

DATA SHEET

SAA7112

**Decoder with High-Performance
Scaler (HPS) for Image Port
(PELICAN)**

Preliminary specification
File under Integrated Circuits, IC22

1996 Jun 20

Decoder with High-Performance Scaler (HPS) for Image Port (PELICAN)

SAA7112

FEATURES

The PELICAN SAA7112 is a video capture device for application at the image port of a VGA controller, with following feature highlights:



Video Decoder

- Six analog inputs, internal analog source selectors, (e.g. 6 × CVBS or (2 × YC and 2 × CVBS) or (1 × YC and 4 × CVBS))
- Two analog preprocessing channels, including built in analog anti-alias filters
- Fully programmable static gain for the main channels or Automatic Gain Control (AGC) for the selected CVBS/Y channel
- Two 8 bit video CMOS Analog-to-Digital Converters (ADCs)
- Automatic Clamp Control (ACC) for CVBS, Y and C
- Switchable white peak control
- On-chip line locked clock generation in accordance with CCIR-601
- Digital PLL for synchronization and clock generation from all standards and non-standard video sources, e.g. consumer grade VTR
- Requires only one crystal (32.11 MHz) for all standards
- Horizontal and vertical sync detection
- Automatic detection of 50/60Hz field frequency, and automatic switching between standards PAL and NTSC
- Luminance and chrominance signal processing for PAL BGHI, PAL N, PAL M, NTSC M, NTSC N, NTSC 4.43 and SECAM
- User programmable luminance peaking or aperture correction
- Cross-colour reduction for NTSC by chrominance combination filtering
- PAL delay line for correcting PAL phase errors
- Real time status information output (RTCO)
- Independent Brightness Contrast Saturation (BCS) adjustment for decoder part.

Video Scaler

- Horizontal and vertical down-scaling and up-scaling to randomly sized windows
- Horizontal and vertical scaling range: 2 (zoom) to $\frac{1}{64}$ (icon); vertical zoom might be restricted
- Anti-alias- and accumulating filter for horizontal scaling

- Vertical scaling with linear phase interpolation (6-bit phase accuracy) and accumulating filter for anti-aliasing
- Horizontal phase correct up- and down-scaling for improved signal quality of scaled data, especially for compression and video phone applications, with 6-bit phase accuracy
- Two independent programming sets for scaler part, to define two 'ranges' per field or per frame
- Field-wise switching between decoder-part and expansion port input
- Brightness, contrast and saturation controls for scaled outputs.

VBI-data decoder and text slicer

- versatile VBI-data decoder, slicer, clock regeneration and byte synchronization; e.g. for WST, NABST, Close Caption, WSS, etc.

Audio clock generation

- Generation of a field locked audio master clock to support a constant number of audio clocks per video field
- Generation of an audio serial and left/right (channel) clock signal.

Digital I/O interfaces

- Real time signal port (R-port), including continuous line locked reference clock and real time status information
- Bidirectional expansion port (X-port) with half duplex functionality (D1), 8-bit YUV
 - output from decoder part, real time, or
 - input to scaler part, e.g. video from MPEG-decoder
- Video image port (I-port) configurable for 8-bit (16-bit) data in master mode (own clock), or slave mode (external clock), with auxiliary timing and hand shake signals
- 8-bit data Host port (H-port) for 16-bit extension of I-port
- Discontinuous data streams supported
- 32-word × 4 bytes FIFO register for video output data

Decoder with High-Performance Scaler (HPS) for Image Port (PELICAN)

SAA7112

- 16-word \times 4 bytes FIFO register for decoded VBI output data
Scaled 4 : 2 : 2, 4 : 1 : 1 YUV output
- Scaled 8-bit luminance only and raw data output
- Decoded VBI data output.

miscellaneous

- Power-on control
- Programming via I²C-bus, or parallel image data port (full read-back ability by an external controller)
- Chip enable function (reset for the clock generator).

APPLICATIONS

- Desktop video
- Multimedia
- Digital television
- Image processing
- Video phone.

GENERAL DESCRIPTION

The PELICAN SAA7112 is a video capture device for applications at the image port of VGA controllers.

