

HX4066-S four-way analog switch

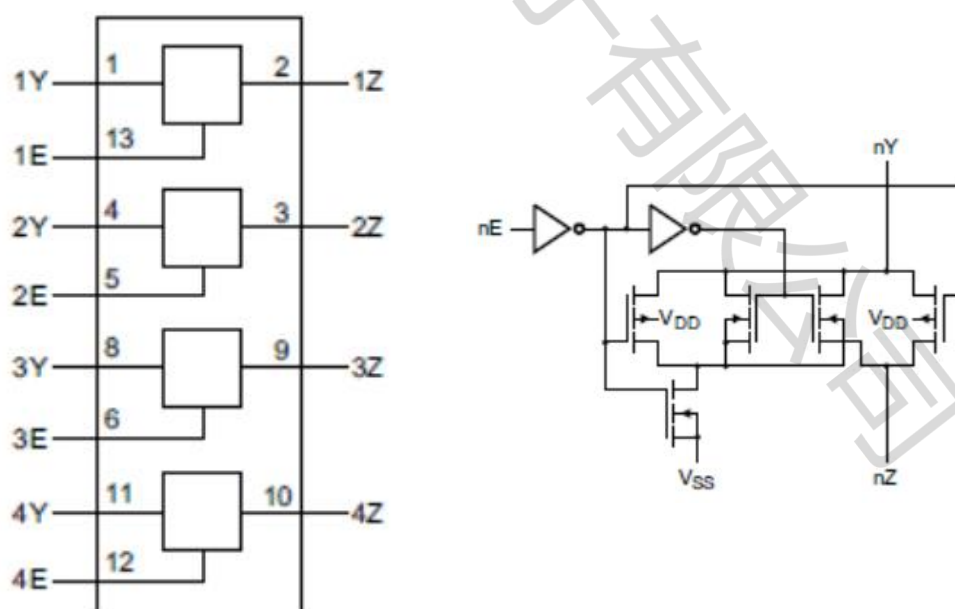
General situation

The HX4066-S offers four single-pole, single-throw analog switch functions. Each switch has two input/output terminals (nY and nZ) and an active high-enabled input (nE). When nE is low, the analog switch is turned off.

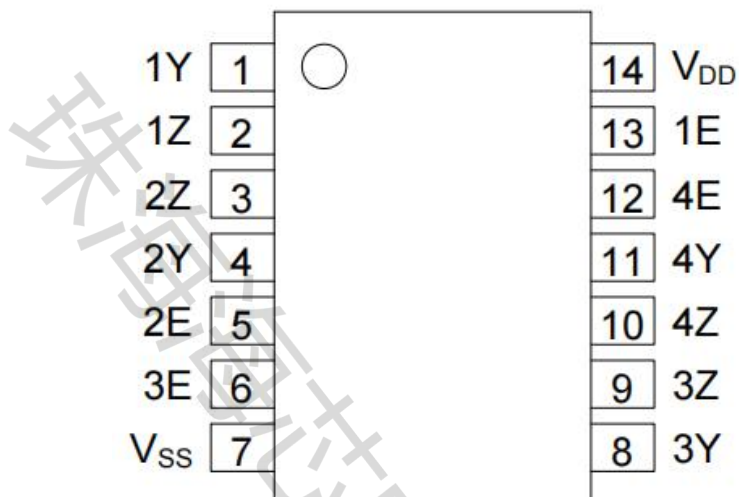
Main feature

Wide supply voltage range from 3V to 9V for full static operation
5V and 9V parameter ratings
Standardized symmetrical output characteristics
Specify from -40 °C to +125 °C

Logic diagram



Pin Configurations



Pin No.	Pin Name	Description
1	1Y	independent input or output
2	1Z	independent input or output
3	2Z	independent input or output
4	2Y	independent input or output
5	2E	enable input (active HIGH)
6	3E	enable input (active HIGH)
7	V _{ss}	ground (0V)
8	3Y	independent input or output
9	3Z	independent input or output
10	4Z	independent input or output
11	4Y	independent input or output
12	4E	enable input (active HIGH)
13	1E	enable input (active HIGH)
14	V _{DD}	supply voltage

Function Table

Input	Switch
nE	
H	ON
L	OFF

Note: H=HIGH voltage level; L=LOW voltage level.

