



双路 SPDT 模拟开关， 可处理超摆幅信号

概述

MAX4850/MAX4850H/MAX4852/MAX4852H 系列是双路 SPDT (单刀/双掷) 开关，工作在 +2V 至 +5.5V 单电源，可以处理大于电源摆幅的信号。这些开关具有 3.5Ω 或 $3.5\Omega/7\Omega$ 的低导通电阻与低导通电容，可理想用于音频与数据信号的切换。

MAX4850/MAX4850H 配置为两个 SPDT 开关，具有两个比较器，用于耳机检测或静音/传送按键功能。MAX4852 配置为两个 SPDT 开关，不具备比较器，电源电流低至 $1\mu\text{A}$ 。

对于超摆幅应用，这些器件提供信号导通或高阻两种选择。对于 MAX4850/MAX4852，即使在超出正电源摆幅的情况下，信号 (高达 5.5V) 也可以不失真地通过开关。对于 MAX4850H/MAX4852H，当输入信号超出电源摆幅时，开关输入变为高阻状态。

MAX4850/MAX4850H/MAX4852/MAX4852H 提供节省空间的 (3mm x 3mm)、16 引脚 TQFN 封装，工作在 -40°C 至 $+85^\circ\text{C}$ 扩展级温度范围。

应用

USB 开关

音频信号切换

蜂窝电话

笔记本电脑

PDA 及其它手持式设备

特性

- ◆ 符合 USB 2.0 全速 (12MB) 和 USB 1.1 信号开关要求
- ◆ 可切换大于 V_{CC} 的信号
- ◆ 0.1ns 偏差
- ◆ $3.5\Omega/7\Omega$ 导通电阻
- ◆ -3dB 带宽: 135MHz
- ◆ +2V 至 +5.5V 电源范围
- ◆ 与 1.8V 逻辑兼容
- ◆ 低电源电流
 - $1\mu\text{A}$ (MAX4852)
 - $5\mu\text{A}$ (MAX4850)
 - $10\mu\text{A}$ (MAX4850H/MAX4852H)
- ◆ 提供节省空间 (3mm x 3mm) 的 16 引脚 TQFN 封装

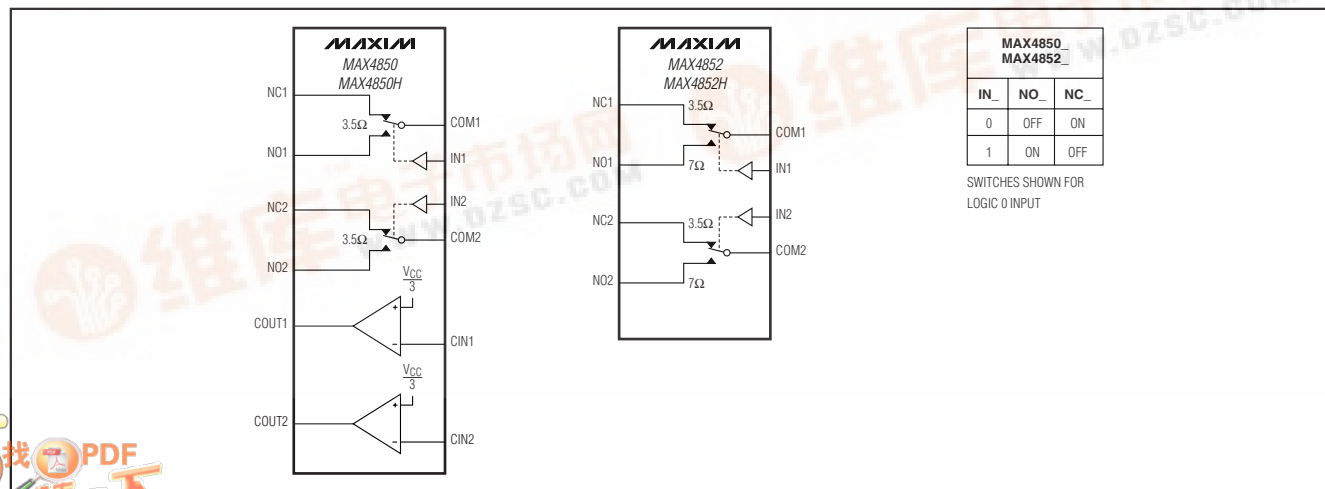
订购信息

PART	TEMP RANGE	PIN-PACKAGE	TOP MARK
MAX4850ETE	-40°C to $+85^\circ\text{C}$	16 TQFN-EP*	ABU
MAX4850HETE	-40°C to $+85^\circ\text{C}$	16 TQFN-EP*	ABV
MAX4852ETE	-40°C to $+85^\circ\text{C}$	16 TQFN-EP*	ABZ
MAX4852HETE	-40°C to $+85^\circ\text{C}$	16 TQFN-EP*	ACA

*EP = 裸露焊盘。

引脚配置和选择指南在数据资料的最后部分给出。

方框图/真值表



MAX4850/MAX4850H/MAX4852/MAX4852H

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ABSOLUTE MAXIMUM RATINGS

V_{CC} , IN_, CIN_, COM_, NO_, NC_ to GND (Note 1).....	-0.3V to +6.0V
COUT_.....	-0.3V to (V_{CC} + 0.3V)
COUT_ Continuous Current.....	±20mA
Closed Switch Continuous Current COM_, NO_, NC_ 3.5 Ω Switch	±100mA
7 Ω Switch	±50mA
Peak Current COM_, NO_, NC_ (pulsed at 1ms, 50% duty cycle) 3.5 Ω Switch	±200mA
7 Ω Switch	±100mA

Peak Current COM_, NO_, NC_ (pulsed at 1ms, 10% duty cycle) 3.5 Ω Switch	±240mA
7 Ω Switch	±120mA
Continuous Power Dissipation (T_A = +70°C) 16-Pin TQFN (derate 20.8mW/°C above +70°C)	1667mW
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

Note 1: Signals on IN, NO, NC, or COM below 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} = +3.0V, T_A = +25°C, unless otherwise noted.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Voltage	V _{CC}			2.0		5.5	V
Supply Current	I _{CC}	V _{CC} = 5.5V, V _{IN_} = 0V or V _{CC}	MAX4850		5	10	μA
			MAX4850H/ MAX4852H		10	20	
			MAX4852			1	
ANALOG SWITCH (3.5Ω Switch)							
Analog Signal Range	V _{NO_} , V _{NC_} , V _{COM_}			0		5.5	V
On-Resistance (Note 3)	R _{ON}	V _{CC} = 3V, I _{COM_} = 10mA, V _{NC_} or V _{NO_} = 0 to 5.5V (MAX485_) or V _{CC} (MAX485_H)	T _A = +25°C		3.5	4.5	Ω
			T _A = -40°C to +85°C			5	
On-Resistance Match Between Channels (Notes 3, 4)	ΔR _{ON}	V _{CC} = 3V, I _{COM} = 10mA, V _{NC_} or V _{NO_} = 1.5V	T _A = +25°C		0.1	0.2	Ω
			T _A = -40°C to +85°C			0.25	
On-Resistance Flatness (Note 5)	R _{FLAT}	V _{CC} = 3V, I _{COM_} = 10mA, V _{NC_} or V _{NO_} = 1V, 2V, 3V	T _A = +25°C		1.2	1.8	Ω
			T _A = -40°C to +85°C			2	
NO_/NC_ Off-Leakage Current	I _{OFF}	V _{CC} = 5.5V, V _{NC_} or V _{NO_} = 1V or 4.5V, V _{COM_} = 4.5V or 1V	T _A = +25°C	-2		+2	nA
			T _A = -40°C to +85°C	-10		+10	
COM_ On-Leakage Current	I _{ON}	V _{CC} = 5.5V; V _{NC_} or V _{NO_} = 1V, 4.5V, or floating; V _{COM_} = 1V, 4.5V, or floating	T _A = +25°C	-2		+2	nA
			T _A = -40°C to +85°C	-12.5		+12.5	
-3dB Bandwidth	BW	Signal = 0dBm, R _L = 50Ω, C _L = 5pF (Figure 5)		100			MHz
NO_/NC_ Off-Capacitance	C _{OFF}	f = 1MHz (Figure 6)		20			pF

