

## SNx4ACT240 Octal Buffers or Drivers with 3-State Outputs

### 1 Features

- Operation of 4.5V to 5.5V  $V_{CC}$
- Inputs accept voltages to 5.5V
- Maximum  $t_{pd}$  of 8.5ns at 5V
- Inputs are TTL-compatible

### 2 Applications

- [Handset: smartphone](#)
- Network switch
- [Health and fitness or wearables](#)

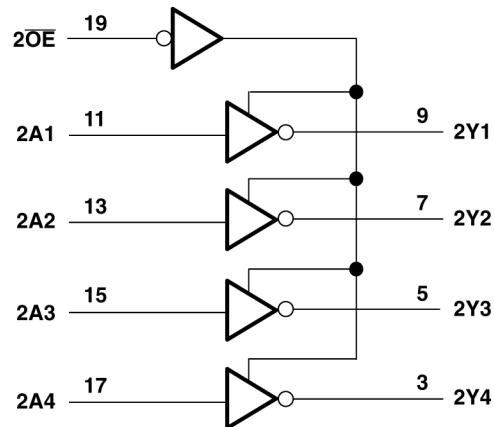
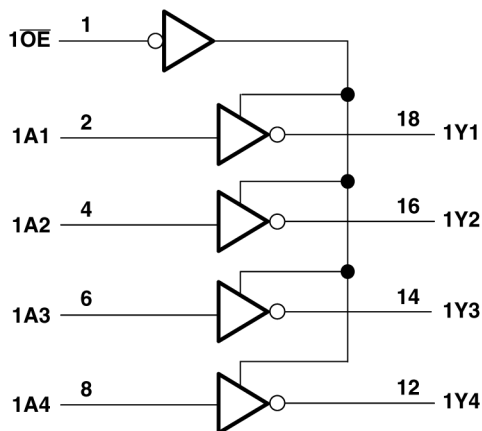
### 3 Description

These octal buffers and line drivers are designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

#### Package Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>	BODY SIZE <sup>(3)</sup>
SN74ACT240	N (PDIP, 20)	24.33mm × 9.4mm	24.33mm × 6.35mm
	DGS (VSSOP, 20)	5.1mm × 4.9mm	5.1mm × 3mm
	DW (SOIC, 20)	12.8mm × 10.3mm	12.80mm × 7.50mm
	NS (SOP, 20)	12.6mm × 7.8mm	12.6mm × 5.3mm
	DB (SSOP, 20)	7.2mm × 7.8mm	7.2mm × 5.3mm
	PW (TSSOP, 20)	6.5mm × 6.4mm	6.5mm × 4.4mm
	RKS (VQFN, 20)	4.5mm × 2.5mm	4.5mm × 2.5mm

- (1) For more information, see [Section 10](#).
- (2) The package size (length × width) is a nominal value and includes pins, where applicable.
- (3) The body size (length × width) is a nominal value and does not include pins.



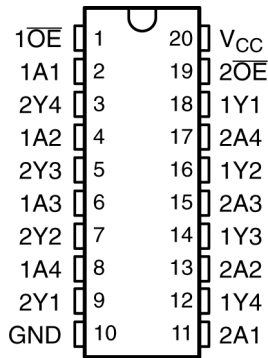
Logic Diagram (Positive Logic)



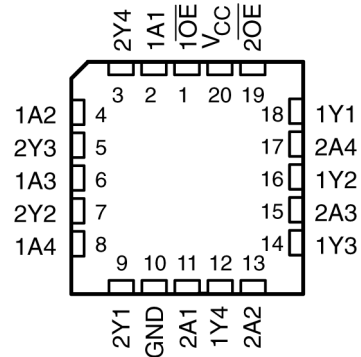
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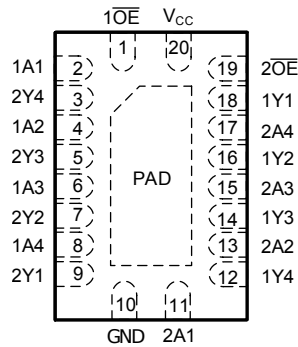
### 4 Pin Configuration and Functions



