

Dual Buffer Driver With 3-State Outputs

Check for Samples: SN74LVC2G240

FEATURES

- Available in the Texas Instruments NanoFree™ **Package**
- Supports 5-V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Max t_{pd} of 4.6 ns at 3.3 V
- Low Power Consumption, 10-µA Max I_{CC}
- ±24-mA Output Drive at 3.3 V
- Typical V_{OLP} (Output Ground Bounce) $<0.8 \text{ V at V}_{CC} = 3.3 \text{ V}, T_A = 25^{\circ}\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) >2 V at V_{CC} = 3.3 V, T_A = 25°C
- I_{off} Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- Can Be Used as a Down Translator to Translate Inputs From a Max of 5.5 V Down to the V_{CC} Level
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- **ESD Protection Exceeds JESD 22**
 - 2000-V Human-Body Model (A114-A)
 - 1000-V Charged-Device Model (C101)

DCT PACKAGE (TOP VIEW) \square V_{cc} 2 7 □ 20E 3 6 GND [□ 2A

See mechanical drawings for dimensions.

DESCRIPTION

This dual buffer driver is designed for 1.65-V to 5.5-V V_{CC} operation.

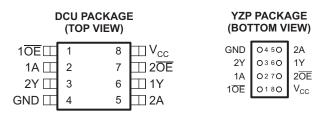
The SN74LVC2G240 device is designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and busoriented receivers and transmitters.

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

This device is organized as two 1-bit buffers/drivers with separate output-enable (OE) inputs. When OE is low, the device passes data from the A input to the Y output. When OE is high, the outputs are in the highimpedance state.

To ensure the high-impedance state during power up or power down, 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.

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



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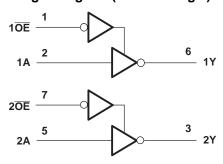


These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Function Table (Each Buffer)

INP	UTS	OUTPUT
ŌĒ	Α	Y
L	Н	L
L	L	Н
Н	Χ	Z

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	-0.5	6.5	V	
Vo	Voltage range applied to any output in the h	igh 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
Io	Continuous output current			±50	mA
	Continuous current through V _{CC} or GND			±100	mA
		DCT package		220	
θ_{JA}	Package thermal impedance (4)	DCU package		227	°C/W
		YZP package		102	
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.

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Recommended Operating Conditions⁽¹⁾

			MIN	MAX	UNIT
	Owner by well to me	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 × V _{CC}		
.,	High lavel input valtage	V _{CC} = 2.3 V to 2.7 V	1.7		V
V_{IH}	High-level input voltage	V _{CC} = 3 V to 3.6 V	2		V
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	0.7 × V _{CC}		
		V _{CC} = 1.65 V to 1.95 V		$0.35 \times V_{CC}$	
.,	Law law diagnativaltana	V _{CC} = 2.3 V to 2.7 V		0.7	
V_{IL}	Low-level input voltage	V _{CC} = 3 V to 3.6 V		0.8	V
		V _{CC} = 4.5 V to 5.5 V		0.3 × V _{CC}	
VI	Input voltage		0	5.5	V
.,	Outrotustians	High or low state	0	V _{CC}	V
Vo	Output voltage	3-state	0	5.5	v
		V _{CC} = 1.65 V		-4	
		V _{CC} = 2.3 V		-8	
I _{OH}	High-level output current	vel output current		-16	mA
		$V_{CC} = 3 V$		-24	
		V _{CC} = 4.5 V			
		V _{CC} = 1.65 V		4	
		V _{CC} = 2.3 V	8		
I_{OL}	Low-level output current	V 2V		16	mA
		$V_{CC} = 3 V$	24		
		V _{CC} = 4.5 V		32	
		$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}, 2.5 \text{ V} \pm 0.2 \text{ V}$			
Δt/Δν	Input transition rise or fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		10	ns/V
		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		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.

