TELEDYNE COAX SWITCHES
Everywhereyoulook™

Series CCT-48K/CT-48K

Internal 50Ω Termination DC-40 GHz
Normally Open Multi-Throw Coaxial Switch

PART NUMBER	DESCRIPTION
CCT-48K	Commercial Normally Open Multi-throw, DC-40 GHz
CT-48K	Elite Normally Open Multi-throw, DC-40GHz

The CCT-48K/CT-48K is an Internally Terminated broadband, multi-throw, electromechanical coaxial switch designed to switch a microwave signal from a common input to any of 3, 4, 5, or 6 outputs. The characteristic impedance is 50 Ohms. Internal terminations provide an impedence match for the unselected ports. The switches are small using the popular connector spacing on a 1.062" dia. circle. Each position has an individual actuator mechanism allowing random position selection. This also minimizes switching time.

The CCT-48K/CT-48K comes with a normally open actuator. For the normally open actuator, all ports are terminated in 50 Ohms, except the common input port which is open when the switch is de-energized.

RoHS Compliant

Available with USB & Ethernet Control!

ENVIRONMENTAL AND PHYSICAL CHARACTERISTICS

Operating Temperature Commercial Model, CCT-48K Elite Model, CT-48K***	 –25°C to 65°C –55°C to 85°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	5,000,000 cycles 1,000,000 cycles
Connector Type	2.92mm (K)
Humidity (Moisture Seal)	Available
Weight	6 oz. (170.1g) (max.)

ELECTRICAL CHARACTERISTICS

Form Factor	Multi-Throw,, break before make
Frequency Range CCT-48K CT-48K	 DC–40 GHz DC–40 GHz
Characteristic Impedance	50 Ohms
Terminations	50Ω, 2 Watts CW max.
Operate Time	15 ms (max.)
Release Time	15 ms (max.)
Actuation Voltage Available	12 15 24 28 V
Actuation Current, max. @ ambient	420 350 250 200 mA

PERFORMANCE CHARACTERISTICS

Frequency	DC–6 GHz	6–12 GHz	12–18 GHz	18–26.5 GHz	26.5–32 GHz	32–40 GHz
Insertion Loss, dB, max.	0.20	0.30	0.60	0.80	.80	1.40
Isolation, dB, min.	80	75	70	70	60	60
VSWR , max.	1.25:1	1.30:1	1.60:1	1.70:1	1.80:1	1.95:1

For maximum limits, please see charts on pages 7-8

PART NUMBERING SYSTEM

CCT-48 K 1 6 C - T**

- CCT-48 — Series
- K — Connectors
- 1 — Actuator Voltage
- 6 — Number of Positions
- C — Actuator Type
- T** — Options

CONNECTOR
K: 2.92mm 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
3: SP3T
4: SP4T
5: SP5T
6: SP6T

ACTUATOR TYPE
0: NO INDICATOR CONTACTS
C: INDICATOR CONTACTS***

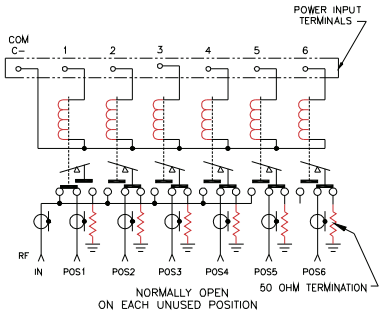
OPTIONS
T: TTL DRIVERS WITH DIODES
D: COIL TRANSIENT SUPPRESSION DIODES
R: POSITIVE + COMMON
TD: DECODERS AND TTL DRIVERS WITH DIODES
M: MOISTURE SEAL
S: D-SUB CONNECTOR*

**SEE PARTS LIST ON PAGE 12-14
***Indicator Contacts Operating Temperature -50°C to 85°C (Elite Model Only)

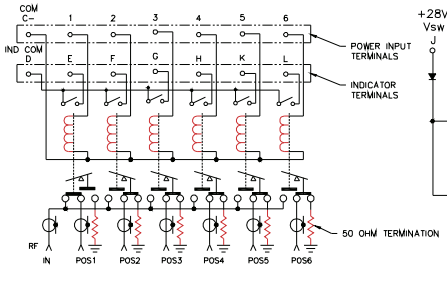
For additional options, please contact factory.

