



High-Speed, Single-Supply, Quad, SPST Analog Switches

MAX4591/MAX4592/MAX4593

General Description

The MAX4591/MAX4592/MAX4593 are high-speed, precision, quad, single-pole/single-throw (SPST) analog switches designed to operate at +12V or +15V. The MAX4591 has four normally closed (NC) switches, and the MAX4592 has four normally open (NO) switches. The MAX4593 has two NO and two NC switches. All three devices offer low leakage (100pA max) and fast switching speeds ($t_{ON} \leq 80ns$, $t_{OFF} \leq 45ns$).

With a +12V supply, the MAX4591/MAX4592/MAX4593 offer guaranteed 1Ω max channel-to-channel matching, 20Ω max on-resistance (R_{ON}), and 1.75Ω max R_{ON} flatness over the specified range.

These switches are also fully specified for single +15V operation, with 16Ω max R_{ON} , 1.5Ω max R_{ON} match, and 1.5Ω max flatness. For low-voltage or dual-supply operation, refer to the MAX391 data sheet.

These low-voltage switches also offer 5pC max charge injection, and electrostatic discharge (ESD) protection is greater than 2000V, per Method 3015.7.

Applications

Test Equipment	Sample-and-Hold Circuits
Disk Drives	Guidance and Control Systems
Tape Drives	Military Radios
Audio and Video	Communications Systems
Switching	PBX, PABX
Heads-Up Displays	

Features

- ◆ Low 16Ω On-Resistance
- ◆ Fast Switching Times: $t_{ON} = 50ns$, $t_{OFF} = 30ns$
- ◆ Guaranteed 1Ω max On-Resistance Match Between Channels
- ◆ Guaranteed 1.75Ω max On-Resistance Flatness over Signal Range
- ◆ Guaranteed 5pC max Charge Injection
- ◆ Improved Leakage over Temperature: 5nA max at +85°C
- ◆ ESD >2000V per Method 3015.7
- ◆ +12V or +15V Single-Supply Operation
- ◆ Pin Compatible with DG611/DG612/DG613, DG211/DG212/DG213

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX4591CUE	0°C to +70°C	16 TSSOP
MAX4591CSE	0°C to +70°C	16 Narrow SO
MAX4591CPE	0°C to +70°C	16 Plastic DIP
MAX4591EUE	-40°C to +85°C	16 TSSOP
MAX4591ESE	-40°C to +85°C	16 Narrow SO
MAX4591EPE	-40°C to +85°C	16 Plastic DIP

Ordering Information continued at end of data sheet.

Pin Configurations/Functional Diagrams/Truth Tables

TOP VIEW

TSSOP/SO/DIP

MAX4591	
LOGIC	SWITCH
0	ON
1	OFF

N.C. = NO CONNECTION

TSSOP/SO/DIP

MAX4592	
LOGIC	SWITCH
0	OFF
1	ON

SWITCHES SHOWN FOR LOGIC "0" INPUT

TSSOP/SO/DIP

LOGIC	MAX4593	
	SWITCHES 1, 4	SWITCHES 2, 3
0	OFF	ON
1	ON	OFF



High-Speed, Single-Supply, Quad, SPST Analog Switches

ABSOLUTE MAXIMUM RATINGS

V+ to GND	-0.3V to +17V
VIN_, VCOM_, VNC_, VNO_ (Note 1)	V- to V+
Current (any terminal)	30mA
Peak Current, COM_, NO_, NC_ (pulsed at 1ms, 10% duty cycle max)	100mA
ESD per Method 3015.7	>2000V
Continuous Power Dissipation (TA = +70°C) 16-Pin TSSOP (derate 5.70mW/°C above +70°C)	457mW

16-Pin Narrow SO (derate 8.70mW/°C above +70°C)	696mW
16-Pin Plastic DIP (derate 10.53mW/°C above +70°C)	842mW
Operating Temperature Ranges	
MAX459_C_E	0°C to +70°C
MAX459_E_E	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C

Note 1: Signals on NC_, NO_, COM_, or IN_ exceeding V+ or V- 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—Single +12V Supply

(V+ = +12V, V- = GND = 0, VINH = 5V, VINL = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
ANALOG SWITCH						
Analog Signal Range	VCOM_, VNO_, VNC_	(Note 3)	C, E	V-	V+	V
On-Resistance	RON	ICOM_ = -10mA, VNO_ or VNC_ = 10V	TA = +25°C C, E	16	20 24	Ω
On-Resistance Match Between Channels (Note 4)	ΔRON	ICOM_ = -10mA, VNO_ or VNC_ = 10V	TA = +25°C C, E	0.5	1 1.5	Ω
On-Resistance Flatness (Note 5)	RFLAT(ON)	ICOM_ = -10mA; VNO_ or VNC_ = 3V, 6V, 9V	TA = +25°C C, E	1	1.75 2	Ω
NO or NC Off-Leakage Current (Note 6)	INO_(OFF) or INC_(OFF)	V+ = 15.5V; VCOM_ = 14V, 1V; VNO_ or VNC_ = 1V, 14V	TA = +25°C C, E	-0.1	0.01 5	0.1 nA
COM Off-Leakage Current (Note 6)	ICOM_(OFF)	V+ = 15.5V; VCOM_ = 14V, 1V; VNO_ or VNC_ = 1V, 14V	TA = +25°C C, E	-0.1	0.01 5	0.1 nA
COM On-Leakage Current (Note 6)	ICOM_(ON)	V+ = 15.5V; VCOM_ = 14V, 1V; VNO_ or VNC_ = 14V, 1V, or floating	TA = +25°C C, E	-0.2	0.01 10	0.2 nA

High-Speed, Single-Supply, Quad, SPST Analog Switches

MAX4591/MAX4592/MAX4593

ELECTRICAL CHARACTERISTICS—Single +12V Supply (continued)

