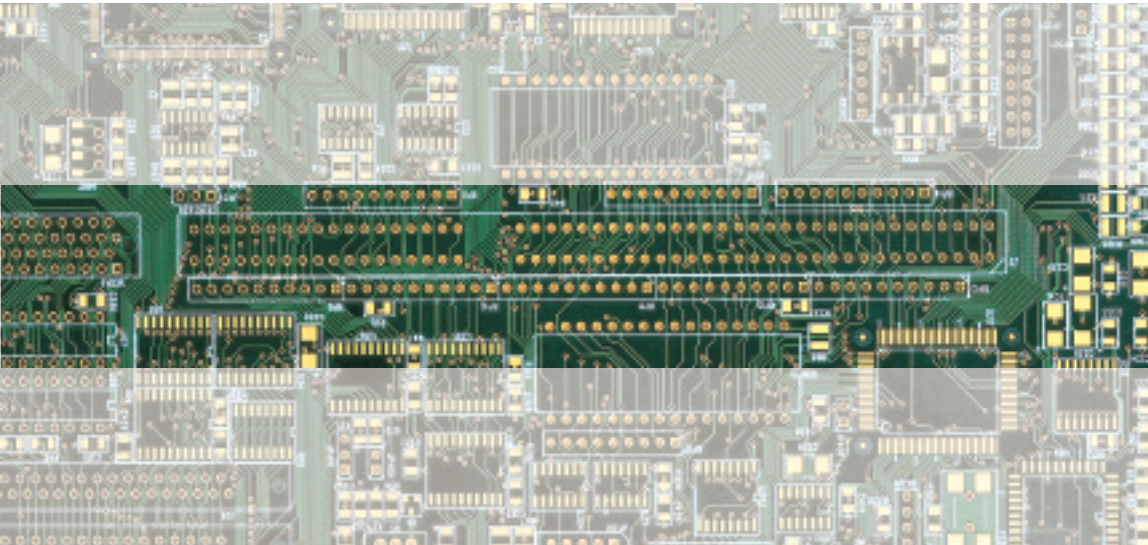


# Field Solving PCB Transmission Line Design System



*PCB transmission line design system extracts full transmission line parameters - especially suitable for modelling of transmission line loss*

*Si9000e*

*Extracts frequency dependent impedance*

*Single and multiple dielectrics*

*Accurate BEM impedance field solver*

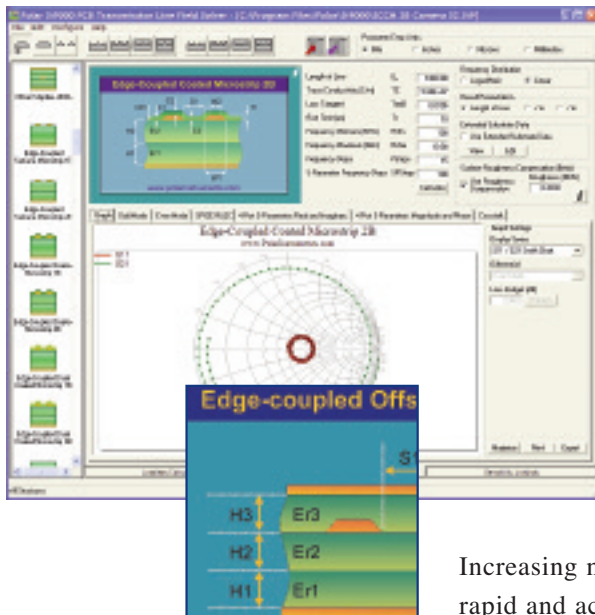
*Model odd mode, even mode, differential and common impedance*

*Manufacturing tolerance prediction*

*Graph copper / dielectric and total loss*

**Polar**

[polarinstruments.com](http://polarinstruments.com)



With its fast, accurate, frequency-dependent transmission line modelling the new Si9000e is designed to model loss and extract full transmission line parameters over a wide range of popular PCB transmission lines. The tool is invaluable in pre-layout calculations and investigations of the most cost effective transmission line structure to use, while meeting the communication channel's loss budget

