WTD120TBS12

SCR Module

Rev.01 - 15 November 2024 Product data sheet

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) module in WeEnTOP-B for use in applications requiring high blocking voltage capability, high inrush current capability and high thermal cycling performance.

2. Features and benefits

- Planar passivated thyristor chips for voltage ruggedness and reliability
- Top-side cooling
- Compact design
- One screw mounting
- Heat transfer and isolation through direct copper bonded aluminum oxide ceramic (DBC)
- Package is RoHS compliant

3. Applications

- UPS

4. Quick reference data

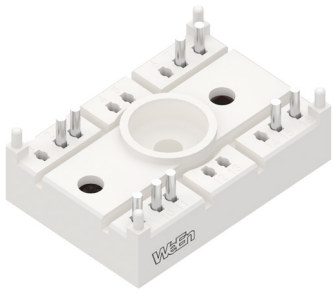
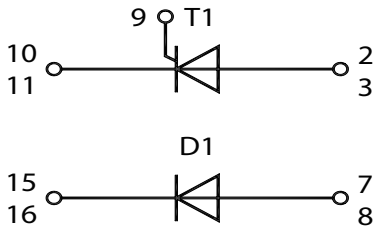
Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values	Unit
Absolute maximum rating					
V_{DRM}	repetitive peak forward voltage			1200	V
V_{RRM}	repetitive peak reverse voltage			1200	V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 95$ °C		134	A
$I_{F(AV)}$	average forward current	δ = 0.5; square-wave pulse		120	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms		2000	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 10 ms		1800	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		2200	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 8.3 ms		1870	A
I_{FSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms		2700	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 10 ms		2300	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		2970	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 8.3 ms		2530	A

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C		30	-	100	mA
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C		-	-	1.50	V
V_T	on-state voltage	I_T = 240 A; T_j = 25 °C		-	-	1.70	V
V_F	forward voltage	I_F = 120 A; T_j = 25 °C		-	1.10	1.30	V

5. Pinning information

Table 2. Pinning information

Simplified outline	Graphic symbol
	

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WTD120TBS12	WeEnTOP-B	WTD120TBS12T	EPE	30	WeEnTOP-BPBP-A	05-Nov-2024

7. Marking

Table 4. Marking codes

Type number	Marking codes
WTD120TBS12	WTD120TBS12

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Notes	Values	Unit
V_{DRM}	repetitive peak forward voltage			1200	V
V_{RRM}	repetitive peak reverse voltage			1200	V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 95$ °C		134	A
		half sine wave; $T_h \leq 99$ °C		120	A
$I_{T(AV)}$	average on-state current	half sine wave		96	A
$I_{F(AV)}$	average forward current	δ = 0.5; square-wave pulse		120	A
I_{TSM}	non-repetitive peak onstate current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms		2000	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 10 ms		1800	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		2200	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 8.3 ms		1870	A
I_{FSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms		2700	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 10 ms		2300	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		2970	A
		half sine wave; $T_{j(init)}$ = 125 °C; t_p = 8.3 ms		2530	A
I^2t	I^2t for fusing	t_p = 10 ms; sine-wave pulse		20	kA^2s
dI_T/dt	rate of rise of on-state current	I_G = 200 mA; T_j = 125 °C		200	A/µs
I_{GM}	peak gate current			10	A
V_{RGM}	peak reverse gate voltage			5	V
P_{GM}	peak gate power			20	W
$P_{G(AV)}$	average gate power	over any 20 ms period		0.5	W
T_{vj}	virtual junction temperature	thyristor		-40 to 130	°C
		diode		-40 to 150	°C
T_{op}	operation temperature	thyristor		-40 to 130	°C
		diode		-40 to 150	°C
T_{stg}	storage temperature			-40 to 125	°C

