

Display Subsystem Solutions Using QuickLogic's ArcticLink III VX Platforms

The ArcticLink® III VX Solution Platform family features QuickLogic's 3rd generation Visual Enhancement Engine (VEE HD+) and Display Power Optimizer (DPO HD+) technologies. Among the 13 distinct variants of the platform are devices featuring display bridging between MIPI, RGB, and LVDS, ideal for OEM systems with mismatched processor and display interfaces. The platform also features devices for systems with matched interfaces, as well as single and

ARCTICLINK™ III VX

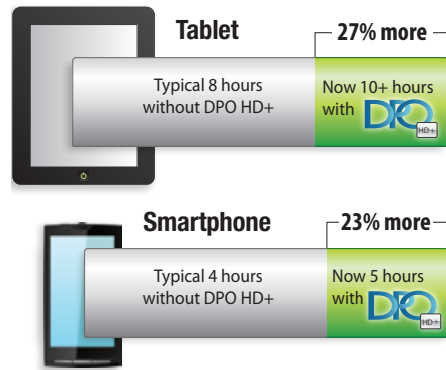
dual output devices that allow the integration of pico projectors into systems with only a single display path. The integrated, yet flexible architecture enables the platform family to be deployed as Customer Specific Standard Product (CSSP) solutions in the display subsystems of Smartphones, Tablets and other handheld consumer devices.



VEE HD+ Technology — Delivers Superior Viewing Experience

QuickLogic's VEE HD+ technology, based on the iridix® core from Apical Limited, greatly enhances the viewability of displays under challenging viewing conditions, such as bright ambient light, while dynamically optimizing video characteristics on a pixel-by-pixel basis to provide a superior viewing experience to the user, regardless of ambient lighting.

- Supports resolutions up to 1920 x 1200 pixels at 60 frames-per-second.
- TV-quality visual experience in mobile devices through dynamic range control.



Battery Life Improvement: Actual OEM Measurements

Note: Actual power savings are system dependent.

DPO HD+ Technology — Extends Battery Life Up To 50%

Used in conjunction with the VEE HD+ technology, QuickLogic's DPO HD+ technology enables significantly longer battery life and the use of smaller, more cost-effective batteries by lowering display brightness without compromising the viewing experience.

- DPO HD+ includes Pulse Width Modulation (PWM) technology to drive the display brightness for active power management.
- Ambient light-based power savings have been demonstrated at up to 41%.
- Using the content-based "Intelligent Brightness Control" (IBC) feature, an additional 10% power savings is possible.

Mobile Device Challenges & QuickLogic Solutions

CHALLENGES

Compromised User Experience

The display in a handheld mobile device may appear bleached or dark depending on the environment, thus affecting the user experience.

Battery Life Drain

Smartphone and tablet displays are increasing dramatically in both physical size and resolution. As displays grow, they consume increasing amounts of power in systems that are already power-starved.

SOLUTIONS

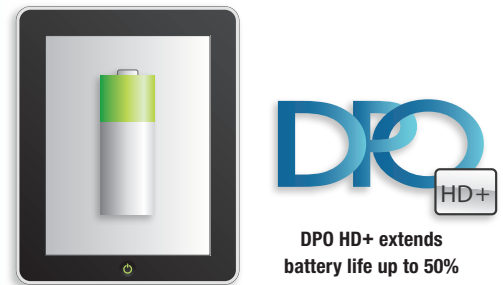
Enhanced Sunlight Viewability

VEE HD+ compensates for the display's reduced contrast, ensuring a consistent high-quality viewing experience through pixel by-pixel dynamic range control without increasing display brightness.



Extended Battery Life

QuickLogic's DPO HD+ technology enables developers to extend battery life by lowering display brightness without compromising the viewing experience, saving considerable system power and extending single-charge battery life.



Customizable “Mobile Device Display Optimizer” Android Application — Enables Mobile Product Differentiation

MDDO (Mobile Device Display Optimizer) gives the system designer complete control over VEE HD+ and DPO HD+ parameters while providing information on ambient light levels, current display brightness, and recommended display brightness based upon the system's Auto Brightness settings. MDDO can be implemented at the user level as a replacement for the standard Android Auto Brightness menu, allowing the consumer to directly adjust VEE HD+ processing and display brightness.

