

Precision, 16-Channel 17V Analog Multiplexer

Features

- Low ON-Resistance (100 Ohms Max.) Minimizes Distortion and Error Voltages
- Low Glitching Reduces Step Errors and Improves Settling Times. Charge Injection: 5pC Max.
- Dual-Supply Operation ($\pm 2.7V$ to $\pm 8V$)
- Single-Supply Operation (+2.7V to +16V)
- ON-Resistance Matching Between Channels: <6 Ohms
- ON-Resistance Flatness: 10 Ohms (Max.)
- TTL/CMOS Logic Compatible (with +5V or $\pm 5V$ supplies)
- Fast Switching Speed, $t_{\text{TRANS}} < 250\text{ns}$
- Break-Before-Make action eliminates momentary crosstalk
- Rail-to-Rail Analog Signal Range
- Low Power Consumption, 10 μW
- Pin Compatible with MAX396
- SOIC and SSOP Packages Minimize Board Area
— Available in Pb-free and Green SSOP

Description

The PS396 low-voltage, CMOS analog multiplexer offers low ON-resistance (100 ohms max.), which is matched to within 6 ohms between switches and remains flat over the specified signal range (10 ohms max). The PS396 is a 16-channel device.

The PS396 are fabricated using Pericom's 17V silicon gate process. Design improvements yield extremely low charge injection (5pC max).

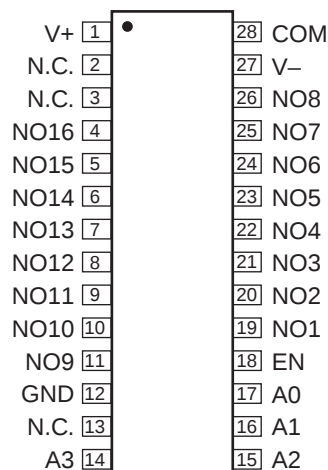
This multiplexer operates with a single +2.7V to +16V supply or with $\pm 2.7V$ to $\pm 8V$ dual supplies, while retaining CMOS-logic input compatibility and fast switching. The PS396 is pin compatible with the MAX396.

Applications

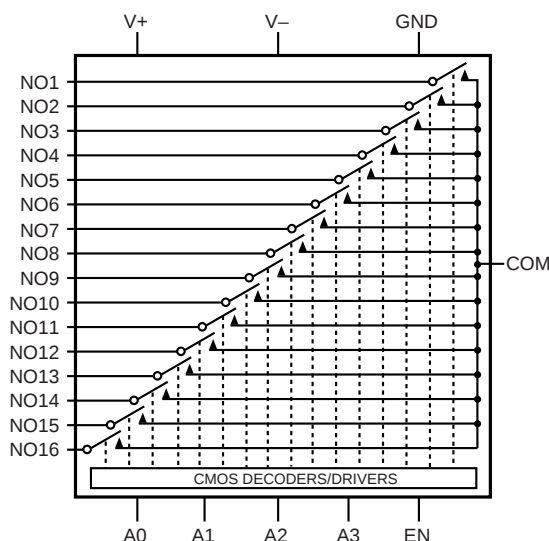
- Data Acquisition Systems
- Audio Switching and Routing
- Test Equipment
- PBX, PABX
- Telecommunication Systems
- Battery-Powered Systems

PS396 16-Channel Single-Ended Multiplexer

Functional Block Diagrams and Pin Configurations



N.C. = NO INTERNAL CONNECTION



PS396					
A3	A2	A1	A0	EN	On Switch
x	x	x	x	0	None
0	0	0	0	1	1
0	0	0	1	1	2
0	0	1	0	1	3
0	0	1	1	1	4
0	1	0	0	1	5
0	1	0	1	1	6
0	1	1	0	1	7
0	1	1	1	1	8
1	0	0	0	1	9
1	0	0	1	1	10
1	0	1	0	1	11
1	0	1	1	1	12
1	1	0	0	1	13
1	1	0	1	1	14
1	1	1	0	1	15
1	1	1	1	1	16

Logic "0" = $V_{\text{AL}} \leq 0.8V$, Logic
"1" = $V_{\text{AH}} \geq 2.4V$

Pin Description

Pin	Name	Function
1	V+	Positive Supply-Voltage Input
2, 3, 13	N.C.	No Internal Connection
	COMB	Analog Signal B Output* (bidirectional)
	N.C.	No Internal Connection
4-11	NO16 NO9	Analog Signal Inputs* (bidirectional)
	NO8B-NO1B	Analog Signal B Inputs* (bidirectional)
12	GND	Logic Ground
14-17	A3-A0	Logic Address Inputs
	A2, A1, A0	Logic Address Inputs
18	EN	Logic enable Input
19-26	NO1-NO8	Analog Signal Inputs* (bidirectional)
	NO1A-NO8A	Analog Signal A Inputs* (bidirectional)
27	V-	Negative Supply-Voltage Input
28	COM	Analog Signal Output* (bidirectional)
	COMA	Analog Signal A Output* (bidirectional)

