

## Final datasheet

### EasyDUAL module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and PressFIT / NTC

#### Features

- Electrical features
  - $V_{CES} = 1200 \text{ V}$
  - $I_{C\text{nom}} = 100 \text{ A} / I_{CRM} = 200 \text{ A}$
  - Overload operation up to  $175^\circ\text{C}$
  - Low  $V_{CE,\text{sat}}$
  - TRENCHSTOP™ IGBT7
  - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
  - High power density
  - Compact design
  - $\text{Al}_2\text{O}_3$  substrate with low thermal resistance
  - PressFIT contact technology
  - 2.5 kV AC 1 minute insulation
  - Integrated NTC temperature sensor



Typical appearance

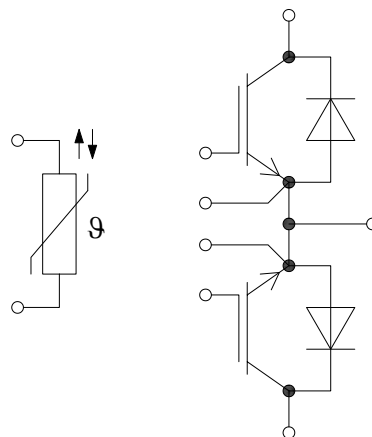
#### Potential applications

- Motor drives
- Air conditioning
- Auxiliary inverters
- Servo drives
- UPS systems

#### 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
Internal isolation		basic insulation (class 1, IEC 61140)	$Al_2O_3$	
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	$L_{sCE}$			20		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25 \text{ °C}$ , per switch		4.2		mΩ
Storage temperature	$T_{stg}$		-40		125	°C
Mounting force per clamp	$F$		20		50	N
Weight	$G$			24		g

*Note:* The current under continuous operation is limited to 25 A rms per connector pin.  
The electrical characterization was performed in NPC2 topology, which combines two FF100R12W1T7E\_B11 modules. It has to be considered, that the commutation in this configuration takes place between both modules.

## 2 IGBT, Inverter

**Table 3** Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	$V_{CES}$		$T_{vj} = 25 \text{ °C}$	1200	V
Implemented collector current	$I_{CN}$			100	A
Continuous DC collector current	$I_{CDC}$	$T_{vj \text{ max}} = 175 \text{ °C}$	$T_H = 65 \text{ °C}$	80	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{vj \text{ op}}$		200	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	$V_{CE\ sat}$	$I_C = 100\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.50	1.80	V
			$T_{vj} = 125\ ^\circ C$		1.64		
			$T_{vj} = 175\ ^\circ C$		1.72		
Gate threshold voltage	$V_{GETh}$	$I_C = 2.5\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.15	5.80	6.45	V
Gate charge	$Q_G$	$V_{GE} = \pm 15\ V, V_{CC} = 600\ V$			1.8		$\mu C$
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\ ^\circ C$			1.5		$\Omega$
Input capacitance	$C_{ies}$	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			21.7		nF
Reverse transfer capacitance	$C_{res}$	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.076		nF
Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 1200\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			0.0076	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)	$t_{don}$	$I_C = 100\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.68\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.121		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.130		
			$T_{vj} = 175\ ^\circ C$		0.136		
Rise time (inductive load)	$t_r$	$I_C = 100\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.68\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.028		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.034		
			$T_{vj} = 175\ ^\circ C$		0.037		
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 100\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 0.68\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.276		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.356		
			$T_{vj} = 175\ ^\circ C$		0.395		
Fall time (inductive load)	$t_f$	$I_C = 100\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 0.68\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.081		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.157		
			$T_{vj} = 175\ ^\circ C$		0.219		
Turn-on energy loss per pulse	$E_{on}$	$I_C = 100\ A, V_{CC} = 600\ V, L_\sigma = 78\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 0.68\ \Omega, di/dt = 2.01\ kA/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		3.03		mJ
			$T_{vj} = 125\ ^\circ C$		4.74		
			$T_{vj} = 175\ ^\circ C$		6.3		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 100\ A, V_{CC} = 600\ V, L_\sigma = 78\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 0.68\ \Omega, dv/dt = 2510\ V/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		6.57		mJ
			$T_{vj} = 125\ ^\circ C$		10.3		
			$T_{vj} = 175\ ^\circ C$		12.6		

**(table continues...)**

**Table 4 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	$I_{SC}$	$V_{GE} \leq 15 \text{ V}, V_{CC} = 800 \text{ V}, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_p \leq 8 \mu\text{s}, T_{vj} = 150 \text{ }^\circ\text{C}$		370	A
			$t_p \leq 7 \mu\text{s}, T_{vj} = 175 \text{ }^\circ\text{C}$		350	
Thermal resistance, junction to heat sink	$R_{thJH}$	per IGBT, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$		0.724		K/W
Temperature under switching conditions	$T_{vj op}$		-40		175	$^\circ\text{C}$

Note:  $T_{vj op} > 150^\circ\text{C}$  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	$V_{RRM}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1200	V	
Continuous DC forward current	$I_F$		100	A	
Repetitive peak forward current	$I_{FRM}$	$t_p = 1 \text{ ms}$	200	A	
$I^2t$ - value	$I^2t$	$t_p = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	1450	$\text{A}^2\text{s}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1300	

