



# HX8303A

132x176 dot, 260,000 color TFT  
controller driver with internal RAM

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## 1. General Description

HX8303A is a 132x176 dot controller driver LSI with internal RAM for maximum 132RGB-by-176-dot graphics on TFT displays in 260,000 colors. With internal bit-operation functions, 18-bit high-speed bus interface, and high-speed RAM-write functions enable efficient data transfer and high-speed rewriting of data to the graphics RAM.

HX8303A has various functions for reducing the power consumption of an LCD system and has a low-voltage operation (2.2V min.) with an internal RAM to display a maximum of 132RGB-by-176-dot color. In addition, HX8303A has the internal booster that generates the liquid crystal voltage, breeder resistance and the voltage follower circuit for liquid crystal driver. And HX8303A can compose a LCM only with an external capacitor and resistor. In addition, precise power control can be achieved by combing these hardware functions with software functions, such as an 8-color display mode, sleep and standby modes. This LSI is suitable for any medium-sized or small portable battery-driven product requiring long-term driving capabilities, such as digital cellular phones, bi-directional pagers, and small PDAs.

## 2. Features

- 132RGB x 176-dot graphics display LCD controller/driver for 260,000 TFT colors.
- Support 18-/16-/9-/8-bit(System i80/m68)/SPI/VSYNC data transfer interface.
- High-speed burst-RAM write function.
- Writing to a window-RAM address area by using a window-address function.
- Bit-operation functions for graphics processing:
  - Write-data mask function in bit units.
  - Logical operation in pixel unit and conditional write function.
- Various color-display control functions:
  - 260,000 possible colors can be displayed at the same time (gamma adjust function included).
  - Vertical scroll display function in line units.
- Low-power consumption architecture supports:
  - $V_{cc} = 2.2$  to  $3.3$  V (corresponding low-voltage operation).
  - $V_{ci} = 2.5$  to  $3.3$  V (internal reference voltage).
  - Power-save functions such as the standby mode and sleep mode.

- Partial LCD drive of two display windows in any position.
- Internal power supply circuit.
- Internal equalize function.
- Structure for TFT-display retention volume Cst/Cadd structure.
- Internal power supply circuit:
  - Step-up circuit: Five to nine times, positive-polarity inversion.
  - Alternating function for TFT-display counter-electrode power supply.
  - N-line alternating drive of Vcom (Vgoff is also available for N-line alternating drive for Cadd).
  - Adjustment of Vcom (Vgoff) amplitude: internal 22-level digital potentiometer.
- Output power-supply voltage:
  - For the TFT-display counter electrode: Vcom amplitude = 6V(max), VomH-GND = VREG1OUT(max), VcomL-GND = Vci + 1.0V to -Vci + 0.5V(max).
  
- Internal RAM capacity: 52,272 bytes.
- Internal operation circuit of liquid crystal display:
  - Source signal: 396.
  - Gate signal: 176.
- n-line inversion AC liquid-crystal drive .
- Available to COG with setting gate on both edge on one chip.
- Internal oscillation and hardware reset.