

CMOS Triple 2-Channel Analog Multiplexer/Demultiplexer

FEATURES

- -3dB Bandwidth: 180MHz
- Single Supply Operation +2.5V to +5.5V
- Low ON Resistance, 48Ω(TYP) With 5V Supply
- High Off-Isolation: -83dB (RL = 50Ω, f = 1MHz)
- Break-Before-Make Switching
- Binary Address Decoding on Chip
- Operating Temperature Range: -40°C to +125°C
- PACKAGES: SOIC-16(SOP16), SSOP-16, TSSOP-16 and QFN-3x3-16L

DESCRIPTION

The RS2253 is a CMOS analog IC configured as three single-pole/double-throw (SPDT) switches. This CMOS device can operate from 2.5 V to 5.5 V.

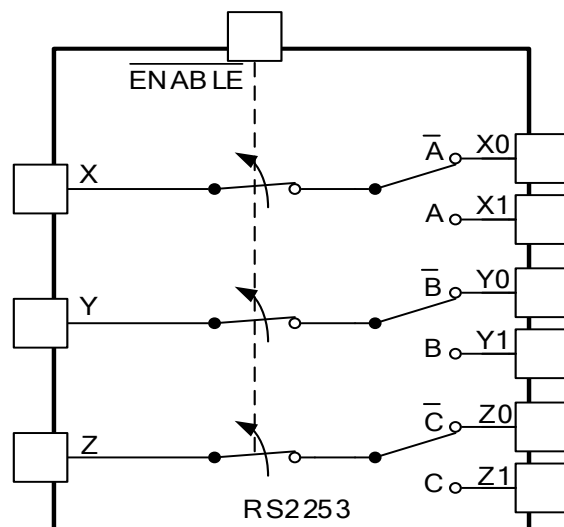
The RS2253 device are digitally-controlled analog switches. It has low on-resistance (48Ω TYP) and very low off-leakage current (1nA TYP).

The RS2253 is available in Green SOIC-16, SSOP-16, TSSOP-16 and QFN-3x3-16L packages. It operates over an ambient temperature range of -40°C to +125°C.

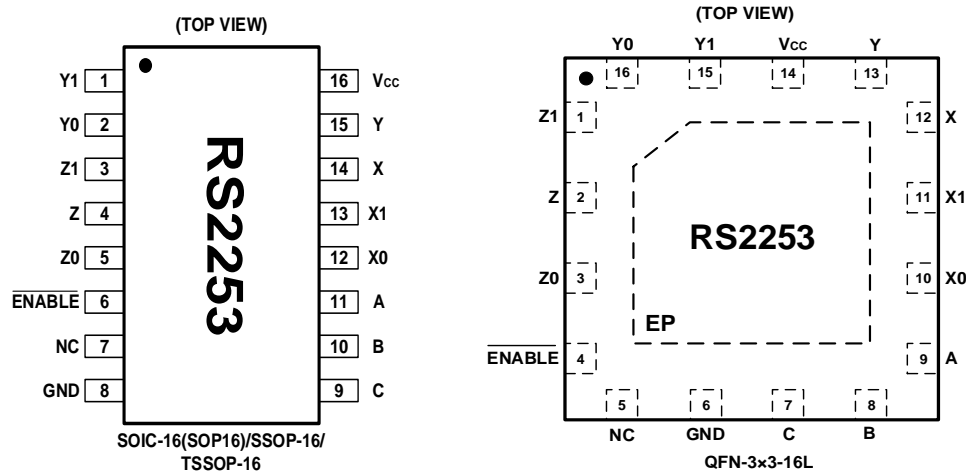
APPLICATIONS

- Sensors
- Analog and Digital Multiplexing and Demultiplexing
- A/D and D/A Conversion
- Signal Gating
- Battery-Operated Equipment
- Factory Automation
- Appliances
- Communications Circuits

Functional Diagrams of RS2253



PIN CONFIGURATIONS



PIN DESCRIPTION

| NAME | PIN SOIC-16/SSOP-16/ TSSOP-16 | PIN QFN-3x3-16L | FUNCTION |
|----------------------------|-------------------------------------|--------------------|--|
| Y1 | 1 | 15 | Analog Switch "Y" Normally Open Input. |
| Y0 | 2 | 16 | Analog Switch "Y" Normally Closed Input. |
| Z1 | 3 | 1 | Analog Switch "Z" Normally Open Input. |
| Z | 4 | 2 | Analog Switch "Z" Output. |
| Z0 | 5 | 3 | Analog Switch "Z" Normally Closed Input. |
| $\overline{\text{ENABLE}}$ | 6 | 4 | Digital Enable Input. Normally connected to GND. |
| NC | 7 | 5 | No Connect. |
| GND | 8 | 6 | Ground. Connect to digital ground. |
| C | 9 | 7 | Digital Address "C" Input. |
| B | 10 | 8 | Digital Address "B" Input. |
| A | 11 | 9 | Digital Address "A" Input. |
| X0 | 12 | 10 | Analog Switch "X" Normally Closed Input. |
| X1 | 13 | 11 | Analog Switch "X" Normally Open Input. |
| X | 14 | 12 | Analog Switch "X" Output. |
| Y | 15 | 13 | Analog Switch "Y" Output. |
| V _{CC} | 16 | 14 | Positive Analog and Digital Supply Voltage Input |
| EP | — | Exposed Pad | Exposed Pad. Connect EP to GND. |

