

## Preliminary datasheet

### EconoPIM™3 module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and NTC

#### Features

- Electrical features
  - $V_{CES} = 1200\text{ V}$
  - $I_{C\text{ nom}} = 200\text{ A} / I_{CRM} = 400\text{ A}$
  - TRENCHSTOP™ IGBT7
  - Overload operation up to  $175^\circ\text{C}$
  - Low  $V_{CESat}$
- Mechanical features
  - Integrated NTC temperature sensor
  - Solder contact technology
  - Copper base plate
  - $\text{Al}_2\text{O}_3$  substrate with low thermal resistance



Typical appearance

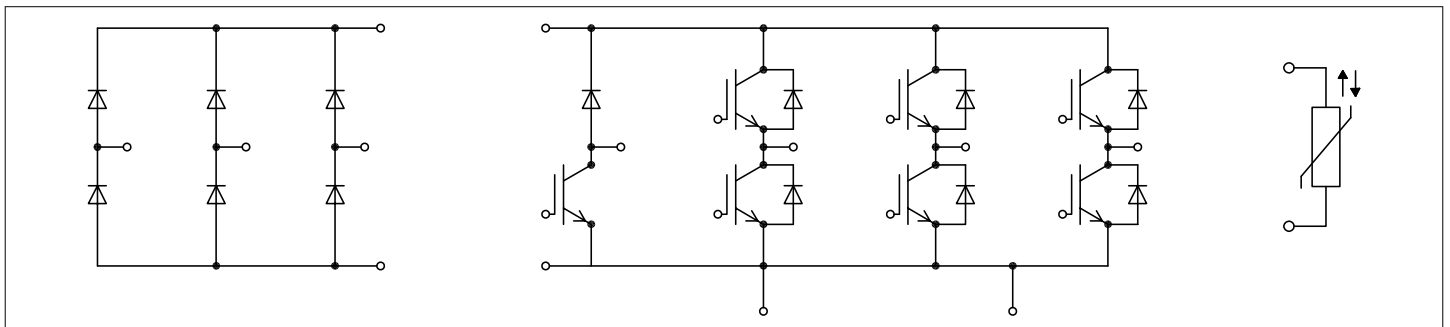
#### Potential applications

- 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)	$\text{Al}_2\text{O}_3$	
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	$L_{SCE}$			25		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_C = 25^\circ\text{C}$ , per switch		1.1		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C = 25^\circ\text{C}$ , per switch		1.6		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	$G$			300		g

Note: The current under continuous operation is limited to 50A rms per connector pin.

## 2 IGBT, Inverter

**Table 3** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	$V_{CES}$	$T_{vj} = 25^\circ\text{C}$	1200	V
Continous DC collector current	$I_{CDC}$	$T_{vj \max} = 175^\circ\text{C}$ $T_C = 70^\circ\text{C}$	200	A
Repetitive peak collector current	$I_{CRM}$	$t_p = 1 \text{ ms}$	400	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	$V_{CE\ sat}$	$I_C = 200\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.55	TBD	V
			$T_{vj} = 125\ ^\circ C$		1.69		
			$T_{vj} = 175\ ^\circ C$		1.77		
Gate threshold voltage	$V_{GEth}$	$I_C = 4.6\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.15	5.80	6.45	V
Gate charge	$Q_G$	$V_{GE} = \pm 15\ V, V_{CE} = 600\ V$			3.34		$\mu C$
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\ ^\circ C$			0.75		$\Omega$
Input capacitance	$C_{ies}$	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			40.3		nF
Reverse transfer capacitance	$C_{res}$	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.14		nF
Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 1200\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			0.02	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)	$t_{don}$	$I_C = 200\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 2.7\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.203		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.226		
			$T_{vj} = 175\ ^\circ C$		0.239		
Rise time (inductive load)	$t_r$	$I_C = 200\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 2.7\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.094		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.097		
			$T_{vj} = 175\ ^\circ C$		0.099		
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 200\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 2.7\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.351		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.414		
			$T_{vj} = 175\ ^\circ C$		0.433		
Fall time (inductive load)	$t_f$	$I_C = 200\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 2.7\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.103		$\mu s$
			$T_{vj} = 125\ ^\circ C$		0.198		
			$T_{vj} = 175\ ^\circ C$		0.262		
Turn-on energy loss per pulse	$E_{on}$	$I_C = 200\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 2.7\ \Omega, di/dt = 2050\ A/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		25.1		mJ
			$T_{vj} = 125\ ^\circ C$		38.3		
			$T_{vj} = 175\ ^\circ C$		45.9		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 200\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 2.7\ \Omega, dv/dt = 3250\ V/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		12.9		mJ
			$T_{vj} = 125\ ^\circ C$		20.5		
			$T_{vj} = 175\ ^\circ C$		23.8		
SC data	$I_{SC}$	$V_{GE} \leq 15\ V, V_{CC} = 800\ V, V_{CEmax} = V_{CES} - L_{sCE} * di/dt$	$t_p \leq 8\ \mu s, T_{vj} = 150\ ^\circ C$		640		A
			$t_p \leq 7\ \mu s, T_{vj} = 175\ ^\circ C$		600		

**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			0.231	K/W
Thermal resistance, case to heatsink	$R_{thCH}$	per IGBT, $\lambda_{grease} = 1 \text{ W/(m}^2\text{K)}$		0.0670		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	$I_F$		200	A	
Repetitive peak forward current	$I_{FRM}$	$t_P = 1 \text{ ms}$	400	A	
$I^2t$ - value	$I^2t$	$t_P = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125^\circ\text{C}$	3700	$\text{A}^2\text{s}$
			$T_{vj} = 175^\circ\text{C}$	3050	

**Table 6** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	$V_F$	$I_F = 200 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^\circ\text{C}$		1.72	TBD	V
			$T_{vj} = 125^\circ\text{C}$		1.59		
			$T_{vj} = 175^\circ\text{C}$		1.52		
Peak reverse recovery current	$I_{RM}$	$V_R = 600 \text{ V}, I_F = 200 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2050 \text{ A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$	$T_{vj} = 25^\circ\text{C}$		79.6		A
			$T_{vj} = 125^\circ\text{C}$		105		
			$T_{vj} = 175^\circ\text{C}$		118		
Recovered charge	$Q_r$	$V_R = 600 \text{ V}, I_F = 200 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2050 \text{ A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$	$T_{vj} = 25^\circ\text{C}$		15.7		$\mu\text{C}$
			$T_{vj} = 125^\circ\text{C}$		27.7		
			$T_{vj} = 175^\circ\text{C}$		35.6		

