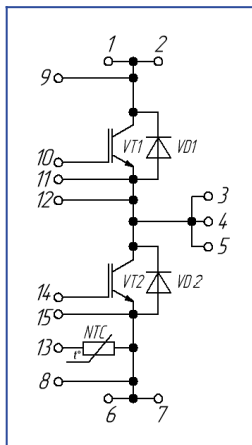
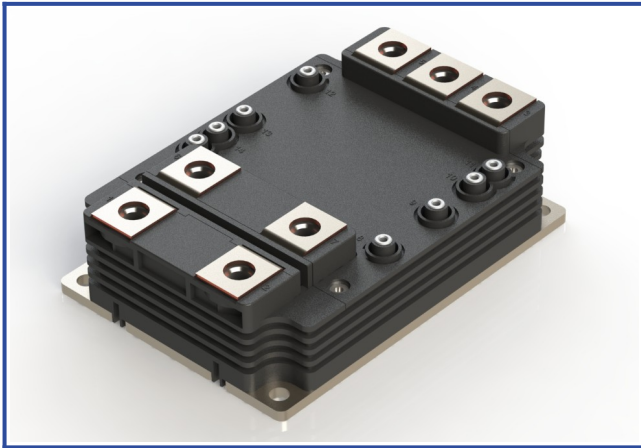




Low inductance IGBT module in a XM package (100mm\*140mm)

1700 V 1100 A



## Chip features

- IGBT chip
  - low  $V_{CE(sat)}$  value
  - 10  $\mu s$  short circuit at 150°C
  - square RBSOA of 2xI<sub>C</sub>
- FRD chip
  - fast and soft reverse recovery
  - low voltage drop

## Design features

- AlSiC baseplate
- AlN substrate
- improved thermal cycling
- RoHS compliant
- low inductance value

## Typical application

- AC motor drives
- solar inverter
- wind-powered generator inverters
- high power converters and UPS

## Maximum rated values

| Definition                                         | Symbol        | Conditions                                                                                                | Value      | Unit    |
|----------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------|------------|---------|
| <b>IGBT</b>                                        |               |                                                                                                           |            |         |
| Collector-Emitter voltage                          | $V_{CES}$     | $V_{GE} = 0$ .                                                                                            | 1700       | V       |
| Maximum allowable collector current (continuous)*2 | $I_{C 25}$    | $T_{vj(max)} = 175^{\circ}C$ ; $T_c = 25^{\circ}C$ .                                                      | 1244       | A       |
|                                                    | $I_{C 80}$    | $T_{vj(max)} = 175^{\circ}C$ ; $T_c = 80^{\circ}C$ .                                                      | 957        | A       |
| Repetitive peak collector current*1                | $I_{CRM}$     | $I_{CRM} = 3 \times I_{C nom}$ ; $t_p = 1 ms$ .                                                           | 3300       | A       |
| Short-circuit duration                             | $t_{psc}$     | $T_{vj} = 25^{\circ}C$ ; $V_{GE} = \pm 15 V$ ; $V_{CE} = 920 V$ ;<br>$R_{G on} = R_{G off} = 1.2 \Omega$  | 10         | $\mu s$ |
|                                                    |               | $T_{vj} = 150^{\circ}C$ ; $V_{GE} = \pm 15 V$ ; $V_{CE} = 920 V$ ;<br>$R_{G on} = R_{G off} = 1.2 \Omega$ | -          |         |
| Gate-Emitter voltage                               | $V_{GES}$     |                                                                                                           | $\pm 20$   | V       |
| Junction operating temperature                     | $T_{vj (op)}$ |                                                                                                           | -40...+150 | °C      |
| <b>Inverse diode</b>                               |               |                                                                                                           |            |         |
| Repetitive peak reverse voltage                    | $V_{RRM}$     | $V_{GE} = 0 V$ .                                                                                          | 1700       | V       |
| Maximum allowable forward current (continuous)*2   | $I_{F 25}$    | $T_{vj(max)} = 175^{\circ}C$ ; $T_c = 25^{\circ}C$ .                                                      | 1179       | A       |
|                                                    | $I_{F 80}$    | $T_{vj(max)} = 175^{\circ}C$ ; $T_c = 80^{\circ}C$ .                                                      | 898        | A       |
| Repetitive peak forward current*1                  | $I_{FRM}$     | $I_{FRM} = 3 \times I_{F nom}$ ; $t_p = 1 ms$ .                                                           | 3300       | A       |
| Junction operating temperature                     | $T_{vj (op)}$ |                                                                                                           | -40...+150 | °C      |
| <b>Module</b>                                      |               |                                                                                                           |            |         |
| Storage temperature                                | $T_{stg}$     |                                                                                                           | -55...+50  | °C      |
| Isolation voltage                                  | $V_{isol}$    | AC sin 50 Hz; $t = 1 min$ .                                                                               | 6000       | V       |

