EM2700/2800 Datasheet

April 17, 2003

Document Rev B

EM2700/2800 USB2.0 Video Controller is a highly integrated VLSI that provides a cost-effective solution for video capture application. As illustrated in the system block diagram, a PC-camera subsystem requires only three chips: CMOS imager, EM2700 and AC 97 codec. Application of such a system can be video phone, video mail. A video capture solution requires three chips only: Video decoder, EM2800 and AC 97 codec. Application of such a system can be TV on PC, Camcorder video capture and editing.

As shown in the functional block diagram, the EMPIA-2700/2800 consists of 6 main blocks

- **Video/Audio Input Port**
- **USB 2.0 Transceiver**
- **Compression Engine**
- **GPIO, Two Wire Serial Bus, AC 97 Interface**
- **USB 2.0 Serial Interface Engine**
- **Color Enhancement**

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Features

No external memory required, No external USB 2.0 PHY required

Flexible Video Input Port

8-bit video input port
Bayer RGB
Interlace and non-interlace video (For EM2800 only)
CCIR-601 4:2:2 YUV (For EM2800 only)
CCIR-656 YUV with embedded sync and field ID (For EM2800 only)
Field/Frame drop control (For EM2800 only)

Bayer RGB Color Processor

Auto black clamping and user-defined black clamping
Gamma correction
Bayer pattern filtering
Gain and offset control in YUV space
Random ratio down scaling
Auto exposure and white balance

YUV Color Processor (For EM2800 only)

Gain and offset control in YUV space
Random ratio down scaling
2, 3, 4-tap horizontal filtering
2, 3-tap vertical filtering

Up to 30fps @ 720 x 480 size for video processor and compression

Proprietary compression algorithm for both still image and motion-video for USB 1.1
Auto-adjust compression ratio for USB 1.1
USB 1.1 support 30fps @ 320 x 240 resolution
USB 2.0 support 30fps @ 720 x 480 resolution

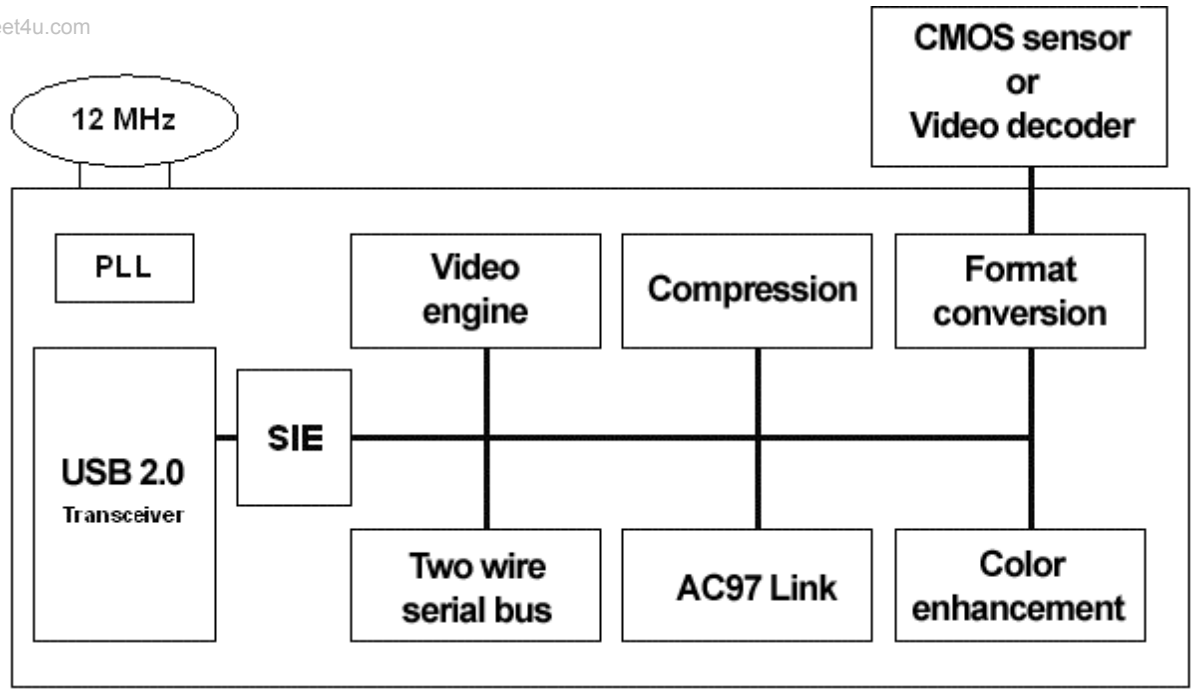
USB Port

On-chip USB Transceiver with High/Full speed compliant
USB 2.0 Isochronous Video pipe up to 24Mb/sec
USB 2.0 Isochronous Audio CD quality pipe up to 1.4Mb/sec
USB Audio Class compliant

