

**PRODUCT** : CAMERA MODULE  
**MODEL NO.** : CM8011-B030SF-E  
**SUPPLIER** : TRULY SEMICONDUCTORS LTD.  
**DATE** : April 19, 2007



CERT. No. 946535  
ISO9001  
TL9000

# SPECIFICATION

Revision: 0.1

**CM8011-B030SF-E**

preliminary

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**

<b>Module No.</b>		<b>CM8011-B030SF-E</b>
Module Size		6.5mm x 6.5mm x 4.10mm
Image Quality		≥200 TV line
Sensor Type		OV7670
Array Size		640 X 480(VGA)
Power supply	Digital Core	1.8VDC+/-10%
	Analog	2.45V to 3.0V
	I/o	1.7V to 3.0V
Lens		1/6 inch 2Plastic+IR
Focus(F.NO)		2.8
View Angle		64°
Image Area		2.36mm x 1.76mm
Object distance		20cm-infinity
Sensitivity		1.3V/(Lux-sec)
Pixel size		3.6μm x 3.6μm
IR Cutter		650+/-10nm
Temperature Range	Operation	-20° C to 70° C
	Storage	-30° C to 80° C
Output Formats(8-bit)		.YUV/YCbCr 4:2:2 .RGB 565/555/444 .RGB 4:2:2 .Raw RGB Data
Maximum Image Transfer Rate		30 fps for VGA
S/N Rate		46dB
Dynamic Range		52dB
IC Package		24 pin CSP2
Substrate		FPC
Scan Mode		Progressive
Power requirement	Active	60mW typical (15fps VGA YUV format)
	Standby	TBD
Electronics Exposure		Up to 510:1(for selected fps)
Dark current		12mV/s at 60°C
Package		Antistatic Plastic

**Pin Assignment**

No.	Name	Pin type	Description
1	NC	Output	Strobe control output
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 (0)	Clears all registers and resets them to their default values.
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	DVDD	Power	Power supply for digital logic core
11	DOVDD	Power	Digital power supply for I/O
12	Y7	Output	YUV/RGB video component output bit[7]
13	XCLK	Input	Crystal clock input
14	Y6	Output	YUV/RGB video component output bit[6]
15	DGND	Power	Digital Ground
16	Y5	Output	YUV/RGB video component output bit[5]
17	PCLK	Output	Pixel clock output
18	Y4	Output	YUV/RGB video component output bit[4]
19	Y0	Output	YUV/RGB video component output bit[0]
20	Y3	Output	YUV/RGB video component output bit[3]
21	Y1	Output	YUV/RGB video component output bit[1]
22	Y2	Output	YUV/RGB video component output bit[2]
23	NC		
24	NC		

## Electrical Characteristics

### 1. Absolute Maximum Ratings

<b>Ambient Storage Temperature</b>		-40°C to +95°C
<b>Supply Voltages (with respect to Ground)</b>	<b>V<sub>DD-A</sub></b>	4.5 V
	<b>V<sub>DD-C</sub></b>	3 V
	<b>V<sub>DD-IO</sub></b>	4.5 V
<b>All Input/Output Voltages (with respect to Ground)</b>		-0.3V to V <sub>DD-IO</sub> +0.5V
<b>Lead-free Temperature, Surface-mount process</b>		245°C
<b>ESD Rating, Human Body model</b>		2000V

**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 (-30°C < Ta < 70°C)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V <sub>DD-A</sub>	DC supply voltage – Analog	–	2.45	2.75	3.0	V
V <sub>DD-C</sub>	DC supply voltage – Digital Core	–	1.62	1.8	1.98	V
V <sub>DD-IO</sub>	DC supply voltage – I/O power	–	1.7	–	3.0V	V
I <sub>DDA</sub>	Active (Operating) Current	See Note <sup>a</sup>		10 + 8 <sup>b</sup>		mA
I <sub>DDS-SCCB</sub>	Standby Current	See Note <sup>c</sup>		1		mA
I <sub>DDS-PWDN</sub>	Standby Current			10	20	μA
V <sub>IH</sub>	Input voltage HIGH	CMOS	0.7 x V <sub>DD-IO</sub>			V
V <sub>IL</sub>	Input voltage LOW				0.3 x V <sub>DD-IO</sub>	V
V <sub>OH</sub>	Output voltage HIGH	CMOS	0.9 x V <sub>DD-IO</sub>			V
V <sub>OL</sub>	Output voltage LOW				0.1 x V <sub>DD-IO</sub>	V
I <sub>OH</sub>	Output current HIGH	See Note <sup>d</sup>	8			mA
I <sub>OL</sub>	Output current LOW		15			mA
I <sub>L</sub>	Input/Output Leakage	GND to V <sub>DD-IO</sub>			± 1	μA