FUNCTION TABLE

| ENABLE INPUT | INPUT STATES | | | ON CHANNEL(S) |
|-----------------|--------------|---|---|---------------|
| | C | B | A | |
| 1 | X | X | X | NONE |
| 0 | 0 | 0 | 0 | X0, Y0, Z0 |
| 0 | 0 | 0 | 1 | X1, Y0, Z0 |
| 0 | 0 | 1 | 0 | X0, Y1, Z0 |
| 0 | 0 | 1 | 1 | X1, Y1, Z0 |
| 0 | 1 | 0 | 0 | X0, Y0, Z1 |
| 0 | 1 | 0 | 1 | X1, Y0, Z1 |
| 0 | 1 | 1 | 0 | X0, Y1, Z1 |
| 0 | 1 | 1 | 1 | X1, Y1, Z1 |

X=Don't care

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

ABSOLUTE MAXIMUM RATINGS (1)

| | |
|--|----------------------|
| V _{CC} to GND..... | -0.3 to 6V |
| Input Terminals, Voltage. (2) | - 0.3 to (V+) + 0.3V |
| Continuous Current into Any Terminal..... | ±20mA |
| Peak Current, X ₁ (Pulsed at 1ms, 10% duty cycle)..... | ±40mA |
| Storage Temperature | -65°C to +150°C |
| Operating Temperature | -40°C to +125°C |
| Junction Temperature..... | +150°C |
| Package Thermal Resistance @ T _A = +25°C | |
| QFN-3x3-16L..... | 41°C/W |
| SSOP-16..... | 112°C/W |
| SOIC-16..... | 76°C/W |
| TSSOP-16..... | 110°C/W |
| Lead Temperature (Soldering, 10s) | 260°C |
| ESD Susceptibility | |
| HBM | 3000V |
| MM | 200V |


ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

(1) 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.

(2) Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.3V beyond the supply rails should be current-limited to 10mA or less.

PACKAGE/ORDERING INFORMATION

| PRODUCT | ORDERING NUMBER | TEMPERATURE RANGE | PACKAGE LEAD | PACKAGE MARKING | PACKAGE OPTION |
|---------|-----------------|-------------------|----------------|-----------------|--------------------|
| RS2253 | RS2253XS16 | -40°C ~+125°C | SOIC-16(SOP16) | RS2253 | Tape and Reel,3000 |
| | RS2253XSS16 | -40°C ~+125°C | SSOP-16 | RS2253 | Tape and Reel,3000 |
| | RS2253XTSS16 | -40°C ~+125°C | TSSOP-16 | RS2253 | Tape and Reel,3000 |
| | RS2253XTQC16 | -40°C ~+125°C | QFN-3x3 -16L | RS2253 | Tape and Reel,3000 |

ELECTRICAL CHARACTERISTICS

$V_{CC} = 5.0\text{ V}$ or 3.3 V , FULL = -40°C to $+125^{\circ}\text{C}$, Typical values are at $T_A = +25^{\circ}\text{C}$. (unless otherwise noted)

| PARAMETER | SYMBOL | CONDITIONS | V_{CC} | T_A | MIN | TYP | MAX | UNITS |
|---|--|--|------------|-------|-----|-----|----------|----------|
| ANALOG SWITCH | | | | | | | | |
| Analog Signal Range | $V_{X_}, V_{Y_}, V_{Z_}$ V_X, V_Y, V_Z | | | FULL | GND | | V_{CC} | V |
| On-Resistance | R_{ON} | $V_{CC}=5\text{V}, I_X, I_Y, I_Z=1\text{mA}$ | 5V | +25°C | | 48 | 65 | Ω |
| | | | | FULL | | | 70 | Ω |
| | | $V_{CC}=3.3\text{V}, I_X, I_Y, I_Z=1\text{mA}$ | 3.3V | +25°C | | 100 | 130 | Ω |
| | | | | FULL | | | 140 | Ω |
| On-Resistance Match Between Channels | ΔR_{ON} | $V_{CC}=5\text{V}, I_X, I_Y, I_Z=1\text{mA}$ | 5V | +25°C | | 1.5 | 5 | Ω |
| | | | | FULL | | | 5.3 | Ω |
| On-Resistance Flatness | $R_{FLAT(ON)}$ | $V_{CC}=5\text{V}, I_X, I_Y, I_Z=1\text{mA}$ | 5V | +25°C | | 17 | 25 | Ω |
| | | | | FULL | | | 28 | Ω |
| X, Y, Z Off Leakage Current | $I_{X(OFF)} I_{Y(OFF)}$ $I_{Z(OFF)}$ | $V_{X_}, V_{Y_}, V_{Z_}=1\text{V}, 4.5\text{V}$ $V_X, V_Y, V_Z=4.5\text{V}, 1\text{V}$ | 5V | +25°C | | 1 | 100 | nA |
| | | | 3.3V | +25°C | | 1 | 100 | nA |
| X, Y, Z Off Leakage Current | $I_{X(OFF)} I_{Y(OFF)}$ $I_{Z(OFF)}$ | $V_{X_}, V_{Y_}, V_{Z_}=1\text{V}, 4.5\text{V}$ $V_X, V_Y, V_Z=4.5\text{V}, 1\text{V}$ | 5V | +25°C | | 1 | 100 | nA |
| | | | 3.3V | +25°C | | 1 | 100 | nA |
| X, Y, Z On Leakage Current | $I_{X(ON)} I_{Y(ON)} I_{Z(ON)}$ | $V_{CC}=5\text{V}, V_X, V_Y, V_Z=4.5\text{V}, 1\text{V}$ | 5V | +25°C | | 1 | 100 | nA |
| | | | 3.3V | +25°C | | 1 | 100 | nA |
| DIGITAL CONTROL INPUTS⁽¹⁾ | | | | | | | | |
| Logic Input Logic Threshold High | $V_{AH}, V_{BH}, V_{CH},$ V_{ENABLE} | | 5V | +25°C | 1.7 | | | V |
| | | | 3.3V | +25°C | 1.7 | | | V |
| Logic Input Logic Threshold Low | $V_{AL}, V_{BL}, V_{CL},$ V_{ENABLE} | | 5V | +25°C | | | 0.5 | V |
| | | | 3.3V | +25°C | | | 0.5 | V |
| Input-Current High | I_{AH}, I_{BH}, I_{CH} I_{ENABLE} | $V_A, V_B, V_C, V_{ENABLE} = V_{CC}$ | 3.3V to 5V | +25°C | | 1 | 100 | nA |
| Input-Current Low | I_{AL}, I_{BL}, I_{CL} I_{ENABLE} | $V_A, V_B, V_C, V_{ENABLE} = 0\text{V}$ | 3.3V to 5V | +25°C | | 1 | 100 | nA |

