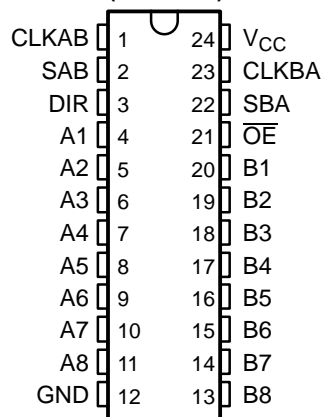


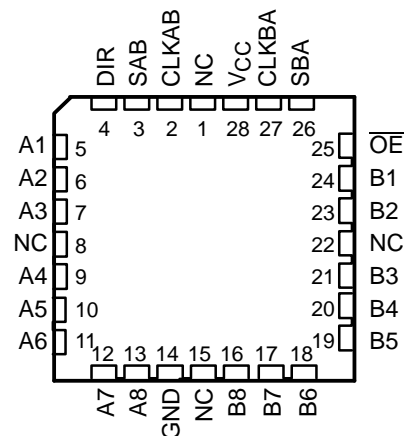
FEATURES

- Operate From 1.65 V to 3.6 V
- Inputs Accept Voltages to 5.5 V
- Max t_{pd} of 7.4 ns at 3.3 V
- Typical V_{OLP} (Output Ground Bounce) <0.8 at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) >2 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Support Mixed-Mode Signal Operation on All Ports (5-V Input/Output Voltage With 3.3-V V_{CC})
- I_{off} Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

SN54LVC646A . . . JT OR W PACKAGE
SN74LVC646A . . . DB, DW, NS, OR PW PACKAGE
(TOP VIEW)



SN54LVC646A . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

DESCRIPTION/ORDERING INFORMATION

The SN54LVC646A octal bus transceiver and register is designed for 2.7-V to 3.6-V V_{CC} operation, and the SN74LVC646A octal bus transceiver and register is designed for 1.65-V to 3.6-V V_{CC} operation.

ORDERING INFORMATION

T_A	PACKAGE ⁽¹⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SOIC – DW	Tube of 25	SN74LVC646ADW	LVC646A
		Reel of 2000	SN74LVC646ADWR	
	SOP – NS	Reel of 2000	SN74LVC646ANSR	LVC646A
	SSOP – DB	Reel of 2000	SN74LVC646ADBR	LC646A
	TSSOP – PW	Tube of 60	SN74LVC646APW	LC646A
		Reel of 2000	SN74LVC646APWR	
Reel of 250		SN74LVC646APWT		
-55°C to 125°C	CDIP – JT	Tube of 15	SNJ54LVC646AJT	SNJ54LVC646AJT
	CFP – W	Tube of 85	SNJ54LVC646AW	SNJ54LVC646AW
	LCCC – FK	Tube of 42	SNJ54LVC646AFK	SNJ54LVC646AFK

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.

SN54LVC646A, SN74LVC646A OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCAS302J—JANUARY 1993—REVISED AUGUST 2005

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

These 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 are performed with the 'LVC646A devices.

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

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

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

These devices are 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.

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.

FUNCTION TABLE

INPUTS						DATA I/O		OPERATION OR FUNCTION
\overline{OE}	DIR	CLKAB	CLKBA	SAB	SBA	A1–A8	B1–B8	
X	X	↑	X	X	X	Input	Unspecified ⁽¹⁾	Store A, B unspecified ⁽¹⁾
X	X	X	↑	X	X	Unspecified ⁽¹⁾	Input	Store B, A unspecified ⁽¹⁾
H	X	↑	↑	X	X	Input	Input	Store 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

(1) 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.

