DESCRIPTION

The A4752 is digitally controlled analog switches that use silicon gate CMOS technology to achieve operating with low-power consumption of Standard CMOS integrated circuits.

This A4752 is a CMOS analog IC configured as two 4-channel multiplexers, operate from 2.5 V to 5.5 V.

The A4752 has low on-resistance (48Ω TYP) and very low off-leakage current (1nA TYP).

The A4752 is available in SOP16, SSOP16, TSSOP16 and QFN16(3x3) packages.

ORDERING INFORMATION

Package Type	Part Number	
SOP16 SPQ: 4,000pcs/Reel	M16	A4752M16R
		A4752M16VR
SSOP16 SPQ: 4,000pcs/Reel	MX16	A4752MX16R
		A4752MX16VR
TSSOP16 SPQ: 4,000pcs/Reel	TMX16	A4752TMX16R
		A4752TMX16VR
QFN16 (3x3) SPQ: 5,000pcs/Reel	Q16	A4752Q16R
		A4752Q16VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

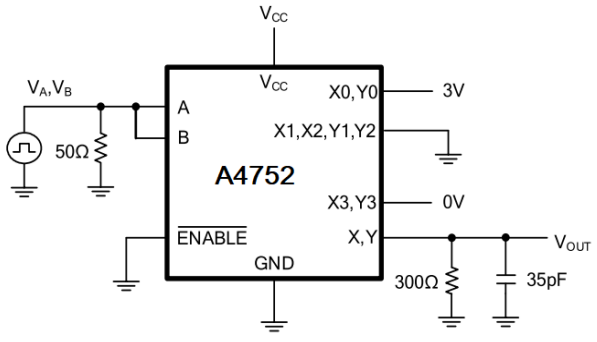
FEATURES

- Low ON Resistance, 48Ω Typical at 5V Supply
- -3dB Bandwidth: 180MHz
- Low Cross Talk Between Switches
- Single Supply Operation +2.5V to +5.5V
- Break-Before-Make Switching
- Binary Address Decoding on Chip
- Wide Operating Temp Range: -40°C to +125°C

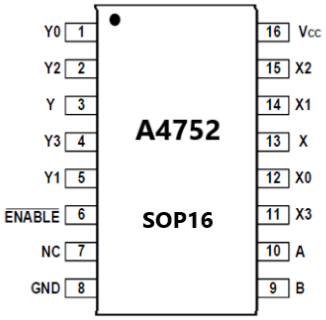
APPLICATION

- Digital Radio
- Signal Gating
- Factory Automation
- Televisions
- Appliances
- Programmable Logic Circuits
- Sensors
- Analog and Digital Multiplexing/Demultiplexing
- A/D and D/A Conversion

