

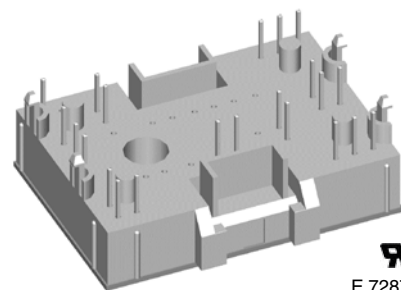
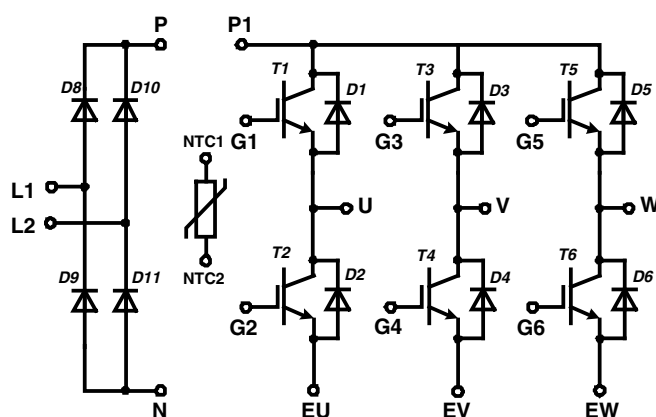
# Converter - Inverter Module

## NPT IGBT

| Single Phase Rectifier      | Three Phase Inverter          |
|-----------------------------|-------------------------------|
| $V_{RRM} = 1600 \text{ V}$  | $V_{CES} = 600 \text{ V}$     |
| $I_{DAVM25} = 65 \text{ A}$ | $I_{C25} = 23 \text{ A}$      |
| $I_{FSM} = 550 \text{ A}$   | $V_{CE(sat)} = 2.1 \text{ V}$ |

**Part name** (Marking on product)

MIAA15WD600TMH



E 72873

Pin configuration see outlines.

### Features:

- High level of integration - only one power semiconductor module required for the whole drive
- Inverter with NPT IGBTs
  - low saturation voltage
  - positive temperature coefficient
  - fast switching
  - short tail current
- Epitaxial free wheeling diodes with hiperfast soft reverse recovery
- Temperature sense included

### Application:

- AC motor drives
- Pumps, Fans
- Washing machines
- Air-conditioning system
- Inverter and power supplies

### Package:

- "Mini" package
- Assembly height is 17 mm
- Insulated base plate
- Pins suitable for wave soldering and PCB mounting
- Assembly clips available
  - IXKU 5-505 screw clamp
  - IXRB 5-506 click clamp
- UL registered E72873

