

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) module in TO-240AA 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
- Package meets UL certification
- Package is RoHS compliant
- Industry standard outline
- Soldering pins for PCB mounting
- Copper base plate
- Cathode Kelvin contacts provided
- UL1557 certified (Document number E346397)

## 3. Applications

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

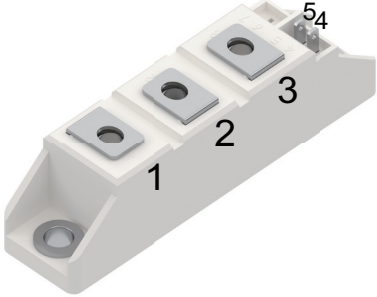
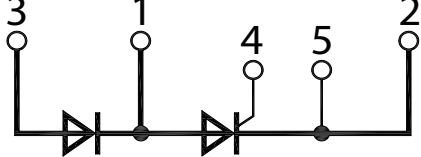
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
<b>Absolute maximum rating</b>							
$V_{DRM}$	repetitive peak forward voltage			1600			V
$V_{RRM}$	repetitive peak reverse voltage			1600			V
$I_{T(RMS)}$	RMS on-state current	half sine wave		182			A
$I_{T(AV)}/I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse		116			A
$I_{TSM}/I_{FSM}$	non-repetitive peak on-state current	half sine wave; $T_{J(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$		2300			A
		half sine wave; $T_{J(init)} = 150\text{ °C}$ ; $t_p = 10\text{ ms}$		2000			A
		half sine wave; $T_{J(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$		2530			A
		half sine wave; $T_{J(init)} = 150\text{ °C}$ ; $t_p = 8.3\text{ ms}$		2200			A
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ °C}$		30	-	100	mA
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ °C}$		-	0.70	1.20	V
$V_T$	on-state voltage	$I_T = 116\text{ A}$ ; $T_J = 25\text{ °C}$		-	-	1.29	V
$V_F$	forward voltage	$I_F = 116\text{ A}$ ; $T_J = 25\text{ °C}$		-	-	1.29	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
WHMH116T16	TO-240AA	WHMH116T16T	Tray	12	WeEnPACK-20mmPHB-D	18-Apr-2024

## 7. Marking

Table 4. Marking codes

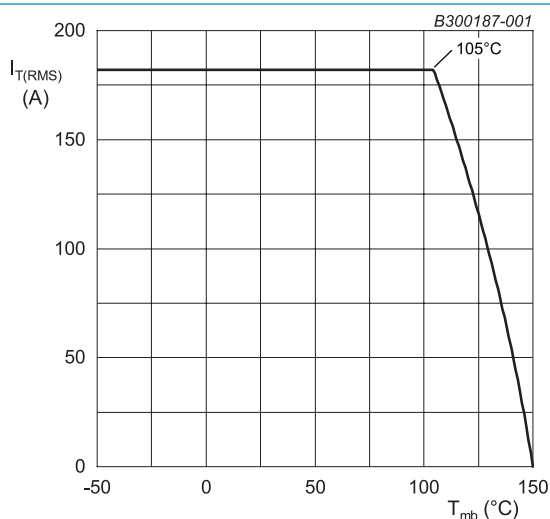
Type number	Marking codes
WHMH116T16	WHMH116T16

