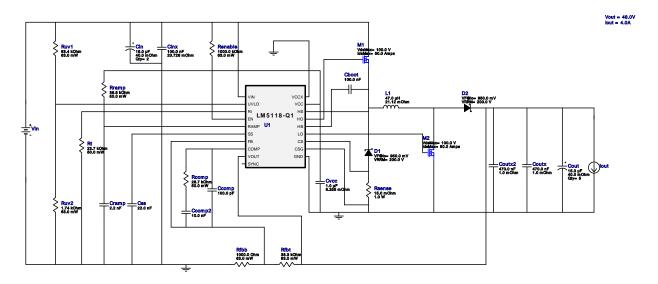
VinMin = 57.5V VinMax = 58.5V Vout = 48.0V Iout = 4.0A Device = LM5118Q1MH/NOPB Topology = Buck_Boost Created = 2023-08-10 02:56:38.695 BOM Cost = \$24.39 BOM Count = 31 Total Pd = 8.16W

WEBENCH® Design Report

Design: 61 LM5118Q1MH/NOPB LM5118Q1MH/NOPB 36V-54.6V to 48.00V @ 4A



Design Alerts

LM5118-Q1 Design

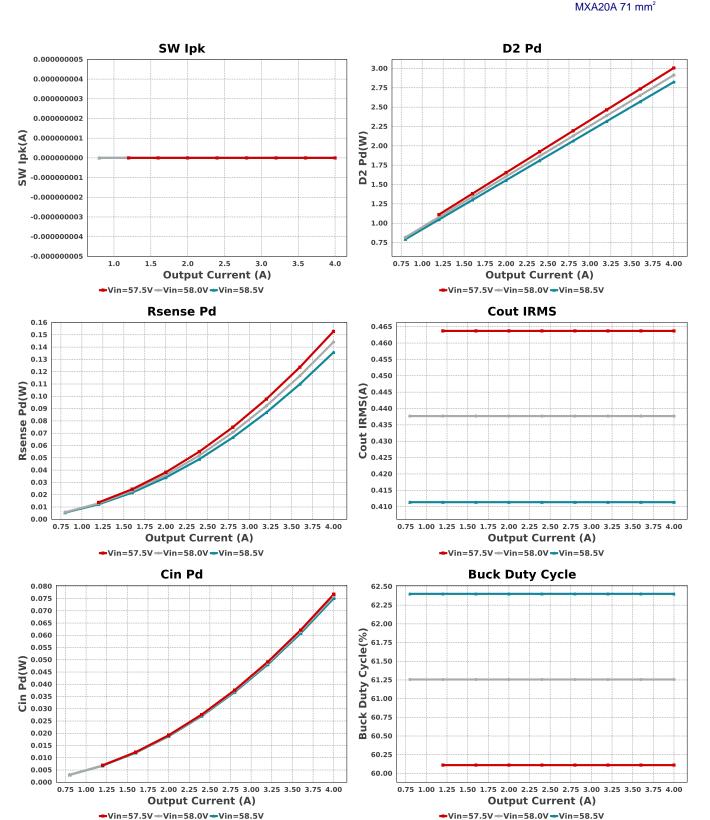
Tool Tip for Keep selected FETs during Redesign Configuration Option: By Default if you hit REDESIGN button, Webench re-designs all the external components including Fets. But if we have checked this configuration option, currently selected fets in schematic will get locked and re-design happens for only other external components. This helps to update the desing by keeping Fets unchanged.

