MC14551 Quad 2-Channel Analog Multiplexer/Demultiplexer

1. General Description

1.1 Description

The GR14551 is a digitally–controlled analog switch. This device implements a 4PDT solid state switch with low ON impedance and very low OFF Leakage current. Control of analog signals up to the complete supply voltage range can be achieved.

1.2 Features

- Triple diode protection on all control inputs
- Supply voltage range = 3 Vdc to 18 Vdc
- Analog voltage range (V_{DD} – V_{EE}) = 3 to 18 V
  Note: V_{EE} must be ≤ V_{SS}
- Linearized transfer characteristics
- Switch function is break before make

1.3 Device Information

PART NUMBER	PACKAGE
GR14551	DIP
	SOP

2. Connection Diagrams and Pin Description

Figure 2.1 Top View

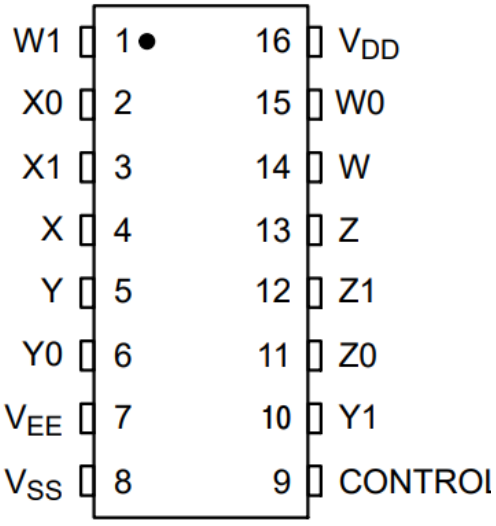
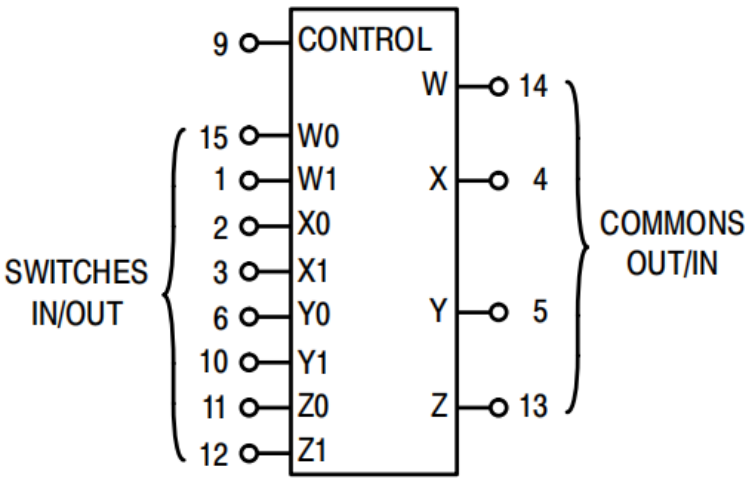


Figure 2.2 Pin Description



NOTE: Control Input referenced to V_{SS}, Analog Inputs and Outputs reference to V_{EE}. V_{EE} must be ≤ V_{SS}.