**Figure 4-1. SN54ACT240 J or W Package; SN74ACT240 DB, DGS, DW, N, NS, or PW Package, (Top View)**



**Figure 4-2. SN54ACT240 FK Package (Top View)**



**Figure 4-3. SNx4ACT240 VQFN Package (Top View)**

**Table 4-1. Pin Functions**

PIN		TYPE <sup>(1)</sup>	DESCRIPTION
NAME	NO.		
10E	1	I	Output enable 1
1A1	2	I	1A1 input
2Y4	3	O	2Y4 output
1A2	4	I	1A2 input
2Y3	5	O	2Y3 output
1A3	6	I	1A3 input
2Y2	7	O	2Y2 output
1A4	8	I	1A4 input
2Y1	9	O	2Y1 output
GND	10	—	Ground pin
2A1	11	I	2A1 input
1Y4	12	O	1Y4 output
2A2	13	I	2A2 input
1Y3	14	O	1Y3 output
2A3	15	I	2A3 input
1Y2	16	O	1Y2 output
2A4	17	I	2A4 input
1Y1	18	O	1Y1 output

Table 4-1. Pin Functions (continued)

PIN		TYPE <sup>(1)</sup>	DESCRIPTION
NAME	NO.		
$2\overline{OE}$	19	I	Output enable 2
VCC	20	—	Power pin
Thermal pad <sup>(2)</sup>		—	The thermal pad can be connect to GND or left floating. Do not connect to any other signal or supply.

(1) Signal Types: I = Input, O = Output, I/O = Input or Output

(2) RKS package only

## 5 Specifications

### 5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) <sup>(1)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range	-0.5	7	V
V <sub>I</sub> <sup>(2)</sup>	Input voltage range	-0.5	V <sub>CC</sub> +0.5	V
V <sub>O</sub> <sup>(2)</sup>	Output voltage range	-0.5	V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	Input clamp current	(V <sub>I</sub> < 0 or V <sub>I</sub> > V <sub>CC</sub> )		±20 mA
I <sub>OK</sub>	Output clamp current	(V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> )		±20 mA
I <sub>O</sub>	Continuous output current	(V <sub>O</sub> = 0 or V <sub>CC</sub> )		±50 mA
	Continuous current through V <sub>CC</sub> or GND			±200 mA
T <sub>stg</sub>	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 voltage ratings may be exceeded if the input and output current ratings are observed.

### 5.2 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		SN54ACT240		SN74ACT240		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.5	5.5		V
V <sub>IH</sub>	High-level input voltage	2				V
V <sub>IL</sub>	Low-level input voltage		0.8	0.8		V
V <sub>I</sub>	Input voltage	0	V <sub>CC</sub>	V <sub>CC</sub>		V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	V <sub>CC</sub>		V
I <sub>OH</sub>	High-level output current		-24	-24		mA
I <sub>OL</sub>	Low-level output current		24	24		mA
Δt/Δv	Input transition rise or fall rate		8	8		ns/V
T <sub>A</sub>	Operating free-air temperature	-55	125	85		°C

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

### 5.3 Thermal Information

THERMAL METRIC <sup>(1)</sup>	DB (SSOP)	DGS (VSSOP)	DW (SOIC)	N (PDIP)	NS (SOP)	PW (TSSOP)	RKS (VQFN)	UNIT	
	20 PINS								
R <sub>θJA</sub>	Junction-to-ambient thermal resistance <sup>(2)</sup>	70	123.5	101.2	69	60	126.2	68	°C/W

- (1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).
- (2) The package thermal impedance is calculated in accordance with JESD 51-7.

