SN74LV4051A 8 通道模拟多路复用器和多路解复用器

1 特性

- 1.65V 至 5.5V V_{CC} 运行
- 所有端口上均支持以混合模式电压运行
- 高开关输出电压比
- 低开关间串扰
- 单独的开关控制
- 极低输入电流
- 闩锁性能超过 100mA，符合 JESD 78 II 类规范的要求
- ESD 保护性能超过 JESD 22 规范要求
  - 2000V 人体放电模型 (A114-A)
  - 200V 机器放电模型 (A115-A)
  - 1000V 充电器件模型 (C101)

2 应用

- 电信
- 紧急呼叫
- 信息娱乐系统

3 说明

SN74LV4051A 8 通道 CMOS 模拟多路复用器和多路解复用器可在 1.65V 至 5.5V V_{CC} 电压下运行。

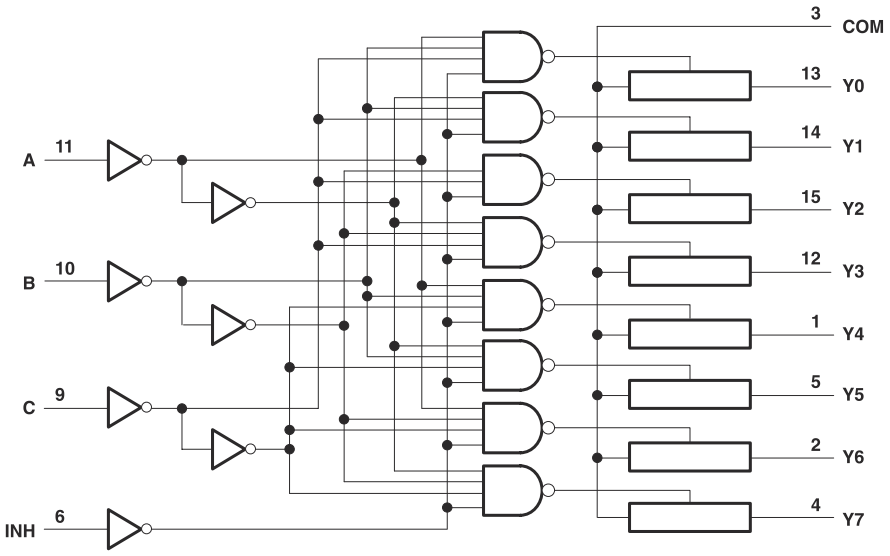
SN74LV4051A 器件能够处理模拟和数字信号。每个通道允许在任意方向传输振幅高达 5.5V（峰值）的信号。

应用包括用于模数和数模转换系统的信号选通、斩波、调制/解调（调制解调器）以及信号多路复用。

封装信息

器件型号	封装(1)	封装尺寸(2)
SN74LV4051A	PW（TSSOP，16）	5mm × 6.4mm
	D（SOIC，16）	9.9mm × 6mm
	RGY（VQFN，16）	4mm × 3.5mm

(1) 有关更多信息，请参阅节 11。
(2) 封装尺寸（长 × 宽）为标称值，并包括引脚（如适用）。



逻辑图（正逻辑）

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4 Pin Configuration and Functions

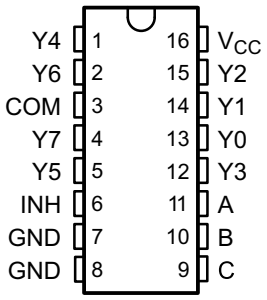


图 4-1. D, PW Package, 16-Pin SOIC, TSSOP (Top View)

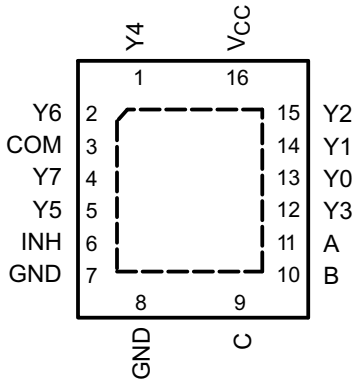


图 4-2. RGY Package 16-Pin VQFN With Exposed Thermal Pad (Top View)

表 4-1. Pin Functions

PIN		TYPE(2)	DESCRIPTION
NAME	NO.		
A	11	I	Selector line A for outputs (see 节 7.4 for specific information)
B	10	I	Selector line B for outputs (see 节 7.4 for specific information)
C	9	I	Selector line C for outputs (see 节 7.4 for specific information)
COM	3	O/I(1)	Output/Input of mux
GND	7, 8	—	Ground
INH	6	I(1)	Enables the outputs of the device. Logic low level with turn the outputs on, high level will turn them off.
Y0	13	I/O(1)	Input/Output to mux
Y1	14	I/O(1)	Input/Output to mux
Y2	15	I/O(1)	Input/Output to mux
Y3	12	I/O(1)	Input/Output to mux
Y4	1	I/O(1)	Input/Output of mux
Y5	5	I/O(1)	Input/Output to mux
Y6	2	I/O(1)	Input/Output to mux
Y7	4	I/O(1)	Input/Output to mux
V_{CC}	16	—	Device power

(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).
(2) I = inputs, O = outputs

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1) (3)

			MIN	MAX	UNIT
V_{CC}	Supply voltage		– 0.5	7.0	V
V_I	Logic input voltage range		– 0.5	7.0	V
V_{IO}	Switch I/O voltage range(2) (3)		– 0.5	V_{CC} + 0.5	V
I_{IK}	Input clamp current	V_I < 0	– 20		mA
I_{IOK}	Switch IO diode clamp current	V_{IO} < 0 or V_{IO} > V_{CC}	– 50	50	mA
I_T	Switch continuous current	V_{IO} = 0 to V_{CC}		±25	mA
	Continuous current through V_{CC} or GND			±50	mA
T_J	Junction temperature			150	°C
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) Pins are diode-clamped to the power-supply rails. Over voltage signals must be voltage and current limited to maximum ratings.
(3) This value is limited to 5.5V maximum

5.2 ESD Ratings

				VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per AEC Q100-002(1)	All pins	±2000	V
		Charged device model (CDM), per AEC Q100-011	All pins	±1000	

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

5.3 Thermal Information: SN74LV4051A

THERMAL METRIC(1)		SN74LV4051A D (SOIC) 16 PINS	SN74LV4051A PW (TSSOP) 16 PINS	SN74LV4051A RGY (VQFN) 16 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance	115.2	140.2	89.4	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	75.0	72.6	89.7	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	76.6	98.7	65.4	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	31.3	13.4	25.0	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	75.7	97.3	65.2	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	48.9	°C/W

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

5.4 Recommended Operating Conditions

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

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		1(2)		5.5	V
V_{IH}	High-level input voltage, logic control inputs	V_{CC} = 1.65	1.2		5.5	V
		V_{CC} = 2V	1.5		5.5	
		V_{CC} = 2.3V to 2.7V	V_{CC} x 0.7		5.5	
		V_{CC} = 3V to 3.6V	V_{CC} x 0.7		5.5	
		V_{CC} = 4.5V to 5.5V	V_{CC} x 0.7		5.5	
V_{IL}	Low-level input voltage, logic control inputs	V_{CC} = 1.65	0		0.4	V
		V_{CC} = 2V	0		0.5	
		V_{CC} = 2.3V to 2.7V	0		V_{CC} x 0.3	
		V_{CC} = 3V to 3.6V	0		V_{CC} x 0.3	
		V_{CC} = 4.5V to 5.5V	0		V_{CC} x 0.3	
V_I	Logic control input voltage		0		5.5	V
V_{IO}	Switch input or output voltage		0		V_{CC}	V
$\Delta t/\Delta V$	Logic input transition rise or fall rate	V_{CC} = 2.3V to 2.7V			200	ns/V
		V_{CC} = 3V to 3.6V			100	
		V_{CC} = 4.5V to 5.5V			20	
T_A	Ambient temperature		–40		125	°C

(1) All unused inputs of the device must be held at V_{CC} or GND for proper device operation. Refer to TI application report *Implications of Slow or Floating CMOS Inputs*, SCBA004.

(2) When using a V_{CC} of ⩽1.2V, it is recommended to use these devices only for transmitting digital signals. When supply voltage is near 1.2V the analog switch ON resistance becomes very non-linear

5.5 Electrical Characteristics

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

PARAMETER		Condition	T_A	V_{CC}	MIN	TYP	MAX	UNIT
r_{ON}	ON-state switch resistance	I_T = 2mA, V_I = V_{CC} or GND, V_{INH} = V_{IL}	25°C	1.65V		60	150	Ω
r_{ON}	ON-state switch resistance	I_T = 2mA, V_I = V_{CC} or GND, V_{INH} = V_{IL}	–40°C to 85°C	1.65V			225	Ω
r_{ON}	ON-state switch resistance	I_T = 2mA, V_I = V_{CC} or GND, V_{INH} = V_{IL}	–40°C to 125°C	1.65V			225	Ω
r_{ON}	ON-state switch resistance	I_T = 2mA, V_I = V_{CC} or GND, V_{INH} = V_{IL}	25°C	2.3V		38	180	Ω
			–40°C to 85°C				225	
			–40°C to 125°C				225	
			25°C	3V		30	150	
			–40°C to 85°C				190	
			–40°C to 125°C				190	
			25°C	4.5V		22	75	
			–40°C to 85°C				100	
			–40°C to 125°C				100	
$r_{ON(p)}$	Peak ON-state resistance	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	25°C	1.65V		220	600	Ω

5.5 Electrical Characteristics（续）

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

PARAMETER		Condition	T_A	V_{CC}	MIN	TYP	MAX	UNIT
$r_{ON(p)}$	Peak ON-state resistance	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	–40°C to 85°C	1.65V			700	Ω
$r_{ON(p)}$	Peak ON-state resistance	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	–40°C to 125°C	1.65V			700	Ω
$r_{ON(p)}$	Peak ON-state resistance	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	25°C	2.3V		113	500	Ω
			–40°C to 85°C				600	
			–40°C to 125°C				600	
			25°C	3V		54	180	Ω
			–40°C to 85°C				225	
			–40°C to 125°C				225	
			25°C	4.5V		31	100	Ω
			–40°C to 85°C				125	
			–40°C to 125°C				125	
Δr_{ON}	Difference in ON-state resistance between switches	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	25°C	1.65V		3	40	Ω
Δr_{ON}	Difference in ON-state resistance between switches	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	–40°C to 85°C	1.65V			50	Ω
Δr_{ON}	Difference in ON-state resistance between switches	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	–40°C to 85°C	1.65V			50	Ω
Δr_{ON}	Difference in ON-state resistance between switches	I_T = 2mA, V_I = GND to V_{CC}, V_{INH} = V_{IL}	25°C	2.3V		2.1	30	Ω
			–40°C to 85°C				40	
			–40°C to 125°C				40	
			25°C	3V		1.4	20	Ω
			–40°C to 85°C				30	
			–40°C to 125°C				30	
			25°C	4.5V		1.3	15	Ω
			–40°C to 85°C				20	
			–40°C to 125°C				20	
I_{IH} I_{IL}	Control input current	V_I = 5.5V or GND	25°C	0 to 5.5V			0.1	μA
			–40°C to 85°C				1	
			–40°C to 125°C				2	
$I_{S(off)}$	OFF-state switch leakage current	V_I = V_{CC} and V_O = GND, or V_I = GND and V_O = V_{CC}, V_{INH} = V_{IH}	25°C	5.5V			0.1	μA
			–40°C to 85°C				1	
			–40°C to 125°C				2	
$I_{S(on)}$	ON-state switch leakage current	V_I = V_{CC} or GND, V_{INH} = V_{IL} (see Figure 6-3)	25°C	5.5V			0.1	μA
			–40°C to 85°C				1	
			–40°C to 125°C				2	
I_{CC}	Supply current	V_I = V_{CC} or GND V_{INH} = 0V	25°C	5.5V		0.01		μA
			–40°C to 85°C				20	
			–40°C to 125°C				40	

5.5 Electrical Characteristics（续）

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

PARAMETER		Condition	T_A	V_{CC}	MIN	TYP	MAX	UNIT
C_{IC}	Control input capacitance	f = 10MHz	25°C	3.3V		2		pF
C_{OS}	Switch terminal capacitance	f = 10MHz	25°C	3.3V		5		pF
C_{IS}	Common terminal capacitance	f = 10MHz	25°C	3.3V		23		pF
$C_{OS(on)}$	Common terminal ON-capacitance	f = 10MHz	25°C	3.3V		23		pF
C_F	Feedthrough capacitance	f = 10MHz	25°C	3.3V		0.5		pF
C_{PD}	Power dissipation capacitance	C_L = 50pF, f = 10MHz	25°C	3.3V		6		pF

5.6 Timing Characteristics V_{CC} = 2.5V ± 0.2V

PARAMETER		FROM (INPUT)	TO (OUTPUT)	CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{PLH} t_{PHL}	Propagation delay time	COM or Yn	Yn or COM	C_L = 15pF	25°C		1.9	10	ns
					– 40°C to 85°C			16	
					– 40°C to 125°C			18	
t_{PZH} t_{PZL}	Enable delay time	INH	COM or Yn	C_L = 15pF	25°C		6.6	18	ns
					– 40°C to 85°C			23	
					– 40°C to 125°C			25	
t_{PHZ} t_{PLZ}	Disable delay time	INH	COM or Yn	C_L = 15pF	25°C		7.4	18	ns
					– 40°C to 85°C			23	
					– 40°C to 125°C			25	
t_{PLH} t_{PHL}	Propagation delay time	COM or Yn	Yn or COM	C_L = 50pF	25°C		3.8	12	ns
					– 40°C to 85°C			18	
					– 40°C to 125°C			20	
t_{PZH} t_{PZL}	Enable delay time	INH	COM or Yn	C_L = 50pF	25°C		7.8	28	ns
					– 40°C to 85°C			35	
					– 40°C to 125°C			35	
t_{PHZ} t_{PLZ}	Disable delay time	INH	COM or Yn	C_L = 50pF	25°C		11.5	28	ns
					– 40°C to 85°C			35	
					– 40°C to 125°C			35	

5.7 Timing Characteristics V_{CC} = 3.3V ± 0.3V

PARAMETER		FROM (INPUT)	TO (OUTPUT)	CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{PLH} t_{PHL}	Propagation delay time	COM or Yn	Yn or COM	C_L = 15pF	25°C		1.2	6	ns
					– 40°C to 85°C			10	
					– 40°C to 125°C			12	
t_{PZH} t_{PZL}	Enable delay time	INH	COM or Yn	C_L = 15pF	25°C		4.7	12	ns
					– 40°C to 85°C			15	
					– 40°C to 125°C			18	

