2022 MACROBLOCK ONLINE SYMPOSIUM

No.04

Lead the LED Industry to Metaverses: Macroblock Solutions

CH.YANG

Macroblock Symposium 2022

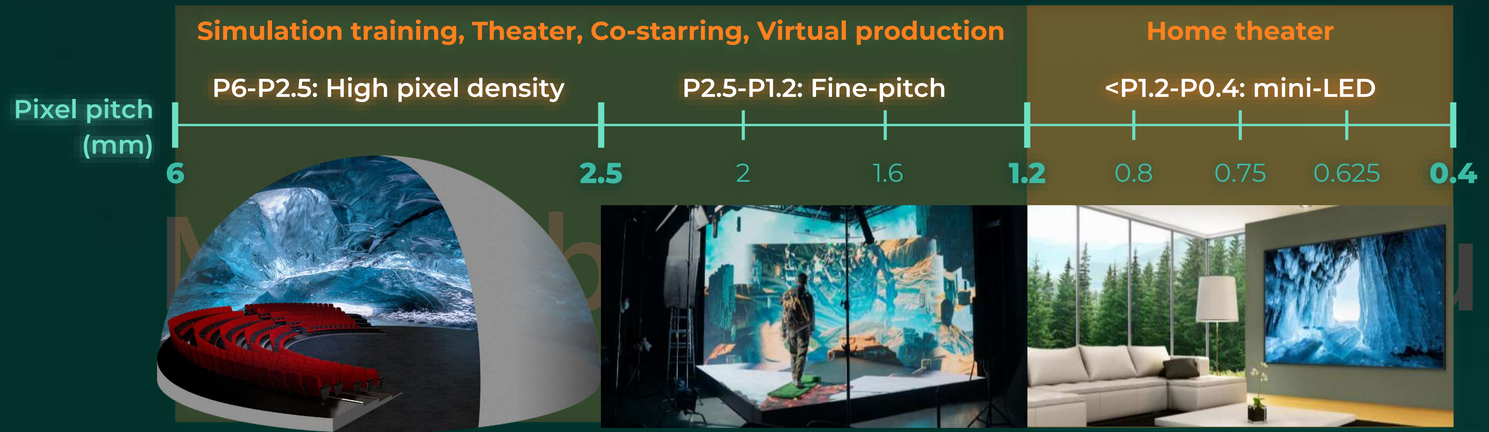
DRIVE A WHOLE NEW WORLD METAVERSE

The Glasses-free Metaverse

Merging real and virtual worlds to create immersive experience

Macroblock Symposium 2022

LED Driver ICs for the Glasses-free Metaverse



Virtual does not accurately reflect reality

Heat Wave Hits

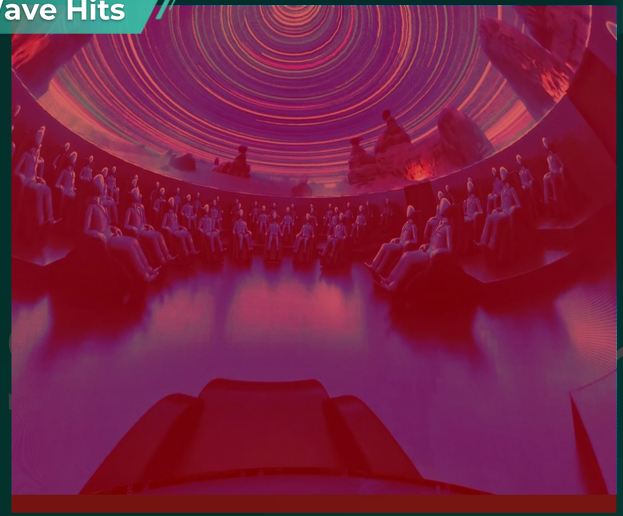


Photo Credit : Vaguard LED

Color Shift

Reducing Power Consumption of LED Display by Cabinets

- Fan cooling
- Utilize aluminum heat sink fins
- Consider Aerodynamics to change shell shape
- Surface radiation treatment

Reducing Power Consumption of LED display
by Modules

- **LEDs:** Good Luminous Efficiency
- **POWER:** Good Management
- **Driver ICs:** Good Architectures & Specifications

Reducing Power Consumption of LED display
by Modules

- LEDs: Good Luminous Efficiency
- POWER: Good Management
- **Driver ICs: Good Architectures & Specifications**

