

GEM_035,_049 QUAD SCR MODULES

Preliminary Data Sheet

- ▶ Electrically insulated metal frame
- ▶ Extremely high power density
- ▶ 3000 V_{RMS} insulation voltage
- ▶ Line voltage range up to 230 V_{RMS}
- ▶ High reliability
- ▶ Modularity
- ▶ Fully customizable
- ▶ Broad range of accessories
- ▶ Cost effective solution
- ▶ Suitable for heavy duty applications

Description

This new family of high power modules brings to the high power applications the same compactness, ease of use and scalability of the lower power semiconductor modules. In addition to these typical features (i.e. standard dimensions, electrical insulation, various circuit types, etc.) the new Green Power Easy Module (GEM) family includes many features aimed to simplify their adoption allowing the end users to focus on their core business. These features include:

- embedded air cooling system (heatsink and fan)
- optimised snubber circuits
- pulse transformer modules
- ducted heat flow.

Maximum Ratings

| Part number | GEM_043 | GEM_049 | GEM_035 | | | Conditions | Units |
|------------------------------------|---------|---------|---------|--|--|--|-------------------|
| $I_{T(AV)}$ | 431 | 497 | 356 | | | 180° cond, half sine T _a = 40 °C Air velocity = 5 m/s | A |
| $I_{T(RMS)}$ | 677 | 780 | 559 | | | | A |
| I_{TSM} | 12.8 | 30 | 22 | | | 50 Hz, T _j = T _{jmax} , V _R = 0 V | kA |
| I_{TSM} | 13.5 | 31.7 | 23.2 | | | 60 Hz, T _j = T _{jmax} , V _R = 0 V | kA |
| I^2t | 819 | 4500 | 2420 | | | 50 Hz, T _j = T _{jmax} , V _R = 0 V | kA ² s |
| I^2t | 745 | 4095 | 2202 | | | 60 Hz, T _j = T _{jmax} , V _R = 0 V | kA ² s |
| V _{DRM} /V _{RRM} | 400 | 800 | 1000 | | | T _j = T _{jmax} | V |
| T _{jmax} | 150 | 150 | 125 | | | | °C |

| Part Number | V code | VDRM VRRM max repetitive reverse and off-state blocking voltage [V] | IDRM IRRM @ Tjmax [mA] | VL(RMS) maximum suggested RMS line voltage [V] |
|----------------|--------|---|------------------------------|---|
| GEM_043 | 04 | 400 | 50 | 115 |
| GEM_049 | 08 | 800 | 100 | 190 |
| GEM_035 | 10 | 1000 | 75 | 230 |

On-State Characteristics

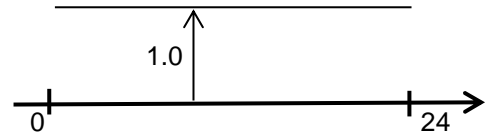
| Parameters | GEM_043 | GEM_049 | GEM_035 | | | Conditions | Units |
|--|---------|---------|---------|--|--|------------------------------------|-------|
| V _{T(TO)} Threshold voltage | 0.87 | 0.80 | 0.85 | | | T _j = T _{jmax} | V |
| r _T On-state slope resistance | 0.238 | 0.170 | 0.270 | | | T _j = T _{jmax} | mΩ |
| I _H Holding current, max | 600 | 300 | 300 | | | T _j = 25°C | mA |
| I _L Latching current, typ | 1000 | 1000 | 1000 | | | T _j = 25°C | mA |
| P _{MAX} Max power losses | 970 | 1006 | 777 | | | T _A = 40°C | W |

Triggering Characteristics

| Parameters | GEM_043 | GEM_049 | GEM_035 | | | Conditions | Units |
|---|---------|---------|---------|--|--|--|-------|
| V _{GT} Gate trigger voltage | 2.5 | 2.5 | 2.5 | | | T _j = 25°C, V _D = 5V | V |
| I _{GT} Gate trigger current | 190 | 250 | 250 | | | T _j = 25°C, V _D = 5V | mA |
| P _{GM} Peak gate power dissipation | 10 | 15 | 15 | | | Pulse width 1 ms | W |
| P _{G(AV)} Average gate power dissipation | 2 | 4 | 4 | | | | W |
| I _{FGM} Peak gate current | 3 | 8 | 8 | | | | A |
| V _{FGM} Peak gate voltage (forward) | 20 | 20 | 20 | | | | V |
| V _{RGM} Peak gate voltage (reverse) | 5 | 5 | 5 | | | | V |