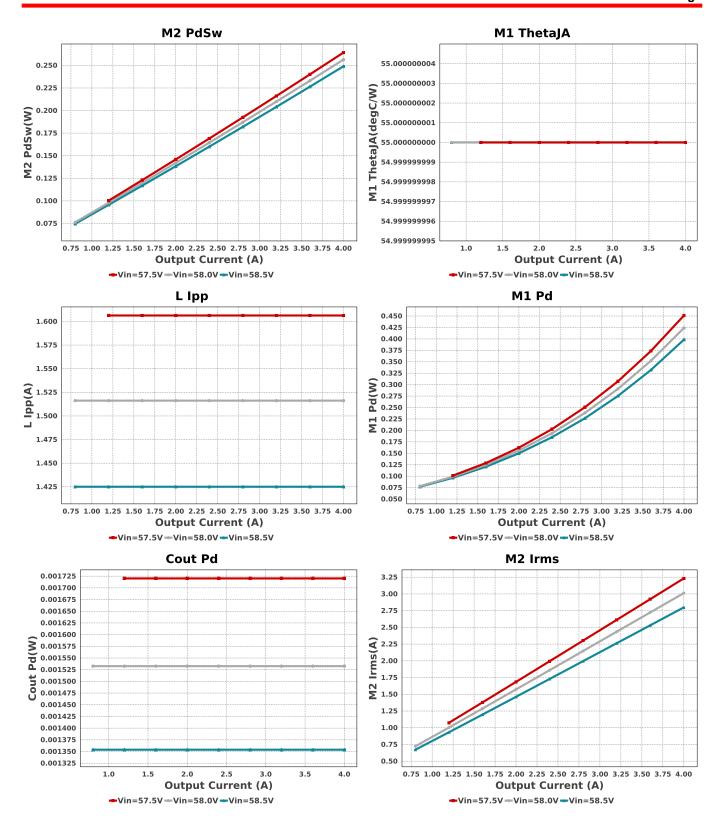
Electrical BOM

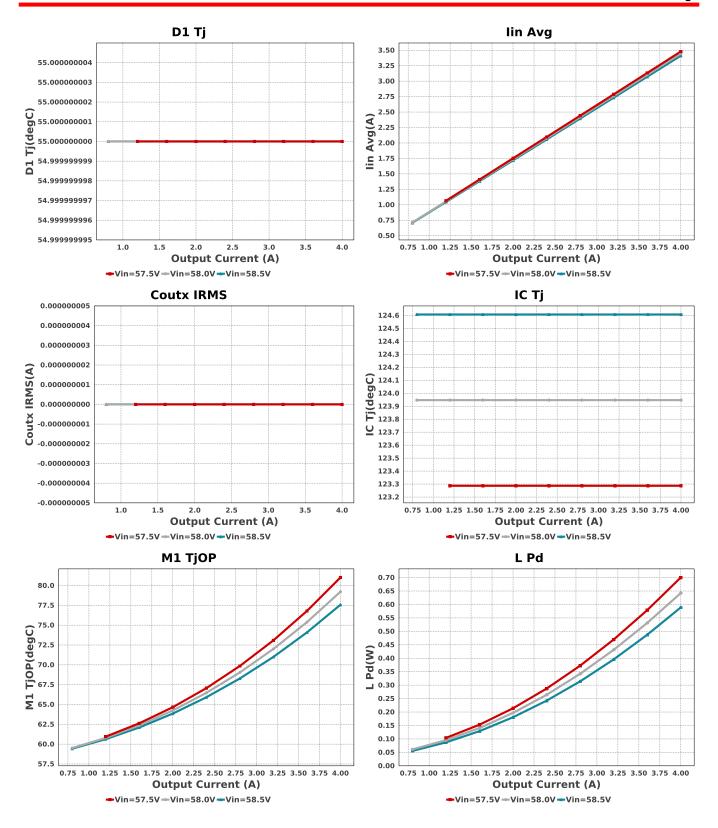
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cboot	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.07	0805 7 mm ²
Ccomp	Samsung Electro- Mechanics	CL21C101JBANNNC Series= C0G/NP0	Cap= 100.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
Ccomp2	TDK	CGA4C2C0G1H103J060AA Series= C0G/NP0	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.06	0805 7 mm ²
Cin	Panasonic	100SXV15M Series= SXV	Cap= 15.0 uF ESR= 40.0 mOhm VDC= 100.0 V IRMS= 2.35 A	2	\$1.95	CAPSMT_62_E12 106 mm ²
Cinx	TDK	C2012X7R2A104K125AA Series= X7R	Cap= 100.0 nF ESR= 20.726 mOhm VDC= 100.0 V IRMS= 1.456 A	1	\$0.03	0805 7 mm ²
Cout	Panasonic	100SXV15M Series= SXV	Cap= 15.0 uF ESR= 40.0 mOhm VDC= 100.0 V IRMS= 2.35 A	5	\$1.95	CAPSMT_62_E12 106 mm ²
Coutx	MuRata	GRM21BR72A474KA73L Series= X7R	Cap= 470.0 nF ESR= 1.0 mOhm VDC= 100.0 V IRMS= 0.0 A	1	\$0.13	0805 7 mm ²

