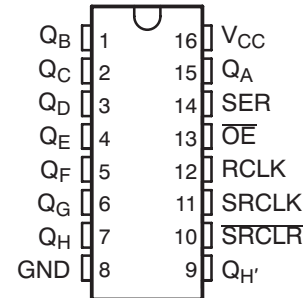


8-BIT SHIFT REGISTER WITH 3-STATE OUTPUT REGISTERS

 Check for Samples: [SN74LV595A-Q1](#)

FEATURES

- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
- 2-V to 5.5-V V_{CC} Operation
- Typical V_{OLP} (Output Ground Bounce) < 0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) > 2.3 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Supports Mixed-Mode Voltage Operation on All Ports
- 8-Bit Serial-In, Parallel-Out Shift
- I_{off} Supports Partial-Power-Down Mode Operation
- Shift Register Has Direct Clear



DESCRIPTION

The SN74LV595A is an 8-bit shift register designed for 2-V to 5.5-V V_{CC} operation.

This device contains an 8-bit serial-in, parallel-out shift register that feeds an 8-bit D-type storage register. The storage register has parallel 3-state outputs. Separate clocks are provided for both the shift and storage register. The shift register has a direct overriding clear (\overline{SRCLR}) input, serial (SER) input, and a serial output for cascading. When the output-enable (\overline{OE}) input is high, all outputs except $Q_{H'}$ are in the high-impedance state.

Both the shift register clock (SRCLK) and storage register clock (RCLK) are positive-edge triggered. If both clocks are connected together, the shift register always is one clock pulse ahead of the storage register.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

ORDERING INFORMATION⁽¹⁾

T_A	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	TSSOP – PW	Reel of 2000	SN74LV595AIPWRQ1	LV595AI
-40°C to 125°C	TSSOP – PW	Reel of 2000	SN74LV595AQPWRQ1	LV595AQ