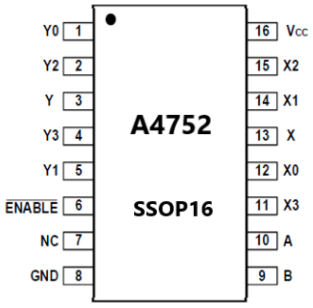
SIMPLIFIED APPLICATION



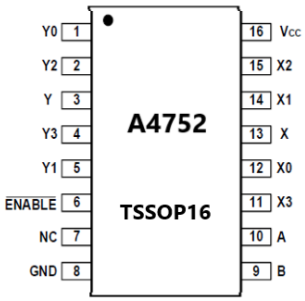
PIN DESCRIPTION



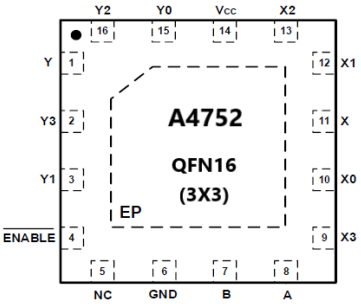
SOP16, M16
Top View



SSOP16, MX16
Top View



SOP16, TMX16
Top View



DFN16(3x3), Q16
Top View

Pin#				Symbol	Function
SOP16	SSOP16	TSSOP16	DFN16 (3x3)		
1	1	1	16	Y0	Analog Switch Inputs Y0
2	2	2	15	Y2	Analog Switch Inputs Y2
3	3	3	1	Y	Analog Switch “Y” Output.
4	4	4	2	Y3	Analog Switch Inputs Y3
5	5	5	3	Y1	Analog Switch Inputs Y1
6	6	6	4	$\overline{\text{ENABLE}}$	Digital Enable Input. Normally connected to GND.
7	7	7	5	NC	No Connect.
8	8	8	6	GND	Ground. Connect to digital ground.
9	9	9	7	B	Digital Address “B” Input.
10	10	10	8	A	Digital Address “A” Input.
11	11	11	9	X3	Analog Switch InputsX3
12	12	12	10	X0	Analog Switch InputsX0
13	13	13	11	X	Analog Switch “X” Output.
14	14	14	12	X1	Analog Switch InputsX1
15	15	15	13	X2	Analog Switch Inputs X2
16	16	16	14	V_{CC}	Positive Analog and Digital Supply Voltage Input
—			Expose Pad	EP	Exposed Pad. Connect EP to GND.

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range, (unless otherwise noted) (1)

V_{CC}, Supply Voltage		-0.3V ~ 6.0V
V_{IN}, Input Voltage (All inputs)		-0.3V ~(V_{CC})0.3V
I_{IN}, Switch Input Current	Any one input	±20mA
I_{PEAKC} Peak Switch Current	Pulsed at 1ms Duration, <10% Duty Cycle	±40mA
T_J, Junction Temperature		150℃
T_{STG}, Storage Temperature		-65℃ ~ 150℃
ESD Ratings		
$V_{(ESD)}$, Electrostatic Discharge	Human-body model (HBM)	±4000V
	Machine model (MM)	±1000V

Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

FUNCTION TABLE

$\overline{\text{ENABLE}}$ INPUT	INPUT STATES		ON CHANNEL(S)
	A	B	
1	X	X	NONE
0	0	0	X0,Y0
0	1	0	X1,Y1
0	0	1	X2,Y2
0	1	1	X3,Y3

X=Don't care

NOTE: Input and output pins are identical and interchangeable.
Either may be considered an input or output; signals pass equally well in either direction

RECOMMENDED OPERATING CONDITIONS

Over operating free-air temperature range (unless otherwise noted) (3)

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{CC}	2.5	5.5	V
Operating temperature	T_A	-40	+125	℃

ELECTRICAL CHARACTERISTICS

V_{CC} = 5.0 V or 3.3V,Typical values are at T_A = +25°C. (unless otherwise noted)

Parameter		Conditions	V+	Temp	Min	Typ	Max	Unit
ANALOG SWITCH								
$V_{X\_}$,V_X $V_{Y\_}$,V_Y	Analog Signal Range			-40~+125℃	0		V_{CC}	V
R_{ON}	On Resistance	V_{CC}=5V, I_X, I_Y=1mA	5V	+25℃	-	48	65	Ω
				-40~+125℃			70	Ω
		V_{CC}=3.3V, I_X, I_Y =1mA	3.3V	+25℃		100	130	Ω
				-40~+125℃			140	Ω
ΔR_{ON}	On Resistance Match Between Channels	V_{CC}=5V, I_X, I_Y =1mA Switch ON	5V	+25℃		1.5	5	Ω
				-40~+125℃			5.3	Ω
$R_{FLAT(ON)}$	On-Resistance Flatness	V_{CC}=5V, I_X, I_Y =1mA Switch ON	5V	+25℃		17	25	Ω
				-40~+125℃			28	Ω
$I_{X\_(OFF)}$, $I_{Y\_(OFF)}$ $I_{X(OFF)}$, $I_{Y(OFF)}$ $I_{X(ON)}$, $I_{Y(ON)}$	X_ Off, Y_ Off, X Off, Y Off, X On, Y On Leakage Current	V_{CC}=5V, $V_{X\_}$, $V_{Y\_}$=1V, 4.5V V_X, V_Y =4.5V, 1V	5V	+25℃		1	100	nA
		V_{CC}=3.3V, $V_{X\_}$, $V_{Y\_}$=1V, 3V V_X, V_Y =3V, 1V	3.3V	+25℃		1	100	nA
DIGITAL CONTROL INPUTS								
V_{AH}, V_{BH}, $V_{\overline{ENABLE}}$	Logic Input Logic Threshold High		5V	+25℃	1.7			V
			3.3V	+25℃	1.7.			V
V_{AL}, V_{BL}, $V_{\overline{ENABLE}}$	Logic Input Logic Threshold Low		5V	+25℃			0.5	V
			3.3V	+25℃			0.5	V
I_{AH}, I_{BH}, $I_{\overline{ENABLE}}$	Input-Current High	V_A, V_B,$V_{\overline{ENABLE}}$ = V_{CC}	3.3V to 5.0V	+25℃		1	100	nA
I_{AL}, I_{BL}, $I_{\overline{ENABLE}}$	Input-Current Low	V_A, V_B,$V_{\overline{ENABLE}}$ = 0V	3.3V to 5.0V	+25℃		1	100	nA