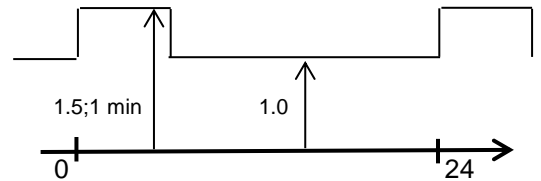
Switching Characteristics

| Parameters | GEM_043 | GEM_049 | GEM_035 | | | Conditions | Units |
|--|---------|---------|---------|--|--|---|-------|
| di/dt Critical rate of rise of on-state current | 200 | 400 | 400 | | | T _j = T _{jmax} | A/μs |
| dV/dt Critical rate of rise of off-state voltage | 500 | 1000 | 1000 | | | T _j = T _{jmax} | V/μs |
| t _q Turn-off time, typ | 200 | 200 | 200 | | | T _j =T _{jmax} , I _T =1000A di/dt=-20A/μs V _R =50V dV/dt=20V/μs | μs |



Maximum IEC class 1 currents for typical circuit type

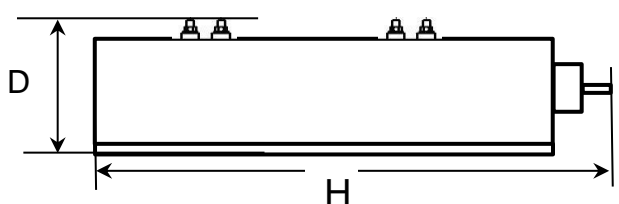
| Circuit Type | GEM_043 | GEM_049 | GEM_035 | | | Conditions | Units |
|-------------------------------|---------|---------|---------|--|--|--|-------|
| AC switch | 963 | 1111 | 796 | | | T _A = 40 °C delay angle = 0° | A |
| Center tap | 862 | 995 | 713 | | | T _A = 40 °C delay angle = 0° | A |
| Two pulse bridge | 862 | 995 | 713 | | | T _A = 40 °C delay angle = 0° | A |
| Six pulse bridge | 1244 | 1440 | 1030 | | | T _A = 40 °C delay angle = 0° | A |
| Double star with I.P. transf. | 2495 | 2887 | 2066 | | | T _A = 40 °C delay angle = 0° | A |



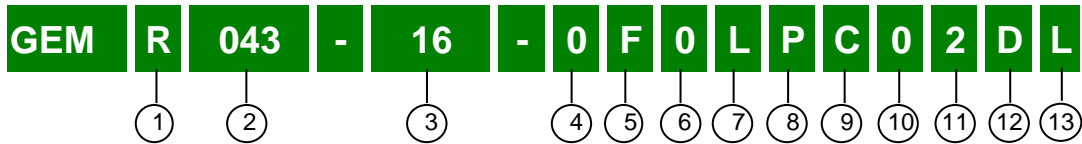
Maximum IEC class 2 currents for typical circuit type

| Circuit Type | GEM_043 | GEM_049 | GEM_035 | | | Conditions | Units |
|-------------------------------|---------|---------|---------|--|--|--|-------|
| AC switch | 777 | 888 | 644 | | | T _A = 40 °C delay angle = 0° | A |
| Center tap | 700 | 800 | 580 | | | T _A = 40 °C delay angle = 0° | A |
| Two pulse bridge | 700 | 800 | 580 | | | T _A = 40 °C delay angle = 0° | A |
| Six pulse bridge | 1000 | 1160 | 840 | | | T _A = 40 °C delay angle = 0° | A |
| Double star with I.P. transf. | 2000 | 2360 | 1690 | | | T _A = 40 °C delay angle = 0° | A |

Thermal and mechanical characteristics

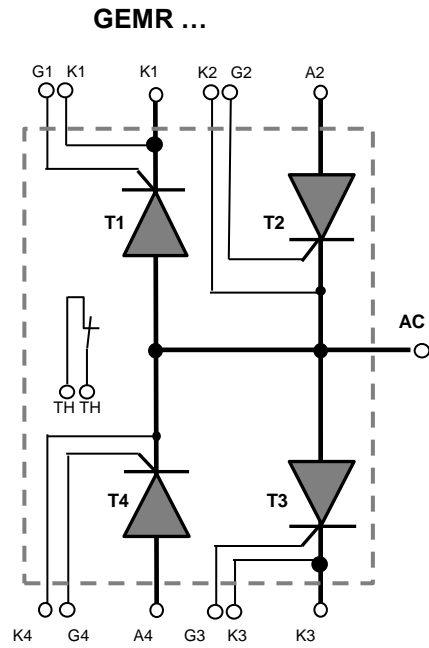
| Parameters | GEM_043 | GEM_049 | GEM_035 | | | Conditions | Units |
|--|---------|--|---------|--|--|----------------------|-------|
| T _{jmax} Max operating junction temperature | 150 | 150 | 125 | | | | °C |
| T _{stg} Storage temperature | -40 +70 | -40 +70 | -40 +70 | | | | °C |
| R _{thJA} Thermal resistance (junction to ambient) | 0.227 | 0.219 | 0.219 | | | Air velocity = 5 m/s | °C/W |
| F Mounting torque - GEM to panel (+/- 10%) | 7 | 7 | 7 | | | M6 mounting screw | N·m |
| | 14 | 14 | 14 | | | M8 mounting screw | N·m |
| m Mass, typ | | | | | | with FAPC options | kg |
| Overall dimensions | | | | | | | |
| D Depth | 200 |  | | | | | mm |
| H Height | 570 | | | | | mm | |
| W Width | 103 | | | | | mm | |

