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DDB6U50N16W1RP

EasyBRIDGE module

Preliminary datasheet

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

Features



Typical appearance

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 50 A / I_{CRM} = 100 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

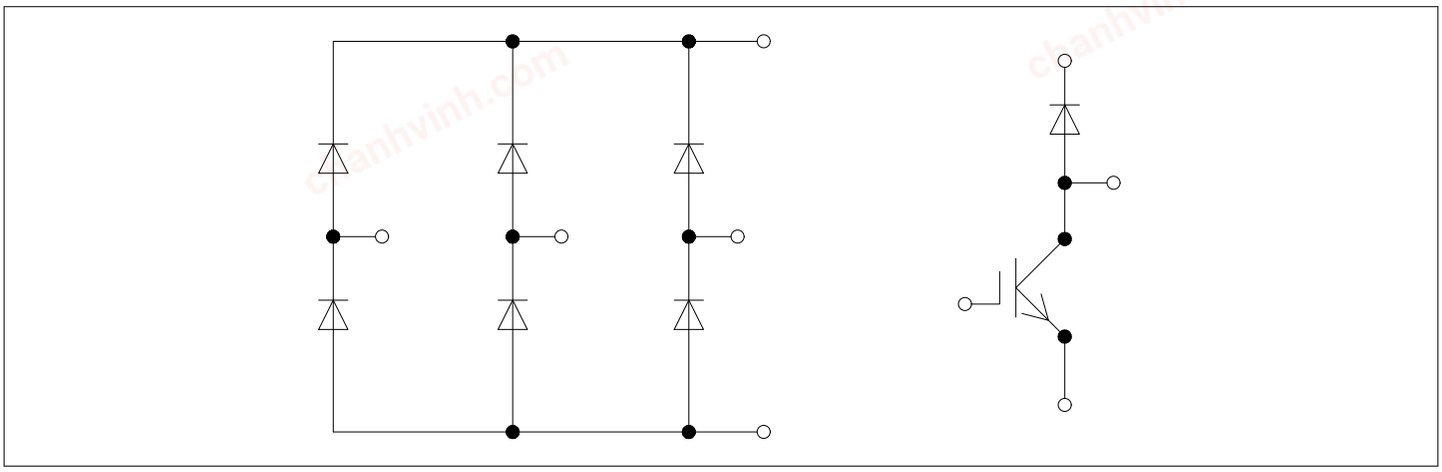
Potential applications

- 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 Hz, t = 1 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°C, per switch		4		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_H=25°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 °C	1200	V
Continous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 85 °C	50	A
Repetitive peak collector current	I_{CRM}	t_P = 1 ms		100	A

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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 °C		1.50	TBD	V
			T_{vj} = 125 °C		1.64		
			T_{vj} = 175 °C		1.72		
Gate threshold voltage	V_{GEth}	I_C = 1.28 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_{CE} = 600 V			0.92		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			11.1		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °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 °C			0.0062	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_{CE} = 600 V, V_{GE} = ±15 V, R_{Gon} = 5.1 Ω	T_{vj} = 25 °C		0.042		µs
			T_{vj} = 125 °C		0.045		
			T_{vj} = 175 °C		0.046		
Rise time (inductive load)	t_r	I_C = 50 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Gon} = 5.1 Ω	T_{vj} = 25 °C		0.036		µs
			T_{vj} = 125 °C		0.040		
			T_{vj} = 175 °C		0.043		
Turn-off delay time (inductive load)	t_{doff}	I_C = 50 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Goff} = 5.1 Ω	T_{vj} = 25 °C		0.270		µs
			T_{vj} = 125 °C		0.350		
			T_{vj} = 175 °C		0.370		
Fall time (inductive load)	t_f	I_C = 50 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Goff} = 5.1 Ω	T_{vj} = 25 °C		0.110		µs
			T_{vj} = 125 °C		0.200		
			T_{vj} = 175 °C		0.270		
Turn-on energy loss per pulse	E_{on}	I_C = 50 A, V_{CE} = 600 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Gon} = 5.1 Ω, di/dt = 850 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		4.47		mJ
			T_{vj} = 125 °C		5.2		
			T_{vj} = 175 °C		5.67		
Turn-off energy loss per pulse	E_{off}	I_C = 50 A, V_{CE} = 600 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Goff} = 5.1 Ω, dv/dt = 2900 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		3.36		mJ
			T_{vj} = 125 °C		5.25		
			T_{vj} = 175 °C		6.45		

