

## NEC Display Solutions

## DirectView LED: How all LEDs are not the same

## Summary

Already well established as an outdoor display technology, attracting attention from far distance, dvLED has more recently been making a name for itself indoors for dynamic, high-bright large surface visualisation. In transport terminals, retail stores and malls, reception areas and boardrooms, fine pitch indoor LED solutions offer a genuine alternative to more traditional LCD large format displays or projection.



Our whitepaper entitled '[Comparing LCD and dvLED solutions](#)' will help you to match the right technology solution to your application. In this document we will address LED technology with particular attention to the vital importance of quality.

With LED solutions flooding the market, the variance in quality is extreme. As a relative newcomer to the mainstream display technology market, it can be difficult to cut through generic top line specs to fully appreciate the detail behind them. Read on to gain an understanding of how to compare LED technologies, identify important features and recognise a smart purchasing decision. With so many seemingly inexpensive LED solutions currently available, it is wise to remember that buying cheap could very well mean buying twice.

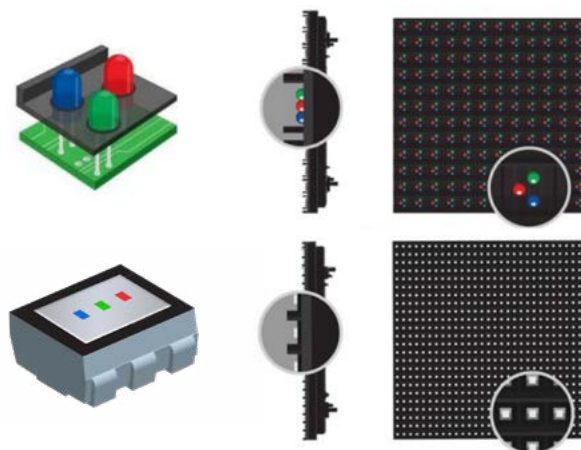
### What are the key features of LED and why is choosing quality so important to visual and operational reliability?

#### WHAT IS AN LED?

A light emitting diode (LED) is a tiny semiconductor that converts electricity into visible light. In an LED panel, each colour pixel has one red, one blue and one green LED. The combination of these three colours enables the LED to create trillions of colours. In an LED panel, each LED produces its own light, unlike an LCD panel where the backlight passes through the liquid crystal layer. This is where the name 'direct view' LED (dvLED) comes from.

#### SMD DIODES

Early LED diodes and those used in outdoor solutions today are of the DIP (Dual In Line Package) or Through Hole LED diode type. It is bright and relatively cost efficient to manufacture but it has limitations.



It is unsuitable for close proximity viewing due to its large pixel size and it suffers from colour shift. In contrast, SMD (Surface Mounted Device) LED diodes are mounted directly onto the printed circuit board. The resulting uniform flush surface generates an unprecedented consistency between LED batches when it comes to viewing angles, colour wavelength and brightness deviation. They can be manufactured in much smaller sizes for finer pixel pitches of <math><10\text{mm}</math> and high resolutions making it more suitable for indoor applications.

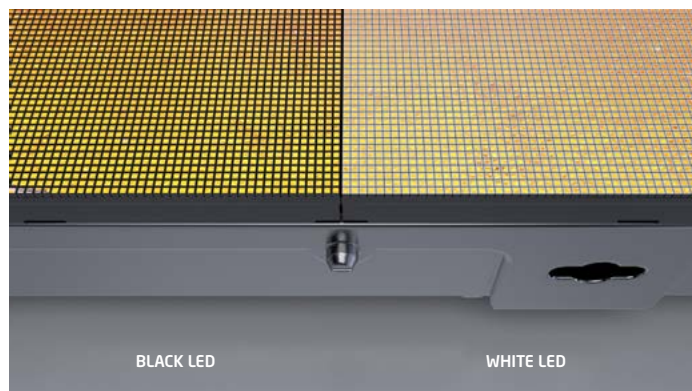
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### FLAT SURFACE LED

By utilizing SMD diodes, an overall flatter front surface can be achieved. Where some SMD diode types still produce a variable convex surface, NEC's Multi-Color LEDs undergo a dedicated finishing process that results in a fully flat surface enabling wider viewing angles of up to 160 degrees with minimized angular colour shift. In addition, a special polyamide surface cap creates a matt finish which reduces the reflection of ambient light.

