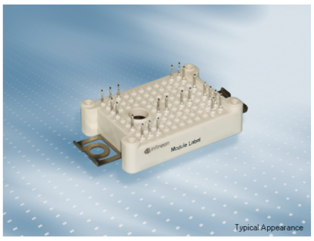
**Preliminary datasheet**

**EasyPIM™ module with TRENCHSTOP™IGBT7 and Emitter Controlled 7 diode and PressFIT / NTC / TIM**

## Features




- Electrical features
  - $V_{CES}$ = 1200 V
  - $I_{C\ nom}$ = 10 A / $I_{CRM}$ = 20 A
  - TRENCHSTOP$^{TM}$ IGBT7
  - Overload operation up to 175°C
  - Low $V_{CEsat}$
- Mechanical features
  - Pre-applied Thermal Interface Material
  - High power density
  - PressFIT contact technology
  - Compact design
  - $Al_2O_3$ substrate with low thermal resistance
  - 2.5 kV AC 1 min insulation

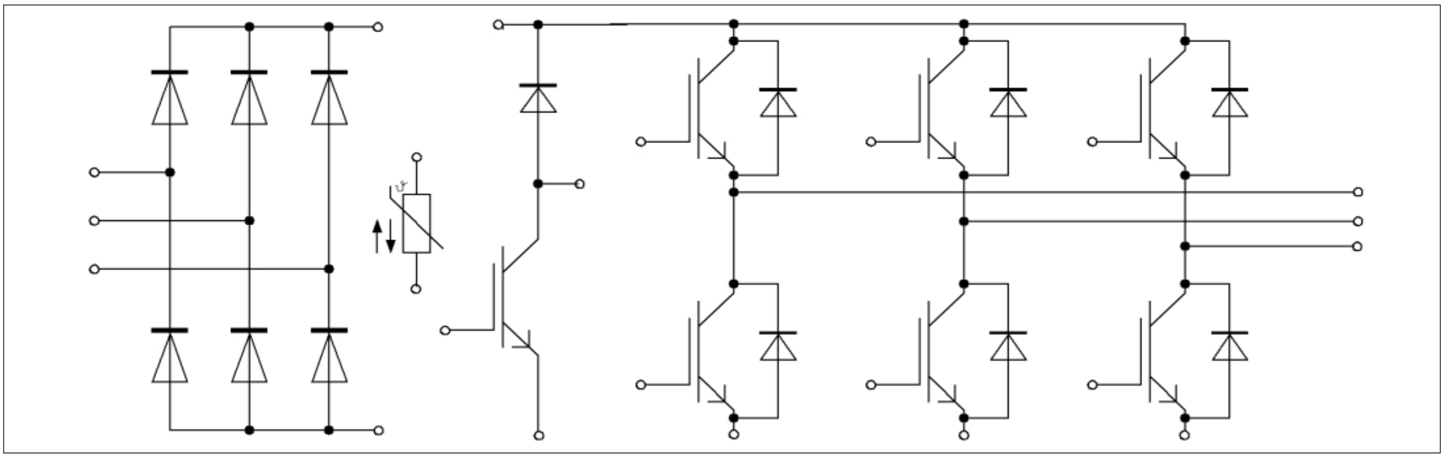
## Potential applications

- Air conditioning
- Auxiliary inverters
- Motor drives

## Product validation

- Qualified for industrial applications according to the relevant tests of IEC 60747, 60749 and 60068

## Description



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# 1 Package

**Table 1 Insulation coordination**

| Parameter | Symbol | Note or test condition | Values | Unit |
|---|---|---|---|---|
| Isolation test voltage | $V_{ISOL}$ | RMS, f = 50 Hz, $t$ = 1 min | 2.5 | kV |
| Internal Isolation | | basic insulation (class 1, IEC 61140) | $Al_2O_3$ | |
| Creepage distance | $d_{Creep}$ | terminal to heatsink | 11.5 | mm |
| Creepage distance | $d_{Creep}$ | terminal to terminal | 6.3 | mm |
| Clearance | $d_{Clear}$ | terminal to heatsink | 10.0 | mm |
| Clearance | $d_{Clear}$ | terminal to terminal | 5.0 | mm |
| Comparative tracking index | $CTI$ | | > 200 | |
| RTI Elec. | $RTI$ | housing | 140 | °C |

**Table 2 Characteristic values**

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Stray inductance module | $L_{sCE}$ | | | 30 | | nH |
| Module lead resistance, terminals - chip | $R_{AA'+CC'}$ | $T_H$=25°C, per switch | | 6 | | mΩ |
| Module lead resistance, terminals - chip | $R_{CC'+EE'}$ | $T_H$=25°C, per switch | | 8 | | mΩ |
| Storage temperature | $T_{stg}$ | | -40 | | 125 | °C |
| Maximum baseplate operation temperature | $T_{BPmax}$ | | | | 125 | °C |
| Mounting force per clamp | $F$ | | 20 | | 50 | N |
| Weight | $G$ | | | 24 | | g |

*Note:* *The current under continuous operation is limited to 25A rms per connector pin.*
*Storage and shipment of modules with TIM => see AN 2012-07*

# 2 IGBT, Inverter

**Table 3 Maximum rated values**

| Parameter | Symbol | Note or test condition | | Values | Unit |
|---|---|---|---|---|---|
| Collector-emitter voltage | $V_{CES}$ | | $T_{vj}$ = 25 °C | 1200 | V |
| Continous DC collector current | $I_{CDC}$ | $T_{vj\,max}$ = 175 °C | $T_H$ = 100 °C | 10 | A |
| Repetitive peak collector current | $I_{CRM}$ | $t_P$ = 1 ms | | 20 | A |

**Table 3 Maximum rated values (continued)**

| Parameter | Symbol | Note or test condition | Values | Unit |
|---|---|---|---|---|
| Gate-emitter peak voltage | $V_{GES}$ | | ±20 | V |

**Table 4 Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Collector-emitter saturation voltage | $V_{CE\ sat}$ | $I_C$ = 10 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25 °C | | 1.60 | TBD | V |
| | | | $T_{vj}$ = 125 °C | | 1.74 | | |
| | | | $T_{vj}$ = 175 °C | | 1.82 | | |
| Gate threshold voltage | $V_{GEth}$ | $I_C$ = 0.22 mA, $V_{CE}$ = $V_{GE}$, $T_{vj}$ = 25 °C | | 5.15 | 5.80 | 6.45 | V |
| Gate charge | $Q_G$ | $V_{GE}$ = ±15 V, $V_{CE}$ = 600 V | | | 0.157 | | µC |
| Internal gate resistor | $R_{Gint}$ | $T_{vj}$ = 25 °C | | | 0 | | Ω |
| Input capacitance | $C_{ies}$ | $f$ = 100 kHz, $T_{vj}$ = 25 °C, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | | | 1.89 | | nF |
| Reverse transfer capacitance | $C_{res}$ | $f$ = 100 kHz, $T_{vj}$ = 25 °C, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | | | 0.0066 | | nF |
| Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | | 0.0045 | mA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = 20 V, $T_{vj}$ = 25 °C | | | | 100 | nA |
| Turn-on delay time (inductive load) | $t_{don}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.023 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.025 | | |
| | | | $T_{vj}$ = 175 °C | | 0.026 | | |
| Rise time (inductive load) | $t_r$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.014 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.017 | | |
| | | | $T_{vj}$ = 175 °C | | 0.019 | | |
| Turn-off delay time (inductive load) | $t_{doff}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.124 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.157 | | |
| | | | $T_{vj}$ = 175 °C | | 0.176 | | |
| Fall time (inductive load) | $t_f$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.227 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.347 | | |
| | | | $T_{vj}$ = 175 °C | | 0.422 | | |
| Turn-on energy loss per pulse | $E_{on}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $L_σ$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Gon}$ = 8.2 Ω, di/dt = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.73 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 0.94 | | |
| | | | $T_{vj}$ = 175 °C | | 1.13 | | |
| Turn-off energy loss per pulse | $E_{off}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $L_σ$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Goff}$ = 8.2 Ω, dv/dt = 2700 V/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.623 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 0.97 | | |
| | | | $T_{vj}$ = 175 °C | | 1.17 | | |