(V+ = +12V, V- = GND = 0, VINH = 5V, VINL = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
LOGIC INPUT							
Input Current with Input Voltage High	IINH	IN_ = V+, all others = 0.8V		-0.5	0.005	0.5	μA
Input Current with Input Voltage Low	IINL	IN_ = 0.8V, all others = V+		-0.5	0.005	0.5	μA
DYNAMIC							
Turn-On Time	tON	VCOM_ = 10V, Figure 2	TA = +25°C	50	80		ns
			C, E		90		
Turn-Off Time	tOFF	VCOM_ = 10V, Figure 2	TA = +25°C	30	45		ns
			C, E		50		
Break-Before-Make Time Delay (Note 3)	tD	MAX4593 only, RL = 300Ω, CL = 35pF, Figure 3		5	20		ns
Charge Injection (Note 3)	Q	CL = 1nF, VGEN = 0, RGEN = 0Ω, Figure 4	TA = +25°C		2	5	pC
Off-Isolation (Note 7)	OIRR	RL = 50Ω, CL = 5pF, f = 10MHz, Figure 5	TA = +25°C		72		dB
Crosstalk (Note 8)		RL = 50Ω, CL = 5pF, f = 10MHz, Figure 6	TA = +25°C		85		dB
NC_ or NO_ Capacitance	C(OFF)	f = 1MHz, Figure 7	TA = +25°C		9		pF
COM_ Off-Capacitance	CCOM_(OFF)	f = 1MHz, Figure 7	TA = +25°C		9		pF
COM_ On-Capacitance	CCOM_(ON)	f = 1MHz, Figure 8	TA = +25°C		22		pF
SUPPLY							
Power-Supply Range				3		16	V
Positive Supply Current	I+	V+ = 15V, VINL = 0 or V+, all channels on or off	C, E	-1	0.001	1	μA

High-Speed, Single-Supply, Quad, SPST Analog Switches

ELECTRICAL CHARACTERISTICS—Single +15V Supply

(V+ = +15V, V- = GND = 0, VINH = 5V, VINL = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.) (Note 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	
ANALOG SWITCH							
Analog Signal Range	VCOM-, VNO-, VNC-	(Note 3)	0		V+	V	
On-Resistance	RON	ICOM- = -10mA, VNO- or VNC- = 10V	TA = +25°C	12	16	Ω	
			C, E		2.0		
On-Resistance Match Between Channels (Notes 3, 4)	ΔRON	ICOM- = -10mA, VNO- or VNC- = 10V	TA = +25°C	0.5	1.5	Ω	
			C, E		2.0		
On-Resistance Flatness (Notes 3, 5)	RFLAT(ON)	ICOM- = -10mA; VNO- or VNC- = 3V, 6V, 9V	TA = +25°C	0.7	1.5	Ω	
			C, E		2.0		
NO- or NC- Off-Leakage Current (Note 6)	INO-(OFF) or INC-(OFF)	V+ = 15.5V; VCOM- = 14V, 1V; VNO- or VNC- = 1V, 14V	TA = +25°C	-0.1	0.01	0.1	nA
			C, E	-5		5	
COM- Off-Leakage Current (Note 6)	ICOM-(OFF)	V+ = 15.5V; VCOM- = 14V, 1V; VNO- or VNC- = 1V, 14V	TA = +25°C	-0.1	0.01	0.1	nA
			C, E	-5		5	
COM- On-Leakage Current (Note 6)	ICOM-(ON)	V+ = 15.5V; VCOM- = 14V, 1V; VNO- or VNC- = 14V, 1V, or floating	TA = +25°C	-0.2	0.02	0.2	nA
			C, E	-10		10	
DYNAMIC							
Turn-On Time	tON	VNO- or VNC- = 10V, Figure 2	TA = +25°C	60	80	ns	
			C, E		90		
Turn-Off Time	tOFF	VNO- or VNC- = 10V, Figure 2	TA = +25°C	30	40	ns	
			C, E		50		
Break-Before-Make Time Delay (Note 3)	tD	MAX4593 only, RL = 300Ω, CL = 35pF	5	20		ns	
Charge Injection (Note 3)	Q	CL = 1nF, VGEN = 0, RGEN = 0Ω, Figure 4		2	5	pC	
SUPPLY							
Positive Supply Current	I+	V+ = 15V, VINL = 0 or V+, all channels on or off	-1	0.001	1	μA	
Negative Supply Current	I-	V+ = 15V, VINL = 0 or V+, all channels on or off	-1	0.001	1	μA	

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

Note 3: Guaranteed by design.

Note 4: ΔRON = ΔRON max - ΔRON 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 range.

Note 6: Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.

Note 7: Off-isolation = 20log10 [VCOM / (VNC or VNO)], VCOM = output, VNC or VNO = input to off switch.

