



# CMOS/DMOS Quad Monolithic SPST Wide Band Analog Switches

## CWB308 / CWB309

### FEATURES

- Low Insertion Loss ..... 0.9 x DC @ 100MHz
- Low Channel-to-Channel Crosstalk..... -80dB
- High OFF Isolation ..... 68dB @ 10MHz
- Fast Switching ..... <140ns
- Low ON Resistance..... 40Ω (typ)

### APPLICATIONS

- High Speed Multiplexing
- RF & Video Switches
- Sample and Hold Switches
- Track and Hold Switches
- Computer Peripherals

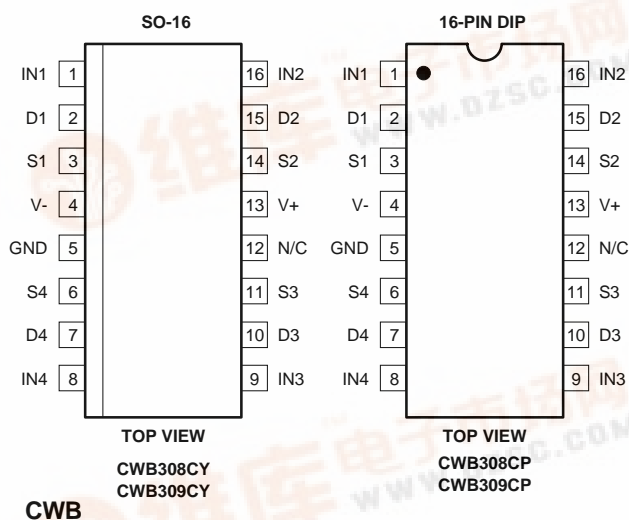
### DESCRIPTION

The Calogic CWB308 and CWB309 feature fast switching (<140ns) and low ON resistance (<40Ω) for excellent performance in applications in communications, computer peripherals and instrument controls. This series combines low power CMOS input logic and level translation circuitry with high speed, low capacitance DMOS switches in a monolithic structure. The CWB308 and CWB309 have CMOS compatible inputs and also have a standard pin configuration for second sourcing.

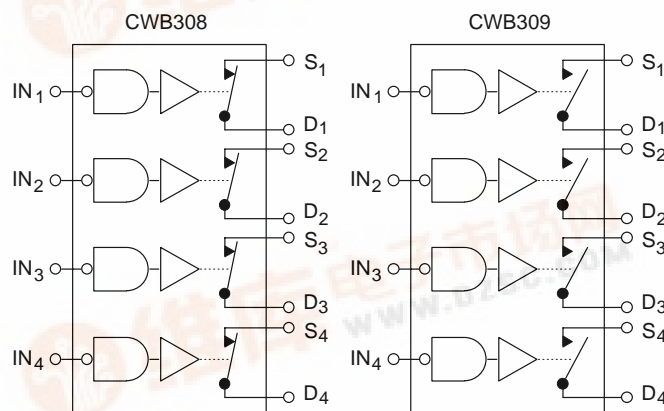
### ORDERING INFORMATION

Part	Package	Temperature Range
CWB308CP	Plastic 16-Pin Dip	0 to +85°C
CWB308CY	Plastic SO-16 Surface Mount	0 to +85°C
XCWB308	Sorted Chips in Carriers	0 to +85°C
CWB309CP	Plastic 16-Pin Dip	0 to +85°C
CWB309CY	Plastic SO-16 Surface Mount	0 to +85°C
XCWB309	Sorted Chips in Carriers	0 to +85°C

### PIN CONFIGURATION



### FUNCTIONAL BLOCK DIAGRAMS



Four SPST Switches per Package.  
Switches shown in Logic '1' Input Position.

### LOGIC TABLE

Logic	CWB308	CWB309
0	OFF	ON
1	ON	OFF

All devices contain diodes to protect inputs against damage due to high static voltages or electric fields; however, it is advised that precautions be taken not to exceed the maximum recommended input voltages. All unused inputs must be connected to an appropriate logic level (either V<sub>cc</sub> or GND).



