

SN74LVC240A Octal Buffer/Driver with 3-State Outputs

1 Features

- Operates from 1.65V to 3.6V
- Inputs accept voltages to 5.5V
- Maximum t_{pd} of 6.5ns at 3.3V
- Typical V_{OLP} (output ground bounce) $<0.8V$ at $V_{CC} = 3.3V$, $T_A = 25^\circ C$
- Typical V_{OHV} (output V_{OH} undershoot) $>2V$ at $V_{CC} = 3.3V$, $T_A = 25^\circ C$
- Supports mixed-mode signal operation on all ports (5V input/output voltage with 3.3V V_{CC})
- I_{off} supports live insertion, partial-power-down mode, and back-drive protection
- Latch-up performance exceeds 100mA per JESD 17

2 Applications

- Drive an indicator LED
- Redrive a digital signal
- Drive a transmission line
- Hold a signal during controller reset

3 Description

The SN74LVC240A is an octal buffer with 3-state outputs. The device is configured into two banks of four drivers, each controlled by an output enable pin.

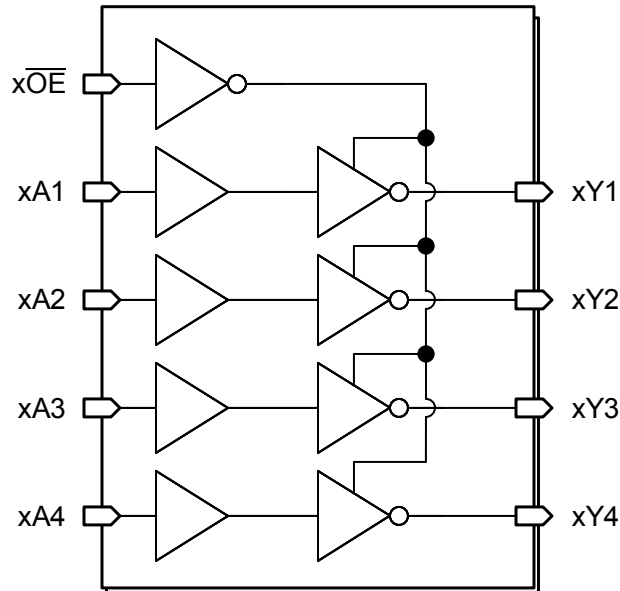
Package Information

PART NUMBER	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾	BODY SIZE ⁽³⁾
SN74LVC240A	PW (TSSOP, 20)	6.5mm × 6.4mm	6.5mm × 4.4mm
	DW (SOIC, 20)	12.80mm × 10.3mm	12.8mm × 7.5mm
	DB (SSOP, 20)	7.2mm × 7.8mm	7.50mm × 5.3mm
	NS (SOP, 20)	12.6mm × 7.8mm	12.6mm × 5.3mm
	DGS (VSSOP, 20)	5.1mm × 4.9mm	5.1mm × 3.0mm
	RKS (VQFN, 20)	4.5mm × 2.5mm	4.5mm × 2.5mm
	DGV (TVSOP, 20)	5.0mm × 6.4mm	5.0mm × 4.4mm

(1) For more information, see [Mechanical, Packaging, and Orderable Information](#).

(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.



Functional Block Diagram



Table of Contents

1 Features	1	7.3 Feature Description.....	9
2 Applications	1	7.4 Device Functional Modes.....	10
3 Description	1	8 Application and Implementation	11
4 Pin Configuration and Functions	3	8.1 Application Information.....	11
5 Specifications	4	8.2 Typical Application.....	11
5.1 Absolute Maximum Ratings.....	4	8.3 Power Supply Recommendations.....	13
5.2 ESD Ratings.....	4	8.4 Layout.....	13
5.3 Recommended Operating Conditions.....	4	9 Device and Documentation Support	15
5.4 Thermal Information.....	5	9.1 Documentation Support.....	15
5.5 Electrical Characteristics.....	5	9.2 Receiving Notification of Documentation Updates....	15
5.6 Switching Characteristics, –40°C to 85°C.....	6	9.3 Support Resources.....	15
5.7 Switching Characteristics, –40°C to 125°C.....	6	9.4 Trademarks.....	15
5.8 Operating Characteristics.....	6	9.5 Electrostatic Discharge Caution.....	15
5.9 Typical Characteristics.....	7	9.6 Glossary.....	15
6 Parameter Measurement Information	8	10 Revision History	15
7 Detailed Description	9	11 Mechanical, Packaging, and Orderable Information	17
7.1 Overview.....	9		
7.2 Functional Block Diagram.....	9		

4 Pin Configuration and Functions

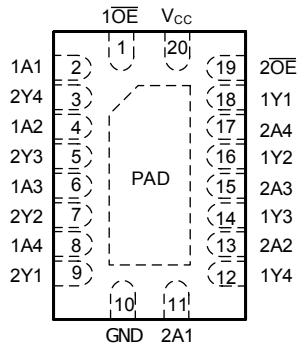


Figure 4-1. SN74LVC240A RKS Package (Top View)

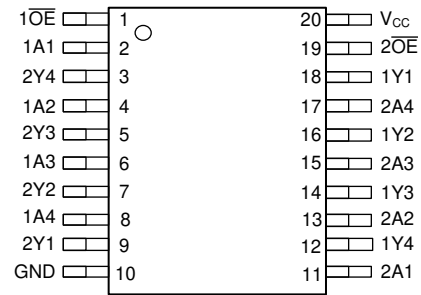


Figure 4-2. SN74LVC240A PW, DW, NS, DB, DGS, DGV Package (Top View)

Pin Functions

PIN		TYPE ⁽¹⁾	DESCRIPTION
NAME	NO.		
A1	2	I	Bank 1, channel 1 input
A2	3	O	Bank 2, channel 4 output
A3	4	I	Bank 1, channel 2 input
A4	5	O	Bank 2, channel 3 output
A5	6	I	Bank 1, channel 3 input
A6	7	O	Bank 2, channel 2 output
A7	8	I	Bank 1, channel 4 input
A8	9	O	Bank 2, channel 1 output
GND	10	G	Ground
$\overline{OE1}$	1	I	Bank 1, output enable, active low
$\overline{OE2}$	19	I	Bank 2, output enable, active low
Thermal Pad ⁽²⁾		—	The thermal pad can be connected to GND or left floating. Do not connect to any other signal or supply.
V _{CC}	20	P	Positive supply
Y1	18	O	Bank 1, channel 1 output
Y2	17	I	Bank 2, channel 4 input
Y3	16	O	Bank 1, channel 2 output
Y4	15	I	Bank 2, channel 3 input
Y5	14	O	Bank 1, channel 3 output
Y6	13	I	Bank 2, channel 2 input
Y7	12	O	Bank 1, channel 4 output
Y8	11	I	Bank 2, channel 1 input

(1) Signal Types: I = Input, O = Output, G = Ground, P = Power.

(2) RKS package only.

5 Specifications

5.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT	
V _{CC}	Supply voltage range	-0.5	6.5	V	
V _I	Input voltage range ⁽²⁾	-0.5	6.5	V	
V _O	Voltage range, applied to any output in the high-impedance or power-off state ⁽²⁾	-0.5	6.5	V	
V _O	Voltage range, applied to any output in the high or low state ^{(2) (3)}	-0.5	V _{CC} + 0.5	V	
I _{IK}	Input clamp current	V _I < 0		-50	mA
I _{OK}	Output clamp current	V _O < 0		-50	mA
I _O	Continuous output current			±50	mA
	Continuous current through V _{CC} or GND			±100	mA
T _{stg}	Storage temperature	-65	150	°C	

- (1) Operation outside the *Absolute Maximum Ratings* may cause permanent device damage. Absolute maximum ratings do not imply functional operation of the device at these or any other conditions beyond those listed under *Recommended Operating Conditions*. If briefly operating outside the *Recommended Operating Conditions* but within the *Absolute Maximum Ratings*, the device may not sustain damage, but it may not be fully functional. Operating the device in this manner may affect device reliability, functionality, performance, and shorten the device lifetime.
- (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.

5.2 ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±2000	V
		Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002 ⁽²⁾	±1000	

- (1) JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process.

