

## Preliminary datasheet

### EasyBRIDGE module with chopper configuration and PressFIT / pre-applied Thermal Interface Material

#### Features

- Electrical features
  - $V_{CES} = 1200\text{ V}$
  - $I_{C\text{ nom}} = 50\text{ A} / I_{CRM} = 100\text{ A}$
  - TRENCHSTOP™ IGBT7
- Mechanical features
  - $\text{Al}_2\text{O}_3$  substrate with low thermal resistance
  - Compact design
  - PressFIT contact technology
  - Pre-applied Thermal Interface Material
  - Rugged mounting due to integrated mounting clamps



Typical appearance

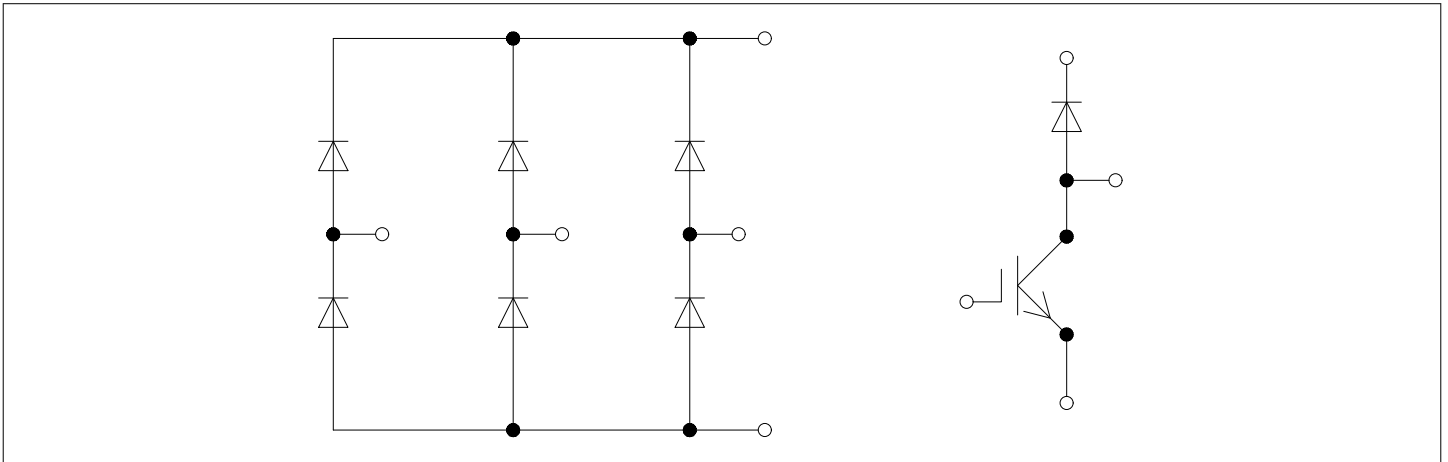
#### Potential applications

- Auxiliary inverters
- Air conditioning
- 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

	<b>Description</b> .....	1
	<b>Features</b> .....	1
	<b>Potential applications</b> .....	1
	<b>Product validation</b> .....	1
	<b>Table of contents</b> .....	2
<b>1</b>	<b>Package</b> .....	3
<b>2</b>	<b>IGBT-Chopper</b> .....	3
<b>3</b>	<b>Diode, Chopper</b> .....	5
<b>4</b>	<b>Diode, Rectifier</b> .....	6
<b>5</b>	<b>Characteristics diagrams</b> .....	8
<b>6</b>	<b>Circuit diagram</b> .....	11
<b>7</b>	<b>Package outlines</b> .....	12
	<b>Revision history</b> .....	13
	<b>Disclaimer</b> .....	14

## 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
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	
RTI Elec.	$RTI$	housing	140	°C

**Table 2** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	$L_{SCE}$			30		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25^\circ\text{C}$ , per switch		4		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25^\circ\text{C}$ , per switch		6		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 25A 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	$V_{CES}$	$T_{vj} = 25^\circ\text{C}$	1200	V
Continuous DC collector current	$I_{CDC}$	$T_{vj\ max} = 175^\circ\text{C}$ $T_H = 85^\circ\text{C}$	50	A
Repetitive peak collector current	$I_{CRM}$	$t_p = 1 \text{ ms}$	100	A

