Product Highlights

COMPONENT GUIDE

Technology leading components for automotive and industrial systems
Introduction to electromechanical relays:

Telecommunications, machine construction, measurement and control systems, automotive electronics, building security and installation – today there is virtually no branch of human activity that can exist without using modern relays. Panasonic is able to meet both simple and complex demands from its vast range of sophisticated, economic switching technologies by offering the most appropriate relay to solve specific applications. With over 30 years experience at the forefront of relay innovation and development, Panasonic today offers one of the world’s most comprehensive ranges of electromechanical and semiconductor types. Load switching capability ranges from low-level signals to high level values. Panasonic relays are available for all common mounting configurations with screw solder or surface mount terminals.

Contact materials and their attributes

<table>
<thead>
<tr>
<th>Contact material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag (silver)</td>
</tr>
<tr>
<td>Highest electrical and thermal conductivity of all metals which contributes in low contact resistance</td>
</tr>
<tr>
<td>AgSnO2 (silver-tin)</td>
</tr>
<tr>
<td>Exhibits superior welding resistance against capacitive loads which result in high inrush currents and low contact erosion for inductive loads</td>
</tr>
<tr>
<td>AgW (silver-tungsten)</td>
</tr>
<tr>
<td>Also known as tungsten-gas contact. Realized in special type of CJ relay (on request) for handling inrush currents up to 600A on request</td>
</tr>
<tr>
<td>AgNi</td>
</tr>
<tr>
<td>Excellent arc resistance which leads to very low contact erosion while switching off inductive loads</td>
</tr>
<tr>
<td>AgPd (silver palladium)</td>
</tr>
<tr>
<td>Advantageously for low level loads with inrush characteristics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surface finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Au clad (gold clad or gold plating)</td>
</tr>
<tr>
<td>Great corrosion resistance especially in adverse atmospheres (pressured welded onto a base metal) uniform thickness and non-existent pinholes</td>
</tr>
<tr>
<td>Au flash plating (0.1 to 0.5µm)</td>
</tr>
<tr>
<td>Protection of the contact base metal during transport &amp; storage will be destroyed after several switching cycles due to low thickness</td>
</tr>
</tbody>
</table>

The design of Panasonic relays is optimized, and contacts are the most important elements of relay construction. Contact performance is influenced by contact material, voltage and current values applied to the contacts, type of load, frequency of switching, ambient atmosphere, form of contact, contact switching speed, bounce...

DW-H series:

Strong performance at a great price

Size in mm: 24x10x15.8 (LwHxW)

Compact 16A high power relay with 1 Form A / 16A contact

- Reflowable (LCP material) type available
- EN 60335 (PBT material) type available
- 16A switching current
- Small dimensions
- Low profile type available

**Typical applications**

- **White goods**
- **Smart metering**
- **Home automation**

**Internal structure of a relay**

- **Moving contact**
- **Fixed contact**
- **Coil (copper)**
- **Rivet contact** (alloy with gold, silver, nickel, palladium...)

**Switching current** 16A

**Max. switching voltage** 277V AC

**Contact arrangement** 1 Form A

**Breakdown voltage between open contacts** 1000Vrms

**Breakdown voltage between contacts and coil** 5000Vrms

**Surge withstand voltage** 12,000V (initial)

**Coil voltage** (DC) 3, 5, 6, 9, 12, 24V

**Coil power** 200mW / 400mW

**Mounting method** Print

**Ambient temperature** -40°C to +85°C (-40°F to +185°F)
DE series: Compact relays

Miniature polarized 8A/10A power relay
- Low coil power
- High switching capacity: 16A = 25,000; 10A = 100,000 switching cycles
- Creepage and clearance distance: min. 8mm
- Mounting method: PCB
- Conforms to European safety standards: EN60730 and EN60335

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching current</td>
<td>Max: 8A (1a1b, 2a); 10/16A (1a)</td>
</tr>
<tr>
<td>Max. switching voltage</td>
<td>230V DC; 440V AC</td>
</tr>
<tr>
<td>Contact arrangement</td>
<td>1a, 1a1b, 2a</td>
</tr>
<tr>
<td>Breakdown voltage between open contacts</td>
<td>1000Vrms</td>
</tr>
<tr>
<td>Breakdown voltage between contact sets</td>
<td>4000Vrms (1a1b, 2a)</td>
</tr>
<tr>
<td>Breakdown voltage between contacts and coil</td>
<td>5000Vrms</td>
</tr>
<tr>
<td>Surge withstand voltage</td>
<td>12,000V</td>
</tr>
<tr>
<td>Coil voltage</td>
<td>(DC) 1.5, 3, 4.5, 5, 6, 9, 12, 24, 48V</td>
</tr>
<tr>
<td>Coil power</td>
<td>Single side stable: 200mW 1 coil latching: 100mW 2 coil latching: 200mW</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40°C to +70°C (-40°F to 158°F)</td>
</tr>
</tbody>
</table>

