



General Description

The iP2986 is a high-performance ISP (Image Signal Processor) supporting Bayer pattern Raw data input of CMOS sensor. It performs color process, noise reduction, data formatter...etc. Its output support 8bit CCIR601 (YUV422) up to 108MHZ to connect video interface of Video Codec SoC, It performs 30fps @ 1280 x 1024 resolution in YUV output data. Besides, iP2986 can also support YUV input CMOS sensors. iP2986 supports DC-iris lens to make Auto-iris control. It accompanies DAC and driver to drive DC-iris motors. iP2986 could support CVBS output(TV Output) by connecting external TV encoder. Furthermore, iP2986 integrated scaler and JPEG encoder equips a high-speed DMA port. The JPEG encoder also support up to 1.3M @ 30fps by DMA port. iP2986 can support auto-focus function for specific auto-focus lens.

Features

- Support CMOS sensors up to 1.3M pixels, e.g. Raw data Sensor : Aptina 9M033/9M034, OV9715/9712, Panasonic 34MN031 YUV (SoC) sensor : 9M131
- Support DC-iris lens to implement Auto-iris function
- Support video input formats : RGB raw data ,YUV, CCIR656
- Support TV encoders for CVBS/AV Output
- Provide DMA capability, 8-bit parallel port
- Provide a Scaler to smoothly scale input image down to any resolution

Features (cont.)

- Integrate an JPEG compression encoder
- Provide Motion Detection function up to 1200 sub-blocks to satisfy small rage detections @ JPEG encoder mode
- Auto gain controls for each R/G/B channel
- Enhanced image process engine
- Frame rates up to 7.5fps @ SXGA(1280x1024), 30fps @ 640x480, through USB interface
- Frame rate up to 15fps @ SXGA(1280x1024) with JPEG data through DMA port
- Frame rates up to 30fps @ SXGA(1280x1024) with YUV data through parallel video port
- Gamma correction function
- Auto white balance function (AWB)
- Auto exposure function (AE)
- 80-pin LQFP package (10 X 10 mm²)

Applications

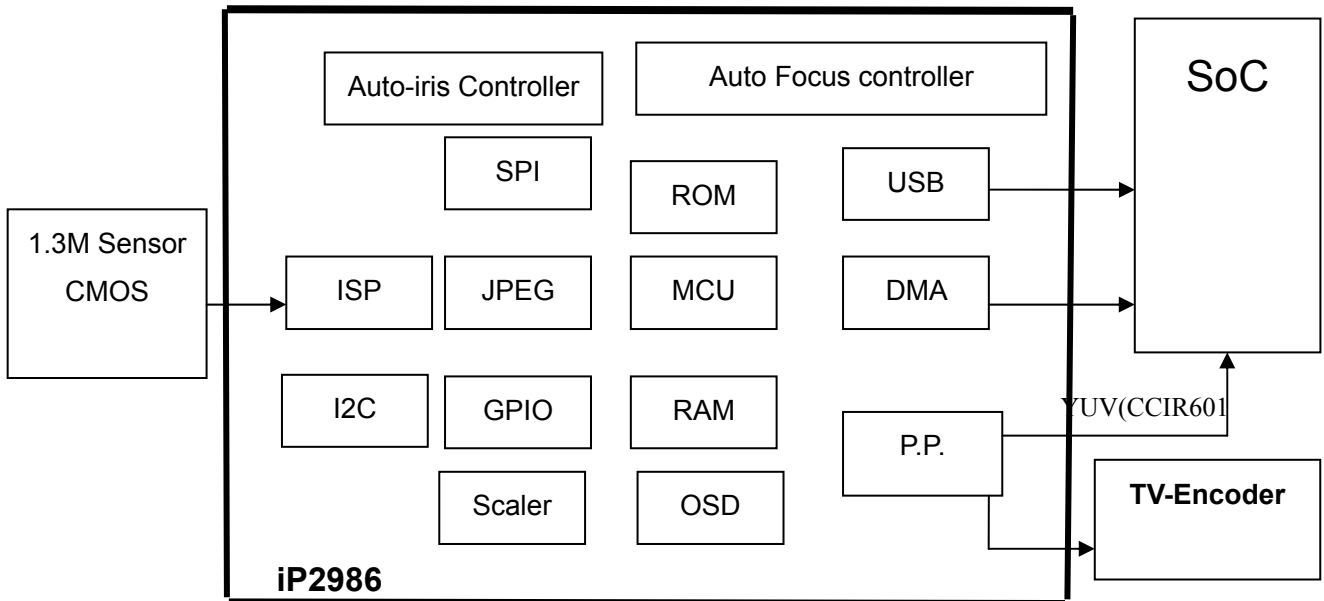
- HD IP/WiFi Camera
- Digital Photo Frame embedded Camera
- Power Line Camera
- HD-SDI CCTV Camera