Absolute Maximum Ratings

Voltages Referenced to GND

V+ -0.3V to +17V

V- +0.3V to -17V

V+ to V- -0.3V to +17V

Voltage into any terminal⁽¹⁾ (V- -2V) to (V+ +2V)
or 30mA, whichever occurs first

Current into any terminal ±30mA

Peak current into any terminal ±50mA

Continuous power Dissipation (T_A = +70°C)

Wide SO (derate 12.50mW/°C above +70°C) 1000mW

SSOP (derate 9.52mW/°C above +70°C) 762mW

Operating Temperature Ranges

PS39_C_I 0°C to +70°C

PS39_E_I -40°C to +85°C

Storage Temperature Range -65°C to +150°C

Lead Temperature (soldering, 10s) +300°C

Note 1:

Signals on any terminal exceeding V+ or V- are clamped by internal diodes. Limit forward current to maximum current rating.

CAUTION

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.

Electrical Characteristics — Dual Supplies

(V+ = +5V ±10%, V- = -5V ±10%, GND = 0V, V_{AH} = V_{ENH} = 2.4V, V_{AL} = V_{ENL} = 0.8V, T_A = T_{Min} to T_{Max}, unless otherwise noted.)

Parameter	Symbol	Conditions	Temperature Range	Min. ⁽²⁾	Typ. ⁽²⁾	Max. ⁽²⁾	Units
Switch							
Analog Signal Range	V _{COM} , V _{NO}	(note 3)		V-		V+	V
Channel ON-Resistance	R _{ON}	I _{NO} = 1mA, V _{COM} = ±3.5V	T _A = +25°C		60	100	Ohm
			T _A = T _{MIN} to T _{MAX}			125	
ON-Resistance Matching Between Channels ⁽⁴⁾	ΔR _{ON}	I _{NO} = 1mA, V _{COM} = ±3.5V, V+ = 5V, V- = -5V	T _A = +25°C		1.8	6	
			T _A = T _{MIN} to T _{MAX}			8	
On-Resistance Flatness ⁽⁵⁾	R _{FLAT(ON)}	I _{NO} = 1mA, V _{COM} = ±3.0V, V+ = 5V, V- = -5V	T _A = +25°C		5	10	nA
			T _A = T _{MIN} to T _{MAX}			13	
NO Off-Leakage Current ⁽⁶⁾	I _{NO(OFF)}	V _{NO} = ±4.5V, V _{COM} = ±4.5V, V+ = 5.5V, V- = -5.5V	T _A = +25°C	-80	-0.03	80	
			T _A = T _{MIN} to T _{MAX}	-100		100	
COM Off-Leakage Current ⁽⁶⁾	I _{COM(OFF)}	V _{COM} = ±4.5V, V _{NO} = ±4.5V, V+ = 5.5V, V- = -5.5V	T _A = +25°C	-80	0.05	80	nA
			T _A = T _{MIN} to T _{MAX}	-100		100	
COM On-Leakage Current ⁽⁶⁾	I _{COM(ON)}	V _{COM} = ±4.5V, V _{NO} = 4.5V	T _A = +25°C	-80	0.09	0.4	
			T _A = T _{MIN} to T _{MAX}	-100		5	

Table continued over..

Electrical Characteristics — Dual Supplies (continued..)

(V+ = +5V ±10%, V- = -5V ±10%, GND = 0V, V_{AH} = V_{ENH} = 2.4V, V_{AL} = V_{ENL} = 0.8V, T_A = T_{Min} to T_{Max}, unless otherwise noted.)

Digital Logic Input						
Logic High Input Voltage	V _{AH} , V _{ENH}		2.4			V
Logic Low Input Voltage	V _{AL} , V _{ENL}				0.8	
Input Current with Input Voltage High	I _{AH} , I _{ENH}	V _A = V _{EN} = 2.4V	-0.1		0.1	μA
Input Current with Input Voltage Low	I _{AL} , I _{ENL}	V _A = V _{EN} = 0.8V	-0.1		0.1	

Electrical Characteristics — Dual Supplies (continued)

(V+ = +5V ±10%, V- = -5V ±10%, GND = 0V, V_{AH} = V_{ENH} = 2.4V, V_{AL} = V_{ENL} = 0.8V, T_A = T_{Min} to T_{Max}, unless otherwise noted.)

