

## SN74LV4051A-Q1 8-Channel Analog Multiplexer/Demultiplexer

### 1 Features

- Qualified for Automotive Applications
- AEC-Q100 Qualified With the Following Results
  - Device Temperature Grade 1: –40°C to +125°C Ambient Operating Temperature Range
  - Device HBM ESD Classification Level 2
  - Device CDM ESD Classification Level C4B
- 2-V to 5.5-V  $V_{CC}$  Operation
- Supports Mixed-Mode Voltage Operation on All Ports
- High On-Off Output-Voltage Ratio
- Low Crosstalk Between Switches
- Individual Switch Controls
- Extremely Low Input Current
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II

### 2 Applications

- Automotive Infotainment and Cluster
- Telematics, eCall

### 3 Description

This 8-channel CMOS analog multiplexer and demultiplexer is designed for 2-V to 5.5-V  $V_{CC}$  operation.

The SN74LV4051A handles analog and digital signals. Each channel permits signals with amplitudes up to 5.5 V (peak) to be transmitted in either direction.

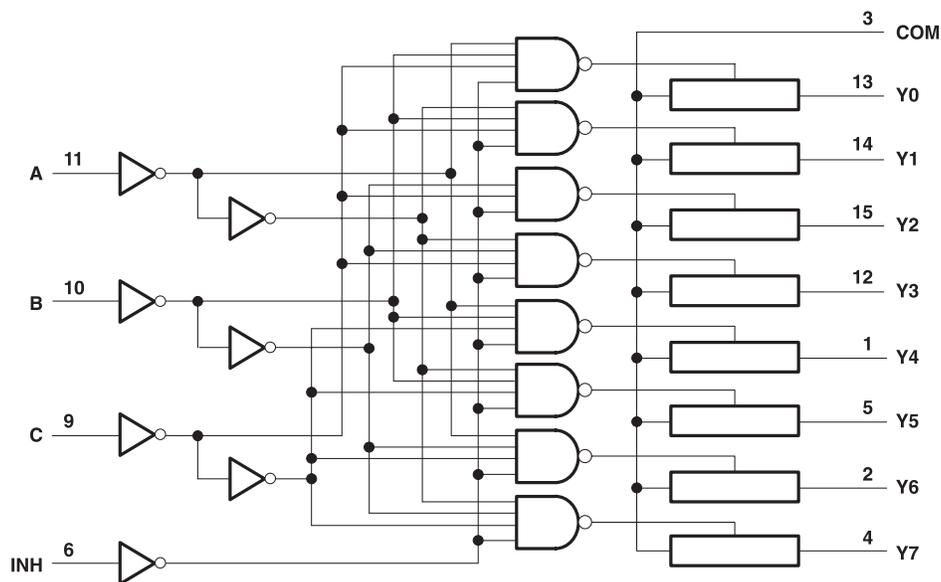
Applications include signal gating, chopping, modulation or demodulation (modem), and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.

#### Device Information<sup>(1)</sup>

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74LV4051A-Q1	TSSOP (16)	5.00 mm × 4.40 mm
	SOIC (16)	10.30 mm × 7.50 mm
		9.90 mm × 3.91 mm

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

#### Logic Diagram (Positive Logic)



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## 4 Revision History

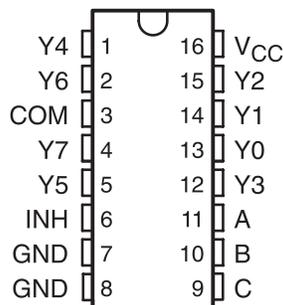
### Changes from Revision D (June 2011) to Revision E

**Page**

- Added *ESD Ratings* table, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section ..... **5**

## 5 Pin Configuration and Functions

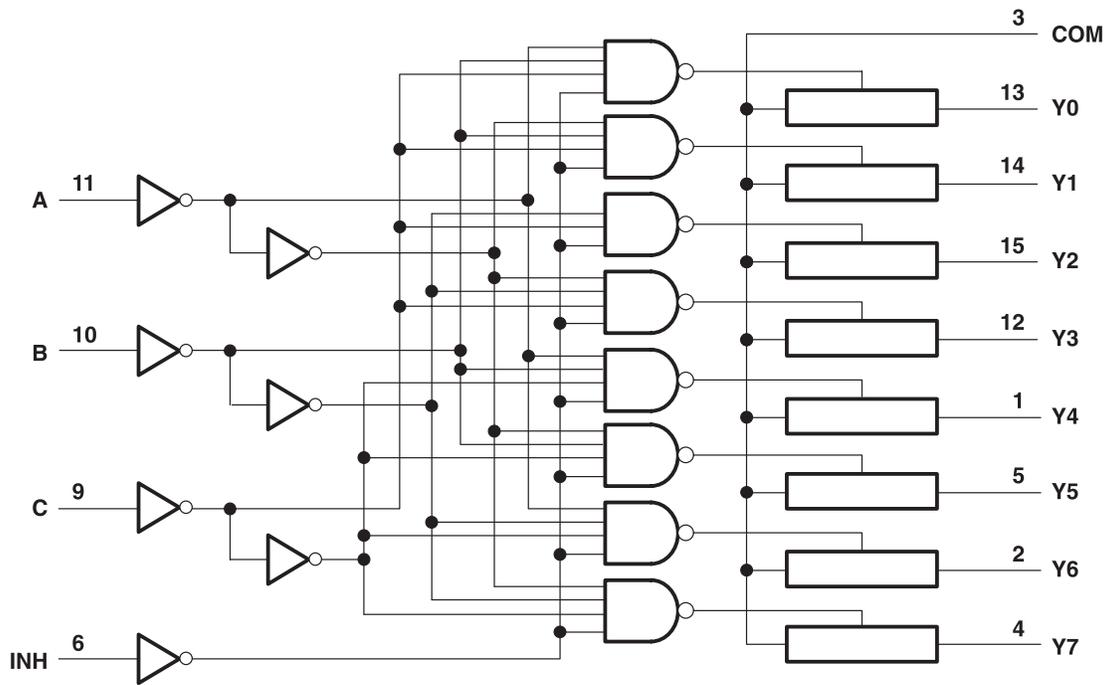
**D, DW, or PW Package  
16 Pins  
Top View**



**Pin Functions**

PIN		I/O	DESCRIPTION
NAME	NO.		
Y4	1	I <sup>(1)</sup>	Input to mux
Y6	2	I <sup>(1)</sup>	Input to mux
COM	3	O <sup>(1)</sup>	Output of mux
Y7	4	I <sup>(1)</sup>	Input to mux
Y5	5	I <sup>(1)</sup>	Input to mux
INH	6	I <sup>(1)</sup>	Enables the outputs of the device. Logic low level will turn the outputs on, high level will turn them off.
GND	7	—	Ground
GND	8	—	Ground
C	9	I	Selector line for outputs (see <a href="#">Device Functional Modes</a> for specific information)
B	10	I	Selector line for outputs (see <a href="#">Device Functional Modes</a> for specific information)
A	11	I	Selector line for outputs (see <a href="#">Device Functional Modes</a> for specific information)
Y3	12	I <sup>(1)</sup>	Input to mux
Y0	13	I <sup>(1)</sup>	Input to mux
Y1	14	I <sup>(1)</sup>	Input to mux
Y2	15	I <sup>(1)</sup>	Input to mux
Vcc	16	I	Device power input

(1) These I/O descriptions represent the device when used as a multiplexer, when this device is operated as a demultiplexer pins Y0-Y7 may be considered outputs (O) and the COM pin may be considered inputs (I).



**Figure 1. Logic Diagram (Positive Logic)**

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	-0.5	7 V	V
V <sub>I</sub>	Input voltage <sup>(2)</sup>	-0.5	7 V	
V <sub>IO</sub>	Switch I/O voltage <sup>(2) (3)</sup>	-0.5	V <sub>CC</sub> + 0.5	
I <sub>IK</sub>	Input clamp current	-20		mA
I <sub>IOK</sub>	I/O diode current	-50		
I <sub>T</sub>	Switch through current	-25	25	
Continuous current through V <sub>CC</sub> or GND		-50	50	
T <sub>stg</sub>	Storage temperature	-65	150	°C

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. 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.
- (3) This value is limited to 5.5 V maximum.