- V<sub>DD-A</sub> = 2.5V, V<sub>DD-C</sub> = 1.8V, V<sub>DD-IO</sub> = 2.5V  
I<sub>DDA</sub> = Σ(I<sub>DD-IO</sub> + I<sub>DD-C</sub> + I<sub>DD-A</sub>), f<sub>CLK</sub> = 24MHz at 30 fps YUV output, no I/O loading
- I<sub>DD-C</sub> = 10mA, I<sub>DD-A</sub> = 8mA, without loading
- V<sub>DD-A</sub> = 2.5V, V<sub>DD-C</sub> = 1.8V, V<sub>DD-IO</sub> = 2.5V  
I<sub>DDS-SCCB</sub> refers to a SCCB-initiated Standby, while I<sub>DDS-PWDN</sub> refers to a PWDN pin-initiated Standby
- Standard Output Loading = 25pF, 1.2KΩ

### 3. Functional and AC Characteristics (-30°C < Ta < 70°C)

Symbol	Parameter	Min	Typ	Max	Unit
<b>Functional Characteristics</b>					
	A/D Differential Non-Linearity		$\pm 1/2$		LSB
	A/D Integral Non-Linearity		$\pm 1$		LSB
	AGC Range			30	dB
	Red/Blue Adjustment Range			12	dB
<b>Inputs (PWDN, CLK, RESET)</b>					
$f_{CLK}$	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
<b>SCCB Timing (see Figure 4)</b>					
$f_{SIO\_C}$	Clock Frequency			400	KHz
$t_{LOW}$	Clock Low Period	1.3			$\mu$ s
$t_{HIGH}$	Clock High Period	600			ns
$t_{AA}$	SIO_C low to Data Out valid	100		900	ns
$t_{BUF}$	Bus free time before new START	1.3			$\mu$ s
$t_{HD:STA}$	START condition Hold time	600			ns
$t_{SU:STA}$	START condition Setup time	600			ns
$t_{HD:DAT}$	Data-in Hold time	0			$\mu$ s
$t_{SU:DAT}$	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
$t_{DH}$	Data-out Hold time	50			ns
<b>Outputs (VSYNC, HREF, PCLK, and D[7:0] (see Figure 5, Figure 6, Figure 7, Figure 9, and Figure 10)</b>					
$t_{PDV}$	PCLK[ $\downarrow$ ] to Data-out Valid			5	ns
$t_{SU}$	D[7:0] Setup time	15			ns
$t_{HD}$	D[7:0] Hold time	8			ns
$t_{PHH}$	PCLK[ $\downarrow$ ] to HREF[ $\uparrow$ ]	0		5	ns
$t_{PHL}$	PCLK[ $\downarrow$ ] to HREF[ $\downarrow$ ]	0		5	ns
<b>AC Conditions:</b>	<ul style="list-style-type: none"> <li><math>V_{DD}</math>: <math>V_{DD-C} = 1.8V, V_{DD-A} = 2.5V, V_{DD-IO} = 2.5V</math></li> <li>Rise/Fall Times: I/O: 5ns, Maximum SCCB: 300ns, Maximum</li> <li>Input Capacitance: 10pf</li> <li>Output Loading: 25pF, 1.2K<math>\Omega</math> to 2.5V</li> <li><math>f_{CLK}</math>: 24MHz</li> </ul>				

**Note:** For more information of sensor please refer to the OV7670 specification.

## Mechanical Drawing



## Appearance Specification

NO.	Item	Standard	Importanc e Class	Designated sample	Method/ Tool
1	Outline	Checked according to product dimension and tolerance spec	A	No	Vernier ,C hecking tool
2	Appearance cleanness and defect	No <b>impurity</b> and oil impurity [Non-glass area]	B	Yes	Fluoresce nt lamp or appointed light source
3	Glass clearness and defect	No defect and dust check from 45° angle under the reflexing light and from 0° under the highlight	A	No	Fluoresce nt lamp
4	Screw glue	Glue homogeneous distributing around lens circle side .Not allows to excess glue over the height of Lens and Holder outside.	A	No	Fluoresce nt lamp
5	Sealed glue	Glue distributing between holder and FPC must be homogeneous and smooth.Not allows to excess glue over the width of holder.	A	Yes	Fluoresce nt lamp
6	FPC impurity	No obvious impurity on the surface	B	Yes	Fluoresce nt lamp
7	FPC label or mark	Recognizable and Clear	C	Yes	Fluoresce nt lamp
8	FPC edge	Edge outshoot limitation (width $\leq$ 0.3mm,length $\leq$ 1mm)	B	No	Fluoresce nt lamp
9	FPC defect	Edge defect limitation: width $\leq$ 1/2H(H is minimum.)、 length $\leq$ 1mm、 defect numbers per edge $\leq$ 2(no tearing gap inby edge)	A	No	Fluoresce nt lamp
10	FPC shield [FPC with silver or silver-platinum coverfilm]	Surface shield pastern must cover the whole silver or silver-platinum area. No exposed copper line	B	No	Fluoresce nt lamp
11	Gold finger appearance	No dust, fingerprint, and not allows to turning colors, burned, unsmoothed and peeled. No open circuit or short circuit	A	Yes	Fluoresce nt lamp

