Supermax
E-CAD

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Supermax
E-CAD

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Contents

Due to DDE policy of constantly development and improvement, the Supermax E-CAD system specifications are subject to change without notice.

Supermax
E-CAD

Dansk Data Elektronik A/S (DDE) has developed Supermax E-CAD, the E-CAD system of the future. Supermax E-CAD is an advanced tool for designing and constructing electronic circuits - a further development of the wellknown Supermax IPL system by DDE.

The life span for a product in the electronic sector is becoming increasingly shorter. At the same time the demands for an effective and efficient integrated toolset for development work is becoming more and more demanding. The impact and success of a new product depends greatly on the speed in which it can be initially introduced.

In order to obtain the best results possible the various phases in development work should be so well integrated that the transference of data from one work tool to another can be carried out quickly and efficiently and without any loss of information. The choice of where to start in the design phase shall be completely up to the individual.

Supermax E-CAD fulfills these demands.

Supermax E-CAD is DDE's solution to the electronic sector where demands press heavily on a quick,effective and accurate construction of new products.

Due to the fast development of components coupled with new production methods and new advanced assembling methods for PCB's the designer should not be inhibited by bounderies made by the design tool. The only bounderies should be that of his own creativity.

Supermax E-CAD increases the creativity.

Supermax E-CAD has been developed through close teamwork and cooperation of both engineers and layout designers. Supermax E-CAD is therefore an E-Cad system with which the designer can identify, since the system has been built on the designers mode of working.

Supermax E-CAD is constantly developed.

The implementation of new ideas and technologies results in Supermax E-CAD holding a leading position in advanced layout technology.

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Supermax
E-CAD

System Description

Supermax E-CAD assists in the development of a project from the initial sketches to data and information required at production level. Supermax E-CAD covers the following areas:

Supermax E-CAD Schema
Supermax E-CAD IPL
Supermax E-CAD Hybrid
Supermax E-CAD Thermo
Supermax E-CAD CAM
Supermax E-CAD Pre/Post
Supermax E-CAD Database

The core of Supermax E-CAD is a fully integrated program module which consists of three facilities, Schematic capture, PCB layout and Hybrid layout. These three structures are described in the same data structure: Supermax E-CAD Design Base.

Supermax E-CAD Design Base is constructed to achieve the quickest possible response time and with the utmost precision in mind. Both metric and imperial units can be applied, and if needed, as a mix. A random grid can be applied.

Supermax E-CAD Cam includes a series of programs that generates data for drilling, milling, photoplotting, automatic and semi-automatic assembling machines, automatic test equipment etc.

Supermax E-CAD Pre/Post are programs enabeling the designer to check netlists written in the Supermax E-CAD Wirelist Format, make check plotting for documentation, generation of BOM, interface to other E-Cad systems etc.

Supermax E-CAD Thermo is a program for thermal analysis and its effects on the layouts.

Supermax E-CAD Database includes component specific information such as gate- and pinswop data along with information
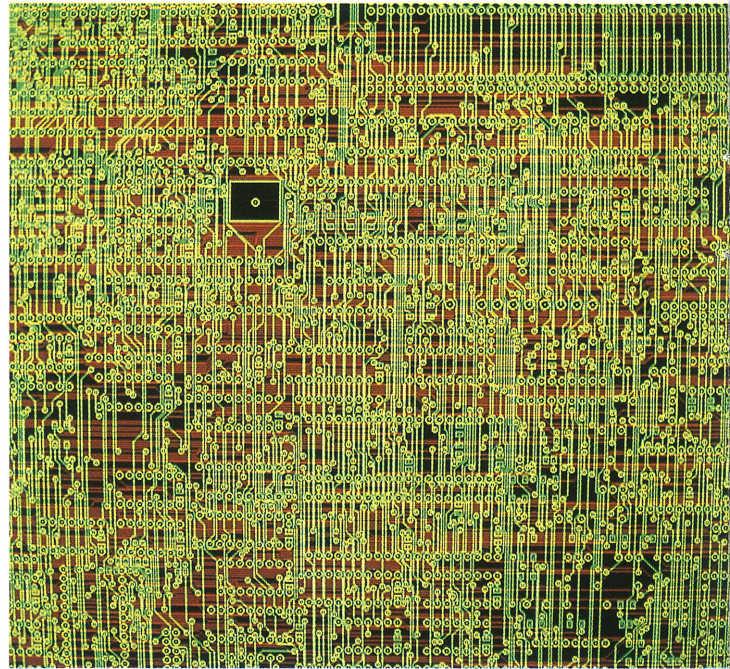
Complex design are solved in a minimum of time with Supermax E-CAD.

which joins symbols and models used in schematics, simulation and layout together.