V_{DD} = Pin 16
V_{SS} = Pin 8
V_{EE} = Pin 7

Control	ON
0	W0 X0 Y0 Z0
1	W1 X1 Y1 Z1

3. System Diagram

3.1 Logic Diagram

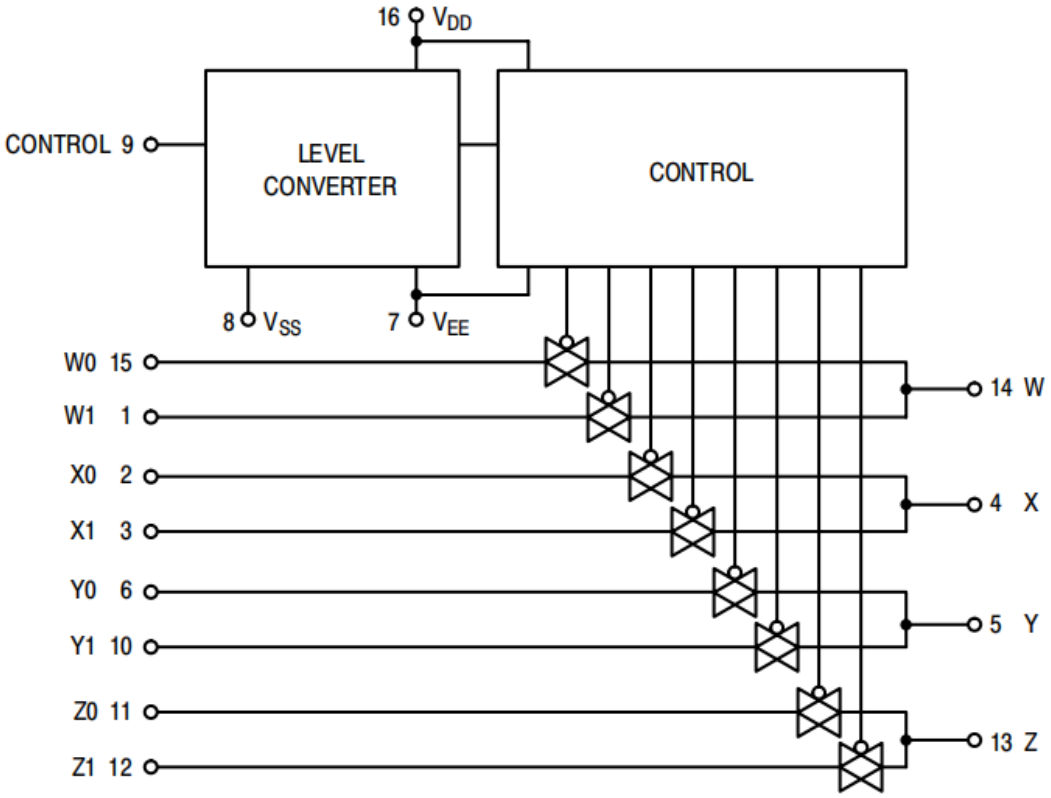


Figure 3.1：GR14551 Logic Diagram

3.2 Schematic Diagram

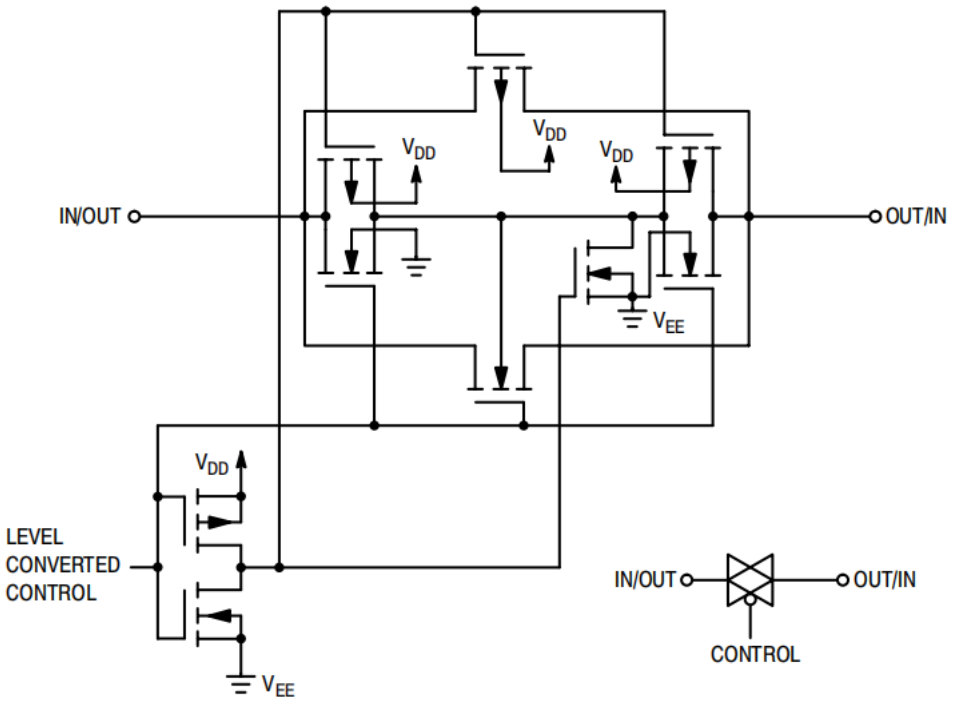


Figure 3.2：Switch Circuit Schematic

4. Specifications

4.1 Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
V_{DD}	DC Supply Voltage Range(Referenced to V_{EE}, $V_{SS} \geq V_{EE}$)	-0.5	18	V
V_{in}, V_{out}	Input or Output Voltage(Referenced to V_{SS} for Control Input & V_{EE} for Switch I/O)	-0.5	VDD+0.5	V
T_J	Junction Temperature		125	℃
T_{OP}	Operating Temperature	-40	85	℃

Absolute maximum ratings are those values beyond which the device could be permanently damaged,These are stress ratings only,which do not imply functional operation of the device at these or any other conditions beyond those indicated under normal operating conditions.

4.2 Electrical Characteristics

4.2.1 DC Specifications

(T_a=25℃, unless otherwise specified)

Symbol	Parameter	Test Condition	V_{DD}	MIN	TYP	MAX	Unit
SUPPLY REQUIREMENTS (Voltages Referenced to V_{EE})							
V_{DD}	Power Supply Voltage Range	V_{DD}-3≥V_{SS}≥V_{EE}	--	3	--	18	V
I_{DD}	Quiescent Current Per Package	Control inputs: V_{in} = V_{SS} or V_{DD}. Switch I/O:V_{EE}≤$V_{I/O}$≤V_{DD}, and ΔV_{switch} ≤ 500mV	5	--	0.01	5	uA