**ABSOLUTE MAXIMUM RATINGS**

V <sub>-</sub>	Negative Supply Voltage	-20V
V <sub>+</sub>	Positive Supply Voltage	+20V
V <sub>IN</sub>	Control Input Voltage Range	V <sub>+</sub> +0.3V V <sub>-</sub> -0.3V
I <sub>L</sub>	Continuous Current, any Pin except S or D	20mA
I <sub>S</sub>	Continuous Current, S or D	30mA
I <sub>S</sub>	Peak Pulsed Current, S or D, 80μsec, 1%, Duty Cycle	180mA
T <sub>J</sub>	Junction Temperature Range	-55 to +125°C
T <sub>S</sub>	Storage Temperature Range	-55 to +125°C
P <sub>D</sub>	Power Dissipation	500mW

**RECOMMENDED OPERATING CONDITIONS**

V <sub>-</sub>	Negative Supply Voltage	-8.0 to -15V
V <sub>+</sub>	Positive Supply Voltage	+8.0 to +15V
V <sub>IN</sub>	Control Input Voltage Range	0 to +5V
V <sub>S</sub>	Analog Switch Voltage Range	-10 to +10V
T <sub>OP</sub>	Operating Temperature	0 to +85°C

**ELECTRICAL CHARACTERISTICS** (V<sub>-</sub> = -15V, V<sub>+</sub> = +15V unless otherwise noted, T<sub>A</sub> = +25°C)

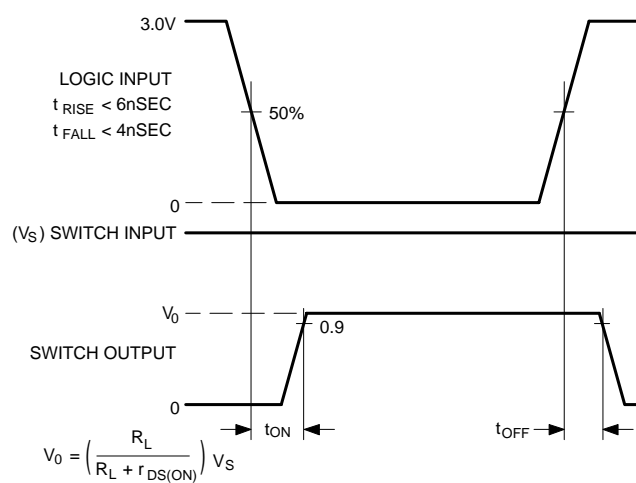
SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS		
STATIC								
V <sub>ANALOG</sub>	Analog Signal Range	-10		+10	V			
r <sub>DS(ON)</sub>	Switch ON Resistance		40	80	ohms	V <sub>S</sub> = -10V		
			45	80		V <sub>S</sub> = +2.0V		
			100	160		V <sub>S</sub> = +10V		
V <sub>IH</sub>	High Level Input Voltage	4.5	3.4		V			
V <sub>IL</sub>	Low Level Input Voltage			1.0				
I <sub>IN</sub>	Logic Input Leakage Current		0.01	0.1	μA	V <sub>IN</sub> = +5.0V		
			0.02	0.1		V <sub>IN</sub> = +15V		
I <sub>D(OFF)</sub>	Switch OFF Leakage Current		0.2	5.0	nA	V <sub>D</sub> = +10V, V <sub>S</sub> = -10V	CWB309 V <sub>IN</sub> = 5.0V CWB308 V <sub>IN</sub> = 1.0V	
I <sub>S(OFF)</sub>			0.4	5.0		V <sub>S</sub> = +10V, V <sub>D</sub> = -10V		
I <sub>-</sub>	Negative Supply Quiescent Current		-0.1	-0.5	μA			
I <sub>+</sub>	Positive Supply Quiescent Current		0.1	0.5				
DYNAMIC								
t <sub>ON</sub>	Switch Turn-ON Time		140	250	nSec	V <sub>IN</sub> = 1.0V CWB308 V <sub>IN</sub> = 5.0V CWB309		
t <sub>OFF</sub>	Switch Turn-OFF Time		80	220				
O <sub>IRR</sub>	Off Isolation Rejection Ratio	60	62		dB	f = 10MHz, R <sub>L</sub> = 50Ω		
C <sub>CRR</sub>	Cross-Coupling Rejection Ratio		80			f = 10MHz, R <sub>L</sub> = 50Ω		
C <sub>d</sub>	Drain-Node Capacitance		0.3		pF	V <sub>IN</sub> = 1.0V CGWB308 V <sub>IN</sub> = 5.0V CWB309		
C <sub>s</sub>	Source-Node Capacitance		3.0			V <sub>D</sub> = V <sub>S</sub> = 0, f = 1MHz		