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MAX4850/MAX4850H/MAX4852/MAX4852H

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 $V_{CC} = +3.0V$, $T_A = +25^{\circ}C$, unless otherwise noted.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
COM On-Capacitance	C_{ON}	$f = 1MHz$ (Figure 6)		60		pF
ANALOG SWITCH (7Ω Switch)						
Analog Signal Range	$V_{NO_}, V_{NC_}, V_{COM_}$		0		5.5	V
On-Resistance	R_{ON}	$V_{CC} = 3V$, $I_{COM_} = 10mA$, $V_{NC_}$ or $V_{NO_} = 0$ to $5.5V$ (MAX4852) or V_{CC} (MAX4852H)	$T_A = +25^{\circ}C$	7	9	Ω
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$		10	
On-Resistance Match Between Channels (Notes 3, 4)	ΔR_{ON}	$V_{CC} = 3V$, $I_{COM_} = 10mA$, $V_{NC_}$ or $V_{NO_} = 1.5V$	$T_A = +25^{\circ}C$	0.2	0.4	Ω
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$		0.5	
On-Resistance Flatness (Note 5)	R_{FLAT}	$V_{CC} = 3V$, $I_{COM_} = 10mA$, $V_{NC_}$ or $V_{NO_} = 1V, 2V, 3V$	$T_A = +25^{\circ}C$	2.5	3.75	Ω
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$		4.0	
NO_/NC_ Off-Leakage Current	I_{OFF}	$V_{CC} = 5.5V$, $V_{NC_}$ or $V_{NO_} = 1V$ or $4.5V$, $V_{COM_} = 4.5V$ or $1V$	$T_A = +25^{\circ}C$	-2	+2	nA
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$	-10	+10	
COM_ On-Leakage Current	I_{ON}	$V_{CC} = 5.5V$; $V_{NC_}$ or $V_{NO_} = 1V$, $4.5V$, or floating; $V_{COM_} = 1V$, $4.5V$, or floating	$T_A = +25^{\circ}C$	-2	+2	nA
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$	-12.5	+12.5	
-3dB Bandwidth	BW	Signal = 0dBm, $R_L = 50\Omega$, $C_L = 5pF$ (Figure 5)		135		MHz
NO_/NC_ Off-Capacitance	C_{OFF}	$f = 1MHz$ (Figure 6)		12		pF
COM On-Capacitance	C_{ON}	$f = 1MHz$ (Figure 6)		50		pF
DYNAMIC CHARACTERISTICS						
Signal Over-Rail to High-Z Switching Time	t_{HIZ}	MAX4850H/MAX4852H, $V_{NO_}$ or $V_{NC_} = V_{CC}$ to $(V_{CC} + 0.5V)$, $V_{CC} < 5V$ (Figure 1)		0.5	1	μs
High-Z to Low-Z Switching Time	t_{HIZB}	MAX4850H/MAX4852H, $V_{NO_}$ or $V_{NC_} = (V_{CC} + 0.5V)$ to V_{CC} , $V_{CC} < 5V$ (Figure 1)		0.5	1	μs
Skew (Note 3)	t_{SKEW}	$R_S = 39\Omega$, $C_L = 50pF$ (Figure 2)		0.1	1	ns
Propagation Delay (Note 3)	t_{PD}	$R_S = 39\Omega$, $C_L = 50pF$ (Figure 2)		0.9	2	ns
Turn-On Time	t_{ON}	$V_{CC} = 3V$, $V_{NO_}$ or $V_{NC_} = 1.5V$, $R_L = 300\Omega$, $C_L = 50pF$ (Figure 1)	$T_A = +25^{\circ}C$	40	60	ns
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$		100	
Turn-Off Time	t_{OFF}	$V_{CC} = 3V$, $V_{NO_}$ or $V_{NC_} = 1.5V$, $R_L = 300\Omega$, $C_L = 50pF$ (Figure 1)	$T_A = +25^{\circ}C$	30	40	ns
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$		60	

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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 $V_{CC} = +3.0V$, $T_A = +25^{\circ}C$, unless otherwise noted.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Break-Before-Make Time Delay (Note 3)	t_D	$V_{CC} = 3V$, $V_{NO_}$ or $V_{NC_} = 1.5V$, $R_L = 300\Omega$, $C_L = 50pF$ (Figure 3)	$T_A = +25^{\circ}C$ 15 $T_A = -40^{\circ}C$ to $+85^{\circ}C$ 2			ns
Charge Injection	Q	$V_{COM_} = 1.5V$, $R_S = 0\Omega$, $C_L = 1nF$ (Figure 4)		8		pC
Off-Isolation (Note 6)	V_{ISO}	$f = 100kHz$, $V_{COM_} = 1V_{RMS}$, $R_L = 50\Omega$, $C_L = 5pF$ (Figure 5)		-80		dB
Crosstalk	V_{CT}	$f = 1MHz$, $V_{COM_} = 1V_{RMS}$, $R_L = 50\Omega$, $C_L = 5pF$ (Figure 5)		-95		dB
Total Harmonic Distortion	THD	$f = 20Hz$ to $20kHz$, $V_{COM_} = 1V + 2V_{P-P}$, $R_L = 600\Omega$		0.04		%
DIGITAL I/O (IN₋)						
Input-Logic High Voltage	V_{IH}	$V_{CC} = 2V$ to $3.6V$	1.4			V
		$V_{CC} = 3.6V$ to $5.5V$	1.8			
Input-Logic Low Voltage	V_{IL}	$V_{CC} = 2V$ to $3.6V$		0.5		V
		$V_{CC} = 3.6V$ to $5.5V$		0.8		
Input Leakage Current	I_{IN}	$V_{IN_} = 0$ or $5.5V$	-0.5		+0.5	μA
COMPARATOR						
Comparator Range			0		5.5	V
Comparator Threshold	V_{TH}	$V_{CC} = 2V$ to $5.5V$, falling input	$0.3 \times V_{CC}$	$0.33 \times V_{CC}$	$0.36 \times V_{CC}$	V
Comparator Hysteresis		$V_{CC} = 2V$ to $5.5V$		50		mV
Comparator Output High Voltage		$I_{SOURCE} = 1mA$	$V_{CC} - 0.4V$			V
Comparator Output Low Voltage		$I_{SINK} = 1mA$		0.4		V
Comparator Switching Time		Rising input (Figure 7)		2.5		μs
		Falling input (Figure 7)		0.5		

Note 2: Specifications are 100% tested at $T_A = +85^{\circ}C$ only, and guaranteed by design and characterization over the specified temperature range.

Note 3: Guaranteed by design and characterization; not production tested.

Note 4: $\Delta R_{ON} = R_{ON(MAX)} - R_{ON(MIN)}$.