**Table 6** Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Reverse recovery energy	$E_{rec}$	$V_R = 600\text{ V}$ , $I_F = 200\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 2050\text{ A}/\mu\text{s}$ ( $T_{vj} = 175\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	4.85		mJ
			$T_{vj} = 125\text{ °C}$	9.64		
			$T_{vj} = 175\text{ °C}$	12.2		
Thermal resistance, junction to case	$R_{thJC}$	per diode			0.376	K/W
Thermal resistance, case to heatsink	$R_{thCH}$	per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}^*\text{K})$		0.0730		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	°C

Note:  $T_{vj\text{ op}} > 150\text{ °C}$  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	$V_{RRM}$	$T_{vj} = 25\text{ °C}$	1600	V	
Maximum RMS forward current per chip	$I_{FRMSM}$	$T_C = 110\text{ °C}$	150	A	
Maximum RMS current at rectifier output	$I_{RMSM}$	$T_C = 110\text{ °C}$	150	A	
Surge forward current	$I_{FSM}$	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	1800	A
			$T_{vj} = 150\text{ °C}$	1600	
$I^2t$ - value	$I^2t$	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	16200	$\text{A}^2\text{s}$
			$T_{vj} = 150\text{ °C}$	12800	

**Table 8** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 200\text{ A}$ , $T_{vj} = 150\text{ °C}$		1.01		V
Reverse current	$I_r$	$T_{vj} = 150\text{ °C}$ , $V_R = 1600\text{ V}$		1.4		mA
Thermal resistance, junction to case	$R_{thJC}$	per diode			0.278	K/W
Thermal resistance, case to heatsink	$R_{thCH}$	per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}^*\text{K})$		0.0690		K/W

**Table 8** Characteristic values (continued)

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

## 5 IGBT, Brake-Chopper

**Table 9** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	$V_{CES}$	$T_{vj} = 25\text{ °C}$	1200	V
Continuous DC collector current	$I_{CDC}$	$T_{vj\ max} = 175\text{ °C}$ $T_C = 75\text{ °C}$	150	A
Repetitive peak collector current	$I_{CRM}$	$t_p = 1\text{ ms}$	300	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	$V_{CE\ sat}$	$I_C = 150\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	1.55	TBD	V
			$T_{vj} = 125\text{ °C}$	1.69		
			$T_{vj} = 175\text{ °C}$	1.77		
Gate threshold voltage	$V_{GEth}$	$I_C = 3.5\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25\text{ °C}$	5.15	5.80	6.45	V
Gate charge	$Q_G$	$V_{GE} = \pm 15\text{ V}, V_{CE} = 600\text{ V}$		2.5		μC
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\text{ °C}$		1		Ω
Input capacitance	$C_{ies}$	$f = 100\text{ kHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		30.1		nF
Reverse transfer capacitance	$C_{res}$	$f = 100\text{ kHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		0.105		nF
Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}$			0.005	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)	$t_{don}$	$I_C = 150\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 5.6\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.197		μs
			$T_{vj} = 125\text{ °C}$	0.208		
			$T_{vj} = 175\text{ °C}$	0.215		
Rise time (inductive load)	$t_r$	$I_C = 150\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 5.6\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.085		μs
			$T_{vj} = 125\text{ °C}$	0.090		
			$T_{vj} = 175\text{ °C}$	0.093		

**Table 10** Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 150\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 5.6\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$	0.419		$\mu\text{s}$
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.502		
			$T_{vj} = 175\text{ }^\circ\text{C}$	0.521		
Fall time (inductive load)	$t_f$	$I_C = 150\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 5.6\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$	0.113		$\mu\text{s}$
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.208		
			$T_{vj} = 175\text{ }^\circ\text{C}$	0.272		
Turn-on energy loss per pulse	$E_{on}$	$I_C = 150\text{ A}, V_{CE} = 600\text{ V}, L_\sigma = 35\text{ nH}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 5.6\ \Omega, di/dt = 1150\text{ A}/\mu\text{s} (T_{vj} = 175\text{ }^\circ\text{C})$	$T_{vj} = 25\text{ }^\circ\text{C}$	12.2		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	19.1		
			$T_{vj} = 175\text{ }^\circ\text{C}$	23.1		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 150\text{ A}, V_{CE} = 600\text{ V}, L_\sigma = 35\text{ nH}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 5.6\ \Omega, dv/dt = 3100\text{ V}/\mu\text{s} (T_{vj} = 175\text{ }^\circ\text{C})$	$T_{vj} = 25\text{ }^\circ\text{C}$	10.5		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	16.1		
			$T_{vj} = 175\text{ }^\circ\text{C}$	20.1		
SC data	$I_{SC}$	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 8\ \mu\text{s}, T_{vj} = 150\text{ }^\circ\text{C}$	480		A
			$t_p \leq 7\ \mu\text{s}, T_{vj} = 175\text{ }^\circ\text{C}$	450		
Thermal resistance, junction to case	$R_{thJC}$	per IGBT			0.290	K/W
Thermal resistance, case to heatsink	$R_{thCH}$	per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m}^2\text{K})$		0.0700		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, Brake-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	$I_F$		75	A
Repetitive peak forward current	$I_{FRM}$	$t_p = 1\text{ ms}$	150	A



**Table 11** Maximum rated values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
I <sup>2</sup> t - value	I <sup>2</sup> t	t <sub>p</sub> = 10 ms, V <sub>R</sub> = 0 V	T <sub>vj</sub> = 125 °C	450		A <sup>2</sup> s
			T <sub>vj</sub> = 175 °C	370		