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

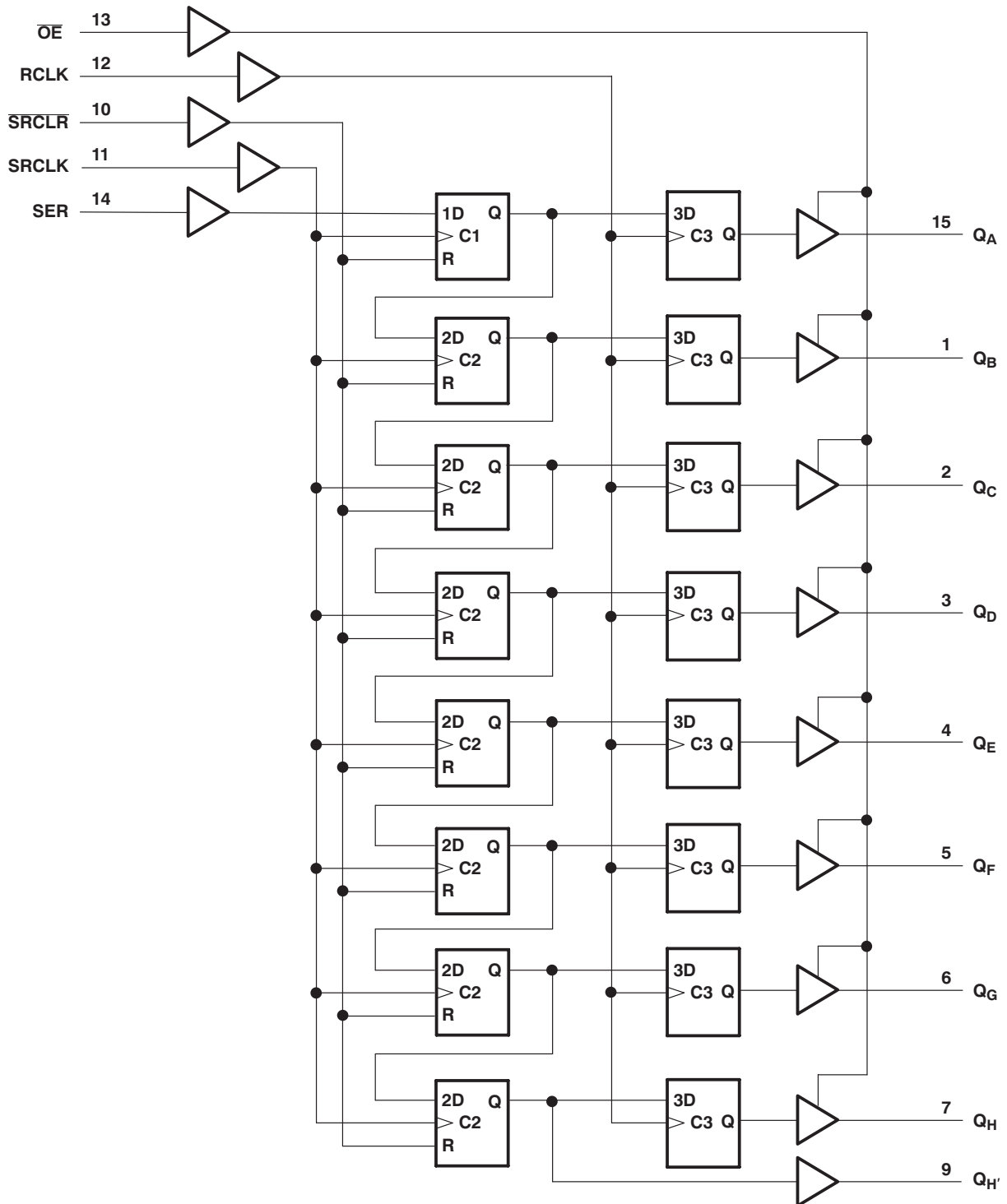


Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

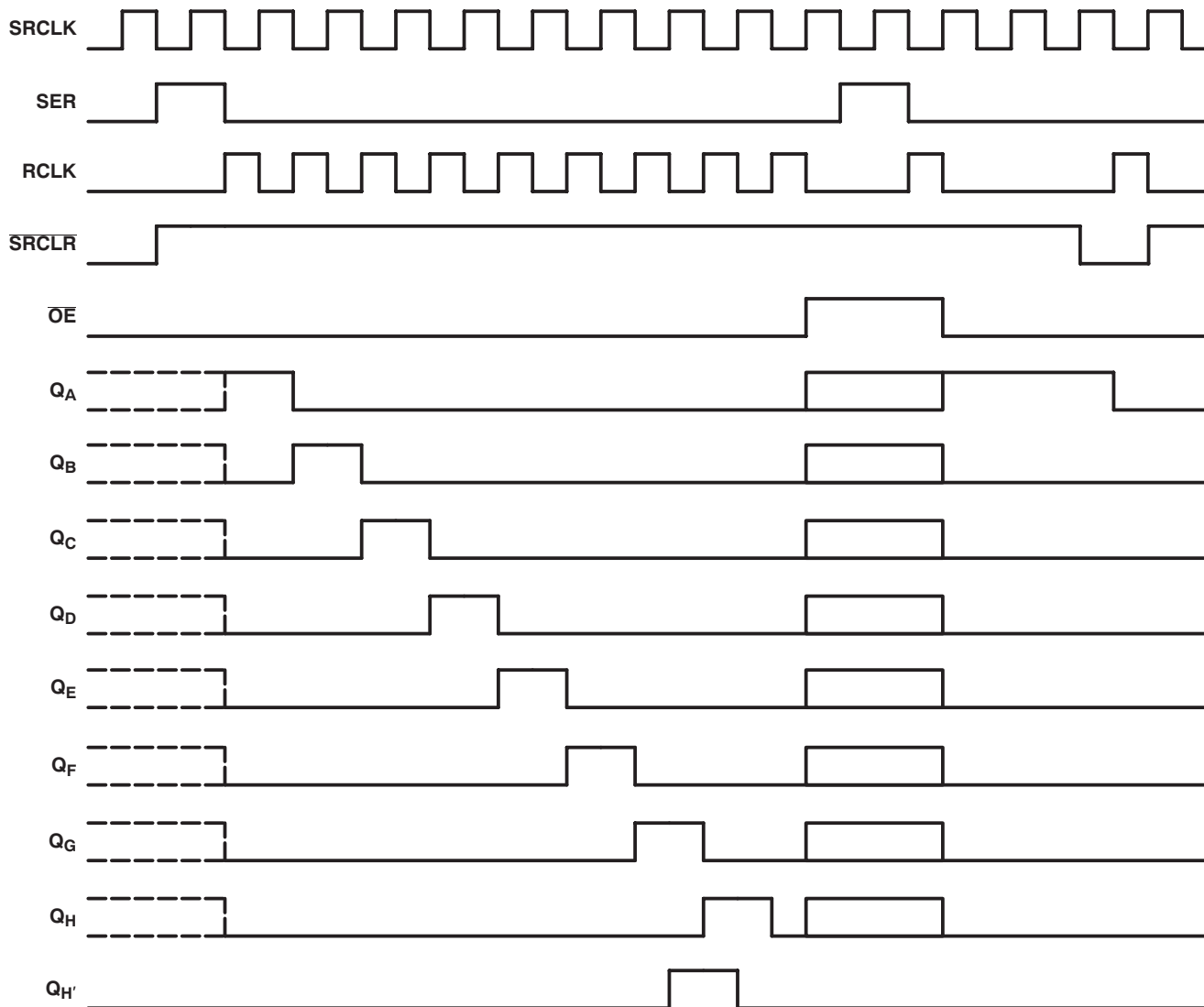
Table 1. FUNCTION TABLE

INPUTS					FUNCTION
SER	SRCLK	SRCLR	RCLK	OE	
X	X	X	X	H	Outputs Q _A –Q _H are disabled.
X	X	X	X	L	Outputs Q _A –Q _H are enabled.
X	X	L	X	X	Shift register is cleared.
L	↑	H	X	X	First stage of the shift register goes low. Other stages store the data of previous stage, respectively.
H	↑	H	X	X	First stage of the shift register goes high. Other stages store the data of previous stage, respectively.
X	X	X	↑	X	Shift-register data is stored in the storage register.

LOGIC DIAGRAM (POSITIVE LOGIC)



TIMING DIAGRAM



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

over operating free-air temperature range (unless otherwise noted)

V_{CC}	Supply voltage range		-0.5 V to 7 V
V_I	Input voltage range ⁽²⁾		-0.5 V to 7 V
V_O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾		-0.5 V to 7 V
V_O	Output voltage range applied in the high or low state ^{(2) (3)}		-0.5 V to $V_{CC} + 0.5$ V
I_{IK}	Input clamp current ⁽²⁾	$V_I < 0$	-20 mA
I_{OK}	Output clamp current ⁽²⁾	$V_O < 0$	-50 mA
I_O	Continuous output current	$V_O = 0$ to V_{CC}	± 35 mA
	Continuous current through V_{CC} or GND		± 70 mA
θ_{JA}	Package thermal impedance ⁽⁴⁾		108°C/W
T_{stg}	Storage temperature range		-65°C to 150°C
ESD	Electrostatic discharge rating	Human-body model (HBM)	2000 V