**Table 3** Maximum rated values (continued)

Parameter	Symbol	Note or test condition	Values	Unit
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	$V_{CE\ sat}$	$I_C = 50\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$	1.50	TBD	V
			$T_{vj} = 125\ ^\circ C$	1.64		
			$T_{vj} = 175\ ^\circ C$	1.72		
Gate threshold voltage	$V_{GEth}$	$I_C = 1.28\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V
Gate charge	$Q_G$	$V_{GE} = \pm 15\ V, V_{CE} = 600\ V$		0.92		$\mu C$
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\ ^\circ C$		0		$\Omega$
Input capacitance	$C_{ies}$	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		11.1		nF
Reverse transfer capacitance	$C_{res}$	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		0.039		nF
Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 1200\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			0.0062 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)	$t_{don}$	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.042		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.045		
			$T_{vj} = 175\ ^\circ C$	0.046		
Rise time (inductive load)	$t_r$	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.036		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.040		
			$T_{vj} = 175\ ^\circ C$	0.043		
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.270		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.350		
			$T_{vj} = 175\ ^\circ C$	0.370		
Fall time (inductive load)	$t_f$	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.110		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.200		
			$T_{vj} = 175\ ^\circ C$	0.270		
Turn-on energy loss per pulse	$E_{on}$	$I_C = 50\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 5.1\ \Omega, di/dt = 850\ A/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	4.47		mJ
			$T_{vj} = 125\ ^\circ C$	5.2		
			$T_{vj} = 175\ ^\circ C$	5.67		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 50\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 5.1\ \Omega, dv/dt = 2900\ V/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	3.36		mJ
			$T_{vj} = 125\ ^\circ C$	5.25		
			$T_{vj} = 175\ ^\circ C$	6.45		

**Table 4** Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	$I_{SC}$	$V_{GE} \leq 15 \text{ V}, V_{CC} = 800 \text{ V}, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_p \leq 8 \mu\text{s}, T_{vj} = 150 \text{ }^\circ\text{C}$	190		A
			$t_p \leq 7 \mu\text{s}, T_{vj} = 175 \text{ }^\circ\text{C}$	180		
Thermal resistance, junction to heatsink	$R_{thJH}$	per IGBT, Valid with IFX pre-applied Thermal Interface Material			0.840	K/W
Temperature under switching conditions	$T_{vjop}$		-40		175	$^\circ\text{C}$

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

### 3 Diode, Chopper

**Table 5** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1200	V	
Continuous DC forward current	$I_F$		25	A	
Repetitive peak forward current	$I_{FRM}$	$t_p = 1 \text{ ms}$	50	A	
$I^2t$ - value	$I^2t$	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	72.5	$\text{A}^2\text{s}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$	63	

**Table 6** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 25 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.83		V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1.70		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1.63		
Peak reverse recovery current	$I_{RM}$	$I_F = 25 \text{ A}, V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, -di_F/dt = 960 \text{ A}/\mu\text{s} (T_{vj} = 175 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	21.6		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	25.3		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	27.6		

**Table 6** Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Recovered charge	$Q_r$	$I_F = 25\text{ A}$ , $V_R = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 960\text{ A}/\mu\text{s}$ ( $T_{vj} = 175\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$	1.89		$\mu\text{C}$
			$T_{vj} = 125\text{ }^\circ\text{C}$	3.53		
			$T_{vj} = 175\text{ }^\circ\text{C}$	4.62		
Reverse recovery energy	$E_{rec}$	$I_F = 25\text{ A}$ , $V_R = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 960\text{ A}/\mu\text{s}$ ( $T_{vj} = 175\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$	0.62		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	1.3		
			$T_{vj} = 175\text{ }^\circ\text{C}$	1.74		
Thermal resistance, junction to heatsink	$R_{thJH}$	per diode, Valid with IFX pre-applied Thermal Interface Material			1.90	K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	$^\circ\text{C}$

Note:  $T_{vj\text{ op}} > 150\text{ }^\circ\text{C}$  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	$V_{RRM}$	$T_{vj} = 25\text{ }^\circ\text{C}$	1600	V	
Maximum RMS forward current per chip	$I_{FRMSM}$	$T_H = 100\text{ }^\circ\text{C}$	50	A	
Maximum RMS current at rectifier output	$I_{RMSM}$	$T_H = 100\text{ }^\circ\text{C}$	85	A	
Surge forward current	$I_{FSM}$	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ }^\circ\text{C}$	500	A
			$T_{vj} = 150\text{ }^\circ\text{C}$	400	
$I^2t$ - value	$I^2t$	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ }^\circ\text{C}$	1250	$\text{A}^2\text{s}$
			$T_{vj} = 150\text{ }^\circ\text{C}$	800	