iP2986

1.3M-Pixel ISP supporting Auto-iris for HD CMOS

- Block Diagram**

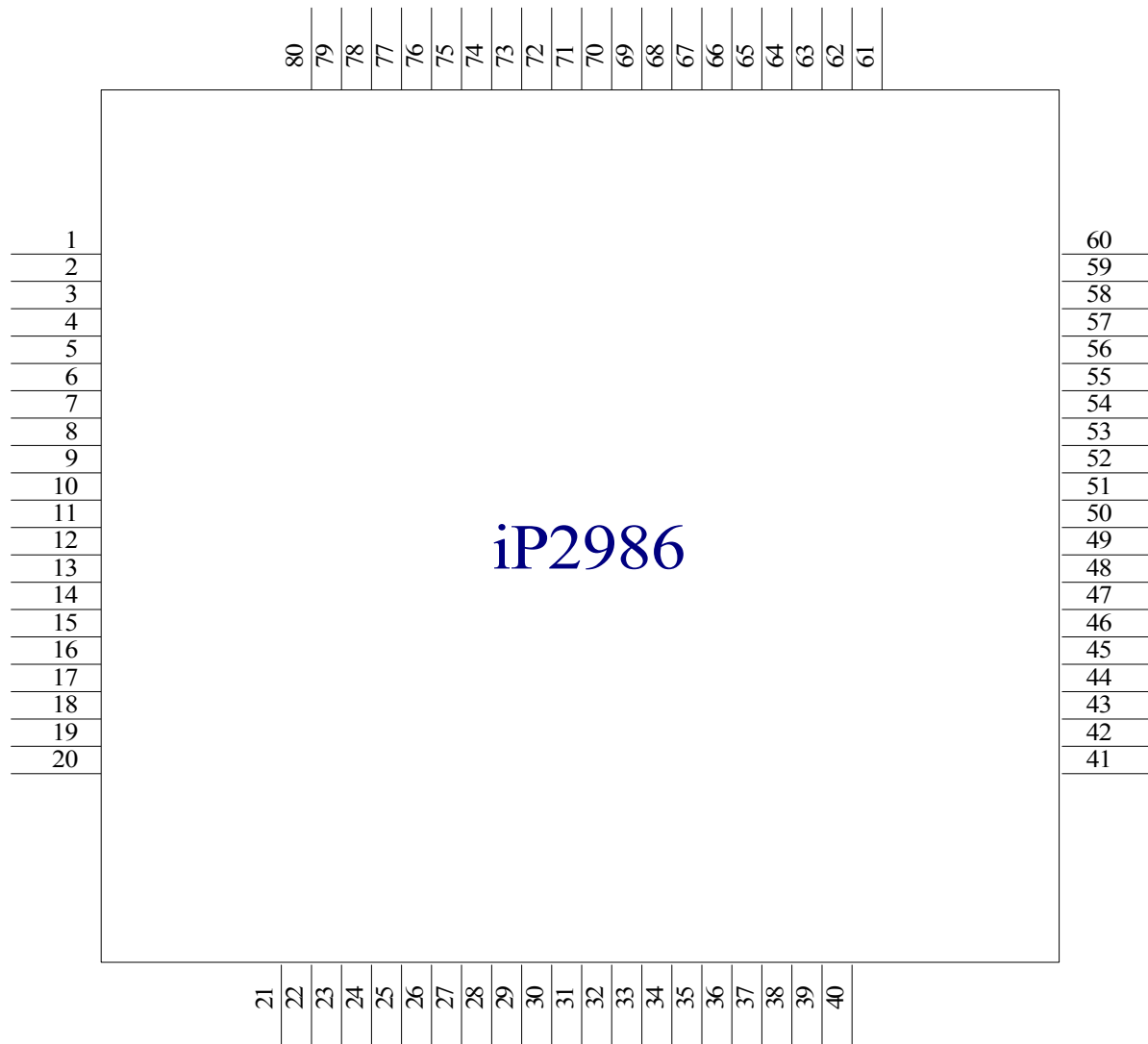




iP2986

1.3M-Pixel ISP supporting Auto-iris for HD CMOS

Pin Configuration



Note :

- 1) P12 means Port1_2



Function Description

1. DMA port description

The iP2986 supports Direct Memory Access(DMA) bus to enhance the performance of data transfer of the iP2986. In the DMA mode, the iP2986 will issue “dma_req” to the host to ask for its reading from FIFO. The reading task is enabled by the “dma_csn” (chip-select) and “dma_rdn” (read-enable) signals affirmed from the host. During the course of continuous reading, the appropriate addresses will be generated automatically by the iP2986. The JPEG bit stream will be read out byte by byte via the DMA bus. Due to the high speed data transfer of the FIFO data from the iP2986 to the host, the JPEG encoder can thus generate higher quality images.

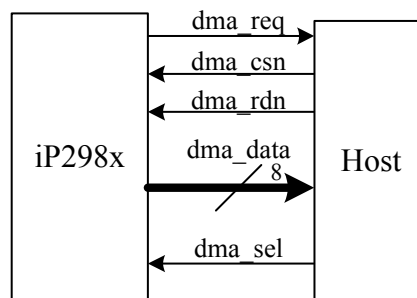


Figure. DMA bus interface

1.1 Ports description

Port A	Port B	Attr.	Description
dma_d7	port2_7	Output	DATA [7], parallel data bit 7
dma_d6	port2_6	Output	DATA [6], parallel data bit 6
dma_d5	port2_5	Output	DATA [5], parallel data bit 5