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Table 4 Characteristic values (continued)

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		190		A
			$t_P \leq$ 7 µs, T_{vj} = 175 °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	$T_{vj\ op}$			-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, Chopper

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
Continous DC forward current	I_F			25	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		50	A
I^2t - value	I^2t	V_R = 0 V, t_P = 10 ms	T_{vj} = 125 °C	72.5	A^2s
			T_{vj} = 175 °C	63	

Table 6 Characteristic values

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

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Table 6 Characteristic values (continued)

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Recovered charge	Q_r	I_F = 25 A, V_R = 600 V, V_{GE} = -15 V, -di$_F$/dt = 960 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		1.89		µC
			T_{vj} = 125 °C		3.53		
			T_{vj} = 175 °C		4.62		
Reverse recovery energy	E_{rec}	I_F = 25 A, V_R = 600 V, V_{GE} = -15 V, -di$_F$/dt = 960 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		0.62		mJ
			T_{vj} = 125 °C		1.3		
			T_{vj} = 175 °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	$T_{vj\,op}$			-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 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		1600	V
Maximum RMS forward current per chip	I_{FRMSM}	T_H = 100 °C		50	A
Maximum RMS current at rectifier output	I_{RMSM}	T_H = 100 °C		85	A
Surge forward current	I_{FSM}	t_P = 10 ms	T_{vj} = 25 °C	500	A
			T_{vj} = 150 °C	400	
I^2t - value	I^2t	t_P = 10 ms	T_{vj} = 25 °C	1250	A^2s
			T_{vj} = 150 °C	800	

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} = 150 °C		0.96		V
Reverse current	I_r	T_{vj} = 150 °C, V_R = 1600 V			1		mA
Thermal resistance, junction to heatsink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material				1.11	K/W

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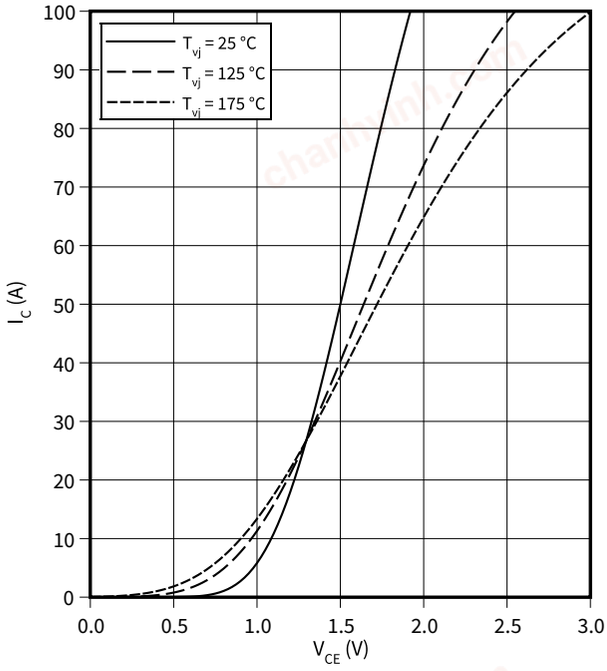
Table 8 Characteristic values (continued)

