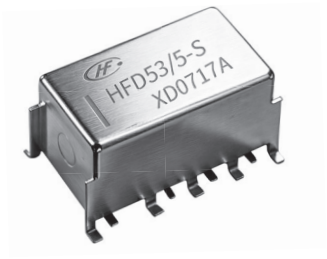
HFD53 MINIATURE 8GHz HIGH FREQUENCY RELAY



Features

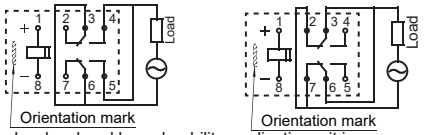
- An ideal device to replace small high-frequency reed relays, capable of transmitting differential signals above 8GHz
- Operate/Release time≤2ms
- Electrical endurance≥3 x 10^8ops
- Low coil power at 50mW. Coil (5V) operating current≤10mA. Can be directly driven by microprocessor.
- Excellent high-frequency characteristics at 3.6GHz, Insertion loss≤0.6dB，VSWR≤1.4， Isolation：between open contacts≥18dB， between contact sets≥20dB.
- Excellent high-frequency characteristics at 8GHz: Insertion loss≤3dB，VSWR≤3 Isolation：between open contacts≥12dB, between contact sets≥15dB.
- Smallest size in signal relay industry: 9.3mm × 5.1mm × 5.5mm

RoHS compliant

CONTACT DATA

Contact arrangement		2Z
Contact resistance		100mΩ max.(10mA 30mVDC)
Contact material		Ag alloy + Au plated
Contact rating	Resistive load	0.3A 125VAC/1A 30VDC
	High frequency load	1W 8GHz(V.SWR≤1.2)
Max. switching voltage		125VAC/60VDC
Max. switching current		1A(30VDC)
Max. switching power		1W 8GHz (V.SWR≤1.2)
Max. through power		1W 8GHz (V.SWR≤1.2)
Min. applicable load[2]		10mV 10μA
Mechanical endurance		1×10^7OPS[3]
Electrical endurance	Resistive load	1×10^5OPS(1A 30VDC,85℃, 1s on 9s off,NO or NC)
	High frequency load	1×10^5OPS(1W 8GHz[4],85℃, 1s on 9s off,NO or NC)
	AJ8 type	3x10^8OPS(Resistive load10mA 5VDC,40℃,0.1s on 0.1s off, 2 form NO or NC parallel connection)[5]

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) Mechanical endurance available≥3 x 10^8ops,If there is a need for higher mechanical endurance , please contact our company.
4) These values are for a V.SWR of 1.2 max. at the load.
5) Two sets of NO or NC parallel wiring diagrams (bottom view) are as follows:



6) For low level and long durability applications, it is recommended to use two sets of NO or NC in parallel. If you need to use a single set of NO or NC, please contact our company.

COIL

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

CHARACTERISTICS

Insulation resistance		1000MΩ(500VDC)
Dielectric strength	Between open contacts	750VAC 1min
	Between coil & contacts	750VAC 1min
	Between contact sets	750VAC 1min
	Between coil, contact and grounding	500VAC 1min
Operate time (Set time)[2]		2ms max.
Release time (Reset time)[2]		2ms max.
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.0.7g
Moisture Sensitivity Level[3]		MSL-3
Construction		Plastic sealed

Notes: 1) The data shown above are initial values.
2) If you require an operation/release time of ≤1ms, please choose our HFD53-K model.
3) Only for SMT type,JEDEC-STD-020.

HIGH-FREQUENCY CHARACTERISTICS

Frequency		3.6GHz	8GHz (standard type)
Isolation	Between open contacts	≥18dB	≥12dB
	Between contact sets	≥20dB	≥15dB
Insertion loss		≤0.6dB	≤3dB
V.SWR		≤1.4	≤3
Max. through power		1W 8GHz (V.SWR≤1.2)	

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.