Product Folder Links: SN74LVC2G240



Electrical Characteristics

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

DADAMETED	TEST COMPLETIONS	v	-40°C	C to 85°C		-40°(C to 125°C		LINUT
PARAMETER	TEST CONDITIONS	V _{cc}	MIN	TYP ⁽¹⁾	MAX	MIN	TYP ⁽¹⁾	MAX	UNIT
	I _{OH} = -100 μA	1.65 V to 5.5 V	V _{CC} - 0.1			V _{CC} - 0.1			
	$I_{OH} = -4 \text{ mA}$	1.65 V	1.2			1.2			
V _{OH}	$I_{OH} = -8 \text{ mA}$	2.3 V	1.9			1.9			V
	$I_{OH} = -16 \text{ mA}$	3 V	2.4			2.4			
	$I_{OH} = -24 \text{ mA}$	3 V	2.3			2.3			
	$I_{OH} = -32 \text{ mA}$	4.5 V	3.8			3.8			
	I _{OL} = 100 μA	1.65 V to 5.5 V			0.1			0.1	
	I _{OL} = 4 mA	1.65 V			0.45			0.45	
V _{OL}	I _{OL} = 8 mA	2.3 V			0.3			0.3	V
	I _{OL} = 16 mA	3 V			0.4			0.4	
	I _{OL} = 24 mA	3 V			0.55			0.55	
	I _{OL} = 32 mA	4.5 V			0.55			0.75	
I _I A or \overline{OE} inputs	V _I = 5.5 V or GND	0 to 5.5 V			±5			±5	μA
I _{off}	V_I or $V_O = 5.5 \text{ V}$	0			±10			±10	μΑ
I _{OZ}	$V_{O} = 0 \text{ to } 5.5 \text{ V}$	3.6 V			10			10	μΑ
Icc	$V_I = 5.5 \text{ V or GND}, \qquad I_O = 0$	1.65 V to 5.5 V			10			10	μΑ
ΔI _{CC}	One input at $V_{CC} - 0.6$ Other inputs at V_{CC} or GND	3 V to 5.5 V			500			500	μΑ
Ci	$V_I = V_{CC}$ or GND	3.3 V		4					pF
C _o	$V_O = V_{CC}$ or GND	3.3 V		6					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 (unless otherwise noted) (see Figure 1)

			SN74LVC2G240 -40°C to 85°C								
PARAMETER	FROM (INPUT)	TO (OUTPUT)	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		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	Α	Υ	2.0	11.3	1.4	5.5	1.1	4.6	1.0	4.0	ns
t _{en}	ŌĒ	Y	2.7	11.7	1.9	6.6	1.4	5.4	1.1	5.0	ns
t _{dis}	ŌĒ	Υ	1.7	12.8	0.8	5.7	1.2	5.5	0.5	4.2	ns

Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER			SN74LVC2G240 -40°C to 85°C								
	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		$V_{CC} = 3.3 \text{ V} \\ \pm 0.3 \text{ V}$		V _{CC} = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	А	Y	2.0	13.7	1.4	6.8	1.1	5.8	1.0	5.0	ns
t _{en}	ŌĒ	Y	2.7	14.3	1.9	8.0	1.4	6.6	1.1	6.0	ns
t _{dis}	ŌE	Y	1.7	15.3	0.8	7.5	1.2	6.8	0.5	5.4	ns

Operating Characteristics

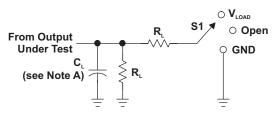
 $T_A = 25^{\circ}C$

	PARAMET	ER	TEST CONDITIONS	V _{CC} = 1.8 V TYP	V _{CC} = 2.5 V TYP	V _{CC} = 3.3 V TYP	V _{CC} = 5 V TYP	UNIT
	Power dissipation	Outputs enabled				15	17	
C _{pd}	capacitance per buffer driver	Outputs disabled	f = 10 MHz	1	1	2	3	pF

