Data Sheet | January 1999 | File Number 1719.5

QMOS 8 x 8 x 1 Crosspoint Switches with Memory Control

The CD74HC22106 is a digitally controlled analog switch which utilize silicon-gate CMOS technology. The CD74HC22106 features CMOS input-voltage-level compatibility.

The Master Reset has an internal pull-up resistor and is normally used with a 0.1µF capacitor. During power up all switches are automatically reset. The crosspoint switches will reset with MR = 0 even if CE is high. A 6-bit address through a 6 line to 64 line decoder selects the transmission gate which can be turned on by applying a logic ONE to the DATA input and logic ZERO to the STROBE. Similarly, any transmission gate can be turned OFF by applying a logic ZERO to the DATA input while strobing the STROBE with a logic ZERO.

The CE pin allows the crosspoint array to be cascaded for matrix expansion in both the X and Y directions.

Ordering Information

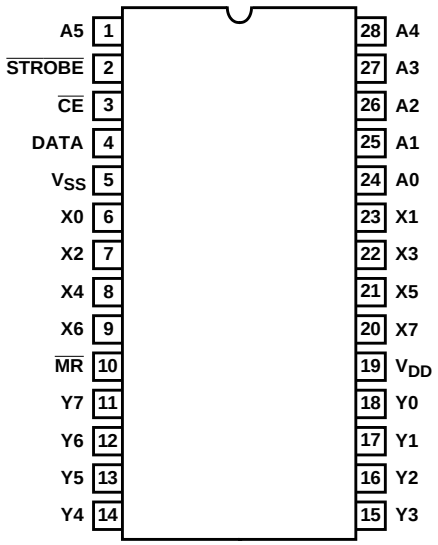
PART NUMBER	TEMP. RANGE (^{o}C)	PACKAGE	PKG. NO.
CD74HC22106E	-40 to 85	28 Ld PDIP	E28.6

Features

- 64 Analog Switches in an 8 x 8 x 1 Array
- On-Chip Line Decoder and Control Latches
- Automatic Power-Up Reset by Using a 0.1µF Capacitor at the MR Pin
- R_{ON} Resistanced 95Ω at V_{CC} = 4.5V
- Analog Signal Capability: $V_{DD}/2$
- Wide Operating Temp. Range: -40^{o}C to 85^{o}C
- 2V to 10V Operation
- High Noise Immunity: N_{IL} = 30%, N_{IH} = 30% of V_{DD}; at V_{DD} = 5V and 10V

Pinout

CD74HC22106
(PDIP)
TOP VIEW



Absolute Maximum Ratings

DC Supply Voltage (V_{DD})
Voltage Reference to V_{SS} Terminal . . . . . -0.5V to 11V
DC Input Diode Current
I_{IK} (for V_I < -0.5 or V_I > V_{DD} 0.5V . . . . . ±20mA
DC Output Diode Current
I_{OK} (For V_O < -0.5 or V_O > V_{DD} 0.5V . . . . . ±20mA
DC Transmission Gate Current . . . . . ±25mA
Power Dissipation per Package (P_D)
For T_A = -40°C to 60°C (Package Type E). 500mW
For T_A = -60°C to 85°C (Package Type E). . . . . Derate Linearly at 12mW/°C to 200mW

Thermal Information

Maximum Junction Temperature . . . . . 175°C
Maximum Junction Temperature (Plastic Package) . . . . . 150°C
Maximum Storage Temperature Range . . . . . -65°C ≤T_A ≤150°C
Maximum Lead Temperature (Soldering 10s) . . . . . 300°C

Operating Conditions

Temperature Range (T_A)
Package Type E . . . . . -40°C to 85°C
Supply Voltage Range (for T_A = Full Package Temp. Range) V_{DD}
CD74HC22106. . . . . 2V to 10V
DC Input or Output Voltage V_I, V_O. . . . . 0V to V_{DD}

CAUTION: Stresses above those listed in "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 above those indicated in the operational sections of this specification is not implied.

