

## The Best Relay



## FT2 / FU2 Relay



2 pole telecom/signal relay  
Through Hole Type (THT)  
Non – polarized. non-latching 1 coil



UL 508  
UL 60950

File No. E111441



IEC 61811-54:01  
(QC 160504)

IEC/EN60950

IEC Ref. Cert. No. 2168

## Features

- Telecom/signal relay (dry circuit, test access, ringing)
- Slim line 15 x 7.5 mm, 0.59 x 0.295 inch
- Switching current 2 A
- 2 changeover contacts (2 form C / DPDT)
- Bifurcated contacts
- High sensitive 24 V and 48 V coil versions
- Meets Bellcore GR 1089, FCC Part 68 and ITU-T K20  $\geq$  2500 V between coil and contacts

## Typical applications:

- Communications equipment  
Linecard application – analog, ISDN, xDSL  
PABX  
Voice over IP
- Office and business equipment
- Measurement and control equipment
- Consumer electronics  
Set top boxes, HiFi
- Medical equipment

## Options:

High Dielectric Version (HDV) with  $>$  5000 V surge voltage between coil and contacts

Suitable for 125 °C ambient temperature

## Insulation category:

Supplementary insulation according IEC / EN 60950 and UL 1950

Working voltage  $\geq$  300 Vrms

Mains supply voltage  $\geq$  250 Vrms

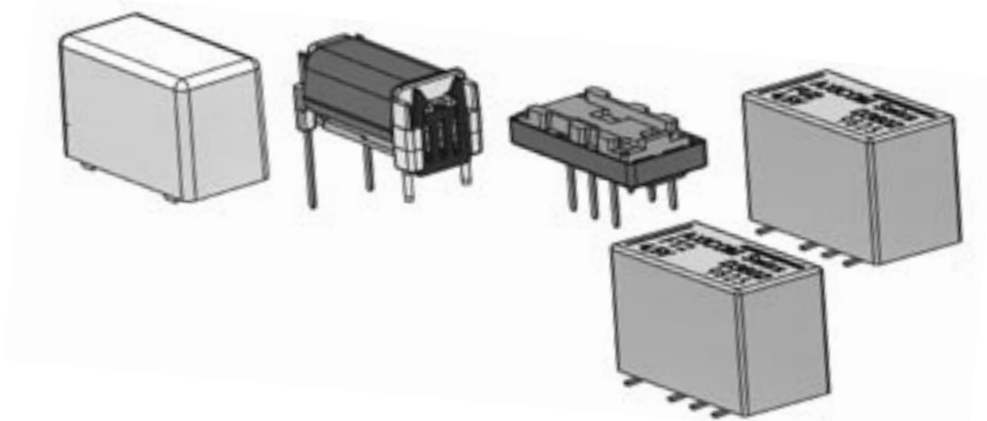
Repetitive peak voltage: 1500 V

Pollution degree: Internal: 1

External: 2

Flammability classification: V-0

Maximum operating temperature: 85 °C



## European Directive conformance:

FT2/FU2 relay product conformance according to:

- Directive 2000/53/EC: ELV (End of Life of Vehicles)
- Directive 2002/95/EC: ROHS (Restrictions of the use of certain hazardous substances in electrical and electronic equipment)

Compliance is evidenced by written declaration from all raw material suppliers.

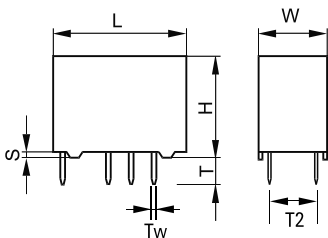
Tyco Electronics AXICOM only has responsibility for the proper processing of these materials.

Confirmation is valid for date codes  $\geq$  0427

Dimensions

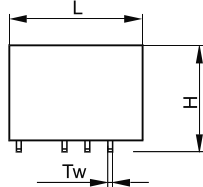
	FT2 THT		FU2 SMT long terminals		FU2 SMT short terminals	
	mm	inch	mm	inch	mm	inch
L	15 ± 0.05	0.590 ± 0.002	15 ± 0.15	0.590 ± 0.002	15 ± 0.05	0.590 ± 0.002
W	7.5 ± 0.05	0.295 ± 0.002	7.5 ± 0.05	0.295 ± 0.002	7.6 ± 0.05	0.296 ± 0.002
H	9.6 ± 0.03	0.377 ± 0.001	10 ± 0.15	0.393 ± 0.006	10 ± 0.15	0.393 ± 0.006
T	3.3 ± 0.3	0.129 ± 0.011	N/A	N/A	N/A	N/A
T1	N/A	N/A	9.2 ± 0.2	0.362 ± 0.008	7.5 ± 0.2	0.295 ± 0.008
T2	5.08	0.200	5.08	0.200	5.08	0.200
Tw	0.5	0.020	0.5	0.020	0.5	0.020
S	0.35 ± 0.03	0.013 ± 0.001	N/A	N/A	N/A	N/A