**ELECTRICAL CHARACTERISTICS** ( $V_- = -15V$ ,  $V_+ = +15V$  unless otherwise noted)

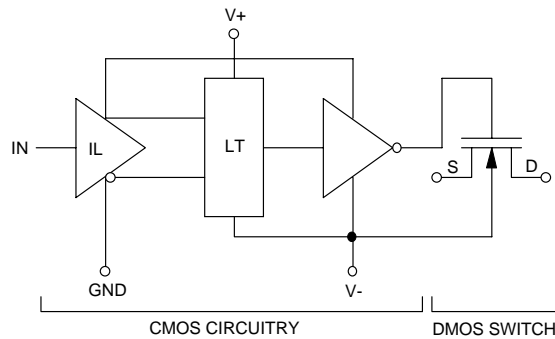
**LIMITS AT TEMPERATURE EXTREMES**

SYMBOL	PARAMETER	MAXIMUM @ T <sub>A</sub> =	UNITS	TEST CONDITIONS
		+85°C		
STATIC				
V <sub>ANALOG</sub>	Analog Signal Range	±10	V	
r <sub>DS(ON)</sub>	Switch ON Resistance	120	ohms	V <sub>S</sub> = -10V
		120		V <sub>S</sub> = +2.0V
		240		V <sub>S</sub> = +10V
I <sub>IN</sub>	Logic Input Leakage Current	1.0	μA	V <sub>IN</sub> = +5.0V
		2.0		V <sub>IN</sub> = +15V
I <sub>D(OFF)</sub>	Switch OFF Leakage Current	100	nA	V <sub>D</sub> = +10V, V <sub>S</sub> = -10V
I <sub>S(OFF)</sub>		100		V <sub>S</sub> = +10V, V <sub>D</sub> = -10V
I <sub>-</sub>	Supply Quiescent Current	-20	μA	
I <sub>+</sub>		20		

**TEST WAVE FORMS**



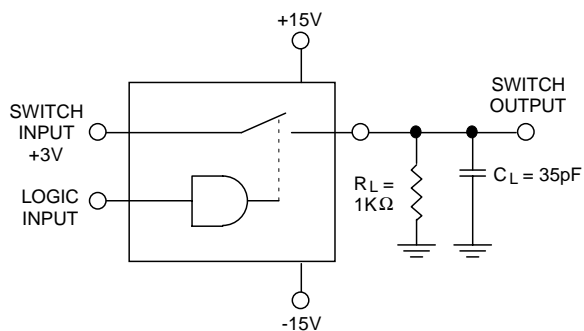
## FUNCTIONAL BLOCK DIAGRAMS (1 of 4 channels)



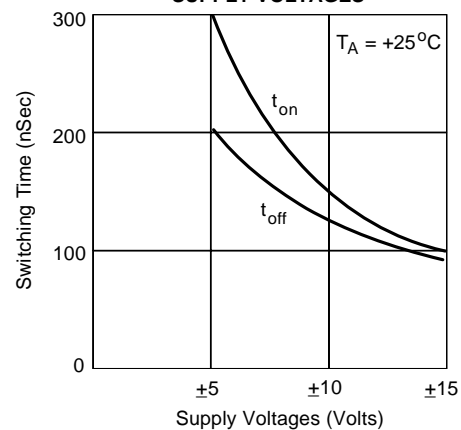
**Switch Contacts:**

Switches are bi-directional (Analog Input can be to Source or Drain. However, for optimum performance in Video Application, connect Input to Source and Output to Drain.