Supermax E-CAD user interface is defined by Supermax E-CAD Macro Language, in which menus, macros, functions and command sequences can be built up freely to suit individual needs and requirements. New and occasional users of the system can apply a hierachical menu orientated user level with pop-up menus. The established user can however ignore the menus and use the system commands directly.

Users of the Supermax E-CAD system will automatically become members of a well established user group. This group meets twice yearly giving each user the opportunity to meet, discuss and influence in the development of the Supermax E-CAD system. The meetings will also give the group a chance to exchange points of view and experiences made with daily use of the system.

Supermax
E-CAD

Specifications/features

General

Supermax E-CAD Design Base:
256 layers.
100"x100" layout size.
More than 2500 pins per
component.
Grid size down to 0.01 mill.

Text:
User defined
-size
-italics
-compression/expansion
-direction
-mirroring
-textfont

ASCII Files:
saved jobs
net lists
library symbols
menues
macros
command sequences

Libraries:
PCB library
Schematic library:
-Prosam 23 analog
-Prosam 17 digital
Hybrid library

Layout part

Unlimited number of:
-components
-connections
Up to 256 different
-pad sizes/forms
-connection widths
per job

Routers:
bus router
pattern router
small router
LEE router

RIP router
orthogonal router
ECL router

Pads, Connections, vias:
arbitrary shapes
concave/convex
arbitrary sizes
offcentre pads

DRC:
Advanced individual
Design Rule built into
each pad, SMD,
connection and via.

Schematic capture

Unlimited number of:
-hieracherial levels
-pages per hierachi
-components per page.

CAM Pre/postpro

New items are constantly
added to the following
list.

Penplotters:
HP
Calcomp
Benson
Houston
HPGL compatible

Laserprinters:
Canon
HPGL compatible

Vectorplotters:
Gerber
EMMA
Computervision
PBI

Electrostatic:
Versatec
Calcomp

Laserplotters:
Disc

CNC machines:
Sieb&Meyer
Excellon
Mape
PDA

ATE equipment:
Genrad
Zenthel
Factron

ACE equipment:
Logpoint
Fuji
Zervatech
Universal
Wirewrap

Interfaces:
DXF-format
HPGL-format
Gerber-format
CadStar
P-Cad
Pads-PCB
EE-Designer
MiCad
OrCad
PC-Schematics
Redac Visula
Redac Maxi
Mentor Graphics
Valid Allegro
Computervision
HP PCDS
IBM CBDS
Calay
CT2000
Top-CAD

Supermax
E-CAD
Schema

Supermax E-CAD Schematic Capture is more than just an ordinary drawing tool. Supermax E-CAD Schema is a layout worktool on a par with Supermax E-CAD IPL. As the schematic is drawn, the system creates a net list in the Supermax E-CAD Wirelist Format. The nets will automatically be given net names. This means that bus connections can be dealt with in an intelligent way.

Hieracherial design

Schematic capture, PCB- and Hybrid layout can be mixed in the Supermax E-CAD Hieracherial design structure. A system can be designed by using function blocks, each containing their own Schematic/PCB/Hybrid. Any one of these blocks can be reused in other blocks.

As well as being able to work Top-Down, Supermax E-CAD can also work Bottom-Up. This means that the design can start at the PCB layout stage as the net list can be generated interactively during the layout process. Complete backannotation means that the update of data in the net list is constant and each change made in the schematic will automatically update the layout or vice-versa.

Supermax E-CAD Wirelist Format

Over and above net list information, Supermax E-CAD Wirelist Format contains information about components, design rules and special net information:

-Components can be specified by their type, position, direction, layer and status. Components can also be placed together in blocks, these blocks being used in the design as smaller functional units.

- The net list can be extended with information about netnames, width of connections, legally used layers,

max/min length , maximun number of vias used, net status etc.

In this way, at schematic level, the designer can influence the construction and ensure that the layout will conform with the specified requirements.

