



## HX8609A

# 240 Channel TFT Gate Driver with Internal Power IC

April 2003, Version 1.0

### 1. General Description

HX8609A is a gate-driver IC for using in systems with color-TFT-liquid-crystal dot-matrix graphic displays. It incorporates a circuit for driving 240 channels of TFT gate-line driving and all the power-supply circuits that are required for liquid crystal displays, and realizes the liquid crystal display by adding external capacitors.

When used with the HX8302A 396-channel source driver with internal RAM, and used with the HX8301A 528-channel source driver with internal RAM, this LSI is suitable for color TFT displays of cellular phones having 132-by-176 and 176-by-240 pixels, respectively. The LSI has functions such as instruction setting from source driver, internal step-up circuit, op-amp circuit, micro-adjustment of power output etc., and is suitable for midium-small potable machine such as mobile phone, small-size PDAs.

#### 2. Features

- TFT gate-line driving circuits
  - 240 outputs
- The driving timing suitable for configuration of TFT structure in display
- Cst structure (Cs-on-common TFT structure)
- 2 Vcom output voltages: Vcom and Vcom2 which is alternating between VcomL, VcomH and VcomL2, VcomH2.
- Alternating driving for TFT-display common-electrode power supply
  - N-line alternating drive of Vcom
- Adjustment of Vcom amplitude : internal 22-level digital potentiometer.
- Adjustment of Vcom high voltage: internal 30-level digital potentiometer / externally adjusted by variable resistor.
- The instruction transfer for mode setting
- Serial transfer from the HX8301A/8302A source driver
- Low-power consumption operation
- Controlling function for the switching performance of step-up circuits and operational amplifiers
- Input power-supply voltage
  - $Vcc GND = 1.8 \sim 3.3 \text{ V}$  (Power supply for logic circuit)
  - $Vci GND = 2.5 \sim 3.3 \text{ V}$  (Power supply for analog circuit)



- Power-supply voltage for liquid crystal(LC) driving
  - DDVDH GND =  $4.0 \sim 5.5$  (V) (Driving for source driver liquid crystal output circuit / Driving for Vcom output)
  - VGH GND =  $9.0 \sim 16.5$  (V) (Driving for gate driver)
  - VGL GND =  $-4.0 \sim -14.0$  (V) (Driving for gate driver)
  - VCL GND =  $0 \sim -3.3$  (V) (Driving for VcomL, VcomL2 output)
- Output voltage level
  - VDH GND = 3.0 ~ (DDVDH-0.5) (V) (Reference power supply for source driver grayscale voltages)
  - Vcom(2) GND (Using for common voltage level)
    - VcomH(2) =  $3.0 \sim$  (DDVDH-0.5) (V) (High-level common voltage in alternating driving)
    - Vcom L(2) = VCL +  $0.5 \sim 1.0$  (V) (Low-level common voltage in alternating driving)
    - Vcom(2) amplitude (VcomH(2)-VcomL(2)) = 6 (V) max.
- Internal step-up circuit output
- DDVDH :VciOUT × 2
  VGH :VciOUT × 6
  VGL :VciOUT × -4 , -5
  VCL :VciOUT × -1

#### 3. Block Diagram

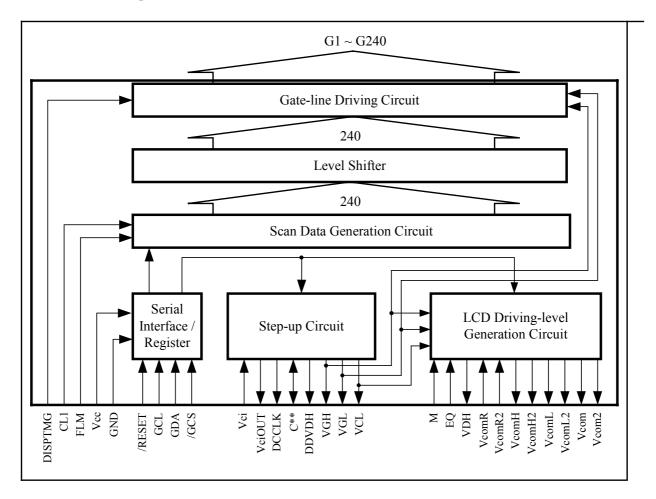


Figure 1. Block Diagram