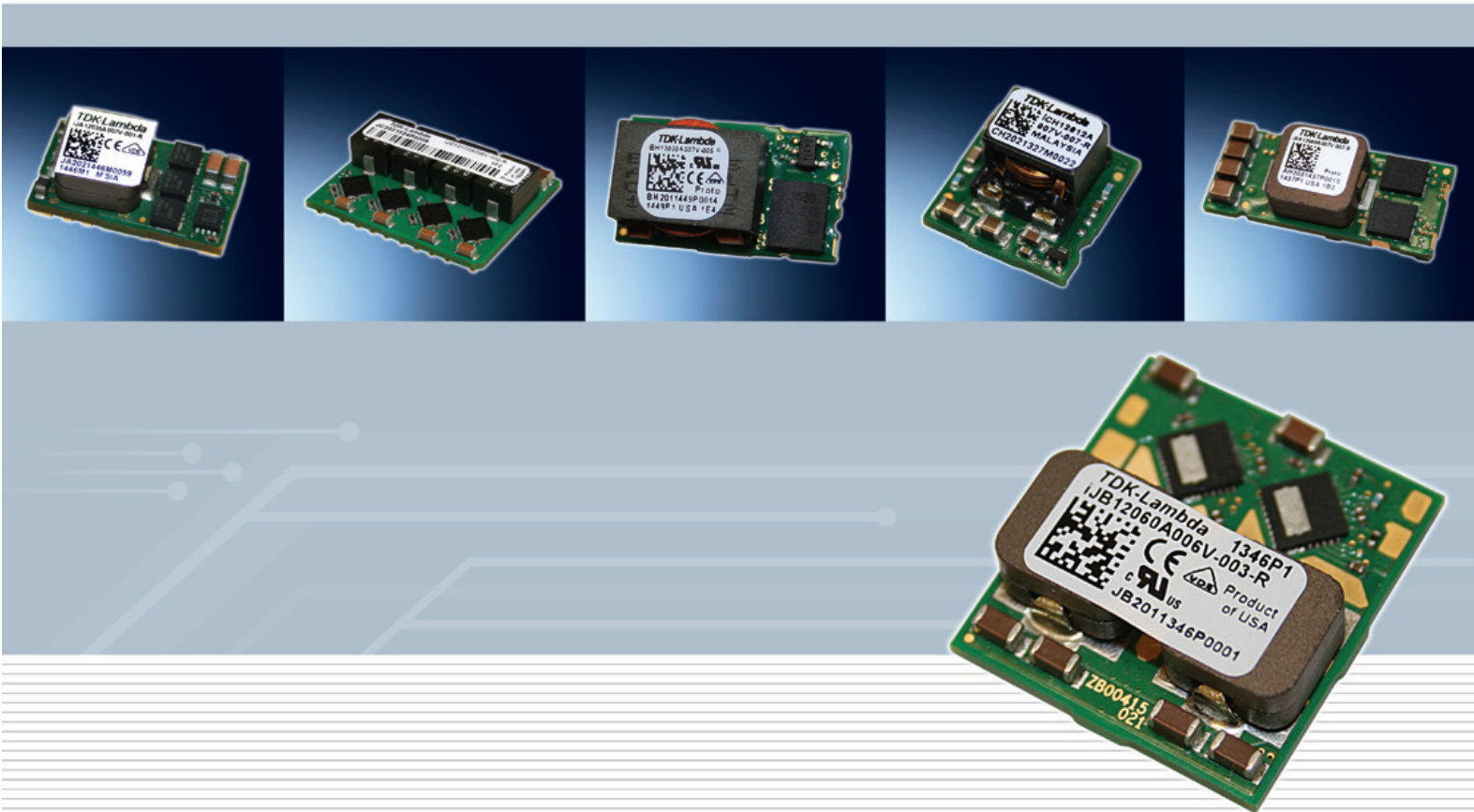


TDK-Lambda DC/DC Point of Load (POL) Power Guide for FPGAs





DC-DC Converters



Non-Isolated

Applications

- ◆ Distributed power architecture
- ◆ Battery powered devices
- ◆ Industrial
- ◆ Medical
- ◆ Communications
- ◆ Computing
- ◆ Data storage
- ◆ Test & measurement
- ◆ Transportation
- ◆ COTS