**Table 8** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 50\text{ A}$ , $T_{vj} = 150\text{ }^\circ\text{C}$		0.96		V
Reverse current	$I_r$	$T_{vj} = 150\text{ }^\circ\text{C}$ , $V_R = 1600\text{ V}$		1		mA
Thermal resistance, junction to heatsink	$R_{thJH}$	per diode, Valid with IFX pre-applied Thermal Interface Material			1.11	K/W

**Table 8**                    **Characteristic values (continued)**

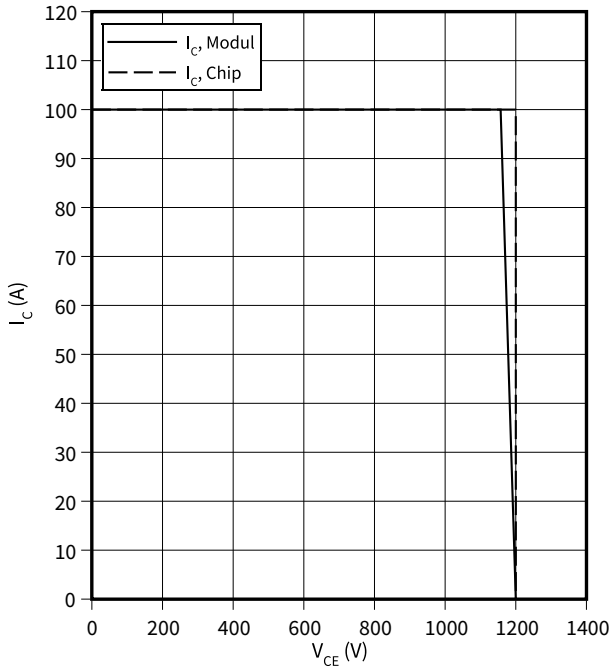
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Temperature under switching conditions	$T_{vj, op}$		-40		150	°C

## 5 Characteristics diagrams

### reverse bias safe operating area (RBSOA), IGBT-Chopper

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

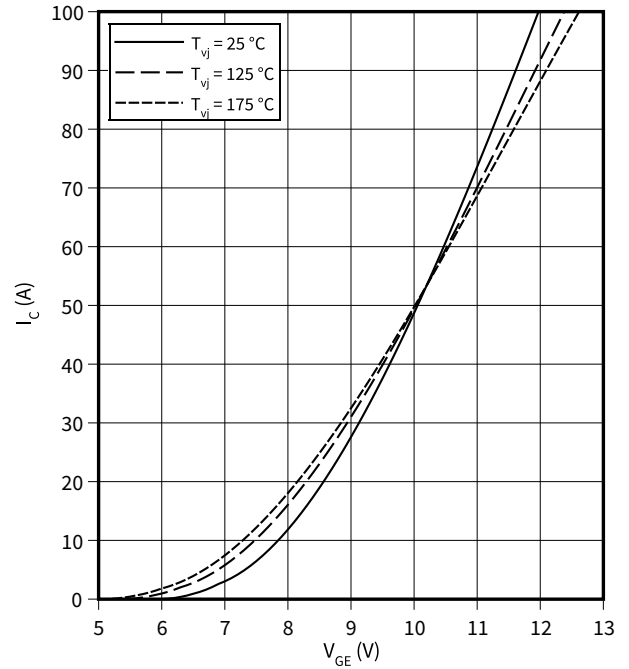
$R_{Goff} = 5.1 \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 175 \text{ }^\circ\text{C}$



