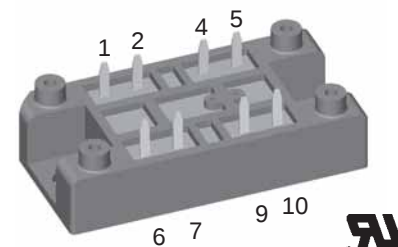
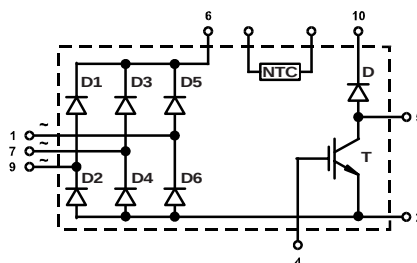


# Three Phase Rectifier Bridge with Brake Chopper

$$V_{RRM} = 1200/1600 \text{ V}$$

$$I_{dAVM} = 110 \text{ A}$$



## Input Rectifier D1 - D6

| Symbol     | Conditions                                                     | Maximum Ratings |   |
|------------|----------------------------------------------------------------|-----------------|---|
| $V_{RRM}$  | VUB 72 -12 NO1                                                 | 1200            | V |
|            | VUB 72 -16 NO1                                                 | 1600            | V |
| $I_{FAV}$  | $T_C = 80^\circ\text{C}$ ; sine $180^\circ$                    | 40              | A |
| $I_{dAVM}$ | $T_C = 80^\circ\text{C}$ ; rectangular; $d = 1/3$ ; bridge     | 110             | A |
| $I_{FSM}$  | $T_{VJ} = 25^\circ\text{C}$ ; $t = 10 \text{ ms}$ ; sine 50 Hz | 530             | A |
| $P_{tot}$  | $T_C = 25^\circ\text{C}$                                       | 100             | W |

| Symbol     | Conditions                                                                                                | Characteristic Values<br>( $T_{VJ} = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------|----------|
|            |                                                                                                           | min.                                                                                 | typ. | max.     |
| $V_F$      | $I_F = 25 \text{ A}$ ; $T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$                        |                                                                                      | 1.0  | 1.1 V    |
|            |                                                                                                           |                                                                                      | 0.9  | V        |
| $I_R$      | $V_R = V_{RRM}$ ; $T_{VJ} = 25^\circ\text{C}$<br>$V_R = 0.8 \cdot V_{RRM}$ ; $T_{VJ} = 125^\circ\text{C}$ |                                                                                      | 0.4  | 0.02 mA  |
|            |                                                                                                           |                                                                                      |      | mA       |
| $R_{thJC}$ | per diode                                                                                                 |                                                                                      |      | 1.2 K/W  |
| $R_{thJH}$ | with heat transfer paste                                                                                  |                                                                                      |      | 1.42 K/W |

## Chopper Diode D

| Symbol    | Conditions                                         | Maximum Ratings |   |
|-----------|----------------------------------------------------|-----------------|---|
| $V_{RRM}$ | $T_{VJ} = 25^\circ\text{C}$ to $150^\circ\text{C}$ | 1200            | V |
| $I_{F25}$ | DC; $T_C = 25^\circ\text{C}$                       | 25              | A |
| $I_{F80}$ | DC; $T_C = 80^\circ\text{C}$                       | 15              | A |

| Symbol     | Conditions                                                                                                            | Characteristic Values |      |          |
|------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------|
|            |                                                                                                                       | min.                  | typ. | max.     |
| $V_F$      | $I_F = 25 \text{ A}$ ; $T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$                                    |                       | 2.7  | 3.1 V    |
|            |                                                                                                                       |                       | 2.0  | V        |
| $I_R$      | $V_R = V_{RRM}$ ; $T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$                                         |                       | 0.1  | 0.1 mA   |
|            |                                                                                                                       |                       |      | mA       |
| $I_{RM}$   | $I_F = 15 \text{ A}$ ; $di_F/dt = -400 \text{ A}/\mu\text{s}$ ; $T_{VJ} = 125^\circ\text{C}$<br>$V_R = 600 \text{ V}$ |                       | 16   | A        |
| $t_{rr}$   |                                                                                                                       |                       | 130  | ns       |
| $R_{thJC}$ | with heat transfer paste                                                                                              |                       |      | 2.3 K/W  |
| $R_{thJH}$ |                                                                                                                       |                       |      | 3.12 K/W |

IXYS reserves the right to change limits, test conditions and dimensions.

