

Preliminary

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

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{nom}} = 150\text{ A} / I_{CRM} = 300\text{ A}$
 - TRENCHSTOP™ IGBT7
 - Overload operation up to 175°C
 - Low V_{CEsat}
- Mechanical features
 - Integrated NTC temperature sensor
 - Solder contact technology
 - Copper base plate
 - Al_2O_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

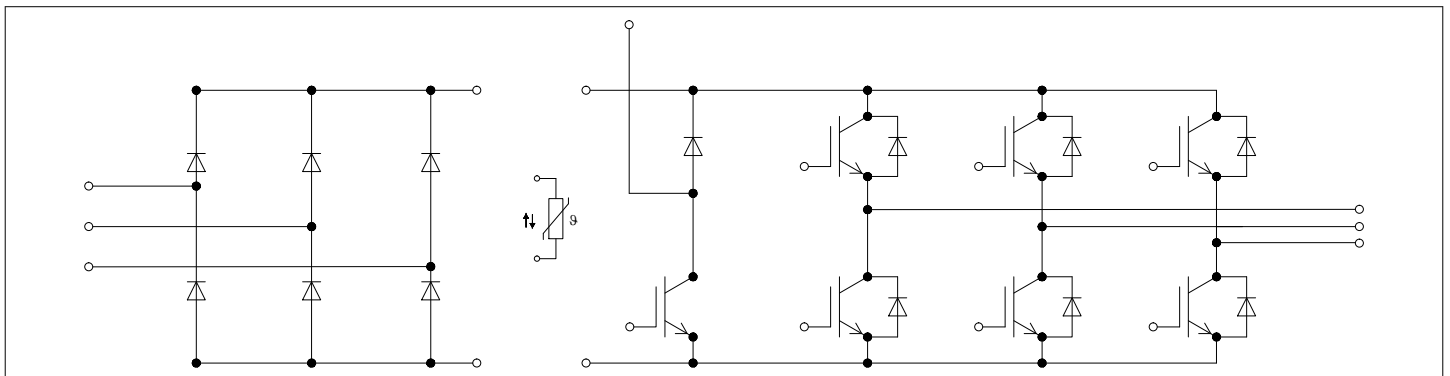


Table of contents

	Description	1
	Features	1
	Potential applications	1
	Product validation	1
	Table of contents	2
1	Package	3
2	IGBT, Inverter	3
3	Diode, Inverter	5
4	Diode, Rectifier	7
5	IGBT, Brake-Chopper	7
6	Diode, Brake-Chopper	9
7	NTC-Thermistor	11
8	Characteristics diagrams	12
9	Circuit diagram	18
10	Package outlines	19
11	Module label code	20
	Disclaimer	21

1 Package

Table 1 Insulation Coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50$ Hz, $t = 1$ min	2.5	kV
Material of module baseplate			Cu	
Internal Isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	10.0	mm
Clearance	d_{Clear}	terminal to heatsink	7.5	mm
Comparative tracking index	CTI		> 200	
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	$R_{AA'+CC'}$	$T_C = 25^\circ C$, per switch		1.1		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C = 25^\circ C$, per switch		1.6		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for modul mounting	M	- Mounting according to valid application note	3		6	Nm
Weight	G			300		g

2 IGBT, Inverter

Table 3 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25^\circ C$	1200	V
Continous DC collector current	I_{CDC}	$T_{vj\ max} = 175^\circ C$ $T_C = 80^\circ C$	150	A
Repetitive peak collector current	I_{CRM}	$t_p = 1$ ms	300	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	$V_{CE\ sat}$	$I_C = 150\ A,$ $V_{GE} = 15\ V$		$T_{vj} = 25\ ^\circ C$	1.55	TBD	V
				$T_{vj} = 125\ ^\circ C$	1.69		
				$T_{vj} = 175\ ^\circ C$	1.77		
Gate threshold voltage	V_{GEth}	$I_C = 3.5\ mA,$ $V_{CE} = V_{GE},$ $T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V	
Gate charge	Q_G	$V_{GE} = \pm 15\ V,$ $V_{CE} = 600\ V$		2.5		μC	
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		1		Ω	
Input capacitance	C_{ies}	$f = 100\ kHz,$ $T_{vj} = 25\ ^\circ C,$ $V_{CE} = 25\ V,$ $V_{GE} = 0\ V$		30.1		nF	
Reverse transfer capacitance	C_{res}	$f = 100\ kHz,$ $T_{vj} = 25\ ^\circ C,$ $V_{CE} = 25\ V,$ $V_{GE} = 0\ V$		0.105		nF	
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\ V,$ $V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		0.012	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}	$I_C = 150\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 3.3\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.172		μs
				$T_{vj} = 125\ ^\circ C$	0.183		
				$T_{vj} = 175\ ^\circ C$	0.189		
Rise time (inductive load)	t_r	$I_C = 150\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 3.3\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.072		μs
				$T_{vj} = 125\ ^\circ C$	0.077		
				$T_{vj} = 175\ ^\circ C$	0.080		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 150\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Goff} = 3.3\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.331		μs
				$T_{vj} = 125\ ^\circ C$	0.414		
				$T_{vj} = 175\ ^\circ C$	0.433		

Table 4 Characteristic Values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Fall time (inductive load)	t_f	$I_C = 150\text{ A},$ $V_{CE} = 600\text{ V},$ $V_{GE} = \pm 15\text{ V},$ $R_{Goff} = 3.3\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		0.103	μs
					0.198	
					0.262	
Turn-on energy loss per pulse	E_{on}	$I_C = 150\text{ A},$ $V_{CE} = 600\text{ V},$ $L_\sigma = 35\text{ nH},$ $V_{GE} = \pm 15\text{ V},$ $R_{Gon} = 3.3\ \Omega,$ $di/dt = 1700\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		16.6	mJ
					24.9	
					29.6	
Turn-off energy loss per pulse	E_{off}	$I_C = 150\text{ A},$ $V_{CE} = 600\text{ V},$ $L_\sigma = 35\text{ nH},$ $V_{GE} = \pm 15\text{ V},$ $R_{Goff} = 3.3\ \Omega,$ $dv/dt = 3200\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		10.4	mJ
					15.9	
					19.9	
SC data	I_{SC}	$V_{GE} \leq 15\text{ V},$ $V_{CC} = 800\text{ V},$ $V_{CEmax} = V_{CES} - L_{sCE} * di/dt$	$t_p \leq 8\ \mu\text{s},$ $T_{vj} = 150\text{ }^\circ\text{C}$ $t_p \leq 7\ \mu\text{s},$ $T_{vj} = 175\text{ }^\circ\text{C}$		520	A
					490	
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.290	K/W
Thermal resistance, case to heatsink	R_{thCH}	per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m}^*\text{K})$			0.0680	K/W
Temperature under switching conditions	$T_{vj\ op}$			-40	175	$^\circ\text{C}$