DJ series: High-current switching relays

Compact polarized with high capacity power relay 16A up to 20A*
- Latching type available
- Low coil power
- Optional available with manual test button
- Creepage and clearance distance: min. 8mm
- Mounting method: PCB

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching current</td>
<td>Max: 16A, up to 20A</td>
</tr>
<tr>
<td>Max. switching voltage</td>
<td>125V DC; 400V AC</td>
</tr>
<tr>
<td>Contact arrangement</td>
<td>1a, 1b, 1c, 1a1b, 2a, 2b, 2c</td>
</tr>
<tr>
<td>Breakdown voltage between open contacts</td>
<td>1000Vrms</td>
</tr>
<tr>
<td>Breakdown voltage between contact sets</td>
<td>4000Vrms</td>
</tr>
<tr>
<td>Breakdown voltage between contacts and coil</td>
<td>5000Vrms</td>
</tr>
<tr>
<td>Surge withstand voltage</td>
<td>10,000V</td>
</tr>
<tr>
<td>Coil voltage</td>
<td>(DC) 5, 6, 12, 24, 48V</td>
</tr>
<tr>
<td>Coil power</td>
<td>Single side stable: 250mW 1 coil latching: 150mW 2 coil latching: 250mW</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40°C to +70°C (-40°F to 158°F)</td>
</tr>
</tbody>
</table>

* 20A acceptable under certain conditions (please consult us)
SWITCHING DEVICES

**PF series: Slim 6A relay**
- **Optimized lifetime**
- **Slim size with wide switching capacity**
- **High surge voltage (6000V) and high breakdown voltage (4000V)**
- **Insulation construction conforms to VDE0700**
- **Contacts with silver nickel or silver nickel gold-clad (also available with AgSnO2 contact material)**
- **Clearance/creepage distance min. 5.5mm/8mm**

**Very slim type relays with high power capacity**
- **Switching current**: 6A (up to 8A*)
- **Max. switching voltage**: 300V DC; 400V AC
- **Contact arrangement**: 1a, 1c
- **Breakdown voltage between open contacts**: 1000Vrms
- **Breakdown voltage between contacts and coil**: 4000Vrms
- **Surge withstand voltage**: 6000V
- **Coil voltage**: (DC) 4.5, 5, 6, 12, 18, 24, 48, 60V
- **Coil power**: 170mW (5 to 24V), 217mW (48V), 175mW (60V)
- **Mounting method**: PCB
- **Ambient temperature**: -40°C to +85°C (-40°F to +185°F)

* 8A 277V AC General use (UL, C-UL, File No. E120782)
  8A 250V AC (VDE File No. 40027672)

**AGN / AGQ series**
- **Nominal operating power of 100mW available**
- **Sealed according to RTIII (IP67)**
- **Increased packaging density**
- **Mounting method**: PCB, SMT
- **Twin crossbar contacts ensure high contact reliability**
- **Stationary contact: AgPd+Au clad movable contact: AgPd**

- **Switching current**: Max: 2A; min: 10μA
- **Max. switching voltage**: 110V DC; 125V AC
- **Contact arrangement**: 2c
- **Breakdown voltage between open contacts**: 750Vrms
- **Breakdown voltage between contact sets**: 1000V rms
- **Breakdown voltage between contacts and coil**: 1500V rms
- **Surge withstand voltage**: 1500V FCC; 2500V Bellcore (Telcordia)
- **Coil voltage**: 1.5, 3, 4.5, 6, 9, 12, 24V
- **Coil power**: Single side stable standard: 140mW (1.5 to 12V DC); 230mW (24V DC)
  Single side stable sensitive: 100mW (1.5 to 12V DC); 120mW (24V DC)
  1 coil latching: 130mW (1.5 to 12V DC); 120mW (24V DC)
- **Ambient temperature**: (Single side stable, 1 coil latching type) -40°C to +70°C (-40°F to +158°F)
  (High sensitivity single side stable type) -40°C to +70°C (-40°F to +158°F)

**Typical applications**
- Interface modules
- Timers
- High packing density suitable for battery power applications
HE-Y6: Smallest 90A in the market

- **Advanced power range for relays**
  - High capacity switching: 90A 277V AC
  - Compact size: W:38 x L:33 x H:38.8mm
  - Energy efficiency by coil holding power of 310mW only
  - Contact gap of 3.0mm
  - Mounting method: PCB

