



**Integrated Multi-Channel DC-DC Converter for TFT-LCD Panels**

**Features**

- 2.5V to 5.5V Input Supply Range
- 640kHz/1.2MHz Current-Mode Boost Regulator
  - ◆ Fast Transient Response to Pulse Load
  - ◆ ±1% Accurate Output Voltage
  - ◆ Built-In 20V/2A, 0.2Ω N-Channel MOSFET
  - ◆ High Efficiency up to 90%
  - ◆ Programmable Soft-Start
  - ◆ Over-Current Protection
  - ◆ Output Under-Voltage Protection
- High-Performance Operational Amplifiers
  - ±150mA Output Short-Circuit Current
  - ◆ 12V/μs Slew Rate
  - ◆ 12MHz, -3dB Bandwidth
  - ◆ Rail-to-Rail Input and Output
- Low Dropout Voltage Linear Regulator
  - ◆ 350mA Maximum Output Current
  - ◆ Adjustable Output Voltage
- On-Chip GPM Controller
  - ◆ Adjustable Falling Time and Power-On Delay
  - ◆ Flicker Compensator
  - ◆ Power-On Sequence Control
- Charge pump for VGH regulation
- Low Voltage Detector
  - ◆ Programmable Detecting Voltage and Delay Time
- Thermal-Overload Protection
- RoHs Compliant
- TQFN4X4-24 Package

**Applications**

- LCD Monitor
- Notebook Computer Displays
- LCD TVs

**General Description**

The G5521 includes a high-performance boost regulator, a low dropout linear regulator (LDO), a gate pulse modulator (GPM), a voltage detector, a VCOM buffer (unity-gain OPA), and a VGH charge pump controller for activematrix thin-film transistor (TFT) liquid-crystal displays (LCDs).

The boost converter provides the regulated supply voltage for the panel source driver ICs. The converter is a

high switching frequency (640kHz or 1.2MHz) current-mode regulator with an integrated 20V N-Channel 0.2Ω MOSFET that allows the use of ultra-small inductors and ceramic capacitors. It provides fast transient response to pulsed loading while achieving efficiency over 90%. The device can produce output voltage as high as 18V from an input as low as 2.8V. Soft-Start is programmed by external capacitor, which sets the input-current ramp-rate. The low-dropout (LDO) linear regulator can supply up to 350mA current while input voltage is 3.3V. It uses an internal PMOS as the pass device. It is suitable for the supply voltage of the timing controller.

The GPM is controlled by frame signals from timing controller to modulate the Gate-On voltage, VGHM, which acts a flicker compensation circuit to reduce the coupling effect between gate lines and pixels. It also can delay the Gate-On voltage while power-on for achieving a corrected power-on sequence for gate driver ICs. Both of power-on delay time and the falling time of the Gate-On voltage are programmable by external capacitor and resistor.

The voltage detector monitors the supply voltage to issue a reset signal while the detected voltage is too low. The detecting level is decided by an external resistor divider and the delay time is programmable by an external capacitor.

The VCOM buffer can drive the LCD VCOM voltage that features high short-circuit current (150mA), fast slew rate (12V/μs), wide bandwidth (12MHz) and rail-to-rail input/output.

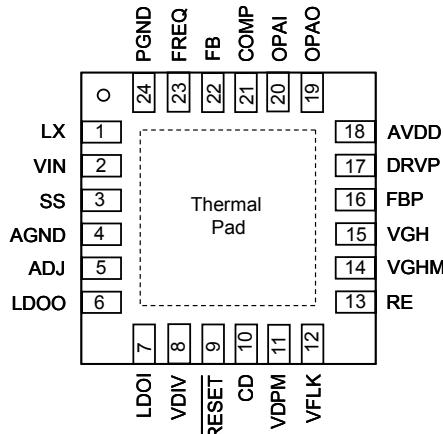
The VGH charge pump controller provides regulated TFT Gate-On voltage. The regulation of the positive charge pump is generated by the internal comparator that senses the output voltage and compares it with an internal reference.

**Ordering Information**

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G5521R51U	5521	-40°C to 85°C	TQFN4X4-24

Note: R5: TQFN4X4-24  
1: Bonding Code  
U: Tape & Reel

**Pin Configuration**



**G5521 TQFN4X4-24**

Note: Recommend connecting the Thermal Pad to the Ground for excellent power dissipation.

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### Features

- 2.5V to 5.5V Input Supply Range
- 640kHz/1.2MHz Current-Mode Boost Regulator
  - ◆ Fast Transient Response to Pulse Load
  - ◆  $\pm 1\%$  Accurate Output Voltage
  - ◆ Built-In 20V/2A, 0.2 $\Omega$  N-Channel MOSFET
  - ◆ High Efficiency up to 90%
  - ◆ Programmable Soft-Start
  - ◆ Over-Current Protection
  - ◆ Output Under-Voltage Protection
- High-Performance Operational Amplifiers
  - ◆  $\pm 150\text{mA}$  Output Short-Circuit Current
  - ◆ 12V/ $\mu\text{s}$  Slew Rate
  - ◆ 12MHz, -3dB Bandwidth
  - ◆ Rail-to-Rail Input and Output
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  - ◆ 350mA Maximum Output Current
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The boost converter provides the regulated supply voltage for the panel source driver ICs. The converter is a high switching frequency (640kHz or 1.2MHz) current-

mode regulator with an integrated 20V N-Channel 0.2 $\Omega$  MOSFET that allows the use of ultra-small inductors and ceramic capacitors. It provides fast transient response to pulsed loading while achieving efficiency over 90%. The device can produce output voltage as high as 18V from an input as low as 2.8V. Soft-Start is programmed by external capacitor, which sets the input-current ramp-rate. The low-dropout (LDO) linear regulator can supply up to 350mA current while input voltage is 3.3V. It uses an internal PMOS as the pass device. It is suitable for the supply voltage of the timing controller.

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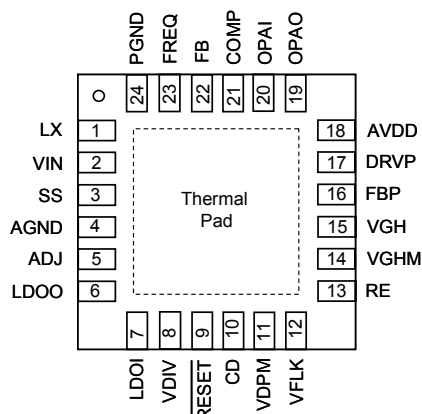
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