

四路、DPDT 音频/数据开关，UCSP/QFN 封装

概述

MAX4758/MAX4759 为四路、双刀/双掷 (DPDT) 模拟开关，采用 +1.8V 至 +5.5V 单电源供电。这些开关具有 0.5Ω 低导通电阻以及 25pF 低电容，这使其非常适合音频和数据信号切换。

MAX4758 有八个导通电阻为 0.5Ω 的开关，用于切换音频信号。MAX4759 有四个导通电阻为 0.5Ω 的开关，用于切换音频信号，以及四个具有 25pF 电容的开关，用于切换数据信号。MAX4758/MAX4759 有四个逻辑输入端，分别用来控制成对的开关。

MAX4758/MAX4759 提供小尺寸、36 引脚 (6mm x 6mm) 薄型 QFN 封装和 36 焊球 (3mm x 3mm) 晶片级封装 (UCSP™)。

应用

扬声器-耳机开关
音频信号切换
蜂窝电话

PDA/手持式设备
笔记本电脑
USB 信号开关

特性

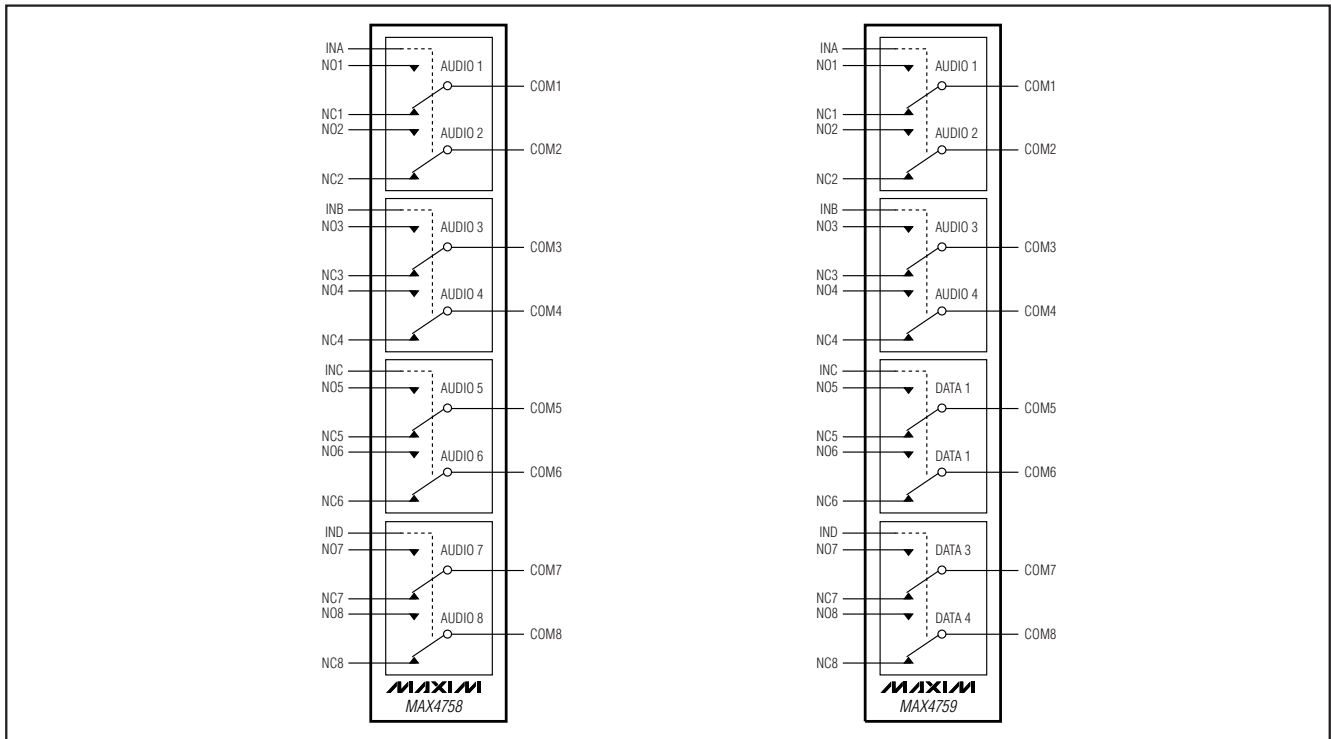
- ◆ 数据与音频信号切换
- ◆ 低导通电阻 (0.5Ω) 音频开关
- ◆ 0.2Ω 导通电阻平坦度
- ◆ 0.1Ω 通道间匹配度
- ◆ 低电容 (25pF) 数据开关 (MAX4759)
- ◆ 0.2ns 偏斜 (MAX4759)
- ◆ 0.03% THD
- ◆ +1.8V 至 +5.5V 电源范围
- ◆ 可处理满摆幅信号
- ◆ 微型 36 焊球 UCSP (3mm x 3mm) 封装
- ◆ 36 引脚薄型 QFN (6mm x 6mm) 封装

订购信息

PART	TEMP RANGE	PIN-PACKAGE
MAX4758EBX-T	-40°C to +85°C	36 UCSP-36
MAX4758ETX	-40°C to +85°C	36 Thin QFN (6mm x 6mm)
MAX4759EBX-T*	-40°C to +85°C	36 UCSP-36
MAX4759ETX*	-40°C to +85°C	36 Thin QFN (6mm x 6mm)

* 未来产品 — 供货情况请联系厂商

功能框图



UCSP 是 Maxim Integrated Products, Inc. 的商标。

引脚配置/真值表在数据资料的最后部分给出。

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ABSOLUTE MAXIMUM RATINGS

(All voltages referenced to GND.)

V+, IN_	-0.3V to +6V
COM_, NO_, NC_ (Note 1)	-0.3V to (V+ + 0.3V)
Continuous Current	
NO_, NC_, COM_ (MAX4758)	±300mA
NO1–NO4, NC1–NC4, COM1–COM4 (MAX4759)	±300mA
NO5–NO8, NC5–NC8, COM5–COM8 (MAX4759)	±100mA
Peak Current NO_, NC_, COM_ (MAX4758)	
NO1–NO4, NC1–NC4, COM1–COM4 (MAX4759)	
(pulsed at 1ms, 10% duty cycle)	±500mA
(pulsed at 1ms, 50% duty cycle)	±400mA
Peak Current NO5–NO8, NC5–NC8, COM5–COM8 (MAX4759)	
(pulsed at 1ms, 10% duty cycle)	±200mA
(pulsed at 1ms, 50% duty cycle)	±300mA

Continuous Power Dissipation (T_A = +70°C)

36-Bump UCSP (derate 15.3mW/°C above +70°C)	1221mW
36-Pin Thin QFN (derate 26.3mW/°C above +70°C)	2105mW
ESD per Method 3015.7	±2kV
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Bump Temperature (soldering)	
Infrared (15s)	+220°C
Vapor Phase (60s)	+215°C

