



4066

CMOS IC

QUAD BILATERAL SWITCH

DESCRIPTION

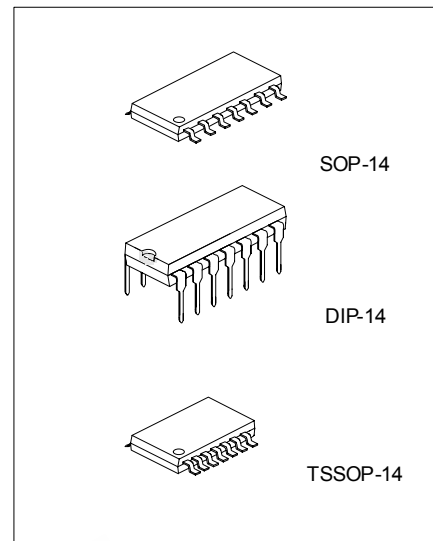
The UTC **4066** is a quad bilateral switch intended for the transmission or multiplexing of analog or digital signals.

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 : R_{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, T_a=25
- * 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

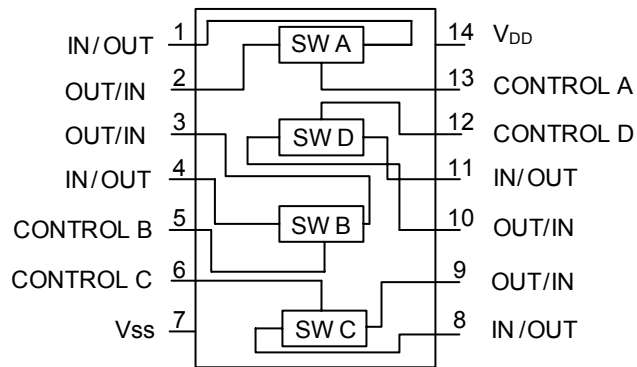
Ordering Number		Package	Packing
Normal	Lead Free Plating		
4066-D14-T	4066L-D14-T	DIP-14	Tube
4066-S14-R	4066L-S14-R	SOP-14	Tape Reel
4066-S14-T	4066L-S14-T	SOP-14	Tube
4066-P14-R	4066L-P14-R	TSSOP-14	Tape Reel
4066-P14-T	4066L-P14-T	TSSOP-14	Tube



