

概述

MAX4947/MAX4948模拟开关采用+1.8V至+5.5V单电源供电，两款开关均具有30pF (典型值)的低电容，适合高速数据切换应用。

MAX4947为3路双刀/双掷(DPDT)开关，而MAX4948为6路单刀双掷(SPDT)开关，带有1个逻辑控制输入端。MAX4947有3个逻辑控制输入端，可成对控制开关。MAX4948有1个逻辑输入端和1个用来禁止开关工作的使能输入端(EN)。

MAX4947/MAX4948采用小尺寸24引脚(4mm x 4mm) TQFN封装或25焊球(2.5mm x 2.5mm)晶片级封装(UCSP™)。

应用

USB信号开关 蜂窝电话
UART信号开关 PDA
SDIO/内存条

特性

- ◆ 复用SDIO或存储条接口
- ◆ 1.8V至5.5V供电范围
- ◆ 4Ω (典型值)低导通电阻
- ◆ 30pF (典型值)低电容开关
- ◆ 可处理满摆幅信号
- ◆ 微型25焊球UCSP™ (2.5mm x 2.5mm)封装或24-TQFN (4mm x 4mm)封装

订购信息

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX4947EBA+*	-40°C to +85°C	25 UCSP-25	B25-1
MAX4947ETG+	-40°C to +85°C	24 TQFN-EP	T2444-4
MAX4948EBA+*	-40°C to +85°C	25 UCSP-25	B25-1
MAX4948ETG+	-40°C to +85°C	24 TQFN-EP	T2444-4

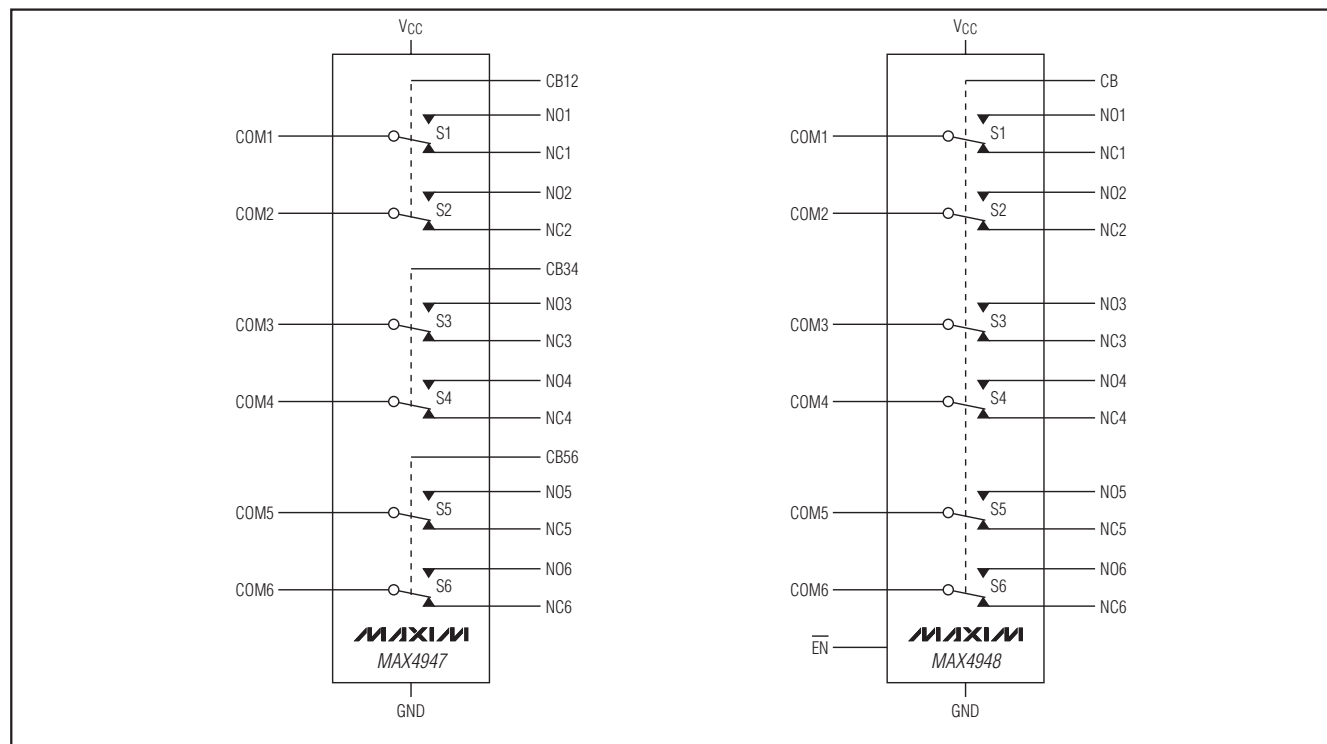
*未来产品——供货情况请与厂商联系。

+表示无铅封装。

EP = 裸焊盘。

典型工作电路在数据资料的最后给出。

功能框图



六通道SPDT数据开关

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND-0.3V to +6.0V
 All other pins to GND (Note 1)-0.3V to V_{CC} + 0.3V
 Continuous Current
 NO₋, NC₋, COM₋±100mA
 Peak Current NO₋, NC₋, COM₋
 (pulsed at 1ms, 50% Duty Cycle).....±200mA
 (pulsed at 1ms, 10% Duty Cycle).....±300mA
 Continuous Power Dissipation (T_A = +70°C)
 25-Bump UCSP (derate 12.2mW/°C above +70°C)976mW
 24-Pin TQFN (derate 20.8mW/°C above +70°C)1667mW

Operating Temperature Range-40°C to +85°C
 Junction Temperature150°C
 Storage Temperature Range-65°C to +150°C
 Bump Temperature (soldering)
 Infrared (15s)+220°C
 Vapor Phase (60s)+215°C
 Lead Temperature (soldering).....+300°C

Note 1: Signals on CB₋, NO₋, NC₋, COM₋, $\overline{\text{EN}}$ exceeding V_{CC} or GND are clamped by internal diodes. Limit forward-diode current to maximum current rating.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V_{CC} = +2.7V to +5.5V, T_A = -40°C to +85°C, unless otherwise noted. Typical values are at V_{CC} = +3V, T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T _A	MIN	TYP	MAX	UNITS
POWER SUPPLY							
Power-Supply Range	V _{CC}		T _{MIN} to T _{MAX}	1.8		5.5	V
Power-Supply Current	I _{CC}	V _{CC} = 5.5V, V _{CB-} = 0V or V _{CC}	T _{MIN} to T _{MAX}			1.0	μA
		V _{CC} = 2.7V, V _{CB-} = 1.6V or 0.5V			5		
		V _{CC} = 5.5V, V _{CB-} = 1.6V or 0.5V			10		
ANALOG SWITCH							
Analog Signal Range	V _{NO-} , V _{NC-} , V _{COM-}		T _{MIN} to T _{MAX}	0		V _{CC}	V
On-Resistance (Note 4)	R _{ON}	V _{CC} = 2.7V, I _{COM-} = 10mA; V _{NC-} or V _{NO-} = 0 or V _{CC}	+25°C		4.0	5.5	Ω
			T _{MIN} to T _{MAX}			6.5	
On-Resistance Match Between Channels (Notes 4, 5)	ΔR _{ON}	V _{CC} = 2.7V, I _{COM-} = 10mA; V _{NO-} or V _{NC-} = 0 or V _{CC}	+25°C		0.3	0.5	Ω
			T _{MIN} to T _{MAX}			0.6	
On-Resistance Flatness (Notes 4, 6)	R _{FLAT}	V _{CC} = 2.7V, I _{COM-} = 10mA; V _{NC-} or V _{NO-} = 0 or V _{CC}	+25°C		0.5	1	Ω
			T _{MIN} to T _{MAX}			1.2	
NO_ or NC_ Off-Leakage Current	I _{NO-(OFF)} or I _{NC-(OFF)}	V _{CC} = 3.6V; V _{COM-} = 3.6V, 0; V _{NO-} or V _{NC-} = 0, 3.6V	+25°C		-3	+3	nA
			T _{MIN} to T _{MAX}		-10	+10	
COM_ On-Leakage Current	I _{NO-(ON)}	V _{CC} = 3.6V; V _{COM-} = 3.6V, 0; V _{NO-} or V _{NC-} = 3.6V, 0 or unconnected	+25°C		-6	+6	nA
			T _{MIN} to T _{MAX}		-10	+10	

