



4066

CMOS IC

QUAD BILATERAL SWITCH

■ DESCRIPTION

The UTC **4066** is a quad bilateral switch intended for the transmission or multiplexing of analog or digital signals.

■ FEATURES

- * Wide supply voltage range: 3V ~ 15V.
- * High noise immunity : 0.45V_{DD} (typ.)
- * Wide range of digital and $\pm 7.5V_{PEAK}$ analog switching
- * "ON" resistance for 15V operation : 80 Ω
- * Matched "ON" resistance : $\Delta R_{ON}=5\Omega$ (typ.) over 15V signal input
- * "ON" resistance flat over peak-to-peak signal range
- * High "ON" / "OFF" : 65 dB (typ.)
- * output voltage ratio @ $f_{IS}=10kHz$, $R_L=10k\Omega$
- * High degree linearity: 0.1% distortion (typ.).
@ $f_{IS}=1kHz$, $V_{IS}=5V_{p-p}$.
 $V_{DD}-V_{SS}=10V$, $R_L=10k\Omega$
- * Extremely low "OFF" : 0.1nA (typ.)
- * switch leakage @ $V_{DD}-V_{SS}=10V$, $T_A=25^\circ C$
- * Extremely high control input impedance : $10^{12}\Omega$ (typ.)
- * Low crosstalk : -50dB (typ.)
- * between switches @ $f_{IS}=0.9MHz$, $R_L=1k\Omega$
- * Frequency response, switch "ON" : 40MHz (typ.)

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
4066L-D14-T	4066G-D14-T	DIP-14	Tube
4066L-UEA-R	4066G-UEA-R	SOP-14U	Tape Reel
4066L-UEB-R	4066G-UEB-R	TSSOP-14U	Tape Reel

4066G-D14-T

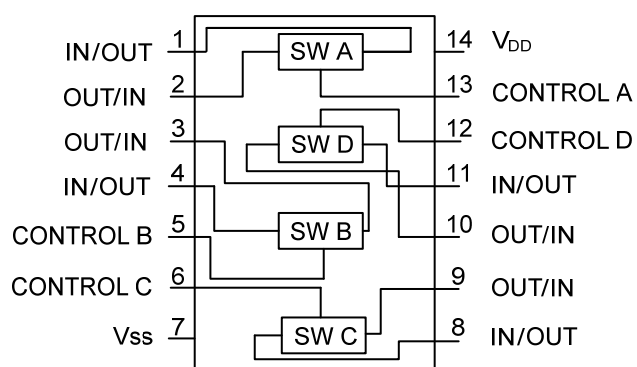
- (1) Packing Type
- (2) Package Type
- (3) Green Package

- (1) T: Tube, R: Tape Reel
- (2) DIP: DIP-14, UEA: SOP-14U, UEB: TSSOP-14U
- (3) G: Halogen Free and Lead Free, L: Lead Free

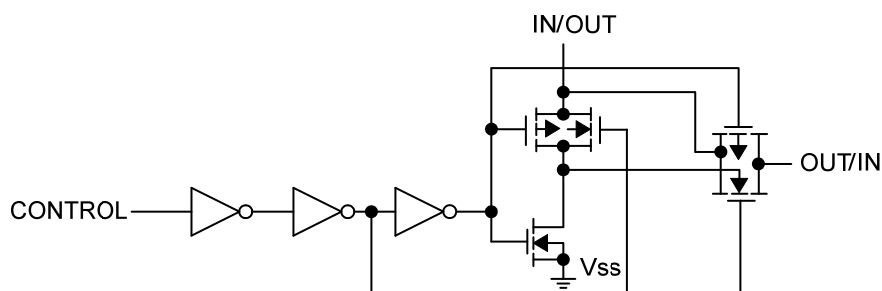
■ MARKING

DIP-14	SOP-14U / TSSOP-14U
14 13 12 11 10 9 8 UTC □□□□ 4066 □ □□ 1 2 3 4 5 6 7 → Date Code L: Lead Free G: Halogen Free → Lot Code	14 13 12 11 10 9 8 UTC □□□□ 4066 □ □□ 1 2 3 4 5 6 7 → Date Code L: Lead Free G: Halogen Free → Lot Code

