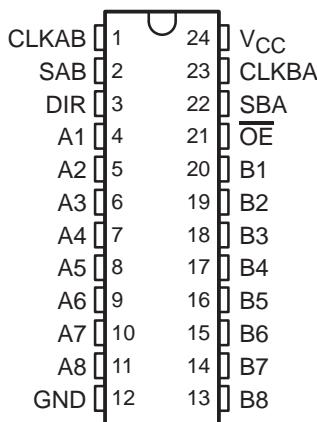


**SN54LVTH646, SN74LVTH646**  
**3.3-V ABT OCTAL BUS TRANSCEIVERS AND REGISTERS**  
**WITH 3-STATE OUTPUTS**

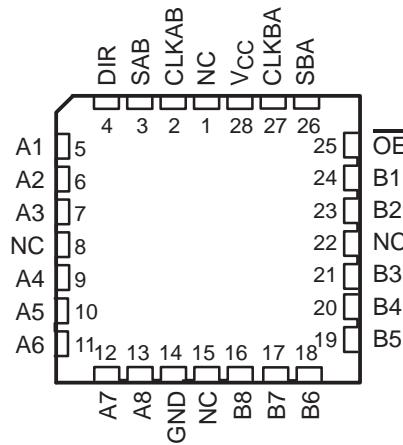
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- **Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V  $V_{CC}$ )**
- **Support Unregulated Battery Operation Down to 2.7 V**
- **Typical  $V_{OLP}$  (Output Ground Bounce) <0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$**
- **$I_{off}$  and Power-Up 3-State Support Hot Insertion**
- **Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors**
- **Latch-Up Performance Exceeds 500 mA Per JESD 17**
- **ESD Protection Exceeds JESD 22**
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)

SN54LVTH646 . . . JT OR W PACKAGE  
SN74LVTH646 . . . DB, DGV, DW, NS, OR PW PACKAGE  
(TOP VIEW)



SN54LVTH646 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

These bus transceivers and registers are designed specifically for low-voltage (3.3-V)  $V_{CC}$  operation, but with the capability to provide a TTL interface to a 5-V system environment.

## ORDERING INFORMATION

$T_A$	PACKAGE <sup>†</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SOIC – DW	Tube	SN74LVTH646DW
		Tape and reel	SN74LVTH646DWR
	SOP – NS	Tape and reel	SN74LVTH646NSR
	SSOP – DB	Tape and reel	SN74LVTH646DBR
	TSSOP – PW	Tube	SN74LVTH646PW
		Tape and reel	SN74LVTH646PWR
-55°C to 125°C	TVSOP – DGV	Tape and reel	SN74LVTH646DGVR
	CDIP – JT	Tube	SNJ54LVTH646JT
	CFP – W	Tube	SNJ54LVTH646W
	LCCC – FK	Tube	SNJ54LVTH646FK

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

# SN54LVTH646, SN74LVTH646

## 3.3-V ABT OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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### description/ordering information (continued)

The 'LVTH646 devices consist of bus transceiver circuits, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the input bus or from the internal registers. Data on the A or B bus is clocked into the registers on the low-to-high transition of the appropriate clock (CLKAB or CLKBA) input. Figure 1 illustrates the four fundamental bus-management functions that can be performed with the 'LVTH646.

Output-enable ( $\overline{OE}$ ) and direction-control (DIR) inputs are provided to control the transceiver functions. In the transceiver mode, data present at the high-impedance port can be stored in either register or in both.

The select-control (SAB and SBA) inputs can multiplex stored and real-time (transparent mode) data. The direction control (DIR) determines which bus receives data when  $\overline{OE}$  is low. In the isolation mode ( $\overline{OE}$  high), A data can be stored in one register and/or B data can be stored in the other register.

When an output function is disabled, the input function still is enabled and can be used to store and transmit data. Only one of the two buses, A or B, can be driven at a time.

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

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.

These devices are fully specified for hot-insertion applications using  $I_{off}$  and power-up 3-state. The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down. The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.

FUNCTION TABLE

INPUTS						DATA I/Os		OPERATION OR FUNCTION
$\overline{OE}$	DIR	CLKAB	CLKBA	SAB	SBA	A1–A8	B1–B8	
X	X	↑	X	X	X	Input	Unspecified†	Store A, B unspecified†
X	X	X	↑	X	X	Unspecified†	Input	Store B, A unspecified†
H	X	↑	↑	X	X	Input	Input	Store A and B data
H	X	H or L	H or L	X	X	Input disabled	Input disabled	Isolation, hold storage
L	L	X	X	X	L	Output	Input	Real-time B data to A bus
L	L	X	H or L	X	H	Output	Input	Stored B data to A bus
L	H	X	X	L	X	Input	Output	Real-time A data to B bus
L	H	H or L	X	H	X	Input	Output	Stored A data to B bus

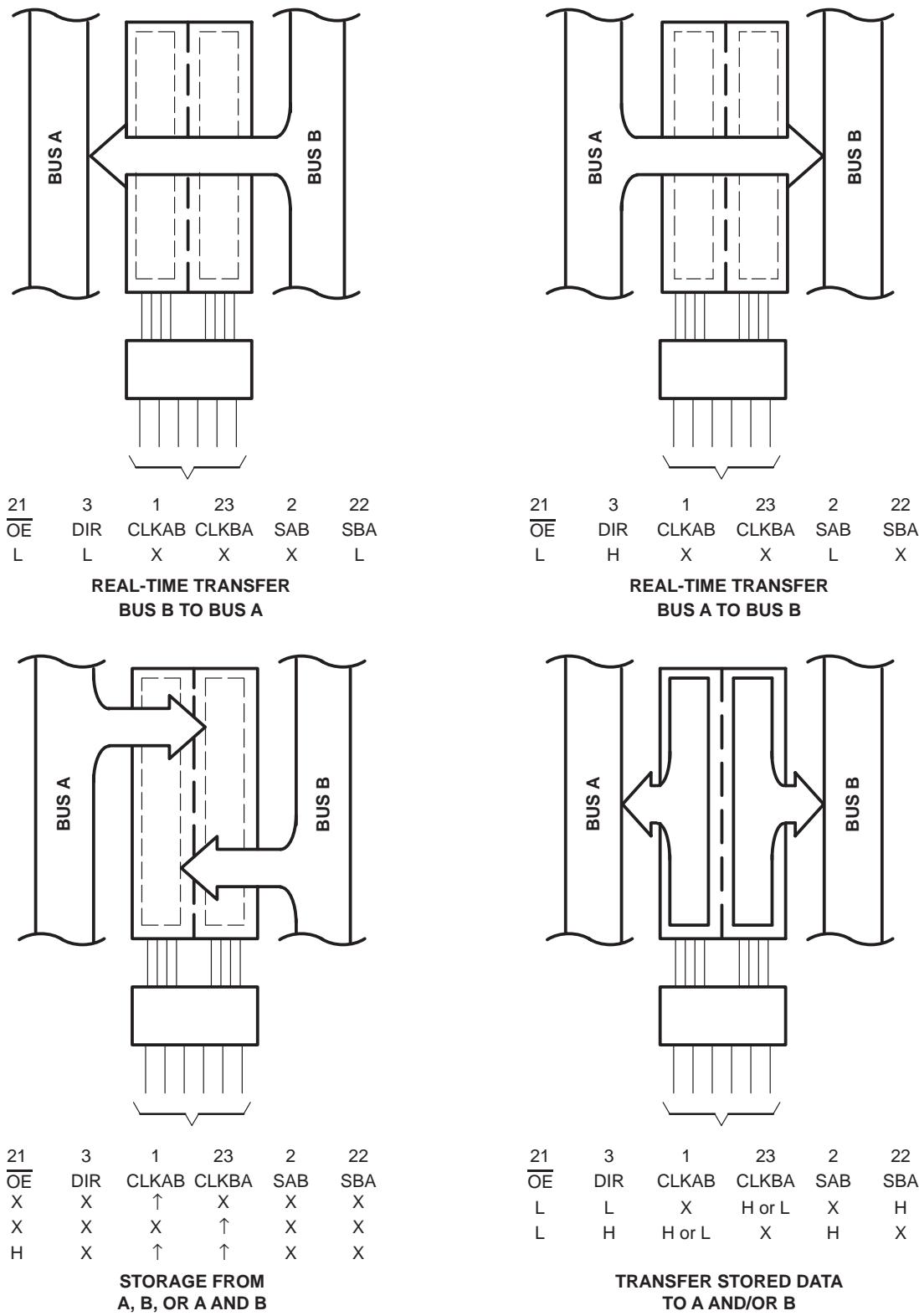
† The data-output functions can be enabled or disabled by various signals at  $\overline{OE}$  and DIR. Data-input functions always are enabled; i.e., data at the bus terminals is stored on every low-to-high transition of the clock inputs.



