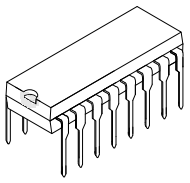
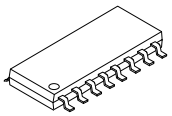
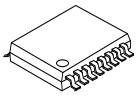
4052 *CMOS IC*

DIFFERENTIAL 4-CHANNEL ANALOG MULTIPLEXERS/ DEMULTIPLEXERS


DIP-16


SOP-16


TSSOP-16

■ DESCRIPTION

The UTC **4052** is differential 4-channel analog multiplexers/ demultiplexers for application as digitally–controlled analog switches.

The device has two binary control inputs and an inhibit input. It feature low ON impedance and very low OFF leakage current. Control of analog signals up to the complete supply voltage range can be achieved.

■ FEATURES

* Wide Analog Voltage Range: V_{DD}–V_{EE} = 3V~18V.
  (Note: V_{EE} must be $\leqq V_{SS}$)
* Break-Before-Make Switching Eliminates Channel Overlap.
* Linearized Transfer Characteristics
* Implement an DP4T Switch Effectively.
* Pin to Pin Replacement for CD4052

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
4052L-D16-T	4052G-D16-T	DIP-16	Tube
4052L-P16-R	4052G-P16-R	TSSOP-16	Tape Reel
4052L-P16-T	4052G-P16-T	TSSOP-16	Tube
4052L-S16-R	4052G-S16-R	SOP-16	Tape Reel
4052L-S16-T	4052G-S16-T	SOP-16	Tube

4052L-D16-R (1)Packing Type (2)Package Type (3)Lead Free	(1) T: Tube, R: Tape Reel (2) D16: DIP-16, P16: TSSOP-16, S16: SOP-16 (3) G: Halogen Free, L: Lead Free

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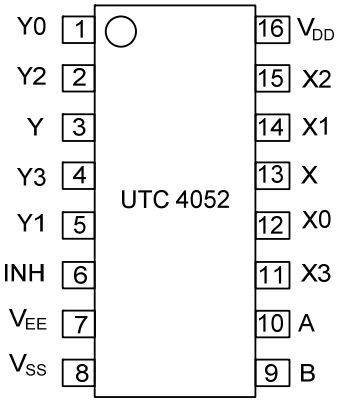
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN No.	SYMBAL	NAME AND FUNCTION
13, 3	X,Y	Commons Input/Output
6	INH	Inhibit Input
7	V_{EE}	Supply Voltage
8	V_{SS}	Ground
10,9	A,B	Binary Control Inputs
12,14,15,11	X0~X3	X Channel Inputs/Outputs
1,5,2,4	Y0~Y3	Y Channel Inputs/Outputs
16	V_{DD}	Positive Supply Voltage

Note: Control Inputs referenced to V_{SS}. Analog Inputs and Outputs reference to V_{EE}. V_{EE} must be $< V_{SS}$.

■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
DC Supply Voltage (Referenced to V_{EE}, $V_{SS} \geqq V_{EE}$)	V_{DD}	-0.5 ~ +18	V
Input or Output Voltage (DC or Transient) (Referenced to V_{SS} for Control Inputs and V_{EE} for Switch I/O)	V_{IN}, V_{OUT}	-0.5 ~ V_{DD} +0.5	V
Input Current (DC or Transient), per Control Pin	I_{IN}	±10	mA
Switch Through Current	I_{SW}	±25	mA
Power Dissipation	P_D	700	mW
Derating above 65°C		7	mW/°C
Junction Temperature	T_J	125	°C
Operating Temperature	T_{OPR}	-40 ~ +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.

