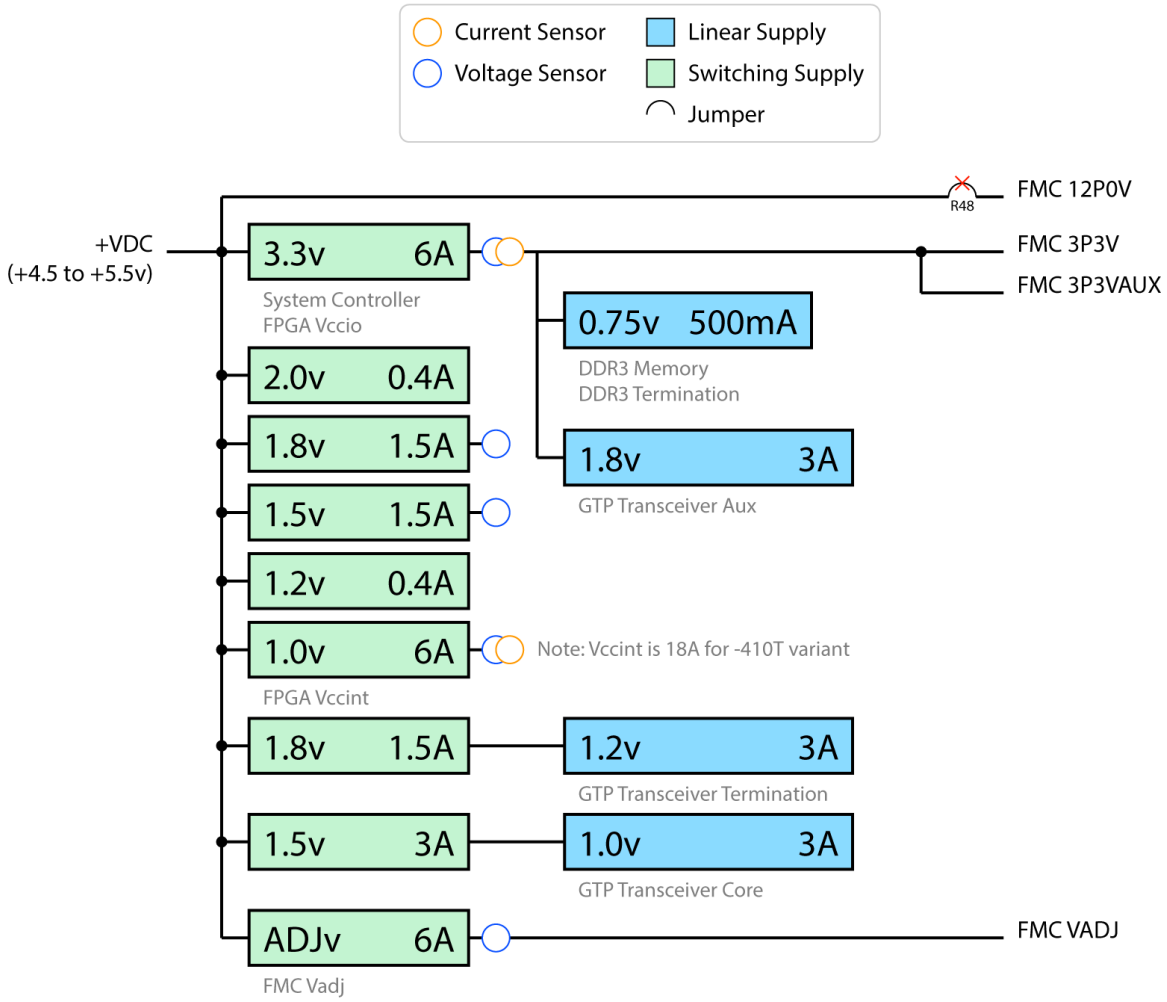
Powering the XEM7350

The XEM7350 requires a clean, filtered, DC supply within the range of 4.5v to 5.5v. This supply must be delivered through the DC power connector.

The XEM7350 power distribution system is rather complex, with several supplies designed to provide suitable, efficient power for several systems and modules. A schematic diagram of the system follows, with input (+VDC) shown to the left and accessible supply rails shown to the right.

Note that the XEM7350-K410T has an 15A supply for the 1.0v Vccint. The XEM7350-K70T and XEM7350-K160T both have 6A supplies for this rail.

