ePIDoX.solutions

D4SWx: 0 to 3 GHz – 75 Ω Solid State RF Switch 4, 8 or 16-ports

FEATURES

- DC to 3 GHz
- Covers Full DOCSIS4.0 / DOCSIS3.1 / CATV Cable Bands
- Designed for reliability based on Solid-State circuitry
- 75 Ohm Impedance — Matched to Cable Infrastructure
- Low Insertion Loss
- Excellent Linearity - IIP3 of 63 dBm
- High Isolation: > 70dB dB RFC-to-RFx @ 1.2GHz
- High RF Input power handling: up to 27 dBm
- USB Control Interface
- Phase-Matched Outputs across all 8 Ports
- Absorptive Design: Unterminated Ports Matched to 75 Ω
- Extended Temp Range: -40 °C to +105 °C
- Powered with external 12V power supply
- Integrated ePIDoX.solutions GUI and Source code available.

APPLICATIONS

- DOCSIS4.0 / Cable TV Signal Path Switching
- CATV Headend & HFC Distribution Test
- Antenna Port Switching
- Switch Matrix
- Tuner Input Selection
- Engineering & Production Test Stations
- Automated Test Equipment (ATE)

CONFIGURATIONS

- Provided as a 4, 8 or 16 RF ports
- Stand-alone Unit or 1U rack mounted chassis

DESCRIPTION

The D4SWx is a high-reliability, low insertion loss, high isolation 75 Ω absorptive solid-state RF switch designed for CATV, DOCSIS, and broadband test infrastructure. The device covers the full frequency range from DC to 3 GHz.

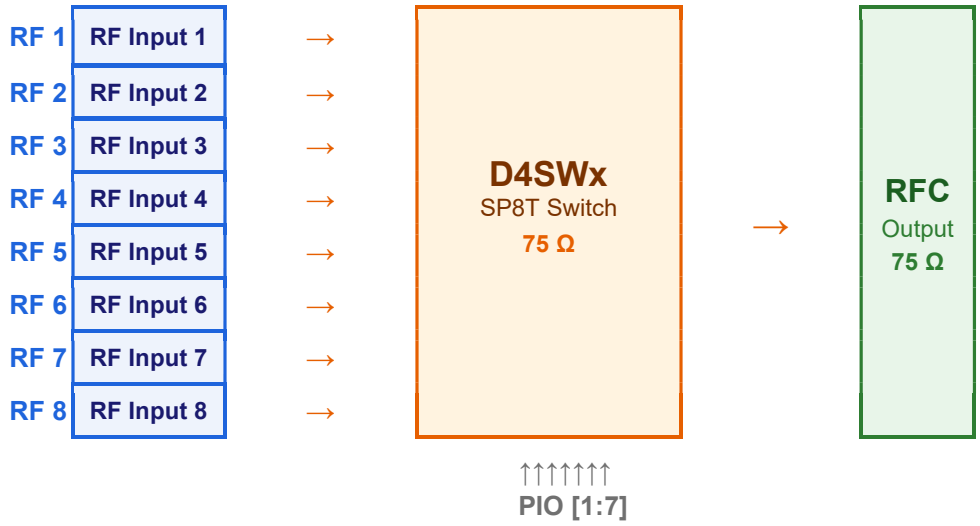
Three cascaded selection levels arranged in a binary tree topology enable the D4SWx to function as a full SP8T switch. This architecture delivers outstanding electrical performance — including a 63 dBm IIP3 and greater than 68 dB isolation at 1200MHz— alongside eight independently selectable 75 Ω RF paths.

Each unselected port is actively terminated to 75 Ω, preventing signal reflections and maintaining excellent return loss across the full operating band. The absorptive design ensures that the system RF environment remains stable regardless of which port is active.

The D4SWx is controlled via the ePIDoX.solutions Windows application, which manages port selection, COM/USB discovery, and real-time status.