### 6.2 ESD Ratings

		VALUE	UNIT	
V <sub>(ESD)</sub>	Electrostatic discharge	Human body model (HBM), per AEC Q100-002 <sup>(1)</sup>	±2000	
		Charged device model (CDM), per AEC Q100-011	All pins	±500
			Corner pins (1, 8, 9, and 16)	±750

- (1) AEC Q100-002 indicates HBM stressing is done in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

### 6.3 Recommended Operating Conditions

See<sup>(1)</sup>

		MIN	NOM	MAX	UNIT
V <sub>CC</sub>	Supply voltage	2 <sup>(2)</sup>		5.5	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.7		
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.7		
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.7		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V		0.5	V
		V <sub>CC</sub> = 2.3 V to 2.7 V		V <sub>CC</sub> × 0.3	
		V <sub>CC</sub> = 3 V to 3.6 V		V <sub>CC</sub> × 0.3	
		V <sub>CC</sub> = 4.5 V to 5.5 V		V <sub>CC</sub> × 0.3	
V <sub>I</sub>	Control input voltage	0		5.5	V
V <sub>IO</sub>	Input/output voltage	0		V <sub>CC</sub>	V
Δt/Δv	Input transition rise or fall rate	V <sub>CC</sub> = 2.3 V to 2.7 V		200	ns/V
		V <sub>CC</sub> = 3 V to 3.6 V		100	
		V <sub>CC</sub> = 4.5 V to 5.5 V		20	
T <sub>A</sub>	Operating free-air temperature	-40		105	°C
T <sub>A</sub>	Operating free-air temperature	-40		125	

- (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*, [SCBA004](#).
- (2) With supply voltages at or near 2 V, the analog switch on-state resistance becomes very nonlinear. It is recommended that only digital signals be transmitted at these low supply voltages.

## 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74LV4051A-Q1			UNIT
		DW	PW	D	
		16 PINS	16 PINS	16 PINS	
$R_{\theta JB}$	Junction-to-board thermal resistance	85.1	92.4	113.3	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	47.2	52.9	48.1	
$R_{\theta JB}$	Junction-to-board thermal resistance	49.8	49.5	58.4	
$\Psi_{JT}$	Junction-to-top characterization parameter	17.8	15.5	6.2	
$\Psi_{JB}$	Junction-to-board characterization parameter	49.3	49.2	57.8	

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

## 6.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40 \text{ to } 105^\circ\text{C}$			$T_A = -40 \text{ to } 125^\circ\text{C}$			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$r_{on}$	On-state switch resistance $I_T = 2 \text{ mA}$ , $V_i = V_{CC}$ or GND, $V_{INH} = V_{IL}$ (see <a href="#">Figure 2</a> )	2.3 V	38	180		225		225			$\Omega$	
		3 V	30	150		190		190				
		4.5 V	22	75		100		100				
$r_{on(p)}$	Peak on-state resistance $I_T = 2 \text{ mA}$ , $V_i = V_{CC}$ or GND, $V_{INH} = V_{IL}$	2.3 V	113	500		600		600			$\Omega$	
		3 V	54	180		225		225				
		4.5 V	31	100		125		125				
$\Delta r_{on}$	Difference in on-state resistance between switch $I_T = 2 \text{ mA}$ , $V_i = V_{CC}$ or GND, $V_{INH} = V_{IL}$	2.3 V	2.1	30		40		40			$\Omega$	
		3 V	1.4	20		30		30				
		4.5 V	1.3	15		20		20				
$I_i$	Control input current $V_i = 5.5 \text{ V}$ or GND	0 V to 5.5 V		$\pm 0.1$		$\pm 1$		$\pm 2$			$\mu\text{A}$	
$I_{S(off)}$	Off-state switch leakage current $V_i = V_{CC}$ and $V_o = \text{GND}$ , or $V_i = \text{GND}$ and $V_o = V_{CC}$ , $V_{INH} = V_{IH}$ (see <a href="#">Figure 3</a> )	5.5 V		$\pm 0.1$		$\pm 1$		$\pm 2$			$\mu\text{A}$	
$I_{S(on)}$	On-state switch leakage current $V_i = V_{CC}$ or GND, $V_{INH} = V_{IL}$ (see <a href="#">Figure 4</a> )	5.5 V		$\pm 0.1$		$\pm 1$		$\pm 2$			$\mu\text{A}$	
$I_{CC}$	Supply current $V_i = V_{CC}$ or GND	5.5 V				20		40			$\mu\text{A}$	
$C_{IC}$	Control input capacitance $f = 10 \text{ MHz}$	3.3 V		2							pF	
$C_{IS}$	Common terminal capacitance	3.3 V		23.4							pF	
$C_{OS}$	Switch terminal capacitance	3.3 V		5.7							pF	
$C_F$	Feedthrough capacitance			0.5							pF	

## 6.6 Switching Characteristics $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			$T_A = -40\text{ to }105^\circ\text{C}$		$T_A = -40\text{ to }125^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$ $t_{PHL}$ Propagation delay time	COM or Yn	Yn or COM	$C_L = 50\text{ pF}$ (see Figure 5)		2.5	9		12		14	ns
$t_{PZH}$ $t_{PZL}$ Enable delay time	INH	COM or Yn	$C_L = 50\text{ pF}$ (see Figure 6)		5.5	20		25		25	ns
$t_{PHZ}$ $t_{PLZ}$ Disable delay time	INH	COM or Yn	$C_L = 50\text{ pF}$ (see Figure 6)		8.8	20		25		25	ns

## 6.7 Switching Characteristics $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			$T_A = -40\text{ to }105^\circ\text{C}$			$T_A = -40\text{ to }125^\circ\text{C}$			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$t_{PLH}$ $t_{PHL}$ Propagation delay time	COM or Yn	Yn or COM	$C_L = 50\text{ pF}$ (see Figure 5)		1.5	6			8		10	ns	
$t_{PZH}$ $t_{PZL}$ Enable delay time	INH	COM or Yn	$C_L = 50\text{ pF}$ (see Figure 6)		4	14			18		18	ns	
$t_{PHZ}$ $t_{PLZ}$ Disable delay time	INH	COM or Yn	$C_L = 50\text{ pF}$ (see Figure 6)		6.2	14			18		18	ns	

## 6.8 Analog Switch Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			UNIT	
					MIN	TYP	MAX		
Frequency response (switch on)	COM or Yn	Yn or COM	$C_L = 50\text{ pF}$ , $R_L = 600\ \Omega$ , $f_{in} = 1\text{ MHz}$ (sine wave) <sup>(1)</sup> (see Figure 7)	2.3 V	20			MHz	
				3 V	25				
				4.5 V	35				
Crosstalk (control input to signal output)	INH	COM or Yn	$C_L = 50\text{ pF}$ , $R_L = 600\ \Omega$ , $f_{in} = 1\text{ MHz}$ (square wave) (see Figure 8)	2.3 V	20			mV	
				3 V	35				
				4.5 V	60				
Feedthrough attenuation (switch off)	COM or Yn	Yn or COM	$C_L = 50\text{ pF}$ , $R_L = 600\ \Omega$ , $f_{in} = 1\text{ MHz}$ <sup>(2)</sup> (see Figure 9)	2.3 V	-45			dB	
				3 V	-45				
				4.5 V	-45				
Sine-wave distortion	COM or Yn	Yn or COM	$C_L = 50\text{ pF}$ , $R_L = 10\text{ k}\Omega$ , $f_{in} = 1\text{ kHz}$ (sine wave) (see Figure 10)	$V_I = 2\text{ Vp-p}$	2.3 V	0.1%			
				$V_I = 2.5\text{ Vp-p}$	3 V	0.1%			
				$V_I = 4\text{ Vp-p}$	4.5 V	0.1%			

(1) Adjust  $f_{in}$  voltage to obtain 0-dBm output. Increase fin frequency until dB meter reads -3 dB.

(2) Adjust  $f_{in}$  voltage to obtain 0-dBm input.