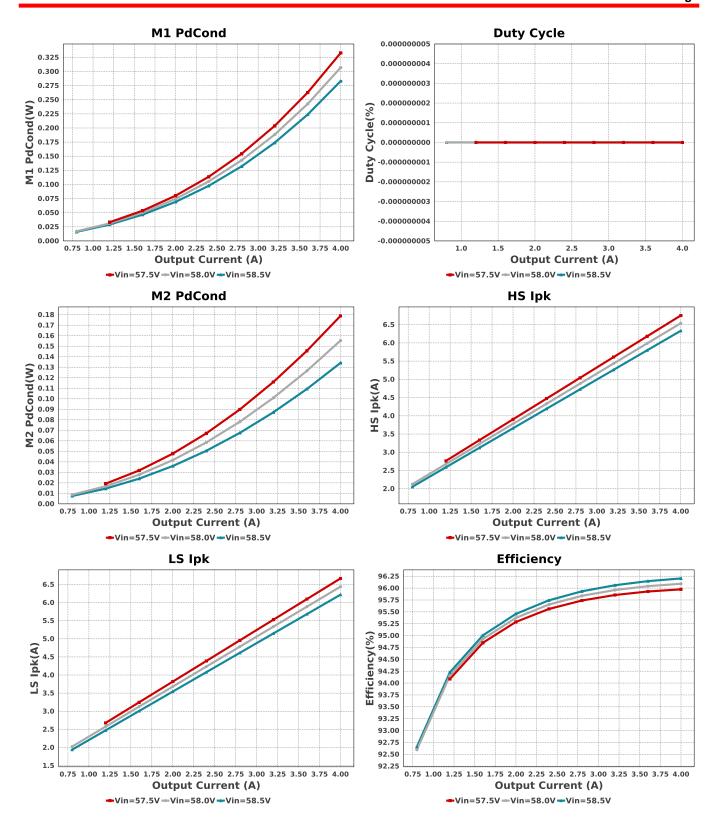
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Coutx2	MuRata	GRM21BR72A474KA73L Series= X7R	Cap= 470.0 nF ESR= 1.0 mOhm VDC= 100.0 V IRMS= 0.0 A	1	\$0.13	0805 7 mm ²
Cramp	Samsung Electro- Mechanics	CL21C222JBFNNNE Series= C0G/NP0	Cap= 2.2 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.02	0805 7 mm ²
Css	TDK	CGA4J2C0G1H223J125AA Series= C0G/NP0	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.07	■ 0805 7 mm²
Cvcc	TDK	C2012X7S2A105K125AB Series= X7S	Cap= 1.0 uF ESR= 8.255 mOhm VDC= 100.0 V IRMS= 2.27442 A	1	\$0.11	0805 7 mm ²
D1	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	\$0.18	DPAK 102 mm ²
D2	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	\$0.18	DPAK 102 mm ²
L1	Wurth Elektronik	74435584700	L= 47.0 μH 21.12 mOhm	1	\$4.99	•
M1	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	\$0.39	WE-HCI_2212 588 mm² DQG0008A 18 mm²
M2	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	\$0.39	DQG0008A 18 mm ²
Rcomp	Yageo	RC0201FR-0728K7L Series=?	Res= 28.7 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm ²
Renable	Vishay-Dale	CRCW04021M00FKED Series= CRCWe3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCWe3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
Rfbt	Vishay-Dale	CRCW040238K3FKED Series= CRCWe3	Res= 38.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
Rramp	Yageo	RC0201FR-0736K5L Series= ?	Res= 36.5 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm ²
Rsense	Susumu Co Ltd	PRL1632-R015-F-T1 Series= PRL1632	Res= 15.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	\$0.20	0612 11 mm ²
Rt	Yageo	RC0201FR-0723K7L Series= ?	Res= 23.7 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm ²
Ruv1	Vishay-Dale	CRCW040263K4FKED Series= CRCWe3	Res= 63.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

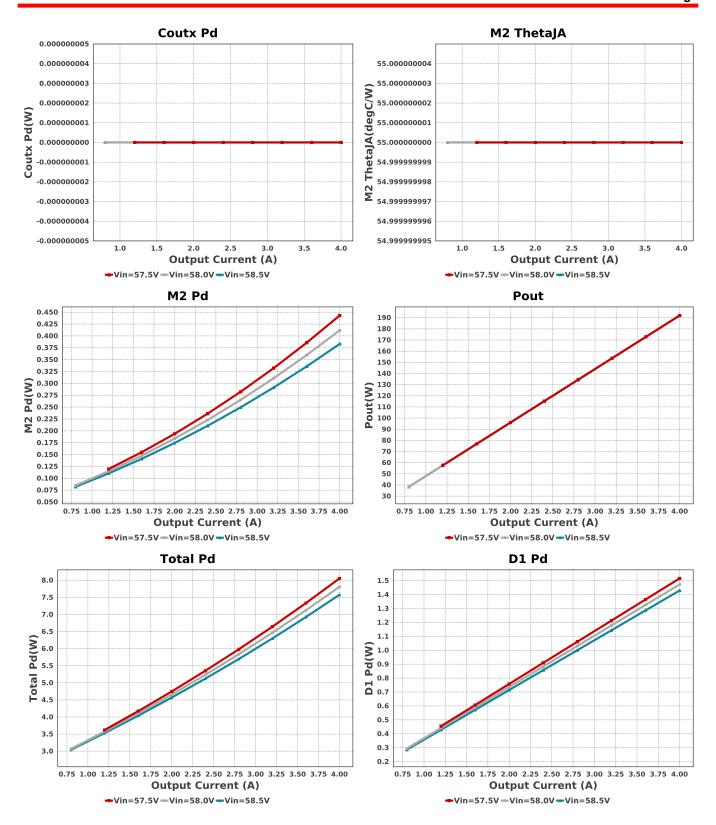
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Ruv2	Vishay-Dale	CRCW04021K74FKED Series= CRCWe3	Res= 1.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
U1	Texas Instruments	LM5118Q1MH/NOPB	Switcher	1	\$3.18	