### 5.4 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54ACT240		SN74ACT240		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 μA	4.5 V	4.4	4.49		4.4		4.4	V	
		5.5 V	5.4	5.49		5.4		5.4		
	I <sub>OH</sub> = -24 mA	4.5 V	3.86			3.7		3.76		
		5.5 V	4.86			4.7		4.76		
	I <sub>OH</sub> = -50 mA <sup>(1)</sup>	5.5 V				3.85				
I <sub>OH</sub> = -75 mA <sup>(1)</sup>	5.5 V						3.85			
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	4.5 V		0.001	0.1		0.1		0.1	
		5.5 V		0.001	0.1		0.1		0.1	
	I <sub>OL</sub> = 24 mA	4.5 V			0.36		0.5		0.44	
		5.5 V			0.36		0.5		0.44	
	I <sub>OL</sub> = 50 mA <sup>(1)</sup>	5.5 V					1.65			
I <sub>OL</sub> = 75 mA <sup>(1)</sup>	5.5 V							1.65		
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	5.5 V			±0.25		±5		±2.5	μA
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V			±0.1		±1		±1	μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			4		80		40	μA
ΔI <sub>CC</sub> <sup>(2)</sup>	One input at 3.4 V, Other inputs at GND or V <sub>CC</sub>	5.5 V		0.6			1.6		1.5	mA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		2.5						pF
C <sub>O</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		8						pF

- (1) Not more than one output should be tested at a time, and the duration of the test should not exceed 2 ms.
- (2) This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V<sub>CC</sub>.

### 5.5 Switching Characteristics

over recommended operating free-air temperature range, V<sub>CC</sub> = 5 V ± 0.5 V (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

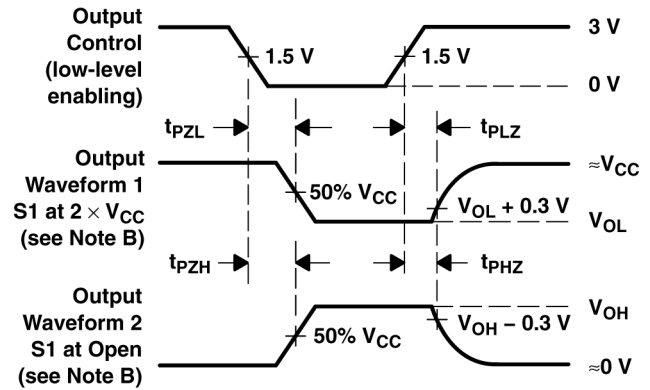
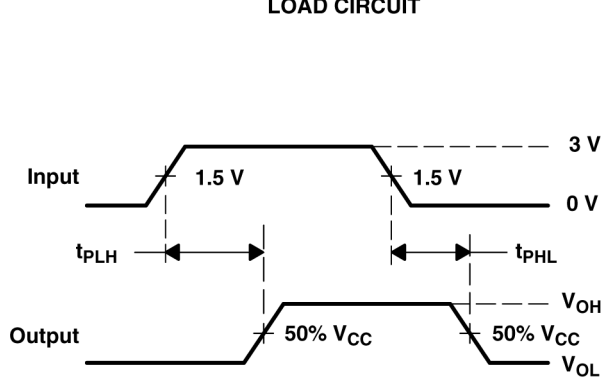
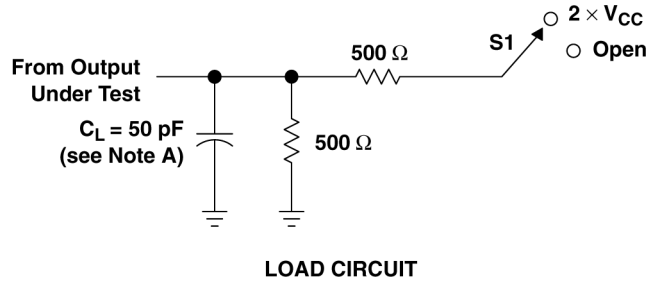
PARAMETER	FROM (INPUT)	TO (OUTPUT)	T <sub>A</sub> = 25°C			SN54ACT240		SN74ACT240		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	1.5	6	8.5	1	9.5	1.5	9.5	ns
t <sub>PHL</sub>			1.5	5.5	7.5	1	9	1.5	8.5	
t <sub>PZH</sub>	OE	Y	1.5	7	8.5	1	10	1	9.5	ns
t <sub>PZL</sub>			2	7	9.5	1	11.5	1.5	10.5	
t <sub>PHZ</sub>	OE	Y	2	8	9.5	1	11	2	10.5	ns
t <sub>PLZ</sub>			2.5	6.5	10	1	11.5	2	10.5	

### 5.6 Operating Characteristics

V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT	
C <sub>pd</sub>	Power dissipation capacitance per buffer/driver	C <sub>L</sub> = 50 pF, f = 1 MHz	45	pF

## 6 Parameter Measurement Information



- $C_L$  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:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
- The outputs are measured one at a time with one input transition per measurement.

