

Final datasheet

EconoPACK™3 module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and NTC

Features

- Electrical features
 - $V_{CES} = 1700 \text{ V}$
 - $I_{C \text{ nom}} = 75 \text{ A} / I_{CRM} = 150 \text{ A}$
 - Low $V_{CE, \text{sat}}$
 - $T_{vj, \text{op}} = 150^\circ\text{C}$
 - TRENCHSTOP™ IGBT7
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - Integrated NTC temperature sensor
 - Standard housing
 - Solder contact technology
 - Isolated base plate



Typical appearance

Potential applications

- High-power converters
- Medium-voltage converters

Product validation

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

Description

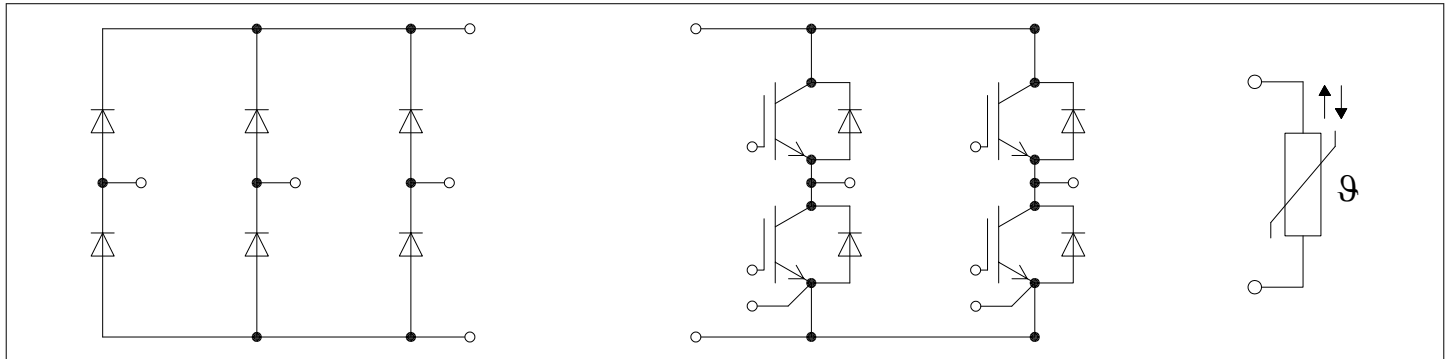




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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	3.4	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	3.4	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	$d_{Creep \text{ nom}}$	terminal to baseplate, nom.	10.0	mm
Clearance	$d_{Clear \text{ nom}}$	terminal to baseplate, nom.	7.5	mm
Comparative tracking index	CTI		> 225	
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}			33		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_C = 25 \text{ °C}$, per switch		2.1		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C = 25 \text{ °C}$, per switch		2.2		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for module mounting	M	- Mounting according to valid application note	3		6	Nm
Weight	G			300		g

Note: The current under continuous operation is limited to 50 A 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}	$T_{vj} = 25 \text{ °C}$	1700	V
Continuous DC collector current	I_{CDC}	$T_{vj \text{ max}} = 175 \text{ °C}$ $T_C = 90 \text{ °C}$	75	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj \text{ op}}$	150	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	$V_{CE\ sat}$	$I_C = 75\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.70	1.85	V
			$T_{vj} = 125\ ^\circ C$		1.95		
			$T_{vj} = 150\ ^\circ C$		2.05		
			$T_{vj} = 175\ ^\circ C$		2.10		
Gate threshold voltage	V_{GEth}	$I_C = 1.54\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.2	5.8	6.4	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 900\ V, T_{vj} = 25\ ^\circ C$			0.7		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			3		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			7.6		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.027		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1700\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			3	μA
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}	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Gon} = 2.7\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.109		μs
			$T_{vj} = 125\ ^\circ C$		0.119		
			$T_{vj} = 175\ ^\circ C$		0.124		
Rise time (inductive load)	t_r	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Gon} = 2.7\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.016		μs
			$T_{vj} = 125\ ^\circ C$		0.021		
			$T_{vj} = 175\ ^\circ C$		0.025		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Goff} = 6.8\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.344		μs
			$T_{vj} = 125\ ^\circ C$		0.433		
			$T_{vj} = 175\ ^\circ C$		0.472		
Fall time (inductive load)	t_f	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Goff} = 6.8\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.274		μs
			$T_{vj} = 125\ ^\circ C$		0.498		
			$T_{vj} = 175\ ^\circ C$		0.640		
Turn-on energy loss per pulse	E_{on}	$I_C = 75\ A, V_{CC} = 900\ V, L_\sigma = 23\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 2.7\ \Omega, di/dt = 2700\ A/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		8.4		mJ
			$T_{vj} = 125\ ^\circ C$		13.5		
			$T_{vj} = 175\ ^\circ C$		16.7		
Turn-off energy loss per pulse	E_{off}	$I_C = 75\ A, V_{CC} = 900\ V, L_\sigma = 23\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 6.8\ \Omega, dv/dt = 3500\ V/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		11.9		mJ
			$T_{vj} = 125\ ^\circ C$		19		
			$T_{vj} = 175\ ^\circ C$		23.2		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}$, $V_{CC} = 1000 \text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$		330		A
				320		
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.486	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1 \text{ W/(m} \cdot \text{K)}$		0.0706		K/W
Temperature under switching conditions	$T_{vj op}$		-40		175	°C

