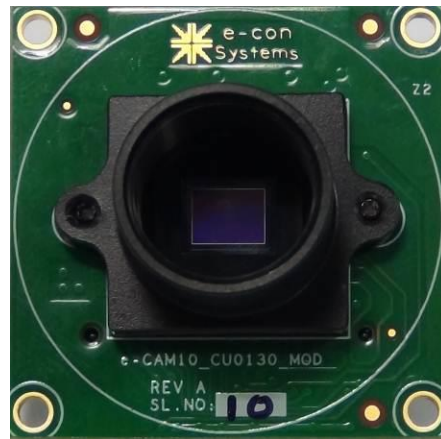




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e-CAM10_CU0130_MOD Camera Module **Datasheet**



Revision 1.2
Tuesday, February 10, 2015



Contents

1	Revision History	3
2	Description.....	4
2.1	Camera Module Features	4
2.2	CMOS Image Sensor Features.....	5
3	Scope	5
4	Disclaimer.....	5
5	Pin Description	5
5.1	Mating Connector Detail.....	7
6	Electrical Specification	7
6.1	Recommended Operating Condition.....	7
6.2	Functional Temperature range.....	7
6.3	DC Characteristics	7
6.4	SLAVE Address selection	8
6.5	Digital Video Output Timing Characteristics	8
6.6	I ² C Interface Timing Characteristics.....	9
6.7	Power-Up Sequence	10
7	Mechanical Specification.....	11
7.1	e-CAM10_CU0130_MOD Module Mechanical Drawing.....	11
7.2	S-Mount Lens Holder Drawing	12
7.3	Mechanical Part Details	12
8	Conclusion.....	12



e-CAM10_CU0130_MOD

1 Revision History

Rev	Date	Description	Author
1.0	01- Oct- 2014	Initial Draft	Hardware Team
1.1	13- Jan- 2014	Updated feedback comments	Hardware Team
1.2	14- Jan- 2014	Updated feedback comments	Hardware Team



2 Description

e-CAM10_CU0130_MOD is a low voltage, small form factor, high performance 1.3 Mega Pixel pluggable Monochrome Camera Module with S-Mount lens holder. It is based on AR0130 CMOS Image sensor from Aptina™. The e-CAM10_CU0130_MOD is designed to connect with any Application Processor that has parallel digital video interface. The standard S-Mount lens holder can accommodate a wide range of lenses based on the customer choice. e-CAM10_CU0130_MOD's S-Mount lens holder can also house a fisheye lens or a zoom lens to meet the application requirements.

The Aptina™ AR0130CS CMOS image sensor is an Electronic Rolling Shutter, 1/3" optical form-factor, 3.75µm pixel size, CMOS Image sensor from Aptina™ and this has superior low light performance and excellent Near IR performance. The low light sensitivity and the excellent NIR efficiency make this camera as an ideal solution for Day/Night Vision Surveillance applications and NIR Imaging applications in medical and biological applications.

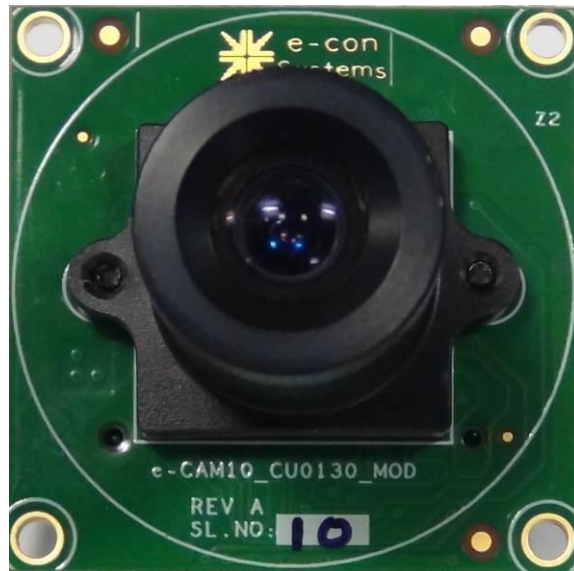


Figure 1: e-CAM10_CU0130_MOD camera module with custom lens

2.1 Camera Module Features

- Small form-factor pluggable camera module using 1.3 Mega pixel Monochrome CMOS Image sensor with enhanced NIR sensitivity
- An ideal solution for Day/Night Vision Surveillance applications and NIR Imaging applications in medical and biological applications.
- Targeted for application where custom lens is required
- M12P0.5 S-Mount Lens holder compatible with off-the-shelf M12 lenses