**Table 12** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 75 A, V <sub>GE</sub> = 0 V	T <sub>vj</sub> = 25 °C	1.72	TBD	V
			T <sub>vj</sub> = 125 °C	1.59		
			T <sub>vj</sub> = 175 °C	1.52		
Peak reverse recovery current	I <sub>RM</sub>	V <sub>R</sub> = 600 V, I <sub>F</sub> = 75 A, V <sub>GE</sub> = -15 V, -di <sub>F</sub> /dt = 1050 A/μs (T <sub>vj</sub> = 175 °C)	T <sub>vj</sub> = 25 °C	38.2		A
			T <sub>vj</sub> = 125 °C	50.9		
			T <sub>vj</sub> = 175 °C	58.9		
Recovered charge	Q <sub>r</sub>	V <sub>R</sub> = 600 V, I <sub>F</sub> = 75 A, V <sub>GE</sub> = -15 V, -di <sub>F</sub> /dt = 1050 A/μs (T <sub>vj</sub> = 175 °C)	T <sub>vj</sub> = 25 °C	5.43		μC
			T <sub>vj</sub> = 125 °C	10.4		
			T <sub>vj</sub> = 175 °C	14.1		
Reverse recovery energy	E <sub>rec</sub>	V <sub>R</sub> = 600 V, I <sub>F</sub> = 75 A, V <sub>GE</sub> = -15 V, -di <sub>F</sub> /dt = 1050 A/μs (T <sub>vj</sub> = 175 °C)	T <sub>vj</sub> = 25 °C	10		mJ
			T <sub>vj</sub> = 125 °C	10		
			T <sub>vj</sub> = 175 °C	10		
Thermal resistance, junction to case	R <sub>thJC</sub>	per diode			0.728	K/W
Thermal resistance, case to heatsink	R <sub>thCH</sub>	per diode, λ <sub>grease</sub> = 1 W/(m*K)		0.0870		K/W
Temperature under switching conditions	T <sub>vj op</sub>		-40		175	°C

Note: T<sub>vj op</sub> > 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 <sub>25</sub>	T <sub>NTC</sub> = 25 °C		5		kΩ
Deviation of R <sub>100</sub>	ΔR/R	T <sub>NTC</sub> = 100 °C, R <sub>100</sub> = 493 Ω	-5		5	%
Power dissipation	P <sub>25</sub>	T <sub>NTC</sub> = 25 °C			20	mW

**Table 13**                    **Characteristic values (continued)**

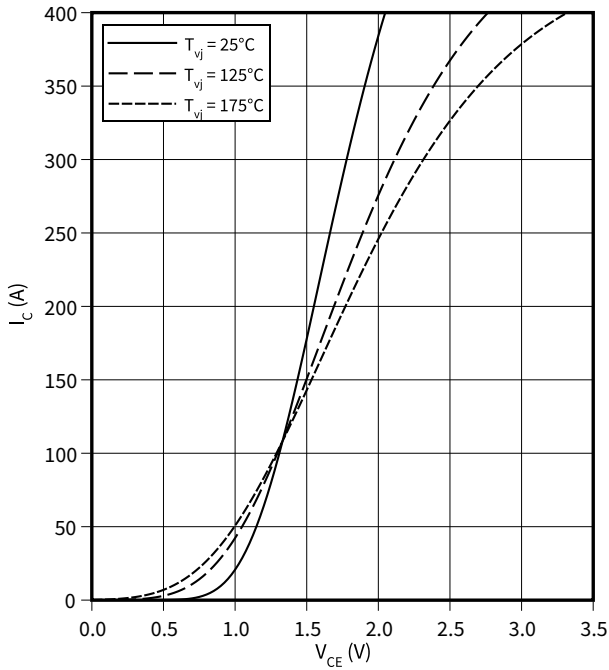
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2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

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

## 8 Characteristics diagrams

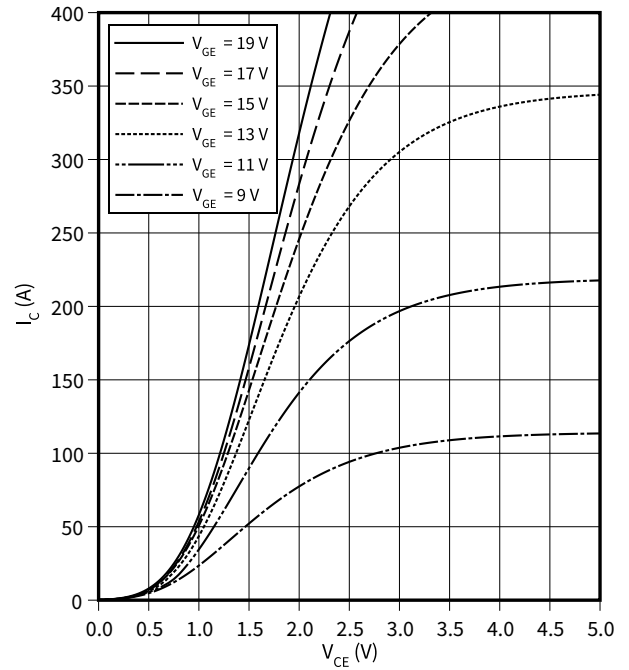
**output characteristic (typical), IGBT, Inverter**

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



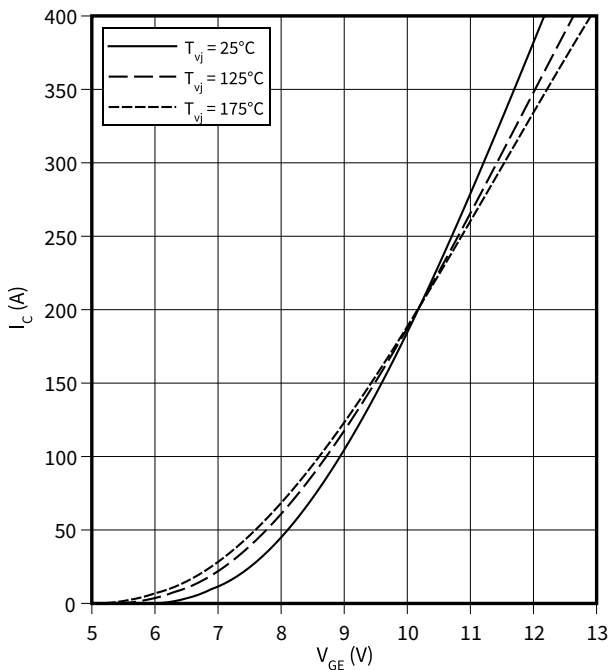
**output characteristic (typical), IGBT, Inverter**

