## EconoPIM™2 module with TRENCHSTOP™IGBT7 and emitter controlled 7 diode and NTC

### Features



Typical appearance

- Electrical features
  - $V_{CES}$ = 1200 V
  - $I_{C\ nom}$ = 25 A / $I_{CRM}$ = 50 A
  - TRENCHSTOP™ IGBT7
  - Overload operation up to 175°C
  - Low $V_{CE,sat}$
- Mechanical features
  - High power density
  - Compact design
  - $Al_2O_3$ substrate with low thermal resistance
  - 2.5 kV AC 1 minute insulation

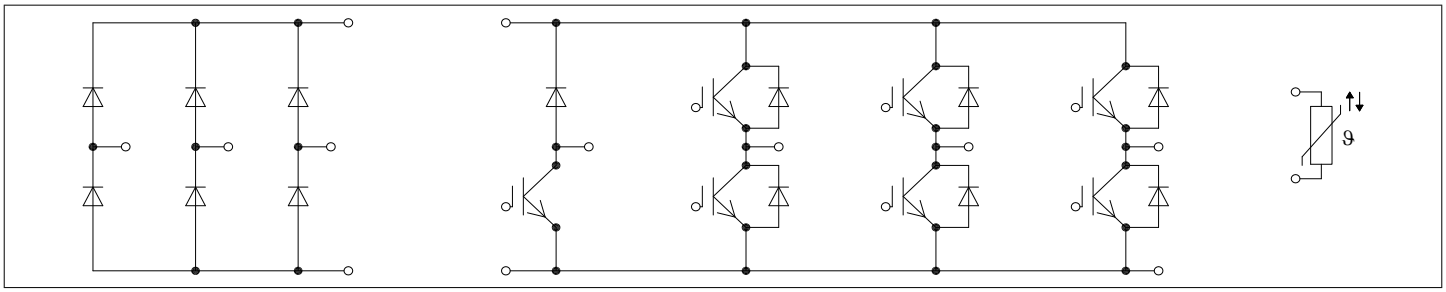
### Potential applications

- Auxiliary inverters
- Air conditioning
- 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 |
| Material of module baseplate | | | Cu | |
| Internal isolation | | basic insulation (class 1, IEC 61140) | $Al_2O_3$ | |
| Creepage distance | $d_{Creep}$ | terminal to heatsink | 10.0 | mm |
| Clearance | $d_{Clear}$ | terminal to heatsink | 7.5 | mm |
| Comparative tracking index | *CTI* | | > 200 | |
| Relative thermal index (electrical) | *RTI* | housing | 140 | °C |

**Table 2 Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Stray inductance module | $L_{sCE}$ | | | | 35 | | nH |
| Module lead resistance, terminals - chip | $R_{AA'+CC'}$ | $T_C$ = 25 °C, per switch | | | 6.9 | | mΩ |
| Module lead resistance, terminals - chip | $R_{CC'+EE'}$ | $T_C$ = 25 °C, per switch | | | 5.9 | | mΩ |
| Storage temperature | $T_{stg}$ | | | -40 | | 125 | °C |
| Mounting torque for module mounting | *M* | - Mounting according to valid application note | M5, Screw | 3 | | 5 | Nm |
| Weight | *G* | | | | 180 | | g |

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

*The current under continuous operation is limited to 50 A rms per connector pin*

# 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 |
| Continuous DC collector current | $I_{CDC}$ | $T_{vj\,max}$ = 175 °C | $T_C$ = 120 °C | 25 | A |
| Repetitive peak collector current | $I_{CRM}$ | $t_p$ limited by $T_{vj\,op}$ | | 50 | A |

**(table continues...)**

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

| 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 | $V_{CE\,sat}$ | $I_C$ = 25 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25 °C | | 1.60 | 1.85 | V |
| | | | $T_{vj}$ = 125 °C | | 1.74 | | |
| | | | $T_{vj}$ = 175 °C | | 1.82 | | |
| Gate threshold voltage | $V_{GEth}$ | $I_C$ = 0.525 mA, $V_{CE}$ = $V_{GE}$, $T_{vj}$ = 25 °C | | 5.15 | 5.80 | 6.45 | V |
| Gate charge | $Q_G$ | $V_{GE}$ = ±15 V, $V_{CC}$ = 600 V | | | 0.395 | | 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 | | | 4.77 | | nF |
| Reverse transfer capacitance | $C_{res}$ | $f$ = 100 kHz, $T_{vj}$ = 25 °C, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | | | 0.017 | | nF |
| Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | | 0.0056 | 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) | $t_{don}$ | $I_C$ = 25 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 9.1 Ω | $T_{vj}$ = 25 °C | | 0.040 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.042 | | |
| | | | $T_{vj}$ = 175 °C | | 0.043 | | |
| Rise time (inductive load) | $t_r$ | $I_C$ = 25 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 9.1 Ω | $T_{vj}$ = 25 °C | | 0.045 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.048 | | |
| | | | $T_{vj}$ = 175 °C | | 0.050 | | |
| Turn-off delay time (inductive load) | $t_{doff}$ | $I_C$ = 25 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 9.1 Ω | $T_{vj}$ = 25 °C | | 0.209 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.325 | | |
| | | | $T_{vj}$ = 175 °C | | 0.376 | | |
| Fall time (inductive load) | $t_f$ | $I_C$ = 25 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 9.1 Ω | $T_{vj}$ = 25 °C | | 0.164 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.233 | | |
| | | | $T_{vj}$ = 175 °C | | 0.300 | | |
| Turn-on energy loss per pulse | $E_{on}$ | $I_C$ = 25 A, $V_{CC}$ = 600 V, $L_\sigma$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Gon}$ = 9.1 Ω, di/dt = 640 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 2.29 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 3.01 | | |
| | | | $T_{vj}$ = 175 °C | | 3.52 | | |

**(table continues...)**

**Table 4 (continued) Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Turn-off energy loss per pulse | $E_{off}$ | $I_C$ = 25 A, $V_{CC}$ = 600 V, $L_\sigma$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Goff}$ = 9.1 Ω, dv/dt = 2900 V/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 1.57 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 2.58 | | |
| | | | $T_{vj}$ = 175 °C | | 3.15 | | |
| 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 | | 80 | | A |
| | | | $t_P$ ≤ 7 µs, $T_{vj}$=175 °C | | 75 | | |
| Thermal resistance, junction to case | $R_{thJC}$ | per IGBT | | | | 0.967 | K/W |
| Thermal resistance, case to heat sink | $R_{thCH}$ | per IGBT, $\lambda_{grease}$ = 1 W/(m·K) | | | 0.170 | | 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 |
| Continuous DC forward current | $I_F$ | | | 25 | A |
| Repetitive peak forward current | $I_{FRM}$ | $t_P$ = 1 ms | | 50 | A |
| $I^2t$ - value | $I^2t$ | $t_P$ = 10 ms, $V_R$ = 0 V | $T_{vj}$ = 125 °C | 125 | $A^2s$ |
| | | | $T_{vj}$ = 175 °C | 95 | |