<table>
<thead>
<tr>
<th>Specification</th>
<th>HE-Y6</th>
<th>PAN-5A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switching current</strong></td>
<td>90A AC, 60A DC</td>
<td>5A AC, 5A DC</td>
</tr>
<tr>
<td><strong>Max. switching voltage</strong></td>
<td>277V AC, 60V DC</td>
<td>110V DC, 250V AC</td>
</tr>
<tr>
<td><strong>Contact arrangement</strong></td>
<td>1a</td>
<td>1a</td>
</tr>
<tr>
<td><strong>Breakdown voltage between open contacts</strong></td>
<td>2000Vrms</td>
<td>1000Vrms (Form A contacts)</td>
</tr>
<tr>
<td><strong>Breakdown voltage between contacts and coil</strong></td>
<td>5000Vrms</td>
<td>3000Vrms (Form A contact and coil)</td>
</tr>
<tr>
<td><strong>Surge withstand voltage</strong></td>
<td>10,000V</td>
<td>6000V</td>
</tr>
<tr>
<td><strong>Coil voltage</strong></td>
<td>(DC) 6, 9, 12, 24V</td>
<td>(DC) 3, 4.5, 5, 6, 9, 12, 18, 24V</td>
</tr>
<tr>
<td><strong>Coil power</strong></td>
<td>1,920 W (holding power: 310 mW)</td>
<td>110mW</td>
</tr>
<tr>
<td><strong>Mounting method</strong></td>
<td>PCB</td>
<td>PCB</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>-40°C to +85°C (-40°F to +185°F)</td>
<td>-40°C to +90°C (-40°F to +194°F)</td>
</tr>
</tbody>
</table>

PAN-5A: Relay at 5mm width

- **Size in mm**: 33 x 38 x 38.8 (LxWxH)

**Reinforced insulation for PLC and interface modules**

- Strong electrical endurance for various loads (resistive, inductive, capacitive)
- Smallest size: W: 5 x L: 20 x H: 12.5 mm (bent pin version 5mm height possible)
- Reinforced insulation acc. to IEC 61010-1 by clearance of 5.29mm and creepage of 5.35mm
- Sealed construction complies with standards for Hazardous locations (ATEX)

**Typical applications**

- Solar inverters
- Charging station
- Battery storage
- Elevators and escalators
- UPS systems
- PLC I/O modules
- Interface modules
- Lowest height applications by bent pin version
**SWITCHING DEVICES**

**DJ-H**: 50A relay dedicated for high inrush currents (EN 60669-1)

- High-capacity switching 50A 277V AC 10,000 switching cycles
- Capable of handling inrush currents up to 600A for loads like 200µF 20A acc. to EN 60669-1
- Compact size
- Reinforced insulation: Clearance/creepage distances btw. coil/contact > 10mm
- Activation power 1W only (latching)

**HE-S**: 2FormA 35A rating at smallest package size

- High-capacity and long life 35A 277V AC 50,000 switching cycles
- Compact size
- Integrated safety by mirror contact mechanisms acc. to EN60947-4-1
- Energy efficiency by coil holding power of 170mW only
- Contact gap: 3.2 mm (VDE0126 compliant)

### Latching relay including manual lever

- Switching current: 50A
- Max. switching voltage: 480V AC
- Contact arrangement: 1a
- Breakdown voltage between open contacts: 1500V rms
- Breakdown voltage between contacts and coil: 4000V rms
- Surge withstand voltage: 12,000V
- Coil voltage: 5, 6, 9, 12, 24V (DC)
- Coil power: 1 coil latching: 1W
  2 coil latching: 2W
- Ambient temperature: -40°C to +85°C (-40°F to +185°F)

### The first power relay which integrates safety by feedback contact mechanism

- Switching current: 35A for each contact (AC), 30A DC
- Max. switching voltage: 300V DC contacts in series; 480V AC
- Contact arrangement: 2a, 2a1b
- Breakdown voltage between open contacts: 2000V rms (Form A contacts)
- Breakdown voltage between contacts and coil: 5000V rms (Form A contact and coil)
- Surge withstand voltage: 10,000V
- Coil voltage: (DC) 5, 6, 9, 12, 24V
- Coil power: 1 coil latching: 1W
  2 coil latching: 2W
- Ambient temperature: -40°C to +85°C (-40°F to +185°F)

**Typical applications**

- Lighting applications in the IoT
- Solar inverters
- Battery storage systems
- Electric vehicle charging station
- Elevators and escalators
- UPS systems

**Size in mm**: 36 x 30 x 40 (LxWxH)
**SF-Y series:** Compact, flat relays with forcibly guided contacts

- **Approvals:** EN61810-1, EN50205, EN50178
  - Reinforced insulation
  - Available as 4-pole and 6-pole types with various contact arrangements
  - Gold-clad contacts available upon request
  - Polarized rotating armature for low nominal operating power and high shock and vibration resistance

