0.8Ω, Low-Voltage, Single-Supply Dual SPST Analog Switches

ABSOLUTE MAXIMUM RATINGS

Voltages Referenced to GND
V+, IN_.....-0.3V to +4V
COM_, NO_, NC_ (Note 1).....-0.3V to (V+ + 0.3V)
Continuous Current COM_ , NO_, NC_ .....±150mA
Peak Current COM_, NO_, NC_
(pulsed at 1ms 10% duty cycle).....±300mA
Continuous Power Dissipation (T_A = +70°C)
8-Pin SOT23 (derate 7.52mW/°C above +70°C).....602mW
8-Pin µMAX (derate 4.5mW/°C above +70°C).....362mW
8-Pin µDFN (derate 4.8mW/°C above +70°C).....381mW
Operating Temperature Range .....-40°C to +85°C
Maximum Junction Temperature .....+150°C
Storage Temperature Range .....-65°C to +150°C
Lead Temperature (soldering, 10s).....+300°C

Note 1: Signals on COM_, NO_, or NC_ exceeding V+ or GND are clamped by internal diodes. Limit forward 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—Single +3V Supply

(V+ = +2.7V to +3.6V, V_{IH} = +1.4V, V_{IL} = +0.5V, T_A = T_{MIN} to T_{MAX}, unless otherwise specified. Typical values are at V+ = +3.0V, T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	$V_{COM\_}$, $V_{NO\_}$, $V_{NC\_}$			0		V+	V
On-Resistance	R_{ON}	V+ = 2.7V, $I_{COM\_}$ = 100mA, $V_{NO\_}$ or $V_{NC\_}$ = 1.5V	+25°C		0.5	0.8	Ω
			T_{MIN} to T_{MAX}			0.9	
On-Resistance Match Between Channels (Note 4)	ΔR_{ON}	V+ = 2.7V, $I_{COM\_}$ = 100mA, $V_{NO\_}$ or $V_{NC\_}$ = 1.5V	+25°C		0.05	0.08	Ω
			T_{MIN} to T_{MAX}			0.09	
On-Resistance Flatness (Note 5)	$R_{FLAT(ON)}$	V+ = 2.7V, $I_{COM\_}$ = 100mA, $V_{NO\_}$ or $V_{NC\_}$ = 1V, 1.5V, 2V	+25°C		0.05	0.18	Ω
			T_{MIN} to T_{MAX}			0.20	
NO_ or NC_ Off-Leakage Current	$I_{NO\_(OFF)}$, $I_{NC\_(OFF)}$	V+ = 3.3V, $V_{COM\_}$ = 0.3V, 3V, $V_{NO\_}$ or $V_{NC\_}$ = 3V, 0.3V	+25°C	-1		1	nA
			T_{MIN} to T_{MAX}	-5		5	
COM_ Off-Leakage Current	$I_{COM\_(OFF)}$	V+ = 3.3V, $V_{COM\_}$ = 0.3V, 3V $V_{NO\_}$ or $V_{NC\_}$ = 3V, 0.3V or floating	+25°C	-1		1	nA
			T_{MIN} to T_{MAX}	-5		5	
COM_ On-Leakage Current	$I_{COM\_(ON)}$	V+ = 3.3V, $V_{COM\_}$ = 3V, 0.3V; $V_{NO\_}$ or $V_{NC\_}$ = 3V, 0.3V or floating	+25°C	-2		2	nA
			T_{MIN} to T_{MAX}	-10		10	

ELECTRICAL CHARACTERISTICS—Single +3V Supply (continued)

(V+ = +2.7V to +3.6V, V_{IH} = +1.4V, V_{IL} = +0.5V, T_A = T_{MIN} to T_{MAX}, unless otherwise specified. Typical values are at V+ = +3.0V, T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
SWITCH DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{NO\_}$, $V_{NC\_}$ = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		18	24	ns
			T_{MIN} to T_{MAX}			28	
Turn-Off Time	t_{OFF}	$V_{NO\_}$, $V_{NC\_}$ = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		12	16	ns
			T_{MIN} to T_{MAX}			18	
Break-Before-Make (Note 6)	t_{BBM}	$V_{NO\_}$, $V_{NC\_}$ = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1 (MAX4743)	+25°C		6		ns
			T_{MIN} to T_{MAX}	1			
Charge Injection	Q	V_{GEN} = 0, R_{GEN} = 0, C_L = 1.0nF, Figure 3	+25°C		28		pC
NO_ or NC_ Off-Capacitance	C_{OFF}	f = 1MHz, Figure 4	+25°C		32		pF
COM_ Off-Capacitance	$C_{COM\_(OFF)}$	f = 1MHz, Figure 4	+25°C		32		pF
COM_ On-Capacitance	$C_{COM\_(ON)}$	f = 1MHz, Figure 4	+25°C		44		pF
-3dB On-Channel Bandwidth	BW	Signal = 0, R_{IN} = R_{OUT} = 50Ω, C_L = 5pF, Figure 2			100		MHz
Off-Isolation (Note 7)	V_{ISO}	f = 1MHz, $V_{COM\_}$ = $1V_{RMS}$, R_L = 50Ω, C_L = 5pF, Figure 2	+25°C		-55		dB
Crosstalk (Note 8)		f = 1MHz, $V_{COM\_}$ = $1V_{RMS}$, R_L = 50Ω, C_L = 5pF, Figure 2	+25°C		-110		dB
Total Harmonic Distortion	THD	f = 20Hz to 20kHz, $V_{COM\_}$ = 2Vp-p, R_L = 32Ω	+25°C		0.02		%
LOGIC INPUT							
Input Logic High	V_{IH}			1.4			V
Input Logic Low	V_{IL}					0.5	V
Input Leakage Current	I_{IN}	$V_{IN\_}$ = 0 or V+		-1	0.005	1	µA
POWER SUPPLY							
Power-Supply Range	V+			1.6		3.6	V
Positive Supply Current	I+	V+ = 3.6V, $V_{IN\_}$ = 0 or V+, all channels on or off	+25°C			0.2	µA

