USB & ETHERNET CONTROLLED

Millimeter Switch Matrix RC-2SP6T-40R

50Ω DC to 40 GHz 2.92mm-Female

THE BIG DEAL

- Millimeter wave switching (up to 40 GHz)
- 2 x mechanical reflective SP6T switches
- High reliability, 2 million switch cycles
- 5W power rating (cold switching)

CASE STYLE: PF3290

DOWNLOAD SOFTWARE PACKAGE

RoHS Compliant
See our website for RoHS Compliance methodologies and qualifications

APPLICATIONS

- 5G node / device testing
- Automated test equipment
- Fail-safe / redundancy switching

PRODUCT OVERVIEW

Mini-Circuits' RC-2SP6T-40R comprises a pair of independently controlled, electro-mechanical SP6T switches. Each switch operates over an extremely wide bandwidth, from DC to 40 GHz with high isolation and low insertion loss. The reflective switches are of a failsafe and break-before-make-configuration, with a minimum lifetime of 2 million switching cycles per switch position, when used within the noted specifications.

The switch box is constructed in a compact, rugged metal case (5.5 x 6.0 x 2.75") with 14 2.92 mm (f) RF connectors on the front panel. The switches are controlled via USB or Ethernet, allowing control directly from a PC, or remotely over a network. Full software support is provided, including our user-friendly GUI application for Windows and a full API with programming instructions for Windows and Linux environments (both 32-bit and 64-bit systems).

KEY FEATURES

Feature	Advantages
Dual mechanical SP6T switches	Mechanical reflective switches provide high reliability and repeatable performance
Operation from DC to 40 GHz	Supports a wide range of RF test and signal routing applications, including 2G, 3G, 4G and 5G, with a single device
Break-before-make configuration	Prevents a momentary connection of the old and new signal paths, reducing the inconsistent transient effects that could otherwise be observed during switching
USB & Ethernet control	USB HID and Ethernet (HTTP / Telnet) interfaces provide easy compatibility with a wide range of software setups and programming environments
Full software support	User friendly Windows GUI (graphical user interface) allows manual control straight out of the box, while the comprehensive API (application programming interface) with examples and instructions allows easy automation in most programming environments

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ECO-020457
RC-2SP6T-40R
MCL NY
240118

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ELECTRICAL SPECIFICATIONS AT 25°C

Parameter	Conditions (GHZ)	Min.	Typ.	Max.	Units
Frequency Range		DC		40	GHz
Insertion Loss	DC - 12	—	0.2	0.5	dB
	12 - 26	—	0.4	0.7	
	26 - 40	—	0.7	1.1	
Isolation	DC - 12	60	90	—	dB
	12 - 26	55	80	—	
	26 - 40	50	70	—	
VSWR[1]	DC - 12	—	1.15	—	:1
	12 - 26	—	1.30	—	
	26 - 40	—	1.45	—	
Switching Time	—	—	25	—	ms
RF Input Power (Cold Switching)	DC - 12	—	—	20	W
	12 - 26	—	—	10	
	26 - 40	—	—	5	
Switch Lifetime (per Switch)	100 mW hot switching[2]	2	—	—	million cycles
	1W hot switching	—	1	—	
Rated Voltage	$24V_{DC}$ input	23	24	25	V
	USB port	—	5	—	
Rated Current (24V DC Input)	Both switches in state 1-6	—	440	—	mA
	Both switches in state 0	—	90	120	
Rated Current (USB)		—	10	20	mA

1. VSWR spec applies on any through path; all disconnected ports are reflective
2. Hot switching powers above this level will degrade the switch lifetime

ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	0°C to 40°C
Storage Temperature	-15°C to 85°C
Supply Voltage	26V

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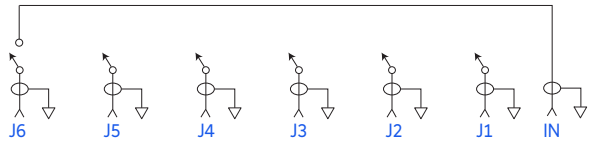
SWITCHING CONFIGURATION:

