# MOSFET BASED
# DC SOLID-STATE RELAY

## SOM040100

► Latest MOSFET technology generation.

► Ultra low on-state resistance.

► Low output leakage current.

► Low control current consumption.

► Built-in overvoltage protection

► Reverse protected triggered control input to avoid linear control risks

► No radiated or conducted disturbances

► Touch protected housing IP20

| | |
|---|---|
| Control voltage range | 3.5-32VDC |
| Max. permanent output voltage | 60VDC |
| Max. load current with heatsink | 40ADC |

| Load voltage range | Load current range | Control input voltage range | In & case / Out Insulation | Connections | Dimensions (WxHxD) | Weight |
|---|---|---|---|---|---|---|
| 5-60VDC | Up to 40A (with heatsink) | 3.5-32VDC | 2.5kV | Screw terminals | 45 x 58.5 x 30 | 80g |

**Fig. 1**   HIGH SIDE WIRING DIAGRAM (Load connected to "-")

See Instruction sheet to select the right protective components

**The red paths (C1/D2) must be as short as possible !**
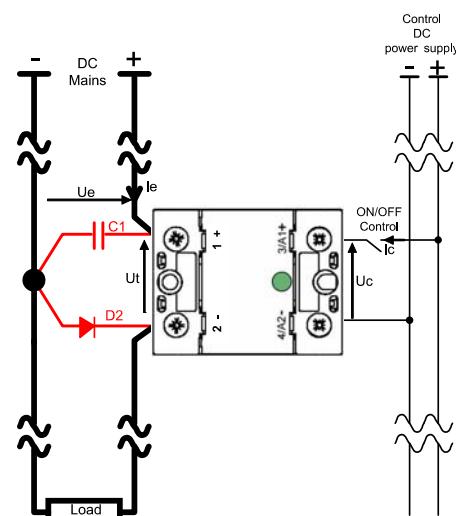
**Fig. 2**   LOW SIDE WIRING DIAGRAM (Load connected to "+")

See Instruction sheet to select the right protective components

**The red paths (C1/D2) must be as short as possible !**
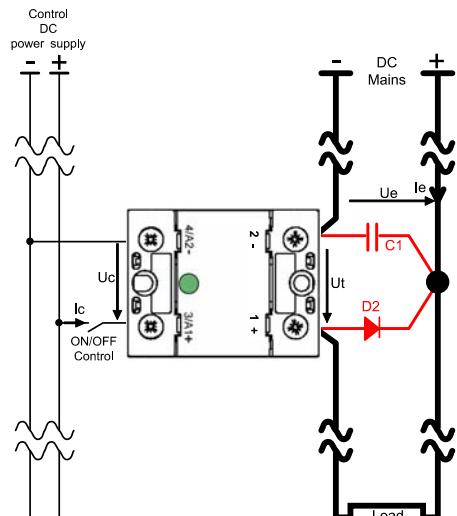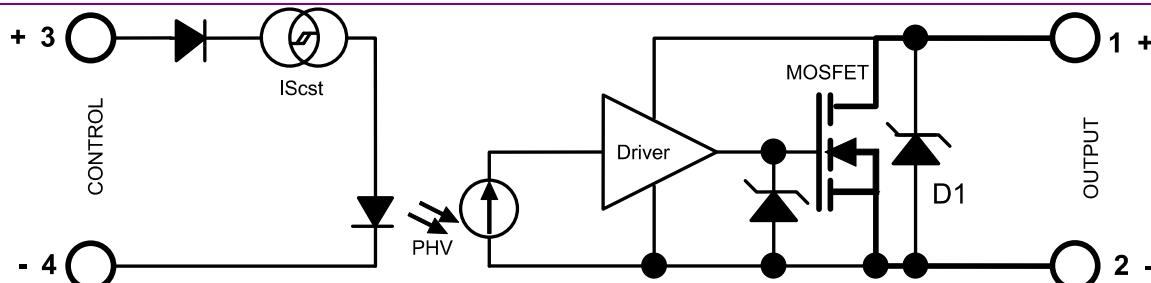
**Fig. 3**   INTERNAL DIAGRAM