**Table 6 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	$V_F$	$I_F = 100 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		1.72	2.10	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1.59		
			$T_{vj} = 175 \text{ }^\circ\text{C}$		1.52		
Peak reverse recovery current	$I_{RM}$	$V_{CC} = 600 \text{ V}, I_F = 100 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2.01 \text{ kA}/\mu\text{s} (T_{vj} = 175 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$		159		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$		169		
			$T_{vj} = 175 \text{ }^\circ\text{C}$		175		

**(table continues...)**

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

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Recovered charge	$Q_r$	$V_{CC} = 600\text{ V}$ , $I_F = 100\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 2.01$ $\text{kA}/\mu\text{s}$ ( $T_{vj} = 175\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$		8.3	$\mu\text{C}$
			$T_{vj} = 125\text{ }^\circ\text{C}$		15.1	
			$T_{vj} = 175\text{ }^\circ\text{C}$		19.5	
Reverse recovery energy	$E_{rec}$	$V_{CC} = 600\text{ V}$ , $I_F = 100\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 2.01$ $\text{kA}/\mu\text{s}$ ( $T_{vj} = 175\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$		3.49	mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$		6.35	
			$T_{vj} = 175\text{ }^\circ\text{C}$		8.08	
Thermal resistance, junction to heat sink	$R_{thJH}$	per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$			1.00	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 NTC-Thermistor

**Table 7** **Characteristic values**

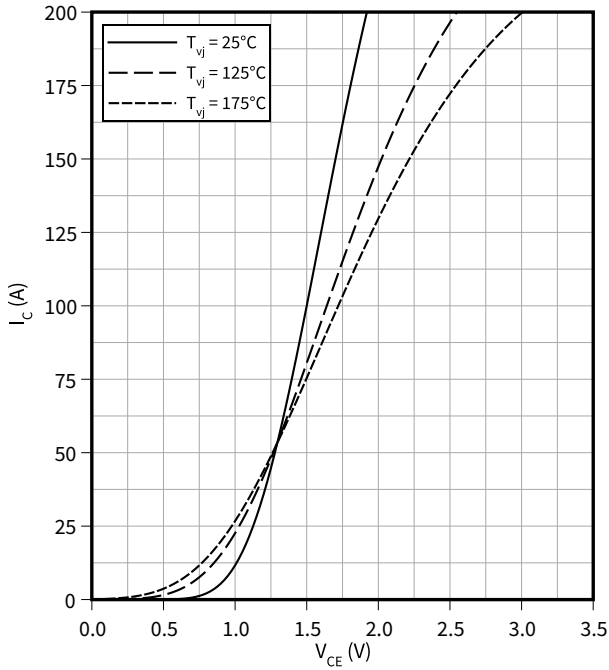
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	$R_{25}$	$T_{NTC} = 25\text{ }^\circ\text{C}$		5		k $\Omega$
Deviation of $R_{100}$	$\Delta R/R$	$T_{NTC} = 100\text{ }^\circ\text{C}$ , $R_{100} = 493\text{ }\Omega$	-5		5	%
Power dissipation	$P_{25}$	$T_{NTC} = 25\text{ }^\circ\text{C}$			20	mW
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: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

## 5 Characteristics diagrams

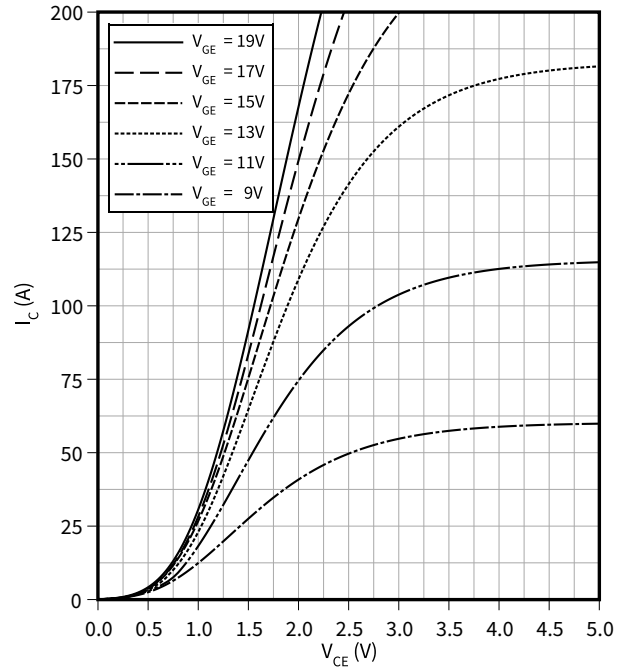
**Output characteristic (typical), IGBT, Inverter**

