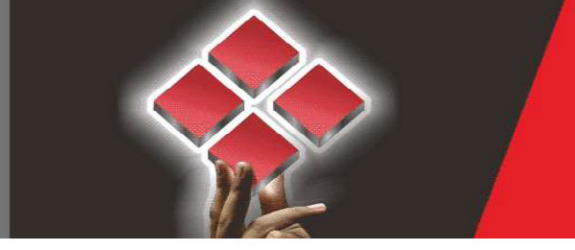
Macroblock

Driver IC for
Fine Pitch Display with micro- LED

The World-Leading LED Driver Expert



Extend Your LED Value

Introduction

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Title
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Patent
9 Innovation Patents in US, China, and Taiwan

Academic
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Article
中國顯屏協會論文: 1
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Outline

- Company Introduction
- Case Study
- Constant Voltage/Current
- Commonly Seen Visual Problems
- Low Power Consumption

About Macroblock

- Founded in June, 1999.
- Publicly traded in October, 2007 (3527.TW)
- Total capital: USD 9,938,040 (TWD327M) 3527.TW
- Employees: +180
- Main products: LED drivers

- Ranked 27th on the 2007 Deloitte Technology Fast 50 Taiwan Ranking
- Ranked 166th on the 2007 Deloitte Technology Fast 500 Asia Pacific Ranking
- Ranked 48th on the 2008 Deloitte Technology Fast 50 Taiwan Ranking in Revenue
- Ranked 47th on the 2008 Deloitte Technology Fast 50 Taiwan Ranking in Profitability Ability
- **Awarded the Certificate of Corporate Governance System CG6004 、 CG6005、CG6007**

Ranked 1st

LED Driver ICs Supplier in LED Display

Macroblock is ranked 1st in LED Display Driver ICs worldwide.

From IHS 2014 Driver IC report

- IHS believes that Macroblock is the number-one supplier in total signage and in the video-wall category.
- Macroblock seems to be leading the market growth in signage and in the video-wall category.

LED Driver ICs Supplier Rankings

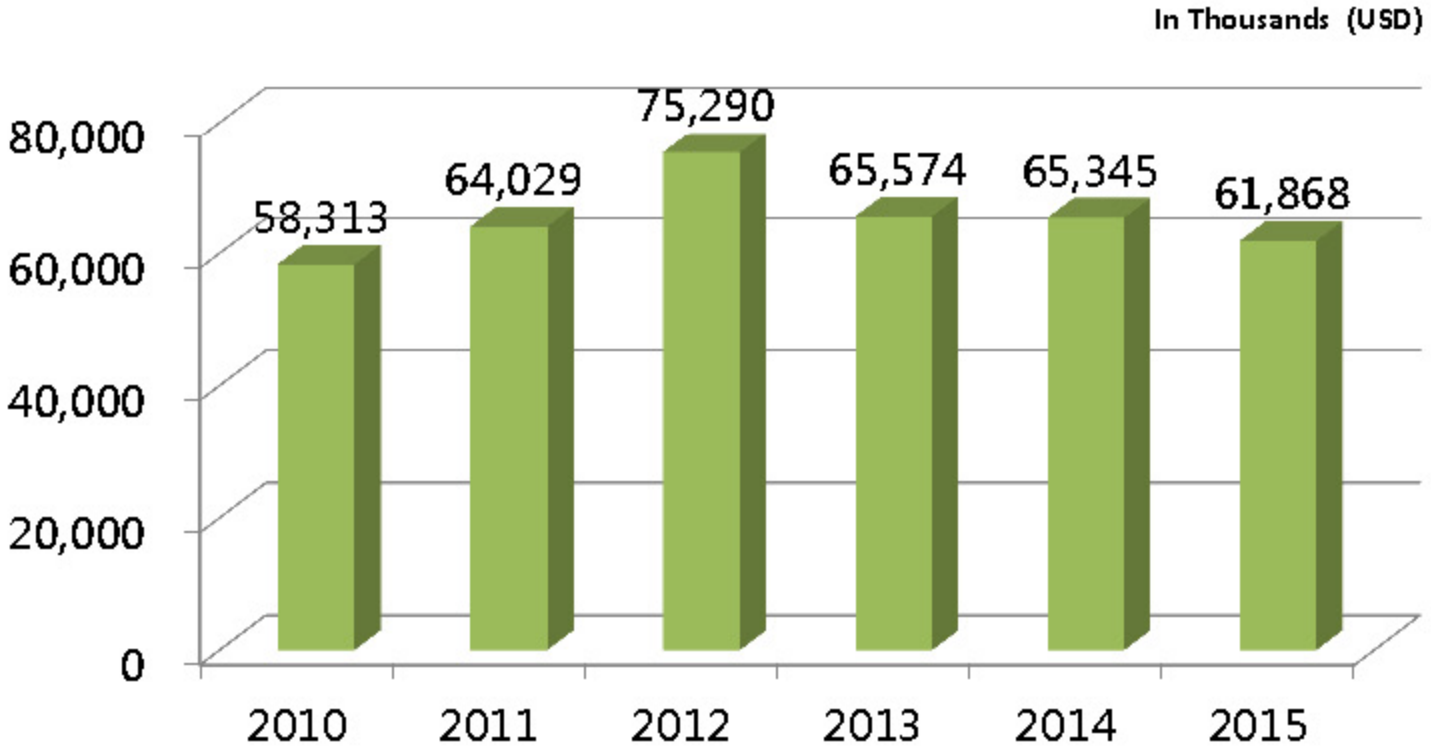
By Application for 2013

Rank	Signage
1	Macroblock
2	Texas Instruments
3	Toshiba
4	ams
5	STMicroelectronics

Source: IHS Apr-14

IHS 2014 Driver IC report (April, 2014)

Consolidated Annual Sales Records



*The financial data is based on T-IFRS since 2013.

