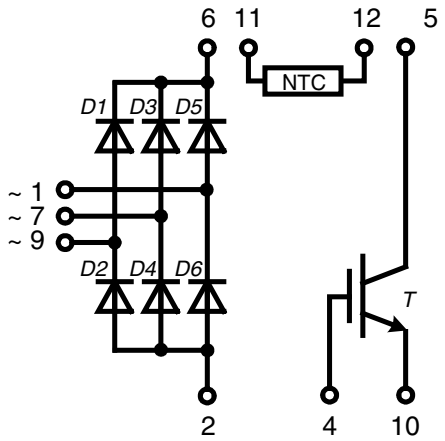
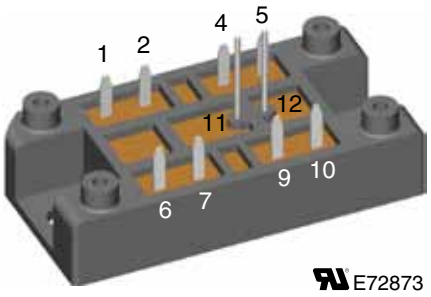
# Three Phase Rectifier Bridge
## with Brake IGBT

$V_{RRM}$ = 1600 V
$I_{dAVM}$ = 110 A

**Part name** (Marking on product)

VUI72-16NOXT




**Features:**

- Three phase mains rectifier
- Brake IGBT
  with low saturation voltage

**Application:**

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

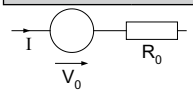
**Package:**

- High level of integration
- Solder terminals for PCB mounting
- UL registered E72873
- Isolated DCB ceramic base plate
- Large creepage and strike distances
- High reliability

## Chopper IGBT T

| Symbol | Definitions | Conditions | | min. | Ratings typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CES}$ | *collector emitter voltage* | | $T_{VJ}$ = 25°C to 150°C | | | 1200 | V |
| $V_{GES}$ | *max. DC gate voltage* | continuous | | -20 | | +20 | V |
| $I_{C25}$ | *collector current* | DC | $T_C$ = 25°C | | | 58 | A |
| $I_{C80}$ | | DC | $T_C$ = 80°C | | | 40 | A |
| $V_{CE(sat)}$ | *collector emitter saturation voltage* | $I_C$ = 35 A; $V_{GE}$ = 15 V | $T_{VJ}$ = 25°C | | 1.85 | 2.2 | V |
| | | | $T_{VJ}$ = 125°C | | 2.15 | | |
| $V_{GE(th)}$ | *gate emitter threshold voltage* | $I_C$ = 1 mA | $T_{VJ}$ = 25°C | 5.4 | | 6.5 | V |
| $I_{CES}$ | *collector emitter leakage current* | $V_{CE}$ = $V_{CES}$; $V_{GE}$ = 0 V | $T_{VJ}$ = 25°C | | | 0.1 | mA |
| | | | $T_{VJ}$ = 125°C | | 0.1 | | mA |
| $I_{GES}$ | *gate emitter leakage current* | $V_{CE}$ = 0 V; $V_{GE}$ = ±20 V | | | | 500 | nA |
| $t_{d(on)}$ | *turn-on delay time* | inductive load | $T_{VJ}$ = 125°C | | 70 | | ns |
| $t_r$ | *current rise time* | $V_{CE}$ = 600 V; $I_C$ = 35 A | | | 40 | | ns |
| $t_{d(off)}$ | *turn-off delay time* | $V_{GE}$ = ±15 V; $R_G$ = 27 Ω; L = 100 µH | | | 250 | | ns |
| $t_f$ | *current fall time* | | | | 100 | | ns |
| $E_{on}$ | *turn-on energy per pulse* | | | | 3.8 | | mJ |
| $E_{off}$ | *turn-off energy per pulse* | | | | 4.1 | | mJ |
| $Q_{Gon}$ | | $V_{CE}$ = 600 V; $V_{GE}$ = 15 V; $I_C$ = 35 A | | | 110 | | nC |
| $I_{CM}$ | *reverse bias safe operating area* | RBSOA; $V_{GE}$ = ±15 V; $R_G$ = 27 Ω; L = 100 µH | | | 70 | | A |
| $V_{CEK}$ | | clamped inductive load; | $T_{VJ}$ = 125°C | | ≤ $V_{CES}$-$L_S$·$d_I$/dt | | V |
| $t_{SC}$ (SCSOA) | *short circuit safe operating area* | $V_{CE}$ = 900 V; $V_{GE}$ = ±15 V; $R_G$ = 27 Ω; non-repetitive | $T_{VJ}$ = 125°C | | | 10 | µs |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0.65 | K/W |
| $R_{thJH}$ | *thermal resistance case to heatsink* | with heat transfer paste, see mounting instructions | | | 0.9 | | K/W |

