PIXELPLUS

PI5008, AVM/LDC Controller IC

February 2017

Solutions

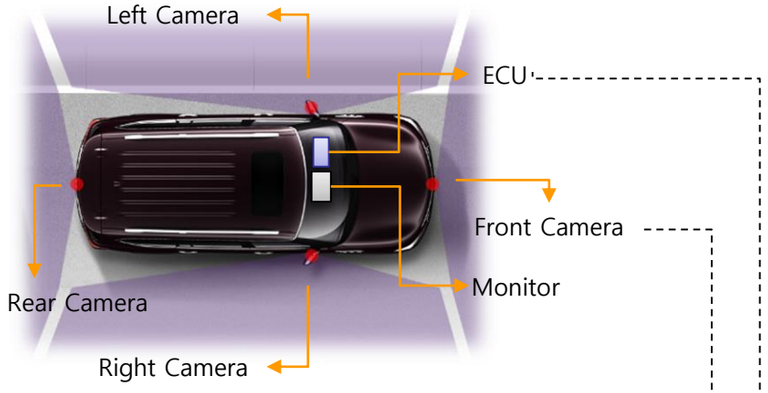
Features

Specifications

Solutions

- ✓ Around Viewing Monitoring Solution
- ✓ Panorama Smart Mirror Solution
- ✓ Dual Side View Camera Solution
- ✓ Front/Rear View Camera Solution

System Solutions



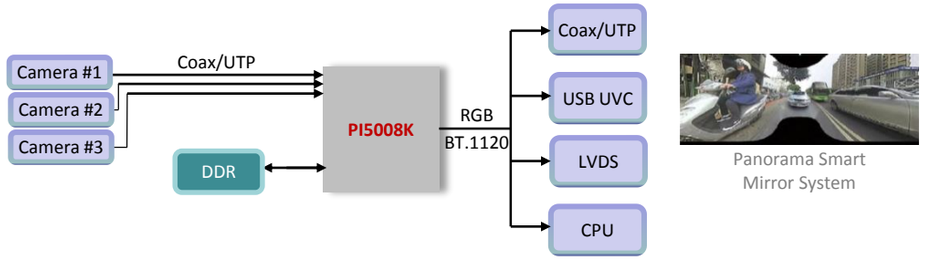
PI5008K *Engineering Sample (2017.11)*

► AVM IC, 1080p@30fps ► On-line Calibration ► BGA

PV2109K *Mass Production*

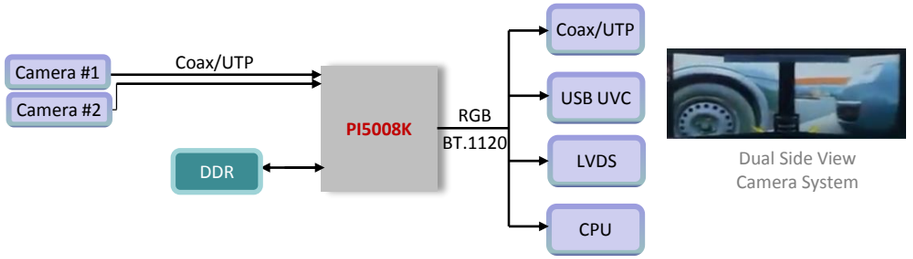
► SoC Image Sensor , 720p@30fps ► Built in Analog HD
► 1/4" ► CLCC, CSP

Triple Camera



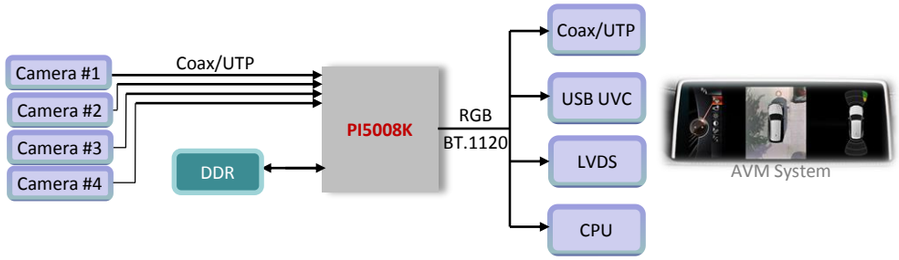
<Panorama Smart Mirror System Based on Analog HD>

Dual Camera



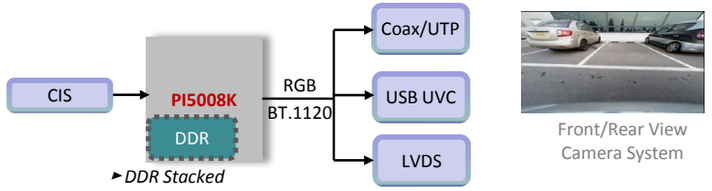
<Panorama Smart Mirror System Based on Analog HD>

Quad Camera



<Around View Monitoring System Based on Analog HD>

Single Camera



<Front/Rear View Camera System>

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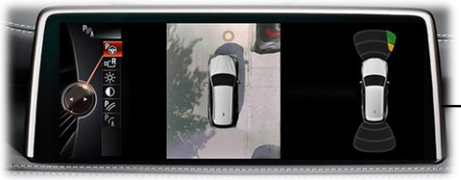
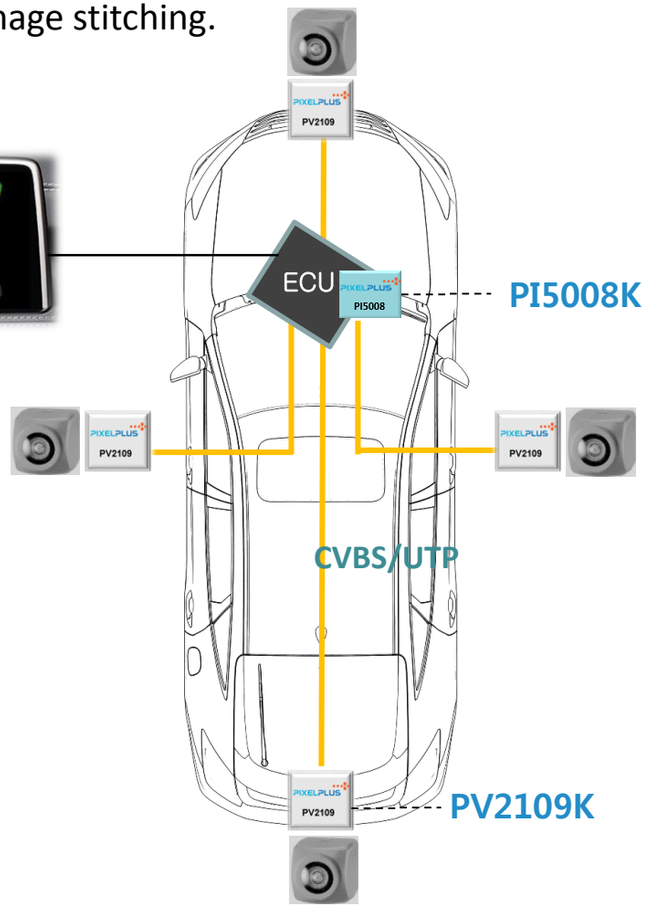
Around Viewing Monitor Solution

HD Around View Camera System with Analog HD Solution

YOU can view 360°@2D/3D all around the vehicle with PIXELPLUS total combinational solution of multiple image stitching.



