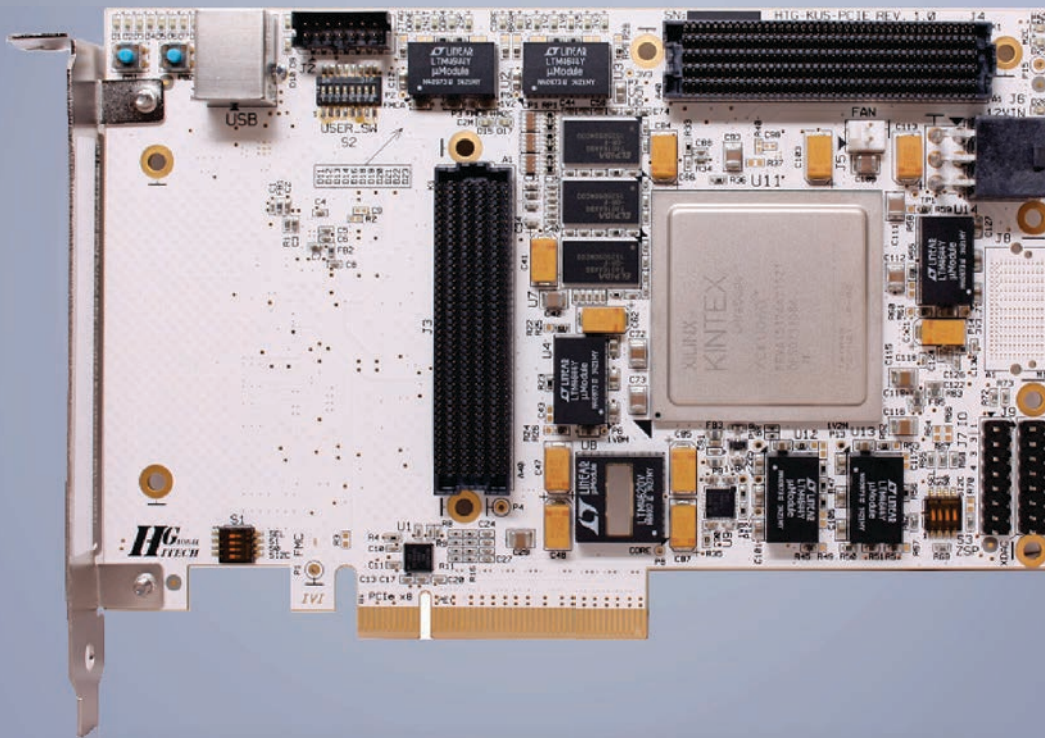


Power Management Solutions for Xilinx® FPGAs

Tested and Verified

- ▣ Schematics
- ▣ Bill-of-Materials
- ▣ Power Circuit Simulation & Design Tools
- ▣ www.linear.com/xilinx

Xilinx Kintex® UltraScale® PCI Express Platform (by HiTech Global)



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Development Boards	4-15
Power Circuit Simulation & Design Tool	18-19

Introduction

Power management solutions presented here have been assembled and verified by Xilinx or third-party FPGA development board providers. Each development board is accompanied by a photo of the board, power tree and its Linear Technology bill-of-materials. For more information and technical documentation, visit www.linear.com/xilinx.

Development Boards in this Brochure Can Be Found at www.linear.com/xilinx

FPGA	Board Supplier	Product Name	Part Number for FPGA Core	Page
Virtex® UltraScale	HiTech Global	Virtex UltraScale Multi 100 GIG Optical Networking Platform (HTG-9100)	LTM4620	4
		Virtex / Kintex UltraScale Development Platform (HTG-830)	LTM4620	5
	Linear Technology	Linear Technology Virtex Ultrascale MGT Power Card (DC2532A)	LTM4630-1	6
Kintex UltraScale	HiTech Global	Kintex UltraScale PCI Express Platform (HTG-K800)	LTM4620	7
		Kintex UltraScale Half-Size PCI Express Platform (HTG-K816)	LTM4644	8
	Linear Technology	Linear Technology Kintex Ultrascale MGT Power Card (DC2340A)	LTM4620	9
Virtex-7	HiTech Global	Virtex-7 V2000T PCI Express Development Board (HTG-700)	LTM4620	10
		Virtex-7 10G/40G/100G Optical Interface FPGA Platform (HTG-707)	LTM4620	11
		Virtex-7 High End Networking Card with Samtec FireFly™ (HTG-712)	LTM4620	12
Kintex-7	HiTech Global	Kintex-7 PCI Express Development Board (HTG-K700)	LTM4627	13
Zynq®		Zynq Networking Platform (HTG-Z100)	LTM4644	14
Artix®-7	Digilent®	Basys 3 Artix-7 FPGA Board	LTC3633	15

Development Boards Listed on the Board Supplier's Website

FPGA	Board Supplier	Product Name	Part Number for FPGA Core	Page
Virtex/Kintex UltraScale	BittWare	Xilinx UltraScale 3/4-Length PCIe Board with Quad QSFP, DDR4, QDR-IV, and QDR-II+ (XUSP3S)	LTM4620	16
		Xilinx UltraScale 3/4-Length PCIe Board with up to VU190, Quad QSFP, and 256 GBytes DDR4 (XUSP3R)	LTM4630A	16
Virtex UltraScale	HiTech Global	Virtex UltraScale 100 GIG Networking Card (HTG-828)	LTM4620	16
Virtex-7		Virtex-7 PCI Express Gen 3 /100 GIG Networking Card (HTG-703)	LTM4620	16
		Virtex-7 High End Networking Card With Dual CXP Ports (HTG-710)	LTM4620	16
		Virtex-7 100 GIG Network Interface Card (HTG-728)	LTM4620	16
		Virtex-7 Quad V2000T ASIC / SoC Emulation Platform (HTG-747)	LTM4620	17
		Virtex-7 FPGA FMC Module (HTG-777)	LTM4620	17
Kintex-7	Digilent	Genesys 2 Kixtex-7 FPGA Development Board	LTC3866	17
Virtex-6	HiTech Global	Virtex 6 PCI Express Gen 2 / SFP / USB 3.0 Development Board (HTG-600)	LTM4616	17
Spartan®-6	Digilent	Nexy3 Spartan-6 FPGA Board	LTC3633	17
	Xilinx	Spartan-6 FPGA SP601 Evaluation Kit	LTM4616	17

Contact board supplier to purchase the board

BittWare: www.bittware.com



Digilent: www.digilentinc.com



HiTech Global: www.hitechglobal.com



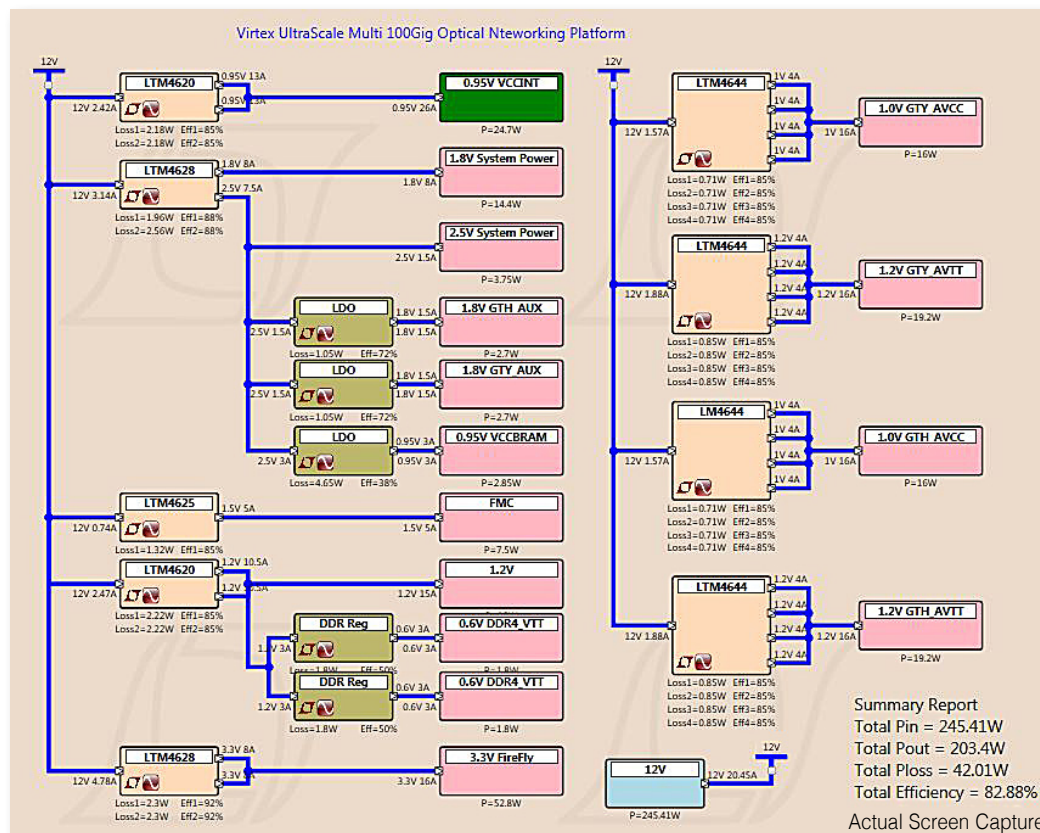
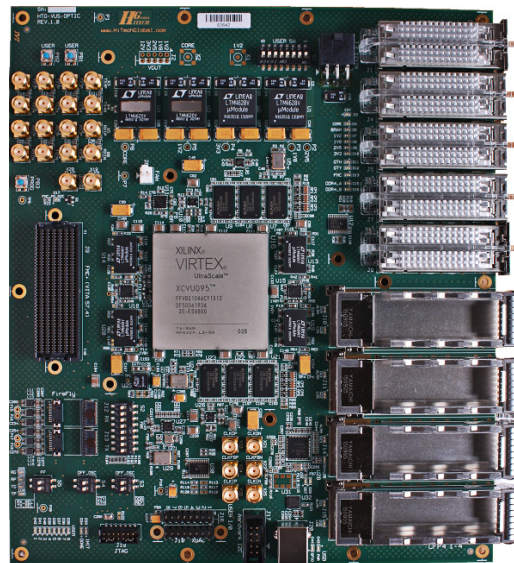
Linear Technology: www.linear.com



Contact Linear Technology for schematics and design support: refdesign@linear.com

Virtex UltraScale Multi 100 GIG Optical Networking Platform (HTG-9100)

HiTech Global's HTG-9100 board is populated with the Xilinx Virtex UltraScale 095, 125, 160, or 190 FPGA. It is an ideal platform for high end networking applications requiring multiple 100 GIG ports through CFP4 and QSFP28 connectors and large DDR4 memory resources.