5.7 Timing Characteristics V_{CC} = 3.3V ± 0.3V（续）

PARAMETER		FROM (INPUT)	TO (OUTPUT)	CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{PHZ} t_{PLZ}	Disable delay time	INH	COM or Yn	C_L = 15pF	25°C		5.7	12	ns
					– 40°C to 85°C			15	
					– 40°C to 125°C			18	
t_{PLH} t_{PHL}	Propagation delay time	COM or Yn	Yn or COM	C_L = 50pF	25°C		2.5	9	ns
					– 40°C to 85°C			12	
					– 40°C to 125°C			14	
t_{PZH} t_{PZL}	Enable delay time	INH	COM or Yn	C_L = 50pF	25°C		5.5	20	ns
					– 40°C to 85°C			25	
					– 40°C to 125°C			25	
t_{PHZ} t_{PLZ}	Disable delay time	INH	COM or Yn	C_L = 50pF	25°C		8.8	20	ns
					– 40°C to 85°C			25	
					– 40°C to 125°C			25	

5.8 Timing Characteristics V_{CC} = 5V ± 0.5V

PARAMETER		FROM (INPUT)	TO (OUTPUT)	CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{PLH} t_{PHL}	Propagation delay time	COM or Yn	Yn or COM	C_L = 15pF	25°C		0.6	4	ns
					– 40°C to 85°C			7	
					– 40°C to 125°C			10	
t_{PZH} t_{PZL}	Enable delay time	INH	COM or Yn	C_L = 15pF	25°C		3.5	8	ns
					– 40°C to 85°C			10	
					– 40°C to 125°C			12	
t_{PHZ} t_{PLZ}	Disable delay time	INH	COM or Yn	C_L = 15pF	25°C		4.4	10	ns
					– 40°C to 85°C			11	
					– 40°C to 125°C			12	
t_{PLH} t_{PHL}	Propagation delay time	COM or Yn	Yn or COM	C_L = 50pF	25°C		1.5	6	ns
					– 40°C to 85°C			8	
					– 40°C to 125°C			10	
t_{PZH} t_{PZL}	Enable delay time	INH	COM or Yn	C_L = 50pF	25°C		4	14	ns
					– 40°C to 85°C			18	
					– 40°C to 125°C			18	
t_{PHZ} t_{PLZ}	Disable delay time	INH	COM or Yn	C_L = 50pF	25°C		6.2	14	ns
					– 40°C to 85°C			18	
					– 40°C to 125°C			18	

5.9 AC Characteristics

PARAMETER	FROM (INPUT)	TO (OUTPUT)	Device	CONDITIONS		MIN	TYP	MAX	UNIT
Frequency response (switch on)	COM or Yn	Yn or COM	SN74LV4051	C_L = 50pF, R_L = 600 Ω, F_{in} = 1MHz (sine wave) (see Figure 6-6) (1)	V_{CC} = 2.3V		20		MHz
					V_{CC} = 3V		25		
					V_{CC} = 4.5V		35		

5.9 AC Characteristics（续）

PARAMETER	FROM (INPUT)	TO (OUTPUT)	Device	CONDITIONS		MIN	TYP	MAX	UNIT
Charge Injection (control input to signal output)	INH	COM or Yn		C_L = 50pF, R_L = 600 Ω, F_{in} = 1MHz (sine wave) (see Figure 6-8)	V_{CC} = 2.3V		20		mV
					V_{CC} = 3V		35		
					V_{CC} = 4.5V		60		
Feedthrough attenuation (switch off)	COM or Yn	Yn or COM		C_L = 50pF, R_L = 600 Ω, F_{in} = 1MHz (sine wave) (see Figure 6-9) (2)	V_{CC} = 2.3V		–45		dB
					V_{CC} = 3V		–45		
					V_{CC} = 4.5V		–45		
Crosstalk (between any switches)	COM or Yn	Yn or COM		C_L = 50pF, R_L = 600 Ω, F_{in} = 1MHz (sine wave) (see Figure 6-7) (2)	V_{CC} = 2.3V		–45		dB
					V_{CC} = 3V		–45		
					V_{CC} = 4.5V		–45		
Sine-wave distortion	COM or Yn	Yn or COM		C_L = 50pF, R_L = 10k Ω, F_{in} = 1kHz (sine wave) (see Figure 6-9)	V_I = $2V_{p-p}$ V_{CC} = 2.3V		0.1		%
					V_I = $2.5V_{p-p}$ V_{CC} = 3V		0.1		
					V_I = $4V_{p-p}$ V_{CC} = 4.5V		0.1		

5.10 Typical Characteristics

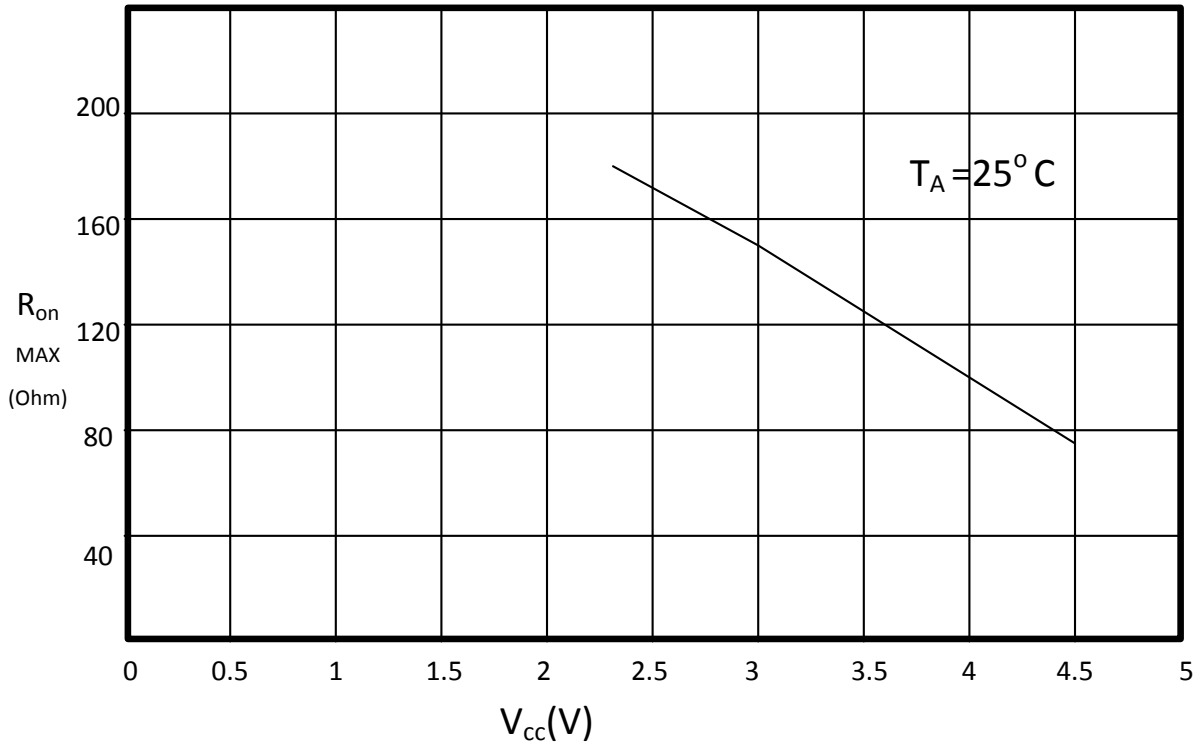


图 5-1. Plot at 25°C for V_{CC} vs Max R_{ON}

6 Parameter Measurement Information

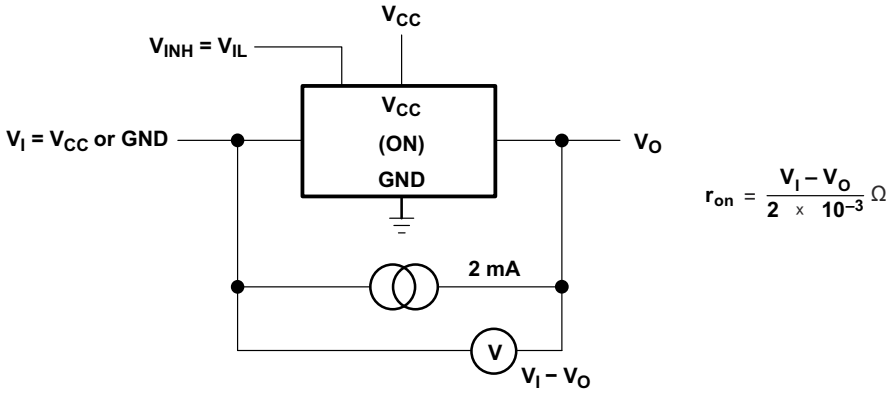


图 6-1. On-State Resistance Test Circuit

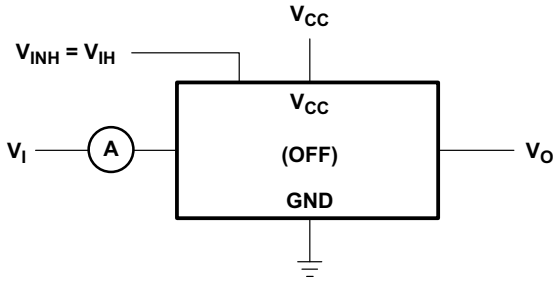


图 6-2. Off-State Switch Leakage-Current Test Circuit

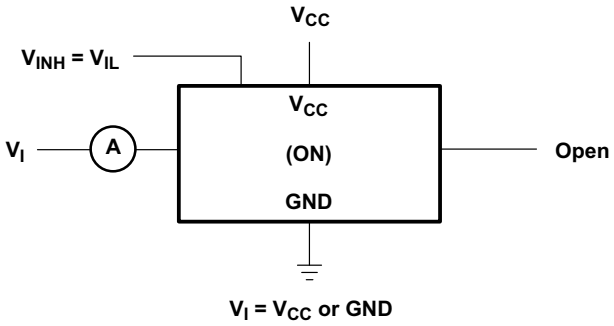


图 6-3. On-State Switch Leakage-Current Test Circuit

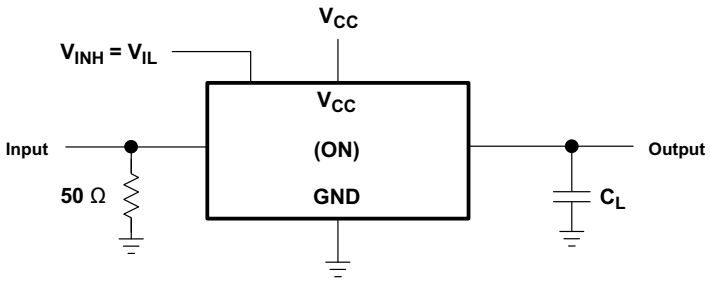
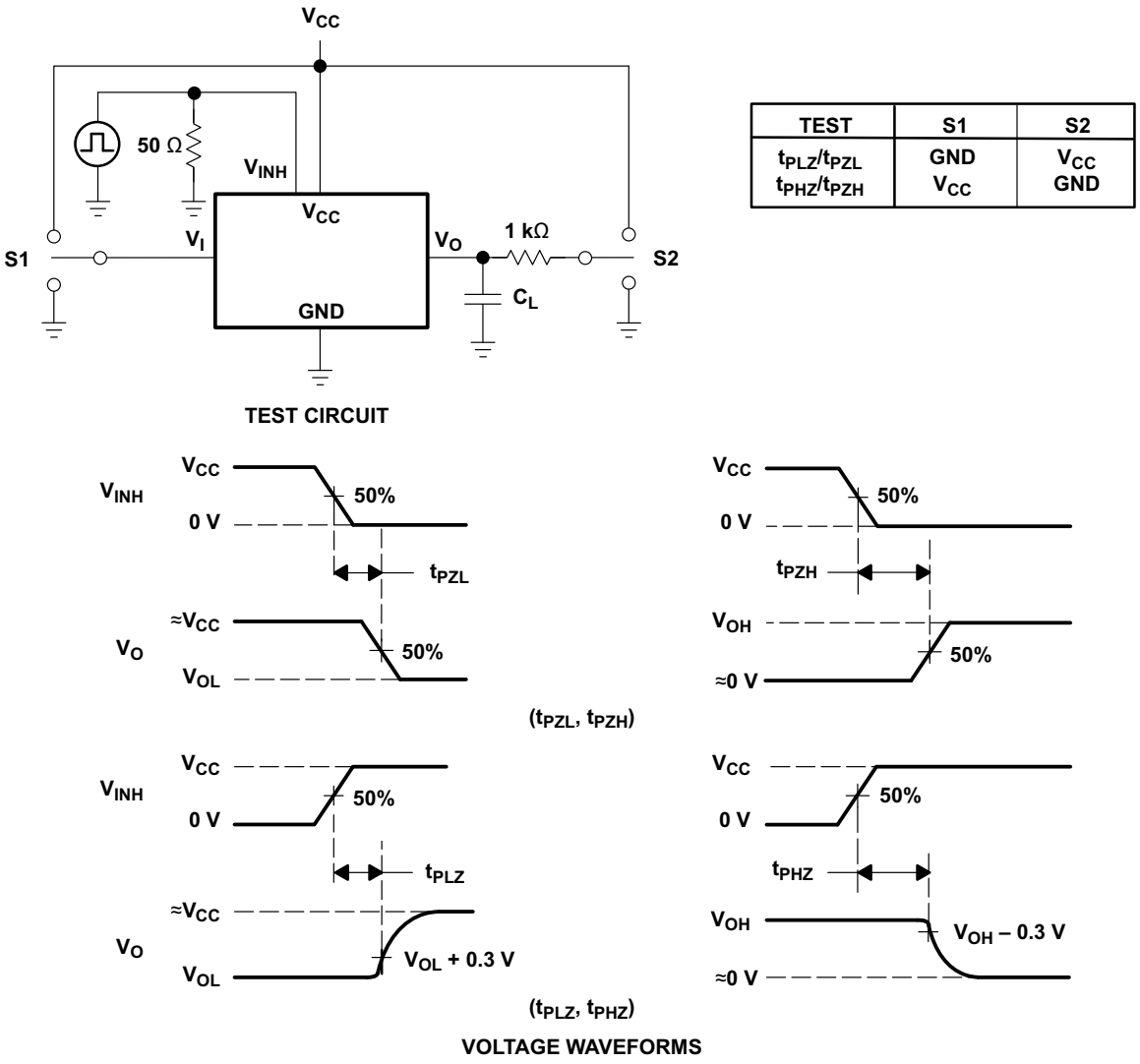
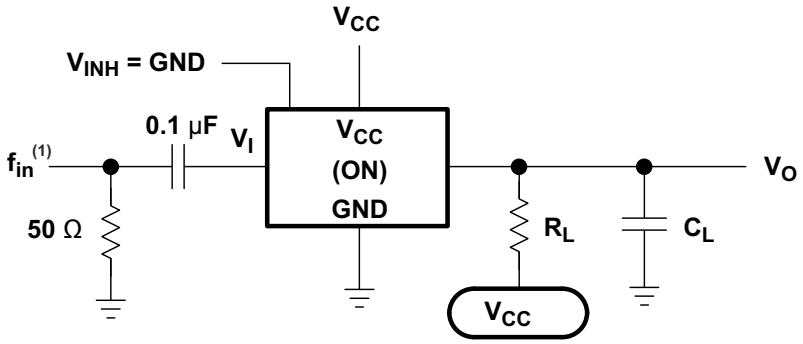