## Features

- three phase mains rectifier
- brake chopper:
  - IGBT with low saturation voltage
  - HiPerFRED™ free wheeling diode
- module package:
  - high level of integration
  - solder terminals for PCB mounting
  - UL registered E72873
  - isolated DCB ceramic base plate
  - large creepage and strike distances
  - high reliability

## Applications

- drives with
- mains input
  - DC link
  - inverter or chopper feeding the machine
  - motor and generator/brake operation

## Chopper Transistor T

| Symbol              | Conditions                                                                                                                   | Maximum Ratings |               |
|---------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|
| $V_{CES}$           | $T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$                                                                       | 1200            | V             |
| $V_{GES}$           |                                                                                                                              | $\pm 20$        | V             |
| $I_{C25}$           | DC; $T_C = 25^{\circ}\text{C}$                                                                                               | 50              | A             |
| $I_{C80}$           | DC; $T_C = 80^{\circ}\text{C}$                                                                                               | 35              | A             |
| $I_{CM}$            | $V_{GE} = \pm 15\text{ V}$ ; $R_G = 39\ \Omega$ ; $T_{VJ} = 125^{\circ}\text{C}$                                             | 50              | A             |
| $V_{CEK}$           | RBSOA; $L = 100\ \mu\text{H}$                                                                                                | $V_{CES}$       |               |
| $t_{SC}$<br>(SCSOA) | $V_{GE} = \pm 15\text{ V}$ ; $V_{CE} = 900\text{ V}$ ; $T_{VJ} = 125^{\circ}\text{C}$<br>$R_G = 39\ \Omega$ ; non repetitive | 10              | $\mu\text{s}$ |

| Symbol                                                                 | Conditions<br>( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)                                                                        | Characteristic Values |                                     |                                  |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------|----------------------------------|
|                                                                        |                                                                                                                                                    | min.                  | typ.                                | max.                             |
| $V_{CE(sat)}$                                                          | $I_C = 25\text{ A}$ ; $V_{GE} = 15\text{ V}$ ; $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                     |                       | 1.9<br>2.1                          | 2.4<br>V                         |
| $V_{GE(th)}$                                                           | $I_C = 1\text{ mA}$ ; $V_{GE} = V_{CE}$                                                                                                            | 4.5                   |                                     | 6.5 V                            |
| $I_{CES}$                                                              | $V_{CE} = V_{CES}$ ; $V_{GE} = 0\text{ V}$ ; $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                       |                       | 0.1                                 | 0.1 mA<br>mA                     |
| $I_{GES}$                                                              | $V_{CE} = 0\text{ V}$ ; $V_{GE} = \pm 20\text{ V}$                                                                                                 |                       |                                     | 200 nA                           |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$ | Inductive load, $T_{VJ} = 125^{\circ}\text{C}$<br>$V_{CE} = 600\text{ V}$ ; $I_C = 25\text{ A}$<br>$V_{GE} = \pm 15\text{ V}$ ; $R_G = 39\ \Omega$ |                       | 80<br>50<br>440<br>50<br>3.8<br>2.0 | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |
| $C_{ies}$                                                              |                                                                                                                                                    |                       | 2.0                                 | nF                               |
| $Q_{Gon}$                                                              |                                                                                                                                                    |                       | 150                                 | nC                               |
| $R_{thJC}$                                                             |                                                                                                                                                    |                       |                                     | 0.6 K/W                          |
| $R_{thJH}$                                                             |                                                                                                                                                    |                       |                                     | 1.2 K/W                          |
|                                                                        | with heat transfer paste, see mounting instructions                                                                                                |                       |                                     |                                  |

## Temperature Sensor NTC

| Symbol       | Conditions                                                                                        | Characteristic Values |            |
|--------------|---------------------------------------------------------------------------------------------------|-----------------------|------------|
|              |                                                                                                   | typ.                  |            |
| $R_{25}$     | $T = 25^{\circ}\text{C}$                                                                          | 2.2                   | k $\Omega$ |
| $B_{25/100}$ | $\left\{ R(T) = R_{25} \cdot e^{B_{25/100} \left( \frac{1}{T} - \frac{1}{298K} \right)} \right\}$ | 100                   | K          |