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



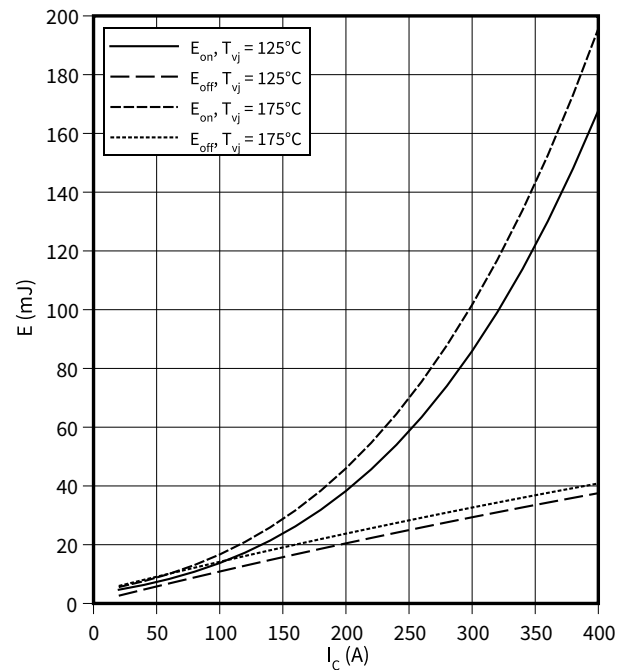
**transfer characteristic (typical), IGBT, Inverter**

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



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

$E = f(I_C)$   
 $R_{Goff} = 2.7 \text{ } \Omega$ ,  $R_{Gon} = 2.7 \text{ } \Omega$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$

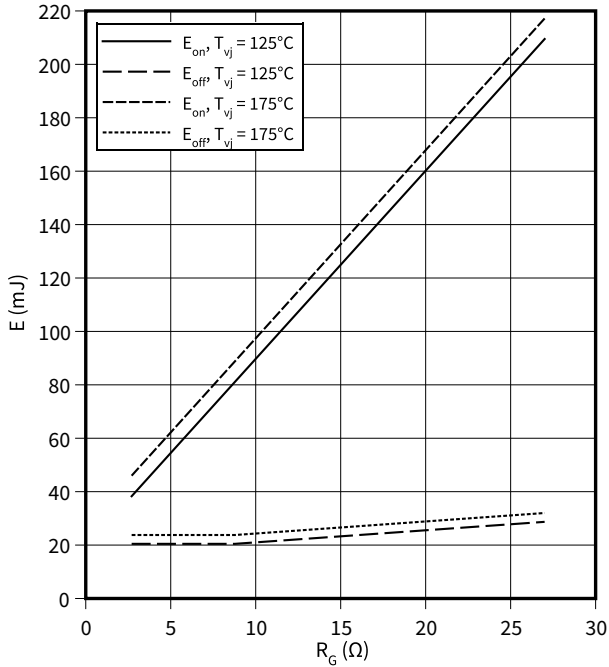


**8 Characteristics diagrams**

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

$E = f(R_G)$

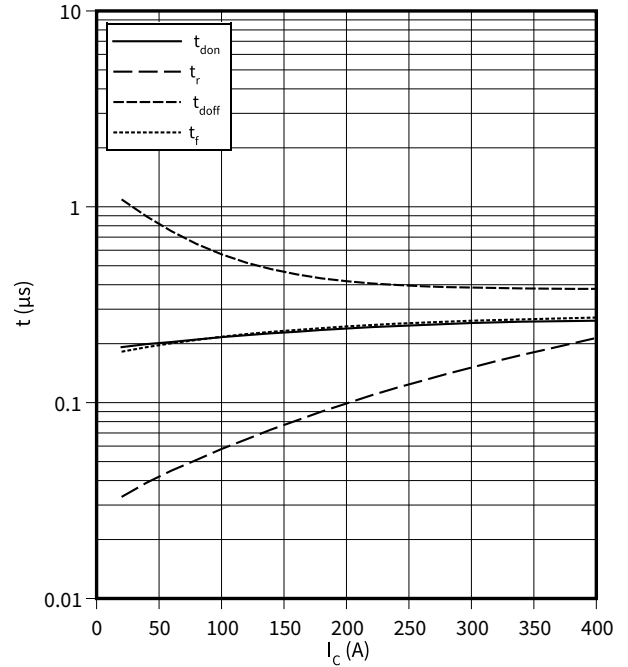
$I_C = 200 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$



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

$t = f(I_C)$

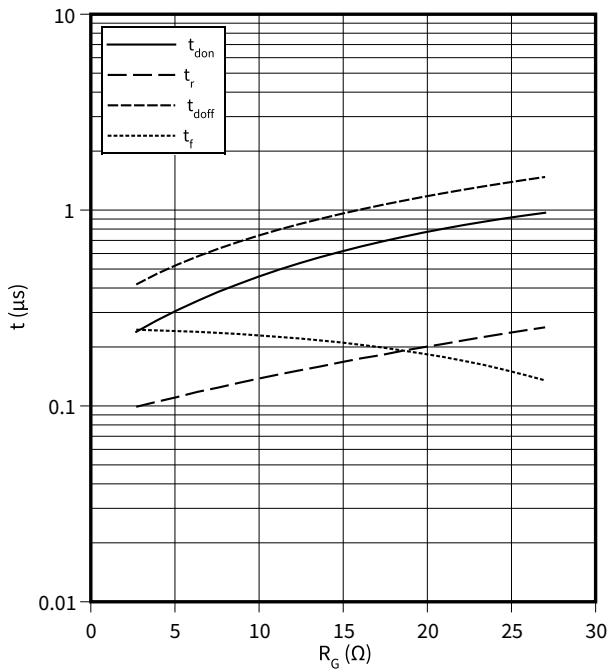
$R_{Goff} = 2.7 \Omega$ ,  $R_{Gon} = 2.7 \Omega$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 175 \text{ °C}$