0.8Ω, Low-Voltage, Single-Supply Dual SPST Analog Switches

ELECTRICAL CHARACTERISTICS—Single +1.8V Supply

(V+ = +1.8V, V_{IH} = +1.0V, V_{IL} = 0.4V, T_A = T_{MIN} to T_{MAX}, unless otherwise specified. Typical values are at T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	$V_{COM\_}$, $V_{NO\_}$, $V_{NC\_}$			0		V+	V
On-Resistance	R_{ON}	$I_{COM\_}$ = 10mA, $V_{NO\_}$ or $V_{NC\_}$ = 0.9V	+25°C		1.3	2.5	Ω
			T_{MIN} to T_{MAX}			5	
NO_ or NC_ Off-Leakage Current	$I_{NO\_(OFF)}$, $I_{NC\_(OFF)}$	$V_{COM\_}$ = 0.3V, 1.5V; $V_{NO\_}$ or $V_{NC\_}$ = 1.5V, 0.3V	+25°C	-1		1	nA
			T_{MIN} to T_{MAX}	-5		5	
COM_ Off-Leakage Current	$I_{COM\_(OFF)}$	$V_{COM\_}$ = 0.3V, 1.5V; $V_{NO\_}$ or $V_{NC\_}$ = 1.5V, 0.3V	+25°C	-1		1	nA
			T_{MIN} to T_{MAX}	-5		5	
COM_ On-Leakage Current	$I_{COM\_(ON)}$	$V_{COM\_}$ = 0.3V, 1.5V, $V_{NO\_}$ or $V_{NC\_}$ = 0.3V, 1.5V, or floating	+25°C	-2		2	nA
			T_{MIN} to T_{MAX}	-10		10	
SWITCH DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{NO\_}$, $V_{NC\_}$ = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		25	35	ns
			T_{MIN} to T_{MAX}			40	
Turn-Off Time	t_{OFF}	$V_{NO\_}$, $V_{NC\_}$ = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		16	25	ns
			T_{MIN} to T_{MAX}			30	
Break-Before-Make (Note 6)	t_{BBM}	$V_{NO\_}$, $V_{NC\_}$ = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1 (MAX4743)	+25°C		10		ns
			T_{MIN} to T_{MAX}	1			
Charge Injection	Q	V_{GEN} = 0, R_{GEN} = 0, C_L = 1nF, Figure 2	+25°C		16		pC
Off-Isolation (Note 7)	V_{ISO}	f = 1MHz, $V_{NO\_}$ = $V_{NC\_}$ = $1V_{RMS}$, R_L = 50Ω, C_L = 5pF, Figure 2	+25°C		-50		dB
Crosstalk (Note 8)		f = 1MHz, $V_{COM\_}$ = $1V_{RMS}$, R_L = 50Ω, C_L = 5pF, Figure 2	+25°C		-110		dB

ELECTRICAL CHARACTERISTICS—Single +1.8V Supply (continued)

(V+ = +1.8V, V_{IH} = +1.0V, V_{IL} = 0.4V, T_A = T_{MIN} to T_{MAX}, unless otherwise specified. Typical values are at T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
LOGIC INPUT							
Input Logic High	V_{IH}			1			V
Input Logic Low	V_{IL}					0.4	V
Input Leakage Current	I_{IN}	$V_{IN\_}$ = 0 or V+		-1		1	µA

Note 2: The algebraic convention, where the most negative value is a minimum and the most positive value is a maximum, is used in this data sheet.

Note 3: µDFN and SOT23 packaged parts are 100% tested at +25°C. Limits across the full temperature range are guaranteed by design and correlation. µMAX packaged parts -40°C specifications are guaranteed by design.

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

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

Note 6: Guaranteed by design.

