

XPT IGBT Module

tentative

$$V_{CES} = 650V$$

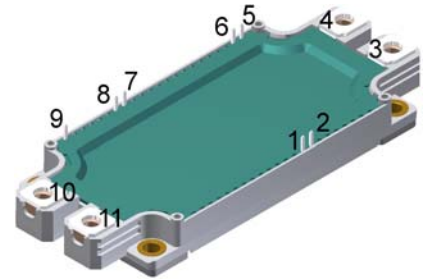
$$I_{C25} = 2 \times 720A$$

$$V_{CE(sat)} = 1.65V$$

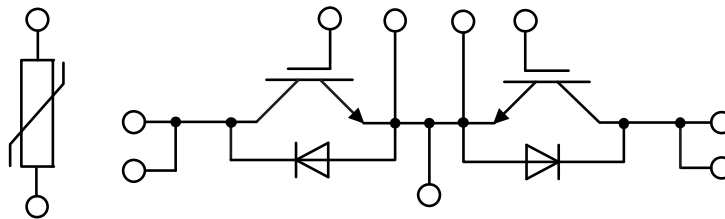
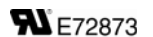
Common emitter + free wheeling diodes

Part number

MIXA600AF650TSF



Backside: isolated



Features / Advantages:

- High level of integration - only one power semiconductor module required for the whole drive
- Rugged XPT design (Xtreme light Punch Through) results in:
 - short circuit rated for 10 μ sec.
 - very low gate charge
 - low EMI
 - square RBSOA @ 2 x Ic
- Thin wafer technology combined with the XPT design results in a competitive low $V_{CE(sat)}$
- Temperature sense included
- SONIC™ diode
 - fast and soft reverse recovery
 - low operating forward voltage

Applications:

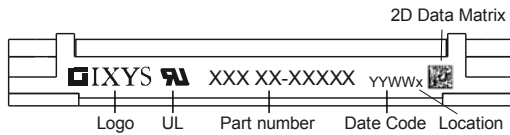
- AC motor drives
- Pumps, Fans
- Washing machines
- Air-conditioning system
- Inverter and power supplies

Package: SimBus F

- Isolation Voltage: 3000V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling

| IGBT | | | | Ratings | | | |
|---------------|--|--|-------------------------|---------|----------|---------|----|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit | |
| V_{CES} | collector emitter voltage | $T_{VJ} = 25^{\circ}C$ | | | 650 | V | |
| V_{GES} | max. DC gate voltage | | | | ± 20 | V | |
| V_{GEM} | max. transient gate emitter voltage | | | | ± 30 | V | |
| I_{C25} | collector current | $T_C = 25^{\circ}C$ | | | 720 | A | |
| I_{C80} | | $T_C = 80^{\circ}C$ | | | 490 | A | |
| P_{tot} | total power dissipation | $T_C = 25^{\circ}C$ | | | 1750 | W | |
| $V_{CE(sat)}$ | collector emitter saturation voltage | $I_C = 600A; V_{GE} = 15V$ | | 1.65 | 1.8 | V | |
| | | | | 1.85 | | V | |
| $V_{GE(th)}$ | gate emitter threshold voltage | $I_C = 3.2mA; V_{GE} = V_{CE}$ | 4 | 4.8 | 5.5 | V | |
| I_{CES} | collector emitter leakage current | $V_{CE} = V_{CES}; V_{GE} = 0V$ | | | 1.8 | mA | |
| | | | | 2 | | mA | |
| I_{GES} | gate emitter leakage current | $V_{GE} = \pm 20V$ | | | 1.5 | μA | |
| $Q_{G(on)}$ | total gate charge | $V_{CE} = 300V; V_{GE} = 15V; I_C = 600A$ | | 840 | | nC | |
| $t_{d(on)}$ | turn-on delay time | inductive load $V_{CE} = 300V; I_C = 600A$ $V_{GE} = \pm 15V; R_G = 1.3\Omega$ | | 90 | | ns | |
| t_r | current rise time | | $T_{VJ} = 150^{\circ}C$ | | 50 | | ns |
| $t_{d(off)}$ | turn-off delay time | | | | 100 | | ns |
| t_f | current fall time | | | | 40 | | ns |
| E_{on} | turn-on energy per pulse | | | | 6 | | mJ |
| E_{off} | turn-off energy per pulse | | | | 22.8 | | mJ |
| RBSOA | reverse bias safe operating area | $V_{GE} = \pm 15V; R_G = 1.3\Omega$ | | | | | |
| I_{CM} | | $V_{CEmax} = 650V$ | | | 1200 | A | |
| SCSOA | short circuit safe operating area | $V_{CEmax} = 650V$ | | | | | |
| t_{sc} | short circuit duration | $V_{CE} = 900V; V_{GE} = \pm 15V$ | | | 10 | μs | |
| I_{sc} | short circuit current | $R_G = 1.3\Omega; \text{non-repetitive}$ | | 2400 | | A | |
| R_{thJC} | thermal resistance junction to case | | | | 0.085 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | | 0.05 | K/W | |
| Diode | | | | | | | |
| V_{RRM} | max. repetitive reverse voltage | $T_{VJ} = 25^{\circ}C$ | | | 650 | V | |
| I_{F25} | forward current | $T_C = 25^{\circ}C$ | | | 490 | A | |
| I_{F80} | | $T_C = 80^{\circ}C$ | | | 340 | A | |
| V_F | forward voltage | $I_F = 600A$ | | | 1.90 | V | |
| | | | | 1.70 | | V | |
| I_R | reverse current | $V_R = V_{RRM}$ | | | * | mA | |
| | * not applicable, see Ices value above | | | | * | mA | |
| Q_{rr} | reverse recovery charge | $V_R = 300V$ $-di_F/dt = 0A/\mu s$ $I_F = 600A; V_{GE} = 0V$ | | tbd | | μC | |
| I_{RM} | max. reverse recovery current | | $T_{VJ} = 125^{\circ}C$ | | tbd | | A |
| t_{rr} | reverse recovery time | | | | tbd | | ns |
| E_{rec} | reverse recovery energy | | | | tbd | | mJ |
| R_{thJC} | thermal resistance junction to case | | | | 0.095 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | | 0.04 | K/W | |

