HFD48 3GHz SUBMINIATURE HIGH-FREQUENCY RELAY



Features

- Excellent high-frequency characteristics at 3GHz:
  Insertion loss≤0.6dB，VSWR≤1.4
  Isolation：between open contacts≥18dB,
  between contact sets≥25dB
- Operate/Release (Reset) time≤1.5ms
  Products with Operate/Release (Reset) time≤1ms are available
- Products with mechanical endurance ≥ 300 million ops available
- Ambient temperature up to 105℃
- 2 Form C configuration
- Single-side stable and latching types available
- SMT type available
- Small product size

RoHS compliant

CONTACT DATA

Contact arrangement		2C
Contact resistance[1)]		100mΩ max. (10mA 30mVDC)
Contact material		Sliver alloy + Au plated
Contact rating	Resistive load	1A 30VDC 0.3A 125VAC
	High frequency load	1W 3GHz
Max. switching voltage		125VAC / 30VDC
Max. switching current		1A (30VDC)
Max. switching power		37.5VA / 30W /1W 3GHz
Min. applicable load[2)]		10mV 10μA
Mechanical endurance		1 x 10^8OPS
Electrical endurance	Resistive load	1 x 10^5OPS(1A 30VDC, 85℃, 1s on 9s off) 1 x 10^5OPS(0.3A 125VAC, 85℃, 1s on 9s off)
	High frequency load[3)]	1 x 10^5OPS(1W 3GHz, 85℃, 1s on 9s off)

Notes: 1) The data shown above are initial values.
2) Min. applicable load is reference value. Please perform the confirmation test with the actual load before production since reference value may change according to switching frequencies, environmental conditions and expected contact resistance and reliability.
3) These values are for a V.SWR of 1.2 max. at the load.
4) In applications of small load, long mechanical endurance or long electrical endurance, it is recommended to connect two sets of NO or NC contacts in parallel.

COIL

Coil power	Single-side stable	See "COIL DATA"
	1 coil latching	See "COIL DATA"
Temperature rise		50K max. (1A load, ambient temperature 85℃)

HIGH-FREQUENCY CHARACTERISTICS

frequency		3GHz	6GHz (Typ.)
Isolation	between open contacts	≥18dB	15dB
	between contact sets	≥25dB	15dB
Insertion loss		≤0.6dB	1dB
V.SWR		≤1.4	1.8
Through maximum power		3W[4)]	

Notes: 1) The characteristic impedance of the measuring system is 50Ω;
2) The data shown above are initial values;
3) Please contact us if the relay will be used in an application that requires radio repeatability in high-frequency characteristics for the microload area (such as test and measurement equipment and ATE,etc.) ;
4) These values are for a V.SWR of 1.2 max. at the load;
5) If you need higher frequency band, please contact us.

CHARACTERISTICS

Insulation resistance		1000MΩ (500VDC)
Dielectric strength	Between coil & contacts	750VAC 1min
	Between open contacts	500VAC 1min
	Between contact sets	750VAC 1min
	Between coil, contact and grounding	500VAC 1min
Operate time (Set time)		≤ 1.5ms
Release time (Reset time)		≤ 1.5ms
Ambient temperature		-40℃ to 85℃
Humidity		5% to 85% RH
Vibration resistance	Functional	735m/s²
	Destructive	980m/s²
Shock resistance	Functional	10Hz to 55Hz 3.3mm DA
	Destructive	10Hz to 55Hz 5.0mm DA
Termination		SMT
Unit weight		Approx .1.2g
Moisture sensitivity levels (Only for SMT type, JEDEC-STD-020)		MSL3
Construction		Plastic sealed

Notes: 1) The data shown above are initial values.