图 6-4. Propagation Delay Time, Signal Input to Signal Output



TEST	S1	S2
t_{PLZ}/t_{PZL} t_{PHZ}/t_{PZH}	GND V_{CC}	V_{CC} GND

图 6-5. Switching Time (t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}), Control to Signal Output



A. f_{in} is a sine wave.

图 6-6. Frequency Response (Switch On)

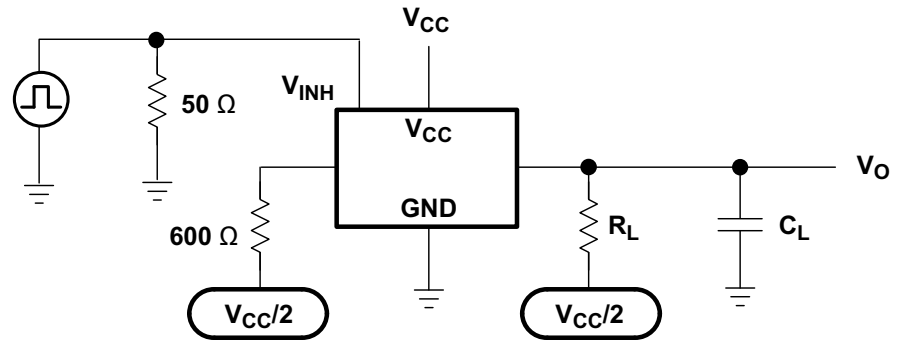


图 6-7. Crosstalk (Control Input, Switch Output)

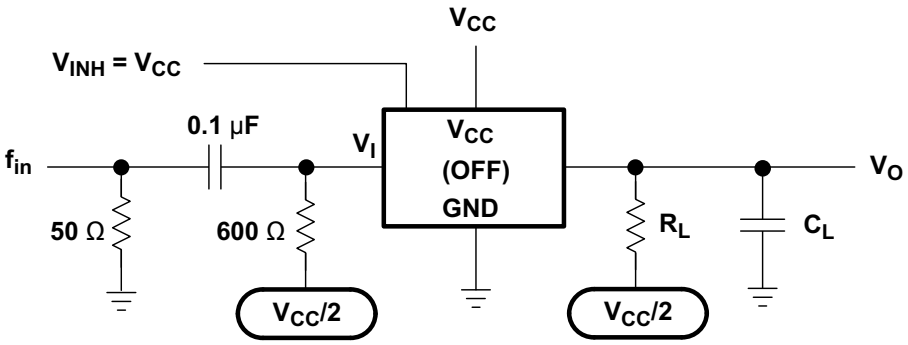


图 6-8. Feedthrough Attenuation (Switch Off)

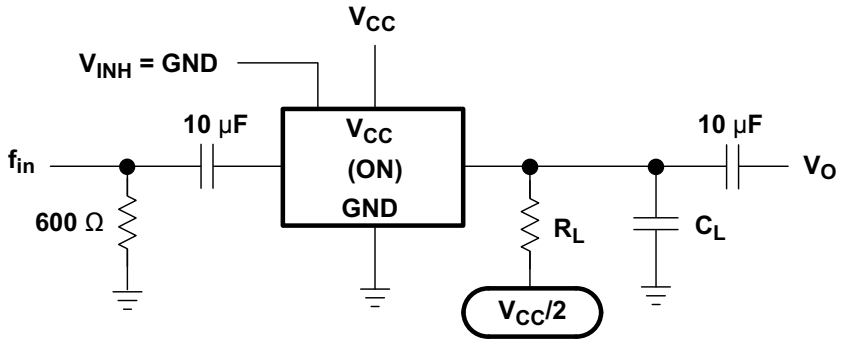


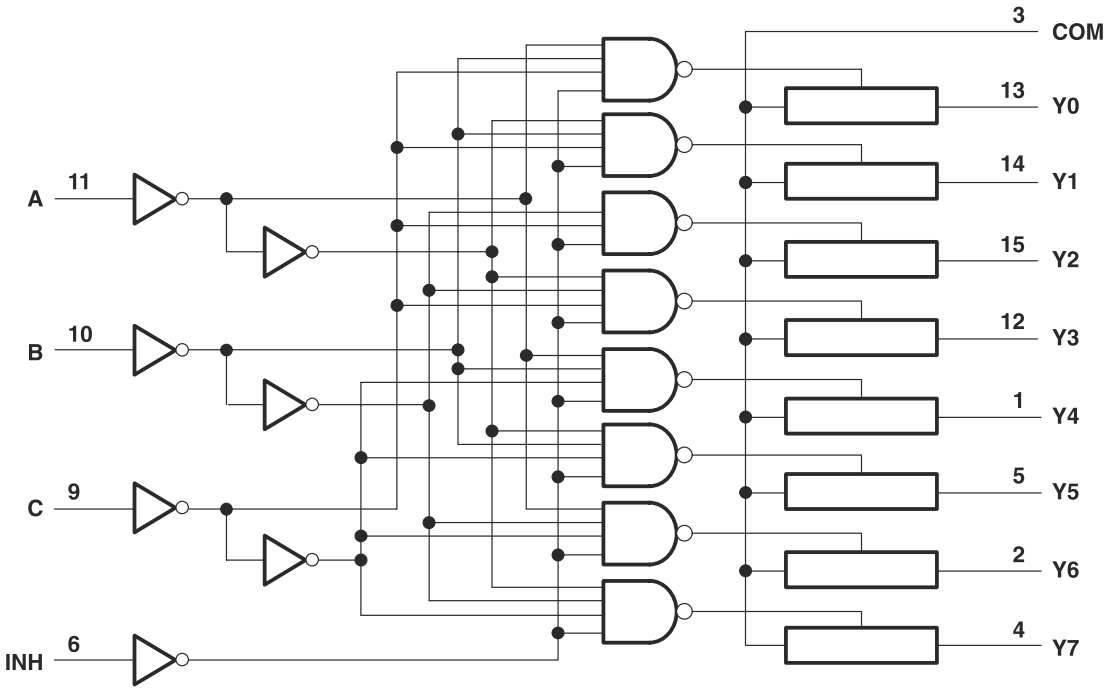
图 6-9. Sine-Wave Distortion

7 Detailed Description

7.1 Overview

The SN74LV4051A device is an 8-channel analog multiplexer. A multiplexer is used when several signals must share the same device or resource. This device allows for the selection of one of these signals at a time for analysis or propagation.

7.2 Functional Block Diagram



7.3 Feature Description

The SN74LV4051A 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 Yn pins as outputs. This device is qualified to operate in the temperature range –40°C to +85°C (maximum depends on package type).

7.4 Device Functional Modes

表 7-1. 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

8 Application and Implementation

备注

以下应用部分中的信息不属于 TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客 户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

8.1 Application Information

A multiplexer is used in applications where multiple signals share a resource. In 图 8-1, several different sensors are connected to the analog-to-digital converter (ADC) of a microcontroller unit (MCU).

8.2 Typical Application

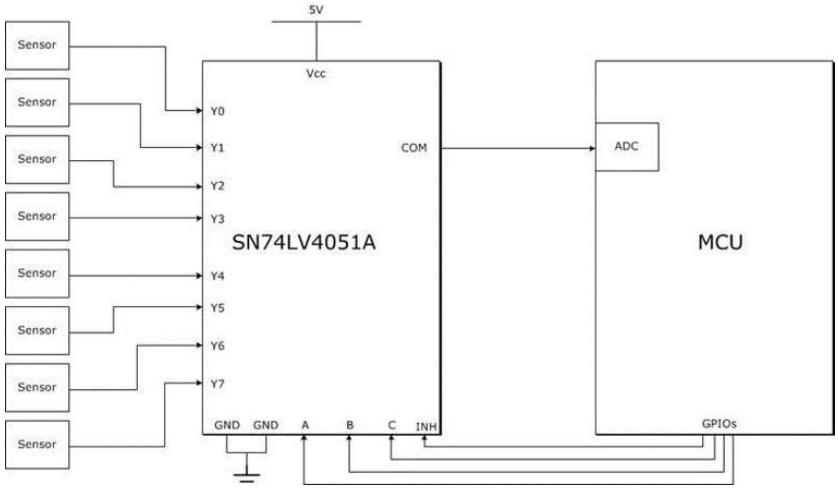


图 8-1. Example of Multiplexer Use With Analog Sensors and the ADC of an MCU

8.2.1 Design Requirements

Designing with the SN74LV4051A device requires a stable input voltage between 2V (see *节 5.4* for details) and 5.5V. Another important design consideration are the characteristics of the signal being multiplexed—ensure no important information is lost due to timing or incompatibility with this device.

8.2.2 Detailed Design Procedure

Processing eight different analog signals normally requires eight separate ADCs, but 图 8-1 shows how to achieve this using only one ADC and four GPIOs (general-purpose input/outputs).

8.2.3 Application Curve

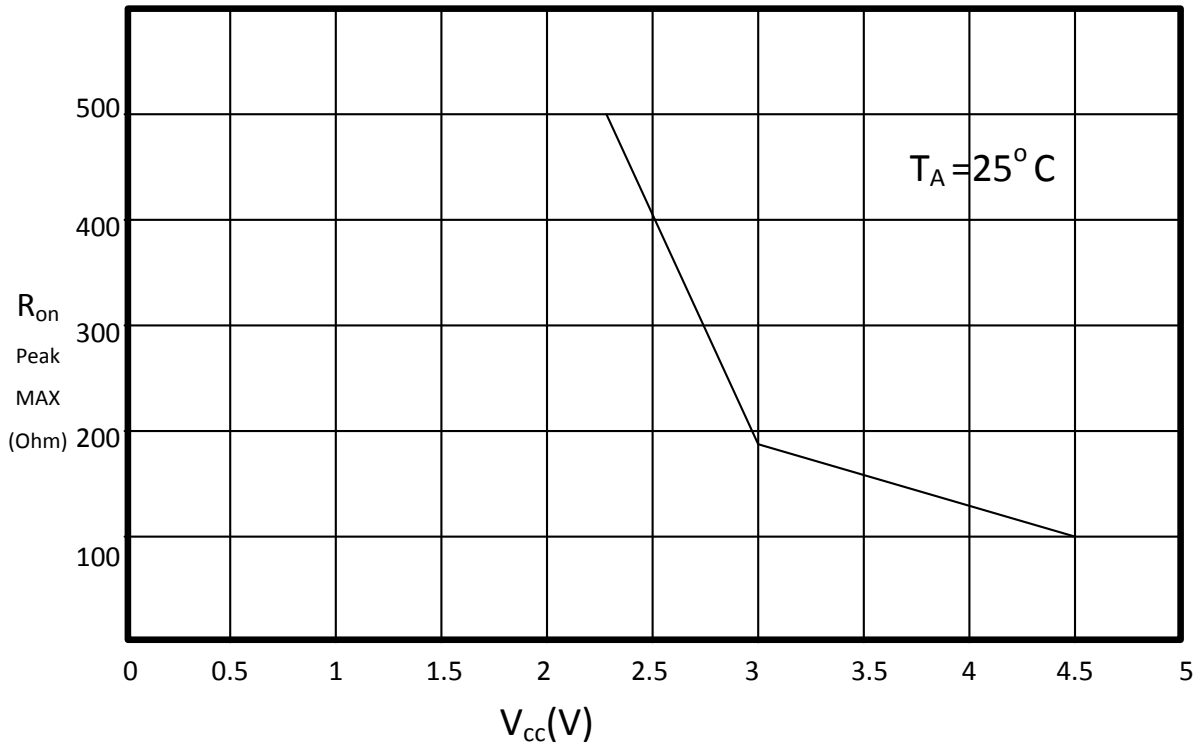


图 8-2. Plot at 25°C for V_{CC} vs Max $R_{ON(peak)}$

8.3 Power Supply Recommendations

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

8.4 Layout

8.4.1 Layout Guidelines

TI recommends keeping the signal lines as short and straight as possible (see 图 8-3). Incorporation of microstrip or stripline techniques are also recommended when signal lines are more than 1" long. These traces must be designed with a characteristic impedance of either 50Ω or 75Ω as required by the application. *Do not* place this device too close to high-voltage switching components because they may cause interference.