COIL DATA

23˚C

Single side stable · Standard type

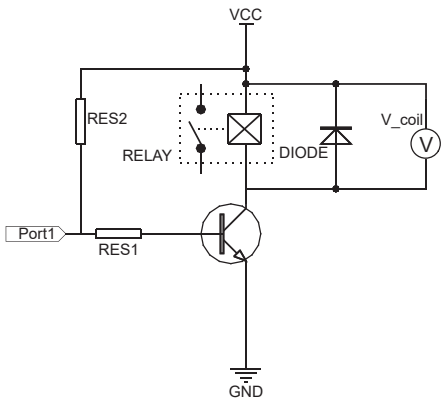
Coil Code	Nominal Coil Voltage VDC	Pick-up Voltage VDC max.[2)]	Drop-out Voltage VDC min.	Coil Resistance Ω	Rated Coil Current mA	Nominal Power mW approx.	Max. Voltage VDC[5)]
HFD53/1.5	1.5	1.2	0.15	45×(1±10%)	33.3	50	2.2
HFD53/2.4	2.4	1.92	0.24	115.2×(1±10%)	20.8		3.6
HFD53/3[3)]	3	2.4	0.3	180×(1±10%)	16.7		4.5
HFD53/4.5	4.5	3.6	0.45	405×(1±10%)	11.1		6.7
HFD53/5[3)]	5	4	0.5	500×(1±10%)	10		7.5
HFD53/6	6	4.8	0.6	720×(1±10%)	8.3		9
HFD53/9	9	7.2	0.9	1620×(1±10%)	5.6		13.5
HFD53/12	12	9.6	1.2	2880×(1±10%)	4.2		18
HFD53/24	24	19.2	2.4	5760×(1±10%)	4.2	100	36

1 coil latching · Standard type

Coil Code	Nominal Coil Voltage VDC	Pick-up Voltage VDC max.[2)]	Reset Voltage VDC max.[2)]	Coil Resistance Ω	Rated Coil Current mA	Nominal Power mW approx.	Max. Voltage VDC[5)]
HFD53/1.5-L	1.5	1.2	1.2	45×(1±10%)	33.3	50	3
HFD53/2.4-L	2.4	1.92	1.92	115.2×(1±10%)	20.8		4.8
HFD53/3-L[3)]	3	2.4	2.4	180×(1±10%)	16.7		6
HFD53/4.5-L	4.5	3.6	3.6	405×(1±10%)	11.1		9
HFD53/5-L[3)]	5	4	4	500×(1±10%)	10		10
HFD53/6-L	6	4.8	4.8	720×(1±10%)	8.3		12
HFD53/9-L	9	7.2	7.2	1620×(1±10%)	5.6		18
HFD53/12-L	12	9.6	9.6	2880×(1±10%)	4.2		24
HFD53/24-L	24	19.2	19.2	5760×(1±10%)	4.2	100	36

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

	HFD53/	12	-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[1)]					
Special code[3)]	**XXX:** Customer special requirement **For instance:** (AJ8) indicates that the product's electrical endurance is ⩾3x10^8 OPS.					

Notes: 1) R type (tape and reel) packing is moisture-proof which meets requirement of MSL-3. Please choose R type packing for SMT products. For R type, the letter "R" will only be printed on packing tag but not on relay cover. Tube packing is normally not available for SMT products unless specially requested by customer. But please note that tube packing is not moisture-proof so please bake the products before use according to description of Notice 11 herewith. In addition, tube packaging will be adopted when the ordering quantity of R type is equal to or less than 100 pieces unless otherwise specified.

2) A hyphen mark "-" should be added between coil voltage and sort/terminal type/packing style if any, for example: HFD53/12-SR;

3) Customer's special requirements will be identified by special codes after evaluation.