Note: $T_{vj op} > 150 \text{ °C}$ is only 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}		$T_{vj} = 25 \text{ °C}$	1700	V
Continuous DC forward current	I_F			75	A
Repetitive peak forward current	I_{FRM}	$t_p = 1 \text{ ms}$		150	A
I^2t - value	I^2t	$t_p = 10 \text{ ms}$, $V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	600	A ² s
			$T_{vj} = 175 \text{ °C}$	510	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 75 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	2.35	2.50	V
			$T_{vj} = 125 \text{ °C}$	2.25		
			$T_{vj} = 150 \text{ °C}$	2.20		
			$T_{vj} = 175 \text{ °C}$	2.10		
Peak reverse recovery current	I_{RM}	$V_{CC} = 900 \text{ V}$, $I_F = 75 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2700 \text{ A/}\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	119		A
			$T_{vj} = 125 \text{ °C}$	111		
			$T_{vj} = 175 \text{ °C}$	110		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Recovered charge	Q_r	$V_{CC} = 900 \text{ V}$, $I_F = 75 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2700 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$		9.3		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$		18.2		
			$T_{vj} = 175 \text{ }^\circ\text{C}$		24		
Reverse recovery energy	E_{rec}	$V_{CC} = 900 \text{ V}$, $I_F = 75 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2700 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$		4.6		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$		10.1		
			$T_{vj} = 175 \text{ }^\circ\text{C}$		13.7		
Thermal resistance, junction to case	R_{thJC}	per diode				0.732	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$			0.0880		K/W
Temperature under switching conditions	T_{vjop}			-40		175	$^\circ\text{C}$

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

4 Diode, Rectifier

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25 \text{ }^\circ\text{C}$	2200	V
Maximum RMS forward current per chip	I_{FRMSM}	$T_C = 110 \text{ }^\circ\text{C}$		135	A
Maximum RMS current at rectifier output	I_{RMSM}	$T_C = 110 \text{ }^\circ\text{C}$		150	A
Surge forward current	I_{FSM}	$t_p = 10 \text{ ms}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1580	A
			$T_{vj} = 150 \text{ }^\circ\text{C}$	1290	
I^2t - value	I^2t	$t_p = 10 \text{ ms}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	7990	A^2s
			$T_{vj} = 150 \text{ }^\circ\text{C}$	5300	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 168 \text{ A}$	$T_{vj} = 25 \text{ °C}$		1.15	1.25	V
			$T_{vj} = 125 \text{ °C}$		1.10		
			$T_{vj} = 150 \text{ °C}$		1.10		
Reverse current	I_r	$T_{vj} = 150 \text{ °C}, V_R = 2200 \text{ V}$			2		mA
Thermal resistance, junction to case	R_{thJC}	per diode				0.368	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W/(m·K)}$			0.0680		K/W
Temperature under switching conditions	$T_{vj, op}$			-40		150	°C

Note: According to standard IEC 60749-23, rev. 1.1, 2011-03, HTRB is performed at 125°C

5 NTC-Thermistor

Table 9 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}	$\Delta R/R$	$T_{NTC} = 100 \text{ °C}, R_{100} = 493 \text{ Ω}$	-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

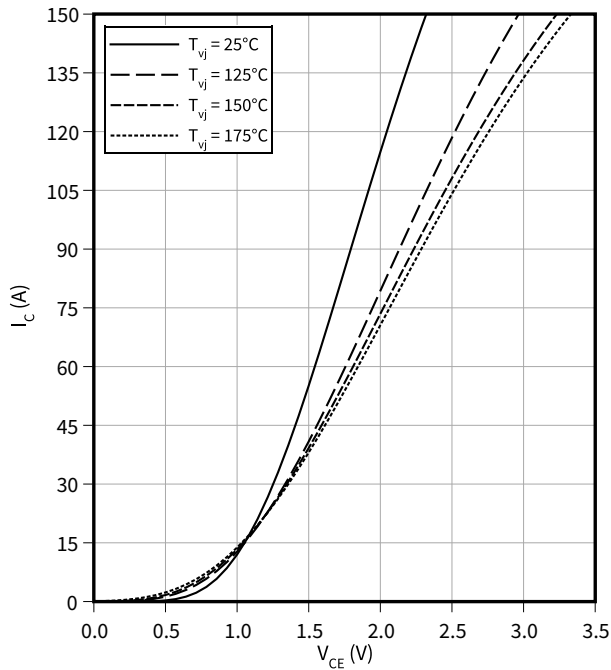
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

6 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

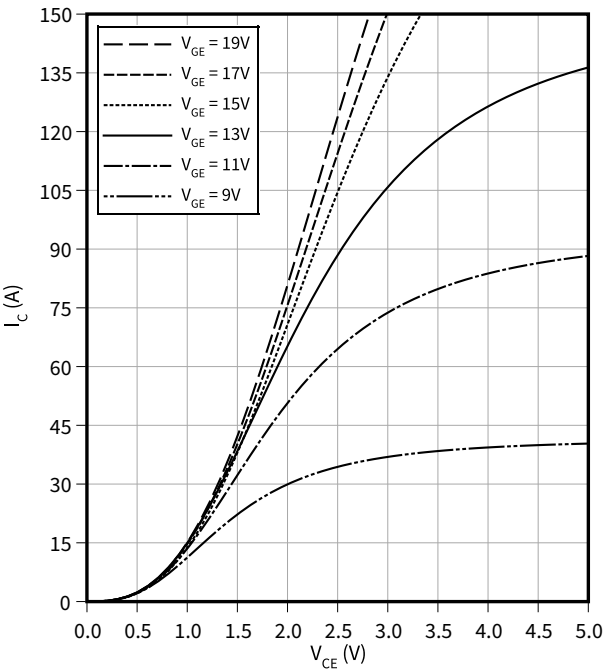
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