Note: $T_{vj\ op} > 150\text{ }^\circ\text{C}$ 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

Table 5 Maximum Rated Values (continued)

Parameter	Symbol	Note or test condition	Values	Unit	
Continuous DC forward current	I_F		150	A	
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	300	A	
I^2t - value	I^2t	$t_P = 10 \text{ ms},$ $V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	2700	A ² s
			$T_{vj} = 175 \text{ °C}$	2250	

Table 6 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 150 \text{ A},$ $V_{GE} = 0 \text{ V}$		$T_{vj} = 25 \text{ °C}$	1.72	TBD	V
				$T_{vj} = 125 \text{ °C}$	1.59		
				$T_{vj} = 175 \text{ °C}$	1.52		
Peak reverse recovery current	I_{RM}	$V_R = 600 \text{ V},$ $I_F = 150 \text{ A},$ $V_{GE} = -15 \text{ V},$ $-di_F/dt = 1700 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$	65.3		A
				$T_{vj} = 125 \text{ °C}$	91.8		
				$T_{vj} = 175 \text{ °C}$	107		
Recovered charge	Q_r	$V_R = 600 \text{ V},$ $I_F = 150 \text{ A},$ $V_{GE} = -15 \text{ V},$ $-di_F/dt = 1700 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$	10.3		μC
				$T_{vj} = 125 \text{ °C}$	21.7		
				$T_{vj} = 175 \text{ °C}$	28.6		
Reverse recovery energy	E_{rec}	$V_R = 600 \text{ V},$ $I_F = 150 \text{ A},$ $V_{GE} = -15 \text{ V},$ $-di_F/dt = 1700 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$	3.27		mJ
				$T_{vj} = 125 \text{ °C}$	7.32		
				$T_{vj} = 175 \text{ °C}$	9.88		
Thermal resistance, junction to case	R_{thJC}	per diode			0.463		K/W
Thermal resistance, case to heatsink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m} \cdot \text{K})$			0.0698		K/W
Temperature under switching conditions	$T_{vj op}$			-40		175	°C

Note: $T_{vj op} > 150 \text{ °C}$ 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}	$T_C = 100\text{ °C}$	150	A	
Maximum RMS current at rectifier output	I_{RMSM}	$T_C = 100\text{ °C}$	150	A	
Surge forward current	I_{FSM}	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	1600	A
			$T_{vj} = 150\text{ °C}$	1400	
I^2t - value	I^2t	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	12800	A ² s
			$T_{vj} = 150\text{ °C}$	9800	

Table 8 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 150\text{ A}$ $T_{vj} = 150\text{ °C}$		0.97		V
Reverse current	I_r	$T_{vj} = 150\text{ °C}$, $V_R = 1600\text{ V}$		1		mA
Thermal resistance, junction to case	R_{thJC}	per diode			0.333	K/W
Thermal resistance, case to heatsink	R_{thCH}	per diode, $\lambda_{grease} = 1\text{ W/(m}^2\text{K)}$		0.0670		K/W
Temperature under switching conditions	$T_{vj, op}$		-40		150	°C

5 IGBT, Brake-Chopper

Table 9 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25\text{ °C}$	1200	V
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 175\text{ °C}$ $T_C = 90\text{ °C}$	100	A
Repetitive peak collector current	I_{CRM}	$t_p = 1\text{ ms}$	200	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	$V_{CE\ sat}$	$I_C = 100\ A,$ $V_{GE} = 15\ V$		$T_{vj} = 25\ ^\circ C$	1.50	TBD	V
				$T_{vj} = 125\ ^\circ C$	1.64		
				$T_{vj} = 175\ ^\circ C$	1.72		
Gate threshold voltage	V_{GEth}	$I_C = 2.5\ mA,$ $V_{CE} = V_{GE},$ $T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V	
Gate charge	Q_G	$V_{GE} = \pm 15\ V,$ $V_{CE} = 600\ V$		1.8		μC	
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		1.5		Ω	
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}	$V_{CE} = 1200\ V,$ $V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		0.01	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}	$I_C = 100\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 4.3\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.169		μs
				$T_{vj} = 125\ ^\circ C$	0.180		
				$T_{vj} = 175\ ^\circ C$	0.187		
Rise time (inductive load)	t_r	$I_C = 100\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 4.3\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.063		μs
				$T_{vj} = 125\ ^\circ C$	0.067		
				$T_{vj} = 175\ ^\circ C$	0.070		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 100\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Goff} = 4.3\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.310		μs
				$T_{vj} = 125\ ^\circ C$	0.390		
				$T_{vj} = 175\ ^\circ C$	0.410		

Table 10 Characteristic Values (continued)

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Fall time (inductive load)	t_f	$I_C = 100\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		0.110		μs
					0.190		
					0.250		
Turn-on energy loss per pulse	E_{on}	$I_C = 100\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\ \Omega$, $di/dt = 1100\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		7.12		mJ
					11.7		
					14.5		
Turn-off energy loss per pulse	E_{off}	$I_C = 100\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\ \Omega$, $dv/dt = 2800\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		6.93		mJ
					10.6		
					13.3		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} * di/dt$	$t_p \leq 8\ \mu\text{s}$, $T_{vj} = 150\text{ }^\circ\text{C}$ $t_p \leq 7\ \mu\text{s}$, $T_{vj} = 175\text{ }^\circ\text{C}$		370		A
					350		
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.373		K/W
Thermal resistance, case to heatsink	R_{thCH}	per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m}^*\text{K})$			0.0680		K/W
Temperature under switching conditions	$T_{vj\ op}$			-40		175	$^\circ\text{C}$

Note: $T_{vj\ op} > 150\text{ }^\circ\text{C}$ 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

Table 11 Maximum Rated Values (continued)

Parameter	Symbol	Note or test condition	Values	Unit	
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	$t_P = 10 \text{ ms},$ $V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	220	A ² s
			$T_{vj} = 175 \text{ °C}$	200	