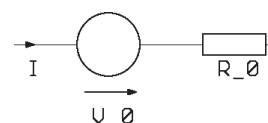
## Module

| Symbol     | Conditions                                                 | Maximum Ratings |                    |
|------------|------------------------------------------------------------|-----------------|--------------------|
| $I_{RMS}$  | per pin                                                    | 100             | A                  |
| $T_{VJ}$   |                                                            | -40...+150      | $^{\circ}\text{C}$ |
| $T_{stg}$  |                                                            | -40...+125      | $^{\circ}\text{C}$ |
| $V_{ISOL}$ | $I_{ISOL} \leq 1\text{ mA}$ ; 50/60 Hz; $t = 1\text{ min}$ | 3600            | V~                 |
| $M_d$      | Mounting torque (M5)                                       | 2 - 2.5         | Nm                 |

| Symbol     | Conditions | Characteristic Values |      |      |
|------------|------------|-----------------------|------|------|
|            |            | min.                  | typ. | max. |
| $d_A, d_S$ |            | 5                     |      | mm   |
| Weight     |            |                       | 35   | g    |

## Equivalent Circuits for Simulation

### Conduction



### D1 - D6

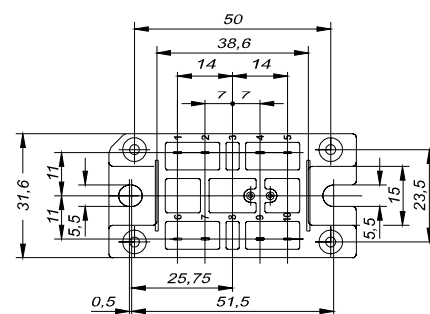
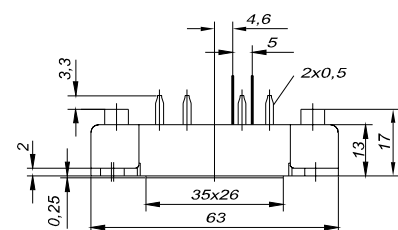
Diode (typ. at  $T_J = 125^{\circ}\text{C}$ )  
 $V_0 = 0.85\text{ V}$ ;  $R_0 = 7\text{ m}\Omega$

### T/D

IGBT (typ. at  $V_{GE} = 15\text{ V}$ ;  $T_J = 125^{\circ}\text{C}$ )  
 $V_0 = 1.0\text{ V}$ ;  $R_0 = 45\text{ m}\Omega$

Free Wheeling Diode (typ. at  $T_J = 125^{\circ}\text{C}$ )  
 $V_0 = 1.25\text{ V}$ ;  $R_0 = 32\text{ m}\Omega$

## Dimensions in mm (1 mm = 0.0394")



## Input Rectifier D1-D6

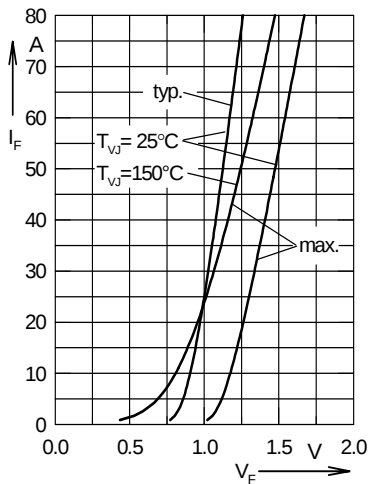


Fig. 1 Forward current versus voltage drop per rectifier diode

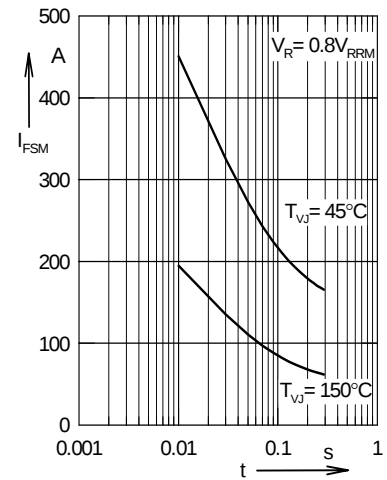


Fig. 2 Surge overload current per rectifier diode

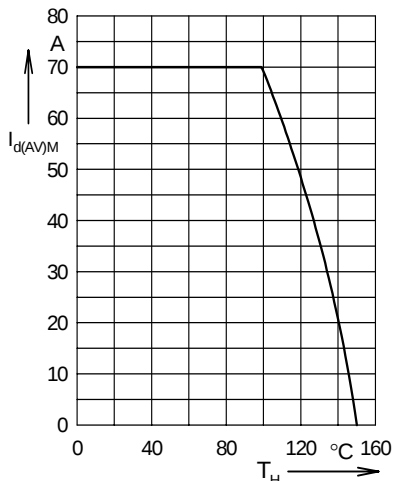


Fig. 3 Maximum forward current versus heatsink temperature (Rectifier bridge)

