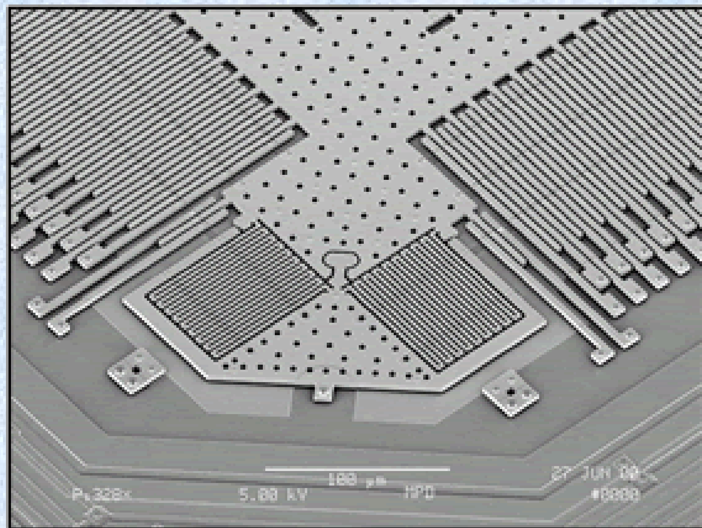
Práctica de Microsistemas

Diseño de un acelerómetro en PolyMUMPS (2)



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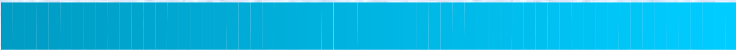
Contenido

1. Recordatorio
2. Proceso PolyMUMPS
3. Reglas de diseño
4. Tanner L-Edit y DRC

Estructura final

Conductores

Sustrato aislante



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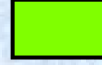
PolyMUMPS

Nitride

Poly 0

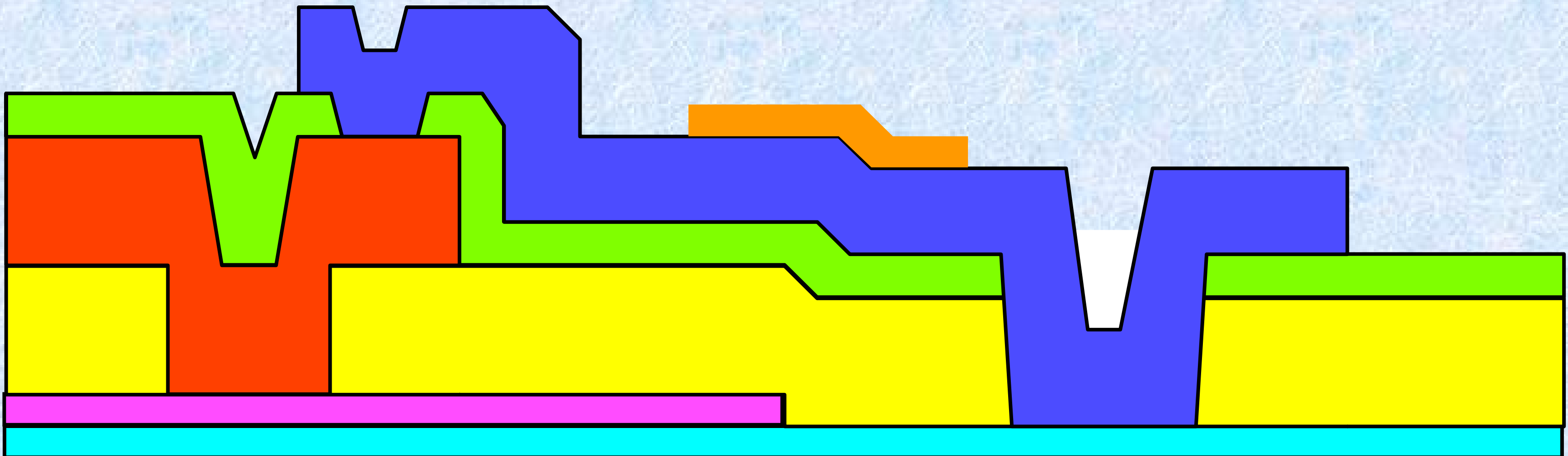
1st Oxide

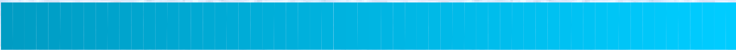
Poly 1


2nd Oxide

Poly 2

Metal





Capas del proceso

Nitride

Isolation between substrate and electrical surface layers

Poly zero

Electrical poly layer for ground plane or electrode formation. Below the first mechanical layer

First oxide

First sacrificial oxide layer, providing gap between poly1 and substrate/nitride

Poly 1

First mechanical layer

Second oxide

Second sacrificial oxide layer, provides gap between second and first polysilicon

Poly 2

Second mechanical layer

Metal

Provides electrical connection to package

Máscaras de fotolitografía

POLY ZERO

Defines the polysilicon zero features

ANCHOR 1

Opens points-of-contact between first polysilicon and substrate (nitride or poly 0)

DIMPLE

Generates 'bumps' in under-surface of poly 1 to minimize stiction

POLY 1

Defines first polysilicon features

POLY1_POLY2_VIA

Opens points-of-contact between first and second polysilicon

ANCHOR 2

Opens points-of-contact between second polysilicon and substrate/nitride

POLY 2

Defines second polysilicon features

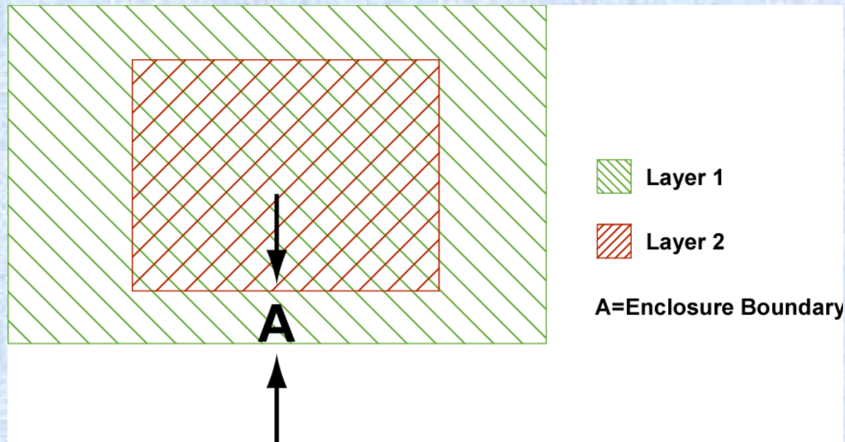
METAL

Defines location of metal features

Reglas de diseño

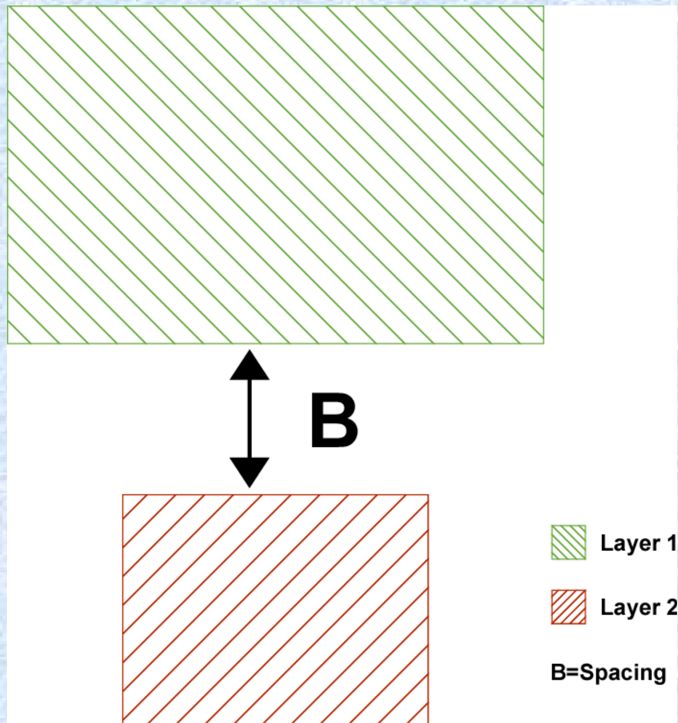
- Definen las comfiguraciones permitidas y las que no
- Determinadas por las tolerancias de los procesos de fabricación
- Resolución mínima del sistema fotolitográfico
- Alineación entre niveles
  - Efectos de la topografía en varios niveles
  - Requisitos de grabado: selectividad, tasas de ataque
- La mayoría de reglas son opcionales, pero nosotros las consideraremos obligatorias

Nomenclatura de las reglas



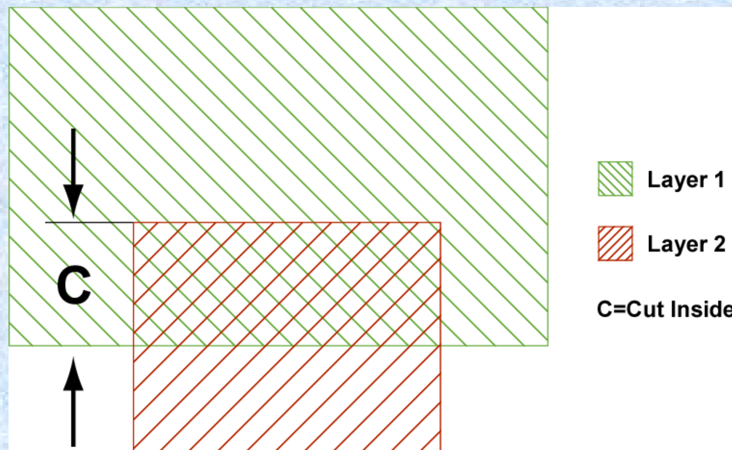
Enclose L2 by L1

Nomenclatura de las reglas



L2 to L1 spacing

Nomenclatura de las reglas



L2 cut-inside L1

Tipos de máscaras

Mnemonic Level Name	Field Type	Purpose
POLY0	light	pattern ground plane
ANCHOR1	dark	open holes for POLY1 to nitride or POLY0 connection
DIMPLE	dark	create dimples/bushings for POLY1
POLY1	light	pattern POLY1
POLY1_POLY2_VIA	dark	open holes for POLY1 to POLY2 connection
ANCHOR2	dark	open holes for POLY2 to nitride or POLY0 connection
POLY2	light	pattern POLY2
METAL	light	pattern METAL
HOLE0	dark	provide holes for POLY0
HOLE1	dark	provide release holes for POLY1
HOLE2	dark	provide release holes for POLY2
HOLEM	dark	provide release holes in METAL

