Final datasheet

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

Features


Typical appearance

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 200 A / I_{CRM} = 400 A
  - Overload operation up to 175°C
  - Low $V_{CE,sat}$
  - TRENCHSTOP™ IGBT7
  - Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder
- Mechanical features
  - High power density
  - Compact design
  - Al_2O_3 substrate with low thermal resistance
  - PressFIT contact technology
  - 2.5 kV AC 1 minute insulation
  - Integrated NTC temperature sensor

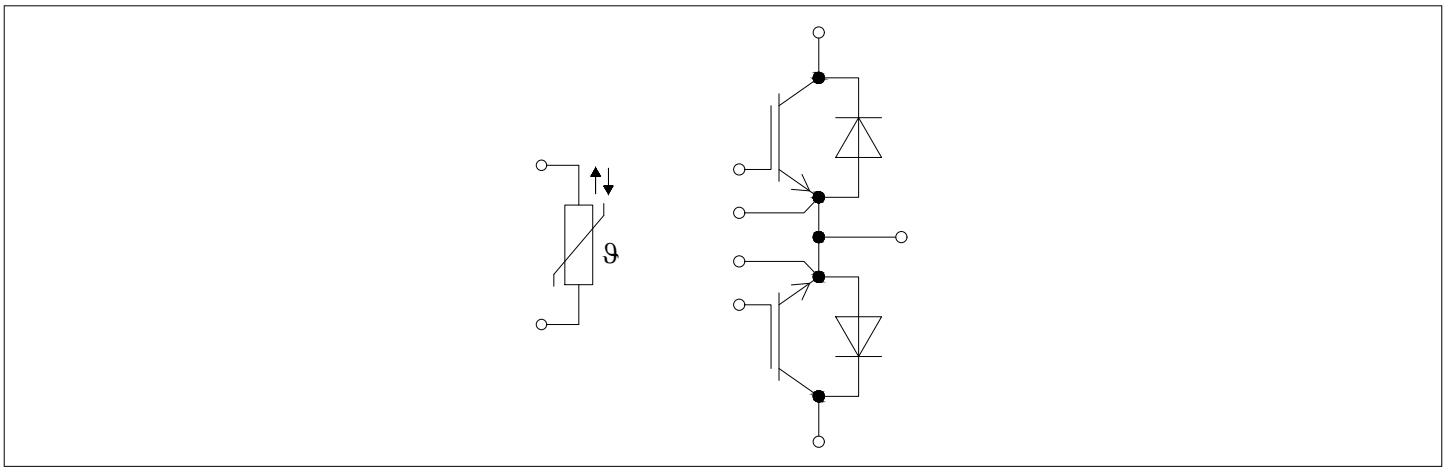
Potential applications

- 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 Hz, *t* = 1 min	2.5	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, f = 50 Hz, *t* = 1 min	2.5	kV
Internal isolation		basic insulation (class 1, IEC 61140)	Al2O3	
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}			18		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T = 25 °C, per switch		1.7		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting force per clamp	*F*		40		80	N
Weight	*G*			39		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 FF200R12W2T7E_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 °C	1200	V
Implemented collector current	I_{CN}			200	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	165	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		400	A
Gate-emitter peak voltage	V_{GES}			±20	V

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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 °C		1.50	1.80	V
			T_{vj} = 125 °C		1.64		
			T_{vj} = 175 °C		1.72		
Gate threshold voltage	V_{GEth}	I_C = 5 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.15	5.80	6.45	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 600 V			3.6		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0.75		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			43.4		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.15		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			15	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25 °C				100	nA
Turn-on delay time (inductive load)	t_{don}	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 1.5 Ω	T_{vj} = 25 °C		0.135		µs
			T_{vj} = 125 °C		0.154		
			T_{vj} = 175 °C		0.164		
Rise time (inductive load)	t_r	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 1.5 Ω	T_{vj} = 25 °C		0.063		µs
			T_{vj} = 125 °C		0.070		
			T_{vj} = 175 °C		0.073		
Turn-off delay time (inductive load)	t_{doff}	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 1.5 Ω	T_{vj} = 25 °C		0.319		µs
			T_{vj} = 125 °C		0.402		
			T_{vj} = 175 °C		0.443		
Fall time (inductive load)	t_f	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 1.5 Ω	T_{vj} = 25 °C		0.078		µs
			T_{vj} = 125 °C		0.168		
			T_{vj} = 175 °C		0.241		
Turn-on energy loss per pulse	E_{on}	I_C = 200 A, V_{CC} = 600 V, L_σ = 62 nH, V_{GE} = ±15 V, R_{Gon} = 1.5 Ω, di/dt = 2.68 kA/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		13.3		mJ
			T_{vj} = 125 °C		17.3		
			T_{vj} = 175 °C		20.1		
Turn-off energy loss per pulse	E_{off}	I_C = 200 A, V_{CC} = 600 V, L_σ = 62 nH, V_{GE} = ±15 V, R_{Goff} = 1.5 Ω, dv/dt = 3030 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		14.1		mJ
			T_{vj} = 125 °C		21.8		
			T_{vj} = 175 °C		27		

(table continues...)

