

SN74HC4852-Q1 具有注入电流效应控制功能的汽车级双通道 4 线至 1 线模拟多路复用器/多路解复用器

1 特性

- 符合汽车应用要求
- 注入电流交叉耦合 $<1\text{mV}/\text{mA}$ (请参阅图 8-1)
- 低开关串扰
- 与 SN74HC4052、SN74LV4052A 和 CD4052B 引脚兼容
- 2V 至 5.5V V_{CC} 运行
- 闩锁性能超过 100mA，符合 JESD 78 II 类规范的要求

2 应用

- 模拟信号开关或多路复用：
 - 信号门控、调制器、静噪控制、解调器、斩波器、换向开关
- 数字信号开关和多路复用
 - 音频和视频信号路由
- 传输门逻辑实施
- 模数和数模转换
- 频率、阻抗、相位和模拟信号增益的数字控制
- 电机转速控制
- 电池充电器
- 直流/直流转换器

3 说明

这款双路 4 线至 1 线 CMOS 模拟多路复用器/多路解复用器与 4052 功能引脚兼容，并且还具有注入电流效应控制功能。此控制功能在电压通常超过正常电源电压的汽车应用中具有出色的价值。

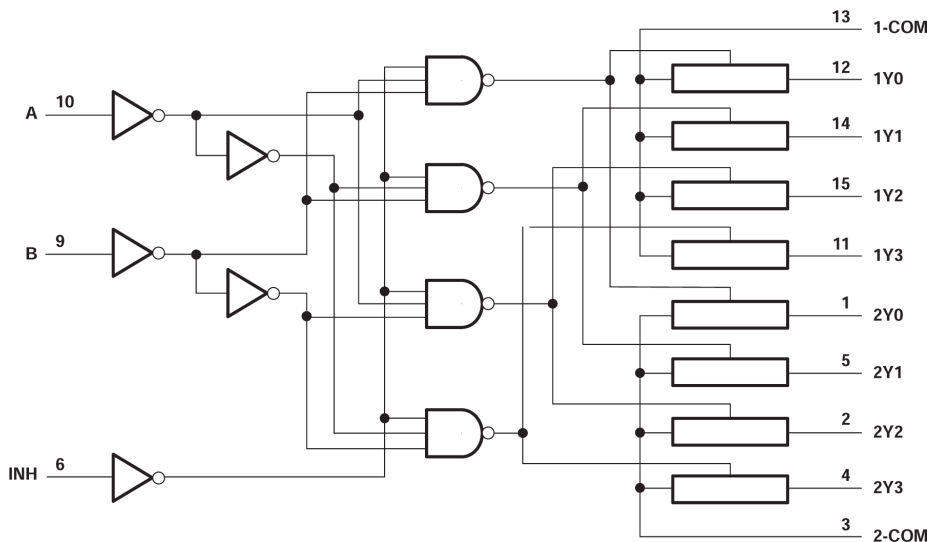
注入电流效应控制功能允许已禁用的模拟输入通道上的信号超过电源电压，而不会影响已启用的模拟通道的信号。这样就不再需要通常使用的外部二极管/电阻器网络将模拟通道信号保持在电源电压范围内。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾
SN74HC4852-Q1	PW (TSSOP , 16)	5mm × 6.4mm

(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)。



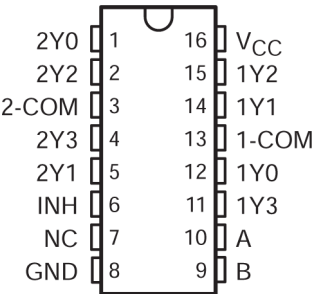
功能图



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4 Pin Configuration and Functions



NC – No internal connection

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

表 4-1. Function Table

INPUTS			ON CHANNEL
INH	B	A	
L	L	L	1Y0, 2Y0
L	L	H	1Y1, 2Y1
L	H	L	1Y2, 2Y2
L	H	H	1Y3, 2Y3
H	X	X	None

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)^{(1) (2)}

		MIN	MAX	UNIT
V _{CC}	Supply voltage	– 0.5	6	V
V _{SEL} or V _{EN}	Logic control input pin voltage (EN, A0, A1, A2)	– 0.5	V _{CC} +0.5V	V
V _S or V _D	Source or drain voltage (Sx, D)	– 0.5	V _{CC} +0.5V	V
I _{IK}	Input clamp current (V _I < 0 or V _I > V _{CC})	– 20	20	mA
I _{IOK}	I/O diode current (V _{IO} < 0 or V _{IO} > V _{CC})	– 20	20	mA
I _T	Switch through current (V _{IO} = 0 to V _{CC})	– 25	25	mA
I _{GND}	Continuous current through V _{CC} or GND	– 50	50	mA
T _{stg}	Storage temperature	– 65	150	°C
T _J	Junction temperature		150	

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

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	±750	

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

5.3 Thermal Information: SN74HC485x-Q1

THERMAL METRIC ⁽¹⁾		SN74HC485x-Q1	UNIT
		PW (TSSOP)	
		PINS	
R _{θJA}	Junction-to-ambient thermal resistance	139.6	°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)

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		2		5.5	V
V_{IH}	Input logic high	2V	1.5			V
		2.5V	2.1			
		3.3V	2.3			
		4.5V	3.15			
		5.5V	4.2			
V_{IL}	Input logic low	2V	0		0.5	V
		2.5V	0		0.7	
		3.3V	0		0.8	
		4.5V	0		0.95	
		5.5V	0		1.05	
V_{SEL} or V_{EN}	Logic control input pin voltage ($\overline{EN}$, A0, A1, A2)		0		V_{CC}	V
V_S or V_D	Signal path input/output voltage (source or drain pin) (Sx, D)		0		V_{CC}	V
$\Delta t / \Delta v$	Input transition rise or fall time	$V_{CC} = 2V$			1000	ns
		$V_{CC} = 3V$			800	
		$V_{CC} = 3.3V$			700	
		$V_{CC} = 4.5V$			500	
		$V_{CC} = 5.5V$			400	
T_A	Ambient temperature		- 40		125	°C

5.5 Electrical Characteristics

At specified $V_{CC} \pm 10\%$

Typical values measured at nominal V_{CC} .