## 8. Limiting values

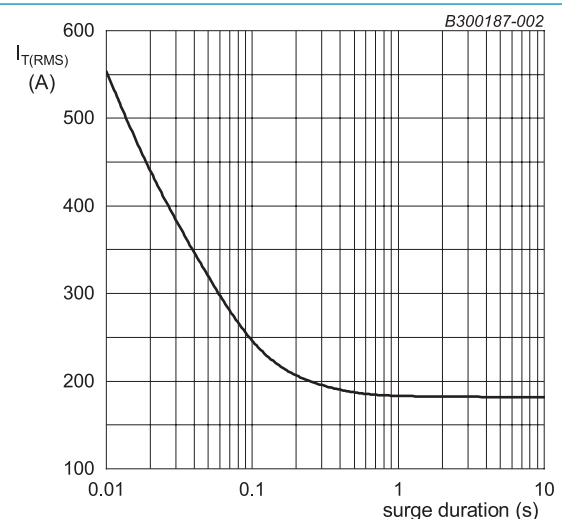
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{DRM}$	repetitive peak forward voltage			1600	V
$V_{RRM}$	repetitive peak reverse voltage			1600	V
$I_{T(RMS)}$	RMS on-state current	half sine wave		182	A
$I_{T(AV)}/I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse		116	A
$I_{TSM}/I_{FSM}$	non-repetitive peak onstate current	half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$		2300	A
		half sine wave; $T_{j(init)} = 150\text{ °C}$ ; $t_p = 10\text{ ms}$		2000	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$		2530	A
		half sine wave; $T_{j(init)} = 150\text{ °C}$ ; $t_p = 8.3\text{ ms}$		2200	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse		26.5	kA <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_G = 200\text{ mA}$ ; $T_j = 150\text{ °C}$		200	A/ $\mu$ s
$I_{GM}$	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			-40 to 150	°C
$T_{op}$	operation temperature			-40 to 130	°C
$T_{stg}$	storage temperature			-40 to 130	°C



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



**Fig. 2. RMS on-state current as a function of surge duration; maximum values**  
 $f = 50\text{ Hz}$ ;  $T_{mb} = 105\text{ °C}$

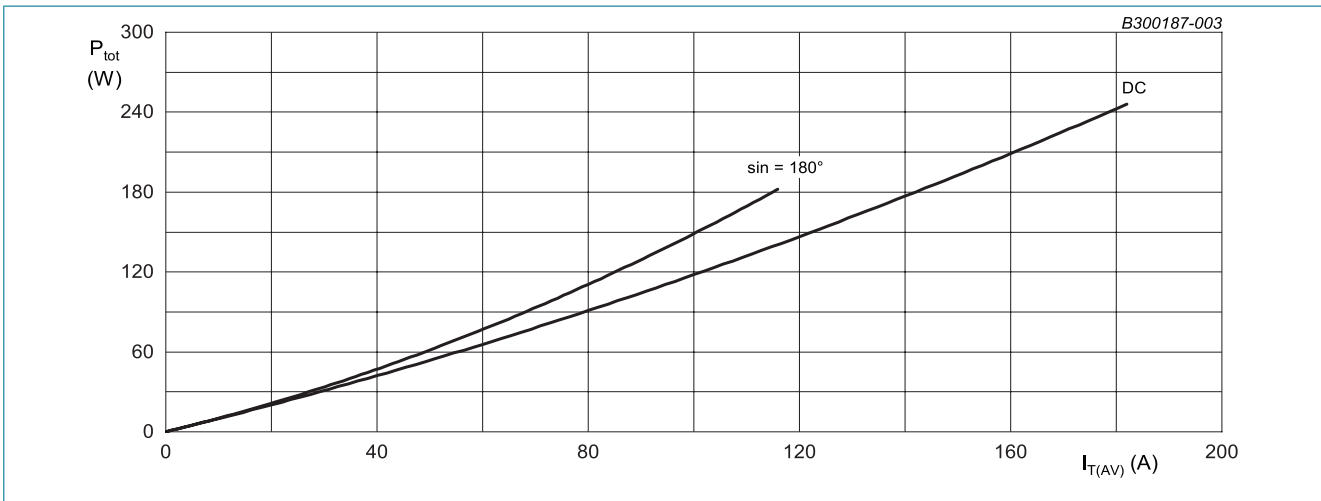


Fig. 3. Total power dissipation as a function of average on-state current; maximum values; per thyristor