六通道SPDT数据开关

MAX4947/MAX4948

ELECTRICAL CHARACTERISTICS (continued)

($V_{CC} = +2.7V$ to $+5.5V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$, unless otherwise noted. Typical values are at $V_{CC} = +3V$, $T_A = +25^{\circ}C$.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T _A	MIN	TYP	MAX	UNITS
COM_ Off-Leakage Current	I _{COM} (OFF)	V _{CC} = 3.6V (MAX4948); V _{COM} _ = 3.3V, 0.3V; V _{NO} _ or V _{NC} _ = 0, 3V, 3.3V	+25°C	-6		+6	nA
			T _{MIN} to T _{MAX}	-10		+10	
DYNAMIC							
Turn-On Time	t _{ON}	V _{CC} = 2.7V; V _{NO} _ or V _{NC} _ = 1.5V; R _L = 50Ω; C _L = 35pF, Figure 1	+25°C		400	800	ns
			T _{MIN} to T _{MAX}			800	
Turn-Off Time	t _{OFF}	V _{CC} = 2.7V; V _{NO} _ or V _{NC} _ = 1.5V; R _L = 50Ω; C _L = 35pF, Figure 1	+25°C		300	800	ns
			T _{MIN} to T _{MAX}			800	
Break-Before-Make	t _{BBM}	V _{CC} = 2.7V; V _{NO} _ or V _{NC} _ = 1.5V; R _L = 50Ω; C _L = 35pF, Figure 2 (Note 7)	+25°C		100		ns
			T _{MIN} to T _{MAX}	2			
HIGH-SPEED TIMING CHARACTERISTICS (rising time = 20ns)							
Skew	t _{SKEW}	V _{CC} = 2.7V; R _S = 39Ω; C _L = 50pF, Figure 3	T _{MIN} to T _{MAX}		0.2		ns
Charge Injection	Q	V _{GEN} = 0, R _{GEN} = 0, C _L = 1nF , Figure 4	+25°C		10		pC
-3dB Bandwidth	BW	Signal = 0dBm, C _L = 5pF, R _L = 50Ω, Figure 5	+25°C		300		MHz
Off-Isolation	V _{ISO}	C _L = 5pF; R _L = 50Ω; V _{COM} _ = 1V _{P-P} , f = 1MHz, Figure 5 (Note 8)	+25°C		-70		dB
Crosstalk	V _{CT}	C _L = 5pF; R _L = 50Ω; f = 1MHz, V _{COM} _ = 1V _{P-P} , Figure 5 (Note 9)	+25°C		-90		dB
NC_ or NO_ Off-Capacitance	C _{NC} _(OFF) C _{NO} _(OFF)	NC_ = NO_ = 0V, f = 1MHz Figure 6	+25°C		15		pF
COM_ Off-Capacitance	C _{COM} _(OFF)	V _{COM} = GND, f = 1MHz (MAX4948), Figure 6	+25°C		25		pF
COM_ On-Capacitance	C _{COM} _(ON)	COM_ = 0V, f = 1MHz, Figure 6	+25°C		30		pF
DIGITAL I/O ($\overline{EN}$, $\overline{CB}$)							
Input-Logic High	V _{IH}		T _{MIN} to T _{MAX}	1.6			V
Input-Logic Low	V _{IL}		T _{MIN} to T _{MAX}			0.5	V
Input Leakage Current	I _{CB}	V _{CB} _ = 0 or V _{CC}	T _{MIN} to T _{MAX}			1	μA

六通道SPDT数据开关

ELECTRICAL CHARACTERISTICS (continued)

($V_{CC} = +2.7V$ to $+5.5V$, $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise noted. Typical values are at $V_{CC} = +3V$, $T_A = +25^\circ C$.) (Notes 2, 3)

Note 2: The algebraic convention is used. The most negative value is shown in the minimum column.

Note 3: UCSP parts are 100% tested at $T_A = +25^\circ C$. Limits across the full temperature range are guaranteed by correlation and design. TQFN parts are guaranteed by correlation and design at $-40^\circ C$.

Note 4: R_{ON} and ΔR_{ON} matching specifications are guaranteed by design.

Note 5: $\Delta R_{ON} = R_{ON}(MAX) - R_{ON}(MIN)$.

Note 6: Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal ranges.

