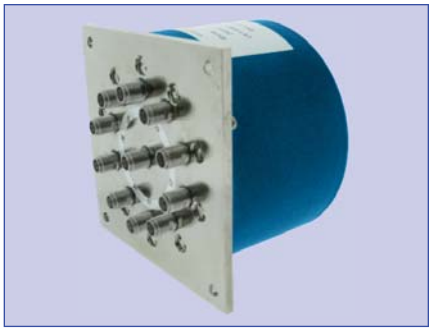
TELEDYNE COAX SWITCHES
Everywhereyoulook™

Series CCT-38S

Multi-Throw DC–12 GHz, SP9T & SP10T Normally Open Coaxial Switch

PART NUMBER	DESCRIPTION
CCT-38S	Commercial Normally Open Multi-throw, DC-12 GHz

The CCT-38S is a broadband, multi-throw, electromechanical coaxial switch designed to switch a microwave signal from a common input to any of 9 or 10 outputs. The characteristic impedance is 50 Ohms. The switches are small using the popular connector spacing on a 1.740" dia. circle. Each position has an individual actuator mechanism allowing random position selection. This also gives the minimum switching time.
With the normally open actuator, all paths are open when the switch is de-energized.



RoHS Compliant

ENVIRONMENTAL AND PHYSICAL CHARACTERISTICS

Operating Temperature Commercial Model, CCT-38S	–40°C to 65°C
Vibration (MIL-STD-202 Method 214, Condition D, non-operating)	10 g's RMS
Shock (MIL-STD-202 Method 213, Condition D, non-operating)	500 g's
Standard Actuator Life Actuator Life w/ Additional Features	3,000,000 cycles 1,000,000 cycles
Connector Type	SMA
Humidity (Moisture Seal)	Available
Weight	9 oz. (255.2G) (max.)

ELECTRICAL CHARACTERISTICS

Form Factor	Multi-Throw, break before make				
Frequency Range	DC–12 GHz				
Characteristic Impedance	50 Ohms				
Operate Time	20 ms (max.)				
Release Time	20 ms (max.)				
Actuation Voltage Available	12	15	24	28	V
Actuation Current, max. @ ambient	580	720	345	405	mA

PERFORMANCE CHARACTERISTICS

Frequency	DC–6 GHz	6–12 GHz
Insertion Loss, dB, max.	0.20	0.40
Isolation, dB, min.	70	60
VSWR , max.	1.30:1	1.40:1

PART NUMBERING SYSTEM

CCT-38 S 1 0 C - T**

- CCT-38 — Series
- S — Connectors
- 1 — Actuator Voltage
- 0 — Number of Positions
- C — Actuator Type
- T** — Options

CONNECTOR
S: SMA FEMALE

ACTUATOR VOLTAGE
1: 28 VDC NORMALLY OPEN
2: 15 VDC NORMALLY OPEN
3: 12 VDC NORMALLY OPEN
4: 24 VDC NORMALLY OPEN

NUMBER OF POSITIONS
9: SP9T
0: SP10T

ACTUATOR TYPE
0: NO INDICATOR CONTACTS
C: INDICATOR CONTACTS

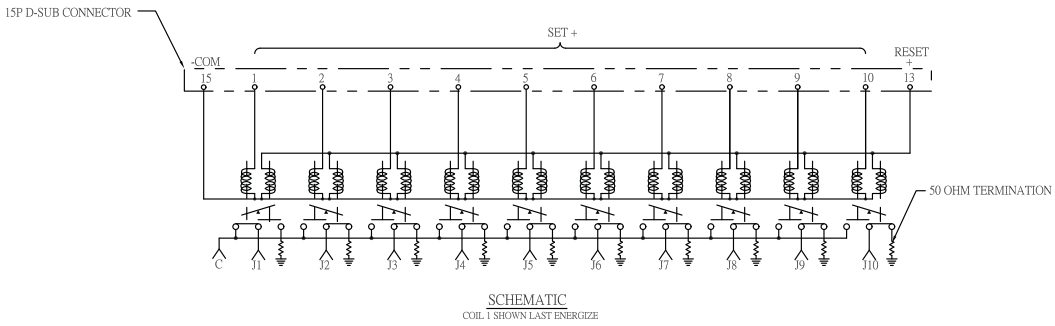
OPTIONS
T: TTL DRIVERS WITH DIODES
D: COIL TRANSIENT SUPPRESSION DIODES
S: D-SUB CONNECTOR*
TD: DECODERS AND TTL DRIVERS WITH DIODES
M: MOISTURE SEAL

**SEE PARTS LIST ON PAGE 10

For additional options, please contact factory.