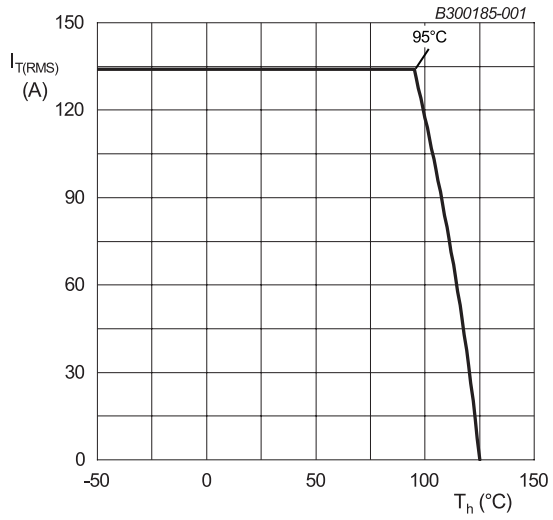
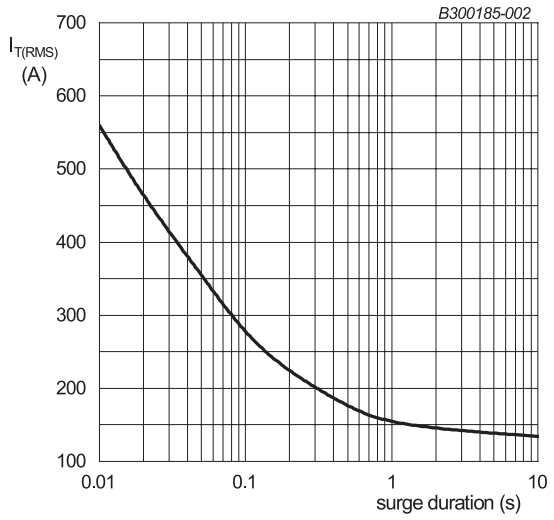


Fig. 1. RMS on-state current as a function of heatsink temperature; maximum values



f = 50 Hz; T_h = 95 °C

Fig. 2. RMS on-state current as a function of surge duration; maximum values

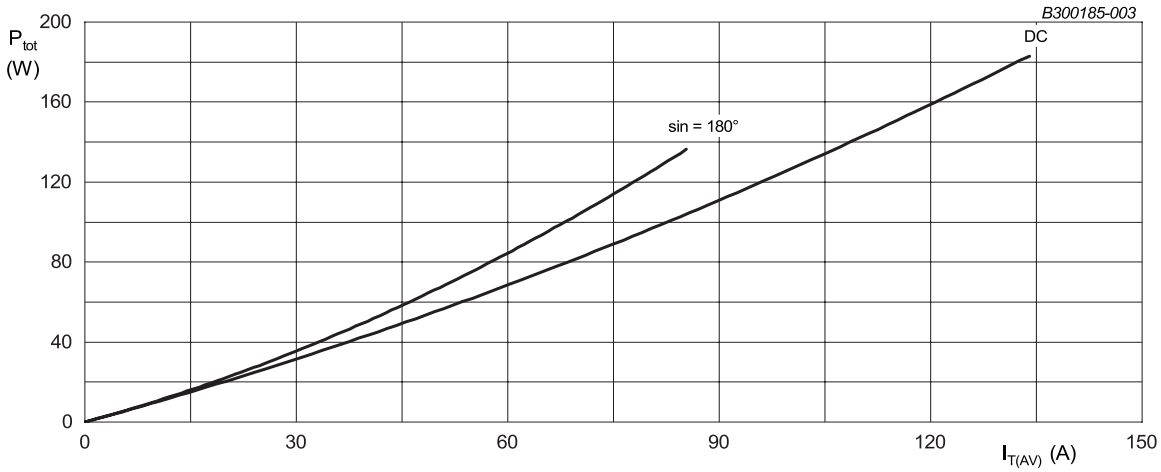
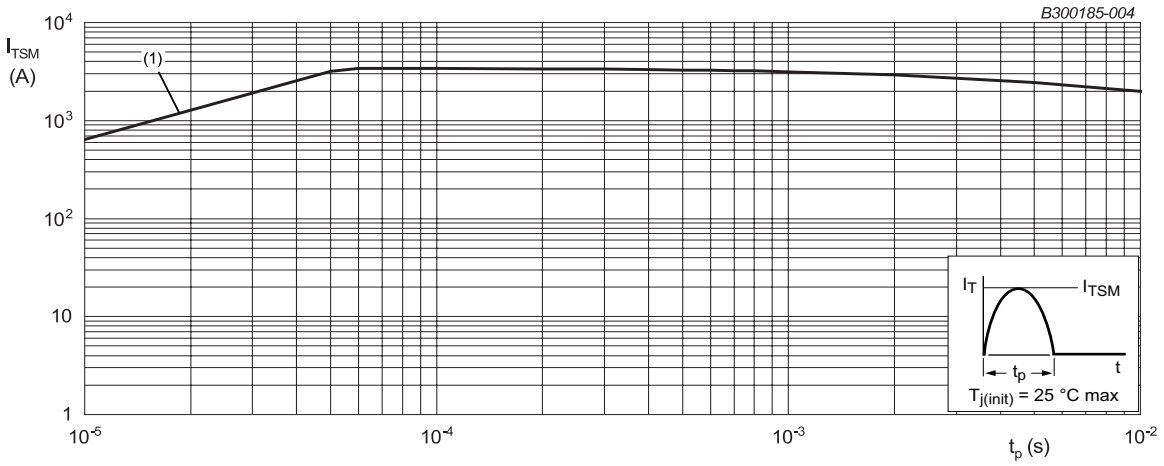


