

# HybridPACK™ Drive Module

FS770R08A6P2B

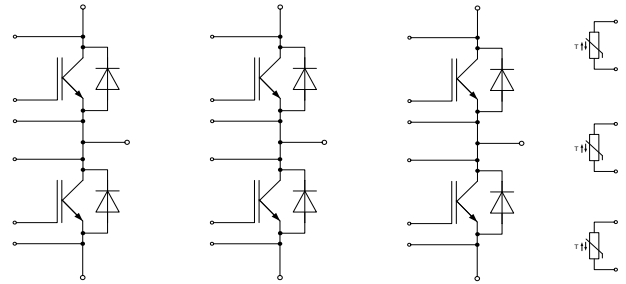
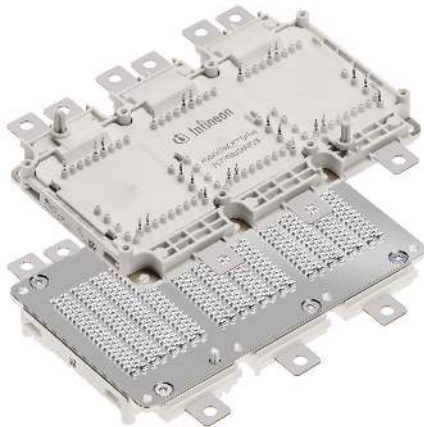
Final Data Sheet

V3.0, 2019-05-28

Automotive High Power

### 1 Features / Description

HybridPACK™ Drive module with EDT2 IGBT and Diode



$V_{CES} = 750 \text{ V}$   
 $I_C = 770 \text{ A}$

#### Typical Applications

- Automotive Applications
- Hybrid Electrical Vehicles (H)EV
- Motor Drives
- Commercial Agriculture Vehicles

#### Electrical Features

- Blocking voltage 750V
- Low  $V_{CEsat}$
- Low Switching Losses
- Low  $Q_g$  and  $Cr_{ss}$
- Low Inductive Design
- $T_{vj\ op} = 150^\circ\text{C}$
- Short-time extended Operation Temperature  
 $T_{vj\ op} = 175^\circ\text{C}$

#### Mechanical Features

- 4.2kV DC 1sec Insulation
- High Creepage and Clearance Distances
- Compact design
- High Power Density
- Direct Cooled Base Plate with Ribbon Bonds
- Guiding elements for PCB and cooler assembly
- Integrated NTC temperature sensor
- PressFIT Contact Technology
- RoHS compliant
- UL 94 V0 module frame

#### Description

The HybridPACK™ Drive is a very compact six-pack module optimized for hybrid and electric vehicles. The product FS770R08A6P2FB comes with a flat baseplate and bonded cooling structure and is a 750V/770A module derivate within the HybridPACK Drive family. The power module implements the new EDT2 IGBT generation, which is an automotive Micro-Pattern Trench-Field-Stop cell design optimized for electric drive train applications. The chipset has benchmark current density combined with short circuit ruggedness and increased blocking voltage for reliable inverter operation under harsh environmental conditions. The EDT2 IGBTs also show excellent light load power losses, which helps to improve system efficiency over a real driving cycle. The EDT2 IGBT was optimized for applications with switching frequencies in the range of 10 kHz.

The new HybridPACK™ Drive power module family comes with mechanical guiding elements supporting easy assembly processes for customers. Furthermore, the press-fit pins for the signal terminals avoid additional time consuming selective solder processes, which provides cost savings on system level and increases system reliability. The products in the HybridPACK Drive family with flat baseplate FS660R08A6P2FB; PinFin baseplate FS820R08A6P2B as well as the FS770R08A6P2B derivate allow a very cost effective scaling for different inverter power levels at a minimum inverter design effort.

|               |               |
|---------------|---------------|
| Product Name  | Ordering Code |
| FS770R08A6P2B | SP001706976   |

## 2 IGBT, Inverter

### 2.1 Maximum Rated Values

| Parameter                         | Conditions   | Symbol            | Value             | Unit |
|-----------------------------------|--|-------------------|-------------------|------|
| Collector-emitter voltage         | $T_{vj} = 25^{\circ}\text{C}$                                | $V_{CES}$         | 750               | V    |
| Implemented collector current     |  | $I_{CN}$          | 770               | A    |
| Continuous DC collector current   | $T_F = 75^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$ | 450 <sup>1)</sup> | A    |
| Repetitive peak collector current | $t_p = 1\text{ ms}$  | $I_{CRM}$         | 1540              | A    |
| Total power dissipation           | $T_F = 75^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $P_{\text{tot}}$  | 654 <sup>1)</sup> | W    |
| Gate-emitter peak voltage         |  | $V_{GES}$         | +/-20             | V    |