**Table 6 Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Forward voltage | $V_F$ | $I_F$ = 25 A, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | 1.83 | 2.30 | V |
| | | | $T_{vj}$ = 125 °C | | 1.70 | | |
| | | | $T_{vj}$ = 175 °C | | 1.63 | | |

**(table continues...)**

**Table 6 (continued) Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Peak reverse recovery current | $I_{RM}$ | $V_{CC}$ = 600 V, $I_F$ = 25 A, $V_{GE}$ = -15 V, -di$_F$/dt = 640 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 17.3 | | A |
| | | | $T_{vj}$ = 125 °C | | 22.1 | | |
| | | | $T_{vj}$ = 175 °C | | 25.1 | | |
| Recovered charge | $Q_r$ | $V_{CC}$ = 600 V, $I_F$ = 25 A, $V_{GE}$ = -15 V, -di$_F$/dt = 640 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 2.01 | | µC |
| | | | $T_{vj}$ = 125 °C | | 3.57 | | |
| | | | $T_{vj}$ = 175 °C | | 4.72 | | |
| Reverse recovery energy | $E_{rec}$ | $V_{CC}$ = 600 V, $I_F$ = 25 A, $V_{GE}$ = -15 V, -di$_F$/dt = 640 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.74 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 1.36 | | |
| | | | $T_{vj}$ = 175 °C | | 1.79 | | |
| Thermal resistance, junction to case | $R_{thJC}$ | per diode | | | | 1.43 | K/W |
| Thermal resistance, case to heat sink | $R_{thCH}$ | per diode, $\lambda_{grease}$ = 1 W/(m·K) | | | 0.182 | | 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 | $I_{FRMSM}$ | $T_C$ = 80 °C | | 70 | A |
| Maximum RMS current at rectifier output | $I_{RMSM}$ | $T_C$ = 80 °C | | 100 | A |
| Surge forward current | $I_{FSM}$ | $t_P$ = 10 ms | $T_{vj}$ = 25 °C | 560 | A |
| | | | $T_{vj}$ = 150 °C | 435 | |
| I$^2$t - value | $I^2t$ | $t_P$ = 10 ms | $T_{vj}$ = 25 °C | 1570 | A$^2$s |
| | | | $T_{vj}$ = 150 °C | 945 | |

**Table 8 Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Forward voltage | $V_F$ | $I_F$ = 25 A | $T_{vj}$ = 150 °C | | 0.88 | | V |
| Reverse current | $I_r$ | $T_{vj}$ = 150 °C, $V_R$ = 1600 V | | | 1 | | mA |
| Thermal resistance, junction to case | $R_{thJC}$ | per diode | | | | 0.870 | K/W |
| Thermal resistance, case to heat sink | $R_{thCH}$ | per diode, $\lambda_{grease}$ = 1 W/(m·K) | | | 0.166 | | K/W |
| 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 |
| Continuous DC collector current | $I_{CDC}$ | $T_{vj\,max}$ = 175 °C | $T_C$ = 125 °C | 15 | A |
| Repetitive peak collector current | $I_{CRM}$ | $t_p$ limited by $T_{vj\,op}$ | | 30 | 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 | $V_{CE\,sat}$ | $I_C$ = 15 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25 °C | | 1.60 | 1.85 | V |
| | | | $T_{vj}$ = 125 °C | | 1.74 | | |
| | | | $T_{vj}$ = 175 °C | | 1.82 | | |
| Gate threshold voltage | $V_{GEth}$ | $I_C$ = 0.553 mA, $V_{CE}$ = $V_{GE}$, $T_{vj}$ = 25 °C | | 5.15 | 5.80 | 6.45 | V |
| Gate charge | $Q_G$ | $V_{GE}$ = ±15 V, $V_{CC}$ = 600 V | | | 0.234 | | 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 | | | 2.82 | | nF |
| Reverse transfer capacitance | $C_{res}$ | $f$ = 100 kHz, $T_{vj}$ = 25 °C, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | | | 0.01 | | nF |
| Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | | | 0.003 | mA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = 20 V, $T_{vj}$ = 25 °C | | | | 100 | nA |

**(table continues...)**

**Table 10 (continued) Characteristic values**

| Parameter | Symbol | Note or test condition | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Turn-on delay time (inductive load) | $t_{don}$ | $I_C$ = 15 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 10 Ω | $T_{vj}$ = 25 °C | | 0.034 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.035 | | |
| | | | $T_{vj}$ = 175 °C | | 0.036 | | |
| Rise time (inductive load) | $t_r$ | $I_C$ = 15 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Gon}$ = 10 Ω | $T_{vj}$ = 25 °C | | 0.053 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.054 | | |
| | | | $T_{vj}$ = 175 °C | | 0.055 | | |
| Turn-off delay time (inductive load) | $t_{doff}$ | $I_C$ = 15 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 10 Ω | $T_{vj}$ = 25 °C | | 0.336 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.534 | | |
| | | | $T_{vj}$ = 175 °C | | 0.632 | | |
| Fall time (inductive load) | $t_f$ | $I_C$ = 15 A, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $R_{Goff}$ = 10 Ω | $T_{vj}$ = 25 °C | | 0.272 | | µs |
| | | | $T_{vj}$ = 125 °C | | 0.313 | | |
| | | | $T_{vj}$ = 175 °C | | 0.333 | | |
| Turn-on energy loss per pulse | $E_{on}$ | $I_C$ = 15 A, $V_{CC}$ = 600 V, $L_\sigma$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Gon}$ = 10 Ω, di/dt = 520 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 4.57 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 5.55 | | |
| | | | $T_{vj}$ = 175 °C | | 6.07 | | |
| Turn-off energy loss per pulse | $E_{off}$ | $I_C$ = 15 A, $V_{CC}$ = 600 V, $L_\sigma$ = 35 nH, $V_{GE}$ = ±15 V, $R_{Goff}$ = 10 Ω, dv/dt = 2100 V/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.927 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 1.49 | | |
| | | | $T_{vj}$ = 175 °C | | 1.77 | | |
| 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 | | 48 | | A |
| | | | $t_P$ ≤ 7 µs, $T_{vj}$=175 °C | | 45 | | |
| Thermal resistance, junction to case | $R_{thJC}$ | per IGBT | | | | 1.29 | K/W |
| Thermal resistance, case to heat sink | $R_{thCH}$ | per IGBT, $\lambda_{grease}$ = 1 W/(m·K) | | | 0.180 | | 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 |
| Continuous DC forward current | $I_F$ | | | 10 | A |
| Repetitive peak forward current | $I_{FRM}$ | $t_P$ = 1 ms | | 20 | A |
| $I^2t$ - value | $I^2t$ | $t_P$ = 10 ms, $V_R$ = 0 V | $T_{vj}$ = 125 °C | 30 | $A^2s$ |
| | | | $T_{vj}$ = 175 °C | 25 | |