**Table 4 Characteristic values (continued)**

| Parameter | Symbol | Note or test condition | | Values Min. | Values Typ. | Values Max. | Unit |
|---|---|---|---|---|---|---|---|
| SC data | $I_{SC}$ | $V_{GE} \leq$ 15 V, $V_{CC}$ = 800 V, $V_{CEmax}$=$V_{CES}$-$L_{sCE}$*di/dt | $t_P \leq$ 8 µs, $T_{vj}$ = 150 °C | | 32 | | A |
| | | | $t_P \leq$ 7 µs, $T_{vj}$ = 175 °C | | 30 | | |
| Thermal resistance, junction to heatsink | $R_{thJH}$ | per IGBT, Valid with IFX pre-applied Thermal Interface Material | | | | 2.18 | K/W |
| Temperature under switching conditions | $T_{vj\ op}$ | | | -40 | | 175 | °C |

*Note:* *$T_{vj\ op}$ > 150°C is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.*

## 3 Diode, Inverter

**Table 5 Maximum rated values**

| Parameter | Symbol | Note or test condition | | Values | Unit |
|---|---|---|---|---|---|
| Repetitive peak reverse voltage | $V_{RRM}$ | | $T_{vj}$ = 25 °C | 1200 | V |
| Continous DC forward current | $I_F$ | | | 10 | A |
| Repetitive peak forward current | $I_{FRM}$ | $t_P$ = 1 ms | | 20 | A |
| $I^2t$ - value | $I^2t$ | $V_R$ = 0 V, $t_P$ = 10 ms | $T_{vj}$ = 125 °C | 27.5 | $A^2s$ |
| | | | $T_{vj}$ = 175 °C | 24 | |

**Table 6 Characteristic values**

| Parameter | Symbol | Note or test condition | | Values Min. | Values Typ. | Values Max. | Unit |
|---|---|---|---|---|---|---|---|
| Forward voltage | $V_F$ | $I_F$ = 10 A, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | 1.72 | TBD | V |
| | | | $T_{vj}$ = 125 °C | | 1.59 | | |
| | | | $T_{vj}$ = 175 °C | | 1.52 | | |
| Peak reverse recovery current | $I_{RM}$ | $I_F$ = 10 A, $V_R$ = 600 V, $V_{GE}$ = -15 V, -$di_F/dt$ = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 10.5 | | A |
| | | | $T_{vj}$ = 125 °C | | 15.3 | | |
| | | | $T_{vj}$ = 175 °C | | 17.5 | | |

**Table 6** **Characteristic values (continued)**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Recovered charge | $Q_r$ | $I_F$ = 10 A, $V_R$ = 600 V, $V_{GE}$ = -15 V, -$di_F/dt$ = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.97 | | µC |
| | | | $T_{vj}$ = 125 °C | | 1.7 | | |
| | | | $T_{vj}$ = 175 °C | | 2.2 | | |
| Reverse recovery energy | $E_{rec}$ | $I_F$ = 10 A, $V_R$ = 600 V, $V_{GE}$ = -15 V, -$di_F/dt$ = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.24 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 0.51 | | |
| | | | $T_{vj}$ = 175 °C | | 0.72 | | |
| Thermal resistance, junction to heatsink | $R_{thJH}$ | per diode, Valid with IFX pre-applied Thermal Interface Material | | | | 2.71 | K/W |
| Temperature under switching conditions | $T_{vj\ op}$ | | | -40 | | 175 | °C |

*Note:* *$T_{vj\ op}$ > 150°C is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.*

## 4 Diode, Rectifier

**Table 7** **Maximum rated values**

| Parameter | Symbol | Note or test condition | | Values | Unit |
|---|---|---|---|---|---|
| Repetitive peak reverse voltage | $V_{RRM}$ | $T_{vj}$ = 25 °C | | 1600 | V |
| Maximum RMS forward current per chip | $I_{FRMSM}$ | $T_H$ = 100 °C | | 25 | A |
| Maximum RMS current at rectifier output | $I_{RMSM}$ | $T_H$ = 100 °C | | 25 | A |
| Surge forward current | $I_{FSM}$ | $t_P$ = 10 ms | $T_{vj}$ = 25 °C | 300 | A |
| | | | $T_{vj}$ = 150 °C | 245 | |
| $I^2t$ - value | $I^2t$ | $t_P$ = 10 ms | $T_{vj}$ = 25 °C | 450 | $A^2s$ |
| | | | $T_{vj}$ = 150 °C | 300 | |

**Table 8** **Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Forward voltage | $V_F$ | $I_F$ = 10 A | $T_{vj}$ = 150 °C | | 0.80 | | V |
| Reverse current | $I_r$ | $T_{vj}$ = 150 °C, $V_R$ = 1600 V | | | 1 | | mA |
| Thermal resistance, junction to heatsink | $R_{thJH}$ | per diode, Valid with IFX pre-applied Thermal Interface Material | | | | 1.58 | K/W |

**Table 8 Characteristic values (continued)**

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Temperature under switching conditions | $T_{vj, op}$ | | -40 | | 150 | °C |

## 5 IGBT, Brake-Chopper

**Table 9 Maximum rated values**

| Parameter | Symbol | Note or test condition | | Values | Unit |
|---|---|---|---|---|---|
| Collector-emitter voltage | $V_{CES}$ | | $T_{vj}$ = 25 °C | 1200 | V |
| Continous DC collector current | $I_{CDC}$ | $T_{vj\ max}$ = 175 °C | $T_H$ = 100 °C | 10 | A |
| Repetitive peak collector current | $I_{CRM}$ | $t_P$ = 1 ms | | 20 | A |
| Gate-emitter peak voltage | $V_{GES}$ | | | ±20 | V |

**Table 10 Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Collector-emitter saturation voltage | $V_{CE\ sat}$ | $I_C$ = 10 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25 °C | | 1.60 | TBD | V |
| | | | $T_{vj}$ = 125 °C | | 1.74 | | |
| | | | $T_{vj}$ = 175 °C | | 1.82 | | |
| Gate threshold voltage | $V_{GEth}$ | $I_C$ = 0.22 mA, $V_{CE}$ = $V_{GE}$, $T_{vj}$ = 25 °C | | 5.15 | 5.80 | 6.45 | V |
| Gate charge | $Q_G$ | $V_{GE}$ = ±15 V, $V_{CE}$ = 600 V | | | 0.157 | | µC |
| Internal gate resistor | $R_{Gint}$ | $T_{vj}$ = 25 °C | | | 0 | | Ω |
| Input capacitance | $C_{ies}$ | $f$ = 100 kHz, $T_{vj}$ = 25 °C, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | | | 1.89 | | nF |
| Reverse transfer capacitance | $C_{res}$ | $f$ = 100 kHz, $T_{vj}$ = 25 °C, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | | | 0.0066 | | nF |
| Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | | 0.0045 | mA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = 20 V, $T_{vj}$ = 25 °C | | | | 100 | nA |
| Turn-on delay time (inductive load) | $t_{don}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.023 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.025 | | |
| | | | $T_{vj}$ = 175 °C | | 0.026 | | |
| Rise time (inductive load) | $t_r$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.014 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.017 | | |
| | | | $T_{vj}$ = 175 °C | | 0.019 | | |