PARAMETER		TEST CONDITIONS	V _{CC}	Operating free-air temperature (T _A)									UNIT
				25°C			- 40°C to 85°C			- 40°C to 125°C			
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
R _{ON}	On-state switch resistance	V _S = 0V to V _{CC} I _{SD} = 0.5mA	2V	500	650	670	700	Ω					
			3V	215	280	320	360						
			3.3V	210	270	305	345						
			4.5V	160	210	240	270						
Δ R _{ON}	On-state switch resistance matching between inputs	V _S = V _{CC} / 2 I _{SD} = 0.5mA	2V	4	20	24	26	Ω					
			3V	2	14	16	18						
			3.3V	2	14	16	18						
			4.5V	2	10	14	18						
I _I	Control input current	V _I = V _{CC} or GND	5V	±0.1			±0.1			±1	μA		
I _{S(OFF)}	Off-state switch leakage current (any one channel)	Switch Off V _{INH} =V _{IH} V _D = V _{CC} / GND V _S = GND / V _{CC}	5V	±0.1			±0.5			±1	μA		
	Off-state switch leakage current (common channel)			±0.2			±2			±4	μA		
I _{S(ON)}	Channel on-state leakage current	Switch Off V _{INH} =V _{IL} V _D = V _{CC} / GND V _S = GND / V _{CC}	5V	±0.1			±0.5			±1	μA		
I _{DD}	V _{CC} supply current	Logic inputs = 0V or V _{CC}	5V	2			5			10	μA		
C _{IC}	Control input capacitance	A, B, C, INH		3.5 10			10			10	pF		
C _{IS}	Common terminal capacitance	Switch off		22 40			40			40	pF		
C _{OS}	Switch terminal capacitance	Switch off		6.7 15			15			15	pF		
C _{PD}	Power Dissipation Capacitance	No Load t _r = t _f = 1ns f = 1MHz	3.3V	32						pF			
			5V	37									

5.6 Timing Characteristics

At specified $V_{CC} \pm 10\%$

Typical values measured at nominal V_{CC} .

PARAMETER		TEST CONDITIONS	V _{CC}	Operating free-air temperature (T _A)									UNIT
				25°C			– 40°C to 85°C			– 40°C to 125°C			
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
SWITCHING CHARACTERISTICS ⁽¹⁾													
t _{PD}	Propagation delay	C _L = 50pF Sx to D, D to Sx	2V	7	19.5	33	6	34	6	35	ns		
			3V	3.6	12	17.5	2.5	19	2.5	20.5			
			3.3V	3.9	11	15.5	2.5	17	2.5	18.5			
			5V	2.3	8.6	13	2.1	13.8	2	15.2			
t _{TRAN}	Transition-time between inputs	R _L = 10k Ω , C _L = 50pF Ax to D, Ax to Sx	2V	25	44	94	25	103	25	103	ns		
			3V	20	30	63		67		67			
			3.3V	18	23	51		54		54			
			5V	15	18	43	15	46	15	46			
t _{ON(EN)}	Turnon-time from enable	R _L = 10k Ω , C _L = 50pF EN to D, EN to Sx	2V	15	39	64	13.8	75	12.5	75	ns		
			3V	7.9	30	45	6.2	50	5.5	55			
			3.3V	7	26.5	42.5	6.4	47.5	5.4	52.5			
			5V	4	24	40	4.3	45	3.4	50			
t _{OFF(EN)}	Turnoff time from enable	R _L = 10k Ω , C _L = 50pF EN to D, EN to Sx	2V	26	48.4	100	25	105	25	115	ns		
			3V	15	21	90	14	100	14	110			
			3.3V	12	15	85	11	95	11	105			
			5V	24.5	41.4	80	24.2	90	24	100			

(1) $t_{PLH}/t_{PHL} = t_{PD}$ propagation delay time, $t_{PZH}/t_{PZL} = t_{ON(EN)}$ enable delay time, $t_{PHZ}/t_{PLZ} = t_{OFF(EN)}$ disable delay time, t_{PLH}/t_{PHL} Channel select = t_{TRAN}

5.7 Injection Current Coupling

At specified $V_{CC} \pm 10\%$

Typical values measured at nominal V_{CC} and $T_A = 25^\circ\text{C}$.

PARAMETER		V _{CC}	TEST CONDITIONS	-40°C to 125°C			UNIT
				MIN	TYP	MAX	
INJECTION CURRENT COUPLING							
Δ V _{OUT}	Maximum shift of output voltage of enabled analog input ⁽¹⁾	3.3V	R _S ≤ 3.9k Ω	I _{INJ} ≤ 1mA	0.05	1	mV
		5V			0.1	1	
		3.3V		I _{INJ} ≤ 10mA	0.345	5	
		5V			0.067	5	
		3.3V	R _S ≤ 20k Ω	I _{INJ} ≤ 1mA	0.05	2	
		5V			0.11	2	
		3.3V		I _{INJ} ≤ 10mA	0.05	20	
		5V			0.024	20	

