19-0236; Rev 1; 6/99

MAXIM

Precision, Quad, SPST Analog Switches

MAX391/MAX392/MAX393

General Description

The MAX391/MAX392/MAX393 are precision, quad, single-pole/single-throw (SPST) analog switches designed to operate at +3V, +5V, or ±5V. The MAX391 has four normally closed (NC) switches, and the MAX392 has four normally open (NO) switches. The MAX393 has two NO and two NC switches. All three devices offer low leakage (100pA max) and fast switching speeds ($t_{ON} \leq$ 130ns, $t_{OFF} \leq$ 75ns). Power consumption is just 1µW—ideal for battery-operated equipment. All devices operate from a single +3V to +15V supply or from dual ±3.0V to ±8V supplies.

With ±5V supplies, the MAX391/MAX392/MAX393 offer guaranteed 2Ω max channel-to-channel matching, 30Ω max on-resistance (R_{ON}), and 4Ω max R_{ON} flatness over the specified range.

These switches are also fully specified for single +5V operation, with 2Ω max R_{ON} match, 60Ω max R_{ON}, and 6Ω max flatness.

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

Applications

Battery-Operated Systems	Sample-and-Hold Circuits
Heads-Up Displays	Guidance and Control Systems
Audio and Video Switching	Military Radios
Test Equipment	Communications Systems
±5V DACs and ADCs	PBX, PABX

Features

♦ **Low On-Resistance, 20Ω Typical**

♦ **Guaranteed On-Resistance Match Between Channels, <2Ω**

♦ **Guaranteed On-Resistance Flatness Over Signal Range, 4Ω Max**

♦ **Guaranteed Charge Injection, <5pC**

♦ **Improved Leakage Over Temperature, <2.5nA at +85°C**

♦ **Electrostatic Discharge >2000V per Method 3015.7**

♦ **Single-Supply Operation (+3V to +15V) Bipolar-Supply Operation (±3V to ±8V)**

♦ **Low Power Consumption, <1µW**

♦ **TTL/CMOS-Logic Compatible**

Ordering Information
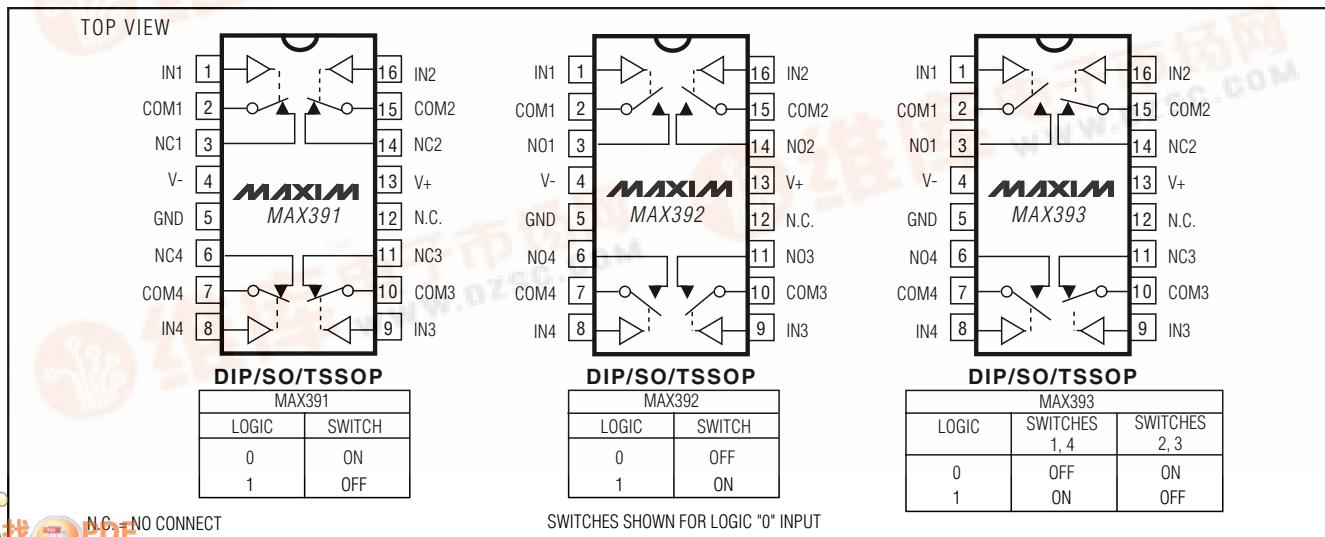
PART	TEMP. RANGE	PIN-PACKAGE
MAX391CPE	0°C to +70°C	16 Plastic DIP
MAX391CSE	0°C to +70°C	16 Narrow SO
MAX391CUE	0°C to +70°C	16 TSSOP
MAX391C/D	0°C to +70°C	Dice*
MAX391EPE	-40°C to +85°C	16 Plastic DIP
MAX391ESE	-40°C to +85°C	16 Narrow SO
MAX391EUE	-40°C to +85°C	16 TSSOP

Ordering Information continued at end of data sheet.

* Contact factory for dice specifications.

