SIEMENS

HYB 514100BJ/BJL -50/-60/-70
4 194 304 x 1 - Bit Dynamic RAM

HYB 514400BJ/BJL -50/-60/-70
1 048 576 x 4 - Bit Dynamic RAM

INFORMATION NOTE

Fourth Generation 4M-DRAM
(Ultrashrink-Version)

General Information
Products
Design and technology highlights
Package outline dimension
Packing

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This information note is intended to provide technical information on the SIEMENS 4M x 1 and 1M x 4 bit generation ("Ultrashrink-Version") DYNAMIC ACCESS MEMORIES HYB 514100BJ and HYB 514400BJ .

GENERAL INFORMATION

The SIEMENS HYB514100BJ and HYB514400BJ are latest generation dynamic RAMs organized 4,194,304 words by 1 bit and 1,048,576 words by 4 bits respectively, assembled in 300 mil wide SOJ26/20 packages. The design features fast page mode operations. Low Power versions with low standby current and high data retention time especially selected for battery backup operations are also available. (fig.1)

The HYB 514100BJ and HYB 514400BJ utilises the SIEMENS submicron twin-well CMOS silicon gate 4M-process technology with depletion type trench capacitors with ONO dielectric as well as advanced circuit techniques to provide wide operation margins, both internally and to the system user.

Figs. 2 - 4 highlight the process, design and assembly related data.

PACKAGE OUTLINE DRAWINGS

The SIEMENS 4M x 1/1M x 4 bit DRAMs are available in an industrial standard 26/20 pin plastic SOJ packages with 300 mil body width, appropriate for surface-mounting techniques. The 4M x 1 or 1M x 4 organisation are implemented by different bonding options. The package outline dimensions of the package meet JEDEC standards.

CODES FOR MARKING

The marking on the top side of every 4M x 1 or 1M x 4 device gives information to the device type, which access-time specification is met, and the country of origin "Germany". In addition, a weekcode indicates in which week of the year this part was tested. (fig.7)

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A SIEMENS internal part number is printed on the bottom side which represents the wafer production lot number, the date of final assembly and a code for the assembly line. Laser equipment is used for top and bottom side marking.
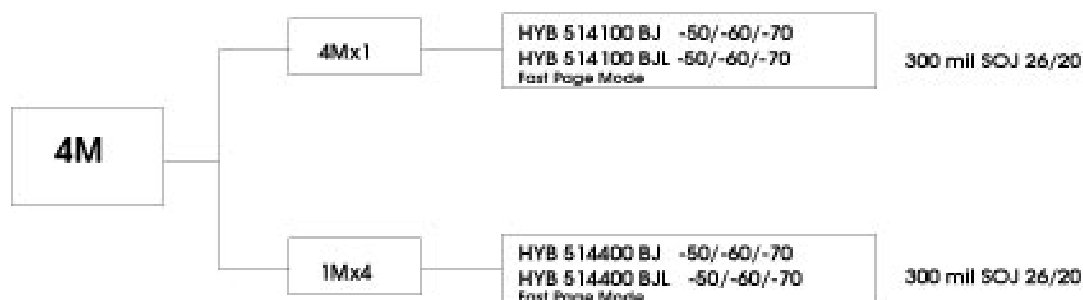

PACKING

Volume conductive polystyrol tubes ,especially designed,for 300 mil SOJ packages with a surface resistance in the range between 10^5 to 10^7 Ohm/sq. are used. Each tube contains 25 SOJ DRAMs.

Before packing, all SOJ 4M-DRAMs are baked in metal tubes at 125 ^{o} C in ovens with circulating hot air for 12 hours. Within 24 hours the devices are seal packed. One sealed dry pack contains 40 tubes along with a pouch of desiccant and a humidity indicator.

SIEMENS 4M-DRAMs in SOJ packages are also available dry-packed on tape & reel . In this case each reel contains 1500 SOJ 4M-devices.

SIEMENS recommends for SOJ packaged devices not to exceed a 168 hours time span between unpacking and vapour-phase or reflow-soldering.

