

SN74LVC240A Octal Buffer/Driver with 3-State Outputs

1 Features

- Operates From 1.65 V to 3.6 V
- Inputs Accept Voltages to 5.5 V
- Max t_{pd} of 6.5 ns at 3.3 V
- Typical V_{OLP} (Output Ground Bounce) <0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) >2 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Supports Mixed-Mode Signal Operation on All Ports (5-V Input/Output Voltage With 3.3-V V_{CC})
- I_{off} Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

2 Applications

- Servers
- PCs and Notebooks
- Network Switches
- Wearable Health and Fitness Devices
- Telecom Infrastructures
- Electronic Points of Sale

3 Description

This octal buffer/driver is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74LVC240A is designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE
SN74LVC240A	SSOP (20)	7.20 mm × 5.30 mm
	TVSOP (20)	5.00 mm × 4.40 mm
	SOIC (20)	12.80 mm × 7.50 mm
	SOP (20)	12.60 mm × 5.30 mm
	TSSOP (20)	6.50 mm × 4.40 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

4 Simplified Schematic

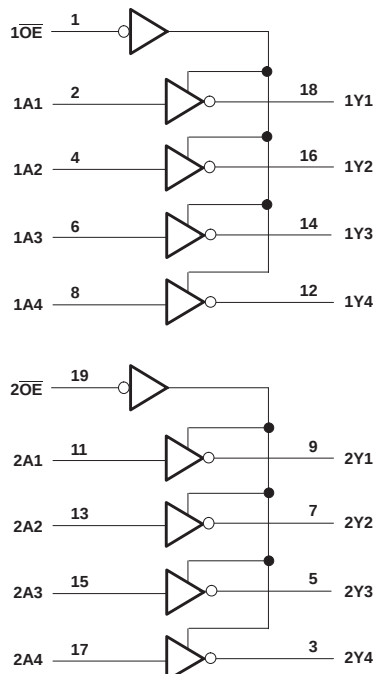


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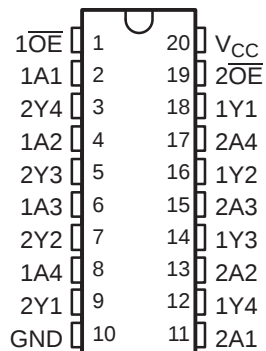
5 Revision History

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

Changes from Revision K (February 2005) to Revision L	Page
• Updated document to new TI data sheet standards.	1
• Deleted Ordering Information table.	1
• Updated I_{off} bullet in Features list.	1
• Added Applications.	1
• Added Device Information table.	1
• Added Handling Ratings table.	4
• Changed MAX ambient temperature to 125°C in Recommended Operating Conditions table.	5
• Added Thermal Information table.	5
• Added –40°C to 125°C temperature range to Electrical Characteristics table.	6
• Added Switching Characteristics table for –40°C to 125°C temperature range.	6
• Added Typical Characteristics.	7
• Added Detailed Description section.	9
• Added Application and Implementation section.	11

6 Pin Configuration and Functions

DB, DGV, DW, NS, OR PW PACKAGE
(TOP VIEW)



Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	$\overline{1OE}$	I	Output Enable 1
2	1A1	I	1A1 Input
3	2Y4	O	2Y4 Output
4	1A2	I	1A2 Input
5	2Y3	O	2Y3 Output
6	1A3	I	1A3 Input
7	2Y2	O	2Y2 Output
8	1A4	I	1A4 Input
9	2Y1	O	2Y1 Output
10	GND	—	Ground Pin
11	2A1	I	2A1 Input
12	1Y4	O	1Y4 Output
13	2A2	I	2A2 Input
14	1Y3	O	1Y3 Output
15	2A3	I	2A3 Input
16	1Y2	O	1Y2 Output
17	2A4	I	2A4 Input
18	1Y1	O	1Y1 Output
19	$\overline{2OE}$	I	Output Enable 2
20	VCC	—	Power Pin

7 Specifications

7.1 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

- (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.