* D-Sub Connector may be 9 or 15 pin depending on number of throws. (See Connector Pinout page)

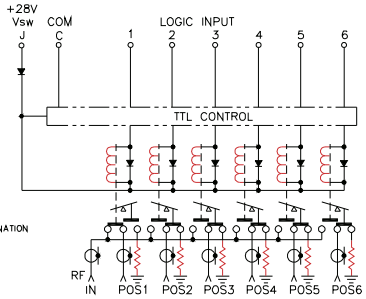
SCHEMATICS AND MECHANICAL OUTLINE



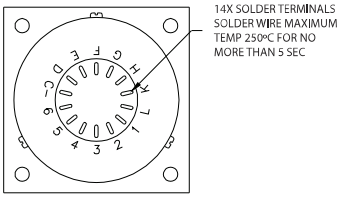
Analog

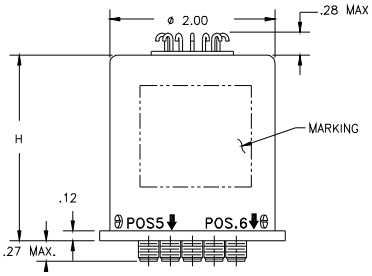


Indicators



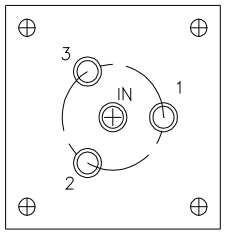
TTL

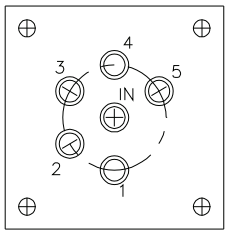




H = 1.85 STD, Indicator & D-Sub Models
H = 2.50 All OTHER Models

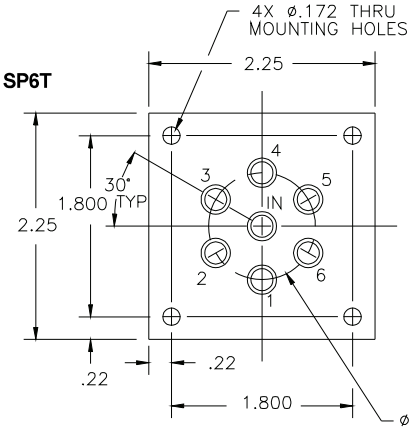
SP3T

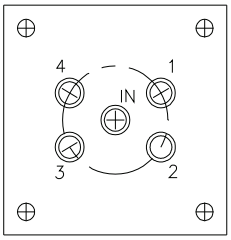




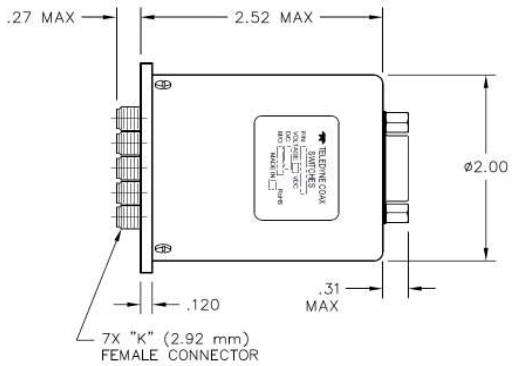
SP5T

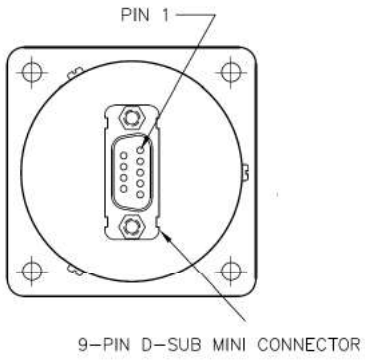
SP6T





SP4T

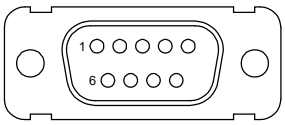




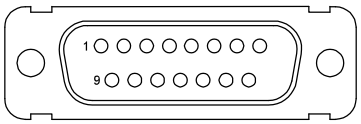
"-SOPTION" 9-PIN, 15-PIN, 26-PIN D-SUB CONNECTOR (EXAMPLE: CCT-48KS660-S)

