

Preliminary datasheet

EasyBRIDGE module with chopper configuration and 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
 - Al_2O_3 substrate with low thermal resistance
 - Compact design
 - Solder 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

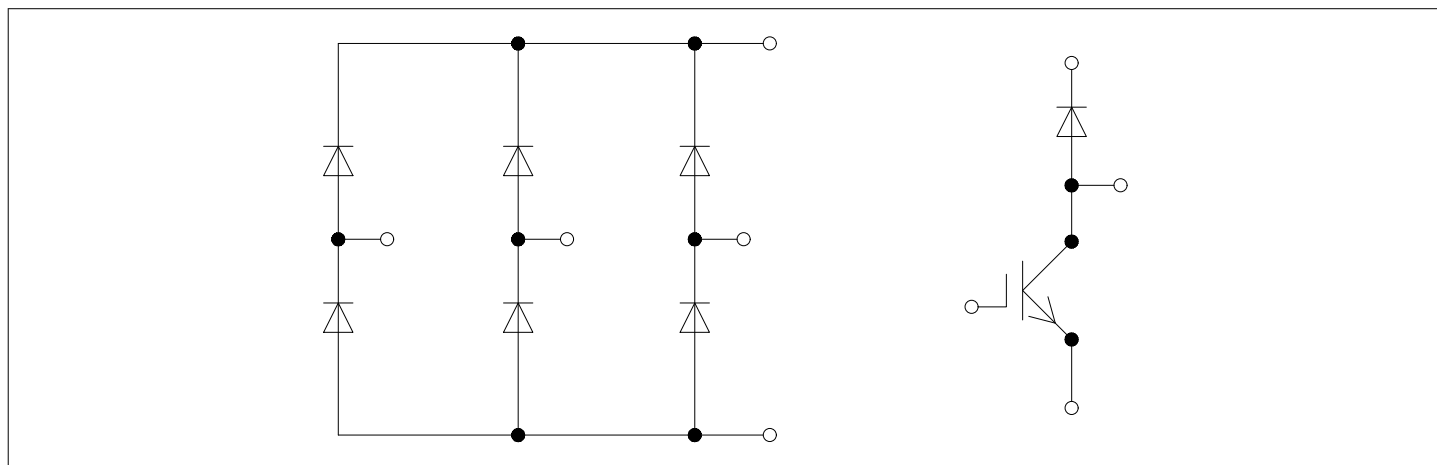


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	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 30A 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	$V_{CE\ sat}$	$I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	1.50	TBD	V
			$T_{vj} = 125\text{ °C}$	1.64		
			$T_{vj} = 175\text{ °C}$	1.72		
Gate threshold voltage	V_{GEth}	$I_C = 1.28\text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25\text{ °C}$	5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\text{ V}$, $V_{CE} = 600\text{ V}$		0.92		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$		0		Ω
Input capacitance	C_{ies}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		11.1		nF
Reverse transfer capacitance	C_{res}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		0.039		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		0.0062	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = 20\text{ V}$, $T_{vj} = 25\text{ °C}$			100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.1\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.042		μs
			$T_{vj} = 125\text{ °C}$	0.045		
			$T_{vj} = 175\text{ °C}$	0.046		
Rise time (inductive load)	t_r	$I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.1\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.036		μs
			$T_{vj} = 125\text{ °C}$	0.040		
			$T_{vj} = 175\text{ °C}$	0.043		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 5.1\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.270		μs
			$T_{vj} = 125\text{ °C}$	0.350		
			$T_{vj} = 175\text{ °C}$	0.370		
Fall time (inductive load)	t_f	$I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 5.1\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.110		μs
			$T_{vj} = 125\text{ °C}$	0.200		
			$T_{vj} = 175\text{ °C}$	0.270		
Turn-on energy loss per pulse	E_{on}	$I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.1\text{ }\Omega$, $di/dt = 850\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	4.47		mJ
			$T_{vj} = 125\text{ °C}$	5.2		
			$T_{vj} = 175\text{ °C}$	5.67		
Turn-off energy loss per pulse	E_{off}	$I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 5.1\text{ }\Omega$, $dv/dt = 2900\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	3.36		mJ
			$T_{vj} = 125\text{ °C}$	5.25		
			$T_{vj} = 175\text{ °C}$	6.45		