5.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT	
V _{CC}	Supply voltage	Operating	1.65	3.6	V
		Data retention only	1.5		
V _{IH}	High-level input voltage	V _{CC} = 1.65V to 1.95V	0.65 × V _{CC}		V
		V _{CC} = 2.3V to 2.7V	1.7		
		V _{CC} = 2.7V to 3.6V	2		
V _{IL}	Low-level input voltage	V _{CC} = 1.65V to 1.95V	0.35 × V _{CC}		V
		V _{CC} = 2.3V to 2.7V	0.7		
		V _{CC} = 2.7V to 3.6V	0.8		
V _I	Input voltage	0	5.5	V	
V _O	Output voltage	High or low state	0	V _{CC}	V
		3-state	0	5.5	
I _{OH}	High-level output current	V _{CC} = 1.65V	-4		mA
		V _{CC} = 2.3V	-8		
		V _{CC} = 2.7V	-12		
		V _{CC} = 3V	-24		

5.3 Recommended Operating Conditions (continued)

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

		MIN	MAX	UNIT
I _{OL}	Low-level output current	V _{CC} = 1.65V	4	mA
		V _{CC} = 2.3V	8	
		V _{CC} = 2.7V	12	
		V _{CC} = 3V	24	
Δt/Δv	Input transition rise or fall rate		6	ns/V
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 verify proper device operation. Refer to the TI application note, [Implications of Slow or Floating CMOS Inputs](#).

5.4 Thermal Information

PACKAGE	PINS	THERMAL METRIC ⁽¹⁾						UNIT
		R _{θJA}	R _{θJC(top)}	R _{θJB}	Ψ _{JT}	Ψ _{JB}	R _{θJC(bot)}	
PW (TSSOP)	20	120.3	62.5	82.4	16.0	81.5	N/A	°C/W
DGS (VSSOP)	20	129.9	72.4	86.1	18.6	85.8	N/A	°C/W
RKS (VQFN)	20	87.2	93.4	59.8	24.9	59.6	44.3	°C/W
DB (SSOP)	20	121.7	86.8	87.8	44.7	87.0	N/A	°C/W
DW (SOIC)	20	114.8	84.1	88.8	55.8	87.8	N/A	°C/W
NS (SOP)	20	116.3	82.4	86.2	43.9	85.5	N/A	°C/W

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application note.

5.5 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} = -100μA	1.65V to 3.6V	V _{CC} - 0.2			V _{CC} - 0.2			V	
	I _{OH} = -4mA	1.65V	1.2			1.2				
	I _{OH} = -8mA	2.3V	1.7			1.7				
	I _{OH} = -12mA	2.7V	2.2			2.2				
		3V	2.4			2.4				
I _{OH} = -24mA	3V	2.2			2.2					
V _{OL}	I _{OL} = 100μA	1.65V to 3.6V	0.2			0.2			V	
	I _{OL} = 4mA	1.65V	0.45			0.45				
	I _{OL} = 8mA	2.3V	0.7			0.7				
	I _{OL} = 12mA	2.7V	0.4			0.4				
	I _{OL} = 24mA	3V	0.55			0.55				
I _I	V _I = 0 to 5.5V	3.6V	±5			±5			μA	
I _{off}	V _I or V _O = 5.5V	0	±10			±20			μA	
I _{OZ}	V _O = 0 to 5.5V	3.6V	±10			±20			μA	
I _{CC}	V _I = V _{CC} or GND	I _O = 0	3.6V	10			10			μA
	3.6V ≤ V _I ≤ 5.5V ⁽²⁾			10			10			

5.5 Electrical Characteristics (continued)

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	
ΔI _{CC}	One input at V _{CC} – 0.6V, Other inputs at V _{CC} or GND	2.7V to 3.6V			500			500	μA
C _i	V _I = V _{CC} or GND	3.3V		4			4		pF
C _o	V _O = V _{CC} or GND	3.3V		5.5			5.5		pF

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

(2) This applies in the disabled state only.

5.6 Switching Characteristics, –40°C to 85°C

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8V ± 0.15V		V _{CC} = 2.5V ± 0.2V		V _{CC} = 2.7V		V _{CC} = 3.3V ± 0.3V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y		16.4		7.8		7.5	1.3	6.5	ns
t _{en}	$\overline{\text{OE}}$	Y		16.5		10.5		9	1.1	8	ns
t _{dis}	$\overline{\text{OE}}$	Y		15.9		9		8	1.4	7	ns
t _{sk(o)}				1		1		1		1	ns

5.7 Switching Characteristics, –40°C to 125°C

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

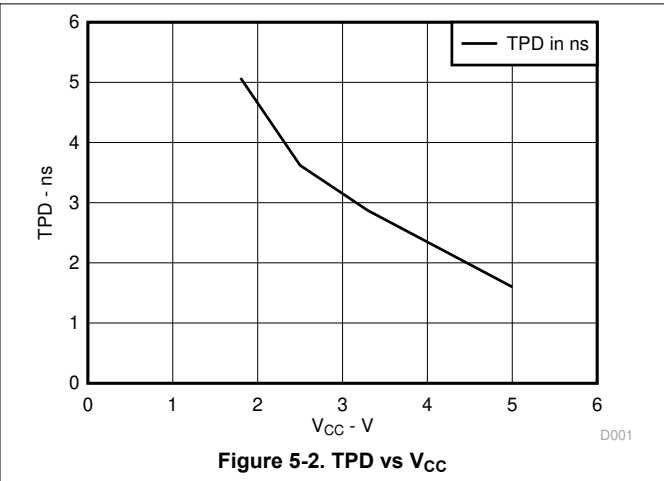
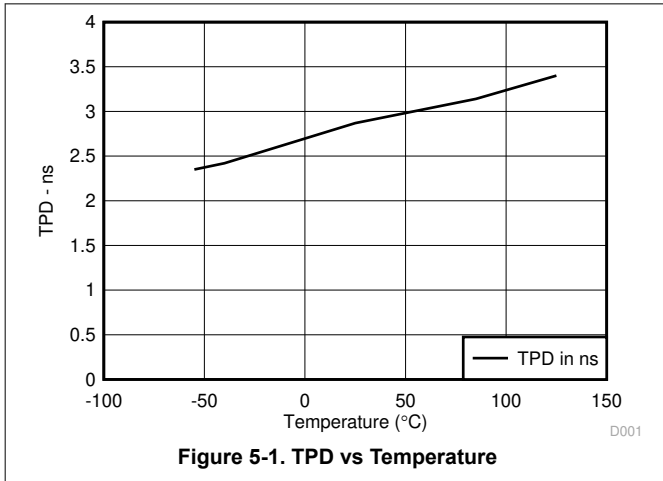
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8V ± 0.15V		V _{CC} = 2.5V ± 0.2V		V _{CC} = 2.7V		V _{CC} = 3.3V ± 0.3V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y		16.4		7.8		7.9	1.3	6.9	ns
t _{en}	$\overline{\text{OE}}$	Y		16.5		10.5		9.4	1.1	8.4	ns
t _{dis}	$\overline{\text{OE}}$	Y		15.9		9		8.6	1.4	7.6	ns
t _{sk(o)}				1		1		1		1	ns

5.8 Operating Characteristics

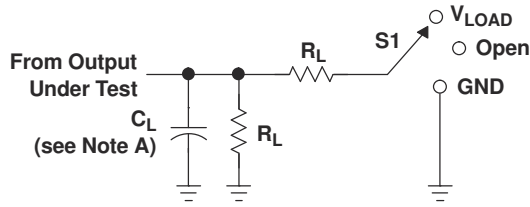
T_A = 25°C

PARAMETER		TEST CONDITIONS	V _{CC} = 1.8V	V _{CC} = 2.5V	V _{CC} = 3.3V	UNIT
			TYP	TYP	TYP	
C _{pd}	Power dissipation capacitance	f = 10MHz	127	156	32	pF
	Outputs disabled		8	9	3	