Electrical Specifications V_{SS} = GND

PARAMETER	TEST CONDITIONS		25°C			-40°C TO 85°C		UNITS
	V_{IS} (V)	V_{DD} (V)	MIN	TYP	MAX	MIN	MAX	
STATIC SPECIFICATIONS								
High-Level Input Voltage, V_{IH}	-	2	1.5	-	-	1.5	-	V
	-	4.5	3.15	-	-	3.5	-	
	-	9	6.3	-	-	6.3	-	
Low-Level Input Voltage, V_{IL}	-	2	-	-	0.5	-	0.5	V
	-	4.5	-	-	1.35	-	1.35	
	-	9	-	-	2.7	-	2.7	
Input Leakage Current (Any Control), I_L	V_{DD} or GND	10	-	-	±0.1	-	±1	µA
Quiescent Device Current, I_{CC} (with $\overline{MR}$ = 1)	V_{DD} or GND	10	-	-	5	-	50	µA
Off Leakage Current, I_L (with $\overline{MR}$ = 1)	All Switches OFF	10	-	-	0.1	-	1	µA
"On" Resistance, R_{ON}	V_{DD} to GND Figures 7, 8	2	-	470	700	-	875	Ω
		4.5	-	64	95	-	120	
		9	-	45	70	-	90	
	V_{DD}/2	-	-	-	-	-	-	Ω
		4.5	-	58	85	-	110	
		9	-	40	60	-	80	
"On" Resistance Between Any Two Channels ΔR_{ON}	V_{DD} to GND	-	-	-	-	-	-	Ω
		4.5	-	25	-	-	-	
		9	-	23	-	-	-	