Note 1: Signals on NO_, NC_, COM_ exceeding V+ 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+ = +2.7V to +5.25V, T_A = -40°C to +85°C, unless otherwise noted. Typical values are at V+ = 3V, T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T _A	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V _{COM_} , V _{NO_} , V _{NC_}		T _{MIN} to T _{MAX}	0		V+	V
On-Resistance (Note 4)	R _{ON}	V+ = 2.7V, I _{COM_} = 10mA, V _{NC_} or V _{NO_} = 0 or V+	MAX4758, MAX4759 (N ₁ –N ₄)	+25°C	0.5	0.85	Ω
				T _{MIN} to T _{MAX}		1.0	
			MAX4759 (N ₅ –N ₈)	+25°C	2.0	3.5	
			T _{MIN} to T _{MAX}			4	
On-Resistance Match Between Channels (Notes 4, 5)	ΔR _{ON}	V+ = 2.7V, I _{COM_} = 10mA, V _{NO_} or V _{NC_} = 1.5V	MAX4758, MAX4759 (N ₁ –N ₄)	+25°C	0.1	0.35	Ω
				T _{MIN} to T _{MAX}		0.55	
			MAX4759 (N ₅ –N ₈)	+25°C	0.2	0.4	
			T _{MIN} to T _{MAX}			0.55	
On-Resistance Flatness (Note 6)	R _{FLAT (ON)}	V+ = 2.7V, I _{COM_} = 10mA, V _{NC_} or V _{NO_} = 0 or V+	MAX4758, MAX4759 (N ₁ –N ₄)	+25°C	0.2	0.45	Ω
				T _{MIN} to T _{MAX}		0.55	
			MAX4759 (N ₅ –N ₈)	+25°C	0.8	1.5	
			T _{MIN} to T _{MAX}			1.8	
NO_, NC_ Off-Leakage Current	I _{NO_ (OFF)} , I _{NC_ (OFF)}	V+ = 3.6V; V _{COM_} = 3.3V, 0.3V; V _{NO_} or V _{NC_} = 0.3V, 3.3V	+25°C	-5		+5	nA
			T _{MIN} to T _{MAX}	-25		+25	
COM_ On-Leakage Current	I _{COM_ (ON)}	V+ = 3.6V; V _{COM_} = 3.3V, 0.3V; V _{NO_} or V _{NC_} = 3.3V, 0.3V, or floating	+25°C	-5		+5	nA
			T _{MIN} to T _{MAX}	-25		+25	
DYNAMIC							
Turn-On Time	t _{ON}	V+ = 2.7V, V _{NO_} or V _{NC_} = 1.5V; R _L = 50Ω; C _L = 35pF, Figure 2	+25°C	45	140		ns
			T _{MIN} to T _{MAX}			150	

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MAX4758/MAX4759

ELECTRICAL CHARACTERISTICS (continued)

(V+ = +2.7V to +5.25V, T_A = -40°C to +85°C, unless otherwise noted. Typical values are at V+ = 3V, T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS		T _A	MIN	TYP	MAX	UNITS
Turn-Off Time	t _{OFF}	V+ = 2.7V, V _{NO_} or V _{NC_} = 1.5V; R _L = 50Ω; C _L = 35pF, Figure 2		+25°C		25	50	ns
				T _{MIN} to T _{MAX}			60	
Break-Before-Make (Note 7)	t _{BBM}	V+ = 2.7V, V _{NO_} or V _{NC_} = 1.5V; R _L = 50Ω, C _L = 35pF, Figure 3		+25°C		15		ns
				T _{MIN} to T _{MAX}		2		
Skew (Note 7)	t _{SKREW}	R _S = 39Ω, C _L = 50pF, MAX4759 (COM5–COM8), Figure 4		+25°C		0.2	0.5	ns
Charge Injection	Q	V _{GEN} = 0, R _{GEN} = 0, C _L = 1.0nF, Figure 5	MAX4758, MAX4759 (COM1–COM4)	+25°C		40		pC
			MAX4759 (COM5–COM8)			15		
On-Channel -3dB Bandwidth	BW	Signal = 0dBm, C _L = 5pF, R _L = 50Ω, MAX4758, MAX4759 (COM1–COM4)		+25°C		50		MHz
		Signal = 0dBm, C _L = 5pF, R _L = 50Ω, MAX4759 (COM5–COM8)		+25°C		320		
Off-Isolation (Note 8)	V _{ISO}	C _L = 5pF, R _L = 50Ω, V _{COM_} = 1VP-P, f = 100kHz, Figure 6		+25°C		-95		dB
Crosstalk (Note 9)	V _{CT}	C _L = 5pF, R _L = 50Ω, V _{COM_} = 1VP-P, f = 100kHz, Figure 6		+25°C		-100		dB
Total Harmonic Distortion	THD	f = 20Hz to 20kHz, 1VP-P	MAX4758, MAX4759 (N ₁ –N ₄), R _L = 32Ω	+25°C		0.03		%
			MAX4759 (N ₅ –N ₈), R _L = 600Ω	+25°C		0.03		
NO __ , NC __ Off-Capacitance	C _{NO(OFF)} , C _{NC(OFF)}	V _{NO_} , V _{NC_} = GND, f = 1MHz, Figure 7	MAX4758, MAX4759 (N ₁ –N ₄)	+25°C		102		pF
			MAX4759 (N ₅ –N ₈)	+25°C		25		
COM __ On-Capacitance	C _(ON)	V _{NO_} , V _{NC_} = GND, f = 1MHz, Figure 7	MAX4758, MAX4759 (COM1–COM4)	+25°C		284		pF
			MAX4759 (COM5–COM8)	+25°C		54		
DIGITAL I/O (IN__)								
Input Logic High	V _{IH}	V+ = 2.7V to 3.6V		T _{MIN} to T _{MAX}		1.4		V
		V+ = 3.6V to 5.5V		T _{MIN} to T _{MAX}		2.0		
Input Logic Low	V _{IL}	V+ = 2.7V to 3.6V		T _{MIN} to T _{MAX}			0.5	V
		V+ = 3.6V to 5.5V		T _{MIN} to T _{MAX}			0.6	
Input Leakage Current	I _{IN}	V _{IN} = 0 or V+		T _{MIN} to T _{MAX}			1	μA

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ELECTRICAL CHARACTERISTICS (continued)

($V_+ = +2.7V$ to $+5.25V$, $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise noted. Typical values are at $V_+ = 3V$, $T_A = +25^\circ C$.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
POWER SUPPLY							
Power-Supply Range	V_+		T_{MIN} to T_{MAX}	1.8		5.5	V
Positive Supply Current	I_+	$V_+ = 5.5V$, $V_{IN_} = 0V$ or V_+	$+25^\circ C$	0.01			μA
			T_{MIN} to T_{MAX}		1.0		

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

Note 3: UCSP packages are 100% tested at $+25^\circ C$ and limits across the full temperature range are guaranteed by correlation and design. Thin QFN parts are 100% tested at $+85^\circ C$ and limits across the full temperature range are guaranteed by correlation and design.

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.

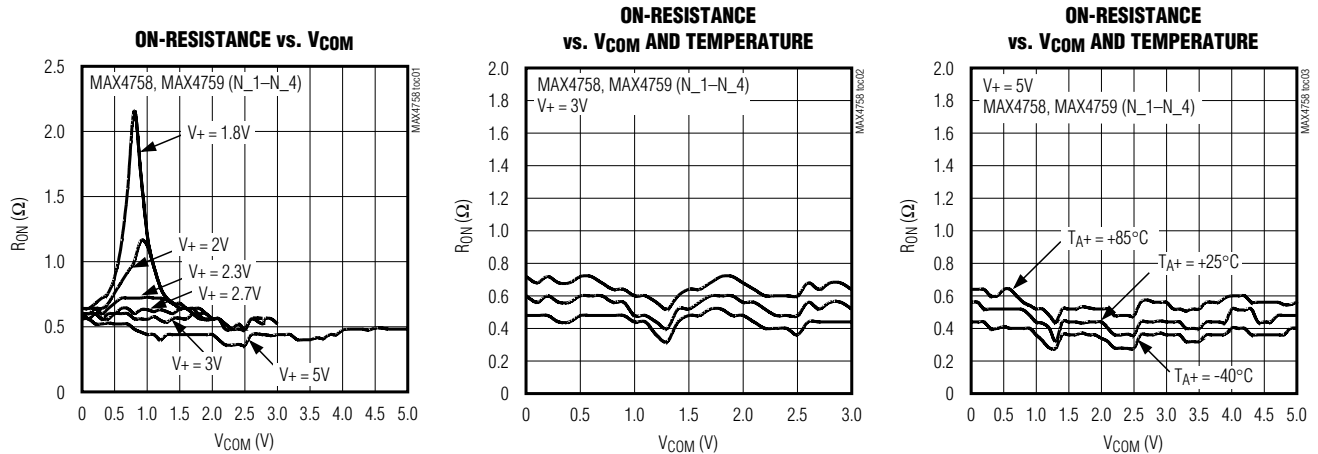
Note 7: Guaranteed by design, not production tested.

