



# Products for Mini LED Applications



Automakers try to differentiate their infotainment human-machine interface (HMI) displays and catch up to the technological advances now common in smartphones, tablets, and television displays. A local-dimming backlight technology is a direct-lit architecture where the LEDs are directly behind the LCD panel, as shown in Figure 1. Each LED or zone of LEDs can dim individually to illuminate only those pixels of the display needed by dynamically adapting to the image content on the display.

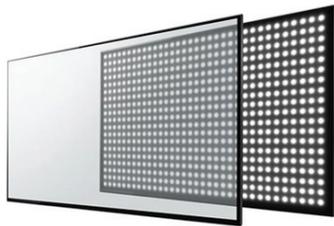


Figure 1: LEDs individually to achieve a better display

Controlling the LCD backlight's local dimming enables selective dimming of screen areas that are darker while keeping luminous screen areas bright. This technology

enhances the apparent contrast ratio resulting in improved image quality. Array local dimming is necessary to display High Dynamic Range (HDR) content and improve content visibility under all lighting conditions.

Lumissil Microsystems, release its latest matrix driver IC IS32FL3749 and multi-channel driver IC IS32FL3248, for controlling arrays of mini-LEDs. It is targeted at the automotive LCD backlight market that utilizes white mini-LED arrays for large ultra-high contrast Central Information Displays (CID), provides accurate zonal dimming and LED brightness control to meet these demanding backlight display requirements.

The IS32FL3749 is an automotive-grade mini-LED matrix driver IC for LCD backlight applications that supports multiple local dimming zones. More dimming zones offer greater contrast control (difference between dark and bright parts of an image), true black levels, and minimized blooming (halos of light around bright light sources). LCDs with more backlight LEDs and more dimming zones, result in brighter displays with a highly granular contrast control.

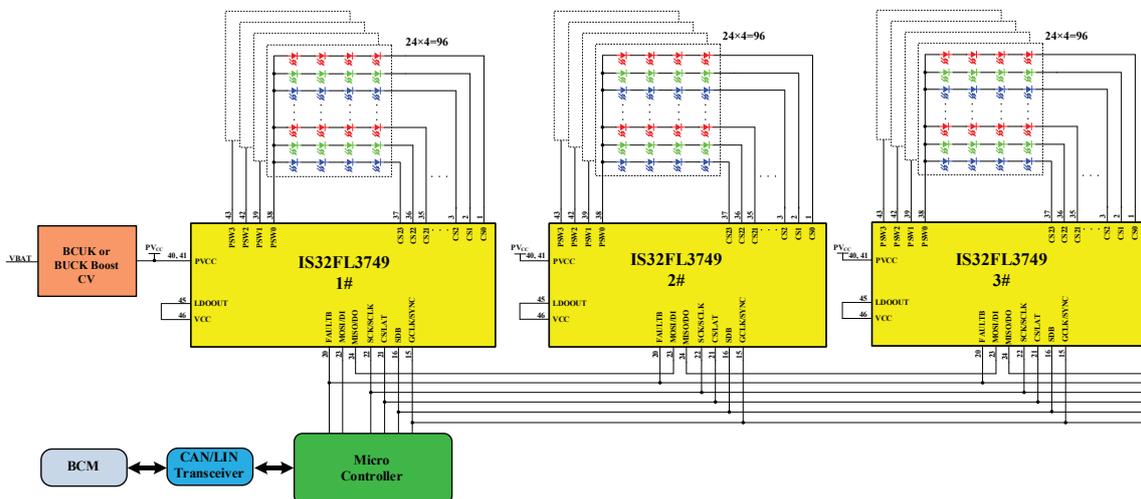


Figure 2

IS32FL3749 features Selectable Traditional PWM and ES-PWM [dithering] for high resolution color and Real-time LED open detection [LOD], Real-time LED short detection [LSD] help customer easily diagnose faulty LED in production and in the development stage as well and the reliability of the display can be improved by the LOD, LSD function. Spread Spectrums to reduce EMI, over temperature protection to protect damage of system and Software shutdown mode to save power, 180-degree phase delay operation to reduce power noise.

IS32FL3248 is a new and advanced high voltage 16V, 48 channel 33mA constant current LED driver that can control LED on-time with pulse width modulation [PWM] in 65,536 steps for grayscale control. A maximum of 281 trillion colors can be generated with red, green, and

[up to 25MHz] serial interface port. The software shutdown mode allows the device to enter a low-power state while retaining all register values, reducing system cost, thermal dissipation, and PCB size in applications. The device offers selectable Traditional PWM and ES-PWM [dithering] for high-resolution color, along with real-time LED open detection [LOD] and LED short detection [LSD] for easy fault diagnostics during production and development. These features enhance display reliability. Additionally, spread spectrum technology reduces EMI, over-temperature protection safeguards the system, and the 180-degree phase delay operation minimizes power noise.