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Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15$ V, $V_{CC} = 800$ V, $V_{CEmax}=V_{CES}-L_{sCE}*di/dt$	$t_P \leq 8$ µs, $T_{vj}=150$ °C		740		A
			$t_P \leq 7$ µs, $T_{vj}=175$ °C		700		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, $\lambda_{grease} = 1$ W/(m·K)			0.355		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°C

***Note**: $T_{vj\,op} > 150$°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}		$T_{vj} = 25$ °C	1200	V
Continuous DC forward current	I_F			200	A
Repetitive peak forward current	I_{FRM}	$t_P = 1$ ms		400	A
I^2t - value	I^2t	$t_P = 10$ ms, $V_R = 0$ V	$T_{vj} = 125$ °C	4280	A^2s
			$T_{vj} = 175$ °C	3650	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 200$ A, $V_{GE} = 0$ V	$T_{vj} = 25$ °C		1.72	2.10	V
			$T_{vj} = 125$ °C		1.59		
			$T_{vj} = 175$ °C		1.52		
Peak reverse recovery current	I_{RM}	$V_{CC} = 600$ V, $I_F = 200$ A, $V_{GE} = -15$ V, $-di_F/dt = 2.68$ kA/µs ($T_{vj} = 175$ °C)	$T_{vj} = 25$ °C		125		A
			$T_{vj} = 125$ °C		172		
			$T_{vj} = 175$ °C		193		

(table continues...)

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Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 200 A, V_{GE} = -15 V, -di$_F$/dt = 2.68 kA/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		12.6		µC
			T_{vj} = 125 °C		25		
			T_{vj} = 175 °C		33.7		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 200 A, V_{GE} = -15 V, -di$_F$/dt = 2.68 kA/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		4.34		mJ
			T_{vj} = 125 °C		9.56		
			T_{vj} = 175 °C		13		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 1 W/(m·K)			0.519		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°C

***Note**: $T_{vj\,op}$ > 150°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 °C		5		kΩ
Deviation of R_{100}	$\Delta R/R$	T_{NTC} = 100 °C, R_{100} = 493 Ω	-5		5	%
Power dissipation	P_{25}	T_{NTC} = 25 °C			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2-1/(298{,}15\ K))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2-1/(298{,}15\ K))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2-1/(298{,}15\ K))]$		3433		K

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

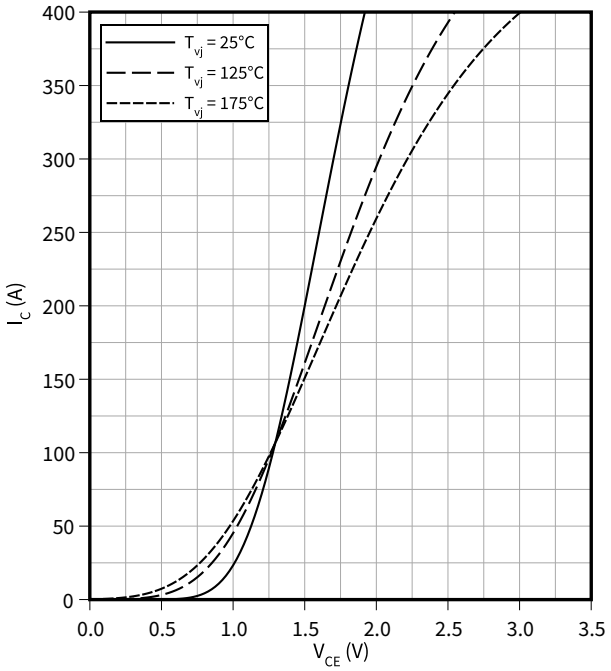
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5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