Reglas de diseño

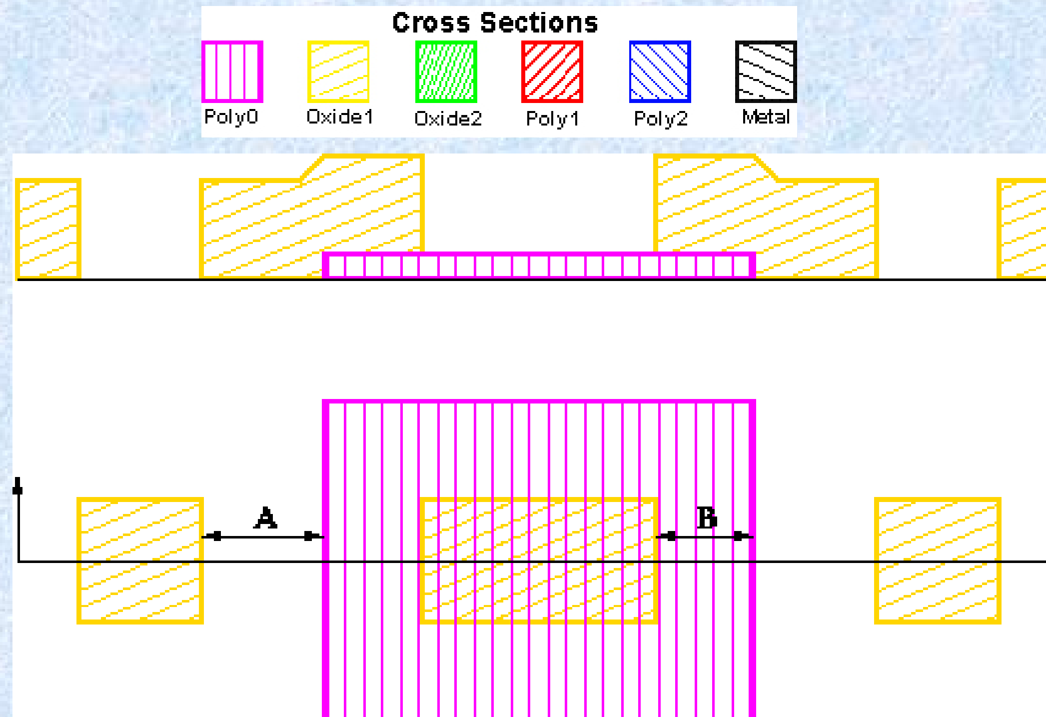


Fig. 2.5 **A: POLY0 space to ANCHOR1--4.0um** The necessary separation between POLY0 and ANCHOR1 hole to ensure that POLY0 is not exposed.

B: POLY0 enclose ANCHOR1--4.0 um. The distance necessary between the edge of POLY0 and an ANCHOR1 hole to ensure the hole does not extend beyond the edge of POLY0.

Reglas de diseño

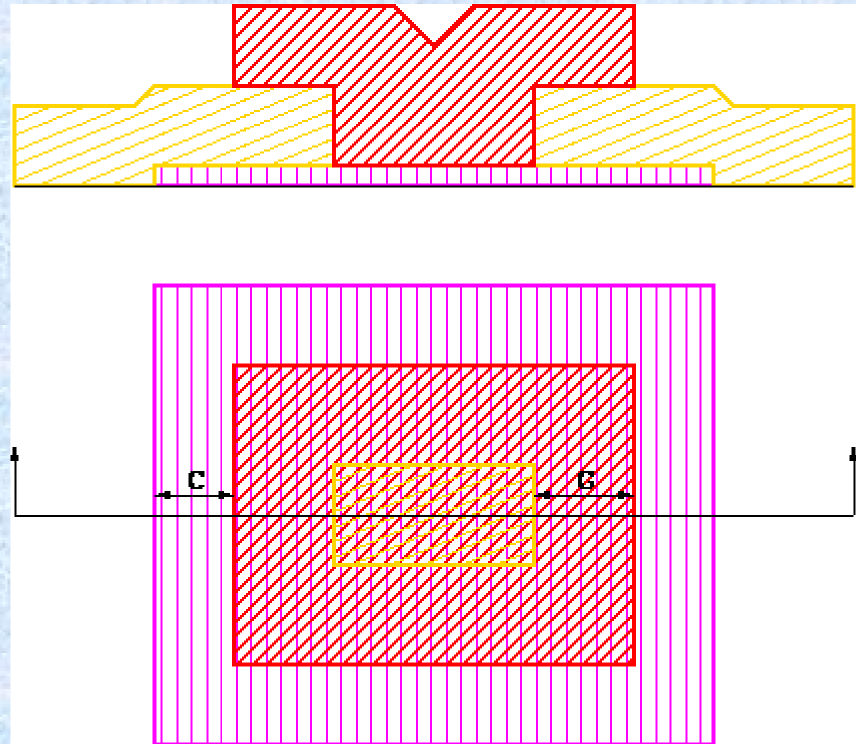


Fig. 2.6 **C: POLY0 enclose POLY1--4.0 um** The amount POLY0 must extend beyond POLY1 to ensure that POLY0 is an effective ground plane for POLY1 structures.

G: POLY1 enclose ANCHOR1--4.0 um. The amount that POLY1 must extend beyond the edge of an ANCHOR1 hole to ensure complete coverage of the hole.

Reglas de diseño

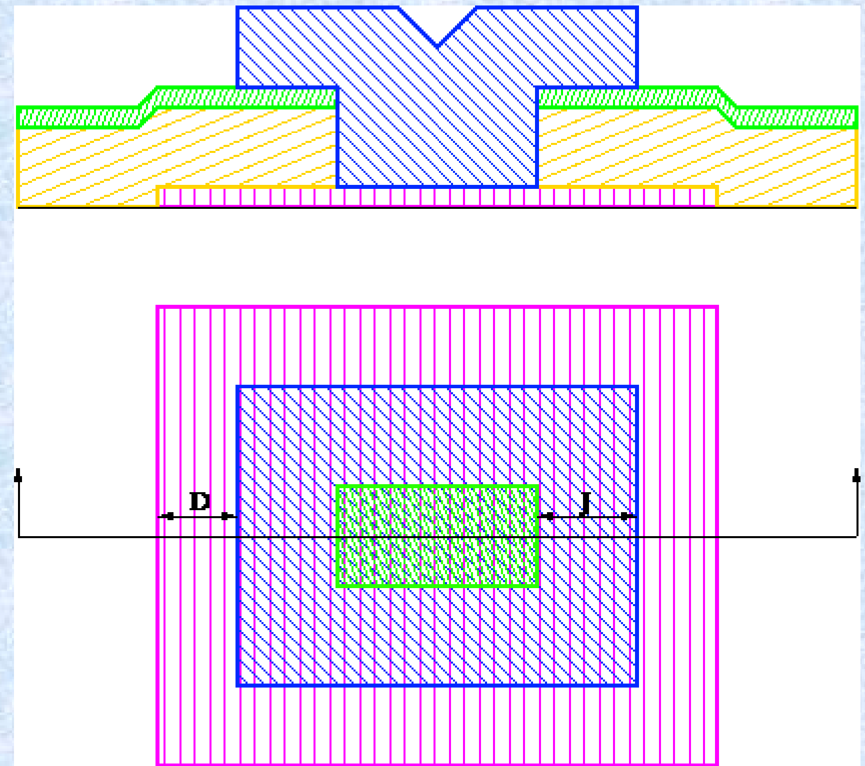


Fig. 2.7 D: POLY0 enclose POLY2--5.0um The amount POLY0 must extend beyond the edge of a POLY2 structure to ensure that POLY0 is an effective ground plane.

J: POLY2 enclose ANCHOR2--5.0 um. The amount POLY2 must extend beyond an ANCHOR2 hole to ensure complete coverage of the hole.

Reglas de diseño

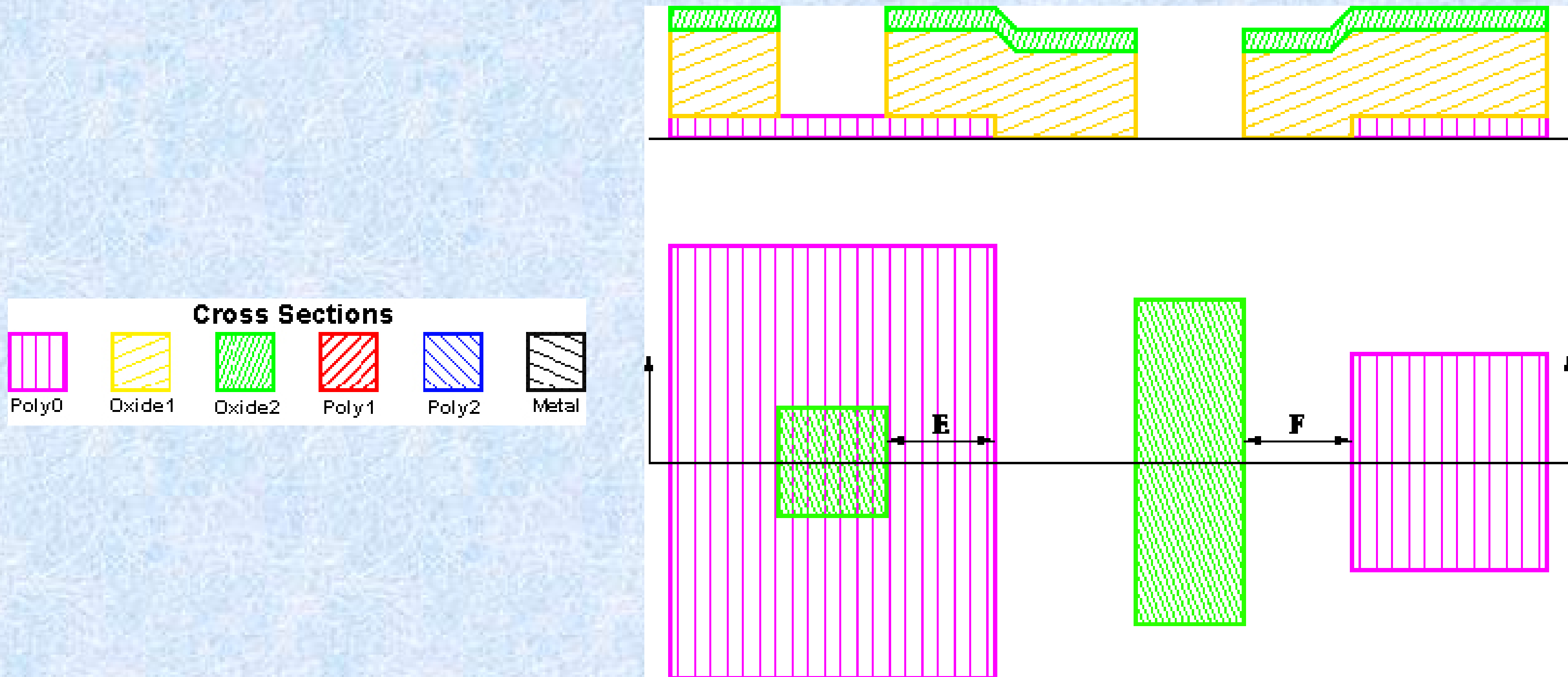


Fig. 2.8 E: POLY0 enclose ANCHOR2--5.0um The amount POLY0 must extend past the edge of an ANCHOR2 hole to ensure the hole is over POLY0.