**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 | 2.10 | V |
| | | | $T_{vj}$ = 125 °C | | 1.59 | | |
| | | | $T_{vj}$ = 175 °C | | 1.52 | | |
| Peak reverse recovery current | $I_{RM}$ | $V_{CC}$ = 600 V, $I_F$ = 10 A, $V_{GE}$ = -15 V, -di$_F$/dt = 450 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 11.2 | | A |
| | | | $T_{vj}$ = 125 °C | | 13.4 | | |
| | | | $T_{vj}$ = 175 °C | | 14.5 | | |
| Recovered charge | $Q_r$ | $V_{CC}$ = 600 V, $I_F$ = 10 A, $V_{GE}$ = -15 V, -di$_F$/dt = 450 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.95 | | µC |
| | | | $T_{vj}$ = 125 °C | | 1.68 | | |
| | | | $T_{vj}$ = 175 °C | | 2.05 | | |
| Reverse recovery energy | $E_{rec}$ | $V_{CC}$ = 600 V, $I_F$ = 10 A, $V_{GE}$ = -15 V, -di$_F$/dt = 450 A/µs ($T_{vj}$ = 175 °C) | $T_{vj}$ = 25 °C | | 0.37 | | mJ |
| | | | $T_{vj}$ = 125 °C | | 0.66 | | |
| | | | $T_{vj}$ = 175 °C | | 0.83 | | |
| Thermal resistance, junction to case | $R_{thJC}$ | per diode | | | | 1.81 | K/W |
| Thermal resistance, case to heat sink | $R_{thCH}$ | per diode, $\lambda_{grease}$ = 1 W/(m·K) | | | 0.181 | | 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 |

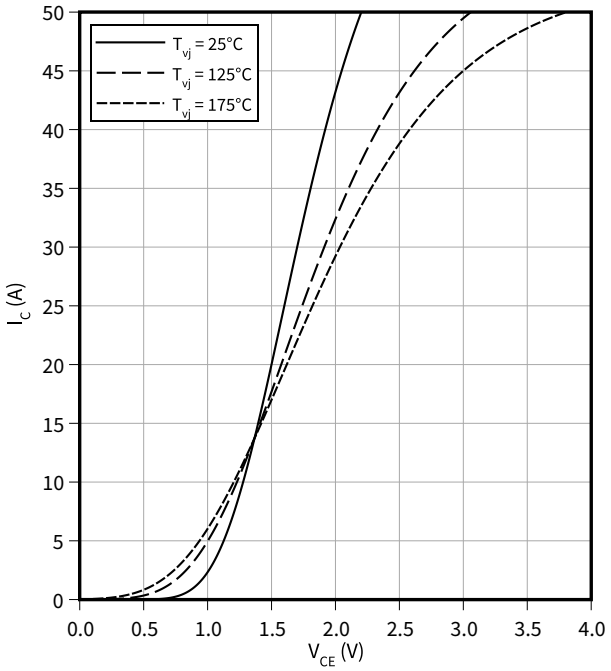
*Note: Specification according to the valid application note.*