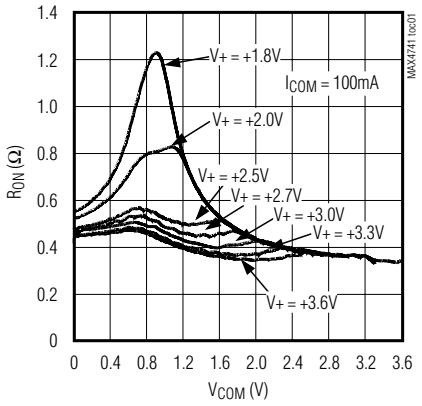
Note 7: Off-Isolation = $20\log_{10}(V_{COM\_}/V_{NO\_})$, $V_{COM\_}$ = output, $V_{NO\_}$ = input to off switch.

Note 8: Between two switches.

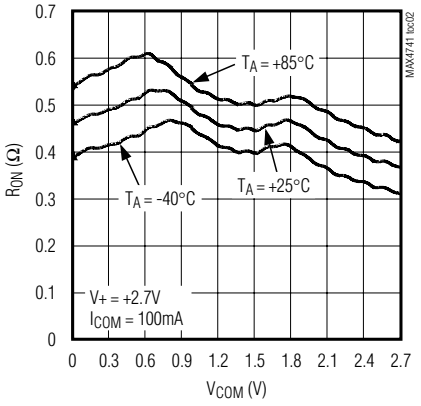
Typical Operating Characteristics

(T_A = +25°C, unless otherwise noted.)

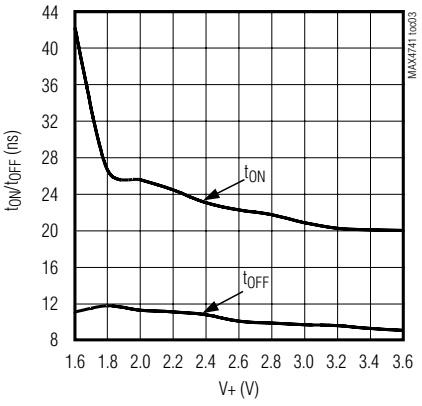
ON-RESISTANCE vs. V_{COM}



ON-RESISTANCE vs. V_{COM} AND TEMPERATURE



TURN-ON/OFF TIME vs. SUPPLY VOLTAGE

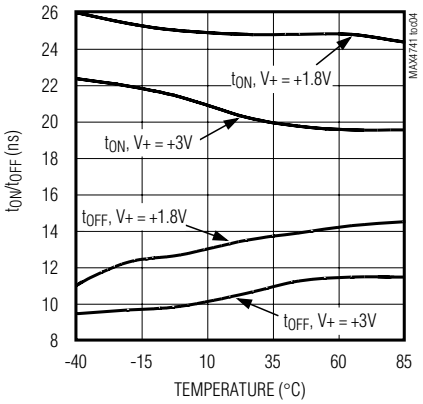


0.8Ω, Low-Voltage, Single-Supply Dual SPST Analog Switches

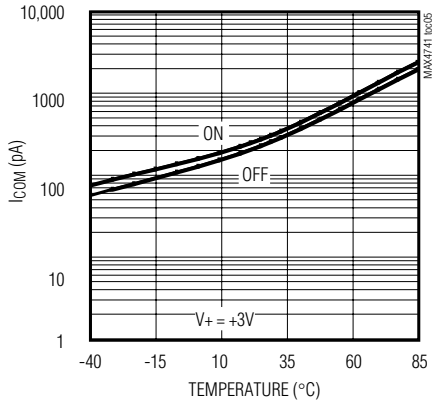
Typical Operating Characteristics (continued)

(T_A = +25°C, unless otherwise noted.)

