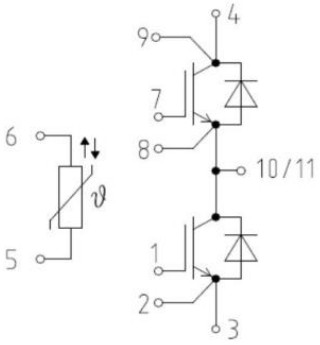
# Product Summary

| Product Type | $V_{CES}$ | $I_c$ | $V_{CE(sat)}$ | Package |
|---|---|---|---|---|
| ATGM450N120HBAMW2 | 1200V | 450A | 1.60V | EcoDual 3 |




# Features

- Positive temperature coefficient for easy paralleling
- Low losses 1200V IGBT half bridge module
- Low inductive design
- Tjmax = 150ºC
- Short circuit rated

# Typica Applications

- Motor drive
- Servo drive
- UPS / Solar
- Energy storage system

## Maximum Ratings (IGBT, $T_j$=25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CES}$ | | 1200 | V |
| Gate-Emitter Voltage | $V_{GES}$ | | ±20V | V |
| DC Continuous Collector Current | $I_C$ | $T_C$ =100°C | 450 | A |
| Pulse Collector Current | $I_{CM}$ | $t_p$ =1ms | 900 | A |
| Maximum Power Dissipation | $P_D$ | $T_C$ =25°C, $T_j$ =150°C | 2710 | W |
| junction temperature | $T_j$ | | -40 to 150 | °C |
| Storage temperature | $T_{stg}$ | | -40 to 150 | °C |

## Maximum Ratings (Freewheeling diode, Tj =25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Peak Repetitive Revers Voltage | $V_{RRM}$ | | 1200 | V |
| Diode forward Current | $I_F$ | $T_C$ =100°C | 450 | A |
| Repetitive peak forward Current | $I_{FRM}$ | $t_p$ =1ms | 900 | A |
| junction temperature | $T_j$ | | -40 to 150 | °C |
| Storage temperature | $T_{stg}$ | | -40 to 150 | °C |

## Module information

| Parameter | Conditions | Value | Unit |
|---|---|---|---|
| Isolation Voltage | RMS, f = 50Hz, t =1min | 3.4 | KV |
| module isolation | | $AL_2O_3$ | |
| CTI | | >200 | |
| Stray Inductance Module | | 20 | nH |
| Module lead resistance, terminals – chip | $T_C$ =25°C | 0.8 | mΩ |
| Mounting torque for module mounting | M5, M6 | 3 to 5 | Nm |
| Weight | | 330 | g |

## IGBT Electrical characteristics ($T_j$ =25°C unless otherwise specified, chip)

| Parameter | Symbol | conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$=450A, $V_{GE}$=15V | $T_j$=25 °C | | 1.65 | 2.05 | V |
| | | | $T_j$=150 °C | | 2.05 | | V |
| Gate-Emitter threshold Voltage | $V_{GE(th)}$ | $I_C$ =10mA, $V_{CE}$ =$V_{GE}$ | | 5.0 | 5.7 | 6.6 | V |
| Gate charge | $Q_G$ | $V_{GE}$ = -15V to +15V | | | 3.3 | | uC |
| Internal gate resistor | $R_{Gint}$ | f=1M,Vpp=1V | $T_j$=25 °C | | 0.8 | | Ω |
| Input Capacitance | $C_{ies}$ | $V_{CE}$ =25V, $V_{GE}$ =0V f =100kHz | $T_j$=25 °C | | 53 | | nF |
| Reverse transfer Capacitance | $C_{res}$ | | | | 0.5 | | nF |
| Collector- Emitter Cut off Current | $I_{CES}$ | $V_{CE}$ =1200V, $V_{GE}$ =0V | $T_j$=25 °C | | | 1 | mA |
| Gate-Emitter Leakage Current | $I_{GES}$ | $V_{CE}$ =20V, $V_{GE}$ =0V | $T_j$=25 °C | | | 500 | nA |
| Turn-on delay time | $t_{d(on)}$ | $V_{CE}$ =600V $I_C$ = 450A $V_{GE}$ =+15V/-15V $R_G$ =1.2Ω Inductive load | $T_j$=25 °C | | 120 | | ns |
| | | | $T_j$=150 °C | | 130 | | ns |
| Rise time | $t_r$ | | $T_j$=25 °C | | 50 | | ns |
| | | | $T_j$=150 °C | | 60 | | ns |
| Turn-off delay time | $t_{d(off)}$ | | $T_j$=25 °C | | 400 | | ns |
| | | | $T_j$=150 °C | | 450 | | ns |
| Fall time | $t_f$ | | $T_j$=25 °C | | 200 | | ns |
| | | | $T_j$=150 °C | | 260 | | ns |
| Turn-on power dissipation | $E_{on}$ | | $T_j$=25 °C | | 20.5 | | mJ |
| | | | $T_j$=150 °C | | 38 | | mJ |
| Turn-off power dissipation | $E_{off}$ | | $T_j$=25 °C | | 40 | | mJ |
| | | | $T_j$=150 °C | | 52 | | mJ |
| Short Circuit | $I_{SC}$ | $V_{GE}$=15V.$V_{CC}$=800V,tp<10us, $T_j$=150°C | | | 1450 | | A |

