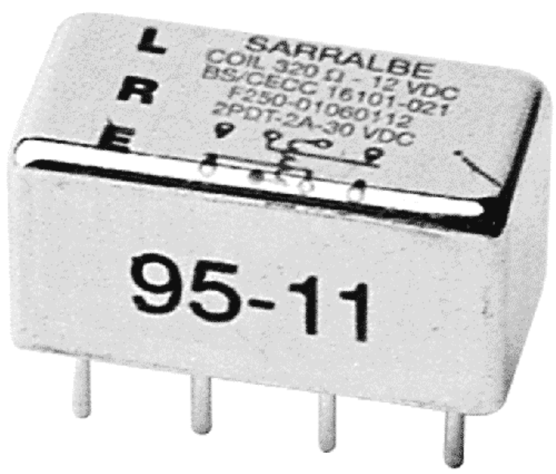
ENGINEERING DATA SHEET

F250

RELAY - NONLATCH
2 PDT, 2 AMP



APPLICATION NOTES:
001
007

APPLICABLE SOCKET:
HRCW
SO9005
SF250-4

Non polarized, non latching hermetically sealed relay

Contact arrangement	**2 PDT**
Coil supply	**Direct current**
Designed to the performance standards of	**MIL-R-6106/6** **CECC16101-014** **BS CECC16101-021**
Contact types per CECC1610-021	**Contacts with reduced service life for resistive loads (contact types I, II, III) -- Code 01; contacts with reduced service life at low level resistive loads -- Code 02**

PRINCIPLE TECHNICAL CHARACTERISTICS

Contacts rated at	**2 Amps / 28 Vdc**
Weight	**less than 11 grams**
Dimensions max. of case in mm	**20.6 x 10.4 x 10.5**

Hermetically sealed, corrosion protected metal can.

CONTACT ELECTRICAL CHARACTERISTICS

Minimum operating cycles	Contact rating per pole and load type	Load Current in Amps	
		@28Vdc	@115Vac/60-400Hz
100,000 cycles	resistive load	2	0.3
100,000 cycles	inductive load (L/R=5ms)	0.75	-
100,000 cycles	lamp load	-	-
100 cycles	resistive overload	4	-
400,000 cycles	at 25% rated load		

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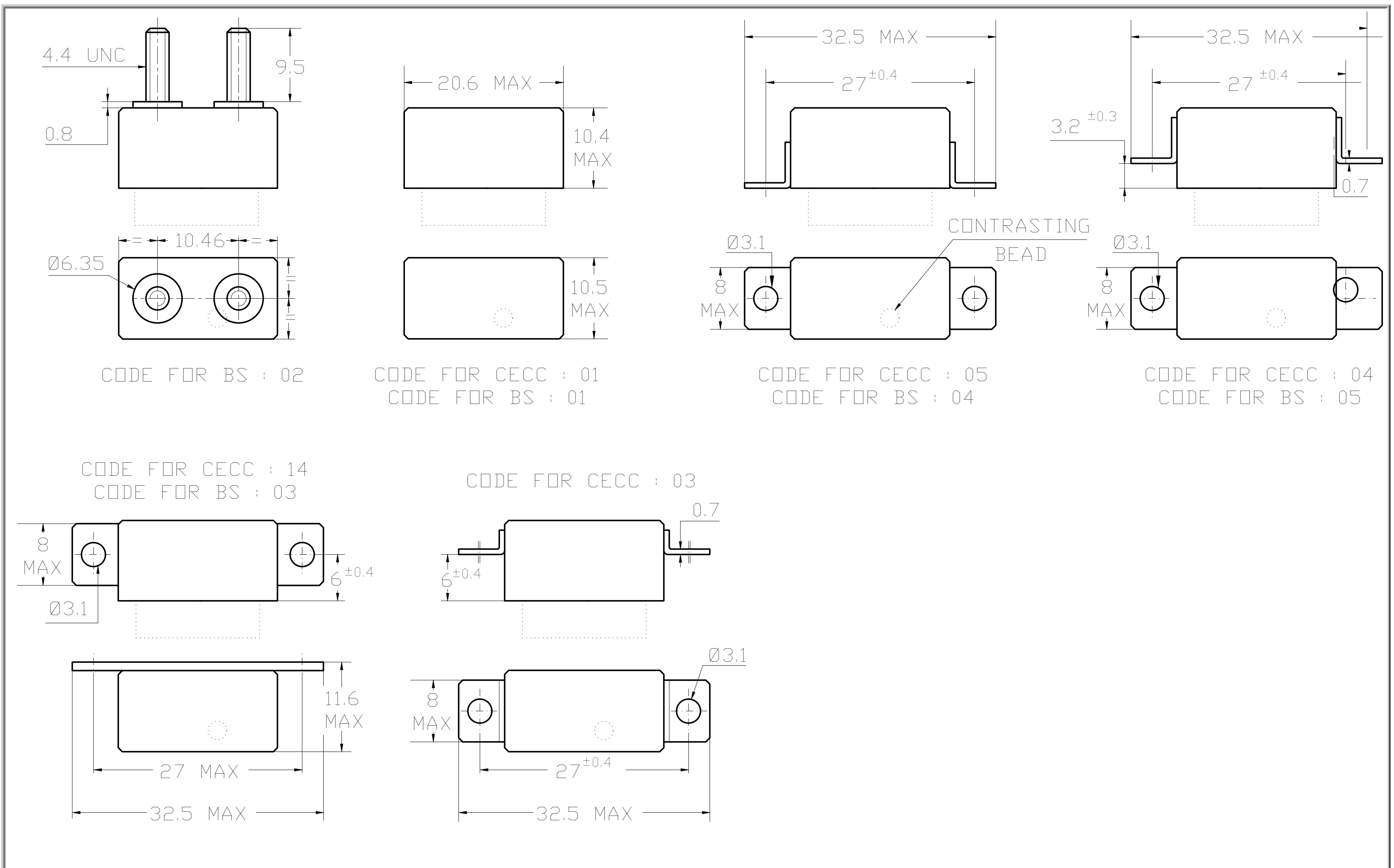
CECC 16101-014	**01**	**02**	**06**	**11**	**13**	**17**	**19**	**20**	**21**	**24**
Nominal operating voltage	5	6	6	12	12	26.5	26.5	28	28	48
Coil resistance in Ω ±10% at +25° C	27	37	47.5	150	190	700	935	700	935	2600
Maximum operating voltage	6	7.5	7.5	15	15	32	32	32	32	55
Pickup voltage at 25° C	2.7	3.2	3.5	6.4	7	13.5	14.5	13.5	14.5	28
Pickup voltage at 125° C	3.8	4.5	4.5	9	9	18	19	18	19	36
Maximum Drop-out voltage at 20° C	1.65	2	2	4	4	8	8	8	8	16
Minimum drop-out voltage at -65° C	0.29	0.35	0.35	0.7	0.7	1.5	1.5	1.5	1.5	2.8