Product Folder Links: SN74LVC2G240



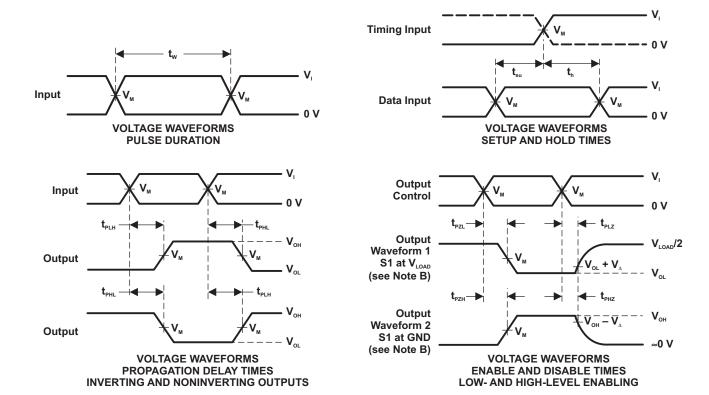
Parameter Measurement Information



TEST	S1
t _{PLH} /t _{PHL}	Open
$t_{_{\mathrm{PLZ}}}/t_{_{\mathrm{PZL}}}$	V _{LOAD}
t _{PHZ} /t _{PZH}	GND

LOAD CIRCUIT

.,	INPUTS		.,	.,		_	.,
V _{cc}	V,	V _I t _r /t _f V _M V _{LC}		V _{LOAD}	C _L	R _∟	V _A
1.8 V ± 0.15 V	V _{cc}	≤2 ns	V _{cc} /2	2 × V _{cc}	30 pF	1 k Ω	0.15 V
$2.5~V~\pm~0.2~V$	V _{cc}	≤2 ns	V _{cc} /2	2 × V _{cc}	30 pF	500 Ω	0.15 V
$3.3~V\pm0.3~V$	3 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
5 V ± 0.5 V	V _{cc}	≤2.5 ns	V _{cc} /2	2 × V _{cc}	50 pF	500 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 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. $t_{\mbox{\tiny PZL}}$ and $t_{\mbox{\tiny PZH}}$ are the same as $t_{\mbox{\tiny en}}.$
- G. $t_{\mbox{\tiny PLH}}$ and $t_{\mbox{\tiny PHL}}$ are the same as $t_{\mbox{\tiny pd}}.$
- H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

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REVISION HISTORY

CI	hanges from Revision H (February 2007) to Revision I	Page
•	Updated document to new TI data sheet format.	1
•	Removed ordering information.	1
•	Updated Features.	1
•	Added ESD warning.	2
•	Updated operating temperature range.	3





10-Dec-2020

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
74LVC2G240DCURG4	ACTIVE	VSSOP	DCU	8	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C40R	Samples
SN74LVC2G240DCTR	ACTIVE	SM8	DCT	8	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C40 (R, Z)	Samples
SN74LVC2G240DCUR	ACTIVE	VSSOP	DCU	8	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	(C40J, C40Q, C40R)	Samples
SN74LVC2G240YZPR	ACTIVE	DSBGA	YZP	8	3000	RoHS & Green	SNAGCU	Level-1-260C-UNLIM	-40 to 125	(CK7, CKN)	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) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (CI) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (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 finish/Ball material Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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PACKAGE OPTION ADDENDUM

10-Dec-2020

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PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
В0	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		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
74LVC2G240DCURG4	VSSOP	DCU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G240DCTR	SM8	DCT	8	3000	177.8	12.4	3.45	4.4	1.45	4.0	12.0	Q3
SN74LVC2G240DCTR	SM8	DCT	8	3000	180.0	13.0	3.35	4.5	1.55	4.0	12.0	Q3
SN74LVC2G240DCUR	VSSOP	DCU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G240DCUR	VSSOP	DCU	8	3000	178.0	9.0	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G240DCUR	VSSOP	DCU	8	3000	178.0	9.5	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G240YZPR	DSBGA	YZP	8	3000	178.0	9.2	1.02	2.02	0.63	4.0	8.0	Q1