(1) I_{INJ} = total current injected into all disabled channels

6 Parameter Measurement Information

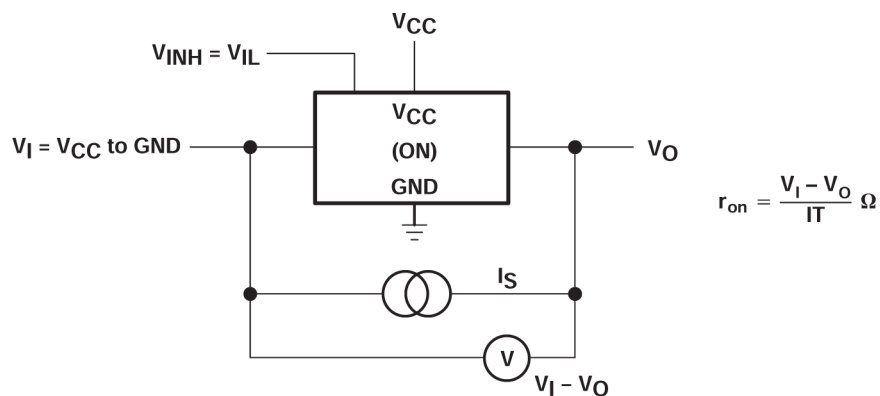


图 6-1. On-State Resistance Test Circuit

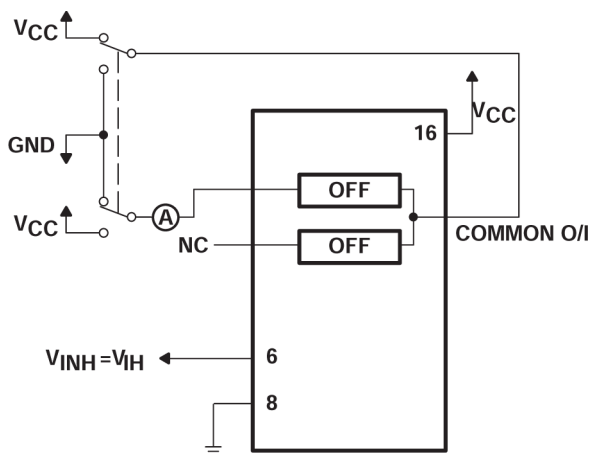


图 6-2. Maximum Off-Channel Leakage Current, Any One Channel, Test Setup

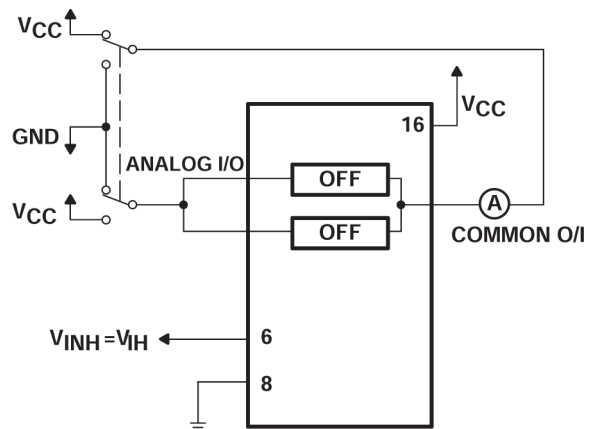


图 6-3. Maximum Off-Channel Leakage Current, Common Channel, Test Setup

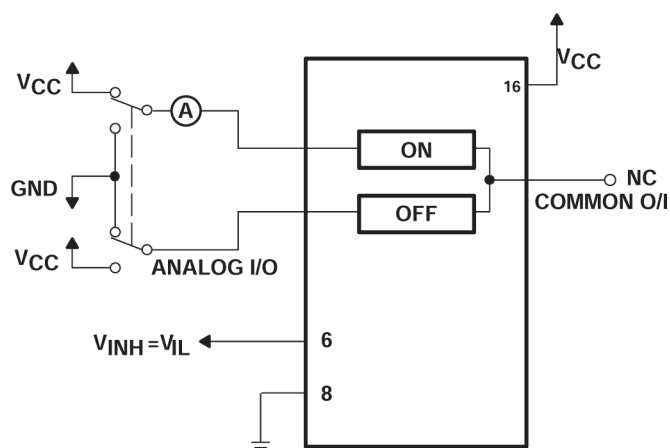


图 6-4. Maximum On-Channel Leakage Current, Channel to Channel, Test Setup

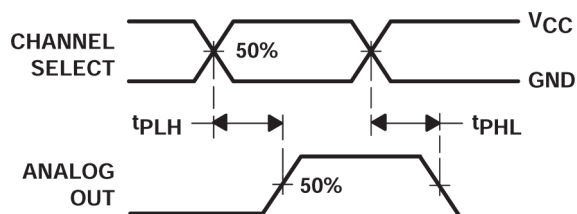


图 6-5. Propagation Delays, Channel Select to Analog Out