AVM System



360°@2D/3D AVM with Coax/UTP cable

- ✓ Safe Parking Experiences
- ✓ 360°@2D/3D Seamless Merging
- ✓ 4 High Resolution Cameras
- ✓ Flexible Omni-Directional Monitoring
- ✓ Calibration Process Handles Camera and Lens Imperfections
- ✓ Color matching for All Cameras
- ✓ Cycle Recording Interface

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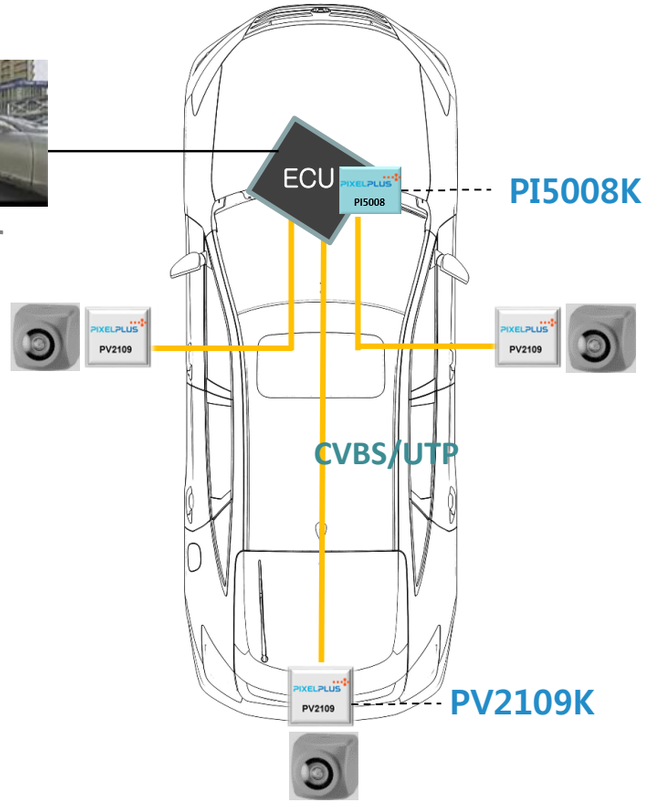
Panorama Smart Mirror Solution

HD Panorama Smart Mirror System with Analog HD Solution

YOU can view panorama visualization of Vehicle's rear view with PIXELPLUS total combinational solution of multiple image stitching.

Panorama Smart Mirror



Panorama Smart Mirror with Coax/UTP cable

- ✓ Safe Driving Experiences with wide views
- ✓ 270˚@2D Seamless Merging
- ✓ 3 High Resolution Cameras
- ✓ Calibration Process Handles Camera and Lens Imperfections
- ✓ Cycle Recording Interface

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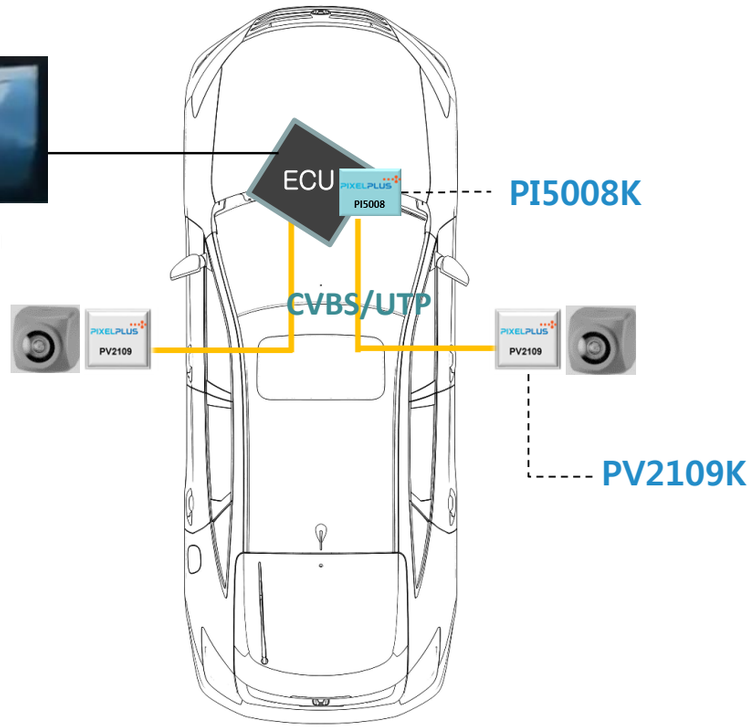
Dual Side View Camera Solution

HD Dual Side View Camera System with Analog HD Solution

YOU can see the left side car through side view mirrors but cannot see the right side car without using Dual Side View Camera System or turning to check the blind spot.

