

OMRON

AVNET<sup>®</sup> ABACUS

Omron MOSFET relays

# Omron MOSFET relays from Avnet Abacus – your partners in solid state innovation

The latest achievements in field of MOSFET relays allow the creation of advanced industry designs with fewer compromises than ever. MOSFET relays are modern electronic components used in all kinds of equipment, spanning test and measurement, the energy industry, factory automation, residential and commercial buildings and medical devices. They are often essential to the performance of communication equipment and offer important benefits for the design of office equipment and amusement devices.

Offering cutting-edge technology, Omron’s MOSFET combine the advantages of mechanical and solid state technology, giving you unprecedented design capability.

Over recent years, the range has continually expanded into a comprehensive portfolio of trusted products with applications in a wide spectrum of business fields. Omron’s G3VM MOSFET relays are a global benchmark in the solid state relay (SSR) market. Manufactured using the latest advances in automated production, they include a variety of improved construction technologies in the areas of key photocoupler elements such as light emitting diode (LED), photodiode array (PDA) and MOSFET chips.

Avnet Abacus’ Europe-wide team of product specialists works closely with Omron to offer you the highest levels of smart engineering support for your design. To arrange a visit or to discuss your design requirement, contact this team in your local language at **[avnet-abacus.eu/ask-an-expert](https://www.avnet-abacus.eu/ask-an-expert)**

**[avnet-abacus.eu/omron-mosfet-relays](https://www.avnet-abacus.eu/omron-mosfet-relays)**

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# MOSFET relays

## THE FIRST CHOICE FOR TOMORROW'S SYSTEMS

Current trends towards equipment downsizing, energy efficiency and faster operation present system designers and manufacturers with tremendous challenges. At the same time, durability and safety standards continue to rise. The Omron G3VM range of MOSFET relays includes more than 200 models, offering you the flexibility you need to match your most demanding customers, designs and manufacturing processes.

## G3VM FEATURES HELPING YOU TO CREATE RELIABLE, HIGH-PERFORMING EQUIPMENT:



### Ultra-small size and weight

The newest VSON and S-VSON packages offer substantial space savings, making them ideal for applications which require small overall size and less space on the bottom surface.



### Low drive current

They achieve energy savings with a standard driving current of 2mA to 15mA. Ultrasensitive models are also available featuring drive currents as low as 0.2mA (max).



### Long operating life

MOSFET relays use light signal instead of moveable contacts. This avoids contact wear, substantially increasing operational life.



### Small leakage current

These relays can withstand external surge current without the addition of a snubber circuit. Under normal conditions, the typical leakage current is around 1nA or lower.



### Excellent shock resistance

All the internal parts are manufactured using a casting method and contain no movable parts. This gives them excellent shock and vibration resistance.



### High insulation

MOSFET relays offer great input/output isolation due to their operating principle, which turns the voltage into light and transfers it by light signal. This means that input and output are isolated. The standard models offer 2,500Vrms between input and output, and superior 5,000Vrms products are also available. Products offering 3,750Vrms have also been added to the SOP package series.



### Silent operation

As MOSFET relays do not have mechanical contacts, by using a MOSFET instead of an electromechanical relay, it is possible to eliminate switching noise in your applications.



### High-speed switching

Compared with a mechanical relay's switching time of 3ms to 5ms, a MOSFET relay's switching time is shortened to 0.2ms (SSOP, USOP, VSON). This ensures quick-response performance.



### Good linearity

MOSFET relays greatly reduce the dead zone when compared to the Triac. The input waveform of the micro analog signal does not suffer as much distortion and the waveform is basically converted into output without significant change.



# Test and measurement equipment: compact and precise

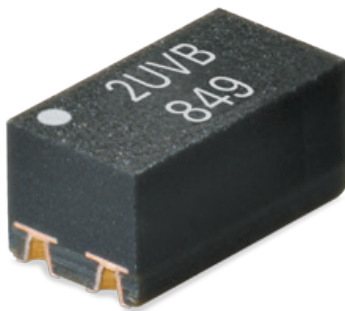
Increasingly sophisticated testing and measuring devices are in demand for the electronics, medical, healthcare and automotive sectors, among others. These complex applications require high density of the assembled components along with high reliability and the utmost accuracy. Small packages of components considerably contribute to space savings in end products. Module solutions can simplify design work, which means shorter time from design to production.

