



LC4966

Quad Bilateral Switch

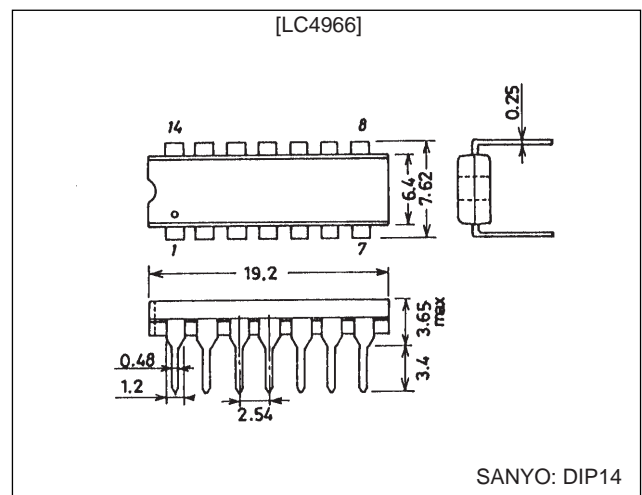
Overview

The LC4966 is an IC that provides the same functions as the MLC4066B and the MLC4066BH over an expanded usable voltage range. The LC4966 provides four bidirectional switch circuits. These circuits form a low-impedance conducting path between the input and output sides when the corresponding control input (CONT) is set high, and form a high-impedance nonconducting open circuit when the control input is set low.

Package Dimensions

unit: mm

3003A-DIP14



Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$, $V_{SS} = 0\text{ V}$

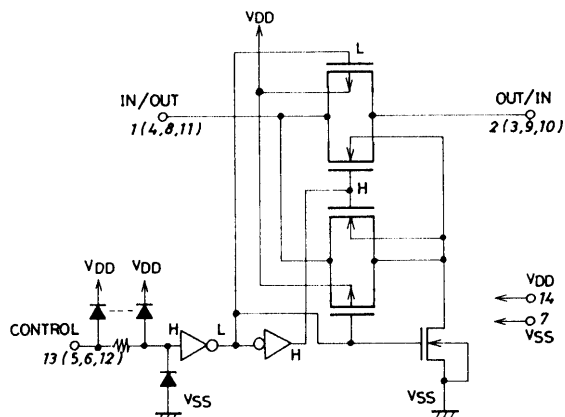
Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{DD\text{ max}}$		$V_{SS} - 0.5$ to $V_{SS} + 40$	V
Input voltage	V_{IN}		$V_{SS} - 0.5$ to $V_{DD} + 0.5$	V
Output voltage	V_{OUT}		$V_{SS} - 0.5$ to $V_{DD} + 0.5$	V
Input current	I_{IN}		± 10	mA
Potential difference between input and output when on	$V_I - V_O$		± 0.5	V
Lead soldering temperature time	T_{sol}	$t = 10\text{ s}$	260	$^\circ\text{C}$
Allowable power dissipation	$Pd\text{ max}$	$T_a \leq 85^\circ\text{C}$, $I_{IN} = \pm 10\text{ mA}$	300	mW
Operating temperature	T_{opr}		-40 to +85	$^\circ\text{C}$
Storage temperature	T_{stg}		-65 to +150	$^\circ\text{C}$

Allowable Operating Ranges at $T_a = -40$ to $+85^\circ\text{C}$

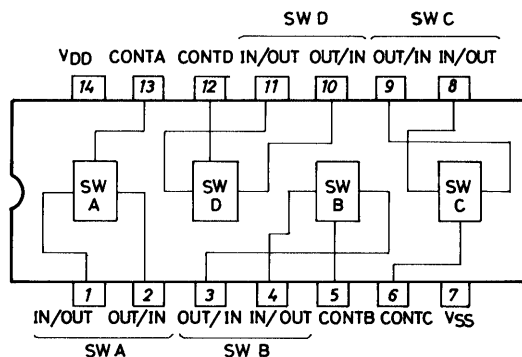
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{DD}		3 to 37	V
Input voltage	V_{IN}		0 to V_{DD}	V

Equivalent Circuit

(1/4 LC4966)