The SAA7112 is a combination of a two channel analog preprocessing circuit including source-selection, anti-aliasing filter and ADC, an automatic clamp and gain control, a Clock Generation Circuit (CGC), a digital multistandard decoder and a SAA7140B based scaler, including variable horizontal and vertical up and down

scaling and a brightness, contrast and saturation control circuit (see Fig.1).

It is a highly integrated circuit for desktop video applications. The decoder is based on the principle of line-locked clock decoding and is able to decode the colour of PAL, SECAM and NTSC signals into CCIR-601 compatible colour component values. The SAA7112 accepts as analog inputs CVBS or S-video (Y-C) from TV or VCR sources, including weak and distorted signals. An Expansion port for digital video (bidirectional half duplex, D1 compatible) is also supported to connect to MPEG or video phone CODEC. At the so called image port the SAA7112 supports 8-bit (16-bit) wide output data with auxiliary reference data for interfacing to VGA controllers

The target application for PELICAN is to capture and scale video images, to be provided as digital video stream through the image port of a VGA controller, for display via VGAs frame buffer, or for capture to system memory.

In parallel the SAA7112 incorporates also provisions for capturing the serially coded data in the vertical blanking interval (VBI-data). Two principal functions are available: to capture raw video samples and a versatile data slicer (data recovery) unit.

The SAA7112 incorporates also a field locked audio clock generation. This function ensures that there is always the same number of audio samples associated with a field, or a set of fields. This prevents the loss of synchronization between video and audio, during capture or playback.

The circuit can be controlled via the I²C-bus or via its fast parallel programming mode of the image port interface (full write/read capability).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V _{DDD}	digital supply voltage	3.0	3.6	V
V _{DDA}	analog supply voltage	3.0	3.6	V
T _{amb}	ambient temperature	0	70	°C

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
SAA7112	LQFP100	plastic low profile quad flat package; 100 leads; body 14 \times 14 \times 1.4 mm	SOT407-1

Decoder with High-Performance Scaler (HPS) for Image Port (PELICAN)

