

Inverter Grade Thyristors (Hockey PUK Version), 370 A



TO-200AB (A-PUK)

FEATURES

- Metal case with ceramic insulator
- All diffused design
- Center amplifying gate
- Guaranteed high dV/dt
- International standard case TO-200AB (A-PUK)
- Guaranteed high dI/dt
- High surge current capability
- Low thermal impedance
- High speed performance
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?999912


RoHS
COMPLIANT

PRODUCT SUMMARY

Package	TO-200AB (A-PUK)
Diode variation	Single SCR
$I_{T(AV)}$	370 A
V_{DRM}/V_{RRM}	1000 V, 1200 V
V_{TM}	1.72 V
I_{TSM} at 50 Hz	5260 A
I_{TSM} at 60 Hz	5510 A
I_{GT}	200 mA
T_C/T_{hs}	55 °C

TYPICAL APPLICATIONS

- Inverters
- Choppers
- Induction heating
- All types of force-commutated converters

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		370	A
	T_{hs}	55	°C
$I_{T(RMS)}$		700	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	5260	A
	60 Hz	5510	
I^2t	50 Hz	138	kA ² s
	60 Hz	126	
V_{DRM}/V_{RRM}		1000 to 1200	V
t_q	Range	20 to 30	µs
T_J		-40 to 125	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	V_{DRM}/V_{RRM} , MAXIMUM REPETITIVE PEAK VOLTAGE V	V_{RSM} , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I_{DRM}/I_{RRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA
VS-ST203C..C	10	1000	1100	40
	12	1200	1300	

**CURRENT CARRYING CAPABILITY**

FREQUENCY							UNITS
50 Hz	860	750	1340	1160	5620	5020	A
400 Hz	840	706	1400	1220	2940	2590	
1000 Hz	700	580	1350	1170	1750	1520	
2500 Hz	430	340	980	830	910	780	
Recovery voltage V_r	50		50		50		V
Voltage before turn-on V_d	V_{DRM}		V_{DRM}		V_{DRM}		
Rise of on-state current di/dt	50		-		-		A/ μ s
Heatsink temperature	40	55	40	55	40	55	°C
Equivalent values for RC circuit	47/0.22		47/0.22		47/0.22		Ω/μ F

ON-STATE CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS	
Maximum average on-state current at heatsink temperature	I _{T(AV)}	180° conduction, half sine wave double side (single side) cooled			370 (140)	A	
					55 (85)	°C	
Maximum RMS on-state current	I _{T(RMS)}	DC at 25 °C heatsink temperature double side cooled			700	A	
Maximum peak, one half cycle, non-repetitive surge current	I _{TSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T _J = T _J maximum	5260		
		t = 8.3 ms			5510		
		t = 10 ms	100 % V _{RRM} reapplied		4420		
		t = 8.3 ms			4630		
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		138	kA ² s	
		t = 8.3 ms			126		
		t = 10 ms	100 % V _{RRM} reapplied		98		
		t = 8.3 ms			89		
Maximum I ² √t for fusing	I ² √t	t = 0.1 to 10 ms, no voltage reapplied			1380	kA ² √s	
Maximum peak on-state voltage	V _{TM}	I _{TM} = 600 A, T _J = T _J maximum, t _p = 10 ms sine wave pulse			1.72	V	
Low level value of threshold voltage	V _{T(TO)1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			1.17		
High level value of threshold voltage	V _{T(TO)2}	(I > π × I _{T(AV)}), T _J = T _J maximum			1.22		
Low level value of forward slope resistance	r _{t1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			0.92	mΩ	
High level value of forward slope resistance	r _{t2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.83		
Maximum holding current	I _H	T _J = 25 °C, I _T > 30 A			600	mA	
Typical latching current	I _L	T _J = 25 °C, V _A = 12 V, R _a = 6 Ω, I _G = 1 A			1000		



SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum non-repetitive rate of rise of turned on current	di/dt	$T_J = T_J$ maximum, $V_{DRM} = \text{Rated } V_{DRM}$ $I_{TM} = 2 \times di/dt$	1000	A/ μ s
Typical delay time	t_d	$T_J = 25^\circ\text{C}$, $V_{DM} = \text{Rated } V_{DRM}$, $I_{TM} = 50$ A DC, $t_p = 1$ μ s Resistive load, gate pulse: 10 V, 5 Ω source	0.8	μ s
Maximum turn-off time	minimum	$T_J = T_J$ maximum, $I_{TM} = 300$ A, commutating di/dt = 20 A/ μ s $V_R = 50$ V, $t_p = 500$ μ s, dV/dt: See table in device code	20	
	maximum		30	

BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum, linear to 80 % V_{DRM} , higher value available on request	500	V/ μ s
Maximum peak reverse and off-state leakage current	I_{RRM} , I_{DRM}	$T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied	40	mA

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $f = 50$ Hz, $d \% = 50$	60	W
Maximum average gate power	$P_{G(AV)}$		10	
Maximum peak positive gate current	I_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms	10	A
Maximum peak positive gate voltage	+ V_{GM}		20	V
Maximum peak negative gate voltage	- V_{GM}		5	
Maximum DC gate current required to trigger	I_{GT}	$T_J = 25^\circ\text{C}$, $V_A = 12$ V, $R_a = 6$ Ω	200	mA
Maximum DC gate voltage required to trigger	V_{GT}		3	V
Maximum DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum, rated V_{DRM} applied	20	mA
Maximum DC gate voltage not to trigger	V_{GD}		0.25	V

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum operating junction temperature range	T_J		- 40 to 125	$^\circ\text{C}$
Maximum storage temperature range	T_{Stg}		- 40 to 150	
Maximum thermal resistance, junction to heatsink	R_{thJ-hs}	DC operation single side cooled	0.17	K/W
		DC operation double side cooled	0.08	
Maximum thermal resistance, case to heatsink	R_{thC-hs}	DC operation single side cooled	0.033	
		DC operation double side cooled	0.017	
Mounting force, ± 10 %			4900 (500)	N (kg)
Approximate weight			50	g
Case style		See dimensions - link at the end of datasheet	TO-200AB (A-PUK)	



ΔR_{thJ-hs} CONDUCTION						
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION		RECTANGULAR CONDUCTION		TEST CONDITIONS	UNITS
	Single Side	Double Side	Single Side	Double Side		
180°	0.015	0.017	0.011	0.011	$T_J = T_{J \text{ maximum}}$	K/W
120°	0.018	0.019	0.019	0.019		
90°	0.024	0.024	0.026	0.026		
60°	0.035	0.035	0.036	0.037		
30°	0.060	0.060	0.060	0.061		

Note

- The table above shows the increment of thermal resistance R_{thJ-hs} when devices operate at different conduction angles than DC