COIL DATA

23˚C

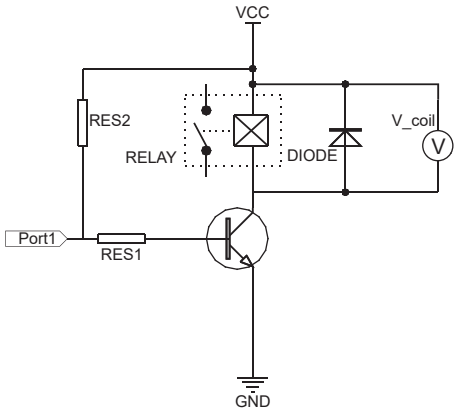
Single side stable

Coil Code	Nominal Coil Voltage VDC	Pick-up Voltage VDC max.[2)]	Drop-out Voltage VDC min.	Coil Resistance Ω	Nominal Power mW approx.	Max. Voltage VDC[5)]
HFD48/1.5	1.5	1.13	0.15	11.3 x (1±10%)	200	2.2
HFD48/2.4	2.4	1.8	0.24	28.9 x (1±10%)	200	3.6
HFD48/3[3)]	3	2.25	0.3	45 x (1±10%)	200	4.5
HFD48/4.5	4.5	3.38	0.45	101.3 x (1±10%)	200	6.7
HFD48/5[3)]	5	3.75	0.5	125 x (1±10%)	200	7.5
HFD48/6	6	4.5	0.6	180 x (1±10%)	200	9.0
HFD48/9	9	6.75	0.9	405 x (1±10%)	200	13.5
HFD48/12	12	9	1.2	720 x (1±10%)	200	18.0
HFD48/24	24	18	2.4	2880 x (1±10%)	200	36.0

1 coil latching

Coil Code	Nominal Coil Voltage VDC	Pick-up Voltage VDC max.[2)]	Reset Voltage VDC max.[2)]	Coil Resistance Ω	Nominal Power mW approx.	Max. Voltage VDC[5)]
HFD48/1.5-L	1.5	1.13	1.13	16 x (1±10%)	140	3.0
HFD48/2.4-L	2.4	1.8	1.8	41 x (1±10%)	140	4.8
HFD48/3-L[3)]	3	2.25	2.25	64.3 x (1±10%)	140	6.0
HFD48/4.5-L	4.5	3.38	3.38	145 x (1±10%)	140	9.0
HFD48/5-L[3)]	5	3.75	3.75	178 x (1±10%)	140	10.0
HFD48/6-L	6	4.5	4.5	257 x (1±10%)	140	12.0
HFD48/9-L	9	6.75	6.75	579 x (1±10%)	140	18.0
HFD48/12-L	12	9	9	1028 x (1±10%)	140	24.0
HFD48/24-L	24	18	18	2880 x (1±10%)	200	36.0

Notes: 1)The data shown above are initial values.
2)The initial Pick-up Voltage and Reset Voltage refer to the factory-set values of the relay. To supply rated step voltage to the coil is the foundation of proper relay operation. Please make sure the voltage applied across the coil reaches the rated value before use. Please refer to the typical diagram below for single-stable relay. "V_coil" is the rated voltage of the coil:



3) In case 5V of transistor drive circuit, it is recommended to use 4.5V type relay, and 3V to use 2.4V type relay.
4) For monostable relays，if you need to drop down voltage and hold mode after reliably operating,make sure that the effective value of holding voltage is not less than 60% of the rated voltage.
5) Maximum voltage refers to the maximum voltage which relay coil could endure in a short period of time.
6) When user's requirements can't be found in the above table, special order allowed.
7) During the relay pick-up or drop-out processes, there are stages of contact pressure change, contact vibration and unstable contact etc. When the voltage applied to coil is gradually changed, it will lengthen the unstable stage and affect relay endurance. To reduce this influence, please apply step voltage(switching circuit) to relay coil.

ORDERING INFORMATION

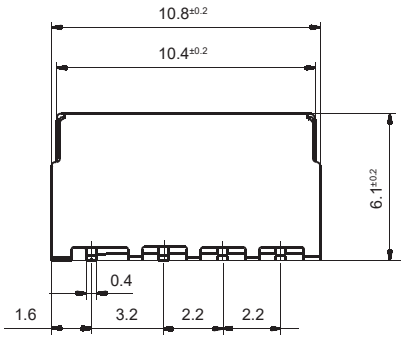
	HFD48 /	24	-L	S	R	(XXX)
Type						
Coil voltage	1.5, 2.4, 3, 4.5, 5，6, 9, 12, 24VDC					
Sort	**L:** 1 coil latching	**Nil:** Single side stable				
Terminal type	**S:** Standard SMT					
Packing style	**R:** Tape and reel packing					
Special code[2)]	**XXX:** Customer special requirement **Nil:** Standard For instance: Product with AD6 suffix is Operate/Release(Reset)time≤1ms Product with 888 suffix is for application at 105℃. Products with AL8 suffix is mechanical endurance ≥ 300 million ops available					