Data given at Tambient=25°C and subject to modification without previous notice
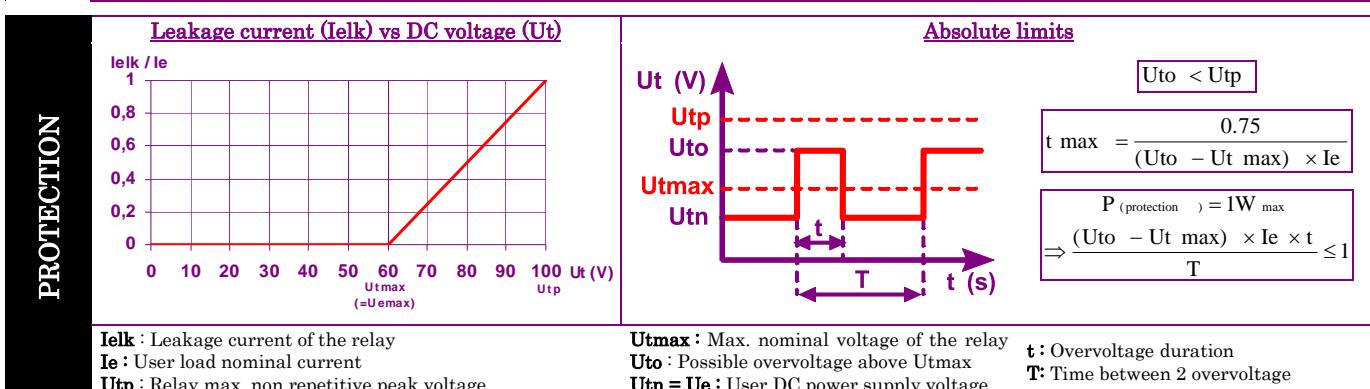
## *CONTROL INPUT CHARACTERISTICS*

**INPUT CIRCUIT**

| CHARACTERISTIC | LABEL | VALUE | INFO. |
|---|---|---|---|
| Nom. Control voltage | Ucnom | 12-24VDC | |
| Min. Control current | Icmin | 35mADC | -100µA/°C |
| Control voltage range | Uc | 3.5 – 32VDC | typical ON=3.3V |
| Control current consumption | Ic | 32 – 35mADC (for control voltage range) | See fig. 5 |
| Releasing control voltage | Ucoffmax | 1VDC | typical OFF= 2.6V |
| Max. reverse control voltage | -Ucmax | 32VDC | -Icmax<100µA |
| Input impedance | Rin | Current limitation | See fig. 5 |

