TELEDYNE COAX SWITCHES
Everywhereyoulook™

Series CCRT-33S/CRT-33S

Internal 50Ω Termination DC–18 GHz/DC-22 GHz
Latching SPDT Coaxial Switch

PART NUMBER	DESCRIPTION
CCRT-33S	Commercial Latching SPDT, DC-18GHz, Internal 50Ω Termination
CRT-33S	Elite Latching SPDT, DC-22GHz, Internal 50Ω Termination

The CCRT-33S/CRT-33S is an internally terminated, broadband, SPDT, electromechanical coaxial switch designed to switch a microwave signal from a common input to either of two outputs. The characteristic impedance is 50 Ohms. Internal terminations provide an impedance match for the unselected port. The switches are small with the minimum spacing that is compatible with SMA connectors.

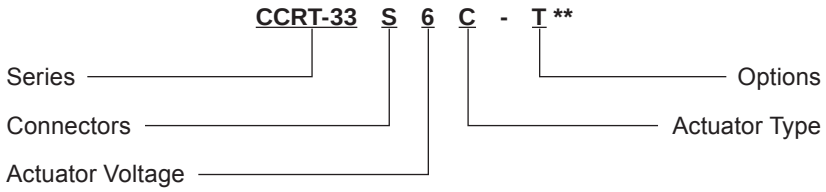
RoHS Compliant

ENVIRONMENTAL AND PHYSICAL CHARACTERISTICS	
Operating Temperature Commercial Model, CCRT-33S Elite Model, CRT-33S	 –40°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	SMA
Humidity (Moisture Seal)	Available
Weight	2.65 oz. (75.13g) (max.)

ELECTRICAL CHARACTERISTICS					
Form Factor	SPDT, break before make				
Frequency Range CCRT-33S CRT-33S	 DC–18 GHz DC–22 GHz				
Characteristic Impedance	50 Ohms				
Terminations	50Ω, 2 Watts CW max.				
Operate Time	10 ms (max.)				
Release Time	10 ms (max.)				
Actuation Voltage Available	12	15	24	28	V
Actuation Current, max. @ ambient	420	350	280	200	mA

PERFORMANCE CHARACTERISTICS				
Frequency	**DC–6 GHz**	**6–12 GHz**	**12–18 GHz**	**18–22 GHz**
Insertion Loss, dB, max.	0.2	0.3	0.4	0.5
Isolation, dB, min.	80	75	70	70
VSWR , max.	1.1:1	1.2:1	1.3:1	1.5:1

PART NUMBERING SYSTEM



Connector
S: SMA Female

Actuator Voltage
6: 28 Vdc Latching
7: 15 Vdc Latching
8: 12 Vdc Latching
9: 24 Vdc Latching

Actuator Type
0: Standard Contacts
C: Indicator Contacts
D: Self Cutoff Only
E: Indicators and Self Cutoff

**SEE PARTS LIST ON PAGE 8

Options
T: TTL Drivers with Diodes
D: Transient Suppression Diodes
R: Positive + Common
M: Moisture Seal
S: 9 Pin D-Sub Connector

For other options, contact factory.

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Latching SPDT Coaxial Switch