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Pin numbers shown are for the DB, DGV, DW, JT, NS, PW, and W packages.

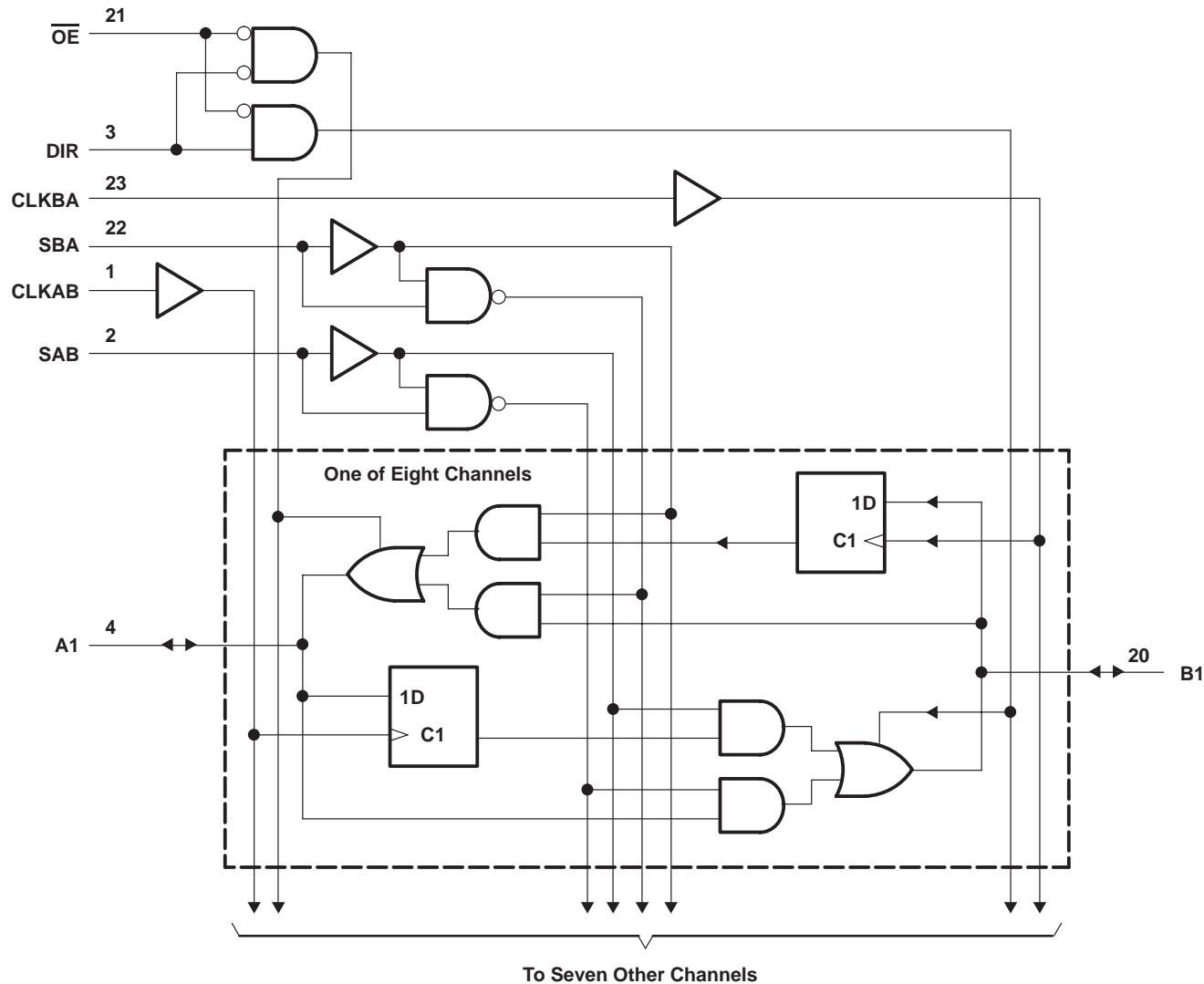
**Figure 1. Bus-Management Functions**

# SN54LVTH646, SN74LVTH646

## 3.3-V ABT OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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### logic diagram (positive logic)



**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)**

† 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.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
 2. This current flows only when the output is in the high state and  $V_O > V_{CC}$ .  
 3. The package thermal impedance is calculated in accordance with JEDEC 51-7.

