

1. General description

Planar passivated thyristor / diode module in industrial standard 34mm package for use in applications requiring high blocking voltage capability, high inrush current capability and high thermal cycling performance.

2. Features and benefits

- High blocking voltage capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- Product is RoHS compliant
- Industry standard outline
- Copper base plate
- Cathode Kelvin contacts provided

3. Applications

- Softstart AC motor control
- DC Motor control
- AC Motor control
- Power converter
- Temperature control
- Lighting control

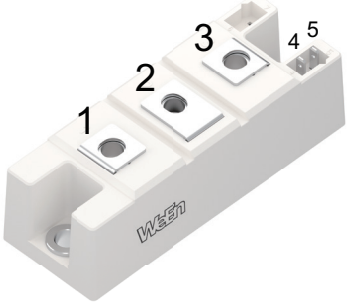
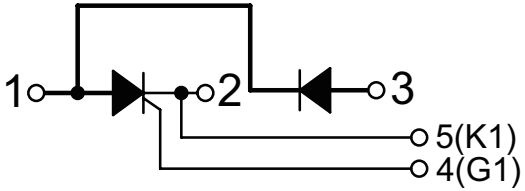
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{DRM}	repetitive peak forward voltage			1600			V
V_{RRM}	repetitive peak reverse voltage			1600			V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_c = 87\text{ °C}$		314			A
$I_{T(AV)}/I_{F(AV)}$	average forward current	single phase, half sine-wave 180°		200			A
I_{TSM}/I_{FSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$		5600			A
		half sine wave; $T_{j(init)} = 135\text{ °C}$; $t_p = 10\text{ ms}$		5100			A
		half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$		6160			A
		half sine wave; $T_{j(init)} = 135\text{ °C}$; $t_p = 8.3\text{ ms}$		5610			A
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.2\text{ A}$; $T_j = 25\text{ °C}$		-	-	150	mA
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.2\text{ A}$; $T_j = 25\text{ °C}$		-	-	2	V
V_T	on-state voltage	$I_T = 200\text{ A}$; $T_j = 25\text{ °C}$		-	-	1.3	V
V_F	forward voltage	$I_F = 200\text{ A}$; $T_j = 25\text{ °C}$		-	-	1.3	V

5. Pinning information

Table 2. Pinning information

Simplified outline	Graphic symbol
	

6. Ordering information

Table 3. Ordering information

Type number	Orderable part number	Packing method	Small packing quantity
WHMH200S16	WHMH200S16T	Tray	16

7. Marking

Table 4. Marking codes

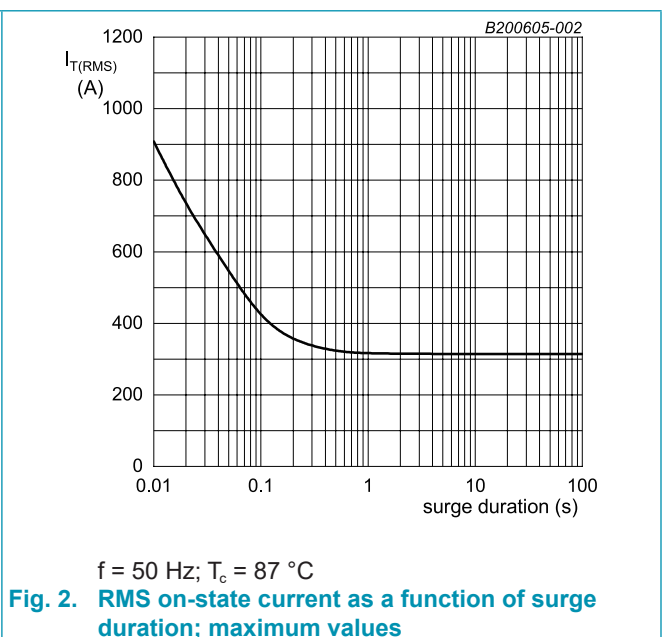
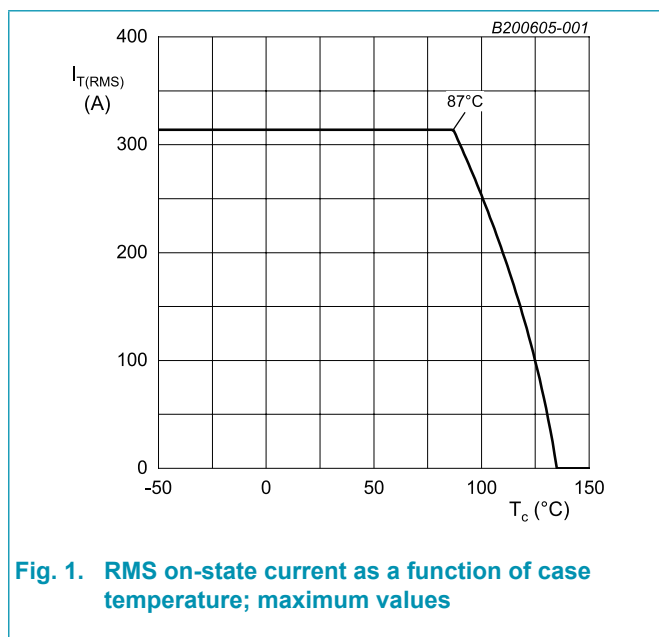
Type number	Marking codes
WHMH200S16	WHMH200S16