7.2 Handling Ratings

			MIN	MAX	UNIT
T _{stg}	Storage temperature range		−65	150	°C
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾	0	2000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾	0	1000	

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

7.3 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
		Data retention only	1.5	
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	
		V _{CC} = 2.3 V to 2.7 V	1.7	
		V _{CC} = 2.7 V to 3.6 V	2	
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.35 × V _{CC}	
		V _{CC} = 2.3 V to 2.7 V	0.7	
		V _{CC} = 2.7 V to 3.6 V	0.8	
V _I	Input voltage	0	5.5	V
V _O	Output voltage	High or low state	0	V _{CC}
		3-state	0	5.5
I _{OH}	High-level output current	V _{CC} = 1.65 V	–4	
		V _{CC} = 2.3 V	–8	
		V _{CC} = 2.7 V	–12	
		V _{CC} = 3 V	–24	
I _{OL}	Low-level output current	V _{CC} = 1.65 V	4	
		V _{CC} = 2.3 V	8	
		V _{CC} = 2.7 V	12	
		V _{CC} = 3 V	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 ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, (SCBA004).

7.4 Thermal Information

THERMAL METRIC ⁽¹⁾		PW	UNIT
		20 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	102.5	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	35.9	
R _{θJB}	Junction-to-board thermal resistance	53.5	
Ψ _{JT}	Junction-to-top characterization parameter	2.2	
Ψ _{JB}	Junction-to-board characterization parameter	52.9	
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	n/a	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report (SPRA953).

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7.5 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} = –100 μA		1.65 V to 3.6 V	V _{CC} – 0.2			V _{CC} – 0.2			V
	I _{OH} = –4 mA		1.65 V	1.2			1.2			
	I _{OH} = –8 mA		2.3 V	1.7			1.7			
	I _{OH} = –12 mA		2.7 V	2.2			2.2			
			3 V	2.4			2.4			
	I _{OH} = –24 mA		3 V	2.2			2.2			
V _{OL}	I _{OL} = 100 μA		1.65 V to 3.6 V	0.2			0.2			V
	I _{OL} = 4 mA		1.65 V	0.45			0.45			
	I _{OL} = 8 mA		2.3 V	0.7			0.7			
	I _{OL} = 12 mA		2.7 V	0.4			0.4			
	I _{OL} = 24 mA		3 V	0.55			0.55			
I _I	V _I = 0 to 5.5 V		3.6 V	±5			±5			μA
I _{off}	V _I or V _O = 5.5 V		0	±10			±20			μA
I _{OZ}	V _O = 0 to 5.5 V		3.6 V	±10			±20			μA
I _{CC}	V _I = V _{CC} or GND	I _O = 0	3.6 V	10			10			μA
	3.6 V ≤ V _I ≤ 5.5 V ⁽²⁾			10			10			
ΔI _{CC}	One input at V _{CC} – 0.6 V, Other inputs at V _{CC} or GND		2.7 V to 3.6 V	500			500			μA
C _i	V _I = V _{CC} or GND		3.3 V	4			4			pF
C _O	V _O = V _{CC} or GND		3.3 V	5.5			5.5			pF

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

(2) This applies in the disabled state only.

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

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 3](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 2.7 V		V _{CC} = 3.3 V ± 0.3 V		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

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

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 2.7 V		V _{CC} = 3.3 V ± 0.3 V		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

7.8 Operating Characteristics

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

PARAMETER		TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	UNIT
			TYP	TYP	TYP	
C_{pd} Power dissipation capacitance	Outputs enabled	$f = 10\text{ MHz}$	127	156	32	pF
	Outputs disabled		8	9	3	

