



Obsolescence Notice

This product is obsolete.

This information is available for your convenience only.

For more information on Zarlink's obsolete products and replacement product lists, please visit http://products.zarlink.com/obsolete_products/

PCA20R20/20R21

5V 2, 4 CHANNEL THIN FILM READ/WRITE PRE-AMPLIFIER

The PCA20R20/20R21 is a multi-channel read/write pre-amplifier designed for use in disk drives with two terminal thin film or other two terminal heads. It can be used in applications supporting up to four heads. The functions of the device include low noise pre-amplifiers, write current circuitry and data protection for two or four channel applications. Power supply fault protection disables the write current when the system is in the incorrect power management mode. The read channel common mode output voltage shift is controlled in the write mode to improve the recovery time.

The PCA20R20 is available in 2 and 4 channel options and offers internal 250 ohm damping resistors, which are switched in only in write mode.

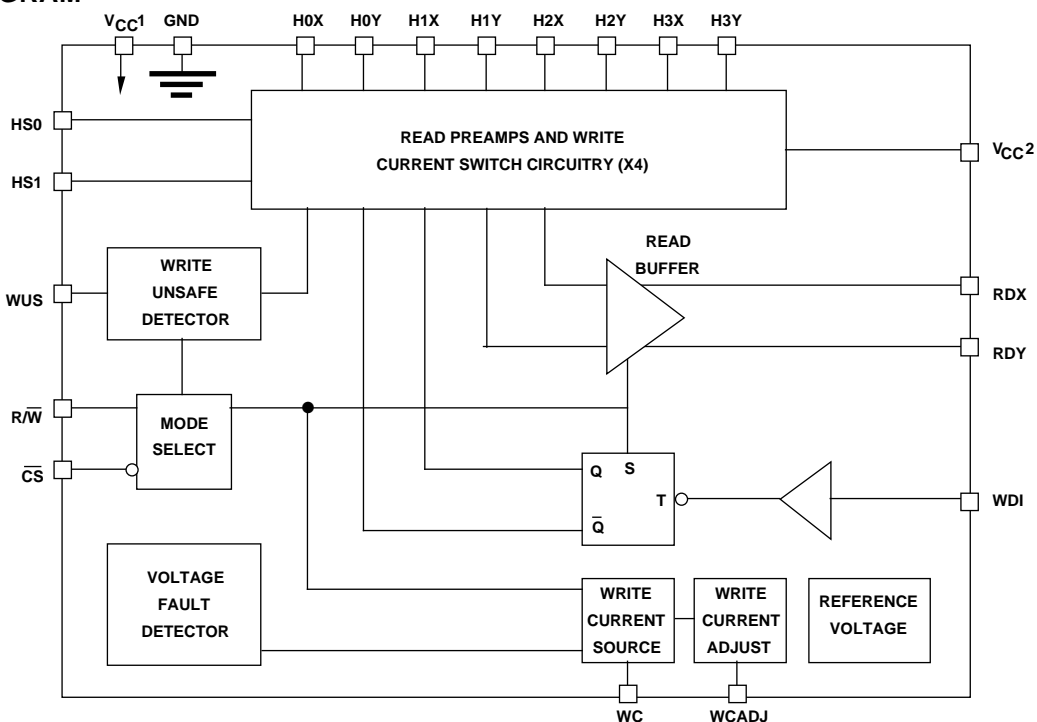
The PCA20R21 is a 4-channel device and has a write current adjust facility.

All devices operate from a single 5 volt supply.

