



# Outgoing Defect Specification

## MT9T111

For the latest data sheet, refer Micron's Web site at [www.micron.com](http://www.micron.com)

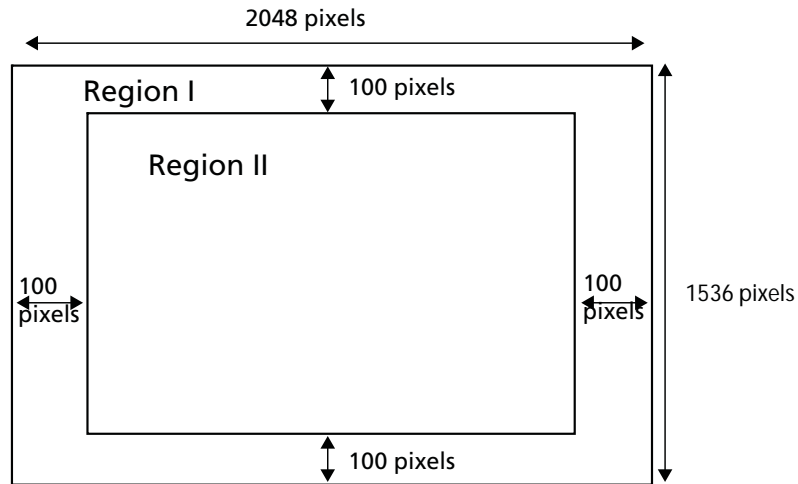
### Introduction

This document defines outgoing defect specifications for Micron's MT9T111 CMOS digital image sensor. The sensor defect regions, as well as types of pixel, row 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**



Draft 12/ 14/ 2007



## MT9T111: Outgoing Defect Specification Defect Specifications

### Defect Specifications

Table 1 and Table 2 specify the allowable number of defects for each of the regions defined in Figure 1.

**Table 1: Defect Specification with Defect Correction Disabled (SOC Bypass Mode)**

Operating condition:  $T_j = 55^\circ\text{C}$  ( $\pm 3^\circ\text{C}$ ),  $V_{AA} = V_{AA\_PIX} = V_{DD\_PLL} = V_{DDIO} = 2.8\text{V}$ ,  $V_{DD} = 1.8\text{V}$

Defect Definition	Number of Defects		Definition <sup>1</sup>
	Region I	Region II	
Very hot pixel defect	Total $\leq 120$		1
Very bright pixel defect	Total $\leq 120$		3
Very dark pixel defect	Total $\leq 120$		5
Hot pixel defect	Total $\leq 480$		2
Bright pixel defect	Total $\leq 480$		4
Dark pixel defect	Total $\leq 240$		6
Bright cluster	0		7
Dark cluster	0		8

Notes: 1. Definitions of defects are given on page 3.

**Table 2: Defect Specification with Defect Correction Enabled (SOC YCbCr Mode)**

Operating condition:  $T_j = 55^\circ\text{C}$  ( $\pm 3^\circ\text{C}$ ),  $V_{AA} = V_{AA\_PIX} = V_{DD\_PLL} = V_{DDIO} = 2.8\text{V}$ ,  $V_{DD} = 1.8\text{V}$

Defect Definition	Number of Defects		Definition <sup>1</sup>
	Region I	Region II	
Bright pixel defect	0	0	9
Dark pixel defect	0	0	10
Bright cluster	0	0	11
Dark cluster	0	0	12
Row/column defect	0	0	13

Notes: 1. Definitions of defects are given on page 4.

### Conditions for Image Test A

- Full resolution images (four frames) are captured at 15 fps in SOC bypass mode (raw Bayer format) in dark condition, with no defect correction. Frames are averaged for analysis.
- Sensor analog gain is 8X for all color planes and digital gain is 1X (unity).
- The sensor is operated at maximum external clock frequency with PLL bypassed.

### Conditions for Image Test B

- Full resolution images (four frames) are captured at 15 fps in SOC bypass mode (raw Bayer format) with light condition equivalent to get 50 percent of sensor full-scale output. Frames are averaged for analysis.
- Sensor analog gain is 2X for all color planes and digital gain is 1X (unity).
- The sensor is operated at maximum external clock frequency with PLL bypassed.