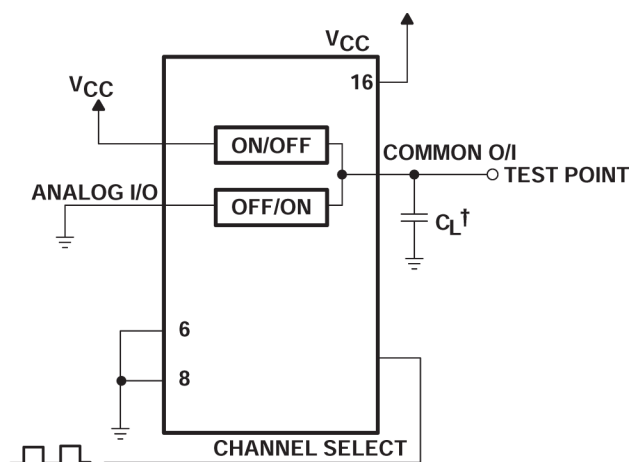


图 6-6. Propagation Delay, Channel Select to Analog Out, Test Setup

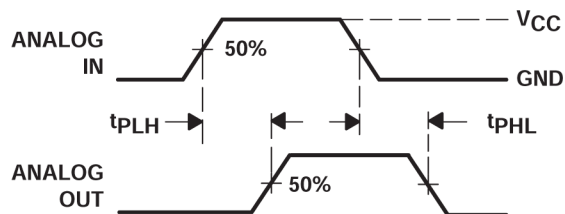


图 6-7. Propagation Delays, Analog in to Analog Out

† Includes all probe and jig capacitance

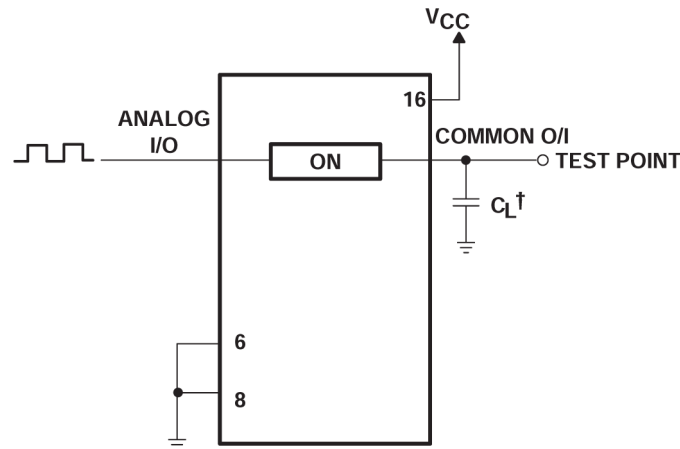


图 6-8. Propagation Delay, Analog in to Analog Out, Test Setup

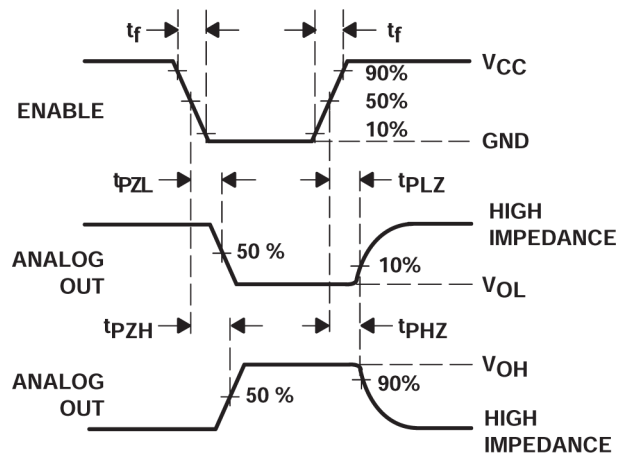


图 6-9. Propagation Delays, Enable to Analog Out

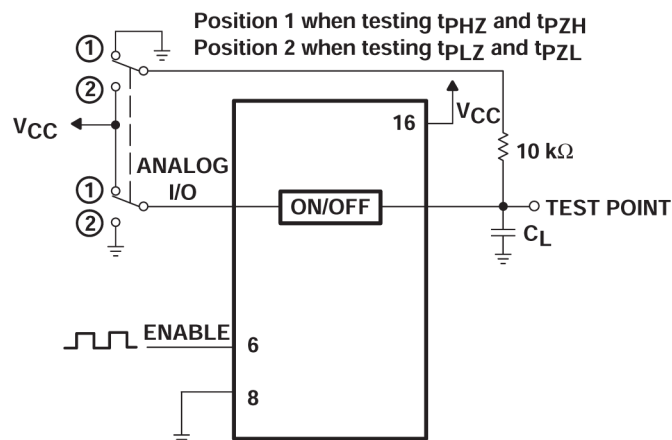


图 6-10. Propagation Delay, Enable to Analog Out, Test Setup

† Includes all probe and jig capacitance

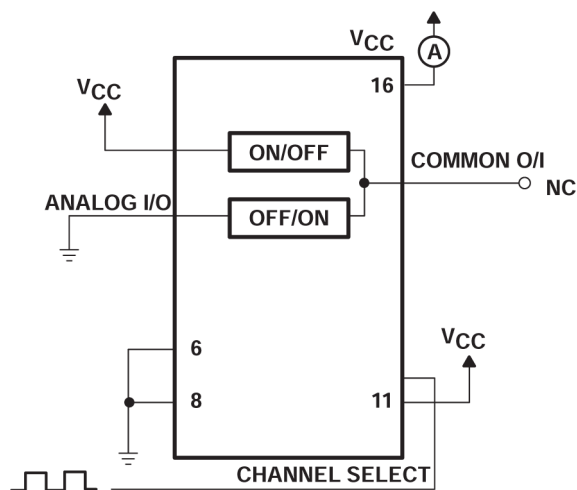
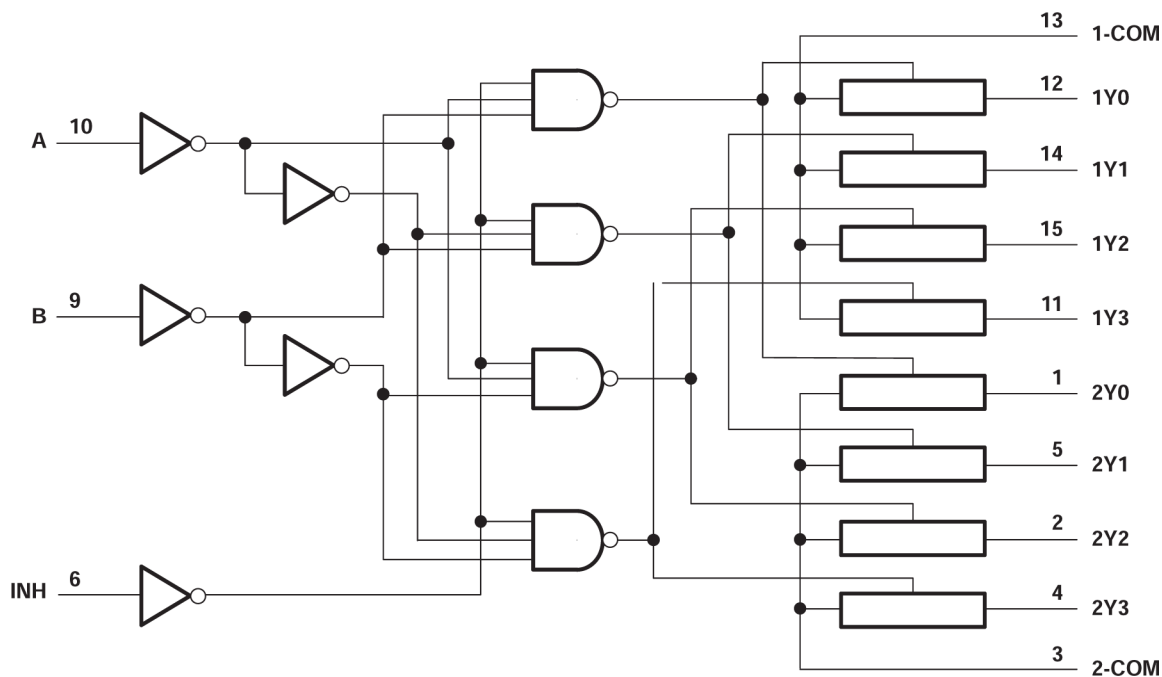