| | | | | | | |
|---|---|---|---|---|---|---|
| Thermal Resistance, Junction to Case ( per IGBT) | $R_{th(j-c)}$ | | | 0.055 | | °C/W |
| Thermal Resistance, Junction to heatsink ( per IGBT) | $R_{th(j-h)}$ | | | 0.03 | | °C/W |

## Freewheeling Diode Electrical characteristics (Tj =25°C unless otherwise specified, chip)

| Item | Symbol | Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Diode Forward Voltage | $V_F$ | $I_F$ =450A, $V_{GE}$ =0V | $T_j$=25 °C | | 1.6 | 1.95 | V |
| | | | $T_j$=150 °C | | 1.55 | | V |
| Peak reverse recovery Current | $I_{rr}$ | $V_{rr}$ =600V, $I_F$ =450A | $T_j$=25 °C | | 610 | | A |
| | | | $T_j$=150 °C | | 615 | | A |
| Recovered charge | $Q_{rr}$ | | $T_j$=25 °C | | 75 | | uC |
| | | | $T_j$=150 °C | | 105 | | uC |
| Reverse recovered energy | $E_{rr}$ | | $T_j$=25 °C | | 35 | | mJ |
| | | | $T_j$=150 °C | | 46 | | mJ |
| Thermal Resistance, Junction to Case ( per Diode) | $R_{th(j-c)}$ | | | | 0.08 | | °C/W |
| Thermal Resistance, Junction to heatsink ( per Diode) | $R_{th(j-h)}$ | | | | 0.05 | | °C/W |

## NTC Electrical characteristics (Tj =25°C unless otherwise specified)

| Item | Symbol | Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Rated resistance | $R_{25}$ | $T_c$=25 °C | | | 5 | | k Ω |
| Deviation of $R_{100}$ | △R/R | $R_{100}$=493 Ω | $T_{NTC}$=100ºC | -5 | | 5 | % |
| Power dissipation | $P_{25}$ | $T_c$=25 °C | | | | 20 | mW |
| B-value | $B_{25/50}$ | $R_2 = R_{25}$ exp [$B_{25/50}$ (1/T2 - 1/(298.15 K))] | | | 3375 | | |