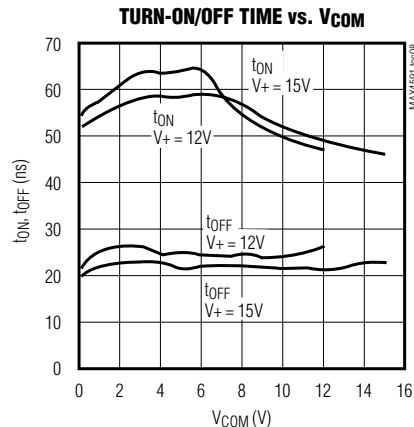
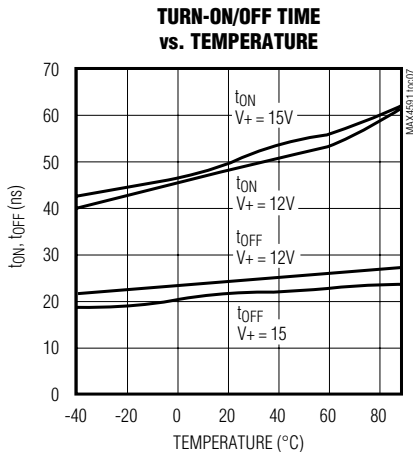
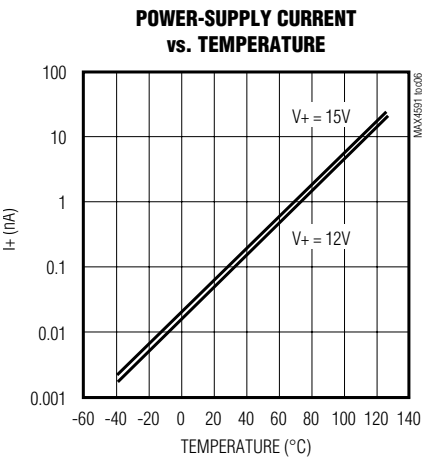
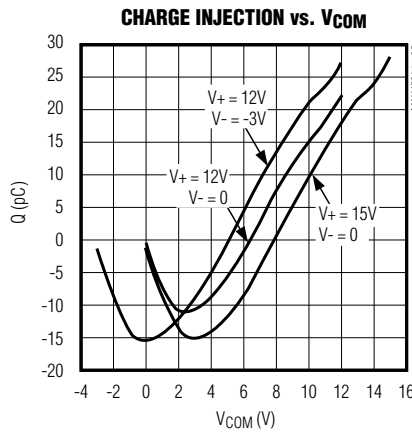
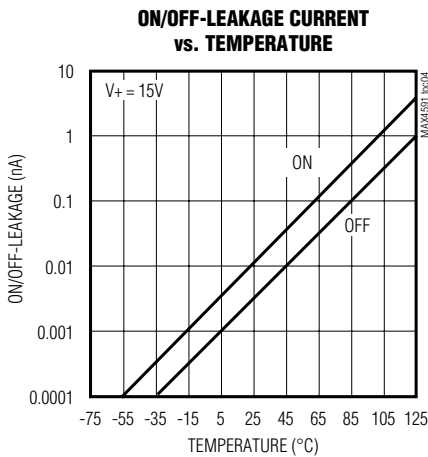
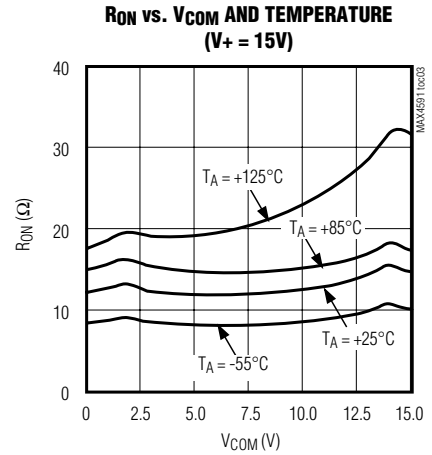
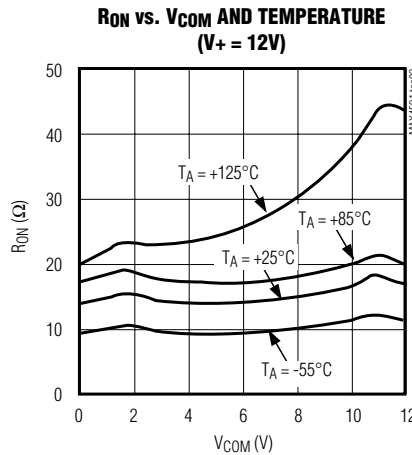
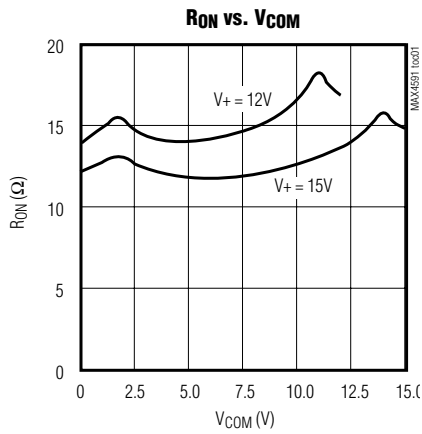
Note 8: Between any two switches.

High-Speed, Single-Supply, Quad, SPST Analog Switches

Typical Operating Characteristics

($V_- = \text{GND} = 0$, $\text{IN}_- = 0$ or V_+ , $T_A = +25^\circ\text{C}$, unless otherwise noted.)

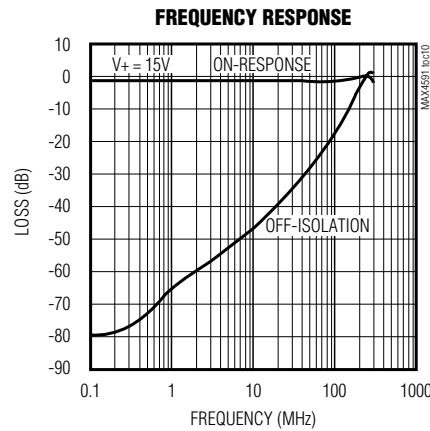
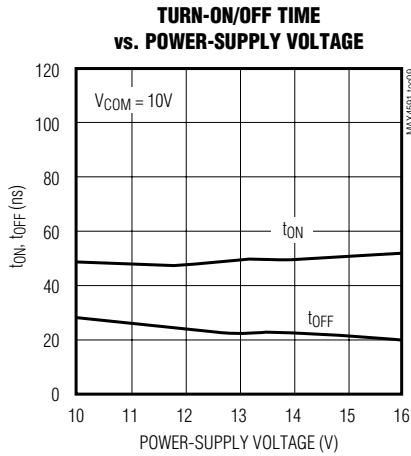
MAX4591/MAX4592/MAX4593



High-Speed, Single-Supply, Quad, SPST Analog Switches

Typical Operating Characteristics (continued)

(V₋ = GND = 0, IN₋ = 0 or V₊, T_A = +25°C, unless otherwise noted.)



Pin Description

PIN	NAME	FUNCTION
1, 16, 9, 8	IN1–IN4	Switch Input Terminals. Drive ≤ 0.8V for logic “0”; drive ≥ 5V for logic “1”.
2, 15, 10, 7	COM1–COM4	Analog Switch Common Terminal
3, 14, 11, 6	NO1–NO4 or NC1–NC4	Switch Inputs
4	V-	Negative Supply Voltage Input. Normally connected to ground.
5	GND	Ground
12	N.C.	No Connection. Not internally connected.
13	V+	Positive Supply Voltage Input. Connected to substrate.