## Equivalent Circuits for Simulation




| Symbol | Definitions | Conditions | | min. | Ratings typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_0$ | *Diode* | D1 - D6 | $T_{VJ}$ = 125°C | | 0.85 | | V |
| $R_0$ | | | | | 7 | | mΩ |
| $V_0$ | *IGBT* | T | $T_{VJ}$ = 150°C | | 1.1 | | V |
| $R_0$ | | | | | 40 | | mΩ |

## Input Rectifier Diode D1 - D6

| Symbol | Conditions | | | Ratings min. | typ. | max. | |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | *max. repetitive reverse voltage* | | $T_{VJ}$ = 25°C | | | 1600 | V |
| $I_{FAV}$ | *average forward current* | sine 180° | $T_C$ = 80°C | | | 40 | A |
| $I_{D(AV)M}$ | *max. average DC output current* | rectangular; d = $^1/_3$; bridge | $T_C$ = 80°C | | | 110 | A |
| $I_{FSM}$ | *max. surge forward current* | t = 10 ms; sine 50 Hz | $T_{VJ}$ = 25°C | | | 530 | A |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 100 | W |
| $I_R$ | *reverse current* | $V_R = V_{RRM}$ | $T_{VJ}$ = 25°C | | | 0.02 | mA |
| | | $V_R = 0.8 \cdot V_{RRM}$ | $T_{VJ}$ = 125°C | | 0.4 | | mA |
| $V_F$ | *forward voltage* | $I_F$ = 25 A | $T_{VJ}$ = 25°C | | 1.0 | 1.1 | V |
| | | | $T_{VJ}$ = 125°C | | 0.9 | | V |
| $R_{thJC}$ | *thermal resistance junction to case* | per diode | $T_{VJ}$ = 25°C | | | 1.2 | K/W |
| $R_{thJH}$ | *thermal resistance case to heatsink* | with heat transfer paste | $T_{VJ}$ = 25°C | | | 1.42 | K/W |

