Five Easy Steps to Create a Multi-Load Power Solution

Introduction

Every application needs power, but it can often be an afterthought. Engineers may choose a power solution simply based on whether it can meet their load demand and price point. Designing a power solution with more information up front can result in a better choice, improving the end product and reducing the risk of costly rework.

For example, efficiency may be overlooked in making a decision on a power solution even though it is critical to how much system heat the end product will produce. Low-efficiency designs consume more energy upfront and generate more heat on the backend. Chances are there is a power-hungry FPGA, graphics processor or MCU in the application. By minimizing heat from other sources like the dc-dc power conversion, the thermal load on the overall system is minimized. Another common scenario is a battery-operated product. In this case, power efficiency directly ties to battery life, so a designer can't afford to overlook it.

But, even when trying to plan ahead, finding a device that meets the input and output requirements while achieving high efficiency and other design considerations is not an easy task. An engineer could spend hours looking at a vendor's parametric search and then referring to datasheets for additional information and efficiency curves to determine if a part was a good choice for their application. No one has that much time. Fortunately, "there's an app for that!" as several vendors of power management ICs now offer sophisticated product selection tools, which help designers find power supply ICs that are well suited for the customers' applications.

Intersil's PowerCompass™ is one such tool. PowerCompass cuts power design time down from hours to minutes. This design tool simplifies the power design process by presenting you with the right groups of parts from the company's catalog of power supply ICs based on your specific requirements. From these parts, you are then presented with the data you need to make an informed choice on which device to use in your next application.

PowerCompass currently supports Intersil's non-isolated dc-dc controllers and regulators, including buck, boost and buck-boost configurations, as well as positive output linear regulators. The tool also supports current sharing among the buck solutions. The types of products suggested in the results include analog controllers, digital controllers, analog modules, digital modules, analog integrated FETs, digital integrated FETs as well as the linear regulators. PowerCompass also supports multiphase controllers in both analog and digital.

This article explains and demonstrates how to use the PowerCompass tool. The following five simple steps create a custom design from initial definition to reference design schematics and a bill of materials (BOM.) Also, note there are two versions of this tool available, one is an online app version that runs in a web browser and the other is an offline Excel version.

Step 1. Define Requirements for Your System

In the example in Figure 1, the power requirements are seen on the left side of the screen, while the right side of the screen illustrates how these same requirements would be entered into the PowerCompass tool. A simple straight forward GUI makes entering requirements as simple as putting them down on paper. Note that while manually entering requirements is always an option, you can also take advantage of the over 250 prebuilt design templates as well as the Xilinx FPGA power estimator import function to jump start this process even faster.

