

PRODUCT : CAMERA MODULE
MODEL NO. : CS2758-D030SF-E
SUPPLIER : TRULY SEMICONDUCTORS LTD.
DATE : April 14, 2008



CERT. No. 946535
ISO9001
TL9000

SPECIFICATION

Revision:1.0

CS2758-D030SF-E

If there is no special request from customer, TRULY SEMICONDUCTORS Co., Ltd will not reserve the tooling of the product under the following conditions:
1. There is no response from customer in two years after TRULY SEMICONDUCTORS Co., Ltd submit the samples;
2. There is no order in two years after the latest mass production.
And correlated data (include quality record) will be reserved one year more after tooling was discarded.

TRULY SEMICONDUCTORS LTD: CUSTOMER:

Quality Assurance Department: _____
Approved by:

Technical Department: _____

Approved by:

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| WRITTEN BY | CHECKED BY | APPROVED BY |
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Key Information

| Module No. | | CS2758-D030SF-E |
|-------------------------|--------------|---|
| Module Size | | 18.00mm x18.00mm x14.52mm |
| Image Quality | | ≥250 TV line |
| Sensor Type | | OV7720 |
| Array Size | | 640 X 480(VGA) |
| Power supply | Digital Core | 1.8VDC+/-10% |
| | Analog | 3.0V to3.3V |
| | I/o | 1.7V to 3.3V |
| Lens | | 1/3.75 inch 2P+2G+IR |
| Focus(F.NO) | | 2.4 |
| View Angle | | 93.9° |
| Image Area | | 3984μm x 2952μm |
| Object distance | | TBD |
| Sensitivity | | 3.0V/(Lux-sec) |
| Pixel size | | 6.0μm x 6.0μm |
| IR Cutter | | 650+/-10nm |
| Temperature Range | | -20° C to 70° C |
| Output Formats(8-bit) | | .YUV/YCbCr 4:2:2 .RGB 565/555/444 .GRB 4:2:2 .Raw RGB Data |
| Max Image Transfer Rate | | 60 fps for VGA |
| S/N Rate | | 50dB |
| Dynamic Range | | 60dB |
| IC Package | | 28 pin CSP2 |
| Substrate | | FPC |
| Scan Mode | | Progressive |
| Power requirement | Active | 120mW typical (60fps VGA YUV) |
| | Standby | <20μA |
| Electronics Exposure | | Up to 510:1(for selected fps) |
| Dark current | | 40mV/s |
| Package | | Antistatic Plastic |

Pin Assignment

| No. | Name | Pin type | Description |
|-----|-------|-----------|---|
| 1 | NC | | |
| 2 | AGND | Power | Analog Ground |
| 3 | SIO_D | I/O | SCCB serial interface data I/O |
| 4 | AVDD | Power | Analog power supply |
| 5 | SIO_C | Input | SCCB serial interface clock input |
| 6 | RESET | Input | System reset input,active low |
| 7 | VSYNC | Output | Vertical sync output |
| 8 | PWDN | Input (0) | Power Down Mode Selection 0: Normal mode 1: Power down mode |
| 9 | HREF | Output | HREF output |
| 10 | NC | | |
| 11 | DOVDD | Power | Digital power supply for I/O |
| 12 | Y9 | Output | Data output bit[9] |
| 13 | XCLK | Input | System clock input |
| 14 | Y8 | Output | Data output bit [8] |
| 15 | DGND | Power | Digital Ground |
| 16 | Y7 | Output | Data output bit [7] |
| 17 | PCLK | Output | Pixel clock output |
| 18 | Y6 | Output | Data output bit [6] |
| 19 | Y2 | Output | Data output bit [2] |
| 20 | Y5 | Output | Data output bit [5] |
| 21 | Y3 | Output | Data output bit [3] |
| 22 | Y4 | Output | Data output bit [4] |
| 23 | Y1 | Output | Data output bit [1] |
| 24 | Y0 | Output | Data output bit [0] |

Electrical Characteristics

1. Absolute Maximum Ratings

| | | |
|--|--------------------|-----------------------------------|
| Ambient Storage Temperature | | -40°C to +95°C |
| Supply Voltages (with respect to Ground) | V _{DD-A} | 4.5 V |
| | V _{DD-C} | 3 V |
| | V _{DD-IO} | 4.5 V |
| All Input/Output Voltages (with respect to Ground) | | -0.3V to V _{DD-IO} +0.5V |
| Lead-free Temperature, Surface-mount process | | 245°C |

NOTE: Exceeding the Absolute Maximum ratings shown above invalidates all AC and DC electrical specifications and may result in permanent device damage.