■ PIN CONFIGURATION



■ SCHEMATIC DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (V_{SS}=0V, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V _{DD}	-0.5 ~ +18	V
Input Voltage	V _{IN}	-0.5 ~ V _{CC} +0.5	V
Junction Temperature	T _J	+125	°C
Storage Temperature	T _{STG}	-40 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING CONDITIONS (V_{SS}=0V, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V _{DD}	3 ~ 15	V
Input Voltage	V _{IN}	0 ~ V _{DD}	V
Operating Temperature Range	T _A	-40 ~ +125	°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Thermal Resistance Junction-Ambient	DIP-14	θ_{JA}	65	°C/W
	SOP-14U		90	°C/W
	TSSOP-14U		115	°C/W

■ DC ELECTRICAL CHARACTERISTICS (V_{SS}=0V, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Quiescent Device Current	I _{DD}	V _{DD} =5V			0.01	1.0	μA
		V _{DD} =10V			0.01	2.0	
		V _{DD} =15V			0.01	4.0	
SIGNAL INPUTS AND OUTPUTS							
Input or Output Leakage Switch “OFF”	I _{IS}	V _C =0			±0.1	±50	nA
“ON” Resistance	R _{ON}	R _L =10kΩ~ (V _{DD} -V _{SS} /2) V _C =V _{DD} , V _{SS} ~ V _{DD}	V _{DD} =5V		270	1050	Ω
			V _{DD} =10V		120	400	
			V _{DD} =15V		80	240	
Δ“ON” Resistance Between Any 2 of 4 Switches	ΔR _{ON}	R _L =10kΩ~ (V _{DD} -V _{SS} /2) V _C =V _{DD} , V _{IS} =V _{SS} ~V _{DD}	V _{DD} =5V		20		Ω
			V _{DD} =10V		10		
			V _{DD} =15V		5		
CONTROL INPUTS							
Low Level Input Voltage	V _{ILC}	V _{IS} =V _{SS} and V _{DD} V _{OS} =V _{DD} and V _{SS} I _{IS} =±10μA	V _{DD} =5V		2.25	1.5	V
			V _{DD} =10V		4.5	3.0	
			V _{DD} =15V		6.75	4.0	
HIGH Level Input Voltage	V _{IHC}	V _{DD} =5V		3.5	2.75		V
		V _{DD} =10V (Note)		7.0	5.5		
		V _{DD} =15V		11.0	8.25		
Input Current	I _{IN}	V _{DD} -V _{SS} =15V, V _{DD} ≥ V _{IS} ≥ V _{SS} , V _{DD} ≥ V _C ≥ V _{SS}			±10 ⁻⁵	±0.3	μA

Note: Conditions for V_{IHC}: (a) V_{IS}=V_{DD}, I_{OS}=standard B series I_{OH}. (b) V_{IS}=0V, I_{OL}=standard B series I_{OL}

■ **AC ELECTRICAL CHARACTERISTICS** (AC Parameters are guaranteed by DC correlated testing)