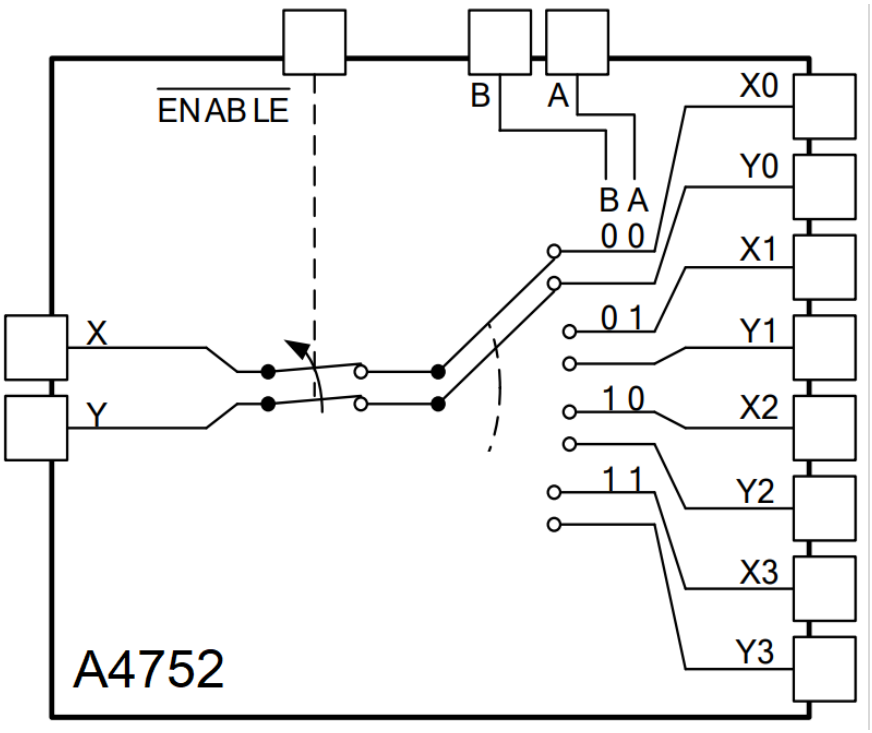
All unused digital inputs of the device must be held at VIO or GND to ensure proper device operation.

ELECTRICAL CHARACTERISTICS (Conti)

V_{CC}= 5.0 V or 3.3V, Typical values are at T_A = +25°C (unless otherwise noted)