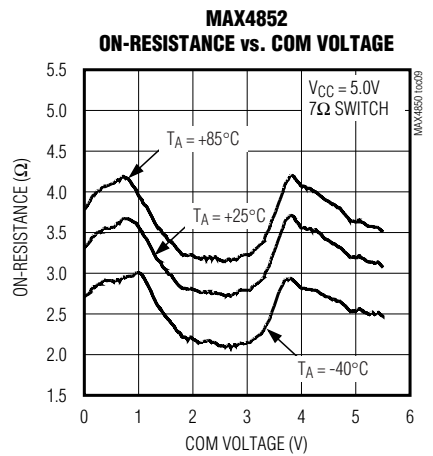
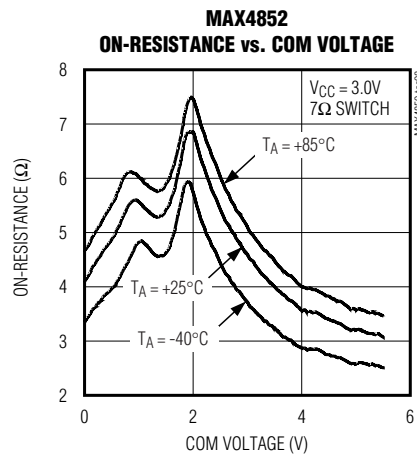
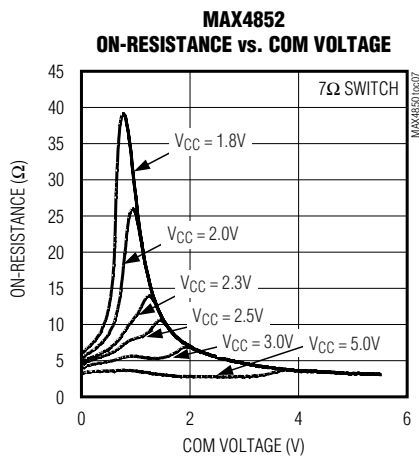
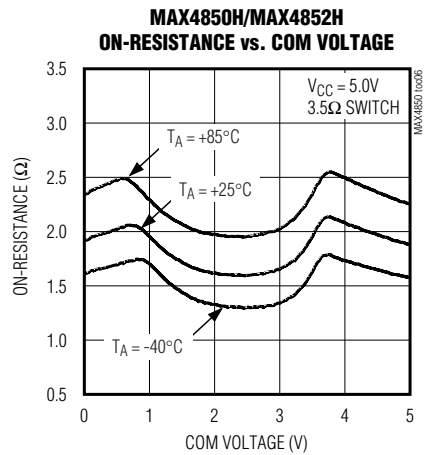
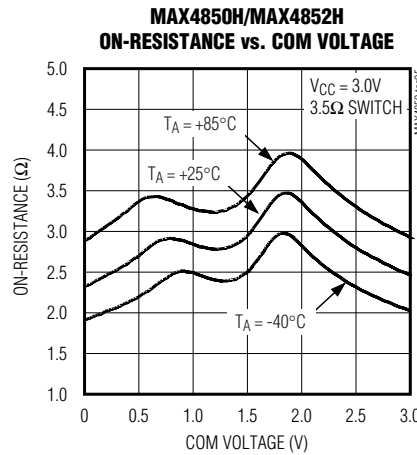
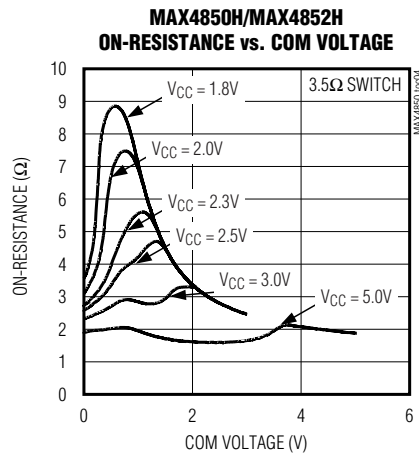
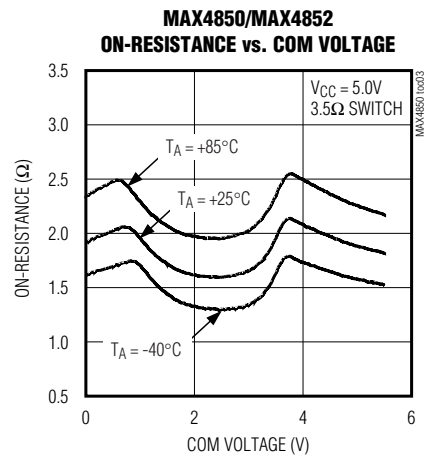
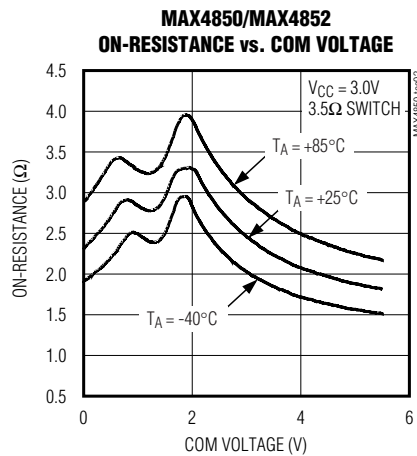
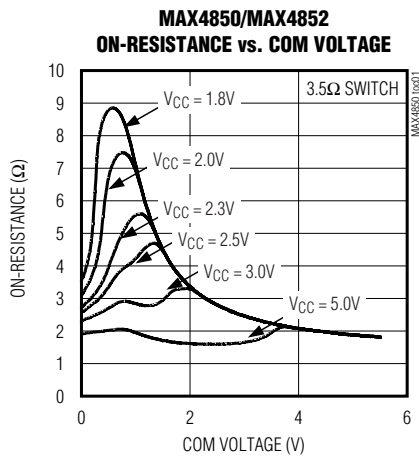
Note 5: Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal ranges.

Note 6: Off-isolation = $20\log_{10}(V_{COM_} / V_{NO_})$, $V_{COM_}$ = output, $V_{NO_}$ = input to off switch.

