

Single 3-Input Positive AND-OR Gate

Check for Samples: [SN74LVC1G0832](#)

FEATURES

- Available in the Texas Instruments NanoFree™ Package
- Supports 5-V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Provides Down Translation to V_{CC}
- Max t_{pd} of 5 ns at 3.3 V
- Low Power Consumption, 10- μ A Max I_{CC}
- ± 24 -mA Output Drive at 3.3 V
- Input Hysteresis Allows Slow Input Transition and Better Switching Noise Immunity at the Input ($V_{hys} = 250$ mV Typ @ 3.3 V)
- Can Be Used in Three Combinations:
 - AND-OR Gate
 - AND Gate
 - OR Gate
- I_{off} Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

DESCRIPTION

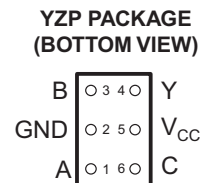
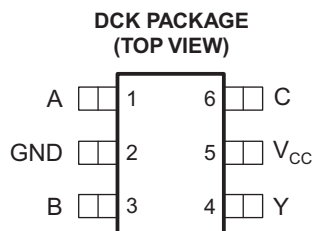
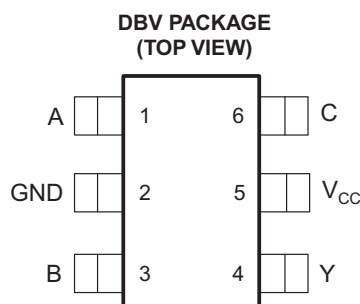
This device is designed for 1.65-V to 5.5-V V_{CC} operation.

The SN74LVC1G0832 device is a single 3-input positive AND-OR gate. It performs the Boolean function $Y = (A \cdot B) + C$ in positive logic.

By tying one input to GND or V_{CC} , the SN74LVC1G0832 device offers two more functions. When C is tied to GND, this device performs as a 2-input AND gate ($Y = A \cdot B$). When A is tied to V_{CC} , the device works as a 2-input OR gate ($Y = B + C$). This device also works as a 2-input OR gate when B is tied to V_{CC} ($Y = A + C$).

NanoFree™ package technology is a major breakthrough in IC packaging concepts, using the die as the package.

This 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.



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

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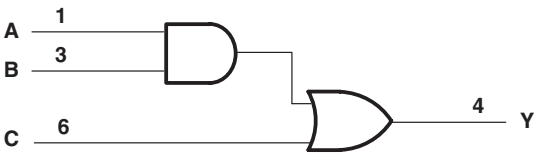
These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Function Table⁽¹⁾

INPUTS			OUTPUT Y
A	B	C	
X	X	H	H
H	H	X	H
X	L	L	L
L	X	L	L

(1) X = Valid H or L

Logic Diagram (Positive Logic)



Function Selection Table

LOGIC FUNCTION	FIGURE
2-Input AND Gate	Figure 1
2-Input OR Gate	Figure 2
$Y = (A \cdot B) + C$	Figure 3

