

## Preliminary datasheet

### EasyBRIDGE module with chopper configuration

#### 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
  - Solder contact technology
  - Rugged mounting due to integrated mounting clamps



Typical appearance

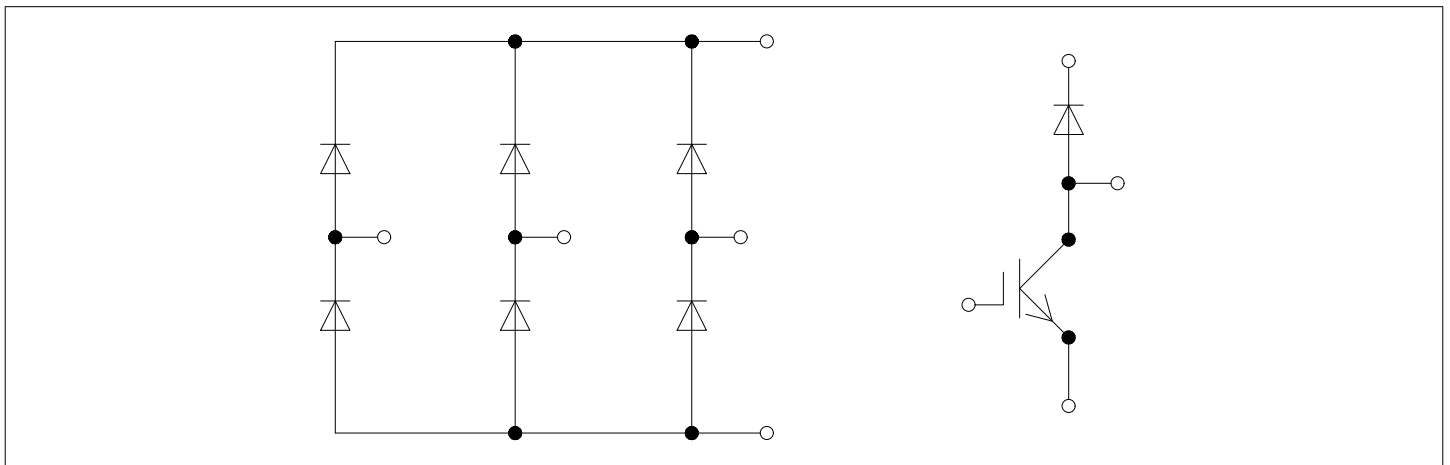
#### Potential applications

- 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



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1 Package

## 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
Mounting force per clamp	$F$		20		50	N
Weight	$G$			24		g

Note: The current under continuous operation is limited to 30A rms per connector pin.

## 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	$I_{CDC}$	$T_{vj \text{ max}} = 175^\circ\text{C}$ $T_H = 85^\circ\text{C}$	50	A
Repetitive peak collector current	$I_{CRM}$	$t_p = 1 \text{ ms}$	100	A
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		
SC data	$I_{SC}$	$V_{GE} \leq 15\ V, V_{CC} = 800\ V, V_{CEmax} = V_{CES} - L_{sCE} * di/dt$	$t_p \leq 8\ \mu s, T_{vj} = 150\ ^\circ C$		190		A
			$t_p \leq 7\ \mu s, T_{vj} = 175\ ^\circ C$		180		

**Table 4** Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction to heatsink	$R_{thJH}$	per IGBT		0.840		K/W
Temperature under switching conditions	$T_{vj\ op}$		-40		175	°C

Note:  $T_{vj\ op} > 150^{\circ}\text{C}$  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	$V_{RRM}$	$T_{vj} = 25^{\circ}\text{C}$	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	$I^2t$	$V_R = 0\ \text{V}, t_p = 10\ \text{ms}$	$T_{vj} = 125^{\circ}\text{C}$	72.5	$\text{A}^2\text{s}$
			$T_{vj} = 175^{\circ}\text{C}$	63	