Features

- ◆ No galvanic isolation
- ◆ Very high efficiency
- ◆ Very fast transient response time
- ◆ SMT or through hole mounting
- ◆ Supply of logic voltages directly at the load
- ◆ Industry leading power density

Innovating Reliable Power

TDK-Lambda's broad selection of DC/DC converters is well suited to powering modern FPGA products.

A combination of distributed power and intermediate bus architecture products can effectively be deployed to meet the power requirements of leading FPGA products. These products include standard "brick" isolated converters as well as intermediate bus converters and non-isolated point-of-load (POL) converters. Examples of distributed and intermediate bus power architectures for powering FPGAs are provided here.

Non-Isolated DC-DC Converters



Series	Total Power (W)	Outputs	Input Volts (VDC)	Output Volts (VDC)	Amps (A)	Size (inches)	Type
iCF	16-24	1	2.4-14	0.6 - 5.5	up to 5	0.48 x 0.48 x 0.175	DOSA 2
iCG	33	1	2.4-14	0.6 - 5.5	up to 6	0.48 x 0.48 x 0.175	DOSA 2
iBF	66	1	2.4-14	0.6-5.5	up to 12	0.8 x 0.45 x .335	DOSA 2
iCH	85	1	4.5-14	0.7-8.5	up to 12	0.48 x 0.48 x 0.335	DOSA 2+
iAF	110	1	2.4-14	0.6-5.5	up to 20	1.3 x 0.53 x 0.305	DOSA 2
iBH	80	1	3-14	0.7-5.5	up to 20	0.8 x 0.45 x 0.39	DOSA 2+
iJA	100	1	8-14	0.6-3.3	up to 35	0.9 x 0.5 x 0.38	SMT
IAH	150	1	3.5-17	0.7-5.5	up to 40	1.3 x 0.53 x 0.4	DOSA 2+
iJB	120	1	8-14	0.6-2	up to 60	1.055 x 0.948 x 0.381	SMT
iJC	150	1	8-14	0.6-1.5	up to 100	1.1 x 1.37 x 0.39	SMT

*Arranged by output current in Amps (A)



iCF Series



24.7W, 4.5A & 16.5W, 3A Non-isolated SMT Point Of Load

- ◆ DOSA Compatible Footprint
- ◆ Surface Mountable
- ◆ Constant Switching Frequency
- ◆ Edge Plated Castellations (EPC)
 - Inspectable Solder Joints
- ◆ No external loop tuning components needed
- ◆ Excellent Transient Response



iCG Series



33W, 6A Non-isolated SMT Point Of Load

- ◆ DOSA Compatible Footprint
- ◆ Surface Mountable
- ◆ Constant Switching Frequency
- ◆ Edge Plated Castellations (EPC)
 - Inspectable Solder Joints
- ◆ No external loop tuning components needed
- ◆ Excellent Transient Response



iBF Series



66W, 12A Non-isolated SMT Point Of Load

- ◆ DOSA Compatible Footprint
- ◆ Surface Mountable
- ◆ Constant Switching Frequency
- ◆ Edge Plated Castellations (EPC)
 - Inspectable Solder Joints
- ◆ No external loop tuning components needed
- ◆ Excellent Transient Response



iCH Series



85W, 12A Non-isolated SMT Point of Load

- ◆ DOSA Compatible Footprint
- ◆ Surface Mountable
- ◆ Constant Switching Frequency
- ◆ No external loop tuning components needed
- ◆ Excellent Transient Response