### transfer characteristic (typical), IGBT-Chopper

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

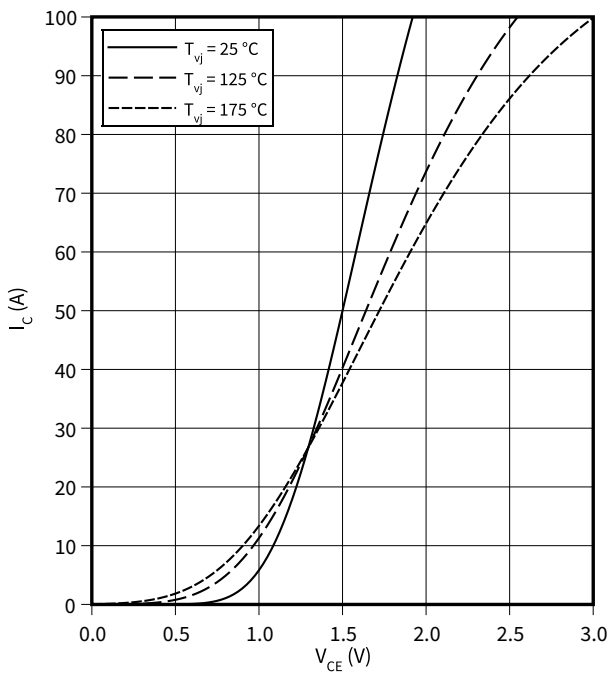
$V_{CE} = 20 \text{ V}$



### output characteristic (typical), IGBT-Chopper

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

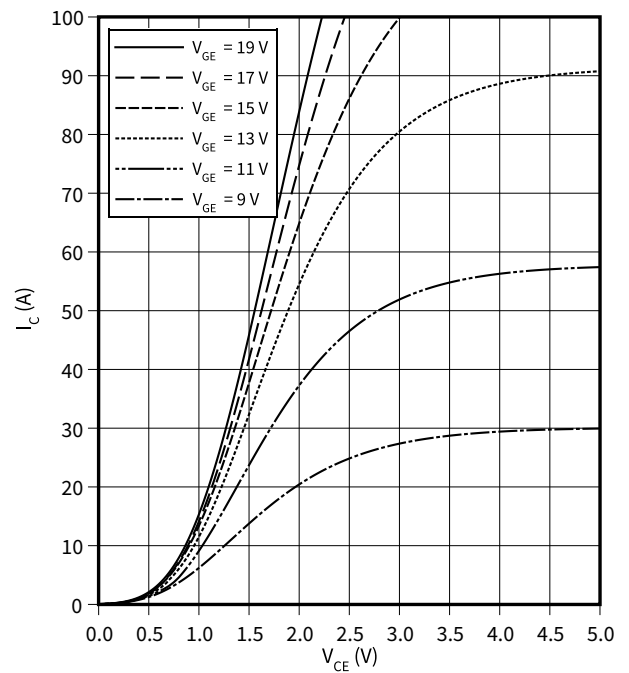
$V_{GE} = 15 \text{ V}$



### output characteristic (typical), IGBT-Chopper

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

