

MAX14759/MAX14761/MAX14763

超摆幅、低导通电阻模拟开关

概述

MAX14759/MAX14761/MAX14763模拟开关允许通过超出其电源电压摆幅的双极性信号，器件采用+3.0V至+5.5V电源供电，支持-25V至+25V的信号范围。

MAX14759为单通道单刀单掷(SPST)模拟开关，MAX14761为双路SPST模拟开关，MAX14763则为单通道单刀双掷(SPDT)模拟开关。

MAX14759具有1Ω (最大值)导通电阻和±200nA (最大值)导通漏电流。MAX14761/MAX14763具有2Ω (最大值)导通电阻和±100nA (最大值)导通漏电流。较低的导通电阻和较宽频带非常适合数字和模拟信号切换电路。

MAX14759/MAX14763提供8引脚(3mm x 3mm) TDFN封装，MAX14761提供10引脚(3mm x 3mm) TDFN封装。这些器件能够工作在-40℃至+85℃扩展级温度范围。

优势和特性

- ◆ 简化电源需求
 - ◇ +3.0V至+5.5V供电范围
 - ◇ -25V至+25V信号范围
- ◆ 高性能
 - ◇ 1Ω (最大值)或2Ω (最大值)低导通电阻
 - ◇ 低至2.4mΩ (典型值)和5.1mΩ (典型值)的R_{ON}平坦度
 - ◇ MAX14759可通过500mA (最大值)电流
 - ◇ 热关断保护
 - ◇ -40℃至+85℃工作温度范围
 - ◇ 宽带: 100MHz (典型值)
 - ◇ 高达±2kV的ESD保护
- ◆ 节省电路板空间
 - ◇ 小尺寸、8引脚和10引脚TDFN封装

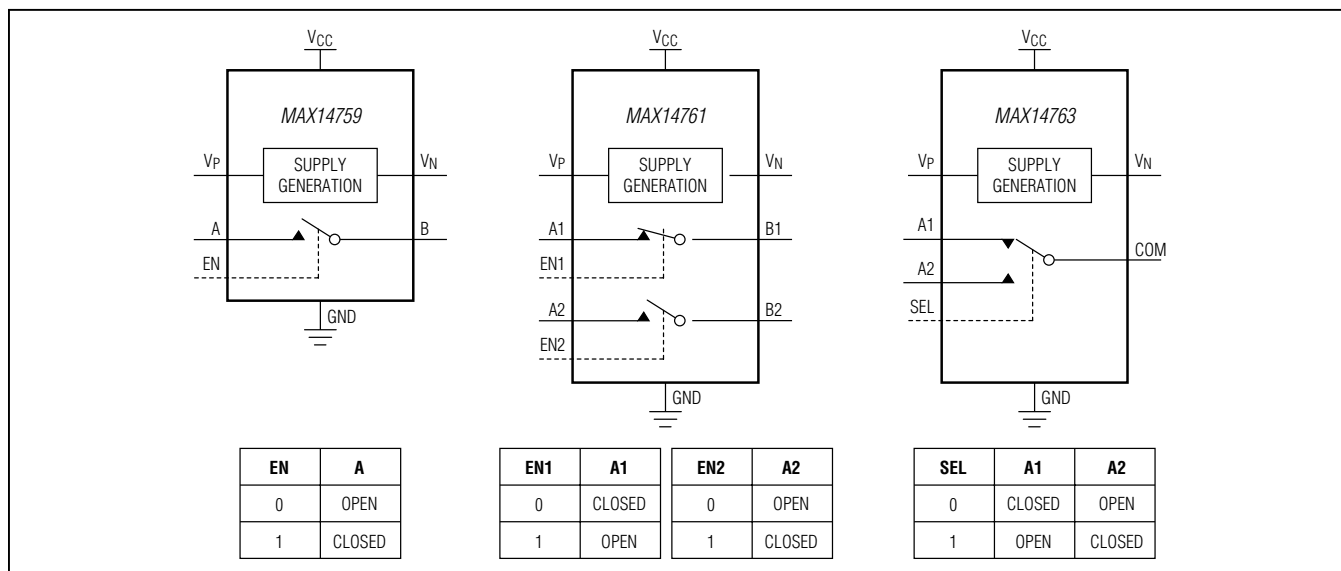
应用

订购信息/选型指南在数据资料的最后给出。

相关型号以及配合该器件使用的推荐产品，请参见：china.maxim-integrated.com/MAX14759.related。

工业测量系统
仪表系统
RS-485端接开关
CAN总线终端开关
光中继替代方案
医疗系统
ATE系统
音频信号路由和切换

功能框图/真值表



本文是英文数据资料的译文，文中可能存在翻译上的不准确或错误。如需进一步确认，请在您的设计中参考英文资料。
有关价格、供货及订购信息，请联络Maxim亚洲销售中心：10800 852 1249 (北中国区)，10800 152 1249 (南中国区)，或访问Maxim的中文网站：china.maximintegrated.com。

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ABSOLUTE MAXIMUM RATINGS

(All voltages referenced to GND, unless otherwise noted.)

V_{CC}	-0.3V to +6V
EN, EN1, EN2, SEL	-0.3V to + ($V_{CC} + 0.3V$)
A, B, A1, A2, B1, B2, COM	($V_N - 0.3V$) to Lesser of ($V_P + 0.3V$) or ($V_N + 52V$)
V_P	-0.3V to Lesser of (+52V) or ($V_N + 70V$)
V_N	Greater of ($V_{CC} - 40V$) or ($V_P - 70V$) to +0.3V
V_P to V_N	-0.3V to +70V
Continuous Current Through Switch (MAX14759)	±500mA

Continuous Current Through Switch

(MAX14761, MAX14763) ±250mA

Continuous Power Dissipation ($T_A = +70^\circ\text{C}$)

8-Pin TDFN Package

(derate 24.4mW/ $^\circ\text{C}$ above +70 $^\circ\text{C}$) 1951.2mW

10-Pin TDFN Package

(derate 24.4mW/ $^\circ\text{C}$ above +70 $^\circ\text{C}$) 1951.2mW

Operating Temperature Range -40 $^\circ\text{C}$ to +85 $^\circ\text{C}$

Storage Temperature Range -65 $^\circ\text{C}$ to +160 $^\circ\text{C}$

Lead Temperature (soldering, 10s) +300 $^\circ\text{C}$

Soldering Temperature (reflow) +260 $^\circ\text{C}$

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.

PACKAGE THERMAL CHARACTERISTICS (Note 1)

8-Pin TDFN

Junction-to-Ambient Thermal Resistance (θ_{JA}) 48 $^\circ\text{C}/\text{W}$

Junction-to-Case Thermal Resistance (θ_{JC}) 8 $^\circ\text{C}/\text{W}$

10-Pin TDFN

Junction-to-Ambient Thermal Resistance (θ_{JA}) 41 $^\circ\text{C}/\text{W}$

Junction-to-Case Thermal Resistance (θ_{JC}) 9 $^\circ\text{C}/\text{W}$

Note 1: Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, refer to china.maxim-ic.com/thermal-tutorial.