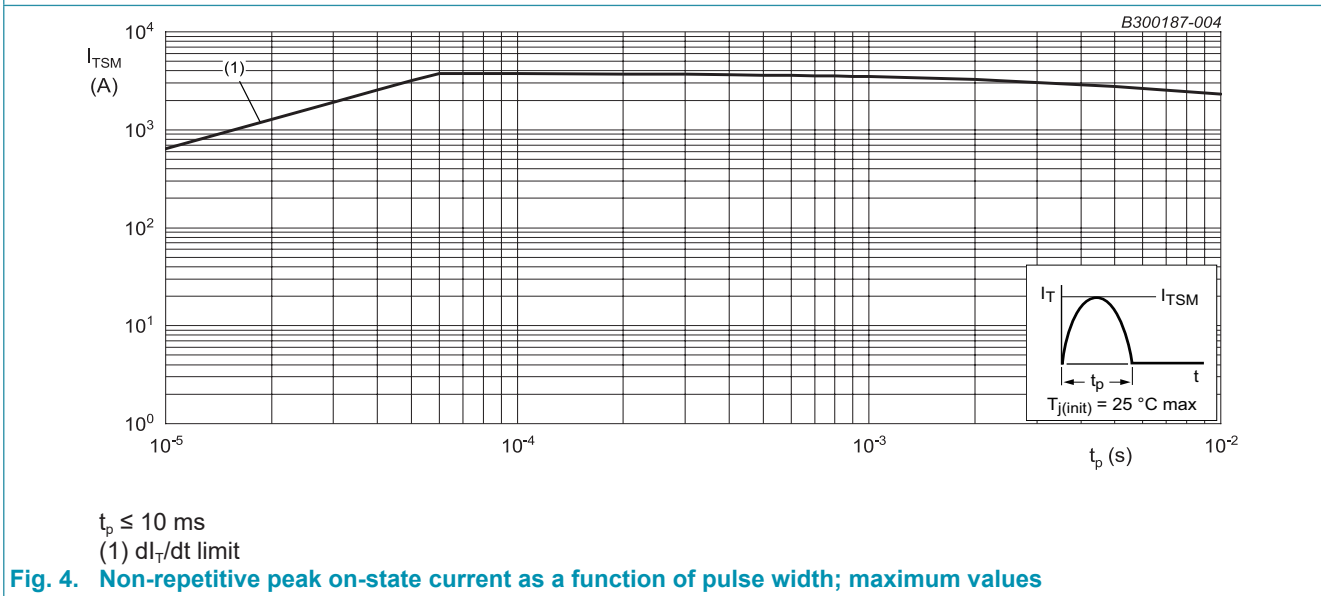


Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values

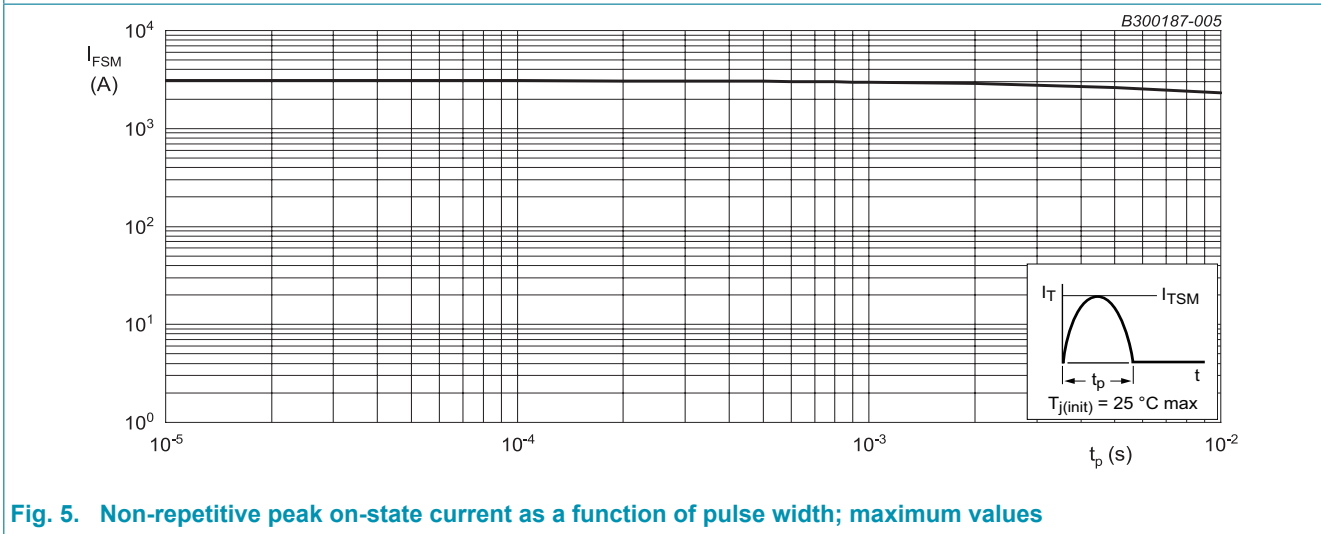


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

### 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	per thyristor/diode		-	-	0.25	K/W
		per module		-	-	0.125	K/W
$R_{th(j-h)}$	thermal resistance from junction to heatsink	per thyristor/diode		-	-	0.48	K/W
		per module		-	-	0.24	K/W