#### **recommended operating conditions (see Note 4)**

		SN54LVTH646		SN74LVTH646		UNIT	
		MIN	MAX	MIN	MAX		
V <sub>CC</sub>	Supply voltage	2.7	3.6	2.7	3.6	V	
V <sub>IH</sub>	High-level input voltage	2		2		V	
V <sub>IL</sub>	Low-level input voltage		0.8		0.8	V	
V <sub>I</sub>	Input voltage		5.5		5.5	V	
I <sub>OH</sub>	High-level output current		-24		-32	mA	
I <sub>OL</sub>	Low-level output current		48		64	mA	
Δt/Δv	Input transition rise or fall rate	Outputs enabled		10	10	ns/V	
Δt/ΔV <sub>CC</sub>	Power-up ramp rate			200	200	μs/V	
T <sub>A</sub>	Operating free-air temperature		-55	125	-40	85	°C

NOTE 4: All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN54LVTH646, SN74LVTH646

## 3.3-V ABT OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS	SN54LVTH646			SN74LVTH646			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 2.7 \text{ V}$ , $I_I = -18 \text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$ , $I_{OH} = -100 \mu\text{A}$	$V_{CC} - 0.2$			$V_{CC} - 0.2$			V
	$V_{CC} = 2.7 \text{ V}$ , $I_{OH} = -8 \text{ mA}$	2.4			2.4			
	$V_{CC} = 3 \text{ V}$	$I_{OH} = -24 \text{ mA}$	2					
		$I_{OH} = -32 \text{ mA}$			2			
$V_{OL}$	$V_{CC} = 2.7 \text{ V}$	$I_{OL} = 100 \mu\text{A}$		0.2			0.2	V
		$I_{OL} = 24 \text{ mA}$		0.5			0.5	
	$V_{CC} = 3 \text{ V}$	$I_{OL} = 16 \text{ mA}$		0.4			0.4	
		$I_{OL} = 32 \text{ mA}$		0.5			0.5	
		$I_{OL} = 48 \text{ mA}$		0.55				
		$I_{OL} = 64 \text{ mA}$					0.55	
$I_I$	Control inputs	$V_{CC} = 3.6 \text{ V}$ , $V_I = V_{CC}$ or GND		±1			±1	μA
		$V_{CC} = 0$ or $3.6 \text{ V}$ , $V_I = 5.5 \text{ V}$		10			10	
	A or B ports‡	$V_{CC} = 3.6 \text{ V}$	$V_I = 5.5 \text{ V}$	20			20	
			$V_I = V_{CC}$	1			1	
		$V_I = 0$		-5			-5	
$I_{off}$	$V_{CC} = 0$ , $V_I$ or $V_O = 0$ to $4.5 \text{ V}$						±100	μA
$I_I$ (hold)	A or B ports	$V_{CC} = 3 \text{ V}$	$V_I = 0.8 \text{ V}$	75			75	μA
			$V_I = 2 \text{ V}$	-75			-75	
		$V_{CC} = 3.6 \text{ V}$ §	$V_I = 0$ to $3.6 \text{ V}$				±500	
$I_{OZPU}$	$V_{CC} = 0$ to $1.5 \text{ V}$ , $V_O = 0.5 \text{ V}$ to $3 \text{ V}$ , $OE = \text{don't care}$			±100			±100	μA
$I_{OZPD}$	$V_{CC} = 1.5 \text{ V}$ to $0$ , $V_O = 0.5 \text{ V}$ to $3 \text{ V}$ , $OE = \text{don't care}$			±100			±100	μA
$I_{CC}$	$V_{CC} = 3.6 \text{ V}$ , $I_O = 0$ , $V_I = V_{CC}$ or GND	Outputs high		0.19			0.19	mA
		Outputs low		5			5	
		Outputs disabled		0.19			0.19	
$\Delta I_{CC}¶$	$V_{CC} = 3 \text{ V}$ to $3.6 \text{ V}$ , One input at $V_{CC} - 0.6 \text{ V}$ , Other inputs at $V_{CC}$ or GND			0.2			0.2	mA
$C_i$	$V_I = 3 \text{ V}$ or $0$			4			4	pF
$C_{io}$	$V_O = 3 \text{ V}$ or $0$			9			9	pF

† All typical values are at  $V_{CC} = 3.3 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ Unused terminals at  $V_{CC}$  or GND

§ This is the bus-hold maximum dynamic current. It is the minimum overdrive current required to switch the input from one state to another.

¶ This is the increase in supply current for each input that is at the specified TTL voltage level, rather than  $V_{CC}$  or GND.

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**timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 2)**

			SN54LVTH646		SN74LVTH646		UNIT	
			V <sub>CC</sub> = 3.3 V ± 0.3 V		V <sub>CC</sub> = 2.7 V			
			MIN	MAX	MIN	MAX		
f <sub>clock</sub>	Clock frequency		150	150	150	150	150	MHz
t <sub>W</sub>	Pulse duration, CLK high or low		3.3	3.3	3.3	3.3	3.3	ns
t <sub>su</sub>	Setup time, A or B before CLKAB↑ or CLKBA↑	Data high	1.3	1.6	1.2	1.5	1.5	ns
		Data low	1.9	2.6	1.6	2.2	2.2	
t <sub>h</sub>	Hold time, A or B after CLKAB↑ or CLKBA↑		1.2	1.2	0.8	0.8	0.8	ns

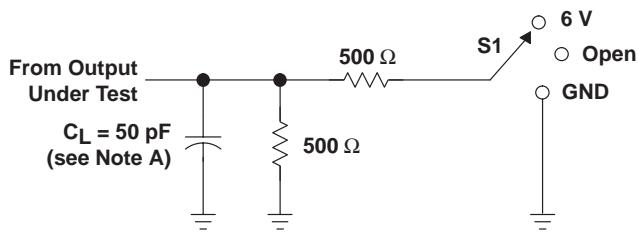
**switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 2)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVTH646		SN74LVTH646		UNIT		
			V <sub>CC</sub> = 3.3 V ± 0.3 V		V <sub>CC</sub> = 2.7 V				
			MIN	MAX	MIN	MAX			
f <sub>max</sub>			150	150	150	150	150	MHz	
t <sub>PLH</sub>	CLKBA or CLKAB	A or B	1	5.3	5.9	1.8	3.1	4.7	ns
			1.5	5	5.9	1.8	3.1	4.7	
t <sub>PLH</sub>	A or B	B or A	1	4.9	5.6	1.3	2.3	3.5	ns
			1.2	4.8	5	1.3	2.4	3.5	
t <sub>PLH</sub>	SBA or SAB‡	A or B	1	5.3	6.3	1.5	3	4.9	ns
			1.3	5.3	6.3	1.5	3.3	4.9	
t <sub>PZH</sub>	OE	A or B	1	5.4	6.7	1.1	3.1	5.2	ns
			1	5.6	6.7	1.1	3.4	5.2	
t <sub>PHZ</sub>	OE	A or B	1.7	6.3	6.5	2.3	3.9	5.5	ns
			2.2	6.3	6.5	2.3	4	5.5	
t <sub>PZL</sub>	DIR	A or B	1.2	5.6	6.8	1.3	3.4	5.2	ns
			1.2	6.7	6.8	1.3	3.6	5.2	
t <sub>PHZ</sub>	DIR	A or B	1.1	7.2	8.1	1.5	3.2	5.6	ns
			1.4	6.1	6.6	1.5	3.8	5.6	

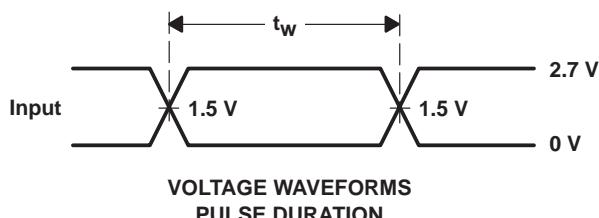
† All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

‡ These parameters are measured with the internal output state of the storage register opposite that of the bus input.