Parameter	Symbol	Conditions	Min. ⁽²⁾	Typ. ^(c) ₂₎	Max. ^(c) ₂₎	Units
Dynamic						
Transition Time	t _{TRANS}	Figure 2	T _A = +25°C	95	150	ns
			T _A = T _{MIN} to T _{MAX}		250	
Break-Before-Make Interval	t _{OPEN}	Figure 4	T _A = +25°C	5	70	ns
Enable Turn-On Time	t _{ON(EN)}	Figure 3	T _A = +25°C	100	150	ns
			T _A = T _{MIN} to T _{MAX}		250	
Enable Turn-Off Time	t _{OFF(EN)}	Figure 3	T _A = +25°C		225	ns
			T _A = T _{MIN} to T _{MAX}		260	
Charge Injection ⁽³⁾	V _{CTE}	C _L = 100pF, V _{NO} = 0V, Figure 5	T _A = +25°C	2	5	pC
Off Isolation ⁽⁷⁾	V _{ISO}	V _{EN} = 0V, R _L = 1kohm, f = 100kHz	T _A = +25°C	-75		dB
Crosstalk Between Channels	V _{CT}	V _{EN} = 2.4V, f = 100kHz, V _{NO} = 1Vp-p, R _L = 1kohm, Figure 7	T _A = +25°C	-92		
Logic Input Capacitance	C _{IN}	f = 1MHz	T _A = +25°C	8		pF
NO Off Capacitance	C _{NO(OFF)}	f = 1 MHz V _{EN} = V _{COM} = 0V	T _A = +25°C	11		pF
COM Off Capacitance	C _{COM(OFF)}	f = 1 MHz V _{EN} = V _{COM} = 0V	T _A = +25°C	80		pF
COM On Capacitance	C _{COM(ON)}	f = 1 MHz, Figure 4	T _A = +25°C	90		pF
Supply						
Power-Supply Range			±3		±8	V
Positive Supply Current	I ₊	V _{EN} = V _A = 0V/V+, V+ = 5.5V, V- = -5.5V,	T _A = +25°C	-1.0	1.0	μA
Negative Supply Current	I ₋	V _{EN} = V _A = 0V/V+, V+ = 5.5V, V- = -5.5V		-1.0	1.0	μA
Ground Current	I _{GND}	V _{EN} = V _A = 0V/V+, V+ = 5.5V, V- = -5.5V	T _A = +25°C	-1.0	1.0	μA
			T _A = T _{MIN} to T _{MAX}	-1.0	1.0	

Electrical Characteristics—Single +5V Supply

(V+ = +5V ±10%, V− = 0V, GND = 0V, V_{AH} = V_{ENH} = 2.4V, V_{AL} = V_{ENL} = 0.8V, T_A = T_{Min} to T_{Max}, unless otherwise noted.)

Parameter	Symbol	Conditions		Min. ⁽²⁾	Typ. ⁽²⁾	Max. ⁽²⁾	Units
Switch							
Analog Signal Range	V _{COM} , V _{NO} , V _{NC}	(Note 3)		V−		V+	V
On-Resistance	R _{ON}	I _{NO} = 1mA, V _{COM} = 3.5V, V+ = 4.5V	T _A = +25°C		120	225	Ω
			T _A = T _{MIN} to T _{MAX}			280	Ω
On-Resistance Matching Between Channels ⁽⁴⁾	ΔR _{ON}	I _{NO} = 1mA, V _{COM} = 3.5V, V+ = 4.5V	T _A = +25°C		2	10	Ω
			T _A = T _{MIN} to T _{MAX}			12	
On-Resistance Flatness	R _{FLAT}	I _{NO} = 1mA, V _{COM} = 3V, 2V, 1V; V+ = 5V	T _A = +25°C		5	16	Ω
			T _A = T _{MIN} to T _{MAX}			20	
NO Off Leakage Current ⁽⁸⁾	I _{NO(OFF)}	V _{NO} = 4.5V, V _{COM} = 0V, V+ = 5.5V	T _A = +25°C	−80		80	nA
			T _A = T _{MIN} to T _{MAX}	−100		100	
COM Off-Leakage Current ⁽⁸⁾	I _{COM(OFF)}	V _{NO} = 0V, V _{COM} = 4.5V, V+ = 5.5V	T _A = +25°C	−80		80	nA
			T _A = T _{MIN} to T _{MAX}	−100		100	
COM On-Leakage Current ⁽⁸⁾	I _{COM(ON)}	V _{NO} = 4.5V, V _{COM} = 4.5V, V+ = 5.5V	T _A = +25°C	−80		80	nA
			T _A = T _{MIN} to T _{MAX}	−100		100	
Digital Logic Input							
Logic High Input Voltage	V _{AH} , V _{ENH}			2.4			V
Logic Low Input Voltage	V _{AL} , V _{ENL}					0.8	V
Input Current with Input Voltage High	I _{AH} , I _{ENH}	V _A = V _{EN} = 2.4V		−0.1	0.001	0.1	μA
Input Current with Input Voltage Low	I _{AL} , I _{ENL}	V _A = 0V, V _{EN} = 0.8V		−0.1	0.001	0.1	μA

Electrical Characteristics—Single +5V Supply (continued)

(V+ = +5V ±10%, V− = 0V, GND = 0V, V_{AH} = V_{ENH} = 2.4V, V_{AL} = V_{ENL} = 0.8V, T_A = T_{Min} to T_{Max}, unless otherwise noted.)

