Features

- Wideband Operation ..... 200 MHz
- Differential Gain 0.03%
- Differential Phase ..... 0.003 Degrees
- Switching Speed 100ns
- R_{ON} 35Ω
- Off Isolation @ 10 MHz ..... -65dB
- Crosstalk @ 10 MHz ..... -80dB

Applications

- Routing Switchers
- Production Mixers
- High Definition TV
- Radar Signal Conditioning
- Medical Imaging
- Heads-Up Displays
- Simulators
- Sonar

Description

The HI-222 is a high frequency analog switch that complements the Harris family of high speed op amps and buffers. Fabricated with our Dielectric Isolation process and using silicon gate technology, many key parameters have been enhanced.

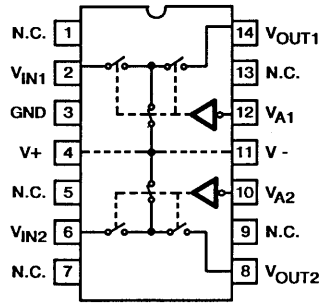
Crosstalk and off isolation are optimized with a T-switch configuration and the use of nonconnected pins for extended shielding. Other features of the HI-222 include wideband operation, low R_{ON}, fast switching speeds and low differential gain and phase. The characteristics of this TTL compatible device make it ideal for designs where improved switching performance is required.

The primary application of this dual SPST switch is the routing of high frequency signals in equipment ranging from video production mixers to military RF circuits.

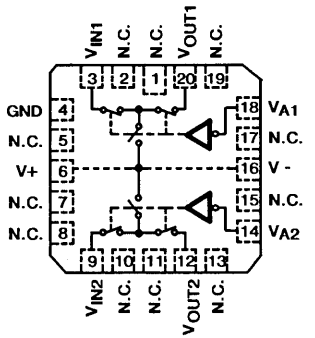
The HI-222 is available in a 14 pin Ceramic DIP with -5, -9 and /883 temperature options, and in a Plastic DIP with a -5 option. A Plastic Leaded Chip Carrier (PLCC) with a -5 option and a Leadless Chip Carrier (LCC) with a /883 option are also offered. For additional information on the /883 products, please refer to the Harris Military Analog Product Data Book.

Pinouts

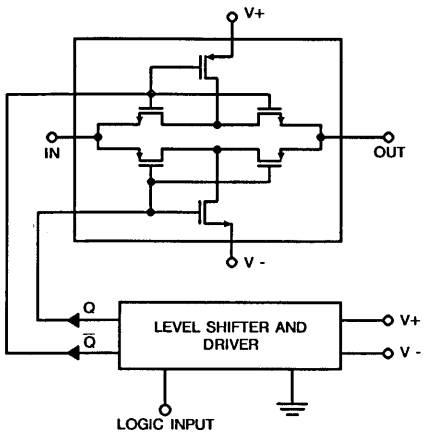
(CERAMIC/PLASTIC DIP) LOGIC "1" INPUT
TOP VIEW



(LCC/PLCC) LOGIC "0" INPUT
TOP VIEW



Functional Diagram



Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HI4P0222-5	0°C to +75°C	20-Pin PLCC
HI1-0222-5	0°C to +75°C	14-Pin CERDIP
HI3-0222-5	0°C to +75°C	14-Pin Plastic DIP
HI1-0222-9	-40°C to +85°C	14-Pin CERDIP

NOTE: Source and Drain are arbitrarily depicted as Analog Input and Output, respectively. They may be interchanged without affecting performance. All nonconnected pins should be tied to ground.

CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper IC Handling Procedures.