- Flexibility to choose a lens as per application requirements
- 30mm x 30mm size. Height depends on the Lens
- Supports 12bit digital Video parallel port with SYNC signals
- RoHS Compliant
- 50-pin SMT Connector
- Wide variety of Interchangeable lenses can be used

2.2 CMOS Image Sensor Features

- AR0130 - 1.3Mega pixel (1280 x 960) CMOS Image sensor from Aptina™.
- Capable of driving 720p@60fps, 960p@45fps and 640x480@60fps in preview mode
- Greyscale image data at 12bits per pixel
- Auto and Manual Exposure
- Normal, Flip and Mirror support

3 Scope

The scope of this document is limited to a brief description, features of this board including the mechanical diagram. This document serves as the datasheet for e-CAM10_CU0130_MOD with electrical and mechanical features supported by it.

4 Disclaimer

The specifications and features of e-CAM10_CU0130_MOD camera board are provided here as reference only and e-con Systems reserves the right to edit/modify this document without any prior intimation of whatsoever.

5 Pin Description

The e-CAM10_CU0130_MOD has a two row, 50-pin connector. The signal names and pin numbers are given below. Pin types are described from sensor perspective.

CN1 Pin No	Signal Name	Pin type	Description
1	GND	POWER	Ground signal for digital and analog
2	GND	POWER	Ground signal for digital and analog
3	Data[6]	OUTPUT	Camera data output line [6]
4	Data[0]	OUTPUT	Camera data output line [0], LSB
5	Data[7]	OUTPUT	Camera data output line [7]
6	Data[1]	OUTPUT	Camera data output line [1]
7	GND	POWER	Ground signal for digital and analog
8	GND	POWER	Ground signal for digital and analog
9	Data[8]	OUTPUT	Camera data output line [8]



10	Data[2]	OUTPUT	Camera data output line [2]
11	Data[9]	OUTPUT	Camera data output line [9]
12	Data[3]	OUTPUT	Camera data output line [3]
13	GND	POWER	Ground signal for digital and analog
14	GND	POWER	Ground signal for digital and analog
15	Data[10]	OUTPUT	Camera data output line [10]
16	Data[4]	OUTPUT	Camera data output line [4]
17	Data[11]	OUTPUT	Camera data output line [11], MSB
18	Data[5]	OUTPUT	Camera data output line [5]
19	GND	POWER	Ground signal for digital and analog
20	GND	POWER	Ground signal for digital and analog
21	S _{CLK}	INPUT	Sensor I2C SCL signal (Internally pulled-up to IO-2.8V using 4.7K Ω)
22	GND	POWER	Ground signal for digital and analog
23	NC	NC	No Connection
24	PIXCLK	OUTPUT	Pixel clock output
25	S _{DATA}	I/O	Sensor I2C SDA signal (Internally pulled-up to IO-2.8V using 4.7K Ω)
26	GND	POWER	Ground signal for digital and analog
27	NC	NC	No Connection
28	LINE_VALID	OUTPUT	Horizontal synchronization output
29	V _{DD_IO}	POWER	2.8V supply for I/O Domain
30	FRAME_VALID	OUTPUT	Vertical synchronization output
31	GND	POWER	Ground signal for digital and analog
32	GND	POWER	Ground signal for digital and analog
33	NC	NC	No Connection
34	SADDR_SLCT	INPUT	Sensor slave address select signal. By default, this is pulled low.
35	NC	NC	No Connection
36	NC	NC	No Connection
37	GND	POWER	Ground signal for digital and analog
38	GND	POWER	Ground signal for digital and analog
39	CAM_TRIGGER	INPUT	External trigger input to sensor (Active low signal-Internally pulled-up)
40	NC	NC	No Connection
41	V _{DD}	POWER	1.8V supply for Sensor Digital domain
42	STROBE	OUTPUT	Strobe output from Sensor
43	GND	POWER	Ground signal for digital and analog
44	RESET_BAR	INPUT	Active low Reset signal; RC Circuit present in the Module board itself.
45	V _{AA}	POWER	2.8V supply for Analog and PLL section
46	PWDN	INPUT	Active High Power down mode enable (Internally pulled-down)