| Package SimBus F | | | Ratings | | | |
|------------------|--|---|---------|------|------|------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| I_{RMS} | RMS current | per terminal | | | | A |
| T_{stg} | storage temperature | | -40 | | 125 | °C |
| T_{VJ} | virtual junction temperature | | -40 | | 175 | °C |
| Weight | | | | 350 | | g |
| M_D | mounting torque | | 3 | | 6 | Nm |
| M_T | terminal torque | | 3 | | 6 | Nm |
| $d_{Spp/App}$ | creepage distance on surface striking distance through air | terminal to terminal | 12.7 | | | mm |
| $d_{Spb/Apb}$ | | terminal to backside | 10.0 | | | mm |
| V_{ISOL} | isolation voltage | t = 1 second | 3000 | | | V |
| | | t = 1 minute | 2500 | | | V |
| $R_{pin-chip}$ | resistance pin to chip | $V = V_{CEsat} + 2 \cdot R \cdot I_C$ resp. $V = V_F + 2 \cdot R \cdot I_F$ | | 0.65 | | mΩ |



Part number

- M = Module
- I = IGBT
- X = XPT IGBT
- A = Gen 1 / std
- 600 = Current Rating [A]
- AF = Common emitter + free wheeling diodes
- 650 = Reverse Voltage [V]
- T = Thermistor \ Temperature sensor
- SF = SimBus F

| Ordering | Part Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MIXA600AF650TSF | MIXA600AF650TSF | Box | | |

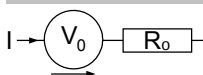
Temperature Sensor NTC

| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
|-------------|-------------------------|---------------------|------|------|------|------|
| R_{25} | resistance | $T_{VJ} = 25^\circ$ | 4.75 | 5 | 5.25 | kΩ |
| $B_{25/50}$ | temperature coefficient | | | 3375 | | K |

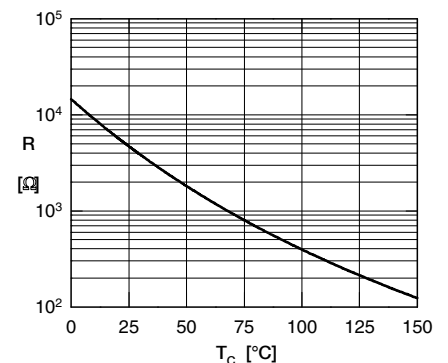
Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 175^\circ\text{C}$



| | | IGBT | Diode | |
|--------------|--------------------|------|-------|----|
| $V_{0\ max}$ | threshold voltage | 1.1 | 1.21 | V |
| $R_{0\ max}$ | slope resistance * | 1.8 | 1 | mΩ |



Typ. NTC resistance vs. temperature