Absolute Maximum Ratngs (Note 1)

Voltage Between V+ and V- Terminals 36V
$\pm V_S$ to Ground (V+, V-) ..... $\pm$18V
Digital and Analog Input Voltage (V_A, V_S, V_D) ..... $\pm V_S \pm 2V$
I_{peak} (S to D) (Pulse at 0.8ms, 10% Duty Cycle Max) 100mA
I_{peak} (Any Pin, 50% Duty Cycle) 28mA
Continuous Current (Any Pin) 15mA
Junction Temperature ..... +175°C
Storage Temperature Range ..... -65°C to +150°C
ESD Rating ..... < 2000V
Lead Temperature (Soldering 10 sec) ..... 300°C

Thermal Information

Thermal Resistance	θ_{ja}	θ_{jc}
Ceramic/Plastic DIP Package	75°C/W	17°C/W
Ceramic LCC Package	76°C/W	19°C/W

Package Power Dissipation Limit at +75°C
Ceramic/Plastic DIP and Ceramic LCC Package 1.0W
Package Power Dissipation Derating Factor Above +75°C
Ceramic/Plastic DIP Package ..... 13.4mW/°C
Ceramic LCC Package ..... 13.2mW/°C
Operating Temp. Range HI-222-5 ..... $0°C \leq T_A \leq +75°C$
HI-222-9 ..... $-40°C \leq T_A \leq +85°C$

D.C. Electrical Specifications $\pm V_S = \pm 15V$. $V_{AH} = 2.0V$, $V_{AL} = 0.8V$, Unless Otherwise Specified

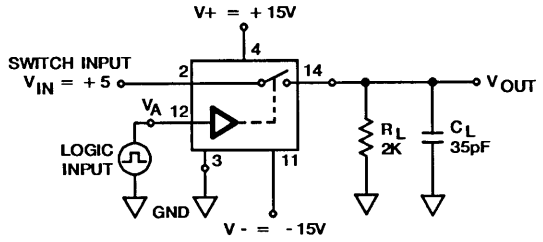
PARAMETER	TEMP	HI-222-9 MIN	HI-222-9 TYP	HI-222-9 MAX	HI-222-5 MIN	HI-222-5 TYP	HI-222-5 MAX	UNITS
ANALOG SWITCH CHARACTERISTICS								
V_S, Analog Signal Range	Full	-15	-	+15	-15	-	+15	V
R_{ON}, ON Resistance (Note 2)	+25°C	-	35	50	-	35	50	Ω
	Full	-	-	75	-	-	75	Ω
I_{SOFF} Leakage	+25°C	-	0.1	2.5	-	0.1	2.5	nA
	Full	-	-	200	-	-	200	nA
I_{DOFF} Leakage	+25°C	-	0.1	2.5	-	0.1	2.5	nA
	Full	-	-	200	-	-	200	nA
I_{DON} Leakage	+25°C	-	0.3	2.5	-	0.3	2.5	A
	Full	-	-	200	-	-	200	nA
DIGITAL INPUT CHARACTERISTICS								
V_{AL}, Low Threshold	Full	-	-	0.8	-	-	0.8	V
V_{AH}, High Threshold	Full	2.0	-	-	2.0	-	-	V
I_{AL}, Low Level Leakage	+25°C	-	0.1	1.0	-	0.1	1.0	µA
	Full	-	-	1.0	-	-	1.0	µA
I_{AH}, High Level Leakage	+25°C	-	0.1	1.0	-	0.1	1.0	µA
	Full	-	-	1.0	-	-	1.0	µA
SWITCHING CHARACTERISTICS								
t_{ON} (Note 3)	+25°C	-	100	200	-	100	200	ns
t_{OFF} (Note 3)	+25°C	-	70	200	-	70	200	ns
Off-Isolation @10MHz (Note 4)	+25°C	-	-65	-	-	-65	-	dB
Crosstalk @10MHz (Note 4)	+25°C	-	-80	-	-	-80	-	dB
Differential Gain (Note 5)	+25°C	-	0.03	-	-	0.03	-	%
Differential Phase (Note 5)	+25°C	-	0.003	-	-	0.003	-	degrees
Gain Tolerance @1MHz (Note 6)	+25°C	-	0.05	-	-	0.05	-	dB
@ 8MHz	+25°C	-	0.15	-	-	0.15	-	dB
Bandwidth (Note 6)	+25°C	-	200	-	-	200	-	MHz
$C_{S(OFF)}$, Switch Input Capacitance	+25°C	-	12	-	-	12	-	pF
$C_{D(OFF)}$, Switch Output Capacitance	+25°C	-	28	-	-	28	-	pF
$C_{D(ON)}$, Switch Output Capacitance	+25°C	-	83	-	-	83	-	pF
C_A, Digital Address Capacitance	+25°C	-	5	-	-	5	-	pF
$C_{DS(OFF)}$, Drain-to-Source Capacitance	+25°C	-	0.2	-	-	0.2	-	pF
POWER REQUIREMENTS								
I± @ ±15V Quiescent Current	+25°C	-	2.5	4.0	-	2.5	4.0	mA
	Full	-	-	6.0	-	-	6.0	mA
P_D, Quiescent Power Dissipation	+25°C	-	75	120	-	75	120	mW
	Full	-	-	180	-	-	180	mW