CONNECTOR PINOUT FOR NORMALLY OPEN SP3T MULTI-THROW SWITCHES						
EXAMPLE	CT-48K130-S	CT-48K13C-S	CT-48K130-TS	CT-48K13C-TS	CT-48K130-TDS	CT-48K13C-TDS
PIN NO	9-PINS	9-PINS	9-PINS	9-PINS	9-PINS	9-PINS
INDICATOR		YES		YES		YES
TTL			YES	YES		
DECODERS & TTL					YES	YES
1	PORT 1	PORT 1	TTL 1	TTL 1	LOGIC 1	LOGIC 1
2	PORT 2	PORT 3	TTL 2	TTL 2	LOGIC 2	LOGIC 2
3	PORT 3	PORT 3	TTL 3	TTL 3		
4		E INDICATOR		E INDICATOR		E INDICATOR
5		F INDICATOR		F INDICATOR		F INDICATOR
6		G INDICATOR		G INDICATOR		G INDICATOR
7	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
8			Vsw	Vsw	Vsw	Vsw
9		D INDICATOR (COM)		D INDICATOR (COM)		D INDICATOR (COM)

CONNECTOR PINOUT FOR NORMALLY OPEN SP4T MULTI-THROW SWITCHES						
EXAMPLE	CT-48K140-S	CT-48K14C-S	CT-48K140-TS	CT-48K14C-TS	CT-48K140-TDS	CT-48K14C-TDS
PIN NO	9-PINS	15-PINS	9-PINS	15-PINS	9-PINS	15-PINS
INDICATOR		YES		YES		YES
TTL			YES	YES		
DECODERS & TTL					YES	YES
1	PORT 1	PORT 1	TTL 1	TTL 1	LOGIC 1	LOGIC 1
2	PORT 2	PORT 3	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		
5						
6						
7	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
8			Vsw	Vsw	Vsw	Vsw
9		D INDICATOR (COM)		D INDICATOR (COM)		D INDICATOR (COM)
10		E INDICATOR		E INDICATOR		E INDICATOR
11		F INDICATOR		F INDICATOR		F INDICATOR
12		G INDICATOR		G INDICATOR		G INDICATOR
13		H INDICATOR		H INDICATOR		H INDICATOR
14						
15						



9-PIN D-SUB CONNECTOR

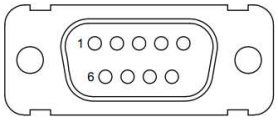


15-PIN D-SUB CONNECTOR

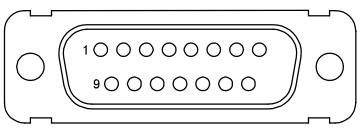
"-S option" 9-pin, 15-pin connector
(example: CCT-48KS660-S)

CONNECTOR PINOUT FOR NORMALLY OPEN SP5T MULTI-THROW SWITCHES						
EXAMPLE	CT-48K150-S	CT-48K15C-S	CT-48K150-TS	CT-48K15C-TS	CT-48K150-TDS	CT-48K15C-TDS
PIN NO	9-PINS	15-PINS	9-PINS	15-PINS	9-PINS	15-PINS
INDICATOR		YES		YES		YES
TTL			YES	YES		
DECODERS & TTL					YES	YES
1	PORT 1	PORT 1	TTL 1	TTL 1	LOGIC 1	LOGIC 1
2	PORT 2	PORT 3	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		
5	PORT 5	PORT 5	TTL 5	TTL 5		
6						
7	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
8			Vsw	Vsw	Vsw	Vsw
9		D INDICATOR (COM)		D INDICATOR (COM)		D INDICATOR (COM)
10		E INDICATOR		E INDICATOR		E INDICATOR
11		F INDICATOR		F INDICATOR		F INDICATOR
12		G INDICATOR		G INDICATOR		G INDICATOR
13		H INDICATOR		H INDICATOR		H INDICATOR
14		K INDICATOR		K INDICATOR		K INDICATOR
15						

