ArcticLink® III VX Solution Platform Data Sheet

High Definition Visual Enhancement Engine (VEE HD+) and Display Power Optimizer (DPO HD+) Solution with LVDS, MIPI and RGB Interface Bridging Capabilities

Platform Highlights

High Definition Visual Enhancement Engine

- VEE HD+ compensates for different viewing environments by restoring and enhancing the display content through contrast and dynamic range optimization.
- Greatly enhanced image and video quality even under low backlight or bright ambient conditions.
- Support up to WUXGA (1920x1200).
- Based on proven, patented technology, licensed from Apical Ltd.

High Definition Display Power Optimizer

- Dramatically improves battery life up to 50% by reducing liquid crystal display (LCD) backlight or organic light-emitting diode (OLED) brightness.
- Tightly coupled with the VEE HD+ technology for optimal operation.
- Directly controls the pulse-width modulation (PWM) for backlight management.
- Integrated Intelligent Brightness Control (IBC) feature allows up to an additional 10% power savings by modulating display brightness based on display content.

Serial Peripheral Interface (SPI) Master

- Serial interface to control sensors, peripherals, and/or displays.

I²C Client

- CPU interface for configuring and controlling internal VEE HD+ registers, DPO HD+ registers and look-up tables (LUT).

NOTE: The MIPI interface can also be used instead of I²C.

Onboard Clock Generation

- Integrated, very low power phase-locked loop (PLL) for generating the clocks necessary for VEE HD+.

Small Form Factor Packaging

- 121-ball, 4.5 mm x 4.5 mm WLCSP, 0.4 mm ball pitch.

Display Interface Bridging

- The ArcticLink III VX solution platform features LVDS, RGB and MIPI interfaces in a variety of configurations.
- Display bridging is available in certain configurations.

Applications Overview

The ArcticLink III VX solution platform consists of the following main modules:

- VEE HD+
- DPO HD+
- Display interface bridging, bridging and duplication, or interface pass-through variants

This highly integrated, yet flexible architecture makes it the ideal platform to implement display path solutions for smartphones, tablets, and smartbooks.

The ArcticLink III VX solution platform can be used to replace several discrete components typically used in mobile devices today to reduce power consumption, reduce bill of materials (BOM) cost, save precious printed circuit board (PCB) space, and reduce the size of cables.

High Definition Visual Enhancement Engine

The ArcticLink III VX solution platform embeds the VEE HD+ technology with very low power and optimal die size for lowest BOM costs. QuickLogic and Apical Limited partnered to architect and develop the optimal blend of algorithms and interfaces for mobile and portable multimedia products. The VEE HD+ technology is based on a proven core licensed from Apical Limited, which is substantiated by nearly a decade of scientific research. These algorithms implement a model of human perception; resulting in a displayed image that retains detail, color and vitality even under variable viewing conditions. It specifically addresses the problem of the low contrast ratio of mobile displays to bring a more TV-like viewing experience to the mobile devices.

The QuickLogic proprietary VEE HD+ solution substantially enhances image and video quality by optimizing the dynamic range, contrast, and color saturation pixel-by-pixel to provide a natural viewing experience under low backlight or bright ambient light conditions. Seamlessly integrated into the display path, the VEE HD+ technology enhances the user's mobile multimedia visual experience while DPO HD+ drastically reduces backlight power to extend battery life.

High Definition Display Power Optimizer

As consumer devices have become more power hungry, system designers are constantly looking for ways to lower system power consumption. As displays typically consume 30% to 60% of the total system power, there has been a tremendous amount of research put into methods of reducing display power. A common solution is to lower the backlight level of the LCD or average brightness level of an OLED. Unfortunately, this solution significantly diminishes the viewing experience since most details are lost due to the lowered contrast ratio.

While the VEE HD+ technology uses statistical information gathered pixel-by-pixel, frame-by-frame to adjust the value of individual pixels, DPO HD+ uses that same information to adjust the display brightness. The ability to provide a unique tone curve for each pixel and tight control over the display backlight gives greater flexibility than the global adjustments of alternative implementations. The QuickLogic approach results in greater power savings and the entirely new capability of adapting to a bright environment.

The ArcticLink III VX solution platform also contains the QuickLogic IBC feature, which allows additional battery savings by modulating the display brightness based upon actual display content. If the content being displayed is of a lower contrast or dynamic range (such as streamed video from popular internet video sites), display brightness can be lowered without affecting the viewing experience. This results in a system-level battery savings.