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

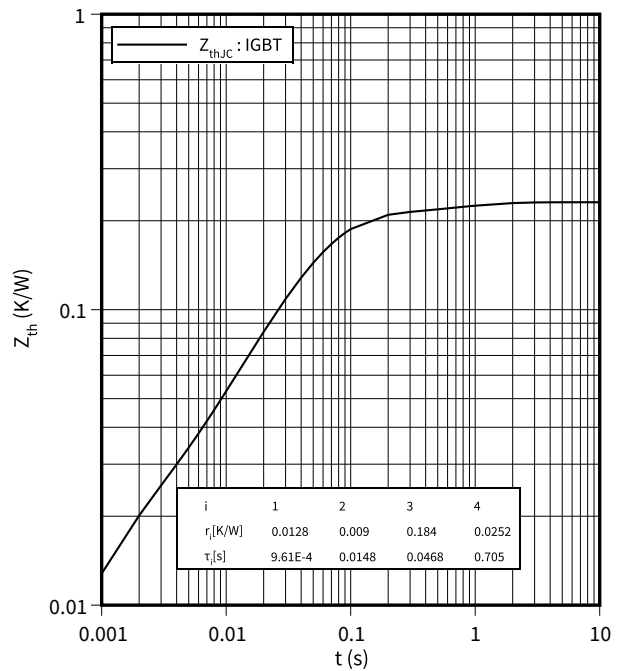
$t = f(R_G)$

$I_C = 200 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 175 \text{ °C}$



**transient thermal impedance, IGBT, Inverter**

$Z_{th} = f(t)$

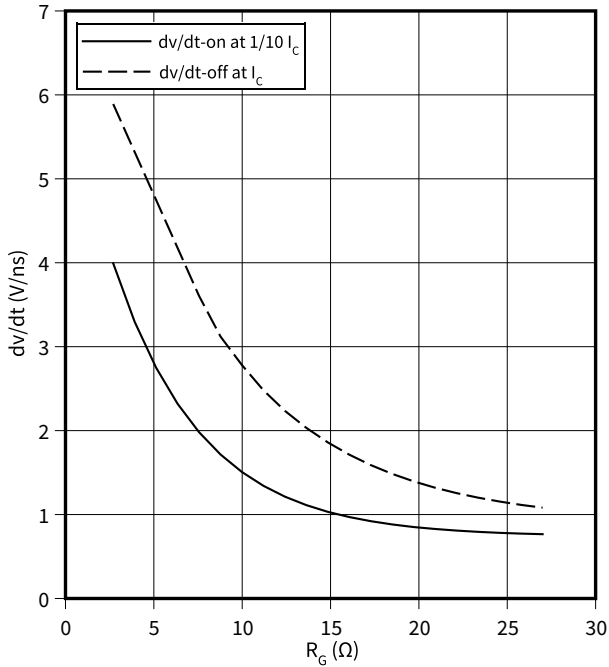


8 Characteristics diagrams

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

$dv/dt = f(R_G)$

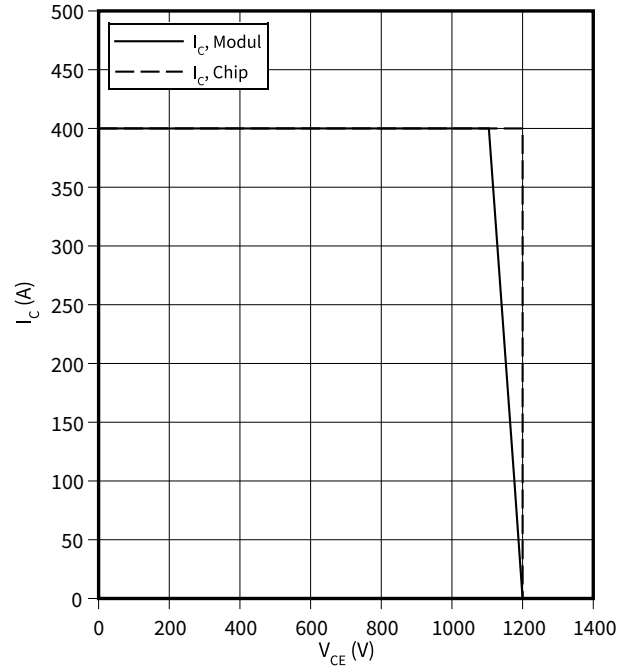
$I_C = 200 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 25 \text{ }^\circ\text{C}$



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

$I_C = f(V_{CE})$

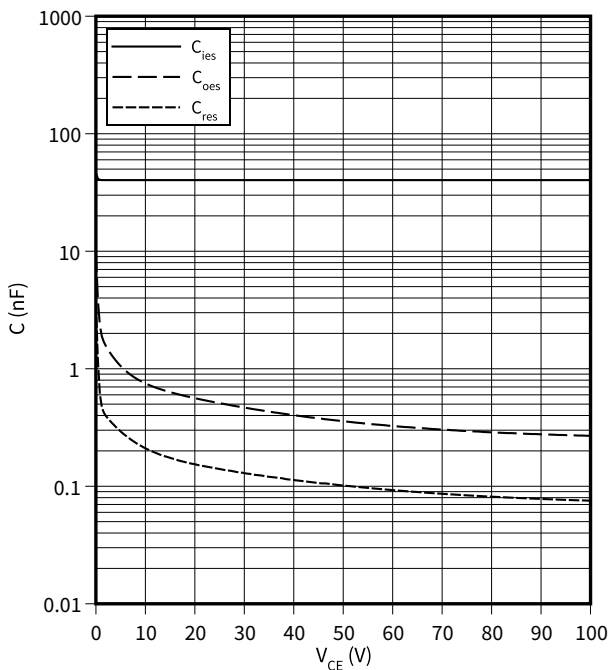
$R_{Goff} = 2.7 \text{ } \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 175 \text{ }^\circ\text{C}$



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

$C = f(V_{CE})$

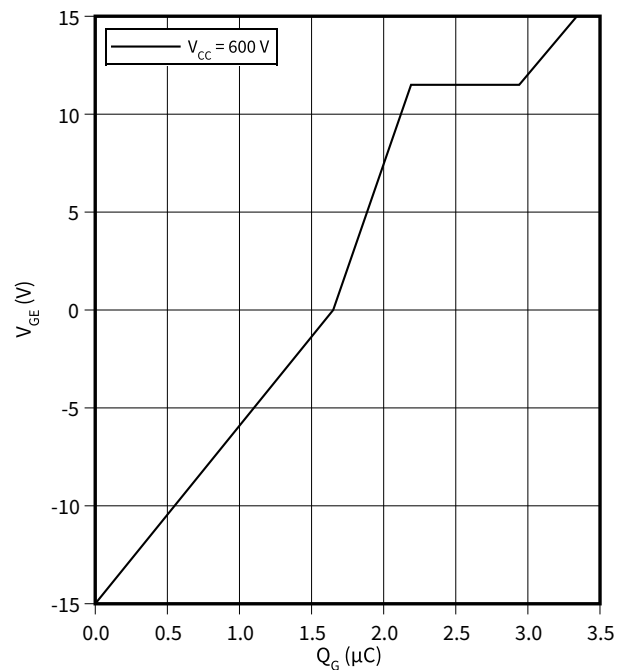
$f = 100 \text{ kHz}$ ,  $V_{GE} = 0 \text{ V}$ ,  $T_{vj} = 25 \text{ }^\circ\text{C}$



