



團隊 · 熱誠 · 專業

**PHILIPS**

# Philips LCD Drivers Solution

● Teamwork - 以人為本、團隊合作   ● Enthusiasm - 誠摯服務、重視承諾   ● Expertise - 專業行銷、經營亞太

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**PHILIPS**  品佳股份有限公司

# Manufacturing and Assembly Sites



■ = Manufacturing sites  
● = Assembly sites

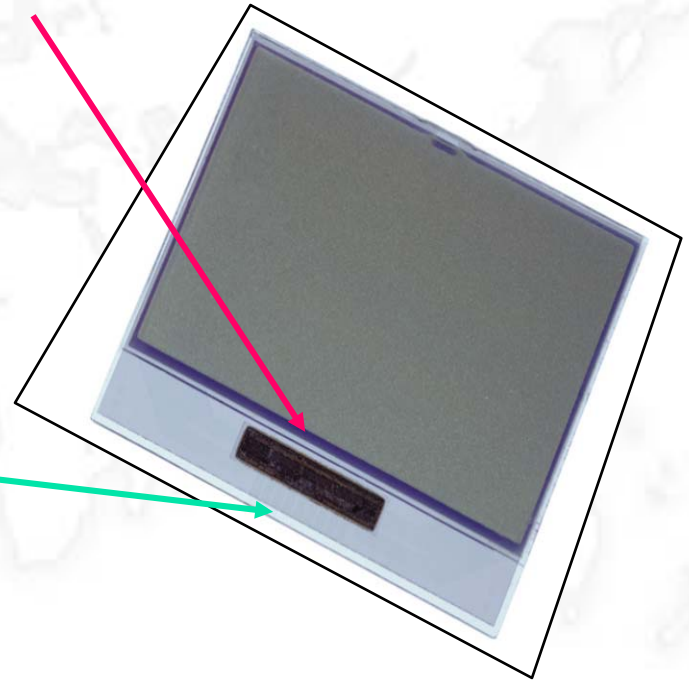
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# Market Position in Mobile Communications

- Top 2 position in display drivers for mobile phones for last five years!!!!

Chip on Glass (COG) LCD Display is typically used in mobile phones:



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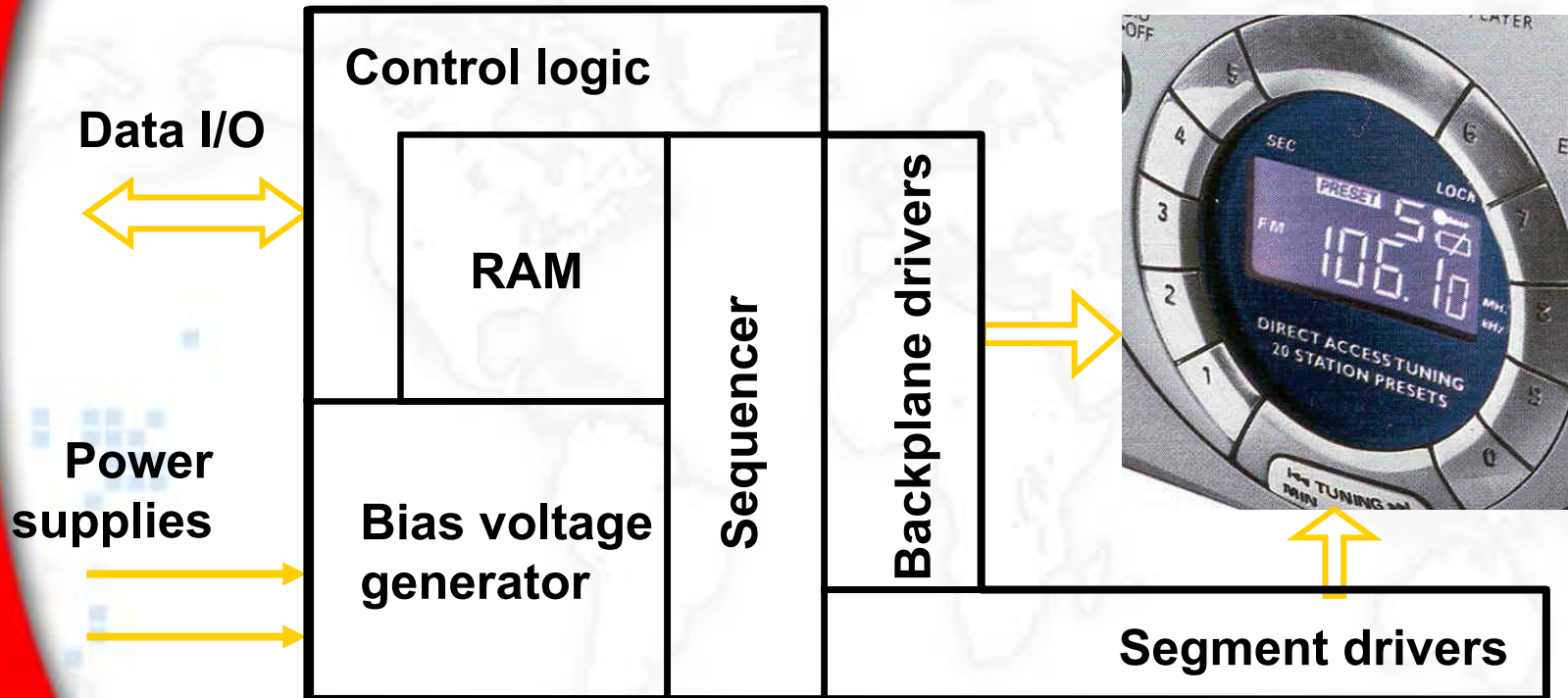
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# Mobile Display Driver Products

## Segment LCD driver

Display sizes e.g:  
1 x 32 ... 2 x 140...  
4 x 80 ... 16 x 24



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# Family of LCD Segment Drivers

Type	multiplex rates versus number of segments						Packages		Bus	IDD	VLCD
	1:1	1:2	1:3	1:4	1:8	1:16					
PCF2100C	-	40	-	-	-	-	DIL28	SO28	C	20	6
PCF2111C	-	64	-	-	-	-	DIL40	VSO40	C	20	6
PCF2112C	32	-	-	-	-	-	DIL40	VSO40	C	20	6
PCF8566	24	48	72	96	-	-	DIL40	VSO40	I <sup>2</sup> C	30	6
PCF8576(C)	40	80	120	160	-	-	LQFP64	VSO56	I <sup>2</sup> C	60(40)	9(6)
PCF8577C	32	64	-	-	-	-	DIL40	VSO40	I <sup>2</sup> C	25	6
PCF8578	-	-	-	-	256	384		VSO56	I <sup>2</sup> C		9
OM4068	32	64	96	-	-	-	DIL40	QFP44	serial	12	6.5
PCF8801	-	140	-	-	-	-	slim chip in tray		serial	32	5.5
PCF8533	80	160	240	320	-	-	slim chip in tray		I <sup>2</sup> C	24	6.5