Pin Assignment and Equivalent Circuit Block Diagram



Electrical Characteristics at $T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = 0\text{ V}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Input high-level control voltage	V_{IH}	$V_{DD} = 5\text{ V}$, for a current between input and output $> 10\ \mu\text{A}$	3.5			V
		$V_{DD} = 10\text{ V}$, for a current between input and output $> 10\ \mu\text{A}$	8.0			V
		$V_{DD} = 15\text{ V}$, for a current between input and output $> 10\ \mu\text{A}$	12.5			V
		$V_{DD} = 20\text{ V}$, for a current between input and output $> 10\ \mu\text{A}$	17.0			V
		$V_{DD} = 30\text{ V}$, for a current between input and output $> 10\ \mu\text{A}$	27.0			V
		$V_{DD} = 37\text{ V}$, for a current between input and output $> 10\ \mu\text{A}$	34.0			V
Input low-level control voltage	V_{IL}	$V_{DD} = 5\text{ V}$, for a current between input and output $< 10\ \mu\text{A}$			1.0	V
		$V_{DD} = 10\text{ V}$, for a current between input and output $< 10\ \mu\text{A}$			2.0	V
		$V_{DD} = 15\text{ V}$, for a current between input and output $< 10\ \mu\text{A}$			2.5	V
		$V_{DD} = 20\text{ V}$, for a current between input and output $< 10\ \mu\text{A}$			2.5	V
		$V_{DD} = 30\text{ V}$, for a current between input and output $< 10\ \mu\text{A}$			3.0	V
		$V_{DD} = 37\text{ V}$, for a current between input and output $< 10\ \mu\text{A}$			3.0	V

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LC4966

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Parameter	Symbol	Conditions	min	typ	max	Unit		
On resistance	R_{ON}	$V_{DD} = 5\text{ V}, V_{IN} = 5\text{ V}, I = \pm 1\text{ mA}$		110	220	Ω		
		$V_{DD} = 5\text{ V}, V_{IN} = 2.5\text{ V}, I = \pm 1\text{ mA}$		90	180	Ω		
		$V_{DD} = 5\text{ V}, V_{IN} = 0.25\text{ V}, I = \pm 1\text{ mA}$		110	220	Ω		
				$V_{DD} = 10\text{ V}, V_{IN} = 10\text{ V}, I = \pm 3\text{ mA}$		70	140	Ω
				$V_{DD} = 10\text{ V}, V_{IN} = 5\text{ V}, I = \pm 3\text{ mA}$		50	100	Ω
				$V_{DD} = 10\text{ V}, V_{IN} = 0.25\text{ V}, I = \pm 3\text{ mA}$		70	140	Ω
				$V_{DD} = 15\text{ V}, V_{IN} = 15\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = 15\text{ V}, V_{IN} = 7.5\text{ V}, I = \pm 3\text{ mA}$		40	80	Ω
				$V_{DD} = 15\text{ V}, V_{IN} = 0.25\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = 20\text{ V}, V_{IN} = 20\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = 20\text{ V}, V_{IN} = 10\text{ V}, I = \pm 3\text{ mA}$		40	80	Ω
				$V_{DD} = 20\text{ V}, V_{IN} = 0.25\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = 30\text{ V}, V_{IN} = 30\text{ V}, I = \pm 3\text{ mA}$		50	100	Ω
				$V_{DD} = 30\text{ V}, V_{IN} = 15\text{ V}, I = \pm 3\text{ mA}$		35	70	Ω