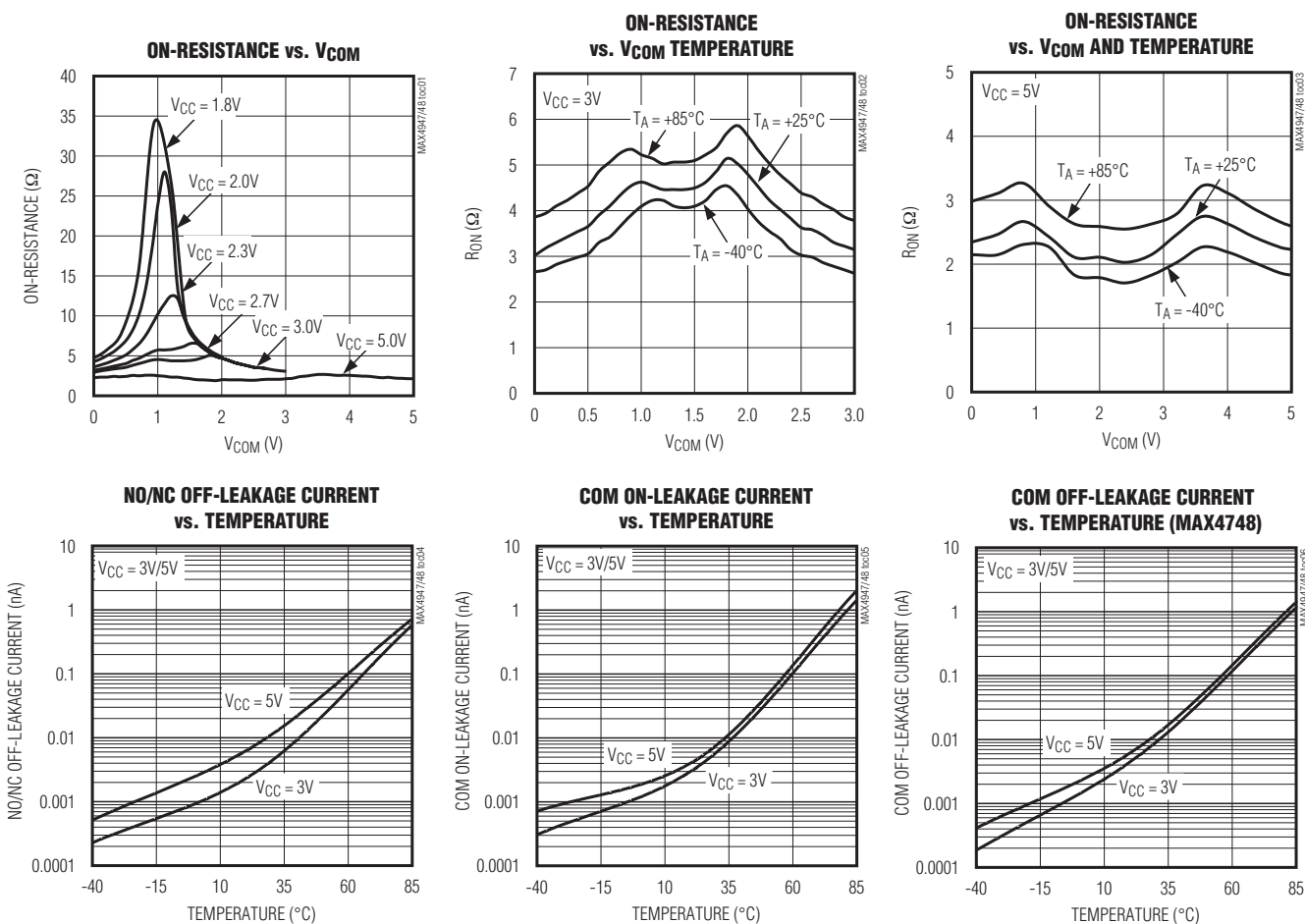
Note 7: Guaranteed by design, not production tested.

Note 8: Off-Isolation = $20\log_{10} [V_{COM_} / (V_{NO_} \text{ or } V_{NC_})]$, $V_{COM_}$ = output, $V_{NO_}$ or $V_{NC_}$ = input to off switch.

Note 9: Between any two switches.

典型工作特性

($V_{CC} = 3V$, $T_A = +25^\circ C$, unless otherwise noted.)

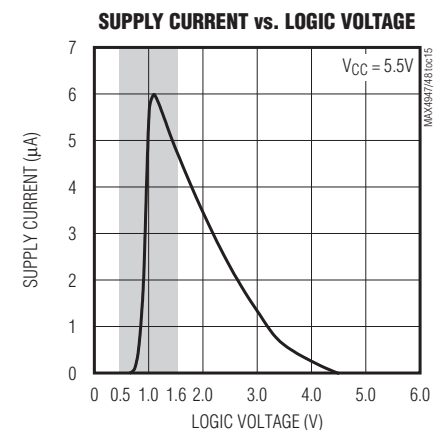
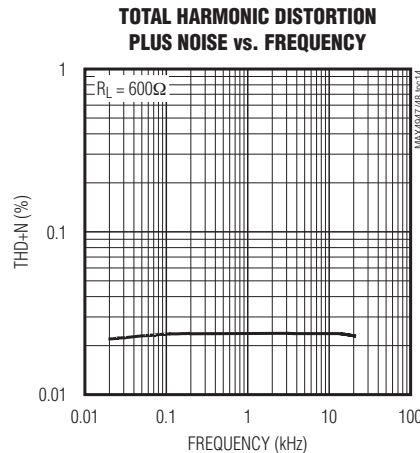
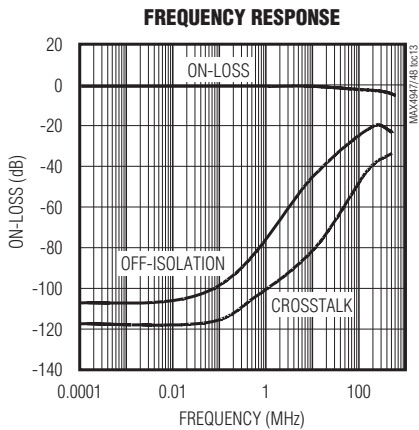
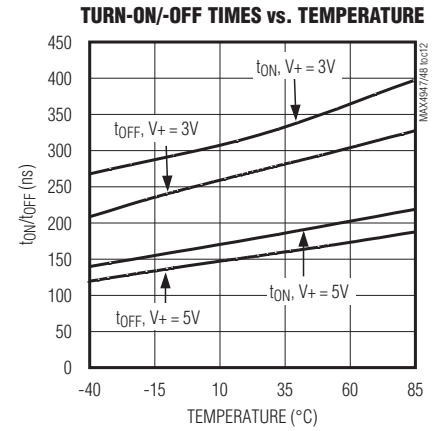
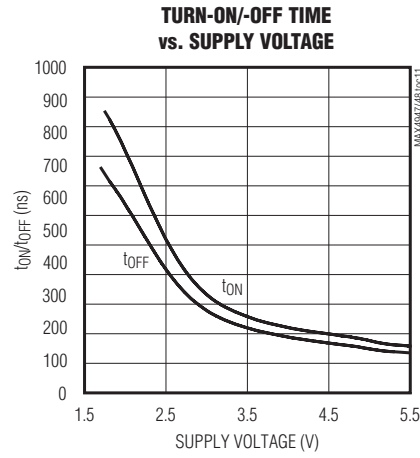
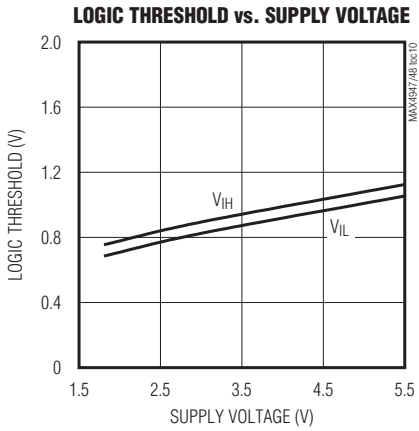
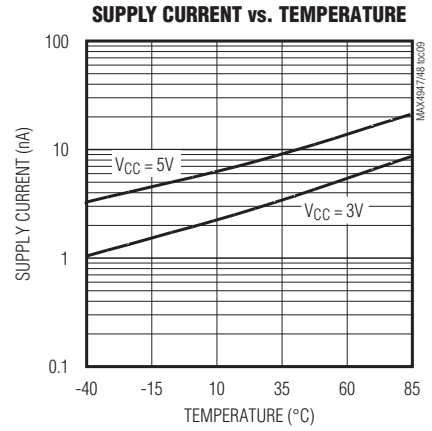
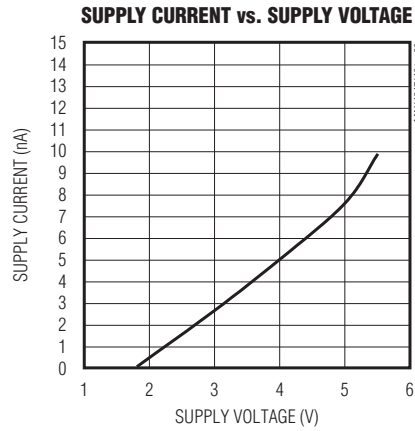
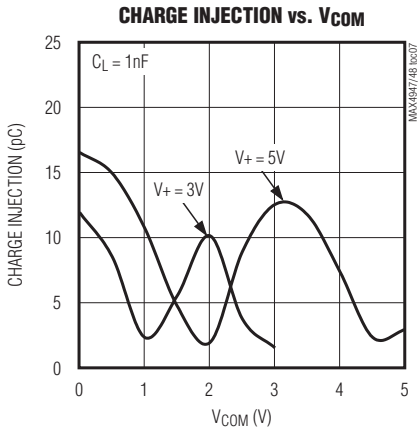


六通道SPDT数据开关

典型工作特性(续)

($V_{CC} = +3V$, $T_A = +25^\circ C$, unless otherwise noted.)