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

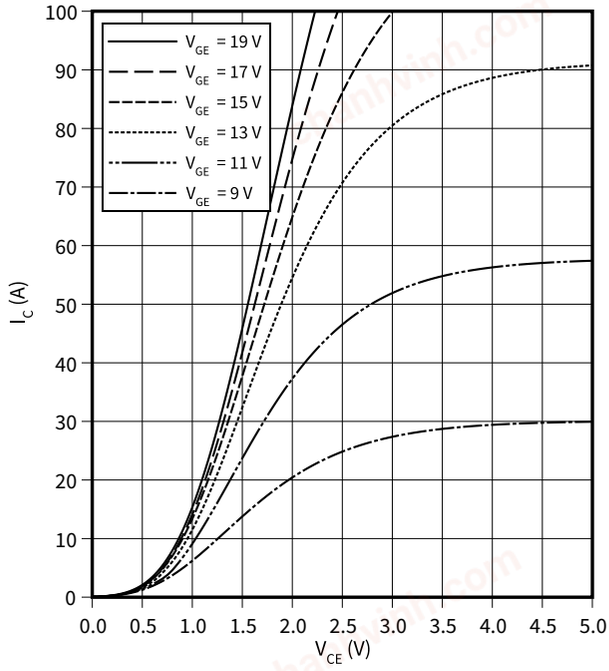
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5 Characteristics diagrams

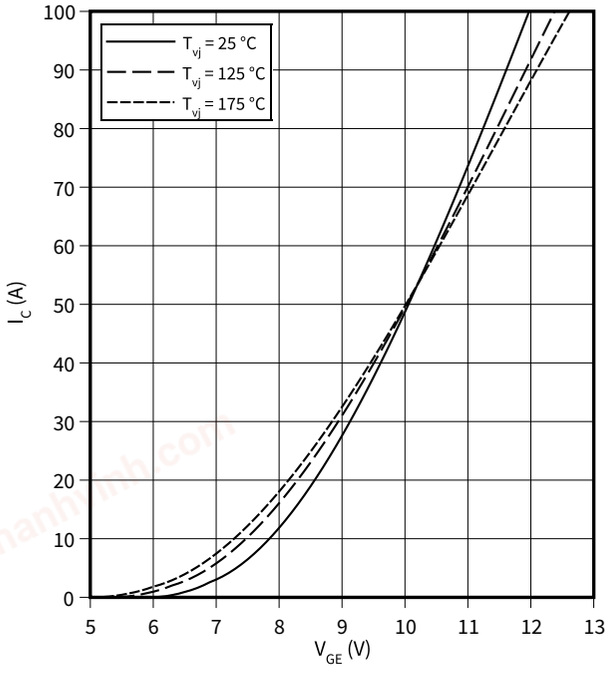
output characteristic (typical), IGBT-Chopper
$I_C = f(V_{CE})$
V_{GE} = 15 V



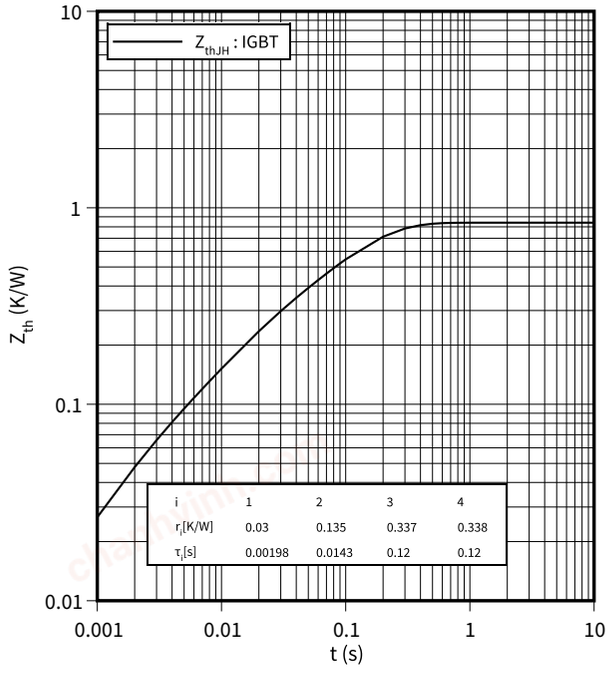
output characteristic (typical), IGBT-Chopper
$I_C = f(V_{CE})$
T_{vj} = 175 °C



