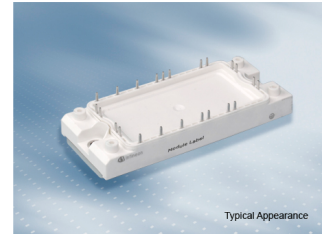


Preliminary datasheet

EconoPIM™2 module with TRENCHSTOP™IGBT7 and Emitter Controlled 7 diode and NTC

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{nom}} = 50\text{ A} / I_{CRM} = 100\text{ A}$
 - TRENCHSTOP™ IGBT7
 - Low V_{CESat}
 - Overload operation up to 175°C
- Mechanical features
 - High power and thermal cycling capability
 - Integrated NTC temperature sensor
 - Copper base plate
 - Al_2O_3 substrate with low thermal resistance
 - Solder contact technology



Potential applications

- Auxiliary inverters
- Motor drives
- Servo drives

Product validation

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

Description

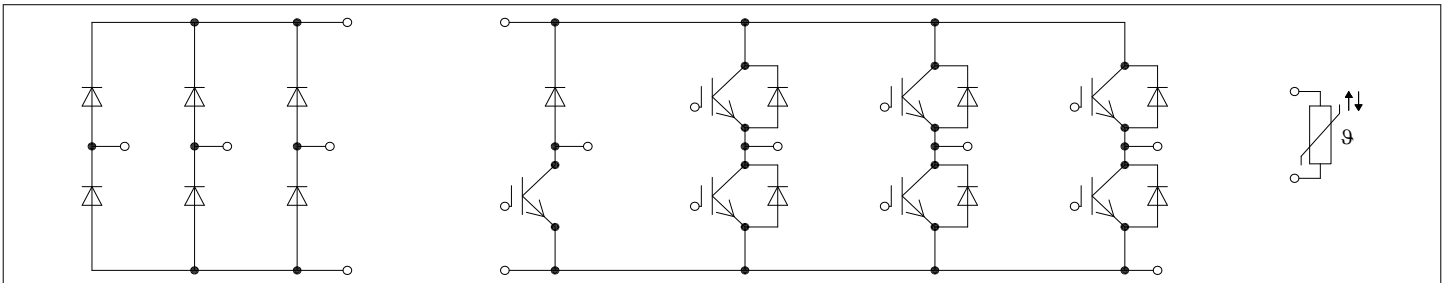


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1 Package

Table 1 Insulation coordination

| Parameter | Symbol | Note or test condition | Values | Unit |
|------------------------------|-------------|--|-----------|------|
| Isolation test voltage | V_{ISOL} | RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$ | 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 | |
| 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} | | | 35 | | nH |
| Module lead resistance, terminals - chip | $R_{AA'+CC'}$ | $T_C = 25^\circ\text{C}$, per switch | | 5.5 | | mΩ |
| Module lead resistance, terminals - chip | $R_{CC'+EE'}$ | $T_C = 25^\circ\text{C}$, per switch | | 4.8 | | mΩ |
| Storage temperature | T_{stg} | | -40 | | 125 | °C |
| Mounting torque for modul mounting | M | - Mounting according to valid application note | M5, Screw | 3 | 6 | Nm |
| Weight | G | | | 180 | | g |

2 IGBT, Inverter

Table 3 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit |
|-----------------------------------|-----------|---|--------|------|
| Collector-emitter voltage | V_{CES} | $T_{vj} = 25^\circ\text{C}$ | 1200 | V |
| Continous DC collector current | I_{CDC} | $T_{vj \text{ max}} = 175^\circ\text{C}$ $T_C = 100^\circ\text{C}$ | 50 | A |
| Repetitive peak collector current | I_{CRM} | $t_p = 1 \text{ ms}$ | 100 | A |
| 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 | $V_{CE\ sat}$ | $I_C = 50\ A, V_{GE} = 15\ V$ | $T_{vj} = 25\ ^\circ C$ | | 1.50 | TBD | V |
| | | | $T_{vj} = 125\ ^\circ C$ | | 1.64 | | |
| | | | $T_{vj} = 175\ ^\circ C$ | | 1.72 | | |
| Gate threshold voltage | V_{GEth} | $I_C = 2\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$ | 5.15 | 5.80 | 6.45 | V | |
| Gate charge | Q_G | $V_{GE} = \pm 15\ V, V_{CE} = 600\ V$ | | 0.92 | | μC | |
| Internal gate resistor | R_{Gint} | $T_{vj} = 25\ ^\circ C$ | | 0 | | Ω | |
| Input capacitance | C_{ies} | $f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$ | | 11.1 | | nF | |
| Reverse transfer capacitance | C_{res} | $f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$ | | 0.039 | | nF | |
| Collector-emitter cut-off current | I_{CES} | $V_{CE} = 1200\ V, V_{GE} = 0\ V$ | $T_{vj} = 25\ ^\circ C$ | | | 0.01 | mA |
| Gate-emitter leakage current | I_{GES} | $V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$ | | | | 100 | nA |
| Turn-on delay time (inductive load) | t_{don} | $I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 7.5\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | | 0.059 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | | 0.061 | | |
| | | | $T_{vj} = 175\ ^\circ C$ | | 0.062 | | |
| Rise time (inductive load) | t_r | $I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 7.5\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | | 0.043 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | | 0.047 | | |
| | | | $T_{vj} = 175\ ^\circ C$ | | 0.049 | | |
| Turn-off delay time (inductive load) | t_{doff} | $I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 7.5\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | | 0.290 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | | 0.380 | | |
| | | | $T_{vj} = 175\ ^\circ C$ | | 0.420 | | |
| Fall time (inductive load) | t_f | $I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 7.5\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | | 0.110 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | | 0.200 | | |
| | | | $T_{vj} = 175\ ^\circ C$ | | 0.270 | | |
| Turn-on energy loss per pulse | E_{on} | $I_C = 50\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 7.5\ \Omega, di/dt = 900\ A/\mu s (T_{vj} = 175\ ^\circ C)$ | $T_{vj} = 25\ ^\circ C$ | | 5.07 | | mJ |
| | | | $T_{vj} = 125\ ^\circ C$ | | 6.76 | | |
| | | | $T_{vj} = 175\ ^\circ C$ | | 7.72 | | |
| Turn-off energy loss per pulse | E_{off} | $I_C = 50\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 7.5\ \Omega, dv/dt = 2900\ V/\mu s (T_{vj} = 175\ ^\circ C)$ | $T_{vj} = 25\ ^\circ C$ | | 3.37 | | mJ |
| | | | $T_{vj} = 125\ ^\circ C$ | | 5.31 | | |
| | | | $T_{vj} = 175\ ^\circ C$ | | 6.58 | | |
| SC data | I_{SC} | $V_{GE} \leq 15\ V, V_{CC} = 800\ V, V_{CEmax} = V_{CES} - L_{sCE} * di/dt$ | $t_p \leq 8\ \mu s, T_{vj} = 150\ ^\circ C$ | | 190 | | A |
| | | | $t_p \leq 7\ \mu s, T_{vj} = 175\ ^\circ C$ | | 180 | | |