		Machine model (MM)	200 V
		Charged-device model (CDM)	1000 V

- (1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 5.5 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

		MIN	MAX	UNIT	
V_{CC}	Supply voltage	2	5.5	V	
V_{IH}	High-level input voltage	$V_{CC} = 2$ V	1.5	V	
		$V_{CC} = 2.3$ V to 2.7 V	$V_{CC} \times 0.7$		
		$V_{CC} = 3$ V to 3.6 V	$V_{CC} \times 0.7$		
		$V_{CC} = 4.5$ V to 5.5 V	$V_{CC} \times 0.7$		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V	0.5	V	
		$V_{CC} = 2.3$ V to 2.7 V	$V_{CC} \times 0.3$		
		$V_{CC} = 3$ V to 3.6 V	$V_{CC} \times 0.3$		
		$V_{CC} = 4.5$ V to 5.5 V	$V_{CC} \times 0.3$		
V_I	Input voltage	0	5.5	V	
V_O	Output voltage	High or low state	0	V_{CC}	V
		3-state	0	5.5	
I_{OH}	High level output current	$V_{CC} = 2$ V	-50	μ A	
		$V_{CC} = 2.3$ V to 2.7 V	-2	mA	
		$V_{CC} = 3$ V to 3.6 V	-8		
		$V_{CC} = 4.5$ V to 5.5 V	-16		
I_{OL}	Low level output current	$V_{CC} = 2$ V	50	μ A	
		$V_{CC} = 2.3$ V to 2.7 V	2	mA	
		$V_{CC} = 3$ V to 3.6 V	8		
		$V_{CC} = 4.5$ V to 5.5 V	16		
$\Delta t/\Delta v$	Input transition rise/fall time	$V_{CC} = 2.3$ V to 2.7 V	200	ns/V	
		$V_{CC} = 3$ V to 3.6 V	100		
		$V_{CC} = 4.5$ V to 5.5 V	20		
T_A	Operating free-air temperature	SN74LV595AIPWRQ1	-40	85	°C
		SN74LV595AQPWRQ1	-40	125	

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. See the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number [SCBA004](#).

ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = -40°C TO 85°C			T _A = -40°C TO 125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V _{OH}		I _{OH} = -50 μA	2 V to 5.5 V		V _{CC} - 0.1		V _{CC} - 0.1		V
		I _{OH} = -2 mA	2.3 V		2		2		
	Q _{H'}	I _{OH} = -6 mA	3 V		2.48		2.45		
	Q _A -Q _H	I _{OH} = -8 mA			2.48		2.45		
	Q _{H'}	I _{OH} = -12 mA	4.5 V		3.8		3.7		
	Q _A -Q _H	I _{OH} = -16 mA			3.8		3.7		
V _{OL}		I _{OL} = 50 μA	2 V to 5.5 V				0.1		V
		I _{OH} = 2 mA	2.3 V				0.45		
	Q _{H'}	I _{OH} = 6 mA	3 V				0.5		
	Q _A -Q _H	I _{OH} = 8 mA					0.5		
	Q _{H'}	I _{OH} = 12 mA	4.5 V				0.65		
	Q _A -Q _H	I _{OH} = 16 mA					0.65		
I _I		V _I = 5.5 V or GND	0 V to 5.5 V		±1		±1		nA
I _{OZ}	Q _A -Q _H	V _O = V _{CC} or GND	5.5 V		±5		±10		μA
I _{CC}		V _I = V _{CC} or GND, I _O = 0	5.5 V		20		40		μA
I _{off}		V _I or V _O = 0 to 5.5 V	0		5 ⁽¹⁾		10		μA
C _i		V _I = V _{CC} or GND	3.3 V		3.5		3.5		pF

(1) I_{off} does not apply to pin 9.

TIMING REQUIREMENTS

over operating free-air temperature range, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ (unless otherwise noted)

		$T_A = 25^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 85^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 125^\circ\text{C}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	SRCLK high or low	7	7.5	8.5	ns		
		RCLK high or low	7	7.5	8.5			
		SRCLR low	6	6.5	7.5			
t_{su}	Setup time	SER before SRCLK \uparrow	5.5	5.5	6.5	ns		
		SRCLK \uparrow before RCLK \uparrow ⁽¹⁾	8	9	10			
		SRCLR low before RCLK \uparrow	8.5	9.5	10.5			
		SRCLR high (inactive) before SRCLK \uparrow	4	4	5			
t_h	Hold time	SER after SRCLK \uparrow	1.5	1.5	2.5	ns		

(1) This setup time allows the storage register to receive stable data from the shift register. The clocks can be tied together, in which case the shift register is one clock pulse ahead of the storage register.

TIMING REQUIREMENTS

over operating free-air temperature range, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted)

		$T_A = 25^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 85^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 125^\circ\text{C}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	SRCLK high or low	5.5	5.5	6.5	ns		
		RCLK high or low	5.5	5.5	6.5			
		SRCLR low	5	5	6			
t_{su}	Setup time	SER before SRCLK \uparrow	3.5	3.5	4.5	ns		
		SRCLK \uparrow before RCLK \uparrow ⁽¹⁾	8	8.5	9.5			
		SRCLR low before RCLK \uparrow	8	9	10			
		SRCLR high (inactive) before SRCLK \uparrow	3	3	4			
t_h	Hold time	SER after SRCLK \uparrow	1.5	1.5	2.5	ns		

(1) This setup time allows the storage register to receive stable data from the shift register. The clocks can be tied together, in which case the shift register is one clock pulse ahead of the storage register.

TIMING REQUIREMENTS

over operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted)

		$T_A = 25^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 85^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 125^\circ\text{C}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	SRCLK high or low	5	5	6	ns		
		RCLK high or low	5	5	6			
		SRCLR low	5.2	5.2	6.2			
t_{su}	Setup time	SER before SRCLK \uparrow	3	3	4	ns		
		SRCLK \uparrow before RCLK \uparrow ⁽¹⁾	5	5	6			
		SRCLR low before RCLK \uparrow	5	5	6			
		SRCLR high (inactive) before SRCLK \uparrow	2.5	2.5	3.5			
t_h	Hold time	SER after SRCLK \uparrow	2	2	3	ns		

(1) This setup time allows the storage register to receive stable data from the shift register. The clocks can be tied together, in which case the shift register is one clock pulse ahead of the storage register.