Applications Information

Overvoltage Protection

Proper power-supply sequencing is recommended for all CMOS devices. Do not exceed the absolute maximum ratings because stresses beyond the listed ratings may cause permanent damage to the devices. Always sequence V₊ on first, followed by the logic inputs. If power-supply sequencing is not possible, add a small signal diode in series with V₊ for overvoltage protection (Figure 1). Adding a diode reduces the analog signal range to 1V below V₊, but low switch resistance and low leakage characteristics are unaffected. Device operation is unchanged, and the difference between V₊ and V₋ should not exceed 17V.

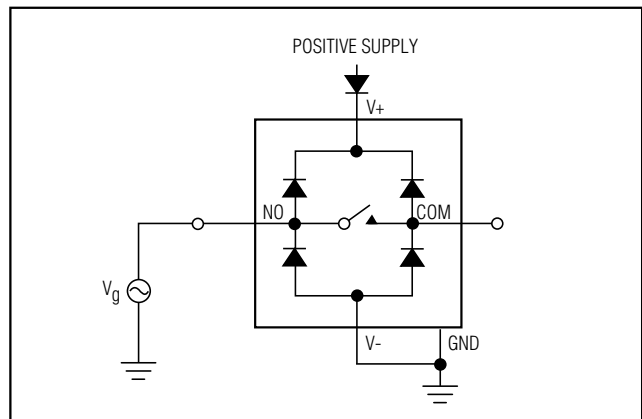


Figure 1. Overvoltage Protection Using Two External Blocking Diodes

High-Speed, Single-Supply, Quad, SPST Analog Switches

Test Circuits/Timing Diagrams

MAX4591/MAX4592/MAX4593

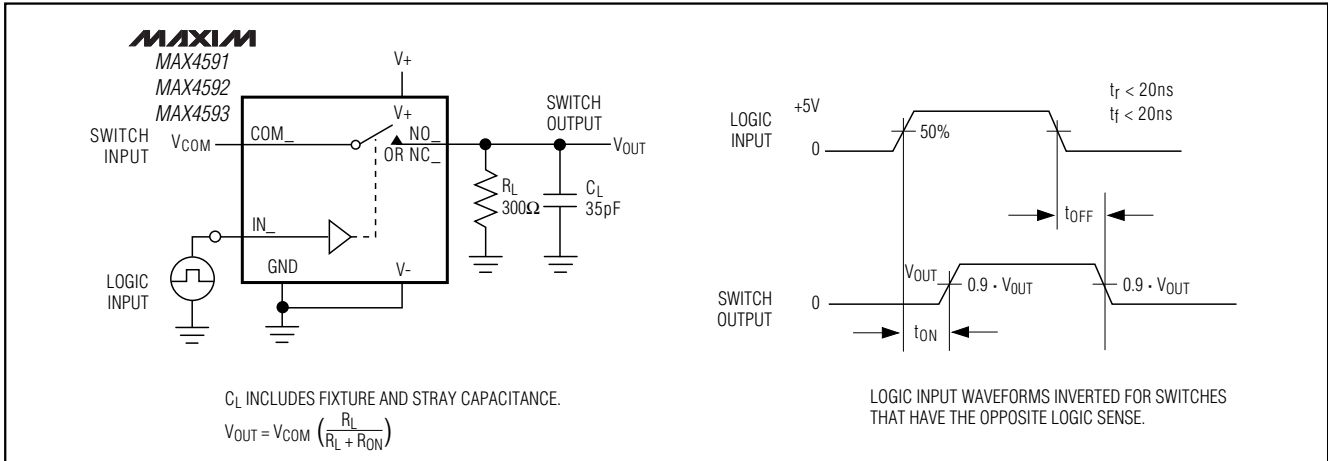


Figure 2. Switching Time

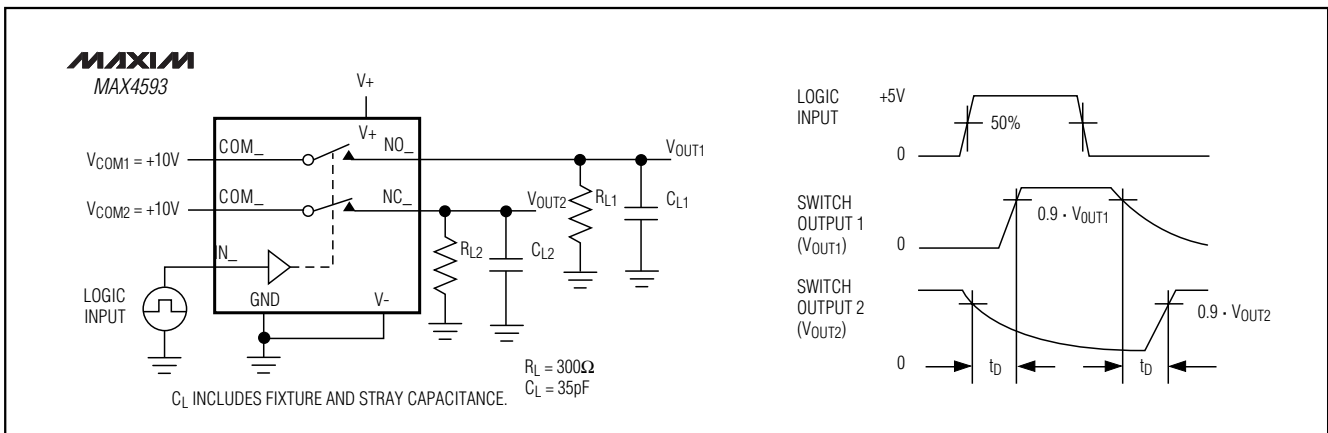


Figure 3. Break-Before-Make Interval (MAX4593 Only)