Table 4 Characteristic values (continued)

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|--------------------|---|--------|-------|-------|------|
| | | | Min. | Typ. | Max. | |
| Thermal resistance, junction to case | R_{thJC} | per IGBT | | | 0.579 | K/W |
| Thermal resistance, case to heatsink | R_{thCH} | per IGBT, $\lambda_{grease} = 1 \text{ W}/(\text{m}^2\text{K})$ | | 0.147 | | K/W |
| Temperature under switching conditions | $T_{vj\text{ op}}$ | | -40 | | 175 | °C |

Note: $T_{vj\text{ op}} > 150^\circ\text{C}$ 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} | $T_{vj} = 25^\circ\text{C}$ | 1200 | V | |
| Continuous DC forward current | I_F | | 50 | A | |
| Repetitive peak forward current | I_{FRM} | $t_P = 1 \text{ ms}$ | 100 | A | |
| I^2t - value | I^2t | $t_P = 10 \text{ ms}, V_R = 0 \text{ V}$ | $T_{vj} = 125^\circ\text{C}$ | 465 | A^2s |
| | | | $T_{vj} = 175^\circ\text{C}$ | 420 | |

Table 6 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit | |
|-------------------------------|----------|--|------------------------------|------|------|------|---------------|
| | | | Min. | Typ. | Max. | | |
| Forward voltage | V_F | $I_F = 50 \text{ A}, V_{GE} = 0 \text{ V}$ | $T_{vj} = 25^\circ\text{C}$ | | 1.72 | TBD | V |
| | | | $T_{vj} = 125^\circ\text{C}$ | | 1.59 | | |
| | | | $T_{vj} = 175^\circ\text{C}$ | | 1.52 | | |
| Peak reverse recovery current | I_{RM} | $V_R = 600 \text{ V}, I_F = 35 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 900 \text{ A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$ | $T_{vj} = 25^\circ\text{C}$ | | 31 | | A |
| | | | $T_{vj} = 125^\circ\text{C}$ | | 39 | | |
| | | | $T_{vj} = 175^\circ\text{C}$ | | 45 | | |
| Recovered charge | Q_r | $V_R = 600 \text{ V}, I_F = 50 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 900 \text{ A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$ | $T_{vj} = 25^\circ\text{C}$ | | 3.96 | | μC |
| | | | $T_{vj} = 125^\circ\text{C}$ | | 7.37 | | |
| | | | $T_{vj} = 175^\circ\text{C}$ | | 9.89 | | |

Table 6 Characteristic values (continued)

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|--------------------|--|--------------------------------------|-------|-------|------------------|
| | | | Min. | Typ. | Max. | |
| Reverse recovery energy | E_{rec} | $V_R = 600\text{ V}$, $I_F = 50\text{ A}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 900\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$) | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1.31 | | mJ |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 2.52 | | |
| | | | $T_{vj} = 175\text{ }^\circ\text{C}$ | 3.46 | | |
| Thermal resistance, junction to case | R_{thJC} | per diode | | | 0.900 | K/W |
| Thermal resistance, case to heatsink | R_{thCH} | per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}^*\text{K})$ | | 0.168 | | K/W |
| Temperature under switching conditions | $T_{vj\text{ op}}$ | | -40 | | 175 | $^\circ\text{C}$ |

Note: $T_{vj\text{ op}} > 150\text{ }^\circ\text{C}$ 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} | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1600 | V | |
| Maximum RMS forward current per chip | I_{FRMSM} | $T_C = 80\text{ }^\circ\text{C}$ | 70 | A | |
| Maximum RMS current at rectifier output | I_{RMSM} | $T_C = 80\text{ }^\circ\text{C}$ | 100 | A | |
| Surge forward current | I_{FSM} | $t_p = 10\text{ ms}$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 560 | A |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 435 | |
| I^2t - value | I^2t | $t_p = 10\text{ ms}$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1570 | A^2s |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 945 | |

Table 8 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--------------------------------------|------------|---|--------|-------|-------|------|
| | | | Min. | Typ. | Max. | |
| Forward voltage | V_F | $I_F = 50\text{ A}$, $T_{vj} = 150\text{ }^\circ\text{C}$ | | 1.05 | | V |
| Reverse current | I_r | $T_{vj} = 150\text{ }^\circ\text{C}$, $V_R = 1600\text{ V}$ | | 1 | | mA |
| Thermal resistance, junction to case | R_{thJC} | per diode | | | 0.870 | K/W |
| Thermal resistance, case to heatsink | R_{thCH} | per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}^*\text{K})$ | | 0.171 | | 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-Chopper

Table 9 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit |
|-----------------------------------|-----------|--|--------|------|
| Collector-emitter voltage | V_{CES} | $T_{vj} = 25\text{ °C}$ | 1200 | V |
| Continuous DC collector current | I_{CDC} | $T_{vj\ max} = 175\text{ °C}$ $T_C = 100\text{ °C}$ | 25 | A |
| Repetitive peak collector current | I_{CRM} | $t_P = 1\text{ ms}$ | 50 | 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 | $V_{CE\ sat}$ | $I_C = 25\text{ A}, V_{GE} = 15\text{ V}$ | $T_{vj} = 25\text{ °C}$ | 1.60 | TBD | V |
| | | | $T_{vj} = 125\text{ °C}$ | 1.74 | | |
| | | | $T_{vj} = 175\text{ °C}$ | 1.82 | | |
| Gate threshold voltage | V_{GEth} | $I_C = 0.525\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25\text{ °C}$ | 5.15 | 5.80 | 6.45 | V |
| Gate charge | Q_G | $V_{GE} = \pm 15\text{ V}, V_{CE} = 600\text{ V}$ | | 0.395 | | µC |
| Internal gate resistor | R_{Gint} | $T_{vj} = 25\text{ °C}$ | | 0 | | Ω |
| Input capacitance | C_{ies} | $f = 1000\text{ kHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | 4.77 | | nF |
| Reverse transfer capacitance | C_{res} | $f = 1000\text{ kHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | 0.017 | | nF |
| Collector-emitter cut-off current | I_{CES} | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}$ | | | 0.004 | mA |
| Gate-emitter leakage current | I_{GES} | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25\text{ °C}$ | | | 100 | nA |
| Turn-on delay time (inductive load) | t_{don} | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 9.1\text{ }\Omega$ | $T_{vj} = 25\text{ °C}$ | 0.041 | | µs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.043 | | |
| | | | $T_{vj} = 175\text{ °C}$ | 0.044 | | |
| Rise time (inductive load) | t_r | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 9.1\text{ }\Omega$ | $T_{vj} = 25\text{ °C}$ | 0.025 | | µs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.028 | | |
| | | | $T_{vj} = 175\text{ °C}$ | 0.030 | | |