Electrical Parameter

Absolute Maximum Ratings

(Voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{DD}	-	-0.5	+12	V
input voltage	V_I	-	-0.5	$V_{DD}+0.5$	V
input clamping current	I_{IK}	$V_I < 0.5V$ or $V_I > V_{DD}+0.5V$	-	± 10	mA
input/output current	$I_{I/O}$	-	-	± 10	mA
storage temperature	T_{stg}	-	-65	+150	$^{\circ}C$
total power dissipation	P_{tot}	-	-	500	mW
device dissipation	P	per output transistor	-	100	mW

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Recommended Operating Conditions

($T_{amb}=25^{\circ}\text{C}$; $R_L=10\text{k}\Omega$; $C_L=50\text{pF}$; $nE=V_{DD}$; $Vis=V_{DD}=5\text{V}$.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{DD}	-	3	5	9	V
ambient temperature	T_{amb}	in free air	-40	-	+125	$^{\circ}\text{C}$
input voltage	V_I	-	0	-	V_{DD}	V
Disable output time (High level→turnoff)	t_{PHZ}	nE to nZ or nE to nY	-	80	160	ns
Disable output time (Low level→turnoff)	t_{PLZ}	nE to nZ or nE to nY	-	80	160	ns
Enable output time (turnoff→high/low level)	t_{PZH}, t_{PZL}	-	-	45	90	ns
input capacitance	C_I	-	-	-	7.5	pF

Electrical Characteristics

DC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)		T _{amb} =25℃			Unit
				Min.	Typ.	Max.	
supply current	I _{DD}	V _I =V _{DD} or V _{SS} , I _O =0A	V _{DD} =5V	-	-	1.0	uA
			V _{DD} =9V	-	-	2.0	uA
HIGH-level input voltage	V _{IH}	I _O <1uA	V _{DD} =5V, V _O =0.5V or 4.5V	3.5	-	-	V
			V _{DD} =9V, V _O =0.5V or 8V	7.0	-	-	V
LOW-level input voltage	V _{IL}	I _O <1uA	V _{DD} =5V, V _O =0.5V or 4.5V	-	-	1.5	V
			V _{DD} =9V, V _O =0.5V or 8V	-	-	3.0	V
input leakage current	I _I	V _I =0V or 9V, V _{DD} =9V		-	-	1.0	uA
		V _I =0V to V _{DD} -V _{EE}	V _{DD} -V _{EE} =5V	-	350	2500	Ω
			V _{DD} -V _{EE} =9V	-	80	245	Ω

ON resistance (rail)	R_{ON}	$V_I=0V$	$V_{DD}-V_{EE}=5V$	-	115	340	Ω
			$V_{DD}-V_{EE}=9V$	-	50	160	Ω
		$V_I=V_{DD}-V_{EE}$	$V_{DD}-V_{EE}=5V$	-	120	365	Ω
			$V_{DD}-V_{EE}=9V$	-	65	200	Ω
ON resistance mismatch between channels	ΔR_{ON}	$V_I=0V$ to $V_{DD}-V_{EE}$	$V_{DD}-V_{EE}=5V$	-	25	-	Ω
			$V_{DD}-V_{EE}=9V$	-	10	-	Ω

DC Characteristics 2

($T_{amb}=-40^{\circ}C$ to $+85^{\circ}C$, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)		T _{amb} =-40℃		T _{amb} =+85℃		Unit
				Min.	Max.	Min.	Max.	
supply current	I _{DD}	V _I =V _{DD} or V _{SS} , I _O =0A	V _{DD} =5V	-	1.0	-	7.5	uA
			V _{DD} =9V	-	2.0	-	15.0	uA
HIGH-level input voltage	V _{IH}	I _O <1uA	V _{DD} =5V, V _O =0.5V or 4.5V	3.5	-	3.5	-	V
			V _{DD} =9V, V _O =0.5V or 8V	7.0	-	7.0	-	V
LOW-level input voltage	V _{IL}	I _O <1uA	V _{DD} =5V, V _O =0.5V or 4.5V	-	1.5	-	1.5	V
			V _{DD} =9V, V _O =0.5V or 8V	-	3.0	-	3.0	V
input leakage current	I _I	V _I =0V or 9V, V _{DD} =9V		-	-	-	1.0	uA

DC Characteristics 3

($T_{amb}=-40^{\circ}C$ to $+125^{\circ}C$, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)		T _{amb} =-40°C		T _{amb} =+125°C		Unit
				Min.	Max.	Min.	Max.	
supply current	I _{DD}	V _I =V _{DD} or V _{SS} , I _O =0A	V _{DD} =5V	-	1.0	-	7.5	uA
			V _{DD} =9V	-	2.0	-	15.0	uA

