ESS TECHNOLOGY, Inc.

DESCRIPTION

The ES7020 Vantage™-II codec is a highly integrated superior performance chip that combines an advanced MPEG-2 decoder with a sophisticated MPEG-2 encoder and an NTSC/PAL encoder. The ES7020 provides time base correction (TBC) for recording from VCR videocassette tapes with weak signals without loss of synchronization, low delay monitoring of decoded video output signal, ATAPI interface, built-in CPRM encode/ decode, state-of-the-art progressive-scan video, and S/ PDIF input and output support.

The MPEG encoder portion does flexible NTSC or PAL encoding on a YUV 4:2:2 stream in response to firmware control of the internal CPU. The internal CPU, in conjunction with an additional hardware accelerator, allows for very flexible encoding and allows for additional functionality to be easily added. An audio DSP engine facilitates the encoding of MPEG-1 layer 2 audio while the host CPU interface unit allows for easy reading of close caption data. In addition, the ES7020 has inverse 3:2 pull-down capability, allowing it to dynamically analyze incoming fields and compress from 60 fields to 24 frames in the case of film material.

The MPEG decoder portion is built on the ESS proprietary dual CPU Programmable Multimedia Processor (PMP), consisting of a 32-bit RISC processor and a 64-bit vector engine. This architecture is extremely programmable and allows for the best DVD feature set. The RISC processor performs bit stream parsing, transfers data to the vector engine, and manages the chip as a whole.

The vector engine performs all the computationally intensive tasks required by applications such as Dolby® Digital, DTS Surround™, and MPEG and JPEG imaging. These tasks include video motion compensation and estimation, loop filtering, discrete and inverse discrete cosine transforms (DCT/IDCT), quantization, and inverse quantization.

The ES7020 with DTS support is offered with the ES7020D, which has the same pinout as the standard ES7020. The ES7020 and ES7020D are available in an industry-standard 388-pin BGA package.

FEATURES

- MPEG-2 video encoding up to MP@ML.
- Constant and variable bit rate (CBR/VBR) encoding.
- Inverse 3:2 pull-down.
- Built-in time base corrector (TBC).
- Frame mode and field mode encoding.
- Vertical blanking interval (VBI) data slicer.
- CPRM encryption.
- ATAPI Interface with control for up to two storage media devices, such as hard disk drives, A/V recordable loaders, and Flash memory cards.
- 4x-8x high speed archiving over ATAPI interface to storage media, such as a hard disk drive to DVD+RW or DVD-RW disc.
- Real time clock.
- On-chip modem with integrated low voltage DAA.
- Integrated NTSC/PAL encoder with pixel-adaptive de-interlacer and five 10-bit 54MHz video DACs.
- High-quality progressive scan video output for flicker-free video display.
- DVD-Video, DVD-VR, VCD and SVCD playback.
- Media playback with CD-ROM, CD-R/RW, DVD-R/RW, DVD+R/RW, and DVD-RAM.
- Up to 7.1 channel audio outputs.
- Bass management.
- Direct 8/16-bit SDRAM interface up to 16 MB capacity.
- Macrovision 7.1 for NTSC/PAL interlaced video or progressive (480p/576p) video.
- Composite, S-video, and CCIR656 video outputs.
- OSD graphics plane with 256 colors and eight levels of transparency.
- ESS Music Slideshow ™
- S/PDIF digital audio input and output.
- MP3, MPEG AAC, and WMA digital audio decoding.
- Dolby Digital, Dolby Pro Logic™, Pro Logic II digital audio decoding.
- DTS Surround and DTS ES digital audio decoding (ES7020D only).
- Lead-free leads using 98%-Sn/2%-Cu or 98%-Sn/2%-Bi.

PINOUT (A1 TO N13)

The pinout diagram for the decoder TDM interface, and for part of the decoder SDRAM, clock, and decoder RISC interfaces of the ES7020, appears in Figure 1.

The pound symbol (#) denotes an active-low signal. The rest of the ES7020 device pinout appears in Figure 2, Figure 3 and Figure 4.