BS CECC 16101-021	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
Nominal operating voltage	6	6	6	12	12	12	24	24	24	48	48	48	5	24	20
Coil resistance in Ohms ±10% at +25° C	40	42	60	150	210	320	675	830	1250	2500	2800	3500	40	700	700
Maximum operating voltage	7.2	7.2	7.2	14.4	14.4	14.4	32	32	32	57.6	57.6	57.6	6	32	24
Pickup voltage at 25° C	3.6	3.6	3.6	7.2	7.2	7.2	14.4	14.4	14.4	28.8	28.8	28.8	3	14.4	10.6
Minimum drop-out voltage	0.3	0.3	0.3	0.6	0.6	0.6	1.2	1.2	1.2	2.4	2.4	2.4	0.25	1.2	1

GENERAL CHARACTERISTICS (Vdc) F250

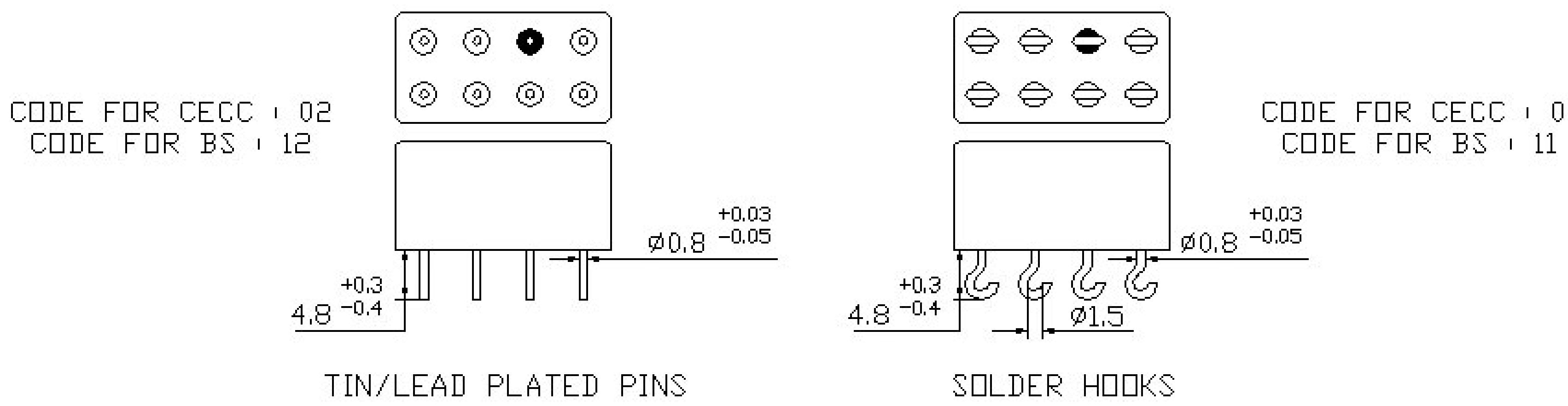
Temperature range	-65°C to 125°C
Dielectric strength at sea level	
- All circuits to ground and circuit to circuit	1000 Vrms / 50 Hz
- Coil to ground and across open contacts	500 Vrms / 50 Hz
Dielectric strength at altitude 22,000 m	350 Vrms / 50 Hz
Initial insulation resistance at 100 Vdc	> 1000 M Ω
Sinusoidal vibration	20 G / 70 to 3000 Hz
Shock	100 G / 11 ms
Maximum contact opening time under vibration and shock	10 µs
Operate time at nominal voltage (including bounce)	4 ms max
Release time (including bounce)	4 ms max
Bounce time	2.5 ms max
Contact resistance at rated current	50 mΩ max