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching current</td>
<td>Max.: 6A; min.: 1mA</td>
</tr>
<tr>
<td>Max. switching voltage</td>
<td>30V DC, 250V AC</td>
</tr>
<tr>
<td>Contact arrangement</td>
<td>2a2b, 3a1b, 4a2b, 5a1b</td>
</tr>
<tr>
<td>Breakdown voltage between open contacts</td>
<td>1500Vrms</td>
</tr>
<tr>
<td>Breakdown voltage between contact sets</td>
<td>4000Vrms</td>
</tr>
<tr>
<td>Breakdown voltage between contacts and coil</td>
<td>4000Vrms, 2500Vrms</td>
</tr>
<tr>
<td>Coil voltage</td>
<td>(DC) 5, 12, 18, 21, 24</td>
</tr>
<tr>
<td>Coil power</td>
<td>670mW</td>
</tr>
<tr>
<td>Mounting method</td>
<td>PCB</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40°C to +70°C (+40°F to +158°F), +85°C on request</td>
</tr>
</tbody>
</table>

**EP series:** High capacity DC cut-off relays

- **High capacity of max. 1000V DC cut-off possible**
  - High capacity to cut off DC voltage in a compact relay: max. cut-off current 2500A/300V DC (300A)
  - Nominal switching capacity (300A 400V DC)
  - Low operating noise
  - High contact reliability
  - DC type with sealed capsule and arc-space-free construction

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. switching voltage</td>
<td>400V DC</td>
</tr>
<tr>
<td>Switching capability (1a)</td>
<td>Max.: from 10A to 300A; min.: 1A</td>
</tr>
<tr>
<td>Breakdown voltage between open contacts</td>
<td>2500Vrms</td>
</tr>
<tr>
<td>Breakdown voltage between contacts and coil</td>
<td>2500Vrms</td>
</tr>
<tr>
<td>Coil voltage</td>
<td>(DC) 12, 24, 48, 100V</td>
</tr>
<tr>
<td>Coil power</td>
<td>From 1.4W to 4.5W (10A...80A) 300A: 45W then 4W (after 100ms)</td>
</tr>
<tr>
<td>Mounting method</td>
<td>Screw terminal</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40°C to +80°C (+40°F to +176°F)</td>
</tr>
</tbody>
</table>

**Typical applications**

- Elevators
- Safety control modules
- Machine safety
- Railway and signal technology
- Solar inverter
- Battery charge and discharge control
- Electric vehicle charging station
- Medical technology
Panasonic has been contributing to the ever increasing need for innovation in transportation electronics for decades, with highly reliable, long lasting devices for safety, comfort, entertainment and powertrain applications. Presenting a broad range of automotive PC board relays Panasonic can offer a suitable and cost efficient switching solution for almost any application.

- Nominal currents up to 70A
- Twin relays as 10-pin type or as 8-pin type (integrated H-bridge) for motor reversing applications
- Types with Pin-in-Paste (PIP) or SMD mounting are available
- Flat or slim types for space saving applications
- TC relay as latching type available
- Special silent relays with extremely low sound pressure
EV series: Relays for hybrid and electric vehicles

Panasonic Electric Works’ EV relay series can already be found in several million vehicles on the streets of Asia, America and Europe. These relays are optimized for each application, come in several shapes and sizes and cover all performance classes. Panasonic has developed new types with more than 6000A short circuit capability without electromagnetic repulsion. This adds more safety to the system in case extreme short circuit current has to be cut-off by the fuse.

High carrying and cut-off performance

› Nominal currents up to 300A
› New high short circuit types (without electromagnetic repulsion)
› Plug-in types for faster assembly
› Silent types for quiet operation
› Several customizations possible (mounting position, coil connector, contact material…)

Mode of operation

When a high voltage circuit is opened, a strong arc will be formed between the contacts. This arc expands due to the presence of a magnetic field, which is used to weaken the arc. To weaken it even further, Panasonic uses inert gas (H2) which rapidly extinguishes the arc. Typical voltage drop is approximately 400V DC.
Introduction to PhotoMOS and Solid State Relays

What makes PhotoMOS relays so successful?
Modern semiconductor technology enables fast, quiet, bounce-free switching, even in miniature sizes. PhotoMOS relays nevertheless enjoy an almost unlimited lifetime if used according to the specifications. Moreover, they are extremely reliable, unaffected by vibrations, and their ON-resistance remains stable throughout their entire lifetime.

The most important advantages at a glance
- Galvanic I/O isolation
- Linear output characteristics
- No threshold voltage
- Low operate current (sensitive type ≤ 0.31mA)
- Low output capacitance (RF type ≤ 1pF)
- Absolute minimum leakage current (pA)
- Extremely long lifetime
- Stable ON-resistance over the entire lifetime
- Extremely compact design (VSSOP, SON, SSOP, SOP)
- No contact bounce
- Highly resistant to shock and vibration
- Flexible mounting orientation

Various packages available
- TSON
- VSSOP
- SON
- SSOP
- SOP
- DIL-THT
- DIL-SMD
- SIL

Smartphone App:
A clear and straightforward navigation with three different search options helps you to find the best PhotoMOS for your application.