ELECTRICAL CHARACTERISTICS

($V_{CC} = +3.0V$ to +5.5V, $T_A = -40^\circ\text{C}$ to +85 $^\circ\text{C}$, unless otherwise noted. Typical values are at $V_{CC} = 5V$ and $T_A = +25^\circ\text{C}$.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC CHARACTERISTICS						
Power Supply Range	V_{CC}		3.0		5.5	V
Continuous Current Through Switch	$I_{A_}$	(MAX14759)	-500		+500	mA
		(MAX14761/MAX14763)	-250		+250	
Supply Current	I_{CC}	$V_{CC} \leq 4.7V$	$V_{EN_} = V_{CC}$		4.1	mA
			$V_{EN_} = V_{CC}/2$		10	
		$V_{CC} > 4.7V$	$V_{EN_} = V_{CC}$		2.5	
			$V_{EN_} = V_{CC}/2$		6	
Analog-Signal Range	$V_{COM}, V_{A_}, V_{B_}$	Switch open or closed	-25		+25	V
On-Resistance	R_{ON}	$I_B = \pm 500mA, V_A = \pm 25V$ (MAX14759)		0.6	1	Ω
		I_{COM} or $I_{B_} = \pm 250mA, V_{A_} = \pm 25V$ (MAX14761/MAX14763)		1.2	2	
On-Resistance Flatness	ΔR_{ON}	$-25V < V_A < +25V, I_B = \pm 500mA$ (MAX14759)		2.4		m Ω
		$-25V < V_{A_} < +25V, I_{B_}$ or $I_{COM} = \pm 250mA$ (MAX14761/MAX14763)		5.1		
A, A1, A2 Off-Leakage Current	$I_{A_ (OFF)}$	$V_A = +25V, V_B = 0V$, Figure 1 (MAX14759)	-250		+250	nA
		$V_{A_} = +25V, V_{COM}$ or $V_{B_} = 0V$, Figure 1 (MAX14761/MAX14763)	-250		+250	
COM, B, B1, B2 Off-Leakage Current	$I_{COM (OFF)}, I_{B_ (OFF)}$	V_{COM} or $V_B = 15V, V_{A_} = 0V$, Figure 1 (MAX14759/MAX14763)	-100		+100	nA
		$V_{B_} = 15V, V_{A_} = 0V$, Figure 1 (MAX14761)	-100		+100	

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ELECTRICAL CHARACTERISTICS (continued)

($V_{CC} = +3.0V$ to $+5.5V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$, unless otherwise noted. Typical values are at $V_{CC} = 5V$ and $T_A = +25^{\circ}C$.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
On-Leakage Current	I _{ON}	V _A = ±25V, B1, B2, or COM are unconnected, Figure 1 (MAX14759)	-200		+200	nA
		V _A = ±25V, B1, B2, or COM are unconnected, Figure 1 (MAX14761)	-100		+100	
		V _A = ±25V, B1, B2, or COM are unconnected, Figure 1 (MAX14763)	-250		+250	
DIGITAL LOGIC						
Input-Voltage Low	V _{IL}	V _{CC} = 3.0V			0.7	V
		V _{CC} = 3.6V			0.7	
		V _{CC} = 4.5V			0.8	
		V _{CC} = 5.5V			0.8	
Input-Voltage High	V _{IH}	V _{CC} = 3.0V	1.7			V
		V _{CC} = 3.6V	1.9			
		V _{CC} = 4.5V	2.0			
		V _{CC} = 5.5V	2.1			
Input Current	I _L		-1		+1	μA
AC CHARACTERISTICS						
Power-On Time	t _{PWRON}	V _{A_} = ±10V, C _{VP} = C _{VN} = 1μF, Note 3		320		ms
Enable Turn-On Time	t _{ON}	V _{A_} = ±10V, R _L = 10kΩ, Figure 2 (MAX14759/MAX14761)		152	300	μs
		V _{A_} = ±10V, R _L = 10kΩ, Figure 2 (MAX14763)		1.12	1.8	ms
Enable Turn-Off Time	t _{OFF}	V _{A_} = ±10V, R _L = 10kΩ, Figure 2		300	1000	μs
Break-Before-Make Interval	t _{BBM}	V _{A_} = 1V _{RMS} , R _L = 10kΩ, Figure 3 (MAX14763)		740		μs
Off-Isolation	V _{ISO}	V _{A_} = 1V _{RMS} , f = 100kHz, R _L = 50Ω, C _L = 15pF, Figure 4		-77		dB
Crosstalk	V _{CT}	R _S = R _L = 50Ω, f = 100kHz, V _{COM} = 1V _{RMS} , Figure 5 (MAX14763)		-83		dB
-3dB Bandwidth	BW	R _S = 50Ω, R _L = 50Ω , V _{A_} = 1V _{P-P} , Figure 6		100		MHz
Total Harmonic Distortion Plus Noise	THD+N	R _S = R _L = 1kΩ, f = 20Hz to 20kHz		0.0012		%
Charge Injection	Q	V _{A_} = GND, C _L = 1nF, Figure 7		1370		pC
Input Capacitance	C _{IN}	At A, A1, A2, B, B1, B2, and COM pins		58		pF
THERMAL PROTECTION						
Thermal Shutdown Temperature	t _{HYST}			+154		°C
Shutdown Temperature Hysteresis	t _{SHUT}			24		°C
ESD PROTECTION						
All Pins		Human Body Model		±2		kV

Note 2: All devices are 100% production tested at $T_A = +25^{\circ}C$. Specifications over operating temperature range are guaranteed by design.

Note 3: The power-on time is defined as the settling time for the charge pump's output to reach steady-state value within 1%.