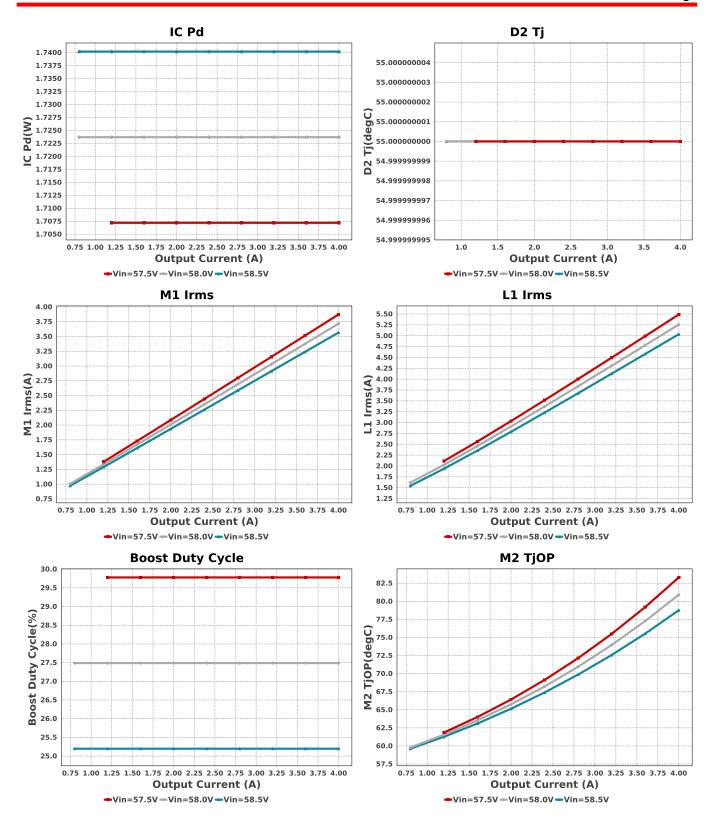


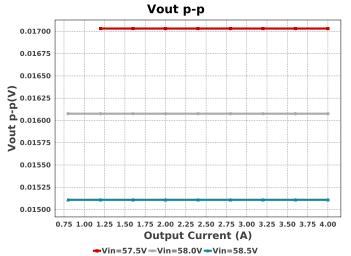


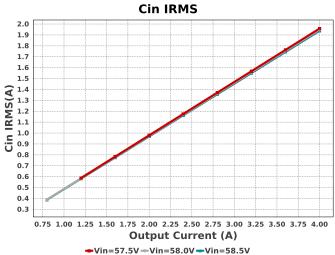


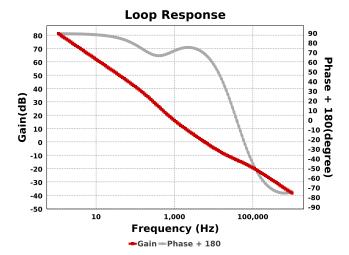












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.959 A	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	76.729 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	463.706 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	1.72 mW	Capacitor	Output capacitor power dissipation
5.	D1 Pd	1.516 W	Diode	Diode power dissipation
6.	D1 Tj	55.0 degC	Diode	D1 junction temperature
7.	D2 Pd	3.006 W	Diode	Diode2 power dissipation
8.	HS lpk	6.751 A	IC	Peak switch current in IC
9.	IC Pd	1.74 W	IC	IC power dissipation
10.	IC Tj	124.607 degC	IC	IC junction temperature
11.	IC Tolerance	18.0 mV	IC	IC Feedback Tolerance
12.	ICThetaJA	40.0 degC/W	IC	IC junction-to-ambient thermal resistance
13.	lin Avg	3.422 A	IC	Average input current
14.	LS lpk	6.666 A	IC	Peak switch current in IC
15.	L lpp	1.606 A	Inductor	Peak-to-peak inductor ripple current
16.	L Pd	700.13 mW	Inductor	Inductor power dissipation
17.	L1 Irms	5.49 A	Inductor	Inductor ripple current
18.	M1 Irms	3.872 A	Mosfet	MOSFET RMS ripple current
19.	M1 Pd	487.8 mW	Mosfet	MOSFET power dissipation
20.	M1 PdCond	366.48 mW	Mosfet	M1 MOSFET conduction losses
21.	M1 ThetaJA	55.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
22.	M1 TjOP	81.207 degC	Mosfet	MOSFET junction temperature
23.	M2 Irms	3.232 A	Mosfet	MOSFET RMS ripple current
24.	M2 Pd	482.68 mW	Mosfet	MOSFET power dissipation
25.	M2 PdCond	218.47 mW	Mosfet	M2 MOSFET conduction losses
26.	M2 PdSw	264.21 mW	Mosfet	M2 MOSFET switching losses
27.	M2 ThetaJA	55.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
28.	M2 TjOP	83.296 degC	Mosfet	MOSFET junction temperature
29.	Cin Pd	76.729 mW	Power	Input capacitor power dissipation
30.	Cout Pd	1.72 mW	Power	Output capacitor power dissipation
31.	D1 Pd	1.516 W	Power	Diode power dissipation
32.	D2 Pd	3.006 W	Power	Diode2 power dissipation