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

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

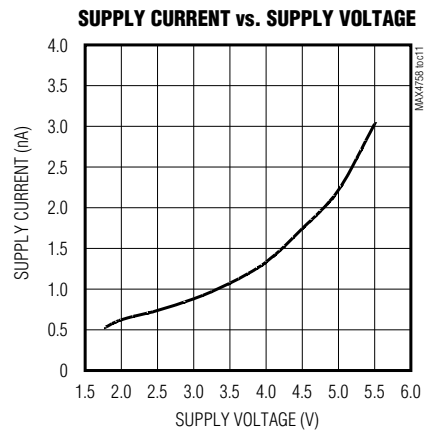
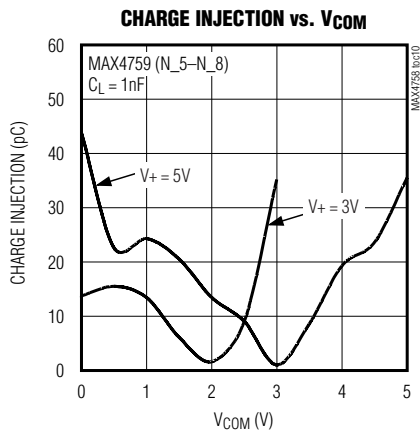
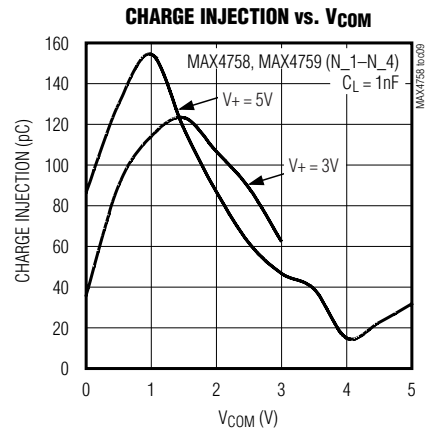
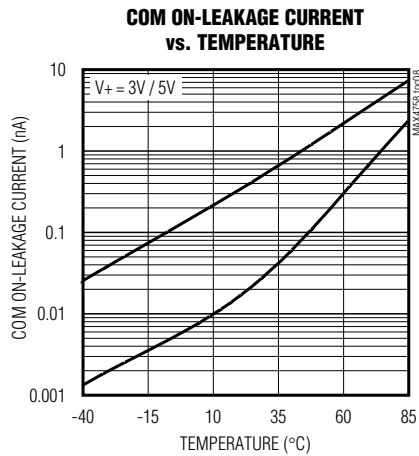
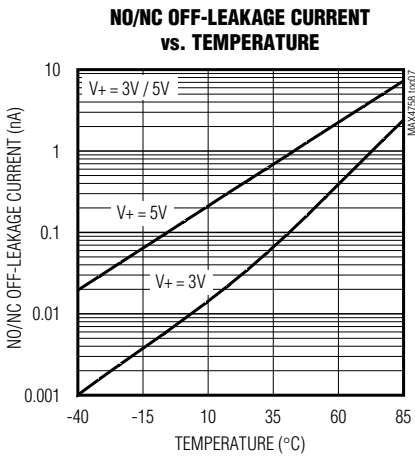
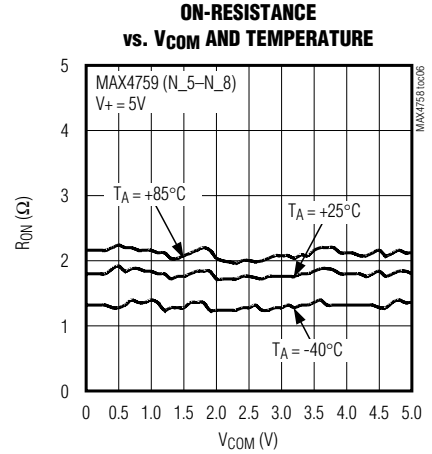
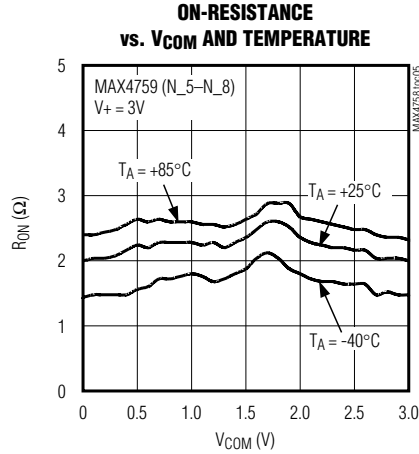
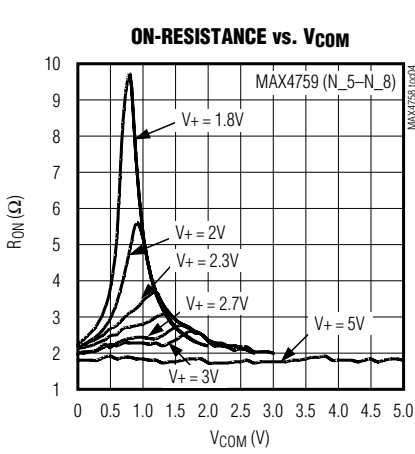


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典型工作特性 (续)