**Table 10** **Characteristic values (continued)**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Turn-off delay time (inductive load) | $t_{doff}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.124 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.157 | | |
| | | | $T_{vj}$ = 175 °C | | 0.176 | | |
| Fall time (inductive load) | $t_f$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 8.2 Ω | $T_{vj}$ = 25 °C | | 0.227 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.347 | | |
| | | | $T_{vj}$ = 175 °C | | 0.422 | | |
| Turn-on energy loss per pulse | $E_{on}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $L_\sigma$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Gon}$ = 8.2 Ω, di/dt = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.73 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 0.94 | | |
| | | | $T_{vj}$ = 175 °C | | 1.13 | | |
| Turn-off energy loss per pulse | $E_{off}$ | $I_C$ = 10 A, $V_{CE}$ = 600 V, $L_\sigma$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Goff}$ = 8.2 Ω, dv/dt = 2700 V/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.623 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 0.97 | | |
| | | | $T_{vj}$ = 175 °C | | 1.17 | | |
| SC data | $I_{SC}$ | $V_{GE}$ ≤ 15 V, $V_{CC}$ = 800 V, $V_{CEmax}=V_{CES}-L_{sCE}*di/dt$ | $t_P$ ≤ 8 µs, $T_{vj}$ = 150 °C | | 32 | | A |
| | | | $t_P$ ≤ 7 µs, $T_{vj}$ = 175 °C | | 30 | | |
| Thermal resistance, junction to heatsink | $R_{thJH}$ | per IGBT, Valid with IFX pre-applied Thermal Interface Material | | | | 2.18 | K/W |
| Temperature under switching conditions | $T_{vj\,op}$ | | | -40 | | 175 | °C |

*Note:* *$T_{vj\,op}$ > 150°C is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.*

## 6 Diode, Brake-Chopper

**Table 11** **Maximum rated values**

| Parameter | Symbol | Note or test condition | | Values | Unit |
|---|---|---|---|---|---|
| Repetitive peak reverse voltage | $V_{RRM}$ | | $T_{vj}$ = 25 °C | 1200 | V |
| Continous DC forward current | $I_F$ | | | 10 | A |
| Repetitive peak forward current | $I_{FRM}$ | $t_P$ = 1 ms | | 20 | A |
| $I^2t$ - value | $I^2t$ | $V_R$ = 0 V, $t_P$ = 10 ms | $T_{vj}$ = 125 °C | 27.5 | $A^2s$ |
| | | | $T_{vj}$ = 175 °C | 24 | |

**Table 12** **Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Forward voltage | $V_F$ | $I_F$ = 10 A, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | 1.72 | TBD | V |
| | | | $T_{vj}$ = 125 °C | | 1.59 | | |
| | | | $T_{vj}$ = 175 °C | | 1.52 | | |
| Peak reverse recovery current | $I_{RM}$ | $I_F$ = 10 A, $V_R$ = 600 V, -$di_F/dt$ = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 10.5 | | A |
| | | | $T_{vj}$ = 125 °C | | 15.3 | | |
| | | | $T_{vj}$ = 175 °C | | 17.5 | | |
| Recovered charge | $Q_r$ | $I_F$ = 10 A, $V_R$ = 600 V, -$di_F/dt$ = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.97 | | µC |
| | | | $T_{vj}$ = 125 °C | | 1.7 | | |
| | | | $T_{vj}$ = 175 °C | | 2.2 | | |
| Reverse recovery energy | $E_{rec}$ | $I_F$ = 10 A, $V_R$ = 600 V, -$di_F/dt$ = 550 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.24 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 0.51 | | |
| | | | $T_{vj}$ = 175 °C | | 0.72 | | |
| Thermal resistance, junction to heatsink | $R_{thJH}$ | per diode, Valid with IFX pre-applied Thermal Interface Material | | | | 2.68 | K/W |
| Temperature under switching conditions | $T_{vj\ op}$ | | | -40 | | 175 | °C |

*Note:* *$T_{vj\ op}$ > 150°C is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.*

## 7 NTC-Thermistor

**Table 13** **Characteristic values**

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Rated resistance | $R_{25}$ | $T_{NTC}$ = 25 °C | | 5 | | kΩ |
| Deviation of $R_{100}$ | $\Delta R/R$ | $T_{NTC}$ = 100 °C, $R_{100}$ = 493 Ω | -5 | | 5 | % |
| Power dissipation | $P_{25}$ | $T_{NTC}$ = 25 °C | | | 20 | mW |
| B-value | $B_{25/50}$ | $R_2 = R_{25} \exp[B_{25/50}(1/T_2-1/(298,15\ K))]$ | | 3375 | | K |
| B-value | $B_{25/80}$ | $R_2 = R_{25} \exp[B_{25/80}(1/T_2-1/(298,15\ K))]$ | | 3411 | | K |
| B-value | $B_{25/100}$ | $R_2 = R_{25} \exp[B_{25/100}(1/T_2-1/(298,15\ K))]$ | | 3433 | | K |

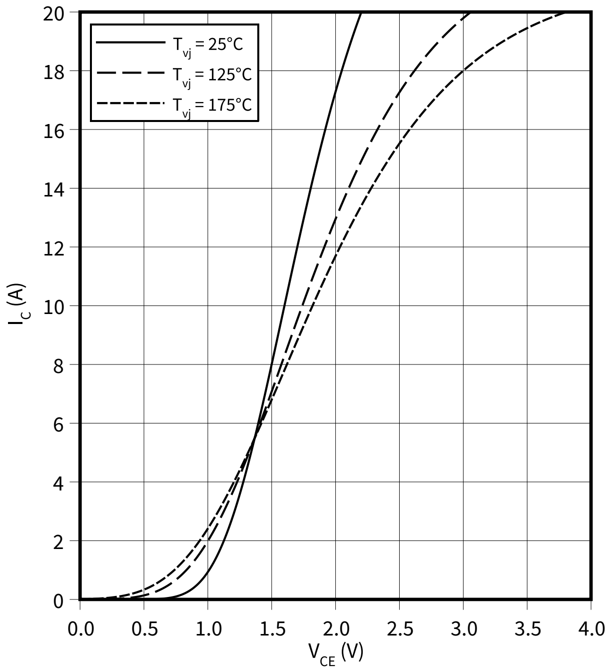
*Note:* *Specification according to the valid application note.*