Parameter	Symbol	Conditions	Min. ⁽²⁾	Typ. ⁽²⁾	Max. ⁽²⁾	Units
Dynamic						
Transition Time ⁽³⁾	t _{TRANS}	V _{NO} = 3V, Figure 2	T _A = +25°C	105	245	ns
			T _A = T _{MIN} to T _{MAX}		350	
Break-Before-Make Time Delay	t _{OPEN}	(Note 3)	T _A = +25°C	10	65	ns
Enable Turn-On-Time ⁽³⁾	t _{ON(EN)}		T _A = +25°C	125	200	ns
			T _A = T _{MIN} to T _{MAX}		275	
Enable Turn-Off-Time ⁽³⁾	t _{OFF(EN)}		T _A = +25°C	100	125	ns
			T _A = T _{MIN} to T _{MAX}		200	
Charge Injection ⁽³⁾	V _{CTE}	C _L = 100pF, V _{NO} = 0V, Figure 5	T _A = +25°C	1.5	5	pC
Supply						
Power-Supply Range	V+		2.7		15	V
Positive Supply Current	I+	V _{EN} = V _A = 0V, V+, V+ = 5.5V, V− = 0V	−1.0	0.06	1.0	μA
Negative Supply Current	I−	V _{EN} = V _A = 0V, V+, V+ = 5.5V, V− = 0V	−1.0	0.08	1.0	μA
Ground Supply Current	I _{GND}	V _{EN} = V+, 0V; V+, V _A = 5.5V, V− = 0V	T _A = +25°C	−1.0	0.08	μA
			T _A = T _{MIN} to T _{MAX}	−1.0	1.0	

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. ⁽²⁾	Typ. ⁽²⁾	Max. ⁽²⁾	Units
Switch							
Analog Signal Range	V _{ANALOG}	(Note 3)		V−		V+	V
On-Resistance	R _{ON}	I _{NO} = 1mA, V _{COM} = 1.5V, V+ = 3V	T _A = +25°C		315	550	Ω
			T _A = T _{MIN} to T _{MAX}			650	
Dynamic							
Transition Time ⁽³⁾	t _{TRANS}	V _{IN} = 2.4V, V _{NO1} = 1.5V, V _{NO8} = 0V, Figure 2	T _A = +25°C		230	575	ns
			T _A = T _{MIN} to T _{MAX}			750	
Enable Turn-On-Time ⁽³⁾	t _{ON(EN)}	V _{INH} = 2.4V, V _{INL} = 0V, V _{NO1} = 1.5V, Figure 3	T _A = +25°C		260	500	ns
Enable Turn-Off-Time ⁽³⁾	t _{OFF(EN)}	V _{INH} = 2.4V, V _{INL} = 0V, V _{NO1} = 1.5V, Figure 3	T _A = +25°C		135	400	ns
Charge Injection ⁽³⁾	V _{CTE}	C _L = 100pF, V _{GEN} = 0V, R _{GEN} = 0 ohm Figure 6	T _A = +25°C		1	5	pC

Notes:

- The algebraic convention, where most negative value is a minimum and most positive value a maximum, is used in this data sheet.
- Guaranteed by design
- ΔR_{ON} = ΔR_{ON(MAX)} − R_{ON(MIN)}
- Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal ranges. i.e., V_{NO} = 3V to 0V and 0V to −3V.
- Leakage parameters are guaranteed by design.
- Worst-case isolation is on channel 4 because of its proximity to the COM pin. Off-isolation - 20log V_{COM}/V_{NO}, V_{COM} = output, V_{NO} = input to off switch.
- Leakage testing at single supply is guaranteed by correlation testing with dual supplies.