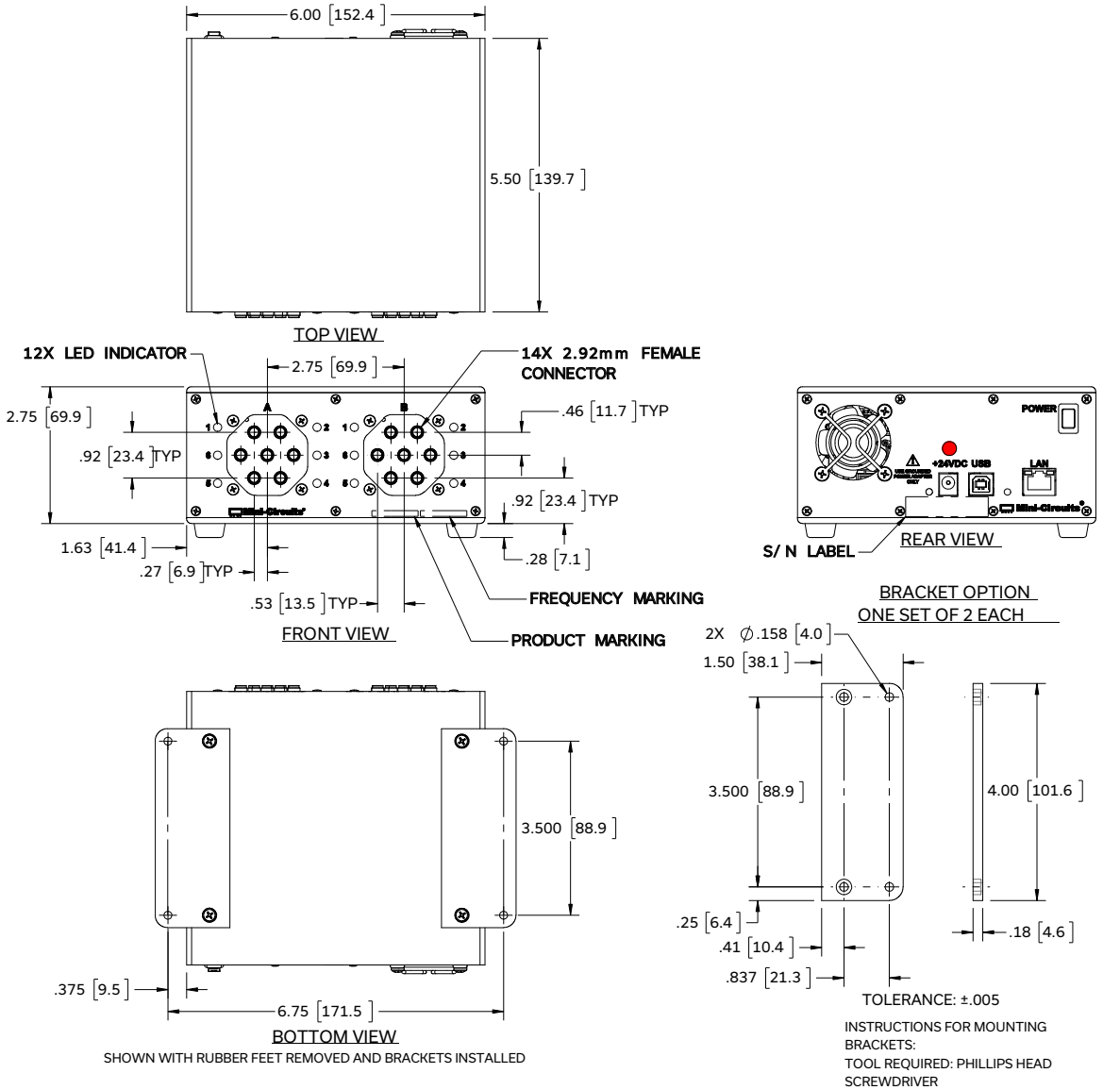
- Normally open (all port disconnected)
- Reflective (unterminated)



CONNECTIONS

Port Name	Connector Type
RF Switch A (Com, 1, 2, 3, 4, 5 & 6)	2.92 mm female
RF Switch B (Com, 1, 2, 3, 4, 5 & 6)	2.92 mm female
USB	USB type-B
Ethernet / LAN	RJ45
24V $_{DC}$ Input	2.1mm center positive DC socket

OUTLINE DRAWING (PF3290)



INSTRUCTIONS FOR MOUNTING BRACKETS:
TOOL REQUIRED: PHILLIPS HEAD SCREWDRIVER
STEP 1: REMOVE RUBBER FEET FROM THE BOTTOM OF THE UNIT, DO NOT DISCARD THE FASTENERS.
STEP 2: MOUNT THE BRACKETS WITH THE FASTENERS REMOVED IN STEP 1, USING THE COUNTER BORE HOLES IN THE BRACKET.

Weight: 1260 grams
Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.03 inch; 3Pl. ±.015 inch