**Table 6** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 25\ \text{A}, V_{GE} = 0\ \text{V}$	$T_{vj} = 25^{\circ}\text{C}$		1.83	V
			$T_{vj} = 125^{\circ}\text{C}$		1.70	
			$T_{vj} = 175^{\circ}\text{C}$		1.63	
Peak reverse recovery current	$I_{RM}$	$I_F = 25\ \text{A}, V_R = 600\ \text{V}, V_{GE} = -15\ \text{V}, -di_F/dt = 960\ \text{A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		21.6	A
			$T_{vj} = 125^{\circ}\text{C}$		25.3	
			$T_{vj} = 175^{\circ}\text{C}$		27.6	
Recovered charge	$Q_r$	$I_F = 25\ \text{A}, V_R = 600\ \text{V}, V_{GE} = -15\ \text{V}, -di_F/dt = 960\ \text{A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		1.89	$\mu\text{C}$
			$T_{vj} = 125^{\circ}\text{C}$		3.53	
			$T_{vj} = 175^{\circ}\text{C}$		4.62	
Reverse recovery energy	$E_{rec}$	$I_F = 25\ \text{A}, V_R = 600\ \text{V}, V_{GE} = -15\ \text{V}, -di_F/dt = 960\ \text{A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		0.62	mJ
			$T_{vj} = 125^{\circ}\text{C}$		1.3	
			$T_{vj} = 175^{\circ}\text{C}$		1.74	

**Table 6** Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction to heatsink	$R_{thJH}$	per diode		1.85		K/W
Temperature under switching conditions	$T_{vj,op}$		-40		175	°C

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

**Table 8** Characteristic values

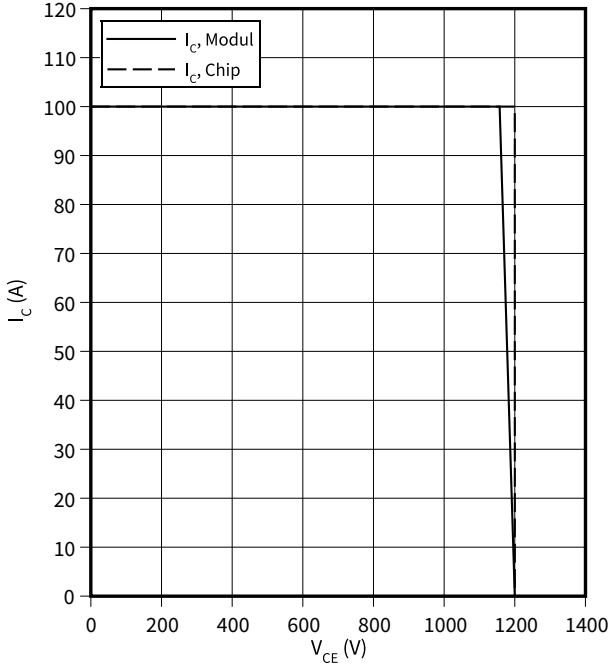
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 50\text{ A}$ $T_{vj} = 150^{\circ}\text{C}$		0.96		V
Reverse current	$I_r$	$T_{vj} = 150^{\circ}\text{C}$ , $V_R = 1600\text{ V}$		1		mA
Thermal resistance, junction to heatsink	$R_{thJH}$	per diode		1.11		K/W
Temperature under switching conditions	$T_{vj,op}$		-40		150	°C

## 5 Characteristics diagrams

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

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

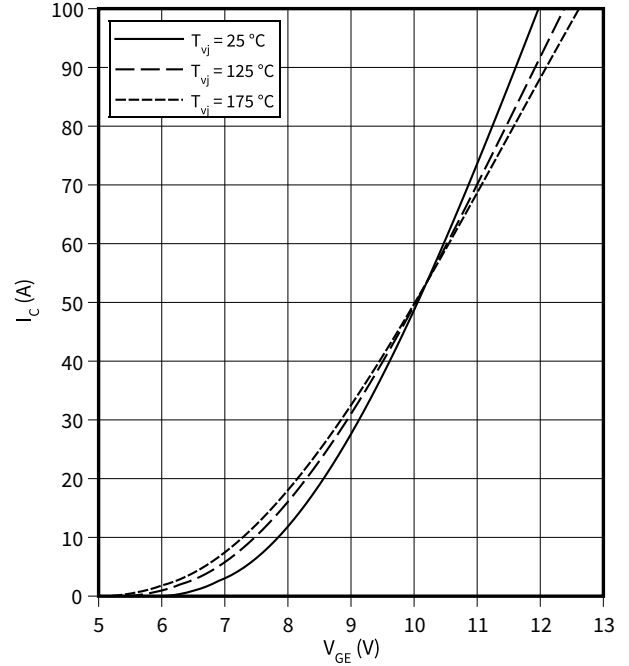
$R_{Goff} = 5.1 \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 175 \text{ }^\circ\text{C}$