Test Circuits and Timing Diagrams

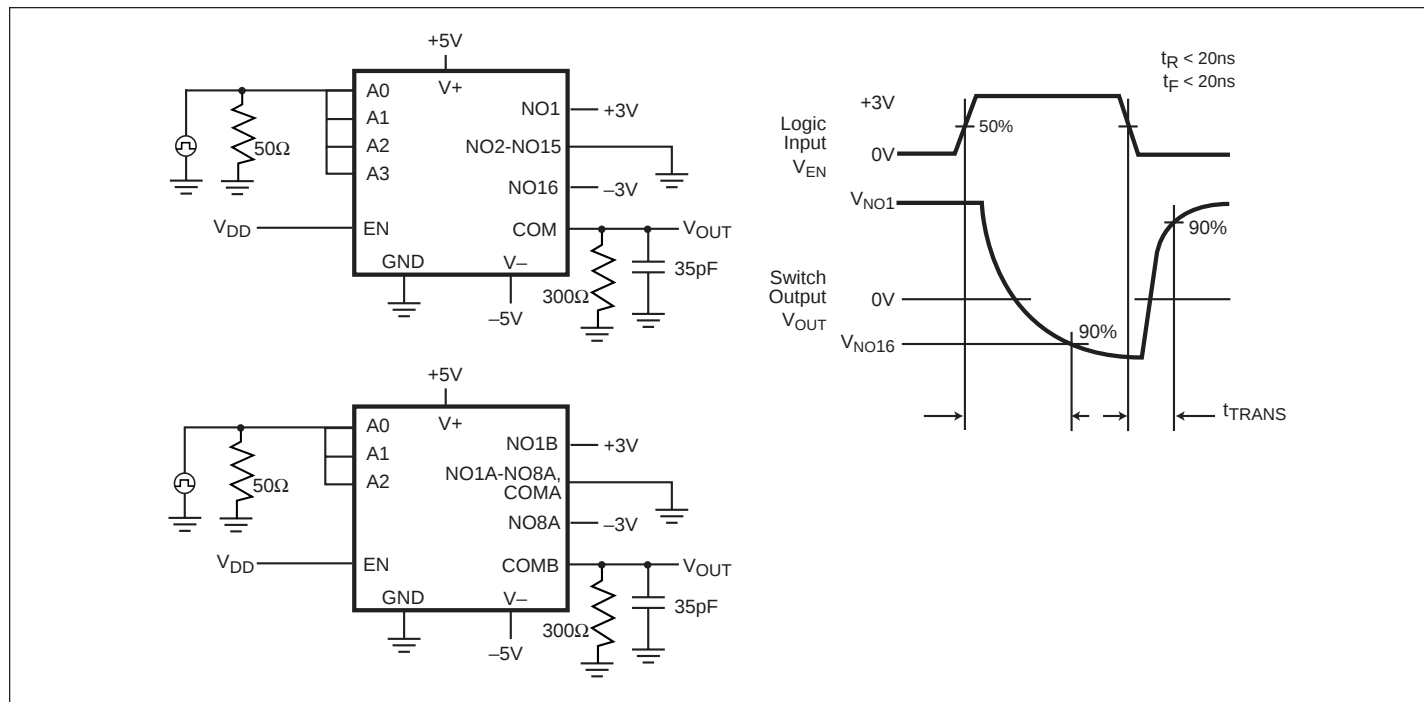


Figure 2. Transition Time

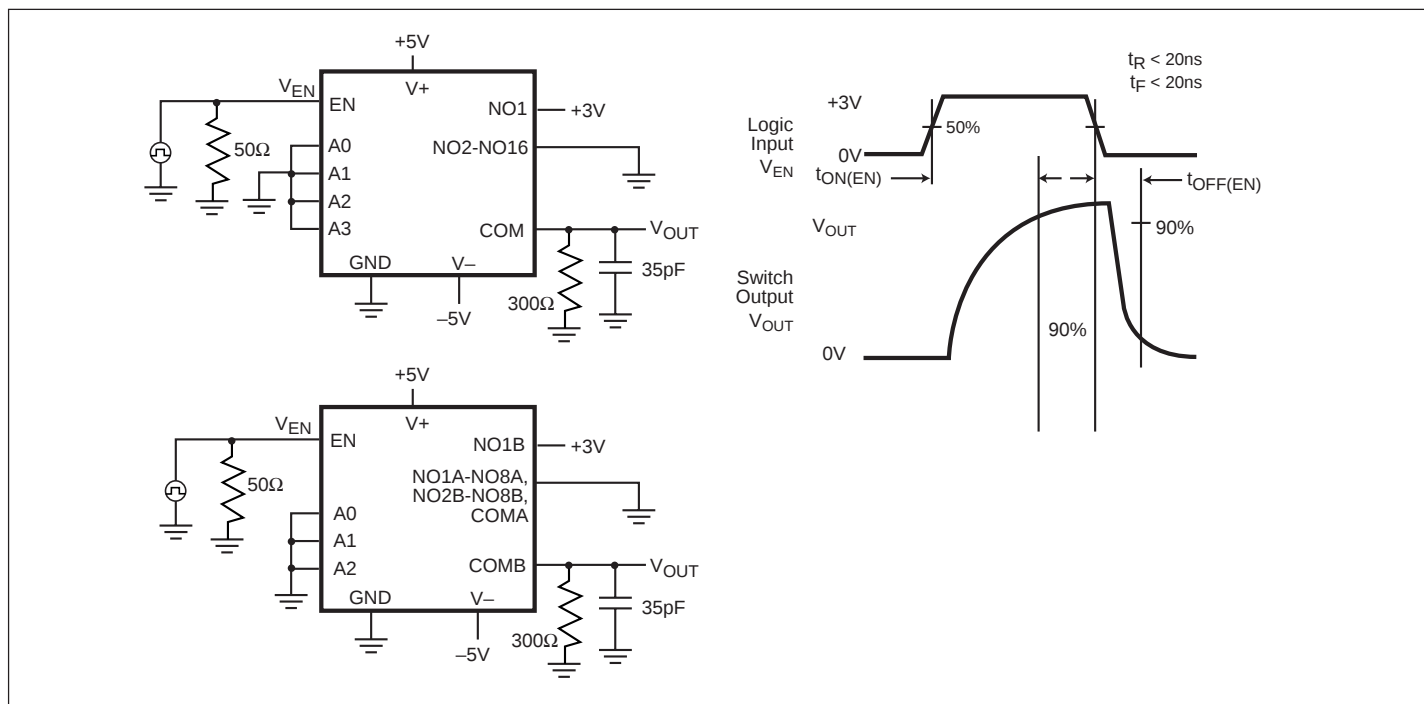