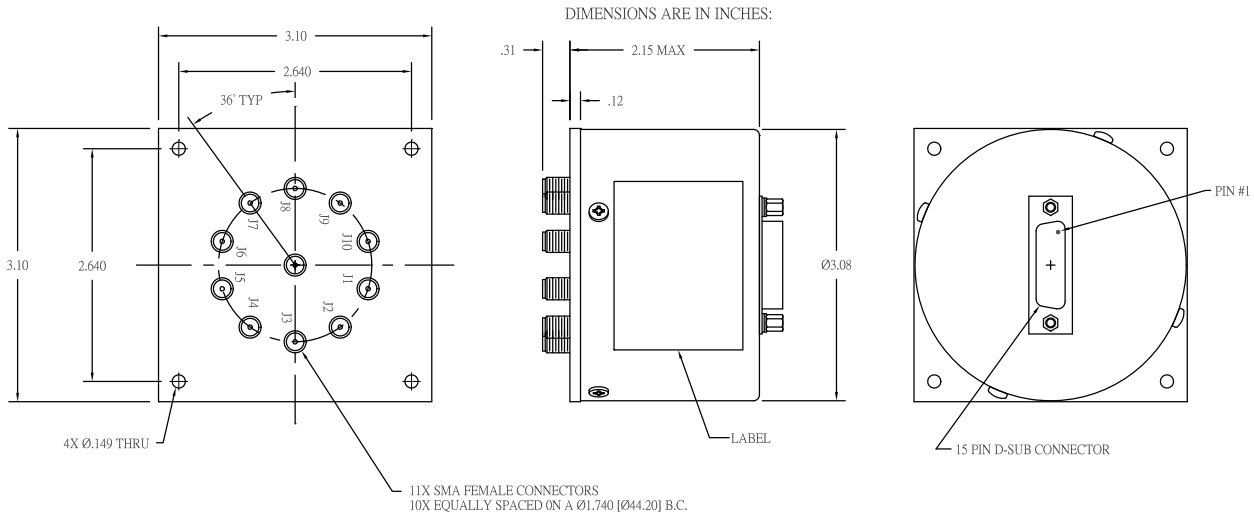
*** D-Sub Connector may be 15 or 26 pin depending on number of throws. (See Connector Pinout page)**

SCHEMATICS AND MECHANICAL OUTLINE



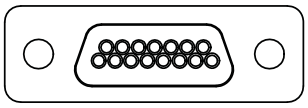
SCHEMATIC
COIL 1 SHOWN LAST ENERGIZE

DIMENSIONS ARE IN INCHES:

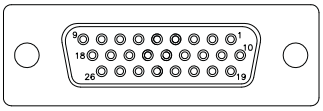


"-S OPTION" 15-PIN D-SUB OR 26-PIN D-MICRO CONNECTOR (EXAMPLE: CCT-38S180-S)