transfer characteristic (typical), IGBT-Chopper
$I_C = f(V_{GE})$
V_{CE} = 20 V



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



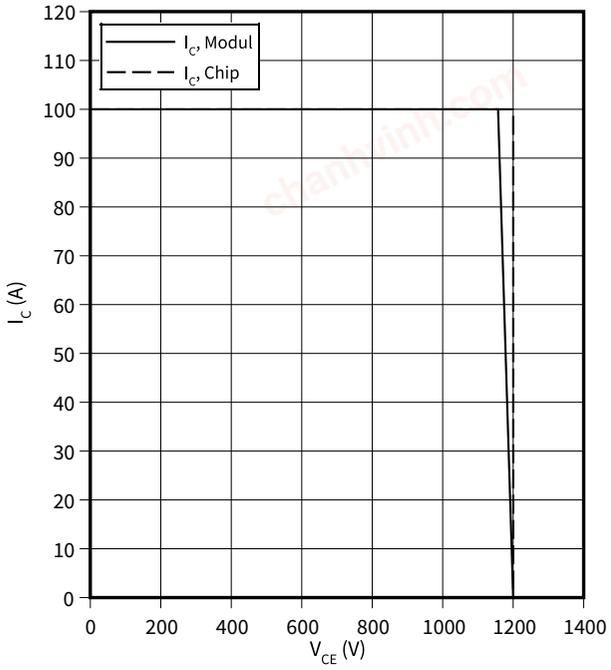
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5 Characteristics diagrams