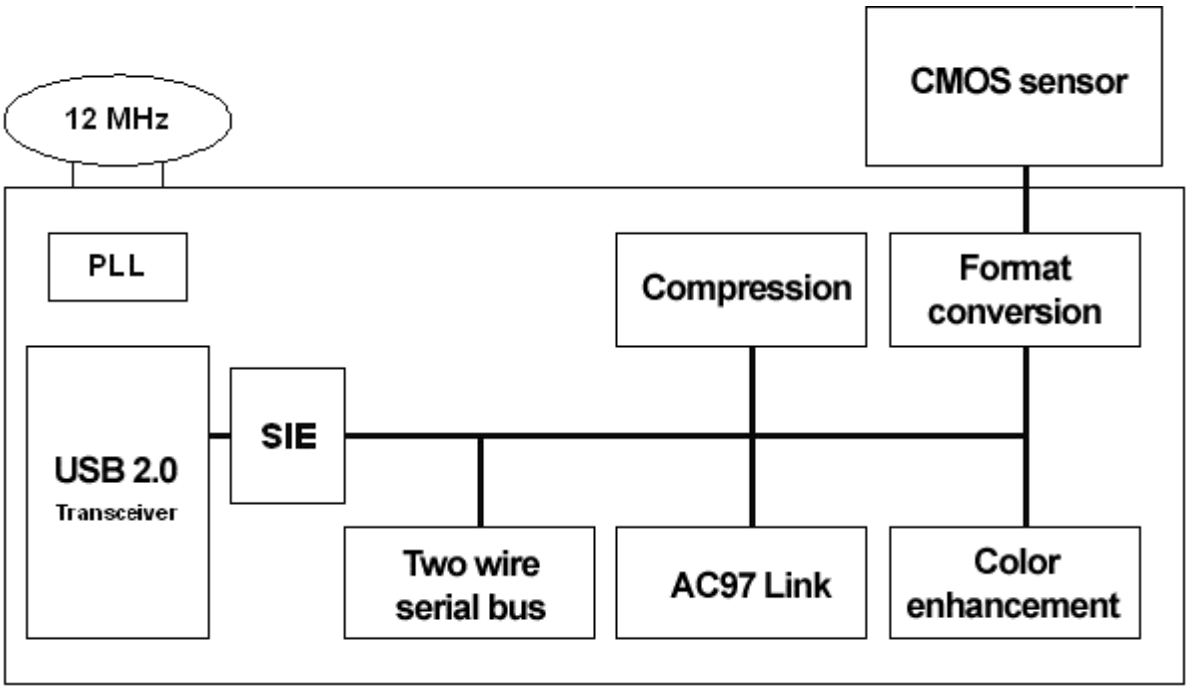
Miscellaneous

Two wire serial bus to program front end video devices
4 General I/O ports and 2 dedicated I/O port
AC97 link interface
2.5/3.3V Low power Technology
64-pin LQFP package