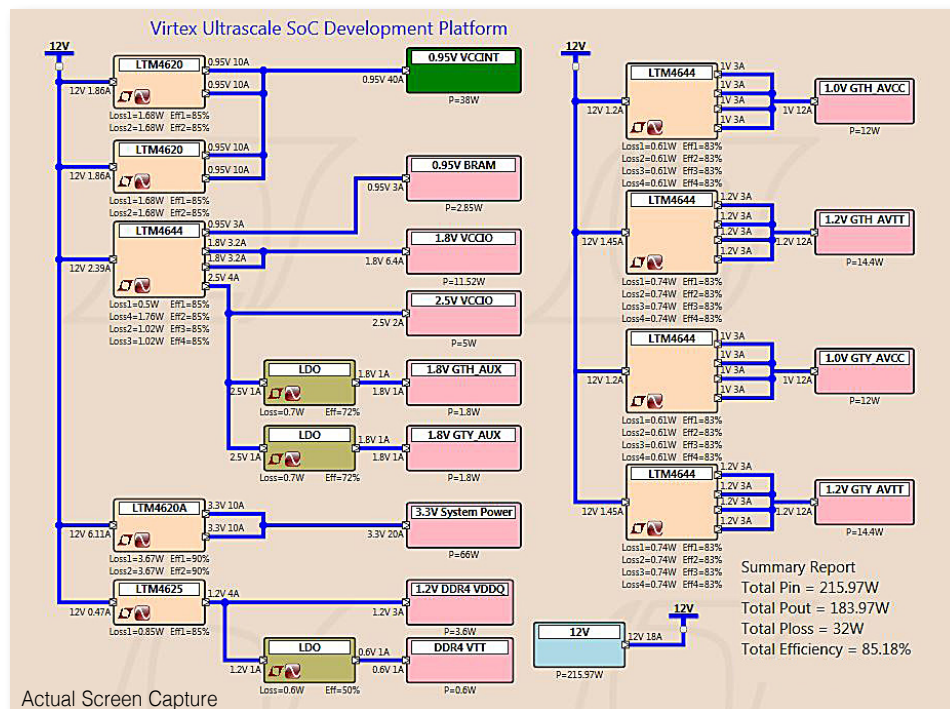
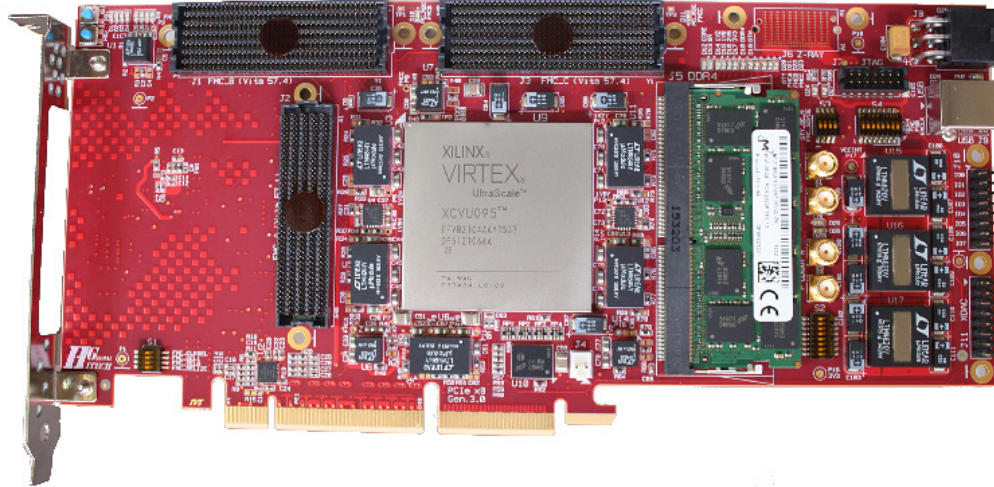


Power Tree designed in [LTpowerPlanner®](#)

Rail/Function	Part Number	General Description
0.95V: FPGA Core 1.2V: System Power	LTM4620	Dual 13A or Single 26A DC/DC μ Module® Regulator
1.8V, 2.5V: System Power	LTM4628	Dual 8A or Single 16A μ Module Regulator
1.5V (Adjustable): FMC	LTM4625	20VIN, 5A Step-Down DC/DC μ Module Regulator
1.0V, 1.2V: MGT	LTM4644	Quad DC/DC μ Module Regulator with Configurable 4A Output Array

Virtex/Kintex UltraScale Development Platform (HTG-830)

The HTG-830 architecture allows easy and versatile functional expansion through two Vita 57.4 and one Vita 57.1 compliant high pin-count FPGA mezzanine card (FMC) connectors. The FMC connectors provide access to 344 single-ended FPGA I/Os (172 LVDS) and up to 32 GTH, and 20 GTY serial transceivers. The high performance Z-Ray connector provides access to 16 GTY serial transceivers (as well as control and voltage pins) for applications requiring a large number of concentrated serial I/Os such as Hybrid Memory Cube (HMC), 100 GIG Ethernet (QSFP28, CFP4), etc.



Actual Screen Capture

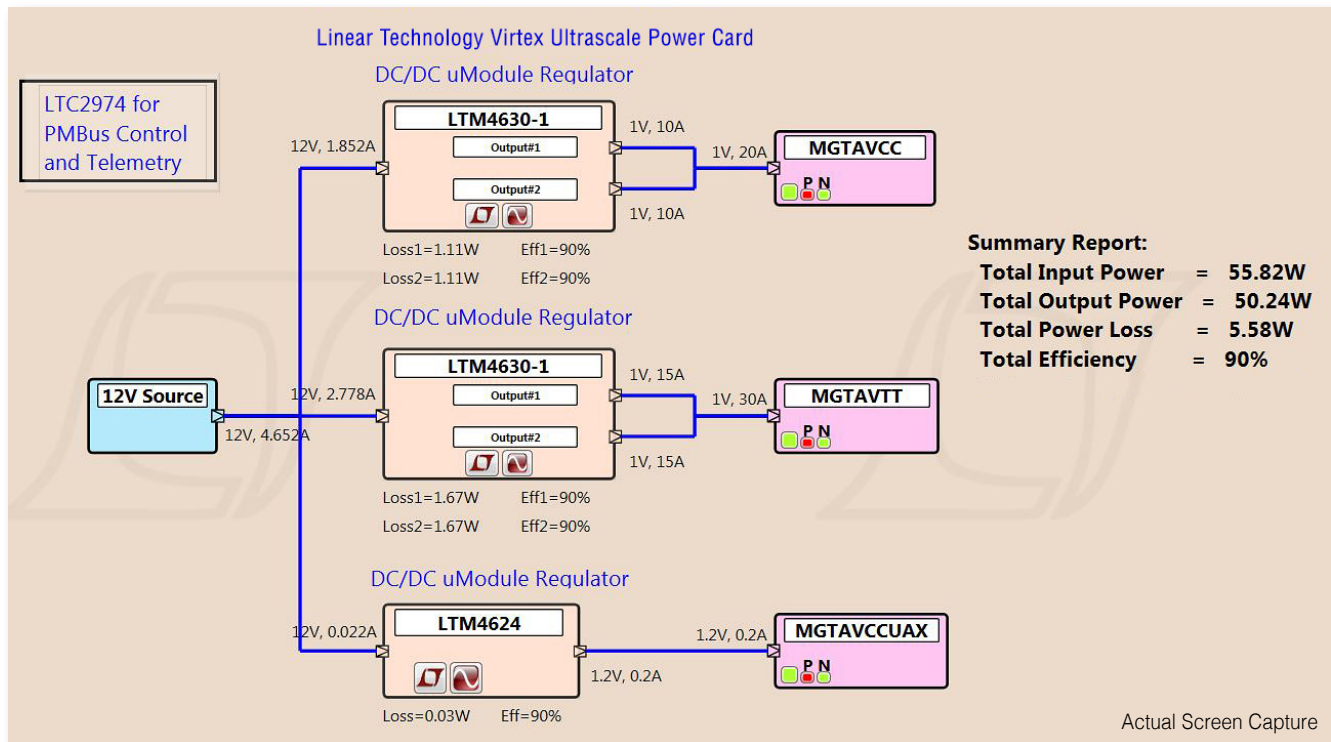
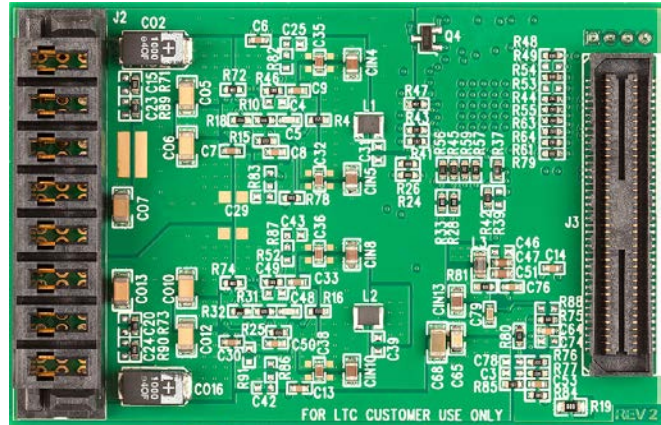
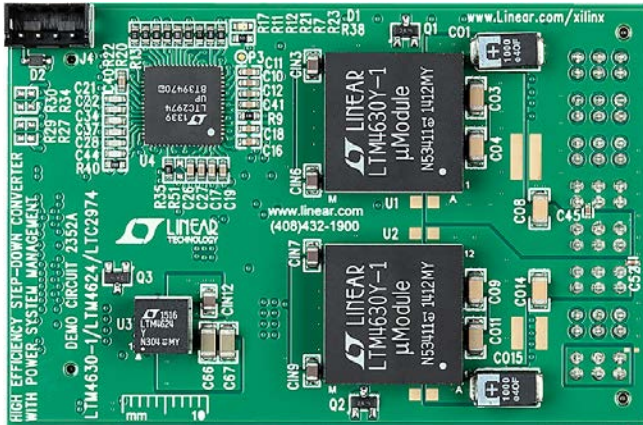
Power Tree designed in [LTpowerPlanner](#)

Rail/Function	Part Number	General Description
0.95V: FPGA Core	LTM4620	Dual 13A or Single 26A DC/DC μ Module Regulator $0.6V \leq V_{OUT} \leq 2.5V$
3.3V: FMC	LTM4620A	Dual 13A or Single 26A DC/DC μ Module Regulator $0.6V \leq V_{OUT} \leq 3.3V$
1.2V BRAM 1.8V BRAM 1.0V GTX/GTY 1.2V GTX/GTY	LTM4644	Quad DC/DC μ Module Regulator with Configurable 4A Output Array
1.2V DDR FMC	LTM4625	20V _{IN} , 5A Step-Down DC/DC μ Module Regulator

Xilinx Tested Power Solution for the Virtex UltraScale MGTS (Multigigabit Transceivers) (DC2352A)



The Xilinx VCU1287 characterization board MGTS can be powered using the Linear Technology DC2352A power card. The LTM4630-1s and LTM4624 μ Modules from Linear Technology are used on the DC2352A to meet the stringent power and low noise requirements for the GTH (16Gbps) & GTY (30Gbps) transceivers. The LTC2974, 4-channel PMBus system manager handles required telemetry functions.