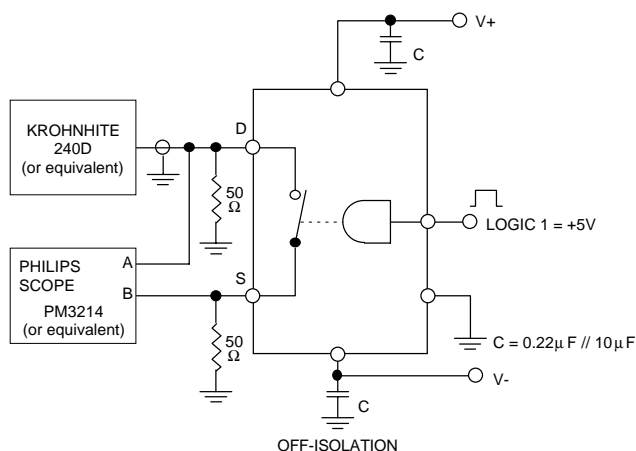
## SWITCHING TIMES TEST CIRCUIT



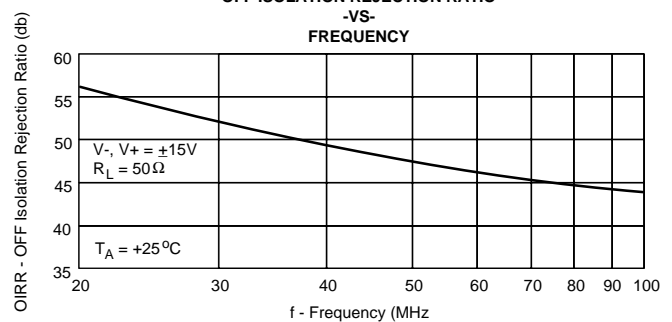
## SWITCHING TIMES -VS- SUPPLY VOLTAGES



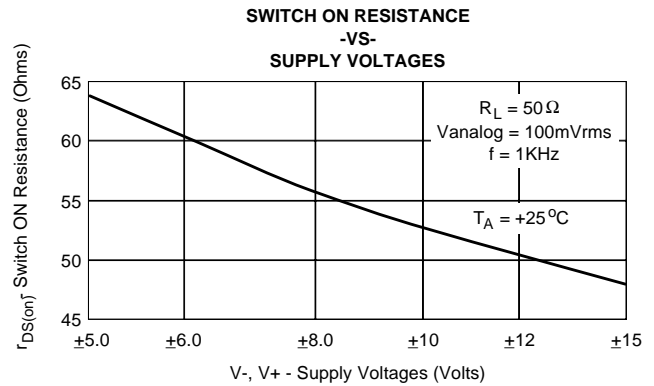
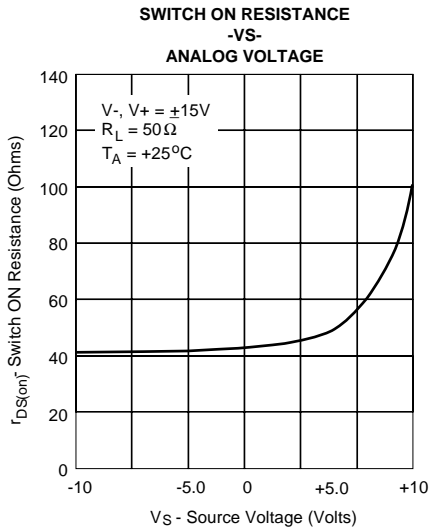
## OFF ISOLATION TEST CIRCUIT



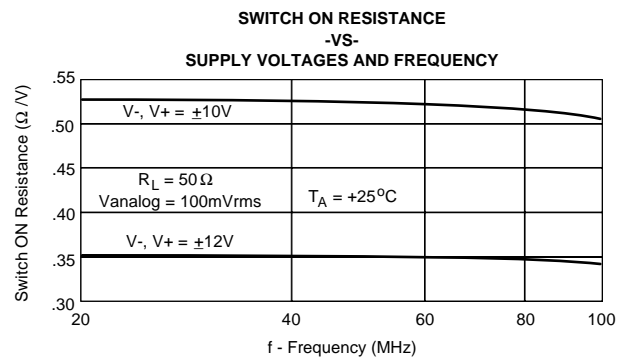
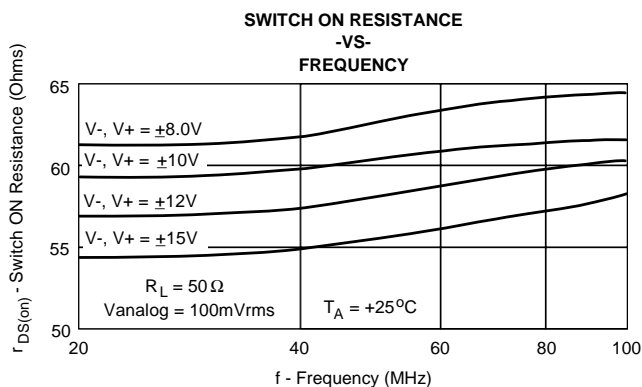
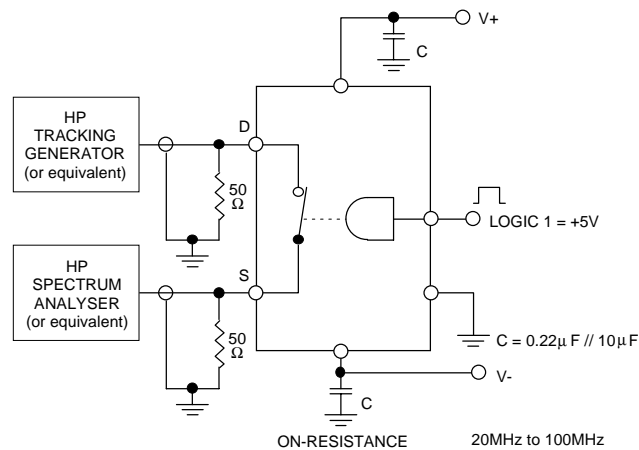
### OFF ISOLATION REJECTION RATIO -VS- FREQUENCY