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

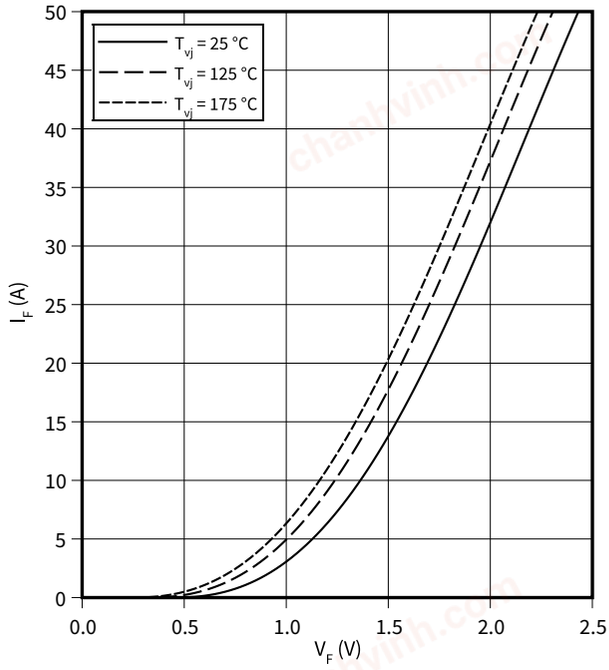
$I_C = f(V_{CE})$

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



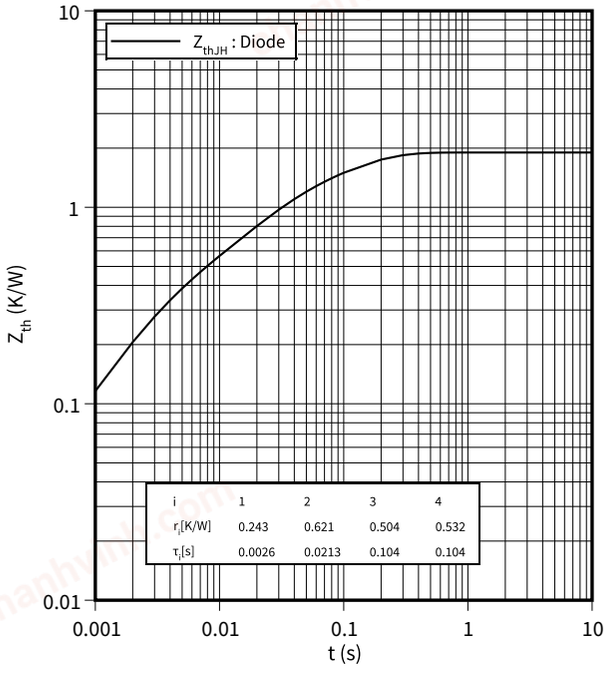
forward characteristic of (typical), Diode, Chopper

$I_F = f(V_F)$



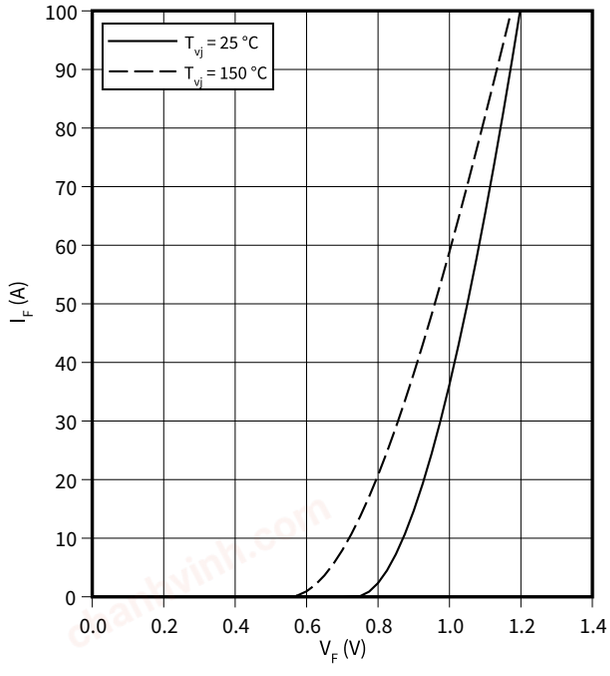
transient thermal impedance , Diode, Chopper