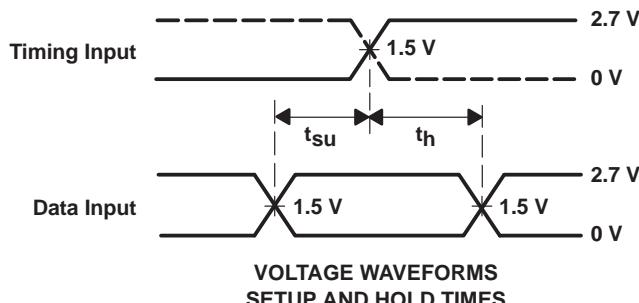
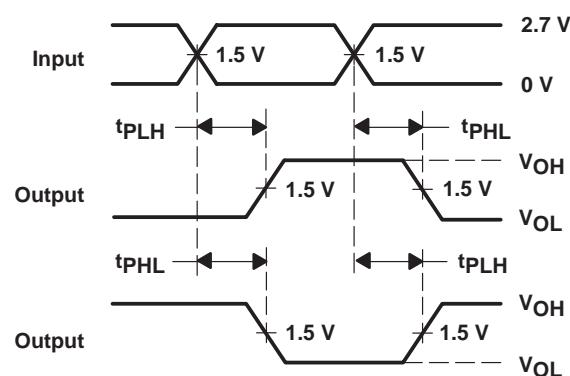
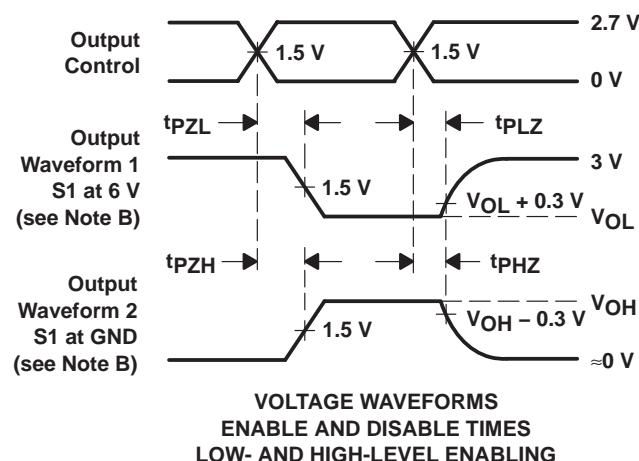
## PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

VOLTAGE WAVEFORMS  
PULSE DURATION

TEST	S1
tPLH/tPHL	Open
tPLZ/tPZL	6 V
tPHZ/tPZH	GND

VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMESVOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTSVOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLINGNOTES: 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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
- D. The outputs are measured one at a time, with one transition per measurement.
- E. All parameters and waveforms are not applicable to all devices.

Figure 2. Load Circuit and Voltage Waveforms

**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
5962-9674801Q3A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962-9674801Q3A SNJ54LVTH646FK	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9674801QKA	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9674801QKA SNJ54LVTH646W	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9674801QLA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9674801QLA SNJ54LVTH646JT	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74LVTH646DBLE	OBsolete	SSOP	DB	24		TBD	Call TI	Call TI	-40 to 85		
SN74LVTH646DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH646	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74LVTH646DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVTH646	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74LVTH646PWLE	OBsolete	TSSOP	PW	24		TBD	Call TI	Call TI	-40 to 85		
SN74LVTH646PWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LXH646	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54LVTH646FK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962-9674801Q3A SNJ54LVTH646FK	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54LVTH646JT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9674801QLA SNJ54LVTH646JT	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54LVTH646W	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9674801QKA SNJ54LVTH646W	<span style="background-color: red; color: white; padding: 2px;">Samples</span>

(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) 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.

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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 SN54LVTH646, SN74LVTH646 :

- Catalog: [SN74LVTH646](#)
- Enhanced Product: [SN74LVTH646-EP](#), [SN74LVTH646-EP](#)
- Military: [SN54LVTH646](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product



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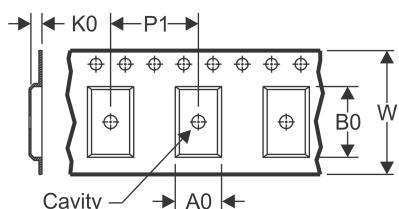
## PACKAGE OPTION ADDENDUM

10-Jun-2014

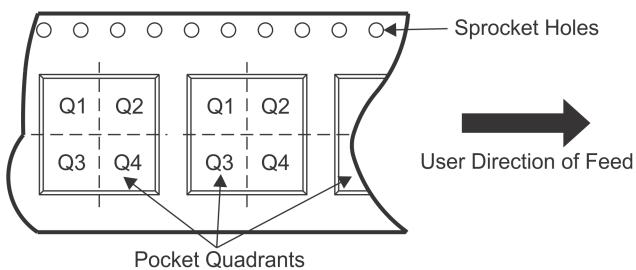
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- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**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
SN74LVTH646PWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**