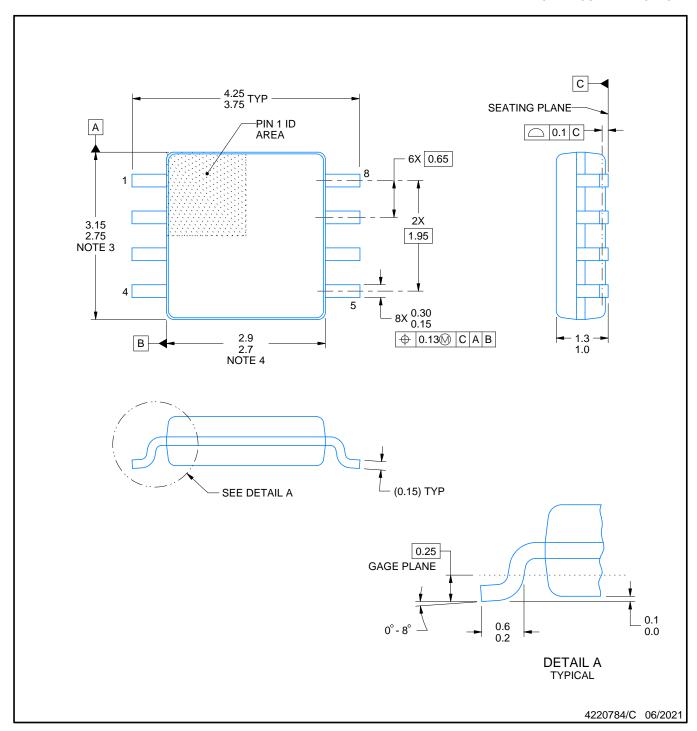
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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74LVC2G240DCURG4	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC2G240DCTR	SM8	DCT	8	3000	183.0	183.0	20.0
SN74LVC2G240DCTR	SM8	DCT	8	3000	182.0	182.0	20.0
SN74LVC2G240DCUR	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC2G240DCUR	VSSOP	DCU	8	3000	180.0	180.0	18.0
SN74LVC2G240DCUR	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC2G240YZPR	DSBGA	YZP	8	3000	220.0	220.0	35.0





NOTES:

- 1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

 2. This drawing is subject to change without notice.

 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.





NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.





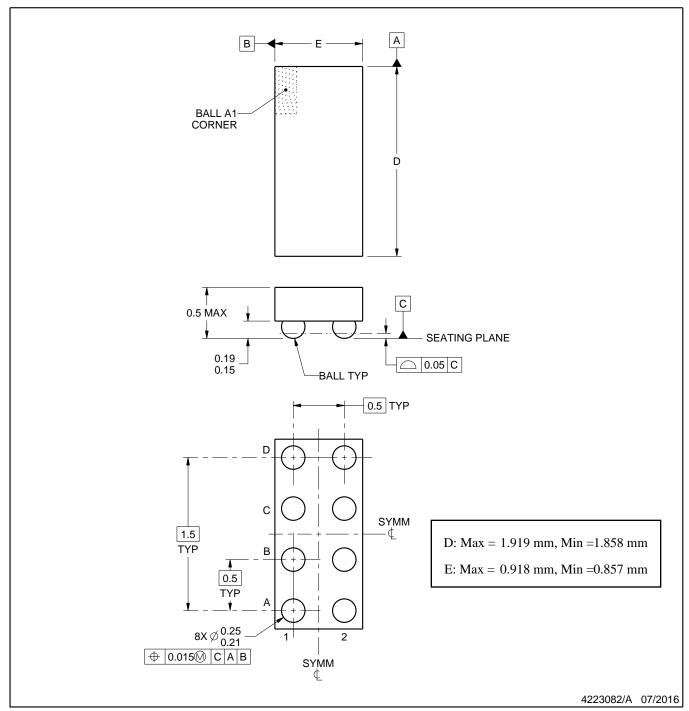
NOTES: (continued)

- 7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 8. Board assembly site may have different recommendations for stencil design.