# 8 Characteristics diagrams

**output characteristic (typical), IGBT, Inverter**

$I_C = f(V_{CE})$

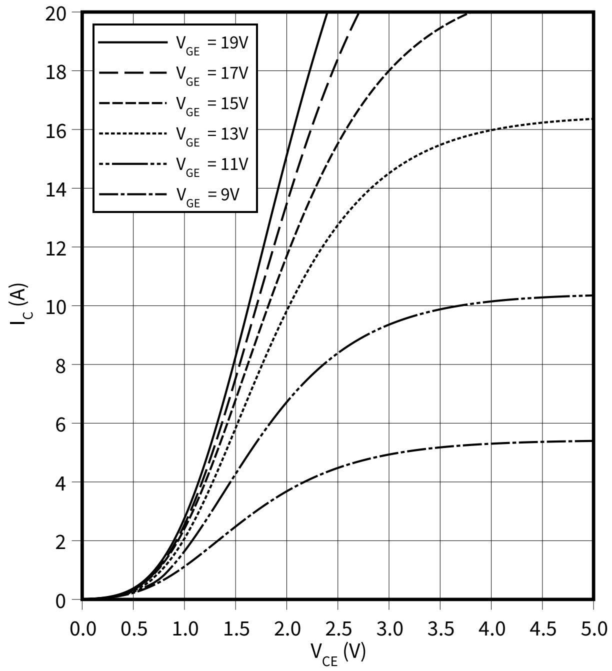
$V_{GE} = 15$ V




**output characteristic (typical), IGBT, Inverter**

$I_C = f(V_{CE})$

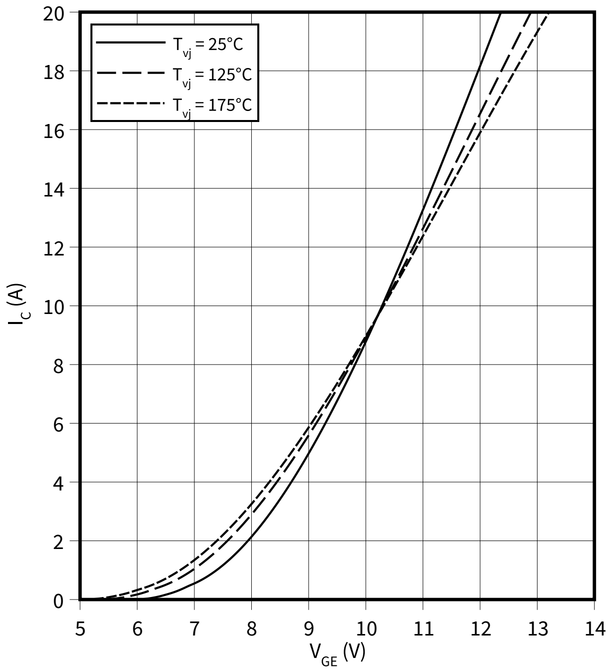
$T_{vj} = 175$ °C




**transfer characteristic (typical), IGBT, Inverter**

$I_C = f(V_{GE})$

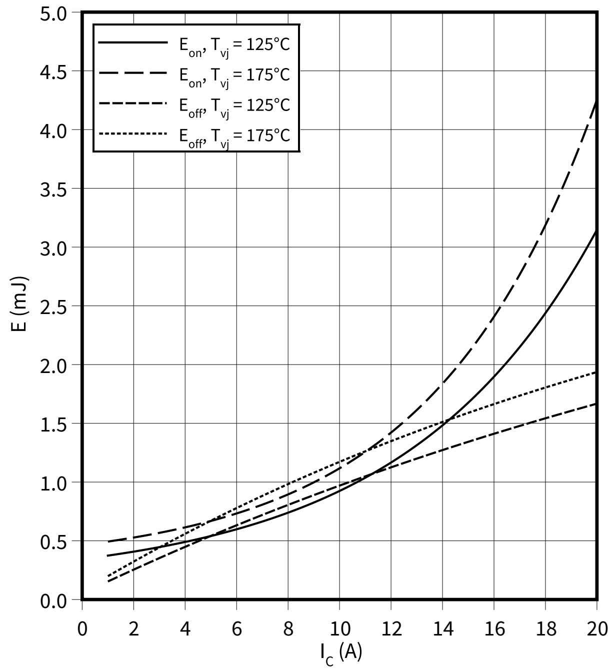
$V_{CE} = 20$ V




**switching losses (typical), IGBT, Inverter**

$E = f(I_C)$

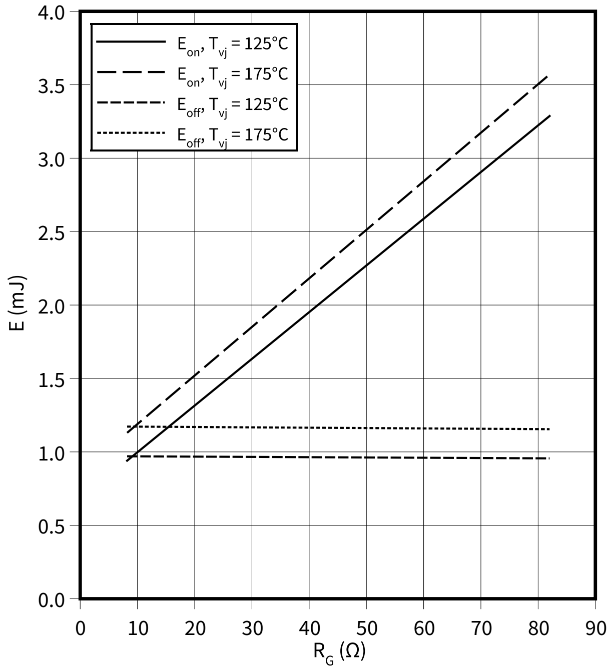
$R_{Goff} = 8.2\ \Omega$, $R_{Gon} = 8.2\ \Omega$, $V_{CE} = 600$ V, $V_{GE} = \pm 15$ V



## switching losses (typical), IGBT, Inverter

$E = f(R_G)$

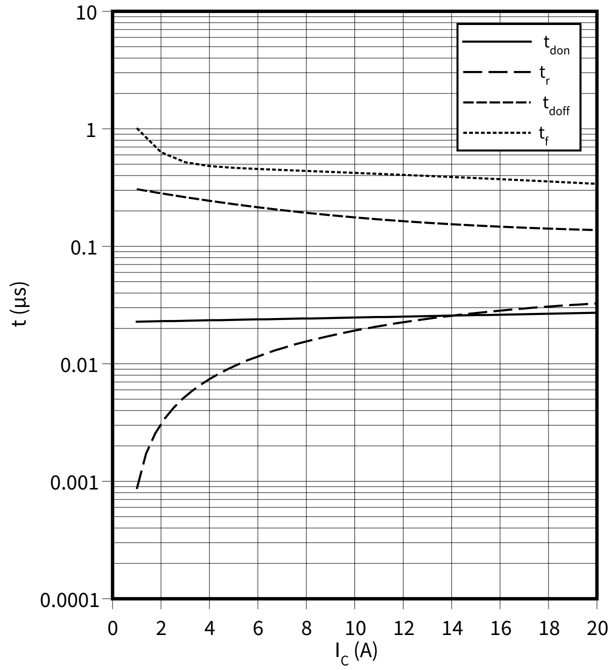
$I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ± 15 V