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Notes	Values	Unit
V_{DSM}	Non-repetitive peak forward voltage			1700	V
V_{RSM}	Non-repetitive peak reverse voltage			1700	V
V_{DRM}	repetitive peak forward voltage			1600	V
V_{RRM}	repetitive peak reverse voltage			1600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_c = 87\text{ °C}$		200	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_c = 87\text{ °C}$		314	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 10\text{ ms}$		5600	A
		half sine wave; $T_{j(\text{init})} = 135\text{ °C}$; $t_p = 10\text{ ms}$		5100	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$		6160	A
		half sine wave; $T_{j(\text{init})} = 135\text{ °C}$; $t_p = 8.3\text{ ms}$		5610	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse		156.8	kA^2s
di_T/dt	rate of rise of on-state current	$I_G = 300\text{ mA}$		200	$\text{A}/\mu\text{s}$
P_{GM}	peak gate power			120	W
$P_{G(AV)}$	average gate power	over any 20 ms period		20	W
T_{vj}	virtual junction temperature			-40 to 135	$^{\circ}\text{C}$
T_{op}	operation temperature			-40 to 135	$^{\circ}\text{C}$
T_{stg}	storage temperature			-40 to 150	$^{\circ}\text{C}$



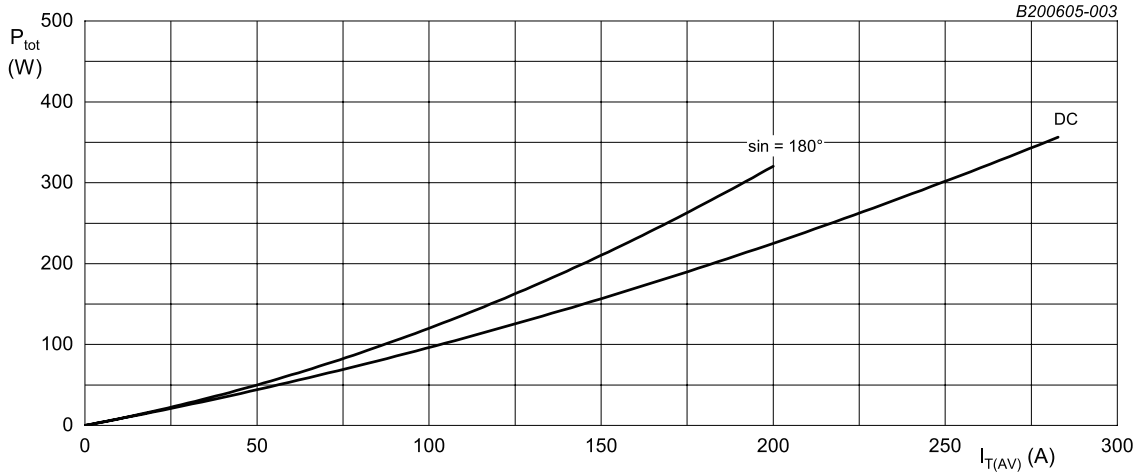
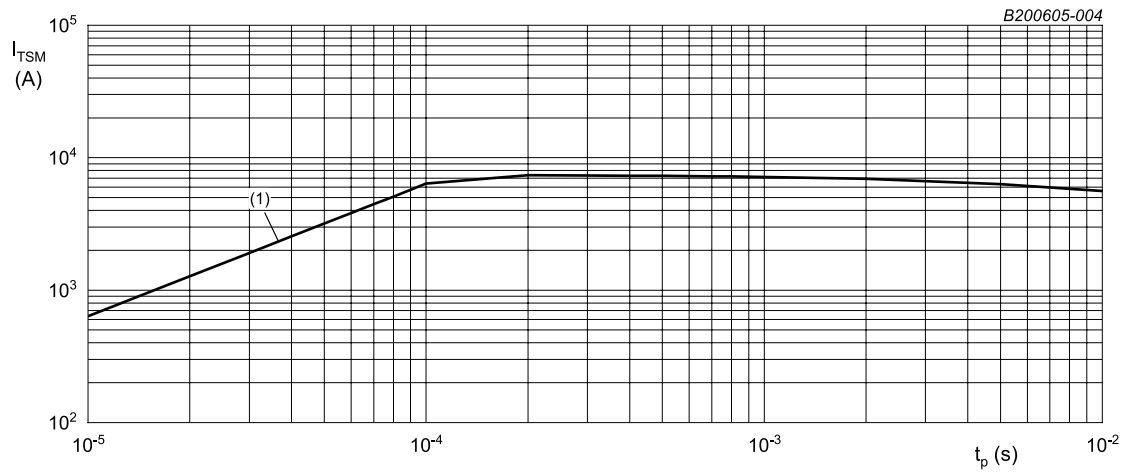


Fig. 3. Total power dissipation as a function of average on-state current; maximum values; per thyristor



$t_p \leq 10 \text{ ms}$
(1) di_T/dt limit

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

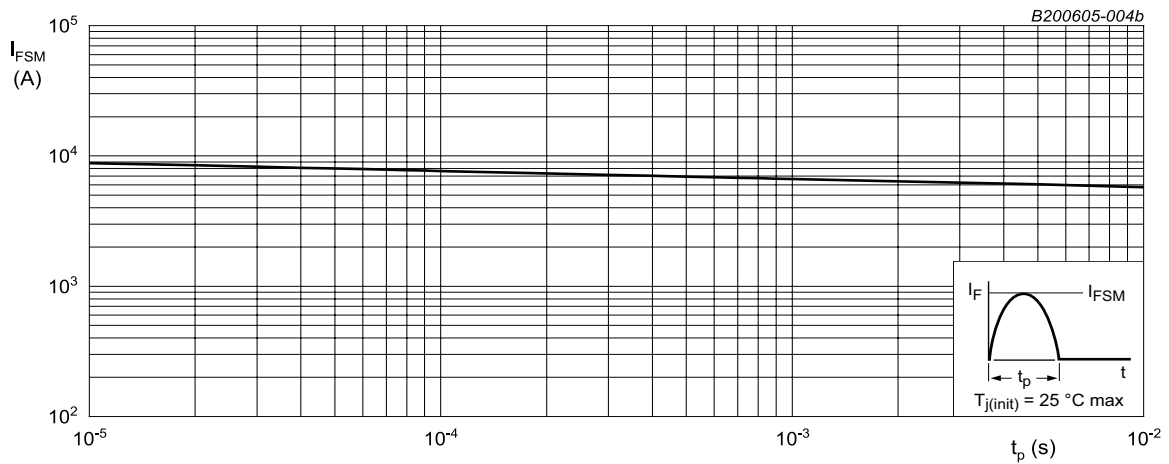


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	per thyristor	-	-	0.15	K/W
		per module	-	-	0.075	K/W
$R_{th(c-h)}$	thermal resistance from case to heatsink	per thyristor	-	-	0.1	K/W
		per module	-	-	0.05	K/W