PhotoMOS technology

10

PHOTOMOS AND SOLID STATE RELAYS
AQY2C1R6P / AQY2C1R2P / AQY2C2R2P series: Capacitive coupled MOSFET Relay

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>AQY2C1R6P</th>
<th>AQY2C1R2P</th>
<th>AQY2C2R2P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output configuration</td>
<td></td>
<td>1 Form A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>V_{in}</td>
<td>3V</td>
<td>3V</td>
<td>3V</td>
</tr>
<tr>
<td>Load voltage</td>
<td>V_L</td>
<td>30V</td>
<td>40V</td>
<td>60V</td>
</tr>
<tr>
<td>Load current</td>
<td>I_L</td>
<td>0.75A</td>
<td>0.3A</td>
<td>0.3A</td>
</tr>
<tr>
<td>I/O isolation voltage</td>
<td>V_{iso}</td>
<td>200V AC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>T_{op}</td>
<td>-40°C ~ +125°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_{stg}</td>
<td>-40°C ~ +125°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operate voltage</td>
<td>V_{op}</td>
<td>Typ. 1.7V</td>
<td>Typ. 1.8V</td>
<td>Typ. 1.8V</td>
</tr>
<tr>
<td>Input current at V_{in}=3.3V</td>
<td>I_{in}</td>
<td>Max. 0.1mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input current at V_{in}=5V</td>
<td>I_{in}</td>
<td>Max. 0.2mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On resistance at V_{in}=3.3V</td>
<td>R_{on}</td>
<td>Typ. 0.22Ω</td>
<td>Typ. 0.9Ω</td>
<td>Typ. 1Ω</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>C_{out}</td>
<td>Typ. 40pF</td>
<td>Typ. 14.5pF</td>
<td>Typ. 27pF</td>
</tr>
<tr>
<td>Leakage current</td>
<td>I_{leak}</td>
<td>Max. 10nA</td>
<td>Max. 10nA</td>
<td>Max. 10nA</td>
</tr>
<tr>
<td>Turn on time at V_{in}=3.3V</td>
<td>T_{on}</td>
<td>Typ. 0.25ms</td>
<td>Typ. 0.15ms</td>
<td>Typ. 0.18ms</td>
</tr>
<tr>
<td>Turn off time at V_{in}=3.3V</td>
<td>T_{off}</td>
<td>Typ. 0.06ms</td>
<td>Typ. 0.04ms</td>
<td>Typ. 0.06ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>AQY2C1R6P</th>
<th>AQY2C1R2P</th>
<th>AQY2C2R2P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size in mm</td>
<td>1.8 x 1.95 x 0.8mm (LxWxH)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ultraminiature PhotoMOS relay with low CxR

- Operating temperature max. +105°C
- Low input current of max. 0.2 mA
- Control by µController directly due to voltage mode (3-5V)
- On-Off times in the range of µs
- Very compact TSON package

Typical applications

- IC & Board Tester
- Medicine market

APS1551S: High Speed Photo IC coupler

- Up to 50 MBd switching speed
- Operating temperature max. +105°C
- Common mode transient rejection (CMTR) min. 15 kV/µs
- Compact 5-pin SOP6 package
- Isolation voltage: 3750Vrms
- Totem pole output type

Size in mm: 4.4 x 4.3 x 2.1mm (LxWxH)

Ultraminiature PhotoMOS relay with low CxR MOSFETS on the output

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>AQY2C1R6P</th>
<th>AQY2C1R2P</th>
<th>AQY2C2R2P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output configuration</td>
<td></td>
<td>1 Form A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>V_{in}</td>
<td>3V</td>
<td>3V</td>
<td>3V</td>
</tr>
<tr>
<td>Load voltage</td>
<td>V_L</td>
<td>30V</td>
<td>40V</td>
<td>60V</td>
</tr>
<tr>
<td>Load current</td>
<td>I_L</td>
<td>0.75A</td>
<td>0.3A</td>
<td>0.3A</td>
</tr>
<tr>
<td>I/O isolation voltage</td>
<td>V_{iso}</td>
<td>200V AC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>T_{op}</td>
<td>-40°C ~ +125°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_{stg}</td>
<td>-40°C ~ +125°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operate voltage</td>
<td>V_{op}</td>
<td>Typ. 1.7V</td>
<td>Typ. 1.8V</td>
<td>Typ. 1.8V</td>
</tr>
<tr>
<td>Input current at V_{in}=3.3V</td>
<td>I_{in}</td>
<td>Max. 0.1mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input current at V_{in}=5V</td>
<td>I_{in}</td>
<td>Max. 0.2mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On resistance at V_{in}=3.3V</td>
<td>R_{on}</td>
<td>Typ. 0.22Ω</td>
<td>Typ. 0.9Ω</td>
<td>Typ. 1Ω</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>C_{out}</td>
<td>Typ. 40pF</td>
<td>Typ. 14.5pF</td>
<td>Typ. 27pF</td>
</tr>
<tr>
<td>Leakage current</td>
<td>I_{leak}</td>
<td>Max. 10nA</td>
<td>Max. 10nA</td>
<td>Max. 10nA</td>
</tr>
<tr>
<td>Turn on time at V_{in}=3.3V</td>
<td>T_{on}</td>
<td>Typ. 0.25ms</td>
<td>Typ. 0.15ms</td>
<td>Typ. 0.18ms</td>
</tr>
<tr>
<td>Turn off time at V_{in}=3.3V</td>
<td>T_{off}</td>
<td>Typ. 0.06ms</td>
<td>Typ. 0.04ms</td>
<td>Typ. 0.06ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
<th>S-5 SOP6 (6.8 x 4.3 x 2.1 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching speed (standard)</td>
<td>Typ. 50 MBd</td>
</tr>
<tr>
<td>Common mode transient immunity (CMTI)</td>
<td>Min. 15 kV/µs</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 to 105°C</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>4.5 to 5.5 V</td>
</tr>
<tr>
<td>Input current</td>
<td>10 to 16 mA</td>
</tr>
<tr>
<td>Supply current (current consumption)</td>
<td>Max. 5 mA</td>
</tr>
<tr>
<td>Propagation delay time</td>
<td>Max. 30 ns</td>
</tr>
<tr>
<td>Pulse width distortion</td>
<td>Max. 10 ns</td>
</tr>
<tr>
<td>Isolation voltage</td>
<td>Min. 3750 Vrms</td>
</tr>
</tbody>
</table>