($T_A=25^\circ\text{C}$, $t_R=t_F=20\text{ ns}$ and $V_{SS}=0\text{V}$ unless otherwise)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time Signal Input to Signal Output	T_{PHL}, T_{PLH}	$V_C=V_{DD}$, $C_L=50\text{pF}$ (Figure1) $R_L=200\text{k}$	$V_{DD}=5\text{V}$	25	55	ns
			$V_{DD}=10\text{V}$	15	35	
			$V_{DD}=15\text{V}$	10	25	
Propagation Delay Time Control Input to Signal Output High Impedance to Logical Level	t_{PZH}, t_{PLZ}	$R_L=1.0\text{k}\Omega$, $C_L=50\text{pF}$ (Fig. 2, 3)	$V_{DD}=5\text{V}$		125	ns
			$V_{DD}=10\text{V}$		60	
			$V_{DD}=15\text{V}$		50	
Propagation Delay Time Control Input to Signal Output Logical Level to High Impedance		$R_L=1.0\text{k}\Omega$, $C_L=50\text{pF}$ (Fig. 2, 3)	$V_{DD}=5\text{V}$		125	ns
			$V_{DD}=10\text{V}$		60	
			$V_{DD}=15\text{V}$		50	
Sine Wave Distortion	t_{PHZ}, t_{PLZ}	$V_C=V_{DD}=5\text{V}$, $V_{SS}=-5\text{V}$ $R_L=10\text{k}\Omega$, $V_{IS}=5\text{V}_{P-P}$, $f=1\text{kHz}$, (Fig. 4)		0.1		%
Frequency Response -Switch "ON" (Frequency at -3dB)		$V_C=V_{DD}=5\text{V}$, $V_{SS}=-5\text{V}$ $R_L=1\text{k}\Omega$, $V_{IS}=5\text{V}_{P-P}$ $20\text{ Log}_{10} V_{OS}/V_{IS}$ (1kHz)-dB (Fig. 4)		40		MHz
Feedthrough - Switch "OFF" (Frequency at -50 dB)		$V_{DD}=5.0\text{V}$, $V_{CC}=V_{SS}=-5.0\text{V}$, $R_L=1\text{k}\Omega$, $V_{IS}=5.0\text{V}_{P-P}$, $20\text{Log}_{10} V_{OS}/V_{IS}=-50\text{dB}$, (Fig. 4)		1.25		MHz
Crosstalk Between Any Two Switches(Frequency at -50dB)		$V_{DD}=V_C(A)=5.0\text{V}$; $V_{SS}=V_C(B)=5.0\text{V}$, $R_L=1\text{k}\Omega$, $V_{IS}(A)=5.0\text{V}_{P-P}$, $20\text{Log}_{10} V_{OS}(B)/V_{IS}(A)=-50\text{dB}$ (Fig. 5)		0.9		MHz
Crosstalk; Control Input to Signal Output		$V_{DD}=10\text{V}$, $R_L=10\text{k}\Omega$, $R_{IN}=1.0\text{k}\Omega$, $V_{CC}=10\text{V}$ Square Wave, $C_L=50\text{pF}$ (Fig. 6)		150		mV _{p-p}
Maximum Control Input		$R_L=1.0\text{k}\Omega$, $C_L=50\text{pF}$ (Fig. 7) $V_{OS}(f)=1/2V_{OS}(1.0\text{kHz})$	$V_{DD}=5.0\text{V}$	6.0		MHz
			$V_{DD}=10\text{V}$	8.0		
			$V_{DD}=15\text{V}$	8.5		
Signal Input Capacitance	C_{IS}			8.0		pF
Signal Output Capacitance	C_{OS}	$V_{DD}=10\text{V}$		8.0		pF
Feedthrough Capacitance	C_{IOS}	$V_C=0\text{V}$		0.5		pF
Control Input Capacitance	C_{IN}			5.0	7.5	pF

■ SPECIAL CONSIDERATIONS

In applications where separate power sources are used to drive V_{DD} and the signal input, the V_{DD} current capability should exceed V_{DD}/R_L (R_L =effective external load of the UTC 4066 bilateral switches). This provision avoids any permanent current flow or clamp action of the V_{DD} supply when power is applied or removed from UTC 4066.

In certain applications, the external load-resistor current may include both V_{DD} and Signal-line components. To avoid drawing V_{DD} current when switch current flows into terminals 1,4,8 or 11, the voltage drop across the bidirectional switch must not exceed 0.6V at $T_A \leq 25^\circ\text{C}$, or 0.4V at $T_A > 25^\circ\text{C}$ (calculated from R_{ON} values shown).

NO V_{DD} current will flow through R_L if the switch current flows into terminals 2, 3, 9 or 10.