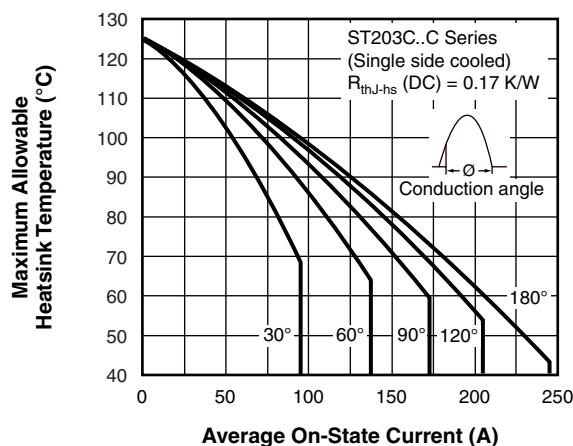


Fig. 1 - Current Ratings Characteristics

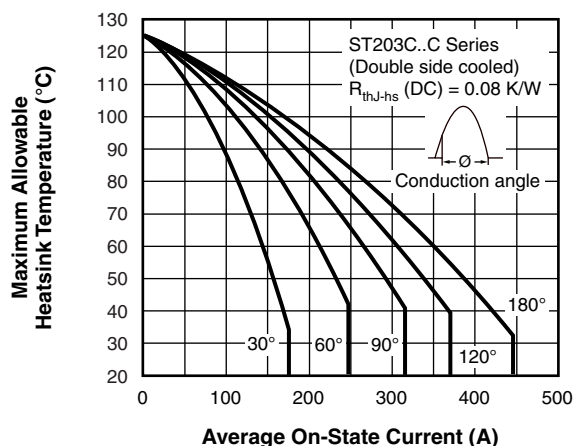


Fig. 3 - Current Ratings Characteristics

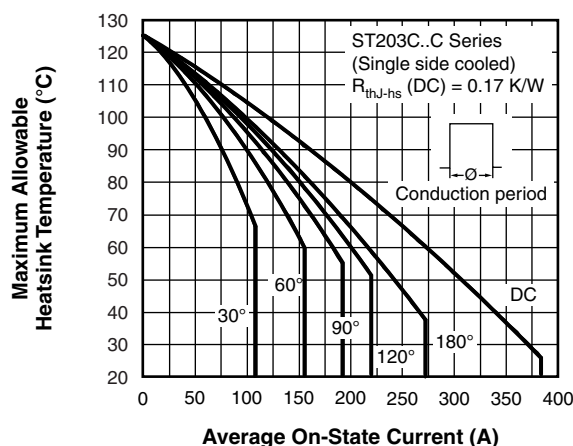


Fig. 2 - Current Ratings Characteristics

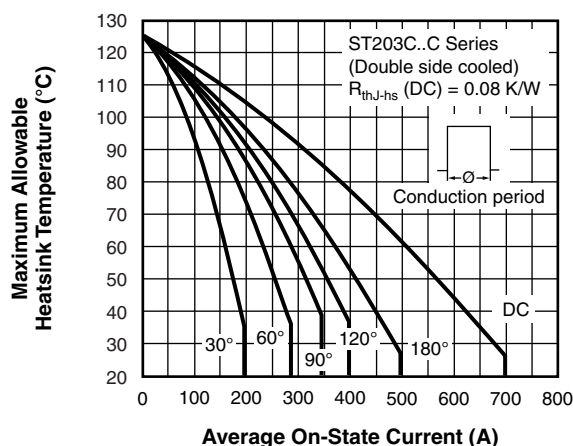


Fig. 4 - Current Ratings Characteristics

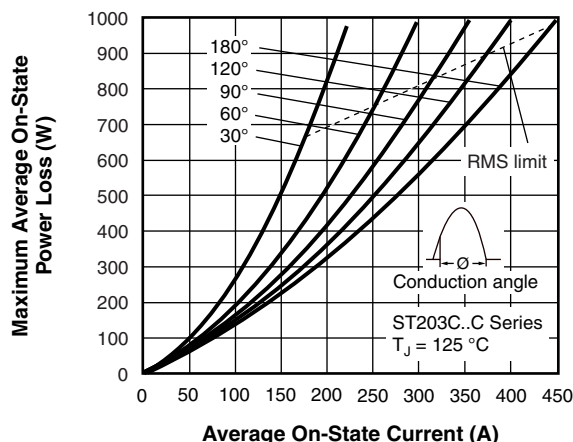


Fig. 5 - On-State Power Loss Characteristics