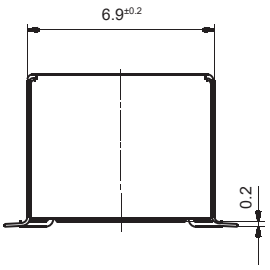
Notes: 1) R type (tape and reel) packing is moisture-proof which meets requirement of MSL-3. For R type, the letter "R" will only be printed on packing tag but not on relay cover.
2) Customer's special requirements will be identified by special codes after evaluation.
3) A hyphen mark "-" should be added between coil voltage and sort/terminal type/packing style if any, for example: HFD48/24-SR.
4) Please make sure that there are no silicon-based substances (such as silicon rubber, silicone oil, silicon-based coating agents, silicon fillers, etc.) around the relay, because it will generate silicon-containing volatile gas, which may cause poor contact in case of silicon-containing volatile gas sticking on contact.Flux proofed and dust cover type relays are prohibited in environments with water vapor and harmful gases (P, Cl, H_2S, SO_2, NO_2). Plastic sealed relays shall be used with practical test verification.

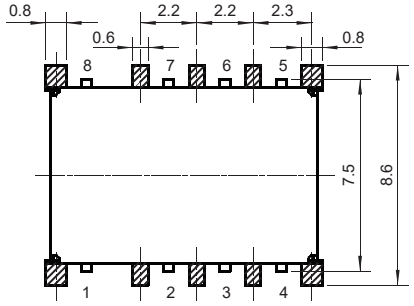
OUTLINE DIMENSIONS, WIRING DIAGRAM AND PC BOARD LAYOUT

Unit: mm

Outline Dimensions

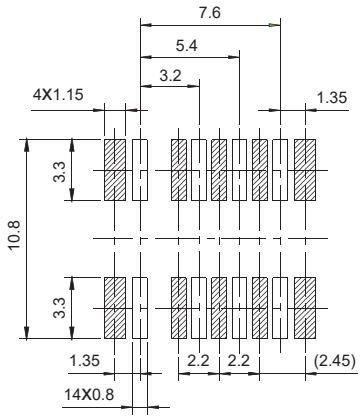






PCB Layout

(Bottom view)



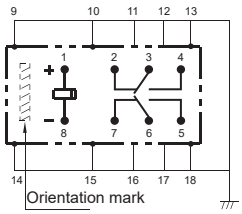
Remark: 1) ▨ represents the ground terminal or ground mounting hole.

OUTLINE DIMENSIONS, WIRING DIAGRAM AND PC BOARD LAYOUT

Unit: mm

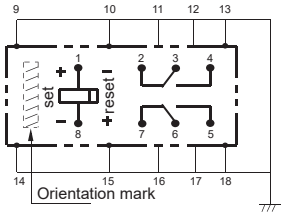
Wiring Diagram

Single side stable(Bottom view)



No energized condition

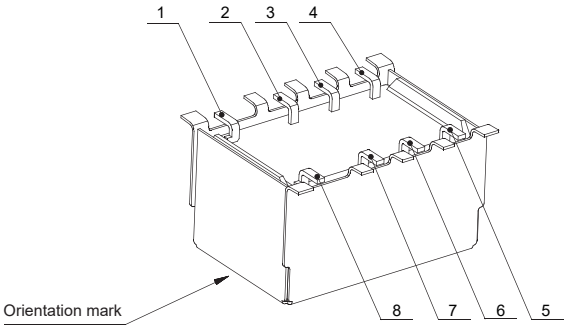
1 coil latching(Bottom view)