### 2.2 Characteristic Values

| Parameter                                     | Conditions   | Symbol             | min. typ. max. |                     |                          | Unit               |
|---|--|--------------------|----------------|---------------------|--------------------------|--------------------|
|   |  |                    |                |                     |                          |                    |
| Collector-emitter saturation voltage          | $I_C = 450\text{ A}, V_{GE} = 15\text{ V}$   | $V_{CE\text{sat}}$ |                | 1.10                | 1.35                     | V                  |
|   | $I_C = 450\text{ A}, V_{GE} = 15\text{ V}$   |                    |                | 1.15                |                          |                    |
|   | $I_C = 450\text{ A}, V_{GE} = 15\text{ V}$   |                    |                | 1.15                |                          |                    |
|   | $I_C = 770\text{ A}, V_{GE} = 15\text{ V}$   |                    |                | 1.28                |                          |                    |
|   | $I_C = 770\text{ A}, V_{GE} = 15\text{ V}$   |                    |                | 1.44                |                          |                    |
| Gate threshold voltage                        | $I_C = 9.60\text{ mA}, V_{CE} = V_{GE}$  | $V_{GE\text{th}}$  | 4.90           | 5.80<br>4,10        | 6.50                     | V                  |
| Gate charge                                   | $V_{GE} = -8\text{ V} \dots 15\text{ V}, V_{CE} = 400\text{ V}$  | $Q_G$              |                | 4.40                |                          | $\mu\text{C}$      |
| Internal gate resistor                        |  | $R_{G\text{int}}$  |                | 0.7                 |                          | $\Omega$           |
| Input capacitance                             | $f = 1\text{ MHz}, V_{CE} = 50\text{ V}, V_{GE} = 0\text{ V}$  | $C_{\text{ies}}$   |                | 80.0                |                          | nF                 |
| Output capacitance                            | $f = 1\text{ MHz}, V_{CE} = 50\text{ V}, V_{GE} = 0\text{ V}$  | $C_{\text{oes}}$   |                | 1.00                |                          | nF                 |
| Reverse transfer capacitance                  | $f = 1\text{ MHz}, V_{CE} = 50\text{ V}, V_{GE} = 0\text{ V}$  | $C_{\text{res}}$   |                | 0.30                |                          | nF                 |
| Collector-emitter cut-off current             | $V_{CE} = 750\text{ V}, V_{GE} = 0\text{ V}$<br>$V_{CE} = 750\text{ V}, V_{GE} = 0\text{ V}$   | $I_{CES}$          |                | 5                   | 1.0                      | mA                 |
| Gate-emitter leakage current                  | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}$  | $I_{GES}$          |                |                     | 400                      | nA                 |
| Turn-on delay time, inductive load            | $I_C = 450\text{ A}, V_{CE} = 400\text{ V}$<br>$V_{GE} = -8\text{ V} / +15\text{ V}$<br>$R_{G\text{on}} = 2.4\ \Omega$   | $t_{d\text{on}}$   |                | 0.28                |                          | $\mu\text{s}$      |
|   |  |                    |                | 0.29                |                          |                    |
|   |  |                    |                | 0.30                |                          |                    |
| Rise time, inductive load                     | $I_C = 450\text{ A}, V_{CE} = 400\text{ V}$<br>$V_{GE} = -8\text{ V} / +15\text{ V}$<br>$R_{G\text{on}} = 2.4\ \Omega$   | $t_r$              |                | 0.07                |                          | $\mu\text{s}$      |
|   |  |                    |                | 0.08                |                          |                    |
|   |  |                    |                | 0.08                |                          |                    |
| Turn-off delay time, inductive load           | $I_C = 450\text{ A}, V_{CE} = 400\text{ V}$<br>$V_{GE} = -8\text{ V} / +15\text{ V}$<br>$R_{G\text{off}} = 5.1\ \Omega$  | $t_{d\text{off}}$  |                | 0.94                |                          | $\mu\text{s}$      |
|   |  |                    |                | 1.05                |                          |                    |
|   |  |                    |                | 1.05                |                          |                    |
| Fall time, inductive load                     | $I_C = 450\text{ A}, V_{CE} = 400\text{ V}$<br>$V_{GE} = -8\text{ V} / +15\text{ V}$<br>$R_{G\text{off}} = 5.1\ \Omega$  | $t_f$              |                | 0.04                |                          | $\mu\text{s}$      |
|   |  |                    |                | 0.05                |                          |                    |
|   |  |                    |                | 0.06                |                          |                    |
| Turn-on energy loss per pulse                 | $I_C = 450\text{ A}, V_{CE} = 400\text{ V}, L_S = 20\text{ nH}$<br>$V_{GE} = -8\text{ V} / +15\text{ V}$<br>$R_{G\text{on}} = 2.4\ \Omega$<br>$di/dt (T_{vj} 25^{\circ}\text{C}) = 5500\text{ A}/\mu\text{s}$<br>$di/dt (T_{vj} 150^{\circ}\text{C}) = 5000\text{ A}/\mu\text{s}$  | $E_{\text{on}}$    |                | 13.5                |                          | mJ                 |
|   |  |                    |                | 17.5                |                          |                    |
|   |  |                    |                | 18.0                |                          |                    |
| Turn-off energy loss per pulse                | $I_C = 450\text{ A}, V_{CE} = 400\text{ V}, L_S = 20\text{ nH}$<br>$V_{GE} = -8\text{ V} / +15\text{ V}$<br>$R_{G\text{off}} = 5.1\ \Omega$<br>$dv/dt (T_{vj} 25^{\circ}\text{C}) = 3100\text{ V}/\mu\text{s}$<br>$dv/dt (T_{vj} 150^{\circ}\text{C}) = 2500\text{ V}/\mu\text{s}$ | $E_{\text{off}}$   |                | 23.5                |                          | mJ                 |
|   |  |                    |                | 29.0                |                          |                    |
|   |  |                    |                | 30.0                |                          |                    |
| SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 400\text{ V}$<br>$V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$   | $I_{SC}$           |                | 4800                |                          | A                  |
|   |  |                    |                | 3900                |                          |                    |
| Thermal resistance, junction to cooling fluid | per IGBT; $\Delta V/\Delta t = 10\text{ dm}^3/\text{min}, T_F = 75^{\circ}\text{C}$  | $R_{thJF}$         |                | 0.130 <sup>2)</sup> | 0.153 <sup>2)</sup>      | K/W                |
| Temperature under switching conditions        | $t_{op}$ continuous<br>for 10s within a period of 30s, occurrence maximum 3000<br>times over lifetime  | $T_{vj\text{op}}$  | -40<br>150     |                     | 150 <sup>3)</sup><br>175 | $^{\circ}\text{C}$ |

<sup>1)</sup> Verified by characterization / design not by test.

<sup>2)</sup> For Cooler design see application note AN-HPD-ASSEMBLY. Cooling fluid 50% water / 50% ethylenglycol.

<sup>3)</sup> For  $T_{vj\text{op}} > 150^{\circ}\text{C}$ : Baseplate temperature has to be limited to  $125^{\circ}\text{C}$ .

### 3 Diode, Inverter

#### 3.1 Maximum Rated Values

| Parameter                       | Conditions   | Symbol    | Value             | Unit   |
|---------------------------------|--|-----------|-------------------|--|
| Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$  | $V_{RRM}$ | 750               | V  |
| Implemented forward current     |  | $I_{FN}$  | 770               | A  |
| Continuous DC forward current   |  | $I_F$     | 450 <sup>1)</sup> | A  |
| Repetitive peak forward current | $t_p = 1 \text{ ms}$   | $I_{FRM}$ | 1540              | A  |
| $I^2t$ - value                  | $V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$<br>$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 175^{\circ}\text{C}$ | $I^2t$    | 19000<br>16000    | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

#### 3.2 Characteristic Values

| Parameter                                     | Conditions  | Symbol      | min. typ. max. |                     |                          | Unit               |
|---|---|-------------|----------------|---------------------|--------------------------|--------------------|
|   |   |             |                |                     |                          |                    |
| Forward voltage                               | $I_F = 450 \text{ A}, V_{GE} = 0 \text{ V}$   | $V_F$       |                | 1.45                | 1.65                     | V                  |
|   | $I_F = 450 \text{ A}, V_{GE} = 0 \text{ V}$   |             |                | 1.30                |                          |                    |
|   | $I_F = 450 \text{ A}, V_{GE} = 0 \text{ V}$   |             |                | 1.25                |                          |                    |
|   | $I_F = 770 \text{ A}, V_{GE} = 0 \text{ V}$   |             |                | 1.65                |                          |                    |
| Peak reverse recovery current                 | $I_F = 450 \text{ A}, -di_F/dt = 5000 \text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$           | $I_{RM}$    |                | 250                 |                          | A                  |
|   | $V_R = 400 \text{ V}$<br>$V_{GE} = -8 \text{ V}$  |             |                | 350<br>370          |                          |                    |
| Recovered charge                              | $I_F = 450 \text{ A}, -di_F/dt = 5000 \text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$           | $Q_r$       |                | 20.0                |                          | $\mu\text{C}$      |
|   | $V_R = 400 \text{ V}$<br>$V_{GE} = -8 \text{ V}$  |             |                | 40.0<br>45.0        |                          |                    |
| Reverse recovery energy                       | $I_F = 450 \text{ A}, -di_F/dt = 5000 \text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$           | $E_{rec}$   |                | 7.00                |                          | mJ                 |
|   | $V_R = 400 \text{ V}$<br>$V_{GE} = -8 \text{ V}$  |             |                | 13.0<br>15.0        |                          |                    |
| Thermal resistance, junction to cooling fluid | per diode; $\Delta V/\Delta t = 10 \text{ dm}^3/\text{min}, T_F = 75^{\circ}\text{C}$                 | $R_{thJF}$  |                | 0.185 <sup>2)</sup> | 0.217 <sup>2)</sup>      | K/W                |
| Temperature under switching conditions        | $t_{op}$ continuous<br>for 10s within a period of 30s, occurrence maximum 3000<br>times over lifetime | $T_{vj op}$ | -40<br>150     |                     | 150 <sup>3)</sup><br>175 | $^{\circ}\text{C}$ |