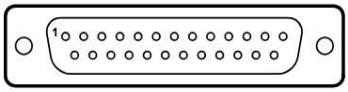
CONNECTOR PINOUT FOR NORMALLY OPEN SP6T MULTI-THROW SWITCHES						
EXAMPLE	CT-48K160-S	CT-48K16C-S	CT-48K160-TS	CT-48K16C-TS	CT-48K160-TDS	CT-48K16C-TDS
PIN NO	9-PINS	15-PINS	9-PINS	15-PINS	9-PINS	15-PINS
INDICATOR		YES		YES		YES
TTL			YES	YES		
DECODERS & TTL					YES	YES
1	PORT 1	PORT 1	TTL 1	TTL 1	LOGIC 1	LOGIC 1
2	PORT 2	PORT 3	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		
5	PORT 5	PORT 5	TTL 5	TTL 5		
6	PORT 6	PORT 6	TTL 6	TTL 6		
7	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
8			Vsw	Vsw	Vsw	Vsw
9		D INDICATOR (COM)		D INDICATOR (COM)		D INDICATOR (COM)
10		E INDICATOR		E INDICATOR		E INDICATOR
11		F INDICATOR		F INDICATOR		F INDICATOR
12		G INDICATOR		G INDICATOR		G INDICATOR
13		H INDICATOR		H INDICATOR		H INDICATOR
14		K INDICATOR		K INDICATOR		K INDICATOR
15		L INDICATOR		L INDICATOR		L INDICATOR



9-PIN D-SUB CONNECTOR



15-PIN D-SUB CONNECTOR



25-PIN D-SUB CONNECTOR

"-S option" 9-pin, 15-pin, 25-pin connector
(example: CCT-48KS660-S)

TRUTH TABLE Normally Open
CCT-48KX3C-T

Logic Input			RF Path			Indicator Switches		
1	2	3	J1	J2	J3	E	F	G
1	0	0	On	Off	Off	C	0	0
0	1	0	Off	On	Off	0	C	0
0	0	1	Off	Off	On	0	0	C

TRUTH TABLE Normally Open
CCT-48KX3C-TD

Logic Input		RF Path			Indicator Switches		
1	2	J1	J2	J3	E	F	G
0	0	On	Off	Off	C	0	0
1	0	Off	On	Off	0	C	0
0	1	Off	Off	On	0	0	C
1	1	Off	Off	Off	0	0	0

TRUTH TABLE Normally Open
CCT-48KX4C-T

Logic Input				RF Path				Indicator Switches			
1	2	3	4	J1	J2	J3	J4	E	F	G	H
1	0	0	0	On	Off	Off	Off	C	0	0	0
0	1	0	0	Off	On	Off	Off	0	C	0	0
0	0	1	0	Off	Off	On	Off	0	0	C	0
0	0	0	1	Off	Off	Off	On	0	0	0	C

TRUTH TABLE Normally Open
CCT-48KX4C-TD

Logic Input			RF Path				Indicator Switches			
1	2	3	J1	J2	J3	J4	E	F	G	H
0	0	0	On	Off	Off	Off	C	0	0	0
1	0	0	Off	On	Off	Off	0	C	0	0
0	1	0	Off	Off	On	Off	0	0	C	0
1	1	0	Off	Off	Off	On	0	0	0	C
1	1	1	Off	Off	Off	Off	0	0	0	0

