Outgoing Defect Specification

MT9P012

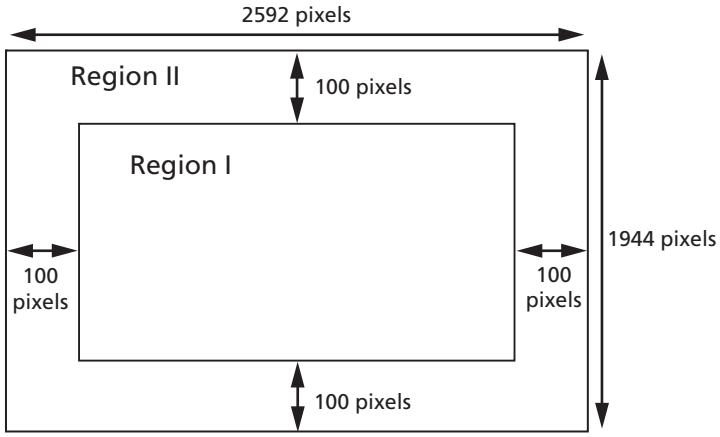
Introduction

This document defines outgoing defect specifications (preliminary) for Micron's MT9P012 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 (Bayer Format)

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)
Setup: V_{AA} = VAA_PIX = V_{DD}_PLL = 2.8V; V_{DD} = V_{DD}_IO = 1.8V; Operating conditions: T_J = 55°C (±3°C)

Defect Definition	Number of Defects		Definition Number
	Region I	Region II	
Very hot, very bright, or very dark pixel defects	Total ≤ 175		1, 3, 5
Hot or bright pixel defects	Total ≤ 350		2, 4
Dark pixel defects	Total ≤ 175		6
Cluster	0	0	7

Notes: 1. Image sensor is tested without a lens. Multiple images captured and analyzed in Bayer format.

Conditions for Image Test A

- Full resolution images (four frames) are captured at an exposure time of 20ms 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 an exposure time of 10ms 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 1.63x for all color planes and digital gain is 1x (unity).

Defect Definitions in Bayer Format

The following are pixel defect and cluster definitions in Bayer format, with no defect correction.

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: Cluster

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

Cluster

Defects defined in Definitions 1–2 are evaluated for clusters separately from defects defined in Definitions 3–6 due to the differences in illumination conditions (Dark vs. Midlevel). Clusters are analyzed by looking at one particular pixel and its surrounding eight adjacent pixels of the same color plane. Any combinations of defects defined for a particular illumination condition (for example, Dark or Midlevel) are used to define a cluster. Examples:

1. A Hot pixel defect adjacent to a Very Hot pixel defect will fail as a cluster,
2. A Bright pixel defect adjacent to a Very Dark pixel defect will also fail as a cluster.

Figure 2 and Figure 3 depict raw output for pixel defects in the R, G1, and G2 color planes, and a cluster fail in the B color plane. None of the pixel defects in the R, G1, or G2 color planes would constitute a cluster.

Figure 2: Defect and Cluster Fails

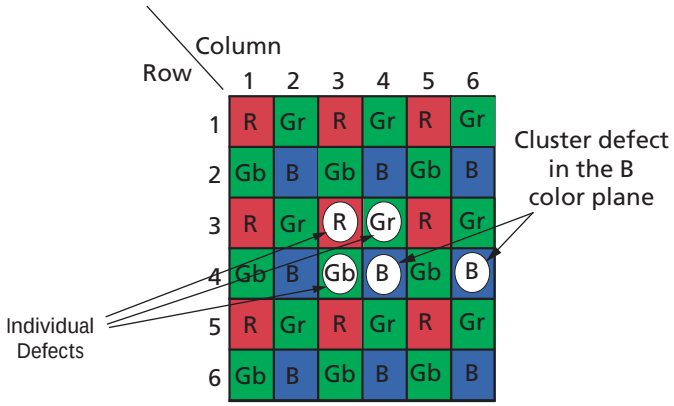
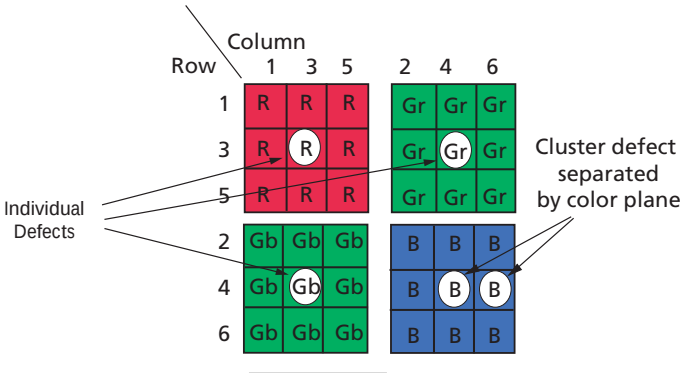


Figure 3: Defect and Cluster Fails - separated by Color Plane



Revision History

Rev. B **10/18/2007**

- Update "Conditions for Image Test A" on page 2
- Update Figure 2: “Defect and Cluster Fails,” on page 4
- Update Figure 3: “Defect and Cluster Fails - separated by Color Plane,” on page 4

Rev. A **07/03/2007**

- Initial release

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