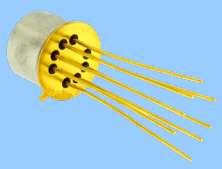
HIGH-SHOCK & HIGH-TEMP HIGH-PERFORMANCE TO-5 RELAY DPDT



SERIES	RELAY TYPE
412KH	DPDT High-Shock, High-Temp, Non-Latching Relay
422KH	DPDT High-Shock, High-Temp, Magnetic-Latching Relay

DESCRIPTION

The TO-5 relay, originally conceived and developed by Teledyne, has become one of the industry standards for low-level switching from dry circuit to 1 ampere. Designed for high-density PC board mounting, its small size and low coil power dissipation make the TO-5 relay one of the most versatile subminiature relays available.

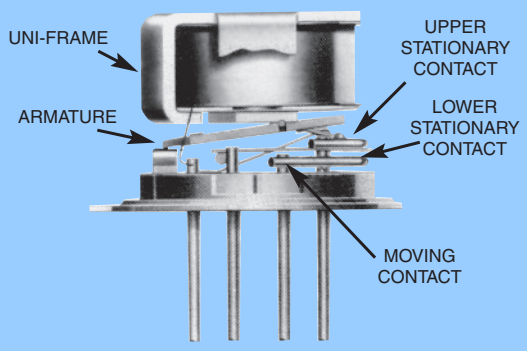
The KH series high-shock & High-Temp TO-5 relays are designed to withstand shock levels up to 4000 g's, .5 millisecond duration and reliably operate in temperatures up to 200°C. Special material selection and construction assure that critical elements of the relay structure and mechanism will not be permanently displaced or damaged as a result of extremely high g level shocks and ultra high ambient temperature conditions.

Typical applications:

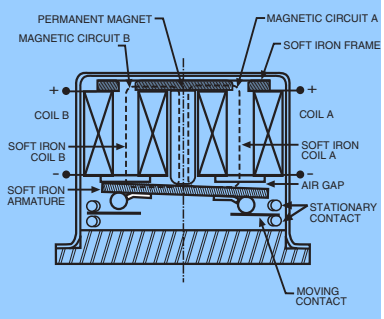
- Oil exploration (down hole) instrumentation
- High temperature industrial and process control
- Telemetry CCA for Military Defense systems
- Military and Commercial avionics aircraft control

By virtue of their inherently low intercontact capacitance and contact circuit losses, the KH Series relays have proven to be excellent subminiature RF switches for applications with frequency ranges well into the UHF spectrum. A typical RF application for the TO-5 relay is in handheld radio transceivers, wherein the combined features of good RF performance, small size, low coil power dissipation and high reliability make it a preferred method of TR switching.