图 6-11. Power-Dissipation Capacitance, Test Setup

7 Detailed Description

7.1 Functional Block Diagram



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

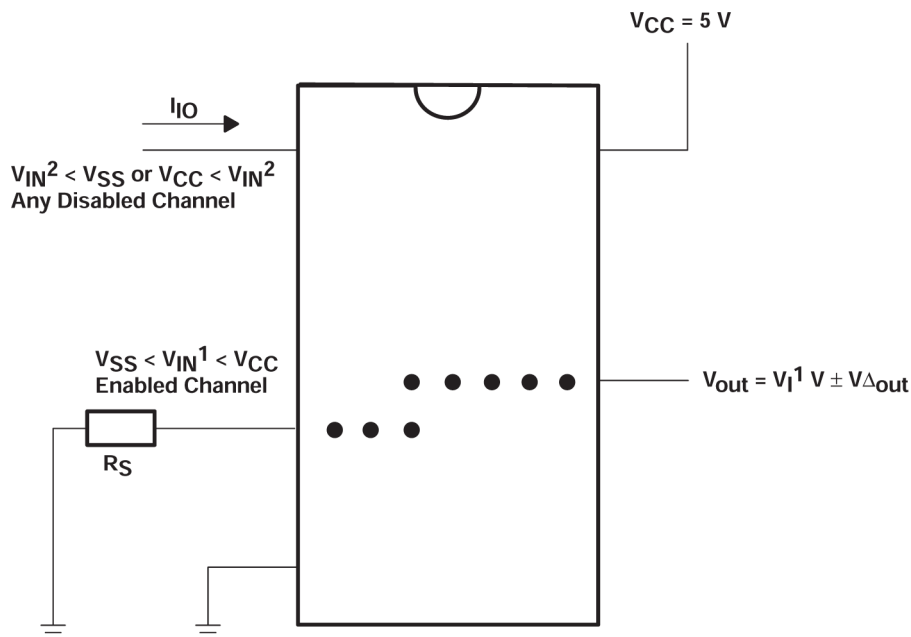


图 8-1. Injection-Current Coupling Specification

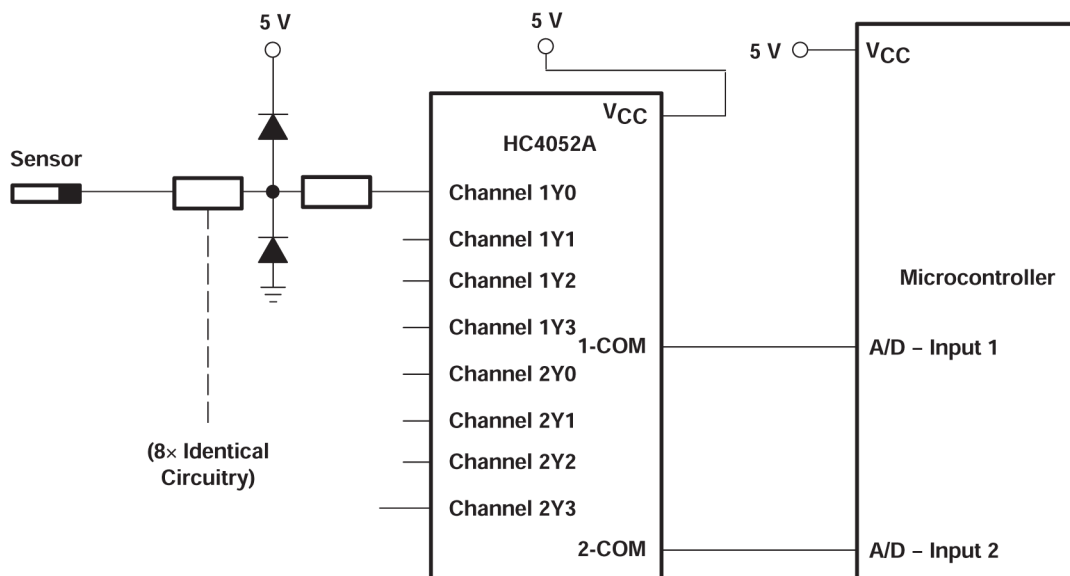


图 8-2. Actual Technology Requires 32 Passive Components and One Extra 6-v Regulator to Suppress Injection Current into a Standard HC4052 Multiplexer