dma_d4	port2_4	Output	DATA [4], parallel data bit 4
dma_d3	port2_3	Output	DATA [3], parallel data bit 3
dma_d2	port2_2	Output	DATA [2], parallel data bit 2
dma_d1	port2_1	Output	DATA [1], parallel data bit 1
dma_d0	port2_0	Output	DATA [0], parallel data bit 0
dma_req	port0_7	Output	DREQ, data valid signal
dma_rdn	port0_6	Input	RD_n, read enable signal from Host
dma_csn	port3_7	Input	CS_n, chip select signal from Host
dma_sel	port0_5	Input	JSEL, jpeg channel selection

1.2 Data Format

- 1.2.1. A complete jpeg image will be started by SOF code, 0xFFD8, and ended by EOF code, 0xFFD9. Please drop the jpeg image out if SOF or EOF codes are not included in the jpeg stream.
- 1.2.2. Since the jpeg header is customized, the header may include any possible codes. Please just bypass the jpeg header when trying to filter the **specified data** out.
- 1.2.3. The number of the jpeg header is ordinarily 537 bytes. But it may vary in different applications.

1.3 Timing diagram

1.3.1. Start Condition, the iP2986 will drive DREQ from low to high state:

The start condition will occur when the buffer fullness is over the buffer threshold size set by the customer.