Dual Side View Camera



Dual Side View Camera with Coax/UTP cable

- ✓ Enabling to See Blind Spots
- ✓ Safe Parking with 2-channel views and Split Screen Images
- ✓ 2 High Resolution Cameras
- ✓ Calibration Process Handles Camera and Lens Imperfections

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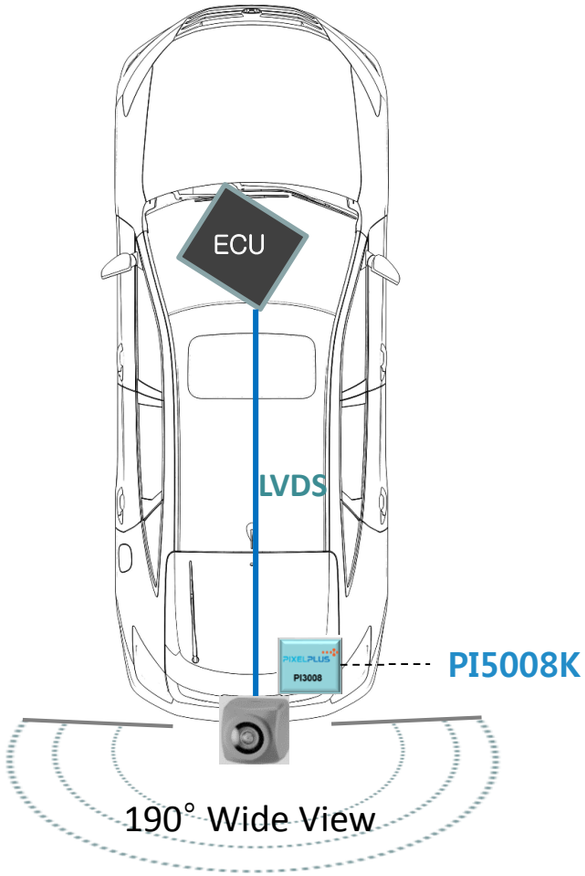
Front/Rear View Camera Solution

HD Wide View Camera System

YOU can view widely around the vehicle with PIXELPLUS image signal processor with distortion correction.

190° Wide View with LDC



- ✓ **Safe Parking Experiences with wide view**
- ✓ **High Resolution Camera**
- ✓ **Calibration Process Handles Camera and Lens Imperfections**

PIXELPLUS

Solutions

Features

Specifications

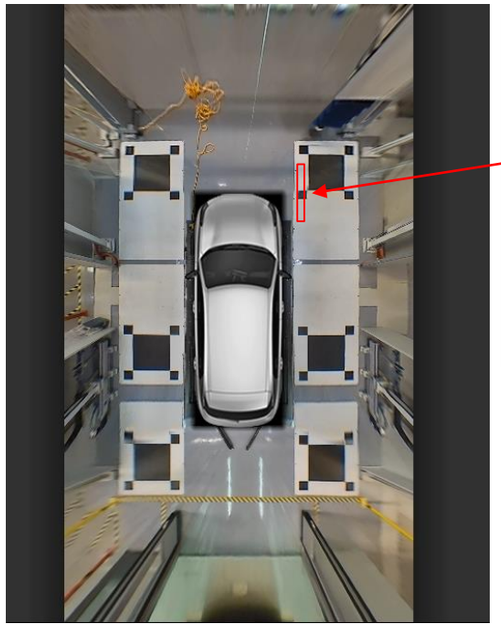
Features

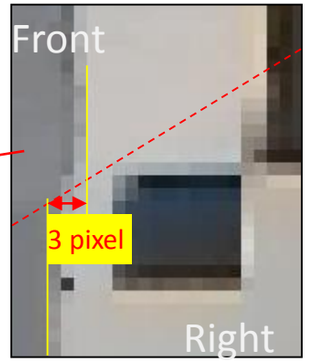
- ✓ Off-line Calibration
- ✓ On-line Calibration
- ✓ Brightness Control
- ✓ Dynamic Blending
- ✓ Intelligent Dynamic Parking

Off-Line Calibration(Factory Calibration)

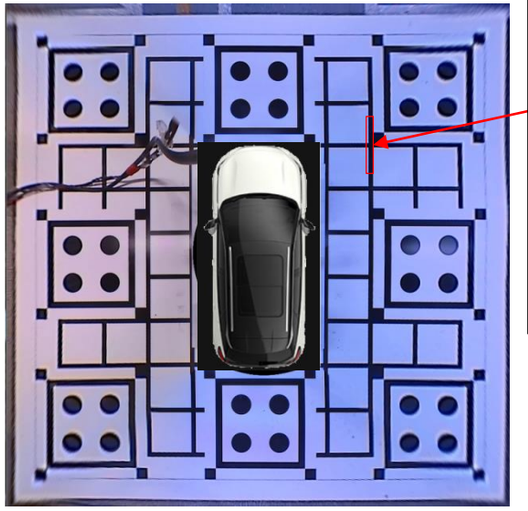
Provide minimized line pixel error on view output

YOU can adjust each camera sample's characteristics and line error can be kept below 1 pixel.

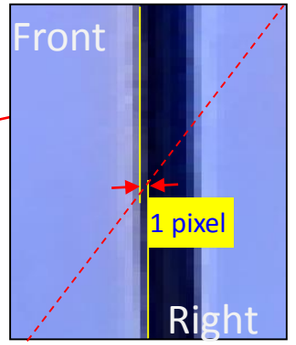


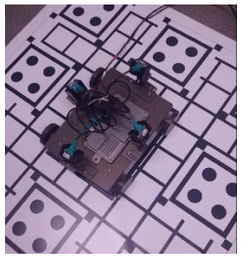


In the previous



Proposal





Test Environment

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On-Line Calibration(Dynamic Calibration)

Adapt the position of the displayed guide and top view by correcting extrinsic camera parameter on driving WITHOUT pre-defined pattern.

This function is to compensate long term changes
such as material expansion, aging process, collision, and changes in vehicle loading.

- **Auto camera calibration**
  departure, parking

Self-diagnosis
for view compensation

↓

Extrinsic Parameter Estimation

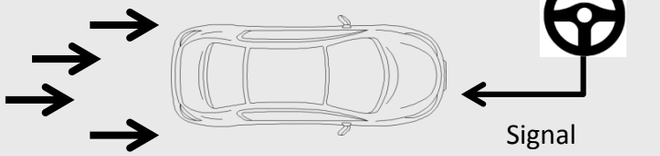
↓

Camera parameter update

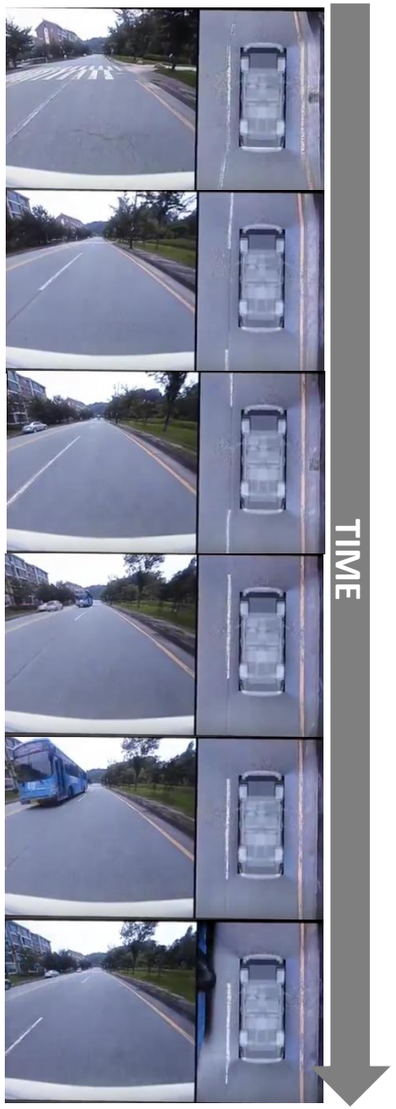
↓

View compensation

- **Environment Judgment unit**
  - Straight Travel Judgment (CAN Signal)