47	NC	NC	No Connection
48	GND	POWER	Ground signal for digital and analog
49	NC	NC	No Connection
50	NC	NC	No Connection

5.1 Mating Connector Detail

Connector	Description	Manufacturer	Part Number
On-board Connector	Board - Board Receptacle, 50Pin 0.635 mm pitch Vertical SMD. Connector mounted on e-CAM10_CU0130_MOD.	Samtec	QTS-025-01-L-D-A
Mating connector (suggested)	Board - Board Plug, 50 Pin 0.635mm pitch Vertical SMD. Suggested connector on your application board.	Samtec	QSS-025-01-L-D-A

6 Electrical Specification

6.1 Recommended Operating Condition

Parameter	Typical Operating Voltage	Power consumption (@ 74.25MHz PIXCLK)
V _{DD}	1.8 V	65 mA Maximum
V _{DD_IO}	2.8 V	35 mA Maximum
V _{AA}	2.8 V	70 mA Maximum

6.2 Functional Temperature range

Temperature Range	Parameter Description
-30°C to 70°C	Electrically functional operating range ¹
0°C to 50°C	Stable image operating range ²

¹sensor functions but image quality may be noticeably different at temperatures outside of stable image range.

²Image quality remains throughout this temperature range.

Note: As the temperature increases, the noise level also increases.

6.3 DC Characteristics

Typical conditions: V_{AA} = 2.8V, V_{DD_IO} = 2.8V, V_{DD} = 1.8V and -30°C < T_A < 70°C

Symbol	Parameter	Min	Typ	Max	Unit
Digital Input signals					
V _{IL}	Input voltage Low			0.84	V
V _{IH}	Input voltage HIGH	1.96			V
C _{IN}	Input Capacitance			2.5	pF



Digital Output signals					
V_{OL}	Output voltage LOW			0.4	V
V_{OH}	Output voltage HIGH	2.5			V

e-con Systems strongly recommends the working voltage levels to be typically 2.8V DC and not to reach the Max limit.

6.4 SLAVE Address selection

The Sensor I²C slave address can be selected from the following configurations.

SADDR_SLCT	Write Address	Read Address
Pulled LOW (0)	0x20	0x21
Pulled Up (1)	0x30	0x31

6.5 Digital Video Output Timing Characteristics

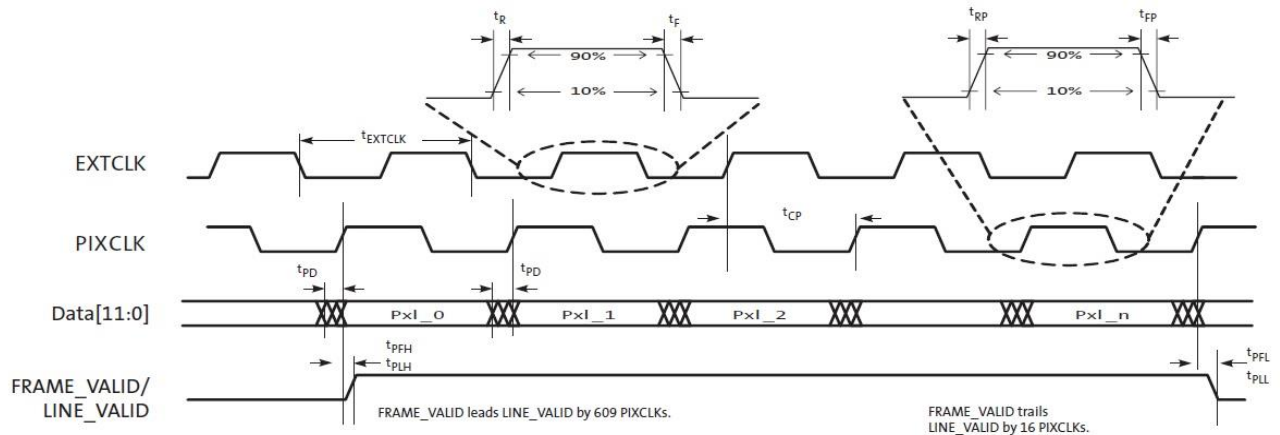


Figure 2: e-CAM10_CU0130_MOD Digital video out timing diagram

Typical conditions: $V_{AA} = 2.8V$, $V_{DD_IO} = 2.8V$, $PIXCLK = 74.25MHz$, $C_L < 10pF$