**Output Inverter T1 - T6**

| Symbol                                 | Definitions                           | Conditions  | Ratings   |            |  | Unit   |          |
|--|---------------------------------------|---|---|------------|--|--------|----------|
|  |                                       |   | min.  | typ.       | max.                                     |        |          |
| $V_{CES}$                              | collector emitter voltage             |   | $T_{VJ} = 150^{\circ}\text{C}$                                  |            | 600                                      | V      |          |
| $V_{GES}$                              | max. DC gate voltage                  | continuous  |   |            | $\pm 20$                                 | V      |          |
| $V_{GEM}$                              | max. transient collector gate voltage | transient   |   |            | $\pm 30$                                 | V      |          |
| $I_{C25}$                              | collector current                     |   | $T_C = 25^{\circ}\text{C}$                                      |            | 23                                       | A      |          |
| $I_{C80}$                              |                                       |   | $T_C = 80^{\circ}\text{C}$                                      |            | 16                                       | A      |          |
| $P_{tot}$                              | total power dissipation               |   | $T_C = 25^{\circ}\text{C}$                                      |            | 80                                       | W      |          |
| $V_{CE(sat)}$                          | collector emitter saturation voltage  | $I_C = 15\text{ A}; V_{GE} = 15\text{ V}$   | $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$ | 2.1<br>2.3 | 2.5                                      | V<br>V |          |
| $V_{GE(th)}$                           | gate emitter threshold voltage        | $I_C = 0.4\text{ A}; V_{GE} = V_{CE}$   | $T_{VJ} = 25^{\circ}\text{C}$                                   | 4.5        | 5.5                                      | 6.5    | V        |
| $I_{CES}$                              | collector emitter leakage current     | $V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$   | $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$ |            | 1.0                                      | 0.6    | mA<br>mA |
| $I_{GES}$                              | gate emitter leakage current          | $V_{GE} = \pm 20\text{ V}$  |   |            | 150                                      | nA     |          |
| $C_{ies}$                              | input capacitance                     | $V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$   |   |            | 700                                      | pF     |          |
| $Q_{G(on)}$                            | total gate charge                     | $V_{CE} = 300\text{ V}; V_{GE} = 15\text{ V}; I_C = 15\text{ A}$  |   |            | 57                                       | nC     |          |
| $t_{d(on)}$                            | turn-on delay time                    | inductive load<br>$V_{CE} = 300\text{ V}; I_C = 15\text{ A}$<br>$V_{GE} = \pm 15\text{ V}; R_G = 68\ \Omega$    | $T_{VJ} = 25^{\circ}\text{C}$                                   |            | 40                                       | ns     |          |
| $t_r$                                  | current rise time                     |   |   |            | 45                                       | ns     |          |
| $t_{d(off)}$                           | turn-off delay time                   |   |   |            | 155                                      | ns     |          |
| $t_f$                                  | current fall time                     |   |   |            | 95                                       | ns     |          |
| $E_{on}$                               | turn-on energy per pulse              |   |   |            | 0.35                                     | mJ     |          |
| $E_{off}$                              | turn-off energy per pulse             |   |   |            | 0.27                                     | mJ     |          |
| $t_{d(on)}$                            | turn-on delay time                    | inductive load<br>$V_{CE} = 300\text{ V}; I_C = 15\text{ A}$<br>$V_{GE} = \pm 15\text{ V}; R_G = 68\ \Omega$    | $T_{VJ} = 125^{\circ}\text{C}$                                  |            | 40                                       | ns     |          |
| $t_r$                                  | current rise time                     |   |   |            | 45                                       | ns     |          |
| $t_{d(off)}$                           | turn-off delay time                   |   |   |            | 160                                      | ns     |          |
| $t_f$                                  | current fall time                     |   |   |            | 120                                      | ns     |          |
| $E_{on}$                               | turn-on energy per pulse              |   |   |            | 0.55                                     | mJ     |          |
| $E_{off}$                              | turn-off energy per pulse             |   |   |            | 0.4                                      | mJ     |          |
| <b>RBSOA</b>                           | reverse bias safe operating area      | $V_{GE} = \pm 15\text{ V}; R_G = 68\ \Omega; I_C = 30\text{ A}$   | $T_{VJ} = 125^{\circ}\text{C}$                                  |            | $V_{CEK} \leq V_{CES} - L_S \cdot di/dt$ | V      |          |
| <b><math>I_{SC}</math><br/>(SCSOA)</b> | short circuit safe operating area     | $V_{CE} = 360\text{ V}; V_{GE} = \pm 15\text{ V};$<br>$R_G = 68\ \Omega; t_p = 10\ \mu\text{s};$ non-repetitive | $T_{VJ} = 125^{\circ}\text{C}$                                  |            | 65                                       | A      |          |
| $R_{thJC}$                             | thermal resistance junction to case   | (per IGBT)  |   |            | 1.6                                      | K/W    |          |
| $R_{thCH}$                             | thermal resistance case to heatsink   |   |   | 0.55       |  | K/W    |          |