### 4 NTC-Thermistor

| Parameter         | Conditions   | Symbol       | min. typ. max. |      |      | Unit             |
|-------------------|--|--------------|----------------|------|------|------------------|
|                   |  |              |                |      |      |                  |
| Rated resistance  | $T_C = 25^{\circ}\text{C}$                                     | $R_{25}$     |                | 5.00 |      | $\text{k}\Omega$ |
| Deviation of R100 | $T_C = 100^{\circ}\text{C}, R_{100} = 493 \Omega$              | $\Delta R/R$ | 5              |      | 5    | %                |
| Power dissipation | $T_C = 25^{\circ}\text{C}$                                     | $P_{25}$     |                |      | 20.0 | mW               |
| B-value           | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$  | $B_{25/50}$  |                | 3375 |      | K                |
| B-value           | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$  | $B_{25/80}$  |                | 3411 |      | K                |
| B-value           | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$ | $B_{25/100}$ |                | 3433 |      | K                |

Specification according to the valid application note.

<sup>1)</sup> Verified by characterization / design not by test.

<sup>2)</sup> For cooler design see application note AN-HPD-ASSEMBLY. Cooling fluid 50% water / 50% ethylenglycol.

<sup>3)</sup> For  $T_{vjop} > 150^{\circ}\text{C}$ : Baseplate temperature has to be limited to  $125^{\circ}\text{C}$ .

## 5 Module

| Parameter                                | Conditions  | Symbol              | Value  |                  |                          | Unit |
|--|---|---------------------|--|------------------|--------------------------|------|
| Isolation test voltage                   | RMS, f = 0 Hz, t = 1 sec  | V <sub>ISOL</sub>   | 4.2  |                  |                          | kV   |
| Maximum RMS module terminal current      | T <sub>F</sub> = 75°C, T <sub>Ct</sub> = 105°C  | I <sub>RMS</sub>    | 500 <sup>1)</sup>                            |                  |                          | A    |
| Material of module baseplate             |   |                     | Cu+Nj <sup>2)</sup>                          |                  |                          |      |
| Internal isolation                       | basic insulation (class 1, IEC 61140)   |                     | Al <sub>2</sub> O <sub>3</sub> <sup>3)</sup> |                  |                          |      |
| Creepage distance                        | terminal to heatsink<br>terminal to terminal  | d <sub>Creep</sub>  | 9.0  |                  |                          | mm   |
|  |   |                     | 9.0  |                  |                          |      |
| Clearance                                | terminal to heatsink<br>terminal to terminal  | d <sub>Clear</sub>  | 4.5  |                  |                          | mm   |
|  |   |                     | 4.5  |                  |                          |      |
| Comperative tracking index               |   | CTI                 | > 200  |                  |                          |      |
|  |   |                     | min.   | typ.             | max.                     |      |
| Pressure drop in cooling circuit         | ΔV/Δt = 10.0 dm <sup>3</sup> /min; T <sub>F</sub> = 75°C                              | Δp                  |  | 87 <sup>4)</sup> |                          | mbar |
| Maximum pressure in cooling circuit      | T <sub>baseplate</sub> < 40°C<br>T <sub>baseplate</sub> > 40°C<br>(relative pressure) | p                   |  |                  | 3.0 <sup>5)</sup><br>2.5 | bar  |
| Stray inductance module                  |   | L <sub>sCE</sub>    | 8.0  |                  |                          | nH   |
| Module lead resistance, terminals - chip | T <sub>F</sub> = 25 °C, per switch  | R <sub>CC+EE'</sub> | 0.75   |                  |                          | mΩ   |
| Storage temperature                      |   | T <sub>stg</sub>    | -40  |                  | 125                      | °C   |
| Mounting torque for modul mounting       | Screw M4 baseplate to heatsink<br>Screw EJOT Delta PCB to frame                       | M                   | 1.80   | 2.00             | 2.20                     | Nm   |
|  |   |                     | 0.45   | 0.50             | 0.55 <sup>6)</sup>       |      |
| Weight                                   |   | G                   | 605  |                  |                          | g    |

<sup>1)</sup> Continous, steady state. Verified by characterization / design not by test.

<sup>2)</sup> Ni plated Cu baseplate.

<sup>3)</sup> Improved Al<sub>2</sub>O<sub>3</sub> ceramic.

<sup>4)</sup> For cooler design see application note AN-HPD-ASSEMBLY. Cooling fluid 50% water / 50% ethylenglycol.

<sup>5)</sup> According to application note AN-HPD-ASSEMBLY.

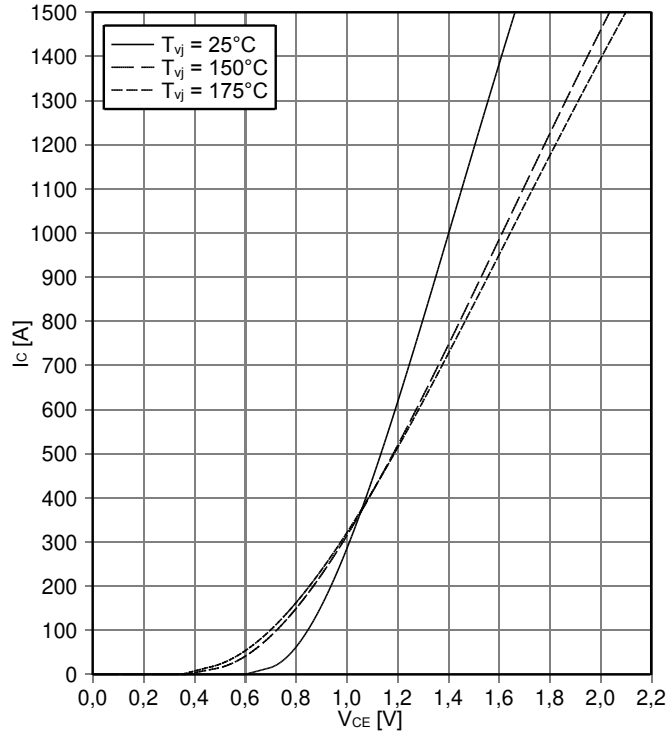
<sup>6)</sup> EJOT Delta PT WN 5451 30x10. Effective mounting torque according to application note AN-HPD-ASSEMBLY