CONNECTOR PINOUT FOR NORMALLY OPEN SP9T MULTI-THROW SWITCHES						
EXAMPLE	CCT-38S190-S	CCT-38S19C-S	CCT-38S190-TS	CCT-38S19C-TS	CCT-38S190-TDS	CCT-38S19C-TDS
INDICATOR		Yes		Yes		Yes
TTL			Yes	Yes		
Decoders & TTL					Yes	Yes
PIN NO.	15-PIN	26-PIN	15-PIN	26-PIN	15-PIN	26-PIN
1	PORT 1	PORT 1	TTL 1	TTL 1	LOGIC 1	LOGIC 1
2	PORT 2	PORT 2	TTL 2	TTL 2	LOGIC 2	LOGIC 2
3	PORT 3	PORT 3	TTL 3	TTL 3	LOGIC 3	LOGIC 3
4	PORT 4	PORT 4	TTL 4	TTL 4	LOGIC 4	LOGIC 4
5	PORT 5	PORT 5	TTL 5	TTL 5		
6	PORT 6	PORT 6	TTL 6	TTL 6		
7	PORT 7	PORT 7	TTL 7	TTL 7		
8	PORT 8	PORT 8	TTL 8	TTL 8		
9	PORT 9	PORT 9	TTL 9	TTL 9		
10						
11						
12						
13			Vsw	Vsw	Vsw	Vsw
14						
15	Common	Common	Common	Common	Common	Common
16		D Indicator (com)		D Indicator (com)		D Indicator (com)
17		E Indicator		E Indicator		E Indicator
18		F Indicator		F Indicator		F Indicator
19		G Indicator		G Indicator		G Indicator
20		H Indicator		H Indicator		H Indicator
21		K Indicator		K Indicator		K Indicator
22		L Indicator		L Indicator		L Indicator
23		M Indicator		M Indicator		M Indicator
24		N Indicator		N Indicator		N Indicator
25		P Indicator		P Indicator		P Indicator
26						



15-PIN D-SUB CONNECTOR



26-PIN D-SUB CONNECTOR

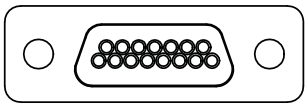
SP9T TRUTH TABLE Normally Open
CCT-38SX9C-T

Logic Input									RF Path									Indicator Switches								
1	2	3	4	5	6	7	8	9	J1	J2	J3	J4	J5	J6	J7	J8	J9	E	F	G	H	K	L	M	N	O
1	0	0	0	0	0	0	0	0	On	Off	Off	Off	Off	Off	Off	Off	Off	C	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	Off	On	Off	Off	Off	Off	Off	Off	Off	0	C	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	Off	Off	On	Off	Off	Off	Off	Off	Off	0	0	C	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	Off	Off	Off	On	Off	Off	Off	Off	Off	0	0	0	C	0	0	0	0	0
0	0	0	0	1	0	0	0	0	Off	Off	Off	Off	On	Off	Off	Off	Off	0	0	0	0	C	0	0	0	0
0	0	0	0	0	1	0	0	0	Off	Off	Off	Off	Off	On	Off	Off	Off	0	0	0	0	0	C	0	0	0
0	0	0	0	0	0	1	0	0	Off	Off	Off	Off	Off	Off	On	Off	Off	0	0	0	0	0	0	C	0	0
0	0	0	0	0	0	0	1	0	Off	Off	Off	Off	Off	Off	Off	On	Off	0	0	0	0	0	0	0	C	0
0	0	0	0	0	0	0	0	1	Off	Off	Off	Off	Off	Off	Off	Off	On	0	0	0	0	0	0	0	0	C

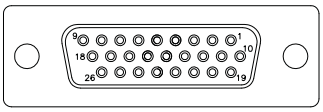
TRUTH TABLE Normally Open
CCT-38SX9C-TD

Logic Input				RF Path									Indicator Switches								
1	2	3	4	J1	J2	J3	J4	J5	J6	J7	J8	J9	E	F	G	H	K	L	M	N	O
0	0	0	0	On	Off	Off	Off	Off	Off	Off	Off	Off	C	0	0	0	0	0	0	0	0
1	0	0	0	Off	On	Off	Off	Off	Off	Off	Off	Off	0	C	0	0	0	0	0	0	0
0	1	0	0	Off	Off	On	Off	Off	Off	Off	Off	Off	0	0	C	0	0	0	0	0	0
1	1	0	0	Off	Off	Off	On	Off	Off	Off	Off	Off	0	0	0	C	0	0	0	0	0
0	0	1	0	Off	Off	Off	Off	On	Off	Off	Off	Off	0	0	0	0	C	0	0	0	0
1	0	1	0	Off	Off	Off	Off	Off	On	Off	Off	Off	0	0	0	0	0	C	0	0	0
0	1	1	0	Off	Off	Off	Off	Off	Off	On	Off	Off	0	0	0	0	0	0	C	0	0
1	1	1	0	Off	Off	Off	Off	Off	Off	Off	On	Off	0	0	0	0	0	0	0	C	0
0	0	0	1	Off	Off	Off	Off	Off	Off	Off	Off	On	0	0	0	0	0	0	0	0	C
1	0	0	1	Off	Off	Off	Off	Off	Off	Off	Off	Off	0	0	0	0	0	0	0	0	0