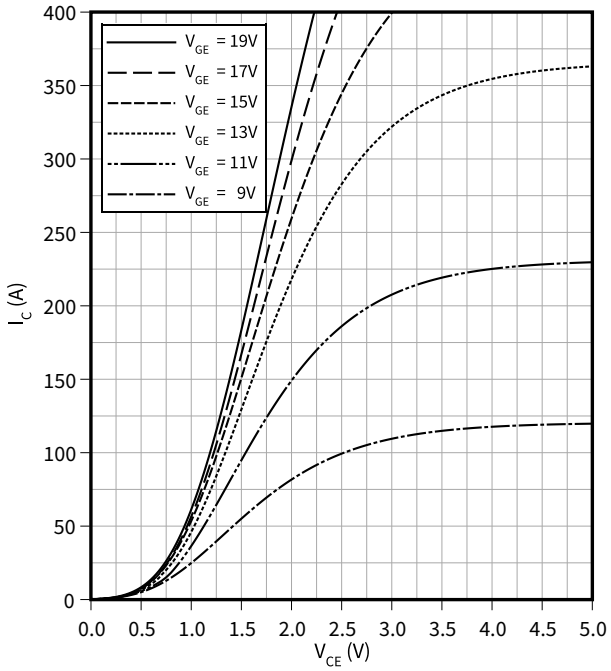
V_{GE} = 15 V



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

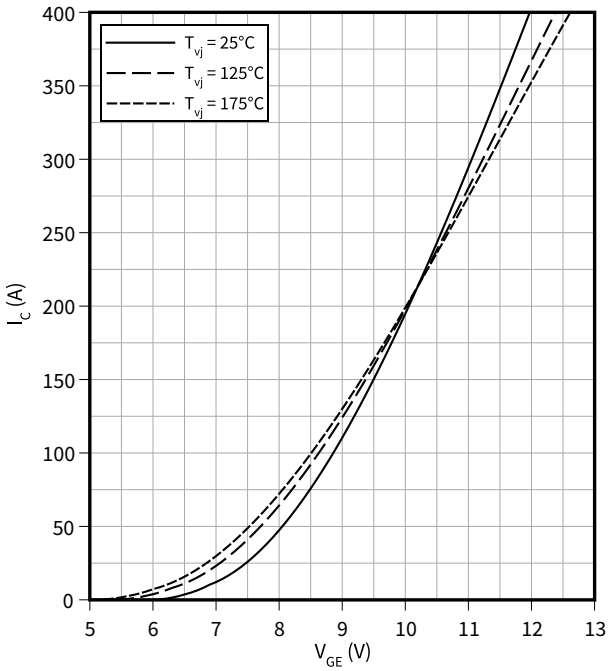
T_{vj} = 175 °C



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

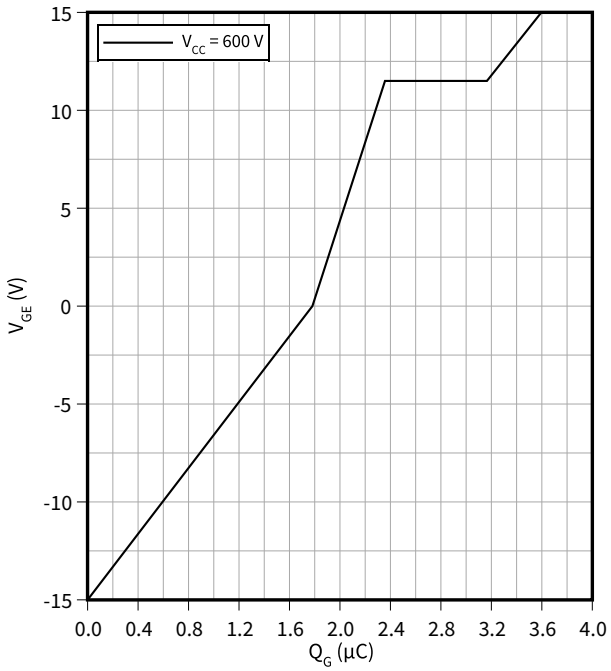
V_{CE} = 20 V



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

I_C = 200 A, T_{vj} = 25 °C

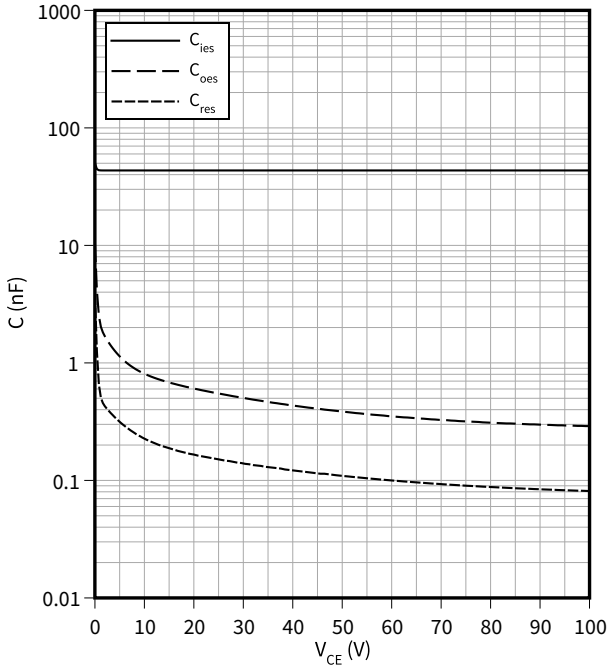


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Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

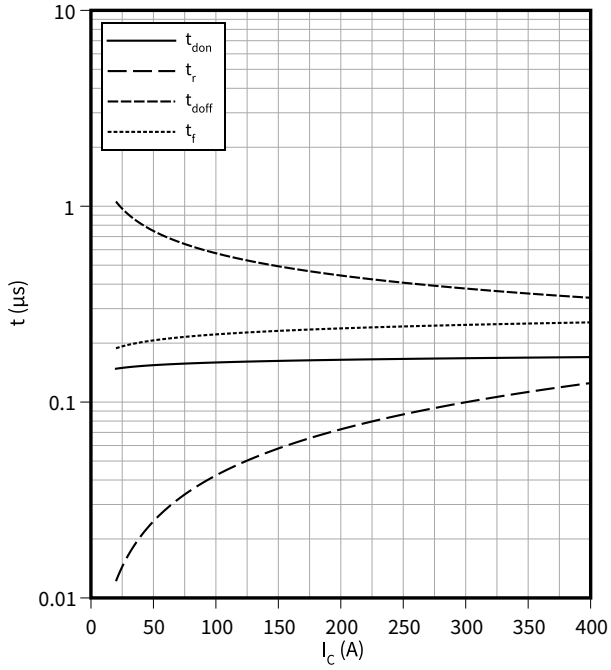
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$