**Output Inverter D1 - D6**

| Symbol     | Definitions                         | Conditions  | Ratings   |            |      | Unit          |
|------------|-------------------------------------|---|---|------------|------|---------------|
|            |                                     |   | min.  | typ.       | max. |               |
| $V_{RRM}$  | max. repetitive reverse voltage     |   | $T_{VJ} = 150^{\circ}\text{C}$                                  |            | 600  | V             |
| $I_{F25}$  | forward current                     |   | $T_C = 25^{\circ}\text{C}$                                      |            | 37   | A             |
| $I_{F80}$  |                                     |   | $T_C = 80^{\circ}\text{C}$                                      |            | 24   | A             |
| $V_F$      | forward voltage                     | $I_F = 15\text{ A}; V_{GE} = 0\text{ V}$  | $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$ | 1.8<br>1.3 | 2.1  | V<br>V        |
| $Q_{rr}$   | reverse recovery charge             | $V_R = 300\text{ V}$<br>$di_F/dt = -380\text{ A}/\mu\text{s}$<br>$I_F = 15\text{ A}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 125^{\circ}\text{C}$                                  |            | 0.58 | $\mu\text{C}$ |
| $I_{RM}$   | max. reverse recovery current       |   |   |            | 11.5 | A             |
| $t_{rr}$   | reverse recovery time               |   |   |            | 115  | ns            |
| $E_{rec}$  | reverse recovery energy             |   |   |            | 50   | $\mu\text{J}$ |
| $R_{thJC}$ | thermal resistance junction to case | (per diode)   |   |            | 1.6  | K/W           |
| $R_{thCH}$ | thermal resistance case to heatsink |   |   | 0.55       |      | K/W           |

 $T_C = 25^{\circ}\text{C}$  unless otherwise stated

**Input Rectifier Bridge D8 - D11**

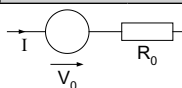
| Symbol     | Definitions                         | Conditions              | Ratings   |            |             | Unit   |
|------------|-------------------------------------|-------------------------|---|------------|-------------|--|
|            |                                     |                         | min.  | typ.       | max.        |  |
| $V_{RRM}$  | max. repetitive reverse voltage     |                         | $T_{VJ} = 25^{\circ}\text{C}$                                   |            | 1600        | V  |
| $I_{FAV}$  | average forward current             | sine $180^{\circ}$      | $T_C = 80^{\circ}\text{C}$                                      |            | 39          | A  |
| $I_{DAVM}$ | max. average DC output current      | rect.; $d = 1/2$        | $T_C = 80^{\circ}\text{C}$                                      |            | 42          | A  |
| $I_{FSM}$  | max. forward surge current          | $t = 10$ ms; sine 50 Hz | $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$ |            | 550<br>tbd  | A<br>A                                       |
| $I^2t$     | $I^2t$ value for fusing             | $t = 10$ ms; sine 50 Hz | $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$ |            | 1270<br>tbd | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |
| $P_{tot}$  | total power dissipation             |                         | $T_C = 25^{\circ}\text{C}$                                      |            | 100         | W  |
| $V_F$      | forward voltage                     | $I_F = 30$ A            | $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$ | 1.2<br>1.3 | 1.5         | V<br>V                                       |
| $I_R$      | reverse current                     | $V_R = V_{RRM}$         | $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$ | 0.3        | 0.03        | mA<br>mA                                     |
| $R_{thJC}$ | thermal resistance junction to case | (per diode)             |   | 0.4        | 1.2         | K/W  |
| $R_{thCH}$ | thermal resistance case to heatsink | (per diode)             |   |            |             | K/W  |

**Temperature Sensor NTC**

| Symbol      | Definitions | Conditions | Ratings                    |      |      | Unit              |
|-------------|-------------|------------|----------------------------|------|------|-------------------|
|             |             |            | min.                       | typ. | max. |                   |
| $R_{25}$    | resistance  |            | $T_C = 25^{\circ}\text{C}$ | 4.75 | 5.0  | $5.25$ k $\Omega$ |
| $B_{25/50}$ |             |            |                            |      | 3375 | K                 |