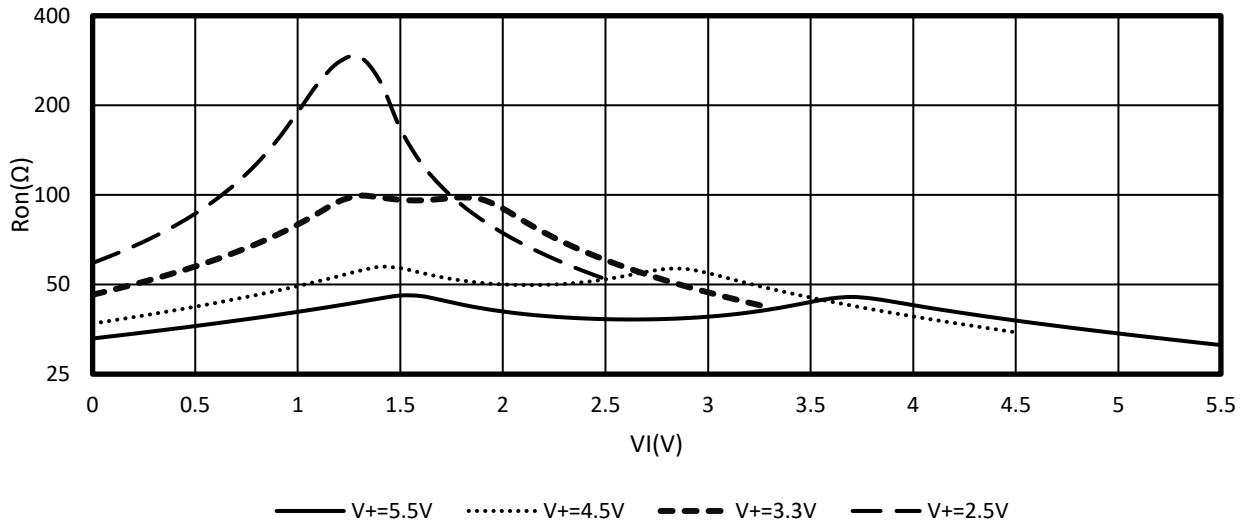
(1) All unused digital inputs of the device must be held at V_{IO} or GND to ensure proper device operation.

ELECTRICAL CHARACTERISTICS (continued)
 $V_{CC} = 5.0\text{ V or }3.3\text{ V}$, FULL = $-40^{\circ}\text{C to }+125^{\circ}\text{C}$ Typical values are at $T_A = +25^{\circ}\text{C}$ (unless otherwise noted)