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified.)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SUPPLY REQUIREMENTS (Voltages Referenced to V_{EE})							
Power Supply Voltage Range		V_{DD}	$V_{DD} - 3 \geqq V_{SS} \geqq V_{EE}$	3		18	V
Quiescent Current per Package	V_{DD}=5V	I_Q	Control Inputs: V_{IN} = V_{SS} or V_{DD} Switch I/O: $V_{EE} \leqq V_{I/O} \leqq V_{DD}$, and $\Delta V_{SW} \leqq 500mV$(Note 2)		0.005	5	μA
	V_{DD}=10V				0.010	10	μA
	V_{DD}=15V				0.015	20	μA
Total Supply Current (Dynamic Plus Quiescent, Per Package)	V_{DD}=5V	$I_{D(AV)}$	T_A=25°C only (The channel component, $(V_{IN}-V_{OUT})/R_{ON}$, is excluded.)	(0.07 μA/kHz) f + I_Q			μA
	V_{DD}=10V			(0.20 μA/kHz) f + I_Q			μA
	V_{DD}=15V			(0.36 μA/kHz) f + I_Q			μA
SWITCHES IN/OUT AND COMMONS OUT/IN -- X, Y, Z (Voltages Referenced to V_{EE})							
Recommended Peak to Peak Voltage Into or Out of the Switch		$V_{I/O}$	Channel On or Off	0		V_{DD}	V_{PP}
Recommended Static or Dynamic Voltage Across the Switch (Note2)		ΔV_{SW}	Channel On	0		600	mV
Output Offset Voltage		$V_{O(OFF)}$	V_{IN} = 0V, No Load		10		μV
ON Resistance	V_{DD}=5V	R_{ON}	$\Delta V_{SW} \leqq 500mV$ (Note2) V_{IN} = V_{IL} or V_{IH} (Control), and V_{IN} = 0 to V_{DD} (Switch)		250	1050	Ω
	V_{DD}=10V				120	500	Ω
	V_{DD}=15V				80	280	Ω
△ON Resistance Between Any Two Channels in the Same Package	V_{DD}=5V	ΔR_{ON}			25	70	Ω
	V_{DD}=10V				10	50	Ω
	V_{DD}=15V				10	45	Ω
Off Channel Leakage Current		I_{OFF}	V_{IN} = V_{IL} or V_{IH} (Control) Channel to Channel or Any One Channel, V_{DD}=15V		±0.05	±100	nA
Capacitance, Switch I/O		$C_{I/O}$	Inhibit = V_{DD}		10		pF
Capacitance, Common O/I		$C_{O/I}$	Inhibit = V_{DD}		17		pF
Capacitance, Feedthrough (Channel Off)		$C_{I/O}$	Pins Not Adjacent		0.15		pF
			Pins Adjacent		0.47		
CONTROL INPUTS – INHIBIT A, B, C (Voltages Referenced to V_{SS})							
Low Level Input Voltage	V_{DD}=5V	V_{IL}	R_{ON}= per spec, I_{OFF} = per spec		2.25	1.5	V
	V_{DD}=10V				4.50	3.0	V
	V_{DD}=15V				6.75	4.0	V
High Level Input Voltage	V_{DD}=5V	V_{IH}	R_{ON}= per spec, I_{OFF} = per spec	3.5	2.75		V
	V_{DD}=10V			7.0	5.50		V
	V_{DD}=15V			11	8.25		V
Input Leakage Current		I_{LEAK}	V_{IN}= 0 or V_{DD}, V_{DD}=15V		±0.00001	±0.1	μA
Input Capacitance		C_{IN}			5.0	7.5	pF

■ DYNAMIC ELECTRICAL CHARACTERISTICS

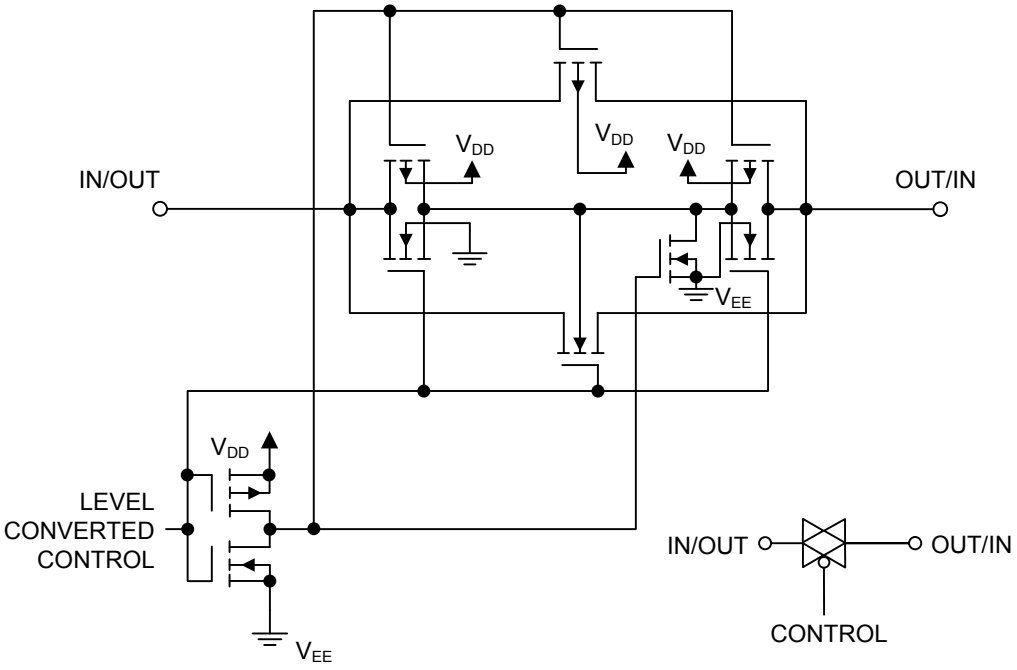
(C_L = 50pF, T_A=25°C, $V_{EE} \leqq V_{SS}$, unless otherwise specified)

