

# IGBT Modules in ECO-PAC 2

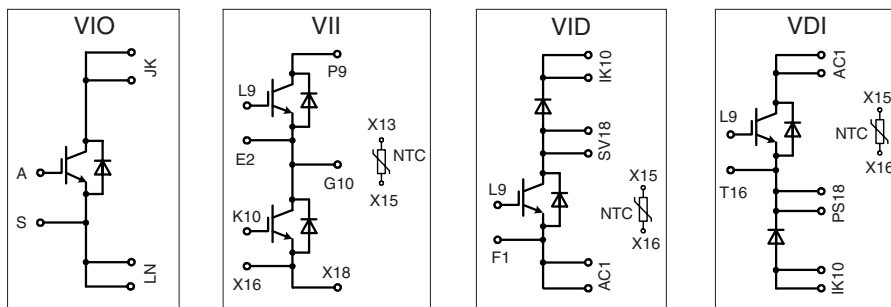
Short Circuit SOA Capability  
Square RBSOA

Preliminary data sheet

$$I_{C25} = 24.5 \text{ A}$$

$$V_{CES} = 600 \text{ V}$$

$$V_{CE(sat) \text{ typ.}} = 2.4 \text{ V}$$



Pin arrangement see outlines

## IGBTs

| Symbol                | Conditions                                                                                                                         | Maximum Ratings |               |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|
| $V_{CES}$             | $T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$                                                                              | 600             | V             |
| $V_{GES}$             |                                                                                                                                    | $\pm 20$        | V             |
| $I_{C25}$             | $T_C = 25^{\circ}\text{C}$                                                                                                         | 24.5            | A             |
| $I_{C80}$             | $T_C = 80^{\circ}\text{C}$                                                                                                         | 17              | A             |
| $I_{CM}$<br>$V_{CEK}$ | $V_{GE} = \pm 15 \text{ V}; R_G = 68 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>RBSOA, Clamped inductive load; $L = 100 \mu\text{H}$ | 30<br>$V_{CES}$ | A             |
| $t_{SC}$<br>(SCSOA)   | $V_{CE} = V_{CES}; V_{GE} = \pm 15 \text{ V}; R_G = 68 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>non-repetitive                     | 10              | $\mu\text{s}$ |
| $P_{tot}$             | $T_C = 25^{\circ}\text{C}$                                                                                                         | 82              | W             |

| Symbol                                                                 | Conditions                                                                                                                                   | Characteristic Values<br>( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) |                                     |                                  |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------|----------------------------------|
|                                                                        |                                                                                                                                              | min.                                                                                   | typ.                                | max.                             |
| $V_{CE(sat)}$                                                          | $I_C = 25 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                   |                                                                                        | 2.4<br>2.9                          | V<br>V                           |
| $V_{GE(th)}$                                                           | $I_C = 0.4 \text{ mA}; V_{GE} = V_{CE}$                                                                                                      | 4.5                                                                                    |                                     | 6.5 V                            |
| $I_{CES}$                                                              | $V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                      |                                                                                        |                                     | 0.6 mA<br>2.7 mA                 |
| $I_{GES}$                                                              | $V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$                                                                                            |                                                                                        |                                     | 100 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>$V_{CE} = 300 \text{ V}; I_C = 15 \text{ A}$<br>$V_{GE} = 15/0 \text{ V}; R_G = 68 \Omega$ |                                                                                        | 30<br>45<br>270<br>40<br>0.7<br>0.5 | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |
| $C_{ies}$                                                              | $V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$                                                                             |                                                                                        | 8                                   | nF                               |
| $R_{thJC}$<br>$R_{thJH}$                                               | (per IGBT)<br>with heatsink compound (0.42 K/m.K; 50 $\mu\text{m}$ )                                                                         |                                                                                        | 3                                   | 1.52 K/W<br>K/W                  |

## Features

- NPT IGBT's
  - positive temperature coefficient of saturation voltage
  - fast switching
- FRED diodes
  - fast reverse recovery
  - low forward voltage
- Industry Standard Package
  - solderable pins for PCB mounting
  - isolated DCB ceramic base plate

## Advantages

- space and weight savings
- reduced protection circuits
- leads with expansion bend for stress relief

## Typical Applications

- AC and DC motor control
- AC servo and robot drives
- power supplies
- welding inverters