$T_{vj} = 175 \text{ }^\circ\text{C}$

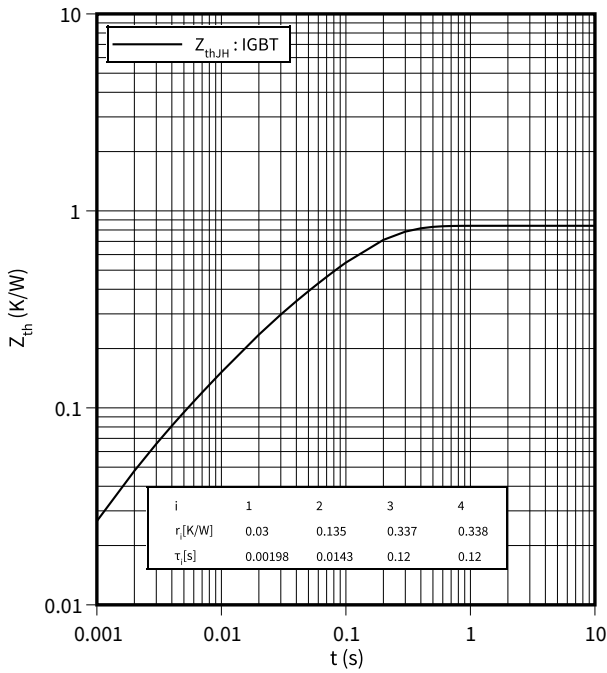




5 Characteristics diagrams

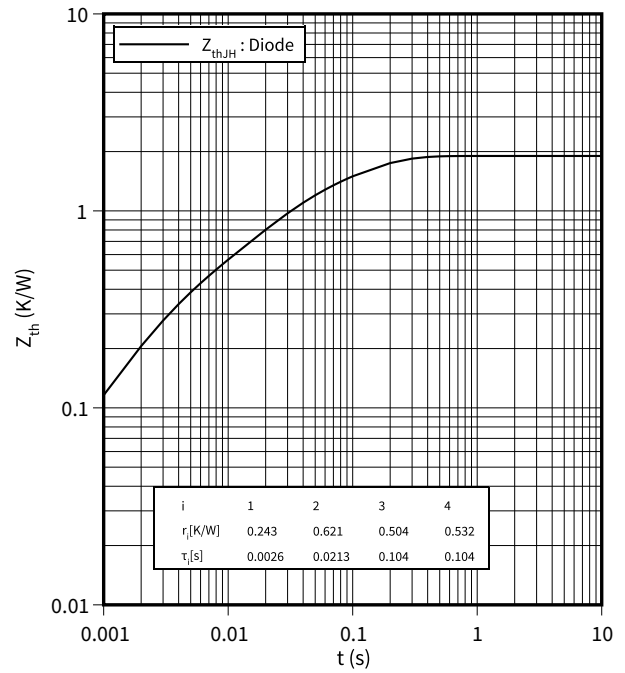
**transient thermal impedance , IGBT-Chopper**

$Z_{th} = f(t)$



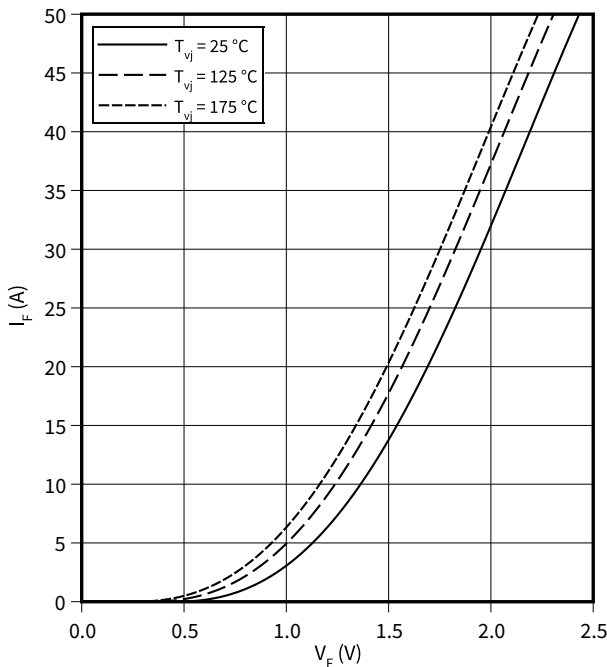
**transient thermal impedance , Diode, Chopper**

$Z_{th} = f(t)$



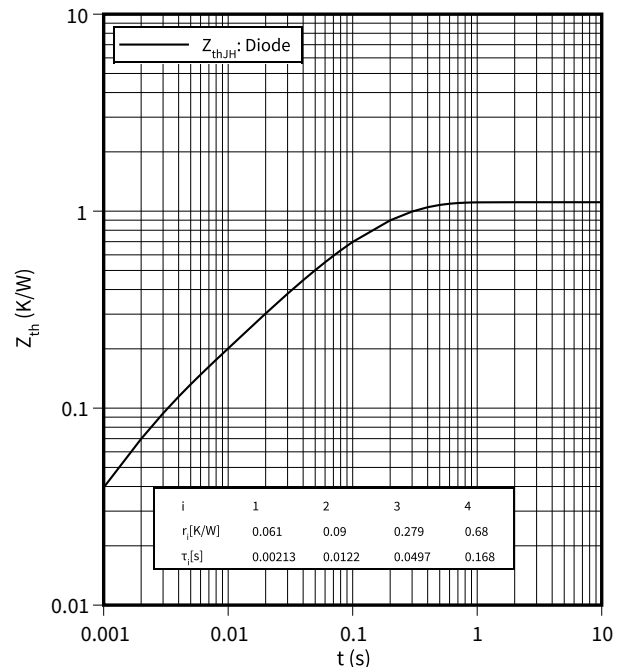
**forward characteristic of (typical), Diode, Chopper**