Fig. 3. Total power dissipation as a function of average on-state current; maximum values; per thyristor



$t_p \leq 10$ ms

(1) dI_T/dt limit

Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values

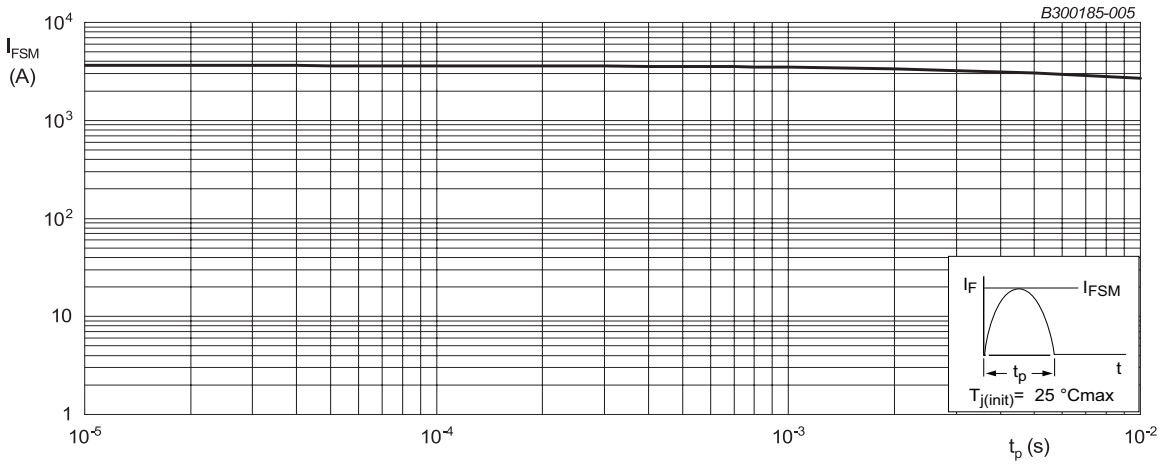


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	per thyristor		-	-	0.44	K/W
		per module for thyristor		-	-	0.22	K/W
		per diode		-	-	0.40	K/W
		per module for diode		-	-	0.20	K/W

