



## U74HC4066

CMOS IC

### QUAD BILATERAL SWITCHES

#### DESCRIPTION

The UTC **U74HC4066** consists of four independent analog switches. Each switch has an Enable input (nE) which is active HIGH to decide the switch status.

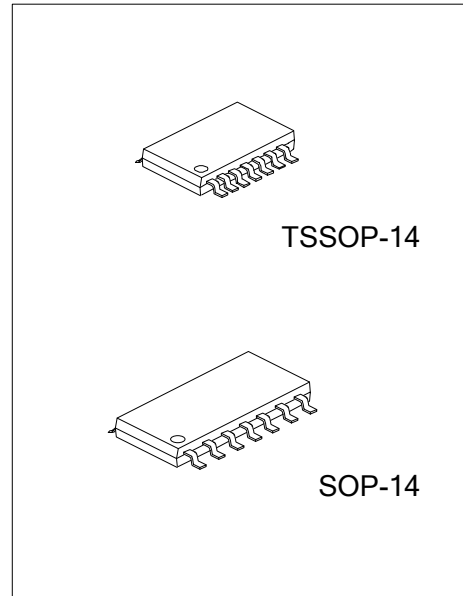
#### FEATURES

\* Operation voltage range: 2~10V

\* Very low "ON" resistance:  $V_{CC}=4.5V, 50\Omega$

$V_{CC}=6V, 45\Omega$

$V_{CC}=9V, 35\Omega$

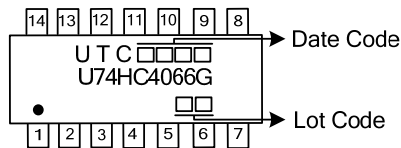


#### ORDERING INFORMATION

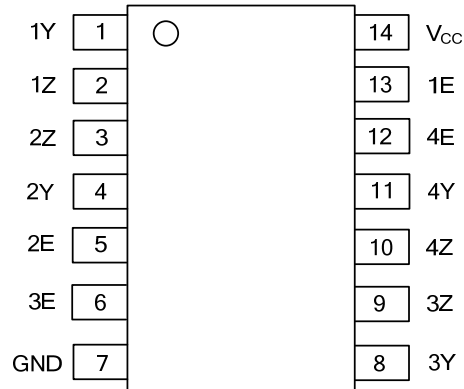
Ordering Number	Package	Packing
U74HC4066G-P14-R	TSSOP-14	Tape Reel
U74HC4066G-S14-R	SOP-14	Tape Reel

<p>U74HC4066G-P14-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) P14: TSSOP-14, S14: SOP-14</p> <p>(3) G: Halogen Free and Lead Free</p>
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#### MARKING



■ PIN CONFIGURATION

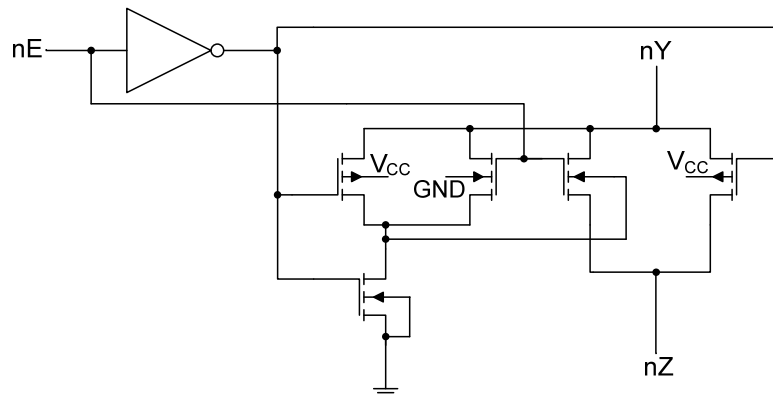


■ FUNCTION TABLE

INPUTS(nE)	SWITCH
H	ON
L	OFF

Note: H: High voltage level; L: Low voltage level.