NOTES:

1. As with all semiconductors, stresses listed under "Absolute Maximum Ratings" may be applied to devices (one at a time) without resulting in permanent damage. This is a stress rating only. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. The conditions listed under "Electrical Specifications" are the only conditions recommended for satisfactory operation.
2. V_{OUT} = ±5V, I_{OUT} = 7.5mA
3. V_{IN} = +5V, R_L = 2kΩ, C_L = 40pF. V_A levels are 0.0V to 3.0V for switch under test. Switch not under test has V_A = 4.0V.
4. V_{IN} = 300mV$_{p-p}$, R_L = 50Ω, V_{AH} = +2.0V, V_{AL} = 0.8, f = 10.0MHz.
5. V_{IN} = 300mV$_{p-p}$, V_{OFFSET} = 1.0, f = 3.58MHz and 4.43MHz, V_{AL} = 0V, R_L = 2KΩ.
6. V_{IN} = 300mV$_{p-p}$, R_L =50Ω, V_{AL} = 0.8V.

Test Circuit

SWITCHING TEST CIRCUIT (t_{ON}, t_{OFF1})

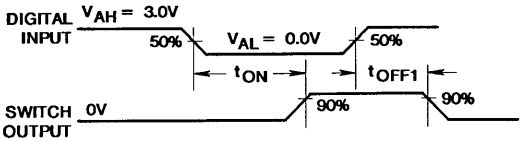


$$V_O = V_{IN} \frac{R_L}{R_L + R_{ON}}$$

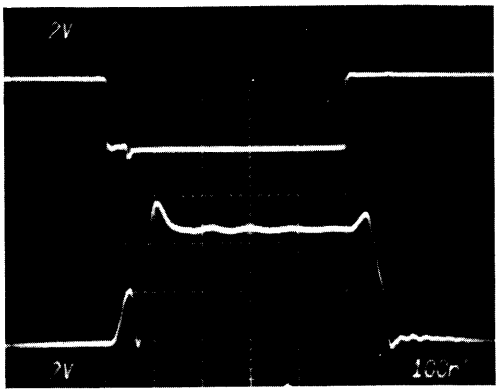
C_L Includes $C_{FIXTURE}$ + C_{PROBE}

Switching Waveforms

LOGIC "0" = SWITCH ON



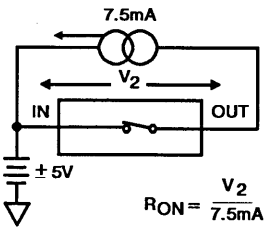
t_{ON}, t_{OFF}, V_{AL} = 0.0V, V_{AH} = 3.0V



Top: (2V/Div.)
Bottom: Output (2V/Div.)
Horizontal: 100ns/Div.