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典型工作特性

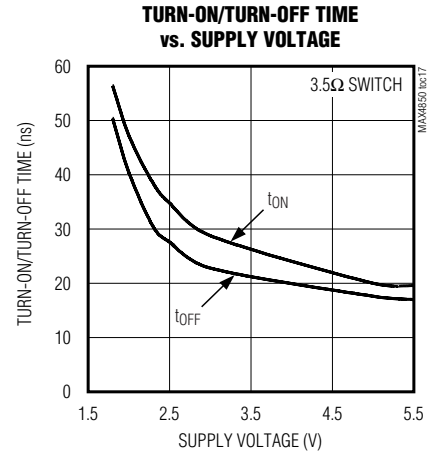
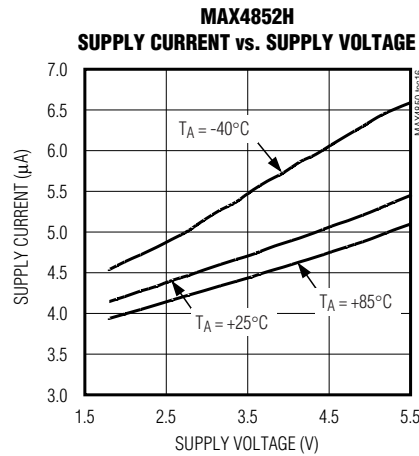
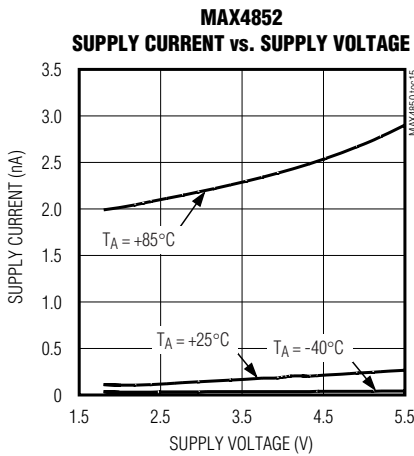
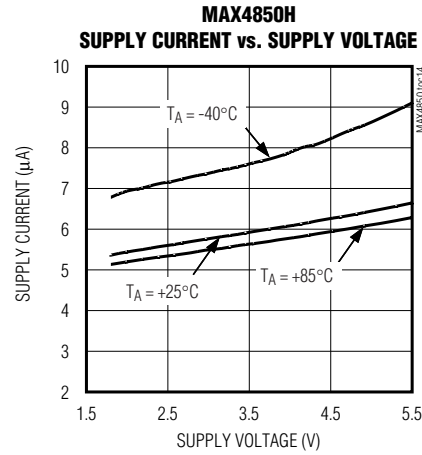
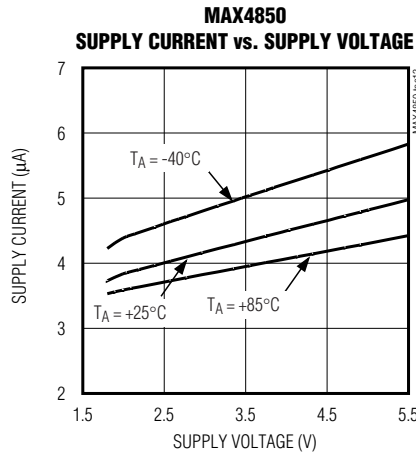
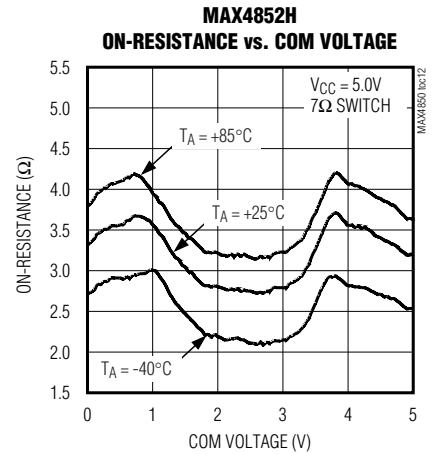
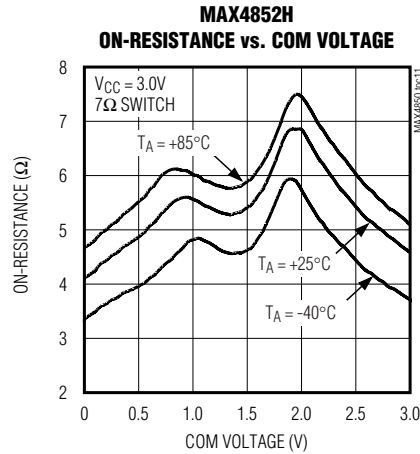
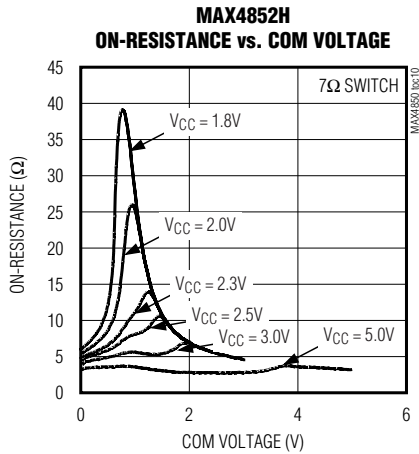
($V_{CC} = 3.0V$, $T_A = +25^{\circ}C$, unless otherwise noted.)



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典型工作特性(续)

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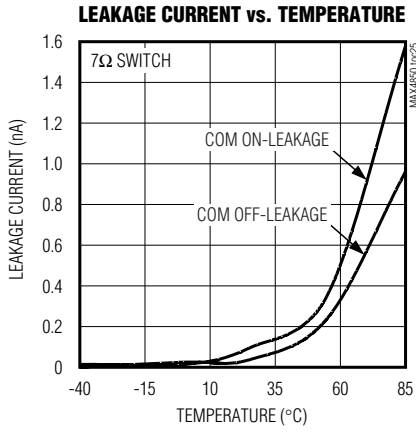
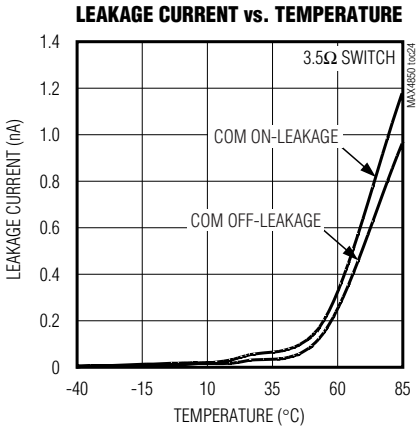
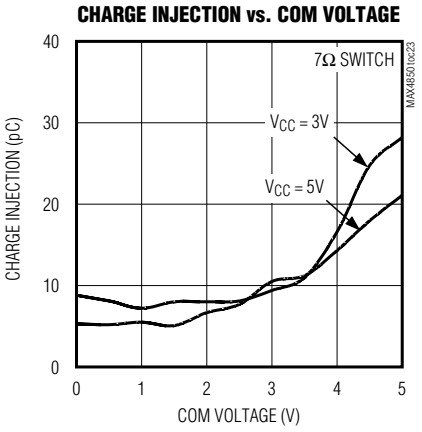
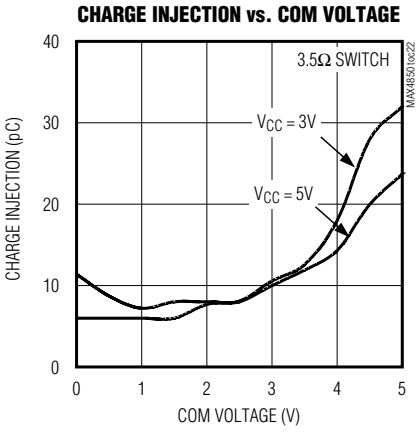
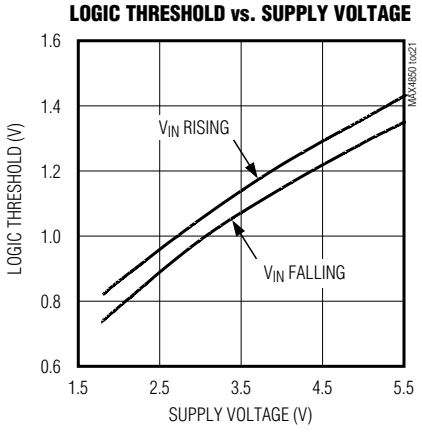
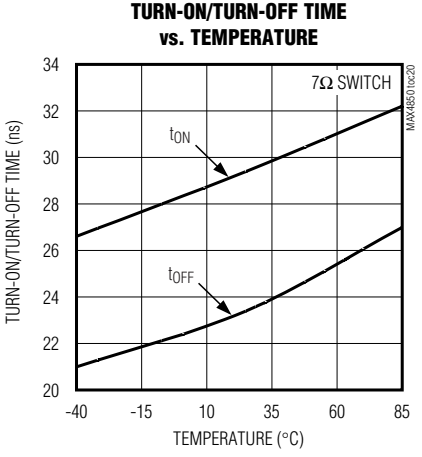
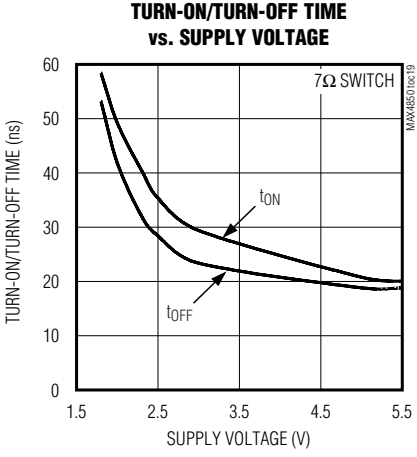
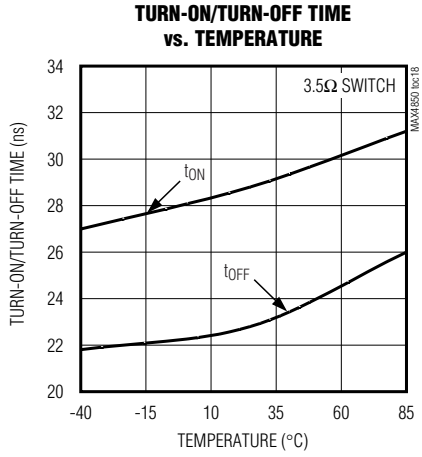