**Figure 6-1. Load Circuit and Voltage Waveforms**

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	Open

## 7 Detailed Description

### 7.1 Overview

The SNx4ACT240 devices are organized as two 4-bit buffers or drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes inverted data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

To put the device in the high-impedance state during power up or power down, tie  $\overline{OE}$  to  $V_{CC}$  through a pullup resistor; the current-sinking capability of the driver determines the minimum value of the resistor.

### 7.2 Functional Block Diagram

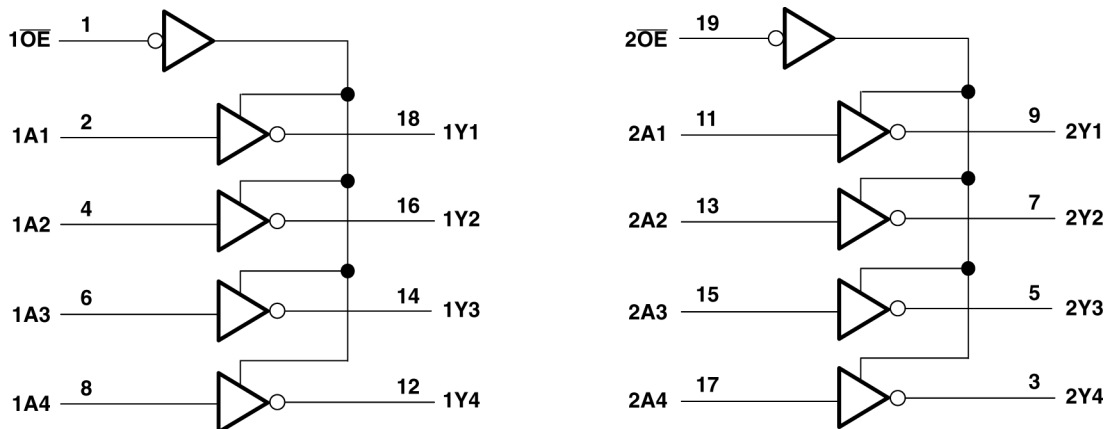


Figure 7-1. Logic Diagram (Positive Logic)

### 7.3 Feature Description

#### 7.3.1 Balanced CMOS Push-Pull Outputs

This device includes balanced CMOS push-pull outputs. The term *balanced* indicates that the device can sink and source similar currents. The drive capability of this device may create fast edges into light loads, so routing and load conditions should be considered to prevent ringing. Additionally, the outputs of this device are capable of driving larger currents than the device can sustain without being damaged. It is important to limit the output power of the device to avoid damage due to overcurrent. The electrical and thermal limits defined in the *Absolute Maximum Ratings* must be followed at all times.

Unused push-pull CMOS outputs must be left disconnected.

### 7.4 Device Functional Modes

Table 7-1. Function Table (Each Buffer)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	L
L	L	H
H	X	Z



## 8 Device and Documentation Support

### 8.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 8.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

### 8.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.  
All trademarks are the property of their respective owners.

### 8.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 8.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 9 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>Changes from Revision F (November 2023) to Revision G (March 2024)</b>	<b>Page</b>
• Added DGS and PW packages to <i>Device Information</i> table, <i>Pin Configuration and Functions</i> section and <i>Thermal Information</i> table.....	<b>1</b>
• Added body size to <i>Device Information</i> table.....	<b>1</b>

<b>Changes from Revision E (November 2023) to Revision F (March 2024)</b>	<b>Page</b>
• Updated RθJA values: DW = 58 to 101.2, PW = 83 to 126.2, all values in °C/W .....	<b>5</b>