## switching times (typical), IGBT, Inverter

$t = f(I_C)$

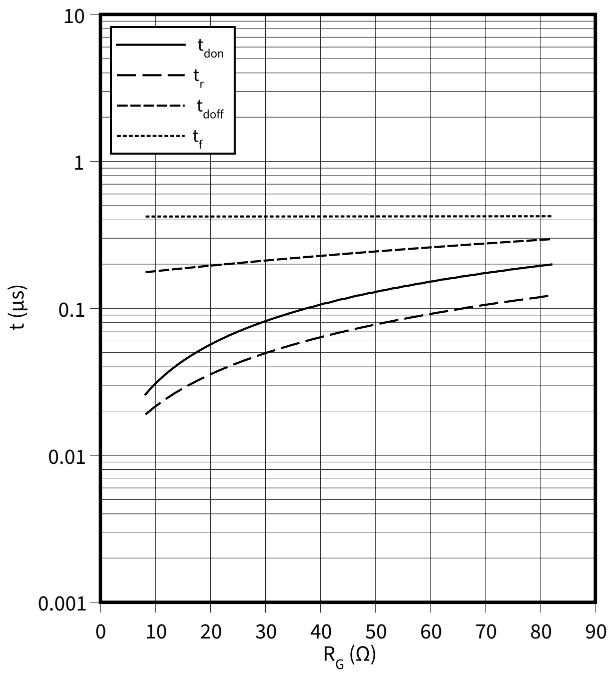
$R_{Goff}$ = 8.2 Ω, $R_{Gon}$ = 8.2 Ω, $V_{CE}$ = 600 V, $V_{GE}$ = ± 15 V, $T_{vj}$ = 175 °C




## switching times (typical), IGBT, Inverter

$t = f(R_G)$

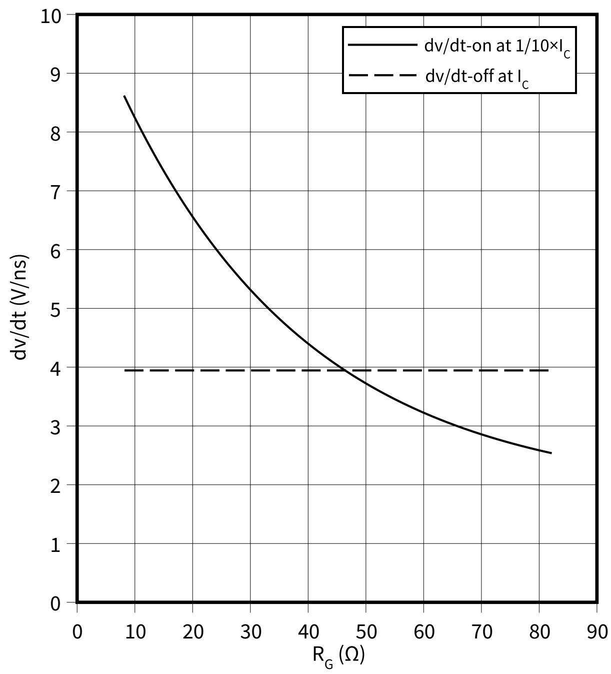
$I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ± 15 V, $T_{vj}$ = 175 °C




## dv/dt (typical), IGBT, Inverter

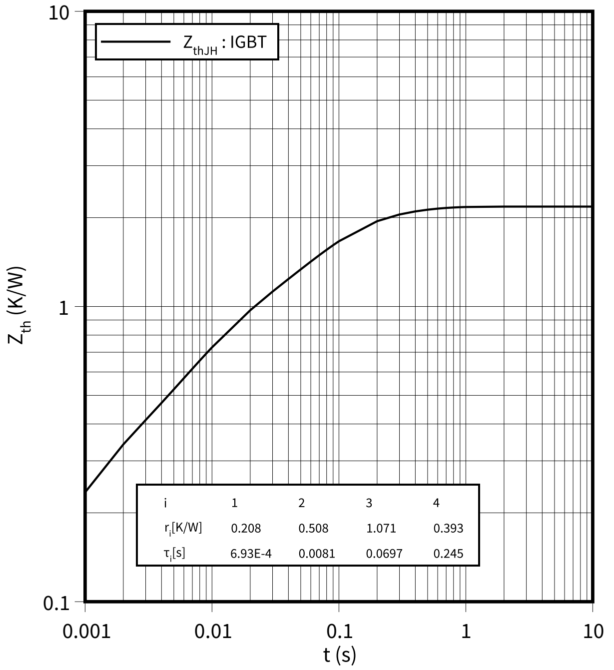
$dv/dt = f(R_G)$

$I_C$ = 10 A, $V_{CE}$ = 600 V, $V_{GE}$ = ±15 V, $T_{vj}$ = 25 °C



**transient thermal impedance , IGBT, Inverter**

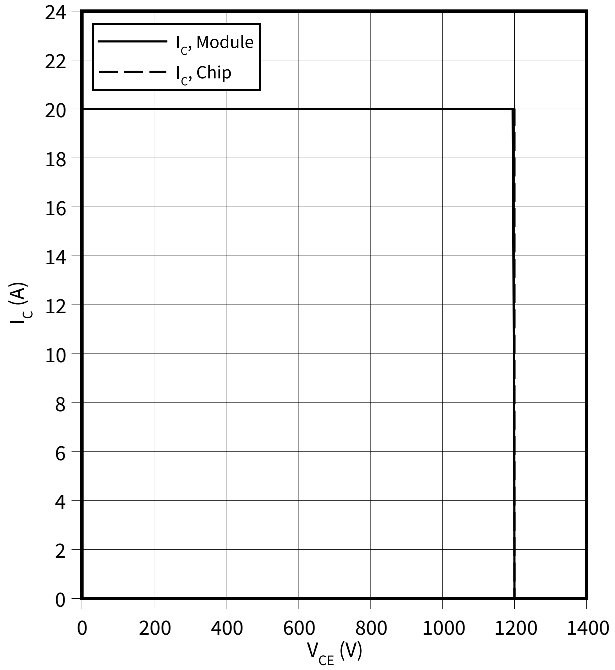
$Z_{th} = f(t)$




**reverse bias safe operating area (RBSOA), IGBT, Inverter**

$I_C = f(V_{CE})$

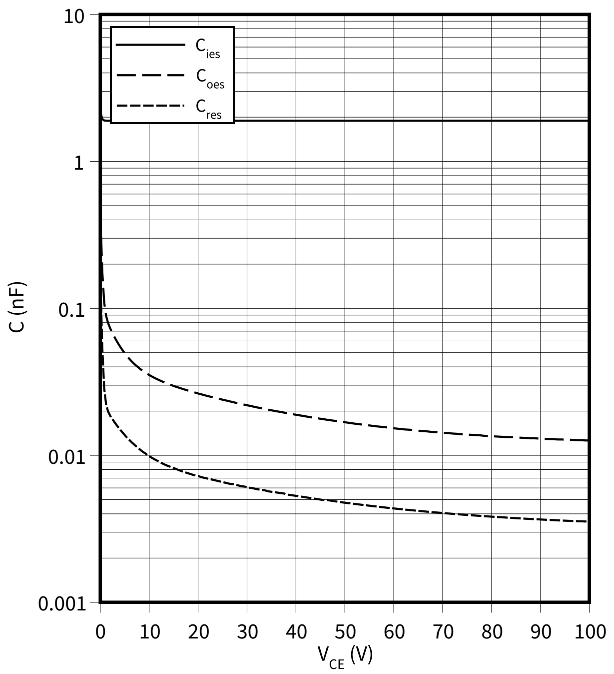
$R_{Goff} = 8.2\ \Omega$, $V_{GE} = \pm15$ V, $T_{vj} = 175$ °C