\*1 Pulse width and repetition rate should be such that device junction temperature does not exceed maximum  $T_{vj}$  rating.

\*2  $I_{C 25}$  and  $I_{C 80}$  ( $I_{F 25}$  и  $I_{F 80}$ ) values were calculated in accordance with typical  $U_{CE0}$ ,  $r_{CE0}$  and  $R_{\theta(j-c)}$  ( $U_{(T0)}$ ,  $r_T$  and  $R_{\theta(jc-D)}$ ).



## Characteristics

| Definition                                             | Symbol                | Conditions                                                                                                                                   | Value                                                                                                                                  |                                                   |            | Unit |     |   |
|--------------------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------|------|-----|---|
|                                                        |                       |                                                                                                                                              | min.                                                                                                                                   | typ.                                              | max.       |      |     |   |
| IGBT                                                   |                       |                                                                                                                                              |                                                                                                                                        |                                                   |            |      |     |   |
| Collector-Emitter saturation voltage<br>(at terminals) | V <sub>CEsat</sub>    | V <sub>GE</sub> = +15 V; I <sub>C</sub> = 900 A;<br>t <sub>u</sub> = 1000 μs.                                                                | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 2.70       | -    | V   |   |
|                                                        |                       |                                                                                                                                              |                                                                                                                                        | -                                                 | 3.40       | -    | V   |   |
| Gate-Emitter threshold voltage                         | V <sub>GE(th)</sub>   | I <sub>C</sub> = 36 mA; V <sub>CE</sub> = V <sub>GE</sub> ; T <sub>vj</sub> = 25°C;<br>t <sub>u</sub> = 2 ms.                                | 4.50                                                                                                                                   | -                                                 | 6.50       | -    | V   |   |
| Collector-Emitter cut-off current                      | I <sub>CES</sub>      | V <sub>CE</sub> = 1700 V; t <sub>u</sub> = 50ms;<br>V <sub>GE</sub> = 0;                                                                     | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | -          | 600  | μA  |   |
|                                                        |                       |                                                                                                                                              |                                                                                                                                        | -                                                 | 10.00      | -    | mA  |   |
| Gate-Emitter leakage current                           | I <sub>GES</sub>      | V <sub>CE</sub> = 0; V <sub>GE</sub> = ±20 V; T <sub>vj</sub> = 25°C;<br>t <sub>u</sub> = 30 ms.                                             | -                                                                                                                                      | -                                                 | 1.00       | -    | nA  |   |
| Input capacitance                                      | C <sub>ies</sub>      | V <sub>CE</sub> = 25 V; V <sub>GE</sub> = 0 V;<br>f = 1 MHz; T <sub>vj</sub> = 25°C.                                                         | -                                                                                                                                      | 54.9                                              | -          | -    | nF  |   |
| Output capacitance                                     | C <sub>oes</sub>      |                                                                                                                                              | -                                                                                                                                      | 3.12                                              | -          | -    | -   |   |
| Reverse transfer capacitance                           | C <sub>res</sub>      |                                                                                                                                              | -                                                                                                                                      | 2.16                                              | -          | -    | nF  |   |
| Total gate charge                                      | Q <sub>G</sub>        | I <sub>C</sub> = 900 A; V <sub>CE</sub> = 920 V;<br>V <sub>GE</sub> = -8...+15 V.                                                            | -                                                                                                                                      | 6300                                              | -          | -    | nC  |   |
| Internal gate resistance                               | R <sub>Gint</sub>     | T <sub>vj</sub> = 25°C.                                                                                                                      | -                                                                                                                                      | 0.79                                              | -          | -    | Ω   |   |
| Turn-on delay time                                     | t <sub>d(on)</sub>    | V <sub>CE</sub> = 920 V;<br>V <sub>GE</sub> = ±15 V;<br>I <sub>C max</sub> = 900 A;<br>R <sub>G</sub> = 3.0 Ω;<br>L <sub>s</sub> = 53 nH.    | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 290<br>320 | -    | ns  |   |
| Rise time                                              | t <sub>ri</sub>       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 100<br>130 | -    | ns  |   |
|                                                        |                       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 300<br>420 | -    | mJ  |   |
| Turn-on energy                                         | E <sub>on</sub>       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 480<br>610 | -    | ns  |   |