Switching times (typical), IGBT, Inverter

$t = f(I_C)$

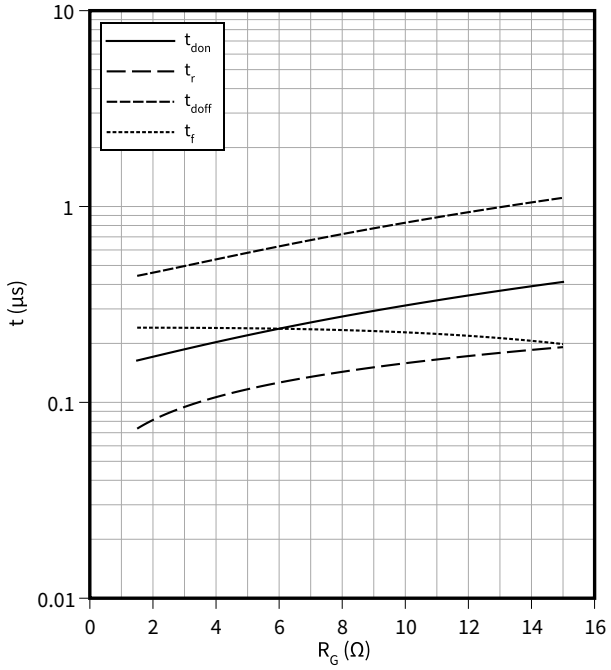
$R_{Goff} = 1.5\ \Omega$, $R_{Gon} = 1.5\ \Omega$, $V_{GE} = \pm 15\ V$, $V_{CC} = 600\ V$, $T_{vj} = 175\ °C$



Switching times (typical), IGBT, Inverter

$t = f(R_G)$

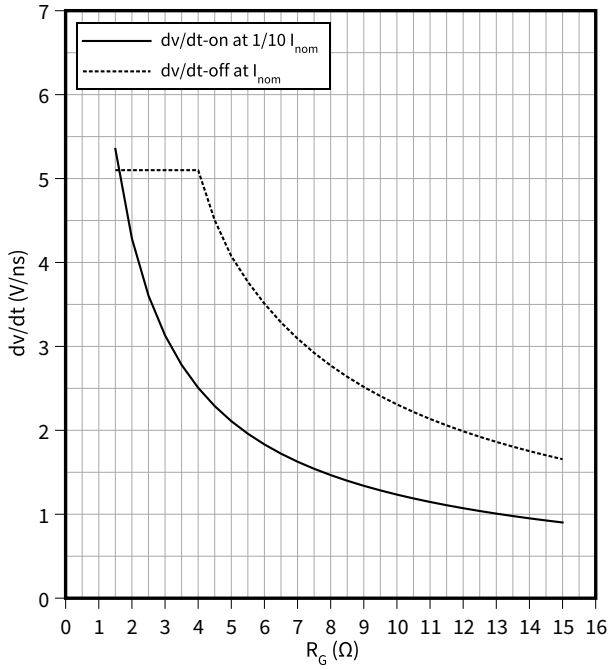
$V_{GE} = \pm 15\ V$, $I_C = 200\ A$, $V_{CC} = 600\ V$, $T_{vj} = 175\ °C$



Voltage slope (typical), IGBT, Inverter

$dv/dt = f(R_G)$

$I_C = 200\ A$, $V_{CC} = 600\ V$, $V_{GE} = \pm 15\ V$, $T_{vj} = 25\ °C$

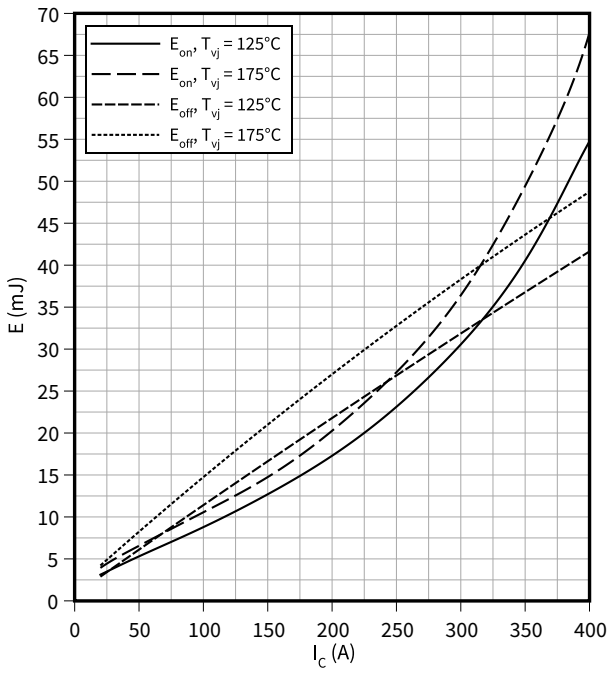


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Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