■ AC TEST CIRCUITS AND SWITCHING TIME WAVEFORMS

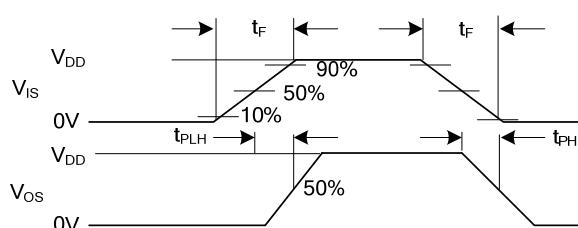
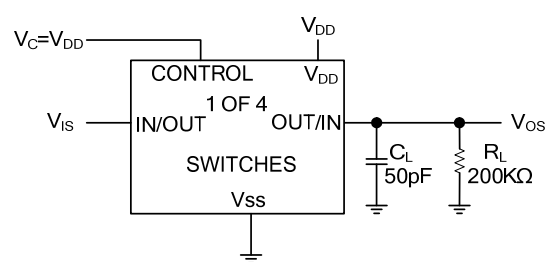


Fig.1 t_{PHL} , t_{PLH} Propagation Delay Time Signal Input to Signal Output

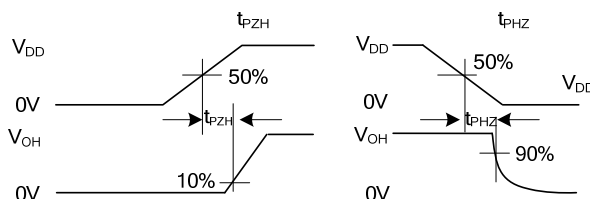
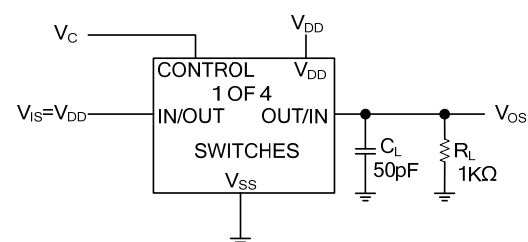


Fig. 2 t_{PZH} , t_{PHZ} Propagation Delay Time Control to Signal Output

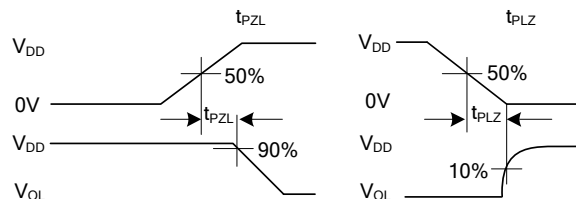
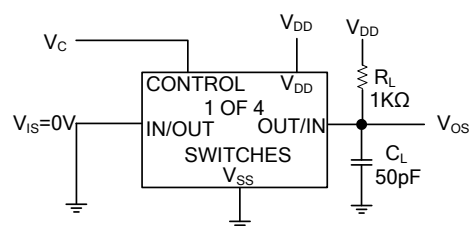
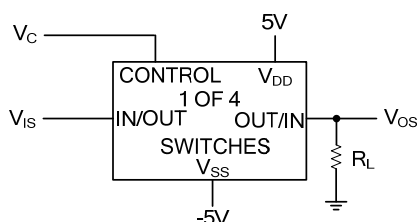


Fig. 3 t_{PZL} , t_{PLZ} Propagation Delay Time Control to Signal Output



$V_C = V_{DD}$ for distortion and frequency response tests
 $V_C = V_{SS}$ for feedthrough test

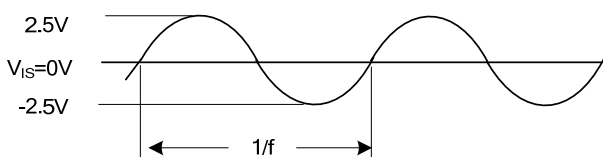


Fig. 4 Sine Wave Distortion, Frequency Response and Feedthrough

■ AC TEST CIRCUITS AND SWITCHING TIME WAVEFORMS (Cont.)