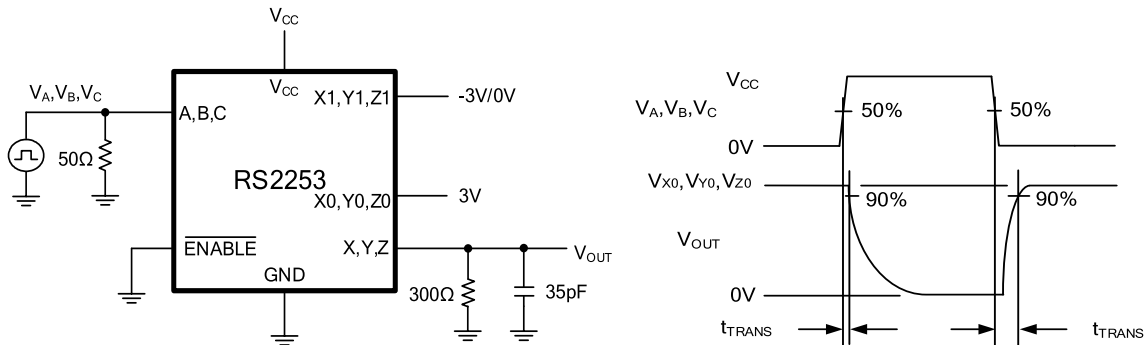
| PARAMETER | SYMBOL | CONDITIONS | V_{CC} | TEMP | MIN | TYP | MAX | UNITS |
|--|--|--|------------|-----------------------|-----|-----------|-----|---------------|
| DYNAMIC CHARACTERISTICS | | | | | | | | |
| Address Transition Time | t_{TRANS} | $V_{X_}, V_{Y_}, V_{Z_} = 3\text{V}/0\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 1 | 5V | $+25^{\circ}\text{C}$ | | 160 | | ns |
| | | $V_{X_}, V_{Y_}, V_{Z_} = 3\text{V}/0\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 1 | 3.3V | $+25^{\circ}\text{C}$ | | 240 | | ns |
| $\overline{\text{ENABLE}}$ Turn-On Time | t_{ON} | $V_{X_}, V_{Y_}, V_{Z_} = 3\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 2 | 5V 3.3V | $+25^{\circ}\text{C}$ | | 90 140 | | ns |
| $\overline{\text{ENABLE}}$ Turn-Off Time | t_{OFF} | $V_{X_}, V_{Y_}, V_{Z_} = 3\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 2 | 5V 3.3V | $+25^{\circ}\text{C}$ | | 70 100 | | ns |
| Internal A, B, C Rise Time | t_R | | 5V | $+25^{\circ}\text{C}$ | | 50 | | ns |
| | | | 3.3V | | | 80 | | |
| Internal A, B, C Fall Time | t_F | | 5V | $+25^{\circ}\text{C}$ | | 60 | | ns |
| | | | 3.3V | | | 85 | | ns |
| Break-Before-Make Time Delay | t_D | $V_{X_}, V_{Y_}, V_{Z_} = 3\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, Test Circuit 3 | 5V | $+25^{\circ}\text{C}$ | | 60 | | ns |
| | | | 3.3V | | | 90 | | ns |
| Charge Injection | Q | $R_S = 0\Omega$, $C_L = 1\text{nF}$, Test Circuit 4 | 5V | $+25^{\circ}\text{C}$ | | 6 | | pC |
| | | | 3.3V | | | 4 | | pC |
| Off Isolation | O_{ISO} | $R_L = 50\Omega$, $f = 1\text{MHz}$, Test Circuit 5 | 5V | $+25^{\circ}\text{C}$ | | -83 | | dB |
| Channel-to-Channel Crosstalk | X_{TALK} | $R_L = 50\Omega$, $f = 1\text{MHz}$, Test Circuit 5 | 5V | $+25^{\circ}\text{C}$ | | -110 | | dB |
| -3dB Bandwidth | BW | $R_L = 50\Omega$ | 5V | $+25^{\circ}\text{C}$ | | 180 | | MHz |
| | | | 3.3V | | | 180 | | MHz |
| Input Off-Capacitance | $C_{X(OFF)}$ $C_{Y(OFF)}$ $C_{Z(OFF)}$ | $V_{X_}, V_{Y_}, V_{Z_} = 0\text{V}$, $f = 1\text{MHz}$, Test Circuit 6 | 5V | $+25^{\circ}\text{C}$ | | 4.7 | | pF |
| Output Off-Capacitance | $C_{X(OFF)}$ $C_{Y(OFF)}$ $C_{Z(OFF)}$ | $V_{X_}, V_{Y_}, V_{Z_} = 0\text{V}$, $f = 1\text{MHz}$, Test Circuit 6 | 5V | $+25^{\circ}\text{C}$ | | 12.7 | | pF |
| Output On- Capacitance | $C_{X(ON)}$ $C_{Y(ON)}$ $C_{Z(ON)}$ | $V_{X_}, V_{Y_}, V_{Z_} = 0\text{V}$, $f = 1\text{MHz}$, Test Circuit 6 | 5V | $+25^{\circ}\text{C}$ | | 16 | | pF |
| Total Harmonic Distortion | THD | $R_L = 600\Omega$, $5V_{P-P}$, $f = 20\text{Hz to }20\text{kHz}$ | 5V | $+25^{\circ}\text{C}$ | | 0.7 | | % |
| POWER REQUIREMENTS | | | | | | | | |
| Power Supply Range | V_{CC} | | | FULL | 2.5 | | 5.5 | V |
| Power Supply Current | I_{CC} | $V_{CC} = 5.0\text{V}$, V_A, V_B, V_C , $V_{ENABLE} = V_{CC}$ or 0 | 5V | $+25^{\circ}\text{C}$ | | 0.001 | 2 | μA |
| | | $V_{CC} = 3.3\text{V}$, V_A, V_B, V_C , $V_{ENABLE} = V_{CC}$ or 0 | 3.3V | $+25^{\circ}\text{C}$ | | 0.001 | 1 | μA |

TYPICAL CHARACTERISTICS

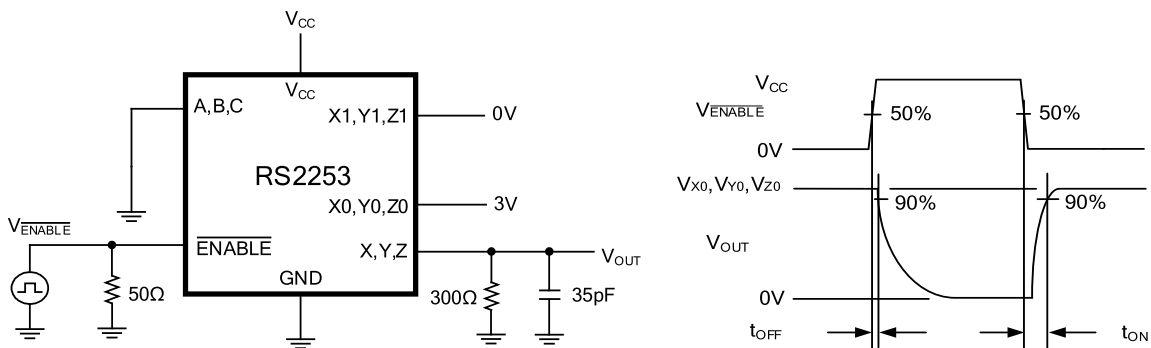
Typical r_{on} as a Function of Input Voltage (V_I) for $V_I = 0$ to V_+



