

$V_{DRM} = 5600$	$V$	<h1>Phase Control Thyristor</h1> <h2>5STP 42U6500</h2>
$V_{DSM} = 6500$	$V$	
$I_{T(AV)M} = 3460$	$A$	
$I_{T(RMS)} = 5440$	$A$	
$I_{TSM} = 71.4 \times 10^3$	$A$	
$V_{(T0)} = 1.24$	$V$	
$r_T = 0.162$	$mW$	

Doc. No. 5SYA1043-02 Oct. 04

- Patented free-floating silicon technology
- Low on-state and switching losses
- Designed for traction, energy and industrial applications
- Optimum power handling capability
- Interdigitated amplifying gate

### Blocking

Maximum rated values <sup>1)</sup>

Symbol	Conditions	5STP 42U6500	5STP 42U6200	5STP 42U5800
$V_{DSM}, V_{RSM}$	$f = 5 \text{ Hz}, t_p = 10 \text{ ms}$	6500 V	6200 V	5800 V
$V_{DRM}, V_{RRM}$	$f = 50 \text{ Hz}, t_p = 10 \text{ ms}$	5600 V	5300 V	4900 V
$V_{RSM}$	$t_p = 5 \text{ ms}, \text{ single pulse}$	7000 V	6700 V	6300 V
$dV/dt_{crit}$	Exp. to 3750 V, $T_{vj} = 110^\circ\text{C}$	2000 V/ $\mu\text{s}$		

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Forward leakage current	$I_{DSM}$	$V_{DSM}, T_{vj} = 110^\circ\text{C}$			700	mA
Reverse leakage current	$I_{RSM}$	$V_{RSM}, T_{vj} = 110^\circ\text{C}$			700	mA

### Mechanical data

Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Mounting force	$F_M$		120	135	160	kN
Acceleration	$a$	Device unclamped			50	$\text{m/s}^2$
Acceleration	$a$	Device clamped			100	$\text{m/s}^2$

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Weight	$m$				3.6	kg
Housing thickness	$H$	$F_M = 135 \text{ kN}, T_a = 25^\circ\text{C}$	34.8		35.5	mm
Surface creepage distance	$D_s$		56			mm
Air strike distance	$D_a$		22			mm

1) Maximum rated values indicate limits beyond which damage to the device may occur

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**On-state**

查询"5STP42U6200"供应商  
Maximum rated values

Parameter	Symbol	Conditions	min	typ	max	Unit
Average on-state current	$I_{T(AV)M}$	Half sine wave, $T_c = 70^\circ\text{C}$			3460	A
RMS on-state current	$I_{T(RMS)}$				5440	A
Peak non-repetitive surge current	$I_{TSM}$	$t_p = 10\text{ ms}$ , $T_{vj} = 110^\circ\text{C}$ , $V_D = V_R = 0\text{ V}$			$71.4 \times 10^3$	A
Limiting load integral	$I^2t$				$25.48 \times 10^6$	$\text{A}^2\text{s}$
Peak non-repetitive surge current	$I_{TSM}$	$t_p = 8.3\text{ ms}$ , $T_{vj} = 110^\circ\text{C}$ , $V_D = V_R = 0\text{ V}$			$76.14 \times 10^3$	A
Limiting load integral	$I^2t$				$24.64 \times 10^6$	$\text{A}^2\text{s}$

**Characteristic values**

Parameter	Symbol	Conditions	min	typ	max	Unit
On-state voltage	$V_T$	$I_T = 3000\text{ A}$ , $T_{vj} = 110^\circ\text{C}$			1.71	V
Threshold voltage	$V_{(T0)}$	$I_T = 2000\text{ A} - 6000\text{ A}$ , $T_{vj} = 110^\circ\text{C}$			1.24	V
Slope resistance	$r_T$				0.162	$\text{m}\Omega$
Holding current	$I_H$	$T_{vj} = 25^\circ\text{C}$			200	mA
		$T_{vj} = 110^\circ\text{C}$			100	mA
Latching current	$I_L$	$T_{vj} = 25^\circ\text{C}$			900	mA
		$T_{vj} = 110^\circ\text{C}$			700	mA