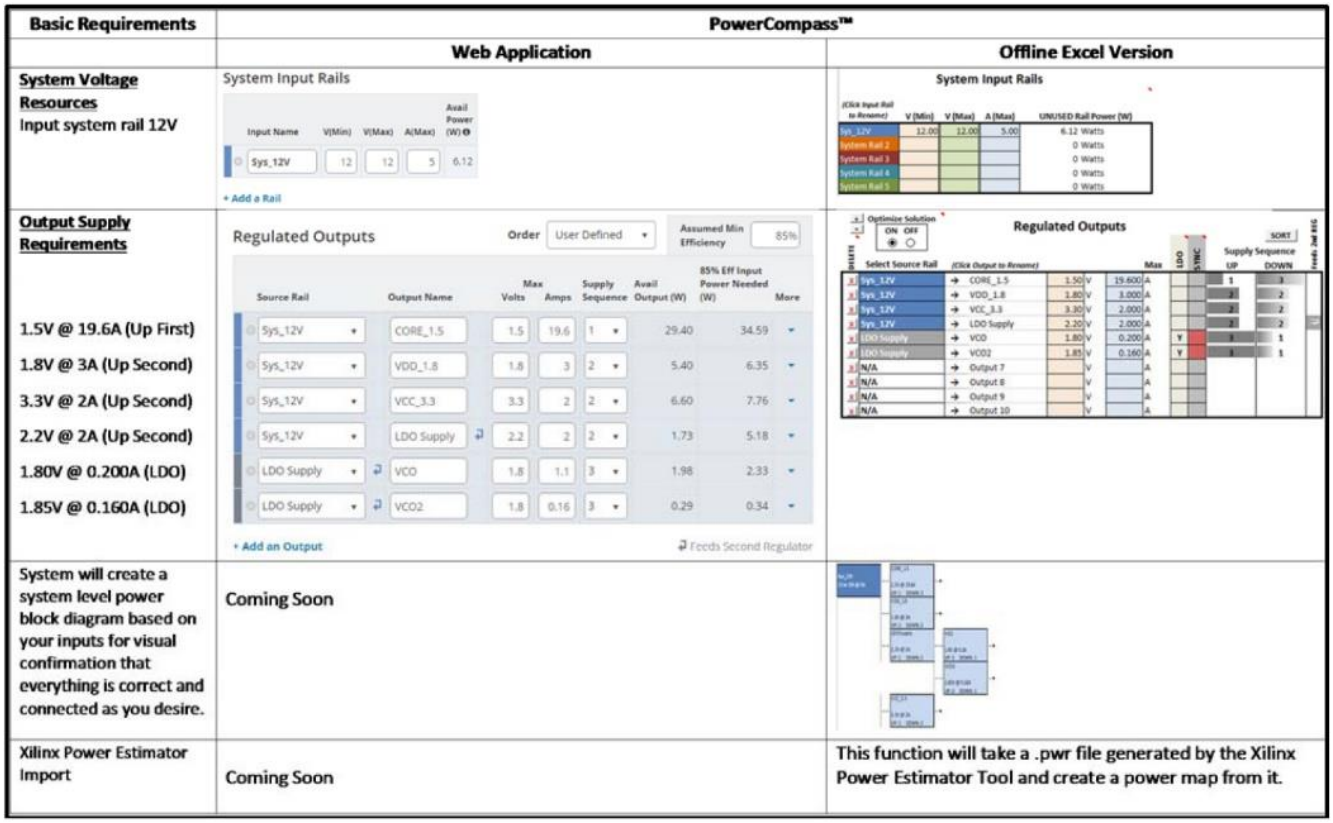


Figure 1. Entering power requirements into the PowerCompass tool

Step 2. Creating a Compatible Parts List

Before hitting the “Find Solutions” button, designers should consider that there is an option in the offline version that allows users to set some specific requirements for the design such as analog or digital, or discrete vs. an all-power-module solution. For an automotive application, there is an option to see only the parts that are AEC-Q100 certified.

The offline version of the tool allows for users to prioritize different design goals before having the tool suggest parts. An “Order Results” menu allows designers to select options such as price, newest release date, closest spec match, smallest package, lowest quiescent current, smallest footprint, lowest BOM cost or lowest BOM count. Currently, the online browser version of PowerCompass outputs results prioritized by price with the option to reorder the results by efficiency. Solution filters allows these kinds of requirements to be placed on a parts list that will be generated in the next step.

Also by default, in the initial view, this tool shows just the first five devices for each topology that is recommended. However, this max number can be changed at the top of results and with the speed of the online tool, the results for all outputs appear almost instantaneously.

Step 3. Select Parts of Interest

After hitting the “Find Solutions” button, a list of parts is generated that meets the requirements from Step 1 and Step 2. Some example results are shown in Figure 2. Besides providing the expected data, the PowerCompass tool also displays the estimated efficiency under full load as well as other information that

will be helpful in making initial parts selections. Part numbers with a schematic icon or a blue highlighted check box include the ability to generate a reference design schematic in the last step.

In the example below, multiple devices have been selected for each output, taking care to also select a few different device topologies to compare for each output. Once all the parts of interest have been checked, simply hit the “Continue” button.