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

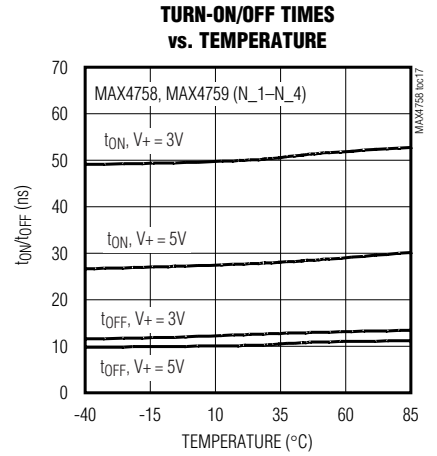
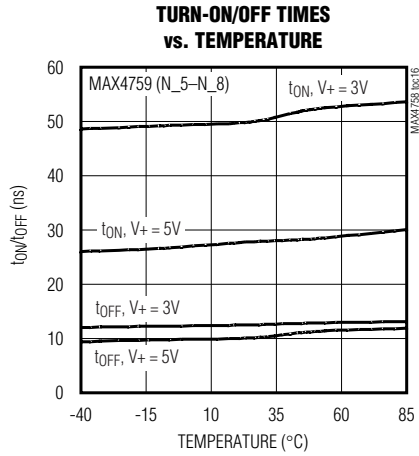
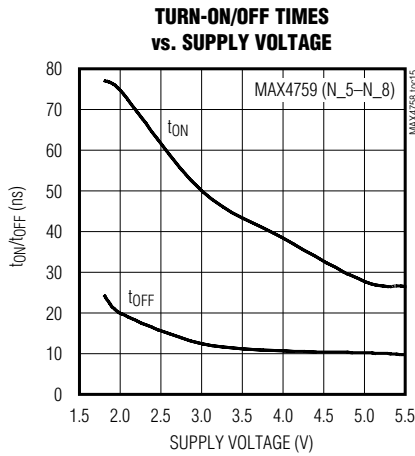
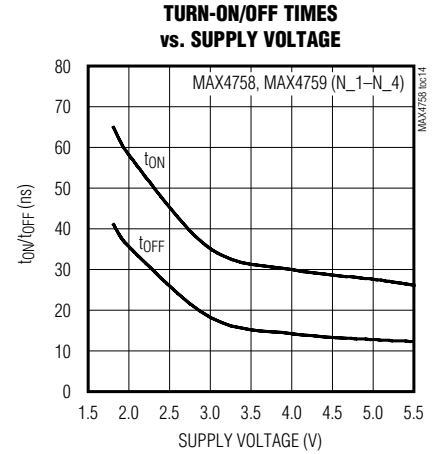
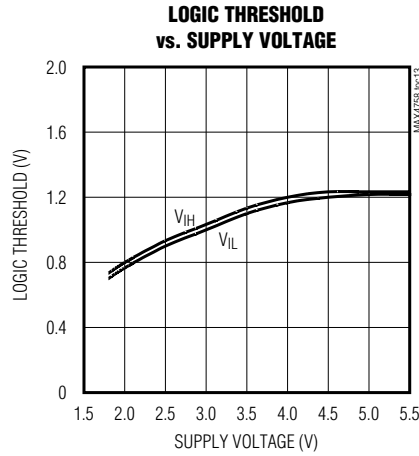
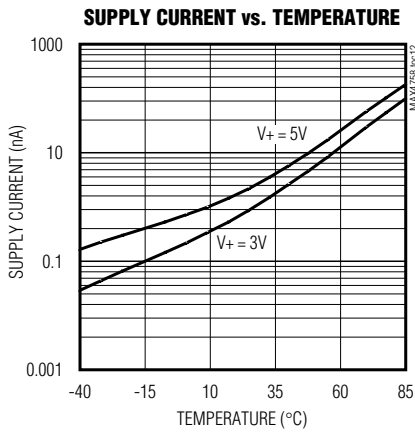
MAX4758/MAX4759



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典型工作特性 (续)

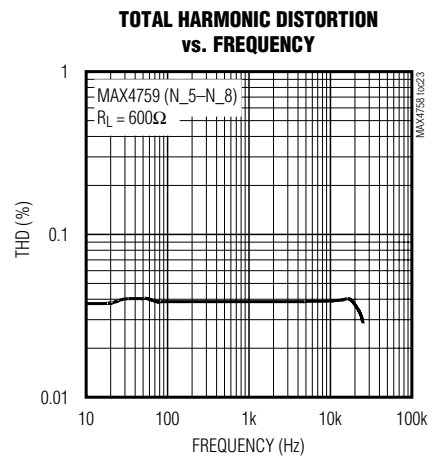
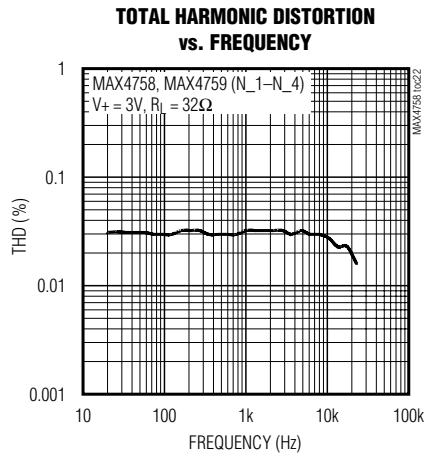
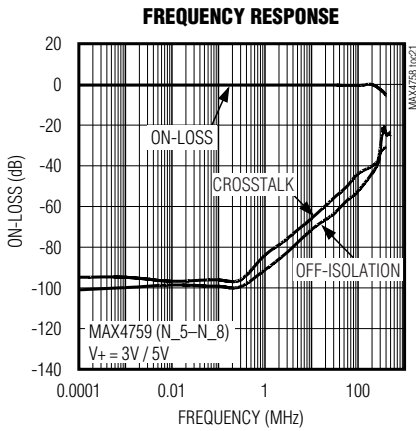
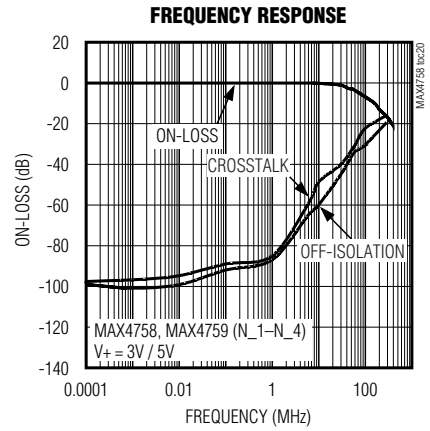
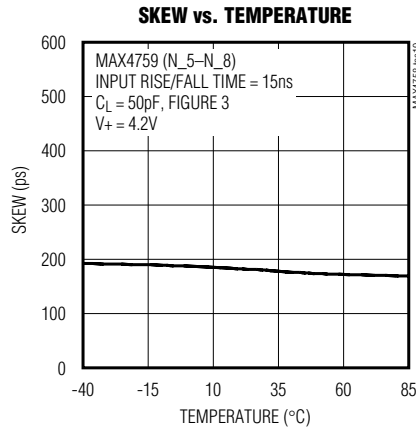
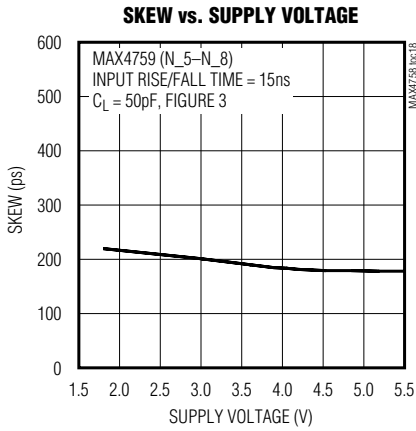
($V_+ = 3V$, $T_A = +25^\circ C$, unless otherwise noted.)



四路、DPDT 音频/数据开关, UCSP/QFN 封装

典型工作特性 (续)