PARAMETER	SYMBOL	V_{DD}-V_{EE} V_{DC}	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Times Switch Input to Switch Output (R_L = 10 kΩ)	t_{PLH}, t_{PHL}	5	t_{PLH}, t_{PHL} =(0.17 ns/pF)C_L + 21.5ns		30	75	ns
		10	t_{PLH}, t_{PHL} =(0.08 ns/pF)C_L + 8.0ns		12	30	ns
		15	t_{PLH}, t_{PHL} =(0.06 ns/pF)C_L + 7.0ns		10	25	ns
Inhibit to Output	t_{PHZ}, t_{PLZ} t_{PZH}, t_{PZL}	5	(R_L=10kΩ, V_{EE}=V_{SS})		300	600	ns
		10	Output “1” or “0” to High Impedance,		155	310	ns
		15	or High Impedance to “1” or “0” Level		125	250	ns
Control Input to Output	t_{PLH}, t_{PHL}	5	R_L = 10 kΩ, V_{EE} = V_{SS}		325	650	ns
		10			130	260	ns
		15			90	180	ns
Total Harmonic Distortion	THD	10	R_L = 10KΩ, f = 1 kHz, V_{IN} = 5 V_{PP}		0.07		%
Bandwidth	BW	10	R_L = 1kΩ, V_{IN} = 1/2 (V_{DD}–V_{EE}) p–p, C_L = 50pF, 20 Log (V_{OUT}/V_{IN}) = -3dB)		17		MHz
Off Channel Feedthrough Attenuation		10	R_L=1KΩ, V_{IN} = 1/2 (V_{DD}–V_{EE}) p–p f_{IN} = 30MHz		-50		dB
Channel Separation		10	R_L = 1kΩ, V_{IN} = 1/2 (V_{DD}–V_{EE}) p–p f_{IN} = 3MHz		-50		dB
Crosstalk, Control Input to Common O/I		10	R_1 = 1kΩ, R_L = 10kΩ Control t_{TLH} = t_{THL} = 20ns, Inhibit = V_{SS}		75		mV

Note: 1. Data of “TYP” is intended as an indication of the IC’s potential performance.

2. For voltage drops across the switch(ΔV_{SW})>600mV (>300mV at high temperature), excessive V_{DD} current may be drawn, i.e. the current out of the switch may contain both V_{DD} and switch input components. The reliability of the device will be unaffected unless the Maximum Ratings are exceeded.