BLOCK DIAGRAM — D4SWX INTERNAL ARCHITECTURE

Figure 1. D4SWx SP8T Switch — Three F2970 SP2T ICs in Binary-Tree Cascade



SWITCH CONTROL — TRUTH TABLE

Table 1. D4SWx Port Selection Logic

Selected Port	PIO 1	PIO 2	PIO 3	PIO 4	PIO 5	PIO 6	PIO 7	Active Path
RF 1	-	ON	ON	-	-	-	ON	RF1→RFC
RF 2	-	ON	ON	-	-	-	OFF	RF2→RFC
RF 3	-	ON	OFF	-	-	ON	-	RF3→RFC
RF 4	-	ON	OFF	-	-	OFF	-	RF4→RFC
RF 5	ON	OFF	-	-	ON	-	-	RF5→RFC
RF 6	ON	OFF	-	-	OFF	-	-	RF6→RFC
RF 7	OFF	OFF	-	ON	-	-	-	RF7→RFC
RF 8	OFF	OFF	-	OFF	-	-	-	RF8→RFC

ELECTRICAL SPECIFICATIONS

TC = +25 °C, ZS = ZL = 75 Ω.

Parameter	Condition / Note	Min	Typ	Max	Units
Frequency Range (MHz)	Full band	DC	—	3000	MHz
Impedance (Ω)	All ports	—	75	—	Ohm
Insertion Loss (dB)	5 – 250 MHz	—	0.50	—	dB
Insertion Loss (dB)	250 – 750 MHz	—	1.4	—	dB
Insertion Loss (dB)	1000 – 1200 MHz	—	2.0	0.57	dB
Insertion Loss (dB)	2000 – 3000 MHz	—	4.0	—	dB
Isolation RFC→RFx (dB)	5 – 250 MHz	79	84	—	dB
Isolation RFC→RFx (dB)	1000 – 1200 MHz	65	70	—	dB
Isolation RFC→RFx (dB)	2000 – 3000 MHz	57	—	—	dB
Isolation RFx→RFx (dB)	1000 – 1200 MHz	63	68	—	dB
Return Loss IL State (dB)	5 – 250 MHz	25	—	—	dB
Return Loss IL State (dB)	1000 – 3000 MHz	18	—	—	dB
Return Loss Term. State (dB)	5 – 250 MHz	27	—	—	dB
Input IP3 (dBm)	Per stage, Pin = 13 dBm/tone	—	63	—	dB
Input P1dB (dBm)	5 – 250 MHz	29	31	—	dB
Max Input CW Power (dBm)	IL State, TC=85°C	—	—	27	dBm
Max Input CW Power (dBm)	Hot Switching	—	—	21	dBm
Switching Time (µs)	50% ctrl to 90% RF	—	2.7	—	Us
Max Switching Rate (kHz)		—	—	25	kHz
Supply Voltage (V)	VDD	10.0	12.0	14.0	Volts
Supply Current (µA)		—	300	500	

ABSOLUTE MAXIMUM RATINGS

Stresses beyond those listed may cause permanent device damage. Do not operate under these conditions.

Parameter	Symbol	Maximum	Units
VDD to GND	VDD	14.0	V
Max CW Input Power (IL State)	PABS	30	dBm
Max CW Input Power (Terminated)	PABS	26	dBm
Junction Temperature	Tjmax	140	°C
Storage Temperature	TST	150	°C
ESD HBM (JEDEC JS-001-2012)	VESDHBM	2000 (Class 2)	V
ESD CDM (JEDEC 22-C101F)	VESDCDM	1500 (Class C3)	V

PHYSICAL & ENVIRONMENTAL

Parameter	Details
Power Requirements	+5 VDC, 100 mA — from USB connection
Operating Temperature	-40 °C to +105 °C (TC, exposed paddle)
Relative Humidity	< 95% (non-condensing)
Power Interface	USB Type-C
Control Interface	USB HID / Ethernet — no kernel driver required
RF Connectors	75 Ω BNC Female (× 9: 1× RFC input, 8× RF outputs)
Dimensions (Stand-alone)	182.9 × 83.1 × 21.8 mm (7.2 × 3.27 × 0.86 in)
Weight (Stand-alone)	< 454 g (< 1.0 lb)
Programming	Windows GUI, C# , LabVIEW, WebUI, Python