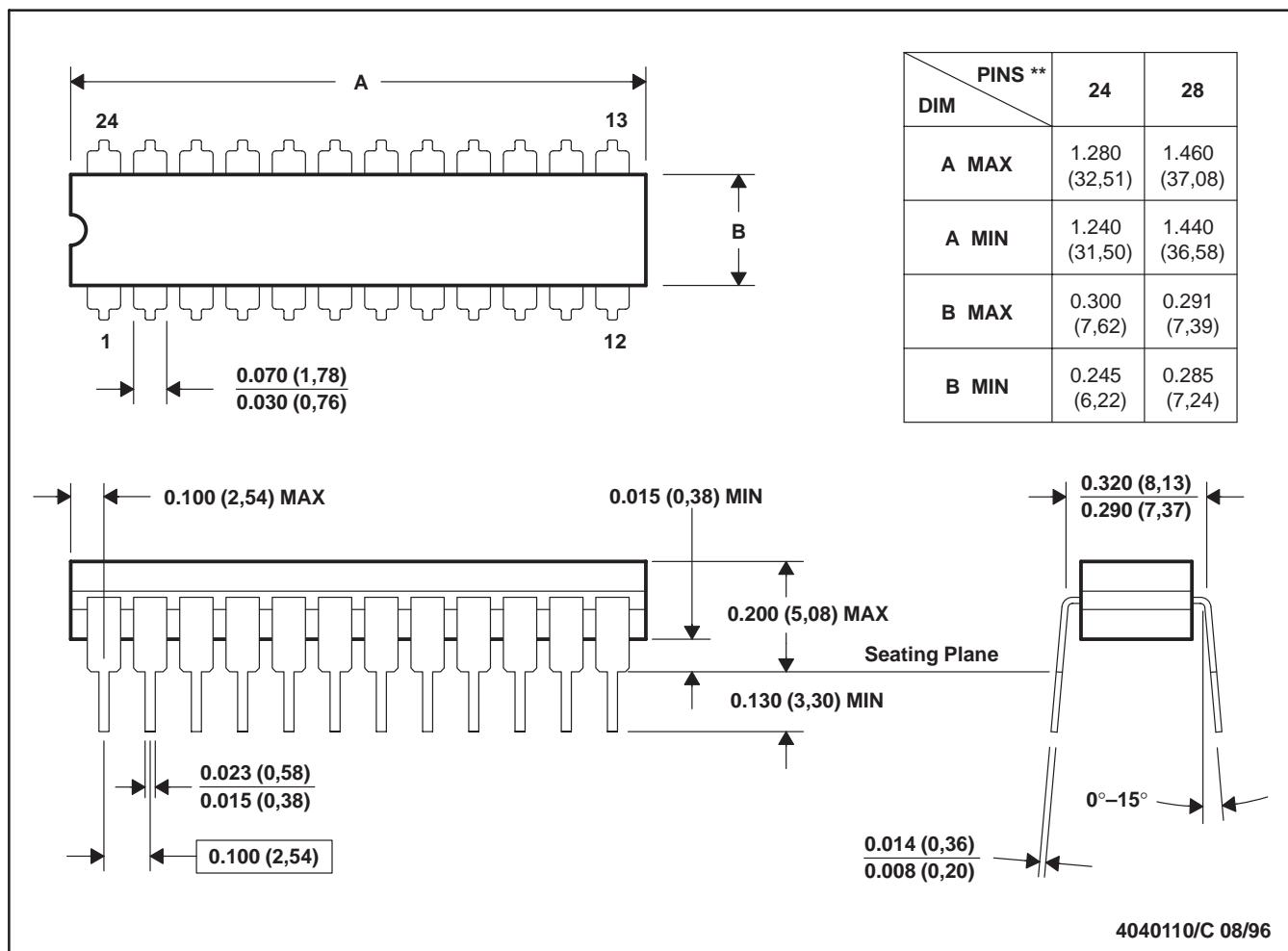
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVTH646PWR	TSSOP	PW	24	2000	367.0	367.0	38.0

## JT (R-GDIP-T\*\*)

24 LEADS SHOWN

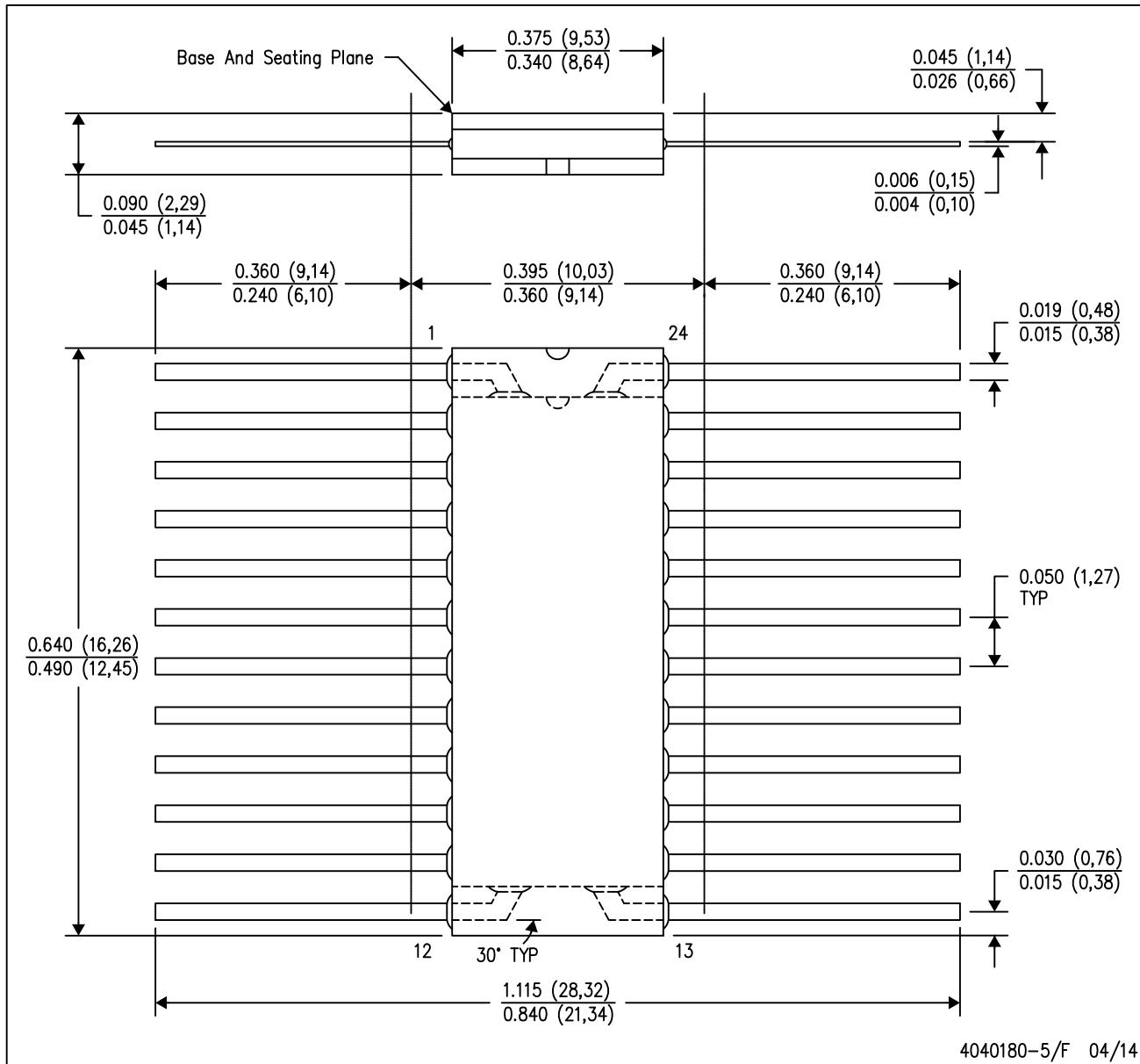
## CERAMIC DUAL-IN-LINE



NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. This package can be hermetically sealed with a ceramic lid using glass frit.  
 D. Index point is provided on cap for terminal identification.  
 E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

W (R-GDFP-F24)