Block Diagram



EM2800 Block Diagram



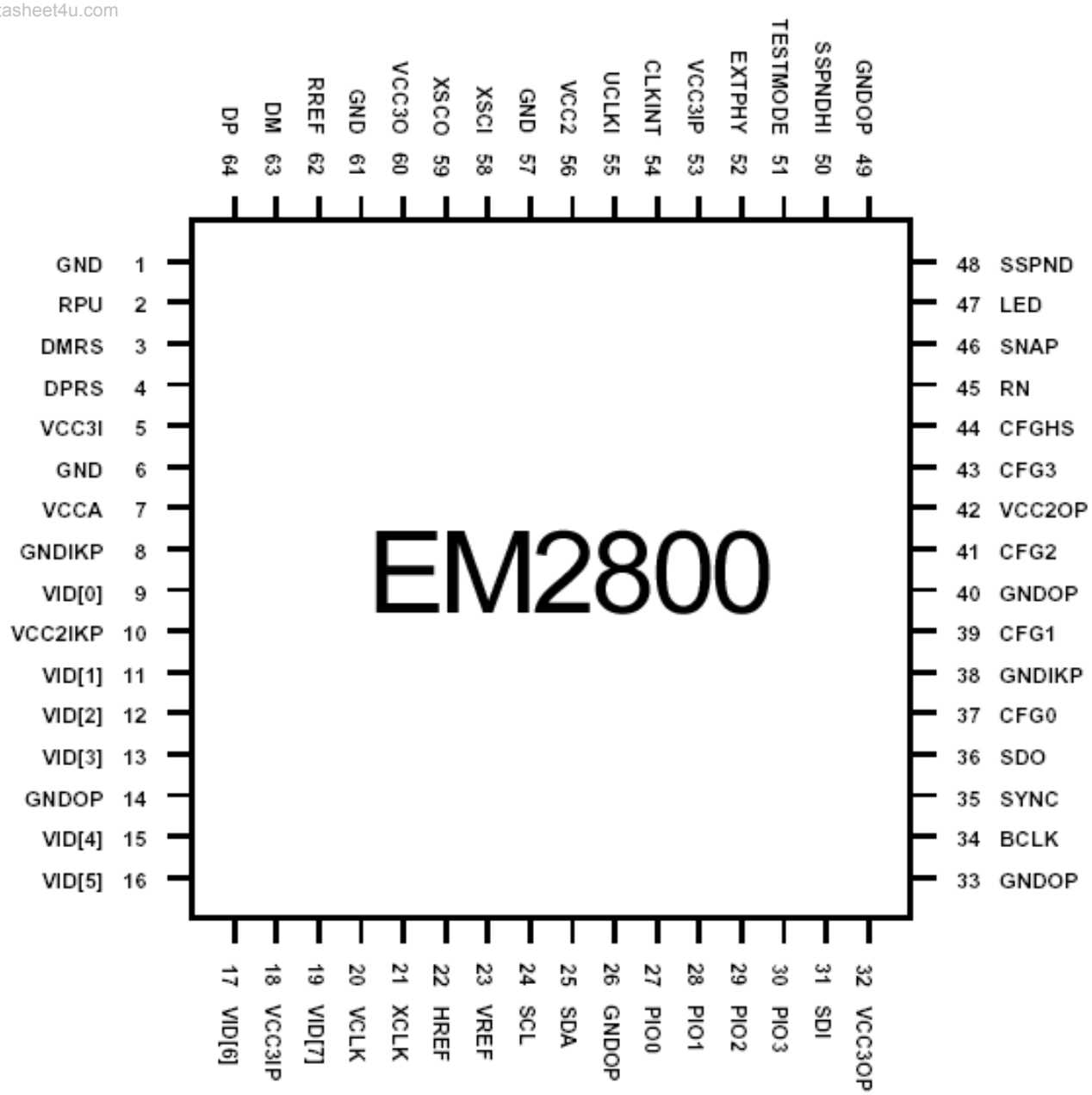
EM2700 Block Diagram

Pin Description

SYMBOL	PIN	I/O	DESCRIPTION
USB PORT			
RPU	2	I	
DMRS	3	B	
DPRS	4	B	
DM	63	B	
DP	64	B	
VIDEO			
VID[0]	9	I	VID[0] ~ VID[7] , Digital video data bus
VID[1]	11	I	
VID[2]	12	I	
VID[3]	13	I	
VID[4]	15	I	
VID[5]	16	I	
VID[6]	17	I	
VID[7]	19	I	
VCLK	20	I	Video reference clock from video source
HREF	22	I	Horizontal lock indicator
VREF	23	I	Vertical lock indicator
XCLK	21	O	Video synchronous clock output
AC97 LINK			
SDI	31	I	Serial TDM AC'97 input
BCLK	34	I	Bit clock output
SYNC	35	O	Sample Sync
SDO	36	O	Serial TDM AC'97 output
TWO WIRE SERIAL BUS CONTROL INTERFACE			
SCL	24	B	Serial bus clock, require 2K pull up resistor
SDA	25	B	Serial data, require 2K pull up resistor
GPIO PORT			
PIO0	27	B	GPIO Port bit 0
PIO1	28	B	GPIO Port bit 1
PIO2	29	B	GPIO Port bit 2
PIO3	30	B	GPIO Port bit 3
CONFIGURATION			
CFG0	37	I	Power on configuration bit 0
CFG1	39	I	Power on configuration bit 1
CFG2	41	I	Power on configuration bit 2
CFG3	43	I	Pull up enable USB audio, Pull down enable external audio
CFGHS	44	I	Connect to GND
RN	45	I	Chip Reset active Low
SNAP	46	I	Snap shutter active Low
LED	47	O	LED indicator
SSPND	48	O	Suspend HI
SSPNDHI	50	I	Pull up SSPND active HI (default), Pull down SSPND active Low
XSCI	58	I	Crystal input (12MHZ)
XSCO	59	O	Crystal output pad
RREF	62	O	With 12K_1% resister to GND
CLKINT	54	I	Connect to 3.3V
UCLKI	55	I	Connect to GND
TESTMODE	51	I	Connect to GND
EXEPHY	52	I	Connect to GND

