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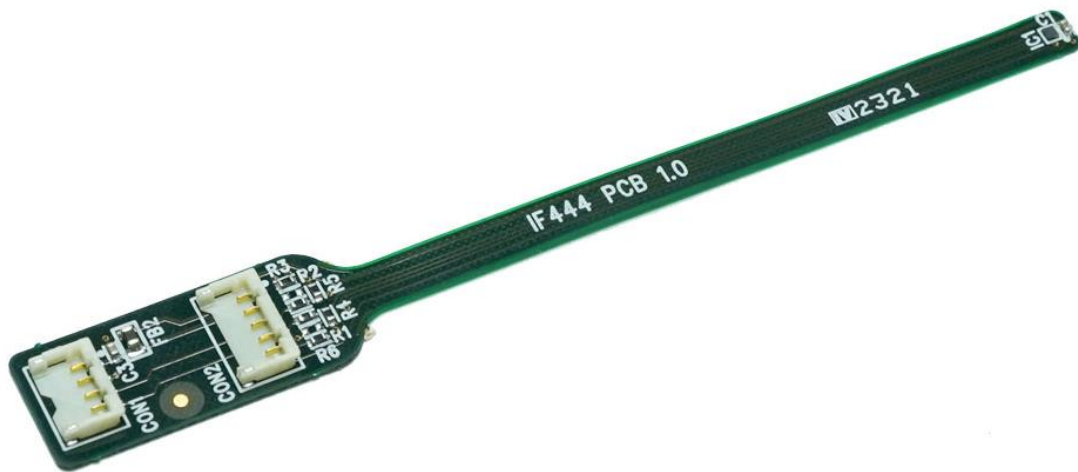
Datasheet

Distec

IF444-00 Frozen-Screen Detector

Frozen screen detection device

ZU-02-512



Version 1.2

06.03.2024

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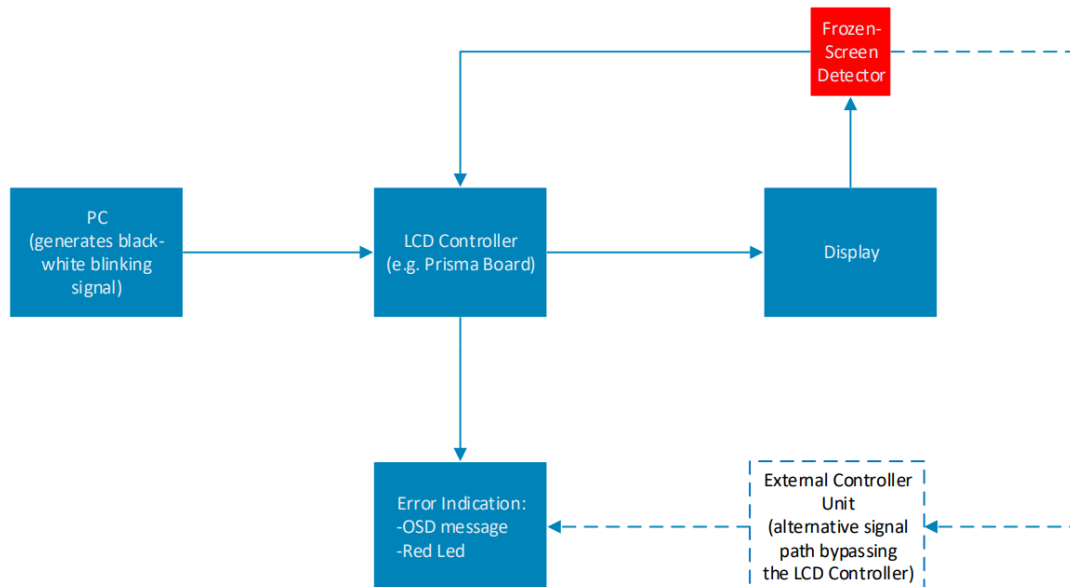
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1 Revision History

| Date | Rev.No. | Description | Page |
|------------|---------|--|----------|
| 21.07.2021 | 1.0 | Initial version | All |
| 01.03.2024 | 1.1 | New template Drawing updated | All 7 |
| 06.03.2024 | 1.2 | Changed typo SAP-Number ZU-02-518> ZU-02-512 | 2 |
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2 Overview

The Frozen-Screen Detector is the key hardware component in the system (Frozen-Screen Detection System) that detects if the contents displayed on a screen are being updated. It is based on the light sensor OPT3006YMFR that is mounted on a flexible PCB and directed towards the monitored screen. The sensor measures changes in brightness of the monitored display and sends the information over the I2C to a controller device. Additionally, the sensor can automatically output an interrupt signal if the brightness thresholds are crossed. The controller device (LCD Controller or External Controller Unit) assesses the signal and indicates an error state to the user if the brightness does not change anymore.