- chip with bumps on request for COG and TCP / COF applications

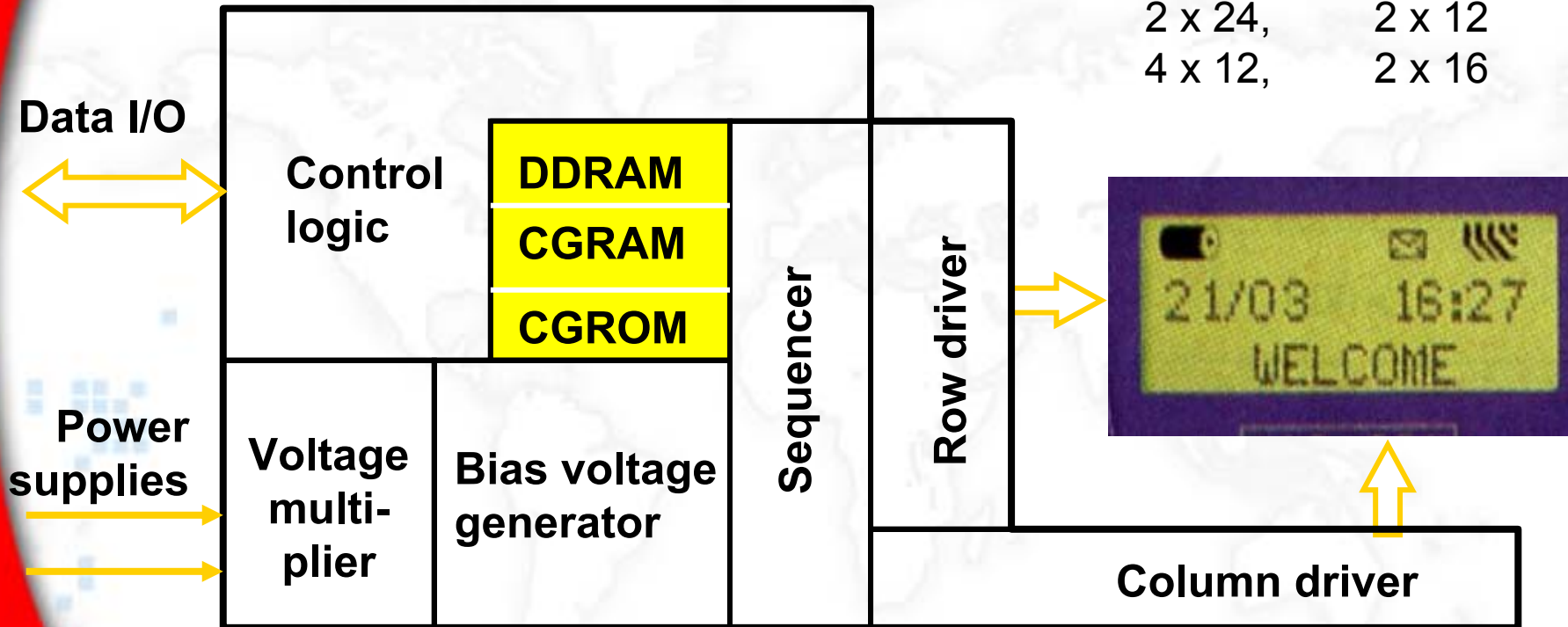
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# Mobile Display Driver Products

## Character LCD driver

Display sizes e.g:  
 lines x characters  
 2 x 24,      2 x 12  
 4 x 12,      2 x 16



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# Family of LCD Character Drivers

Type	#lines x #character	delivery form	I <sub>DD</sub> typ [μA]	V <sub>LCD</sub> [V]	internal V <sub>LCD</sub> generation
PCF2103	2 x12 or 1 x24 120 icons	die with bumps	60	6.5	no
PCF2104 / PCF2105	2/4 x12 or 1/2 x24	die with bumps	200	9.0	no
PCF2113	2 x12 or 1 x24 120 icons	die with bumps die w/o BUMPS LQF100	200	6.5	programmable temperature compensation
PCF2116(k)	2/4 x12 or 1/2 x24	die with bumps die w/o BUMPS	200	9.0	internal, extern. analog control
PCF2119	2 x16 160 icons	die with bumps	190	6.5	programmable temperature comp.



I<sup>2</sup>C interface  
4/8 bit parallel interface

Memory: character set: 240 characters in ROM  
16 characters in RAM  
character size: 5 x 8 or 5 x 7 + cursor



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Enthusiasm - 誠摯服務、重視承諾



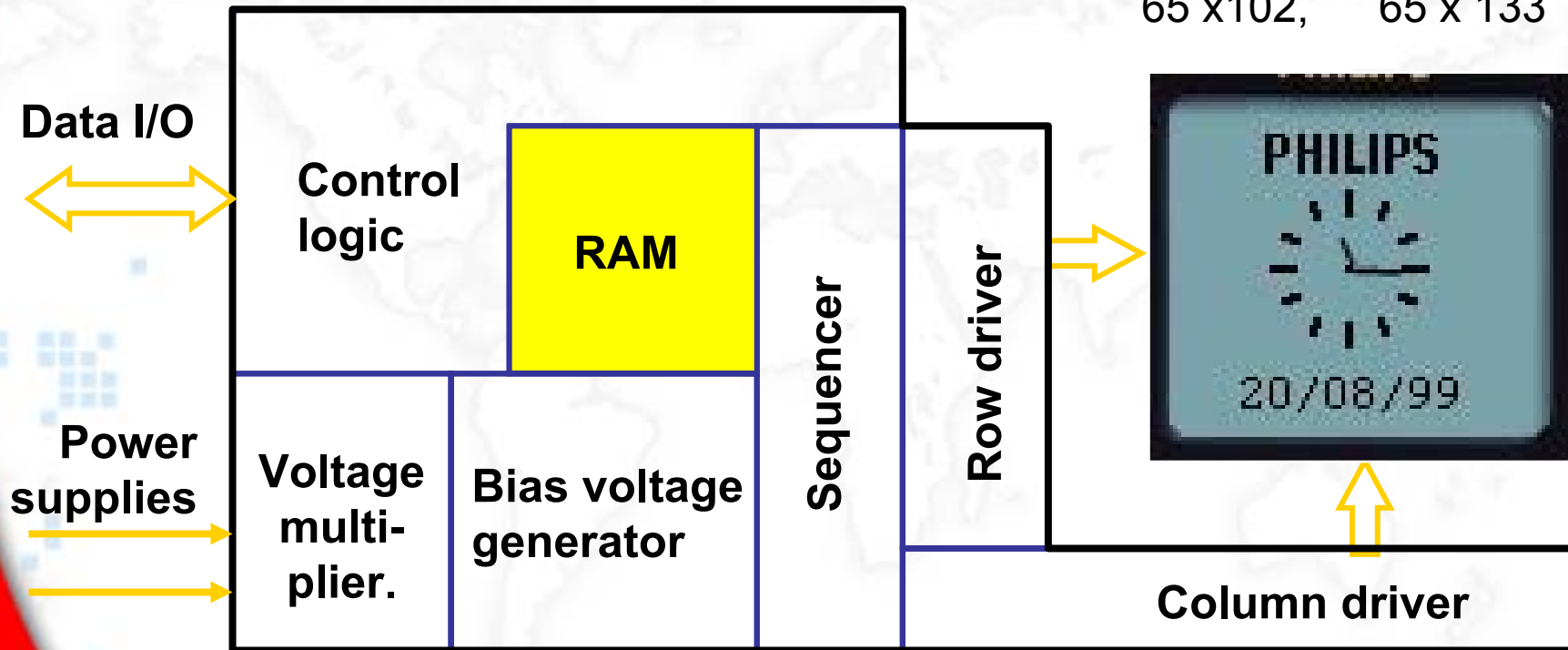
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# Mobile Display Driver Products