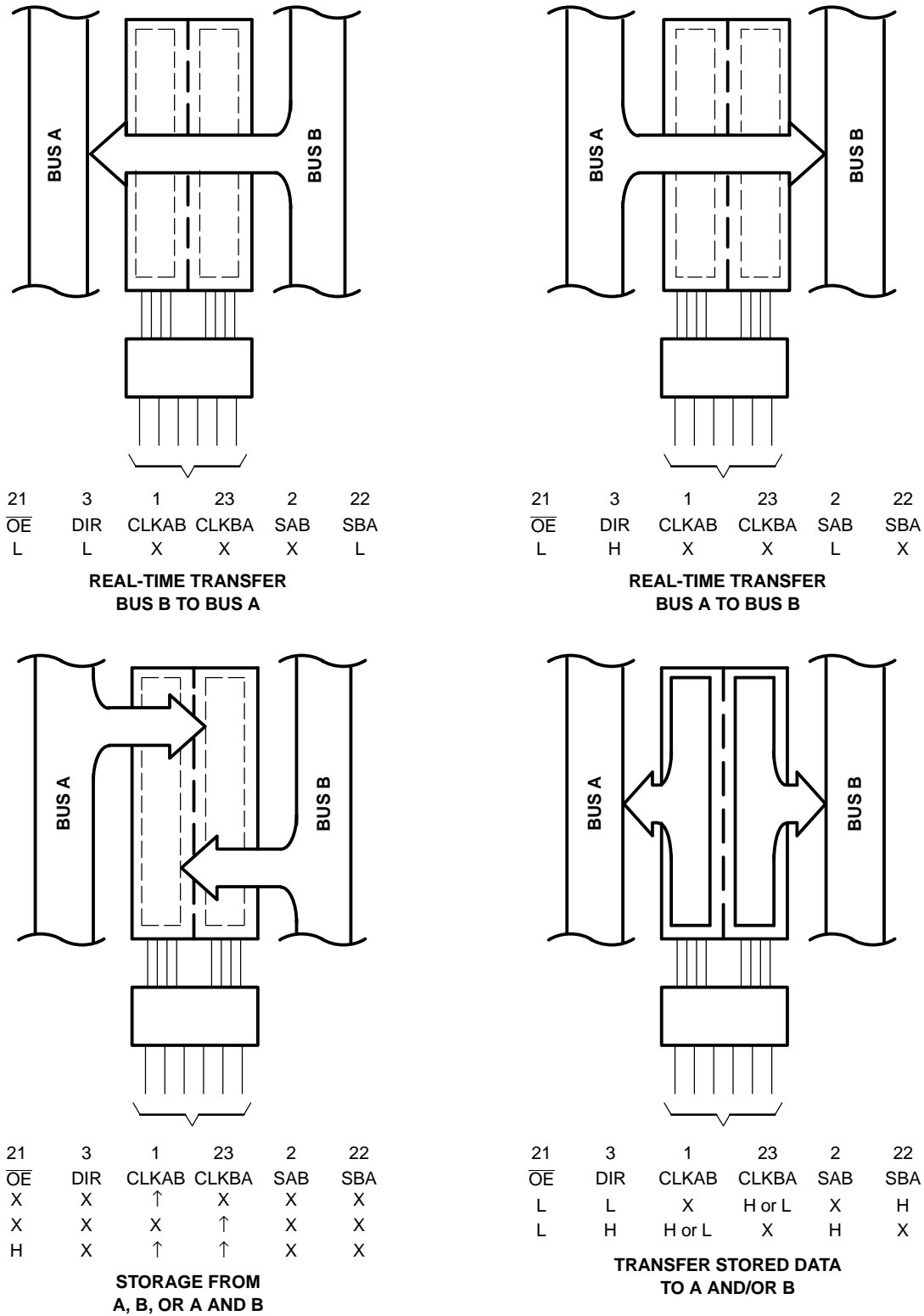
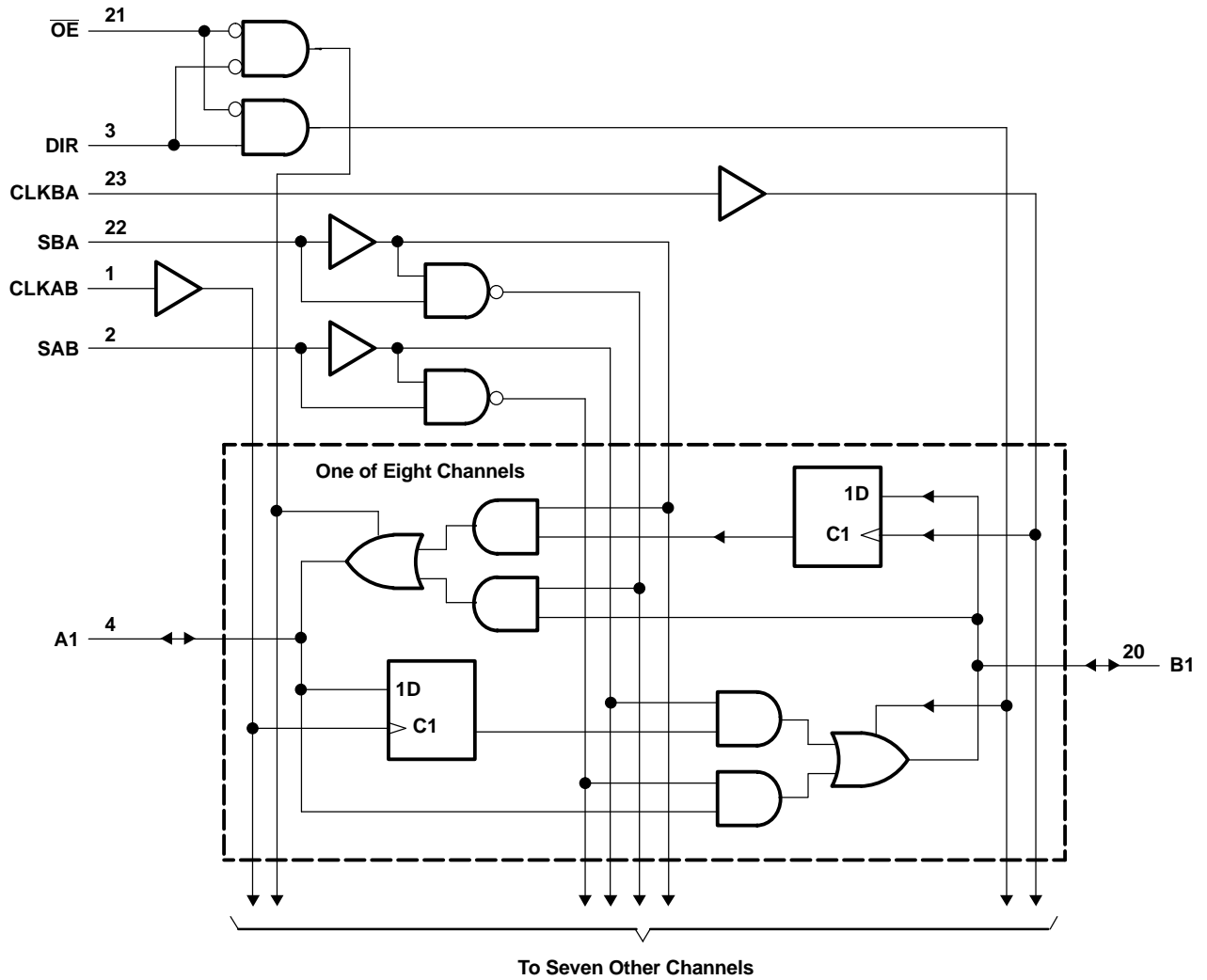


