



4066

CMOS IC

QUAD BILATERAL SWITCH

DESCRIPTION

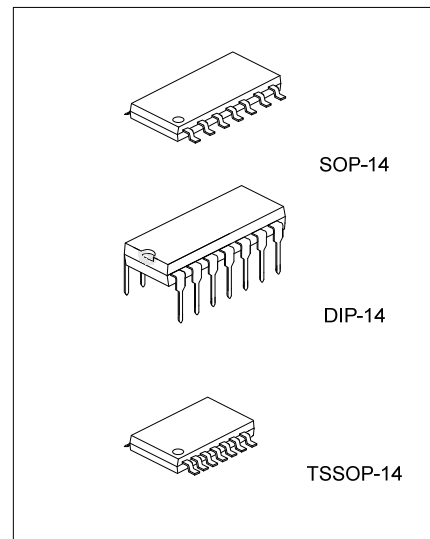
The UTC **4066** is a quad bilateral switch intended for the transmission or multiplexing of analog or digital signals.

FEATURES

- * Wide supply voltage range: 3V ~ 15V.
- * High noise immunity : 0.45V_{DD} (typ.)
- * Wide range of digital and ± 7.5V_{PEAK} analog switching
- * "ON" resistance for 15V operation : 80Ω
- * Matched "ON" resistance : ΔR_{ON}=5Ω (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=10kΩ
- * High degree linearity: 0.1% distortion (typ.)
- @ f_{IS}=1kHz, V_{IS}=5Vp-p.
- V_{DD}-V_{SS}=10V, R_L=10kΩ
- * Extremely low "OFF" : 0.1nA (typ.)
- switch leakage @V_{DD}-V_{SS}=10V, Ta=25°C
- * Extremely high control input impedance : 10¹²Ω (typ.)
- * Low crosstalk : -50dB (typ.)
- between switches @ f_{IS}=0.9MHz, R_L=1kΩ
- * Frequency response, switch "ON" : 40MHz (typ.)

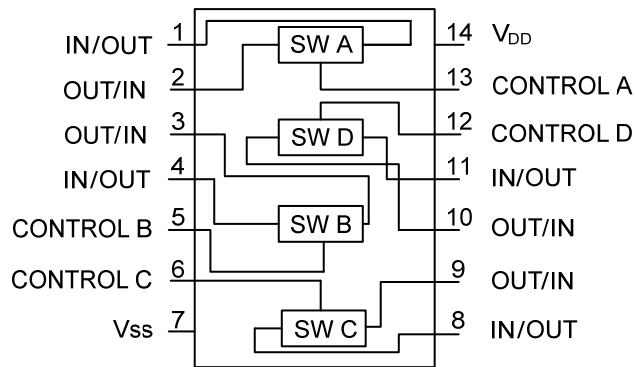
ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
4066L-D14-T	4066G-D14-T	DIP-14	Tube
4066L-S14-R	4066G-S14-R	SOP-14	Tape Reel
4066L-S14-T	4066G-S14-T	SOP-14	Tube
4066L-P14-R	4066G-P14-R	TSSOP-14	Tape Reel
4066L-P14-T	4066G-P14-T	TSSOP-14	Tube

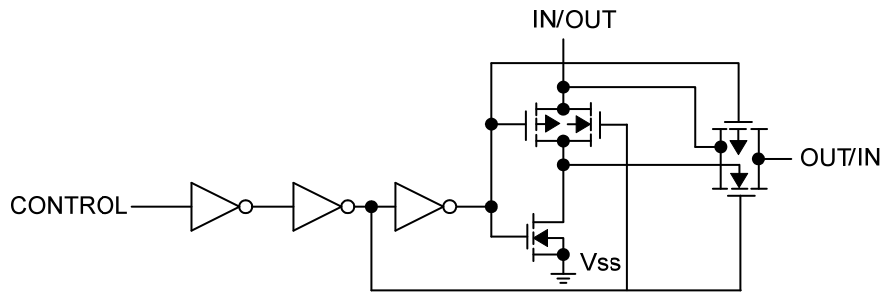


<p>4066L-D14-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) R: Tape Reel, T: Tube (2) D14: DIP-14, S14: SOP-14, P14: TSSOP-14 (3) G: Halogen Free, L: Lead Free</p>
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■ PIN CONFIGURATION