## Characteristics Curve:

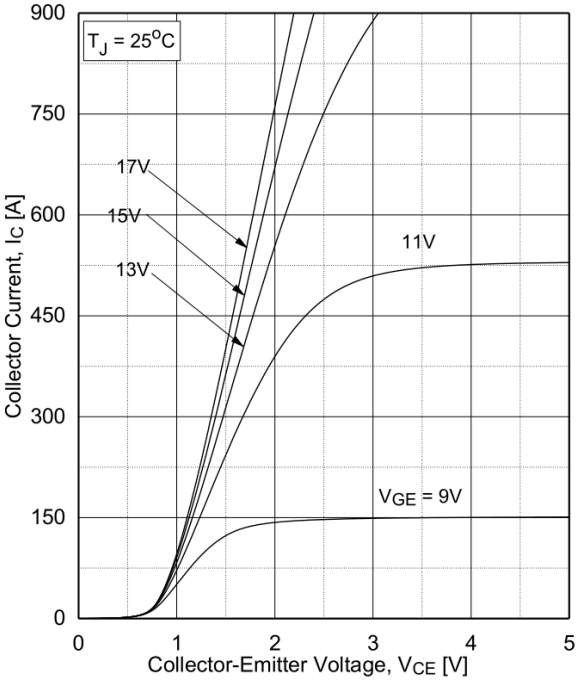



Fig1: Typical output chacteristics@25ºC

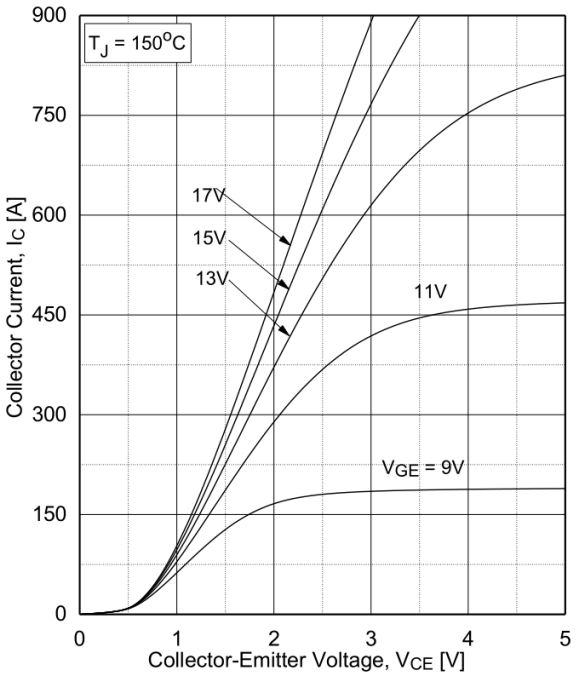



Fig2: Typical output characteristics@150ºC

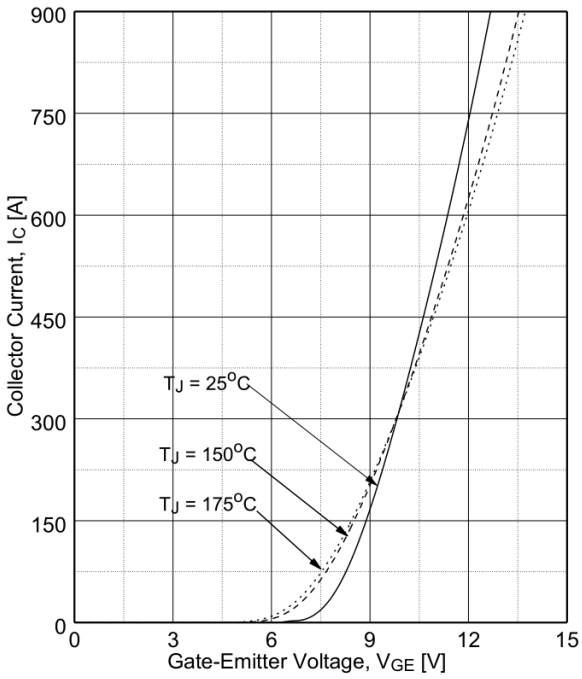



Fig3: IGBT Transfer characteristic