FT2: THT Version

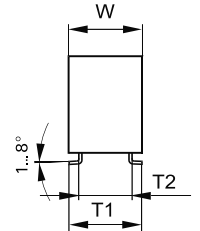
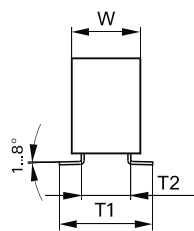
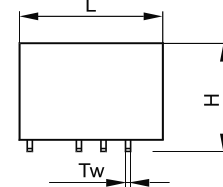


FU2: SMT Version

Long terminals (W)

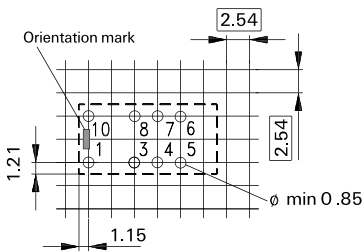


Short terminals (N)



Mounting hole layout

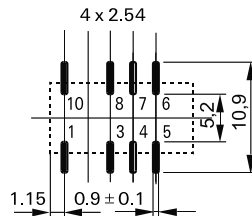
View onto the component side of the PCB



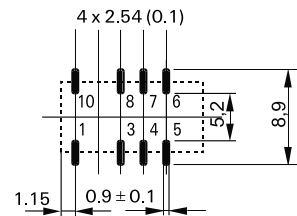
Solder pad layout

View onto the component side of the PCB

Long terminals



Short terminals

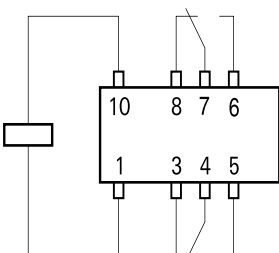


Basic grid 2.54 mm

Terminal assignment

Relay - top view

non-latching 1 coil  
release condition



**Coil Data (values at 23 °C)**

**Ordering Information**

Nominal voltage $U_{nom}$	Operate/set voltage range		Release/reset voltage Minimum	Coil power	Coil Resistance	Relay code	Tyco part number
	Minimum voltage $U_{min}$	Maximum voltage $U_{max}$					
Vdc	Vdc	Vdc	Vdc	mW	$\Omega / \pm 10\%$		

**THT sensitive version non-latching 1 coil**

3	2.25	6.8	0.30	200	45	D3421	0-1462035-9
4	3.00	9.0	0.40	200	114	D3429	1-1462035-9
4.5	3.38	10.1	0.45	200	101	D3422	1-1462035-0
5	3.75	11.2	0.50	200	125	D3423	1-1462035-1
6	4.50	13.5	0.60	200	180	D3424	1-1462035-2
9	6.75	20.3	0.90	200	405	D3425	1-1462035-3
12	9.00	27.0	1.20	200	720	D3426	1-1462035-4
24	18.00	47.5	2.40	240	2400	D3427	1-1462035-7
48	36.00	95.0	4.80	240	9600	D3428	1-1462035-8

**SMT sensitive version Long Terminals non-latching 1 coil**

3	2.25	6.8	0.30	200	45	D3521W	1-1462036-8
4	3.00	9.0	0.40	200	114	D3529W	3-1462036-1
4.5	3.38	10.1	0.45	200	101	D3522W	2-1462036-0
5	3.75	11.2	0.50	200	125	D3523W	2-1462036-2
6	4.50	13.5	0.60	200	180	D3524W	2-1462036-4
9	6.75	20.3	0.90	200	405	D3525W	2-1462036-6
12	9.00	27.0	1.20	200	720	D3526W	2-1462036-8
24	18.00	47.5	2.40	240	2400	D3527W	9-1462036-1
48	36.00	95.0	4.80	240	9600	D3528W	9-1462036-5

