

- **PRODI: WP1 OTFT for display requirements**

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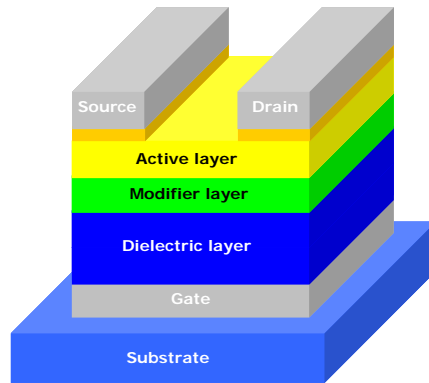
- **Overview**
- **Overall conclusions**
- **Example**
  - Application structure
  - Manufacturing sequence
  - Application parameters
  - Technological parameters
  - Manufacturing method comparison

- **Overall conclusions**
- **The report is a starting point for discussion**
  - Based on state-of-the-art scientific literature
  - Needs input from industry
- **All fabrication methods require improvements**
  - Layer thickness
  - Feature size
  - Registration and overlay
- **Technological breakthroughs required**
  - Understanding of device operation
    - *E.g.* Effect of roughness and surface energy on mobility
  - New semiconductor materials
    - *E.g.* Higher mobility, low off current
  - New manufacturing techniques
    - *E.g.* R2R photo lithography and R2R evaporation