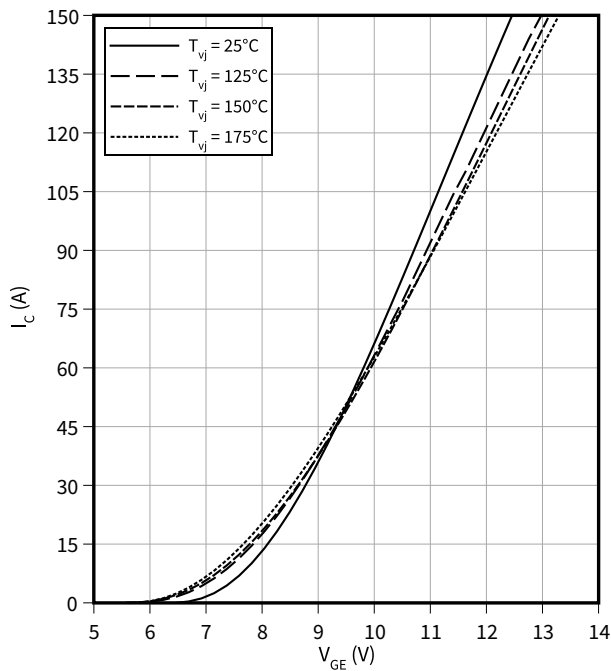
$T_{vj} = 175\text{ °C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

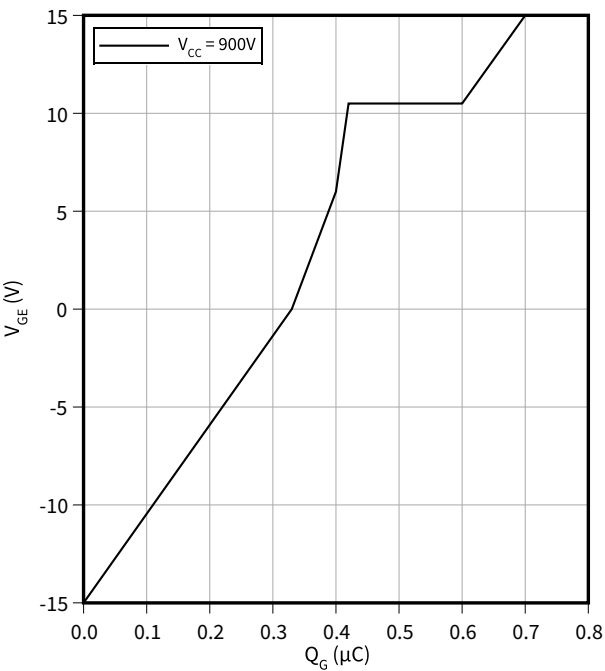
$V_{CE} = 20\text{ V}$



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

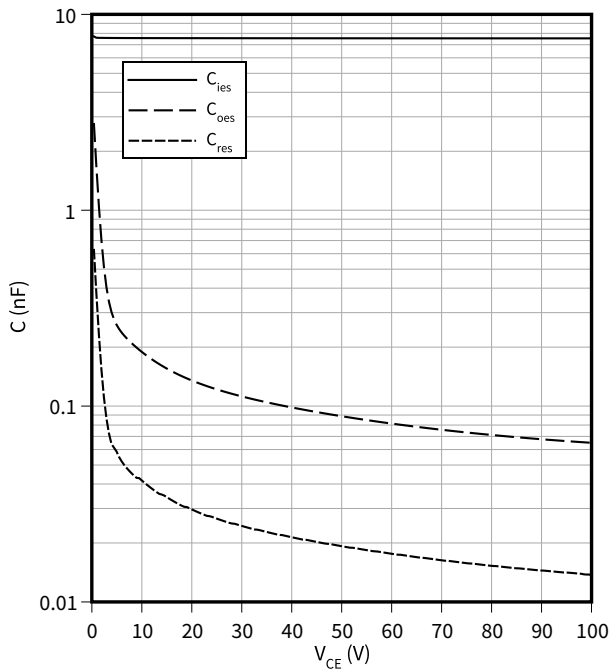
$I_C = 75\text{ A}, T_{vj} = 25\text{ °C}$