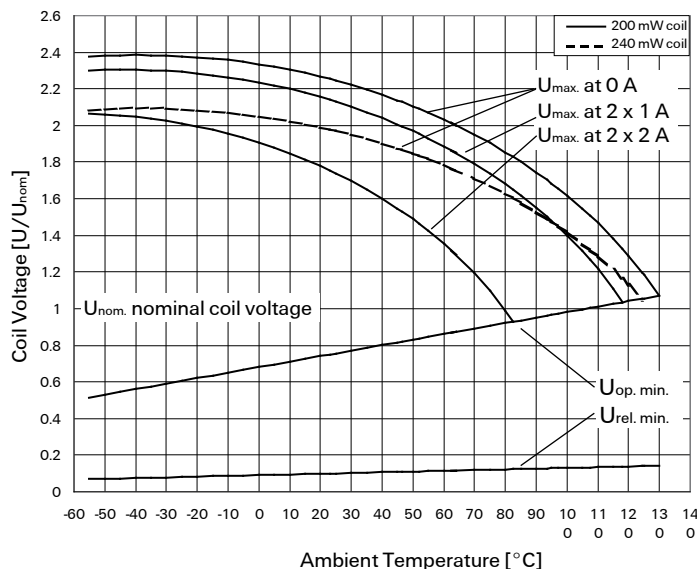
**SMT sensitive version Short Terminals non-latching 1 coil**

3	2.25	6.8	0.30	200	45	D3521N	1-1462036-7
4	3.00	9.0	0.40	200	114	D3529N	3-1462036-0
4.5	3.38	10.1	0.45	200	101	D3522N	1-1462036-9
5	3.75	11.2	0.50	200	125	D3523N	2-1462036-1
6	4.50	13.5	0.60	200	180	D3524N	2-1462036-3
9	6.75	20.3	0.90	200	405	D3525N	2-1462036-5
12	9.00	27.0	1.20	200	720	D3526N	2-1462036-7
24	18.00	47.5	2.40	240	2400	D3527N	2-1462036-9
48	36.00	95.0	4.80	240	9600	D3528N	9-1462036-3

**THT High dielectric version non-latching**

3	2.25	6.8	0.30	200	45	D3491	2-1462035-0
5	3.75	11.2	0.50	200	125	D3493	1-1462035-5
12	9.00	27.0	1.20	200	720	D3496	2-1462035-4
24	18.00	47.5	2.40	240	2400	D3497	2-1462035-5

**Coil operating range 200 / 240 mW**



- $U_{nom}$  = Nominal coil voltage
- $U_{max}$  = Upper limit of the operative range of the coil voltage (limiting voltage) when coils are continuously energized
- $U_{op.min}$  = Lower limit of the operative range of the coil voltage (reliable operate voltage)
- $U_{rel.min}$  = Lower limit of the operative range of the coil voltage (reliable release voltage)

Coil Data (values at 23 °C)				Ordering Information			
Nominal voltage $U_{nom}$	Operate/set voltage range		Release/ reset voltage Minimum	Coil power	Coil Resistance	Relay code	Tyco part number
	Minimum voltage $U_{min}$	Maximum voltage $U_{max}$	Vdc				
Vdc	Vdc	Vdc	Vdc	mW	$\Omega / \pm 10\%$		

**THT Standard version non-latching**

3	2.25	5.5	0.30	300	30	D3401	0-1462035-1
4.5	3.38	8.3	0.45	300	68	D3402	0-1462035-2
5	3.75	9.2	0.50	300	83	D3403	0-1462035-3
6	4.5	11.0	0.60	300	120	D3404	0-1462035-4
9	6.75	16.6	0.90	300	270	D3405	0-1462035-5
12	9.00	22.1	1.20	300	480	D3406	0-1462035-6
24	18.00	44.2	2.40	300	1920	D3407	0-1462035-7
48	36.00	88.3	4.80	300	7680	D3408	0-1462035-8

