

# EM2700/2800 Datasheet

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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

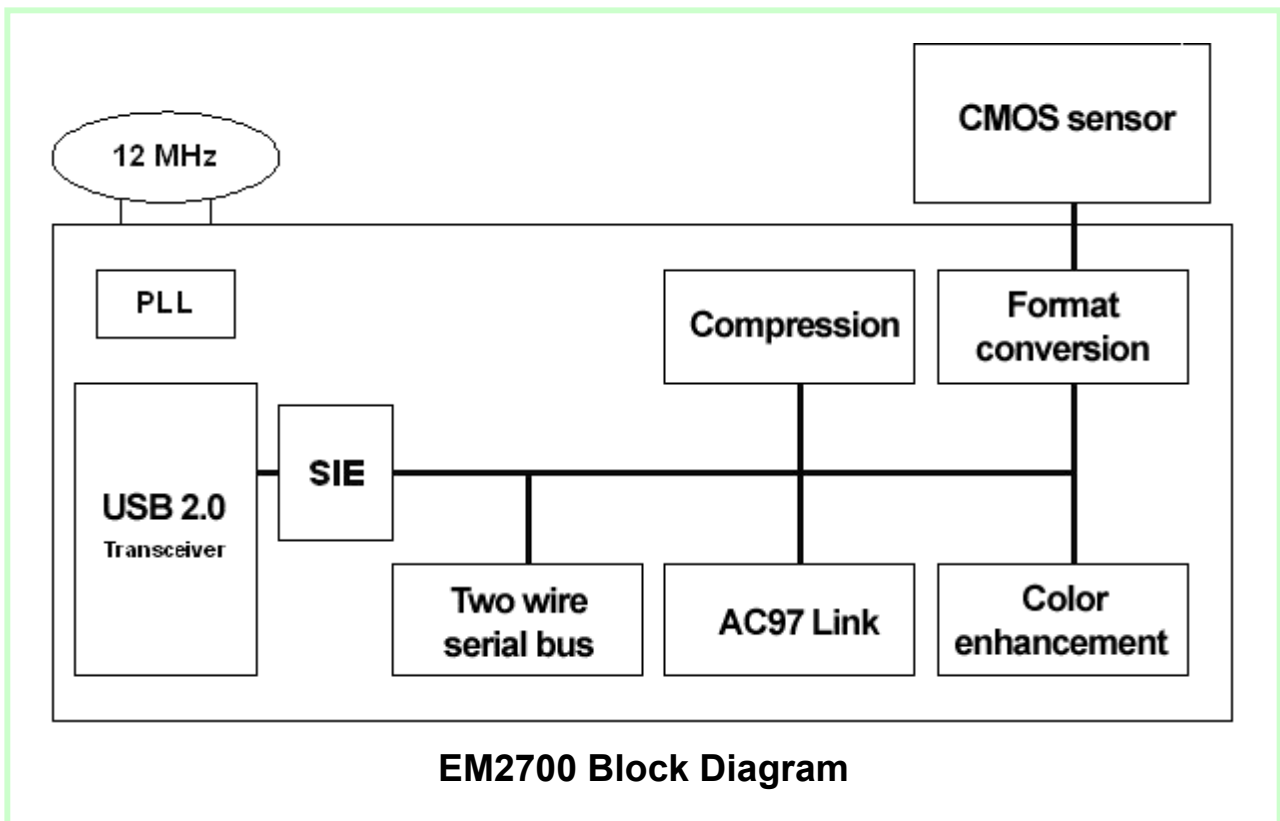
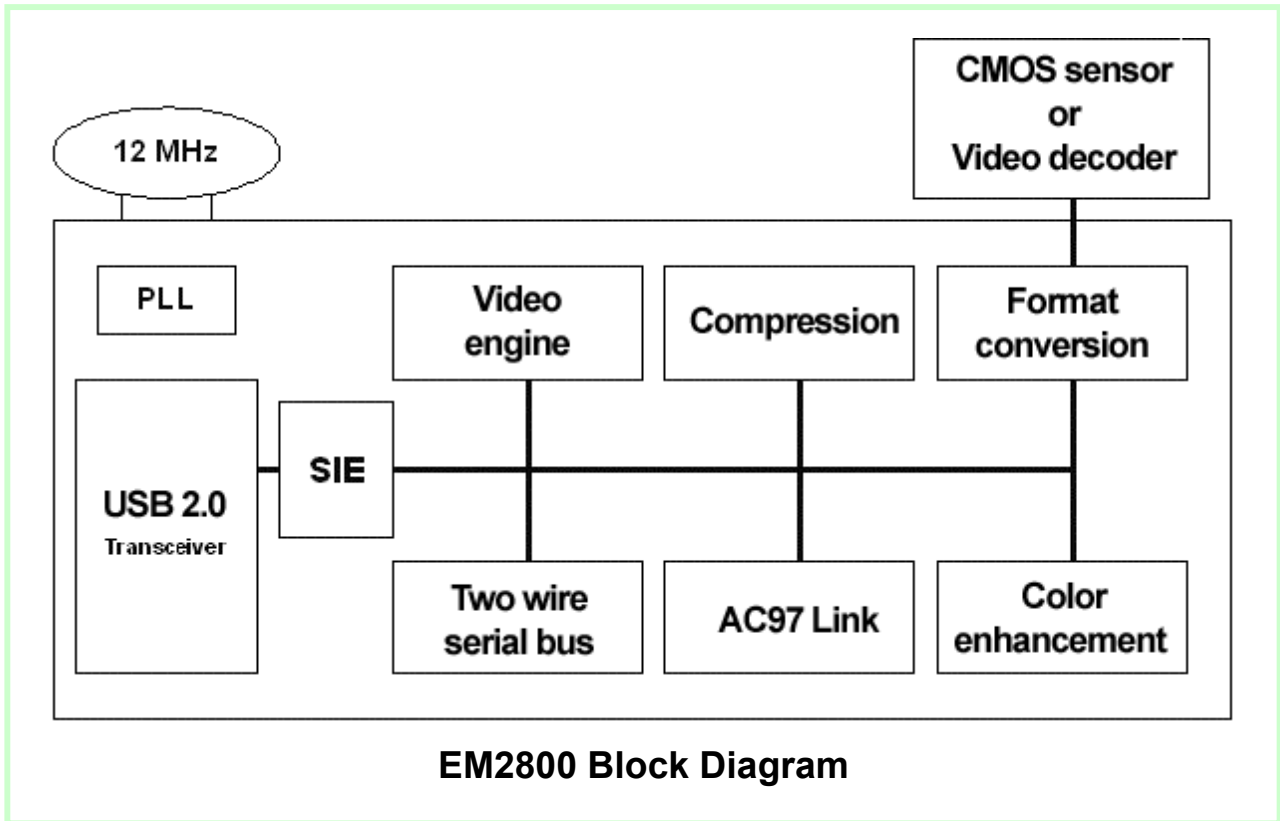
### USB Port