TRUTH TABLE Normally Open
CCT-48KX5C-T

Logic Input					RF Path					Indicator Switches				
1	2	3	4	5	J1	J2	J3	J4	J5	E	F	G	H	K
1	0	0	0	0	On	Off	Off	Off	Off	C	0	0	0	0
0	1	0	0	0	Off	On	Off	Off	Off	0	C	0	0	0
0	0	1	0	0	Off	Off	On	Off	Off	0	0	C	0	0
0	0	0	1	0	Off	Off	Off	On	Off	0	0	0	C	0
0	0	0	0	1	Off	Off	Off	Off	On	0	0	0	0	C

TRUTH TABLE Normally Open
CCT-48KX5C-TD

Logic Input			RF Path					Indicator Switches				
1	2	3	J1	J2	J3	J4	J5	E	F	G	H	K
0	0	0	On	Off	Off	Off	Off	C	0	0	0	0
1	0	0	Off	On	Off	Off	Off	0	C	0	0	0
0	1	0	Off	Off	On	Off	Off	0	0	C	0	0
1	1	0	Off	Off	Off	On	Off	0	0	0	C	0
0	0	1	Off	Off	Off	Off	On	0	0	0	0	C
1	1	1	Off	Off	Off	Off	Off	0	0	0	0	0

TRUTH TABLE Normally Open
CCT-48KX6C-T

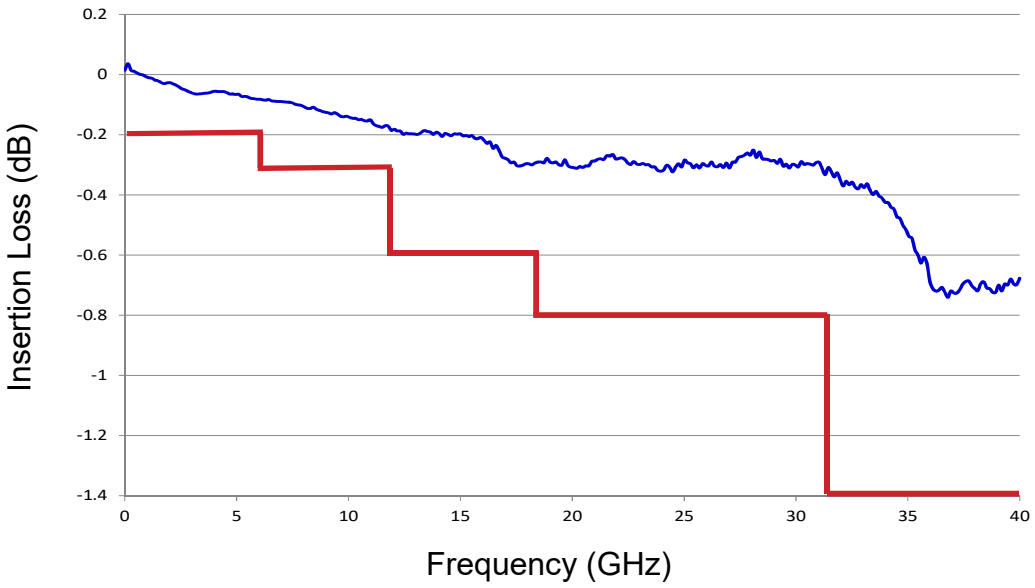
Logic Input						RF Path						Indicator Switches					
1	2	3	4	5	6	J1	J2	J3	J4	J5	J6	E	F	G	H	K	L
1	0	0	0	0	0	On	Off	Off	Off	Off	Off	C	0	0	0	0	0
0	1	0	0	0	0	Off	On	Off	Off	Off	Off	0	C	0	0	0	0
0	0	1	0	0	0	Off	Off	On	Off	Off	Off	0	0	C	0	0	0
0	0	0	1	0	0	Off	Off	Off	On	Off	Off	0	0	0	C	0	0
0	0	0	0	1	0	Off	Off	Off	Off	On	Off	0	0	0	0	C	0
0	0	0	0	0	1	Off	Off	Off	Off	Off	On	0	0	0	0	0	C