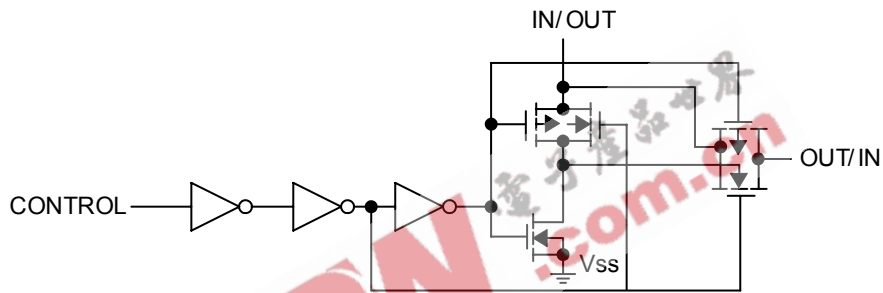
*Pb-free plating product number: 4066L

<p>4066L-D14-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube (2) D14: DIP-14, S14: SOP-14, P14: TSSOP-14 (3) L: Lead Free Plating Blank: Pb/Sn</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	700	mW
	SOP-14	500	mW
	TSSOP-14	500	mW
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		UNITS
			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	μA	
		$V_{DD}=15V$		4.0	0.01	4.0		30	μA	
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	Ω	
		$V_{DD}=15V$		210	80	240		300	Ω	
"ON" Resistance Between Any 2 of 4 Switches	R_{ON}	$R_L=10k\Omega \sim (V_{DD}-V_{SS}/2)$ $V_C=V_{DD}, V_{IS}=V_{SS} \sim V_{DD}$ $V_{DD}=10V$ $V_{DD}=15V$			10 5			Ω Ω		
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	
		$V_{DD}=15V$		4.0	6.75	4.0		4.0	V	
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	
		$V_{DD}=15V$	11.0		11.0	8.25		11.0	V	
Input Current	I_{IN}	$V_{DD}-V_{SS}=15V$ $V_{DD} \quad V_{IS} \quad V_{SS}$ $V_{DD} \quad V_C \quad V_{SS}$		± 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	ns
			$V_{DD}=15\text{V}$	10	25	ns
Propagation Delay Time Control Input to Signal Output High Impedance to Logical Level	t_{PZH}, t_{PLZ}	$R_L=1.0\text{k}\Omega, C_L=50\text{pF}$ (Figure 2, Figure 3)	$V_{DD}=5\text{V}$		125	ns
			$V_{DD}=10\text{V}$		60	ns
			$V_{DD}=15\text{V}$		50	ns
Propagation Delay Time Control Input to Signal Output Logical Level to High Impedance	t_{PHZ}, t_{PLZ}	$R_L=1.0\text{k}\Omega, C_L=50\text{pF}$, (Figure 2, Figure 3) $V_{DD}=5\text{V}$ $V_{DD}=10\text{V}$ $V_{DD}=15\text{V}$			125	ns
					60	ns
Sine Wave Distortion	t_{PHZ}, t_{PLZ}	$V_c=V_{DD}=5\text{V}, V_{ss}=-5\text{V}$ $R_L=10\text{k}\Omega, V_{IS}=5\text{V}_{P-P}, f=1\text{kHz}$, (Figure 4)		0.1	50	%
Frequency Response -Switch "ON" (Frequency at -3dB)	t_{PHZ}, t_{PLZ}	$V_c=V_{DD}=5\text{V}, V_{ss}=-5\text{V}$ $R_L=1\text{k}\Omega, V_{IS}=5\text{V}_{P-P}$ $20 \text{ Log}_{10} V_{OS}/V_{OS} (1\text{kHz})\text{-dB}$ (Figure 4)		40		MHz
Feedthrough - Switch "OFF" (Frequency at -50 dB)		$V_{DD}=5.0\text{V}, V_{CC}=V_{SS}=-5.0\text{V}$, $R_L=1\text{k}\Omega, V_{IS}=5.0\text{V}_{P-P}, 20\text{Log}_{10}$, $V_{OS}/V_{IS}=-50\text{dB}$, (Figure 4)		1.25		
Crosstalk Between Any Two Switches(Frequency at -50dB)		$V_{DD}=V_C(A)=5.0\text{V}; V_{SS}=V_C(B)=5.0\text{V}$, $R_L=1\text{k}\Omega, V_{IS}(A)=5.0\text{V}_{P-P}, 20\text{Log}_{10}$, $V_{OS}(B)/V_{IS}(A)=-50\text{dB}$ (Figure 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, $C_L=50\text{pF}$ (Figure 6)		150		mV_{P-P}
Maximum Control Input		$R_L=1.0\text{k}\Omega, C_L=50\text{pF}$, (Figure 7) $V_{OS}(f)=1/2V_{OS} (1.0\text{kHz})$ $V_{DD}=5.0\text{V}$ $V_{DD}=10\text{V}$ $V_{DD}=15\text{V}$		6.0		MHz
				8.0		MHz
				8.5		MHz
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 $T_a \leq 25$, or 0.4V at $T_a > 25$ (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

