

PROTOTYPING PRODUCTS

PROTOTYPING PRODUCTS

The Circuit Board Division of VERO Electronics provides an extensive range of products enabling the electronics engineer to design and construct circuitry and to interconnect and package systems.

The Circuit Board Division product range supporting the prototype engineer covers prototyping boards, non-Eurocard circuit boards, Eurocard bus systems, extender boards and accessories.

PROTOTYPING BOARDS

VERO's prototyping board products range from the original Veroboard, through products for thermal analysis to products supporting personal computers. An extensive range of standard products meet the requirements of engineers constructing prototype or short run production circuits.

WIRING SYSTEMS

To simplify the construction of circuits, two different wiring systems are available.

Speedwire - VERO's insulation displacement wiring system - and the Verowire hard wiring system. These systems allow the engineer to select the method of wiring most appropriate to the circuit under construction.

CIRCUIT BOARD ACCESSORIES

From card handles and display bezels to circuit pins and track breaking tools, a comprehensive range of accessories are available in support of the standard prototyping board range.

MANUFACTURING STANDARDS

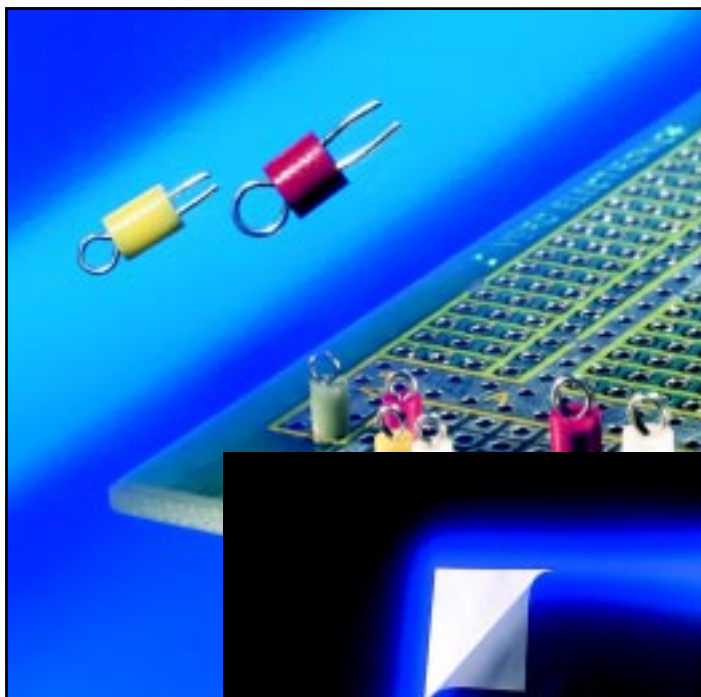
All VERO Electronics backplanes are manufactured in accordance with quality assurance levels to BS9000, CECC 23000 and IECQ PCQ88, with systems approval in accordance with BS EN ISO9001.



Certificate Number

Hedge End
FM 14253

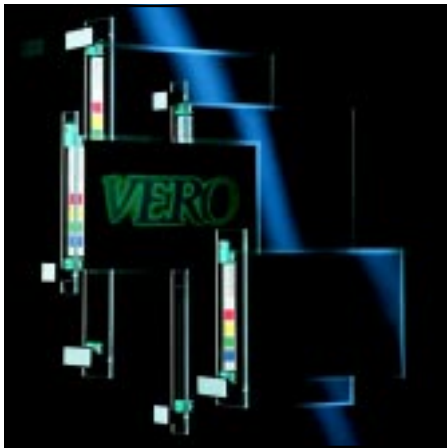
BS EN ISO 9001
BS 9761 BS 9762 BS 9763
CECC 23 300-004
CECC 23 300 CECC 23 200 CECC 23 100
Underwriters Laboratories



NEW PRODUCTS

▲ In line with its stated policy of constant product development VERO Electronics regularly introduces new or enhanced products. In this edition of the Product Handbook an additional product for temperature thermal analysis - **SpectraFlex** ThermoChromic Heat Imaging Lamina - can be found on page 8.03.



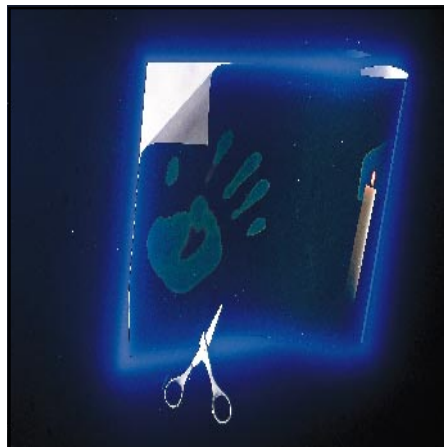


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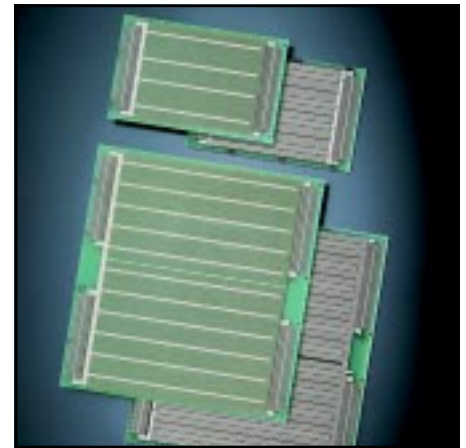
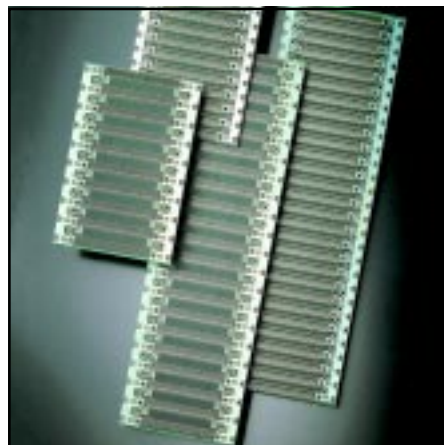
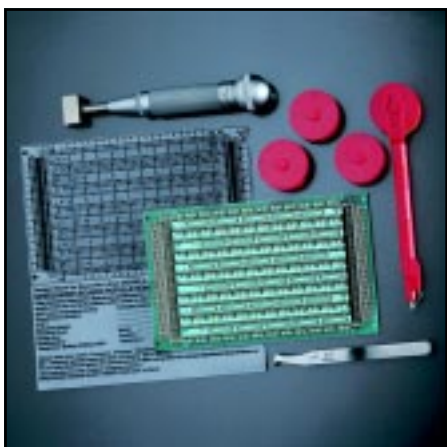
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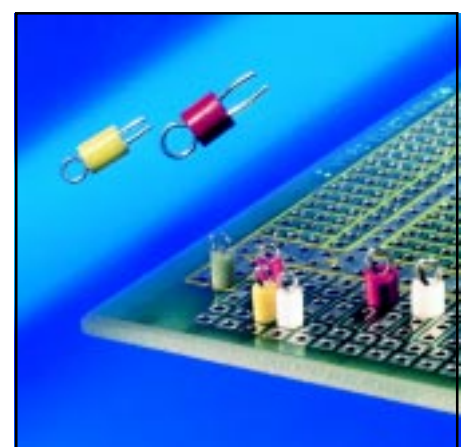


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THERMOCHROMIC HEAT IMAGING PRODUCTS

INTRODUCTION - THERMOCHROMIC HEAT IMAGING PRODUCTS

VERO Electronics has used its extensive experience - gained over more than thirty years in the electronic packaging and interconnect industry - to develop the Thermochromic Heat Imaging range of products.

The increase in power consumption of devices has highlighted the need for more efficient thermal management of both complex and simple integrated systems whilst offsetting effective system cooling against acceptable noise levels and ease of system maintenance.

The recent development of sophisticated software for thermal management modelling has enabled engineers to accurately predict the thermal characteristics of specific systems. However, drawbacks such as the cost of software and the need to know exact characteristics of each individual component within the environment mean that such software packages are not always ideally suited to prototyping or development on a limited budget.

SpectraFlex - THERMOCHROMIC HEAT IMAGING LAMINA

Following the successful launch of the rigid Thermochromic Heat Imaging Boards VERO Electronics has extended the product range to include **SpectraFlex** - a flexible, self adhesive lamina. Available in A4 sized sheets, which can be cut and shaped to size, this product provides wide versatility in identifying heat sources in difficult applications.

In contrast the **SpectraFlex** flexible laminas are cost effective - yet simple to use - products, giving accurate replication of the thermal properties exhibited by the component or sub-assembly under test rather than the theoretically calculated data.

Two temperature ranges are available with both exhibiting a colour change starting at red through yellow, then green and finally to blue. The colour changes are relatively linear. The temperature ranges are 35-45°C and 65-85°C.

LIQUID CRYSTAL PRINTED LAMINA

The sheets are polyester plastic sheets, reverse printed with Thermochromic Liquid Crystals and Alkyd Backing Black ink. The polyester is essentially an inert polymer, presenting no hazard to health.

Thermochromic Liquid Crystal materials are organic compounds based on cyanobiphenyls, and are encapsulated in microcapsules of gelatin/gum arabic polymers. The capsules are in an acrylic based ink film.

The thermochromic layer is overprinted with an alkyd oil based black ink. The black pigment is a carbon black. All materials involved are of a low order of toxicity. No lead based driers are used in any inks.

SIZE CONFIGURATION

SpectraFlex can be easily adapted to suit individual applications by cutting the lamina to size. A scalpel, scissors or guillotine are all suitable for this operation.



TIPS FOR MAKING STRONG BONDS

- Peel off the protective release liner and apply the tacky side to desired surface by hand or roller
- Use firm pressure
- Make sure surfaces are free from oil or other surface contaminants such as powder, dust or release agents
- Be sure parts are aligned properly before making bond
- Adhesive performance should be carefully checked when used on substrates containing plasticizers.

PERFORMANCE DATA

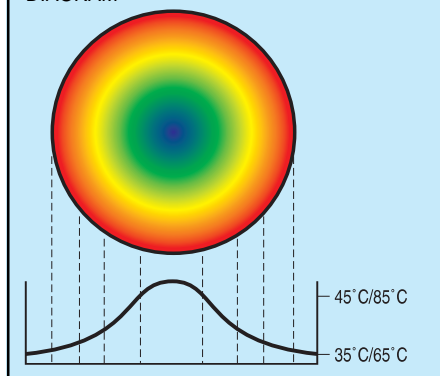
Shelf life is one year from date of shipment. Product should be stored in a cool, dry place below 76°F

Water resistance, 97% peel retention after 24 hour soak

Humidity resistance, 92% peel retention after one week @ 100°F/100% R.H

To ensure repeatability of the colour change, **SpectraFlex** must not be subjected to prolonged temperatures greater than 25% above the top temperature of the product ie 56°C and 106°C respectively. To avoid damage to any surface, exposure to temperatures greater than 110°C must

TEMPERATURE REPRESENTATION DIAGRAM



be avoided as it may make subsequent removal of the lamina difficult. Below this temperature **SpectraFlex** may be removed from smooth surfaces.

Due to the nature of this product, which is for surface measurement purposes only, users must ensure that airflow to temperature sensitive components is not adversely affected (e.g. by blocking ventilation holes)

SPECTRAFLEX THERMOCHROMIC HEAT IMAGING LAMINA

Ordering Information

Temperature range	Size	Order code
35-45°C	300x210	431-314826E
65-85°C	300x210	431-314828A

THERMOCHROMIC HEAT IMAGING BOARDS

The thermochromic heat imaging range of boards are a cost-effective and simple product to use, giving accurate replication of the thermal properties of a system rather than the calculated predictions achieved using software.

STRUCTURE OF INK CRYSTALS

By varying the complex mix of chemicals used in the thermochromic ink manufacturing process it is possible to determine the start and finish points of the colour cycle. This allows VERO to offer boards covering three temperature ranges. The lower range starts at 28°C (red) and changes through yellow and green to blue at 35°C, the middle range shows an initial change at 35°C with a highest visible response at 45°C, and the top temperature range responds between 65°C and 85°C.

FEATURES

- Three temperature ranges
- Simple to assemble and use
- Eurocard and hard metric compatibility
- Requires no power or special tooling
- Cost effective development tool
- Excellent graphic display
- Extensive lifetime
- Choice of front panels

MATERIAL SPECIFICATION

	28-35°C & 35-45°C	65-85°C
Board	acrylic	polycarbonate
Front panel	acrylic	acrylic
Handle	luranyl	luranyl
and moulding		
Ident	aluminium	aluminium

Luranyl is a UL94 V1 rated material with a continuous rating of 105°C.

CONTENTS OF KIT (Supplied packed flat)

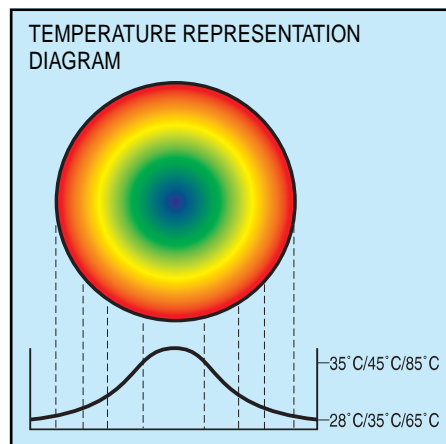
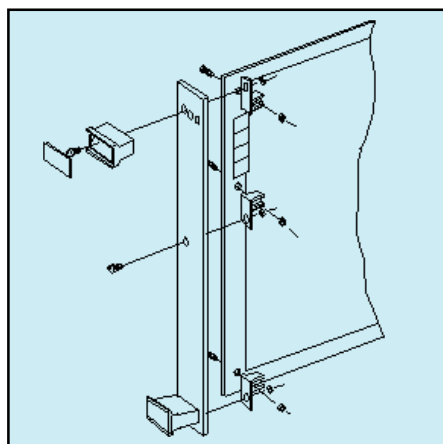
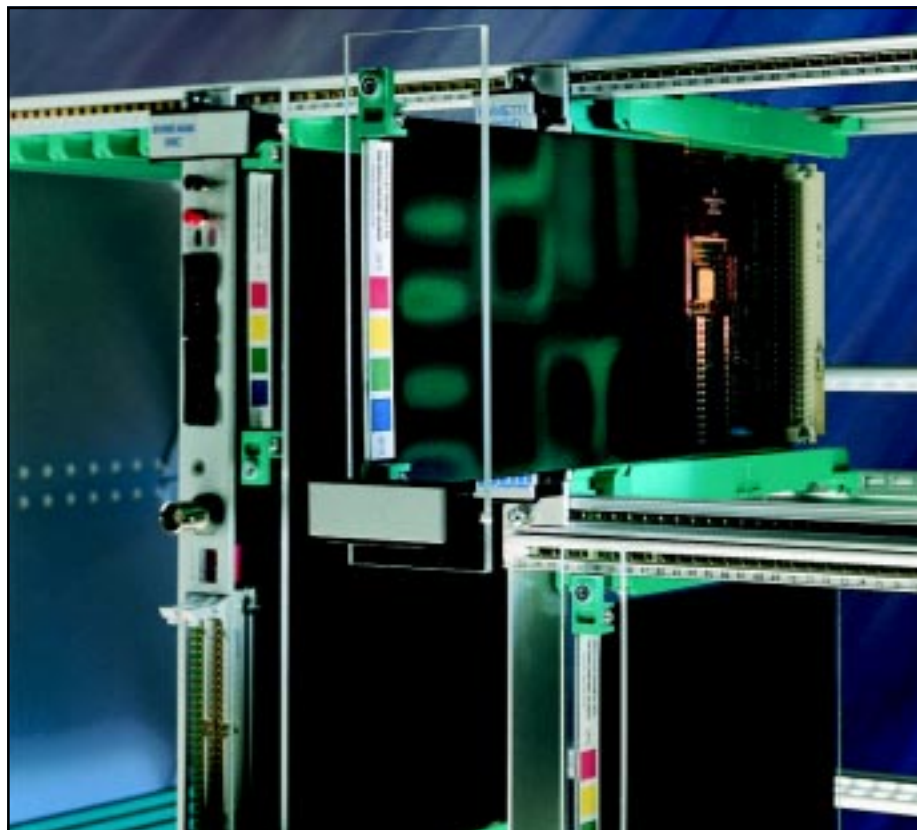
Board
Front panel (except universal version)
Front panel handles (1 for 3U, 2 for 6U)
Handle ident (1 for 3U, 2 for 6U)
Fixings
Instruction leaflet (for assembly)
Self adhesive visual temperature indicator

APPLICATIONS

Available in a variety of formats (see ordering information) the boards show a detectable colour change for approximately a 1°C change in temperature (increase or decrease) in the lower temperature range product and approximately 5°C for the highest range (65°C - 85°C) boards.

The boards can either be used to measure the various sources of heat by placing the thermochromic board in an adjacent slot position, or as an aid to identifying the effectiveness of cooling within a system during development.

Using simple baffle and deflector plates - which can be fashioned from readily available materials - it is possible to model corresponding airflow by introducing heat at the system's air inlet and assessing the effects by observing the response of the thermochromic boards.



SPECIAL INFORMATION

Boards subjected to temperatures greater than 25% above the upper limits of the temperature range may suffer from deterioration of the molecular structure of the thermochromic ink crystals, causing visible distortion of the colour response. It is therefore recommended that these temperatures are not exceeded for more than 45 seconds.

Care should be taken to avoid any abrasion of the screened ink surface as this will mark and adversely affect the performance and usability of the board.

Boards should be cleaned with a damp, lint-free cloth (or similar). Organic solvents and vapour will cause damage to the board.

THERMOCHROMIC HEAT IMAGING BOARDS

Ordering information

Description	Board size (mm)	Front panel width	Order code		
			28 - 35°C	35 - 45°C	65 - 85°C
Thermo-chromic Heat Imaging Boards	3U x 160mm	4HP	431-312041G	431-312364E	431-313738G
	3U x 160mm	8HP	431-312042E	431-312365C	431-313739E
	6U x 160mm	4HP	431-312043C	431-312366A	431-313740J
	6U x 160mm	8HP	431-312044A	431-312367K	431-313741G
	Metric 12SU x 288mm	12SP	431-312045K	431-312644K	431-313742E
	Universal 9U x 340mm	Order separately*	431-312046H	431-312645H	431-313743C

*See Section 4 of this Handbook

PROTOTYPING BOARDS

PTH MICROBOARD

FEATURES

- Reliability of plated through holes
- DIN 41494 (KM6-I) compatible
- Medium packing density
- DIN 41612 connector position, up to 96/96 ways, front and rear
- Solder resist protection to component side of board
- Two Vcc power rails and a 0V ground plane
- Grid print to aid component layout
- Microbus backplane compatible

APPLICATIONS

Specifically designed for microprocessor applications where high reliability, freedom from crosstalk and interface capability is a requirement. Fully compatible with DIN 41494 (KM6-II etc.) and equally suited to soldered or wirewrapped interconnections. When soldering a PTH board, capillary action draws the solder around the component leads forming extremely solid, reliable joints, particularly important in high vibration applications.

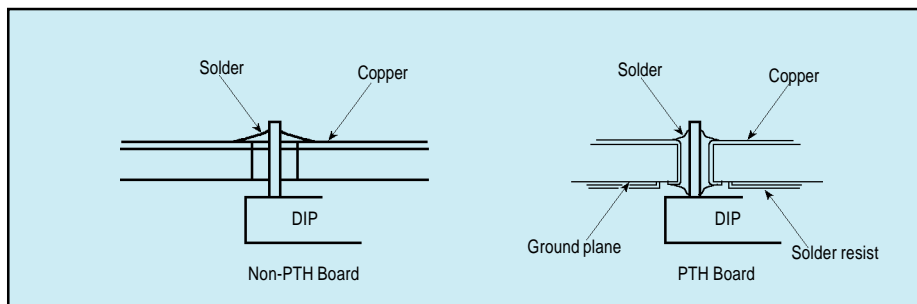
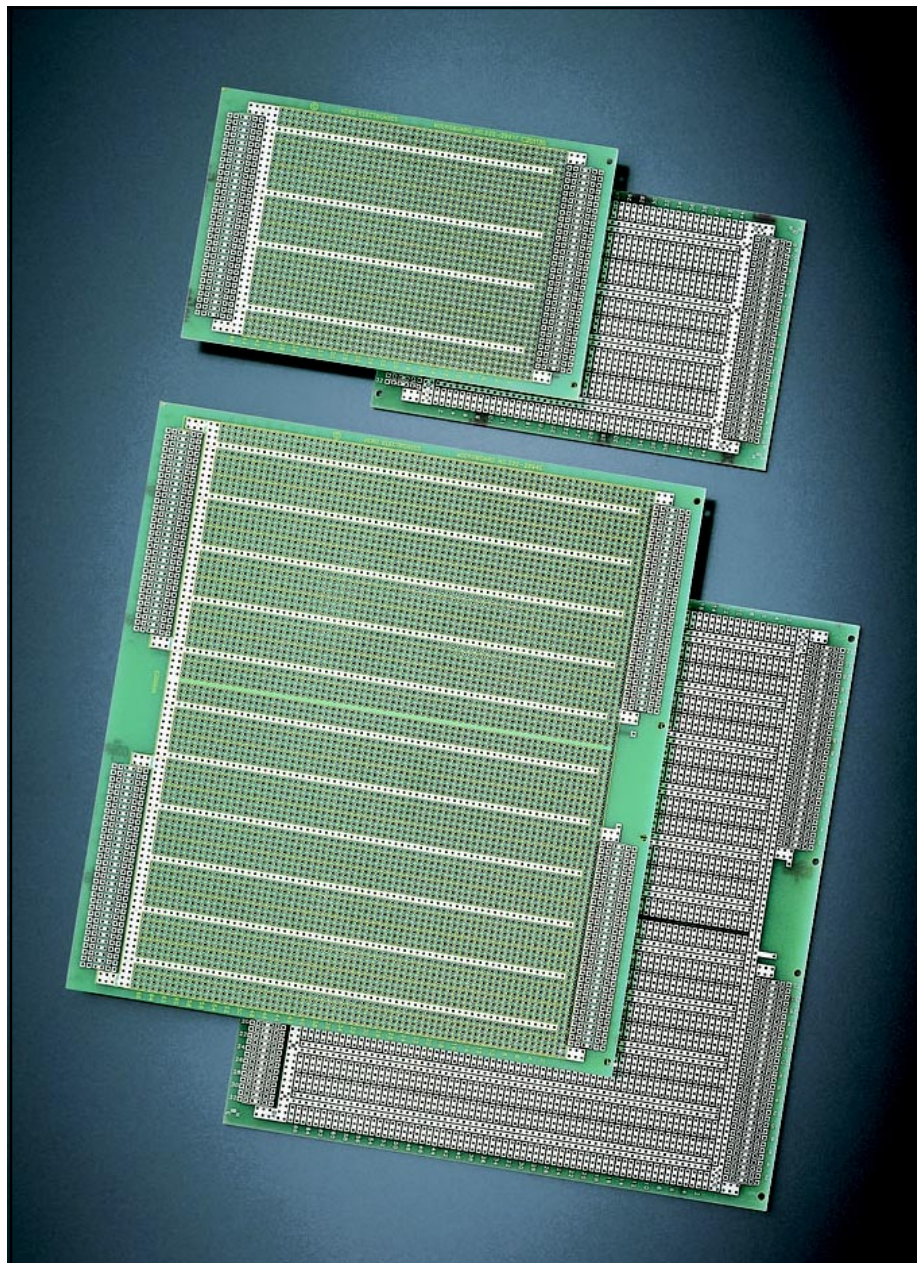
SCREENING

A maximum copper colander 0V ground plane is provided on the component side of the board. It is recommended that this side is used for interwiring with looms lying flat on the ground plane surface. This will reduce crosstalk from signal lines coupling directly to the ground plane.