INTERNAL CONSTRUCTION OF 412K

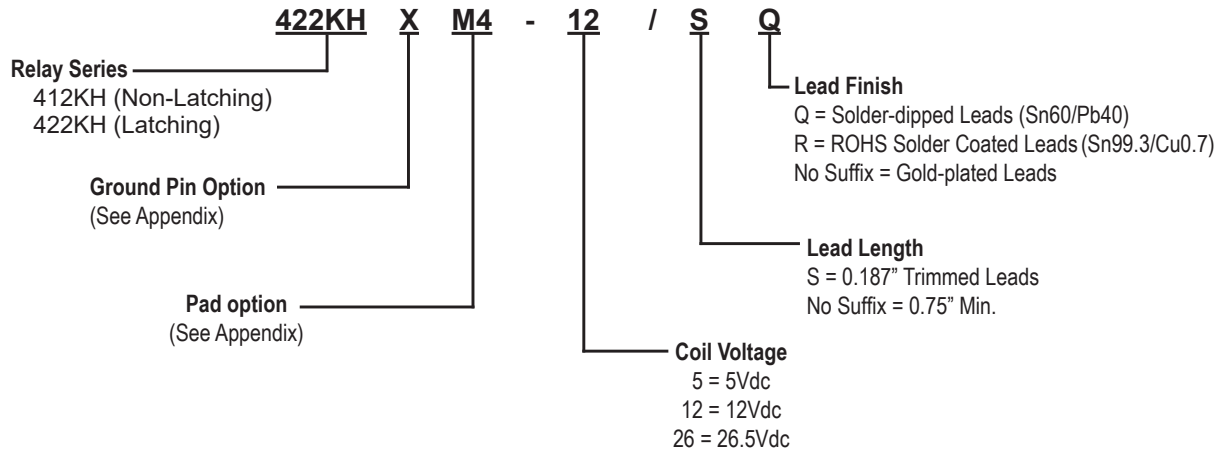


PRINCIPLE OF OPERATION 422K



Energizing Coil B produces a magnetic field opposing the holding flux of the permanent magnet in Circuit B. As this net holding force decreases, the attractive force in the air gap of circuit A, which also results from the flux of the permanent magnet, becomes great enough to break the armature free of Core B, and snap it into a closed position against Core A. The armature then remains in this position upon removal of power from Coil B, but will snap back to position B upon energizing Coil A. since operation depends upon cancellation of a magnetic field, it is necessary to apply the correct polarity to the relay coils as indicated on the relay schematic. When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less than rated coil voltage and the pulse width should be a minimum of three times the specified operate time of the relay. If these conditions are not followed it is possible for the relay to be in the magnetically neutral position.

Part Numbering System (Notes 4 & 5)



Notes

1. Relay contacts will exhibit no chatter in excess of 10 µs or transfer in excess of 1 µs.
2. "Typical" characteristics are based on available data and are best estimates. No on-going verification tests are performed.
3. Unless otherwise specified, parameters are initial values.
4. Unless otherwise specified, relays will be supplied with gold-plated leads.
5. The slash and characters appearing after the slash are not marked on the relay.
6. Survival Only - contact chatter may occur
7. Screened HI-REL versions available. Contact factory.

ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS

412KH		
Temperature (Ambient)		–65°C to +200°C
Vibration (Note 1)		30 g's 10 to 3000 Hz
Shock	**Operating (Note 1)**	75 g's, 6ms half sine
	Survival Only (Note 6)	4000 g's, 0.5 msec. axial plane, half-sine 1000 g's, 0.5 ms side planes, half-sine
Acceleration		50 g's
Enclosure		Hermetically sealed
Weight		0.09 oz. (2.55g) max.

422KH		
Temperature (Ambient)		–65°C to +200°C
Vibration (Note 1)		30 g's 10 to 3000 Hz
Shock	**Operating (Note 1)**	100 g's, 6ms half sine
	Survival Only (Note 6)	2100 g's, 0.5 msec. axial plane, half-sine 750 g's, 0.5 msec side planes, half-sine
Acceleration		50 g's
Enclosure		Hermetically sealed
Weight		0.10 oz. (2.84g) max.

GENERAL ELECTRICAL SPECIFICATIONS (-65°C to +125°C unless otherwise noted)(Notes 2 & 3)

Contact Arrangement		2 Form C (DPDT)
Rated Duty		Continuous
Contact Resistance Measured 1/8" below header	**412KH**	0.125 Ω max. before life; 0.225 Ω max. after life at 1A/28Vdc
	422KH	0.150 Ω max. before life; 0.250 Ω max. after life at 1A/28Vdc
Contact Load Rating (DC) (See Fig. 2 for other DC resistive voltage/current ratings)		Resistive: 1A / 28Vdc Inductive: 200mA / 28Vdc (320 mH) Lamp: 100mA / 28Vdc Low Level: 10 to 50μA / 10 to 50mV
Contact Load Rating (AC)		Resistive: 250mA / 115Vac, 60 and 400 Hz (Case not grounded) 100mA / 115Vac, 60 and 400 Hz (Case grounded)
Contact Life Ratings		10,000,000 cycles (typical) at low level 1,000,000 cycles at 0.5A/28Vdc resistive 100,000 cycles min. at all other loads specified above
Contact Overload Rating		2A / 28Vdc Resistive (100 cycles min.)
Contact Carry Rating		Contact Factory
Coil Operating Power	**412KH**	500mW typ. @ 25°C
	422KH	290mW typ. @ 25°C
Operate Time	**412KH**	2.0 ms max.
	422KH	1.5 ms max.
Release Time		2.0 ms max.
Contact Bounce		1.5 ms maximum
Minimum Operate Pulse	**422KH**	4.5 ms width @ rated voltage
Intercontact Capacitance		0.4 pf typical
Insulation Resistance		10,000 MΩ minimum, between mutually isolated terminals
Dielectric Strength		Atmospheric pressure: 500 V_{rms} / 60Hz 70,000 ft.: 125 V_{rms} / 60Hz