## 10 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8775901M2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8775901M2A SNJ54ACT 240FK	<a href="#">Samples</a>
5962-8775901MRA	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8775901MR A SNJ54ACT240J	<a href="#">Samples</a>
5962-8775901MSA	ACTIVE	CFP	W	20	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8775901MS A SNJ54ACT240W	<a href="#">Samples</a>
SN74ACT240DBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AD240	<a href="#">Samples</a>
SN74ACT240DGSR	ACTIVE	VSSOP	DGS	20	5000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	T240	<a href="#">Samples</a>
SN74ACT240DWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ACT240	<a href="#">Samples</a>
SN74ACT240N	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74ACT240N	<a href="#">Samples</a>
SN74ACT240NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ACT240	<a href="#">Samples</a>
SN74ACT240PW	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-40 to 85	AD240	
SN74ACT240PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	AD240	<a href="#">Samples</a>
SN74ACT240PWRG4	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AD240	<a href="#">Samples</a>
SN74ACT240RKSR	ACTIVE	VQFN	RKS	20	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	ACT240	<a href="#">Samples</a>
SNJ54ACT240FK	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8775901M2A SNJ54ACT 240FK	<a href="#">Samples</a>
SNJ54ACT240J	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8775901MR A SNJ54ACT240J	<a href="#">Samples</a>
SNJ54ACT240W	ACTIVE	CFP	W	20	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8775901MS A SNJ54ACT240W	<a href="#">Samples</a>

(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 (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of  $\leq 1000$ ppm threshold. Antimony trioxide based flame retardants must also meet the  $\leq 1000$ ppm 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.

**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 SN54ACT240, SN74ACT240 :**

● Catalog : [SN74ACT240](#)

● Automotive : [SN74ACT240-Q1](#), [SN74ACT240-Q1](#)

● Military : [SN54ACT240](#)

## NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

**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
SN74ACT240DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74ACT240DGSR	VSSOP	DGS	20	5000	330.0	16.4	5.4	5.4	1.45	8.0	16.0	Q1
SN74ACT240DWR	SOIC	DW	20	2000	330.0	24.4	10.9	13.3	2.7	12.0	24.0	Q1
SN74ACT240DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ACT240NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ACT240PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74ACT240PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74ACT240PWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74ACT240RKSR	VQFN	RKS	20	3000	180.0	12.4	2.8	4.8	1.2	4.0	12.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ACT240DBR	SSOP	DB	20	2000	356.0	356.0	35.0
SN74ACT240DGSR	VSSOP	DGS	20	5000	353.0	353.0	32.0
SN74ACT240DWR	SOIC	DW	20	2000	356.0	356.0	45.0
SN74ACT240DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ACT240NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74ACT240PWR	TSSOP	PW	20	2000	353.0	353.0	32.0
SN74ACT240PWR	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74ACT240PWRG4	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74ACT240RKSR	VQFN	RKS	20	3000	210.0	185.0	35.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-8775901M2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-8775901MSA	W	CFP	20	25	506.98	26.16	6220	NA
SN74ACT240N	N	PDIP	20	20	506	13.97	11230	4.32
SNJ54ACT240FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54ACT240W	W	CFP	20	25	506.98	26.16	6220	NA

W (R-GDFP-F20)

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





4220206/A 02/2017

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. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220206/A 02/2017

NOTES: (continued)

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

# EXAMPLE STENCIL DESIGN

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220206/A 02/2017

NOTES: (continued)

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

PW (R-PDSO-G20)

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.

# DB0020A



# PACKAGE OUTLINE

## SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4214851/B 08/2019

### 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. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4214851/B 08/2019

NOTES: (continued)

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

# EXAMPLE STENCIL DESIGN

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4214851/B 08/2019

NOTES: (continued)