Omron provides a range of purpose-built products for the test and measurement industry, suitable for applications like Automated Test Equipment (ATE), semiconductor test boards, oscilloscopes, data loggers and other measurement instruments. For example, they can be used for LSI functional testing in performance boards, or to switch the

measurement line in display test equipment. They can also be found in spectrum analysers and various recorders.

Low output capacitance (COFF) and on-resistance (RON) types are available in a selection including VSON and S-VSON packages. Remarkably small capacitance between terminals and output on-resistance enables clear signal transfer at high frequencies. Easily visible solder joints make installation quick and convenient, despite their miniature package sizes.

Recently developed MOSFET relay modules are enriching the product offer for the ATE market. Relays in module package in SPDT contact form save considerable space on PCBs and offer the advantage of solid state technology, such as a long, maintenance-free lifetime.



## G3VM- UV SERIES VSON(R)

The G3VM- 21UV11/51UV/61UV relays are voltage driven type MOSFET relays in a VSON package with a current limiting internal resistor on the input side and an operating temperature range up to +110°C. These components are used in semiconductor test equipment, test and measurement equipment, communication equipment and data loggers.



## G3VM- 41QR10 SERIES S-VSON (L)

The industry's smallest class of G3VM-41QR10 relays broadens Omron's range of low CxR category S-VSON relays. It is ultra-small package cover only 2.9mm<sup>2</sup> on PCB and, with Coff of only 0.45pF, it is ideal for switching high-speed test signals.



## G3VM-66M MODULE

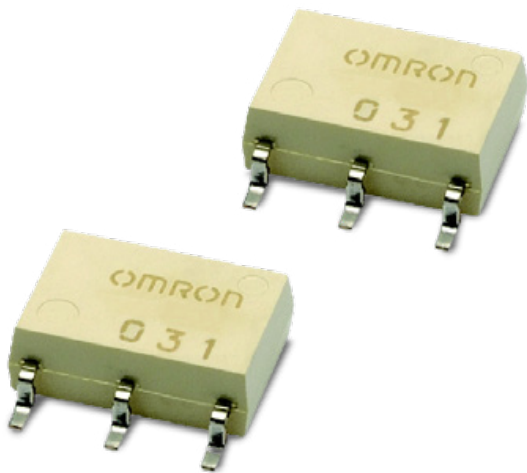
The SPDT MOSFET relay module extends operating life while reducing mounting space and design time. Operated by voltage, the module also offers extremely high-speed switching and good leakage current characteristics. This product is used in the semiconductor test equipment market.

# Industrial equipment: performance and reliability

Reliable on-off signal switching is a vital requirement for power management in many industrial applications. Omron's general-purpose MOSFET relays combine reliable high-speed switching with high switching capacity and small size. They are ideal for Programmable Logic Controllers (PLC), small solenoid controlled valves, motors and lamps used in robotic and other manufacturing

equipment. They are also used extensively in control terminals and power supplies for factory automation.

Omron supplies purpose-built MOSFET relays for industrial applications in a wide array of DIP, SOP, SSOP and USOP packages. These reliable components allow system designers to stay ahead of many challenges.



## G3VM-101HR2

### Low RON and high current type

The G3VM-101HR2 MOSFET relay takes the control of high current circuits closer to mechanical relay levels. In an SOP6 package, it typically achieves on-resistance of only 16mΩ, enabling control of 3A (6A for DC possible) at 100V. This relay, which also features improved operating temperature and reduced timing characteristics, is suitable for various applications where high switching capacity is needed.