# 8 Characteristics diagrams

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

$I_C = f(V_{CE})$

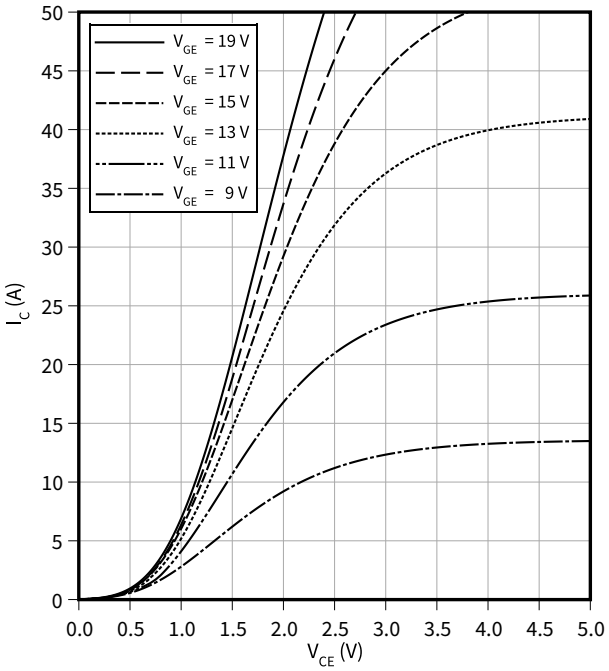
$V_{GE} = 15$ V




**Output characteristic field (typical), IGBT, Inverter**

$I_C = f(V_{CE})$

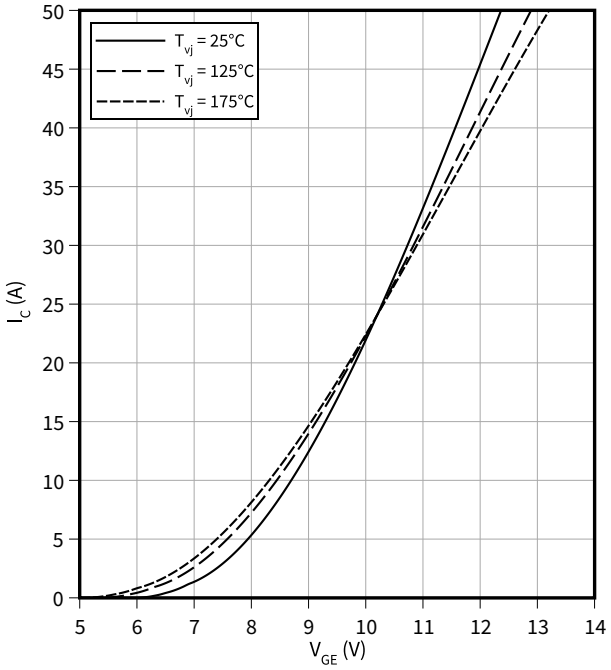
$T_{vj} = 175$ °C




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

$I_C = f(V_{GE})$

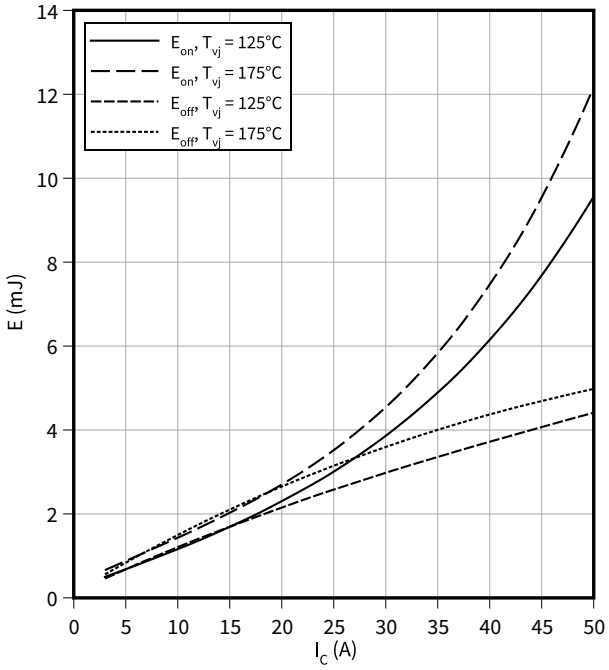
$V_{CE} = 20$ V




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

$E = f(I_C)$

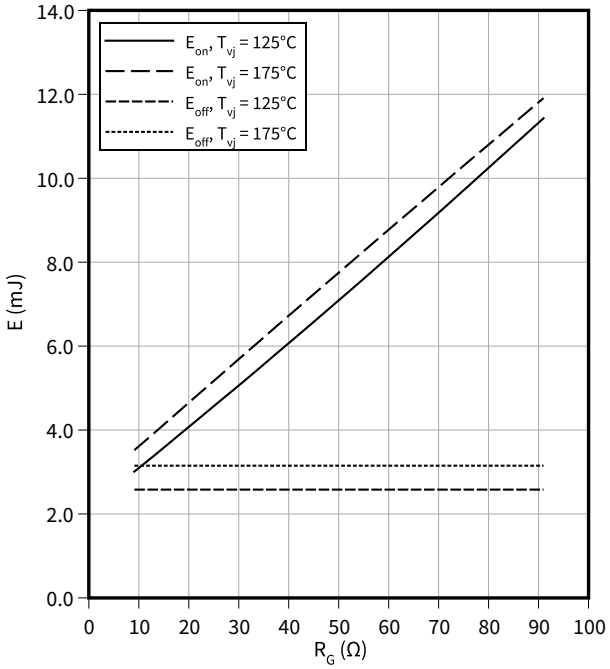
$R_{Goff} = 9.1\ \Omega$, $R_{Gon} = 9.1\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CC} = 600$ V



### Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

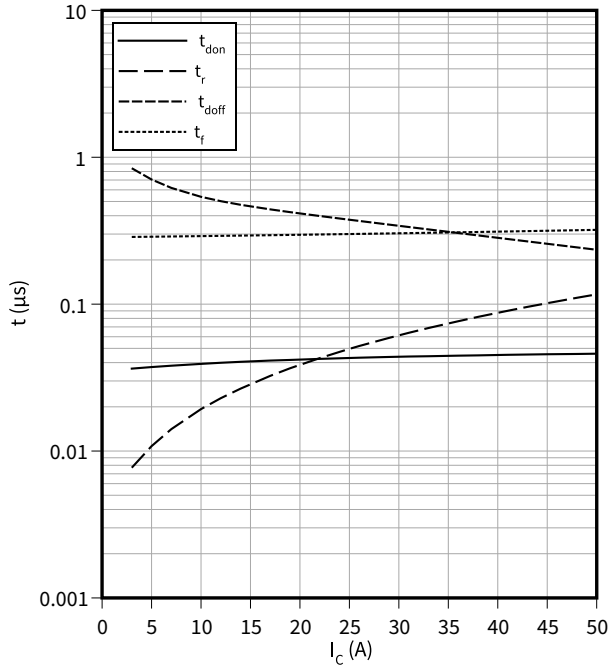
$V_{GE}$ = ±15 V, $I_C$ = 25 A, $V_{CC}$ = 600 V




### Switching times (typical), IGBT, Inverter

$t = f(I_C)$

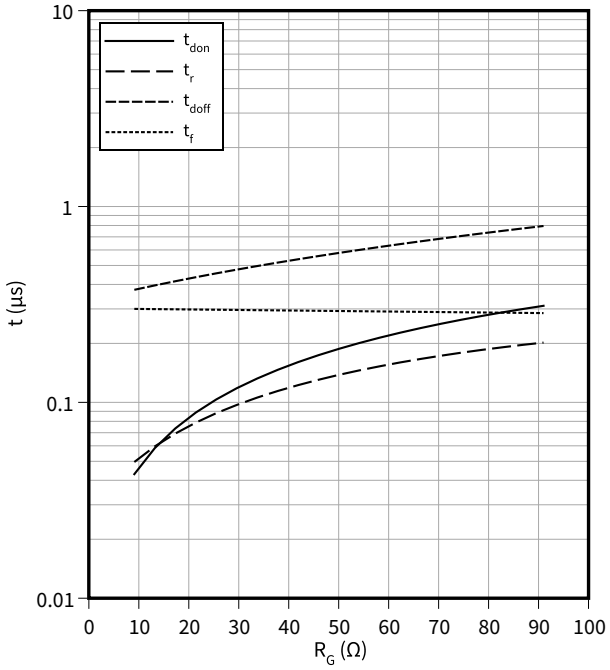
$R_{Goff}$ = 9.1 Ω, $R_{Gon}$ = 9.1 Ω, $V_{GE}$ = ±15 V, $V_{CC}$ = 600 V, $T_{vj}$ = 175 °C