FEATURES

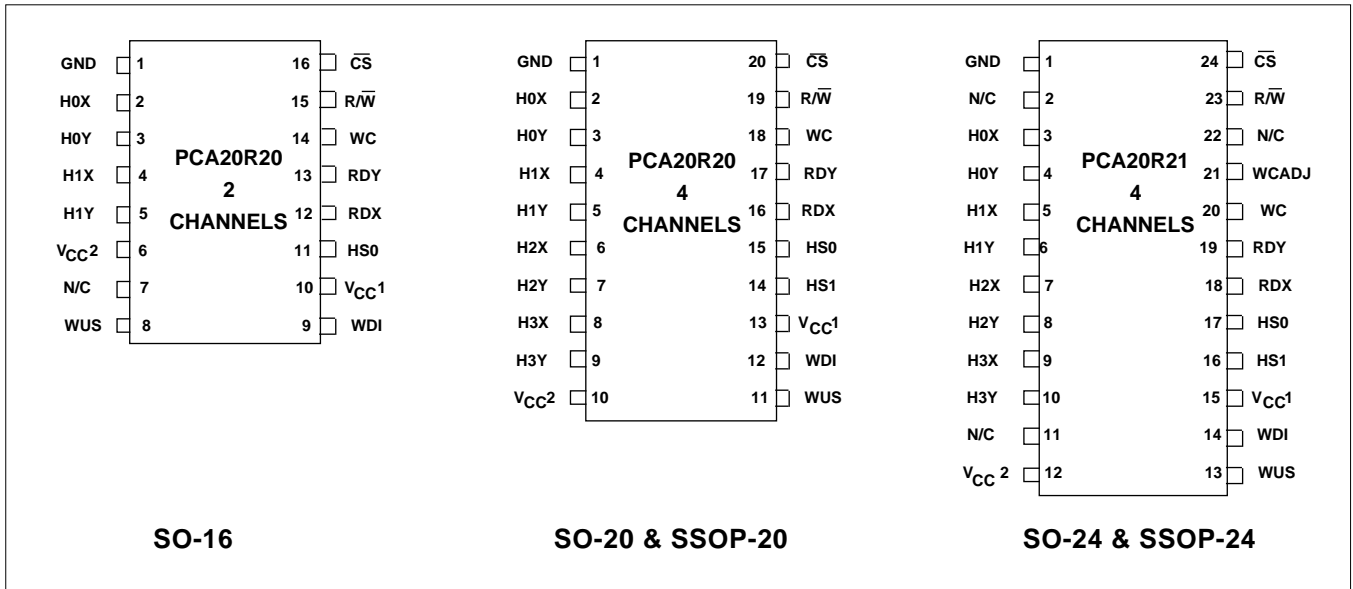
- Designed for operation with two terminal thin film disk drive heads
- 5 volt supply operation
- Low power (<140mW in Read Mode)
- High performance circuit features
 - Read Mode Gain = 300 V/V
 - Input Noise = 0.55nV/ $\sqrt{\text{Hz}}$ typ.
 - Input Capacitance = 14pF typ.
 - Write Current Range = 5-35 mA
- Programmable Write Current Source
- Write Unsafe indicator
- Enhanced System Write to Read Recovery time
- Power supply fault protection
- Head short to ground protection

BLOCK DIAGRAM



PCA20R20/20R21

PINOUT DIAGRAMS



CIRCUIT OPERATION

The PCA20R20/20R21 has three modes of operation. In one mode, it reads signals from the disk heads and amplifies them to a level suitable for processing by a read channel circuit; in the second mode, it writes signals back to the disk; the third mode is an idle condition to minimise power consumption.

The mode (read, write or idle) is selected using inputs R/W and CS, as shown in Table 1. These inputs are protected from accidental write current operations by internal pull-up resistors on the pins.

Head selection is controlled by inputs HS0 and HS1, as detailed in Table 2. These pins have internal pull-down resistors. In addition, internal clamp circuitry is included in order to protect the heads and the IC in the event of any accidental short between head and ground in any mode.

READ MODE

In the read mode, low noise pre-amplifiers with differential outputs boost the signals from the disk heads, and, via a multiplexer, supply emitter follower outputs RDX and RDY. These outputs should be ac coupled to the load.

Note: In write and idle modes, the RDX and RDY outputs become high impedance, allowing the outputs to be wire-or'ed for multiple head/chip applications.

WRITE MODE

In the write mode, the selected head switches current between X and Y sides of the head on the falling edge of the Write Data Input (WDI) pin. The Write Unsafe (WUS) detector is also activated. The Write Data flip flop is initialised to pass current through the X side of the head.

The current in the write driver is set by the external resistor R_w where:

$$I_{\text{current}} = \frac{V_{\text{wc}}}{R_w}$$

R_w is connected between the pin WC and ground. The actual head current is a function of the head resistance and external wire resistance (R_h) and the damping resistance (R_d) where:

$$I_{x,y} = \frac{I_w}{1 + R_h/R_d}$$

R_h = Head Resistance

R_d = Damping Resistance

Note: In read and idle modes, the write current source is deactivated.