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

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## Reverse diodes (FRED)

| Symbol    | Conditions               | Maximum Ratings |   |
|-----------|--------------------------|-----------------|---|
| $I_{F25}$ | $T_C = 25^\circ\text{C}$ | 18.5            | A |
| $I_{F80}$ | $T_C = 80^\circ\text{C}$ | 12.0            | A |

| Symbol                   | Conditions                                                                                                                       | Characteristic Values |      |            |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------|
|                          |                                                                                                                                  | min.                  | typ. | max.       |
| $V_F$                    | $I_F = 15\text{ A}; T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$                                                   | 2.58                  | 2.64 | V          |
| $I_{RM}$<br>$t_{rr}$     | $I_F = 10\text{ A}; di_F/dt = 400\text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$<br>$V_R = 300\text{ V}; V_{GE} = 0\text{ V}$ | 7                     | 70   | A<br>ns    |
| $R_{thJC}$<br>$R_{thJH}$ | with heatsink compound (0.42 K/m.K; 50 $\mu\text{m}$ )                                                                           | 7                     | 3.5  | K/W<br>K/W |

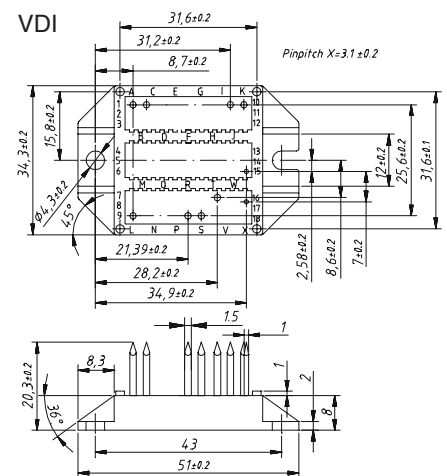
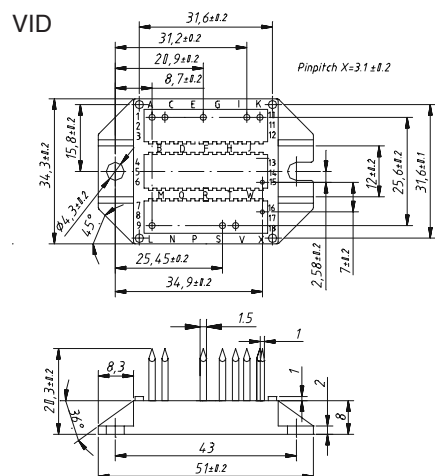
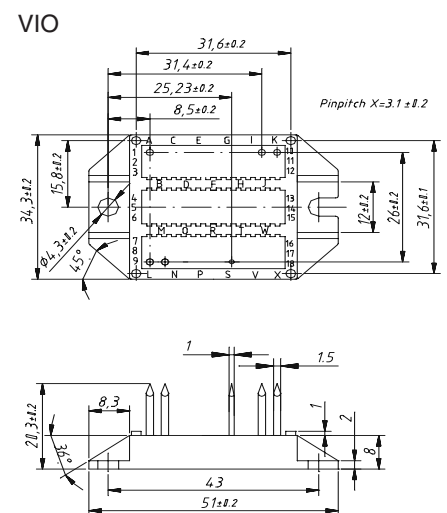
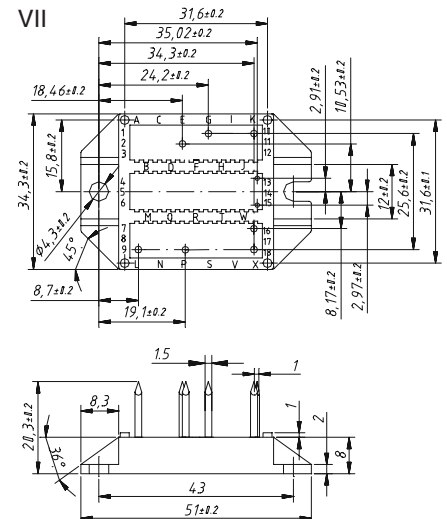
## Temperature Sensor NTC

| Symbol      | Conditions             | Characteristic Values |      |            |
|-------------|------------------------|-----------------------|------|------------|
|             |                        | min.                  | typ. | max.       |
| $R_{25}$    | $T = 25^\circ\text{C}$ | 4.75                  | 5.0  | k $\Omega$ |
| $B_{25/50}$ |                        | 3375                  |      | K          |