BOARD SPECIFICATION

Board type	Epoxy glass
PTH	BS 4584 EP-GC-Cu 3 FR4
Max. working temp.	155°C
Nom. board thickness	1,6mm
Laminate copper thickness	35µm or 1oz/ft ² or 305g/m ²
Plated copper	25µm
Tin lead	10µm
Total	70µm

Note: bare boards are UL V-0 recognised components file number E116551.
Bare boards are approved to BS 9762



PTH MICROBOARDS

Board dimensions	7,62 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
100 x 160	4/44	4/44	Epoxy glass	222-2991F
100 x 220	4/67	4/67		222-2992B
233,4 x 160	11/44	17/44		222-2993J
233,4 x 220	11/67	17/67		222-2994E
366,8 x 220	17/67	10/67		222-27561D

Hole grid 2,54 x 2,54mm. Hole dia. 1,02mm

Ordering information

MICROBOARD - DOUBLE SIDED

FEATURES

- DIN 41494 (KM6-Ⅰ) compatible
- Medium packing density
- DIN 41612 connector up to 64/96 ways, front and rear
- Solder resist protection to component side of board
- Grid print to aid component layout
- Microbus backplane compatible
- 0V ground plane screen

MICROBOARD - DOUBLE SIDED

The forerunner of the PTH microboard, this range of boards finds similar applications in all but high reliability of plated through holes and restricted use of DIN 41612 connectors up to 64/96 ways only.

MICROBOARD - SINGLE SIDED

FEATURES

- DIN 41494 (KM6-Ⅰ) compatible
- Medium packing density
- DIN 41612 connector pattern, up to 64/96 ways, front and rear
- Grid print to aid component layout
- Microbus backplane compatible

MICROBOARD - SINGLE SIDED

This range of low cost Eurocards has no 0V ground plane on the component side, but is otherwise identical to the double sided microboards.

BOARD SPECIFICATION

Board type	Epoxy glass
Double/single sided	
copper	BS 4584 part 16
Max. working temp.	155°C
Nom. board thickness (inc. copper)	1,6mm
Copper thickness	35µm or 1oz/ft ² or 305g/m ²

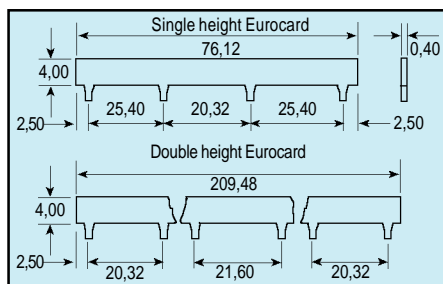
MICROBOARD - ON-BOARD BUSBAR

- Designed to provide gridded power distribution on voltage rails for all type of microboard

Technical specification

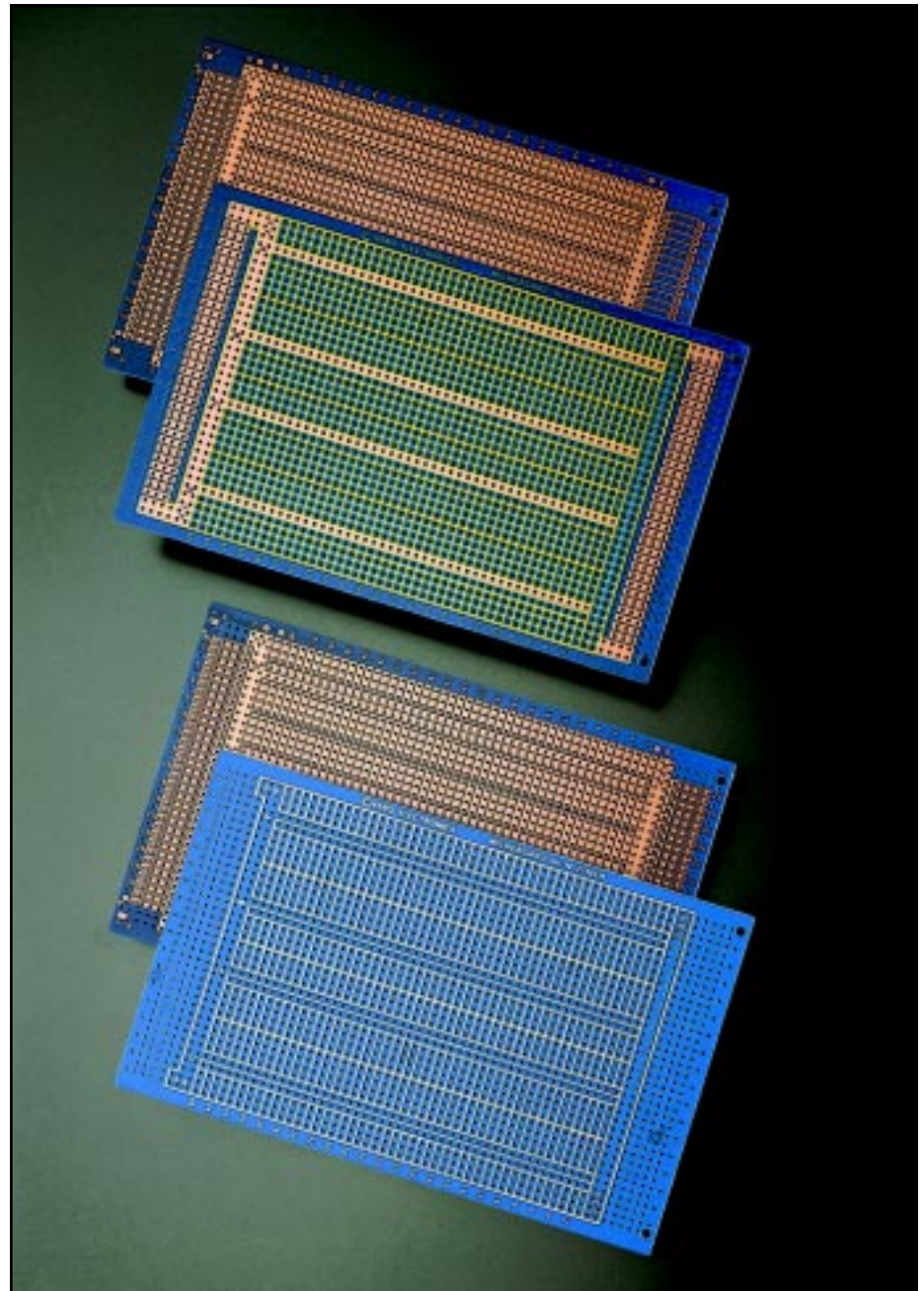
Material: High conductivity copper to BS 2870-C103

Finish: Bright tin electro-plated 5µm-9µm over 2,5µm copper flash



ON-BOARD BUSBAR Ordering information

Description	Order code
Single height microboard on-board busbar	22-2985J
Double height microboard on-board busbar	22-2986D



MICROBOARD - DOUBLE SIDED

Ordering information

Board dimensions	7,62 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
100 x 160	4/46	4/46	Epoxy glass	10-2845B
100 x 220	4/69	4/69		10-2857H
233,4 x 160	11/46	7/46		10-2846H
233,4 x 220	11/69	7/69		10-2858C

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm N.B. 3,81mm centre gap on double height boards

MICROBOARD - SINGLE SIDED

Ordering Information

Board dimensions	7,62 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
100 x 160	4/46	4/46	Epoxy glass	10-27563H
233,4 x 160	11/69	7/60		10-27564D

Hole grid 2,54 x 2,54mm Hole ida. 1,02mm N.B. 3,81mm gap on double height board

PROTOTYPING BOARDS

MICROBOARD 48WAY "F" TYPE

FEATURES

- DIN 41494 (KM6-1) compatible
- Medium packing density
- 48 way "F" type connector pattern at front
- DIN 41612, up to 96 ways, at rear
- Grid print to aid component layout

MICROBOARD 48 WAY "F" TYPE

Similar in use to the single sided microboard but offering the unique facility of interfacing via a full 48 way F-type DIN 41612 connector.

3 PLANE HIGH DENSITY DIP BOARD

FEATURES

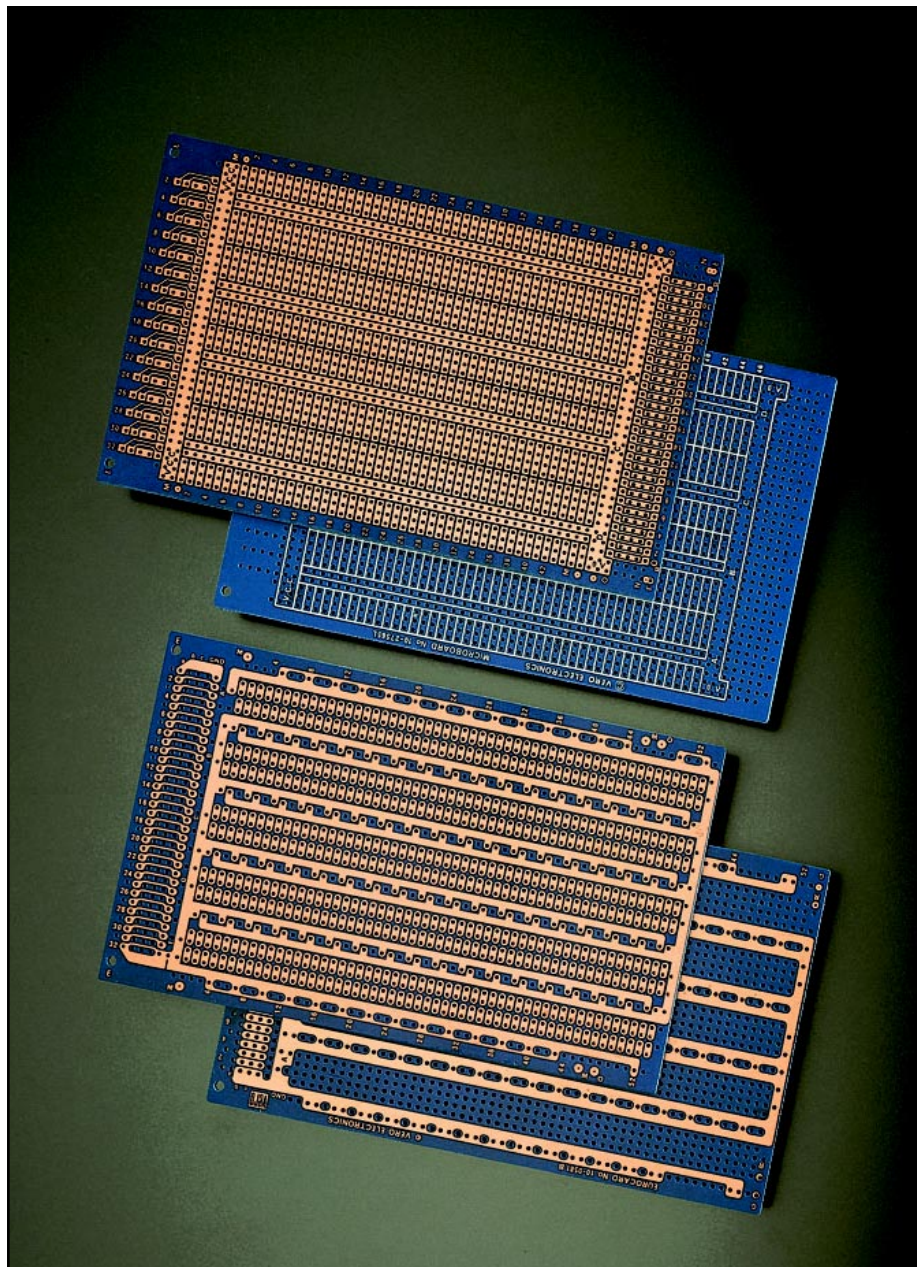
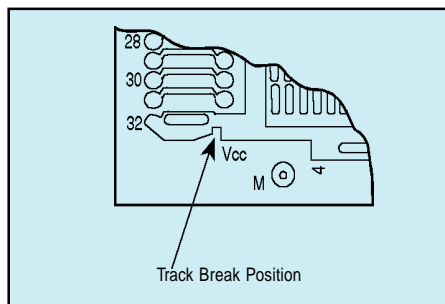
- High packing density
- Two Vcc and one 0V power rail options
- DIN 41494 (KM6-1) compatible
- DIN 41612 connector pattern, up to 64/96 ways
- Microbus backplane compatible

3 PLANE HIGH DENSITY DIP BOARD

Ideal for high density circuitry using wirewrapping, hardwiring or Verowire interconnection techniques. The board features two power rail options, either as two 0V or one Vcc and a ground plane on the component side. Power rails run between rows of 7,62 pitch integrated circuits allowing end-to-end stacking for increased packing density.

BACKPLANE COMPATIBLE

By utilising a simple track break facility to isolate Vcc from pin 32, high density DIP boards are fully compatible with the VERO Microbus range of backplanes.



MICROBOARD 48 WAY "F" TYPE

Ordering information

Board dimensions	7,62 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
100 x 160	4/46	4/46	Epoxy	10-27565L
233,4 x 160	11/46	7/46	glass	10-27566G

BOARD SPECIFICATION

Board type	Epoxy glass
Double/single sided	BS 4584 part 16
Max. working temp.	155°C
Nom. board thickness (inc. copper)	1,6mm
Copper thickness	35µm or 1oz/ft ² or 305g/m ²

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm N.B. 3,81mm gap on double height board

3 PLANE HIGH DENSITY DIP BOARD

Ordering information

Board dimensions	7,61 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
100 x 160	5/53	4/53	Epoxy glass	10-0581B
100 x 220	5/76	4/76		10-2731B
233,4 x 160	7/84	6/84		10-1372J
233,4 x 220	10/84	9/84		10-2730G

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm N.B. 3,81mm gap on double height boards

KM6 DIP BOARD

FEATURES

- DIN 41494 (KM6-Ⅰ) compatible
- DIN 41612 connector position, up to 64/96 ways
- Rear end input/output facility
- Grid print to aid component layout
- Microbus backplane compatible
- Ample room for wiring looms and/or discrete components

N.B. The board pattern is turned through 90° on double height Eurocard versions in order to maximise packing density.

KM6 DIP BOARD

A low density board designed for hard wiring of integrated circuits. 0V and Vcc rail patterns are duplicated on the component side of the board giving increased power distribution. Connector pattern at rear edge of board allows input/output via ribbon cable headers.

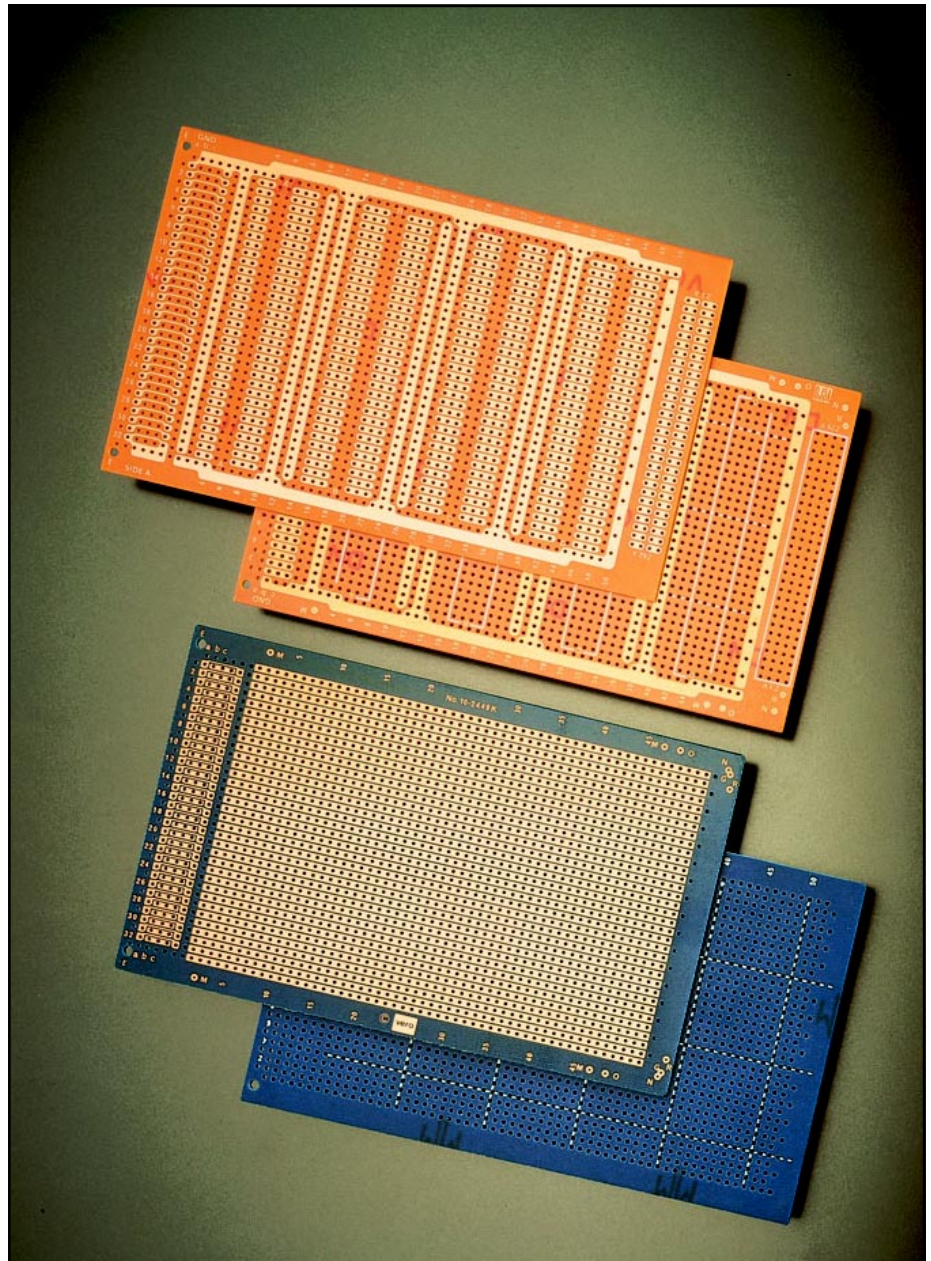
KM6 EUROCARD VEROBOARD PATTERN

FEATURES

- DIN 41494 (KM6-Ⅰ) compatible
- Ideal for hard wiring of discrete components
- Grid pattern to aid component layout
- Microbus backplane compatible
- Eurocard sizes

VEROBOARD PATTERN

A unique board giving the advantages of Veroboard with the flexibility of Eurocard and DIN 41612 connectors. Primarily used for hard wiring of discrete components, typically in analogue circuits, it is equally useful where a number of common bus or signal lines are required. For wirewrapping applications a 3,81mm gap on the double height boards maintains board patterns on grid with adjacent connectors.



KM6 DIP BOARD

Ordering information

Board dimensions	7,62 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
100 x 160	4/32	3/32	SRBP	10-2445H
100 x 160	4/32	3/32	Epoxy	10-2446C
233,4 x 160	7/46	7/46	SRBP	10-2447J
233,4 x 160	7/46	7/46	Epoxy	10-2448D

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

BOARD SPECIFICATION

Board type	Epoxy	SRBP
Single/double sided copper	BS4584 part 16	BS 4584 part 5
Max. working temp.	155°C	97°C
Nom. board thickness (inc.copper)	1,6mm	
Copper thickness	35µm or 1oz/ft² or 305g/m²	

KM6 EUROCARD - VEROBOARD PATTERN

Ordering information

Board dimensions	Tracks	Holes per track	Base material	Order code
100 x 160	34	52	Epoxy glass	10-2449K
100 x 220	34	77		10-27558D
233,4 x 160	86	52		10-27559L
233,4 x 220	86	75		10-27560J

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm N.B. 3,81mm gap on double height versions

PROTOTYPING BOARDS

VEROBOARD PATTERN WITH COLANDER GROUND

FEATURES

- DIN 41494 (KM6-Ⅰ) compatible
- Ideal for hard wiring of discrete components
- Colander ground plane for maximum screening
- DIN 41612 connector up to 64/96 ways
- Microbus backplane compatible

VEROBOARD PATTERN WITH COLANDER GROUND PLANE

Similar in use to the standard Veroboard pattern but offering the advantages of full 0V colander ground plane to provide maximum screening on the component side of the board.