Table 12 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 50 \text{ A},$ $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		1.72	TBD	V
					1.59		
					1.52		
Peak reverse recovery current	I_{RM}	$V_R = 600 \text{ V},$ $I_F = 50 \text{ A},$ $V_{GE} = -15 \text{ V},$ $-di_F/dt = 550 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		37.3		A
					44.3		
					49.6		
Recovered charge	Q_r	$V_R = 600 \text{ V},$ $I_F = 50 \text{ A},$ $V_{GE} = -15 \text{ V},$ $-di_F/dt = 550 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		3.86		μC
					7.05		
					10.1		
Reverse recovery energy	E_{rec}	$V_R = 600 \text{ V},$ $I_F = 50 \text{ A},$ $V_{GE} = -15 \text{ V},$ $-di_F/dt = 550 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		1.13		mJ
					2.34		
					3.23		
Thermal resistance, junction to case	R_{thJC}	per diode			0.909	K/W	
Thermal resistance, case to heatsink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m} \cdot \text{K})$			0.109	K/W	
Temperature under switching conditions	$T_{vj op}$		-40		175	°C	

Note: $T_{vj op} > 150 \text{ °C}$ 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}	$T_{NTC} = 25\text{ °C}$		5		kΩ
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100\text{ °C}$, $R_{100} = 493\ \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25\text{ °C}$			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

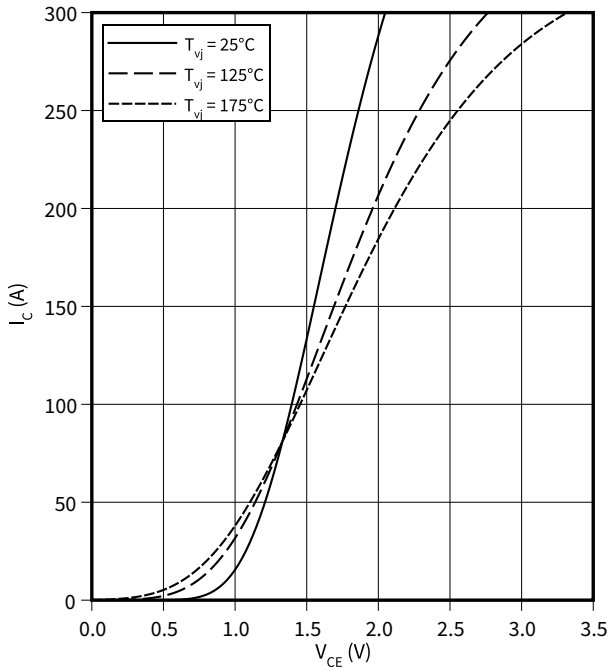
Note: Specification according to the valid application note.