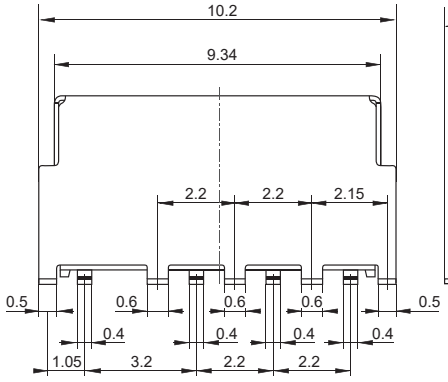
4) Please make sure that there are no silicon-based substances (such as silicon rubber, silicone oil, silicon-based coating agents, silicon fillers, etc.) around the relay, because it will generate silicon-containing volatile gas, which may cause poor contact in case of silicon-containing volatile gas 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

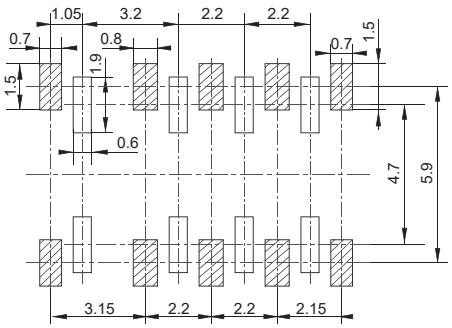
S type: Standard SMT

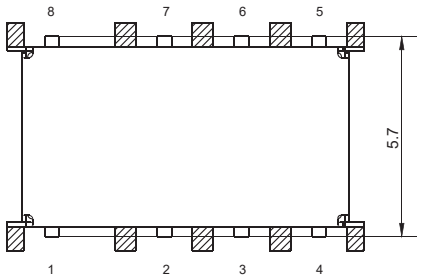
Outline Dimensions



PCB Layout

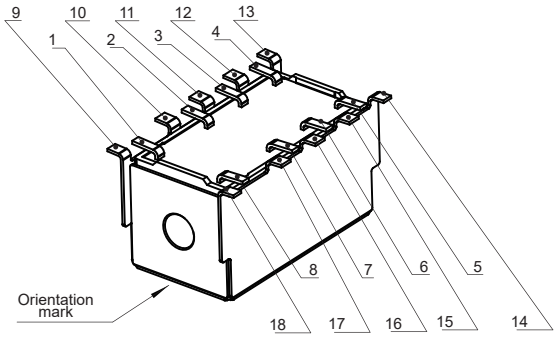
(Bottom view)





Pin Layout

(Single side stable & 1coil latching)



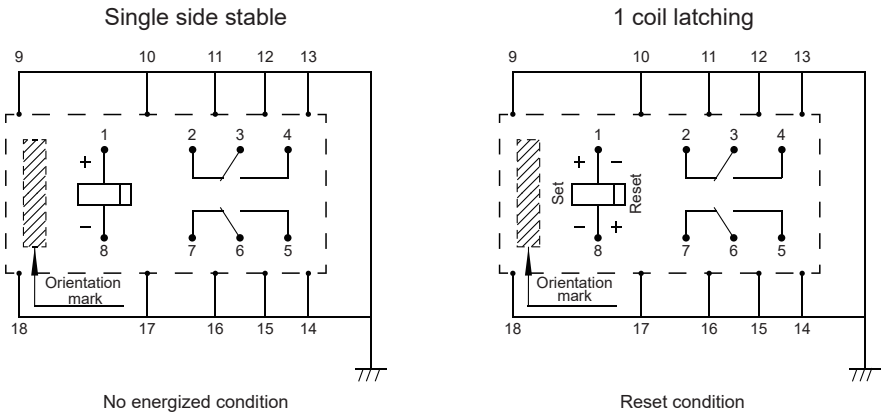
Remark: 1) ▨ represents the ground terminal or ground mounting hole.