6 Characteristics diagrams

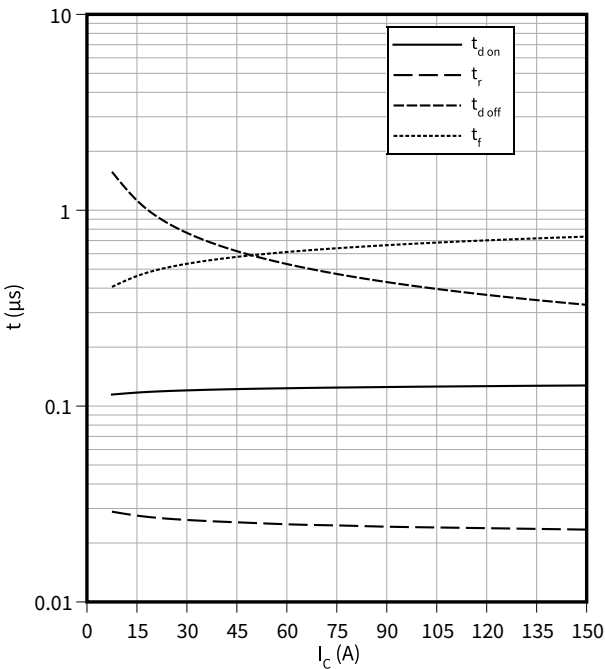
Capacity characteristic (typical), IGBT, Inverter

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



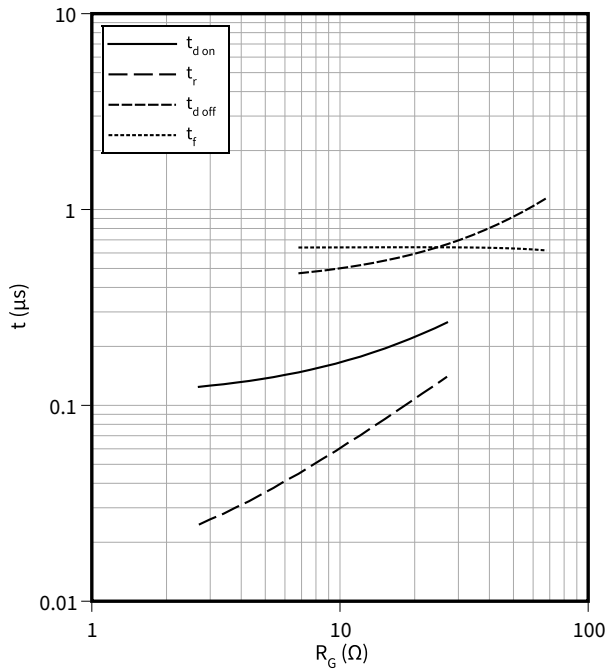
Switching times (typical), IGBT, Inverter

$t = f(I_C)$
 $R_{Goff} = 6.8 \text{ } \Omega$, $R_{Gon} = 2.7 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 900 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



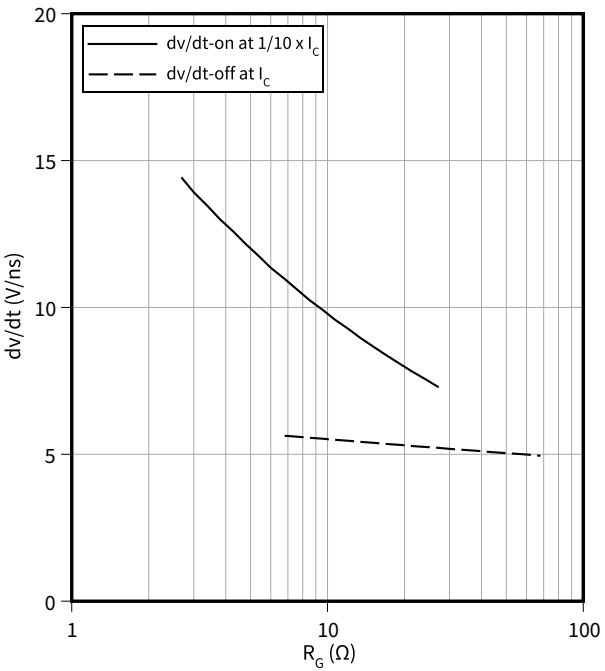
Switching times (typical), IGBT, Inverter

$t = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 75 \text{ A}$, $V_{CC} = 900 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



Voltage slope (typical), IGBT, Inverter

$dv/dt = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 75 \text{ A}$, $V_{CC} = 900 \text{ V}$, $T_{vj} = 25 \text{ }^{\circ}\text{C}$