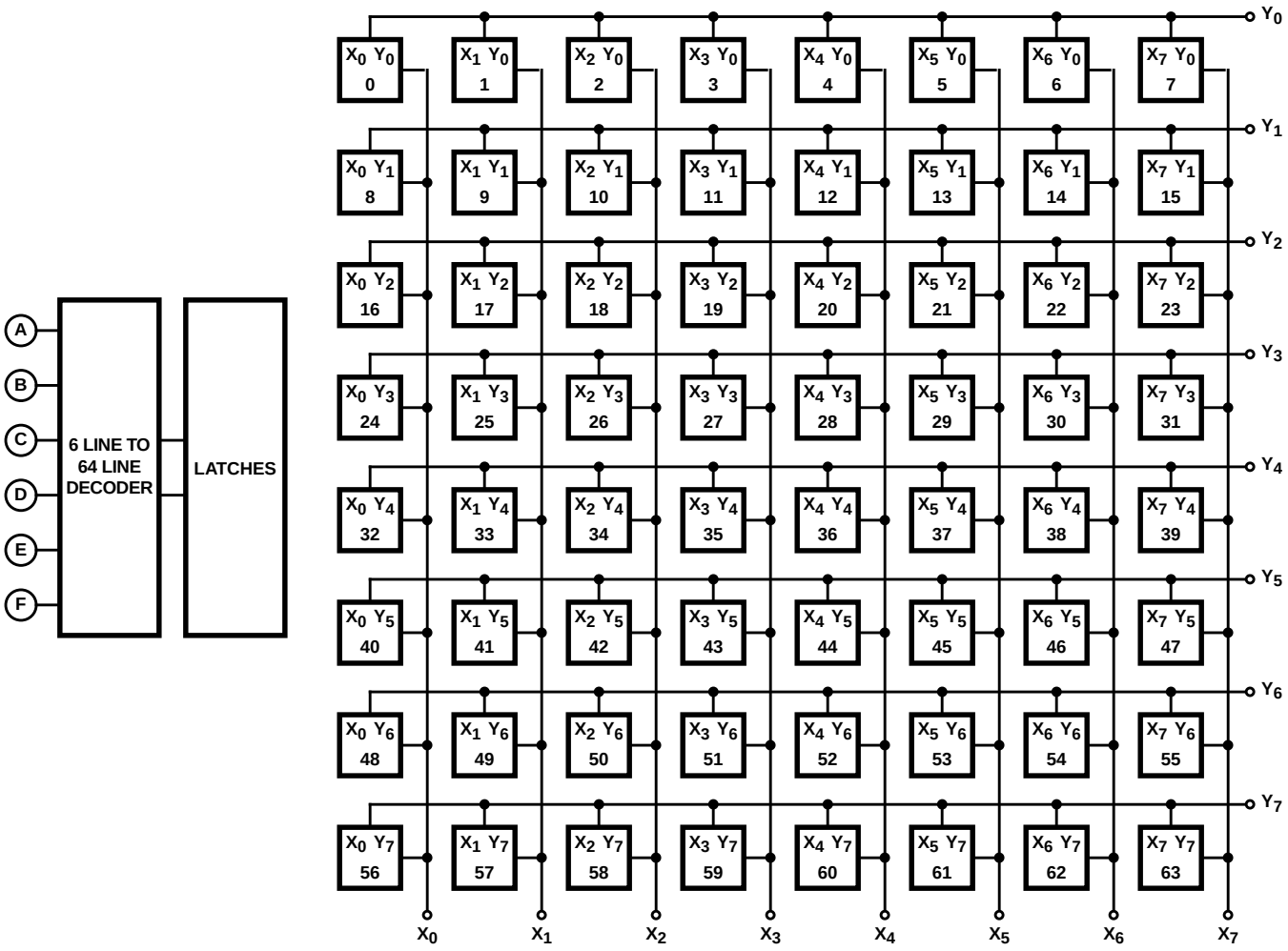
Electrical Specifications V_{SS} = 0V

PARAMETER	SYMBOL	TEST CONDITIONS	FIG.	V_{DD} (V)	25°C MIN	25°C MAX	-40°C TO 85°C MIN	-40°C TO 85°C MAX	UNITS
DYNAMIC CONTROLS									
Propagation Delay Time:	t_{PZH}	R_L = 10kΩ, C_L = 50pF, t_R, t_F = 6ns	1	2	-	370	-	385	ns
Strobe to Output (Switch Turn-On to High Level)				4.5	-	110	-	125	ns
				9	-	65	-	70	ns
Data-In to Output (Turn-On to High Level)	t_{PZH}		2	2	-	240	-	255	ns
				4.5	-	75	-	85	ns
				9	-	50	-	55	ns
Address to Output (Turn-On to High Level)	t_{PZH}		3	2	-	380	-	400	ns
				4.5	-	110	-	125	ns
				9	-	65	-	75	ns
Propagation Delay Time:	t_{PHZ}		1	2	-	400	-	420	ns
Strobe to Output Switch Turn-Off				4.5	-	135	-	155	ns
				9	-	90	-	100	ns
Data-In to Output (Turn-On to Low Level)	t_{PZL}		2	2	-	240	-	255	ns
				4.5	-	75	-	85	ns
				9	-	50	-	55	ns
Address to Output (Turn-Off)	t_{PHZ}		3	2	-	420	-	440	ns
				4.5	-	140	-	155	ns
				9	-	95	-	100	ns
Minimum Setup Time (Data-In to Strobe, Address to Strobe)	t_{SU}		-	2	35	-	40	-	ns
				4.5	20	-	20	-	ns
				9	15	-	15	-	ns
Minimum Hold Time (Data-In to Strobe, Address to Strobe)	t_H		-	2	85	-	90	-	ns
				4.5	25	-	25	-	ns
				9	20	-	20	-	ns
Minimum Strobe Pulse Width	t_W		-	2	200	-	210	-	ns
				4.5	45	-	55	-	ns
				9	25	-	30	-	ns
Maximum Switching Frequency	F_O		-	2	0.7	-	0.6	-	MHz
				4.5	3.0	-	2.8	-	MHz
				9	7	-	6.5	-	MHz
Input (Control) Capacitance	C_I		-	-	-	10	-	10	pF

Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	V_{IS} (V_{P-P})	V_{SS} (V)	V_{DD} (V)	25°C		-40°C TO 85°C		UNITS
						MIN	MAX	MIN	MAX	
DYNAMIC SPECIFICATIONS										
Propagation Delay Time, Signal Input to Output	t_{PLH}, t_{PHL}	R_L = 10kΩ C_L = 50pF t_R, t_F = 6ns	-	0	2	-	30	-	33	ns
			-	0	4.5	-	20	-	22	ns
			-	-	9	-	15	-	17	ns
						Typical				
Switch Frequency Response at -3dB	f_{3dB}	R_S = R_L = 600Ω	2	-2.25	2.25	5		-	-	MHz
			2	-4.5	4.5	6		-	-	MHz
Crosstalk Between Any Two Channels	F_{CT}	R_S = R_L = 600Ω f = 1kHz	2	-2.25	2.25	-110		-	-	dB
		R_S = R_L = 600Ω f = 1MHz	2	-2.25	2.25	-53		-	-	dB
			2	-4.5	4.5	-55		-	-	dB
Switch "OFF" -40dB Feed Through Frequency	F_{DT}	R_S = R_L = 600Ω	2	-2.25	2.25	7		-	-	MHz
			2	-4.5	4.5	8		-	-	MHz
Total Harmonic Distortion	THD	R_L = 10kΩ f = 1kHz sinewave	4	-2.25	2.25	0.05		-	-	%
			8	-4.5	4.5	0.05		-	-	%
		R_L = 600Ω f = 1kHz sinewave	4	-2.25	2.25	0.25		-	-	%
			7	-4.5	4.5	0.12		-	-	%
Control to Switch FeedThrough Noise (DATA IN, Strobe, Address)		R_L = 10kΩ t_R, t_F = 6ns	V_{DD}	0	5	35		-	-	mV
			V_{DD}	0	10	65		-	-	mV
Capacitance,	C_{IS}									
Xn to GND		f = 1MHz	-	0	10	48		-	-	pF
Yn to GND			-	0	10	44		-	-	pF