Hierarcherial design with Supermax E-CAD.
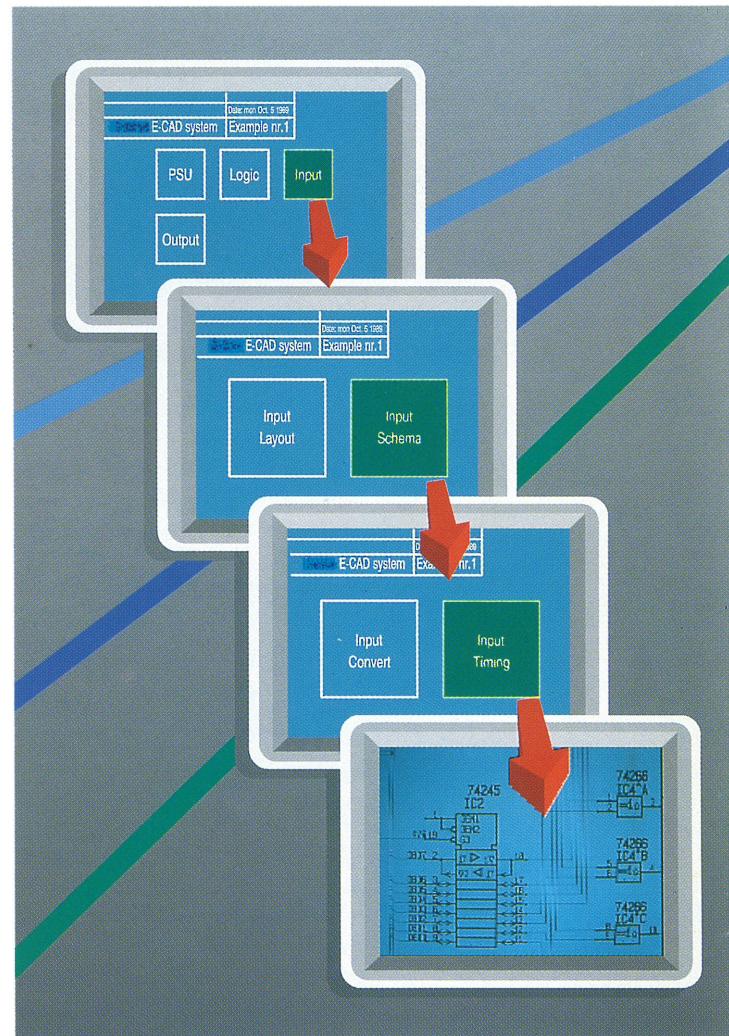
Supermax
E-CAD

Thermo

Supermax E-CAD Thermo is an interactive program calculating heat transferrence on layouts. The program uses the component placement made with Supermax E-CAD IPL. Supermax E-CAD Thermo will detect hot spots, through calculation of case, junction and board temperatures under various environment specifications. The result of the heat simulation is shown in the form of various colour zones identifying isotherms.

Database

The Supermax E-CAD Database contains special component information not found in the individual libraries. Information about input and output, supplies, the possibility of pin and gate-swop and production technology are available on-line and are used in conjunction with various functions in the Supermax E-CAD IPL, Supermax E-CAD Schema and Supermax E-CAD Hybrid.

The keyword in the database is the stock name. The stock name is used throughout the Supermax E-CAD system, in order to have a unique reference, which joins the library symbol/model together in schematics, simulation and layout. Besides the Supermax E-CAD Database, it is possible to use Oracle or Informix databases.

Supermax
E-CAD
IPL

Placement

A successful routing depends mainly on well placed components. Supermax E-CAD IPL contains a series of efficient tools making the job of the layout designer a much easier one.

Positioning can be made automatically or interactively. All automatic routines are fully re-entrant, giving the designer full control over the placement in the design. SMD components on two sides or a mixture of SMD and through-hole technology components can be dealt with easily.

During the placement, it is important to be able to put components into various logical groups. The select facility in Supermax E-CAD can, from various criteria, group components, place the group in question and give the components a new placement status. From this status the Supermax E-CAD IPL can decide how these components should be treated in further placement.

Density graphs keep the designer informed regarding the improvement in the placing of components.

Paired swopping or rotation of components can optimize space in placement and pin- or gateswop can be dealt with automatically or manually.

Components can be put in special blocks. A component block is treated in the same way as an ordinary single component. It can therefore be moved, and placed as such.