Reset condition

Pin Layout

Single side stable & 1 coil latching

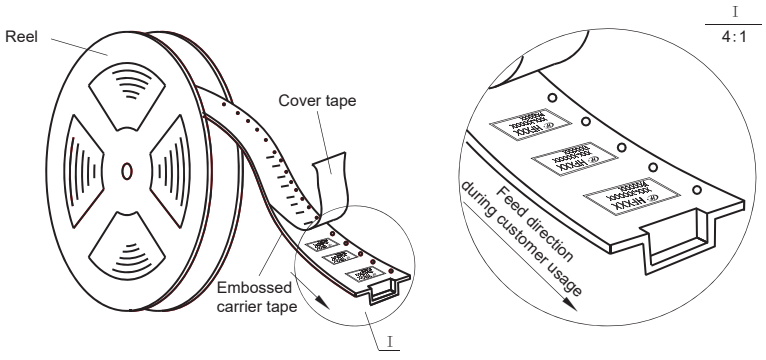


Remark: 1)In case of no tolerance shown in outline dimension: outline dimension ≤1mm, tolerance should be±2mm; outline dimension >1mm and ≤5mm, tolerance should be±3mm; outline dimension >5mm, tolerance should be±4mm.
2)The tolerance without indicating for PCB layout is always±1mm.
3) 9 to18 are relay ground Termination.

TAPE PACKING

Unit: mm

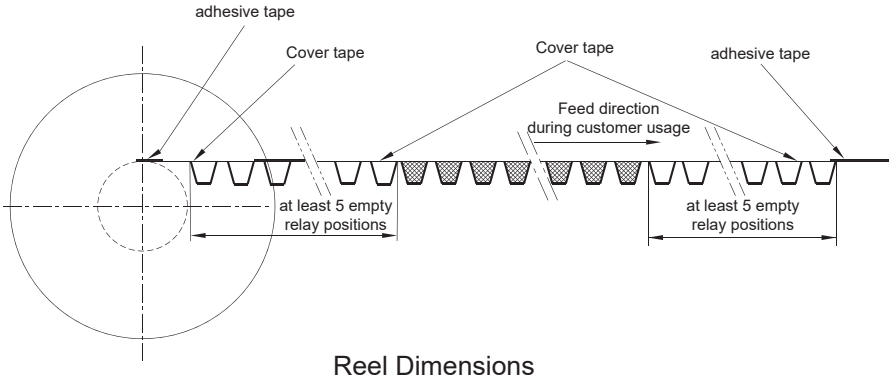
Direction of Relay Insertion



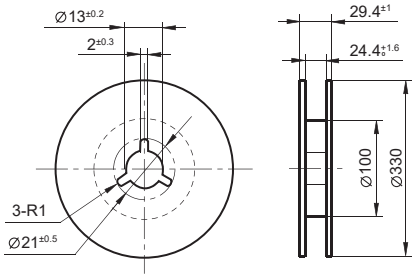
Notes: 1) Packing: 500pcs/reel, 2 reels/carton.
2) MOQ for reel packing is 500pcs.