1. Pd	#	Name	Value	Category	Description
34. L Pd 700.13 mW Power AR7.8 mW Inductor power dissipation 36. M1 Pd 487.8 mW Power MOSETE power dissipation 36. M1 PdCond 366.48 mW Power MSETE power dissipation 37. M2 Pd 482.68 mW Power MSETE power dissipation 38. M2 PdSw 204.21 mW Power MSETE power dissipation 39. M2 PdSw 204.21 mW Power MSETE power dissipation 40. Rsense Pd 152.75 mW Power LED Current Rans Power Dissipation 41. Total Pd 8.165 W Resistor LED Current Rans Power Dissipation 43. BOM Count 31 System Information Boost Duty Cycle Boost Duty Cycle 45. Buck Duty Cycle 60.111 % System Information Boost Duty cycle 46. Cross Freq 5.85 l kHz System Information System Information 48. Efficiency 95.921 % System Information 49. FootPrint 1.735 k mm² System Information 50. Frequency 239.521 kHz System Information 50. Low Freq Gain 81.112 dB			1.74 W		
35. M1 Pd 487.8 mW Power MCSFET power dissipation 36. M1 PdCond 366.48 mW Power MCSFET power dissipation 37. M2 Pd 482.88 mW Power MCSFET power dissipation 38. M2 PdCond 218.47 mW Power MCSFET conduction losses 39. M2 PdSw 264.21 mW Power MCSFET conduction losses 40. Rsense Pd 152.75 mW Power MCSFET conduction losses 41. Total Pd 8.165 W Power LED Current Rsns Power Dissipation 42. Rsense Pd 152.75 mW Resistor LED Current Rsns Power Dissipation 42. Rsense Pd 152.75 mW Resistor LED Current Rsns Power Dissipation 43. BOM Count 31 System Information LED Current Rsns Power Dissipation 44. Boost Duty Cycle 69.111 % System Information Boost Duty cycle 45. BURC Duty Cycle 60.111 % System Information System Information 47. D2 Tj 55.0 degC System Information System Information 50. Frequency 239.521 kHz System Information System Informatio					
37. M2 Pd 482.88 mW Power MOSFET power dissipation 38. M2 PdCond 218.47 mW Power M2 MSFET conduction losses 39. M2 PdSw 264.21 mW Power M2 MOSFET conduction losses 40. Rsense Pd 152.75 mW Power LED Current Rsns Power Dissipation 41. Total Pd 8.165 W Power LED Current Rsns Power Dissipation 42. Rsense Pd 152.75 mW Resistor LED Current Rsns Power Dissipation 43. BOM Count 31 System Information LED Current Rsns Power Dissipation 44. Boost Duty Cycle 29.779 % System Information Boost Duty cycle 45. Buck Duty Cycle 60.111 % System Information Boost Duty cycle 46. Cross Freq 5.851 kHz System Information System Information 47. D 2 Tj 55.0 degC System Information System Information 49. FootPrint 1.735 k mm² System Information System Information 50. Frequency 239.521 kHz System Information System Information 51. Low Freq Gain 81.112 dB System Information<	35.	M1 Pd	487.8 mW	Power	·
38. M2 PdCond 218.47 mW Power M2 MOSFET conduction losses 39. M2 PdSw 264.21 mW Power M2 MOSFET switching losses 40. Rsense Pd 152.75 mW Power LED Current Rsns Power Dissipation 41. Total Pd 8.165 W Resistor Total Power Dissipation 42. Rsense Pd 152.75 mW Resistor Total Power Dissipation 43. BOM Count 31 System Information 44. Boost Duty Cycle 60.111 % System Information 45. Buck Duty Cycle 60.111 % System Information 46. Cross Freq 5.851 kHz System Information 47. D2 Tj 55.0 degC System Information 48. Efficiency 95.921 % System Information 49. FootPrint 1.735 k mm² System Information 50. Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Information 52. lout 4.0 A System Information 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 55. Vin 55.5 V System Information 59. Vout Actual 48.339 V System Information 59. System Information <td>36.</td> <td>M1 PdCond</td> <td>366.48 mW</td> <td>Power</td> <td>M1 MOSFET conduction losses</td>	36.	M1 PdCond	366.48 mW	Power	M1 MOSFET conduction losses
38. M2 PdCond 218.47 mW Power M2 MOSFET switching losses 40. Rsense Pd 152.75 mW Power LED Current Rsns Power Dissipation 152.75 mW Resistor 152.7	37.	M2 Pd	482.68 mW	Power	MOSFET power dissipation
40. Rsense Pd 152.75 mW Power Asense Pd LED Current Rsns Power Dissipation 41. Total Pd 8.165 W Power Resistor 42. Rsense Pd 152.75 mW Resistor 43. BOM Count 31 System Information 44. Boost Duty Cycle 29.779 % System Information 45. Buck Duty Cycle 60.111 % System Information 46. Cross Freq 5.851 kHz System Information 47. D2 TJ 55.0 degC System Information 48. Efficiency 95.921 % System Information 49. FootPrint 1.735 k mm² System Information 50. Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Information 52. lout 4.0 A System Information 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 59. Vin 58.5 V System Information 59. Vout Actual <td>38.</td> <td>M2 PdCond</td> <td>218.47 mW</td> <td>Power</td> <td>M2 MOSFET conduction losses</td>	38.	M2 PdCond	218.47 mW	Power	M2 MOSFET conduction losses
41. Total Pd Rense Pd 152.75 mW Resistor Resistor System Information S	39.	M2 PdSw	264.21 mW	Power	M2 MOSFET switching losses
43. BOM Count 31 System Information 44. Boost Duty Cycle 29.779 % System Information 45. Buck Duty Cycle 60.111 % System Information 46. Cross Freq 5.851 kHz System Information 47. D2 Tj 55.0 degC System Information 48. Efficiency 95.921 % System Information 50. Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Information 52. Iout 4.0 A System Information 53. Low Freq Gain 81.112 dB System Information 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Information 59. Vout Actual 48.339 V System Information 59. Vout Tolerance 3.461 % System Information 59. Vout Tolerance 3.461 % System Information 59. Vout Tolerance 3.461 % System Information 59. Vout Tolerance 1.7031 mV System Information 59. Vout Tolerance 3.461 % System Information System Infor	40.	Rsense Pd	152.75 mW	Power	LED Current Rsns Power Dissipation
43. BOM Count 44. Boost Duty Cycle 45. Buck Duty Cycle 46. Cross Freq 5.851 kHz 10formation 47. D2 Tj 55.0 degC 10formation 48. Efficiency 49. FootPrint 1.735 k mm² 50. Frequency 239.521 kHz 10formation 50. Frequency 239.521 kHz 10formation 51. Gain Marg 1-13.538 dB 52. lout 4.0 A 57. Derating Topology 55. Phase Marg 69.045 deg 57. Total BOM 58. Vin 58. Vin 58. Vin 58. Vin 58. Vor 59. Vout Actual 59. Vout Actual 60. Vout Tolerance 60. Vout Tolerance 60. Vout P-p 17.031 mV 59. System Information System	41.	Total Pd	8.165 W	Power	Total Power Dissipation
Information System Boost Duty Cycle 29.779 % System Information System Boost Duty cycle Buck Duty Cycle 60.111 % System Information System Information System Information D2 Tj S5.0 degC System Information System In	42.	Rsense Pd	152.75 mW	Resistor	LED Current Rsns Power Dissipation