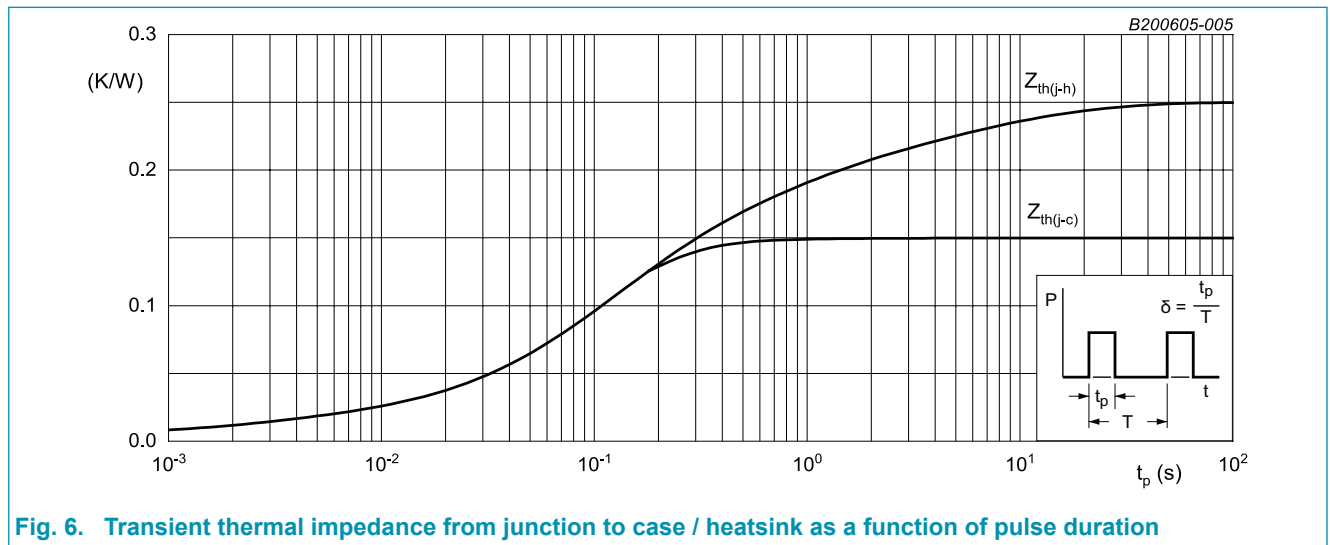


Fig. 6. Transient thermal impedance from junction to case / heatsink as a function of pulse duration

10. Package characteristics

Table 7. Isolation characteristics

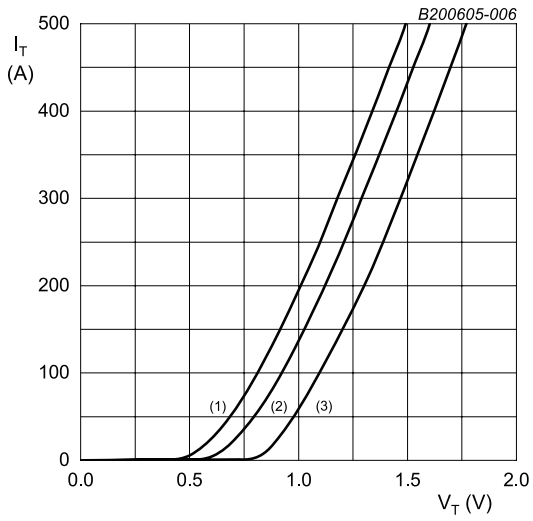
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{isol}	isolation voltage	50/60 Hz; RMS; $I_{ISOL} \leq 1 \text{ mA}$; $t = 1 \text{ second}$; AC	-	-	3600	V
		50/60 Hz; RMS; $I_{ISOL} \leq 1 \text{ mA}$; $t = 1 \text{ minute}$; AC	-	-	3000	V