			10	--	0.01	5	uA
			15	--	0.01	5	uA
CONTROL INPUT (Voltages Referenced to V_{SS})							
V_{IL}	Low Level Input Voltage	R_{on} = per spec I_{off} = per spec	5	--	--	1.5	V
			10	--	--	3	V
			15	--	--	4	V
V_{IH}	High Level Input Voltage	R_{on} = per spec I_{off} = per spec	5	3.5	--	--	V
			10	7	--	--	V
			15	11	--	--	V
I_{IN}	Input Leakage Current	V_{in} = 0 or V_{DD}	15	--	0	±1	uA
SWITCHES IN/OUT AND COMMONS OUT/IN — W, X, Y, Z (Voltages Referenced to V_{EE})							
$V_{I/O}$	Recommended Peak-to-Peak Voltage Into or Out of the Switch	Channel On or Off	--	0	--	V_{DD}	V_{p-p}
ΔV_{switch}	Recommended Static or Dynamic Voltage Across the Switch	Channel On		0	--	600	mV
V_{OO}	Output Offset Voltage	V_{in} = 0V, No Load	--	--	10	--	uV

R_{on}	ON Resistance	$\Delta V_{switch} \leq 500mV$ $V_{in} = V_{IL}$ or V_{IH} (Control), and V_{in}=0 to V_{DD} (Switch)	5	--	200	500	Ω
			10	--	100	300	Ω
			15	--	50	200	Ω
ΔR_{on}	ΔON Resistance Between Any Two Channels in the Same Package	R_{on} = per spec I_{off} = per spec	5	--	10	50	Ω
			10	--	5	30	Ω
			15	--	5	30	Ω
I_{off}	Off–Channel Leakage Current	$V_{in} = V_{IL}$ or V_{IH} (Control) Channel to Channel or Any One Channel	15	--	0	±1	uA

For voltage drops across the switch (ΔV_{switch}) > 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.