### Switching times (typical), IGBT, Inverter

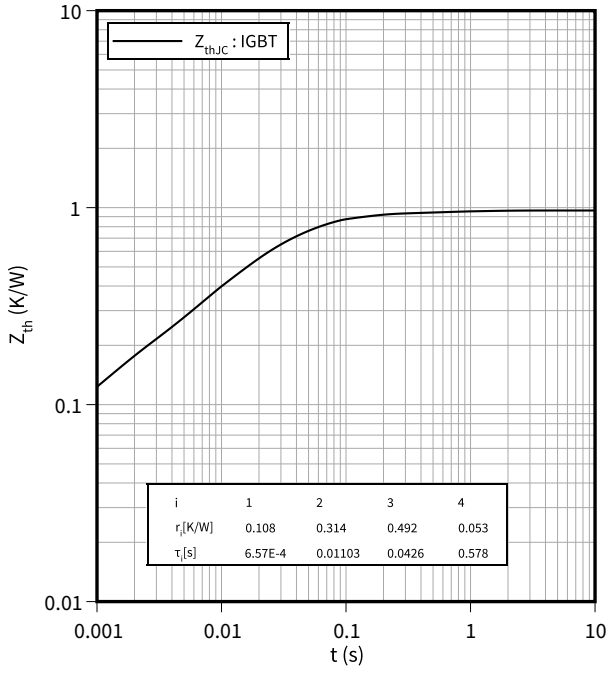
$t = f(R_G)$

$V_{GE}$ = ±15 V, $I_C$ = 25 A, $V_{CC}$ = 600 V, $T_{vj}$ = 175 °C




### Transient thermal impedance , IGBT, Inverter

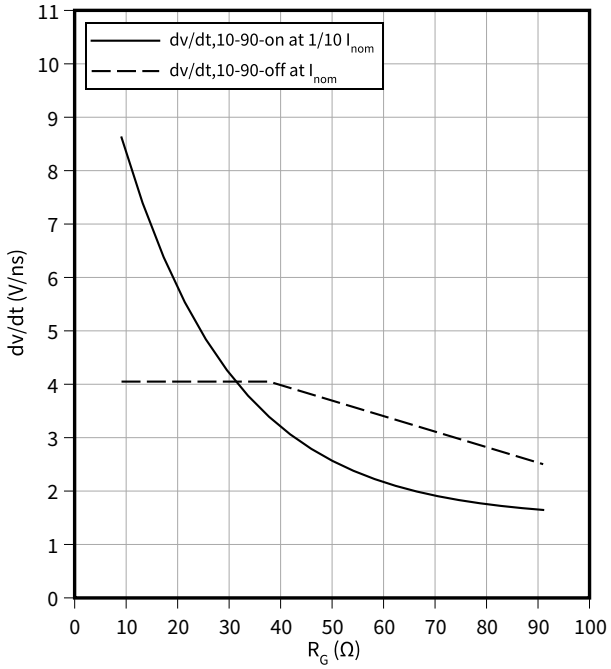
$Z_{th} = f(t)$



### Voltage slope (typical), IGBT, Inverter

$dv/dt = f(R_G)$

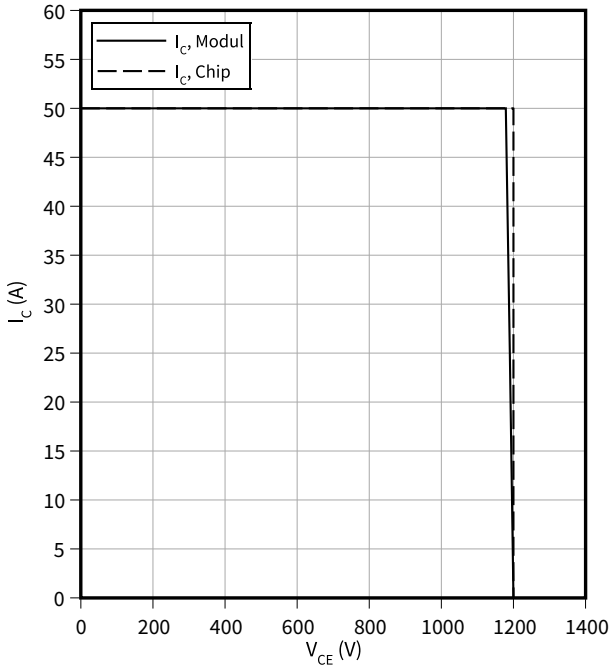
$I_C = 25\ A$, $V_{CC} = 600\ V$, $V_{GE} = \pm 15\ V$, $T_{vj} = 25\ °C$




### Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$

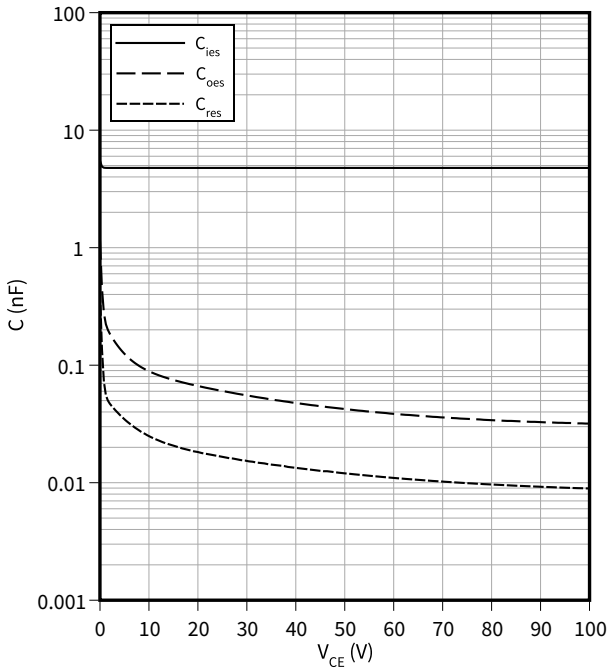
$R_{Goff} = 9.1\ \Omega$, $V_{GE} = \pm 15\ V$, $T_{vj} = 175\ °C$




### Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

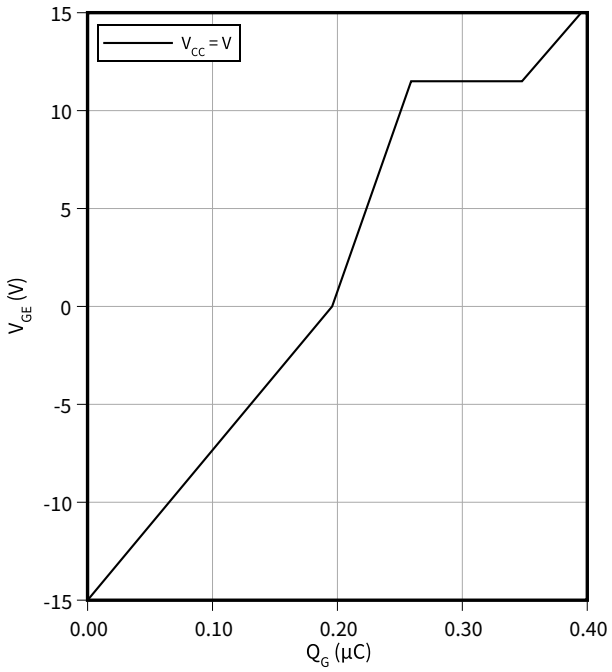
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$




### Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

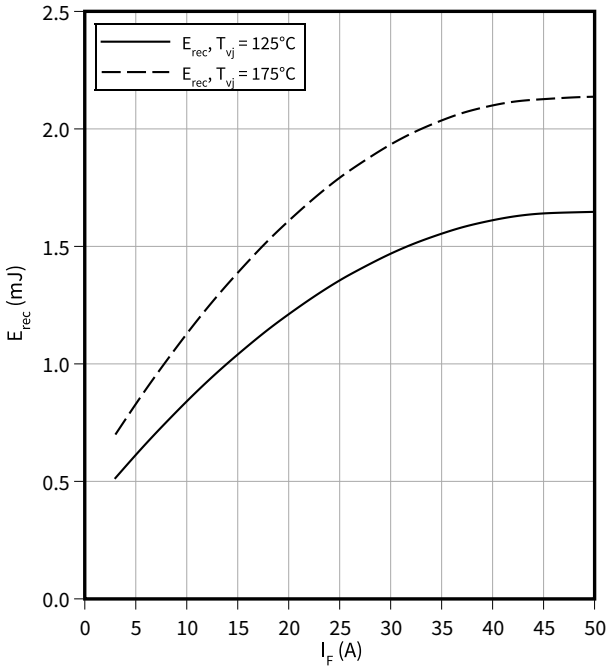
$I_C = 25\ A$, $T_{vj} = 25\ °C$



### Switching losses (typical), Diode, Inverter

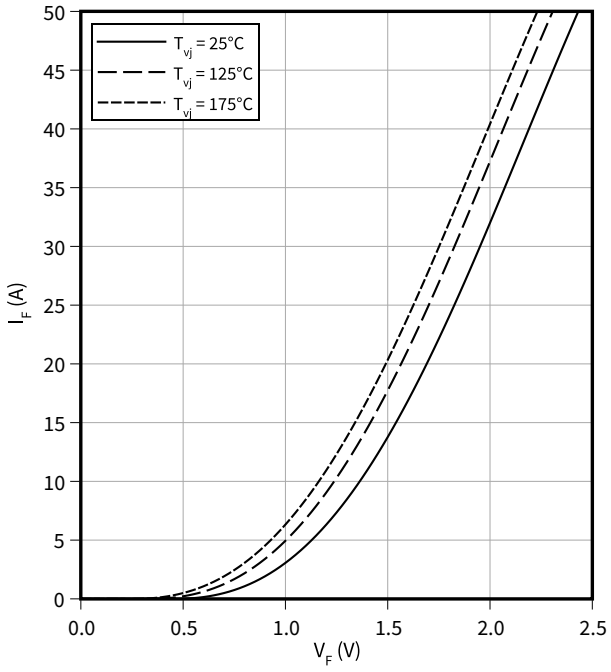
$E_{rec} = f(I_F)$

$R_{Gon} = 9.1\ \Omega$, $V_{CC} = 600$ V




### Forward characteristic (typical), Diode, Inverter

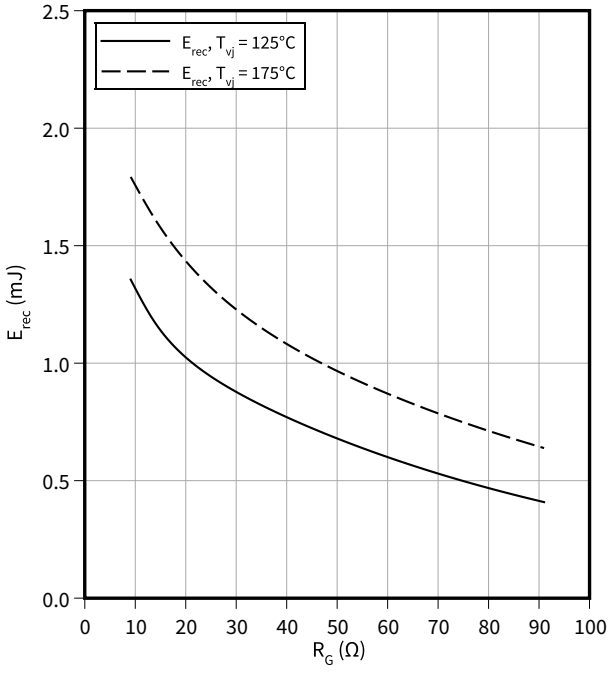
$I_F = f(V_F)$




### Switching losses (typical), Diode, Inverter

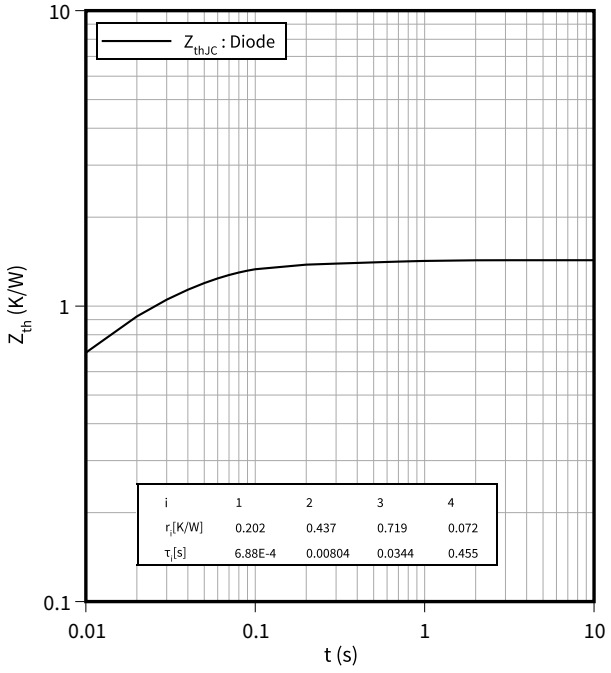
$E_{rec} = f(R_G)$

$I_F = 25$ A, $V_{CC} = 600$ V



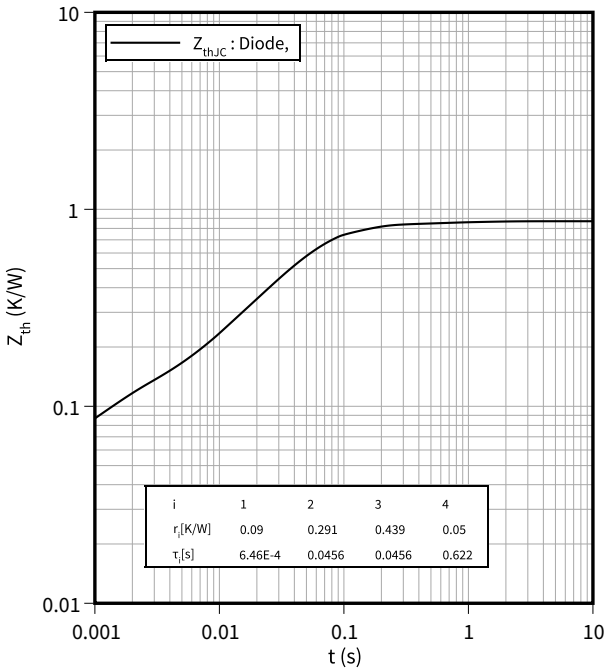

### Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



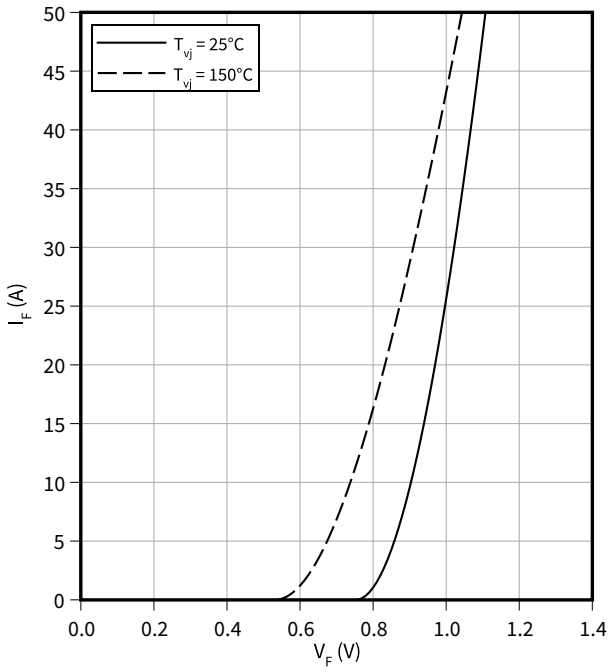
### Transient thermal impedance, Diode, Rectifier

