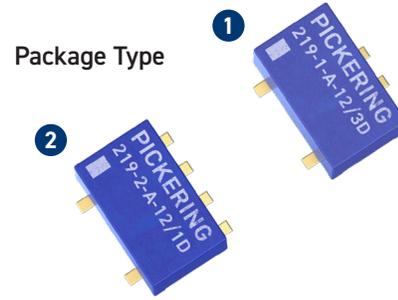


- Up to **3 kV** stand-off Switch - Switch
& Up to **5 kV** stand-off Switch - Coil
- **1 Form A, 2 Form A** or **1 Form B** configurations
- **3 V, 5 V & 12 V** coils with **optional internal diode**
- Insulation resistance **>10¹² Ω**
- Switching up to **0.7 A, 10 W**
- **Additional build options are available**
- Many benefits compared to industry standard relays
(see last page)
- Suitable for mixed signal semiconductor testing, medical electronic equipment testing, EV charge point testing, monitoring photovoltaic efficiency, in-circuit test equipment, and high voltage instrumentation



Note: Package Types 1 & 2 are the same size yet have different pin positions

Switch Ratings - Dry Switches

1 Form A (energize to make)	1 Form B (energize to break)	2 Form A (energize to make)
Stand-off 1.5 kV, switching up to 1kV Stand-off 2 kV, switching up to 1kV Stand-off 3 kV, switching up to 1kV	Stand-off 1.5 kV, switching up to 1kV Stand-off 2 kV, switching up to 1kV	Stand-off 1.5 kV, switching up to 1kV

Series 219 switch ratings - contact ratings for each switch type

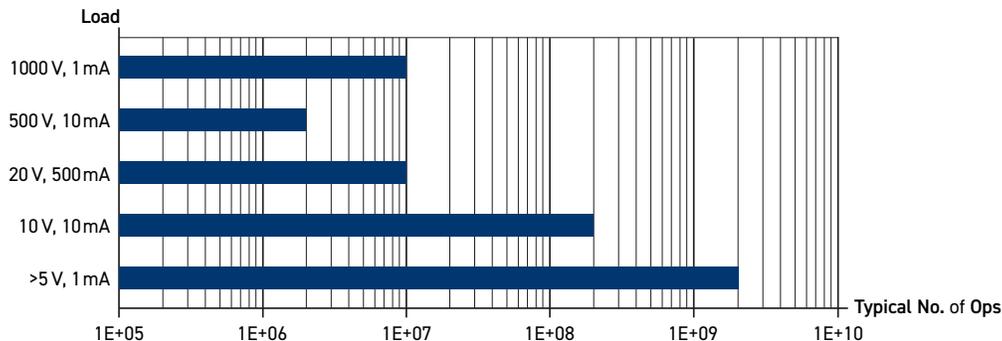
Switch No	Switch form	Power rating	Max. switch current	Max. carry current	Max. switching volts (see Note ¹)	Min. stand-off volts (Switch - Switch)	Min. stand-off volts (Switch - Coil)	Life expectancy ops typical (see Note ²)	Operate time in bounce (max)	Release time	Special features
1	A or B	10 W	0.7 A	1.25 A	1000	1500	1500	10 ⁸	0.5 ms	0.2 ms	High voltage
2	A or B	10 W	0.7 A	1.25 A	1000	2000	5000	10 ⁸	0.5 ms	0.2 ms	High voltage
3	A	10 W	0.7 A	1.25 A	1000	3000	5000	10 ⁸	0.5 ms	0.2 ms	High voltage

Note¹: Switching Voltage

This high voltage rating is for **RESISTIVE loads only**. At these high voltages, even stray capacitance can generate very high current pulses, which can damage the contact plating causing welding of the reed switch. If there is capacitance in circuit, provision should be made to limit the surge, to within the current and power ratings of the relay.