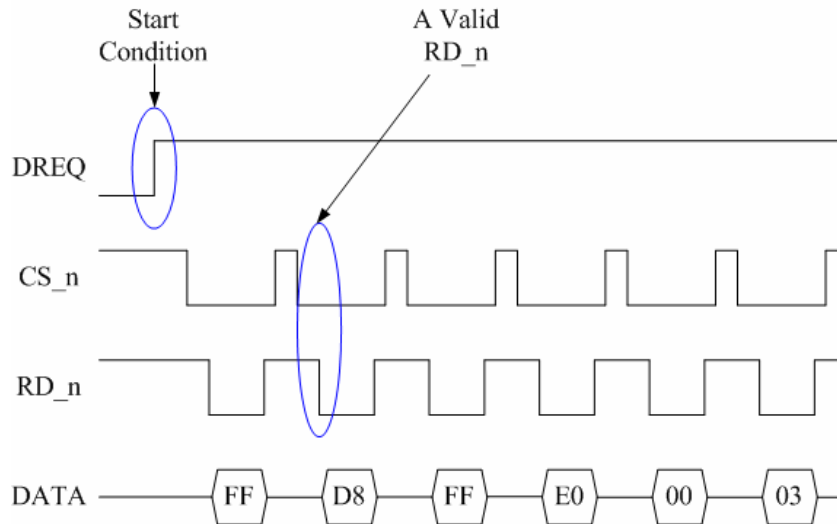


Figure. The timing diagram of the start condition

1.3.2. End Condition, the iP2986 will drive DREQ from high to low state:

The DREQ will be driven from high to low state **all the data are sent to the host**. For example, if the host needs 1024 bytes for one request, the End Condition will occur after the 1024 bytes, including dummy data if necessary, are sent to the host.

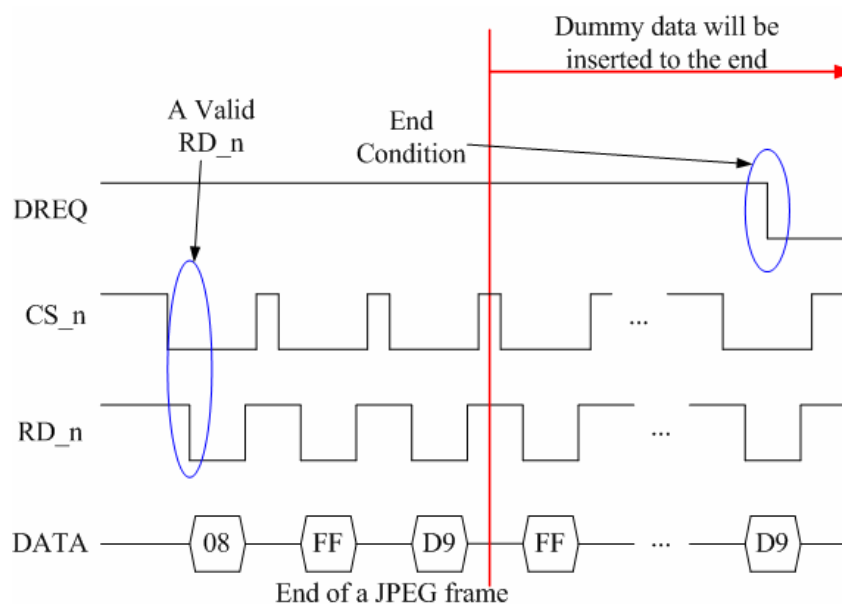


Figure. The End Condition of one request

1.3.3. Image Frame End Code:

The JPEG image frame will end by sending an EOF code, 0xFF, followed by 0xD9. If there is no dummy data in the request task which includes the EOF code, the EOF code will be the last 2 sending data. And if the dummy data are inserted in the request task, the last dummy data 0xFF will be replaced by 0xD9.