**Switching**Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Critical rate of rise of on-state current	$di/dt_{crit}$	$T_{vj} = 110^\circ\text{C}$ , $I_{TRM} = 3000\text{ A}$ , Cont. $f = 50\text{ Hz}$			250	$\text{A}/\mu\text{s}$
		$V_D \leq 1880\text{ V}$ , $I_{FG} = 2\text{ A}$ , $t_r = 0.5\ \mu\text{s}$ Cont. $f = 1\text{ Hz}$			1000	$\text{A}/\mu\text{s}$
Circuit-commutated turn-off time	$t_q$	$T_{vj} = 110^\circ\text{C}$ , $I_{TRM} = 3000\text{ A}$ , $V_R = 200\text{ V}$ , $di_T/dt = -1\text{ A}/\mu\text{s}$ , $V_D \leq 0.67 \cdot V_{DRM}$ , $dv_D/dt = 20\text{ V}/\mu\text{s}$	800			$\mu\text{s}$

**Characteristic values**

Parameter	Symbol	Conditions	min	typ	max	Unit
Recovery charge	$Q_{rr}$	$T_{vj} = 110^\circ\text{C}$ , $I_{TRM} = 3000\text{ A}$ , $V_R = 200\text{ V}$ , $di_T/dt = -1\text{ A}/\mu\text{s}$	4200		5200	$\mu\text{As}$
Gate turn-on delay time	$t_{gd}$	$V_D = 0.4 \cdot V_{RM}$ , $I_{FG} = 2\text{ A}$ , $t_r = 0.5\ \mu\text{s}$ , $T_{vj} = 25^\circ\text{C}$			3	$\mu\text{s}$

## Triggering

Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Peak forward gate voltage	V <sub>FGM</sub>				12	V
Peak forward gate current	I <sub>FGM</sub>				10	A
Peak reverse gate voltage	V <sub>RGM</sub>				10	V
Average gate power loss	P <sub>G(AV)</sub>		see Fig. 9			

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Gate-trigger voltage	V <sub>GT</sub>	T <sub>vj</sub> = 25 °C			2.6	V
Gate-trigger current	I <sub>GT</sub>	T <sub>vj</sub> = 25 °C			400	mA
Gate non-trigger voltage	V <sub>GD</sub>	V <sub>D</sub> = 0.4 x V <sub>DRM</sub> , T <sub>vjmax</sub> = 110 °C	0.3			V
Gate non-trigger current	I <sub>GD</sub>	V <sub>D</sub> = 0.4 x V <sub>DRM</sub> , T <sub>vjmax</sub> = 110 °C	10			mA

## Thermal

Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Operating junction temperature range	T <sub>vj</sub>				110	°C
Storage temperature range	T <sub>stg</sub>		-40		140	°C

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Thermal resistance junction to case	R <sub>th(j-c)</sub>	Double-side cooled F <sub>m</sub> = 120...160 kN			4	K/kW
	R <sub>th(j-c)A</sub>	Anode-side cooled F <sub>m</sub> = 120...160 kN			8	K/kW
	R <sub>th(j-c)C</sub>	Cathode-side cooled F <sub>m</sub> = 120...160 kN			8	K/kW
Thermal resistance case to heatsink	R <sub>th(c-h)</sub>	Double-side cooled F <sub>m</sub> = 120...160 kN			0.8	K/kW
	R <sub>th(c-h)</sub>	Single-side cooled F <sub>m</sub> = 120...160 kN			1.6	K/kW

Analytical function for transient thermal impedance:

$$Z_{th(j-c)}(t) = \sum_{i=1}^n R_{thi} (1 - e^{-t/t_i})$$

i	1	2	3	4
R <sub>thi</sub> (K/kW)	2.695	0.814	0.330	0.162
τ <sub>i</sub> (s)	0.9692	0.1332	0.0177	0.0042