**SMT Standard version Long Terminals non-latching**

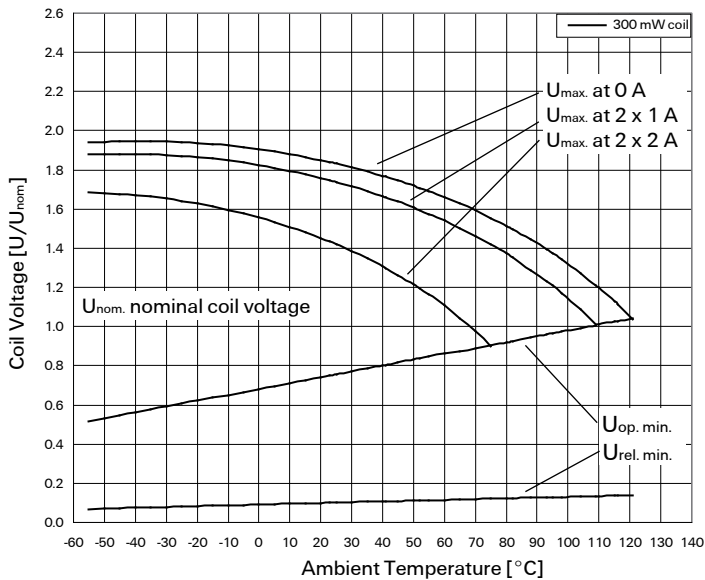
3	2.25	5.5	0.30	300	30	D3501W	0-1462036-2
4.5	3.38	8.3	0.45	300	68	D3502W	0-1462036-4
5	3.75	9.2	0.50	300	83	D3503W	0-1462036-6
6	4.5	11.0	0.60	300	120	D3504W	0-1462036-8
9	6.75	16.6	0.90	300	270	D3505W	1-1462036-0
12	9.00	22.1	1.20	300	480	D3506W	1-1462036-2
24	18.00	44.2	2.40	300	1920	D3507W	1-1462036-4
48	36.00	88.3	4.80	300	7680	D3508W	1-1462036-6

**SMT Standard version Short Terminals non-latching**

3	2.25	5.5	0.30	300	30	D3501N	0-1462036-1
4.5	3.38	8.3	0.45	300	68	D3502N	0-1462036-3
5	3.75	9.2	0.50	300	83	D3503N	0-1462036-5
6	4.5	11.0	0.60	300	120	D3504N	0-1462036-7
9	6.75	16.6	0.90	300	270	D3505N	0-1462036-9
12	9.00	22.1	1.20	300	480	D3506N	1-1462036-1
24	18.00	44.2	2.40	300	1920	D3507N	1-1462036-3
48	36.00	88.3	4.80	300	7680	D3508N	1-1462036-5

Further coil versions are available on request.

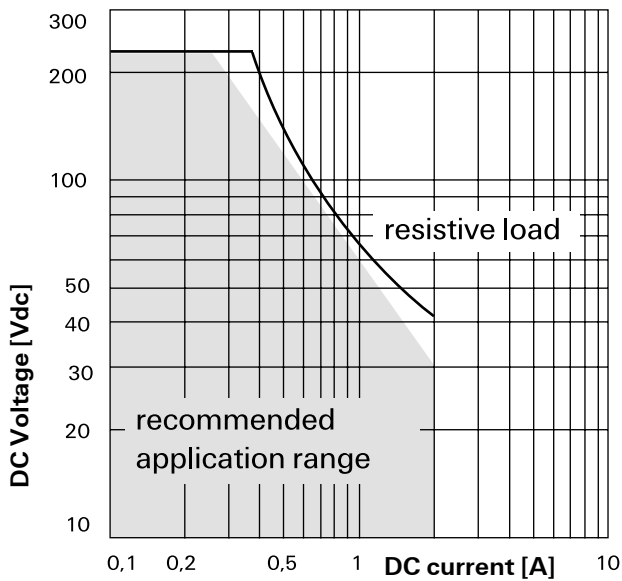
**Coil operating range 300 mW**



- $U_{nom}$  = Nominal coil voltage
- $U_{max.}$  = Upper limit of the operative range of the coil voltage (limiting voltage) when coils are continuously energized
- $U_{op. min.}$  = Lower limit of the operative range of the coil voltage (reliable operate voltage)
- $U_{rel. min.}$  = Lower limit of the operative range of the coil voltage (reliable release voltage)

Contact Data		Standard Version	High Dielectric Version
Number of contacts and type		2 changeover contacts	
Contact assembly		Bifurcated contacts	
Contact material		Silver nickel, gold-covered	Palladium-ruthenium, gold covered
Limiting continuous current at max. ambient temperature		2 A	2 A
Maximum switching current		2 A	2 A
Maximum switching voltage		220 Vdc 250 Vac	220 Vdc 250 Vdc
Maximum switching capacity		60 W, 62.5 VA	60 W, 62.5 VA
Thermoelectric potential		< 10 $\mu$ V	
Minimum switching voltage		100 $\mu$ V	
Initial contact resistance / measuring condition: 10 mA / 20 mV		< 70 m $\Omega$	
Electrical endurance	at contact application 0 ( $\geq 12$ V / $\geq 10$ mA) at cable load open end	min. 2.5 x 10 <sup>6</sup> operations min. 2.0 x 10 <sup>6</sup> operations	
Resistive load	125 Vdc / 0.24 A - 30 W	min. 1 x 10 <sup>5</sup> operations	
	250 Vdc / 0.25 A - 62.5 VA	min. 1 x 10 <sup>5</sup> operations	
	24 Vdc / 1.25 A - 30 W	min. 1 x 10 <sup>5</sup> operations	
Mechanical endurance		typ. 10 <sup>8</sup> operations	
UL contact ratings		220 Vdc / 0.24 A - 60 W 125 Vdc / 0.24 A - 30 W 250 Vac / 0.25 A - 62.5 VA 125 Vac / 0.5 A - 62.5 VA 30 Vdc / 2 A - 60 W	