DETAILED ELECTRICAL SPECIFICATIONS (-65°C to +125°C unless otherwise noted) (Note 3)

Coil Ratings		**5V**	**12V**	**26.5V**
Coil Voltage, Nominal (Vdc)	**Nom.**	5.0	12.0	26.5
	Max.	5.8	16.0	32.0
412KH Coil Resistance (Ohms ±10%, 25°C)		50	300	1350
422KH Coil Resistance (Ohms ±10%, 25°C)		61	500	2000
Pick-up Voltage, (Vdc, Max.)	**412K**	4.3	10.0	21.0
Drop-out Voltage, (Vdc, Min.)		0.14	0.41	0.89
Set & Reset Voltage, (Vdc, Max.)	**422K**	3.5	9.0	18.0

PERFORMANCE CURVES (Note 2)

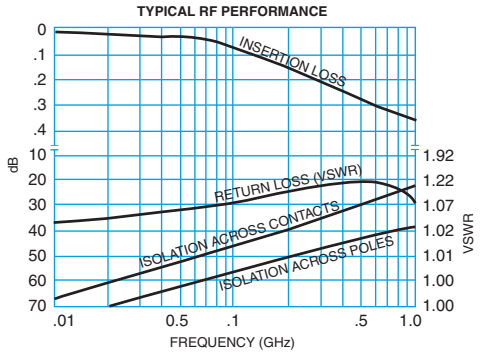


Figure 1

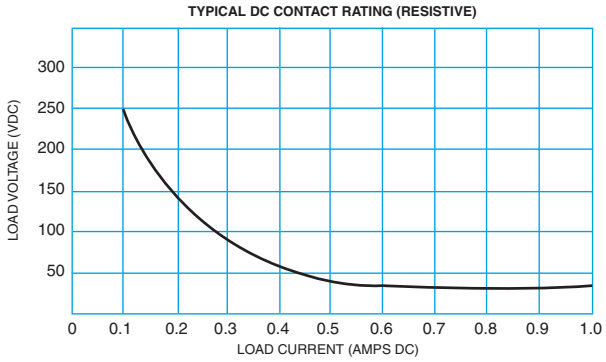
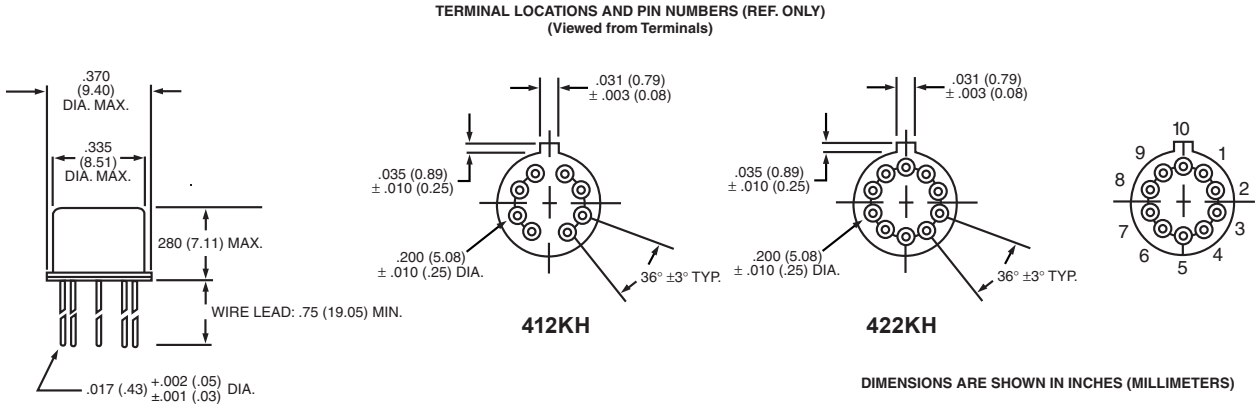
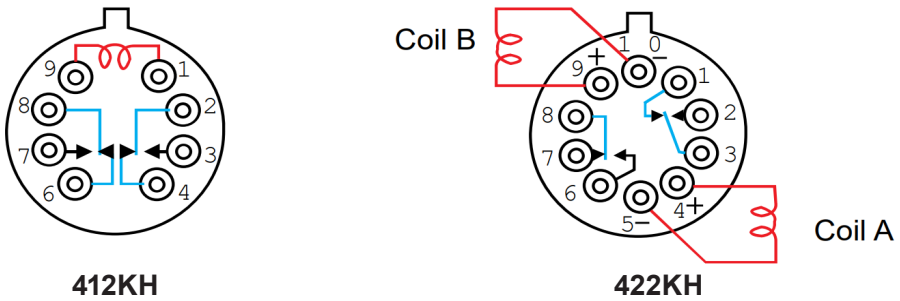