Functional Diagram



TRUTH TABLE

A_5	A_4	A_3	A_2	A_1	A_0	SWITCH SELECT	A_5	A_4	A_3	A_2	A_1	A_0	SWITCH SELECT
0	0	0	0	0	0	X_0 Y_0	1	0	0	0	0	0	X_0 Y_4
0	0	0	0	0	1	X_1 Y_0	1	0	0	0	0	1	X_1 Y_4
0	0	0	0	1	0	X_2 Y_0	1	0	0	0	1	0	X_2 Y_4
0	0	0	0	1	1	X_3 Y_0	1	0	0	0	1	1	X_3 Y_4
0	0	0	1	0	0	X_4 Y_0	1	0	0	1	0	0	X_4 Y_4
0	0	0	1	0	1	X_5 Y_0	1	0	0	1	0	1	X_5 Y_4
0	0	0	1	1	0	X_6 Y_0	1	0	0	1	1	0	X_6 Y_4
0	0	0	1	1	1	X_7 Y_0	1	0	0	1	1	1	X_7 Y_4
0	0	1	0	0	0	X_0 Y_1	1	0	1	0	0	0	X_0 Y_5
0	0	1	0	0	1	X_1 Y_1	1	0	1	0	0	1	X_1 Y_5
0	0	1	0	1	0	X_2 Y_1	1	0	1	0	1	0	X_2 Y_5
0	0	1	0	1	1	X_3 Y_1	1	0	1	0	1	1	X_3 Y_5
0	0	1	1	0	0	X_4 Y_1	1	0	1	1	0	0	X_4 Y_5
0	0	1	1	0	1	X_5 Y_1	1	0	1	1	0	1	X_5 Y_5
0	0	1	1	1	0	X_6 Y_1	1	0	1	1	1	0	X_6 Y_5
0	0	1	1	1	1	X_7 Y_1	1	0	1	1	1	1	X_7 Y_5
0	1	0	0	0	0	X_0 Y_2	1	1	0	0	0	0	X_0 Y_6
0	1	0	0	0	1	X_1 Y_2	1	1	0	0	0	1	X_1 Y_6
0	1	0	0	1	0	X_2 Y_2	1	1	0	0	1	0	X_2 Y_6
0	1	0	0	1	1	X_3 Y_2	1	1	0	0	1	1	X_3 Y_6
0	1	0	1	0	0	X_4 Y_2	1	1	0	1	0	0	X_4 Y_6
0	1	0	1	0	1	X_5 Y_2	1	1	0	1	0	1	X_5 Y_6
0	1	0	1	1	0	X_6 Y_2	1	1	0	1	1	0	X_6 Y_6
0	1	0	1	1	1	X_7 Y_2	1	1	0	1	1	1	X_7 Y_6
0	1	1	0	0	0	X_0 Y_3	1	1	1	0	0	0	X_0 Y_7
0	1	1	0	0	1	X_1 Y_3	1	1	1	0	0	1	X_1 Y_7
0	1	1	0	1	0	X_2 Y_3	1	1	1	0	1	0	X_2 Y_7
0	1	1	0	1	1	X_3 Y_3	1	1	1	0	1	1	X_3 Y_7
0	1	1	1	0	0	X_4 Y_3	1	1	1	1	0	0	X_4 Y_7
0	1	1	1	0	1	X_5 Y_3	1	1	1	1	0	1	X_5 Y_7
0	1	1	1	1	0	X_6 Y_3	1	1	1	1	1	0	X_6 Y_7
0	1	1	1	1	1	X_7 Y_3	1	1	1	1	1	1	X_7 Y_7

Test Circuits and Waveforms

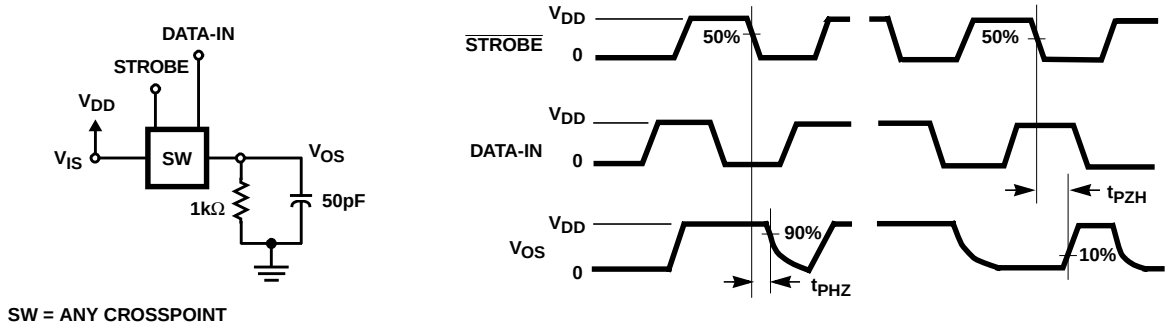


FIGURE 1. PROPAGATION DELAY TIME TEST CIRCUIT AND WAVEFORMS (STROBE TO SIGNAL OUTPUT, SWITCH TURN-ON OR TURN-0FF)