MOUNTING STYLES

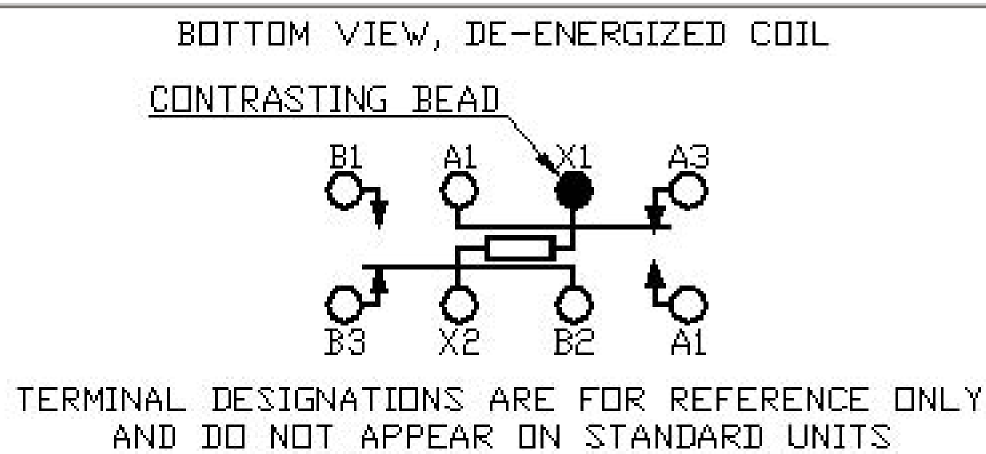


Dimensions in mm
Tolerances unless otherwise specified ±0.25mm

TERMINAL TYPES



SCHEMATIC DIAGRAM



NUMBERING SYSTEM

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                                             CECC 16101-014      XX   XX   XX
   Basic series designation__________________________|           |    |    |
   1-Coil Voltage____________________________________________________|    |    |
   2-Mounting Style_______________________________________________________|    |
   3-Terminal Types____________________________________________________________|
```

BS CECC 16101-021

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                                                   F250      XX   XX   XX   XX
   Basic series designation__________________________|         |    |    |    |
   1-Contact Variations________________________________________|    |    |    |
   2-Coil Voltage___________________________________________________|    |    |
   3-Mounting Styles_____________________________________________________|    |
   4-Terminal Types___________________________________________________________|
```

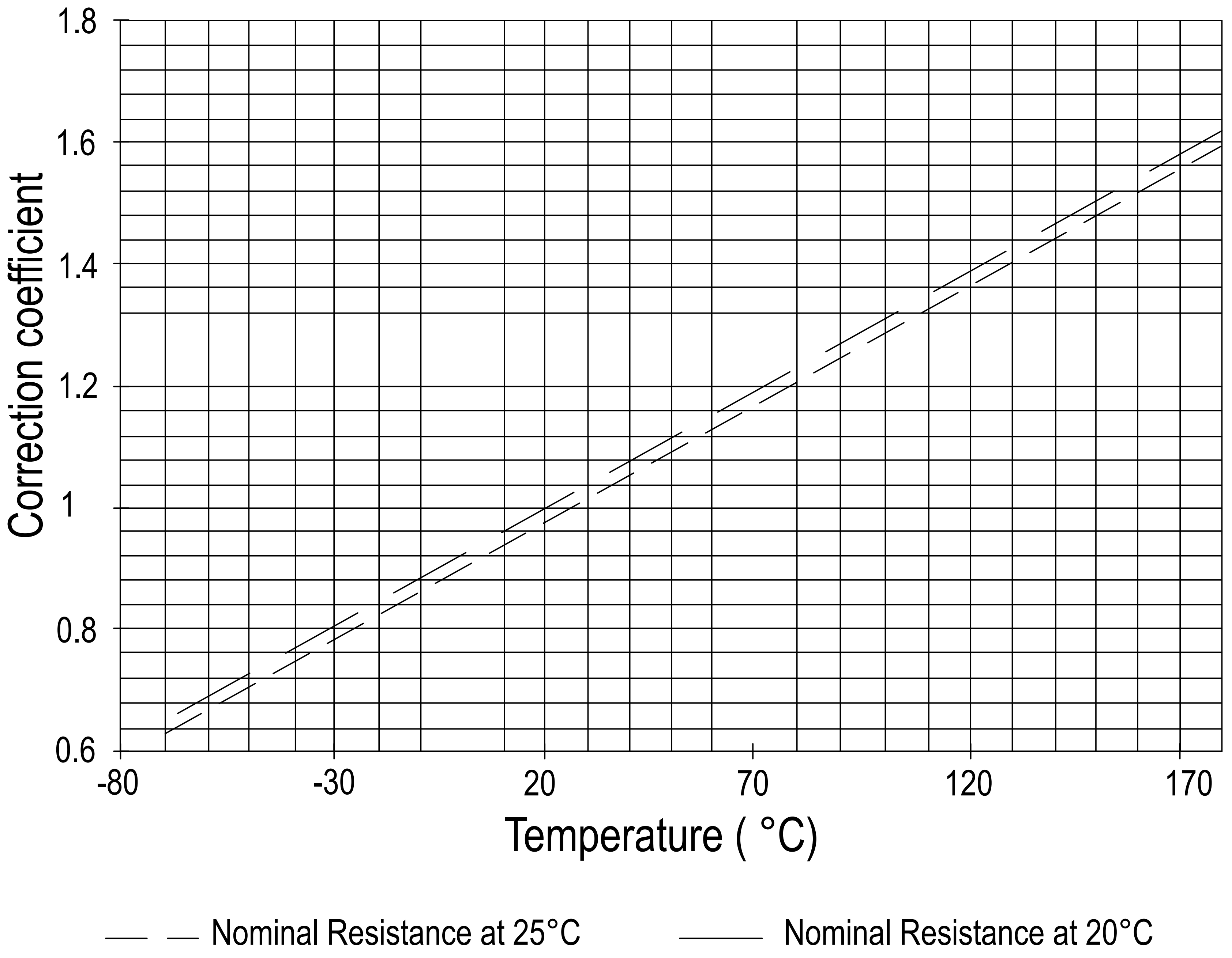
NOTES

1. Socket:
    - 1.1 HRCW - 1M with mounting hardware and solder connections.
    - 1.2 SF 250-R4 with mounting hardware and crimping contacts.
    - 1.3 SO-9005 for printed circuit board.
2. Isolation spacer pads for PCB mounting available on request
3. Ultrasonic cleaning may adversely effective the normally closed contacts

TYPICAL CHARACTERISTICS

- Coil resistance/temperature change: See application note no. 001
- L/R ratio for all coils is: = 1.5 ms
- Coil resistance

CORRECTION DUE TO COIL COPPER WIRE RESISTANCE CHANGE IN TEMPERATURE



Example: Coil resistance at 25°C: 935 ohms. What is it at 125°C?
Correction coefficient on diagram is: 1.39 at 125°C. R becomes: 935x1.39=1299 Ohms

Correction also applies to operating voltages

SUPPRESSOR DEVICES FOR RELAY COILS

The inductive nature of relay coils allows them to create magnetic forces which are converted to mechanical movements to operate contact systems. When voltage is applied to a coil, the resulting current generates a magnetic flux, creating mechanical work. Upon deenergizing the coil, the collapasing magnetic field induces a reverse voltage (also known as back EMF) which tends to maintain current flow in the coil. The induced voltage level mainly depends on the duration of the deenergization. The faster the switch-off, the higher the induced voltage.