7.9 Typical Characteristics

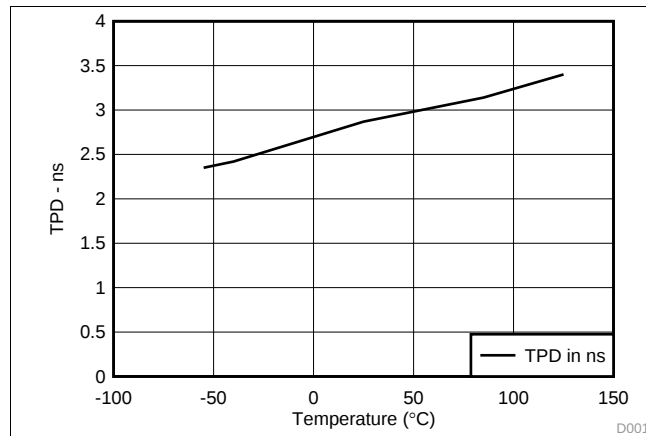


Figure 1. TPD vs Temperature

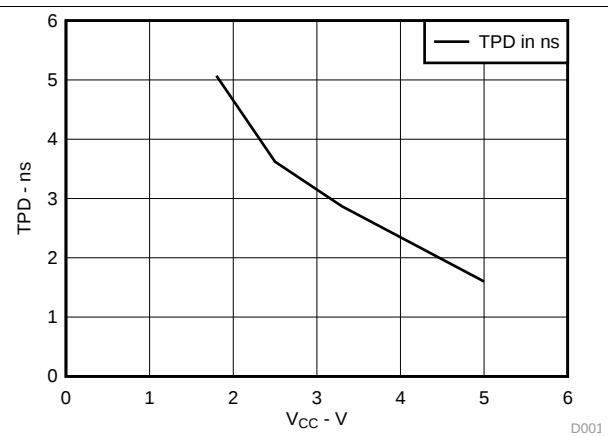
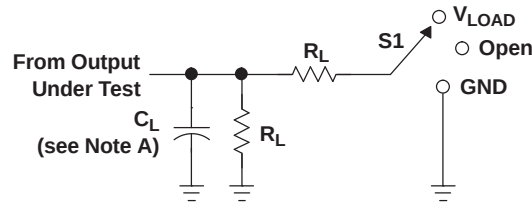


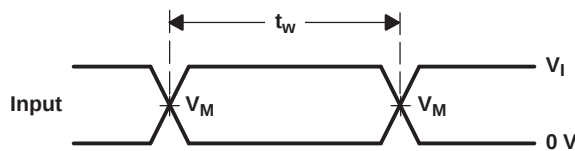
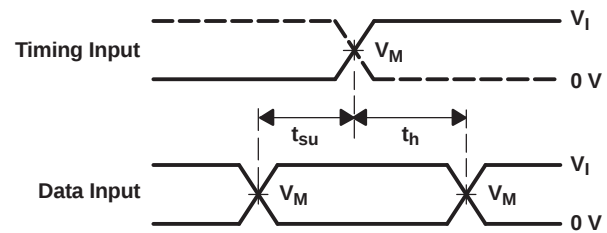
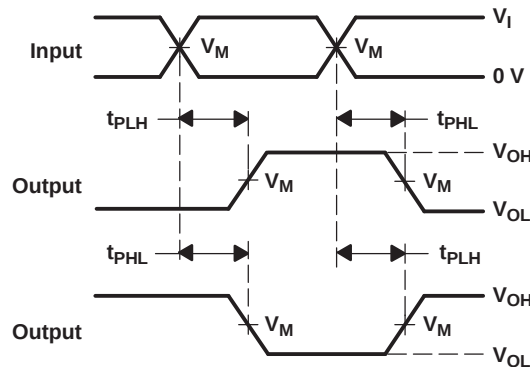
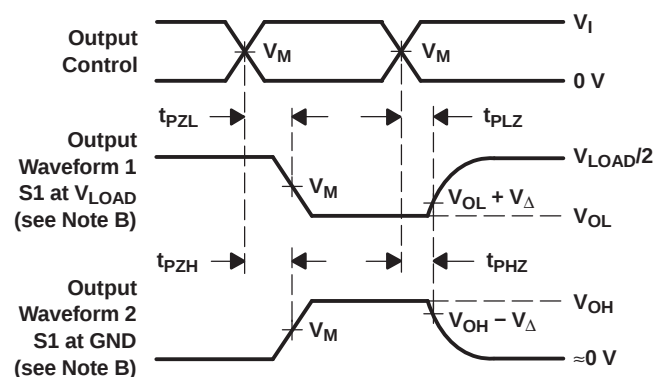
Figure 2. TPD vs V_{CC}

8 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:
- C_L includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .
 - All parameters and waveforms are not applicable to all devices.