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典型工作特性(续)

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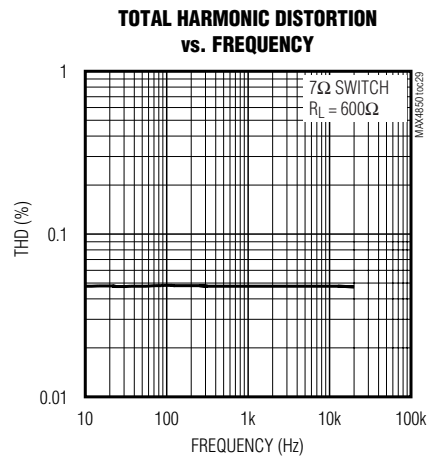
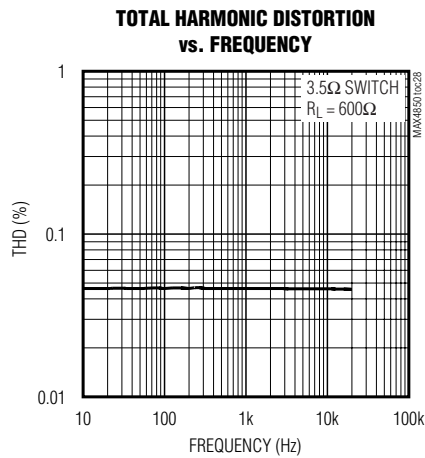
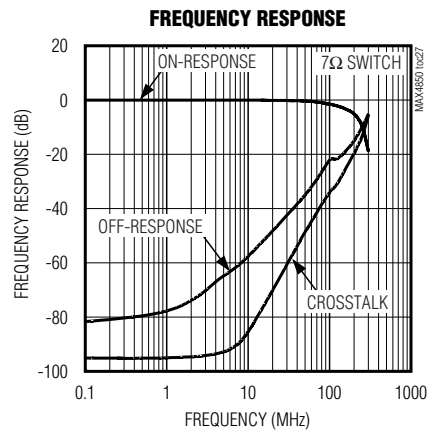
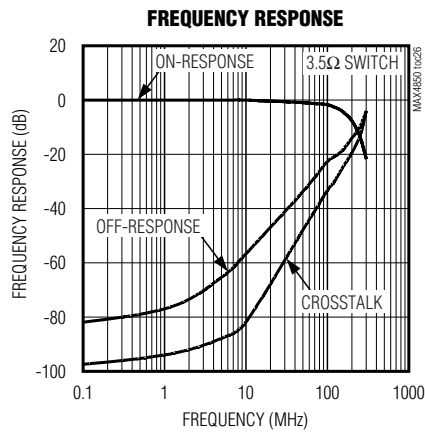
MAX4850/MAX4850H/MAX4852/MAX4852H



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典型工作特性(续)

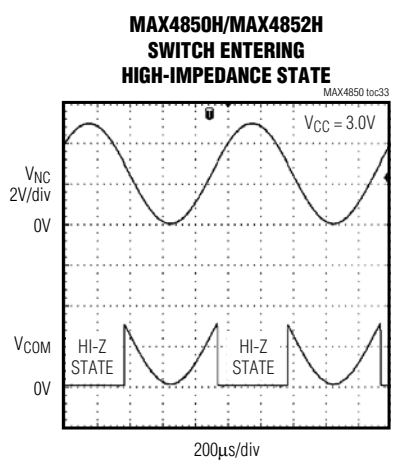
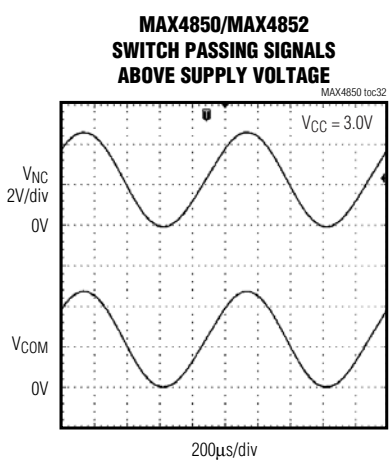
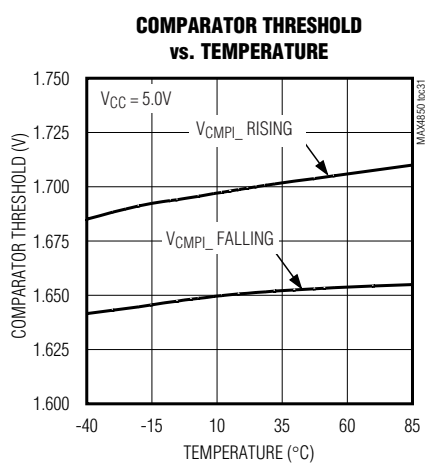
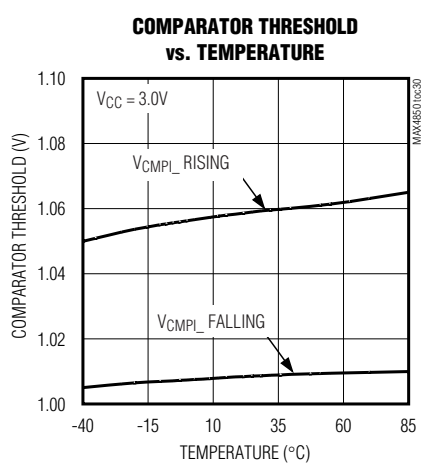
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引脚说明

MAX4850/MAX4850H

引脚	名称	功能
1, 8	N.C.	未接。内部无连接。
2	CIN1	比较器 1 反相输入
3	CIN2	比较器 2 反相输入
4	COM1	模拟开关 1 的公共端
5	NO1	模拟开关 1 的常开端
6	GND	地
7	NC2	模拟开关 2 的常闭端
9	IN2	模拟开关 2 的数字控制输入。IN2 为逻辑低时接通 COM2 和 NC2，IN2 为逻辑高时接通 COM2 和 NO2。
10	COM2	模拟开关 2 的公共端
11	COU1	比较器 1 的输出
12	NO2	模拟开关 2 的常开端
13	COU2	比较器 2 的输出
14	V _{CC}	电源电压。通过一个尽可能靠近该引脚的 0.01μF 电容旁路至 GND。
15	IN1	模拟开关 1 的数字控制输入。IN1 为逻辑低时接通 COM1 和 NC1，IN1 为逻辑高时接通 COM1 和 NO1。
16	NC1	模拟开关 1 的常闭端
EP	—	裸露焊盘。接至 PC 板地层。