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CASE STUDY

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A Case for Display Driver IC:
Fine Pitch Display

Location: Taiwan Taoyuan International Airport Terminal II , Taiwan

MBI's Solution： MBI5153

Application： Fine Pitch LED Display for Commercial

Requirements：

- High Gray Scale：14 bit
- High Refresh Rate: 3840Hz
- Resolve non-uniform image, bright lines / cross lines caused by LED dead pixels

A Case for Display Driver IC:
Fine Pitch Display

Location: Broadcast TV Studio,
Canal France Inter-national (CFI), France

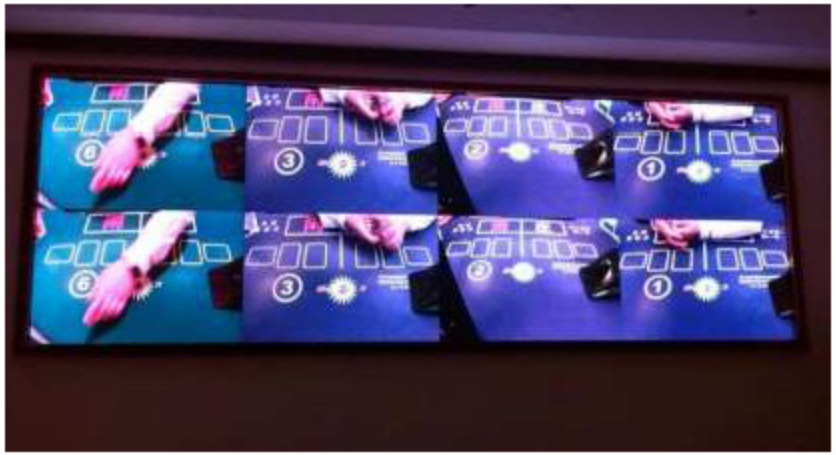
MBI's Solution： MBI5152

Application： Fine Pitch LED Display at TV Studio

Requirement：

- High Gray Scale：14 bit
- High Refresh Rate: 3840Hz
- Deghosting
- Resolve Color Shift

A Case for Display Driver IC:
Fine Pitch Display



Location: Macao,
Sands Macao Hotel

MBI's Solution： MBI5153

Application：

Fine Pitch LED Display at Central Control Room

Requirement：

- Superior Image Quality
- High Reliability with Non-Stop Transmission
- Resolve Cross Effect Caused by LED Failure
- Bezel-Free

