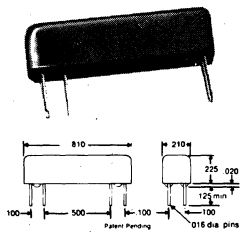
COTO CORPORATION

REED RELAYS

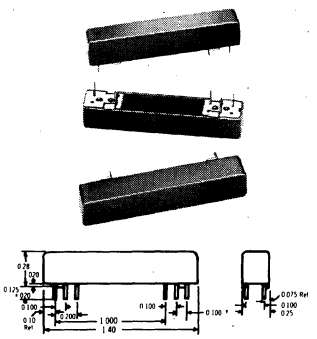
HIGH VOLTAGE, MERCURY-WETTED, LONG-LIFE
MINIATURE, ULTRA-LOW THERMAL EMF AND DIP



2200/2900 SERIES

Microminiature reed relays for maximum versatility and dependability. Encapsulated in epoxy coated magnetically-shielding steel shell. Ideal for switching high-frequency signals. Greater than 10^{12} ohms insulation resistance available.

Model #	Contact Form	Switch Volt	Switch Current	Carry Current
2204	1A Dry	200	0.5A	1.0A
2211	1C Dry	100	0.25A	0.5A
2231	1A Hi-V	200	0.5A	1.0A
2902	1A Dry	200	0.5A	1.5A
2904	1A Dry	200	0.5A	1.5A
2911	1C Dry	150	0.25A	1.0A
2920	1A HG	500	1.0A	2.0A



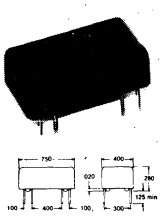
2400 SERIES

Coto's new series 2400 miniature reed relays are ideal for use in Telephone Switching and ATE applications (such as Texas Instruments ATE equipment) or in applications where high sensitivity, high power or high voltage relays are required.

Slightly larger than the Series 2200 microminiature relays, the Series 2400 units are available in a wide variety of custom pin configurations. In addition, wider pin spacing allows better contact to coil isolation on the PCB.

Model* #	Contact Form	Switch Voltage	Switch Current	Feature
2404	1A	200	0.5	Hi sensitivity
2405	1A	200	1.0	Hi power (50W)
2406	1A	200	0.5	ATE
2411	1C	150	0.25	Hi sensitivity
2420	1A**	500	1.0	Hg wetted
2430	1A	250	0.5	Tel. switching
2431	1A	500	0.5	Hi voltage

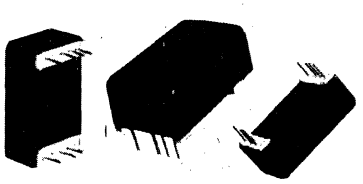
* All Models available w/ 5V or 12V coils
** Vertical mounting required



2600 SERIES

Highly reliable DIP reed relays designed for versatility. Offered in a wide variety of contact types and coil resistances. Excellent for new designs or to retro-fit lesser quality molded DIP relays. Diode coil suppression available.

Model #	Contact Form	Switch Volt	Switch Current	E.S. Shield
2604	1A	200	0.5A	YES
2610	1C	100	0.2A	NO
2611	1C	100	0.25A	YES
2631	1A Hi-V	250	0.5A	NO
2653	2A	100	0.5A	YES



3200/3400 SERIES

Low and ultra-low thermal EMF series. Feature 500 nanovolt thermals and 50 nanovolt stability. Fully encapsulated in magnetically shielding steel shell. For scanning low level analog and digital signals, multiplexing, data acquisition and automatic test equipment.

Model #	Contact Form	Thermal EMF Options (Max)
3201	1A	3μV, 1μV, 500nV
3202	2A	5μV, 3μV, 1μV, 500nV
3203	3A	5μV, 3μV, 1μV
3204	1B	5μV, 3μV, 1μV, 500nV
3205	2B	5μV, 3μV, 1μV
3206	1A/1B	5μV, 3μV, 1μV
3207	1A Latch	1μV, 200nV
3250	3A	5μV, 3μV, 1μV, 500nV
3221	1A Hi-V	5μV, 3μV
3222	2A Hi-V	5μV, 3μV
3402	2A	5μV, 3μV, 1μV, 500nV
3432	2A HG	10μV, 5 μV
3450	3A	5μV, 3μV, 1μV, 500nV
3460	3A	5μV, 3μV, 1μV, 500nV

CALL/WRITE FOR NEW COTO CATALOG CC-85E

Contact Coto Sales Office in the Manufacturers' Directory.