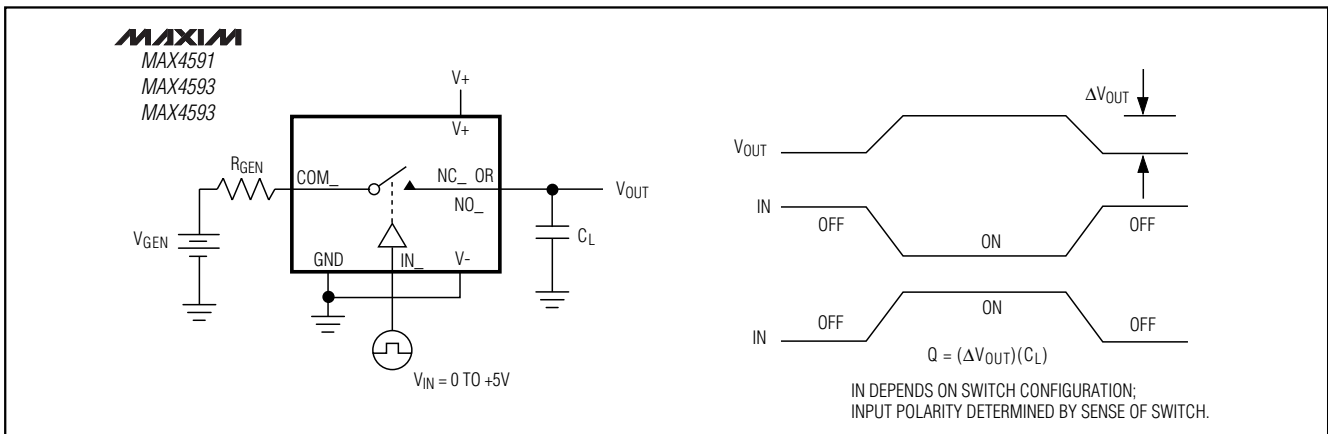


Figure 4. Charge Injection

High-Speed, Single-Supply, Quad, SPST Analog Switches

Test Circuits/Timing Diagrams (continued)

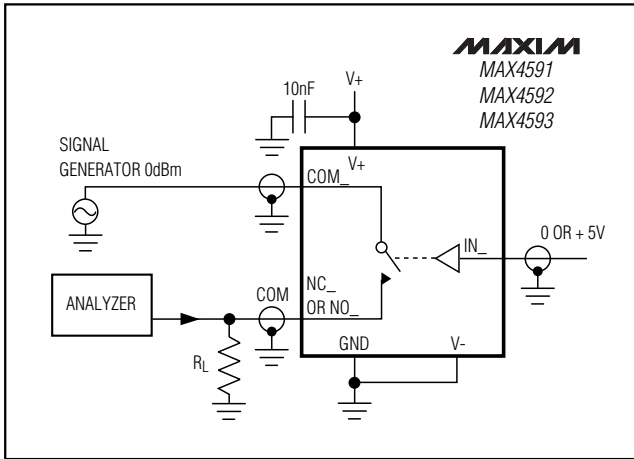


Figure 5. Off-Isolation

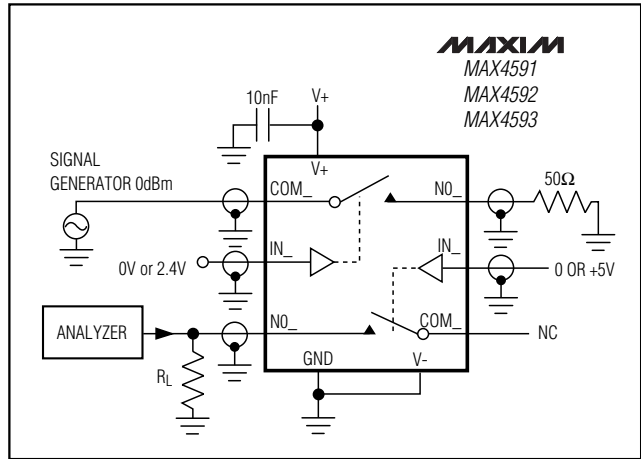


Figure 6. Crosstalk

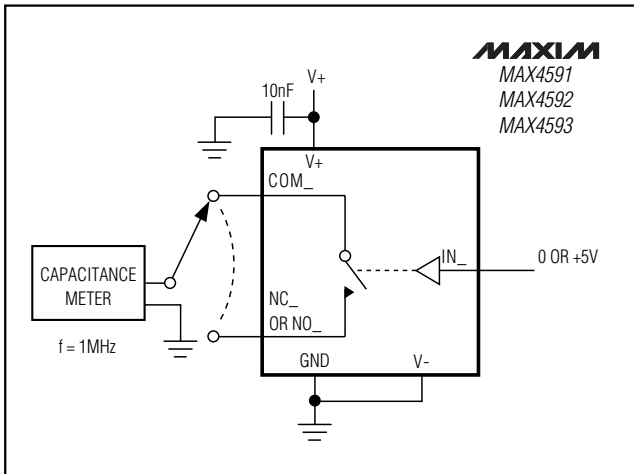


Figure 7. Channel Off-Capacitance

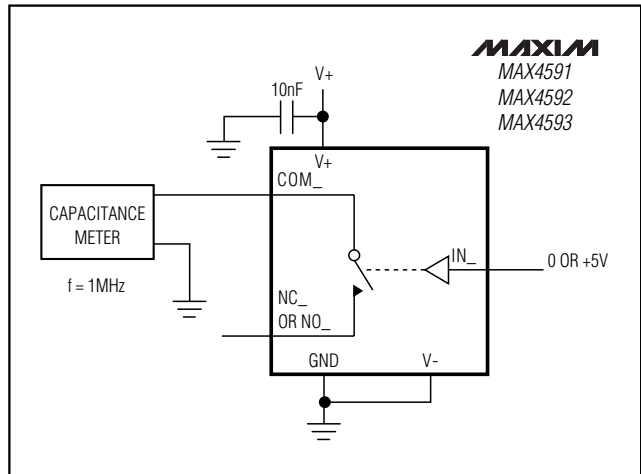


Figure 8. Channel On-Capacitance

High-Speed, Single-Supply, Quad, SPST Analog Switches

Ordering Information (continued)