8 Characteristics diagrams

output characteristic (typical), IGBT, Inverter

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

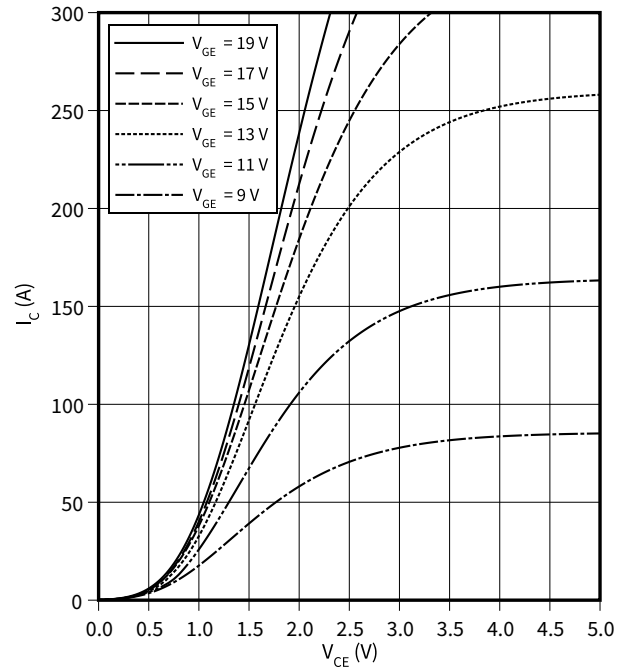
$$V_{GE} = 15 \text{ V}$$



output characteristic (typical), IGBT, Inverter

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

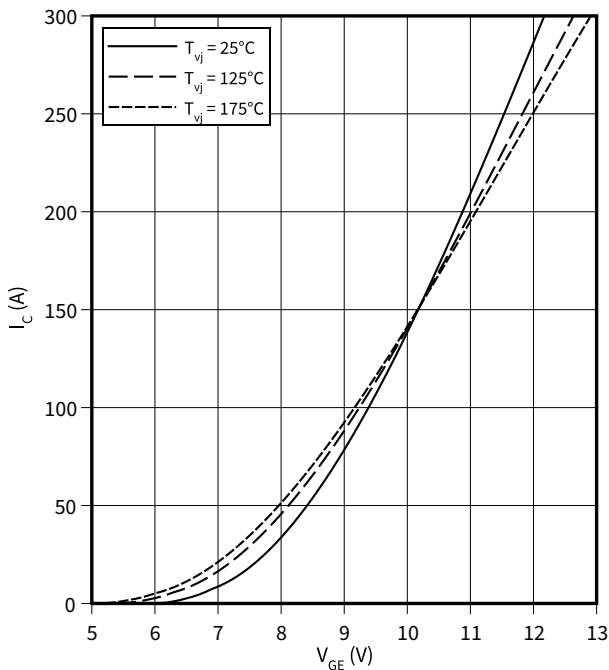
$$T_{vj} = 175 \text{ °C}$$



transfer characteristic (typical), IGBT, Inverter

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

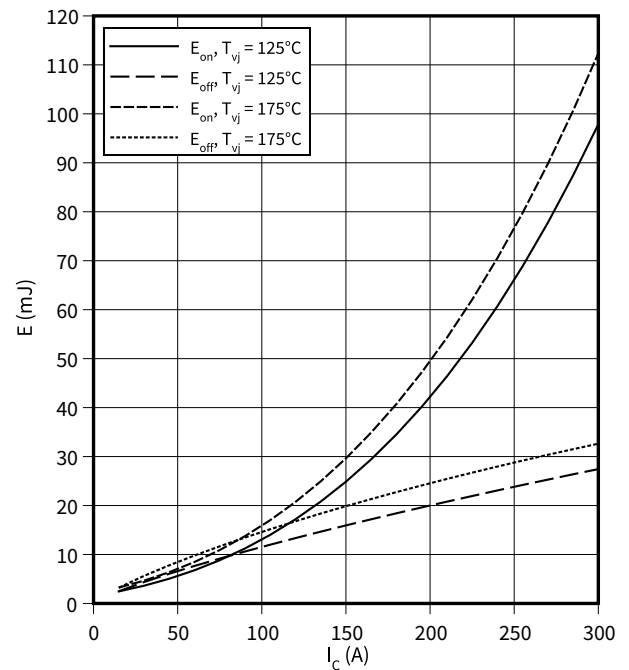
$$V_{CE} = 20 \text{ V}$$



switching losses (typical), IGBT, Inverter

$$E = f(I_C)$$

$$R_{Goff} = 3.3 \text{ } \Omega, R_{Gon} = 3.3 \text{ } \Omega, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}$$

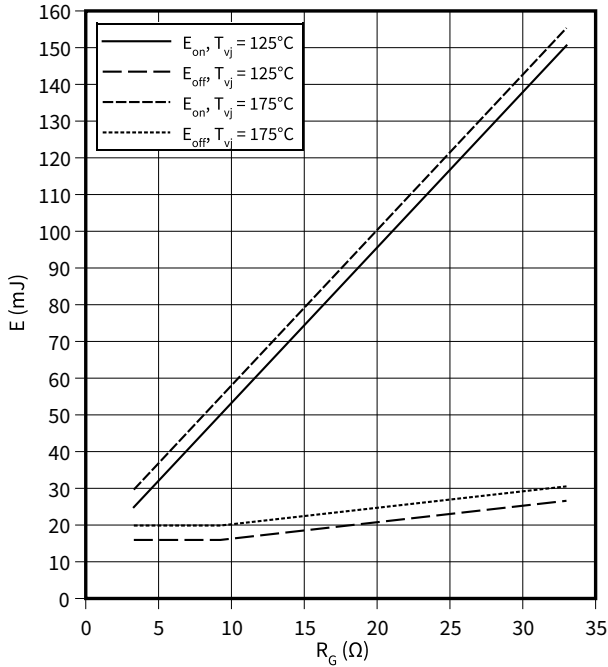


8 Characteristics diagrams

switching losses (typical), IGBT, Inverter

$E = f(R_G)$

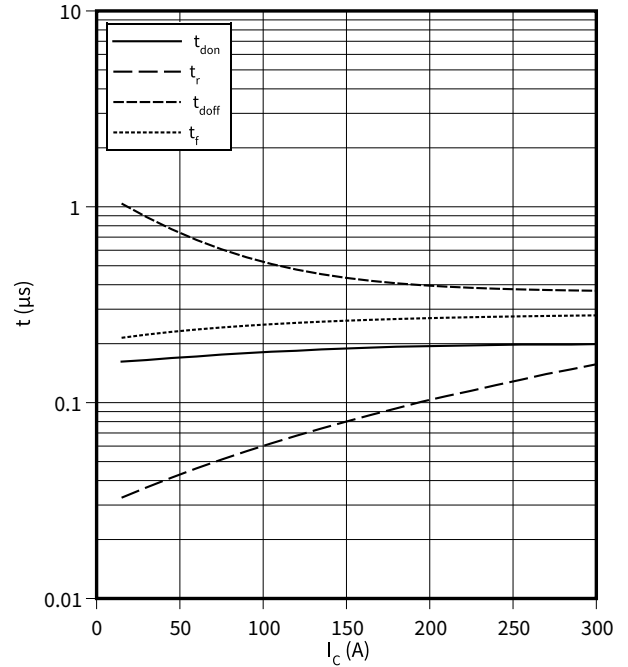
$I_C = 150 \text{ A}, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}$



switching times (typical), IGBT, Inverter

$t = f(I_C)$

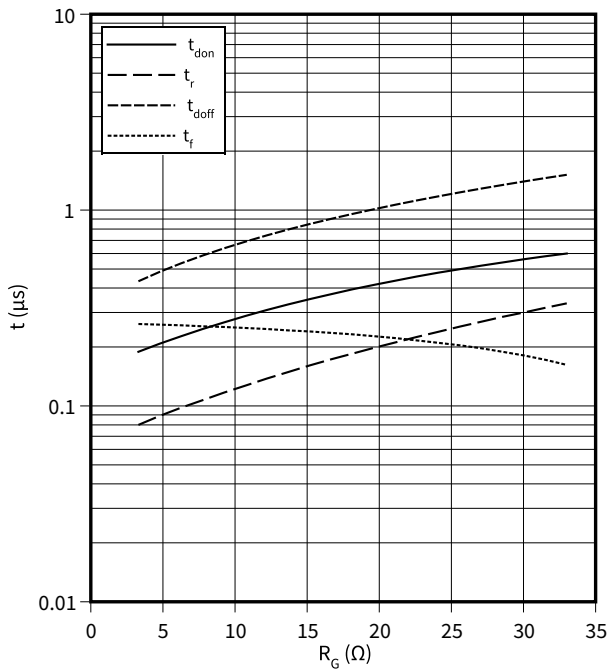
$R_{Goff} = 3.3 \Omega, R_{Gon} = 3.3 \Omega, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}$



