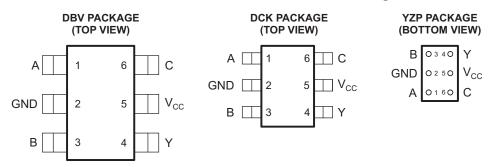


FEATURES

- Available in the Texas Instruments NanoFree™ Package
- Supports 5-V V_{cc} Operation
- Inputs Accept Voltages to 5.5 V
- Max t_{nd} of 4.5 ns at 3.3 V
- Low Power Consumption, 10-μA Max I_{cc}
- ±24-mA Output Drive at 3.3 V

- I_{off} Supports Partial-Power-Down Mode Operation
- 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)



See mechanical drawings for dimensions.

DESCRIPTION/ORDERING INFORMATION

The SN74LVC1G27 performs the Boolean function $Y = \overline{A + B + C}$ or $Y = \overline{A} \cdot \overline{B} \cdot \overline{C}$ in positive logic.

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.

ORDERING INFORMATION

T _A	PACKAGE ⁽¹⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽²⁾
–40°C to 85°C	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)	Reel of 3000	SN74LVC1G27YZPR	CU_
	SOT (SOT-23) – DBV	Reel of 3000	SN74LVC1G27DBVR	C27_
	SOT (SC-70) – DCK	Reel of 3000	SN74LVC1G27DCKR	CU_

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

(2) DBV/DCK: The actual top-side marking has one additional character that designates the assembly/test site. YZP: The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate the assembly/test site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).



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.

NanoFree is a trademark of Texas Instruments.

SN74LVC1G27 SINGLE 3-INPUT POSITIVE-NOR GATE SCES488D-SEPTEMBER 2003-REVISED JANUARY 2007

TEXAS INSTRUMENTS www.ti.com

FUNCTION TABLE

	INPUTS		OUTPUT
Α	В	С	Y
Н	Х	Х	L
Х	н	Х	L
Х	Х	Н	L
L	L	L	н

LOGIC DIAGRAM (POSITIVE LOGIC)



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
VI	Input voltage range ⁽²⁾		-0.5	6.5	V
Vo	Voltage range applied to any output in the h	high-impedance or power-off state ⁽²⁾	-0.5	6.5	V
Vo	Voltage range applied to any output in the h	-0.5	V _{CC} + 0.5	V	
I _{IK}	Input clamp current	V ₁ < 0		-50	mA
I _{OK}	Output clamp current	V ₀ < 0		-50	mA
I _O	Continuous output current			±50	mA
	Continuous current through V_{CC} or GND			±100	mA
		DBV package		165	
θ_{JA}	Package thermal impedance ⁽⁴⁾	DCK package		259	°C/W
		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 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⁾

			MIN	MAX	UNIT		
	Currente una lás ano	Operating	1.65	5.5	V		
V _{CC}	Supply voltage	Data retention only	1.5		v		
		V _{CC} = 1.65 V to 1.95 V	$0.65 imes V_{CC}$				
. /	LP-b. Local Construction Reserve	V_{CC} = 2.3 V to 2.7 V	1.7				
VIH	High-level input voltage	V _{CC} = 3 V to 3.6 V	2		V		
		V_{CC} = 4.5 V to 5.5 V	$0.7 imes V_{CC}$				
		V _{CC} = 1.65 V to 1.95 V		$0.35 \times V_{CC}$			
		V_{CC} = 2.3 V to 2.7 V		0.7	V		
V _{IL}	Low-level input voltage	$V_{CC} = 3 V \text{ to } 3.6 V$		0.8	v		
		$V_{CC} = 4.5 \text{ V} \text{ to } 5.5 \text{ V}$		$0.3 imes V_{CC}$			
VI	Input voltage		0	5.5	V		
Vo	Output voltage		0	V _{CC}	V		
		V _{CC} = 1.65 V		-4			
		V _{CC} = 2.3 V		-8			
I _{ОН}	High-level output current			-16	mA		
		$V_{CC} = 3 V$		-24			
		V _{CC} = 4.5 V		-32			
		V _{CC} = 1.65 V		4			
		V _{CC} = 2.3 V		8			
I _{OL}	Low-level output current	<u> </u>		16	mA		
		$V_{CC} = 3 V$		24			
		V _{CC} = 4.5 V		32	l		
		V_{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V		20			
Δt/Δv	Input transition rise or fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		10	ns/V		
		$V_{CC} = 5 V \pm 0.5 V$		10			
T _A	Operating free-air temperature		-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.

Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V _{cc}	MIN	TYP ⁽¹⁾ MAX	UNIT		
	I _{OH} = -100 μA	1.65 V to 5.5 V	V _{CC} – 0.1				
	$I_{OH} = -4 \text{ mA}$	1.65 V	1.2		V		
V _{OH}	$I_{OH} = -8 \text{ mA}$	2.3 V	1.9				
	$I_{OH} = -16 \text{ mA}$	- 3 V	2.4		v		
	$I_{OH} = -24 \text{ mA}$	- 3V	2.3				
	$I_{OH} = -32 \text{ mA}$	4.5 V	3.8				
	I _{OL} = 100 μA	1.65 V to 5.5 V		0.1			
	I _{OL} = 4 mA	1.65 V		0.45			
N/	I _{OL} = 8 mA	2.3 V		V			
V _{OL}	I _{OL} = 16 mA	- 3 V		0.4	v		
	I _{OL} = 24 mA	3V					
	I _{OL} = 32 mA	4.5 V		0.55			
I _I All inputs	$V_1 = 5.5 \text{ V or GND}$	0 to 5.5 V		±5	μΑ		
l _{off}	$V_{I} \text{ or } V_{O} = 5.5 \text{ V}$	0		±10	μΑ		
I _{CC}	$V_{I} = 5.5 \text{ V or GND}, \qquad I_{O} = 0$	1.65 V to 5.5 V		10	μΑ		
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	3 V to 5.5 V		500	μΑ		
Ci	$V_{I} = V_{CC} \text{ or } GND$			3.5	pF		

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

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 15 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		$\begin{array}{c} \mathrm{V_{CC}=2.5~V}\\ \pm~0.2~\mathrm{V} \end{array}$		V_{CC} = 3.3 V ± 0.3 V		V_{CC} = 5 V \pm 0.5 V		UNIT
	(INFOT)	(001201)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A, B, or C	Y	2	18.2	1.2	6.2	1	4.5	0.8	3.1	ns

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 30 \text{ pF}$ or 50 pF (unless otherwise noted) (see Figure 2)

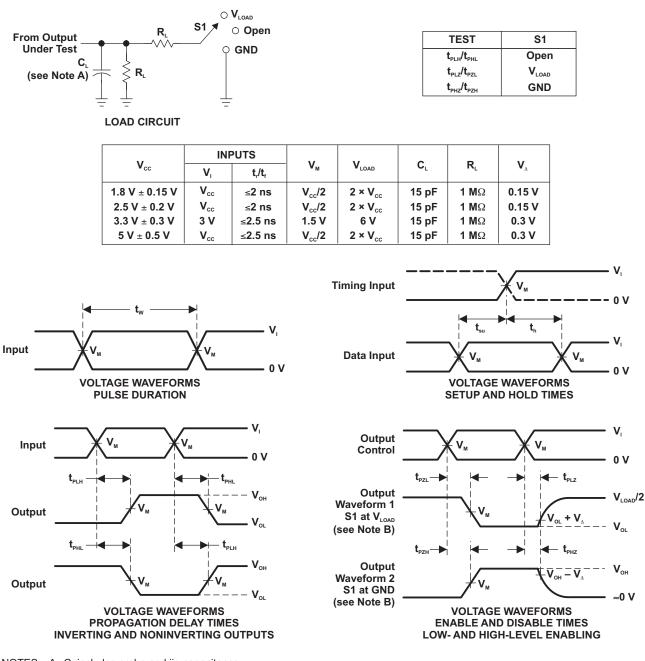
PARAMETER	FROM (INPUT)	TO (OUTPUT)		V_{CC} = 1.8 V ± 0.15 V		$\begin{array}{c} \mathrm{V_{CC}} \texttt{=} \texttt{ 2.5 V} \\ \pm \texttt{ 0.2 V} \end{array}$		V_{CC} = 3.3 V \pm 0.3 V		V_{CC} = 5 V ± 0.5 V	
	(INFOT)	(001101)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A, B, or C	Y	2.2	20.5	1.4	7.1	1.3	5.4	1	3.6	ns

