

## Wavelength Selective Switch (WSS) 1x9



### Key Features



- 100 GHz 1x9
- Free space optics and MEMS technology
- Optional integrated PLC based OCM providing per channel power control
- Equalize, attenuate, block, switch/route any or all wavelengths
- Flat wide pass bands, low dispersion- cascability
- Colorless solution
  - Any wavelength/any port
- Telcordia qualified
- RoHS Compliant
- High volume manufacturing
  - Automated optics alignment and assembly (high throughput, multi-parameter optimization, high precision/repeatability, operator independent)
  - Fully automated test and calibration facility (auto data logging and monitoring, networked access to data and test status)
- 40 Gb/s compatible with high cascability
- CAPEX – eliminates O-E-O conversions
- OPEX – remote planning and re-configuration
- Faster time to revenue

### Applications

- Wavelength routing/grooming
  - Ring inter-connect/optical hubbing and add/drop capability – 2D to 8D nodes
- Dynamic bandwidth management and per channel output power control with OCM option

JDSU's Agile Optical Switch family provides the broadest portfolio of ROADM solutions designed to match the requirements of major market segments. They are the building blocks of Agile Optical Networks and provide the flexibility to remotely reconfigure any or all wavelengths, thereby reducing time-to-service, simplifying the network and streamlining planning and management. This results in significant Opex and Capex reductions and faster time to revenue. In addition, they enable the cost effective creation and deployment of more complex network architectures.

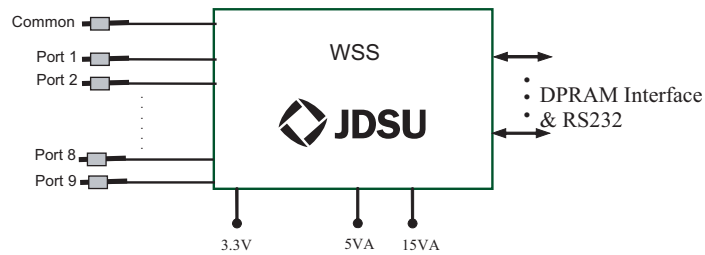
The Wavelength Selective Switch is an N-port module composed of a hermetically sealed optics block, control electronics and OCM. The optics block is based on the highly successful free space optics platform developed for the Wavelength Blockers, hence maintaining a common platform solution while evolving to the WSS. The OCM is based on JDSU controlled PLC technology providing a secure supply of low cost, per channel power and wavelength monitoring capability which is ideal for channel identification and tracking.

**Continued**

The WSS is used to dynamically attenuate, block switch and route wavelengths independently. Any wavelength/wavelengths can be routed from any port/ports to any other port/ports in any order, resulting in a colorless solution, that is highly flexible and requires no pre-planning. With the addition of the OCM functionality the WSS can provide closed loop control using JDSU software or can provide the flexibility for OCM data acquisition by the customer for use in the customer's network management software. The WSS combined with OCM provides higher level integration resulting in lower monitoring cost and reduced space requirements at a system level all within the same form factor as the current 1x9 WSS.