SQUARE PAD BOARD

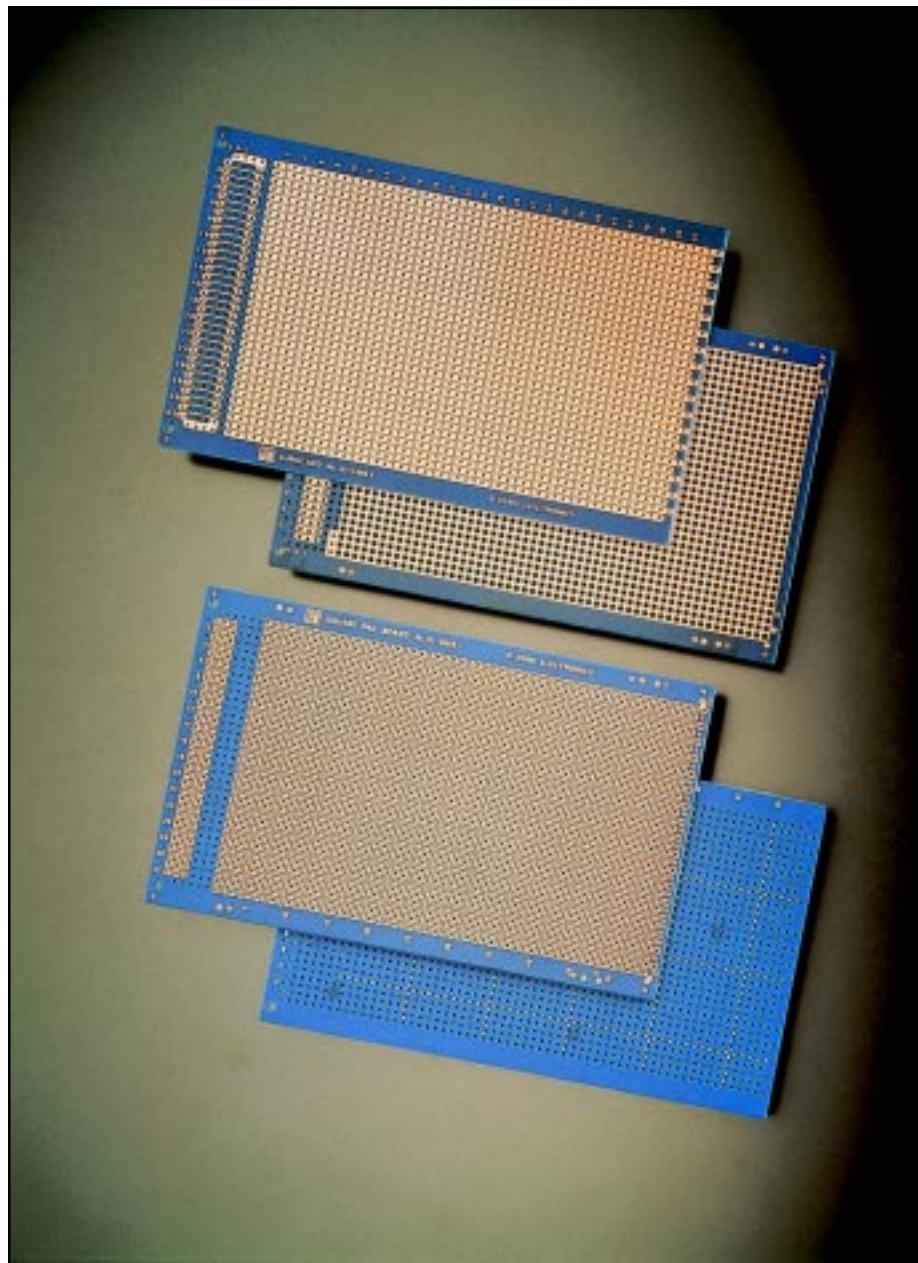
FEATURES

- Maximum packing density
- Total flexibility using hard wire or wirewrapping techniques
- DIN 41494 (KM6-Ⅰ) compatible
- DIN 41612 connector pattern up to 96/96 ways
- Grid references to both sides of board to aid component layout and to assist wiring
- Microbus backplane compatible

SQUARE PAD BOARD

A range of boards offering total flexibility and maximum density of wirewrapped circuitry. Any size of wirewrapping DIP socket or terminal pin can be accepted in either X or Y planes. Vcc and 0V rails may be daisy chained from post to post around the board eliminating the need to stake pins in power rails as on other types of board.

N.B. Component grids compatible with connectors. **Board 03-0111L** has a full board pattern aligned with the lower connector giving a 1,27mm offset between the top and bottom connector patterns.



BOARD SPECIFICATIONS

Board type	Epoxy glass
Double sided copper	BS 4584 part 16
Max. working temp.	155°C
Nom. board thickness (inc. copper)	1,6mm
Copper thickness	35µm or 1oz/ft ² or 305g/m ²

VEROBOARD PATTERN WITH COLANDER GROUND PLANE

Ordering information

Board dimensions	Tracks	Holes/tracks	Base material	Order code
100 x 160	34	54	Epoxy glass	03-2990F
233,4 x 160	84	54		03-22848J

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm N.B. 3,81mm gap on double height boards

SQUARE PAD BOARDS

Ordering information

Board dimensions	No. of Pads		Base material	Order code
	width	length		
100 x 160	34	54	Epoxy glass	03-0026J
100 x 220	34	77		03-27555K
233,4 x 160	85	52		03-0111L
233,4 x 160	86	52		03-27556F*
233,4 x 220	86	75		03-27557B*

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm N.B. * 3,81mm gap on these double height boards

SQUARE PAD BOARD WITH COLANDER GROUND PLANE

FEATURES

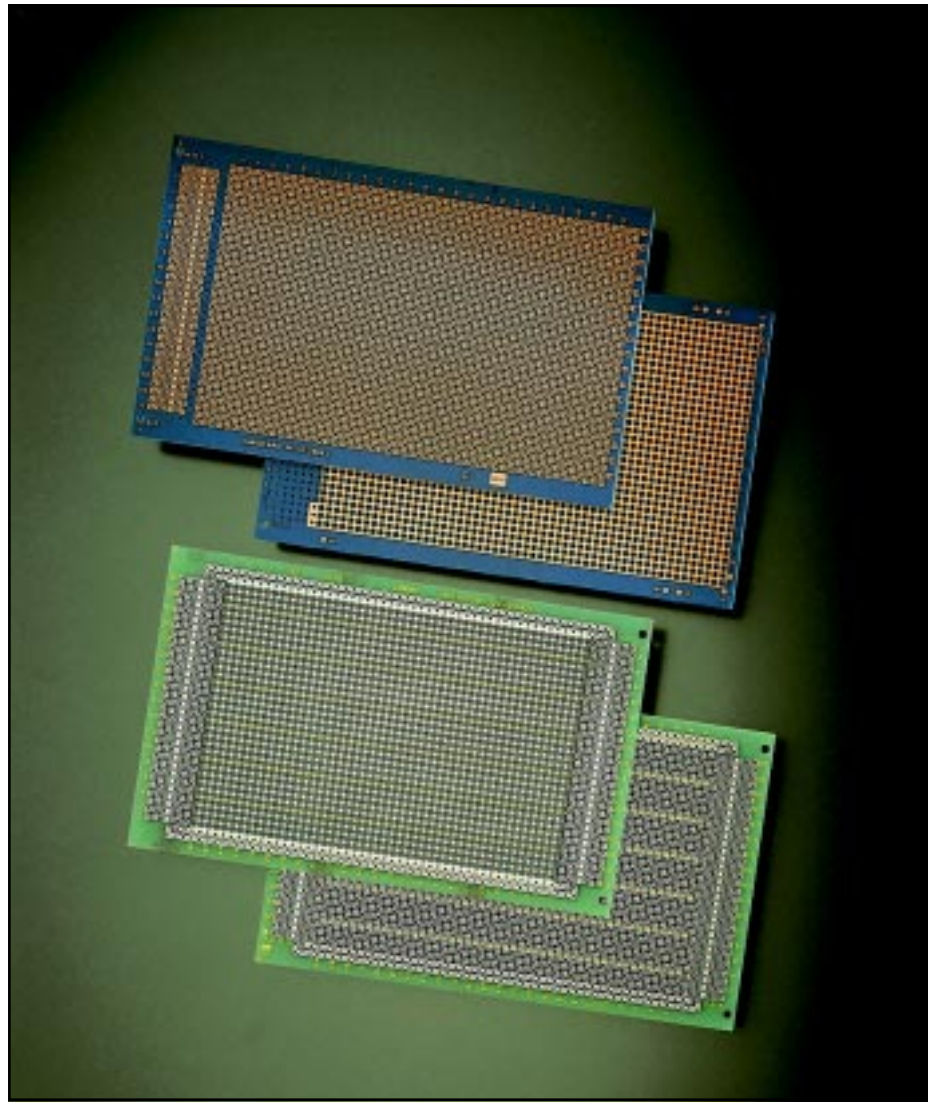
- Maximum packing density
- Total flexibility using hard wire or wire wrapping techniques
- Colander ground plane for maximum screening
- DIN 41494 (KM6-Ⅰ) compatible
- DIN 41612 connector pattern up to 96/96 ways
- Grid references to both sides of board to aid component layout and to assist wiring
- Microbus backplane compatible

SQUARE PAD BOARD WITH COLANDER GROUND PLANE

A single height Eurocard similar to the standard square pad board but offering the additional advantage of 0V colander ground plane.

BOARD SPECIFICATION

Board type	Epoxy glass
Double sided copper	BS 5484 part 16
Max. working temp.	155°C
Nom. board thickness (inc. copper)	1,6mm
Copper thickness	35µm or 1oz/ft ² or 305g/m ²



PTH SQUARE PAD BOARDS

FEATURES

- Maximum packing density
- Total flexibility using hard wire or wirewrapping techniques
- DIN 41494 (KM6-Ⅰ) compatible
- DIN 41612 connector pattern up to 96/96 ways, front and rear
- Solder resist protection to component side of board

PTH SQUARE PAD BOARD

By having plated through holes, these boards are able to offer the same high density and flexibility as the square pad Eurocards but for hard wiring applications. A high level of interfacing may be achieved with boards able to accept 96/96 way DIN 41612 connectors.

Power rails are provided along the length of the board and a colander ground plane affords maximum screening to the component side of the board.

BOARD SPECIFICATION

Board type	Epoxy glass
Plated through hole	BS 4584 Ep-GC-Cu3-FR4
Max. working temp.	155°C
Nom. board thickness	1,6mm
Laminate copper thickness	35µm or 1oz/ft ² or 305g/m ²
Plated copper	25µm
Tin lead	10µm
Total	70µm

Note: bare boards are UL 94 V-0 recognised components file number E116551. Bare boards are approved to BS9762.

SQUARE PAD BOARD WITH COLANDER GROUND PLANE

Ordering information

Board dimensions	No. of Pads		Base material	Order code
	width	length		
100 x 160	34	54	Epoxy	03-2989L

hole grid 2,54 x 2,54mm Hole dia. 1,02mm

PTH SQUARE PAD BOARDS

Ordering information

Board dimensions	No. of Pads		Base material	Order code
	width	length		
100 x 160	32	48	Epoxy	222-26492L
100 x 220	32	71	Epoxy	222-53134H
233,4 x 160	70	48	Epoxy	222-53135E
233,4 x 220	70	71	Epoxy	222-53136B

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

PROTOTYPING BOARDS

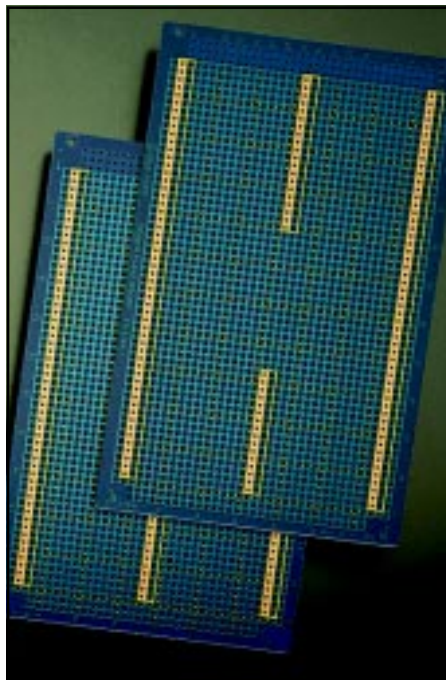
DOUBLE SIDED POWER PLANE BOARD

FEATURES

- Very high packing density
- VERO high reliability wirewrap DIP sockets and pin grid arrays press securely into holes and remain in position during wiring
- Provision for mounting pin grid arrays
- Caters for local decoupling
- Blue solder resist on both sides with exposed power rails
- Screen printed notations on both sides with power rail indication
- Reservoir capacitor positions provided between DIN connectors on double Eurocards

POWER PLANE BOARDS

This range of boards is ideal for wirewrapping, providing maximum packing density combined with convenient power and 0V return plane. They have improved gridding and screening capability and can carry a range of pin grid array sockets in mixed socket applications.



BOARD SPECIFICATION

Board type	Epoxy glass
Plated through hole	BS 4584
	Ep-GC-Cu3-FR4
Max. working temp.	155°C
Nom. board thickness	1,6mm
Laminate copper thickness	35µm or 1oz/ft² or 305g/m²
Plated copper	25µm
Tin lead	10µm
Total	70µm

Note: bare boards are UL 94 V-0 recognised components file number E116551. Bare boards are approved to BS9762.

POWER PLANE BOARDS

Board dimensions	Useable hole pos.		Base material	Order code
	width	length		
100 x 160	36	55	Epoxy glass	03-27691L
100 x 220	36	78		03-27692G
233,4 x 160	89	55		03-27693C
233,4 x 220	89	78		03-27694K

Ordering information

Hole grid 2,54 x 2,54mm Hole dia. 0,9mm N.B.3,81mm gap on double height boards

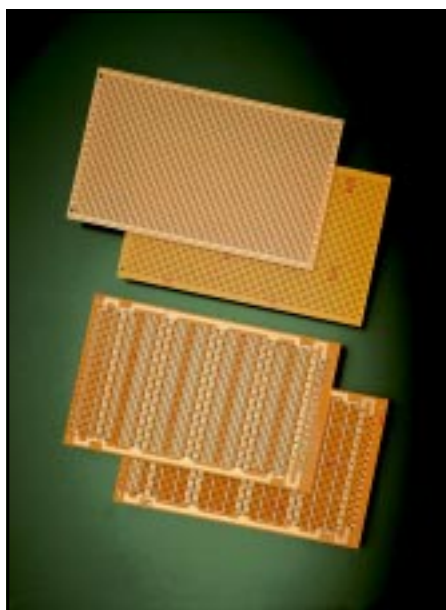
BUDGET EUROCARD

FEATURES

- Ideal for low cost prototyping
- DIN 41494 (KM6-1) compatible
- Fixing holes provided for DIN 41612 connector
- Microbus backplane compatible

BUDGET EUROCARDS

A range of low cost prototyping boards primarily for hard wiring of general discrete components, as used in analogue and general circuitry, but equally useful where a number of common bus or signal lines are required.



DIP BOARD

FEATURES

- Ideal for hard wiring applications
- DIN 41612 or DIN 41617 connector patterns
- Grid print to aid component layout
- Microbus backplane compatible

DIP BOARD

A low density board designed for hard wiring of integrated circuits. Ample room is provided between rows for wiring looms and discrete components. 0V and Vcc rail patterns duplicated on component side of board give increased power distribution.

N.B. The board pattern is turned through 90° on double Eurocard versions in order to maximise packaging density.

BUDGET EUROCARD

Ordering information

Board dims.	No. of tracks	Holes per track	Base material	Order code
100 x 160	36	60	SRBP	09-2196L
100 x 220	36	83	SRBP	09-27562G

BOARD SPECIFICATION

Board type	Epoxy glass	SRBP
Double sided copper	BS4584 part 16	BS4584 part 5
Max. working temperature	155°C	97°C
Nom. board thickness (inc. copper)	1,6mm	
Copper thickness	35µm or 1oz/ft² or 305g/m²	

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

DIP BOARD

Ordering information

Board dimensions	7,62 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
100 x 160	4/32	3/32	SRBP	10-1041J
100 x 160	4/32	3/32	Epoxy	10-1042D
233,4 x 160	7/47	6/47	Epoxy	10-3183G

PLUG-IN VEROBOARD

FEATURES

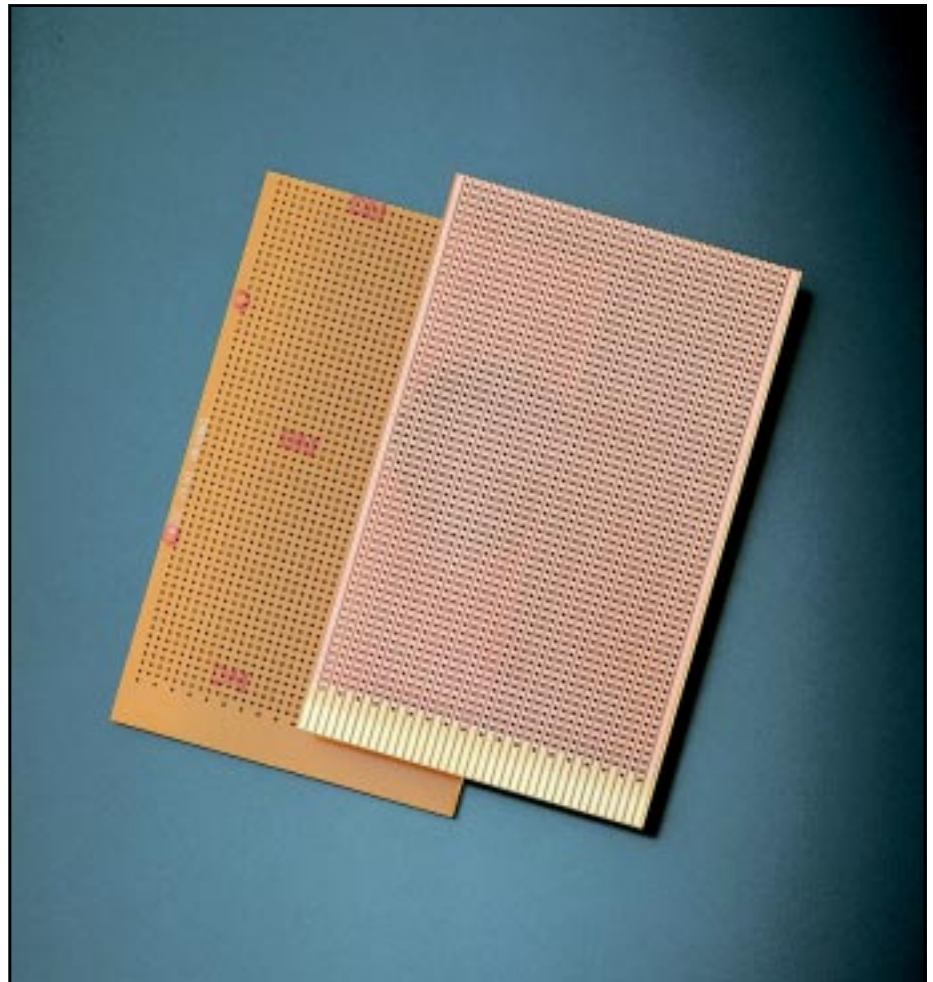
- Ideal for hard wired applications
- 37 way 2,54mm pitch gold plated tongue

PLUG-IN VEROBOARD

This board combines the unique Veroboard pattern with the 37 way 2,54mm pitch direct edge connector. Intended primarily for hard wiring of discrete components it is equally useful where a number of common bus or signal lines are required.

BOARD SPECIFICATION

Board type	Epoxy glass
Single sided copper	BS4584 part 16
Max. working temp.	155°C
Nom. board thickness (inc. copper)	1,6mm
Copper thickness	35µm or 1oz/ft ² or 305g/m ²



PLUG-IN VEROBOARD

Ordering information

Board dimensions	Tracks	Holes per track	Base material	Order code
100 x 160	37	57	SRBP	09-1036G

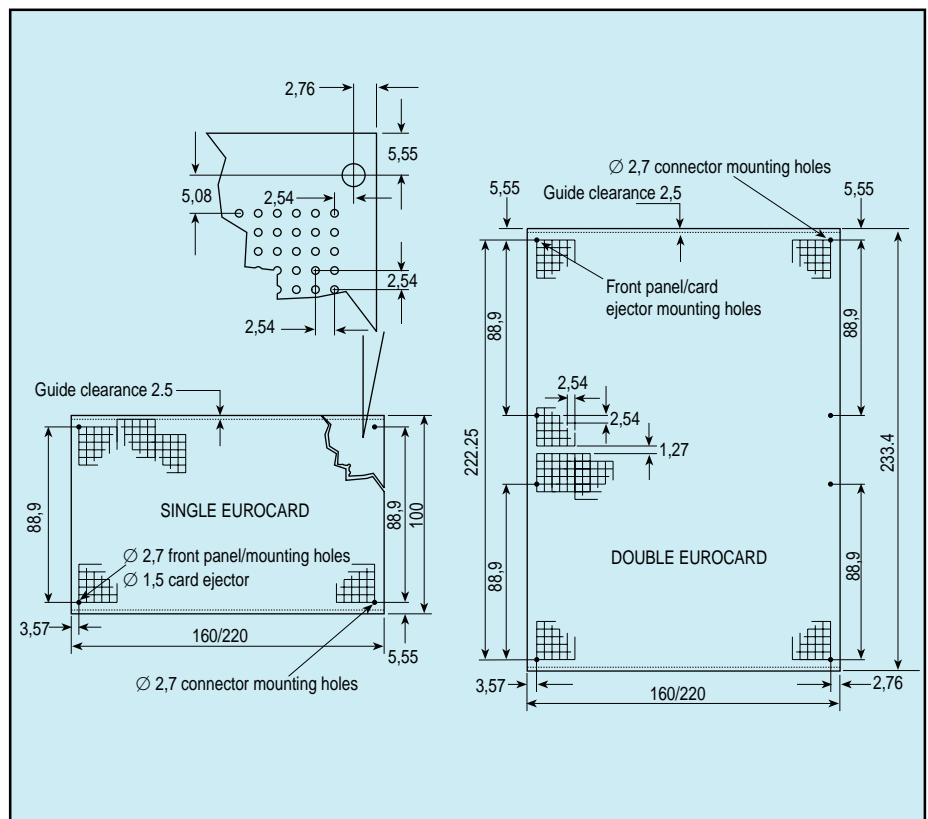
Hole grid 2,54 x 2,54mm Hole dia. 1,02mm Contact pitch 2,54mm

CRITICAL EUROCARD DIMENSIONS

A 2,5mm wide border is necessary top and bottom of printed circuit boards to allow clearance for guides and for mounting into plug-in unit guide rails. On the double height Eurocard, owing to the overall size and position of the connectors, it is recommended that when fitting components to front panels the grid as laid out is adopted. This will allow consistency between 3U and 6U height front panels.

List of undrilled pads which appear on most Eurocards

- E. DIN 41612 connector mounting
- F. DIN 41617 connector mounting
- G. Card ejectors
- H. Card handle Type A - 45,72 centres
- K. Card handle Type C
- L. Card handle Type B - 30,48 centres
- M. Module mounting
- N. Card mounting brackets KM4 and KM6, card ejector KM6
- O. KM4 module mounting extended with "M" holes
- P. Module mounting 220 cards only
- R. Flexible card handle Type E



PROTOTYPING BOARDS

VEROBOARD METRIC PITCH

FEATURES

- Metric pitch
- Ideal for hard wiring of discrete components

VEROBOARD - METRIC PITCH

A range of general purpose Eurocards primarily for hard wiring of discrete components, typically in analogue circuits, they are equally useful where a number of common bus or signal lines are required. The boards feature a metric pitch of 2,50 x 2,50mm or 5,0 x 2,50mm which is not DIN 41612 compatible, but can be used inside modules.