**Module**

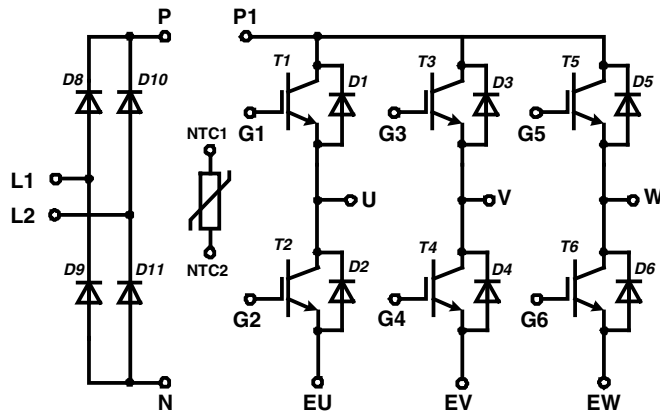
| Symbol     | Definitions                       | Conditions                     | Ratings |      |      | Unit               |
|------------|-----------------------------------|--------------------------------|---------|------|------|--------------------|
|            |                                   |                                | min.    | typ. | max. |                    |
| $T_{VJ}$   | operating temperature             |                                | -40     |      | 125  | $^{\circ}\text{C}$ |
| $T_{VJM}$  | max. virtual junction temperature |                                |         |      | 150  | $^{\circ}\text{C}$ |
| $T_{stg}$  | storage temperature               |                                | -40     |      | 125  | $^{\circ}\text{C}$ |
| $V_{ISOL}$ | isolation voltage                 | $I_{ISOL} \leq 1$ mA; 50/60 Hz |         |      | 2500 | V~                 |
| CTI        | comparative tracking index        |                                |         | -    |      |                    |
| $F_C$      | mounting force                    |                                | 40      |      | 80   | N                  |
| $d_S$      | creep distance on surface         |                                | 12.7    |      |      | mm                 |
| $d_A$      | strike distance through air       |                                | 12      |      |      | mm                 |
| Weight     |                                   |                                |         | 35   |      | g                  |

**Equivalent Circuits for Simulation**


| Symbol | Definitions         | Conditions | Ratings                        |      |      | Unit             |
|--------|---------------------|------------|--------------------------------|------|------|------------------|
|        |                     |            | min.                           | typ. | max. |                  |
| $V_0$  | rectifier diode     | D8 - D11   | $T_{VJ} = 125^{\circ}\text{C}$ | 0.9  |      | V                |
| $R_0$  |                     |            |                                | 6    |      | $\text{m}\Omega$ |
| $V_0$  | IGBT                | T1 - T6    | $T_{VJ} = 125^{\circ}\text{C}$ | 1.15 |      | V                |
| $R_0$  |                     |            |                                | 77   |      | $\text{m}\Omega$ |
| $V_0$  | free wheeling diode | D1 - D6    | $T_{VJ} = 125^{\circ}\text{C}$ | 1.05 |      | V                |
| $R_0$  |                     |            |                                | 30   |      | $\text{m}\Omega$ |