All coil suppression networks are based on a reduction of speed of current decay. This reduction may also slow down the opening of contacts, adversly effecting contact life and reliability. Therefore, it is very important to have a clear understanding of these phenomena when designing a coil suppression circuitry.

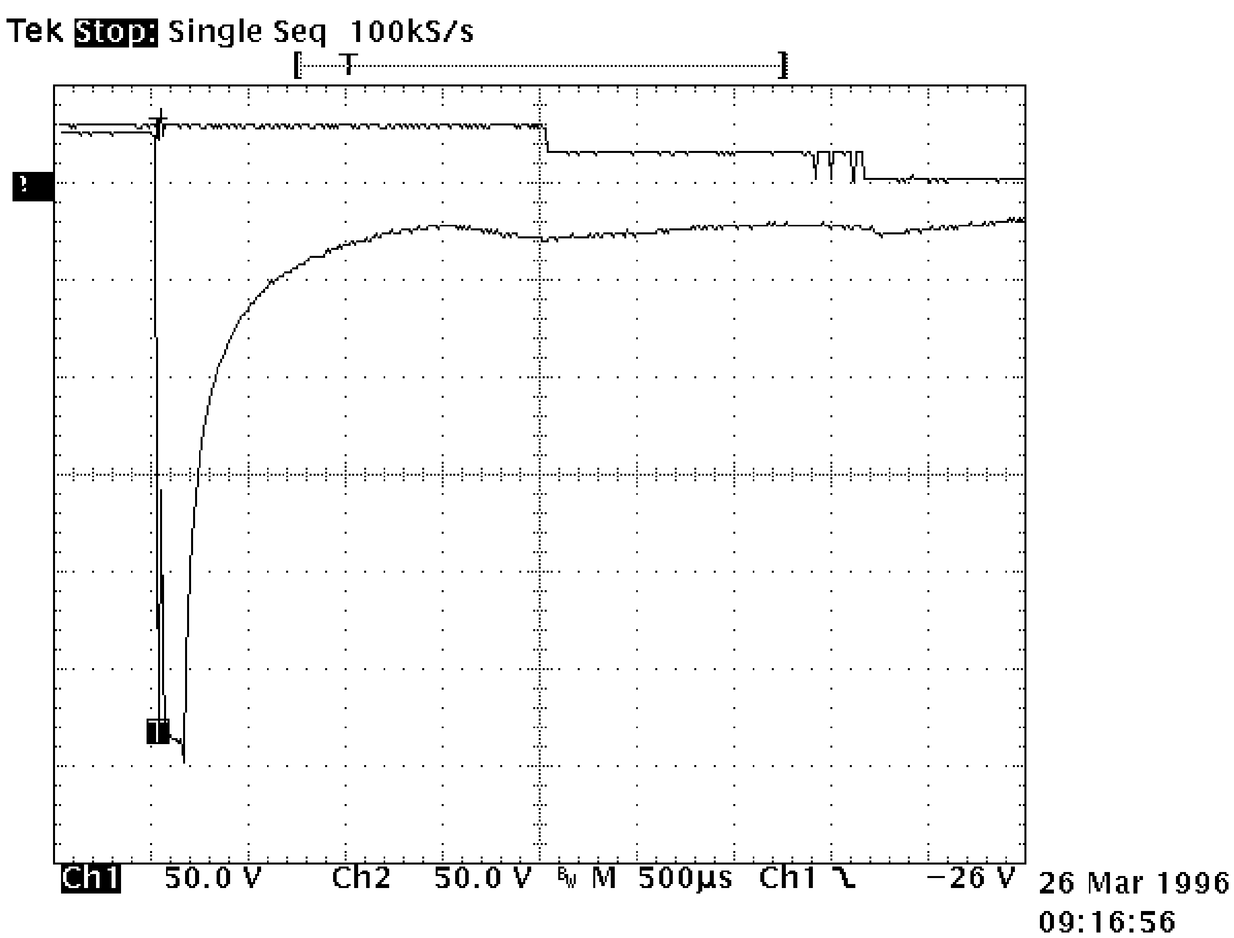
Typical coil characteristics

On the graph below, the upper record shows the contacts state. (High level NO contacts closed, low level NC contacts closed, intermediate state contact transfer). The lower record shows the voltage across the coil when the current is switched off by another relay contact.

The surge voltage is limited to -300V by the arc generated across contact poles. Discharge duration is about 200 mircoseconds after which the current change does not generate sufficient voltage. The voltage decreases to the point where the contacts start to move, at this time, the voltage increases due to the energy contained in the NO contact springs. The voltage decreases again during transfer, and increases once more when the magnetic circuit is closed on permanent magnet.

Operating times are as follows:
Time to start the movement 1.5ms
Total motion time 2.3ms
Transfer time 1.4ms

Contact State



Types of suppressors:

Passive devices.