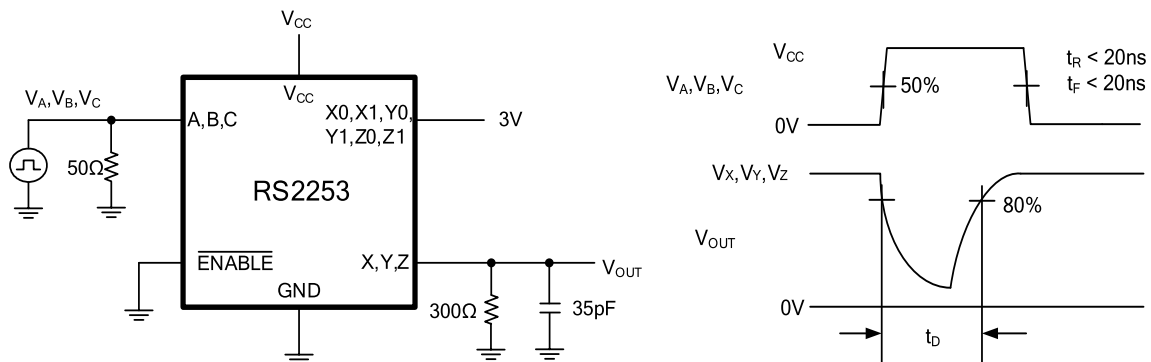
Parameter Measurement Information



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

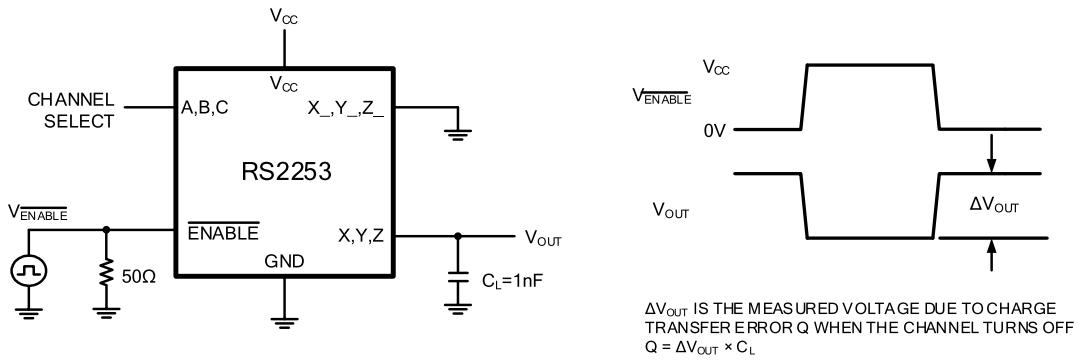


Test Circuit 2. Switching Times (t_{ON} , t_{OFF})

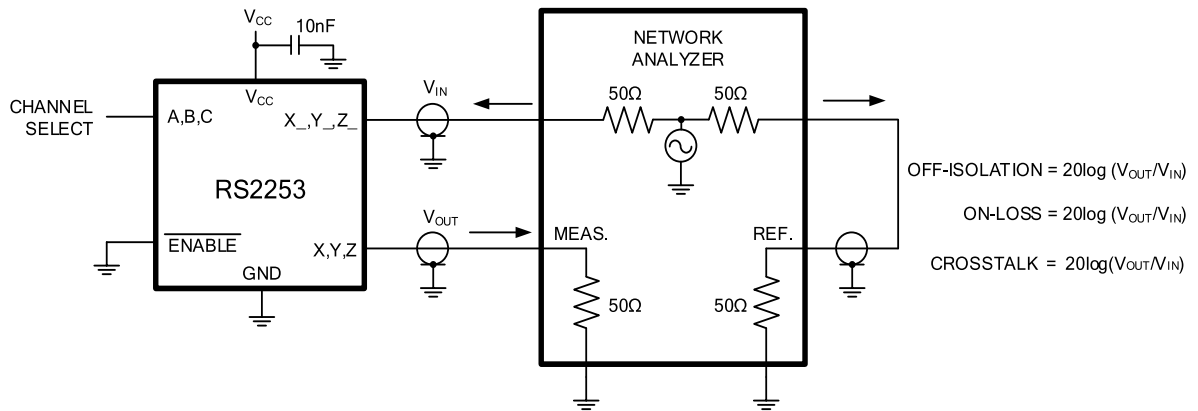


Test Circuit 3. Break-Before-Make Time Delay (t_D)

Parameter Measurement Information (continued)

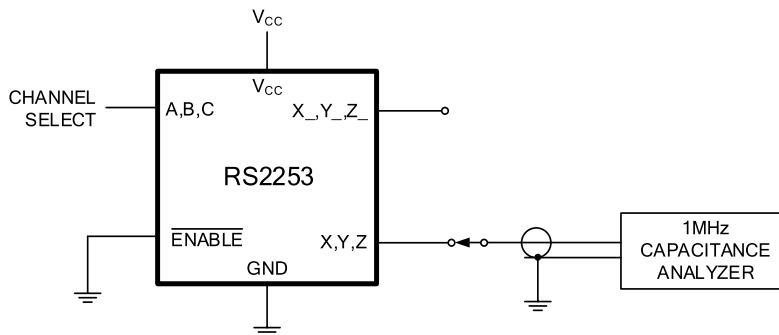


Test Circuit 4. Charge Injection (Q)



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.
 CROSSTALK IS MEASURED FROM ONE CHANNEL(A,B,C) TO ALL OTHER CHANNELS.
 SIGNAL DIRECTION THROUGH SWITCH IS REVERSED; WORST VALUES ARE RECORDED.