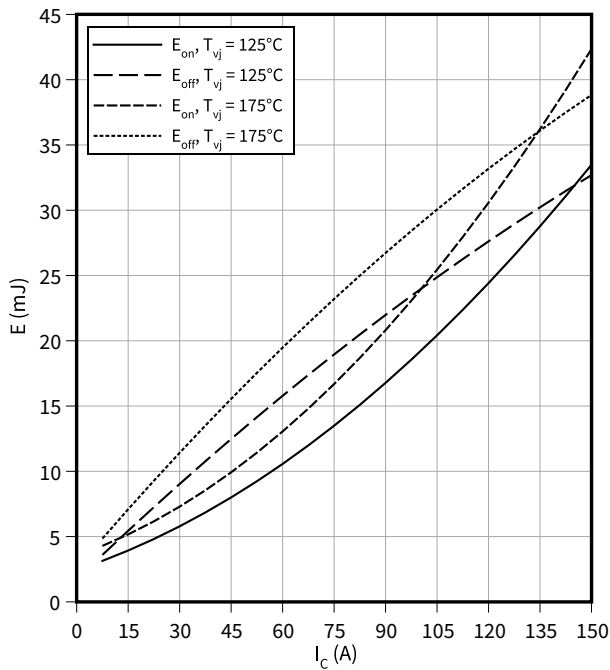


6 Characteristics diagrams

Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

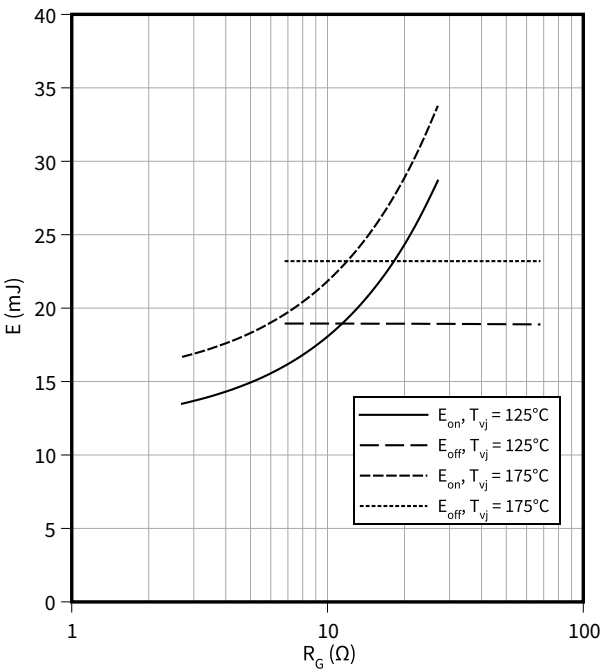
$R_{Goff} = 6.8 \Omega$, $R_{Gon} = 2.7 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 900 \text{ V}$



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

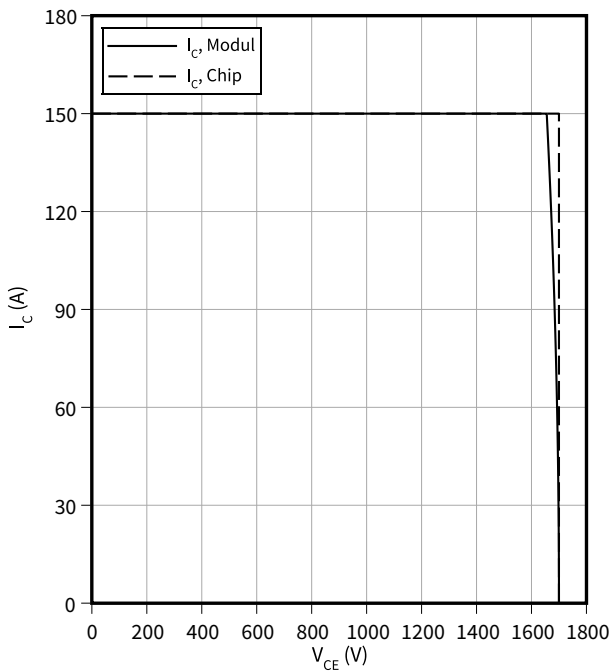
$V_{GE} = \pm 15 \text{ V}$, $I_C = 75 \text{ A}$, $V_{CC} = 900 \text{ V}$



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

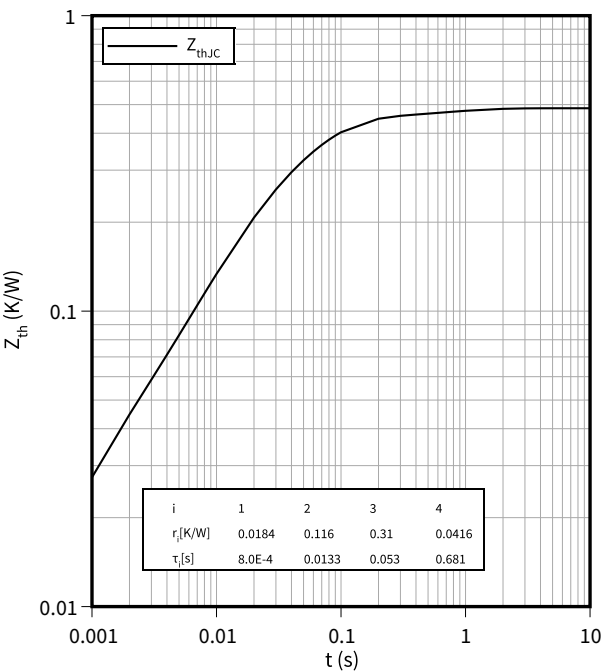
$I_C = f(V_{CE})$

$R_{Goff} = 6.8 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 175^\circ\text{C}$