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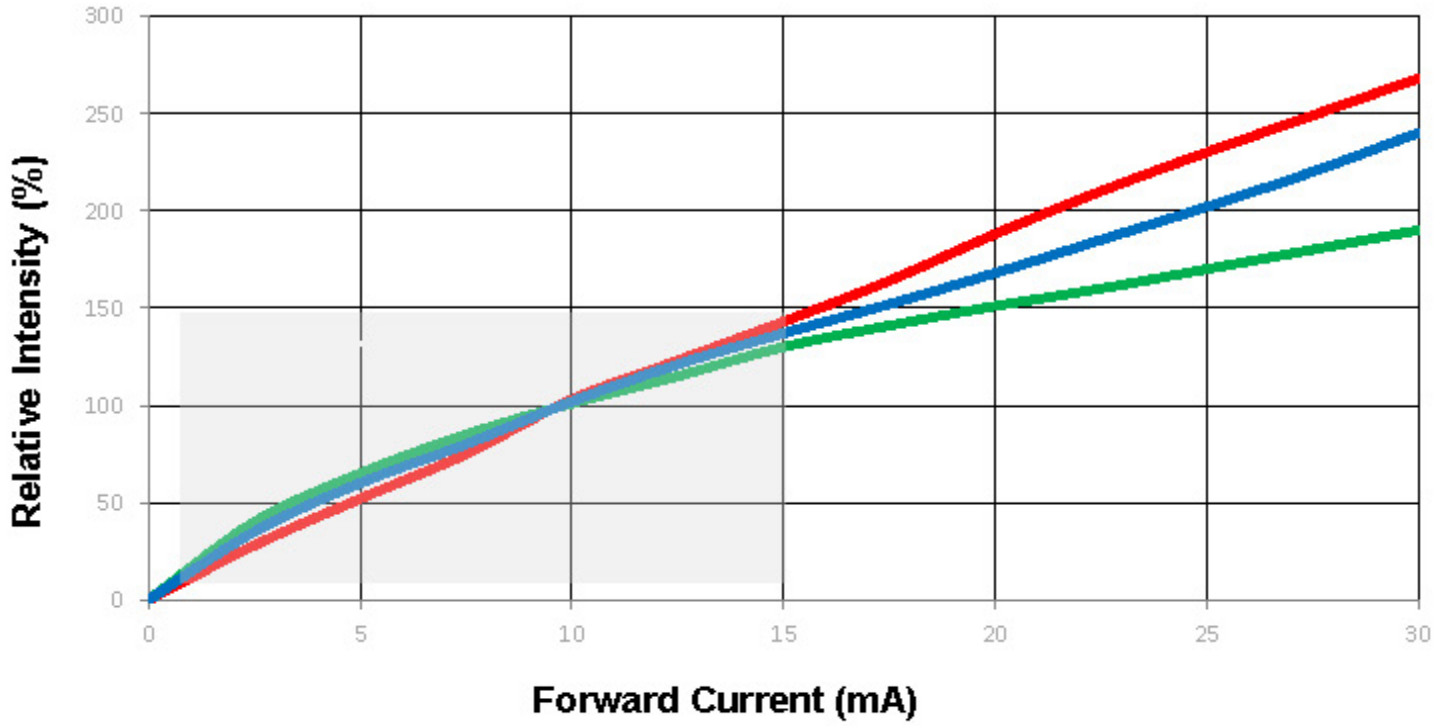
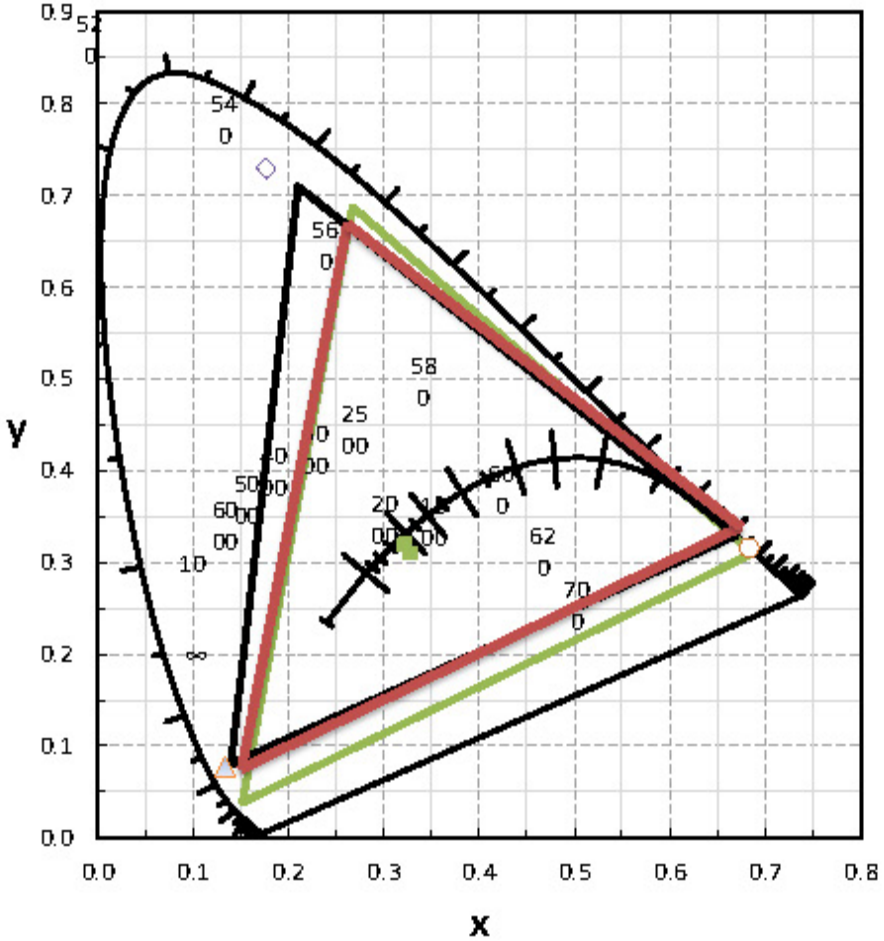
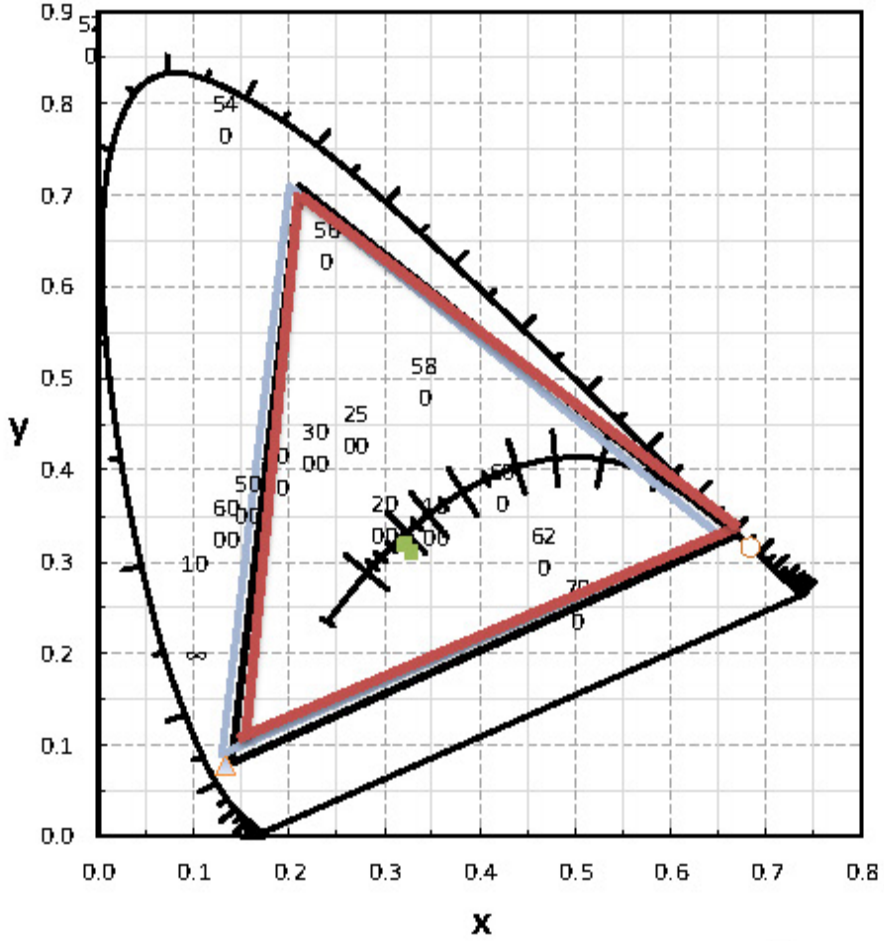
CONSTANT VOLTAGE/CURRENT