Figure 1. Bus-Management Functions

SN54LVC646A, SN74LVC646A
OCTAL BUS TRANSCEIVERS AND REGISTERS
WITH 3-STATE OUTPUTS

SCAS302J—JANUARY 1993—REVISED AUGUST 2005

LOGIC DIAGRAM (POSITIVE LOGIC)



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

Absolute Maximum Ratings⁽¹⁾

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	6.5	V
V _I	Input voltage range ⁽²⁾	-0.5	6.5	V
V _O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾	-0.5	6.5	V
V _O	Voltage range applied to any output in the high or low state ⁽²⁾⁽³⁾	-0.5	V _{CC} + 0.5	V
I _{IK}	Input clamp current	V _I < 0	-50	mA
I _{OK}	Output clamp current	V _O < 0	-50	mA
I _O	Continuous output current		±50	mA
	Continuous current through V _{CC} or GND		±100	mA
θ _{JA}	Package thermal impedance ⁽⁴⁾	DB package	63	°C/W
		DW package	46	
		NS package	65	
		PW package	88	
T _{stg}	Storage temperature range	-65	150	°C

- (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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V_{CC} is provided in the recommended operating conditions table.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions⁽¹⁾

		SN54LVC646A		SN74LVC646A		UNIT	
		MIN	MAX	MIN	MAX		
V _{CC}	Supply voltage	Operating	2	3.6	1.65	3.6	V
		Data retention only	1.5		1.5		
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V			0.65 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V			1.7		
		V _{CC} = 2.7 V to 3.6 V	2		2		
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V			0.35 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V				0.7	
		V _{CC} = 2.7 V to 3.6 V		0.8		0.8	
V _I	Input voltage	0	5.5			5.5	V
V _O	Output voltage	High or low state	0	V _{CC}		V _{CC}	V
		3-state	0	5.5		5.5	
I _{OH}	High-level output current	V _{CC} = 1.65 V				-4	mA
		V _{CC} = 2.3 V				-8	
		V _{CC} = 2.7 V		-12		-12	
		V _{CC} = 3 V		-24		-24	
I _{OL}	Low-level output current	V _{CC} = 1.65 V				4	mA
		V _{CC} = 2.3 V				8	
		V _{CC} = 2.7 V		12		12	
		V _{CC} = 3 V		24		24	
Δt/Δv	Input transition rise or fall rate		10			10	ns/V
T _A	Operating free-air temperature	-55	125	-40		85	°C