  - Moving Stability Judgment (Image Analysis)



On-Line Calibration

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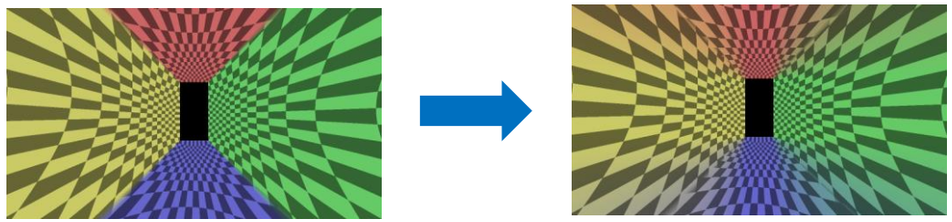
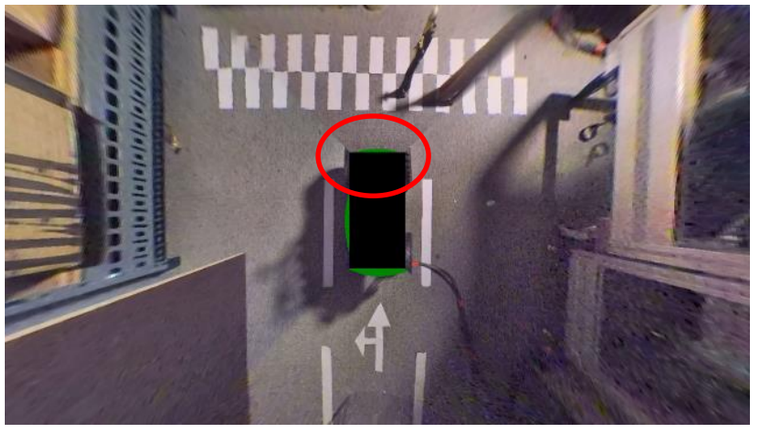
Brightness Control

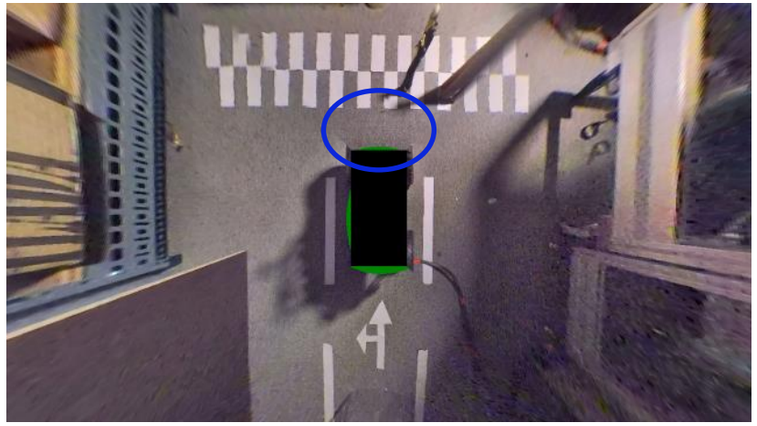
Brightness Matching for all Cameras



Dynamic guide trajectory
Autonomous working
High definition image and video



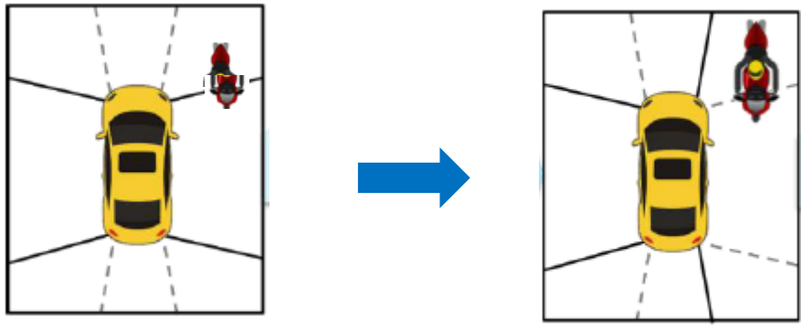
Blending only



Brightness Control

Dynamic Blending

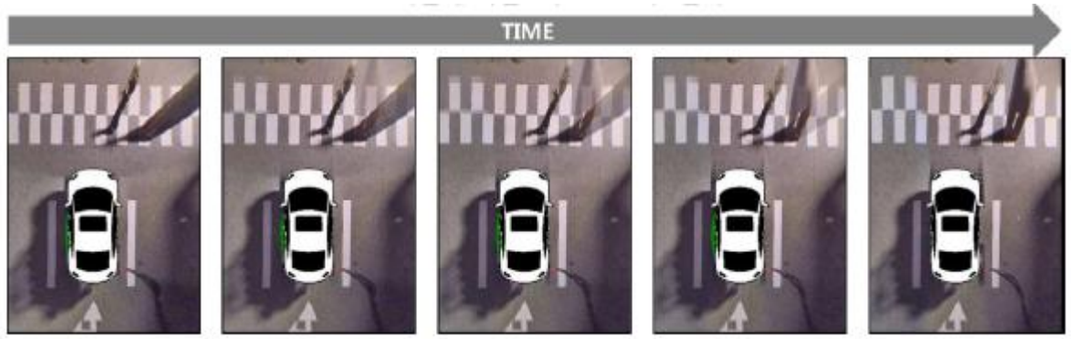
Dynamic Blending for Ghost Artifact Removal



Preliminary Synthesis

Current Synthesis

Change blending area according to Object movement
To avoid confusion caused by sudden changes, the map changes with the weighted average