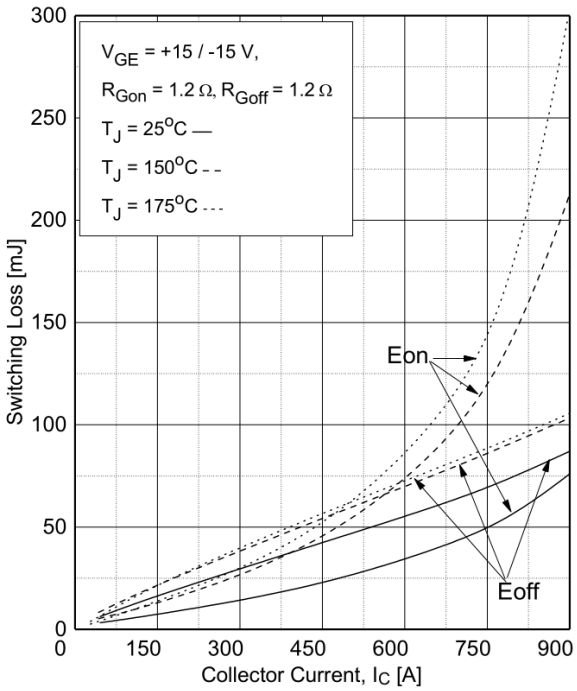



Fig4: IGBT Typical switching loss as Ic

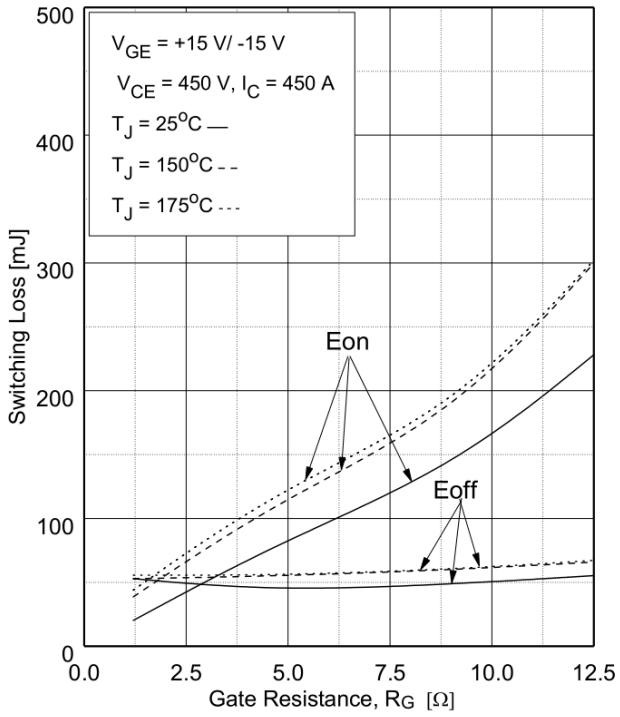



Fig5: Typical switching loss as Rg

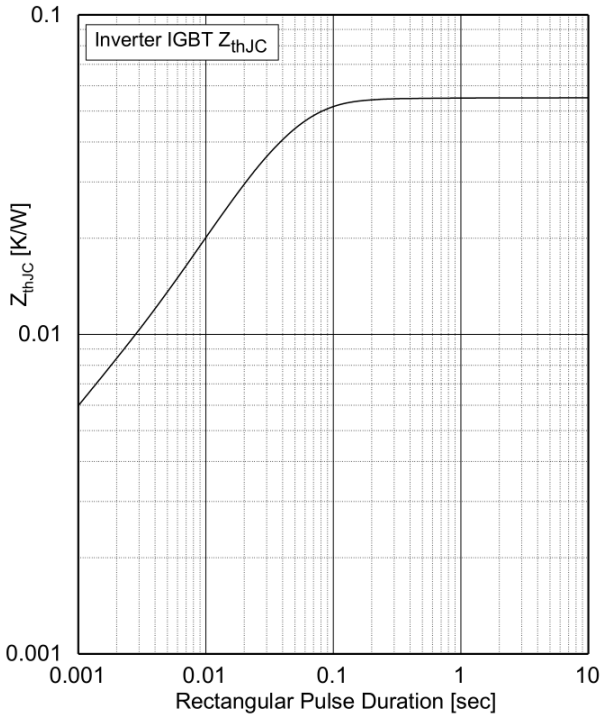



Fig6: IGBT Thermal Impedance

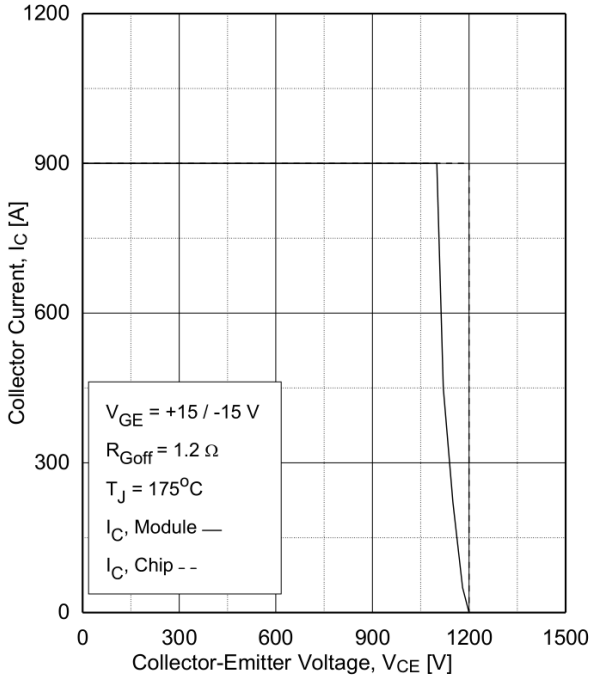