12	Gold finger defect	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.	B	No	Fluorescent lamp
13	Stiffener	Holder anchor pole length overtopping the steel plate shall be less than 0.3mm. No dust, rust and deep scratch on the steel surface without Double coated tapes.	C	Yes	Fluorescent lamp
14	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	No	Fluorescent lamp
15	Protective film	No dust in the glue side. Not allows to float or drop.	B	No	Fluorescent lamp

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.
- C: The defect can not be found in the finished product. It has no any effect on the product quality but a little difference from others of the same terms. We will supervise these items and check products selectively.

2. Sampling standard

Referenced standard: GB/T 2828.1 (SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES (REFER TO GB/T 2828.1))

Exterior standards: Class II

## Image Specification

NO.	Item	Standard	Important level	Sample limit	Tool	Inspecting Method	Inspection numbers
1	Product height	4.10mm +/- 0.2 (Without protective film and Double coated tapes)	A	No	Tool of inspecting height	Pass tool of inspecting height	100% Inspection
2	TV Line	$\geq 200$	A	No	Testing machine	Inspecting Automatically by machine	100% Inspection
3	Shading	The lightness of 90% viewing area must reach 45% of center lightness .The size of sampling area is 40×40 pixels.(Shading correction function of sensor disabled)	A	No	Testing machine	Inspecting Automatically by machine	100% Inspection
4	Dust	No dust in the viewing area.	A	No	Testing machine	Inspecting Automatically by machine	100% Inspection
5	Dead & Wound (size $\leq 4 \times 4$ pixels)	0.3Mega Module A area: Blemish number $\leq 2$ B area: Blemish number $\leq 4$ 1.3Mega module and upwards A area: Blemish number $\leq 1$ B area: Blemish number $\leq 2$	A	No	Testing machine	Inspecting Automatically by machine	100% Inspection
6	Color	Color distortion ratio $< 20\%$	A	No	Testing machine	Inspecting Automatically by machine	100% Inspection
7	Gray Scale	Margin of two near scales' brightness $> 8$	A	No	Testing machine	Inspecting Automatically by machine	100% Inspection
8	Screw torsion measure	1. Lens $\phi \leq 6$ , no less than 0.5Kgf.cm 2. Others no less than 1Kgf.cm	A	No	Torsional dynamometer	Apparatus display	Sampling by QA

9	Thrust test	No less than 2kgf	A	No	Thrust dynamometer	Apparatus display	Sampling by QA
10	Wearing test	Inspecting selective samples with all above items after reliability testing was finished.	A	No	AF-600/ Tool of inspecting height/ Torsional dynamometer	Eyeballing	100% inspecting in Sample term. Selective inspecting in mass production term.

### QA Plan

NO.	Item	Sampling frequency	Measure	Remark
Image and reliability item				
1	Product height	0.65 II Class	Same as production	100% Inspection
2	TV Line	0.65 II Class	Same as production	100% Inspection
3	Shading	0.65 II Class	Same as production	100% Inspection
4	Dust	0.65 II Class	Same as production	100% Inspection
5	Dead & Wound pixel	0.65 II Class	Same as production	100% Inspection
6	Color	0.65 II Class	Same as production	100% Inspection
7	Gray Scale	0.65 II Class	Same as production	100% Inspection
8	TV 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
10	Screw torsion	N=5,c=0 per batch	Special torsional dynamometer	Sampling by QA
11	Holder thrust	N=5,c=0 per batch	Special thrust dynamometer	Sampling by QA
12	Reliability test	N=5,c=0 per style of mass production on the first time	1.Use reliability testing instrument 2. Inspecting all items of QA plan after reliability test finished.	1. Test 1 time in Sample term. 2. Test along sampling frequency in mass production term.
Appearance Check Items				
1	External dimension	AQL 1.0 II Class	Same as production	100% Inspection
2	Appearance clear and defect	AQL 1.0 II Class	Same as production	100% Inspection
3	Glass clear and defect	AQL 1.0 II Class	Same as production	100% Inspection
4	Screw glue	AQL 1.0 II Class	Same as production	100% Inspection
5	Fluid sealant	AQL 1.0 II Class	Same as production	100% Inspection
6	FPC sully	AQL 1.0 II Class	Same as production	100% Inspection
7	FPC printing	AQL 1.0 II Class	Same as production	100% Inspection
8	FPC coarse	AQL 1.0 II Class	Same as production	100% Inspection
9	FPC defect	AQL 1.0 II Class	Same as production	100% Inspection
10	FPC shield	AQL 1.0 II Class	Same as production	100% Inspection (only for