|                                                        |                       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 115<br>140 | -    | ns  |   |
| Fall time                                              | t <sub>fi</sub>       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 210<br>300 | -    | mJ  |   |
|                                                        |                       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 1.00       | -    | V   |   |
| Collector-emitter threshold voltage                    | V <sub>CE0</sub>      |                                                                                                                                              | V <sub>GE</sub> = +15 V; T <sub>vj</sub> = 150°C;<br>I <sub>CE1</sub> = 275 A; I <sub>CE2</sub> = 1100 A;<br>t <sub>u</sub> = 1000 μs. | -                                                 | 2.66       | -    | mΩ  |   |
| On-State slope resistance (IGBT)                       | r <sub>CE0</sub>      |                                                                                                                                              | DC; I <sub>CE</sub> = 300±50 A; I <sub>test</sub> = 1.5 A;<br>V <sub>GE</sub> = +15 V.                                                 | -                                                 | 0.028      | -    | K/W |   |
| Thermal resistance junction to case                    | R <sub>th(j-c)</sub>  |                                                                                                                                              |                                                                                                                                        |                                                   |            |      |     |   |
| Inverse diode                                          |                       |                                                                                                                                              |                                                                                                                                        |                                                   |            |      |     |   |
| Forward voltage drop (at terminals)                    | V <sub>F</sub>        |                                                                                                                                              | I <sub>F</sub> = 900 A;<br>V <sub>GE</sub> = 0; t <sub>u</sub> = 1000 μs.                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C | -          | 2.10 | -   | V |
|                                                        |                       | -                                                                                                                                            |                                                                                                                                        |                                                   | 2.45       | -    | V   |   |
| Reverse recovery time                                  | t <sub>rr</sub>       | V <sub>GE</sub> = ±15 V;<br>V <sub>CE</sub> = 920 V;<br>I <sub>C max</sub> = 900 A;<br>L <sub>s</sub> = 53 nH;<br>R <sub>G on</sub> = 3.0 Ω. | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 650        | -    | ns  |   |
|                                                        |                       |                                                                                                                                              |                                                                                                                                        | -                                                 | 870        | -    | ns  |   |
| Peak reverse recovery current                          | I <sub>rr</sub>       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 970        | -    | A   |   |
|                                                        |                       |                                                                                                                                              |                                                                                                                                        | -                                                 | 1030       | -    | A   |   |
| Reverse recovered charge                               | Q <sub>rr</sub>       |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 258        | -    | μC  |   |
|                                                        |                       |                                                                                                                                              |                                                                                                                                        | -                                                 | 486        | -    | μC  |   |
| Reverse recovery energy                                | E <sub>rec</sub>      |                                                                                                                                              | T <sub>vj</sub> = 25°C<br>T <sub>vj</sub> = 150°C                                                                                      | -                                                 | 174        | -    | mJ  |   |
|                                                        |                       |                                                                                                                                              |                                                                                                                                        | -                                                 | 312        | -    | mJ  |   |
| Threshold voltage                                      | V <sub>(T0)</sub>     | T <sub>vj</sub> = 150°C; V <sub>GE</sub> = 0; I <sub>CE1</sub> = 275 A;<br>I <sub>CE2</sub> = 1100 A; t <sub>u</sub> = 1000 μs.              | -                                                                                                                                      | 0.86                                              | -          | V    |     |   |
| Forward slope resistance                               | r <sub>T</sub>        |                                                                                                                                              | -                                                                                                                                      | 1.78                                              | -          | mΩ   |     |   |
| Thermal resistance junction to case                    | R <sub>th(JC-D)</sub> | DC; I <sub>CE</sub> = 300±50 A; I <sub>test</sub> = 1.5 A;<br>V <sub>GE</sub> = +15 V.                                                       | -                                                                                                                                      | 0.043                                             | -          | K/W  |     |   |