## 6 Characteristics Diagrams

output characteristic IGBT, Inverter (typical)

$$I_C = f(V_{CE})$$

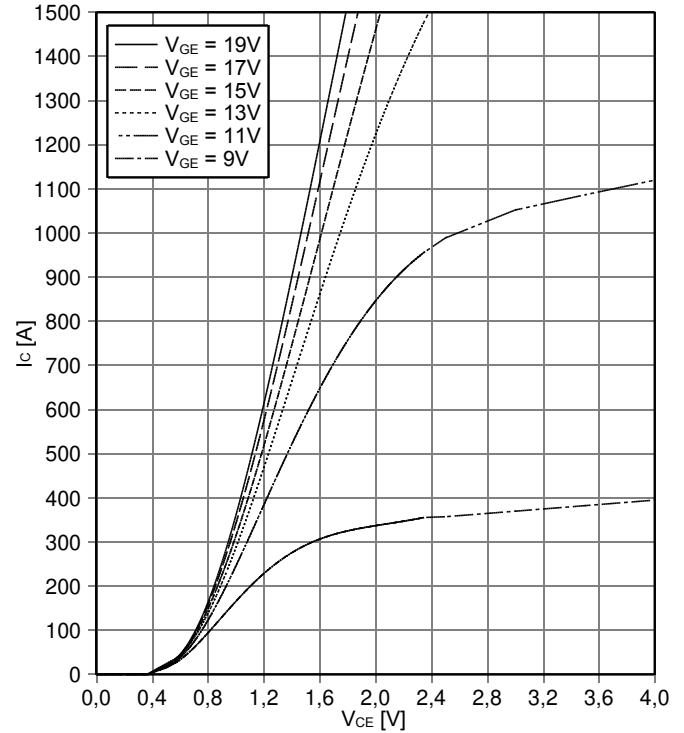
$V_{GE} = 15\text{ V}$



output characteristic IGBT, Inverter (typical)

$$I_C = f(V_{CE})$$

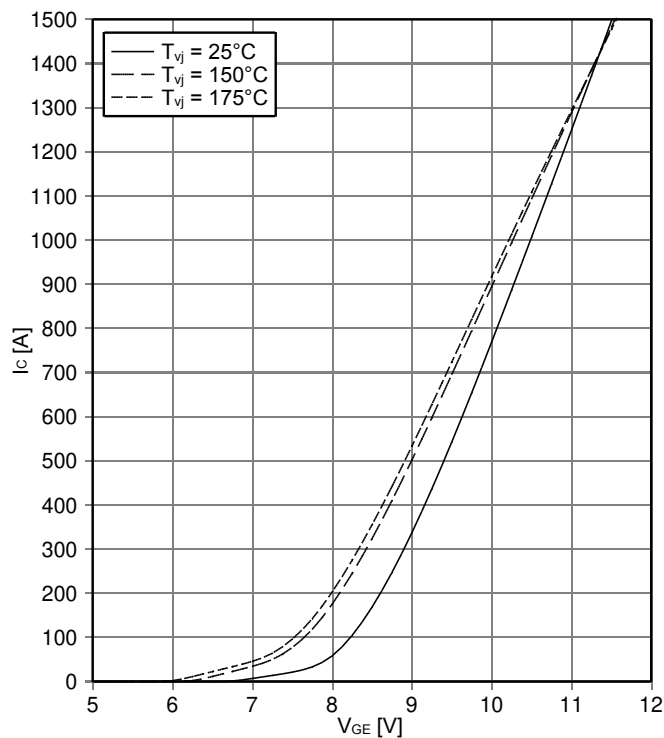
$T_{vj} = 150^\circ\text{C}$



transfer characteristic IGBT, Inverter (typical)

$$I_C = f(V_{GE})$$

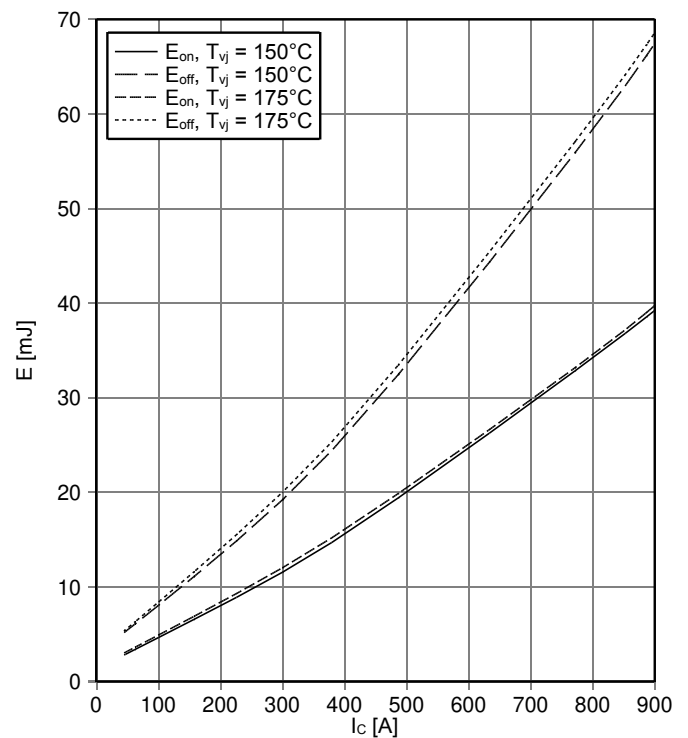
$V_{CE} = 20\text{ V}$



switching losses IGBT, Inverter (typical)

$$E_{on} = f(I_C), E_{off} = f(I_C)$$

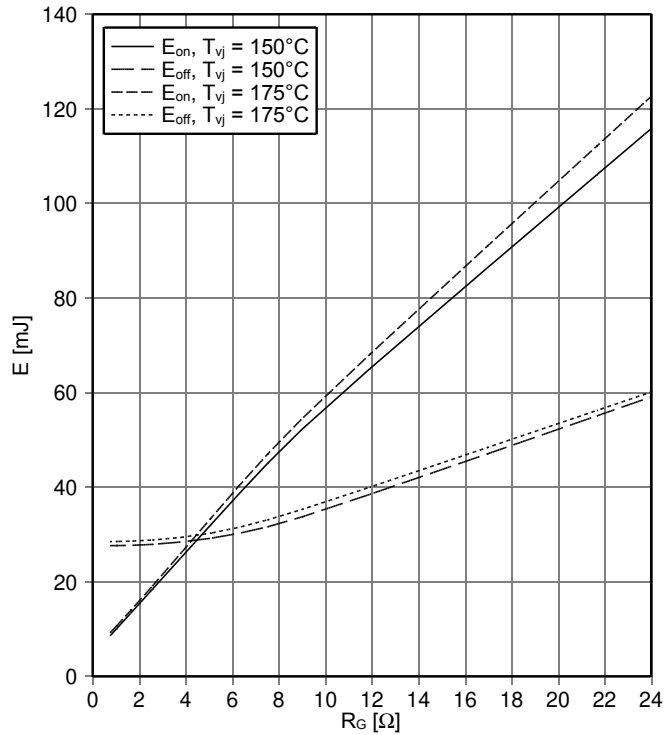
$V_{GE} = +15\text{ V} / -8\text{ V}, R_{Gon} = 2.4\ \Omega, R_{Goff} = 5.1\ \Omega, V_{CE} = 400\text{ V}$



switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$

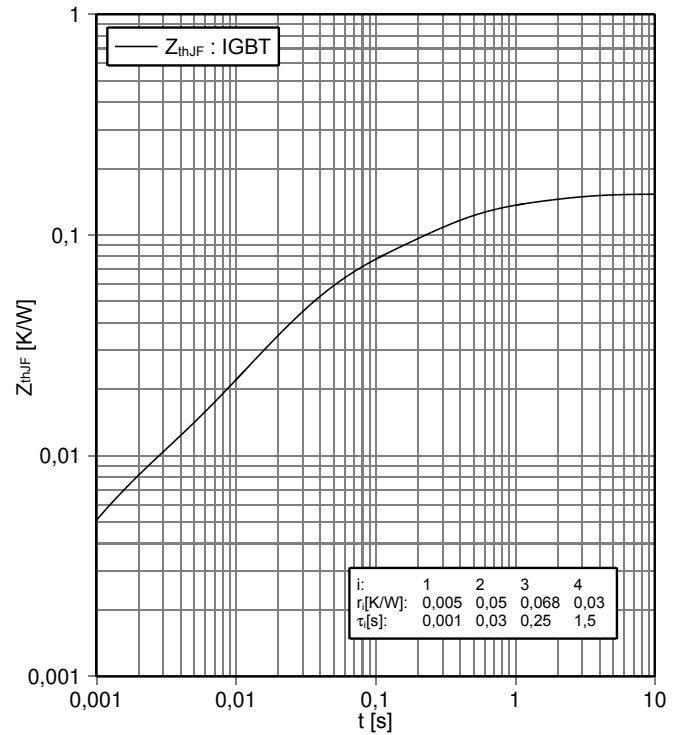
$V_{GE} = +15V / -8V, I_C = 450 A, V_{CE} = 400 V$



transient thermal impedance IGBT, Inverter

$Z_{thJF} = f(t)$ , cooler design according to AN-HPD-ASSEMBLY

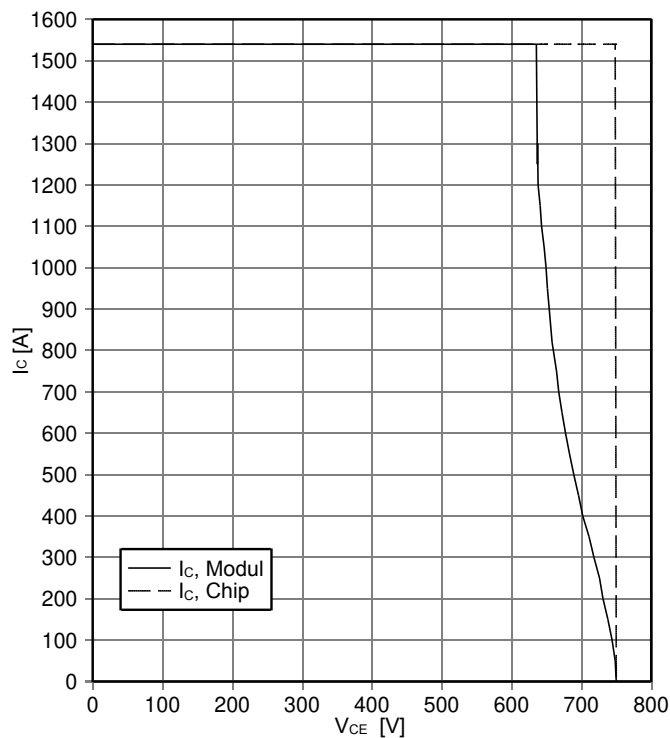
$\Delta V/\Delta t = 10 \text{ dm}^3/\text{min}; T_f = 75^\circ\text{C}; 50\% \text{ water} / 50\% \text{ ethylenglycol}$



reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$

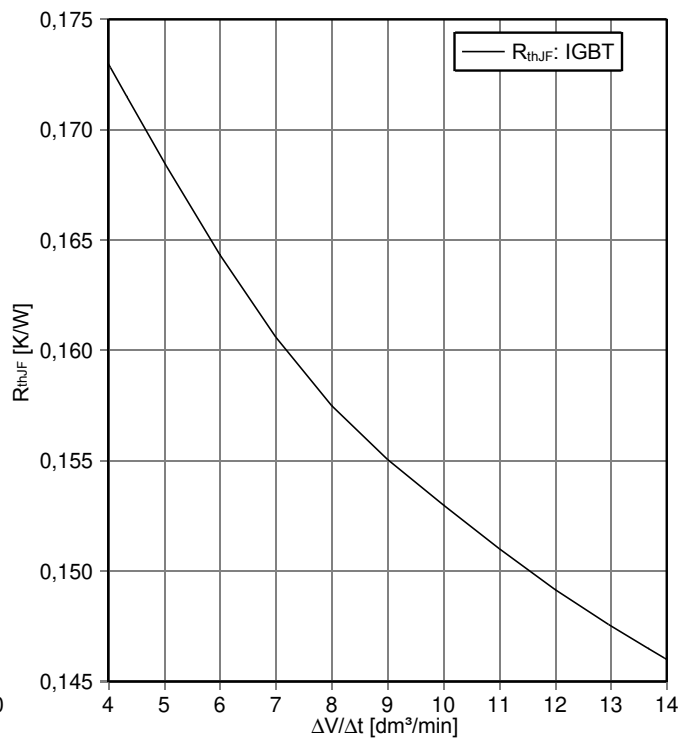
$V_{GE} = +15V / -8V, R_{Goff} = 5,1 \Omega, T_{vj} = 175^\circ\text{C}$



thermal impedance IGBT, Inverter

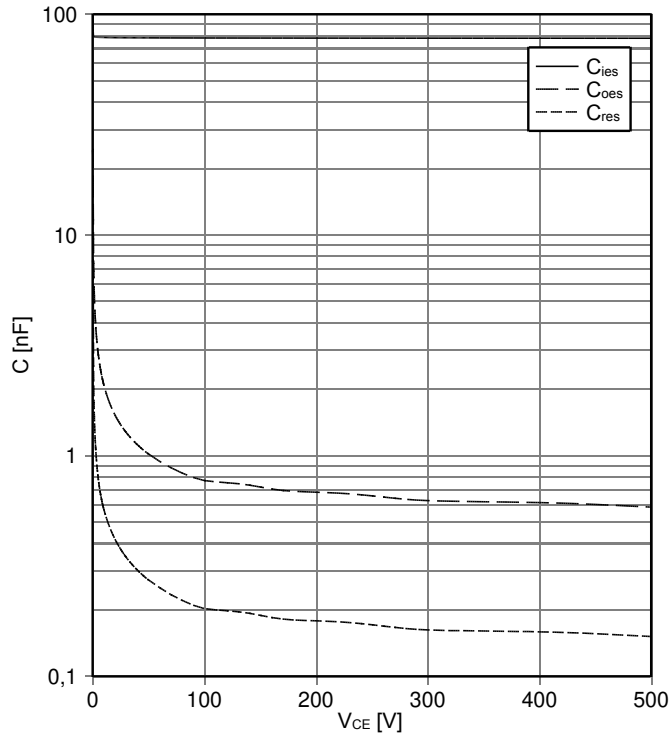
$R_{thJF} = f(\Delta V/\Delta t)$ , cooler design according to AN-HPD-Assembly