Surface mount symbols can be mirrored back and forth from side to side during the placement, and all relevant information such as, pad layout, soldermask and silk screen will automatically be changed.
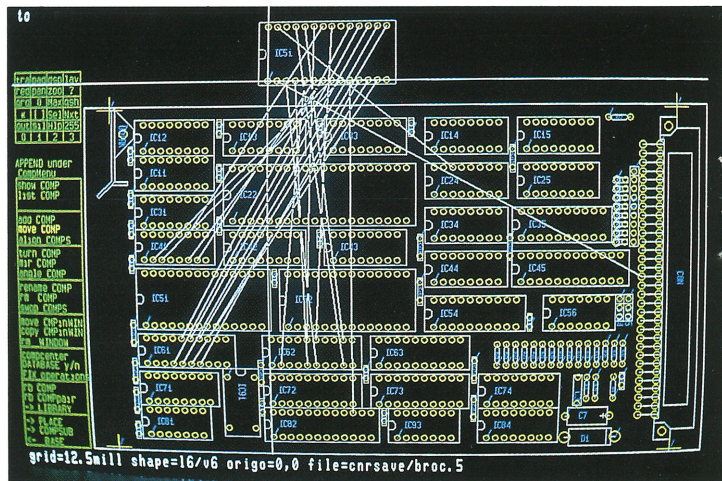

Rubberbands lead to optimal component placement.

Components in a window can be moved or copied. The net list is maintained if the components are only moved. If however, they are copied, the system will automatically introduce a generation number after the name of the component.

A series of intelligent functions automatically place test points based on design specifications.

Copper areas are easily defined.
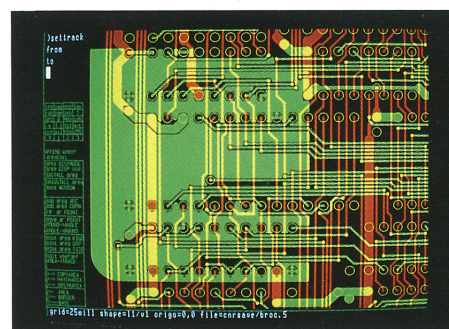
Supermax
E-CAD
IPL

Supermax E-CAD has facilities to control restrictions on construction heights of components. Areas on the layout can be completely barred of components or just for components over a specific height.

New library symbols are easily made with the help of the graphic editor and existing symbols can be edited while working on the layout.

Layout

Designing a layout on the Supermax E-CAD system means a combination of the skill of the PCB designer and his ability to see any critical situation coupled with the computers ability to carry out trivial tasks and labouring, time consuming calculations.

Supermax E-CAD IPL is built on a series of true 45° autorouters together with an advanced on-line Design Rule Check. Since autorouters are an integrated part of Supermax E-CAD IPL, they can be used on-line. This ensures that the operator has the maximum help from the system whether used interactively or automatically.

Supermax E-CAD autorouters show the routing in real time. Autorouters are fully re-entrant, so the designer decides if he wants to make any manual changes during routing. Supermax E-CAD 's unique wave function displays in which direction the router is working and in this way can help with interactive routing.

Supermax E-CAD IPL copes with all types of layouts: Digital, Analog, Fineline, Flex-PCBs, Multilayer and SMD. SMD routing can be done gridless with the possibility to decide in which direction connections may leave the pad.

The different nets can be routed selectively, as the designer can pick out nets from various criterias.
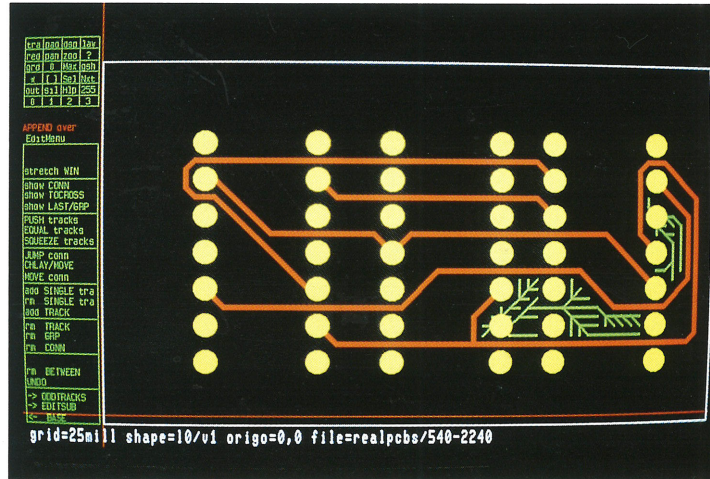

The Wave of Supermax E-CAD IPL shows the possibility of the router.