| Module                                 |             |                                                                              |                  |      |       |       |     |
|----------------------------------------|-------------|------------------------------------------------------------------------------|------------------|------|-------|-------|-----|
| Pin resistance                         | $R_{Pxy}$   | $T_{vj} = 25^{\circ}\text{C}$                                                | $R_{P1/2-3/4/5}$ | -    | 0.269 | -     | mΩ  |
|                                        |             |                                                                              | $R_{P6/7-3/4/5}$ | -    | 0.366 | -     |     |
|                                        |             |                                                                              | $R_{P1/2-6/7}$   | -    | 0.516 | -     |     |
| Parasitic inductance between terminals | $L_{Pce}$   |                                                                              | $L_{P1/2-3/4/5}$ | -    | 16.3  | -     | nH  |
|                                        |             |                                                                              | $L_{P6/7-3/4/5}$ | -    | 18.9  | -     |     |
|                                        |             |                                                                              | $L_{P1/2-6/7}$   | -    | 8.8   | -     |     |
| Thermistor resistance                  | $R_{t25}$   | $T_{vj} = 30^{\circ}\text{C}$                                                |                  | -    | 4.06  | -     | kΩ  |
|                                        |             | $T_{vj} = 100^{\circ}\text{C}$                                               |                  | -    | 0.54  | -     |     |
| Coefficient of temperature sensitivity | $B_{25/50}$ | $R_2 = R_{25} \exp [B_{25/50} (1/T_2 - 1/T_1)],$<br>$T_1 = 298,15 \text{ K}$ |                  | -    | -     | -     | K   |
| Thermal resistance case to heatsink    | $R_{thCH}$  | per module                                                                   |                  | -    | 0.02  | -     | K/W |
| Mounting torque for screws to heatsink | $M_s$       | to heatsink M6                                                               |                  | 4.00 | -     | 6.00  | N*m |
| Mounting torque for terminal screws    | $M_t$       | to terminals M8                                                              |                  | 8.00 | -     | 10.00 | N*m |
| Mounting torque for gate terminal      | $M_a$       | to gate terminal M3                                                          |                  | 0.90 | -     | 1.10  |     |
| Weight                                 | W           |                                                                              |                  | -    | 820   | -     | g   |