Table 10 Characteristic values (continued)

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|------------|---|---|-------|-------|------------------|
| | | | Min. | Typ. | Max. | |
| Turn-off delay time (inductive load) | t_{doff} | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 9.1\ \Omega$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 0.230 | | μs |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 0.320 | | |
| | | | $T_{vj} = 175\text{ }^\circ\text{C}$ | 0.350 | | |
| Fall time (inductive load) | t_f | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 9.1\ \Omega$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 0.140 | | μs |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 0.220 | | |
| | | | $T_{vj} = 175\text{ }^\circ\text{C}$ | 0.280 | | |
| Turn-on energy loss per pulse | E_{on} | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, L_\sigma = 35\text{ nH}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 9.1\ \Omega, di/dt = 780\text{ A}/\mu\text{s} (T_{vj} = 175\text{ }^\circ\text{C})$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1.47 | | mJ |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 2.05 | | |
| | | | $T_{vj} = 175\text{ }^\circ\text{C}$ | 2.39 | | |
| Turn-off energy loss per pulse | E_{off} | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, L_\sigma = 35\text{ nH}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 9.1\ \Omega, dv/dt = 3120\text{ V}/\mu\text{s} (T_{vj} = 175\text{ }^\circ\text{C})$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1.65 | | mJ |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 2.58 | | |
| | | | $T_{vj} = 175\text{ }^\circ\text{C}$ | 3.13 | | |
| SC data | I_{SC} | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ | $t_P \leq 8\ \mu\text{s}, T_{vj} = 150\text{ }^\circ\text{C}$ | 90 | | A |
| | | | $t_P \leq 7\ \mu\text{s}, T_{vj} = 175\text{ }^\circ\text{C}$ | 85 | | |
| Thermal resistance, junction to case | R_{thJC} | per IGBT | | | 0.967 | K/W |
| Thermal resistance, case to heatsink | R_{thCH} | per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m}^2\text{K})$ | | 0.171 | | K/W |
| Temperature under switching conditions | T_{vjop} | | -40 | | 175 | $^\circ\text{C}$ |

Note: $T_{vjop} > 150\text{ }^\circ\text{C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

6 Diode, Chopper

Table 11 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit |
|---------------------------------|-----------|-------------------------------------|--------|------|
| Repetitive peak reverse voltage | V_{RRM} | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1200 | V |
| Continuous DC forward current | I_F | | 25 | A |
| Repetitive peak forward current | I_{FRM} | $t_P = 1\text{ ms}$ | 50 | A |

Table 11 Maximum rated values (continued)

| Parameter | Symbol | Note or test condition | Values | Unit | |
|--------------------------|------------------|--|--------------------------|------|------------------|
| I ² t - value | I ² t | t _p = 10 ms, V _R = 0 V | T _{vj} = 125 °C | 125 | A ² s |
| | | | T _{vj} = 175 °C | 95 | |

Table 12 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 | TBD | V |
| | | | T _{vj} = 125 °C | 1.70 | | |
| | | | T _{vj} = 175 °C | 1.63 | | |
| Peak reverse recovery current | I _{RM} | V _R = 600 V, I _F = 25 A, V _{GE} = -15 V, -di _F /dt = 395 A/μs (T _{vj} = 175 °C) | T _{vj} = 25 °C | 18 | | A |
| | | | T _{vj} = 125 °C | 25 | | |
| | | | T _{vj} = 175 °C | 29 | | |
| Recovered charge | Q _r | V _R = 600 V, I _F = 25 A, V _{GE} = -15 V, -di _F /dt = 395 A/μs (T _{vj} = 175 °C) | T _{vj} = 25 °C | 2.79 | | μC |
| | | | T _{vj} = 125 °C | 3.36 | | |
| | | | T _{vj} = 175 °C | 4.41 | | |
| Reverse recovery energy | E _{rec} | V _R = 600 V, I _F = 25 A, V _{GE} = -15 V, -di _F /dt = 395 A/μs (T _{vj} = 175 °C) | T _{vj} = 25 °C | 1.36 | | mJ |
| | | | T _{vj} = 125 °C | 1.54 | | |
| | | | T _{vj} = 175 °C | 2.03 | | |
| Thermal resistance, junction to case | R _{thJC} | per diode | | | 1.43 | K/W |
| Thermal resistance, case to heatsink | R _{thCH} | per diode, λ _{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.

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 | ΔR/R | T _{NTC} = 100 °C, R ₁₀₀ = 493 Ω | -5 | | 5 | % |
| Power dissipation | P ₂₅ | T _{NTC} = 25 °C | | | 20 | mW |

Table 13 **Characteristic values (continued)**

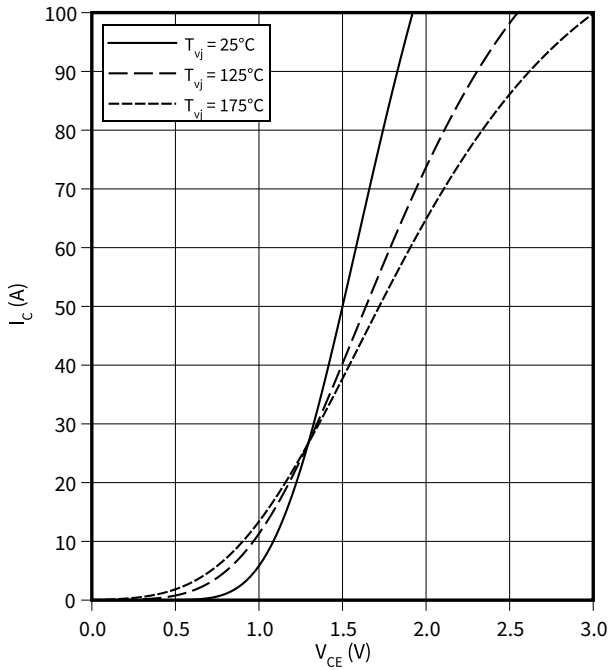
| Parameter | Symbol | Note or test condition | Values | | | Unit |
|-----------|--------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| B-value | $B_{25/50}$ | $R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$ | | 3375 | | K |
| B-value | $B_{25/80}$ | $R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$ | | 3411 | | K |
| B-value | $B_{25/100}$ | $R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$ | | 3433 | | K |

