EasyBRIDGE module with chopper configuration and PressFIT / pre-applied thermal interface material

Features


Typical appearance

- Electrical features
  - V_{CES} = 1700 V
  - $I_{C\ nom}$ = 50 A / I_{CRM} = 100 A
  - $T_{vj,op}$ = 150°C
  - Trench IGBT 4
  - 2.2 kV rectifier diodes
- Mechanical features
  - Al_2O_3 substrate with low thermal resistance
  - 4 kV AC 1 min insulation
  - PressFIT contact technology
  - Compact design
  - Rugged mounting due to integrated mounting clamps
  - Pre-applied thermal interface material

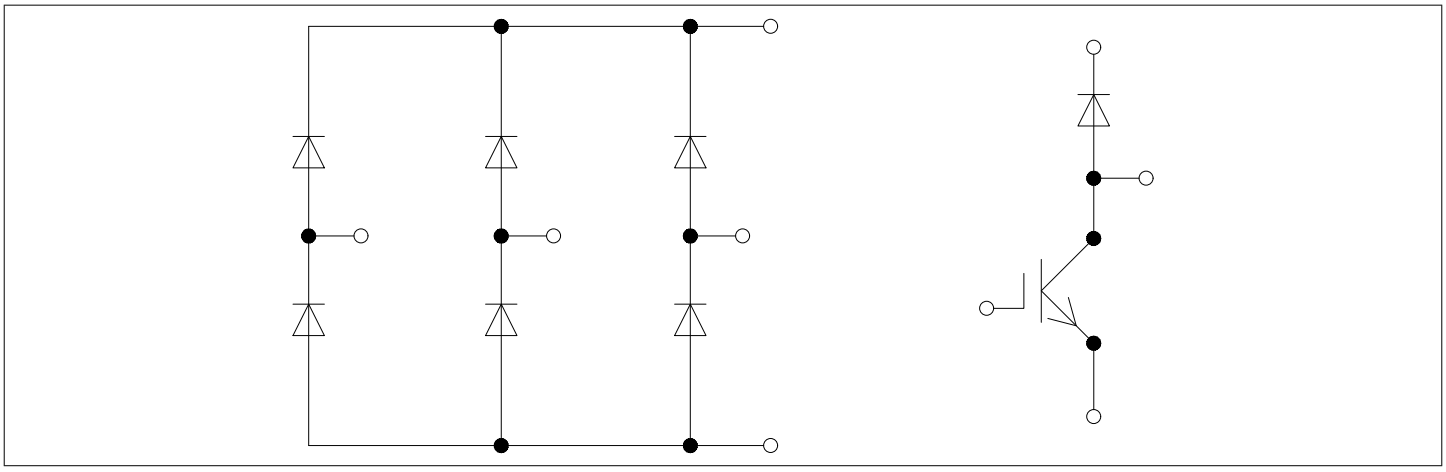
Potential applications

- Motor 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 Hz, *t* = 1 min	4.0	kV
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	11.5	mm
Creepage distance	d_{Creep}	terminal to terminal	6.3	mm
Clearance	d_{Clear}	terminal to heatsink	10.0	mm
Clearance	d_{Clear}	terminal to terminal	5.0	mm
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}			30		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	T_H=25°C, per switch		3.4		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_H=25°C, per switch		4		mΩ
Storage temperature	T_{stg}		-40		125	°C
Maximum baseplate operation temperature	T_{BPmax}				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.
Storage and shipment of modules with TIM => see AN 2012-07

2 IGBT-Chopper

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		T_{vj} = 25 °C	1700	V
Implemented collector current	I_{CN}			50	A

(table continues...)