Figure 3. Load Circuit and Voltage Waveforms

9 Detailed Description

9.1 Overview

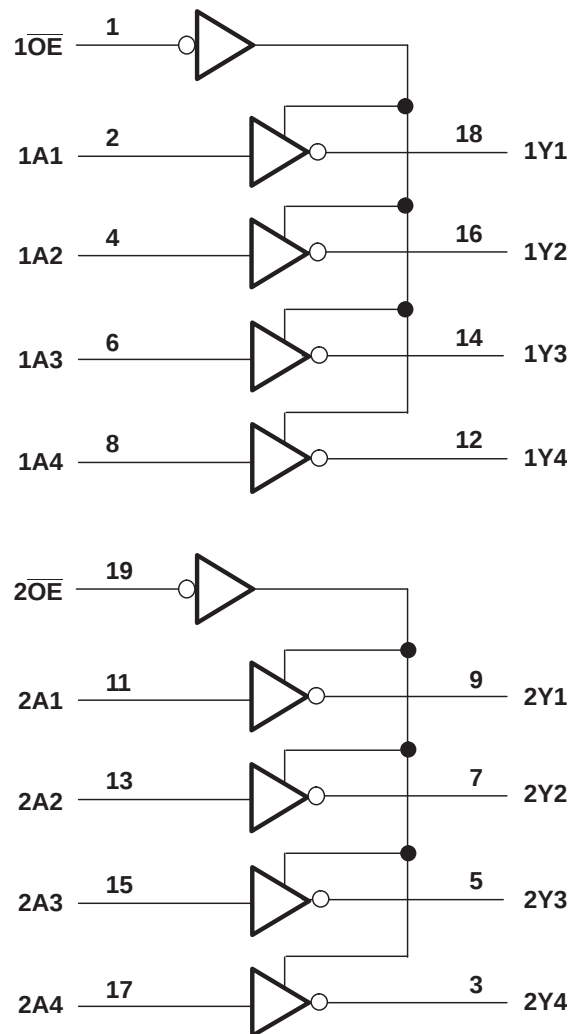
This device is organized as two 4-bit buffers/drivers with separate output-enable ($\overline{\text{OE}}$) inputs. When $\overline{\text{OE}}$ is low, the device passes data from the A inputs to the Y outputs. When $\overline{\text{OE}}$ is high, the outputs are in the high-impedance state.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of this device as a translator in a mixed 3.3-V/5-V system environment.

To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ 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 I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

9.2 Functional Block Diagram



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9.3 Feature Description

- Wide operating voltage range from 1.65 V to 3.6 V
- Allows down voltage translation
- Inputs accept voltages to 5.5 V
- I_{off} feature allows voltages on the inputs and outputs when V_{CC} is 0 V

9.4 Device Functional Modes

**Table 1. Function Table
(Each 4-Bit Buffer)**

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

10 Application and Implementation

10.1 Application Information

The SN74LVC240A device is a high drive CMOS device that can be used for a multitude of bus-interface type applications where the data needs to be retained or latched. It can produce 24 mA of drive current at 3.3 V making it ideal for driving multiple outputs and also good for high-speed applications up to 100 Mhz. The inputs are 5.5 V tolerant allowing it to translate down to V_{CC} .

10.2 Typical Application

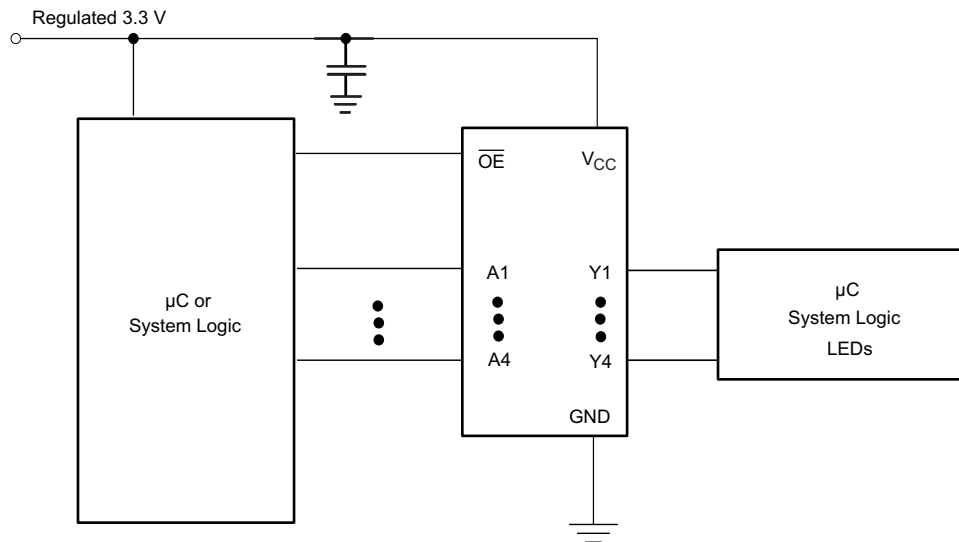


Figure 4. Typical Application Diagram

10.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads; therefore, routing and load conditions should be considered to prevent ringing.