MAX4852/MAX4852H

引脚	名称	功能
1, 2, 3, 8, 11, 13	N.C.	未连。内部无连接。
4	COM1	模拟开关 1 的公共端
5	NO1	模拟开关 1 的常开端
6	GND	地
7	NC2	模拟开关 2 的常闭端
9	IN2	模拟开关 2 的数字控制输入。IN2 为逻辑低时接通 COM2 和 NC2，IN2 为逻辑高时接通 COM2 和 NO2。
10	COM2	模拟开关 2 的公共端
12	NO2	模拟开关 2 的常开端
14	V _{CC}	电源电压。通过一个尽可能靠近该引脚的 0.01μF 电容旁路至 GND。
15	IN1	模拟开关 1 的数字控制输入。IN1 为逻辑低时接通 COM1 和 NC1，IN1 为逻辑高时接通 COM1 和 NO1。
16	NC1	模拟开关 1 的常闭端
EP	—	裸露焊盘。接至 PC 板地层。

双路 SPDT 模拟开关， 可处理超摆幅信号

详细说明

MAX4850/MAX4850H/MAX4852/MAX4852H 是低导通电阻、低电压、工作在 +2V 至 +5.5V 单电源的模拟开关，完全规范于电源标称值为 3.0V 的应用。这些器件具有超摆幅信号处理能力，在电源电压降至 2.0V 时，信号仍然允许高达 5.5V。这些器件配置为双路 SPDT 开关。

这些开关具有 50pF 的低导通电容，能够满足 USB 2.0 全速/1.1 应用中 12Mbps 数据信号的开关要求。MAX485__ 设计用来切换 USB 的 D+ 和 D- 信号，并能保证在输入信号的 50% 和输出信号的 50% 处测量的偏差小于 1ns (见图 2)。

MAX4850_ 具有一个比较器，可用于耳机或静音检测。比较器的门限值由内部设定，约为 V_{CC} 的 1/3。

应用信息

数字控制输入

逻辑输入 (IN_) 可接受高达 +5.5V 的电压，即使电源电压低于这个电平。例如， V_{CC} 电源为 +3.3V 时，IN_ 输入可低至 GND，最高可达 +5.5V，这样就允许多种逻辑电平共存于同一系统中。满摆幅驱动 IN_ 可使功耗降至最低。对于 +2V 电源电压，逻辑门限值为 0.5V (低) 和 1.4V (高)；对于 +5V 电源电压，逻辑门限值是 0.8V (低) 和 1.8V (高)。

模拟信号电平

当模拟输入信号在整个电源电压范围内变化时，这些开关的导通电阻变化极小 (见典型工作特性)。这些开关是双向的，因此 NO_、NC_ 和 COM_ 既可做输入也可做输出。

比较器

比较器的同相输入端内部设置为 $V_{CC}/3$ 。当反相端 (CIN_) 低于该门限值时 ($V_{CC}/3$)，比较器的输出 (COUT_) 变高。当 CIN_ 上升到超过 $V_{CC}/3$ 时，COUT_ 变低。