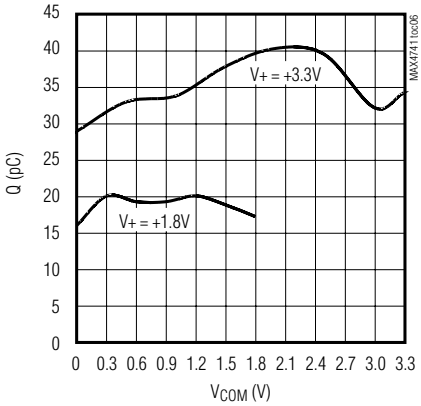
TURN-ON/OFF TIME vs. TEMPERATURE



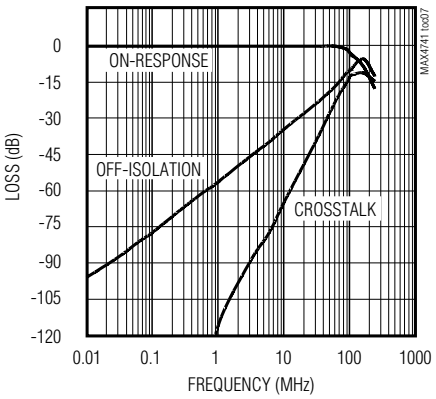
LEAKAGE CURRENT vs. TEMPERATURE



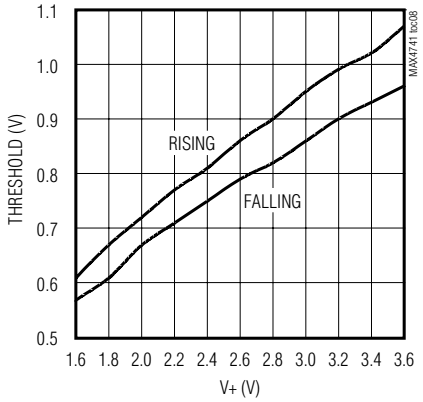
CHARGE INJECTION vs. OUTPUT VOLTAGE



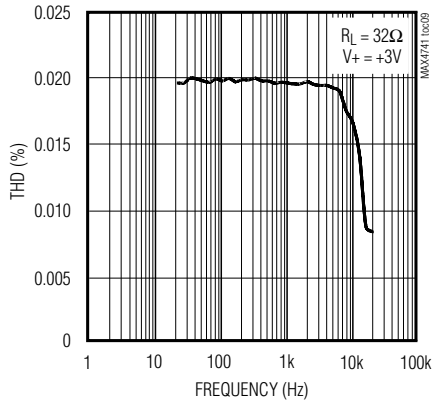
FREQUENCY RESPONSE



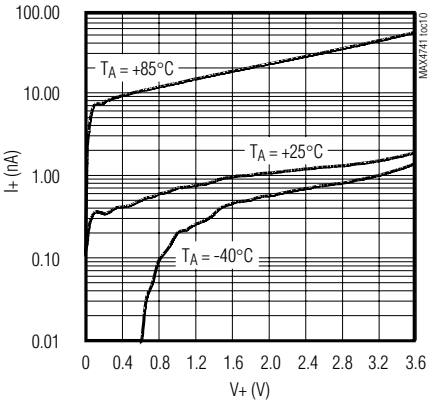
LOGIC THRESHOLD VOLTAGE vs. SUPPLY VOLTAGE



TOTAL HARMONIC DISTORTION vs. FREQUENCY



SUPPLY CURRENT vs. SUPPLY VOLTAGE AND TEMPERATURE



Pin Description

PIN						NAME	FUNCTION
MAX4741		MAX4742		MAX4743			
µMAX/µDFN	SOT23-8	µMAX	SOT23-8	µMAX	SOT23-8		
1	8	—	—	1	8	NO1	Analog Switch 1 Normally Open
—	—	1	8	—	—	NC1	Analog Switch 1 Normally Closed
2	7	2	7	2	7	COM1	Analog Switch 1 Common
3	6	3	6	3	6	IN2	Logic Control Input Switch 2
4	5	4	5	4	5	GND	Ground
5	3	—	—	—	—	NO2	Analog Switch 2 Normally Open
—	—	5	3	5	3	NC2	Analog Switch 2 Normally Closed
6	4	6	4	6	4	COM2	Analog Switch 2 Common
7	1	7	1	7	1	IN1	Logic Control Input Switch 1
8	2	8	2	8	2	V+	Positive Supply Voltage

Detailed Description

The MAX4741/MAX4742/MAX4743 are low 0.8Ω max (at V+ = +3V) on-resistance, low-voltage, dual analog switches that operate from a +1.6V to +3.6V single supply. CMOS switch construction allows switching analog signals that are within the supply voltage range (GND to V+).

When powered from a +3V supply, the 0.8Ω max R_{ON} allows high continuous currents to be switched in a variety of applications.

Applications Information

Proper power-supply sequencing is recommended for all CMOS devices. Do not exceed the absolute maximum ratings, because stresses beyond the listed ratings can cause permanent damage to the devices. Always sequence V+ on first, followed by NO_, NC_, or COM_.

Although it is not required, power-supply bypassing improves noise margin and prevents switching noise propagation from the V+ supply to other components. A 0.1µF capacitor, connected from V+ to GND, is adequate for most applications.

Logic Inputs

The MAX4741/MAX4742/MAX4743 logic inputs can be driven up to +3.6V regardless of the supply voltage. For example, with a +1.8V supply, IN_ may be driven low to GND and high to +3.6V. Driving IN_ rail-to-rail minimizes power consumption.

Analog Signal Levels

Analog signals that range over the entire supply voltage (V+ to GND) can be passed with very little change in on-resistance (see *Typical Operating Characteristics*). The switches are bidirectional, so the NO_, NC_, and COM_ pins can be used as either inputs or outputs.

Layout

High-speed switches require proper layout and design procedures for optimum performance. Reduce stray inductance and capacitance by keeping traces short and wide. Ensure that bypass capacitors are as close to the device as possible. Use large ground planes where possible.