10.2.2 Detailed Design Procedure

1. Recommended Input Conditions

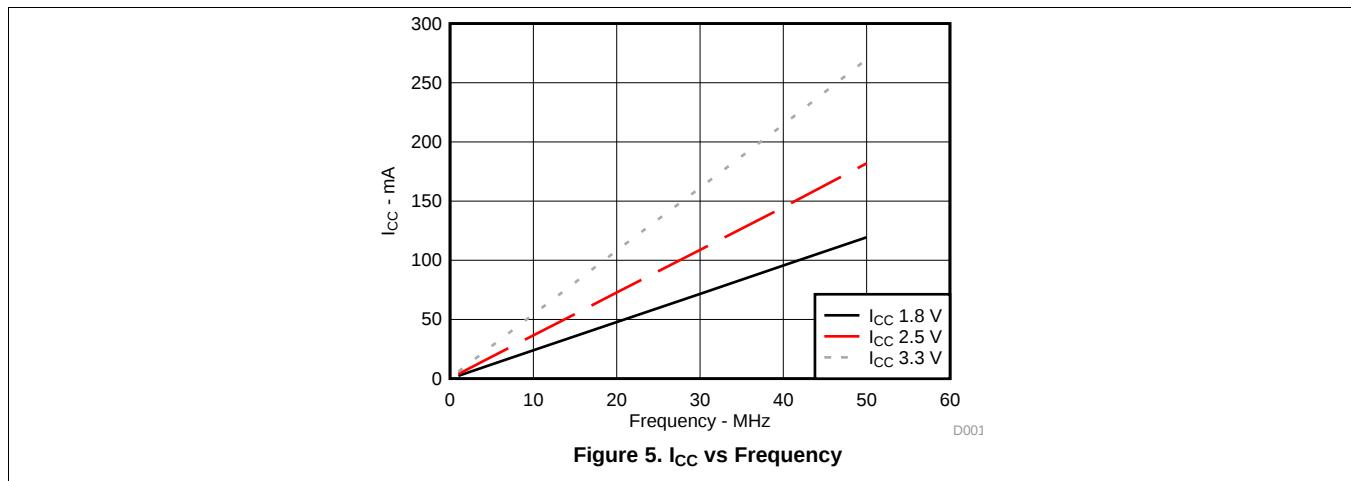
- Rise time and fall time specs: See $(\Delta t/\Delta V)$ in the [Recommended Operating Conditions](#) table.
- Specified high and low levels: See $(V_{IH}$ and $V_{IL})$ in the [Recommended Operating Conditions](#) table.
- Inputs are overvoltage tolerant allowing them to go as high as 5.5 V at any valid V_{CC} .

2. Recommend Output Conditions

- Load currents should not exceed 25 mA per output and 50 mA total for the part.
- Outputs should not be pulled above V_{CC} .

Typical Application (continued)

10.2.3 Application Curves



11 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the [Recommended Operating Conditions](#) table.

Each V_{CC} pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 μ f is recommended; if there are multiple V_{CC} pins, then 0.01 μ f or 0.022 μ f is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A 0.1 μ f and a 1 μ f are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

12 Layout

12.1 Layout Guidelines

When using multiple-bit logic devices, inputs should never float.

In many cases, functions or parts of functions of digital logic devices are unused, for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. [Figure 6](#) specifies the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or V_{CC} , whichever makes more sense or is more convenient. It is generally acceptable to float outputs, unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the output section of the part when asserted. This will not disable the input section of the IOs, so they cannot float when disabled.

12.2 Layout Example

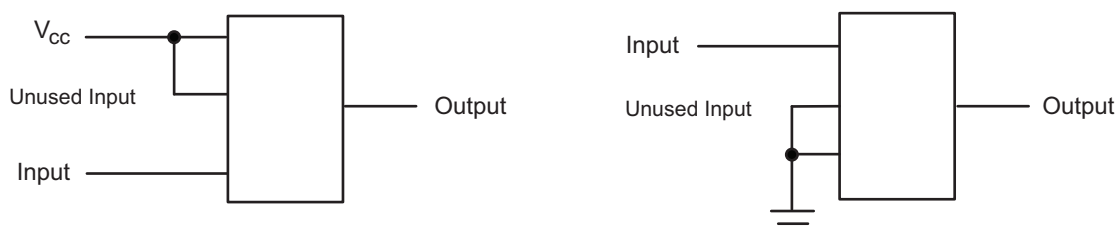


Figure 6. Layout Diagram

13 Device and Documentation Support

13.1 Trademarks

All trademarks are the property of their respective owners.

13.2 Electrostatic Discharge Caution



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.

13.3 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

14 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
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.

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TAPE AND REEL INFORMATION



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LVC240ADBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	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
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
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
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

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

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



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

- 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



SOIC - 2.65 mm max height

Technical drawing of a 20-pin connector showing top, side, and detail views with dimensions and callouts.