Logic Configurations

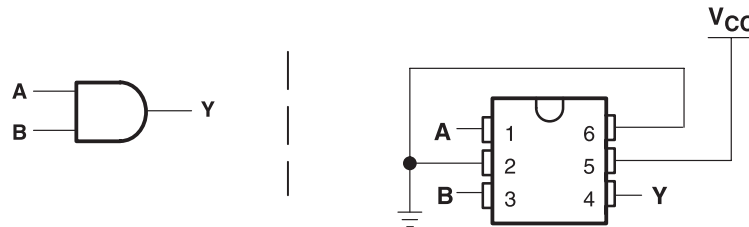


Figure 1. 2-Input AND Gate

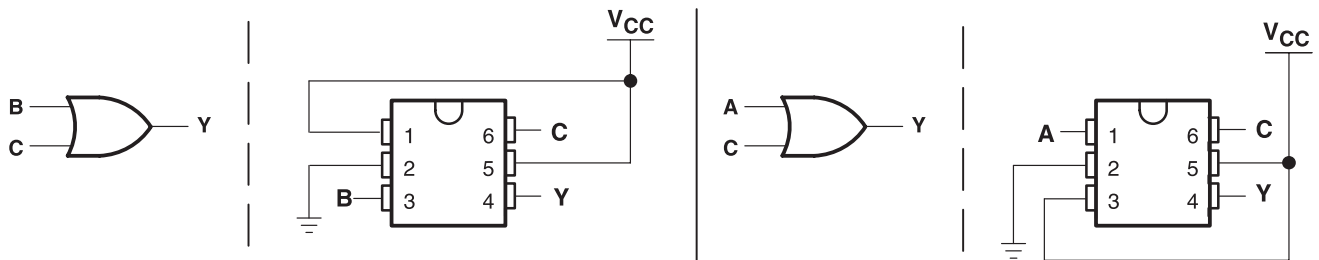


Figure 2. 2-Input OR Gate



Figure 3. $Y = (A \cdot B) + C$

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 Y 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⁾	DBV package		215
		DCK package		259
		YZP package		123
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 and output negative-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⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	5.5	V
		V _{CC} = 2.3 V to 2.7 V	1.7	5.5	
		V _{CC} = 3 V to 3.6 V	2	5.5	
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	5.5	
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V	0	0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	0		
		V _{CC} = 3 V to 3.6 V	0		
		V _{CC} = 4.5 V to 5.5 V	0		
V _O	Output voltage		0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 1.65 V		–4	mA
		V _{CC} = 2.3 V		–8	
		V _{CC} = 3 V		–16	
		V _{CC} = 4.5 V		–32	
I _{OL}	Low-level output current	V _{CC} = 1.65 V		4	mA
		V _{CC} = 2.3 V		8	
		V _{CC} = 3 V		16	
		V _{CC} = 4.5 V		32	
Δt/Δv	Input transition rise or fall rate	V _{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V		20	ns/V
		V _{CC} = 3.3 V ± 0.3 V		10	
		V _{CC} = 5 V ± 0.5 V		5	
T _A	Operating free-air temperature		–40	125	°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](#).

Electrical Characteristics

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

PARAMETER		TEST CONDITIONS		V _{CC}	–40°C to 85°C			–40°C to 125°C			UNIT
					MIN	TYP ⁽¹⁾	MAX	MIN	TYP ⁽¹⁾	MAX	
V _{OH}		I _{OH} = –100 μA	V _I = 5.5 V or GND	1.65 V to 5.5 V	V _{CC} – 0.1			V _{CC} – 0.1			V
		I _{OH} = –4 mA		1.65 V	1.2			1.2			
		I _{OH} = –8 mA		2.3 V	1.9			1.9			
		I _{OH} = –16 mA		3 V	2.4			2.4			
		I _{OH} = –24 mA			2.3			2.3			
		I _{OH} = –32 mA		4.5 V	3.8			3.8			
V _{OL}		I _{OL} = 100 μA	V _I = 5.5 V or GND	1.65 V to 5.5 V	0.1			0.1			V
		I _{OL} = 4 mA		1.65 V	0.45			0.45			
		I _{OL} = 8 mA		2.3 V	0.3			0.3			
		I _{OL} = 16 mA		3 V	0.4			0.4			
		I _{OL} = 24 mA			0.55			0.55			
		I _{OL} = 32 mA		4.5 V	0.55			0.6			
I _I	A, B, or C inputs	V _I = 5.5 V or GND	0 to 5.5 V	±5			±5			μA	
I _{off}		V _I or V _O = 5.5 V	0	±10			±10			μA	
I _{CC}		V _I = 5.5 V or GND, I _O = 0	1.65 V to 5.5 V	10			10			μA	
ΔI _{CC}		One input at V _{CC} – 0.6 V, Other inputs at V _{CC} or GND	3 V to 5.5 V	500			500			μA	
C _i		V _I = V _{CC} or GND	3.3 V	7						pF	

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

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 15$ pF (unless otherwise noted) (see [Figure 4](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74LVC1G0832 –40°C to 85°C								UNIT
			V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A, B, or C	Y	3.7	14	2.4	7	1.7	5	1.2	3.4	ns

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 30$ pF or 50 pF (unless otherwise noted) (see [Figure 5](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74LVC1G0832 –40°C to 85°C								UNIT
			V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A, B, or C	Y	2.5	17.5	1.8	7.6	1.8	5.9	1.3	4	ns

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 30$ pF or 50 pF (unless otherwise noted) (see [Figure 5](#))