44. Boost Duty Cycle 29.779 % System Information 45. Buck Duty Cycle 60.111 % System Information 46. Cross Freq 5.851 kHz System Information 47. D2 Tj 55.0 degC System Information 48. Efficiency 95.921 % System Information 49. FootPrint 1.735 k mm² System Information 50. Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Information 52. lout 4.0 A System Information 53. Low Freq Gain 81.112 dB System Information 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Information 59. Vout Actual 48.339 V System Information 60. Vout Tolerance 3.461 % System Information 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	43.	BOM Count	31	System	Total Design BOM count
45. Buck Duty Cycle 60.111 % System Information System Information System Information Information Information Information System Information Information System Information In				Information	
45. Buck Duty Cycle 60.111 % System Information 46. Cross Freq 5.851 kHz System Information 47. D2 Tj 55.0 degC System Information 48. Efficiency 95.921 % System Information 49. FootPrint 1.735 k mm² System Information 50. Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Information 52. lout 4.0 A System Information 53. Low Freq Gain 81.112 dB System Information 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Information 59. Vout Actual 48.339 V System Information 60. Vout Tolerance 3.461 % System Information System Information 60. Vout P-p 17.031 mV System Peak-to-peak output fipple voltage	44.	Boost Duty Cycle	29.779 %	System	Boost Duty cycle
Information System Information System Information Informatio				Information	
46. Cross Freq 5.851 kHz System Information 47. D2 Tj 55.0 degC System Information 48. Efficiency 95.921 % System Information 49. FootPrint 1.735 k mm² System Information 50. Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Information 52. lout 4.0 A System Information 53. Low Freq Gain 81.112 dB System Information 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Information 59. Vout Actual 48.339 V System Information 60. Vout Tolerance 3.461 % System Information Information 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	45.	Buck Duty Cycle	60.111 %	System	Buck Duty cycle
Information System Steady state efficiency System Steady state efficiency System Information System System Information System Information System System Information System Information System Vin operating point System Vin operating point System Vout Actual calculated based on selected voltage divider resistors if applicable System Steady state efficiency Switching frequency Switching freq				Information	
47.D2 Tj55.0 degCSystem InformationD2 junction temperature Information48.Efficiency95.921 %System System Information49.FootPrint1.735 k mm²System System Information50.Frequency239.521 kHzSystem System Information51.Gain Marg-13.538 dBSystem System Information52.lout4.0 ASystem Information53.Low Freq Gain81.112 dBSystem Information54.Operating TopologyTransitionSystem Information55.Phase Marg69.045 degSystem Information56.Pout192.0 WSystem Information57.Total BOM\$24.39System Information58.Vin58.5 VSystem Information59.Vout Actual48.339 VSystem Information59.Vout Tolerance3.461 %System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors information60.Vout Tolerance17.031 mVSystem Peak-to-peak output ripple voltage	46.	Cross Freq	5.851 kHz	•	Bode plot crossover frequency
Information System Information System Information Information System Information Informa					
48. Efficiency 95.921 % System Information 49. FootPrint 1.735 k mm² System Information 50. Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Information 52. lout 4.0 A System Information 53. Low Freq Gain 81.112 dB System Information 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Information 59. Vout Actual 48.339 V System Information 60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable Peak-to-peak output ripple voltage	47.	D2 Tj	55.0 degC	,	D2 junction temperature
Information System System System Information System Total BOM System System Total BOM Cost Information System Vin operating point System Vin operating point System Vin operating point System Vin operating point System Vin operating based on selected voltage divider resistors System Vout Actual calculated based on selected voltage divider resistors System					
49.FootPrint1.735 k mm²System InformationTotal Foot Print Area of BOM components50.Frequency239.521 kHzSystem InformationSwitching frequency51.Gain Marg-13.538 dBSystem InformationBode Plot Gain Margin52.Iout4.0 ASystem InformationIout operating point53.Low Freq Gain81.112 dBSystem InformationGain at 1Hz54.Operating TopologyTransitionSystem InformationThe current operating topology of the device55.Phase Marg69.045 degSystem InformationBode Plot Phase Margin56.Pout192.0 WSystem InformationTotal output power57.Total BOM\$24.39System InformationTotal BOM Cost58.Vin58.5 VSystem Information59.Vout Actual48.339 VSystem InformationVout Actual calculated based on selected voltage divider resistors60.Vout Tolerance3.461 %System InformationVout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable61.Vout p-p17.031 mVSystemPeak-to-peak output ripple voltage	48.	Efficiency	95.921 %	,	Steady state efficiency
Frequency 239.521 kHz System Information 51. Gain Marg -13.538 dB System Bode Plot Gain Margin 52. lout 4.0 A System Information 53. Low Freq Gain 81.112 dB System Gain at 1Hz 54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Information 59. Vout Actual 48.339 V System Information 59. Vout Actual 48.339 V System Information 60. Vout Tolerance 3.461 % System Information 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage 11. Switching frequency Switching frequency Information Switching frequency Information Switching frequency Information Switching frequency Information Switching frequency Information Switching frequency Switching frequency Information Switching frequency Iout operating point The current operating topology of the device The current operating topol			•		T. 15 . D. 1.1
50.Frequency239.521 kHzSystem InformationSwitching frequency51.Gain Marg-13.538 dBSystem Information52.Iout4.0 ASystem Information53.Low Freq Gain81.112 dBSystem Gain at 1Hz54.Operating TopologyTransitionSystem Information55.Phase Marg69.045 degSystem Information56.Pout192.0 WSystem Information57.Total BOM\$24.39System Information58.Vin58.5 VSystem Information59.Vout Actual48.339 VSystem Information59.Vout Tolerance3.461 %System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable61.Vout P-p17.031 mVSystem Peak-to-peak output ripple voltage	49.	FootPrint	1.735 k mm²	,	Total Foot Print Area of BOM components