0.8Ω, Low-Voltage, Single-Supply Dual SPST Analog Switches

Test Circuits/Timing Diagrams

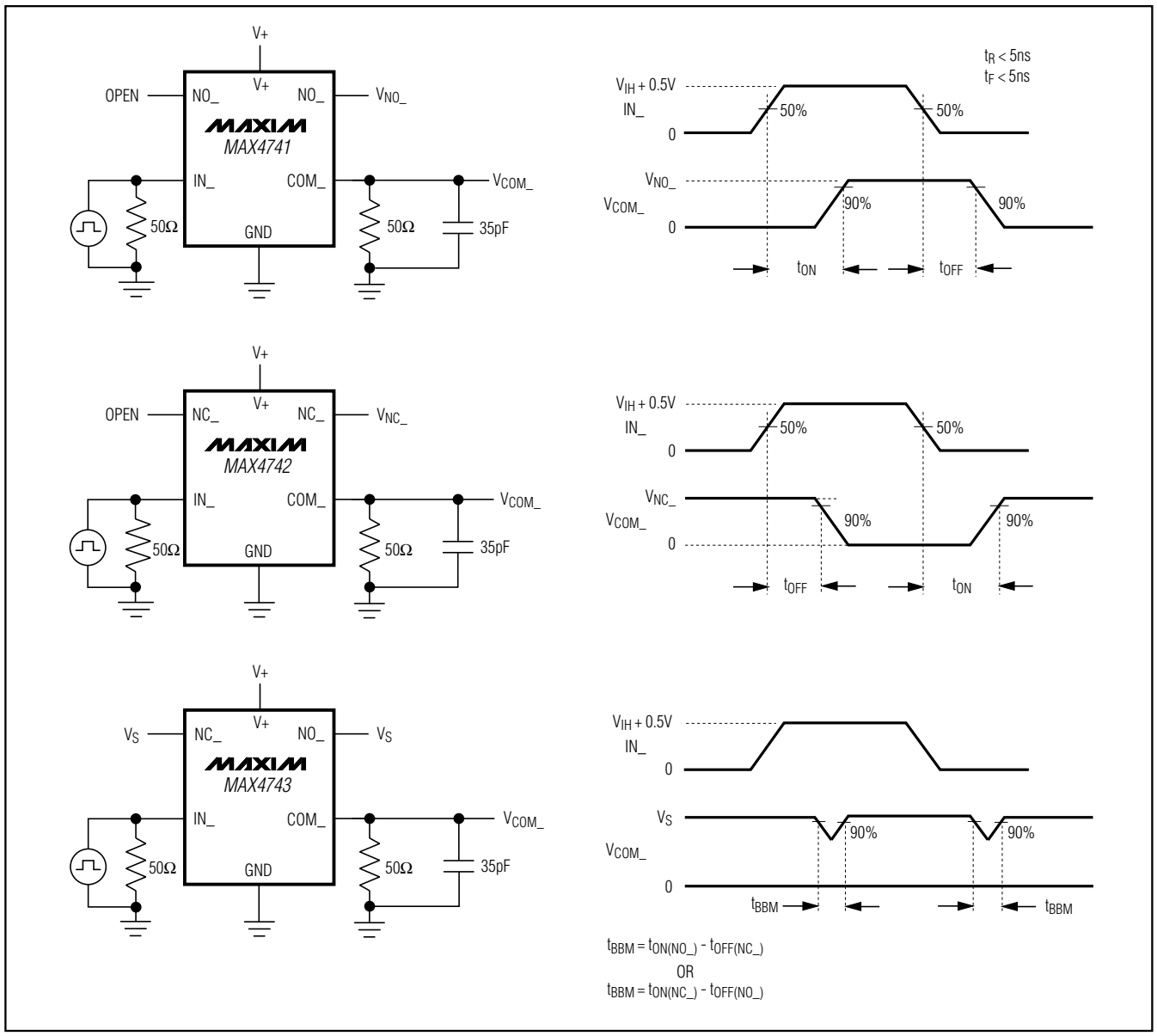


Figure 1. Switching Times

Test Circuits/Timing Diagrams (continued)