■ 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
Power Dissipation	DIP-14	P_D	700	mW
	SOP-14/ TSSOP-14		500	
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_{OPR}	-40 ~ +85	°C

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

PARAMETER	SYMBOL	CONDITIONS	-40°C		+25°C			+85°C		UNIT
			MIN	MAX	MIN	TYP	MAX	MIN	MAX	
Quiescent Device Current	I_{DD}	$V_{DD}=5V$		1.0		0.01	1.0		7.5	μA
		$V_{DD}=10V$		2.0		0.01	2.0		15	
		$V_{DD}=15V$		4.0		0.01	4.0		30	
SIGNAL INPUTS AND OUTPUTS										
Input or Output Leakage Switch "OFF"	I_{IS}	$V_C=0$		± 50		± 0.1	± 50		± 200	nA
"ON" Resistance	R_{ON}	$R_L=10k\Omega \sim (V_{DD}-V_{SS}/2)$ $V_C=V_{DD}$, $V_{SS} \sim V_{DD}$	$V_{DD}=5V$		850		270	1050	1200	Ω
			$V_{DD}=10V$		330		120	400	520	
			$V_{DD}=15V$		210		80	240	300	
Δ "ON" Resistance Between Any 2 of 4 Switches	ΔR_{ON}	$R_L=10k\Omega \sim (V_{DD}-V_{SS}/2)$ $V_C=V_{DD}$, $V_{IS}=V_{SS} \sim V_{DD}$	$V_{DD}=10V$				10			Ω
			$V_{DD}=15V$				5			
CONTROL INPUTS										
Low Level Input Voltage	V_{ILC}	$V_{IS}=V_{SS}$ and V_{DD} $V_{OS}=V_{DD}$ and V_{SS} $I_{IS}=\pm 10\mu A$	$V_{DD}=5V$		1.5		2.25	1.5	1.5	V
			$V_{DD}=10V$		3.0		4.5	3.0	3.0	
			$V_{DD}=15V$		4.0		6.75	4.0	4.0	
HIGH Level Input Voltage	V_{IHC}	$V_{DD}=5V$	3.5		3.5	2.75		3.5	V	
		$V_{DD}=10V$ (Note 4)	7.0		7.0	5.5		7.0		
		$V_{DD}=15V$	11.0		11.0	8.25		11.0		
Input Current	I_{IN}	$V_{DD}-V_{SS}=15V$ $V_{DD} \geq V_{IS} \geq V_{SS}$ $V_{DD} \geq V_C \geq V_{SS}$		± 0.3		$\pm 10^{-5}$	± 0.3		± 1.0	μA

■ 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	UNITS
Propagation Delay Time Signal Input to Signal Output	T_{PHL}, T_{PLH}	$V_C=V_{DD}, C_L=50\text{pF}$, (Figure 1) $R_L=200\text{k}$	$V_{DD}=5\text{V}$	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	t_{PHZ}, 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	
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)				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		
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

Note 1: These devices should not be connected to circuits with the power "ON"

Note 2: In all cases, there is approximately 5pF of probe and jig capacitance in the output; however, this capacitance is included in C_L wherever it is specified.

Note 3: V_{IS} is the voltage at the in/out pin and V_{OS} is the voltage at the out/in pin. V_C is the voltage at the control input.