Reducing Power Consumption of LED display
by Driver ICs

- [x] Using a common cathode architecture featuring dual power supplies
- [ ] Decreasing driver IC count
  - ✦ High scans
  - ✦ Mega output channels
- [ ] Power saving mode

Reducing Power Consumption of LED display
by Driver ICs

- ○ Using a common cathode architecture featuring dual power supplies
- ✓ Decreasing driver IC count
  - ✦ High scans
  - ✦ Mega output channels
- ○ Power saving mode

Reducing Power Consumption of LED display
by Driver ICs

- Using a common cathode architecture featuring dual power supplies
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Fundamentally Reducing Power Consumption of LED Displays:
Choosing Common Cathode Architectures

The current setting value of an LED module with 1.9mm pitch/ 160 * 90 pixels

RGB LED Brightness: 1,000nits	30-scan Design	1010LED
	mcd	Current(mA)
R	76.33	12.7
G	152.47	8.02
B	25.41	7.26

US Patents for Common Cathode Architecture:
US 11,132,940,B2 ; US 11,132,939,B2

Fundamentally Reducing Power Consumption of LED Displays:
Choosing Common Cathode Architectures

Comparison of power consumption of 1.9mm pitch modules at different input voltages

Input Voltage	5V	4.2V	3.8V	3.8V/2.8V
Module Power Consumption (W)	67.18	56.43	49.9	44.95
Cabinet Power Consumption (W)	268.72	225.72	199.6	179.8
Power Consumption Difference When Comparing to the 5V Input Voltage Solution	0%	-16%	-26%	-33%

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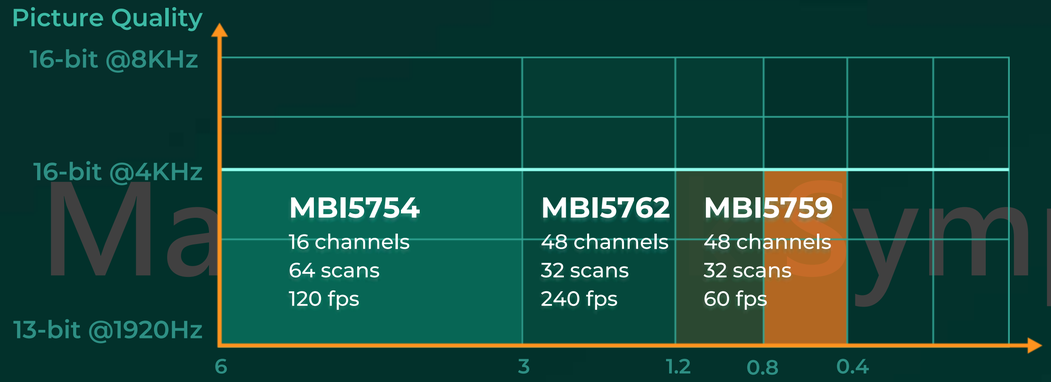
Overview of Macroblock Driver ICs with Common Cathode Architectures



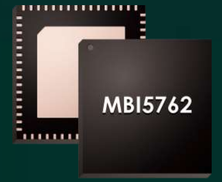
HDR Optimized

- Grayscale 16-bit
- Refresh rate 3,840 Hz

Common Cathode Architectures: MBI5762

Specification Requirements of LED Background Wall:

- P2.5 – P1.2mm pitch
- 16-Bit grayscale
- 1500+nits brightness
- Under 16 scans
- Good performance at low grayscale



for Virtual Production

- 48 channels
- 32 scans (16 scans is most suitable for VP)
- 0.5mA-10mA @3.8V/ 2.8V
- Current Accuracy of +/-2%
- 240fps
- 16-bit / 7,680Hz