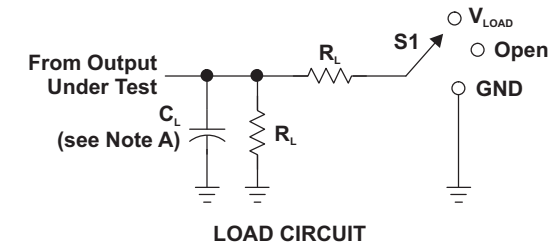
PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74LVC1G0832 –40°C to 125°C								UNIT
			V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{rd}	A, B, or C	Y	2.5	17.5	1.8	7.6	1.8	5.9	1.3	4.5	ns

Operating Characteristics

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

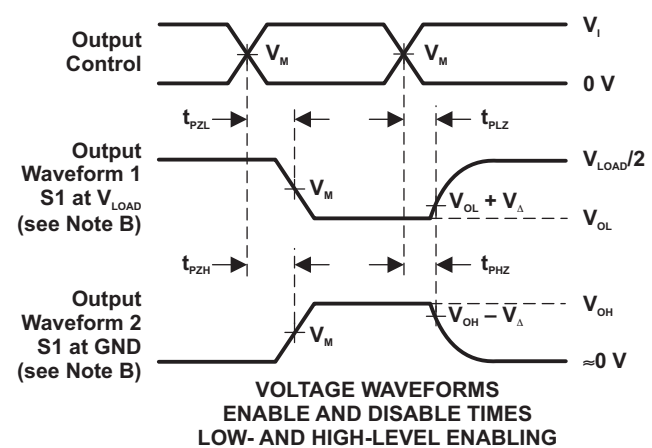
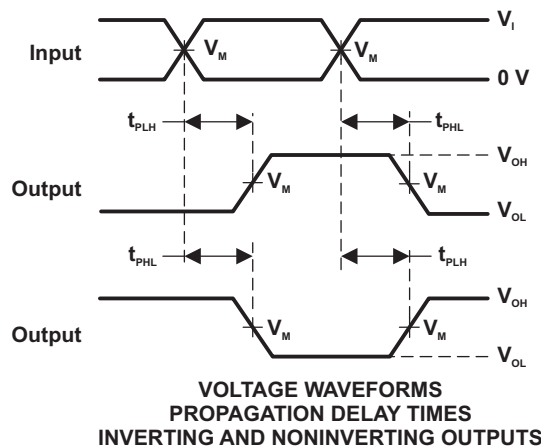
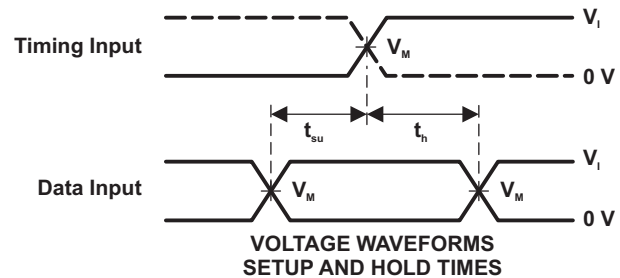
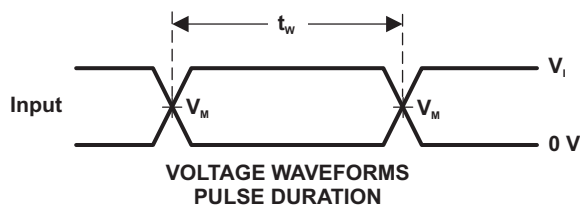
PARAMETER		TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	$V_{CC} = 5\text{ V}$	UNIT
			TYP	TYP	TYP	TYP	
C_{pd}	Power dissipation capacitance	$f = 10\text{ MHz}$	15	15	16	18	pF

Parameter Measurement Information



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

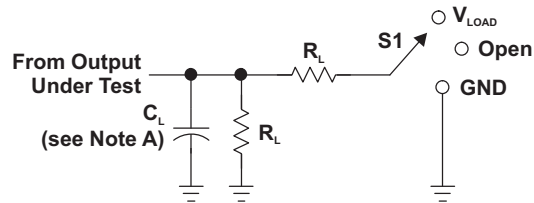
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M Ω	0.15 V
$3.3\text{ V} \pm 0.3\text{ V}$	3 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	15 pF	1 M Ω	0.3 V
$5\text{ V} \pm 0.5\text{ V}$	V_{CC}	$\leq 2.5\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M Ω	0.3 V



- 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 $\leq 10\text{ MHz}$, $Z_o = 50\ \Omega$.
 D. The outputs are measured one at a time, with one 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_{PLH} and t_{PHL} are the same as t_{pd} .
 H. All parameters and waveforms are not applicable to all devices.