				$V_{DD} = 30\text{ V}, V_{IN} = 0.25\text{ V}, I = \pm 3\text{ mA}$		50	100	Ω
				$V_{DD} = 37\text{ V}, V_{IN} = 37\text{ V}, I = \pm 3\text{ mA}$		45	90	Ω
				$V_{DD} = 37\text{ V}, V_{IN} = 19\text{ V}, I = \pm 3\text{ mA}$		30	60	Ω
				$V_{DD} = 37\text{ V}, V_{IN} = 0.25\text{ V}, I = \pm 3\text{ mA}$		45	90	Ω
				$V_{DD} = +5\text{ V}, V_{IN} = -5\text{ V}, V_{IN} = 5\text{ V}, I = \pm 3\text{ mA}$		70	140	Ω
				$V_{DD} = +5\text{ V}, V_{SS} = -5\text{ V}, V_{IN} = \pm 0.25\text{ V}, I = \pm 3\text{ mA}$		50	100	Ω
				$V_{DD} = +5\text{ V}, V_{SS} = -5\text{ V}, V_{IN} = -5\text{ V}, I = \pm 3\text{ mA}$		70	140	Ω
				$V_{DD} = +7.5\text{ V}, V_{SS} = -7.5\text{ V}, V_{IN} = 5\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = +7.5\text{ V}, V_{SS} = -7.5\text{ V}, V_{IN} = \pm 0.25\text{ V}, I = \pm 3\text{ mA}$		40	80	Ω
				$V_{DD} = +7.5\text{ V}, V_{SS} = -7.5\text{ V}, V_{IN} = -5\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = +10\text{ V}, V_{SS} = -10\text{ V}, V_{IN} = 10\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = +10\text{ V}, V_{SS} = -10\text{ V}, V_{IN} = \pm 0.25\text{ V}, I = \pm 3\text{ mA}$		40	80	Ω
				$V_{DD} = +10\text{ V}, V_{SS} = -10\text{ V}, V_{IN} = -10\text{ V}, I = \pm 3\text{ mA}$		60	120	Ω
				$V_{DD} = +15\text{ V}, V_{SS} = -15\text{ V}, V_{IN} = 15\text{ V}, I = \pm 3\text{ mA}$		50	100	Ω
				$V_{DD} = +15\text{ V}, V_{SS} = -15\text{ V}, V_{IN} = \pm 0.25\text{ V}, I = \pm 3\text{ mA}$		35	70	Ω
				$V_{DD} = +15\text{ V}, V_{SS} = -15\text{ V}, V_{IN} = -15\text{ V}, I = \pm 3\text{ mA}$		50	100	Ω
				$V_{DD} = +18.5\text{ V}, V_{SS} = -18.5\text{ V}, V_{IN} = 18.5\text{ V}, I = \pm 3\text{ mA}$		45	90	Ω
				$V_{DD} = +18.5\text{ V}, V_{SS} = -18.5\text{ V}, V_{IN} = \pm 0.25\text{ V}, I = \pm 3\text{ mA}$		30	60	Ω
				$V_{DD} = +18.5\text{ V}, V_{SS} = -18.5\text{ V}, V_{IN} = -18.5\text{ V}, I = \pm 3\text{ mA}$		45	90	Ω
Input off leakage current	I_{OFF}	$V_{DD} = 37\text{ V}, V_{IN} = 37\text{ V}, V_{OUT} = 0\text{ V}$		± 1	± 500	nA		
		$V_{DD} = 37\text{ V}, V_{IN} = 0\text{ V}, V_{OUT} = 37\text{ V}$		± 1	± 500	nA		
Quiescent current drain	I_{DD}	$V_{DD} = 5\text{ V}$		0.001	1	μA		
		$V_{DD} = 10\text{ V}$		0.001	2	μA		
		$V_{DD} = 15\text{ V}$		0.002	4	μA		
		$V_{DD} = 20\text{ V}$		0.004	8	μA		
		$V_{DD} = 25\text{ V}$		0.01	20	μA		
		$V_{DD} = 30\text{ V}$		0.02	40	μA		
		$V_{DD} = 35\text{ V}$		0.04	80	μA		
		$V_{DD} = 37\text{ V}$		0.1	160	μA		
Input high-level control current	I_{IH}	$V_{DD} = 37\text{ V}, V_{IN} = 37\text{ V}$		10^{-4}	3	μA		
Input low-level control current	I_{IL}	$V_{DD} = 37\text{ V}, V_{IN} = 0\text{ V}$		-10^{-4}	3	μA		
Input capacitance	C_{IN}	Control inputs		5	7.5	pF		
		Switch input and outputs		10		pF		