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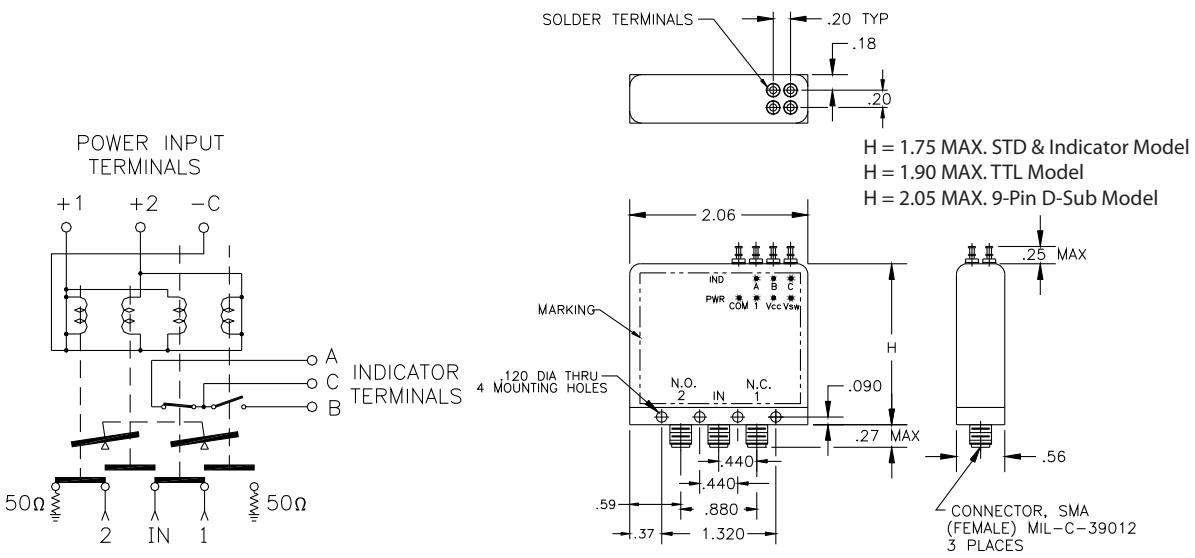
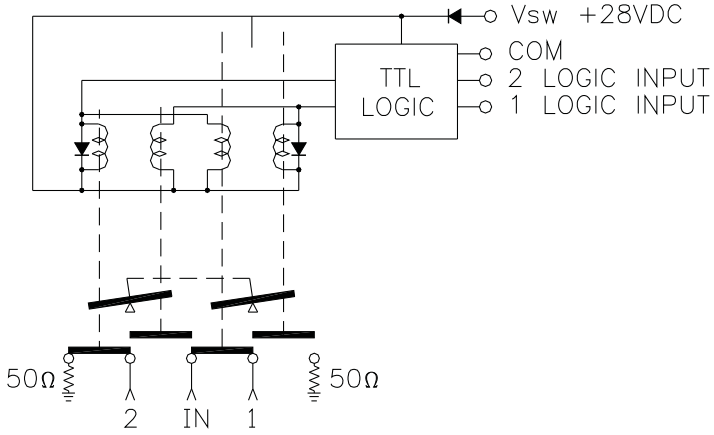
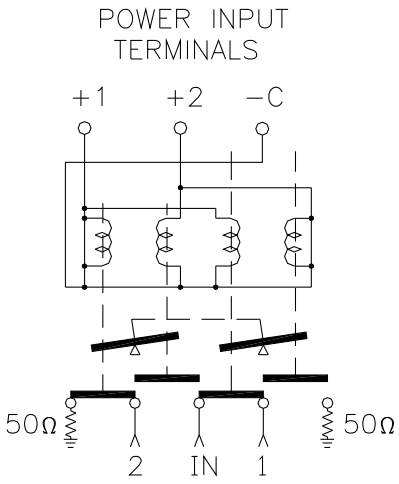
SCHEMATICS AND MECHANICAL OUTLINE



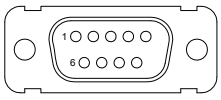
Indicators



TTL



Analog



"-S OPTION" 9-PIN D-SUB CONNECTOR (EXAMPLE: CCRT-33S60-S)

9 PIN D-SUB PINOUT FOR LATCHING SPDT

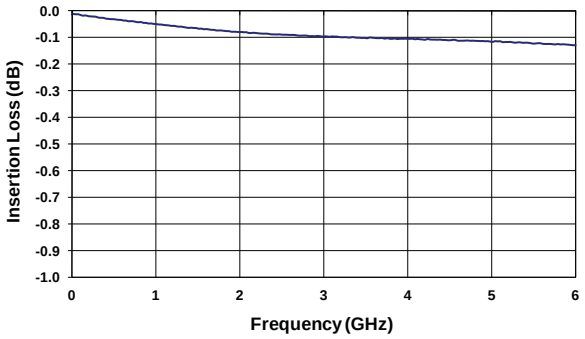
	OPTIONS			
Pin No.	Basic	Indicators	TTL	Indicators & TTL
1	1	1		
2	2	2		
3	C	C	Common	Common
4			1	1
5			2	2
6			Vsw	Vsw
7		A		A
8		B		B
9		C		C