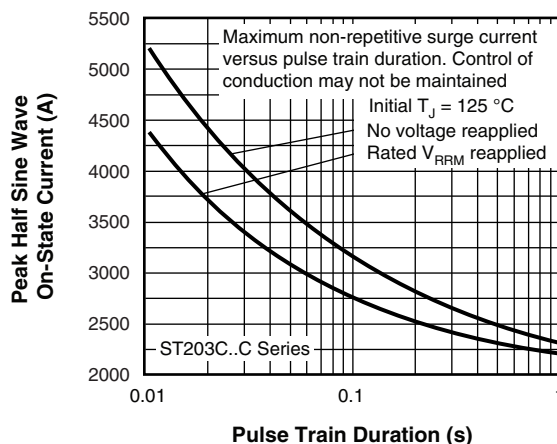


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

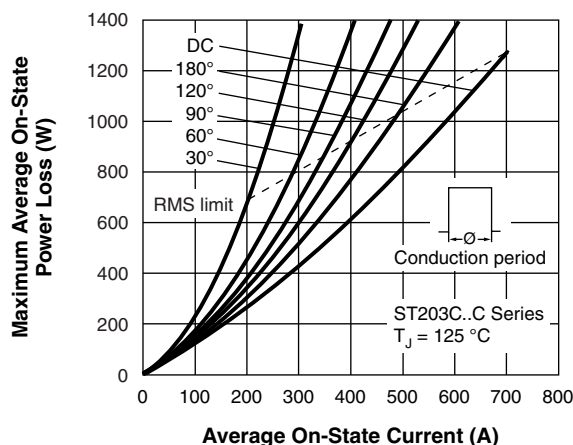


Fig. 6 - On-State Power Loss Characteristics

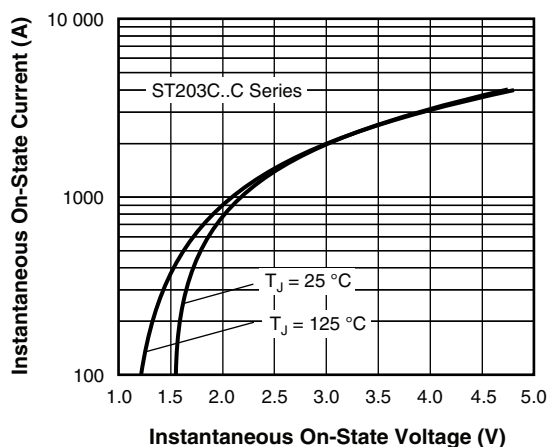


Fig. 9 - On-State Voltage Drop Characteristics

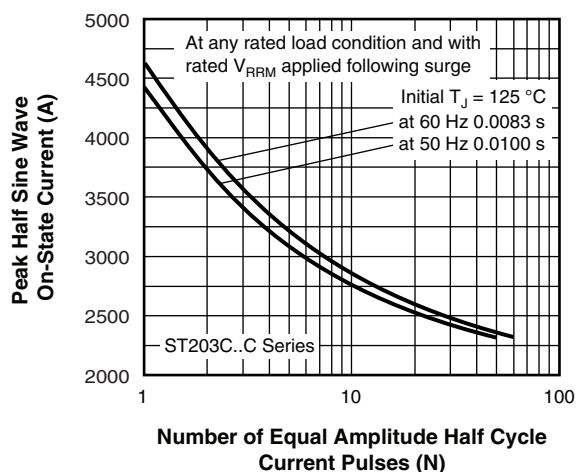


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

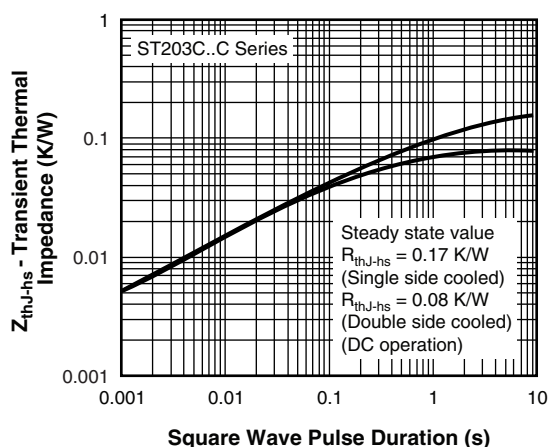