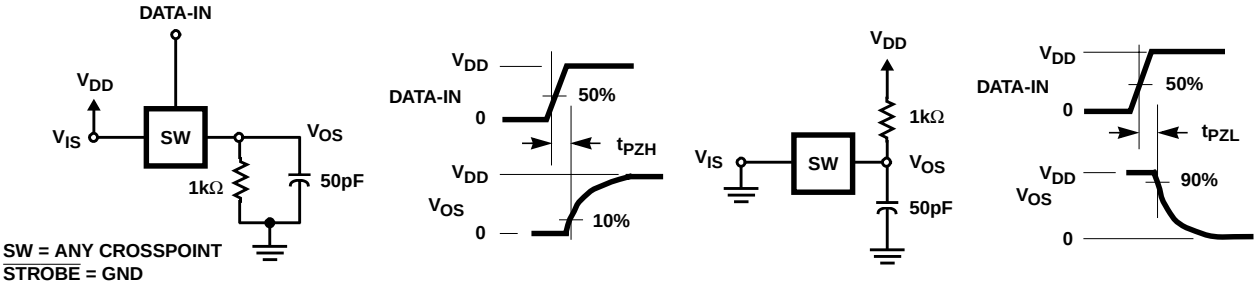


FIGURE 2. PROPAGATION DELAY TIME TEST CIRCUIT AND WAVEFORMS (DATA-IN TO SIGNAL OUTPUT, SWITCH TURN-ON TO HIGH OR LOW LEVEL)

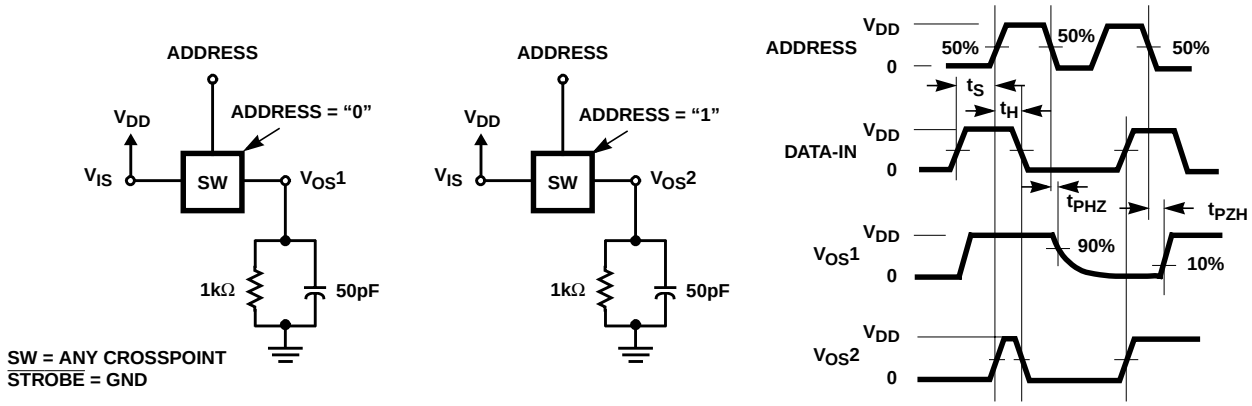


FIGURE 3. PROPAGATION DELAY TIME TEST CIRCUIT AND WAVEFORMS (ADDRESS TO SIGNAL OUTPUT, SWITCH TURN-ON OR TURN-0FF)