**capacity characteristic (typical), IGBT, Inverter**

$C = f(V_{CE})$

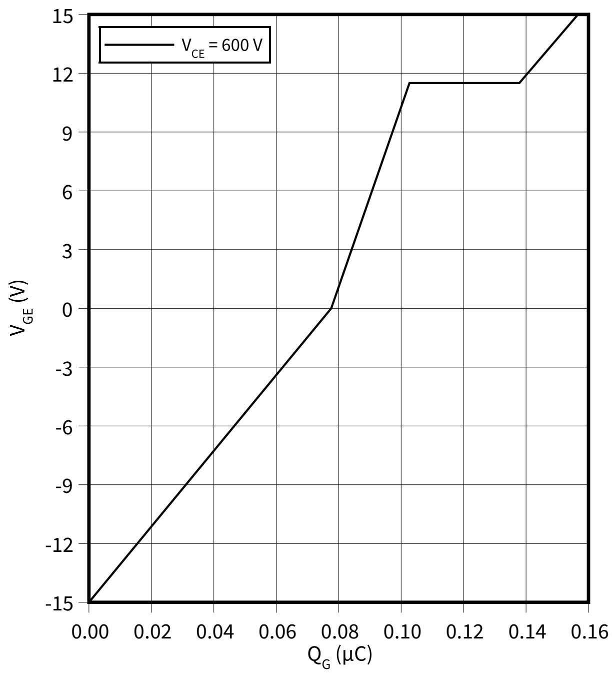
$T_{vj} = 25$ °C, f = 100 kHz, $V_{GE} = 0$ V




**gate charge characteristic (typical), IGBT, Inverter**

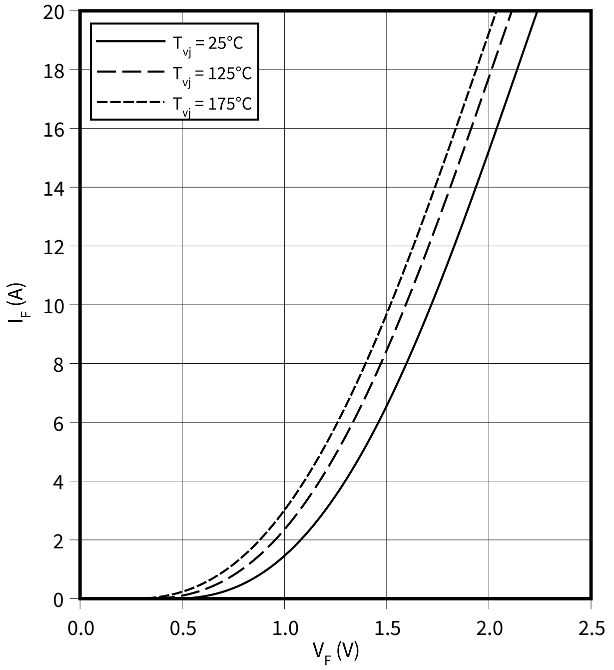
$V_{GE} = f(Q_G)$

$T_{vj} = 25$ °C, $I_C = 10$ A



**forward characteristic (typical), Diode, Inverter**

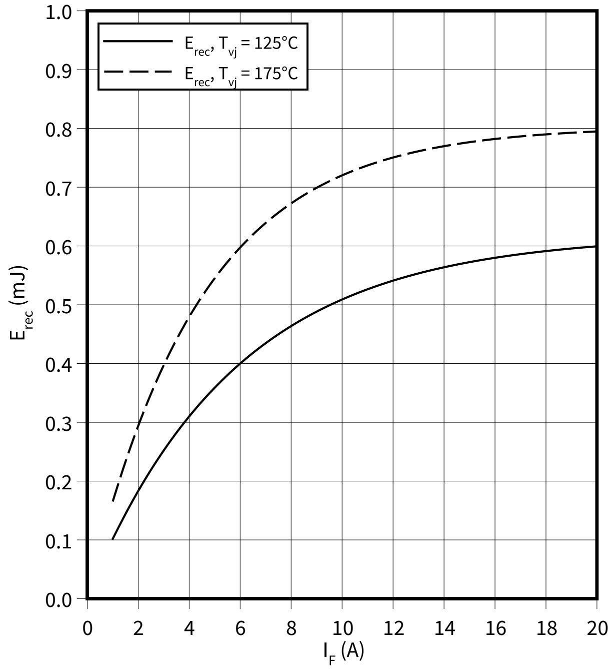
$I_F = f(V_F)$




**switching losses (typical), Diode, Inverter**

$E_{rec} = f(I_F)$

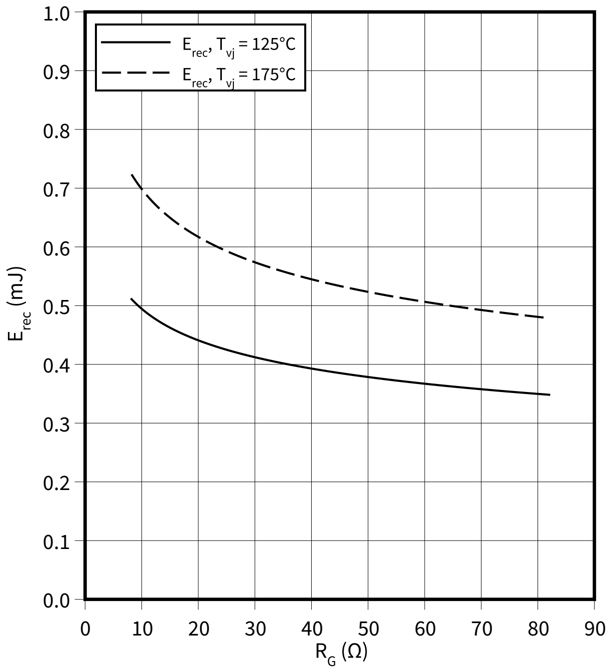
$R_{Gon} = 8.2\ \Omega$, $V_{CE} = 600\ V$