## G3VM-401DY

### High dielectric strength type

Relays with dielectric strength of 5,000Vrms between input/output in a small DIP4 package are also available with other load voltages (40V/60V/200V/350V/600V) and with lower trigger current specifications (high sensitivity types).

### Current limit function

A built-in Current Limit Function (CLF) is incorporated in some models for protection against surge. Traditionally used to clamp excessive overcurrent fault conditions in sensitive equipment, this feature can also be used to good effect to resist transient and short circuit conditions.

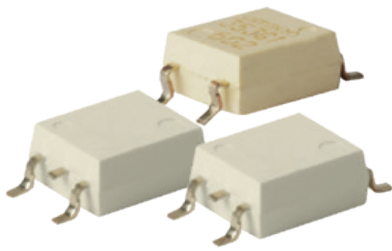
### Double the DC current

Some G3VM models can be connected in three different ways (connection A/B/C). If used with a DC circuit, connections B and C are available. MOSFET relay types compatible with connection C (i.e. parallel connection of two MOSFET elements) offer switching at double the ratings of the continuous load current. The current portfolio of G3VM products can reach a maximum switching current level of 10A for DC loads.

# Building automation: safe and efficient

Efficient alarm and access control systems contribute to both convenience and peace of mind for building occupants. Omron MOSFET relays come in a wide range of formats and contact configurations to suit the latest building automation systems. Offering reliability, energy efficiency and high isolation, they are essential components in security alarm systems, fire and smoke detectors and building access control systems.

Their small size complements today's compact designs, while a long lifetime and excellent shock resistance ensure long-term reliability, even in demanding applications.



### G3VM 61G2/G3

Omron ultrasensitive type relays are suitable for many energy-saving and battery-driven devices used in building automation systems.



### G3VM-61VY3 AND G3VM-351VY

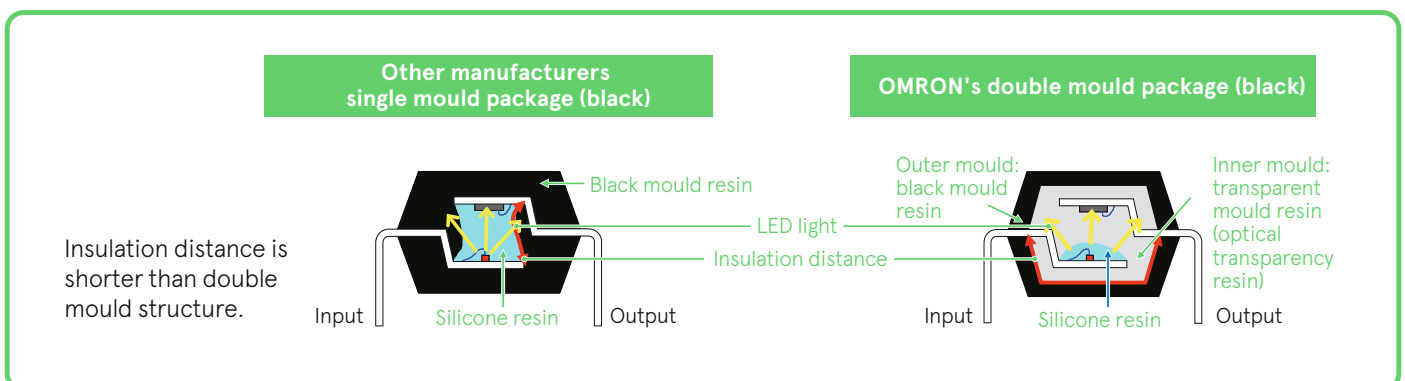
The newest general-purpose MOSFET relays in a special SOP package are characterised by improved load performance, isolation and temperature range. These popular types can be used in various applications, including ON/OFF control or handling micro analog signal operation in building and factory automation.

## High sensitivity types (low drive current)

Many models of Omron's MOSFET relays are made with white mould resin in order to achieve high sensitivity. White moulded relays can receive light both from the LED and indirectly reflected from resin. This results in higher sensitivity.

