Supertex inc.

HV10

4-Channel High Voltage Analog Switch

Ordering Information

V_{PP}	V_{NN}	V_{SIG}	Order Number / Package		
			18-pin Ceramic Side-brazed DIP*	18-pin Plastic DIP	Die
+70V	-70V	110V P-P	HV1014C	HV1014P	HV1014X
+80V	-80V	130V P-P	HV1016C	HV1016P	HV1016X

* Consult factory for Cerdip and Ceramic LCC availability.

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 direct control and latch logic circuitry

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.

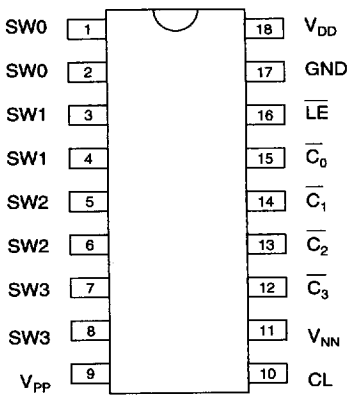
Absolute Maximum Ratings*

V_{DD} logic power supply voltage	-0.5V to +18V
V_{PP} - V_{NN} supply voltage	174V†
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
Analog signal range	V_{NN} to V_{PP}
Peak analog signal current/channel	3.0A
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.

† For HV1016.

Pin Configuration



top view

18-pin DIP

i2

Electrical Characteristics

(over operating conditions, V_{PP} = +80V, V_{NN} = -80V, and V_{DD} = 15V unless otherwise 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_{ONS}		25		25	40		45	ohms	I_{SW} = 5mA, V_{SIG} = 0V
Switch (ON) Resistance	R_{ONS}		15		15	30		35	ohms	I_{SW} = 200mA, V_{SIG} = 0V
Switch (ON) Resistance	R_{ONS}		28		28	40		50	ohms	V_{PP} = +50V, V_{NN} = -50V, I_{SW} = 5mA, V_{SIG} = 0V
Switch (ON) Resistance	R_{ONS}		30		18	35		40	ohms	V_{PP} = +50V, V_{NN} = -50V, I_{SW} = 200mA, V_{SIG} = 0V
Switch (ON) Resistance Matching (0-3)	ΔR_{ONS}		15			15		15	%	V_{PP} = +50V, V_{NN} = -50V, I_{SW} = 5mA, V_{SIG} = 0V
Switch Off Leakage Per Switch	I_{SOL}		50		0.5	50		150	µA	V_{SIG} = V_{PP} -10V thru 10KΩ with 4 SWS in parallel
DC Offset Switch Off			500		100	500		500	mV	R_L = 100KΩ
DC Offset Switch On			500		100	500		500	mV	R_L = 100KΩ
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_{PPQ}				1.6	3.2			mA	1 SW ON, I_{SW} = 5mA,
Neg. HV Supply Current	I_{NNQ}				-1.6	-3.2			mA	V_{SIG} = 0V
Pos. HV Supply Current	I_{PPQ}				1.2	2.4			mA	V_{PP} = +50V, V_{NN} = -50V,
Neg. HV Supply Current	I_{NNQ}				-1.2	-2.4			mA	1 SW ON, I_{SW} = 5mA
Switch Output Peak Current					2.5				A	V_{SIG} ≤ 0.1% Duty Cycle, f = 10KHz
Logic Supply Average Current	I_{DD}				4				mA	Input Freq. = 3MHz
Logic Supply Quiescent Current	I_{DDQ}				10	500			µA	

AC Characteristics

Characteristics	Sym	0°C		+25°C			+70°C		Units	Test Conditions
		min	max	min	typ	max	min	max		
Data Hold Time After $\overline{LE}$ Rises	t_{HD}			5					ns	
Set Up Time Before $\overline{LE}$ Rises	t_{SD}			260					ns	
Time Width of $\overline{LE}$	t_{WLE}			300					ns	
Time Width of CL	t_{WCL}			150					ns	
Turn On Time	t_{ON}		5.0		2.5	5.0		5.0	µs	R_L = 10KΩ
Turn Off Time	t_{OFF}		10		5.0	10		10	µs	R_L = 10KΩ
Off Isolation	KO			-35	-45				dB	Signal Freq. = 5MHz
Switch Crosstalk	K_{CR}				-45				dB	Signal Freq. = 5MHz

* For HV1016. For HV1014; V_{PP} = +70V, V_{NN} = -70V, and V_{DD} = 15V.