TRUTH TABLE (with TTL option)

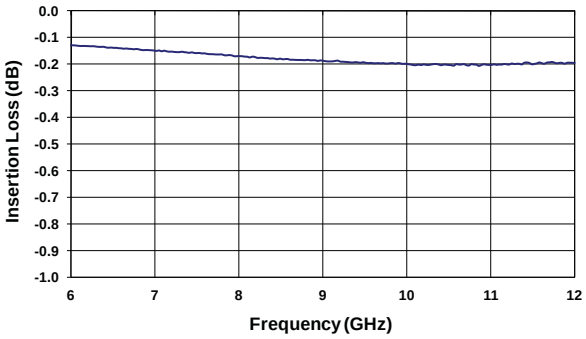
Logic Input		RF Path		Indicator (if applicable)	
1	2	IN to 1	IN to 2	A	B
0	0	No Change			
1	0	On	Terminated	C	0
0	1	Terminated	On	0	C
1	1	Forbidden			

TYPICAL NARROWBAND RF INSERTION LOSS PERFORMANCE CURVES

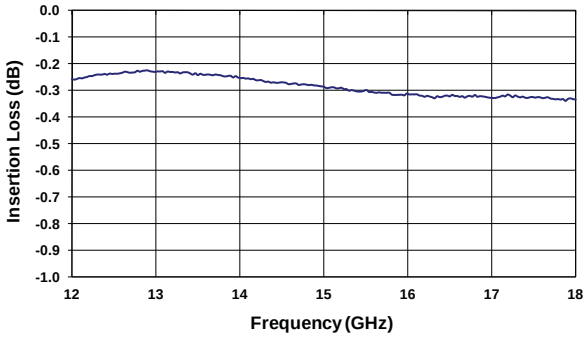
Insertion Loss (DC-6 GHz)



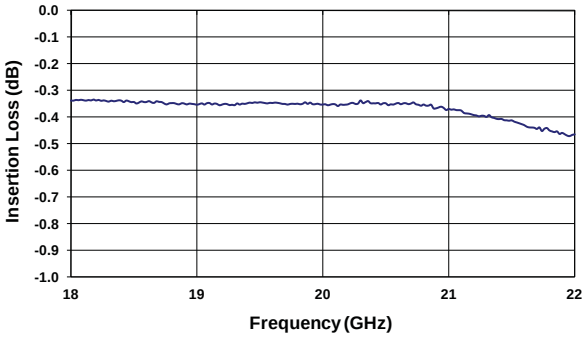
Insertion Loss (6-12 GHz)



Insertion Loss (12-18 GHz)



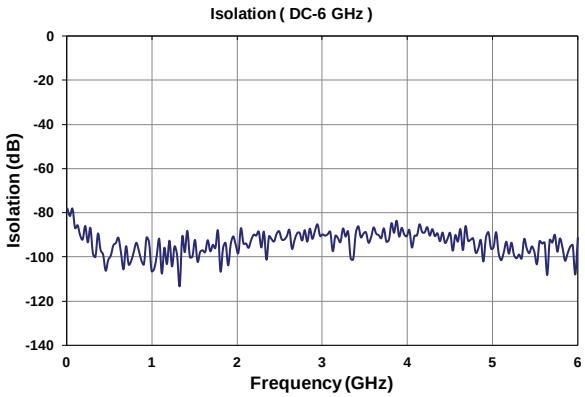
Insertion Loss (18-22 GHz)