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

8 Characteristics diagrams

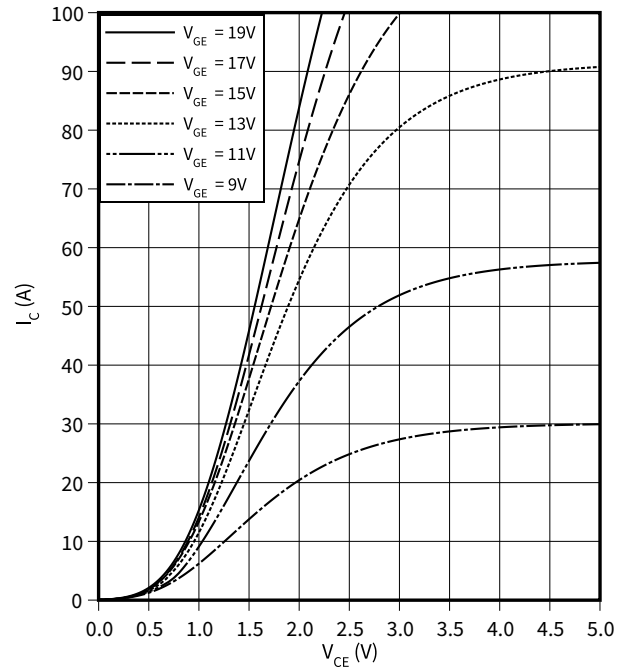
output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



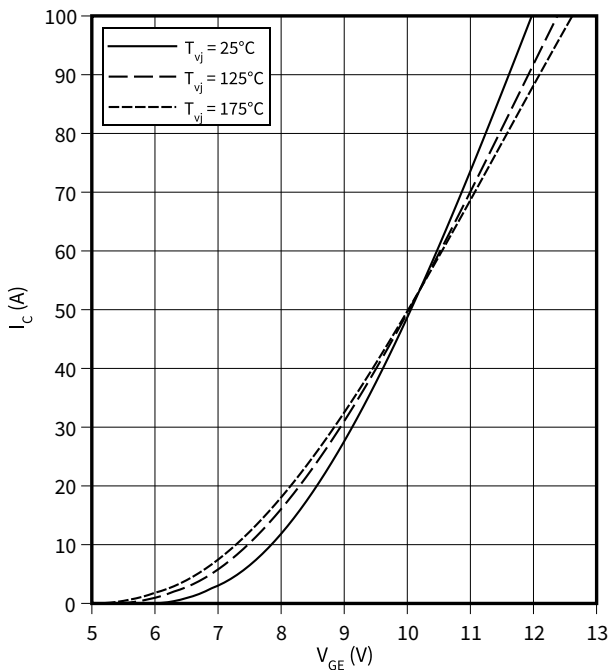
output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$
 $T_{vj} = 175\text{ °C}$



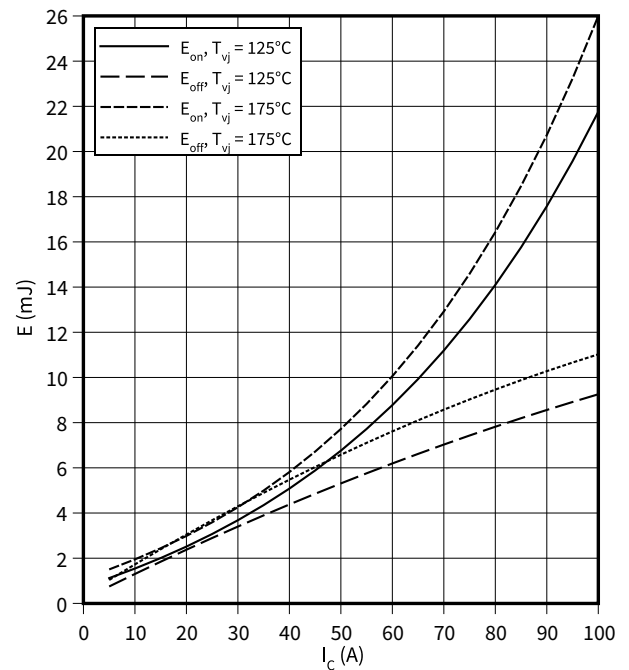
transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 7.5\ \Omega, R_{Gon} = 7.5\ \Omega, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}$

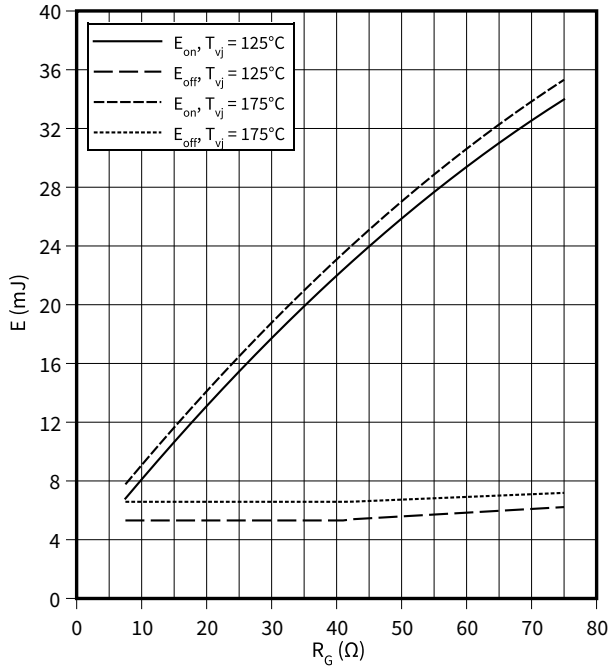


8 Characteristics diagrams

switching losses (typical), IGBT, Inverter

$E = f(R_G)$

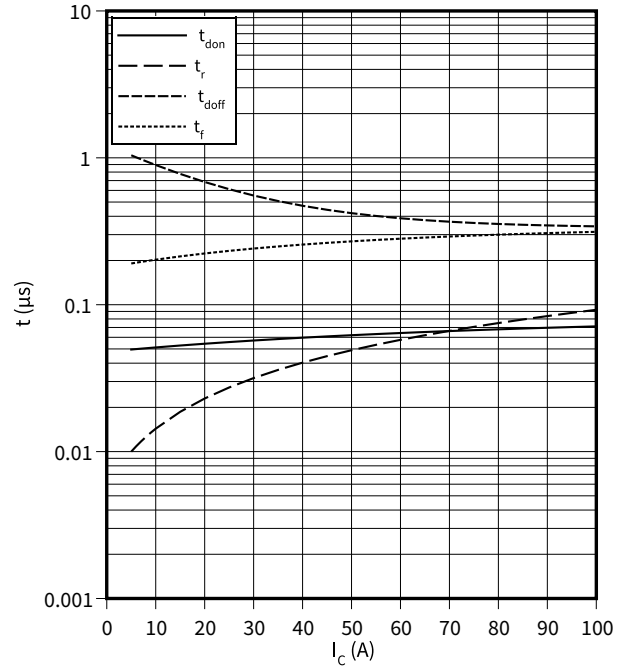
$I_C = 50 \text{ A}, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}$