## 6.9 Operating Characteristics

 $V_{CC} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	$C_L = 50\text{ pF}$ , $f = 10\text{ MHz}$	5.9	pF

## 7 Parameter Measurement Information

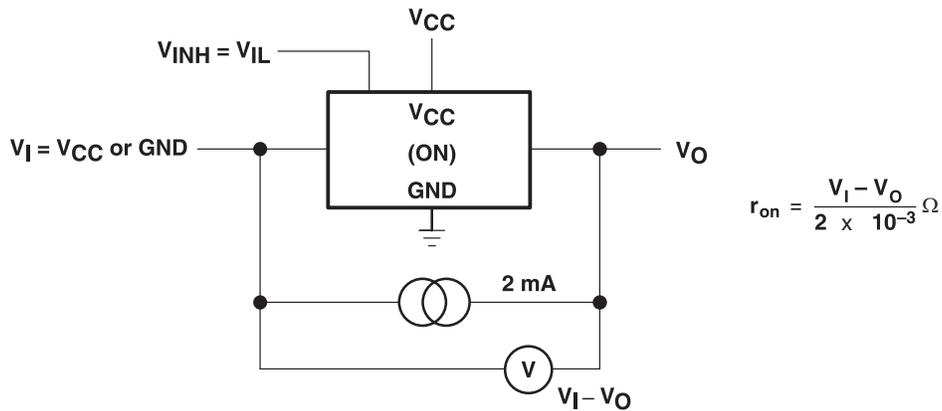


Figure 2. On-State Resistance Test Circuit

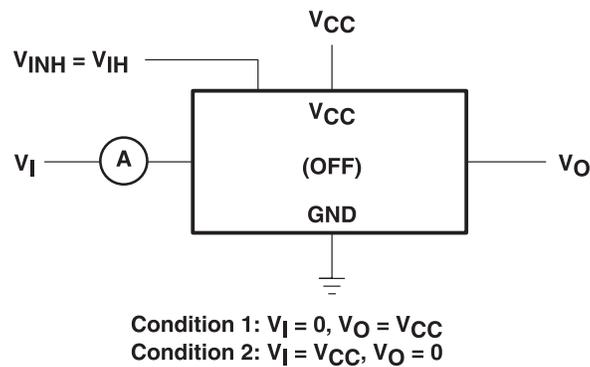


Figure 3. Off-State Switch Leakage-Current Test Circuit

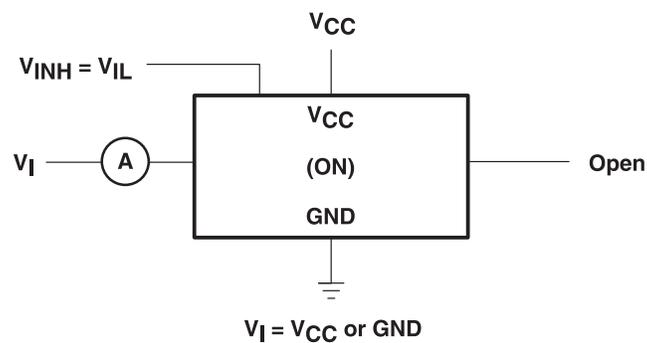


Figure 4. On-State Switch Leakage-Current Test Circuit

Parameter Measurement Information (continued)

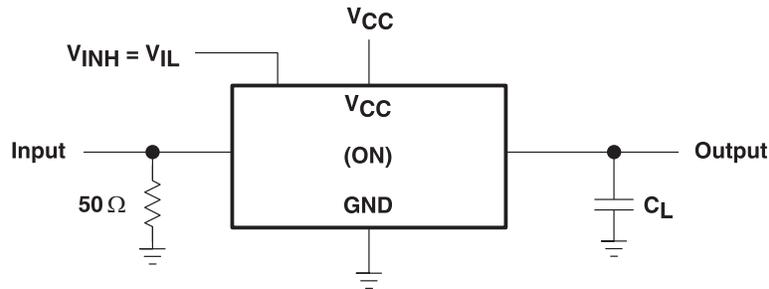


Figure 5. Propagation Delay Time, Signal Input to Signal Output

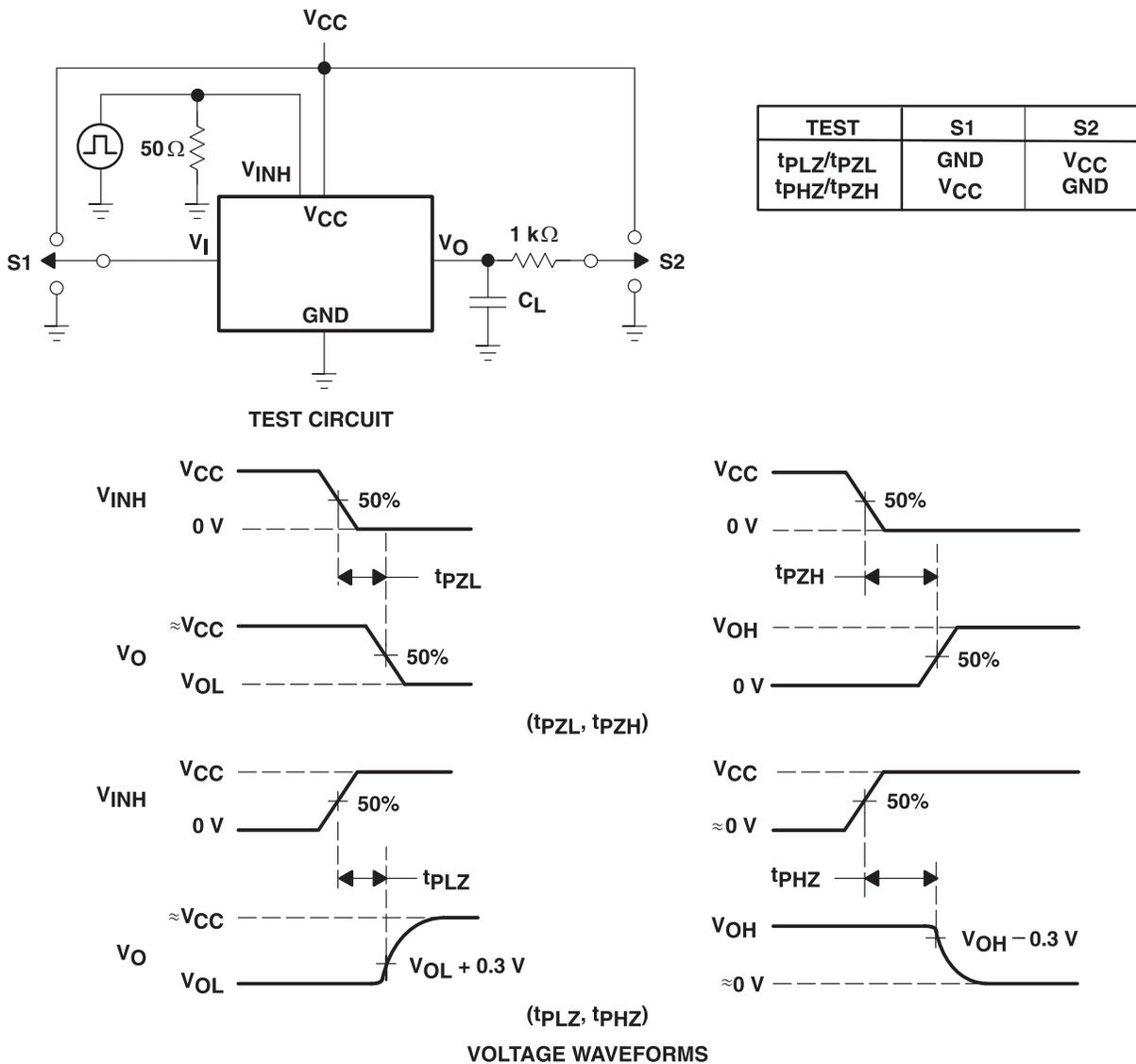
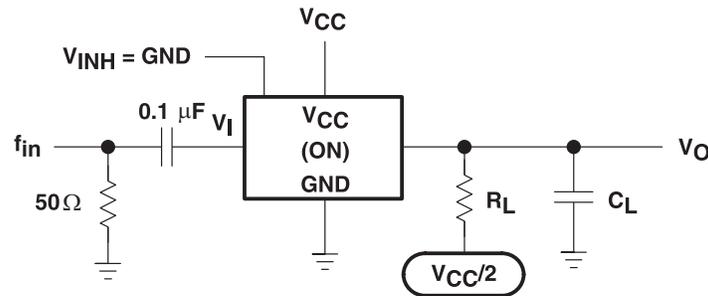
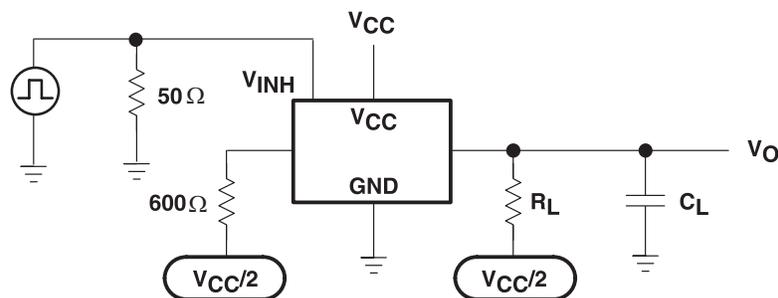
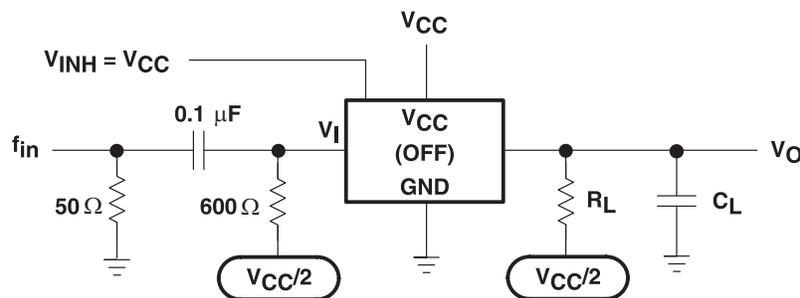
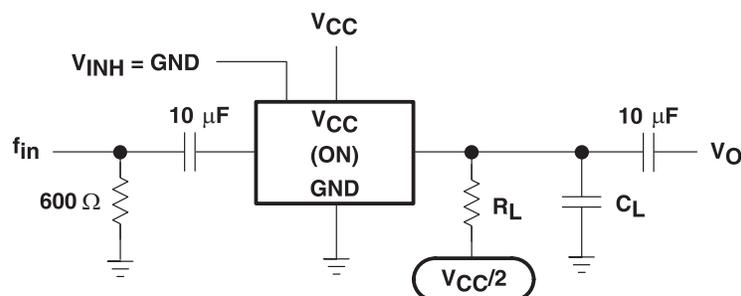