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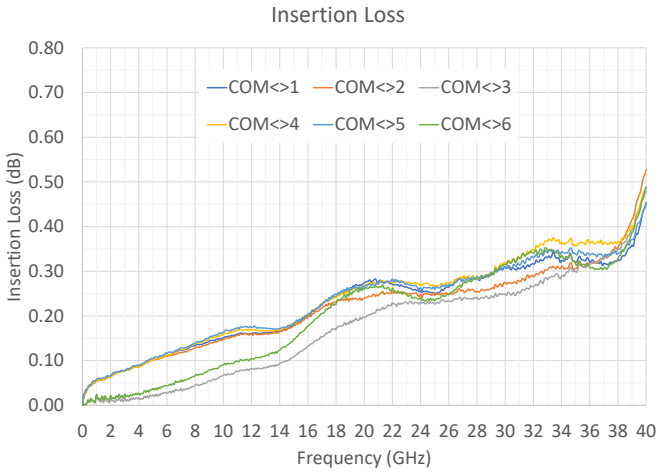
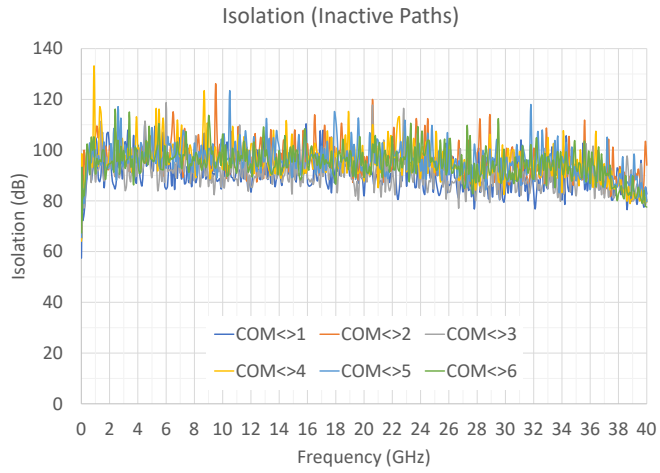
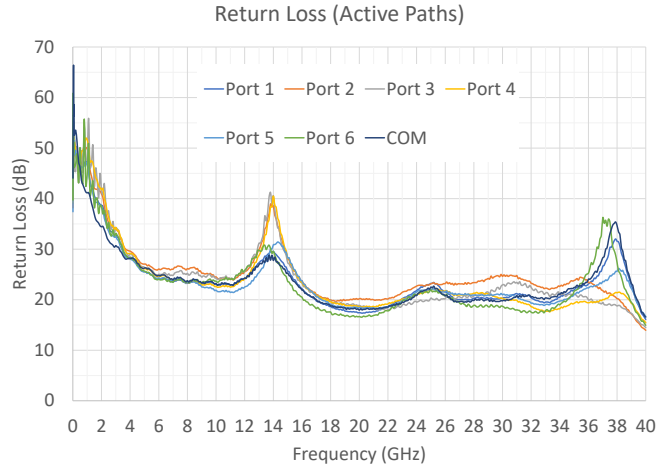
TYPICAL PERFORMANCE DATA (PER SWITCH)







SOFTWARE SPECIFICATIONS

SOFTWARE & DOCUMENTATION DOWNLOAD:

- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples can be downloaded free of charge from: www.minicircuits.com/softwaredownload/rfswitchcontroller.html
- Please contact testsolutions@minicircuits.com for support

MINIMUM SYSTEM REQUIREMENTS:

Parameter	Requirements	
Interface	USB HID & Ethernet (HTTP & Telnet)	
System Requirements	GUI	Windows 98 or later
	USB API DLL	Windows 98 or later and programming environment with ActiveX or .NET support
	USB Direct Programming	Linux, Windows 98 or later
	Ethernet	Windows, Linux or Mac computer with a network port and Ethernet TCP/IP support
Hardware	Pentium II or later with 256 MB RAM	

APPLICATION PROGRAMMING INTERFACE (API)

ETHERNET SUPPORT:

- Simple ASCII / SCPI command set for attenuator control
- Communication via HTTP or Telnet
- Supported by most common programming environments

USB SUPPORT (WINDOWS):

- ActiveX COM DLL file for creation of 32-bit programs
- .NET library DLL file for creation of 32 / 64-bit programs
- Supported by most common programming environments (refer to application note AN-49-001 for summary of suported environments)

USB SUPPORT (LINUX):

- Direct USB programming using a series of USB interrupt codes

Full programming instructions and examples available for a wide range of programming environments / languages.