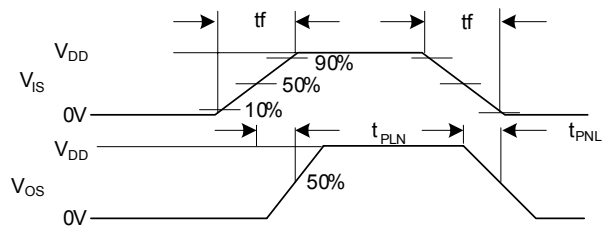
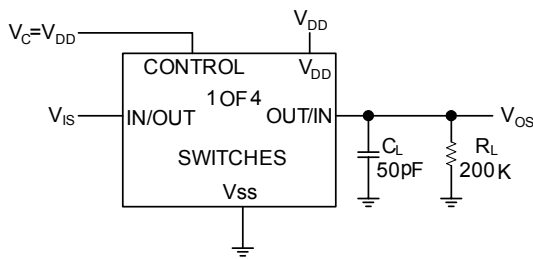


FIGURE 1. t_{PHL} , t_{PLH} Propagation Delay Time Signal Input to Signal Output

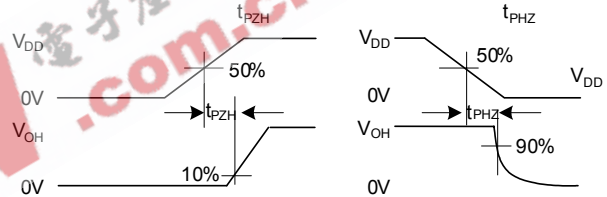
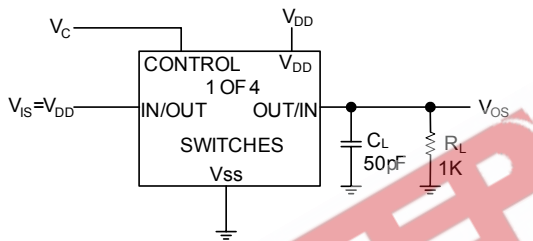


FIGURE 2. t_{PZH} , t_{PHZ} Propagation Delay Time Control to Signal Output

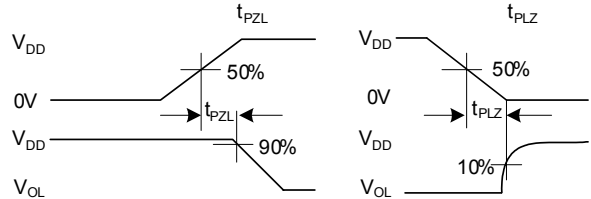
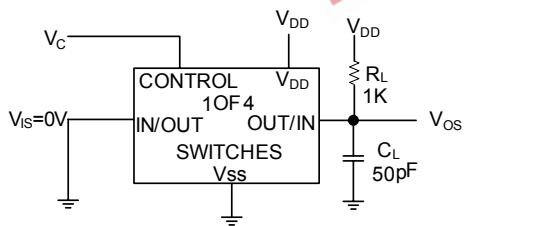
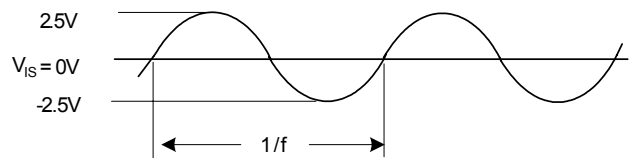
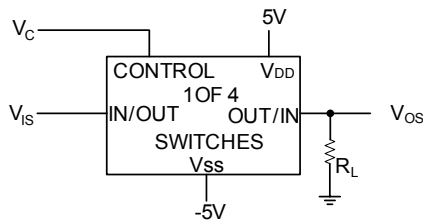