## Temperature Sensor NTC

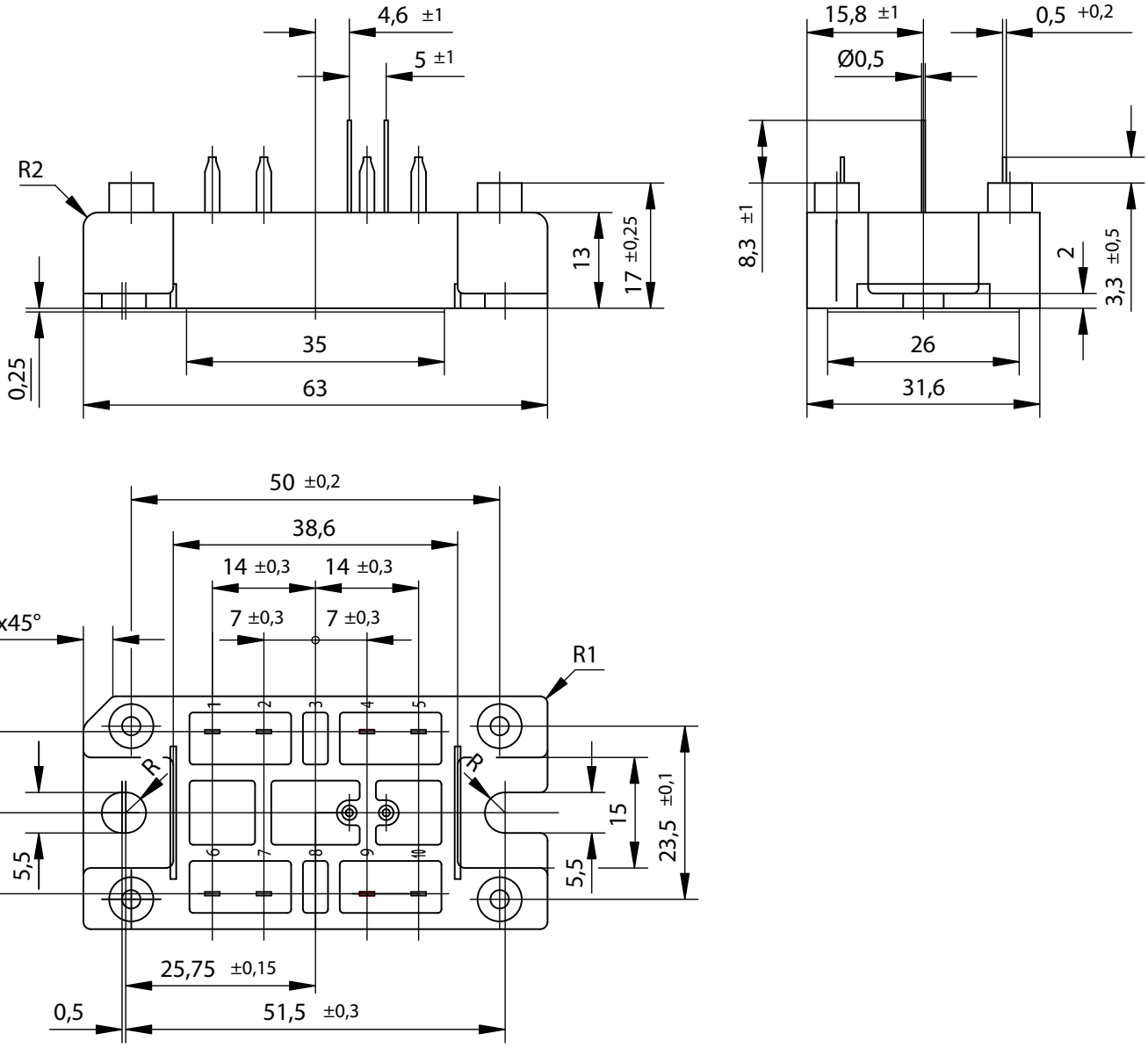
| Symbol | Definitions | Conditions | | Ratings min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $R_{25}$ | *resistance* | $\left\{R(T) = R_{25} \cdot e^{B_{25/100}\left[\frac{1}{T} - \frac{1}{298K}\right]}\right\}$ | T = 25°C | | 2.2 | | kΩ |
| $B_{25/100}$ | | | | | 3560 | | K |

## Module

| Symbol | Definitions | Conditions | | Ratings min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_{RMS}$ | *RMS current* | per pin | | | | 100 | A |
| $T_{VJ}$ | *operating temperature* | | | -40 | | 150 | °C |
| $T_{VJM}$ | *max. virtual junction temperature* | | | | | 150 | °C |
| $T_{stg}$ | *storage temperature* | | | -40 | | 125 | °C |
| $V_{ISOL}$ | *isolation voltage* | $I_{ISOL} \leq$ 1 mA; 50/60 Hz; | t = 1 min | | | 3600 | V~ |
| $M_d$ | *mounting torque* | (M5) | | 2 | | 2.5 | Nm |
| $d_S$ | *creep distance on surface* | | | 5 | | | mm |
| $d_A$ | *strike distance through air* | | | 5 | | | mm |
| **Weight** | | | | | 35 | | g |