Typical Application Information

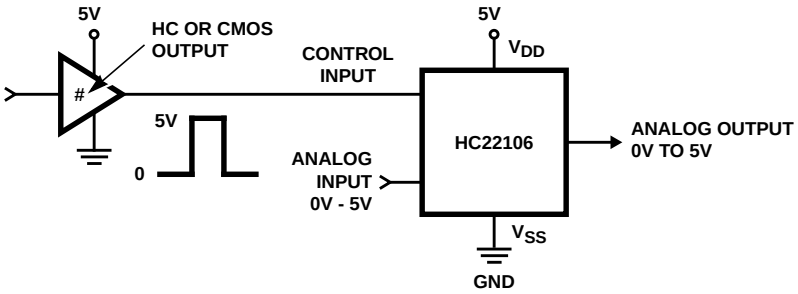


FIGURE 4. TYPICAL SINGLE SUPPLY CONNECTION FOR HC22106

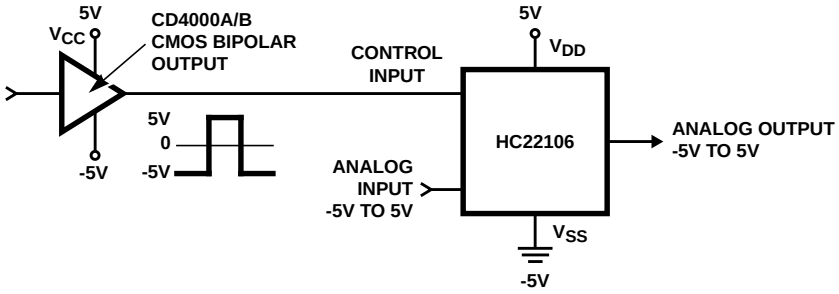


FIGURE 5. TYPICAL DUAL SUPPLY CONNECTION FOR HC22106

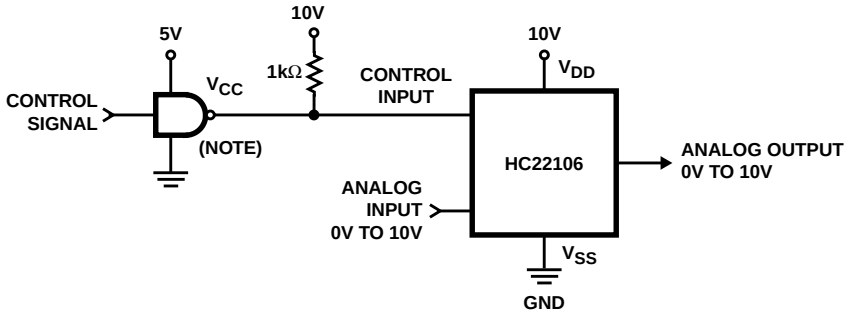


FIGURE 6. USE OF HC22106 WHEN CONTROL IS 0V TO 5V AND ANALOG SIGNAL IS 0V TO 10V

Typical Performance Curves

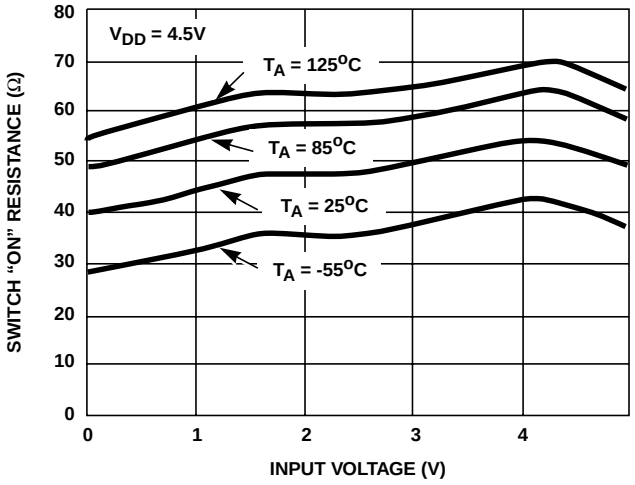


FIGURE 7. TYPICAL "ON" RESISTANCE AS A FUNCTION OF INPUT SIGNAL VOLTAGE vs TEMPERATURE

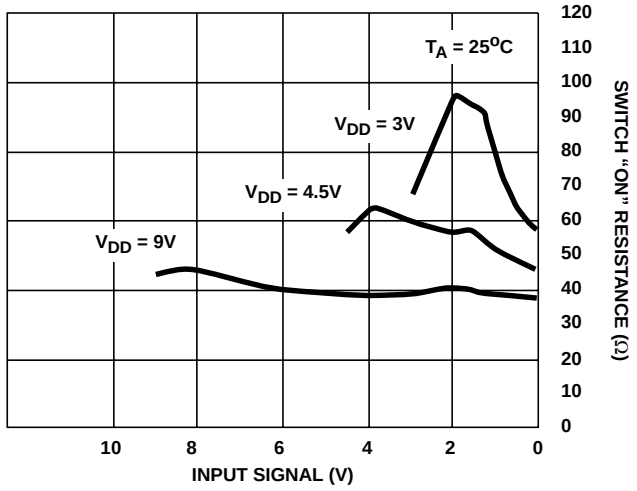


FIGURE 8. TYPICAL "ON" RESISTANCE AS A FUNCTION OF INPUT SIGNAL VOLTAGE vs V_{DD}

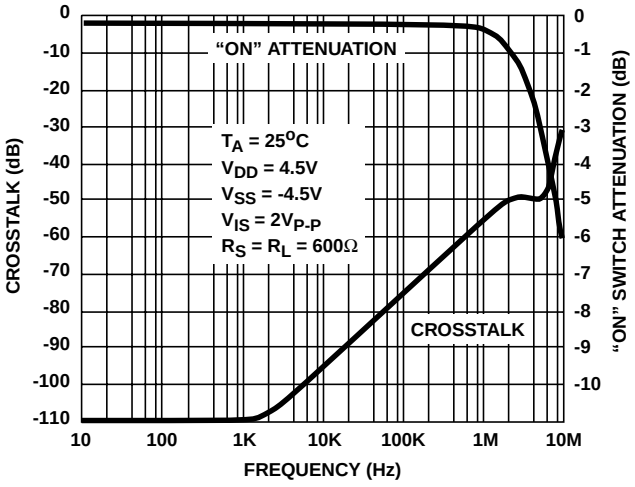


