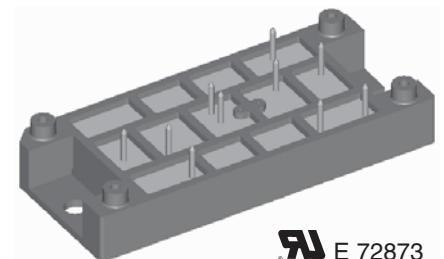
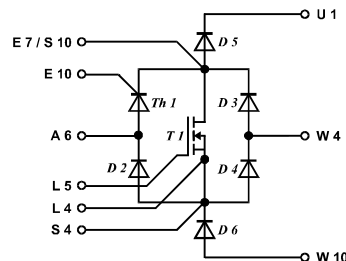


# Rectifier Module for Three Phase Power Factor Correction

$V_{DSS} = 500\text{ V}$   
 $I_{D25} = 130\text{ A}$   
 $R_{DS(on)} = 36\text{ m}\Omega$

Preliminary data

| $V_{RRM}$<br>(FAST Diode)<br>V | $V_{RRM, DRM}$<br>(Diode, Thyr.)<br>V | $V_{DSS}$<br>(MOSFET)<br>V | Type       |
|--------------------------------|---------------------------------------|----------------------------|------------|
| 600                            | 500                                   | 500                        | VUM 85-05A |



| Symbol                                     | Conditions  | Maximum Ratings |                    |
|--|---|-----------------|--------------------|
| <b>MOSFET T 1</b>                          |   |                 |                    |
| $V_{DSS}$                                  | $T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$                                    | 500             | V                  |
| $V_{DGR}$                                  | $T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$ ; $R_G = 1\text{ M}\Omega$         | 500             | V                  |
| $V_{GSM}$                                  | Transient   | $\pm 30$        | V                  |
| $V_{GS}$                                   | Continuous  | $\pm 20$        | V                  |
| $I_D$                                      | $T_C = 100^{\circ}\text{C}$ , $T_{VJ} = 125^{\circ}\text{C}$                              | 60              | A                  |
| $I_{D25}$                                  | $T_C = 25^{\circ}\text{C}$ , $T_{VJ} = 150^{\circ}\text{C}$                               | 130             | A                  |
| $I_{DM}$                                   | $T_C = 25^{\circ}\text{C}$ , $T_{VJ} = 150^{\circ}\text{C}$                               | 520             | A                  |
| $E_{AR}$                                   | $T_C = 25^{\circ}\text{C}$  | 60              | mJ                 |
| $P_{tot}$                                  | $T_C = 25^{\circ}\text{C}$  | 1380            | W                  |
| <b>Single Phase Bridge Th1, D2, D3, D4</b> |   |                 |                    |
| $V_{RRM}, V_{DRM}$                         |   | 500             | V                  |
| $I_{DAV}$                                  | $T_{VJ} = 150^{\circ}\text{C}$ , $T_C = 100^{\circ}\text{C}$                              | 47              | A                  |
| $I_{FSM}, I_{TSM}$                         | $T_{VJ} = 45^{\circ}\text{C}$ , $t = 10\text{ ms}$ (50 Hz)                                | 320             | A                  |
|  | $t = 8.3\text{ ms}$ (60 Hz)   | 340             | A                  |
|  | $T_{VJ} = 150^{\circ}\text{C}$ , $t = 10\text{ ms}$ (50 Hz)                               | 280             | A                  |
|  | $t = 8.3\text{ ms}$ (60 Hz)   | 300             | A                  |
| $P_{tot}$                                  | $T_C = 25^{\circ}\text{C}$ ; per diode  | 90              | W                  |
| <b>Fast Diodes D5, D6</b>                  |   |                 |                    |
| $V_{RRM}$                                  |   | 600             | V                  |
| $I_{FAV}$                                  | $T_{VJ} = 150^{\circ}\text{C}$ , $T_C = 100^{\circ}\text{C}$ , rectangular $\delta = 0.5$ | 31              | A                  |
| $I_{FSM}$                                  | $T_{VJ} = 45^{\circ}\text{C}$ , $t = 10\text{ ms}$ (50 Hz)                                | 250             | A                  |
| $P_{tot}$                                  | $T_C = 25^{\circ}\text{C}$  | 95              | W                  |
| <b>Module</b>                              |   |                 |                    |
| $T_{VJ}$                                   |   | -40...+150      | $^{\circ}\text{C}$ |
| $T_{JM}$                                   |   | 150             | $^{\circ}\text{C}$ |
| $T_{stg}$                                  |   | -40...+125      | $^{\circ}\text{C}$ |
| $V_{ISOL}$                                 | $I_{ISOL} \leq 1\text{ mA}$   | 50/60 Hz        | 3600 V~            |
| $M_d$                                      | Mounting torque (M5)  | 2-2.5/18-22     | Nm/lb.in.          |
| <b>Weight</b>                              |   | 80              | g                  |

## Features

- Package with DCB ceramic base plate
- Soldering connections for PCB mounting
- Isolation voltage 3600 V~
- Low  $R_{DS(on)}$  HDMOS™ process
- Low package inductance for high speed switching
- Ultrafast diodes
- Kelvin source for easy drive
- UL recognized

## Applications

- Three phase PFC by Kolar circuit
- Three phase input rectifier with power factor correction consisting of three modules VUM 85-05
- For power supplies, UPS, SMPS, drives, welding etc.