Dynamic Blending

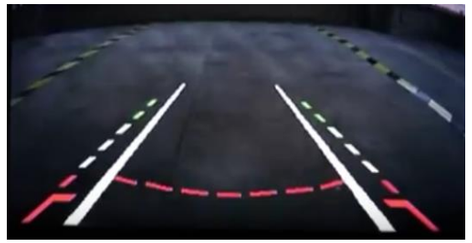
Intelligent Dynamic Parking Guide

Intelligent forwarding & reversing guidance trajectory

Dynamic guide trajectory
Autonomous working
High definition image and video
Distinct night viewing image

Parallel parking

Lateral side parking



Linear parking

Night viewing

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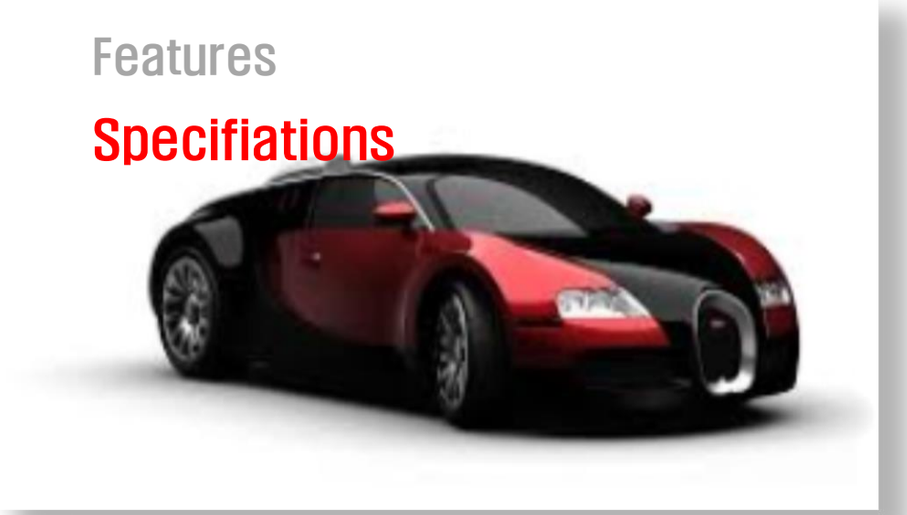
Solutions

Features

Specifiations



Specifications

- ✓ Specifications
- ✓ Block Diagram
- ✓ ECU Scheme

PI5008K Specifications

	Contents
CPU	• 250MHz, 8KB I/D Cache on RTOS
Memory	• 400MHz for MDDR1/DDR2/DDR3, x16bit • DDR stacked (Optional) • Interface to low-cost and high-speed Flash or EPROM through (quad)SPI
Resolution	• 30fps at 720p/960p/1080p
Video Input	• 10/12bit RGB Bayer • BT.1120/656 • MIPI CSI-2 Receiver • SD/HD Combo Analog HD(PVI™) with 4 ch
Video Output	• BT.1120/656, RGB888 • 8 bit Parallel Bayer • PIP, POP, OSD, Alpha blending • BCSH control, Gamma, CSC, Chroma
ISP	• 4ch 2M pixels for AE/AWB/Generic signal processing • Optimized for operation with HDR sensors • Global Tone Mapping • Color and gamma correction
Advanced Vision Processing	• Off-line / On-line Calibration • Brightness Matching for all Cameras • Dynamic Blending for Ghost Artifact Removal
Automotive View	• Full Resolution Parking Guide Line • 2D/3D flexible Omni-Directional View • Flexible Morphing View

	Contents
Peripherals	• UART, GPIO, PWM, I2C, I2S, SPI, Quad SIP, WDT, ADC
Others	• Fail-Safe I/O • Multi-Camera Synchronization support • Peripheral Diagnosis support • Video mal-functional input/output control support
Voltages	• Core(1.2V) / IO(3.3V)
Temperature	• -40℃~+105℃
Packages	• 256 BGA, 0.8 pitch, 14mmx14mm, AEC-Q100

Applications
• Around/Surround View Cameras • Rear and Front View Cameras • Side mirror replacement cameras • Automotive viewing/processing fusion cameras
ADAS Applicable • Motion Object Detection • Rear Auto Braking(TBD) • Parking Space Detection (TBD)