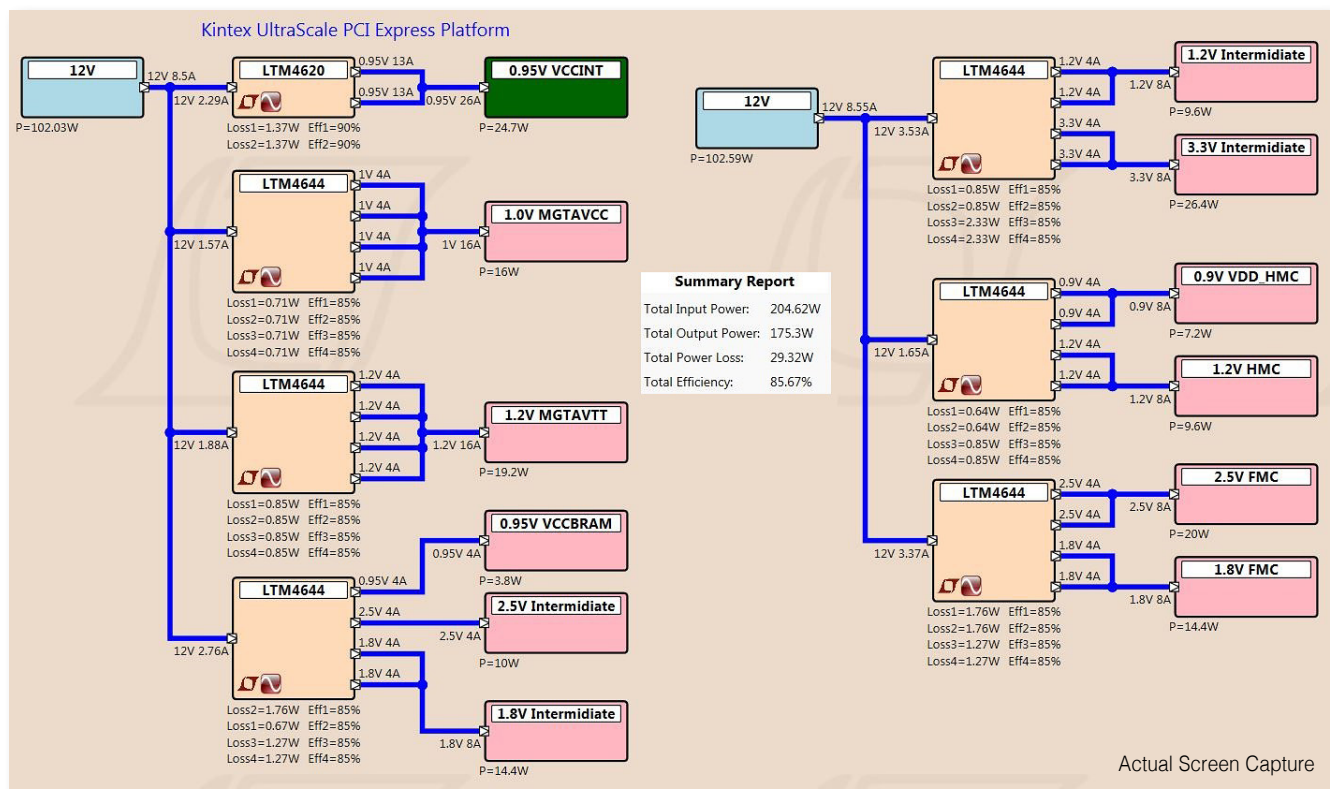
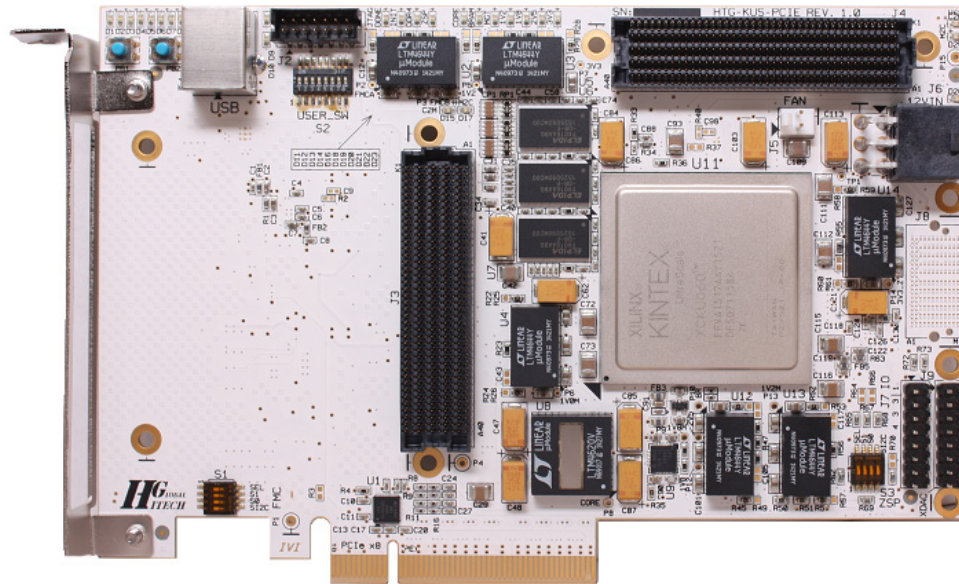


Power Tree designed in LTpowerPlanner

Rail/Function	Part Number	General Description
1V: MGTA VCC	LTM4630-1	Dual 18A or Single 36A μ Module Regulator with 0.8% DC and 3% Transient Accuracy
1V: MGTAVTT	LTM4630-1	Dual 18A or Single 36A μ Module Regulator with 0.8% DC and 3% Transient Accuracy
1.2V: MGTAVCCUAX	LTM4624	14VIN, 4A Step-Down μ Module Regulator
PMBus Voltage Control and Telemetry	LTC2974	4-Channel Power System Management Featuring Accurate Output Current Measurement

Kintex UltraScale PCI Express Platform (HTG-K800)

HiTech Global's HTG-K800 board is populated with the Xilinx Kintex UltraScale XCKU-60, 085, or 115 FPGA and supports a wide variety of expansion modules.

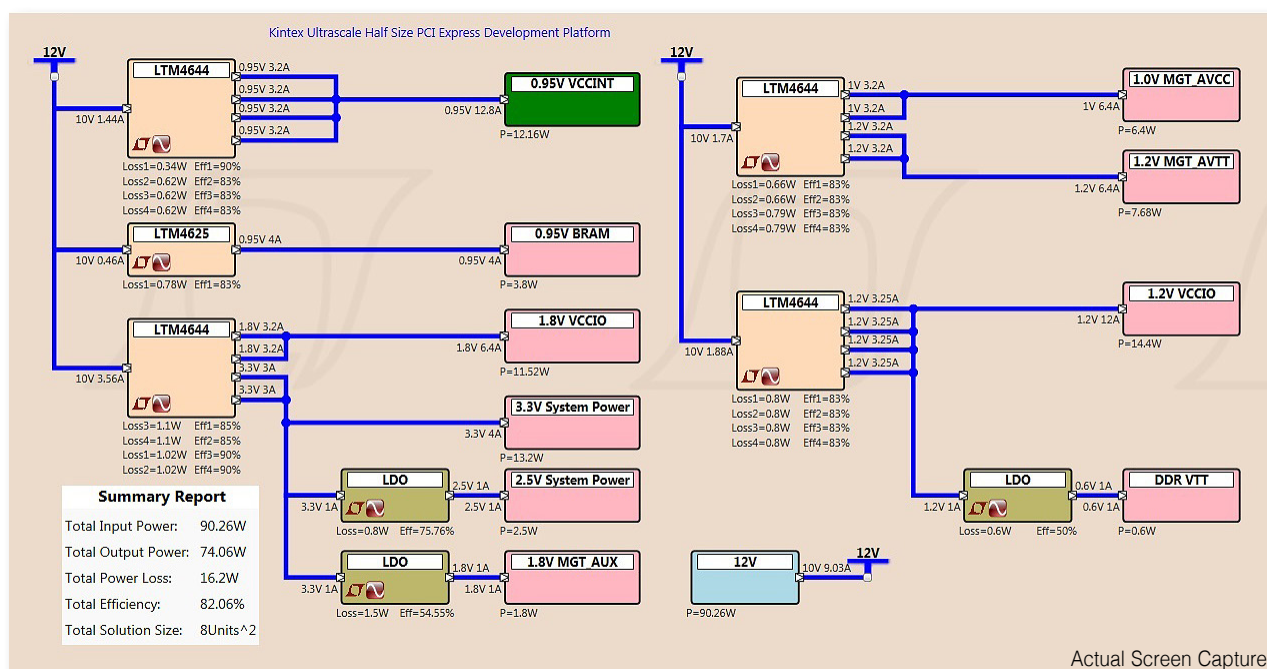
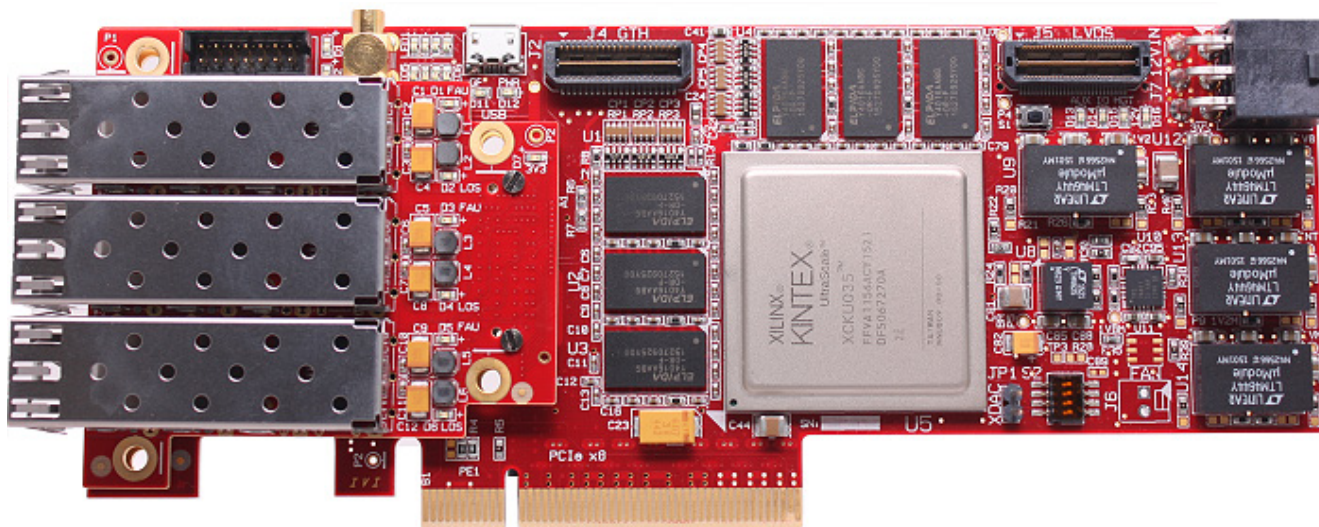


Power Tree designed in [LTpowerPlanner](#)

Rail/Function	Part Number	General Description
0.95V: VCCINT (FPGA Core)	LTM4620	Dual 13A Single 26A DC/DC μ Module Regulator
1.0V: MGTAVCC 1.2V: MGTAVTT, HMC 0.95V: VCCBRAM 2.5V, 1.8V, 1.2V, 3.3V: System Power, FMC 0.9V: VDD_HMC	LTM4644	Quad DC/DC μ Module Regulator with Configurable 4A Output Array
Clock for μ Module Regulators	LTC6900	Low Power, 1kHz to 20MHz Resistor Set SOT-23 Oscillator

Kintex UltraScale Half-Size PCI Express Platform (HTG-K816)

HiTech Global's HTG-K816 is populated with the Xilinx Kintex UltraScale 035, 040, or 060 FPGA. The HTG-K816 network card provides access to eight lanes of PCI Express Gen 3 (8 x 8Gbps), two independent banks of DDR4 (72-bit) memory components (5GB), and front panel Z-Ray interface for hosting high speed mezzanine cards.