## Outline Drawing

Dimensions in mm (1 mm = 0.0394“)




## Product Marking

| Ordering | Part Name | Marking on Product | Delivering Mode | Base Qty | Ordering Code |
|---|---|---|---|---|---|
| Standard | VUI 72-16NOXT | VUI72-16NOXT | Box | 10 | 510748 |

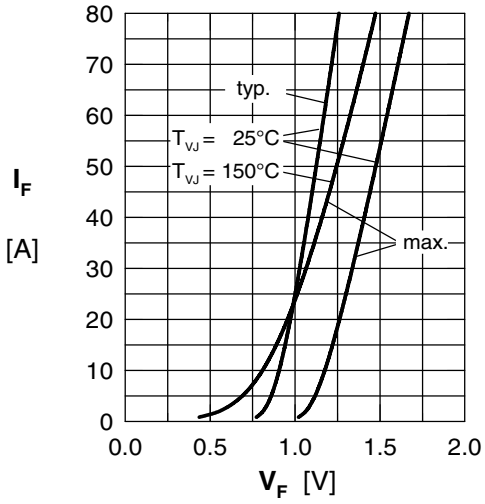



Fig. 1 Forward current vs. voltage drop per rectifier diode

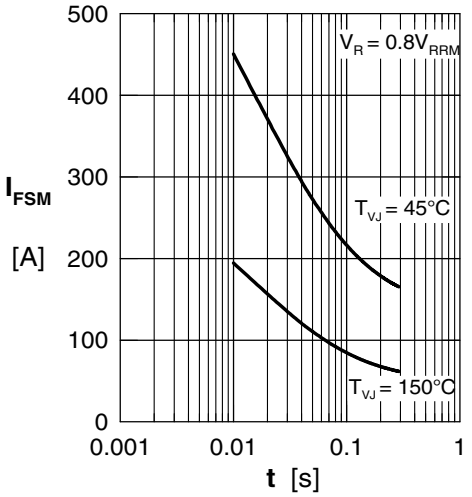



Fig. 2 Surge overload current per rectifier diode

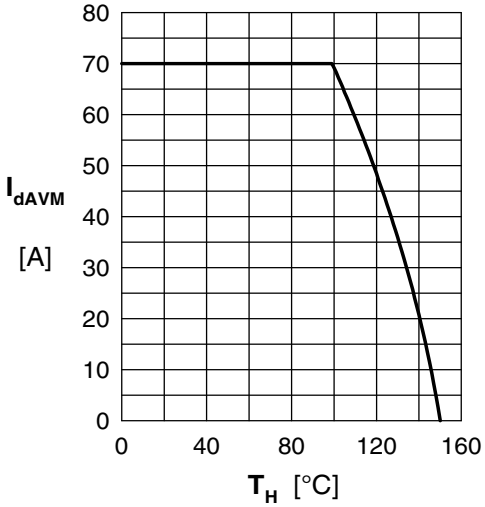



Fig. 3 Max. forward current vs. heatsink temperature (Rectifier bridge)