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

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

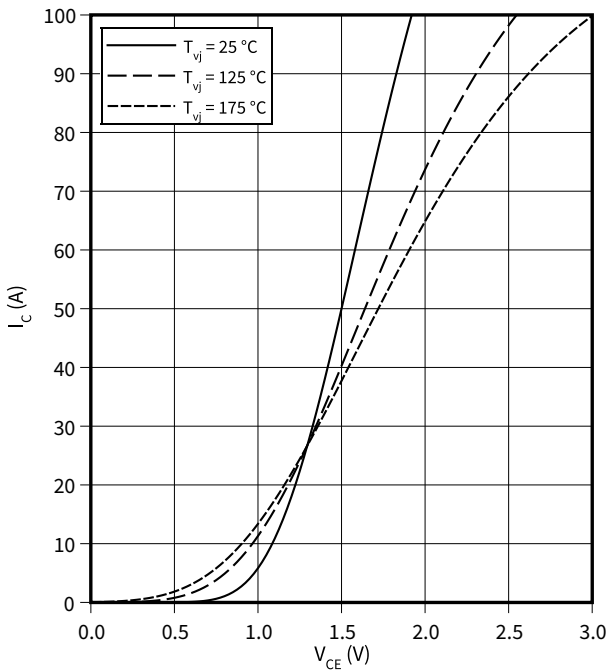
$V_{CE} = 20 \text{ V}$



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

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

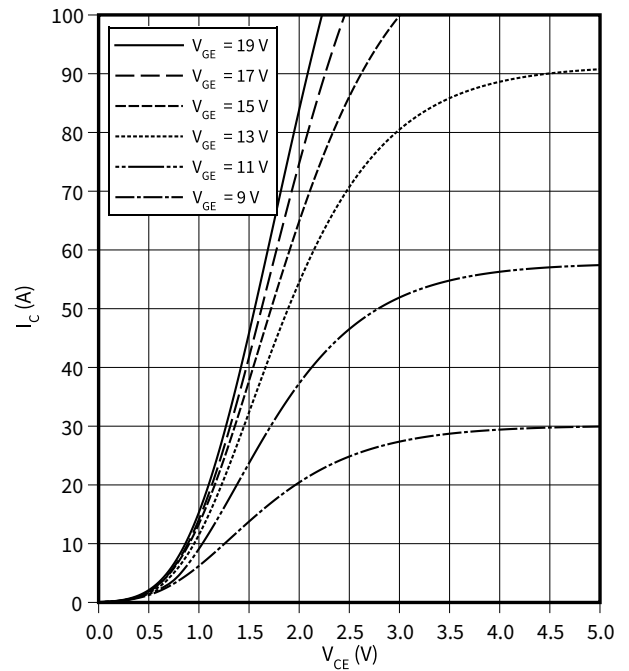
$V_{GE} = 15 \text{ V}$



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

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