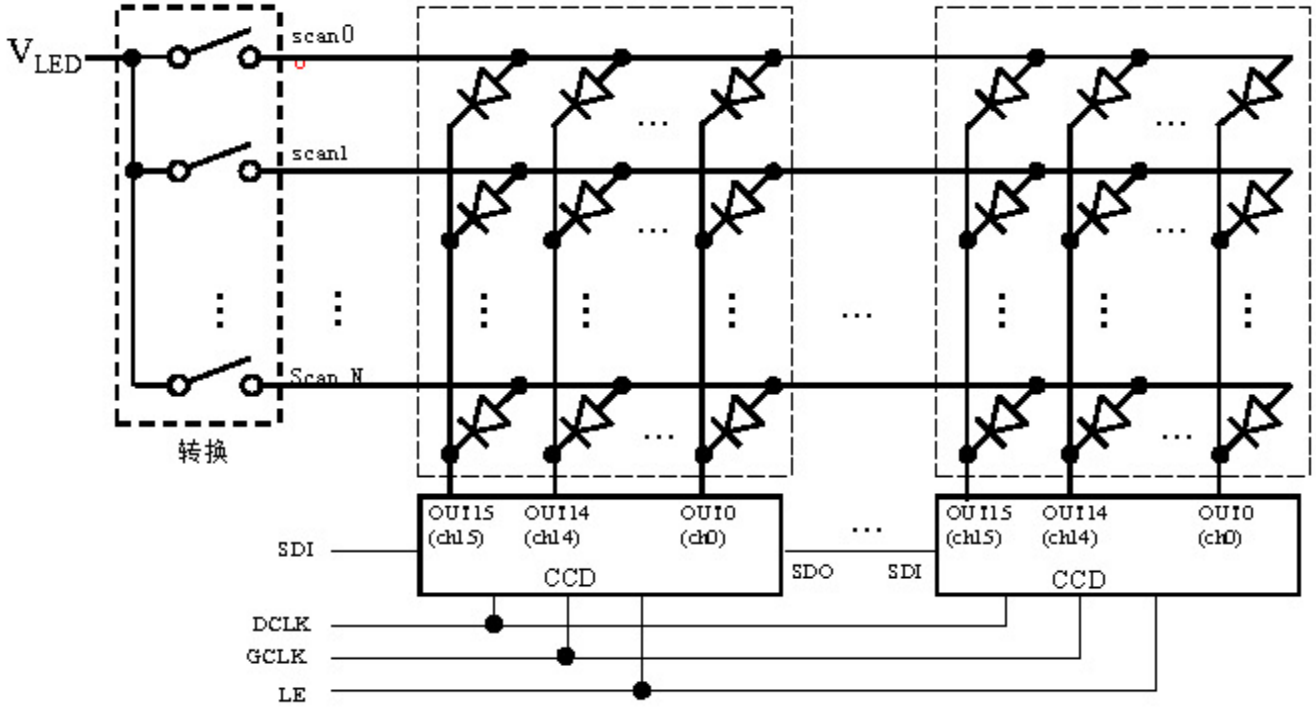
Non-Linearity between Current/Luminance

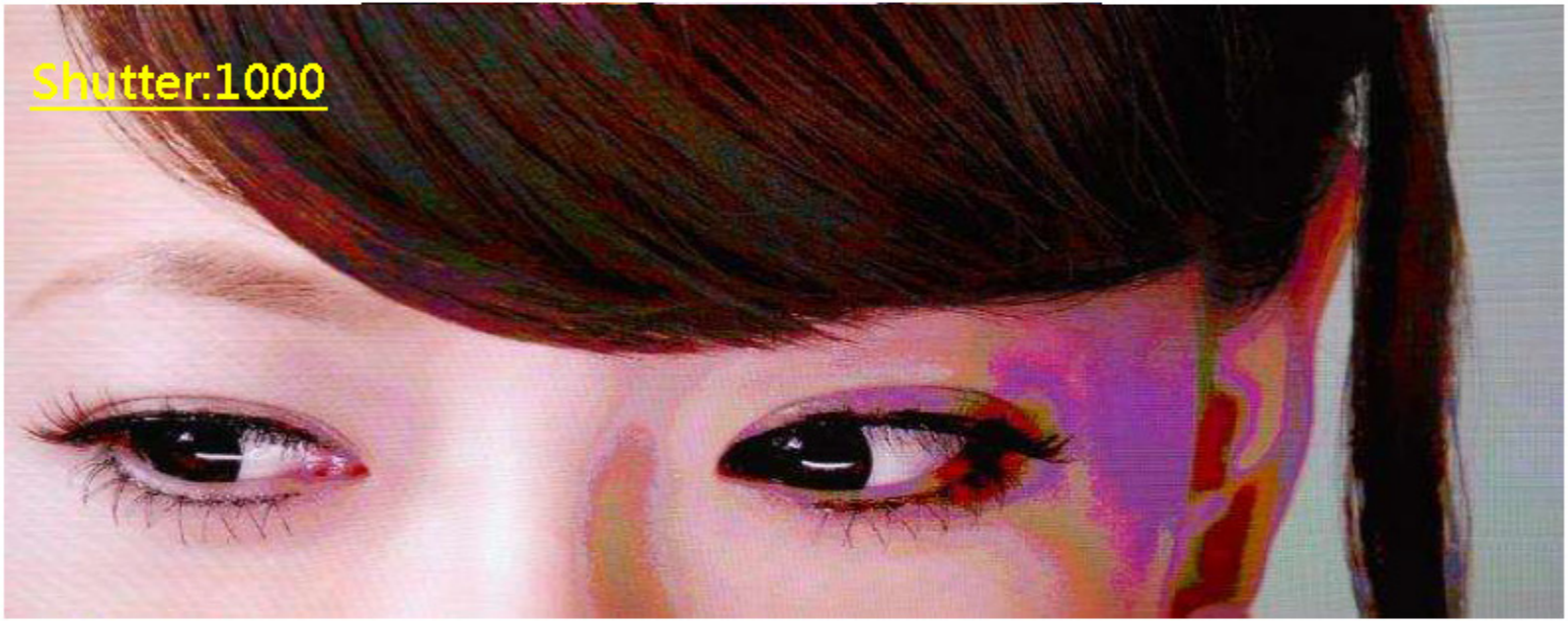



y
x
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


y
x
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8

Principle of Time Multiplexing





High Refresh Rate
Low Gray Scale

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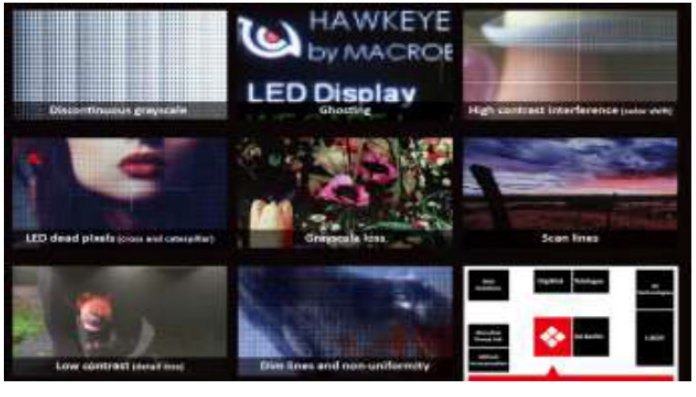
COMMONLY SEEN VISUAL PROBLEMS