The resistor capacitor circuit

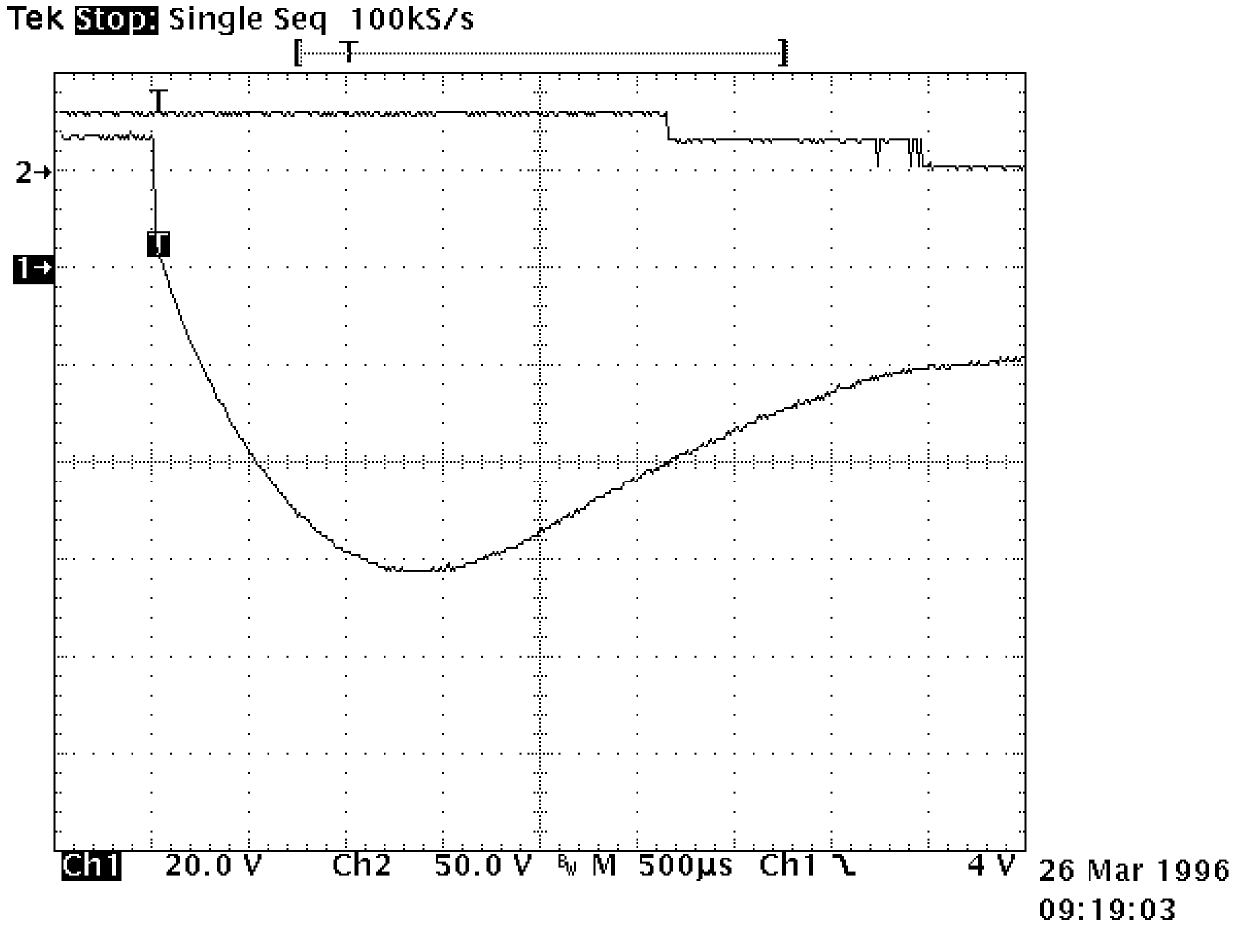
It eliminates the power dissipation problem, as well as fast voltage rises. With a proper match between coil and resistor, approximate capacitance value can be calculated from:

C = 0.02xT/R, where

T = operating time in milliseconds
R = coil resistance in kiloOhms
C = capacitance in microFarads

The series resistor must be between 0.5 and 1 times the coil resistance. Special consideration must be taken for the capacitor inrush current in the case of a low resistance coil.

The record shown opposite is performed on the same relay as above. The operation time becomes:
- time to start the movement 2.3ms
- transfer time 1.2ms
The major difficulty comes from the capacitor volume. In our example of a relay with a 290 Ω coil and time delay of 8 ms, a capacitance value of C=0.5 uF is found. This non polarized capacitor, with a voltage of 63V minimum, has a volume of about 1cm^3. For 150V, this volume becomes 1.5 cm^3.



The bifilar coil

The principle is to wind on the magnetic circuit of the main coil a second coil shorted on itself. By a proper adaptation of the internal resistance of this second coil it is possible to find an acceptable equilibrium between surge voltage and reduction of the opening speed. To be efficient at fast voltage changes, the coupling of two coils must be perfect. This implies embedded windings. The volume occupied by the second coil reduces the efficiency of the main coil and results in higher coil power consumption. This method cannot be applied efficiently to products not specifically designed for this purpose.

The resistor (parallel with the coil)
For efficient action, the resistor must be of the same order of magnitude as the coil resistance. A resistor 1.5 times the coil resistance will limit the surge to 1.5 times the supply voltage. Release time and opening speed are moderately affected. The major problem is the extra power dissipated.