Table 4 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}, V_{CC} = 800 \text{ V}, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$		190		A
				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	$T_{vj op}$		-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}		$T_{vj} = 25\text{ }^{\circ}\text{C}$	1200	V
Continous 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	A^2s
			$T_{vj} = 175\text{ }^{\circ}\text{C}$	63	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 25 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^\circ\text{C}$	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		

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		μC
			$T_{vj} = 125\text{ }^\circ\text{C}$	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	A^2s
			$T_{vj} = 150\text{ }^\circ\text{C}$	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

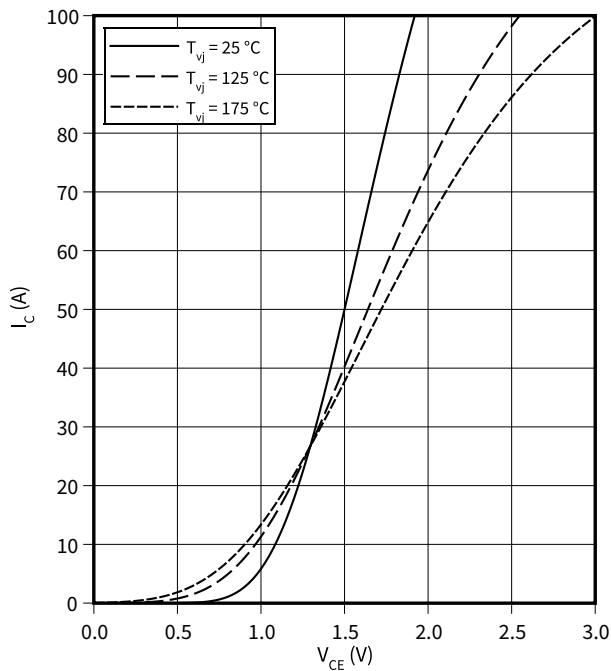
Table 8 **Characteristic values (continued)**

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

5 Characteristics diagrams

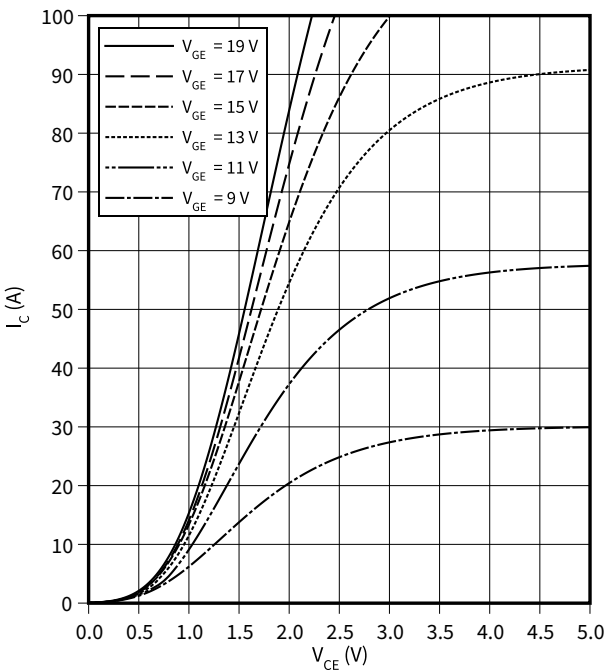
output characteristic (typical), IGBT-Chopper

$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



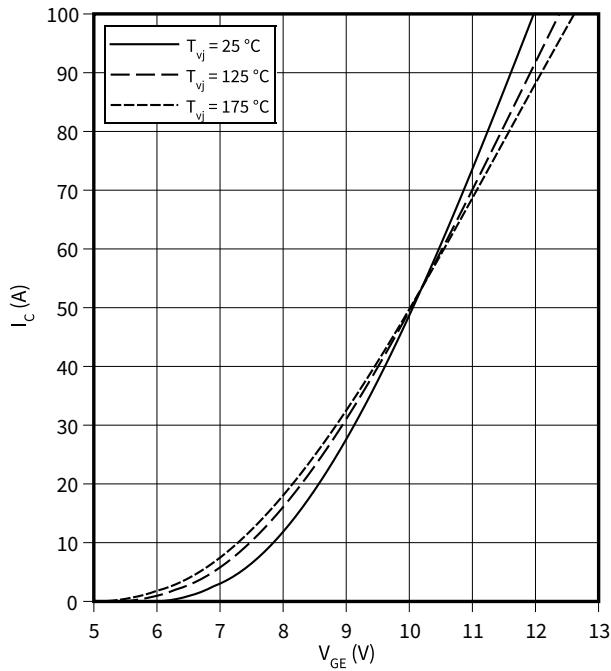
output characteristic (typical), IGBT-Chopper