** Contact factory for availability and processing to MIL-STD-883.

Pin Configurations/Functional Diagrams/Truth Tables

TOP VIEW

MAX391

IN1	1		16	IN2
COM1	2		15	COM2
NC1	3		14	NC2
V-	4		13	V+
GND	5		12	N.C.
NC4	6		11	NC3
COM4	7		10	COM3
IN4	8		9	IN3

DIP/SO/TSSOP

MAX391	
LOGIC	SWITCH
0	ON
1	OFF

N.C. = NO CONNECT

MAX392

IN1	1		16	IN2
COM1	2		15	COM2
NO1	3		14	NO2
V-	4		13	V+
GND	5		12	N.C.
NO4	6		11	NO3
COM4	7		10	COM3
IN4	8		9	IN3

DIP/SO/TSSOP

MAX392	
LOGIC	SWITCH
0	OFF
1	ON

SWITCHES SHOWN FOR LOGIC "0" INPUT

MAX393

IN1	1		16	IN2
COM1	2		15	COM2
NO1	3		14	NC2
V-	4		13	V+
GND	5		12	N.C.
NO4	6		11	NC3
COM4	7		10	COM3
IN4	8		9	IN3

DIP/SO/TSSOP

MAX393		
LOGIC	SWITCHES 1, 4	SWITCHES 2, 3
0	OFF	ON
1	ON	OFF

MAXIM _____ **Maxim Integrated Products** 1

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ABSOLUTE MAXIMUM RATINGS

Voltage Referenced to V-
   V+ ....-0.3V to +17V
   GND..-0.3V to +17V
   GND...-0.3V to (V+ + 0.3V)
V_{IN}, V_{COM}, V_{NC}, V_{NO} (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 (T_A = +70°C)
   Plastic DIP (derate 10.53mW/°C above+70°C) 842mW
   Narrow SO (derate 8.70mW/°C above +70°C) 696mW
   TSSOP (derate 6.7mW/°C above +70°C) 457mW
   CERDIP (derate 10.00mW/°C above +70°C)..............800mW
Operating Temperature Ranges
   MAX39_C_ _ ....0°C to +70°C
   MAX39_E_ _..-40°C to +85°C
   MAX39_M_ _...-55°C to +125°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—Dual Supplies

(V+ = +5V ±10%, V- = -5V ±10%, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS			MIN	TYP (Note 2)	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{COM}, V_{NO}, V_{NC}	(Note 3)			V-		V+	V
On-Resistance	R_{ON}	V+ = 4.5V, V- = -4.5V, I_{COM} = -10mA, V_{NO} or V_{NC} = ±3.5V	T_A = +25°C	C, E		20	35	Ω
				M		20	30	
			T_A = T_{MIN} to T_{MAX}				45	
On-Resistance Match Between Channels (Note 4)	ΔR_{ON}	V+ = 5V, V- = -5V, I_{COM} = -10mA, V_{NO} or V_{NC} = ±3V	T_A = +25°C			0.3	2	Ω
			T_A = T_{MIN} to T_{MAX}				4	
On-Resistance Flatness (Note 5)	$R_{FLAT(ON)}$	V+ = 5V, V- = -5V, I_{COM} = -10mA, V_{NO} or V_{NC} = ±3V	T_A = +25°C			1	4	Ω
			T_A = T_{MIN} to T_{MAX}				6	
NO or NC Off Leakage Current (Note 6)	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	V+ = 5.5V, V- = -5.5V, V_{COM} = ±4.5V, V_{NO} or V_{NC} = ∓4.5V	T_A = +25°C		-0.1	0.01	0.1	nA
			T_A = T_{MIN} to T_{MAX}	C, E	-2.5		2.5	
				M	-5		5	
COM Off Leakage Current (Note 6)	$I_{COM(OFF)}$	V+ = 5.5V, V- = -5.5V, V_{COM} = ±4.5V, V_{NO} or V_{NC} = ∓4.5V	T_A = +25°C		-0.1	0.01	0.1	nA
			T_A = T_{MIN} to T_{MAX}	C, E	-2.5		2.5	
				M	-5		5	
COM On Leakage Current (Note 6)	$I_{COM(ON)}$	V+ = 5.5V, V- = -5.5V, V_{COM} = ±4.5V, V_{NO} or V_{NC} = ±4.5V	T_A = +25°C		-0.2	0.01	0.2	nA
			T_A = T_{MIN} to T_{MAX}	C, E	-5.0		5.0	
				M	-20		20	

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ELECTRICAL CHARACTERISTICS—Dual Supplies (continued)