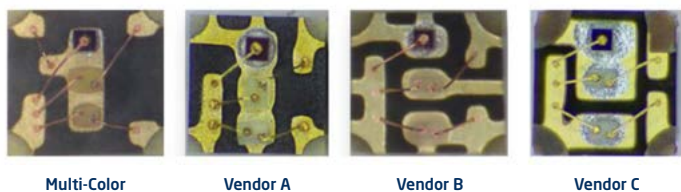
### WHITE v BLACK SMD

SMD diodes are available in either black or white. A black diode enhances the image quality with a higher perceived contrast ratio and high brightness for both indoor and outdoor settings. A white diode is best suited to outdoor settings, enhancing the image quality with a very high brightness level.



### WIRE BOND

Within the LED diode, the wire bond connecting the Anode and the Cathode can be copper or gold. LED encapsulations with golden bonding wire produces slightly more light (3.55% lumen) compared to LED encapsulations using copper wire. The thermal conductivity of gold is slightly lower than copper, and gold can last longer as copper is susceptible to oxidization. However, the patented LED design from Multi-Color, as used by NEC, maximises product lifetime without the need for more expensive gold wire. The design uses a so called "isolation island" whereby the crystal fixing area and common poles are isolated from the other components of the circuit to prevent the ingress of humidity and the threat of oxidization. Thus, potential corrosion is no longer an issue and the SMD diodes offer the highest operational reliability.

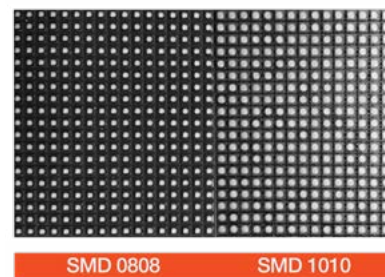


### SMD DIODE SIZE

Not to be confused with the pixel pitch, the size of the diode refers to how much of the casing is visible around the light producing element within each diode. The smaller the diode the more of the background of the pixel card will be visible, if you have made a wise choice for a black diode, this will enhance the image with a high contrast ratio.

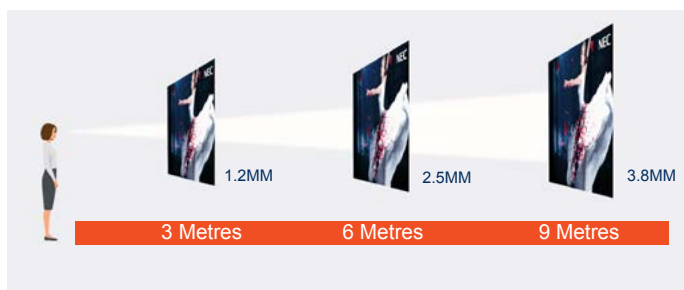
When comparing specifications, look out for the SMD size. SMD0808 or SMD1010 refers to the horizontal and vertical size of the SMD (0.8mm x 0.8 mm; 1.0mm x 1.0mm).

Compare the image of two LED modules with the same pixel pitch. The smaller SMD0808 diode has a larger ultra-black mask area visible between each diode compared to the SMD1010,



resulting in a higher contrast. Naturally, there is a cost implication, but the resulting perceived image quality will be impacted by the size of the diode.

### PIXEL PITCH



Pixel pitch is the distance from the centre of a pixel to the centre of any adjacent one. The smaller the pixel pitch, the higher the density and the clearer the image. Greater pixel density carries a higher price tag, so the best way to choose the right option is to consider the optimal viewing distance for the type of content - whether its text, images or video; and its application - whether for company presentations or for digital signage.

A good rule of thumb for estimating the pixel pitch best suited to the viewing distance is 1mm of pixel pitch per 2.44 metres of viewing distance (or 1mm pixel pitch per 8 feet of viewing distance). Using this calculation to identify the best viewing distance for NEC's standard pixel pitches, the super-fine 1.2mm pixel pitch is best viewed from approx. 3 metre distance and the 2.5mm pixel pitch is best viewed from 6 metres. For longer optimal viewing distances, a lower pixel pitch option will provide the perfect view and be more cost effective.