Operating Characteristics

 $T_A = 25^{\circ}C$

PARAMETER		TEST	V _{CC} = 1.8 V	V _{CC} = 2.5 V	/ _{CC} = 2.5 V V _{CC} = 3.3 V		UNIT	
	FARAMETER	CONDITIONS	TYP TYP		TYP	TYP		
C_{pd}	Power dissipation capacitance	f = 10 MHz	17	18	19	22	pF	

PARAMETER MEASUREMENT INFORMATION



NOTES: A. $C_{\scriptscriptstyle L}$ includes probe and jig capacitance.

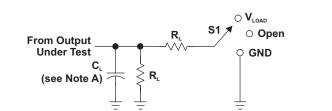
- B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z₀ = 50 Ω.
- D. The outputs are measured one at a time, with one transition per measurement.
- E. $t_{\mbox{\tiny PLZ}}$ and $t_{\mbox{\tiny PHZ}}$ are the same as $t_{\mbox{\tiny dis}}.$
- F. t_{PZL} and t_{PZH} are the same as t_{en} .
- G. t_{PLH} and t_{PHL} are the same as t_{od} .
- H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

SN74LVC1G27 SINGLE 3-INPUT POSITIVE-NOR GATE



SCES488D-SEPTEMBER 2003-REVISED JANUARY 2007



LOAD CIRCUIT

 $3.3~V\pm0.3~V$

 $5 V \pm 0.5 V$

TEST	S1
t _{PLH} /t _{PHL}	Open
t_{PLZ}/t_{PZL}	VLOAD
$t_{_{PHZ}}/t_{_{PZH}}$	GND

V, 0.15 V

0.15 V

0.3 V

0.3 V

Texas

STRUMENTS www.ti.com

N.	INF	PUTS	N N	N.	•	R∟	
V _{cc}	V	t,/t,	V _M	VLOAD	C		
1.8 V ± 0.15 V	V _{cc}	≤2 ns	V _{cc} /2	2 × V _{cc}	30 pF	1 k Ω	
2.5 V ± 0.2 V	V _{cc}	≤2 ns	V _{cc} /2	2 × V _{cc}	30 pF	500 Ω	

1.5 V

 $V_{cc}/2$

 $2 \times V_{cc}$ 6 V

 $2 \times V_{c}$

50 pF

50 pF

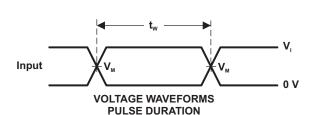
≤2.5 ns

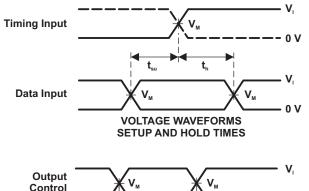
≤2.5 ns

3 V

 V_{cc}

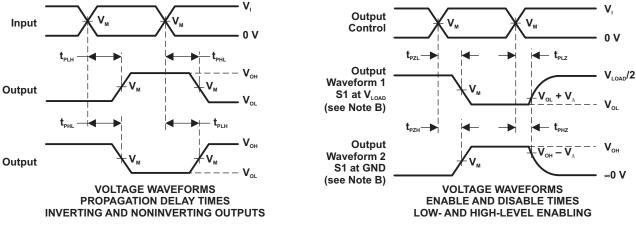
PARAMETER MEASUREMENT INFORMATION





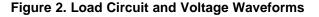
500 Ω

500 Ω



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 MHz, Z_o = 50 Ω .
- 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_{od} .
- H. All parameters and waveforms are not applicable to all devices.



