4-Channel High Voltage Switch

Ordering Information

V_{PP}	V_{NN}	V_{SIG}	Order Number / Package		
			18-pin ceramic side-brazed DIP	18-pin Plastic DIP	Die in waffle pack
+70V	-70V	110V P-P	HV1014C	HV1014P	HV1014X
+80V	-80V	130V P-P	HV1016C	HV1016P	HV1016X

Features

- ☐ HVCMOS® Technology
- ☐ Up to 130V peak to peak switching capability
- ☐ Output On-resistance typically 25 ohms
- ☐ Low parasitic capacitances
- ☐ DC to 10MHz analog signal frequency
- ☐ 45 dB typical output off isolation at 5 MHz
- ☐ CMOS logic circuitry for low power and excellent noise immunity
- ☐ On-chip latch and chip select logic circuitry

Absolute Maximum Ratings*

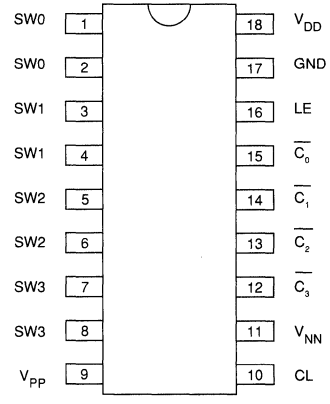
V_{DD} logic power supply voltage	-0.5V to +18V
V_{PP} positive high voltage supply	-0.5V to +90V
V_{NN} negative high voltage supply	+0.5V to -90V
Logic input voltages	-0.5 to V_{DD} +0.3V
Peak analog signal current/channel	3A
Storage temperature	-65°C to +150°C
Power dissipation	800mW

* Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability.

General Description

This device is a 4-channel high-voltage integrated circuit (HVIC) intended for use in applications requiring high voltage switching controlled by low voltage signals; e.g., ultrasound imaging and printers. On-chip latches are provided for the data inputs. Using HVCMOS technology, this HVIC combines high voltage bi-lateral DMOS switches and low power CMOS logic to provide efficient control of high voltage analog signals.

Pin Configuration



top view

18-pin DIP

Electrical Characteristics (over recommended operating conditions unless noted)

DC Characteristics

Characteristics	Sym	0°C		+25°C			+70°C		Units	Test Conditions
		min	max	min	typ	max	min	max		
Switch (ON) Resistance	R_{SW}		25		25	40		45	ohms	I_{SW} = 5mA
Switch (ON) Resistance	R_{SW}		15		15	30		35	ohms	I_{SW} = 200mA
Switch (ON) Resistance	R_{SW}		28		28	40		50	ohms	V_{PP} = +50V V_{NN} = -50V I_{SW} = 5mA
Switch (ON) Resistance	R_{SW}		30		18	35		40	ohms	V_{PP} = +50V V_{NN} = -50V I_{SW} = 200mA
Switch (ON) Resistance Matching (0-3)	R_{SW}		15			15		15	%	I_{SW} = 5mA V_{PP} = +50V, V_{NN} = -50V
Switch Off Leakage	I_{SWL}		50		0.5	50		150	µA	V_{OUT} = V_{PP} -10V thru 10K with 4 SWS in parallel
DC Offset Switch Off			500		100	500		500	mV	RL = 100K
DC Offset Switch On			500		100	500		500	mV	RL = 100K
Pole to Pole Switch Capacitance	C_{SW}		10		4.5	10		10	pF	DC Bias = 40V f = 1MHz
Logic Input Capacitance	C_{IN}				3.5				pF	
Pos. HV Supply Current	I_{PPQ}		200		50	200		200	µA	ALL SWS OFF
Neg. HV Supply Current	I_{NNQ}		-200		-50	-200		-200	µA	
Pos. HV Supply Current	I_{PP}				1.6	3.2			mA	1 SW ON
Neg. HV Supply Current	I_{NN}				-1.6	-3.2			mA	I_{SW} = 5mA
Pos. HV Supply Current	I_{PP}				1.2	2.4			mA	V_{PP} = +50V
Neg. HV Supply Current	I_{NN}				-1.2	-2.4			mA	V_{NN} = -50V 1 SW ON, I_{SW} = 5mA
Switch Output Peak Current					2.5				A	
Logic Supply Current	I_{DD}				0.001	0.5			mA	