*Designed to help design engineers model transmission lines*

*Over 100 transmission line structures*

*Boundary element method (BEM) field solver*

*Extracts RLGC matrices*

*Calculates conductor, dielectric and insertion loss*

*Analyzes single and multiple dielectric builds*

*Takes solder mask performance into account*

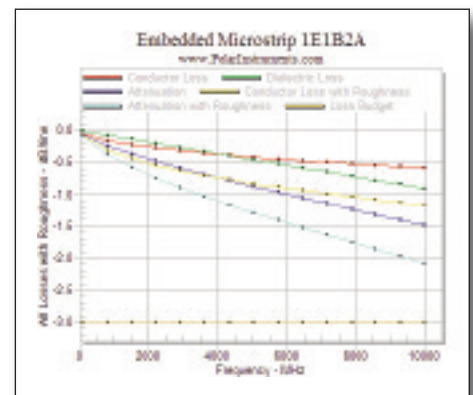
*“Si9000e is ideal for you if you work with high speed differential busses such as Xilinx RocketIO™, PCI-Express Gen2, XAUI, HyperTransport and FC-AL”*

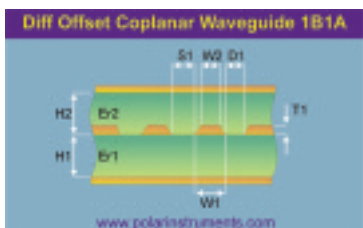
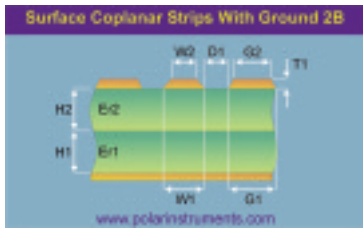
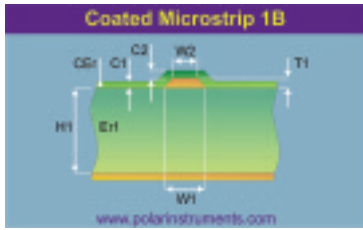
Increasing numbers of engineers using the Si8000m as a rapid and accurate design tool for transmission line impedance requested a tool developed specifically for frequency-dependent impedance modelling of transmission line losses. The result is the Si9000e.

The Polar Si9000e field solver is built on the same proven boundary element field solving platform as the Si8000m, the standard of choice for the PCB fabrication industry and extends its functionality to extract full transmission line parameters. The Si9000e employs boundary element method (BEM) field solving to extract RLGC matrices and rapidly plots a range of transmission line information for the structure you are designing.

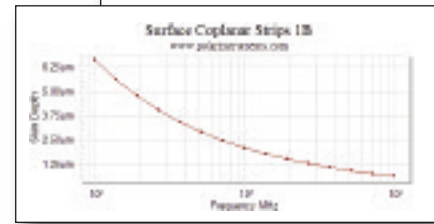
Offering the flexibility to meet the challenges faced by most design engineers, the Si9000e provides built-in support for over 100 popular transmission line structures.

Polar's Si9000e calculates all losses: conductor, dielectric and insertion loss, with the output clearly graphing each parameter. Multiple, as well as single, dielectric builds can be analyzed and the Si9000e will also take solder mask performance into account, with a flexible choice of setting mask coverage as adjacent, between or above traces.





The ever-increasing speeds of modern circuitry demand high quality controlled impedance printed circuit boards. Today's PCB is not just a simple electrical interconnection device, it is a complex, highly specified component in its own right, and design engineers need to ensure that its transmission line characteristics meet the demands of the components in system. The Polar Si9000e allows designers to extract frequency-dependent impedance and loss, helping to ensure that the board works reliably from the first spin.



The Si9000e is ideal for designers working with differential busses such as Xilinx RocketIO™, PCI-Express Gen2, XAUI, HyperTransport and FC-AL.

Benefiting from an intuitive interface designers realise a clear graphical display of transmission line characteristics against frequency. Calculated data can be easily exported as tables, allowing for further analysis in other programs such as spreadsheets and databases.

The boundary element method field solver engine extracts RLGC matrices and 2-Port (single-ended) or 4-Port (differential) S-Parameters as well as quickly plotting transmission line information for the structure under design, allowing designers to use the analysis tools with which they are familiar. Graphing against frequency is provided for impedance magnitude, loss (conductor loss, dielectric loss, insertion loss and losses due to surface roughness), inductance, capacitance, resistance, conductance and skin depth.

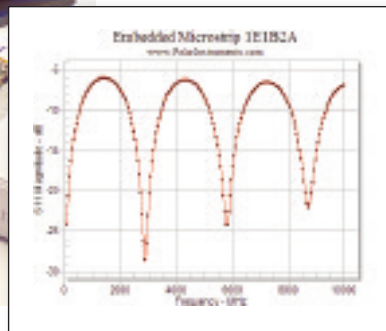
The fast, interactive nature of the Si9000e lets designers experiment with different transmission lines and substrates to discover how the production process will affect the performance of their board and to select the optimal solution for their needs. By allowing experimentation the Si9000e provides designers a wealth of experience in a very short period of time.