**switching losses (typical), Diode, Inverter**

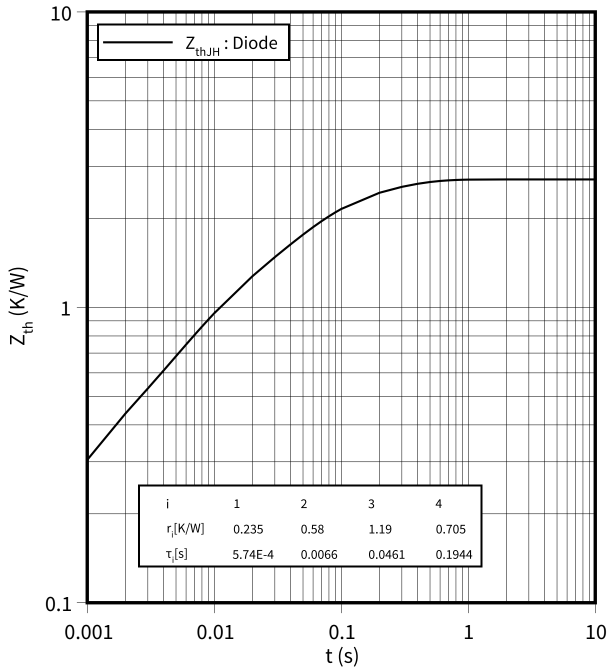
$E_{rec} = f(R_G)$

$V_{CE} = 600\ V$, $I_F = 10\ A$




**transient thermal impedance , Diode, Inverter**

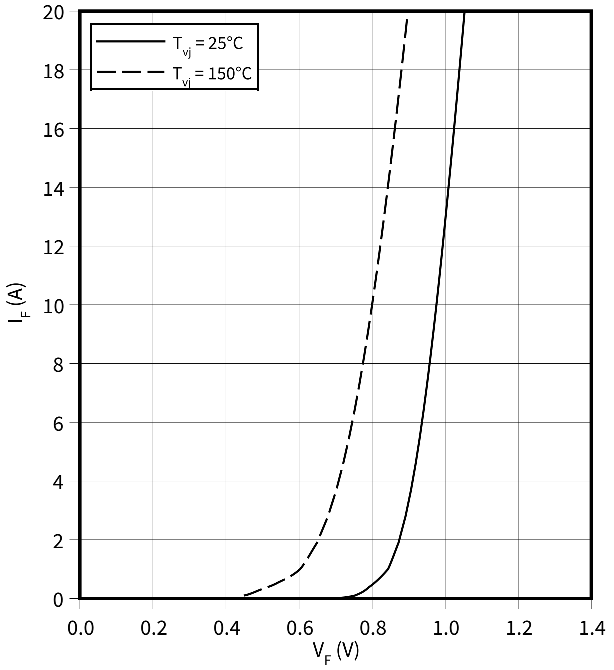
$Z_{th} = f(t)$




| i | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $r_i$[K/W] | 0.235 | 0.58 | 1.19 | 0.705 |
| $\tau_i$[s] | 5.74E-4 | 0.0066 | 0.0461 | 0.1944 |

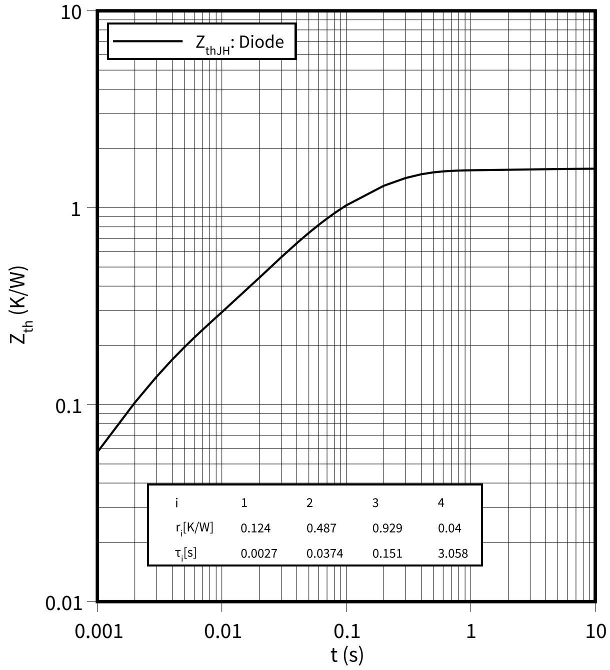
**forward characteristic (typical), Diode, Rectifier**

$I_F = f(V_F)$




**transient thermal impedance , Diode, Rectifier**

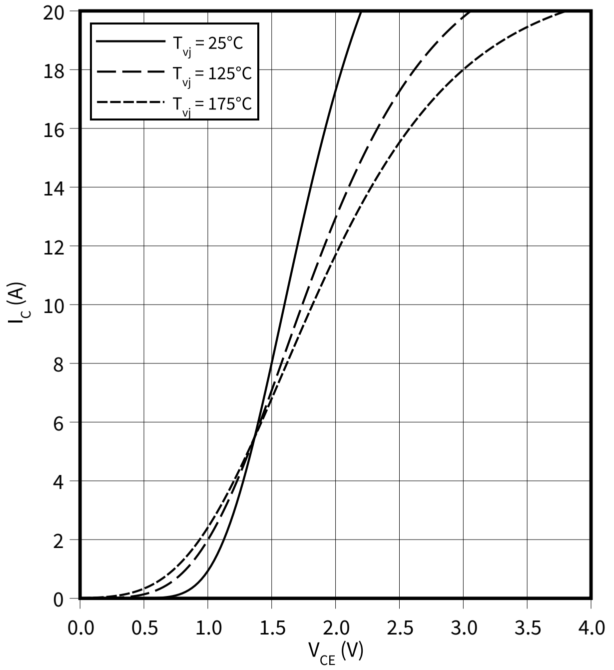
$Z_{th} = f(t)$




**output characteristic (typical), IGBT, Brake-Chopper**

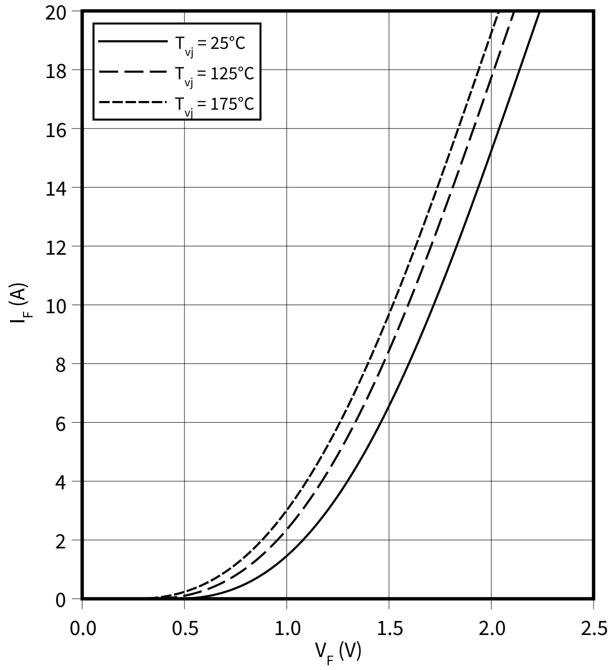
$I_C = f(V_{CE})$

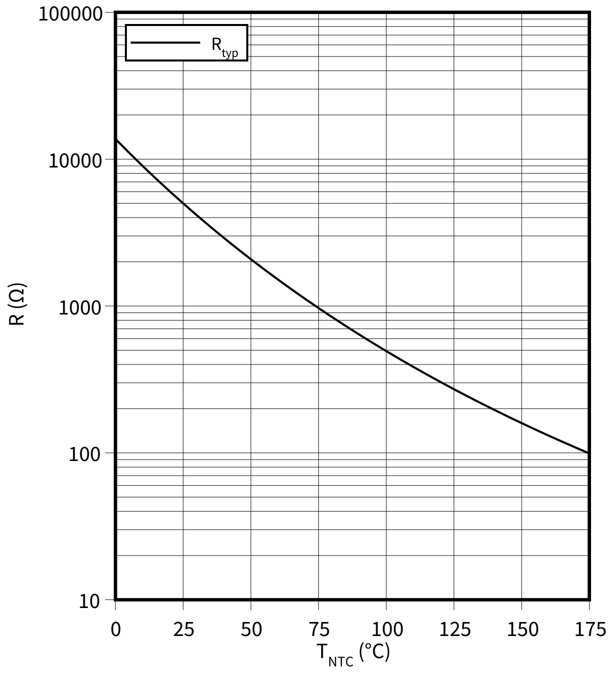
$V_{GE} = 15\ V$




**forward characteristic (typical), Diode, Brake-Chopper**

$I_F = f(V_F)$



| **temperature characteristic (typical), NTC-Thermistor**<br>$R = f(T_{NTC})$ | |
|---|---|
|  | |