FIGURE 9. TYPICAL "ON" SWITCH ATTENUATION AND CROSSTALK AS A FUNCTION OF FREQUENCY

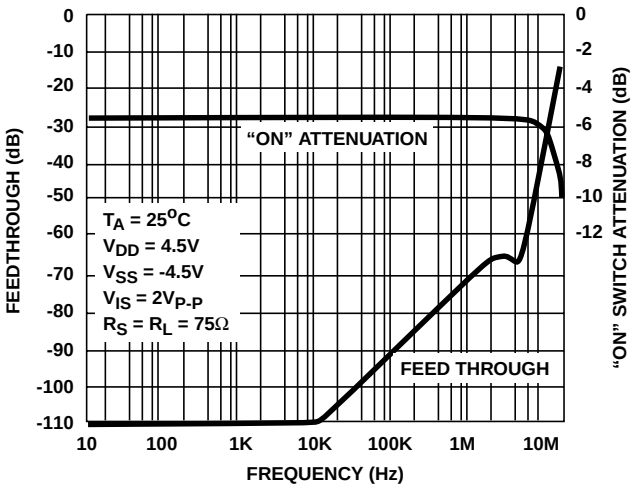


FIGURE 10. TYPICAL "ON" SWITCH ATTENUATION AND "OFF" SWITCH FEED THROUGH AS A FUNCTION OF FREQUENCY

Sales Office Headquarters

NORTH AMERICA
Intersil Corporation
P. O. Box 883, Mail Stop 53-204
Melbourne, FL 32902
TEL: (407) 724-7000
FAX: (407) 724-7240

EUROPE
Intersil SA
Mercure Center
100, Rue de la Fusee
1130 Brussels, Belgium
TEL: (32) 2.724.2111
FAX: (32) 2.724.22.05

ASIA
Intersil (Taiwan) Ltd.
7F-6, No. 101 Fu Hsing North Road
Taipei, Taiwan
Republic of China
TEL: (886) 2 2716 9310
FAX: (886) 2 2715 3029