Figure 6. Switching Time ( $t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}$ ), Control to Signal Output

**Parameter Measurement Information (continued)**

 NOTE A:  $f_{in}$  is a sine wave.

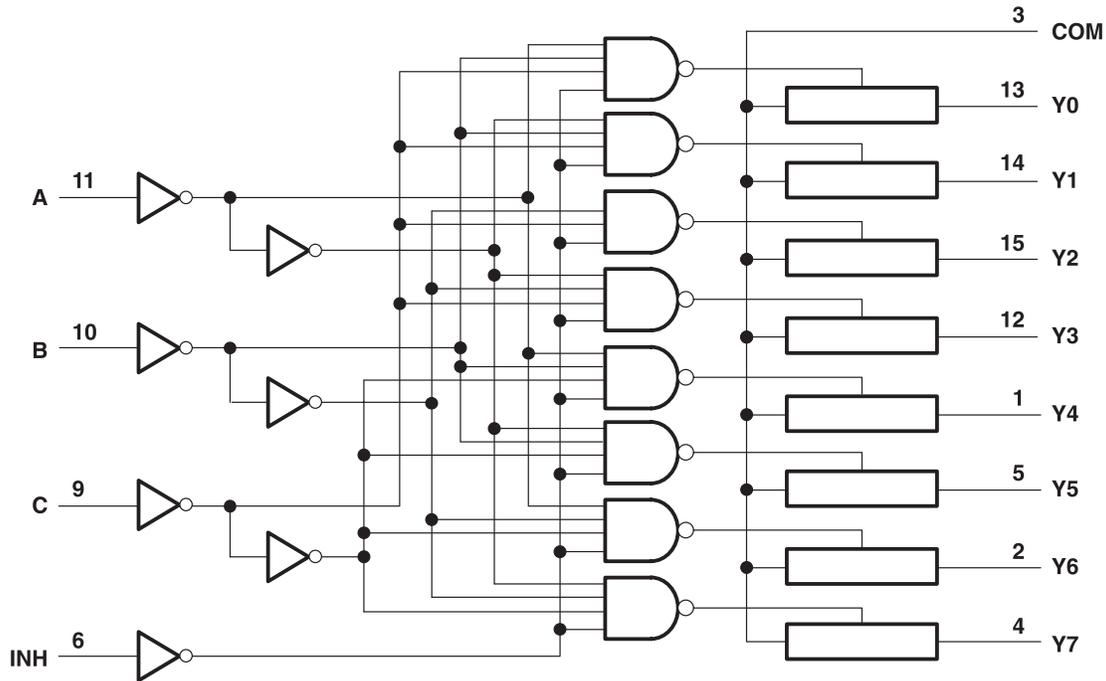
**Figure 7. Frequency Response (Switch On)**

**Figure 8. Crosstalk (Control Input, Switch Output)**

**Figure 9. Feedthrough Attenuation (Switch Off)**

**Figure 10. Sine-Wave Distortion**

## 8 Detailed Description

### 8.1 Overview

This device is an 8-channel analog multiplexer. A multiplexer is used when several signals must share the same device or resource. This device allows the selection of one of these signals at a time, for analysis or propagation.

### 8.2 Functional Block Diagram



### 8.3 Feature Description

This device contains one 8-channel multiplexer for use in a variety of applications, and can also be configured as demultiplexer by using the COM pin as an input and the Yx pins as outputs. This device is qualified for automotive applications and has an extended temperature range of  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  (maximum depends on package type).

### 8.4 Device Functional Modes

Table 1. Function Table

INPUTS				ON CHANNEL
INH	C	B	A	
L	L	L	L	Y0
L	L	L	H	Y1
L	L	H	L	Y2
L	L	H	H	Y3
L	H	L	L	Y4
L	H	L	H	Y5
L	H	H	L	Y6
L	H	H	H	Y7
H	X	X	X	None

## 9 Application and Implementation

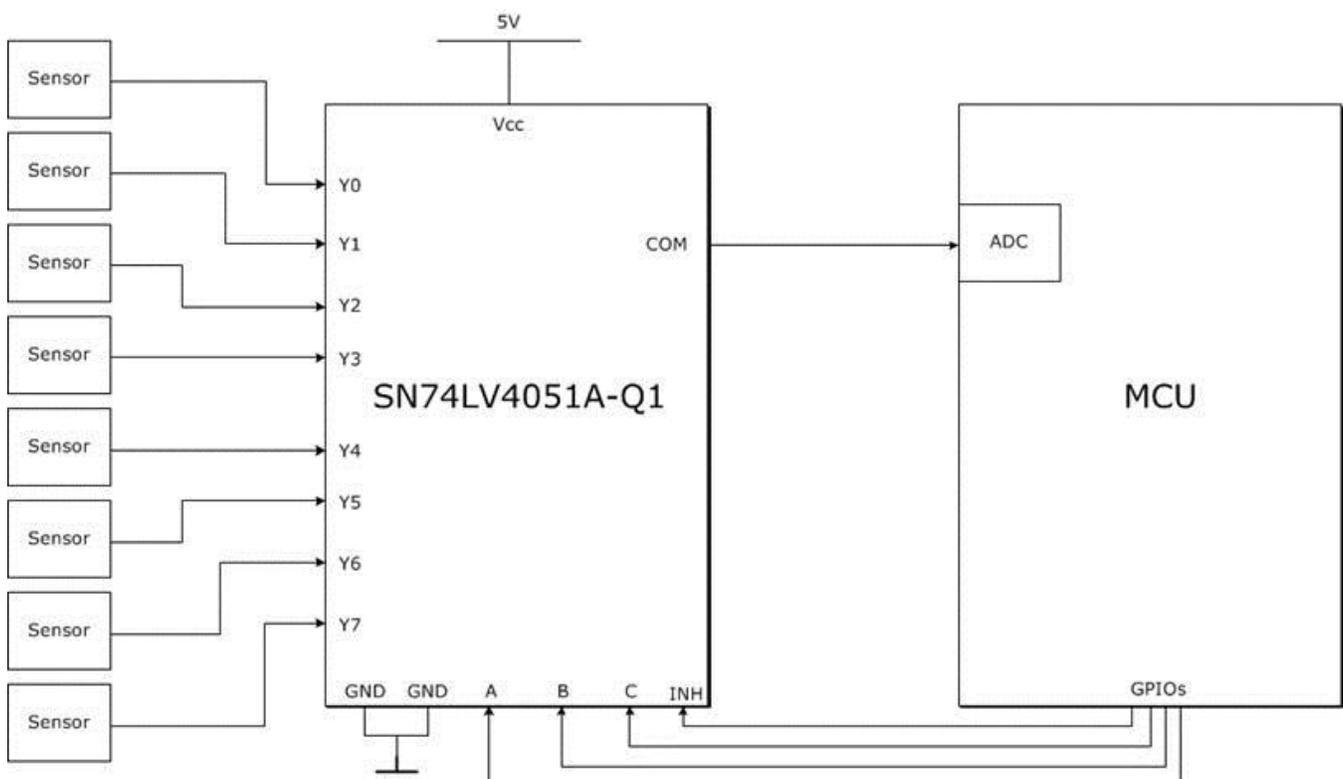
### NOTE

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. Customers should validate and test their design implementation to confirm system functionality.