switching times (typical), IGBT, Inverter

$t = f(I_C)$

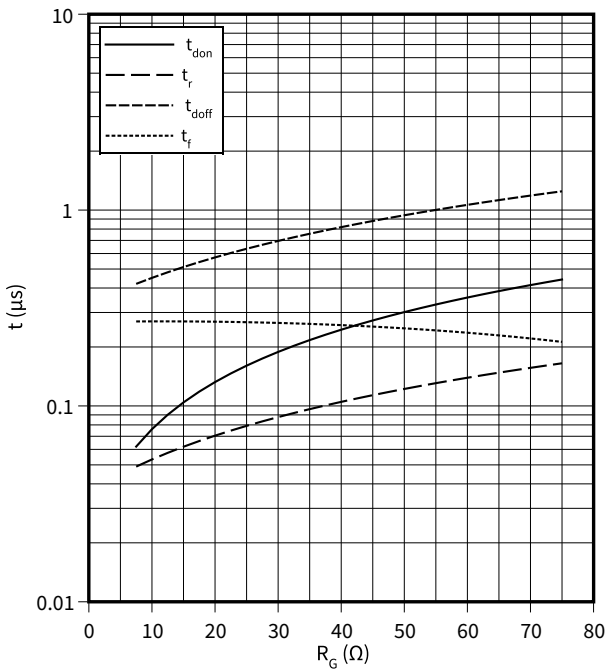
$R_{Goff} = 7.5 \Omega, R_{Gon} = 7.5 \Omega, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175 \text{ °C}$



switching times (typical), IGBT, Inverter

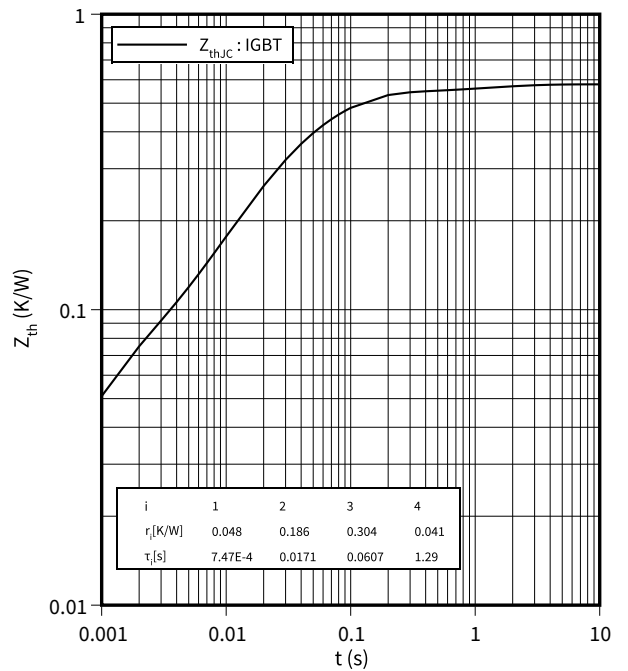
$t = f(R_G)$

$I_C = 50 \text{ A}, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175 \text{ °C}$



transient thermal impedance , IGBT, Inverter

$Z_{th} = f(t)$

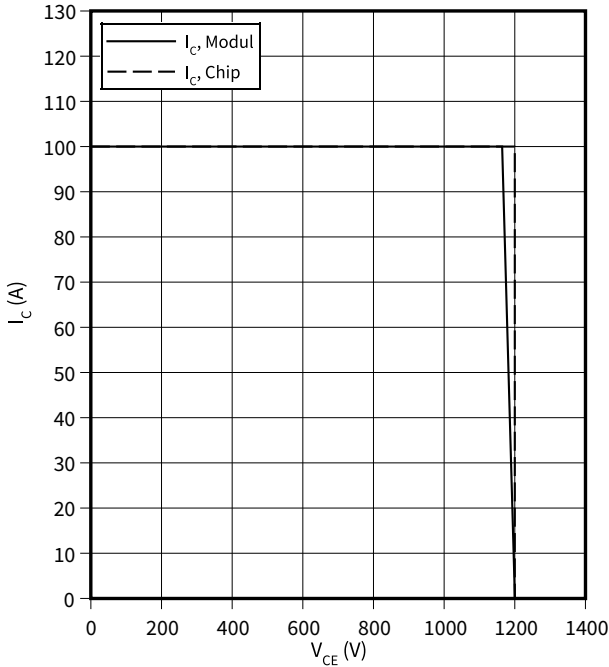


8 Characteristics diagrams

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

$I_C = f(V_{CE})$

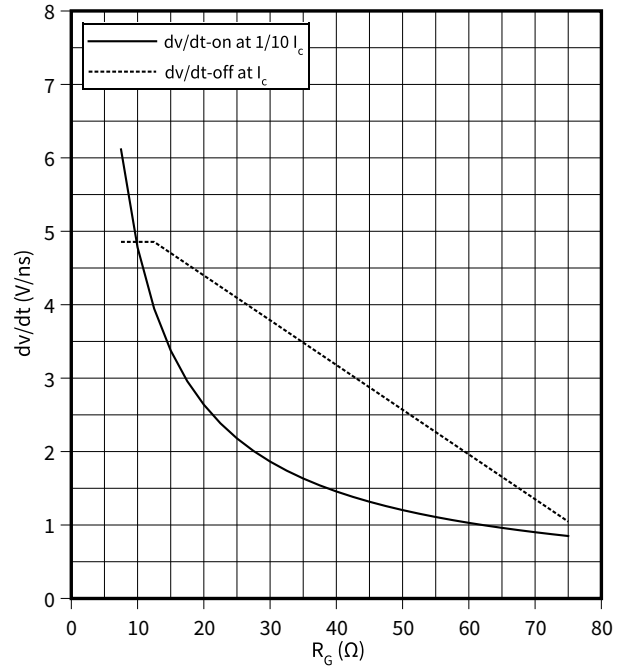
$R_{Goff} = 7.5 \Omega, V_{GE} = \pm 15 V, T_{vj} = 175 \text{ }^\circ\text{C}$