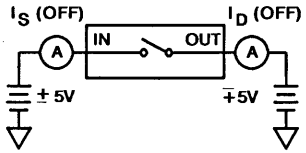
Test Circuits

R_{DS}



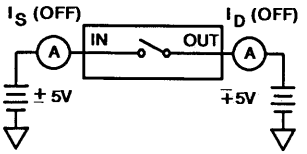
V_{IN} = ±5V, I = 7.5mA, V_A = 0.8V

$I_{S(OFF)}$



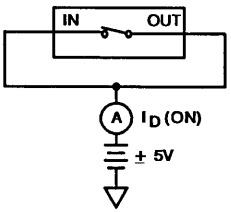
V_{IN} = ±5V, V_{OUT} = ∓5V, V_A = 2.0V

$I_{D(OFF)}$



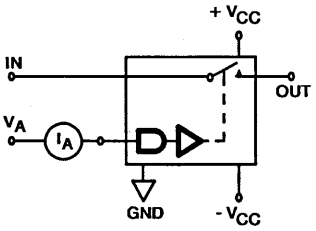
V_{IN} = ±5V, V_{OUT} ∓5V, V_A = 2.0V

$I_{D(ON)}$



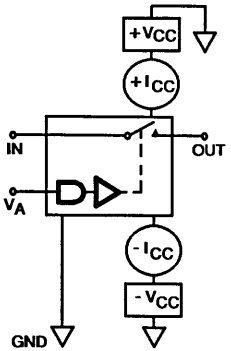
V_{IN} = ±5V, V_{OUT} = ±5V, V_A = 0.8V

ADDRESS CURRENT



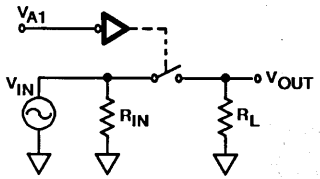
V_{AH} = 2.0V, V_{AL} = 0.8V

SUPPLY CURRENTS



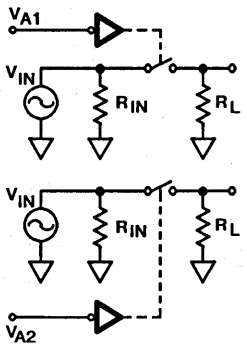
V_A = 0.8V, 2.0V

OFF ISOLATION



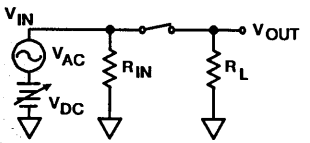
V_{IN} = 300mV_{p-p}, f = 10MHz, R_{IN} = R_L = 50Ω, V_{A1} = 2.0V

CROSSTALK



V_{IN} = 300mV_{p-p}, f = 10MHz, R_{IN} = R_L = 50Ω
V_{A1} = 2.0V, V_{A2} = 0.8V

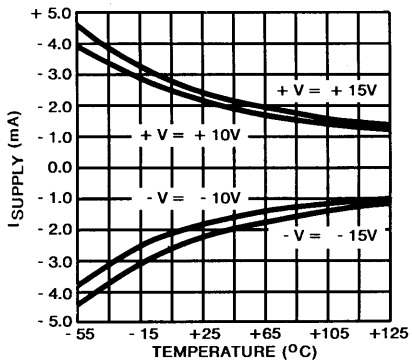
DIFFERENTIAL GAIN, PHASE



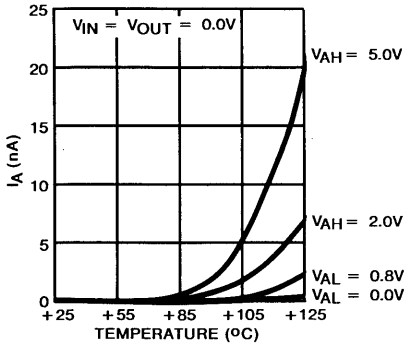
V_{AC} = 300mV_{p-p}, f = 3.58MHz and 4.43MHz,
V_{DC} = 0.0V to 1.0V, R_L = 2kΩ, R_{IN} = 50Ω

Typical Performance Curves Unless Otherwise Specified: $T_A = +25^oC$, $V_{SUPPLY} = \pm 15V$

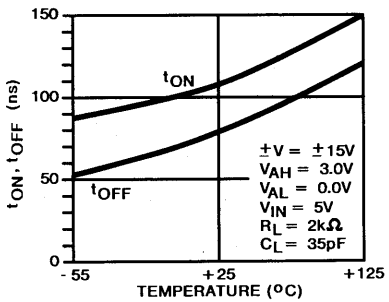
SUPPLY CURRENT vs. TEMPERATURE vs. SUPPLY VOLTAGE