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$, $C_L = 50\text{ pF}$ (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ TO 85°C		$T_A = -40^\circ\text{C}$ TO 125°C		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{\max}			60	70		40		30		MHz
t_{PLH}	RCLK	Q_A-Q_H		11.2	17.2	1	19.3	1	22.3	ns
t_{PHL}				11.2	17.2	1	19.3	1	22.3	ns
t_{PLH}	SRCLK	Q_H		13.1	22.5	1	25.5	1	28.5	ns
t_{PHL}				13.1	22.5	1	25.5	1	28.5	ns
t_{PHL}	$\overline{\text{SRCLR}}$	Q_H		12.4	18.8	1	21.1	1	24.1	ns
t_{PZH}	$\overline{\text{OE}}$	Q_A-Q_H		10.8	17	1	18.3	1	21.3	ns
t_{PZL}				13.4	21	1	23	1	26	ns
t_{PHZ}	$\overline{\text{OE}}$	Q_A-Q_H		12.2	18.3	1	19.5	1	22.5	ns
t_{PLZ}				14	20.9	1	22.6	1	25.6	ns

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$, $C_L = 50\text{ pF}$ (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ TO 85°C		$T_A = -40^\circ\text{C}$ TO 125°C		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{\max}			55	105		50		40		MHz
t_{PLH}	RCLK	Q_A-Q_H		7.9	15.4	1	17	1	20	ns
t_{PHL}				7.9	15.4	1	17	1	20	ns
t_{PLH}	SRCLK	Q_H		9.2	16.5	1	18.5	1	21.5	ns
t_{PHL}				9.2	16.5	1	18.5	1	21.5	ns
t_{PHL}	$\overline{\text{SRCLR}}$	Q_H		9	16.3	1	17.2	1	20.2	ns
t_{PZH}	$\overline{\text{OE}}$	Q_A-Q_H		7.8	15	1	17	1	20	ns
t_{PZL}				9.6	15	1	17	1	20	ns
t_{PHZ}	$\overline{\text{OE}}$	Q_A-Q_H		8.1	15.7	1	16.2	1	19.2	ns
t_{PLZ}				9.3	15.7	1	16.2	1	19.2	ns

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$, $C_L = 50\text{ pF}$ (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ TO 85°C		$T_A = -40^\circ\text{C}$ TO 125°C		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{\max}			95	140		85		75		MHz
t_{PLH}	RCLK	Q_A-Q_H		5.6	9.4	1	10.5	1	13.5	ns
t_{PHL}				5.6	9.4	1	10.5	1	13.5	ns
t_{PLH}	SRCLK	Q_H		6.4	10.2	1	11.4	1	14.4	ns
t_{PHL}				6.4	10.2	1	11.4	1	14.4	ns
t_{PHL}	$\overline{\text{SRCLR}}$	Q_H		6.4	10	1	11.1	1	14.1	ns
t_{PZH}	$\overline{\text{OE}}$	Q_A-Q_H		5.7	10.6	1	12	1	15	ns
t_{PZL}				6.8	10.6	1	12	1	15	ns
t_{PHZ}	$\overline{\text{OE}}$	Q_A-Q_H		3.5	10.3	1	11	1	14	ns
t_{PLZ}				3.4	10.3	1	11	1	14	ns

NOISE CHARACTERISTICS⁽¹⁾

 $V_{CC} = 3.3\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER		MIN	TYP	MAX	UNIT
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.3		V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		-0.2		V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		2.8		V
$V_{IH(D)}$	High-level dynamic input voltage	2.31			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.99	V