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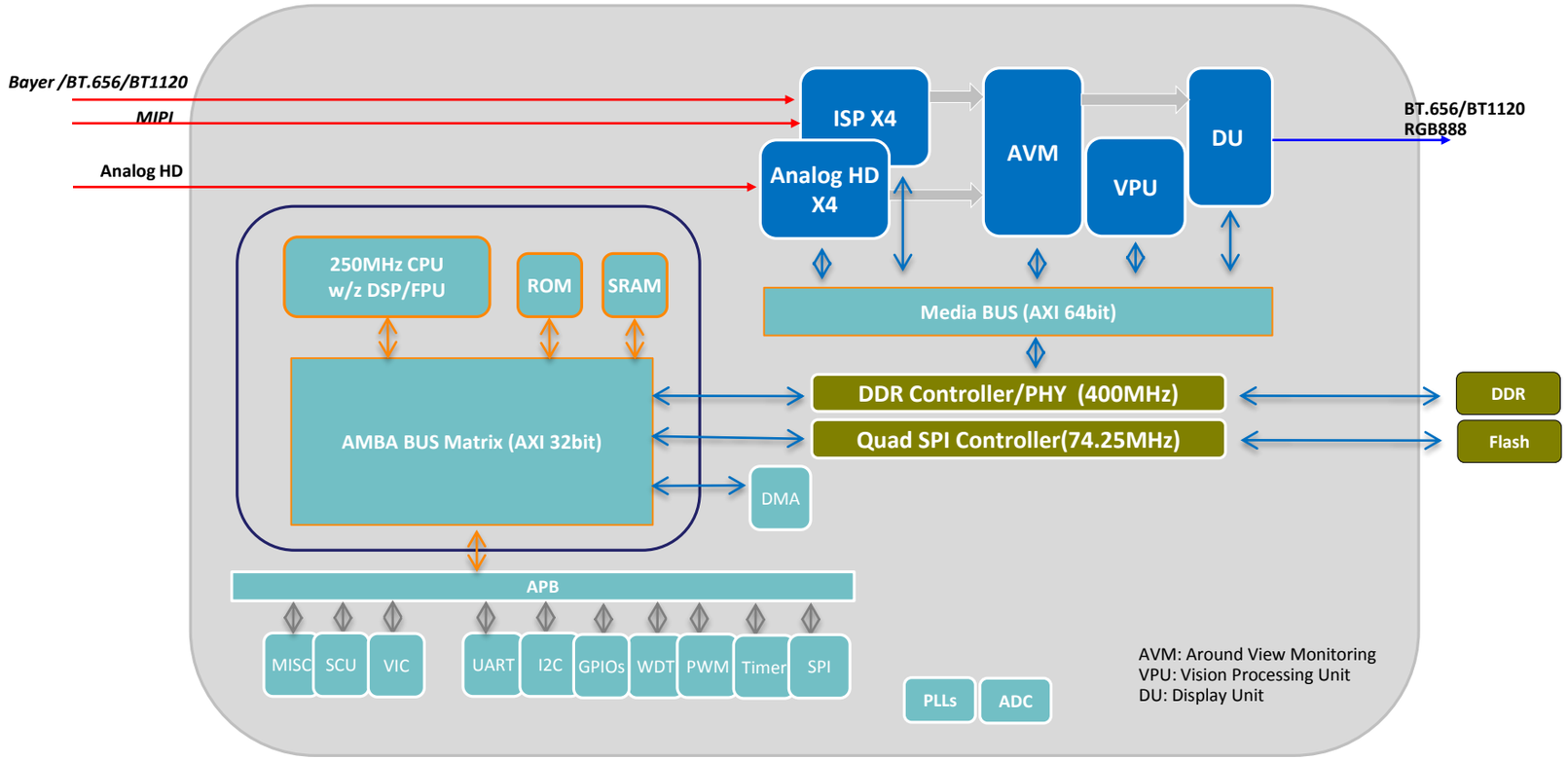
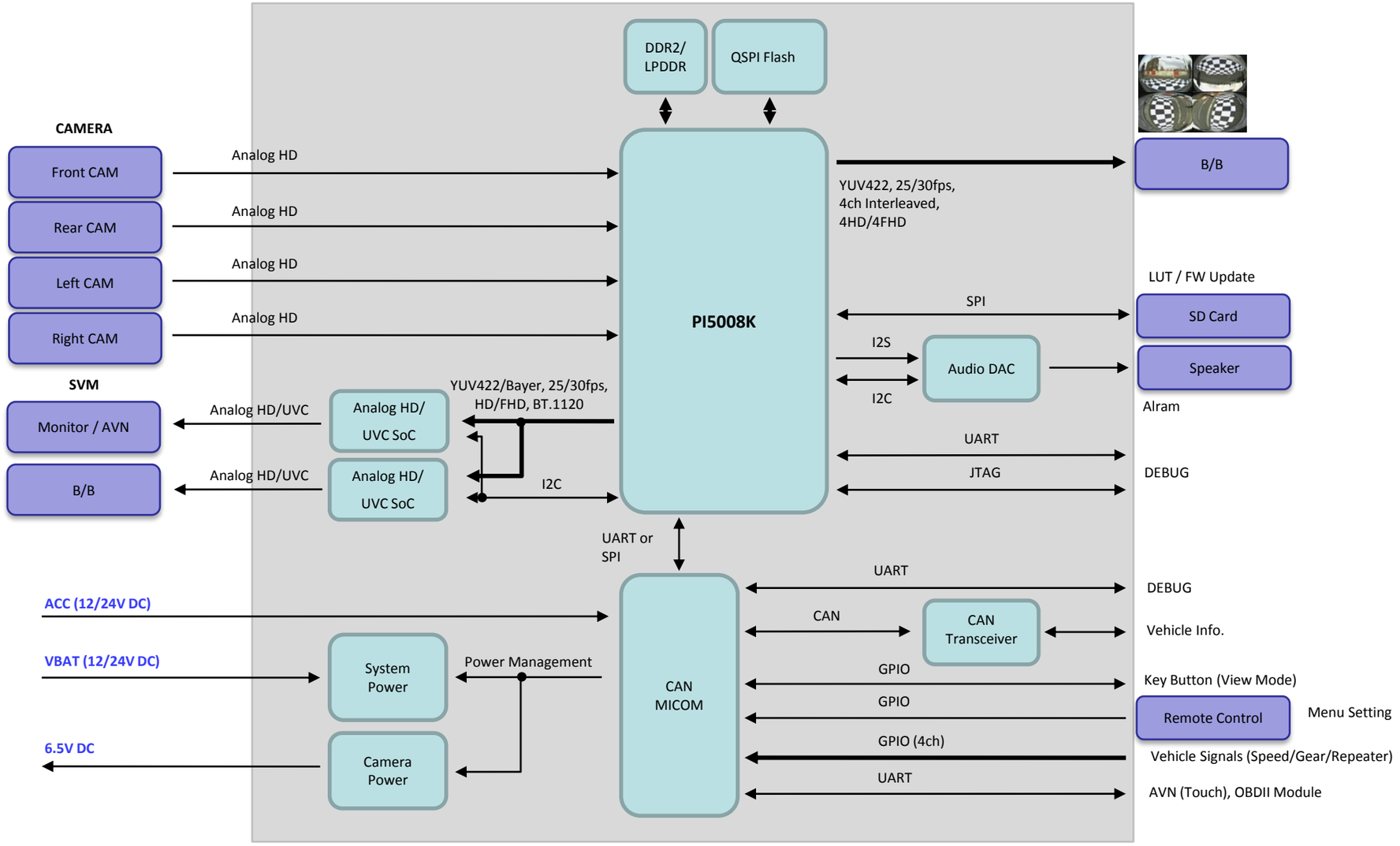
Block Diagram