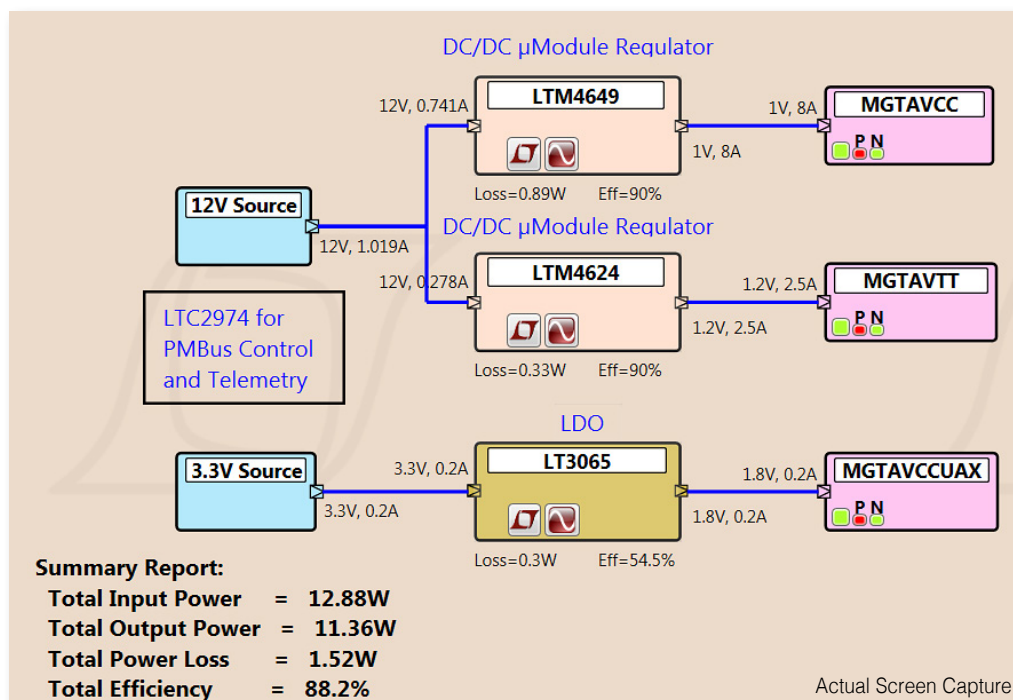
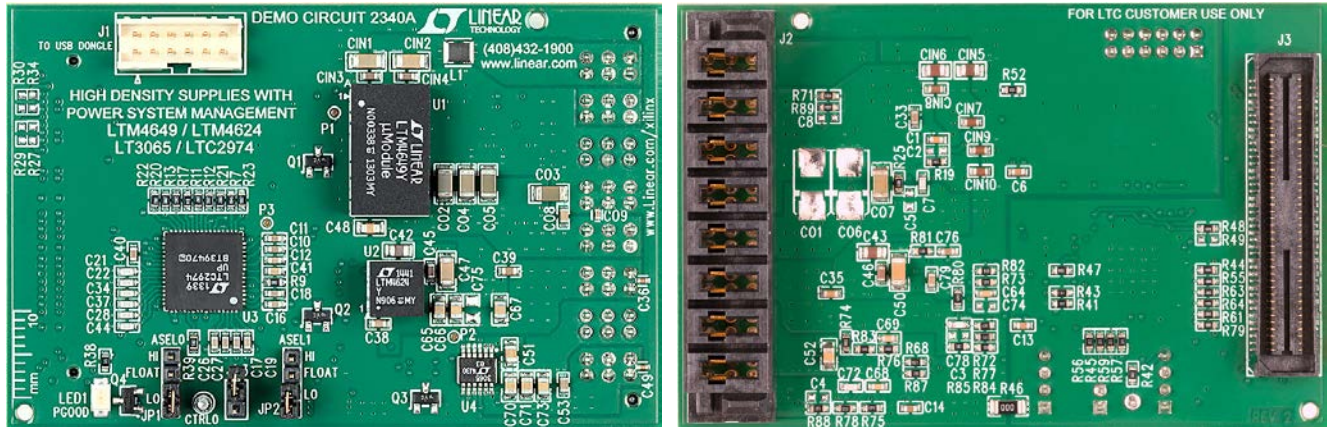
Power Tree designed in [LTpowerPlanner](#)

Rail/Function	Part Number	General Description
0.95V: FPGA Core 1.8V: System Power 3.3V: System Power 1.0V: MGT/MGY 1.2V: MGT/MGY 1.2V: System Power	LTM4644	Quad DC/DC μ Module Regulator with Configurable 4A Output Array
0.95V: BRAM	LTM4625	20VIN, 5A Step-Down DC/DC μ Module Regulator

Xilinx Tested Power Solution for the Kintex UltraScale MGTs (Multigigabit Transceivers) (DC2340A)



The KCU1250 characterization board MGTs can be powered using the Linear Technology DC2340A power card. The LTM4649 and LTM4624 μ Module regulators from Linear Technology are used on the DC2340A to meet the stringent power and noise requirements for the GTH (16Gbps) transceivers. The LTC2974, 4-channel PMBUS system manager handles required telemetry functions.

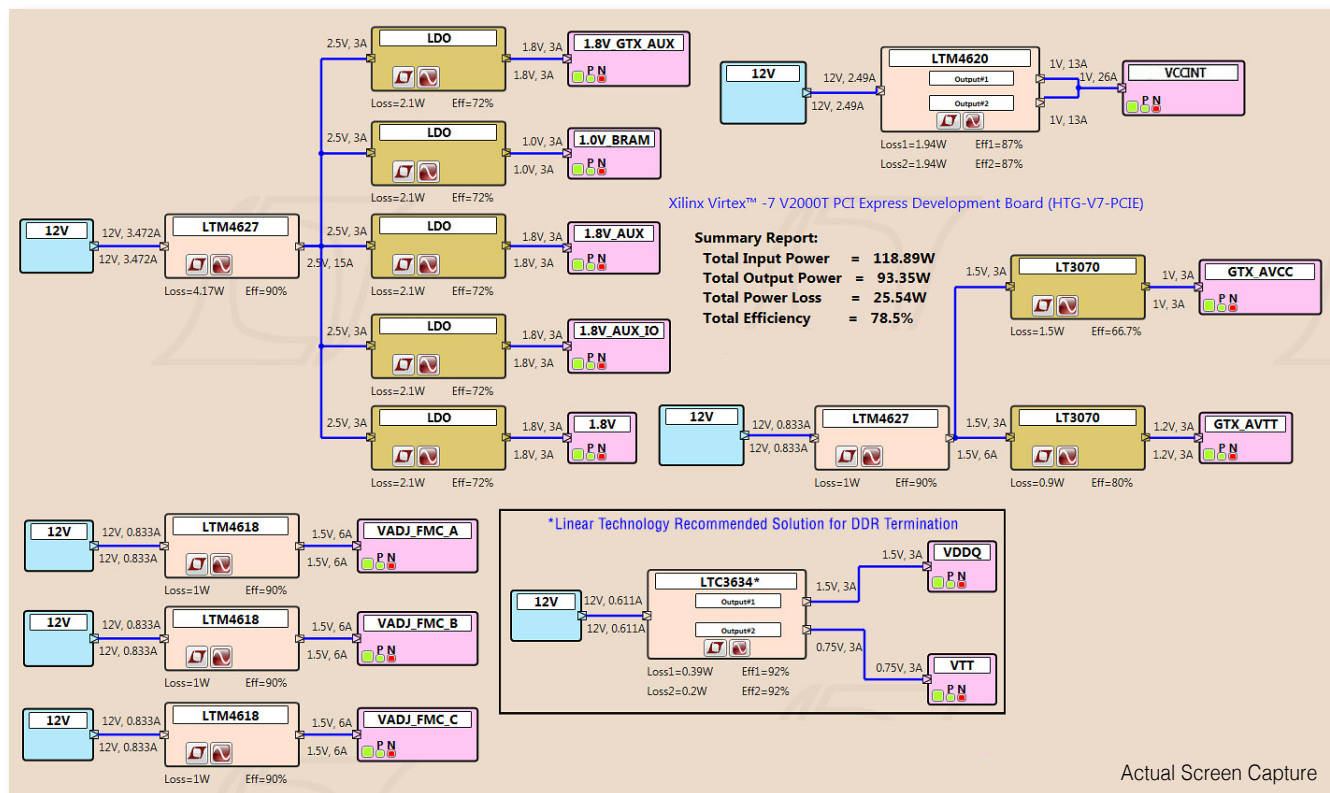
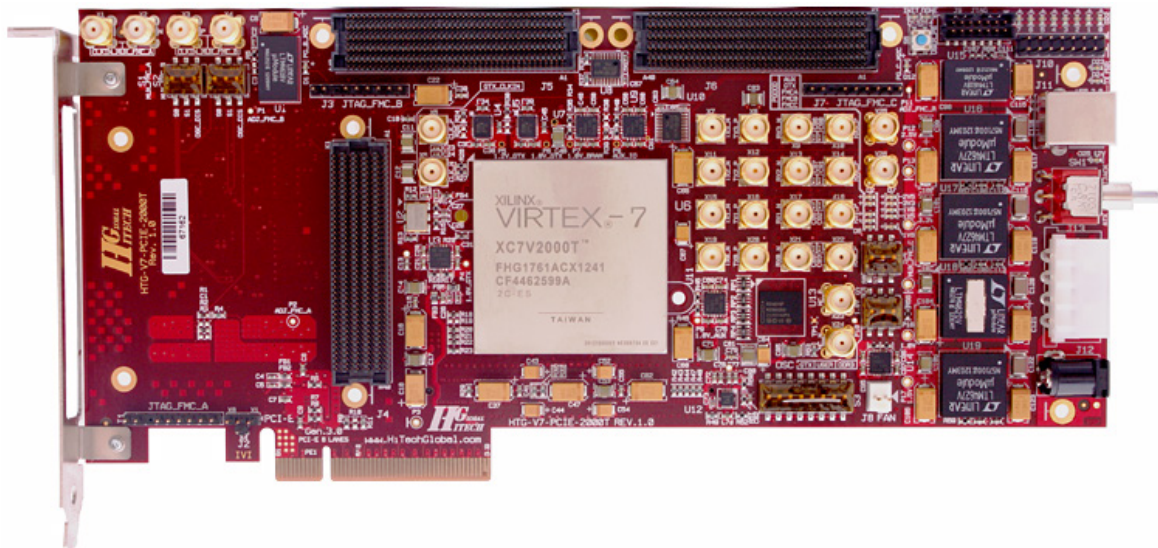


Power Tree designed in LTpowerPlanner

Rail/Function	Part Number	General Description
1V: MGTAVCC	LTM4649	10A Step-Down DC/DC μ Module Regulator
1.2V: MGTAVTT	LTM4624	14V _{IN} , 4A Step-Down μ Module Regulator
1.8V: MGTAVCCAUX	LT3065	500mA Low Noise Linear Regulator with Programmable Current Limit and Power Good
PMBus Voltage Control and Telemetry	LTC2974	4-Channel Power System Management Featuring Accurate Output Current Measurement

Virtex-7 V2000T PCI Express Development Board (HTG-700)

HiTech Global's HTG700, populated with the Xilinx Virtex-7 V2000T, V585, or X690T is ideal for ASIC/SOC prototyping, high performance computing, high end image processing, PCI Express Gen 2 & 3 development, general purpose FPGA development, and/or applications requiring high speed serial transceivers (up to 12.5Gbps).