## Dot matrix LCD driver - B/W graphic

Display sizes e.g:  
34 x 128, 48 x 84  
65 x 102, 65 x 133



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# Family of LCD Graphic Drivers: black/white

Type	display size	mux rates 1: ...	Interface bus	VDD [V]	IDD [ $\mu$ A]	VLCD [V]
PCF8531	34 x 128	34,26,17	I <sup>2</sup> C, 400kbps	1.5 - 5.5	200	3.0 - 9.0
OM6211	48 x 84	48	Serial, 4 Mbps	2.7 - 3.3	240	6.0 - 8.5
OM6213	48 x 84	48	Serial, 4 Mbps	2.7 - 3.3	240	6.0 - 8.5
PCF8548	65 x 102	65	I <sup>2</sup> C, 400kbps	1.5 - 5.5	200	4.5 - 8.5
OM6206	65 x 102	65	Serial, 4 Mbps	2.5 - 4.5	150	4.5 - 9.0
PCF8811	80 x 128	80,64,48,32,16	I <sup>2</sup> C,serial, Prll	1.5 - 4.5	150	6.0 - 9.0
PCF8813	67 x 102	67	I <sup>2</sup> C,serial,Prll	2.5 - 4.5	100	4.5 - 9.0
PCF8814	65 x 96	65	Serial, 4Mbps	2.7 - 3.3	120	6.0 - 9.0
PCF8535	65 x 133	65, 49, 26,17	I <sup>2</sup> C, 400kbps	4.5 - 5.5	160	8.0 - 16

- all chips have internal voltage multiplier for  $V_{LCD}$
- chip with bumps for COG and TCP / COF applications



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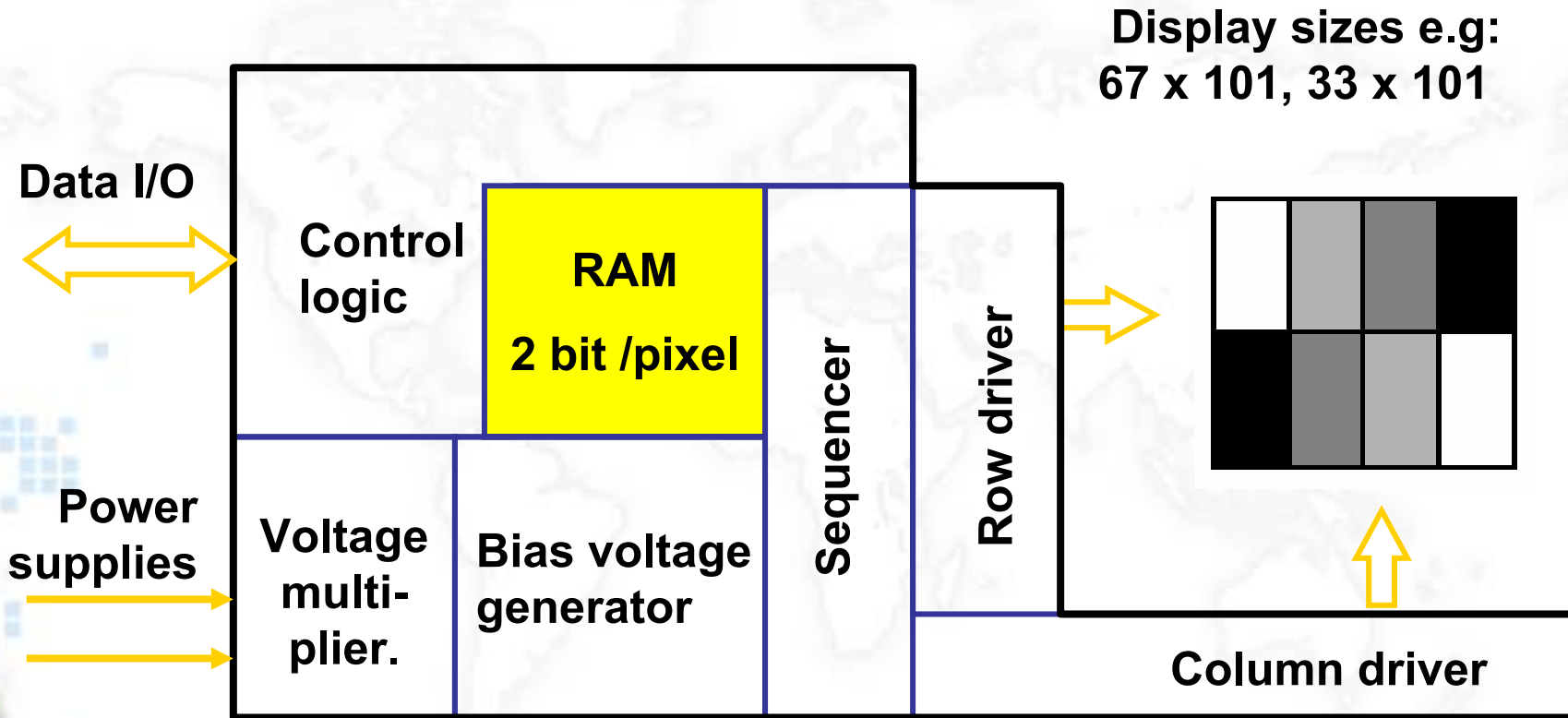
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# Mobile Display Driver Products

## Dot matrix LCD driver – Grey Scale graphic



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# Family of LCD Grey Scale Drivers

Type	display	mux rates	grey levels	V <sub>DD</sub> [V]	I <sub>DD</sub> typ [μA]	V <sub>LCD</sub> [V]
PCF8820	67 x 101	1:67, 1:8	4 out of 64	2.5 - 5.5	400	4.5-16
PCF8821	33 x 101	1:33, 1:8	4 out of 64	2.5 - 5.5	400	2.75-9.0V
OM6208	65 x 96	65:1	4 out of 64	2.5 - 5.5	300	4.5 - 9.0V

- 400kHz I<sup>2</sup>C interface
- Temperature read back (8820)
- X & Y mirroring

Applications of grey scales:

- still pictures
- **high lighting** / low lighting
- setting Focusing e.g. for selections
- ECB color

