



# Outgoing Defect Specification

## MT9V013

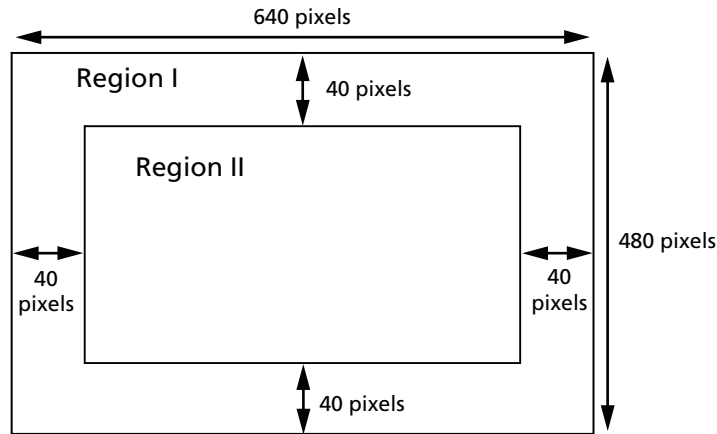
### Introduction

This document defines outgoing defect specifications for Micron’s MT9V013 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 (Bayer Format)**

VAA = VAA\_PIX = VDD\_PLL = 2.8V; VDD = VDD\_IO = VDD\_PHY = 1.8V

Defect Definition	Number of Defects		Definition Number <sup>1</sup>
	Region I	Region II	
Very hot, very bright, or very dark pixel defects	Total ≤ 10		1, 3, 5
Hot or bright pixel defects	Total ≤ 50		2, 4
Dark pixel defects	Total ≤ 10		6
Bright or dark clusters	0	0	7,8

Notes: 1. Operating condition  $T_J = 55^{\circ}\text{C} (\pm 3^{\circ}\text{C})$ . Image sensor is tested without a lens. Multiple images are captured and analyzed in Bayer format.

## Conditions for Image Test A

Full resolution images (four frames) are captured at 15 fps in dark condition without a lens system. Frames are averaged for analysis.

Sensor analog gain is 8x for all color planes and digital gain is 1x (unity).

## Conditions for Image Test B

Full resolution images (four frames) are captured at 30 fps with light condition equivalent to get 50 percent of sensor full-scale output without a lens system. Frames are averaged for analysis.

Sensor analog gain is 1x for all color planes and digital gain is 1x (unity).



## 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 single pixel that is greater than 50 percent of the sensor full-scale output when the sensor is operated as in image test A.

### Definition 2: Hot Pixel Defect

A hot pixel is defined as any single pixel that is greater than 15 percent of the sensor full-scale output when the sensor is operated as in image test A.

### Definition 3: Very Bright Pixel Defect

Within a color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the pixel value is 50 percent or more above the mean, it is considered a very bright pixel defect when the sensor is operated as in image test B.

### Definition 4: Bright Pixel Defect

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 when the sensor is operated as in image test B.

### Definition 5: Very Dark Pixel Defect

Within a color plane, each pixel is compared to the mean of the neighboring 11 x 11 pixels. If the pixel value is 50 percent or more below the mean, it is considered a very dark pixel defect when the sensor is operated as in image test B.

### Definition 6: Dark Pixel Defect

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 below the mean, it is considered a dark pixel defect when the sensor is operated as in image test B.)

### Definition 7: Bright Cluster

Using definitions 2 and 4 results, the defects within each color plane are examined. If any two or more 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 a color plane are examined. If any two or more adjacent pixels that are considered dark pixel defects are detected, they are then defined as a dark cluster.



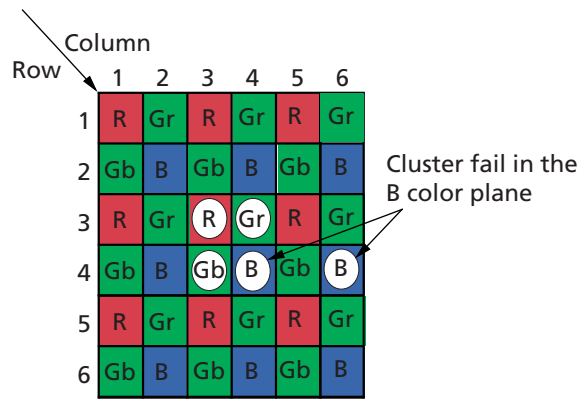
## Cluster Defects

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.

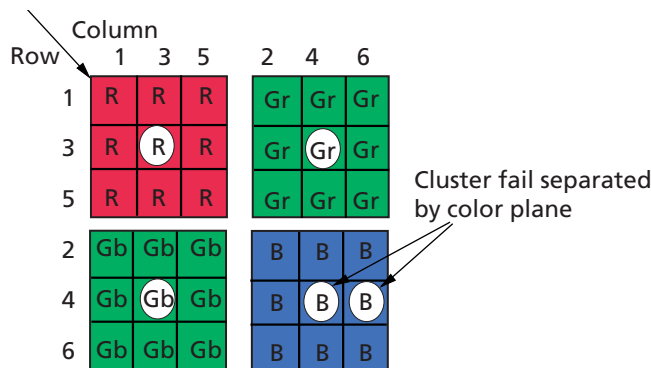
Clusters are analyzed by looking at one particular pixel and its surrounding eight adjacent pixels within the same color plane, as seen in Figure 3. For example, if the center pixel is a dark pixel and any of its surrounding eight pixels within the same color plane are dark pixels, then it is defined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

For definitions 1–6 (“Defect Definitions in Bayer Format” on page 3), each of red, greenR, greenB, and blue color planes shown in Figure 3 are analyzed.

**Figure 2: Raw Pixel Output**



**Figure 3: Raw Pixel Output Separated by Color Plane**



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## Revision History

Rev. A .....7/27/2007

- Initial release