switching times (typical), IGBT, Inverter

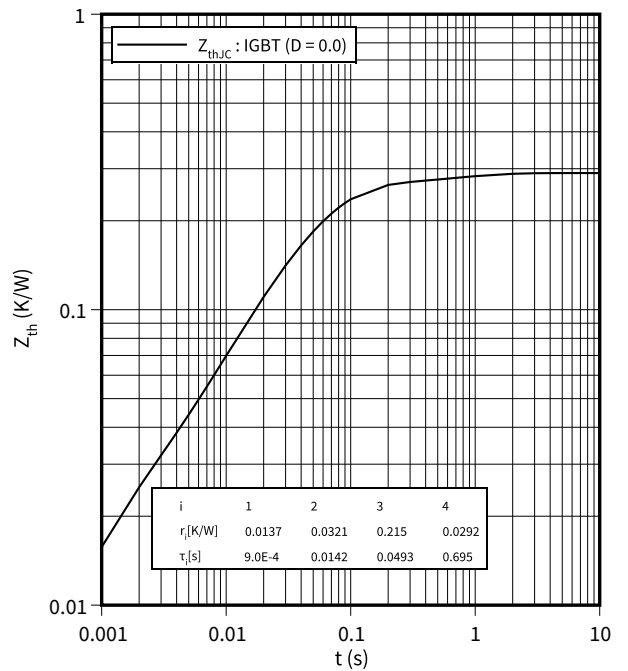
$t = f(R_G)$

$I_C = 150 \text{ A}, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}$



transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$

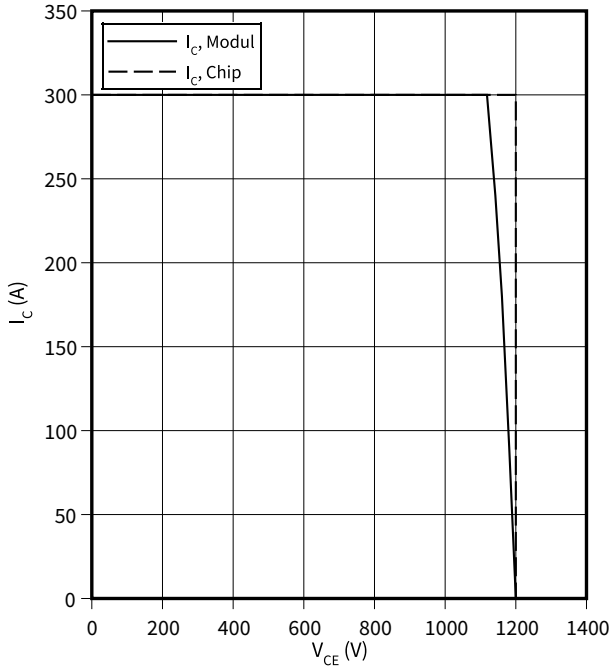


8 Characteristics diagrams

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

$I_C = f(V_{CE})$

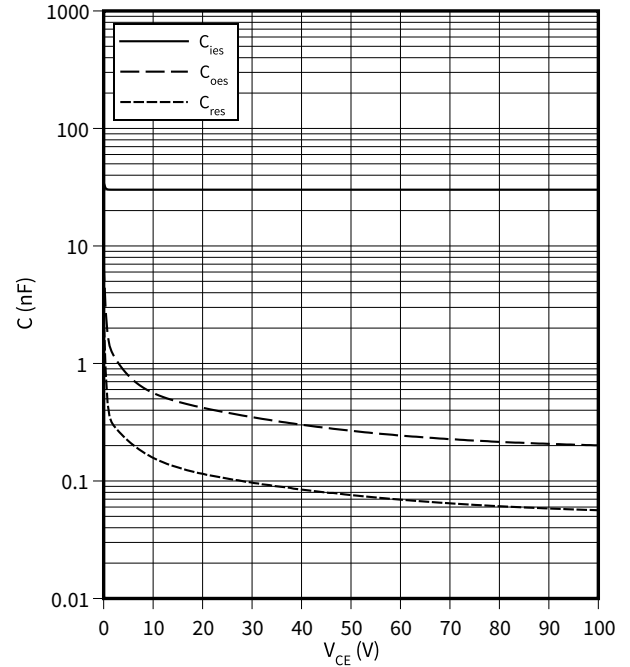
$R_{Goff} = 3.3 \Omega$, $V_{GE} = 15 \text{ V}$, $T_{vj} = 175 \text{ }^\circ\text{C}$



capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

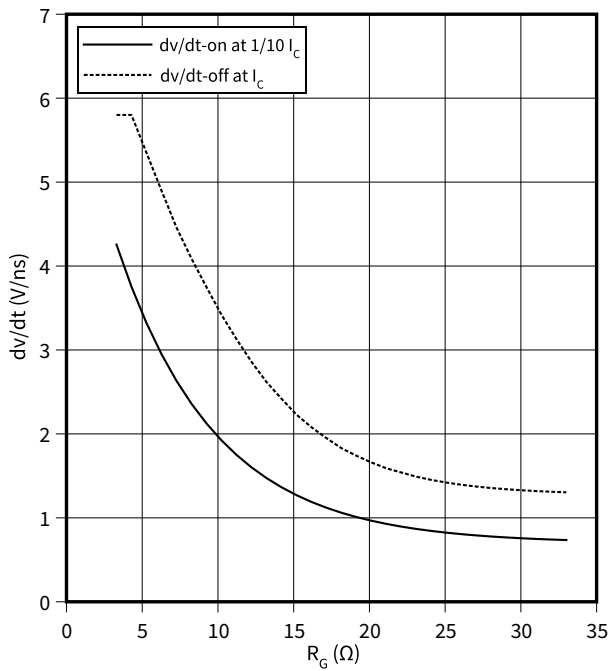
$f = 100 \text{ kHz}$, $V_{GE} = 0 \text{ V}$, $T_{vj} = 25 \text{ }^\circ\text{C}$



Voltage slope (typical), IGBT, Inverter

$dv/dt = f(R_G)$

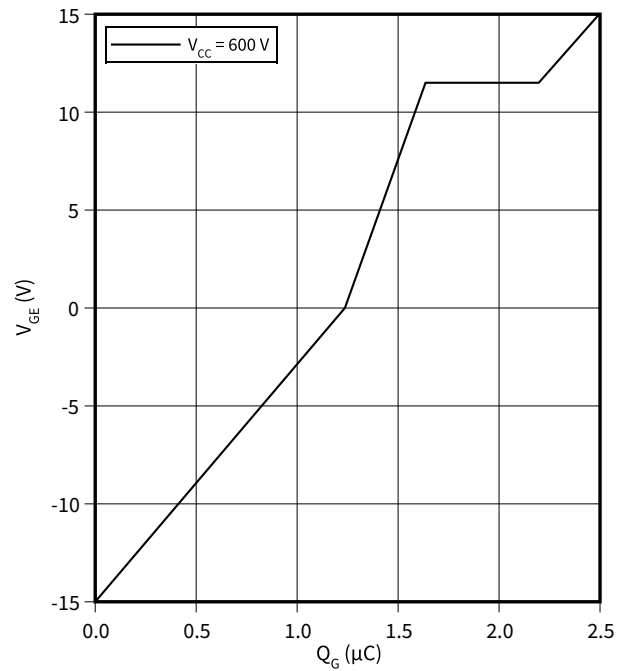
$I_C = 150 \text{ A}$, $V_{CE} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 25 \text{ }^\circ\text{C}$



gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

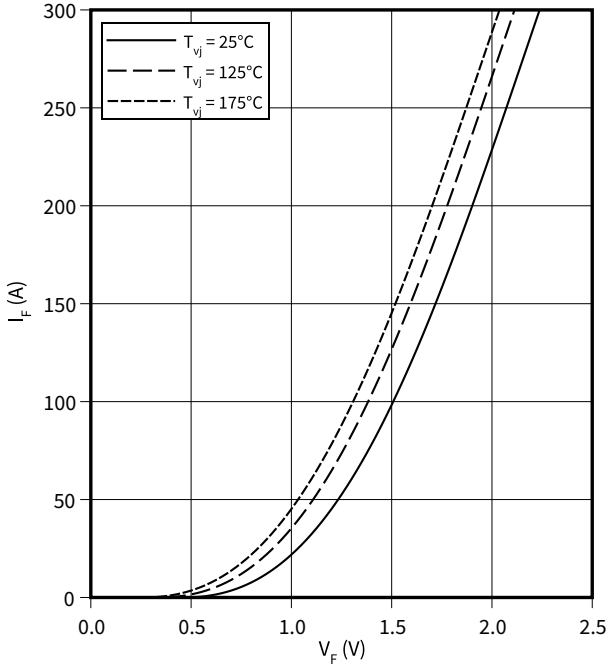
$I_C = 150 \text{ A}$, $T_{vj} = 25 \text{ }^\circ\text{C}$