(V+ = +5V ±10%, V- = -5V ±10%, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V, $T_A = T_{MIN}$ to T_{MAX}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP (Note 2)	MAX	UNITS
LOGIC INPUT							
Input Current with Input Voltage High	I_{INH}	IN = 2.4V, all others = 0.8V		-0.5	0.005	0.5	µA
Input Current with Input Voltage Low	I_{INL}	IN = 0.8V, all others = 2.4V		-0.5	0.005	0.5	µA
DYNAMIC							
Turn-On Time	t_{ON}	V_{COM} = ±3V, Figure 2	T_A = +25°C		65	130	ns
			$T_A = T_{MIN}$ to T_{MAX}			175	
Turn-Off Time	t_{OFF}	V_{COM} = ±3V, Figure 2	T_A = +25°C		35	75	ns
			$T_A = T_{MIN}$ to T_{MAX}			100	
Break-Before-Make Time Delay (Note 3)	t_D	MAX393 only, R_L = 300Ω, C_L = 35pF, Figure 3		5	10		ns
Charge Injection (Note 3)	Q	C_L = 1.0nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 4	T_A = +25°C		2	5	pC
Off Isolation (Note 7)	OIRR	R_L = 50Ω, C_L = 5pF, f = 1MHz, Figure 5	T_A = +25°C		72		dB
Crosstalk (Note 8)		R_L = 50Ω, C_L = 5pF, f = 1MHz, Figure 6	T_A = +25°C		85		dB
NC or NO Capacitance	$C_{(OFF)}$	f = 1MHz, Figure 7	T_A = +25°C		9		pF
COM Off Capacitance	$C_{COM(OFF)}$	f = 1MHz, Figure 7	T_A = +25°C		9		pF
COM On Capacitance	$C_{COM(ON)}$	f = 1MHz, Figure 8	T_A = +25°C		22		pF
SUPPLY							
Power-Supply Range				-8.0		+8.0	V
Positive Supply Current	I+	V+ = 5.5V, V- = -5.5V, V_{IN} = 0V or V+, All channels on or off	$T_A = T_{MIN}$ to T_{MAX}	-1		1	µA
Negative Supply Current	I-	V+ = 5.5V, V- = -5.5V, V_{IN} = 0V or V+, All channels on or off	$T_A = T_{MIN}$ to T_{MAX}	-1		1	µA

Precision, Quad, SPST Analog Switches

ELECTRICAL CHARACTERISTICS—Single +5V Supply

(V+ = +5V ±10%, V- = 0V ±10%, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS			MIN	TYP (Note 2)	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{COM}, V_{NO}, V_{NC}	(Note 3)			0		V+	V
On-Resistance	R_{ON}	V+ = 4.5V, I_{COM} = -10mA, V_{NO} or V_{NC} = 3.5V	T_A = +25°C			30	60	Ω
			T_A = T_{MIN} to T_{MAX}				75	
On-Resistance Match Between Channels (Note 4)	ΔR_{ON}	V+ = 5V, I_{COM} = -1.0mA, V_{NO} or V_{NC} = 3V	T_A = +25°C			0.8	2	Ω
			T_A = T_{MIN} to T_{MAX}				4	
On-Resistance Flatness (Notes 3, 5)	$R_{FLAT(ON)}$	V+ = 5V, I_{COM} = -1.0mA, V_{NO} or V_{NC} = 1V, 3V	T_A = +25°C			2	6	Ω
			T_A = T_{MIN} to T_{MAX}				8	
NO or NC Off Leakage Current (Note 9)	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	V+ = 5.5V, V_{COM} = 0V, V_{NO} or V_{NC} = 4.5V	T_A = +25°C		-0.25	0.01	0.25	nA
			T_A = T_{MIN} to T_{MAX}	C, E	-0.1		0.1	
				M	-2.5		2.5	
COM Off Leakage Current (Note 9)	$I_{COM(OFF)}$	V+ = 5.5V, V_{COM} = 0V, V_{NO} or V_{NC} = 4.5V	T_A = +25°C		-0.1		0.1	nA
			T_A = T_{MIN} to T_{MAX}	C, E	-2.5		2.5	
				M	-5.0		5.0	
COM On Leakage Current (Note 9)	$I_{COM(ON)}$	V+ = 5.5V, V_{COM} = 5V, V_{NO} or V_{NC} = 4.5V	T_A = +25°C		-0.2		0.2	nA
			T_A = T_{MIN} to T_{MAX}	C, E	-5.0		5.0	
				M	-20		20	
DYNAMIC								
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 3V	T_A = +25°C			85	170	ns
			T_A = T_{MIN} to T_{MAX}				240	
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 3V	T_A = +25°C			25	50	ns
			T_A = T_{MIN} to T_{MAX}				100	
Break-Before-Make Time Delay (Note 3)	t_D	MAX393 only, R_L = 300Ω, C_L = 35pF			10			ns
Charge Injection (Note 3)	Q	C_L = 1.0nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 4	T_A = +25°C			1	5	pC
SUPPLY								
Positive Supply Current	I+	V+ = 5.5V, V_{IN} = 0V or V+, all channels on or off			-1		1	µA
Negative Supply Current	I-	V+ = 5.5V, V_{IN} = 0V or V+, all channels on or off			-1		1	µA

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ELECTRICAL CHARACTERISTICS—Single +3.3V Supply