Draft 12/14/2007



## MT9T111: Outgoing Defect Specification Defect Definitions in SOC Bypass Mode

### Conditions for Image Test C

- Full resolution images (four frames) are captured at 5 fps in SOC YCbCr mode at 2 lux incident light with defect correction enabled. Frames are averaged for analysis.
- Sensor analog gain is 16X for blue color plane and all digital gains are unity. ADC reference and gamma are set to default conditions.
- The sensor is operated at maximum external clock frequency with PLL bypassed.

### Defect Definitions in SOC Bypass Mode

Defect definitions in the bypass mode (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 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 20 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 11x11 pixels. If the pixel value is 50% 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 11x11 pixels. If the pixel value is 15% 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 definition 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.

Draft 12/ 14/ 2007



## MT9T111: Outgoing Defect Specification Defect Definitions in SOC YCbCr Mode

### Defect Definitions in SOC YCbCr Mode

Defect definitions in the SOC YCbCr mode (with defect correction enabled) 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 50 percent or more above the mean, it is considered a bright pixel defect when the sensor is operated as in image test C.

#### 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 50 percent or more below the mean, it is considered a dark pixel defect when the sensor is operated as in image test C.

#### Definition 11: Bright Cluster

Using definition 9 results, the defects within each RGB 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 12: Dark Cluster

Using definition 10 results, the defects within each RGB 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.

#### Definition 13: Row/Column Defect

Within an image each row/column is compared with an average of 4 nearest rows/columns. If the value of a row/column is different from its adjacent rows/columns averages by 6 percent that row/column is defined as row/column defect when the sensor is operated as in image test .

### Cluster Defects

Figure 2 and Figure 3 on page 5 represent the same subarea of pixels. Figure 2 represents the raw Bayer output format; Figure 3 represents the pixel output separated by color plane.

Clusters are analyzed by looking at one particular pixel and its surrounding 8 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, each of R, Gr, Gb, and B color planes shown in Figure 3 are analyzed.

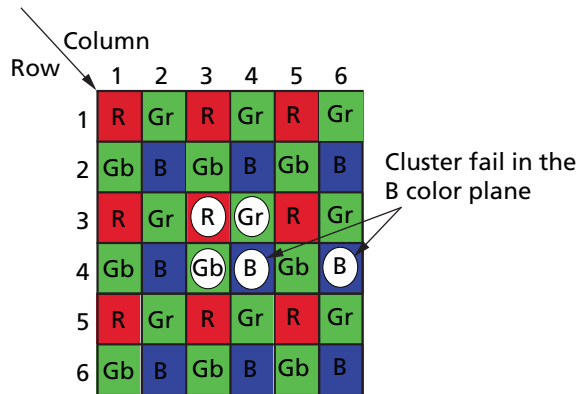
For definitions 9–13, each of the R, G, and B color planes are analyzed.

Draft 12/ 14/ 2007

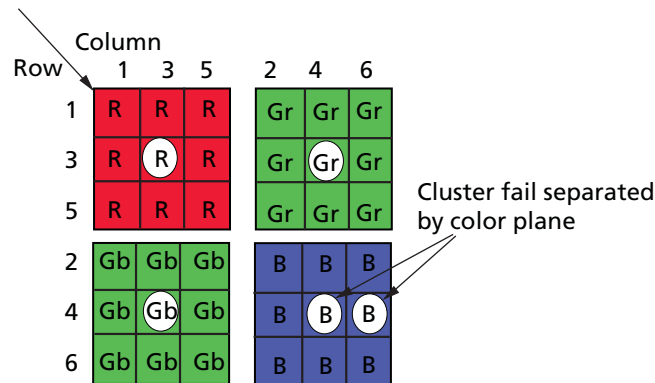


# MT9T111: Outgoing Defect Specification Cluster Defects

**Figure 2: Raw Pixel Data**



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



Draft 12/ 14/ 2007



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

Micron, the M logo, and the Micron logo are trademarks of Micron Technology, Inc. All other trademarks are the property of their respective owners.

**Advance: This data sheet contains initial descriptions of products still under development.**



# MT9T111: Outgoing Defect Specification Revision History

## Revision History

Rev. A .....	12/14/2007
<ul style="list-style-type: none"><li>• Initial release</li></ul>	

Draft 12/ 14/ 2007