DIE SIZE BALL GRID ARRAY

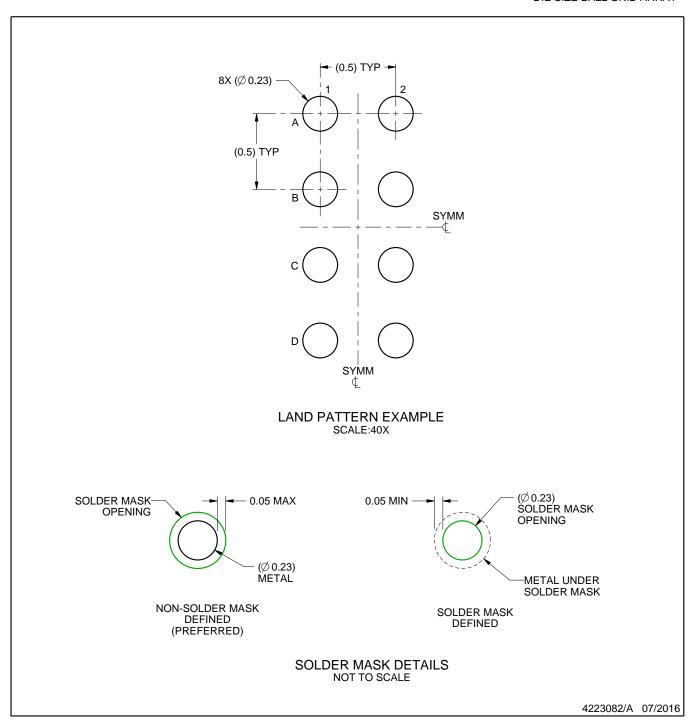


NOTES:

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- 2. This drawing is subject to change without notice.



DIE SIZE BALL GRID ARRAY

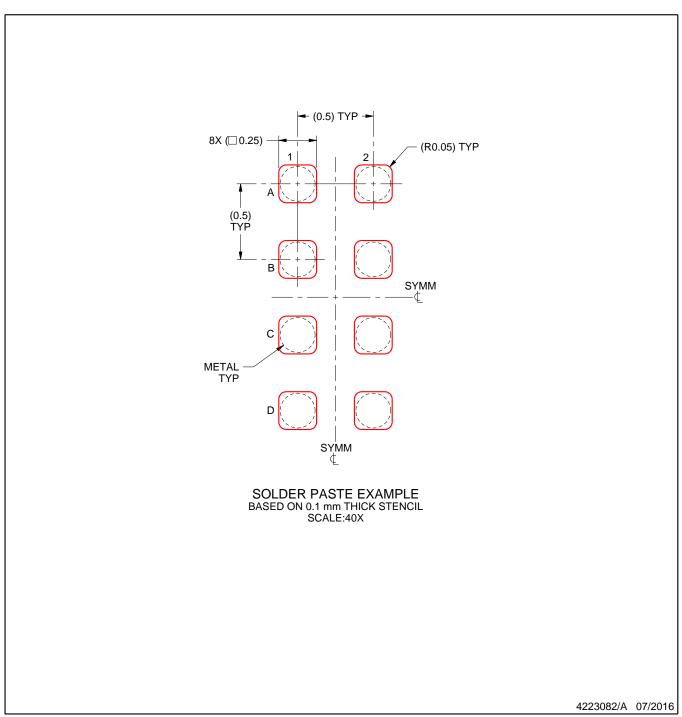


NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).