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



MAX4758/MAX4759

四路、DPDT 音频/数据开关，UCSP/QFN 封装

引脚说明

MAX4758/MAX4759

引脚				名称	功能
MAX4758		MAX4759			
薄型 QFN	UCSP	薄型 QFN	UCSP		
1	A1	1	A1	NC1	模拟开关 1, 常闭端 1。
2	B2	2	B2	COM2	模拟开关 2, 公共端 2。
3	A2	3	A2	NC2	模拟开关 2, 常闭端 2。
4	A3	4	A3	INA	开关 1 和 2 的逻辑控制数字输入
5	C3, D4	5	C3, D4	V+	正电源输入
6	A4	6	A4	INB	开关 3 和 4 的逻辑控制数字输入
7	A5	7	A5	NC3	模拟开关 3, 常闭端 3。
8	B5	8	B5	COM3	模拟开关 3, 公共端 3。
9	A6	9	A6	NC4	模拟开关 4, 常闭端 4。
10	B6	10	B6	COM4	模拟开关 4, 公共端 4。
11, 14, 17, 29, 32, 35	—	11, 14, 17, 29, 32, 35	—	N.C.	未连接, 内部无连接。
12	C5	12	C5	NO3	模拟开关 3, 常开端 3。
13	C6	13	C6	NO4	模拟开关 4, 常开端 4。
15	D6	15	D6	NO8	模拟开关 8, 常开端 8。
16	D5	16	D5	NO7	模拟开关 7, 常开端 7。
18	E6	18	E6	COM8	模拟开关 8, 公共端 8。
19	F6	19	F6	NC8	模拟开关 8, 常闭端 8。
20	E5	20	E5	COM7	模拟开关 7, 公共端 7。
21	F5	21	F5	NC7	模拟开关 7, 常闭端 7。
22	F4	22	F4	IND	开关 7 和 8 的逻辑控制数字输入
23	C4, D3	23	C4, D3	GND	地
24	F3	24	F3	INC	开关 5 和 6 的逻辑控制数字输入
25	F2	25	F2	NC6	模拟开关 6, 常闭端 2。
26	E2	26	E2	COM6	模拟开关 6, 公共端 6。
27	F1	27	F1	NC5	模拟开关 5, 常闭端 5。
28	E1	28	E1	COM5	模拟开关 5, 公共端 5。
30	D2	30	D2	NO6	模拟开关 6, 常开端 6。
31	D1	31	D1	NO5	模拟开关 5, 常开端 5。
33	C1	33	C1	NO1	模拟开关 1, 常开端 1。
34	C2	34	C2	NO2	模拟开关 2, 常开端 2。
36	B1	36	B1	COM1	模拟开关 1, 公共端 1。
—	—	—	—	EN	输出使能, 低电平有效。
EP	—	EP	—	EP	裸露焊盘, 与 GND 相连。

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详细说明

MAX4758/MAX4759 为四路 DPDT 模拟开关，采用 +1.8V 至 +5.5V 单电源供电。这些器件完全规范于 +3V 电源供电的应用。

MAX4758/MAX4759 (开关 1-4) 可保证 0.5Ω 导通电阻，这使其非常适合音频切换应用。MAX4759 还提供另外四个单刀/双掷 (SPDT) 开关 (开关 5-8)，这些开关可保证 0.2Ω 导通电阻、具有 25pF 低电容和 0.2ns 偏斜变化，非常适合数据或音频切换应用。这些开关有四个逻辑输入，分别用来控制成对的开关。

应用信息

数控输入

无论采用何种电源电压，MAX4758/MAX4759 的逻辑输入端都可以承受最大 +5.5V 的电压。例如在 +3.3V 供电时，IN₋ 端可以低至 GND，也可以高至 +5.5V，这就允许混合逻辑电平共存于同一系统中。满摆幅驱动控制逻辑输入可将功耗降至最低。在 +3V 电源电压下，逻辑门限值为 0.5V (低) 和 1.4V (高)。

模拟信号电平

整个供电电压范围内 (0V 到 V_{+}) 的模拟信号输入都可通过开关，且导通电阻变化极小 (见典型工作特性)。开关是双向的，因此 NO₋、NC₋ 和 COM₋ 既可作为输入也可作为输出。

电源旁路

电源旁路能够改善噪声容限，并能阻止开关噪声从 V_{+} 电源传播到其它器件。在 V_{+} 和 GND 之间连接一个 $0.1\mu\text{F}$ 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。总是在加载模拟信号前先加 V_{+} ，特别是在输入信号没有限流的情况下。如果

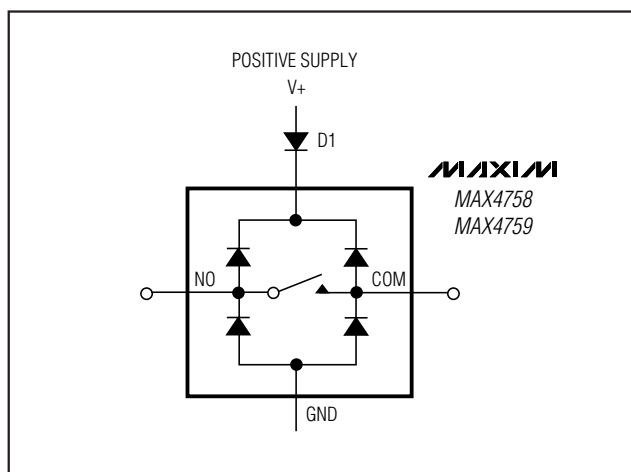


图 1. 外接隔离二极管实现过压保护

供电顺序不能保证，而且输入信号电流无法限制在 20mA 以内时，则需要加一个小信号二极管 (见图 1)。增加了这个二极管，模拟信号范围要比 V_{+} 降低一个二极管压降 (0.7V)，并会略微增大导通电阻。无论何时，最大供电电压都不能超过 +6V。

UCSP 应用信息

关于 UCSP 结构、尺寸、载带信息、印刷电路板技术、焊盘布局、推荐的回流焊温度特性，以及可靠性测试结果的最新应用数据，可从 Maxim 网站 www.maxim-ic.com.cn/ucsp 下载应用笔记：UCSP—晶片级封装。