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                    ┌────────┐   ┌─────────────────────────────┐
                    │ 4Mx1   │──▶│ HYB 514100 BJ  -50/-60/-70   │  300 mil SOJ 26/20
          ┌─────────┤        │   │ HYB 514100 BJL -50/-60/-70   │
┌──────┐  │         └────────┘   │ Fast Page Mode               │
│  4M  │──┤                      └─────────────────────────────┘
└──────┘  │         ┌────────┐   ┌─────────────────────────────┐
          └─────────┤ 1Mx4   │──▶│ HYB 514400 BJ  -50/-60/-70   │  300 mil SOJ 26/20
                    │        │   │ HYB 514400 BJL -50/-60/-70   │
                    └────────┘   │ Fast Page Mode               │
                                 └─────────────────────────────┘
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-- fig. 1 --

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4Mx1 / 1M x 4 DRAM
PROCESS RELATED DATA

PROCESS	0,6 um twin well CMOS on a p-type substrate 2 Polysilicon layers 1 Molybdenum silicide layer 1 Aluminium layer
SIEMENS PROCESS NAME	C5DH
MINIMAL DESIGN RULES	
Line	0,6 μm
Space	0,7 μm
LITHOGRAPHY	g-line Stepper / i-line Stepper
CONTACT DIMENSIONS	
final	0,8 μm x 1.0 μm AlSiCu/TiN-barrier metalization
CHANNEL LENGTH	
gate final	n-Channel 0,75 μm LDD p-Channel 0,75 μm
OXIDE THICKNESS	18 nm
JUNCTION DEPTH	n-Channel 0.25 μm p-Channel 0.35 μm
THRESHOLD VOLTAGE	n-Channel 0.7 V p-Channel -1.1 V
CELL-TYPE	Trench-Capacitor with Fully Overlapping Bitline Contact (FOBIC) 13 nm eff ONO 4.5 um depth p-well depth 6 um
CELL-CAPACITCANCE	> 40 fF
BITLINE TO CELL CAPACITANCE RATIO	10 : 1
METAL (AlSiCu)	
Thickness	800 nm

--- fig 2 ---

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4Mx1/1Mx4 DRAM
DESIGN RELATED DATA

ORGANIZATION	4M x 1 / 1M x 4 (bonding option)
OPERATION MODES	FAST PAGE MODE LOW POWER VERSIONS
REFRESH	1024 CYCLES / 16 ms 1024 CYCLES /128 ms for LOW POWER VERSIONS
TESTMODE	8 bit

SPECIFICATIONS

trac	50 / 60 / 70	ns
tcac	13 / 15 / 20	ns
taa	25 / 30 / 35	ns

CHIP SIZE   4.72 mm x 10.46 mm = 49.37 mm^2

CELL SIZE   1.63 um x 3.27 um = 5.33 μm^2

SENSE LINE   FOLDED BITLINE CONCEPT
with 16 blocks of 256k cells

WORDLINE PITCH   1.63 μm

BITLINE PITCH   1.63 μm

PARTITIONING

cells	43%
pitched circuits	28%
periphery	29%

REDUNDANCY

ROWS	16
COLUMNS	64
METHOD	LASER

NUMBER OF DEVICES

transistors	4.7 Mio
trench capacitors	4.2 Mio
contact holes	3.0 Mio

-- fig.3 --

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4Mx1/1Mx4 DRAM
ASSEMBLY RELATED DATA

Surface mount package:

PACKAGE		300 mil SOJ 26/20 JEDEC-standard
LEAD FRAME		
	Material	Cu Ni(3.2%)
	Finish	80% Pb / 20% Sn solder (electroplated)
DIE ATTACH		silver filled epoxy
WIRE BOND		24 um Au wires,thermosonic
CHIP PROTECTION		Polyimid layer
MOLDING COMPOUND		ARATRONIK 2180VA (Ciba Geigy)

-- fig.4 --

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CODES FOR MARKING

The following codes are marked on the top of all SIEMENS
4M x 1 / 1Mx 4 DRAMS:

Example: HYB 514100 BJL - 70

1.Dash Number
2. Special Selection
3.Package
4.Die revision
5.Device number
6.SIEMENS prefix

1.Dash number

Two numerical characters defining specific device performance
-50   part meets 50 ns tRAC access time specification
-60   part meets 60 ns tRAC access time specification
-70   part meets 70 ns tRAC access time specification

2.Special selection

The addional marking shown below indicates that the device is a special
selection out of the standard product.

L   Low Power Version for battery backup operations
T   extended temperature range (-40°C to +85°C)

3.Package

J   SOJ26/20 300 mil wide surface mount package
T   TSOPII - 26/20 package

4.Die revision

B   Design revision

5.Device number

514100 4Mx1 with fast page mode operation
514400 1Mx4 with fast page mode operation

6.SIEMENS prefix

HYB standard prefix for SIEMENS memories

FOUR DIGIT WEEKCODE:

Example : 9601   is the first week of year 1996

Note   The top side marking is done after the lot has been through
            a 100 % dynamic burn-in

fig.7