Test Circuit 5. Off Isolation, On Loss



Test Circuit 6. Capacitance

APPLICATION NOTES

The RS2253 device is a triple 2-channel multiplexer having three separate digital control inputs, A, B, and C, and an inhibit input. Each control input selects one of a pair of channels which are connected in a single-pole, double-throw configuration.

When the devices are used as demultiplexers, the CHANNEL IN/OUT terminals are the outputs and the COMMON OUT/IN terminals are the inputs.

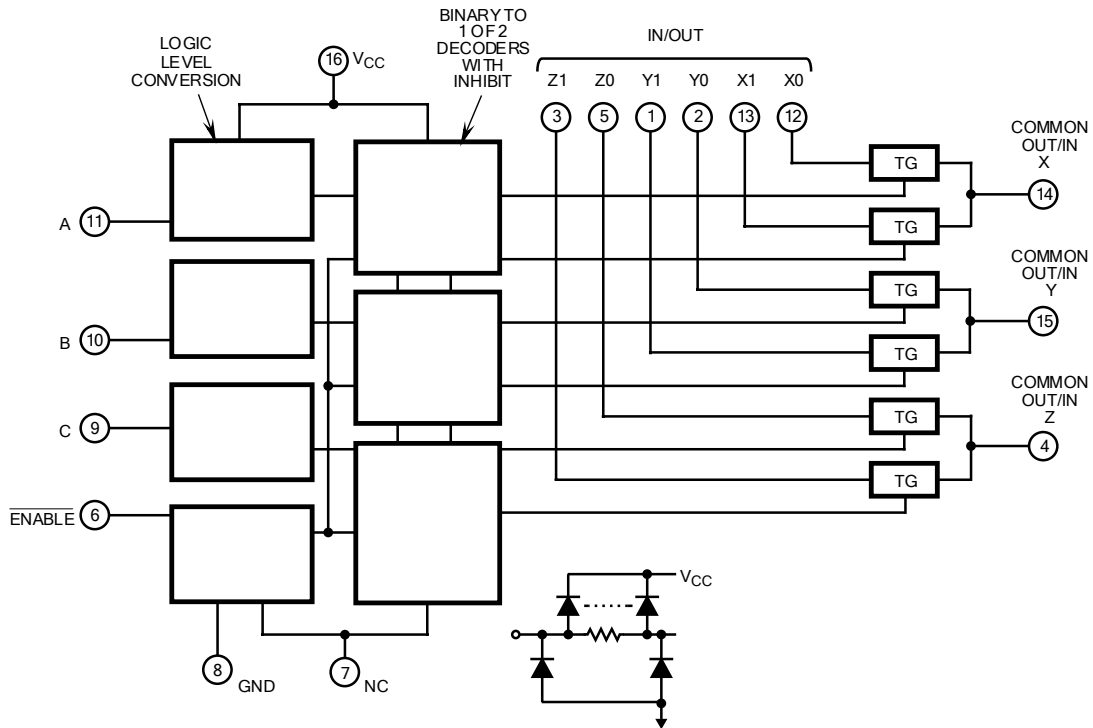
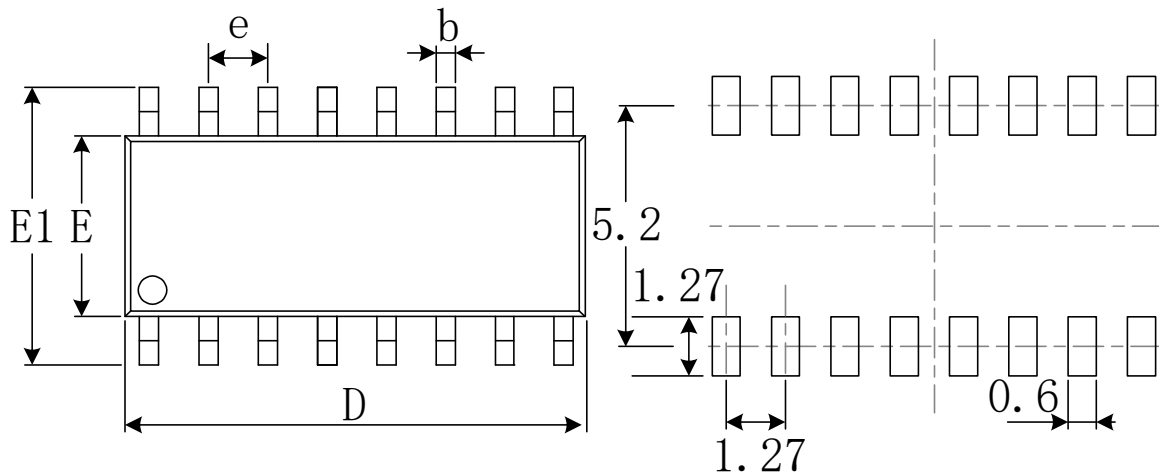