11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}; I_T = 0.2\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	-	150	mA
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}; I_T = 0.2\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	-	2	V
		$V_D = \frac{2}{3} V_{DRM}; I_T = 0.2\text{ A}; T_j = 135\text{ }^\circ\text{C}$	0.25	0.48	-	V
I_{GD}	gate non-trigger current	$T_j = 135\text{ }^\circ\text{C}$	-	-	10	mA
V_{GD}	gate non-trigger voltage	$T_j = 135\text{ }^\circ\text{C}$	-	-	0.2	V
I_L	latching current	$V_D = 12\text{ V}; I_T = 0.2\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	-	300	mA
I_H	holding current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	200	mA
V_T	on-state voltage	$I_T = 200\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	-	1.3	V
V_{TO}	threshold voltage	$T_j = 135\text{ }^\circ\text{C}$	-	-	0.8	V
r_T	slope resistance	$T_j = 135\text{ }^\circ\text{C}$	-	-	1.6	m Ω
I_D	off-state current	$V_D = 1600\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	100	μA
		$V_D = 1600\text{ V}; T_j = 135\text{ }^\circ\text{C}$	-	-	10	mA
I_R	reverse current	$V_R = 1600\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	100	μA
		$V_R = 1600\text{ V}; T_j = 135\text{ }^\circ\text{C}$	-	-	10	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 1072\text{ V}; T_j = 135\text{ }^\circ\text{C}; (V_{DM} = 67\% \text{ of } V_{DRM}); \text{exponential waveform; gate open circuit}$	1500	-	-	V/ μs
t_{gt}	gate-controlled turn-on time	$V_D = 67\% \text{ of } V_{DRM}$	-	-	2	μs
t_q	commutated turn-off time	$V_R = 100\text{ V}; t_p = 50\text{ } \mu\text{s}; dV_D/dt = 5\text{ V}/\mu\text{s}; dI/dt = 30\text{ A}/\mu\text{s}; T_j = 135\text{ }^\circ\text{C}$	-	150	-	μs

Diode							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	$I_F = 200\text{ A}; T_j = 25\text{ }^\circ\text{C}$		-	-	1.3	V
I_R	reverse current	$V_R = 1600\text{ V}; T_j = 25\text{ }^\circ\text{C}$		-	-	100	μA
		$V_R = 1600\text{ V}; T_j = 135\text{ }^\circ\text{C}$		-	-	10	mA



- (1) $T_j = 135\text{ }^\circ\text{C}$; typical values
- (2) $T_j = 135\text{ }^\circ\text{C}$; maximum values
- (3) $T_j = 25\text{ }^\circ\text{C}$; maximum values

Fig. 7. On-state current as a function of on-state voltage

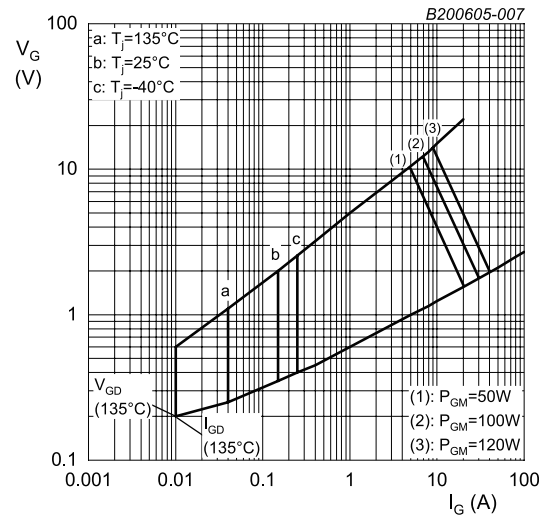
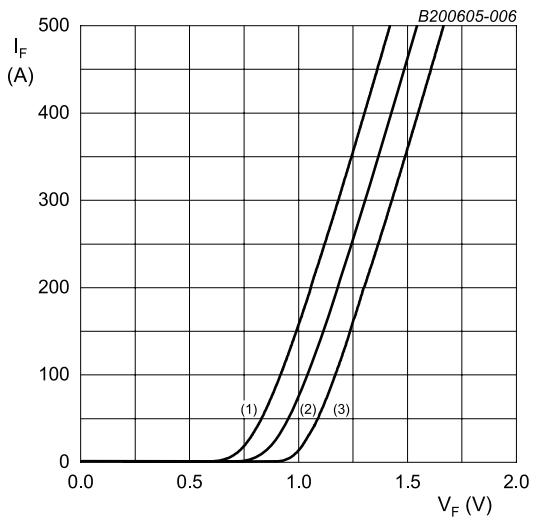