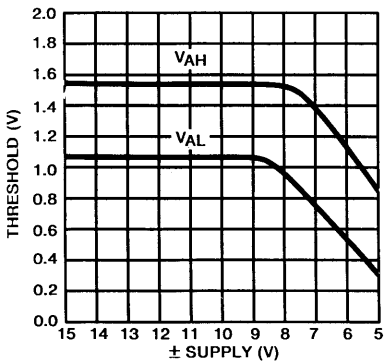
STEADY STATE ADDRESS INPUT CURRENT vs. TEMPERATURE



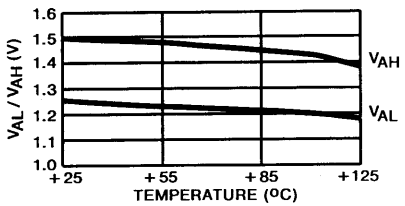
SWITCHING TIME vs. TEMPERATURE



SWITCHING THRESHOLD vs. ±SUPPLY VOLTAGE



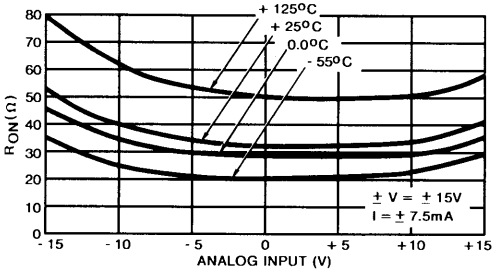
ADDRESS INPUT THRESHOLD vs. TEMPERATURE



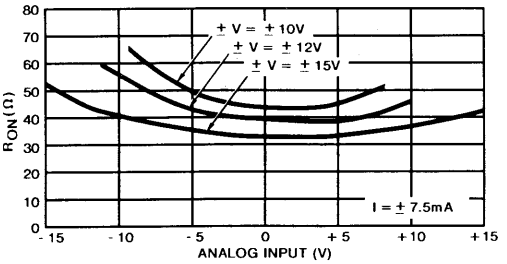
Typical Performance Curves

Unless Otherwise Specified: $T_A = +25^oC$, $V_{SUPPLY} = \pm 15V$

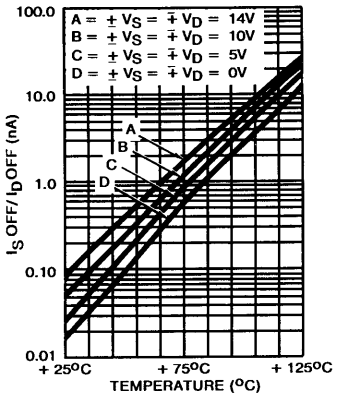
R_{ON} vs. ANALOG INPUT vs. TEMPERATURE



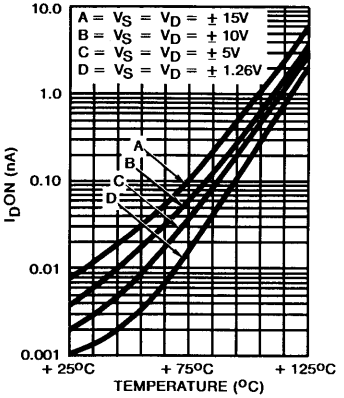
R_{ON} vs. ANALOG INPUT vs. SUPPLY VOLTAGE



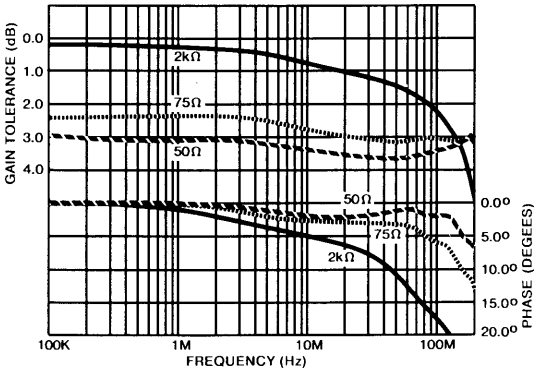
I_{SOFF}/I_{DOFF} vs. TEMPERATURE vs. ANALOG INPUT