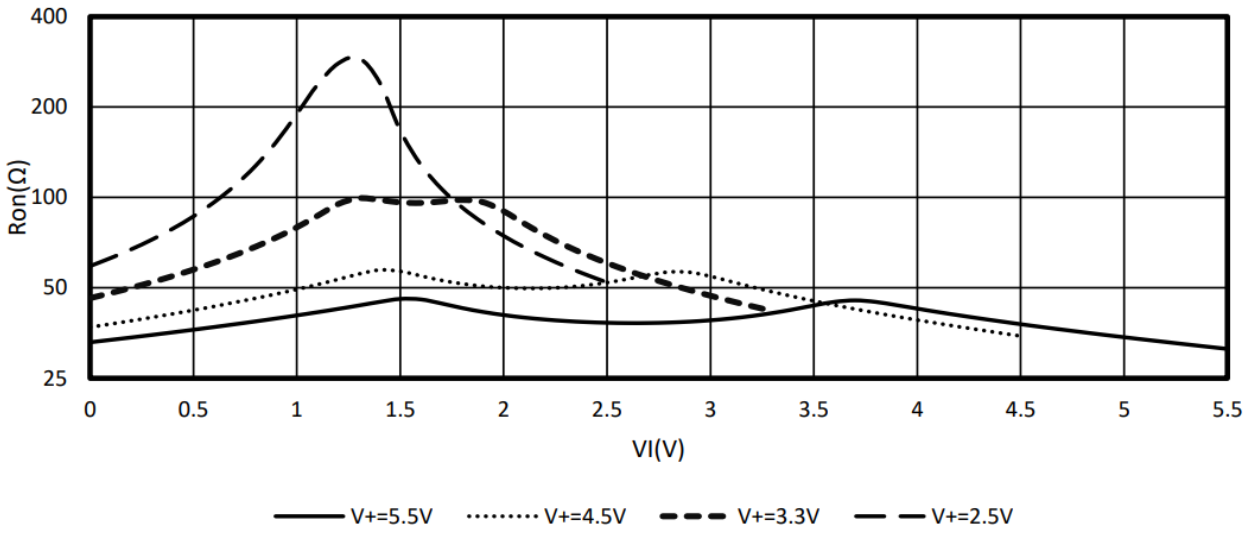
Parameter		Conditions	V+	Min	Typ	Max	Unit
t_{TRANS}	Address Transition Time	$V_{X\_}$, $V_{Y\_}$= 3V/0V, R_L = 300Ω, C_L =35pF, Test Circuit 1	5V		120		ns
		$V_{X\_}$, $V_{Y\_}$= 3V/0V, R_L = 300Ω, C_L =35pF, Test Circuit 1	3.3V		210		ns
t_{ON}	$\overline{ENABLE}$ Turn On Time	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	5V	-	70		ns
			3.3V		130		
t_{OFF}	$\overline{ENABLE}$ Turn-Off Time	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	5V		80		ns
			3.3V		120		
t_R	Internal A, B, C Rise Time		5V		50		ns
			3.3		80		
t_F	Internal A, B, C Fall Time		5V		60		ns
			3.3		85		ns
t_D	Break-Before-Make Time Delay	$V_{X\_}$, $V_{Y\_}$ = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 3	5V		50		ns
			3.3V		80		
Q	Charge Injection	R_S = 0Ω, C_L = 1nF, Test Circuit 4	5V		6		pC
		R_S = 0Ω, C_L = 1nF, Test Circuit 4	3.3		4		pC
X_{TALK}	Crosstalk	f = 1MHz, Test Circuit 5	5V		-110		dB
O_{ISO}	Off Isolation	R_L = 50Ω, f = 1MHz, Test Circuit 5	3.3		-83		dB
BW	-3dB Bandwidth	R_L = 50Ω	5V		180		MHz
			3.3V		180		MHz
$C_{X\_(OFF)}$, $C_{X\_(OFF)}$	Input Off-Capacitance	f = 1MHz, Test Circuit 6	5V		4.7		pF
$C_{X(OFF)}$ $C_{Y(OFF)}$	Output Off-Capacitance	f = 1MHz, Test Circuit 6	5V		12.7		pF
$C_{X(ON)}$ $C_{Y(ON)}$	Output On- Capacitance	f = 1MHz, Test Circuit 6	5V		16		pF
THD	Total Harmonic Distortion	R_L = 600Ω,5V_{P-P}, f = 20Hz to 20kHz	5V		0.7		%
POWER REQUIREMENTS							
V_{CC}	Power Supply Range	–40°C ~ +125°C		2.5		5.52	V
I_{CC}	Power Supply Current	V_{CC} = 5.0V, V_A, V_B, $V_{\overline{ENABLE}}$=V_{CC} or 0	5V		0.001	2	μA
		V_{CC} = 3.3V, V_A, V_B, $V_{\overline{ENABLE}}$=V_{CC} or 0	3.3V		0.001	1	μA