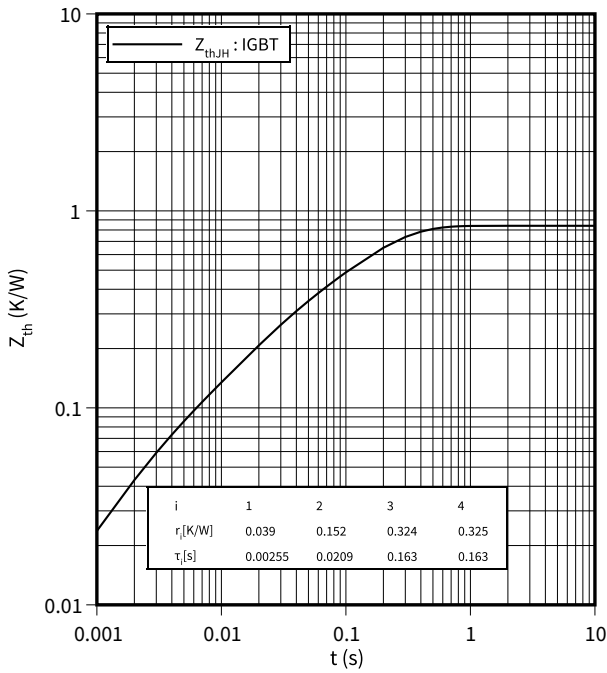
$T_{vj} = 175 \text{ }^\circ\text{C}$



5 Characteristics diagrams

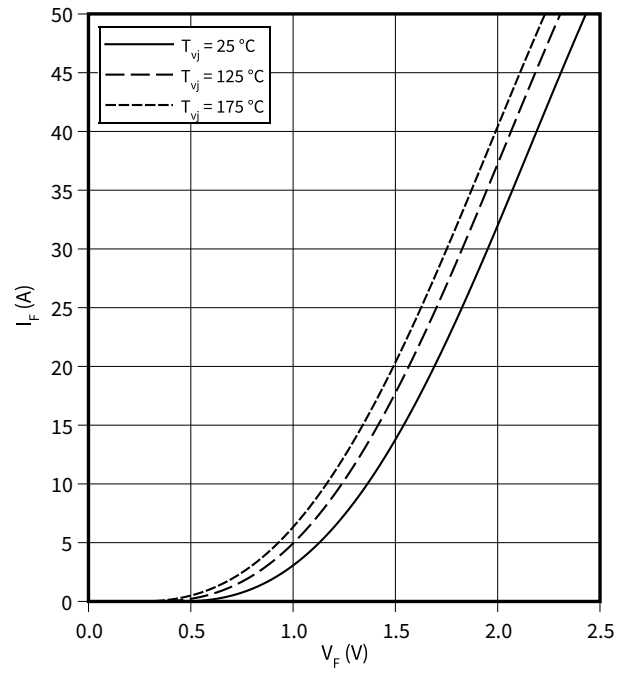
**transient thermal impedance , IGBT-Chopper**

$Z_{th} = f(t)$



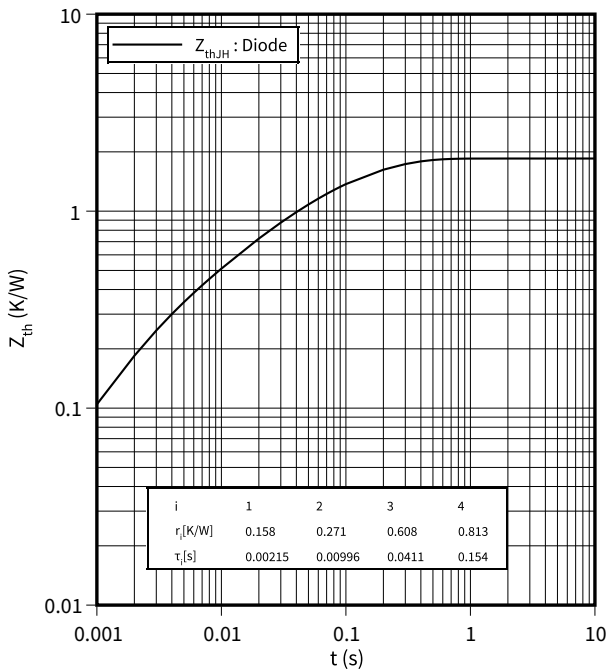
**forward characteristic of (typical), Diode, Chopper**

$I_F = f(V_F)$



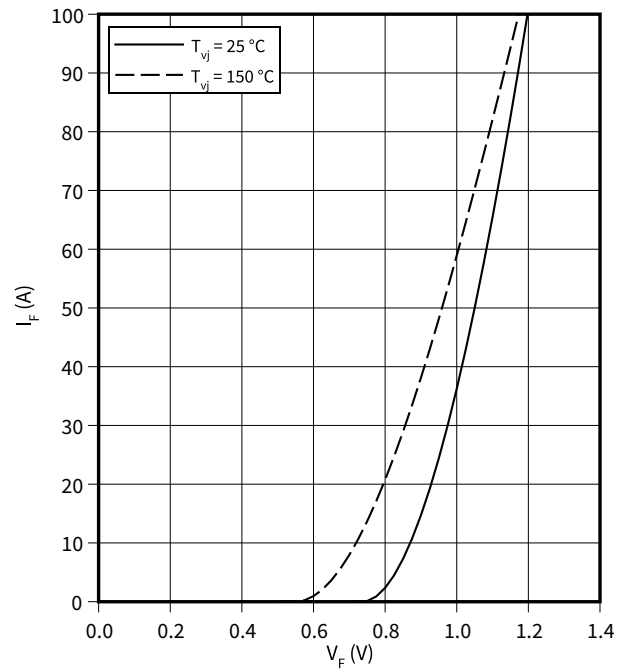
**transient thermal impedance , Diode, Chopper**