HIGH-level input voltage	V_{IH}	$ I_o < 1\mu A$	$V_{DD}=5V$, $V_O=0.5V$ or $4.5V$	3.5	-	3.5	-	V
			$V_{DD}=9V$, $V_O=0.5V$ or $8V$	7.0	-	7.0	-	V
LOW-level input voltage	V_{IL}	$ I_o < 1\mu A$	$V_{DD}=5V$, $V_O=0.5V$ or $4.5V$	-	1.5	-	1.5	V
			$V_{DD}=9V$, $V_O=0.5V$ or $8V$	-	3.0	-	3.0	V
input leakage current	I_I	$V_I=0V$ or $9V$, $V_{DD}=9V$		-	-	-	1.0	μA

AC Characteristics 1

($T_{amb}=25^\circ C$, $V_{EE}=V_{SS}=0V$, t_r , $t_f \leq 20ns$, $C_L=50pF$, $R_L=10k\Omega$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH to LOW propagation delay time	t_{PHL}	nY to nZ; nZ tonY; see Figure 4	$V_{DD}=5V$	-	10	20	ns
			$V_{DD}=9V$	-	5	10	ns
LOW to HIGH propagation delay	t_{PLH}	nY to nZ; nZ tonY; see Figure 4	$V_{DD}=5V$	-	10	20	ns
			$V_{DD}=9V$	-	5	10	ns
HIGH to OFF-state propagation delay	t_{PHZ}	nE tonY, nZ; see Figure 5	$V_{DD}=5V$	-	80	160	ns
			$V_{DD}=9V$	-	65	130	ns
LOW to OFF-state propagation delay	t_{PLZ}	nE tonY, nZ; see Figure 5	$V_{DD}=5V$	-	80	160	ns
			$V_{DD}=9V$	-	70	140	ns
OFF-state to HIGH propagation delay	t_{PZH}	nE tonY, nZ; see Figure 5	$V_{DD}=5V$	-	40	80	ns
			$V_{DD}=9V$	-	20	40	ns
OFF-state to LOW propagation	t_{PZL}	nE tonY, nZ; see	$V_{DD}=5V$	-	45	90	ns
			$V_{DD}=9V$	-	20	40	ns

delay		Figure 5					
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AC Characteristics 2

($T_{amb}=25^{\circ}\text{C}$, $V_{EE}=V_{SS}=0\text{V}$, $V_I=0.5V_{DD}$ (p-p), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Square wave distortion	d_{sin}	see Figure 6; $R_L=10k\Omega$; $C_L=15pF$; channel ON; $f_i=1kHz$	$V_{DD}=5V$	0.25	-	-	%
			$V_{DD}=9V$	0.04	-	-	%
any two channel crosstalk	f_{ct}	$V_{DD}=9V$, see note2		1	-	-	MHz
crosstalk voltage (nE to nY to nZ)	V_{ct}	see Figure 7; $R_L=10k\Omega$; $C_L=15pF$; E^- or Sn= V_{DD} (square-wave)		50	-	-	mV
OFF frequency	f_{OFF}	$V_{DD}=9V$, see note3		1	-	-	MHz
conduction frequency	f_{ON}	$V_{DD}=5V$, see note4		-	-	-	MHz
		$V_{DD}=9V$, see note4		90	-	-	MHz

Note:

[1] f_i is biased at $0.5V_{DD}$; $V_I=0.5V_{DD}$ (p-p).

[2] $R_L=1\text{k}\Omega$; $20\log V_{os}/V_{is}=-50\text{dB}$, see Figure 8.

[3] $R_L=1\text{k}\Omega$; $C_L=5\text{pF}$, channel off, $20\log V_{os}/V_{is}=-50\text{dB}$, see Figure 6.

[4] $R_L=1\text{k}\Omega$; $C_L=5\text{pF}$, channel on, $20\log V_{os}/V_{is}=-3\text{dB}$, see Figure 6.