8.4.2 Layout Example

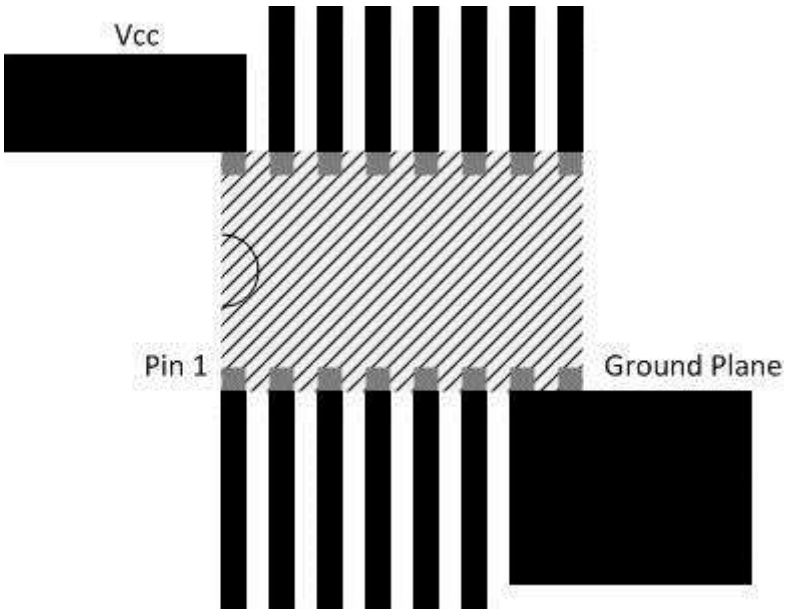


图 8-3. Layout Schematic

9 Device and Documentation Support

9.1 Documentation Support

9.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, *Implications of Slow or Floating CMOS Inputs*

9.2 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击*通知* 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

9.3 支持资源

TI E2E™ 中文支持论坛是工程师的重要参考资料，可直接从专家处获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题，获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的使用条款。

9.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.
所有商标均为其各自所有者的财产。

9.5 静电放电警告

静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

9.6 术语表

TI 术语表　　本术语表列出并解释了术语、首字母缩略词和定义。

10 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision I (September 2015) to Revision J (June 2024)	Page
• 通篇更新了表格、图和交叉参考的编号格式	1
• Added new VIH and VIL Specifications at 1.65V Vcc	5
• Increased max ambient temperature max to 125C	5
• Added Ron, Ron Peak, and Delta Ron Specifications at 1.65V Vcc	5
• Added Ron, Ron Peak, and Delta Ron Specifications at 125C	5
• Added Timing Specifications at 125C	7

Changes from Revision H (April 2005) to Revision I (September 2015)	Page
• 添加了*器件信息* 表、*引脚功能* 表、*ESD 等级* 表、*热性能信息* 表、*详细说明* 部分、*应用和实施* 部分、*电源相关建议* 部分、*布局* 部分、*器件和文档支持* 部分，以及*机械、封装和可订购信息* 部分	1
• 删除了数据表中的 SN54LV4051A 器件型号	1
• 删除了*订购信息* 表	1

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 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
SN74LV4051AD	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-40 to 85	LV4051A	
SN74LV4051ADBR	NRND	SSOP	DB	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LW051A	
SN74LV4051ADGVR	NRND	TVSOP	DGV	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LW051A	
SN74LV4051ADGVRG4	NRND	TVSOP	DGV	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LW051A	
SN74LV4051ADR	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 85	LV4051A	Samples
SN74LV4051ADYYR	ACTIVE	SOT-23-THIN	DYY	16	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LV4051	Samples
SN74LV4051AN	NRND	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74LV4051AN	
SN74LV4051ANS	NRND	SO	NS	16	50	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	74LV4051A	
SN74LV4051ANSR	NRND	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	74LV4051A	
SN74LV4051APW	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85	LW051A	
SN74LV4051APWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 85	LW051A	Samples
SN74LV4051APWRG4	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85	LW051A	
SN74LV4051APWT	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85	LW051A	
SN74LV4051ARGYR	ACTIVE	VQFN	RGY	16	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	LW051A	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (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.

OTHER QUALIFIED VERSIONS OF SN74LV4051A :

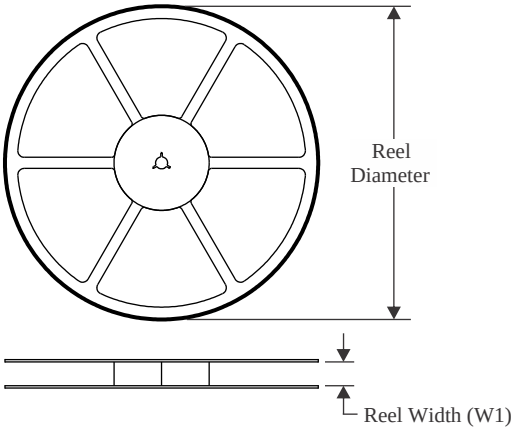
- Automotive : SN74LV4051A-Q1
- Enhanced Product : SN74LV4051A-EP

NOTE: Qualified Version Definitions:

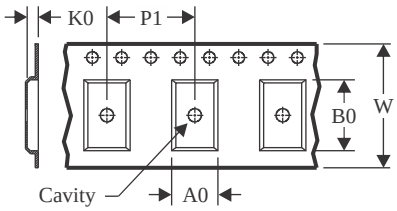
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

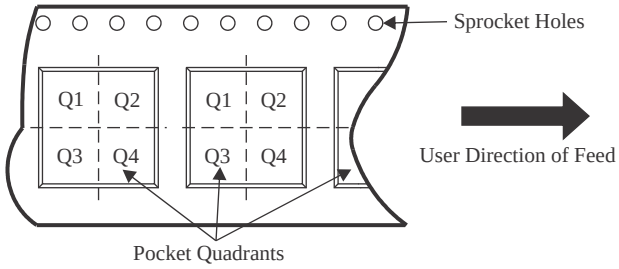


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

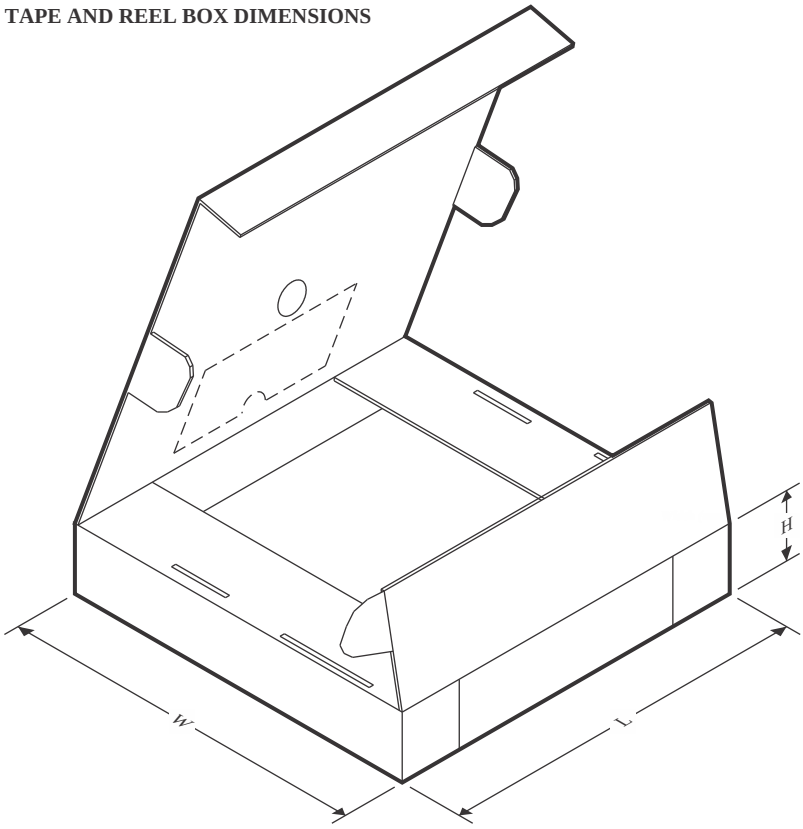
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LV4051ADBR	SSOP	DB	16	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LV4051ADGVR	TVSOP	DGV	16	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74LV4051ADR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74LV4051ANSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74LV4051APWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV4051APWRG4	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV4051APWT	TSSOP	PW	16	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV4051ARGYR	VQFN	RGY	16	3000	330.0	12.4	3.8	4.3	1.5	8.0	12.0	Q1

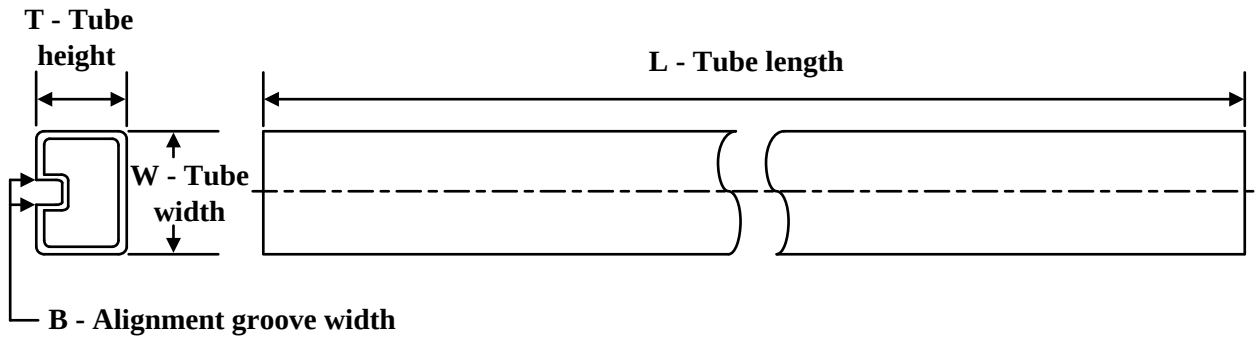
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LV4051ADBR	SSOP	DB	16	2000	356.0	356.0	35.0
SN74LV4051ADGVR	TVSOP	DGV	16	2000	356.0	356.0	35.0
SN74LV4051ADR	SOIC	D	16	2500	340.5	336.1	32.0
SN74LV4051ANSR	SO	NS	16	2000	356.0	356.0	35.0
SN74LV4051APWR	TSSOP	PW	16	2000	356.0	356.0	35.0
SN74LV4051APWRG4	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74LV4051APWT	TSSOP	PW	16	250	356.0	356.0	35.0
SN74LV4051ARGYR	VQFN	RGY	16	3000	367.0	367.0	35.0

TUBE



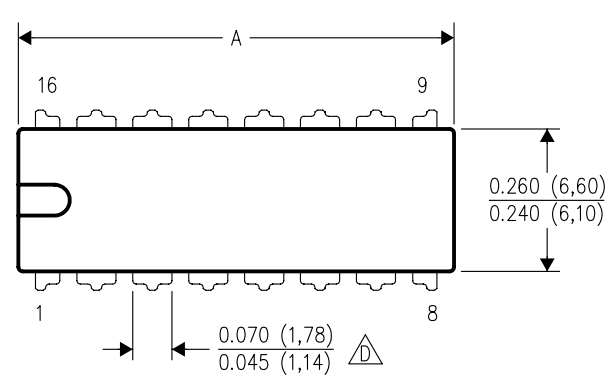
*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
SN74LV4051AD	D	SOIC	16	40	507	8	3940	4.32
SN74LV4051AN	N	PDIP	16	25	506	13.97	11230	4.32
SN74LV4051AN	N	PDIP	16	25	506	13.97	11230	4.32
SN74LV4051ANS	NS	SOP	16	50	530	10.5	4000	4.1
SN74LV4051APW	PW	TSSOP	16	90	530	10.2	3600	3.5
SN74LV4051APWG4	PW	TSSOP	16	90	530	10.2	3600	3.5

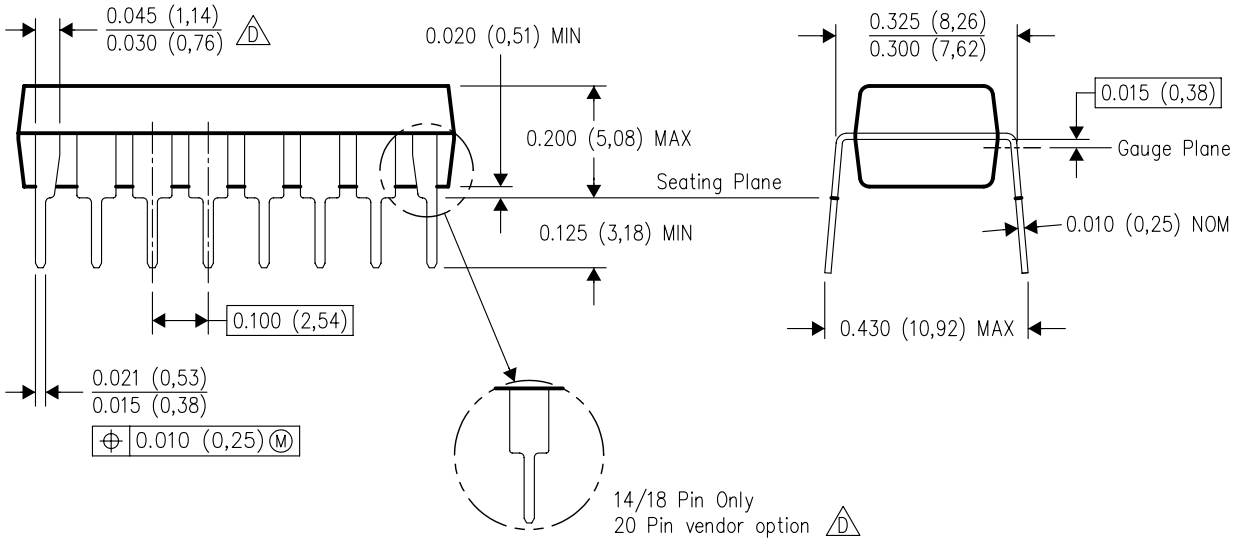
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