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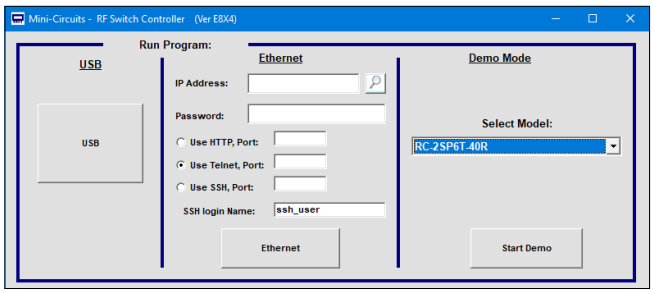
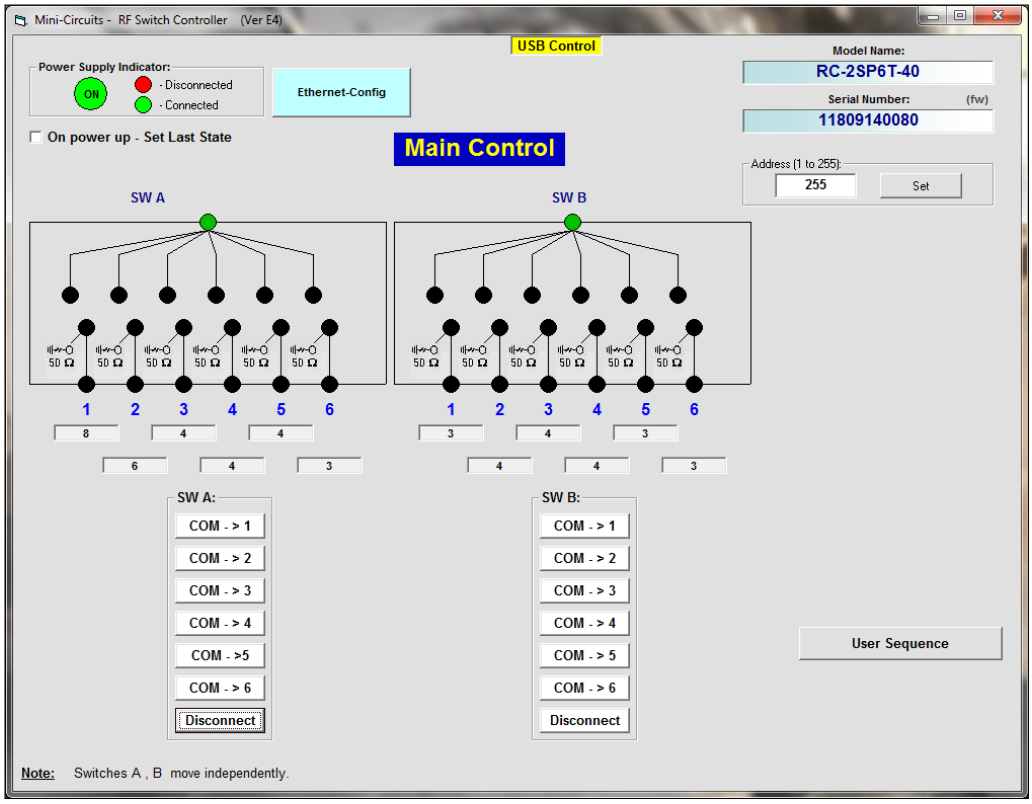
GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS - KEY FEATURES

- Connect via USB or Ethernet
- Run GUI in "demo mode" to evaluate software without a hardware connection



- View and set switch states at the click of a button
- Configure and run timed switching sequences
- Set start-up switch state
- Configure Ethernet IP settings



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ORDERING INFORMATION

Refer to Mini-Circuits' website for pricing and availability information:
https://www.minicircuits.com/WebStore/dashboard.html?model=RC-2SP6T-40R

Model	Description
RC-2SP6T-40R	USB & Ethernet controlled SP6T switch matrix

Included Accessories	Part No.	Description
	AC/DC-24-3W1	AC/DC 24V_{DC} Grounded Power Adaptor. Operating temperature: 0°C to +40°C, I_{Max}=2.5A
See Below	CBL-3W1-XX	AC Power Cord (Select one power cord from below with each Switch Matrix box)
	USB-CBL-AB-3+	2.7 ft (0.8 m) USB Cable: USB type A(Male) to USB type B(Male)

AC Power Cords[3]	Part No.	Description
	CBL-3W1-US	Power Cord for United States
	CBL-3W1-EU	Power Cord for Europe
	CBL-3W1-UK	Power Cord for United Kingdom
	CBL-3W1-AU	Power Cord for Australia and China
	CBL-3W1-IL	Power Cord for Israel

3. If you need a Power cord for a country not listed please contact testsolutions@minicircuits.com

OPTIONAL ACCESSORIES

USB-CBL-AB-3+	2.7 ft (0.8 m) USB Cable: USB type A(Male) to USB type B(Male)
USB-CBL-AB-7+	6.8 ft (2.1 m) USB Cable: USB type A(Male) to USB type B(Male)
USB-CBL-AB-11+	11 ft (3.4 m) USB Cable: USB type A(Male) to USB type B(Male)
CBL-RJ45-MM-5+	5 ft (1.5 m) Ethernet cable: RJ45(Male) to RJ45(Male) Cat 5E cable
BKT-272-08+	Bracket (One set of 2 each)

NOTES

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

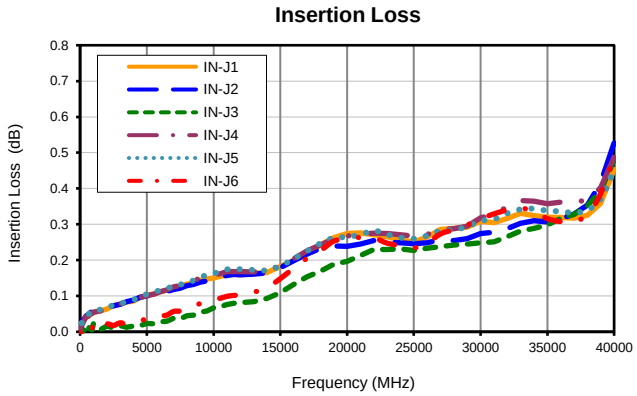
Typical Performance Data (per Switch)