3 General Features

- Power Supply: 1.6 – 3.6 V
- Human-Eye-Like perception: rejects more than 99% of the IR light
- Wide Lux Measurement Range: 0.01 lux to 83k lux
- IC Package that allows direct placement on a display

4 Absolute Maximum Ratings

| Item | Symbol | Min. | Max. | Unit | Note |
|-----------------------|----------|------|------|------|------|
| Supply Voltage | V_{IN} | -0.5 | 6 | VDC | 1 |
| Storage Temperature | T_{ST} | -25 | +85 | °C | 1 |
| Operating Temperature | T_{OP} | -25 | +85 | °C | 1 |

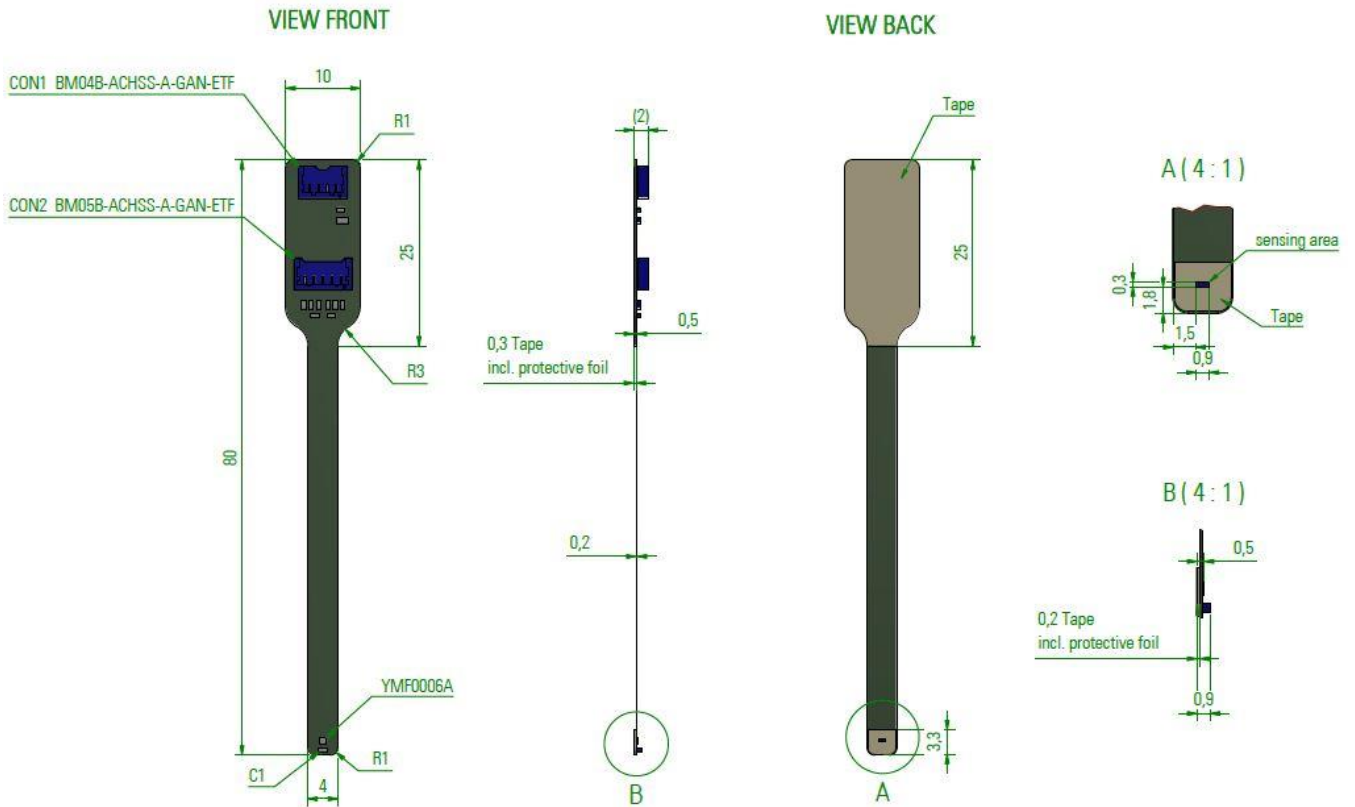
Note (1): Permanent damage to the device may occur if maximum values are exceeded.

5 Electrical Specification

| Item | Symbol | Min. | Typ. | Max. | Unit | Remarks |
|------------------------|-----------|------|------|------|------|---------|
| Supply Voltage | V_{IN} | 1.6 | 3.3 | 3.6 | V | |
| Supply Current | I_{IN} | - | 3.7 | - | μA | |
| Serial-Clock Frequency | f_{SCL} | 10 | - | 400 | kHz | |

6 Mechanical Specification

The Frozen-Screen Detector is a flexible PCB with a layer of an adhesive on the bottom side to mount the device reliably on the surface of a screen. There are no components on the bottom side.