Figure 4. Load Circuit and Voltage Waveforms

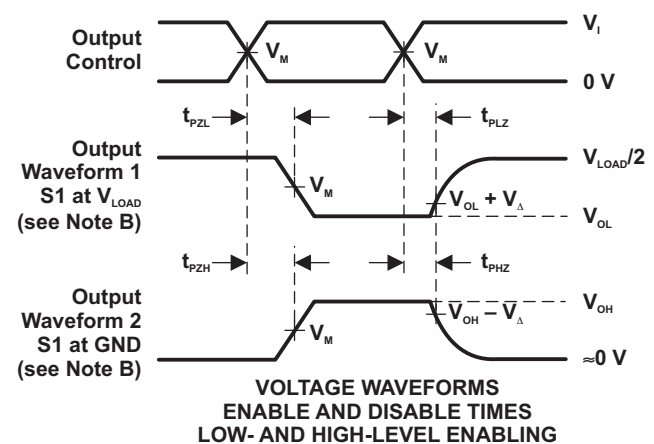
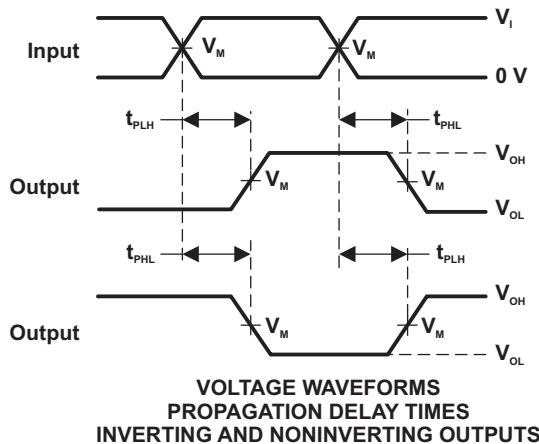
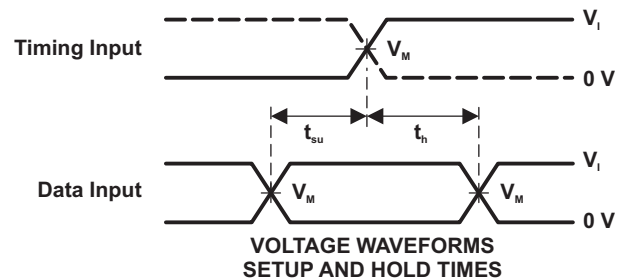
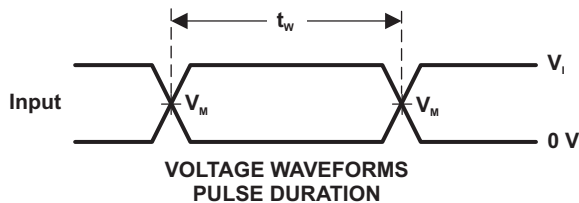
Parameter Measurement Information (continued)



LOAD CIRCUIT

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_i/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
$3.3\text{ V} \pm 0.3\text{ V}$	3 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V
$5\text{ V} \pm 0.5\text{ V}$	V_{CC}	$\leq 2.5\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	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 $\leq 10\text{ MHz}$, $Z_o = 50\text{ }\Omega$.
 - 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 5. Load Circuit and Voltage Waveforms

REVISION HISTORY

Changes from Revision C (January 2007) to Revision D	Page
• Updated document to new TI data sheet format.	1
• Updated Features.	1
• Added ESD warning.	2
• Updated operating temperature range.	5

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
74LVC1G0832DCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	DCR	Samples
SN74LVC1G0832DBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	CDCR	Samples
SN74LVC1G0832DBVT	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	CDCR	Samples
SN74LVC1G0832DCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	DCR	Samples
SN74LVC1G0832DCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	DCR	Samples
SN74LVC1G0832YZPR	ACTIVE	DSBGA	YZP	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	(DC7 ~ DCN)	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.