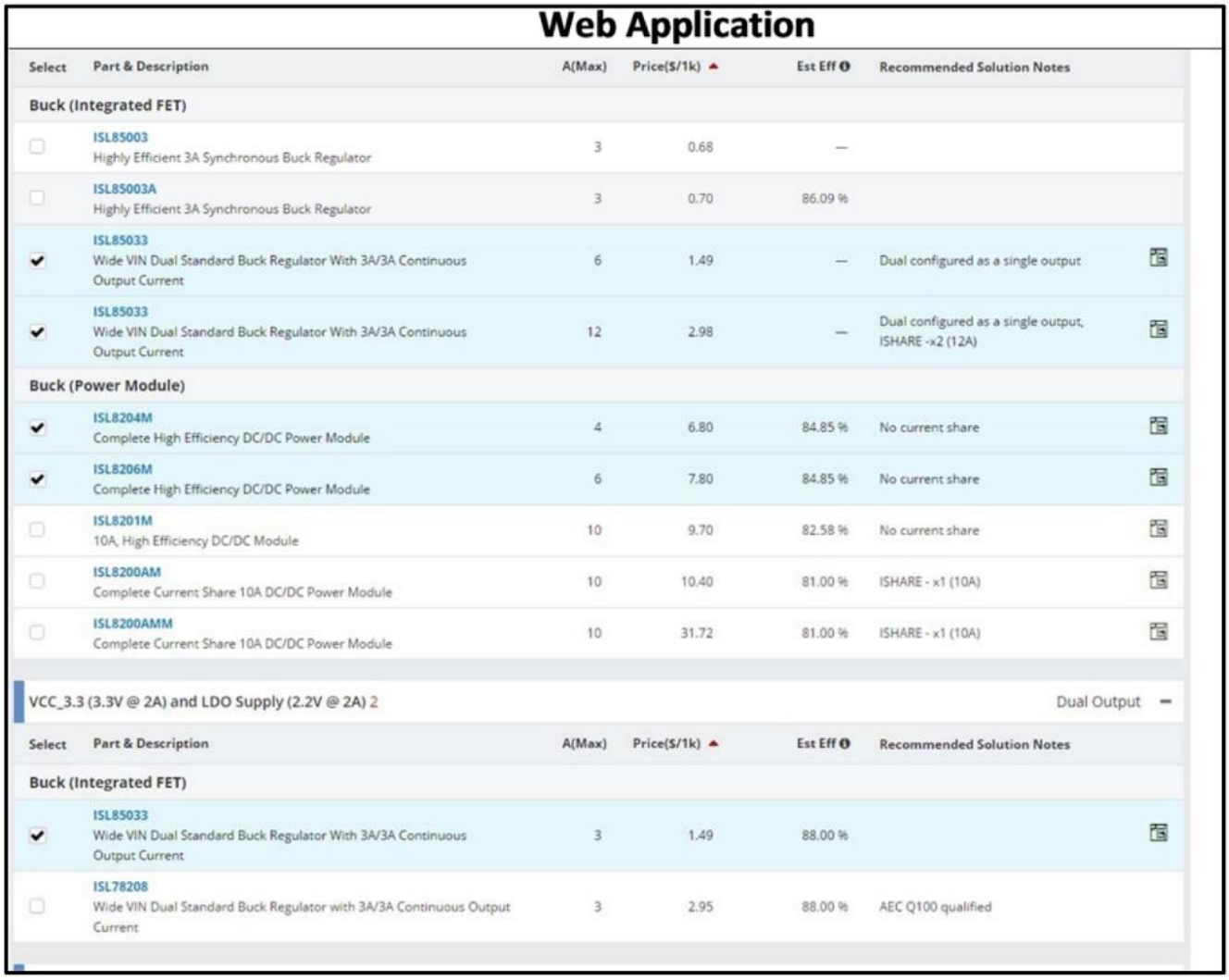


Figure 2. Part list example in the PowerCompass tool

Step 4. Review Device Data and Narrow Selections

After performing a system analysis in the previous step, the PowerCompass tool now presents the parts selected in Step 3 in a detailed view as shown in Figure 3. This allows analysis of the devices on a deeper level to enable the most informed decision. In this view, not only are the individual output device specifics presented, but as devices are added, overall system efficiencies, power dissipations as well as thermal information relating to the device junction temperature are displayed.