(V+ = +3.0V to +3.6V, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V, $T_A = T_{MIN}$ to T_{MAX}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP (Note 2)	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{COM}, V_{NO}, V_{NC}	(Note 3)		0		V+	V
Channel On-Resistance	R_{ON}	V+ = 3V, I_{COM} = -1.0mA, V_{NO} or V_{NC} = 1.5V	T_A = +25°C		83	175	Ω
			$T_A = T_{MIN}$ to T_{MAX}			275	
DYNAMIC							
Turn-On Time (Note 3)	t_{ON}	V_{NO} or V_{NC} = 1.5V	T_A = +25°C		160	400	ns
			$T_A = T_{MIN}$ to T_{MAX}			500	
Turn-Off Time (Note 3)	t_{OFF}	V_{NO} or V_{NC} = 1.5V	T_A = +25°C		40	125	ns
			$T_A = T_{MIN}$ to T_{MAX}			175	
Break-Before-Make Time Delay (Note 3)	t_D	MAX393 only, R_L = 300Ω, C_L = 35pF	T_A = +25°C	20			ns
Charge Injection (Note 3)	Q	C_L = 1.0nF, V_{GEN} = 0V, R_{GEN} = 0V	T_A = +25°C		1	5	pC
SUPPLY							
Positive Supply Current	I+	V+ = 3.6V, V_{IN} = 0V or V+, all channels on or off		-1		1	µA
Negative Supply Current	I-	V+ = 3.6V, V_{IN} = 0V or V+, all channels on or off		-1		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: $\Delta R_{ON} = \Delta R_{ON}$ max - ΔR_{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 range.
Note 6: Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.
Note 7: Off Isolation = $20\log_{10}$ [V_{COM} ⁄ (V_{NC} or V_{NO})], V_{COM} = output, V_{NC} or V_{NO} = input to off switch.
**Note 8:** Between any two switches.
Note 9: Leakage testing at single supply is guaranteed by testing with dual singles.
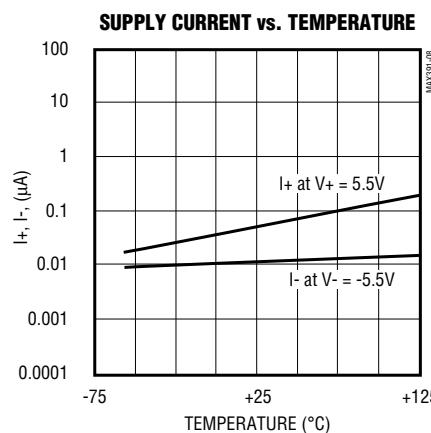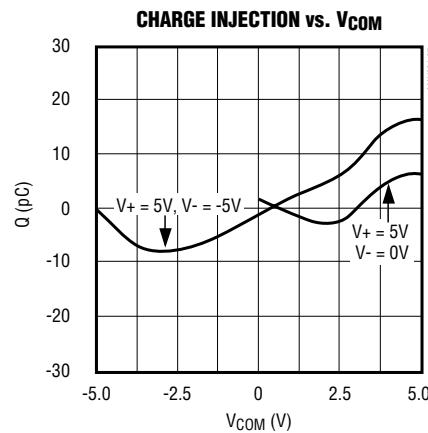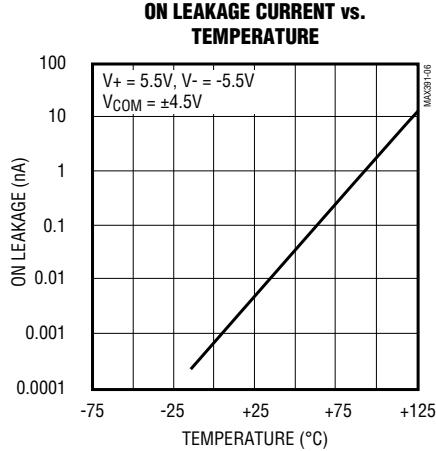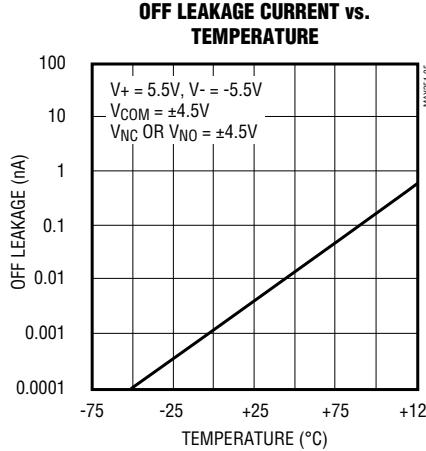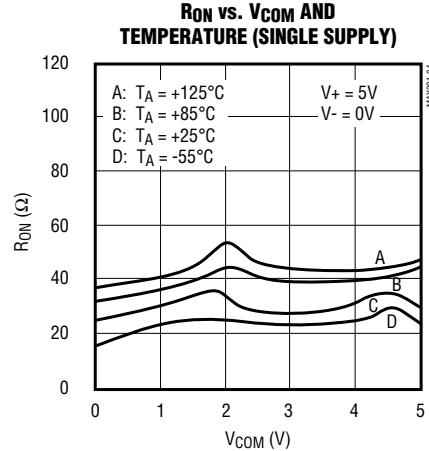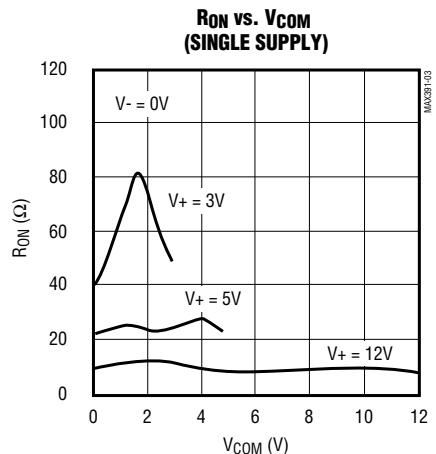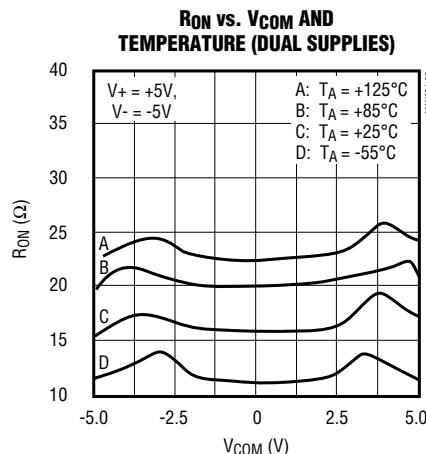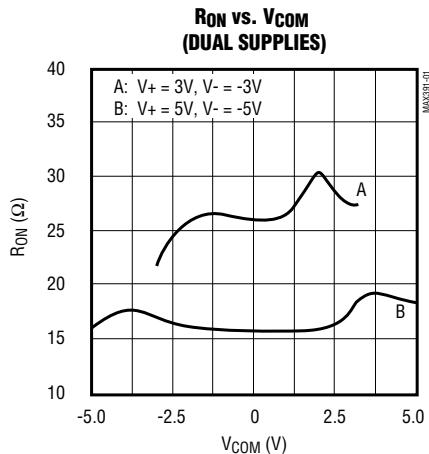
MAX391/MAX392/MAX393