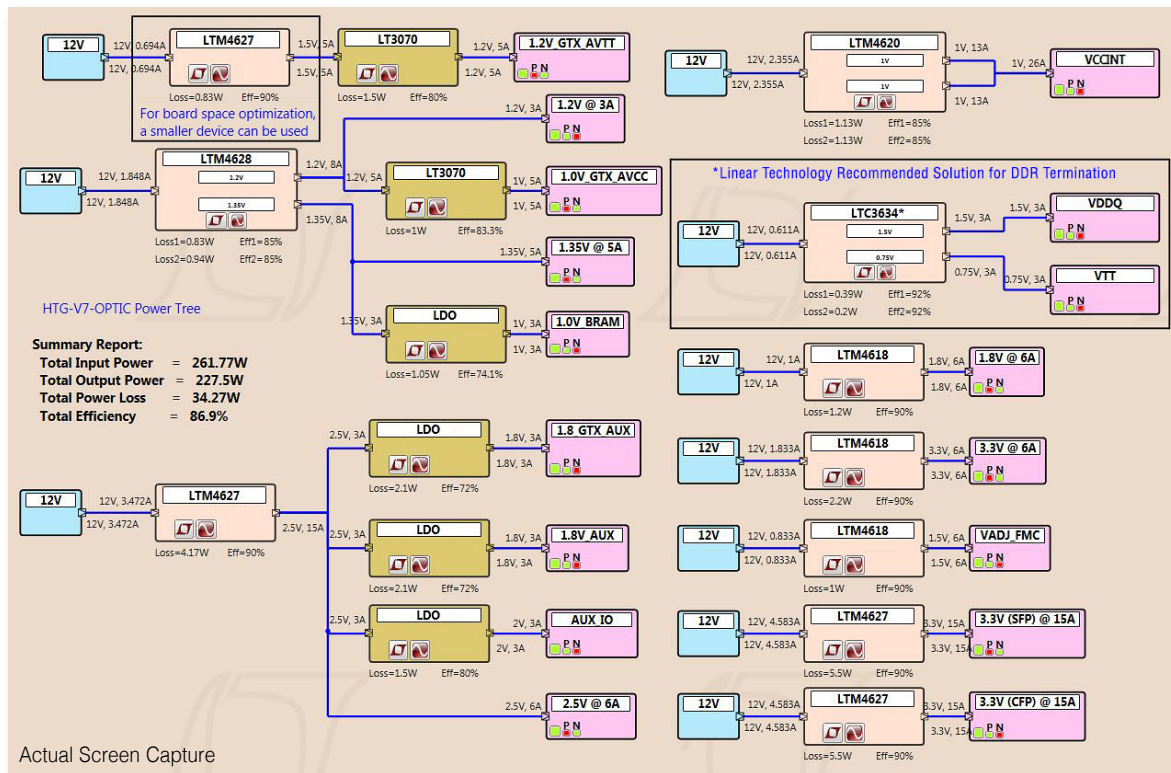
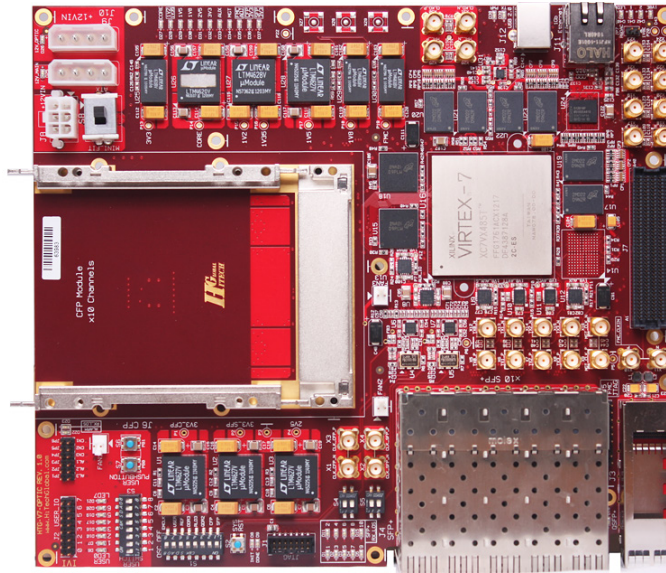


Power Tree designed in [LTPowerPlanner](#)

Rail/Function	Part Number	General Description
1.0V: VCC_Core	LTM4620	Dual 13A or Single 26A DC/DC μ Module Regulator
2.5V, 1.5V: System Power	LTM4627	15A DC/DC μ Module Regulator
1.8V: GTX_AUX, AUX, AUX_IO 1.0V: BRAM, GTX_AVCC 1.2V: AVTT	LT3070	5A, Low Noise, Programmable Output, 85mV Dropout Linear Regulator
1.5V: VADJ_FMC	LTM4618	6A DC/DC μ Module Regulator with Tracking and Frequency Synchronization

Virtex-7 10G/40G/100G Optical Interface FPGA Platform (HTG-707)

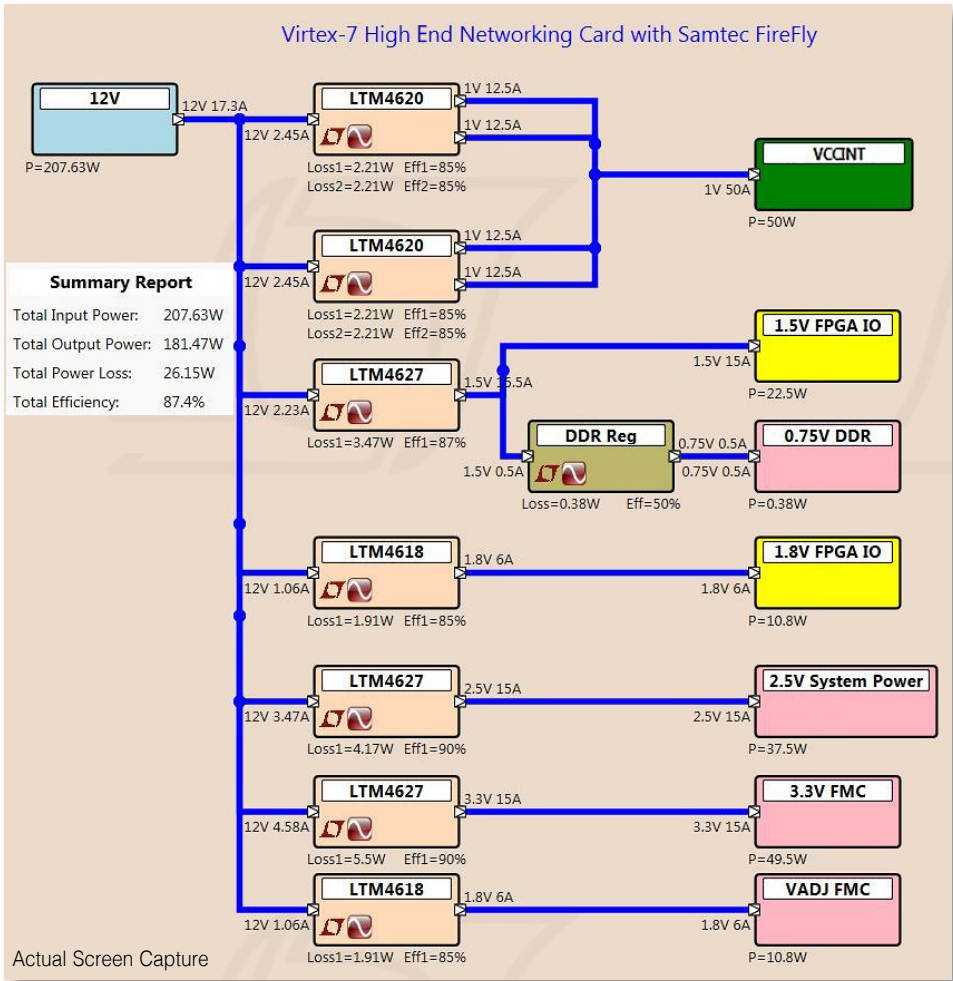
HiTech Global's HTG707, populated with the Xilinx Virtex-7 X485T, X690T, or V2000T FPGA, is a development platform that delivers the fundamental functional blocks required for building 10G/40G/100G subsystems.



Rail/Function	Part Number	General Description
1V: VCC_CORE	LTM4620	Dual 13A or Single 26A DC/DC μ Module Regulator
1.5V, 2.5V, 3.3V: System Power	LTM4627	15A DC/DC μ Module Regulator
1.2V: GTX_AVTT 1.0V: GTX_AVCC, BRAM 1.8V: GTX_AUX, AUX, AUX_IO	LT3070	5A, Low Noise, Programmable Output, 85mV Dropout Linear Regulator
1.2V, 1.35V: System Power	LTM4628	Dual 8A or Single 16A DC/DC μ Module Regulator
1.8V, 3.3V: System Power 1.5V: VADJ_FMC	LTM4618	6A DC/DC μ Module Regulator with Tracking and Frequency Synchronization
Clock for μ Module Regulators	LTC6900	Low Power, 1kHz to 20MHz Resistor Set SOT-23 Oscillator

Virtex-7 High End Networking Card with Samtec FireFly™ (HTG-712)

HiTech Global's HTG-712, populated with the Xilinx Virtex-7 V2000T, V585T, or X690T, is ideal for high end networking applications requiring data transfer above 120Gbps.