F: POLY0 space to ANCHOR2--5.0um The amount of space between an ANCHOR2 hole and POLY0 necessary to prevent subsequent shorting between POLY0 and POLY2.

Reglas de diseño

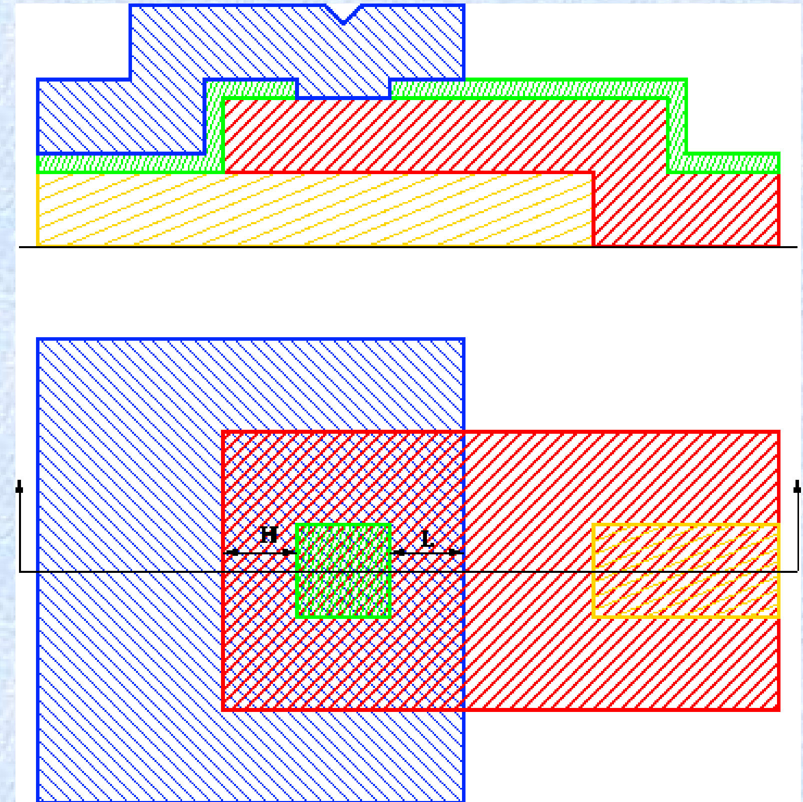


Fig. 2.9 **H: POLY1 enclose POLY1_POLY2_VIA-4.0um** The distance between the POLY1_POLY2_VIA hole and the edge of POLY1 necessary to ensure the via hole is entirely over POLY1.

L:POLY2 enclose POLY1_POLY2_VIA--4.0um The amount POLY2 must extend beyond the POLY1_POLY2_VIA hole to ensure complete coverage of the hole.

Reglas de diseño

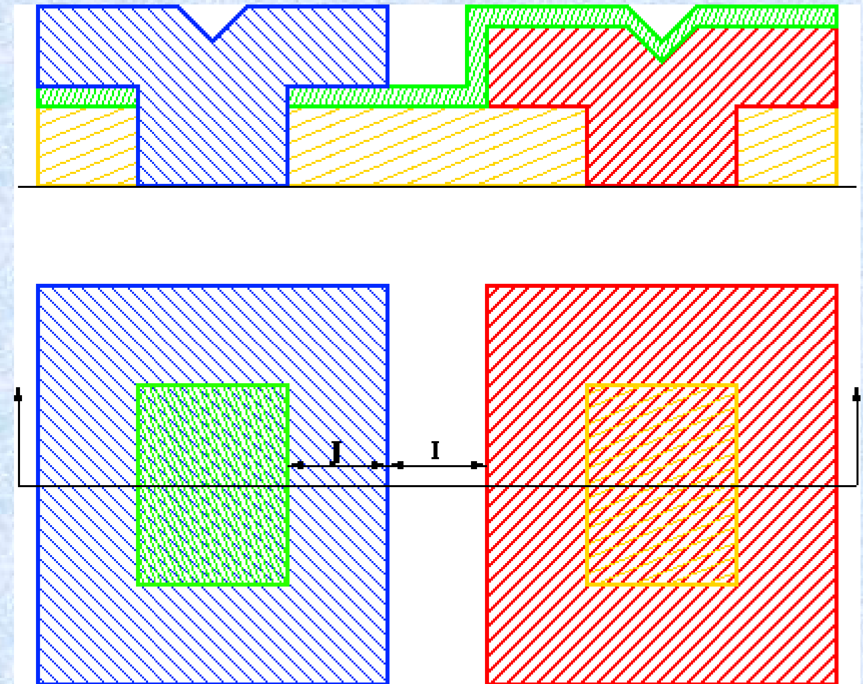


Fig. 2.10 J:POLY2 enclose ANCHOR2--5.0um The amount POLY2 must extend beyond an ANCHOR2 hole to ensure complete coverage of the hole.

I:POLY2 space to POLY1--3.0um The space required between POLY1 and POLY2 structures to ensure that the features are separate (no overlap).

Reglas de diseño

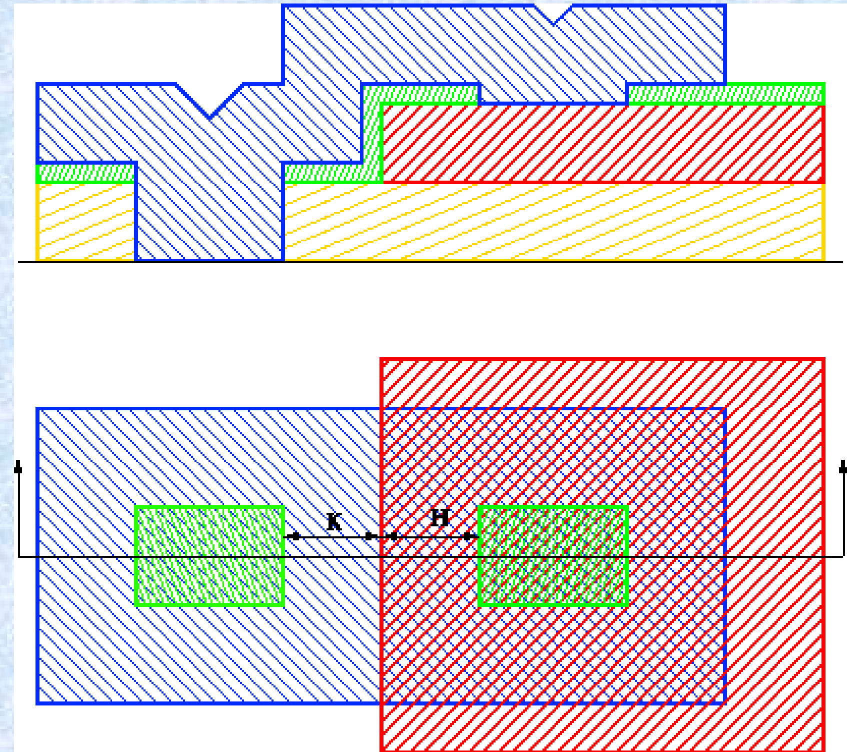


Fig. 2.11 K: POLY1 space to ANCHOR2--3.0um The space between a POLY1 structure and an ANCHOR2 hole necessary to avoid subsequent POLY1-POLY 2 contact.

H: POLY1 enclose POLY1_POLY2_VIA--4.0um The distance between the POLY1_POLY2_VIA hole and the edge of POLY1 necessary to ensure the via hole is entirely over POLY1.

Reglas de diseño

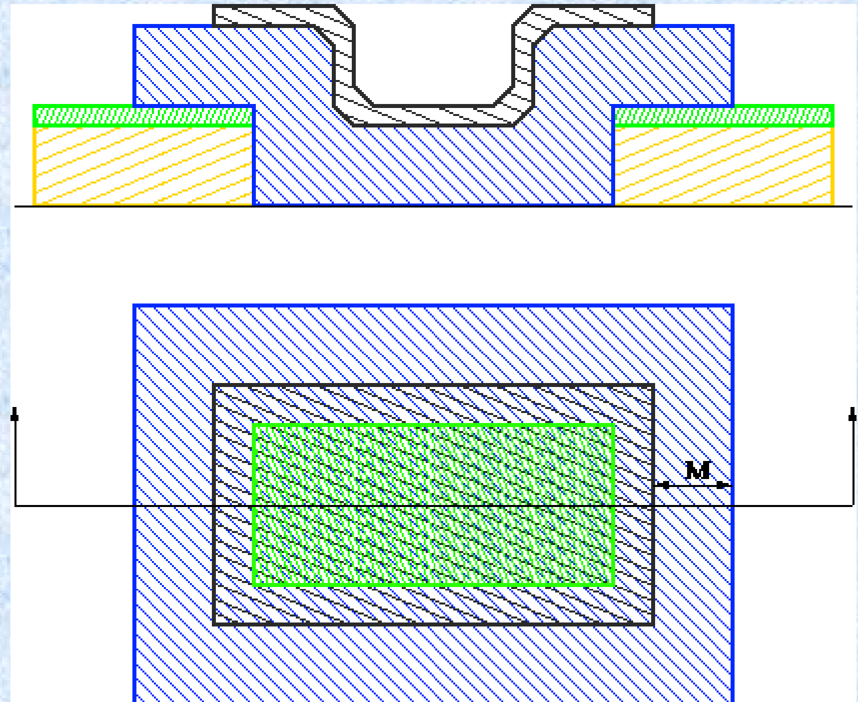


Fig. 2.12 M: POLY2 enclose METAL--3.0um The distance between the edge of METAL and a POLY2 structure necessary to ensure the entire metal area is on POLY2.