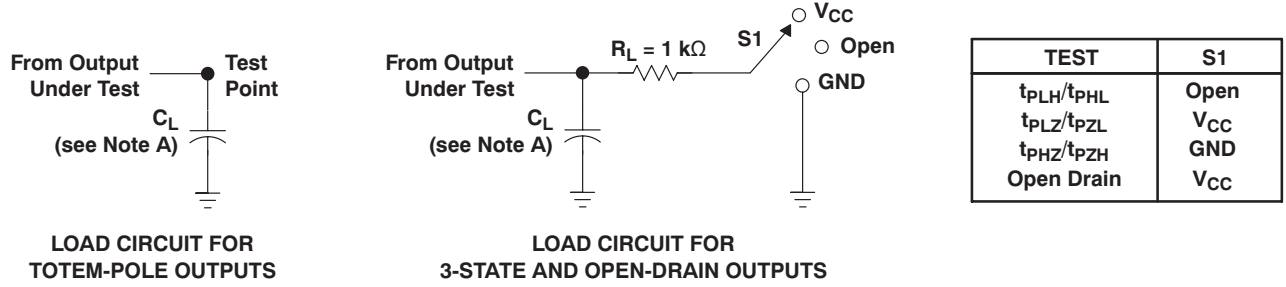
(1) Characteristics are for surface-mount packages only.

OPERATING CHARACTERISTICS

 $T_A = 25^\circ\text{C}$

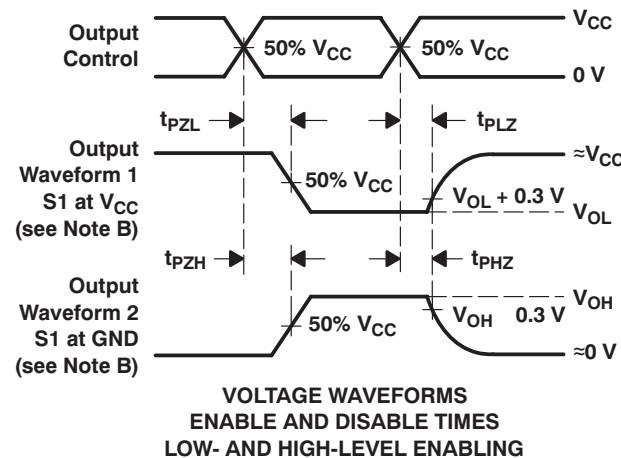
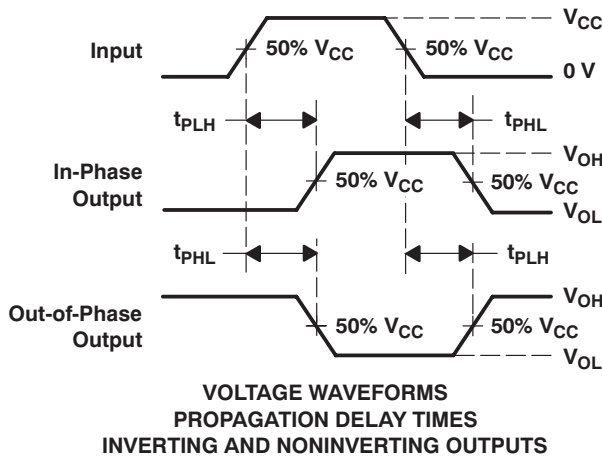
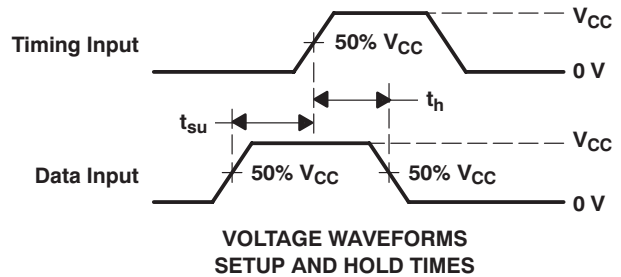
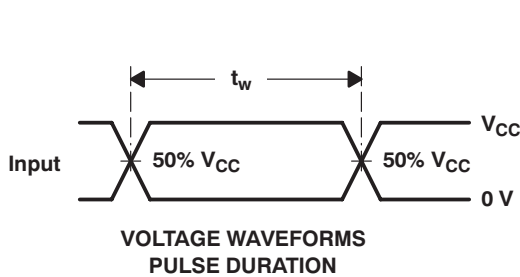
PARAMETER		TEST CONDITIONS	TYP	UNIT	
C_{pd}	Power dissipation capacitance	$C_L = 50\text{ pF}$, $f = 10\text{ MHz}$	$V_{CC} = 3.3\text{ V}$	111	pF
			$V_{CC} = 5\text{ V}$	114	

PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT FOR TOTEM-POLE OUTPUTS

LOAD CIRCUIT FOR 3-STATE AND OPEN-DRAIN OUTPUTS



- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 3 \text{ ns}$, $t_f \leq 3 \text{ ns}$.
 - D. The outputs are measured one at a time, with one input transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PHL} and t_{PLH} are the same as t_{pd} .
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
SN74LV595AIPWRG4Q1	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LV595AI	Samples
SN74LV595AIPWRQ1	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	LV595AI	Samples
SN74LV595AQPWRQ1	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595AQ	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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

(4) Only one of markings shown within the brackets will appear on the physical device.