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Precision, Quad, SPST Analog Switches

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

MAX391/MAX392/MAX393

R_ON vs. V_COM (DUAL SUPPLIES)

A: V+ = 3V, V- = -3V
B: V+ = 5V, V- = -5V

R_ON vs. V_COM AND TEMPERATURE (DUAL SUPPLIES)

V+ = +5V, V- = -5V

A: T_A = +125°C
B: T_A = +85°C
C: T_A = +25°C
D: T_A = -55°C

R_ON vs. V_COM (SINGLE SUPPLY)

V- = 0V

V+ = 3V
V+ = 5V
V+ = 12V

R_ON vs. V_COM AND TEMPERATURE (SINGLE SUPPLY)

A: T_A = +125°C   V+ = 5V
B: T_A = +85°C   V- = 0V
C: T_A = +25°C
D: T_A = -55°C

OFF LEAKAGE CURRENT vs. TEMPERATURE

V+ = 5.5V, V- = -5.5V
V_COM = ±4.5V
V_NC OR V_NO = ±4.5V

ON LEAKAGE CURRENT vs. TEMPERATURE

V+ = 5.5V, V- = -5.5V
V_COM = ±4.5V

CHARGE INJECTION vs. V_COM

V+ = 5V, V- = -5V

V+ = 5V
V- = 0V

SUPPLY CURRENT vs. TEMPERATURE

I+ at V+ = 5.5V

I- at V- = -5.5V

MAXIM

Precision, Quad, SPST Analog Switches

Pin Description

PIN	NAME	FUNCTION
1, 16, 9, 8	IN1–IN4	Inputs
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
5	GND	Ground
12	N.C.	No Connect—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 V-, and then logic inputs. If power-supply sequencing is not possible, add two small signal diodes in series with supply pins for overvoltage protection (Figure 1). Adding diodes reduces the analog signal range to 1V below V+ and 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.
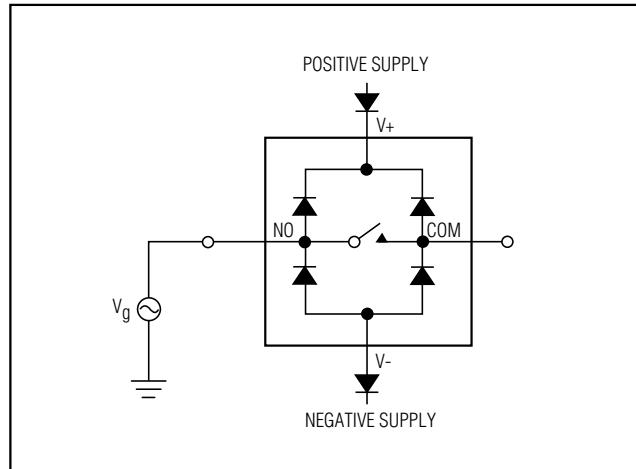
Figure 1. Overvoltage Protection Using Two External Blocking Diodes

_____***Test Circuits/Timing Diagrams***

Figure 2. Switching Time

C_L INCLUDES FIXTURE AND STRAY CAPACITANCE.

$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$

LOGIC INPUT WAVEFORMS INVERTED FOR SWITCHES THAT HAVE THE OPPOSITE LOGIC SENSE.