Note²: Life Expectancy

The life of a reed relay depends upon the switch load and the end of life criteria. For example, for an 'end of life' contact resistance specification of 1Ω, switching low loads or when 'cold' switching, typical life is expected to be greater than 1 x 10⁸ ops. At higher voltages and the maximum load (resistive), typical life is 1 x 10⁷ ops. In the event of abusive conditions, e.g. high currents due to capacitive inrushes, this figure reduces considerably. Pickering will be pleased to perform life testing with any particular load conditions.



Series 219 Life Test Data

Operating Voltages

Coil voltage - nominal	Must operate voltage - maximum at 25 °C	Must release voltage - minimum at 25 °C
3 V	2.25 V	0.3 V
5 V	3.75 V	0.5 V
12 V	9 V	1.2 V

Environmental Specification/Mechanical Characteristics

In the table below, the upper temperature limit can be extended to +125 °C if the coil drive voltage is increased to accommodate the resistance/temperature coefficient of the copper coil winding. This is approximately 0.4% per °C. This means that at 125 °C the coil drive voltage will need to be increased by approximately $40 \times 0.4 = 16\%$ to maintain the required magnetic drive level. Please contact sales@pickeringrelay.com for assistance.

Operating Temperature Range	-40 °C to +105 °C
Storage Temperature Range	-40 °C to +125 °C
Shock Resistance	50 g
Vibration Resistance (10 - 2000 Hz)	20 g
Soldering Temperature (max) (10 s max)	270 °C
Washability (Proper drying process is recommended)	Fully Sealed

Washing Guidelines

Pickering do not make any specific recommendations on washing reed relays, due to the large number of factors in cleaning processes, however we do have suggestions on best practices. Click [here](#) for more information.

Contact Resistance

A characteristic of the switch used in this range is the contact resistance can increase over time if subjected to standoff voltages in the upper range of the specification. This does not affect the life expectancy but can result in contact resistances greater than 1Ω. In most high voltage applications this increase has no effect on performance but, in some mixed signal applications low and stable contact resistance is important.

The technical information shown in this data sheet could contain inaccuracies or typographical errors. This information may be periodically changed or updated and these changes will be included in future versions of this data sheet.

For different values, latest specifications and product details, please contact your local Pickering sales office.

For **FREE** evaluation samples go to: pickeringrelay.com/samples

Coil Data and Type Numbers

Device Type	Type Number	Coil (V)	Coil resistance	Max. contact resistance (initial)	Insulation resistance (minimum at 25 °C) (see Note ⁴)		Capacitance (typical) (see Note ³)	
					Switch to coil	Across switch	Closed switch to coil	Across open switch
1 Form A Switch No. 1 (1.5 kV) Package Type 1	219-1-A-3/1D	3	100 Ω	0.17 Ω	10 ¹² Ω	10 ¹² Ω	2.5 pF	0.1 pF
	219-1-A-5/1D	5	250 Ω					
	219-1-A-12/1D	12	750 Ω					
1 Form A Switch No. 2 (2 kV) Package Type 1	219-1-A-3/2D	3	75 Ω	0.17 Ω	10 ¹² Ω	10 ¹² Ω	2.5 pF	0.1 pF
	219-1-A-5/2D	5	200 Ω					
	219-1-A-12/2D	12	500 Ω					
1 Form A Switch No. 3 (3 kV) Package Type 1	219-1-A-3/3D	3	50 Ω	0.17 Ω	10 ¹² Ω	10 ¹² Ω	2.0 pF	0.1 pF
	219-1-A-5/3D	5	125 Ω					
	219-1-A-12/3D	12	400 Ω					
2 Form A Switch No. 1 (1.5 kV) Package Type 2	219-2-A-3/1D	3	50 Ω	0.17 Ω	10 ¹² Ω	10 ¹² Ω	2.5 pF	0.1 pF
	219-2-A-5/1D	5	100 Ω					
	219-2-A-12/1D	12	400 Ω					
1 Form B Switch No. 1 (1.5 kV) Package Type 1	219-1-B-3/1D	3	50 Ω	0.17 Ω	10 ¹² Ω	10 ¹² Ω	2.5 pF	0.1 pF
	219-1-B-5/1D	5	100 Ω					
	219-1-B-12/1D	12	400 Ω					
1 Form B Switch No. 2 (2 kV) Package Type 1	219-1-B-3/2D	3	50 Ω	0.17 Ω	10 ¹² Ω	10 ¹² Ω	2.5 pF	0.1 pF
	219-1-B-5/2D	5	100 Ω					
	219-1-B-12/2D	12	400 Ω					

When an internal diode is required, the suffix D is added to the part number as shown in the table.