## High dielectric strength

High dielectric strength types, supplied in a black package (black mould resin), have achieved great insulation values through their double mould structure. These models have been added to the DIP and SOP series, achieving values of 5,000Vrms for DIP and 3,750Vrms for SOP.



# Energy equipment: smart and convenient

The energy industry is evolving fast, and so are the needs of its generation, monitoring and storage systems. To optimise the benefits, system components need to meet the highest standards of safety and reliability.

Energy management is growing as smart meters enable more control over energy consumption and contribute to energy savings. MOSFET relays with high dielectric strength fit the requirements of this development and are increasingly in demand as components to enable switching of high voltages in small spaces in smart metering application.

MOSFET relays can be found in other energy-related devices too. Their small package sizes and low power consumption are making them a preferred choice for external/internal signal control in the communication units of energy devices. Power monitoring and battery charging systems are further examples of applications that utilise the benefits of solid state technology in the energy sector.

Many other industries, including office automation, the medical market, audio/video, broadcasting, communication and amusement, are also finding MOSFET relays to be useful and value-adding components.

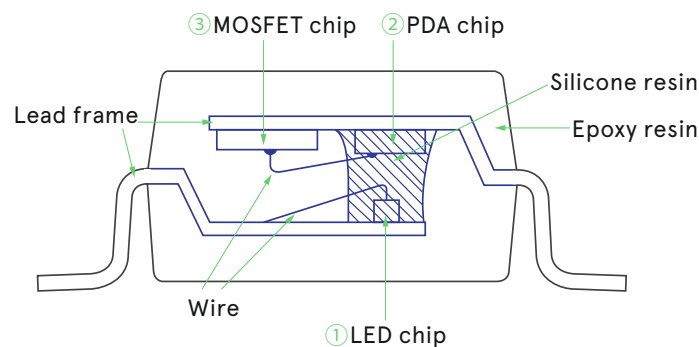


# Design flexibility

The internal optocoupling structure of Omron's MOSFET relays is designed for the utmost versatility in terms of mounting possibilities. It gives device designers the flexibility they need for advanced innovation. MOSFET relays allow flexibility in circuitry designs: they can be

driven directly from a logic circuit and they allow AC or DC load to be switched in either direction. In many parameters, they become a fully functional alternative to an electromechanical relay with minimal additional drive circuitry.

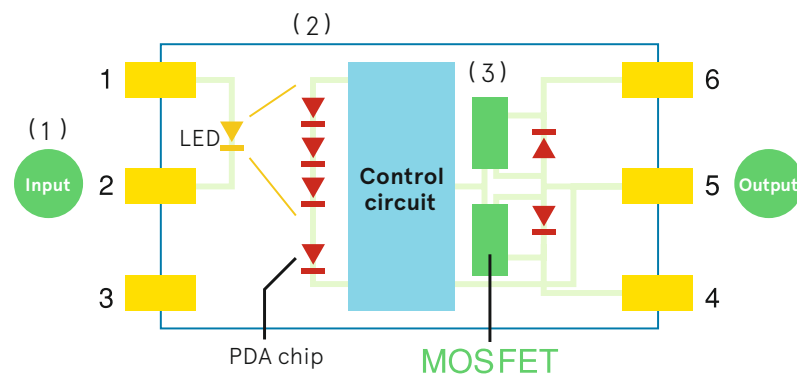
## Internal structure



MOSFET relay consists of the following three components:

- ① LED (Light Emitting Diode)
- ② Photodiode Dome Array (PDA)
- ③ MOSFET

## Operating principle



- (1) The LED lights up when the current is connected at the input side.
- (2) The light sent by the LED will be converted into voltage when it is received by the photodiode.
- (3) This voltage will be the gate voltage to drive the MOSFET via control circuit.



# Omron MOSFET relay product range

As an industry leader in switching solutions, Omron offers a portfolio designed around the specific needs of different markets. It contains G3VM relays with load voltages as high as 600V, as well as models with load current up to 5A (\*10A for DC loads).