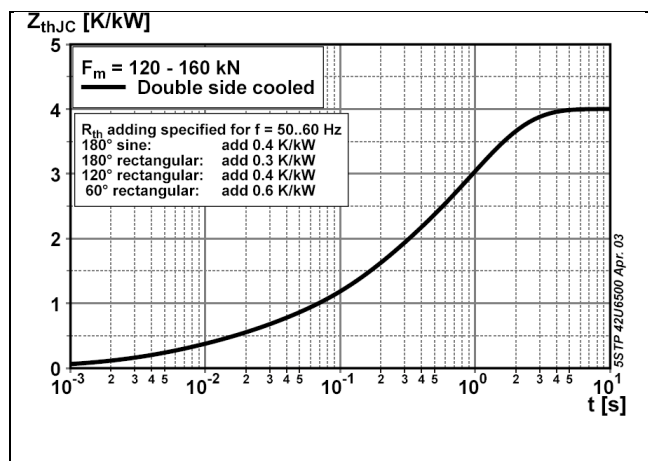


Fig. 1 Transient thermal impedance junction-to case.

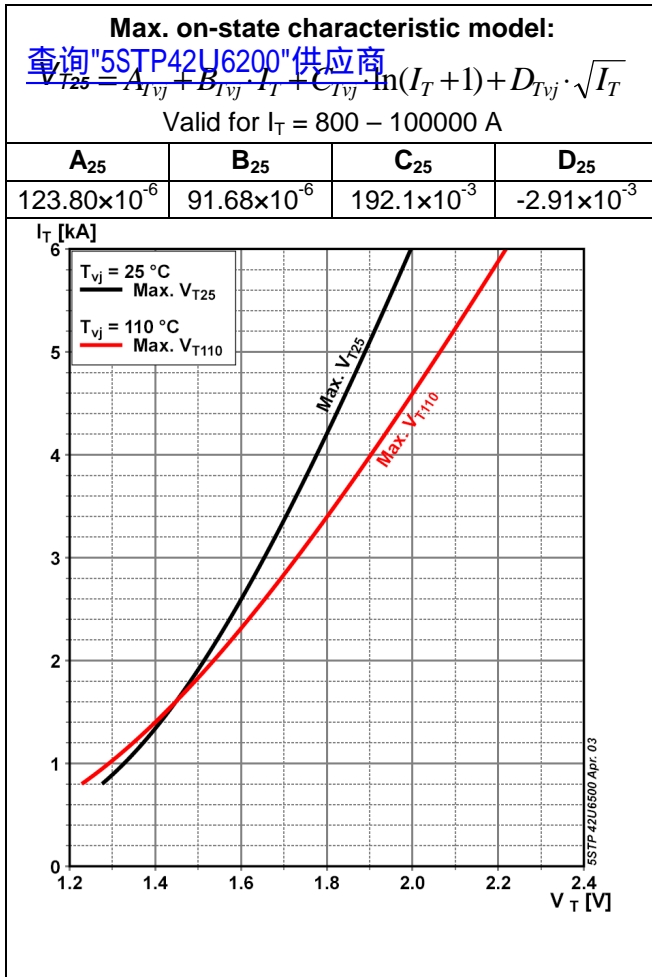


Fig. 2 Max. on-state voltage characteristics

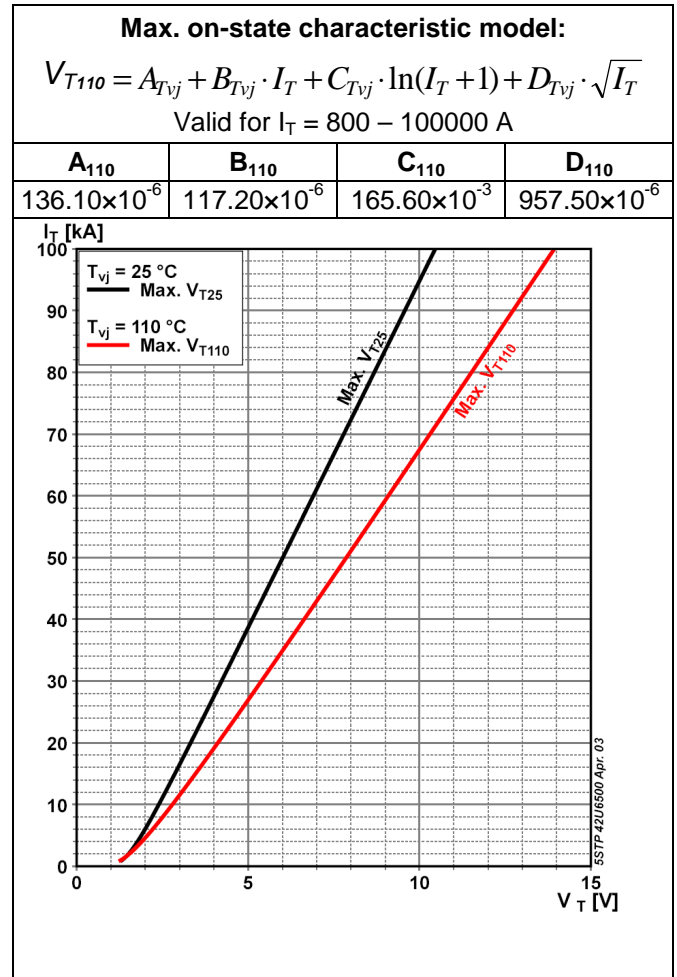


Fig. 3 Max. on-state voltage characteristics