CONNECTOR PINOUT FOR NORMALLY OPEN SP10T MULTI-THROW SWITCHES						
EXAMPLE	CCT-38S100-S	CCT-38S10C-S	CCT-38S100-TS	CCT-38S10C-TS	CCT-38S100-TDS	CCT-38S10C-TDS
INDICATOR		Yes		Yes		Yes
TTL			Yes	Yes		
Decoders & TTL					Yes	Yes
PIN NO.	15-PIN	26-PIN	15-PIN	26-PIN	15-PIN	26-PIN
1	PORT 1	PORT 1	TTL 1	TTL 1	LOGIC 1	LOGIC 1
2	PORT 2	PORT 2	TTL 2	TTL 2	LOGIC 2	LOGIC 2
3	PORT 3	PORT 3	TTL 3	TTL 3	LOGIC 3	LOGIC 3
4	PORT 4	PORT 4	TTL 4	TTL 4	LOGIC 4	LOGIC 4
5	PORT 5	PORT 5	TTL 5	TTL 5		
6	PORT 6	PORT 6	TTL 6	TTL 6		
7	PORT 7	PORT 7	TTL 7	TTL 7		
8	PORT 8	PORT 8	TTL 8	TTL 8		
9	PORT 9	PORT 9	TTL 9	TTL 9		
10	PORT 10	PORT 10	TTL 10	TTL 10		
11						
12						
13			Vsw	Vsw	Vsw	Vsw
14						
15	Common	Common	Common	Common	Common	Common
16		D Indicator (com)		D Indicator (com)		D Indicator (com)
17		E Indicator		E Indicator		E Indicator
18		F Indicator		F Indicator		F Indicator
19		G Indicator		G Indicator		G Indicator
20		H Indicator		H Indicator		H Indicator
21		K Indicator		K Indicator		K Indicator
22		L Indicator		L Indicator		L Indicator
23		M Indicator		M Indicator		M Indicator
24		N Indicator		N Indicator		N Indicator
25		P Indicator		P Indicator		P Indicator
26		T Indicator		T Indicator		T Indicator



15-PIN D-SUB CONNECTOR



26-PIN D-SUB CONNECTOR

SP10T TRUTH TABLE Normally Open
CCT-38SX0C-T

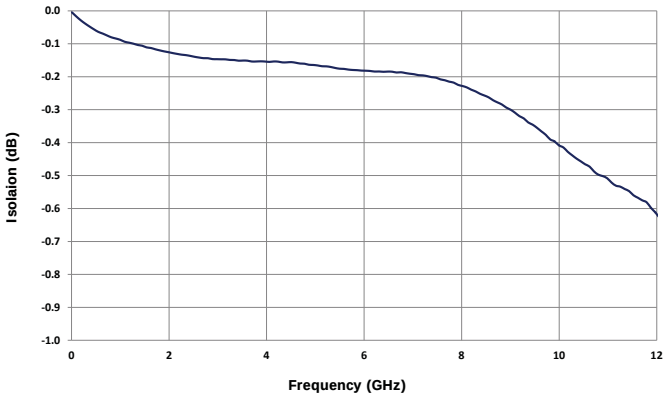
Logic Input										RF Path										Indicator Switches									
1	2	3	4	5	6	7	8	9	10	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	E	F	G	H	K	L	M	N	O	P
1	0	0	0	0	0	0	0	0	0	On	Off	Off	Off	Off	Off	Off	Off	Off	Off	C	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	Off	On	Off	Off	Off	Off	Off	Off	Off	Off	0	C	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	Off	Off	On	Off	Off	Off	Off	Off	Off	Off	0	0	C	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	0	0	0	C	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	Off	Off	Off	Off	On	Off	Off	Off	Off	Off	0	0	0	0	C	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	Off	Off	Off	Off	Off	On	Off	Off	Off	Off	0	0	0	0	0	C	0	0	0	0
0	0	0	0	0	0	1	0	0	0	Off	Off	Off	Off	Off	Off	On	Off	Off	Off	0	0	0	0	0	0	C	0	0	0
0	0	0	0	0	0	0	1	0	0	Off	Off	Off	Off	Off	Off	Off	On	Off	Off	0	0	0	0	0	0	0	C	0	0
0	0	0	0	0	0	0	0	1	0	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	0	0	0	0	0	0	0	0	C	0
0	0	0	0	0	0	0	0	0	1	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	0	0	0	0	0	0	0	0	0	C