				FPC with silver coverfilm)
11	Gold finger appearance	AQL 1.0 II Class	Same as production	100% Inspection
12	Gold defect	AQL 1.0 II Class	Same as production	100% Inspection
13	Stiffener	AQL 1.0 II Class	Same as production	100% Inspection
14	Double coated tapes	AQL 1.0 II Class	Same as production	100% Inspection
15	Protective film	AQL 1.0 II Class	Same as production	100% Inspection

Sample reference standard: GB/T 2828.1 (SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES (REFER TO GB/T 2828.1) )

**Reliability Specification**

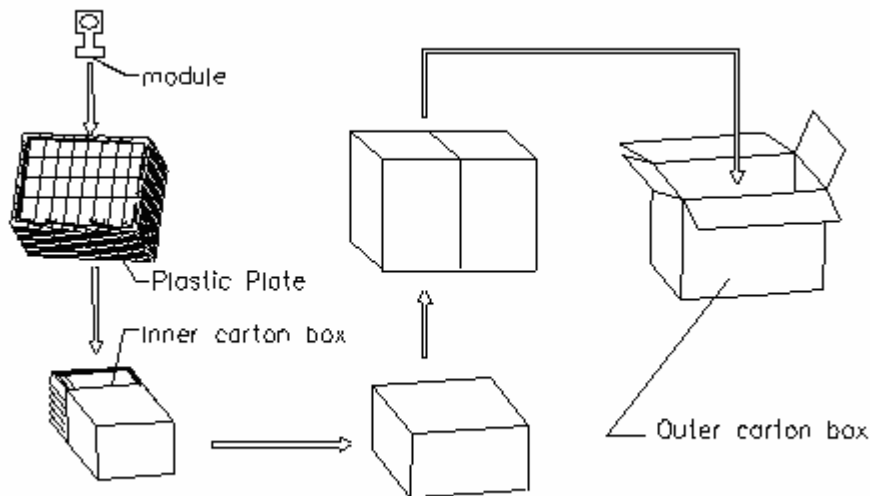
No.	Test item	Test condition
1	Temperature strike cycle [Power off]	Low temperature:-30°C±2°C for 30 min High temperature:+80°C±2°C for 30 min Cycle:10 times
2	High temperature and high humidity operating	Temperature:40°C Humidity:90%RH Time:48 hours
3	High temperature and high humidity storage	Temperature:60°C Humidity:90%RH Time:120 hours
4	Low temperature operating	Temperature:-20°C±2°C Time:120 hours
5	High temperature operating	Temperature:70°C±2°C Time:120 hours
6	Low temperature storage	Temperature:-30°C±2°C Time:120 hours
7	High temperature storage	Temperature:80°C±2°C Time:120 hours
8	ESD test [Power off]	C:150pF R:330Ω Voltage:+/-2KV Air discharge: Cycle:10 times
9	Vibration Test [Packaged]	Frequency:10Hz~55Hz~10Hz Amplitude:1.5 mm Times: each X,Y,Z directions for 60mins
10	Dropping test [Packaged]	Product dropping from 150cm height to smooth marble Drop style:1 coner,3 arris,6 faces Test times:10

## Package Specification

### Packaging Design

Product No.	CM8011-B030SF-E	Release date						
Product name	Compact Camera Module	Releaser						
Supplier	TRULY SEMI CONDUCTORS LTD	Recycle	( )YES ( )NO					
Quantity/ each box	TBD	Material for box	( ) paper ( ) plastic					
Outer carton box size	TBD	Box type	( )new ( )update					
Quantity / inner box * Quantity / outer box	TBD	Weight	<table border="1"> <tr> <td>g / pcs</td> <td>BOX=TYPE Record of SRF Dept.</td> <td rowspan="2">Kg(Max)</td> </tr> <tr> <td>Kg / outer box</td> <td></td> </tr> </table>	g / pcs	BOX=TYPE Record of SRF Dept.	Kg(Max)	Kg / outer box	
g / pcs	BOX=TYPE Record of SRF Dept.	Kg(Max)						
Kg / outer box								

#### Packing Standards:



There are TBD modules each plastic plate.

There are TBD modules each inner carton box..

There are TBD inner carton boxes each outer carton box.

#### Requirements of outer carton box :

1. Weight(Max): TBD Kg
2. Height (Max): TBD 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

**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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