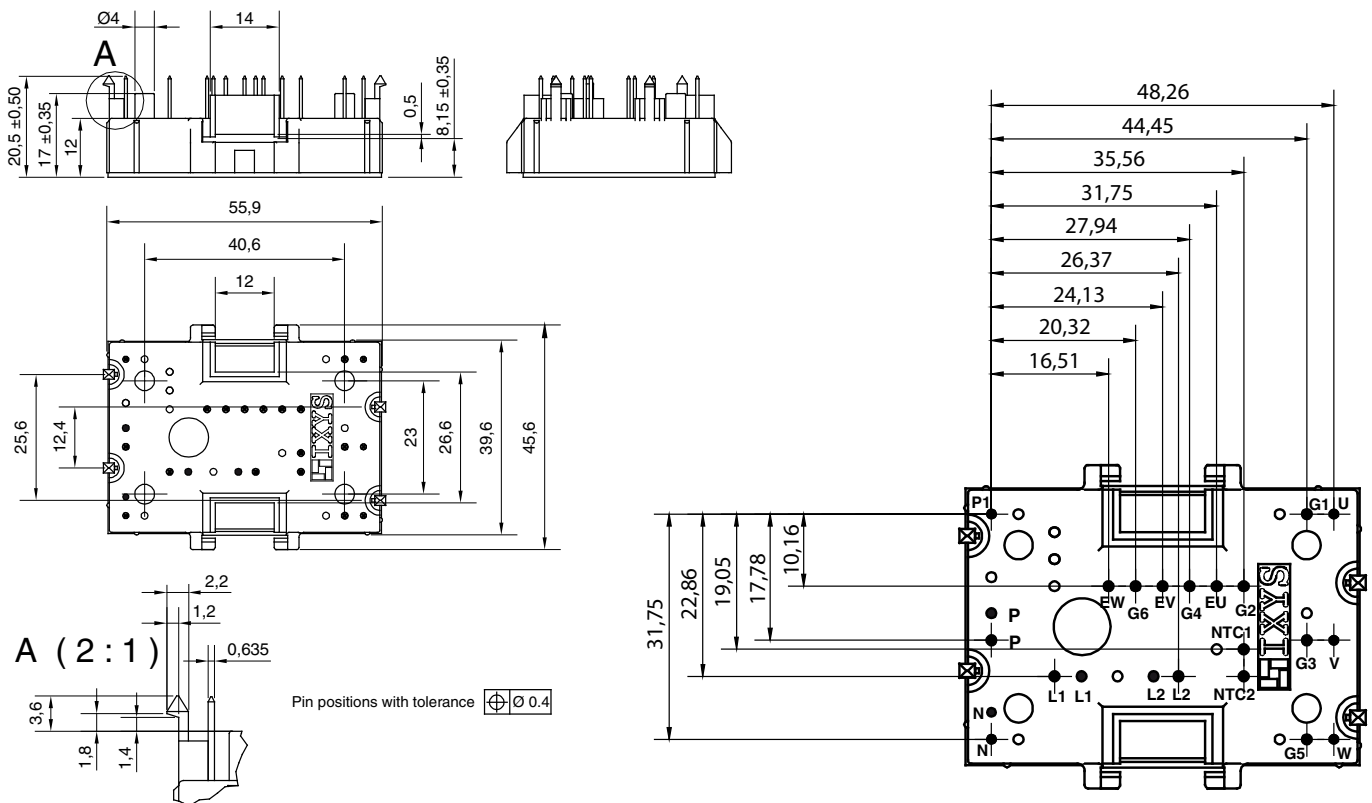
 $T_C = 25^{\circ}\text{C}$  unless otherwise stated

### Circuit Diagram

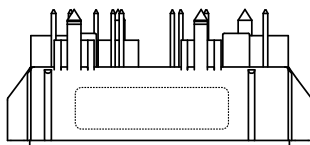


### Outline Drawing

Dimensions in mm (1 mm = 0.0394")



