Outgoing Defect Specification

MT9P001

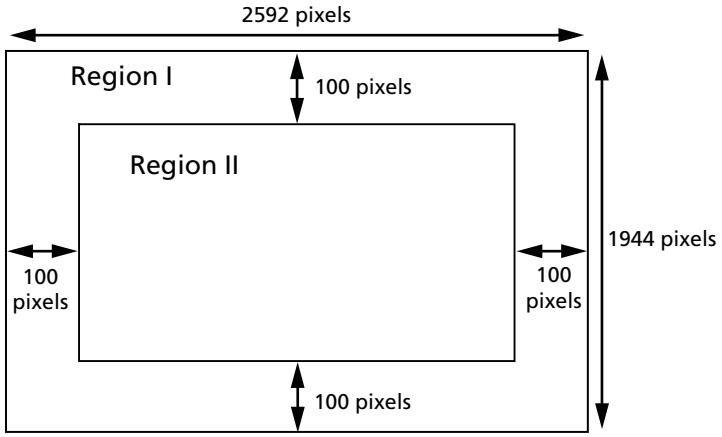
Introduction

This document defines outgoing defect specifications for Micron's MT9P001 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 No Defect Correction (Full Resolution 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 ≤ 200		1, 3, 5
Hot or bright pixel defects	Total ≤ 500		2, 4
Dark pixel defects	Total ≤ 200		6
Clusters	0		7

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

Defect Definitions in Bayer Format

(with no Defect Correction)

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 single pixel that is greater than 512 LSBs (all LSB values refer to a 10-bit output) above the mean value of the array when the sensor is operated under no illumination (dark conditions).
(Analog gain = 8x; exposure time = 20ms)

Definition 2: Hot Pixel Defect

A hot pixel is defined as any single pixel that is greater than 155 LSBs above the mean value of the array when the sensor is operated under no illumination (dark conditions).
(Analog gain = 8x; exposure time = 20ms)

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 pixel value is 25 percent or more above the mean, it is considered a very bright pixel defect. (Analog gain = 1x; exposure time = 10ms)

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 15 percent or more above the mean, it is considered a bright pixel defect. (Analog gain = 1x; exposure time = 10ms)

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 pixel value is 25 percent or more below the mean, it is considered a very dark pixel defect. (Analog gain = 1x; exposure time = 10ms)

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 = 10ms)

Definition 7: Cluster

Any two adjacent defective pixels under same illumination conditions, as defined in Definitions 1 and 2 (dark conditions) or Definitions 3 through 6 (midlevel conditions) above, within the same color plane constitute a cluster.

Cluster Defects

Figure 2 and Figure 3 on page 6 represent the same sub-area of pixels. Figure 2 represents the raw pixel output; Figure 3 represents the pixel output separated by color plane.

Using definitions 1–6 (“Defect Definitions in Bayer Format” on page 3), each of red, greenR, greenB, and blue color planes as shown in Figure 3 are analyzed for cluster defects. Defects defined in Definitions 1 and 2 are evaluated for clusters separately from defects defined in Definitions 3 through 6 due to the differences in illumination conditions (dark versus midlevel).

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 on page 6. Any combination of defects defined for a particular illumination condition (dark or midlevel) is used to define a cluster.

For example:

1.) A hot defect adjacent to a very hot defect will fail as a cluster (dark condition).

2.) A bright defect adjacent to a very dark defect will also fail as a cluster (midlevel condition).

Figure 2 and Figure 3 on page 6 depict a cluster defect in the B color plane. None of the other defects in the red, greenR, or greenB color planes would constitute a cluster defect.

Figure 2: Raw Pixel Output

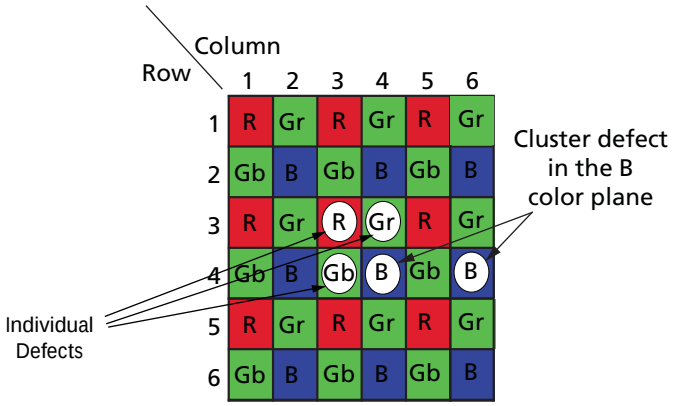
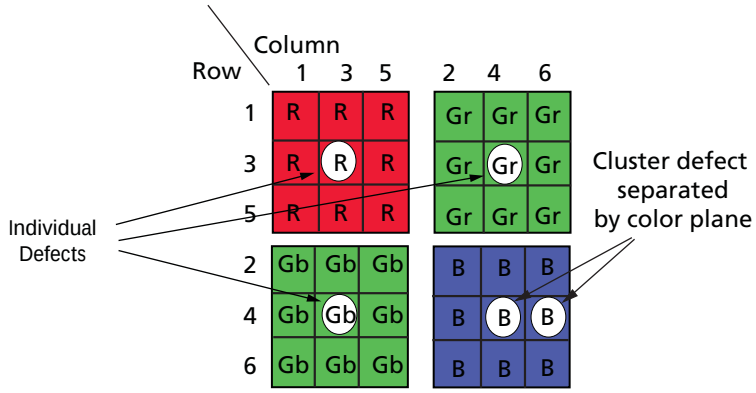


Figure 3: Raw Pixel Output Separated by Color Plane



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Revision History

Rev. B 09/14/2007

- Updated “Defect Specifications” on page 2
- Updated “Cluster Defects” on page 5
- Updated Figure 1: “Sensor Array,” on page 1
- Updated Figure 2: “Raw Pixel Output,” on page 6
- Updated Figure 3: “Raw Pixel Output Separated by Color Plane,” on page 6

Rev. A 10/31/2006

- Initial release