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



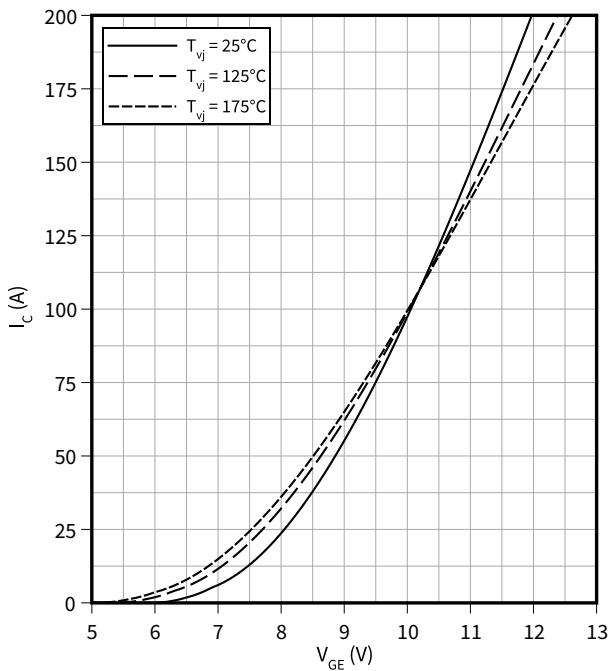
**Output characteristic field (typical), IGBT, Inverter**

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



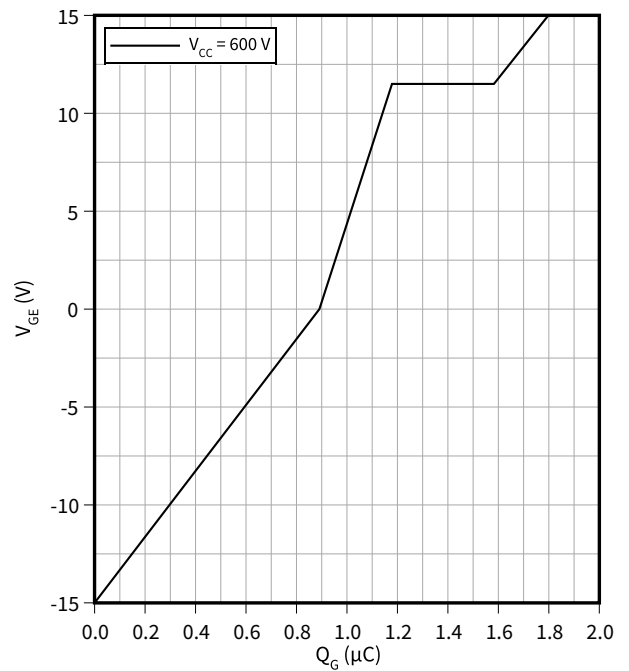
**Transfer characteristic (typical), IGBT, Inverter**

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



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

$V_{GE} = f(Q_G)$   
 $I_C = 100 \text{ A}, T_{vj} = 25 \text{ °C}$

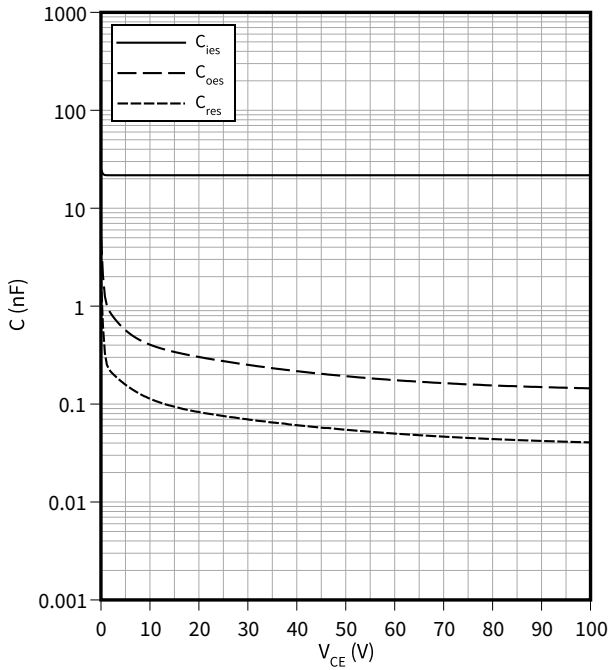


5 Characteristics diagrams

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

$C = f(V_{CE})$

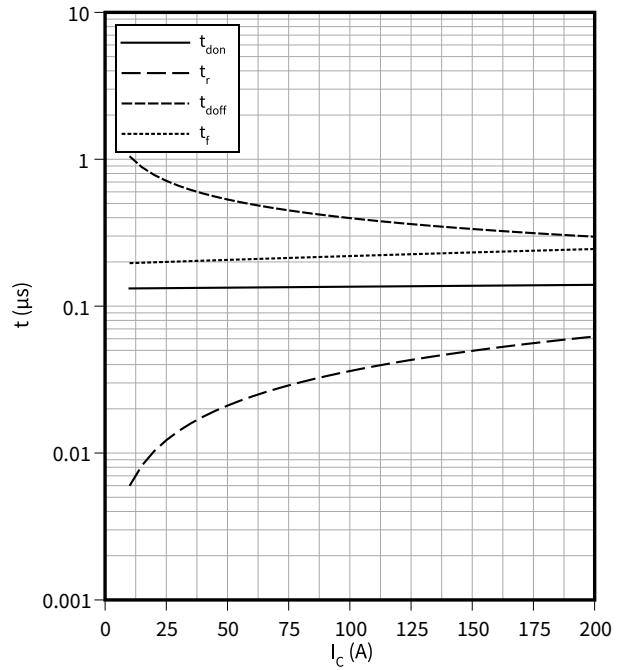
$f = 100 \text{ kHz}, V_{GE} = 0 \text{ V}, T_{vj} = 25 \text{ }^\circ\text{C}$