Challenge I

Discontinuous grayscale

What it should be

Challenge II

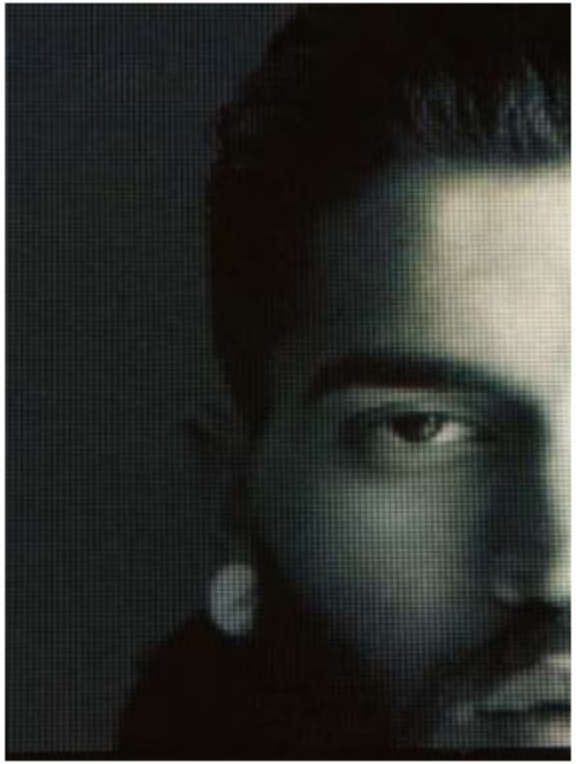
Ghosting

What it should be

Challenge III

Color shift-Red tint

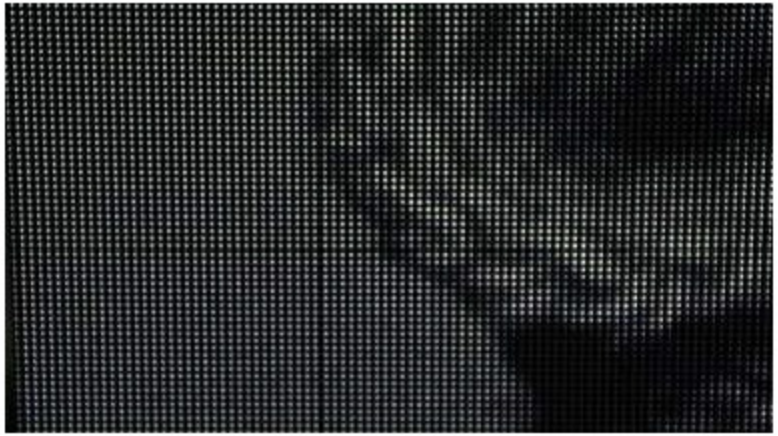
What it should be



Challenge IV

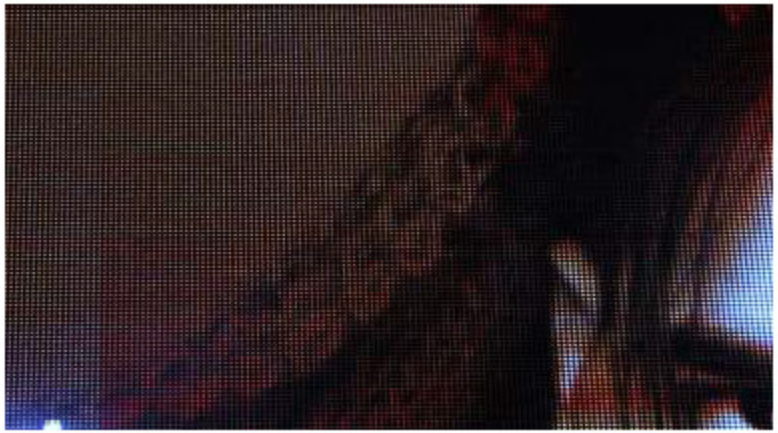
Patches

What it should be

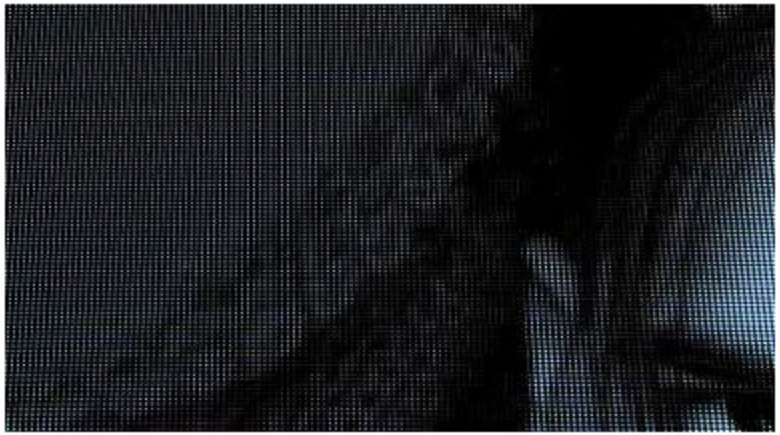