OUTLINE DIMENSIONS, WIRING DIAGRAM AND PC BOARD LAYOUT

Unit: mm

Wiring Diagram

(Bottom view)

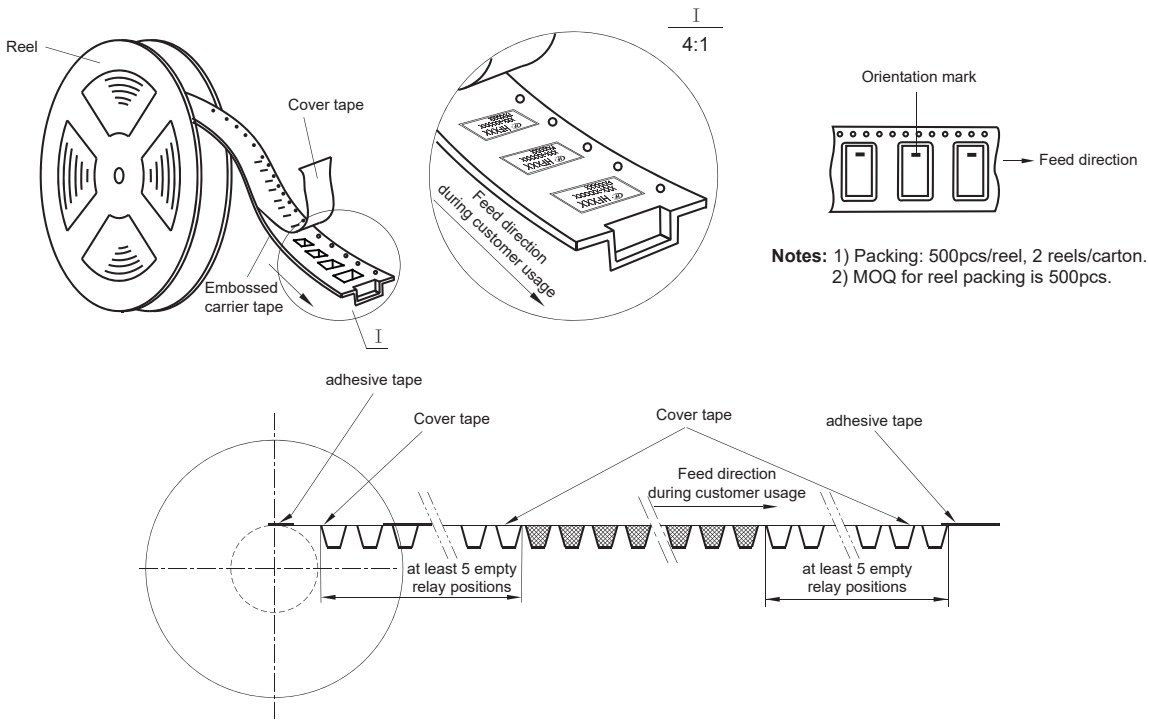


Notes: 1) In case of no tolerance shown in outline dimension: outline dimension ≤1mm, tolerance should be±0.2mm; outline dimension >1mm and ≤5mm, tolerance should be±0.3mm; outline dimension ≥5mm, tolerance should be±0.4mm.
2) The tolerance without indicating for PCB layout is always±0.1mm.

TAPE PACKING

Unit: mm

Direction of Relay Insertion

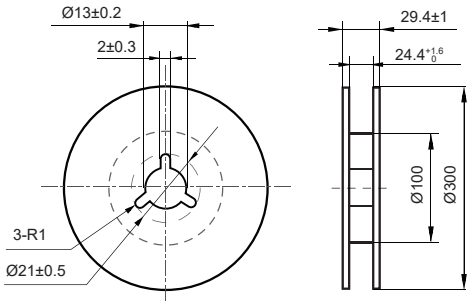


Notes: 1) Packing: 500pcs/reel, 2 reels/carton.
2) MOQ for reel packing is 500pcs.