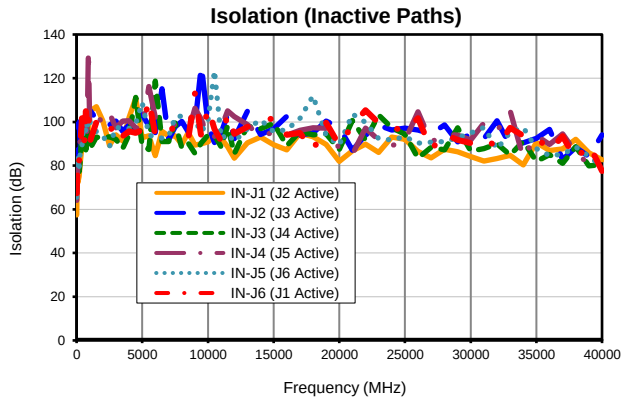
FREQUENCY	INSERTION LOSS (dB)						ISOLATON (Inactive Paths) (dB)					
(MHz)	IN-J1	IN-J2	IN-J3	IN-J4	IN-J5	IN-J6	IN-J1 (J2 Active)	IN-J2 (J3 Active)	IN-J3 (J4 Active)	IN-J4 (J5 Active)	IN-J5 (J6 Active)	IN-J6 (J1 Active)
10	-0.01	-0.03	-0.01	-0.01	-0.04	-0.05	57.43	70.25	68.11	64.10	65.57	67.35
50	0.00	0.02	0.00	0.01	0.02	0.00	76.64	83.07	72.70	76.24	81.55	74.40
100	0.03	0.02	0.00	0.02	0.02	0.00	72.23	85.32	82.71	79.39	84.38	84.17
200	0.03	0.03	0.00	0.02	0.03	0.00	75.08	99.96	77.19	81.60	79.01	82.09
300	0.03	0.04	0.01	0.03	0.03	0.00	81.94	88.43	82.81	93.57	87.08	89.98
400	0.04	0.04	0.01	0.04	0.04	0.01	89.43	95.63	99.35	99.94	89.11	102.15
500	0.04	0.05	0.01	0.04	0.05	0.01	94.22	99.69	92.49	99.90	96.83	97.79
600	0.04	0.05	0.02	0.04	0.05	0.02	97.87	97.87	96.02	96.02	102.87	90.47
700	0.05	0.05	0.01	0.05	0.05	0.01	88.24	102.31	87.20	102.40	94.96	104.93
800	0.05	0.05	0.01	0.05	0.05	0.01	91.54	102.74	99.44	94.05	101.30	99.97
900	0.05	0.05	0.01	0.05	0.05	0.01	96.29	100.12	96.03	133.20	97.22	105.03
1000	0.05	0.06	0.02	0.05	0.06	0.02	104.84	105.46	87.44	98.87	100.08	90.73
1500	0.06	0.06	0.01	0.06	0.06	0.01	106.98	101.28	93.04	103.30	95.62	100.00
2000	0.06	0.07	0.02	0.06	0.07	0.02	100.50	101.61	92.59	99.37	93.67	94.60
2500	0.07	0.07	0.01	0.07	0.07	0.02	89.27	98.60	93.14	103.92	88.66	95.75
3000	0.08	0.08	0.02	0.08	0.08	0.03	94.14	100.36	92.08	97.24	97.64	99.83
3500	0.08	0.08	0.01	0.08	0.09	0.02	91.31	95.65	87.78	100.33	96.94	93.47
4000	0.09	0.09	0.02	0.09	0.09	0.03	101.94	98.68	94.27	100.51	97.01	95.63
4500	0.10	0.10	0.02	0.10	0.10	0.03	110.90	94.82	111.27	97.27	99.21	95.00
5000	0.10	0.10	0.02	0.10	0.10	0.04	92.82	103.48	89.21	96.52	108.87	96.33
5500	0.11	0.10	0.02	0.10	0.11	0.04	93.72	98.19	87.36	116.17	94.03	110.23
6000	0.11	0.11	0.03	0.11	0.12	0.04	84.57	95.12	118.69	102.13	92.84	94.03
6500	0.12	0.11	0.03	0.12	0.12	0.05	95.64	115.11	90.96	102.26	92.66	96.98
7000	0.12	0.12	0.04	0.13	0.13	0.06	93.47	91.90	90.98	100.95	93.39	97.95
7500	0.13	0.12	0.04	0.13	0.13	0.06	93.64	97.75	99.53	98.50	102.18	96.02
8000	0.13	0.13	0.04	0.14	0.14	0.07	89.64	100.20	88.11	96.66	102.76	95.78
8500	0.14	0.13	0.05	0.14	0.14	0.07	95.07	95.47	90.33	95.38	101.92	92.14
9000	0.14	0.14	0.05	0.15	0.15	0.08	89.41	98.62	85.59	106.22	100.53	113.11
9500	0.15	0.14	0.06	0.15	0.16	0.08	90.05	125.99	90.47	101.11	95.22	92.90