**Functional Diagram**

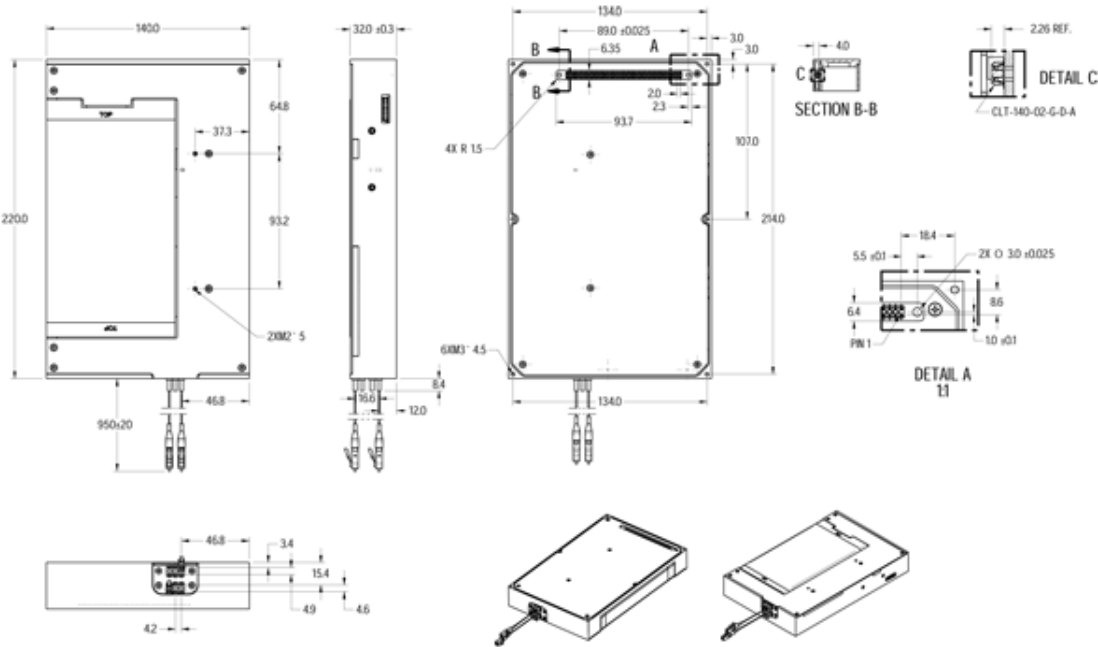
(This diagram shows the functionality of the Wavelength Selective Switch only. Diagram does not resemble actual device.)



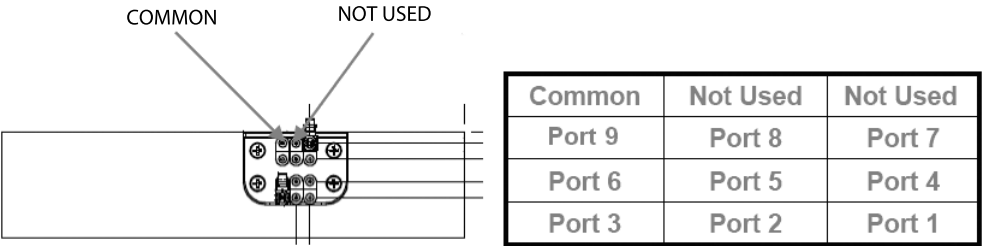
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Dimensions Diagram

(Specifications in mm unless otherwise noted.)



Fiber Output Scheme and Labeling



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## Specifications

Parameter	Condition	Minimum	Typical <sup>1</sup>	Maximum
<b>Optical-WSS</b>				
Number of ports (1 input, 9 outputs, bi-directional)		-	10	-
Wavelength spacing		-	100 GHz	-
Number of controllable channels		-	46	-
Spectral range		-	196.2 to 191.7 THz	-
Maximum input power	Aggregate power	-	-	27 dBm
	Single port	-	-	24 dBm
	Single channel	-	-	12 dBm
Insertion loss (IL)	Including connectors	-	4.0 dB	6.5 dB
0.5 dB channel bandwidth (0.5 BW)	0 dB attenuation	50 GHz	-	-
Polarization dependent loss	Over $\pm 20$ GHz at 0 dB attenuation	-	0.2 dB	0.5 dB
	Over $\pm 20$ GHz at 10 dB attenuation	-	0.3 dB	0.6 dB
	Over $\pm 20$ GHz at 15 dB attenuation	-	0.6 dB	0.9 dB
Insertion loss ripple	Over $\pm 15$ GHz at 0 dB attenuation	-	0.1 dB	0.4 dB
	Over $\pm 15$ GHz at 10 dB attenuation	-	0.3 dB	0.5 dB
	Over $\pm 15$ GHz at 15 dB attenuation	-	0.4 dB	0.8 dB
Dynamic attenuation range	Relative to channel min IL	-	0 to 15 dB	-
Attenuation step size		0.3 dB	0.1 dB	-
Extinction ratio	Over $\pm 20$ GHz	35 dB	45 dB	-
Return loss	Not including connectors	-	40 dB	35 dB
Group delay ripple	Measured at 0 dB attenuation	-	1 ps	3 ps
PMD	Measured at 0 dB attenuation	-	0.6 ps	1 ps
<b>Environmental and Operational</b>				
Operating case temperature		-5°C	-	70°C
Operating humidity		5% RH	-	85% RH
Storage temperature		-40°C	-	70°C
Storage humidity		5% RH	-	95% RH
<b>Mechanical and Fiber Labeling</b>				
Module dimensions (W x D x H)	Entire module		220 x 140 x 32 mm	
Fiber type	All ports		900 $\mu$ m tight buffer SMF-28	
Fiber length			1.0 $\pm$ 0.1 m	
Optical connector	All ports		LC/UPC connectors	
Electrical interface			DPRAM and RS232	
Connector labeling (see Fiber Output Scheme and Labeling on page 3)	Input fiber		Common	
	Output fiber		Ports 1, 2, 3, 4, 5, 6, 7, 8, and 9	
<b>Electrical</b>				
Supply voltage A	3.3 V $\pm$ 5%		0.35 A <sup>2</sup>	
Supply voltage B	5.0 V $\pm$ 5%		0.30 A	
Supply voltage C	15 V $\pm$ 5%		0.40 A	