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

## GENERIC PACKAGE VIEW

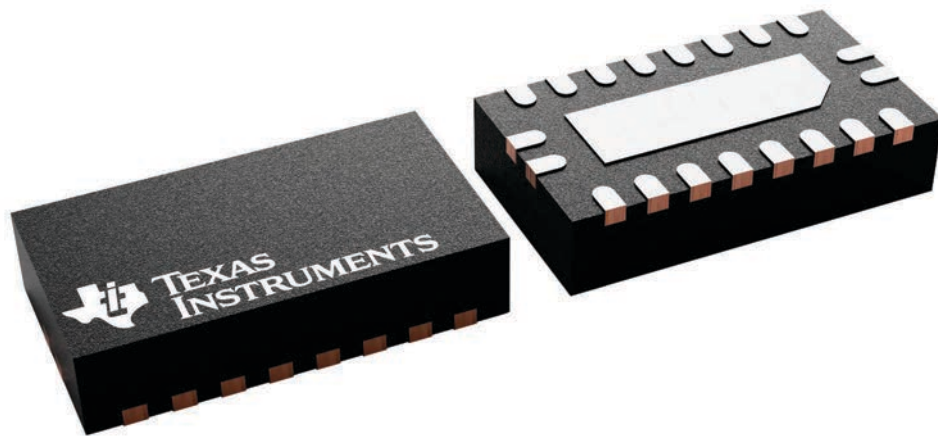
**RKS 20**

**VQFN - 1 mm max height**

2.5 x 4.5, 0.5 mm pitch

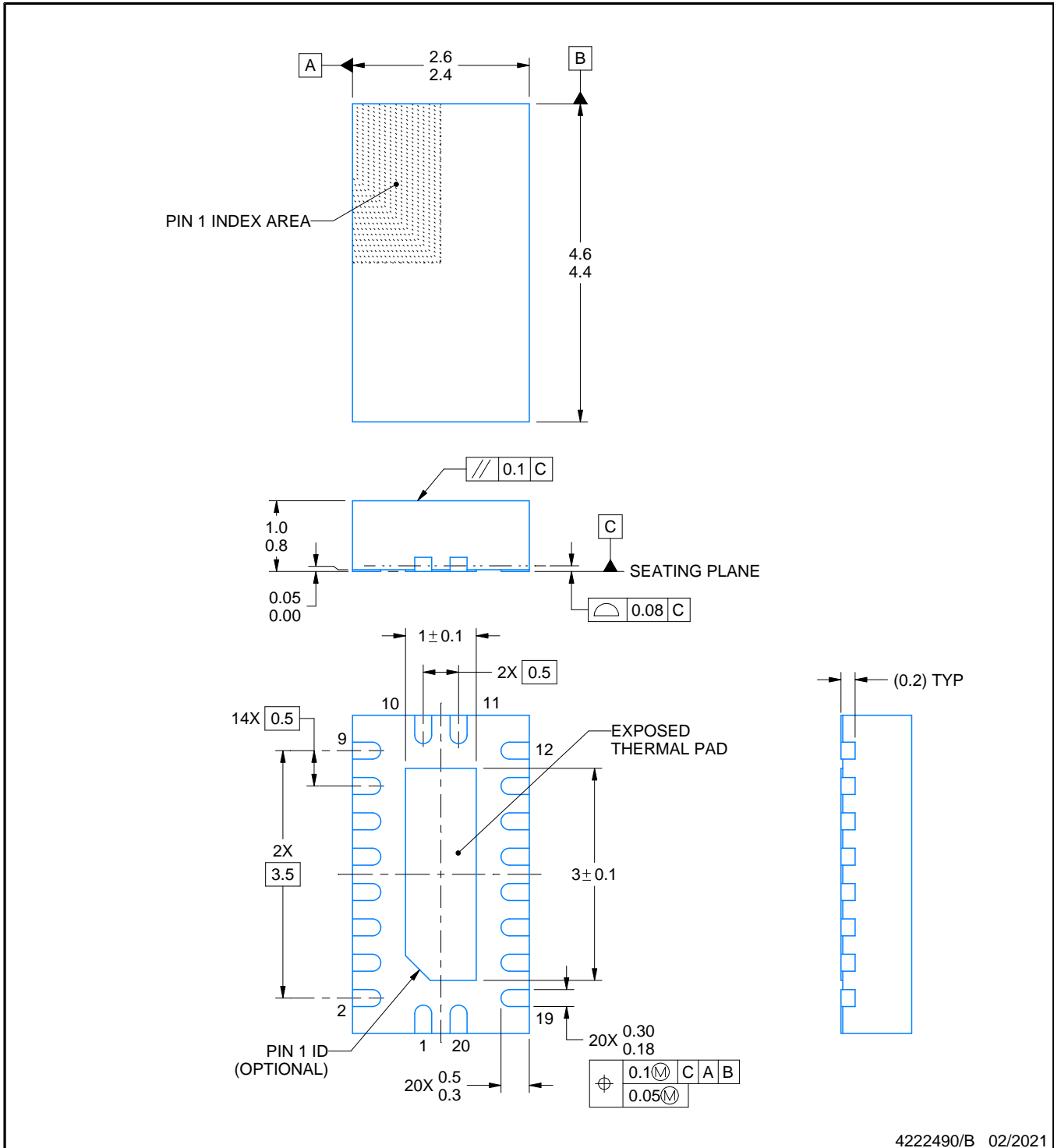
PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4226872/A