USER INTERFACE — EPIDOX.SOLUTIONS CONTROL PANEL

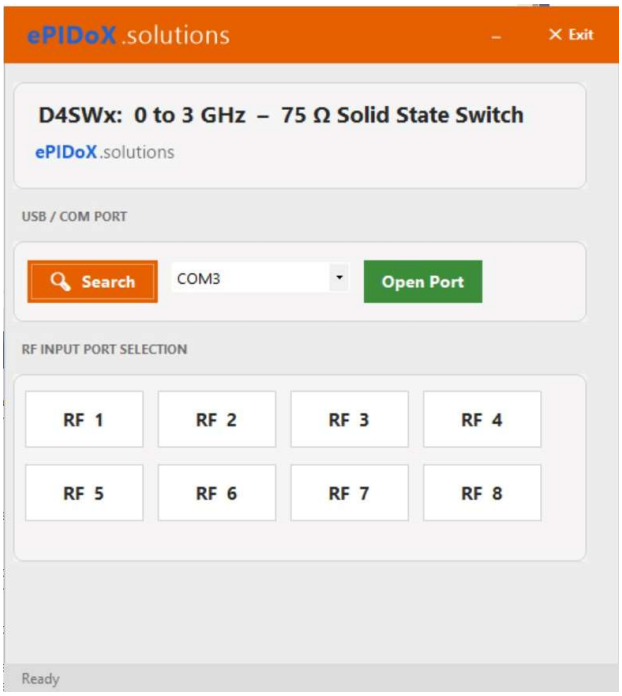


Figure 2. D4SWx Control Panel — ePIDoX.solutions Windows Application

The D4SWx is operated through the ePIDoX.solutions Windows application providing real-time status, COM port discovery, and one-click RF path selection. The interface is organized into three sections

USB / COM Port Connection

A USB serial connection to the D4SWx must be established before RF switching. The USB / COM Port section provides:

- Search button: Scans all COM ports on the host PC and refreshes the drop-down list. Click each time the D4SWx is plugged in or replugged.
- COM Port drop-down: Lists all detected ports. Select the port corresponding to the D4SWx (visible as a USB Serial Device in Windows Device Manager).
- Open Port / Close Port button: Opens the selected port at 115 200 baud, 8N1. The button turns red and reads Close Port when active. The status bar confirms the live connection.

RF Input Port Selection (RF 1 to RF 8)

The RF Input Port Selection panel provides eight buttons labeled RF 1 through RF 8, arranged in a 4x2 grid. Each button corresponds to one of the eight 75 Ohm RF output ports on the D4SWx hardware.

- Click any RF button to route the RFC common input to that port.
- The active button highlights in vivid blue. The previously active button returns to white.
- A non-blocking background task writes the correct PIO logic states via the serial port.

- The status bar updates to confirm the active port and PIO states sent to hardware.
- Switching is glitch-free and completes in under 30 microseconds.

ORDERING INFORMATION

Part Number	Configuration	Description
D4SWx	Stand-alone	Single unit, no chassis
D4SW4	Stand-alone	4 RF ports Single unit, no chassis
D4SW8	Stand-alone	8 RF ports Single unit, no chassis
D4SW16	Stand-alone	16 RF ports Single unit, no chassis
D4SW4r	1 RU (1 unit)	4 RF ports in 1U rack chassis
D4SW8r	1 RU (4 units)	8 RF ports in 1U rack chassis
D4SW16r	1 RU (8 units)	16 RF ports in 1U rack chassis

REVISION HISTORY

Rev	Date	Description
1.0	June 2025	Initial release of Datasheet