Reglas de diseño

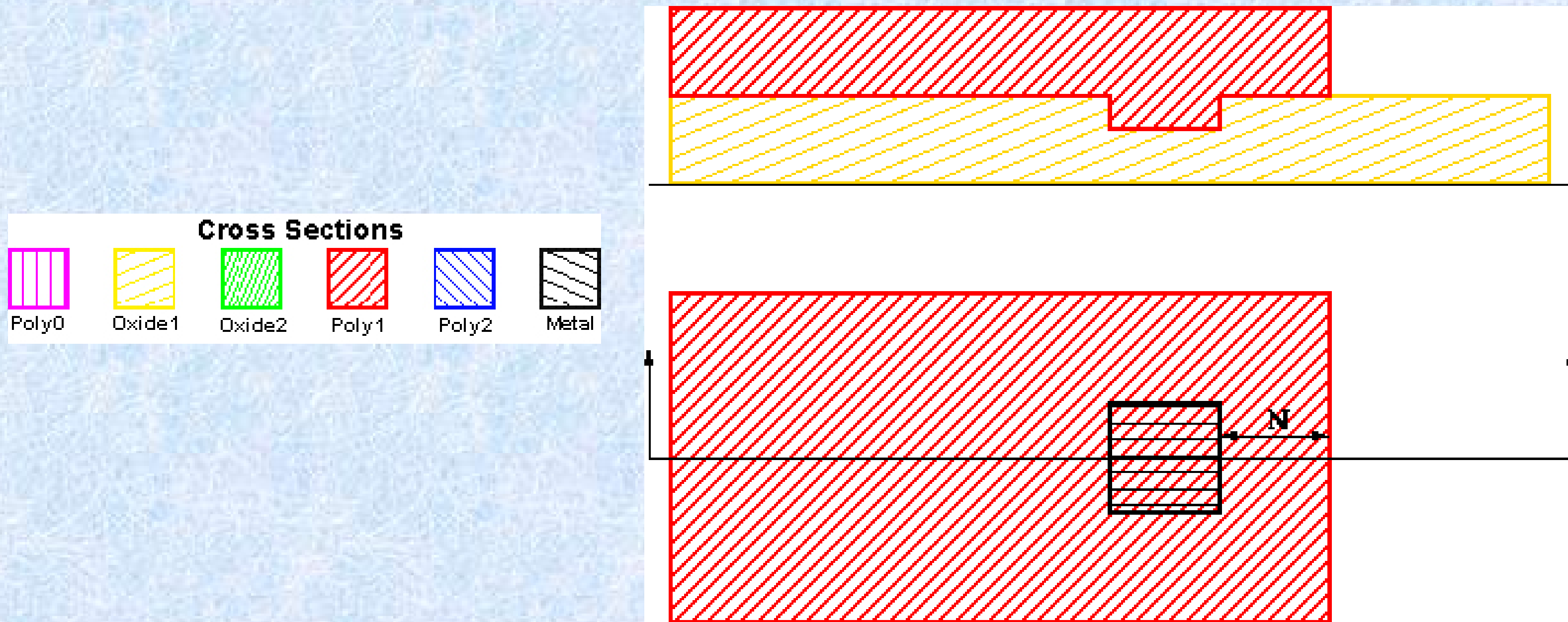


Fig. 2.13 N: POLY1 enclose DIMPLE--4.0um The amount POLY1 must extend beyond the edge of DIMPLE to ensure the DIMPLE is completely covered by POLY1.

Reglas de diseño

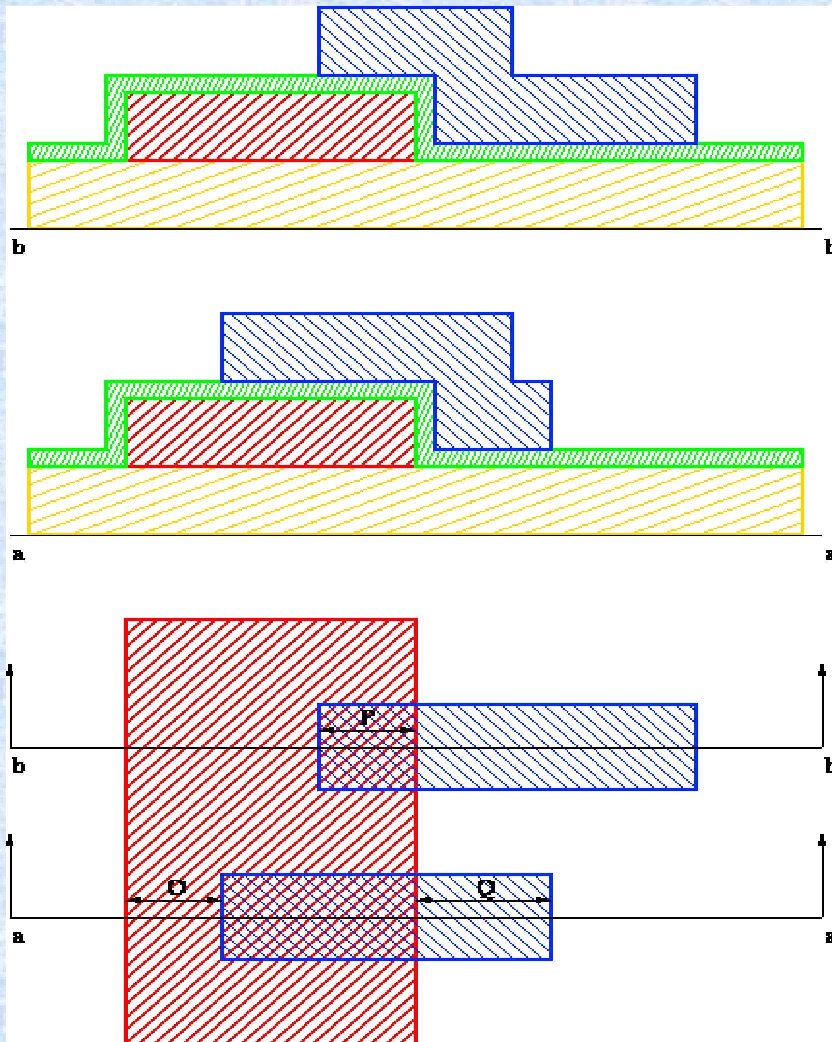


Fig. 2.14 P: POLY2 cut-in POLY1--5.0um The minimum amount POLY2 must extend over a POLY1 structure to ensure overlap.

O: POLY1 enclose POLY2--4.0um The minimum distance from the edge of POLY1 to POLY2 necessary to ensure the POLY2 does not overlap the POLY1 edge.

Q: POLY2 cut-out POLY1--4.0um The minimum distance POLY2 must extend beyond the POLY1 edge to ensure complete edge overlap.

Reglas de diseño

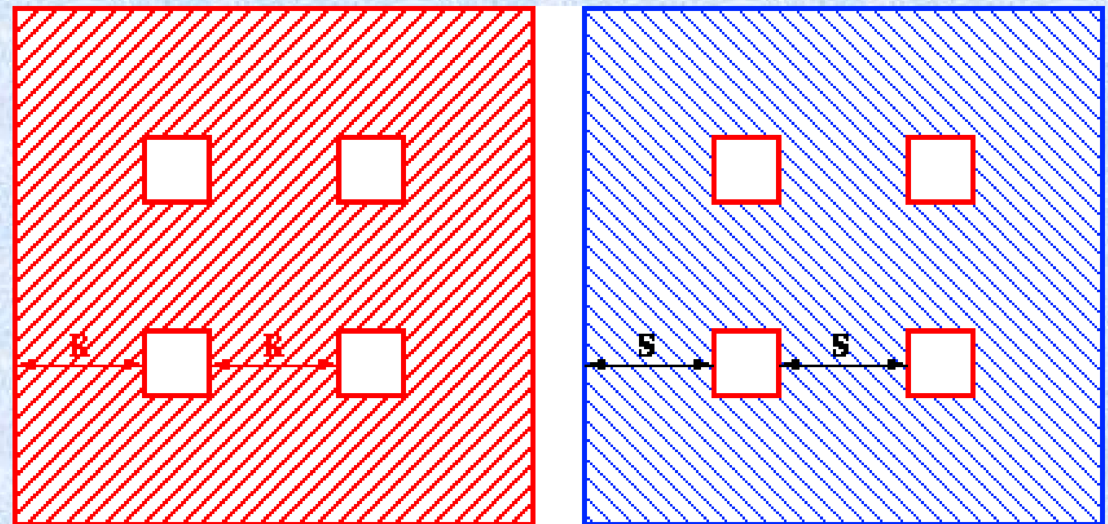


Fig. 2.15 R: Etch hole separation in POLY1: 30um The maximum separation distance between POLY1 etch holes necessary to ensure subsequent release of POLY1 structures.

S: Etch hole separation in POLY2: 30um The maximum separation distance between POLY2 etch holes necessary to ensure subsequent release of POLY2 structures.

Reglas de diseño

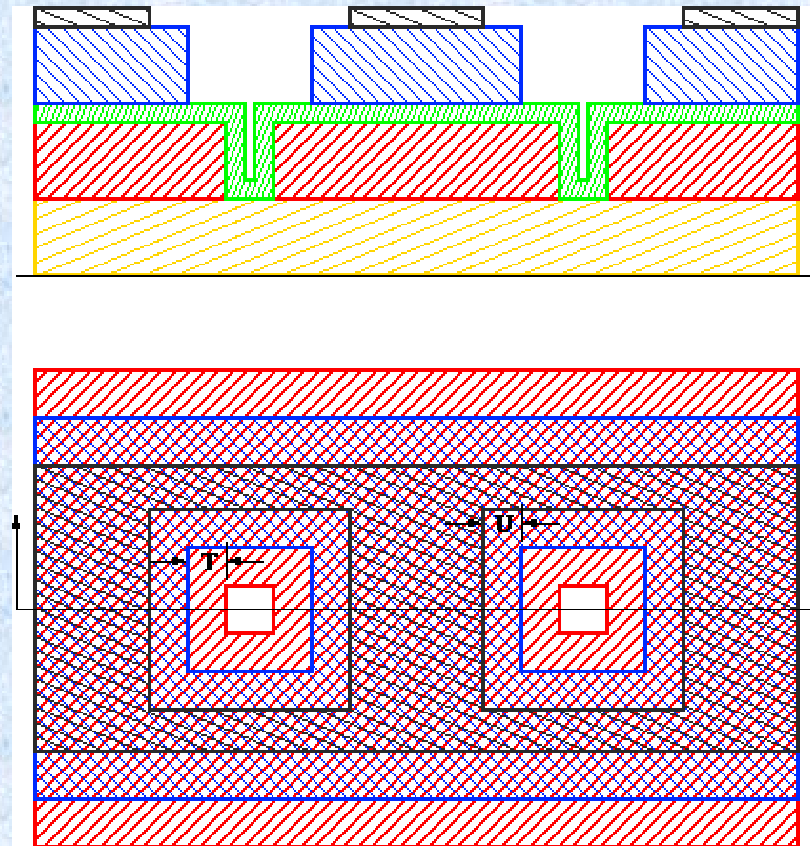


Fig. 2.16 **T: HOLE2 enclose HOLE1--2.0um** The necessary border of HOLE2 around HOLE1 to ensure good release results.