Symbol	Parameter	Min	Typ	Max	Unit
t_{rp}	PCLK rise time	2		7	ns
t_{fp}	PCLK fall time	3		8	ns
t_{PD}	PCLK falling edge to Data valid	-2		4	ns
t_{PFH}	PCLK falling edge to FV high	-2		4	ns
t_{PLH}	PCLK falling edge to LV high	-3		4	ns



6.6 I²C Interface Timing Characteristics

When Slave Address Select (SADDR_SLCT) is low, the slave address of sensor is 0x20 (Write) and 0x21 (Read).

When Slave Address Select (SADDR_SLCT) is High, the slave address of sensor is 0x30 (Write) and 0x31 (Read).

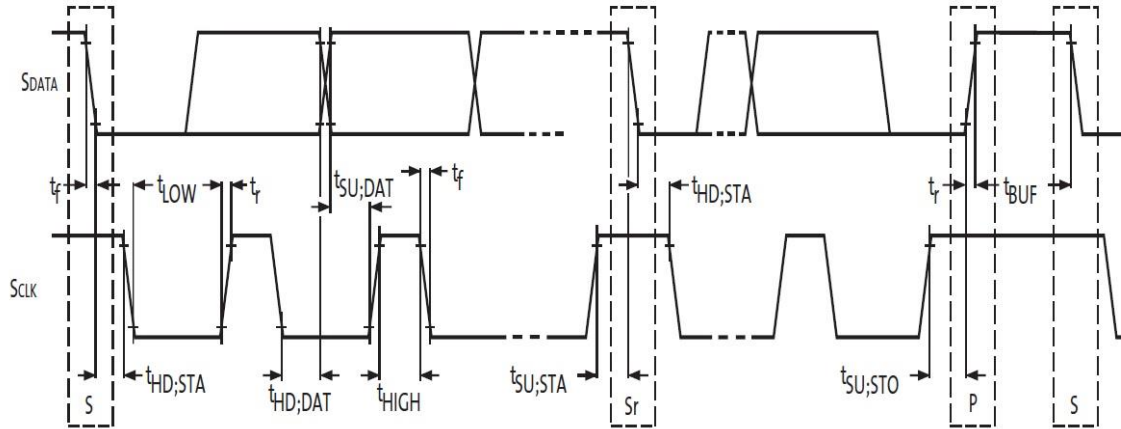


Figure 3: e-CAM10_CU0130_MOD SCCB interface timing diagram

Typical conditions: $S_{CLK} = 100 \text{ KHz}$ and $EXTCLK = 24\text{MHz}$

Symbol	Parameter	Standard-Mode		Fast-Mode		Unit
		Min	Max	Min	Max	
f_{SCL}	Clock frequency		100		400	KHz
t_{LOW}	Clock low period	4.7		1.3		μs
t_{HIGH}	Clock high period	4.0		0.6		μs
t_{AA}	SIOC low to data out valid	0.1	0.9			μs
t_{BUF}	Bus free time before new start	4.7		1.3		μs
$t_{HD;DAT}$	Data hold time	0	3.45	0	0.9	μs
$t_{SU;DAT}$	Data setup time	0.25		0.1		μs
$t_{SU;STO}$	Stop condition setup time	4.0		0.6		μs
t_R	S_{DATA} and S_{CLK} rise time		1		0.3	μs
t_F	S_{DATA} and S_{CLK} fall time		0.3		0.3	μs
t_{DH}	Data out hold time	0.05				μs



6.7 Power-Up Sequence

e-CAM10_CU0130_MOD Camera module uses 1.8V for camera's digital core power. There should not be any I²C activity during power-up. e-con Systems recommends implementing the following power on sequences in the customer design.