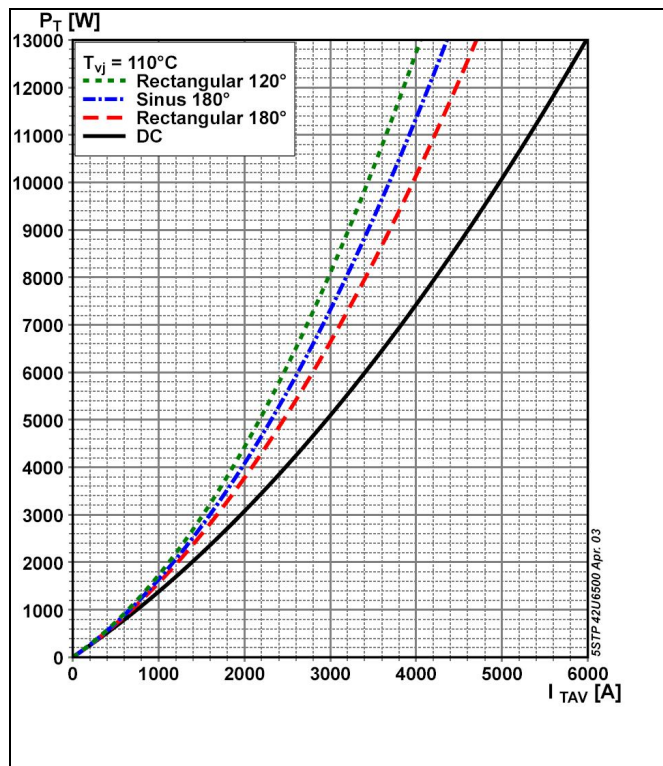


Fig. 4 On-state power dissipation vs. mean on-state current. Turn-on losses excluded.

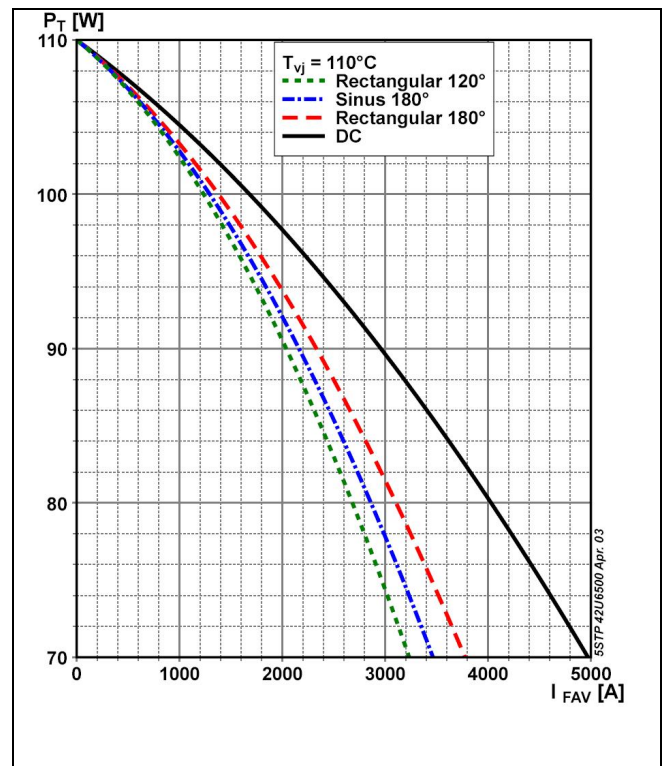


Fig. 5 Max. permissible case temperature vs. mean on-state current.