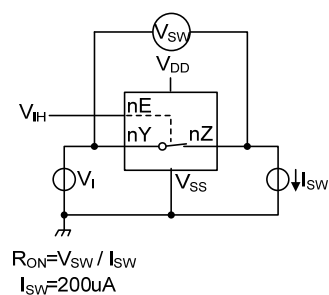
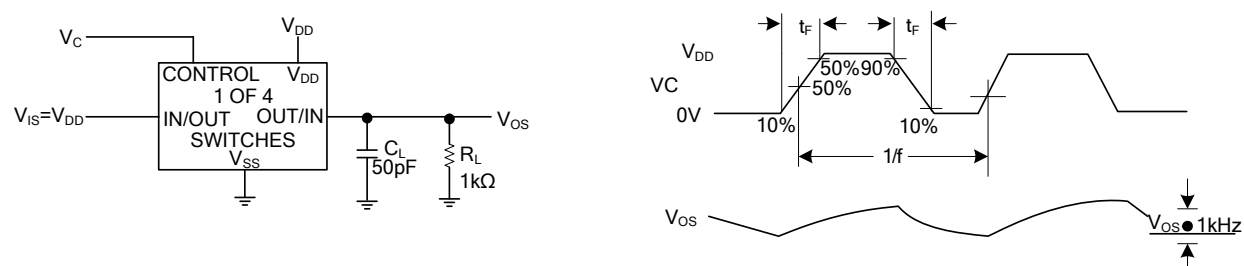
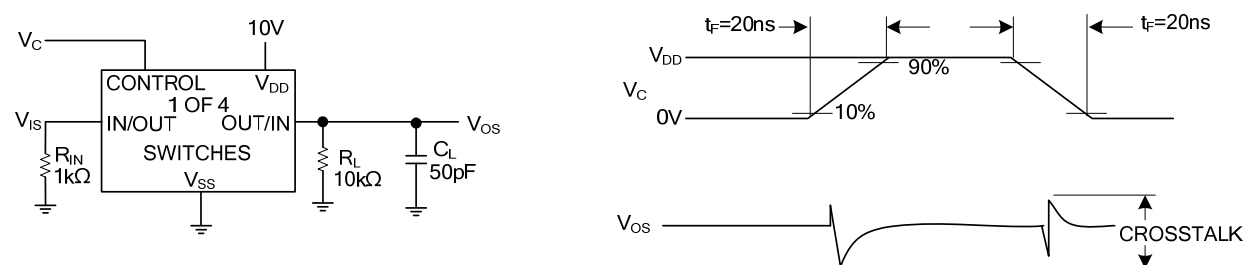
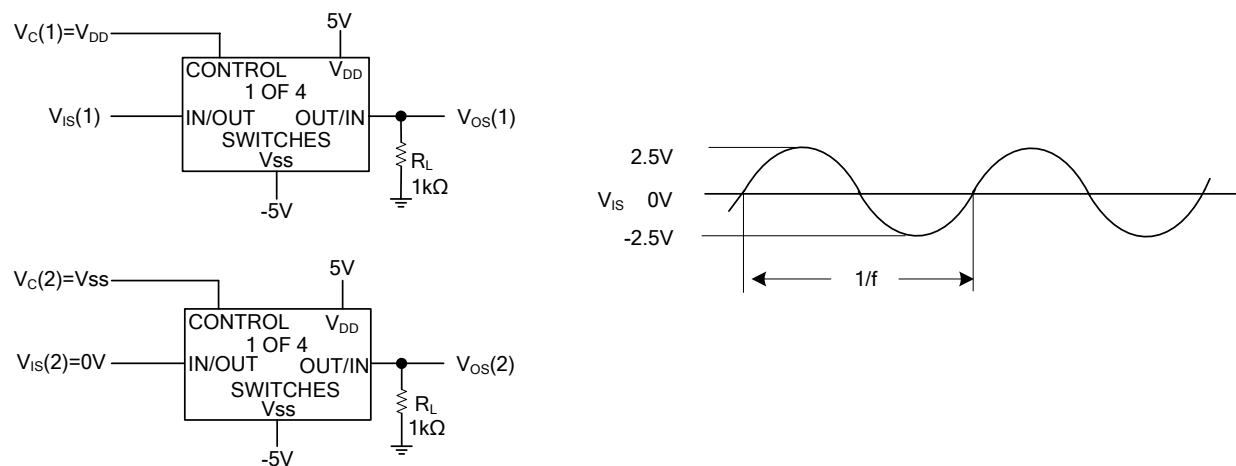
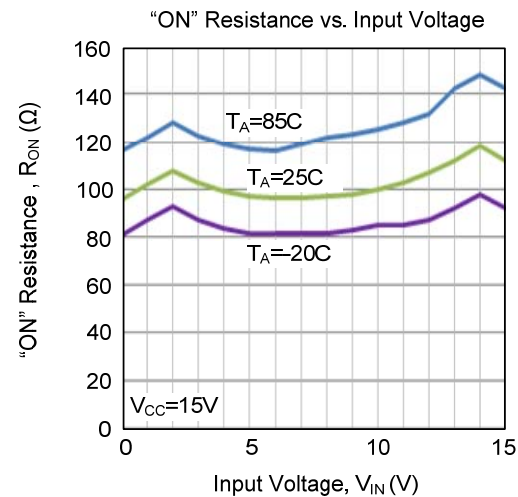
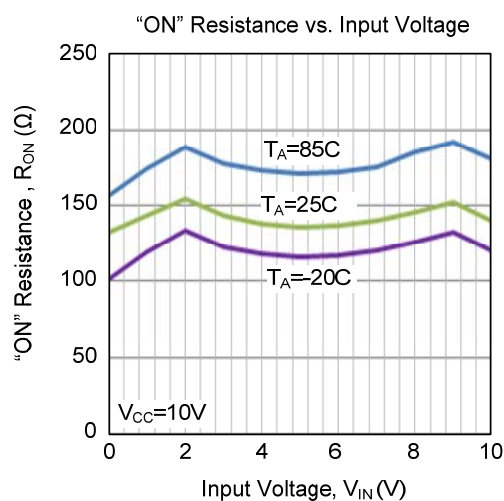