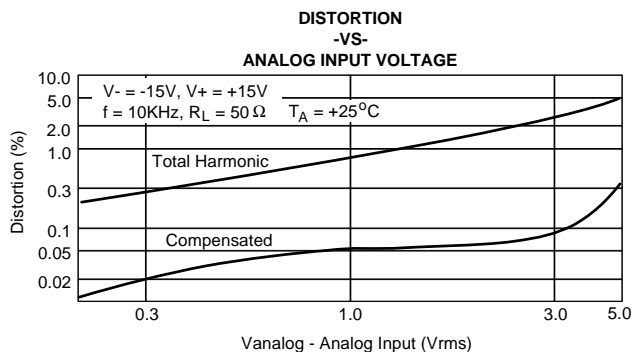
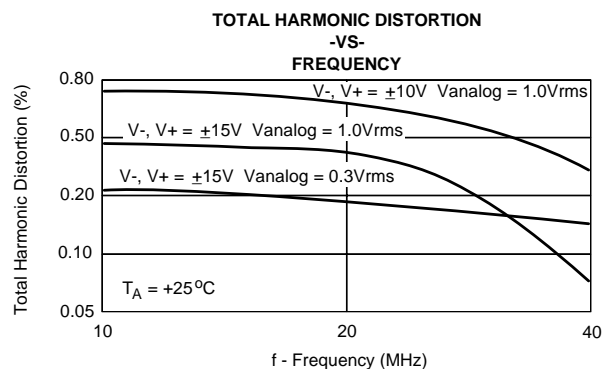
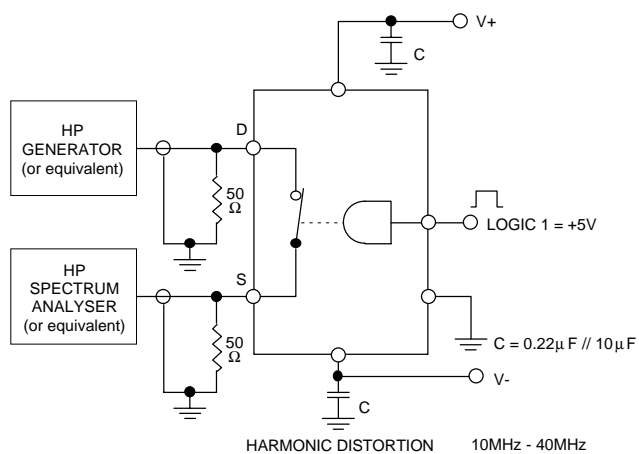
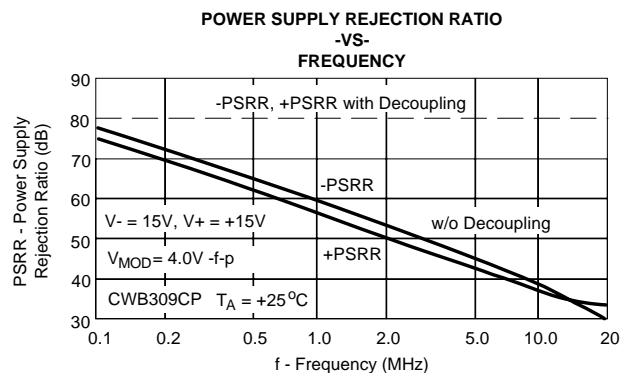
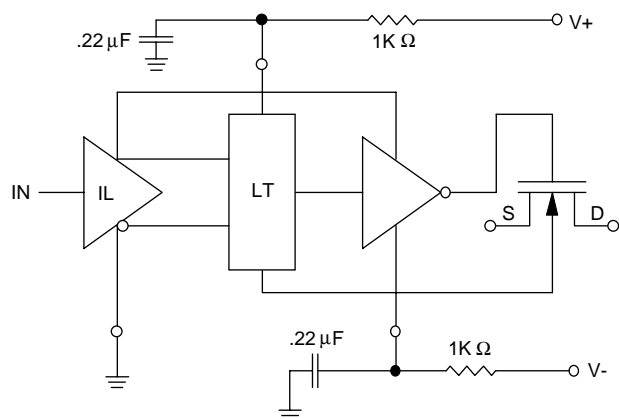