Information System Information Information Information Information Information Information Information Information Information		_	000 504 111		0.711.7
51.Gain Marg-13.538 dBSystem InformationBode Plot Gain Margin52.lout4.0 ASystem Informationlout operating point53.Low Freq Gain81.112 dBSystem Gain at 1Hz54.Operating TopologyTransitionSystem InformationThe current operating topology of the device55.Phase Marg69.045 degSystem Information56.Pout192.0 WSystem Information57.Total BOM\$24.39System Information58.Vin58.5 VSystem Information59.Vout Actual48.339 VSystem Vout Actual calculated based on selected voltage divider resistors Information60.Vout Tolerance3.461 %System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable61.Vout p-p17.031 mVSystem Peak-to-peak output ripple voltage	50.	Frequency	239.521 KHZ	,	Switching frequency
Information System Iout operating point Information System Total output power Information System Total BOM Cost Information System Vin operating point Information System Vin operating point Information System Vout Actual calculated based on selected voltage divider resistors Information System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable System Sy	E 1	Coin Mora	40 E00 dD		Rada Blat Cain Marain
System Information System Gain at 1Hz	51.	Gain Marg	-13.336 UD	,	Bode Plot Gain Margin
Information System Gain at 1Hz	52	lout	4 O A		lout operating point
53.Low Freq Gain81.112 dBSystem InformationGain at 1Hz54.Operating TopologyTransitionSystem InformationThe current operating topology of the device55.Phase Marg69.045 degSystem InformationBode Plot Phase Margin56.Pout192.0 WSystem InformationTotal output power57.Total BOM\$24.39System InformationTotal BOM Cost58.Vin58.5 VSystem InformationVin operating point59.Vout Actual48.339 VSystem InformationVout Actual calculated based on selected voltage divider resistors60.Vout Tolerance3.461 %System InformationVout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable61.Vout p-p17.031 mVSystemPeak-to-peak output ripple voltage	52.	lout	4.0 A	•	lout operating point
Information System The current operating topology of the device Information	53	Low Fred Gain	81 112 dB		Gain at 1Hz
54. Operating Topology Transition System Information 55. Phase Marg 69.045 deg System Bode Plot Phase Margin 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Vin operating point Information 59. Vout Actual 48.339 V System Vout Actual calculated based on selected voltage divider resistors Information 60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	55.	Low ricq Gain	01.112 dD	•	Calif at 1112
Information System Bode Plot Phase Margin Four terms System Information System Total output power System Information Total BOM Cost Information System Information System Vin operating point Information System Vin operating point Information System Vout Actual calculated based on selected voltage divider resistors Information System Vout Tolerance System Vout Tolerance System System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable System Peak-to-peak output ripple voltage System Syst	54	Operating Topology	Transition		The current operating topology of the device
55.Phase Marg69.045 degSystem InformationBode Plot Phase Margin56.Pout192.0 WSystem InformationTotal output power57.Total BOM\$24.39System InformationTotal BOM Cost Information58.Vin58.5 VSystem Vin operating point Information59.Vout Actual48.339 VSystem Vout Actual calculated based on selected voltage divider resistors Information60.Vout Tolerance3.461 %System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable61.Vout p-p17.031 mVSystem Peak-to-peak output ripple voltage	0-1.	operating repology	Transition	,	The durient operating topology of the device
Information 56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Total BOM Cost Information 58. Vin 58.5 V System Vin operating point Information 59. Vout Actual 48.339 V System Vout Actual calculated based on selected voltage divider resistors Information 60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	55	Phase Marg	69 045 dea		Bode Plot Phase Margin
56. Pout 192.0 W System Information 57. Total BOM \$24.39 System Information 58. Vin 58.5 V System Vin operating point 59. Vout Actual 48.339 V System Vout Actual calculated based on selected voltage divider resistors Information 60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	00.	T Hadd Mary	00.0 10 dog	,	2000 Flot Flago Margin
Information 57. Total BOM \$24.39 System Total BOM Cost Information 58. Vin 58.5 V System Vin operating point Information 59. Vout Actual 48.339 V System Vout Actual calculated based on selected voltage divider resistors Information 60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	56.	Pout	192.0 W		Total output power
57.Total BOM\$24.39System InformationTotal BOM Cost58.Vin58.5 VSystem InformationVin operating point59.Vout Actual48.339 VSystem InformationVout Actual calculated based on selected voltage divider resistors60.Vout Tolerance3.461 %System InformationVout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable61.Vout p-p17.031 mVSystemPeak-to-peak output ripple voltage	00.		.02.0	,	Total output porto:
Information System Vin operating point System Vout Actual calculated based on selected voltage divider resistors	57.	Total BOM	\$24.39		Total BOM Cost
Information 59. Vout Actual 48.339 V System Vout Actual calculated based on selected voltage divider resistors Information 60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage			,	,	
 59. Vout Actual 48.339 V 60. Vout Tolerance 3.461 % 61. Vout p-p 48.339 V System Information System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable Peak-to-peak output ripple voltage 	58.	Vin	58.5 V		Vin operating point
Information 60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage				•	
60. Vout Tolerance 3.461 % System Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	59.	Vout Actual	48.339 V	System	Vout Actual calculated based on selected voltage divider resistors
Information resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage				•	ŭ
Information resistors if applicable 61. Vout p-p 17.031 mV System Peak-to-peak output ripple voltage	60.	Vout Tolerance	3.461 %	System	Vout Tolerance based on IC Tolerance (no load) and voltage divider
-7				Information	
Information	61.	Vout p-p	17.031 mV	System	Peak-to-peak output ripple voltage
				Information	