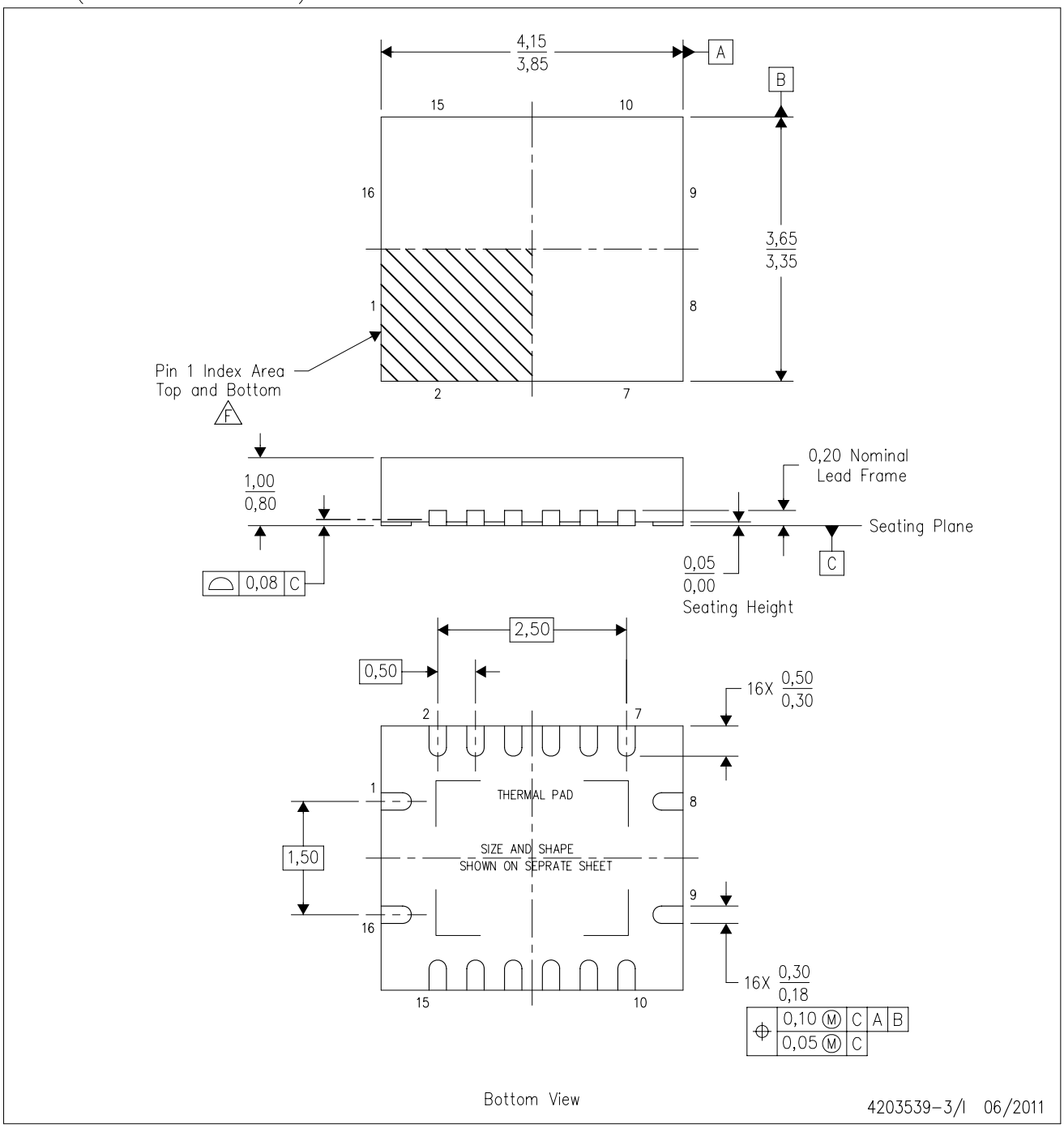
DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

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

RGY (R–PVQFN–N16) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. QFN (Quad Flatpack No–Lead) package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
F. Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
G. Package complies to JEDEC MO–241 variation BA.

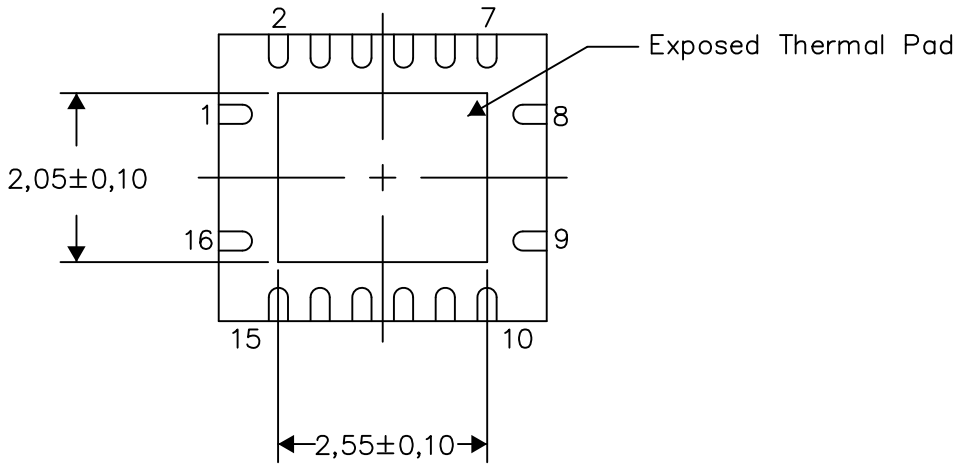
RGY (R–PVQFN–N16) PLASTIC QUAD FLATPACK NO–LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



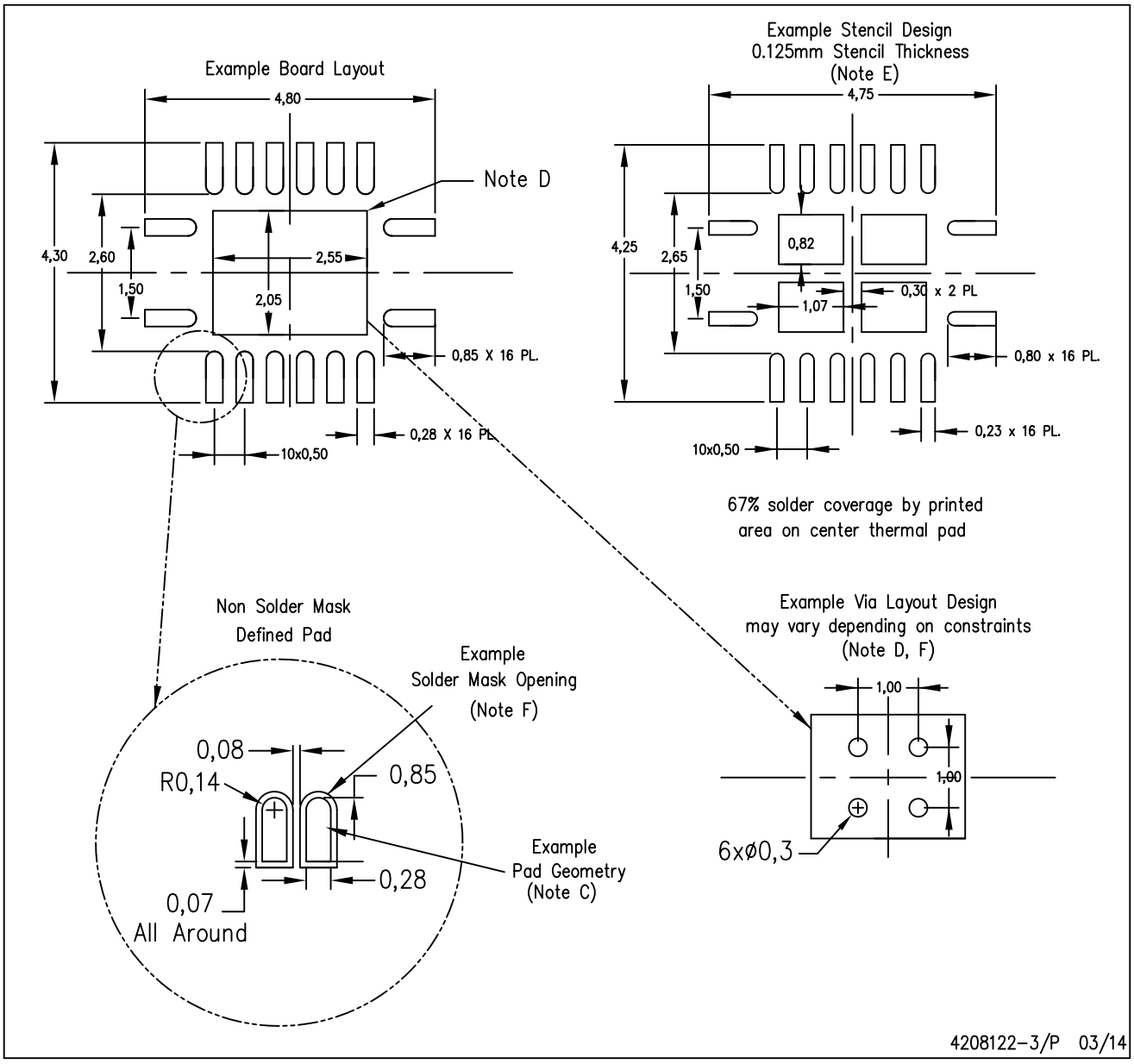
Bottom View

Exposed Thermal Pad Dimensions

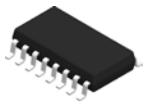
4206353–3/P 03/14

NOTE: All linear dimensions are in millimeters

RGY (R–PVQFN–N16) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat–Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http: //www.ti.com>.
E. 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 stencil design considerations.
F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