$T_f = 75^\circ\text{C}; 50\% \text{ water} / 50\% \text{ ethylenglycol}$



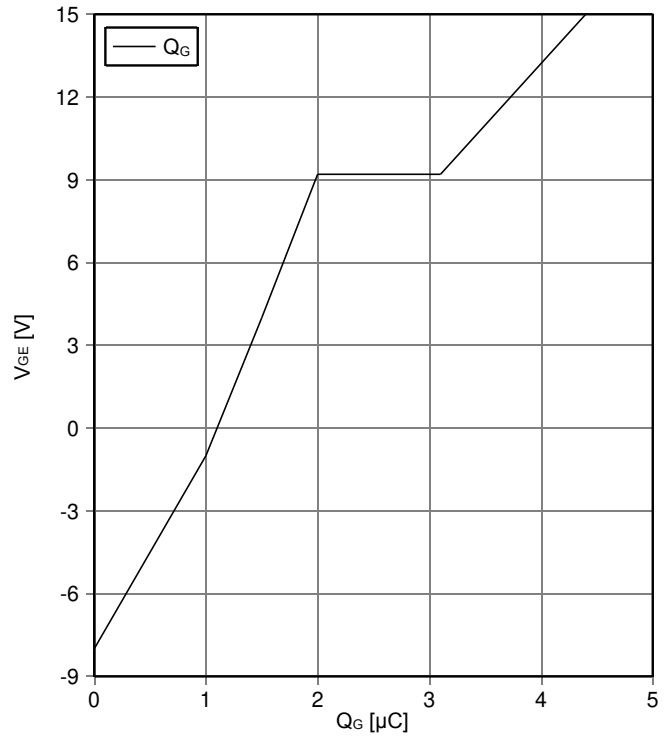
capacity characteristic IGBT, Inverter (typical)

$C = f(V_{CE})$   
 $V_{GE} = 0\text{ V}, T_{vj} = 25^\circ\text{C}, f = 1\text{ MHz}$



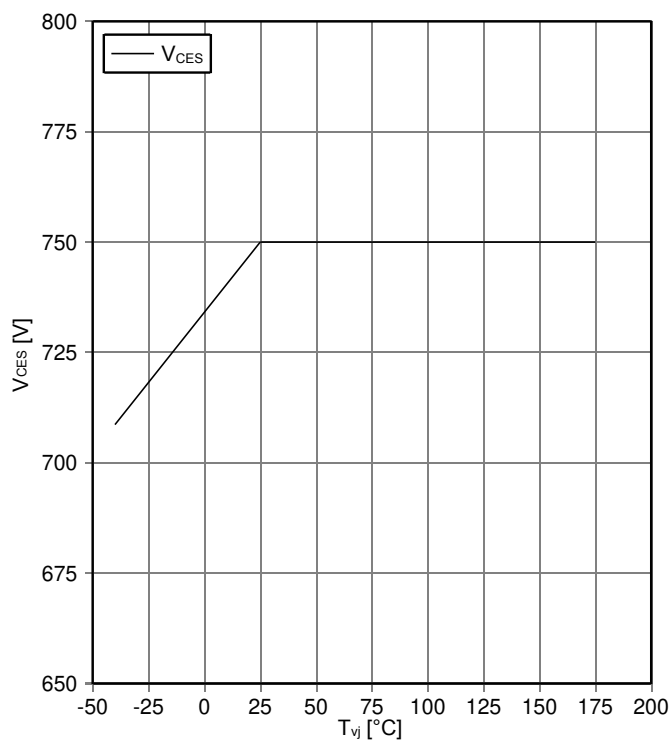
gate charge characteristic IGBT, Inverter (typical)

$V_{GE} = f(Q_G)$   
 $V_{CE} = 400\text{ V}, I_C = 450\text{ A}, T_{vj} = 25^\circ\text{C}$



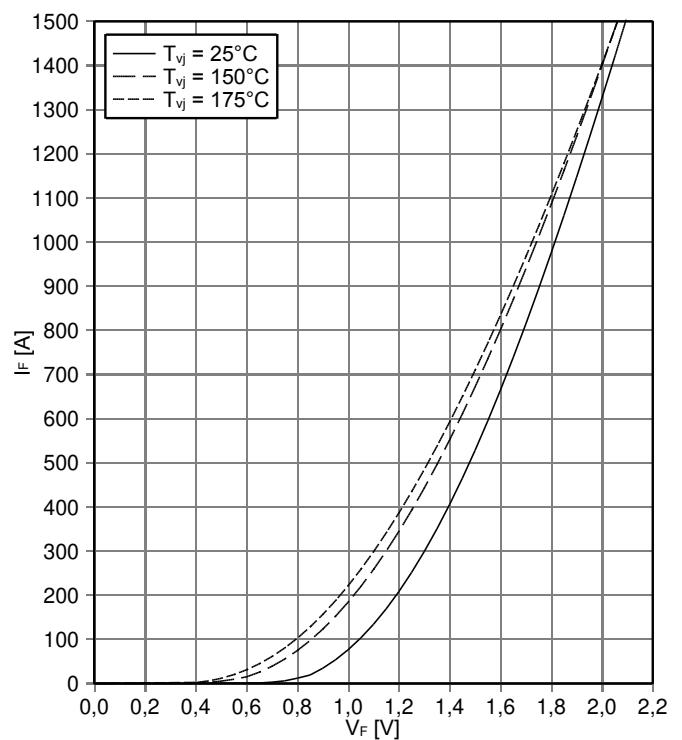
maximum allowed collector-emitter voltage

$V_{CES} = f(T_{vj})$ , verified by characterization / design not by test  
 $I_{CES} = 1\text{ mA}$  for  $T_{vj} \leq 25^\circ\text{C}$ ;  $I_{CES} = 30\text{ mA}$  for  $T_{vj} > 25^\circ\text{C}$



forward characteristic of Diode, Inverter (typical)