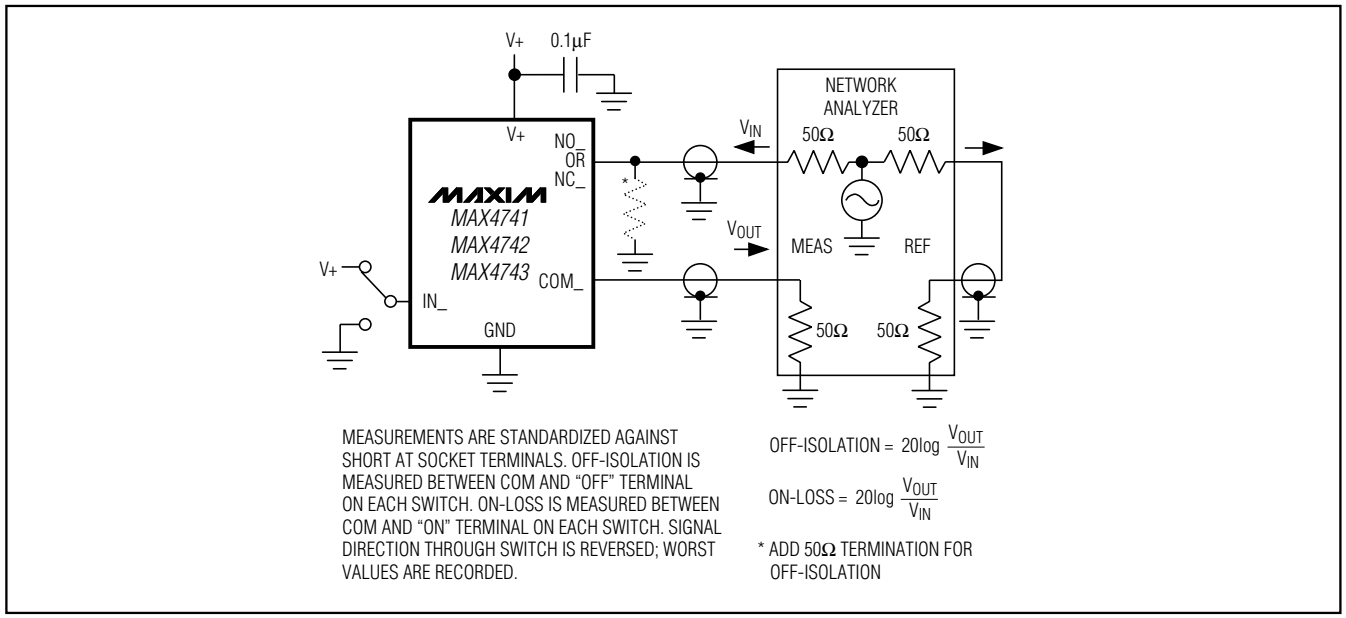


Figure 2. Off-Isolation, On-Loss, and Crosstalk

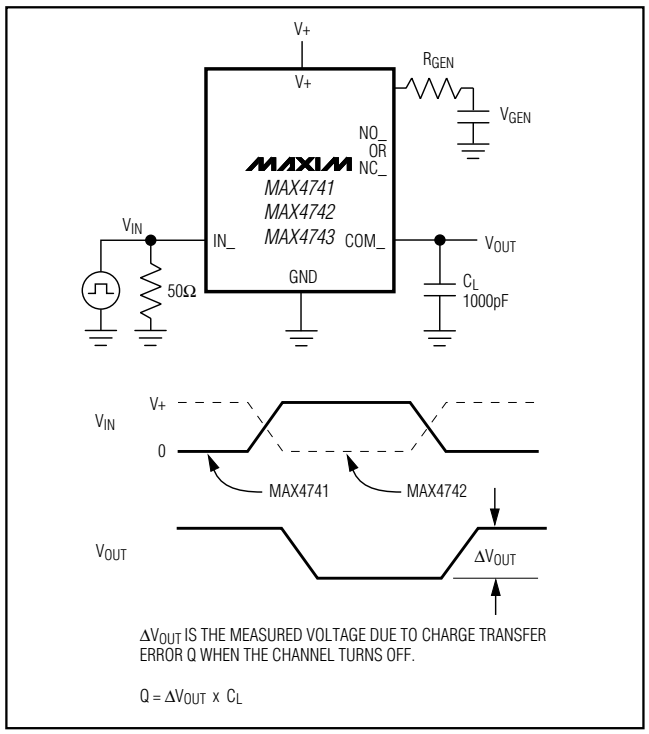


Figure 3. Charge Injection

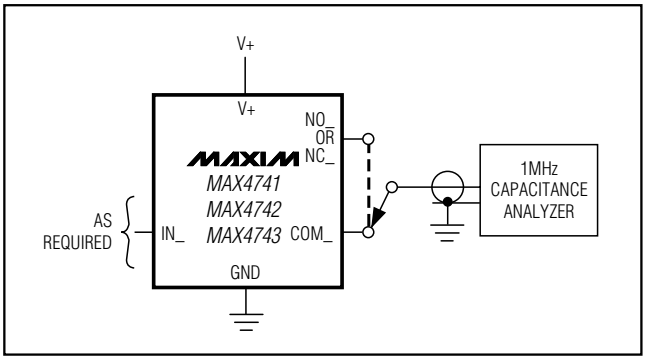
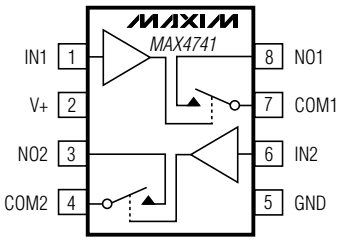