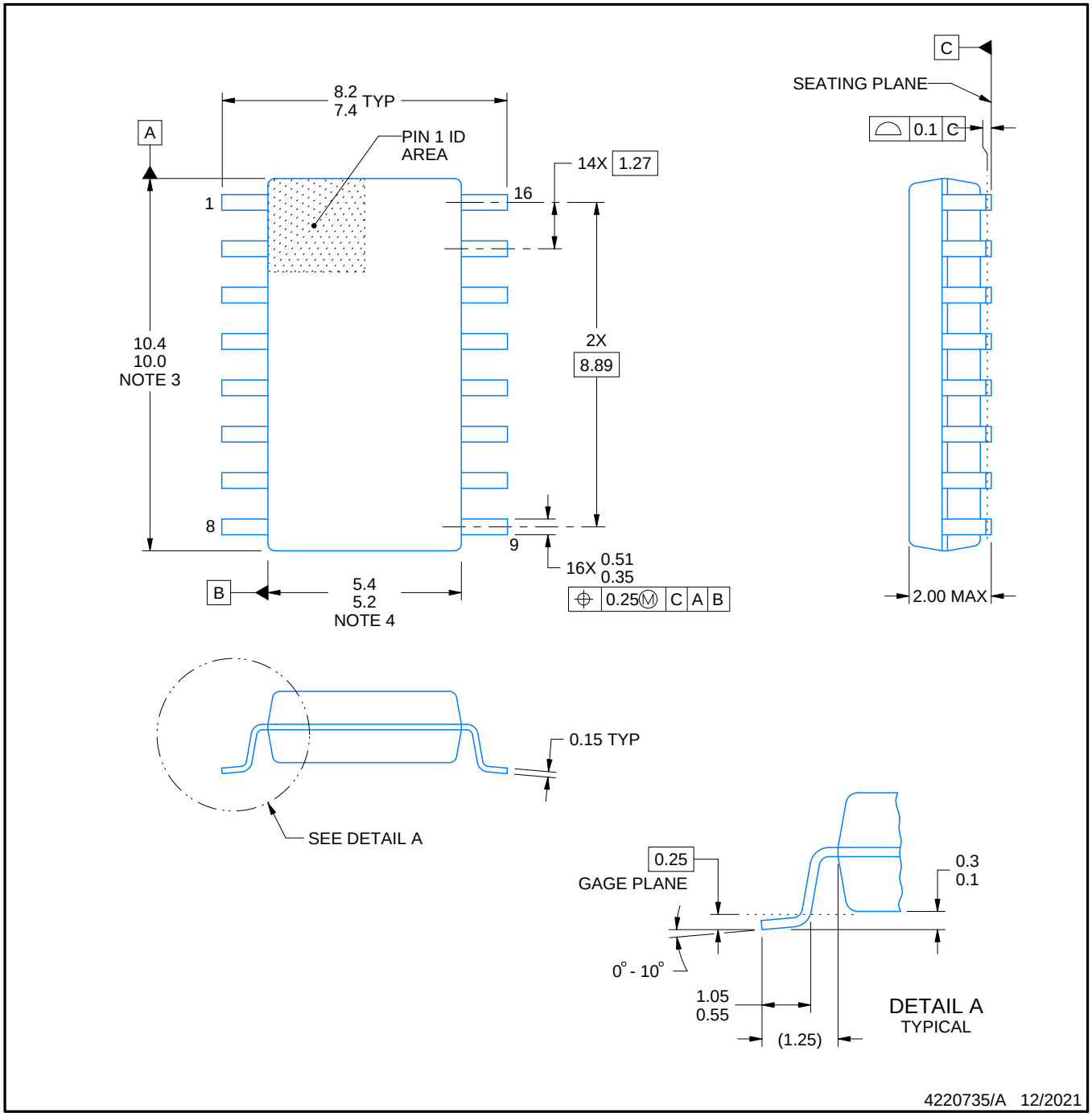


PACKAGE OUTLINE

NS0016A

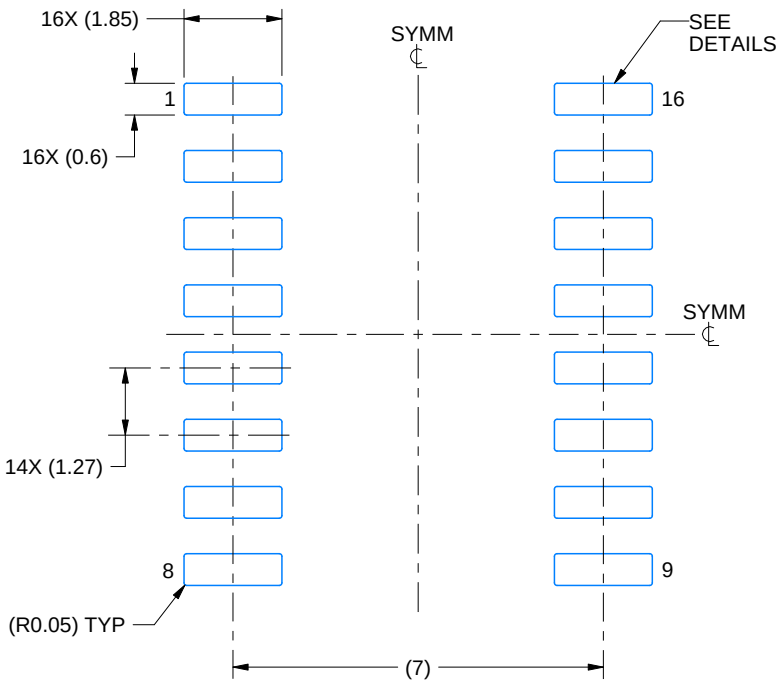
SOP - 2.00 mm max height

SOP

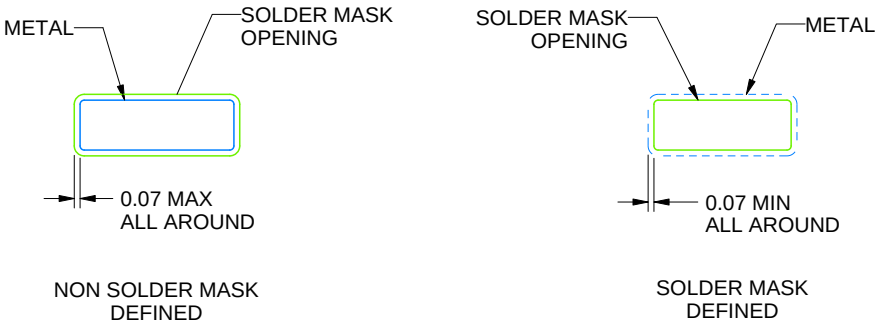


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:7X



NON SOLDER MASK
DEFINED

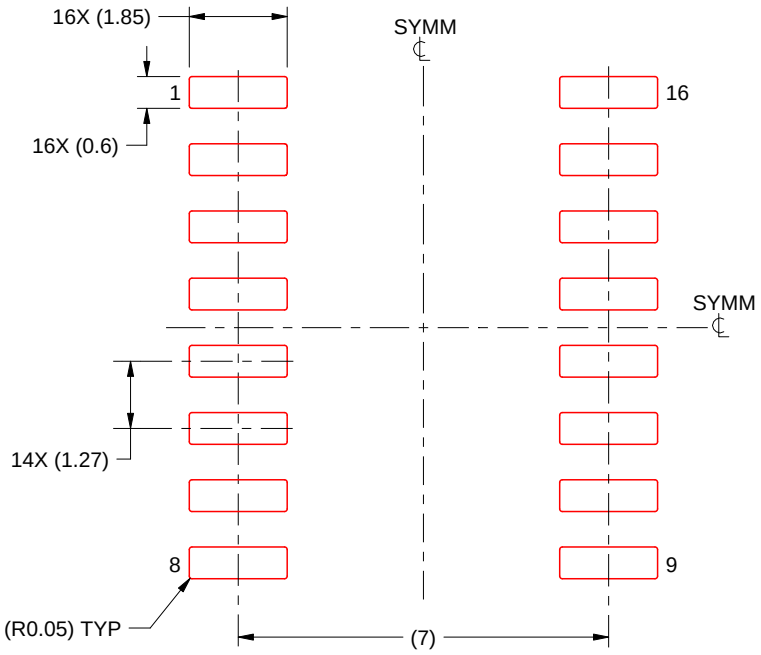
SOLDER MASK
DEFINED

SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

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



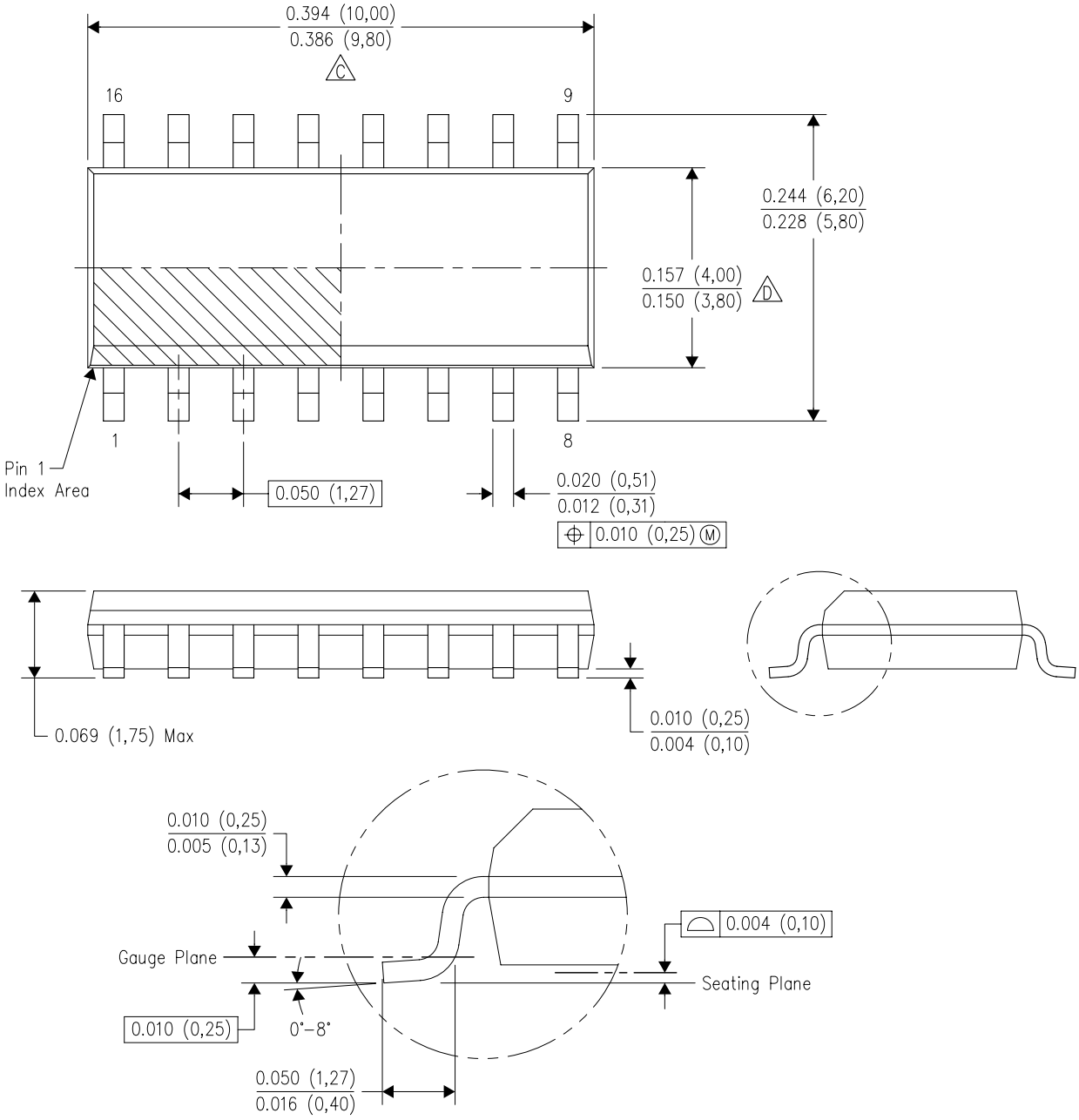
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

4220735/A 12/2021

NOTES: (continued)

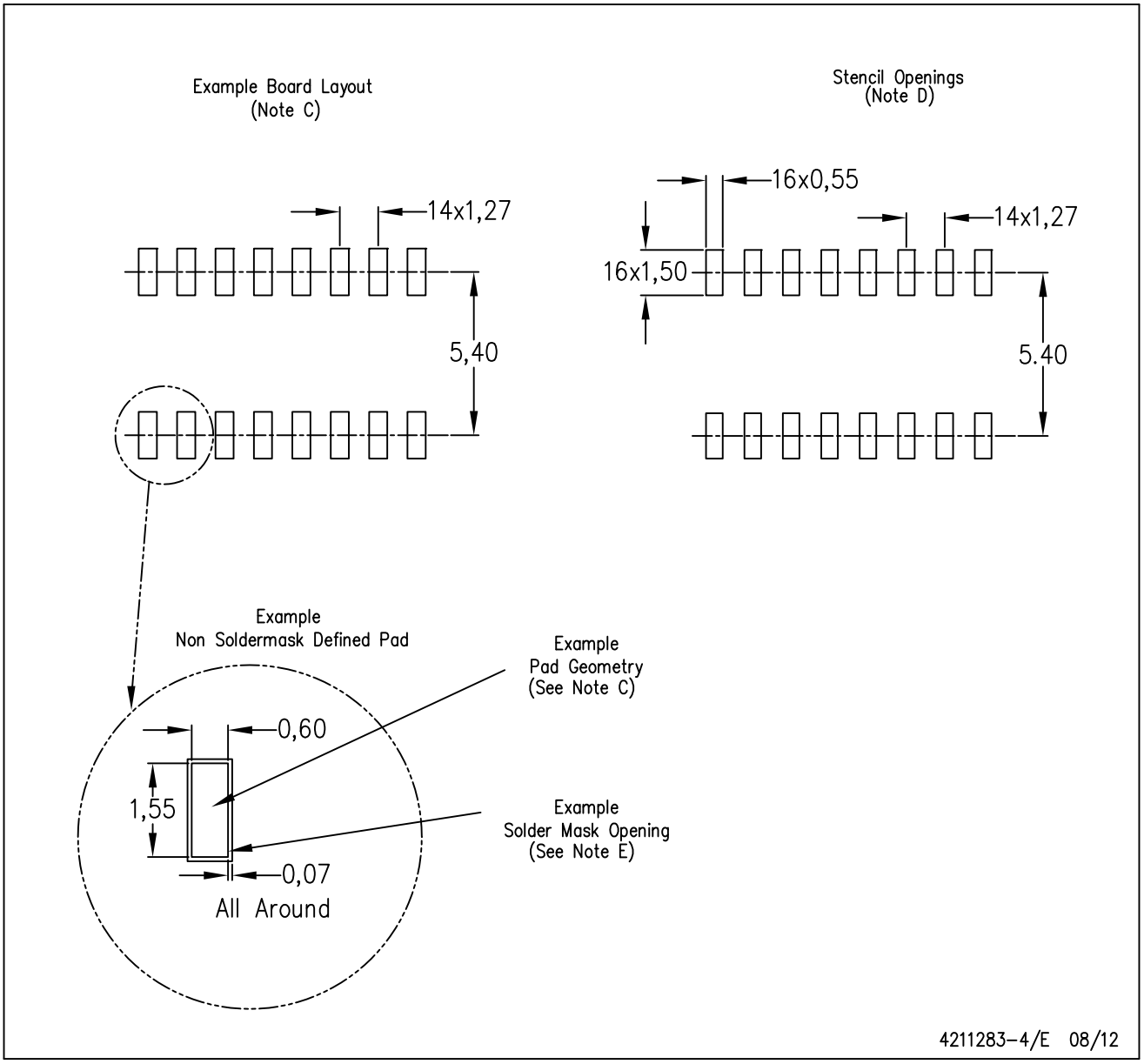
7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

D (R–PDSO–G16) PLASTIC SMALL OUTLINE



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



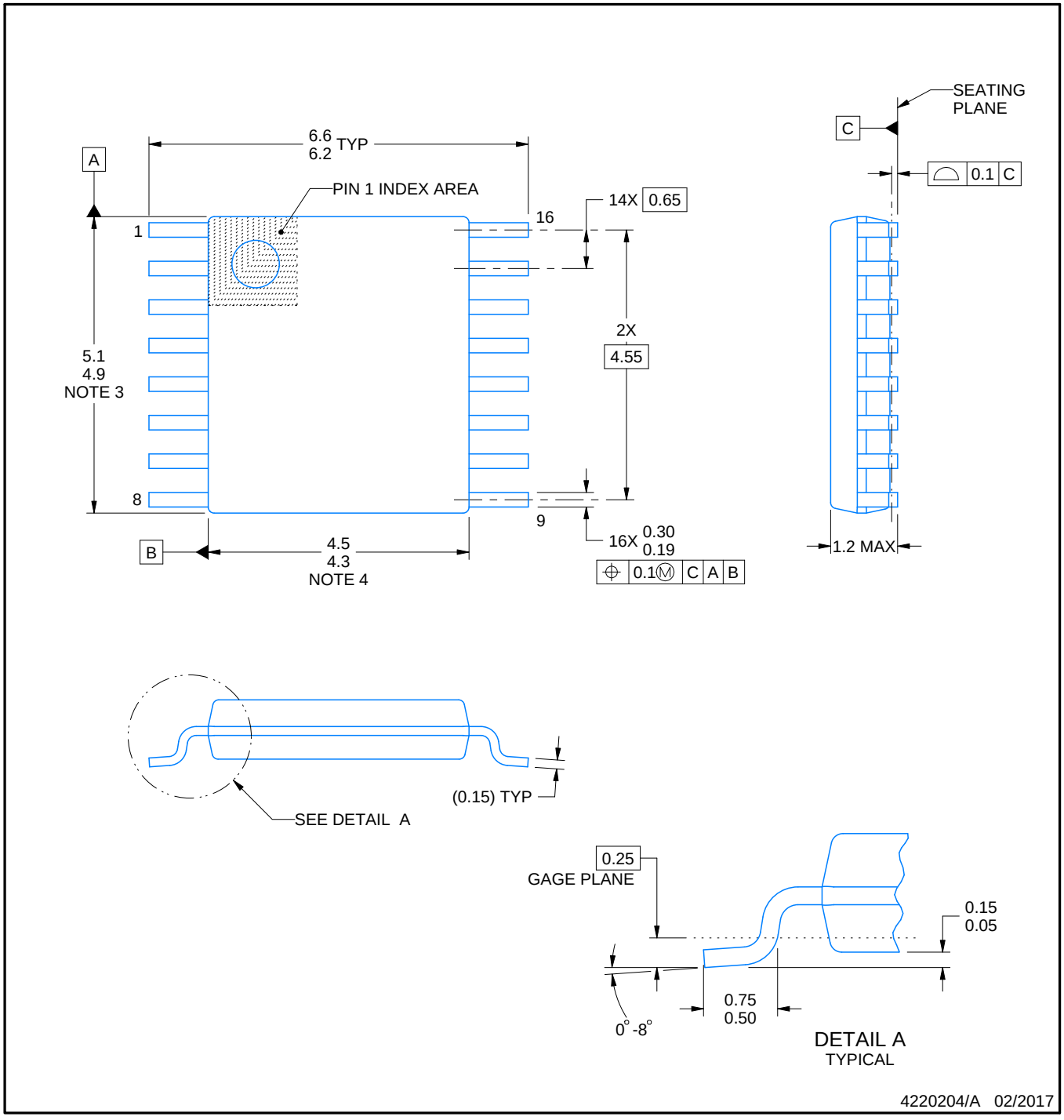
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC–7525 for other stencil recommendations.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PACKAGE OUTLINE

PW0016A

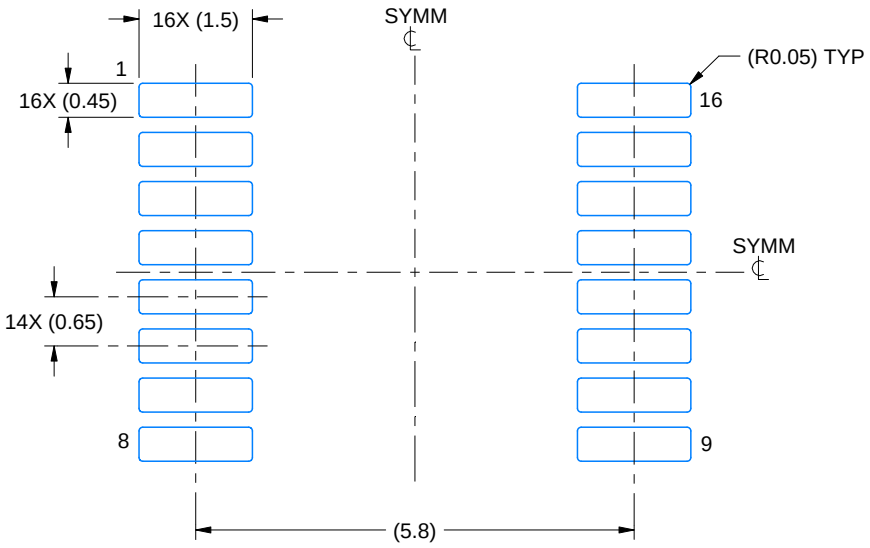
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