MAX4947/MAX4948



六通道SPDT数据开关

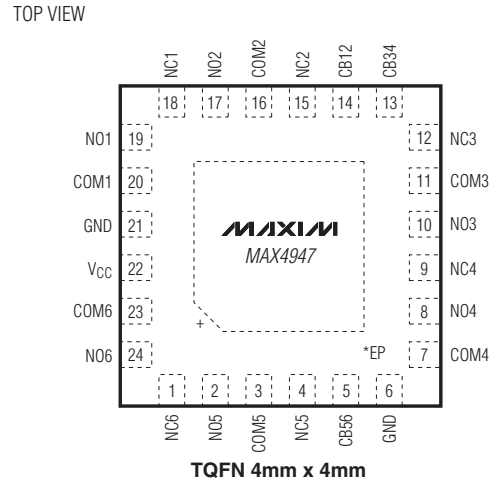
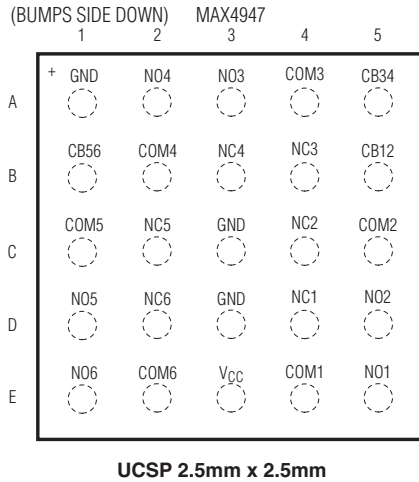
引脚说明

引脚				名称	功能
MAX4947		MAX4948			
TQFN	UCSP	TQFN	UCSP		
1	D2	1	D2	NC6	模拟开关6, 常闭端6。
2	D1	2	D1	NO5	模拟开关5, 常开端5。
3	C1	3	C1	COM5	模拟开关5, 公共端5。
4	C2	4	C2	NC5	模拟开关5, 常闭端5。
5	B1	—	—	CB56	模拟开关5和6的数控输入端。
6, 21	A1, C3, D3	6, 21	A1, C3, D3	GND	地。
7	B2	7	B2	COM4	模拟开关4, 公共端4。
8	A2	8	A2	NO4	模拟开关4, 常开端4。
9	B3	9	B3	NC4	模拟开关4, 常闭端4。
10	A3	10	A3	NO3	模拟开关3, 常开端3。
11	A4	11	A4	COM3	模拟开关3, 公共端3。
12	B4	12	B4	NC3	模拟开关3, 常闭端3。
13	A5	—	—	CB34	模拟开关3和4的数控输入端。
14	B5	—	—	CB12	模拟开关1和2的数控输入端。
15	C4	15	C4	NC2	模拟开关2, 常闭端2。
16	C5	16	C5	COM2	模拟开关2, 公共端2。
17	D5	17	D5	NO2	模拟开关2, 常开端2。
18	D4	18	D4	NC1	模拟开关1, 常闭端1。
19	E5	19	E5	NO1	模拟开关1, 常开端1。
20	E4	20	E4	COM1	模拟开关1, 公共端1。
22	E3	22	E3	VCC	正电源电压。
23	E2	23	E2	COM6	模拟开关6, 公共端6。
24	E1	24	E1	NO6	模拟开关6, 常开端6。
—	—	5	B1	$\overline{\text{EN}}$	使能控制输入, 驱动 $\overline{\text{EN}}$ 至高电平时, 所有开关进入高阻态。
—	—	13	A5	N.C.	未连接, N.C.没有连接。
—	—	14	B5	CB	模拟开关1-6的数控输入。驱动CB至低电平时, 六个开关的COM_端将连接至NC_；驱动CB至高电平时, 六个开关的COM_端将连接至NO_。仅当 $\overline{\text{EN}}$ 为低电平时CB才有效, 如果 $\overline{\text{EN}}$ 为高电平, 则所有六个开关均为高阻态。
EP	—	EP	—	EP	裸焊盘, 连接裸焊盘至地。

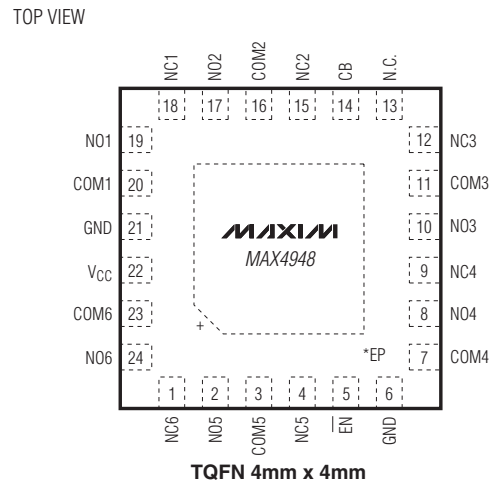
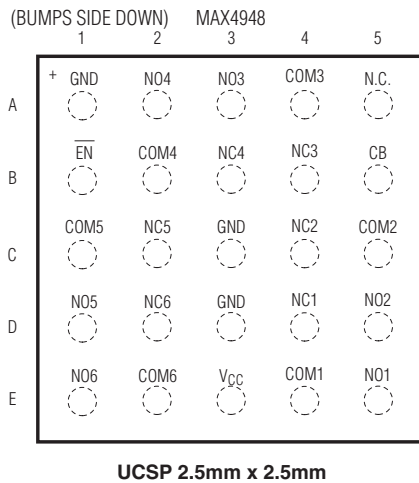
六通道SPDT数据开关

引脚配置/真值表

MAX4947/MAX4948



*EXPOSED PADDLE CONNECT TO GROUND



*EXPOSED PADDLE-CONNECT TO GROUND

MAX4947		
CB12	NO1/NO2	NC1/NC2
0	OFF	ON
1	ON	OFF
CB34	NO3/NO4	NC3/NC4
0	OFF	ON
1	ON	OFF
CB56	NO5/NO6	NC5/NC6
0	OFF	ON
1	ON	OFF

MAX4948			
$\overline{\text{EN}}$	CB	NO ₋	NC ₋
LOW	LOW	OFF	ON
LOW	HIGH	ON	OFF
HIGH	X	OFF	OFF