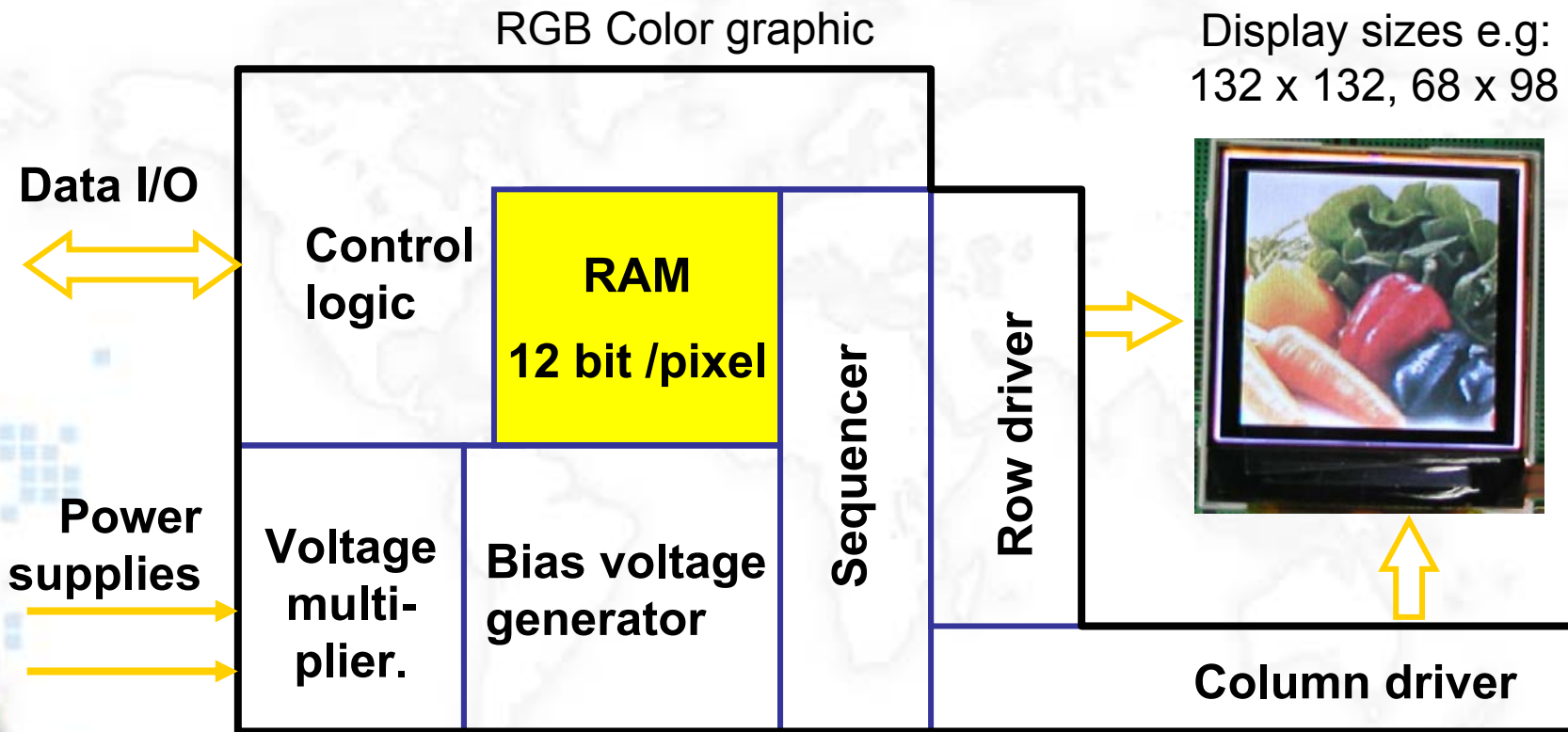


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# Mobile Color Display Driver Products

## Dot matrix LCD driver – RGB Color graphic



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# STN RGB Color

## Dot matrix LCD driver – RGB Color graphic

PCF8831	160 Row driver	256 color
PCF8832	128 x RGB Column driver	Two chip solutions
PCF8833	STN RGB 32x132x3 Driver	
PCF8834	STN RGB 84x104x3 Driver	64K color
PCF8835	STN RGB 68x98x3 Driver	Single chip solutions
PCF8837	STN RGB 176x132x3 Driver	64Kcolor
PCF8839	STN RGB 132x132x3 Driver	Up to 16bit interface

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# PCF8833

- Resolution 132 x 132 x 3
- Colors: 64k Colors
  - 4k colors + H/W dither
  - 12 bit color RAM (RGB=4,4,4)
  - 256 color mode option
  - 8 color power save mode
- MRA driving
  - VLCD = 20V
  - C075HV process = 0.35um
- COG / COF / TCP assembly
- On-chip main features:
  - capacitive HV generation
  - bias levels generation
  - oscillator
  - Partial display mode
  - N-line Inversion (reduced CT)
  - Area Scrolling
  - Temperature compensation
- Bus interfaces:
  - 3/4 line serial
  - 8080 8 bit parallel
- Schedule:
  - Datasheet available now
  - MP Q2 2003



# PCF8835

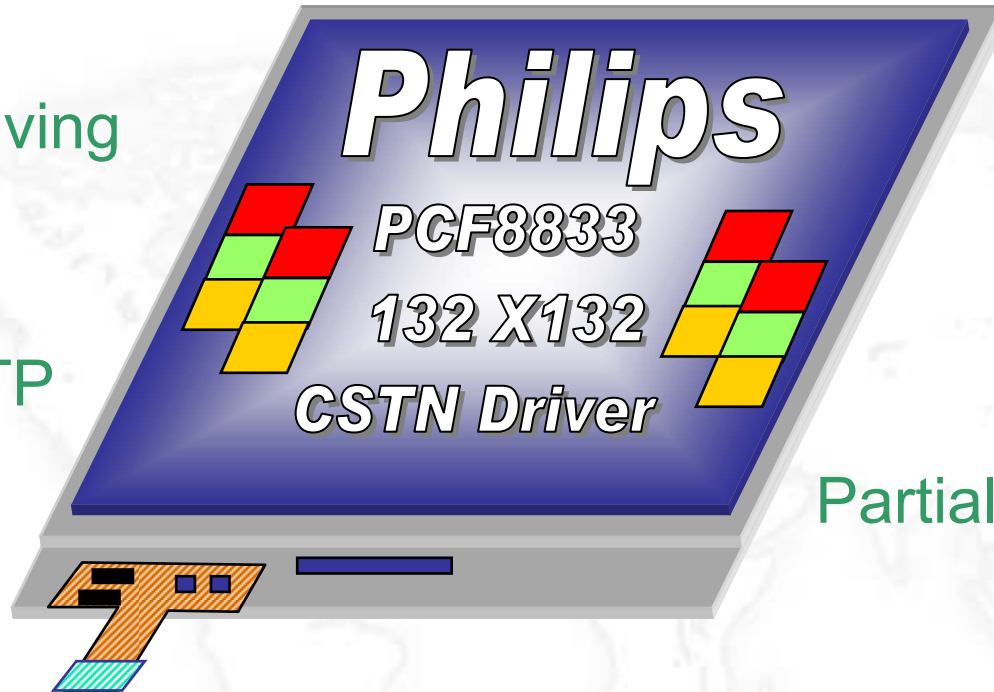
- Resolution : 98 x 67 x 3
- Colors : 64K Colors
  - 12-bit color RAM (RGB=4,4,4)
- MRA Driving
  - VLCD = 20V
  - C075HV process = 0.35um
- COG / COF / TCP assembly
- On-chip main features:
  - capacitive HV generation
  - bias levels generation
  - oscillator
  - temperature compensation
  - partial display mode
  - N-line inversion
- Bus interfaces:
  - 3/4 line serial
  - 8080 8 bit parallel
- Schedule:
  - Datasheet available now
  - Engineering samples WK45 2002