5.9 Typical Characteristics



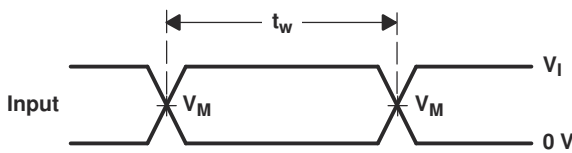
6 Parameter Measurement Information



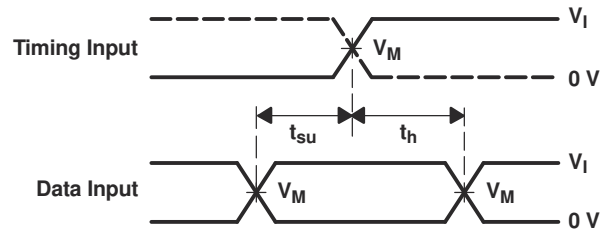
LOAD CIRCUIT

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

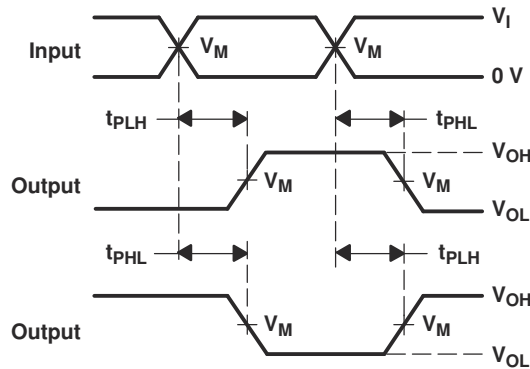
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	$\leq 2.5\text{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



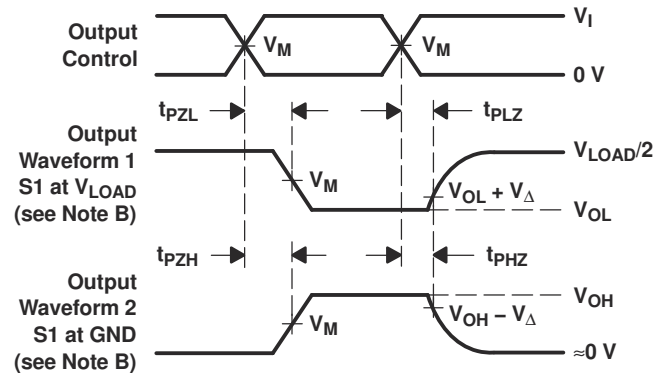
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- 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 6-1. Load Circuit and Voltage Waveforms

7 Detailed Description

7.1 Overview

The SN74LVC240A contains 8 individual high speed CMOS inverters with Schmitt-trigger inputs and 3-state outputs.

Each inverter performs the Boolean logic function $xY_n = \overline{xA_n}$, with x being the bank number and n being the channel number.

Each output enable ($x\overline{OE}$) controls four inverters. When the $x\overline{OE}$ pin is in the low state, the outputs of all inverters in the bank x are enabled. When the $x\overline{OE}$ pin is in the high state, the outputs of all inverters in the bank x are disabled. All disabled output are placed into the high-impedance state.

To confirm the high-impedance state during power up or power down, both \overline{OE} pins must be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current sinking capability of the driver and the leakage of the pin as defined in the *Electrical Characteristics* table.

7.2 Functional Block Diagram

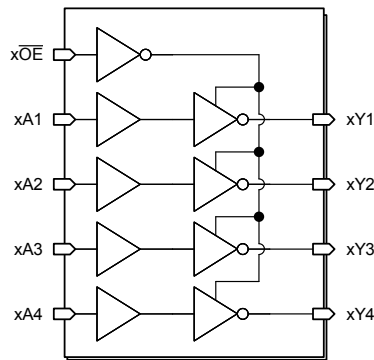


Figure 7-1. Logic Diagram (Positive Logic) for SN74LVC240A

7.3 Feature Description

7.3.1 Balanced CMOS 3-State Outputs

This device includes balanced CMOS 3-state outputs: driving high, driving low, and high impedance. The term *balanced* indicates that the device can sink and source similar currents. The drive capability of this device can create fast edges into light loads, so consider routing and load conditions to prevent ringing. Additionally, the outputs of this device can drive larger currents than the device can sustain without damage. Limit the output power of the device to avoid damage from overcurrent. The electrical and thermal limits defined in the *Absolute Maximum Ratings* must be followed at all times.

When placed into the high-impedance state, the output does not source or sink current except minor leakage current as defined in the *Electrical Characteristics* table. In the high-impedance state, the device does not control the output voltage. The output current is dependent on external factors. A floating node is a node that has no other drivers connected, and the voltage is unknown. A pull-up or pull-down resistor can be connected to the output to provide a known voltage at the output while the device is in the high-impedance state. The value of the resistor depends on multiple factors, including parasitic capacitance and power consumption limitations. Typically, a 10k Ω resistor meets these requirements.

Leave unused 3-state CMOS outputs disconnected.

7.3.2 Partial Power Down (I_{off})

This device includes circuitry to disable all outputs when the supply pin is held at 0V. When disabled, the outputs neither source nor sink current, regardless of the input voltages. The amount of leakage current at each output is defined by the I_{off} specification in the *Electrical Characteristics* table.

7.3.3 Standard CMOS Inputs

This device includes standard CMOS inputs. Standard CMOS inputs are high impedance and are typically modeled as a resistor in parallel with the input capacitance given in the *Electrical Characteristics*. The worst case resistance is calculated with the maximum input voltage, given in the *Absolute Maximum Ratings*, and the maximum input leakage current, given in the *Electrical Characteristics*, using Ohm's law ($R = V \div I$).

Standard CMOS inputs require that input signals transition between valid logic states quickly, as defined by the input transition time or rate in the *Recommended Operating Conditions* table. Failing to meet this specification results in excessive power consumption and can cause oscillations. See more details in *Implications of Slow or Floating CMOS Inputs*.

Do not leave standard CMOS inputs floating at any time during operation. Terminate unused inputs at V_{CC} or GND. If a system does not always drive an input, consider adding a pull-up or pull-down resistor to provide a valid input voltage. The resistor value depends on multiple factors; a 10k Ω resistor, however, is recommended and typically meets all requirements.

7.3.4 Clamp Diode Structure

Figure 7-2 shows the inputs and outputs to this device have negative clamping diodes only.

CAUTION

Voltages beyond the values specified in the *Absolute Maximum Ratings* table can cause damage to the device. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

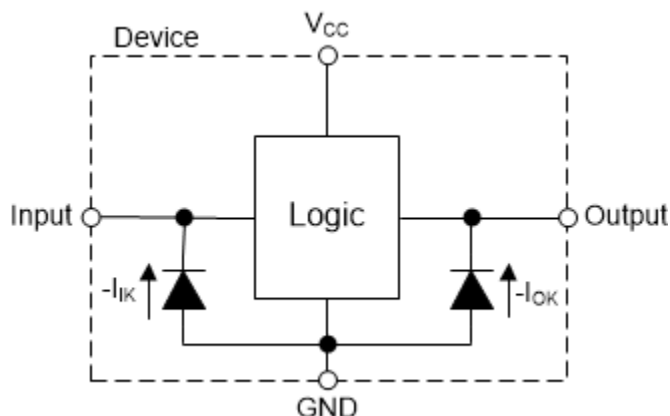


Figure 7-2. Electrical Placement of Clamping Diodes for Each Input and Output

7.4 Device Functional Modes

Table 7-1 lists the functional modes of the SN74LVC240A.

Table 7-1. Function Table

INPUTS ⁽¹⁾		OUTPUTS
\overline{OE}	A	Y
L	L	H
L	H	L
H	X	Z

(1) H = High Voltage Level, L = Low Voltage Level, X = Do Not Care, Z = High-Impedance State

8 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

8.1 Application Information

The SN74LVC240A can be used to drive signals over relatively long traces or transmission lines. A series damping resistor placed in series with the transmitter's output can be used to reduce ringing caused by impedance mismatches between the driver, transmission line, and receiver. The figure in the *Application Curve* section shows the received signal with three separate resistor values. Just a small amount of resistance can make a significant impact on signal integrity in this type of application.

8.2 Typical Application

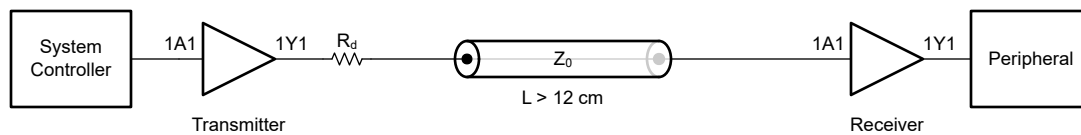


Figure 8-1. Typical Application Block Diagram

8.2.1 Design Requirements

The SN74LVC240A device uses CMOS technology and has balanced output drive. Take care to avoid bus contention because it can drive currents that can exceed maximum limits.