Frequency-dependent calculations can be refined using extended substrate data to ensure accurate modelling of the PCB materials that will be used; users simply assign substrate values by frequency band to accommodate material from any manufacturer.



## Integration With Stackup Design System

The Si9000e builds on Polar's extensive PCB expertise, built on our tools for creating stackups and our controlled impedance test systems that are used by leading PCB manufacturers across the world. For those working with complex high layer-count builds the Si9000e also links to the Polar Speedstack PCB Stackup Design System and is available in the Speedstack Si package. Using the Speedstack Si allows you to keep all your stack design data in one convenient file and you can also draw library material from your fabricator or from base material suppliers in the Polar Material Partner program.



*Speeds development of high layer-count builds*

*Links to Speedstack PCB Stackup Design System*

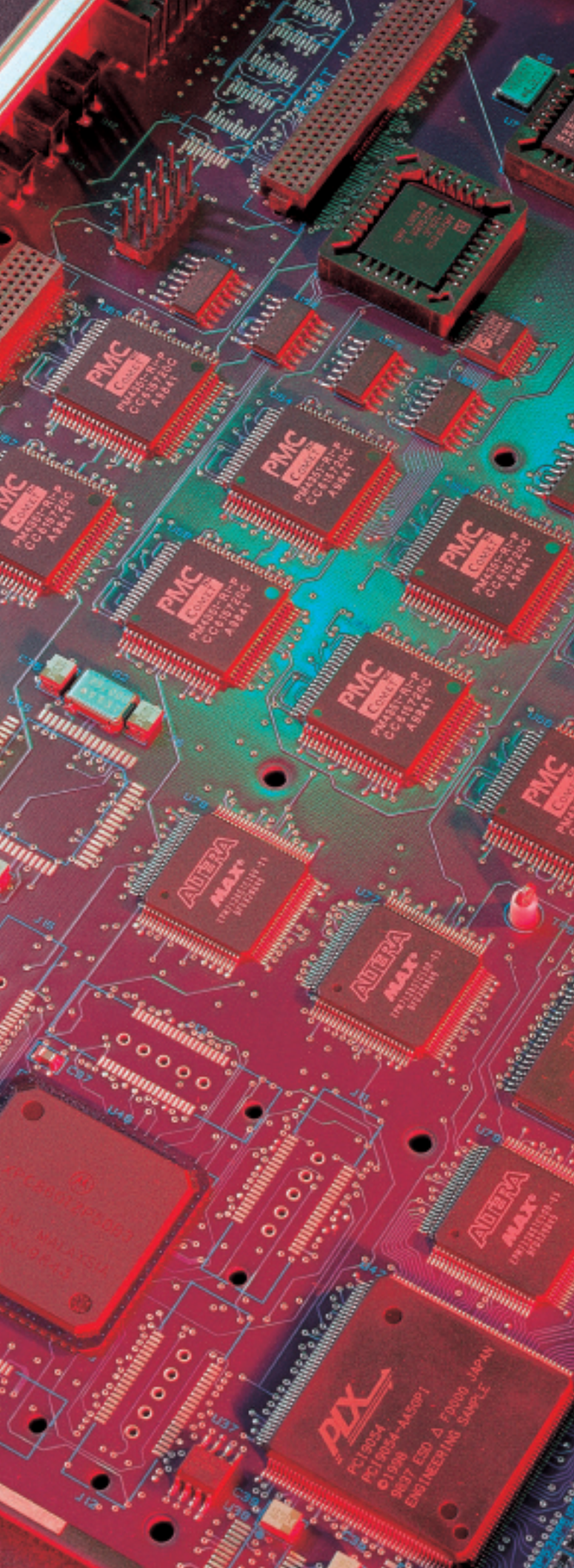
*Specify Er and TanD across a range of frequencies*

*Enter data supplied by your board fabricator*

*Draw data from material suppliers in Polar Material Partner program*

## Save engineering time with the Si9000e

Designed to save you time compared with traditional methods the Si9000e lets you choose graphically the structure you need to model and enter the geometric and material data and the range of frequencies under analysis. Select the graphs or table you need and accurate results are returned quickly and easily. For even greater accuracy advanced users may also enter available data for Er and TanD versus frequency.



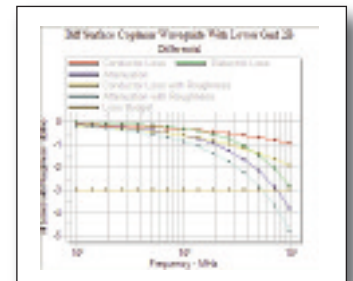
## Sensitivity analysis

Sensitivity analysis provides fast and interactive built-in graphing of impedance variation against a range of physical structure parameters.