I_{DON} vs. TEMPERATURE vs. ANALOG INPUT



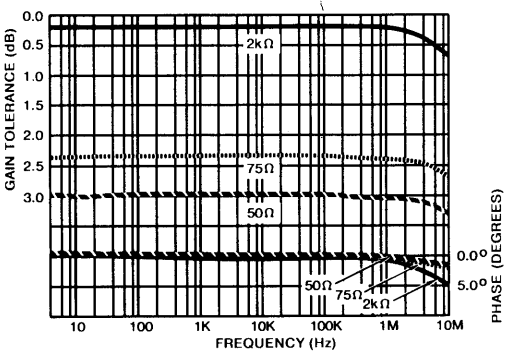
BANDWIDTH



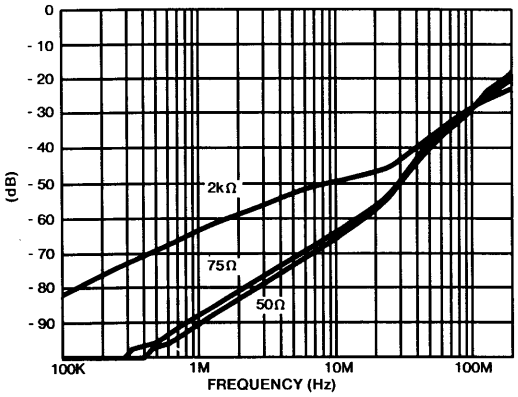
Typical Performance Curves

Unless Otherwise Specified: $T_A = +25^oC$, $V_{SUPPLY} = \pm 15V$

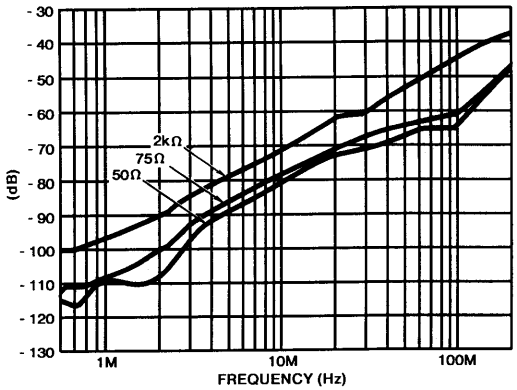
GAIN TOLERANCE



OFF ISOLATION

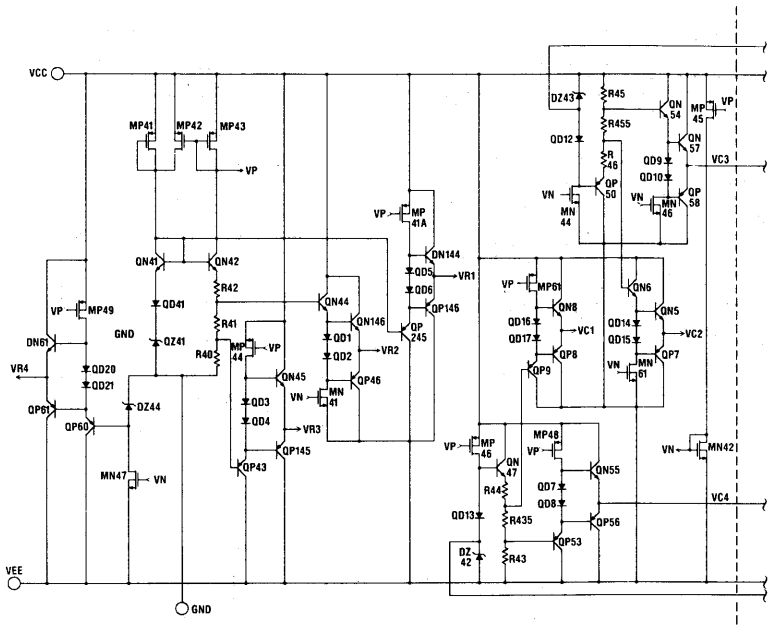


CROSSTALK



Schematic Diagram

BIAS NETWORK



LEVEL SHIFTER

SWITCH