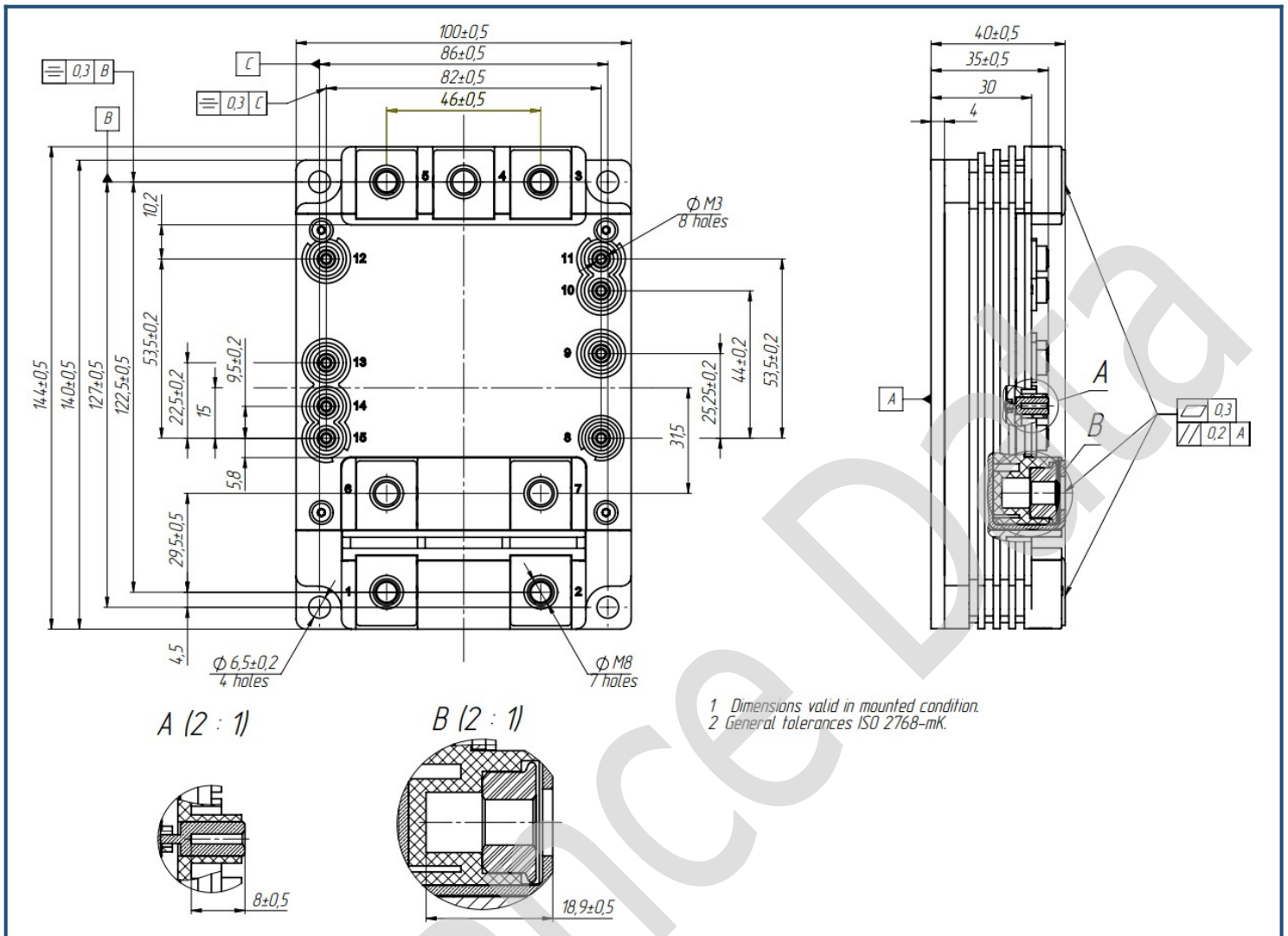
" - " — data will be refined as additional tests are conducted and statistics are collected.

## Notes:

- Insulating material operating temperature  $125^{\circ}\text{C}$  max;
- Case temperature  $125^{\circ}\text{C}$  max;
- The recommended operating junction temperature  $T_{vj \text{ op}} = -40 \div +150^{\circ}\text{C}$ .



### Overall dimensions: Package type – XM



### Part numbering guide

| MIXM | - | HB | 17 | AB | - | 1100 | N | - | A |                                        |
|------|---|----|----|----|---|------|---|---|---|----------------------------------------|
| MIXM |   | HB | 17 | AB |   | 1100 | N |   | A | IGBT module package type: XM           |
|      |   |    |    |    |   |      |   |   |   | 2 switches as Half-Bridge              |
|      |   |    |    |    |   |      |   |   |   | Voltage rating (V <sub>CES</sub> /100) |
|      |   |    |    |    |   |      |   |   |   | IGBT+FRD chipset modification          |
|      |   |    |    |    |   |      |   |   |   | Current Rating                         |
|      |   |    |    |    |   |      |   |   |   | Climatic version: normal climate       |
|      |   |    |    |    |   |      |   |   |   | AlSiC baseplate                        |

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