Single connection points within the net can be reorganized.

On-line Design Rule Check includes checking of safety distance together with a check of net list errors, but the designer can also choose functions which do not include DRC. Introduced design rule errors are then found by various check functions, which can also find and remove blind connections.

The making of negative innerlayers.
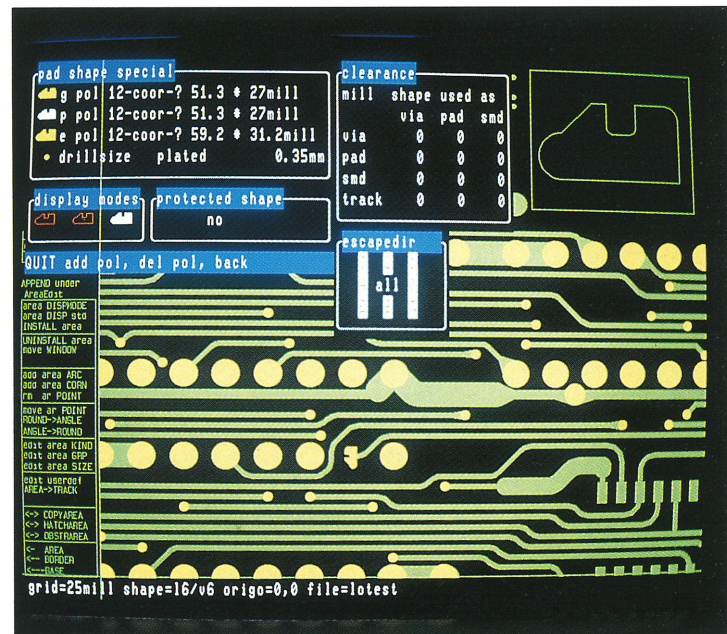
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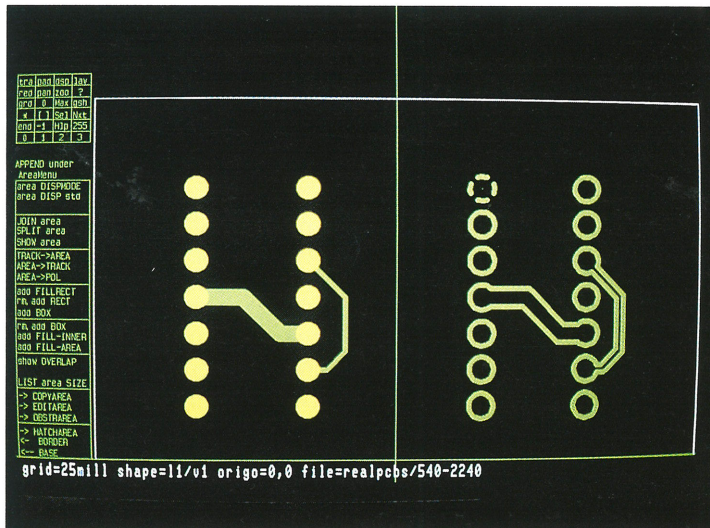
IPL

Multilayer designs can be auto-routed simultaneuosly in 8 layers at a time with hidden vias. The ground and power layers can either be generated during the actual layout process or during postprocessing.

Ground/copper areas are defined easily by simply marking corners of the area which has to be filled in. The area can be connected to a specified group, and editing the shape of the area or connections in the area are easily done. Other types of areas are used as keep in/out for connections and vias.

Production optimization

The finished layout can be optimized in a couple of ways: through minimization of vias and the number of tracksegments, by removing 90° angles and by moving connections in order to spread out the safety distances equally.

Wide tracks towards pads can be made narrower at a given distance from the pads,or vice versa. Tracks and pads can be changed locally of globally. These changes can be carried out during the course of the

Advanced graphical possibilities.

layout with on-line DRC. In the case of flex PCB's, tear drops can be added to pads and angles in tracks can be made round with specified radii.