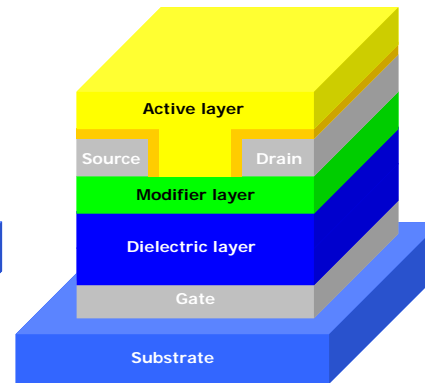


• Example device structure

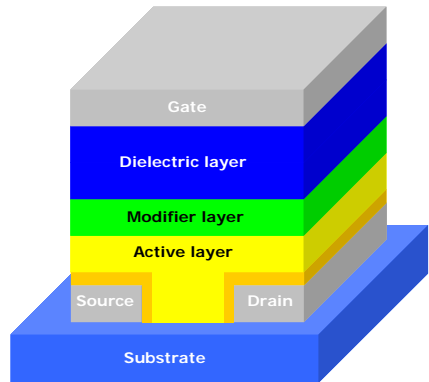
Most common →



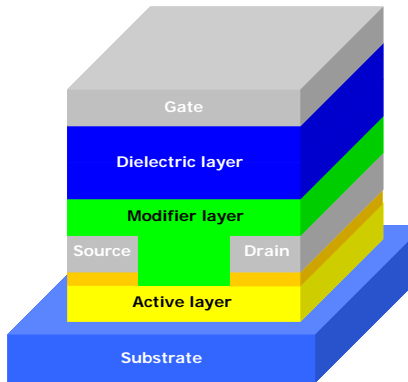
Bottom Gate, Top Contact



Bottom Gate, Bottom Contact



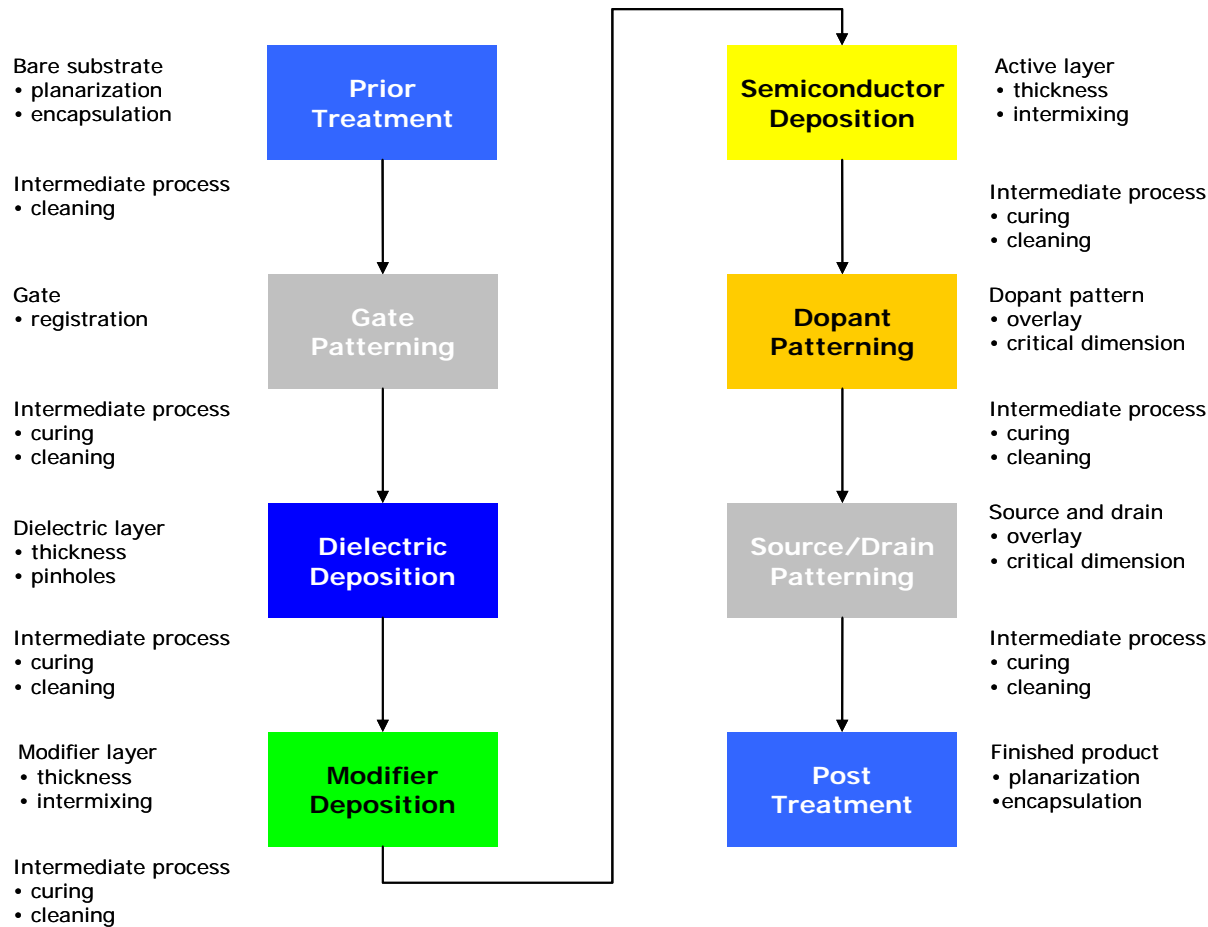
Top Gate, Bottom Contact



Top Gate, Top Contact



# • Example manufacturing sequence



For Bottom Gate, Top Contact OTFT



## • Example application parameters

Application parameter	Value			Unit
	Short term	Medium term	Long term	
Cost	1	0.7	0.5	Silicon
Number of pixels	0.1	1	10	M
Frame refresh rate	1	10	100	Hz
Outline dimension	0.2	0.5	1.0	m <sup>2</sup>
Colour range	B/W	Colour	Full colour	
Power consumption	50	20	1	μW/cm <sup>2</sup>
Uniformity of drive current	50	10	2	%
Uniformity of output	30	10	2	%
Bend radius	20	10	1	cm
Operational lifetime	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	hours
Shelf lifetime	1	6	12	months
Environmental compliance	Partly	Almost full	Full	

- Example technological parameters (geometry)

Feature	Dimension	Value			Unit
		Short term	Medium term	Long term	
Substrate	Vertical	250	100	50	$\mu\text{m}$
Gate pattern	Vertical	10	1	0.1	$\mu\text{m}$
	Lateral	100	50	20	$\mu\text{m}$
	Registration	50	25	10	$\mu\text{m}$
Dielectric + modifier layer	Vertical	500	100	10	nm
Semiconductor layer	Vertical	1	0.1	0.1	$\mu\text{m}$
Source/drain pattern	Vertical	10	1	0.1	$\mu\text{m}$
	Lateral	50	25	10	$\mu\text{m}$
	Overlay	5	2.5	0.1	$\mu\text{m}$
Encapsulation layer	Vertical	250	100	50	$\mu\text{m}$
Overall	Vertical	500	200	100	$\mu\text{m}$
	Lateral*	0.2	0.5	1	m
	Bend radius	10	2	1	cm

## • Example manufacturing method comparison (gate)

Printing method	Advantages	Disadvantages
Gravure	Good viscosity range Good layer thickness Reasonable feature size Good registration Good speed	
Screen	Good viscosity range	Poor layer thickness Poor feature size Poor registration Poor speed
Inkjet	Good viscosity range Good layer thickness Good feature size Good registration	Very poor speed
Offset	Good viscosity range Reasonable layer thickness Good feature size Good registration Good speed	
Flexography	Good viscosity range Good layer thickness Reasonable feature size Good speed	Poor registration
Lamination	Not applicable	Not applicable
Coating	Not applicable	Not applicable
Evaporation	Excellent layer thickness Excellent feature size Excellent registration	Poor speed Requires vacuum environment <i>R2R incompatible at present</i>
Soft lithography	Excellent layer thickness Excellent feature size Excellent registration	Poor speed Requires vacuum environment <i>R2R incompatible at present</i>