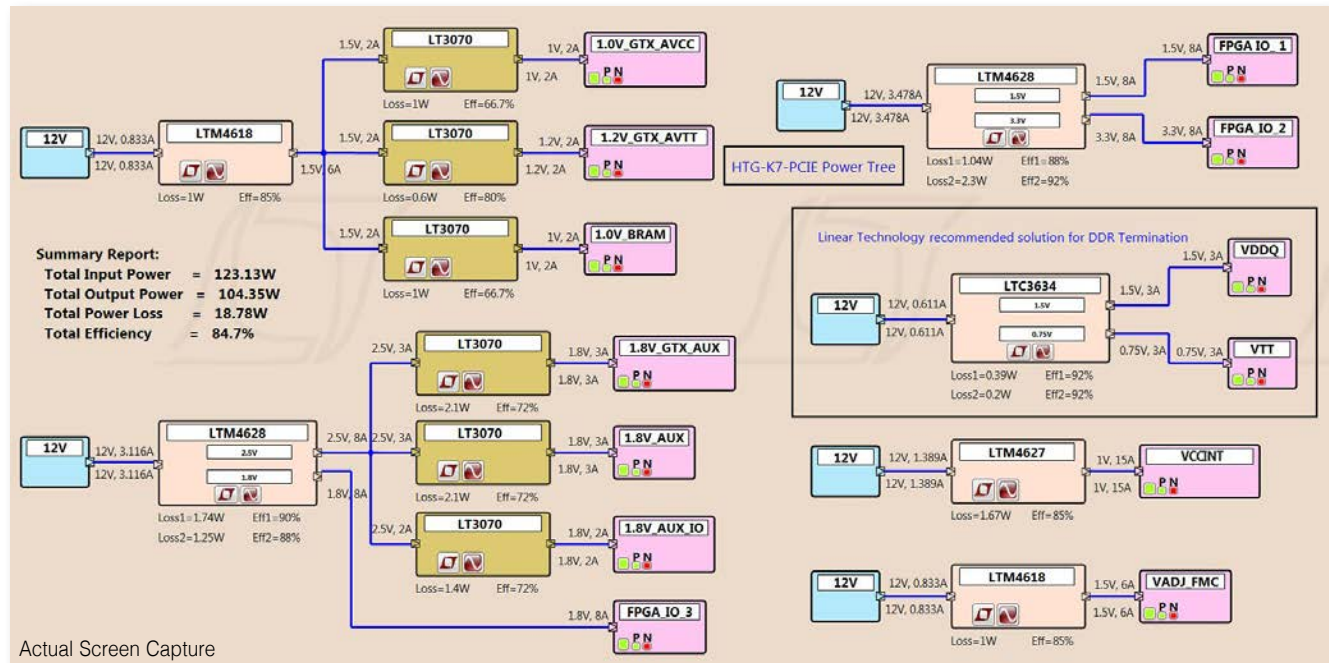
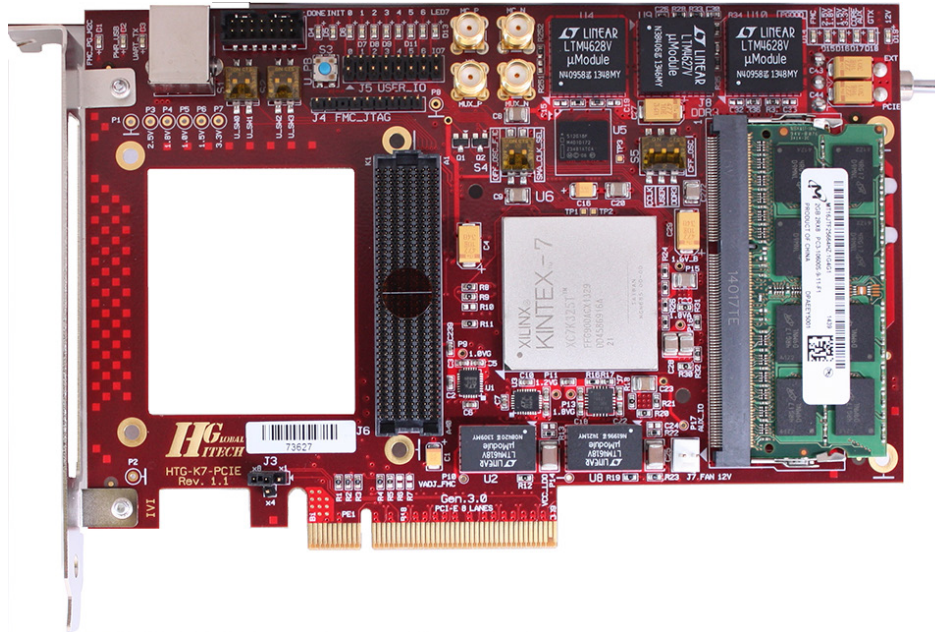


Power Tree designed in LTpowerPlanner

Rail/Function	Part Number	General Description
1.0V: FPGA Core	LTM4620	Dual 13A or Single 26A DC/DC μ Module Regulator
1.5V: FPGA IO 2.5V: System Power 3.3V: FMC	LTM4627	15A DC/DC μ Module Regulator
1.8V: FPGA IO 1.8V: FMC	LTM4618	6A DC/DC μ Module Regulator with Tracking and Frequency Synchronization

Kintex-7 PCI Express Development Board (HTG-K700)

HiTech Global's HTG-K700 board is populated with the Xilinx Kintex-7 K325T or K410T FPGA, and is supported by 8-lane PCI Express Gen2 (hard)/Gen 3 (soft), FPGA mezzanine connector (FMC) and DDR3 SODIMM.

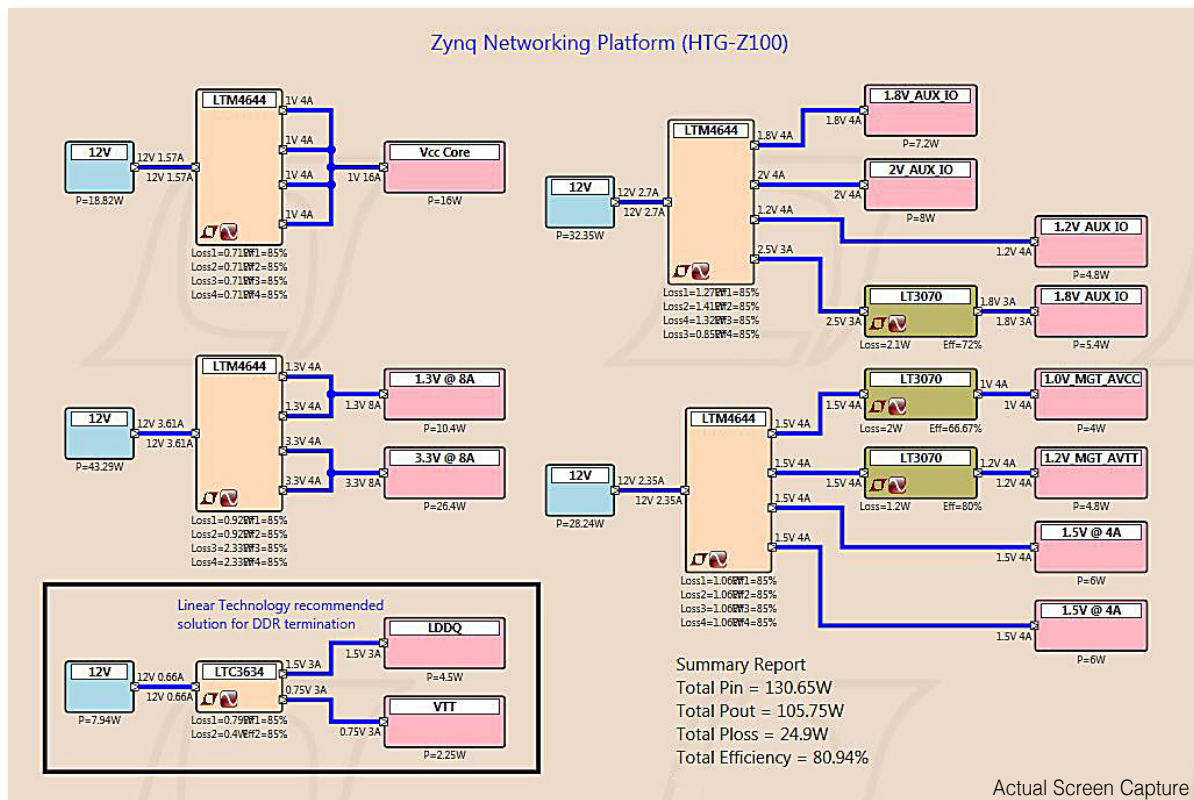
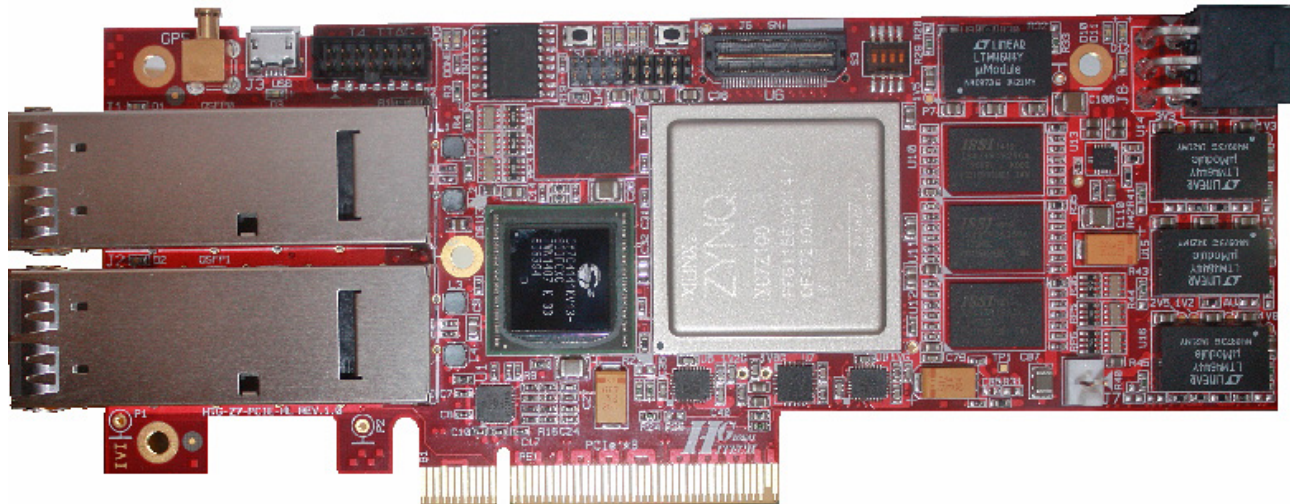


Power Tree designed in LTpowerPlanner

Rail/Function	Part Number	General Description
1.0V: VCC_Core (FPGA Core)	LTM4627	15A DC/DC μ Module Regulator
1.5V: System Power, FMC	LTM4618	6A DC/DC μ Module Regulator with Tracking and Frequency Synchronization
1.0V: GTX_AVCC, BRAM 1.2V: GXT_AVTT 1.8V: GTX_AUX, AUX, AUX_IO	LT3070	5A, Low Noise, Programmable Output, 85mV Dropout Linear Regulator
2.5V: System Power 1.8V: FPGA_IO 1.5V: FPGA_IO 3.3V: FPGA_IO	LTM4628	Dual 8A or Single 16A μ Module Regulator
Clock for μ Module Regulators	LTC6902	Multiphase Oscillator with Spread Spectrum Frequency Modulation

Zynq Networking Platform (HTG-Z100)

HiTech Global's HTG-100, populated with the Xilinx Zynq XC7Z100, is an ideal platform for applications requiring embedded processing power, high speed networking interfaces, and high performance programmability.