Transient thermal impedance, IGBT, Inverter

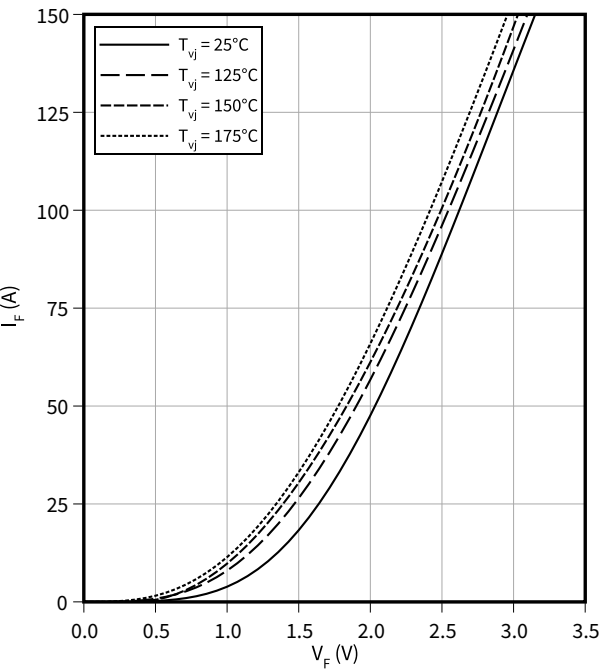
$Z_{th} = f(t)$



6 Characteristics diagrams

Forward characteristic (typical), Diode, Inverter

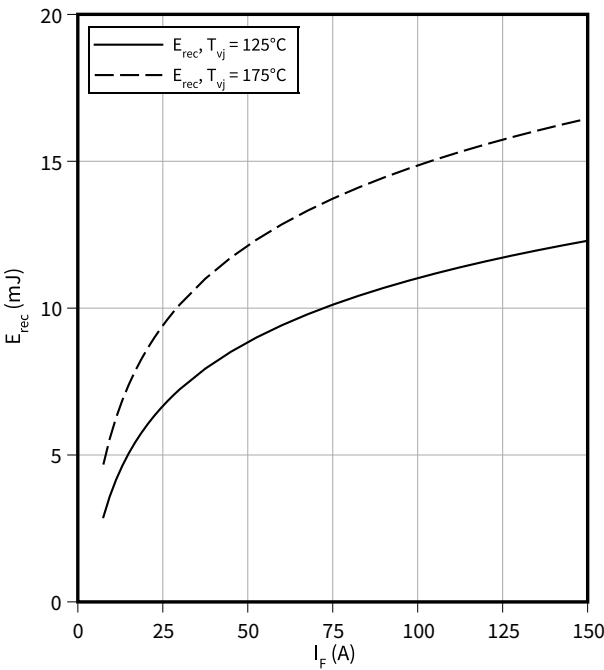
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

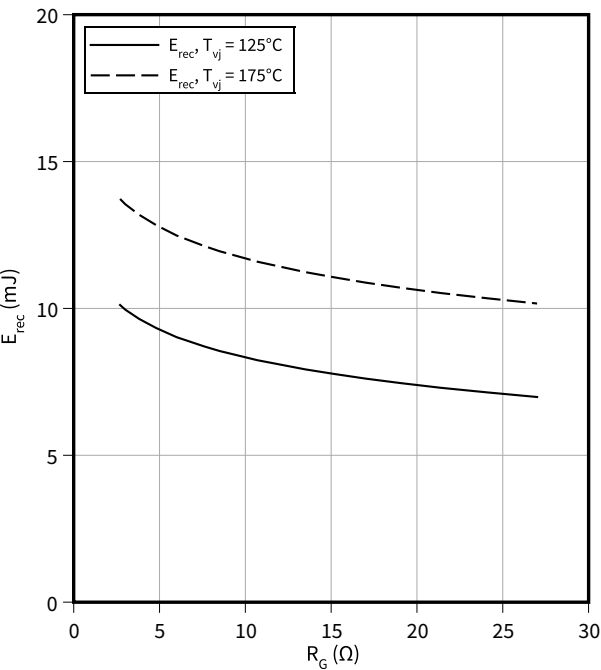
$R_{Gon} = 2.7\ \Omega, V_{CC} = 900\ \text{V}$