$I_C = f(V_{CE})$
 $T_{vj} = 175\text{ °C}$



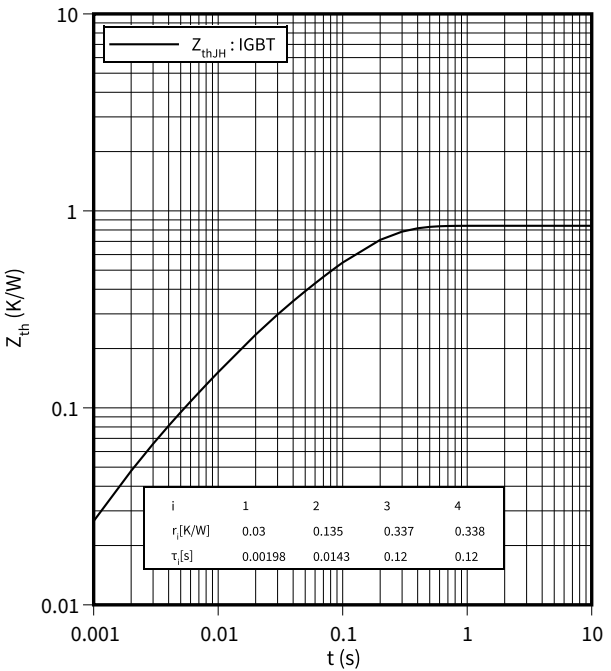
transfer characteristic (typical), IGBT-Chopper