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

SN54LVC646A, SN74LVC646A OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCAS302J–JANUARY 1993–REVISED AUGUST 2005

Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V _{CC}	SN54LVC646A			SN74LVC646A			UNIT	
			MIN	TYP ⁽¹⁾	MAX	MIN	TYP ⁽¹⁾	MAX		
V _{OH}	I _{OH} = –100 μA	1.65 V to 3.6 V				V _{CC} – 0.2			V	
		2.7 V to 3.6 V	V _{CC} – 0.2							
	I _{OH} = –4 mA	1.65 V			1.2					
	I _{OH} = –8 mA	2.3 V			1.7					
	I _{OH} = –12 mA	2.7 V	2.2			2.2				
		3 V	2.4			2.4				
I _{OH} = –24 mA	3 V	2.2			2.2					
V _{OL}	I _{OL} = 100 μA	1.65 V to 3.6 V				0.2			V	
		2.7 V to 3.6 V				0.2				
	I _{OL} = 4 mA	1.65 V			0.45					
	I _{OL} = 8 mA	2.3 V			0.7					
	I _{OL} = 12 mA	2.7 V				0.4				
3 V		0.55			0.55					
I _I	Control inputs	V _I = 0 to 5.5 V	3.6 V			±5			μA	
I _{off}		V _I or V _O = 5.5 V	0			±10			μA	
I _{OZ} ⁽²⁾		V _O = 0 to 5.5 V	3.6 V			±15			μA	
I _{CC}		V _I = V _{CC} or GND 3.6 V ≤ V _I ≤ 5.5 V ⁽³⁾	I _O = 0	3.6 V			10			μA
							10			
ΔI _{CC}		One input at V _{CC} – 0.6 V, Other inputs at V _{CC} or GND	2.7 V to 3.6 V			500			μA	
C _i	Control inputs	V _I = V _{CC} or GND	3.3 V			4.5			pF	
C _{io}	A or B port	V _O = V _{CC} or GND	3.3 V			7.5			pF	

(1) All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

(2) For I/O ports, the parameter I_{OZ} includes the input leakage current.

(3) This applies in the disabled state only.

Timing Requirements

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

		SN54LVC646A				UNIT
		V _{CC} = 2.7 V		V _{CC} = 3.3 V ± 0.3 V		
		MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency	150		150		MHz
t _w	Pulse duration	3.3		3.3		ns
t _{su}	Setup time, data before CLK↑	1.6		1.5		ns
t _h	Hold time, data after CLK↑	1.7		1.7		ns

Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 2](#))

		SN74LVC646A								UNIT
		$V_{CC} = 1.8\text{ V}$ $\pm 0.18\text{ V}$		$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f_{clock}	Clock frequency	(1)		(1)		150		150		MHz
t_w	Pulse duration	(1)		(1)		3.3		3.3		ns
t_{su}	Setup time, data before CLK \uparrow	(1)		(1)		1.6		1.5		ns
t_h	Hold time, data after CLK \uparrow	(1)		(1)		1.7		1.7		ns

(1) This information was not available at the time of publication.

Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVC646A				UNIT
			$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		
			MIN	MAX	MIN	MAX	
f_{max}			150		150		MHz
t_{pd}	A or B	B or A	7.9		1	7.4	ns
	CLK	A or B	8.8		1	8.4	
	SBA or SAB		9.9		1	8.6	
t_{en}	$\overline{\text{OE}}$	A	10.2		1	8.2	ns
t_{dis}	$\overline{\text{OE}}$	A	8.9		1	7.5	ns
t_{en}	DIR	B	10.4		1	8.3	ns
t_{dis}	DIR	B	8.7		1	7.9	ns

Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74LVC646A								UNIT
			$V_{CC} = 1.8\text{ V}$ $\pm 0.15\text{ V}$		$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f_{max}			(1)		(1)		150		150		MHz
t_{pd}	A or B	B or A	(1)	(1)	(1)	(1)	7.9		1	7.4	ns
	CLK	A or B	(1)	(1)	(1)	(1)	8.8		1	8.4	
	SBA or SAB		(1)	(1)	(1)	(1)	9.9		1	8.6	
t_{en}	$\overline{\text{OE}}$	A	(1)	(1)	(1)	(1)	10.2		1	8.2	ns
t_{dis}	$\overline{\text{OE}}$	A	(1)	(1)	(1)	(1)	8.9		1	7.5	ns
t_{en}	DIR	B	(1)	(1)	(1)	(1)	10.4		1	8.3	ns
t_{dis}	DIR	B	(1)	(1)	(1)	(1)	8.7		1	7.9	ns

(1) This information was not available at the time of publication.