Note³: Capacitance across open switch

This is measured with all other component leads connected to the guard terminal of the measuring bridge.

Note⁴: Insulation resistance

Insulation resistance will reduce at higher temperatures. For more information on temperature effects [click here](#), or [contact Pickering](#) for more in depth guidance.

Pin Configuration, Weights and Dimensional Data (dimensions in inches, millimeters in brackets)

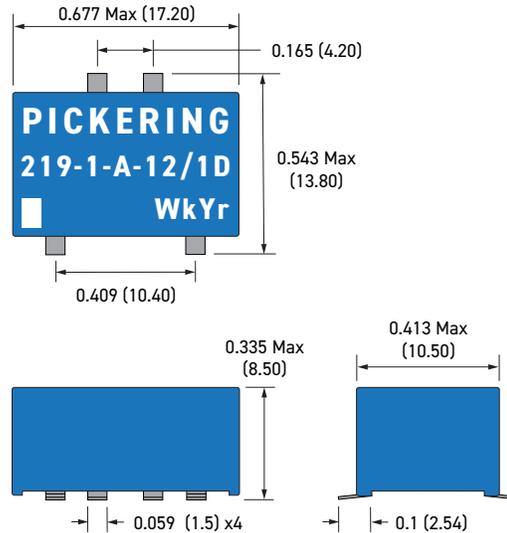
Package Type 1

1 Form A

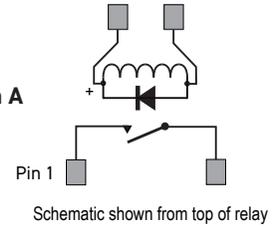
Weight: Typical 2.12 g

1 Form B

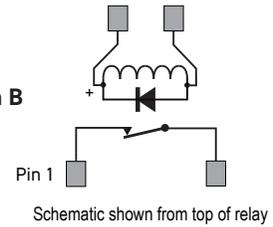