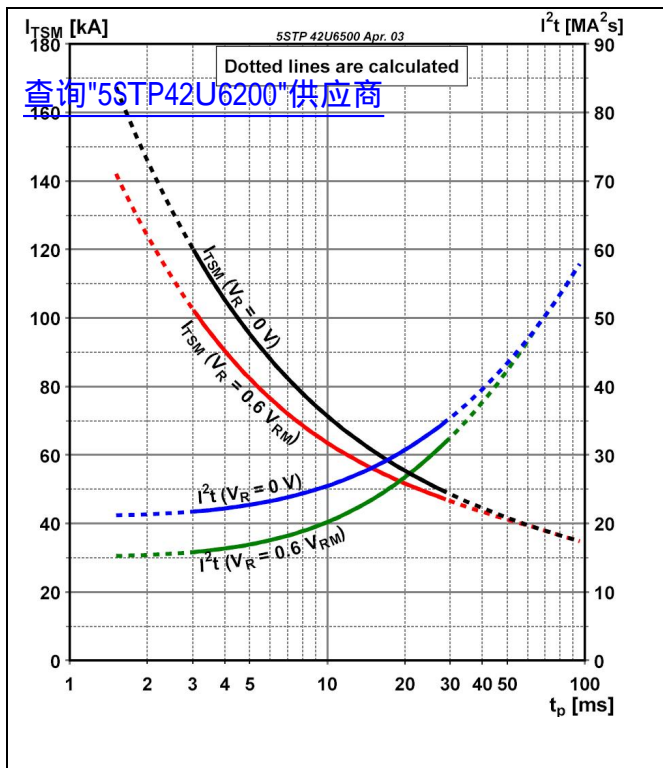


Fig. 6 Surge on-state current vs. pulse length. Half-sine wave.

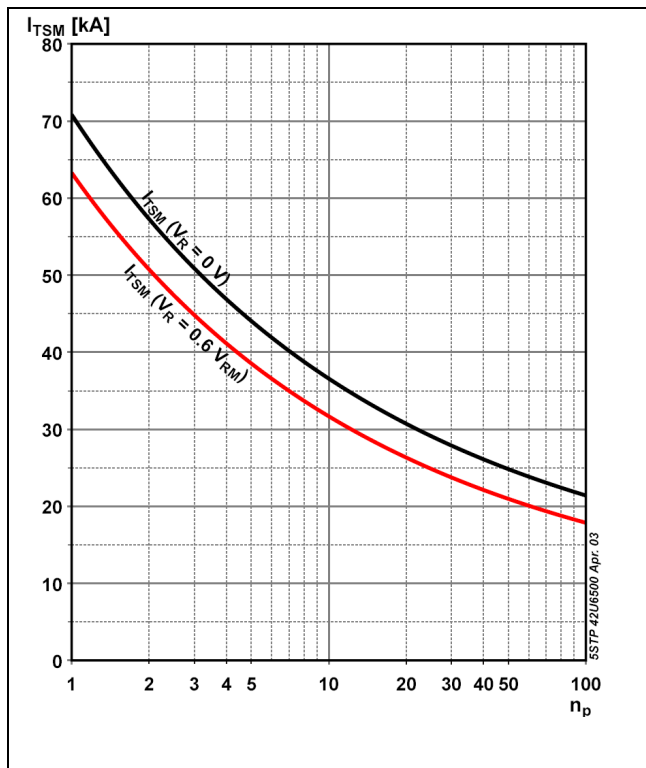


Fig. 7 Surge on-state current vs. number of pulses. Half-sine wave, 10 ms, 50Hz.