DPO HD+ seamlessly integrates with the QuickLogic VEE HD+, ensuring longer battery life and an excellent visual experience by coupling the PWM driving the display backlight with the display content processing parameters of the VEE HD+ technology.

Display Interface Bridging

The ArcticLink III VX features a number of input/output configurations which allow for easy, on-chip bridging of processor to display interfaces as shown in **Table 1**.

ArcticLink III VX Solution Platform Variants

The ArcticLink III VX solution platform features 17 distinct variants as described in **Table 1**.

Table 1: ArcticLink III VX Solution Platform Variants

QuickLogic Part Order Number	Part Number	Device Input	Device Output	Max Resolution[a] (60 FPS, 24 bpp)	Primary Application
CSSP-BBFDN120	VX3B3B	MIPI-4[b]	MIPI-4[b]	1920 x 1200	Smartphones and tablets
CSSP-ABFDN120	VX3B2F	MIPI-2[c]	MIPI-4[b]	1366 x 768	Smartphones with COG
CSSP-ASFDN120	VX3B2B	MIPI-2[c]	MIPI2[b]	1920 x 1200	Smartphones
CSSP-AQFDN120	VX5B3D	MIPI-4[b]	LVDS-2[d]	1920 x 1200	Smartphones and tablet computers
CSSP-ADFDN120	VX5A1D	RGB	LVDS-1[e]	1280 x 960	Smartphones and tablet computers
CSSP-ARFDN120	VX5A3D	RGB	LVDS-2[d]	1920 x 1200	Smartphones and tablet computers
CSSP-ACFDN120	VX5B1D	MIPI-2[c]	LVDS-1[e]	1280 x 720	Smartphones and tablet computers
CSSP-AXFDN120	VX5B3A	MIPI-4[b]	RGB	1920 x 1200	Smartphones and tablet computers
CSSP-AYFDN120	VX5B2A	MIPI-2[c]	RGB	1366 x 768	Smartphones and tablet computers
CSSP-AZFDN120	VX5A3B	RGB	MIPI-4[b]	1920 x 1200	Smartphones and tablet computers
CSSP-BAFDN120	VX5A2B	RGB	MIPI-2[c]	1366 x 768	Smartphones and tablet computers
CSSP-AUFDN120	VX6B2E	MIPI-2[c]	MIPI-2[c]and RGB	1366 x 768	Smartphones and tablets with pico projectors
CSSP-AEFDN120	VX6B3E	MIPI-4[b]	MIPI-4[b] and RGB	1920 x 1200	Smartphones and tablets with pico projectors

Table 1: ArcticLink III VX Solution Platform Variants *(Continued)*

QuickLogic Part Order Number	Part Number	Device Input	Device Output	Max Resolution[a] (60 FPS, 24 bpp)	Primary Application
CSSP-BRFDN120	VX6B2G	MIPI-2[c]	LVDS-1[e] and RGB	1280 x 720	Tablets with pico projectors or secondary HDMI/MHL encoders
CSSP-BSFDN120	VX6B3G	MIPI-4[b]	LVDS-2[d] and RGB	1920 x 1200	Tablets with pico projectors or secondary HDMI/MHL encoders
CSSP-BYFDN120	VX6B2H	MIPI-2[c]	MIPI-2[c] and LVDS-1[e]	1280 x 720	Tablets with secondary HDMI/MHL encoders
CSSP-BZFDN120	VX6B3H	MIPI-4[b]	MIPI-4[b] and LVDS-2[d]	1920 x 1200	Tablets with secondary HDMI/MHL encoders

a. MIPI “video mode” only.
b. MIPI-4: Four lane MIPI interface.
c. MIPI-2: Two lane MIPI interface.
d. LVDS-2: Dual link LVDS interface (eight data differential pairs and two clock differential pairs).
e. LVDS-1: Single link LVDS interface (four data differential pairs and one clock differential pair).

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Revision History

Revision	Date	Originator and Comments
1.0	February 2013	Initial Production Release
1.1	March 2013	Paul Karazuba and Kathleen Bylsma Added packages VX6B2H and VX6B3H.
1.2	June 2016	Brian Faith and Kathleen Bylsma Added QuickLogic Part Order Number to Table 1.

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