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测试电路/时序图

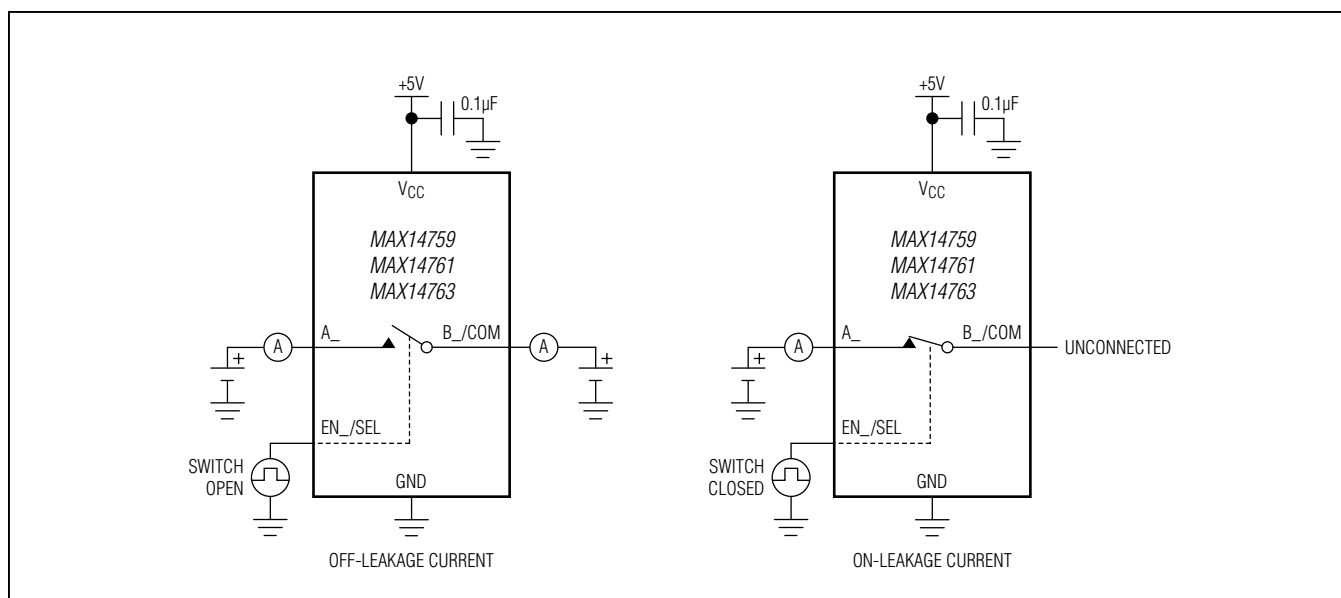


图1. 漏电流测量

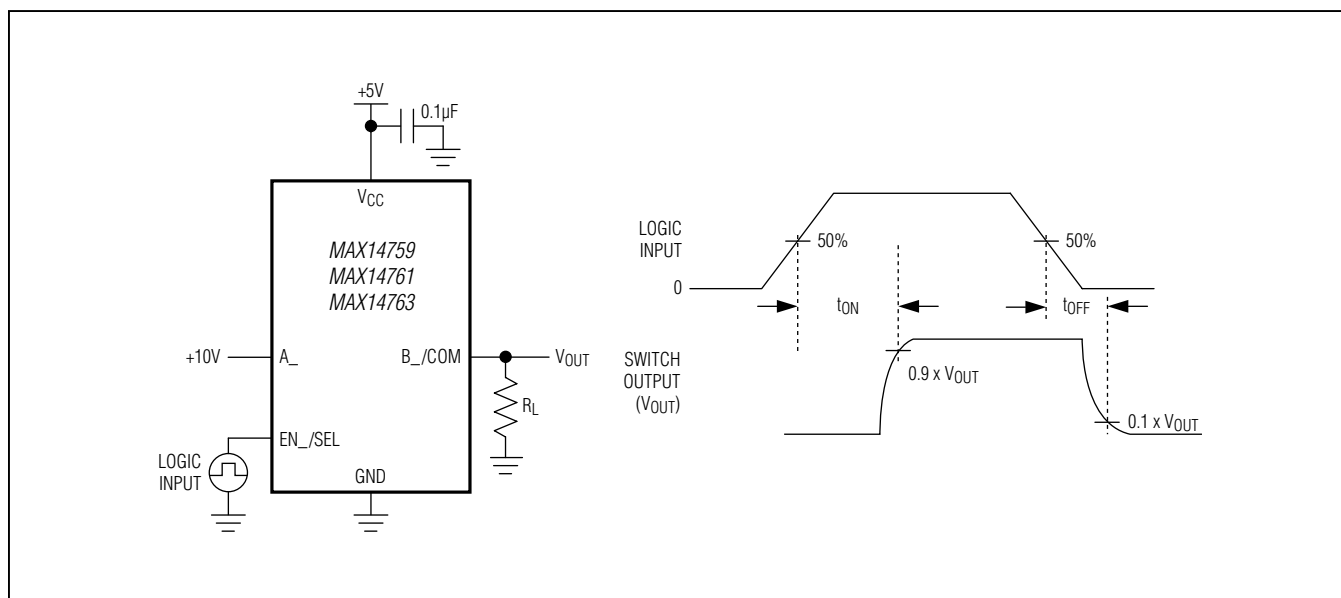


图2. 开关时间

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测试电路/时序图(续)

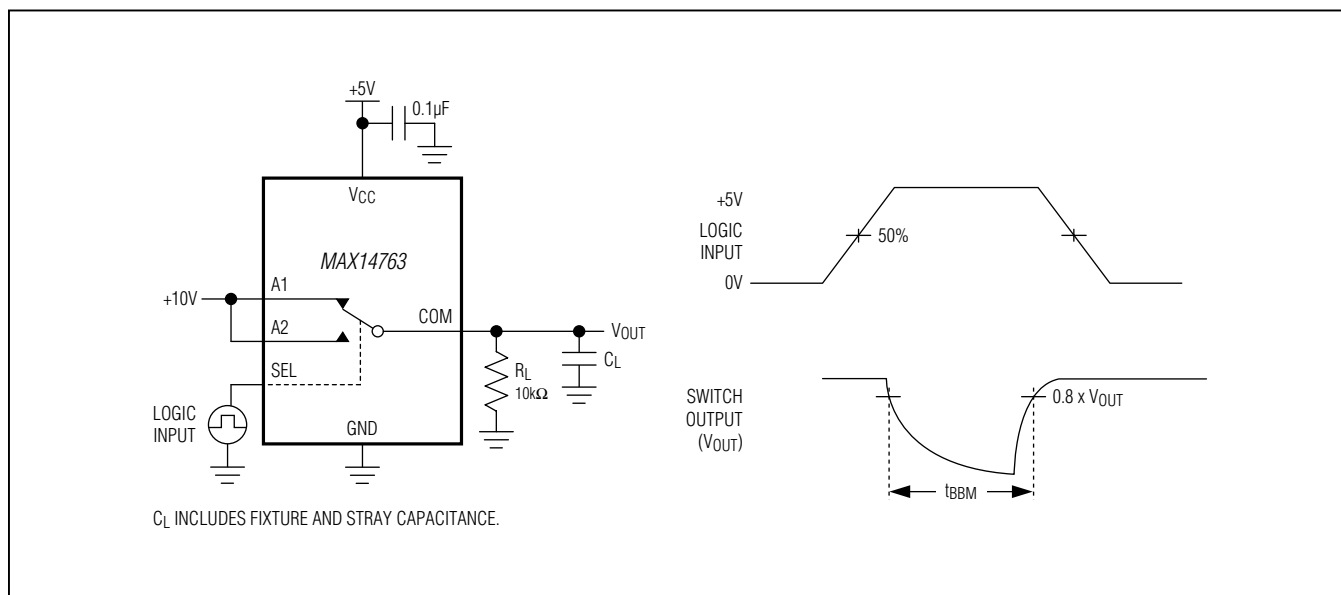


图3. 先开后合

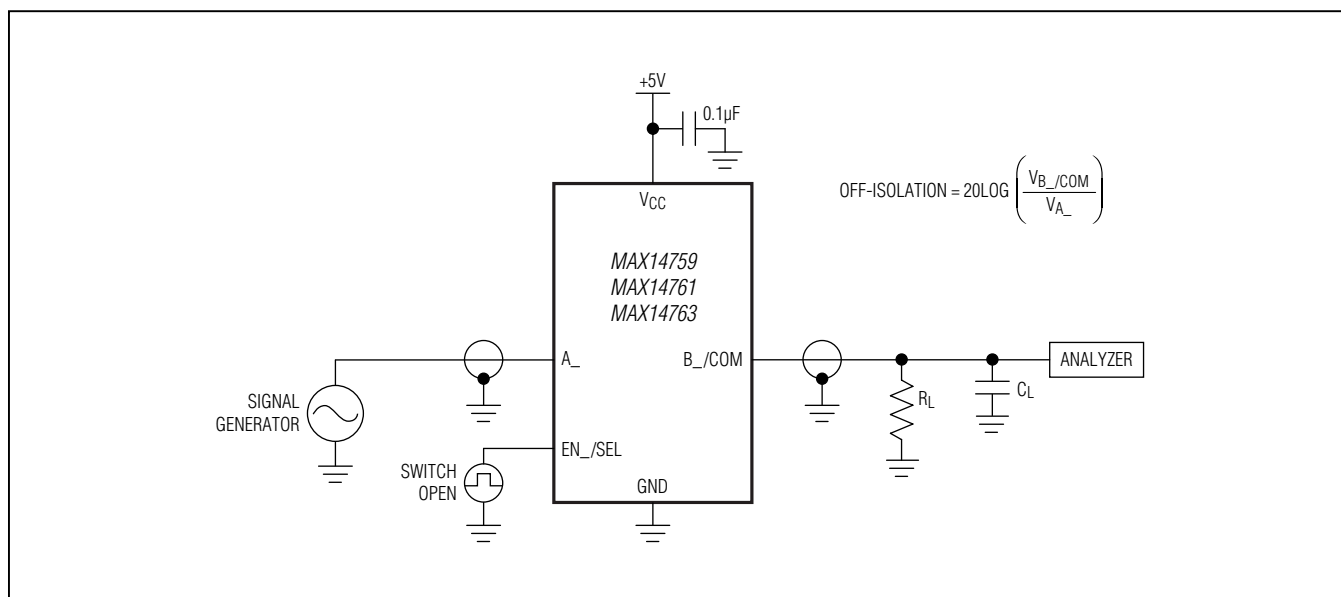


图4. 关断隔离

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测试电路/时序图(续)