$Z_{th} = f(t)$



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

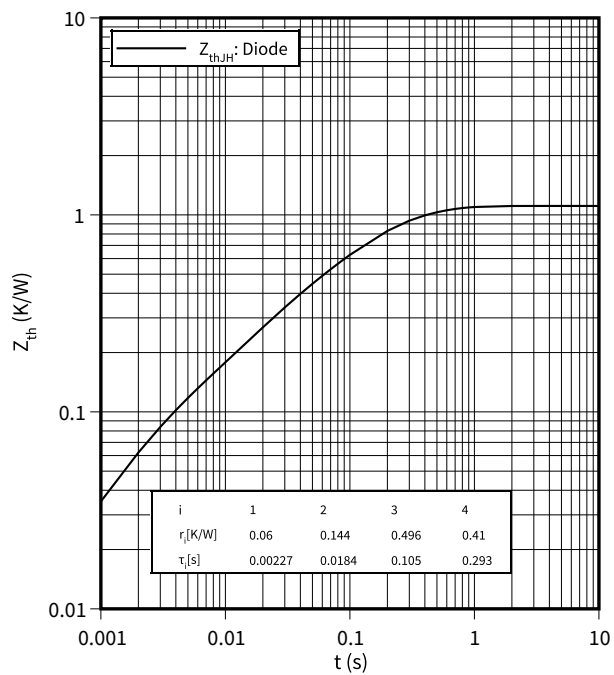
$I_F = f(V_F)$





**transient thermal impedance , Diode, Rectifier**

$Z_{th} = f(t)$



## 6 Circuit diagram

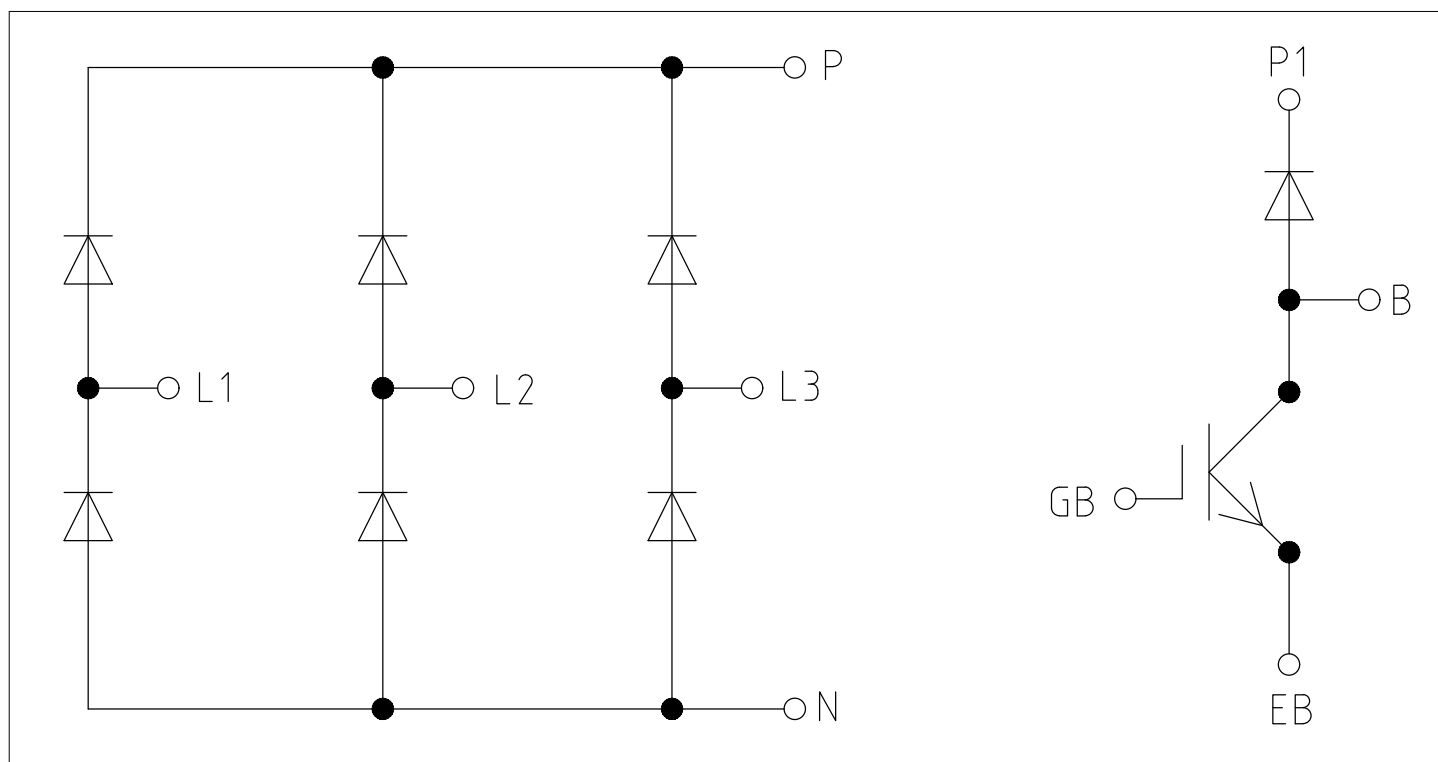
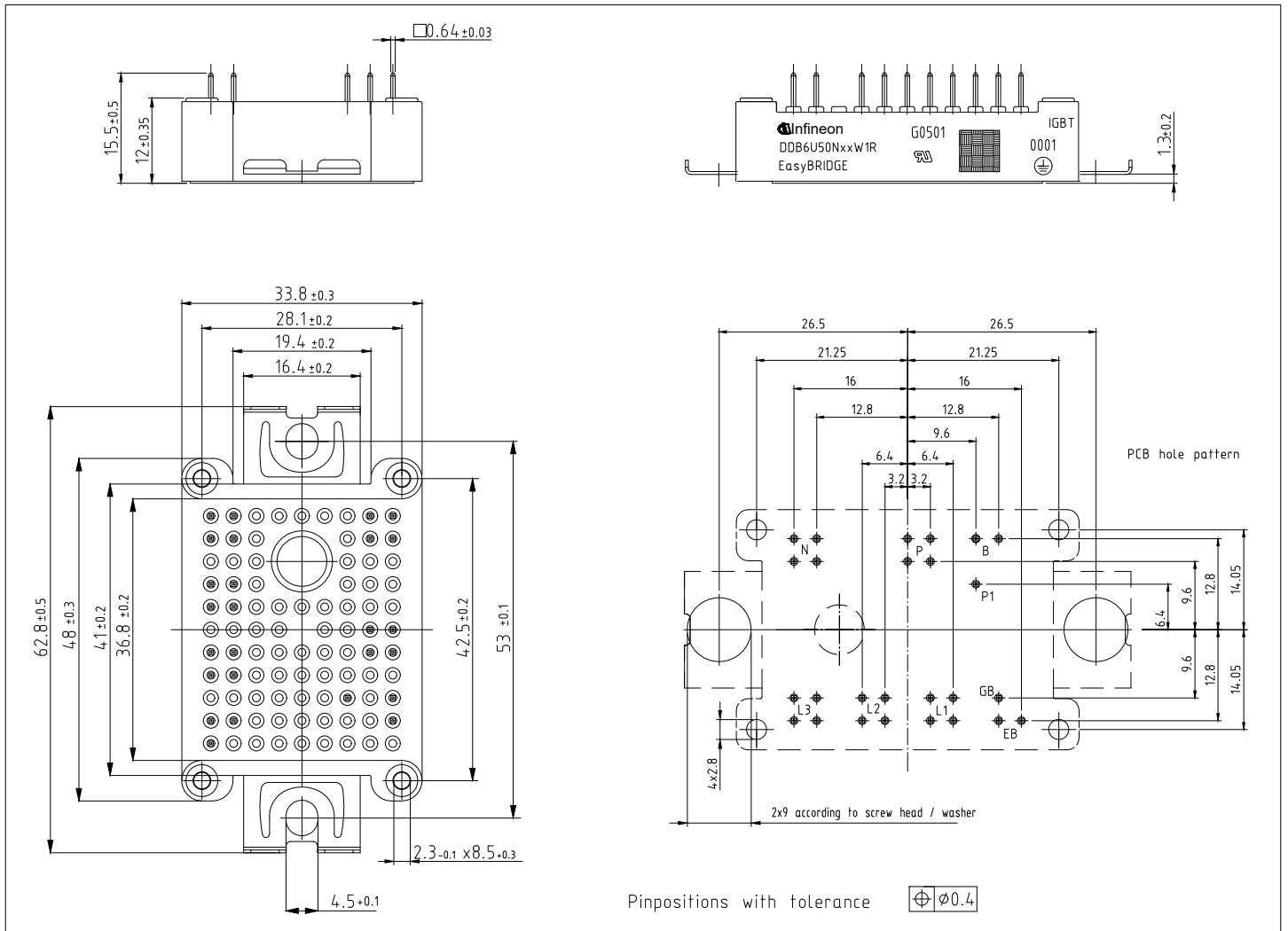


Figure 2

**7 Package outlines**



**Figure 3**

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Revision history

## Revision history

Document revision	Date of release	Description of changes
0.10	2021-07-30	Initial version

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