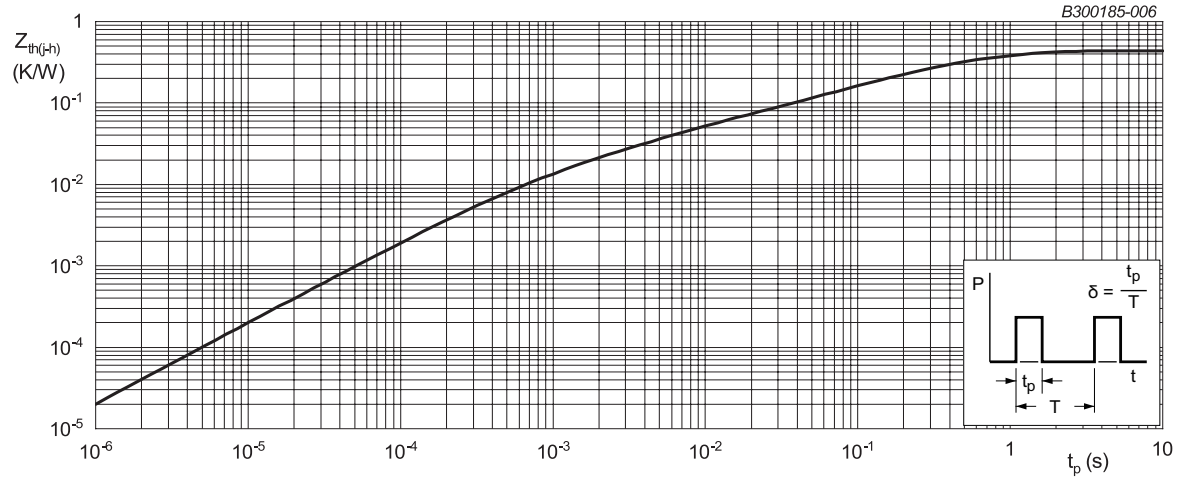


Fig. 6. Transient thermal impedance from junction to heatsink as a function of pulse duration; per thyristor

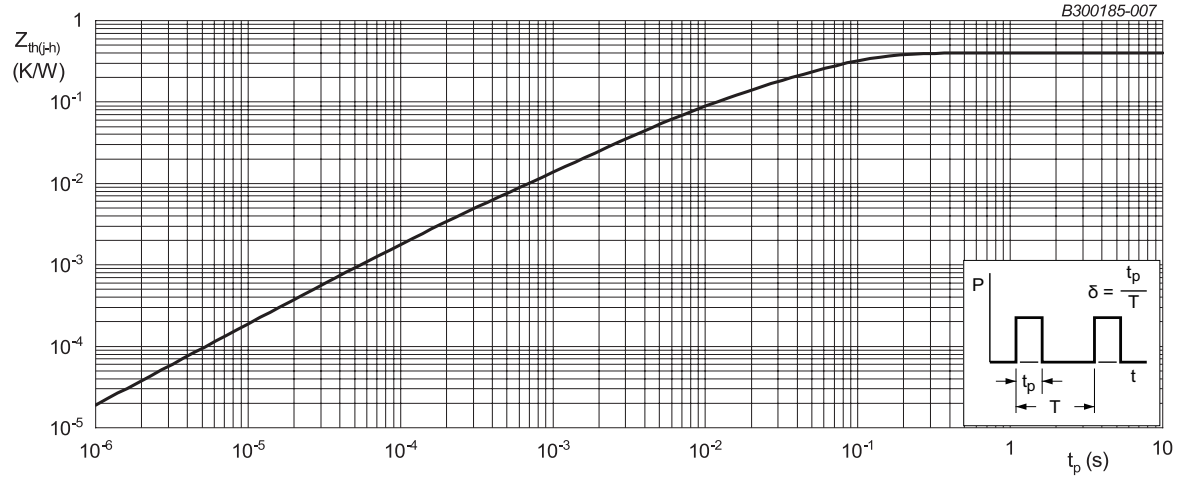


Fig. 7. Transient thermal impedance from junction to heatsink as a function of pulse duration; per diode

10. Package characteristics

Table 7. Isolation characteristics

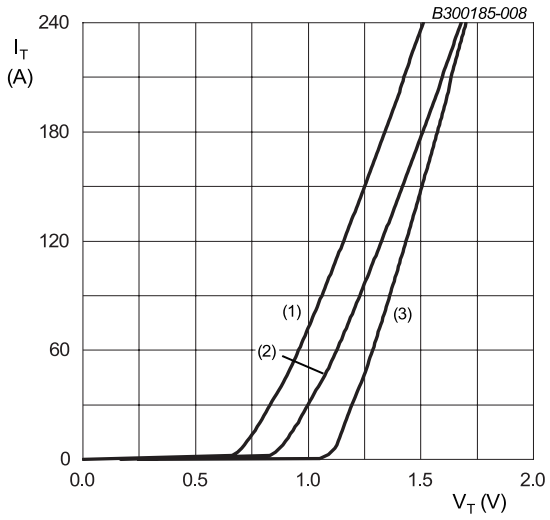
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
V_{isol}	isolation voltage	50/60 Hz; RMS; I_{ISOL} ≤ 1 mA; t = 1 second; AC		-	-	3600	V
		50/60 Hz; RMS; I_{ISOL} ≤ 1 mA; t = 1 minute; AC		-	-	2500	V