TRUTH TABLE Normally Open
CCT-38SX0C-TD

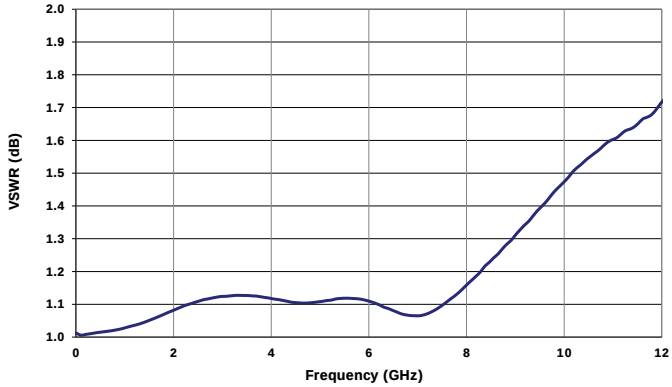
Logic Input				RF Path										Indicator Switches									
1	2	3	4	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	E	F	G	H	K	L	M	N	O	P
0	0	0	0	On	Off	Off	Off	Off	Off	Off	Off	Off	Off	C	0	0	0	0	0	0	0	0	0
1	0	0	0	Off	On	Off	Off	Off	Off	Off	Off	Off	Off	0	C	0	0	0	0	0	0	0	0
0	1	0	0	Off	Off	On	Off	Off	Off	Off	Off	Off	Off	0	0	C	0	0	0	0	0	0	0
1	1	0	0	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	0	0	0	C	0	0	0	0	0	0
0	0	1	0	Off	Off	Off	Off	On	Off	Off	Off	Off	Off	0	0	0	0	C	0	0	0	0	0
1	0	1	0	Off	Off	Off	Off	Off	On	Off	Off	Off	Off	0	0	0	0	0	C	0	0	0	0
0	1	1	0	Off	Off	Off	Off	Off	Off	On	Off	Off	Off	0	0	0	0	0	0	C	0	0	0
1	1	1	0	Off	Off	Off	Off	Off	Off	Off	On	Off	Off	0	0	0	0	0	0	0	C	0	0
0	0	0	1	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	0	0	0	0	0	0	0	0	C	0
1	0	0	1	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	0	0	0	0	0	0	0	0	0	C
0	1	0	1	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	0	0	0	0	0	0	0	0	0	0

TYPICAL RF PERFORMANCE CURVES

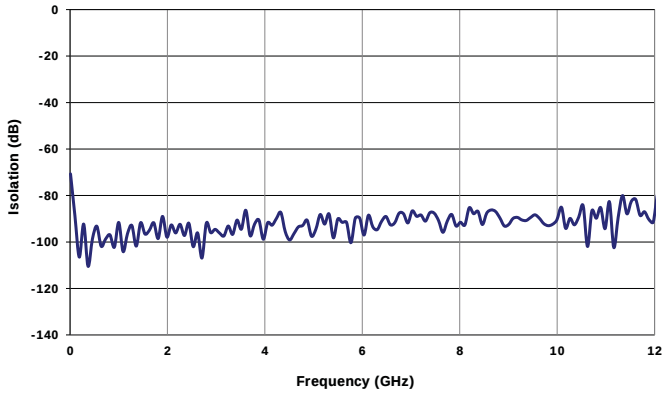
Insertion Loss (DC-12GHz)