Note 4: Conditions for V_{IHC} : (a) $V_{IS}=V_{DD}, I_{OS}=\text{standard B series } I_{OH}$. (b) $V_{IS}=0\text{V}, I_{OL}=\text{standard B series } I_{OL}$

■ 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 swith must not exceed 0.6V at $T_A \leq 25^\circ C$, or 0.4V at $T_A > 25^\circ C$ (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

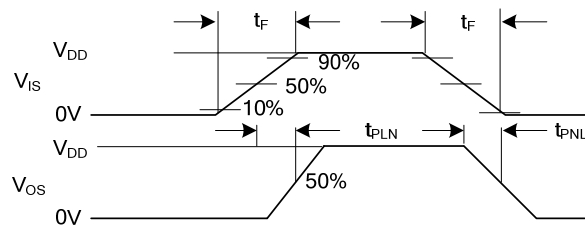
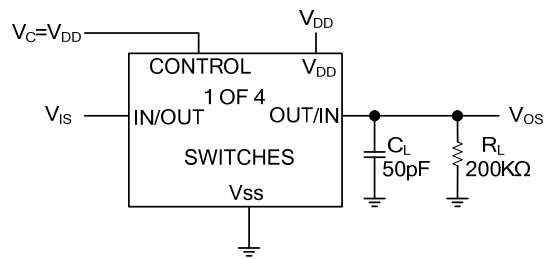


Fig.1 t_{PHL} , t_{PLH} Propagation Delay Time Signal Input to Signal Output

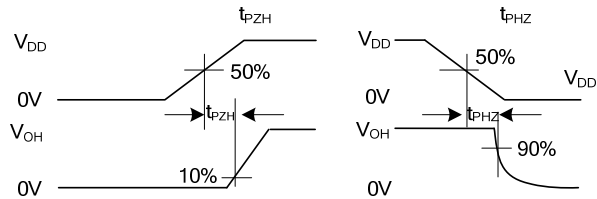
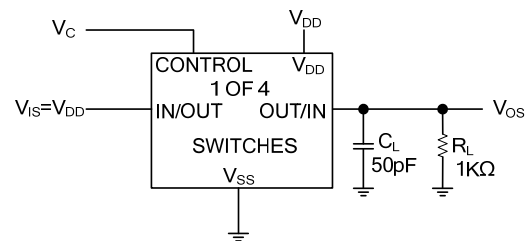


Fig. 2 t_{PZH} , t_{PHZ} Propagation Delay Time Control to Signal Output

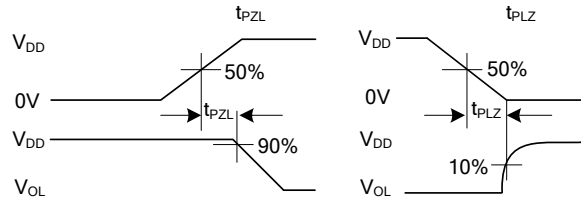
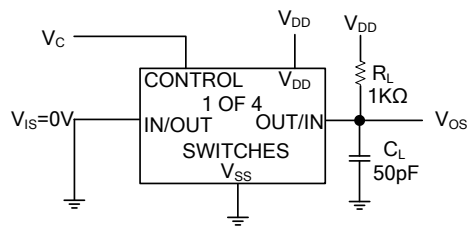
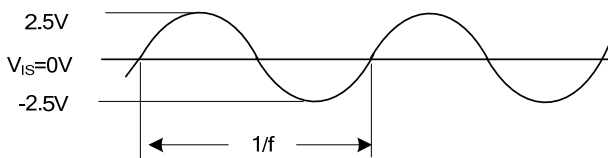
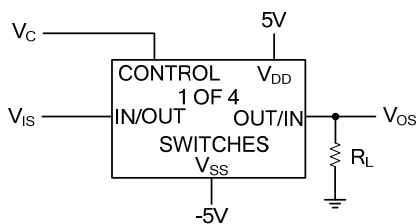


Fig. 3 t_{PZL} , t_{PLZ} Propagation Delay Time Control to Signal Output



$V_C=V_{DD}$ 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.)