2. DC Characteristics (-20°C < Ta < 70°C)

| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
|-----------------------|----------------------------------|---------------------------|--------------------------|---------------------|--------------------------|------|
| V _{DD-A} | DC supply voltage – analog | – | 3.0 | 3.3 | 3.6 | V |
| V _{DD-C} | DC supply voltage – digital core | – | 1.62 | 1.8 | 1.98 | V |
| V _{DD-IO} | DC supply voltage – I/O | – | 2.5 | – | 3.3 | V |
| I _{DDA} | Active (operating) current | See Note ^a | | 10 + 8 ^b | | mA |
| I _{DDS-SCCB} | Standby current | See Note ^c | | 1 | | mA |
| I _{DDS-PWDN} | Standby current | | | 10 | 20 | μA |
| V _{IH} | Input voltage HIGH | CMOS | 0.7 x V _{DD-IO} | | | V |
| V _{IL} | Input voltage LOW | | | | 0.3 x V _{DD-IO} | V |
| V _{OH} | Output voltage HIGH | CMOS | 0.9 x V _{DD-IO} | | | V |
| V _{OL} | Output voltage LOW | | | | 0.1 x V _{DD-IO} | V |
| I _{OH} | Output current HIGH | See Note ^d | 8 | | | mA |
| I _{OL} | Output current LOW | | 15 | | | mA |
| I _L | Input/Output leakage | GND to V _{DD-IO} | | | ± 1 | μA |

a. At 25°C, V_{DD-A} = 3.3V, V_{DD-C} = 1.8V, V_{DD-IO} = 3.3V

I_{DDA} = Σ(I_{DD-IO} + I_{DD-C} + I_{DD-A}); f_{CLK} = 24MHz at 30 fps YUV output, no I/O loading

b. I_{DD-C} = 10mA, I_{DD-A} = 8mA, without loading

c. At 25°C, V_{DD-A} = 3.3V, V_{DD-C} = 1.8V, V_{DD-IO} = 3.3V

I_{DDS-SCCB} refers to a SCCB-initiated Standby, while I_{DDS-PWDN} refers to a PWDN pin-initiated Standby

d. Standard Output Loading = 25pF, 1.2KΩ

3. Functional and AC Characteristics (-20°C < Ta < 70°C)

| Symbol | Parameter | Min | Typ | Max | Unit |
|--|---|-----|-----------|-----|------|
| Functional Characteristics | | | | | |
| | A/D Differential non-linearity | | $\pm 1/2$ | | LSB |
| | A/D Integral non-linearity | | ± 1 | | LSB |
| | AGC Range | | | 30 | dB |
| | Red/Blue adjustment range | | | 12 | dB |
| Inputs (PWDN, CLK, RESET#) | | | | | |
| f _{CLK} | Input clock frequency | 10 | 24 | 48 | MHz |
| t _{CLK} | Input clock period | 21 | 42 | 100 | ns |
| t _{CLK:DC} | Clock duty cycle | 45 | 50 | 55 | % |
| t _{S:RESET} | Setting time after software/hardware reset | | | 1 | ms |
| t _{S:REG} | Settling time for register change (10 frames required) | | | 300 | ms |
| SCCB Timing (see Figure 4) | | | | | |
| f _{SCL} | Clock frequency | | | 400 | KHz |
| t _{LOW} | Clock low period | 1.3 | | | μs |
| t _{HIGH} | Clock high period | 600 | | | ns |
| t _{AA} | SCL low to data out valid | 100 | | 900 | ns |
| t _{BUF} | Bus free time before new START | 1.3 | | | μs |
| t _{HD:STA} | START condition hold time | 600 | | | ns |
| t _{SU:STA} | START condition setup time | 600 | | | ns |
| t _{HD:DAT} | Data in hold time | 0 | | | μs |
| t _{SU:DAT} | Data in setup time | 100 | | | ns |
| t _{SU:STO} | STOP condition setup time | 600 | | | ns |
| t _R , t _F | SCCB rise/fall times | | | 300 | ns |
| t _{OH} | Data out hold time | 50 | | | ns |
| Outputs (VSYNC, HREF, PCLK, and D[9:0] (see Figure 5, Figure 6, Figure 7, and Figure 8) | | | | | |
| t _{PDV} | PCLK[↓] to data out Valid | | | 5 | ns |
| t _{SU} | D[9:0] setup time | 15 | | | ns |
| t _{HD} | D[9:0] Hold time | 8 | | | ns |
| t _{PHH} | PCLK[↓] to HREF[↑] | 0 | | 5 | ns |
| t _{PHL} | PCLK[↓] to HREF[↓] | 0 | | 5 | ns |
| AC Conditions: | <ul style="list-style-type: none"> • V_{DD}: V_{DD-C} = 1.8V, V_{DD-A} = 3.3V, V_{DD-IO} = 3.3V • Rise/Fall Times: I/O: 5ns, Maximum SCCB: 300ns, Maximum • Input Capacitance: 10pf • Output Loading: 25pF, 1.2KΩ to 3.3V • f_{CLK}: 24MHz | | | | |

Note: For more information of sensor please refer to the OV7720 specification.