四路、DPDT 音频/数据开关，UCSP/QFN 封装

测试电路/时序图

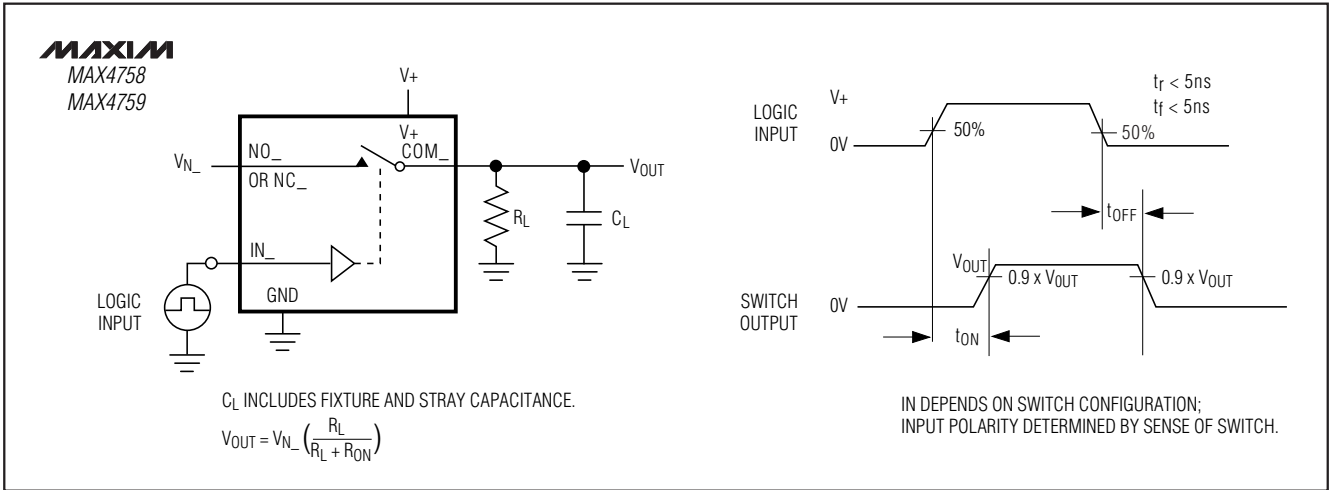


图 2. 开关时间

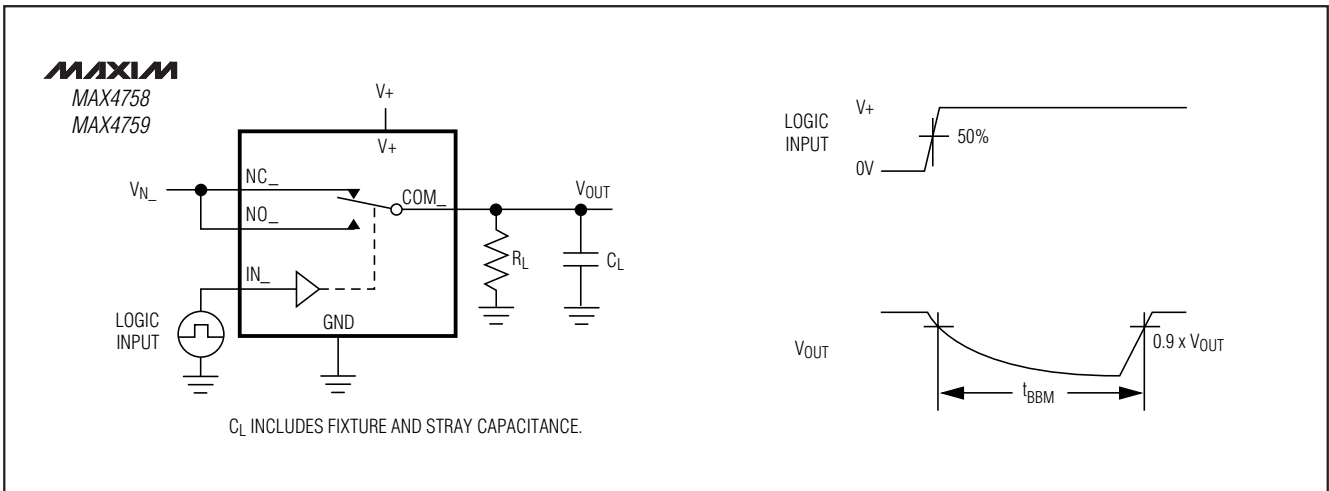


图 3. 先断后合的间隔

四路、DPDT 音频/数据开关，UCSP/QFN 封装

测试电路/时序图 (续)

MAX4758/MAX4759

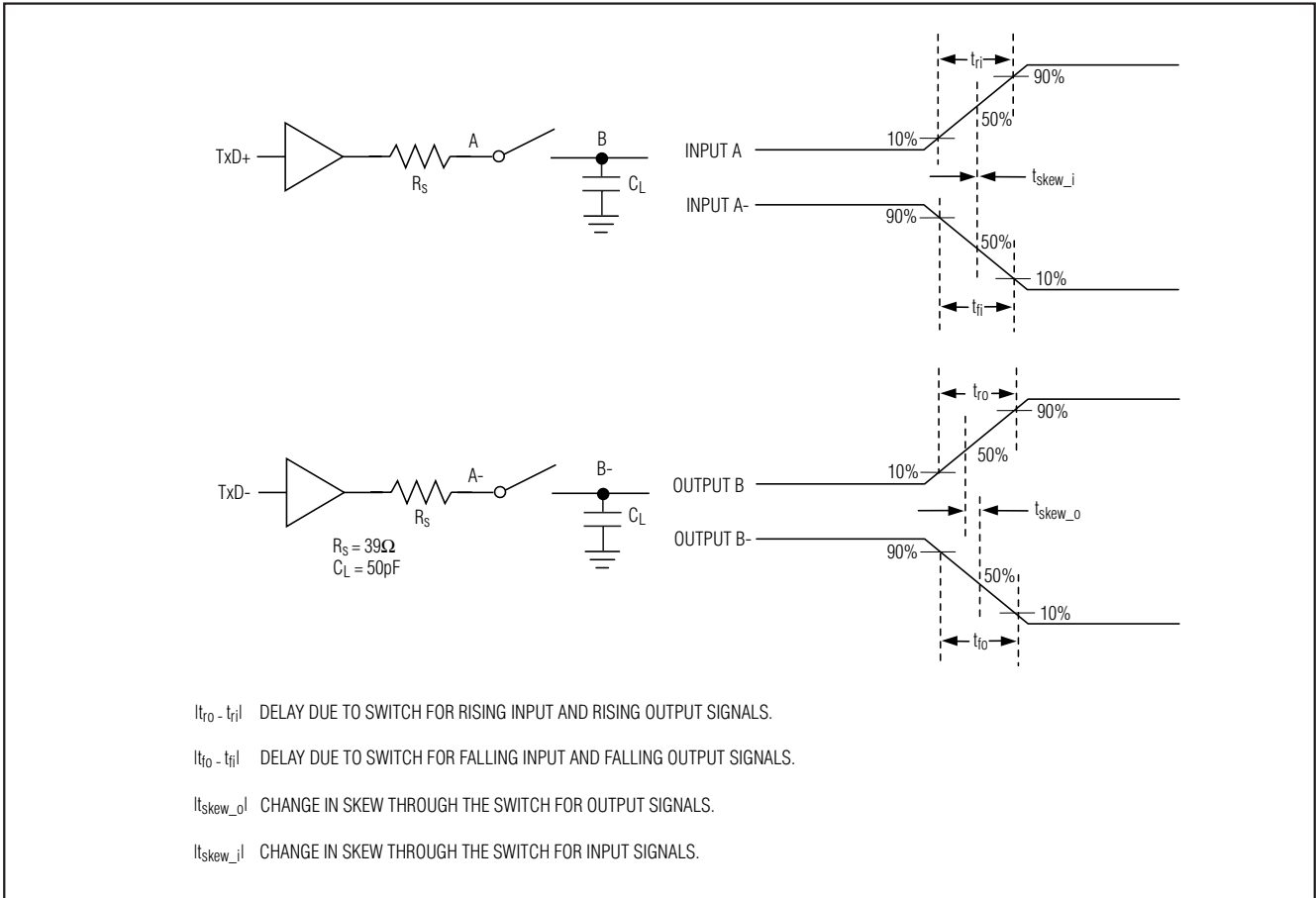


图 4. 输入/输出偏差时序图

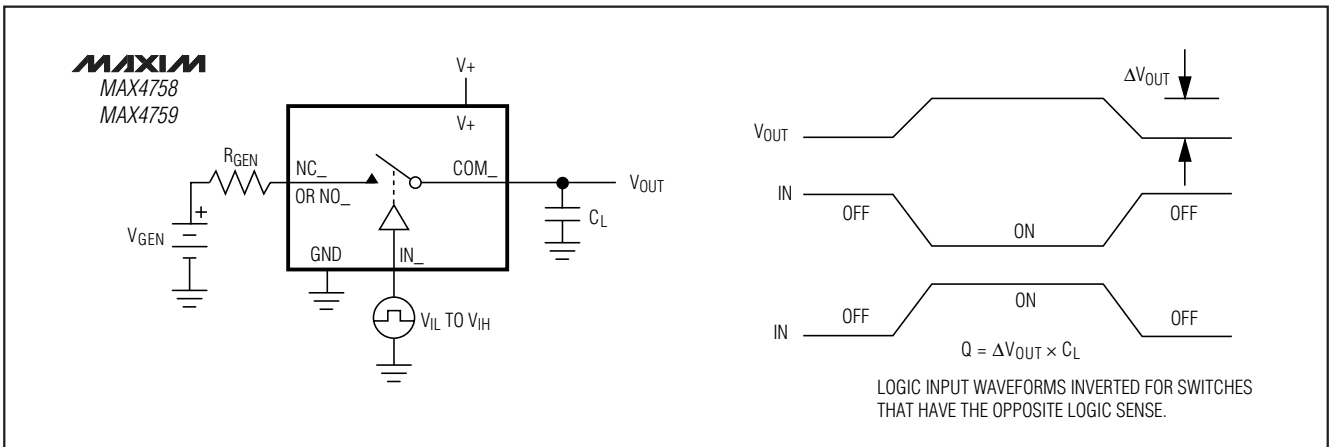


图 5. 电荷注入

四路、DPDT 音频/数据开关，UCSP/QFN 封装

测试电路/时序图 (续)