## *POWER OUTPUT CHARACTERISTICS*

**POWER CIRCUIT**

| CHARACTERISTIC | LABEL | VALUE | | INFO. |
|---|---|---|---|---|
| Nominal voltage | Uenom | 48VDC | | |
| Voltage range | Ut / Ue | 5-60VDC | | |
| Non-repetitive peak voltage | Utp | 100V | | |
| Overvoltage protection | D1 | Transient voltage suppressor 56V (1500W/1ms) | | |
| Max reverse voltage drop (internal diode at OFF state) | -Ut | 1.3V | | @Ie=80A @Uc=0 |
| Maximum nominal currents | Ie max | Resistive: 40A | Motor: Please contact us | See fig. 7 (limits) |
| Non-repetitive peak overload current | Id max | 320A | | See fig. 8 |
| Min. load current | Iemin | 5mA | | |
| Max. leakage current | Ielk max | 3mA | | @Utmax @Tjmax |
| Max. on-state resistance | RDSon | 30mOhms | | @Iemax @Tjmax |
| Typ. output capacitance | Cout | 0.7nF | | |
| Junction/case thermal resistance per power element | Rthjc | 0.9K/W | | |
| Built-in heatsink thermal resistance vertically mounted | Rthra | 10K/W | | @ΔTra=75°C |
| Heatsink thermal time constant | Tthra | 10 minutes | | @ΔTra=75°C |
| Control inputs/power outputs insulation voltage | Uimp | 2.5kV | | |
| Inputs/case insulation voltage | Uimp | 2.5kV | | |
| Outputs/case insulation voltage | Uimp | 2.5kV | | |
| Isolation resistance | Rio | 1GΩ | | |
| Isolation capacitance | Cio | <8pF | | |
| Maximum junction temperature | Tjmax | 175°C | | |
| Storage ambient temperature | Tstg | -40->+100°C | | |
| Operating ambient temperature | Tamb | -25->+90°C | | See fig. 7 |
| Max. case temperature | Tc | 100°C | | |
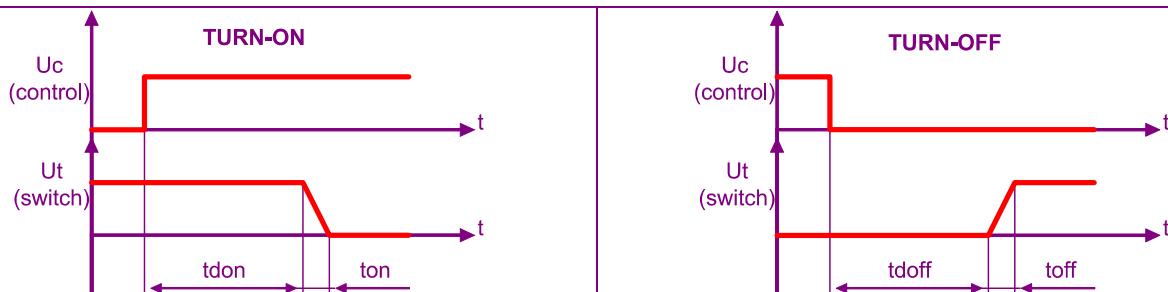
## *PROTECTION  CHARACTERISTICS*

**PROTECTION**



Leakage current (Ielk) vs DC voltage (Ut)



Absolute limits

$$Uto < Utp$$

$$t\ max = \frac{0.75}{(Uto - Ut\ max) \times Ie}$$

$$P_{(protection)} = 1W_{max}$$

$$\Rightarrow \frac{(Uto - Ut\ max) \times Ie \times t}{T} \leq 1$$

**Ielk** : Leakage current of the relay
**Ie** : User load nominal current
**Utp** : Relay max. non repetitive peak voltage

**Utmax** : Max. nominal voltage of the relay
**Uto** : Possible overvoltage above Utmax
**Utn = Ue** : User DC power supply voltage

**t** : Overvoltage duration
**T** : Time between 2 overvoltage

# TIME CHARACTERISTICS

| Fig. 4 | TIME DIAGRAMS |
| --- | --- |



TURN-ON / TURN-OFF time diagrams showing Uc (control), Ut (switch), tdon, ton, tdoff, toff

**TIME CHARACT.**

| CHARACTERISTIC | LABEL | VALUE | INFO. |
| --- | --- | --- | --- |
| Turn on time | ton | 20μs | |
| Turn on delay | tdon | 20μs | |
| Turn off time | toff | 20μs | |
| Turn off delay | tdoff | 20μs | |
| Max. On-Off frequency | F(on-off) | >1000Hz (for high frequency, take 2 x Ie to calculate the heatsink; the protections must be chosen carefully) | Refer to the instruction sheet |

# GENERAL INFORMATION

**CONNECTIONS**

| Connections | | Power | Control | |
| --- | --- | --- | --- | --- |
| Screwdriver advised | | POZIDRIV2 | | |
| Min and max tightening torque | | 2 N.m | 1.2 N.m | |
| Insulated crimp terminals (round tabs, eyelet type) | | M5 | M4 | |

**MISC.**

| Display | | Green LED (indicates relay has switched ON) | |
| --- | --- | --- | --- |
| Housing | | UL94V0 | |
| Mounting | | 2 screws (M4x12mm ; tightening = 1.2N.m) | See mounting sheet |
| Noise level | | None | |
| Weight | | 80g | |