## CERAMIC DUAL FLATPACK



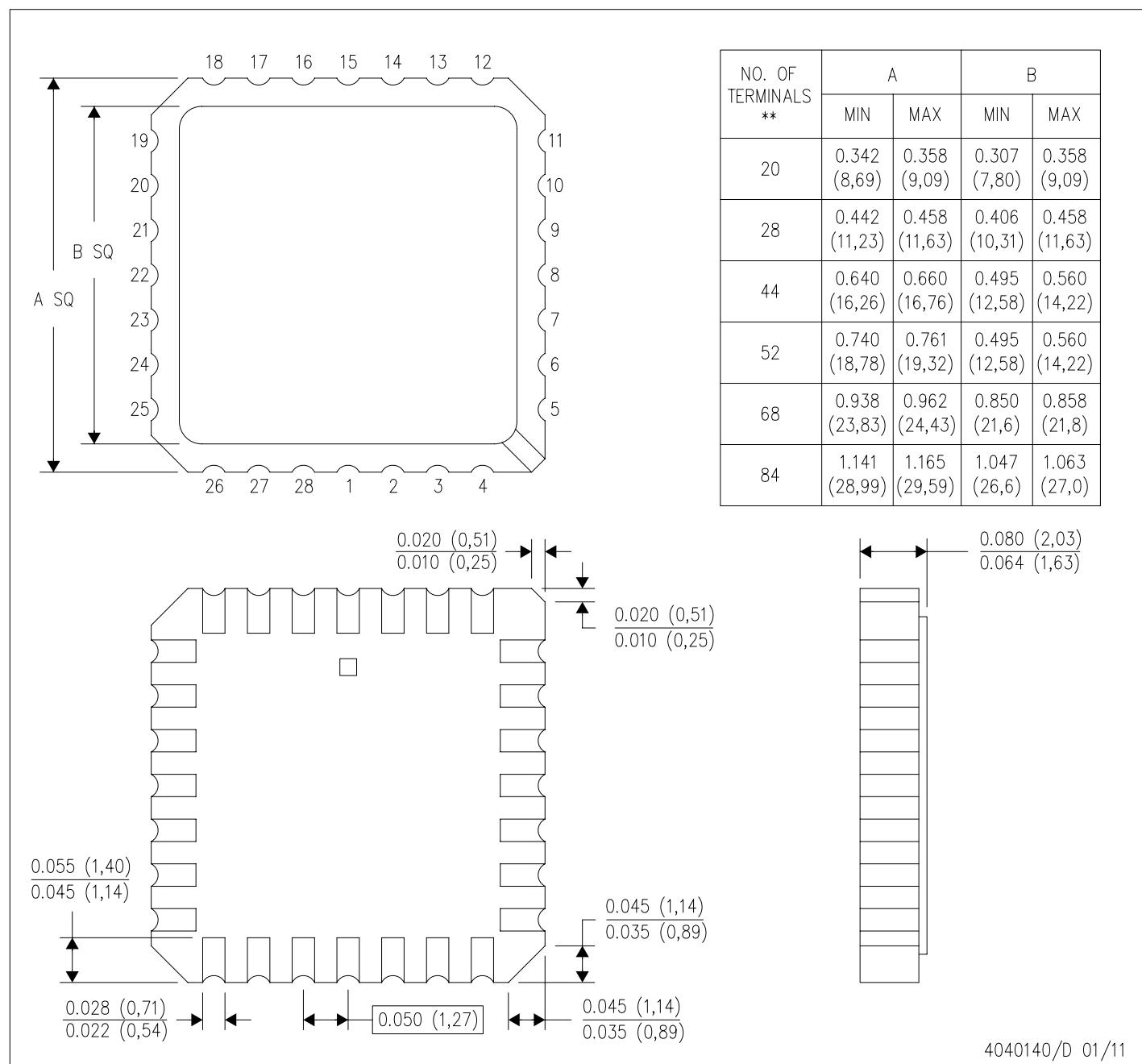
NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within Mil-Std 1835 GDFP2-F20

FK (S-CQCC-N\*\*)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



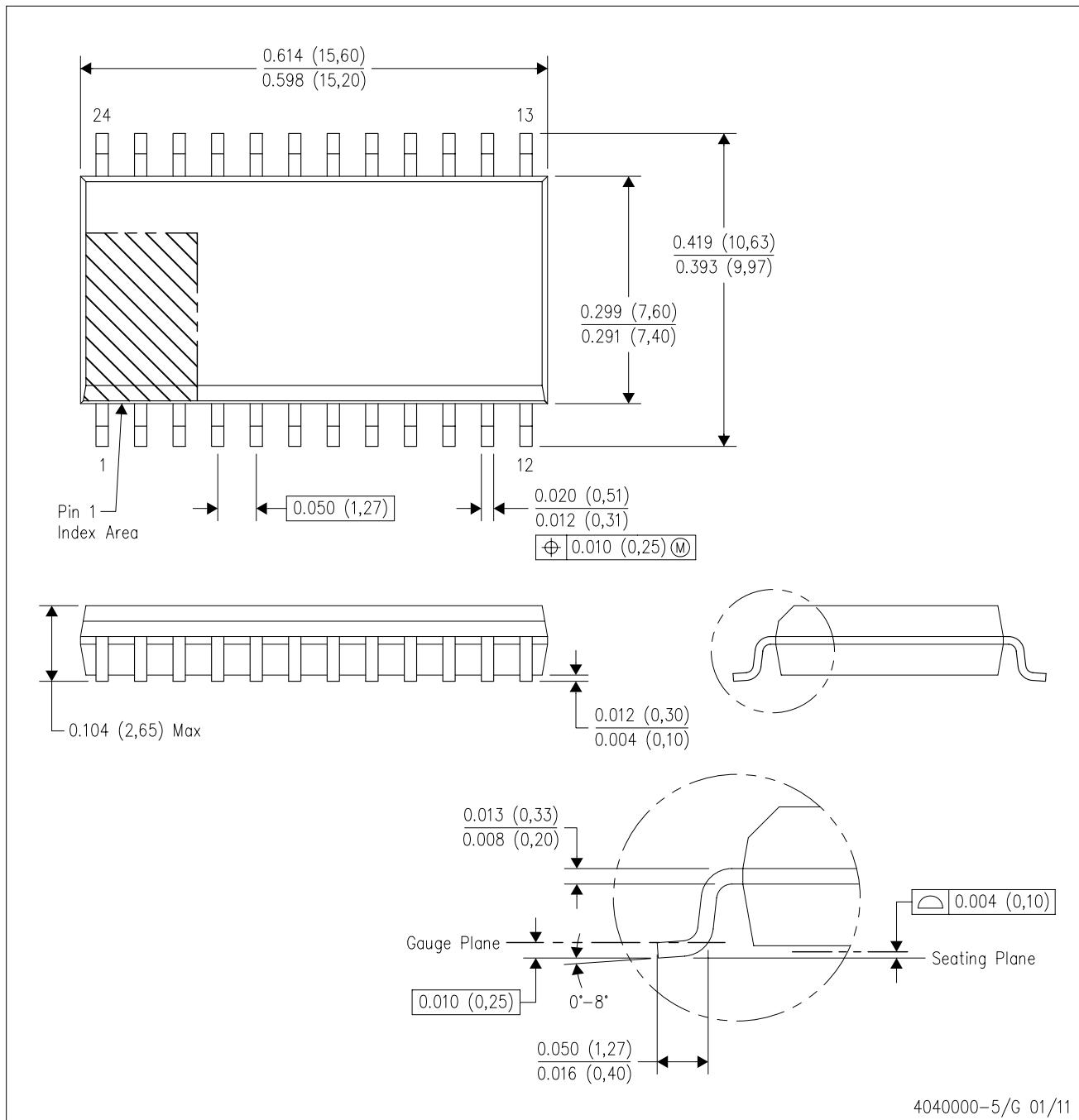
NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. Falls within JEDEC MS-004