六通道SPDT数据开关

详细说明

MAX4947为3路DPDT模拟开关，MAX4948为6路SPDT模拟开关，采用+1.8V至+5.5V单电源供电。这些开关完全规范于+3V供电应用。

MAX4947/MAX4948能够确保4Ω (典型值)的导通电阻和30pF (典型值)的低电容，非常适合数据切换应用。MAX4947有3个逻辑控制输入，可成对儿控制两路开关；MAX4948具有1个逻辑控制输入和1个可用来禁止开关工作的使能输入($\overline{\text{EN}}$)。

应用信息

数控输入

MAX4947/MAX4948提供1个数控逻辑输入CB₋。CB₋控制开关的切换位置，如引脚配置/真值表所示。满摆幅驱动CB₋能够获得最低功耗。

MAX4948具有1个 $\overline{\text{EN}}$ 输入，能够打开或关断所有开关。驱动 $\overline{\text{EN}}$ 至高电平时，CB被禁止，且模拟输入进入高阻态；驱动 $\overline{\text{EN}}$ 至低电平时，能够打开所有开关并使能CB。

模拟信号电平

MAX4947/MAX4948具有非常低的导通电阻，并在模拟输入信号从地电位至V_{CC}的整个变化范围内保持稳定(参见典型工作特性)。这些开关可双向工作，因此NO₋、NC₋和COM₋既可作为输入也可作为输出。

电源旁路

电源旁路能够提高噪声容限，防止开关噪声通过V_{CC}电源耦合到其它器件。在V₊和GND之间连接一只0.1μF电容即可满足大多数应用要求。

供电顺序

CMOS器件需要正确的供电顺序，要求在加载模拟信号前先施加V_{CC}，特别是在输入信号没有限流的情况下。

UCSP应用信息

如需获得UCSP的结构、尺寸、载带信息、印刷电路板、焊盘布局、回流温度特性曲线以及可靠性测试结果的最新数据，可从Maxim网站www.maxim-ic.com.cn/ucsp下载应用笔记：UCSP——晶片级封装。

测试电路/时序图

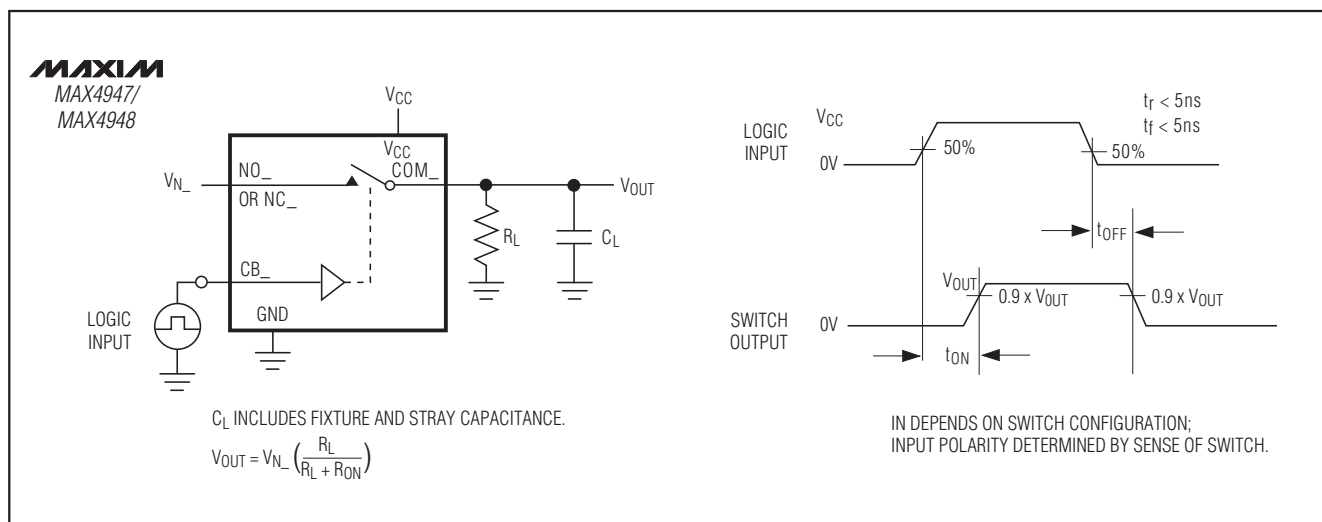


图1. 开关时间

MAX4947/MAX4948

测试电路/时序图(续)