PLAIN BOARDS, METRIC AND IMPERIAL PITCH

FEATURES

METRIC PITCH

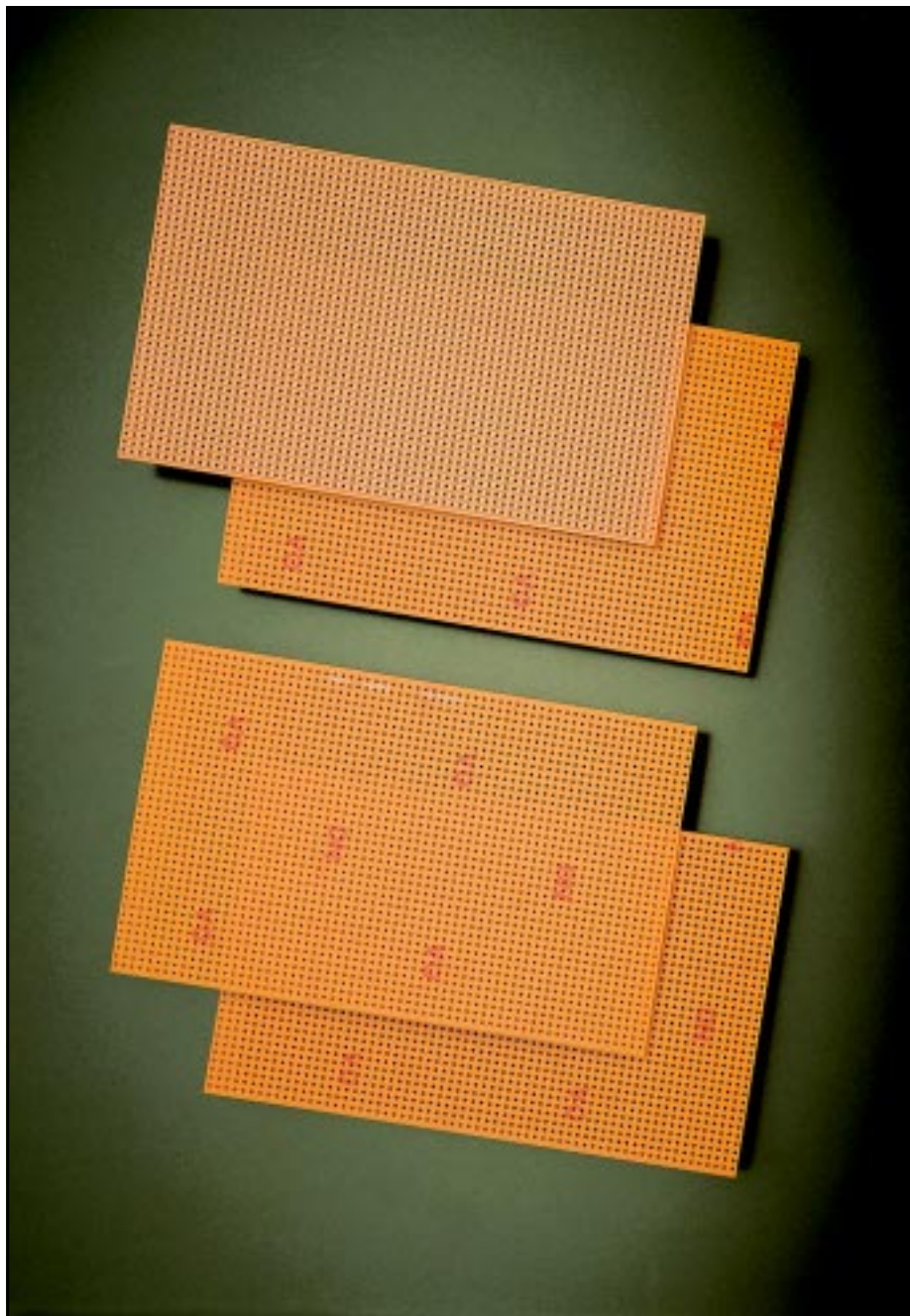
- Ideal for hard wiring of discrete components
- For use with solder pins
- Total flexibility
- Compatible with KM6 cardframes

IMPERIAL PITCH

- Compatible with KM6 cardframes
- Fibreglass material
- For use with solder pins or wirewrap DIP sockets
- DIN 41612 connector compatible
- Grid printed for component reference

PLAIN BOARDS - METRIC AND IMPERIAL PITCH

These boards offer total flexibility for the hard wiring of discrete components or the mounting of wirewrap sockets and pins and for the prototyping of analogue circuitry.



BOARD SPECIFICATION

Board type	Epoxy glass	SRBP
Single sided copper	BS4584 part 16	BS4584 part 5
Max.	155°C	97°C
Nom. board thickness (inc. copper)		1,6mm
Copper thickness	35µm or 1oz/ft ² or 305g/m ²	

VEROBOARD - METRIC PITCH

Ordering information

Board dimensions	Tracks	Holes/track	Board pitch	Base material	Order code
100 x 160	39	64	2,50 x 2,50	SRBP	09-1034F
100 x 160	39	64	2,50 x 2,50	Epoxy	09-1461H

Hole dia. 1,02mm

PLAIN BOARDS - METRIC AND IMPERIAL PITCH

Ordering information

Board dimensions	Rows of holes	Hole matrix	Base material	Order code
100 x 160	34 x 64	2,50 x 2,50	SRBP	09-1040J
100 x 160	39 x 60	2,54 x 2,54	Epoxy	09-19082K

Hole dia. 1,02mm

VEROBOARD - SINGLE SIDED COPPER

FEATURES

- Ideal for hard wiring or discrete components
- Range of standard sizes
- Choice of hole sizes and grid pitch

VEROBOARD - SINGLE SIDED COPPER

Ideal for development and prototyping work, Veroboard is designed primarily for hard wiring of discrete components, typically in analogue circuits, but is equally useful where a number of common bus or signal lines are required.

Veroboard is manufactured from copper clad laminated board which has been pierced with a grid of holes and machined to provide parallel tracks.

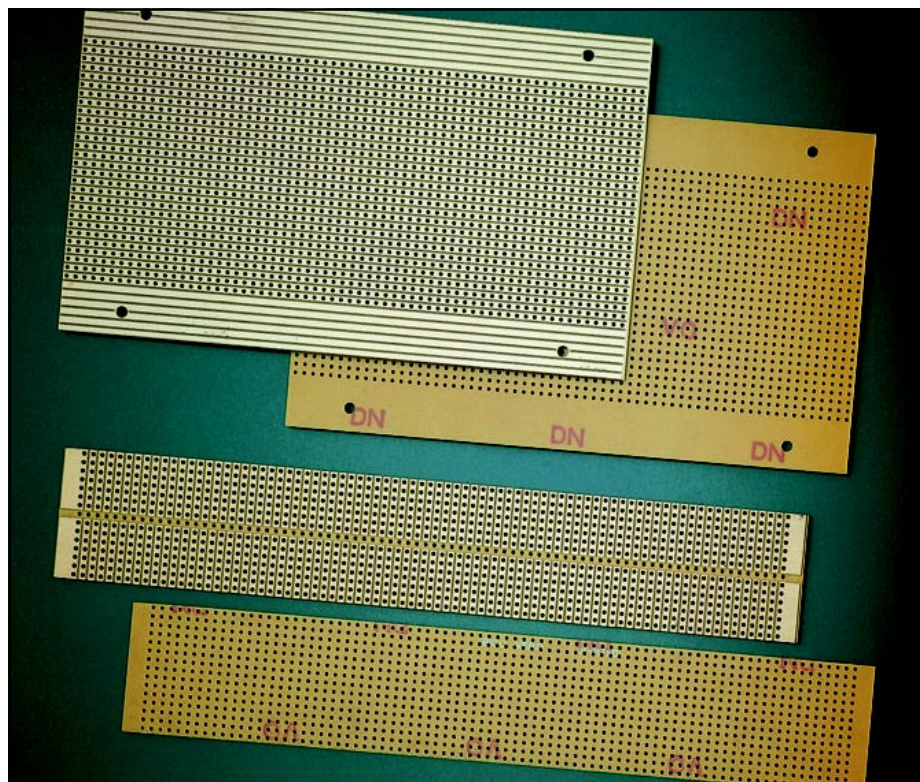
VEROSTRIP - SINGLE SIDED COPPER

FEATURES

- Ideal for hard wiring of discrete components
- Central track break already provided

VEROSTRIP

A variant of Veroboard designed to provide a simple and inexpensive mounting board for discrete components or integrated circuits. The board is suitable for all applications where a conventional tag strip or group board might be used.



BOARD SPECIFICATION

Board type	Epoxy glass	SRBP
Single sided copper	BS4584 part 16	BS4584 part 5
Max. working temp.	155°C	97°C
Nom. board thickness (inc. copper)	1,6mm	
Copper thickness	35µm or 1oz/ft ² or 305g/m ²	

VEROBOARD - SINGLE SIDED

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

Ordering information

Board dimensions	No. of pierced copper tracks	Holes/ track	Base material	Order code
121,92 x 101,60	41	44	SRBP	01-0021H
100,84 x 162,56	28	64	SRBP	07-0008H
111,76 x 176,53	40	61	SRBP	01-0014K
145,29 x 238,76	46	94	SRBP	07-0011D
200,66 x 252,73	75	91	SRBP	01-0019G
204,75 x 393,70	78	155	SRBP	67-1902F
95,10 x 454,66	34	179	Epoxy glass	01-0112B
95,10 x 454,66	34	179	SRBP	01-0040A
119,38 x 454,66	36	179	SRBP	01-0041G
119,38 x 454,66	38	179	SRBP	01-0043H
179,07 x 454,66	60	179	SRBP	01-0042B
100,00 x 500,00	36	197	SRBP	01-27567D
100,00 x 500,00	36	197	Epoxy glass	01-27568L

VEROSTRIP

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

Ordering information

Board dimensions	No. of pierced copper tracks	Holes/ track	Base material	Order code
38,10 x 214,60	81	15	SRBP	01-0171D

NON-EUROCARD CIRCUIT BOARDS

VEROBOARD - DOUBLE SIDED COPPER

FEATURES

- Ideal for prototyping of double sided boards
- Minimal cross wiring required

VEROBOARD - DOUBLE SIDED COPPER

This board is a fully pierced Veroboard with tracks on the reverse side at right angles to the tracks on the face side. Interconnections can be made via the copper tracks using VERO shorting pins, greatly reducing the amount of wiring required.

PLAIN BOARD

FEATURES

- Ideal for hard wiring of discrete components
- Total flexibility
- Choice of material and hole sizes
- May also be used for wirewrapping

PLAIN BOARD

A range of fully pierced boards designed for prototyping analogue circuitry. Utilising VERO terminal pins, these boards offer total flexibility for hard wiring of discrete components or wirewrapping sockets or pins.

VEROBOARD - PLUG-IN

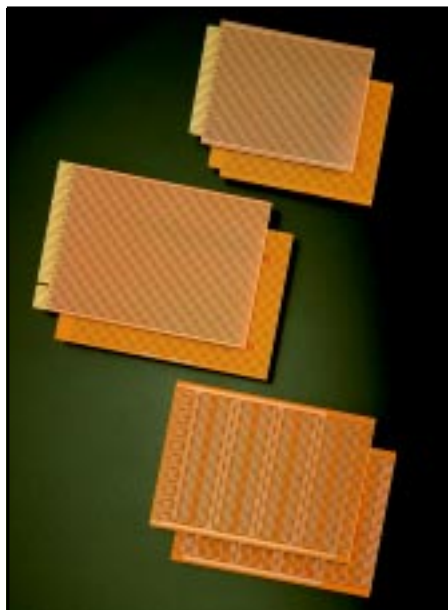
FEATURES

- Ideal for hard wiring components
- Range of standard sizes
- Profile or full width gold plated tongue
- Compatible connectors available

VEROBOARD - PLUG-IN

A range of boards as easy to use as standard Veroboard but offering the facility of interfacing via direct, edge card connectors. The copper tracks at one end of the board are left unpierced and are hard gold plated for minimum contact resistance, reliability and long life.

Hole grid 2,54 x 2,54mm Hole dia.1,02mm



DIP BREADBOARD

FEATURES

- Ideal for hard wired applications
- Grid print to aid component layout
- Full range of terminal pins available for interfacing



VEROBOARD - DOUBLE SIDED COPPER Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

Board dimensions	No. of pierced copper tracks	Holes per track	Base material	Order code
213,49 x 210,82	79	83	SRBP	03-0109K

Ordering information

PLAIN BOARDS Hole grid 2,54 x 2,54mm Hole dia. 1,32mm

Ordering information

Board dimensions	No. of holes		Base material	Order code
	Width	Length		
179,07 x 238,79	60	94	Epoxy glass	02-0116F

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

200,66 x 252,73	75	91	SRBP	02-0125E
95,10 x 454,66	34	179		02-0134D

DIP BREADBOARD

BOARD SPECIFICATION

A range of low density boards for hard wiring of integrated circuits, particularly useful in R & D applications. 0V and Vcc rail patterns are duplicated on the component side of the board giving increased power capacity. These boards do not have gold plated contacts, therefore offering a cost saving over plug-in boards. In place of contacts, individual mounting pads for terminal pins are provided.

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm

Board type	SRBP
Double/single sided copper	BS4584 part 5
Max. working temp.	97°C
Nom. board thickness (inc. copper)	1,6mm
Copper thickness	35µm or 1oz/ft ² or 305g/m ²

VEROBOARD - PLUG-IN profiled tongue version

Ordering information

Board dimensions	Tongue no./ways	Tongue width	No.of pierced copper tracks	Holes	Base material	Order code
95,10 x 129,54	32	83,67	34	46	SRBP	03-0075F

FULL TONGUE VERSION polarising slot cut in position 7 from bottom

114,30 x 203,20	42	-	43	75	SRBP	09-0089C
114,30 x 165,10	42	-	42	60		09-0090J
158,75 x 203,20	59	-	60	75		09-0091D

DIP BREADBOARD

Ordering information

Board dimensions	7,62 pitch IC DIP rows/pads	15,24 pitch IC DIP rows/pads	Base material	Order code
114,30 x 156,21	4/39	4/39	SRBP	06-0166F
203,30 x 194,31	5/76	5/76		06-0168G

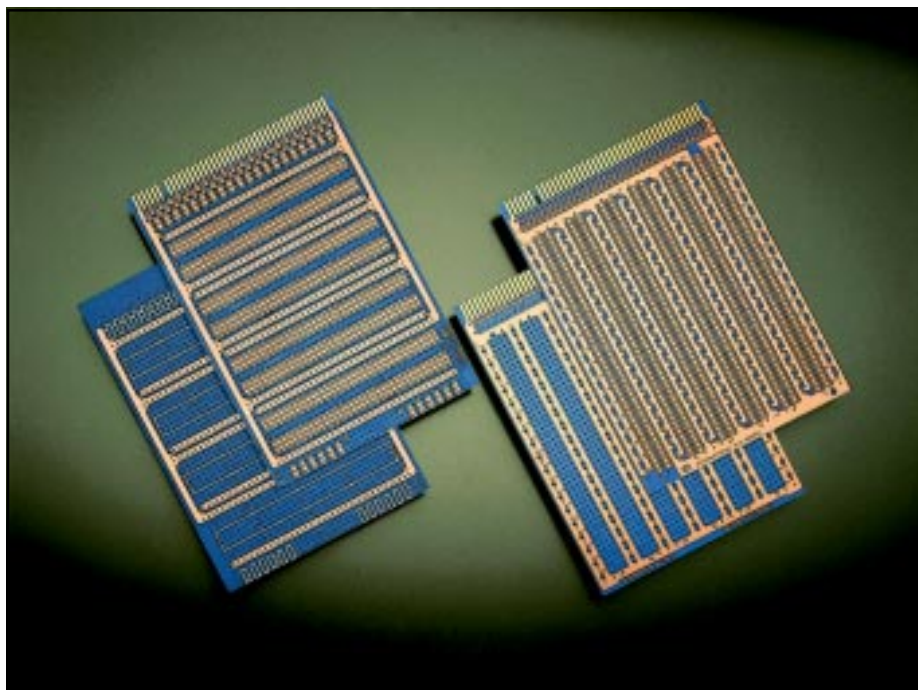
DIP PLUG-IN BOARD FOR SINGLE AND DOUBLE SIDED CONNECTORS

FEATURES

- Ideal for hard wiring applications
- Single or double sided contacts
- Profiled or full width gold plated tongue
- Choice of contact pitch and number of ways
- Grid pattern to aid component layout
- Test point facility

DIP PLUG-IN BOARD FOR SINGLE AND DOUBLE SIDED CONNECTORS

This range of DIP boards is provided with either single or double sided contacts for interfacing via direct, edge card connectors. Primarily low density, they have been designed for hard wiring of integrated circuits. A test point facility is given by copper pads situated at the front end of each board.



BOARD SPECIFICATION

Board type	Epoxy glass	SRBP
Double sided copper	BS4584 part 16	BS4584 part 5
Max. working temp.	155°C	97°C
Nom. board thickness (inc. copper)	1,6mm	
Copper thickness	35µm or 1oz/ft ² or 305g/m ²	

DIP PLUG-IN BOARD

Ordering information

Single sided, full tongue version - polarising slot cut in 7 from bottom

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm Contact pitch 2,54mm

Board dimensions	7,62 pitch ICs rows/pads	15,24 pitch ICs rows/pads	Tongue no.of ways	Base material	Order code
114,30 X 165,10	4/39	4/39	42	Epoxy	10-0145A

Double sided, profiled tongue 102,24

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm Contact pitch 2,54mm

114,30 x 165,10	4/40	4/40	40/40	Epoxy	06-0153E
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Double sided, profiled tongue 90,73

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm Contact pitch 3,96mm

114,30 x 165,10	4/39	4/39	22/22	SRBP	06-0146G
114,30 x 165,10	4/39	4/39	22/22	Epoxy	06-0147B

3 PLANE HIGH DENSITY PLUG-IN DIP BOARD

FEATURES

- High packing density
- Two Vcc and one 0V power rail options
- Profiled or full width gold plated tongue

3 PLANE HIGH DENSITY PLUG-IN DIP BOARD

Ideal for high density circuitry using wirewrapping, hard wiring or Verowire techniques. Power rails run between rows of 7,62mm pitch integrated circuits allowing end to end stacking for increased density and easy decoupling. Gold plated contacts are provided to facilitate interfacing via direct edge card connectors. The seventh contact measured from the bottom is removed for polarisation.

3 PLANE HIGH DENSITY DIP BOARD

Ordering information

Hole grid 2,54 x 2,54mm Hole dia. 1,02mm Contact pitch 2,54mm

Board dimensions	7,62 pitch ICs rows/pads	15,24 pitch ICs rows/pads	Tongue no. of ways	Base material	Order code
114,30 x 165,10	6/53	5/53	42/42	Epoxy	06-1631F

BOARD SPECIFICATION

Board type	Epoxy glass
Plated through hole	BS4584 EP-GC-Cu3 FR4
Max. working temp.	155°C
Nom. board thickness	1,6mm
Laminate copper thickness	35µm or 1oz/ft ² or 305g/m ²

EUROCARD EXTENDER BOARDS

DOUBLE SIDED EXTENDER BOARDS

FEATURES

- Eurocard compatible
- Suitable for 160 and 220mm deep boards
- DIN 41612 type B and C connectors
- Support/ejector mechanism
- Terminal assemblies for ease of testing (except 96/96 way versions)
- Solder resist coating to prevent solder bridging and prevent finger staining

DOUBLE SIDED EXTENDER BOARDS

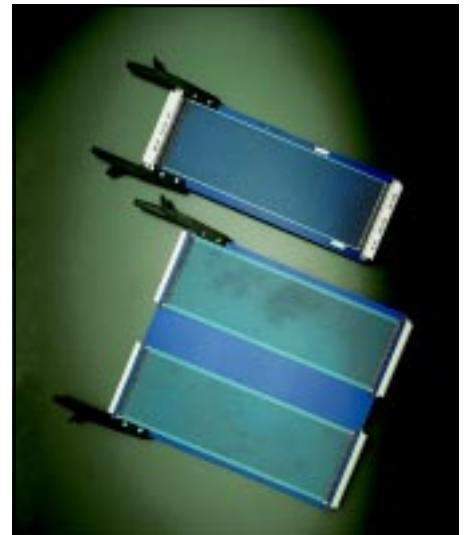
A range of double sided extender boards to enable testing of single and double height Eurocards, both

160 and 220mm deep, using DIN 41612 type B and C connectors. The extender board plugs directly into a subrack connector with the unique support/ejector mechanism at the front supporting the board under test.

Terminal assemblies (supplied with the boards), may be fitted to the board to allow easy attachment of scope probes typically for measuring voltage levels.

N.B. This feature is not available on the 96/96 way extenders.

Supplied as a kit comprising:
Board assembled with connectors
Support/eject mechanism
Terminal assemblies (where applicable)



DOUBLE SIDED EXTENDER BOARDS

Ordering information

For frame height	Connectors fitted			Order code
	plug	socket	type	
3U	1 off	1 off	64/64	09-3817H
6U	2 off	2 off	64/64	09-0106D
3U	1 off	1 off	64/64	09-3865K
6U	2 off	2 off	64/64	09-0108E
3U	1 off	1 off	96/96	09-2459K
6U	2 off	2 off	96/96	09-2460E

Hole grid 2,54 x 2,54mm Hole dia. 0,9mm N.B.3,81mm gap on double height boards

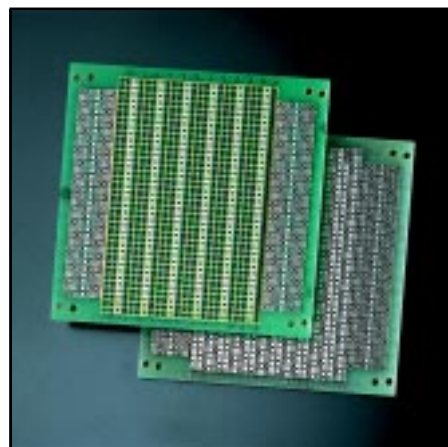
GENERAL PURPOSE STUB TERMINATOR BOARD

This board is available in the popular PTH Microboard format and will accommodate all the necessary components for the termination of backplane signals in customer built systems.

GENERAL PURPOSE STUB TERMINATOR BOARD

Ordering information

Size	Order code
100 x 100	222-39076B



BOARD SPECIFICATION

Board type	Epoxy glass
Plated through hole	BS4584 part 16
Copper thickness to outer layers	38µm
Plated copper	37µm
Tin lead	5µm
Total	80µm
Copper thickness inner layers	38µm

Note: bare boards are UL 94 V-0 recognised components file number E116551. Bare boards are approved to BS9762.

60mm DAUGHTER BOARD EXTENDER

A multilayer extender fitted with 96/96 way plug and 96/96 way socket suitable for adapting a 160mm deep daughter board to fit into a 220mm deep card slot or a 220 deep daughter board to fit into a 280mm deep card slot. The extender is 60mm deep so that front panels are positioned correctly.

60mm DAUGHTER BOARD EXTENDER

Ordering information

Description	Order code
60mm board extender	38-42640F



BOARD SPECIFICATION

Board type	Epoxy glass
Plated through hole	BS4584 part 16
Copper thickness to outer layers	38µm
Plated copper	37µm
Tin lead	5µm
Total	80µm
Copper thickness inner layers	38µm

Note: bare boards are UL 94 V-0 recognised components file number E116551. Bare boards are approved to BS9762.