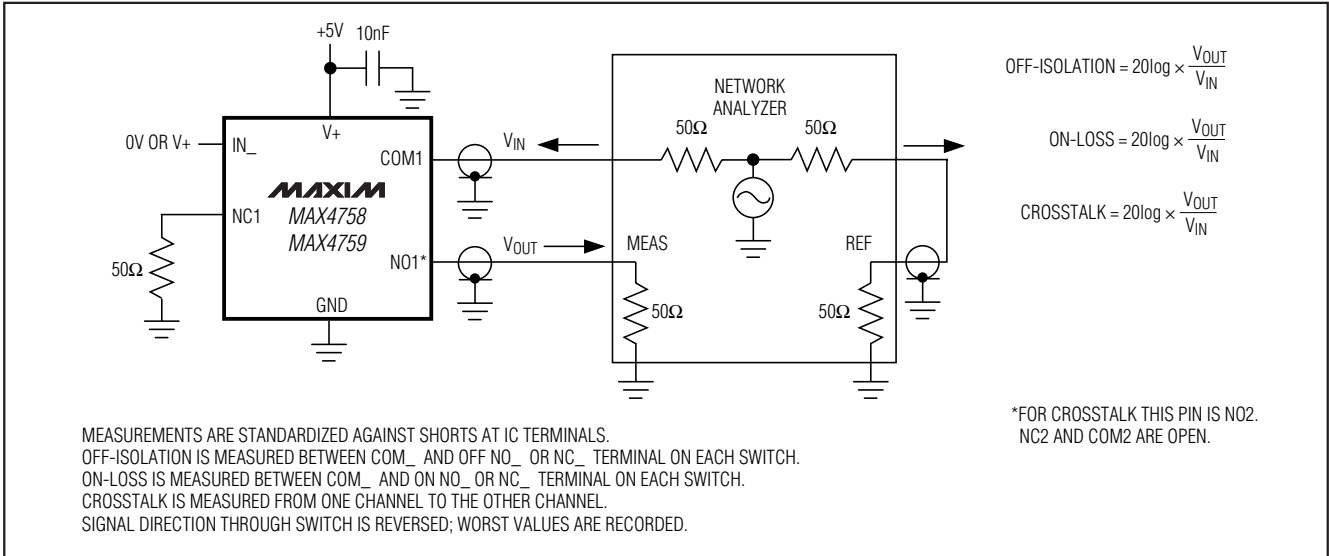


图 6. 导通损耗、关断隔离和串扰

典型工作电路

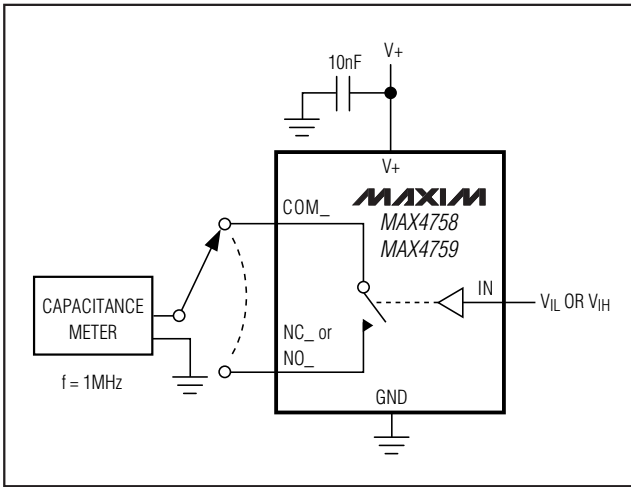
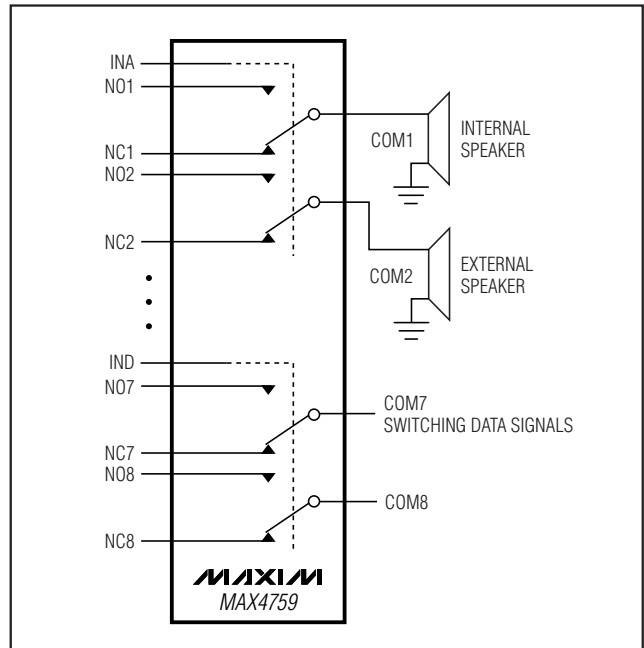


图 7. 通道开/关电容



四路、DPDT 音频/数据开关，UCSP/QFN 封装

引脚配置/真值表

MAX4758/MAX4759

TOP VIEW

MAXIM
MAX4758/MAX4759

(BUMP SIDE DOWN)

UCSP
MAX4758/MAX4759

INA	NO1/NO2	NC1/NC2
LOW	OFF	ON
HIGH	ON	OFF
INB	NO3/NO4	NC3/NC4
LOW	OFF	ON
HIGH	ON	OFF
INC	NO5/NO6	NC5/NC6
LOW	OFF	ON
HIGH	ON	OFF
IND	NO7/NO8	NC7/NC8
LOW	OFF	ON
HIGH	ON	OFF

THIN QFN

NOTE: EXPOSED PADDLE CONNECTED TO GND OR FLOATING.