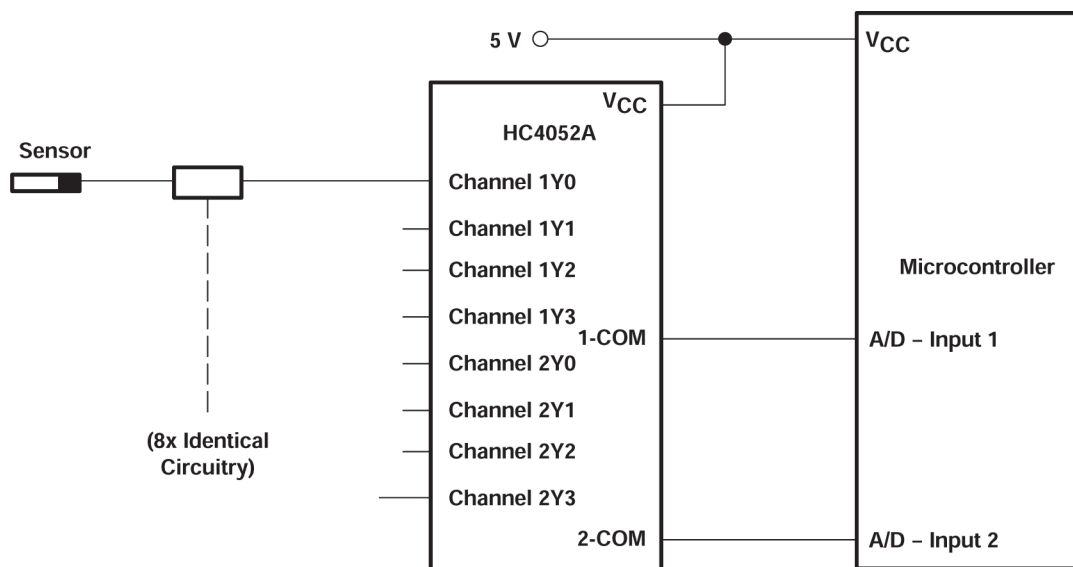


图 8-3. Solution by Applying the HC4852 Multiplexer

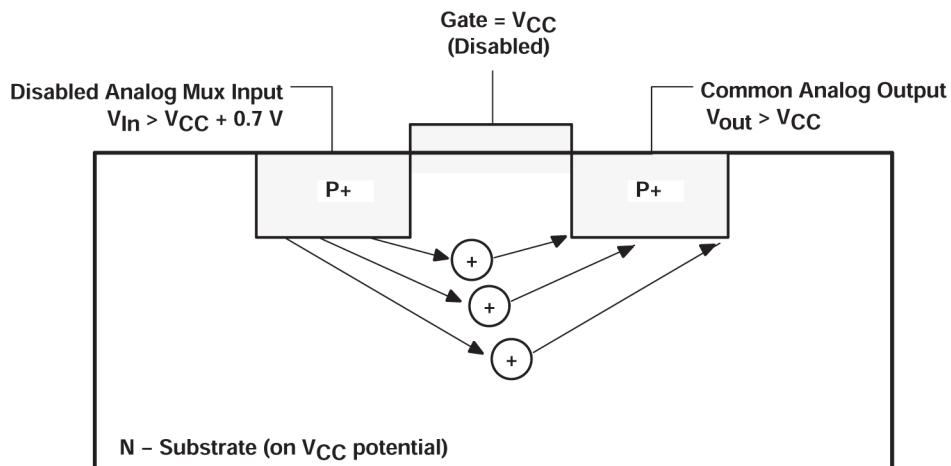


图 8-4. Diagram of Bipolar Coupling Mechanism (Appears If V_{In} Exceeds V_{CC} , Driving Injection Current into the Substrate)

9 Device and Documentation Support

9.1 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。

9.2 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](#)。

9.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

9.4 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。

9.5 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 A (December 2006) to Revision B (June 2024)	Page
• Changed VCC ABS Max from 7V to 6V.....	3
• Changed R ^θ JA	3
• Recommended supply changed from 6V to 5.5V and all test conditions using 6V were removed.....	4
• Changed tpd, ttran, tON, tOFF parameters.....	6

11 Mechanical, Packaging, and Orderable Information

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

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74HC4852QDRQ1	NRND	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC4852Q
SN74HC4852QDRQ1.A	NRND	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC4852Q
SN74HC4852QPWRQ1	Active	Production	TSSOP (PW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC4852Q
SN74HC4852QPWRQ1.A	Active	Production	TSSOP (PW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HC4852Q

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

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN74HC4852-Q1 :

- Catalog : [SN74HC4852](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

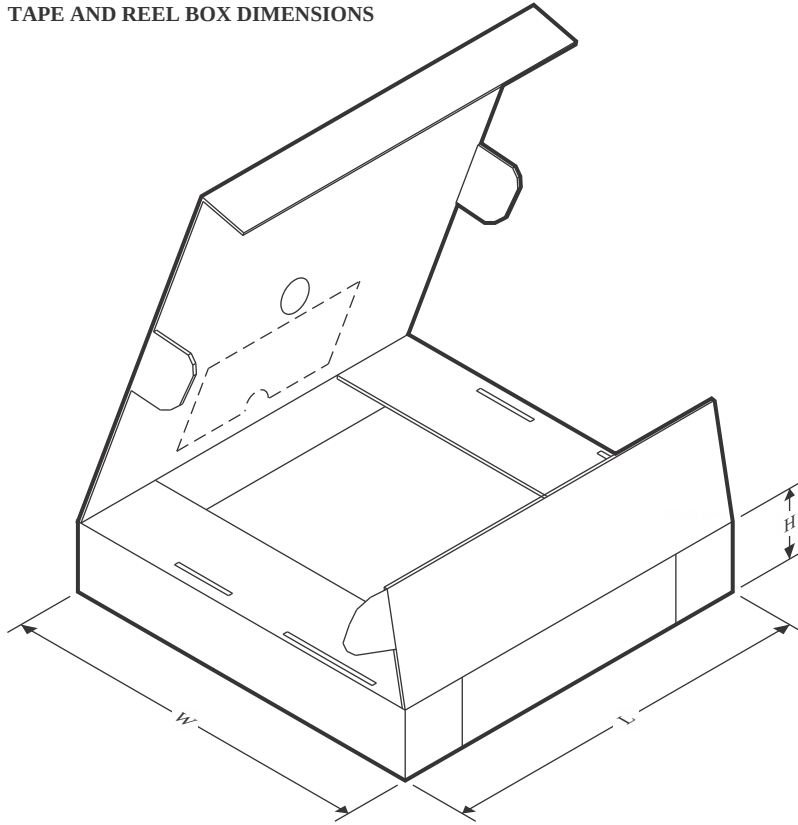
TAPE AND REEL INFORMATION



*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
SN74HC4852QPWRQ1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