PART-NUMBERING SYSTEM

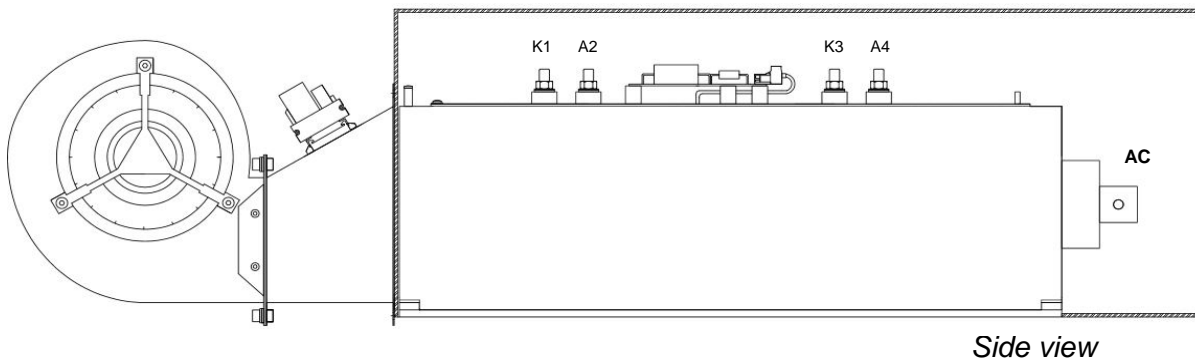


- ① Circuit configuration
- ② GEM average current / 10
- ③ GEM blocking voltage / 100
- ④ 0 = No fan
- ⑤ 0 = No fuse - F = With fuse protection
- ⑥ 0 = No standard busbar available for this module; please contact factory in case of specific need
- ⑦ 0 = No anti-parallel busbar - L = Anti-parallel busbar
- ⑧ 0 = No pulse transformer - P = With pulse transformer *
- ⑨ 0 = No fan loss detection module - C = With fan loss detection module
- ⑩ 0 = No SCR fault detection module - S = SCR fault detection module (for AC-switch circuits)
- ⑪ 0 = No snubber - 1 = One snubber - 2 = Two snubbers
- ⑫ 0 = No fan-on-demand thermo-switch - D = Fan-on-demand thermo-switch (trip point 50 °C)
- ⑬ 0 = No current transformer - L (R) = Sirio current transformer on the Left side (or on the Right side)

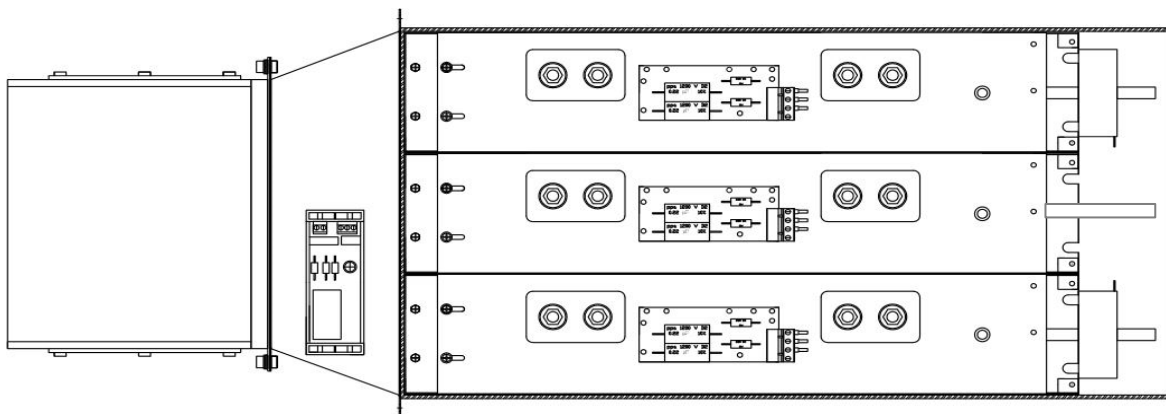
* Pulse transformer GT001 (dual) or GT002 (single) depending on the circuit configuration.
For pulse transformer characteristics see their specific datasheets.



Example of application - 3P Regen bridge realized with three GEMR modules



Side view



Top view

In the interest of product improvement Green Power Solutions reserves the right to change any specification given in this data sheet without notice.