**Max. DC load breaking capacity**



Insulation	Standard Version	High Dielectric Version
Insulation resistance at 500 VDC	> 10 <sup>9</sup> Ω	> 10 <sup>9</sup> Ω
Dielectric test voltage (1 min)		
between coil and contacts	1500 Vrms	3500 Vrms
between adjacent contact sets	1500 Vrms	1800 Vrms
between open contacts	1000 Vrms	1500 Vrms
Surge voltage resistance		
according to Bellcore TR-NWT-001089 (2 / 10 μs)		
between coil and contacts	2500 V	5000 V
between adjacent contact sets	1500 V	2500 V
between open contacts	1500 V	2500 V
according to FCC 68 (10 / 160 μs)		
between coil and contacts	2500 V	5000 V
between adjacent contact sets	1500 V	2500 V
between open contacts	1500 V	2500 V

High Frequency Data	
Capacitance	
between coil and contacts	max. 4 pF
between adjacent contact sets	max. 1 pF
between open contacts	max. 1 pF
RF Characteristics	
Isolation at 100 MHz / 900 MHz	- 30.6 dB / - 13.7 dB
Insertion loss at 100 MHz / 900 MHz	- 0.02 dB / - 0.50 dB
V.S.W.R. at 100 MHz / 900 MHz	1.02 / 1.27

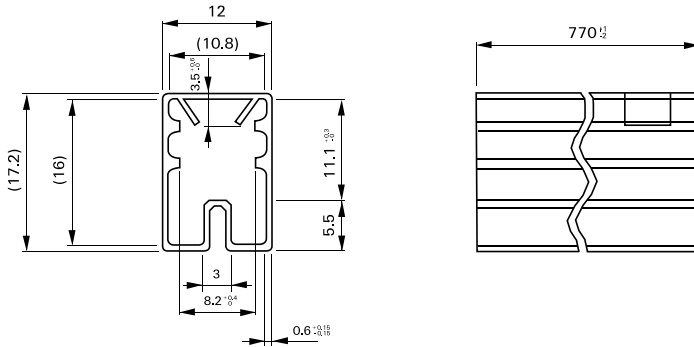
General data	
Operate time at $U_{nom}$ typ. / max.	3 ms / 5 ms
Release time without diode in parallel, typ. / max.	2 ms / 5 ms
Release time with diode in parallel, typ. / max.	4 ms / 5 ms
Bounce time at closing contact, typ. / max.	1 ms / 5 ms
Maximum switching rate without load	50 operations/s
Ambient temperature	-55 °C ... +85 °C
Thermal resistance	< 125 K/W
Maximum permissible coil temperature	150 °C
Vibration resistance (function)	10 G 10 to 1000 Hz
Shock resistance, half sinus, 11 ms	15 G (function) 500 G (damage)
Degree of protection / Environmental protection	immersion cleanable, IP 67 / RT III / RT V
Needle flame test	application time 20 s, no burning or glowing
Mounting position	any
Processing information	Ultrasonic cleaning is not recommended
Weight (mass)	max. 3 g
Terminal surface	SnCu 0,7
Moisture sensitive level (JEDEC J-STD-020B) - SMD types	MSL 3
Resistance	260 °C / 10 s

All data refers to 23° C unless otherwise specified.