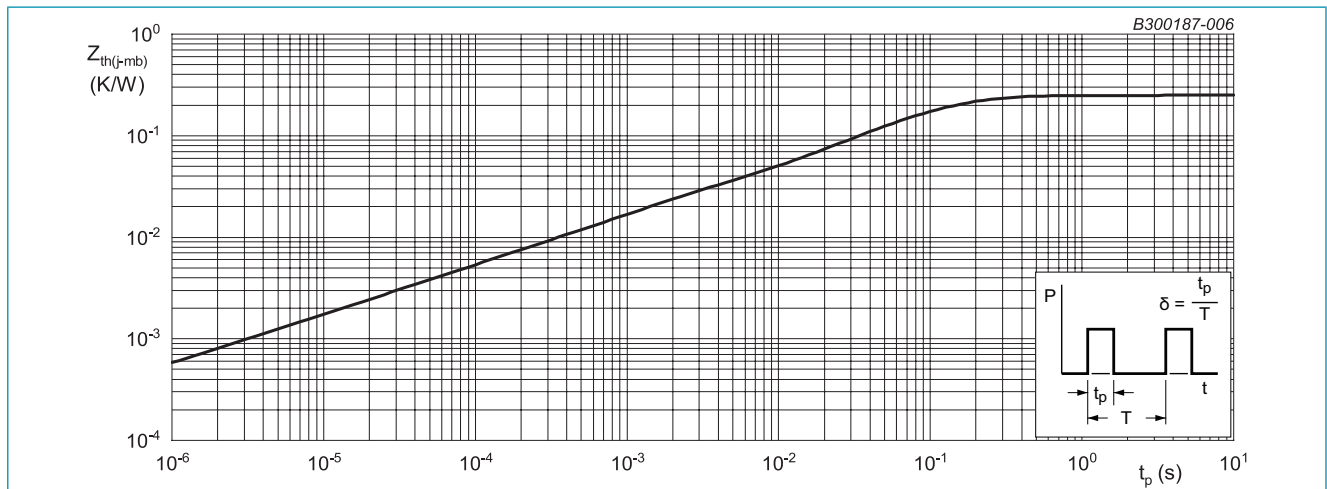


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration; per thyristor

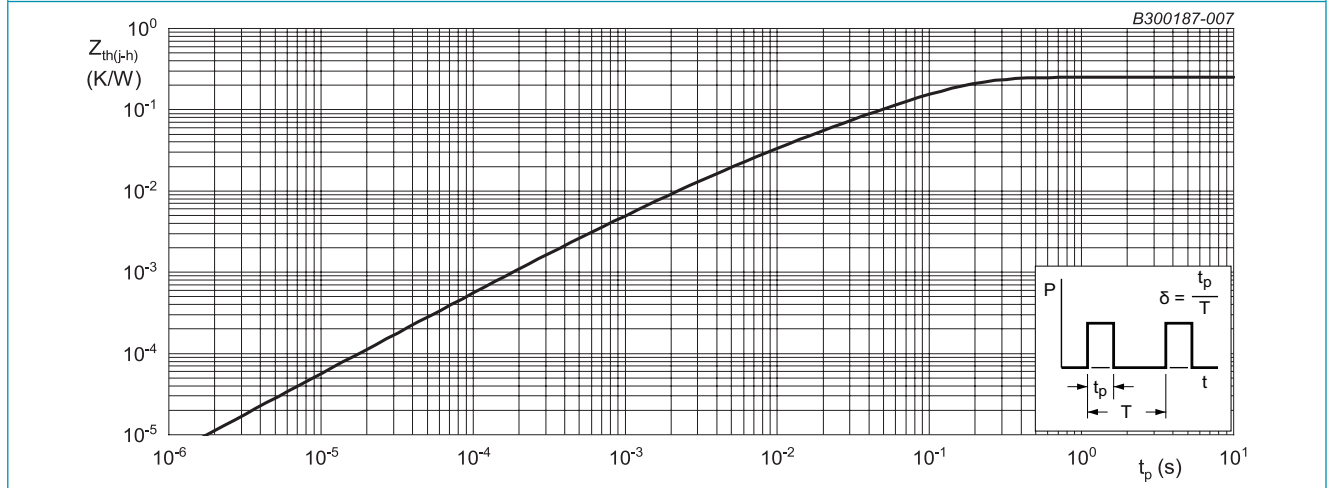


Fig. 7. Transient thermal impedance from junction to mounting base as a function of pulse duration; per diode