### 9.1 Application Information

A multiplexer is used in applications where multiple signals share a resource. In the example below, several different sensors are connected to the analog-to-digital converter (ADC) of a microcontroller unit (MCU).

### 9.2 Typical Application



**Figure 11. Example of Multiplexer Use With Analog Sensors and the ADC of an MCU**

#### 9.2.1 Design Requirements

Designing with the SN74LV4051A-Q1 device requires a stable input voltage between 2 V (see [Recommended Operating Conditions](#) for details) and 5.5 V. Another important design consideration is the characteristics of the signal being multiplexed, to ensure no important information is lost due to timing or incompatibility with this device.

#### 9.2.2 Detailed Design Procedure

Normally, processing eight different analog signals would require eight separate ADCs, but [Figure 11](#) shows how to achieve this using only one ADC and four GPIOs (general-purpose input/outputs).

## 10 Power Supply Recommendations

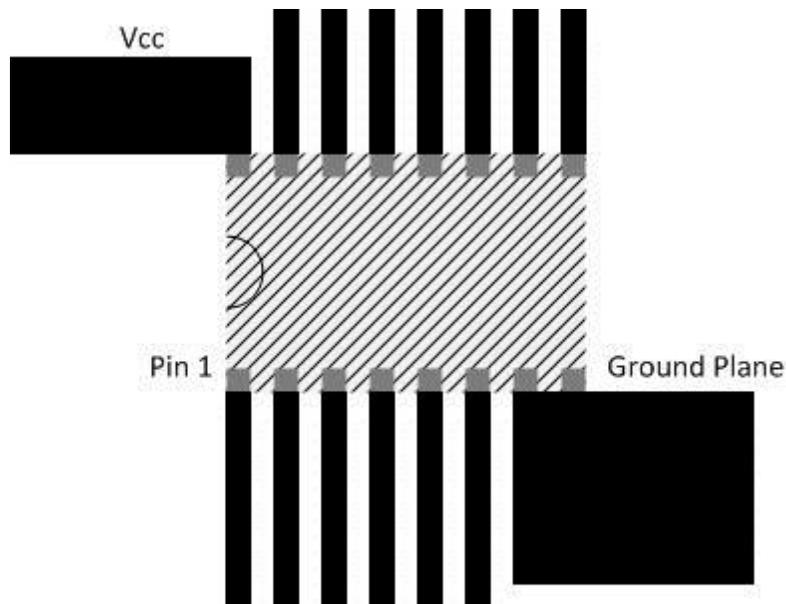
Most systems have a common 3.3-V or 5-V rail that can supply the Vcc pin of this device. If this is not available, a switched-mode power supply (SMPS) or a low dropout regulator (LDO) can supply this device from a higher voltage rail.

## 11 Layout

### 11.1 Layout Guidelines

TI recommends keeping the signal lines as short and as straight as possible. Incorporation of microstrip or stripline techniques is also recommended when signal lines are more than 1 inch long. These traces must be designed with a characteristic impedance of either 50  $\Omega$  or 75  $\Omega$ , as required by the application. Do not place this device too close to high-voltage switching components, as they may cause interference.

### 11.2 Layout Example



**Figure 12. Layout Schematic**

## 12 Device and Documentation Support

### 12.1 Trademarks

All trademarks are the property of their respective owners.

### 12.2 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.

### 12.3 Glossary

[SLYZ022](#) — *TI Glossary*.

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

## 13 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
CLV4051ATDWRG4Q1	ACTIVE	SOIC	DW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 105	L4051AQ	<a href="#">Samples</a>
CLV4051ATPWRG4Q1	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 105	L4051AQ	<a href="#">Samples</a>
SN74LV4051AQPWRQ1	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	4051AQ1	<a href="#">Samples</a>
SN74LV4051ATDRQ1	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 105	L4051AQ	<a href="#">Samples</a>
SN74LV4051ATDWRQ1	ACTIVE	SOIC	DW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 105	L4051AQ	<a href="#">Samples</a>
SN74LV4051ATPWRQ1	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 105	L4051AQ	<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 <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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

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**OTHER QUALIFIED VERSIONS OF SN74LV4051A-Q1 :**

- Catalog: [SN74LV4051A](#)
- Enhanced Product: [SN74LV4051A-EP](#)

**NOTE: Qualified Version Definitions:**

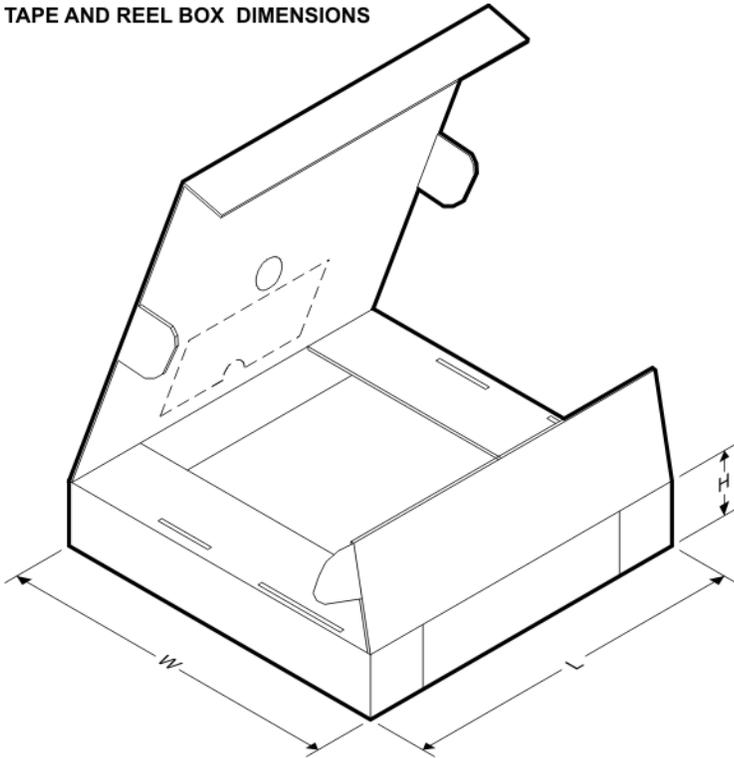
- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

**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
CLV4051ATDWRG4Q1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
CLV4051ATPWRG4Q1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV4051AQPWRQ1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV4051ATDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
SN74LV4051ATPWRQ1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