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

$t = f(I_C)$

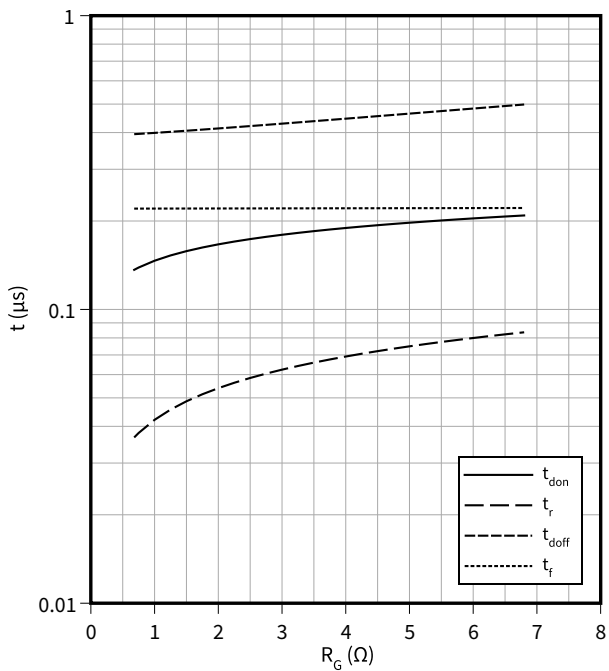
$R_{Goff} = 0.68 \text{ } \Omega, R_{Gon} = 0.68 \text{ } \Omega, V_{GE} = \pm 15 \text{ V}, V_{CC} = 600 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}$



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

$t = f(R_G)$

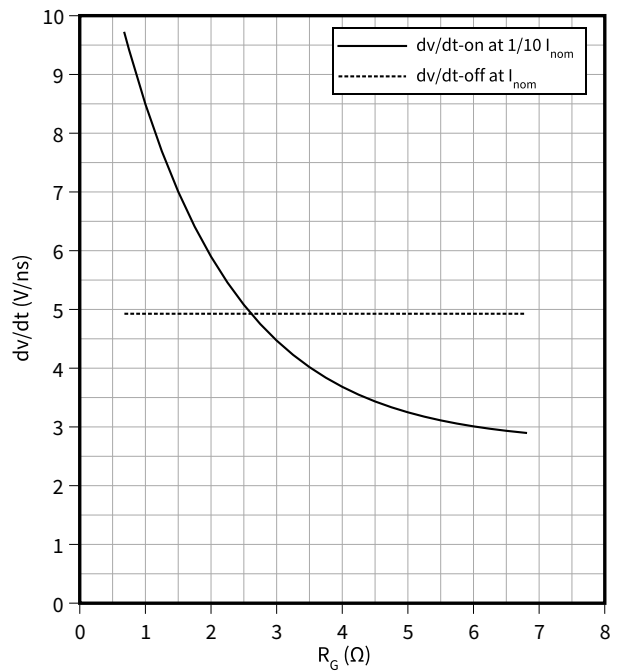
$V_{GE} = \pm 15 \text{ V}, I_C = 100 \text{ A}, V_{CC} = 600 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}$



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

$dv/dt = f(R_G)$

$I_C = 100 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 25 \text{ }^\circ\text{C}$