The PCA20R21 has an additional feature which allows the user to adjust the I_w current by a finite amount. The WCADJ pin is used to adjust write current on different zones of the disk. It operates by switching a separate write current adjust resistor in and out on the WCADJ pin or by connecting a DAC to that pin to sink a controllable amount of current. The WCADJ pin is nominally biased to V_{CC}/2. Sinking current from this pin to ground diverts a proportional amount of current from the actual head current while maintaining a constant current through the WC resistor and V_{CC}. Allowing WCADJ to float or pulling it high will cut off the circuit and it will have no effect. A TTL gate can be used as a switch with a small degradation in accuracy. The amount of write current decreased is shown below:

$$I_w \text{ head (decrease) (mA)} = (27 - V_{\text{WCADJ}}/R_{\text{WCADJ}}) \text{ where:}$$

$$V_{\text{WCADJ}} = V_{\text{CC}}/2 \text{ (volts)}$$

$$R_{\text{WCADJ}} = \text{write current adjust setting resistor (K } \Omega \text{)}$$

$$\text{Example: For a 7.25 mA head current decrease, } R_{\text{WCADJ}} = (27 - 2.5) / 7.25 = 10\text{k}$$

VOLTAGE FAULT

This function disables the write current function when either a voltage fault or a power startup mode is detected, regardless of the mode the device is in.

WRITE UNSAFE

The following conditions will activate this function, and will put a high level on the Write Unsafe (WUS) open collector output.

- WDI Frequency too low
- Device in read mode
- Chip Disabled
- No Write current
- Open circuit head
- Head short to ground

Note: To ensure no false WUS triggering, the product of the head current and R_h should be between 0.1V and 1.7V.

MODE DESCRIPTION

<u>CS</u>	<u>R/W</u>	Mode
0	0	Write
0	1	Read
1	0	Idle
1	1	Idle

Table 1: Mode Select

For correct operation of the open circuit head function a minimum of 10mA write current is required.

IDLE MODE

In this mode, selected by taking pin CS high, RDX and RDY are put in a high impedance state and the device power consumption is minimised.

PACKAGING

The PCA20R20/20R21 is supplied in surface mount packaging. The 2 channel PCA20R20 is available in a 16 pin SO package; the 4 channel is available in 20 pin and 24 pin SO and SSOP packaging.

HS1	HS0	Head
0	0	0
0	1	1
1	0	2
1	1	3

Table 2: Head Select

PIN DESCRIPTIONS

Name	Type	Description
HS0,HS1 †	I	Head Select: selects one of four heads
<u>CS</u>	I	Chip Select: a high inhibits the chip
<u>R/W</u> †	I	Read/Write: a high selects Read mode
WUS †	O	Write Unsafe: a high indicates an unsafe writing condition
WDI †	I	Write Data In: changes the direction of the current in the recording head
H0X - H3X; H0Y - H3Y	I/O	X, Y Head Connections
RDX, RDY †	O	X, Y Read Data: differential read data output
WC †		Write Current: used to set the magnitude of the write current
WC ADJ		Write Current Adjust
V _{CC1}	I	+5V Supply
V _{CC2}	I	+5V Supply for Write current drivers
GND	I	Ground

† These signals can be wire OR'ed

RECOMMENDED OPERATING CONDITIONS

Parameter		Rating	Unit
DC Supply Voltage	V _{CC1}	5±10%	VDC
	V _{CC2}	5±10%	VDC
Operating Junction Temperature	T _j	+25 to +110	°C
Head Load Range	L _h	0.3 to 5	µH

PCA20R20/20R21

ABSOLUTE MAXIMUM RATINGS

Operation at absolute maximum ratings is not implied. Exposure to stresses greater than those listed could cause permanent damage to the device.

Parameter		Rating	Units
DC Supply Voltage	V _{CC1}	-0.3 to +6	VDC
	V _{CC2}	-0.3 to +6	VDC
Write Current	I _W	60	mA
Digital Input Voltage	V _{in}	-0.3 to V _{CC1} +0.3	VDC
Head Port Voltage	V _H	-0.3 to V _{CC2} +0.3	VDC
Output Current: RDX,RDY WUS	I _O	-10	mA
		+12	mA
Storage Temperature	T _{stg}	-65 to +150	°C

DC CHARACTERISTICS

Recommended operating conditions apply.

Parameter	Condition	Min.	Typ.	Max.	Units
V _{CC1} Supply Current	READ Mode		24		mA
	WRITE Mode		14		mA
	IDLE Mode		600		μA
V _{CC2} Supply Current	READ Mode		5		mA
	WRITE Mode		6 + I _W		mA
	IDLE Mode		0		mA
Power Dissipation	READ Mode		140		mW
	WRITE Mode		100 + 4I _W		mW
	IDLE Mode		3		mW

DIGITAL INPUTS

Recommended operating conditions apply.