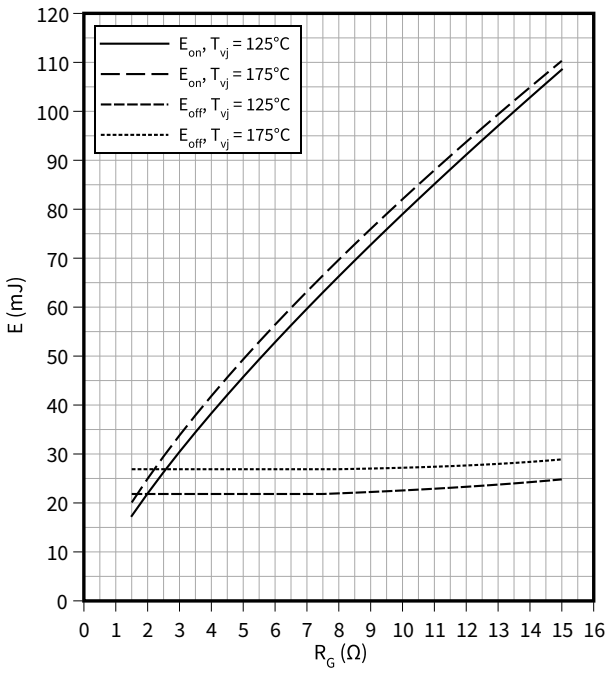
$R_{Goff} = 1.5\ \Omega$, $R_{Gon} = 1.5\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CC} = 600$ V



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

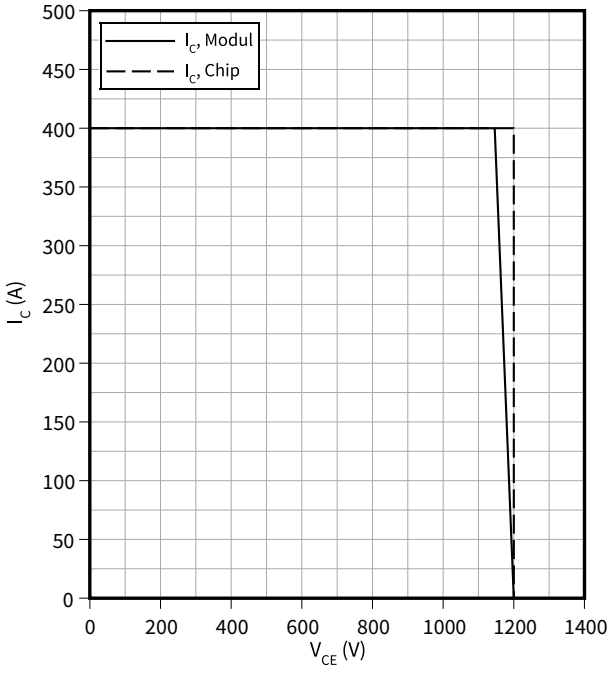
$V_{GE} = \pm 15$ V, $I_C = 200$ A, $V_{CC} = 600$ V