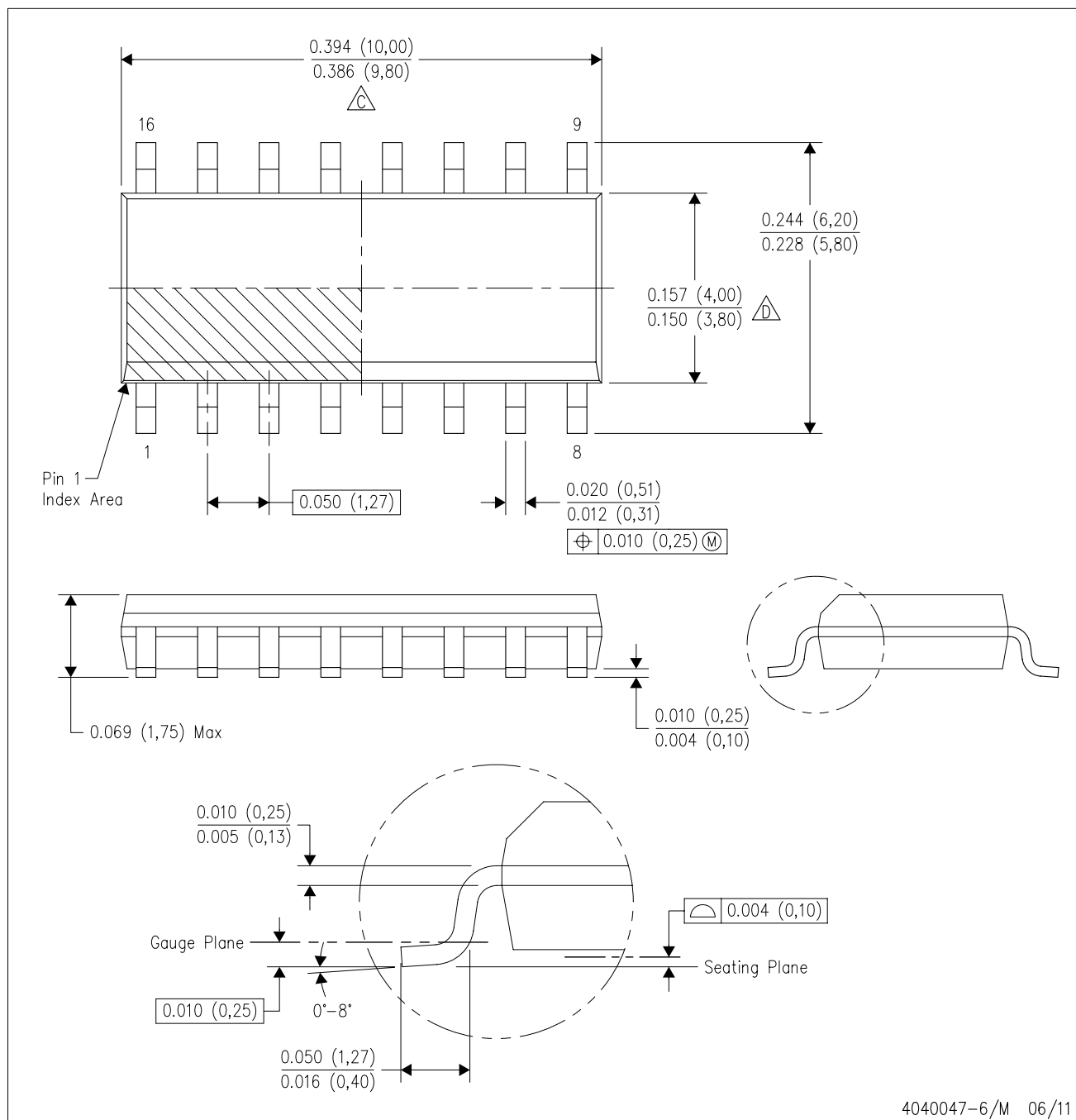


*All dimensions are nominal

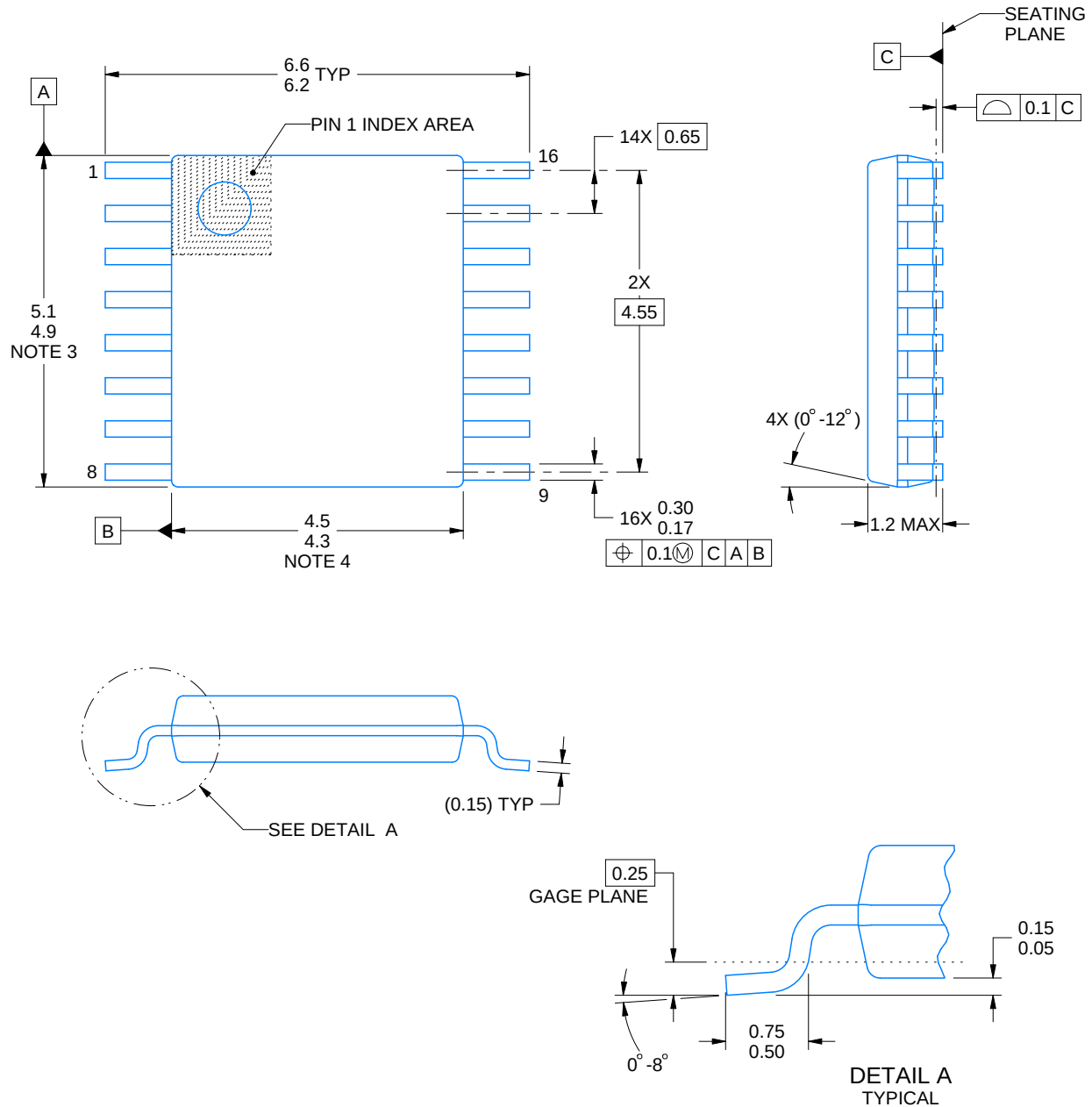
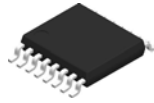
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC4852QPWRQ1	TSSOP	PW	16	2000	353.0	353.0	32.0