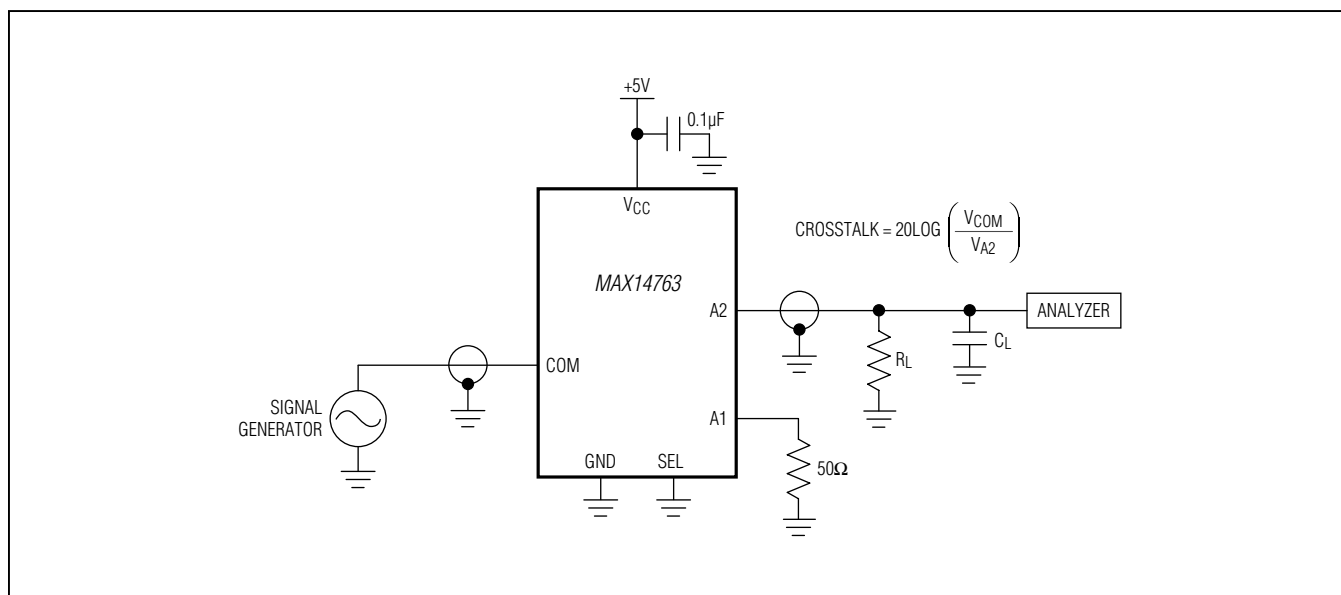


图5. 串扰

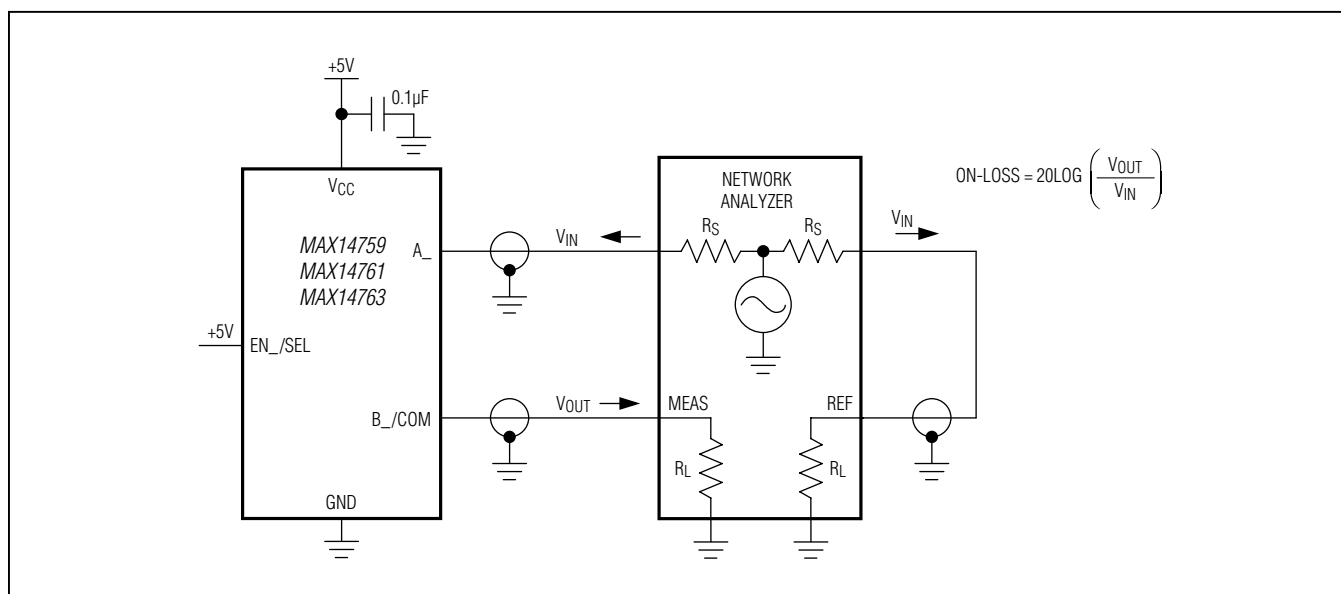


图6. 插入损耗

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测试电路/时序图(续)

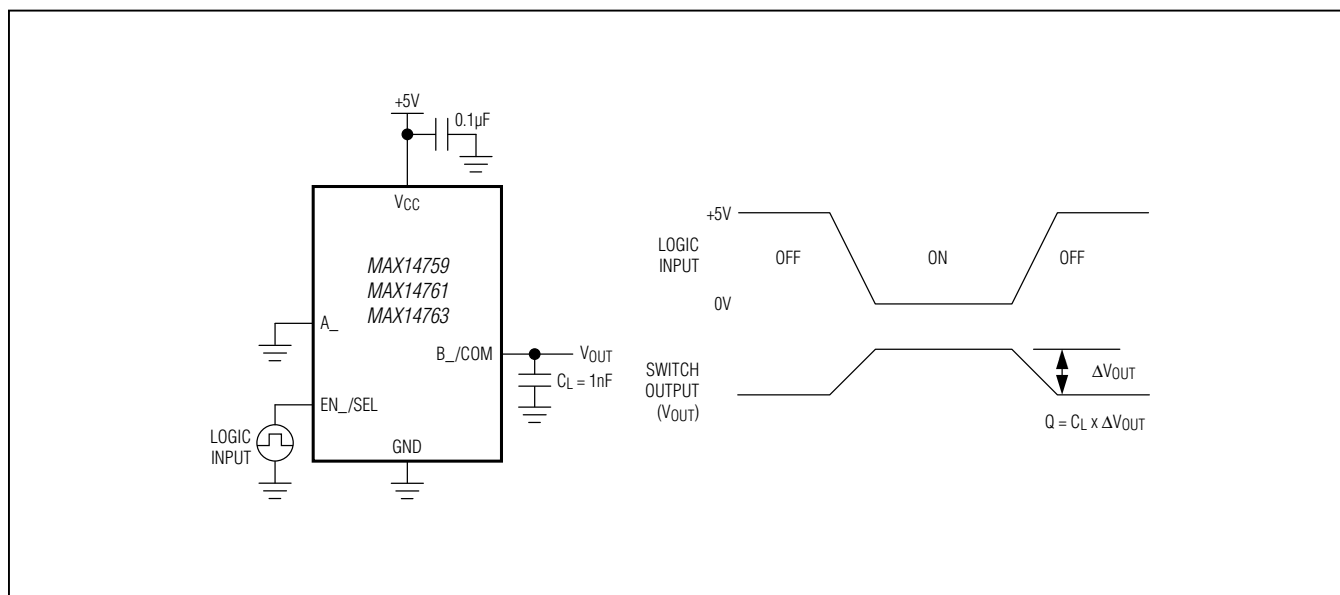
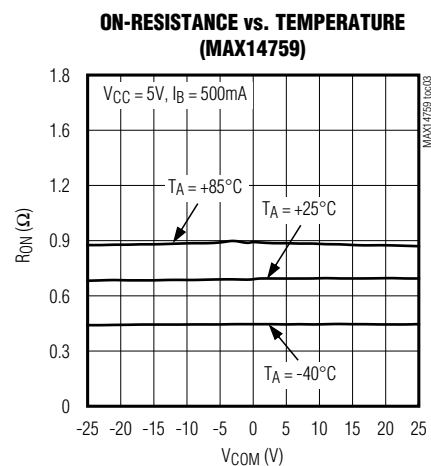
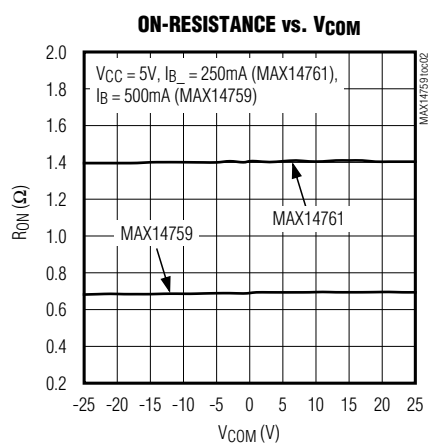
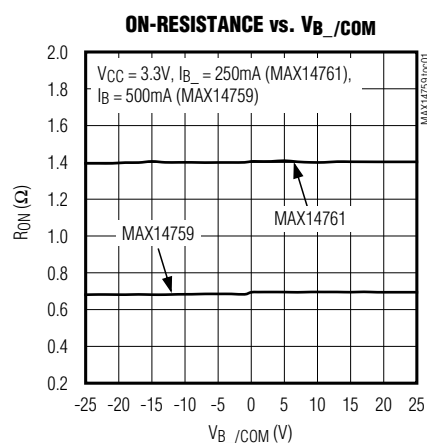