比较器的门限值可用于耳机检测，这是因为典型情况下，耳机音频信号是偏置到 $V_{CC}/2$ 的。

供电顺序

警告： 不要超过极限参数，因为超过列出的极限参数可能引起器件永久损坏。

对于所有 CMOS 器件，推荐使用正确的供电顺序。总是在加模拟信号之前先加 V_{CC} ，特别是在模拟信号没有有限流的情况下。

双路 SPDT 模拟开关， 可处理超摆幅信号

测试电路/时序图

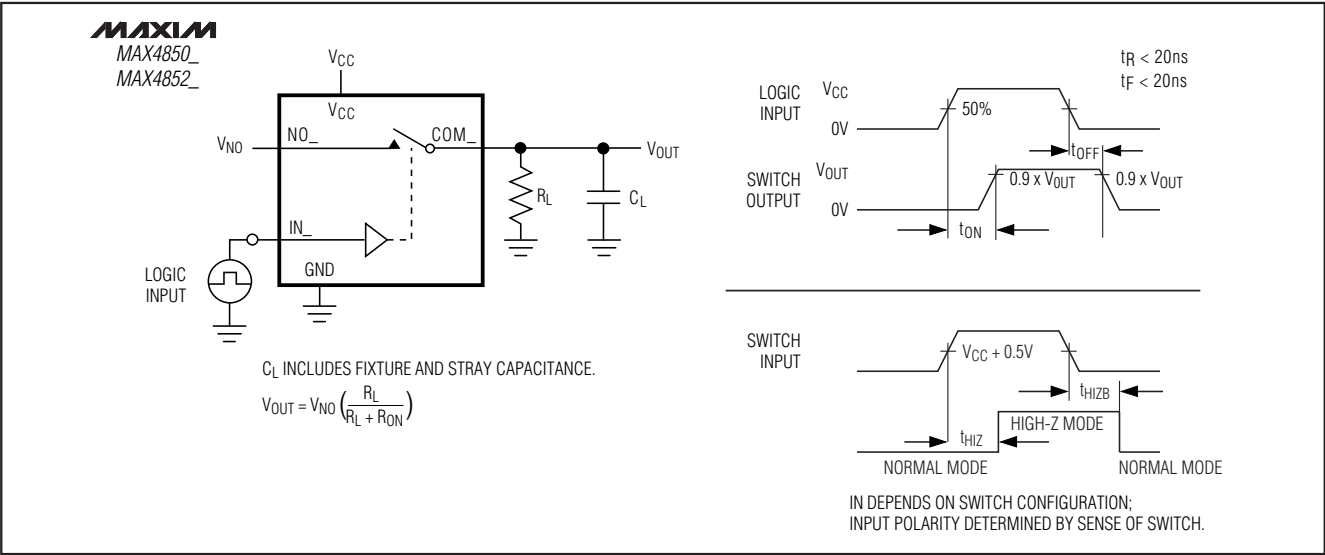


图 1. 开关时间

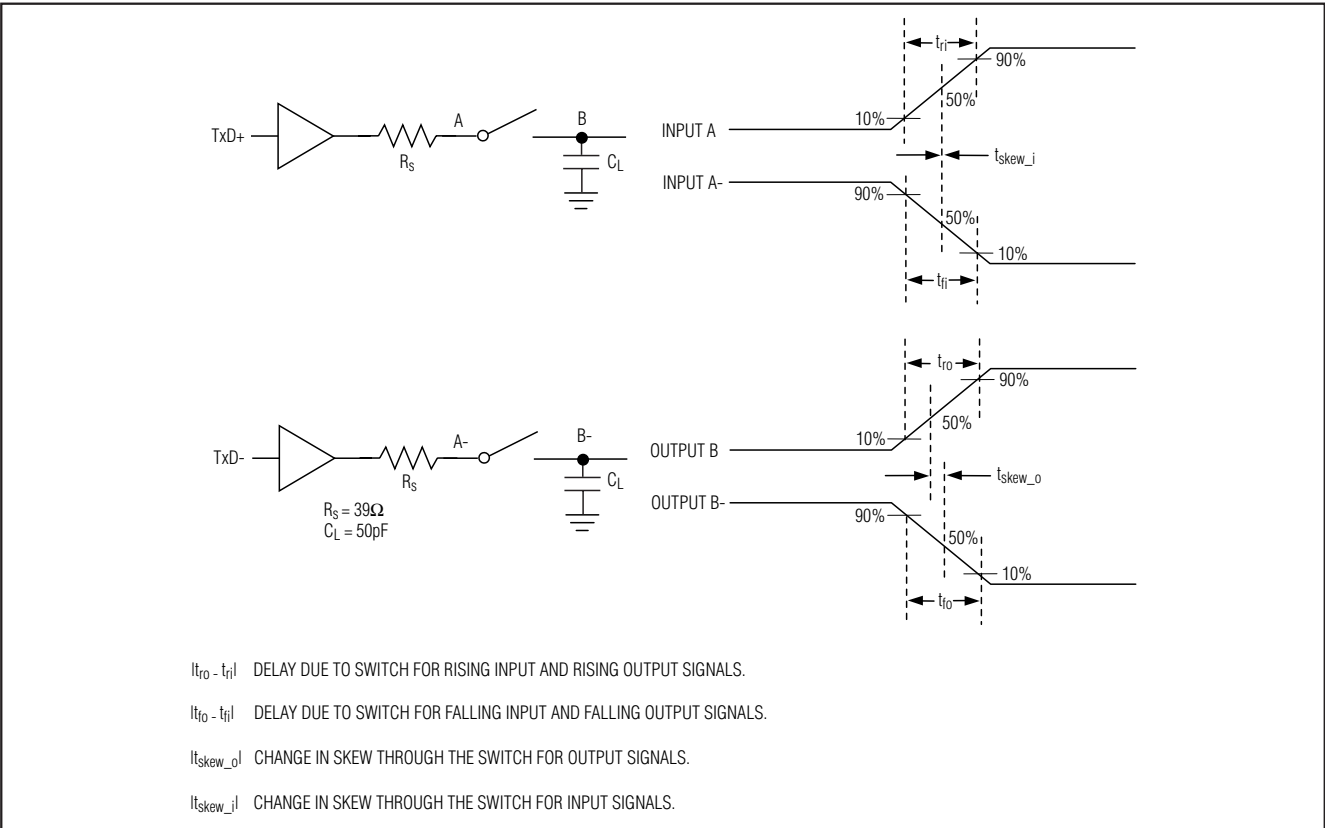
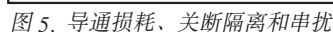


图 2. 输入/输出偏差时序图

MAX4850/MAX4850H/MAX4852/MAX4852H



双路 SPDT 模拟开关， 可处理超摆幅信号

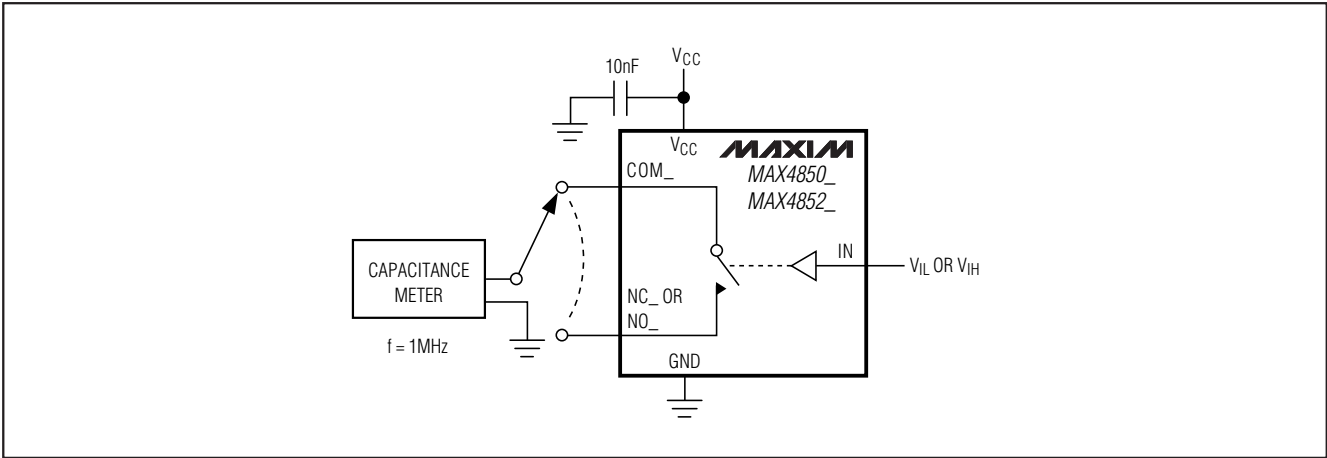


图 6. 通道关/开电容

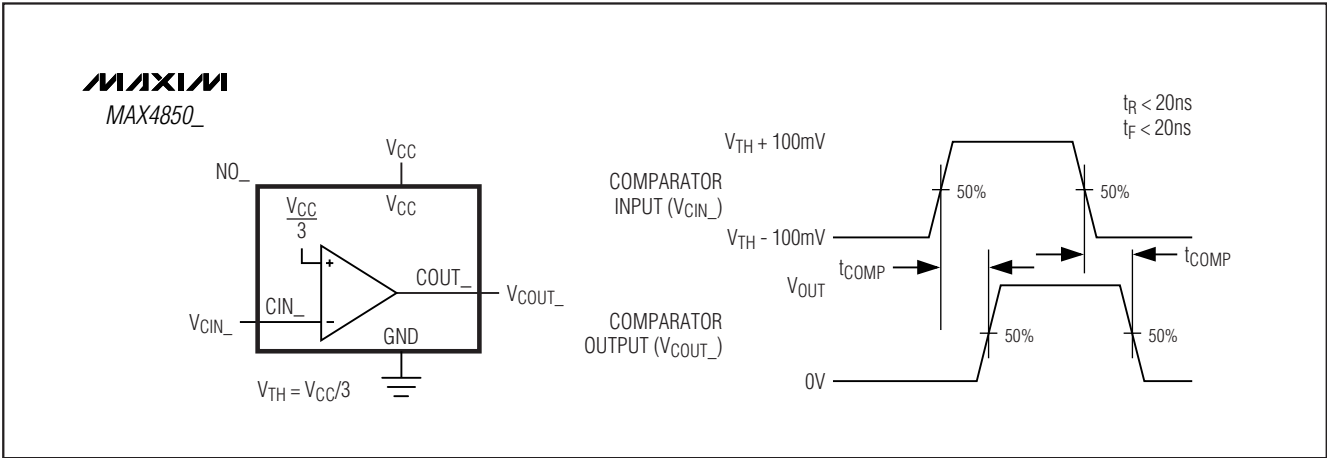
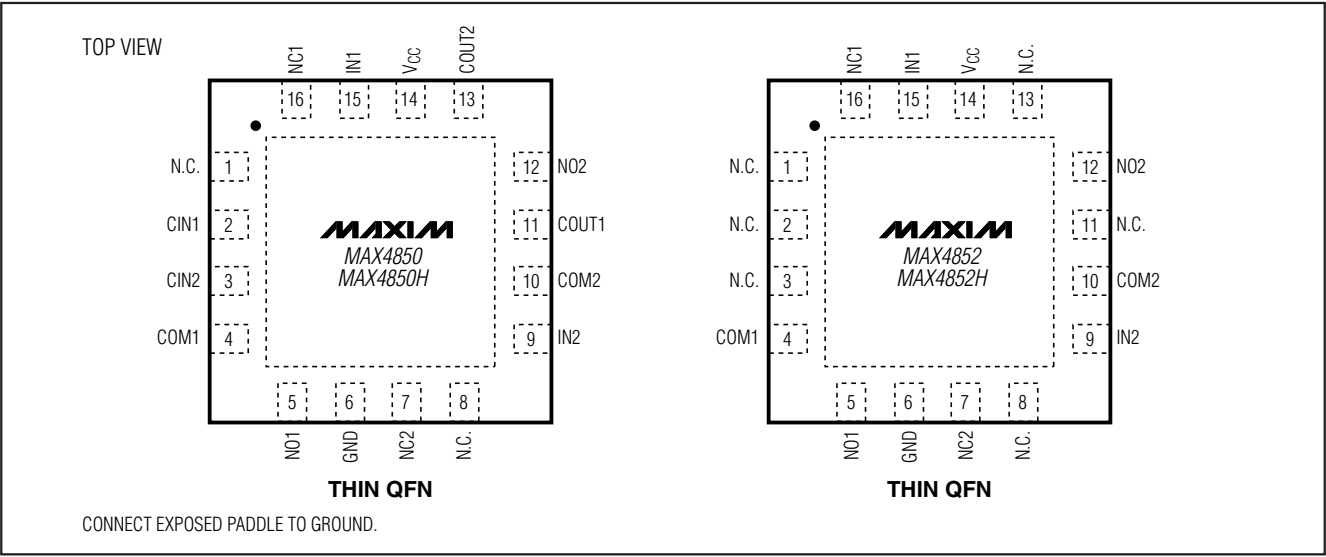