Table 3 (continued) Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 150 °C	T_H = 65 °C	40	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		100	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 = 50 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.95	2.40	V
			T_{vj} = 125 °C		2.35		
			T_{vj} = 150 °C		2.45		
Gate threshold voltage	V_{GEth}	I_C = 2 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.25	5.80	6.35	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 900 V			0.6		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			9.5		Ω
Input capacitance	C_{ies}	f = 1000 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			4.5		nF
Reverse transfer capacitance	C_{res}	f = 1000 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} = 1700 V, V_{GE} = 0 V	T_{vj} = 25 °C			1	mA
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 = 50 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Gon} = 1 Ω	T_{vj} = 25 °C		1.240		µs
			T_{vj} = 125 °C		1.390		
			T_{vj} = 150 °C		1.430		
Rise time (inductive load)	t_r	I_C = 50 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Gon} = 1 Ω	T_{vj} = 25 °C		0.350		µs
			T_{vj} = 125 °C		0.410		
			T_{vj} = 150 °C		0.420		
Turn-off delay time (inductive load)	t_{doff}	I_C = 50 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Goff} = 1 Ω	T_{vj} = 25 °C		0.380		µs
			T_{vj} = 125 °C		0.520		
			T_{vj} = 150 °C		0.560		
Fall time (inductive load)	t_f	I_C = 50 A, V_{CC} = 900 V, V_{GE} = ±15 V, R_{Goff} = 1 Ω	T_{vj} = 25 °C		0.290		µs
			T_{vj} = 125 °C		0.530		
			T_{vj} = 150 °C		0.610		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on energy loss per pulse	E_{on}	I_C = 50 A, V_{CC} = 900 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Gon} = 1 Ω, di/dt = 960 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		11.4		mJ
			T_{vj} = 125 °C		15.7		
			T_{vj} = 150 °C		17		
Turn-off energy loss per pulse	E_{off}	I_C = 50 A, V_{CC} = 900 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Goff} = 1 Ω, dv/dt = 2850 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		9.1		mJ
			T_{vj} = 125 °C		15.3		
			T_{vj} = 150 °C		17.3		
SC data	I_{SC}	V_{GE} ≤ 15 V, V_{CC} = 1000 V, V_{CEmax}=V_{CES}-L_{sCE}*di/dt	t_P ≤ 10 µs, T_{vj}=150 °C		240		A
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material				0.711	K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

3 Diode, Chopper

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		T_{vj} = 25 °C	1700	V
Continuous DC forward current	I_F			50	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		100	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	425	A^2s
			T_{vj} = 150 °C	390	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 50 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.80	2.20	V
			T_{vj} = 125 °C		1.90		
			T_{vj} = 150 °C		1.95		
Peak reverse recovery current	I_{RM}	V_{CC} = 900 V, I_F = 50 A, V_{GE} = -15 V, -di$_F$/dt = 960 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		40		A
			T_{vj} = 125 °C		46.6		
			T_{vj} = 150 °C		47.6		

(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 V, I_F = 50 A, V_{GE} = -15 V, -di$_F$/dt = 960 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		11.6		µC
			T_{vj} = 125 °C		19.3		
			T_{vj} = 150 °C		21.5		
Reverse recovery energy	E_{rec}	V_{CC} = 900 V, I_F = 50 A, V_{GE} = -15 V, -di$_F$/dt = 960 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		6.6		mJ
			T_{vj} = 125 °C		11.4		
			T_{vj} = 150 °C		12.8		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material				1.09	K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

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 °C	2200	V
Maximum RMS forward current per chip	I_{FRMSM}	T_H = 65 °C		40	A
Maximum RMS current at rectifier output	I_{RMSM}	T_H = 65 °C		70	A
Surge forward current	I_{FSM}	t_P = 10 ms	T_{vj} = 125 °C	250	A
			T_{vj} = 150 °C	235	
I^2t - value	I^2t	t_P = 10 ms	T_{vj} = 125 °C	320	A^2s
			T_{vj} = 150 °C	285	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 50 A	T_{vj} = 25 °C		1.22		V
			T_{vj} = 125 °C		1.20		
			T_{vj} = 150 °C		1.20		
Reverse current	I_r	T_{vj} = 150 °C, V_R = 1760 V			2		mA
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material				1.57	K/W

(table continues...)