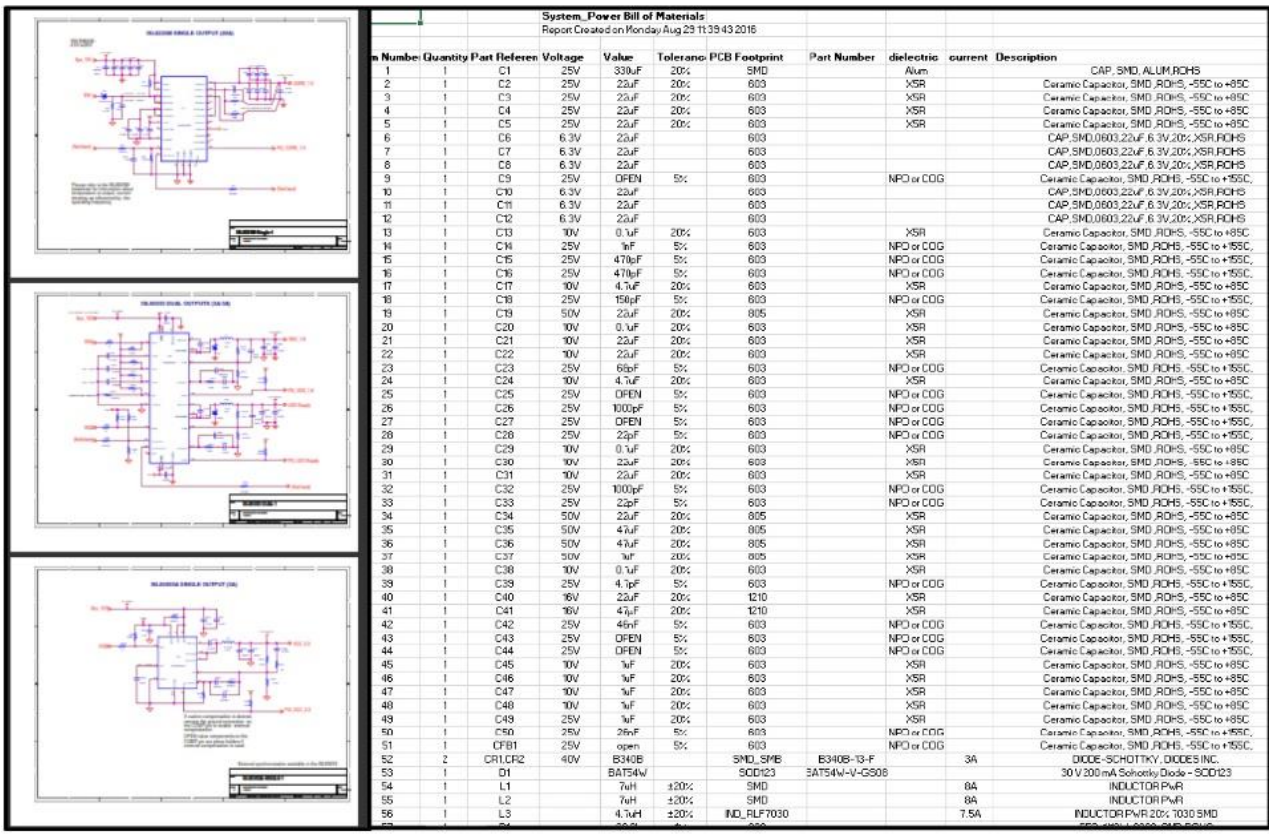
Each output has adjustments for the light load, typical load and max load requirements for that particular output. By default, these are set to 10%, 50% and 100% of the max current specified for that output.

Adjustments to these sliders will affect the overall system efficiency points presented in the top summary area.

Figure 3. Detailed product comparison dashboard in the PowerCompass tool

Step 5. Generate Reference Design

For schematic-enabled devices, a reference design is now just a click away. Just click on the “Generate Reference Design” button. This will kick off the schematic generation process, which only takes a few minutes. When this process is done, users are e-mailed a complete set of multipage schematics that are connected and preconfigured to your specific design requirements. As you can see in Figure 4, along with these schematics, a complete bill of materials (BOM) is also provided to simplify and speed up the design effort.