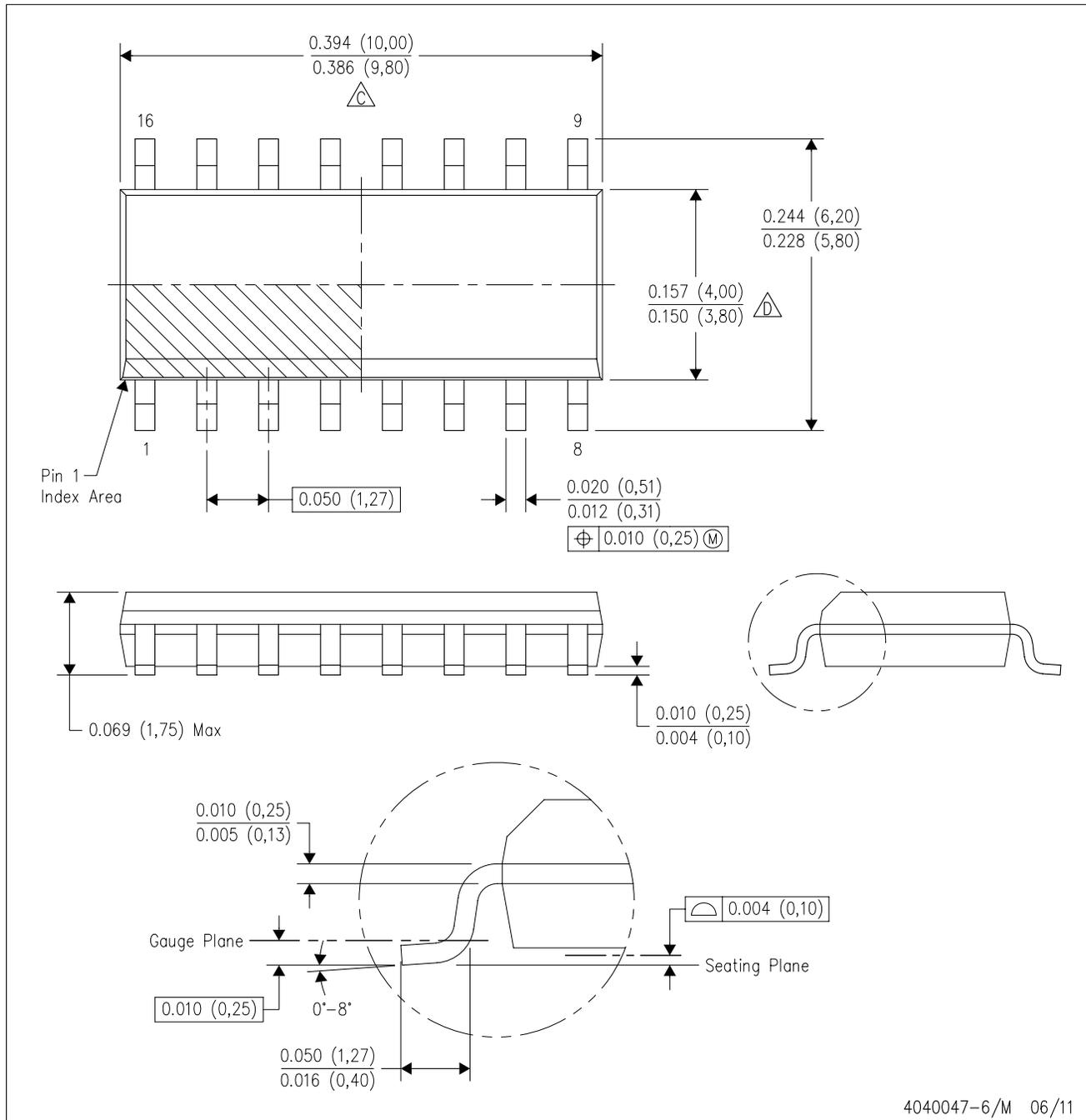
**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CLV4051ATDWRG4Q1	SOIC	DW	16	2000	350.0	350.0	43.0
CLV4051ATPWRG4Q1	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74LV4051AQPWRQ1	TSSOP	PW	16	2000	853.0	449.0	35.0
SN74LV4051ATDWRQ1	SOIC	DW	16	2000	350.0	350.0	43.0
SN74LV4051ATPWRQ1	TSSOP	PW	16	2000	853.0	449.0	35.0

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE

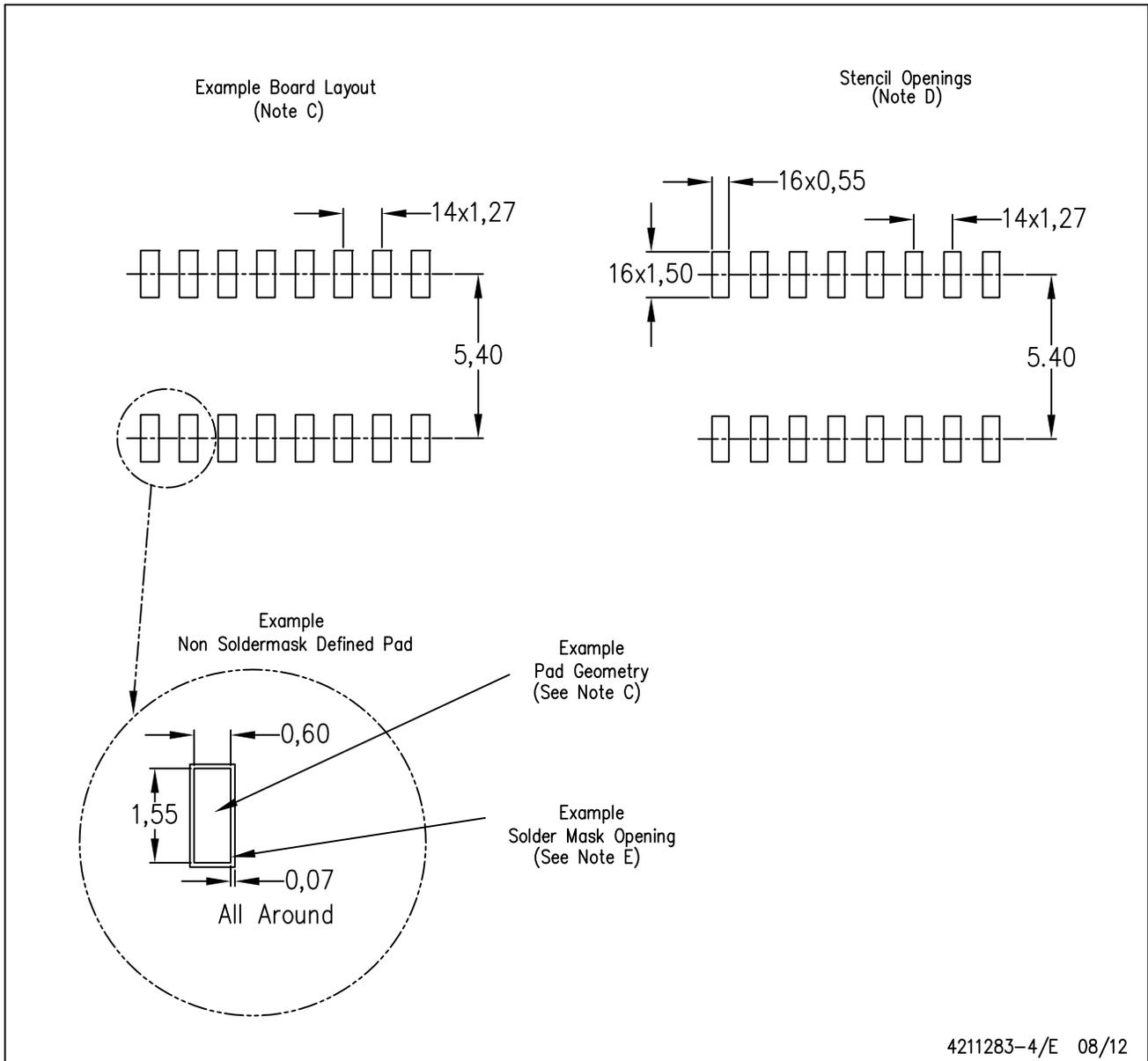


4040047-6/M 06/11

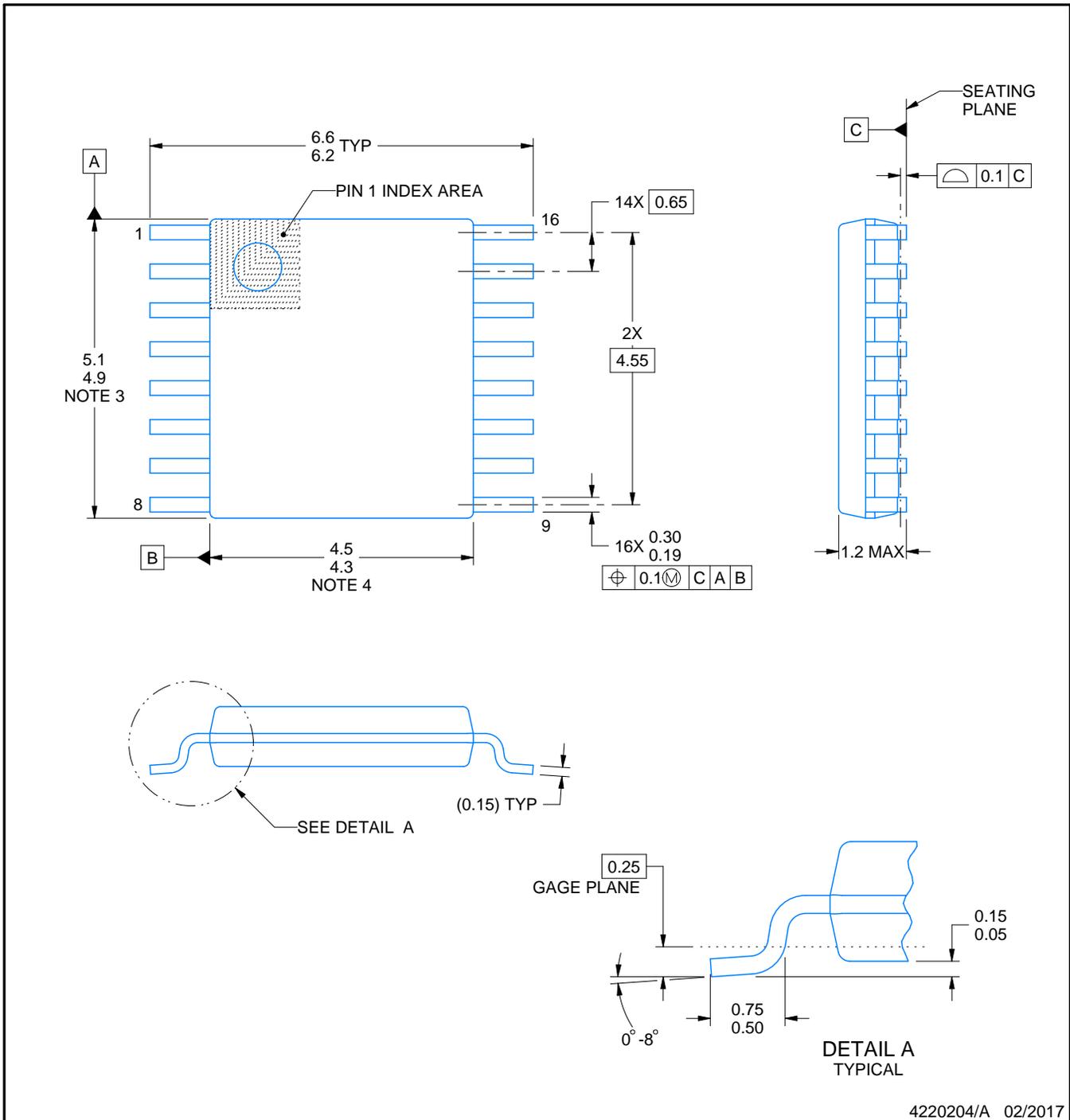
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  -  D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - 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.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