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

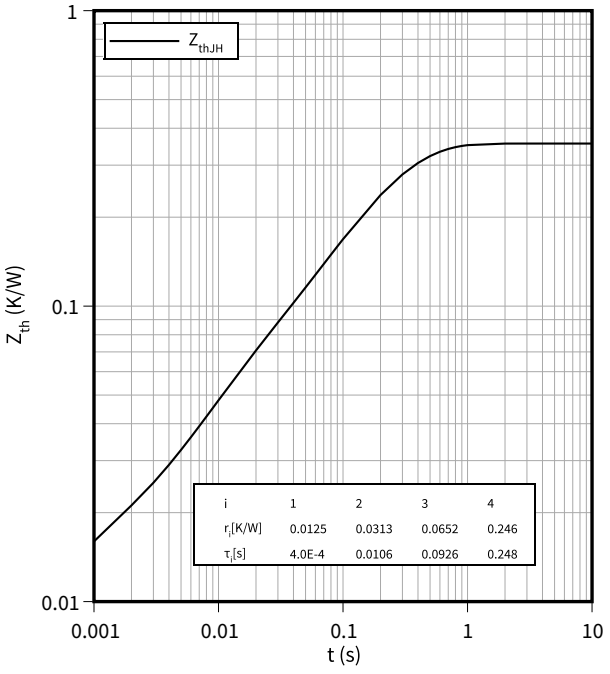
$I_C = f(V_{CE})$

$R_{Goff} = 1.5\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 175$ °C



Transient thermal impedance, IGBT, Inverter

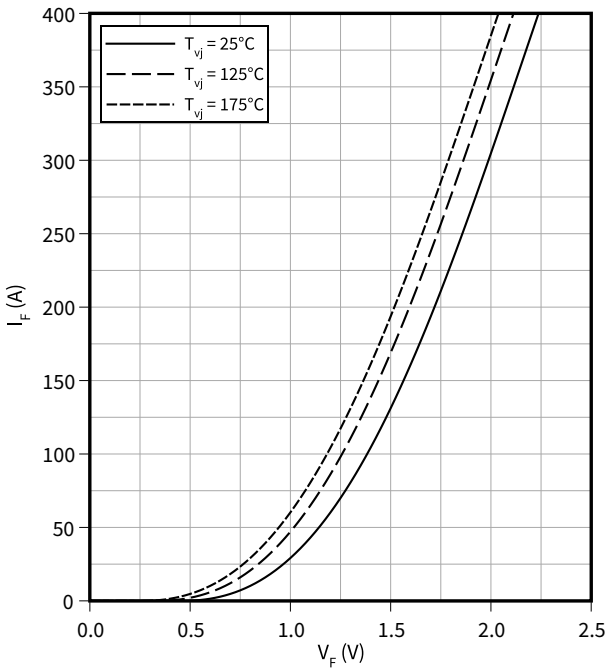
$Z_{th} = f(t)$



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Forward characteristic (typical), Diode, Inverter

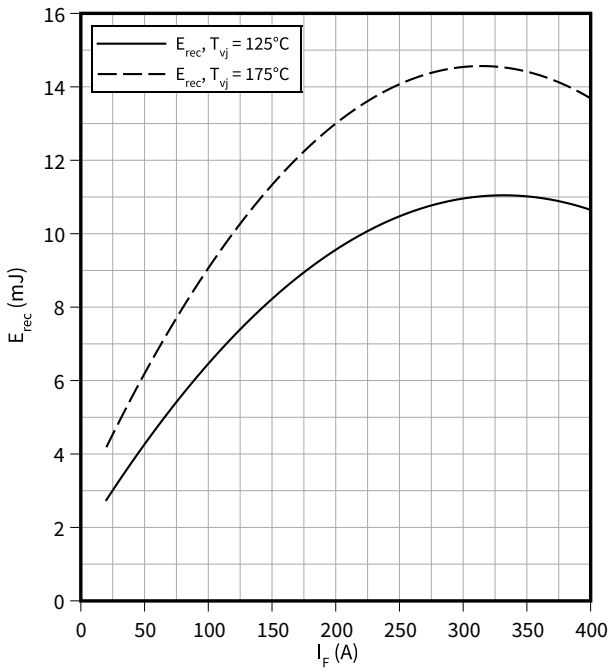
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

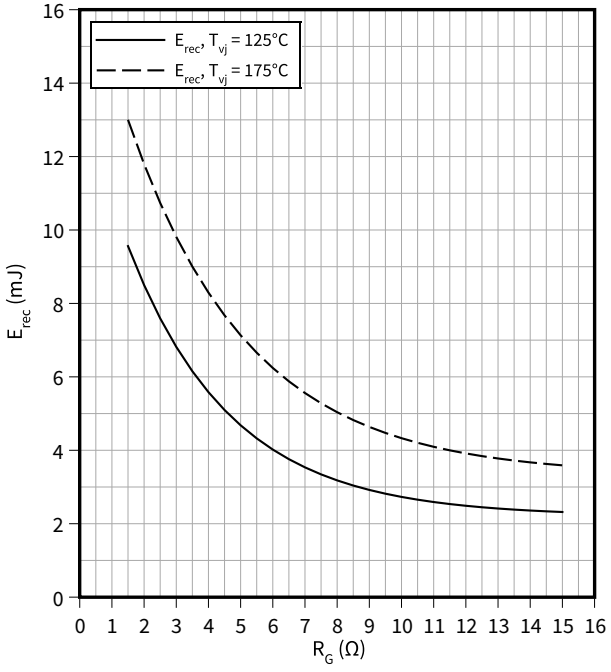
$R_{Gon} = 1.5\ \Omega$, $V_{CC} = 600\ V$