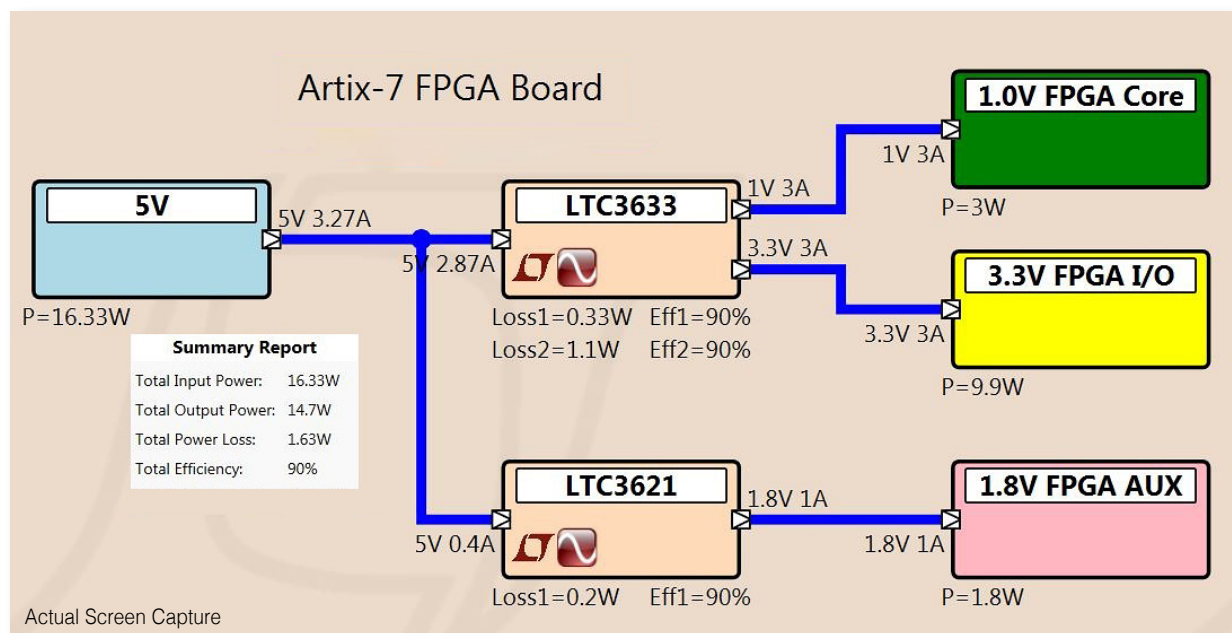
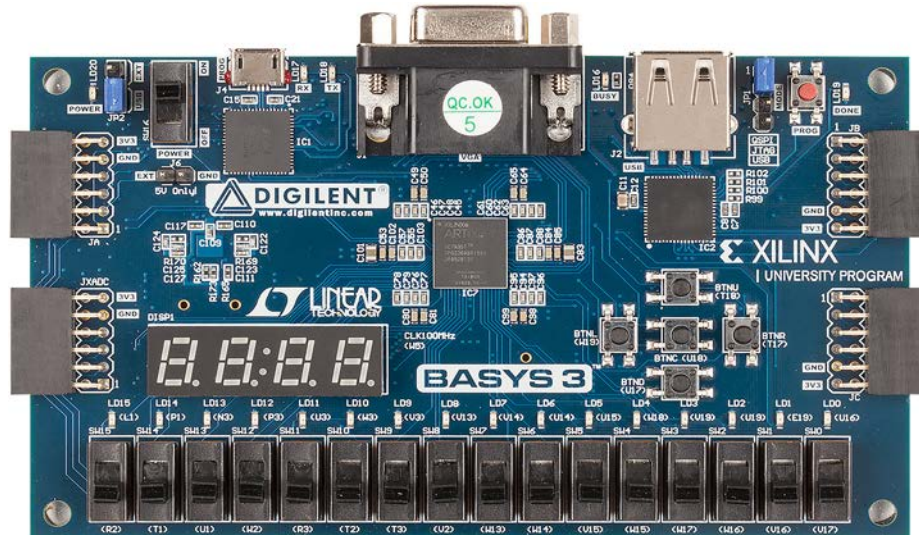


Power Tree designed in [LTPowerPlanner](#)

Rail/Function	Part Number	General Description
1V: VCC_Core (FPGA Core) 1.3V, 3.3V, 1.5V: System Power 1.8V: FPGA_IO 2.0V: AUX_IO	LTM4644	Quad DC/DC μ Module Regulator with Configurable 4A Output Array
1.8V: MGT_AUX 1.0V: MGT_AVCC 1.2V: MGT_AVTT	LT3070	5A, Low Noise, Programmable Output, 85mV Dropout Linear Regulator

Basys 3 Artix-7 FPGA Board

Digilent's Basys 3 board is an entry level evaluation platform featuring the Artix-7 FPGA.



Power Tree designed in [LTpowerPlanner](#)

Rail/Function	Part Number	General Description
1.0V : FPGA Core	LTC3633	Dual Channel 3A, 15V Monolithic Synchronous Step-Down Regulator
3.3V : FPGA IO, USB Port, Clocks, Flash, PMOD		
1.8V : FPGA Auxiliary and RAM	LTC3621	17V, 1A Synchronous Step-Down Regulator with 3.5µA Quiescent Current

Additional Development Boards



Virtex UltraScale

BittWare: Xilinx UltraScale 3/4-Length PCIe Board with up to VU190, Quad QSFP, and 256 GBytes DDR4 (XUSP3R)



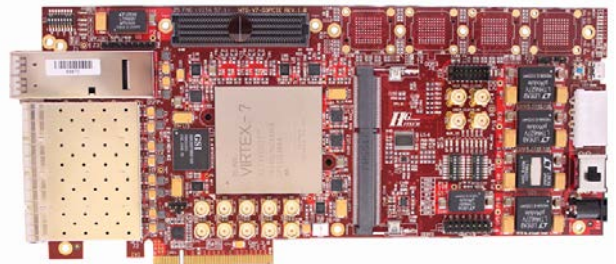
Virtex UltraScale

BittWare: Xilinx UltraScale 3/4-Length PCIe Board with Quad QSFP, DDR4, QDR-IV, and QDR-II+ (XUSP3S)



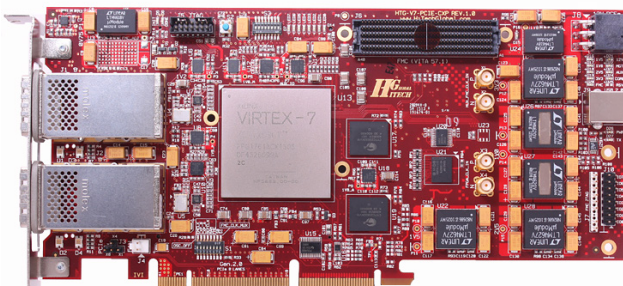
Virtex UltraScale

HiTech Global: Virtex UltraScale 100 GIG Networking Card (HTG-828)



Virtex-7

HiTech Global: Virtex 7 PCI Express Gen 3/100 GIG Networking Card (HTG-703)



Virtex-7

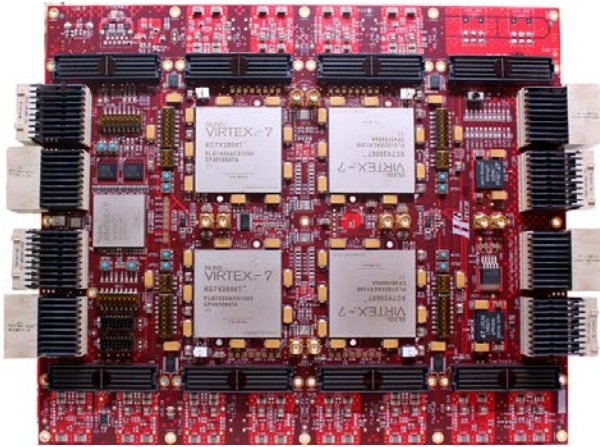
HiTech Global: Virtex-7 High End Networking Card with Dual CXP Ports (HTG-710)



Virtex-7

HiTech Global: Virtex-7 100 GIG Network Interface Card (HTG-728)

Additional Development Boards



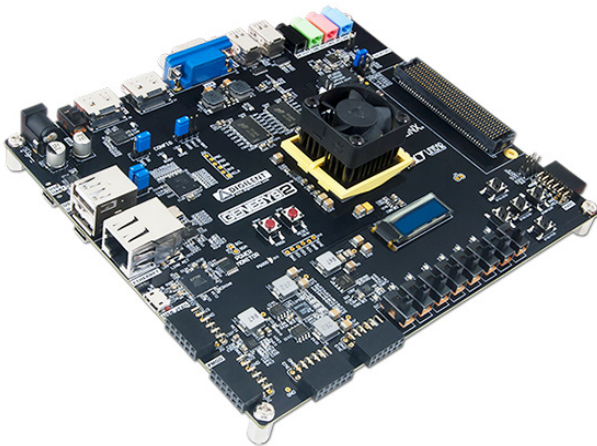
Virtex-7

HiTech Global: Virtex-7 Quad V2000T ASIC/SoC Emulation Platform (HTG-747)



Virtex-7

HiTech Global: Virtex-7 FPGA FMC Module (HTG-777)



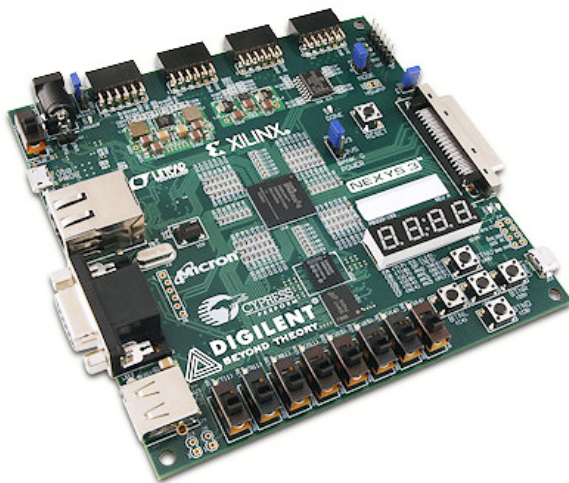
Kintex-7

Digilent: Genesys 2 Kintex-7 FPGA Development Board



Virtex-6

HiTech Global: Virtex 6 PCI Express Gen 2/SFP/USB 3.0 Development Board (HTG-600)



Spartan-6

Digilent: Nexys 3 Spartan-6 FPGA Trainer Board



Spartan-6

Xilinx: Spartan-6 FPGA SP601 Evaluation Kit

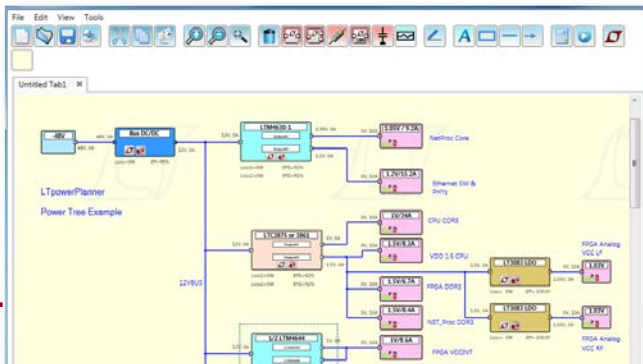
Design Support

Linear Technology provides design support tools that help you select, design and simulate Linear Technology's products. These tools shorten your design time and optimize your power supply solution before you build your prototype board.