Switching losses (typical), Diode, Inverter

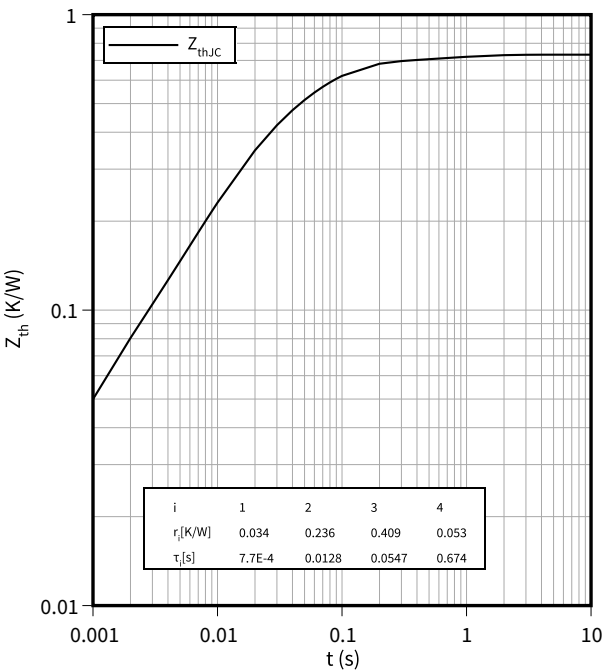
$E_{rec} = f(R_G)$

$I_F = 75\ \text{A}, V_{CC} = 900\ \text{V}$



Transient thermal impedance, Diode, Inverter

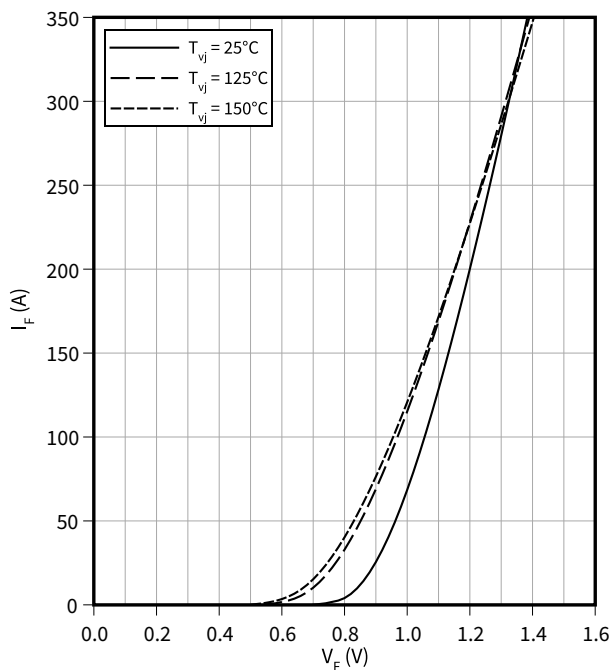
$Z_{th} = f(t)$



6 Characteristics diagrams

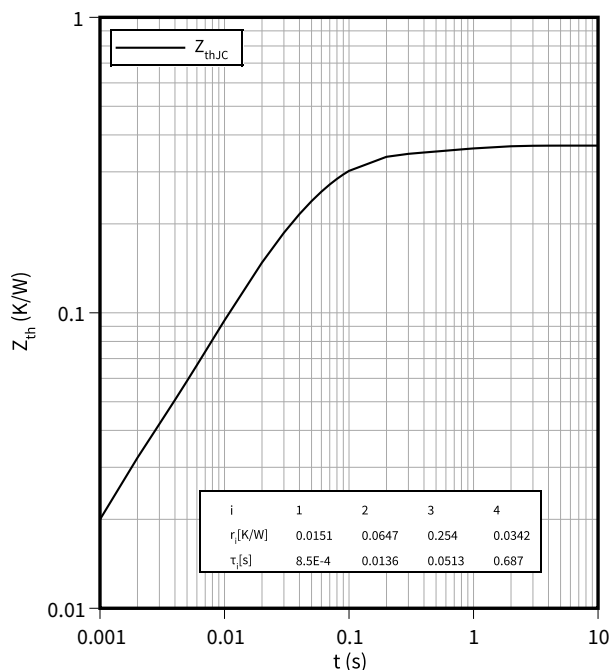
Forward characteristic (typical), Diode, Rectifier

$I_F = f(V_F)$



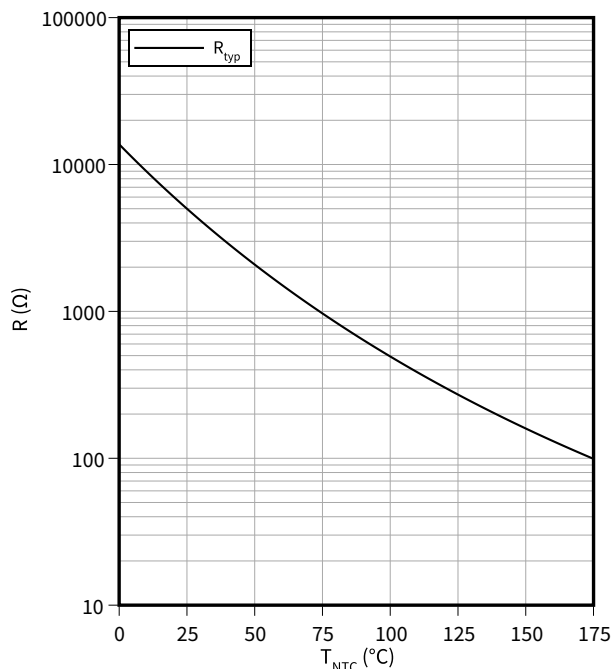
Transient thermal impedance, Diode, Rectifier