Figure 4. NO_, NC_, and COM_ Capacitance

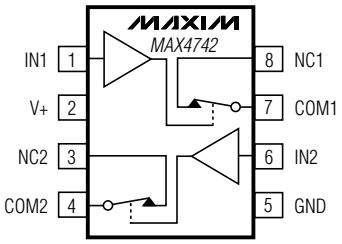
0.8Ω, Low-Voltage, Single-Supply Dual SPST Analog Switches

Pin Configurations (continued)

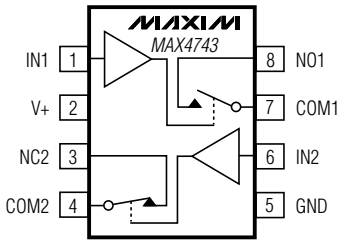
TOP VIEW



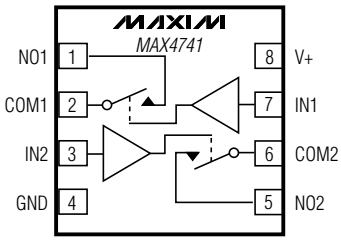
SOT23-8



SOT23-8



SOT23-8



µDFN

(2mm x 2mm)

Chip Information

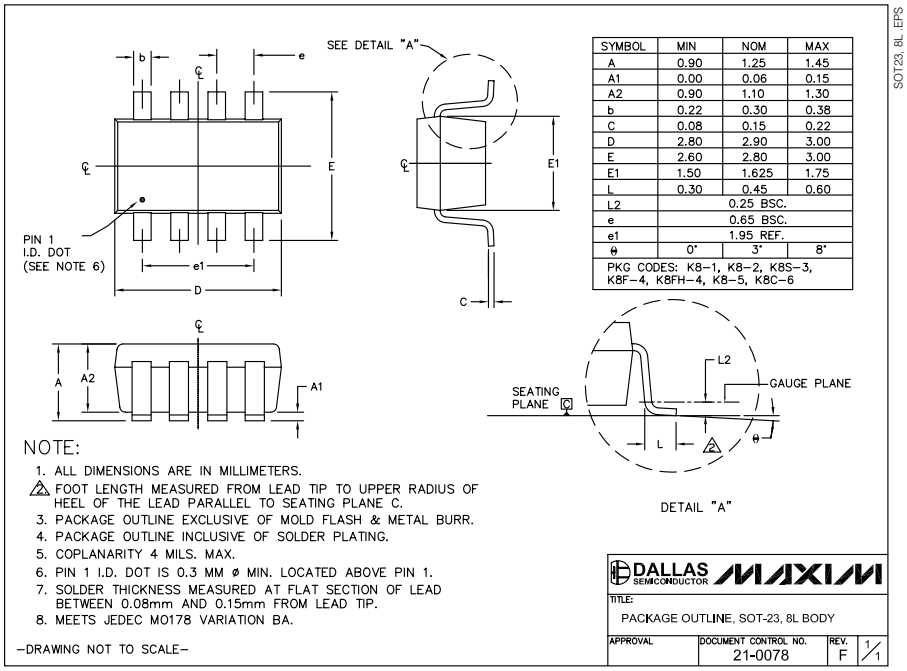
TRANSISTOR COUNT = 121

PROCESS = CMOS

Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to **www.maxim-ic.com/packages**.)

SOT23, 8L .EPS



SYMBOL	MIN	NOM	MAX
A	0.90	1.25	1.45
A1	0.00	0.06	0.15
A2	0.90	1.10	1.30
b	0.22	0.30	0.38
C	0.08	0.15	0.22
D	2.80	2.90	3.00
E	2.60	2.80	3.00
E1	1.50	1.625	1.75
L	0.30	0.45	0.60
L2	0.25 BSC.		
e	0.65 BSC.		
e1	1.95 REF.		
θ	0°	3°	8°

PKG CODES: K8-1, K8-2, K8S-3, K8F-4, K8FH-4, K8-5, K8C-6

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. FOOT LENGTH MEASURED FROM LEAD TIP TO UPPER RADIUS OF HEEL OF THE LEAD PARALLEL TO SEATING PLANE C.
3. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & METAL BURR.
4. PACKAGE OUTLINE INCLUSIVE OF SOLDER PLATING.
5. COPLANARITY 4 MILS. MAX.
6. PIN 1 I.D. DOT IS 0.3 MM ø MIN. LOCATED ABOVE PIN 1.
7. SOLDER THICKNESS MEASURED AT FLAT SECTION OF LEAD BETWEEN 0.08mm AND 0.15mm FROM LEAD TIP.
8. MEETS JEDEC M0178 VARIATION BA.