SAA7112

BLOCK DIAGRAMS

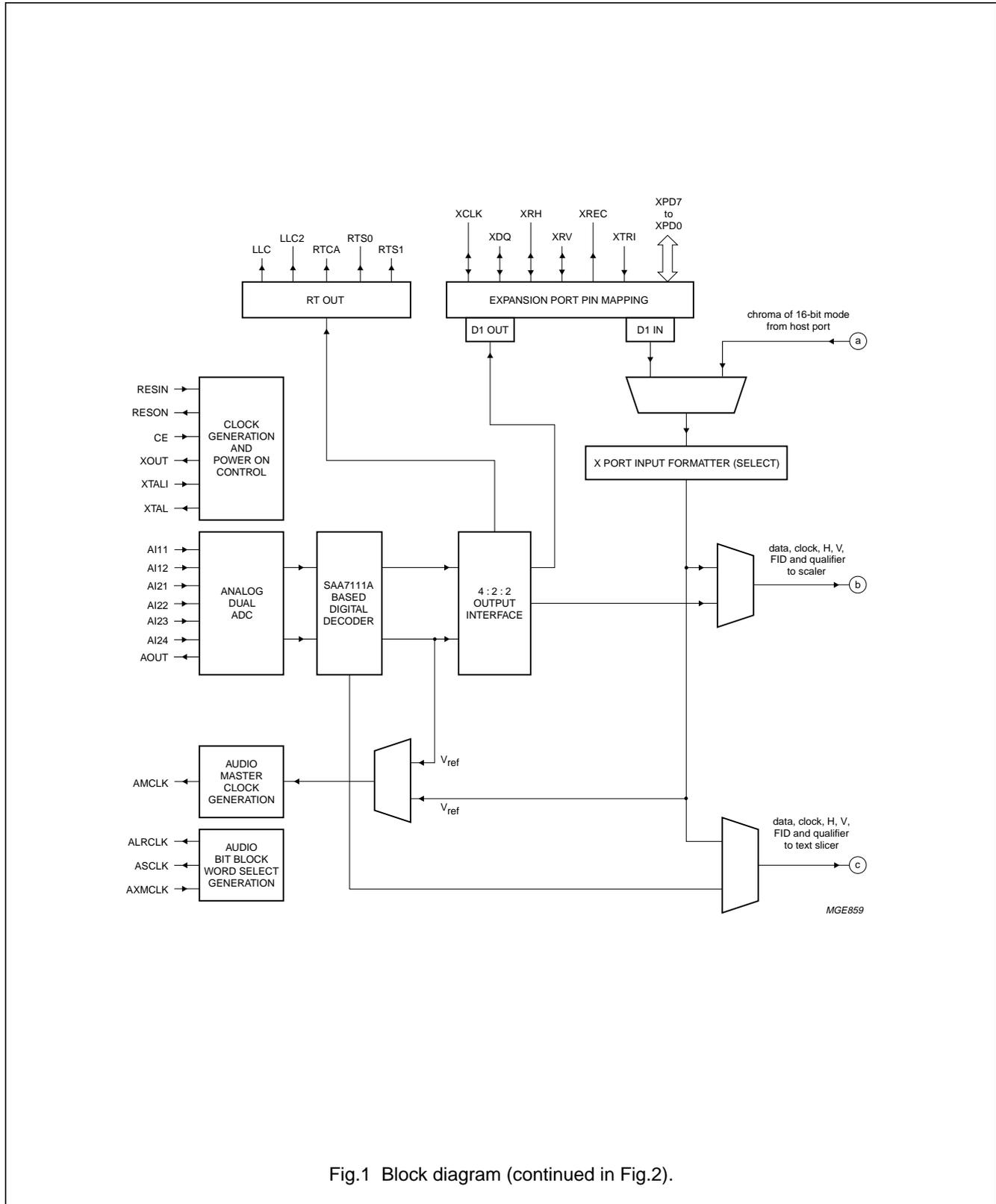


Fig.1 Block diagram (continued in Fig.2).

Decoder with High-Performance Scaler (HPS) for Image Port (PELICAN)

