Outgoing Defect Specification

MT9V131

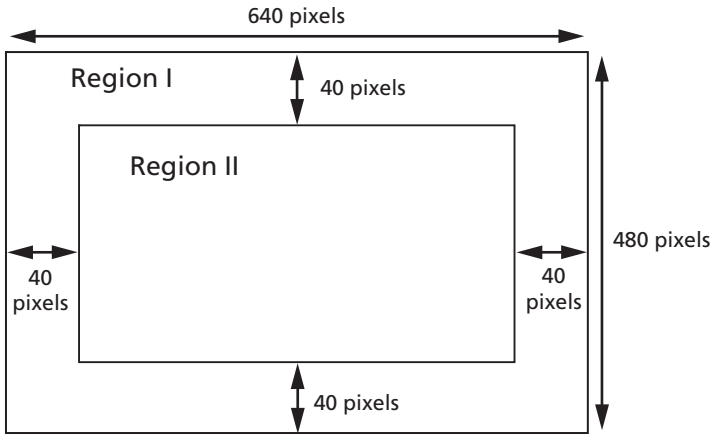
Introduction

This document defines outgoing defect specifications for Micron's MT9V131 CMOS digital image sensor. The sensor defect regions, as well as types of pixel and cluster defects, are defined.

Sensor Defect Specifications

The sensor array is partitioned into two regions: Region I and Region II. These dimensions are defined in Figure 1.

Figure 1: Sensor Array



Defect Specifications

Table 1 specifies the allowable number of defects for each of the regions defined in Figure 1 on page 1.

Table 1: Defect Specification with Defect Correction Disabled (Bayer Format)
Operating condition T_J = 27°C (±1°C)

Defect Definition	Number of Defects		Definition Number[1]
	Region I	Region II	
Very hot, very bright, or very dark pixel defects	Total ≤ 30		1, 3, 5
Hot or bright pixel defects	Total ≤ 30		2, 4
Dark pixel defects	Total ≤ 30		6
Bright or dark clusters	0	0	7, 8

Notes: 1. For definition of defects, see "Defect Definitions in Bayer Format" on page 3.

Table 2: Defect Specification with Defect Correction Enabled (YCbCr Format)

Defect Definition	Number of Defects		Definition Number
	Region I	Region II	
Bright or dark pixel defects	0	0	9, 10
Bright or dark clusters	0	0	11, 12

Notes: 1. All specifications address operation is at T_J = 27°C (±1°C) and all supply voltages = 2.8V. Image sensor is tested without a lens. Multiple images are captured in YCbCr format and analysis is done in RGB format. Testing is done with default register settings, default frame timing, and using 0.5 lux incident at the sensor, which is approximately 15 lux incident at the camera module with a lens.

Defect Definitions in Bayer Format

Defect definitions with no defect correction are defined in this section.

Definition 1: Very Hot Pixel Defect

A very hot pixel defect is defined as any pixel that is 500 LSBs above the mean value of the array when the sensor is operated under no illumination.
(Analog gain = 8x; exposure time = 16ms)

Definition 2: Hot Pixel Defect

A hot pixel is defined as any pixel that is 120 LSBs above the mean value of the array when the sensor is operated under no illumination.
(Analog gain = 8x; exposure time = 16ms)

Definition 3: Very Bright Pixel Defect

The sensor is illuminated to midlevel condition, about 400 LSBs to 700 LSBs. Within a color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the value is 50 percent or more above the mean, it is considered a very bright defect.
(Analog gain = 1x; exposure time = 16ms)

Definition 4: Bright Pixel Defect

The sensor is illuminated to midlevel condition, about 400 LSBs to 700 LSBs. Within a color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the pixel value is between 15 percent or more above the mean, it is considered a bright pixel defect. (Analog gain = 1x; exposure time = 16ms)

Definition 5: Very Dark Pixel Defect

The sensor is illuminated to midlevel condition, about 400 LSBs to 700 LSBs. Within a color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the value is 50 percent or more below the mean, it is considered a very dark pixel defect.
(Analog gain = 1x; exposure time = 16ms)

Definition 6: Dark Pixel Defect

The sensor is illuminated to midlevel condition, about 400 LSBs to 700 LSBs. Within a color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the value is 15 percent or more below the mean, it is considered a dark pixel defect.
(Analog gain = 1x; exposure time = 16ms)

Definition 7: Bright Cluster

Using definition 4 results, the defects within each color plane are examined. If any adjacent pixels that are considered bright pixel defects are detected, they are then defined as a bright cluster.