BLOCK DIAGRAM

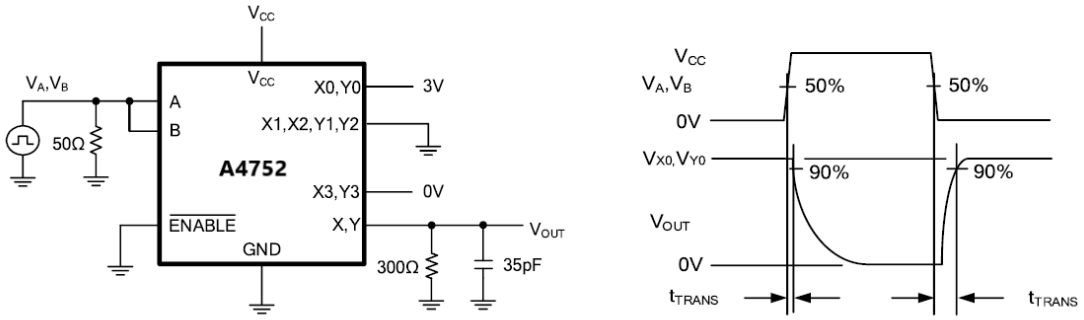


TPICAL PERFORMANCE CHARACTERISTICS

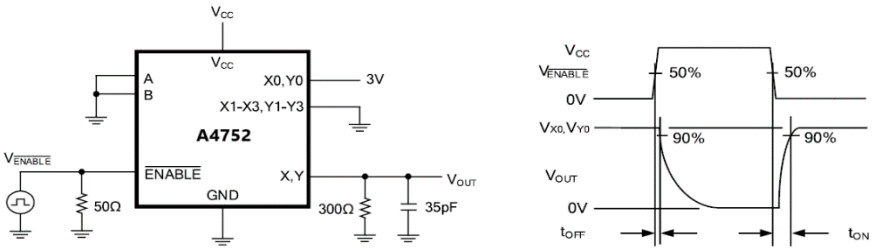
Typical Ron as a Function of Input Voltage (VI) for VI = 0 to V+



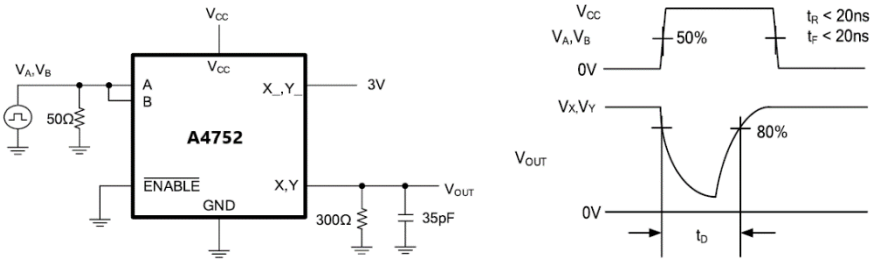
PARAMETER MEASUREMENT INFORMATION



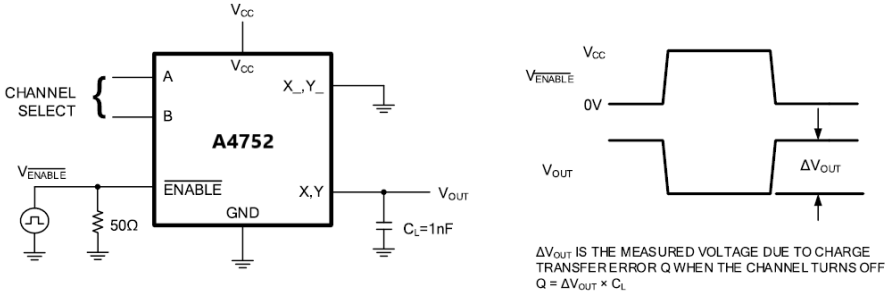
Test Circuit 1. Address Transition Times (t_{TRANS})



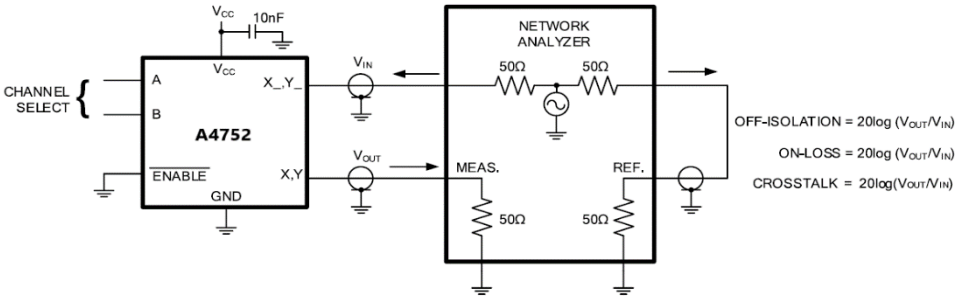
Test Circuit 2. Switching Times (t_{ON}, t_{OFF})



Test Circuit 3. Break-Before-Make Time Delay (t_D)

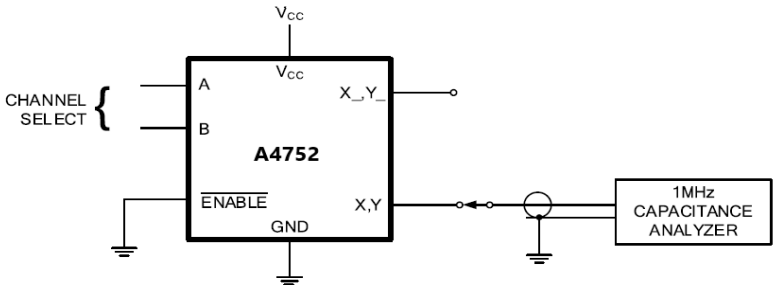


Testa Circuit 4. Charge Injection (Q)



