S1E106K Series= X6S	Cap= 10.0 uF ESR= 2.553 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.12	 1206 11 mm ²
12.	Daux	Panasonic	DB2S31600L	VF@Io= 550.0 mV VRRM= 30.0 V	1	\$0.04	 SOD-523 5 mm ²
13.	Dsec	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	\$0.11	 DPAK 102 mm ²
14.	Dsec2	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	\$0.11	 DPAK 102 mm ²
15.	Dsnub	ON Semiconductor	MBRB40250TG	VF@Io= 860.0 mV VRRM= 250.0 V	1	\$0.99	 DDPAK 210 mm ²
16.	Dvcc	Diodes Inc.	DFLZ12-7	Zener	1	\$0.15	 PowerDI123 13 mm ²
17.	Dz	Diodes Inc.	MMSZ5239B-7-F	Zener	1	\$0.04	 SOD-123 13 mm ²
18.	M1	Texas Instruments	CSD19534Q5A	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	\$0.34	 TRANS_NexFET_Q5A 55 mm ²
19.	O1	California Eastern Laboratories	PS2501L-1-A	Optocoupler	1	\$0.23	 PS2501L 77 mm ²
20.	Raux	Vishay-Dale	CRCW040248R7FKED Series= CRCW..e3	Res= 48.7 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
21.	Rcs	Vishay-Dale	CRCW0805100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
22.	Rfbb	Vishay-Dale	CRCW0402976RFKED Series= CRCW..e3	Res= 976.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
23.	Rfbt	Vishay-Dale	CRCW04023K01FKED Series= CRCW..e3	Res= 3.01 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

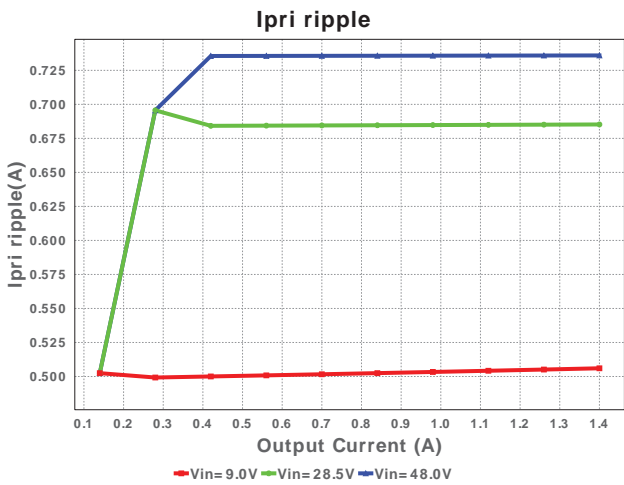
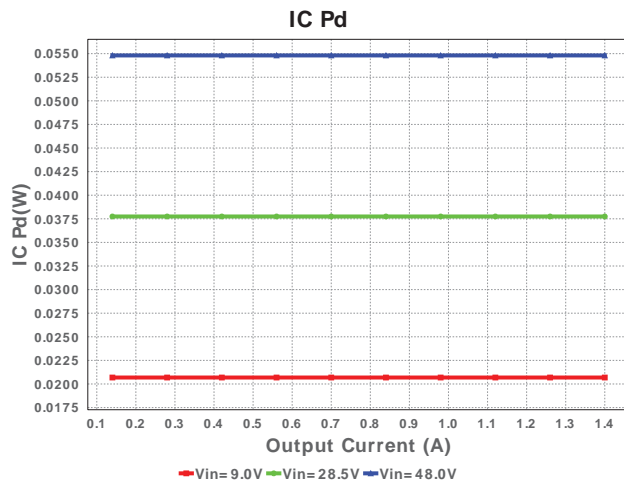
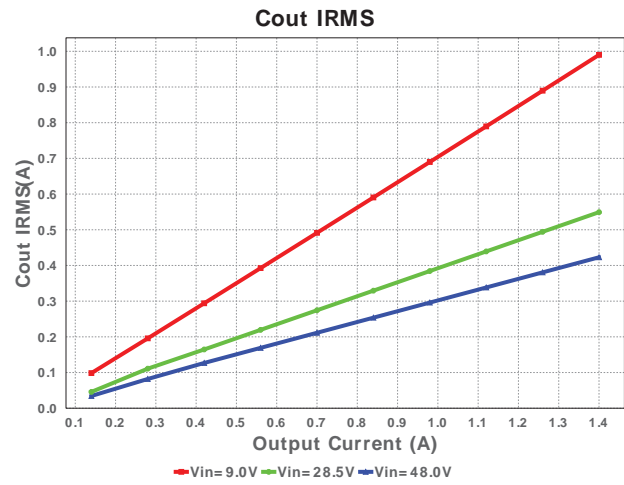
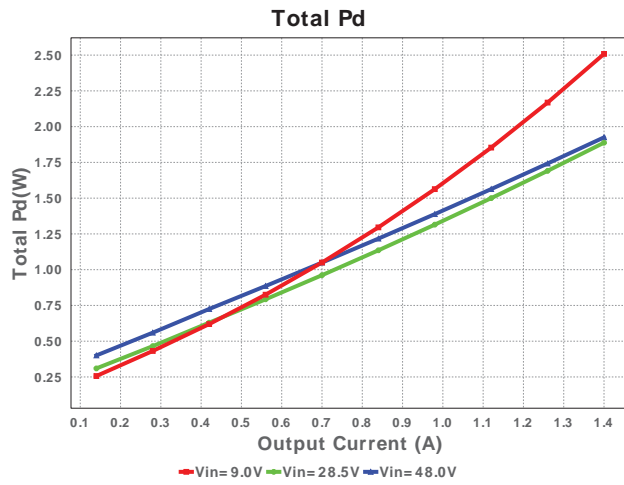
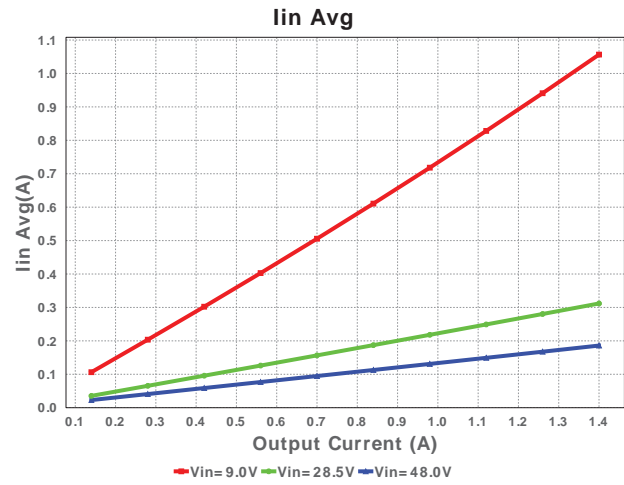
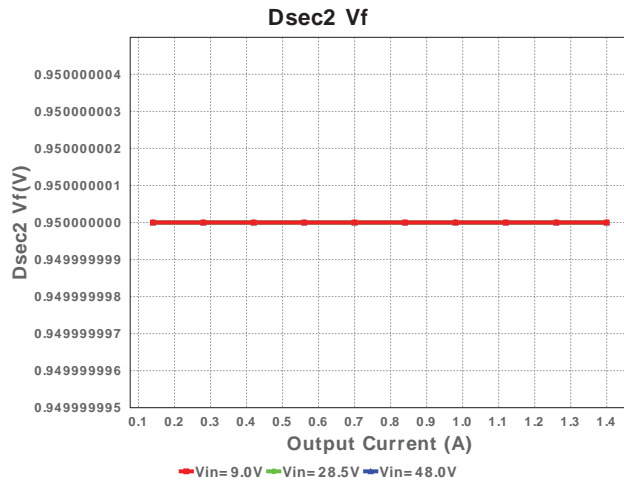
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
24.	Rled	Panasonic	ERJ-6ENF1961V Series= ERJ-6E	Res= 1.96 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 7 mm ²
25.	Rled2	Vishay-Dale	CRCW080510R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 7 mm ²