FIGURE 3. t_{PZL} , t_{PLZ} Propagation Delay Time Control to Signal Output



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

FIGURE 4. Sine Wave Distortion, Frequency Response and Feedthrough

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

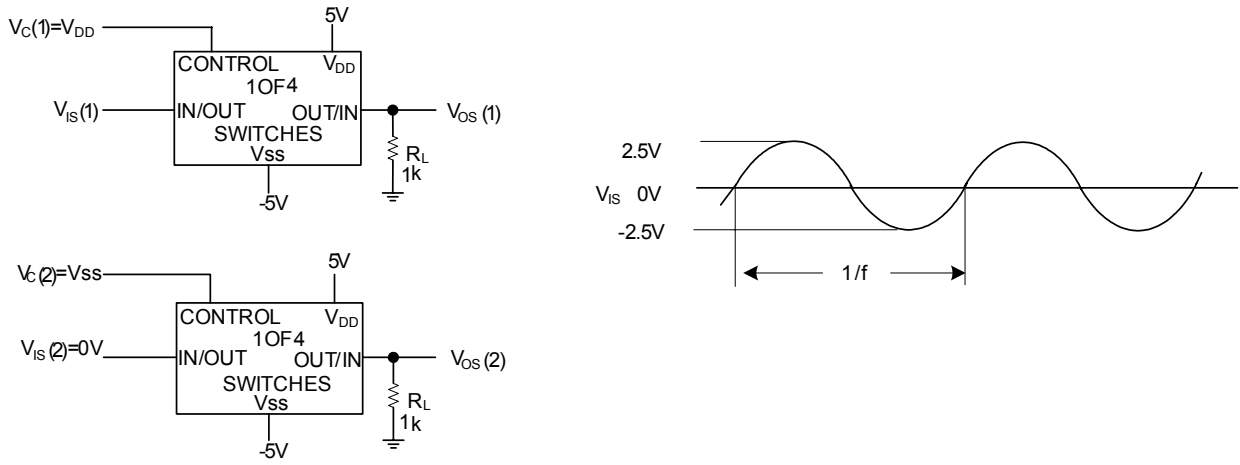


FIGURE 5. Crosstalk Between Any Two Switches

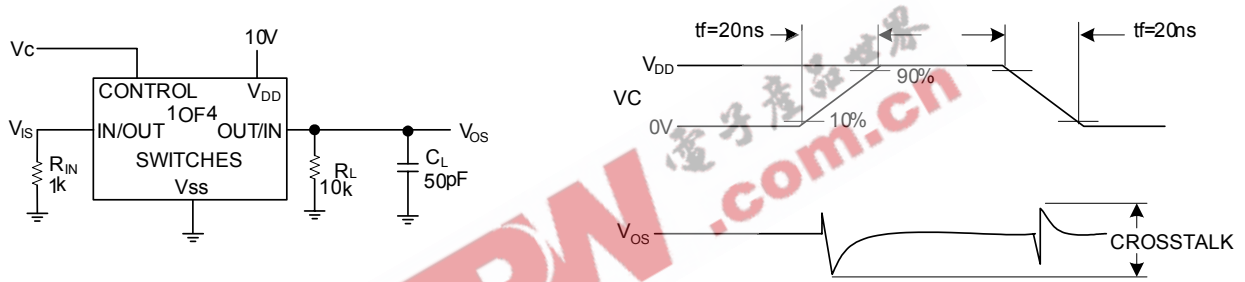


FIGURE 6. Crosstalk: Control Input to Signal Output

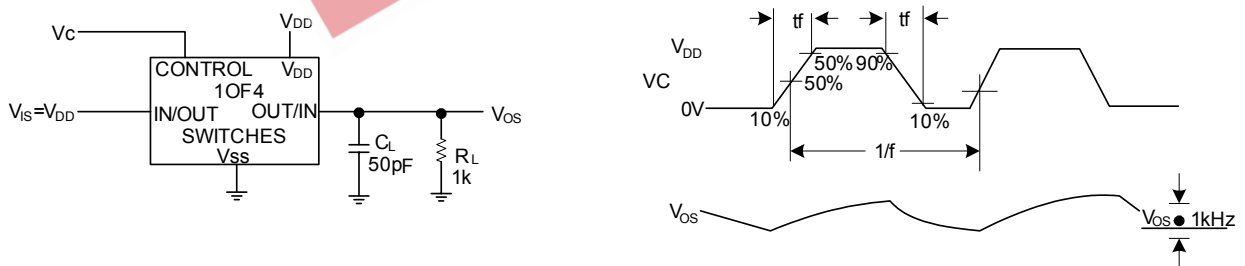
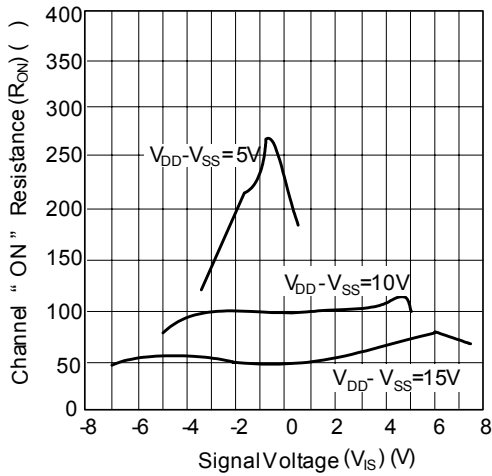