ONE BILLION LIFETIMES!

COTO reed relays have been life tested for 1 billion operations. This assures you of complete product integrity in your most critical designs.

Each and every COTO reed relay is triple-tested in all operating parameters prior to shipment. You can depend absolutely on COTO quality and reliability.

COTO offers a wide variety of reed relays to meet every requirement.

COTO WABASH

55 DuPont Drive, Providence, R.I. 02907
(401) 943-2686 FAX (401) 942-0920

ULTRA-LOW THERMAL EMF REED RELAYS FOR LOW-LEVEL DATA ACQUISITION SYSTEMS

THERMAL EMF

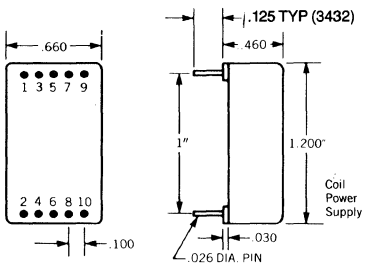
Ratings. Thermal EMF is specified differentially between the two thermal EMF switches (pins 5-6 and 7-8). It is directly proportional to coil power or the square of the applied voltage. When the relays are operated in a scanning mode, the thermal EMF is also proportional to the coil duty cycle.

Coto Series 3600 relays are available with maximum differential thermal EMF ratings of <5μV, <3μV, <1μV, or <0.5μV.

The Mercury wetted 3432 Relay is available with maximum differential thermal EMF ratings of <5μV, <10μV.

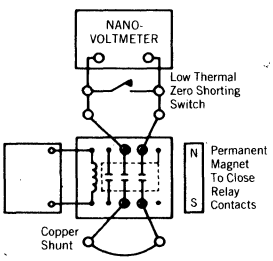
Note: The must operate and must release voltages and the coil resistance are specified at 25°C. These values vary by approximately 0.4%/°C as the ambient temperature varies.
Vibration: 20 G's to 2000Hz Shock: 50 G's

MECHANICAL SPECS



All dimensions are nominal
Pin 9 is the electrostatic shield pin.

Thermal EMF Test Circuit



ORDERING INFORMATION

To order – assemble a part number from the parameters.
Specifications subject to change without notice.

3602, 3650, 3660

Model Number (02,50,60) **36XX-XX-X X**
Coil Voltage (05 or 12)
Thermal
- <5μV – Suffix 9
- <3μV – Suffix 8
- <1μV – Suffix 7
- <0.5μV – Suffix 5

Pin Length
- Standard (0.135" ± 0.020") "2" – Suffix 2
- VME (0.110" ± 0.010) "3" – Suffix 3

3432-XX-1X

Hg Wet
Coil Voltage
Thermal <10μV – Suffix 1
<5μV – Suffix 9
Contact Isolation (Ohms)
- 10^{10} – Suffix "0"
- 10^{12} – Suffix "1"