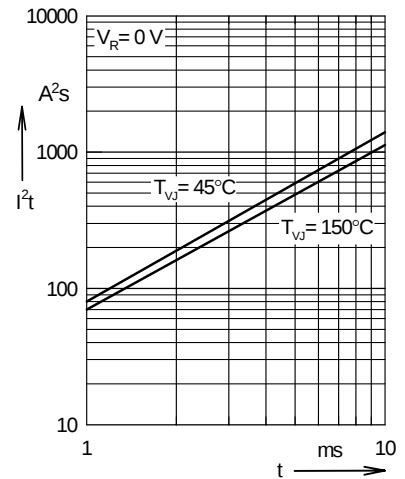


Fig. 4  $I^2t$  versus time per rectifier diode

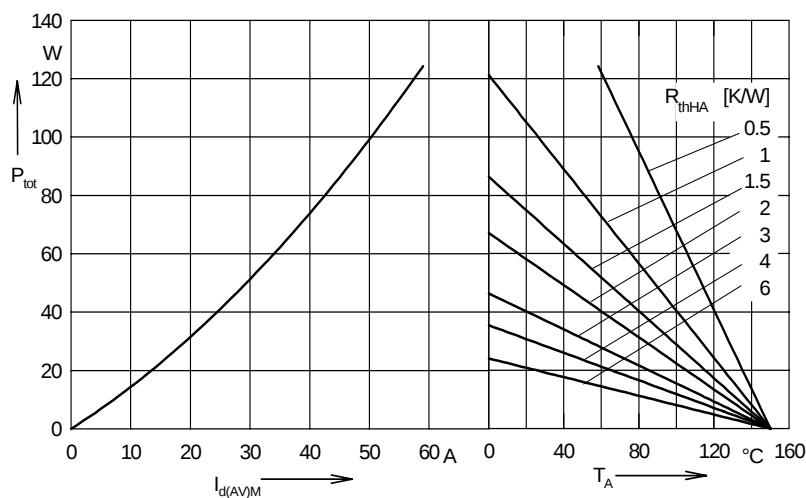


Fig. 5 Power dissipation versus direct output current and ambient temperature (Rectifier bridge)