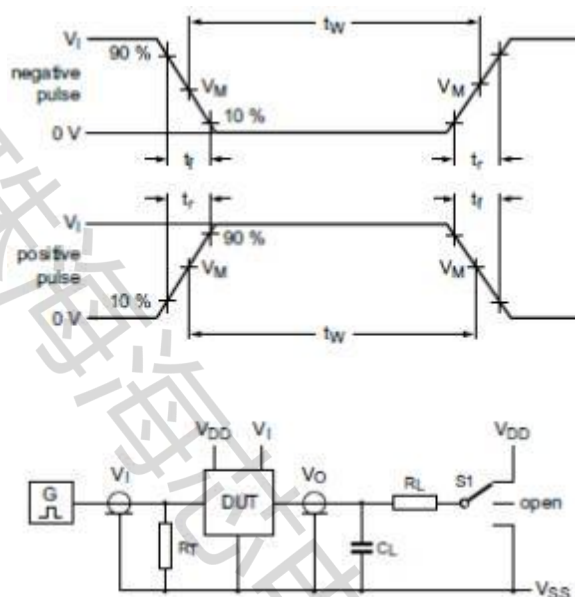


Figure 3. Test circuit for switching times

Definitions for
test circuit:

DUT=Device

Under Test.

C_L =Load capacitance including jig and probe capacitance.

R_T =Termination resistance should be equal to the output impedance Z_o of the pulse generator. R_L =Load resistance.

AC Testing Waveforms

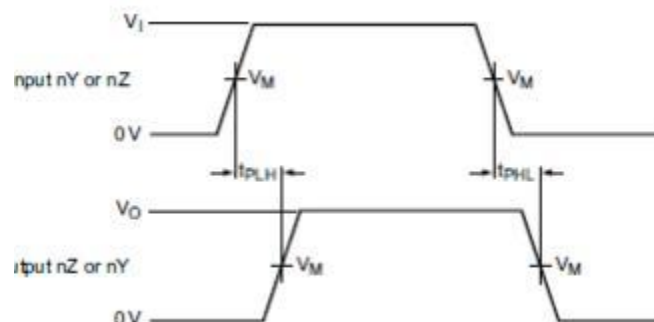


Figure 4. nY or nZ to nZ or nY propagation delays

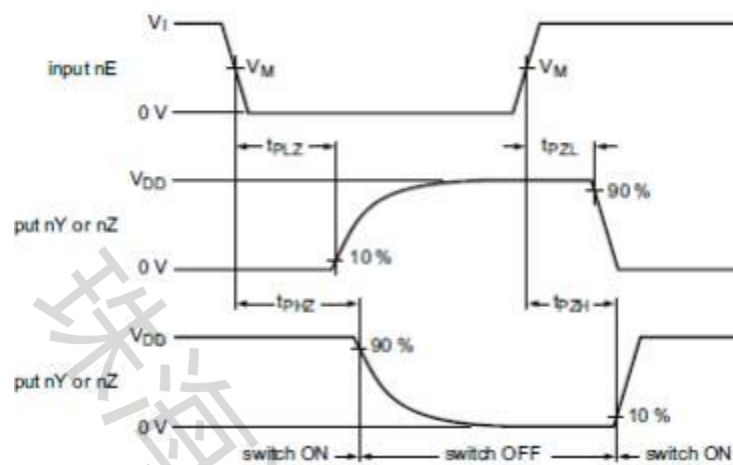
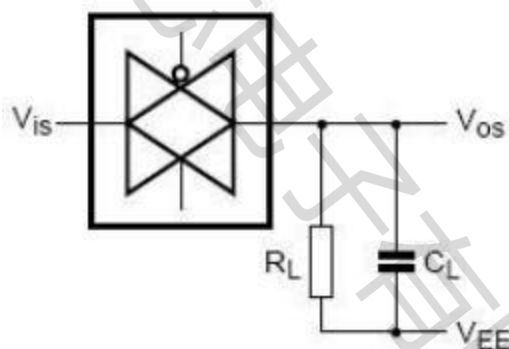


Figure 5. Enable and disable times

AC Testing Circuit 2



Square wave distortion degree of cut-off frequency and conduction frequency test pattern