# STANDARDS

**GENERAL**

| Standards | | IEC60947-1 | |
| --- | --- | --- | --- |
| Protection level | | IP20 | |
| Protection against direct touch | | Yes | |
| CE marking | | Yes | |
| UL, cULUS | | Yes | |

**E.M.C. IMMUNITY**

| TYPE OF TEST | STANDARD | LEVEL | EFFECT |
| --- | --- | --- | --- |
| Fast transients bursts | EN61000-4-4 | 4kV criterion B | |
| Electric chocks | EN61000-4-5 | 1kV criterion B | |
| Voltage drop | EN61000-4-11 | - | |

# CHARACTERISTIC CURVES

**Fig. 5** | INPUT CHARACTERISTIC



Ic (mADC)
-35°C
25°C
100°C
Uc (VDC)
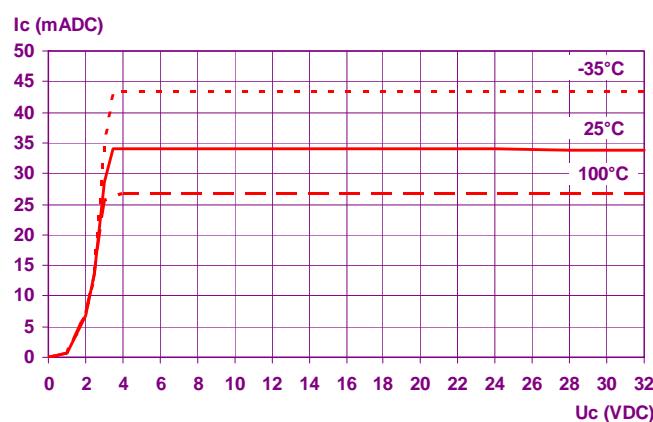
**Fig. 6** | ON RESISTANCE VS JUNCTION TEMPERATURE



RDSon (mOhms)
Junction Temperature (°C)
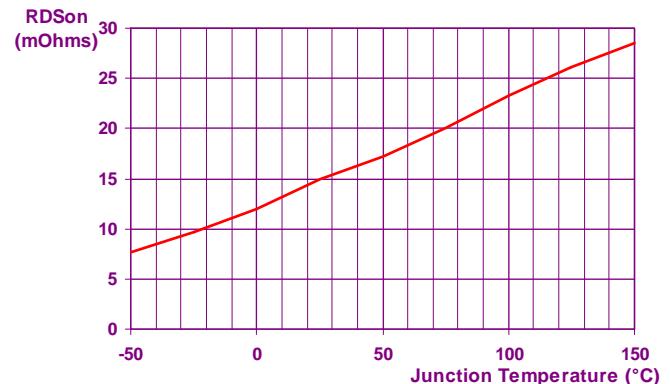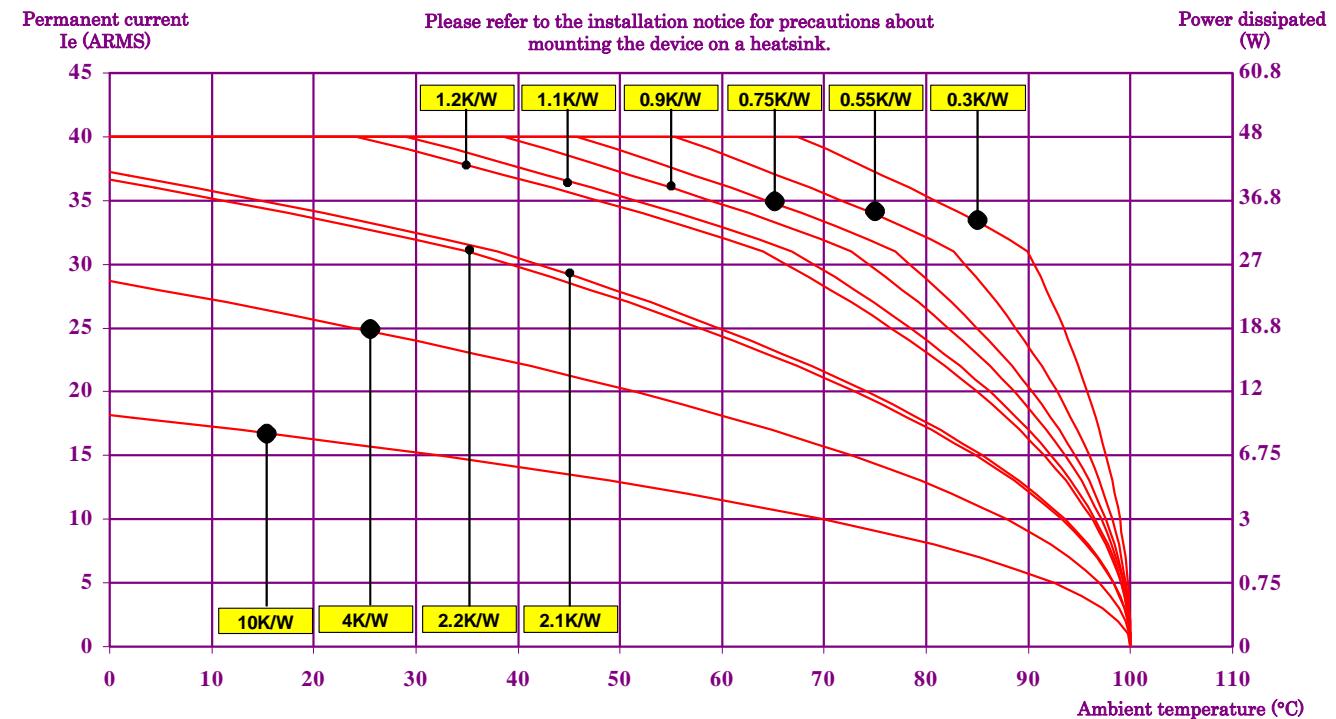
**Fig. 7** | POWER DISSIPATED AND LOAD CURRENT LIMIT VS TEMPERATURE