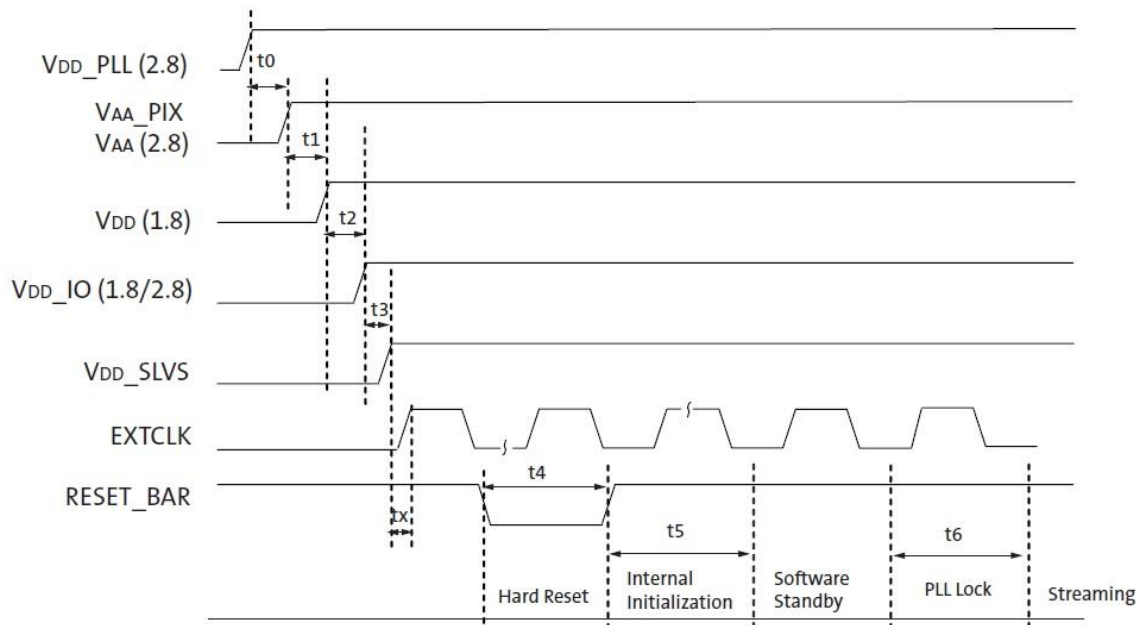


Figure 4: e-CAM10_CU0130_MOD camera module power-up sequence

Where:

- $t_0 \geq 0$ ms; V_{DD_PLL} stable to V_{AA_PIX} and V_{AA} .
- $t_1 \geq 0$ ms ; delay from V_{AA_PIX} to V_{DD} .
- $t_2 \geq 5$ us ; delay from V_{DD} stable to V_{DD_IO} .
- $t_3 \geq 0$ ms; delay from V_{DD_IO} to V_{DD_SLVS} (V_{DD_SLVS} is do not connect pin).
- t_x is 10-100ms external clock settle time.
- $t_4 \geq 1$ ms; Hard reset time is the minimum time required after power rails are settled.
- $t_5 \geq 150000$ EXTCLKs.
- $t_6 \geq 1$ ms; PLL lock time.



7 Mechanical Specification

Module size is 30mm x 30mm and the stack-up height of the board with its mating connector is 5mm. The height of the S-Mount lens holder is 13mm and the actual height of the module above the PCB depends on the lens chosen. The datasheets of the connectors, the S-mount lens holder and the modules mechanical drawing in DXF File format are available on request.

