

# MAXIM

## Dual/Quad RF/Video Switches

### General Description

The IH5341 and the IH5352 are dual and quad, single pole single throw (SPST) switches designed specifically for switching RF and video signals. Maxim's IH5341 and IH5352 incorporate an enhanced series-shunt-series structure, providing 70dB of OFF isolation and cross coupling rejection (an additional 10dB compared with other manufacturers' products).

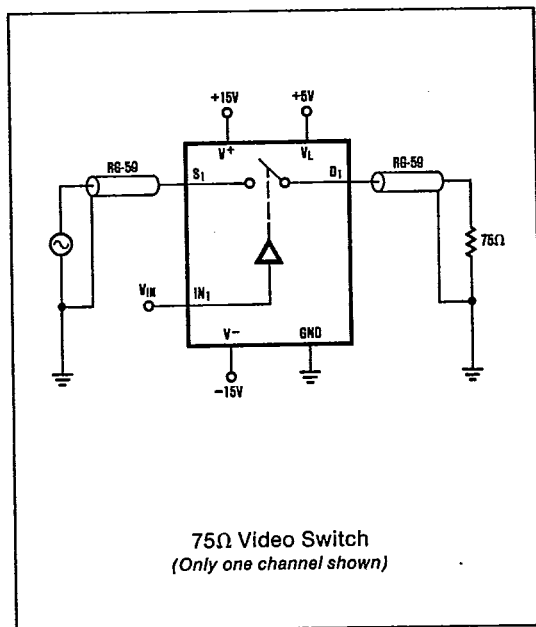
Both devices can be operated with supplies ranging from  $\pm 5V$  to  $\pm 15V$ . The switches typically have a  $t_{ON} = 160ns$  and a  $t_{OFF} = 70ns$ , assuring break-before-make switching. The channel thru resistance of  $50\Omega$  provides excellent matching to video impedances. In the D.C. state, with switches being either on or off, power supply quiescent currents are typically 100nA. This limits the quiescent current drain to 3 $\mu$  watts—ideal for portable equipment.

### Applications

These devices are used in applications requiring the routing, blocking or switching of video or RF signals such as:

- Winchester Disk Drives
- Commercial TV Cameras
- Video Special Effects
- Low Power RF Switching
- Radar Switching
- Mil and Space Communications

### Typical Operating Circuit



### Features

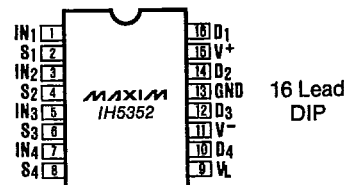
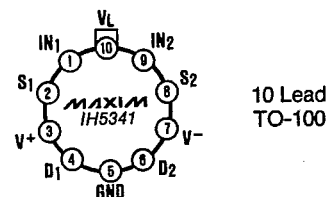
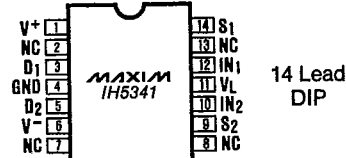
- ♦ "OFF" Isolation  $\geq 70dB$  @ 10MHz
- ♦ Cross Coupling Isolation  $\geq 70dB$  @ 10MHz
- ♦  $r_{ds(on)} < 75\Omega$ ,  $< 3dB$  Loss from DC to 100 MHz
- ♦  $\pm 5V$  to  $\pm 15V$  Operating Supply Range
- ♦ Supply Currents  $< 1\mu A$
- ♦ Fast, Break-Before-Make Switching (70ns/160ns typ.)
- ♦ Monolithic, Low Power CMOS Design

### Ordering Information

PART	TEMP. RANGE	PACKAGE
IH5341CPD	0°C to +70°C	14 Lead Plastic DIP
IH5341IJD	-20°C to +85°C	14 Lead Cerdip
IH5341ITW	-20°C to +85°C	10 Lead TO-100
IH5341MJD	-55°C to +125°C	14 Lead Cerdip
IH5341MTW	-55°C to +125°C	10 Lead TO-100
IH5341C/D	0°C to 70°C	Dice
IH5352CPE	0°C to +70°C	16 Lead Plastic DIP
IH5352IJE	-20°C to +85°C	16 Lead
IH5352MJE	-55°C to +125°C	16 Lead Cerdip
IH5352C/D	0°C to 70°C	Dice

### Pin Configuration

#### Top View



**Dual/Quad RF/Video Switches****ABSOLUTE MAXIMUM RATINGS**

Supply Voltages  $V^+$  and  $V^-$  .....  $\pm 17V$   
 Current in any Terminal ..... 50mA  
 Analog Input Voltage .....  $V^+$  to  $V^-$   
 Operating Temperature Range  
 (M Version)  $-55^\circ C$  to  $+125^\circ C$   
 (I Version)  $-20^\circ C$  to  $+85^\circ C$   
 (C Version)  $0^\circ C$  to  $+70^\circ C$