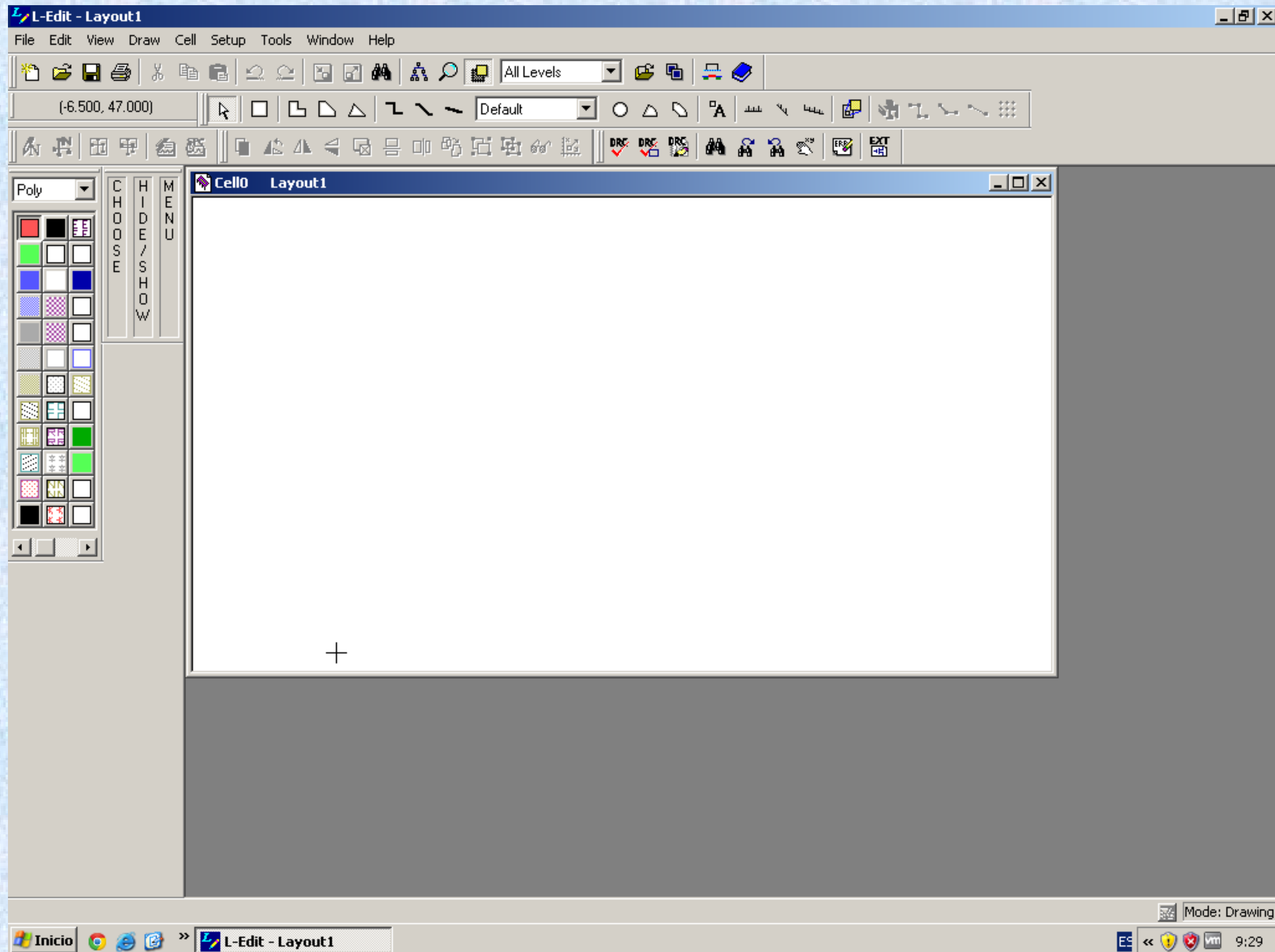
U: HOLEM enclose HOLE2--2.0um The necessary border of HOLEM around HOLE2 to ensure good release results.

Información disponible

Fichero con capas y DRC en formato Tanner para L-Edit

Versión evaluación Tanner L-Edit

Tanner L-Edit 8.3



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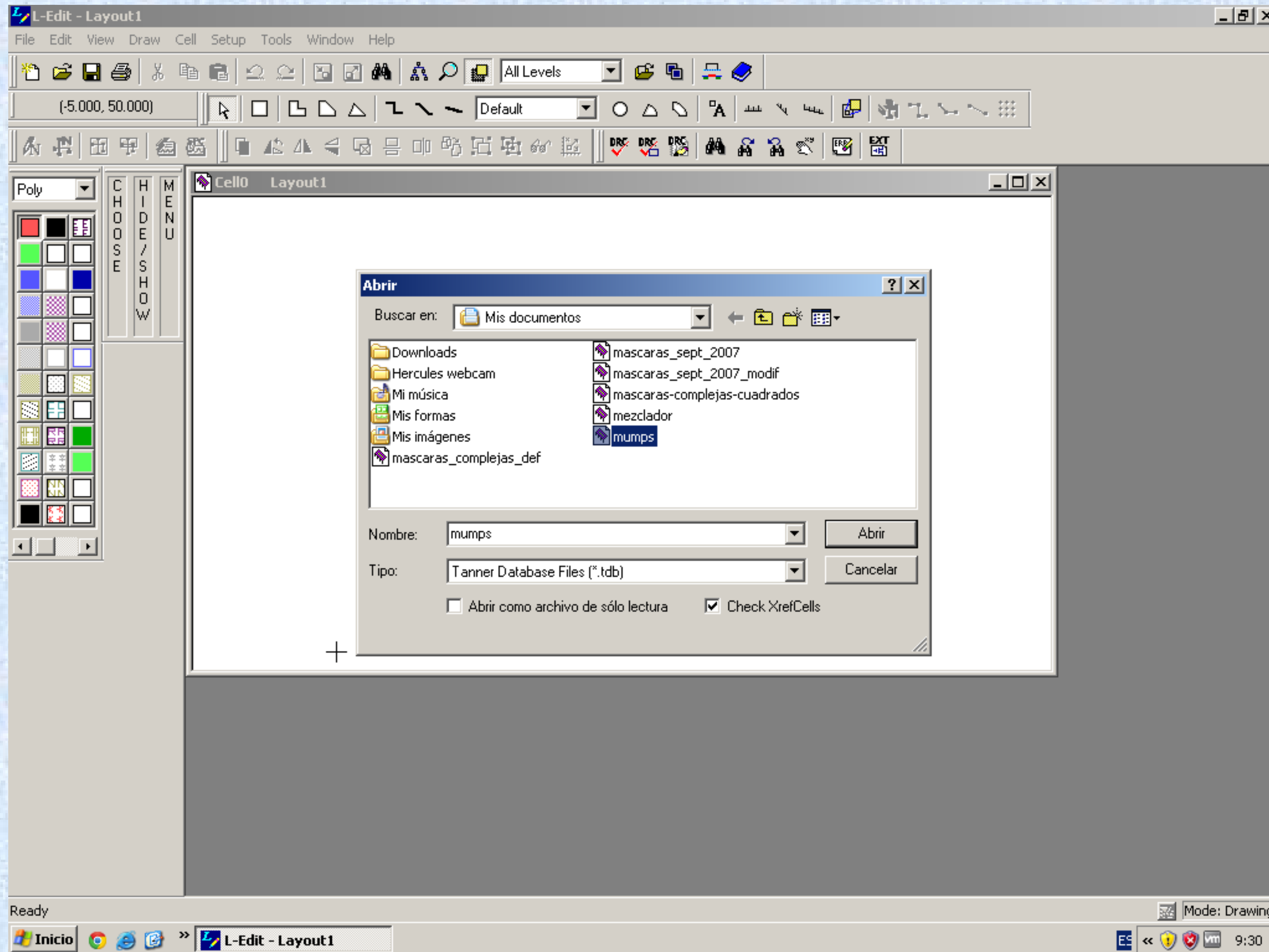

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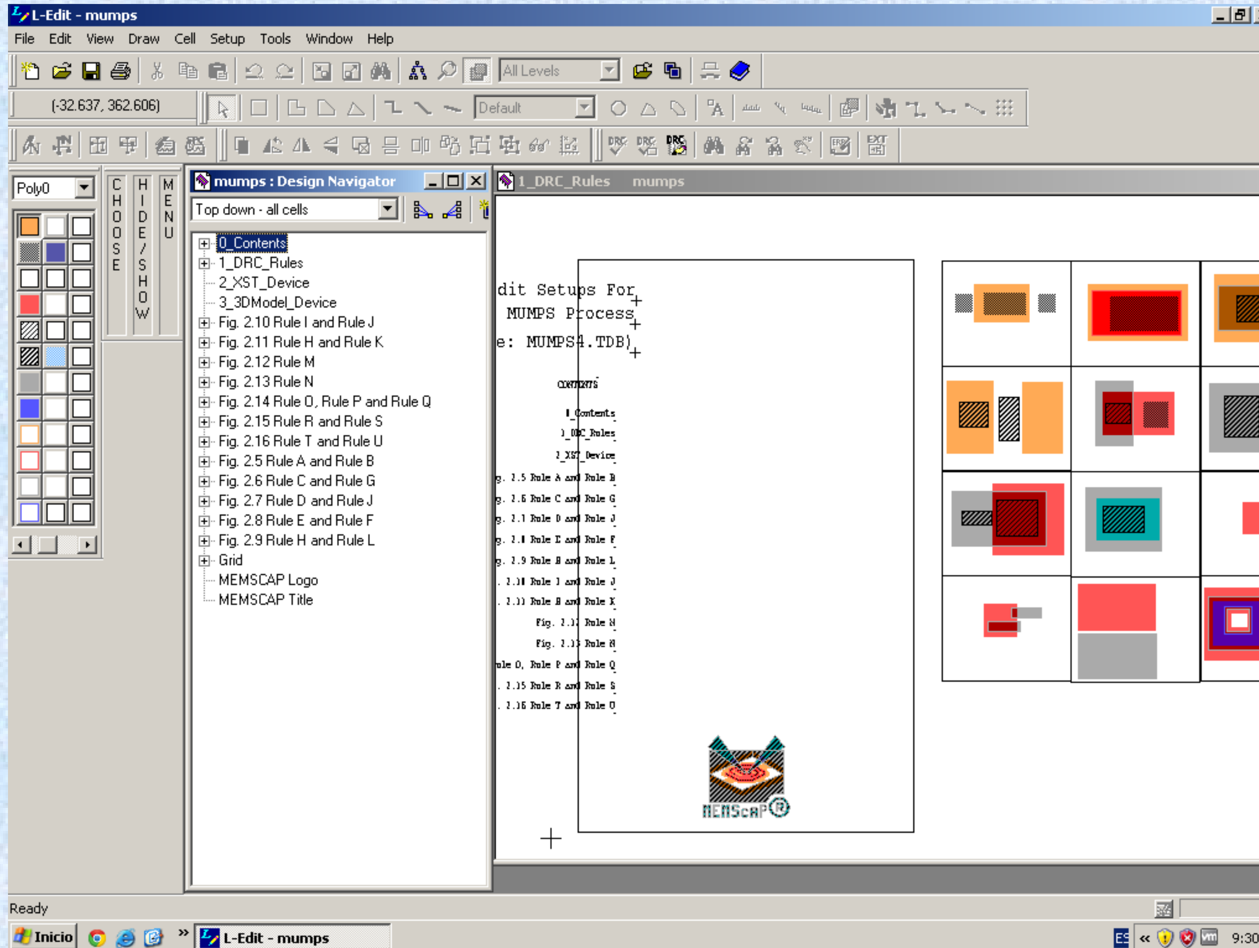