Note:  
transient thermal impedance  
see next page

## Chopper T - D

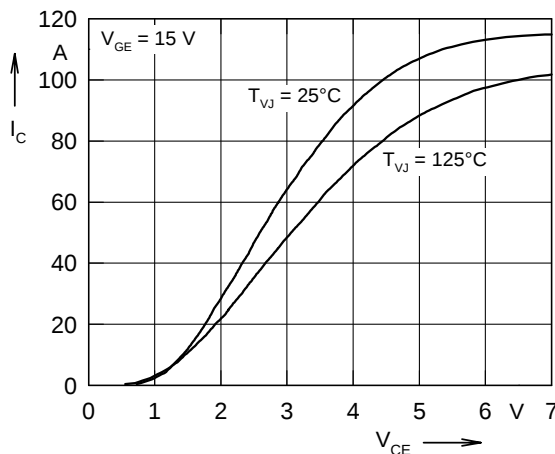


Fig. 6 Typ. IGBT output characteristics

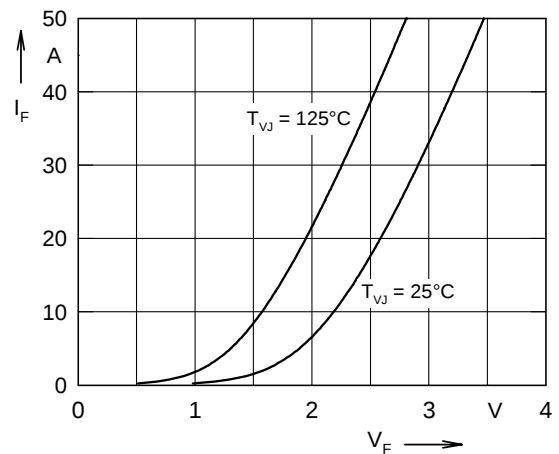


Fig. 7 Typ. forward characteristics of free wheeling diode

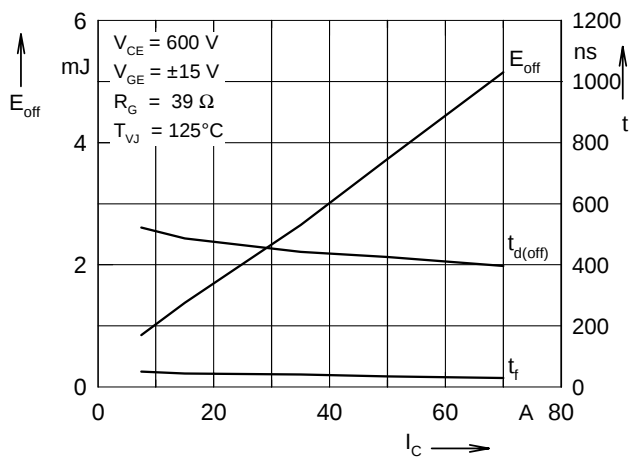


Fig. 8 Typ. IGBT turn off energy and switching times versus collector current

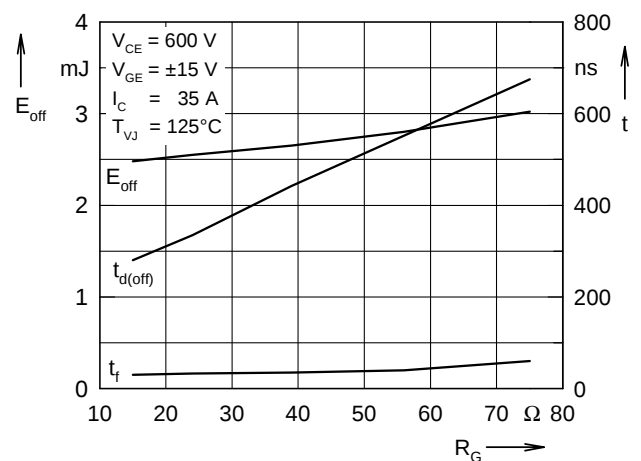


Fig. 9 Typ. IGBT turn off energy and switching times versus gate resistor

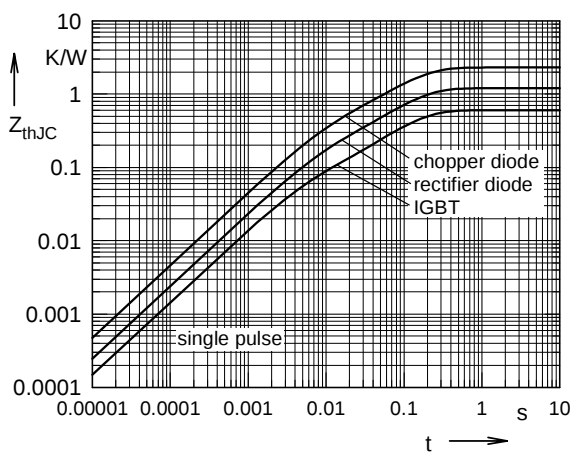


Fig. 10 Typ. transient thermal impedance

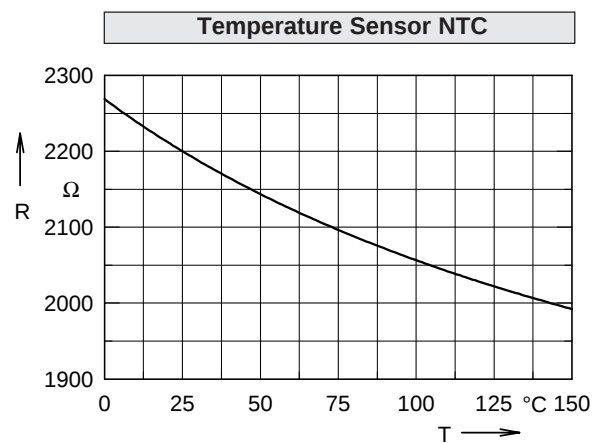


Fig. 11 Typ. thermistorresistance versus temperature

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