Supermax
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Hybrid

Supermax E-CAD Hybrid is a system for the design of hybrid layout and PCB design using polymer technique. All possible techniques are supported by Supermax E-CAD Hybrid, for example single and double sided substrate with wiring on various layers and hidden or staggered vias, automatic generated cross-over, SMD, chip & wire components and printed resistors.

Components

Supermax E-CAD Hybrid handles all elements involved in thick or thin film hybrid or polymer designs. Surface mounted components can be mixed with through hole components, screenprinted resistors and bonded chips. Screenprinted inductors and micro wave elements can be generated and used in the same way as all other components as Supermax E-CAD Hybrid includes a 2D drafting work tool specially for this purpose.

Design of resistors

Supermax E-CAD Hybrid generates thick film resistors of various geometrical shapes, for example rectangular or top hat. The value of the resistor can be changed during design. Simulation of trimming, by laser or sandblasting, analising the current density and equipotential. Thin film resistors can be designed and stored as standard components.
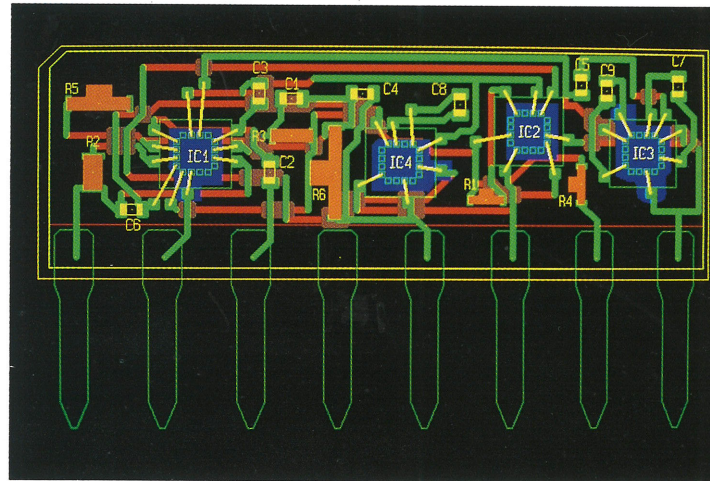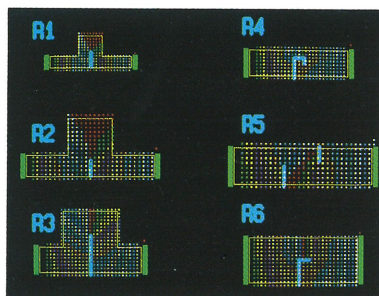
Hybrid with bonded chips, screen printed resistors and cross-overs.

Bonding

By utilizing bonded components, bond pads can be moved with complete control of the length of the bond wire. Chips can also be moved without influence on the bond pads. Unused pads can be removed.

Layout

The placement routines used in Supermax E-CAD IPL are also used in Supermax E-CAD Hybrid, with respect to the special rules regarding hybrid layout. The advanced layout routines from Supermax E-CAD IPL are also available in Supermax E-CAD Hybrid. Due to extra safety distance perdendicular to the screenrake, it is possible to add a value to the DRC in the x- or y direction.

Productiondata

Data for production of the finished layout is carried out by Supermax E-CAD CAM. As well as normal plot data, special hybrid data is also included. This includes bonding, pick and place, ATE, laser- and sandtrimming etc.

Simulation of resistor trimming.

Supermax
E-CAD
CAM

Stepped innerlayer with automatically generated Zebra-stribes.

The effective use of production equipment is part of an effective layout work tool.