NOTES:

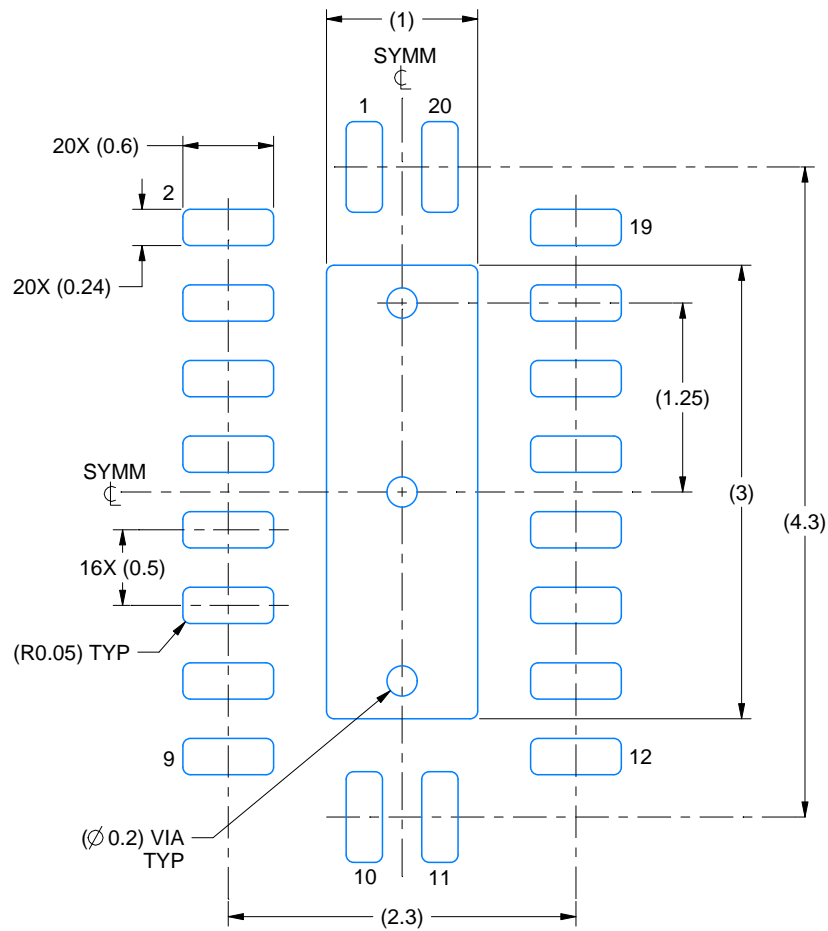
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

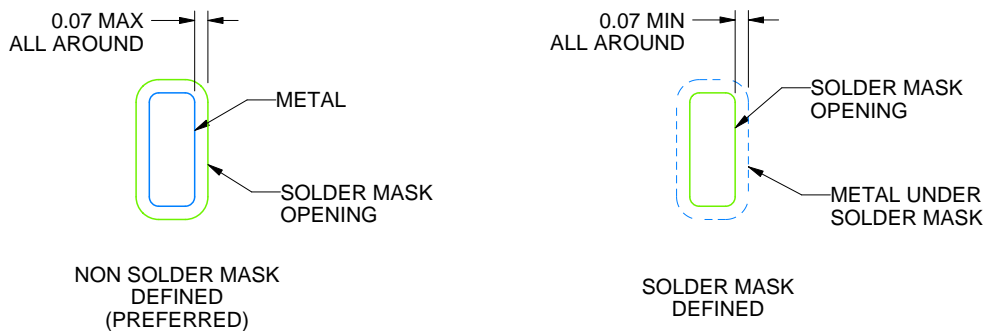
RKS0020A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
SCALE:20X



SOLDER MASK DETAILS

4222490/B 02/2021

NOTES: (continued)