The SN74LVC240A allows switching control of analog and digital signals with a digital control signal. All input signals must remain as close as possible to either 0V or V_{CC} for peak operation.

8.2.1.1 Power Considerations

Verify that the desired supply voltage is within the range specified in the *Electrical Characteristics*. The supply voltage sets the device electrical characteristics, as described in the *Electrical Characteristics* section.

The positive voltage supply must be capable of sourcing current equal to the total current to be sourced by all outputs of the SN74LVC240A plus the maximum static supply current, I_{CC} , listed in the *Electrical Characteristics*, and any transient current required for switching. The logic device can only source as much current that is provided by the positive supply source. Verify that the maximum total current through V_{CC} listed in the *Absolute Maximum Ratings* is not exceeded.

The ground must be capable of sinking current equal to the total current to be sunk by all outputs of the SN74LVC240A plus the maximum supply current, I_{CC} , listed in the *Electrical Characteristics*, and any transient current required for switching. The logic device can only sink as much current that can be sunk into the ground connection. Verify that the maximum total current through GND listed in the *Absolute Maximum Ratings* is not exceeded.

The SN74LVC240A can drive a load with a total capacitance less than or equal to 50pF while still meeting all of the datasheet specifications. Larger capacitive loads can be applied; however, do not exceed 50pF.

The SN74LVC240A can drive a load with total resistance described by $R_L \geq V_O / I_O$, with the output voltage and current defined in the *Electrical Characteristics* table with V_{OH} and V_{OL} . When outputting in the HIGH state, the output voltage in the equation is defined as the difference between the measured output voltage and the supply voltage at the V_{CC} pin.

Total power consumption can be calculated using the information provided in the [CMOS Power Consumption and Cpd Calculation application note](#).

Thermal increase can be calculated using the information provided in the [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices application note](#).

CAUTION

The maximum junction temperature, $T_{J(max)}$ listed in the *Absolute Maximum Ratings*, is an additional limitation to prevent damage to the device. Do not violate any values listed in the *Absolute Maximum Ratings*. These limits are provided to prevent damage to the device.

8.2.1.2 Input Considerations

Input signals must cross $V_{IL(max)}$ to be considered a logic LOW, and $V_{IH(min)}$ to be considered a logic HIGH. Do not exceed the maximum input voltage range found in the *Absolute Maximum Ratings*.

Unused inputs must be terminated to either V_{CC} or ground. The unused inputs can be directly terminated if the input is completely unused, or the inputs can be connected with a pullup or pulldown resistor if the input is used sometimes, but not always. A pullup resistor is used for a default state of HIGH, and a pulldown resistor is used for a default state of LOW. The drive current of the controller, leakage current into the SN74LVC240A (as specified in the *Electrical Characteristics*), and the desired input transition rate limits the resistor size. A 10k Ω resistor value is often used due to these factors.

The SN74LVC240A has CMOS inputs and thus requires fast input transitions to operate correctly, as defined in the Electrical Characteristics table. Slow input transitions can cause oscillations, additional power consumption, and reduction in device reliability.

Refer to the *Feature Description* for additional information regarding the inputs for this device.

8.2.1.3 Output Considerations

The positive supply voltage is used to produce the output HIGH voltage. Drawing current from the output decreases the output voltage as specified by the V_{OH} specification in the *Electrical Characteristics*. The ground voltage is used to produce the output LOW voltage. Sinking current into the output increases the output voltage as specified by the V_{OL} specification in the *Electrical Characteristics*.

Push-pull outputs that can be in opposite states, even for a very short time period, must never be connected directly together. This can cause excessive current and damage to the device.

Two channels within the same device with the same input signals can be connected in parallel for additional output drive strength.

Unused outputs can be left floating. Do not connect outputs directly to V_{CC} or ground.

Refer to the *Feature Description* section for additional information regarding the outputs for this device.

8.2.2 Detailed Design Procedure

1. Recommended input conditions:
 - For rise time and fall time specifications, see $\Delta t/\Delta v$ in the *Recommended Operating Conditions* table.
 - For specified high and low levels, see V_{IH} and V_{IL} in the *Recommended Operating Conditions* table.
 - Inputs and outputs are overvoltage tolerant and can therefore go as high as 5.5V at any valid V_{CC} .
2. Recommended output conditions:
 - Load currents not exceeding $\pm 50\text{mA}$.
3. Frequency selection criterion:
 - The effects of frequency upon the device's power consumption should be studied in the [CMOS Power Consumption and CPD Calculation application note](#).
 - Added trace resistance and capacitance can reduce maximum frequency capability; follow the layout practices listed in the *Layout* section.

8.2.3 Application Curves

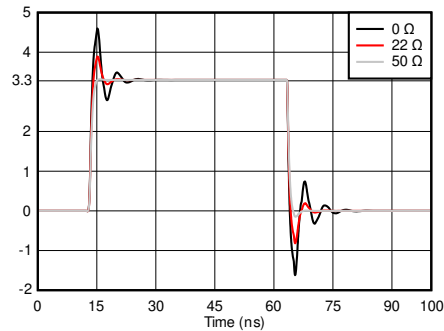


Figure 8-2. Simulated Signal Integrity at the Receiver With Different Damping Resistor (R_d) Values

8.3 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating listed in the *Recommended Operating Conditions*.

Verify that each V_{CC} terminal has a good bypass capacitor to prevent power disturbance. For the SN74LVC240A, a $0.1\mu\text{F}$ bypass capacitor is recommended. To reject different frequencies of noise, use multiple bypass capacitors in parallel. Capacitors with values of $0.1\mu\text{F}$ and $1\mu\text{F}$ are commonly used in parallel.

8.4 Layout

8.4.1 Layout Guidelines

- Bypass capacitor placement
 - Place near the positive supply terminal of the device
 - Provide an electrically short ground return path
 - Use wide traces to minimize impedance
 - Keep the device, capacitors, and traces on the same side of the board whenever possible
- Signal trace geometry
 - 8mil to 12mil trace width
 - Lengths less than 12cm to minimize transmission line effects
 - Avoid 90° corners for signal traces
 - Use an unbroken ground plane below signal traces
 - Flood fill areas around signal traces with ground
 - Parallel traces must be separated by at least 3x dielectric thickness
 - For traces longer than 12cm
 - Use impedance controlled traces
 - Source-terminate using a series damping resistor near the output
 - Avoid branches; buffer each signal that must branch separately

8.4.2 Layout Example

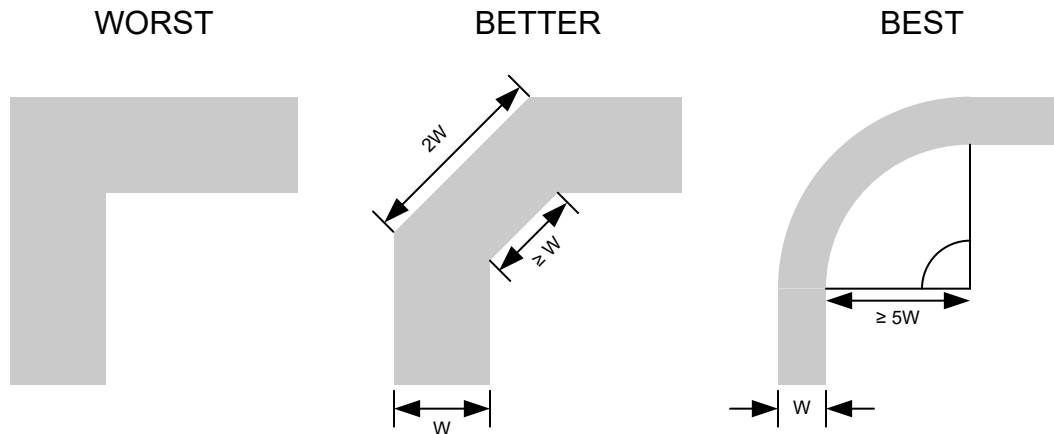


Figure 8-3. Example Trace Corners for Improved Signal Integrity

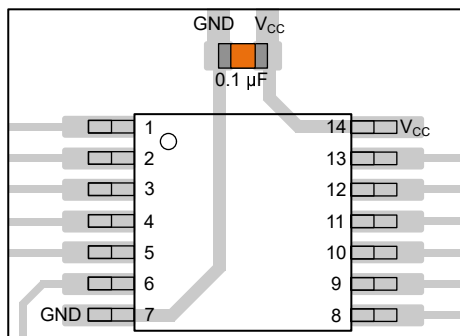


Figure 8-4. Example Bypass Capacitor Placement for TSSOP and Similar Packages

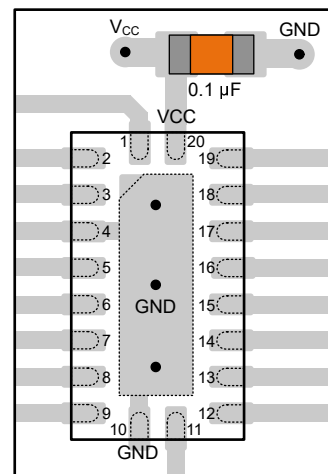


Figure 8-5. Example Bypass Capacitor Placement for WQFN and Similar Packages

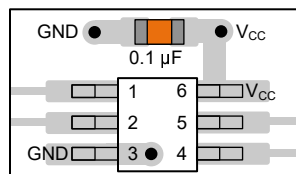


Figure 8-6. Example Bypass Capacitor Placement for SOT, SC70 and Similar Packages