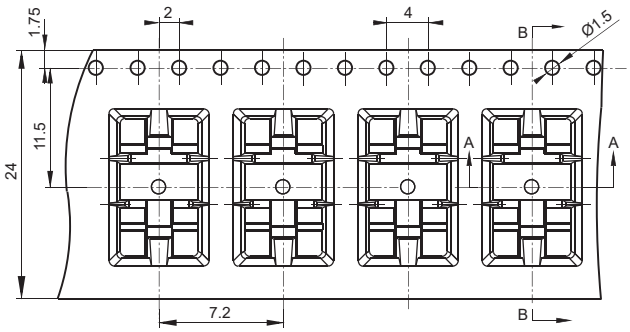
TAPE PACKING

Unit: mm

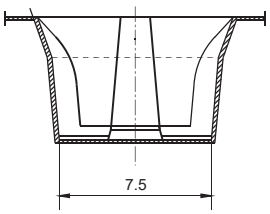
Reel Dimensions



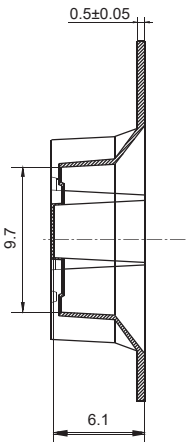
Tape Dimensions
（S type: Standard SMT）



A-A

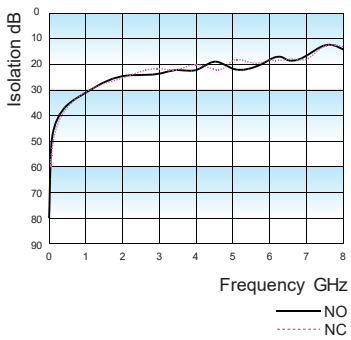


B-B

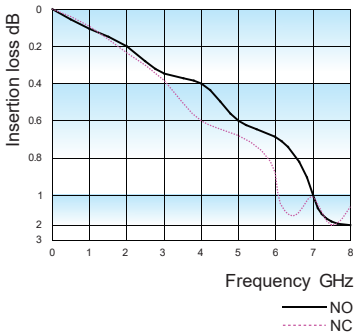


HIGH FREQUENCY CHARACTERISTICS CURVES

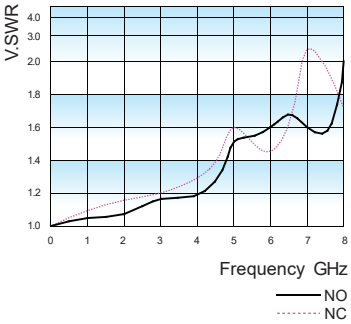
ISOLATION



INSERTION LOSS



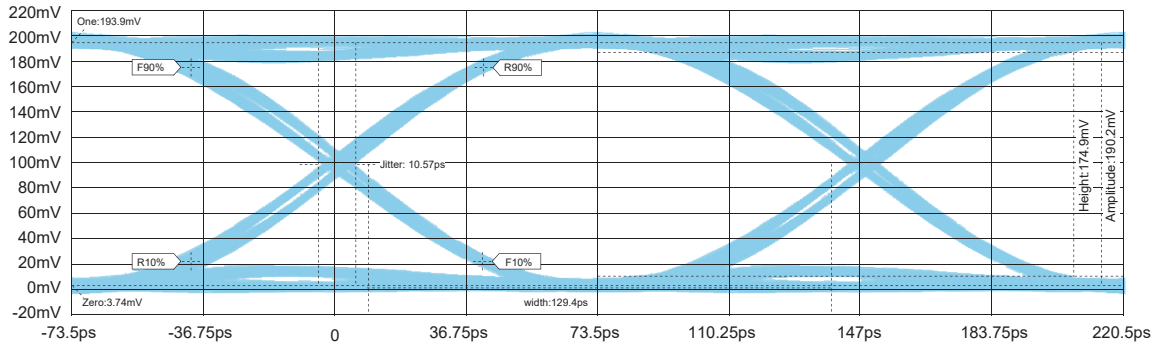
VOLTAGE STANDING WAVE RATIO



Notes: 1) Ambient temperature conditions is 23℃;
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: HFD53/4.5-SR，test instrument: Keysight E5071Cnetwork analyzer, the characteristic impedance of the measurement system is 50Ω.