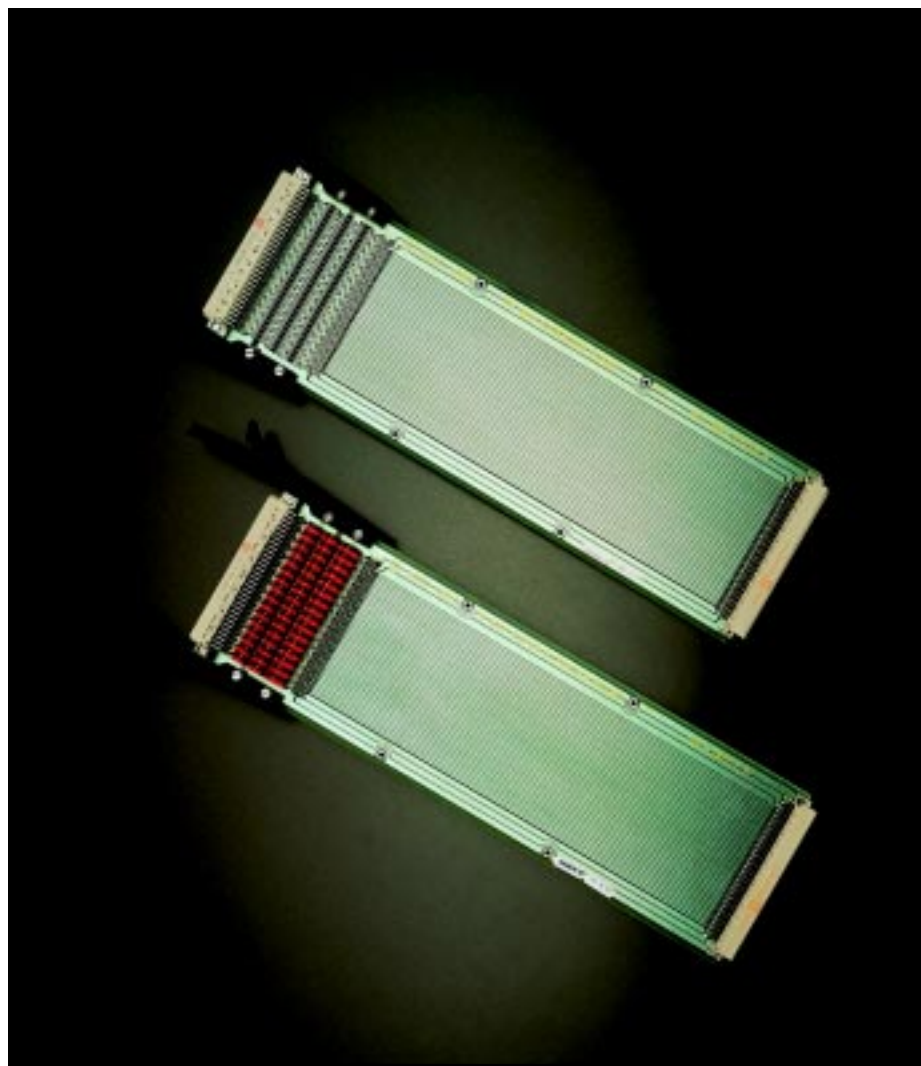
STANDARD AND SUPER PTH EXTENDER BOARDS

FEATURES

- Expandable height in multiples of 3U, i.e. 3U, 6U, 9U etc. is achieved by simply adding a standard divider plate assembly as required
- The ability to mix different types of extenders on 3U upwards to suit a particular bus system
- Suitable 160 and 220mm deep systems
- Maximum track widths with a copper plating thickness of 70µm in order to minimise voltage drop
- DIN connector outer rows 1abc, 2abc, 31abc and 32abc have extra wide tracks to match power rails on most standard bus systems, i.e. VERO Microbus range
- Voltage and current measuring facilities available by either simply breaking tracks and pinning for the addition of jumper links (see illustration) or using the fully assembled super version
- Standard version provide the facility for mounting a backplane stub terminator or logic analyser to the side of the board as required. This is supplied complete with the super version.
- Provides support/eject mechanism to ensure the daughter board remains captive within the guides when ejecting and that the correct connector breaks when dismantling
- Solder resist coated to prevent solder bridging of joints and finger staining

STANDARD AND SUPER PTH EXTENDER BOARDS

A range of PTH extender board assemblies available in two combinations of standard and super. The standard range, in either 64/96 or 96/96, is assembled with front and rear DIN connectors and supplied complete with ejector arms. The super version, in 96/96 format only, is complete with all the standard parts including gold plated wirewrapping pins, jumper links and logic analyser reverse DIN connector. The boards provide a high degree of mechanical flexibility and have many electrical advantages over their double sided predecessors.



PTH EXTENDER BOARDS

Ordering information

Description	Order code
64/64 Standard PTH extender board	188-29937F
96/96 Standard PTH extender board	188-27573A
96/96 Super PTH extender board	188-39011D
Extender board conversion kit	188-27542E

BOARD SPECIFICATION

Board type	Epoxy glass
Plated through hole	BS4584
	EP-GC-Cu FR4
Max. working temp.	155°C
Nom. board thickness	1,6mm
Laminated copper thickness	35µm or 1oz/ft ² or 305g/m ²
Plated copper	25µm
Tin lead	10µm
Total	70µm

Note: bare boards are UL 94 V-0 recognised components file number E116551. Bare boards are approved to BS9762

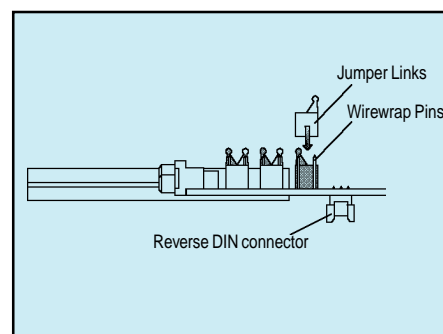
ACCESSORIES

Jumper links, wirewrapping pins, reverse DIN connector.

ACCESSORIES

Ordering information

Description	Order code
Jumper links Red/10	188-29988E
Jumper links Black/10	188-29989B
Wirewrapping pins/100	188-29990C
Reverse DIN connector	906-72382B



EUROCARD EXTENDER BOARDS

MULTILAYER EXTENDERS

FEATURES

- 3 layer bonded multilayer construction with a 0V ground plane sandwich between layers
- Patented 0V guard tracking between all signal lines
- Flexible power rail construction with up to four separate Vcc rails and a 0V return plane
- Voltage and current measuring facilities are available by use of wirewrapping pins and jumper links which are fully assembled to the board
- Logic analyser or backplane stub terminator position on board
- Expandable to 3U, 6U, 9U etc. in many combinations using the compatible range of PTH and super PTH extender boards
- Suitable for 160 and 220mm deep systems
- Compatible with multilayer Microbus backplanes and PTH backplanes
- Support/eject mechanism to ensure that the daughter board remains captive within the guides when ejecting and that the correct connector breaks when dismantling

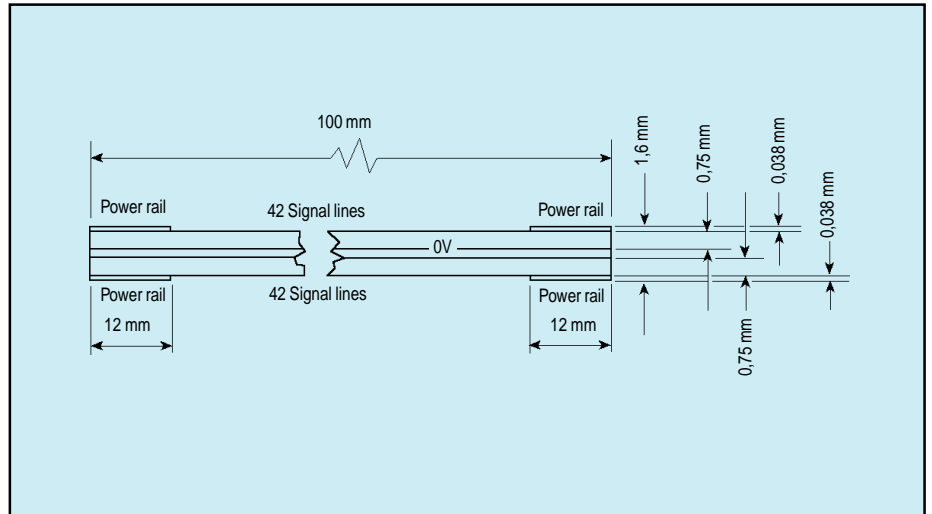
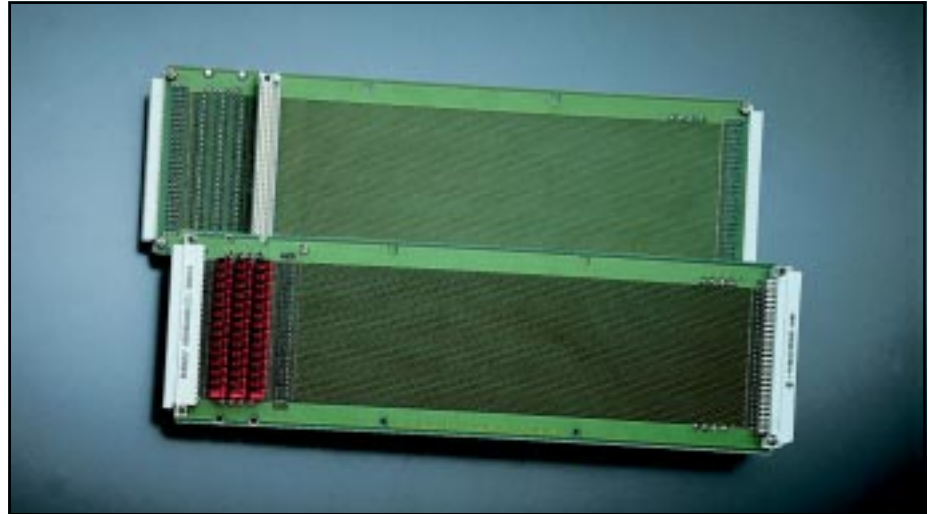
MULTILAYER EXTENDERS

This multilayer extender board offers the engineer the best possible guarantee against crosstalk due to the 0V guarding being positioned on three sides of each individual signal line.

The multilayer construction features a control 0V ground plane inner layer with a latticed trace around all jumper pin positions for maximum shielding. The extender board features 42 signal lines on both sides of the board which are protected by an 0V guard track between each pair of signal lines. The guard track is connected to the 0V inner layer plane at both ends by the use of via holes.

The power rails on the outer edges of the board feature a cross patching facility which uses jumper links in order to give the user complete flexibility when trying to match a particular backplane system. The board is supplied completely assembled with connectors at both ends.

Power rails are committed to pins 1abc, 2abc, 31abc and 32abc. If necessary any of these power rails may be connected to the 0V inner plane by use of cross patching jumper links.



BOARD SPECIFICATION

Board type	Epoxy glass
Plated through hole	BS4584 part 16
Copper thickness to outer layers	38μm
Plated copper	37μm
Tin lead	5μm
Total	80μm
Copper thickness inner layers	38μm

Note: bare boards are UL 94 V-0 recognised components file number E116551. Bare boards are approved to BS9762.

CHARACTERISTICS IMPEDANCE

The separation of signal layers to the 0V ground plane is 0,74mm and the signal track width is 0,3mm which gives a theoretical characteristic impedance of 94Ω with a Zo tolerance of ±5%.

- N.B. Zo = 94Ω ±5% excluding all holes in the boards
 Zo = approximately 80Ω including connector and jumper pin holes
 Zo = approximately 65Ω when active daughter board is in position.

The guard tracking arrangement is manufactured under licence from University College, London.

MULTILAYER EXTENDER BOARD

Ordering information

Description	Order code
96/96 multilayer extender board	38-39084J
Extender board conversion kit	188-27542E

MULTILAYER UN-COMMITTED EXTENDER BOARDS

FEATURES

- 6 layer construction providing full voltage and ground planes
 - Patented 0V guard tracking between all signal lines
 - Full 0V and Vcc planes plus two auxiliary Vcc rails
 - Suitable for 220 and 280mm deep subracks
 - Total flexibility of voltage and ground commitment
 - Signal line interrupt facilities by means of wirewrap pins and jumper links which are pre-fitted to the board
 - Reverse 96/96 DIN connector to accept stub terminator or logic analyser
 - Support/eject mechanism to ensure that the correct connector breaks when dismantling and that the daughter board remains captive within the guides when ejecting
 - Expandable in height by multiples of 3U.
- This is achieved by means of an extender board conversion kit

MULTILAYER UN-COMMITTED EXTENDER BOARDS

These extender boards have been designed to offer the greatest flexibility in the arrangement of power, ground and signal lines, yet afford the engineer the best possible protection against crosstalk by the use of a patented method of 0V guard tracking. The 96 signal lines are positioned over three layers with the facility to commit any line to any voltage. The remaining layers are committed to 0V and Vcc planes, thus minimising voltage drop over the length of the extender. These extenders are supplied completely assembled with connectors at each end plus wirewrap pins, jumpers and a reverse DIN connector for the fitment of a "stub" terminator or a logic analyser.

Signal lines can be committed to either 0V or Vcc by using the Commitment strap shown below. By fitting the tag into the holes in the guard track (round pads) adjacent, the connector pattern will commit the required pins to 0V. Conversely, rotating the strap 180° and fitting the tag to the square padded holes will commit to Vcc. This process is to be repeated at both ends of the extender.

BOARD SPECIFICATION

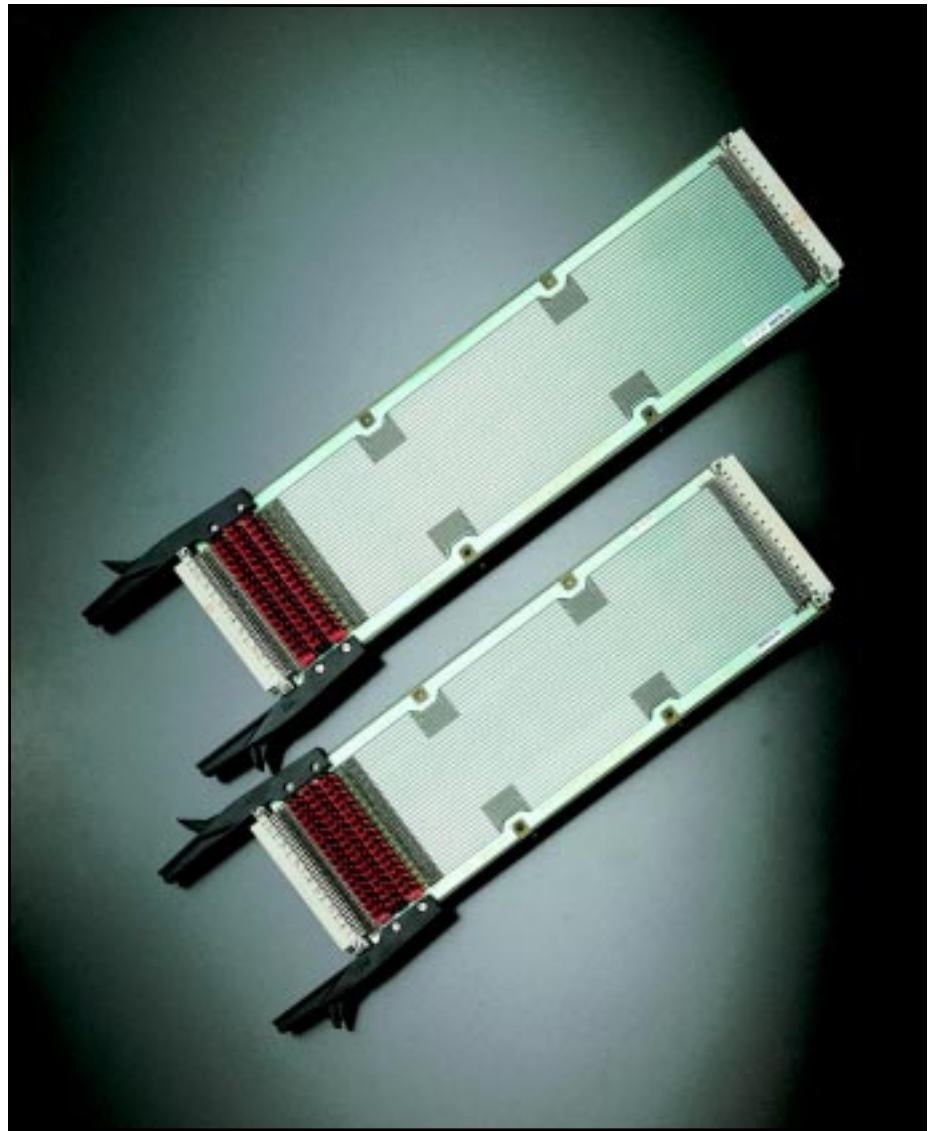
Dielectric	Epoxy glass BS4584 EP-GC-Cu3 FR4
Nom. thickness	1,6mm
Base copper thickness	35µm
Finish	
Plated copper	25µm average
Tin lead	5µm nominal
Total	68µm outer layers only

Note: bare boards are UL 94 V-0 recognised components file number E116551. Bare boards are approved to BS9762.

The guard tracking arrangement is manufactured under licence from University College, London.

COMMITMENT STRAP

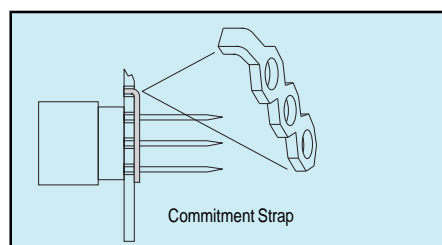
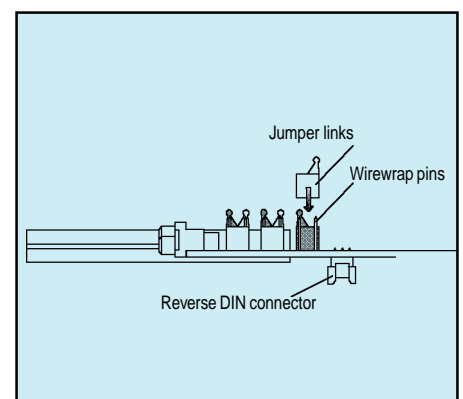
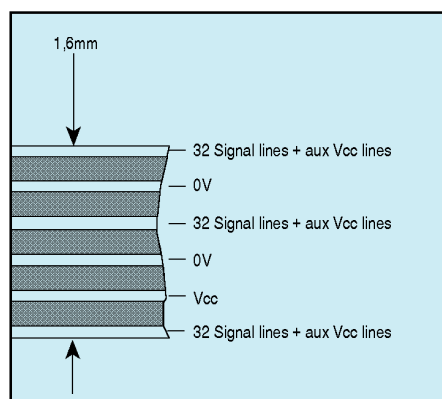
These commitment straps drop over the tails of a DIN connector, committing a row of pins to a common voltage. The tag on the end of the strap fits into the PTH hole which is assigned to the voltage or ground plane on the un-committed backplane or un-committed extender. The straps can be cut to size, ensuring only the required pins are committed. Commitment straps are supplied in packs of 100.



UN-COMMITTED EXTENDER BOARDS

Ordering information

Description	Order code
220mm deep Un-committed extender	38-63623C
280mm deep Un-committed extender	38-61486J
Extender board conversion kit 220mm	188-27542E
Extender board conversion kit 280mm	188-39120J



COMMITMENT STRAP

Ordering information

Description	Order code
Commitment strap	22-301331B

EUROCARD BUS SYSTEMS

MICROBUS BACKPLANES

FEATURES

- Reliability of plated through holes
- Minimal crosstalk
- DIN 41612 connectors
- DIN 41494 (KM6-II) compatible
- Choice of connector styles and pitches:
15,24mm for PCB's for hard wired daughter boards. 20,32mm for two level wirewrap daughter boards

MICROBUS BACKPLANE

A range of double sided PTH Eurocard backplanes designed for use with microprocessors housed in DIN 41494 subracks (KM6-II).

96/96 VERSIONS

Ideal for high speed applications using 96/96 way connectors, screening is provided on row b between each signal track on the backplane and, via the connector, through onto the individual cards.

Alternatively for slower applications the 96/96 way connector allows the use of a maximum of 84 separate signal lines by simply breaking the 0V commoning line in the end position. Using either of these methods input/output connections are generally made at the front end of the individual plug-in boards. If a 64/96 way connector is used on the system, the 0V screen is still a feature of the Microbus, with the added advantage of input/output connections being possible from the rear of the system.

When using 0V and two power rails, pin 1 and 32 on rows a, b and c are fully committed to 0V and commoned together at one end. Two separate Vcc planes are provided for dual voltage systems and are committed to pins 2 and 31 on rows a, b and c. If 0V and three power rails are required the same situation exists as for two power rails except that it is now necessary to convert 0V on pins 32 a, b and c to Vcc by simply cutting the 0V link on the extreme edge of the connector side of the backplane. Power onto the 0V and Vcc planes is made via plated through holes positioned beneath the connector fixing screws.

64/96 WAY VERSION

A low cost version of the Microbus backplane still with the reliability of plated through holes but restricted in use to only 64/96 way connectors.

The basic design is very simple, with pin 1 and 32 on rows a and c committed to 0V with a complete 0V screen over one side of the board. Pin 2 and 31 on rows a and c are committed to Vcc. This leaves 56 separate signal lines from pin 3 a and c to pin 29 a and c inclusive.

CROSSTALK

Tests have been carried out on the 84HP version by feeding a 1MHz square wave signal (5ns rise and fall times), through a DIN 41612 connector and measuring the adjacent tracks at the opposite end. N.B. The Microbus motherboard was not terminated, which would have reduced the amplitude to the crosstalk and changed its shape considerably.