Table 8 (continued) Characteristic values

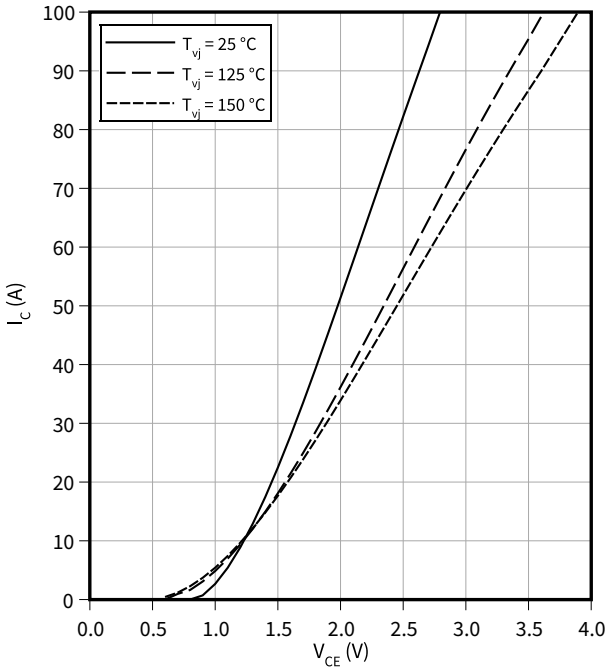
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Temperature under switching conditions	$T_{vj, op}$		-40		150	°C