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TAPE AND REEL INFORMATION


*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
SN74LVC1G0832DBVR	SOT-23	DBV	6	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74LVC1G0832DBVT	SOT-23	DBV	6	250	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74LVC1G0832DCKR	SC70	DCK	6	3000	180.0	8.4	2.41	2.41	1.2	4.0	8.0	Q3
SN74LVC1G0832DCKT	SC70	DCK	6	250	180.0	8.4	2.41	2.41	1.2	4.0	8.0	Q3
SN74LVC1G0832YZPR	DSBGA	YZP	6	3000	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS

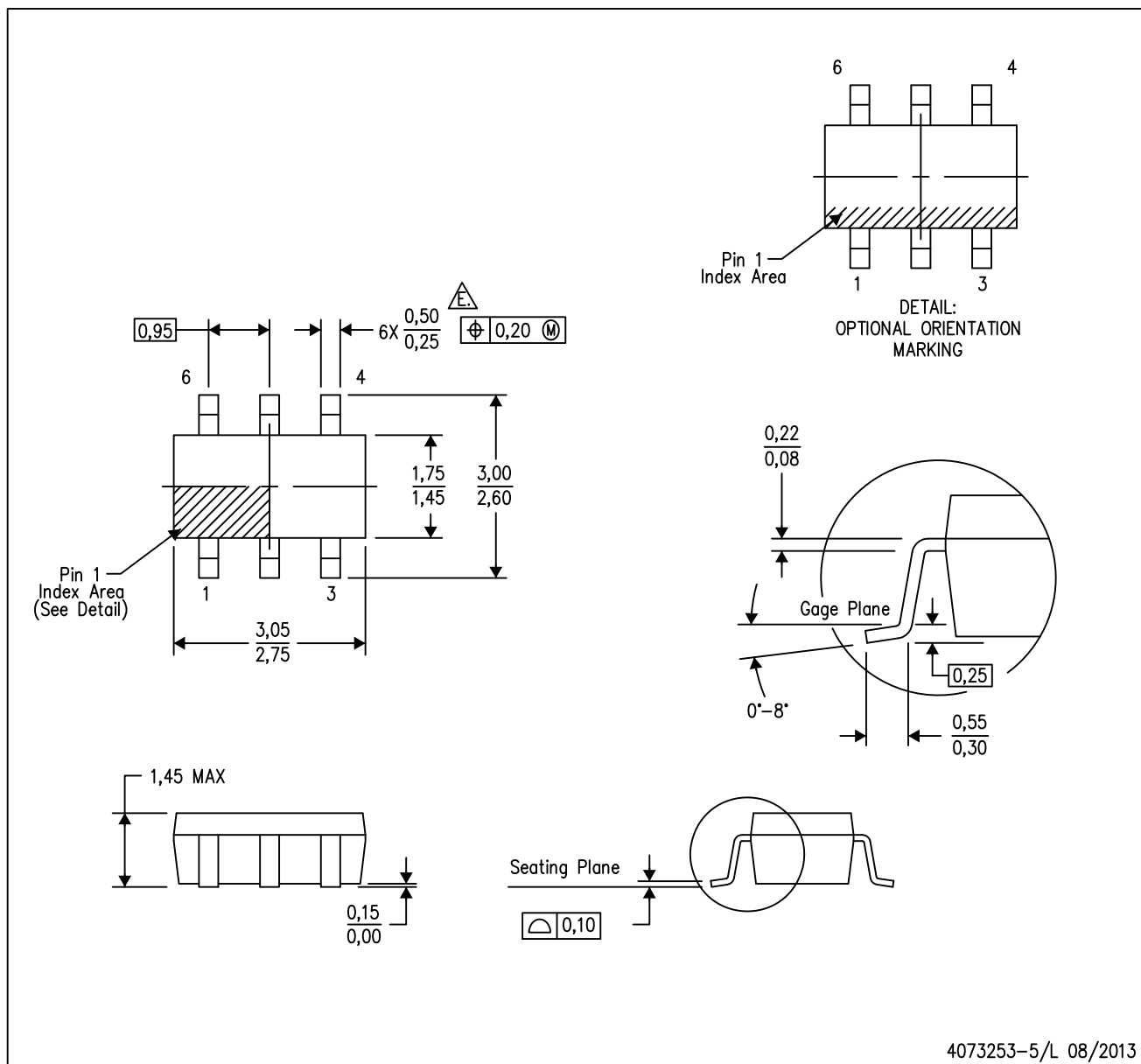


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC1G0832DBVR	SOT-23	DBV	6	3000	202.0	201.0	28.0
SN74LVC1G0832DBVT	SOT-23	DBV	6	250	202.0	201.0	28.0
SN74LVC1G0832DCKR	SC70	DCK	6	3000	202.0	201.0	28.0
SN74LVC1G0832DCKT	SC70	DCK	6	250	202.0	201.0	28.0
SN74LVC1G0832YZPR	DSBGA	YZP	6	3000	220.0	220.0	35.0