Typical applications

- PLC
- Measurement market
- Control panels for infrastructure
ASQ Mini: Turquoise stroke mini switches

Size in mm: 8.3 x 5.3 x 7.85 (LxWxH)

Smallest size in IP67

- Minimization achieved with changing from 1 Form C to 1 Form A or 1 Form B contacts. (For the terminal type, volume has been cut 45% compared to our previous product.)
- Lever installation possible while being miniature. Operation possible in various moving parts such as metal cams.
- Contact pressure does not depend on the operation stroke
- High contact reliability to support low level switching loads
- Highly effective sealing for resistance against adverse environments (IP67)
- Silent operation with sliding contact

| Electrical switching life | 5V DC 1mA (resistive load): min. $3 \times 10^5$
| 12V DC 50mA (resistive load): min. $2 \times 10^5$
| 16V DC 50mA (resistive load): min. $1.5 \times 10^5$
| Switching frequency | 20 times/min
| Pushbutton operation speed | 30 to 500 mm/s
| Degree of protection | IP67

ASQM fork shape: For press fit

Size in mm: 8.3 x 5.3 x 7.85 (LxWxH)

Solderless connection

- ASQM with fork shape
- Press fit solution
- Contributes to a time and cost-efficient production process

| Electrical switching life | 5V DC 1mA (resistive load): min. $3 \times 10^5$
| 12V DC 50mA (resistive load): min. $2 \times 10^5$
| 16V DC 50mA (resistive load): min. $1.5 \times 10^5$
| Switching frequency | 20 times/min
| Pushbutton operation speed | 30 to 500 mm/s
| Degree of protection | IP67

Actuator type: Operating force, max.: Pin plunger | 1.2N
Simulated roller lever | 1.5N

Typical applications

- Seat comfort
- Air condition
- Gear shifter
- HUD
- Blind control
- Coffee machine
- Access control (Latches)
**ASQ series**: Sliding contact construction

Highly resistant to harsh environments, suitable for all markets

- Tightness class conforming to IP67
- High contact reliability thanks to double-sided sliding & gold-plated contact
- Ultra long stroke of 2.5mm for NC contact
- Stable contact pressure without bouncing
- No operational click sound by sliding contact
- Direct lateral actuation of the pin plunger

- **Size in mm**: 13.3 x 5.4 x 10.1 (LxWxH)

**Working principle**

- **NC contact**
- **Silicon rubber cap**
- **COM contact**
- **NO contact**

**T-Series**: Including toggle-, rocker- and push button switches

**With new UL61058**

- Sealed types available
- Portfolio includes up to 4-pole type
- Momentary and alternate function
- Various terminal types make installation easy
- Accessories for custom needs

**Electrical switching life**

- 5VDC 1mA (resistive load): min. 5 x 10⁵
- 16VDC 50mA (resistive load): min. 5 x 10⁵
- 30VDC 100mA (resistive load): min. 2 x 10⁵

**Switching frequency**

- 20 times/min.