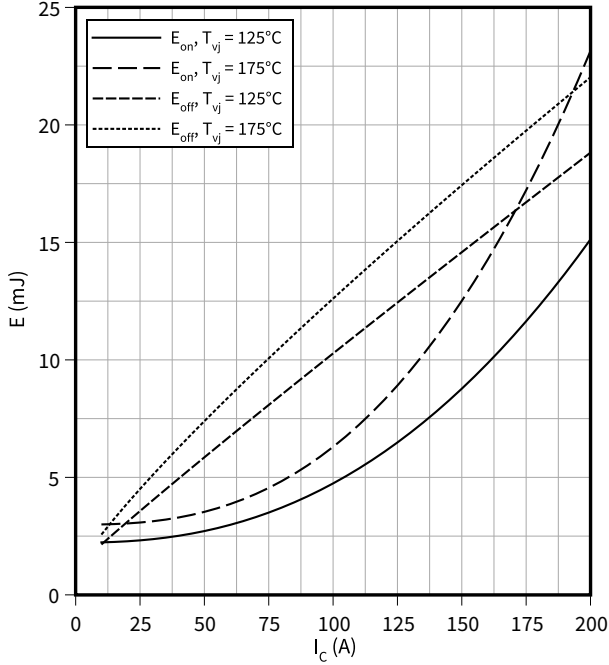


5 Characteristics diagrams

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

$E = f(I_C)$

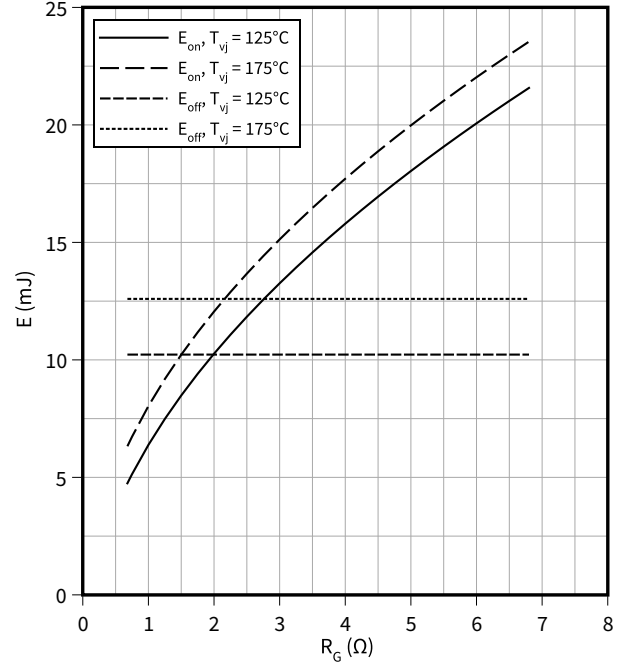
$R_{Goff} = 0.68 \Omega$ ,  $R_{Gon} = 0.68 \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $V_{CC} = 600 \text{ V}$



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

$E = f(R_G)$

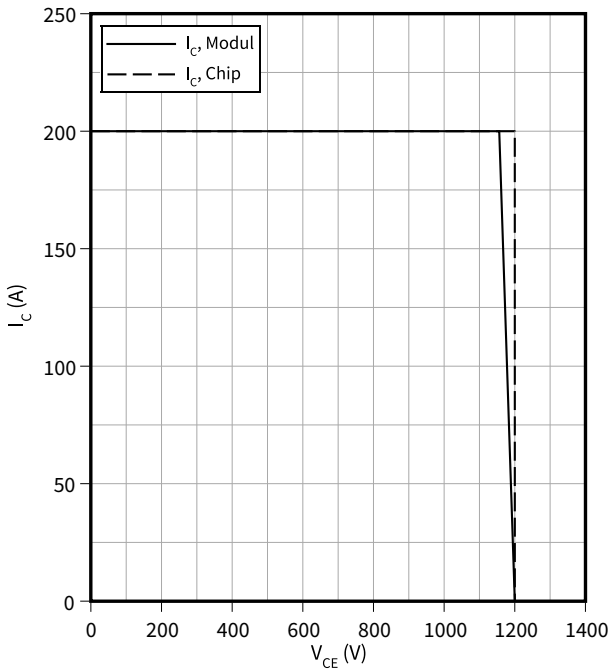
$V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 100 \text{ A}$ ,  $V_{CC} = 600 \text{ V}$



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

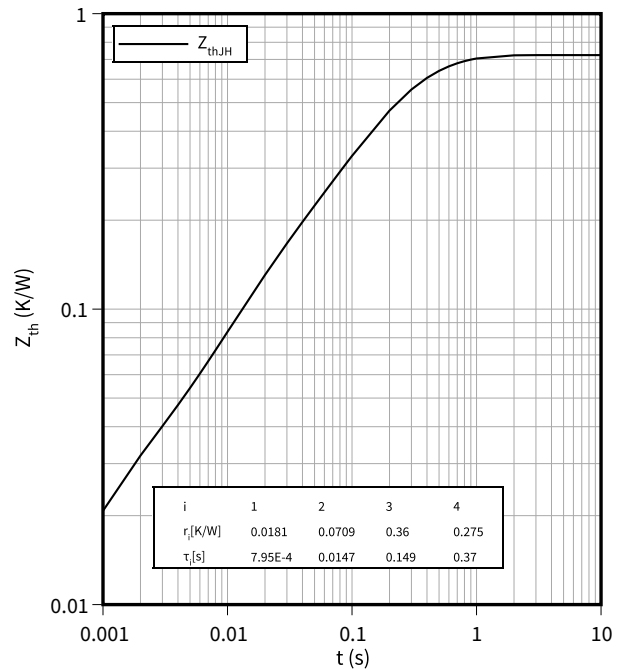
$I_C = f(V_{CE})$

$R_{Goff} = 0.68 \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 175 \text{ °C}$