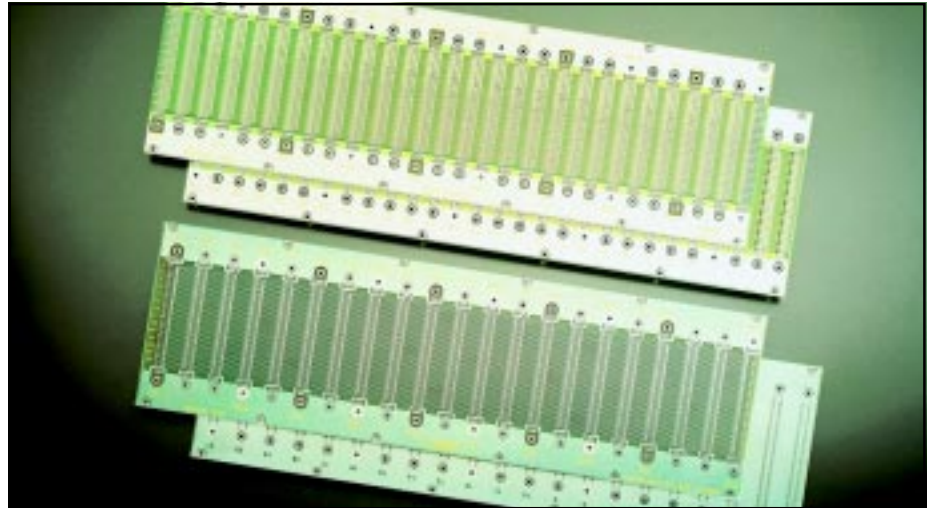
RESULTS

96/96 way Microbus

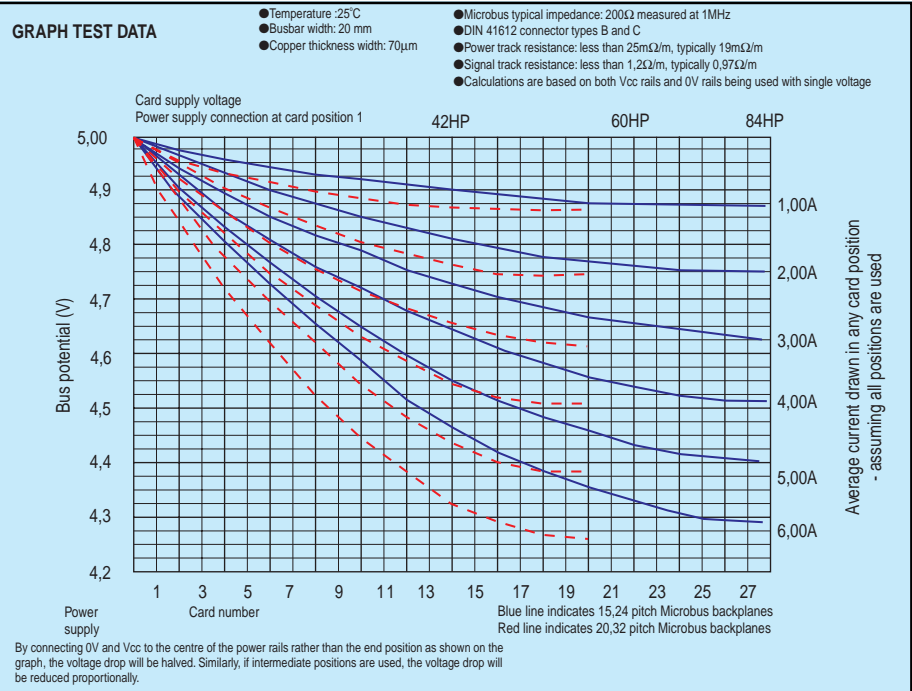
Worst case in row c (square wave fed on row a) amplitude of crosstalk was 15% with only 8% on adjacent tracks in the same row.

64/96 way Microbus

Worst case in row c (square wave fed on row a) amplitude of crosstalk was 35% of main signal line reducing further away from the main signal line. Adjacent tracks on the same row were 25-30% amplitude.



GRAPH TEST DATA



BOARD SPECIFICATION

Dielectric Epoxy glass	BS4584
	EP-GC-Cu3 FR4
Nominal thickness	1,6mm
Base copper thickness	35µm
Finish	
Plated copper	25µm average
Tin lead	8µm maximum
Total	68µm

Note: bare boards are UL 94 V-0 recognised components file number E116551.

Bare boards are approved to BS9762

MICROBUS BACKPLANES

Ordering information

Connector type	Connector pitch (HP)	Size	No. of Slots	Length	Order code
96/96	15,24 (3 HP)	42HP	14	213,0	222-26034E
96/96	15,24 (3 HP)	60HP	20	304,4	222-26035B
96/96	15,24 (3 HP)	84HP	28	426,3	222-2470F
96/96	20,32 (4 HP)	84HP	21	426,3	222-22847J
64/96	15,24 (3 HP)	84HP	28	426,3	222-26025F
64/96	20,32 (4 HP)	84HP	21	426,3	222-27569B

**DOUBLE SIDED
UN-COMMITTED BACKPLANE**

FEATURES

- Total flexibility on positioning of Vcc or 0V
- Four voltage rails available
- M3 stud or 6,3mm Faston power connection facilities
- Choice of backplane widths and pitches
- High quality PTH boards with resist coating to prevent solder bridging

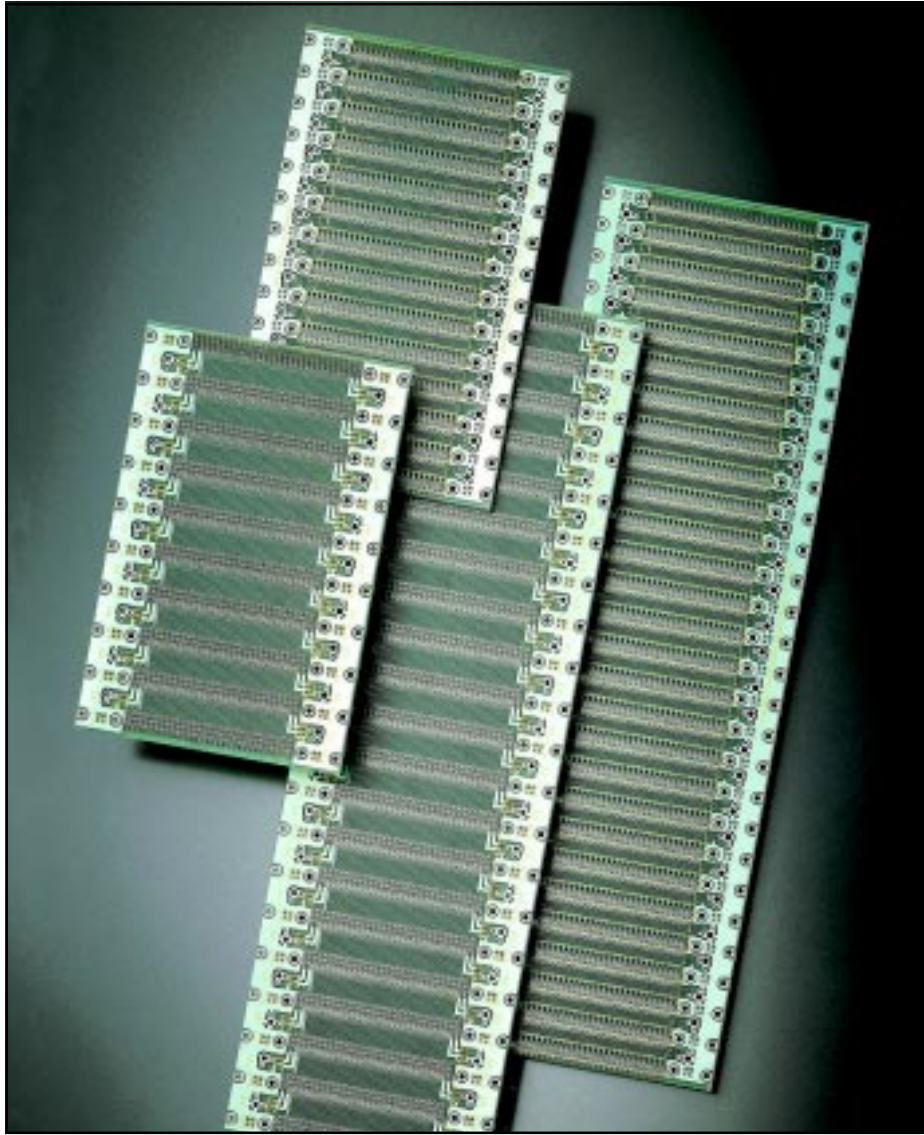
DOUBLE SIDED UN-COMMITTED BACKPLANES

This range of backplanes has been designed to be totally flexible, allowing the engineer to configure the backplane to exactly match the requirements of his system. Each pin is bussed across the board, with the added facility of using row b as 0V guard rails thus minimising crosstalk on rows a and c. Power connection to the backplane is by means of M3 studs or 6,3mm Faston tabs. To identify voltages a combination of studs and Fastons may be used. Power commitment to pins 1, 2, 31 and 32 is by a 2,54mm pitch link, other pins can be committed by either wirewrapping or hard wiring. Rows a, b and c can be linked together by the Commitment Strap.

BOARD SPECIFICATION

Dielectric Epoxy glass	BS4584
	EP-GC-Cu3 FR4
Nom. thickness	1,6mm
Base copper thickness	35µm
Finish	
Plated copper	25µm average
Tin lead	8µm nominal
Total	68µm

Note: bare boards are UL 94 V-0 recognised components file number E 116551.
Bare boards are approved to BS9762.



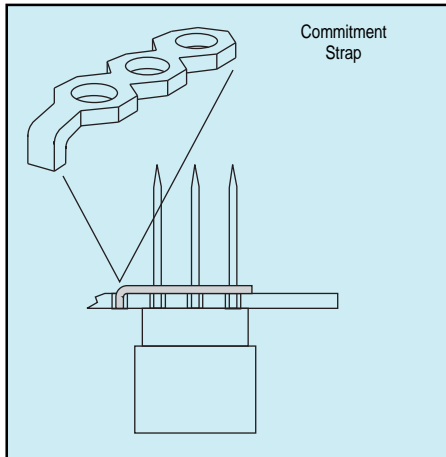
UN-COMMITTED BACKPLANES

Ordering information

Connector type	Connector pitch (HP)	No. of slots	Width x Length	Order code
96/96	20,32 (4 HP)	21	128,6 x 420,8	222-63630K
96/96	20,32 (4 HP)	10	128,6 x 197,3	222-63631G
96/96	20,32 (4 HP)	5	128,6 x 95,7	222-63632D
96/96	15,24 (3 HP)	28	128,6 x 425,9	222-63633A
96/96	15,24 (3 HP)	14	128,6 x 212,5	222-63634J

COMMITMENT STRAP

These commitment straps drop over the tails of a DIN connector, committing a row of pins to a common voltage. The tag on the end of the strap fits into the PTH hole which is assigned to the voltage or ground plane on the un-committed backplane or un-committed extender. The straps can be cut to size, ensuring only the required pins are committed. Commitment straps are supplied in packs of 100.



COMMITMENT STRAP

Ordering information

Description	Order code
Commitment strap	22-301331B

EUROCARD BUS SYSTEMS

MULTILAYER MICROBUS BACKPLANES

FEATURES

- 3 layer bonded multilayer construction with 0V ground plane sandwiched between signal layers
- Patented 0V guard tracking between all signal lines
- Theoretical characteristic impedance $Z_0 = 100\Omega \pm 5\%$
- Flexible power rail construction with up to four separate Vcc rails
- Fully assembled with 96/96 standard DIN 41612 compliant pin press-fit connectors and ample spade style power pick-up points
- 0,8 inch (20,32mm) and 0,6 inch (15,24mm) pitch versions
- Compatible with KM6-I cardframes, multilayer extender boards and stub terminators

MULTILAYER MICROBUS BACKPLANES

This range of multilayer Microbus backplanes is available in 0,8" (20,32mm) and 0,6" (15,24mm) pitches. The 0,8" pitch versions have widths of 5, 10, 20 and 21 slots and the 0,6" pitch version is available in a single 20 slot width only. All widths coincide with either 42HP, 60HP or 84HP KM6-II cardframes. All multilayer Microbus backplanes feature a patented tracking arrangement which includes 42 signal lines on each side of the board with a 0V guard track between each signal line. Power distribution is designed for use with a maximum of four power rails each capable of handling the total current rating of all connector pins, providing several feeders are used on order to distribute the load evenly.

N.B. The 20 slot 0,8" version is compatible with VMEbus mechanical specifications and therefore may be used in conjunction with the P1 backplane for special P2 applications on undefined pins.

V1 is committed to pin 1 a,b,c

V2 is committed to pin 2 a,b,c

V3 is committed to pin 32 a,b,c

V4 is committed to pin 31 a,b,c

If necessary any of these power rails may be connected to the 0V plane with a simple cross patching jumper link.

BOARD SPECIFICATION

Copper clad Epoxy glass board to	BS4584
Nominal thickness	2,4mm
Copper thickness outer layers	38 μ m
Plated copper	37 μ m
Tin lead	5 μ m
Total	80 μ m
Copper thickness inner layers	38 μ m

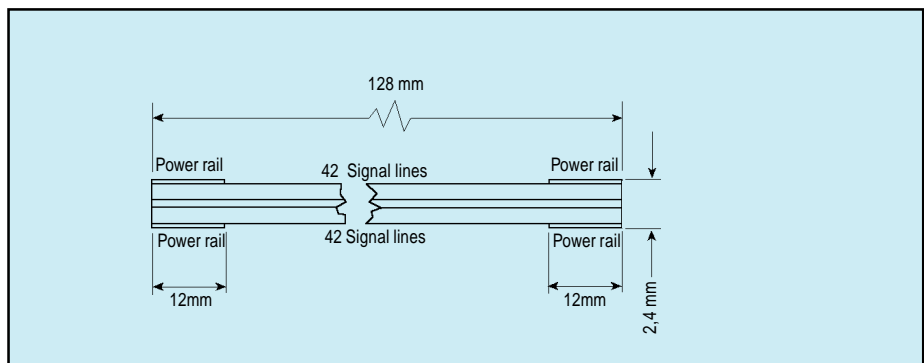
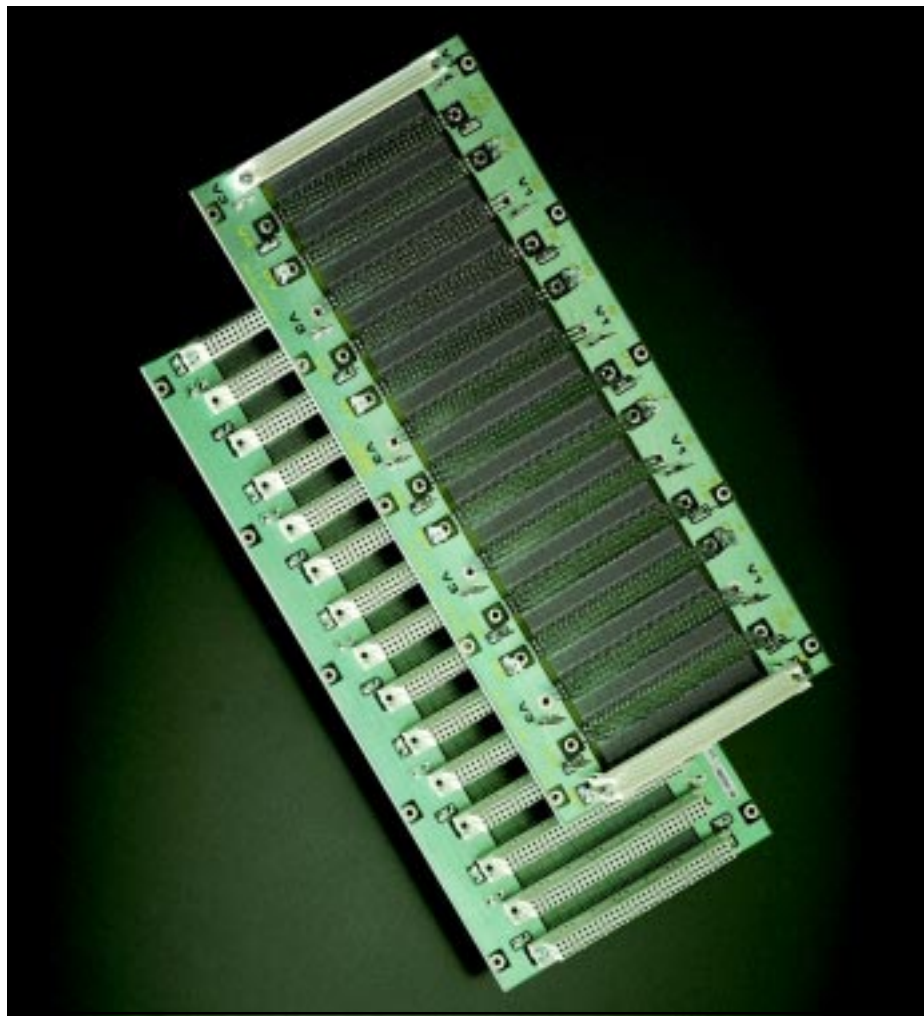
Note: bare boards are UL 94 V-0 recognised components file number E 116551.

Bare boards are approved to BS9762.

CHARACTERISTIC IMPEDANCE

The impedance of signal layers to the 0V ground plane is 1mm and the signal track width is 0,38mm which gives a theoretical impedance of 100Ω with a Z_0 tolerance of $\pm 5\%$.

N.B. $Z_0 = 100\Omega \pm 5\%$ theoretical impedance excluding holes in the board
 $Z_0 =$ approximately 80Ω including connector holes in backplane
 $Z_0 =$ approximately 20Ω fully loaded with boards



96/96 MULTILAYER MICROBUS BACKPLANES

Ordering information

Slot pitch (HP)	No. of slots	Length x width	Cardframe width	Order code
15,24 (3 HP)	20	303 x 128	60HP	38-39114E
20,32 (4 HP)	5	96 x 128	21HP	38-39104K
20,32 (4 HP)	10	212 x 128	42HP	38-39105F
20,32 (4 HP)	15	303 x 128	60HP	38-39106B
20,32 (4 HP)	21	425 x 128	84HP	38-39108E

Manufactured under licence from University College, London

BENEFITS OF SPEEDWIRE COMPARED WITH CONVENTIONAL POINT-TO-POINT WIRING SYSTEMS

HIGH SPEED APPLICATION

The daisy chain principle of Speedwire is less time consuming than the on/off principle of wire wrap (see Fig. 1). This together with no wire stripping and less wire cutting reduces production costs. Even greater savings are achieved when compared to discrete soldering. Further time savings are achieved when preparing wiring schedules. Simple daisy chain listings are all that is needed for Speedwire compared with the more complicated level 1 and 2, point-to-point stringing schedules of wire wrapping.

INCREASED CARD FRAME PACKING DENSITY

Fig. 2 compares two level wire wrap and the Speedwire system. Speedwire offers a 0,325" (8,25mm) space saving on the wiring side, providing 28 card positions in an 84HP sub-rack to DIN 41494 such as the VERO KM6-II. This compares with only 16 two level wire wrap boards thus increasing the density by 31% or 75% for three level wire wrap. An additional benefit is that in common applications off 0,6" (15,24mm) a Speedwire interconnected board can replace a printed circuit board on a one-to-one basis.

WIRING DENSITY

With practice it is possible to achieve a wiring density equivalent to a maximum of five wires between terminals without exceeding the terminal height. This could consist of 3 wires in the *x* direction and two wires in the *y* direction. However with careful package placement, routing simulation of multi-layer boards is possible.

LOW PROFILE

Speedwire's low profile interconnections minimise the "antenna" effect generated by radiation at fast clock speeds associated with the top of the wire wrapping posts. Additionally, plated through hole/Speedwire board planes greatly increase the chances of noise free operation especially in high speed circuits.

EASE OF RE-WORK

Speedwire circuitry can be easily modified and rewired many times without degrading the insulation displacement connection,

LOW COST TOOLING

The cost of a Speedwire SL pen is minimal when compared to powered wrapping tools and yet is much faster.

NO NEED FOR DIP SOCKET

The component socket of the Speedwire terminal provides a four jaw contact positioned to wipe on all four faces of the IC lead which is an improvement even on the highest quality DIP sockets available.

OTHER ADVANTAGES

In addition to the benefits outlined above, Speedwire has all the advantages over soldering normally associated with wire wrapping; i.e. no crystallisation of joints, no dry joints, easily achievable high density and neater wiring.

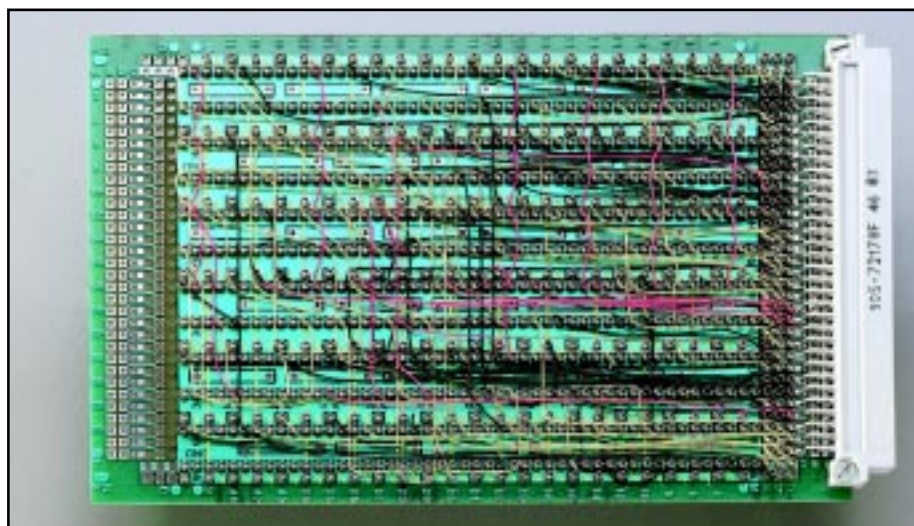


Figure 1 Comparison of two-level wirewrap and Speedwire showing the daisy chain principle

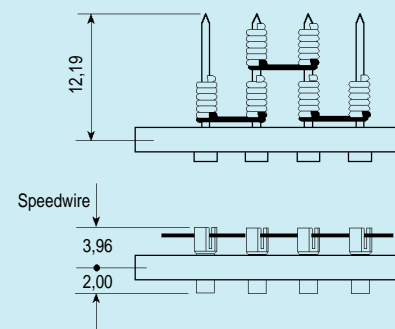
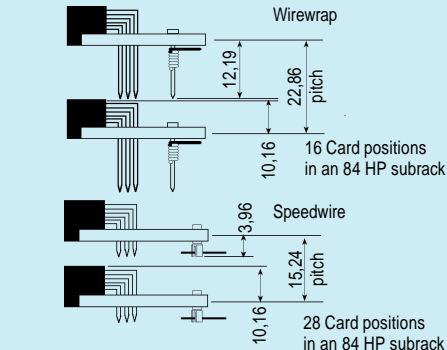


Figure 2 Profile comparison of two-level wirewrap and Speedwire contacts, showing how increased packing density is achieved



PERFORMANCE CHARACTERISTICS

Characteristics	Performance
Corrosive atmosphere test. Gas test to BS2011 Part 2 Kc 1977 4 days immersion in S02	
Socket	Pass
IDC element	Pass
Durability (insertion/withdrawals)	
Socket	100 min
IDC element	50 min
Insertion/withdrawal force of socket using a 0,45 dia. pin	3,73 N av.
Initial contact resistance of socket 0,45 dia. pin	1,68 N av.
Wire bend test (bend and return)	144mΩ av.
Thermal shock to MIL STD 883 method 1011	Av. 14 x 90° before discontinuity
Vibration test to MIL STD 1344A method 20051	No deterioration
Pull off tests	Pass
Maximum	12,36N
Minimum	9,02 N
Average	10,79 N

All test were carried out by an independent British Standards Institute approved test house. Detailed test data is available on request.