LC4966

Switching Characteristics at $T_a = 25 \pm 2^\circ\text{C}$

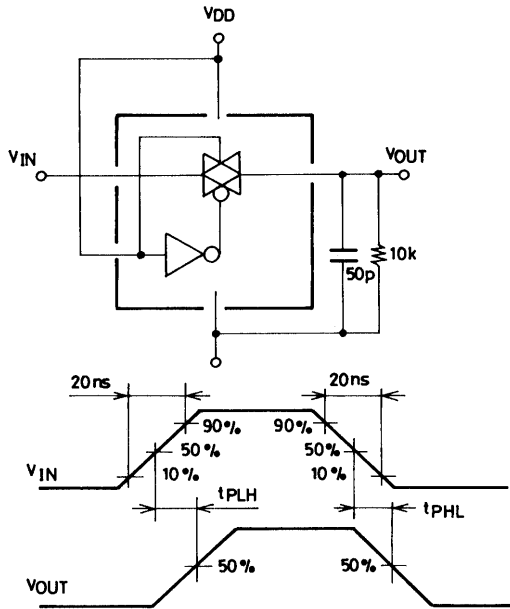
Parameter	Symbol	Conditions	min	typ	max	Unit
Transmission time (IN to OUT)	t_{PLH}, t_{PHL}	$V_{DD} = 5\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		15	45	ns
		$V_{DD} = 10\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		10	30	ns
		$V_{DD} = 15\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		8	25	ns
		$V_{DD} = 20\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		8	25	ns
		$V_{DD} = 25\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		8	25	ns
		$V_{DD} = 30\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		7	25	ns
		$V_{DD} = 35\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		7	25	ns
		$V_{DD} = 37\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		7	25	ns
Transmission time (control → OUT)	t_{PLH}, t_{PHL}	$V_{DD} = 5\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		100	200	ns
		$V_{DD} = 10\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		40	70	ns
		$V_{DD} = 15\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		35	60	ns
		$V_{DD} = 20\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		35	60	ns
		$V_{DD} = 25\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		35	60	ns
		$V_{DD} = 30\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		35	60	ns
		$V_{DD} = 35\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		35	60	ns
		$V_{DD} = 37\text{ V}, R_L = 10\text{ k}\Omega, C_L = 50\text{ pF}$		35	60	ns
Maximum control input frequency	$f_{\text{max}}(c)$	$V_{DD} = 5\text{ V}, C_L = 15\text{ pF}$		1.0		MHz
		$V_{DD} = 10\text{ V}, C_L = 15\text{ pF}$		1.0		MHz
		$V_{DD} = 20\text{ V}, C_L = 15\text{ pF}$		1.0		MHz
		$V_{DD} = 30\text{ V}, C_L = 15\text{ pF}$		1.0		MHz
		$V_{DD} = 37\text{ V}, C_L = 15\text{ pF}$		1.0		MHz
Maximum transmission frequency	$f_{\text{max}}(I-O)$	$V_{DD} = +5\text{ V}, V_{SS} = -5\text{ V}, R_L = 10\text{ k}\Omega, C_L = 15\text{ pF}^{*1}$		35		MHz
		$V_{DD} = +10\text{ V}, V_{SS} = -10\text{ V}$		40		MHz
		$V_{DD} = +15\text{ V}, V_{SS} = -15\text{ V}$		50		MHz
		$V_{DD} = +18.5\text{ V}, V_{SS} = -18.5\text{ V}$		50		MHz
Sine wave total harmonic distortion		$V_{DD} = +5\text{ V}, V_{SS} = -5\text{ V}, R_L = 10\text{ k}\Omega, f = 1\text{ kHz}^{*2}$		0.010		%
		$V_{DD} = +10\text{ V}, V_{SS} = -10\text{ V}$		0.005		%
		$V_{DD} = +15\text{ V}, V_{SS} = -15\text{ V}$		0.005		%
		$V_{DD} = +18.5\text{ V}, V_{SS} = -18.5\text{ V}$		0.005		%
Feedthrough (switch off state)		$V_{DD} = +5\text{ V}, V_{SS} = -5\text{ V}, R_L = 10\text{ k}\Omega^{*3}$		1		MHz
		$V_{DD} = +10\text{ V}, V_{SS} = -10\text{ V}$		1		MHz
		$V_{DD} = +15\text{ V}, V_{SS} = -15\text{ V}$		1		MHz
		$V_{DD} = +18.5\text{ V}, V_{SS} = -18.5\text{ V}$		1		MHz

- Note
1. V_{is} is a $\pm 2.5\text{ Vp-p}$ sine wave; $f_{\text{max}} = 20\log(V_{os}/V_{is})$ = the -3 dB frequency.
 2. V_{is} is a $\pm 2.5\text{ Vp-p}$ sine wave.
 3. V_{is} is a $\pm 2.5\text{ Vp-p}$ sine wave. Frequency (feedthrough): $20\log(V_{os}/V_{is}) = -50\text{ dB}$

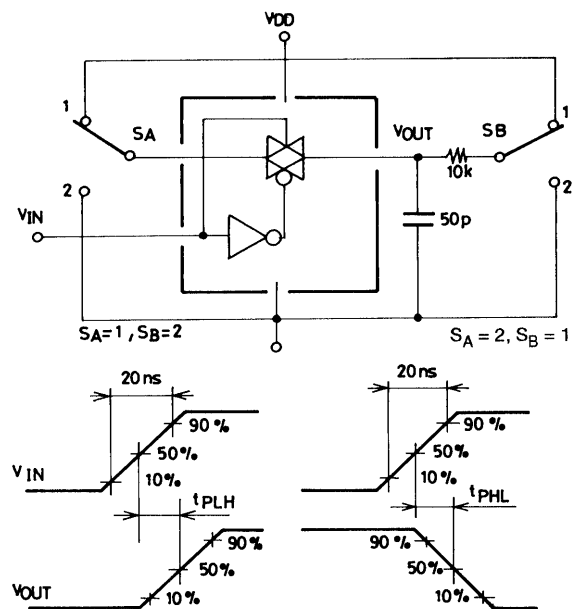
Test Circuits and Waveforms

Unit (resistance: Ω, capacitance: F)