## SWITCH ON RESISTANCE



## SWITCH ON RESISTANCE -VS- FREQUENCY TEST CIRCUIT



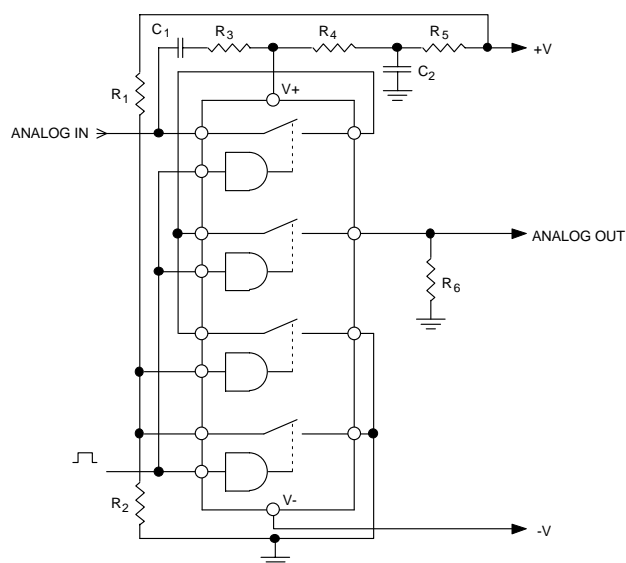
**DISTORTION -VS- FREQUENCY**

**POWER SUPPLY REJECTION RATIO POWER SUPPLY DECOUPLING CIRCUIT**


By inserting 1K ohm resistors in series with V+ and V- power supply lines and decoupling both pins at the device socket, it is possible to improve power supply rejection ratios of a video switch by 50dB at frequencies of 20MHz and higher.

## APPLICATIONS

### LOW DISTORTION, RAIL-TO-RAIL ANALOG SWITCH

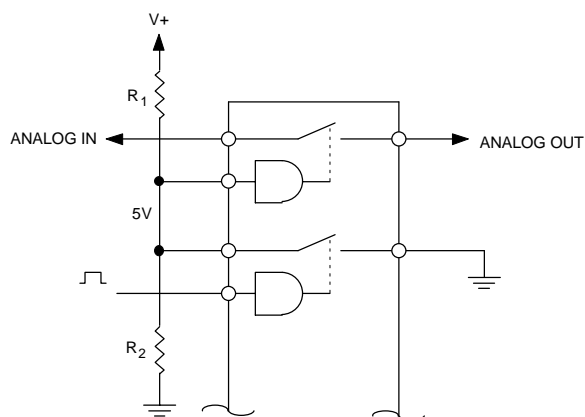
Features very low distortion for low frequency and large signal applications.



### VERY LOW DISTORTION CIRCUIT FOR LOW FREQUENCY AND LARGE SIGNAL APPLICATIONS

This circuit provides very low distortion ( $<0.1\%$ ) and high off isolation ( $>90$  dB) at signal levels equal to the supply voltage. The signal passes through a T switch configuration and at the same time is modulating the power supply. This modulation maintains a constant on resistance  $r_{DS(on)}$  which in turn reduces the distortion.  $R_5$  is for bypassing the power supply and has a typical value of 1K ohm,  $R_4$  should be a value that can be accommodated by the signal source as load,  $R_3$  is only necessary at loads lower than 100 ohms and should be selected during the initial design of the circuit,  $C_1$  has to be large enough for the lowest signal to pass and  $C_2$  will have to bypass all signals.  $R_1$  and  $R_2$  set up the one logic level for the control input and should be set to 5 volts.

### LOGIC INVERTER



This circuit provides logic inversion with two resistors and one switch. It does not require additional logic parts. The resistors divide the supply voltage down to a 5 volt level when high and are switched to a low level via the switch. This configuration allows a single pole, single throw switch to be changed into a single pole, double throw switch.