

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 x 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.

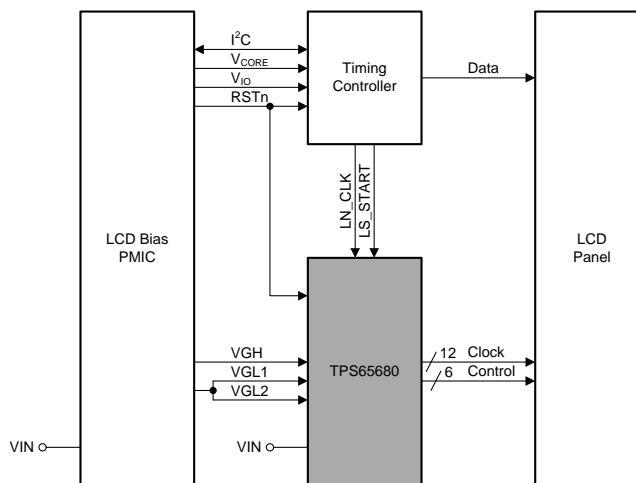
Customer-defined patterns and configuration settings can be stored in an on-chip nonvolatile memory to be used as the default settings after power up. Alternatively, this data can be written to the device after power up, using the I²C interface. The programmability of the TPS65680 device lets you change 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 x 4.0 mm

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

Simplified Schematic



Copyright © 2017, Texas Instruments Incorporated



Table of Contents

1 Features	1	5.1 Third-Party Products Disclaimer	3
2 Applications	1	5.2 Trademarks	3
3 Description	1	5.3 Electrostatic Discharge Caution	3
4 Revision History	2	5.4 Glossary	3
5 Device and Documentation Support	3	6 Mechanical, Packaging, and Orderable Information	3

4 Revision History

DATE	REVISION	NOTES
November 2017	*	Advance Information release.

ADVANCE INFORMATION

5 Device and Documentation Support

5.1 Third-Party Products Disclaimer

TI'S PUBLICATION OF INFORMATION REGARDING THIRD-PARTY PRODUCTS OR SERVICES DOES NOT CONSTITUTE AN ENDORSEMENT REGARDING THE SUITABILITY OF SUCH PRODUCTS OR SERVICES OR A WARRANTY, REPRESENTATION OR ENDORSEMENT OF SUCH PRODUCTS OR SERVICES, EITHER ALONE OR IN COMBINATION WITH ANY TI PRODUCT OR SERVICE.

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.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS65680RSNR	ACTIVE	QFN	RSN	32	3000	Green (RoHS & no Sb/Br)	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	TPS 65680	
TPS65680RSNT	ACTIVE	QFN	RSN	32	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	TPS 65680	

(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.

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

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (www.ti.com/legal/termsofsale.html) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2020, Texas Instruments Incorporated