10000	0.15	0.15	0.07	0.16	0.16	0.09	90.83	98.49	94.05	92.53	101.02	106.35
10500	0.15	0.15	0.07	0.16	0.17	0.09	93.86	90.63	93.92	93.40	123.46	96.79
11000	0.16	0.16	0.08	0.17	0.17	0.10	92.50	94.97	88.53	97.22	92.33	91.09
11500	0.16	0.16	0.08	0.17	0.18	0.10	88.62	103.47	98.23	105.09	94.74	103.52
12000	0.16	0.16	0.08	0.17	0.17	0.10	83.40	92.35	85.51	102.37	90.99	94.48
13000	0.16	0.16	0.08	0.17	0.17	0.11	90.46	104.90	98.11	98.82	96.92	97.69
14000	0.17	0.16	0.09	0.17	0.17	0.12	93.11	94.18	96.81	93.27	101.03	99.83
15000	0.18	0.18	0.11	0.19	0.18	0.15	89.49	96.82	99.34	95.36	95.60	101.83
16000	0.20	0.20	0.13	0.20	0.20	0.18	87.16	102.53	89.07	93.98	96.46	94.08
17000	0.22	0.22	0.15	0.23	0.23	0.21	94.85	93.93	95.58	96.11	101.62	95.00
18000	0.24	0.23	0.17	0.24	0.25	0.23	93.25	95.01	94.04	97.36	111.99	86.84
19000	0.26	0.24	0.19	0.26	0.26	0.25	89.73	100.31	94.50	97.10	93.80	99.68
20000	0.27	0.24	0.20	0.27	0.26	0.26	81.93	97.42	87.37	87.95	89.41	89.21
21000	0.28	0.24	0.21	0.27	0.27	0.26	86.78	87.07	100.72	85.17	103.61	98.45
22000	0.27	0.25	0.23	0.28	0.28	0.26	89.81	93.95	91.74	97.15	99.86	105.42
23000	0.27	0.25	0.23	0.27	0.27	0.25	86.02	98.48	103.14	91.72	92.40	99.57
24000	0.26	0.25	0.23	0.27	0.26	0.24	93.10	96.21	97.29	89.12	91.81	97.77
25000	0.25	0.25	0.23	0.27	0.26	0.23	92.00	97.11	94.43	91.43	93.27	95.48
26000	0.26	0.25	0.23	0.27	0.27	0.25	86.43	96.32	83.47	104.56	90.21	101.73
27000	0.29	0.26	0.24	0.29	0.28	0.27	83.47	94.59	88.44	90.77	90.77	87.28
28000	0.29	0.25	0.24	0.29	0.28	0.29	87.52	98.62	87.25	94.38	90.94	94.33
29000	0.29	0.26	0.25	0.29	0.29	0.30	86.39	90.81	97.24	93.97	92.75	91.81
30000	0.31	0.27	0.25	0.32	0.31	0.32	84.09	94.72	86.59	91.79	94.94	90.34
31000	0.31	0.28	0.25	0.33	0.31	0.33	82.03	92.37	87.76	99.49	97.49	92.47
32000	0.32	0.29	0.27	0.35	0.33	0.34	83.26	100.58	89.91	95.87	87.67	88.51
33000	0.33	0.30	0.28	0.37	0.34	0.35	84.77	89.18	84.84	105.02	95.24	97.29
34000	0.32	0.31	0.29	0.36	0.34	0.34	80.29	90.36	91.21	83.56	97.50	93.70
35000	0.32	0.31	0.30	0.36	0.34	0.32	90.63	92.41	81.93	93.81	87.80	93.18
36000	0.32	0.32	0.32	0.36	0.34	0.31	86.93	96.56	84.96	89.63	84.64	86.79
37000	0.32	0.33	0.33	0.36	0.33	0.31	87.59	82.74	81.12	94.55	85.21	93.48
38000	0.33	0.35	0.35	0.37	0.34	0.33	92.04	88.30	88.67	86.04	88.51	82.82
39000	0.36	0.42	0.39	0.40	0.37	0.39	85.83	84.18	79.94	80.68	84.25	89.88
40000	0.45	0.53	0.48	0.49	0.45	0.49	82.67	94.04	80.45	79.51	79.65	77.55