- 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

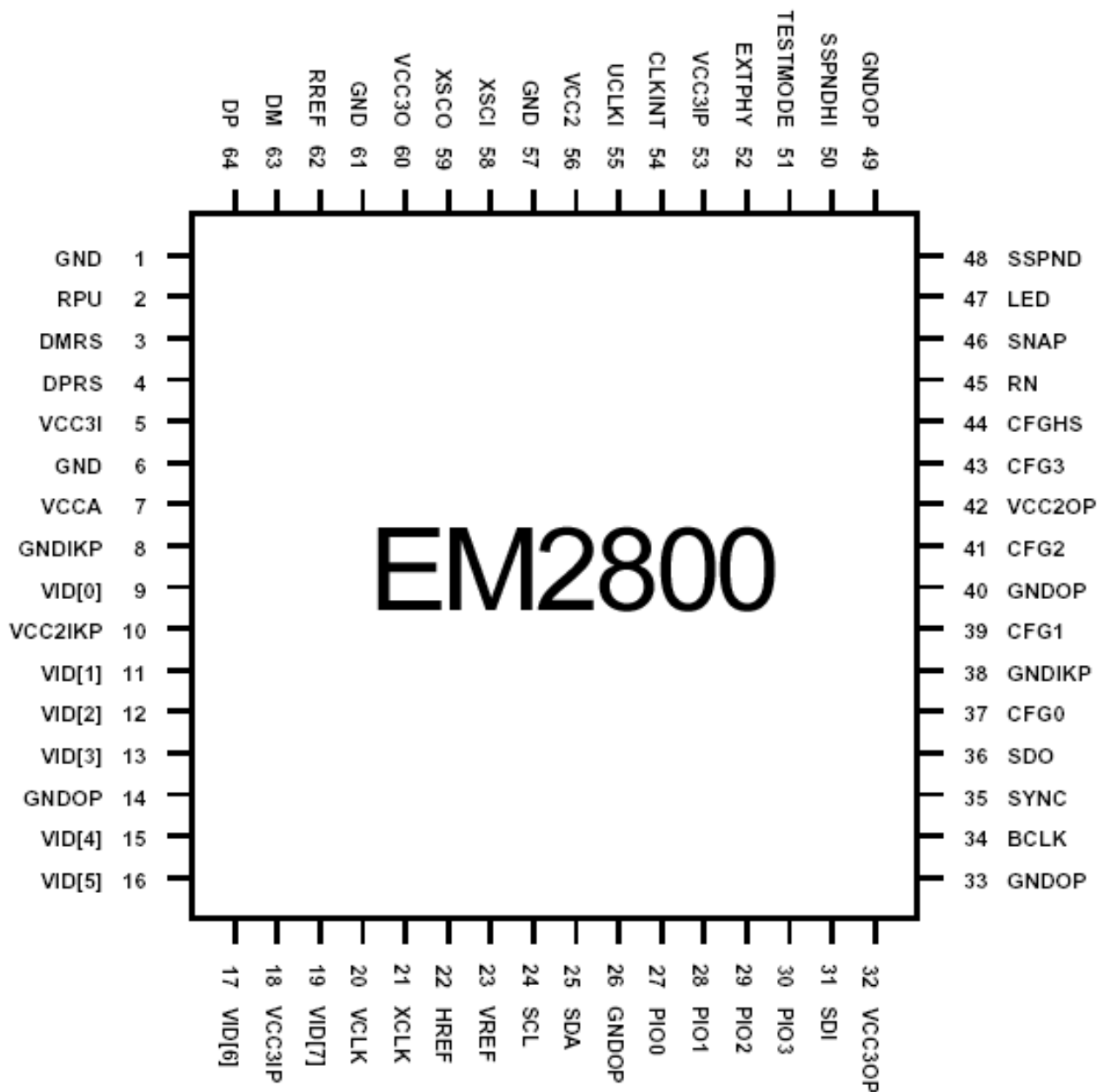


## Pin Description

SYMBOL	PIN	I/O	DESCRIPTION
<b>USB PORT</b>			
RPU	2	I	
DMRS	3	B	
DPRS	4	B	
DM	63	B	
DP	64	B	
<b>VIDEO</b>			
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
<b>AC97 LINK</b>			
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
<b>TWO WIRE SERIAL BUS CONTROL INTERFACE</b>			
SCL	24	B	Serial bus clock, require 2K pull up resistor
SDA	25	B	Serial data, require 2K pull up resistor
<b>GPIO PORT</b>			
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
<b>CONFIGURATION</b>			
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% resistor 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		DC 3.3V
VCC3IP	18		
VCC3OP	32		
VCC3I	53		
VCC3O	60		
AVDD	7		
VCKK	10		DC 2.5V
VCKKP	42		
VCC	56		
GND	1,6		GND
GNDIK	8		
GND0	14		
GNDOP	26,33,38		
GNDIKP	40		
GND0	49		