SAA7112

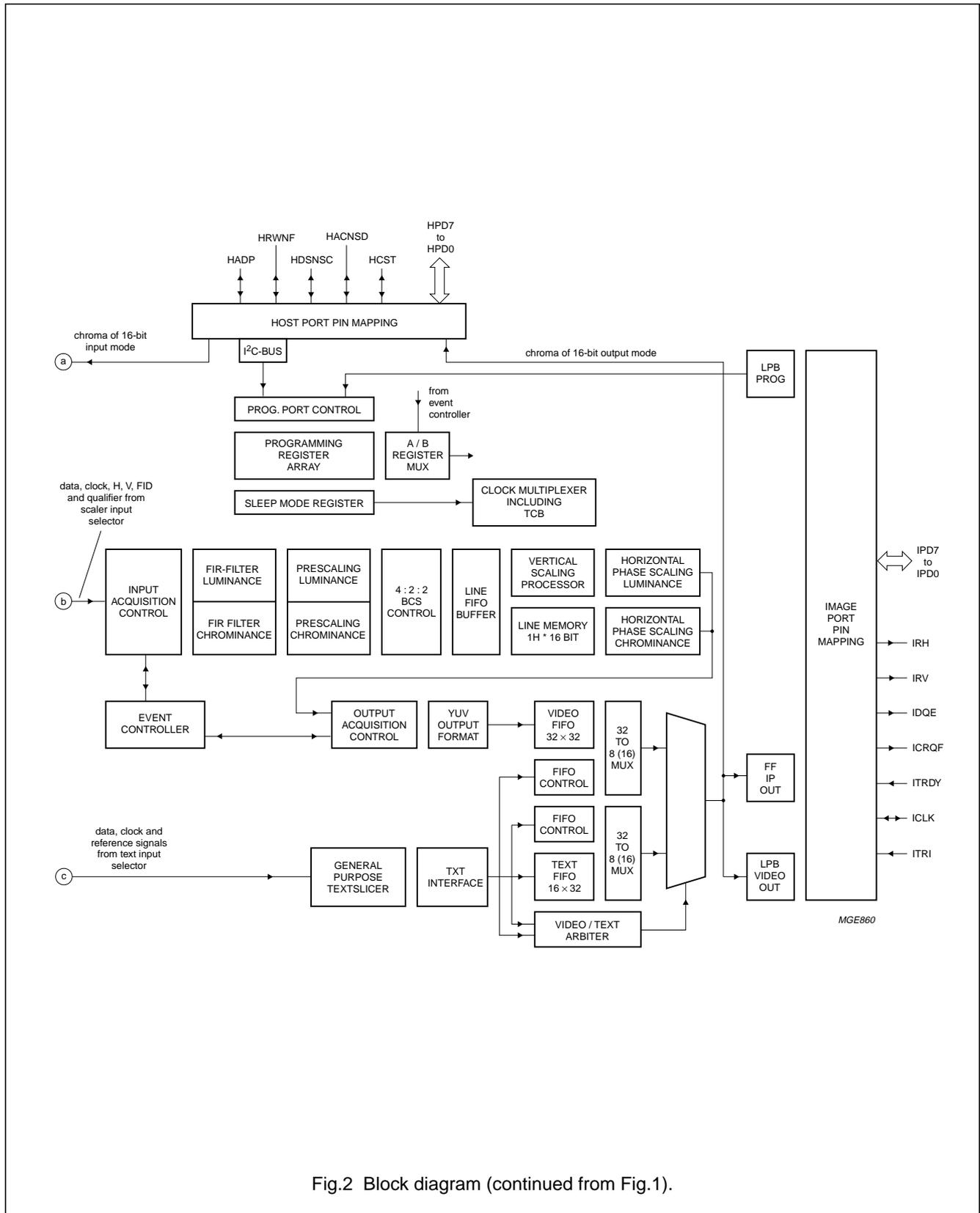


Fig.2 Block diagram (continued from Fig.1).

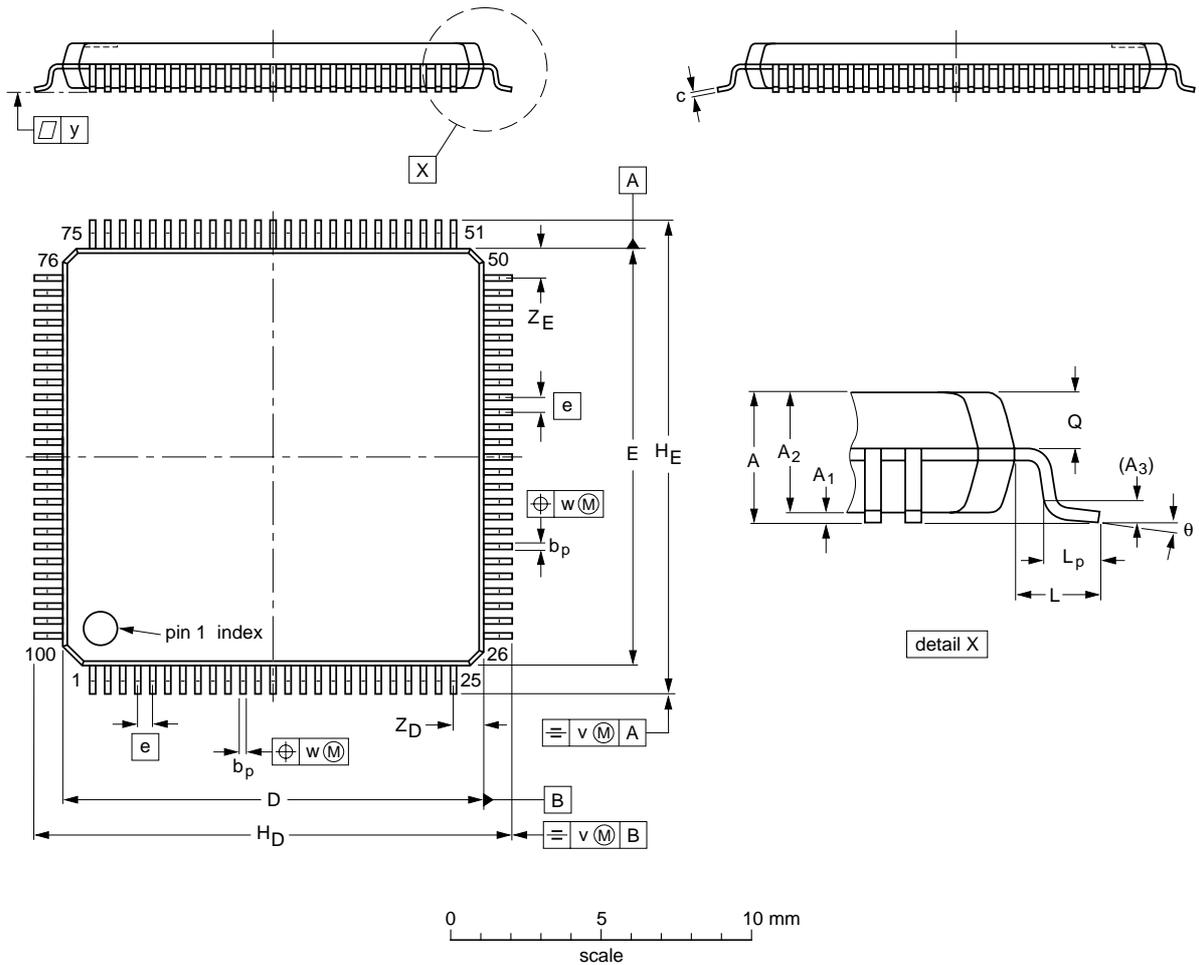
Decoder with High-Performance Scaler (HPS) for Image Port (PELICAN)