dv/dt (typical), IGBT, Inverter

$dv/dt = f(R_G)$

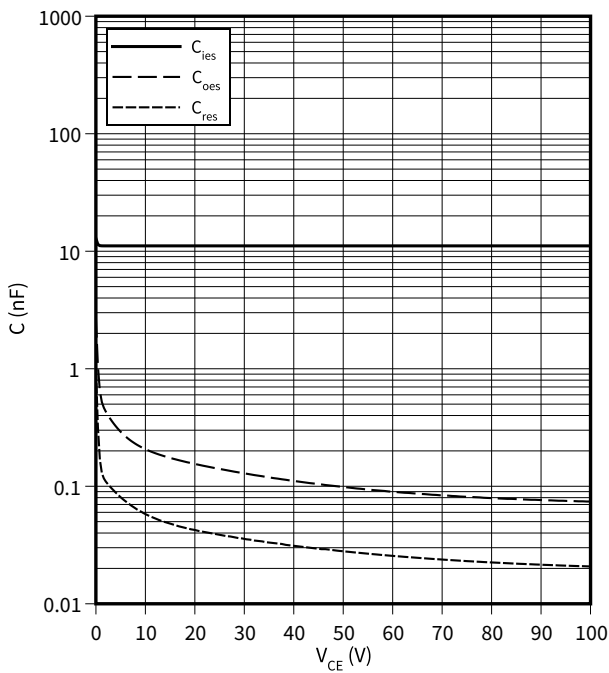
$I_C = 50 A, V_{CE} = 600 V, V_{GE} = \pm 15 V, T_{vj} = 25 \text{ }^\circ\text{C}$



capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

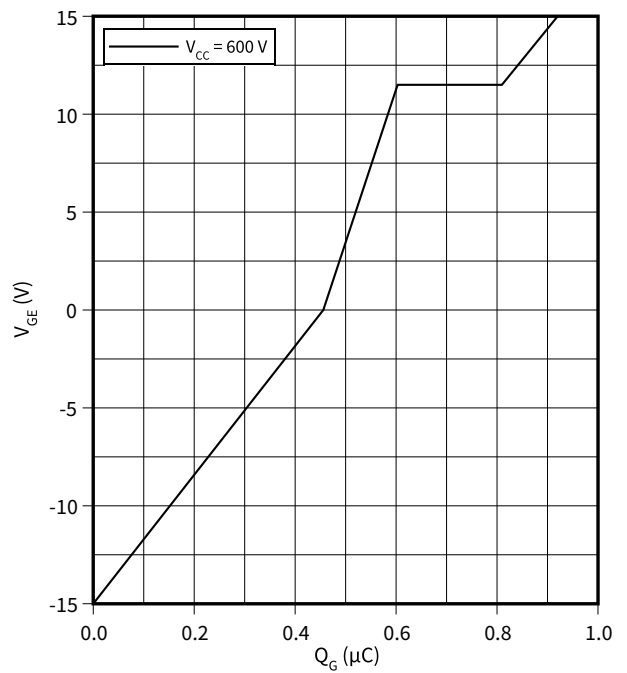
$f = 100 \text{ kHz}, V_{GE} = 0 V, T_{vj} = 25 \text{ }^\circ\text{C}$



gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

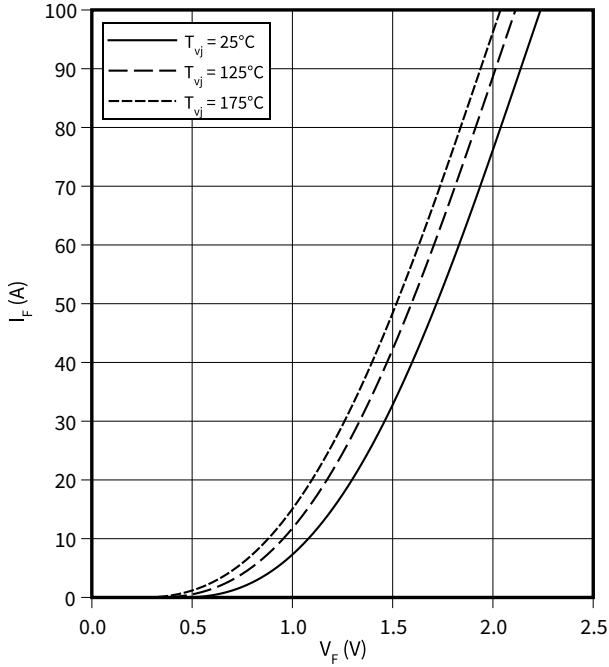
$I_C = 50 A, T_{vj} = 25 \text{ }^\circ\text{C}$