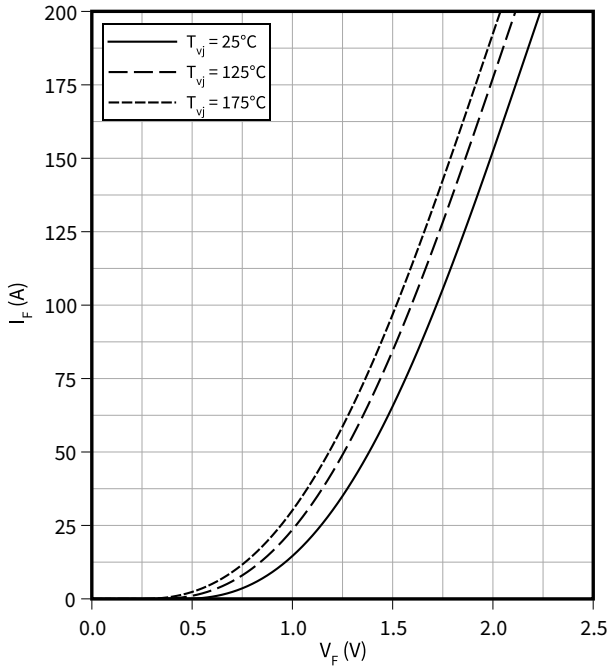
**Transient thermal impedance, IGBT, Inverter**

$Z_{th} = f(t)$



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

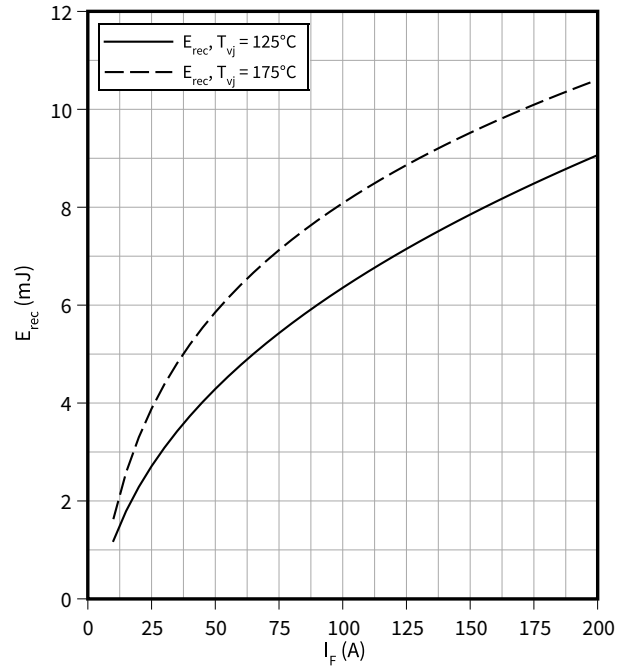
$I_F = f(V_F)$



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

$E_{rec} = f(I_F)$

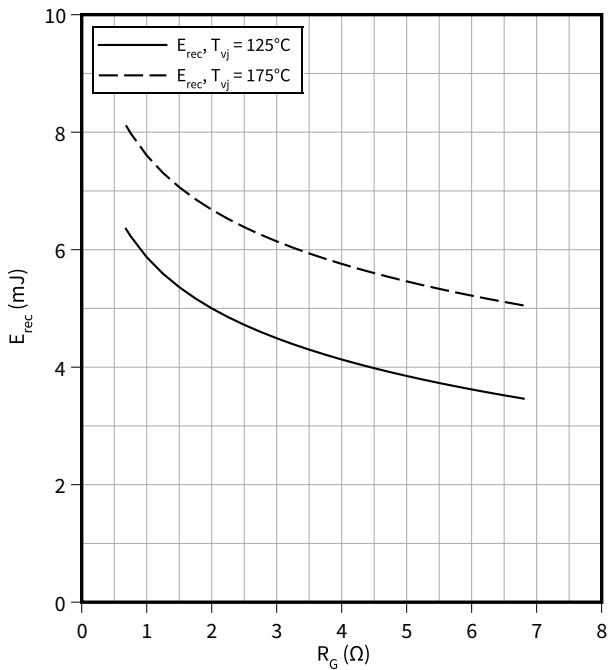
$R_{Gon} = 0.68 \Omega, V_{CC} = 600 \text{ V}$