Top View:

- Overall width: 10.63 (9.97 TYP)
- Overall height: 13.0 (12.6 NOTE 3)
- Pin 1 ID AREA (dotted pattern)
- Pin 1 location: 1
- Pin 10 location: 10
- Pin 11 location: 11
- Pin 20 location: 20
- Pin 18 location: 18X 1.27
- Pin 2 location: 2X 11.43
- Pin 20X location: 20X 0.51 0.31
- Pin 7.6 location: 7.6 (7.4 NOTE 4)
- Pin 10.63 location: 10.63 (9.97 TYP)
- Pin 13.0 location: 13.0 (12.6 NOTE 3)
- Pin 16.5 location: 16.5 (16.0 NOTE 3)
- Pin 19.5 location: 19.5 (19.0 NOTE 3)
- Pin 22.5 location: 22.5 (22.0 NOTE 3)
- Pin 25.5 location: 25.5 (25.0 NOTE 3)
- Pin 28.5 location: 28.5 (28.0 NOTE 3)
- Pin 31.5 location: 31.5 (31.0 NOTE 3)
- Pin 34.5 location: 34.5 (34.0 NOTE 3)
- Pin 37.5 location: 37.5 (37.0 NOTE 3)
- Pin 40.5 location: 40.5 (40.0 NOTE 3)
- Pin 43.5 location: 43.5 (43.0 NOTE 3)
- Pin 46.5 location: 46.5 (46.0 NOTE 3)
- Pin 49.5 location: 49.5 (49.0 NOTE 3)
- Pin 52.5 location: 52.5 (52.0 NOTE 3)
- Pin 55.5 location: 55.5 (55.0 NOTE 3)
- Pin 58.5 location: 58.5 (58.0 NOTE 3)
- Pin 61.5 location: 61.5 (61.0 NOTE 3)
- Pin 64.5 location: 64.5 (64.0 NOTE 3)
- Pin 67.5 location: 67.5 (67.0 NOTE 3)
- Pin 70.5 location: 70.5 (70.0 NOTE 3)
- Pin 73.5 location: 73.5 (73.0 NOTE 3)
- Pin 76.5 location: 76.5 (76.0 NOTE 3)
- Pin 79.5 location: 79.5 (79.0 NOTE 3)
- Pin 82.5 location: 82.5 (82.0 NOTE 3)
- Pin 85.5 location: 85.5 (85.0 NOTE 3)
- Pin 88.5 location: 88.5 (88.0 NOTE 3)
- Pin 91.5 location: 91.5 (91.0 NOTE 3)
- Pin 94.5 location: 94.5 (94.0 NOTE 3)
- Pin 97.5 location: 97.5 (97.0 NOTE 3)
- Pin 100.5 location: 100.5 (100.0 NOTE 3)
- Pin 103.5 location: 103.5 (103.0 NOTE 3)
- Pin 106.5 location: 106.5 (106.0 NOTE 3)
- Pin 109.5 location: 109.5 (109.0 NOTE 3)
- Pin 112.5 location: 112.5 (112.0 NOTE 3)
- Pin 115.5 location: 115.5 (115.0 NOTE 3)
- Pin 118.5 location: 118.5 (118.0 NOTE 3)
- Pin 121.5 location: 121.5 (121.0 NOTE 3)
- Pin 124.5 location: 124.5 (124.0 NOTE 3)
- Pin 127.5 location: 127.5 (127.0 NOTE 3)
- Pin 130.5 location: 130.5 (130.0 NOTE 3)
- Pin 133.5 location: 133.5 (133.0 NOTE 3)
- Pin 136.5 location: 136.5 (136.0 NOTE 3)
- Pin 139.5 location: 139.5 (139.0 NOTE 3)
- Pin 142.5 location: 142.5 (142.0 NOTE 3)
- Pin 145.5 location: 145.5 (145.0 NOTE 3)
- Pin 148.5 location: 148.5 (148.0 NOTE 3)
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- Pin 166.5 location: 166.5 (166.0 NOTE 3)