## Advantages

- Reduced harmonic content of input currents corresponding to standards
- Rectifier generates maximum DC power with a given AC fuse
- Wide input voltage range
- No external isolation
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability

| Symbol                                     | Conditions   | Characteristic Values<br>( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) |                          |                        |
|--|--|--|--------------------------|------------------------|
|  |  | min.   | typ.                     | max.                   |
| <b>MOSFET T 1</b>                          |  |  |                          |                        |
| $V_{GS(th)}$                               | $V_{DS} = \pm 20\text{ V}$ , $I_D = 30\text{ mA}$  | 2  | 3                        | 4 V                    |
| $I_{GSS}$                                  | $V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$   |  |                          | $\pm 1.5\ \mu\text{A}$ |
| $I_{DSS}$                                  | $V_{DS} = V_{DSS}$ , $V_{GS} = 0\text{ V}$<br>$V_{DS} = 0,8 \cdot V_{DSS}$ , $V_{GS} = 0\text{ V}$ , $T_{VJ} = 125^{\circ}\text{C}$  |  | 0.5                      | 1.4 mA                 |
|  |  |  | 1                        | 7 mA                   |
| $R_{DS(on)}$                               | $I_D = \frac{1}{2} I_{D25}$ , $V_{GS} = 10\text{ V}$ , pulse test<br>$t \leq 300\ \mu\text{s}$ , $d \leq 2\%$  |  |                          | 36 m $\Omega$          |
| $g_{fs}$                                   | $V_{DS} = 10\text{ V}$ , $I_D = \frac{1}{2} I_{D25}$ , $t = < 300\ \mu\text{s}$  | 75   | 145                      | S                      |
| $t_{d(on)}$                                | $V_{DS} = \frac{1}{2} V_{DSS}$ , $I_D = \frac{1}{2} I_{D25}$ , $V_{GS} = 15\text{ V}$<br>$R_G = 1\ \Omega$ , $L = 100\ \mu\text{H}$ , $T_{VJ} = 125^{\circ}\text{C}$   |  | 16                       | 25 ns                  |
| $t_r$                                      |  |  | 33                       | 45 ns                  |
| $t_{d(off)}$                               |  |  | 65                       | 80 ns                  |
| $t_f$                                      |  |  | 30                       | 40 ns                  |
| $C_{iss}$                                  | $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$  |  | 30                       | nF                     |
| $C_{oss}$                                  |  |  | 3                        | nF                     |
| $C_{riss}$                                 |  |  | 1                        | nF                     |
| $Q_g$                                      | $V_{DS} = \frac{1}{2} V_{DSS}$ , $I_D = \frac{1}{2} I_{D25}$ , $V_{GS} = 15\text{ V}$  |  | 945                      | 1120 nC                |
| $Q_{gs}$                                   |  |  | 195                      | 280 nC                 |
| $Q_g$                                      |  |  | 435                      | 595 nC                 |
| $R_{thJC}$                                 |  |  | 0.05                     | 0.09 K/W               |
| $R_{thCH}$                                 |  |  |                          | K/W                    |
| <b>Single Phase Bridge Th1, D2, D3, D4</b> |  |  |                          |                        |
| $V_F, V_T$                                 | $I_F, I_T = 45\text{ A}$ , $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$   |  |                          | 1.50 V<br>1.55 V       |
| $I_{RRM}, I_{DRM}$                         | $V_D, V_R = V_{DRM}, V_{RRM}$ , $T_{VJ} = 25^{\circ}\text{C}$<br>$V_D, V_R = 0,8 \cdot V_{DRM}, V_{RRM}$ , $T_{VJ} = 125^{\circ}\text{C}$  |  | 0.5                      | 1.4 mA                 |
|  |  |  | 1                        | 7 mA                   |
| $V_{T0}$                                   | For power-loss calculations only   |  |                          | 0.85 V                 |
| $r_T$                                      | $T_{VJ} = 150^{\circ}\text{C}$   |  |                          | 14 m $\Omega$          |
| $V_{GT}$                                   | $V_D = 6\text{ V}$   |  |                          | 1.5 V                  |
| $I_{GT}$                                   |  |  |                          | 100 mA                 |
| $V_{GD}$                                   | $V_D = \frac{2}{3} V_{DRM}$ , $T_{VJ} = 150^{\circ}\text{C}$   |  |                          | 0.2 V                  |
| $I_{GD}$                                   |  |  |                          | 5 mA                   |
| $V_{RGM}$                                  |  |  |                          | 10 V                   |
| $I_H$                                      | $V_D = 6\text{ V}$ , $R_{GK} = \infty$   |  |                          | 200 mA                 |
| $I_L$                                      | $I_G = 0.45\text{ A}$ , $di_G/dt = 0.45\text{ A}/\mu\text{s}$ , $t_p = 10\ \mu\text{s}$  |  |                          | 450 mA                 |
| $(di/dt)_{cr}$                             | $I_G = 0.45\text{ A}$ , $di_G/dt = 0.45\text{ A}/\mu\text{s}$ , $t_p = 200\ \mu\text{s}$ , $f = 50\text{ Hz}$<br>$V_D = \frac{2}{3} V_{DRM}$ , $T_{VJ} = 150^{\circ}\text{C}$ , $I_T = 45\text{ A}$ , repetitive |  |                          | 150 A/ $\mu\text{s}$   |
|  | $I_G = 0.45\text{ A}$ , $di_G/dt = 0.45\text{ A}/\mu\text{s}$ , $t_p = 200\ \mu\text{s}$ , $f = 50\text{ Hz}$<br>$V_D = \frac{2}{3} V_{DRM}$ , $T_{VJ} = 150^{\circ}\text{C}$ , $I_T = I_{DAV}$ , non-repetitive |  |                          | 500 A/ $\mu\text{s}$   |
| $t_{gd}$                                   | $I_G = 0.45\text{ A}$ , $di_G/dt = 0.45\text{ A}/\mu\text{s}$ , $V_D = \frac{1}{2} V_{DRM}$  |  |                          | 2 $\mu\text{s}$        |
| $t_q$                                      | $I_T = 20\text{ A}$ , $di/dt = -10\text{ A}/\mu\text{s}$ , $V_R = 100\text{ V}$ , $V_D = \frac{2}{3} V_{DRM}$<br>$t_p = 200\ \mu\text{s}$ , $dv/dt = 15\text{ V}/\mu\text{s}$ , $T_{VJ} = 150^{\circ}\text{C}$   | 150  |                          | $\mu\text{s}$          |
| $P_{GM}$                                   | $I_T = I_{d(AV)}$ , $T_{VJ} = 150^{\circ}\text{C}$   |  | $t_p = 30\ \mu\text{s}$  | 10 W                   |
|  |  |  | $t_p = 300\ \mu\text{s}$ | 5 W                    |
| $P_{GAVM}$                                 |  |  |                          | 0,5 W                  |
| $R_{thJC}$                                 | DC per diode / thyristor   |  |                          | 1.3 K/W                |
| $R_{thCH}$                                 | DC per diode / thyristor   | 0.4  |                          | K/W                    |