# 9 Circuit diagram

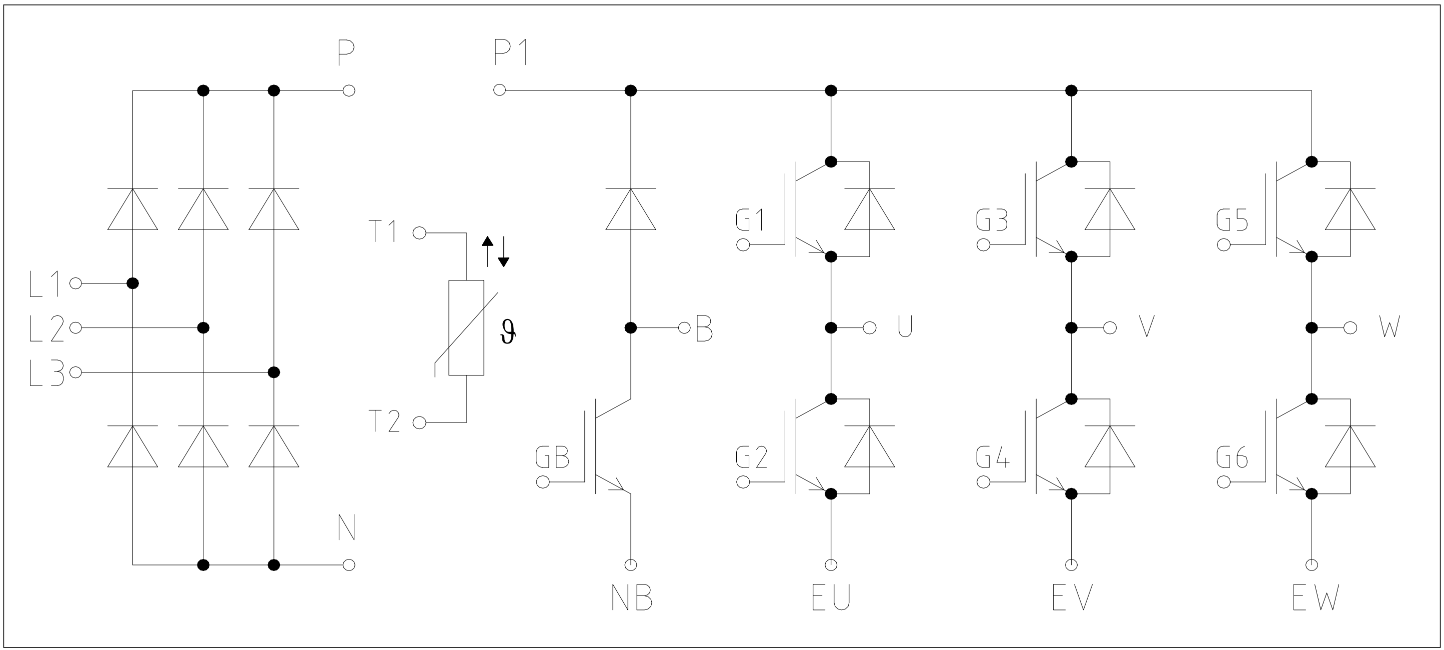



**Figure 2**

# 10 Package outlines

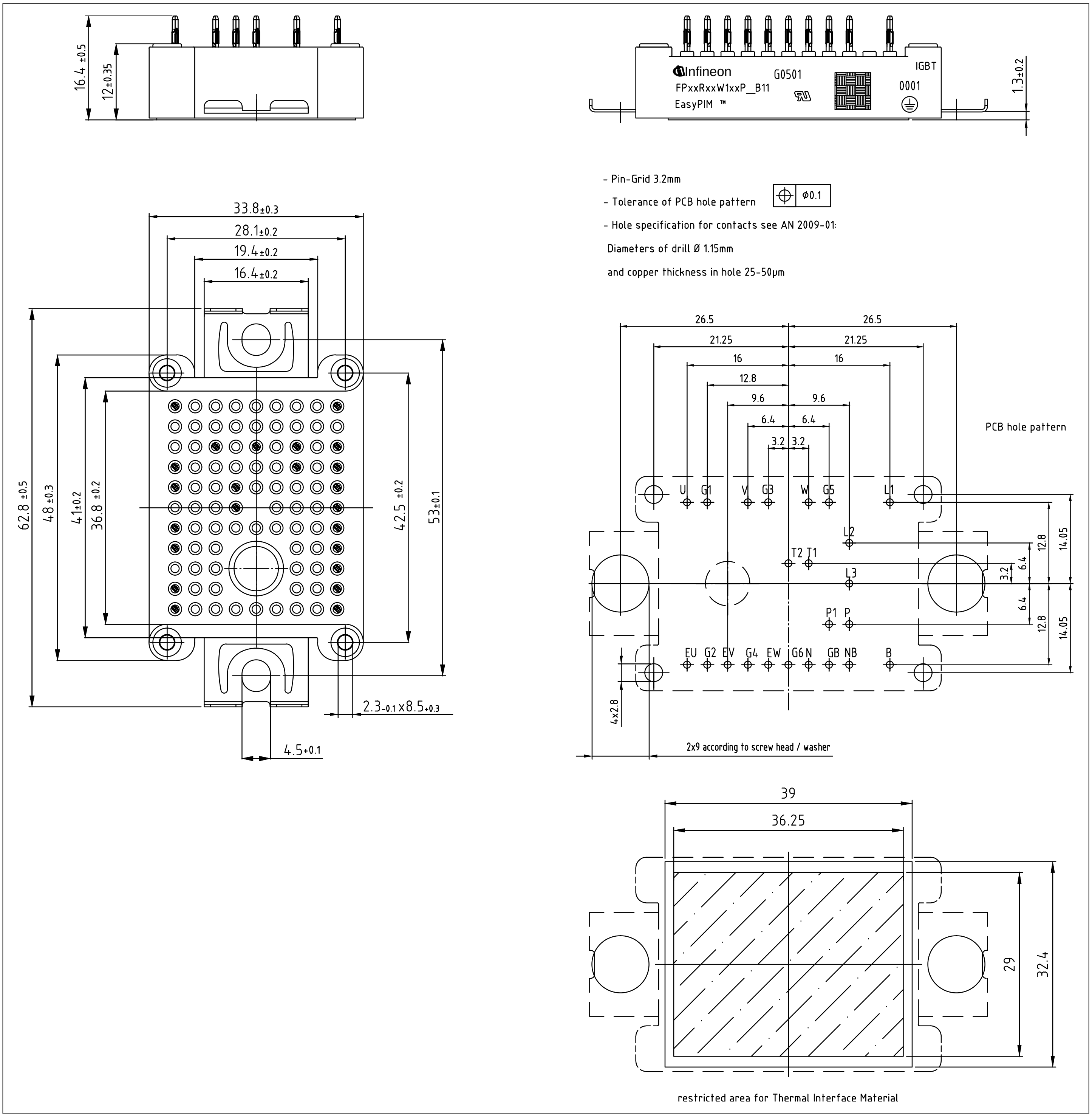



**Figure 3**

# 11 Module label code

| **Module label code** | | |
|---|---|---|
| Code format | Data Matrix | Barcode Code128 |
| Encoding | ASCII text | Code Set A |
| Symbol size | 16x16 | 23 digits |
| Standard | IEC24720 and IEC16022 | IEC8859-1 |

| Code content | *Content* | *Digit* | *Example* |
|---|---|---|---|
| | Module serial number | 1 – 5 | 71549 |
| | Module material number | 6 - 11 | 142846 |
| | Production order number | 12 - 19 | 55054991 |
| | Date code (production year) | 20 – 21 | 15 |
| | Date code (production week) | 22 – 23 | 30 |
| Example | 71549142846550549911530 | | 71549142846550549911530 |

**Figure 4**

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