Challenge V

Dim lines

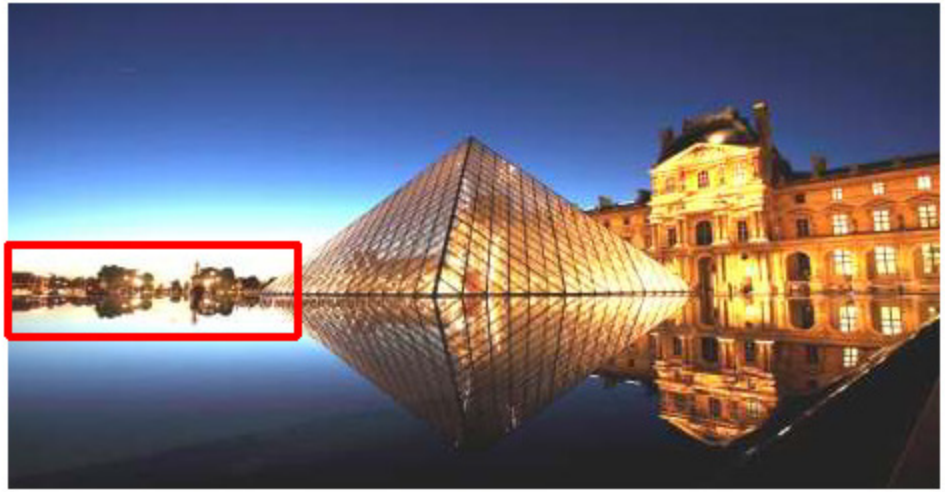


What it should be

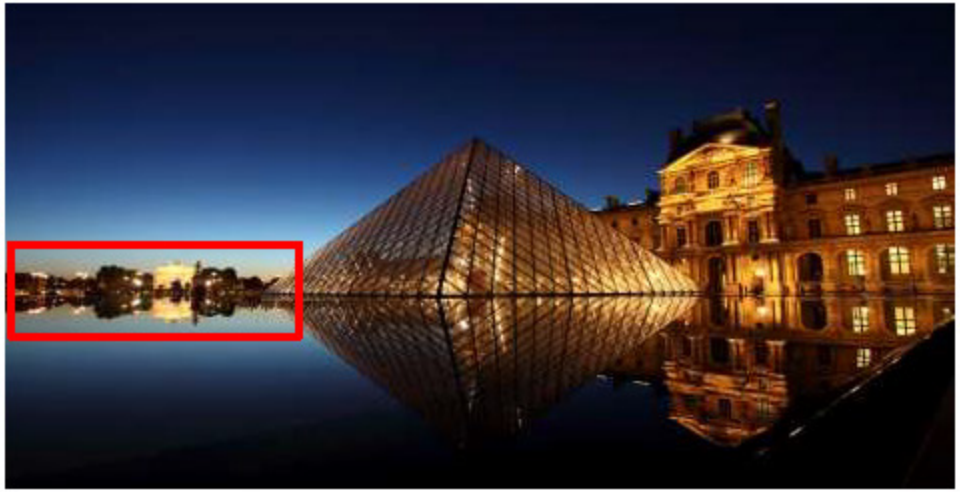


Challenge VI

White out-Details loss



What it should be



Challenge VII

LED dead pixel-Cross

Dead pixel isolation

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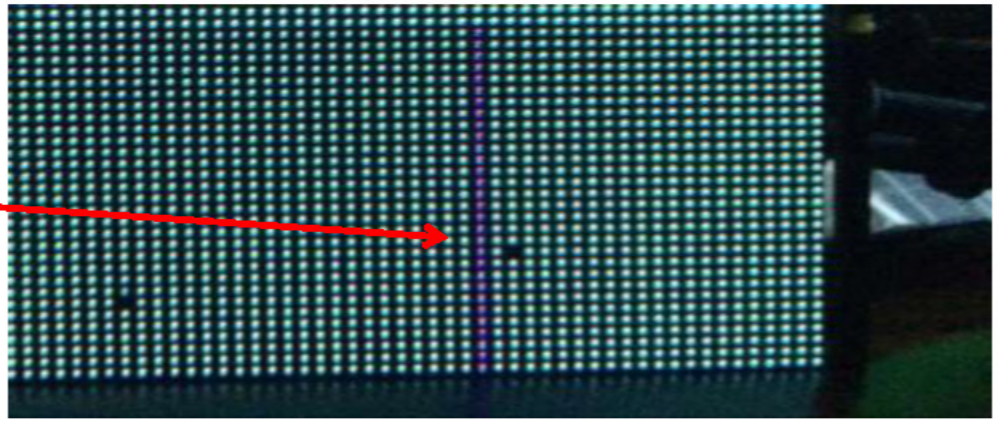
Challenge VIII