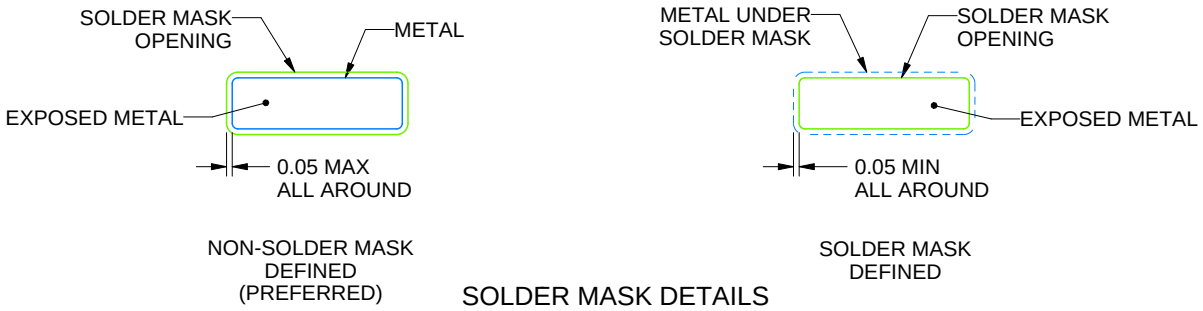


NOTES:

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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

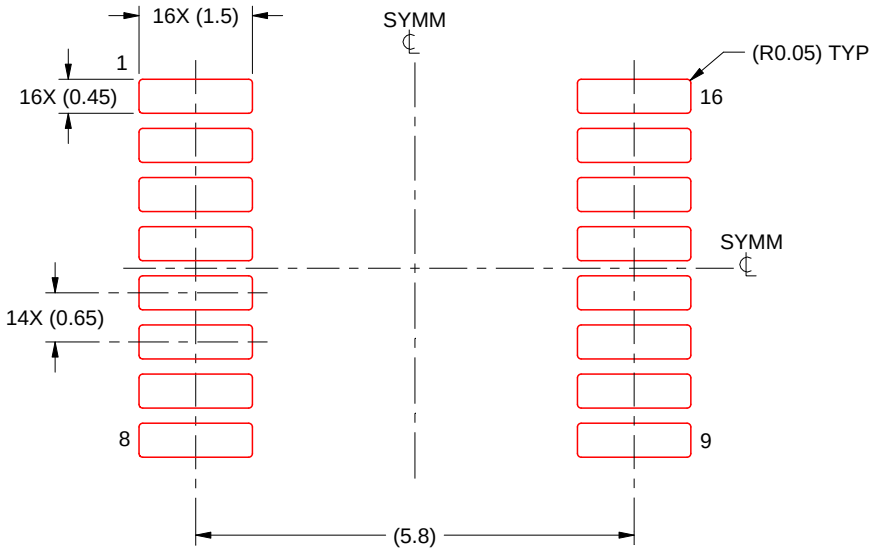


SOLDER MASK DETAILS

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.



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

4220204/A 02/2017

NOTES: (continued)

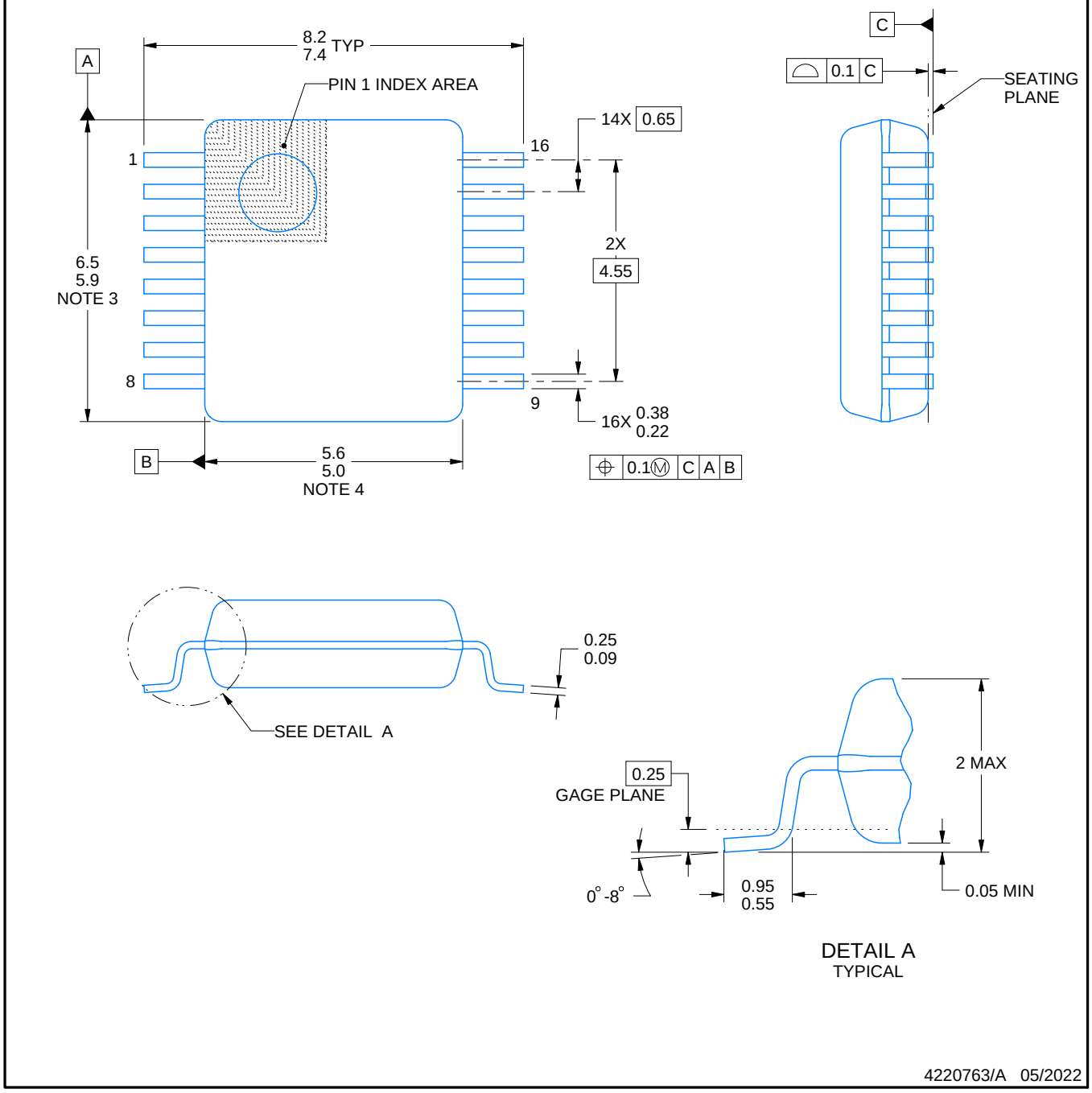
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PACKAGE OUTLINE

DB0016A

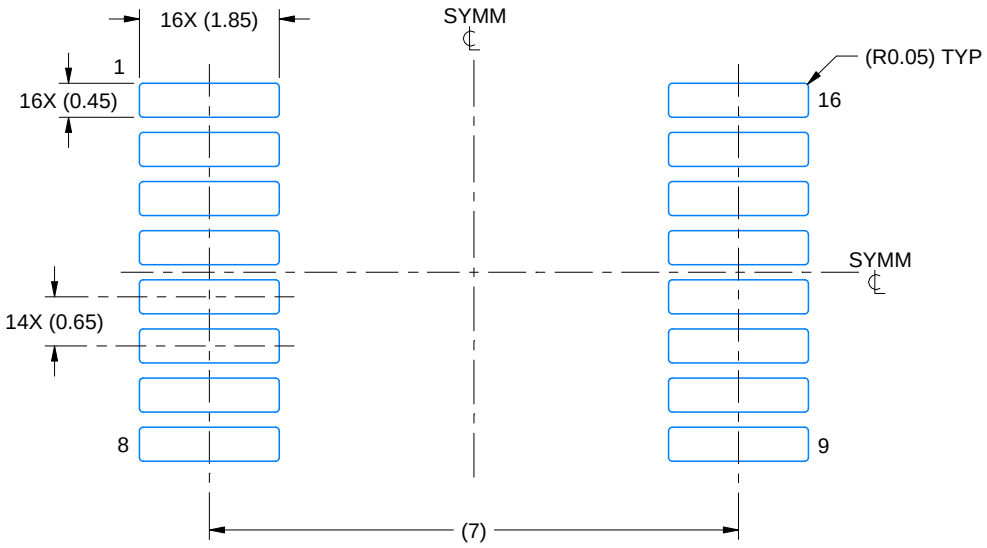
SSOP - 2 mm max height

SMALL OUTLINE PACKAGE

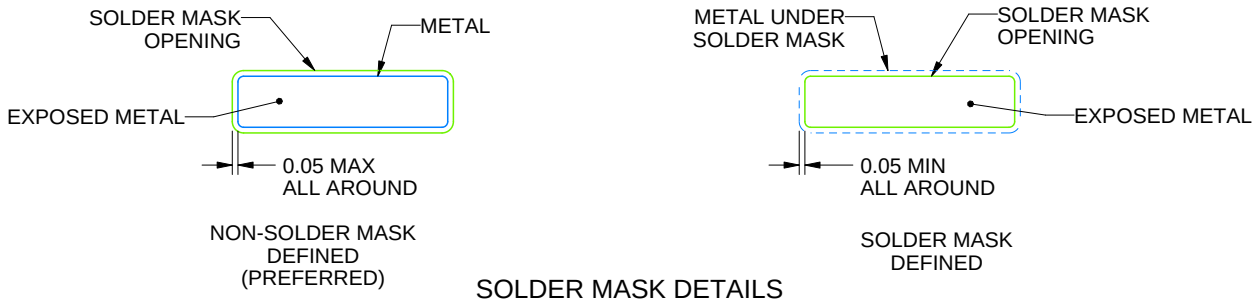


NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-150.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

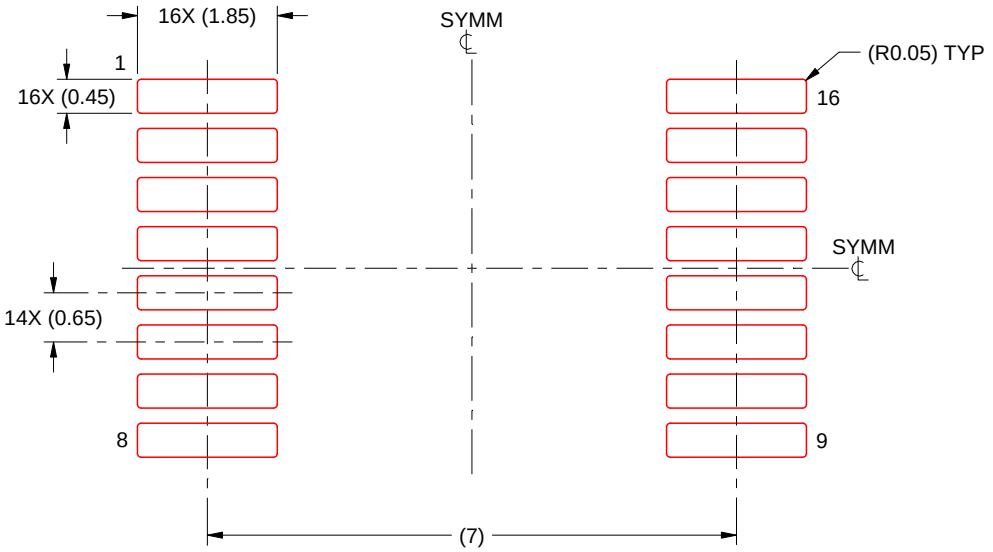


SOLDER MASK DETAILS

4220763/A 05/2022

NOTES: (continued)

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



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

4220763/A 05/2022

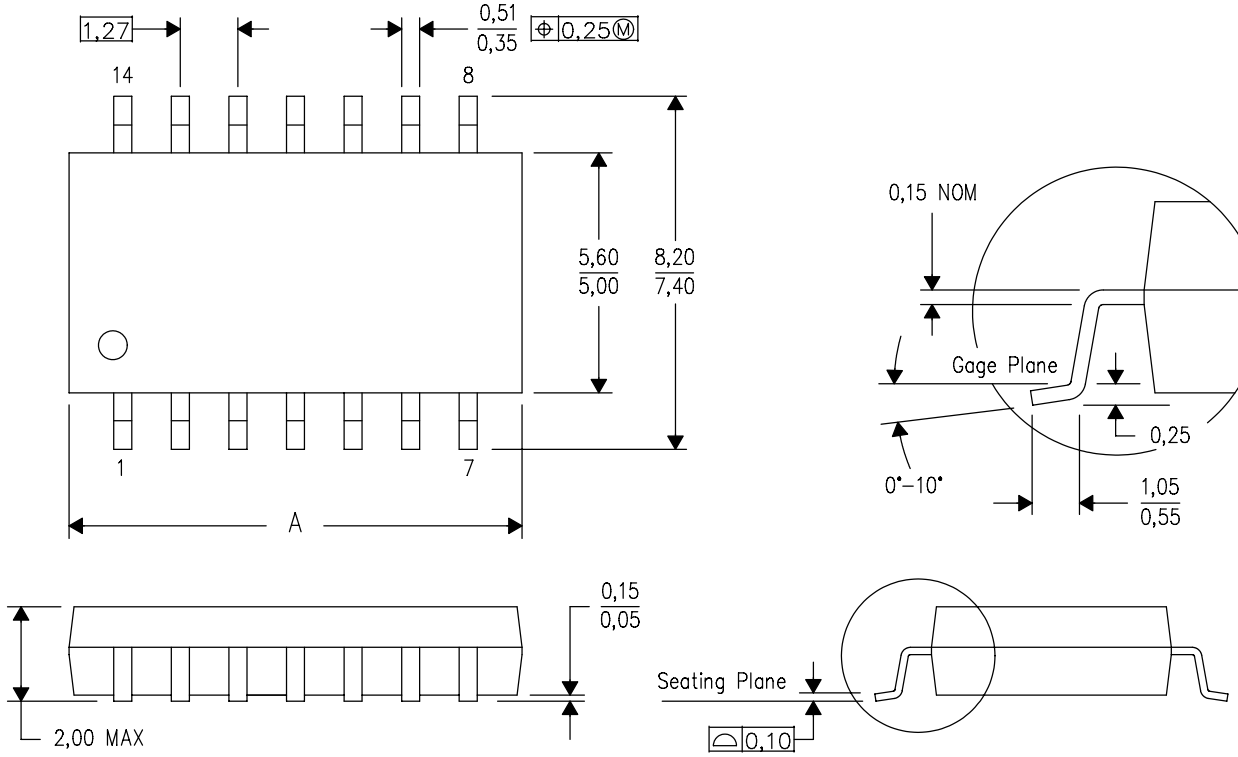
NOTES: (continued)