SN54LVC646A, SN74LVC646A OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCAS302J—JANUARY 1993—REVISED AUGUST 2005

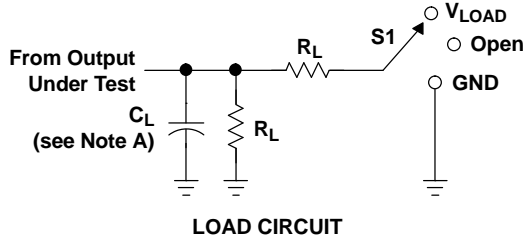
Operating Characteristics

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

PARAMETER		TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	UNIT	
			TYP	TYP	TYP		
C _{pd}	Power dissipation capacitance per transceiver	Outputs enabled	f = 10 MHz	(1)	(1)	75	pF
				Outputs disabled	(1)	(1)	

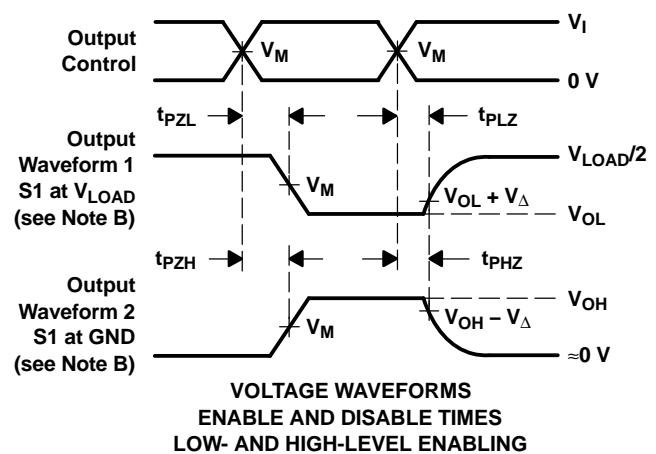
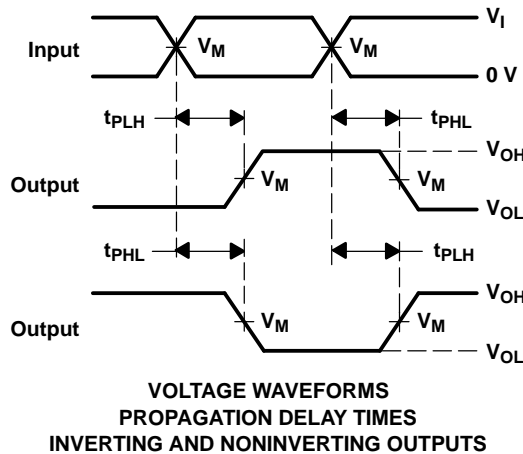
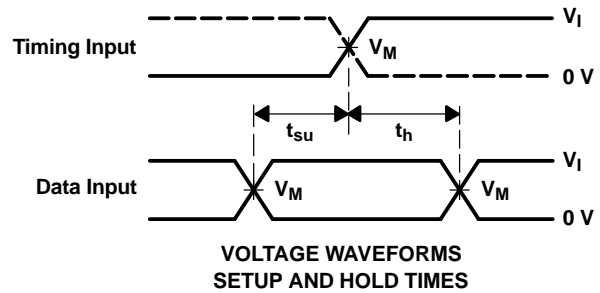
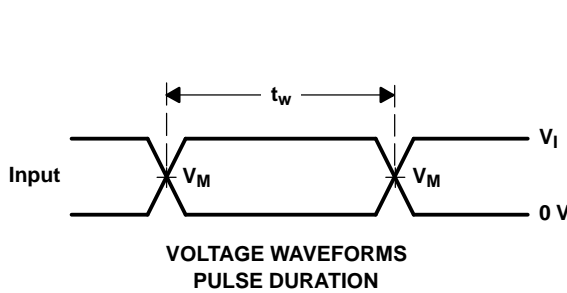
(1) This information was not available at the time of publication.

PARAMETER MEASUREMENT INFORMATION



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V
$3.3\text{ V} \pm 0.3\text{ V}$	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V



- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .
 - 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
5962-9762601Q3A	LIFEBUY	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9762601Q3A SNJ54LVC 646AFK	
5962-9762601QKA	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9762601QK A SNJ54LVC646AW	Samples
5962-9762601QLA	LIFEBUY	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9762601QL A SNJ54LVC646AJT	
SN74LVC646ADBLE	OBSOLETE	SSOP	DB	24		TBD	Call TI	Call TI	-40 to 85		
SN74LVC646ADBR	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LC646A	Samples
SN74LVC646ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVC646A	Samples
SN74LVC646ADWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVC646A	Samples
SN74LVC646APW	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LC646A	Samples
SN74LVC646APWLE	OBSOLETE	TSSOP	PW	24		TBD	Call TI	Call TI	-40 to 85		
SN74LVC646APWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LC646A	Samples
SNJ54LVC646AFK	LIFEBUY	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9762601Q3A SNJ54LVC 646AFK	
SNJ54LVC646AJT	LIFEBUY	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9762601QL A SNJ54LVC646AJT	
SNJ54LVC646AW	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9762601QK A SNJ54LVC646AW	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⁾ 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.