Parameter	Condition	Min.	Max.	Units
Input Low Voltage (V _{IL})			0.8	V
Input High Voltage (V _{IH})		2.0		V
Input Low Current	V _{IL} = 0.8V	-400		μA
Input High Current	V _{IH} = 2.0V		100	μA
WUS Output Low Voltage (V _{OL})	I _{OL} = 2mA		0.5	V
V _{CC1} Fault Voltage	I _W < 0.2mA	3.5	4.2	V

WRITE CHARACTERISTICS

Recommended operating conditions apply.

Parameter	Condition	Min.	Typ.	Max.	Units
Write Current Voltage (VWC)		1.15	1.25	1.35	V
Differential Head Voltage Swing		3.6			V _{pp}
Unselected Head Current				1	mA(pk)
Head Differential Load Capacitance				25	pF
Head Differential Load Resistance			500		
WDI Pulse Width	V _{il} ≥ 0.2V	PWH	10		ns
		PWL	5		ns
Write Current Range (IW)		5		35	mA
WCADJ Voltage	PCA20R21*	2	V _{CC} /2	3	VDC
I _{head} (Decrease) / I _{WCADJ}	PCA20R21	24	27	30	mA/mA
I _{WCADJ} Range	PCA20R21	0		0.5	mA

*I_{WCADJ} = 0 to 0.5mA**READ CHARACTERISTICS**

Recommended operating conditions apply.

(CL = 20pF RL = 1K)

Parameter	Condition	Min.	Typ.	Max.	Units
Differential Voltage Gain	V _{in} = 1mV p-p f = 1MHz	250	300	350	V/V
Bandwidth -1dB	Z _s < 5 V _{in} = 1mV p-p	20			MHz
Bandwidth -3dB	Z _s < 5 V _{in} = 1mV p-p	42			MHz
Input Noise Voltage	BW = 15MHz L _h = 0, R _h = 0		0.55	0.8	nV/√Hz
Differential Input Capacitance			14	23	pF
Differential Input Resistance		720	1200		
Dynamic Range to 90% of Gain		2			mV
Common Mode Rejection Ratio	100mV p-p @5MHz	45			dB
Power Supply Rejection Ratio	100mV p-p @5MHz	40			dB
Channel Rejection Ratio	Unselected channels driven with 100mV p-p	45			dB
Output Offset Voltage				±300	mV
Single Ended Output Resistance				40	
Output Current		1			mA
Common Mode Output Voltage		2		3.5	V