PART	TEMP. RANGE	PIN-PACKAGE
MAX4592CUE	0°C to +70°C	16 TSSOP
MAX4592CSE	0°C to +70°C	16 Narrow SO
MAX4592CPE	0°C to +70°C	16 Plastic DIP
MAX4592EUE	-40°C to +85°C	16 TSSOP
MAX4592ESE	-40°C to +85°C	16 Narrow SO
MAX4592EPE	-40°C to +85°C	16 Plastic DIP
MAX4593CUE	0°C to +70°C	16 TSSOP
MAX4593CSE	0°C to +70°C	16 Narrow SO
MAX4593CPE	0°C to +70°C	16 Plastic DIP
MAX4593EUE	-40°C to +85°C	16 TSSOP
MAX4593ESE	-40°C to +85°C	16 Narrow SO
MAX4593EPE	-40°C to +85°C	16 Plastic DIP

Chip Information

TRANSISTOR COUNT: 76

MAX4591/MAX4592/MAX4593

Package Information

MECHANICAL DIMENSIONS

SYMBOL	PARAMETER	MILS	INCHES
A	MAXIMUM HEIGHT	200	0.00787
B	MAXIMUM LEAD HEIGHT	100	0.00394
C	MINIMUM LEAD HEIGHT	75	0.00295
D	MAXIMUM LEAD LENGTH	200	0.00787
E	MINIMUM LEAD LENGTH	150	0.00591
F	MAXIMUM LEAD LENGTH	200	0.00787
G	MINIMUM LEAD LENGTH	150	0.00591
H	MAXIMUM LEAD LENGTH	200	0.00787
I	MINIMUM LEAD LENGTH	150	0.00591
J	MAXIMUM LEAD LENGTH	200	0.00787
K	MINIMUM LEAD LENGTH	150	0.00591
L	MAXIMUM LEAD LENGTH	200	0.00787
M	MINIMUM LEAD LENGTH	150	0.00591
N	MAXIMUM LEAD LENGTH	200	0.00787
O	MINIMUM LEAD LENGTH	150	0.00591
P	MAXIMUM LEAD LENGTH	200	0.00787
Q	MINIMUM LEAD LENGTH	150	0.00591
R	MAXIMUM LEAD LENGTH	200	0.00787
S	MINIMUM LEAD LENGTH	150	0.00591
T	MAXIMUM LEAD LENGTH	200	0.00787
U	MINIMUM LEAD LENGTH	150	0.00591
V	MAXIMUM LEAD LENGTH	200	0.00787
W	MINIMUM LEAD LENGTH	150	0.00591
X	MAXIMUM LEAD LENGTH	200	0.00787
Y	MINIMUM LEAD LENGTH	150	0.00591
Z	MAXIMUM LEAD LENGTH	200	0.00787
AA	MINIMUM LEAD LENGTH	150	0.00591
AB	MAXIMUM LEAD LENGTH	200	0.00787
AC	MINIMUM LEAD LENGTH	150	0.00591
AD	MAXIMUM LEAD LENGTH	200	0.00787
AE	MINIMUM LEAD LENGTH	150	0.00591
AF	MAXIMUM LEAD LENGTH	200	0.00787
AG	MINIMUM LEAD LENGTH	150	0.00591
AH	MAXIMUM LEAD LENGTH	200	0.00787
AI	MINIMUM LEAD LENGTH	150	0.00591
AJ	MAXIMUM LEAD LENGTH	200	0.00787
AK	MINIMUM LEAD LENGTH	150	0.00591
AL	MAXIMUM LEAD LENGTH	200	0.00787
AM	MINIMUM LEAD LENGTH	150	0.00591
AN	MAXIMUM LEAD LENGTH	200	0.00787
AO	MINIMUM LEAD LENGTH	150	0.00591
AP	MAXIMUM LEAD LENGTH	200	0.00787
AQ	MINIMUM LEAD LENGTH	150	0.00591
AR	MAXIMUM LEAD LENGTH	200	0.00787
AS	MINIMUM LEAD LENGTH	150	0.00591
AT	MAXIMUM LEAD LENGTH	200	0.00787
AU	MINIMUM LEAD LENGTH	150	0.00591
AV	MAXIMUM LEAD LENGTH	200	0.00787
AW	MINIMUM LEAD LENGTH	150	0.00591
AX	MAXIMUM LEAD LENGTH	200	0.00787
AY	MINIMUM LEAD LENGTH	150	0.00591
AZ	MAXIMUM LEAD LENGTH	200	0.00787
BA	MINIMUM LEAD LENGTH	150	0.00591
BB	MAXIMUM LEAD LENGTH	200	0.00787
BC	MINIMUM LEAD LENGTH	150	0.00591
BD	MAXIMUM LEAD LENGTH	200	0.00787
BE	MINIMUM LEAD LENGTH	150	0.00591
BF	MAXIMUM LEAD LENGTH	200	0.00787
BG	MINIMUM LEAD LENGTH	150	0.00591
BH	MAXIMUM LEAD LENGTH	200	0.00787
BI	MINIMUM LEAD LENGTH	150	0.00591
BJ	MAXIMUM LEAD LENGTH	200	0.00787
BK	MINIMUM LEAD LENGTH	150	0.00591
BL	MAXIMUM LEAD LENGTH	200	0.00787
BM	MINIMUM LEAD LENGTH	150	0.00591
BN	MAXIMUM LEAD LENGTH	200	0.00787
BO	MINIMUM LEAD LENGTH	150	0.00591
BP	MAXIMUM LEAD LENGTH	200	0.00787
BQ	MINIMUM LEAD LENGTH	150	0.00591
BR	MAXIMUM LEAD LENGTH	200	0.00787
BS	MINIMUM LEAD LENGTH	150	0.00591
BT	MAXIMUM LEAD LENGTH	200	0.00787
BU	MINIMUM LEAD LENGTH	150	0.00591
BV	MAXIMUM LEAD LENGTH	200	0.00787
BW	MINIMUM LEAD LENGTH	150	0.00591
BX	MAXIMUM LEAD LENGTH	200	0.00787
BY	MINIMUM LEAD LENGTH	150	0.00591
BZ	MAXIMUM LEAD LENGTH	200	0.00787
CA	MINIMUM LEAD LENGTH	150	0.00591
CB	MAXIMUM LEAD LENGTH	200	0.00787