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

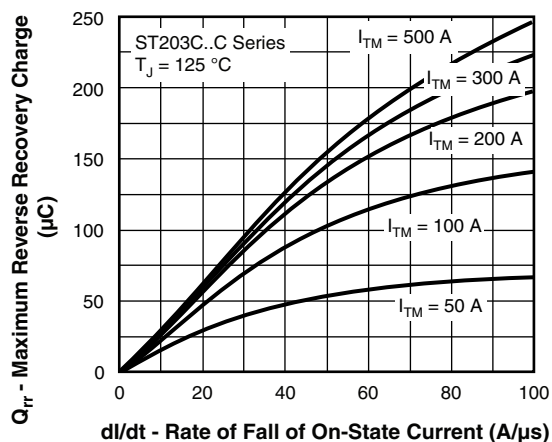


Fig. 11 - Reverse Recovered Charge Characteristics

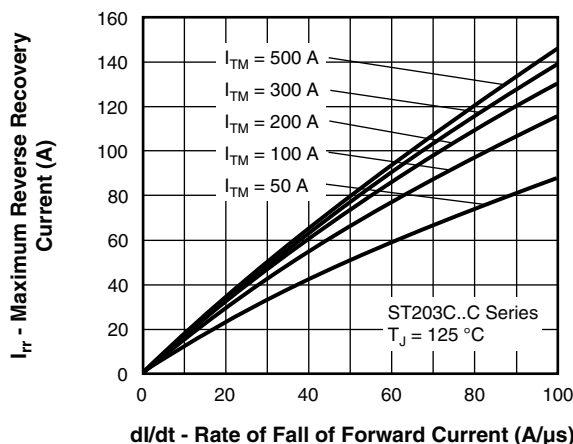


Fig. 12 - Reverse Recovery Current Characteristics

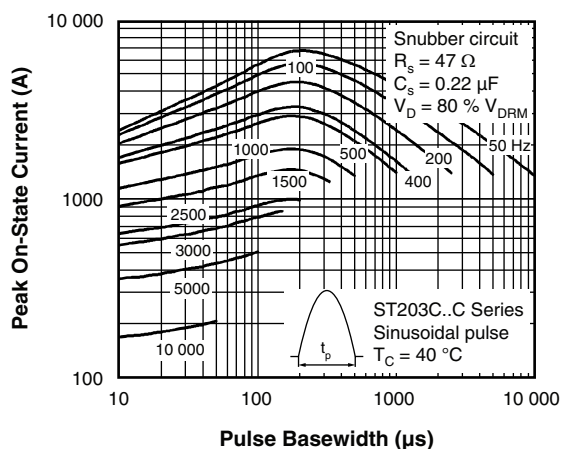


Fig. 13 - Frequency Characteristics

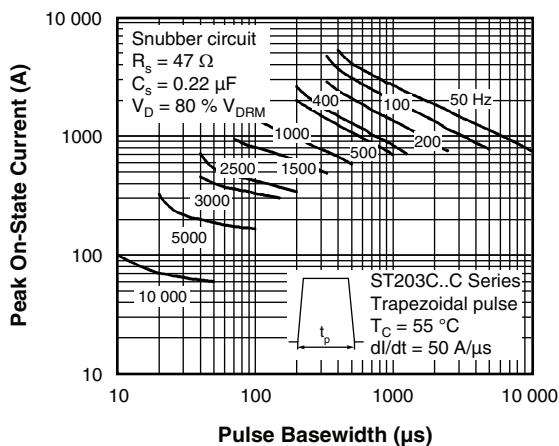
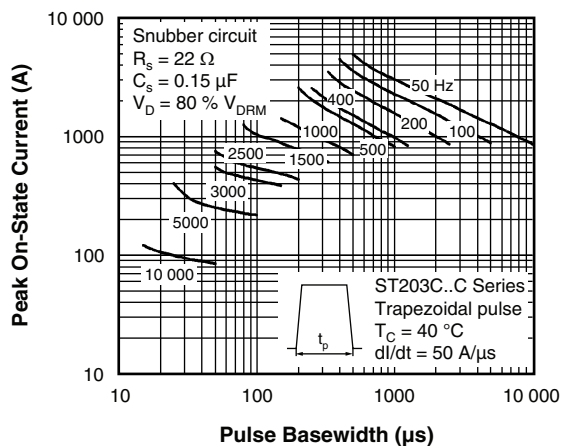
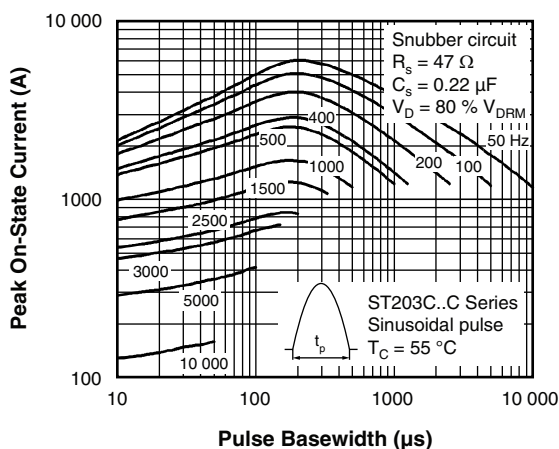