PCA20R20/20R21

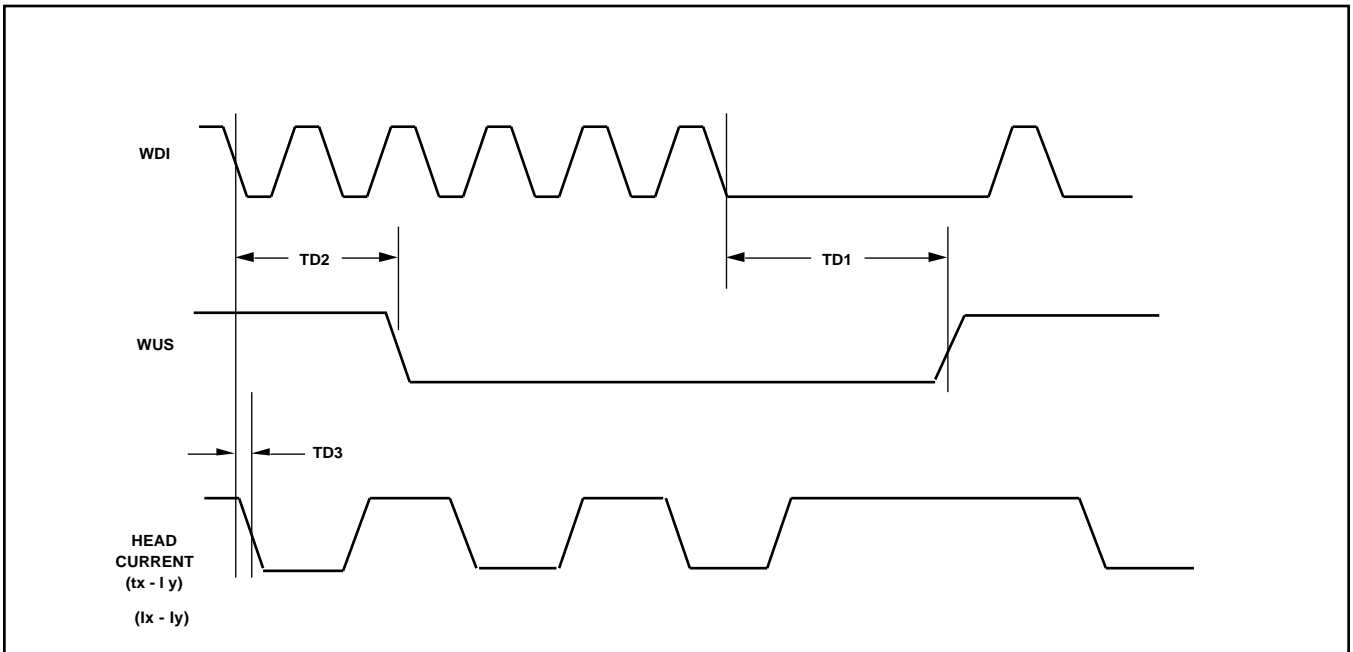
SWITCHING CHARACTERISTICS

Recommended operating conditions apply unless otherwise specified.

I_W = 20mA, L_h = 1.0μH, R_h = 30 , f(Data) = 5MHz.

Parameter	Conditions	Min.	Nom.	Max.	Units
R/W	Read to Write			0.6	μs
	Write to Read			1.0	μs
CS	Unselect to Select			2.0	μs
	Select to Unselect			0.6	μs
HS0,1 to any Head	To 90% of 100mV 10MHz Read signal envelope			1.0	μs
WUS: Safe to Unsafe (TD1)		0.6		3.6	μs
Unsafe to Safe (TD2)			0.2	1.0	μs
Head Current:					
WDI to I _x - I _y (TD3)	from 50% level			10	ns
Asymmetry	WDI has 1ns rise/fall time			1.0	ns
Rise/fall Time	L _h = 0, R _h = 0 10% to 90% level		3	5	ns
	L _h = 1μH, R _h = 30 10% to 90% level		12		ns

WRITE MODE TIMING DIAGRAM



PART NUMBERING

When ordering please use the following part numbers:

SOP

Part No.	Description	Package
PCA20R202MP	Two channel, without write current adjust	SO-16
PCA20R204MP	Four channel, without write current adjust	SO-20
PCA20R214MP	Four channel, with write current adjust	SO-24

SSOP

Part No.	Description	Package
PCA20R204NP	Four channel, without write current adjust	SSOP-20
PCA20R214NP	Four channel, with write current adjust	SSOP-24

PRIMARY SEMI-CUSTOM DESIGN CENTRES

UNITED KINGDOM: Swindon, Tel: (01793) 518000 Fax: (01793) 518411. Oldham, Tel: (0161) 682 6844, Fax: (0161) 688 7898. Lincoln, Tel: (01522) 500500 Fax: (01522) 500550. **UNITED STATES OF AMERICA:** Scotts Valley, CA, Tel: (408) 438 2900 Fax: (408) 438 5576. Boston, MA, Tel: (617)251-0100. Fax: (617) 251-0104. Irvine, CA, Tel: (714) 455-2950. Fax: (714) 455-9671. **AUSTRALIA:** Rydalmere, NSW, Tel: (612) 638 1888. Fax: (612) 638 1798. **FRANCE:** Les Ulis Cedex, Tel: (1) 64 46 23 45 Fax: (1) 64 46 06 07. **ITALY:** Milan, Tel: (02) 66040867 Fax: (02) 66040993. **GERMANY:** Munich, Tel: (089) 3609 06 0 Fax: (089) 3609 06 55. **JAPAN:** Tokyo, Tel: (3) 5276-5501. Fax: (3) 5276-5510.