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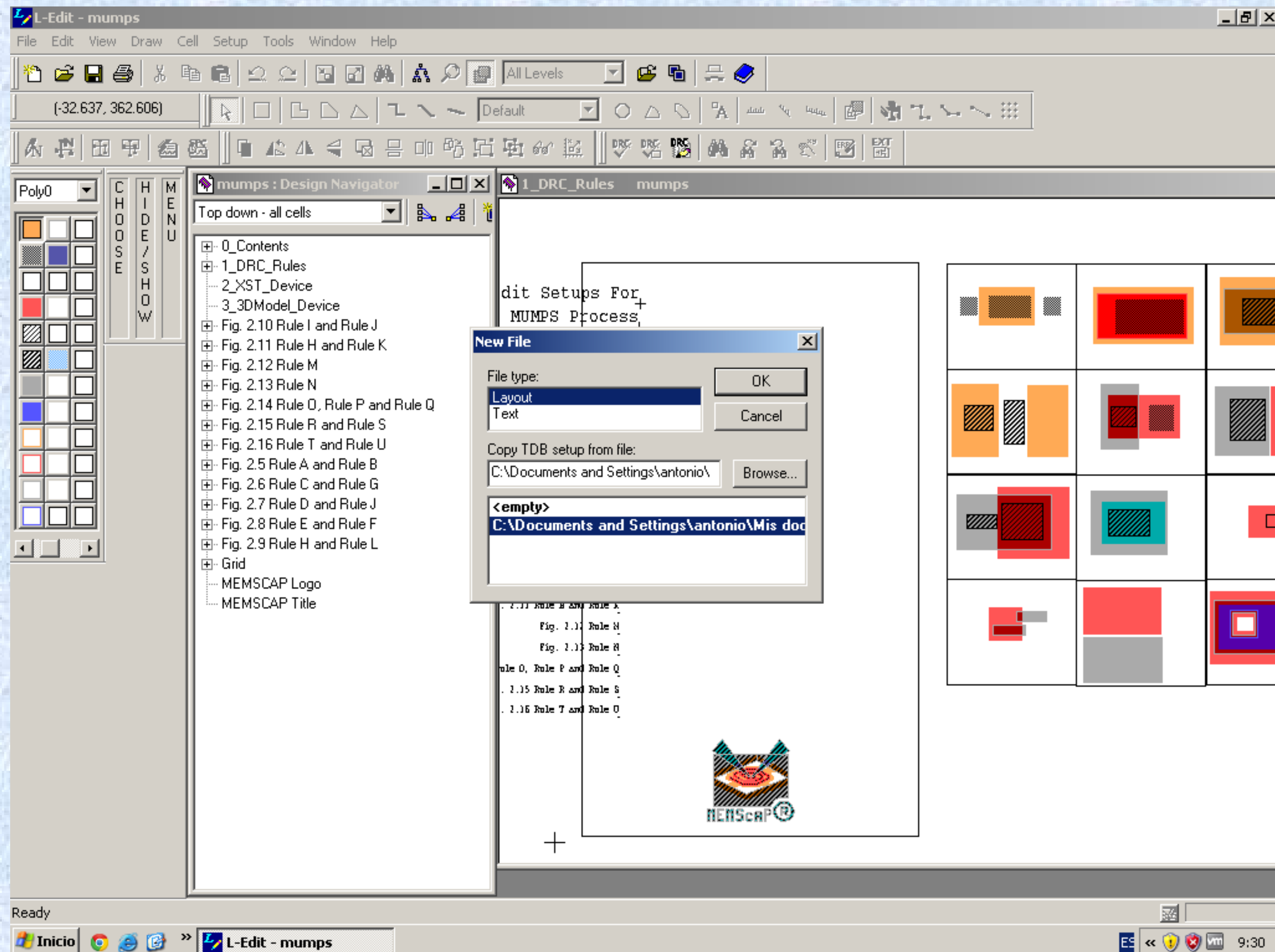

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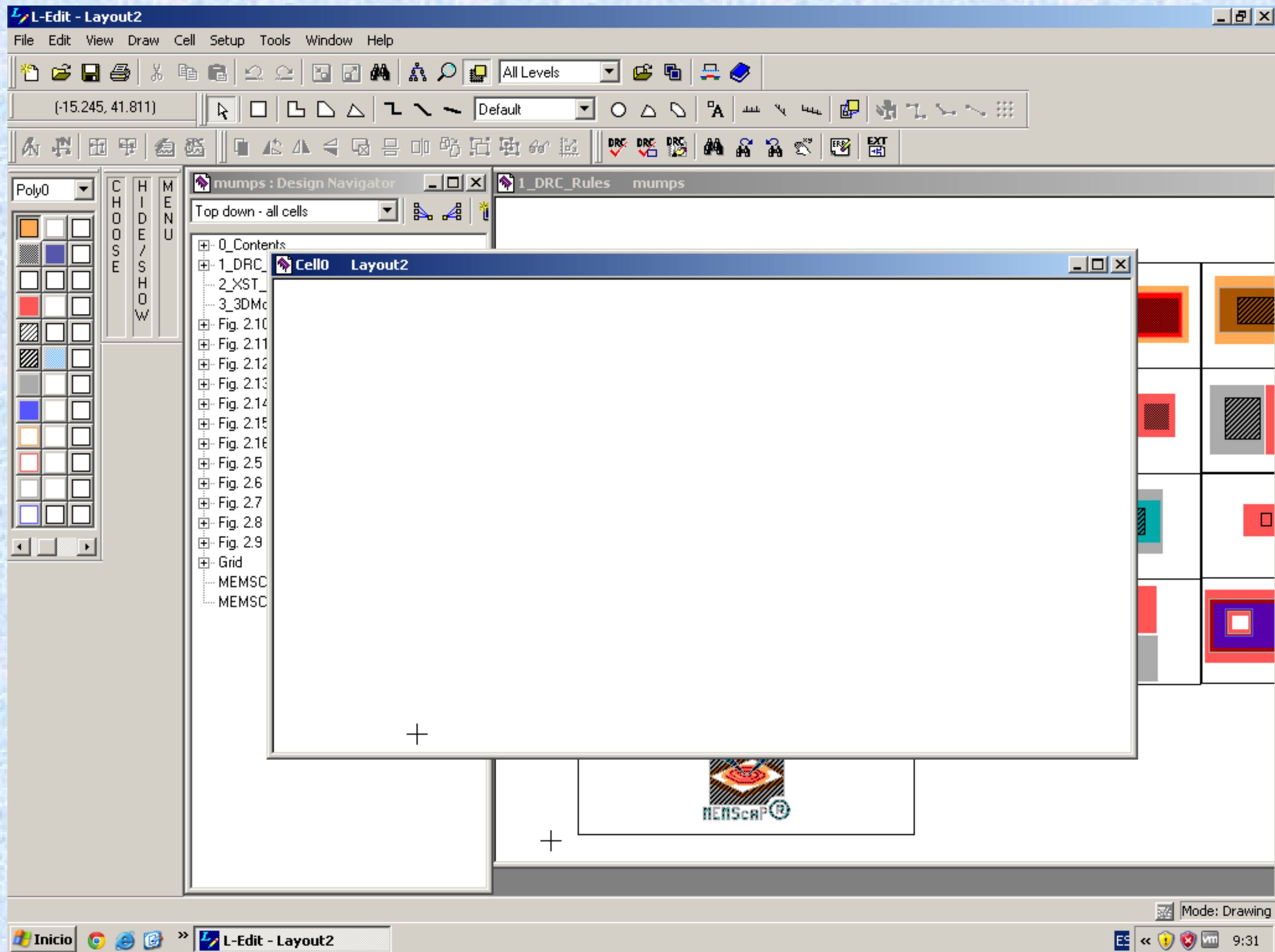