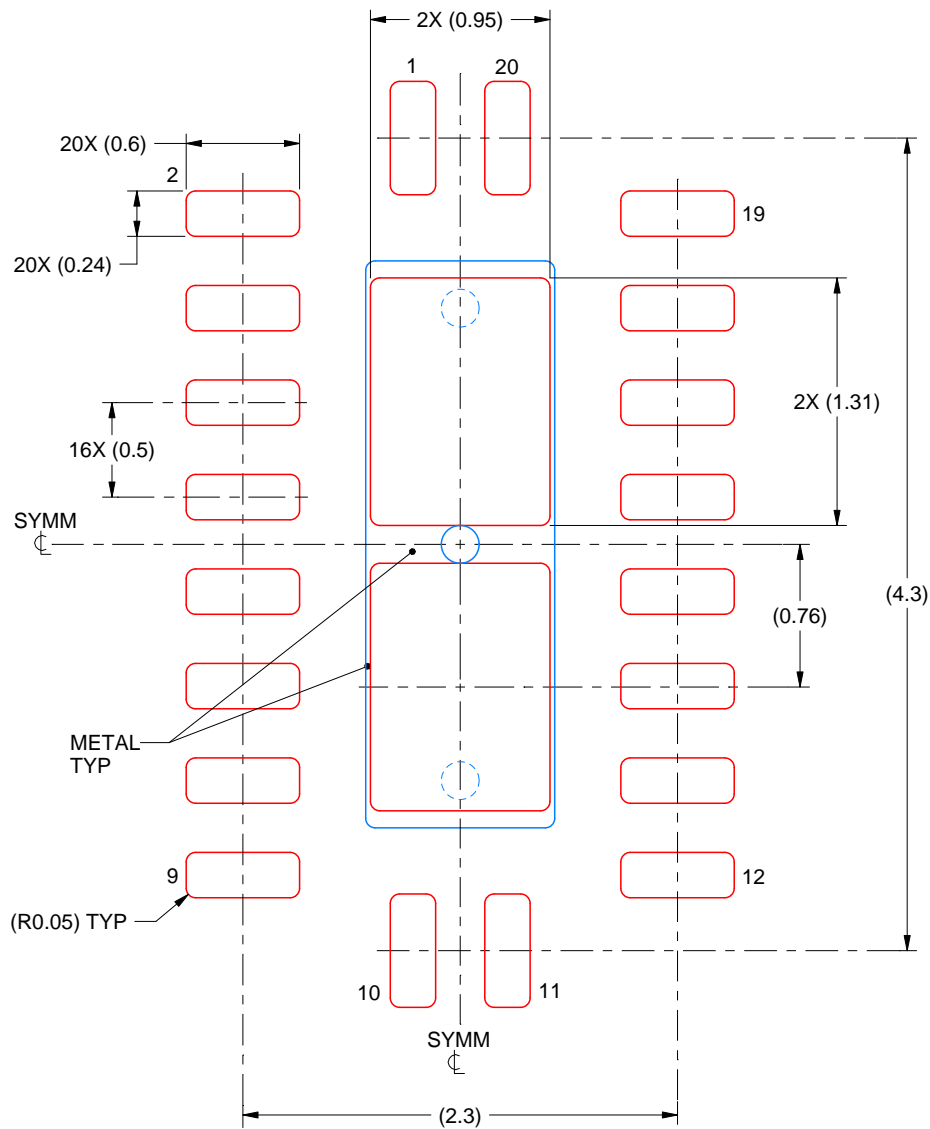
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
- Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.

# EXAMPLE STENCIL DESIGN

RKS0020A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE  
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
 83% PRINTED SOLDER COVERAGE BY AREA  
 SCALE:25X

4222490/B 02/2021

NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

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

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

## GENERIC PACKAGE VIEW

**FK 20**

**LCCC - 2.03 mm max height**

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4229370VA\

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - D The 20 pin end lead shoulder width is a vendor option, either half or full width.

4040049/E 12/2002

# DW0020A



# PACKAGE OUTLINE

## SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

**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 0.43 mm per side.
5. Reference JEDEC registration MS-013.



# EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

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

# EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4220724/A 05/2016

NOTES: (continued)

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

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