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- Pin 196.5 location: 196.5 (196.0 NOTE 3)
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- Pin 202.5 location: 202.5 (202.0 NOTE 3)
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- Pin 208.5 location: 208.5 (208.0 NOTE 3)
- Pin 211.5 location: 211.5 (211.0 NOTE 3)
- Pin 214.5 location: 214.5 (214.0 NOTE 3)
- Pin 217.5 location: 217.5 (217.0 NOTE 3)
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- Pin 223.5 location: 223.5 (223.0 NOTE 3)
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- Pin 253.5 location: 253.5 (253.0 NOTE 3)
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- Pin 259.5 location: 259.5 (259.0 NOTE 3)
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- Pin 265.5 location: 265.5 (265.0 NOTE 3)
- Pin 268.5 location: 268.5 (268.0 NOTE 3)
- Pin 271.5 location: 271.5 (271.0 NOTE 3)
- Pin 274.5 location: 274.5 (274.0 NOTE 3)
- Pin 277.5 location: 277.5 (277.0 NOTE 3)
- Pin 280.5 location: 280.5 (280.0 NOTE 3)
- Pin 283.5 location: 283.5 (283.0 NOTE 3)
- Pin 286.5 location: 286.5 (286.0 NOTE 3)
- Pin 289.5 location: 289.5 (289.0 NOTE 3)
- Pin 292.5 location: 292.5 (292.0 NOTE 3)
- Pin 295.5 location: 295.5 (295.0 NOTE 3)
- Pin 298.5 location: 298.5 (298.0 NOTE 3)
- Pin 301.5 location: 301.5 (301.0 NOTE 3)
- Pin 304.5 location: 304.5 (304.0 NOTE 3)
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- Pin 331.5 location: 331.5 (331.0 NOTE 3)
- Pin 334.5 location: 334.5 (334.0 NOTE 3)
- Pin 337.5 location: 337.5 (337.0 NOTE 3)
- Pin 340.5 location: 340.5 (340.0 NOTE 3)
- Pin 343.5 location: 343.5 (343.0 NOTE 3)
- Pin 346.5 location: 346.5 (346.0 NOTE 3)
- Pin 349.5 location: 349.5 (349.0 NOTE 3)
- Pin 352.5 location: 352.5 (352.0 NOTE 3)
- Pin 355.5 location: 355.5 (355.0 NOTE 3)
- Pin 358.5 location: 358.5 (358.0 NOTE 3)
- Pin 361.5 location: 361.5 (361.0 NOTE 3)
- Pin 364.5 location: 364.5 (364.0 NOTE 3)
- Pin 367.5 location: 367.5 (367.0 NOTE 3)
- Pin 370.5 location: 370.5 (370.0 NOTE 3)
- Pin 373.5 location: 373.5 (373.0 NOTE 3)
- Pin 376.5 location: 376.5 (376.0 NOTE 3)
- Pin 379.5 location: 379.5 (379.0 NOTE 3)
- Pin 382.5 location: 382.5 (382.0 NOTE 3)
- Pin 385.5 location: 385.5 (385.0 NOTE 3)
- Pin 388.5 location: 388.5 (388.0 NOTE 3)
- Pin 391.5 location: 391.5 (391.0 NOTE 3)
- Pin 394.5 location: 394.5 (394.0 NOTE 3)
- Pin 397.5 location: 397.5 (397.0 NOTE 3)
- Pin 4