$I_F = f(V_F)$



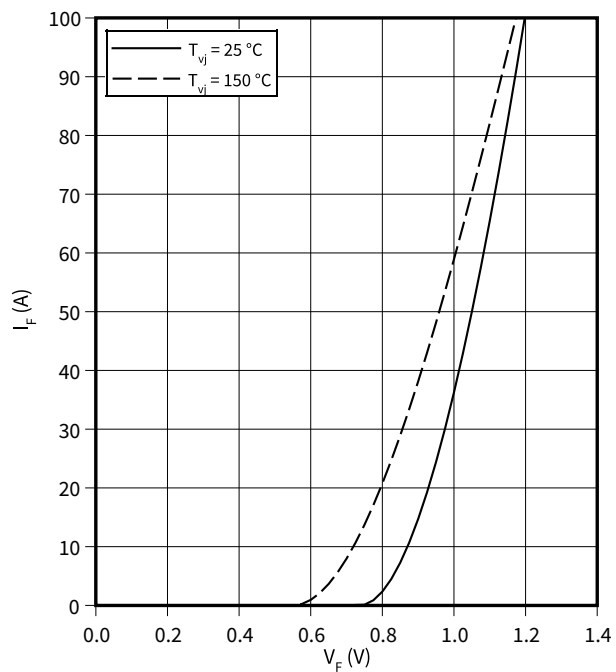
**transient thermal impedance , Diode, Rectifier**

