intersil

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.

Basic Requirements	PowerCompass™										
		Web Applic	ation	Offline Excel Version							
System Voltage Resources Input system rail 12V	System Input Rails Input Name V(Min) V(Max) Sys.12V 12 12 + Add a Rail	Avail Power A(Max) (W) O 5 6.12			System Input Ralls (bits span fiel) V (bits) V (bits) UNXXXID Rail Power (W) W1_2XV 12.00 22.00 5.00 6.12 Witts Vptems Res3 0 Watts 0 Watts 0 Watts Vptems Res3 0 Watts 0 Watts Vptems Res3 0 Watts 0 Watts						
Output Supply Requirements	Regulated Outputs	Order	User Defined •	Assumed Min Efficiency 85%	Optimiler solution On OF OF						
	Source Rail Out	Max stput Name Volts /	Supply Avai Amps Sequence Out;	85% Eff Input Power Needed nut (W) (W) More	Select Source Rall (Disk departs Rowne) Mail B Juppy Sequence g Jupy 12V + (OR_15) 1.50 15.800 A 1 3 Jupy 12V + (OR_15) 1.50 15.800 A 2 2						
1.5V @ 19.6A (Up First)	0 5ys_12V • 0	CORE_1.5	19.6 1 •	29.40 34.59 •	JL Syn_3XY → VCC_JL3 3.00V 02.0000Å 2 2 JL Syn_3XY → LDO Supply 2.20V 4 2 2 2 V						
1.8V @ 3A (Up Second)	© Sys_12V • V	/DD_1.8	3 2 +	5.40 6.35 •	x 000 ↔ V002 1.85 V 0.260 A V 8 1 x NAA → 0xppt 7 V A A 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
3.3V @ 2A (Up Second)	0 Sys_12V • V	/00,33	2 2 •	6.60 7.76 -	1 N/A + Output 9 1 N/A + Output 9 1 N/A + Output 10 V A						
2.2V @ 2A (Up Second)	0 Sys_12V •	DO Supply 22	2 2 •	1,73 5.18 •							
1.80V @ 0.200A (LDO)	O LDO Supply + 2 V	/co	1.1 3 +	1.98 2.33 •							
1.85V @ 0.160A (LDO)	O LDO Supply + 2 V	1.8	0.16 3 •	0.29 0.34 •							
	+ Add an Output			Preeds Second Regulator							
System will create a system level power block diagram based on your inputs for visual confirmation that everything is correct and connected as you desire.	Coming Soon				No (N, d)						
Xilinx Power Estimator Import	Coming Soon			This function will take a .pwr file generated by the Xilinx Power Estimator Tool and create a power map from it.							



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.

	Web Application								
Select	Part & Description	A(Max)	Price(\$/1k)	Est Eff O	Recommended Solution Notes				
Buck (I	ntegrated FET)								
	ISL85003 Highly Efficient 3A Synchronous Buck Regulator	3	0.68	-					
	ISL85003A Highly Efficient 3A Synchronous Buck Regulator	3	0.70	86.09 %					
•	ISL85033 Wide VIN Dual Standard Buck Regulator With 3A/3A Continuous Output Current	6	1.49	-	Dual configured as a single output	13			
•	ISL85033 Wide VIN Dual Standard Buck Regulator With 3A/3A Continuous Output Current	12	2.98	-	Dual configured as a single output, ISHARE -x2 (12A)	13			
Buck (F	Power Module)								
~	ISL8204M Complete High Efficiency DC/DC Power Module	4	6.80	84.85 %	No current share	ß			
~	ISL8206M Complete High Efficiency DC/DC Power Module	6	7.80	84.85 %	No current share	13			
	ISL8201M 10A, High Efficiency DC/DC Module	10	9.70	82.58 %	No current share	個			
	ISL8200AM Complete Current Share 10A DC/DC Power Module	10	10.40	81.00 %	ISHARE - x1 (10A)	1			
	ISL8200AMM Complete Current Share 10A DC/DC Power Module	10	31.72	81.00 %	ISHARE - x1 (10A)	ß			
VCC_3.	3 (3.3V @ 2A) and LDO Supply (2.2V @ 2A) 2				Dual Outpu	t -			
Select	Part & Description	A(Max)	Price(S/1k)	Est Eff O	Recommended Solution Notes				
Buck (I	ntegrated FET)								
•	ISL85033 Wide VIN Dual Standard Buck Regulator With 3A/3A Continuous Output Current	3	1.49	88.00 %		13			
0	ISL78208 Wide VIN Dual Standard Buck Regulator with 3A/3A Continuous Output Current	3	2.95	88.00 %	AEC Q100 qualified				