The Supermax E-CAD CAM programs are extremely effective and the generated data are optimized such that production time is cut to a minimum.
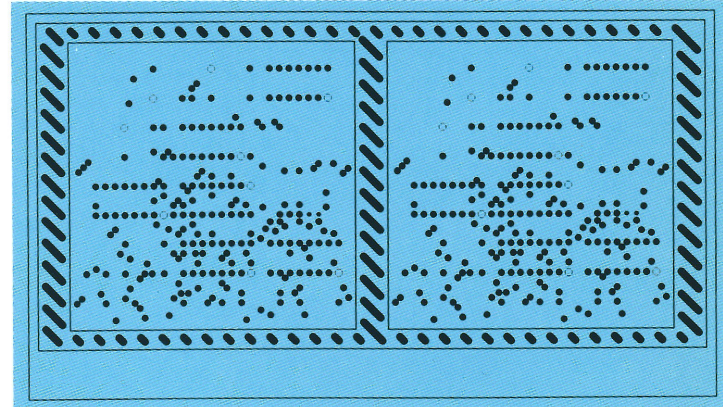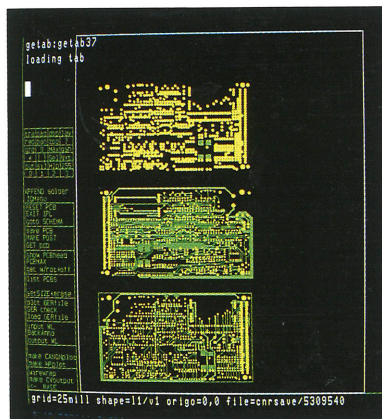
The CAM programs are combined in the tool Makepost. Here, the operations needed in a specific job, are described in detail. This could be, for example, photoplot of specific layers, drilling, milling and pen plots for documention. Furthermore a job can be panellized, cutting production costs to a minimum. This desciption of operations can be reused on other jobs.

Photoplot Data

The photoplot program generates photoplot data for vector and laser plotters. A photoplot file can be checked against an aperture table and a print out of data can be made, listing which aperatures the pad-shapes will apply. If a given pad shape can not be found in the table, the program will generate data for drawing the shape.

The photoplot file can be check-plotted on the graphic workstation.

CNC data

The drilling and milling program creates the data necessary to apply to various machines, but a worktool capable of editing the code tables ensures that the relevant data can be used on all current machine types. Plotting of drilling and milling drawings can be made for documentational purposes. Besides information for production and the fabrication of layouts, the Supermax E-CAD CAM can generate data for insertion machines, semi-automatic mounting boards, bare board testers and in-circuit testers.

Photoplot data is controllable by the graphic display.

Milling data is read directly from the layout.
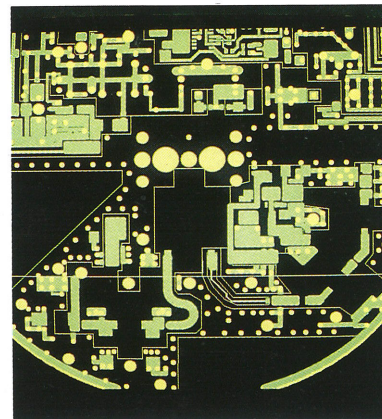
Supermax
E-CAD
Pre/Postprocessing

Supermax E-CAD Pre/Post includes programs to prepare and finalise data.

Preprocessing

Written net lists and net lists converted from other E-CAD systems can be syntax checked against the Supermax E-CAD Wirelist Format. Double use of component connections and netnames together with missing component definitions are listed.

Print outs of pins used on components, cross reference lists between component pins and net names, comparisons between two net lists, and a user specified Bill Of Materials can be generated. This check program is also available in a version for PC's under DOS.

Postprocessing

The final artwork can be plotted for documentational purposes. Supermax E-CAD supports a line of penplotters, electrostatic plotters and laser printers. Print out on laser printers can be made in grey scale in order to be able to separate information.

The different layers of the layout, for example, copper layer, silk screen, component placement, solder mask etc. can be plotted layer by layer with or without filled-in tracks and pads. Supermax E-CAD can also generate drilling and milling drawings indicating hole sizes, the number of holes used and measuring of the layout.

The combination of Supermax E-CAD IPL's wide range of facilities and Supermax E-CAD Pre/Post plotting program offers a wide variety of possibilities, e.g. plotting of a specified net.

Documentation for symbol libraries is carried out with the help of a user controlled program. The program automatically plots new
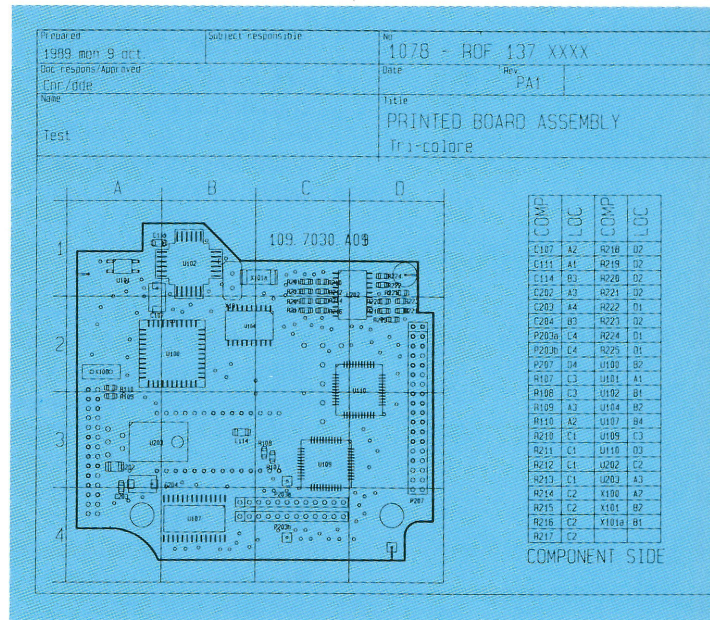
Automatically generated component mounting drawing.