MEASUREMENTS ARE STANDARDIZED AGAINST SHORT AT SOCKET TERMINALS.
OFF-ISOLATION IS MEASURED BETWEEN COM AND "OFF" NO TERMINAL ON EACH SWITCH.
ON-LOSS IS MEASURED BETWEEN COM AND "ON" NO TERMINAL ON EACH SWITCH.
SIGNAL DIRECTION THROUGH SWITCH IS REVERSED; WORST VALUES ARE RECORDED.

Test Circuit 5. Off Isolation, On Loss



Test Circuit 6. Capacitance

DETAILED INFORMATION

The A4752 device is a differential 4-channel multiplexer having two binary control inputs, A and B, and an inhibit input. The two binary input signals select 1 of 4 pairs of channels to be turned on and connect the analog inputs to the outputs.

One application of the A4752 is to use it in conjunction with a microcontroller to poll a keypad. Figure 1. shows the basic schematic for such a polling system. The microcontroller uses the channel select pins to cycle through the different channels while reading the input to see if a user is pressing any of the keys. This is a very robust setup, allowing for multiple simultaneous key-presses with very little power consumption. It also utilizes very few pins on the microcontroller. The down side of polling is that the microcontroller must continually scan the keys for a press and can do little else during this process.

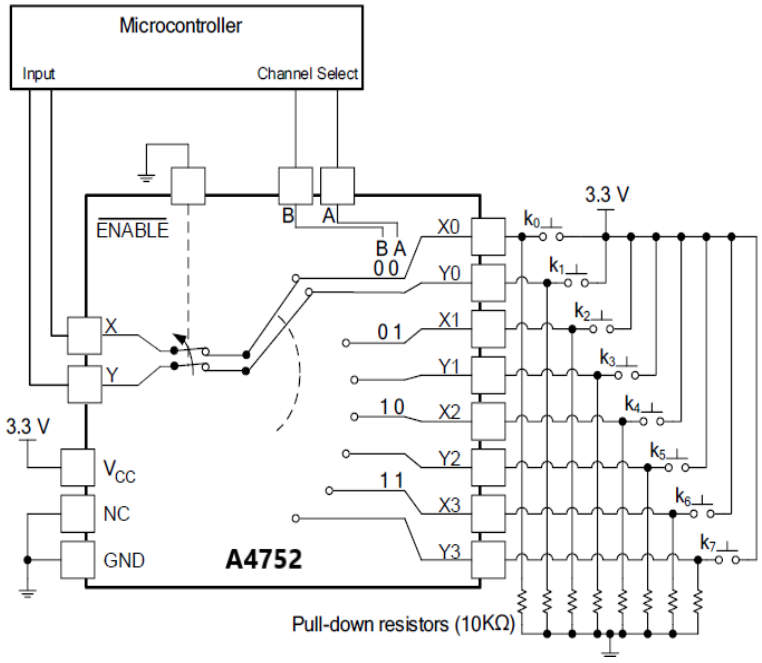
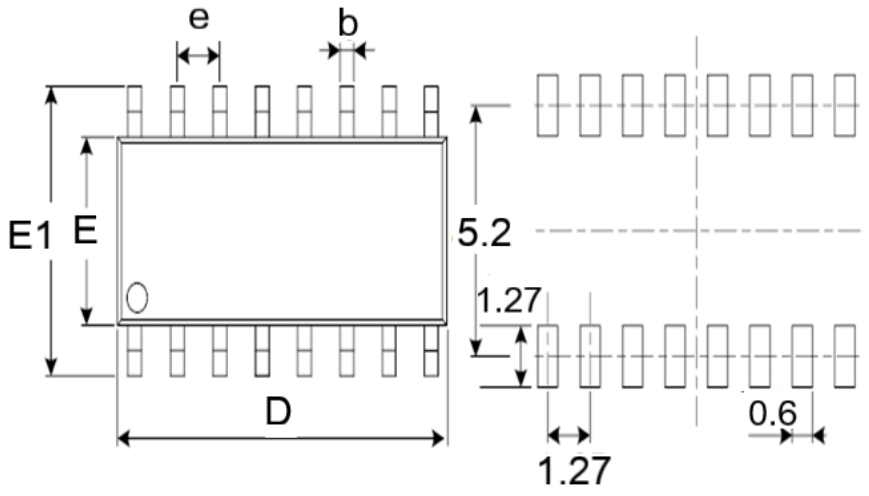