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									
IN ACCOUNT OWNER & LOUPPUT LINES	Report Created on Monday Aug 23 11:39 43 2016									
70/2017	and the second second									
WWW TITTE	n Numbe Quantity	Part Referen	Voltage	Value	Tolerano	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		XSR		Ceramic Capacitor, SMD , RDHS, -55C to +85C
	3 1	C3	25V	22JF	20%	603		XSR		Ceramic Capacitor, SMD , ROHS, -55C to +85C
	4 1	C4	25V	22uF	20%	603		XSR		Ceramic Capacitor, SMD ,RDHS, -55C to +85C
	5 1	C5	25V	22JF	20%	603		XSR		Ceramic Capacitor, SMD , RDHS, -55C to +85C
	6 1	C6	6.3V	22JF		603				CAP.SMD.0603.22vF.6.3V.20%,X5R.ROHS
The self-self.	7 1	C7	6.3V	ZauF		603				CAP, SMD, 0603, 22uF, 6, 3V, 20%, XSR, FICHS
	8 1	C8	6.3V	22uF		603				CAP, SMD, 0603, 22uF, 6, 3V, 20%, XSR, ROHS
Transferrantiation in the second second	9 1	C9	25V	OFEN	5%	603		NPO or COG		Ceramic Capacitor, SMD, RDH5, -55C to +155C,
manual or state where the	10 1	C10	6.3V	22uF		603				CAP, SMD, 0603, 224P, 6, 3V, 20%, XSR, FICHS
	n 1	Lm	6.30	2245		603				CAP, SMD, 0603, 22uh, 6.3V, 20%, XSH, HUHS
	12 1	C12	6.30	Zaut		603		1.000		CAP, SMD, UBU3, 224P, 6 3V, 20%, X5H, HUHS
	13 1	CB	107	0.1uF	20%	603		XSR		Ceramic Capacitor, SMD , RDHS, -55C to +85C
	N	CN	25V	Infr 170 F	5%	603		NPD or COG		Ceramic Capacitor, SMD, ADH5, -55C to +155C,
	10	UT5	25V	470pF	574	603		NPU or LOG		Ceramic Lapacitor, SMU, HURIS, -SSC to +155C,
	10	U16	25V	470pF	30%	603		MPU or COG		Ceramic Lapacitor, SMD, RUHS, -55C to +155C,
Version and the second se	10 1	CHP	250	9. NF 150-F	20%	003		NDD CCC		Ceremio Lapacitor, SMD, HURS, -550 to +650
TRANSFERRAR DURING STATUTE (SE SE	10	C 10	25V	130pr	201	005		MEDIOLOG		Certamic Lapacitol, SMU, HURD, HSEC 10+155U,
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	20 1	C10	300	COUP	20%	000		MED		Ceramic Capacitor, SMD DRUPS, FEC to 1950
and the summer from	20 1	020	100	0. UF	20%	603		VED		Certamic Capacitor, SMD, MURG, -SSC to +6SC
	20 1	021	100	2201	20%	005		VED		Caranio Capacitor, SHD (XORS, 430-104000
	72 1	622	251	ES-F	EV.	603		NPD at COG		Certainic Capacitor, SMD (2006), 550 to 1050
	24 1	023	100/	1.7.5	20%	603		VSP		Ceramic Capacitor, SMD, PDHS, -55C to +85C
	25 1	C25	251/	DEEN	54	603		NPD or COG		Caratric Canacitor SMD BOHS -55C to ± 55C
The second secon	26 1	C26	253/	1000eE	5%	603		NPD or COG		Ceremic Cenerator, SMD, POHS, #550 to #7550
	27 1	C27	25V	DEEN	5%	603		NPDgrCOG		Ceramic Capacitor, SMD, BDH3, -55C to +155C
	28 1	C28	25V	22pF	5%	603		NPOwCOG		Ceramic Capacitor, SMD, BCH3, -55C to +155C
	29 1	C29	10V	0.145	20%	603		XSB		Ceramic Capacitor, SMD, BOES, -55C to +85C
+ Line	30 1	C30	101/	23.4F	20%	603		XSR		Ceramic Capacitor, SMD , ROHS, -55C to +85C