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

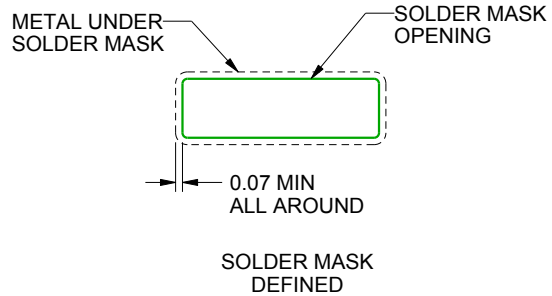
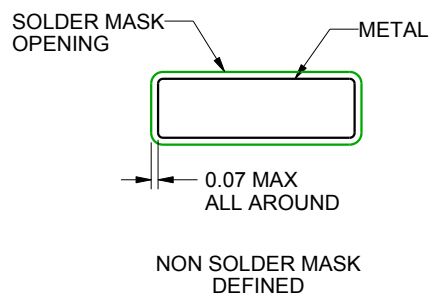
DW0020A

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.



4220206/A 02/2017

NOTES:

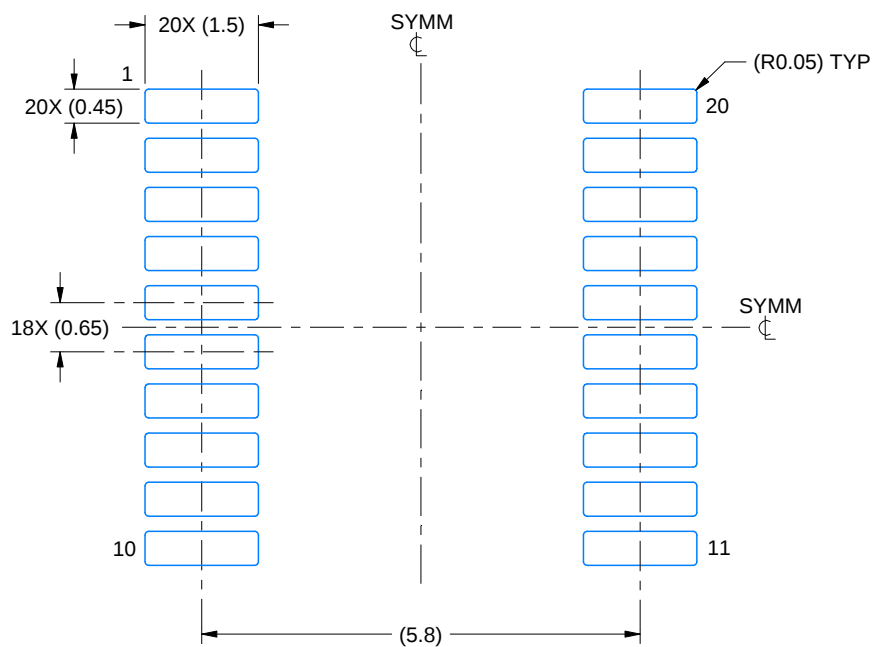
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

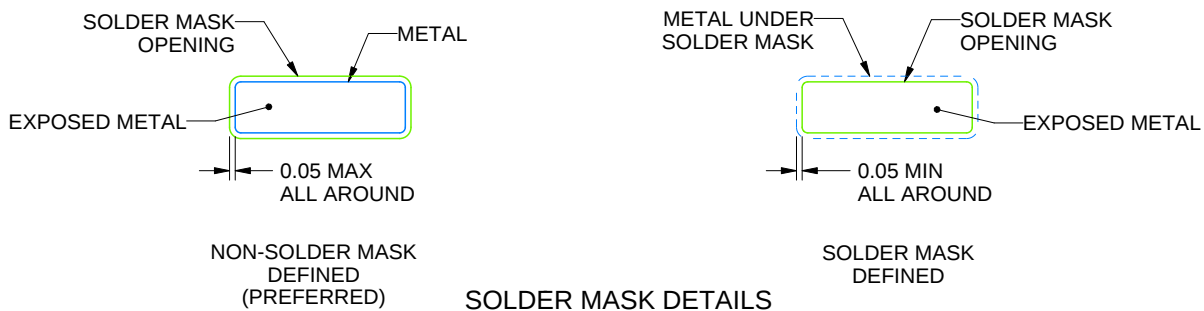
PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220206/A 02/2017

NOTES: (continued)

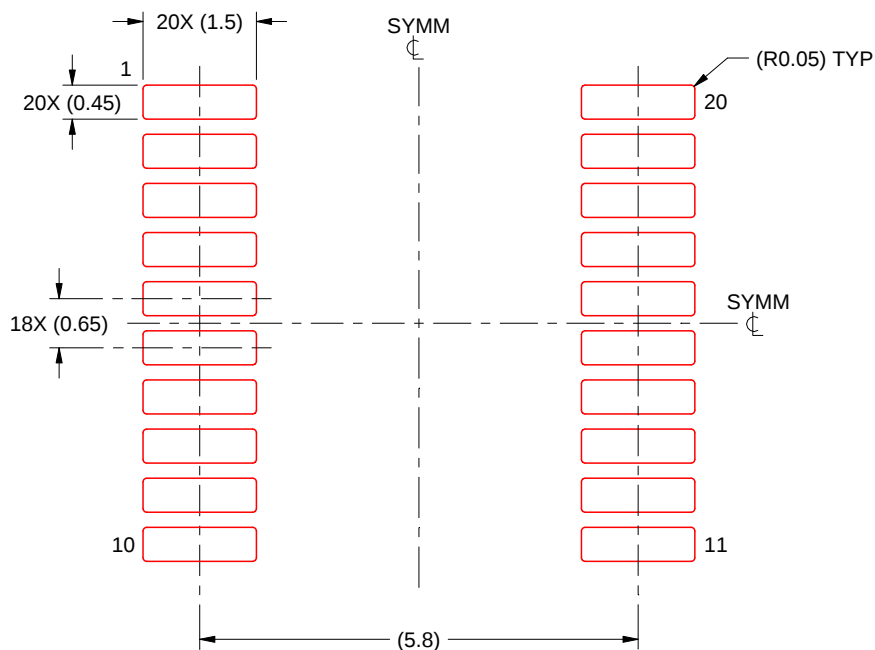
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

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