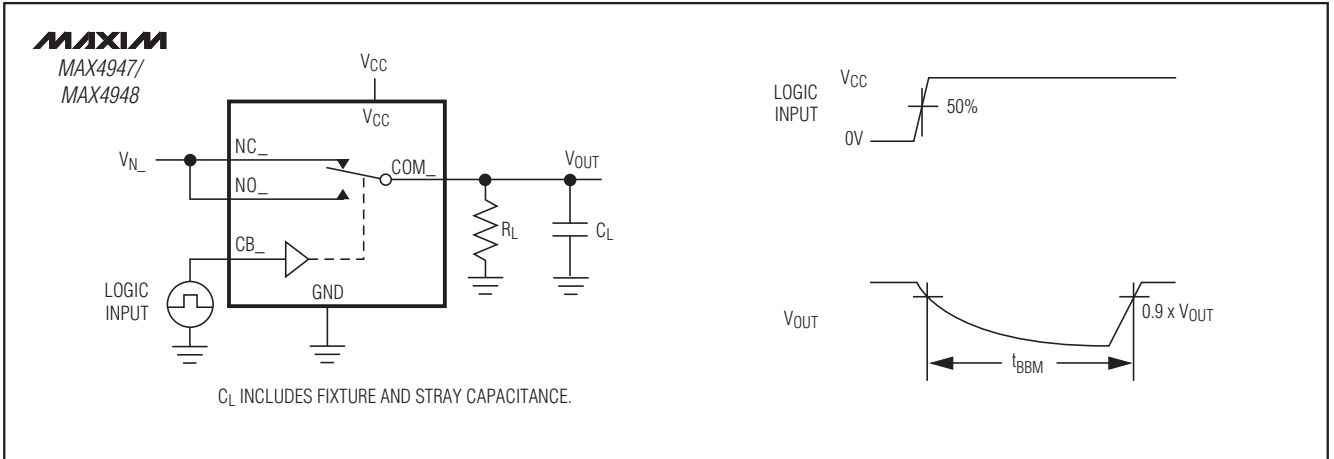


图2. 先断后合的间隔

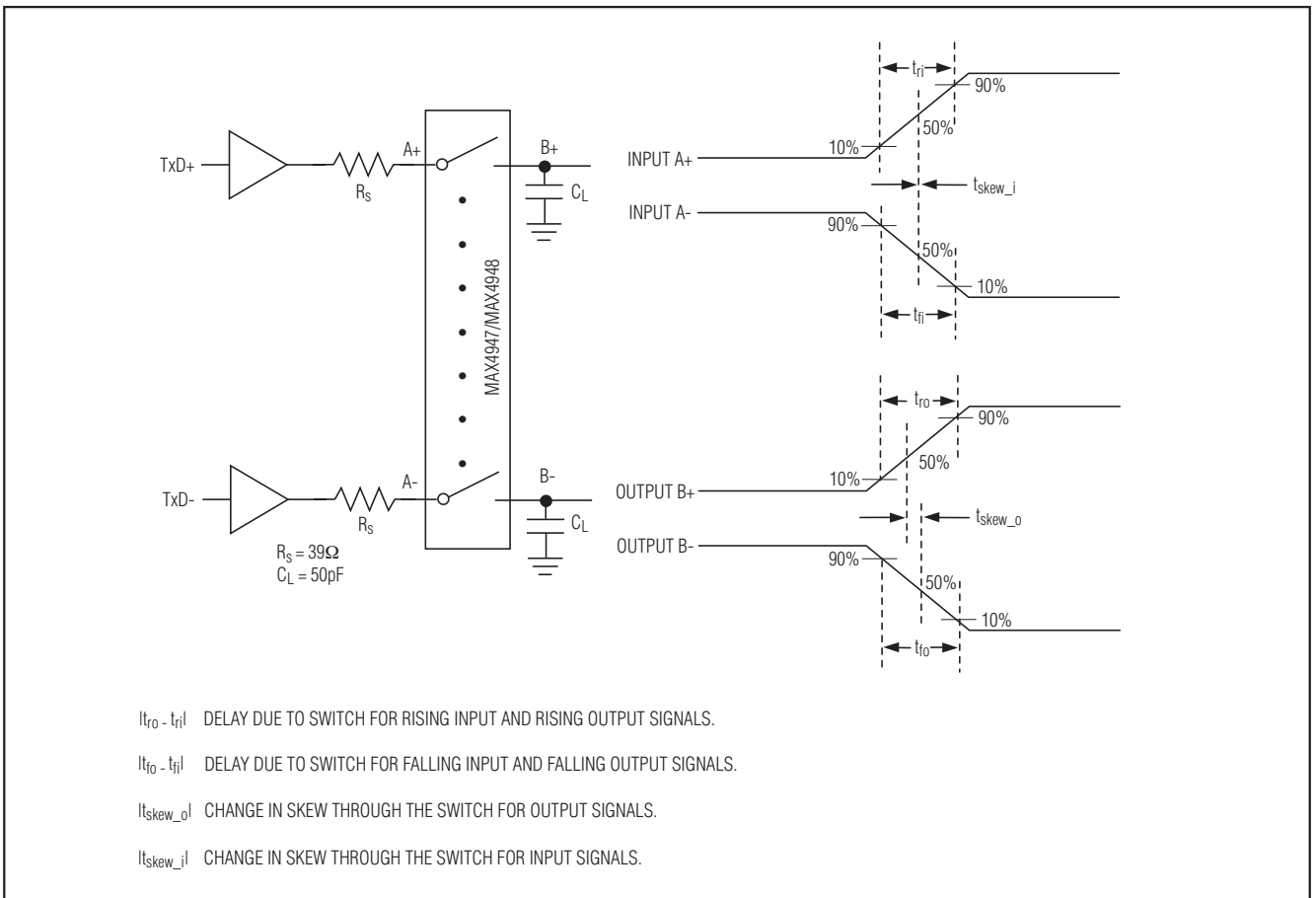


图3. 输入/输出偏差时序图

六通道SPDT数据开关

测试电路/时序图(续)