VSWR (DC-12GHz)

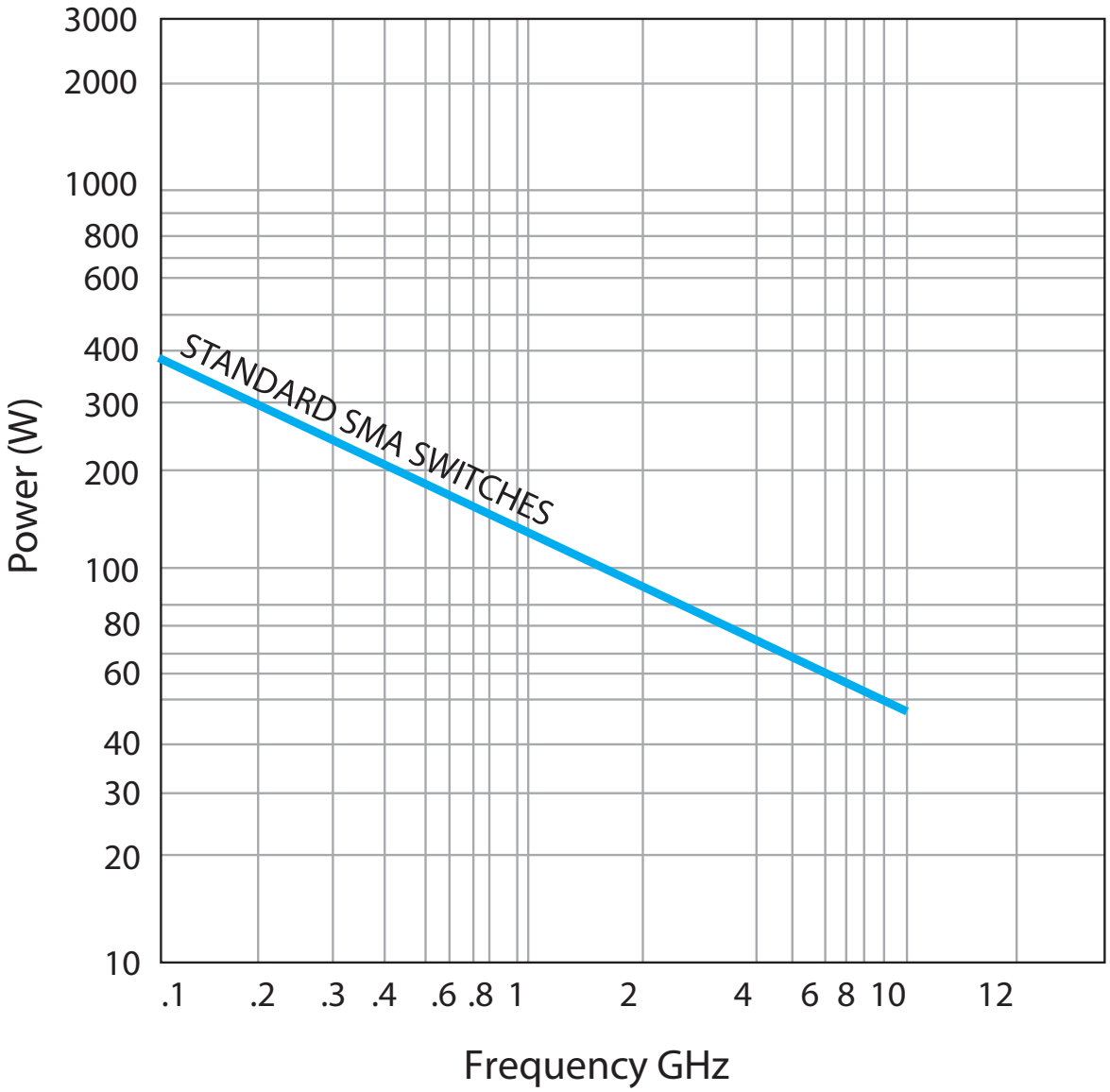


Isolation (DC-12Ghz)



TYPICAL POWER PERFORMANCE CURVE

Power Handling vs. Frequency



Estimates based on the following reference conditions:

- Ambient temperature of 40°C or less
- Sea level operation
- Load VSWR of 1.20:1 maximum
- No high-power (hot) switching

Please contact Teledyne Coax Switches for derating factors when applications do not meet the foregoing reference conditions.