8 Characteristics diagrams

forward characteristic (typical), Diode, Inverter

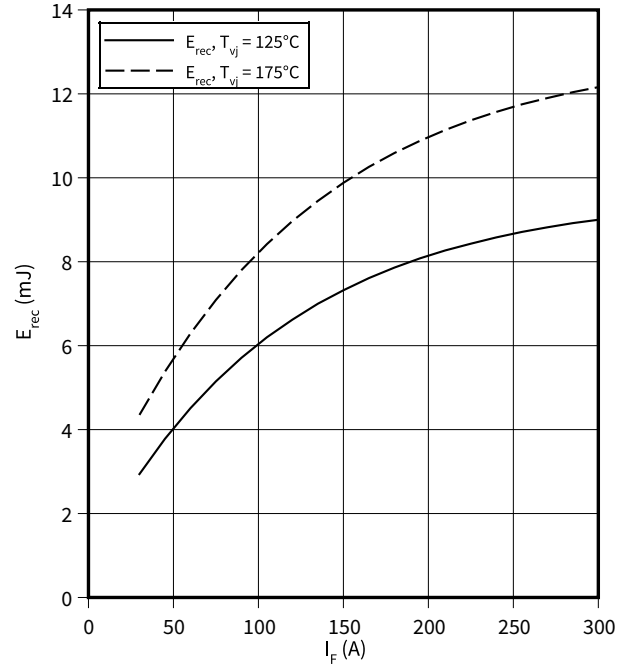
$I_F = f(V_F)$



switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

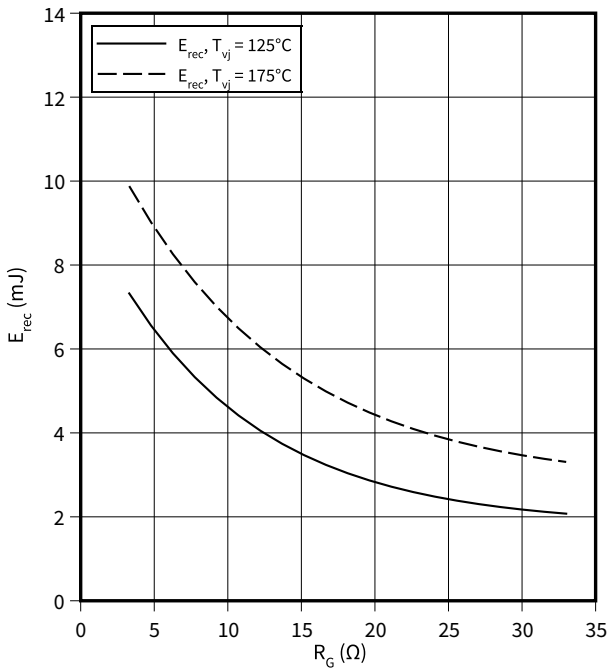
$R_{Gon} = 3.3 \Omega, V_{CE} = 600 V$



switching losses (typical), Diode, Inverter

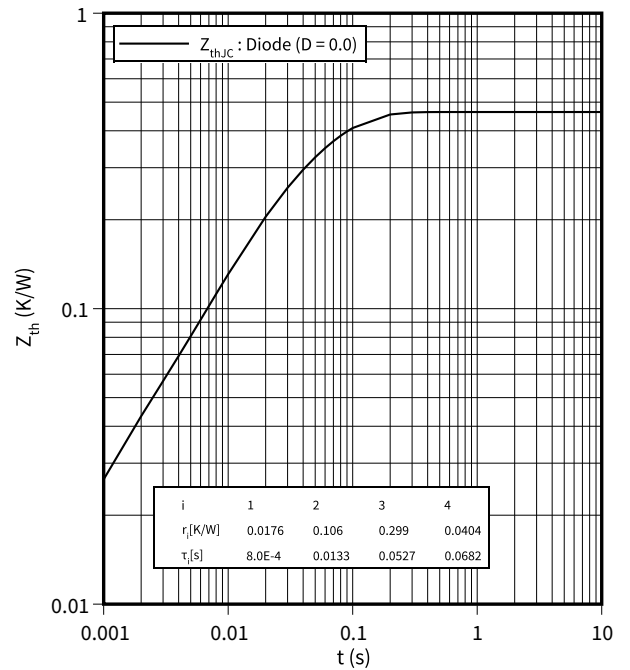
$E_{rec} = f(R_G)$

$V_{CE} = 600 V, I_F = 150 A$



transient thermal impedance, Diode, Inverter

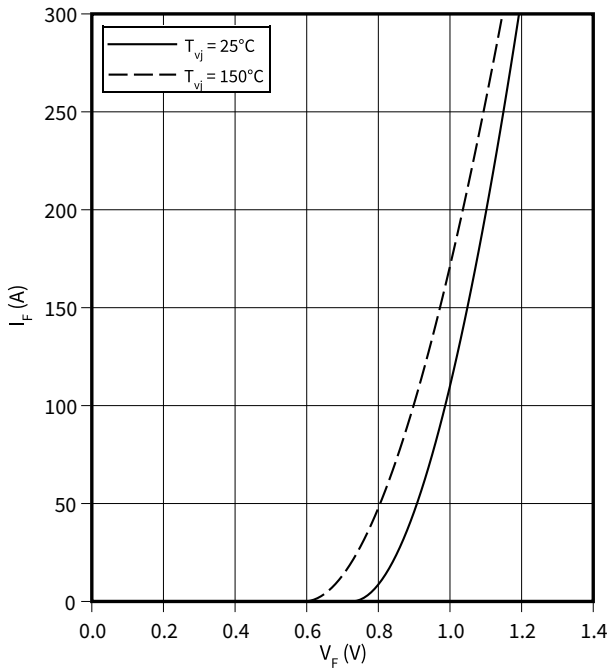
$Z_{th} = f(t)$



8 Characteristics diagrams

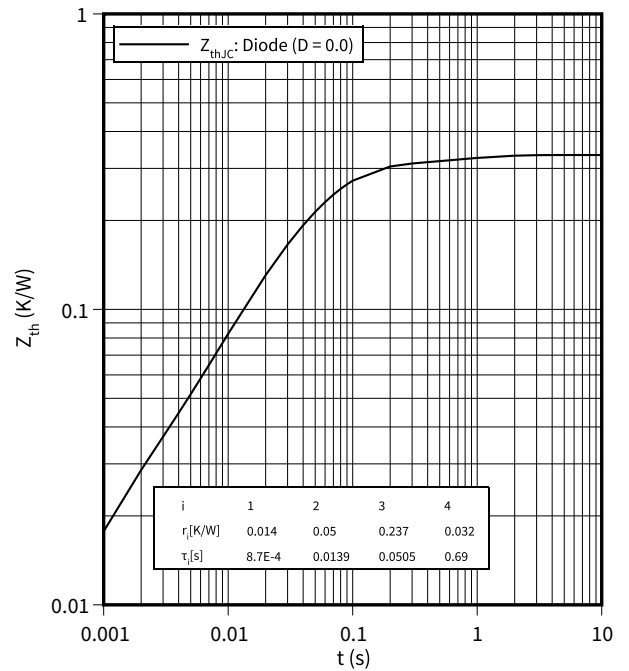
forward characteristic (typical), Diode, Rectifier

$I_F = f(V_F)$



transient thermal impedance, Diode, Rectifier

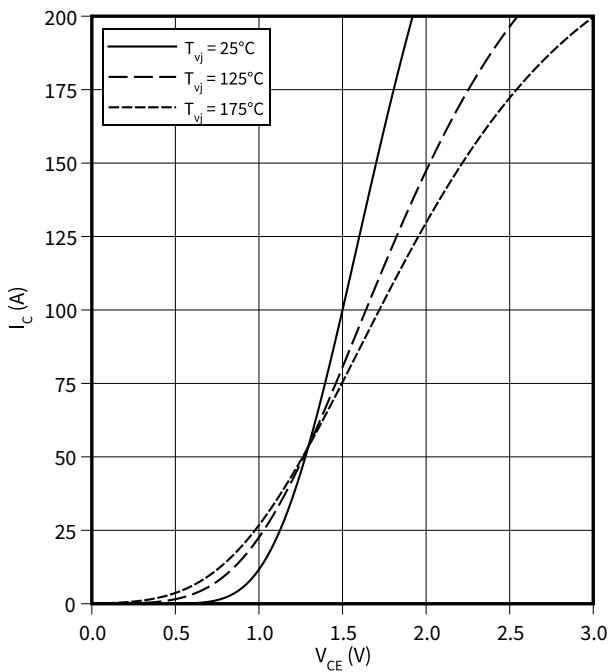
$Z_{th} = f(t)$



output characteristic (typical), IGBT, Brake-Chopper

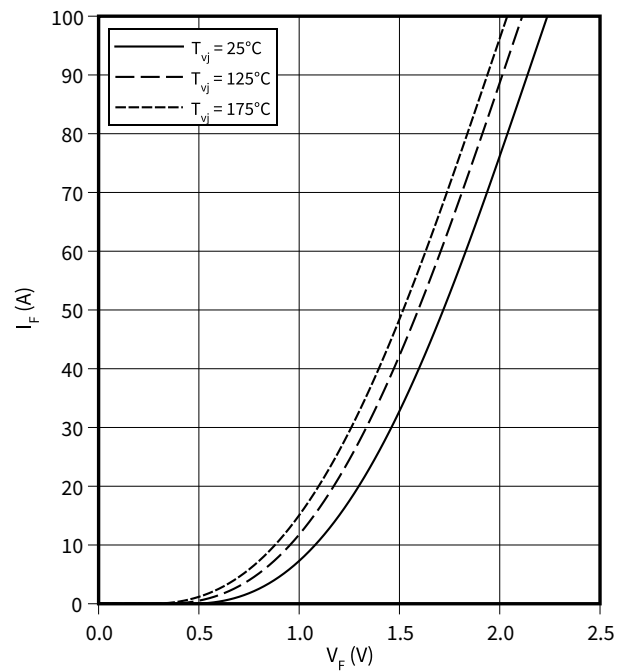
$I_C = f(V_{CE})$

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



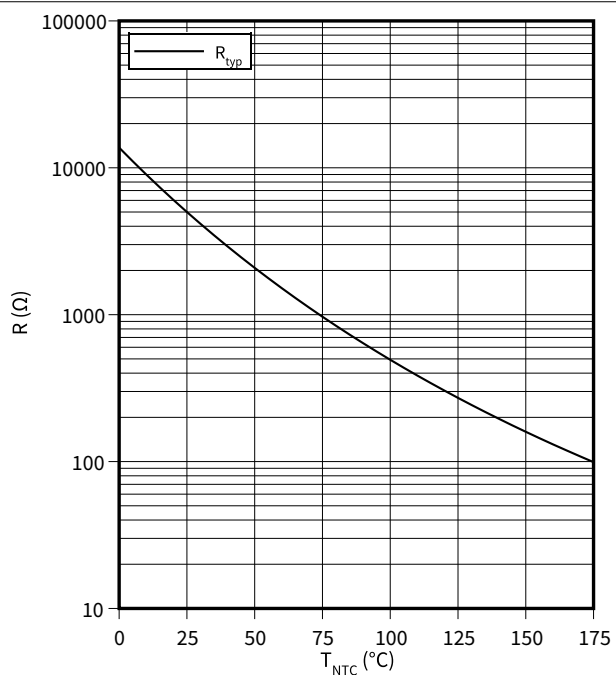
forward characteristic (typical), Diode, Brake-Chopper

