“EMBEDDED AI MPU”
RZ/V2M
ISP SUPPORT PACKAGE
FOR IMAGE QUALITY TUNING

MPU BUSINESS DEVELOPMENT DEPARTMENT
ENTERPRISE INFRASTRUCTURE BUSINESS DIVISION
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RENESAS ELECTRONICS CORPORATION
MULTIMEDIA SUPPORT BY API

- Multimedia features are operated by ISP support PKG (ISP control software) submitted by Renesas.
- Functions can be controlled by API.
- One Cortex-A53 core is dedicated to control the camera ISP function.
- Main function supported by ISP Support Package
  • MIPI-CSI
  • ISP
  • H.264/265 Video Codec
  • HDMI output
ISP FUNCTION SUPPORT LIST

- ISP supports not only basic ISP function but also supports WDR, 2D and 3D noise reduction.

**Image sensor image capturing block**
Captures data and applies optical and sensor correction.
- Exposure
- White balance
- Black level correction
- Sensor defective pixel correction
- Digital gain
- Shading correction

**Development processing block**
Handles Bayer to YUV conversion and color correction.
- Demosaicing
- Wide Dynamic Range
- 2D noise reduction
- Gamma correction
- Custom color correction
- Edge enhancement
- Aberration correction
- Tone Mapping
- Color space conversion

**Post processing block**
Handles processing of YUV images.
- Resize
- 3D noise reduction
- Optical Distortion correction
- Rotate
- Crop(Trimming)

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API DETAILS
IMAGING SYSTEM (IMAGE QUALITY PARAMETERS)
WHITE BALANCE SETTINGS

Overview:
Select white balance setting
It can select auto white balance or manual white balance.

Description:
Parameter info:
Parameter of level has following:
- Auto white balance
- Manual white balance
2D NOISE REDUCTION FOR COLOR

Overview:
This API selects enable or disable of the 2D noise reduction for color plane. Also, it can select the level of noise reduction.

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_2DCNR_LEVEL_0: disabled
- D_IMAGE_2DCNR_LEVEL_1: enabled(level1)
- D_IMAGE_2DCNR_LEVEL_10: enabled(level10)

Condition: Exposure Time: 1/3600.
2D NOISE REDUCTION FOR LUMINANCE

Overview:
This API selects enable or disable of the 2D noise reduction for luminance plane. Also, it can select the level of noise reduction.

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_2DYNR_LEVEL_0: disabled
- D_IMAGE_2DYNR_LEVEL_1: enabled(level1)
- D_IMAGE_2DYNR_LEVEL_10: enabled(level10)

Condition: Exposure Time: 1/3600.
# RELATIONSHIP BY YNR AND CNR SETTINGS

<table>
<thead>
<tr>
<th></th>
<th>YNR == 0</th>
<th>YNR == 5</th>
<th>YNR == 10</th>
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<td>CNR == 0</td>
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<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
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<tr>
<td>CNR == 5</td>
<td><img src="image4" alt="Image" /></td>
<td><img src="image5" alt="Image" /></td>
<td><img src="image6" alt="Image" /></td>
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<tr>
<td>CNR == 10</td>
<td><img src="image7" alt="Image" /></td>
<td><img src="image8" alt="Image" /></td>
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<td><img src="image11" alt="Image" /></td>
<td><img src="image12" alt="Image" /></td>
</tr>
</tbody>
</table>

No Image
CONTRAST SETTINGS

Overview:
This API controls the intensity of contrast. Also, it can select the level of contrast.

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_CONTRAST_LOW_5: Lower level of contrast (level5)
- D_IMAGE_CONTRAST_LOW_1: Lower level of contrast (level1)
- D_IMAGE_CONTRAST_NORMAL: Reference setting
- D_IMAGE_CONTRAST_HIGH_1: Higher level of contrast (level1)
- D_IMAGE_CONTRAST_HIGH_5: Higher level of contrast (level5)
SATURATION SETTINGS

Overview:
Sets the saturation of the monitoring.

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_SATURATION_LOW_5: Weakest level (level5)
- D_IMAGE_SATURATION_LOW_1: Weaker level (level1)
- D_IMAGE_SATURATION_NORMAL: default
- D_IMAGE_SATURATION_HIGH_1: Stronger level (level1)
- D_IMAGE_SATURATION_HIGH_5: Strongest level (level5)
SHARPNESS SETTINGS

Overview:
Sets the sharpness of monitoring

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_SATURATION_LOW_5:
- D_IMAGE_SHARPNESS_LEVEL_0: Off
- D_IMAGE_SHARPNESS_LEVEL_1: Level 1 Weakest level
- D_IMAGE_SHARPNESS_LEVEL_10: Level 10 Strongest level
EXPOSURE CORRECTION SETTINGS

Overview:
Sets the exposure compensation value

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_EXPOCRCT_M10: -10
- D_IMAGE_EXPOCRCT_M1: -1
- D_IMAGE_EXPOCRCT_N: 0
- D_IMAGE_EXPOCRCT_P1: +1
- D_IMAGE_EXPOCRCT_P10: +10
EXPOSURE TIME SETTINGS

Overview:
Sets the exposure time

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_EXPOTIME_1_64000: 1/64000
- D_IMAGE_EXPOTIME_1_1: 1
- D_IMAGE_EXPOTIME_500_1: 500
SENSOR GAIN SETTINGS

Overview:
Sets the gain

Description:
Parameter info:
You can select level as follows:
- D_IMAGE_GAIN_AUTO: auto
- D_IMAGE_GAIN_0dB: Base gain
- D_IMAGE_GAIN_1dB: Base gain +1 dB
- D_IMAGE_GAIN_64dB: Base gain +64 dB
**TONE MAPPING SETTINGS**

**Overview:**
Switches tone mapping in monitoring on or off and sets its level.

**Description:**
Parameter info:
You can select level as follows:
- D_IMAGE_TM_LEVEL_0: 0 (Off)
- D_IMAGE_TM_LEVEL_1: 1
- D_IMAGE_TM_LEVEL_10: 10