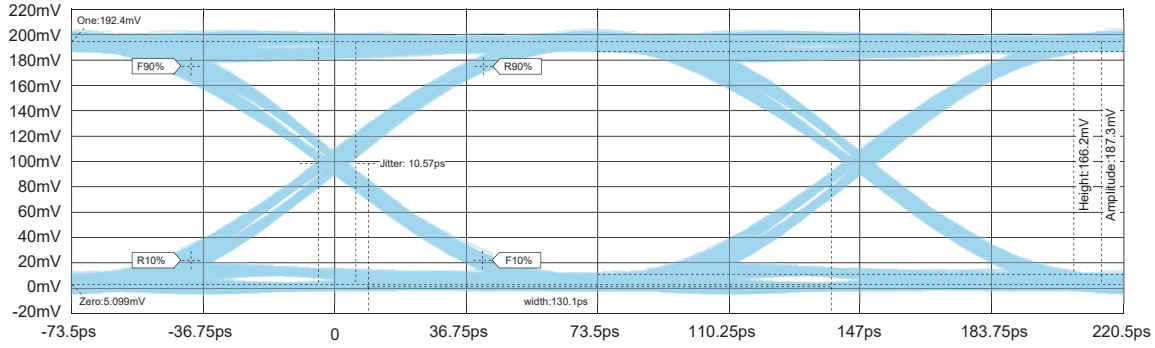
6.8 Gbps EYE DIAGRAM

NO contacts



Eye Height	Eye Width	Jitter P-P
174.9 mV	129.4 ps	10.57 ps

NC contacts



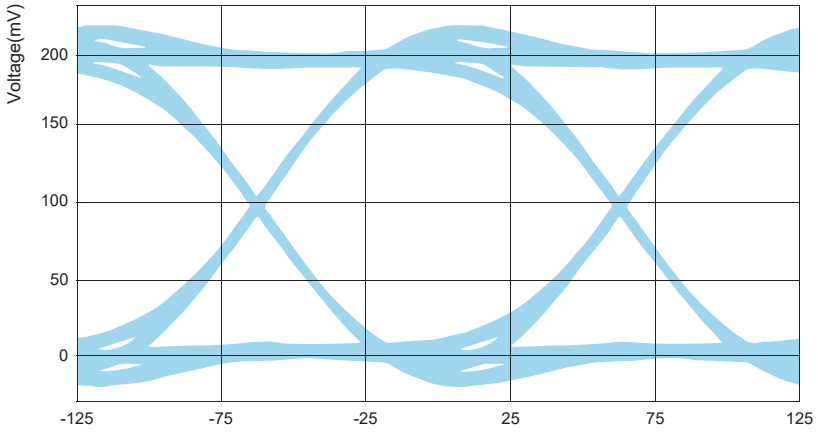
Eye Height	Eye Width	Jitter P-P
166 mV	130 ps	10.57 ps

Test conditions:

1) 2^{11}-1 PRBS signal.
2) Input differential voltage 200 mV.
3) Rise time 58.8ps @10-90%.
4) Ambient temperature condition:23℃
5) The impedance of the measurement system is 50Ω.
6) This data includes loss due to the test board.