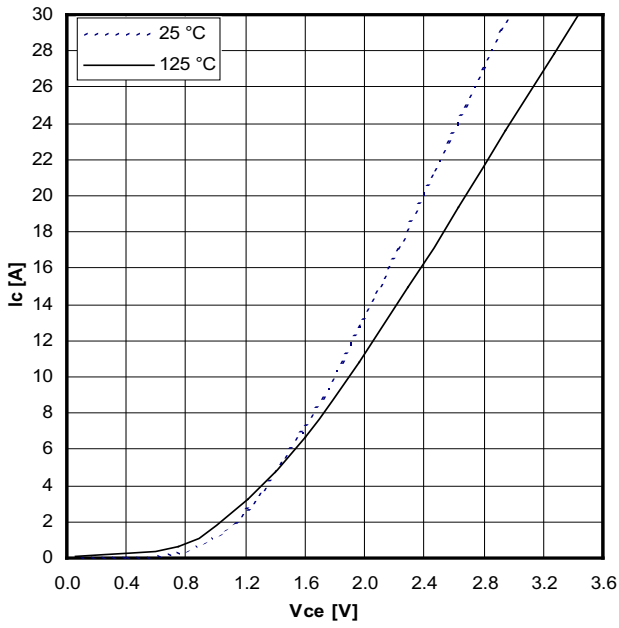
### Product Marking



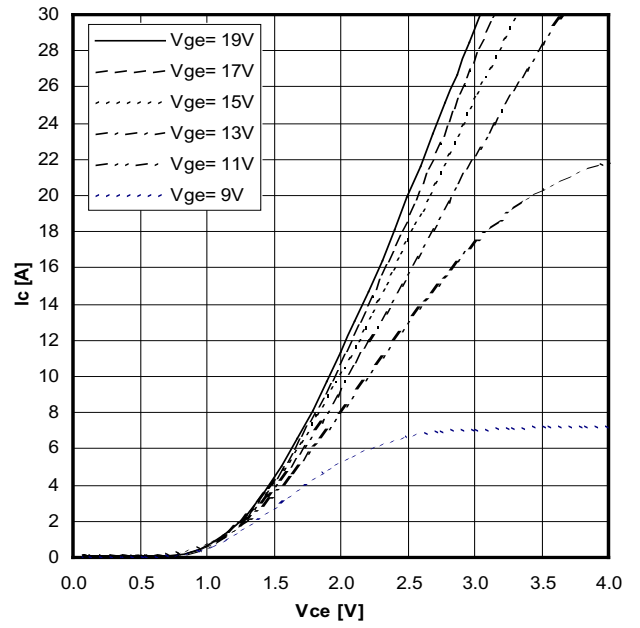
#### Part number

- M = Module
- I = IGBT
- A = IGBT (NPT)
- A = Gen 1 / std
- 15 = Current Rating [A]
- WD = 6-Pack + 1~ Rectifier Bridge
- 600 = Reverse Voltage [V]
- T = NTC
- MH = MiniPack2

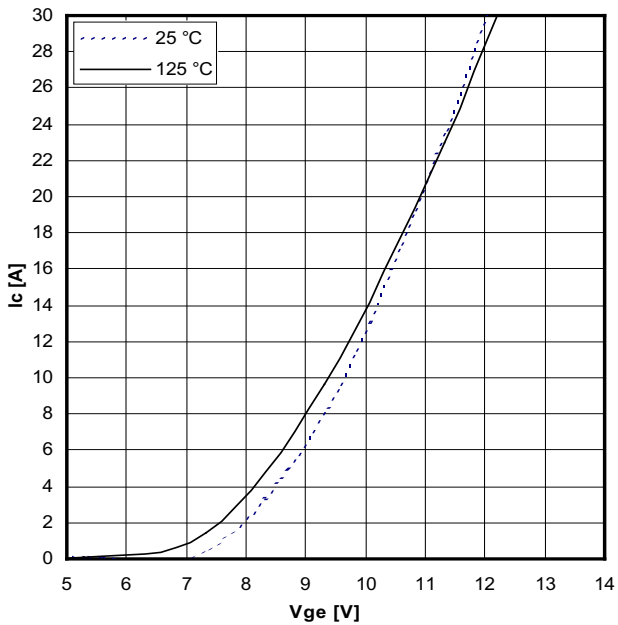
| Ordering | Part Name          | Marking on Product | Delivering Mode | Base Qty | Ordering Code |
|----------|--------------------|--------------------|-----------------|----------|---------------|
| Standard | MIAA 15 WD 600 TMH | MIAA15WD600TMH     | Box             | 20       | 504869        |



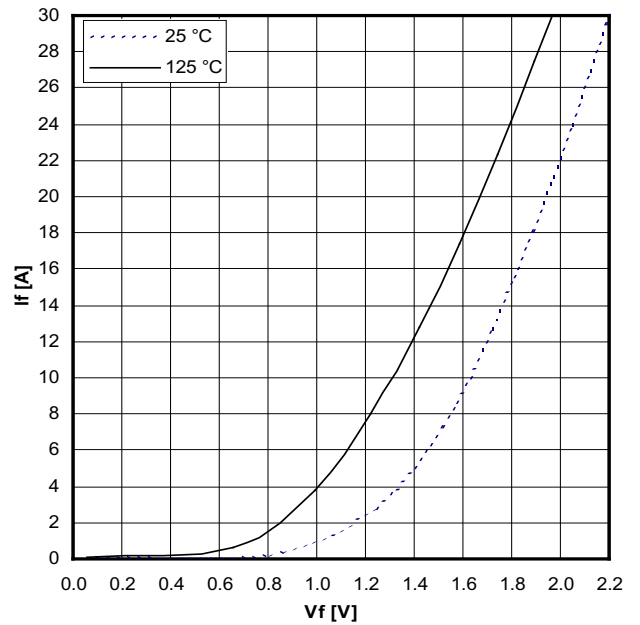
Typical output characteristics,  $V_{GE} = 15\text{ V}$