| Symbol                      | Conditions   | Characteristic Values                                |      |                  |
|-----------------------------|--|--|------|------------------|
|                             |  | (T <sub>VJ</sub> = 25°C, unless otherwise specified) |      |                  |
|                             |  | min.   | typ. | max.             |
| <b>Fast Diodes D 5, D 6</b> |  |  |      |                  |
| V <sub>F</sub>              | I <sub>F</sub> = 30 A; T <sub>VJ</sub> = 25°C<br>T <sub>VJ</sub> = 125°C                   |  |      | 2.70 V<br>1.85 V |
| I <sub>R</sub>              | V <sub>R</sub> = 600 V, T <sub>VJ</sub> = 25°C<br>T <sub>VJ</sub> = 125°C                  |  |      | 0.5 mA<br>1 mA   |
| V <sub>T0</sub>             | For power-loss calculations only   |  |      | 1.23 V           |
| r <sub>T</sub>              | T <sub>VJ</sub> = 150°C  |  |      | 9.8 mΩ           |
| I <sub>RM</sub>             | I <sub>F</sub> = 50 A; di/dt = 100 A/μs<br>V <sub>R</sub> = 100 V, T <sub>VJ</sub> = 100°C |  | 3    | 3.5 A            |
| t <sub>rr</sub>             | I <sub>F</sub> = 1 A, V <sub>R</sub> = 30 V, di/dt = 200 A/μs                              |  | 25   | 30 ns            |
| R <sub>thJC</sub>           | DC per diode   |  |      | 1.3 K/W          |
| R <sub>thCH</sub>           | DC per diode   |  | 0.4  | K/W              |

Dimensions in mm (1 mm = 0.0394")