$t_r < 20ns$
$t_f < 20ns$
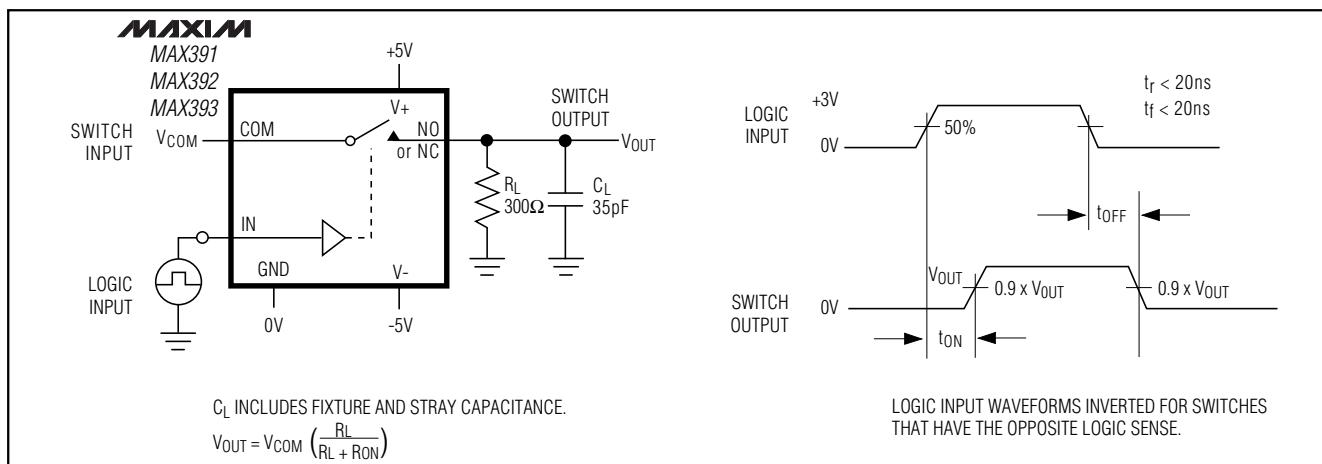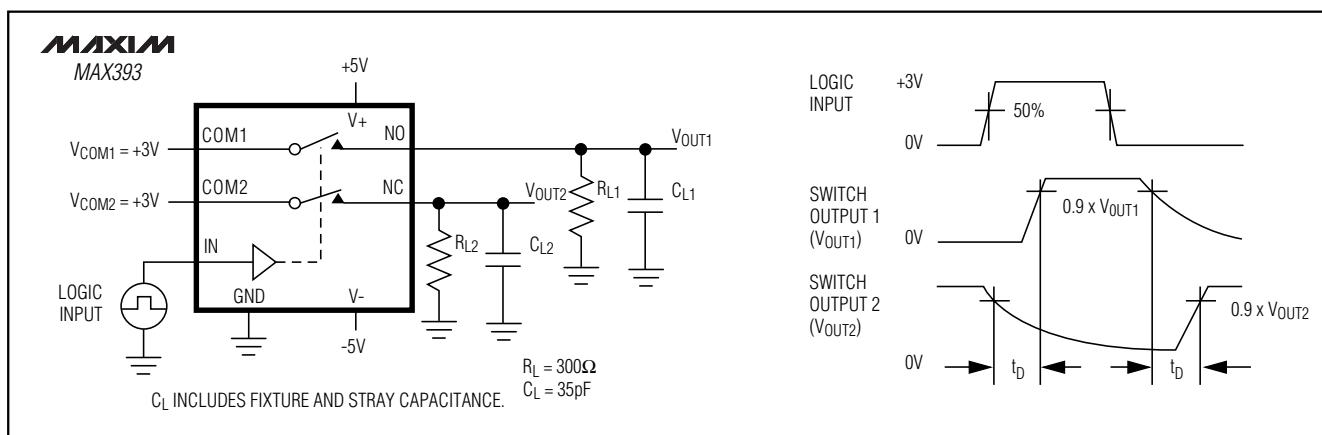
Figure 3. Break-Before-Make Interval (MAX393 only)

$R_L = 300\Omega$
$C_L = 35pF$

C_L INCLUDES FIXTURE AND STRAY CAPACITANCE.
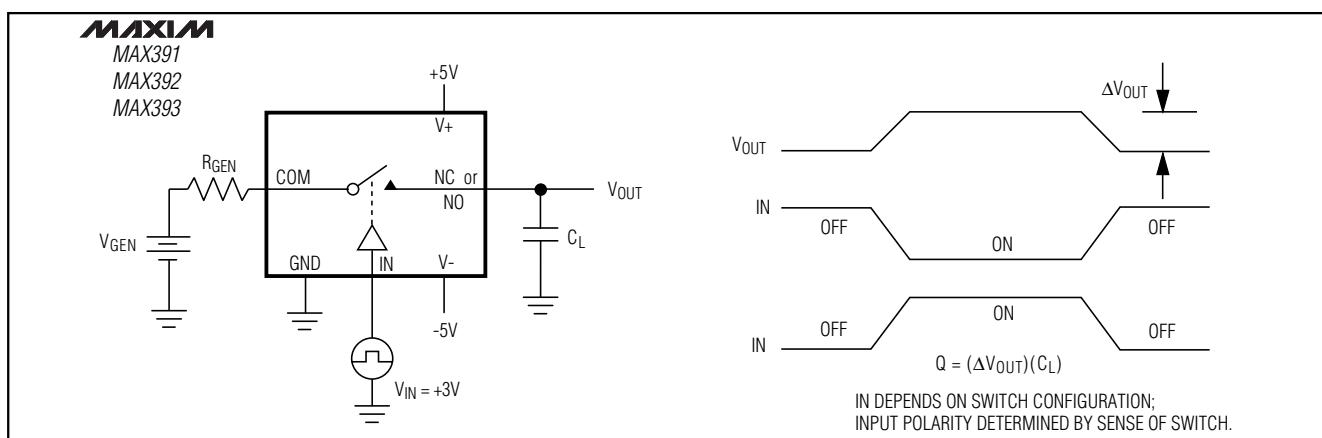
Figure 4. Charge Injection

$$Q = (\Delta V_{OUT})(C_L)$$

IN DEPENDS ON SWITCH CONFIGURATION;
INPUT POLARITY DETERMINED BY SENSE OF SWITCH.