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



transient thermal impedance, IGBT-Chopper

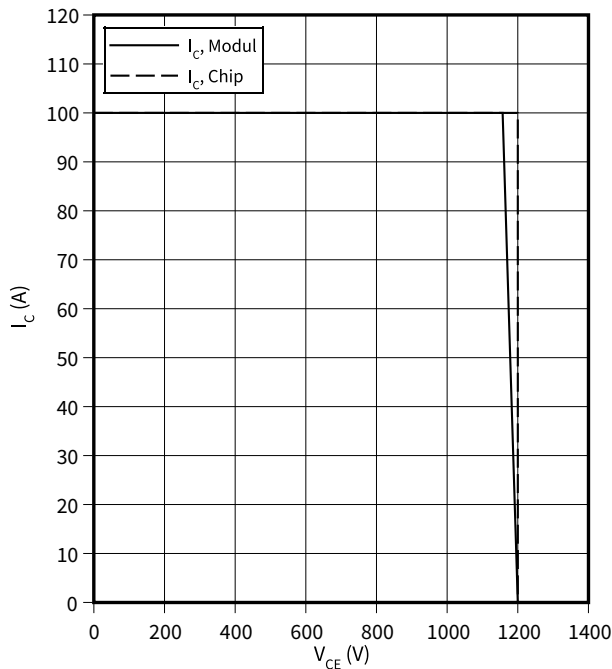
$Z_{th} = f(t)$



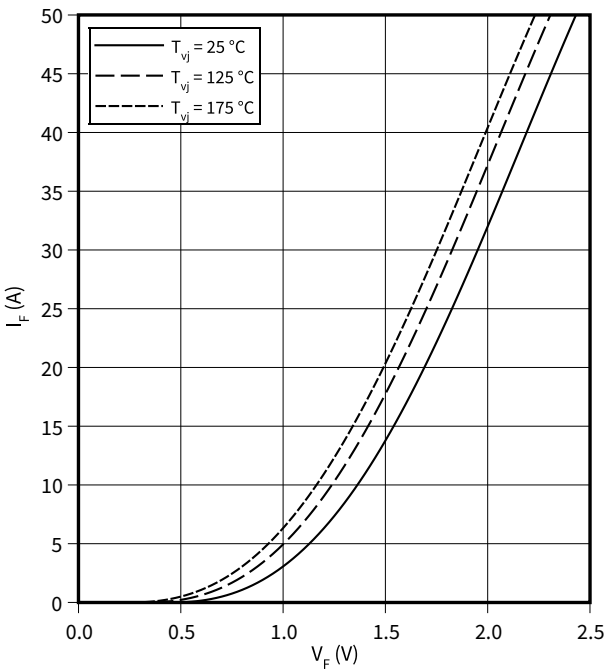
5 Characteristics diagrams

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

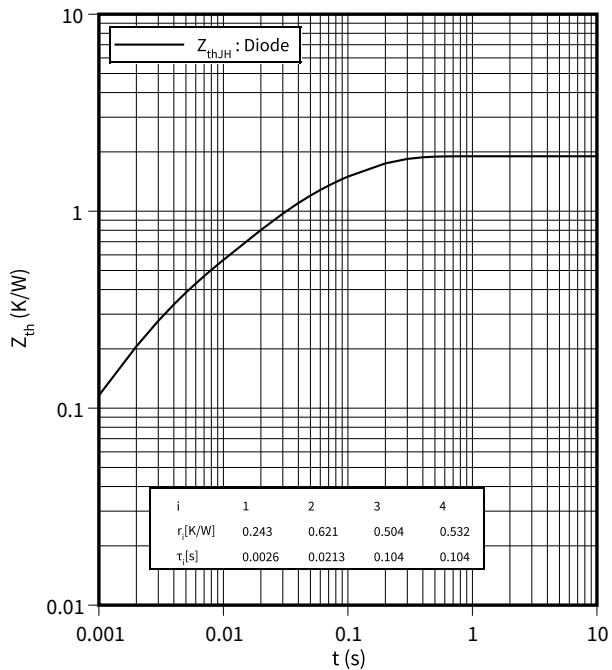
$I_C = f(V_{CE})$
 $R_{Goff} = 5.1 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 175 \text{ }^\circ\text{C}$



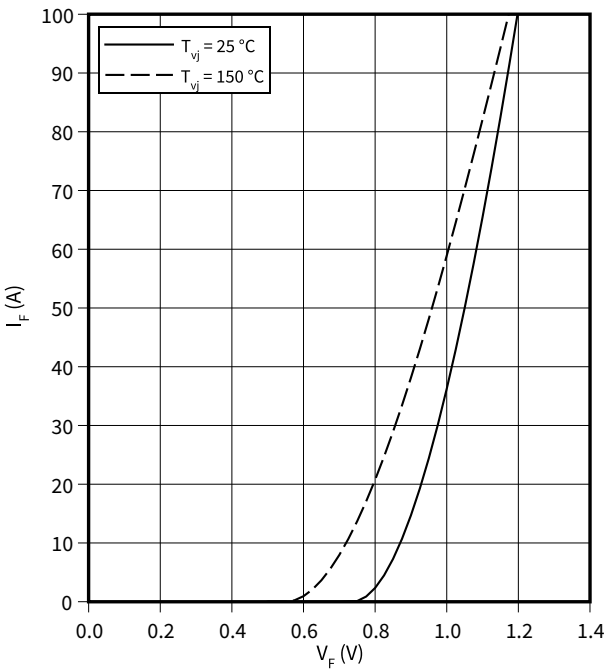
forward characteristic of (typical), Diode, Chopper
 $I_F = f(V_F)$



transient thermal impedance, Diode, Chopper
 $Z_{th} = f(t)$



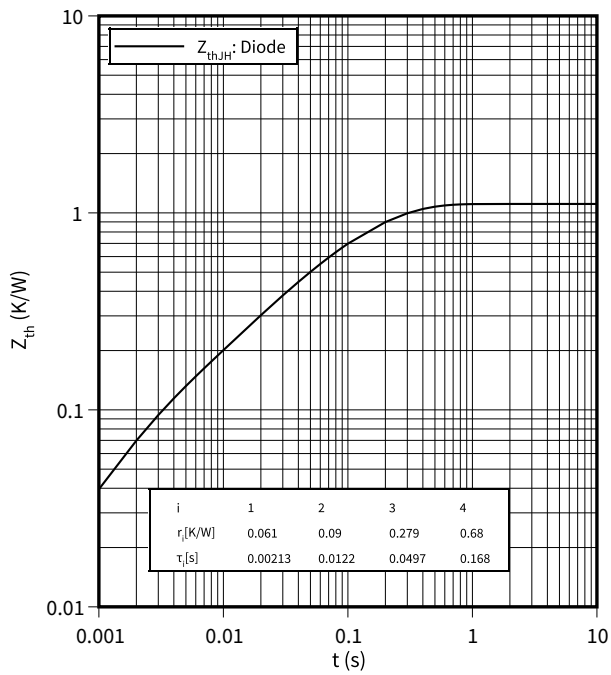
forward characteristic of (typical), Diode, Rectifier
 $I_F = f(V_F)$