Appearance Specification

| NO. | Item | Standard | Importance Class |
|-----|------------------|--|------------------|
| 1 | Top side of Lens | No obvious impurity and oil impurity on the front of lens within the half area; The defect(unfeeling) limitation: width \leq 1mm, length \leq 2mm, the defect number \leq 2; No feeling defect; The width of defects and gaps on the outside of Lens \leq 0.3mm. Others are unlimited. | A |
| 2 | Screw glue | Normally screw glue shall be symmetrical distributed around lens circle side. Particular circs, glue distribution must not disturb customer's assembly operation. | A |
| 3 | L1 Glass | No defect and dust check from 45° angle under the reflexing light and from 0° under the highlight | A |
| 4 | Holder | No obvious impurity and distortion of outline. The width and length of defect is unlimited, the depth \leq 0.1mm and \leq 1/4 of the thickness of Holder. | B |
| 5 | Sealed glue | Sealed glue distributing between holder and FPC must be symmetrical and smooth. Not allow glue leakage and asymmetric thickness. After holder assembly, the thickness distance between one side and its opposite side shall be less than 0.2mm. Excess glue over the holder shall not make the outside dimension be out of control. | A |
| 6 | FPC/PCB | Edge defect limitation: width \leq 1/2H (H is minimum.)、 length \leq 1mm、 defect numbers per edge \leq 2(No tearing gap inby edge for FPC); Edge outshoot limitation (width \leq 0.3mm, length \leq 1mm). No obvious impurity and crease on the surface. If there was shield film on the surface, the spot size of the film shall be less than 0.3mm \times 1mm and no line is exposed. If it was not be cleaned and did not influence the total thickness, it would be permitted. Label and mark shall be clear enough to be discerned. | A |
| 7 | Connector | No dust, fingerprint, and not allows to turning colors, distortion; Solder must be well; No open circuit or short circuit | A |

| | | | |
|----|---------------------|--|---|
| 8 | Gold finger | No dust, fingerprint, and not allows to turning colors, burned, unsmoothed and peeled; No open circuit or short circuit; The defect width shall be smaller than 20% of gold finger's width. No copper/nickel exposed in defect. Numbers of defected pin shall be less than 3. The defect limitation:width \leq 0.08mm,length \leq 5mm. | A |
| 9 | Stiffener | Holder anchor pole length overtopping the steel plate shall be less than 0.2mm. No dust, rust and deep scratch on the steel surface without Double coated tapes. | B |
| 10 | Double coated tapes | Adhered direction shall be right. Not allows to excess steel plate edge. No alveoli and stick. Not allows to peel glue and rip protective paper when tear the protective paper. | B |
| 11 | Protective film | No dust in the glue side. Not allows to float or drop. Adhered direction shall be right. | B |

Remark:

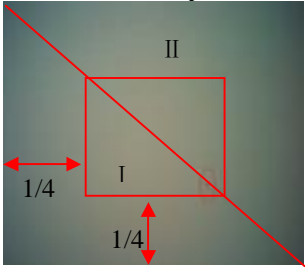
1. The definition of the appearance importance class

- A: The defect can be found in the finished product, or have obvious visual differences from good products, such as crack, defect and dust, or influence image quality, or are appointed by the customer. We will emphasize these items and check all products.
- B: The defect can be found in the finished product and has visual difference from the good one, but will not affect customer's aesthetic judgement. Or the defect can not be found in the finished product and will not generate functional problem, but will slightly influence sequential manufacture process or condition. We will supervise these items in the manufacturing process and check products selectively.