TAPE PACKING

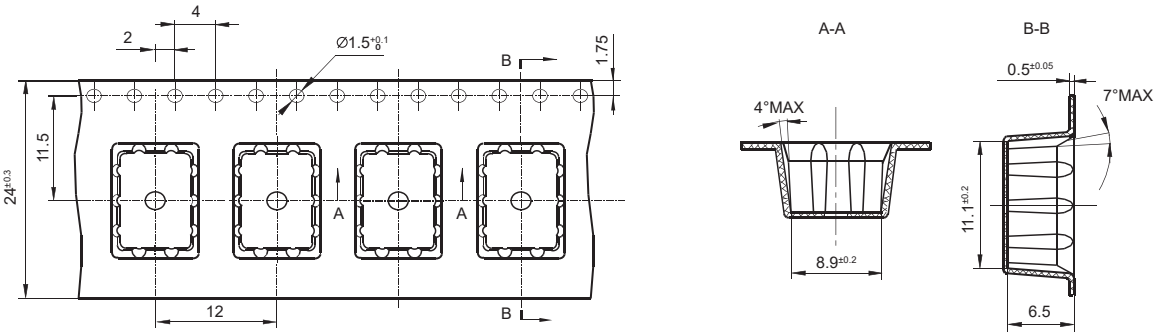
Unit: mm



Reel Dimensions

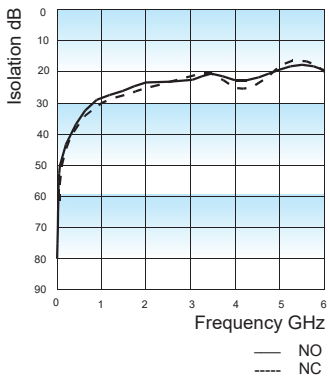


Tape Dimensions

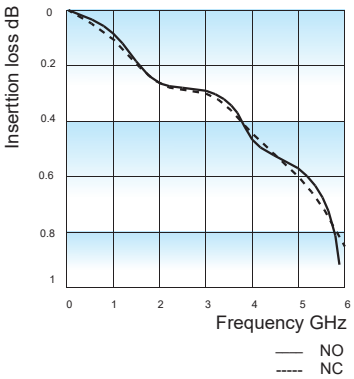


HIGH FREQUENCY CHARACTERISTICS CURVES

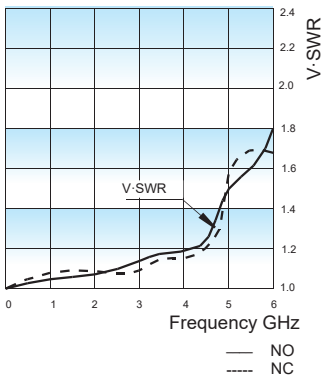
ISOLATION
（between open contacts）



INSERTTION LOSS



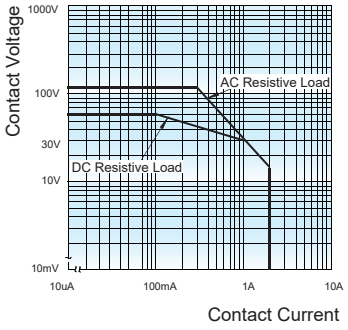
VOLTAGE STANDING WAVE RATIO



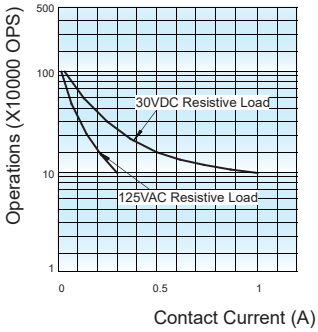
Remark: 1) Ambient temperature conditions is 23˚C；
2) The data shown above are initial values.
3) The high-frequency characteristics will vary depending on the PCB board.Please be sure to check performance parameters including durability in actual equipment before use.
4) Test model and specification: HFD48/5-SR, test instrument: Keysight E5071C network analyzer, the characteristic impedance of the measurement system is 50Ω.

CHARACTERISTIC CURVES

MAXIMUM SWITCHING POWER

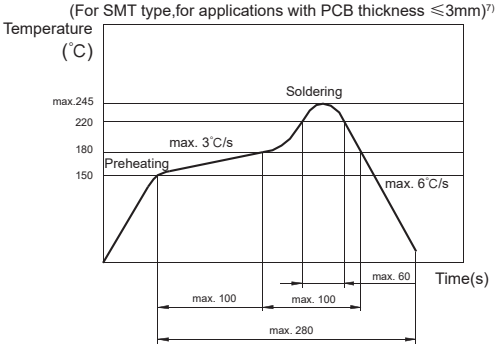


ENDURANCE CURVE



RECOMMENDED REFLOW SOLDERING PROFILE

(For SMT type,for applications with PCB thickness ⩽3mm)[7)]



(Measurement point: PCB surface where the relay is mounted)

Test conditions:
Energized with rated voltage
Resistive load, at 85˚C, 1s on 9s off.