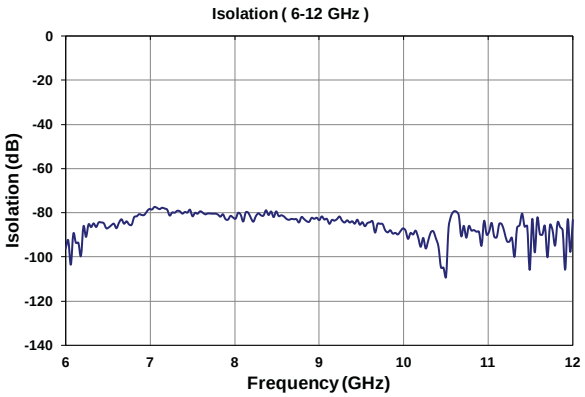


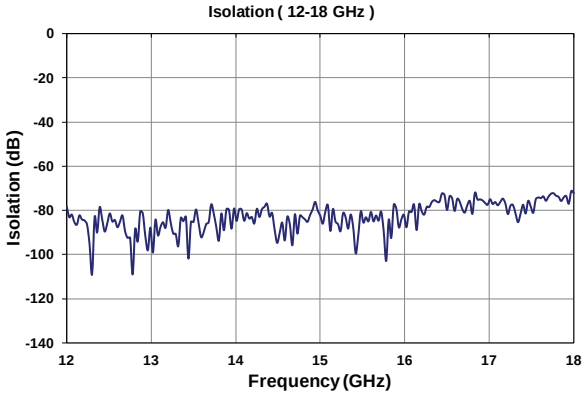
ELITE MODEL ONLY

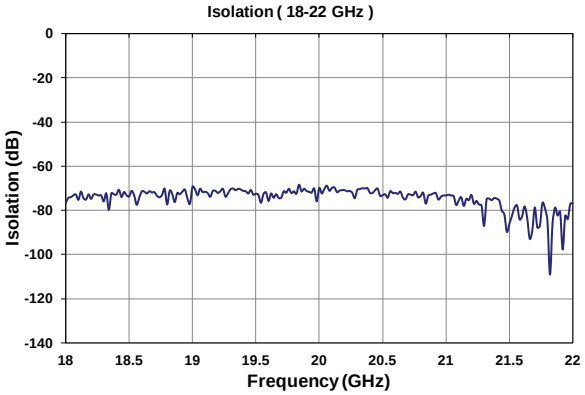
RF NOTES

TYPICAL NARROWBAND RF ISOLATION PERFORMANCE CURVES







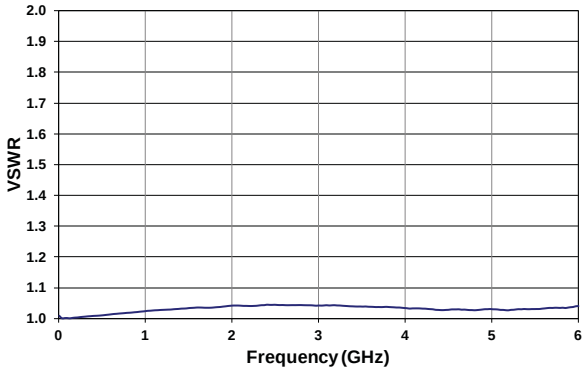


ELITE MODEL ONLY

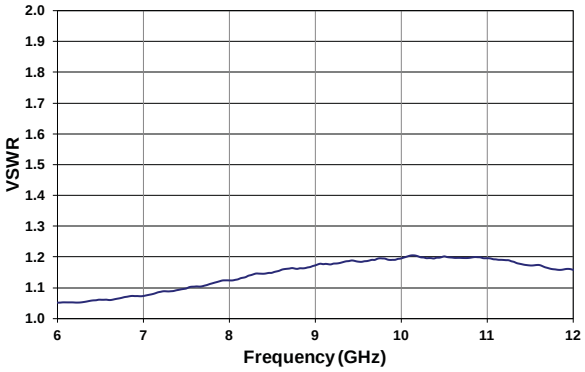
RF NOTES

TYPICAL NARROWBAND RF VSWR PERFORMANCE CURVES

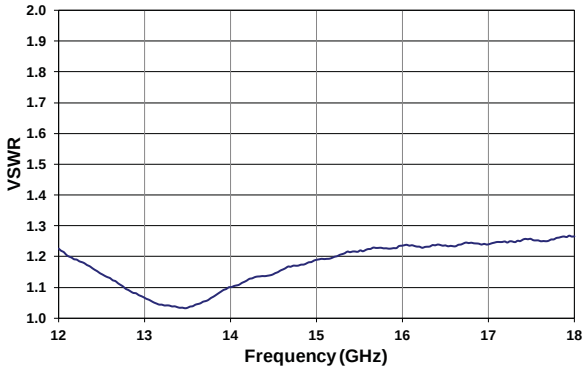
VSWR (DC-6 GHz)