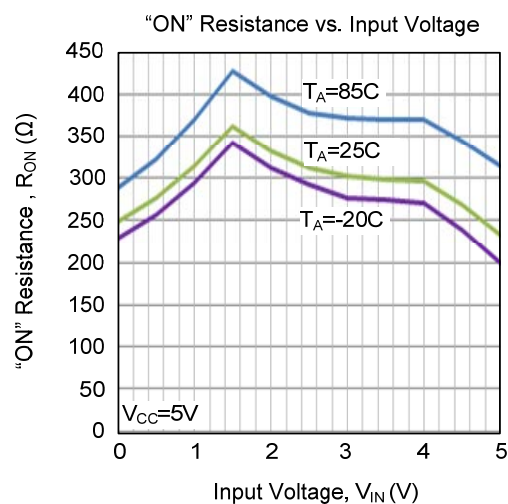
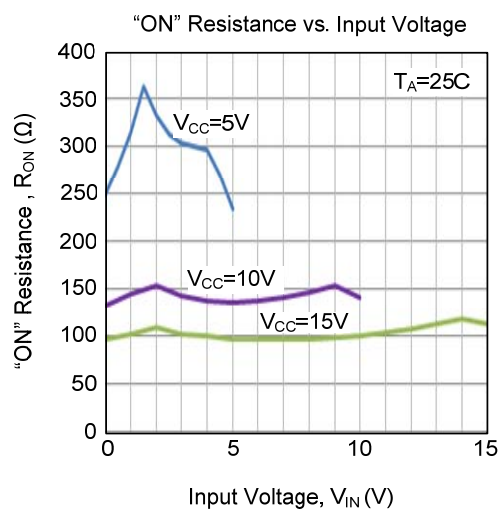


Fig. 8 Test circuit for measuring R_{ON}

■ TYPICAL CHARACTERISTICS



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