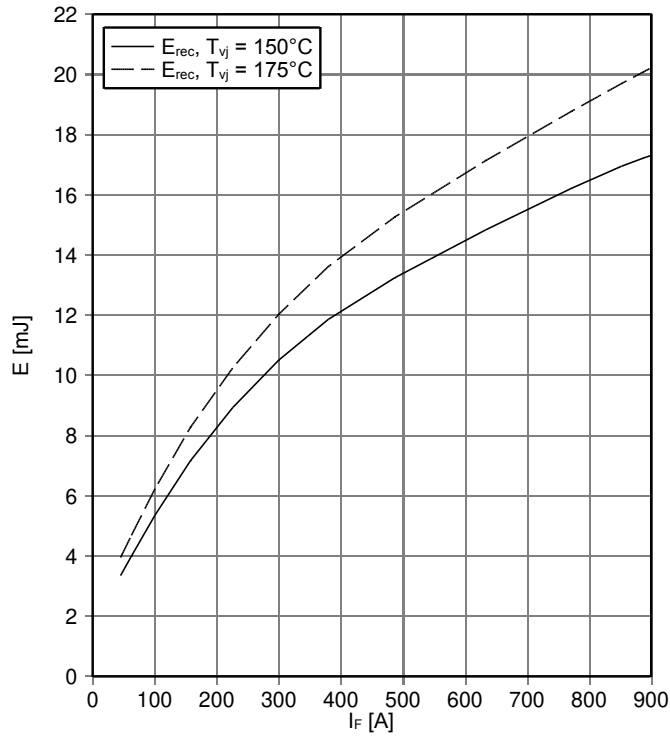
$I_F = f(V_F)$





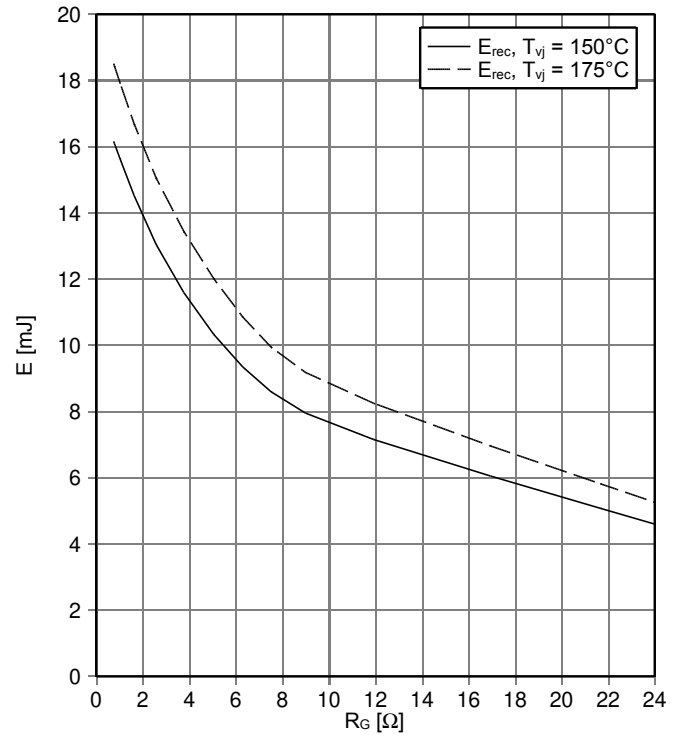
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$ ,  
 $R_{Gon} = 2.4 \Omega$ ,  $V_{CE} = 400 V$



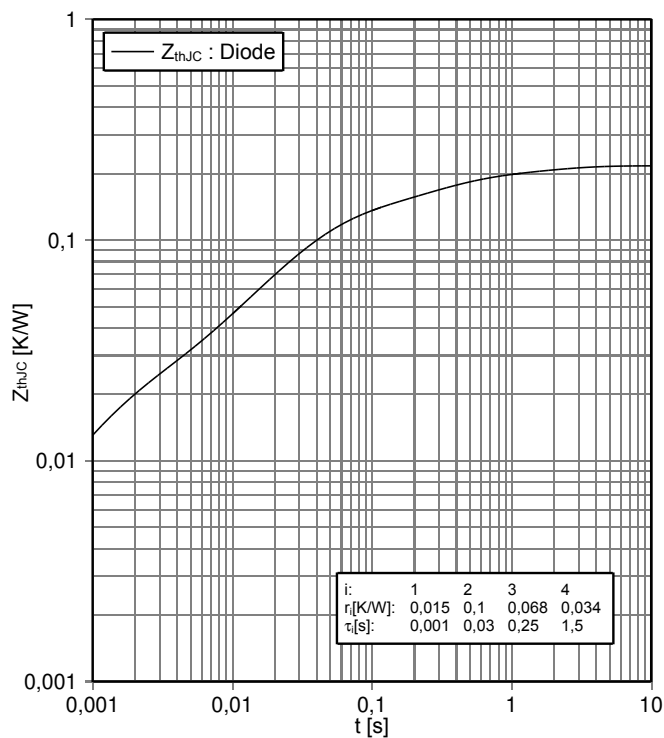
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$ ,  
 $I_F = 450 A$ ,  $V_{CE} = 400 V$



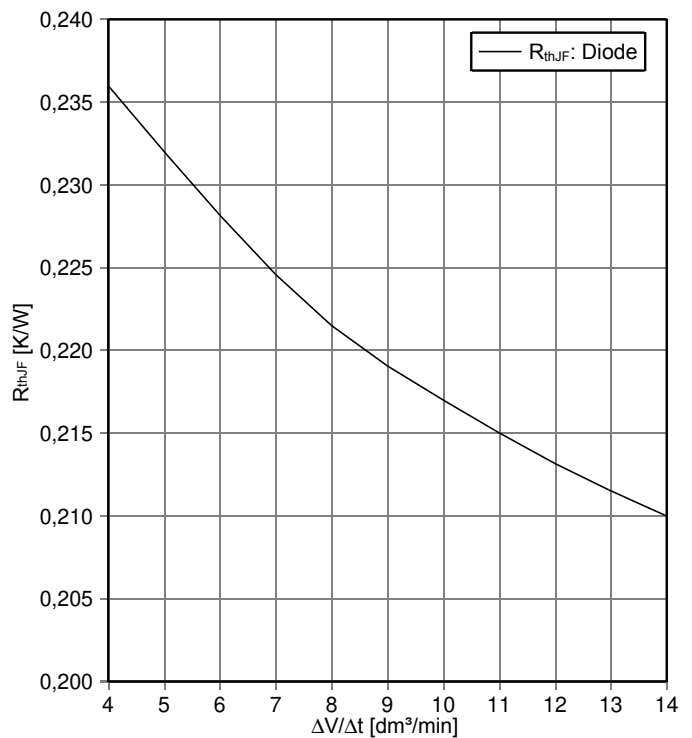
transient thermal impedance Diode, Inverter

$Z_{thJF} = f(t)$ , cooler design according to AN-HPD-ASSEMBLY  
 $\Delta V/\Delta t = 10 \text{ dm}^3/\text{min}$ ;  $T_f = 75^\circ\text{C}$ ; 50% water / 50% ethylenglycol