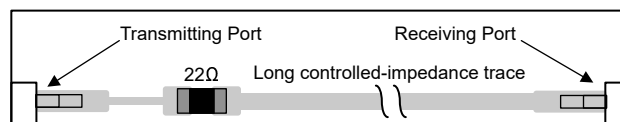


Figure 8-7. Example Damping Resistor Placement for Improved Signal Integrity

9 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

9.1 Documentation Support

9.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [CMOS Power Consumption and \$C_{pd}\$ Calculation application note](#)
- Texas Instruments, [Designing With Logic application note](#)
- Texas Instruments, [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices application note](#)

9.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on 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.

9.3 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](#).

9.4 Trademarks

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

9.5 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.

9.6 Glossary

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

10 Revision History

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

Changes from July 1, 2014 to June 25, 2026 (from Revision L (July 2014) to Revision M (June 2026))

	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	1
• Moved ESD ratings to <i>ESD Ratings</i> table.....	1
• Updated latch-up ratings to latest standards.....	1
• Updated <i>Device Information</i> format and included package size.....	1
• Updated <i>Simplified Schematic</i>	1
• Updated <i>Applications</i>	1
• Added DGS and RKS package information.....	1
• Added DGS and RKS package information.....	2
• Added <i>ESD Ratings</i> table.....	4

• Changed Junction-to-ambient thermal resistance value for PW package from: 102.5°C/W to: 120.3°C/W	5
• Changed Junction-to-case (top) thermal resistance value for PW package from: 35.9°C/W to: 62.5°C/W.....	5
• Changed Junction-to-board thermal resistance value for PW package from: 53.5°C/W to: 82.4°C/W.....	5
• Changed Junction-to-top characterization value for PW package from: 2.2°C/W to: 16.0°C/W.....	5
• Changed Junction-to-board characterization value for PW package from: 52.9°C/W to: 81.5°C/W.....	5
• Added DW, DB and NS package Thermal Information table.....	5
• Added parallel trace spacing recommendation to layout guidelines. Changed wording of "Avoid branches; buffer signals that must branch separately" to "Avoid branches; buffer each signal that must branch separately".....	13
• Updated <i>Detailed Description, Application and Implementation</i> and <i>Device Documentation</i> sections.....	15

Changes from Revision K (February 2005) to Revision L (July 2014)	Page
• Updated document to new TI data sheet standards.....	1
• Deleted Ordering Information table.....	1
• Updated I_{off} bullet in Features list.....	1
• Added Device Information table.....	1
• Changed MAX ambient temperature to 125°C in Recommended Operating Conditions table.....	4
• Added Thermal Information table.....	5
• Added –40°C to 125°C temperature range to Electrical Characteristics table.....	5
• Added Switching Characteristics table for –40°C to 125°C temperature range.....	6
• Added Typical Characteristics.	7
• Added Detailed Description section.....	15
• Added Application and Implementation section.....	15

11 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 part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74LVC240ADBR	Active	Production	SSOP (DB) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240ADBR.B	Active	Production	SSOP (DB) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240ADGSR	Active	Production	VSSOP (DGS) 20	5000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C240A
SN74LVC240ADGVR	Active	Production	TVSOP (DGV) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240ADGVR.B	Active	Production	TVSOP (DGV) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240ADGVRG4	Active	Production	TVSOP (DGV) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240ADGVRG4.B	Active	Production	TVSOP (DGV) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240ADW	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240ADW.B	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240ADWR	Active	Production	SOIC (DW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240ADWR.A	Active	Production	SOIC (DW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240ADWR.B	Active	Production	SOIC (DW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240ANS.B	Active	Production	SOP (NS) 20	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240ANSR	Active	Production	SOP (NS) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240ANSR.B	Active	Production	SOP (NS) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC240A
SN74LVC240APW	Active	Production	TSSOP (PW) 20	70 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APW.B	Active	Production	TSSOP (PW) 20	70 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWG4	Active	Production	TSSOP (PW) 20	70 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWR	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWR.A	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWR.B	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWRE4	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWRG4	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWRG4.A	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWRG4.B	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWT	Active	Production	TSSOP (PW) 20	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A
SN74LVC240APWT.B	Active	Production	TSSOP (PW) 20	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC240A

(1) **Status:** For more details on status, see our [product life cycle](#).

- (2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
- (3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.
- (4) **Lead finish/Ball material:** Parts 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.
- (5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
- (6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that 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.

OTHER QUALIFIED VERSIONS OF SN74LVC240A :

- Automotive : [SN74LVC240A-Q1](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

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
SN74LVC240ADBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74LVC240ADGSR	VSSOP	DGS	20	5000	330.0	16.4	5.4	5.4	1.45	8.0	16.0	Q1
SN74LVC240ADGVR	TVSOP	DGV	20	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC240ADGVRG4	TVSOP	DGV	20	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC240ADWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74LVC240ANSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74LVC240APWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74LVC240APWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74LVC240APWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74LVC240APWT	TSSOP	PW	20	250	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC240ADBR	SSOP	DB	20	2000	353.0	353.0	32.0
SN74LVC240ADGSR	VSSOP	DGS	20	5000	353.0	353.0	32.0
SN74LVC240ADGVR	TVSOP	DGV	20	2000	353.0	353.0	32.0
SN74LVC240ADGVRG4	TVSOP	DGV	20	2000	353.0	353.0	32.0
SN74LVC240ADWR	SOIC	DW	20	2000	356.0	356.0	45.0
SN74LVC240ANSR	SOP	NS	20	2000	356.0	356.0	45.0
SN74LVC240APWR	TSSOP	PW	20	2000	353.0	353.0	32.0
SN74LVC240APWRG4	TSSOP	PW	20	2000	353.0	353.0	32.0
SN74LVC240APWRG4	TSSOP	PW	20	2000	353.0	353.0	32.0
SN74LVC240APWT	TSSOP	PW	20	250	353.0	353.0	32.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74LVC240ADW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74LVC240ADW.B	DW	SOIC	20	25	507	12.83	5080	6.6
SN74LVC240ANS.B	NS	SOP	20	40	530	10.5	4000	4.1
SN74LVC240APW	PW	TSSOP	20	70	530	10.2	3600	3.5
SN74LVC240APW.B	PW	TSSOP	20	70	530	10.2	3600	3.5
SN74LVC240APWG4	PW	TSSOP	20	70	530	10.2	3600	3.5

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

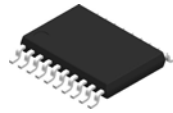


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

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.