Note: Parameters are specified for End-of-Life (EOL), over passband, over all channels, over operating temperature, attenuation range, and all polarization states unless stated otherwise. Typical data is provided for information only; manufacturing tests are done using EOL spec.

1. 90th percentile of population at Beginning-of-Life (BOL)

2. Suggested minimum 2.5 W for 3.3V power supply for current transient at startup

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## Optional Integrated OCM Specifications

Parameter	Condition	Minimum	Typical <sup>1</sup>	Maximum
<b>OCM</b>				
Number of channels		-	44	-
Spectral range		-	196.2 to 191.7 THz	-
Insertion loss (WSS IL)	Including 5% OCM tap	-	5.0 dB	6.9 dB
Input power dynamic range	At common	-40 dBm	-	+3 dBm
Maximum channel dynamic range		-	-	20 dB
Optical power reading resolution		0.1 dB	-	-
Absolute wavelength error		-50 pm	-	+50 pm
Polarization dependent error	Over $\pm 10$ GHz from ITU frequency	-	-	0.4 dB
Absolute channel power	Over $\pm 10$ GHz from ITU frequency	-	-	1.0 dB
Total band power	Includes power within $\pm 25$ GHz of ITU	-1.5 dB	-	+1.5 dB
Electrical noise	Noise equivalent power at common	-	-	-47 dBm
Acquisition interval power		-	-	20 ms
Acquisition interval wavelength		-	-	60 s
<b>Optional Closed Loop Control of WSS</b>				
Optical power setting resolution		0.3 dB	0.1 dB	-
Closed loop time (user controllable)		100 ms	-	30 s
Attenuation maximum increment (user controllable)		0.1 dB	-	20 dB
Minimum controllable output power		-	-	-32 dBm
<b>Electrical - WSS with optional OCM</b>				
Supply voltage A	3.3 V $\pm 5\%$	-	0.7 A <sup>1</sup>	-
Supply voltage B	5.0 V $\pm 5\%$	-	3.5 A <sup>2</sup>	-
Supply voltage C	15 V $\pm 5\%$	-	0.4 A <sup>3</sup>	-

Note: Parameters are specified for End-of-Life (EOL), over passband, over all channels, over operating temperature, attenuation range, and all polarization states unless stated otherwise. Typical data is provided for information only; manufacturing tests are done using EOL spec.

1. Suggested minimum 2.5 W for 3.3 V power supply for current transient at startup
2. Suggested minimum 2 W for 5.0 V power supply for current transient at startup
3. Suggested minimum 4 W for 15.0 V power supply for current transient at startup

**Ordering Information**

For more information on this or other products and their availability, please contact your local JDSU account manager or JDSU directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide or via e-mail at [customer.service@jdsu.com](mailto:customer.service@jdsu.com).

**Sample: MWSWC19100J501**

Product Code	Description
MWSWC19100J501	Wavelength Selective Switch 1x9 (WSS)
WSSMC100P91V00	Wavelength Selective Switch with Monitor 1X9 (WSSM)

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