**Pushbutton operation speed**

- 30 to 500mm/s

**Degree of protection**

- IP67

**Typical applications**

- Automotive (door locking units)
- Automotive (steering column lock)
- Automotive (comfort applications)
- E-bike
- Vacuum cleaner
- **Industrial power supply**
- Radio control
- Forklift
- Good lifts
- Agriculture devices

**Customized solutions**

Please consult us for customized solutions:

- Wire cutting, wire welding, hot melt potting, contact crimping, over molding, 100% end test, marking & packing.
PYROELECTRIC INFRARED SENSORS (PIR MOTION SENSORS)

**EKMB**

**Plug & Sense PIR**
- Amplifier and Comparator
- Digital Output (LVTT & TTL)
- Highest signal to noise ratio
- Highest Responsivity

<table>
<thead>
<tr>
<th>Output</th>
<th>Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection type</td>
<td>Standard</td>
</tr>
<tr>
<td>Current consumption</td>
<td>1μA, 2μA, 6μA</td>
</tr>
<tr>
<td>Detection distance</td>
<td>5m</td>
</tr>
<tr>
<td>Field of view</td>
<td>Horizontal</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
</tr>
<tr>
<td>Switching zones</td>
<td>64</td>
</tr>
<tr>
<td>Lens color</td>
<td>white, black, pearl white</td>
</tr>
</tbody>
</table>

**EKMC**

- Highest D* & best NEP
- Smallest focal distance

<table>
<thead>
<tr>
<th>Output</th>
<th>Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection type</td>
<td>Standard</td>
</tr>
<tr>
<td>Current consumption</td>
<td>170μA</td>
</tr>
<tr>
<td>Detection distance</td>
<td>5m</td>
</tr>
<tr>
<td>Field of view</td>
<td>Horizontal</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
</tr>
<tr>
<td>Switching zones</td>
<td>64</td>
</tr>
<tr>
<td>Lens color</td>
<td>white, black, pearl white</td>
</tr>
</tbody>
</table>

**Plug & Sense PIR**

- Amplifier and Comparator
- Digital Output (LVTT & TTL)
- Highest signal to noise ratio
- Highest Responsivity

**Typical applications**
- Wireless sensors
- Wireless products
- Power management
- Smart home
- Safety and security
- Lighting management
- Heating, ventilation and air conditioning
- TV and display

**NEW!**

**Plug & Sense PIR**

- Amplifier and Comparator
- Digital Output (LVTT & TTL)
- Highest signal to noise ratio
- Highest Responsivity

**Typical applications**
- Wireless sensors
- Wireless products
- Power management
- Smart home
- Safety and security
- Lighting management
- Heating, ventilation and air conditioning
- TV and display
## EKMB/EKMC

<table>
<thead>
<tr>
<th>Output</th>
<th>Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection type</td>
<td>Lensless*</td>
</tr>
</tbody>
</table>

Lensless type available

The EKMB/EKMC series also offers a lensless type for those customers who design their own lens.

**EKMB series**
- 1μA type: EKMB1100100
- 2μA type: EKMB1200100
- 6μA type: EKMB1300100K

**EKMC series**
- 170μA type: EKMC1600100

Please contact us for detailed specification

* For own lens design or pin-hole lens application

### Pin-hole lens application example

- No blind zones
- Improved radial motion detection

### Typical applications

- Wireless sensors
- Wireless products
- Power management
- Smart home
- Safety and security
- TV and display

### Detection area

- 64° Detection area
- 80° Detection area

**Coming soon!**

HMH type with unique detection performance!

**Application examples for integration**
FPC connectors: Back lock type

- Designed for space saving applications
  - Mechanical design freedom is achieved with double top and bottom contacts
  - Wiring patterns can be placed underneath the connector
  - Easy-to-handle back lock design
  - Man-hours of assembly time can be reduced by delivering the connectors with their levers opened
  - Nickel barrier helps resist solder creepage
  - FPC holding contacts available

Typical applications

Usage | FPC
---|---
Pitch | 0.2mm to 0.5mm
Mated height | 0.6mm to 1.0mm
Lock structure | Back lock
Applicable FPC thickness | 0.2mm / 0.3mm
Specification | Top and bottom double contact (except Y3BL)
Terminal capability | 0.2A to 0.5A terminal
Number of pin contacts | 2 to 71
Ambient temperature | -55°C to +85°C
Insertion and removal life | 20 times

Panasonic’s proprietary pattern

- High resistance to various environments
- Simple lock structure provides tactile feedback to ensure excellent mating/unmating operation feel
- Gull-wing-shaped terminals to facilitate visual inspections
- Connectors for use in test adapters or inspection equipment available
- Stacking connector series for high currents up to 10A

Typical applications

Usage | Board to FPC / Board to Board
---|---
Pitch | 0.35mm to 0.5mm
Mated height | 0.6 to 9mm
Specification | Ultra-slim body
Terminal capability | 0.25A to 0.5A terminal
Number of pin contacts | 6 to 100
Ambient temperature | -55°C to +85°C
Insertion and removal life | Min. 30 times

Narrow pitch connectors: For Board to FPC/Board to Board

- Panasonics proprietary pattern
  - High resistance to various environments
  - Simple lock structure provides tactile feedback to ensure excellent mating/unmating operation feel
  - Gull-wing-shaped terminals to facilitate visual inspections
  - Connectors for use in test adapters or inspection equipment available
  - Stacking connector series for high currents up to 10A