## 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.

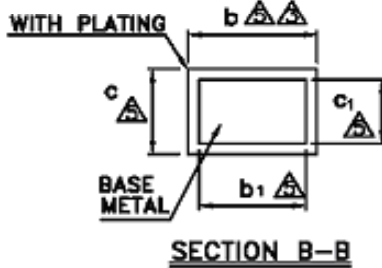
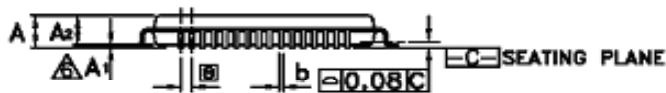
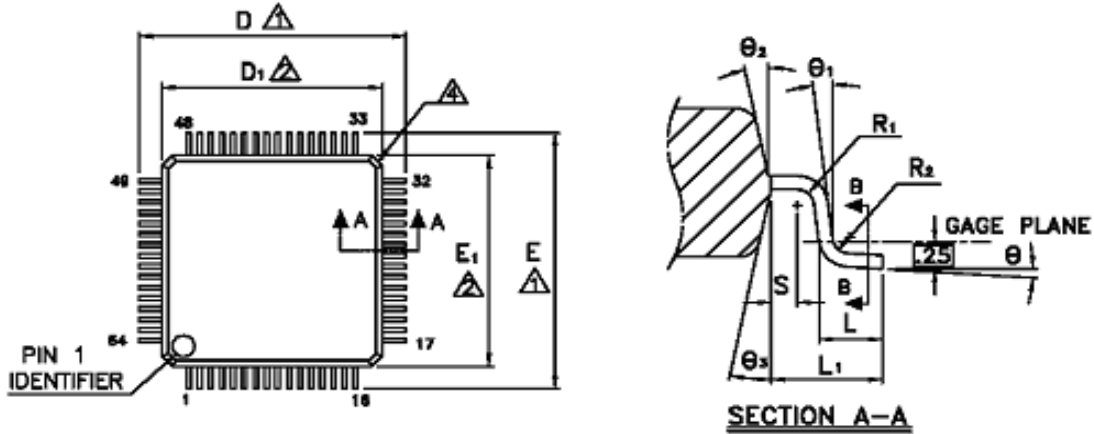
### DC Characteristics

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
A <sub>1</sub>	0.05	—	0.15	0.002	—	0.006
A <sub>2</sub>	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
b <sub>1</sub>	0.17	0.20	0.23	0.012	0.014	0.016
c	0.09	—	0.20	0.004	—	0.008
c <sub>1</sub>	0.09	—	0.16	0.004	—	0.006
D	12.00 BSC			0.472 BSC		
D <sub>1</sub>	10.00 BSC			0.394 BSC		
E	12.00 BSC			0.472 BSC		
E <sub>1</sub>	10.00 BSC			0.394 BSC		
⊠	0.50 BSC			0.020 BSC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L <sub>1</sub>	1.00 REF			0.039 REF		
R <sub>1</sub>	0.08	—	—	0.003	—	—
R <sub>2</sub>	0.08	—	0.20	0.003	—	0.008
S	0.20	—	—	0.008	—	—
θ	0°	3.5°	7°	0°	3.5°	7°
θ <sub>1</sub>	0°	—	—	0°	—	—
θ <sub>2</sub>	12°TYP			12°TYP		
θ <sub>3</sub>	12°TYP			12°TYP		