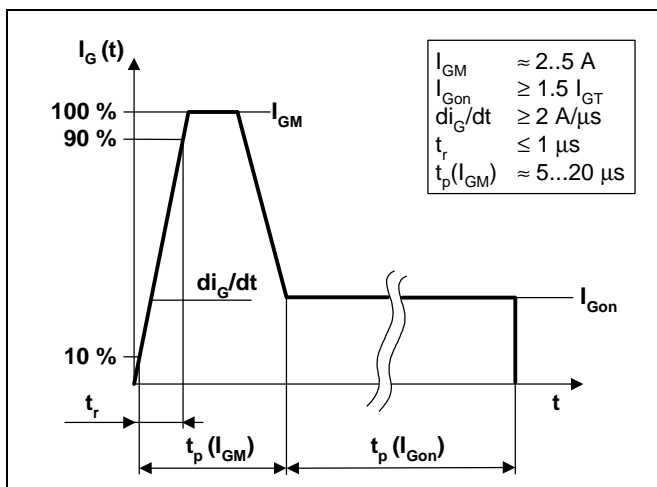


Fig. 8 Recommended gate current waveform.

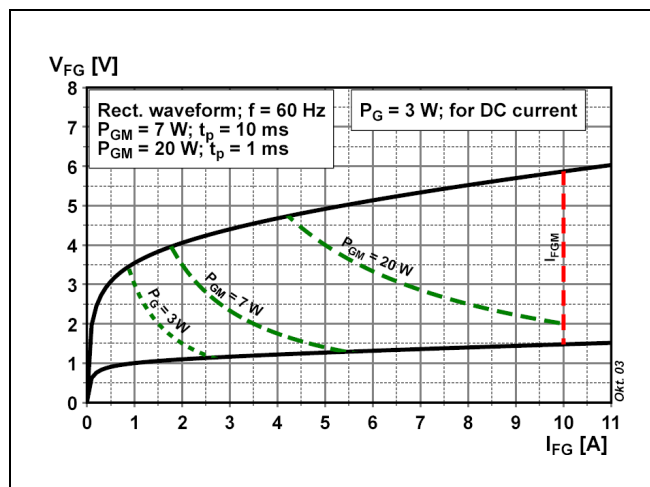


Fig. 9 Max. peak gate power loss.

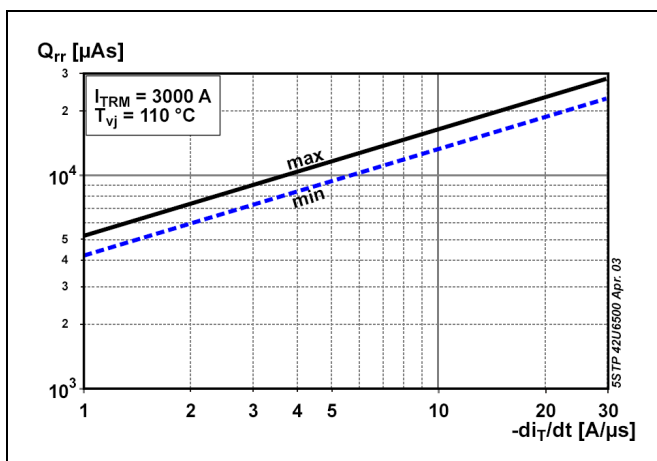


Fig. 10 Recovery charge vs. decay rate of on-state current.

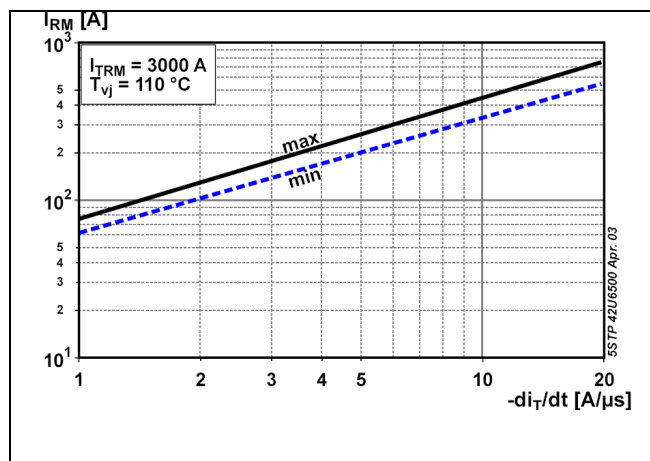


Fig. 11 Peak reverse recovery current vs. decay rate of on-state current.