> **Supply Heat Dissipation (IMPORTANT!!)**
>
> Due to the limited area available on the small form-factor of the XEM7350 and the density of logic provided, heat dissipation may be a concern. This depends entirely on the end application and cannot be predicted in advance by Opal Kelly. Heat sinks may be required on any of the devices on the XEM7350. Of primary focus should be the FPGA (U8) and SDRAM (U12). Although the switching supplies are high-efficiency, they are very compact and consume a small amount of PCB area for the current they can provide.
>
> If you plan to put the XEM7350 in an enclosure, be sure to consider heat dissipation in your design.



Power Supply

The XEM7350 is designed to be operated from a single 5-volt power source supplied through the DC power jack on the device. This provides power for the several high-efficiency switching regulators on-board to provide multiple DC voltages for various components on the device as well as an adjustable supply for the FMC peripheral.

DC Power Connector

The DC power connector on the XEM7350 is part number PJ-102AH from CUI, Inc. It is a standard “canon-style” 2.1mm / 5.5mm jack. The outer ring is connected to DGND. The center pin is connected to +VDC.

Powering via USB

Note: Read this section carefully before applying this technique. The XEM7350 power consumption depends greatly on the FPGA and device configuration and could easily exceed available power from USB. Even the inrush current on the K160T and K410T variants may saturate and prevent the device from properly booting with this technique.

The XEM7350 has been designed to accept power (+5VDC only) via the USB connector with a small modification. To power from USB, you will need to install a 0 resistor (0402 dimension) at location R30, located on the reverse side of the PCB under the power connector. This will connect the +5VUSB from the USB connector to the +5VDC on the XEM7350.

With this resistor in place, you should not apply +5VDC to the external power connector.

Power Budget

The table below can help you determine your power budget for each supply rail on the XEM7350. All values are highly dependent on the application, speed, usage, and so on. Entries we have made are based on typical values presented in component datasheets or approximations based on Xilinx power estimator results. Shaded boxes represent unconnected rails to a particular component. Empty boxes represent data that the user must provide based on power estimates.

The user may also need to adjust parameters we have already estimated (such as FPGA Vcco values) where appropriate. All values are shown in milliwatts (mW). Note that this table does not include the two supplies dedicated to the GTX transceivers. These are independent and can be computed separately for power budget based on their assigned function.

Component(s)	1.0v	1.2v	1.5v	1.8v	2.0v	3.3v
200 MHz						231
USB, DDR3		240	720			250
FPGA Vccint, Vccbram						
FPGA Vccaux				355		
FPGA Vccaux_io					120	
FPGA Vcco33,34 (DDR3), est.			273			
FPGA Vcco14 (USB), est.				216		
FPGA Vcco						
Total (mW)						
Available (mW)	6,000	480	2,250	2,700	800	19,800

Example XEM7350-K160T FPGA Power Consumption

XPower Estimator version 14.3 was used to compute the following power estimates for the Vccint supply. These are simply estimates; your design requirements may vary considerably. The numbers below indicate approximately 80% utilization.

Component	Parameters	Vccint
Clock	250 MHz GCLK, 163,237 fanout	716 mW
Logic (DFF)	250 MHz, 162,240 DFFs	1,322 mW
Logic (LUT)	250 MHz, 81,120	927 mW
BRAM	18-bit, 517 @ 250 MHz	674 mW
DSP	250 MHz, 480 slices	605 mW
Memory Controller	1600 Mb/s, DDR3	7 mW
GTX	Aurora, 8 lanes, 8 Gb/s	458 mW
Misc.	DCM, PLL, etc.	5 mW
	Total	4,714 mW
	Available	6,000 mW