GLOSSARY

Actuator
An actuator is the electromechanical mechanism that transfers the RF contacts from one position to another upon DC command.

Arc Suppression Diode
A diode is connected in parallel with the coil. This diode limits the "reverse EMF spike" generated when the coil de-energizes to 0.7 volts. The diode cathode is connected to the positive side of the coil and the anode is connected to the negative side.

Date Code
All switches are marked with either a unique serial number or a date code. Date codes are in accordance with MIL-STD-1285 Paragraph 5.2.5 and consist of four digits. The first two digits define the year and the last two digits define the week of the year (YYWW). Thus, 1032 identifies switches that passed through final inspection during the 32nd week of 2010.

Indicator
Indicators tell the system which position the switch is in. Other names for indicators are telemetry contacts or tellback circuit. Indicators are usually a set of internally mounted DC contacts linked to the actuator. They can be wired to digital input lines, status lights, or interlocks. Unless otherwise specified, the maximum indicator contact rating is 30 Vdc, 50 mA, or 1.5 Watts into a resistive load.

Isolation
Isolation is the measure of the power level at the output connector of an unconnected RF channel as referenced to the power at the input connector. It is specified in dB below the input power level.

Multi-Throw Switch
A multi-throw switch is a switch with one input and three or more output ports. The CCT-38 can switch a microwave signal to any of 10 outputs from a single common input.

Switching Time
Switching time is the total interval beginning with the arrival of the leading edge of the command pulse at the switch DC input and ending with the completion of the switch transfer, including contact bounce. It consists of three parts: (1) inductive delay in the coil, (2) transfer time of the physical movement of the contacts, and (3) the bounce time of the RF contacts.

TTL Switch Driver Option
As a special option, switch drivers can be provided for both failsafe and latching switches, which are compatible with industry-standard low-power Schottky TTL circuits.

TD-Option
This option includes a decoder. The 3-bit parallel command is decoded to internally select the appropriate position. See the logic tables. The TD-Option increases the Vsw supply current demand by 50mA max at 28Vdc and +20°C.

Performance Parameters vs Frequency
Generally speaking, the RF performance of coaxial switches is frequency dependent. With increasing frequency, VSWR and insertion loss increase while isolation decreases. All data sheets specify these three parameters as "worst case" at the highest operating frequency. If the switch is to be used over a narrow frequency band, better performance can be achieved.

Actuator Current vs Temperature
The resistance of the actuator coil varies as a function of temperature. There is an inverse relationship between the operating temperature of the switch and the actuator drive current. For switches operating at 28 VDC, the approximate actuator drive current at temperature, T, can be calculated using the equation:

$$I_T = \frac{I_A}{[1 + .00385\ (T-20)]}$$

Where:

I_T = Actuator current at temperature, T

I_A = Room temperature actuator current – see data sheet

T = Temperature of interest in °C

Magnetic Sensitivity
An electro-mechanical switch can be sensitive to ferrous materials and external magnetic fields. Neighboring ferrous materials should be permitted no closer than 0.5 inches and adjacent external magnetic fields should be limited to a flux density of less than 5 Gauss.

SPECIAL FEATURE

Switching High-Power or Highly Sensitive Signals
Ensure the most linear response with the best galvanically matched contact system in the industry. Extremely low passive intermodulation is standard on all of our switches.