## Low Cost !

# Main Features

MRA driving

On-chip OTP



N-line inversion

Partial display modes

Lowest power consumption

Lowest external component count

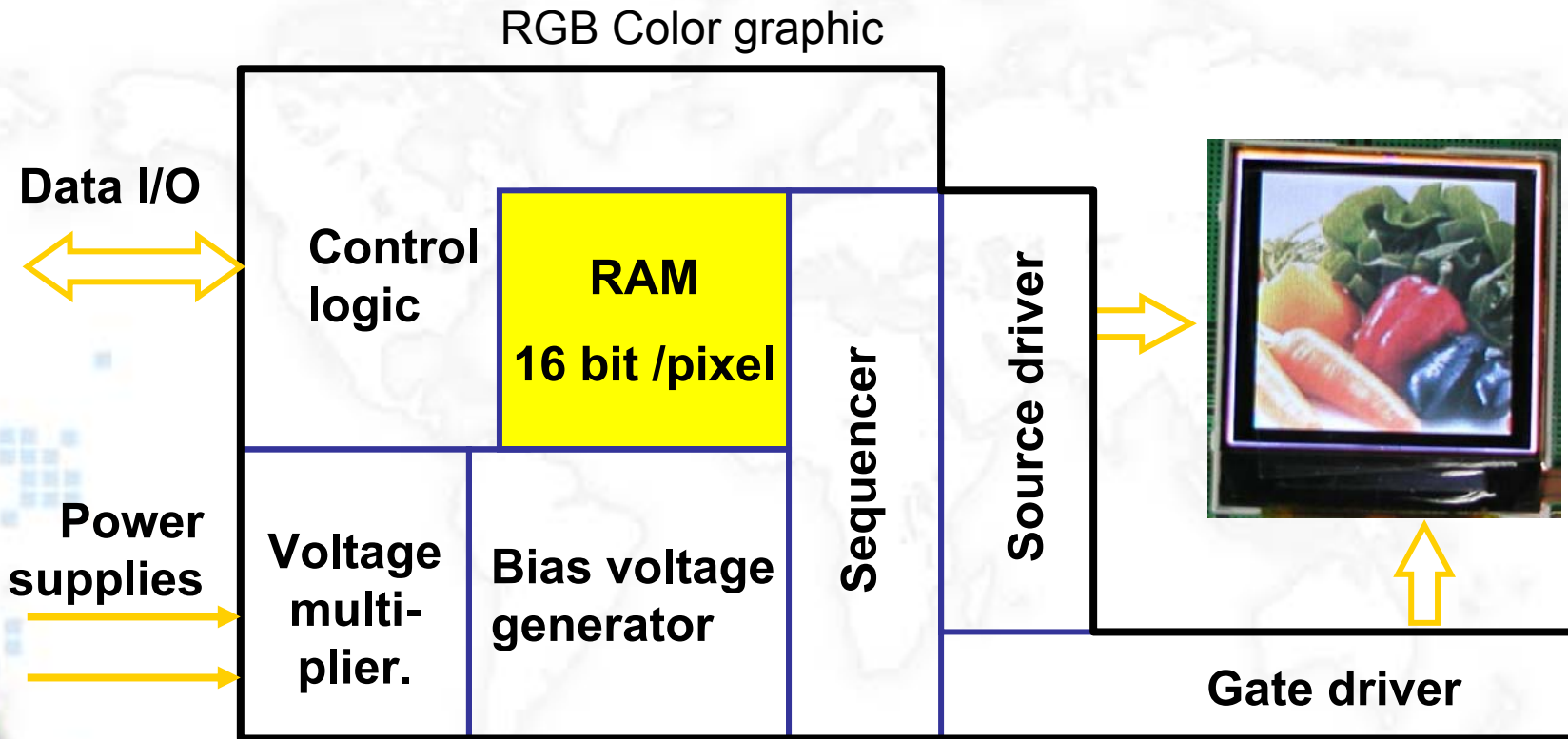
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# Mobile Display Driver Products

## TFT LCD drivers



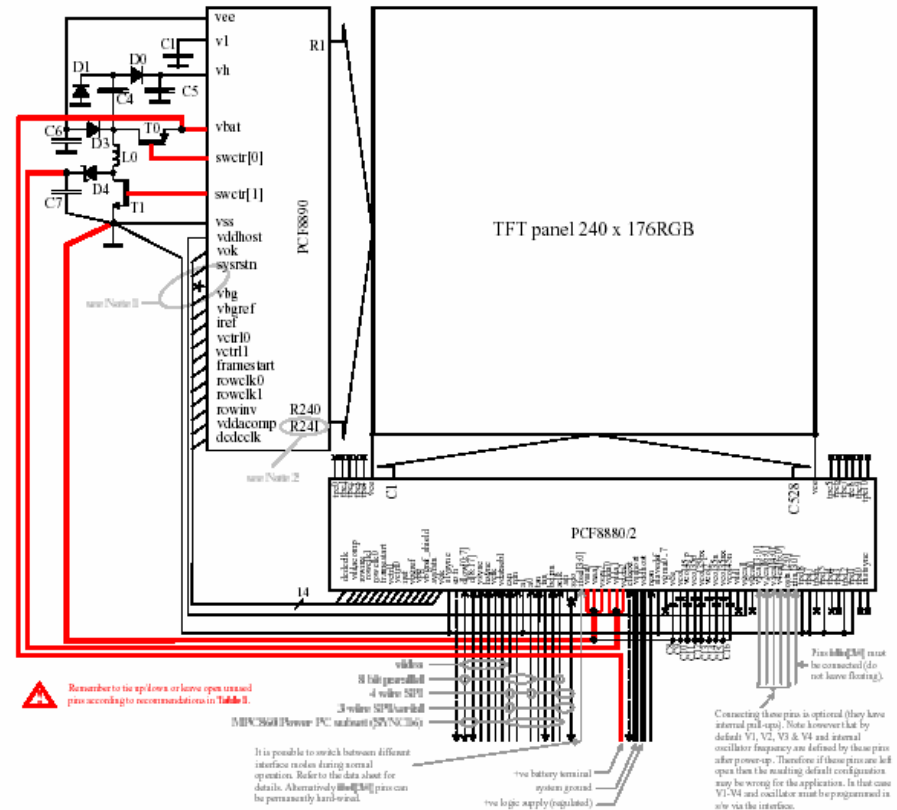
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# Mobile Display Driver Products