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

$V_{GE} = f(Q_G)$

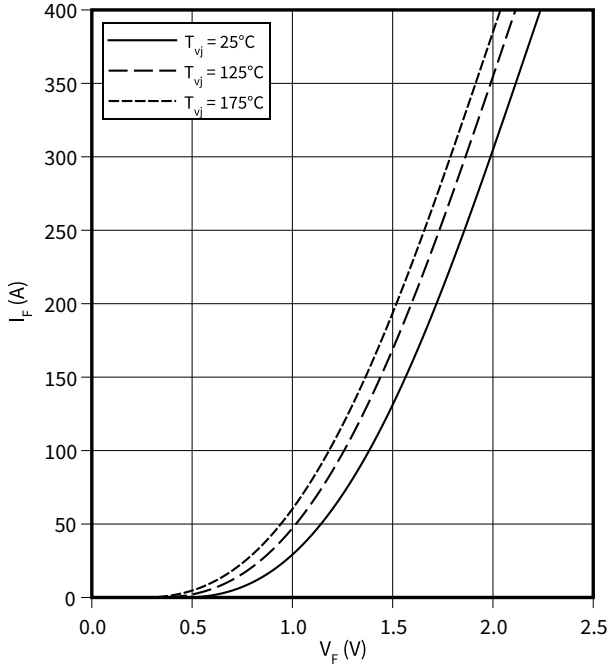
$I_C = 200 \text{ A}$ ,  $T_{vj} = 25 \text{ }^\circ\text{C}$