### 10. Package characteristics

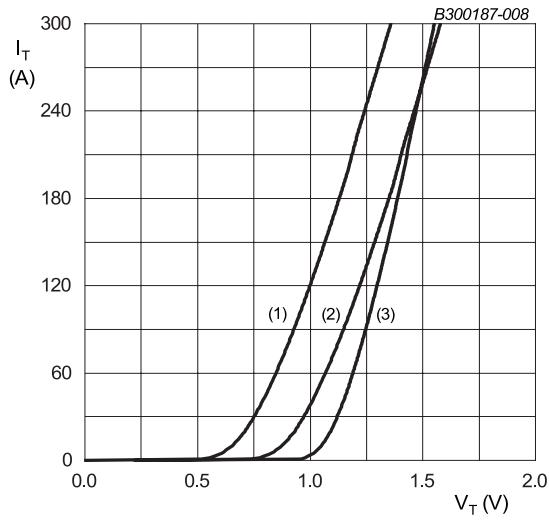
Table 7. Isolation characteristics

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

## 11. Characteristics

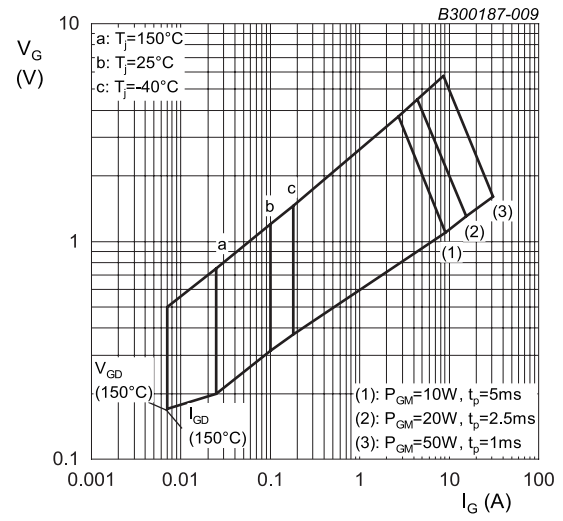
Table 8. Characteristics

Thyristor							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ °C}$		30	-	100	mA
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ °C}$		-	0.70	1.20	V
		$V_D = 2/3 V_{DRM}; I_T = 0.1\text{ A}; T_j = 150\text{ °C}$		0.2	0.4	-	V
$I_{GD}$	gate non-trigger current	$T_j = 150\text{ °C}$		-	-	7.0	mA
$V_{GD}$	gate non-trigger voltage	$T_j = 150\text{ °C}$		-	-	0.17	V
$I_L$	latching current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ °C}$		-	-	300	mA
$I_H$	holding current	$V_D = 12\text{ V}; T_j = 25\text{ °C}$		-	-	200	mA
$V_T$	on-state voltage	$I_T = 116\text{ A}; T_j = 25\text{ °C}$		-	-	1.29	V
$V_{TO}$	threshold voltage	$T_j = 150\text{ °C}$		-	-	0.969	V
$r_T$	slope resistance	$T_j = 150\text{ °C}$		-	-	2.1	mΩ
$I_D$	off-state current	$V_D = 1600\text{ V}; T_j = 25\text{ °C}$		-	-	100	μA
		$V_D = 1600\text{ V}; T_j = 150\text{ °C}$		-	-	15	mA
$I_R$	reverse current	$V_R = 1600\text{ V}; T_j = 25\text{ °C}$		-	-	100	μA