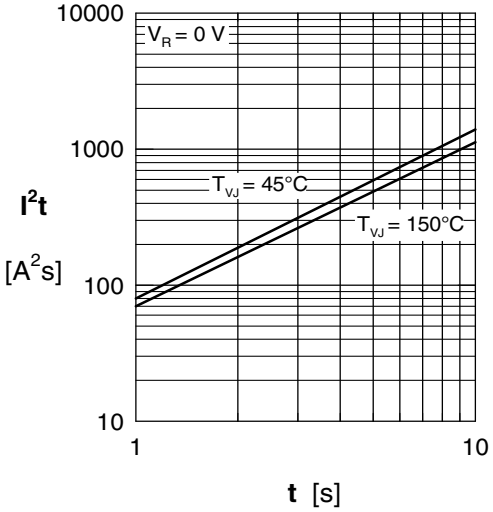



Fig. 4 $I^2t$ versus time per rectifier diode

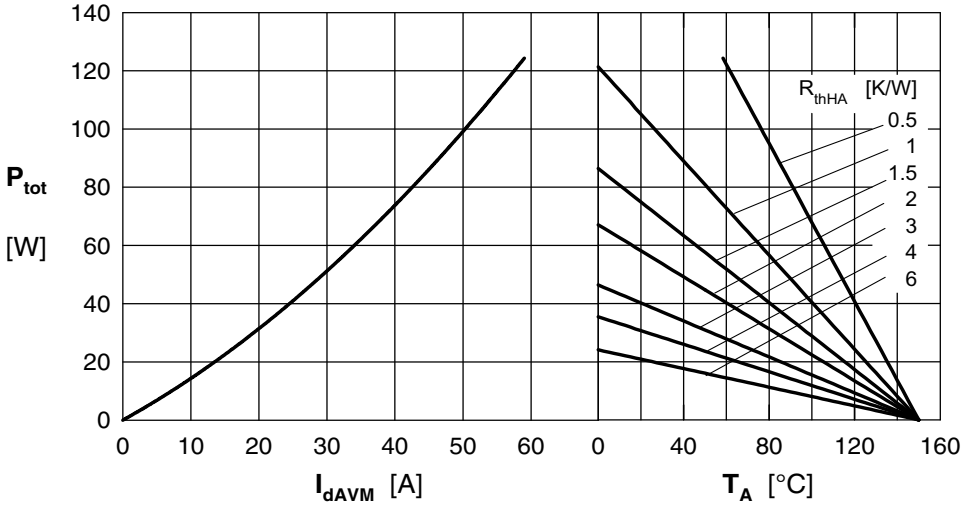



Fig. 5 Power dissipation vs. direct output current & ambient temperature (Rectifier bridge)