Operating Conditions

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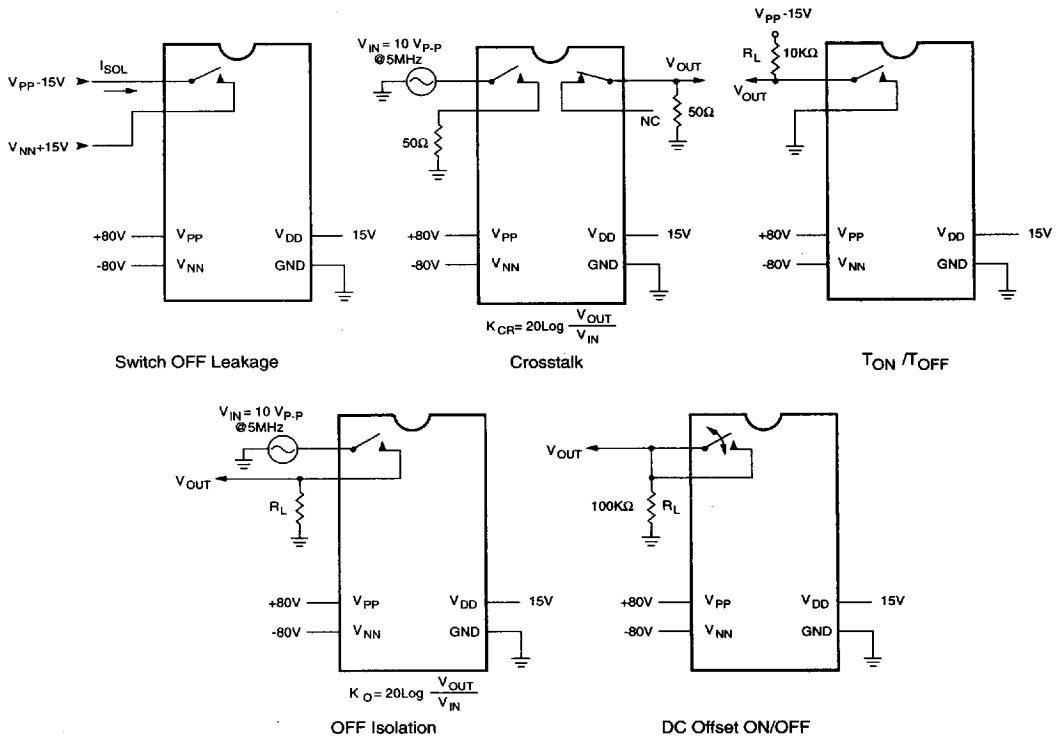
Symbol	Parameter	Device		Value
		HV1014	HV1016	
V_{DD}	Logic power supply voltage	X	X	+10V to +15.5V
V_{PP}	Positive high voltage supply	X		+50V to +70V
			X	+50V to +80V
V_{NN}	Negative high voltage supply	X		-50V to -70V
			X	-50V to -80V
V_{IH}	High level input voltage	X	X	V_{DD} -2V to V_{DD}
V_{IL}	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:
1. Power up/down sequence is arbitrary except GND must be powered-up first and powered -down last.
2. V_{SIG} must be $V_{NN} \leq V_{SIG} \leq V_{PP}$ or floating during power up/down transition.

Test Circuits



Logic Timing Waveforms

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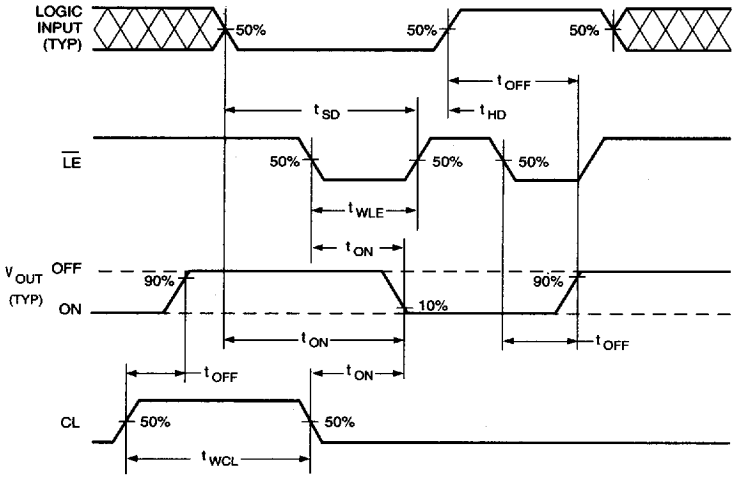
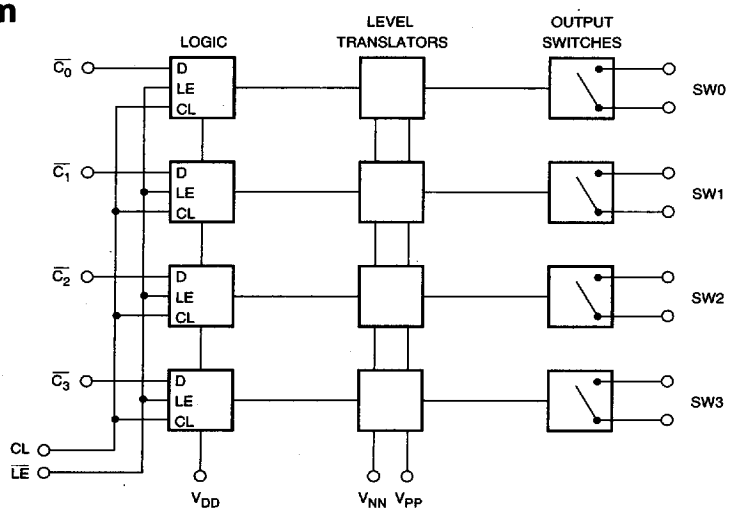