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.

OTHER QUALIFIED VERSIONS OF SN74LV595A-Q1 :

- Catalog: [SN74LV595A](#)
- Enhanced Product: [SN74LV595A-EP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LV595AIPWRG4Q1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV595AIPWRQ1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV595AQPWRQ1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

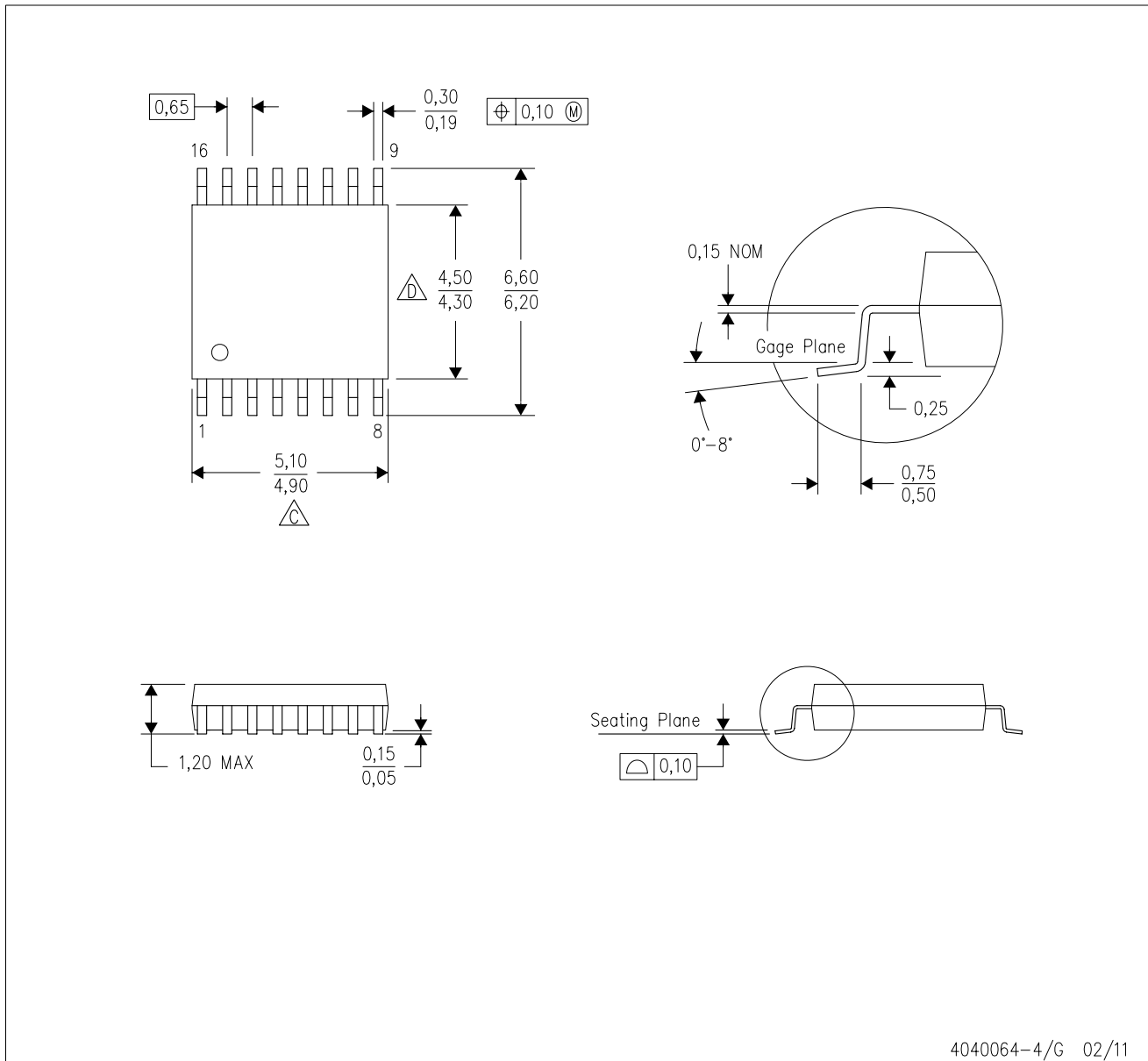
TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LV595AIPWRG4Q1	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74LV595AIPWRQ1	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74LV595AQPWRQ1	TSSOP	PW	16	2000	367.0	367.0	35.0