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

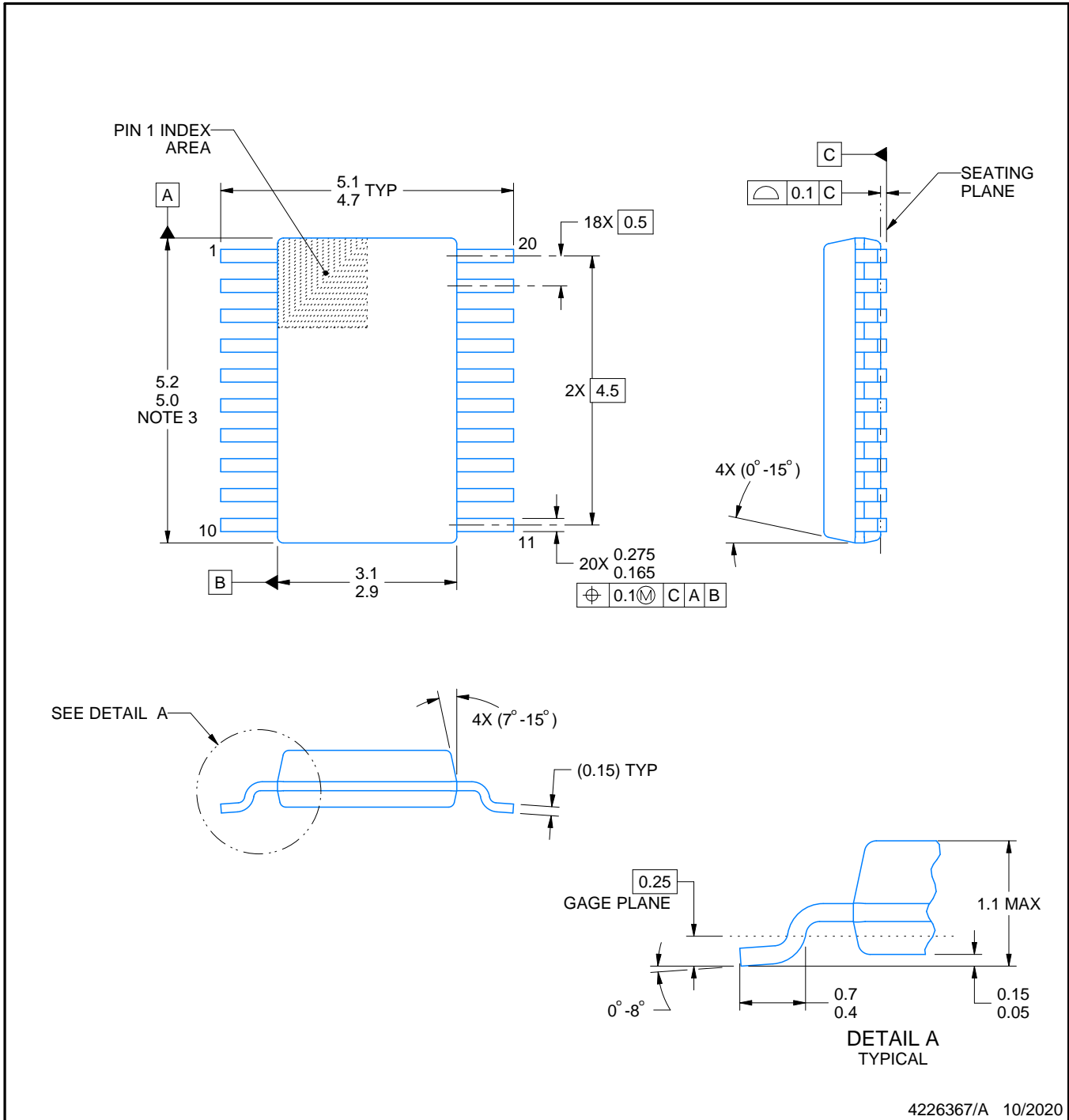


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

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.



4226367/A 10/2020

NOTES:

PowerPAD is a trademark of Texas Instruments.

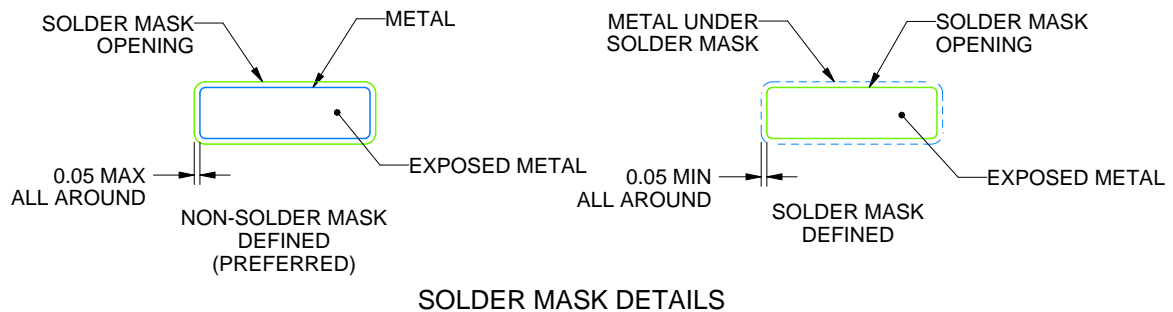
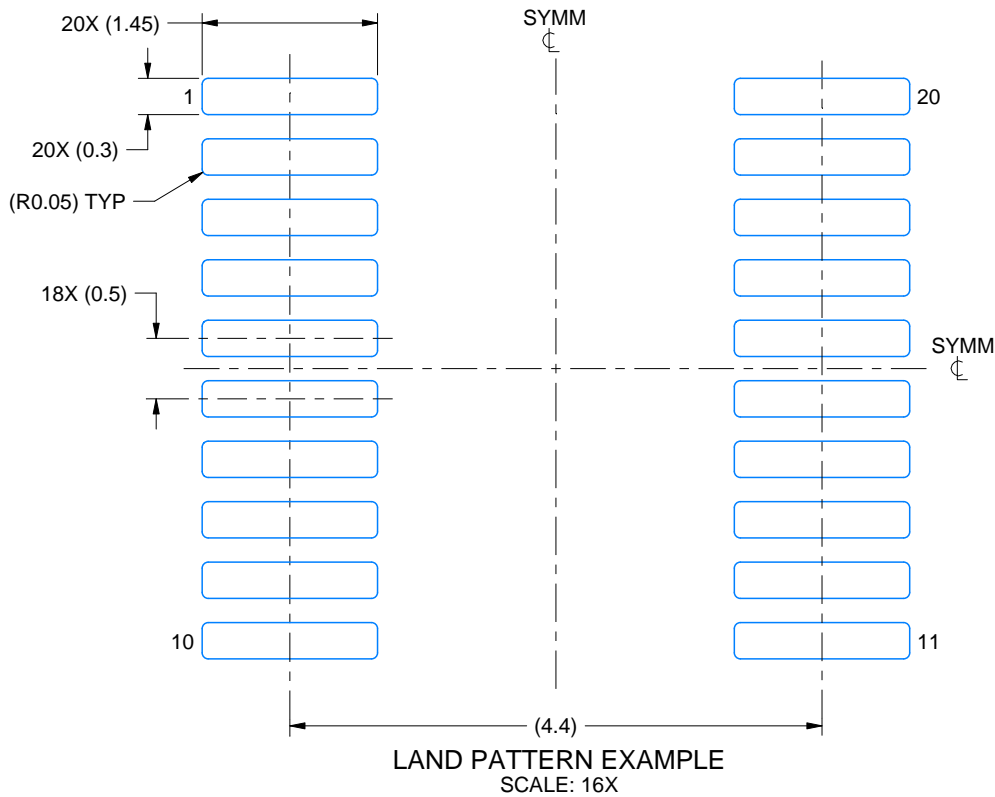
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. No JEDEC registration as of September 2020.
5. Features may differ or may not be present.