Heat Sink

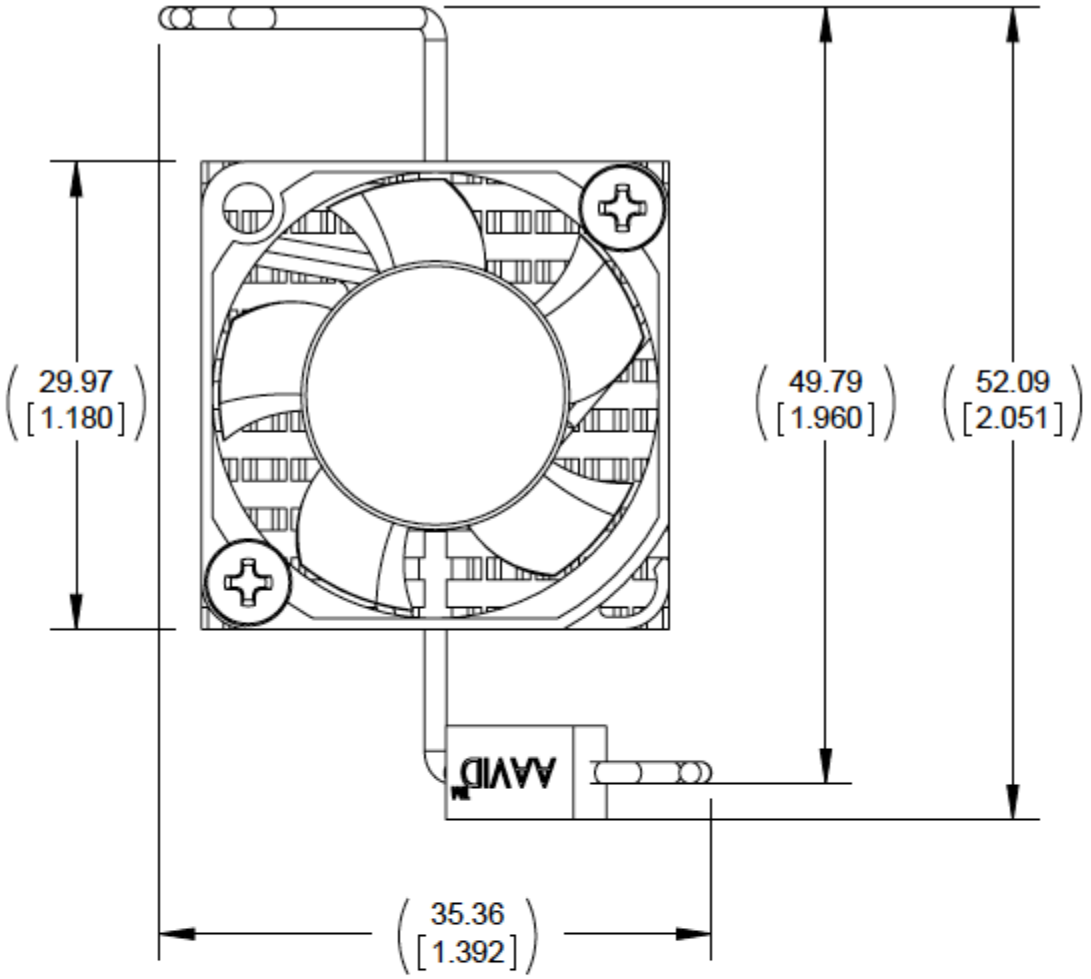
The device has been fitted with two heat sink anchors, proximate to the FPGA for mounting a passive or active heat sink. The following heat sinks have been tested with the XEM7350.

Manufacturer	Part Number	Description
Aavid Termalloy	374524B60023G	Off-the-shelf passive
Aavid Termalloy	3358230-PAL03010-P0	Custom with fan mount

The passive heat sink above is a low cost option available through Aavid Thermalloy distributors such as Arrow Electronics and Newark Electronics.

The active heat sink above was custom built based on design specifications provided by Opal Kelly to mate to the XEM7350. It includes a small fan which connects to the fan controller on-board for manual or automatic fan speed control. It is available for purchase directly from Opal Kelly. The assigned part number should allow you to order direct from Aavid, if desired.

Heat Sink Dimensions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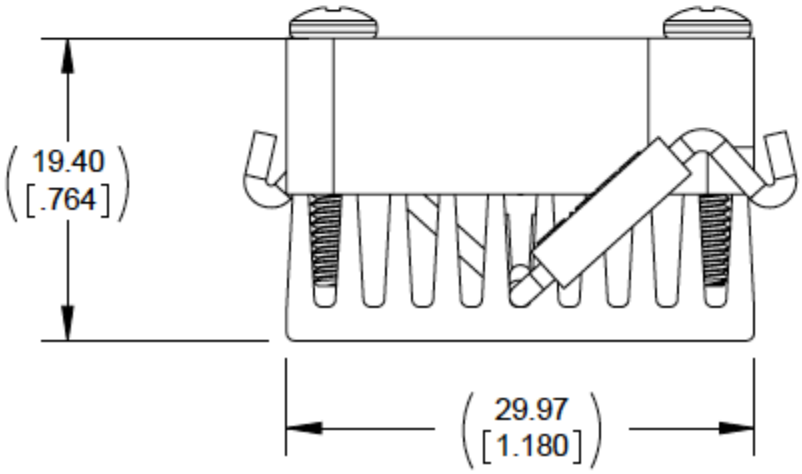
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