$Z_{th} = f(t)$



forward characteristic of (typical), Diode, Rectifier

$I_F = f(V_F)$

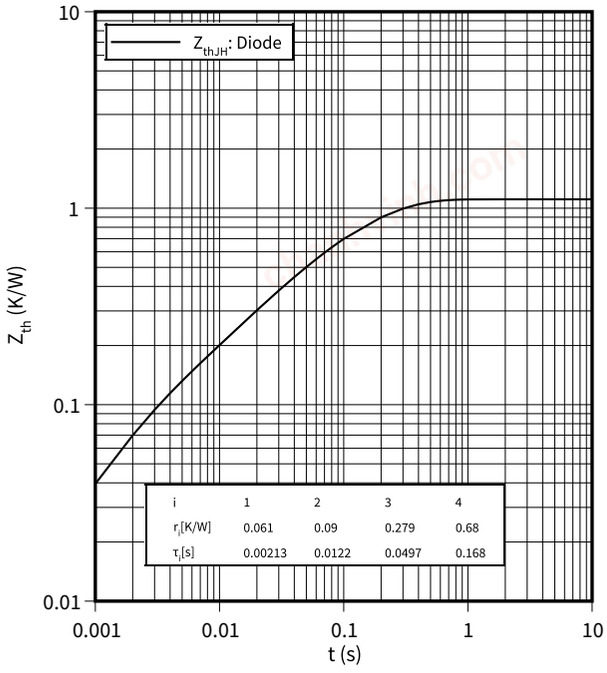


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5 Characteristics diagrams

transient thermal impedance , Diode, Rectifier

$Z_{th} = f(t)$



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6 Circuit diagram

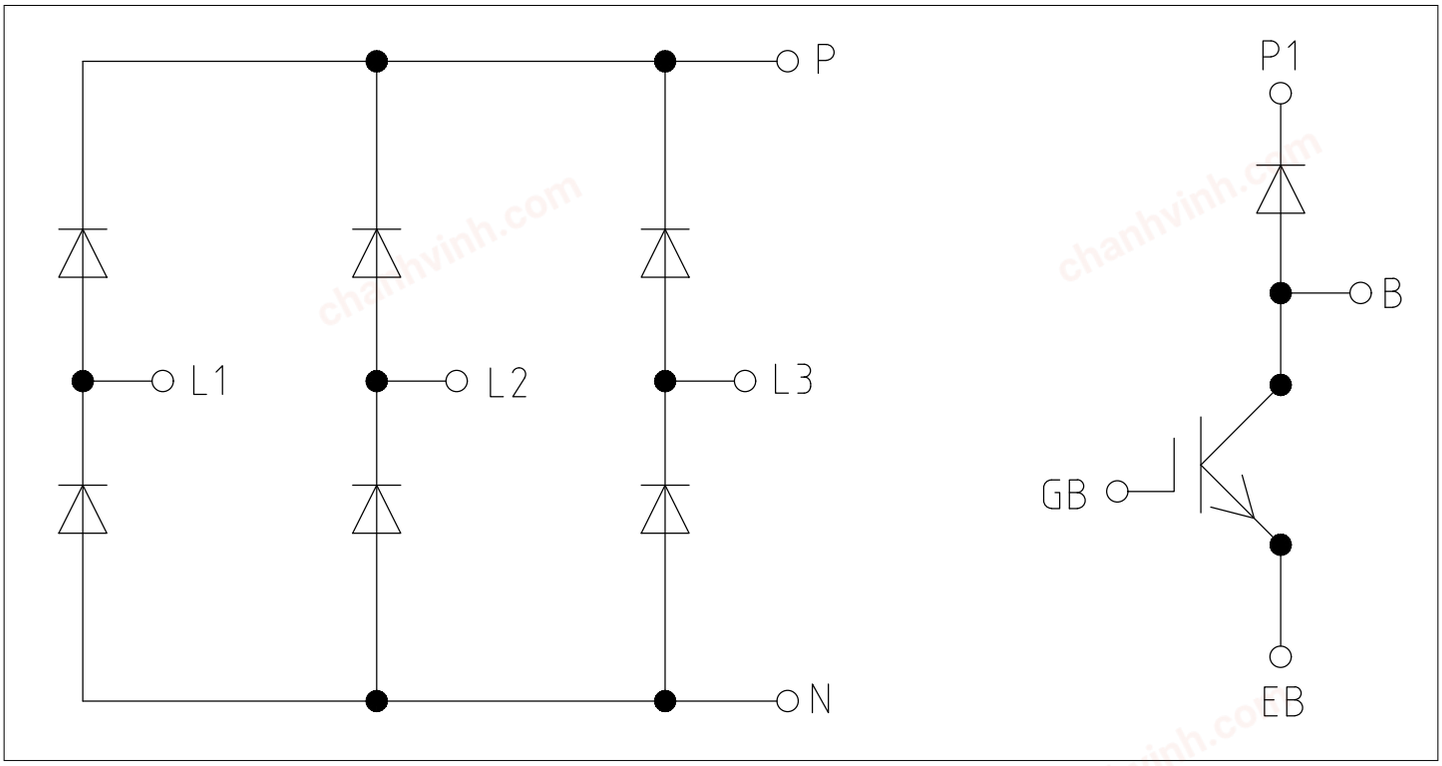