Carrier Frequency 1	Carrier Frequency 2	PIM 3rd Order Frequency	PIM 5th Order Frequency
870 MHz	893 MHz	847 MHz	824 MHz

	3rd Order Intermodulation	5th Order Intermodulation
Multiple Positions	–96 dBm	–115 dBm
	–139 dBc	–158 dBc

NORMALLY OPEN CCT-38S PART NUMBER LIST

	Part No.		Part No.		Part No.
1	CCT-38SX9C	43	CCT-38SX90	85	CCT-38SX0C
2	CCT-38SX9C-D	44	CCT-38SX90-D	86	CCT-38SX0C-D
3	CCT-38SX9C-DM	45	CCT-38SX90-DM	87	CCT-38SX0C-DM
4	CCT-38SX9C-M	46	CCT-38SX90-M	88	CCT-38SX0C-M
5	CCT-38SX9C-MS	47	CCT-38SX90-MS	89	CCT-38SX0C-MS
6	CCT-38SX9C-S	48	CCT-38SX90-S	90	CCT-38SX0C-S
7	CCT-38SX9C-T	49	CCT-38SX90-T	91	CCT-38SX0C-T
8	CCT-38SX9C-TD	50	CCT-38SX90-TD	92	CCT-38SX0C-TD
9	CCT-38SX9C-TDM	51	CCT-38SX90-TDM	93	CCT-38SX0C-TDM
10	CCT-38SX9C-TDMS	52	CCT-38SX90-TDMS	94	CCT-38SX0C-TDMS
11	CCT-38SX9C-TDS	53	CCT-38SX90-TDS	95	CCT-38SX0C-TDS
12	CCT-38SX9C-TM	54	CCT-38SX90-TM	96	CCT-38SX0C-TM
13	CCT-38SX9C-TMS	55	CCT-38SX90-TMS	97	CCT-38SX0C-TMS
14	CCT-38SX9C-TS	56	CCT-38SX90-TS	98	CCT-38SX0C-TS
15	CCT-38SX90	57	CCT-38SX0C	99	CCT-38SX00
16	CCT-38SX90-D	58	CCT-38SX0C-D	100	CCT-38SX00-D
17	CCT-38SX90-DM	59	CCT-38SX0C-DM	101	CCT-38SX00-DM
18	CCT-38SX90-M	60	CCT-38SX0C-M	102	CCT-38SX00-M
19	CCT-38SX90-MS	61	CCT-38SX0C-MS	103	CCT-38SX00-MS
20	CCT-38SX90-S	62	CCT-38SX0C-S	104	CCT-38SX00-S
21	CCT-38SX90-T	63	CCT-38SX0C-T	105	CCT-38SX00-T
22	CCT-38SX90-TD	64	CCT-38SX0C-TD	106	CCT-38SX00-TD
23	CCT-38SX90-TDM	65	CCT-38SX0C-TDM	107	CCT-38SX00-TDM
24	CCT-38SX90-TDMS	66	CCT-38SX0C-TDMS	108	CCT-38SX00-TDMS
25	CCT-38SX90-TDS	67	CCT-38SX0C-TDS	109	CCT-38SX00-TDS
26	CCT-38SX90-TM	68	CCT-38SX0C-TM	110	CCT-38SX00-TM
27	CCT-38SX90-TMS	69	CCT-38SX0C-TMS	111	CCT-38SX00-TMS
28	CCT-38SX90-TS	70	CCT-38SX0C-TS	112	CCT-38SX00-TS
29	CCT-38SX9C	71	CCT-38SX00		
30	CCT-38SX9C-D	72	CCT-38SX00-D		
31	CCT-38SX9C-DM	73	CCT-38SX00-DM		
32	CCT-38SX9C-M	74	CCT-38SX00-M		
33	CCT-38SX9C-MS	75	CCT-38SX00-MS		
34	CCT-38SX9C-S	76	CCT-38SX00-S		
35	CCT-38SX9C-T	77	CCT-38SX00-T		
36	CCT-38SX9C-TD	78	CCT-38SX00-TD		
37	CCT-38SX9C-TDM	79	CCT-38SX00-TDM		
38	CCT-38SX9C-TDMS	80	CCT-38SX00-TDMS		
39	CCT-38SX9C-TDS	81	CCT-38SX00-TDS		
40	CCT-38SX9C-TM	82	CCT-38SX00-TM		
41	CCT-38SX9C-TMS	83	CCT-38SX00-TMS		
42	CCT-38SX9C-TS	84	CCT-38SX00-TS		

* X = 1 (28Vdc), 2 (15Vdc), 3 (12Vdc) and 4 (24Vdc)