MODEL NUMBER			3602			3650			3660			3432[1]		
CONTACT ARRANGEMENT			2A DRY			3A DRY			3A DRY			2A HG WET		
PARAMETERS & TEST CONDITIONS		UNIT	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
COIL RESISTANCE	5 VOLT COIL	Ω	315	350	385	315	350	385	315	350	385	97.5	105	115.5
	12 VOLT COIL	Ω	1800	2000	2200	1800	2000	2200	1800	2000	2200	540	600	660
COIL DRIVE VOLTAGE	5 VOLT COIL	VDC	—	5	6.5		5	6.5	—	5	6.5	—	5	6.5
	12 VOLT COIL	VDC	—	12	15	—	12	15	—	12	15	—	12	15
RELAY OPERATE VOLTAGE	5 VOLT COIL	VDC	—	—	3.8	—	—	3.8	—	—	3.8	—	—	3.8
	12 VOLT COIL	VDC	—	—	9.0	—	—	9.0	—	—	9.0	—	—	9.0
RELAY RELEASE VOLTAGE	5 VOLT COIL	VDC	0.4	—	—	0.4	—	—	0.4	—	—	0.4	—	—
	12 VOLT COIL	VDC	1.0	—	—	1.0	—	—	1.0	—	—	1.0	—	—
SWITCHING VOLTAGE (DC/Peak AC, Resistive)		Volts	—	—	150	—	—	150	—	—	150	—	—	500
SWITCHING CURRENT (DC/Peak AC, Resistive)		mA	—	—	250	—	—	250	—	—	250	—	—	1.0
CARRY CURRENT (DC/Peak AC, Resistive)		Amps	—	—	1.5	—	—	1.5	—	—	1.5	—	—	2.0
CONTACT POWER RATING (DC/Peak AC, Resistive)		W	—	—	5.0	—	—	5.0	—	—	5.0	—	—	5.0
LIFE EXPECTANCY	(@ Signal Level <1.0 V, .010A)	×10⁶	500	—	500	500	—		500	—		1000	—	—
	(Switching >1.0 V, Consult Factory)	×10⁶	—	—		—	—		—	—	—	—	—	—
STATIC CONTACT RESISTANCE (Max. initial, measured with .050 V, 10mA Contact Lead)		Ω	—	—	0.100	—	—	0.100	—	—	0.100	—	—	0.050
DYNAMIC CONTACT (Max. initial, meas. w/.050 V, .050 A @ 100 Hz 1.5 msec after closure)		Ω	—	—	0.200	—	—	0.200	—	—	0.200	—	—	0.100
INSULATION RESISTANCE (Between all isolated pins)	25°C, 40% RH	Ω	10^{10}	10^{10}	—	10^{12}	10^{13}	—	10^{12}	10^{13}	—	10^{10}	10^{12}	—
MEASURED WITH 100 V @	40°C, 95% RH	Ω	—	—	—	—	—	—	—	—	—	—	—	—
DIELECTRIC STRENGTH	ACROSS OPEN CONTACTS:	VDC	250	—	—	250	—	—	250	—	—	1000	—	—
	CONTACTS TO SHIELD:	VDC	500	—	—	500	—	—	500	—	—	1000	—	—
	CONTACTS & SHIELD TO COIL:	Vrms	1500	—	—	1500	—	—	1500	—	—	1500	—	—
CAPACITANCE ACROSS OPEN CONTACTS	Shield floating	pf	—	1.2	—	—	1.2	—	—	1.2	—	—	1.2	—
	Shield guarding	pf	—	0.2	—	—	0.2	—	—	0.2	—	—	0.2	—
OPEN CONTACTS TO COIL AND SHIELD		pf	—	2.5	—	—	2.5	—	—	2.5	—	—	2.5	—
OPERATE TIME (Incl. bounce @ Nom. voltage)		msec.	—	.75	1.0	—	.75	1.0	—	.75	1.0	—	2.0	3.0
RELEASE TIME	Diode & Zener supressed:[2]	msec.	—	100	500	—	100	500	—	100	500	—	1.5	2.5
TEMPERATURE RANGE	Operate:	°C	−20	—	+70	−20	—	+70	−20	—	+70	−20	—	+70
	Storage:	°C	−50	—	+100	−50	—	+100	−50	—	+100	−30	—	+100
ALL RATINGS AT 25°C UNLESS NOTED.														
PIN DIAGRAM (Bottom View) Switches connected to pins 5-6 and 7-8 are the low thermal EMF switches.			1 3 5 7 9 / 2 4 6 8 10			1 3 5 7 9 / 2 4 6 8 10			1 3 5 7 9 / 2 4 6 8 10			1 3 5 7 9 / 2 4 6 8 10		

1. Mercury-wetted Relay 3432 must be mounted vertically with the arrow pointing up and shield pin at the top.
2. Consists of 20V Zener-diode and 1N4002 diode in series connected in parallel to coil.
3. For Series 3660, the third non-low thermal switch (9-10) is connected in common with the electrostatic shield at pin 9.