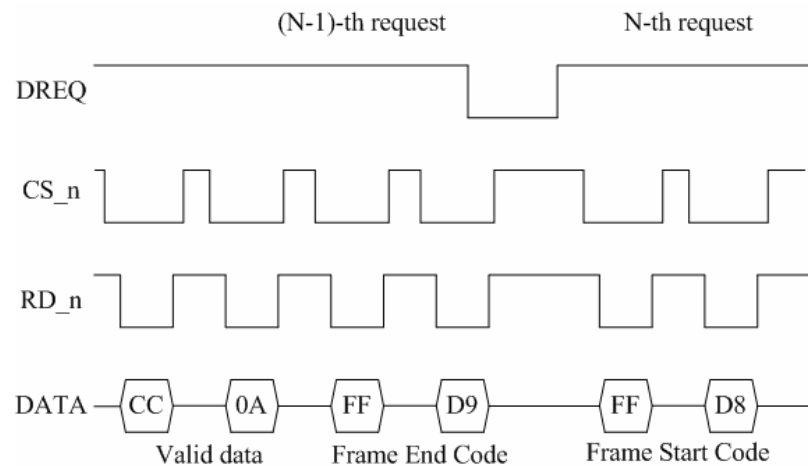


Figure. The request task including the EOF code without dummy data

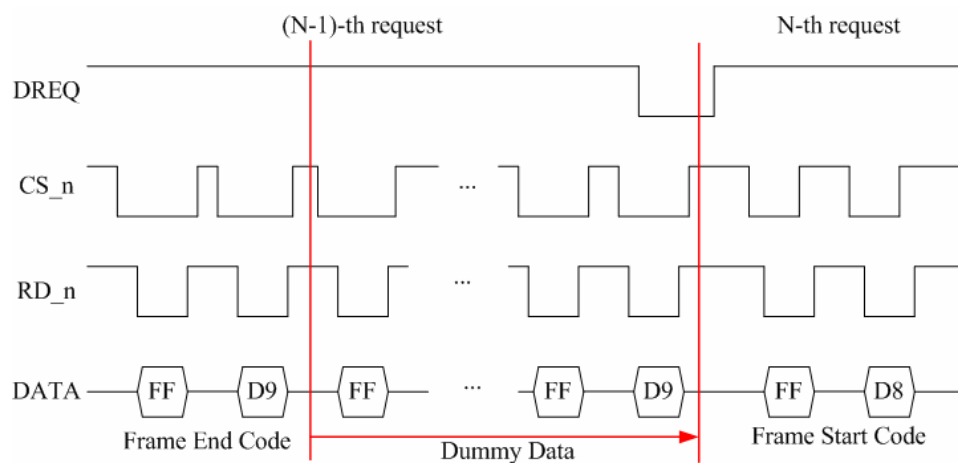


Figure. The request task including the EOF code with dummy data

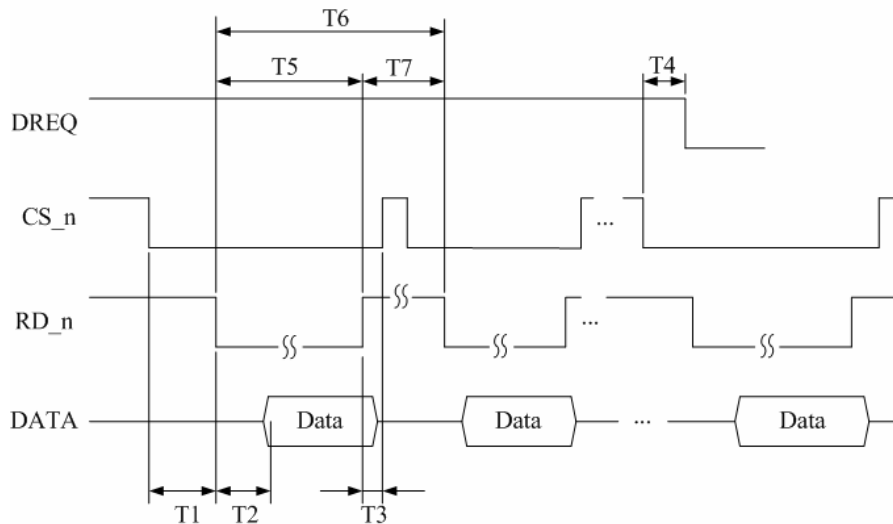


1.4 Timing Response

1.4.1. Timing

Symbol	Description	Min.	Max.	Unit
T1	RD_n active delay	8.0	---	ns
T2	Data output delay	---	40	ns
T3	CS_n hold for reading inactive	9	---	ns
T4	DREQ inactive delay	---	40	ns
T5	RD_n active in hold	50	---	ns
T6	Rd_n cycle time	100	---	ns
T7	Rd_n inactive in hold	19	---	ns

1.4.2. Waveform

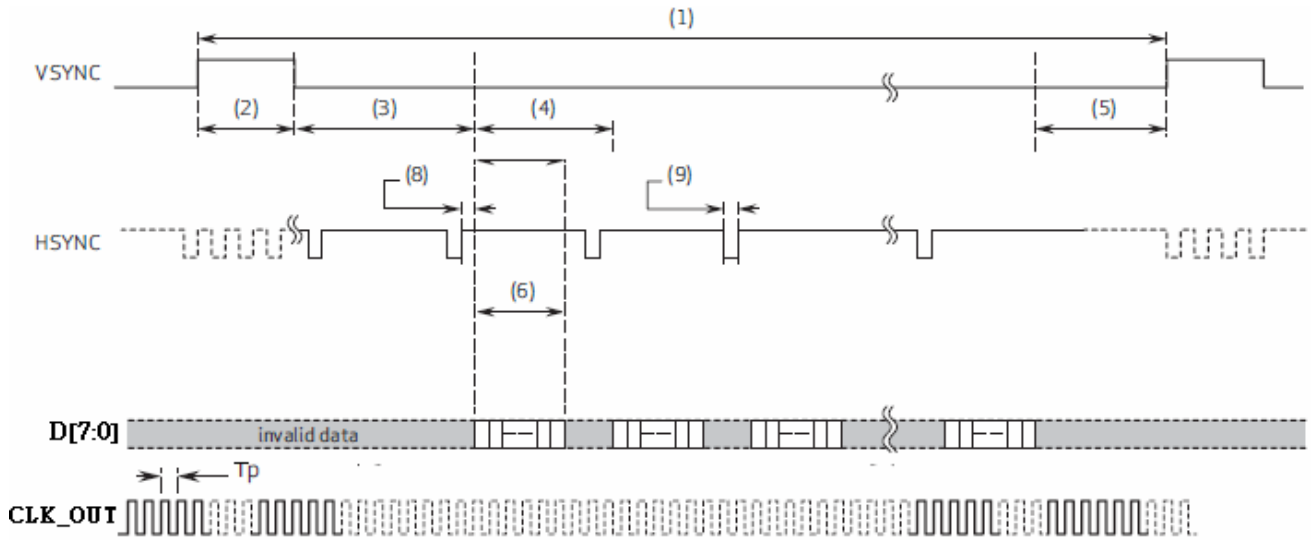


Data Format v.s. Data Output Path (Output Port) :

Data Format	YUV/CCIR656 without JPEG	YUV/CCIR656 with JPEG
Output Bus		
DMA		15fps@1.3M(1280x1024) 60fps@300K(640x480)
Parallel Video Prot	Max. 30fps@1.3M(1280x1024)	No
USB	No	8fps@1.3M(1280x1024) 30fps@300K(640x480)



1.5 YUV(CCIR601) Output Timing



Note :

1. Timing value of (1),(2)...(9) is dependent on sensor



2 Motion Detection Function

This function is triggered when object movement in the active area is detected. A detection message can be generated together with the image data. It can also generate a signal through a General I/O to trigger an I/O device, such as a buzzer alarm. The active area can be divided into over 400 blocks in a full screen. It means the active area can be made small enough to avoid false alarms.