5. Parameter Measurement Information

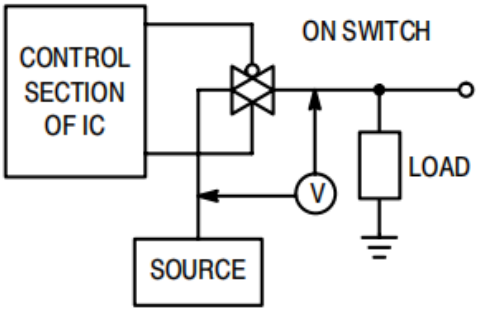


Figure 5.1：ΔV Across Switch

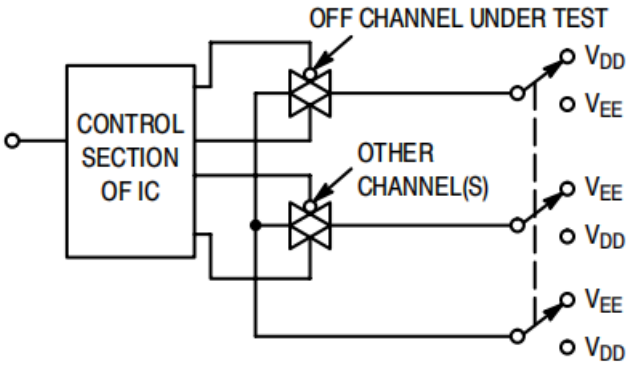


Figure 5.2：Off Channel Leakage

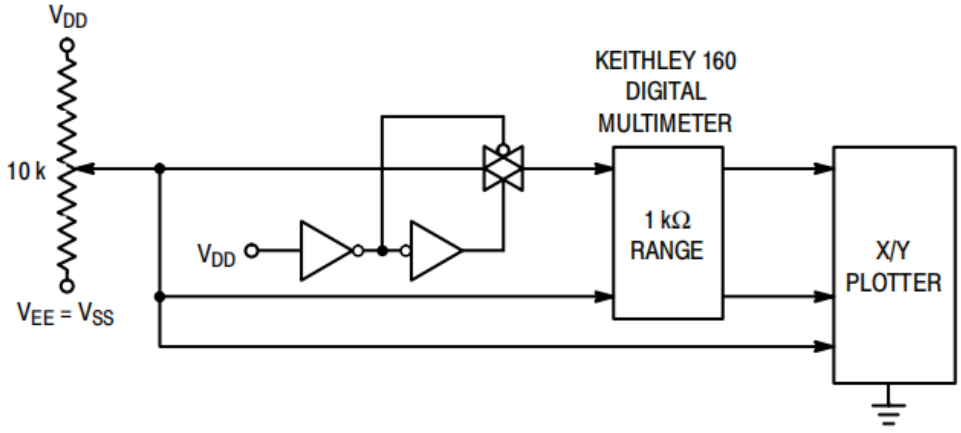


Figure 3.4：Channel Resistance (R_{ON}) Test Circuit

6. Applications information

Figure 6.1 illustrates use of the on–chip level converter detailed in Figure 3.2. The 0 to 5 volt Digital Control signal is used to directly control a 9 Vp-p analog signal.