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Figure 5. Isolation

Figure 6. Crosstalk
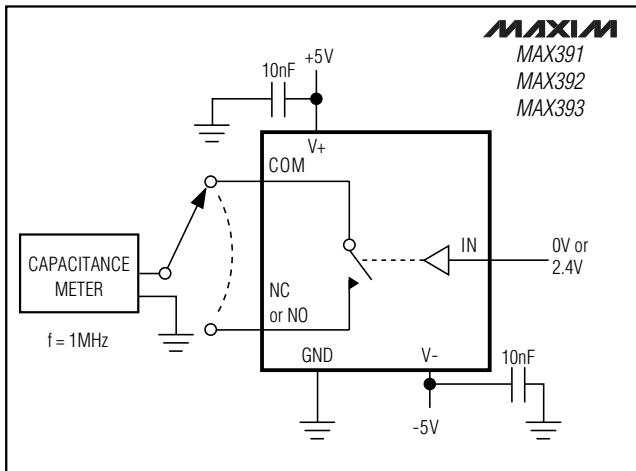
Figure 7. Channel-Off Capacitance
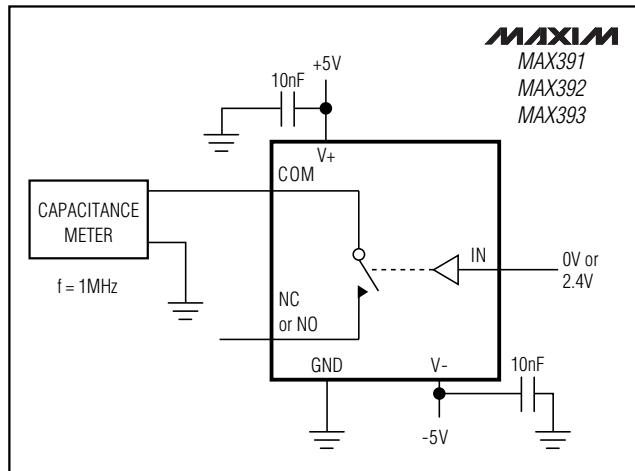
Figure 8. Channel-On Capacitance

MAX391/MAX392/MAX393

MAX391/MAX392/MAX393
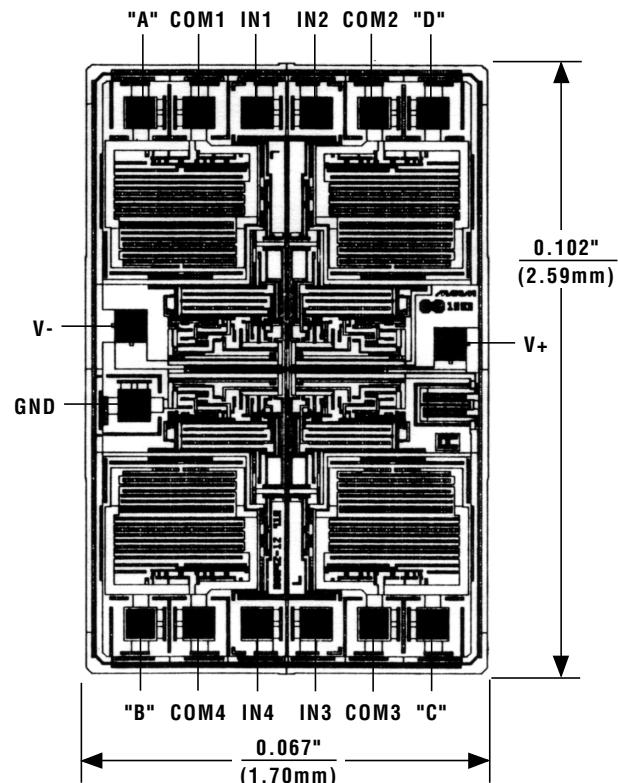
__Ordering Information (continued)

PART	TEMP. RANGE	PIN-PACKAGE
MAX391EJE	-40°C to +85°C	16 CERDIP
MAX391MJE	-55°C to +125°C	16 CERDIP**
MAX392CPE	0°C to +70°C	16 Plastic DIP
MAX392CSE	0°C to +70°C	16 Narrow SO
MAX392CUE	0°C to +70°C	16 TSSOP
MAX392C/D	0°C to +70°C	Dice*
MAX392EPE	-40°C to +85°C	16 Plastic DIP
MAX392ESE	-40°C to +85°C	16 Narrow SO
MAX392EUE	-40°C to +85°C	16 TSSOP
MAX392EJE	-40°C to +85°C	16 CERDIP
MAX392MJE	-55°C to +125°C	16 CERDIP**
MAX393CPE	0°C to +70°C	16 Plastic DIP
MAX393CSE	0°C to +70°C	16 Narrow SO
MAX393CUE	0°C to +70°C	16 TSSOP
MAX393C/D	0°C to +70°C	Dice*
MAX393EPE	-40°C to +85°C	16 Plastic DIP
MAX393ESE	-40°C to +85°C	16 Narrow SO
MAX393EUE	-40°C to +85°C	16 TSSOP
MAX393EJE	-40°C to +85°C	16 CERDIP
MAX393MJE	-55°C to +125°C	16 CERDIP**

Contact factory for dice specifications.
** Contact factory for availability and processing to MIL-STD-883B.