MATERIAL SPECIFICATIONS

SPEEDWIRE CUTTERS

Precision-ground satin finished stainless steel.

SPEEDWIRE TERMINAL

Terminal shell: beryllium copper, 5mm tin nickel over 2mm nickel and 1mm copper

Contact clip: beryllium copper 9,75mm hard gold over 2mm nickel over 1mm copper

SPEEDWIRE WIRE

KYNAR®

Kynar is the registered trade mark of the Pennwalt Corporation.

SPEEDWIRE PTH EUROCARDS BOARD SPECIFICATIONS

Dielectric Epoxy glass	BS 4584
	EP.GC-CU-3 (FR4)
Nominal thickness:	1,6mm
Base copper thickness:	35µm
Finish	
Plated copper	25µm av.
Tin lead	8µm max.
Total	68µm

SL WIRING PEN

Barrel: Glass filled polycarbonate.

All other components: stainless steel.

PLAIN DRILLED BOARD

1,6mm thick plain fibreglass material - similar hole pattern to PTH boards. Every hole drilled at 1,65mm diameter to accommodate a Speedwire terminal.

APPLICATION NOTES

A complete set of application notes containing hints on wiring and terminal are contained with the pen and introductory kits. They are also available on request.

SPEEDWIRE

SPEEDWIRE EUROCARDS

Available as plated through-hole in single, double and triple heights either with terminals in situ (populated) or without terminals (unpopulated). Also in single and double heights only in plain, drilled epoxy glass.

SPEEDWIRE BOARD - INTEGRATED CIRCUIT PACKING DENSITY

Size (mm)	0,3 pitch rows/terms	0,6 pitch rows/terms
100 x 160	6/48	4/48
233,4 x 160	15/48	10/48
100 x 220	6/71	4/71
233,4 x 220	15/71	10/71
366,7 x 220	23/71	15/71
366,7 x 280	23/95	15/95

Speedwire terminals fitted in 96 positions in order to achieve direct wiring access to each DIN connector (rear end of board only). 0V and Vcc1 or Vcc2 speedwire terminals provided in every possible position directly adjacent to the DIP, this facilitates easy power pick-up and decoupling.

UNPOPULATED (PTH) EUROCARDS

Ordering information

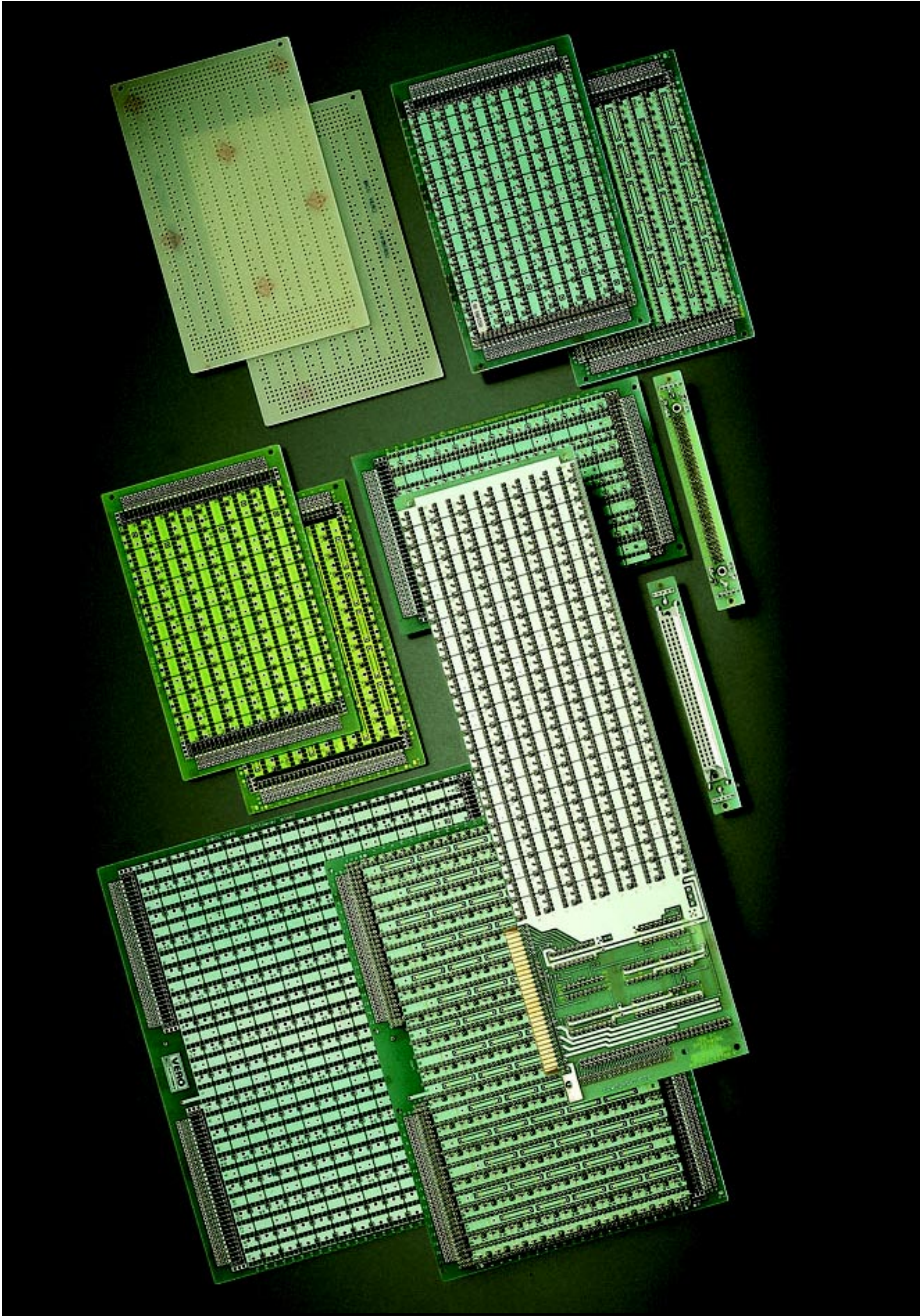
Board size mm	Order code
100 x 160	244-26236K
100 x 220	244-26238D
233,4 x 160	244-26237G
233,4 x 220	244-26239A
366,7 x 280	244-27699F

POPULATED (PTH) EUROCARDS

Ordering information

Board size mm	Order code
100 x 160	244-26079F
100 x 220	244-26081D
233,4 x 160	244-26080G
233,4 x 220	244-26082A
366,7 x 220	244-27697A
366,7 x 280	244-29800C

Complete details of personal computer compatible Speedwire boards can be found in Section 7 of this Handbook.



HIGH DENSITY SPEEDWIRE BOARDS

HIGH DENSITY PACKAGING WITH PGA AREAS

FEATURES

- Double and triple height boards have full depth Pin Grid Array areas
- High density pattern allows the use of 0,3, 0,4, 0,5 and 0,6 DIL packages
- Three independent voltage planes and full ground plane. Any voltage plane may be tied to any other, or to ground, to extend the power availability throughout the board
- 0V, V1, V2 and V3 terminals located directly adjacent to the DIL pattern, facilitating easy power pick-up and decoupling
- Board available with fully populated PGA areas or PGA areas populated in component rows only and unpopulated boards
- Alpha-numeric reference, wiring angle, voltage and ground planes are silk screened on both sides of the board to clearly identify the relevant features

VERO Electronics have responded to the need for high component densities and the latest device package styles, by introducing a range of High Density Speedwire Boards.

The new range of boards offers a fast reliable low profile method of board interconnection, minimising the problems inherent in high speed systems.

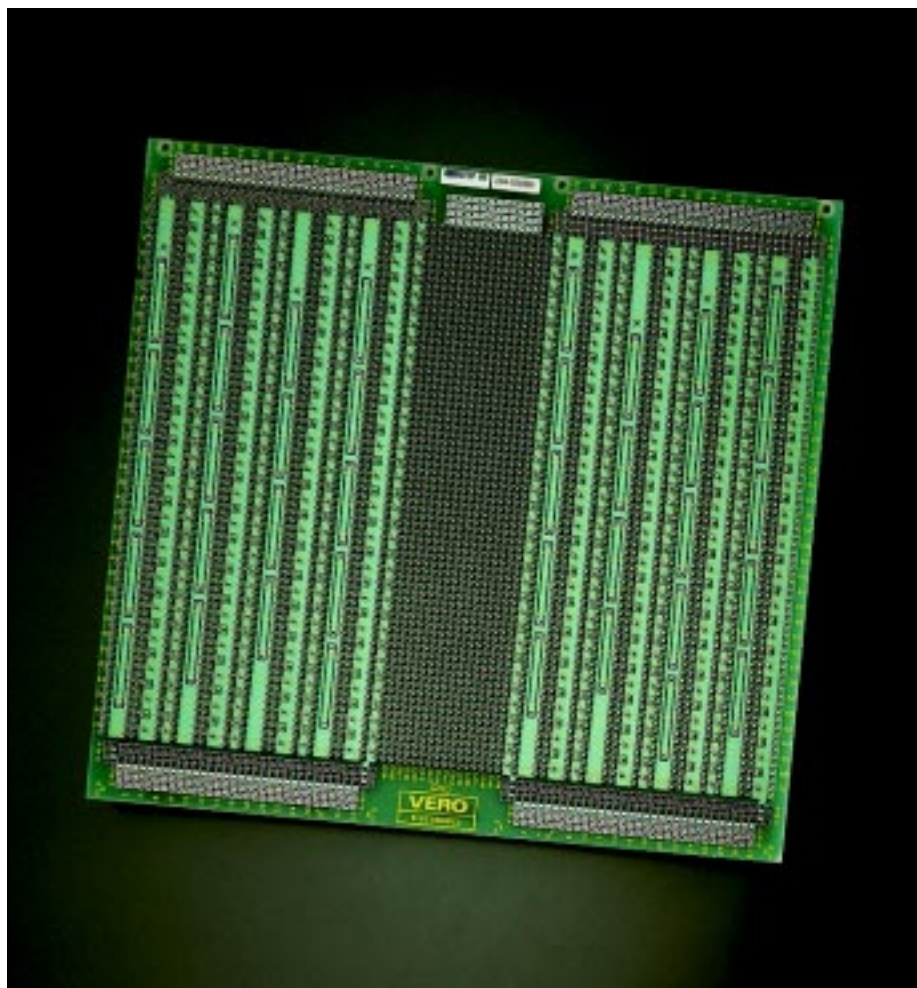
The High Density pattern provided enables 0,3, 0,4, 0,5 and 0,6 pitch DIL packages to be used, while double Eurocard and larger board sizes have dedicated pin grid array areas which run the entire length of the board. Boards are also available without the PGA area being fully populated and on such boards the High Density pattern covers the entire board.

The double sided PTH boards have been designed to give a maximum copper dedicated 0V plane on the wiring side, whilst on the component side the pattern provides three voltage planes distributed evenly across the board. Any independent voltage plane may be coupled to any other, or to ground, to suit the power requirements of the designer. An additional feature of the High Density Speedwire board is the provision for de-coupling capacitors to be fitted to the board for each of the voltage planes. All voltage and ground Speedwire contacts are clearly identified and located adjacent to the High Density pattern, facilitating easy power pick-up and de-coupling.

High Density Speedwire boards are available in seven sizes ranging from 100 x 160mm to 366,7 x 400mm, and in three styles-bare boards, partially populated and fully populated. All boards have provision for the mounting of DIN 41612 connectors, front and rear.

Notes

1. All boards are 1,6mm thick except the 366,7 x 400mm deep boards, which are 2,4mm thick for greater mechanical rigidity. The edges of these boards are milled down to 1,6mm enabling them to fit standard subrack card guides.
2. All double and triple height boards have full depth PGA areas except the 366,7 x 400 mm deep boards where the PGA area is 280 mm deep.



HIGH DENSITY SPEEDWIRE BOARDS

Ordering information

Size	Population	Order code
100 x 160	Unpopulated	244-59055J
233,4 x 160	Unpopulated	244-59057C
233,4 x 220	Unpopulated	244-59058L
233,4 x 160	Part populated PGA	244-59051K
233,4 x 220	Part populated PGA	244-59052G
100 x 160	Fully populated	244-53182D
100 x 220	Fully populated	244-53186C
233,4 x 160	Fully populated PGA	244-53184J
233,4 x 220	Fully populated PGA	244-53188H
366,7 x 400	Fully populated PGA	244-59895H



FULLY POPULATED INTRODUCTORY KIT

The fully populated, Eurocard introductory kit has been introduced as a "package" deal for the engineer who wishes to produce high quality, finished Speedwire assemblies.

CONTENTS OF KIT

- 1 PTH fully populated Eurocard, 100 x 160 mm
- 1 Eurocard design layout sheet
- 1 Wiring pen with spool of 30 AWG Kynar® wire
- 3 Spare spools of wire - various colours
- 1 Pair of Speedwire cutters

Order code	244-26224J
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UN-POPULATED INTRODUCTORY KIT

Intended primarily for the engineer who wishes to wire circuits at minimum cost using terminal only as required.

CONTENTS OF KIT

- 1 PTH un-populated Eurocard, 100 x 160 mm
- 1 Eurocard design layout sheet
- 1 Wiring pen with spool of 30 AWG wire
- 1 Hand Speedwire insertion tool
- Bandolier of 250 Speedwire terminals

Order code	244-26223A
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IDENT STRIPS

These indents are self-adhesive. Simply peel off required indent and stick to board.

A single sheet of 81 mixed sizes of DIP indents is available.

8 way 10 off	14 way 22 off	16 way 21 off
18 way 7 off	20 way 6 off	24 way 10 off
28 way 2 off	40 way 4 off	64 way 1 off

Order code	244-27258A
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WIRE CUTTERS

Designed specifically for accurate cutting close to Speedwire terminals.

Order code	244-26225F
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SPEEDWIRE TERMINALS

Available in quantities of 250 and 1000 for insertion into part- or unpopulated boards.

Ordering information

Description	Order code
Box of 250 terms.	244-26221G
Reel of 1000 terms.	244-26219J



SPEEDWIRE SL WIRING PEN

In order to make wiring as easy as possible the SL pen offers the following features.

- Spring-loaded outer sleeve to allow a maximum of five wires between terminals
- Self-centering of wire within tines to automatically correct wiring angle errors
- Positive wiring gridding system with easy location over terminals
- Easy reloading system with a clip-on spool



The Speedwire SL pen is sold as a single item with an 18 m spool of 30 AWG Kynar® wire.

Order code	244-26213E
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SPEEDWIRE WIRE

The best all round results have been achieved using 30 AWG Kynar® wire although this does not preclude the use of any 30 AWG wire Kynar® wire, in a choice of four colours, is available on spools of 18 m which clip directly onto the SL pen.

Ordering information

Description	Order code
Pack of 4 colours*	244-26227L
Pack of 10 - Blue	244-26228H
Pack of 10 - Red	244-26229E
Pack of 10 - Black	244-26230F
Pack of 10 - Yellow	244-26231C

* Mixed colours

TERMINAL - HAND INSERTION TOOL

This tool has an adjustable input action and is capable of three basic functions.

- Inserting up to two terminals in IC package rows
- Removing individual terminals
- Replacing terminals in the centre row of three consecutive rows on a 3,54 mm pitch

Order code	244-29984J
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TERMINAL INSERTION PRESS

This robust cam-action press is constructed from cast aluminium, and is specifically designed for minimal deflection under a 10-way terminal insertion load. The body profile of the press ensures that boards up to 254mm wide can be accommodated. It is supplied complete with adaptor and terminal insertion head.

Order code	244-26298B
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COMPATIBLE KM6 FRONT PANEL CARD-MOUNTING BRACKET

A special card-mounting bracket is available for mounting single and double height Speedwire Eurocards onto KM6 front panels.

N.B. In order to provide clearance for the terminals, the mounting bracket moves the board 5,08 mm to the right, viewing from the front.

Ordering information

Description	Order code
2 brackets & fixings	173-232672L

VEROWIRE

FEATURES

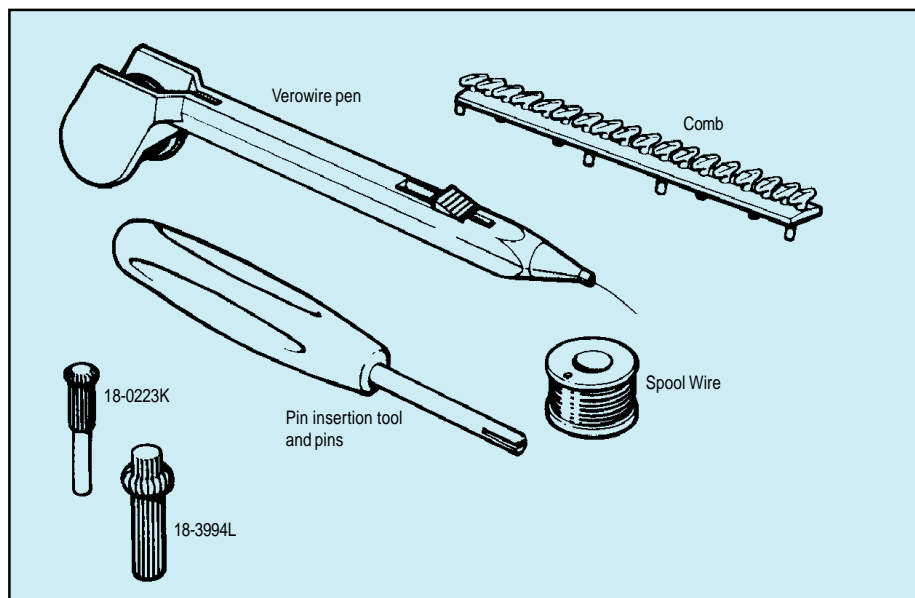
- Low profile
- High speed applications
- Suitable for high-density wiring
- No headers required
- Low cost

The Verowire wiring system is ideal for prototypes, breadboards and limited production runs. Finished results are of a high standard with a neat orderly appearance achieved in significantly less time than more conventional methods.

WIRE SPECIFICATION

Diameter of wire: 0,15 mm (34 AWG)
 Insulation: Self-fluxing polyurethane ∇
 Insulation Thickness: 0,005 mm
 Proof Voltage: 600V d.c.
 Current Rating: 0,100 A
 Resistance @ 20°C: 0,857 Ω /m
 Length of wire/spool: 40 m
 Colours: Pink
 Gold

⚠ WARNING! When soldering through polyurethane enamelled wire a small quantity of TDI gas is produced. Use in a well ventilated room.



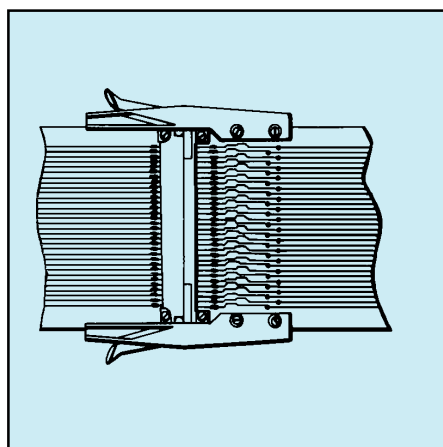
VEROWIRE WIRING SYSTEM

Ordering information

Unit of Sale	Description	Order code
1	Wiring pen	79-1732G
4	Spools wire; 2 gold, 2 pink	79-19038G
4	Spool wire, Pink	79-1737D
4	Spool wire, Gold	79-1739E
100	Wiring combs	79-1735C
1	Pin insertion tool	22-0230H
1000	Shoulder terminal pin	18-3994L
1000	Half pin	18-0223K

CARD SUPPORT - EJECTOR MECHANISM

Supplied as an accessory for any extender board, this device attaches to the plug end and guides/supports the circuit board under test. Supplied as a kit comprising 2 support-ejector assemblies, 4 M3 x 8 long screws and 4 M3 nuts.



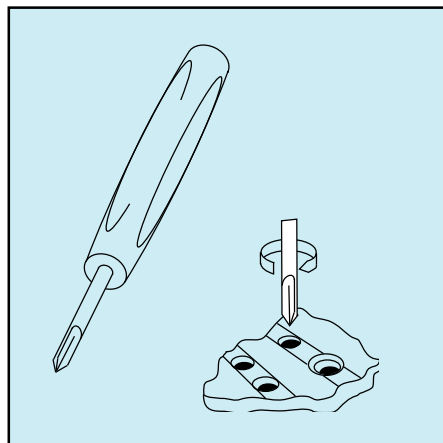
SUPPORT/EJECTOR MECHANISM

Ordering information

Description	Order code
Card support/ejector	22-2427D

SPOT FACE CUTTER

Used to break copper tracks on a PCB.
 Can be used by hand or, with the handle removed, fitted into a bench drill.



SPOT FACE CUTTER

Ordering information

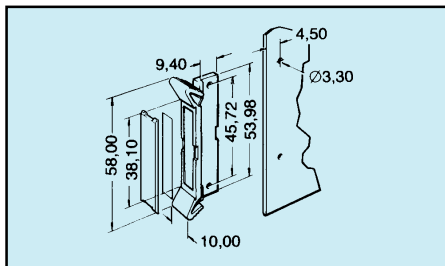
Description	Order code
Spot face cutter	22-0239G

PROTOTYPING BOARD ACCESSORIES

CARD HANDLES

CARD HANDLE TYPE A

These card handles have provision for card identification, by means of a recess which may be covered by a clip-in window (supplied separately).



HANDLE TYPE A

Ordering information

Colour	Material	Order code
Black	Noryl	21-0246C
Grey		21-0247J
Red		21-0248D
Blue		21-0249K
Green		21-0250E
Yellow		21-0251L

Supplied in packets of 10

TYPE A ACCESSORIES

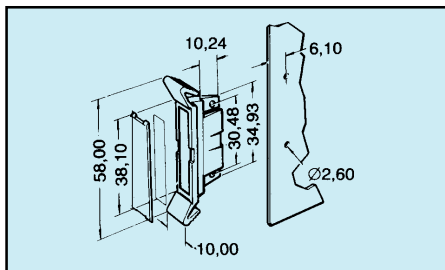
Ordering information

Item	Unit of Sale	Order code
Window & label	Kit	22-0318F
M3 Screw	100	27-1407A
M3 Nut	100	41-0505B
Washer	100	41-0600J
Rivet	100	29-1345J

Kits include 10 windows and labels

CARD HANDLE TYPE B

Differs from type A only in the means of attachment to the board. This handle has a clip-on feature which enables it to be assembled onto a PCB 1,6 mm thick which is pre-drilled with 2,6 mm dia. holes.