图7. 电荷注入

典型工作特性

($T_A = +25^\circ\text{C}$, unless otherwise noted.)



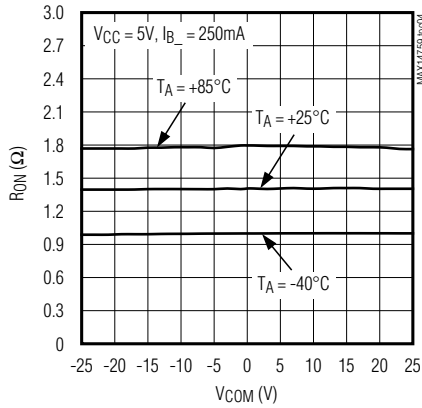
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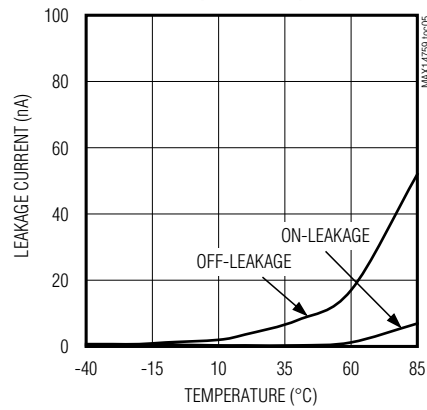
典型工作特性(续)

($T_A = +25^\circ\text{C}$, unless otherwise noted.)

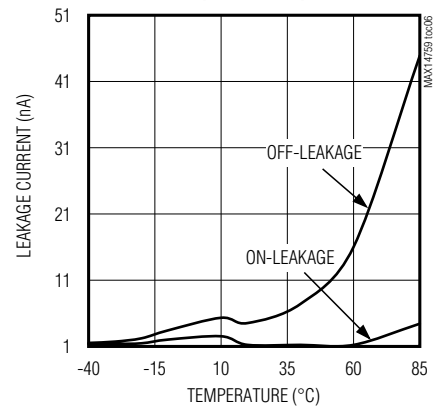
ON-RESISTANCE vs. V_{COM}
(MAX14761)



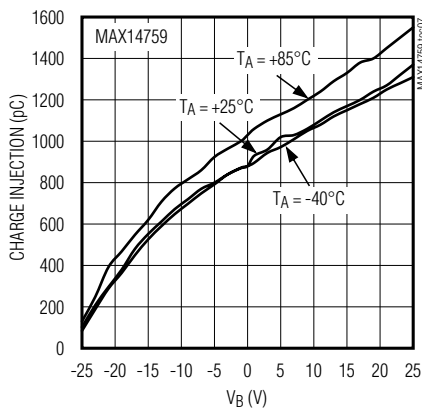
LEAKAGE CURRENT vs. TEMPERATURE
(MAX14759)



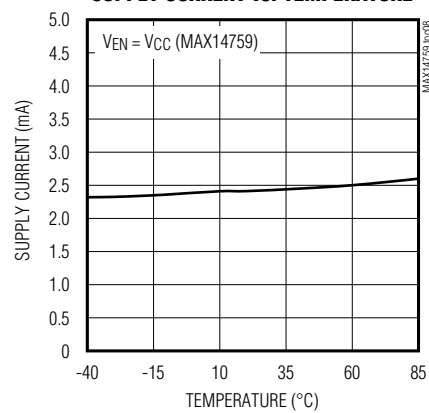
LEAKAGE CURRENT vs. TEMPERATURE
(MAX14761)