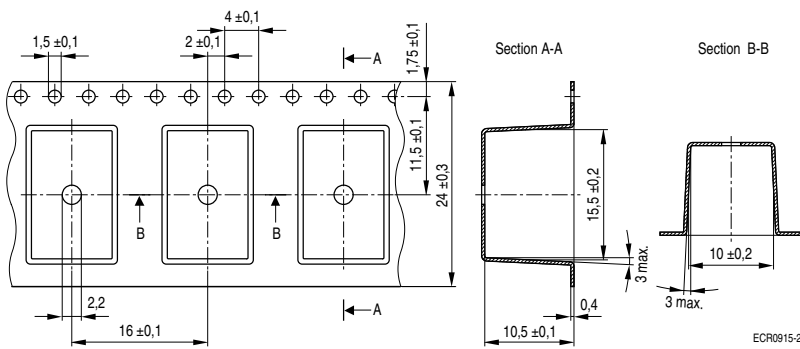
Packing

Dimensions in mm

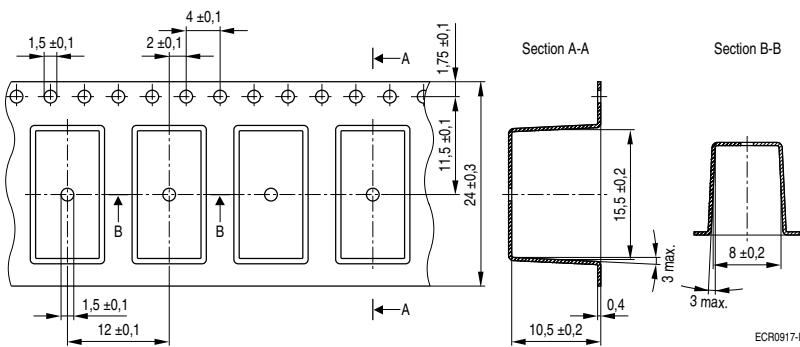
Tube for THT version - 50 relays per stick, 1000 relays per box



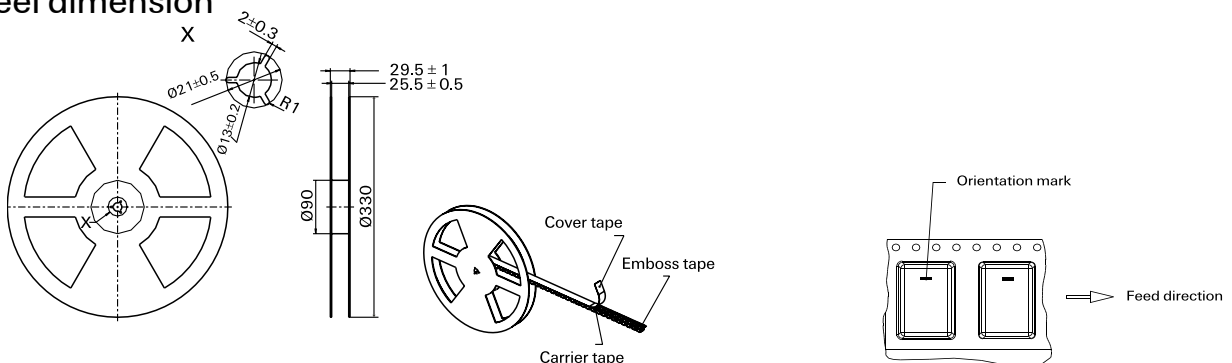
Tape and reel for SMT version with long terminals - 400 relays per reel, 2000 relays per box



Tape and reel for SMT version with short terminals - 500 relays per reel, 2500 relays per box