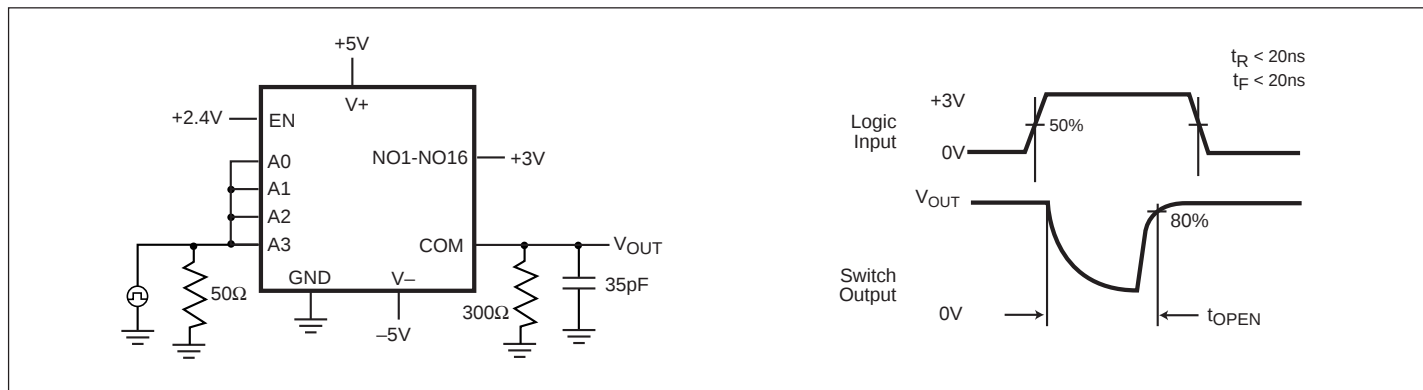
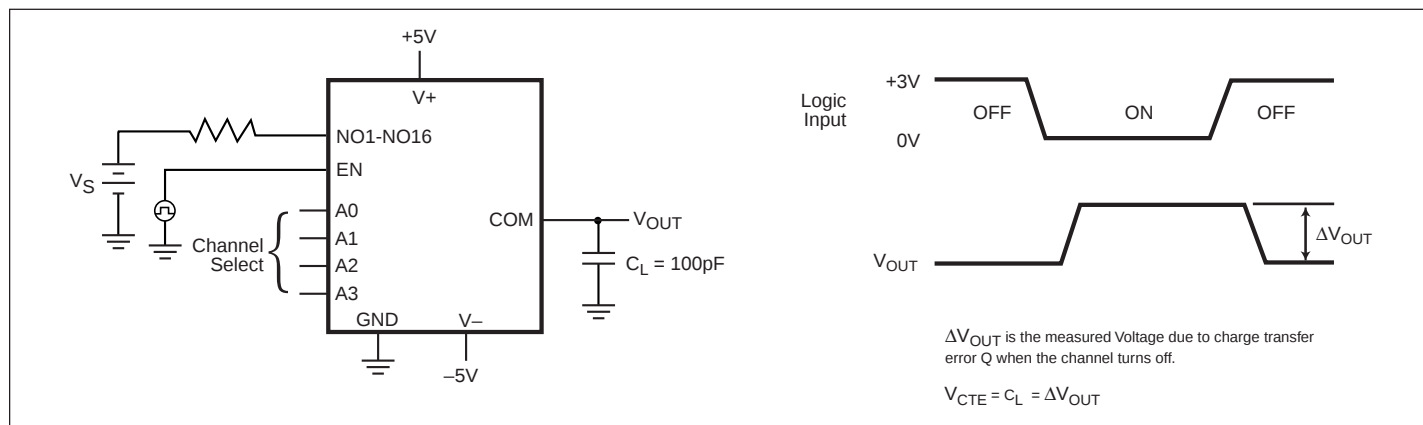
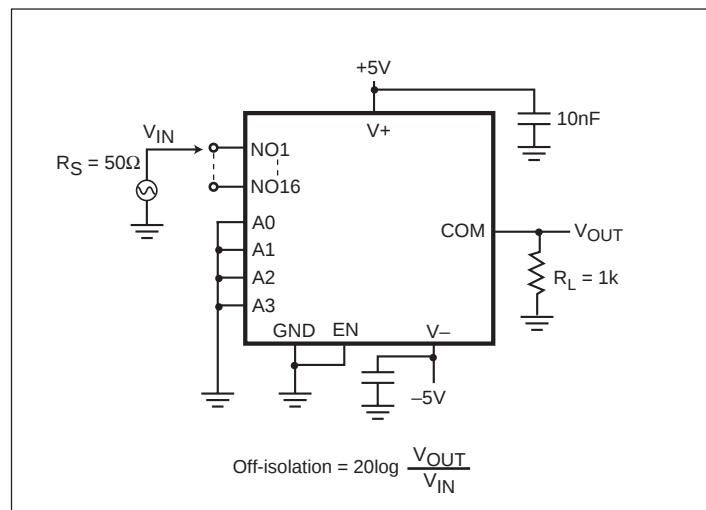
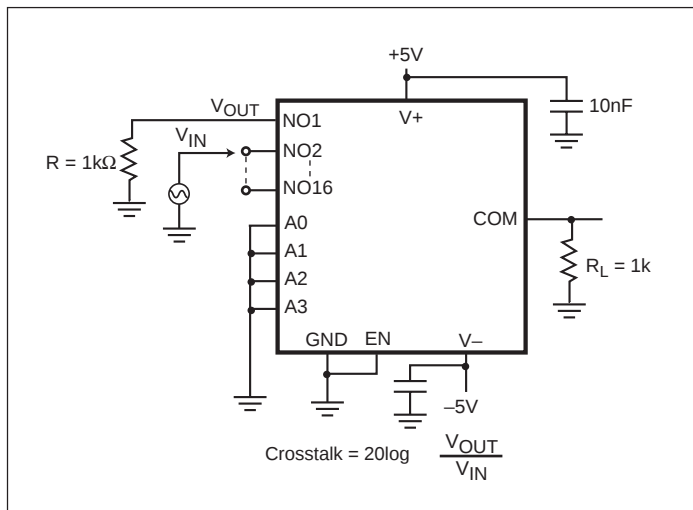