5 Characteristics diagrams

Output characteristic (typical), IGBT-Chopper

$I_C = f(V_{CE})$

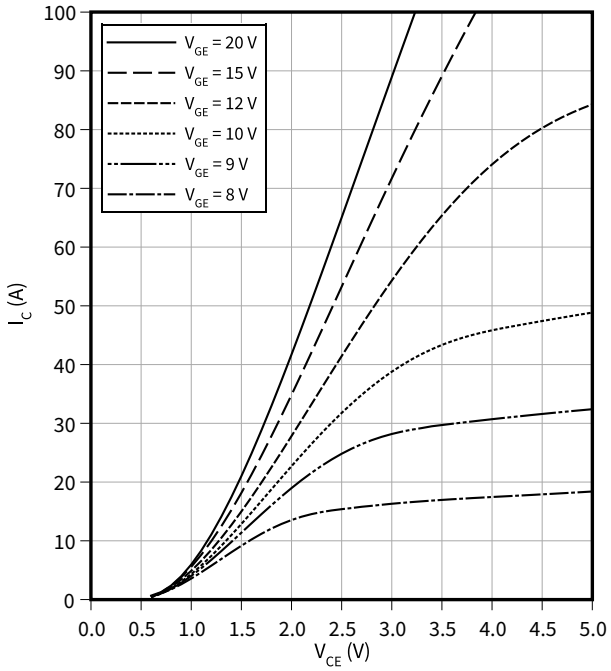
V_{GE} = 15 V



Output characteristic field (typical), IGBT-Chopper

$I_C = f(V_{CE})$

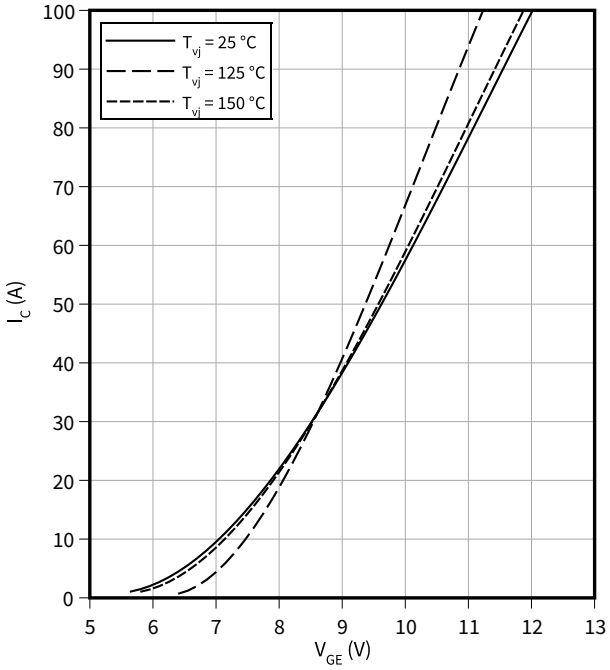
T_{vj} = 150 °C



Transfer characteristic (typical), IGBT-Chopper

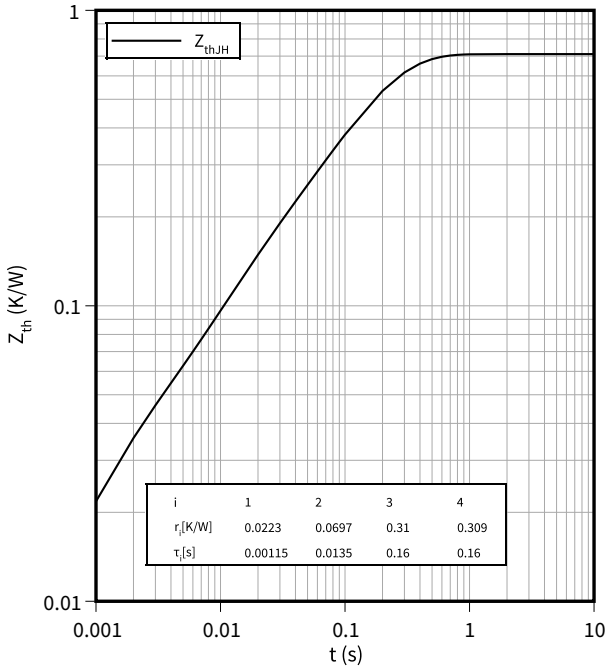
$I_C = f(V_{GE})$

V_{CE} = 20 V



Transient thermal impedance , IGBT-Chopper

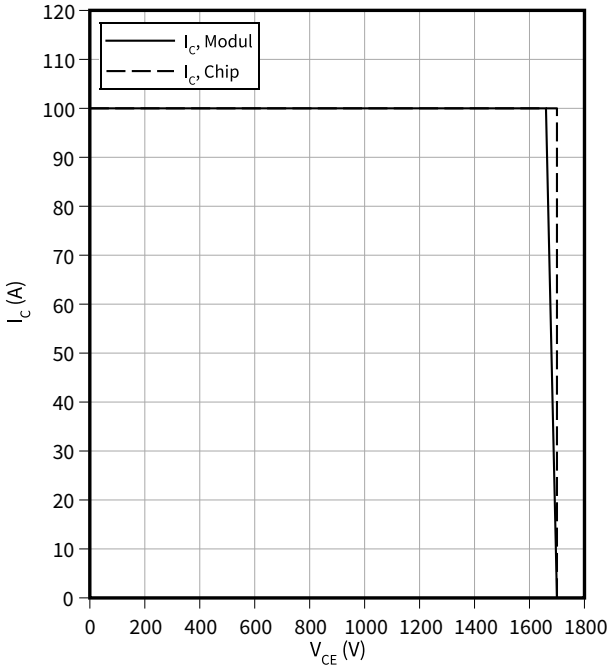
$Z_{th} = f(t)$