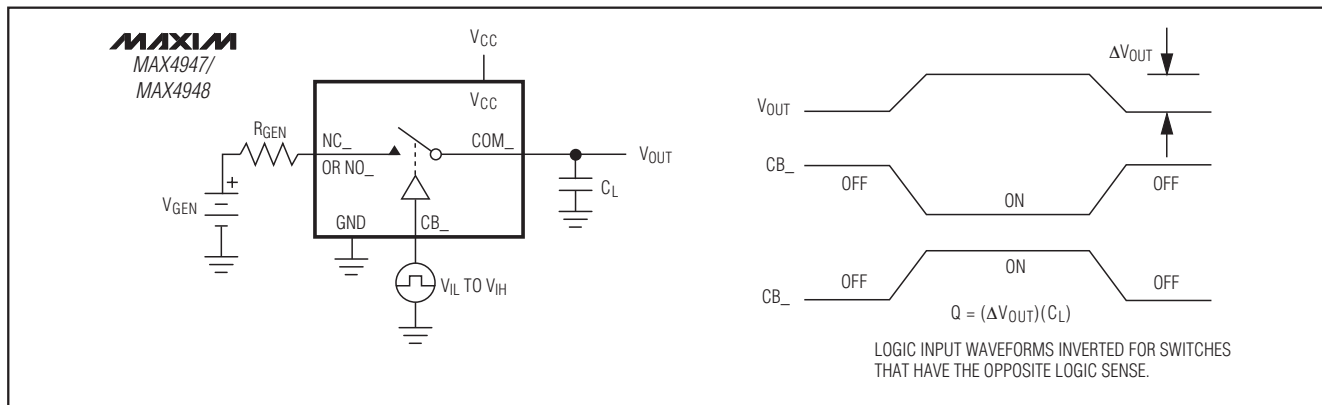


图4. 电荷注入

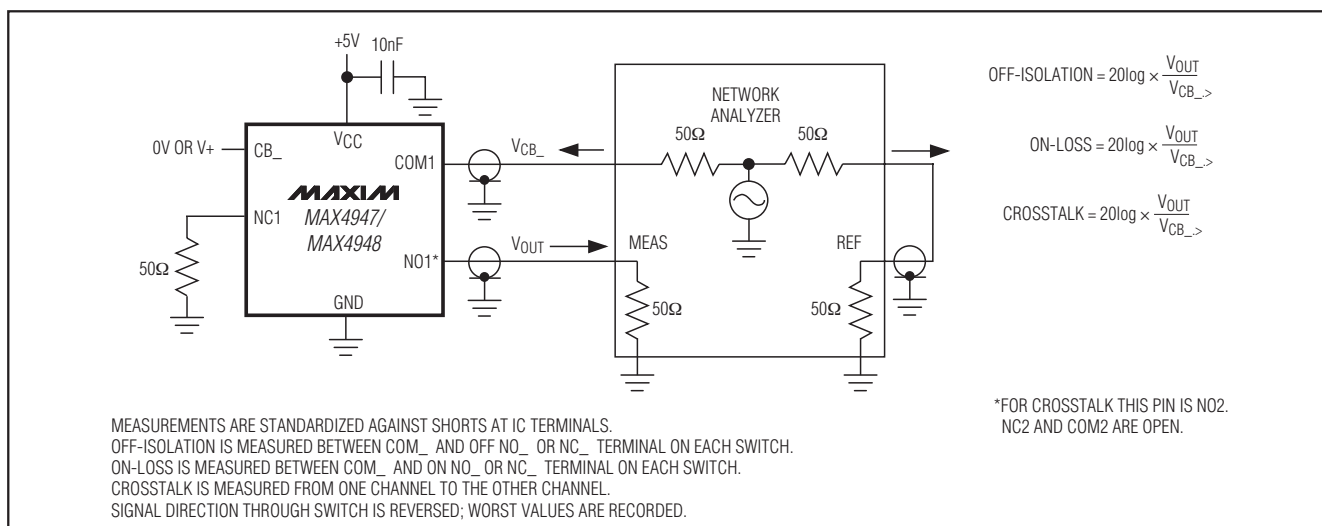


图5. 导通损耗、关断隔离和串扰

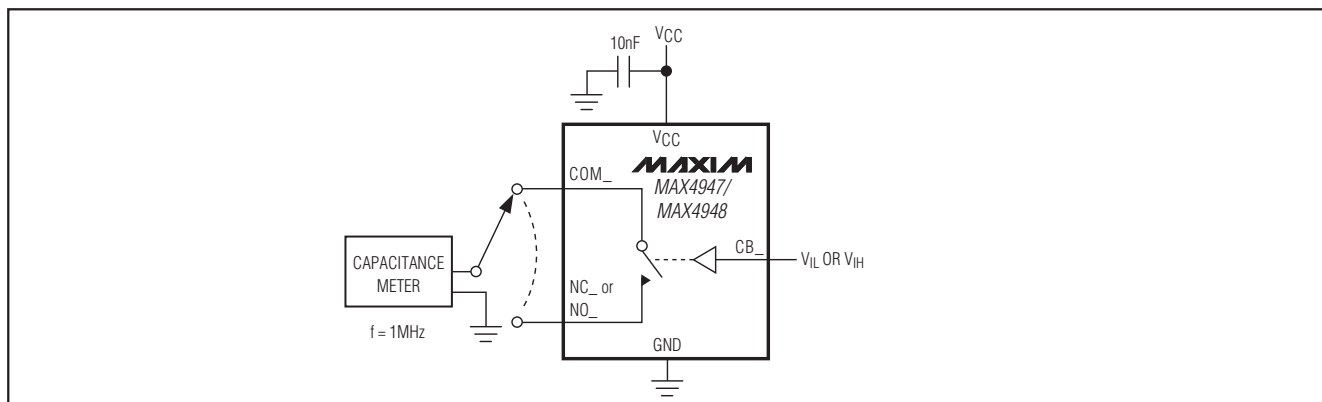
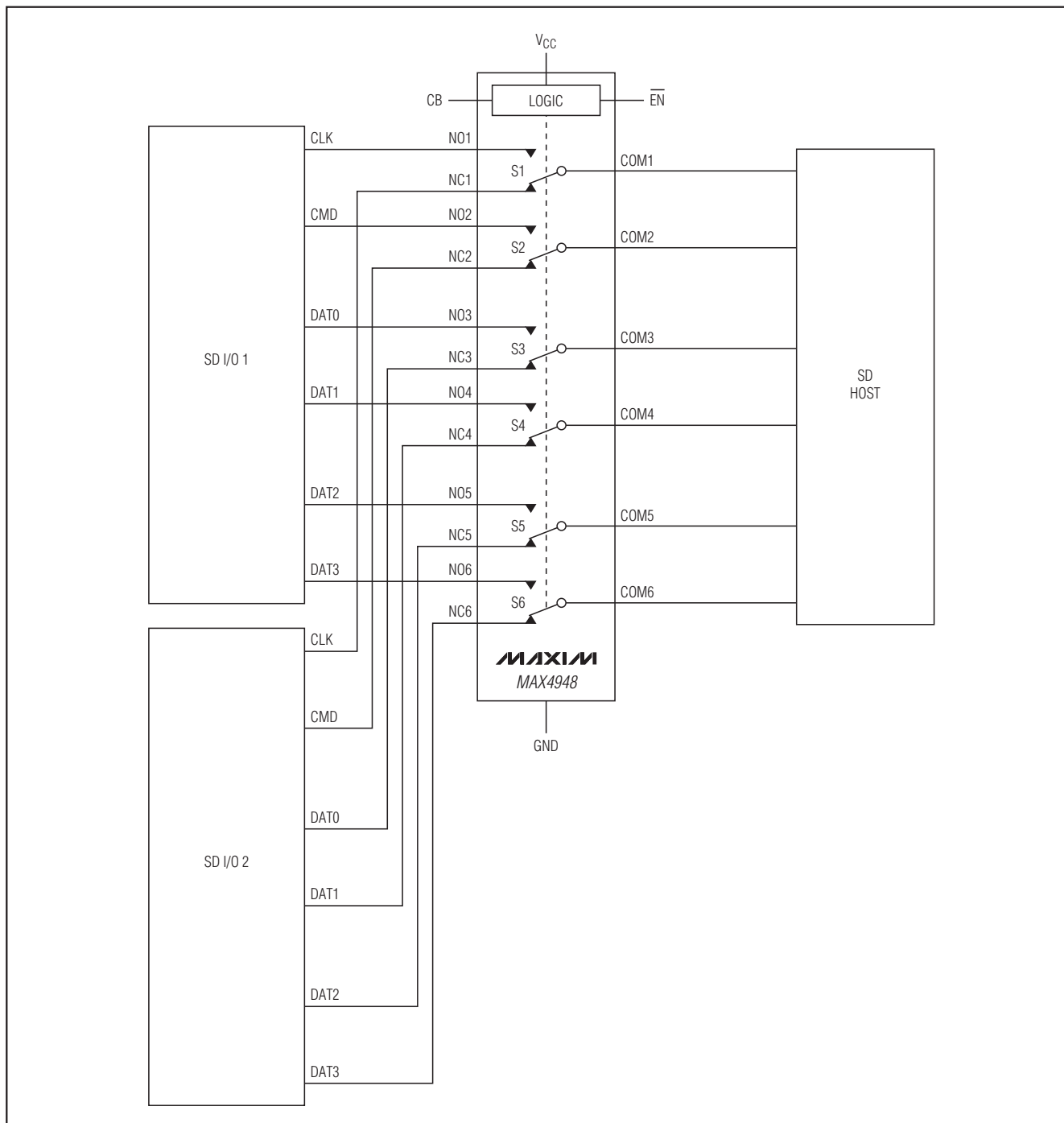