Figure 3. Enable Switching Time

Test Circuits and Timing Diagrams (continued)

Figure 4. Break-Before-Make Interval

Figure 5. Charge Injection (V_{CTE})

Figure 6. Off-Isolation (V_{ISO})

Figure 7. Cross Talk (V_{CT})

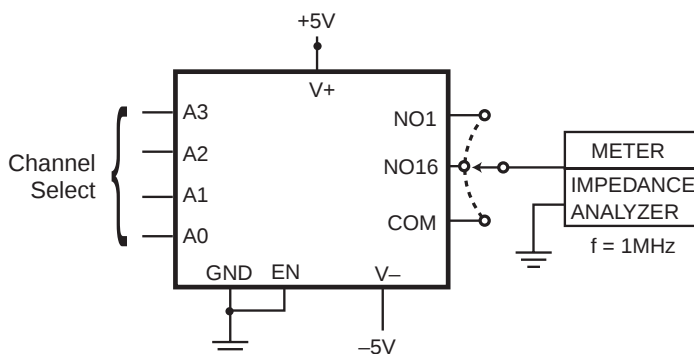
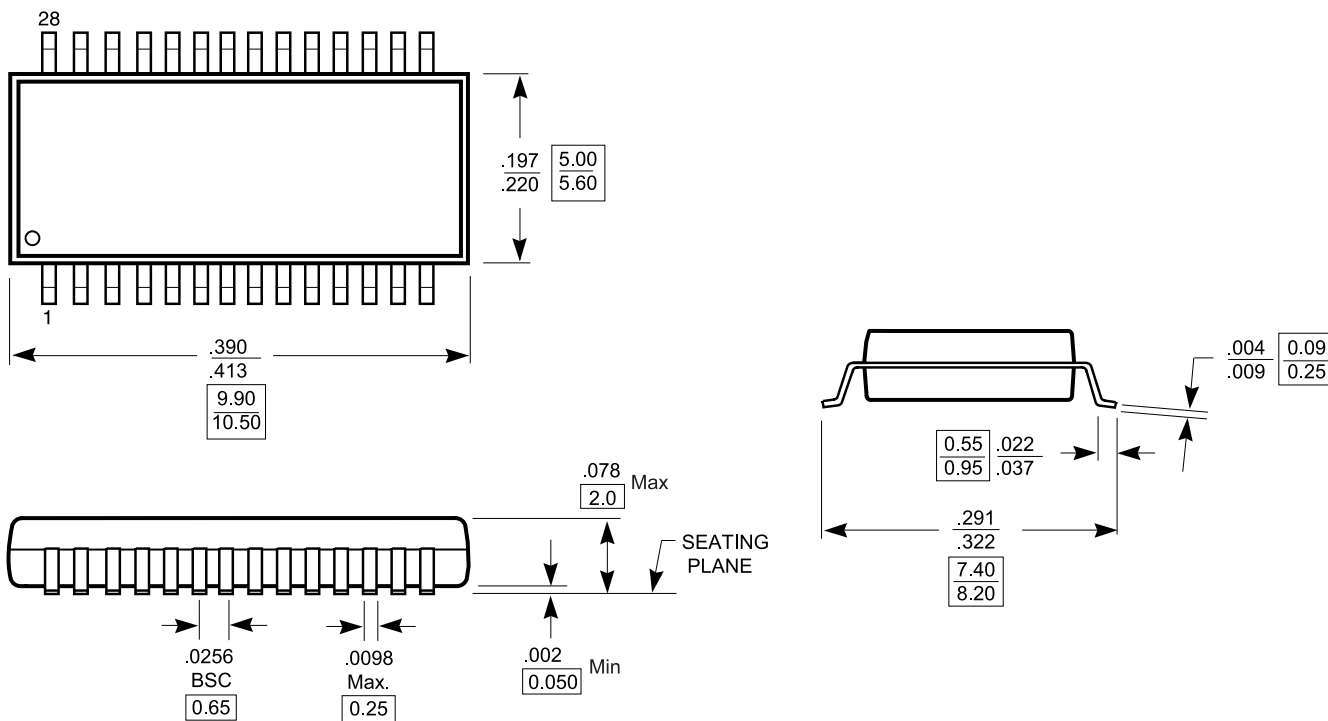
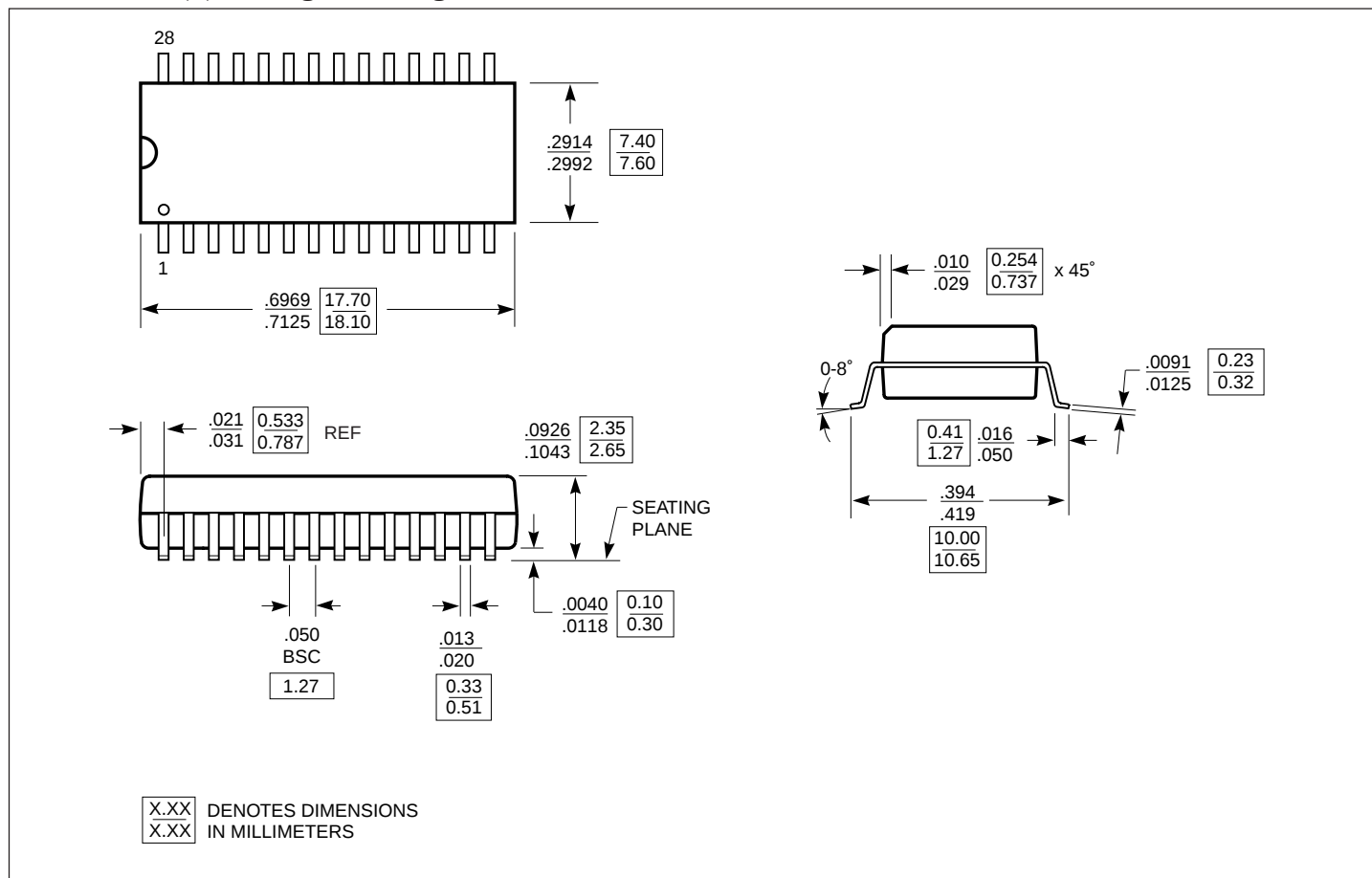


Figure 8. NO/COM Capacitance

28-Pin SSOP (H) Package Drawing



X.XX DENOTES DIMENSIONS
X.XX IN MILLIMETERS

28-Pin SOIC (S) Package Drawing

Ordering Information

Part Number	Temperature Range	Pin - Package
PS396CWI	0°C to +70°C	28-pin Wide SOIC (S)
PS396CAI	0°C to +70°C	28-pin SSOP (H)
PS396CAIE	0°C to +70°C	Pb-free and Green 28-pin SSOP (H)