24-Jan-2013

PACKAGING INFORMATION

Orderable Device	Status	Package Type	•	Pins	Package Qty	Eco Plan	Lead/Ball Finish	•	Op Temp (°C)		Samples
	(1)		Drawing			(2)		(3)		(4)	
SN74LVC1G27DBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C272, C27F, C27K, C27R)	Samples
SN74LVC1G27DBVRE4	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C272, C27F, C27K, C27R)	Samples
SN74LVC1G27DBVRG4	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C272, C27F, C27K, C27R)	Samples
SN74LVC1G27DCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(CU5, CUR)	Samples
SN74LVC1G27DCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(CU5, CUR)	Samples
SN74LVC1G27DCKRG4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(CU5, CUR)	Samples
SN74LVC1G27DRYR	ACTIVE	SON	DRY	6	5000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU	Samples
SN74LVC1G27DSFR	ACTIVE	SON	DSF	6	5000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU	Samples
SN74LVC1G27YZPR	ACTIVE	DSBGA	YZP	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	(CU7, CUN)	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)



www.ti.com

24-Jan-2013

⁽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.

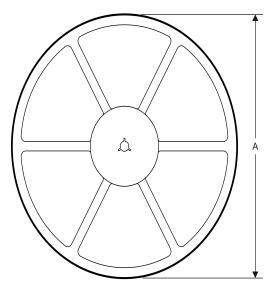
PACKAGE MATERIALS INFORMATION

www.ti.com

TAPE AND REEL INFORMATION

REEL DIMENSIONS

Texas Instruments





TAPE AND REEL INFORMATION

*All dimensions are nominal

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

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LVC1G27DBVR	SOT-23	DBV	6	3000	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
SN74LVC1G27DBVR	SOT-23	DBV	6	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
SN74LVC1G27DCKR	SC70	DCK	6	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74LVC1G27DRYR	SON	DRY	6	5000	180.0	9.5	1.15	1.6	0.75	4.0	8.0	Q1
SN74LVC1G27DSFR	SON	DSF	6	5000	180.0	9.5	1.16	1.16	0.5	4.0	8.0	Q2
SN74LVC1G27YZPR	DSBGA	YZP	6	3000	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1

TEXAS INSTRUMENTS

www.ti.com

PACKAGE MATERIALS INFORMATION

11-Aug-2012



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC1G27DBVR	SOT-23	DBV	6	3000	205.0	200.0	33.0
SN74LVC1G27DBVR	SOT-23	DBV	6	3000	180.0	180.0	18.0
SN74LVC1G27DCKR	SC70	DCK	6	3000	180.0	180.0	18.0
SN74LVC1G27DRYR	SON	DRY	6	5000	180.0	180.0	30.0
SN74LVC1G27DSFR	SON	DSF	6	5000	180.0	180.0	30.0
SN74LVC1G27YZPR	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.
- È. Falls within JEDEC MO-178 Variation AB, except minimum lead width.



LAND PATTERN DATA



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.



DCK (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. Falls within JEDEC MO-203 variation AB.