■ LOGIC DIAGRAM



■ ABSOLUTE MAXIMUM RATING ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT	
Supply Voltage	$V_{CC}$	-0.5 ~ +11	V	
Input Diode Current	$I_{IK}$	$\pm 20$	mA	
Switch Diode Current	$I_{SK}$	$\pm 20$	mA	
Switch Current	$I_S$	$\pm 25$	mA	
$V_{CC}$ or GND Current	$I_{CC}$	$\pm 50$	mA	
Power Dissipation	$P_D$	500	mW	
Derate above $70^{\circ}\text{C}$		SOP-14	8	mW/K
Derate above $60^{\circ}\text{C}$		TSSOP-14	5.5	mW/K
Storage Temperature	$T_{STG}$	-65 ~ +150	$^{\circ}\text{C}$	

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$		2.0	5.0	10.0	V
Input Voltage	$V_{IN}$		GND		$V_{CC}$	V
Switch Voltage	$V_S$		GND		$V_{CC}$	V
Input Transition Rise or Fall Rate	$t_R, t_F$	$V_{CC}=2.0\text{V}$		6	1000	ns
		$V_{CC}=4.5\text{V}$			500	ns
		$V_{CC}=6.0\text{V}$			400	ns
		$V_{CC}=10.0\text{V}$			250	ns
Operating Temperature	$T_A$		-40		85	$^{\circ}\text{C}$

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT		
High-Level Input Voltage		V <sub>IH</sub>	V <sub>CC</sub> =2.0V	1.5			V		
			V <sub>CC</sub> =4.5V	3.15			V		
			V <sub>CC</sub> =6.0V	4.2			V		
			V <sub>CC</sub> =9.0V	6.3			V		
Low-Level Input Voltage		V <sub>IL</sub>	V <sub>CC</sub> =2.0V			0.50	V		
			V <sub>CC</sub> =4.5V			1.35	V		
			V <sub>CC</sub> =6.0V			1.80	V		
			V <sub>CC</sub> =9.0V			2.70	V		
Input Leakage Current		I <sub>I(LEAK)</sub>	V <sub>CC</sub> =6V, V <sub>IN</sub> =V <sub>CC</sub> or GND			±1.0	μA		
			V <sub>CC</sub> =10V, V <sub>IN</sub> =V <sub>CC</sub> or GND			±2.0	μA		
current per channel	OFF-state	I <sub>S</sub>	V <sub>CC</sub> =10V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>S</sub> =V <sub>CC</sub> -GND			±1.0	μA		
	ON-state					±1.0	μA		
Quiescent Supply Current		I <sub>Q</sub>	V <sub>CC</sub> =6V, V <sub>IN</sub> =V <sub>IS</sub> =V <sub>OS</sub> =V <sub>CC</sub> or GND			20	μA		
			V <sub>CC</sub> =10V, V <sub>IN</sub> =V <sub>IS</sub> =V <sub>OS</sub> =V <sub>CC</sub> or GND			40	μA		
ON-resistance		Peak	V <sub>CC</sub> =4.5V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub> to GND		54	118	Ω		
			V <sub>CC</sub> =6.0V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub> to GND		42	105	Ω		
			V <sub>CC</sub> =9.0V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub> to GND		32	88	Ω		
			V <sub>CC</sub> =2.0V, I <sub>S</sub> =100μA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =GND		80		Ω		
			Rail	V <sub>CC</sub> =4.5V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =GND		35	95	Ω	
				V <sub>CC</sub> =6.0V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =GND		27	82	Ω	
		V <sub>CC</sub> =9.0V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =GND			20	70	Ω		
		V <sub>CC</sub> =2.0V, I <sub>S</sub> =100μA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub>			100		Ω		
		V <sub>CC</sub> =4.5V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub>			42	106	Ω		
		V <sub>CC</sub> =6.0V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub>			35	94	Ω		
		V <sub>CC</sub> =9.0V, I <sub>S</sub> =1mA, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub>			27	78	Ω		
		Maximum variation of ON-resistance between any two channels		ΔR <sub>ON</sub>	V <sub>CC</sub> =4.5V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub> to GND		5		Ω
					V <sub>CC</sub> =6.0V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub> to GND		4		Ω
					V <sub>CC</sub> =9.0V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>IS</sub> =V <sub>CC</sub> to GND		3		Ω

■ DYNAMIC CHARACTERISTICS (T<sub>A</sub>=25°C, GND=0V; t<sub>r</sub>=t<sub>f</sub>=6ns; C<sub>L</sub>=50pF)