图6. 导通损耗、关断隔离和串扰

六通道SPDT数据开关

典型工作电路

MAX4947/MAX4948



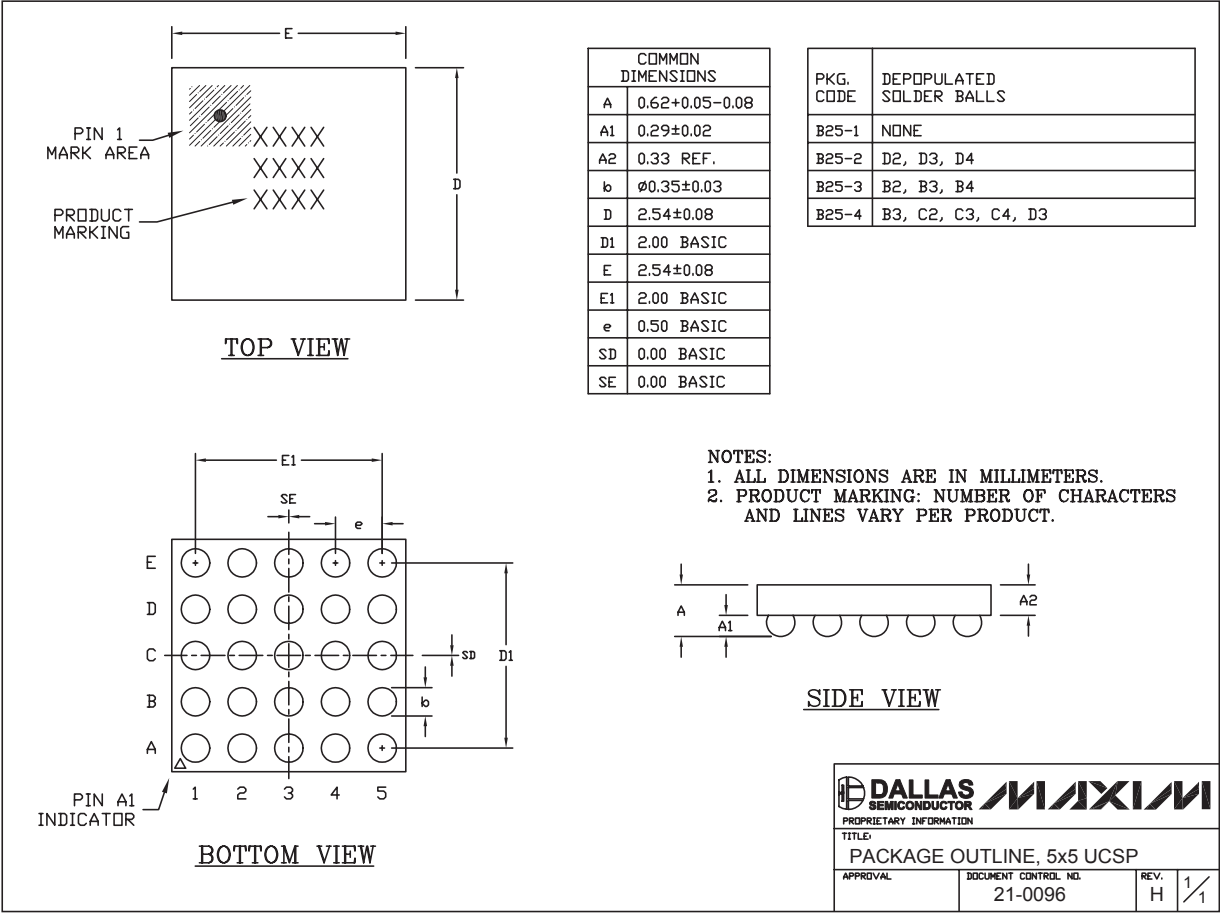
芯片信息

PROCESS: CMOS

六通道SPDT数据开关

封装信息

(本数据资料提供的封装图可能不是最近的规格，如需最近的封装外形信息，请查询 www.maxim-ic.com.cn/packages.)

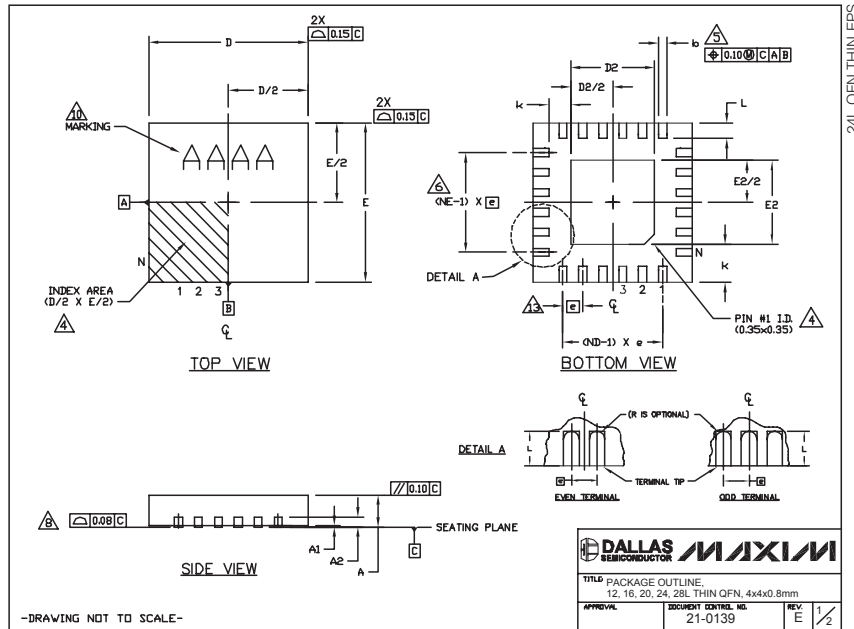


25L UCSP.EPS

六通道SPDT数据开关

封装信息(续)

(本数据资料提供的封装图可能不是最近的规格, 如需最近的封装外形信息, 请查询 www.maxim-ic.com.cn/packages.)



COMMON DIMENSIONS													EXPOSED PAD VARIATIONS												
PKG REF.	12L 4x4			16L 4x4			20L 4x4			24L 4x4			28L 4x4			PKG CODES	B2			E2			DOWN BOND ALLOWED		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.	MIN.	NOM.	MAX.			
A	0.78	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	T1844-3	1.95	2.10	2.25	1.95	2.10	2.25	YES		
A1	0.0	0.02	0.05	0.0	0.02	0.05	0.0	0.02	0.05	0.0	0.02	0.05	0.0	0.02	0.05	T1844-4	1.95	2.10	2.25	1.95	2.10	2.25	NO		
A2	0.20 REF			0.20 REF			0.20 REF			0.20 REF			0.20 REF			T1644-3	1.95	2.10	2.25	1.95	2.10	2.25	YES		
b	0.25	0.30	0.35	0.25	0.30	0.35	0.25	0.30	0.35	0.25	0.30	0.35	0.25	0.30	0.35	T1644-4	1.95	2.10	2.25	1.95	2.10	2.25	NO		
D	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	T2844-2	1.95	2.10	2.25	1.95	2.10	2.25	YES		
E	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	T2844-3	1.95	2.10	2.25	1.95	2.10	2.25	NO		
e	0.80 BSC.			0.65 BSC.			0.50 BSC.			0.30 BSC.			0.40 BSC.			T2444-2	1.95	2.10	2.25	1.95	2.10	2.25	YES		
k	0.25	-	-	0.25	-	-	0.25	-	-	0.25	-	-	0.25	-	-	T2444-3	2.45	2.60	2.63	2.45	2.60	2.63	YES		
L	0.45	0.55	0.65	0.45	0.55	0.65	0.45	0.55	0.65	0.30	0.40	0.50	0.30	0.40	0.50	T2444-4	2.45	2.60	2.63	2.45	2.60	2.63	NO		
N	12			16			20			24			28			T2844-1	2.50	2.60	2.70	2.50	2.60	2.70	NO		
ND				4			5			6															
NE	3			4			5			6			7												
VGDD																									
VGGE																									

NOTES:

- DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.
- N IS THE TOTAL NUMBER OF TERMINALS.
- THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEDEC 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.
- DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.
- ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.
- DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.
- COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.
- DRAWING CONFORMS TO JEDEC W0220, EXCEPT FOR T2444-3, T2444-4 AND T2844-1.
- MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
- COPLANARITY SHALL NOT EXCEED 0.08mm.
- WARPAGE SHALL NOT EXCEED 0.10mm.
- LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.
- NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.

-DRAWING NOT TO SCALE-

			
TITLE: PACKAGE OUTLINE.			
12, 16, 20, 24, 28L THIN QFN, 4x4x0.8mm			
APPROVE:	SECURITY CONTROL, INC	21-0139	REV E 2

修订历史

Rev 1中的修改页: 1.

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13

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