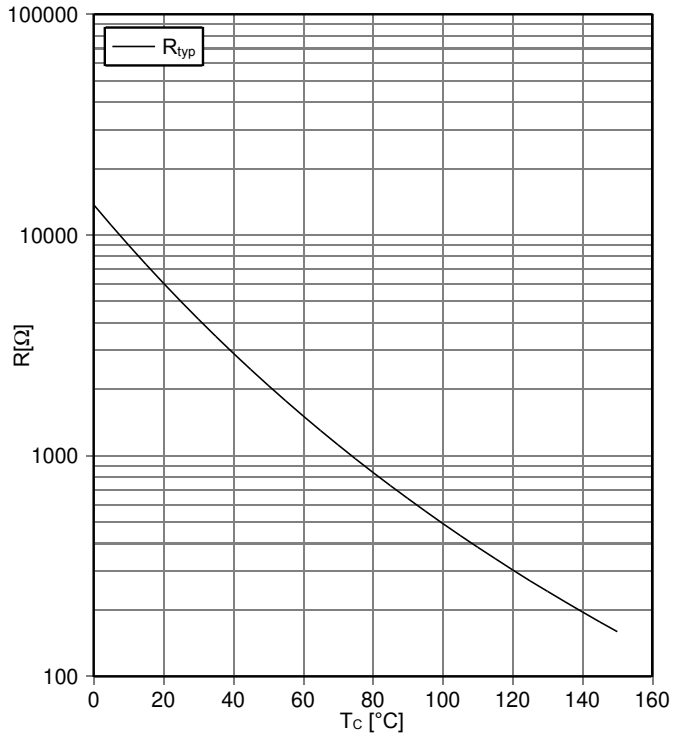


thermal impedance Diode, Inverter

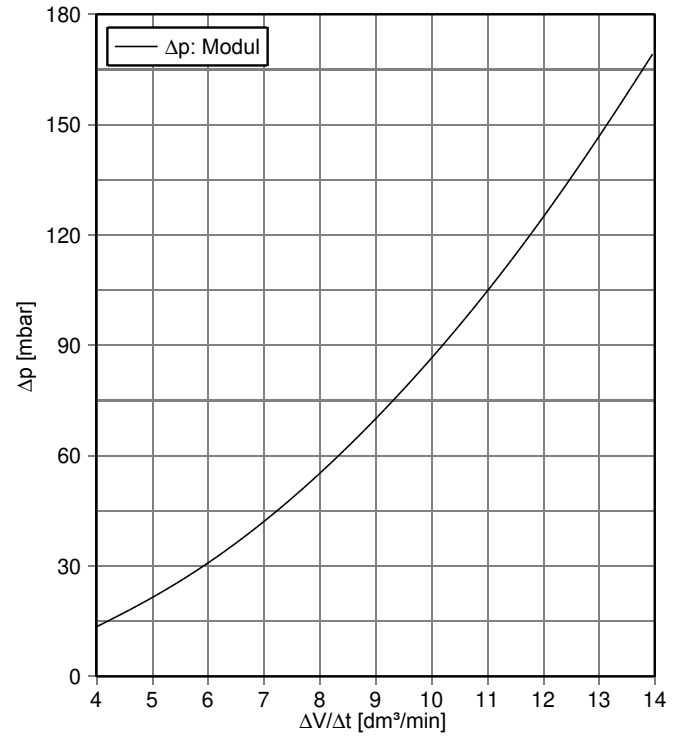
$R_{thJF} = f(\Delta V/\Delta t)$ , cooler design according to AN-HPD-ASSEMBLY  
 $T_f = 75^\circ\text{C}$ ; 50% water / 50% ethylenglycol



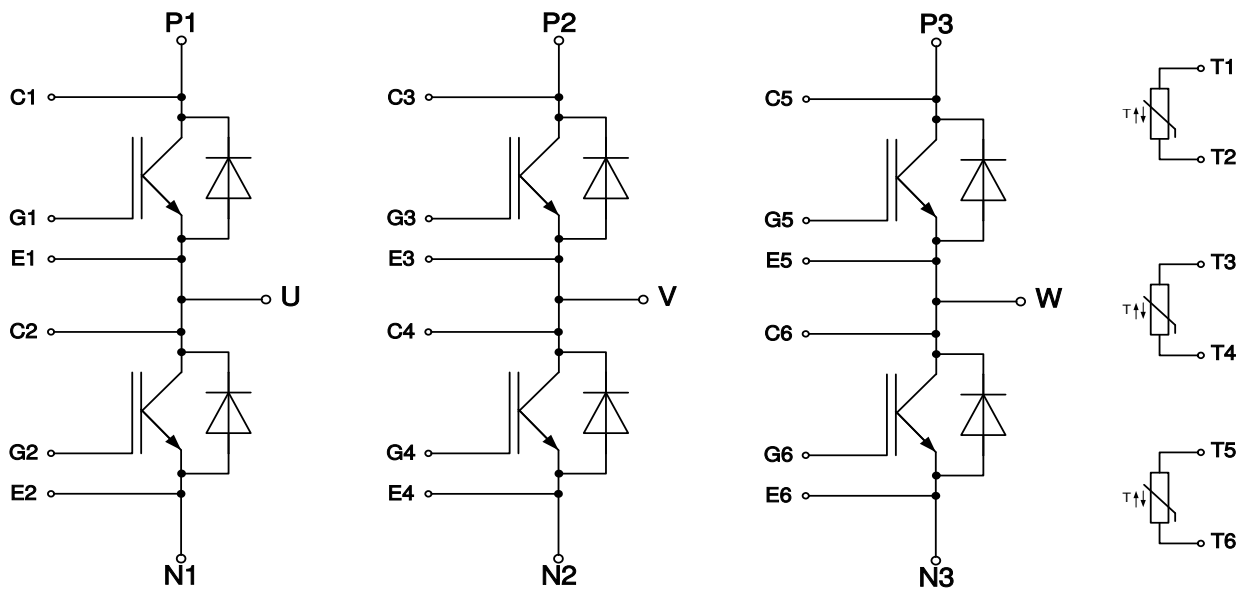
NTC-Thermistor-temperature characteristic (typical)  
 $R = f(T)$



pressure drop in cooling circuit  
 $\Delta p = f(\Delta V/\Delta t)$ , cooler design according to AN-HPD-ASSEMBLY  
 $T_f = 75^\circ\text{C}$ ; 50% water / 50% ethylenglycol




7 Circuit diagram






## 9 Label Codes

### 9.1 Module Code

|              |  |   |  |
|--------------|--|---|--|
| Code Format  | Data Matrix  |   |  |
| Encoding     | ASCII Text   |   |  |
| Symbol Size  | 16x16  |   |  |
| Standard     | IEC24720 and IEC16022  |   |  |
| Code Content | Content<br>Module Serial Number<br>Module Material Number<br>Production Order Number<br>Datecode (Production Year)<br>Datecode (Production Week) | Digit<br>1 - 5<br>6 - 11<br>12 - 19<br>20 - 21<br>22 - 23 | Example (below)<br>71549<br>142846<br>55054991<br>15<br>30 |
| Example      | <br>71549142846550549911530                                    |   |  |

### 9.2 Packing Code

|              |  |                                       |  |   |
|--------------|--|---------------------------------------|--|---|
| Code Format  | Code128  |                                       |  |   |
| Encoding     | Code Set A   |                                       |  |   |
| Symbol Size  | 34 digits  |                                       |  |   |
| Standard     | IEC8859-1  |                                       |  |   |
| Code Content | Content<br>Backend Construction Number<br>Production Lot Number<br>Serial Number<br>Date Code<br>Box Quantity              | Identifier<br>X<br>1T<br>S<br>9D<br>Q | Digit<br>2 - 9<br>12 - 19<br>21 - 25<br>28 - 31<br>33 - 34 | Example (below)<br>95056609<br>2X0003E0<br>754389<br>1139<br>15 |
| Example      | <br>X950566091T2X0003E0S754389D1139Q15 |                                       |  |   |

## Revision History

Major changes since previous revision

| Revision History |            |                  |
|------------------|------------|------------------|
| Reference        | Date       | Description      |
| V1.0             | 2017-06-06 | Target datasheet |
| V2.0             | 2018-07-10 | -                |
| V3.0             | 2019-05-28 | -                |

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