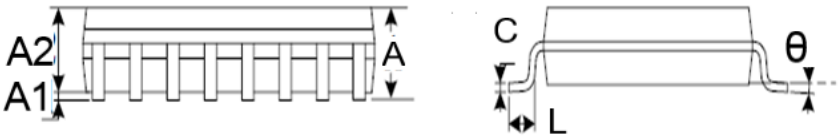
Figure 1. The A4752 Being Used to Help Read Button Presses on a Keypad.

PACKAGE INFORMATION

Dimension in SOP-16 (Unit: mm)

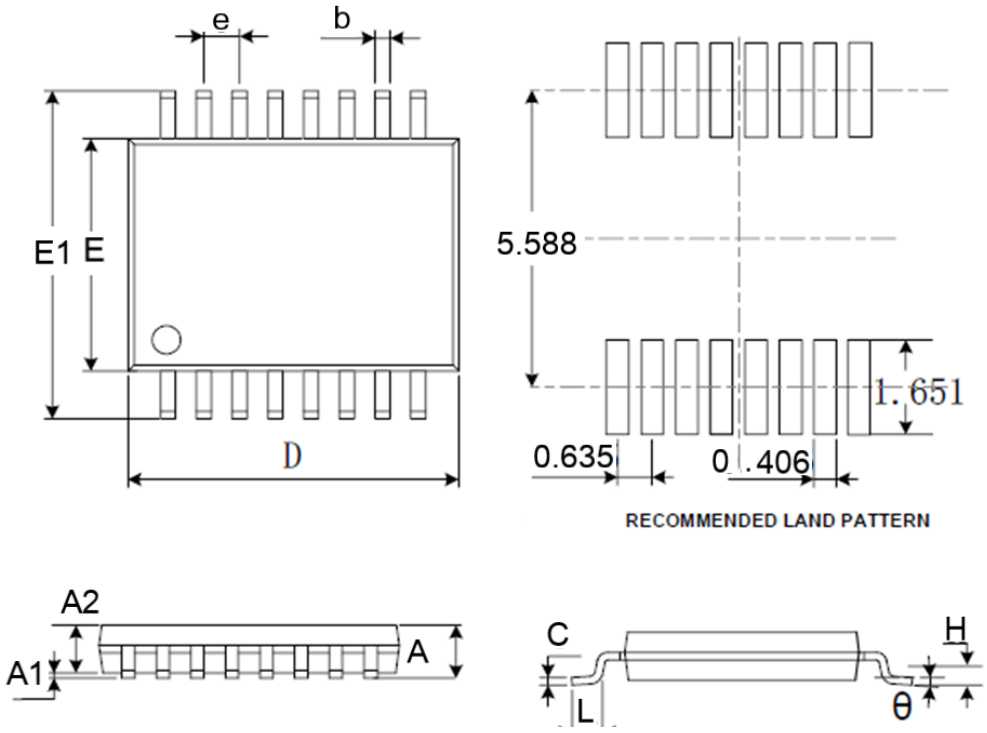


RECOMMENDED LAND PATTERN



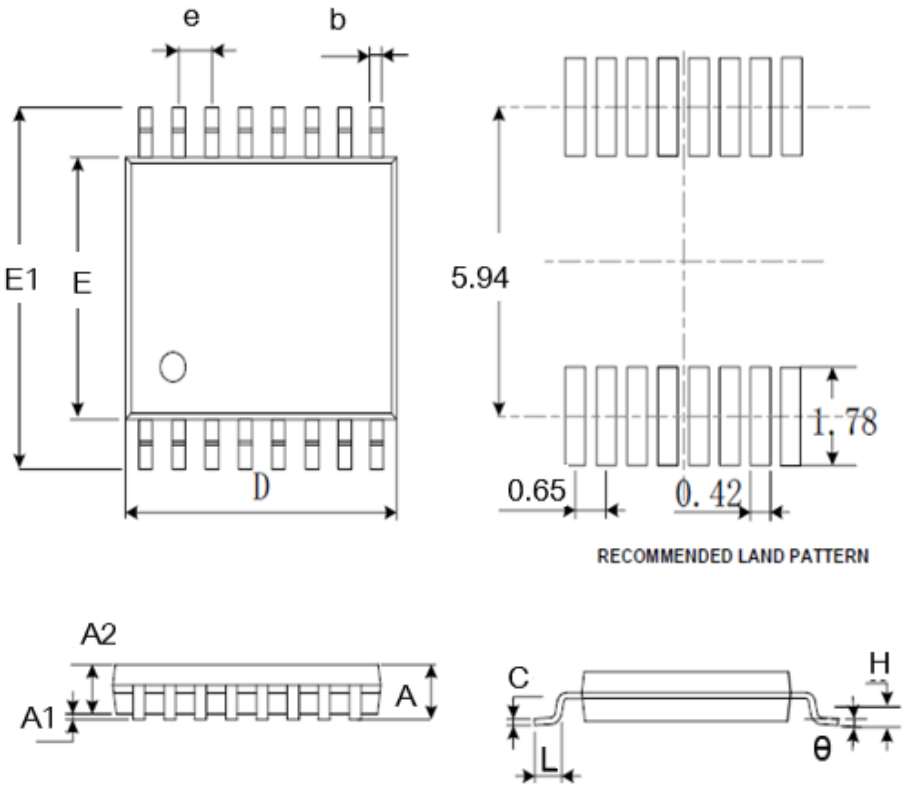
Symbol	Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	9.800	10.200
E	3.800	4.000
E1	5.800	6.200
e	1.27(BSC)	
L	0.400	1.270
θ	0°	8°

Dimension in SSOP-16 (Unit: mm)



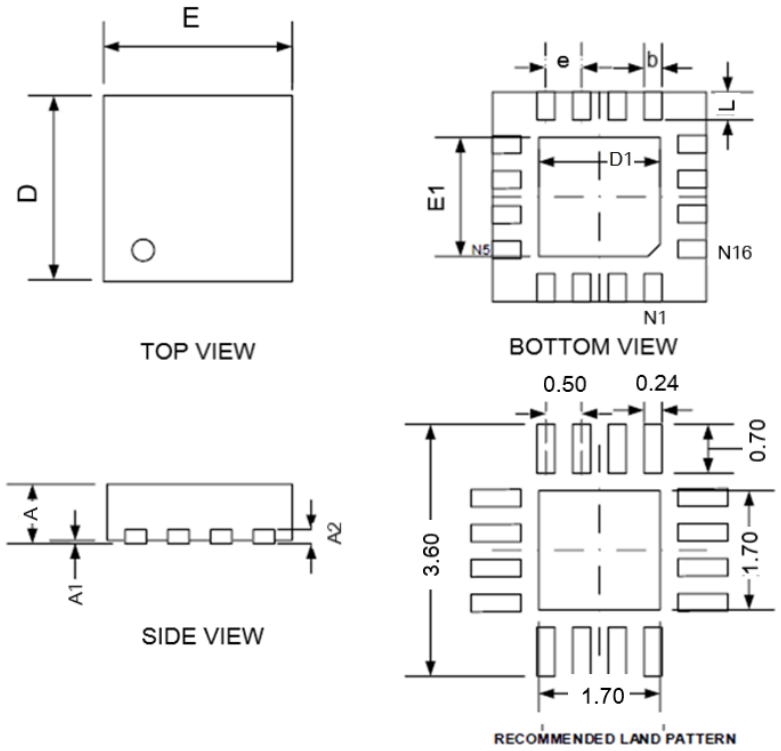
Symbol	Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.200	0.300
c	0.170	0.250
D	4.700	5.100
E	3.800	4.000
E1	5.800	6.200
e	0.635 (BSC)	
L	0.400	1.270
θ	0°	8°

Dimension in TSSOP-16 (Unit: mm)



Symbol	Millimeters	
	Min	Max
A		1.200
A1	0.050	0.150
A2	0.800	1.050
b	0.190	0.300
c	0.090	0.200
D	4.860	5.100
E	4.300	4.500
E1	6.200	6.600
e	0.650 (BSC)	
L	0.500	0.700
θ	1°	7°

Dimension in QFN16 (3X3)(Unit: mm)



Symbol	Millimeters	
	Min	Max
A	0.700	0.800
A1	0.000	0.050
A2	0.203	
b	0.180	0.300
D	2.900	3.100
D1	1.600	1.800
E	2.900	3.100
E1	1.600	1.800
e	0.500TYP	
L	0.300	0.500

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