	1	2	3	4	5	6	7	8	9	10	11	12	13
A	VSS	VSS	LD6	LD8	LD11	LD15	LA1	LA5	LA9	LA12	LA14	LA16	LA18
B	LD5	VSS	LD7	LD9	LD13	LOE#	LA2	LA6	LA10	LA13	LA15	LA17	LA19
C	LD4	LD3	VSS	LD10	LD12	LA0	LA3	LA7	LA11	AVDD_PLL	AVDD_PLL	AVSS_PLL	AVDD_PLL
D	LD0	LD1	LD2	VSS	LD14	VDD1.5	LA4	LA8	VSS	AVSS_PLL	VDD3.3	VDD1.5	AVDD_PLL
E	TDMFS	TDMDR	TDMDX	TDMTSC#									
F	TBCK	MCLK	TDMCLK	VDD3.3									
G	DCS0#	DSCK	NC	CLK									
H	DRAS1#	DRAS0#	DCS1#	VSS									
J	DOE#	DWE#	DCAS#	DRAS2#									
K	DB13	DB14	DB15	DQM									
L	DB10	DB11	DB12	VDD1.5							VSS	VSS	VSS
M	DB6	DB7	DB8	DB9							VSS	VSS	VSS
N	DB2	DB3	DB4	VSS							VSS	VSS	VSS

Figure 1 ES7020 Device Pinout (A1 to N13)

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PINOUT (P1 TO AF13)

The pinout diagram for the auxiliary port interface, and for part of the decoder audio and video, decoder SDRAM, decoder host, modem, and decoder S/PDIF audio interfaces of the ES7020, appears in Figure 2.

The pound symbol (#) denotes an active-low signal. The rest of the ES7020 device pinout appears in Figure 1, Figure 3 and Figure 4.
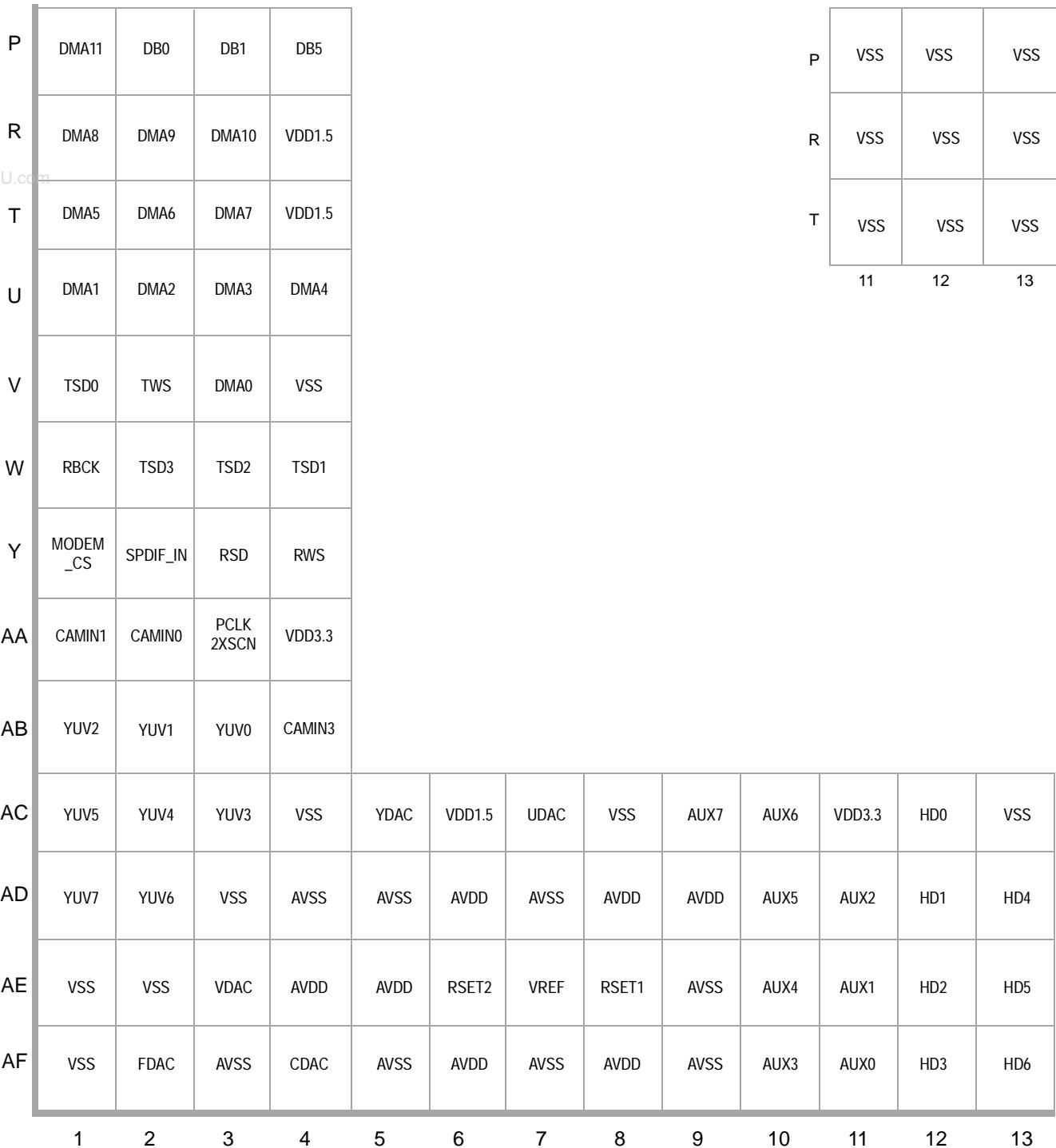
	1	2	3	4	5	6	7	8	9	10	11	12	13
P	DMA11	DB0	DB1	DB5							VSS	VSS	VSS
R	DMA8	DMA9	DMA10	VDD1.5							VSS	VSS	VSS
T	DMA5	DMA6	DMA7	VDD1.5							VSS	VSS	VSS
U	DMA1	DMA2	DMA3	DMA4									
V	TSD0	TWS	DMA0	VSS									
W	RBCK	TSD3	TSD2	TSD1									
Y	MODEM_CS	SPDIF_IN	RSD	RWS									
AA	CAMIN1	CAMIN0	PCLK 2XSCN	VDD3.3									
AB	YUV2	YUV1	YUV0	CAMIN3									
AC	YUV5	YUV4	YUV3	VSS	YDAC	VDD1.5	UDAC	VSS	AUX7	AUX6	VDD3.3	HD0	VSS
AD	YUV7	YUV6	VSS	AVSS	AVSS	AVDD	AVSS	AVDD	AVDD	AUX5	AUX2	HD1	HD4
AE	VSS	VSS	VDAC	AVDD	AVDD	RSET2	VREF	RSET1	AVSS	AUX4	AUX1	HD2	HD5
AF	VSS	FDAC	AVSS	CDAC	AVSS	AVDD	AVSS	AVDD	AVSS	AUX3	AUX0	HD3	HD6