iAF Series



110W, 20A Non-isolated SMT Point Of Load

- ◆ DOSA Compatible Footprint
- ◆ Surface Mountable
- ◆ Constant Switching Frequency
- ◆ Edge Plated Castellations (EPC)
 - Inspectable Solder Joints
- ◆ No external loop tuning components needed
- ◆ Excellent Transient Response



iBH Series



80W, 20A Non-isolated SMT Point of Load

- ◆ DOSA Compatible Footprint
- ◆ Surface Mountable
- ◆ Constant Switching Frequency
- ◆ No external loop tuning components needed
- ◆ Excellent Transient Response



iJA Series



100W, 35A Non-isolated SMT Point of Load with PMBus

- ◆ Only 0.45 in² Board Space
- ◆ PMBus Compliant (Read & Write)
- ◆ Surface Mountable
- ◆ Digital Adaptive Control
- ◆ Parallel Operation with Current Sharing
- ◆ Configurable Sequence & Fault Management



iAH Series



150W, 40A Non-isolated SMT Point of Load

- ◆ DOSA Compatible Footprint
- ◆ Surface Mountable
- ◆ Constant Switching Frequency
- ◆ No external loop tuning components needed
- ◆ Excellent Transient Response



iJB Series



120W, 60A Non-isolated SMT Point of Load with PMBus

- ◆ Only 1.0 in² Board Space
- ◆ PMBus Compliant (Read & Write)
- ◆ Surface Mountable
- ◆ Digital Adaptive Control
- ◆ Parallel Operation with Current Sharing
- ◆ Configurable Sequence & Fault Management



iJC Series



150W, 100A Non-isolated SMT Point Of Load with PMBus

- ◆ Only 1.5 in² Board Space
- ◆ PMBus Compliant (Read & Write)
- ◆ Surface Mountable
- ◆ Digital Adaptive Control
- ◆ Parallel Operation with Current Sharing
- ◆ Configurable Sequence & Fault Management

From Xilinx®:

Power specifications for FPGA designs should be determined early in the design cycle. The Xilinx® Power Estimator (XPE) is a spreadsheet based tool that helps achieve this. After using the Xilinx® Power Estimator (XPE) analysis spreadsheet, use the selector guides to identify the right PoL converter for your design. Be sure to always check the latest Xilinx® datasheet for your FPGA device before making your final selection.

◆ Artix®-7

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Kintex®-7

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Spartan®-3

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						IAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Spartan®-6

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						IAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Virtex®-4

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						IAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Virtex®-5

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Virtex®-6

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Virtex®-7

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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From Altera®:

Power specifications for FPGA designs should be determined early in the design cycle. The Altera® PowerPlay Early Power Estimator (EPE) is a spreadsheet based tool that helps achieve this. After using the Altera® PowerPlay (EPE) analysis spreadsheet, use the selector guides to identify the right PoL converter for your design. Be sure to always check the latest Altera® datasheet for your FPGA device before making your final selection.

◆ Arria® GX

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Arria® II

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Arria® V

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						IAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Arria® 10

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						IAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Cyclone® III

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						IAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Cyclone® IV

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Cyclone® V

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Hardcopy® IV

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Max® 10 Series

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Stratix® II

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Stratix® III

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Stratix® IV

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Stratix® V GX

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Stratix® V GX, GS, GT

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						iAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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◆ Stratix® 10

Input Voltage	0 to 3A	3A to 6A	6A to 12A	12A to 20A	12A to 35A	12A to 40A	12A to 60A	12A to 100A*
2.4V - 14V	iCF	iCG						
3.5V - 14V				iBH				
3.5V - 17V						IAH		
4.5 - 14V			iCH					
8V - 14V					iJA Digital PMBus		iJB Digital PMBus	iJC* Digital PMBus

*Up to 180 Amps attainable with two iJC Devices in parallel.

Core and I/O Voltage Selector - Module Output Voltage Range:

0.6 to 3.63V or 0.7 to 5.5V	0.7V to 8.5V	0.7V to 5.5V	0.6V to 3.3V	0.6V to 2.0V	0.6V to 1.5V
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