TRUTH TABLE Normally Open
CCT-48KX6C-TD

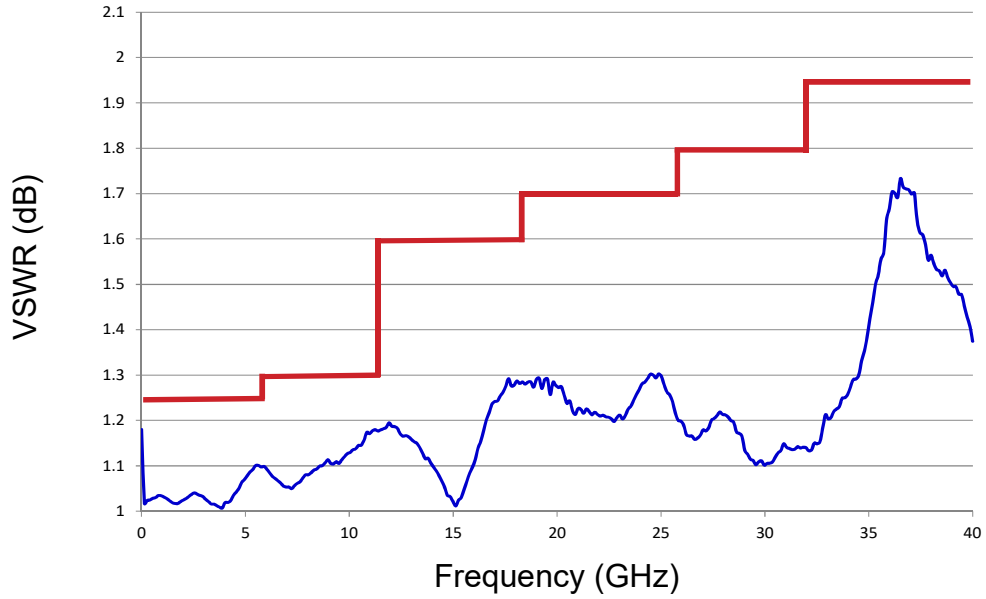
Logic Input			RF Path						Indicator Switches					
1	2	3	J1	J2	J3	J4	J5	J6	E	F	G	H	K	L
0	0	0	On	Off	Off	Off	Off	Off	C	0	0	0	0	0
1	0	0	Off	On	Off	Off	Off	Off	0	C	0	0	0	0
0	1	0	Off	Off	On	Off	Off	Off	0	0	C	0	0	0
1	1	0	Off	Off	Off	On	Off	Off	0	0	0	C	0	0
0	0	1	Off	Off	Off	Off	On	Off	0	0	0	0	C	0
1	0	1	Off	Off	Off	Off	Off	On	0	0	0	0	0	C
1	1	1	Off	Off	Off	Off	Off	Off	0	0	0	0	0	0