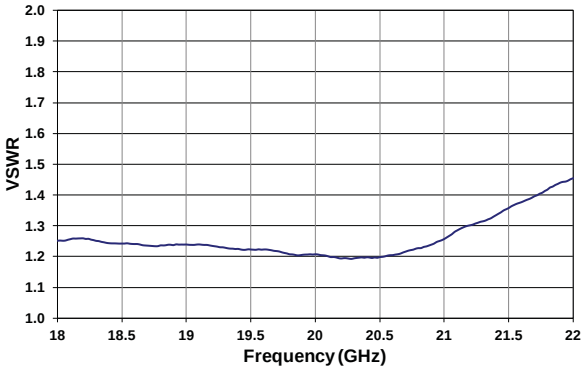
VSWR (6-12 GHz)



VSWR (12-18 GHz)



VSWR (18-22 GHz)

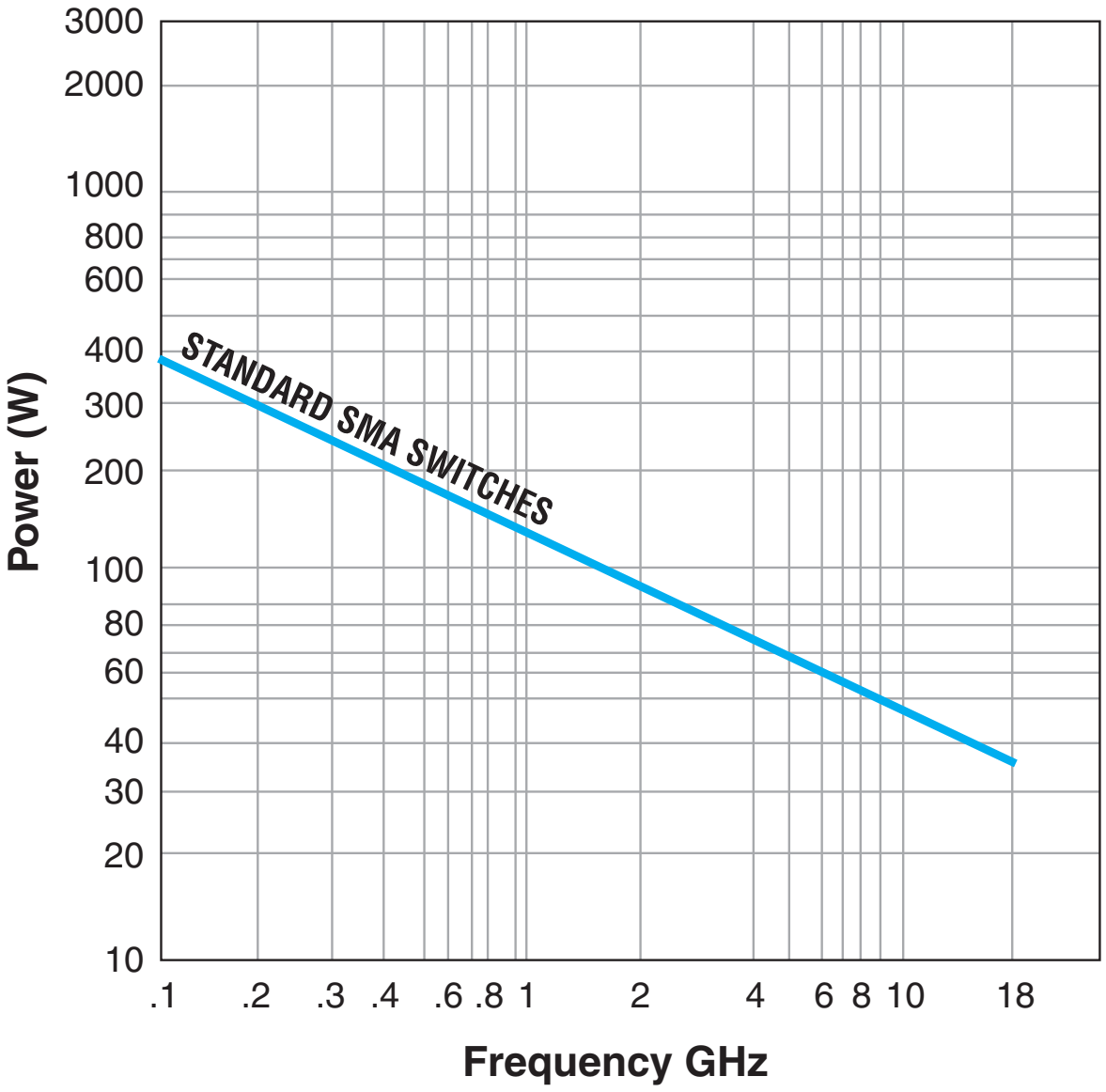


ELITE MODEL ONLY

RF NOTES

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.

Latching
A latching switch remains in the selected position whether or not voltage is maintained. This can be accomplished with either a magnetic or mechanical latching mechanism.

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.

Internal Termination
Unselected ports are internally terminated to a matched load. The load is 50Ω resistive device. The max RF power rating is 2 Watts CW. Without the internal termination option, the unselected ports are open circuits.

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.

Self-Cutoff
The self-cutoff option disables the actuator current on completion of actuation. Either a series contact (linked to the actuator) or an IC driver circuit provides the current cutoff. This option results in minimum power consumption by the RF switch. Cutthroat is another name used in the industry for this option. Pulse latching is a term used to describe a switch without this feature.

SPDT Switch