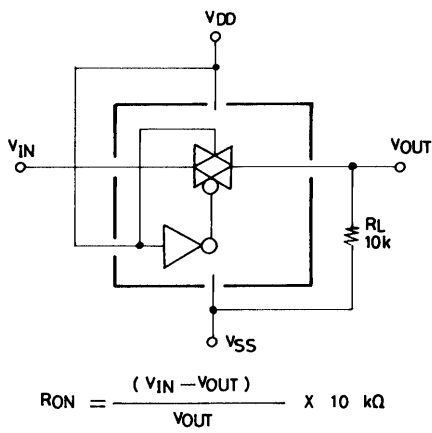
1. t_{PLH} , t_{PHL} (IN-OUT) Test Circuit



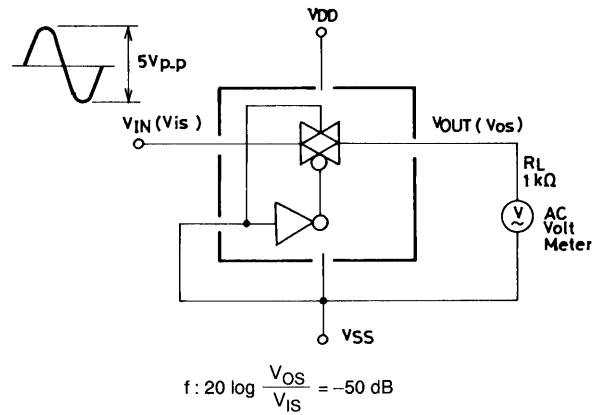
2. t_{PLH} , t_{PHL} (Control-OUT) Test Circuit



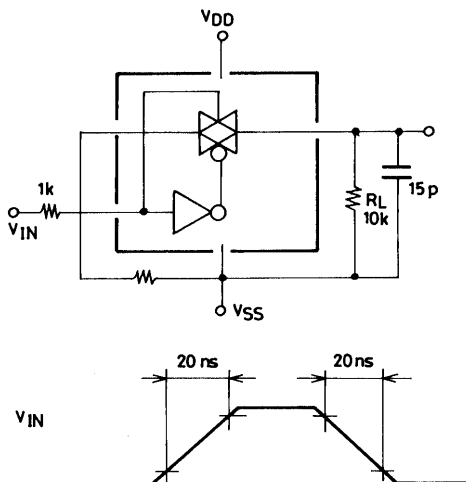
3. R_{ON} Test Circuit



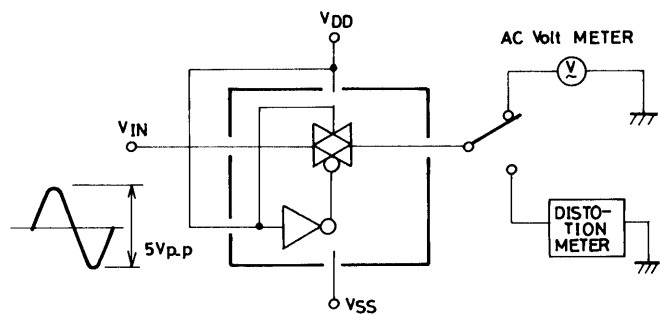
4. Feedthrough Test Circuit

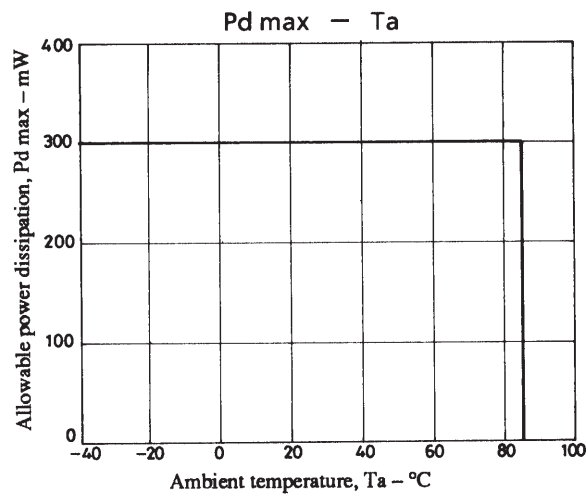


5. Crosstalk



6. Frequency Response (f_{max}) and Total Harmonic Distortion





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