Fig7: Reverse Bias Safe Operation Area

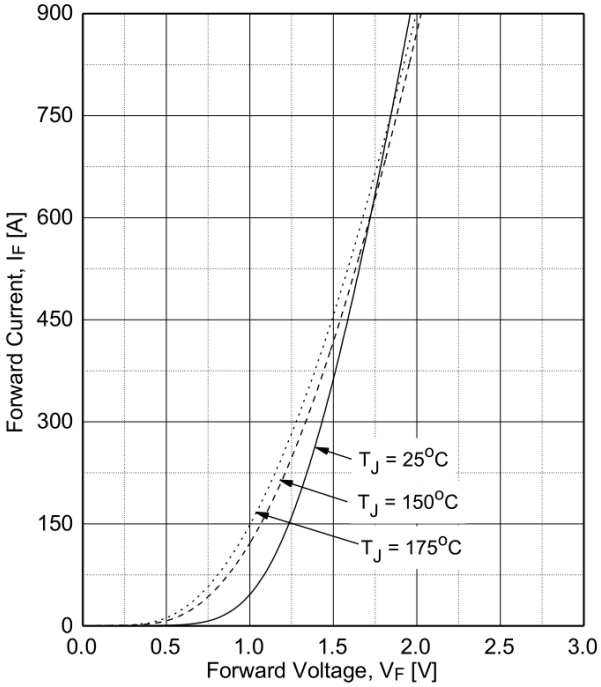



Fig8: Forward Characteristics of Diode

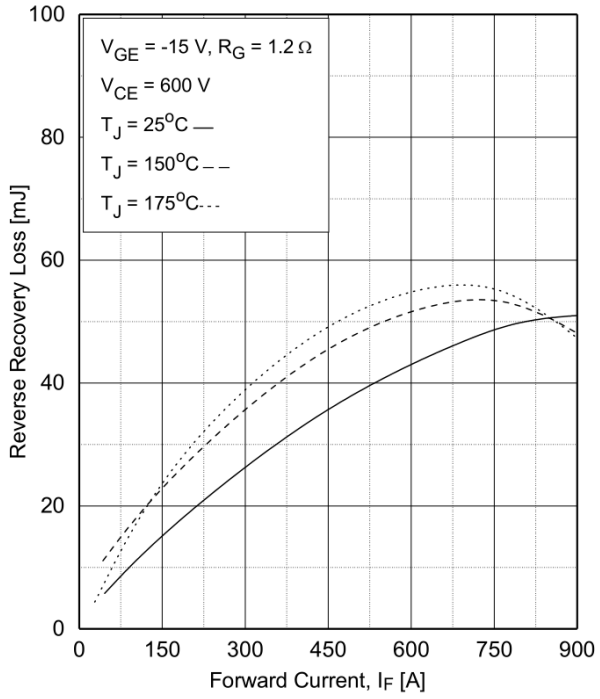



Fig9: Diode Switching loss as $I_F$

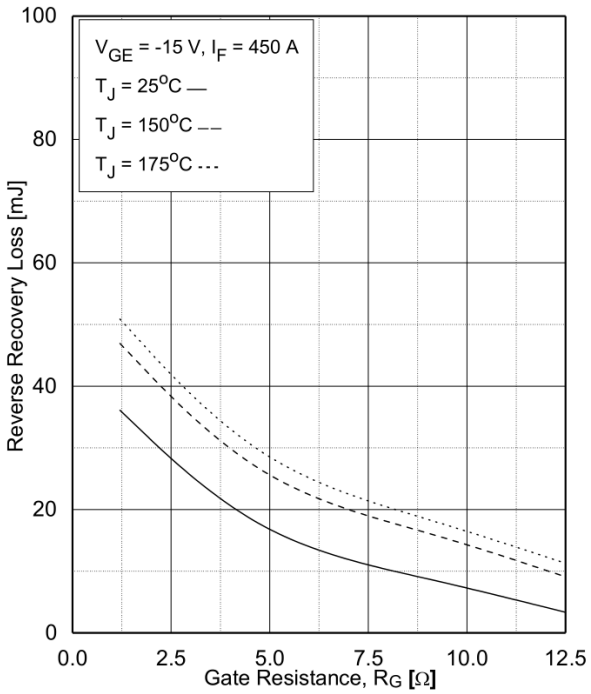