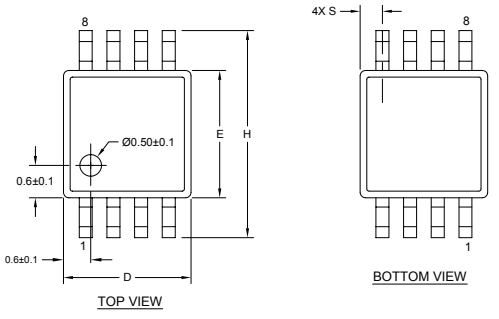
–DRAWING NOT TO SCALE–

DALLAS SEMICONDUCTOR MAXIM

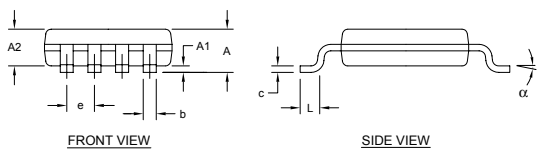
TITLE: PACKAGE OUTLINE, SOT-23, 8L BODY

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0078	F	1/1

8LUMAXD.EPS



DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	-	0.043	-	1.10
A1	0.002	0.006	0.05	0.15
A2	0.030	0.037	0.75	0.95
b	0.010	0.014	0.25	0.36
c	0.005	0.007	0.13	0.18
D	0.116	0.120	2.95	3.05
e	0.0256 BSC		0.65 BSC	
E	0.116	0.120	2.95	3.05
H	0.188	0.198	4.78	5.03
L	0.016	0.026	0.41	0.66
α	0°	6°	0°	6°
S	0.0207 BSC		0.5250 BSC	



NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15MM (.006").
3. CONTROLLING DIMENSION: MILLIMETERS.
4. MEETS JEDEC MO-187C-AA.

DALLAS SEMICONDUCTOR MAXIM

PROPRIETARY INFORMATION

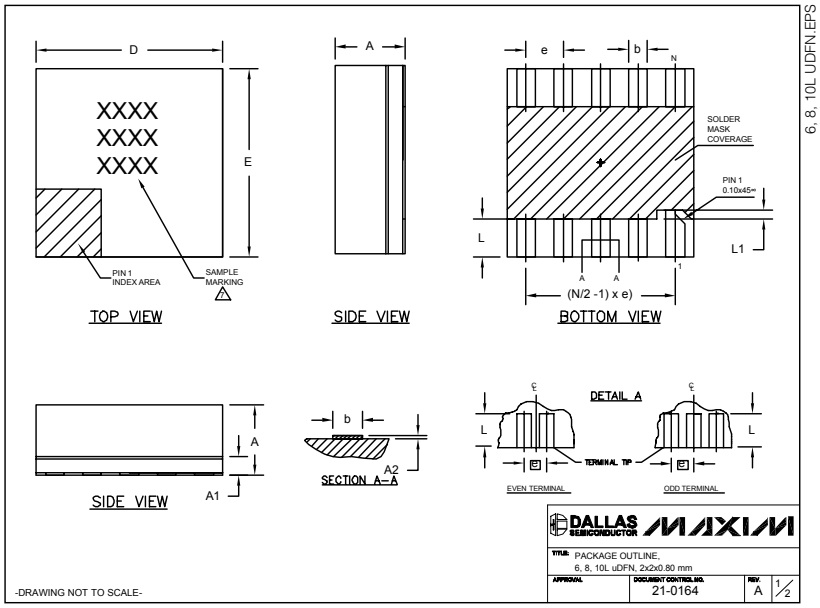
TITLE: PACKAGE OUTLINE, 8L uMAX/uSOP

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0036	J	1/1

0.8Ω, Low-Voltage, Single-Supply Dual SPST Analog Switches

Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to **www.maxim-ic.com/packages**.)



COMMON DIMENSIONS			
SYMBOL	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.15	0.20	0.25
A2	0.020	0.025	0.035
D	1.95	2.00	2.05
E	1.95	2.00	2.05
L	0.30	0.40	0.50
L1	0.10 REF.		

PACKAGE VARIATIONS				
PKG. CODE	N	e	b	(N/2 -1) x e
L622-1	6	0.65 BSC	0.30±0.05	1.30 REF.
L822-1	8	0.50 BSC	0.25±0.05	1.50 REF.
L1022-1	10	0.40 BSC	0.20±0.03	1.60 REF.

NOTES:
1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY SHALL NOT EXCEED 0.08mm.
3. WARPAGE SHALL NOT EXCEED 0.10mm.
4. PACKAGE LENGTH/PACKAGE WIDTH ARE CONSIDERED AS SPECIAL CHARACTERISTIC(S).
5. "N" IS THE TOTAL NUMBER OF LEADS.
6. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.
7. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.

-DRAWING NOT TO SCALE-

DALLAS SEMICONDUCTOR MAXIM
PACKAGE OUTLINE, 6, 8, 10L uDFN, 2x2x0.80 mm
21-0164
A
2/2

Revision History

Pages changed at Rev 2: 1, 12

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.