Weight: Typical 2.19 g



1 Form A



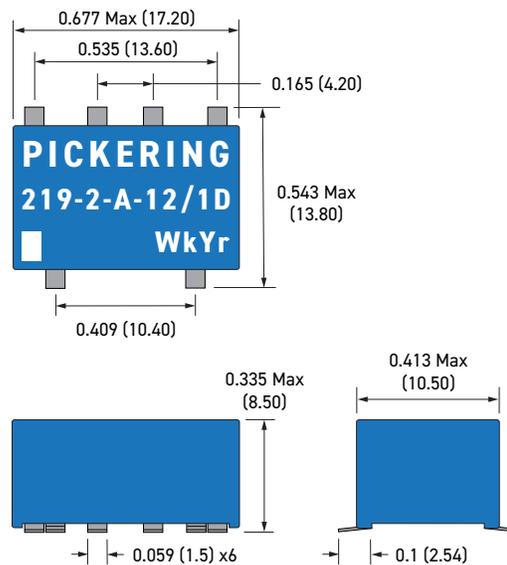
1 Form B



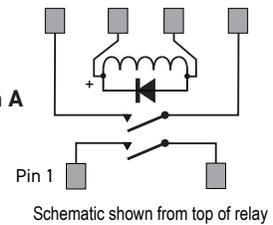
Package Type 2

2 Form A

Weight: Typical 2.39 g



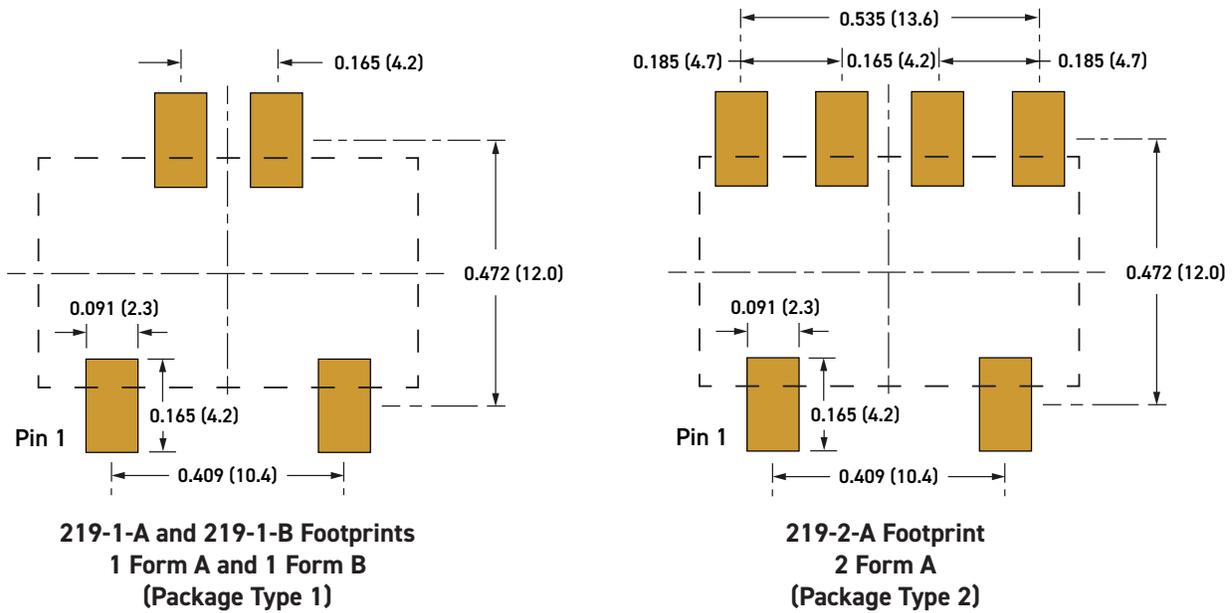
2 Form A



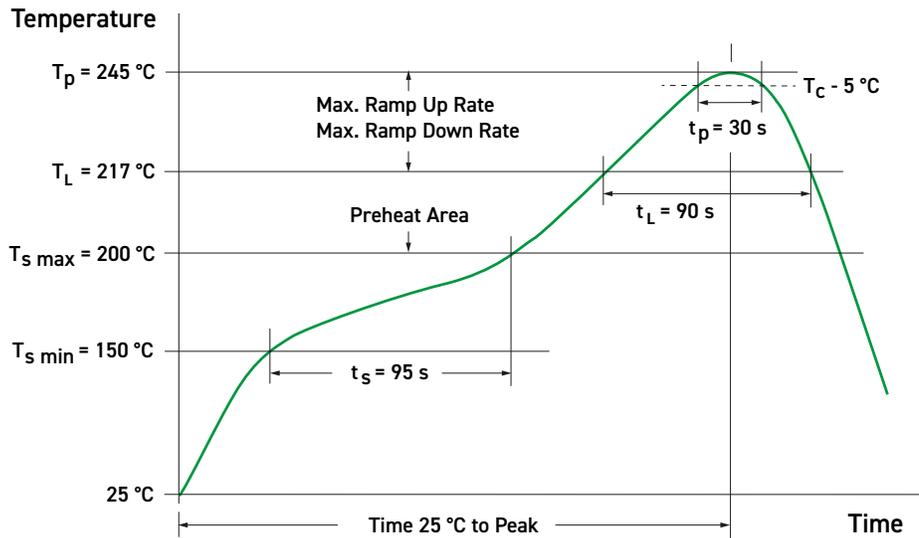
Important: Where the optional internal diode is fitted or for all Form B types, the correct coil polarity must be observed, as shown by the + symbol on the schematics.

Note: A 1 cm space should be left between Form B types and other relays, as the magnetic field from the internal biasing magnet could slightly affect the sensitivity of the relay alongside.