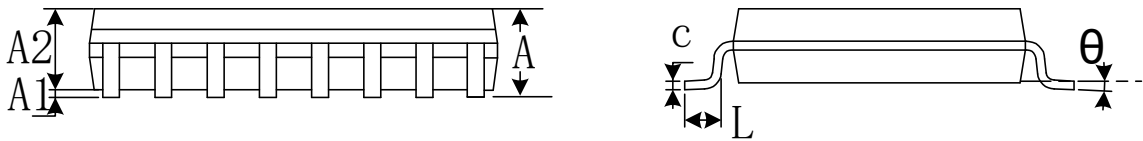
Figure 1. The RS2253 Functional Block Diagram

PACKAGE OUTLINE DIMENSIONS

SOIC-16

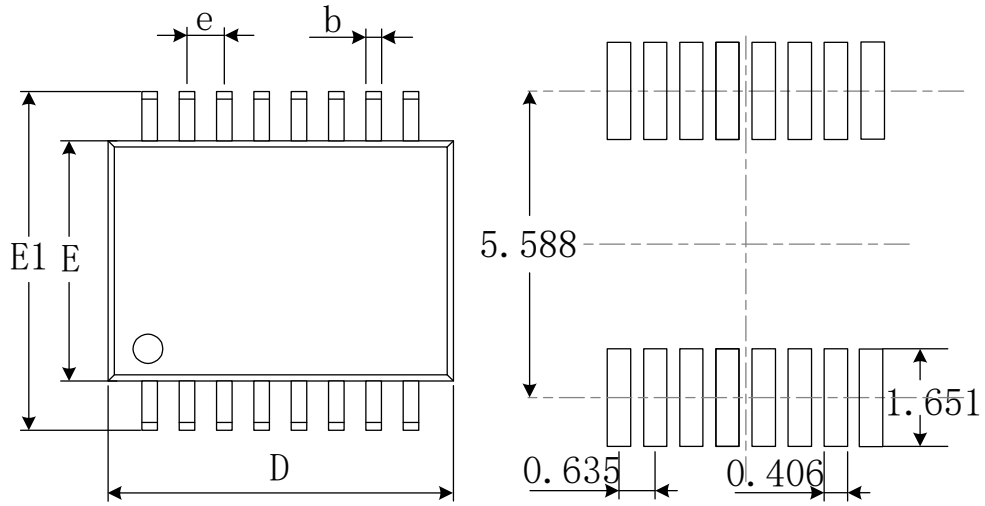


RECOMMENDED LAND PATTERN (Unit: mm)

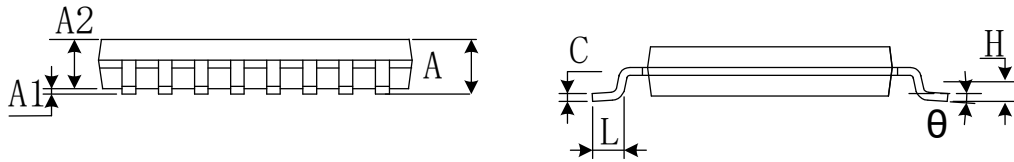


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|---------------------------|--------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 9.800 | 10.200 | 0.386 | 0.402 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.27(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

SSOP-16

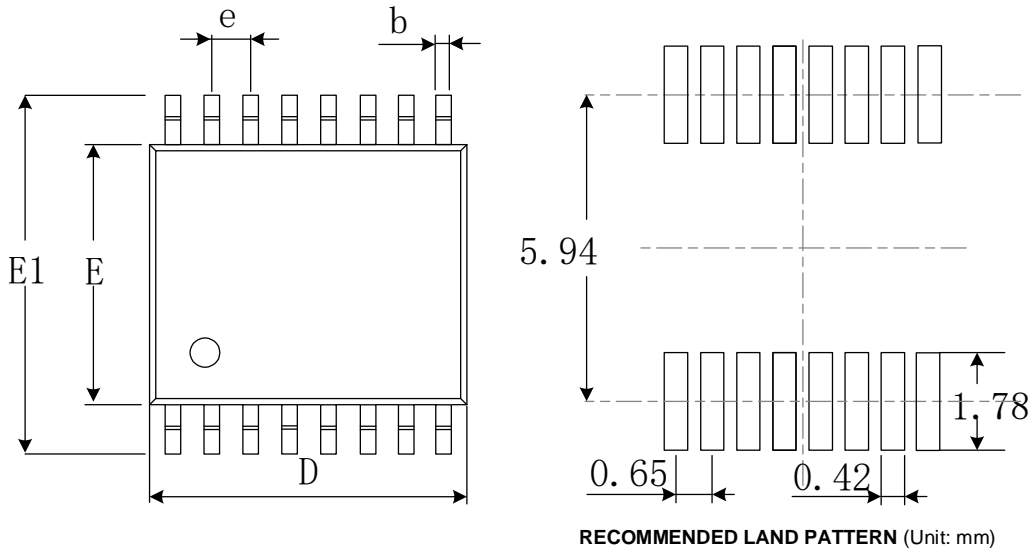


RECOMMENDED LAND PATTERN (Unit: mm)