4220204/A 02/2017

NOTES:

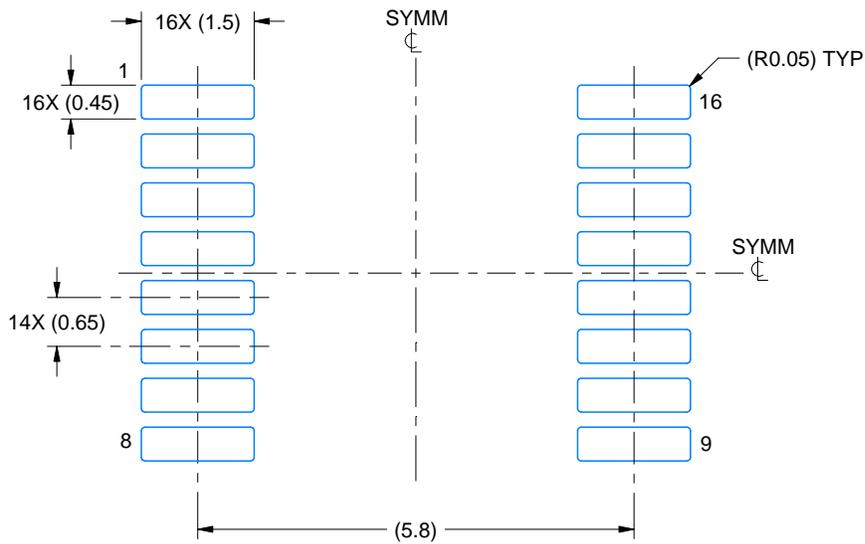
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

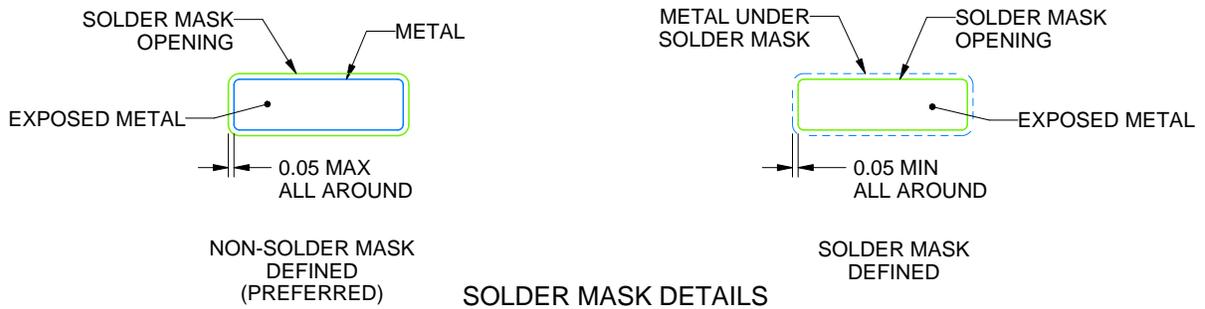
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220204/A 02/2017

NOTES: (continued)

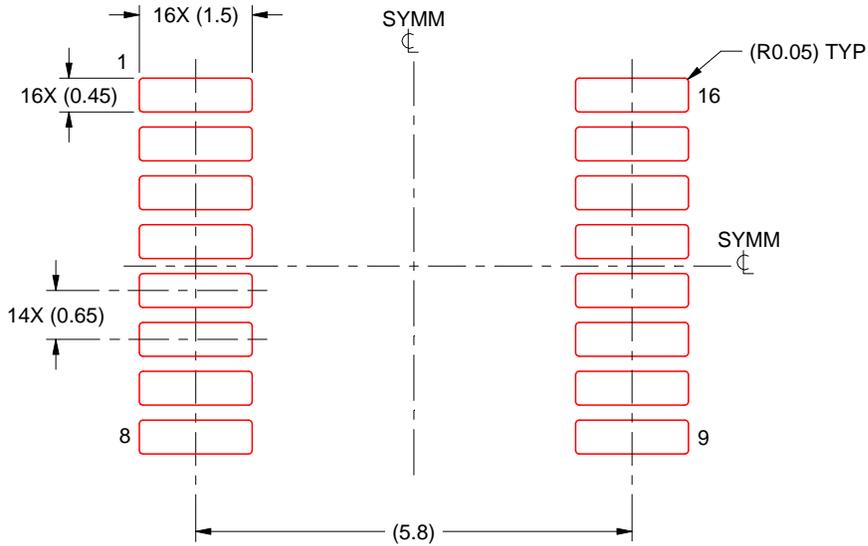
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220204/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.

## GENERIC PACKAGE VIEW

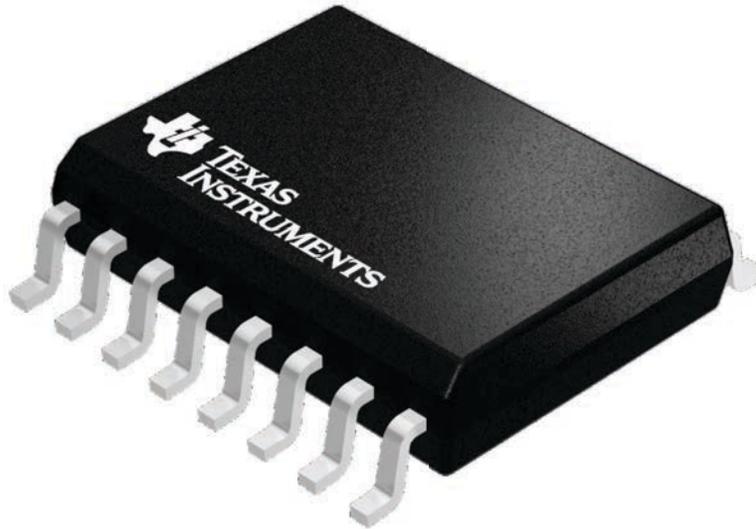
**DW 16**

**SOIC - 2.65 mm max height**

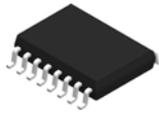
7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