CC	MINIMUM LEAD LENGTH	150	0.00591
CD	MAXIMUM LEAD LENGTH	200	0.00787
CE	MINIMUM LEAD LENGTH	150	0.00591
CF	MAXIMUM LEAD LENGTH	200	0.00787
CG	MINIMUM LEAD LENGTH	150	0.00591
CH	MAXIMUM LEAD LENGTH	200	0.00787
CI	MINIMUM LEAD LENGTH	150	0.00591
CJ	MAXIMUM LEAD LENGTH	200	0.00787
CK	MINIMUM LEAD LENGTH	150	0.00591
CL	MAXIMUM LEAD LENGTH	200	0.00787
CM	MINIMUM LEAD LENGTH	150	0.00591
CN	MAXIMUM LEAD LENGTH	200	0.00787
CO	MINIMUM LEAD LENGTH	150	0.00591
CP	MAXIMUM LEAD LENGTH	200	0.00787
CQ	MINIMUM LEAD LENGTH	150	0.00591
CR	MAXIMUM LEAD LENGTH	200	0.00787
CS	MINIMUM LEAD LENGTH	150	0.00591
CT	MAXIMUM LEAD LENGTH	200	0.00787
CU	MINIMUM LEAD LENGTH	150	0.00591
CV	MAXIMUM LEAD LENGTH	200	0.00787
CW	MINIMUM LEAD LENGTH	150	0.00591
CX	MAXIMUM LEAD LENGTH	200	0.00787
CY	MINIMUM LEAD LENGTH	150	0.00591
CZ	MAXIMUM LEAD LENGTH	200	0.00787
DA	MINIMUM LEAD LENGTH	150	0.00591
DB	MAXIMUM LEAD LENGTH	200	0.00787
DC	MINIMUM LEAD LENGTH	150	0.00591
DD	MAXIMUM LEAD LENGTH	200	0.00787
DE	MINIMUM LEAD LENGTH	150	0.00591
DF	MAXIMUM LEAD LENGTH	200	0.00787
DG	MINIMUM LEAD LENGTH	150	0.00591
DH	MAXIMUM LEAD LENGTH	200	0.00787
DI	MINIMUM LEAD LENGTH	150	0.00591
DJ	MAXIMUM LEAD LENGTH	200	0.00787
DK	MINIMUM LEAD LENGTH	150	0.00591
DL	MAXIMUM LEAD LENGTH	200	0.00787
DM	MINIMUM LEAD LENGTH	150	0.00591
DN	MAXIMUM LEAD LENGTH	200	0.00787
DO	MINIMUM LEAD LENGTH	150	0.00591
DP	MAXIMUM LEAD LENGTH	200	0.00787
DQ	MINIMUM LEAD LENGTH	150	0.00591
DR	MAXIMUM LEAD LENGTH	200	0.00787
DS	MINIMUM LEAD LENGTH	150	0.00591
DT	MAXIMUM LEAD LENGTH	200	0.00787
DU	MINIMUM LEAD LENGTH	150	0.00591
DV	MAXIMUM LEAD LENGTH	200	0.00787
DW	MINIMUM LEAD LENGTH	150	0.00591
DX	MAXIMUM LEAD LENGTH	200	0.00787
DY	MINIMUM LEAD LENGTH	150	0.00591
DZ	MAXIMUM LEAD LENGTH	200	0.00787
EA	MINIMUM LEAD LENGTH	150	0.00591
EB	MAXIMUM LEAD LENGTH	200	0.00787
EC	MINIMUM LEAD LENGTH	150	0.00591
ED	MAXIMUM LEAD LENGTH	200	0.00787
EE	MINIMUM LEAD LENGTH	150	0.00591
EF	MAXIMUM LEAD LENGTH	200	0.00787
EG	MINIMUM LEAD LENGTH	150	0.00591
EH	MAXIMUM LEAD LENGTH	200	0.00787
EI	MINIMUM LEAD LENGTH	150	0.00591
EJ	MAXIMUM LEAD LENGTH	200	0.00787
EK	MINIMUM LEAD LENGTH	150	0.00591
EL	MAXIMUM LEAD LENGTH	200	0.00787
EM	MINIMUM LEAD LENGTH	150	0.00591
EN	MAXIMUM LEAD LENGTH	200	0.00787
EO	MINIMUM LEAD LENGTH	150	0.00591
EP	MAXIMUM LEAD LENGTH	200	0.00787
EQ	MINIMUM LEAD LENGTH	150	0.00591
ER	MAXIMUM LEAD LENGTH	200	0.00787
ES	MINIMUM LEAD LENGTH	150	0.00591
ET	MAXIMUM LEAD LENGTH	200	0.00787
EU	MINIMUM LEAD LENGTH	150	0.00591
EV	MAXIMUM LEAD LENGTH	200	0.00787
EW	MINIMUM LEAD LENGTH	150	0.00591
EX	MAXIMUM LEAD LENGTH	200	0.00787
EY	MINIMUM LEAD LENGTH	150	0.00591
EZ	MAXIMUM LEAD LENGTH	200	0.00787
FA	MINIMUM LEAD LENGTH	150	0.00591
FB	MAXIMUM LEAD LENGTH	200	0.00787
FC	MINIMUM LEAD LENGTH	150	0.00591
FD	MAXIMUM LEAD LENGTH	200	0.00787
FE	MINIMUM LEAD LENGTH	150	0.00591
FF	MAXIMUM LEAD LENGTH	200	0.00787
FG	MINIMUM LEAD LENGTH	150	0.00591
FH	MAXIMUM LEAD LENGTH	200	0.00787
FI	MINIMUM LEAD LENGTH	150	0.00591
FJ	MAXIMUM LEAD LENGTH	200	0.00787
FK	MINIMUM LEAD LENGTH	150	0.00591
FL	MAXIMUM LEAD LENGTH	200	0.00787
FM	MINIMUM LEAD LENGTH	150	0.00591
FN	MAXIMUM LEAD LENGTH	200	0.00787
FO	MINIMUM LEAD LENGTH	150	0.00591
FP	MAXIMUM LEAD LENGTH	200	0.00787
FO	MINIMUM LEAD LENGTH	150	0.00591
FP	MAXIMUM LEAD LENGTH	200	0.00787
FO	MINIMUM LEAD LENGTH	150	0.00591
FP	MAXIMUM LEAD LENGTH	200	0.00787