## TFT LCD drivers

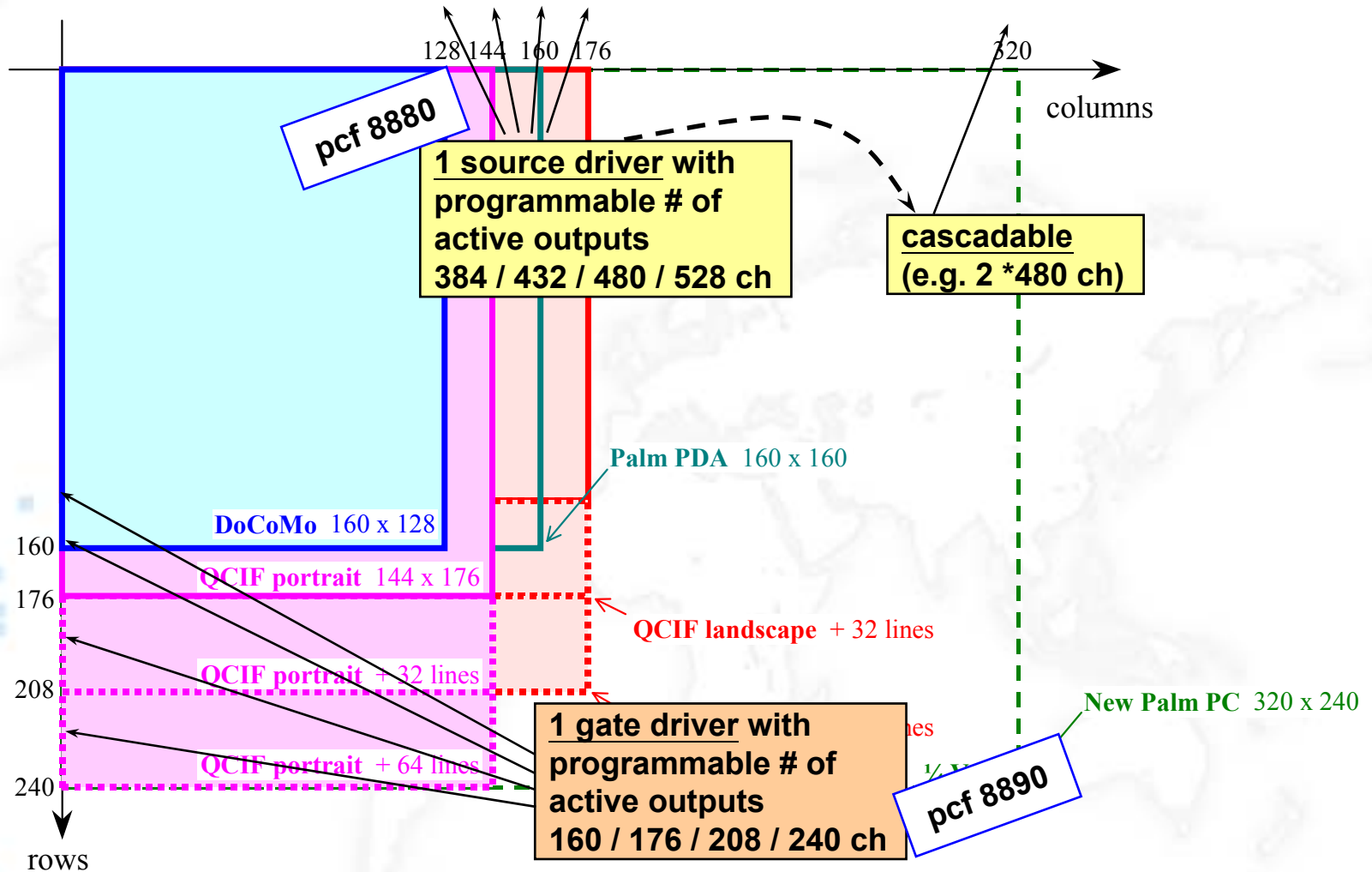
- PCF8880  
528 CH TFT LCD source driver with RAM
- PCF8890  
240+1 outputs TFT LCD gate driver



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# LP TFT Drivers for Telecom/ PDA



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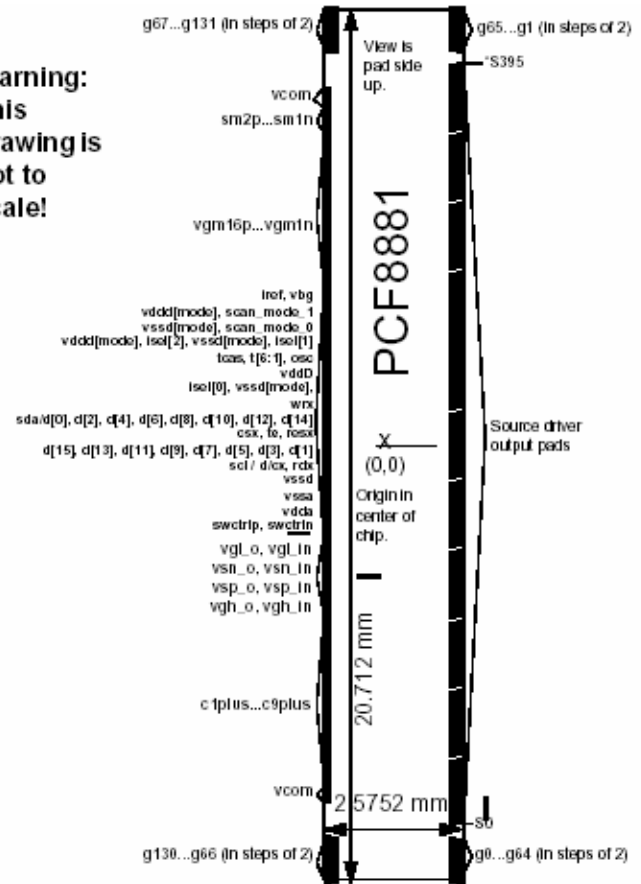
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# Mobile Display Driver Products