COTO WABASH

DuPont Drive, Providence, R.I. 02907
(401) 943-2686 FAX (401) 942-0920

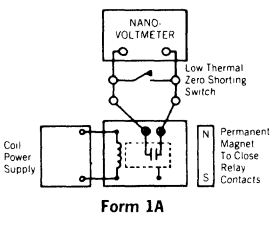
LOW THERMAL EMF REED RELAYS SERIES 3500

THERMAL EMF

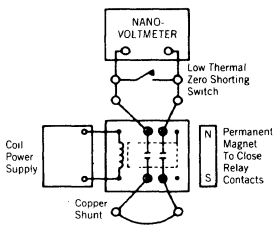
Ratings. The thermal EMF is specified individually for Form 1A relays and differentially between the switches for Form 2A relays. This measurement is made as shown in block diagram. Form 2A relays are measured by shorting pins 2 and 4 with a copper shunt and connecting a nanovolt meter across pins 8 and 10.

The 3500 relays are available with maximum differential thermal EMF ratings of either <10μV, <5μV, <3μV, <1μV or <500nV. The ratings are determined by 100% testing and sorting according to the thermal EMF's measured after the coil has been energized for 5 minutes at its nominal voltage.

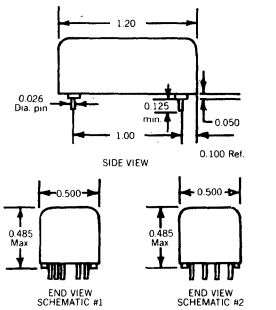
Thermal EF Test Circuits:

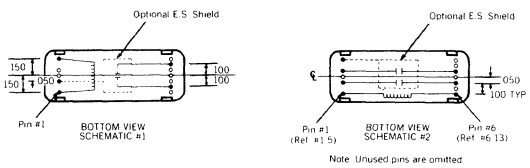


Form 1A



Form 2A





Note: Unused pins are omitted

ORDERING INFORMATION

To order – assemble a part number from the parameters. Specifications subject to change without notice.

35 XX-XX-XXX

- Model No.
- Coil Voltage: 05, 12
- Thermal:
  - <10μV – Suffix "1" Hg Wet
  - <5μV – Suffix "9" Dry & Hg Wet
  - <3μV – Suffix "8" Dry Only
  - <1μV – Suffix "7" Dry Only
  - <500nV – Suffix "5" Dry Only
- Contact Isolation (Ohms)
  - 10^{10} – Suffix "0"
  - 10^{12} – Suffix "1"
- No electrostatic shield – "0"
- Electrostatic shield – "1"