Design Inputs

Name	Value	Description	
lout	4.0	Maximum Output Current	
SoftStart	2.5 ms	Soft Start Time (ms)	
VinMax	58.5	Maximum input voltage	
VinMin	57.5	Minimum input voltage	
Vout	48.0	Output Voltage	
base_pn	LM5118-Q1	Base Product Number	
source	DC	Input Source Type	
Ta	55.0	Ambient temperature	
UserFsw	239.521 k	Customer Selected Frequency	

WEBENCH® Assembly

Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

Soldering Component to Board

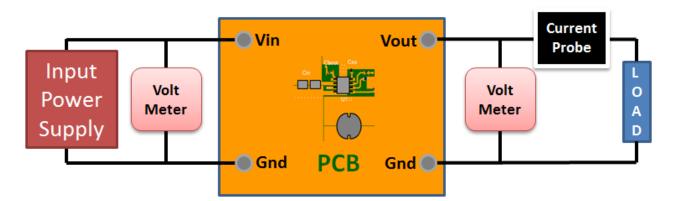
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 57.5V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum lout of the design from Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated output power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.



Design Assistance

- 1. The LM5118-Q1 is a wide range buck-boost controller which is operable in an ultra wide input range of 3 to 75V. A buck-boost regulator can maintain regulation for input voltages either higher or lower than the output voltage. The challenge is that buck-boost power converters are not as efficient as buck regulators. The LM5118 has been designed as a dual mode controller whereby the power converter acts as a buck regulator while the input voltage is above the output. As the input voltage approaches the output voltage, a gradual transition to the buck-boost mode occurs. This gradual transition between modes eliminates disturbances at the output during transitions.
- 2. Master key: F1AEBBBE3F2F05F3[v1]
- 3. LM5118-Q1 Product Folder: http://www.ti.com/product/LM5118%2DQ1: contains the data sheet and other resources.

Important Notice and Disclaimer

TI provides technical and reliability data (including datasheets), design resources (including reference designs), application or other design advice, web tools, safety information, and other resources AS IS and with all faults, and disclaims all warranties. These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

Providing these resources does not expand or otherwise alter TI's applicable Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with TI products.