- Speeds time-to-market by providing a standard software platform that substantially improves the native Auto Brightness controls in Android™.



MDDO Screenshot



ArcticLink III VX Solution Platform Family

Platform	Input	Output	Application	Maximum Resolution	Size
VX3	MIPI	MIPI	Smartphone Tablet	Up to 1920 x 1200 pixels at 60 frames-per-second	4.5mm x 4.5mm
VX5AxB	RGB	MIPI	Smartphone Tablet		
VX5AxD	RGB	LVDS	Tablet		
VX5BxA	MIPI	RGB	Smartphone Tablet		
VX5BxD	MIPI	LVDS	Tablet		
VX6	MIPI	MIPI & RGB	Smartphone with Pico Projector		

VEE HD+ and DPO HD+ Background

VEE HD+ uses a Dynamic Range Compression (DRC) technology, which differs from conventional methods, such as gamma correction, in that it applies different tonal and color transformations to every pixel in an image. These algorithms implement a model of human perception resulting in a displayed image that retains detail, color and vitality even under difficult viewing conditions. VEE HD+ technology specifically addresses the problem of the low contrast ratio of mobile displays to bring a more television-like viewing experience to mobile devices.

While VEE HD+ uses statistical information gathered pixel-by-pixel, frame-by-frame to adjust the value of individual pixels, QuickLogic’s DPO HD+ uses that same information to adjust the display brightness. The ability to provide a unique tone curve for each pixel, as well as have tight control over the display brightness, gives greater flexibility

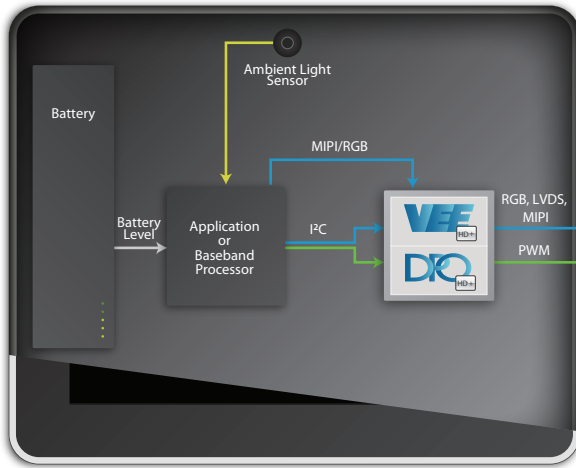
than the global adjustments of alternative implementations. This approach results in greater power savings and the entirely new capability of adapting to an environment with bright ambient light.

In addition to ambient light-based power savings, DPO HD+ features QuickLogic’s Intelligent Brightness Control (IBC), which further increases power savings through modulating display brightness when lower contrast and/or dynamic range content is present. This offers additional system battery life savings of up to 10% (content dependent).

VEE HD+ and DPO HD+ are hardware-based technologies, integrated into consumer devices via a CSSP (Customer Specific Standard Product) chip from QuickLogic. The CSSP is placed in the display path, between the CPU/ Applications Processor and the display.

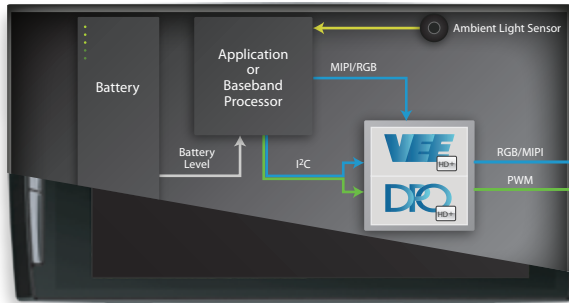
Application Examples

Tablet



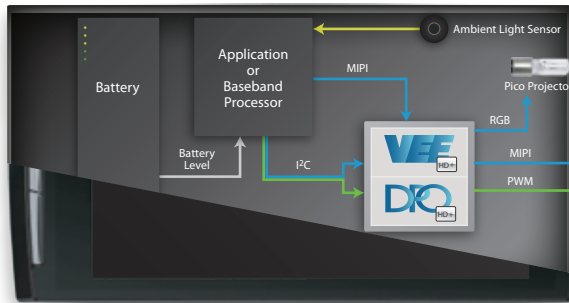
Tablet Display

Smartphone



Smartphone Display

Smartphone with Pico Projector



Pico Projector Screen



Smartphone Display



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