7 Connector Overview

| Connector | Description | Type | Matching Part | Manufacturer |
|-----------|---|----------------------|---------------|--------------|
| CON1 | Power and I ² C Connector | BM04B-ACHSS-A-GAN-TF | ACHR-04V-A-S | JST |
| CON2 | Power, I ² C Connector, Interrupt Output | BM05B-ACHSS-A-GAN-TF | ACHR-05V-A-S | JST |

| CON1: Power and I ² C Connector | | |
|--|--------|--------------------|
| Pin | Signal | Description |
| 1 | +3.3V | Power Supply Input |
| 2 | GND | Ground |
| 3 | SCL | Serial Clock |
| 4 | SDA | Serial Data |

| CON2: Power and I ² C Connector with an Additional Interrupt Output | | |
|--|--------|--------------------|
| Pin | Signal | Description |
| 1 | +3.3V | Power Supply Input |
| 2 | GND | Ground |
| 3 | SCL | Serial Clock |
| 4 | SDA | Serial Data |
| 5 | INT | Interrupt Output |

8 Controller devices

The data from the Frozen-Screen Detector can be interpreted by the MStar-based Prisma boards. Alternatively, the Prisma board can be replaced with an external controller unit. The exact specification for this device will be determined in an additional document (see. IF445).

9 Firmware / Software

9.1 Firmware

The Frozen-Screen Detector works with two software components – embedded firmware and PC software. The firmware is running on the Prisma board or on an External Controller Unit.

The main task of the firmware is the detection of intensity changes that are measured by the sensor. If no changes are detected within the specified timeout period, the firmware emits various warnings (UART, GPIO, OSD menu).

The firmware can also perform a calibration to check, what is the minimum brightness that allows the display to be still operated reliably. **(available only on boards with LCD controller)**

Additionally, if the self-test feature is enabled, a display test is performed if a timeout occurs. The firmware is then able to indicate if the display is the faulty component in the system. **(available only on boards with LCD controller)**

The parameters that can be adjusted by the user are listed below.

| Parameter | Description | Range | Unit |
|----------------------|--|---------------------------------------|---------|
| Frozen Screen On/Off | Turns the detector On or Off | On - Off | - |
| Timeout | The Frozen Screen Detector waits this much time, after the heartbeat signal is not present before communicating a warning message. | 0 - 60 | [s] |
| Calibration On/Off | Starts the calibration process | On - Off | - |
| Self-Test On/Off | Enables / Disables the self-test feature | On - Off | - |
| Sensor X Pos. | X position of the sensor on the screen (for calibration and self-test) | 0 – Max. horizontal screen resolution | [pixel] |
| Sensor Y Pos. | Y position of the sensor on the screen (for calibration and self-test) | 0 – Max. vertical screen resolution | [pixel] |

9.2 Software

The second component of the system is the software running on the device generating the displayed content (e.g. PC, Embedded Computer). This component is not included in the Frozen Screen package.

The basic function of this part of the system is to change brightness of a selected rectangular area of a screen periodically by changing its color between black and white. This way the Frozen-Screen detector receives a heartbeat signal and can detect if the screen contents are being updated. **The customer's software should have this functionality integrated into it to ensure the reliable error detection.**

The key requirements on the software can be summarized as follows:

- **The blinking feature should be integrated into the software as a Watchdog reset function. That is, the blinking signal should only be generated if the program executes properly, otherwise the generation of the signal should stop with the program.**
- **The generated black and white signal should be visible to the sensor regardless of the user applications (always on top mode).**

9.3 Detected Error Cases

The following table summarizes the errors that are detected and covered by the Frozen-Screen Detection System.

| Faulty Component | Description | Detection Method Result | Error Indication Method | Remarks |
|--|--|--|---|--|
| Content Generating Device (e.g. PC, Embedded Computer) | Contents of the Screen are not getting updated but the old screen contents are still visible | PME-II/ External Controller Unit detects the black/white blinking PC-Signal [Failure Source: PC or Display] + Check again with PME-II generates black and white signal. 1) No detection: Display is faulty 2) Signal change detection: PC is faulty | OSD warning (PME-II) LED, GPIO, UART/USB | Primary use case |
| PME-II | Complete black or white screen is visible, but PME-II is not responding | PC communication [UART] | PC application detect no communication with PME-II + Light sensor Interrupt checked by PC | Error indication via LED possible if it is NOT controlled by the LCD controller |
| LCD Display | Complete black or white screen is visible | PME-II / External Controller Unit detects the black/white blinking PC-Signal [Failure Source: PC or Display] + Check again with PME-II generates black and white signal. 1) No detection: Display is faulty 2) Signal change detection: PC is faulty | LED, GPIO, UART/USB | |

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