## TFT LCD drivers

- PCF8881  
132 x 132 RGB Single  
Chip TFT Driver with  
DC/DC converter

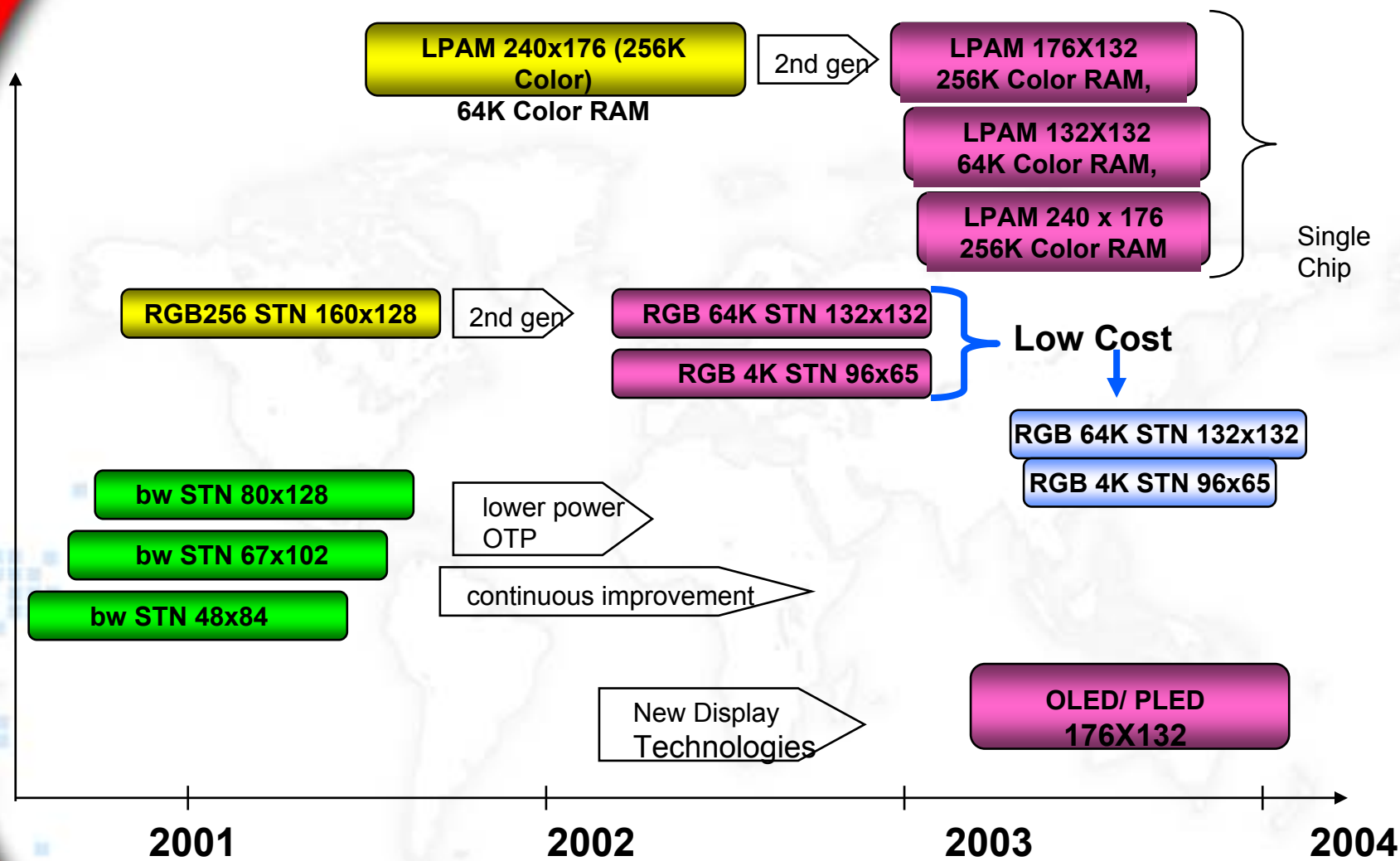
**Warning:**  
This  
drawing is  
not to  
scale!



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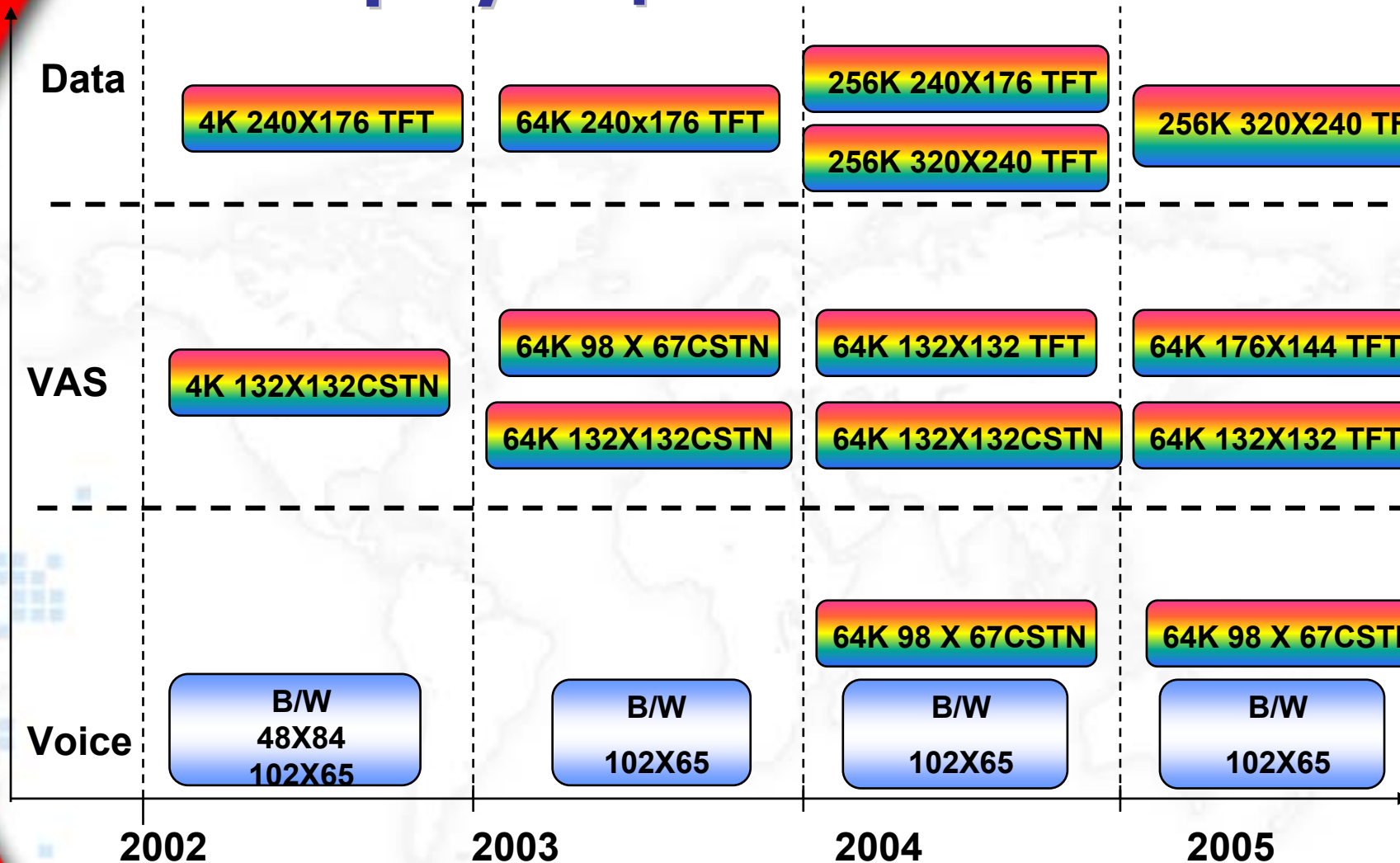
# Display Drivers Product Roadmap