Permanent current Ie (ARMS)

Please refer to the installation notice for precautions about mounting the device on a heatsink.

Power dissipated (W)



1.2K/W  1.1K/W  0.9K/W  0.75K/W  0.55K/W  0.3K/W

10K/W  4K/W  2.2K/W  2.1K/W

Ambient temperature (°C)

10K/W = No Heatsink
2.1K/W = WF210000
0.75K/W = WF070000
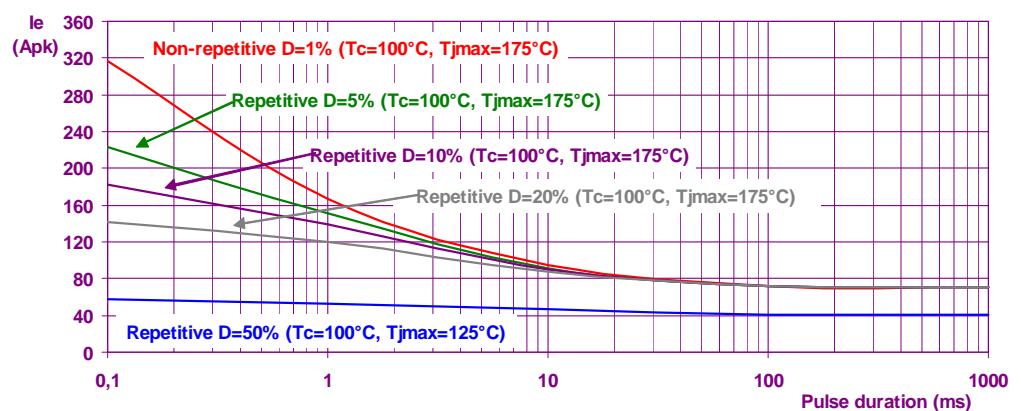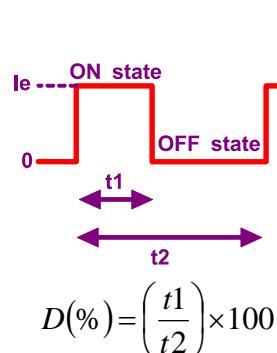
4K/W = 150x150x3mm aluminium sheet
1.2K/W = WF121000
0.55K/W = WF050000