Figure 2 ES7020 Device Pinout (P1 to AF13)

PINOUT (A14 TO N26)

The pinout diagram for the clock and JTAG interfaces, and for part of the decoder video, encoder input, PLL, RISC, and encoder SDRAM interfaces of the ES7020, appears in Figure 3.

The pound symbol (#) denotes an active-low signal. The rest of the ES7020 device pinout appears in Figure 1, Figure 2 and Figure 4.

	14	15	16	17	18	19	20	21	22	23	24	25	26	
	LA20	LWRHL#	LCS3#	LCS1#	PCLK QSCN	HSYNC#	TMS	TMC1	AIMCLK	RSVD	AILRCK	VIFLD	VSS	A
	LA21	LWRLL#	LCS2#	LCS0#	VSYNC#	TRST	TDO	TDI	TMC2	AIBD	AIBCK	VSS	VSS	B
	AVSS_PLL	AVSS_PLL	VID_XO	AVDD_PLL	AVDD_PLL	TCK	PSTOP	RSVD	CS2	VBAT	VSS	VI VSYNC#	VI HSYNC#	C
	VSS	VID_XI	VDD1.5	AVSS_PLL	AVSS_PLL	VSS	OSC32 OUT	VDD3.3	OSC32 IN	VSS	RESET#	VIN0	VIN1	D
										VIN2	VIN3	VIN4	VIN5	E
										VDD3.3	VIN6	VIN7	VICLK	F
										MDQM	MWE#	MCAS#	MRAS#	G
										MCS#	MCKE	MEMCLK	MD0	H
										VSS	MD1	MD2	MD3	J
										MD4	MD5	MD6	MD7	K
										VDD1.5	MD8	MD9	MD10	L
										VDD1.5	MD11	MD12	MD13	M
										MD14	MD15	MD16	MD17	N

	14	15	16	
	VSS	VSS	VSS	L
	VSS	VSS	VSS	M
	VSS	VSS	VSS	N

Figure 3 ES7020 Device Pinout (A14 to N26)

PINOUT (P14 TO AF26)

The pinout diagram for the decoder ATAPI, decoder GPIO and test interfaces, and for part of the encoder SDRAM, decoder host, and decoder S/PDIF audio interfaces of the ES7020, appears in Figure 4.

The pound symbol (#) denotes an active-low signal. The rest of the ES7020 device pinout appears in Figure 1, Figure 2 and Figure 3.