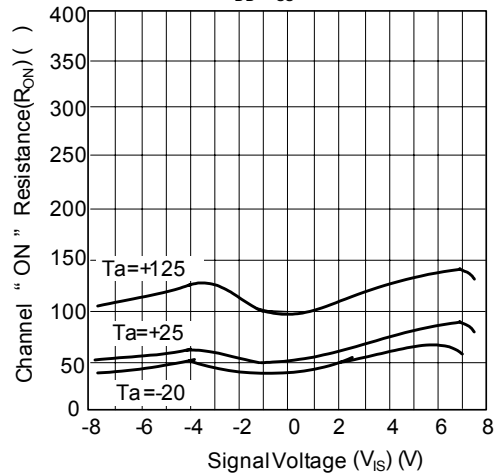
FIGURE 7. Maximum Control Input Frequency

■ TYPICAL PERFORMANCE CHARACTERISTICS

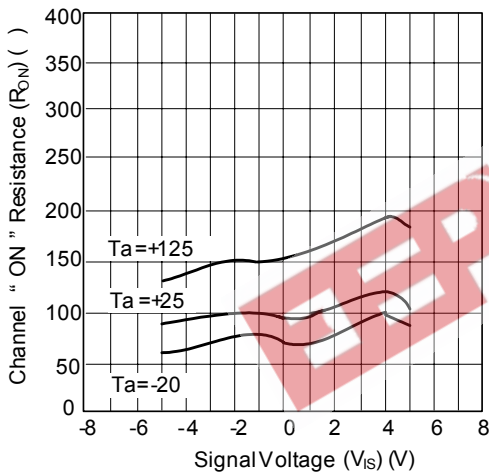
" ON " Resistance vs Signal Voltage for $T_a=25$



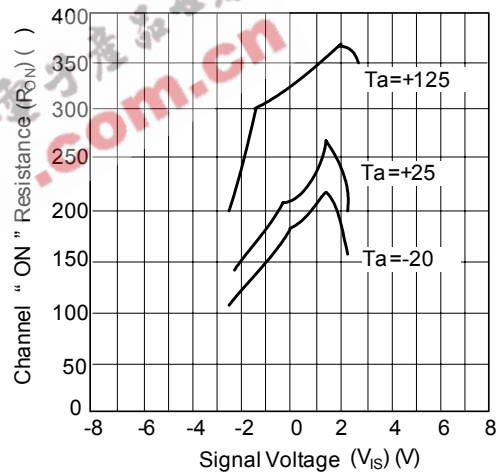
" ON " Resistance as a Function of emperature for $V_{DD}-V_{SS}=15V$



"ON" Resistance as a Function of Temperature for $V_{DD}-V_{SS}=10V$



"ON" Resistance as a Function of Temperature for $V_{DD}-V_{SS}=15V$



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