4040140/D 01/11

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE

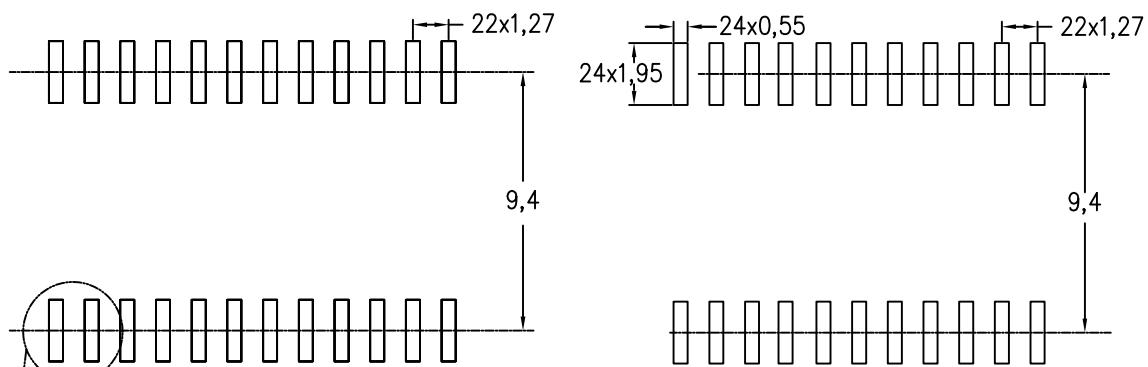


NOTES:

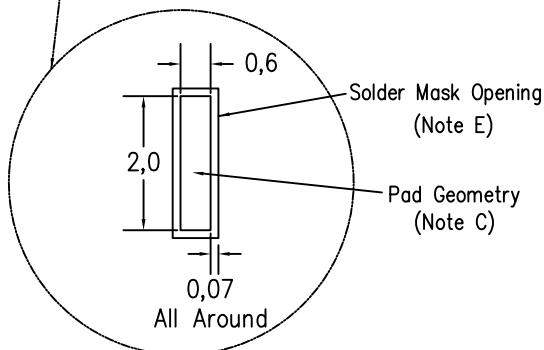
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
- This drawing is subject to change without notice.
- Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0.15).
- Falls within JEDEC MS-013 variation AD.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE

Example Board Layout  
(Note C)Stencil Openings  
(Note D)

Non Solder Mask Define Pad



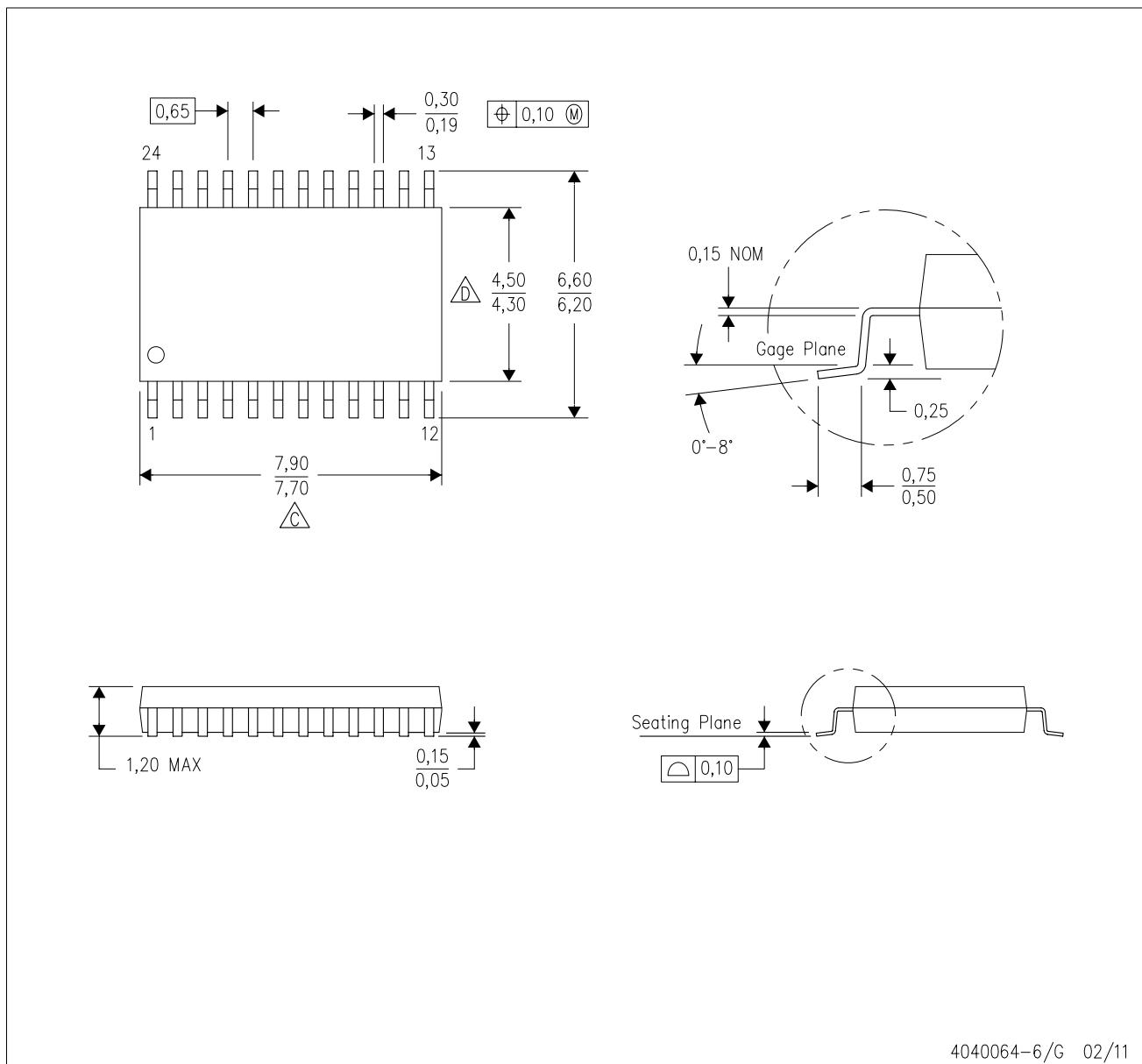
4209202-5/F 08/13

NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Refer to IPC7351 for alternate board design.
- 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
- Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



4040064-6/G 02/11

NOTES:

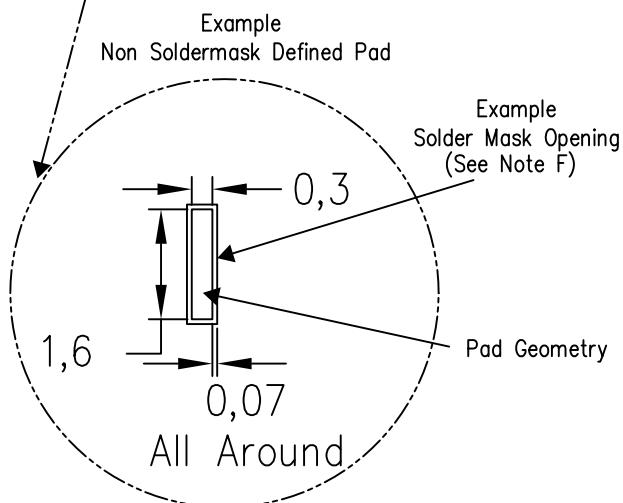
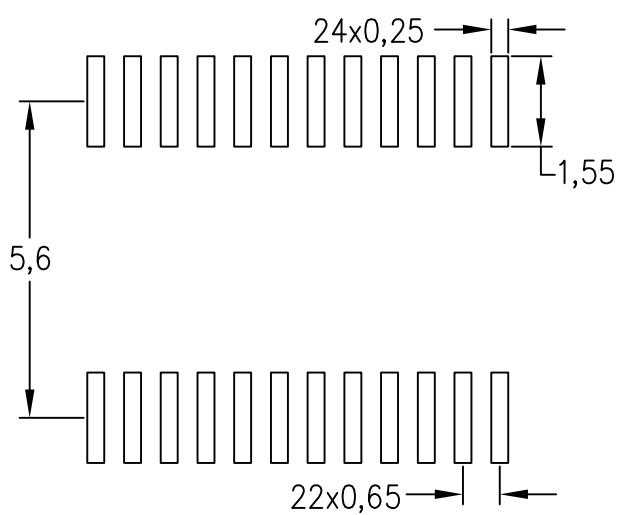
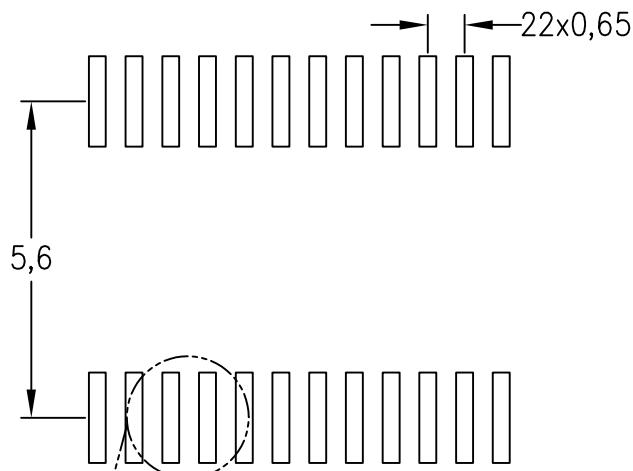
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
- B. This drawing is subject to change without notice.
-  C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
-  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-G24)

## PLASTIC SMALL OUTLINE

Example Board Layout

Stencil Openings  
Based on a stencil thickness  
of .127mm (.005inch).



4211284-4/F 12/12

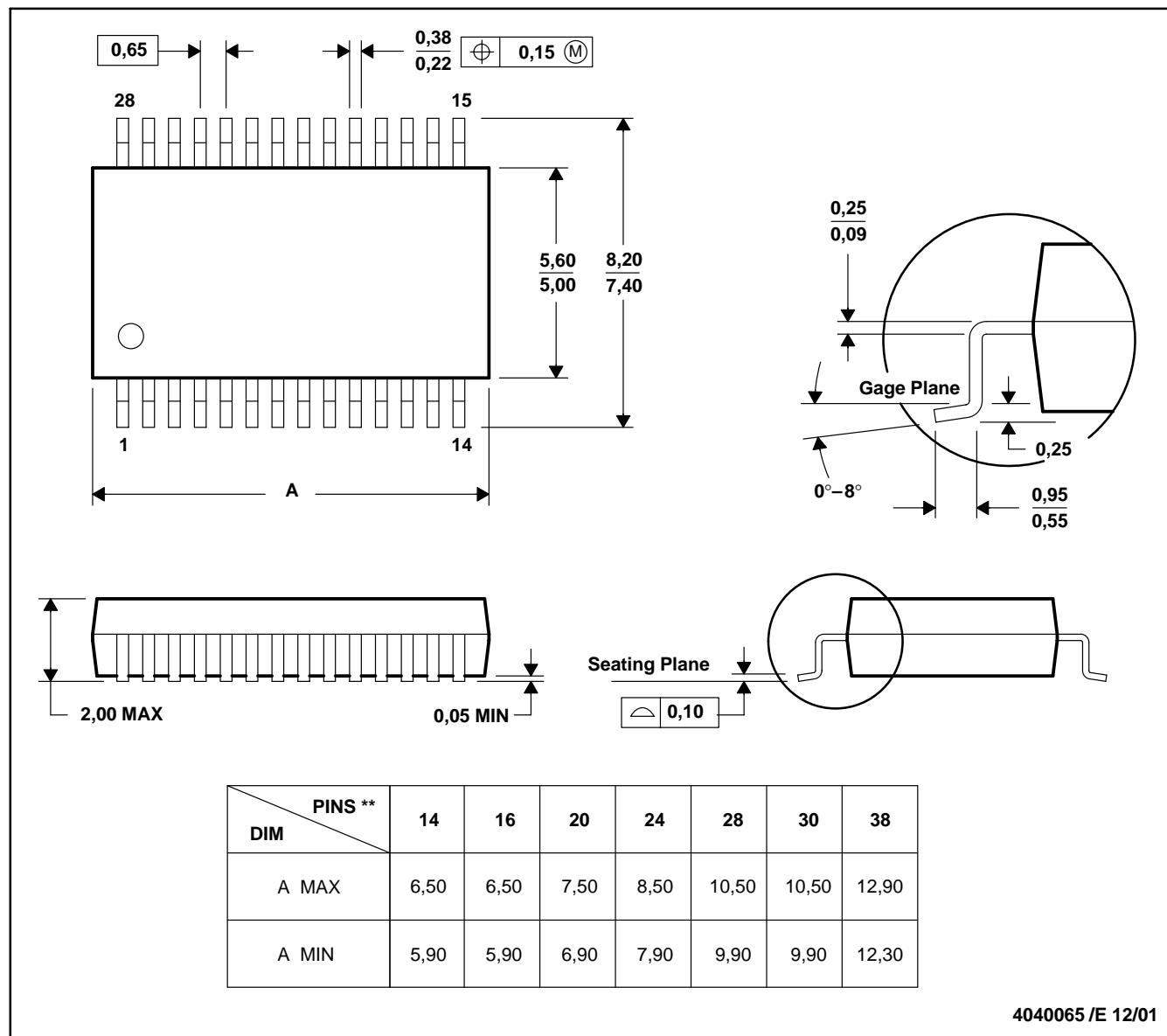
NOTES:

- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate design.
- 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.

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

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DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
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