TYPICAL RF PERFORMANCE CURVES

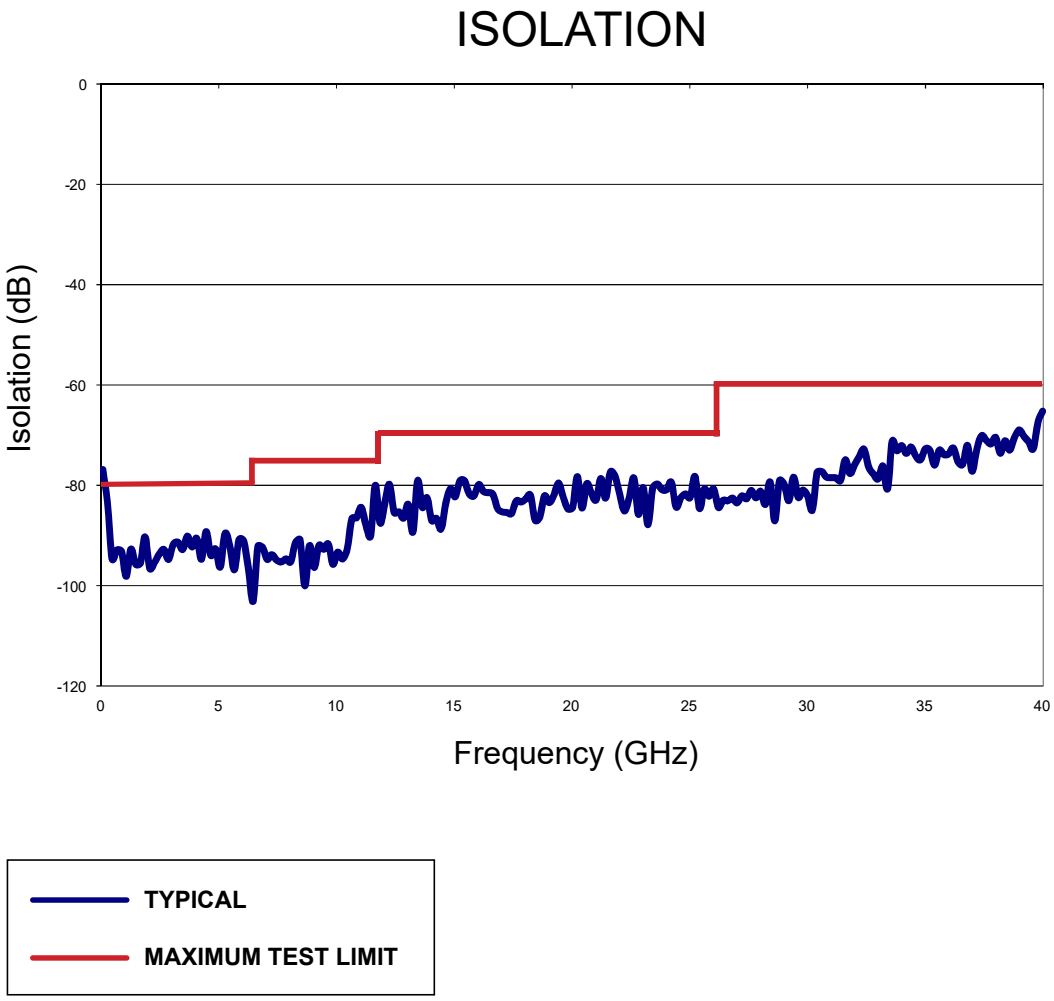
INSERTION LOSS



VSWR

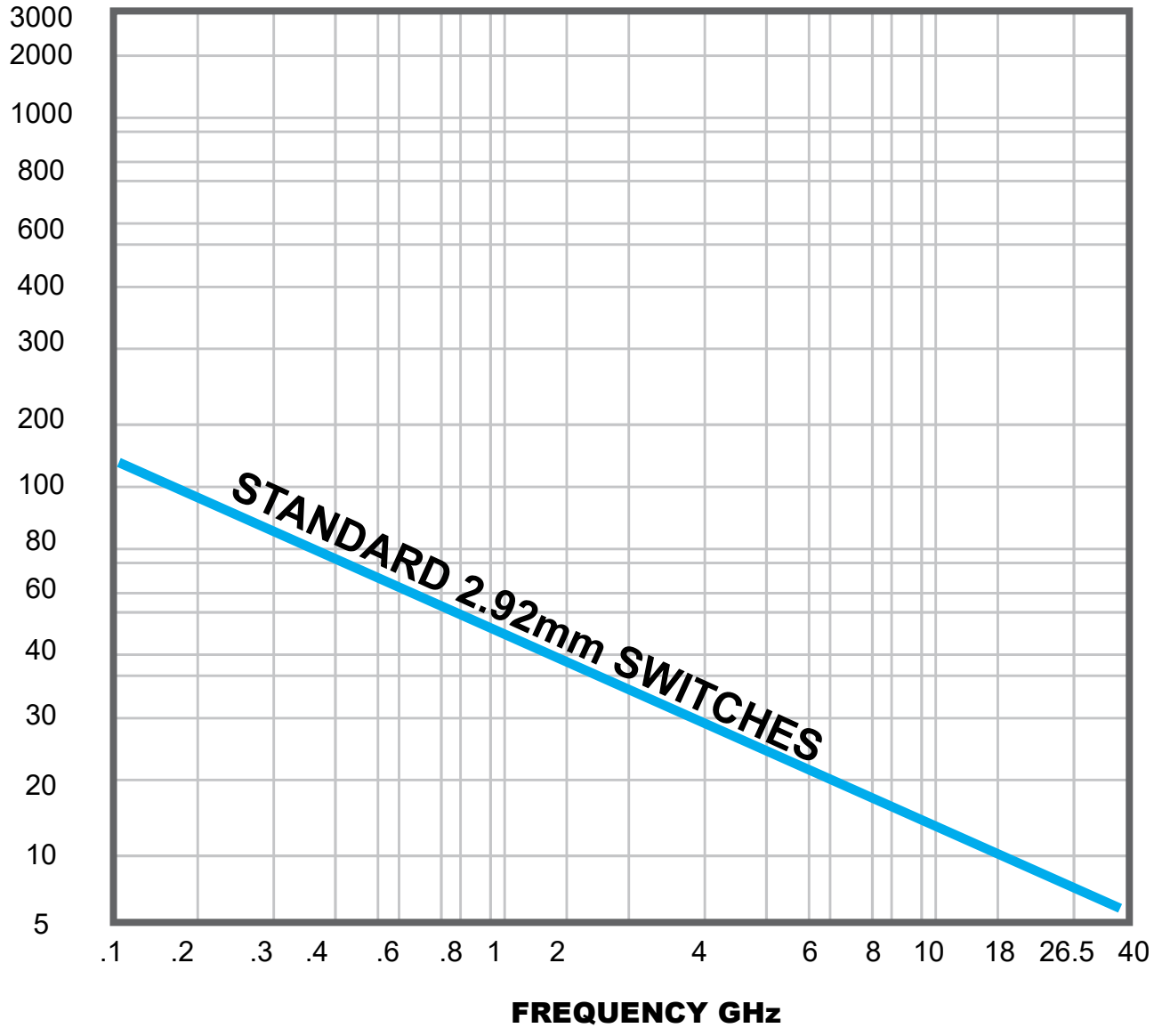


TYPICAL RF PERFORMANCE CURVES



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.

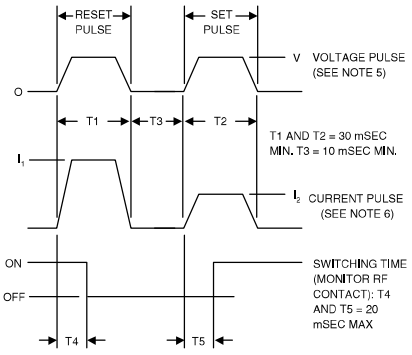
Date Code
All switches are marked with either a unique serial number or a date code. Date codes are in accordance with MIL-STD-1285 Paragraph 5.2.5 and consist of four digits. The first two digits define the year and the last two digits define the week of the year (YYWW). Thus, 1032 identifies switches 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 Latching Switch
A multi-throw switch is a switch with one input and three or more output ports. The CCT-48K can switch a microwave signal to any of 2,3,4,5 or 6 output from a single common input.

DUAL PULSE SWITCHING COMMAND CHARACTERISTICS:
1. APPLIES FOR SINGLE-POLE MULTI-THROW LATCHING SWITCH ONLY.
2. MUST APPLY RESET PULSE FIRST (BREAK-BEFORE-MAKE).
3. RESET AND SET DEFINITIONS
   RESET: OPEN ALL RF PATHS (POSITIONS).
   SET: CLOSE THE SELECTED RF PATH (POSITION).
4. COMMAND PULSE TIMING:



5. COMMAND SWITCHING VOLTAGE:
   V = 26-32 VDC PULSE

6. SWITCHING CURRENT:

SWITCHING CURRENT AT 28 VDC AND 20°C		
NO. OF POS.	RESET (I_1)	SET (I_2)
3 POS.	270 mA	90 mA
4 POS.	360 mA	90 mA
5 POS.	450 mA	90 mA
6 POS.	540 mA	90 mA

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.