7.1 e-CAM10_CU0130_MOD Module Mechanical Drawing

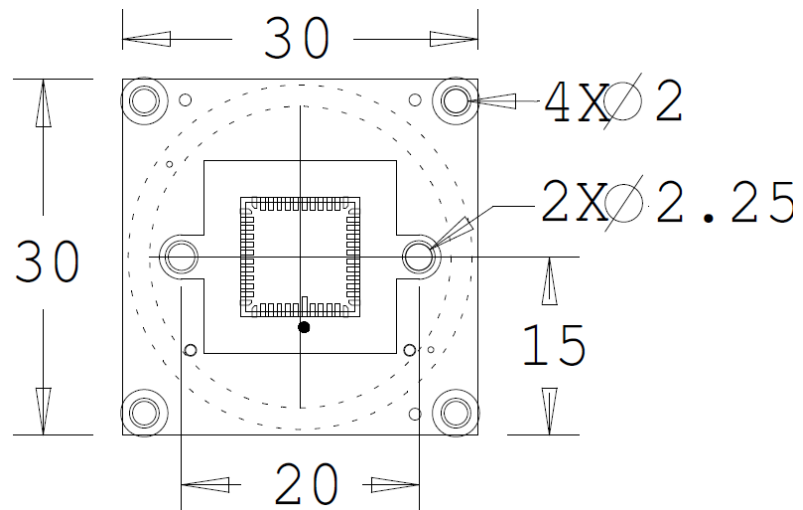


Figure 5a: e-CAM10_CU0130_MOD Top drawing with Optical orientation

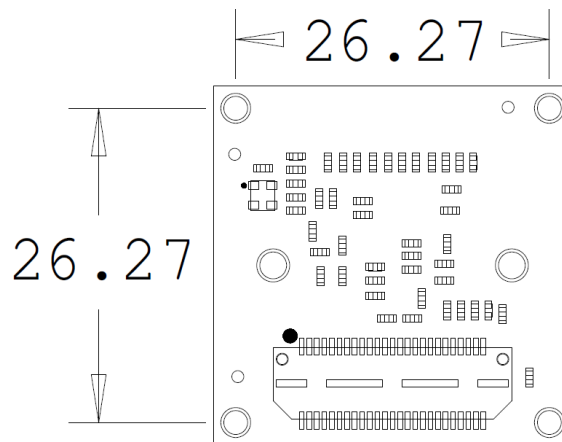


Figure 5b: e-CAM10_CU0130_MOD bottom drawing (mirrored)



7.2 S-Mount Lens Holder Drawing

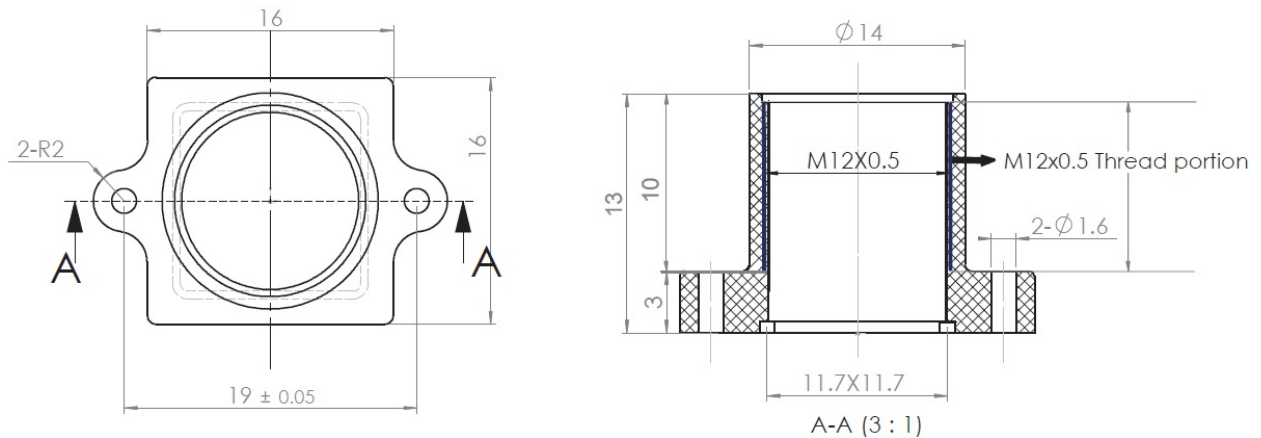


Figure 6: e-CAM10_CU0130_MOD camera module's S-Mount holder outline dimension drawing

Note – All dimensions are in mm.

7.3 Mechanical Part Details

Below table indicates the list of mechanical accessories for e-CAM10_CU0130_MOD camera board.

Part	Quantity	Specification	Comments
Lens Holder	1	Standard S-Mount Lens (M12P0.5) plastic Lens holder mounted on the e-CAM10_CU0130_MOD	
Lens holder screw	2	1.6mm diameter self-tapping screws	
Module connector (QTS-025-01-L-D-A)	1	Samtec vertical SMD 50 pin 0.635mm pitch, board-board connector.	
Lens		Lens is optional. The lens holder is M12 S-mount and any compatible S-mount lens can be used with this camera module.	S-mount lenses are available from various vendors. Please refer our article http://www.e-consystems.com/choosing_custom_lens_camera.asp

8 Conclusion

Thus the features and specification of e-CAM10_CU0130_MOD is explained in this datasheet.