NOTES:

1. DIMENSIONS B AND C DO NOT INCLUDE FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 25 μm PER SIDE.
3. CONTROLLING DIMENSION MILLIMETER.
4. METRIC JESD OUTLINE MO-153 VARIATIONS FOR MC, ML, ME, MF.
5. DIMENSIONS M AND Y APPLY TO EXPOSED PAD DIPS VERSIONS ONLY.
6. EXPOSED PAD FLUSH WITH BOTTOM OF PACKAGE WITHIN 0.1mm.

MAXIM

PACKAGE OUTLINE, TSSOP, 64mm BODY, 16mm PITCH

ES-0066

High-Speed, Single-Supply, Quad, SPST Analog Switches

Package Information (continued)

	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
e	0.050		1.27	
E	0.150	0.157	3.80	4.00
H	0.228	0.244	5.80	6.20
h	0.010	0.020	0.25	0.50
L	0.016	0.050	0.40	1.27

	INCHES		MILLIMETERS		N	MS012
	MIN	MAX	MIN	MAX		
D	0.189	0.197	4.80	5.00	8	A
D	0.337	0.344	8.55	8.75	14	B
D	0.386	0.394	9.80	10.00	16	C

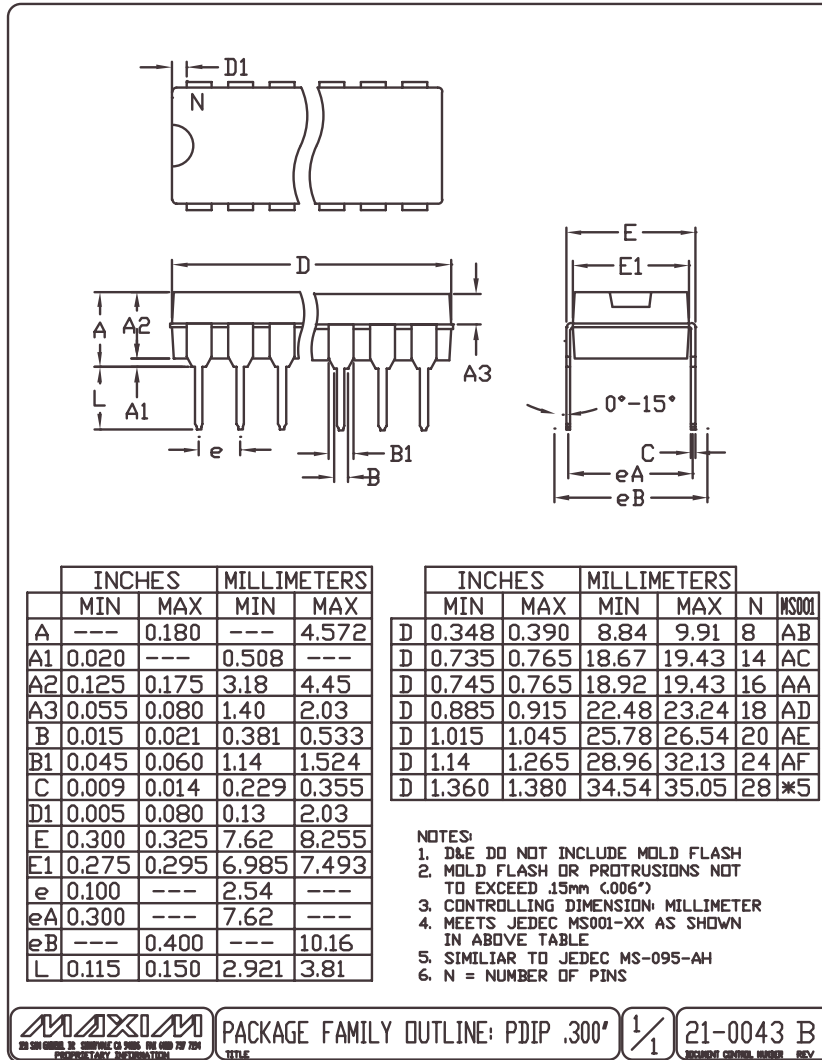
NOTES:
 1. D&E DO NOT INCLUDE MOLD FLASH
 2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")
 3. LEADS TO BE COPLANAR WITHIN .102mm (.004")
 4. CONTROLLING DIMENSION: MILLIMETER
 5. MEETS JEDEC MS012-XX AS SHOWN IN ABOVE TABLE
 6. N = NUMBER OF PINS

MAXIM PACKAGE FAMILY OUTLINE: SOIC .150° 1/1 21-0041 A
MAXIM IS A REGISTERED TRADEMARK OF MAXIM INTEGRATED PRODUCTS REVISION CONTROL NUMBER REV

High-Speed, Single-Supply, Quad, SPST Analog Switches

Package Information (continued)

MAX4591/MAX4592/MAX4593



High-Speed, Single-Supply, Quad, SPST Analog Switches

NOTES

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.

12 _____ **Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600**