HANDLE TYPE B

Ordering information

Colour	Material	Order code
Black	Noryl	21-0252C
Grey		21-0253A
Red		21-0254G
Blue		21-0255B
Green		21-0256H
Yellow		21-0257C

Supplied in packets of 10

TYPE B ACCESSORIES

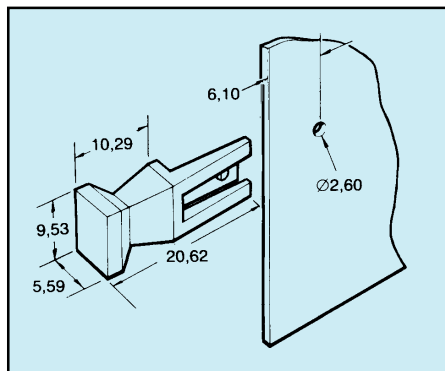
Ordering information

Description	Order code
Window & label kit	22-0318F

Kits include 10 windows and labels

CARD HANDLE TYPE C

This handle has a clip-on feature, and is used for applications where a minimum of space is available on a PCB. Fixing hole dia. 2,6 mm.



HANDLE TYPE C

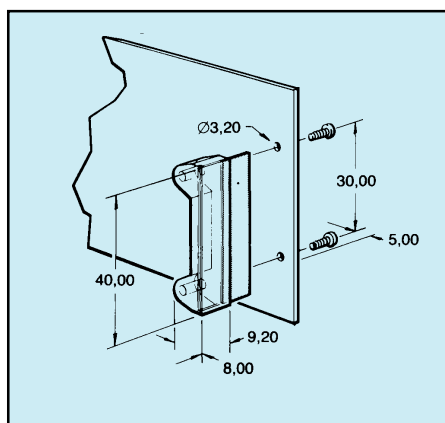
Ordering information

Colour	Material	Order code
Black	Noryl	21-0240L
Grey		21-0241F
Red		21-0242A
Blue		21-0243G
Green		21-0244B
Yellow		21-0245H

Supplied in packets on 10

CARD HANDLE TYPE D

These handles are made in a transparent makrolon material, so that the ident strip is readily visible from the front of the PCB. Supplied with 2 no. 4 self-tapping screws, this screw-on type handle also incorporates an identification strip.



HANDLE TYPE D

Ordering information

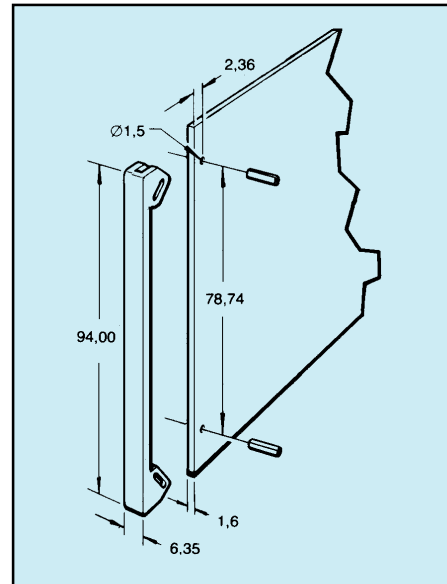
Colour	Material	Order code
Clear	Makrolon	21-3170J
Amber		21-3171D
Red		21-3172K
Green		21-3173E
Blue		21-3174L

Supplied as a kit comprising 10 handles plus fixing

CARD HANDLE TYPE E (FLEXIBLE HANDLE)

By bowing out from the board, when pulled, this handle enables a positive grip for card extraction. When not in use handle projects forward from the board edge less than 2,5 mm, making these handles fully compatible with the requirements of DIN 41494 (KM6-II).

The front surface of the handle is flat and provides ample space for card identification.



HANDLE TYPE E

Ordering information

Colour	Material	Order code
Natural	Nylon 66	21-1884E
Red		21-1885L
Green		21-1886F
Yellow		21-1887A
Black		21-1888G
Blue		21-1889B

Supplied as a kit of 10 handles and 20 fixing pins

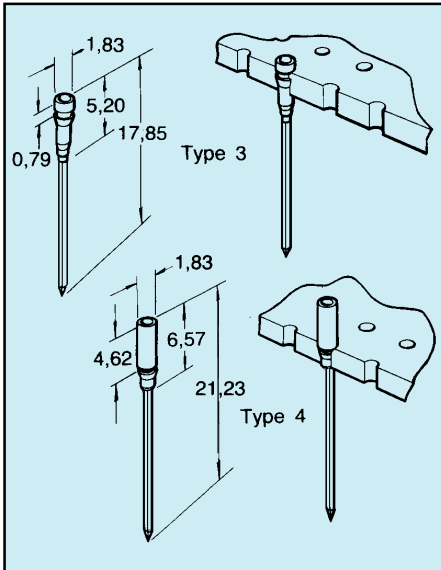
HEADERS AND SOCKET PINS

MINIWRAP SOCKET PINS (TYPES 3, 4 & 5)

These pins have 4-leaf spring beryllium copper inserts enabling components to be plugged directly into sockets.

Type 3 is a low-profile pin allowing components to be mounted close to the board surface

Type 4 has a higher profile allowing heat to be dissipated by convection between the components and the board



MINIWRAP SOCKET PINS Ordering information

Type	Compatible hole dia.		Order code
	pierced	drilled	
3	-	1,45	66-3472C
4	1,02	1,05	66-3505A

Material: All wire wrapping pins are manufactured from brass to BS249 and gold plated over a copper and nickel finish (unless otherwise stated)
Post size: 0,61 mm square, 0,86 mm diagonal.

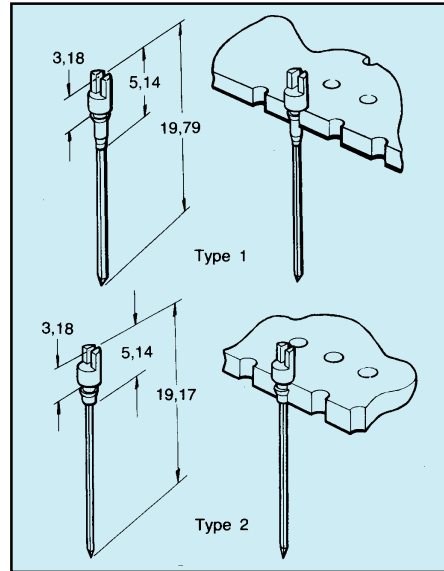
SOCKET PINS - TYPICAL TEST DATA (test data shown applies to 66-3472C and 66-3505A only)

Test	Result
Terminal retention	5,4 kgf
Contact resistance	Initial 5,3 mΩ average After 1000 insertions / withdrawals 6,4 mΩ av.
Low voltage	0,1 mA measured with open-circuit voltage of 10 μV
Salt spray (48 Hours)	Contact resistance <15 mΩ No evidence of galvanic corrosion
Humidity	No evidence of damage
Exposure to atmospheric pollution	5m Ω maximum

MINIWRAP HEADED PINS (TYPES 1 & 2)

For mounting discrete components.

These pins feature a 0,89 mm cross-cut slot on the component side to locate component leads for assembly.



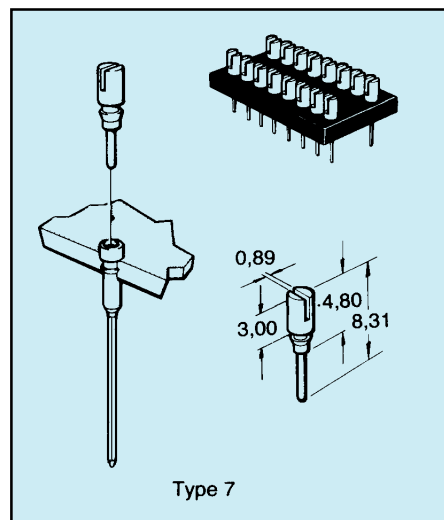
MINIWRAP HEADED PINS Ordering information

Type	Compatible hole dia.		Order code
	pierced	drilled	
1	1,32	1,40	66-3478F
2	1,02	1,05	66-3523K

Supplied in packets of 100

TERMINAL HEADER PIN (TYPE 7)

May be mounted directly into header board or alternatively plugged into socket pins (66-3472C - type 3) or (66-3505A - type 4).



TERMINAL HEADER PIN Ordering information

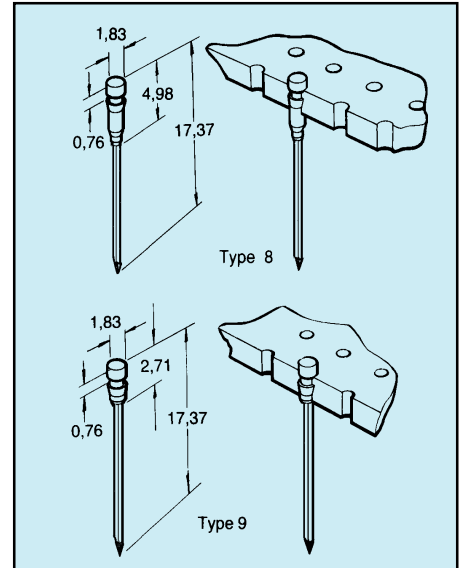
Type	Compatible hole dia.		Order code
	pierced	drilled	
7	1,32	1,40	66-3469G

Supplied in packets of 100

MINIWRAP TERMINALS

SINGLE SIDED PINS TYPES 8 & 9

Suitable for use with all types of boards. This pin may be soldered to a copper track or pad to ensure electrical continuity.

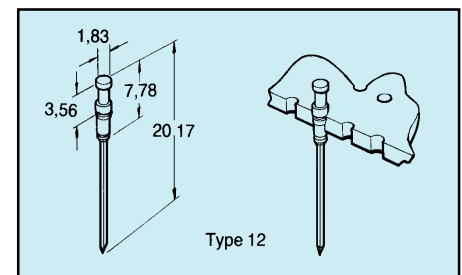


SINGLE SIDED PINS Ordering information

Type	Compatible hole dia.		Order code
	pierced	drilled	
8	1,32	1,40	66-3496D
9	1,02	1,05	66-3514L

TEST POINT PINS (TYPE 12)

These pins feature a turreted lug on the component side, guaranteeing a firm connection using a clip-on style test probe.



TEST POINT PINS Ordering information

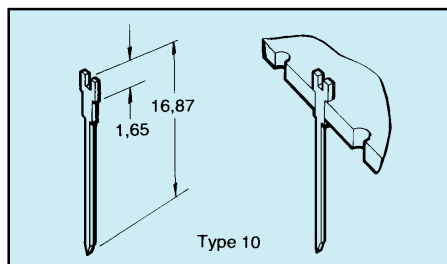
Type	Compatible hole dia.		Order code
	pierced	drilled	
12	1,32	1,40	66-3532J

Supplied in packets of 100

PROTOTYPING BOARD ACCESSORIES

SINGLE SIDED PIN (TYPE 10)

For use with plain or copper-clad boards. These pins have the facility for soldering discrete components on one side and wire wrapping on the other.



Material: Manufactured from phosphor bronze to BS 2870 PB 102 with tin finish over copper flash. Post size: 0,68 mm x 0,64 mm, diagonal 0,94 mm

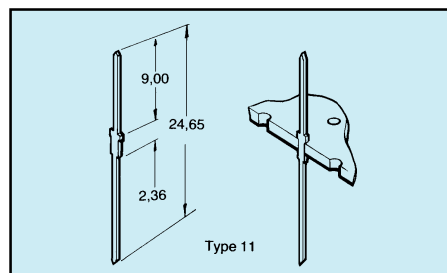
SINGLE SIDED PIN Ordering information

Type	Compatible hole dia.		Order code
	pierced	drilled	
10	1,00	1,05	18-0226F

Supplied in packets of 500

DOUBLE SIDED PIN (TYPE 11)

For use when wire wrapping is required both sides of board.



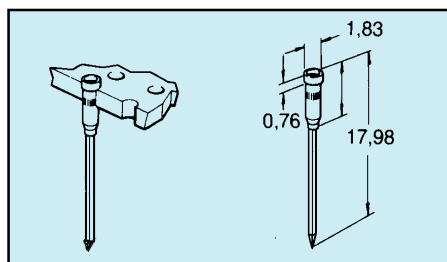
DOUBLE SIDED PIN Ordering information

Type	Compatible hole dia.		Order code
	pierced	drilled	
11	1,00	1,05	18-1657B

Supplied in packets of 500

WIRE WRAP PINS

Machine socketed triple height pressfit wire wrap pins with gold plated beryllium contacts. Typical insertion force 1,8N, withdrawal force 0,9N using a 0,43mm dia. polished steel gauge. Recommended for drilled and PTH holes.



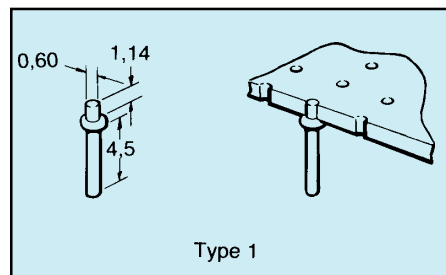
WIRE WRAP PINS Ordering information

Pack size	Order code
100	68-42417H

SOLDER TERMINAL PINS

SHOULDER HALF PIN (TYPE 1)

Designed for take-off points of PCB's where there is insufficient track space for more than 0,64 mm holes.



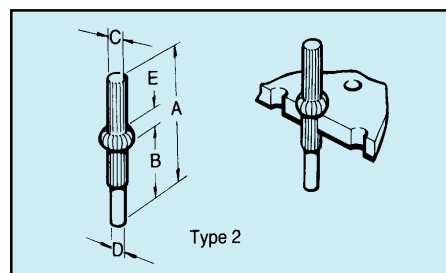
SHOULDER HALF PIN Ordering information

Type	Hole dia.	Order code
1	0,64	18-0221J

Supplied in packets of 1000

SHOULDER TERMINAL PIN (TYPE 2)

By inserting pin up to its shoulder these pins stand at a fixed height above the board surface. The separated profile offers good mechanical retention while electrical contact is made by soldering shoulder to copper track. Available in two sizes for hole size 1,02 and 1,32 mm.



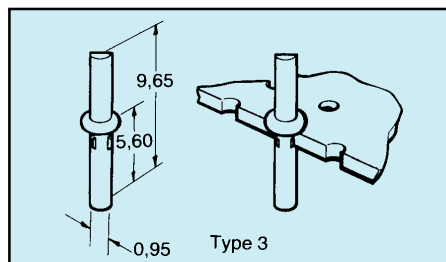
SHOULDER TERMINAL PIN Ordering information

Hole dia.	Dimensions					Order code
	A	B	C	D	E	
1,00	9,7	5,6	1,1	1,0	0,4	18-0222D
1,32	11,9	6,7	1,4	1,2	0,5	18-0219H

Supplied in packets of 1000

SHOULDER TERMINAL PIN (TYPE 3)

Similar to 18-0222D but manufactured from phosphor bronze to BS 2873 PB 102, tin finish over copper flash.



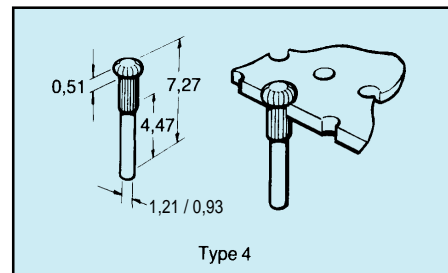
SHOULDER TERMINAL PIN Ordering information

Type	Hole dia.	Order code
3	1,00	18-0218B

Supplied in packets of 1000

HALF PIN (TYPE 4)

These pins are ideally suited to take off points or flying leads from a PCB. The shoulder is soldered to the copper track with the pin protruding on the component side of the board. Two sizes are available for 1,02 and 1,32 mm diameter holes.



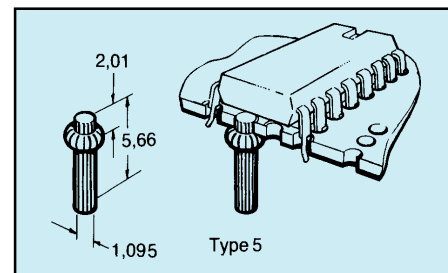
HALF PIN Ordering information

Type	Hole dia.	Dim.A	Order code
4	1,32	1,21	18-0217G
	1,00	0,93	18-0223K

Supplied in packets of 1000

SHOULDERED HALF PIN (TYPE 5)

The pin is similar to the other shouldered pins except that it is soldered to the wiring side of the board, where the main body of the pin protrudes. The top of the pin is flush with the component side of the board, allowing IC's or sockets to be mounted over it.



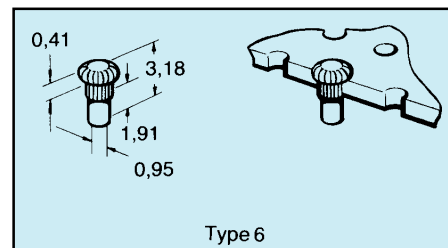
SHOULDER TERMINAL PIN Ordering information

Type	Hole dia.	Order code
5	1,00	18-3994L

Supplied in packets of 1000

SHORTING PIN (TYPE 6)

This pin is ideal for connecting copper tracks on opposite sides of a PCB. It is a low-cost alternative to PTH boards, allowing a double sided board to be used as an alternative.



SHORTING PIN Ordering information

Type	Hole dia.	Order code
6	1,00	18-0224E

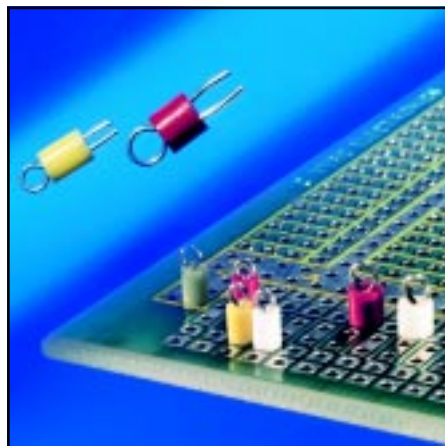
Supplied in packets of 1000

MATERIAL SPECIFICATION

All solder pins are manufactured from brass to BS 2873 CZ 124 (unless otherwise stated) and have a tin finish over a copper flash.

TERMINAL ASSEMBLY (TYPE 8)

This assembly is designed to act as a terminal on PC boards for attachment of scope probe etc. The spring design allows the terminal to be inserted into a plated through hole board without damaging the hole plating. The terminal will remain in place when the board is reversed for soldering. The sintered glass bead has a recommended maximum working temperature of 475°C. Assemblies are available for two different hole diameters. The terminal assemblies are available in five standard colours; black, yellow, red, white or green.



TERMINAL ASSEMBLY

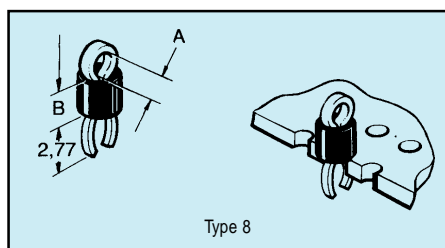
Ordering information

Type	Colour	Nominal hole Ø 1,0mm ±0,1	Nominal hole Ø 1,4mm ±0,2
8	Red	20-313137D	20-313141G
	Green	20-313138A	20-313142D
	White	20-313139J	20-313143A
	Yellow	20-313140K	20-313144J
	Black	20-002137D	20-002136J

Supplied in packets of 100

8	Black	20-312633H	20-312634E
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Supplied in packets of 1000



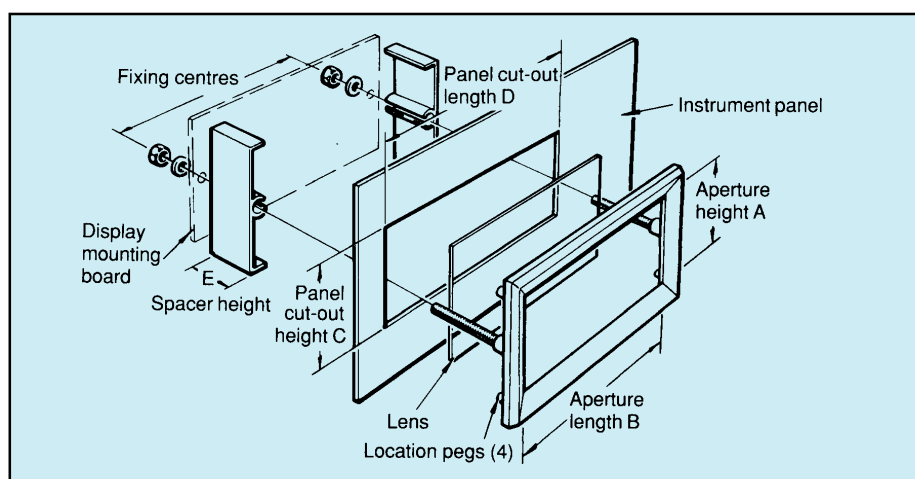
Nominal hole Ø	Dim. A	Dim. B
1,4 ±0,2	2,0-2,2	2,9-3,1
1,0 ±0,1	1,1-1,3	3,1-3,3

FRONT PANEL DISPLAY BEZELS

For 2,4 and 6 digit use in LED and LCD configurations.

FEATURES

- Enhances aperture appearance and gives clear digital readout
- Supplied with spacers to accommodate circuit boards which in turn may carry LED or LCD displays
- 1,5 to 3,0 mm panel mounting thickness
- Unique location pegs align display which is then firmly secured by two moulded-in screw studs
- 2 spacer heights are offered: 15,5 which allows assembly of the largest profile sockets and LEDs and 5,0 for use with LCDs
- 3 types of lens are offered: neutral, red for LEDs and clear for LCDs



FRONT PANEL DISPLAY BEZELS

Ordering information

No of digits	Overall dimensions		Aperture dimensions		Min. panel cutout dimensions		Spacer height	Fixin clips	Lens		For use with	Order code
	Height	Length	A	B	C	D			Colour	Type		
2	27,2	43,2	14,0	30,0	16,6	40,2	15,5	35,5	Neutral	P	LED	170-2330B
							15,5		Red	P	LED	170-2331J
							5,0		Clear	UP	LCD	170-2332E
4	27,2	68,6	14,0	55,4	16,6	65,6	15,5	60,9	Neutral	P	LED	170-2333A
							15,5		Red	P	LED	170-2334H
							5,0		Clear	UP	LCD	170-2335D
4	38,1	68,6	24,9	55,4	27,7	65,6	15,5	60,9	Neutral	P	LED	170-1834G
							15,5		Red	P	LED	170-1835C
							5,0		Clear	UP	LCD	170-1836K
6	38,1	94,0	24,9	80,8	27,7	91,0	15,5	86,3	Neutral	P	LED	170-1837F
							15,5		Red	P	LED	170-1838B
							5,0		Clear	UP	LCD	170-1839J