- Graph impedance against any varying structure parameters
- Set an impedance target line on the graphs
- Export the graph data to clipboard for use in Excel
- Single ended structures graph impedance
- Differential structures graph: Odd mode/Even/Differential/Common/All
- Export graph to .jpg

## Graphing against loss budget

In addition to its comprehensive graphing capabilities the Si9000e also adds the ability to set a loss budget or target loss line on the frequency-dependent graph.



## Licensing options

A wide variety of license options is available to suit your budget or usage requirements; timed licenses come in 3 month, Annual or Full license styles. For single users the most popular license usage style is node locked, locked to a single PC; more flexibility is available with portable hardware key licenses, along with Floating 5/1 licenses which support 5 occasional users per concurrent license. Enterprise licenses offer corporate users full flexibility with each seat floating across unlimited nodes in the organisation. For high usage customers we are able to tailor a mix of license styles to suit your organisation's requirements. Please contact your local Polar office for more details.



**USA / CANADA**

**Polar Instruments Inc**

T: (503) 356 5270  
F: (503) 356 5274  
E: ken.taylor@polarinstruments.com

**JAPAN**

**Polar Instruments - Japan Branch**

T: +81 45-339-0155  
F: +81 45-339-0051  
E: terumitsu.tsuji@polarinstruments.com

**ASIA / PACIFIC**

**Polar Instruments (Asia Pacific) Pte Ltd**

T: +65 6873 7470  
F: +65 6873 7471  
E: calvin.sie@polarinstruments.com

**GERMANY, AUSTRIA, SWITZERLAND**

**Polar Instruments**

T: +43 7666 20041-0  
F: +43 7666 20041-20  
E: hermann.reischer@polarinstruments.com

**KOREA**

**Polar Instruments Korea Corp**

T: +82 2 2644 2493/4  
F: +82 2 2644 2495  
E: jsbae@polarinstruments.com

**EUROPE**

**Polar Instruments (Europe) Ltd**

T: +44 23 9226 9113  
F: +44 23 9226 9114  
E: neil.chamberlain@polarinstruments.com

**REST OF WORLD**

**Polar Instruments Ltd**

**(Head Office)**

Garenne Park, Guernsey  
UK. GY2 4AF  
United Kingdom  
T: +44 1481 253081  
F: +44 1481 252476  
E: martyn.gaudion@polarinstruments.com

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## Si9000e Controlled Impedance Field Solver

### Single ended:

- Impedance magnitude
- Skin depth
- Insertion loss S21
- Conductor loss dB
- Dielectric loss dB
- Propagation velocity
- Propagation delay
- SPICE RLGC
- 2 Port S-Parameters

### Differential:

- Impedance magnitude
- Skin depth
- Insertion loss S21
- Conductor loss dB
- Dielectric loss dB
- Differential propagation velocity
- Differential delay
- Odd mode Z magnitude
- Even mode Z magnitude
- SPICE RLGC
- 4-Port S-Parameters

### Software activation

Software Activation Fixed

A range of license options is available, including node-locked to ethernet (MAC) address or FLEXnet ID (software key/dongle\*)

Software Activation Floating

FLEXIm floating license

\* Software key/dongle licensing available for 32-bit Windows only

### System requirements

|                          |   |
|--------------------------|---|
| Computer                 | IBM PC compatible                             |
| Processor                | 2GHz Pentium/Athlon (min.)                    |
| System memory            | 1GB minimum recommended                       |
| Hard disk space required | 150MB (min.)                                  |
| Video standard           | SVGA (1280 x 1024 min.)                       |
| Mouse                    | Microsoft compatible                          |
| CDROM drive              |   |
| Operating system         | Windows 2000 (SP4), Windows XP, Windows Vista |

### PolarCare maintenance and support

PolarCare offers you both technical support and regular updates, along with additional discounts for extra seats. In addition PolarCare membership entitles you to contribute feedback for consideration in future maintenance releases. The PolarCare development panel regularly reviews customer requests and the most popular suggestions are considered for development. PolarCare also offers subsidized replacement of lost portable keys along with subsidized rehosting of floating and enterprise licenses. Please check the PolarCare brochure or the Polar website for current PolarCare benefits.

### About Polar Instruments

Polar Instruments Ltd provides innovative and easy to use measurement, test, design tools and utilities for the PCB fabrication industry and related disciplines. With offices in the USA, Singapore, Japan, UK and Europe Polar has been established for over 30 years and is a world leader in both PCB Faultfinding Systems and Controlled Impedance Test Systems (using TDR). Polar's recently released Signal Integrity tools are serving a growing market in pre-layout design and PCB fabrication.

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