Power Dissipation ..... 250mW  
 (Derate 7.5mW/ $^\circ C$  above  $25^\circ C$ )  
 Storage Temperature Range .....  $-65^\circ C$  to  $+160^\circ C$   
 Logic Control Voltage .....  $V^+$  to  $V^-$   
 Voltage on  $V_L$  Pin .....  $V^+$  to  $V^-$   
 Lead Temperature (Soldering, 10 sec.) .....  $+300^\circ C$

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**ELECTRICAL CHARACTERISTICS**

( $V^+ = +15V$ ,  $V_L = +5V$ ,  $V^- = -15V$ ,  $T_A = 25^\circ C$  unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	TYP (Note 1)	M GRADE DEVICE			I/C GRADE DEVICE			UNITS
				$-55^\circ C$	$+25^\circ C$	$+125^\circ C$	$-20/0^\circ C$	$+25^\circ C$	$+85/+70^\circ C$	
Supply Voltage Ranges										
Positive Supply	$V^+$	(Note 3)	$4.5 > 16$		5 to 15			5 to 15		V
Logic Supply	$V_L$		$4.5 > V^+$		5 to $V^+$			5 to $V^+$		
Negative Supply	$V^-$		$-4 > -16$		-5 to -15			-5 to -15		
Switch "ON" Resistance	$r_{ds(ON)}$	$V_D = -5V$ to $+5V$		75	75	100	75	75	100	$\Omega$
(Note 4)		$I_S = 10$ mA, $V_{IN} = 2.4V$								
		$V_D = -15V$ to $+15V$		125	125	175	150	150	175	
Switch "ON" Resistance	$r_{ds(ON)}$	$V^+ = V_L = 5V$ , $V_{IN} = 3V$		250	250	350	300	300	350	$\Omega$
(Note 4)		$V^- = -5V$ , $V_D = \pm 5V$								
On Resistance Match		$I_S = 10$ mA, $V_D = \pm 5V$	5							
Switch "OFF" Leakage	$I_{D(OFF)}$ or $I_{S(OFF)}$	$V_{S/D} = +5V$ to $-5V$		0.1	0.1	20	0.5	0.5	20	nA
(Notes 2 and 4)		$V_{IN} = 0.8V$								
		$V_{S/D} = +14V$ to $-14V$		0.2	0.2	50	1.0	1.0	100	
Switch "ON" Leakage	$I_{D(ON)}$ + $I_{S(ON)}$	$V_D = +5V$ or $-5V$		0.3	0.3	50	1.0	1.0	40	$\mu A$
		$V_{IN} = 2.4V$								
		$V_D = +14V$ to $-14V$		0.5	0.5	100	1.0	5.0	100	
Input Logic Current	$I_{IN}$	$V_{IN} > 2.4V$ or $< 0$	0.001	1	1	10	1	1	10	$\mu A$
Positive Supply Quiescent Current	$I^+$	$V_{IN} = 0V$ or $+5V$ (Note 5)	0.01	1	1	10	1	1	10	
Negative Supply Quiescent Current	$I^-$	$V_{IN} = 0V$ or $+5V$ (Note 5)	0.01	1	1	10	1	1	10	
Logic Supply Quiescent Current	$I_L$	$V_{IN} = 0V$ or $+5V$ (Note 5)	0.01	1	1	10	1	1	10	

**AC ELECTRICAL CHARACTERISTICS**

( $V^+ = +15V$ ,  $V_L = +5V$ ,  $V^- = 0V$ ,  $T_A = +25^\circ C$ )

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Switch "ON" Time	$t_{ON}$	See Figure 1		160	300	ns
Switch "OFF" Time	$t_{OFF}$	See Figure 1		70	150	
"OFF" Isolation Rejection Ratio	OIRR	See Figure 2 (Note 6)	70	80		dB
Cross Coupling Rejection Ratio	CCRR	Figure 3 IH5341 (Note 6) IH5352	70 66	80 72		
Frequency where $r_{ds(ON)} = 0.7 \times DC$		(Note 6)	100			MHz

**Note 1:** Typical values are not tested in production. They are given as a design aid only.

**Note 2:** Positive and negative voltages applied to opposite sides of switch, in both directions successively.

**Note 3:** These are the operating voltages at which the other parameters are tested, and are not directly tested.

**Note 4:** The logic inputs are either greater than or equal to 2.4V or less than or equal to 0.8V, as required, for this test.