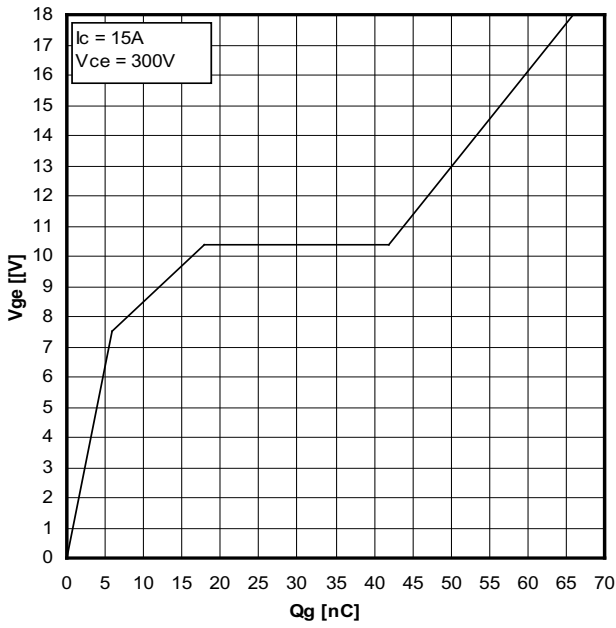
Typical output characteristics ( $125\text{ }^\circ\text{C}$ )



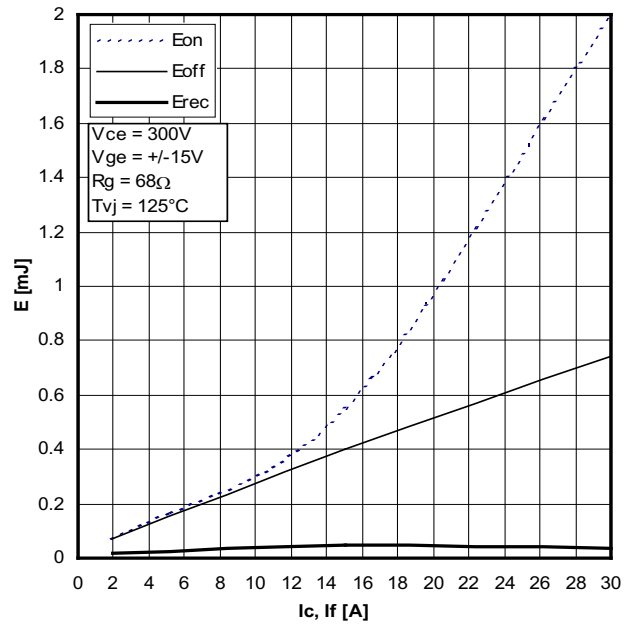
Typical transfer characteristics



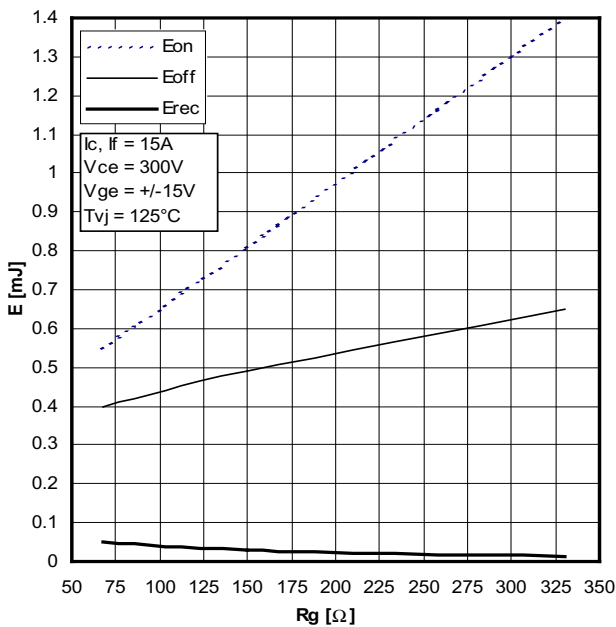
Typical forward characteristics of freewheeling diode