Definition 8: Dark Cluster

Using definition 6 results, the defects within each color plane are examined. If any adjacent pixels that are considered dark pixel defects are detected, they are then defined as a dark cluster.

Defect Definitions in YCbCr Format

Defect definitions with defect correction are defined in this section.

Definition 9: Bright Pixel Defect

Within each RGB color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the pixel value is 30 percent or more above the mean, it is considered a bright pixel defect with 0.5 lux illumination incident on the sensor.

Definition 10: Dark Pixel Defect

Within each RGB color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the pixel value is 30 percent or more below the mean, it is considered a dark pixel defect with 0.5 lux illumination incident on the sensor.

Definition 11: Bright Cluster

Using definition 9 results, the defects within each RGB color plane are examined. If any two adjacent pixels that are considered bright pixel defects are detected, they are then defined as a bright cluster.

Definition 12: Dark Cluster

Using definition 10 results, the defects within each RGB color plane are examined. If any two adjacent pixels that are considered dark pixel defects are detected, they are then defined as a dark cluster.

Cluster Defects

Figure 2 and Figure 3 represent the same sub-area of pixels. Figure 2 represents the raw pixel output; Figure 3 represents the pixel output separated by color plane.

Clusters are analyzed by looking at one particular pixel and its surrounding eight adjacent pixels within the same color plane, as seen in Figure 3. For example, if the center pixel is a very dark pixel and any of its surrounding eight pixels within the same color plane are very dark pixels, then it is defined as a very dark cluster.

For definitions 1–8 (“Defect Definitions in Bayer Format” on page 3) shown in , each of red, greenR, greenB, and blue color planes are analyzed.

For definitions 9–12 (“Defect Definitions in YCbCr Format” on page 4), shown in Figure 3, each of R, G, and B color planes are analyzed.

Figure 2: Raw Pixel Output

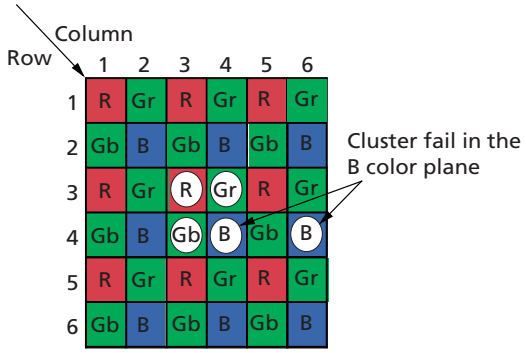
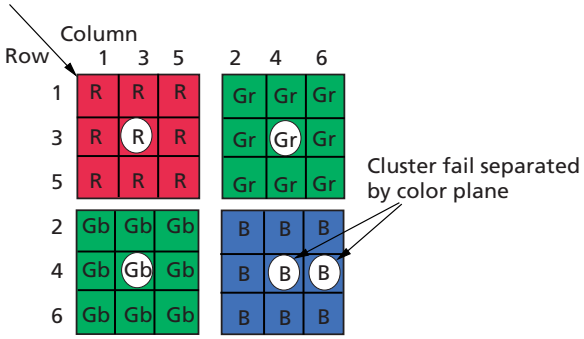


Figure 3: Raw Pixel Output Separated by Color Plane



8000 S. Federal Way, P.O. Box 6, Boise, ID 83707-0006, Tel: 208-368-3900
prodmktg@micron.com www.micron.com Customer Comment Line: 800-932-4992

Revision History

Rev. A 02/20/2007

- Initial release