Model Number			3501			3502			3520			3530			3531			3540			3541		
Features			High Sensitivity			High Sensitivity			Mercury Wetted			Intermediate High Voltage			Intermediate High Voltage			High Voltage			High Voltage		
Contact Form			1A			2A			2A Hg[1]			1A			2A			1A			2A		
Electrostatic Shield Available			Yes			Yes			Yes			No			No			Yes			Yes		
Thermal EMF Options Available 4		μV Max	Individual 5,3,1,0.5			Differential 5,3,1,0.5			Differential 10,5			Individual 5,3,1,0.5			Differential 5,3,1,0.5			Individual 5,3,1,0.5			Differential 5,3,1,0.5		
PARAMETERS & TEST CONDITIONS		UNIT	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
COIL RESISTANCE[2]	5 VOLT COIL	Ω	315	350	385	315	350	385	180	200	220	225	250	275	225	250	275	225	250	275	225	250	275
	12 VOLT COIL	Ω	1800	2000	2200	1800	2000	2200	765	850	935	1350	1500	1650	1350	1500	1650	1350	1500	1650	1350	1500	1650
COIL DRIVE VOLTAGE	5 VOLT COIL	VDC	–	5	6.5	–	5	6.5	–	5	6.5	–	5	6.5	–	5	6.5	–	5	6.5	–	5	6.5
	12 VOLT COIL	VDC	–	12	15	–	12	15	–	12	15	–	12	15	–	12	15	–	12	15	–	12	15
RELAY OPERATE VOLTAGE	5 VOLT COIL	VDC	–	–	3.8	–	–	3.8	–	–	3.8	–	–	3.8	–	–	3.8	–	–	3.8	–	–	3.8
	12 VOLT COIL	VDC	–	–	9.0	–	–	9.0	–	–	9.0	–	–	9.0	–	–	9.0	–	–	9.0	–	–	9.0
RELAY RELEASE VOLTAGE	5 VOLT COIL	VDC	0.4	–	–	0.4	–	–	0.4	–	–	0.4	–	–	0.4	–	–	0.4	–	–	0.4	–	–
	12 VOLT COIL	VDC	1.0	–	–	1.0	–	–	1.0	–	–	1.0	–	–	1.0	–	–	1.0	–	–	1.0	–	–
SWITCHING VOLTAGE (DC/Peak AC, Resistive)		Volts	–	–	200	–	–	200	–	–	500	–	–	250	–	–	250	–	–	500	–	–	500
SWITCHING CURRENT (DC/Peak Ac, Resistive)		Amps	–	–	0.5	–	–	0.5	–	–	1.0	–	–	0.5	–	–	0.5	–	–	0.5	–	–	0.5
CARRY CURRENT (DC/Peak AC, Resistive)		Amps	–	–	1.5	–	–	1.5	–	–	2.0	–	–	2.5	–	–	2.5	–	–	2.0	–	–	2.0
CONTACT POWER RATING (DC/Peak AC, Resistive)[3]		W	–	–	10	–	–	10	–	–	28	–	–	20	–	–	20	–	–	10	–	–	10
LIFE EXPECTANCY	(@ Signal Level <1.0 V, .010A)	10^6	500	–	–	500	–	–	1000	–	–	500	–	–	500	–	–	100	–	–	100	–	–
	(Switching>1.0 V, Consult Factory		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
STATIC CONTACT RESISTANCE (Max. initial, measured with .050V, 10 mA Contact Load)		Ω	–	–	0.200	–	–	0.100	–	–	0.050	–	–	0.200	–	–	0.100	–	–	0.200	–	–	0.100
DYNAMIC CONTACT (Max. initial, meas. w/.050 V, .050 A @ 100 Hz 1.5 msec after closure)		Ω	–	–	0.300	–	–	0.200	–	–	0.100	–	–	0.300	–	–	0.200	–	–	0.300	–	–	0.200
INSULATION RESISTANCE (Between all isolated pins) MEASURED WITH 100 V @ 25°C. 40% RH		Ω	10^{10}			10^{10}			10^{10}			10^{10}			10^{10}			10^{10}			10^{10}		
DIELECTRIC STRENGTH (DC/Peak AC)	ACROSS OPEN CONTACTS:	Volts	700	–	–	350	–	–	1500	–	–	1500	–	–	750	–	–	1500	–	–	1500	–	–
	CONTACTS TO SHIELD:	Volts	500	–	–	500	–	–	500	–	–	500	–	–	500	–	–	500	–	–	500	–	–
	CONTACTS & SHIELD TO COIL:	Volts	1500	–	–	1500	–	–	1500	–	–	1500	–	–	1500	–	–	1500	–	–	1500	–	–
CAPACITANCE ACROSS OPEN CONTACTS	Without shield	pf	–	3.0	–	–	1.7	–	–	1.7	–	–	3.0	–	–	1.7	–		3.0			1.7	
	Shield guarding	pf	–	1.9	–	–	0.2	–	–	0.2	–	–	1.9	–	–	0.2	–	–	1.9	–	–	0.2	–
OPEN CONTACTS TO COIL AND SHIELD		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OPERATING TIME (Incl. bounce @ Nom. voltage)		msec	–	0.75	–	–	0.75	–	–	2.0	–	–	1.0	–	–	1.0	–	–	1.0	–	–	1.0	–
RELEASE TIME Diode & Zener suppressed:		msec	–	0.1	–	–	0.1	–	–	0.1	–	–	0.2	–	–	0.2	–	–	0.2	–	–	0.2	–
TEMPERATURE RANGE	Operate:	C°	−20	–	+70	−20	–	+70	−20	–	+70	−20	–	+70	−20	–	+70	−20	–	+70	−20	–	+70
	Storage:	C°	−35	–	+100	−35	–	+100	−35	–	+100	−35	–	+100	−35	–	+100	−35	–	+100	−35	–	+100
ALL RATINGS AT 25°C UNLESS NOTED																							
SCHEMATIC NUMBER			1			2			2			1			2			1			2		

1 Must be mounted vertically. Pin #1 is up.
2 The coil resistance & operate & release voltages are specified at 25°C. These values vary by approx. 0.39%/°C as the ambient temperature changes.
3 The life expectancy when switching intermediate voltages and currents may vary widely. Consult the factory for your exact load requirements.
4 Measured after 5 minutes at nominal coil voltage.