Notice : 1) This relay is highly sensitive polarized relay, if correct polarity is not applied to the coil terminals, the relay does not operate properly.
2) To avoid using relays under strong magnetic field which will change the parameters of relays such as pick-up voltage and drop-out voltage.
3) Relay is on the "reset" status when being released from stock, with the consideration of shock risen from transit and relay mounting, it should be changed to the "set" status when application(connecting to the power supply). Please reset the relay to "set" or "reset" status on request.
4) Energizing coil with rated voltage is basic for normal operation of a relay, please make sure the energized voltage to relay coil have reached the rated voltage. Regarding latching relay, in order to maintain the "set" or "reset" status, impulse width of the rated voltage applied to coil should be more than 5 times of "set" or "reset" time.
5) For single-side stable relays, if voltage drop is needed to maintain the operation of relay after the relay operates reliably, please ensure that the effective value of the holding voltage is not less than 60% of the rated voltage.
6) The relay may be damaged because of falling or when shocking conditions exceed the requirement.
7) For SMT products, practical validation shall be performed and confirmed acceptable before mass production if the reflow-soldering profile deviates from our recommended profile. In principle, double reflow-soldering of relays is not recommended. If a second reflow-soldering process is required, the relay shall be cooled down to ambient temperature by natural cooling or forced-air cooling after the first reflow, and practical validation shall be completed and confirmed acceptable prior to mass production.
For applications with PCB thickness ＞3mm, the temperature of the relay body may be significantly higher than the PCB surface temperature. Practical validation shall be performed and confirmed acceptable before use and mass production.
8) Contact is recommended for suitable condition and specifications if water cleaning or surface process is involved in assembling relays on PCB.
9) Regarding the plastic sealed relay, we should leave it cooling naturally untill below 40˚C after welding, then clean it and deal with coating, remarkably the temperature of solvents should also be controlled below 40˚C.Please avoid cleaning the relay by ultrasonic, avoid using the solvents like gasoline, Freon, and so on, which would affect the configuration of relay or influence the environment.
10) About preferable condition of operation, storage and transportation, please refer to "Explanation to terminology and guidetines of relay".
11) For relays with moisture-proof package, the package meets requirements of MSL-3.After opening the package,please store the relays in an environment of ⩽30˚C, ⩽60% RH,and use them within 168 hours.If the relays can't be used up in time it's recommended to repack them with vacuum packaging or store them in a drying oven of 25˚C±5˚C, ⩽10% RH.If the storage conditions exceed the aforementioned conditions. please perform actual soldering confirmation or bake the relays at 50˚C±5˚C, ⩽30% RH for 72 hours before use.
12) Please be sure to avoid switching both large and small or radio-frequency loads with the same relay. Because switching large load is likely to incur splashes which, if being attached to the contacts, will lead to the contact failure or decline of the radio-frequency characteristics when the relay switches the small or high-frequency load.
13) When the relay is used in a long-term continuous energization circuit, the coil insulation material will age due to the self-heating of the coil; therefore, please try not to ground the relay coil to reduce the risk of electrical corrosion. At the same time, please design an appropriate safety circuit to prevent losses due to disconnection.
14) Please make sure that there are no silicon-based substances (such as silicon rubber, silicone oil, silicon-based coating agents, silicon fillers, etc.) around the relay, because it will generate silicon-containing volatile gas, which may cause poor contact in case of silicon-containing volatile gas sticking on contact.Flux proofed and dust cover type relays are prohibited in environments with water vapor and harmful gases (P, Cl, H_2S, SO_2, NO_2). Plastic sealed relays shall be used with practical test verification.
15) For other recommended usage, storage and transportation conditions, please refer to "Relay Terminology Explanation and Selection Guide".
16) During the relay pick-up or drop-out processes, there are stages of contact pressure change, contact vibration and unstable contact etc. When the voltage applied to coil is gradually changed, it will lengthen the unstable stage and affect relay endurance. To reduce this influence, please apply step voltage(switching circuit) to relay coil.

Disclaimer

The specification is for reference only. See to "Terminology and Guidelines" for more information. Specifications subject to change without notice. We could not evaluate all the performance and all the parameters for every possible application. Thus the user should be in a right position to choose the suitable product for their own application. If there is any query, please contact Hongfa for the technical service. However, it is the user's responsibility to determine which product should be used only.

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