-14	31 1	C31	10V	22uF	20%	603		XSR		Ceramic Capacitor, SMD , RDHS, -55C to +85C
- A facial	32 1	C32	25V	1000pF	5%	603		NFO or COG		Ceramic Capacitor, SMD JPDHS, -55C to +155C,
- 1000121	33 1	C33	25V	22pF	5%	603		NPO or COG		Ceramic Capacitor, SMD ,ROH5, -55C to +155C,
Tama P	34 1	C34	50V	22uF	20%	805		XSR		Ceramic Capacitor, SMD ,RDHS, -55C to +85C
	35 t	C35	SOV	47uF	20%	805		XSR		Ceramic Capacitor, SMD ,RDHS, -55C to +85C
	36 1	C36	50V	47uF	20%	805		XSR		Ceramic Capacitor, SMD ,ROHS, -55C to +85C
	37 1	C37	50V	Tuff	20%	805		X5B		Ceramic Capacitor, SMD ,ROh5, -55C to +65C
	38 1	C38	10V	0.1uF	20%	603		XSR		Ceramic Capacitor, SMD JROHS, -55C to +85C
NLOUGH SHELP IN THE CA	39 1	C39	25V	4.7pF	5%	603		NPO or COG		Ceramic Capacitor, SMD , RDH5, -55C to +155C,
	40 1	C40	16V	22uF	20%	1210		XSR		Ceramic Capacitor, SMD ,RDHS, -55C to +85C
	41 1	C41	16V	47µF	20%	1210		XSR		Ceramic Capacitor, SMD , RDHS, -55C to +85C
	42 1	C42	25V	46nF	5%	603		NPO or COG		Ceramic Capacitor, SMD ,ROH5, -55C to +155C,
The state of the second second	43 1	C43	25V	OFEN	5%	603		NPO or COG		Ceramic Capacitor, SMD , RDH5, -55C to +155C,
	44	044	25V	UPEN	5%	603		NPU or CUG		Ceramic Lapacitor, SMU, HUHS, -55C to +155C,
	45	045	10V	NF	20%	603		ASH		Leramic Lapacitor, SMD ,HUHS, +55C to +85C
TTTL TTE	46 1	046	107	TUP A F	20%	603		XSH		Ceramio Capacitor, SMD (HURS, -55C to +85C
	46 1	047	100	air S.F	20%	603		XSH		Ceramic Capacitor, SMD, HURS, -SSC to +BSC
Training and a first state of the state of t	40	C48	2EV	AP S.E	2074	603		ASH MED		Certainic Capacitor, SMD JRUPS, "SSC to #85C
Targe Contractor	50 1	043	25V 25V	25.5	20% EV	803		NEO or COC		Certamic Capacitor, 3MD (HURS, +350 to +350
1287 pri ang ping haliyon di	S1 1	CEBI	250	oten	54	603		NPOgrCOG		Caracter Capacitor, SMD (RCH5, -55C to + 55C)
	52 2	CR1CR2	40V	BMDB		SMD SMB	B3408-T3-F	1. 50 000	36	DEDE-SCHOTTKY DIDESINC
Table and a state of a	53 1	DI	-104	BAT54W		SOD123	BATS4W-V-GS0	18	Jin	30 V 200 mA Schottky Diode - 900123
	54 1	L1		7uH	#20%	SMD		1	84	INDUCTOR PWR
	55 1	L2		7uH	±20%	SMD			84	INDUCTOR PWR
2	56 1	L3		4.7uH	±20%	ND_RLF7030			7.5A	NOUCTOR PWR 20% 1030 5MD
	1000	24		000		000		1	100000	550 (WOLL 0000, OLD DOUD

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
- <u>Check out the training videos</u>
- Submit PowerCompass feedback

About Intersil

Intersil Corporation is a leader in the design and manufacture of high-performance analog, mixed-signal and power management semiconductors for the industrial and infrastructure, personal computing and high-end consumer markets. For more information about Intersil, visit our website at <u>www.intersil.com</u>.

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