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

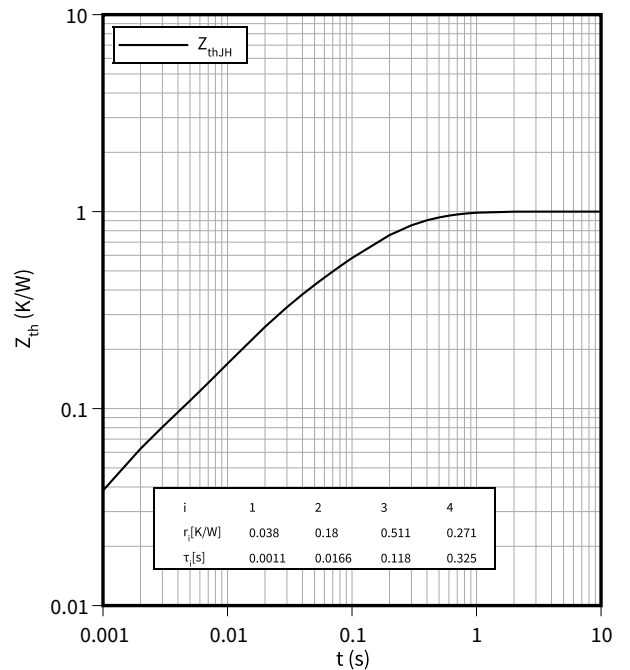
$E_{rec} = f(R_G)$

$I_F = 100 \text{ A}, V_{CC} = 600 \text{ V}$



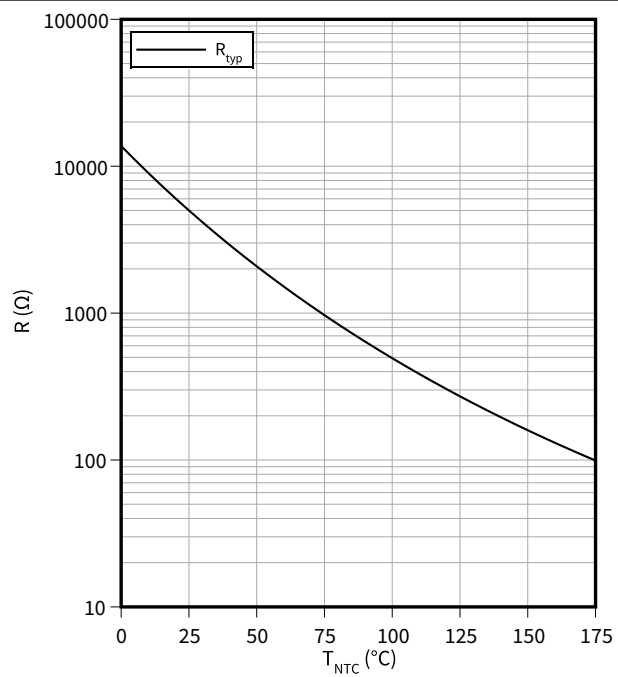
**Transient thermal impedance, Diode, Inverter**