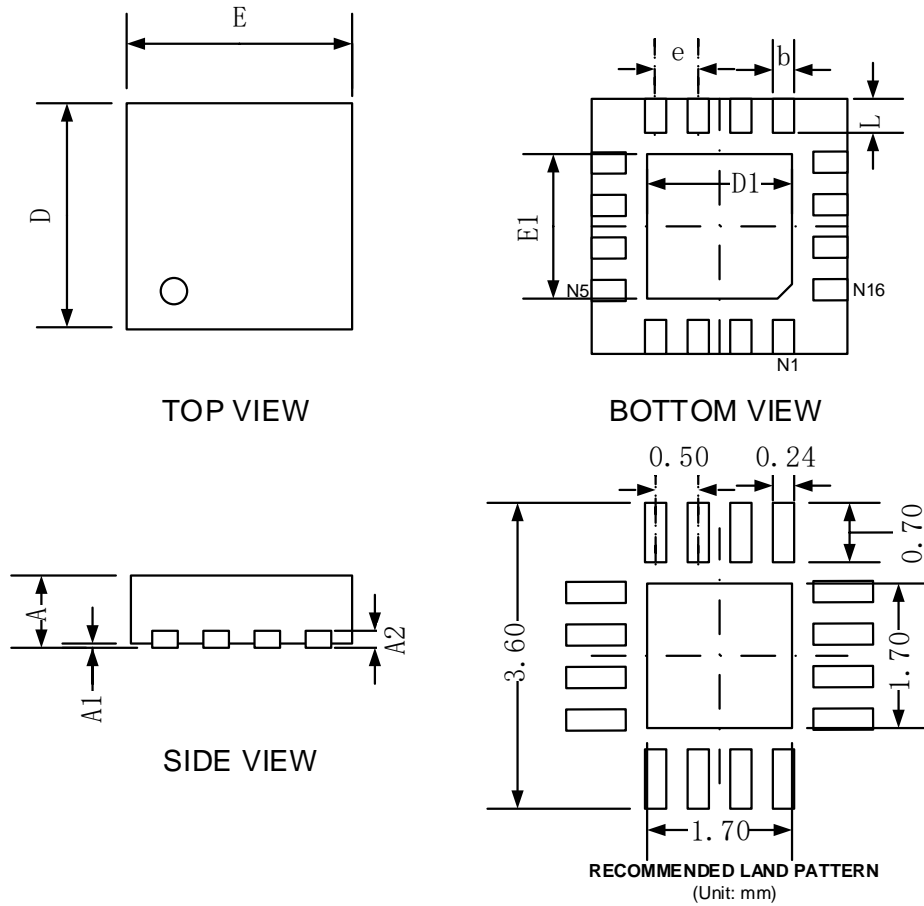
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.200 | 0.300 | 0.008 | 0.012 |
| c | 0.170 | 0.250 | 0.007 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 0.635(BSC) | | 0.025(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

TSSOP-16



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | | 1.200 | | 0.047 |
| A1 | 0.050 | 0.150 | 0.002 | 0.006 |
| A2 | 0.800 | 1.050 | 0.031 | 0.041 |
| b | 0.190 | 0.300 | 0.007 | 0.012 |
| c | 0.090 | 0.200 | 0.004 | 0.008 |
| D | 4.860 | 5.100 | 0.191 | 0.201 |
| E | 4.300 | 4.500 | 0.169 | 0.177 |
| E1 | 6.200 | 6.600 | 0.244 | 0.260 |
| e | 0.650(BSC) | | 0.026(BSC) | |
| L | 0.500 | 0.700 | 0.02 | 0.028 |
| H | 0.25TYP | | 0.01TYP | |
| θ | 1° | 7° | 1° | 7° |

QFN-3x3-16L



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A2 | 0.203 | | 0.008 | |
| b | 0.180 | 0.300 | 0.007 | 0.012 |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| D1 | 1.600 | 1.800 | 0.063 | 0.071 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 1.600 | 1.800 | 0.063 | 0.071 |
| e | 0.500 TYP | | 0.020 TYP | |
| L | 0.300 | 0.500 | 0.012 | 0.020 |

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [Analogue Switch ICs](#) category:

Click to view products by [RUNIC](#) manufacturer:

Other Similar products are found below :

[FSA3051TMX](#) [NLAS4684FCTCG](#) [NLVAS4599DTT1G](#) [425541DB](#) [425528R](#) [099044FB](#) [MAX4762ETB+](#) [NLAS5123MNR2G](#)
[PI5A4157CEX](#) [PI5A4599BCEX](#) [NLAS4717EPFCT1G](#) [PI5A3167CCEX](#) [DG4051EEN-T1-GE4](#) [SLAS3158MNR2G](#) [PI5A392AQEX](#)
[PI5A392AQE](#) [FSA634UCX](#) [NX3L1T5157GMZ](#) [ADG714BCPZ-REEL7](#) [HT4051ARZ](#) [BL1551B](#) [BCT4227EMB-TR](#)
[SN74LVC1G3157DBVR](#) [SN74LVC1G3157DCKR](#) [ET3157](#) [WSP6582C-12/TR](#) [AiP74HC4066TA14.TR](#) [AIP74HC4052SA16.TR](#) [GS3157-](#)
[CR](#) [74HC4051](#) [U7SB3157G-SM2-R](#) [CD4051](#) [SGM330A-YS/TR](#) [AIP4052TA16.TR](#) [RS2253XTSS16](#) [NJG1815K75-TE1](#) [BL2556ACB5TR](#)
[UM7222](#) [TC4066BP\(N,F\)](#) [TMUX136RSER](#) [DG302BDJ-E3](#) [PI5A100QEX](#) [HV2733FG-G](#) [HV2701FG-G](#) [HV2301FG-G](#) [HV2301FG-G-](#)
[M931](#) [RS2117YUTQK10](#) [RS2118YUTQK10](#) [RS2227XUTQK10](#) [MAX4715EXK+T](#)