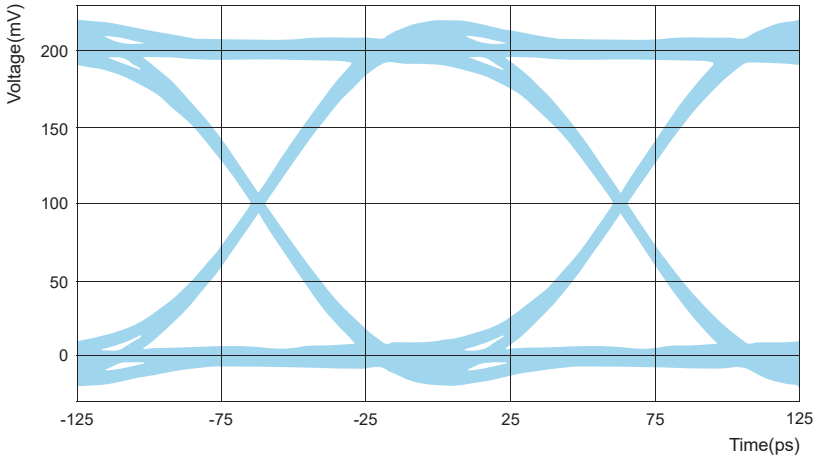
8 Gbps EYE DIAGRAM

NO contacts



Eye Height	Eye Width	Jitter P-P
161.4 mV	119.4 ps	5.6 ps

NC contacts



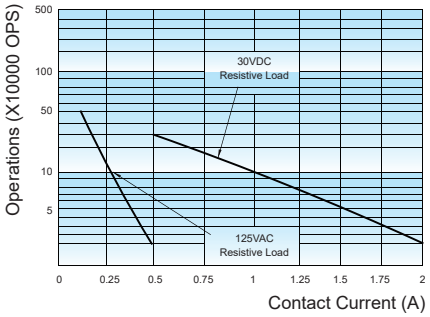
Eye Height	Eye Width	Jitter P-P
156.3 mV	118.9 ps	5.6 ps

Test conditions:

1) 2^{11}-1 PRBS signal.
2) Input differential voltage 200 mV.
3) Rise time 58.8ps @10-90%.
4) Ambient temperature condition:23℃
5) The impedance of the measurement system is 50Ω.
6) This data includes loss due to the test board.

CHARACTERISTIC CURVES

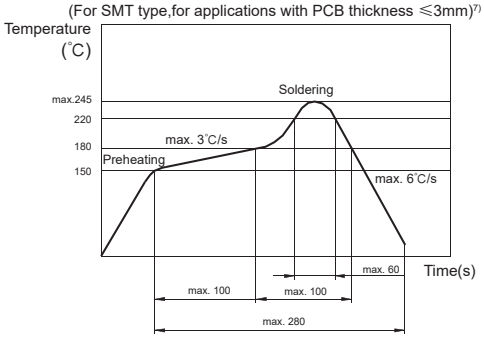
ENDURANCE CURVE



Test conditions:
Resistive load, 1s on 9s off.

RECOMMENDED REFLOW SOLDERING PROFILE

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



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

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) The relay action voltage and release/return voltage are the initial values tested under standard conditions (23℃). Applying rated voltage to both ends of the relay coil is the basis for normal operation of the relay. Considering the influence of environment temperature, coil temperature rise (such as hot start), voltage fluctuation, etc., in order to ensure the safety margin, make sure that the voltage applied to both ends of the relay coil reaches the rated voltage before use. For a magnetic retention relay, the pulse width of the rated voltage applied to both ends of the relay coil must be more than five times the action or recovery time in order to ensure its action or recovery.
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) Please use wave soldering or manual soldering for straight-in relay. If you need reflow welding, please confirm the feasibility with us.
9) Contact is recommended for suitable condition and specifications if water cleaning or surface process is involved in assembling relays on PCB.
10) Regarding the plastic sealed relay, we should leave it cooling naturally untill below 40℃ after welding, then clean it and deal with coating, remarkably the temperature of solvents should also be controlled below 40℃.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.
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℃, ⩽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℃±5℃, ⩽10% RH.If the storage conditions exceed the aforementioned conditions please perform actual soldering confirmation or bake the relays at 50℃±5℃, ⩽30% RH for 72 hours before use.
12) 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.
13) 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.
14) For other recommended usage, storage and transportation conditions, please refer to "Relay Terminology Explanation and Selection Guide".
15) 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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