11. Characteristics

Table 8. Characteristics

Thyristor							
Symbol	**Parameter**	**Conditions**	**Notes**	**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C		30	-	100	mA
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C		-	-	1.50	V
		V_D = 2/3 V_{DRM}; I_T = 0.1 A; T_j = 125 °C		0.25	-	-	V
I_{GD}	gate non-trigger current	T_j = 125 °C		-	-	8.5	mA
V_{GD}	gate non-trigger voltage	T_j = 125 °C		-	-	0.2	V
I_L	latching current	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C		-	-	300	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C		-	-	200	mA
V_T	on-state voltage	I_T = 240 A; T_j = 25 °C		-	-	1.70	V
V_{TO}	threshold voltage	T_j = 125 °C		-	-	0.960	V
r_T	slope resistance	T_j = 125 °C		-	-	3.0	mΩ
I_D	off-state current	V_D = 1200 V; T_j = 25 °C		-	-	100	µA
		V_D = 1200 V; T_j = 125 °C		-	-	15	mA
I_R	reverse current	V_R = 1200 V; T_j = 25 °C		-	-	100	µA
		V_R = 1200 V; T_j = 125 °C		-	-	15	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 804 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		1500	-	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 40 A; V_D = 800 V; I_G = 100 mA; $(dI_G/dt)_M$ = 1 A/µs; T_j = 25 °C		-	2	-	µs
t_q	commutated turn-off time	I_{TM} = 2 A; t_p = 50 µs; dV/dt = 5 V/µs; dI/dt = 30 A/µs; T_j = 25 °C		-	150	-	µs

Diode							
Symbol	**Parameter**	**Conditions**	**Notes**	**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 120 A; T_j = 25 °C		-	1.10	1.30	V
		I_F = 120 A; T_j = 125 °C		-	1.00	1.20	V
V_O	threshold voltage	T_j = 125 °C		-	-	0.989	V
R_S	slope resistance	T_j = 125 °C		-	-	1.8	mΩ
I_R	reverse current	V_R = 1200 V; T_j = 25 °C		-	-	100	µA
		V_R = 1200 V; T_j = 125 °C		-	-	4	mA



V_{TO} = 0.960 V; r_T = 0.0030 Ω
(1) T_j = 125 °C; typical values
(2) T_j = 125 °C; maximum values
(3) T_j = 25 °C; maximum values

Fig. 8. Thyristor on-state current as a function of on-state voltage

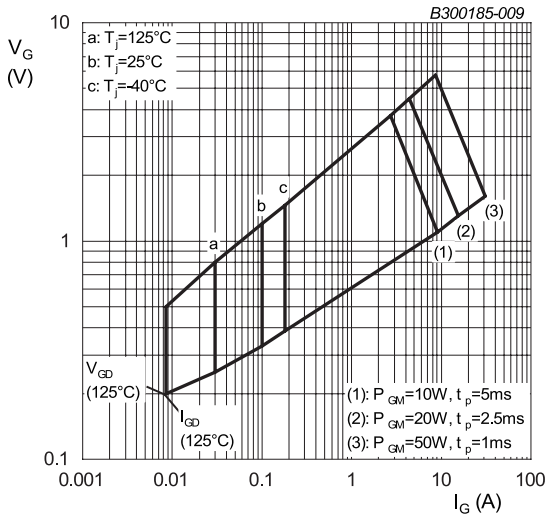
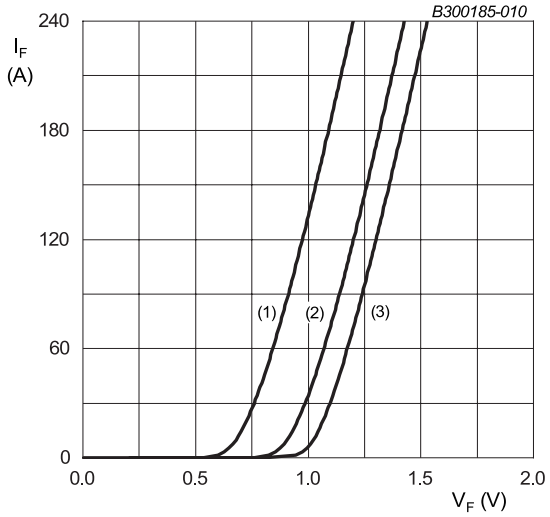