EXAMPLE BOARD LAYOUT

DGS0020A

VSSOP - 1.1 mm max height

SMALL OUTLINE PACKAGE



4226367/A 10/2020

NOTES: (continued)

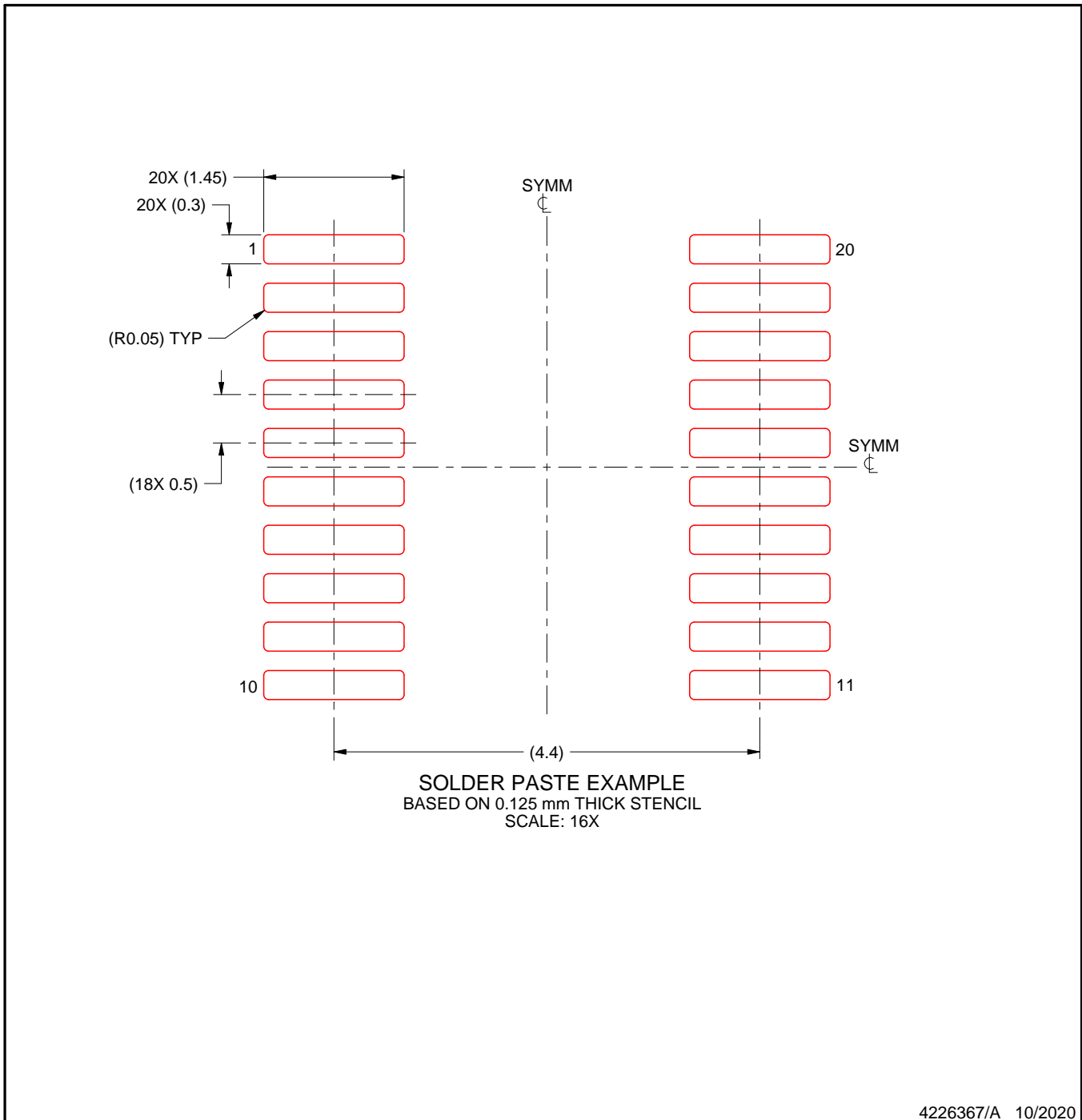
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
8. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature numbers SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004).
9. Size of metal pad may vary due to creepage requirement.
10. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

DGS0020A

VSSOP - 1.1 mm max height

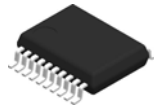
SMALL OUTLINE PACKAGE



NOTES: (continued)

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

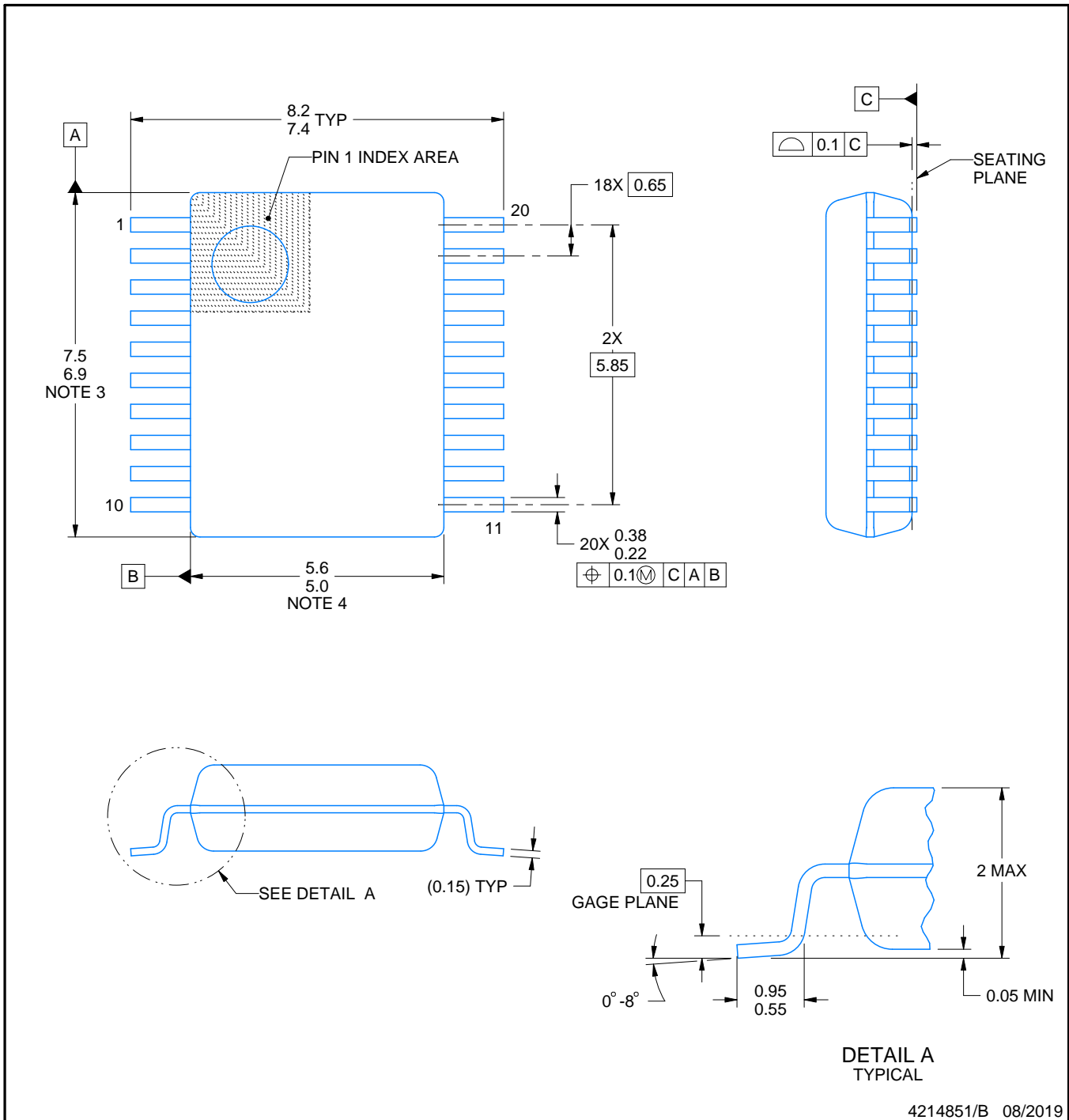
DB0020A



PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4214851/B 08/2019

NOTES:

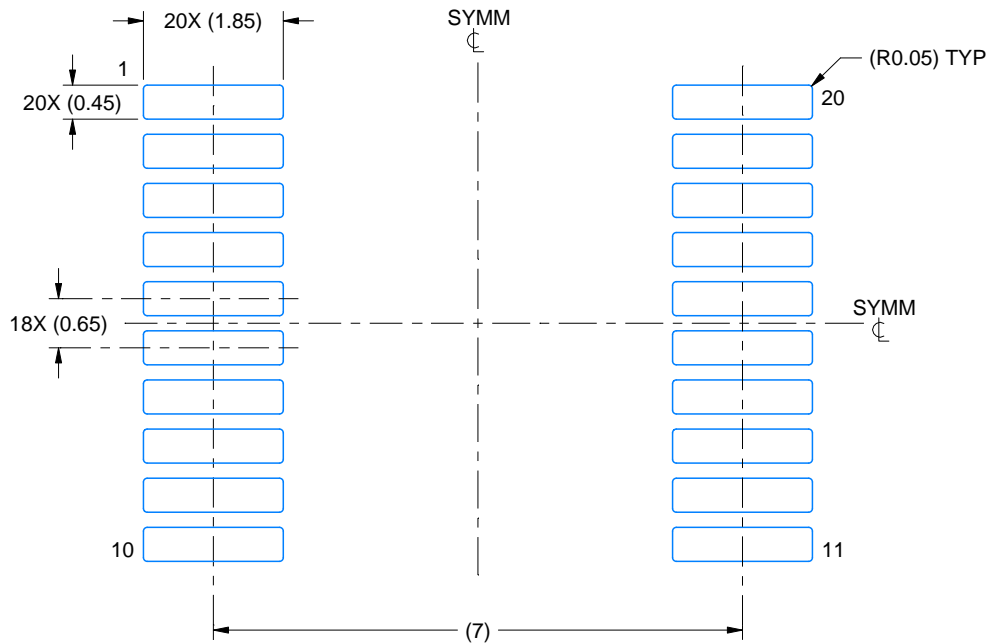
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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