symbols, when these are inserted in the appropriate library.

Interfacing with other E-cad systems can be made at different levels all depending on the capacity and structure of the foreign system. Supermax E-CAD interfaces with various E-Cad systems and DDE are prepared to implement new solutions towards other systems.

Photoplot, HPGL and DXF files can be converted to Supermax E-CAD Design Base Format, whereby graphic input can be used as a base for new layouts.

Supermax
E-CAD
Hardware

As well as being able to fit central CAD departments, Supermax E-CAD can be used decentralised by engineers and tecnicians. The system is built to suit the individual needs both in software and hardware.

Supermax E-CAD can be supplied as a single or multi user system. It is possible to begin a Supermax E-CAD installation with a single 386 based workstation. Later on, more workstations can be joined together by network, and a Supermax can be attached to the system. Since the software running on the different hardware is identical, jobs can be easily transferred between the systems.

Supermax E-CAD Single User System

This configuration is an AT/386 workstation with the 386ix operating system based on Unix V.3.
The system employs X Windows, and TCP/IP is used as communication protocol.

Supermax E-CAD Multi User System

Supermax E-CAD multiuser system is based on the DDE Supermax series of high performance supermini computers, based on MC680xx/R3000 processors and Unix V.3.
Supermax is a multi CPU computer with the constant possibilty of modular expansion, hence, the sys-
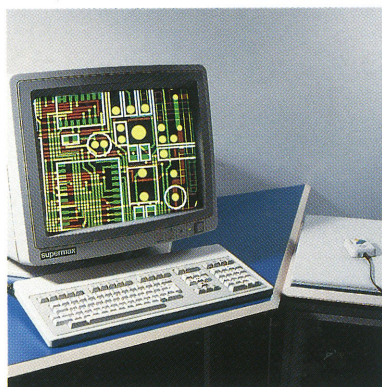
The Supermax series of computers.

tem can be upgraded with more workstations without jeopardizing earlier investments. Also the Supermax can be upgraded to newest available processor technology. The Supermax Graphical Display (SGD) is employed as graphical workstation. The SGD communicates with the Supermax via network.
Furthermore PC's can be used as terminals.
An example of a Supermax E-CAD system is a Supermax with 16 SGD terminals and 8 MC 68030/33MHz CPU's each with 16 Mb memory.

A wide communications concept is found with the Supermax. Data to and from other computers can be transferred via SNA, OSI, and TCP. Furthermore data networks like the X25 are supported.

Supermax E-CAD workstation with SGD display and tablet.

Supermax
E-CAD

Support and education

It is DDE's policy that a professional education together with a fine service and support are the most important factors for a successful installation. These factors ensure the best possible performance from the Supermax E-CAD system.

New users of the Supermax E-CAD system should therefore attend specially constructed courses designed and formed for the individual. This gives the user a basic view of the uses and possibilties the system can offer. After a given time, when the user has

had a chance to work with the system, more concentrated courses may be held based on the individual needs of the company in question.

All users of the Supermax E-CAD system have easy access to our technical department which covers the service and support of the Supermax E-CAD. Qualified personnel are at the disposal of our customers with advise and help nesessary in a given situation. This department also have a team of hardware technicans who's job it is to service and support all Supermax E-CAD installations.

Dansk Data Elektronik A/S has it's main offices in Herlev, a suburb just outside Copenhagen. Here the majority of DDE's 500 employees work. The Supermax computer is produced at DDE's own factory in Klokkerholm, North Jutland. DDE is also represented by daughter companies and agents in 18 different countries.

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