PCB Footprints (dimensions in inches, millimeters in brackets)



Reflow Soldering: Recommended Profile and Parameters



SMT Soldering Profile based on IPC/JEDEC J-STD-020E

Profile Feature		Value
Preheat Temperature Min	$T_S \text{ min}$	150 °C
Preheat Temperature Max	$T_S \text{ max}$	200 °C
Preheat Time t_S from $T_S \text{ min}$ to $T_S \text{ max}$	t_S	60 - 120 s
Ramp-up Rate (T_L to T_p)		3 °C/s max
Liquidous Temperature	T_L	217 °C
Time t_L maintained above T_L	t_L	60 - 150 s

Profile Feature		Value
Peak Package Body Temperature	T_p	245 °C
Time within 5 °C of actual Peak Temperature	t_p	20-30 s
Ramp-down Rate (T_L to T_p)		6 °C/s max
Time 25 °C to Peak Temperature		8 minutes max
Applied Cycles		2 cycles max

Moisture Sensitivity of Surface Mount Reed Relays

Quality and reliability concerns regarding internal damage, cracks and delamination from the solder reflow process have demanded standardised procedures regarding moisture control for some surface mount devices. Pickering Series 219 Surface Mount Reed Relays are classified to IPC/JEDEC J-STD-020 MSL1, and thus dry packs and special procedures are not required.

Packing

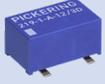
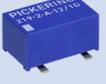
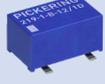
Pickering 219 Series relays can be provided in tape and reel format on request.

Shelf and Floor Life

Through their moisture sensitivity level 1 classification 219 Series relays have an “infinite floor life” when the conditions are 30 °C/85% RH.

Similar Relays Comparison

If the Series 219 is unsuitable for your application, Pickering also manufacture four series of thru-hole high voltage reed relays in various package sizes.

Series Name		219-1-A			219-2-A		219-1-B	
Physical Outline								
Depth	mm (inches)	10.5 (0.42) Body, 13.8 (0.55) Across Legs						
Width		17.2 (0.677)						
Height		8.5 (0.34)						
Package Volume (mm ³)		① 1535			② 1535		① 1535	
Typical Weights (g)		2.12			2.39		2.19	
Contact Configuration		1-A (SPST)			2-A (DPST)		1-B (SPNC)	
Reed Switch Type		Dry	Dry	Dry	Dry	Dry	Dry	
Stand-off Voltage (V)		1500	2000	3000	1500	1500	2000	
Switching Voltage (V)		1000						
Switching Current (A)		0.7						
Carry Current (A)		1.25						
Switch Power (W)		10						

Series Name		131L-1-A	131-1-A	119L-1-A			119-1-A		119L-2-A		119-2-A	119L-1-B			119-1-B	104-1-A & 104HT-1-A			
Physical Outline																			
Depth	mm (inches)	3.7 (0.145)		3.7 (0.145)			3.7 (0.145)		3.7 (0.145)		3.7 (0.145)			6.3 (0.245)					
Width		12.5 (0.49)		15.1 (0.595)			15.1 (0.595)		20.1 (0.79)		15.1 (0.595)			24.1 (0.95)					
Height		6.6 (0.26)		6.6 (0.26)			6.6 (0.26)		8.9 (0.35)		8.9 (0.35)			8.2 (0.32)					
Package Volume (mm ³)		306		369	369	369	369	491	662	662	498	498	498	1245	1245	1245	1245		
Typical Weights (g)		0.58		0.67			0.74		1.06		0.89			2.06		2.06			
Contact Configuration		1-A (SPST)		1-A (SPST)			1-A (SPST)		2-A (DPST)		1-B (SPNC)			1-A (SPST)					
Reed Switch Type		Dry Low Level	Dry	Dry Low Level	Dry Low Level	Dry	Dry	Dry	Dry Low Level	Dry	Dry Low Level	Dry	Dry	Dry	Dry	Dry	Mercury Wetted	Dry	Dry
Stand-off Voltage (V)		1000	1500	1000	1500	1500	2000	3000	1000	1500	1000	1500	2000	1500	2000	1500	3000	4000	
Switching Voltage (V)		1000		1000			1000		1000		1000			1000	500	1000			
Switching Current (A)		0.7		0.7			0.7		0.7		0.7			1	2	1			
Carry Current (A)		1.25		1.25			1.25		1.25		1.25			1.5	3	1.5			
Switch Power (W)		10		10			10		10		10			25	50	25			