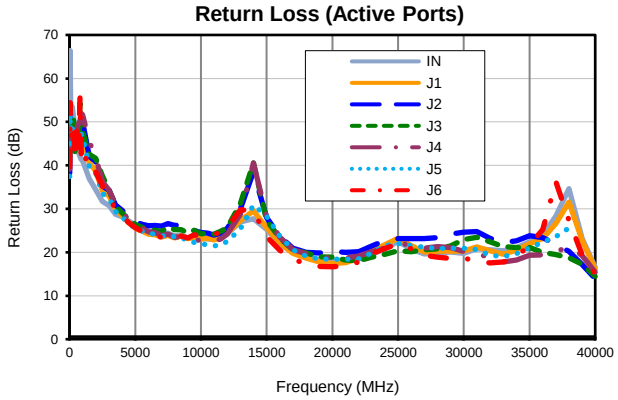
Typical Performance Data (per Switch)

FREQUENCY	Return Loss (Active Ports) (dB)						
(MHz)	IN	J1	J2	J3	J4	J5	J6
10	44.06	39.10	38.18	42.05	39.14	37.41	39.72
50	66.41	52.69	52.65	53.36	52.16	51.83	54.41
100	52.53	52.54	49.55	45.45	51.71	48.51	46.11
200	53.52	49.15	49.00	45.38	49.26	49.54	46.92
300	50.99	47.35	47.55	50.36	47.38	47.06	48.77
400	47.30	46.77	47.82	43.18	47.49	47.58	43.11
500	46.22	45.87	46.52	46.99	46.87	46.08	50.09
600	43.61	46.35	47.07	49.49	49.11	46.10	44.79
700	42.78	46.37	47.79	45.27	49.61	46.23	43.09
800	42.04	46.86	48.93	54.23	50.34	46.49	55.74
900	41.34	47.51	49.90	47.57	51.96	47.18	42.67
1000	41.14	47.31	50.05	47.85	51.67	46.54	44.62
1500	36.90	40.61	42.05	42.49	45.56	39.74	38.25
2000	34.43	38.69	40.91	41.62	41.74	38.27	38.46
2500	31.69	34.19	35.22	37.56	36.25	33.55	35.29
3000	30.70	32.98	34.28	34.24	34.29	32.45	33.13
3500	28.75	29.92	30.92	30.62	31.05	29.38	29.70
4000	28.16	28.40	29.61	29.03	29.15	28.07	28.29
4500	27.19	26.82	28.06	27.60	27.57	26.64	26.85
5000	26.27	25.55	27.04	26.40	26.12	25.49	25.65
5500	25.66	24.95	26.46	25.84	25.60	24.92	24.88
6000	24.81	24.16	26.08	25.01	24.73	24.32	24.03
6500	24.61	24.01	26.16	25.09	24.55	24.17	23.89
7000	23.92	23.49	26.03	24.80	23.81	23.70	23.44
7500	24.42	23.87	26.58	25.74	24.15	24.04	24.06
8000	23.75	23.32	26.14	25.20	23.46	23.50	23.69
8500	23.94	23.73	26.38	25.23	23.68	23.51	23.77
9000	23.30	23.12	25.24	24.46	22.88	22.52	23.27
9500	23.62	23.35	24.99	25.04	23.03	22.29	24.00
10000	23.18	23.09	24.52	24.25	22.65	21.87	23.67
10500	23.09	23.21	24.37	24.40	22.77	21.79	24.03
11000	22.92	22.86	23.99	24.17	22.47	21.43	24.03
11500	23.71	23.39	24.43	24.86	23.08	21.76	24.77
12000	24.25	24.30	25.52	25.63	24.17	22.51	25.82
13000	26.96	27.29	29.93	31.17	28.77	25.35	29.75
14000	27.75	29.56	38.56	40.60	40.51	30.86	29.57
15000	25.27	25.62	28.03	27.32	28.20	28.27	23.62
16000	21.89	22.20	23.73	23.31	23.50	23.73	20.50
17000	20.03	19.74	20.97	20.56	20.68	20.60	18.23
18000	18.75	18.68	19.98	19.83	19.64	19.10	17.57
19000	18.40	17.76	19.84	18.98	18.86	18.43	16.72
20000	17.94	17.44	20.19	18.87	18.66	18.45	16.67
21000	18.27	17.66	19.98	18.24	18.67	18.37	16.88
22000	18.52	18.59	20.14	18.09	19.15	18.54	17.78
23000	19.52	20.20	21.46	18.88	20.14	19.84	19.71
24000	20.81	21.78	22.69	19.54	20.95	21.51	20.91
25000	22.49	23.23	23.15	20.32	22.03	22.05	21.95
26000	20.74	21.52	23.17	20.16	21.71	21.54	20.80
27000	19.64	20.03	23.13	20.61	20.95	21.14	19.35
28000	19.84	20.29	23.38	20.76	21.29	20.89	18.89
29000	20.07	20.30	24.21	21.48	21.07	20.95	18.61
30000	19.76	20.26	24.62	22.92	20.22	20.96	18.70
31000	20.80	21.20	24.77	23.42	19.89	20.66	17.99
32000	20.54	20.37	23.23	22.43	18.61	19.31	17.52
33000	20.36	19.51	22.28	21.29	17.75	19.00	17.80
34000	21.03	20.47	22.62	21.07	18.19	19.71	18.98
35000	22.42	21.95	23.80	21.12	19.29	21.00	21.68
36000	24.07	23.14	23.37	19.97	19.39	22.32	25.23
37000	28.29	26.61	21.82	19.46	20.03	23.60	36.23
38000	34.63	31.56	20.20	18.75	21.37	25.61	27.32
39000	23.20	22.75	17.19	17.28	19.26	22.20	19.46
40000	16.56	16.09	13.94	14.48	15.44	16.64	14.93

Typical Performance Data (per Switch)