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE

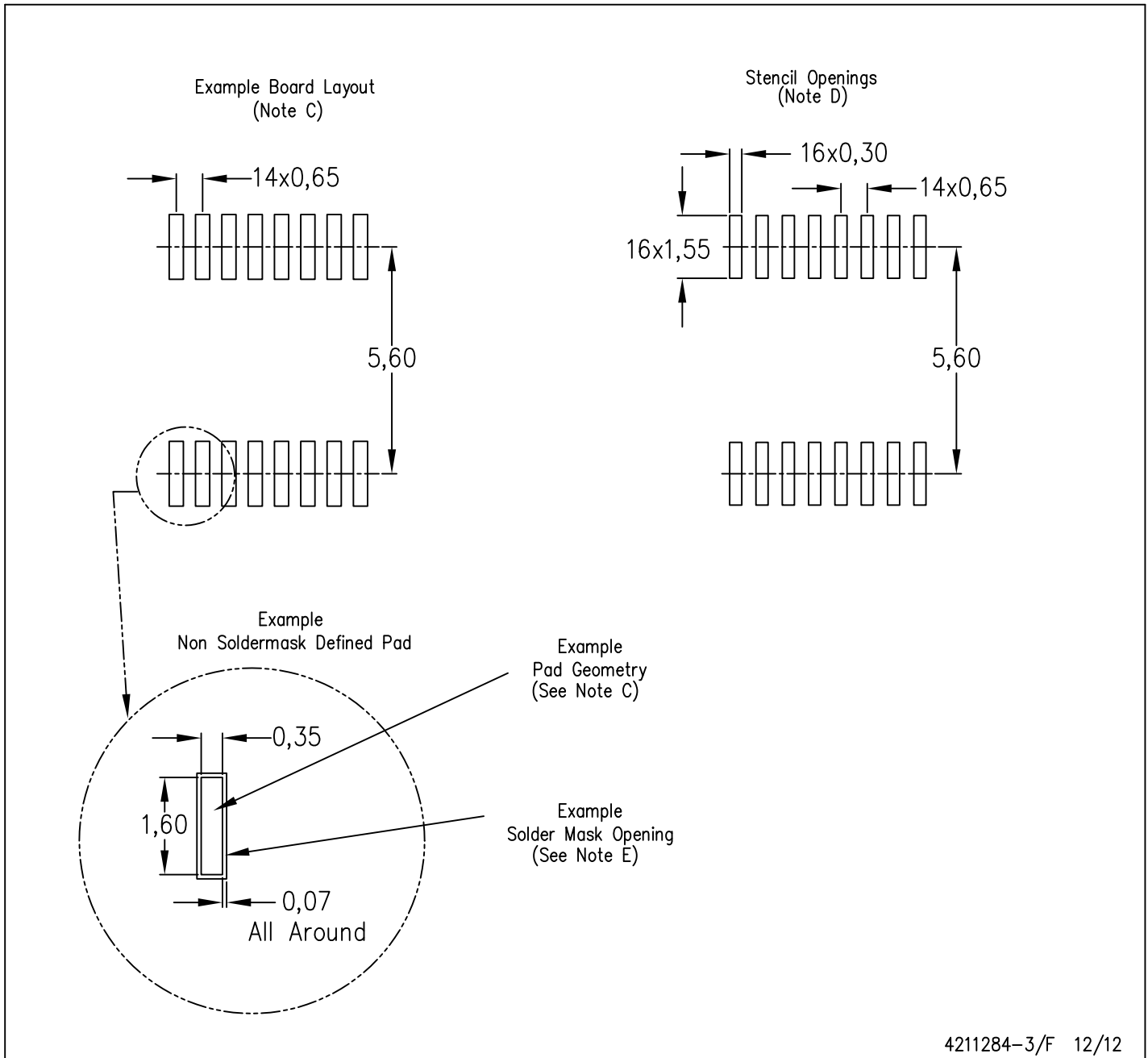


4040064-4/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com