The Omron G3VM lineup has been expanded considerably to include particular performance characteristics such as high current and low on-resistance models, high dielectric strength types, multi-contact types, low CxR types and the highly popular general-purpose MOSFET relays.

## PRODUCTS BY PACKAGE:



**GENERAL PURPOSE RELAY** - Best-selling products suitable for various applications ideal for AC/DC load, micro analog signal

Package	Model	Contact form	Load voltage (V) max.	Continuous load current (mA) max.	Dielectric strength between I/O (Vrms)
DIP	G3VM-61A1/D1	1a	60	500	2500
	G3VM-61B1/E1	1a	60	500 (1000)	2500
	G3VM-62C1/F1	2a	60	500	2500
	G3VM-351A/D	1a	350	120	2500
	G3VM-351B/E	1a	350	120 (240)	2500
	G3VM-352C/F	2a	350	120	2500
SOP	G3VM-61G1	1a	60	400	1500
	G3VM-61VY1	1a	60	100	3750
	G3VM-61VY2	1a	60	500	3750
	G3VM-61VY3 <b>NEW</b>	1a	60	700	3750
	G3VM-63G	1b	60	500	1500
	G3VM-61H1	1a	60	400 (800)	1500
	G3VM-62J1	2a	60	400	1500
	G3VM-81G1	1a	80	350	1500
	G3VM-351G	1a	350	110	1500
	G3VM-351VY	1a	350	110	3750
	G3VM-351H	1a	350	110 (220)	1500
	G3VM-352J	2a	350	110	1500
	G3VM-401VY <b>NEW</b>	1a	400	110	3750

\* 1. Load current in case of connection C is shown in parentheses (DC load only)

\* 2. VY, VY1, VY2, and VY3 types: special SOP4 pin package

## HIGH CURRENT AND LOW ON-RESISTANCE TYPE

Offers high current and low on-resistance in the same level as the mechanical relay

Package	Model	Load voltage (V) Max.	Continuous load current (A) Max.	Maximum resistance with output ON ( $\Omega$ ) typ.	
DIP	G3VM-21AR/DR	20	3	0.04	
	G3VM-21BR/ER	20	4 (8)*	0.02 (0.005)*	
	G3VM-31BR/ER	<i>NEW</i>	30	5	0.04
	G3VM-31AR/DR	<i>NEW</i>	30	4	0.05
	G3VM-41AR/DR		40	2.5	0.05
	G3VM-41BR/ER		40	3.5 (7)*	0.03 (0.008)*
	G3VM-61AR/DR		60	2	0.08
	G3VM-61AR1/DR1	<i>NEW</i>	60	3	0.1
	G3VM-61BR/ER		60	2.5	0.065
	G3VM-61BR1/ER1		60	3 (6)*	0.04 (0.01)*
	G3VM-61BR1/ER2	<i>NEW</i>	60	4	0.06
	G3VM-61CR1/FR1		60	5(10)	0.022(0.013)
	G3VM-101AR/DR		100	1	0.25
	G3VM-101AR1/DR1	<i>NEW</i>	100	2	0.2
	G3VM-101BR/ER		100	2 (4)*	0.1 (0.025)*
	G3VM-101BR1/ER1	<i>NEW</i>	100	3.5	0.08
	G3VM-101CR/FR	<i>NEW</i>	100	3(6)	0.06
	G3VM-201AR/DR	<i>NEW</i>	200	0.7	2
	G3VM-201CR/FR	<i>NEW</i>	200	1.5(3)	0.25
	G3VM-401CR/FR		400	0.4(0.8)	3(1.3)
G3VM-601CR/FR		600	0.6(1.2)	1.3(0.5)	
SOP	G3VM-21HR	20	2.5 (5)*	0.02 (0.005)*	
	G3VM-31HR	<i>NEW</i>	30	4(8)	0.02(0.004)
	G3VM-41GR8		40	1	0.1
	G3VM-41HR		40	2.5 (5)*	0.03 (0.008)*
	G3VM-61GR1		60	1	0.25
	G3VM-61GR2		60	1.7	0.08
	G3VM-61VR	<i>NEW</i>	60	1.4	0.13
	G3VM-61HR		60	2.3 (4.6)*	0.04 (0.01)*
	G3VM-61HR1		60	3.3(6.6)	0.03(0.008)
	G3VM-81HR		80	1.25 (2.5)*	0.11 (0.03)*
	G3VM-101HR		100	1.4 (2.8)*	0.1 (0.025)*
	G3VM-101HR1	<i>NEW</i>	100	2(4)	0.045(0.011)
	G3VM-101HR2	<i>NEW</i>	100	3	0.065
S-VSON	G3VM-31QR	30	1.5	0.1	
	G3VM-61QR2	<i>NEW</i>	60	1	0.2
	G3VM-101QR1	<i>NEW</i>	100	0.65	0.4

