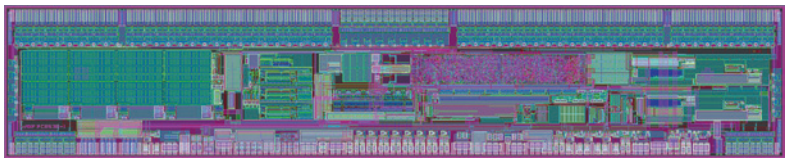


NXP automotive-grade COG LCD segment driver PCA8530

Full-featured, highly integrated AEC-Q100 COG LCD driver in mux 1:4

This advanced, AEC-Q100 compliant chip-on-glass (COG) LCD segment driver, with a resolution up to 4 x 102, integrates a charge pump for on-chip generation of V_{LCD}, a temperature sensor, and very accurate V_{LCD} temperature compensation.

KEY FEATURES

- 102 segment and 4 backplane outputs
- V_{DD} range: 2.5 to 5.5 V
- V_{LCD} range: 4 to 12 V
- Charge pump with on-chip capacitors for V_{LCD} generation
- Temp sensor with temp measurement readout
- V_{LCD} temperature compensation
- Multiplex drive mode: static, 1:2, 1:4
- Display bias configuration: static, 1/2, 1/3
- Selectable n-line and frame display inversion mode
- Selectable internal or external clock
- Programmable frame frequency from 45 to 300 Hz
- Hardware reset input pin RST and software reset command
- Device status readout as diagnostic or self-test functionality
- 2-line I^2C (400 kHz) or 3-line SPI (3 MHz) interface
- Very accurate V_{LCD}: ±60 mV at 8 V and 25 °C
- Very accurate temp readout: ±3 °C at 25 °C
- Very accurate frame frequency: ±3 Hz at 80 Hz and 25 °C
- Cascade up to 4 chips using on-chip V_{LCD}
- Laser marking for full traceability
- Four bumps per backplane output plus additional second set of backplanes (top and bottom)
- AEC-Q100 grade 2 compliant up to 105 °C

APPLICATIONS

- Automotive displays
- Healthcare devices
- White goods
- Industrial systems

KEY BENEFITS

- High and stable contrast over the temperature range
- Automotive grade up to 105 °C
- High integration for more compact designs
- Diagnostic feature
- High reliability
- Easy glass layout, supporting wide ITO tracks and a dual set of backplanes
- Suitable for a wide selection of LCDs including the high-contrast Vertical Alignment (VA) displays

The NXP PCA8530 is a single-chip LCD controller and driver with an integrated oscillator, charge pump, bias generation, temperature sensor, RAM, and instruction decoding.

Guidelines for use with a glass layout

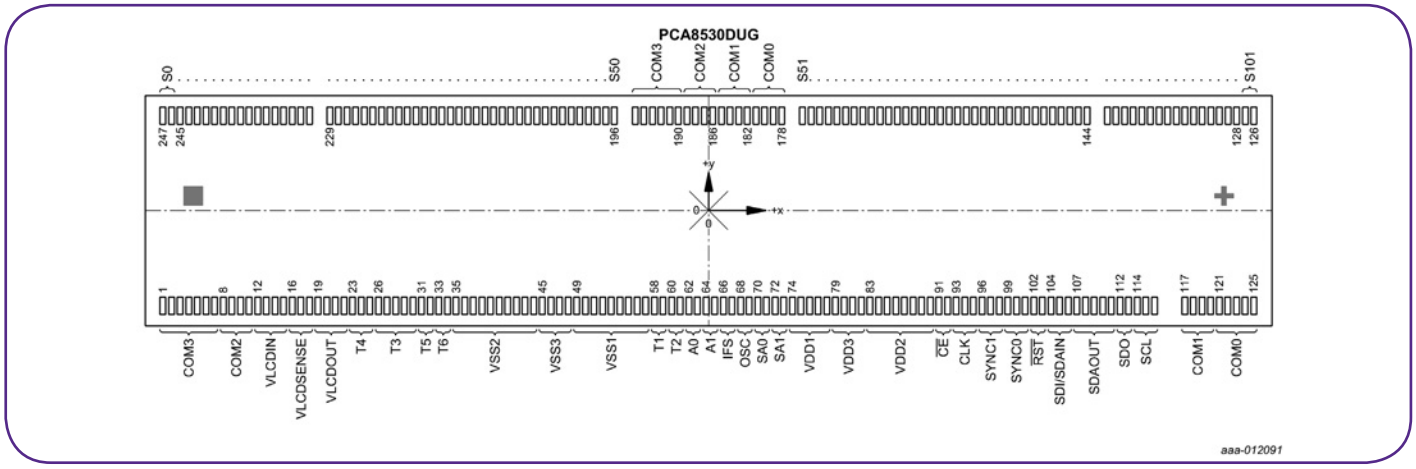
When using the PCA8530 with a glass layout, the following considerations should be taken into account:

- The PCA8530 features four bumps per backplane output. Since the bump pitch is 45 µm, this allows an ITO track of 180 µm wide per backplane. This guarantees low resistance of the ITO track and makes it possible to drive large display elements. There is also a dual set of backplanes that can be used to further enhance the drive capability or simplify the glass layout.
- The PCA8530 supports keeping the $R_{ITO\ (VSS)}$ as low as possible by, for example, making a wide track and fanning out the other connections. V_{SS1}, V_{SS2}, and V_{SS3} should have separate ITO tracks but can be connected together on the FPC connector to a common V_{SS} line. A low $R_{ITO\ (VSS)}$ makes EMC/ESD more robust and improves communication with the microcontroller, making the system more stable and less susceptible to noise.

Optimizing contrast

Given the LCD resolution, a defined multiplex rate, and a defined LCD bias configuration, the display contrast depends on the V_{LCD} voltage. The PCA8530 meets all the requirements needed to deliver higher contrast:

- V_{LCD} is independent from the V_{DD} supply. This makes it possible to select the LCD voltage value and then optimize the display contrast independently from the V_{DD} supply.
- V_{LCD} is programmable over a wide range, from 4 to 12 V. This enables optimization of the display contrast for a wide selection of LCDs with different threshold voltage V_{th} and saturation voltage V_{sat}.
- V_{LCD} is programmable with a small programming step (30 mV) and is very accurate (±60 mV at 8 V and 25 °C). This guarantees that the programmed LCD voltage value is close as possible to the optimum value across process variations.
- V_{LCD} is compensated over temperature to keep a high and stable contrast over the temperature range (-40 to 105 °C). Since the display characteristics change over temperature, V_{LCD} should also change to maintain the best contrast over temperature. The PCA8530 integrates an accurate temperature sensor (±3 °C at 25 °C) and a V_{LCD} temperature compensation circuit with programmable temperature ranges and programmable positive and negative slopes in each temperature range. As a result, the PCA8530 enables very high optical performance, especially when used to drive VA displays that have high contrast and a wide viewing angle.



PCA8530 pin configuration

Ordering information

Type	Package	Order number	Delivery format	IC version
PCA8530DUG/A	Bare die with gold bumps	935304442033	Chip in tray	1

Parameters	PCA8530
Die size	5.88 x 1.20 mm
IC thickness	380 um
Bump size	30 x 90 um
Minimum bump pitch	45 um
Bump height	15 um

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