**Note 5:** Maximum values shown are for the dual (IH5341). They are doubled for the quad (IH5352).

**Note 6:** All AC parameters are sample tested only. Test circuits should be built on copper clad ground plane board, with correctly terminated coax leads, etc.

# Dual/Quad RF/Video Switches

## Test Circuits

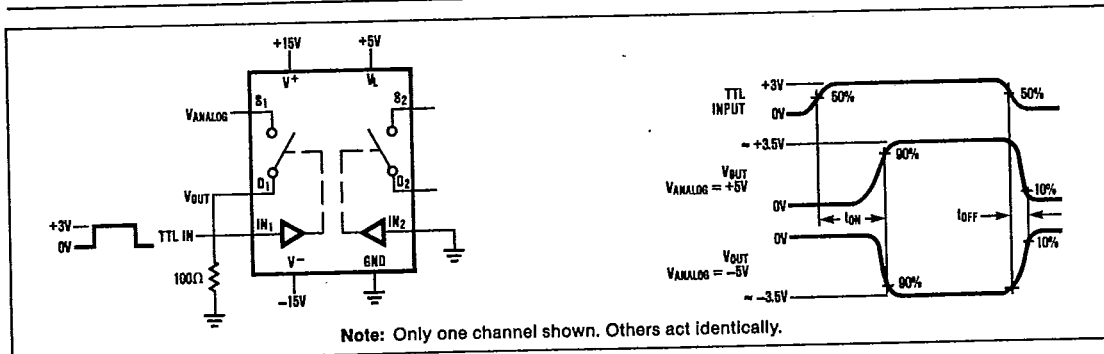


Figure 1. Switching Time Test Circuit and Waveforms

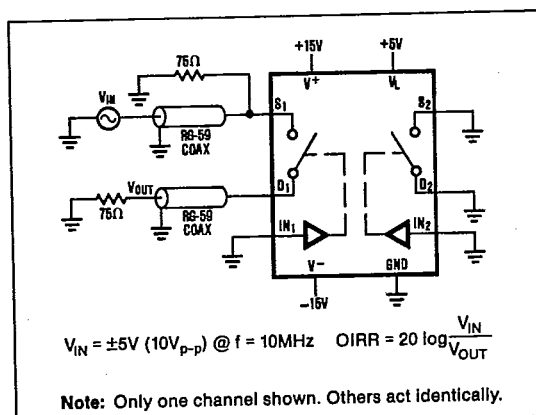


Figure 2. OFF Isolation Test Circuit

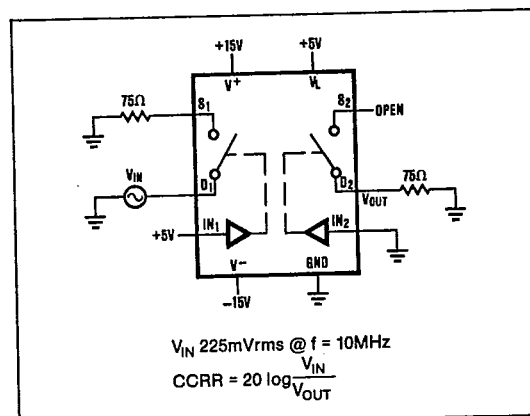
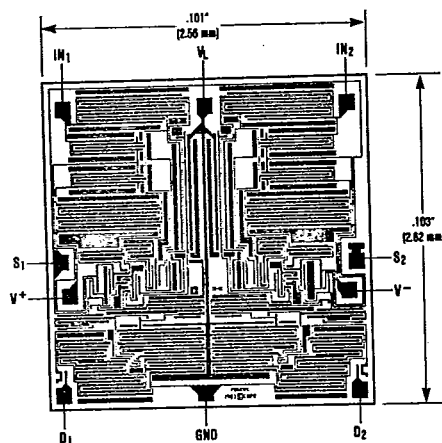
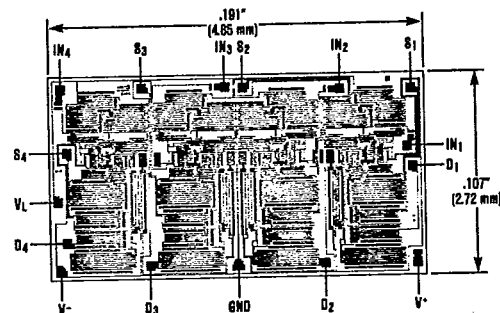


Figure 3. Cross-Coupling Rejection Test Circuit

## Chip Topography



IH5341 (Dual SPST)



IH5352 (Quad SPST)

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IH5341/IH5352