OTHER QUALIFIED VERSIONS OF SN54LVC646A, SN74LVC646A :

- Catalog: [SN74LVC646A](#)

- Military: [SN54LVC646A](#)

- Space: [SN54LVC646A-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

TAPE AND REEL INFORMATION

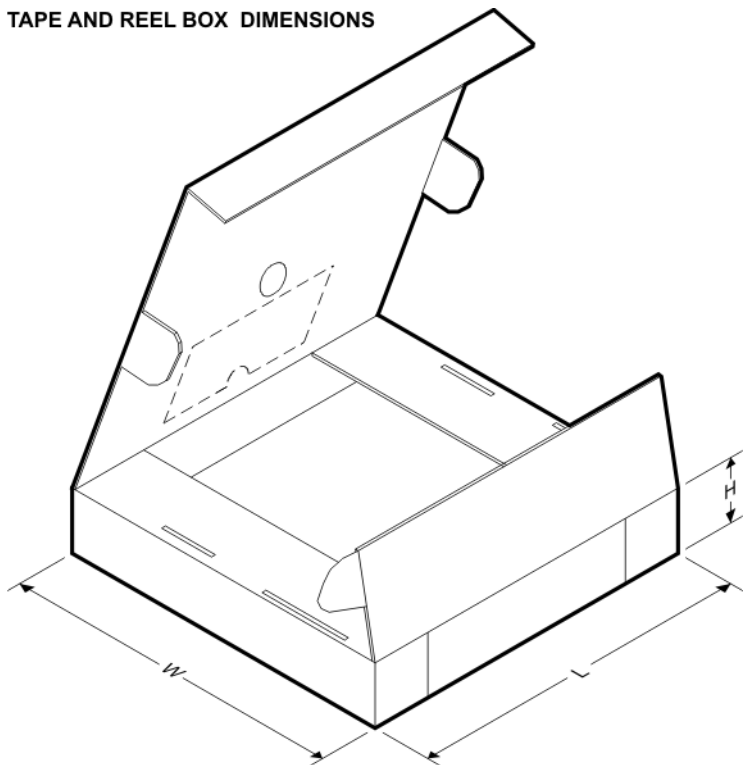


QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74LVC646ADBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
SN74LVC646APWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


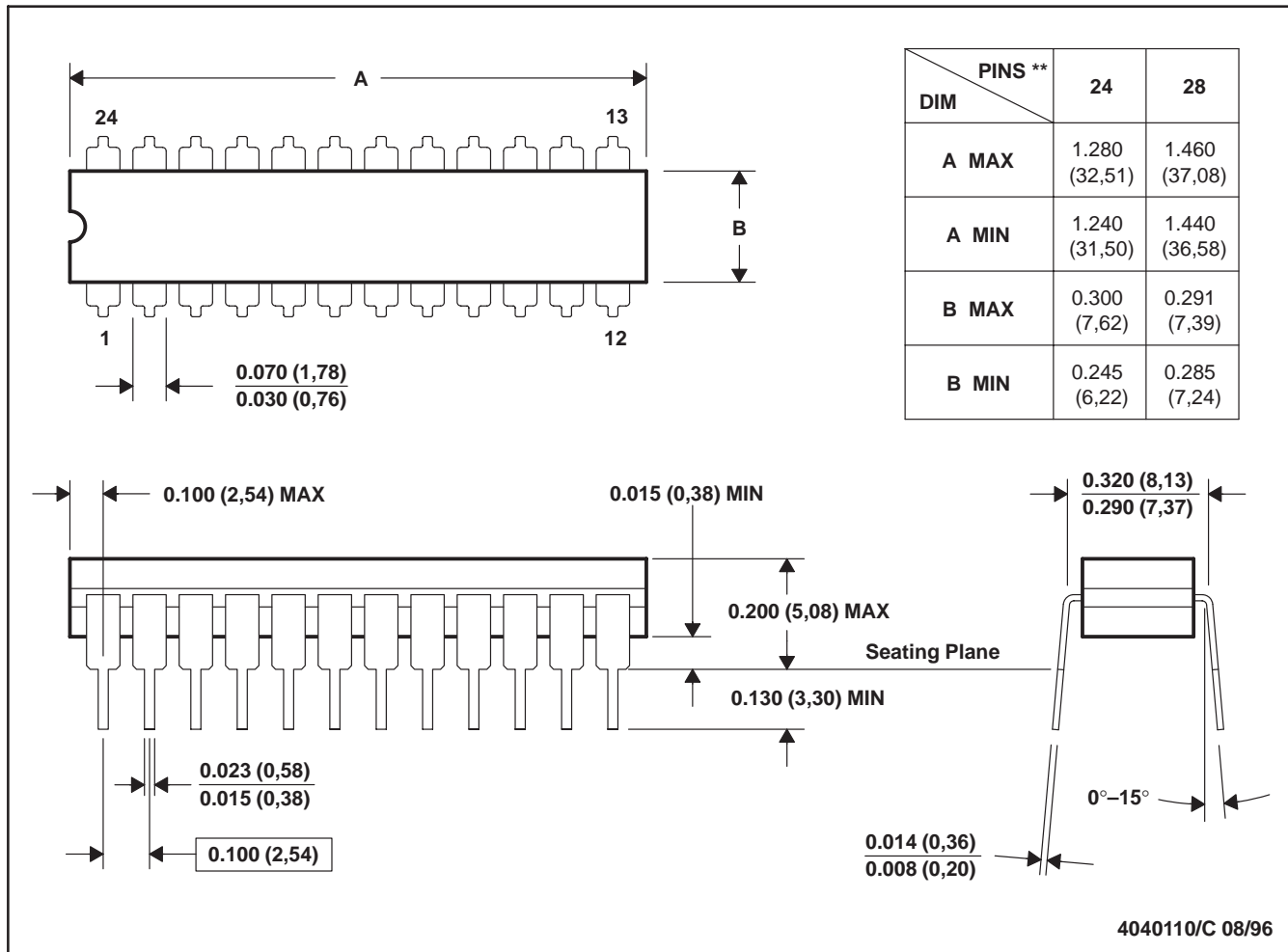
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC646ADBR	SSOP	DB	24	2000	367.0	367.0	38.0
SN74LVC646APWR	TSSOP	PW	24	2000	367.0	367.0	38.0