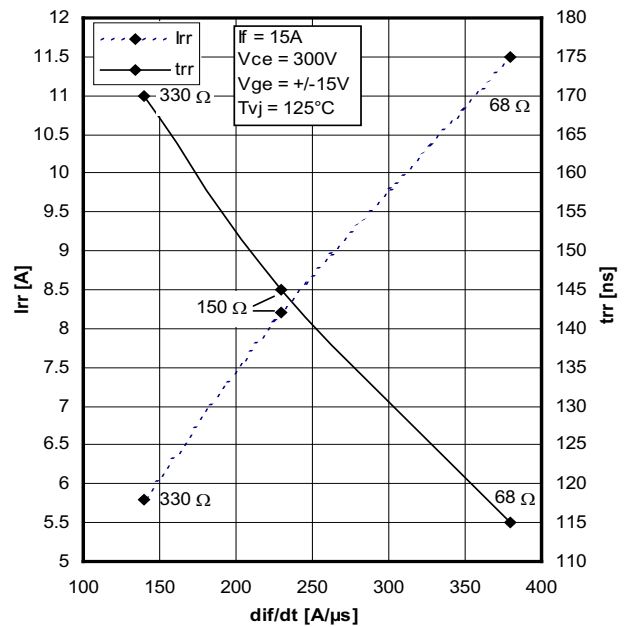
Typical turn on gate charge



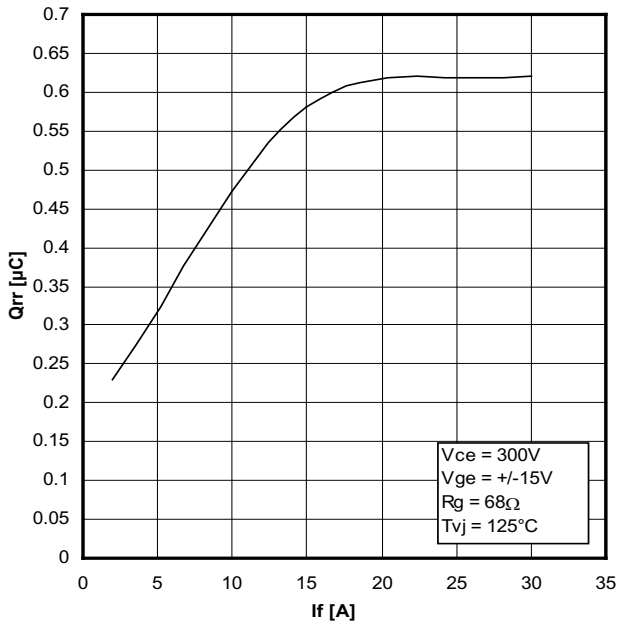
Typical switching energy versus collector current



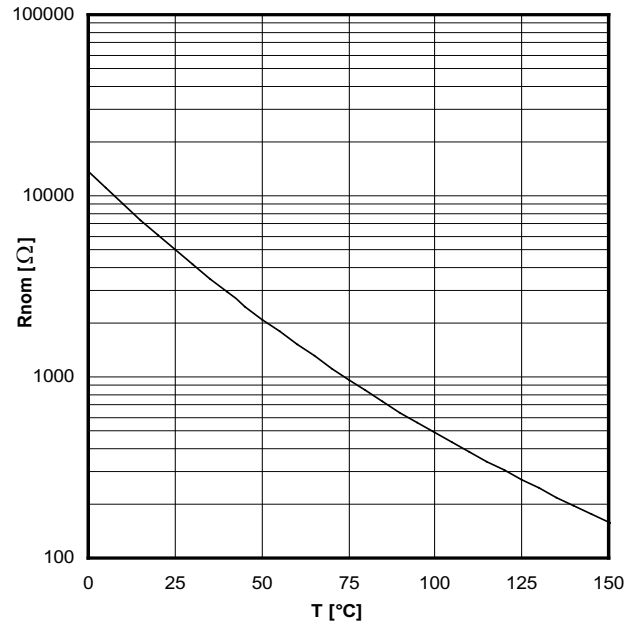
Typical switching energy versus gate resistance



Typical turn-off characteristics of free wheeling diode



Typical turn-off characteristics of free wheeling diode



Typical thermistor resistance versus temperature



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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