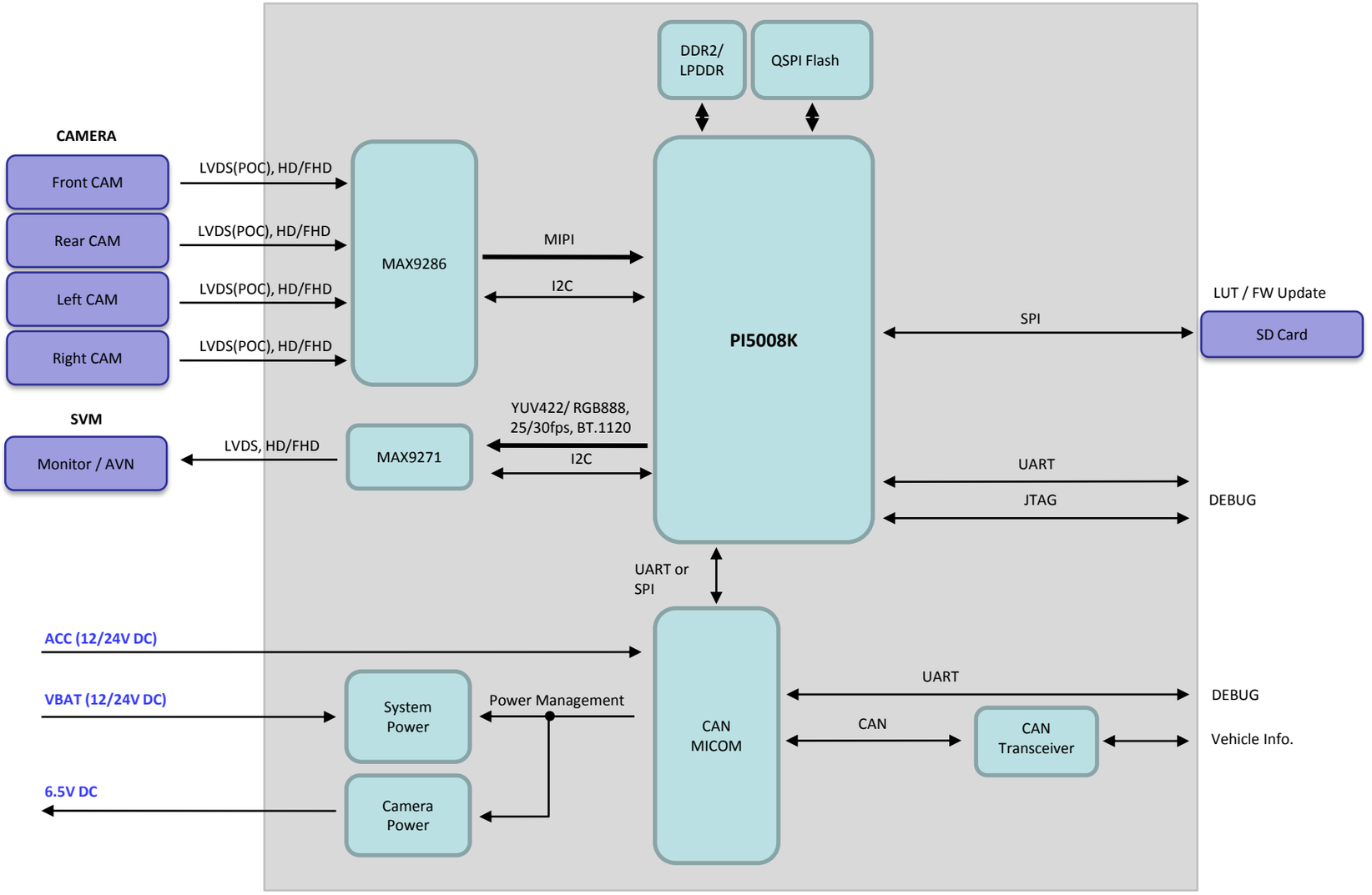


PI5008K Block Diagram

ECU Scheme – Analog HD



ECU Scheme – LVDS



Appendix

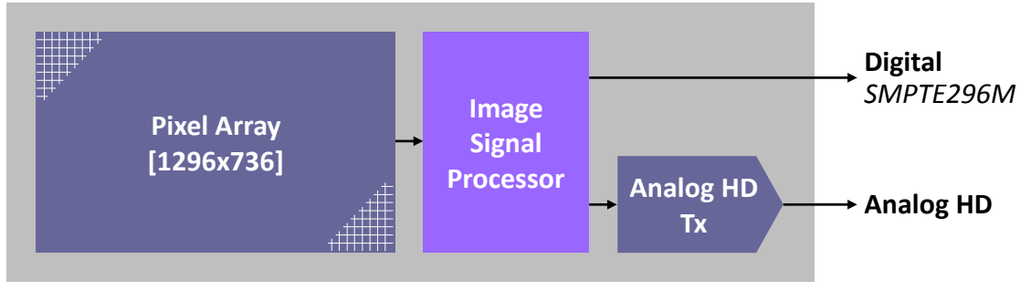
PV2109K – 1/4.0” HD Single Chip Image Sensor

HD Single Chip Image Sensor Built-in Analog HD Transmitter *Customer Sample*

PV2109K is a multi-standard HD analog SoC where Pixelplus’ superior pixel technology is applied to meet industry needs for higher sensitivity and robust design.

- ✓ **3-in-One Single Chip**

  Image Sensor + Signal Processor + Analog HD Transmitter
- ✓ **High Sensitivity for Low Light**
- ✓ **Support GenLock with External Sync**
- ✓ **Small Package for Automotive Size**
- ✓ **Application for RVC and AVM System**



Features

Optical Format	1/4 inch
Pixel Size	3.0x3.0
Effective Pixel Array	1296x736
Output Format	All Kinds of Analog HD, Digital
Input Clock Frequency	27MHz(Max.54MHz)
Frame Rate	30fps, SMPTE296M@74.25Hz 30fps, Analog HD
Sensitivity	3.7V/Lux.sec
Power Consumption	369.0mW@Dynamic 1.2mW@Stanby
Operating temp.	-40~105℃
Package	64CLCC(11x11), CSP (Developing)

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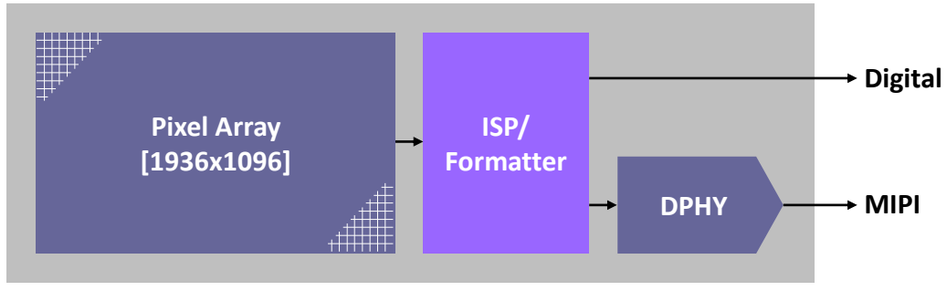
PS3210K – 1/2.7” Full-HD Bayer Image Sensor

Full-HD Bayer Image Sensor *Customer Sample*

PS3210K is a highly integrated CMOS image sensor that output of 1920x1080 pixels. PS3210K outputs 10-bit RGB raw data through a parallel bus or MIPI.