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



7 Circuit diagram

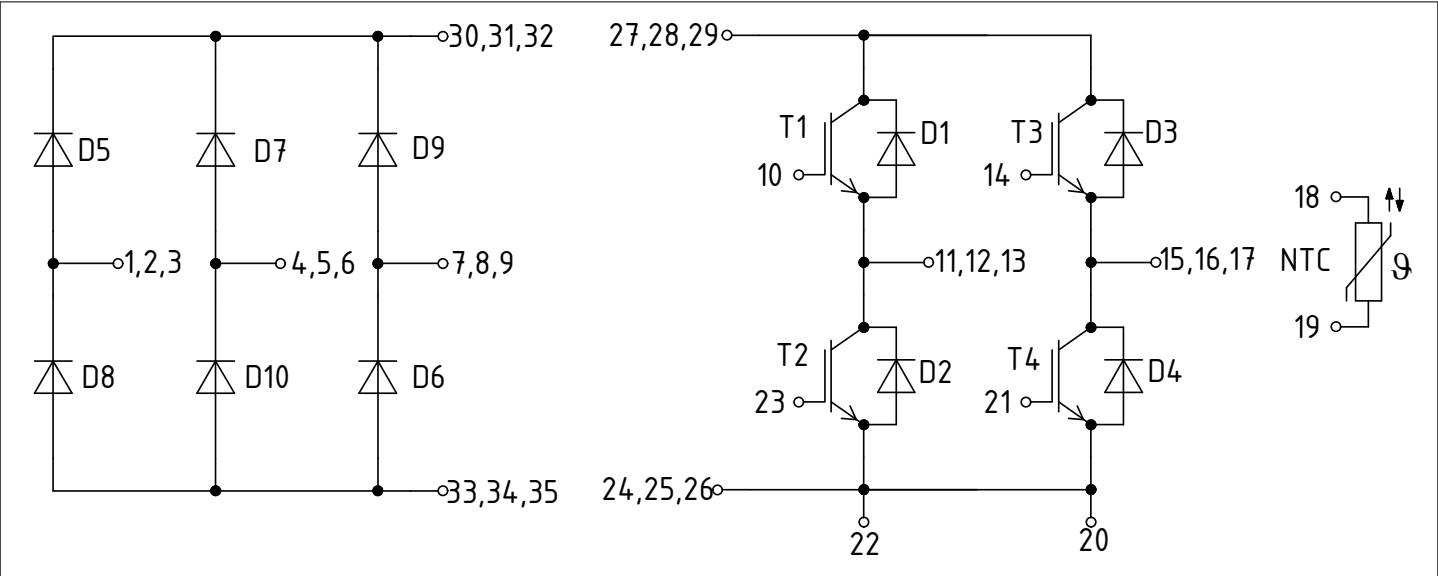
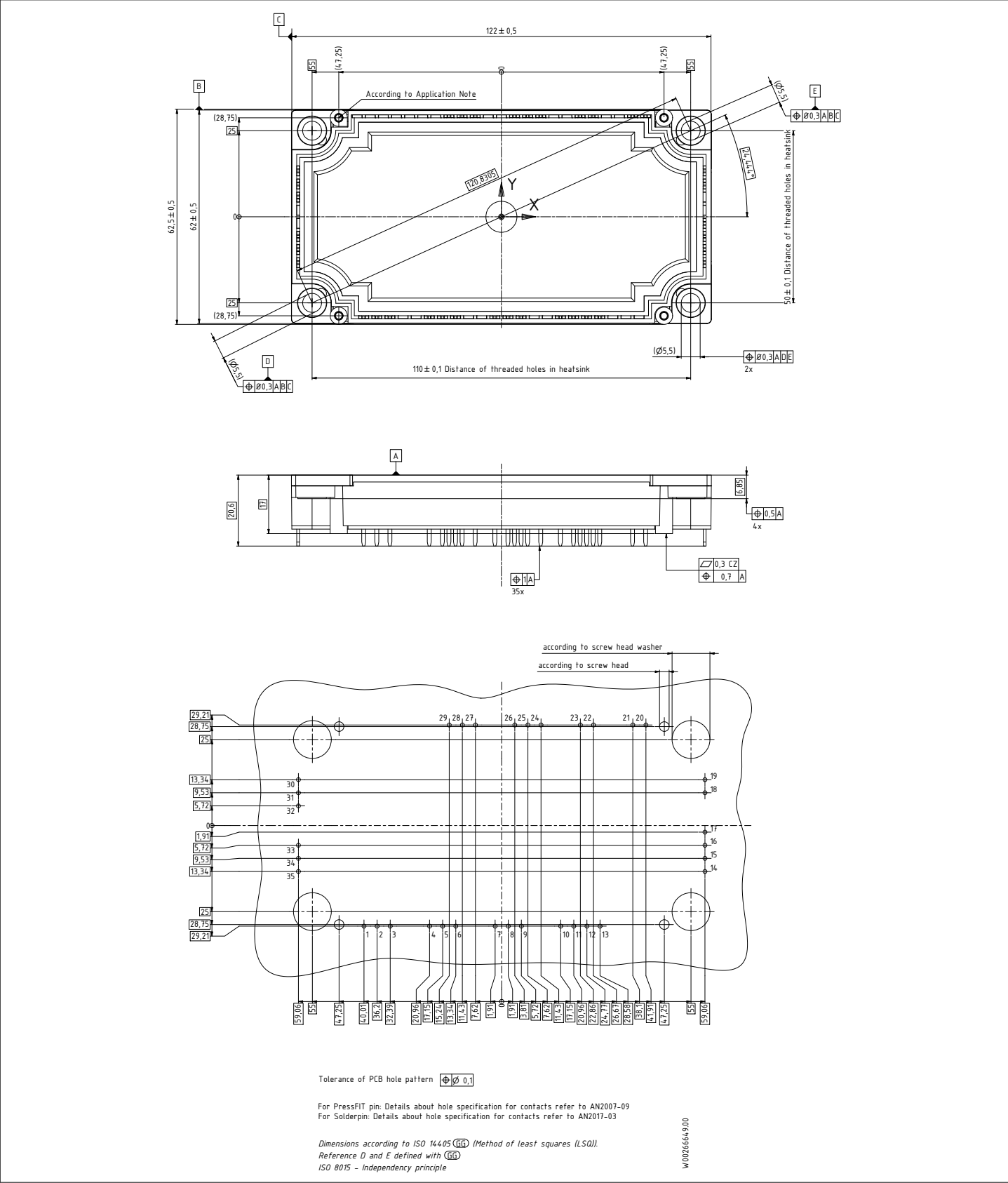


Figure 1

8 Package outlines



9 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 3



Revision history

Revision history

Document revision	Date of release	Description of changes
1.00	2024-12-16	Final datasheet

Trademarks

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Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.