图 7. 比较器切换时间

双路 SPDT 模拟开关，
可处理超摆幅信号

引脚配置



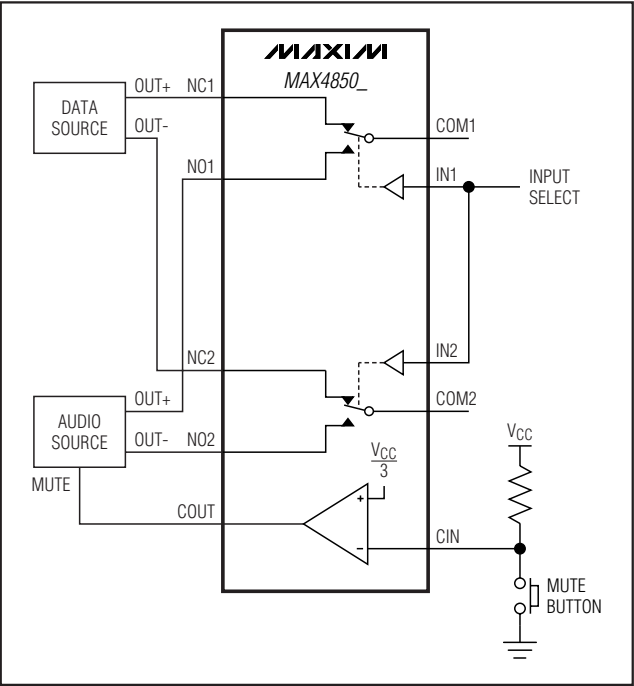
选择指南

PART	R _{ON} NC_/NO_ (Ω)	COMPARATORS	OVER-RAIL HANDLING
MAX4850	3.5/3.5	2	Input signal passes through the switch
MAX4850H	3.5/3.5	2	High-impedance switch input
MAX4852	3.5/7	—	Input signal passes through the switch
MAX4852H	3.5/7	—	High-impedance switch input

芯片信息

TRANSISTOR COUNT: 735
PROCESS: CMOS

典型工作电路

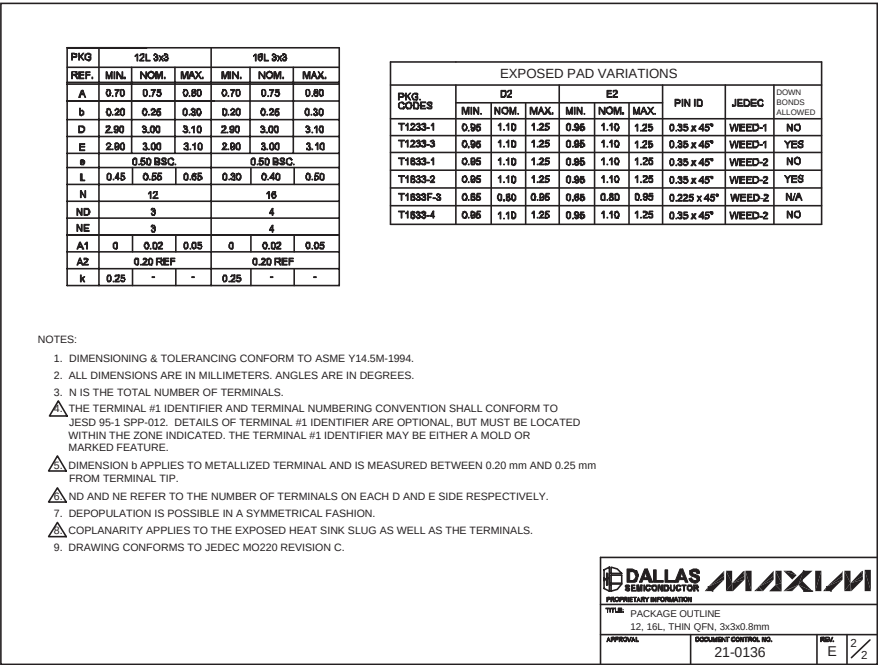
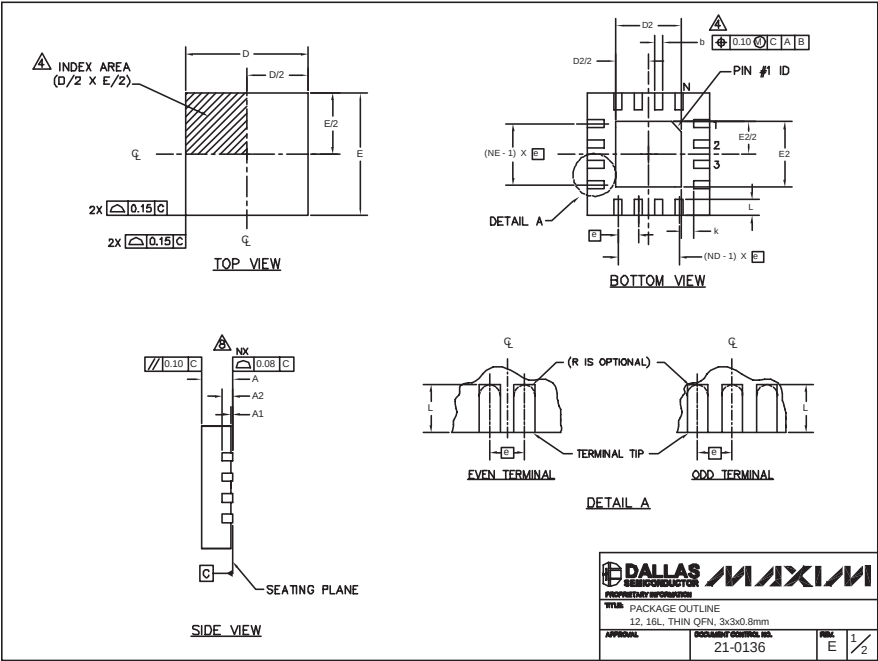


MAX4850/MAX4850H/MAX4852/MAX4852H

双路 SPDT 模拟开关，
可处理超摆幅信号

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。)



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