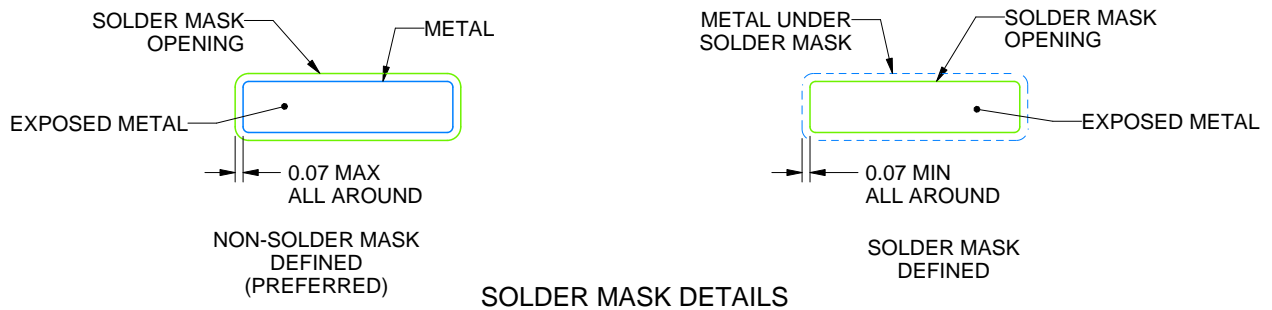
DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4214851/B 08/2019

NOTES: (continued)

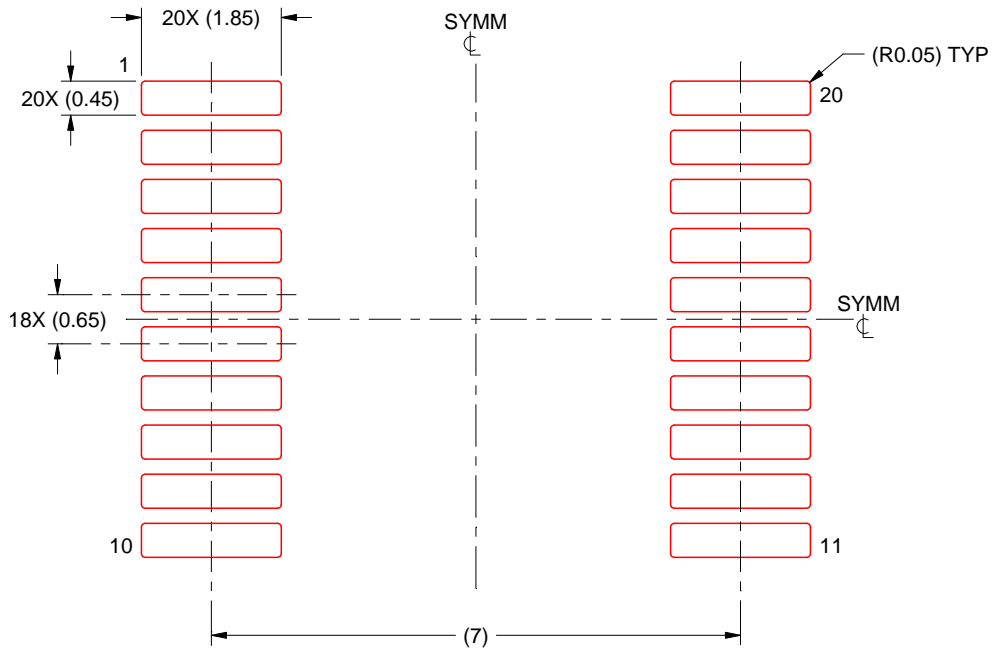
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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)

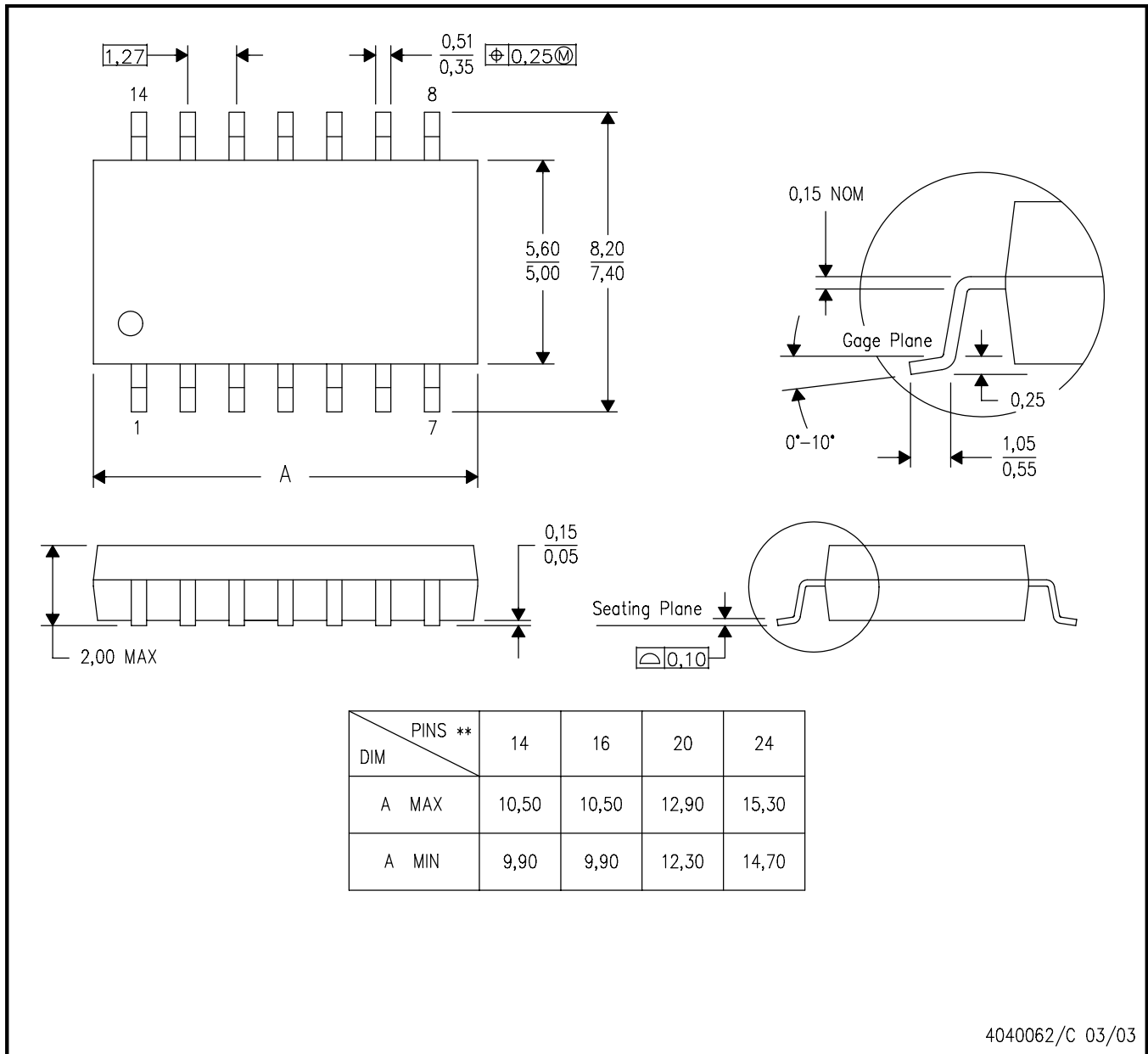
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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.

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 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 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on [ti.com](#) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025