Fig. 9. Gate voltage as a function of gate current



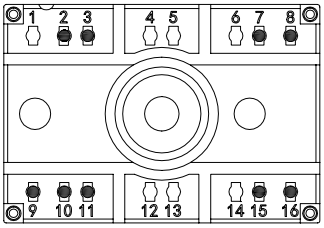
V_O = 0.989 V; R_S = 0.0018 Ω
(1) T_j = 125 °C; typical values
(2) T_j = 125 °C; maximum values
(3) T_j = 25 °C; maximum values

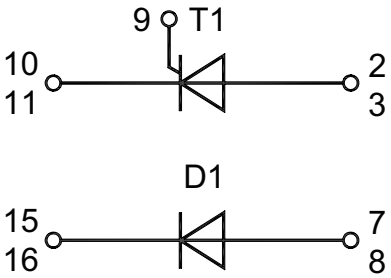
Fig. 10. Diode forward current as a function of forward voltage

12. Package outline

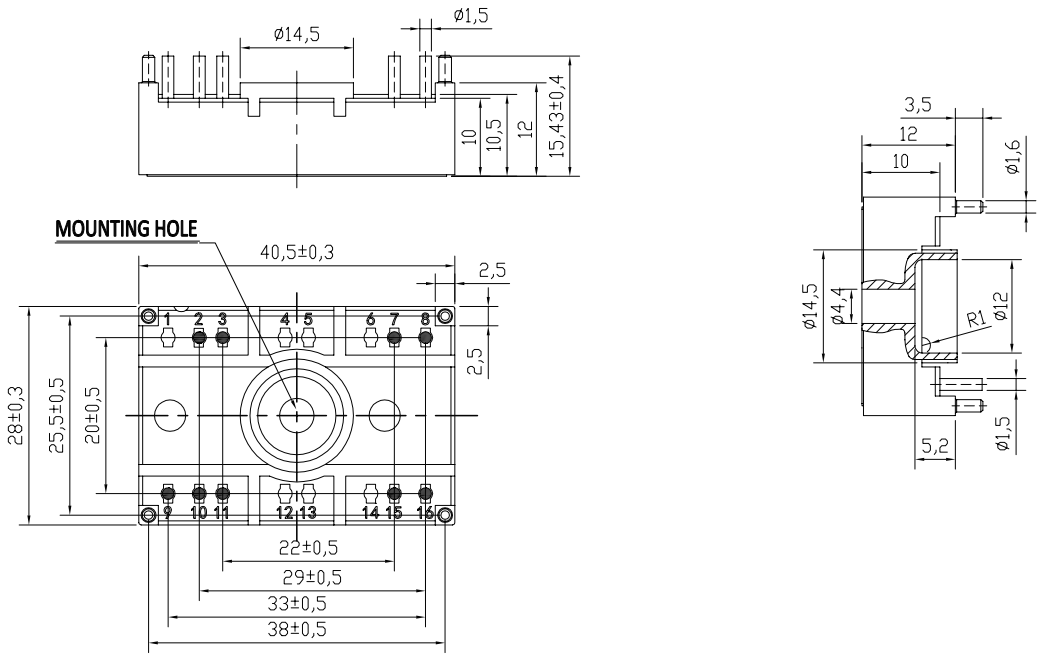
Dimensions in mm

Pinout





Package Outline



Suggested hole diameter in the PCB for solder pins and mounting pins: 2mm

13. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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14. Contents

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Date of release: 15 November 2024