Photo Credit: Mirage

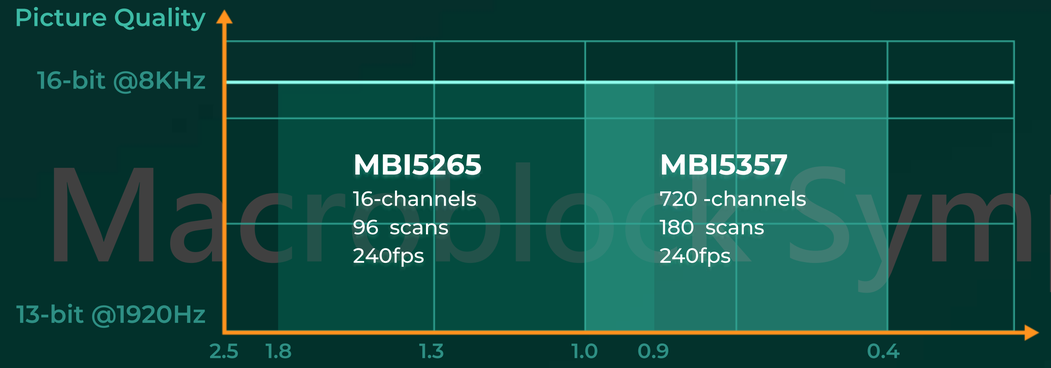
Reducing Power Consumption of LED display
by Driver ICs

- Common cathode architectures
- Decreasing driver IC count
  - ✦ High scans
  - ✦ Mega output channels
- Power saving mode

Reducing Power Consumption of LED display
by Driver ICs

- Common cathode architectures
- **Decreasing driver IC count**
  - **High scans**
  - **Mega output channels**
- Power saving mode

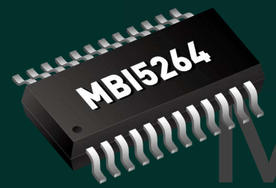
Overview of Macroblock Driver ICs with High Scans/ Mega Output Channels



HDR Optimized

- Grayscale 16-bit
- Refresh rate 3,840 Hz

High Scans: MBI5265



New evolution

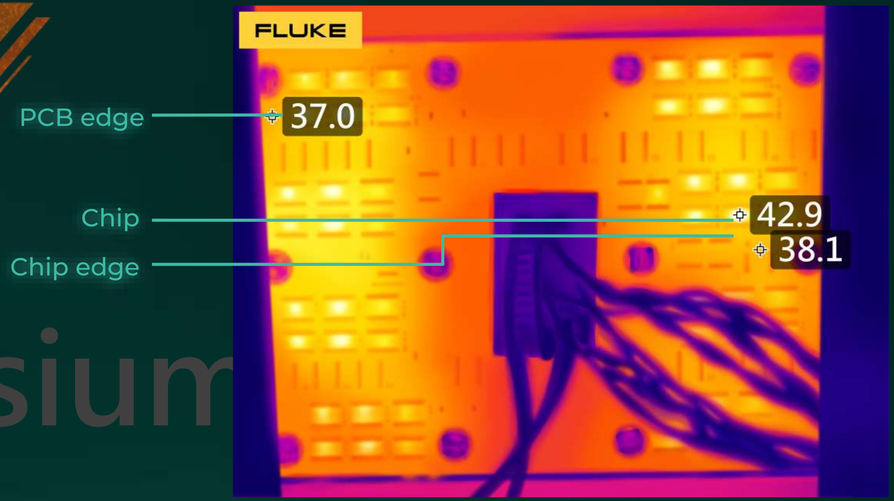
- 16 channels
- 96 scans
- 1mA-20mA/ 30mA @3.3V/5V
- Current Accuracy of +/-1.5%
- 240fps
- 16-bit / 7,680Hz

Module Temperature Measurement of MBI5265

- 64 Scans@ brightness 100%
- LED surface brightness: 860nits ; Color coordinates: (0.2760, 0.3004)

The temperature difference between different places does not exceed 8℃

- Less power consumption and therefore less color shift



High Scans / Mega Output Channels: MBI5357

- ✦ 720 channels
- ✦ 180 scans
- ✦ 0.1mA-5.5mA@3.3V
- ✦ Current Accuracy of +/-0.5%
- ✦ 240fps

Specification Requirements

mini- / micro-LED Display

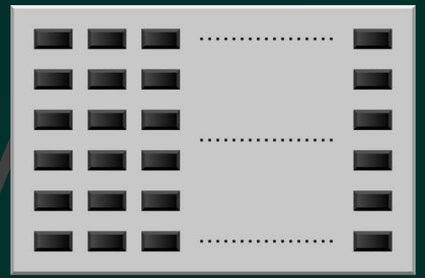
- ✦ **P0.9375 - P0.4mm pitch**
- ✦ **16-bit grayscale**
- ✦ **Good for high-scan design**