Series Name		104ES-1-A			104-1-B		104-2-A			100HV-1-A			100HV-1-B		100HV-2-A		
Physical Outline																	
Depth	mm (inches)	6.3 (0.245)									10.2 (0.40)			10.2 (0.40)		10.2 (0.40)	
Width		24.1 (0.95)			29 (1.14)			24.1 (0.95)			29 (1.14)		29 (1.14)				
Height		8.2 (0.32)			12.5 (0.49)			12.7 (0.50)			15.2 (0.60)		15.2 (0.60)				
Package Volume (mm ³)		1245			2284			3122			3122		4496		4496		
Typical Weights (g)		1.94			3.75		3.7			6.99			8.75		8.75		
Contact Configuration		1-A (SPST)s			1-B (SPNC)		2-A (DPST)			1-A (SPST)			1-B (SPNC)		2-A (DPST)		
Reed Switch Type		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Mercury Wetted	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Stand-off Voltage (V)		1500	2000	3000	1500	2000	1500	2000	1500	1500	2000	3000	1500	2000	1500	2000	
Switching Voltage (V)		1000	1000	1000	1000			500			1000			1000		1000	
Switching Current (A)		1	1	1	1			2			1			1		1	
Carry Current (A)		1.5	1.5	1.5	1.5			3			1.5			1.5		1.5	
Switch Power (W)		25	25	25	25			50			25			25		25	

Reed Relay Selection Tool

Because Pickering offer the largest range of high-quality reed relays, sometimes it can be difficult to find the right reed relay you require. That is why we created the Reed Relay Selector, this tool will help you narrow down our offering to get you the correct reed relay for your application. To try the tool today go to: pickeringrelay.com/reed-relay-selector-tool

Standard Build Options

The Series 219 Reed Relay is available with a number of standard build options to tailor it to your specific application. These options are detailed in the table below. If you decide to go ahead and specify one, or more, of these options you will be allocated a unique part number suffix.

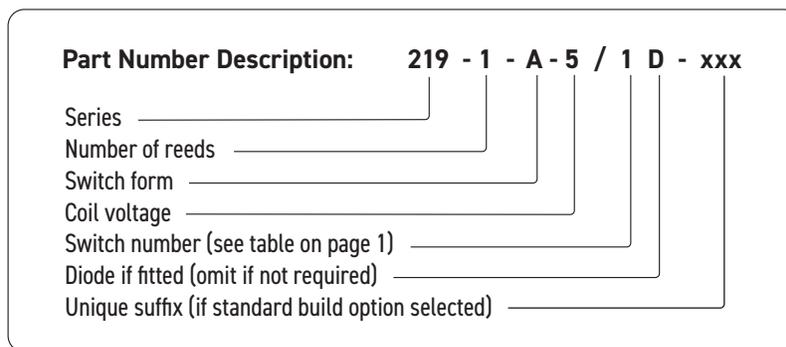
Mechanical Build Options	Electrical Build Options
Special pin configurations or pin lengths	Different coil resistance
Special print with customer's own part number or logo	Very low capacitance possibility
Custom packaging possibility	Different stand-off or switching voltage
	Operate or de-operate time
	Pulse capability
	Enhanced specifications
	Non-standard coil voltages and resistance figures
	Special Life testing under customer's specific load conditions
	Specific environmental requirements
	Controlled thermal EMF possibility

Customization

If your specific requirements are not met by standard relay, or any of the standard build options, please speak to us to discuss producing a customized reed relay to service your specific application: pickeringrelay.com/contact

3D Models

Interactive 3D models of the complete range of Pickering relay products in STEP, IGS and SLDPRN formats can be downloaded from the website: pickeringrelay.com/3d-models