8 Characteristics diagrams

forward characteristic (typical), Diode, Inverter

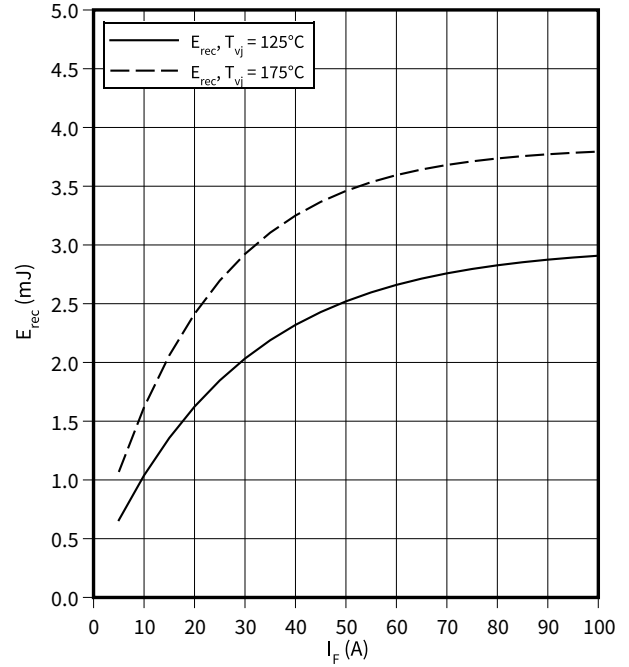
$I_F = f(V_F)$



switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

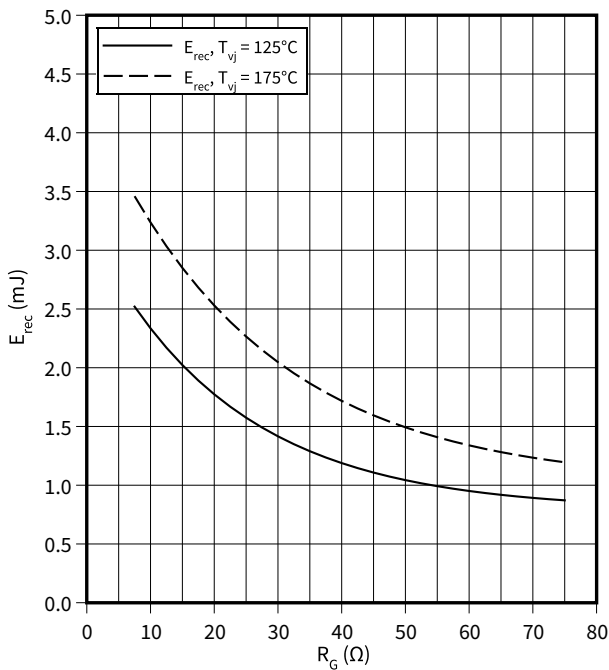
$R_{Gon} = 7.5 \Omega, V_{CE} = 600 V$



switching losses (typical), Diode, Inverter

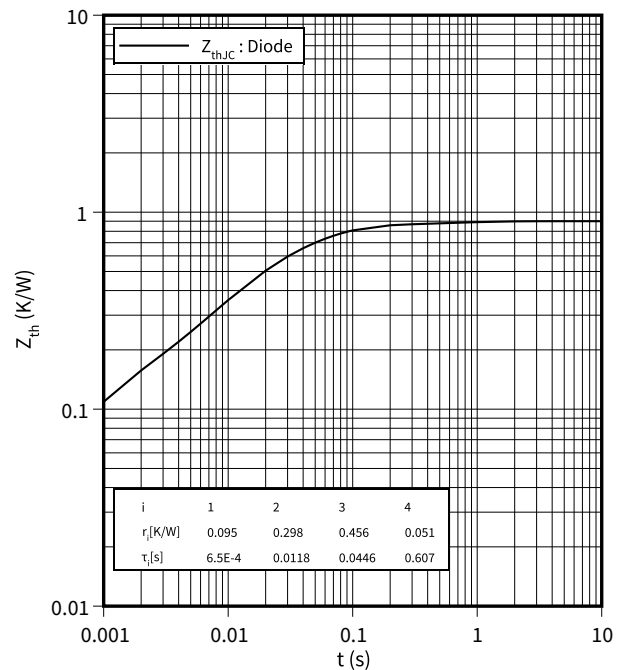
$E_{rec} = f(R_G)$

$V_{CE} = 600 V, I_F = 50 A$



transient thermal impedance, Diode, Inverter

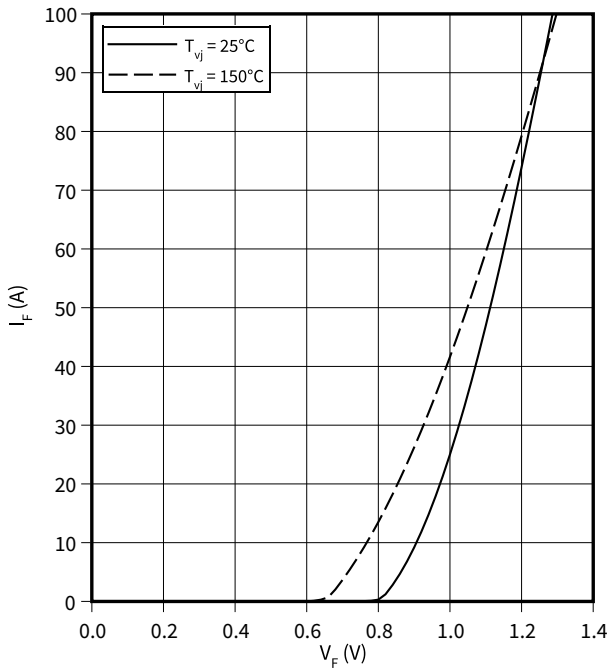
$Z_{th} = f(t)$



8 Characteristics diagrams

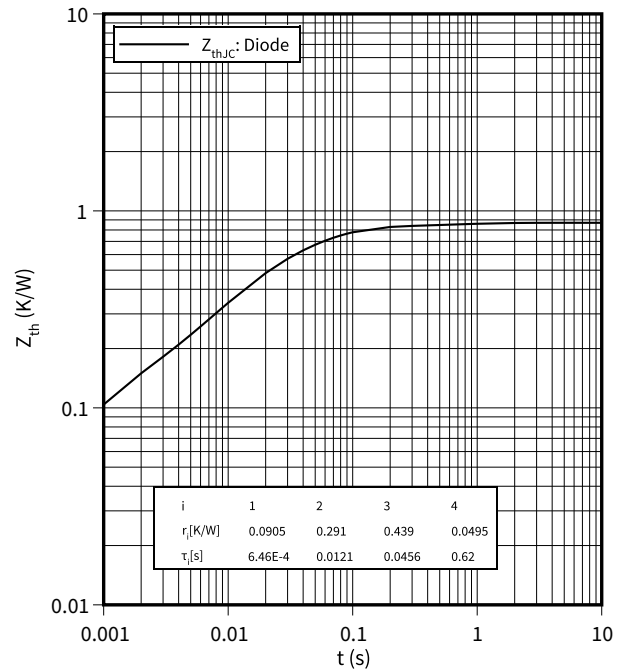
forward characteristic (typical), Diode, Rectifier