MBI5357

240 X 180 pixels

Generic IC

- 16 channels
- 32 scans
- 4K resolution requires 51,840 ICs



MBI5357

240 X 180 pixels

Generic IC
- 16 channels
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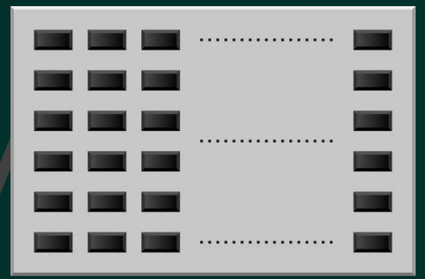


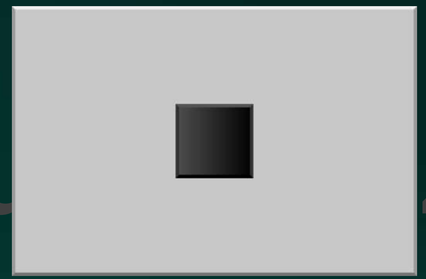
270 : 1

ratio of required driver IC count

51,648 ICs Saved

240 X 180 pixels

MBI5357
- 720 channels
- 180 scans
- 4K resolution requires only 192 ICs



MBI5357

- 2.5D Packaging
  Multi-die
- Flip Chip BGA
  Packaging

MBI5357

For mini- / micro-LED Display

- 2.5D packaging
  - Multi-die
- Flip Chip
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For mini- / micro-LED Display

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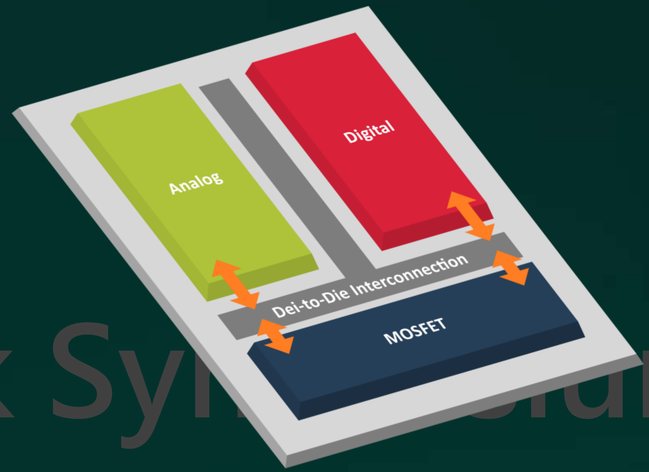
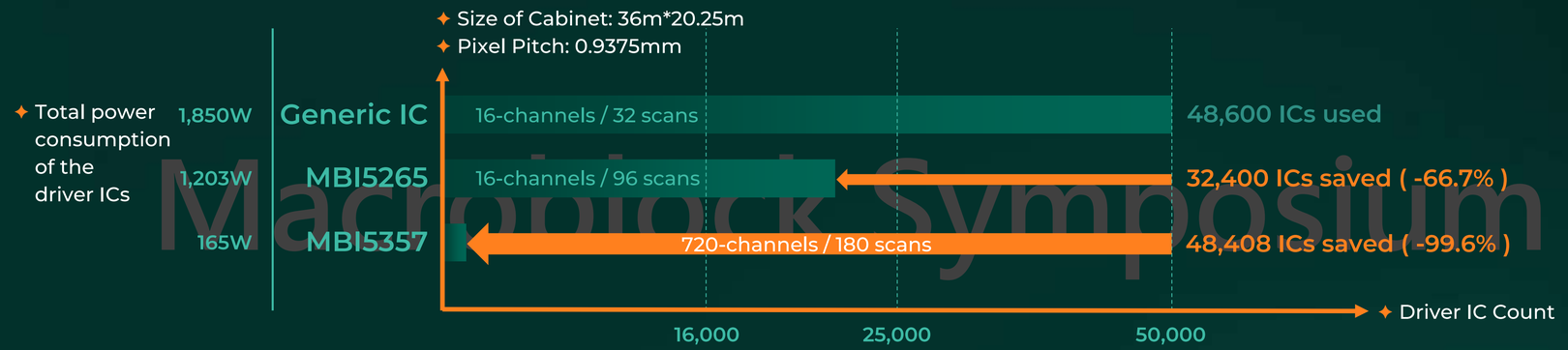


Fundamentally Reducing Power Consumption of LED Displays: Choosing High Scans/ Mega Output Channels



Glasses-free Metaverse LED Driver Solutions