LAND PATTERN DATA

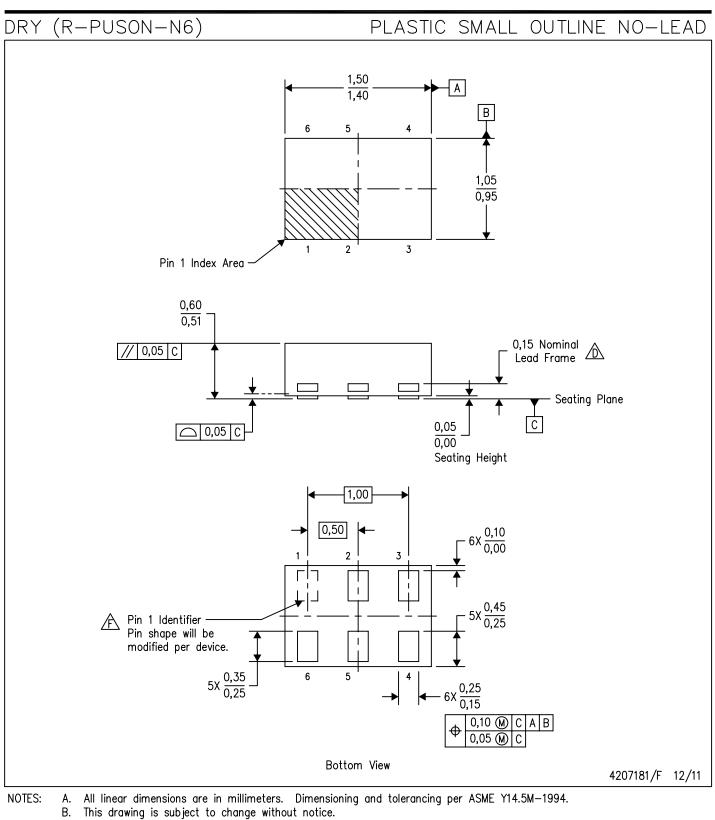


NOTES:

- 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.



MECHANICAL DATA



- C. SON (Small Outline No-Lead) package configuration.
- Δ The exposed lead frame feature on side of package may or may not be present due to alternative lead frame designs.
- E. This package complies to JEDEC MO-287 variation UFAD.
- 🖄 See the additional figure in the Product Data Sheet for details regarding the pin 1 identifier shape.



MECHANICAL DATA



- - B. This drawing is subject to change without notice.
 C. SON (Small Outline No-Lead) package configuration.
 D. This package complies to JEDEC M0-287 variation X2AAF.





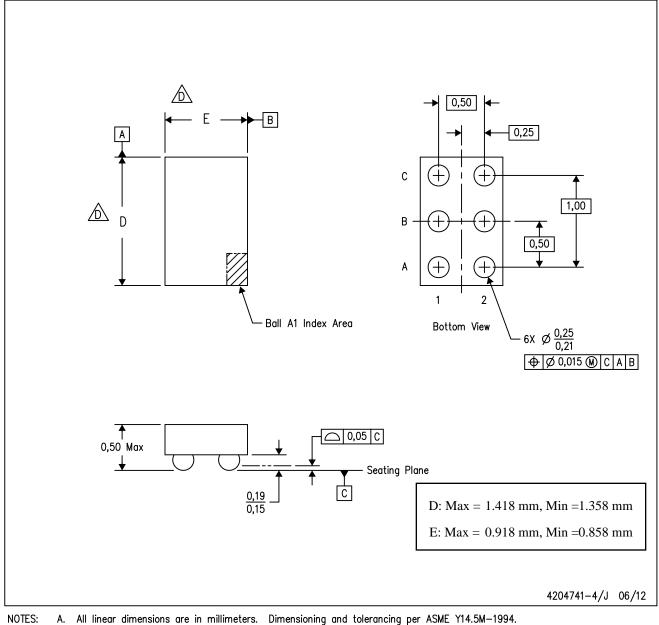
NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads. If 2 mil solder mask is outside PCB vendor capability, it is advised to omit solder mask.
- E. Maximum stencil thickness 0,1016 mm (4 mils). All linear dimensions are in millimeters.
- F. 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 stencil design considerations.
- G. Suggest stencils cut with lasers such as Fiber Laser that produce the greatest positional accuracy.
- H. Component placement force should be minimized to prevent excessive paste block deformation.



YZP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



- Α. B. This drawing is subject to change without notice.
- NanoFree™ package configuration. Ç.
- / The package size (Dimension D and E) of a particular device is specified in the device Product Data Sheet version of this drawing, in case it cannot be found in the product data sheet please contact a local TI representative.
- E. This package is a Pb-free solder ball design. Refer to the 6 YEP package (drawing 4204725) for tin-lead (SnPb).

NanoFree is a trademark of Texas Instruments.



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		Applications				
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive			
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications			
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers			
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps			
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy			
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial			
Interface	interface.ti.com	Medical	www.ti.com/medical			
Logic	logic.ti.com	Security	www.ti.com/security			
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense			
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video			
RFID	www.ti-rfid.com					
OMAP Applications Processors	www.ti.com/omap	TI E2E Community	e2e.ti.com			
Wireless Connectivity	www.ti.com/wirelessconnectivity					

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2013, Texas Instruments Incorporated