		$V_R = 1600\text{ V}; T_j = 150\text{ °C}$		-	-	15	mA
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 1072\text{ V}; T_j = 150\text{ °C}; (V_{DM} = 67\% \text{ of } V_{DRM}); \text{exponential waveform}; \text{gate open circuit}$		1500	-	-	V/μs
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 40\text{ A}; V_D = 800\text{ V}; I_G = 100\text{ mA}; (dI_G/dt)_M = 1\text{ A}/\mu\text{s}; T_j = 25\text{ °C}$		-	2	-	μs
$t_q$	commutated turn-off time	$I_{TM} = 2\text{ A}; t_p = 50\text{ μs}; dV/dt = 5\text{ V}/\mu\text{s}; dI/dt = 30\text{ A}/\mu\text{s}; T_j = 25\text{ °C}$		-	150	-	μs
<b>Diode</b>							
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_F$	forward voltage	$I_F = 116\text{ A}; T_j = 25\text{ °C}$		-	1.15	1.29	V
		$I_F = 116\text{ A}; T_j = 150\text{ °C}$		-	-	1.20	V
$V_O$	threshold voltage	$T_j = 150\text{ °C}$		-	-	0.933	V
$R_S$	slope resistance	$T_j = 150\text{ °C}$		-	-	2.4	mΩ
$I_R$	reverse current	$V_R = 1600\text{ V}; T_j = 25\text{ °C}$		-	-	100	μA
		$V_R = 1600\text{ V}; T_j = 150\text{ °C}$		-	-	15	mA

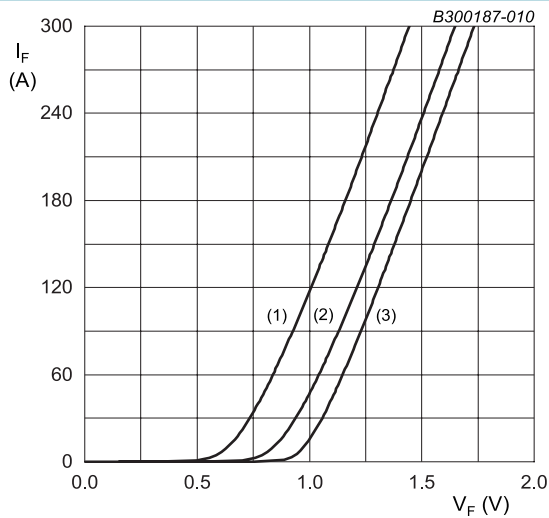


$V_{T0} = 0.969 \text{ V}$ ;  $r_T = 0.0021 \Omega$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