DBV (R-PDSO-G6)

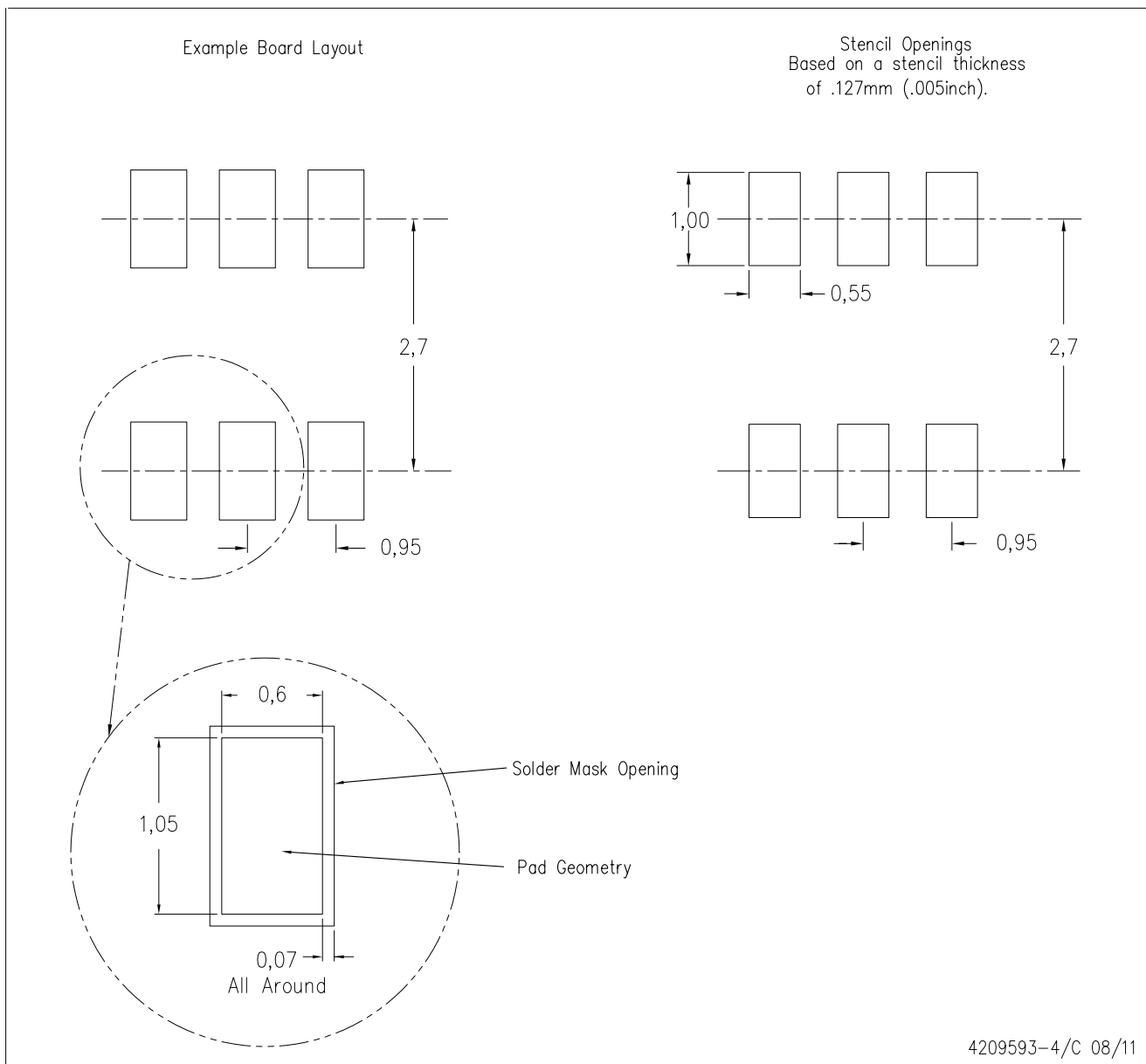
PLASTIC SMALL-OUTLINE PACKAGE



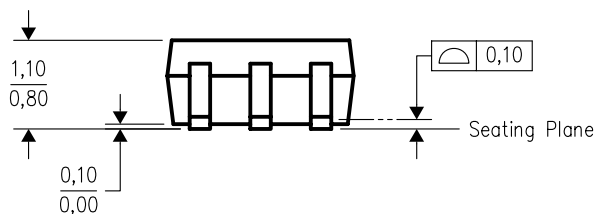
- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
 - E. Falls within JEDEC MO-178 Variation AB, except minimum lead width.