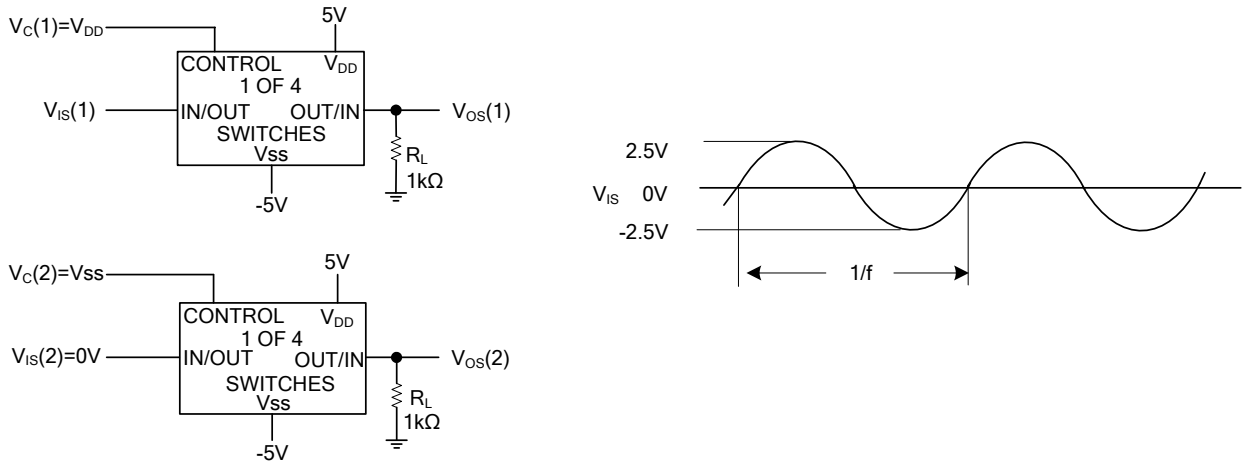


Fig. 5 Crosstalk Between Any Two Switches

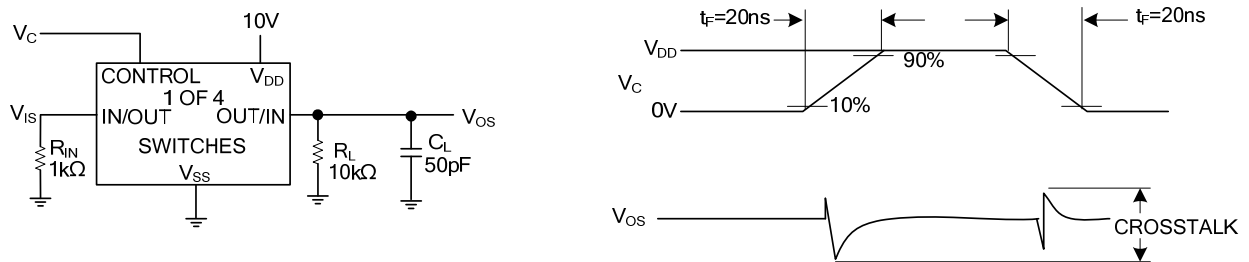


Fig.6 Crosstalk: Control Input to Signal Output

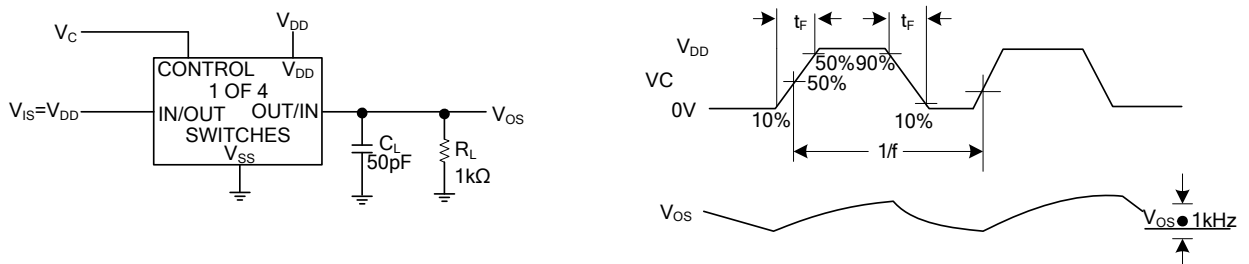
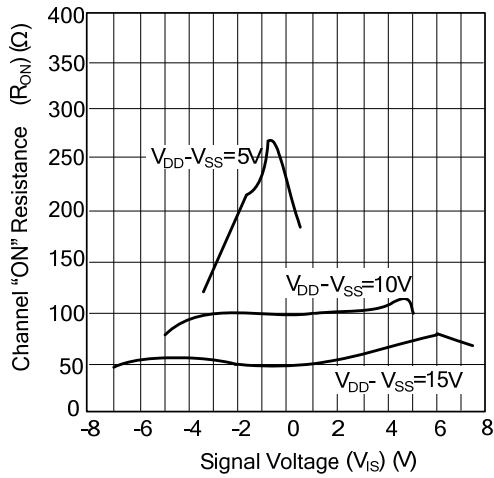


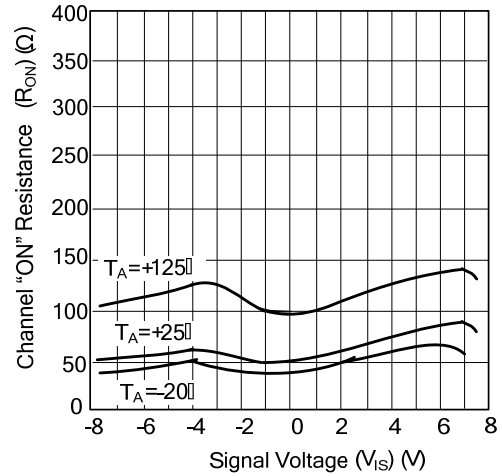
Fig. 7 Maximum Control Input Frequency

■ TYPICAL PERFORMANCE CHARACTERISTICS

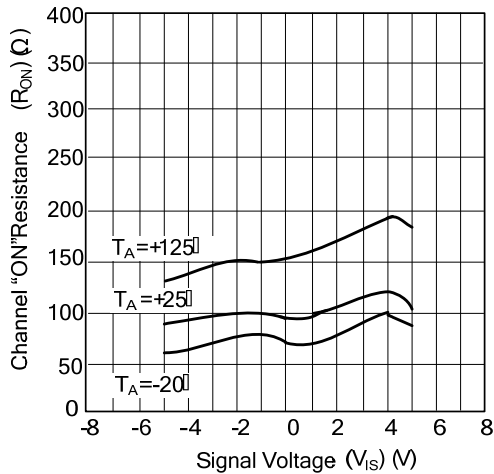
“ON” Resistance vs Signal Voltage for $T_A=25^\circ\text{C}$



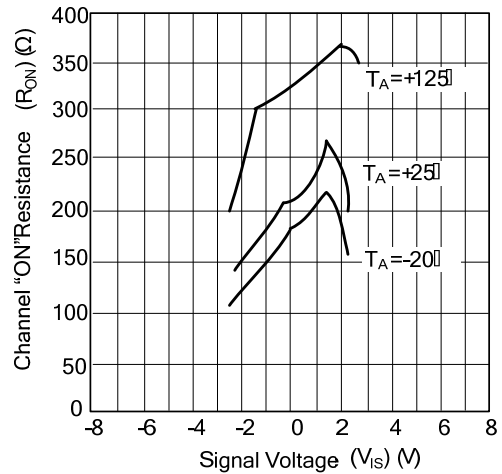
“ON” Resistance as a Function of temperature for $V_{DD}-V_{SS}=15\text{V}$



“ON” Resistance as a Function of Temperature for $V_{DD}-V_{SS}=10\text{V}$



“ON” Resistance as a Function of Temperature for $V_{DD}-V_{SS}=15\text{V}$



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