Fig. 8. Gate voltage as a function of gate current

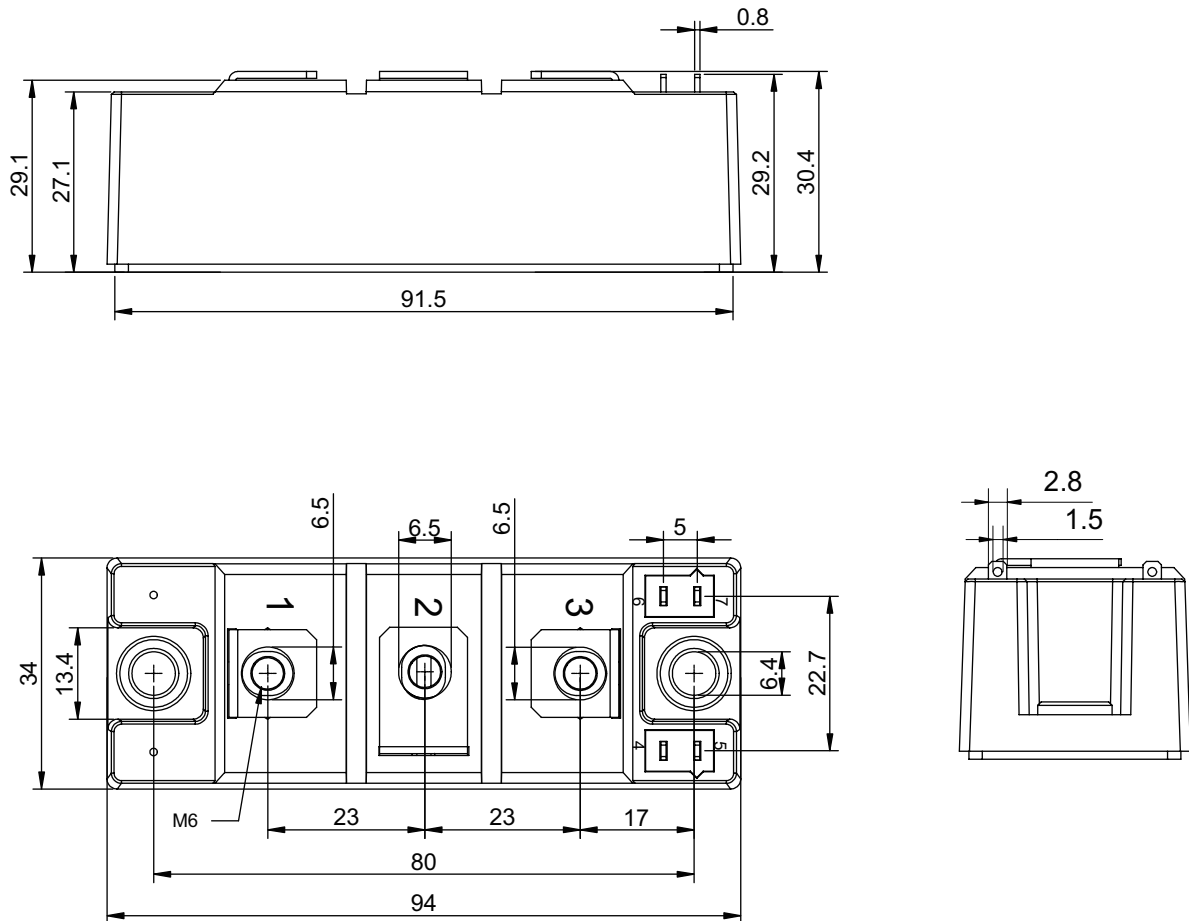


- (1) $T_j = 135\text{ }^\circ\text{C}$; typical values
- (2) $T_j = 135\text{ }^\circ\text{C}$; maximum values
- (3) $T_j = 25\text{ }^\circ\text{C}$; maximum values

Fig. 9. Diode forward current as a function of forward voltage

12. Package outline

Dimensions in mm



General tolerance $\pm 0.5\text{mm}$
Signal pins 4-7 are optional, defined by graphic symbol definition.

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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 07 May 2026