$I_F = f(V_F)$



temperature characteristic (typical), NTC-Thermistor

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



9 Circuit diagram

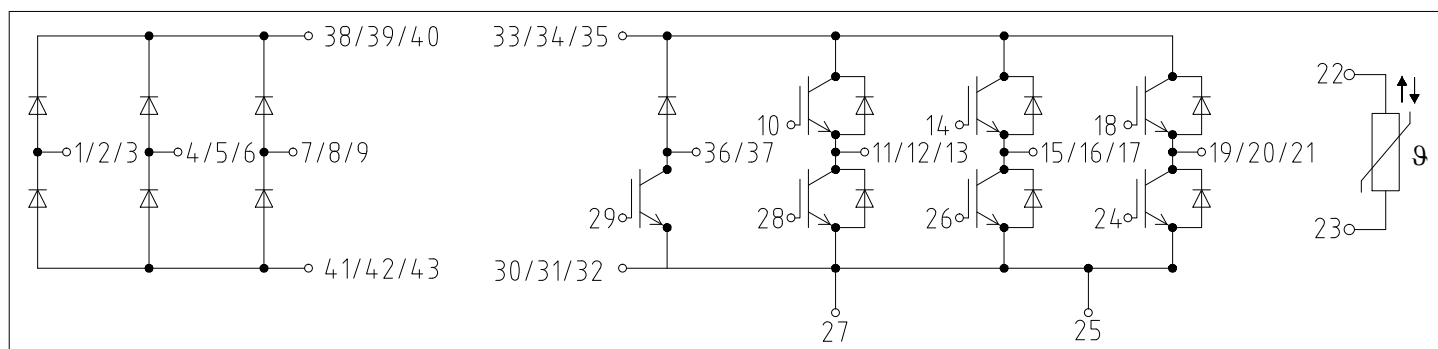


Figure 2

10 Package outlines

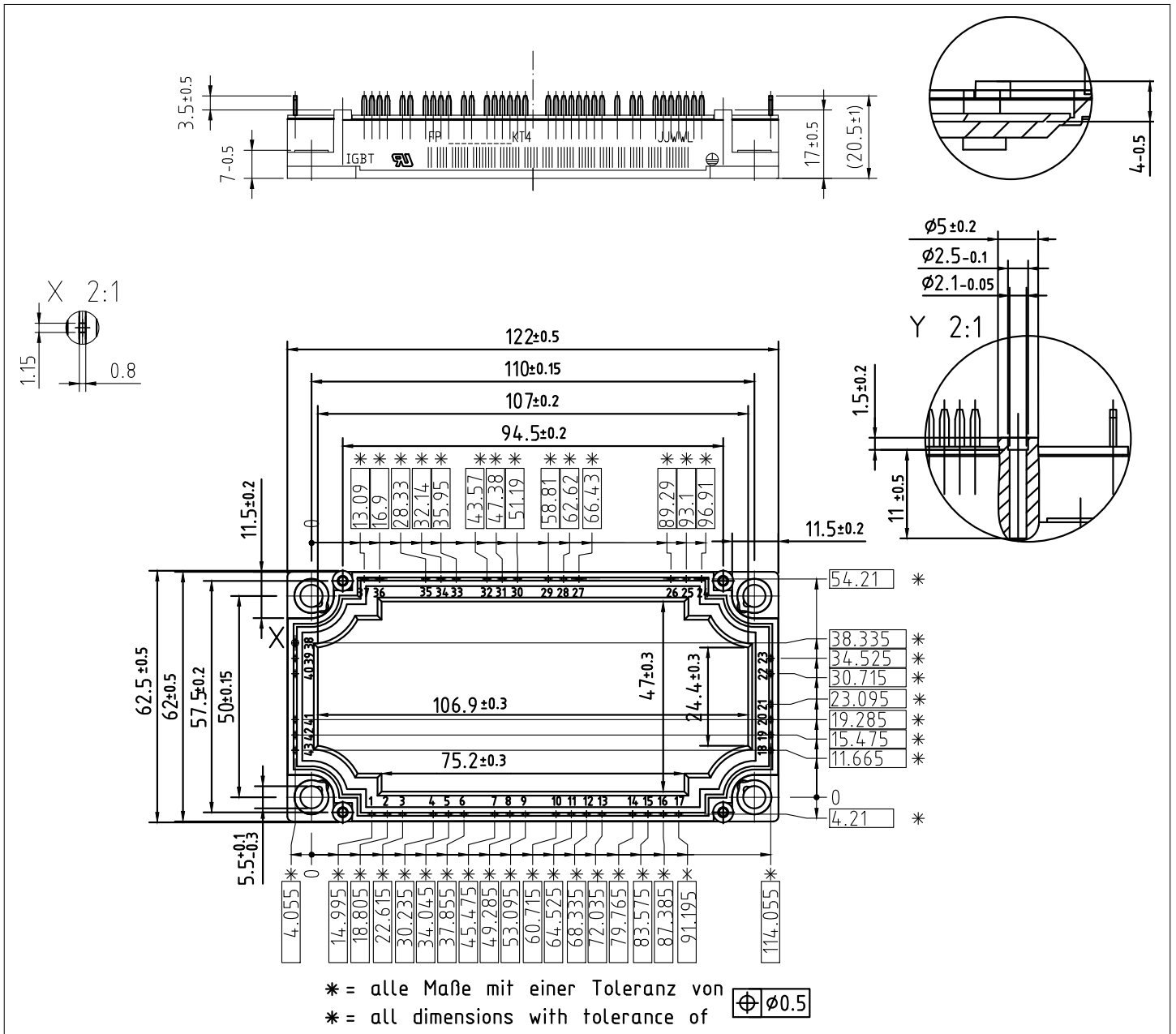


Figure 3

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	<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 4