$Z_{th} = f(t)$



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

$R = f(T_{NTC})$



## 6 Circuit diagram

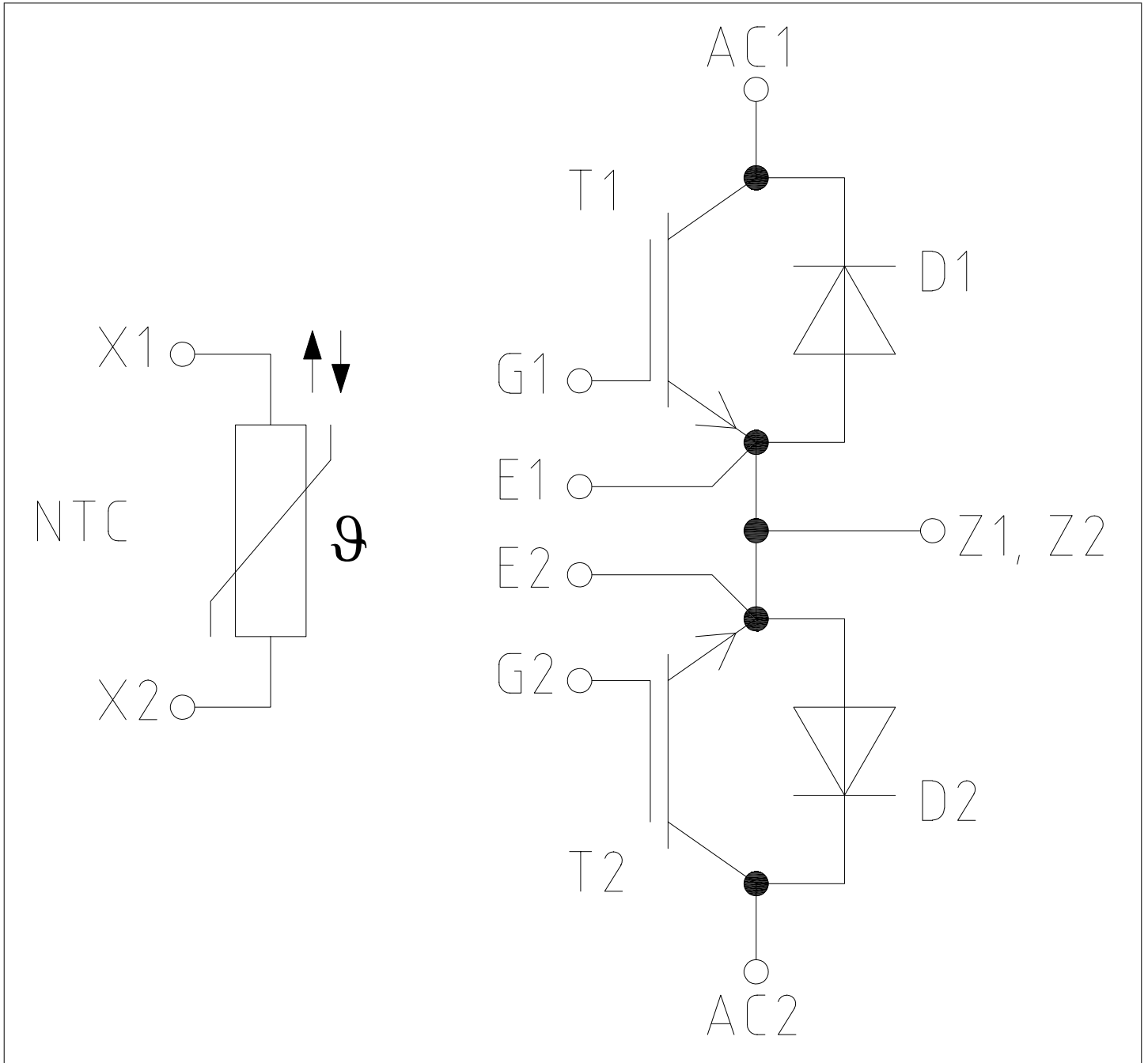
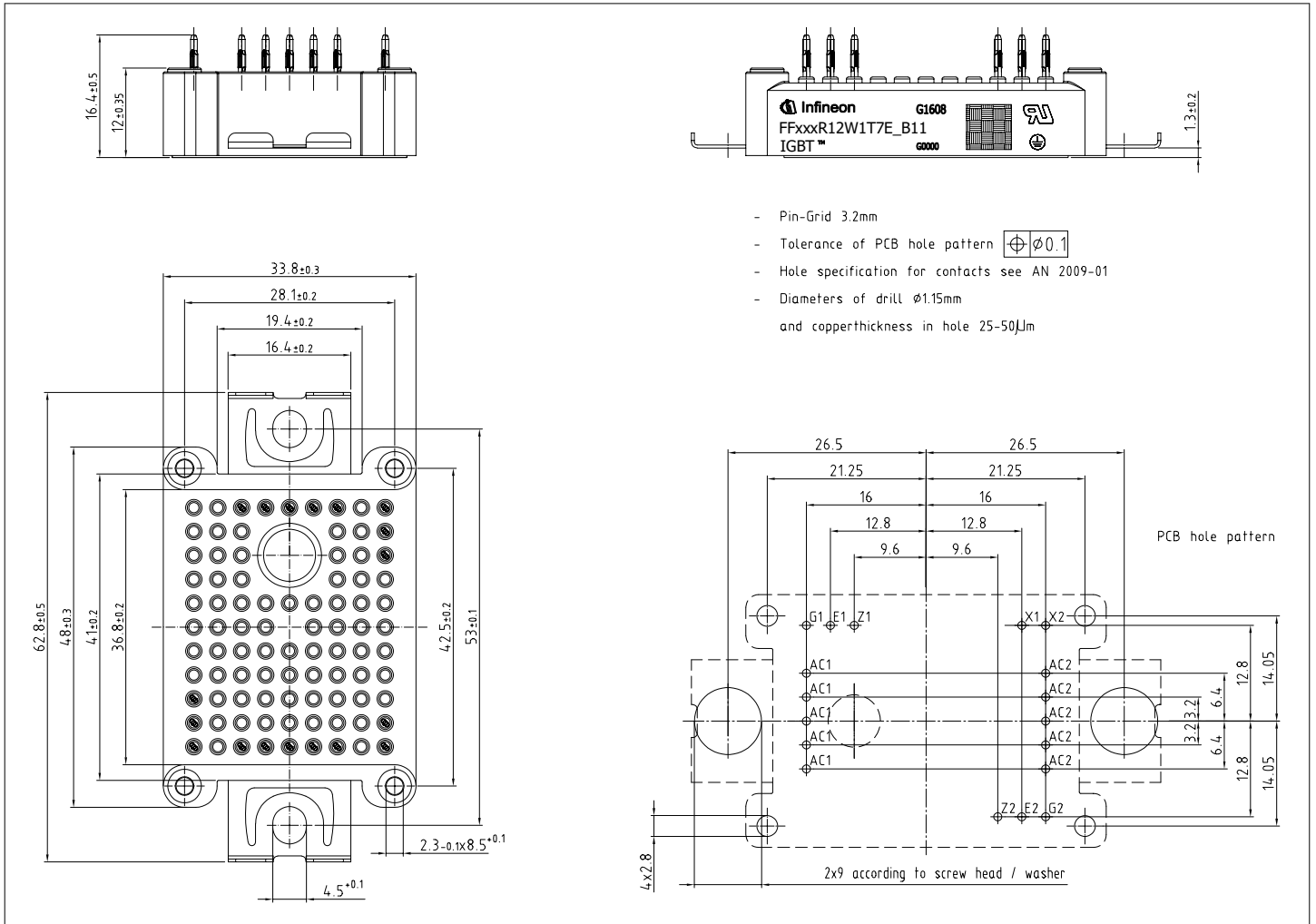



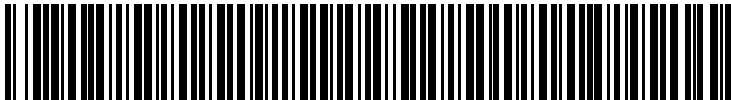
Figure 1

**7 Package outlines**



**Figure 2**

## 8 Module label code

<b>Module label code</b>			
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	<i>Content</i>	<i>Digit</i>	<i>Example</i>
	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 3**

## Revision history

Document revision	Date of release	Description of changes
0.10	2023-06-01	Initial version
1.00	2023-08-28	Final datasheet

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