HEADQUARTERS OPERATIONS
GEC PLESSEY SEMICONDUCTORS
 Cheney Manor, Swindon,
 Wiltshire, United Kingdom SN2 2QW.
 Tel: (01793) 518000
 Fax: (01793) 518411

GEC PLESSEY SEMICONDUCTORS
 P.O. Box 660017
 1500 Green Hills Road,
 Scotts Valley, California 95067-0017,
 United States of America.
 Tel: (408) 438 2900
 Fax: (408) 438 5576

CUSTOMER SERVICE CENTRES

- **FRANCE & BENELUX** Les Ulis Cedex Tel: (1) 64 46 23 45 Fax: (1) 64 46 06 07
- **GERMANY** Munich Tel: (089) 3609 06-0 Fax: (089) 3609 06-55
- **ITALY** Milan Tel: (02) 66040867 Fax: (02) 66040993
- **JAPAN** Tokyo Tel: (03) 5276-5501 Fax: (03) 5276-5510
- **NORTH AMERICA** Scotts Valley, USA Tel: (408) 438 2900 Fax: (408) 438 7023
- **SOUTH EAST ASIA** Singapore Tel: (65) 3827708 Fax: (65) 3828872
- **SWEDEN** Stockholm, Tel: 46 8 702 97 70 Fax: 46 8 640 47 36
- **TAIWAN, ROC** Taipei, Tel: 886 2 5461260 Fax: 886 2 7190260
- **UK, EIRE, DENMARK, FINLAND & NORWAY**
 Swindon Tel: (01793) 518510 Fax: (01793) 518582

These are supported by Agents and Distributors in major countries world-wide.
 © GEC Plessey Semiconductors 1993 Publication No.DS3828 Issue No. 1.3 Oct 1993
 TECHNICAL DOCUMENTATION - NOT FOR RESALE. PRINTED IN UNITED KINGDOM.

This publication is issued to provide information only which (unless agreed by the Company in writing) may not be used, applied or reproduced for any purpose nor form part of any order or contract nor to be regarded as a representation relating to the products or services concerned. No warranty or guarantee express or implied is made regarding the capability, performance or suitability of any product or service. The Company reserves the right to alter without prior knowledge the specification, design or price of any product or service. Information concerning possible methods of use is provided as a guide only and does not constitute any guarantee that such methods of use will be satisfactory in a specific piece of equipment. It is the user's responsibility to fully determine the performance and suitability of any equipment using such information and to ensure that any publication or data used is up to date and has not been superseded. These products are not suitable for use in any medical products whose failure to perform may result in significant injury or death to the user. All products and materials are sold and services provided subject to the Company's conditions of sale, which are available on request.



**For more information about all Zarlink products
visit our Web Site at
www.zarlink.com**

Information relating to products and services furnished herein by Zarlink Semiconductor Inc. trading as Zarlink Semiconductor or its subsidiaries (collectively "Zarlink") is believed to be reliable. However, Zarlink assumes no liability for errors that may appear in this publication, or for liability otherwise arising from the application or use of any such information, product or service or for any infringement of patents or other intellectual property rights owned by third parties which may result from such application or use. Neither the supply of such information or purchase of product or service conveys any license, either express or implied, under patents or other intellectual property rights owned by Zarlink or licensed from third parties by Zarlink, whatsoever. Purchasers of products are also hereby notified that the use of product in certain ways or in combination with Zarlink, or non-Zarlink furnished goods or services may infringe patents or other intellectual property rights owned by Zarlink.

This publication is issued to provide information only and (unless agreed by Zarlink in writing) may not be used, applied or reproduced for any purpose nor form part of any order or contract nor to be regarded as a representation relating to the products or services concerned. The products, their specifications, services and other information appearing in this publication are subject to change by Zarlink without notice. No warranty or guarantee express or implied is made regarding the capability, performance or suitability of any product or service. Information concerning possible methods of use is provided as a guide only and does not constitute any guarantee that such methods of use will be satisfactory in a specific piece of equipment. It is the user's responsibility to fully determine the performance and suitability of any equipment using such information and to ensure that any publication or data used is up to date and has not been superseded. Manufacturing does not necessarily include testing of all functions or parameters. These products are not suitable for use in any medical products whose failure to perform may result in significant injury or death to the user. All products and materials are sold and services provided subject to Zarlink's conditions of sale which are available on request.

Purchase of Zarlink's I²C components conveys a licence under the Philips I²C Patent rights to use these components in an I²C System, provided that the system conforms to the I²C Standard Specification as defined by Philips.

Zarlink and the Zarlink Semiconductor logo are trademarks of Zarlink Semiconductor Inc.

Copyright 2001, Zarlink Semiconductor Inc. All Rights Reserved.

TECHNICAL DOCUMENTATION - NOT FOR RESALE