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



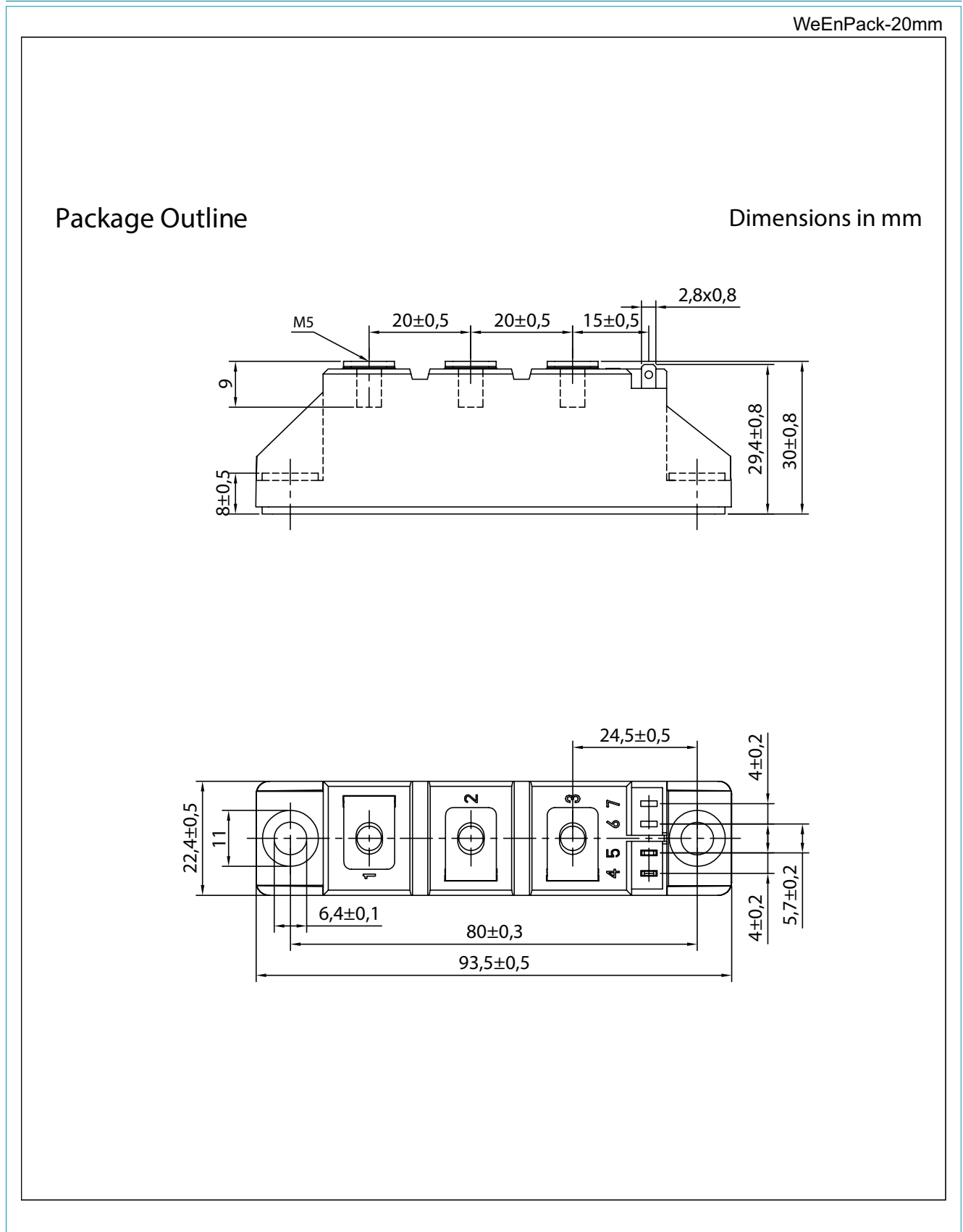
**Fig. 9. Gate voltage as a function of gate current**



$V_o = 0.933 \text{ V}$ ;  $R_s = 0.0024 \Omega$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

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

## 12. Package outline





## 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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Date of release: 20 November 2024

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