26.	Rsense	Stackpole Electronics Inc	CSRN2010FKR150 Series= ?	Res= 150.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	\$0.11	2010 32 mm ²
27.	Rt	Vishay-Dale	CRCW040252K3FKED Series= CRCW..e3	Res= 52.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
28.	Ruvlo1	Panasonic	ERJ-6ENF2102V Series= ERJ-6E	Res= 21.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 7 mm ²
29.	Ruvlo2	Vishay-Dale	CRCW04023K48FKED Series= CRCW..e3	Res= 3.48 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
30.	T1	Coiltronics	VPH5-0155-R	Lp= 22.3 µH Rp= 71.1 mOhm Leakage_L= 235.0 nH Ns1toNp= 1.0 Rs1= 71.1 mOhms Ns2toNp= 2.0 Rs2= 142.2 mOhms	1	\$4.38	 VP5 702 mm ²
31.	U1	Texas Instruments	LM5022MM/NOPB	Switcher	1	\$0.90	 MUB10A 24 mm ²
32.	VR	Texas Instruments	LMV431CM5/NOPB	Voltage References	1	\$0.16	 R-PDSO-G3 16 mm ²

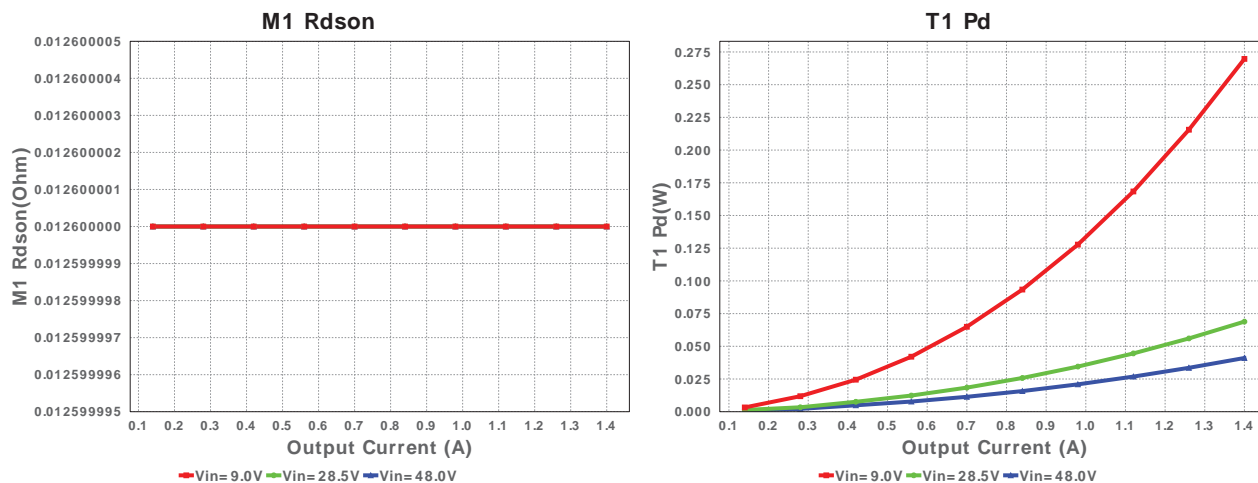












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.289 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	990.002 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.056 A	Current	Average input current
4.	Ipri ripple	506.034 mA	Current	Ripple Current in the Primary Winding
5.	Isec Ripple	301.21 mA	Current	Ripple Current in the Secondary Winding
6.	M1 Irms	1.674 A	Current	Q Iavg
7.	T1 Iprim RMS	1.674 A	Current	Transformer Primary RMS Current
8.	T1 Iprim pk	2.88 A	Current	Transformer Primary Peak Current
9.	T1 Is1 RMS	996.181 mA	Current	Transformer Secondary1 RMS Current
10.	BOM Count	34	General	Total Design BOM count
11.	Dsec Vf	950.0 mV	General	Effective Forward Voltage Drop at the Operating Current
12.	Dsec2 Vf	950.0 mV	General	Effective Forward Voltage Drop at the Operating Current
13.	FootPrint	1.564 k mm ²	General	Total Foot Print Area of BOM components