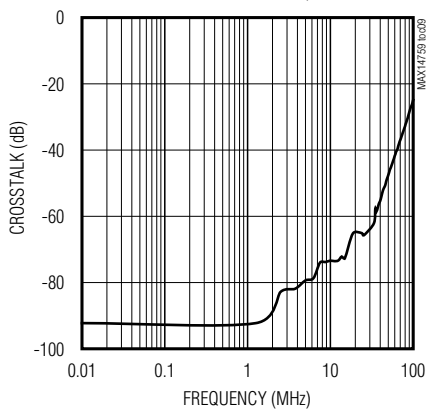
CHARGE INJECTION vs. V_B



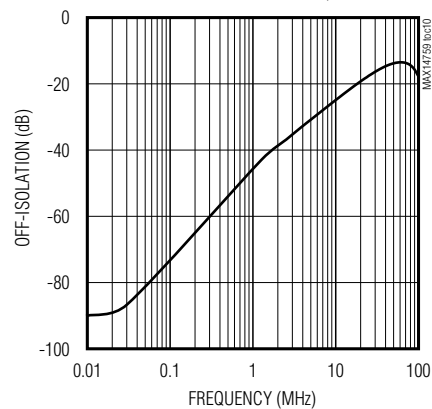
SUPPLY CURRENT vs. TEMPERATURE



CROSSTALK vs. FREQUENCY



OFF-ISOLATION vs. FREQUENCY

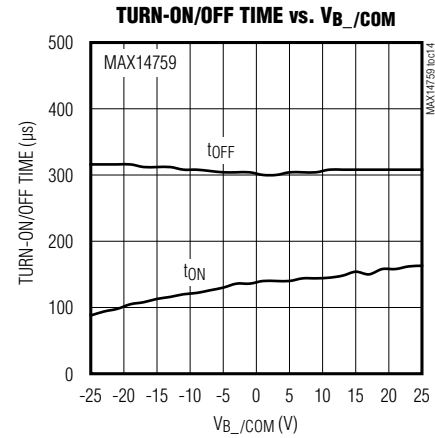
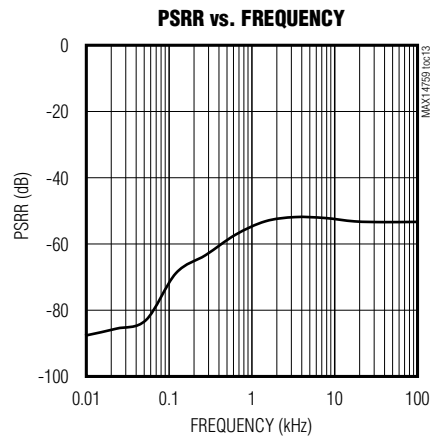
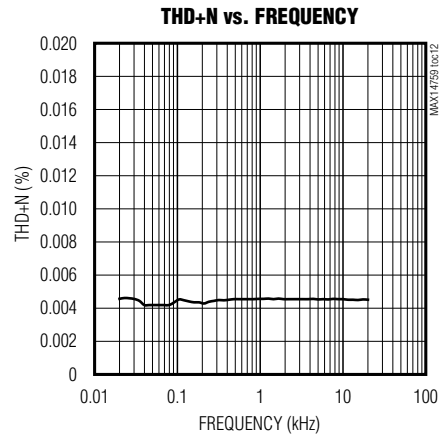
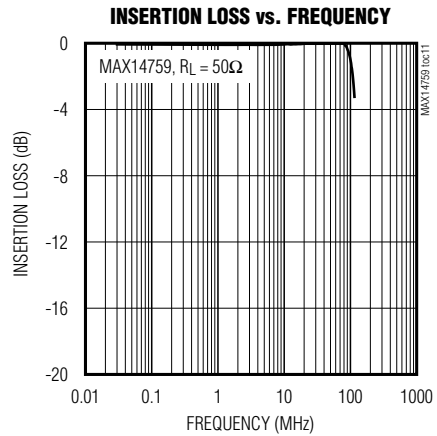


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典型工作特性(续)

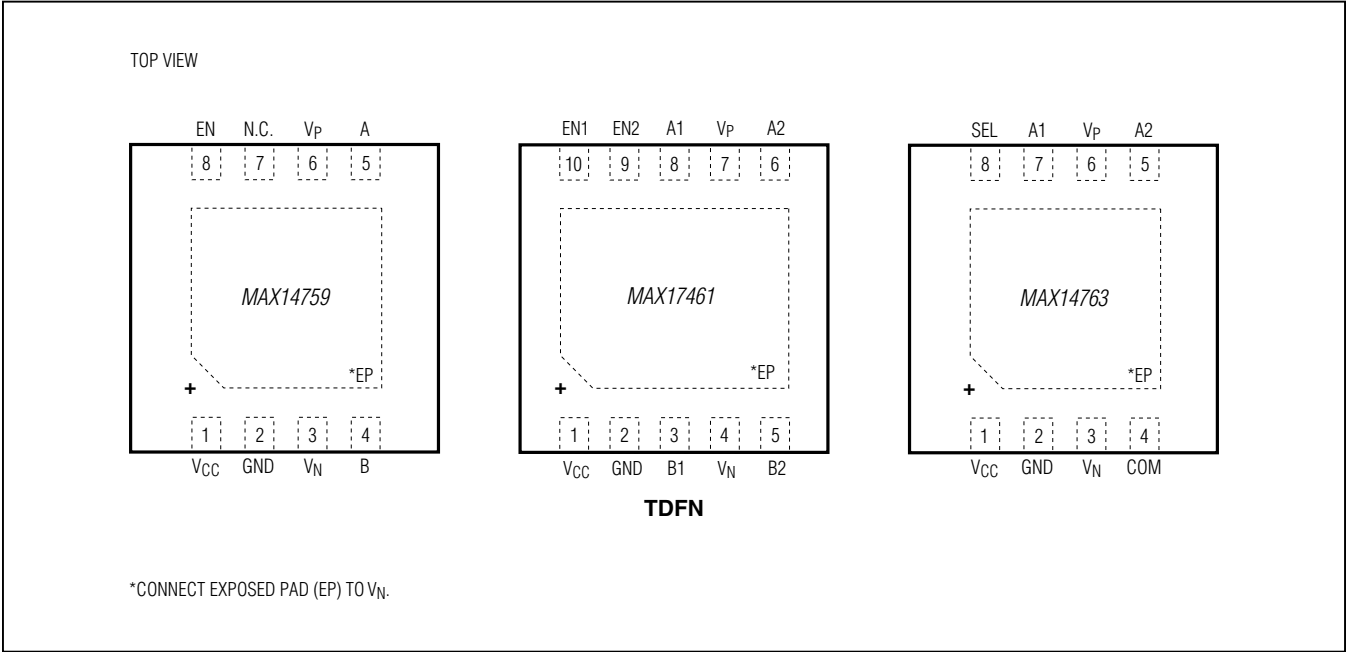
($T_A = +25^\circ\text{C}$, unless otherwise noted.)



MAX14759/MAX14761/MAX14763

超摆幅、低导通电阻模拟开关

引脚配置



引脚说明

引脚			名称	功能
MAX14759	MAX14761	MAX14763		
1	1	1	V_{CC}	正电源电压输入，利用0.1 μ F陶瓷电容将 V_{CC} 旁路至GND，电容须尽量靠近器件放置。
2	2	2	GND	地。
3	4	3	V_N	负电压输出，利用1 μ F陶瓷电容将 V_N 旁路至GND，电容须尽量靠近器件放置。
4	—	—	B	模拟开关公共端。
—	—	4	COM	模拟开关公共端。
5	—	—	A	模拟开关常开端。
6	7	6	V_P	正电压输出，利用1 μ F陶瓷电容将 V_P 旁路至GND，电容须尽量靠近器件放置。
7	—	—	N.C.	无连接，保持浮空。
8	—	—	EN	开关控制输入，将EN驱动为高电平闭合开关，或将EN驱动为低电平断开开关。
—	8	7	A1	模拟开关1常闭端。

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引脚说明(续)

引脚			名称	功能
MAX14759	MAX14761	MAX14763		
—	3	—	B1	模拟开关1公共端。
—	6	5	A2	模拟开关2常开端。
—	5	—	B2	模拟开关2公共端。
—	10	—	EN1	开关1控制输入，将EN1驱动为高电平断开开关1，或将EN1驱动为低电平闭合开关1。
—	9	—	EN2	开关2控制输入，将EN2驱动为高电平闭合开关2，或将EN2驱动为低电平断开开关2。
—	—	8	SEL	开关控制输入，将SEL驱动为低电平时，COM端连接至A1；将SEL驱动为高电平时，COM端连接至A2。
—	—	—	EP	裸焊盘。内部连接至V _N ，不要将其作为电气连接，裸焊盘应保持浮空。

详细说明

MAX14759/MAX14761/MAX14763为模拟开关，能够处理超摆幅信号。器件采用+3.0V至+5.5V单电源供电，可处理-25V至+25V范围的信号。低导通电阻和较宽频带使其非常适合数字和模拟信号切换应用。

模拟信号范围

器件能够切换-25V至+25V范围的超摆幅信号，在-25V至+25V整个输入电压范围内，器件导通电阻保持较高的平坦度：2.4mΩ (MAX14759典型值)和5.1mΩ (MAX14761/MAX14763典型值)。模拟开关允许通过双向电流，所以A、A1、A2、B、B1、B2和COM既可作为输入，也可作为输出。