LTpowerCAD II

LTpowerCAD® is a free download and easy-to-use power supply design tool with a user-friendly graphical user interface (GUI) and powerful design features. It helps power supply designers select a solution for given supply specifications, design power stage components, estimate regulator efficiency and power loss, and optimize supply loop stability and load transient performance. It is a fast offline tool that runs on Windows PCs, and includes a sync-release feature to ensure your program and its solution libraries are up-to-date. Once a circuit design is completed, it is easily exported to the LTspice® simulation platform. Inside the LTpowerCAD toolbox, there is also an [LTpowerPlanner](#) system architecture tool for system-level power management design and optimization.

LTpowerPlanner



System Architecture and Plan



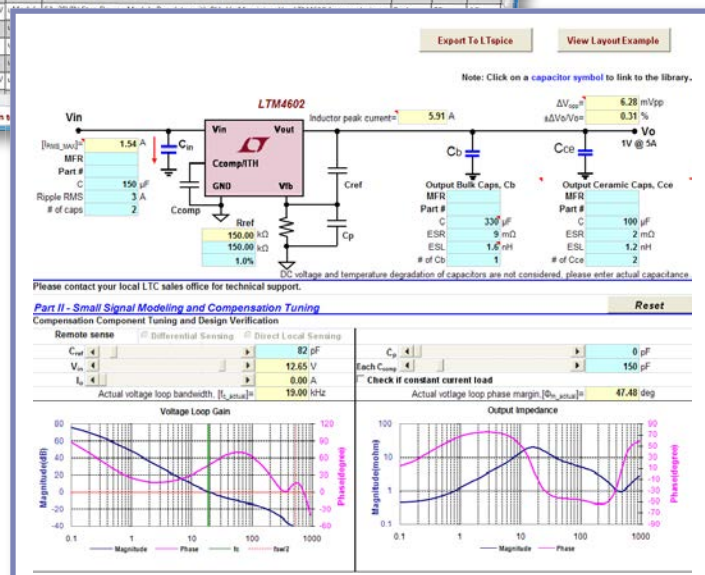
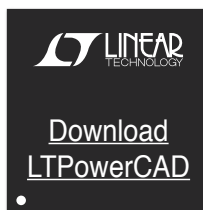
Search and Selection



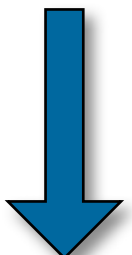
LTpowerCAD

The screenshot shows the LTpowerCAD Design Tool v2.4.2 interface. It includes a 'Converter Specification' section with fields for Converter Topology (Buck), Converter Type (uModule), Min. Input Voltage (10 V), Nom. Input Voltage (12 V), Max. Input Voltage (13 V), Num. of Output Rails (One), and Num. of Parallel Phases (1). There is also a 'Find Part #' field and a 'Go' button. Below this is a table of available parts:

Design Tool	Website	Part Name	Type	Desc.	Topology	Max Vin	Min Vin
LT	LTC Web	LTM4625	uModule	14VIN, 5A Step-Down DC/DC uModule Regulator	Buck	20	4
LT	LTC Web	LTM4649	uModule	28V Single 30A Step-Down DC/DC uModule Regulator	Buck	16	4.5
LT	LTC Web	LTM4603-1	uModule	6A Step-Down uModule Regulator. Use LTM4618 for new designs.	Buck	20	4.5
LT	LTC Web	LTM4603	uModule	6A Step-Down uModule Regulator with PLL, Output Margining. Use LTM4618 for new designs.	Buck	20	4.5
LT	LTC Web	LTM4603HV	uModule	6A Step-Down uModule Regulator with PLL, Output Margining. Use LTM4618 for new designs.	Buck	20	4.5
LT	LTC Web	LTM4618	uModule	14VIN, 5A Step-Down DC/DC uModule Regulator	Buck	20	4
LT	LTC Web	LTM4606	uModule	6A Step-Down uModule Regulator. Use LTM4618 for new designs.	Buck	20	4.5
LT	LTC Web	LTM4602	uModule	14VIN, 5A Step-Down DC/DC uModule Regulator	Buck	20	4
LT	LTC Web	LTM4602HV	uModule	14VIN, 5A Step-Down DC/DC uModule Regulator	Buck	20	4

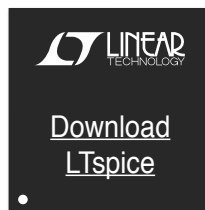
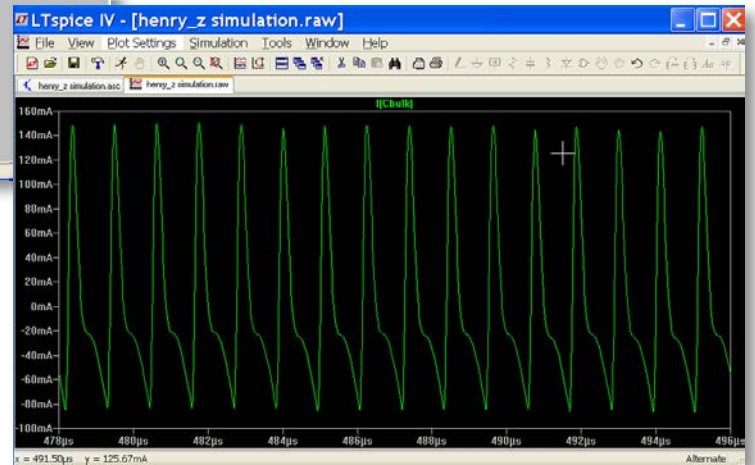
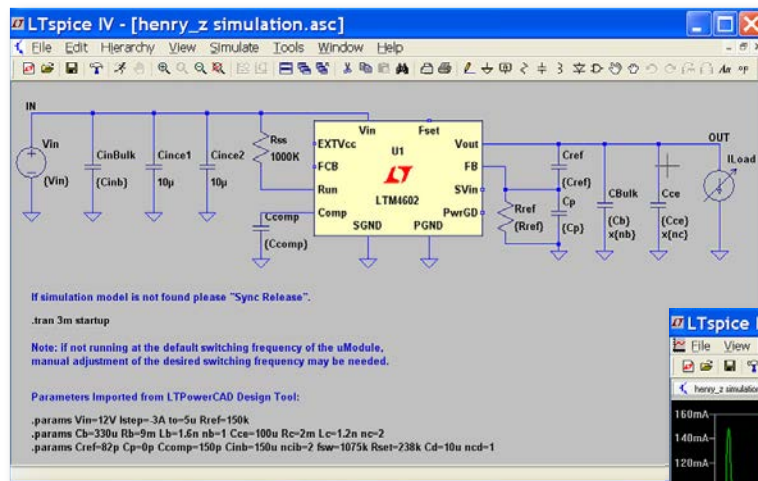


Circuit
Parameter
Design



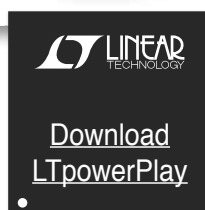
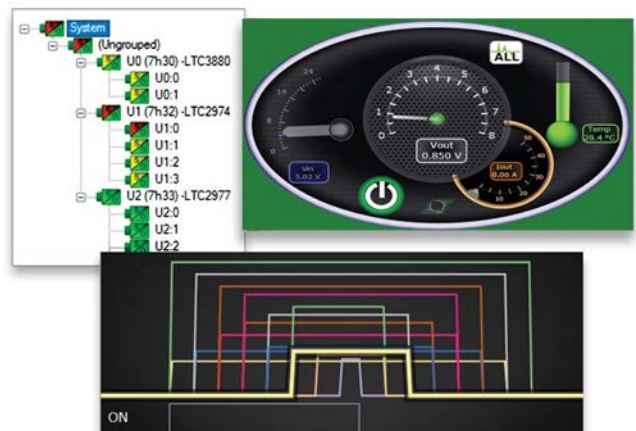
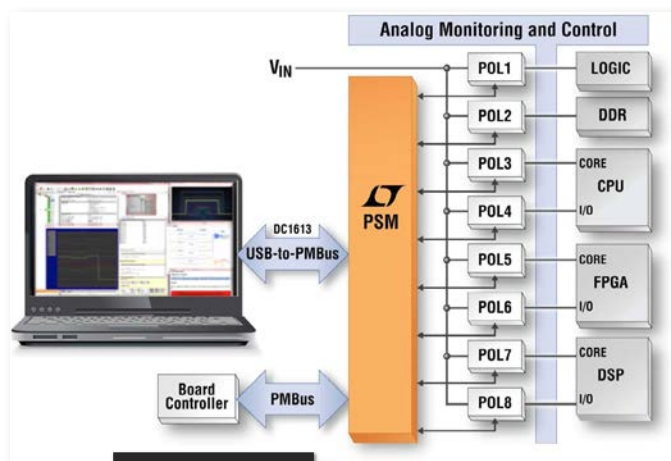
LTspice

LTspice is a free, simple and powerful circuit simulation tool with a library containing all Linear Technology products, as well as commonly used discrete passive and transistor components.



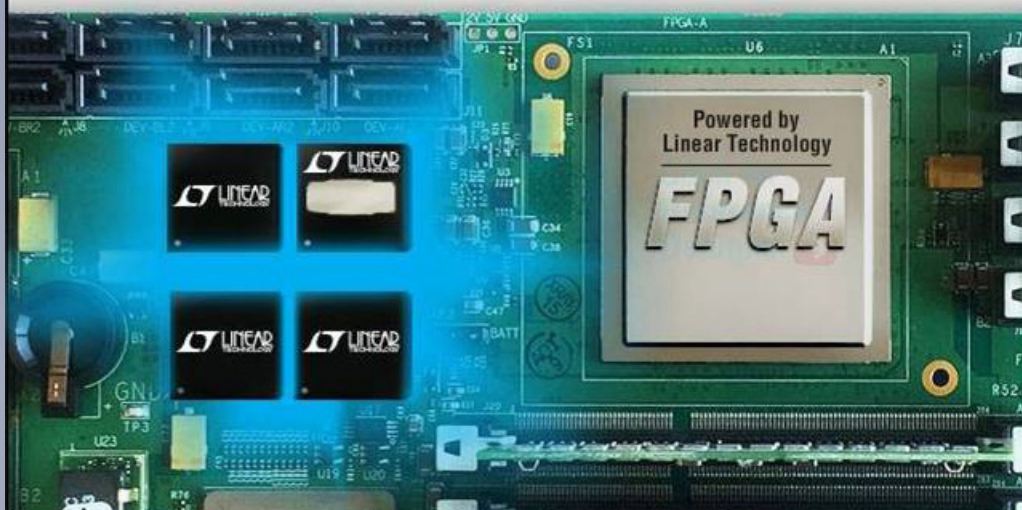
LTpowerPlay

LTpowerPlay® is a powerful and intuitive Windows-based development environment used to configure and interrogate power system management (PSM) devices. It can also be used in an offline mode (with no hardware present) in order to build a multichip configuration file that can be saved and reloaded at a later time.





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