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.
 - $\triangle C$ 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.
 - $\triangle D$ 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.



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NOTES:

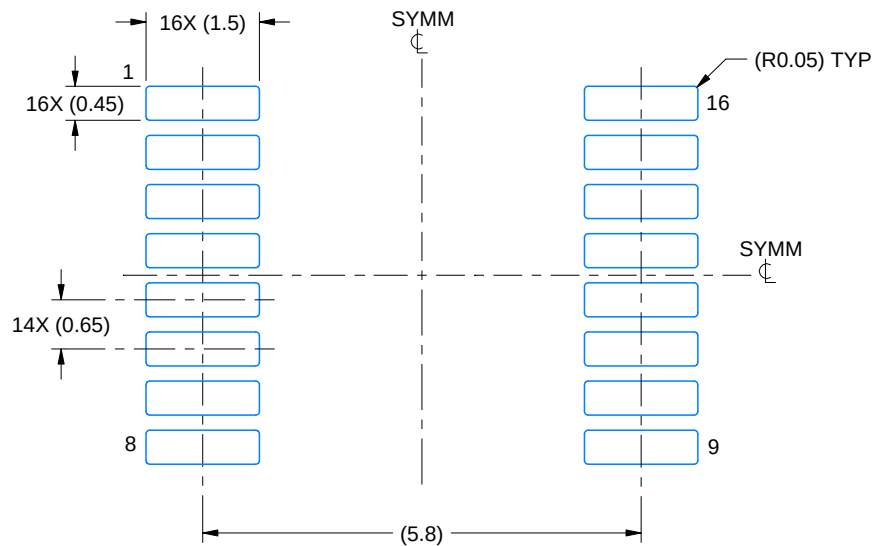
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

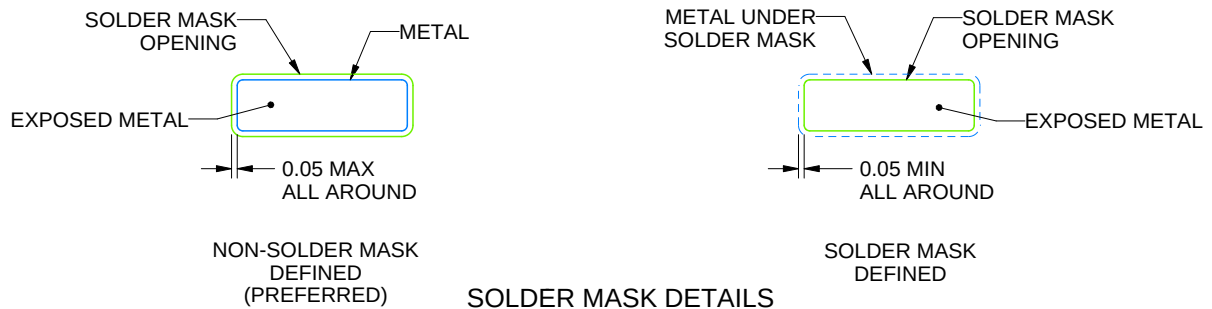
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

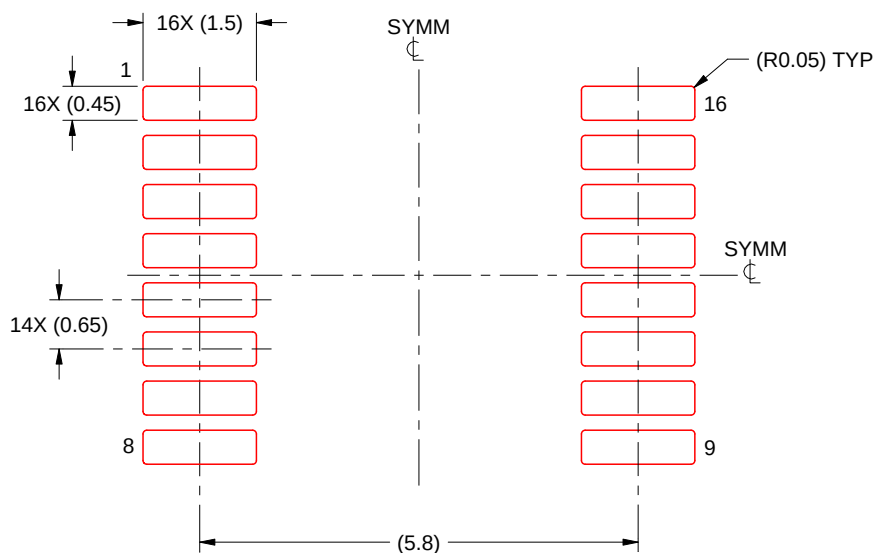
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

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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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