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



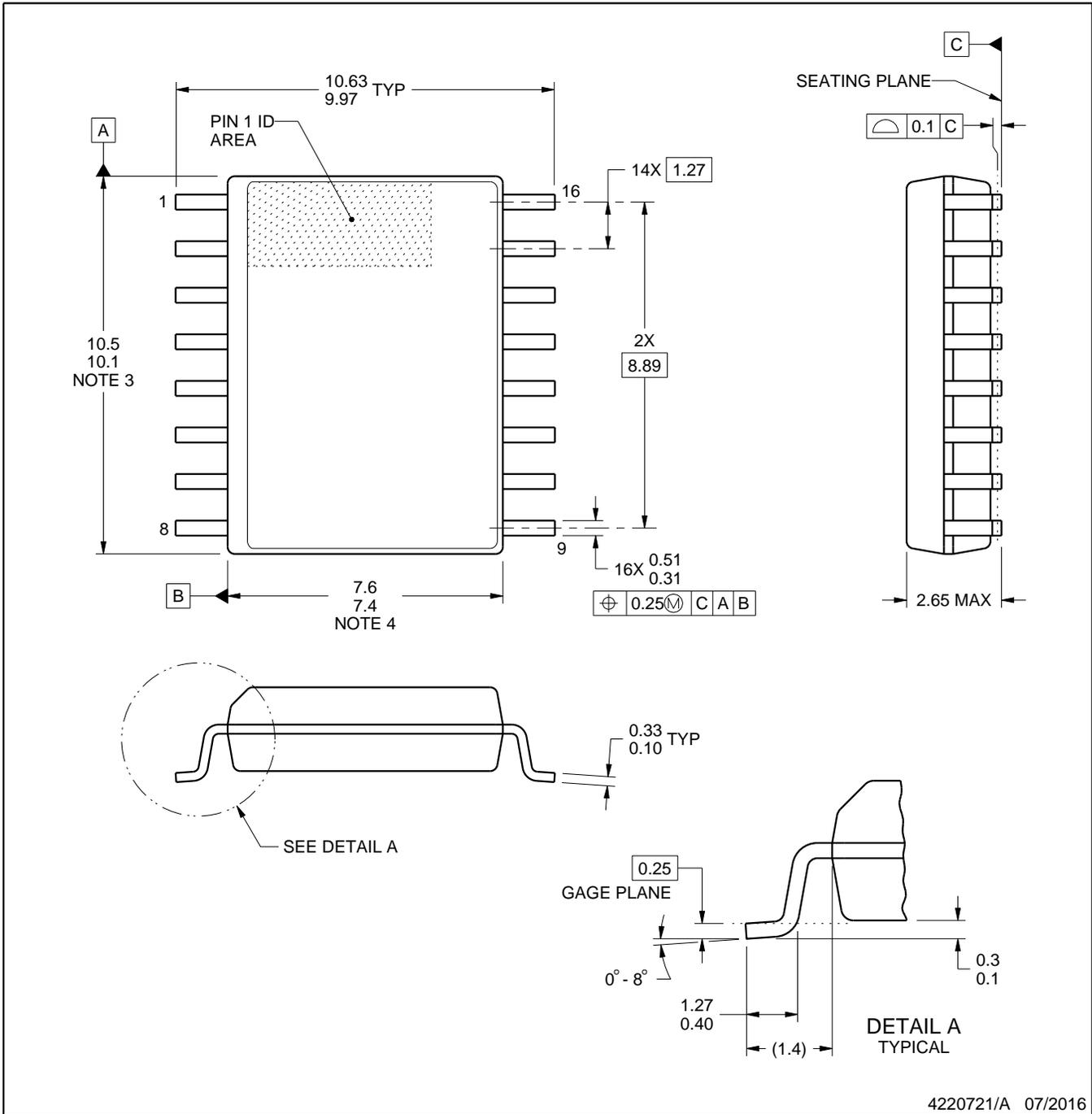
4224780/A



# DW0016A

# PACKAGE OUTLINE SOIC - 2.65 mm max height

SOIC



4220721/A 07/2016

### NOTES:

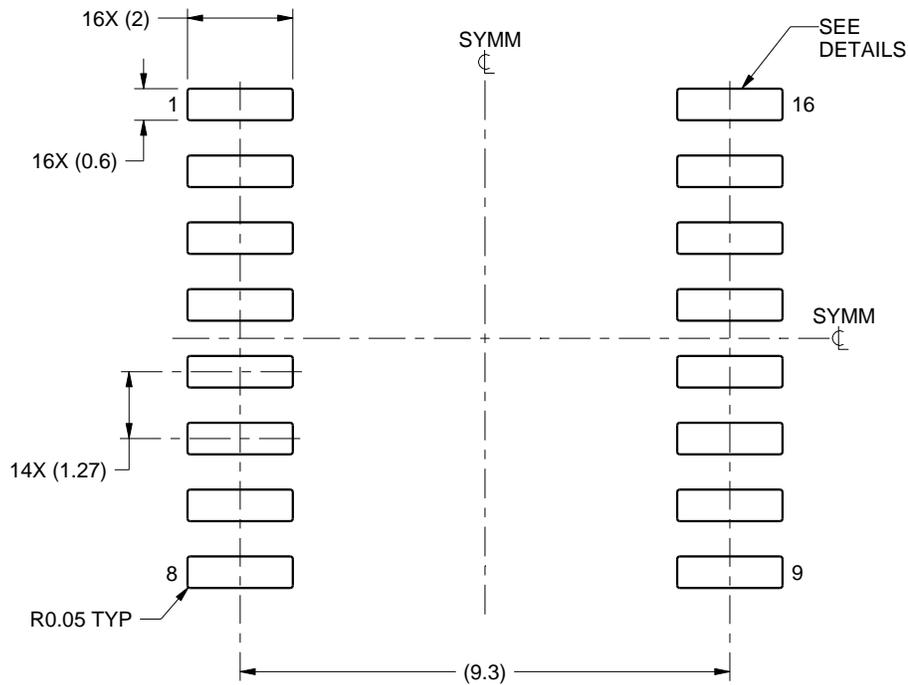
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MS-013.

# EXAMPLE BOARD LAYOUT

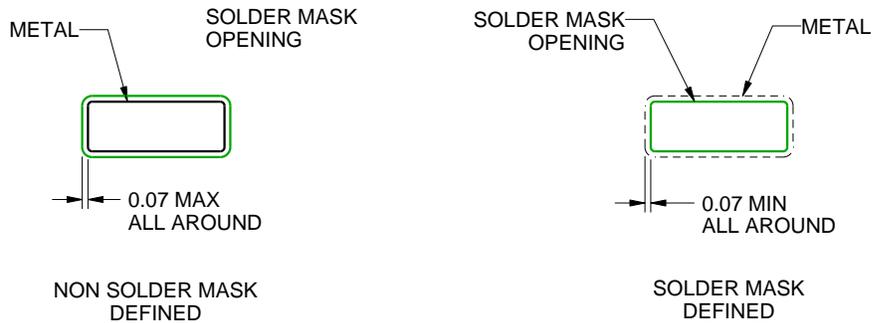
DW0016A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:7X



SOLDER MASK DETAILS

4220721/A 07/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

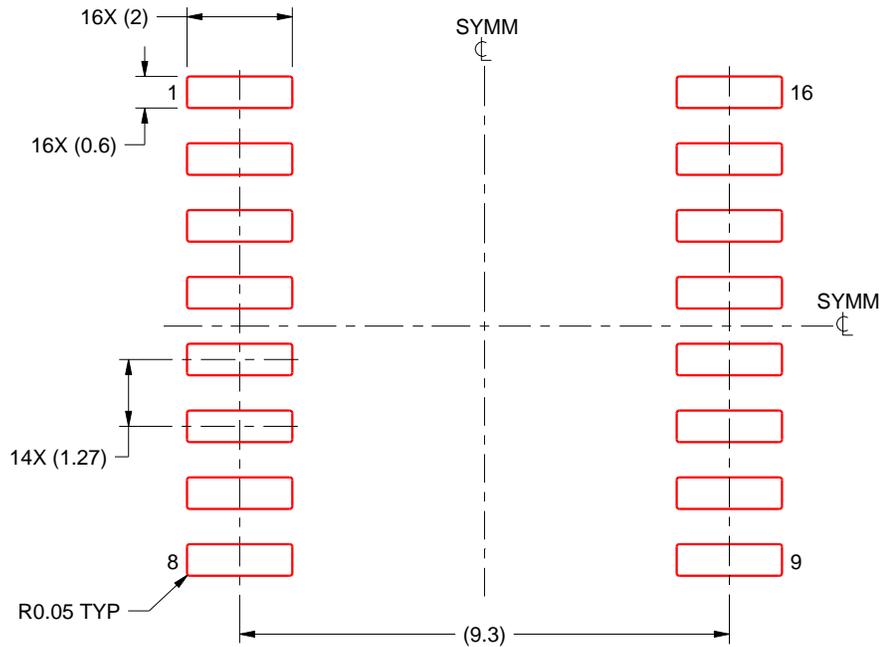
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DW0016A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

4220721/A 07/2016

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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