Reverse bias safe operating area (RBSOA), IGBT-Chopper

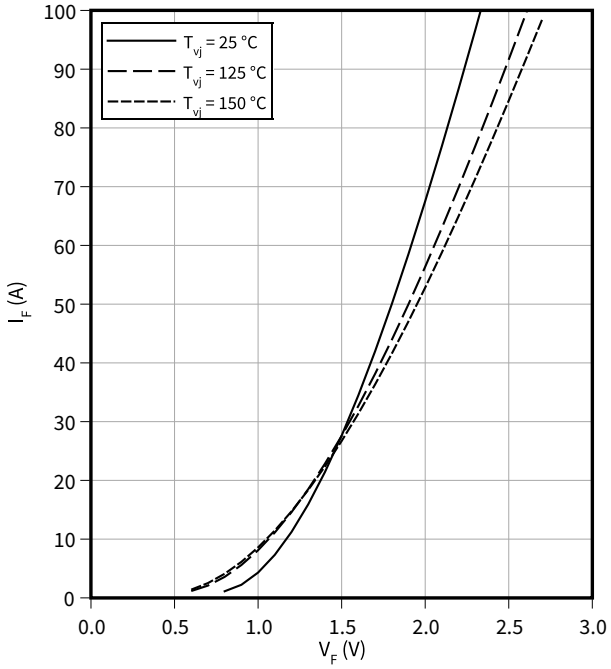
$I_C = f(V_{CE})$

$R_{Goff} = 1\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 150$ °C



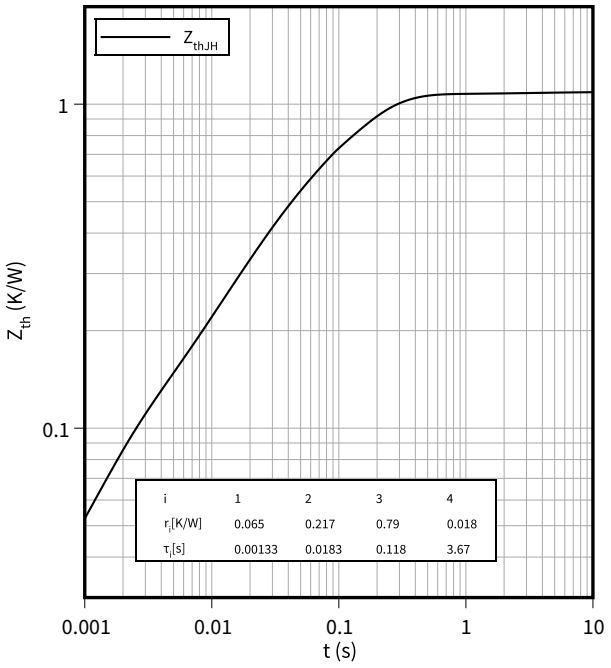
Forward characteristic (typical), Diode, Chopper

$I_F = f(V_F)$



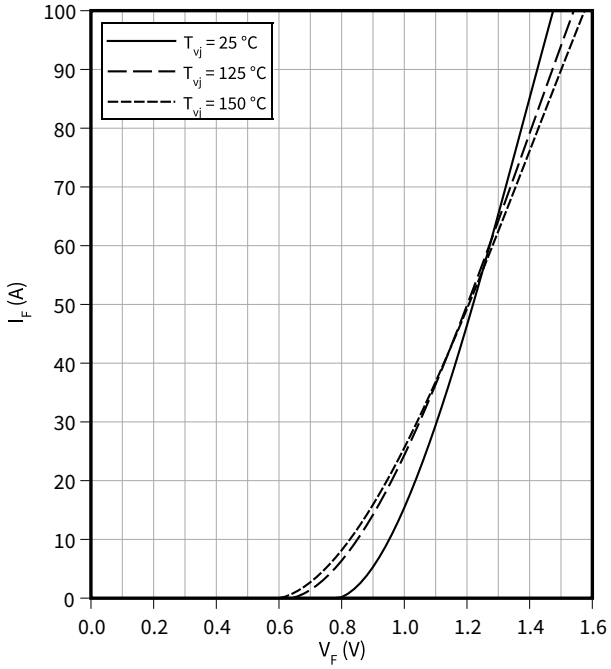
Transient thermal impedance, Diode, Chopper

$Z_{th} = f(t)$



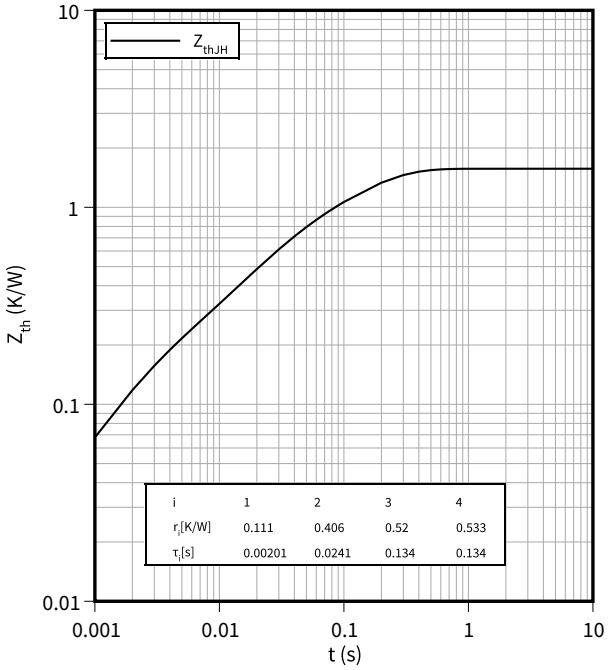
Forward characteristic (typical), Diode, Rectifier