$Z_{th} = f(t)$



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

$I_F = f(V_F)$



## 6 Circuit diagram

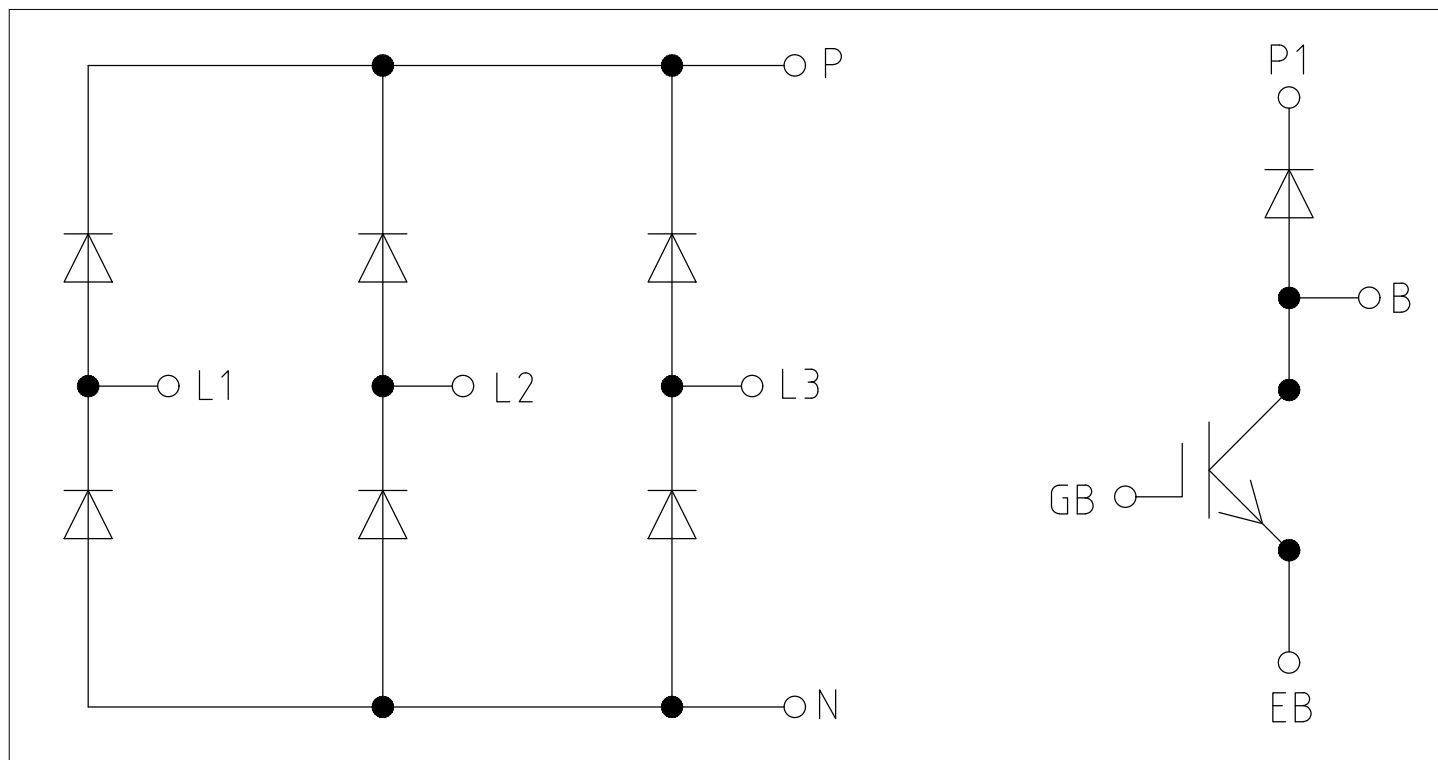


Figure 2

7 Package outlines

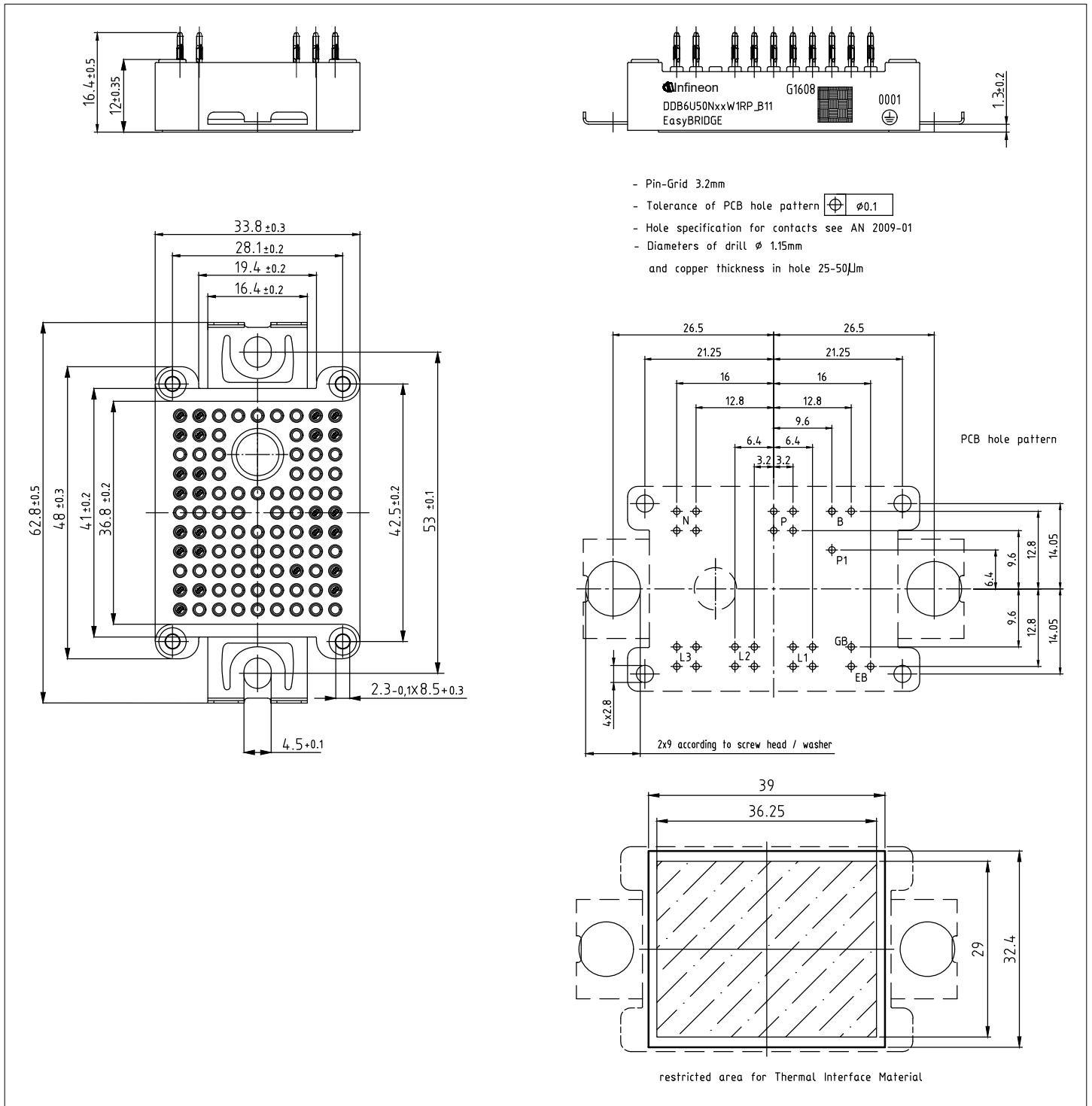


Figure 3

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Revision history

## Revision history

Document revision	Date of release	Description of changes
0.10	2021-08-27	Initial version

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