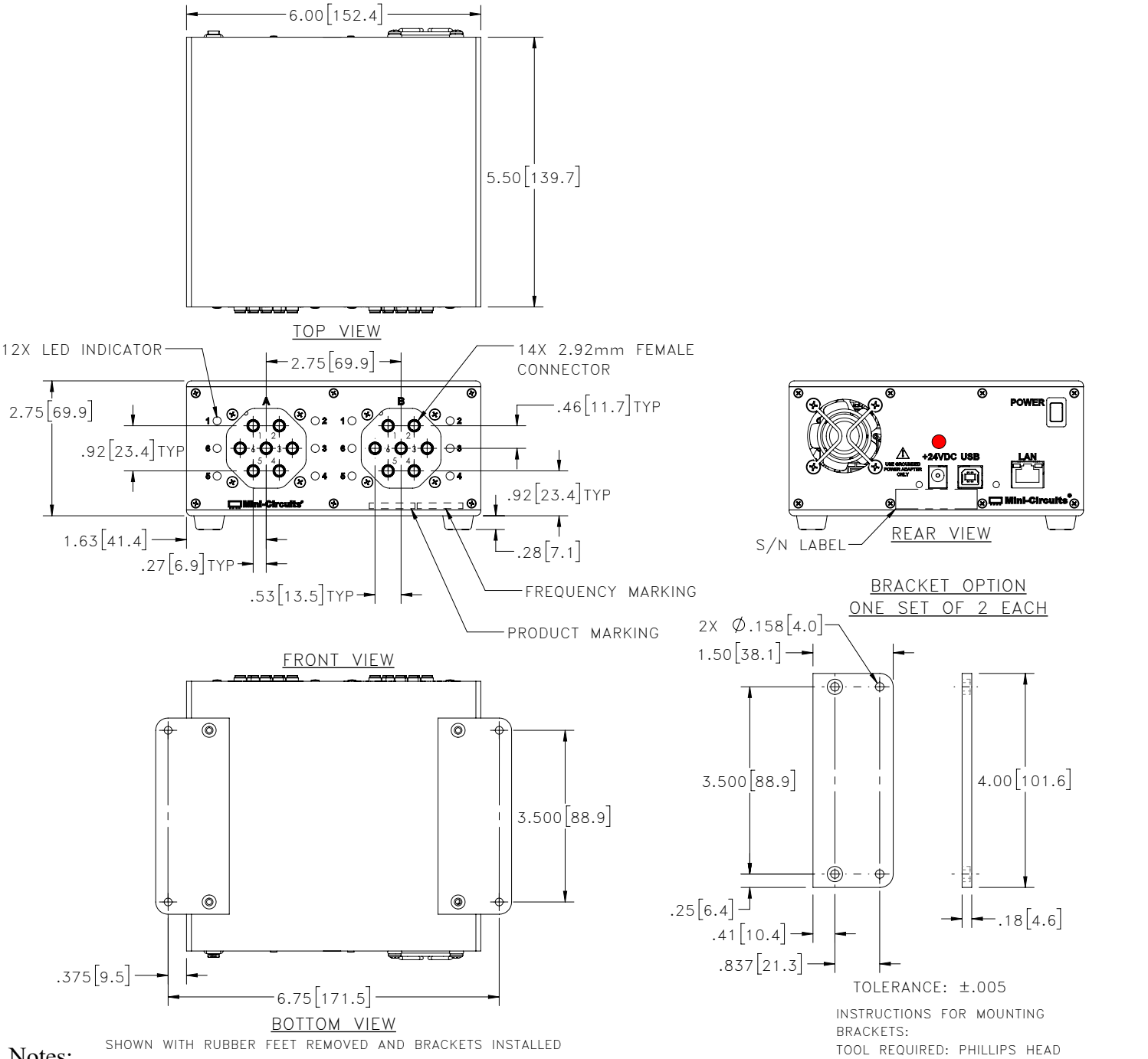




Case Style PF

Outline Dimensions

PF3290



INSTRUCTIONS FOR MOUNTING BRACKETS:
TOOL REQUIRED: PHILLIPS HEAD SCREWDRIVER
STEP 1: REMOVE RUBBER FEET FROM THE BOTTOM OF THE UNIT, DO NOT DISCARD THE FASTENERS.
STEP 2: MOUNT THE BRACKETS WITH THE FASTENERS REMOVED IN STEP 1, USING THE COUNTER BORE HOLES IN THE BRACKET.

Notes:

1. Case material: Aluminum (with protective coating to prevent corrosion).
2. Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.
3. Weight: 1260 grams.
4. Marking may contain other features or characters for internal lot control.

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Environmental Specifications ENV104

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	0° to 40° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-15° to 85°C Ambient Environment	Individual Model Data Sheet
Operating and Storage Humidity	5% to 85% RH (non-condensing)	Ambient
Bench Handling Test	Bench Top Tip 45° & Drop	MIL-PRF-28800F
Transit Drop Test	Free Fall Drop, 20 cm (7.9 inches)	MIL-PRF-28800F class 3

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