\* 1. Load current in case of connection C is shown in parentheses (DC load only)

\* 2. VY, VY1, VY2, VY3 and VR types: Special SOP4 pin package

Ideal for semi-conductor test equipment. low C (capacitance between terminals) × R (output on-resistance) type

## VSON package

Model	Load voltage (V) max.	Continuous load current (mA) max.	Maximum resistance with output ON(Ω) typ.	Capacitance between terminals (pF) typ.
G3VM-21UR10	20	200	3	0.8
G3VM-21UR1	20	450	0.8	5
G3VM-21UR11	20	1000	0.18	40
G3VM-41UR12	40	100	15	0.3
G3VM-41UR10	40	120	12	0.45
G3VM-41UR11	40	140	7	0.7
G3VM-61UR1	60	120	10	0.7
G3VM-21UV11* <b>NEW</b>	20	1000	0.22	40
G3VM-51UV* <b>NEW</b>	50	300	1.5	12
G3VM-61UV* <b>NEW</b>	60	400	1.5	20

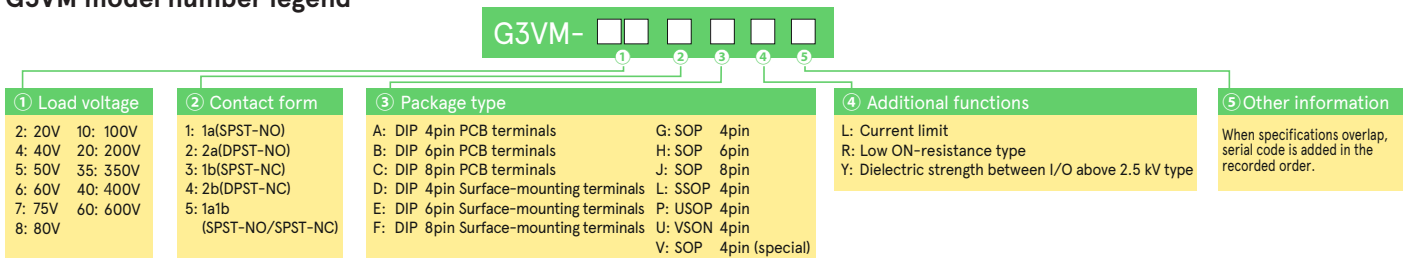
\*Very small outline non-leaded package with voltage driving type; VSON(R) MOSFET relay with current limiting internal resistor on the input side

## S-VSON package

Model	Load voltage (V) max.	Continuous load current (mA) max.	Maximum resistance with output ON(Ω) typ.	Capacitance between terminals (pF) typ.
G3VM-41QR10* <b>NEW</b>	40	120	11	0.45
G3VM-61QR <b>NEW</b>	60	400	1.1	12

\* 41QR10 type: S-VSON(L) package (low profile type)

## G3VM model number legend



Note 1 : some products may have a different model number structure.

Note 2 : in order to avoid the confusion of I (English letter) and 1 (number), I (English letter) is not used here.

Note 3 : for 4-pin SOP models, where the available marking space is insufficient to clearly differentiate model numbers with 6 or more suffix digits, the package type code ③ is omitted.

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