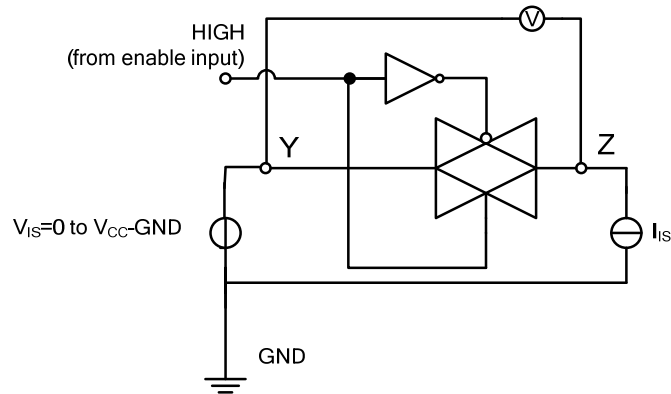
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay From V <sub>IS</sub> to V <sub>OS</sub>	t <sub>PHL</sub> /t <sub>PLH</sub>	V <sub>CC</sub> =2.0V, R <sub>L</sub> =∞		8	75	ns
		V <sub>CC</sub> =4.5V, R <sub>L</sub> =∞		3	15	ns
		V <sub>CC</sub> =6.0V, R <sub>L</sub> =∞		2	13	ns
		V <sub>CC</sub> =9.0V, R <sub>L</sub> =∞		2	10	ns
Turn-ON Time from nE to V <sub>OS</sub>	t <sub>PZH</sub> /t <sub>PZL</sub>	V <sub>CC</sub> =2.0V, R <sub>L</sub> =1KΩ		36	125	ns
		V <sub>CC</sub> =4.5V, R <sub>L</sub> =1KΩ		13	25	ns
		V <sub>CC</sub> =6.0V, R <sub>L</sub> =1KΩ		10	21	ns
		V <sub>CC</sub> =9.0V, R <sub>L</sub> =1KΩ		8	16	ns
Turn-OFF Time from nE to V <sub>OS</sub>	t <sub>PHZ</sub> /t <sub>PLZ</sub>	V <sub>CC</sub> =2.0V, R <sub>L</sub> =1KΩ		44	190	ns
		V <sub>CC</sub> =4.5V, R <sub>L</sub> =1KΩ		16	38	ns
		V <sub>CC</sub> =6.0V, R <sub>L</sub> =1KΩ		13	33	ns
		V <sub>CC</sub> =9.0V, R <sub>L</sub> =1KΩ		16	26	ns
Sine-Wave Distortion	THD	V <sub>CC</sub> =4.5V, V <sub>IS(P-P)</sub> =4V, f=1kHz, R <sub>L</sub> =10k		0.04		%
		V <sub>CC</sub> =9V, V <sub>IS(P-P)</sub> =8V, f=1kHz, R <sub>L</sub> =10k		0.02		%
		V <sub>CC</sub> =4.5V, V <sub>IS(P-P)</sub> =4V, f=10kHz, R <sub>L</sub> =10k		0.12		%
		V <sub>CC</sub> =9V, V <sub>IS(P-P)</sub> =8V, f=10kHz, R <sub>L</sub> =10k		0.06		%
Switch OFF Signal Feed-Through (Note 1)	α <sub>OFF</sub>	V <sub>CC</sub> =4.5V, R <sub>L</sub> =600Ω, f=1MHz		-50		dB
		V <sub>CC</sub> =9V, R <sub>L</sub> =600Ω, f=1MHz		-50		dB
Crosstalk Between any two Switches (Note 1)	α <sub>CT(S)</sub>	V <sub>CC</sub> =4.5V, R <sub>L</sub> =600Ω, f=1MHz		-60		dB
		V <sub>CC</sub> =9V, R <sub>L</sub> =600Ω, f=1MHz		-60		dB
Crosstalk Voltage Between any input to any Switch (Peak-to-Peak Value)	V <sub>(P-P)</sub>	V <sub>CC</sub> =4.5V, R <sub>L</sub> =600Ω, f=1MHz		110		mV
		V <sub>CC</sub> =9V, R <sub>L</sub> =600Ω, f=1MHz		220		mV
Minimum Frequency Response(-3dB) (Note 2)	f <sub>MAX</sub>	V <sub>CC</sub> =4.5V, R <sub>L</sub> =50Ω, C <sub>L</sub> =10pF		180		MHz
		V <sub>CC</sub> =9V, R <sub>L</sub> =50Ω, C <sub>L</sub> =10pF		200		MHz
maximum switch capacitance	C <sub>S</sub>			8		pF

Note 1. Adjust input voltage V<sub>IS</sub> is 0dbm level (0dbm=1mW into 600Ω)