LED dead pixel-Caterpillar



Dead pixel isolation

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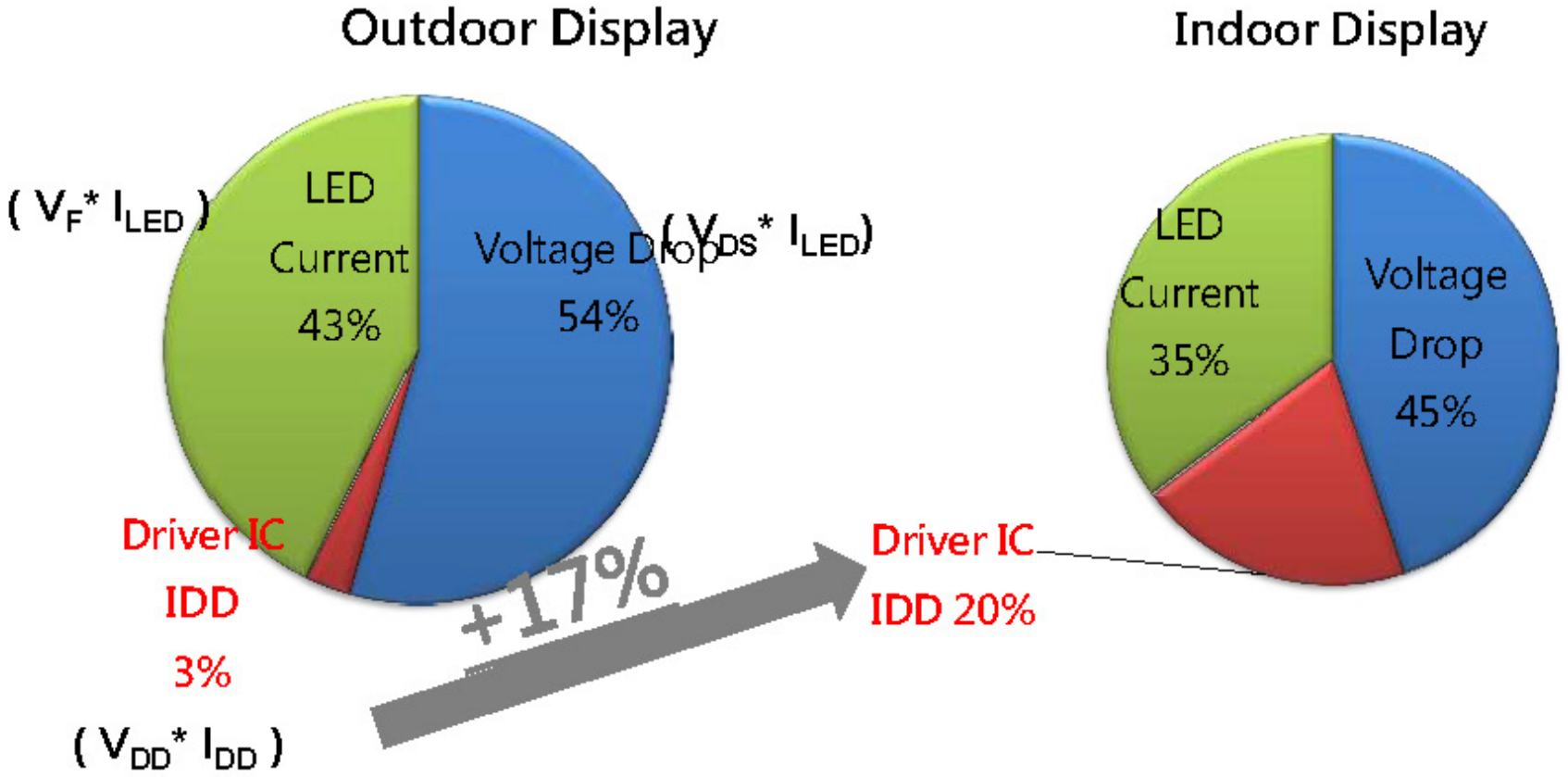
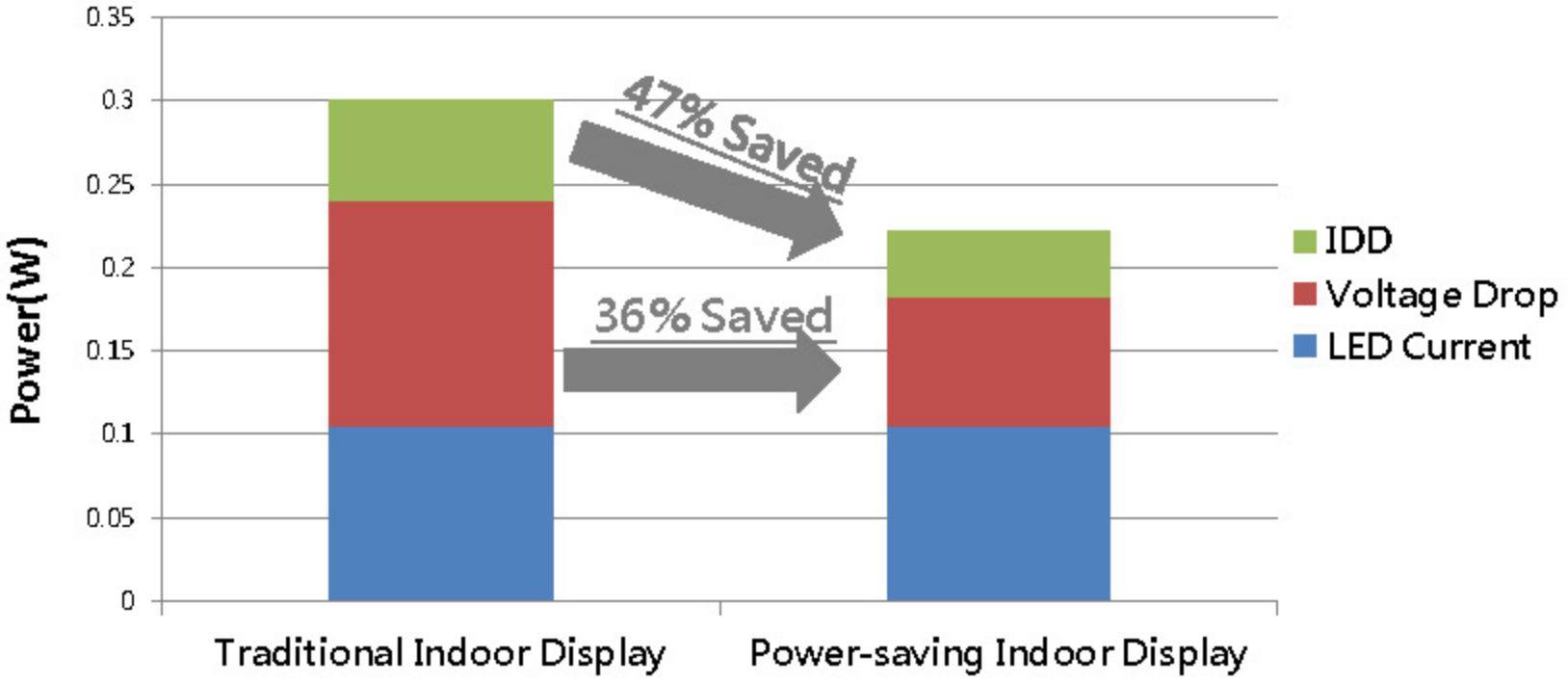
LOW POWER CONSUMPTION