## Module

| Symbol     | Conditions                                   | Maximum Ratings |                  |
|------------|----------------------------------------------|-----------------|------------------|
| $T_{VJ}$   |                                              | -40...+150      | $^\circ\text{C}$ |
| $T_{stg}$  |                                              | -40...+150      | $^\circ\text{C}$ |
| $V_{ISOL}$ | $I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}$ | 3000            | V~               |
| $M_d$      | mounting torque (M4)                         | 1.5 - 2.0       | Nm               |
|            |                                              | 14 - 18         | lb.in.           |
| $a$        | Max. allowable acceleration                  | 50              | m/s <sup>2</sup> |

| Symbol | Conditions                                     | Characteristic Values |      |      |
|--------|------------------------------------------------|-----------------------|------|------|
|        |                                                | min.                  | typ. | max. |
| $d_s$  | Creepage distance on surface (Pin to heatsink) | 11.2                  |      | mm   |
| $d_A$  | Strike distance in air (Pin to heatsink)       | 11.2                  |      | mm   |
| Weight |                                                | 24                    |      | g    |



Data according to IEC 60747 and refer to a single transistor or diode unless otherwise stated.

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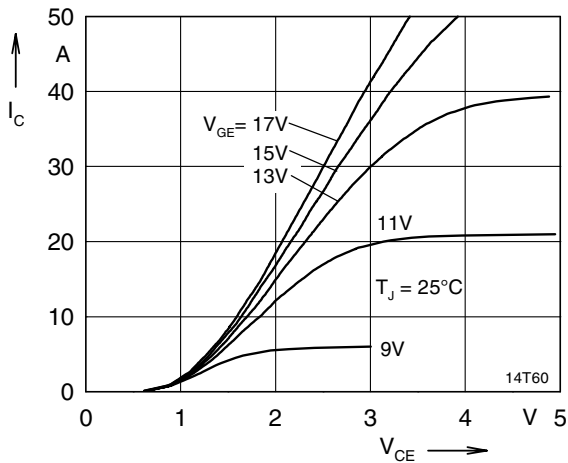