OPERATION VOLTAGE			
VCC3I	5	I	DC 3.3V
VCC3IP	18	I	
VCC3OP	32	I	
VCC3I	53	I	
VCC3O	60	I	
AVDD	7	I	
VCCK	10	I	DC 2.5V
VCCKP	42	I	
VCC	56	I	
GND	1,6	I	GND
GNDIK	8	I	
GNDO	14	I	
GNDOP	26,33,38	I	
GNDIKP	40	I	
GNDO	49	I	

Pin Configuration



EM2700/2800 Pin Configuration

Section 4 – Electrical Specifications

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power Supply Voltage	-0.5	3.6	V
Voltage on any input	-0.5	3.6	V
Operating Temperature (Ambient)	0	70	°C
Storage Temperature	-65	150	°C

Note:
1. Stress beyond those listed may cause permanent damage to the device.
2. Input pins are 5V tolerant.

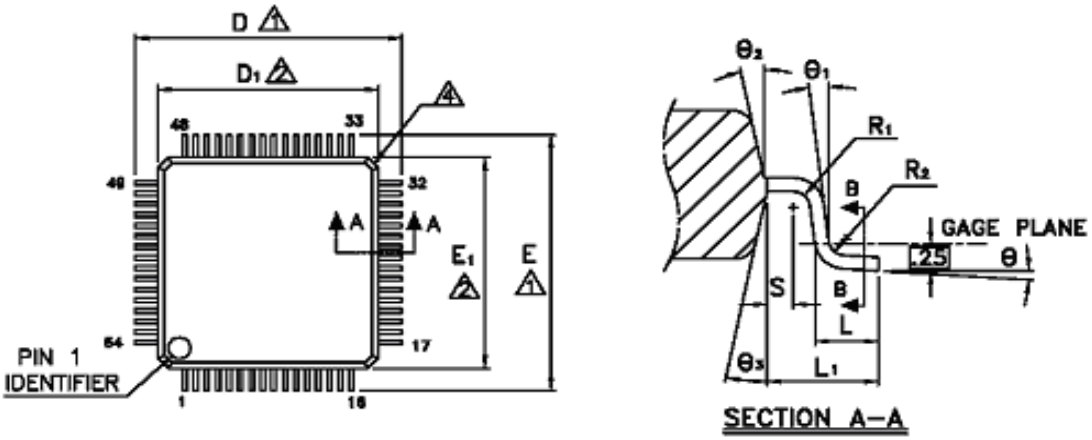
DC Characteristics

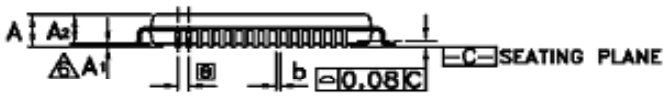
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage		3.0	3.3	3.6	V
V_{IH}	Input High Voltage	V_{cc} = 3.3V	2.0			V
V_{IL}	Input Low Voltage	V_{cc} = 3.3V			0.8	V
V_{OH}	Output High Voltage		2.4			V
V_{OL}	Output Low Voltage				0.4	V
I_{CC}	Supply Current	V_{cc} = 3.3V			70	mA
C_{IN}	Input Capacitance				7	pF
C_{OUT}	Output Capacitance				7	pF

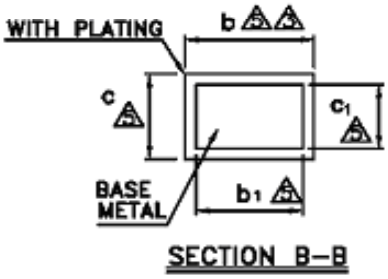
AC Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
F_{XTAL}	Crystal Frequency (at XIN and XOUT pins)			12.000		MHz

Section 5 - Packaging Information







Symbol	Dimension in mm			Dimension in inch		
	Min	Nom	Max	Min	Nom	Max
A	—	—	1.60	—	—	0.063
A1	0.05	—	0.15	0.002	—	0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
b	0.17	0.22	0.27	0.012	0.015	0.018
b1	0.17	0.20	0.23	0.012	0.014	0.016
c	0.09	—	0.20	0.004	—	0.008
c1	0.09	—	0.16	0.004	—	0.006
D	12.00 BSC			0.472 BSC		
D1	10.00 BSC			0.394 BSC		
E	12.00 BSC			0.472 BSC		
E1	10.00 BSC			0.394 BSC		
e	0.50 BSC			0.020 BSC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L1	1.00 REF			0.039 REF		
R1	0.08	—	—	0.003	—	—
R2	0.08	—	0.20	0.003	—	0.008
S	0.20	—	—	0.008	—	—
θ	0°	3.5°	7°	0°	3.5°	7°
θ1	0°	—	—	0°	—	—
θ2	12°TYP			12°TYP		
θ3	12°TYP			12°TYP		