14.	Frequency	322.82 kHz	General	Switching frequency
15.	M1 Rdson	12.6 mOhm	General	Drain-Source On-resistance
16.	Mode	CCM	General	Conduction Mode
17.	Pout	7.027 W	General	Total output power
18.	Total BOM	\$9.42	General	Total BOM Cost
19.	Vout Actual	5.105 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
21.	Duty Cycle	40.476 %	Op_point	Duty cycle
22.	Efficiency	73.62 %	Op_point	Steady state efficiency
23.	IC Tj	34.137 degC	Op_point	IC junction temperature
24.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	1.4 A	Op_point	Iout operating point
26.	M1 TjOP	34.45 degC	Op_point	M1 MOSFET junction temperature
27.	VIN_OP	9.0 V	Op_point	Vin operating point
28.	Vout p-p	4.048 mV	Op_point	Peak-to-peak output ripple voltage
29.	Cin Pd	2.594 mW	Power	Input capacitor power dissipation
30.	Cout Pd	7.841 mW	Power	Output capacitor power dissipation
31.	Dsec Pd	665.0 mW	Power	Secondary Diode Power Dissipation
32.	Dsec2 Pd	665.0 mW	Power	Secondary Diode Power Dissipation
33.	IC Pd	20.685 mW	Power	IC power dissipation
34.	M1 Pd	86.064 mW	Power	MOSFET power dissipation
35.	Rsns Pd	420.135 mW	Power	Current Limit Sense Resistor Power Dissipation
36.	T1 Pd	269.703 mW	Power	Estimated Losses in Transformer
37.	Total Pd	2.508 W	Power	Total Power Dissipation
38.	Vout Tolerance	3.556 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.4	Maximum Output Current
2.	VinMax	48.0	Maximum input voltage
3.	VinMin	9.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LM5022	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Isolated feedback, DC-DC Flyback controller with wide Vin range
2. **LM5022** Product Folder : <http://www.ti.com/product/LM5022> : contains the data sheet and other resources.

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