Fig. 1 Typ. output characteristics

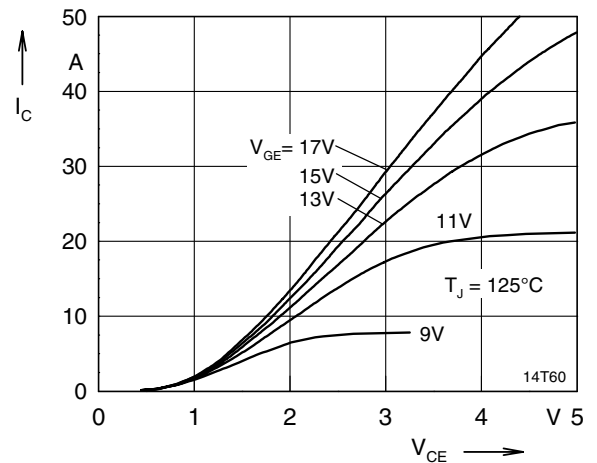


Fig. 2 Typ. output characteristics

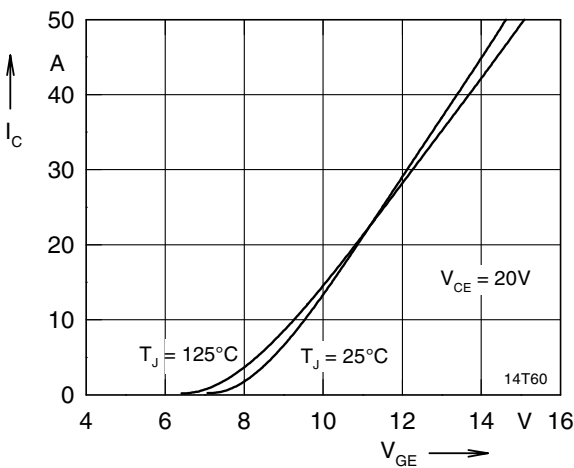


Fig. 3 Typ. transfer characteristics

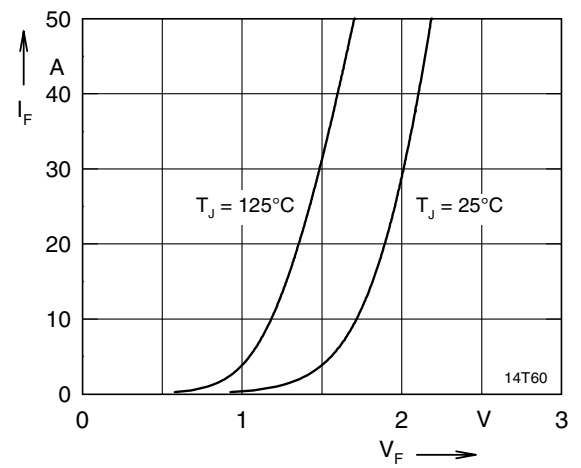


Fig. 4 Typ. forward characteristics of free wheeling diode

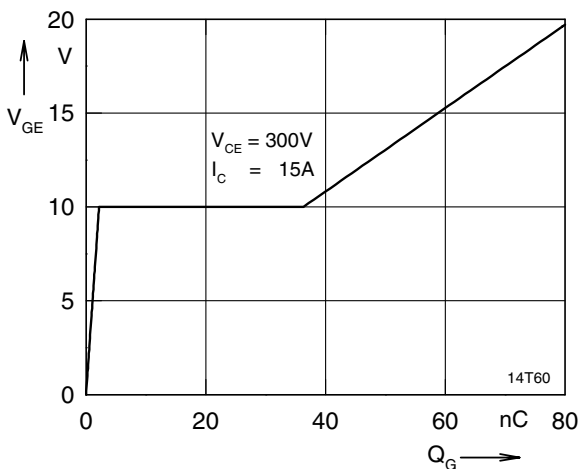


Fig. 5 Typ. turn on gate charge

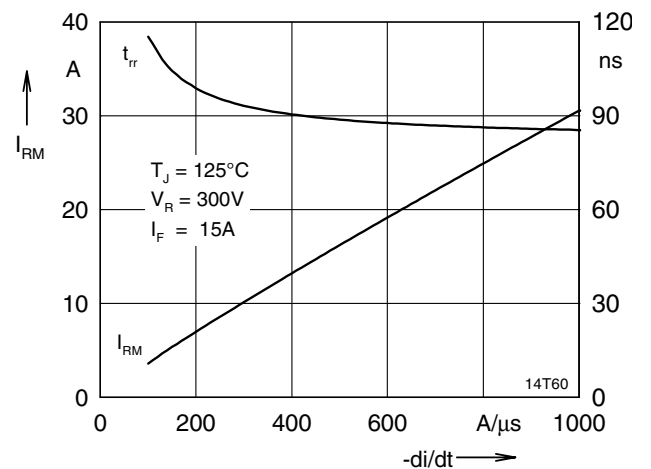


Fig. 6 Typ. turn off characteristics of free wheeling diode

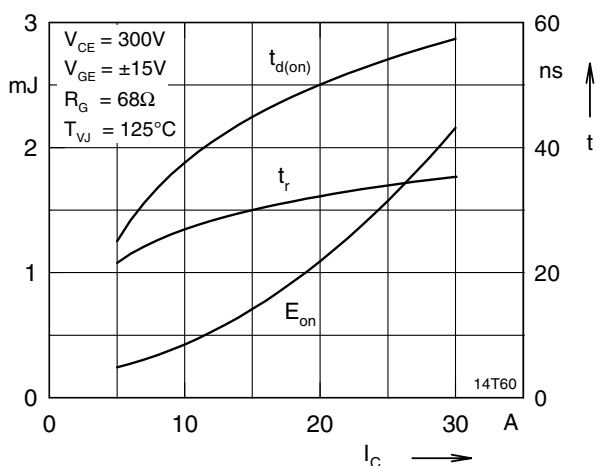


Fig. 7 Typ. turn on energy and switching

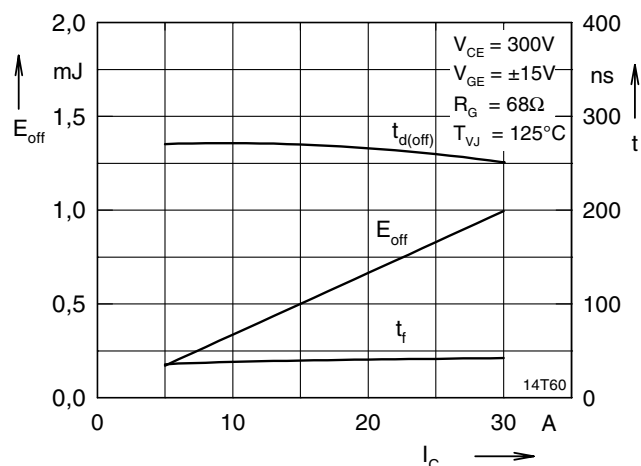


Fig. 8 Typ. turn off energy and switching times versus collector current times versus collector current