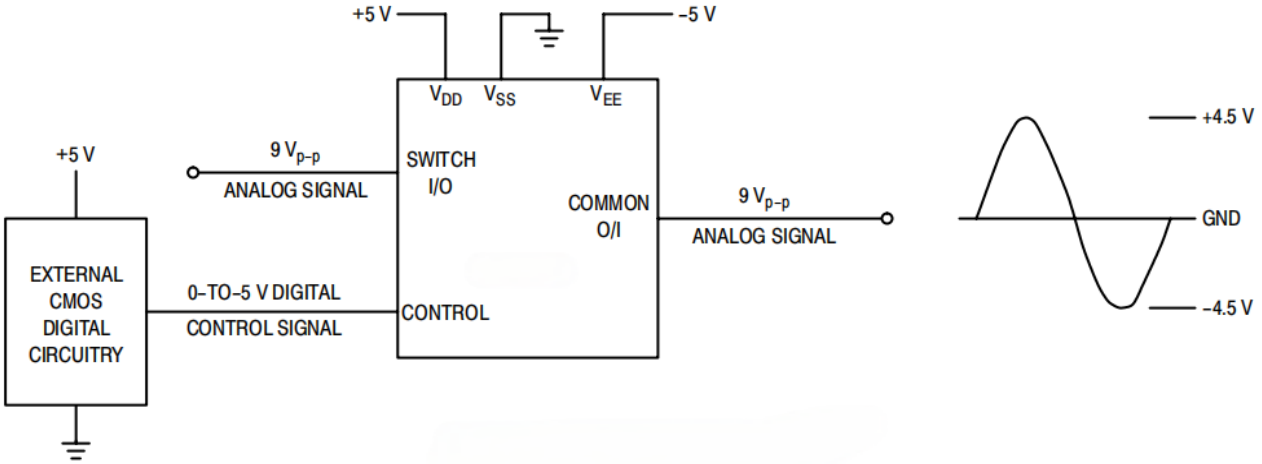


Figure 6.1：Application example

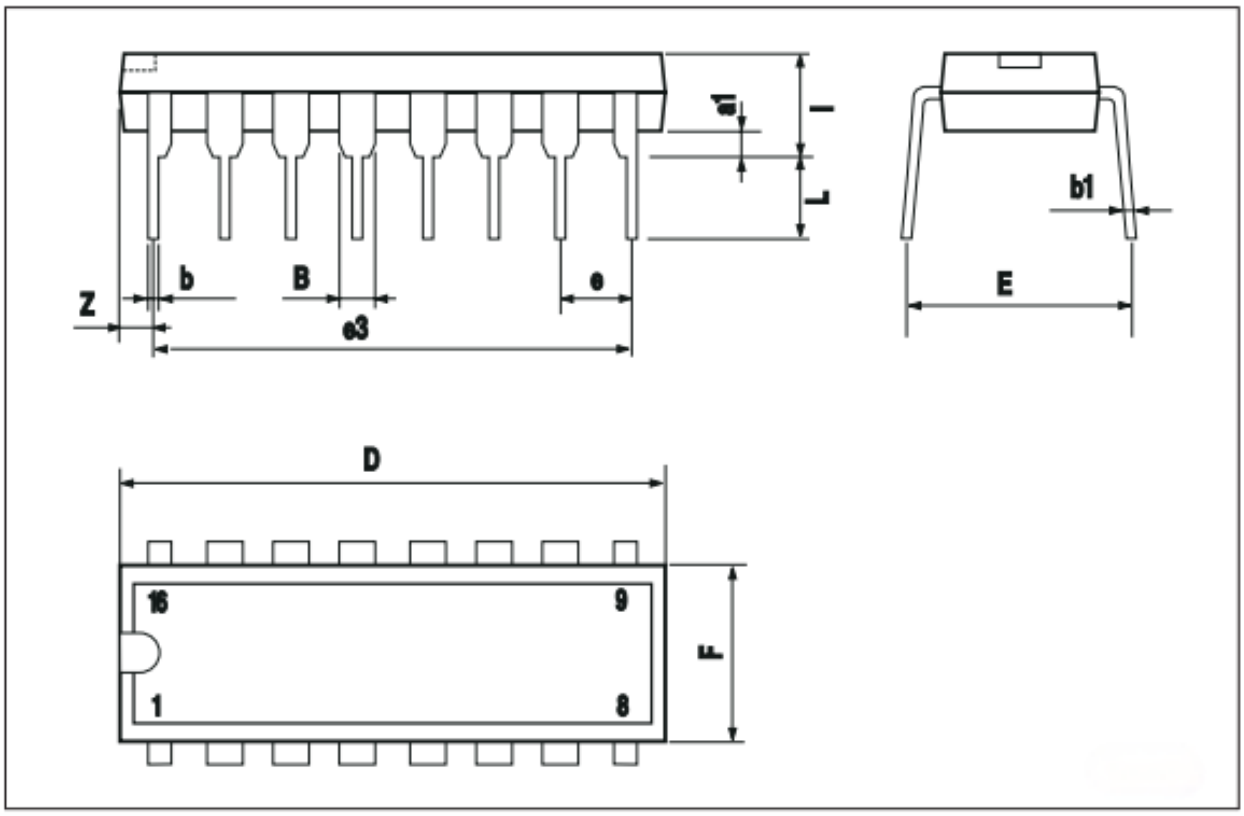
7. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
GR14551ND16ATBE	DIP	16	Tube	25
GR14551NS16ARDQ	SOP	16	Tape & Reel	4000

8. Package Information

8.1 DIP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



8.2 SOP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)