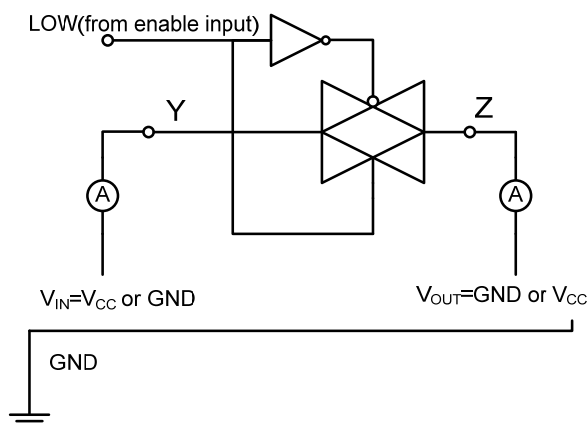
2. Adjust input voltage V<sub>IS</sub> is 0dbm level at V<sub>OS</sub> for 1MHz (0dbm=1mW into 50Ω)

## ■ TEST CIRCUIT AND WAVEFORMS

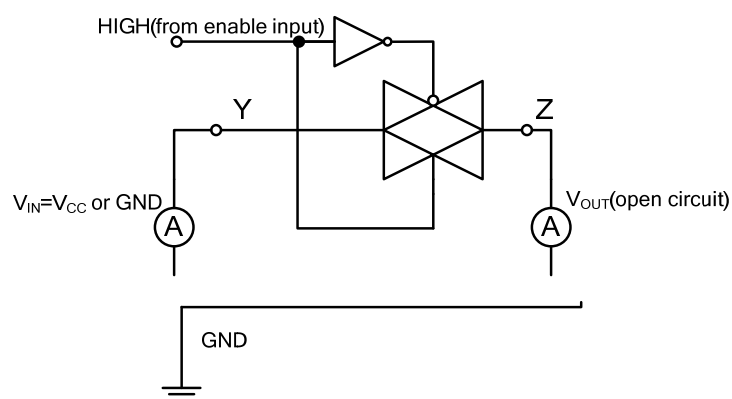
### Test circuit for measuring ON-resistance (Ron)



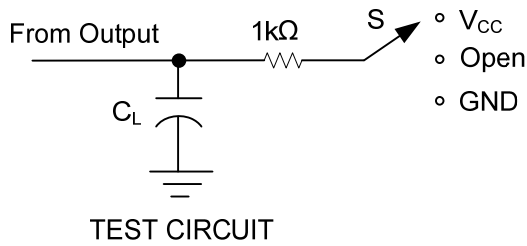
### Test circuit for measuring OFF-state current



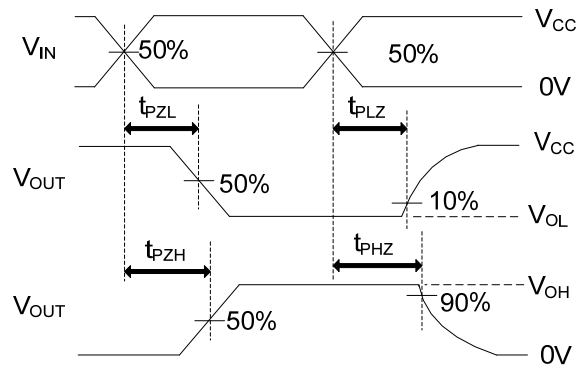
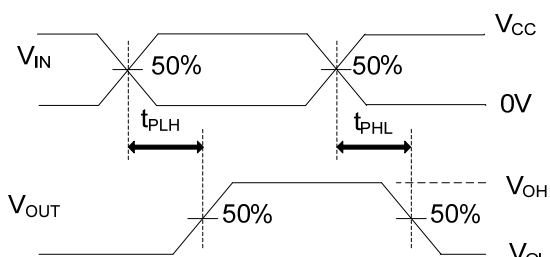
### Test circuit for measuring ON-state current



## ■ TEST CIRCUIT AND WAVEFORMS(Cont.)



	S	V <sub>IN</sub>
t <sub>PLH</sub> /t <sub>PHL</sub>	OPEN	V <sub>CC</sub>
t <sub>PHZ</sub> /t <sub>PZH</sub>	GND	V <sub>CC</sub>
t <sub>PLZ</sub> /t <sub>PZL</sub>	V <sub>CC</sub>	GND



Note: 1. C<sub>L</sub> includes probe and jig capacitance.  
 Note: 2. PRR ≤ 1MHz, Z<sub>o</sub> = 50Ω, t<sub>r</sub> ≤ 6ns, t<sub>f</sub> ≤ 6ns.

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