Semi-conductor devices

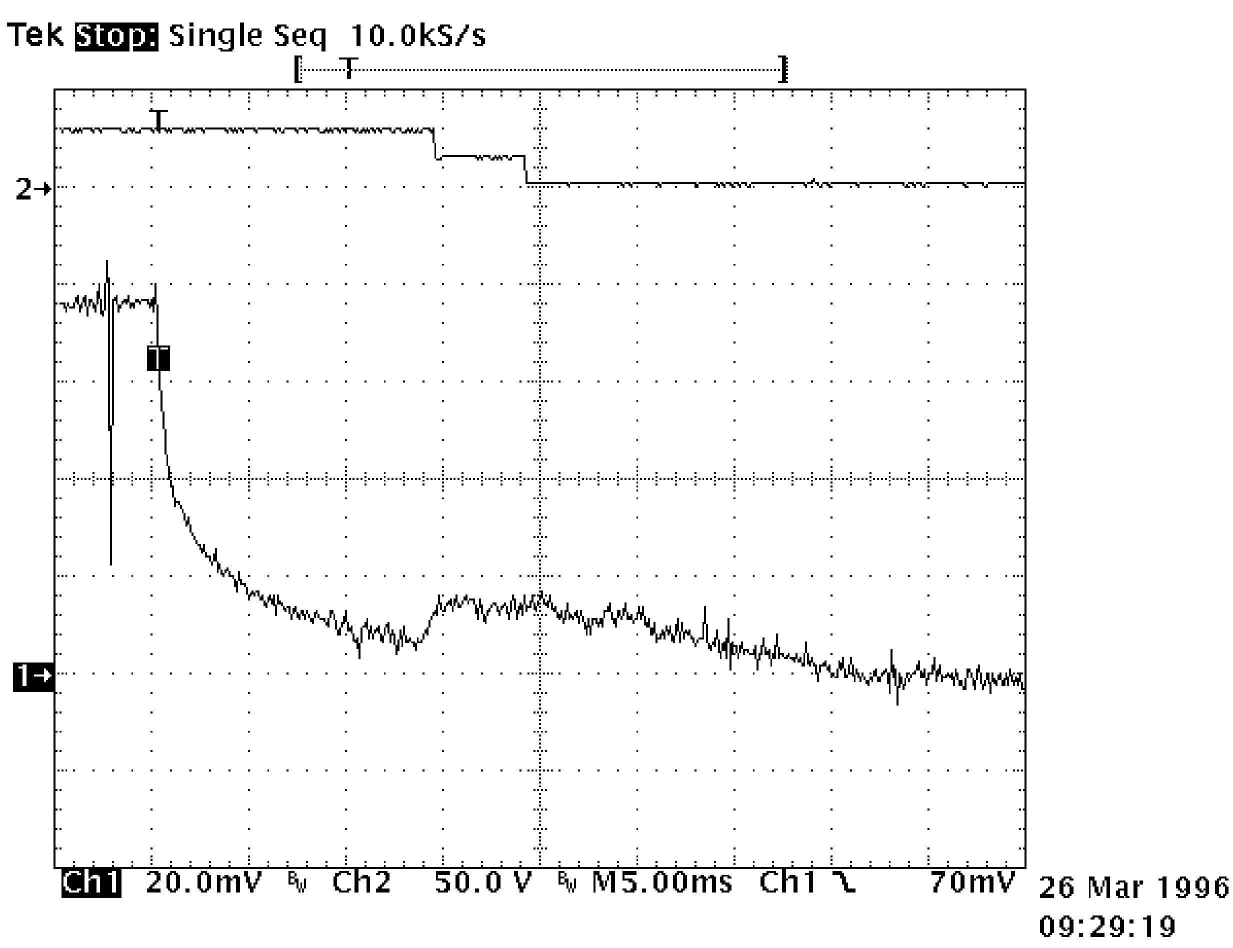
The diode

It is the most simple method to totally suppress the surge voltage. It has the major disadvantage of the higher reduction of contact opening speed. This is due to the total recycling, through the diode, of the energy contained in the coil itself. The following measurement is performed once again on the same relay. Operation times are given by the upper curve:

- time to start the movement 14ms
- transfer time 5ms

These times are multiplied by a coefficient from 4 to 8.
The lower curve shows the coil current. The increase prior to NO contact opening indicates that the contact spring dissipates its energy. At the opening time the current becomes constant as a result of practically zero opening speed.

Due to this kind of behavior, this type of suppression must be avoided for power relays. For small relays which have to switch low currents of less than 0.2 A, degradation of life is not that significant and the method may be acceptable.



The diode + resistor network

It eliminates the inconvenience of the resistor alone, explained above, and it limits the action of a single diode. It is now preferred to used the diode + zener network.