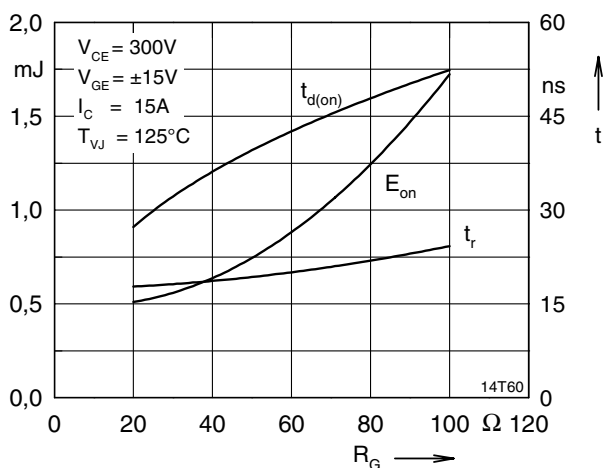


Fig. 9 Typ. turn on energy and switching

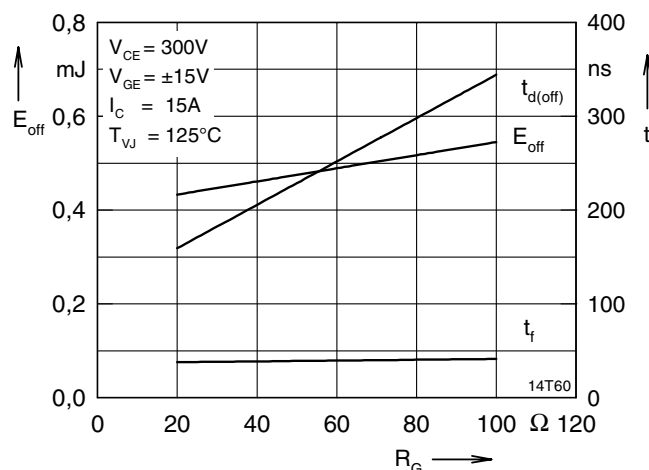


Fig. 10 Typ. turn off energy and switching times versus gate resistor times versus gate resistor

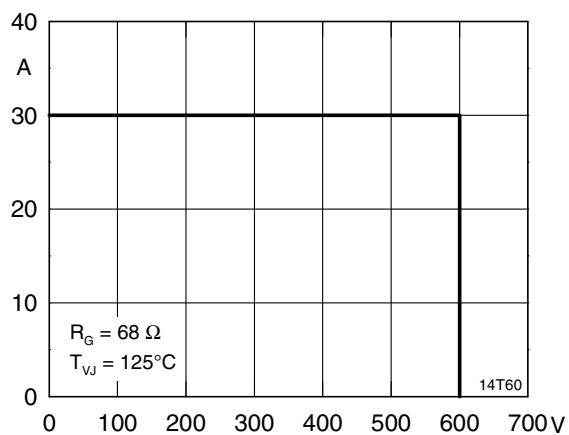


Fig. 11 Reverse biased safe operating area

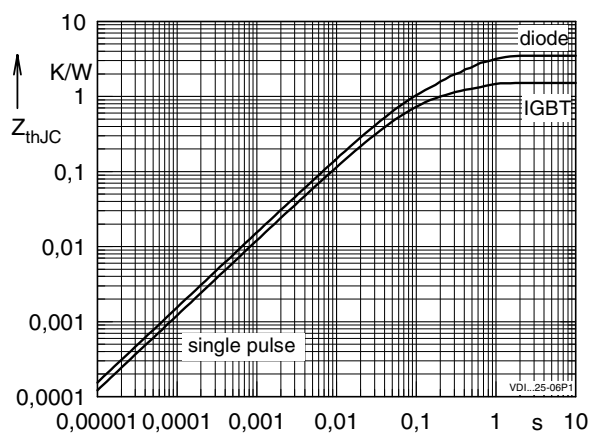


Fig. 12 Typ. transient thermal impedance RBSOA