Logic Diagram



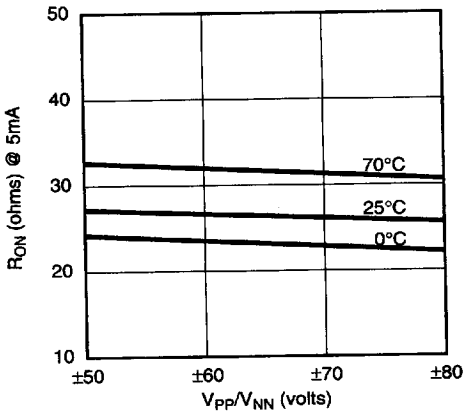
Truth Table

$\overline{C_0}$	$\overline{C1}$	$\overline{C2}$	$\overline{C3}$	$\overline{LE}$	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			

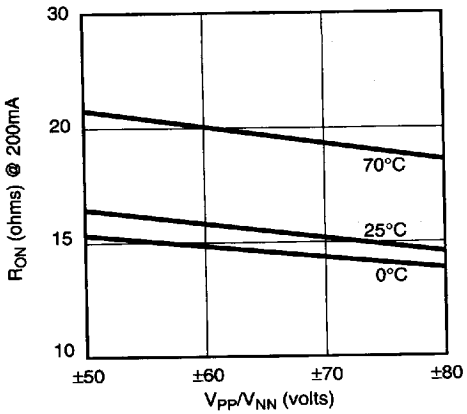
Notes: 1. The four switches operate independently.
2. The clear input overrides all other inputs.
3. The switches go to a state retaining their present condition at the rising edge of $\overline{LE}$. When $\overline{LE}$ is low, the switch control data flows through the latch.

Typical Performance Curves

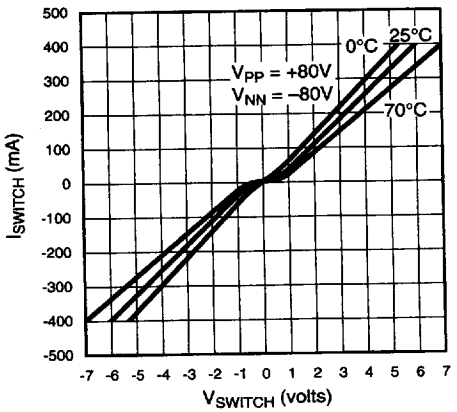
R_{ON} vs. V_{PP}/V_{NN}



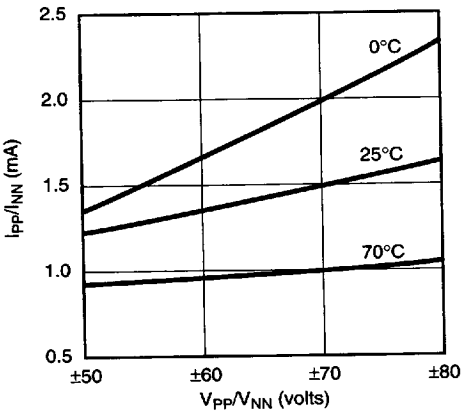
R_{ON} vs. V_{PP}/V_{NN}



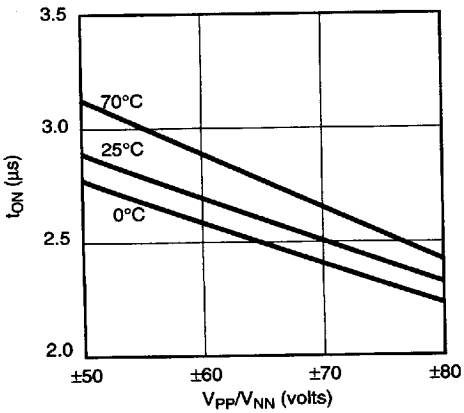
Switch Current vs. Switch Voltage



I_{PP}/I_{NN} vs. V_{PP}/V_{NN} (1 Switch ON)



t_{ON} vs. V_{PP}/V_{NN}



t_{OFF} vs. V_{PP}/V_{NN}