JT (R-GDIP-T**)

CERAMIC DUAL-IN-LINE

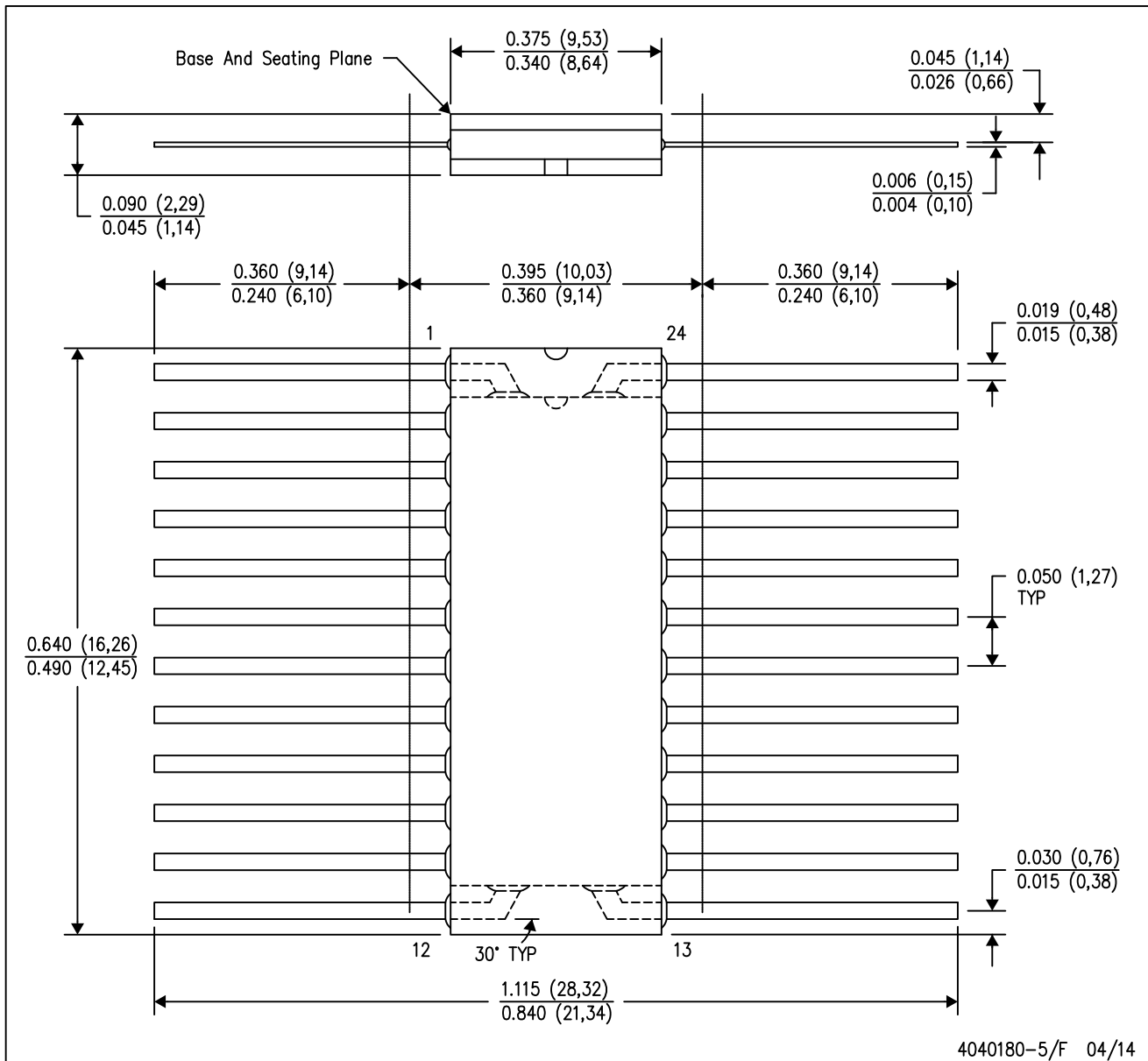
24 LEADS SHOWN



- 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**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

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

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AD.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE

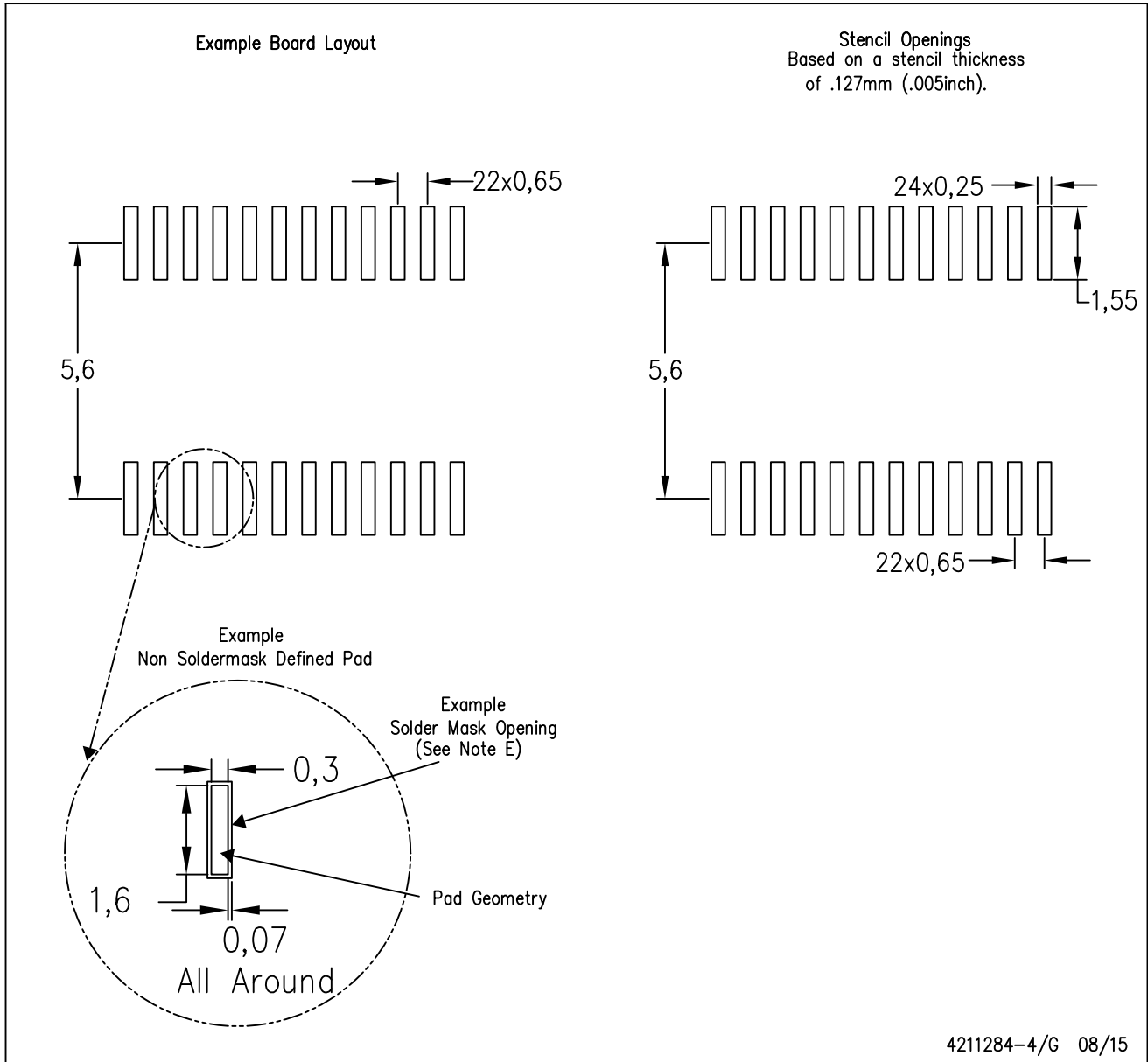


4209202-5/F 08/13

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

PW (R-PDSO-G24)

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 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

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