TEXAS INSTRUMENTS

TPS65680

SLVSE47 –NOVEMBER 2017

TPS65680 18-Channel Pattern-Programmable Level Shifter with Overcurrent Protection

1 Features

- Programmable Output Pattern
  - Same Hardware can Support Different Displays
  - Ideal for Nonstandard / Small-Volume Applications
  - Pattern Changes During Development are Easy to Implement
- Simple 2-Wire Interface Between Level Shifter and TCON
  - Uses Fewer TCON I/O Resources / Allows Smaller TCON Package
  - Simplifies PCB Layout
  - Same 2-Wire Interface can be Shared by Multiple Level Shifter Devices Operating in Parallel
- 12 High-Voltage Clock Outputs
- 6 High-Voltage Control Outputs
- Advanced Functionality
  - Gate-Voltage Shaping
  - Charge-Sharing
  - Low-Frequency ODD / EVEN Output Generation
  - Panel Discharge During Shutdown
  - Output Overcurrent Protection
  - Overtemperature Protection
- Wide Supply Voltage Range
  - V_{IN} Supplies from 2.7 V to 5.5 V
  - V_{GH} Supplies from 9 V to 40 V
  - V_{GL} Supplies from –4 V to –18 V
- 4-mm × 4-mm, 32-Pin QFN Package

2 Applications

- LCD Panels Using GIP / GOA / ASG Technology
  - TVs
  - Monitors
  - Notebook / Tablet PCs
  - Industrial Equipment
  - Public Signage

3 Description

The TPS65680 device is a fully programmable high-voltage level shifter solution for LCD panels. It supports up to twelve high-voltage clock outputs in either charge-sharing or gate-voltage shaping configuration and six high-voltage control outputs for generating start, clear/reset, low-frequency ODD / EVEN signals and panel discharge. The output timing is generated by the level shifter itself, based on a user-programmable pattern sequence and requires only two connections to the timing controller: a line clock and a start pulse that indicates the start of a new frame. These two signals can be shared between multiple TPS65680 devices in applications that require a higher number of output channels than one device can generate.
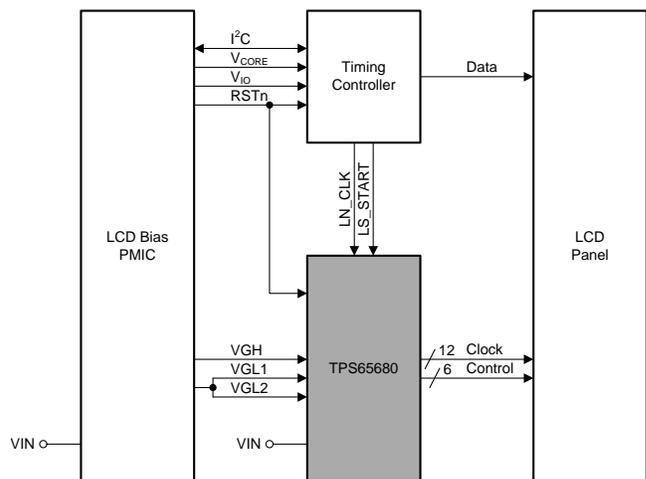
Customer-defined patterns and configuration settings can be stored in an on-chip nonvolatile memory to be used as the default settings after power up. Alternatively, this data can be written to the device after power up, using the I^{2}C interface. The programmability of the TPS65680 device lets you change the output pattern without reprogramming or changing the TCON. Thus one PCB can support many different panels, which simplifies the system design, shortens the design cycle and enables economies of scale.

Device Information[1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
TPS65680	WQFN (32)	4.0 mm × 4.0 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Simplified Schematic

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4 Revision History

DATE	REVISION	NOTES
November 2017	*	Advance Information release.

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5 Device and Documentation Support

5.1 Third-Party Products Disclaimer

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5.2 Trademarks

All trademarks are the property of their respective owners.

5.3 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

5.4 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

6 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS65680RSNR	ACTIVE	QFN	RSN	32	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TPS 65680	Samples
TPS65680RSNT	ACTIVE	QFN	RSN	32	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TPS 65680	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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