Figure 2

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7 Package outlines

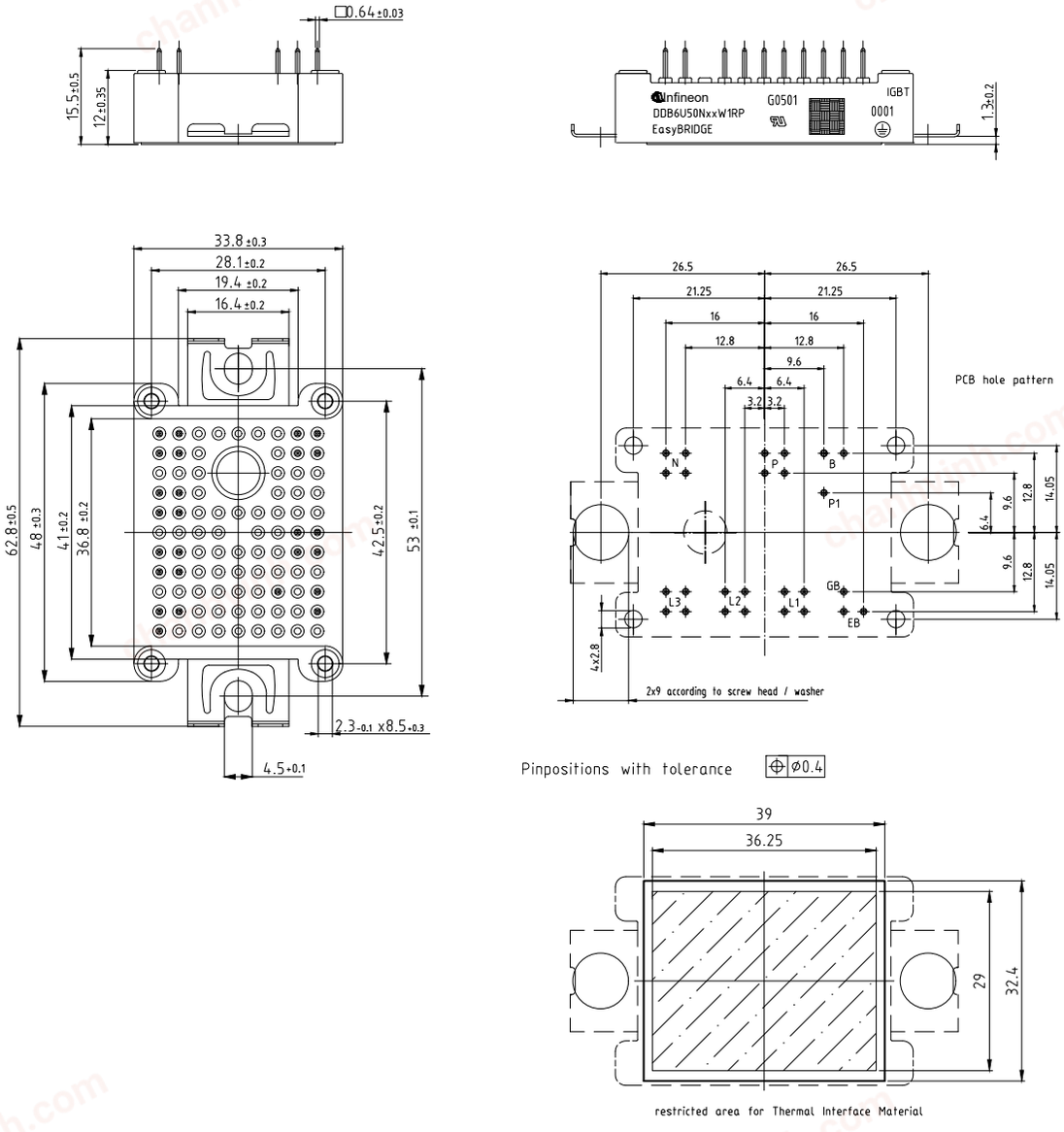


Figure 3

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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 4

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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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