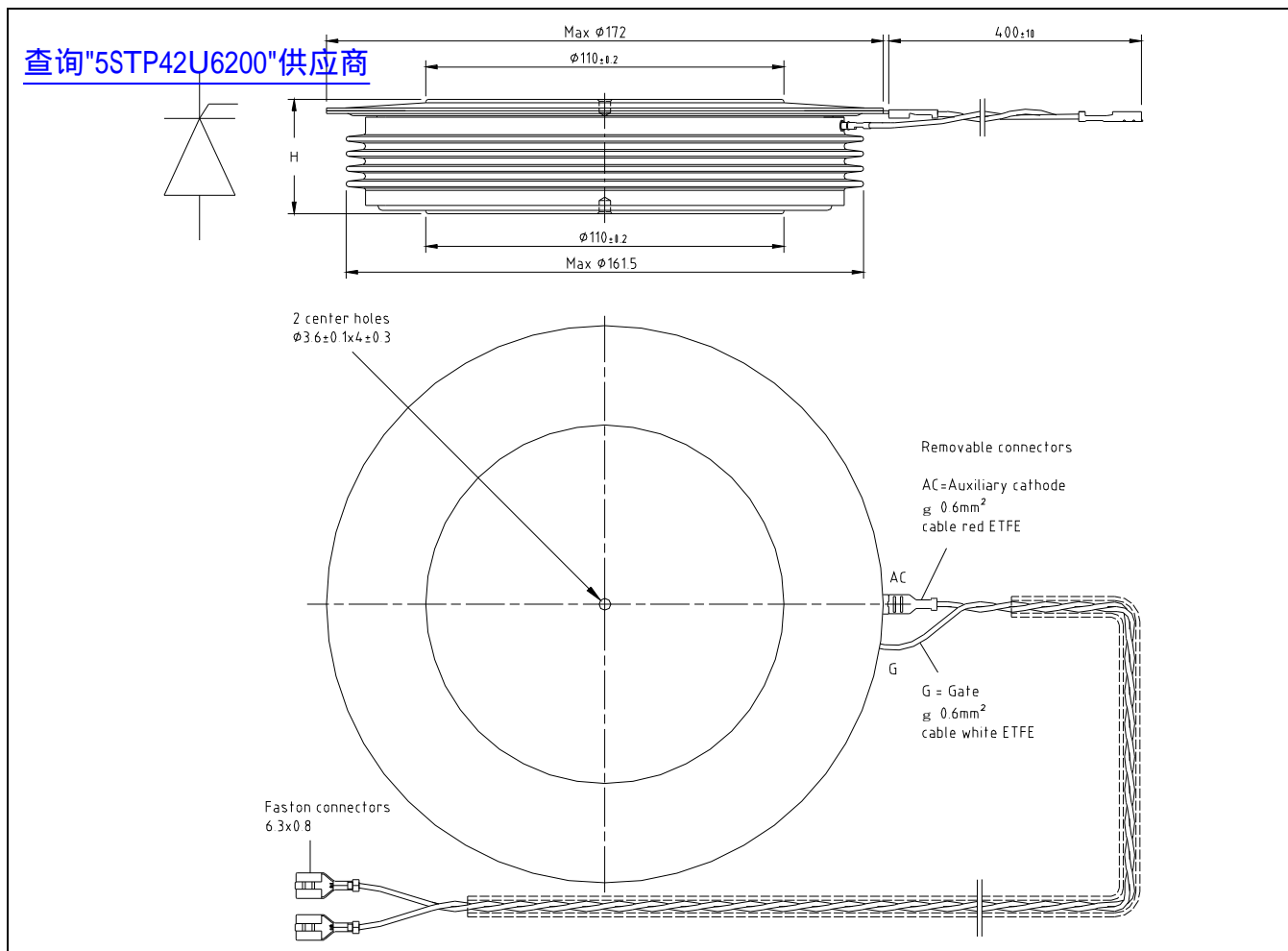


Fig. 12 Device Outline Drawing.

### Related application notes:

Doc. Nr	Titel
5SYA2020	Design of RC-Snubber for Phase Control Applications
5SYA2034	Gate-drive Recommendations for PCT's
5SYA 2036	Recommendations regarding mechanical clamping of Press Pack High Power Semiconductors

Please refer to <http://www.abb.com/semiconductors> for actual versions.

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