$I_F = f(V_F)$



Transient thermal impedance, Diode, Rectifier

$Z_{th} = f(t)$



6 Circuit diagram

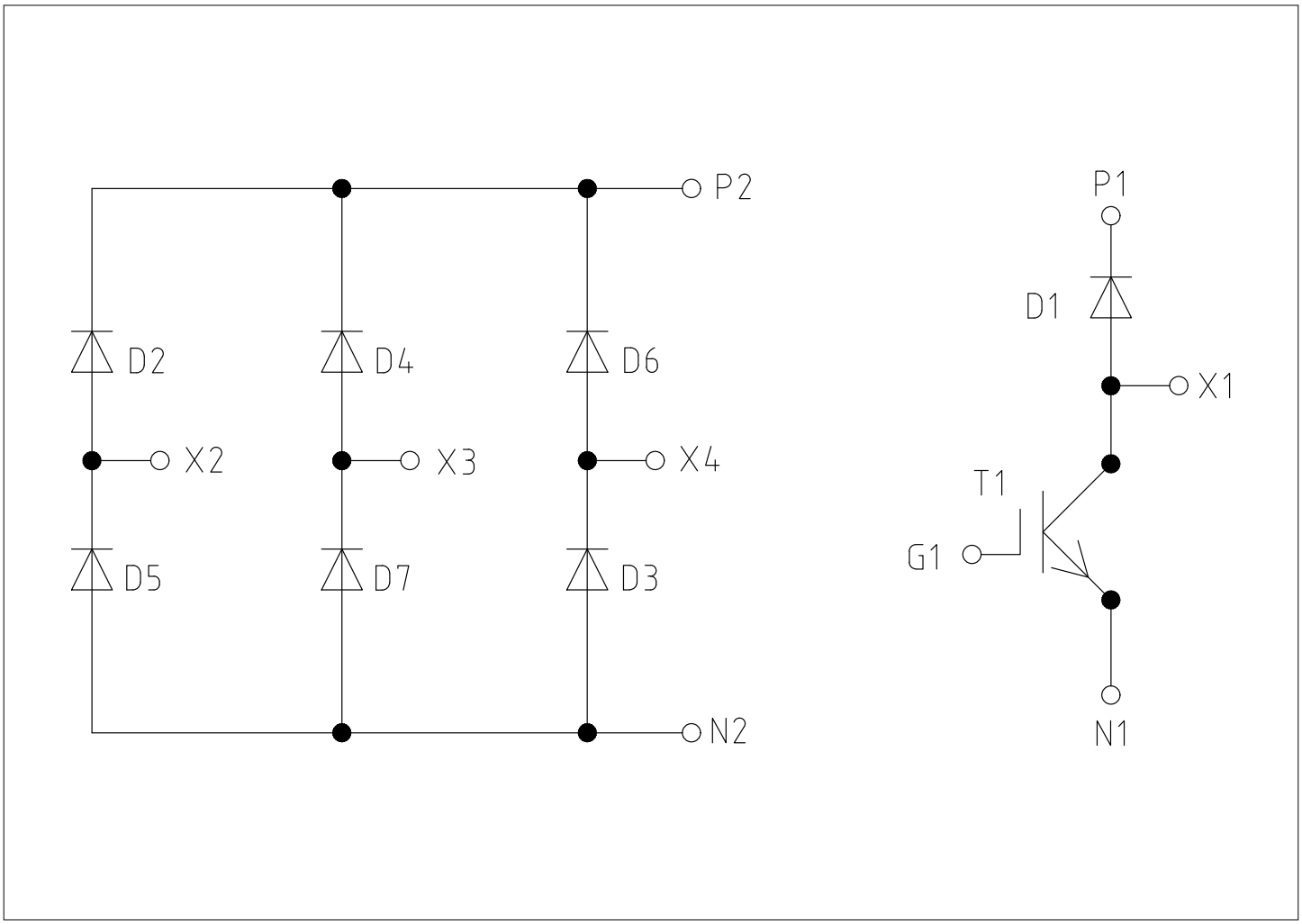


Figure 1

7 Package outlines

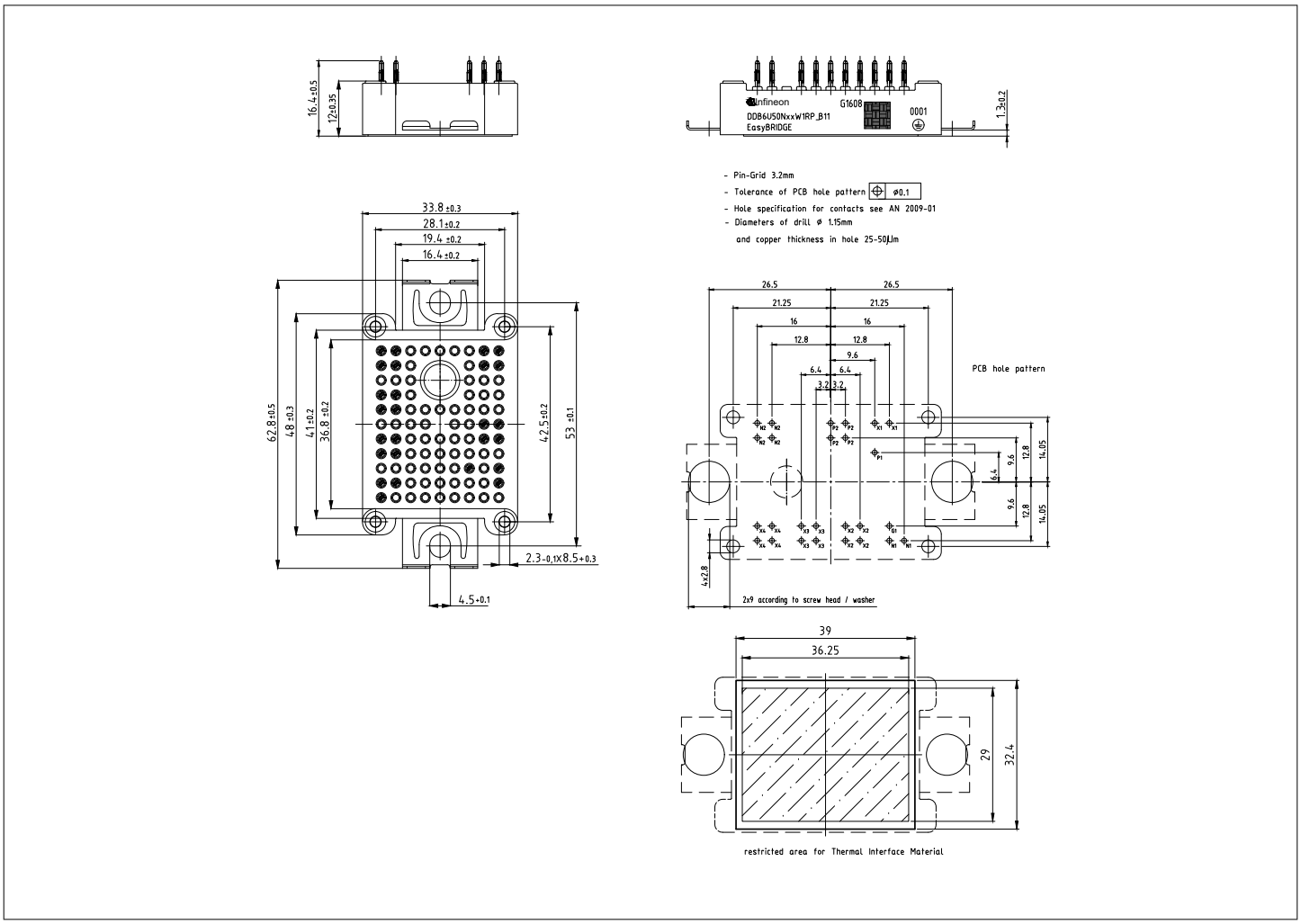


Figure 2

8 Module label code

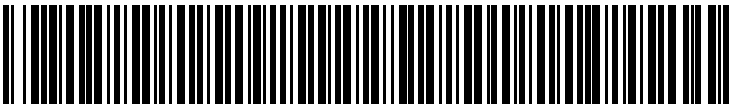
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production week)	*Digit* 1 – 5 6 - 11 12 - 19 20 – 21 22 – 23	*Example* 71549 142846 55054991 15 30
Example	 7154914284655054991530		 7154914284655054991530

Figure 3

Revision history

Document revision	Date of release	Description of changes
0.10	2021-09-21	Initial version
0.20	2022-07-29	Preliminary datasheet
1.00	2022-09-05	Final datasheet

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Edition 2022-09-05

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference
IFX-ABB286-003

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