VSS	VSS	VSS	P
VSS	VSS	VSS	R
VSS	VSS	VSS	T
14	15	16	

VSS	MD18	MD19	MD20	P
MD21	MD22	MD23	MD24	R
VDD1.5	MD25	MD26	MD27	T
MD28	MD29	MD30	MD31	U
MA0	MA1	MA2	MA3	V
VSS	MA4	MA5	MA6	W
MA7	MA8	MA9	MA10	Y
VDD3.3	MA11	MA12	MA13	AA
GPIO0	GPIO1	GPIO2	GPIO3	AB

HD7	HD11	VDD1.5	HDD_IRQ	VSS	HDD_CS#	HRST#	VDD3.3	HCS1FX#	VSS	GPIO4	GPIO5	GPIO6
HD8	HD12	HD15	HDD_DRQ	DVD_WR#	HDD_WR#	HRD#	RSVD	HCS3FX#	HA1	VSS	GPIO7	GPIO8
HD9	HD13	DVD_IRQ	HIORDY	DVD_RD#	HDD_RD#	HWR#	HWRQ#	HIRQ	HA2	GPIO11	VSS	GPIO9
HD10	HD14	DVD_DRQ	DVD_CS#	DVD_ACK#	HDD_ACK#	HRRQ#	HIOCS16#	HA0	SPDIF_OUT	GPIO10	VSS	VSS
14	15	16	17	18	19	20	21	22	23	24	25	26

The AC, AD, AE, AF rows correspond to the bottom table (right column labels: AC, AD, AE, AF).

Figure 4 ES7020 Device Pinout (P14 to AF26)

SYSTEM BLOCK DIAGRAM

Figure 5 depicts a sample ES7020-based system block diagram.
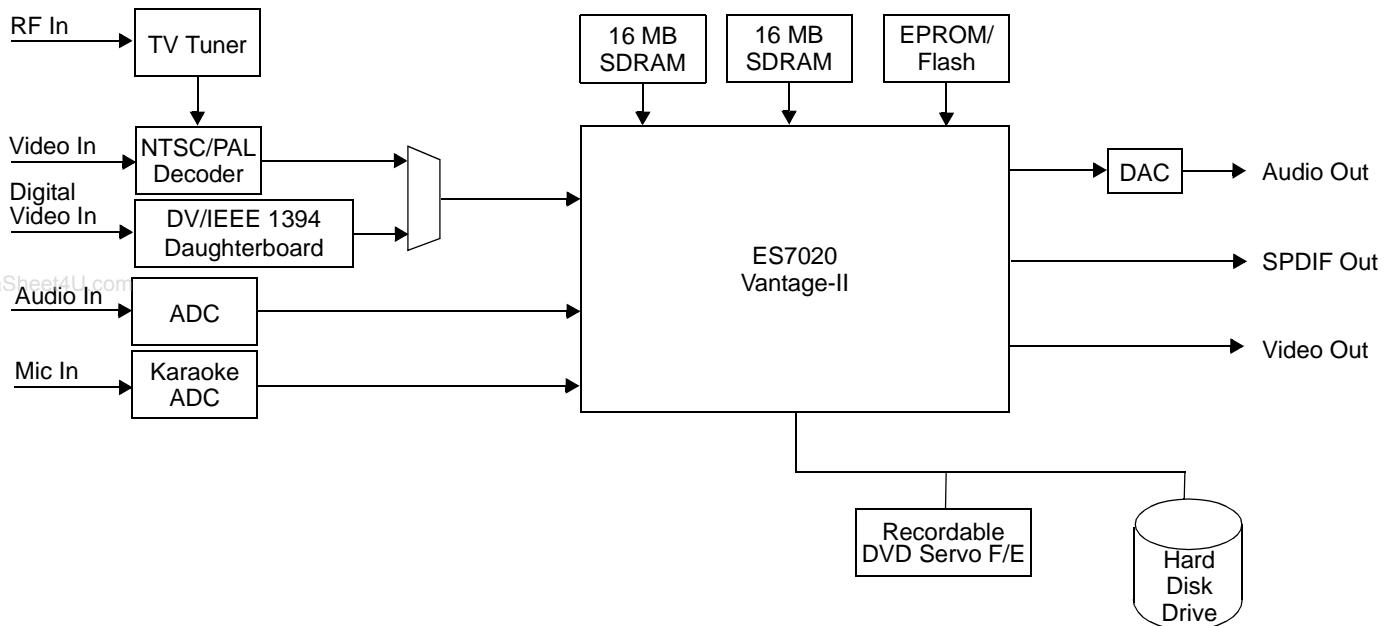
Figure 5 ES7020 System Block Diagram

ORDERING INFORMATION

Part Number	Description	Package
ES7020BF	Vantage-II A/V Codec with lead-free leads.	388-pin BGA
ES7020BDF	Vantage-II Audio/Video Codec with DTS with lead-free leads.	388-pin BGA

The letter B at the end of the part number identifies the package type BGA. The letter F indicates lead-free leads.

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