■ TEST CIRCUIT



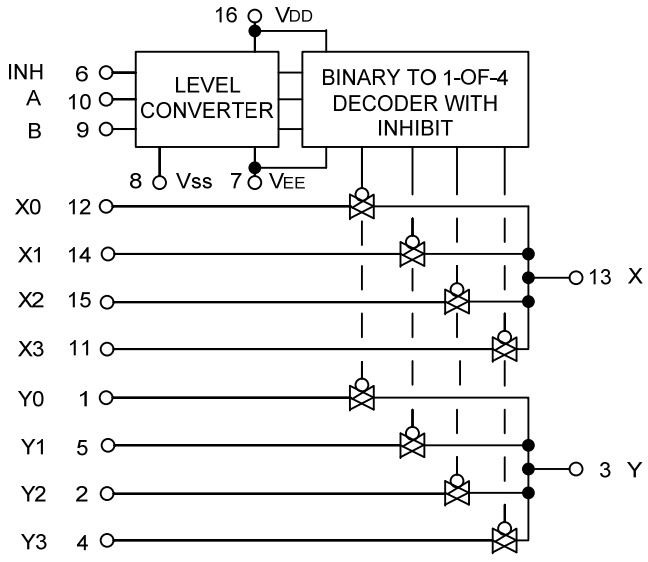
Switch Circuit Schematic

■ TRUTH TABLE

TRUTH TABLE

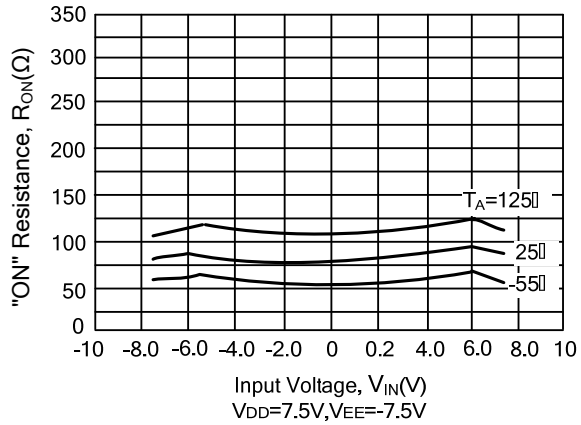
Control Inputs			ON Switches
	Select		
Inhibit	B	A	
0	0	0	Y0 X0
0	0	1	Y1 X1
0	1	0	Y2 X2
0	1	1	Y3 X3
1	X	X	None

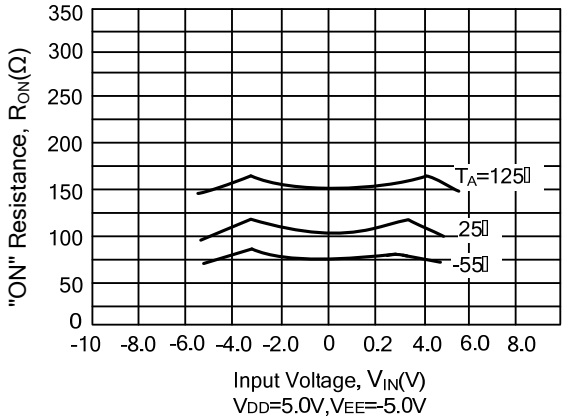
* X=Don't Care

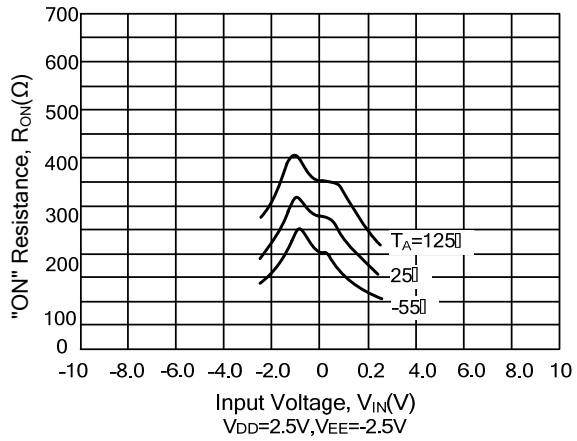


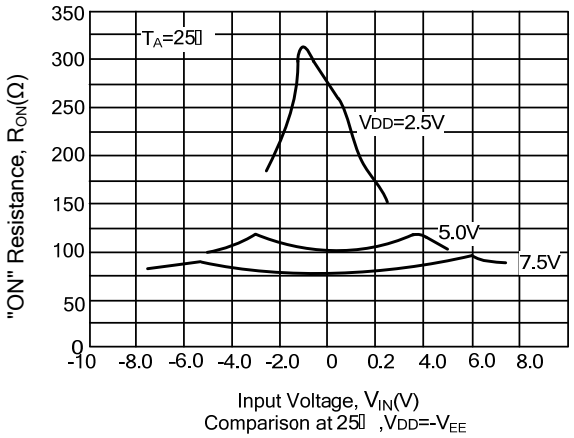
UTC 4052 Functional Diagram

■ TYPICAL CHARACTERISTICS









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