Fig10: Diode switching loss as Rg

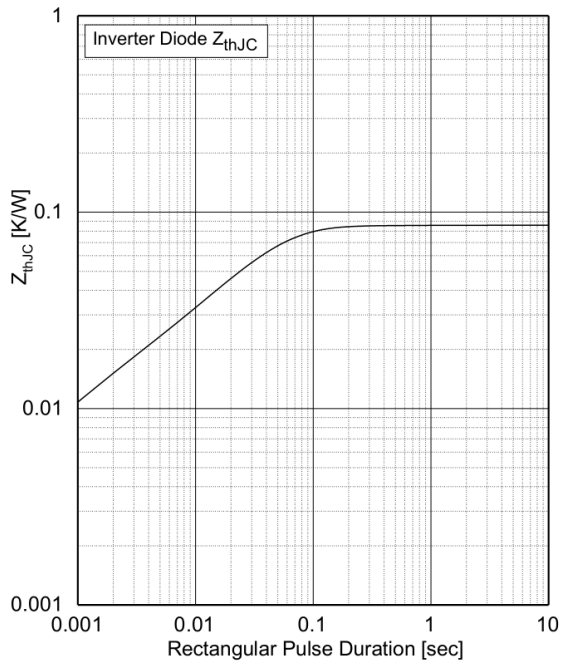



Fig11: Diode Thermal Impedance

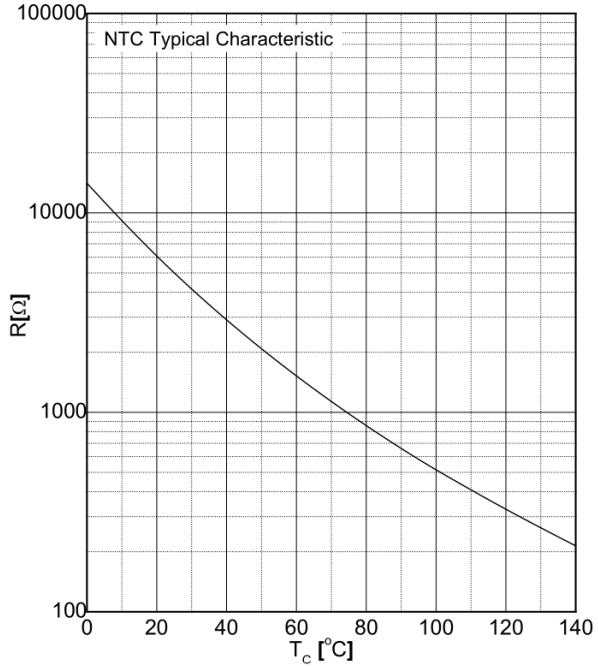
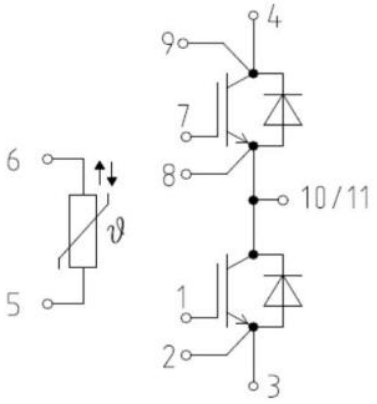



Fig12: NTC Characteristics

## Package Information: EcoDual 3 module




Dimensions in Millimeters