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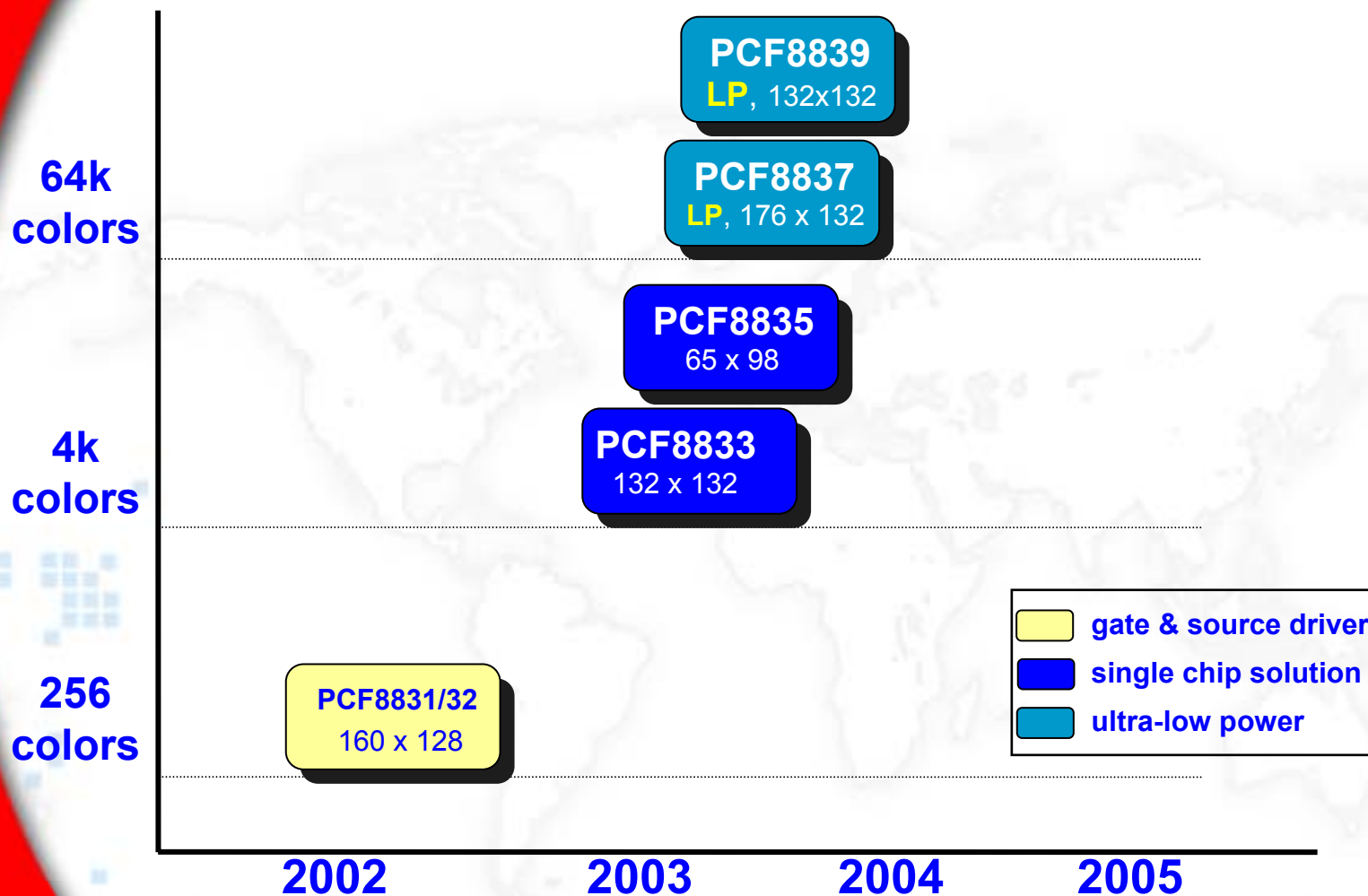
## Display Requirement Outlook



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# CSTN Display Driver Portfolio



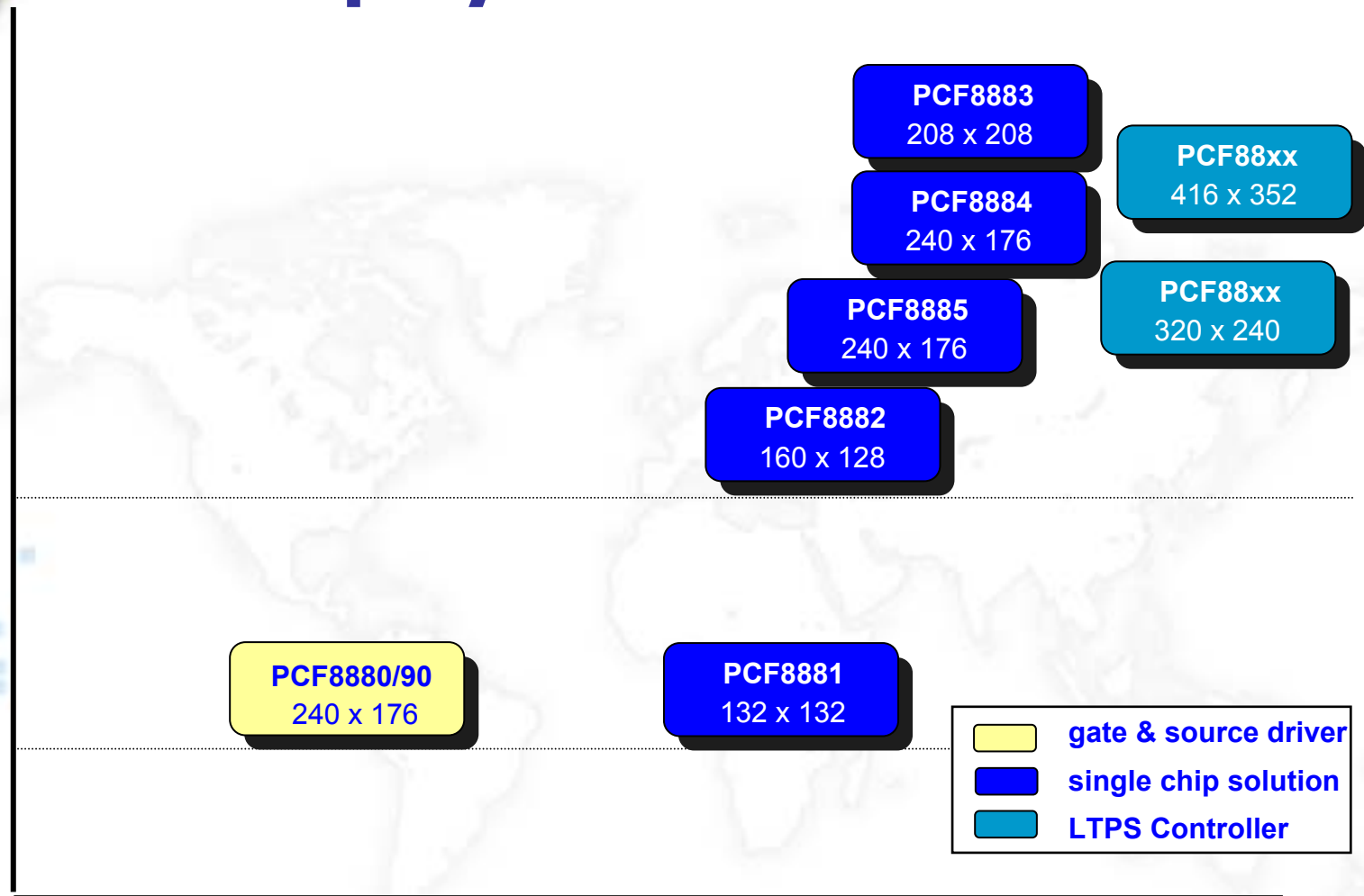
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# TFT Display Driver Portfolio

256k colors

64k colors



2002

2003

2004

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