8 Characteristics diagrams

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

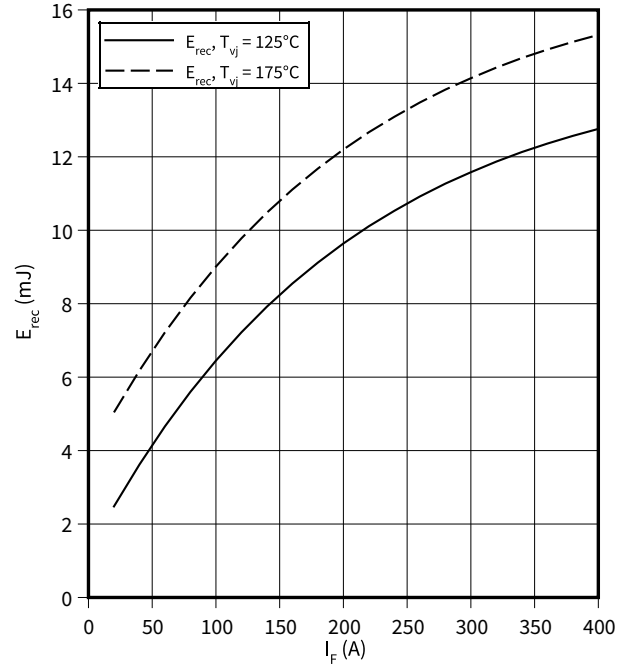
$I_F = f(V_F)$



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

$E_{rec} = f(I_F)$

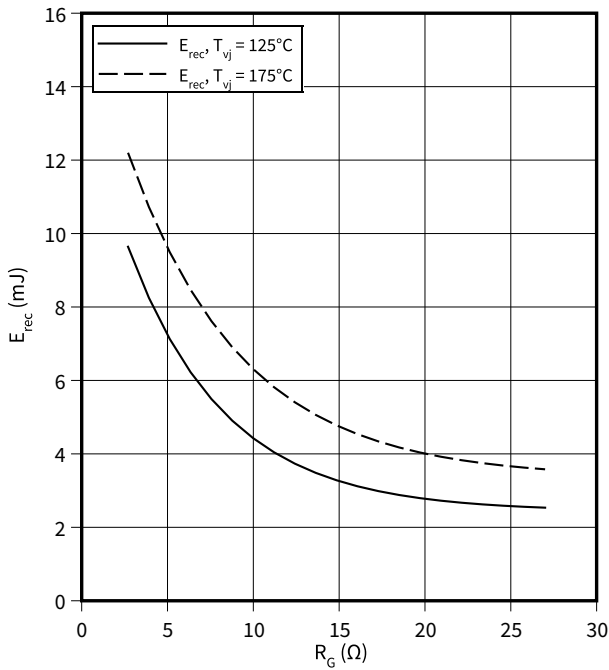
$R_{Gon} = 2.7 \Omega, V_{CE} = 600 V$



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

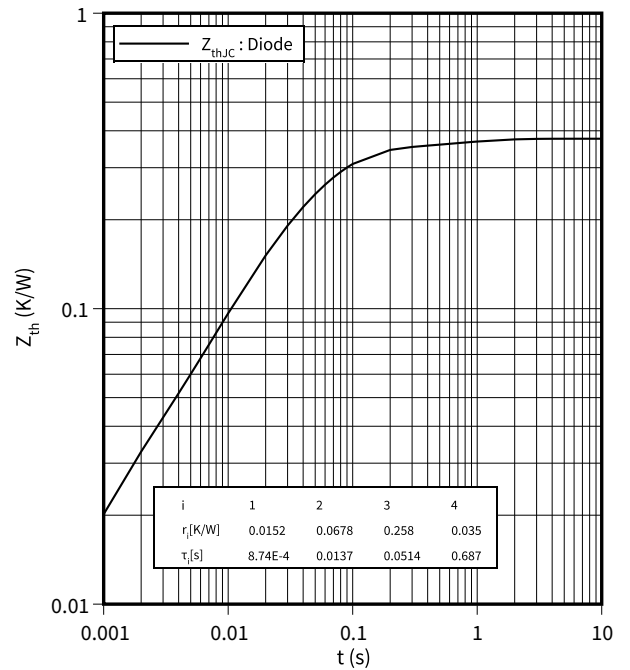
$E_{rec} = f(R_G)$

$V_{CE} = 600 V, I_F = 200 A$



**transient thermal impedance, Diode, Inverter**

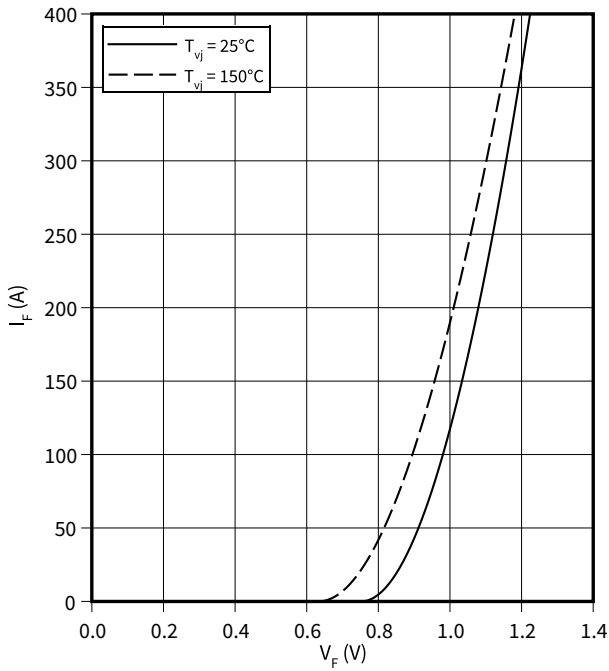
$Z_{th} = f(t)$



8 Characteristics diagrams

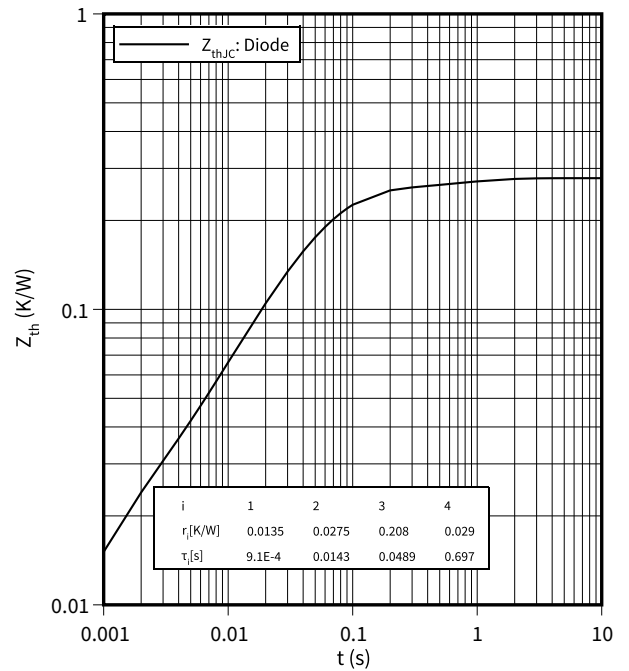
**forward characteristic (typical), Diode, Rectifier**

$I_F = f(V_F)$



**transient thermal impedance, Diode, Rectifier**

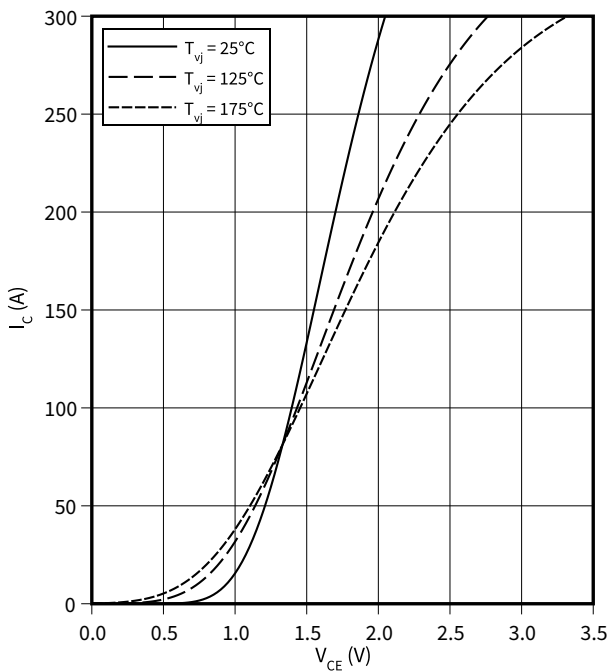
$Z_{th} = f(t)$



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

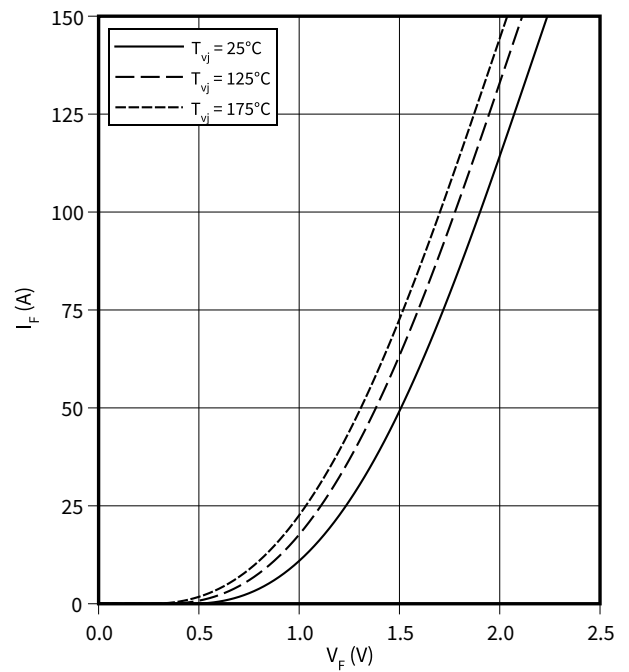
$I_C = f(V_{CE})$

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



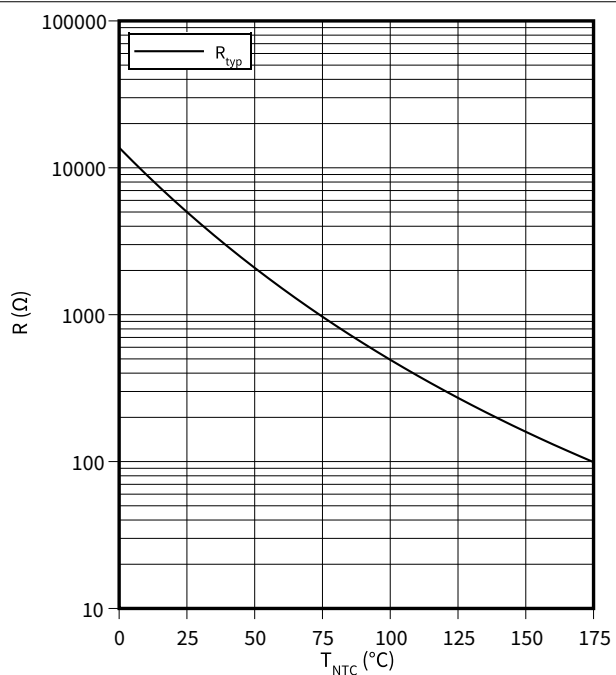
**forward characteristic (typical), Diode, Brake-Chopper**