SAA7112

PACKAGE OUTLINE

LQFP100: plastic low profile quad flat package; 100 leads; body 14 x 14 x 1.4 mm

SOT407-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _D	H _E	L	L _p	Q	v	w	y	Z _D ⁽¹⁾	Z _E ⁽¹⁾	θ
mm	1.6	0.20 0.05	1.5 1.3	0.25	0.28 0.16	0.18 0.12	14.1 13.9	14.1 13.9	0.5	16.25 15.75	16.25 15.75	1.0	0.75 0.45	0.70 0.57	0.2	0.12	0.1	1.15 0.85	1.15 0.85	7° 0°

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT407-1						95-12-19

Decoder with High-Performance Scaler (HPS) for Image Port (PELICAN)

SAA7112

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

PURCHASE OF PHILIPS I²C COMPONENTS



Purchase of Philips I²C components conveys a license under the Philips' I²C patent to use the components in the I²C system provided the system conforms to the I²C specification defined by Philips. This specification can be ordered using the code 9398 393 40011.

Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113,
Tel. +61 2 805 4455, Fax. +61 2 805 4466

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213,
Tel. +43 1 60 101, Fax. +43 1 60 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381, Fax. +1 708 296 8556

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
Tel. +45 32 88 2636, Fax. +45 31 57 1949

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 615 800, Fax. +358 615 80920

France: 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex,
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 23 52 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS,
Tel. +30 1 4894 339/911, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd.
Worli, MUMBAI 400 018, Tel. +91 22 4938 541, Fax. +91 22 4938 722

Indonesia: see Singapore

Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180,
Tel. +972 3 645 0444, Fax. +972 3 648 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +1 800 234 7381, Fax. +1 708 296 8556

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 83749, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA,
Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 926 5361, Fax. +7 095 564 8323

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231,
Tel. +65 350 2538, Fax. +65 251 6500

Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Rua do Rocio 220 - 5th floor, Suite 51,
CEP: 04552-903-SÃO PAULO-SP, Brazil, P.O. Box 7383 (01064-970),
Tel. +55 11 821 2333, Fax. +55 11 829 1849

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 3 301 6312, Fax. +34 3 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 632 2000, Fax. +46 8 632 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2686, Fax. +41 1 481 7730

Taiwan: PHILIPS TAIWAN Ltd., 23-30F, 66,
Chung Hsiao West Road, Sec. 1, P.O. Box 22978,
TAIPEI 100, Tel. +886 2 382 4443, Fax. +886 2 382 4444

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 2A Akademika Koroleva str., Office 165,
252148 KIEV, Tel. +380 44 476 0297/1642, Fax. +380 44 476 6991

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381, Fax. +1 708 296 8556

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,
Tel. +381 11 825 344, Fax. +381 11 635 777

For all other countries apply to: Philips Semiconductors, Marketing & Sales Communications,
Building BE-p, P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

Internet: <http://www.semiconductors.philips.com/ps/>

© Philips Electronics N.V. 1996

SCA49

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

657021/01/pp8

Date of release: 1996 Jun 20

Document order number: 9397 750 00923

Let's make things better.

Philips
Semiconductors



PHILIPS