2. Sampling standard

Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 II

Image Specification

| NO. | Item | Standard | Important Class |
|-----|-------------|--|-----------------|
| 1 | TV Line | Center \geq 350 8 point of 0.7 viewing field \geq 250 | A |
| 2 | Shading | The lightness of 90% viewing area \geq 40% of center lightness(Lens correction Shading [Turn off]); The lightness of 90% viewing area \geq 60% of center lightness(Lens correction Shading [Turn on]) | A |
| 3 | Dust | No dust in the center viewing area; Border area according to the limit samples | A |
| 4 | Dead pixel | No in the viewing area. | A |
| 5 | Wound pixel |  <p>I area: Blemish number \leq2 II area: Blemish number \leq6</p> | B |
| 6 | Color | Color distortion ratio of center \pm 15% | B |
| 7 | Gray Scale | Margin of two near scales' brightness \geq 6 | B |
| 8 | Distortion | $<$ 7.5% | B |
| 9 | Flare | No flare in 45° viewing angle; No ghost in full viewing angle | B |

QA Plan

| NO. | Item | Sampling frequency | Measure | Remark |
|----------------------------|---------------------|--------------------|--------------------|-----------------|
| Image and reliability item | | | | |
| 1 | TV Line | AQL 0.65 II Class | Same as production | 100% Inspection |
| 2 | Shading | AQL 0.65 II Class | Same as production | 100% Inspection |
| 3 | Dust | AQL 0.65 II Class | Same as production | 100% Inspection |
| 4 | Dead pixel | AQL 0.65 II Class | Same as production | 100% Inspection |
| 5 | Wound pixel | AQL 1.5 II Class | Same as production | 100% Inspection |
| 6 | Color | AQL 1.5 II Class | Same as production | 100% Inspection |
| 7 | Gray Scale | AQL 1.5 II Class | Same as production | 100% Inspection |
| 8 | Distortion | N=5,c=0 per batch | Same as production | Sampling by QA |
| 9 | Flare | N=5,c=0 per batch | Same as production | Sampling by QA |
| Appearance Check Items | | | | |
| 1 | Top side of Lens | AQL 1.0 II Class | Same as production | 100% Inspection |
| 2 | Screw glue | AQL 1.0 II Class | Same as production | 100% Inspection |
| 3 | L1 Glass | AQL 1.0 II Class | Same as production | 100% Inspection |
| 4 | Holder | AQL 1.5 II Class | Same as production | 100% Inspection |
| 5 | Sealed glue | AQL 1.0 II Class | Same as production | 100% Inspection |
| 6 | FPC/PCB | AQL 1.0 II Class | Same as production | 100% Inspection |
| 7 | Connector | AQL 1.0 II Class | Same as production | 100% Inspection |
| 8 | Gold finger | AQL 1.0 II Class | Same as production | 100% Inspection |
| 9 | Stiffener | AQL 1.5 II Class | Same as production | 100% Inspection |
| 10 | Double coated tapes | AQL 1.5 II Class | Same as production | 100% Inspection |
| 11 | Protective film | AQL 1.5 II Class | Same as production | 100% Inspection |

Sample:

Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 II

Package Specification Packaging Design One

| | | | | | | | | | |
|--|---------------------------|------------------|---|---------|----------|-----|----------------|---------------------|---------|
| Product No. | CS2758-D030SF-E | Release date | | | | | | | |
| Product name | Compact Camera Module | Releaser | | | | | | | |
| Supplier | TRULY SEMI CONDUCTORS LTD | Recycle | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | | |
| Quantity/ each box | TBD | Material for box | <input checked="" type="checkbox"/> paper <input type="checkbox"/> plastic | | | | | | |
| Outer carton box size | 405mm*290mm*290mm | Box type | <input checked="" type="checkbox"/> new <input type="checkbox"/> update | | | | | | |
| Quantity / inner box * Quantity / outer box | TBD | Weight | <table border="1"> <tr> <td>g / pcs</td> <td>BOX=TYPE</td> <td>TBD</td> </tr> <tr> <td>Kg / outer box</td> <td>Record of SRF Dept.</td> <td>Kg(Max)</td> </tr> </table> | g / pcs | BOX=TYPE | TBD | Kg / outer box | Record of SRF Dept. | Kg(Max) |
| g / pcs | BOX=TYPE | TBD | | | | | | | |
| Kg / outer box | Record of SRF Dept. | Kg(Max) | | | | | | | |

Packing Standards:

There are TBD modules each plastic plate.

There are TBD modules each inner carton box..

There are 4 each outer carton box.