A single-pole double-throw, bi-directional switch that can be used as having one input and two outputs or two inputs and one output.

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.

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
SPDT	–91 dBm	–110 dBm
	–134 dBc	–153 dBc

LATCHING CCRT-33S/CRT-33S PART NUMBER LIST

	Part No.		Part No.
1	CCRT-33SXC	43	CRT-33SX0-MS
2	CCRT-33SXC-D	44	CRT-33SX0-S
3	CCRT-33SXC-DM	45	CRT-33SX0-T
4	CCRT-33SXC-DMS	46	CRT-33SX0-TM
5	CCRT-33SXC-DS	47	CRT-33SX0-TMS
6	CCRT-33SXC-M	48	CRT-33SX0-TS
7	CCRT-33SXC-MS		
8	CCRT-33SXC-S		
9	CCRT-33SXC-T		
10	CCRT-33SXC-TM		
11	CCRT-33SXC-TMS		
12	CCRT-33SXC-TS		
13	CCRT-33SX0		
14	CCRT-33SX0-D		
15	CCRT-33SX0-DM		
16	CCRT-33SX0-DMS		
17	CCRT-33SX0-DS		
18	CCRT-33SX0-M		
19	CCRT-33SX0-MS		
20	CCRT-33SX0-S		
21	CCRT-33SX0-T		
22	CCRT-33SX0-TM		
23	CCRT-33SX0-TMS		
24	CCRT-33SX0-TS		
25	CRT-33SXC		
26	CRT-33SXC-D		
27	CRT-33SXC-DM		
28	CRT-33SXC-DMS		
29	CRT-33SXC-DS		
30	CRT-33SXC-M		
31	CRT-33SXC-MS		
32	CRT-33SXC-S		
33	CRT-33SXC-T		
34	CRT-33SXC-TM		
35	CRT-33SXC-TMS		
36	CRT-33SXC-TS		
37	CRT-33SX0		
38	CRT-33SX0-D		
39	CRT-33SX0-DM		
40	CRT-33SX0-DMS		
41	CRT-33SX0-DS		
42	CRT-33SX0-M		

* X = 6 (28Vdc), 7 (15Vdc), 8 (12Vdc) and 9 (24Vdc)