Figure 2

OUTLINE DIMENSIONS

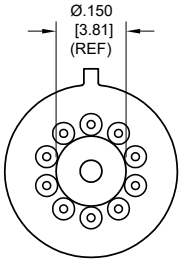
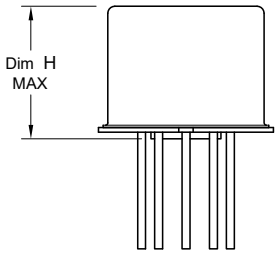


SCHEMATIC DIAGRAMS



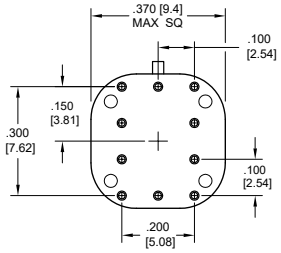
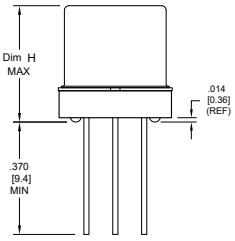
SCHEMATICS ARE VIEWED FROM TERMINALS

APPENDIX: Spacer Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
 “M4” Pad for TO-5		412KH	.295 (7.49)
		422KH	.305 (7.75)

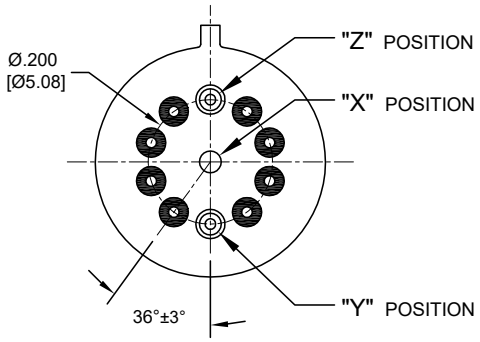
Notes:
1. Spacer pad material: Polyester film.
2. To specify an “M4” spacer pad, refer to the mounting variants portion of the part numbering example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is ± .010” (.25 mm).
5. Add 10 mΩ to the contact resistance shown in the datasheet.
6. Add 0.01 oz. (0.25 g) to the weight of the relay assembly shown in the datasheet.

APPENDIX: Spreader Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
 “M” Pad 5/ 6/		412KH	.388 (9.86)
		422KH	.398 (10.11)

Notes:
1. Spreader pad material: Diallyl Phthalate.
2. To specify an “M” spreader pad, refer to the mounting variants portion of the part number example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is ± .010” (0.25 mm).

APPENDIX: Ground Pin Positions



- ○ Indicates ground pin position
- ● Indicates glass insulated lead position
- ◎ Indicates ground pin or lead position depending on relay type

TO-5 Relays:
ER411T, ER412, ER412T, ER420, ER421, ER422, ER431T, ER432, ER432T, 712, 712TN, 400H, 400K, 400V, RF300, RF303, RF341, RF312, RF332, RF310, RF313, RF320, RF323, SI800, SI803, RF700, RF703

NOTES
1. Terminal views shown
2. Dimensions are in inches (mm)
3. Tolerances: ± .010 (±.25) unless otherwise specified
4. Ground pin positions are within .015 (0.38) dia. of true position
5. Ground pin head dia., 0.035 (0.89) ref: height 0.010 (0.25) ref.
6. Lead dia. 0.017 (0.43) nom.