Help

If you need any technical advice or other help, please do not hesitate to contact our Technical Sales Department. We will always be pleased to discuss Pickering relays with you. email: techsales@pickeringrelay.com

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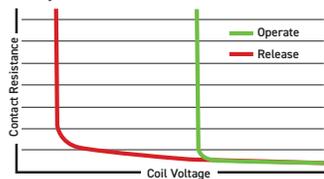
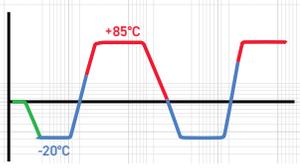
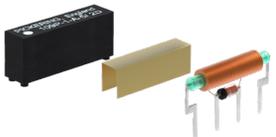
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For a full list of agents, distributors and representatives visit: pickeringrelay.com/agents



10 Key Benefits of Pickering Reed Relays

Key Benefit	Pickering Reed Relays	Typical Industry Reed Relays	
1 Instrumentation Grade Reed Switches	Instrumentation Grade Reed Switches with vacuum sputtered Ruthenium plating to ensure stable, long life up to 5x10E9 operations.	Often low grade Reed Switches with electroplated Rhodium plating resulting in higher, less stable contact resistance.	
2 Formerless Coil Construction	Formerless coil construction increases the coil winding volume, maximizing magnetic efficiency, allowing the use of less sensitive reed switches resulting in optimal switching action and extended lifetime at operational extremes.	Use of bobbins decreases the coil winding volume, resulting in having less magnetic drive and a need to use more sensitive reed switches which are inherently less stable with greatly reduced restoring forces.	  Pickering former-less coil Typical industry coil wound on bobbin
3 Magnetic Screening	Mu-metal magnetic screening (either external or internal), enables ultra-high PCB side-by-side packing densities with minimal magnetic interaction, saving significant cost and space. Pickering Mu-Metal magnetic screen - interaction approx. 5%	Lower cost reed relays have minimal or no magnetic screening, resulting in magnetic interaction issues causing changes in operating and release voltages, timing and contact resistance, causing switches to not operate at their nominal voltages. Typical industry screen - interaction approx. 30%	  X-Ray of Pickering mu-metal magnetic screen X-Ray of typical industry magnetic screen
4 SoftCenter™ Technology	SoftCenter™ technology, provides maximum cushioned protection of the reed switch, minimising internal lifetime stresses and extending the working life and contact stability.	Transfer moulded reed relays (produced using high temperature/pressure), result in significant stresses to the glass reed switch which can cause the switch blades to deflect or misalign leading to changes in the operating characteristics, contact resistance stability and operating lifetime.	  Pickering soft center protection of the reed switch Typical industry thermo-setting hard moulded protection of the reed switch
5 100% Dynamic Testing	100% testing for all operating parameters including dynamic contact wave-shape analysis with full data scrutiny to maintain consistency.	Simple dc testing or just batch testing which may result in non-operational devices being supplied.	Dynamic Contact Resistance Test 
6 100% Inspection at Every Stage of Manufacturing	Inspection at every stage of manufacturing maintaining high levels of quality.	Often limited batch inspection.	
7 100% Thermal Cycling	Stress testing of the manufacturing processes, from -20 °C to +85 °C to -20 °C, repeated 3 times.	Rarely included resulting in field failures.	
8 Flexible Manufacturing Process	Flexible manufacturing processes allow quick-turn manufacturing of small batches.	Mass production: Usually large batch sizes and with no quick-turn manufacturing.	
9 Custom Reed Relays	Our reed relays can be customized easily, e.g. special pin configurations, enhanced specifications, non-standard coil or resistance figures, special life testing, low capacitance, and more.	Limited ability to customize.	
10 Product Longevity	Pickering are committed to product longevity; our reed relays are manufactured and supported for more than 25 years from introduction, typically much longer.	Most other manufacturers discontinue parts when they reach a low sales threshold; costing purchasing and R&D a great deal of unnecessary time and money to redesign and maintain supply.	

For more information go to: pickeringrelay.com/10-key-benefits