System_Power Bill of Materials

Report Created on Monday Aug 29 11:39:43 2016

n Numbe	Quantity	Part Referen	Voltage	Value	Tolerance	PCB Footprint	Part Number	dielectric	current	Description
1	1	C1	25V	330uF	20%	SMD		Alum		CAP, SMD, ALUM,ROHS
2	1	C2	25V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
3	1	C3	25V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
4	1	C4	25V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
5	1	C5	25V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
6	1	C6	6.3V	22uF		603				CAP,SMD,0603,22uF,6.3V,20%,X5R,ROHS
7	1	C7	6.3V	22uF		603				CAP,SMD,0603,22uF,6.3V,20%,X5R,ROHS
8	1	C8	6.3V	22uF		603				CAP,SMD,0603,22uF,6.3V,20%,X5R,ROHS
9	1	C9	25V	OPEN	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
10	1	C10	6.3V	22uF		603				CAP,SMD,0603,22uF,6.3V,20%,X5R,ROHS
11	1	C11	6.3V	22uF		603				CAP,SMD,0603,22uF,6.3V,20%,X5R,ROHS
12	1	C12	6.3V	22uF		603				CAP,SMD,0603,22uF,6.3V,20%,X5R,ROHS
13	1	C13	10V	0.1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
14	1	C14	25V	1uF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
15	1	C15	25V	470pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
16	1	C16	25V	470pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
17	1	C17	10V	4.7uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
18	1	C18	25V	150pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
19	1	C19	50V	22uF	20%	805		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
20	1	C20	10V	0.1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
21	1	C21	10V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
22	1	C22	10V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
23	1	C23	25V	68pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
24	1	C24	10V	4.7uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
25	1	C25	25V	OPEN	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
26	1	C26	25V	1000pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
27	1	C27	25V	OPEN	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
28	1	C28	25V	22pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
29	1	C29	10V	0.1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
30	1	C30	10V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
31	1	C31	10V	22uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
32	1	C32	25V	1000pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
33	1	C33	25V	22pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
34	1	C34	50V	22uF	20%	805		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
35	1	C35	50V	4.7uF	20%	805		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
36	1	C36	50V	4.7uF	20%	805		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
37	1	C37	50V	1uF	20%	805		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
38	1	C38	10V	0.1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
39	1	C39	25V	4.7pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
40	1	C40	16V	22uF	20%	1210		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
41	1	C41	16V	4.7uF	20%	1210		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
42	1	C42	25V	46pF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
43	1	C43	25V	OPEN	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
44	1	C44	25V	OPEN	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
45	1	C45	10V	1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
46	1	C46	10V	1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
47	1	C47	10V	1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
48	1	C48	10V	1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
49	1	C49	25V	1uF	20%	603		X5R		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
50	1	C50	25V	26nF	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
51	1	CFB1	25V	open	5%	603		NP0 or COG		Ceramic Capacitor, SMD ,ROHS, -55C to +155C,
52	2	CR1,CR2	40V	B340B		SMD_SMB	B340B-13-F		3A	DIODE-SCHOTTKY, DIODES INC.
53	1	D1		BAT54W		SOD123	BAT54W-V-GS08			30 V 200 mA Schottky Diode - SOD123
54	1	L1		7uH	±20%	SMD			8A	INDUCTOR PWR
55	1	L2		7uH	±20%	SMD			8A	INDUCTOR PWR
56	1	L3		4.7uH	±20%	IND_RLF7030			7.5A	INDUCTOR PWR 20% 7030 SMD

Figure 4. Full set of schematics and BOM

That's it. Really!

That's the process. No more regrets about selecting the power device at the last minute while paging through datasheet after datasheet to find the right part. With the PowerCompass tool, the process from initial requirements to schematic generation is straightforward. It's like having access to an application engineer with a breadth of knowledge on how the devices will perform in a system. If you have five minutes, give it a try! Go to www.intersil.com/powercompass.

Next Steps

- Learn more about PowerCompass
- Check out the training videos
- Submit PowerCompass feedback

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