2.2K/W = WF262100
1.1K/W = WF131100
0.3K/W = WF031100

2.2K/W = WF151200
0.9K/W = WF115100

**Fig. 8** | PEAK OVERLOAD CURRENT vs. PULSE DURATION CHARACTERISTIC



Ie ---
ON state
OFF state
Ie
0
t1
t2

$$D(\%) = \left(\frac{t1}{t2}\right) \times 100$$

Ie (Apk)

Non-repetitive D=1% (Tc=100°C, Tjmax=175°C)
Repetitive D=5% (Tc=100°C, Tjmax=175°C)
Repetitive D=10% (Tc=100°C, Tjmax=175°C)
Repetitive D=20% (Tc=100°C, Tjmax=175°C)
Repetitive D=50% (Tc=100°C, Tjmax=125°C)

Pulse duration (ms)

## DIMENSIONS AND ACCESSORIES

**Fig. 9** — DIMENSIONS (mm)

45 MAX

16.3

3

30 MAX

58.5 MAX

43.2

7

28

M5    Ø4.7

2 -    1 +

4/A2    3/A1

47.6

5.2

M4

25.4
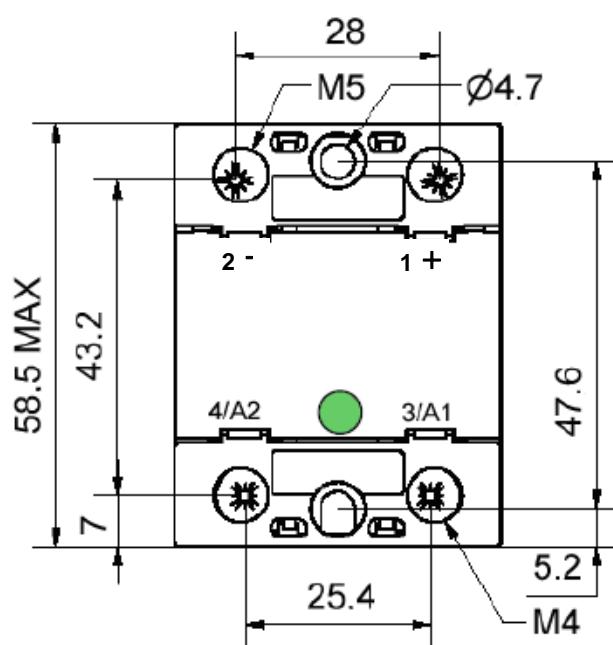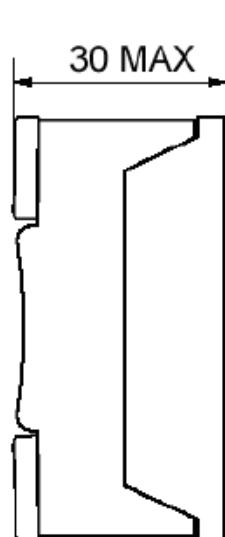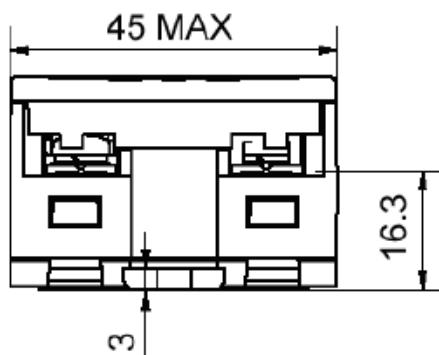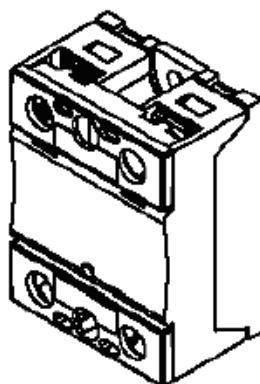
**Fig. 10** — ACCESSORIES

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