### METAL CABINET

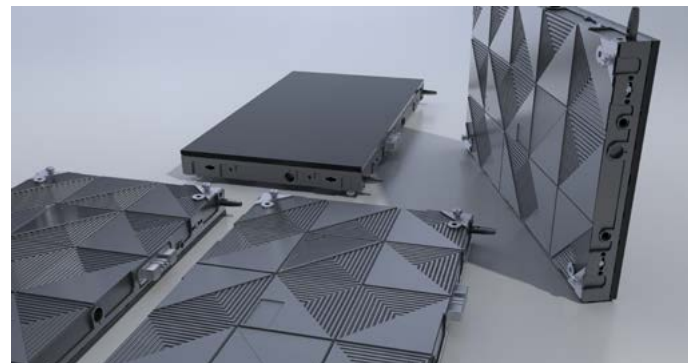
NEC utilises aluminium cabinets for its dvLED products where many other brands use plastic or polycarbonate. Precision machined aluminium is much more rigid and stable over time especially in changing heat environments ensuring perfect and consistent alignment between modules.

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### Why Quality should be a key decision factor

NEC is perceived in the market place as a quality brand, highly regarded in the provision of superior products and service. In a competitive industry, where on first glance technical specifications look identical, we draw on our reputation for quality to stand out from the crowd, offering a level of excellence which cannot be ignored. Customised support and service packages that accompany the product over its lifetime ensure that users continue to enjoy a secure long-term investment. NEC offers display solutions which meet all usage requirements and budgets. There is no sense in choosing a solution which is over-specified and paying for features which are not required. Equally, choosing a solution designed for entry-level usage and expecting it to perform 24/7 will lead to disappointment. Choosing a solution which is 'fit for purpose' and specified according to the requirements of the application and possible future usage is vital to ensure a reliable long term asset for your business operations.

You can be certain that whichever solution you choose, under the NEC brand, it will deliver the same consistent reliable performance according to its operational parameters. Trusted by professional pro-AV integrators as a no risk partnership, NEC is the brand of choice for professional installations.



[Find out more about  
NEC LED Solutions here](#)

Metal supports excellent heat dissipation, efficient against heat build-up for consistent temperature management, vital to extend the lifetime of the display.

The metal cabinet means NEC achieves excellent results in fire safety and fire load testing; this is mandatory in public spaces.

Approved for use in public spaces, NEC's LED products are unlikely to require additional investments such as smoke evacuation or sprinkler systems for protection compensation, thus saving costs, saving effort and guaranteeing peace of mind. For further information, see our [LED Quality & Safety document](#)

#### POWER REDUNDANCY

Where fail-safe operation is business critical, the provision of two power supplies will ensure that should one fail, the other will remain available to provide continuous operation. For the NEC FA series, redundancy extends to the provision of 2 x LED controllers per installation and 2 x data receiving cards per LED module.

#### FUTURE PROOF

High quality dvLED solutions typically deliver up 100,000 hours life to 50% brightness, meaning this technology can be a 10-year product. A fixed asset would typically accrue over 5 years as the value of the expenditure depreciates, however, as LED offers a much longer lifecycle, the actual Total Cost of Ownership is much lower compared to other technologies. Whilst future developments might bring higher resolutions, NEC protects the long term investment through innovative front-serviceable pixel cards. Simple replacement of the pixel cards to benefit from higher pixel pitches or future technology development does not impact the existing wall or mounting structure. When a pixel card is replaced, chrominance and luminance calibration can be carried out to ensure continued visual uniformity over the lifetime of the product.

#### DEFECT PIXELS

There is currently no universal industry standard guideline for LED pixel defects. The variation in quality in the dvLED market is vast. Whilst prices are dropping, there are innovative components which remain cost intense and it is wise to be wary of cheap product. In line with its stringent quality control and reputation for reliable, fit-for-purpose solutions, NEC has defined its own standard for permissible faults applicable to each of its dvLED series of products, bearing in mind that it is nearly impossible (and cost prohibitive) to produce a dvLED module which is entirely free from pixel faults.

#### ENVIRONMENT / RECYCLABILITY

As a manufacturer of quality professional products, NEC uses industry-grade components which are highly recyclable. Our LED products are optimized for long term operation of up to 100,000 hours and are highly energy efficient. NEC adheres to all current environmental guidelines and regulations including those governing the use of plastics and retardants.

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