Typical applications

Keyboard | Sensor module | Display connection
Camera module | Battery module | Wireless products
Active Optical Connector: V-Series

High-speed optical transmission by electrical connector

- Structure of electric-optic conversion inside the plug
- Bi-directional high speed and wideband data transmission
- Excellent noise reduction and electrical isolation
- Easy to handle by electrical connector
- Suitable for small equipment by compact design

<table>
<thead>
<tr>
<th>Channel</th>
<th>Bi-direction · 1ch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber length</td>
<td>50mm, 300mm, 1m</td>
</tr>
<tr>
<td>Transmission rate</td>
<td>20Mbit/s to 6Gbps (max. 10Gbps)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>3.3VDC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Max. 230mW</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 to 70°C</td>
</tr>
</tbody>
</table>

Connector with E/O Converter

Transmitter
E/O Converter

Receiver
O/E Converter

Typical applications

Medical equipment  Measuring equipment  Imaging processing instruments

Radio control  Good lifts  Agriculture devices
**Stacking connector:** BO2-series for high current

- High current rating: 10.0 A (5.0 A/pin × 2 pin)
- High reliability in low profile of 0.7mm
- 4 signal terminals
- High removal force

<table>
<thead>
<tr>
<th>Usage</th>
<th>Board to FPC / Board to Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mated height</td>
<td>0.7mm</td>
</tr>
<tr>
<td>Number of pin contacts</td>
<td>4 pins power terminal</td>
</tr>
<tr>
<td></td>
<td>4 pins signal terminal</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>30V AC/DC</td>
</tr>
<tr>
<td>Rated current</td>
<td>5.0A/pin (Power contact)</td>
</tr>
<tr>
<td></td>
<td>0.3A/pin (Signal contact)</td>
</tr>
<tr>
<td>Contact resistance</td>
<td>Power contact: max 16mΩ</td>
</tr>
<tr>
<td></td>
<td>Signal contact: max. 90mΩ</td>
</tr>
<tr>
<td>Removal force</td>
<td>Min. 10N</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-55°C to +85°C</td>
</tr>
<tr>
<td>Insertion and removal life</td>
<td>30 times</td>
</tr>
</tbody>
</table>

**FPC connector:** Y4BH-series:

- Compact design with 0.4mm pitch and 1.0mm height
- Suitable for high-speed transmission up to 10Gbps
- Enable flexible circuit design
- Back-lock design
- Delivered with the levers opened

<table>
<thead>
<tr>
<th>Usage</th>
<th>FPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mated height</td>
<td>1mm</td>
</tr>
<tr>
<td>Number of pin contacts</td>
<td>40, 50</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>50V AC/DC</td>
</tr>
<tr>
<td>Rated current</td>
<td>0.3A/pin</td>
</tr>
<tr>
<td>Contact resistance</td>
<td>100mΩ</td>
</tr>
<tr>
<td>Impedance</td>
<td>85 / 90Ω ±10Ω / 100Ω ±15Ω</td>
</tr>
<tr>
<td>Applicable FPC thickness</td>
<td>0.3mm</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-55°C to +85°C</td>
</tr>
<tr>
<td>Insertion and removal life</td>
<td>20 times</td>
</tr>
</tbody>
</table>

**Impedance matching type**

- Differential Impedance (100Ω ±15Ω)

**Typical applications**

- Battery module
- Sensor module
- Mobile equipment
- Wireless modules
- Battery module
- Mobile equipment and wearable devices
- Wireless modules
**Tough Contact technology**

- **Tough against dropping**
  - Bellows contact construction improves the ability to withstand twisting and increased resistance to shock of dropping.

- **Tough against solder rise**
  - Solder remains in the terminal area and a stable fillet of the soldering joints is possible. Prevents contact area from solder rise.

- **Tough against foreign particles and flux**
  - Prevents foreign substances from contact area, doubles the contact points and increases contact pressure.

- **Tough against corrosive gases**
  - Porosity treatment ensures high contact reliability by sealing pinholes in the gold plating.

---

**MIPTEC technology**

- **3D fine pattern**
  - 3D fine patterning is achieved by the high accuracy laser processing technology (circuit width/distance between circuit ~ 50µm/50µm, molded component pattern accuracy ± 30µm).

- **Direct bare chip mounting**
  - Direct mounting of chips is achieved with a resin material featuring a low linear expansion coefficient. Combined with a surface activation technology, this ensures smoothness of circuit surfaces.

- **Ceramic MID**
  - Capable of forming 3D fine patterns on surfaces made of ceramic as well as resin. High mounting reliability (low coefficient of linear expansion), high thermal resistance/high heat dissipation, good high-frequency characteristics.
Panasonic Electric Works

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