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

MECHANICAL DATA

NS (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN



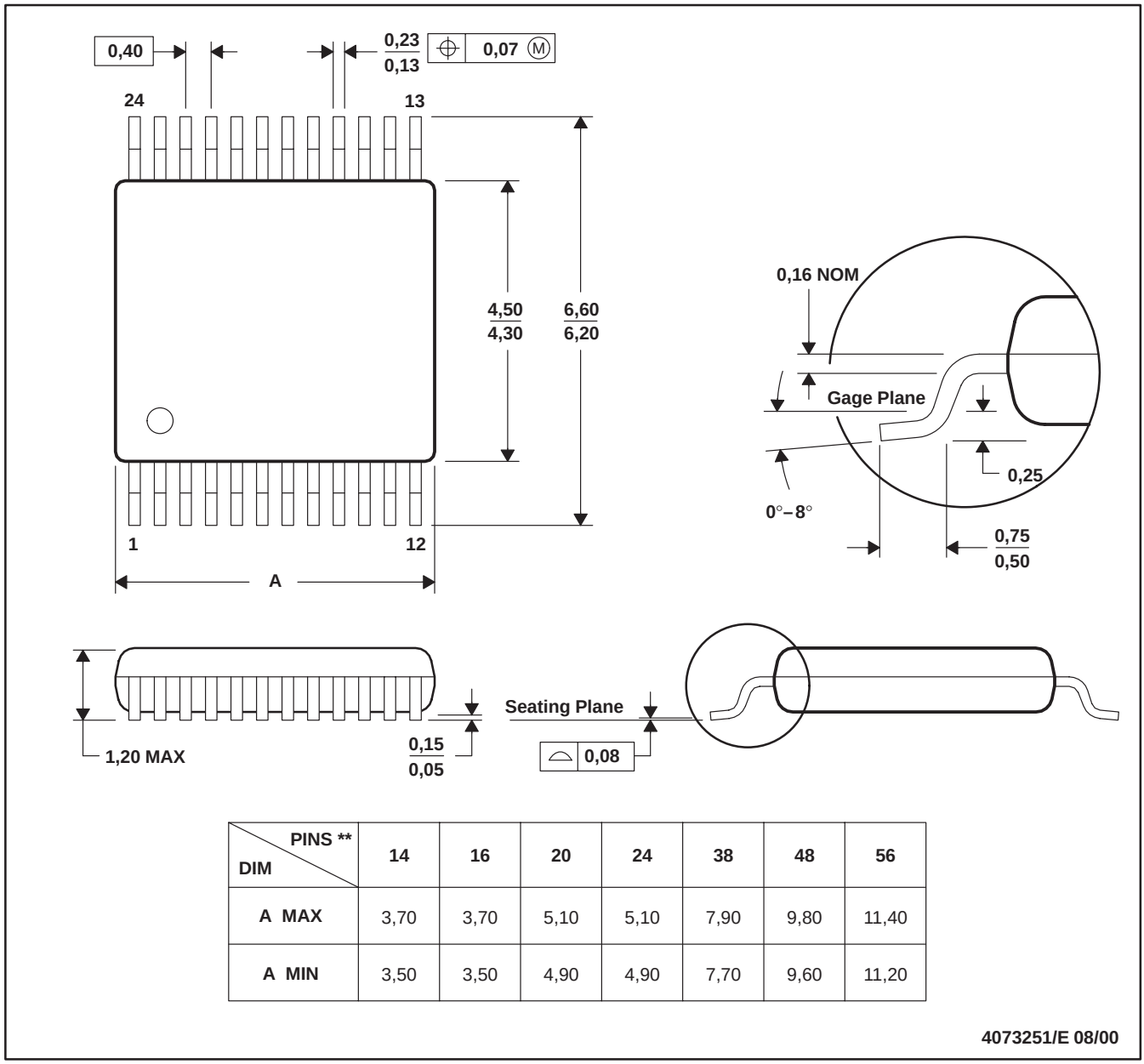
DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

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



DIM \ PINS **	14	16	20	24	38	48	56
A MAX	3,70	3,70	5,10	5,10	7,90	9,80	11,40
A MIN	3,50	3,50	4,90	4,90	7,70	9,60	11,20

4073251/E 08/00

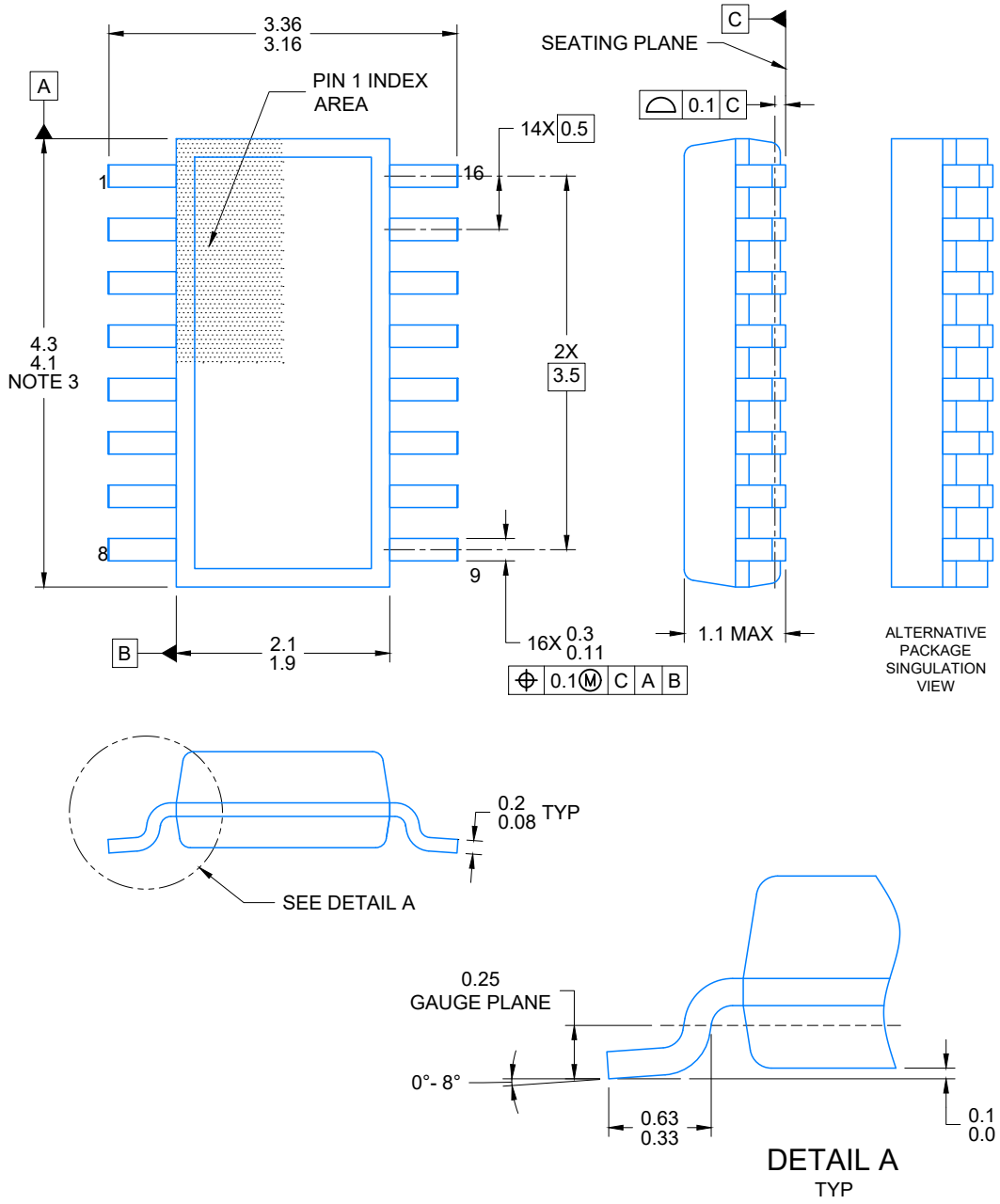
NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
D. Falls within JEDEC: 24/48 Pins – MO-153
14/16/20/56 Pins – MO-194

PACKAGE OUTLINE

DYY0016A

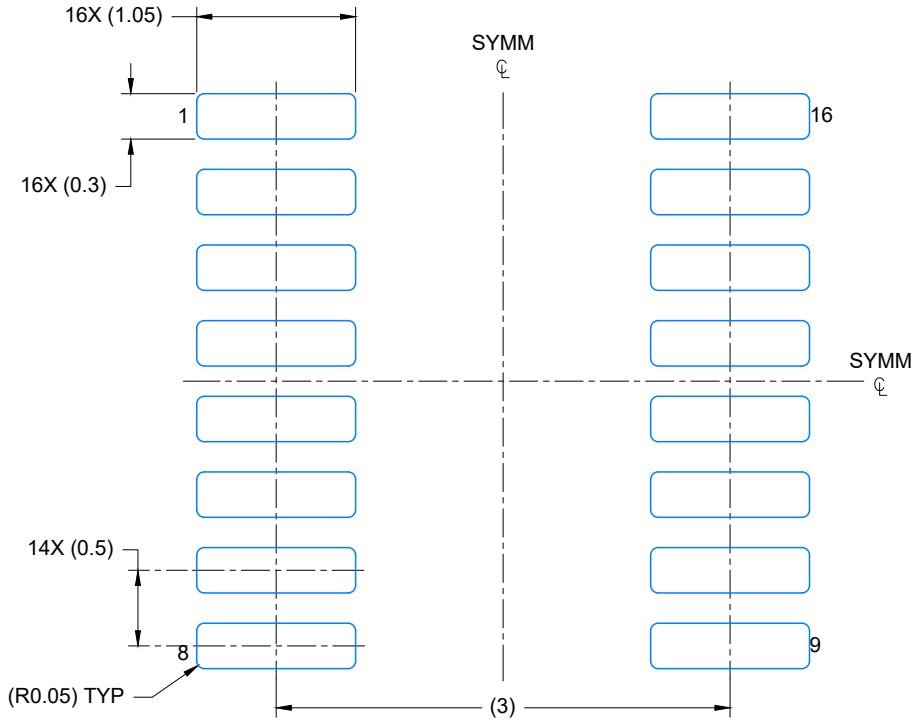
SOT-23-THIN - 1.1 mm max height

PLASTIC SMALL OUTLINE

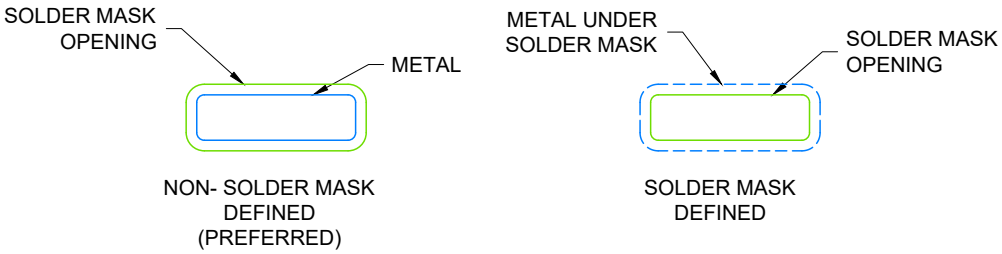


NOTES:

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 per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
5. Reference JEDEC Registration MO-345, Variation AA



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X



SOLDER MASK DETAILS

4224642/C 04/2024

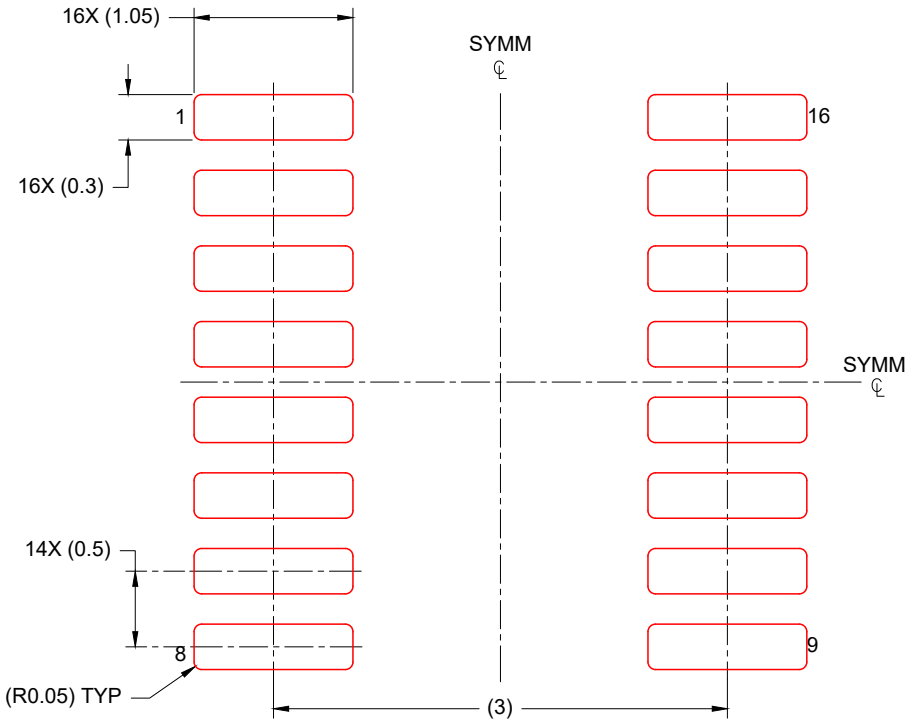
NOTES: (continued)

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

SOT-23-THIN - 1.1 mm max height

PLASTIC SMALL OUTLINE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 20X

4224642/C 04/2024

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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