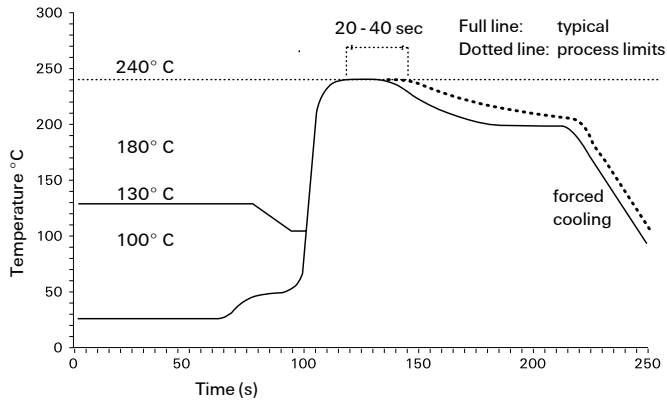
Reel dimension





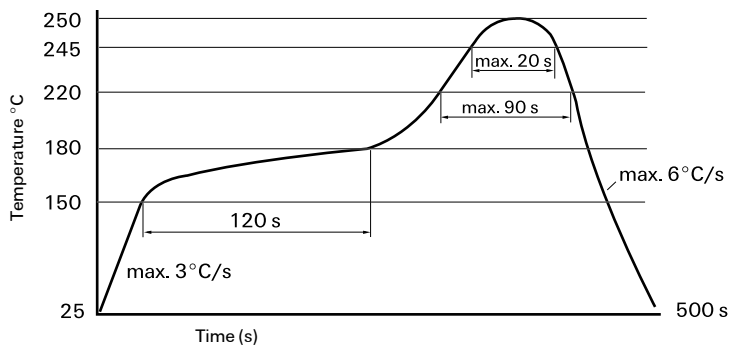
### Recommended soldering conditions

Soldering conditions according IEC 60058-2-58 and IPC/JEDEC J-STD-020B



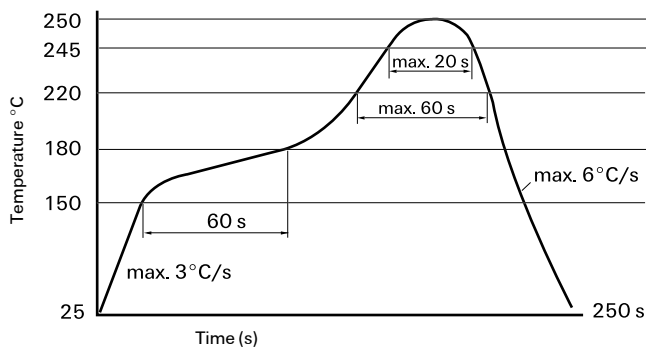
Vapor Phase Soldering: Temperature/Time Profile (Lead and Housing Peak Temperature)

### Resistance to soldering heat - Reflow profile



Infrared Soldering: Temperature/Time Profile (Lead and Housing Peak Temperature)

### Recommended reflow soldering profile



Infrared Soldering: Temperature/Time Profile (Lead and Housing Peak Temperature)

## IM Relays

4<sup>th</sup> generation slim line – low profile polarized 2 c/o telecom relay with bifurcated contacts, available as non latching or latching relay with 1 coil. Nominal voltage range from 1.5... 24 V, coil power consumption of 140... 200 mW, latching relays with 1 coil 100 mW. The IM relay is available as through hole and surface mount type (J-Legs and Gull Wings) and capable to switch loads up to 60 W/62,5 VA. Dielectric strength fulfills the Bellcore requirements according GR 1089 (2,5 kV – 2 / 10 µs) and FCC part 68 (1,5 kV – 10 / 160 µs). The IM relay is CECC/IECQ approved and certified in accordance with IEC/EN 60950 and UL 1950. Dimensions approx. 10 x 6 mm board space and 5,65 mm height.

## P2 Relays

3<sup>rd</sup> generation polarized 2 c/o telecom relay with bifurcated contacts, available as non latching or latching relay with 1 or 2 coils. Nominal voltage range from 3 ... 24 V, coil power consumption 140 mW, latching relays with 1 coil 70 mW. The P2 Relay is available as through hole or surface mount type and capable to switch currents up to 5 A. Dielectric strength fulfills the Bellcore requirements according GR 1089 (2,5 kV – 2 / 10 µs) and FCC part 68 (1,5 kV – 10 / 160 µs). Dimensions approx. 15 x 7,5 mm board space and 10 mm height.

## FX Relays

3<sup>rd</sup> generation polarized 2 c/o telecom relay with bifurcated contacts, available as non latching or latching relay with 1 coil. Nominal voltage range from 3 ... 48 V, coil power consumption of 80 ... 260 mW for the high sensitive version, 140... 300 mW for the standard version, latching relays with 1 coil 100 mW. The FX2 relay is available as through hole type and capable to switch loads up to 60 W/62,5 VA. Dielectric strength fulfills the Bellcore requirements according GR 1089 (2,5 kV – 2 / 10 µs) and FCC part 68 (1,5 kV – 10 / 160 µs). The FX2 is CECC/IECQ approved and certified in accordance with IEC/EN 60950 and UL 1950. Dimensions approx. 15 x 7,5 mm board space and 10,7 mm height.

## FT2 / FU2 Relays

3<sup>rd</sup> generation non polarized, non latching 2 c/o telecom relay with bifurcated contacts. Nominal voltage range from 3 ... 48 V, coil power consumption 200 ... 300 mW. Most sensitive 48 V relay. Available as through hole and surface mount type. Dielectric strength fulfills the Bellcore requirements according GR 1089 (2,5 kV – 2 / 10 µs) and FCC part 68 (1,5 kV – 10 / 160 µs). The FT2/FU2 is CECC/IECQ approved and certified in accordance with IEC/EN 60950 and UL 1950. Dimensions approx. 15 x 7,5 mm board space and 10 mm height.