DBV (R-PDSO-G6)

PLASTIC SMALL OUTLINE

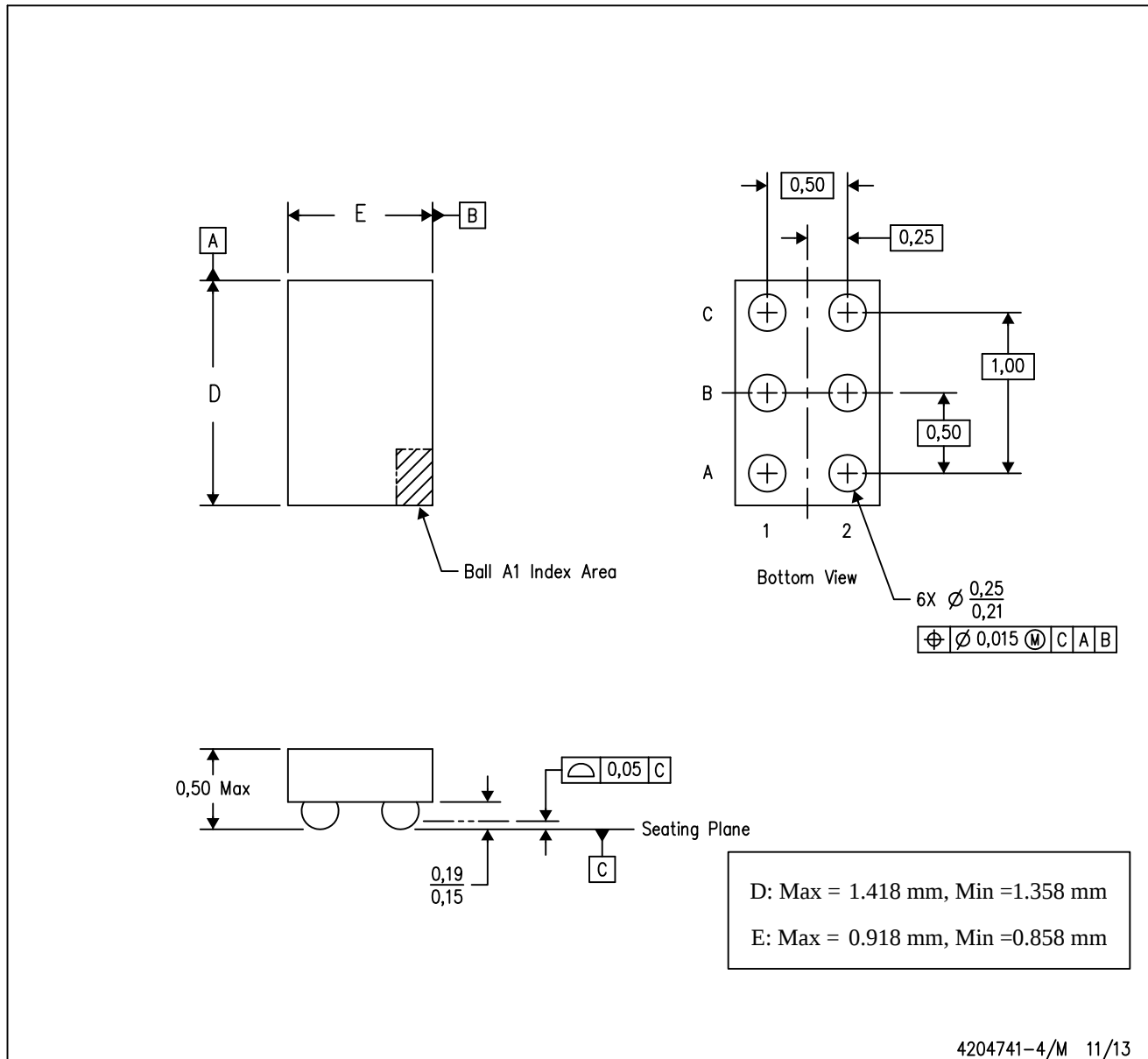


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.



YZP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



- 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. NanoFree™ package configuration.

NanoFree is a trademark of Texas Instruments.

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