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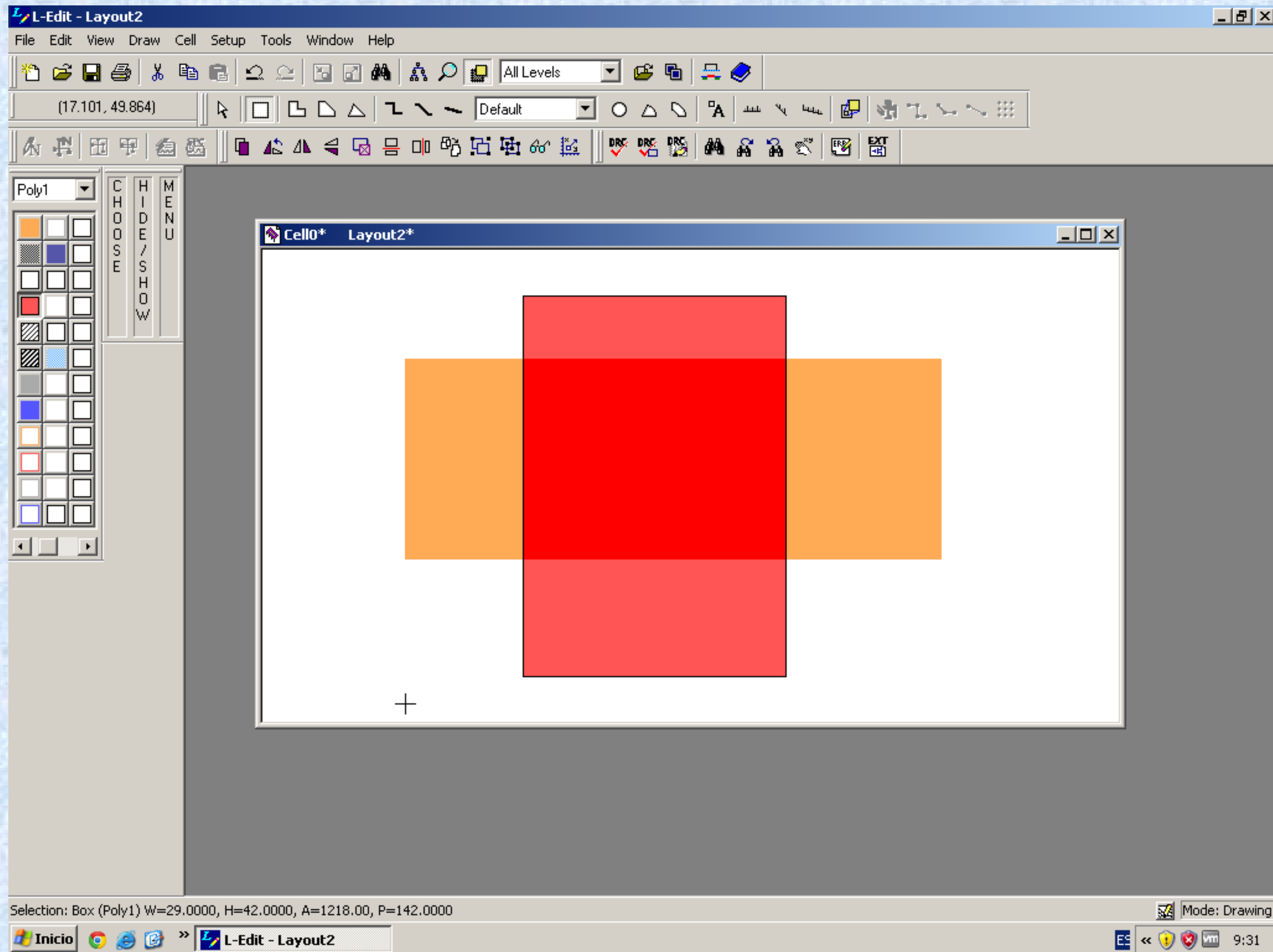

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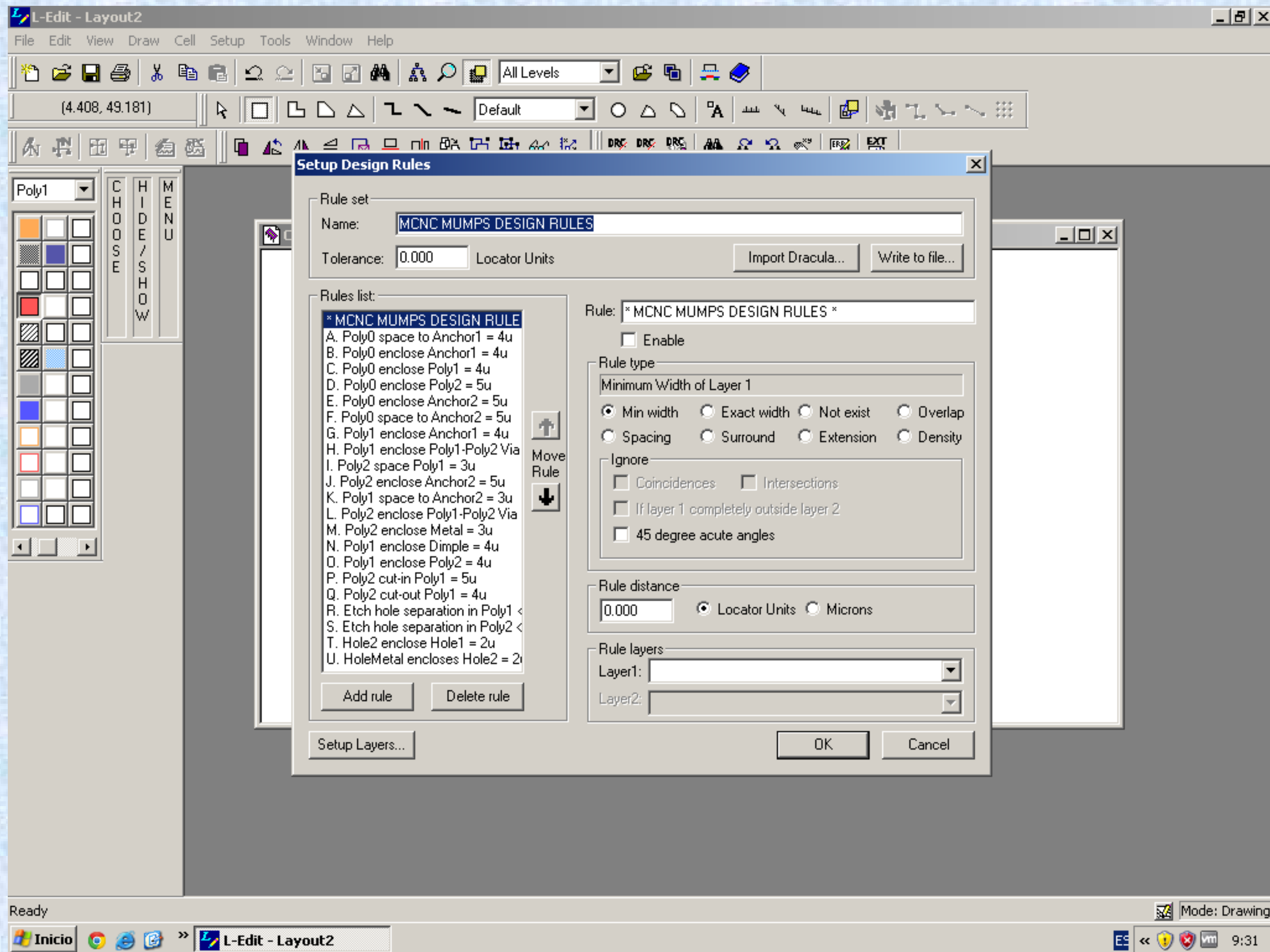

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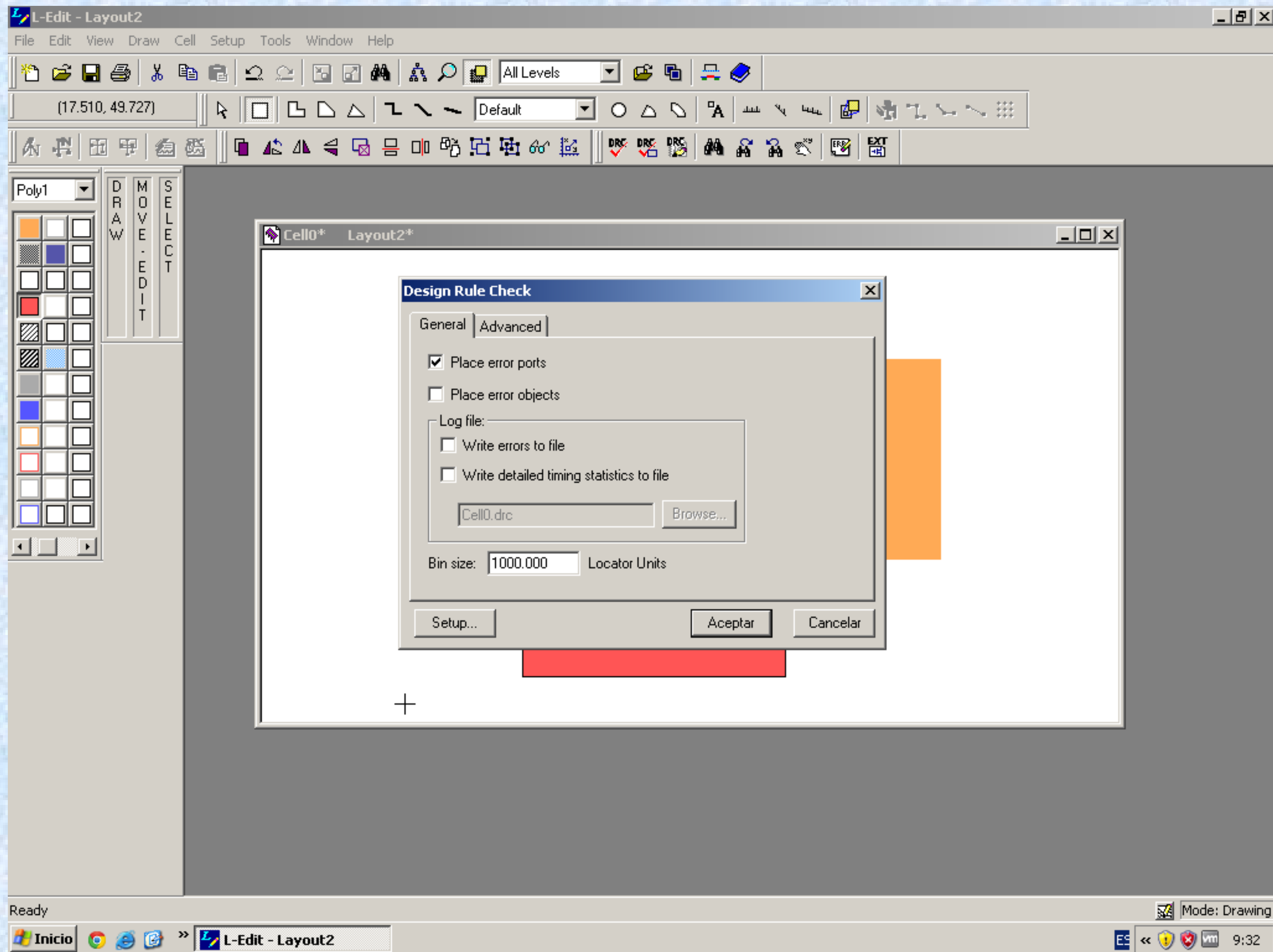