$Z_{th} = f(t)$




### Forward characteristic (typical), Diode, Rectifier

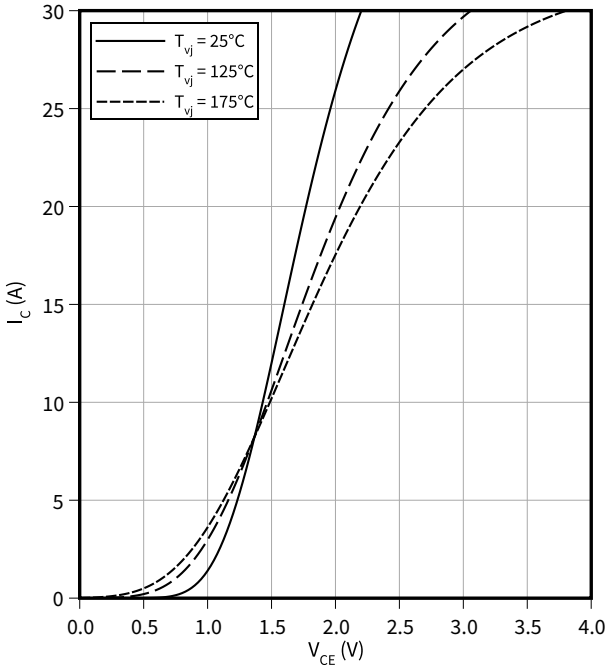
$I_F = f(V_F)$




### Output characteristic (typical), IGBT, Brake-Chopper

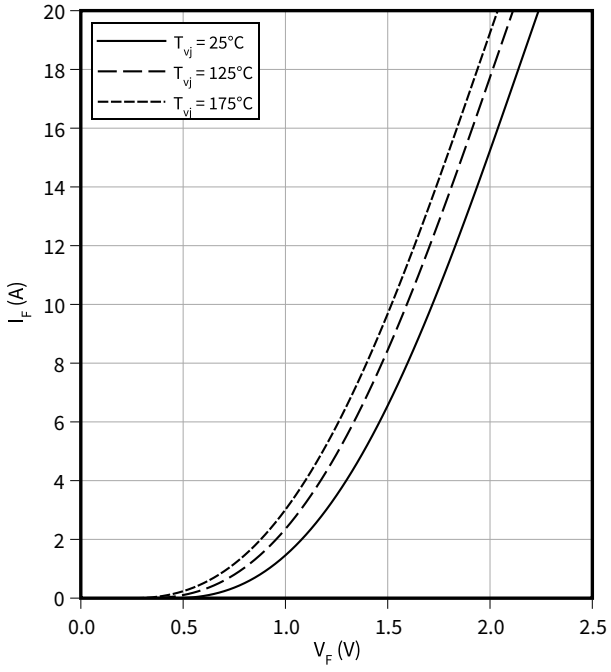
$I_C = f(V_{CE})$

$V_{GE} = 15\ V$



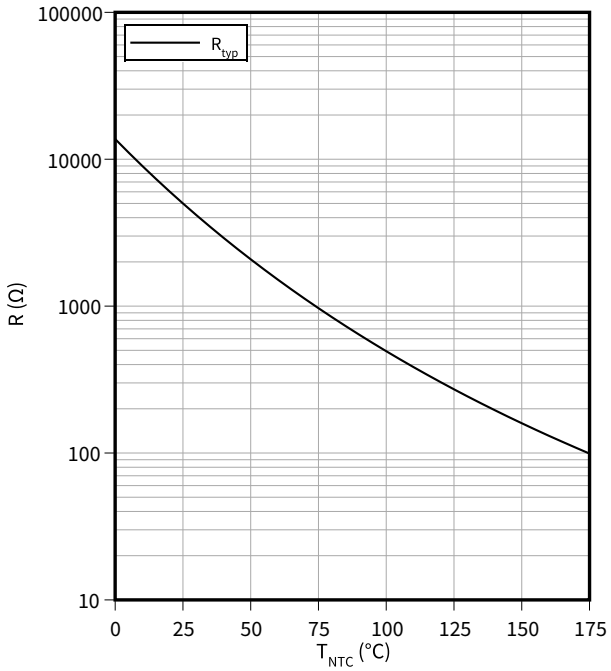

### Forward characteristic (typical), Diode, Brake-Chopper

$I_F = f(V_F)$



**Temperature characteristic (typical), NTC-Thermistor**

$R = f(T_{NTC})$



# 9 Circuit diagram

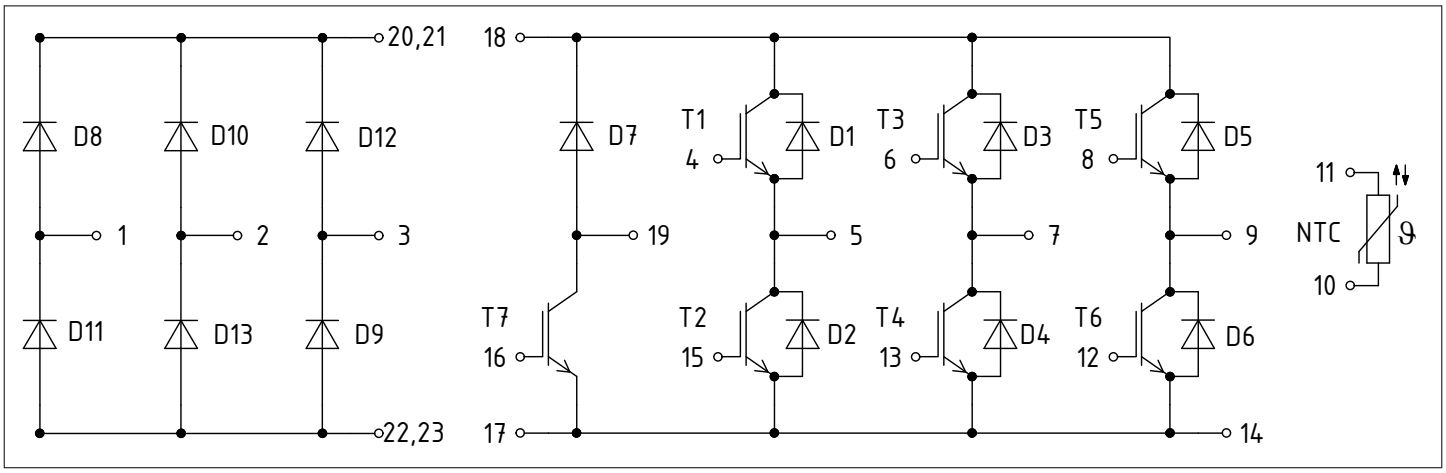
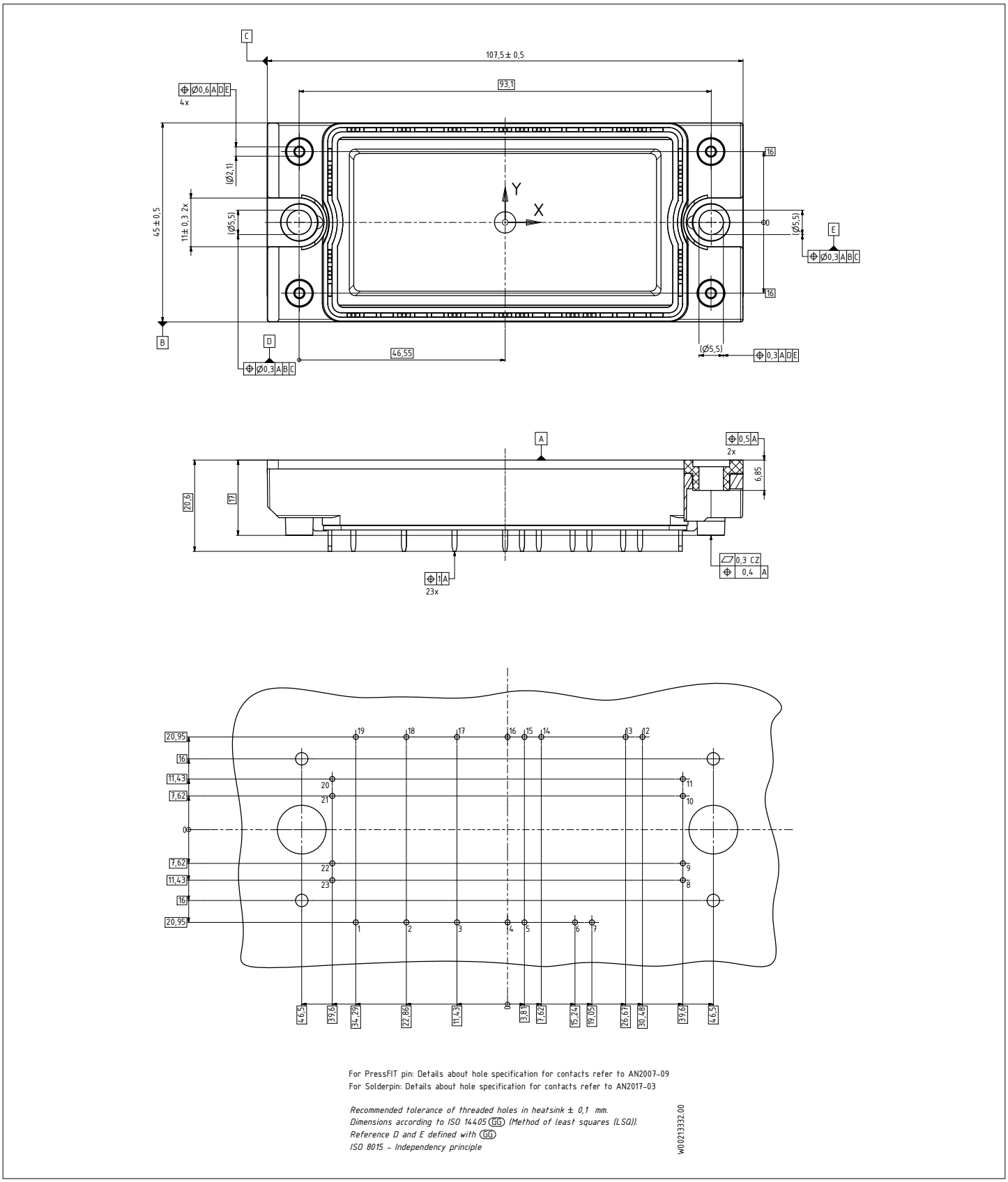



**Figure 1**

# 10 Package outlines




For PressFIT pin: Details about hole specification for contacts refer to AN2007-09
For Solderpin: Details about hole specification for contacts refer to AN2017-03

*Recommended tolerance of threaded holes in heatsink ± 0,1 mm.*
*Dimensions according to ISO 14405 (GG) (Method of least squares (LSQ)).*
*Reference D and E defined with (GG)*
*ISO 8015 - Independency principle*

W00213332.00

**Figure 2**

# 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*<br>Module serial number<br>Module material number<br>Production order number<br>Date code (production year)<br>Date code (production week) | *Digit*<br>1 – 5<br>6 - 11<br>12 - 19<br>20 – 21<br>22 – 23 | *Example*<br>71549<br>142846<br>55054991<br>15<br>30 |
| Example | 7154914284655054991530 | | 7154914284655054991530 |

**Figure 3**

## Revision history

| Document revision | Date of release | Description of changes |
|---|---|---|
| V1.0 | 2019-11-14 | Target datasheet |
| n/a | 2020-09-01 | Datasheet migrated to a new system with a new layout and new revision number schema: target or preliminary datasheet = 0.xy; final datasheet = 1.xy |
| 1.00 | 2022-11-28 | Final datasheet |

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**IFX-AAY212-002**

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