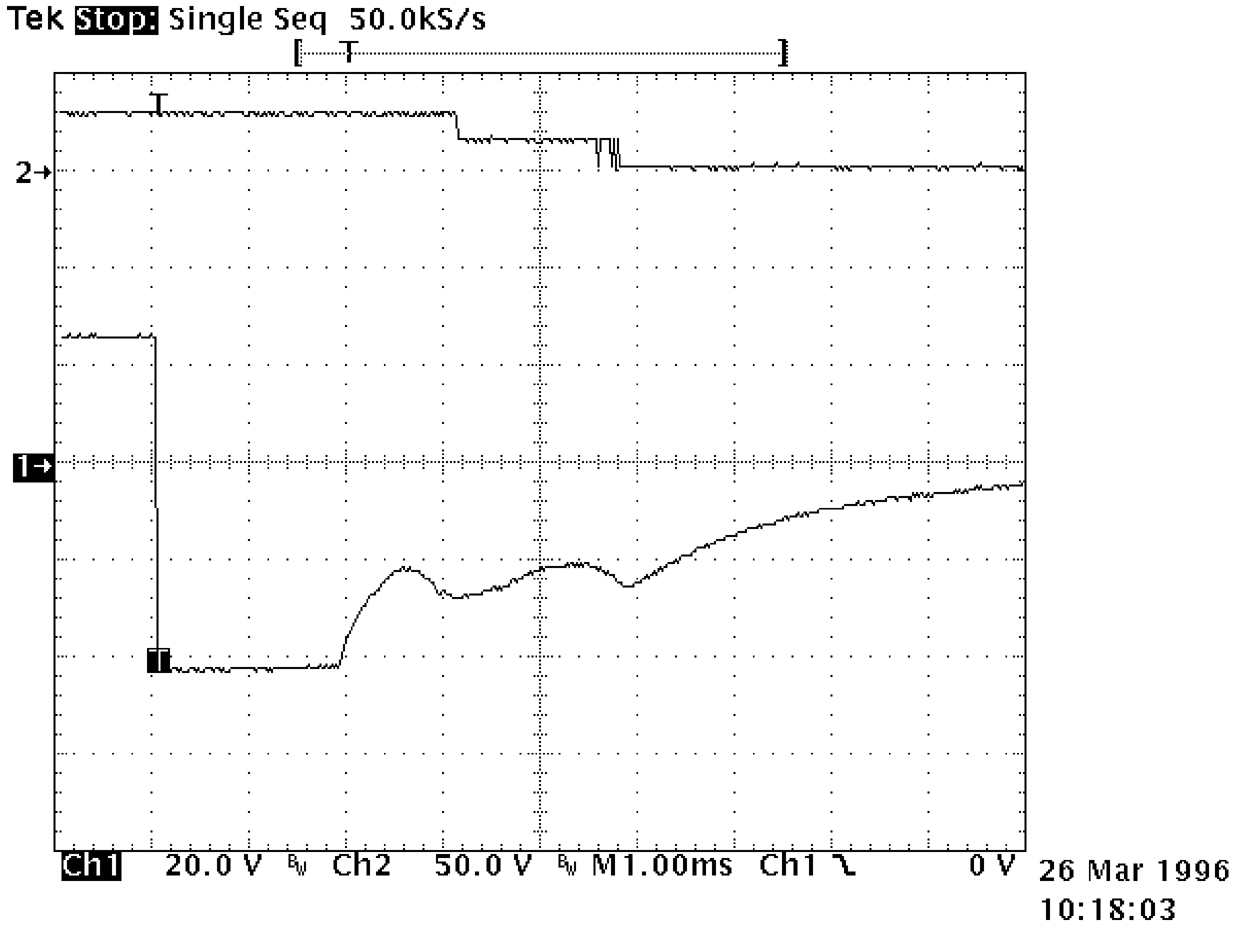
The diode + zener network

Like the resistor, the zener allows a faster decurrent decay. In addition it introduces a threshold level for current conduction which avoids the recycling of energy released during contact movement.

The lower curve on the opposite record demonstrates those characteristics. Voltage limitation occurs at 42V. The two voltages spikes generated by internal movement are at lower levels than zener conduction. As a result, no current is recycled in the coil.

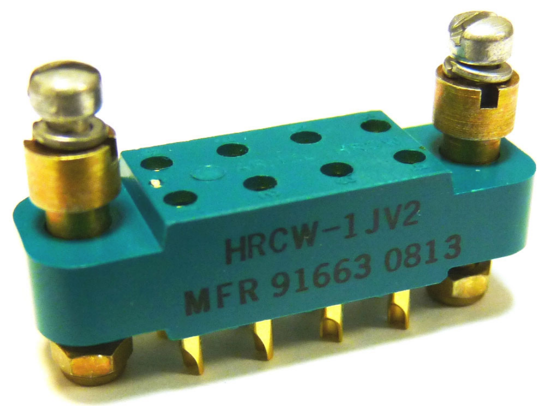
The opening time phases are as follows:
- time to start the movement 2.6ms
- total motion time 2.4ms
- transfer time 1.4ms

The release time is slightly increased. The contacts' opening speed remains unchanged.



HRCW

RELAY SOCKET
2 AMP



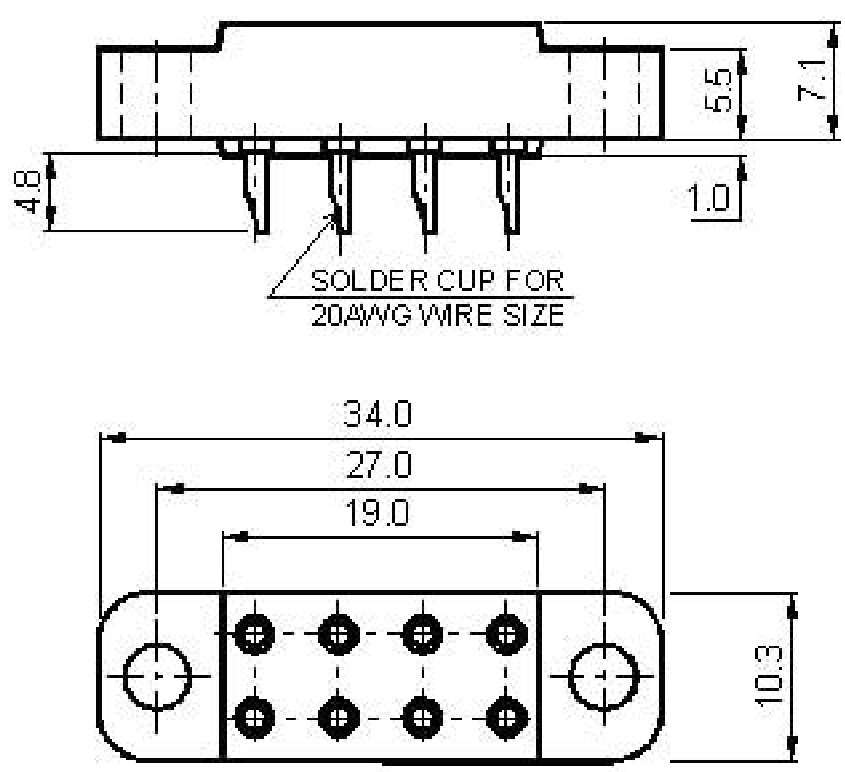
BASIC SOCKET SERIES DESIGNATION FOR:

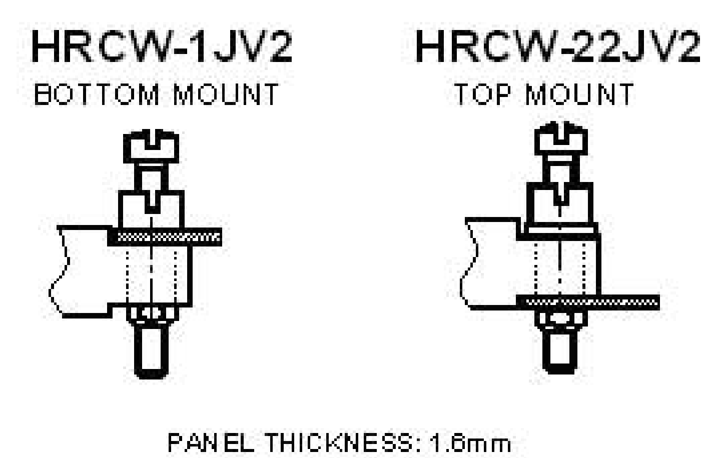
SERIES F250, F257, W260, GP5, and 144

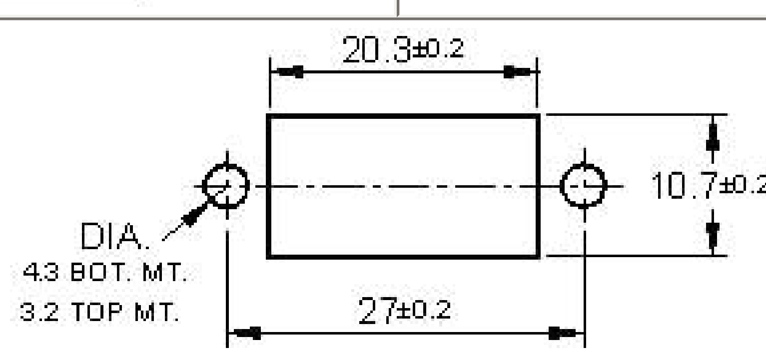
MEETS THE REQUIREMENTS OF:

MIL-S-12883

DIMENSIONS







GENERAL CHARACTERISTICS

Supplied with mounting hardware.	
Temperature range	-65°C to +125°C
Weight	10 grams
Dielectric Strength at sea level	1500 Vrms / 50 Hz Minimum
Gold plated contact per MIL-G-45204	
Dallyl phthalate, glass-fiber filled per MIL-M-14	

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ENGINEERING DATA SHEET

SO9005

RELAY SOCKET
2 AMP

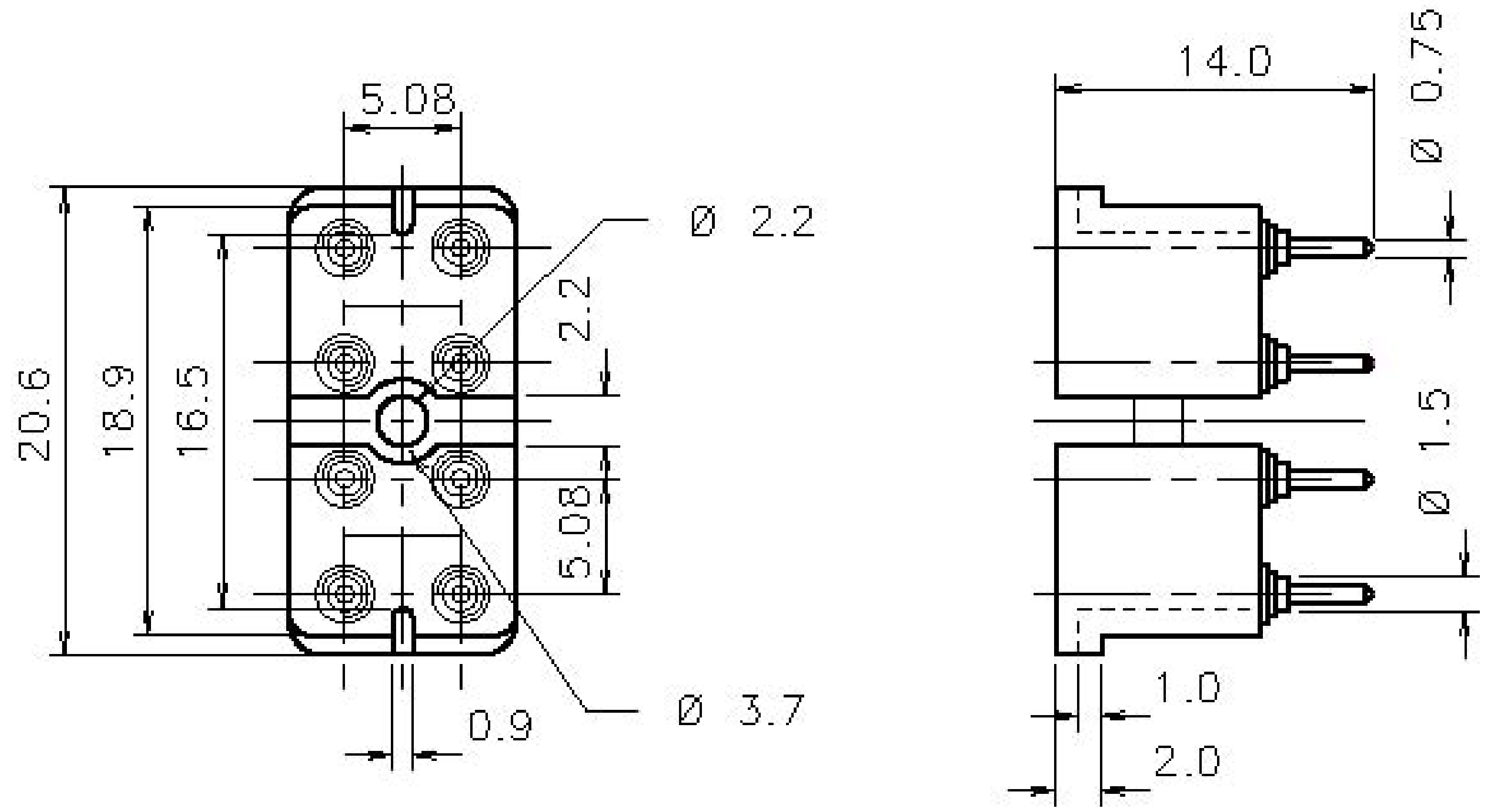
BASIC SOCKET SERIES DESIGNATION FOR:

Series F250, F257, W260, WB260

MEETS THE REQUIREMENTS OF:

MIL-DTL-12883

DIMENSIONS



GENERAL CHARACTERISTICS

Temperature range	-65°C to +125°C
Weight	10 grams
Terminal designations	On coupling face
Insulation resistance	1200 M Ω
Contact resistance	2 mΩ

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