DIE SIZE BALL GRID ARRAY

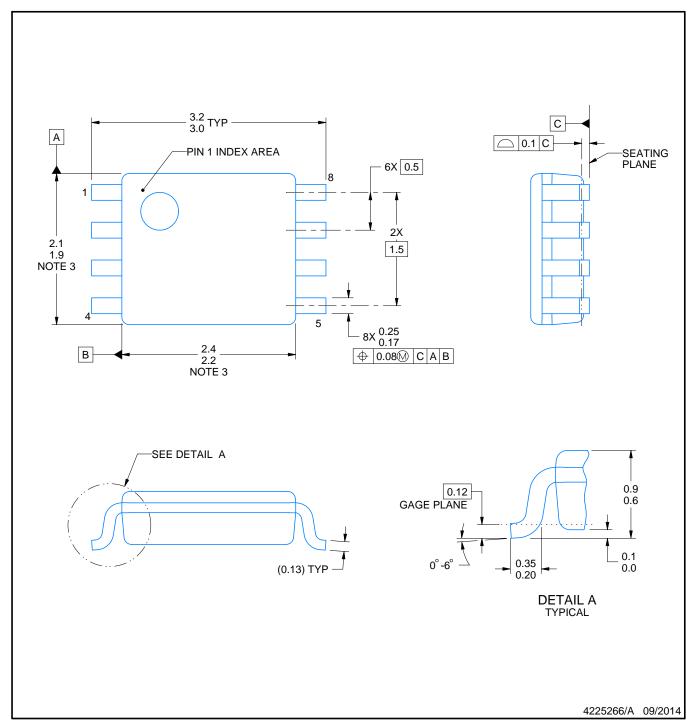


NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.







NOTES:

- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

 2. This drawing is subject to change without notice.

 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
 4. Reference JEDEC registration MO-187 variation CA.

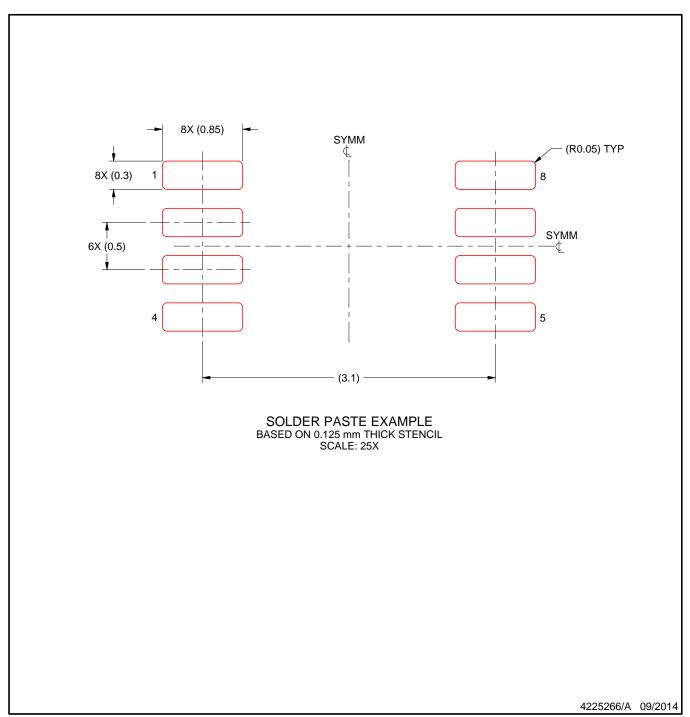




NOTES: (continued)

- 5. Publication IPC-7351 may have alternate designs.
- 6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.





NOTES: (continued)

- 7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 8. Board assembly site may have different recommendations for stencil design.



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LE87290YQC LE87290YQCT 74AUP1G125FW5-7 NLU2G16CMUTCG MC74LCX244MN2TWG NL17SG17P5T5G

NLV74HC125ADR2G NLVHCT245ADTR2G NLVVHC1G126DFT2G EL5623IRZ ISL15102AIRZ-T13 ISL1539IRZ-T13

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