- ✓ **High Sensitivity for Low Light**
- ✓ **I2C Interface**
- ✓ **Support GenLock with External Sync**
- ✓ **Application for RVC and AVM System**



Features

Optical Format	1/2.7 inch
Pixel Size	3.0x3.0
Effective Pixel Array	1936x1096
Output Format	MIPI(2/4 lane), Digital
Input Clock Frequency	27MHz(Max.54MHz)
Frame Rate	30fps, Bayer@74.25Hz 60fps, Bayer(MIPI)@222.75MHz
Sensitivity	3.57V/Lux.sec
Power Consumption	348.0mW@Dynamic 70.0uW@Stanby
Operating temp.	-40~105℃
Package	64CLCC(11x11)

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Products Line up

Image Sensor Line up

Product Type	Product No.	Pixel Array	Optical Format	Output	Package	Qualification (AEC-Q100)	Application
Image Sensor	PC6030K	648 x 488 (VGA)	1/3.7”	NTSC/PAL	Im2BGA	O	RVC, AVM
	PC9030K	712 x 552 (VGA)	1/4"	NTSC/PAL	Im2BGA, CSP	O	RVC, AVM
	PC3089K	756 x 504 (D1)	1/3”	NTSC/PAL	CLCC	-	RVC, AVM
	PC1058K	976 x 592 (960H)	1/3”	NTSC/PAL	CLCC	-	RVC, AVM
	PV2109K	1296x736(HD)	1/4"	Analog HD	CLCC, CSP	Developing	RVC, AVM
	PS3210K	1936x1096(FHD)	1/2.7”	MIPI, Digital	CLCC	-	RVC, AVM

Companion Chip Line up

Product Type	Product No.	Input	Output	Features	Package	Qualification (AEC-Q100)	Application
ISP	PI3008K	1080p@30fps	CVBS, BT1120	LDC, 3D DNR, Defog, Automotive View, SPI	FBGA	O	RVC
TX(PVI™)	PT1000K	FHD/HD Analog Video	1 Ports with Arbitrary Video Scaler	PTZ Control	QFN	-	RVC
RX(PVI™)	PR1000K	FHD/HD/SD Analog Video	4 Ports with Arbitrary Video Scaler, SDR/DDR	PTZ Control, Tampering Detection	QFP	-	AVM
	PR2000K	FHD/HD Analog Video	1 Ports with Arbitrary Video Scaler, MIPI	PTZ Control, Tampering Detection	QFN	Developing	RVC, AVM

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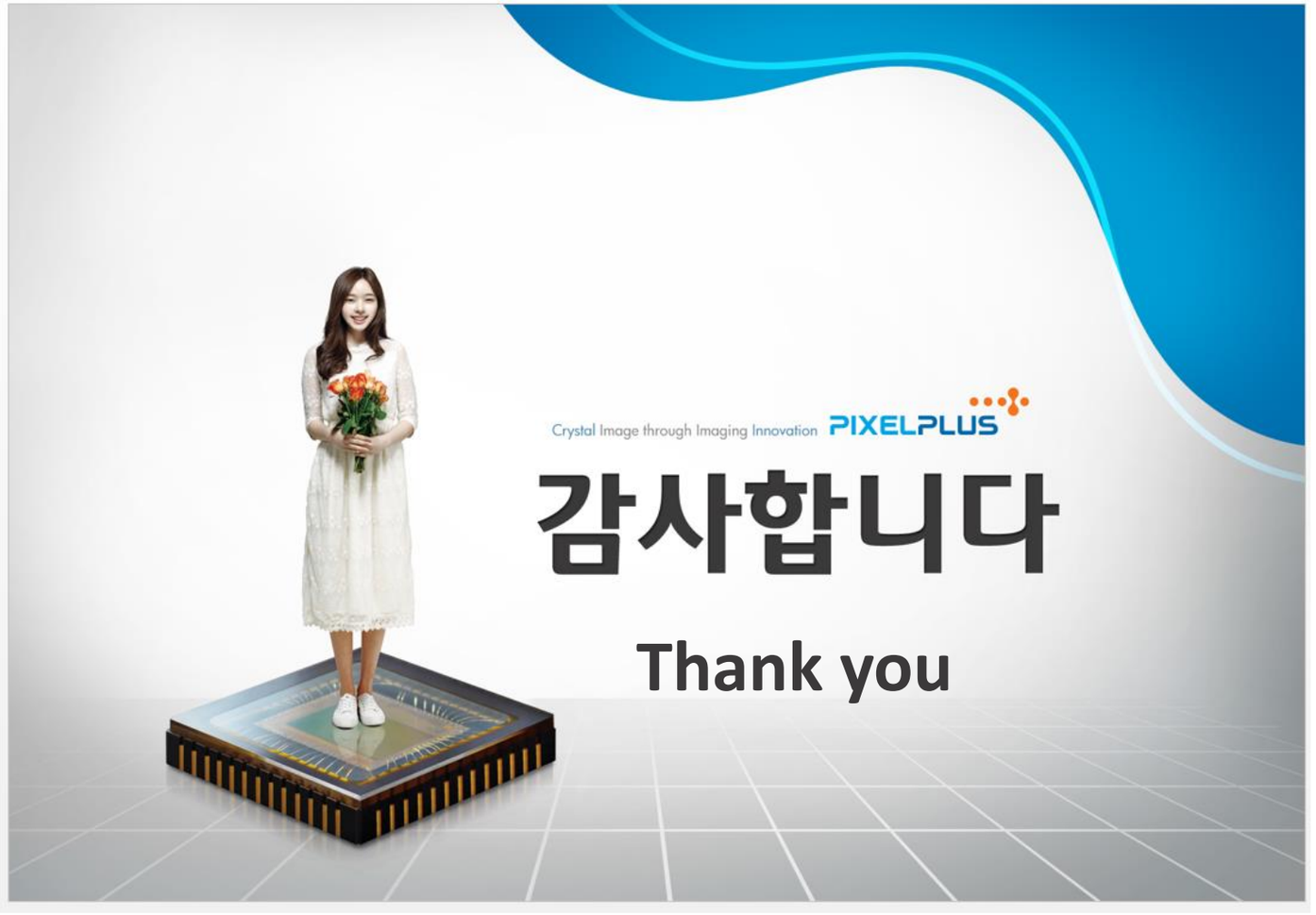
Crystal Image through Imaging Innovation
PIXELPLUS
감사합니다
Thank you

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