$I_F = f(V_F)$



transient thermal impedance, Diode, Rectifier

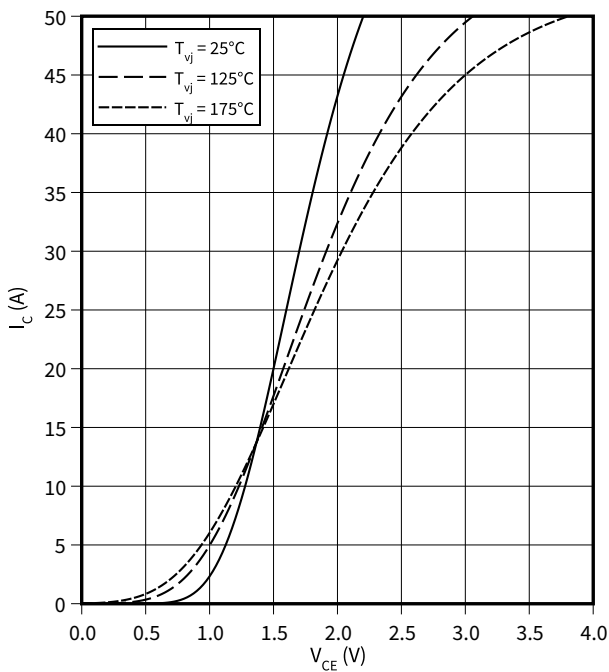
$Z_{th} = f(t)$



output characteristic (typical), IGBT-Chopper

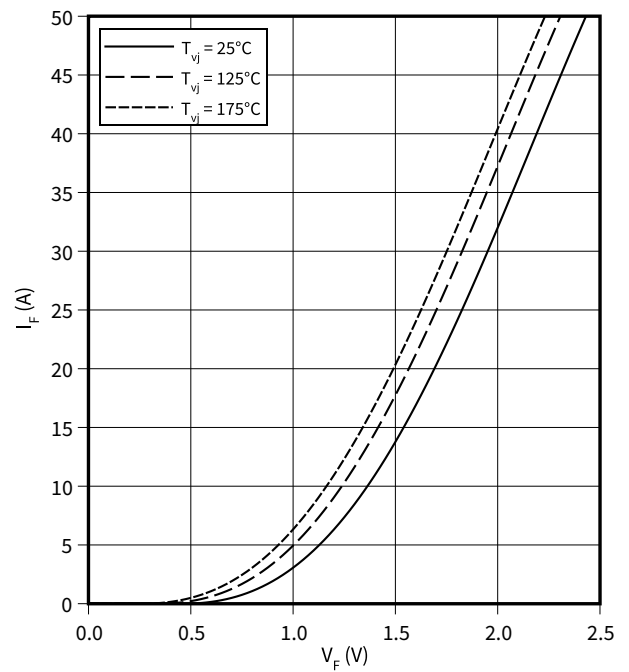
$I_C = f(V_{CE})$

$V_{GE} = 15 \text{ V}$



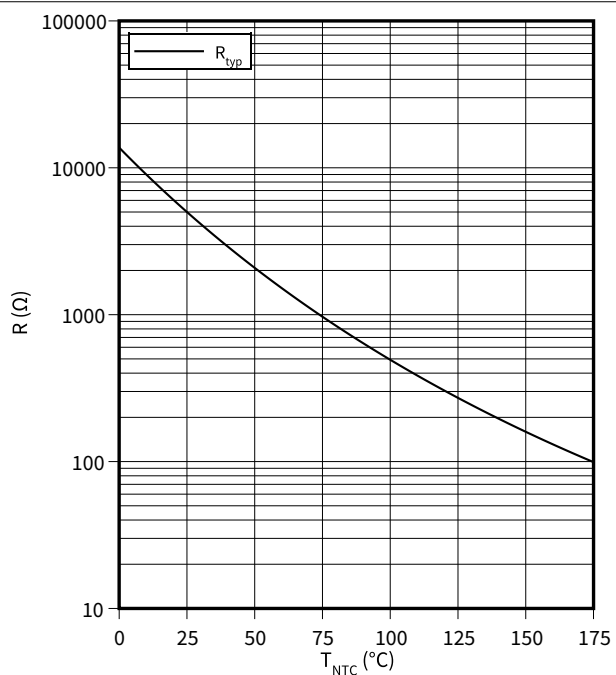
forward characteristic (typical), Diode, Chopper

$I_F = f(V_F)$



temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



10 Package outlines

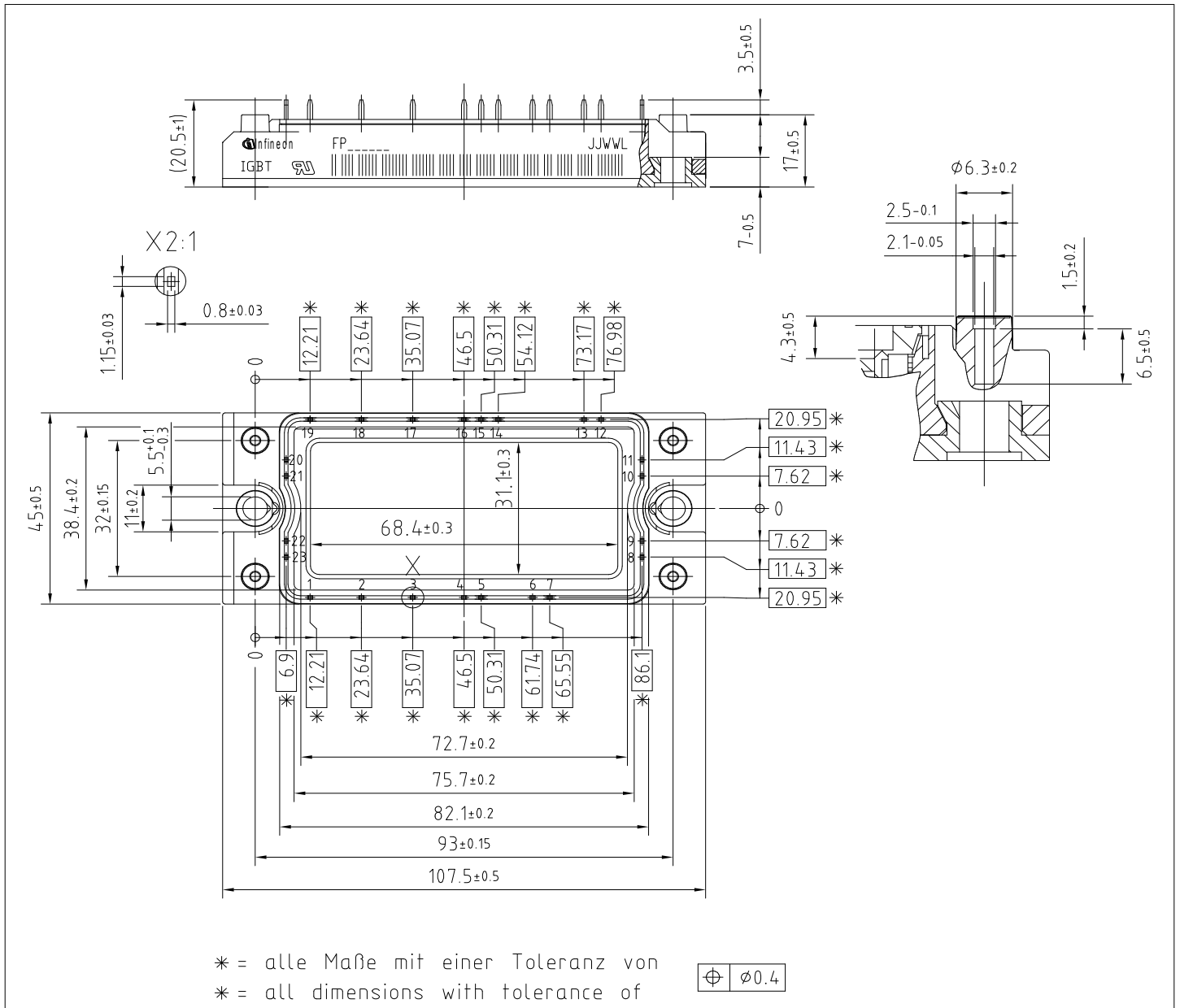


Figure 3

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

Revision history

Revision history

| Document revision | Date of release | Description of changes |
|-------------------|-----------------|------------------------|
| V1.0 | 2021-06-17 | |
| 0.20 | 2021-06-17 | |
| 0.30 | 2021-06-17 | Preliminary datasheet |

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Edition 2021-06-17

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference

IFX-AA119-003

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