AC Characteristics

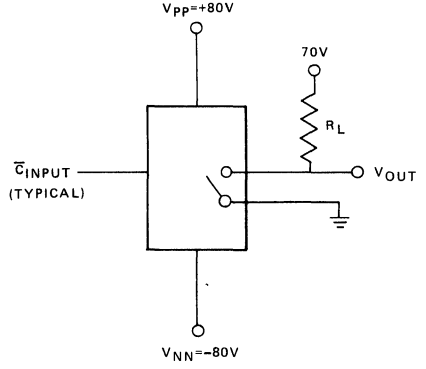
Characteristics	Sym	0°C		+25°C			+70°C		Units	Test Conditions
		min	max	min	typ	max	min	max		
Data Hold Time After LE Rises	t_{HD}			5					ns	
Set Up Time Before LE Rises	t_{SD}			260					ns	
Time Width of LE	t_{WLE}			300					ns	
Time Width of $\overline{CL}$	t_{WCL}			100					ns	
Turn On Time	t_{ON}		5		2.5	5		5	µs	
Turn Off Time	t_{OFF}		10		5.0	10		10	µs	
Off Isolation	KO			35	45				dB	f = 5MHz

Recommended Operating Conditions

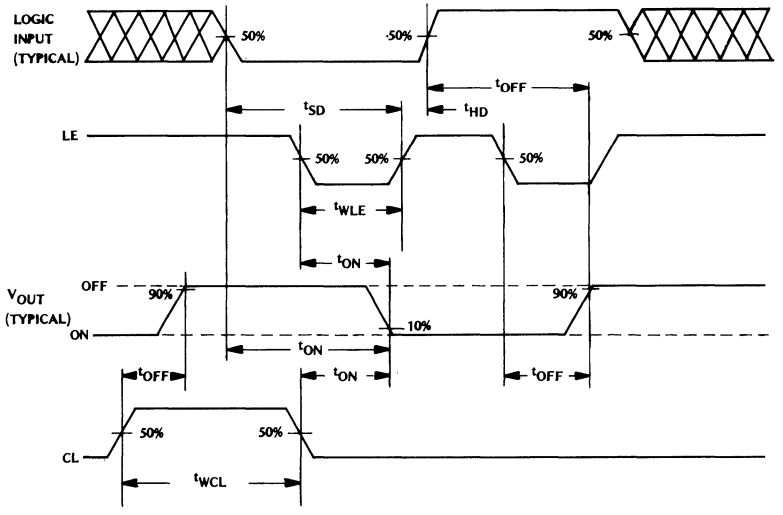
Symbol	Parameter	Device		Value
		HV1014	HV1016	
V_{DD}	Logic power supply voltage	X	X	+10.0V to +15.5V
V_{PP}	Positive high voltage supply	X		+50.0V to +70.0V
			X	+50.0V to +80.0V
V_{NN}	Negative high voltage supply	X		-50.0V to -70.0V
			X	-50.0V to -80.0V
V_{IH}	High level input voltage	X	X	V_{DD} -2V to V_{DD}
V_{IL}	Low level input voltage	X	X	0 to 2.0V
V_{SIG}	Analog signal voltage peak to peak	X	X	V_{NN} +15V to V_{PP} -15V
T_A	Operating free air-temperature	X	X	0° to 70°C

Note: For non-ground referenced systems the following must be used:
Power up sequence: GND VNN VDD VPP
Power down sequence: VPP VDD VNN GND