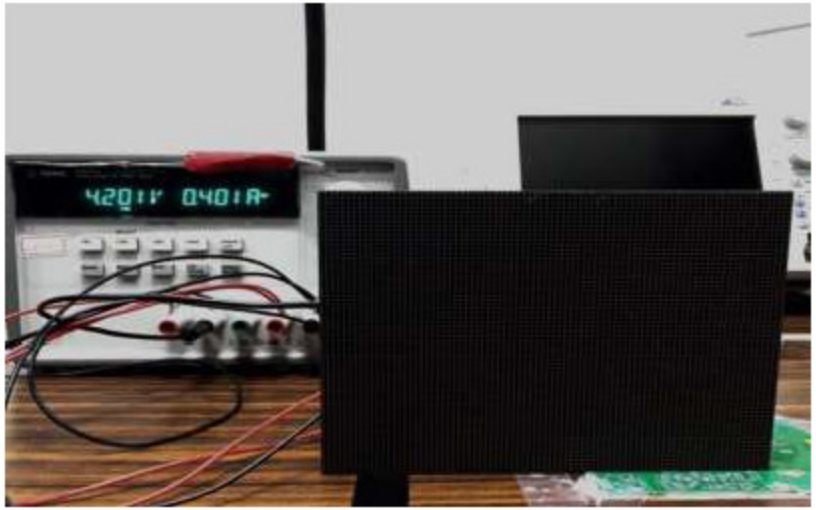
I_{DD} Accounts More in LED Display



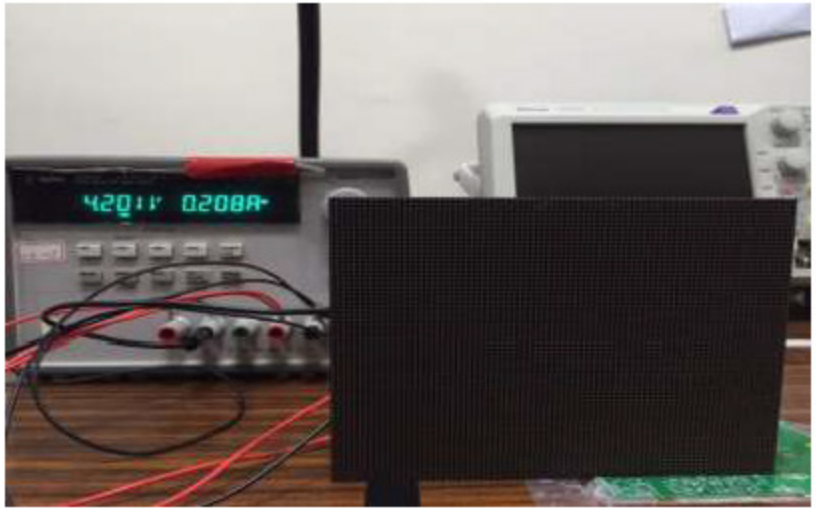
$V_{DD} = V_{LED} = 4V$


0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Power(W)
47% Saved
36% Saved
IDD
Voltage Drop
LED Current
Traditional Indoor Display
Power-saving Indoor Display

Intelligent Power Saving Mode



without intelligent power saving mode:
401mA is consumed
(Display is showing black)



with intelligent power saving mode
208mA is consumed
(Display is showing black)

Module Spec.: P1.9/21S/84x63 Pixels

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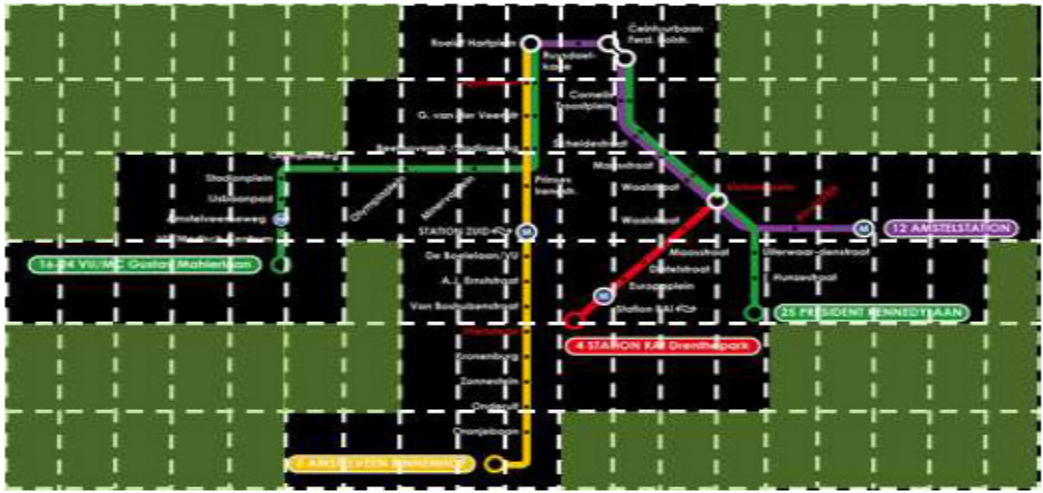
Example of Dynamic Power Saving

P1.9, ~2m²

Dynamic Power Consumption:
430W (Varied with designs)
Power Saving: 45.4W

Efficiency: 10.4% ↑

Note.
Dynamic Power Saving Per Module:
(401mA-208mA)*4.2V/1,000=0.81W
(Based on experiment data)
Power Saving:
55(Black area)*0.81=44.6W
Efficiency:
44.6/430=10.4%



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Thank You!