## FP2 Relays

3<sup>rd</sup> generation polarized 2 c/o telecom relay with bifurcated contacts, available as non latching or latching relay with 1 or 2 coils. Nominal voltage range from 3 ... 48 V, coil power consumption of 80 ... 260 mW for the high sensitive version, 140... 300 mW for the standard version, latching relays with 1 coil 100 mW. The FP2 Relay is available as through hole type and capable to switch loads up to 30 W/62,5 VA. Dielectric strength fulfills FCC part 68 (1,5 kV – 10 / 160 µs). The FP2 is CECC/IECQ approved. Dimensions approx. 14 x 9 mm board space and 5 mm height.

## MT2 / MT4

2<sup>nd</sup> generation non polarized, non latching 2 c/o and 4 c/o telecom and signal relay with bifurcated contacts. Nominal voltage range from 4.5 ... 48 V, coil power consumption 150/200/300/400 and 550 mW, and 300 mW (MT4). Dielectric strength fulfills the requirements according FCC part 68 (1,5 kV – 10 / 160 µs) for both and the Bellcore requirements according GR 1089 (2,5 kV – 2 / 10 µs) the MT4 only. Dimensions MT2 approx. 20 x 10 mm board space and 11 mm height, MT4 approx. 20 x 15 mm board space and 11 mm height.

## D2n Relays

2<sup>nd</sup> generation non polarized 2 c/o relay for telecom and various other applications. Nominal voltage range from 3 ... 48 V, coil power consumption from 150 ... 500 mW. The D2n relay is capable to switch currents up to 3 A. Dielectric strength fulfills the requirements according FCC part 68 (1,5 kV – 10 / 160 µs). Dimensions approx. 20 x 10 mm board space and 11,5 mm height.

## P1 Relays

Extremely sensitive, polarized 1 c/o relay with bifurcated contacts for a wide range of applications, available as non latching or latching relay with 1 or 2 coils. Nominal voltage range from 3 ... 24 V, coil power consumption 65 mW, latching relays with 1 coil 30 mW. The P1 relay is available as through hole or surface mount type and capable to switch currents up to 1 A. Dielectric strength fulfills the requirements according FCC part 68 (1,5 kV – 10 / 160 µs). Dimensions approx. 13 x 7,6 mm board space and 7 mm height for THT or 8 mm height for SMT version.

## W11 Relays

Low cost, non polarized 1 c/o relay for various applications. Nominal voltage range from 3 ... 24 V, coil power consumption 450 mW, sensitive versions 200 mW. The W11 relay is capable to switch currents up to 3 A. Dielectric strength 1000 Vrms. Dimensions approx. 15,6 x 10,6 mm board space and 11,5 mm height.

## Reed Relays

High sensitive, non polarized relay for telecom and various other applications, available with 1 n/o, 2 n/o or 1 c/o contacts. Nominal voltage range from 5 ... 24 V, coil power consumption 50...280 mW for 1 n/o and 125 ... 280 mW for 2 n/o or 1 c/o versions. Reedrelays are available in DIP or SIL housing and capable to switch currents up to 0,5 A. Integrated diode and/or electrostatic shield optional. Dielectric strength 1500 Vdc. Dimensions approx. 19,3 x 7 mm board space and 5 ... 7,5 mm height for DIP or 19,8 x 5 mm board space and 7,8 mm height for SIL version.

## Cradle Relays

Extremely reliable and mature relay family of 1<sup>st</sup> generation for various signal switching applications. Available as non polarized, polarized / latching and relay with AC coil. The benefit is the possibility of combining various contact sets from 1 up to 6 poles, single and bifurcated contacts, different contact materials with a coil voltage range from 1,5 Vdc to 220 Vac. Cradle relays are available as dust protected and hermetically sealed versions, with plug in or solder terminals and are capable to switch currents up to 5 A. Forcibly guided (linked) contact sets optional. Dielectric strength 500 Vrms. Dimensions from approx. 19 x 24 to 19x35 mm board space and 30 mm height.

## Other Relays

We offer a variety of different relay families for maintenance and replacement purposes. These relays are up to 60 years old now, such as Card Relay SN (V23030 / V23031 series), Small General Purpose Relay (V23006 series), Small Polarized Relay (V23063 ... V23067 and V23163 ... V23167 series). Accessories like sockets, hold down springs, etc. optional.

## HF3 Relay

High performance low cost RF relay with excellent RF characteristics. Available with an impedance of 50 and 75 Ohm. Suitable for frequencies up to 3 GHz. Actually smallest RF relay available combining small size, excellent RF performance and SMD solderability. Available as non latching or latching relay with 1 or 2 coils and a nominal coil voltage range from 3 ... 24 V, coil power consumption 140 mW, latching relays with 1 coil 70 mW. Dimensions 14,6 x 7,3 x 10 mm.



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