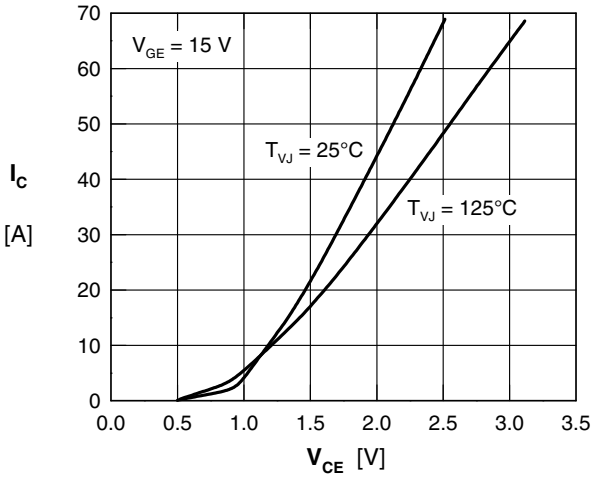



Fig. 6 IGBT, typ. output characteristics

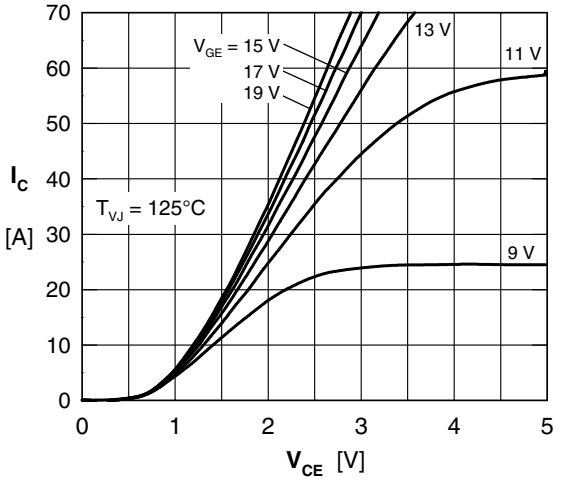



Fig. 7 IGBT, typ. output characteristics

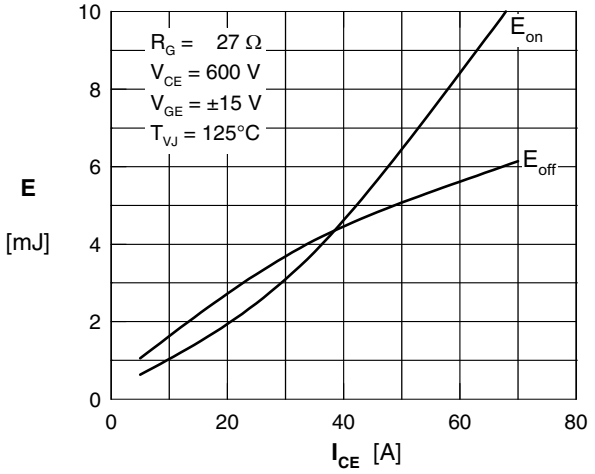



Fig. 8 IGBT, typ. switching energy versus collector current

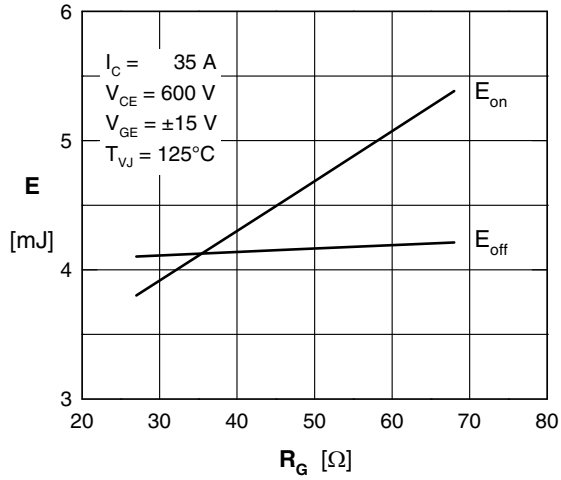



Fig. 9 IGBT, typ. switching energy versus gate resistance

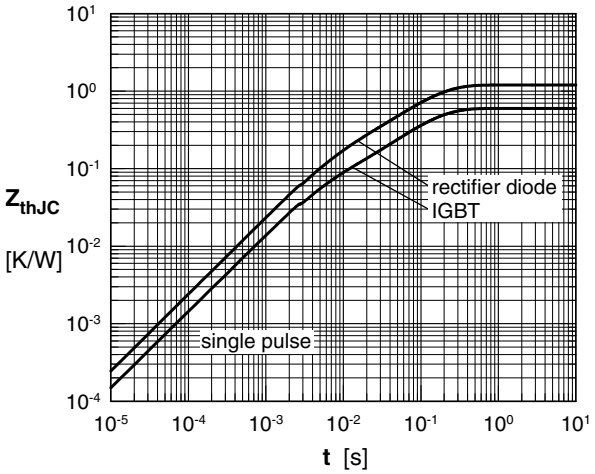



Fig. 10 Typ. transient thermal impedance

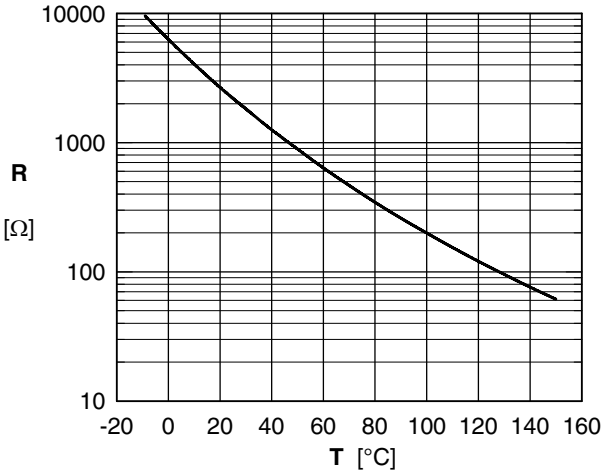



Fig. 11 Typ. thermistor resistance vs. temperature