$I_F = f(V_F)$



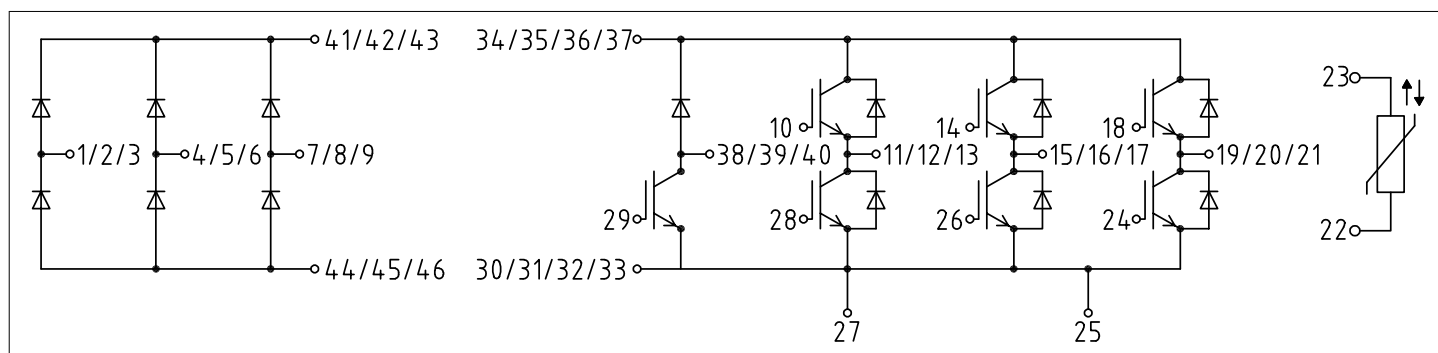
temperature characteristic (typical), NTC-Thermistor

$$R = f(T_{NTC})$$





## 9 Circuit diagram



**Figure 2**

10 Package outlines

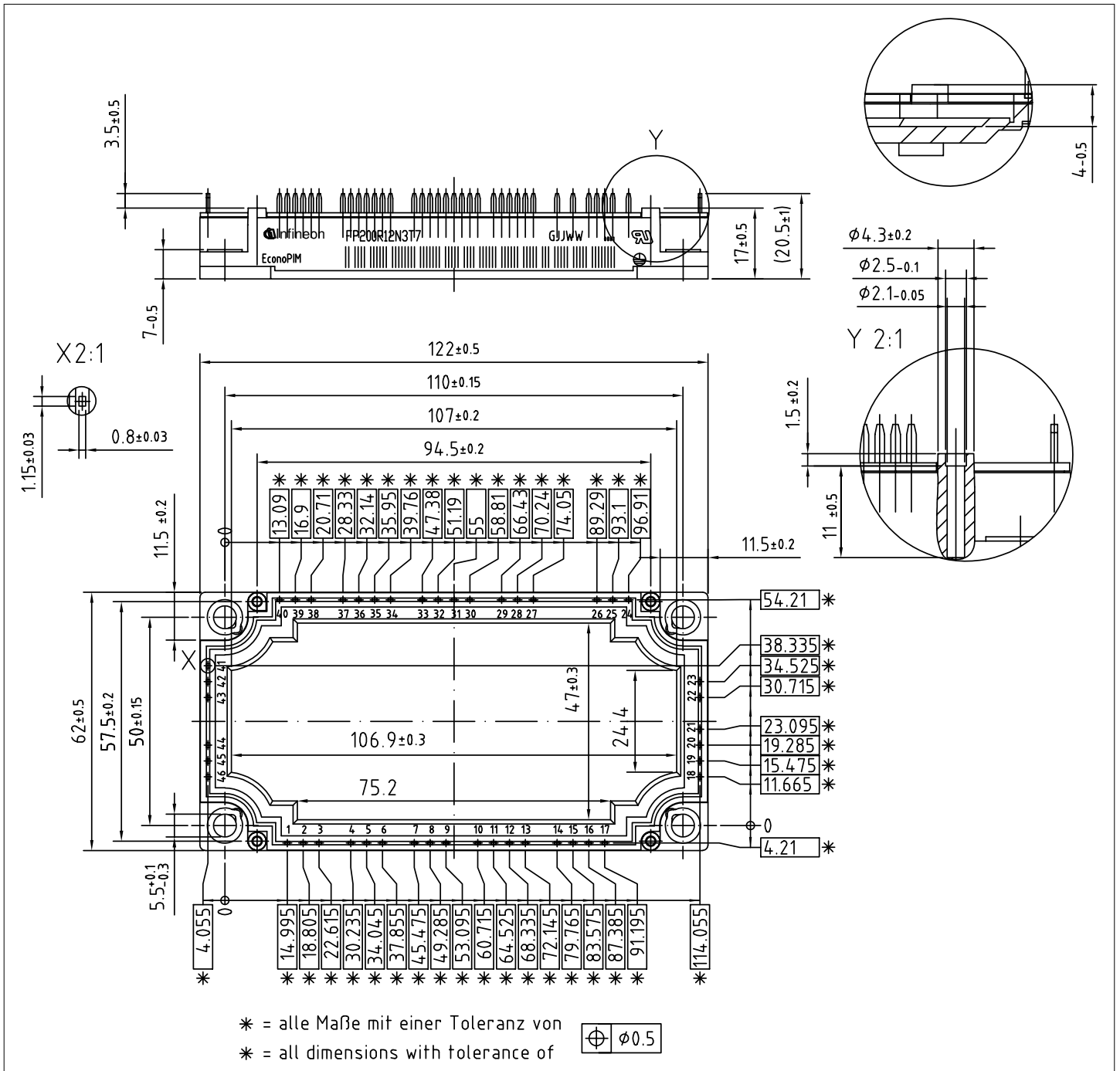




Figure 3

## 11 Module label code

Module label code			
Code format	Data Matrix	Barcode Code128	
Encoding	ASCII text	Code Set A	
Symbol size	16x16	23 digits	
Standard	IEC24720 and IEC16022	IEC8859-1	
Code content	Content	Digit	Example
	Module serial number	1 - 5	71549
	Module material number	6 - 11	142846
	Production order number	12 - 19	55054991
	Date code (production year)	20 - 21	15
	Date code (production week)	22 - 23	30
Example	 		
	71549142846550549911530		71549142846550549911530

**Figure 4**

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