5 Characteristics diagrams

transient thermal impedance , Diode, Rectifier

$Z_{th} = f(t)$



6 Circuit diagram

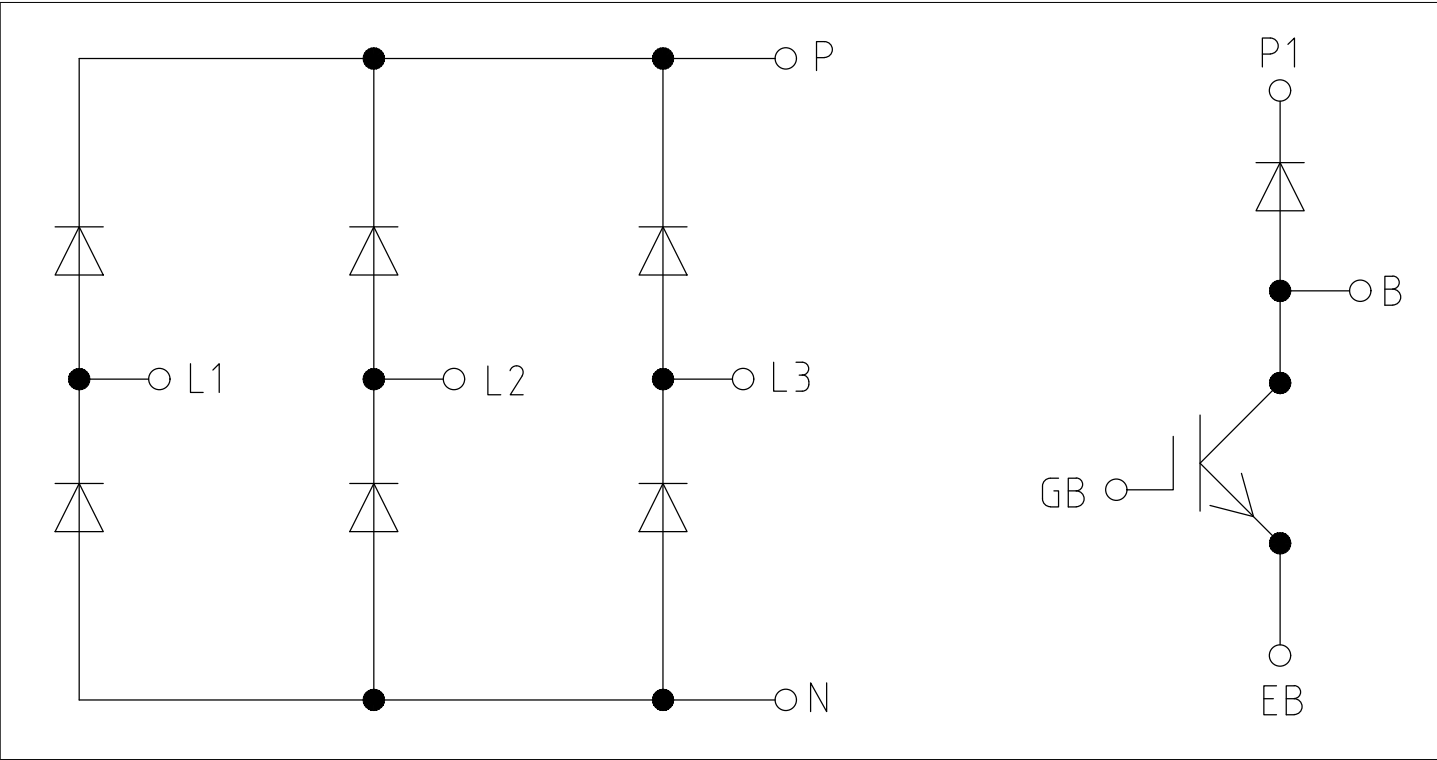
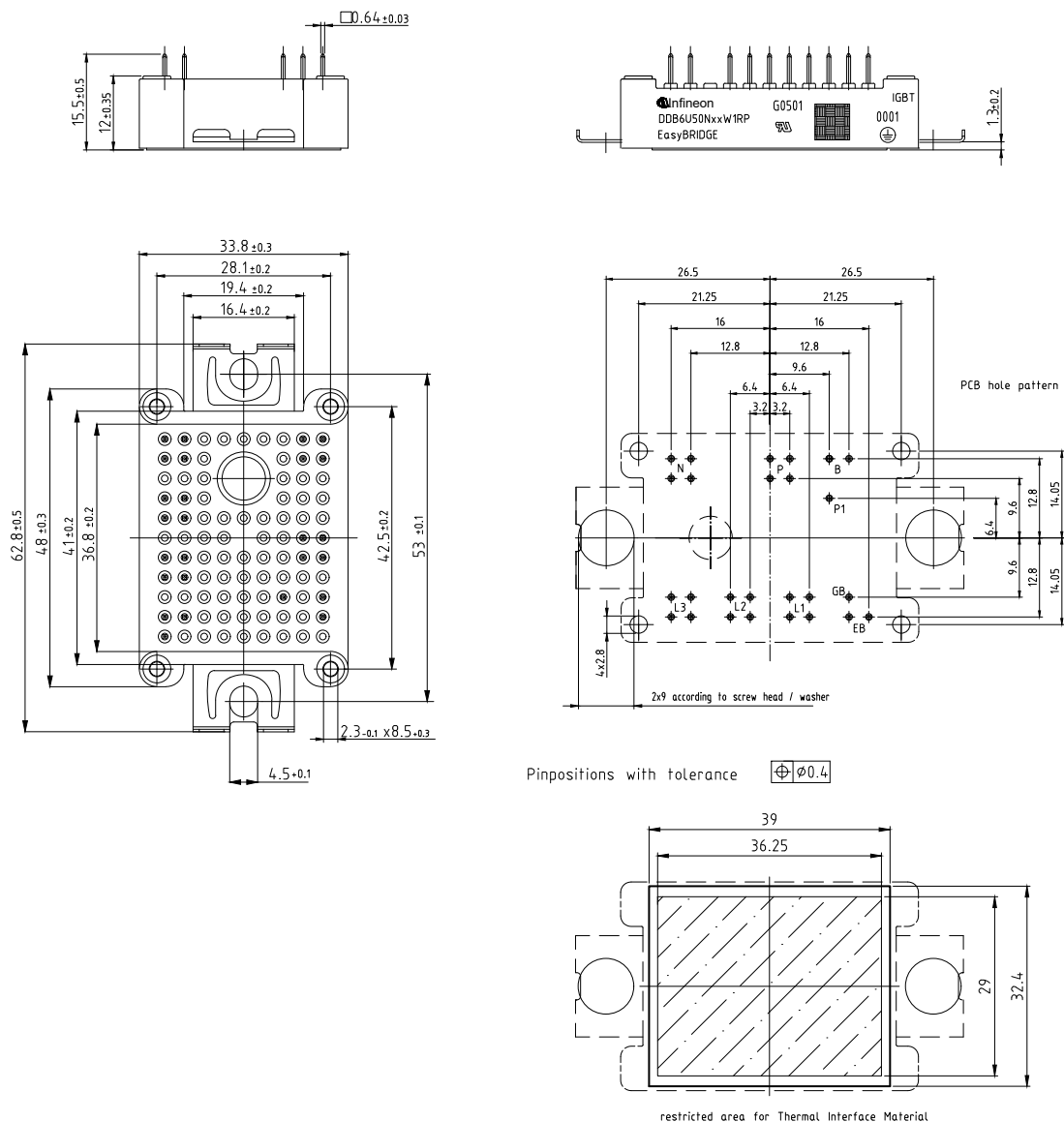


Figure 2



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	<i>Content</i>	<i>Digit</i>	<i>Example</i>
	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 4

Revision history

Document revision	Date of release	Description of changes
V1.0	2020-06-27	
0.10	2021-07-28	Preliminary datasheet

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