旁路电容

V_P和V_N引脚上需要接外部电容，以稳定偏置。建议采用1μF陶瓷电容，确保可靠工作。不要将V_P和V_N用作其它电路的供电电源。

应用信息

上电条件

V_{CC}上电1秒内确保A₋、B₋或COM输入端没有负信号。

差分匹配电阻开关

MAX14759可用于接入或断开差分匹配电阻。在RS-485和CAN总线应用中，高速传输线两端都需要连接匹配电阻。[图8](#)和[图9](#)所示为使用两个相同电阻匹配RS-485和CAN总线的应用，这些开关支持RS-485总线-7V至+12V的高共模范围。

在RS-232/RS-485多协议应用中，MAX14759可用于接入RS-485的匹配电阻，而在RS-232工作状态下可以断开匹配电阻，如[图10](#)所示。

MAX14761可以在RS-485应用中理想切换失效保护偏置电阻，如[图11](#)和[图12](#)所示。

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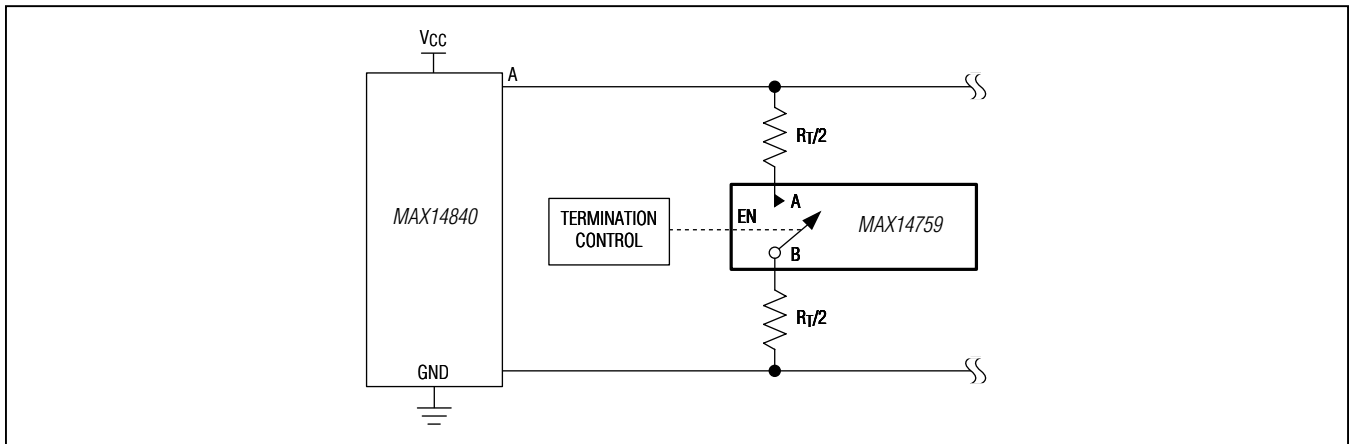