Requirements of outer carton box :

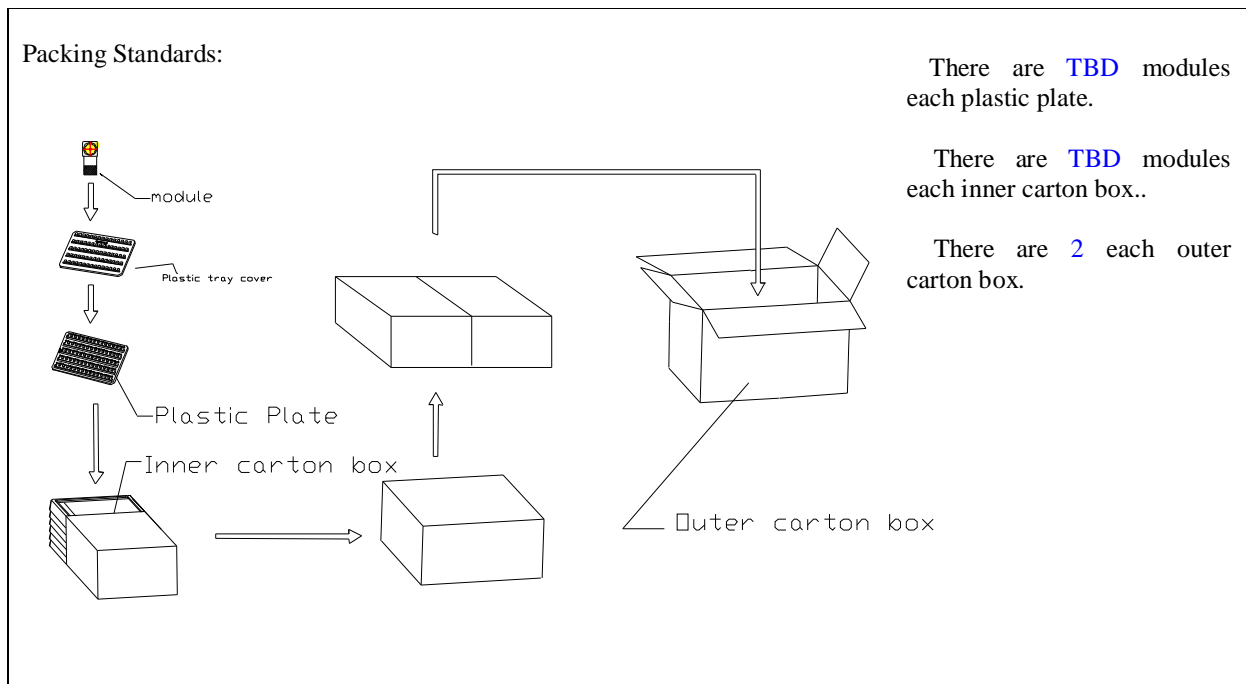
1. Weight(Max): TBD Kg
2. Height (Max): 0.29 M
3. Prohibition: Box made by log

Material for Plastic tray

It is made of antistatic polystyrene which has no chemical pollution. Surface resistivity : 10^6 ohm/sq

Packaging Design Two

| | | | | | | | |
|--|---------------------------------|------------------|---|---------|---------------------------------|----------------|----------------|
| Product No. | CS2758-D030SF-E | Release date | | | | | |
| Product name | Compact Camera Module | Releaser | | | | | |
| Supplier | TRULY SEMI CONDUCTORS LTD | Recycle | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | |
| Quantity/ each box | TBD | Material for box | <input checked="" type="checkbox"/> paper <input type="checkbox"/> plastic | | | | |
| Outer carton box size | 405 mm *290 mm *170 mm | Box type | <input checked="" type="checkbox"/> new <input type="checkbox"/> update | | | | |
| Quantity / inner box * Quantity / outer box | TBD | Weig ht | <table border="1"> <tr> <td>g / pcs</td> <td rowspan="2">BOX-TYPE Record of SRF Dept.</td> <td rowspan="2">TBD Kg(Max)</td> </tr> <tr> <td>Kg / outer box</td> </tr> </table> | g / pcs | BOX-TYPE Record of SRF Dept. | TBD Kg(Max) | Kg / outer box |
| g / pcs | BOX-TYPE Record of SRF Dept. | TBD Kg(Max) | | | | | |
| Kg / outer box | | | | | | | |



Requirements of outer carton box :

4. Weight(Max): TBD Kg
5. Height (Max): 0.17 M
6. Prohibition: Box made by log

Material for Plastic tray

It is made of antistatic polystyrene which has no chemical pollution. Surface resistivity : 10^6 ohm/sq

PRIOR CONSULT MATTER

- 1.①For Truly standard products, we keep the right to change material, process for improving the product property without notice on our customer.
②For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
2. If you have special requirement about reliability condition, please let us know before you start the test on our samples.

FACTORY CONTACT INFORMATION

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