3 Scaler Function

When the application requires a smaller resolution than 1.3M pixels, a scaler function is necessary to preserve the image quality. Without a true scaler, the resulted images most likely will become jaggy and blurred. Often the colors will be off too. The iP2986 provides a true scaler to smoothly scale down the image from 1.3M pixels to any smaller resolutions. Some examples are such as 720x480, 240x720,240x360,240x320,160x120,128x160,120x176...etc.



Recommended Operating Conditions

Parameter	Limit			Unit
	Min	Typ	Max	
I/O DC supply Voltage	3.0	3.3	3.6	Volt
Temperature	0	25	70	°C

DC Electrical Characteristics

Parameter	Symbol	Limit			Unit	Test Condition
		Min	Typ	Max		
Low level Input Voltage	V_{IL}			0.8	V	CMOS interface
		0.8		1.2		CMOS Schmitt trigger interface
High level Input Voltage	V_{IH}	2.0			V	CMOS interface
		1.4		2.0		CMOS Schmitt trigger interface
Low level Output Voltage	V_{OL}			0.4	V	$I_{OL} = 4mA$
High level Output Voltage	V_{OH}	2.4			V	$I_{OH} = 4mA$
Input Current	I_I	-10		10	μA	$V_{dd} = MAX, 0V \leq V_{in} \leq 5.5V$
Input Current with 40k Ω pull-down		40		160	μA	$V_{in} = V_{dd}$
Input Current with 40k Ω pull-up		-160		40	μA	$V_{in} = 0$

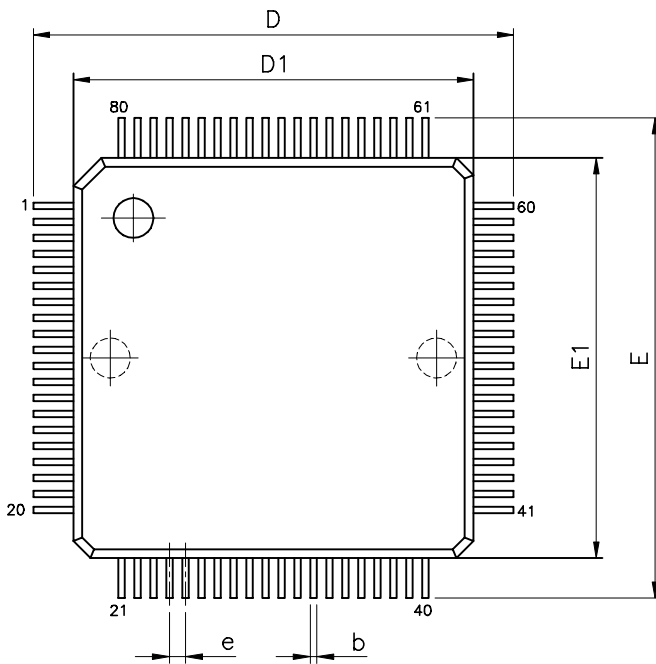
AC Electrical Characteristics(TBC)

Parameter	Symbol	Limit			Unit
		Min	Typ	Max	
Sensor Clock	SCLK			48	MHz
Crystal Input	XTAL_IN			12	MHz
Serial Interface Clock	SCL			1	MHz



Package Information

- 80 Pin LQFP



VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	MAX.
A	--	1.6
A1	0.05	0.15
A2	1.35	1.45
c1	0.09	0.16
D	12 BSC	
D1	10 BSC	
E	12 BSC	
E1	10 BSC	
e	0.4 BSC	
b	0.17	0.27
L	0.45	0.75
L1	1 REF	

NOTES:

1. JEDEC OUTLINE: MS-026 BCE
2. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25mm PER SIDE. D1 AND E1 ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED THE MAXIMUM b DIMENSION BY MORE THAN 0.08mm.