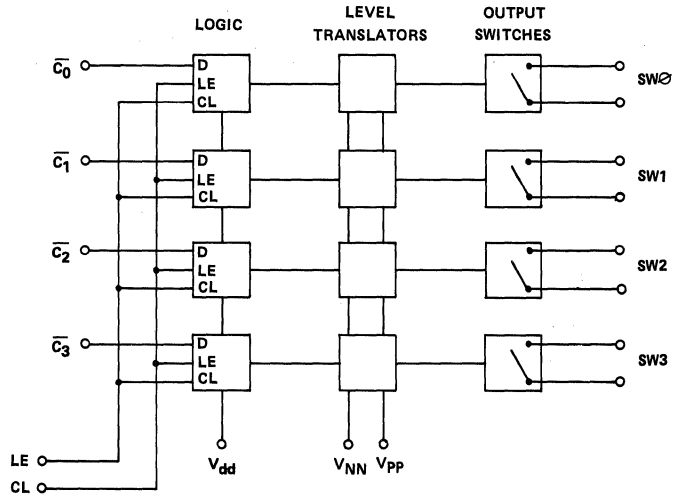
T_{ON}/T_{OFF} Measurement Circuit



Logic Timing Waveforms



Logic Diagram



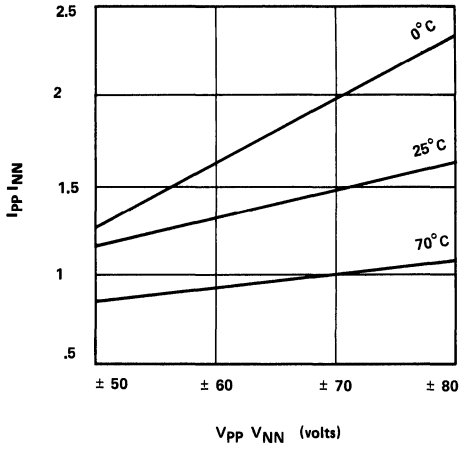
Truth Table

$\overline{C_0}$	$\overline{C_1}$	$\overline{C_2}$	$\overline{C_3}$	LE	CL	SW0	SW1	SW2	SW3
H				L	L	OFF			
L				L	L	ON			
	H			L	L		OFF		
	L			L	L		ON		
		H		L	L			OFF	
		L		L	L			ON	
			H	L	L				OFF
			L	L	L				ON
X	X	X	X	X	H	OFF	OFF	OFF	OFF
X	X	X	X	H	L	HOLD			

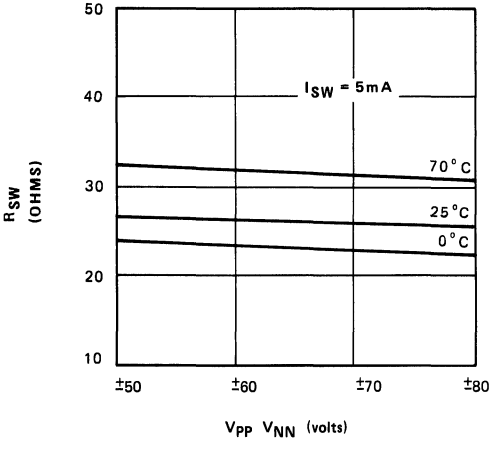
Notes: 1. The four switches operate independently.
2. The clear input overrides all other inputs.
3. The switches go to a state retaining their present condition at the rising edge of LE. When LE is low, the switch control data flows through the latch.

Typical Performance Curves

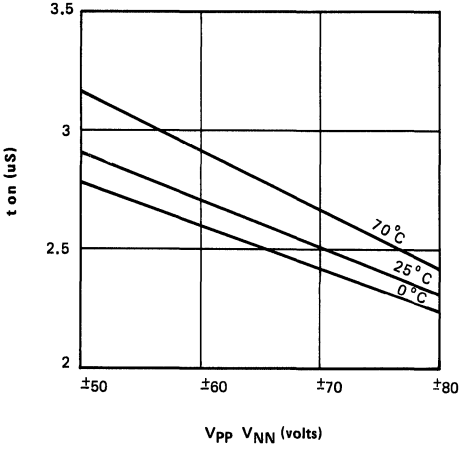
TYPICAL
I_{PP} I_{NN} vs. V_{PP} V_{NN} (ONE SWITCH ON)



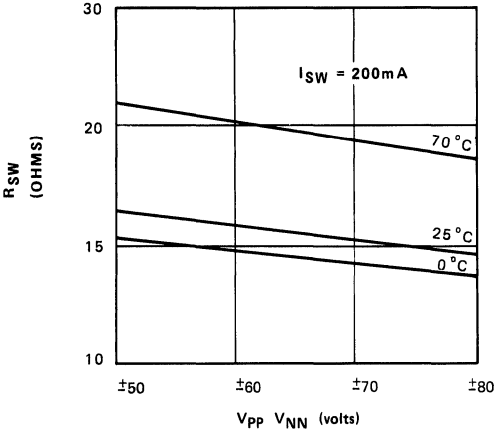
TYPICAL
R_{SW} vs. V_{PP} V_{NN}



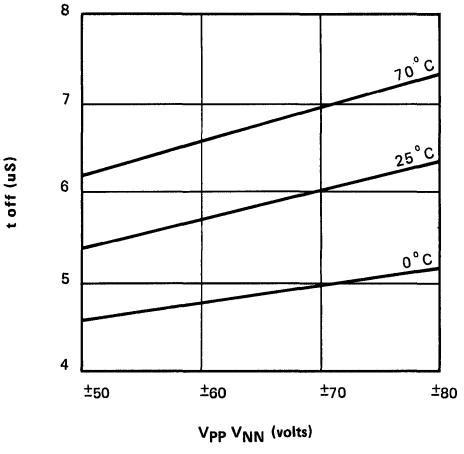
TYPICAL
t on (uS) vs. V_{PP} V_{NN}



TYPICAL
R_{SW} vs. V_{PP} V_{NN}



TYPICAL
t_{off} vs. V_{PP} V_{NN}



Typical
Switch Current vs. Voltage