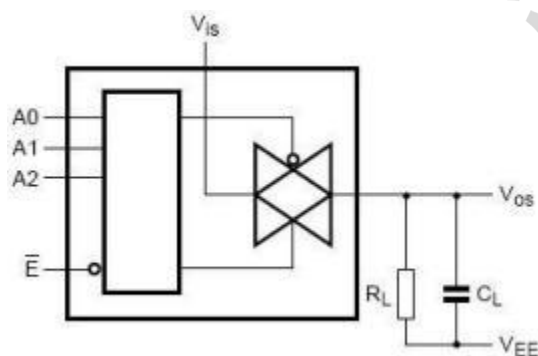


Figure 7. Crosstalk logical input/output test

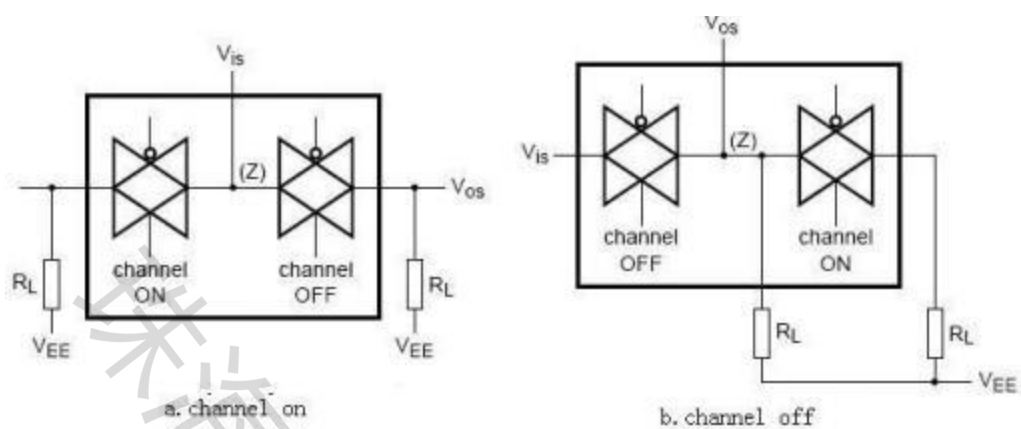


Figure 8. Inter channel Crosstalk

On Resistance Waveform And Test Circuit

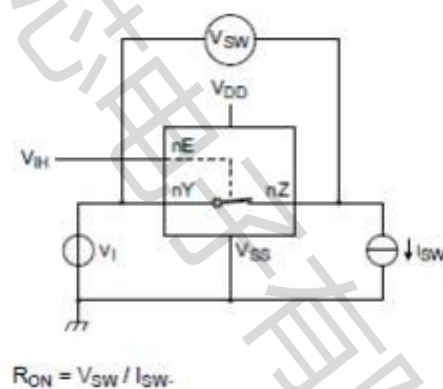


Figure 9. Test circuit for measuring R_{ON}

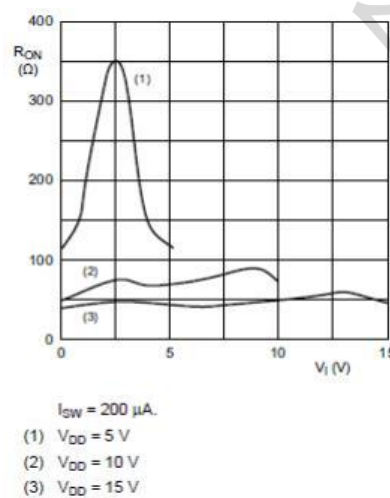
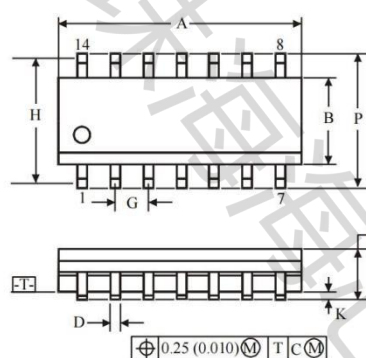


Figure 10. Typical R_{ON} as a function of input voltage

封装

SOP14 (Package Outline Dimensions)

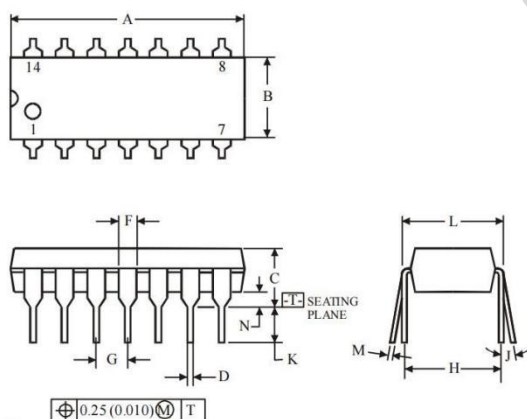


NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B - 0.25 mm (0.010) per side.

Symbol	Dimension, mm	
	MIN	MAX
A	8.55	8.75
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.27	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5

DIP14 (Package Outline Dimensions)



NOTES:

1. Dimensions "A", "B" do not include mold flash or protrusions.
Maximum mold flash or protrusions 0.25 mm (0.010) per side.

Symbol	Dimension, mm	
	MIN	MAX
A	18.67	19.69
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

Part Number	Package Type	Package	quantity
HX4066-S	SOP-14	Taping	2500