The IS32FL3749 is a scan-type LED driver, while the IS32FL3248 is a non-scan type. However, the IS32FL3248

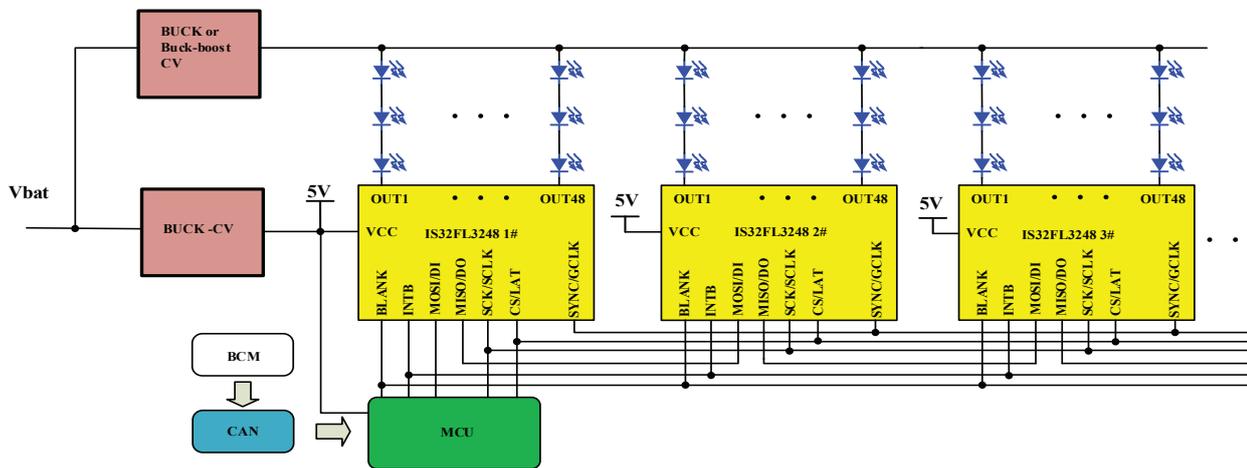


Figure 3

blue LEDs connected to the constant current outputs for backlighting with high contrast ratios, each channel has 16-bit PWM brightness control, and 64 steps of constant-current scaling [SL]. SL can adjust brightness deviation between channels. Global current control [GCC] can adjust brightness deviation between the R, G, and B color groups. The eight-step maximum current band control [CB] selects the maximum output current range for all channels. IS32FL3248 also features chain topology via SPI/VSB interface, PWM data I/O is daisy chained with bi-directional data transmission [write and read] which allows multiple IS32FL3248 connection and tolerate up to 18V, nominal operation voltage between 3.0V to 16V, multiple LED's can be connected in series to supports 4 LEDs/string. [Please refer to Fig.3].

The IS32FL3248 uses proprietary programmable algorithms to minimize audible noise from MLCC decoupling capacitors. It supports programming of SL, GCC, CB, and other registers via a high-speed VSB [up to 25MHz] or SPI

can also function as an external scan type when used with external PMOS. By controlling the power lines and enabling time-division locations, the PMOS switching frequency can exceed 60Hz. This allows the IS32FL3248 to act as a scan-type LED driver, capable of driving more LEDs. For example, with 9 external scans, one IS32FL3248 can control 432 individual LEDs [48 LEDs per scan]. [Please refer to Fig.4].

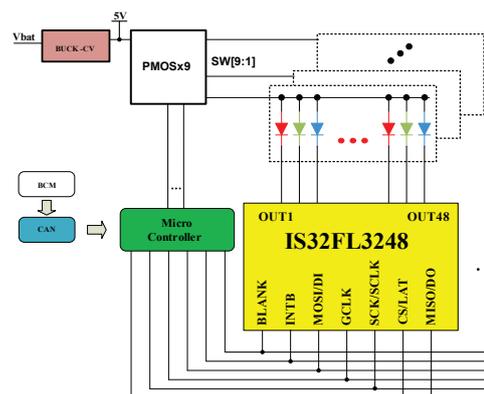


Figure 4

	Scan type	Non-scan type	Ext-scan type
Solution	IS32FL3749	IS32FL3248	IS32FL3248 + Ext PMOS
LED quantity	16	32	9 typ. 432 LEDs, 16 max. 768LEDs
Peak current	42mA typ. 60mA max.	10mA typ. 33mA max.	33mA max.
Average current	10mA	10mA typ. 33mA max.	3.2mA [n=9] 2mA [n=16]
Drive type	4 scan	No scan	9 external scan
PWM frequency	488Hz@16bit mode 125kHz@8+8bit mode 125kHz@8+4bit mode	62kHz @8-bit 62kHz @8+8-bit 244Hz @16-bit	About 244Hz
Scan frequency [Matrix]	122Hz@16bit mode 32kHz@8+8bit mode 32kHz@8+4bit mode	-	About 244Hz

Table 1

IS32FL3749 and IS32FL3248 are AEC-Q100 qualified with operating temperature of -40°C to 125°C. IS32FL3749 is available in an eTQFP-48 (7mm × 7mm) package. IS32FL3248 is available in an eLQFP-64 (10mm×10mm) and WFQFN-64 (9mm×9mm) packages. They both target Mini LED Back Light, Automotive LED Back Light, Automotive Center Information Display, Automotive Signage and LED Video Displays. Lumissil also offers consumer grade (non-auto) of them (IS31FL3749 and IS31FL3248), target consumer mini LED back light applications.