Switching losses (typical), Diode, Inverter

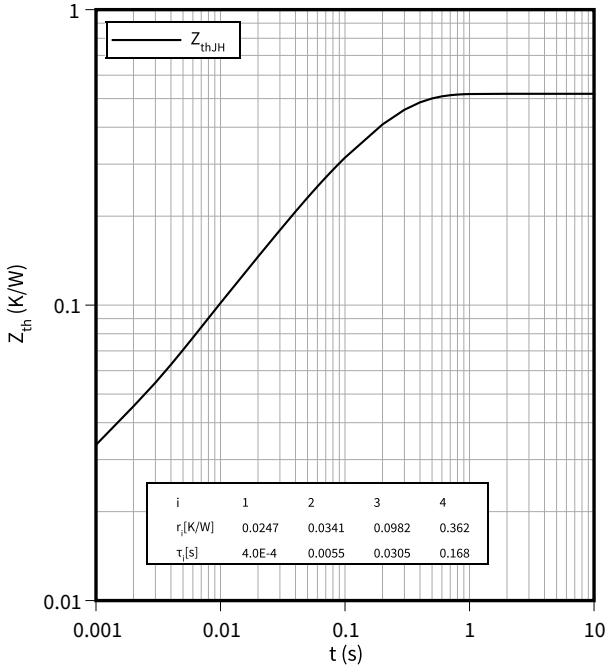
$E_{rec} = f(R_G)$

$I_F = 200\ A$, $V_{CC} = 600\ V$



Transient thermal impedance, Diode, Inverter

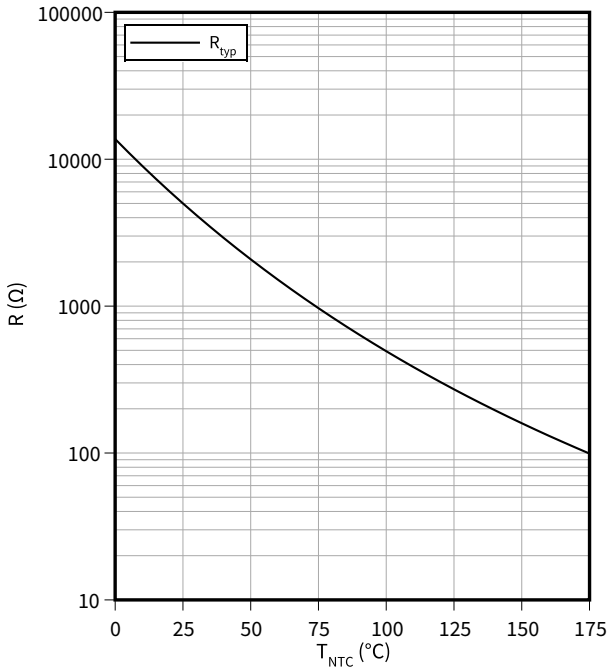
$Z_{th} = f(t)$



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Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