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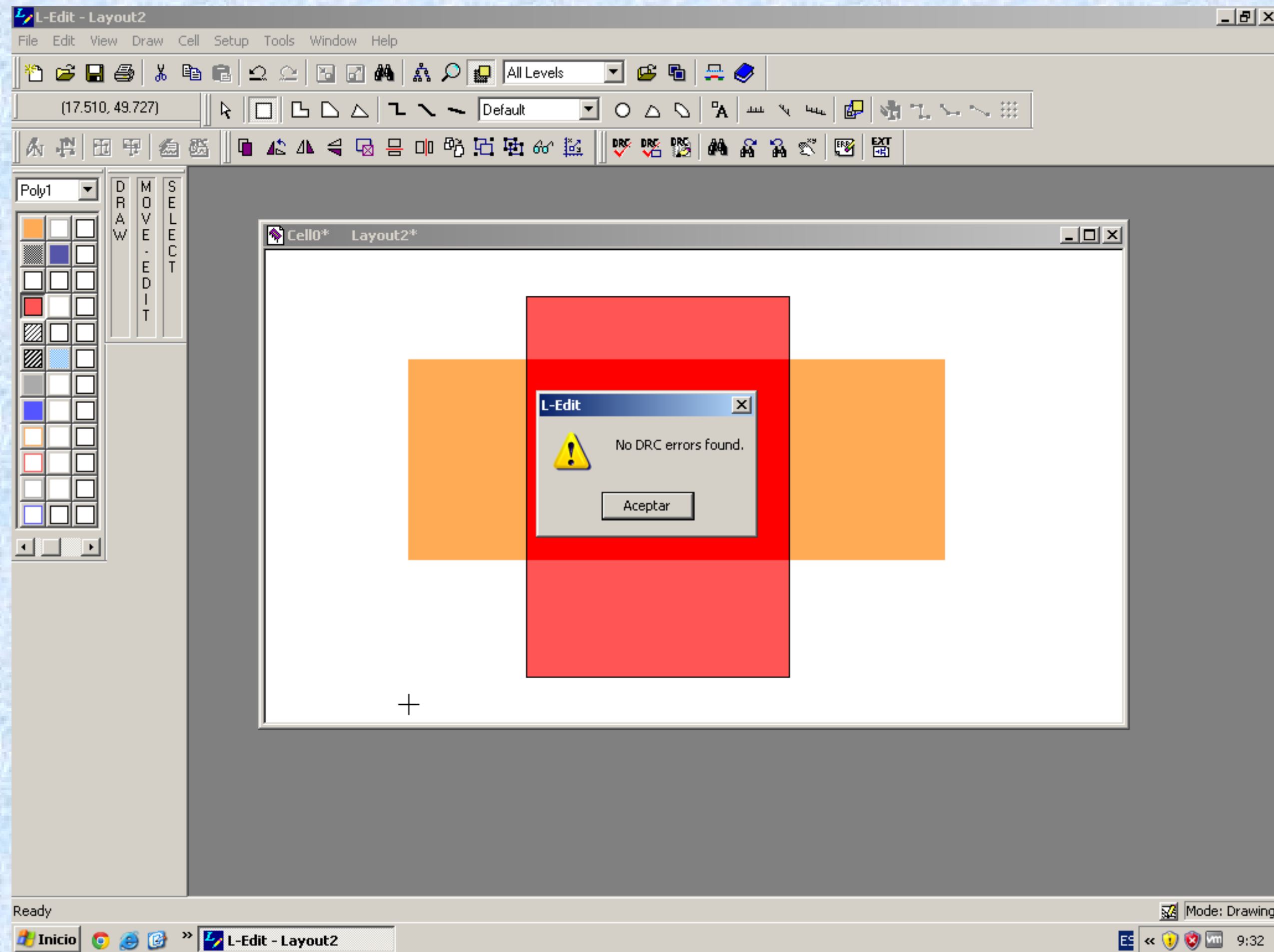

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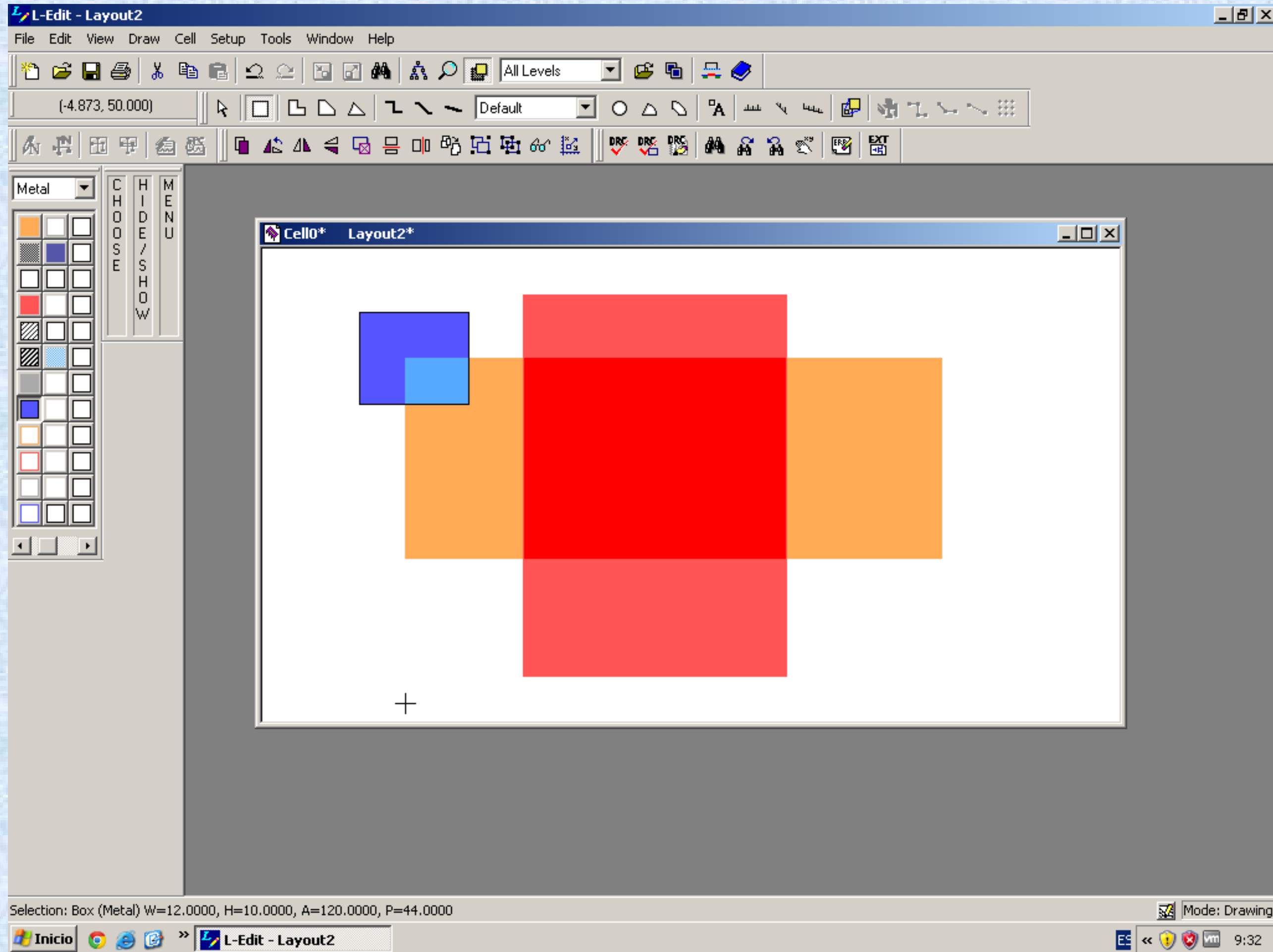

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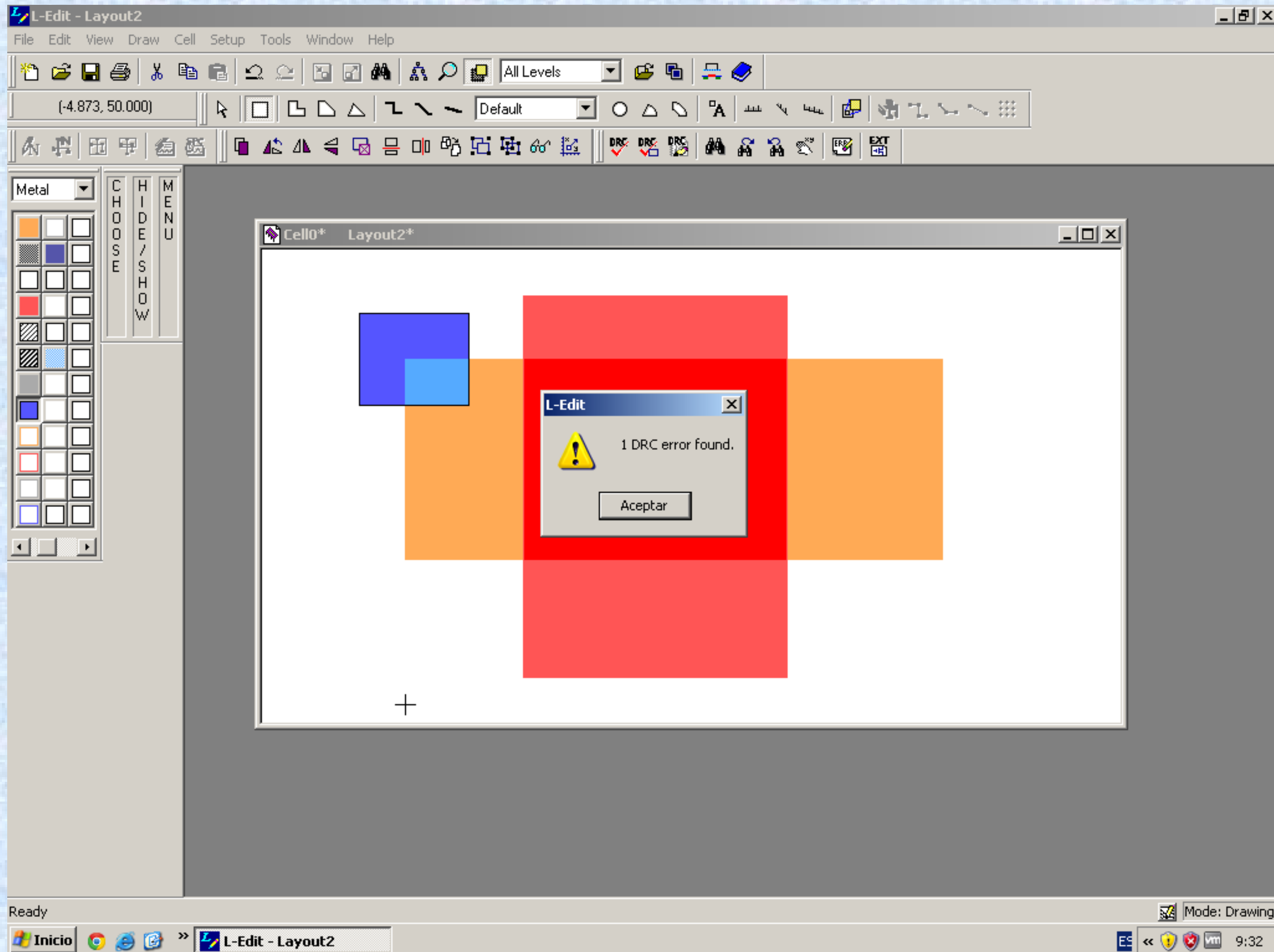

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