图8. RS-485端接开关

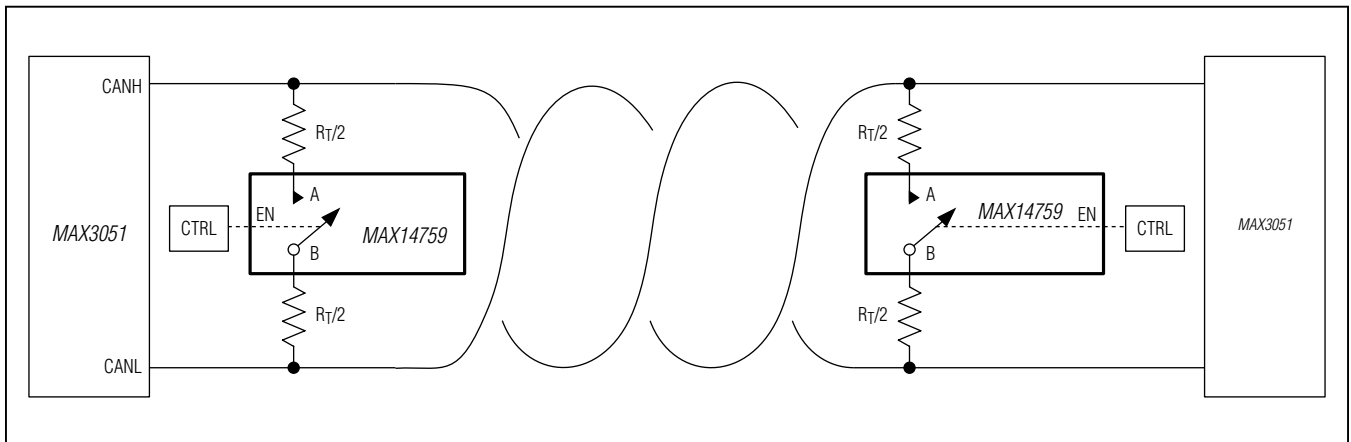


图9. CAN端接开关

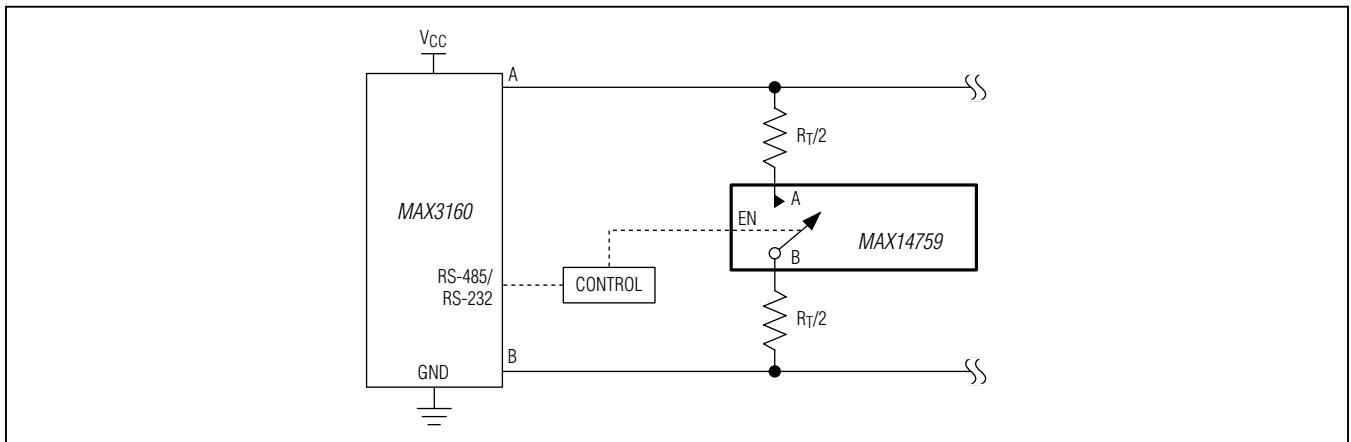


图10. 多协议端接开关

MAX14759/MAX14761/MAX14763

超摆幅、低导通电阻模拟开关

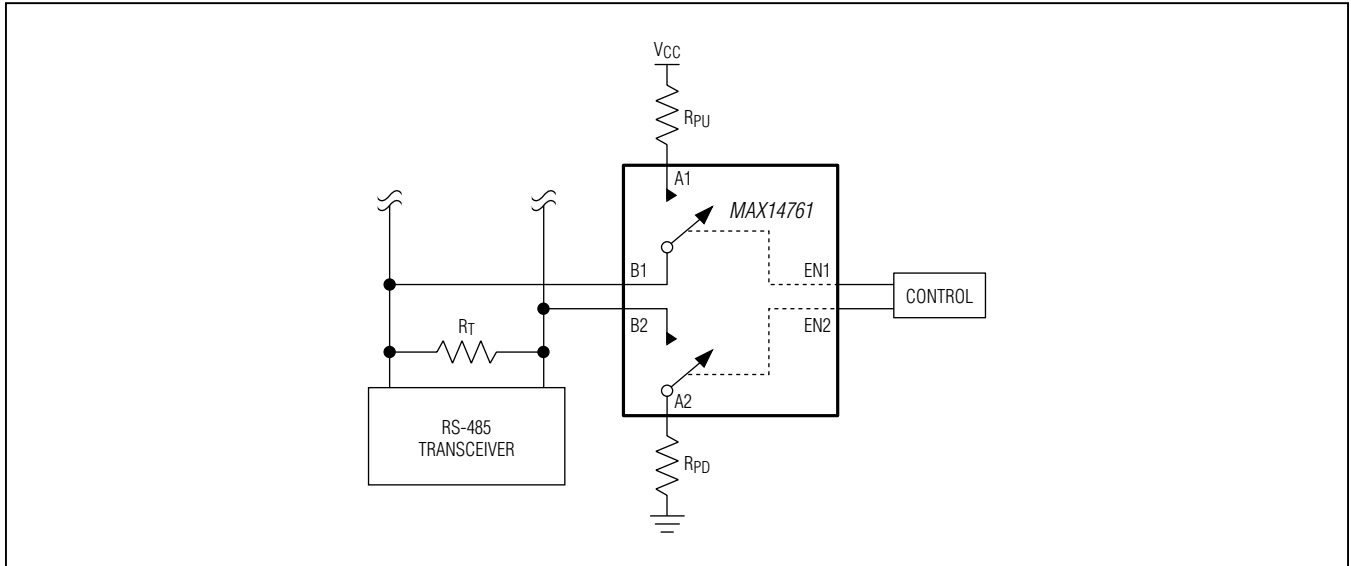


图11. 上拉和下拉电阻开关

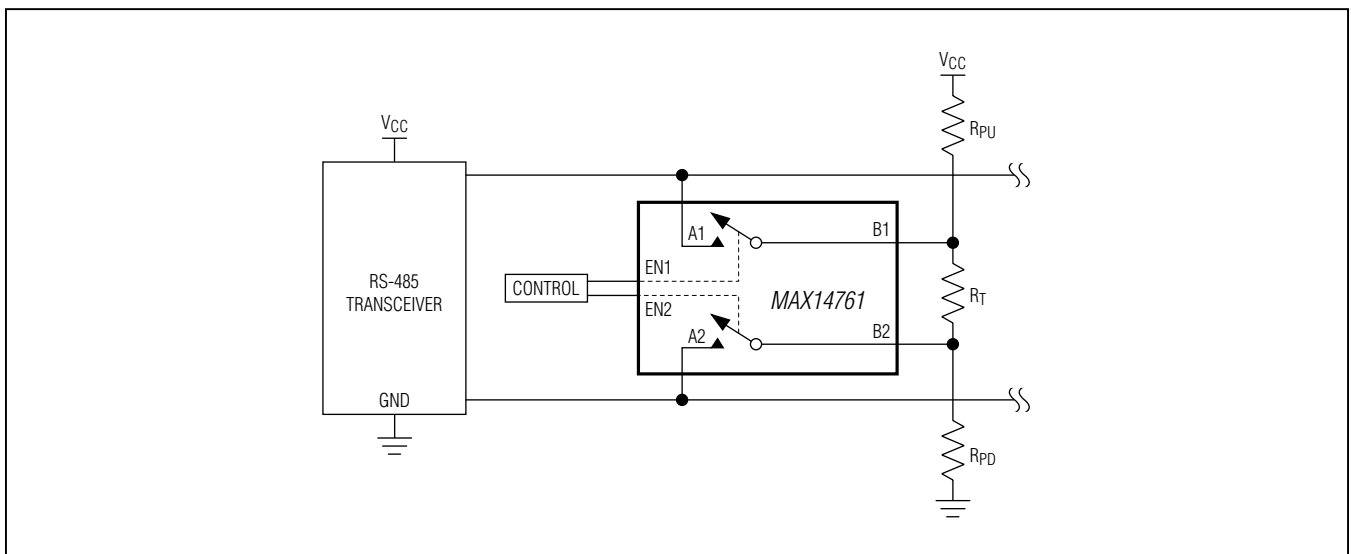


图12. 失效保护偏置网络开关

MAX14759/MAX14761/MAX14763

超摆幅、低导通电阻模拟开关

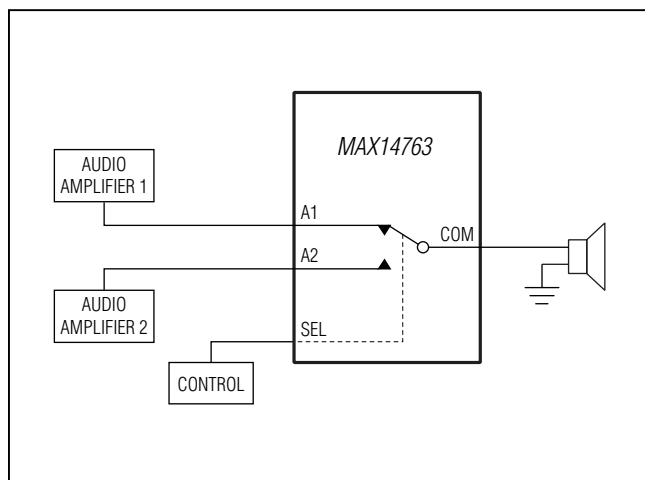


图13. 单端放大器开关

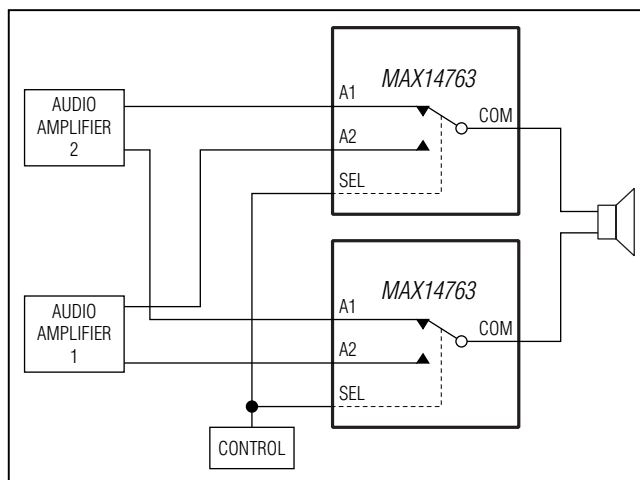


图14. 差分放大器开关

音频放大器开关

MAX14763可用于选择音频放大器的信号源，以驱动扬声器(图13和图14)。

MAX14759/MAX14761/MAX14763

超摆幅、低导通电阻模拟开关

订购信息/选型指南

PART	TEMP RANGE	PIN-PACKAGE	FUNCTION	R _{ON} (MAX) (Ω)
MAX14759ETA+	-40°C to +85°C	8 TDFN-EP*	1 x SPST	1
MAX14761ETB+	-40°C to +85°C	10 TDFN-EP*	2 x SPST	2
MAX14763ETA+	-40°C to +85°C	8 TDFN-EP*	1 x SPDT	2

+表示无铅(Pb)/符合RoHS标准的封装。

*EP = 裸焊盘。

芯片信息

PROCESS: BiCMOS

封装信息

如需最近的封装外形信息和焊盘布局(占位面积), 请查询china.maxim-ic.com/packages。请注意, 封装编码中的“+”、“#”或“-”仅表示RoHS状态。封装图中可能包含不同的尾缀字符, 但封装图只与封装有关, 与RoHS状态无关。

封装类型	封装编码	外形编号	焊盘布局编号
8 TDFN	T833+2	21-0137	90-0059
10 TDFN	T1033+1	21-0137	90-0003

MAX14759/MAX14761/MAX14763

超摆幅、低导通电阻模拟开关

修订历史

修订号	修订日期	说明	修改页
0	9/11	最初版本。	—

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