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6 Circuit diagram

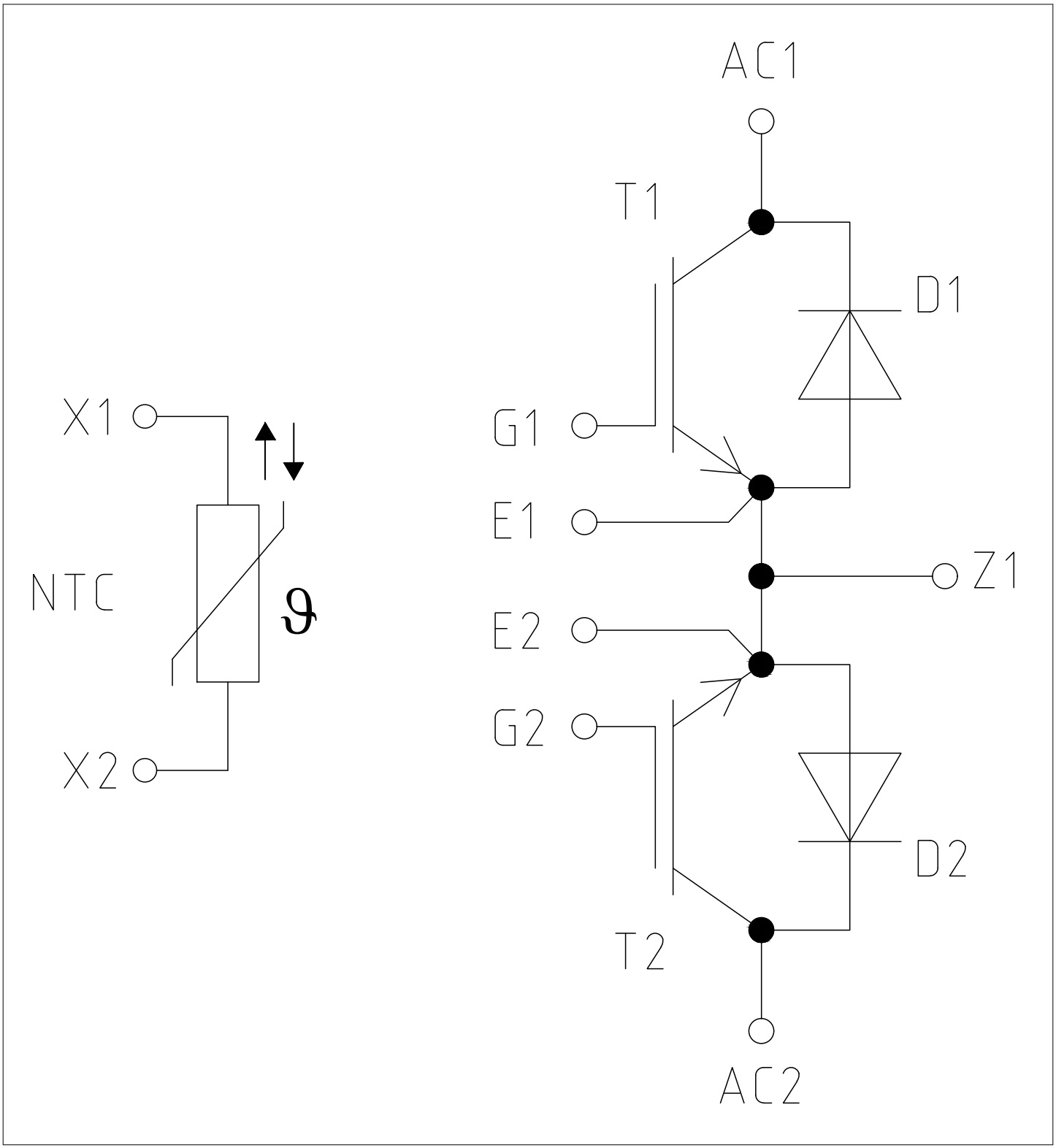


Figure 1

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7 Package outlines

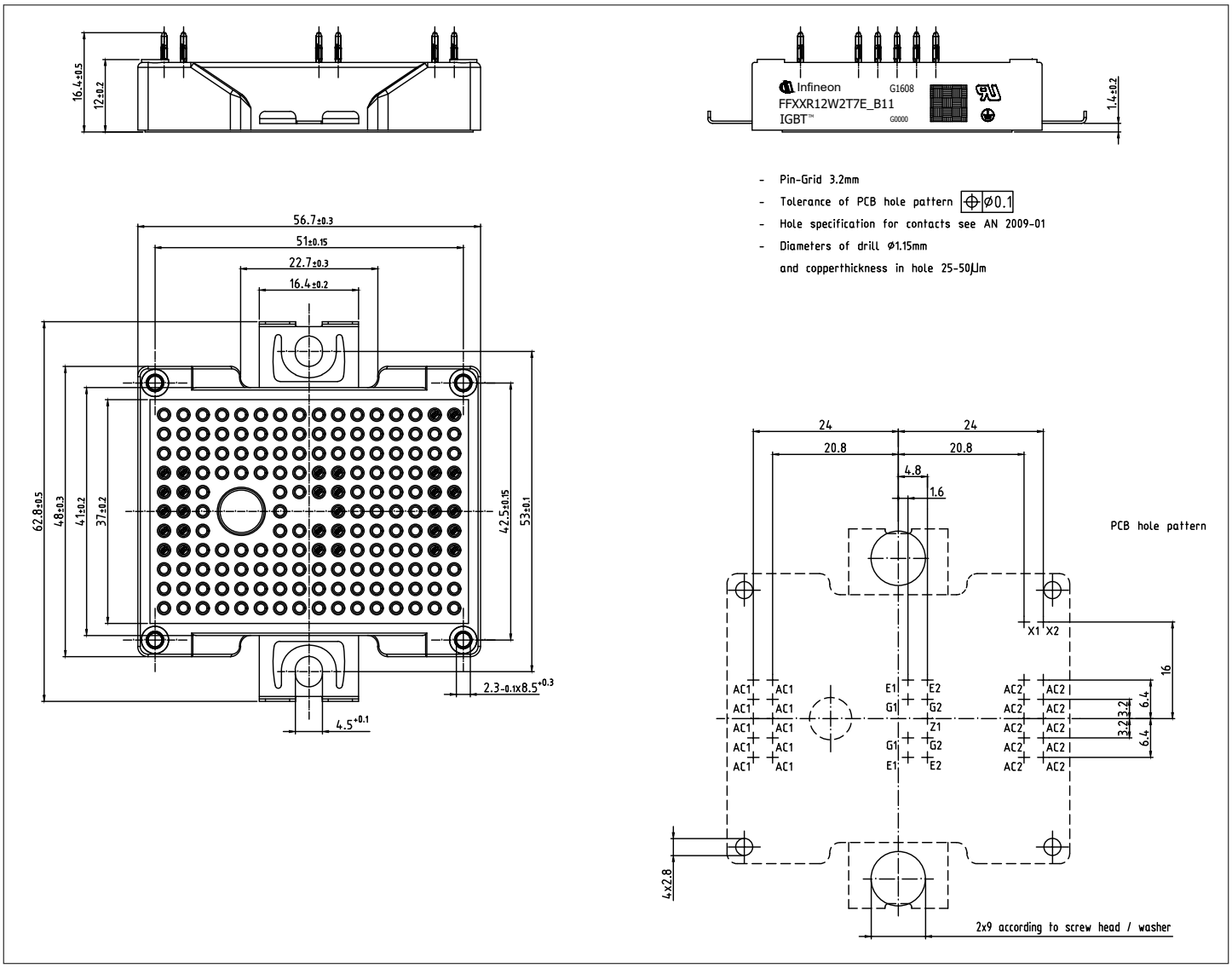


Figure 2

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8 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* Module serial number Module material number Production order number Date code (production year) Date code (production week)	*Digit* 1 – 5 6 - 11 12 - 19 20 – 21 22 – 23	*Example* 71549 142846 55054991 15 30
Example	7154914284655054991530		7154914284655054991530

Figure 3

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Revision history

Document version	Date of release	Description of changes
0.10	2024-04-03	Initial version
1.00	2024-05-03	Final datasheet

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Edition 2024-05-03

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference
IFX-ABJ807-002

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