__Chip Topography

0.102"
(2.59mm)

0.067"
(1.70mm)

MAX391		MAX392		MAX393	
PIN	NAME	PIN	NAME	PIN	NAME
A	NC1	A	NO1	A	NO1
B	NC4	B	NO4	B	NO4
C	NC3	C	NO3	C	NC3
D	NC2	D	NO2	D	NC2

TRANSISTOR COUNT: 76

SUBSTRATE CONNECTED TO V+

MAXIM

Precision, Quad, SPST Analog Switches

_____**Package Information**

COMMON DIMENSIONS

SYMBOL	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	—	1.10	—	.043
A1	0.05	0.15	.002	.006
A2	0.85	0.95	.033	.037
b	0.19	0.30	.007	.012
b1	0.19	0.25	.007	.010
c	0.090	0.20	.0035	.008
c1	0.090	0.135	.0035	.0053
D	SEE VARIATIONS		SEE VARIATIONS	
E	4.30	4.50	.169	.177
e	0.65 BSC		.026 BSC	
H	6.25	6.50	.246	.256
L	0.50	0.70	.020	.028
N	SEE VARIATIONS		SEE VARIATIONS	
Y	2.85	3.15	.112	.124
α	0°	8°	0°	8°

JEDEC MO-153	N	VARIATIONS			
		MILLIMETERS		INCHES	
		MIN.	MAX.	MIN.	MAX.
AB	14 D	4.90	5.10	.193	.201
AC	16 D	4.90	5.10	.193	.201
AC-EP	16 D	4.90	5.10	.193	.201
	X	2.85	3.15	.112	.124
AD	20 D	6.40	6.60	.252	.260
AD-EP	20 D	6.40	6.60	.252	.260
	X	4.00	4.34	.157	.171
AE	24 D	7.70	7.90	.303	.311
AF	28 D	9.60	9.80	.378	.386
AF-EP	D	9.60	9.80	.378	.386
	X	5.35	5.65	.211	.222

NOTES:
1. DIMENSIONS D AND E DO NOT INCLUDE FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15 mm PER SIDE.
3. CONTROLLING DIMENSION: MILLIMETER.
4. MEETS JEDEC OUTLINE MO-153 VARIATIONS AB, AC, AD, AE, AF.
5. DIMENSIONS X AND Y APPLY TO EXPOSED PAD (EP) VERSIONS ONLY.
6. EXPOSED PAD FLUSH WITH BOTTOM OF PACKAGE WITHIN .002".
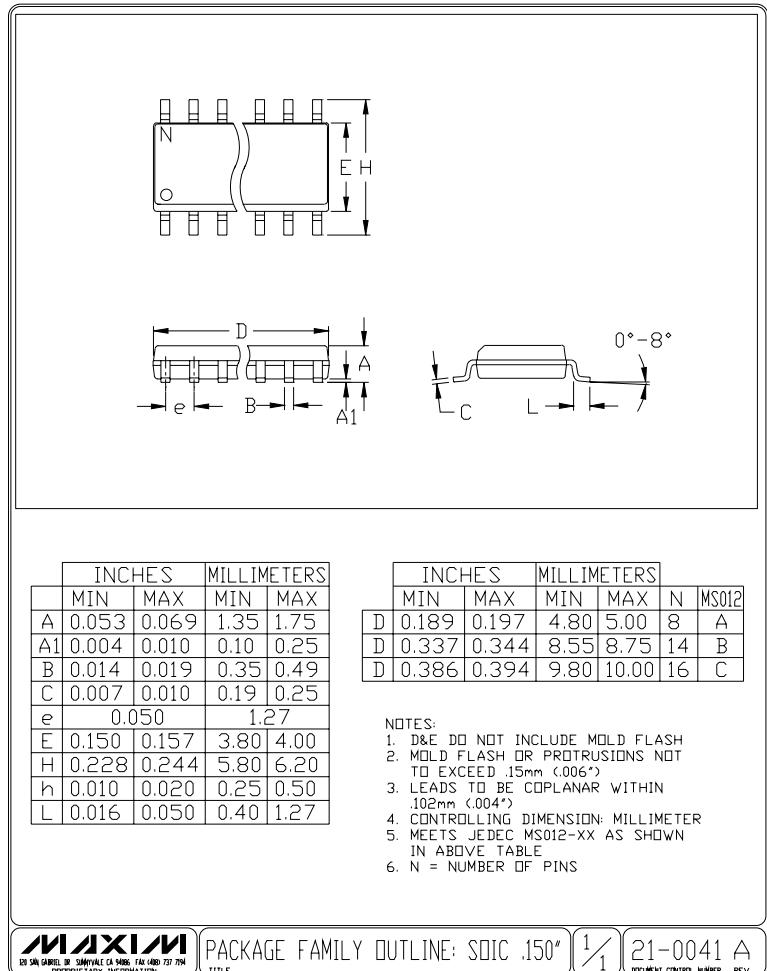
MAXIM
PROPRIETARY INFORMATION
TITLE: PACKAGE OUTLINE, TSSOP, 4.40mm BODY, 0.65mm PITCH
APPROVAL | DOCUMENT CONTROL NO. 21-0066 | REV C | 1/1

MAX391/MAX392/MAX393

TSSOP.EPS

MAXIM _____ 11

Precision, 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
120 SAN GABRIEL DR. SUNNYVALE CA 94086 FAX (408) 737-7194
PROPRIETARY INFORMATION

PACKAGE FAMILY OUTLINE: SOIC .150"
TITLE

1/1

21-0041 A
DOCUMENT CONTROL NUMBER   REV