芯片信息

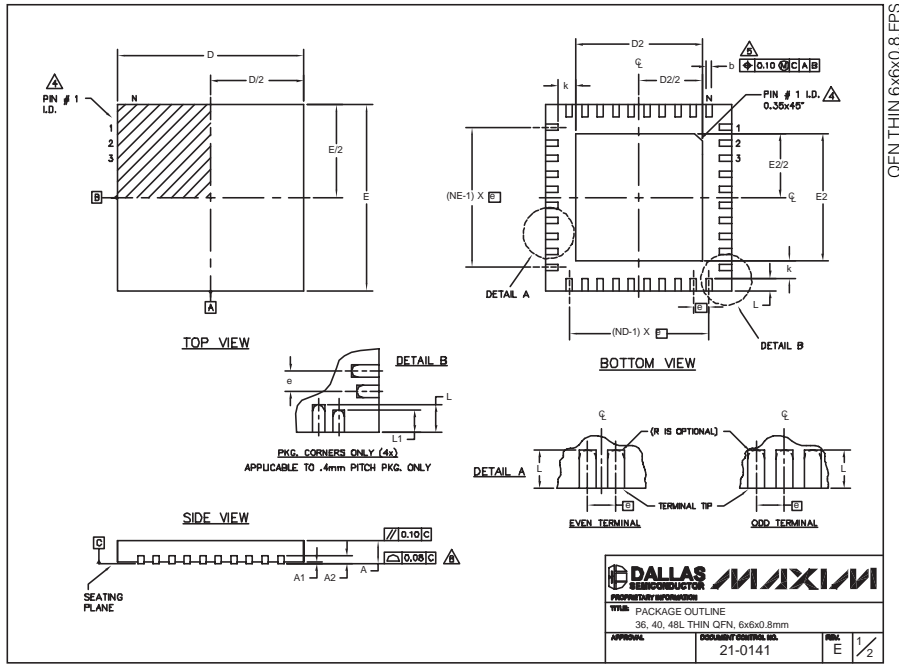
TRANSISTOR COUNT: 1432

PROCESS: CMOS

四路、DPDT 音频/数据开关，UCSP/QFN 封装

封装信息

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



COMMON DIMENSIONS									
PKG. SYMBOL	36L 6x6			40L 6x6			48L 6x6		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80
A1	0	0.02	0.05	0	0.02	0.05	0	—	0.05
A2	0.20 REF.			0.20 REF.			0.20 REF.		
b	0.20	0.25	0.30	0.20	0.25	0.30	0.15	0.20	0.25
D	5.90	6.00	6.10	5.90	6.00	6.10	5.80	6.00	6.10
E	5.90	6.00	6.10	5.90	6.00	6.10	5.80	6.00	6.10
e	0.50 BSC.			0.50 BSC.			0.40 BSC.		
k	0.25	—	—	0.25	—	—	0.25	0.35	0.45
L	0.45	0.55	0.65	0.30	0.40	0.50	0.40	0.50	0.60
L1	—	—	—	—	—	—	0.30	0.40	0.50
N	36			40			48		
ND	9			10			12		
NE	9			10			12		
JEDEC	WJJD-1			WJJD-2			—		

PKG. CODES	EXPOSED PAD VARIATIONS						DOWN BONDS ALLOWED
	D2			E2			
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
T3666-1	3.60	3.70	3.80	3.60	3.70	3.80	NO
T3666-2	3.60	3.70	3.80	3.60	3.70	3.80	YES
T3666-3	3.60	3.70	3.80	3.60	3.70	3.80	NO
T4066-1	4.00	4.10	4.20	4.00	4.10	4.20	NO
T4066-2	4.00	4.10	4.20	4.00	4.10	4.20	YES
T4066-3	4.00	4.10	4.20	4.00	4.10	4.20	YES
T4066-4	4.00	4.10	4.20	4.00	4.10	4.20	NO
T4066-5	4.00	4.10	4.20	4.00	4.10	4.20	NO
T4866-1	4.20	4.30	4.40	4.20	4.30	4.40	YES

NOTES:

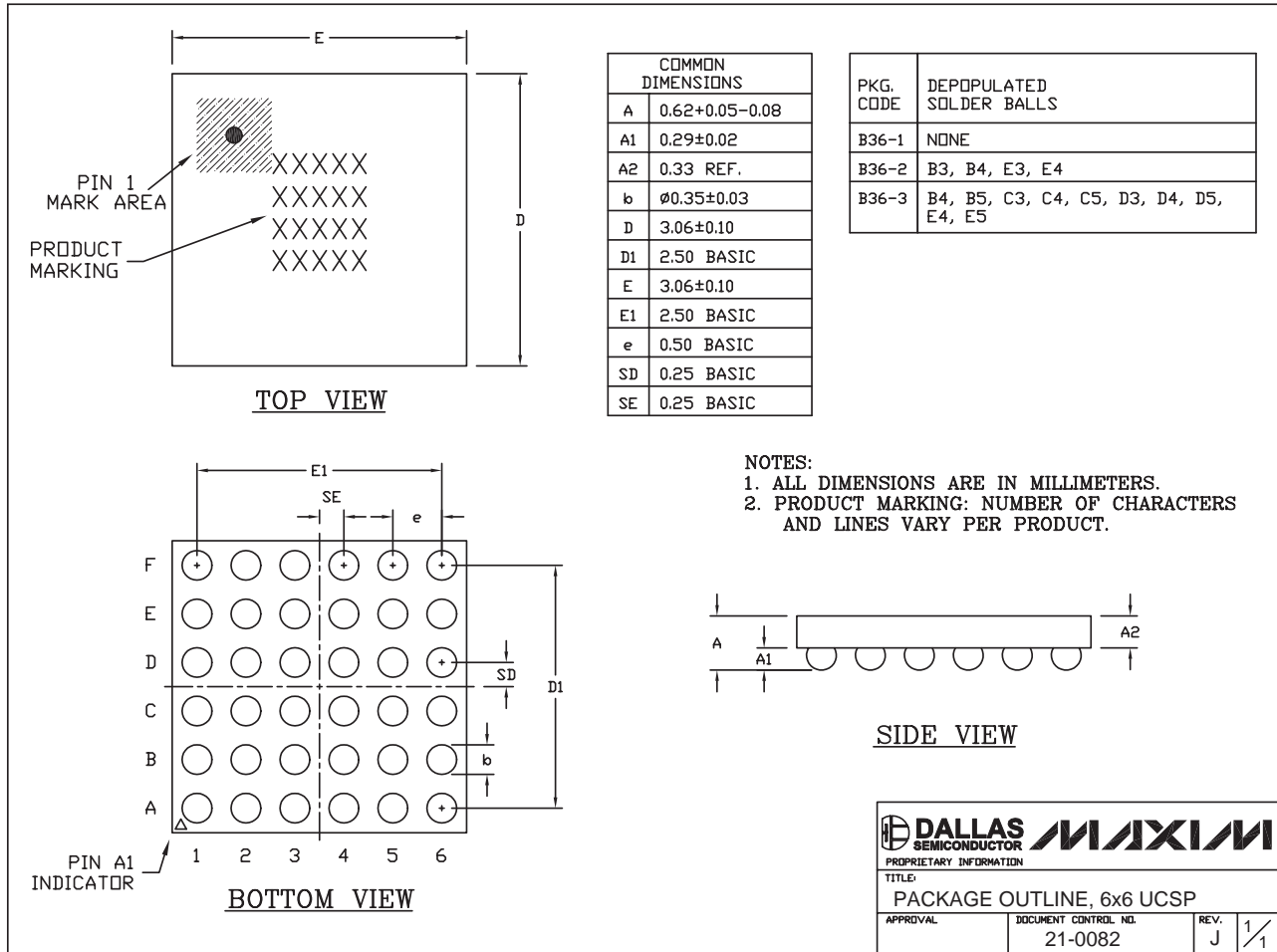
- DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
- N IS THE TOTAL NUMBER OF TERMINALS.
- THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEDEC 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, 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 MO220, EXCEPT FOR 0.4mm LEAD PITCH PACKAGE T4866-1.
- WARPAGE SHALL NOT EXCEED 0.10 mm.

DALLAS SEMICONDUCTOR
MAXIM
 PACKAGE OUTLINE
 36, 40, 48L THIN QFN, 6x6x0.8mm
 APPROVAL: DOCUMENT CONTROL, 21-0141, REL E 2/2

四路、DPDT 音频/数据开关, UCSP/QFN 封装

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, 如需最近的封装外型信息, 请查询 www.maxim-ic.com.cn/packages。)



MAX4758/MAX4759

MAXIM 北京办事处

北京 8328 信箱 邮政编码 100083
 免费电话: 800 810 0310
 电话: 010-6201 0598
 传真: 010-6201 0298

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