Fig. 14 - Frequency Characteristics

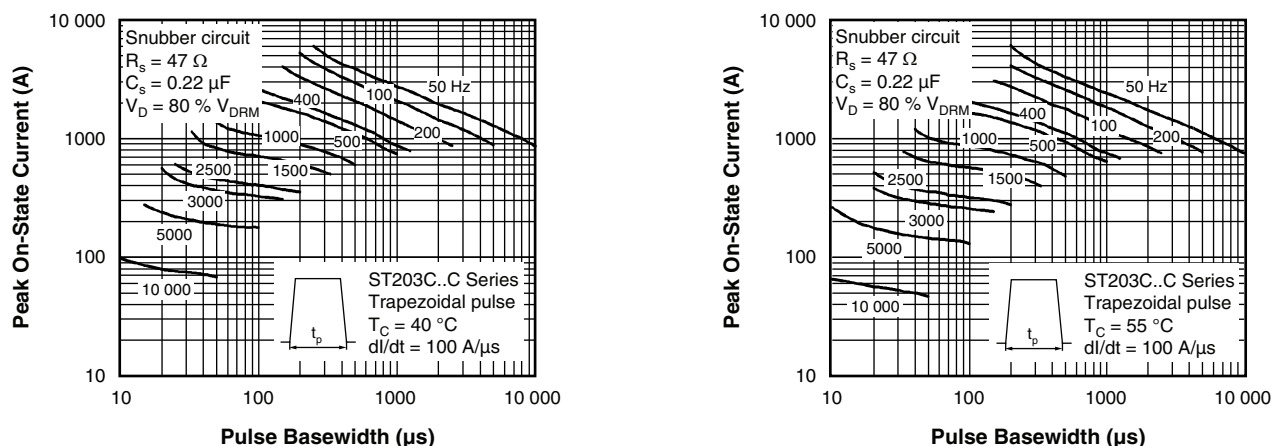


Fig. 15 - Frequency Characteristics

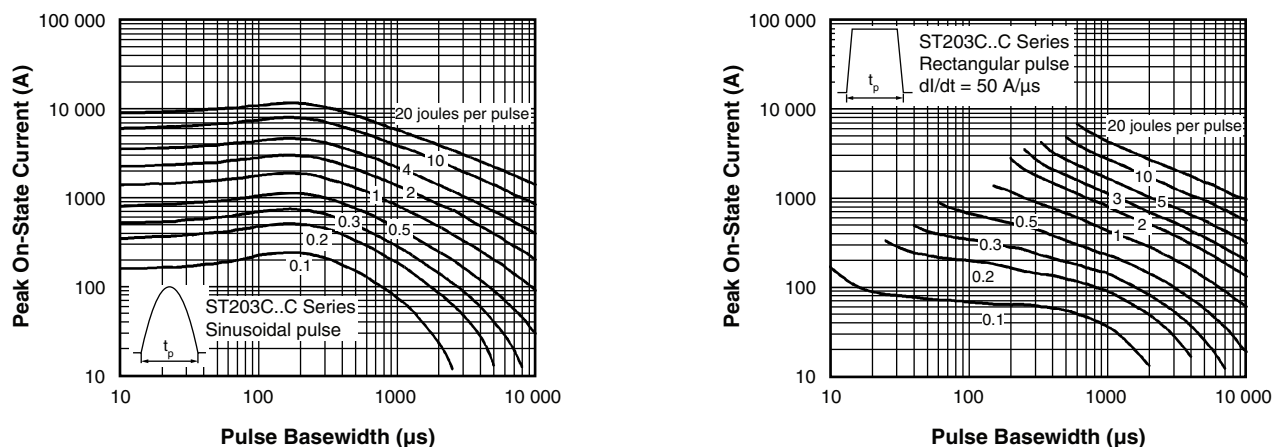


Fig. 16 - Maximum On-State Energy Power Loss Characteristics

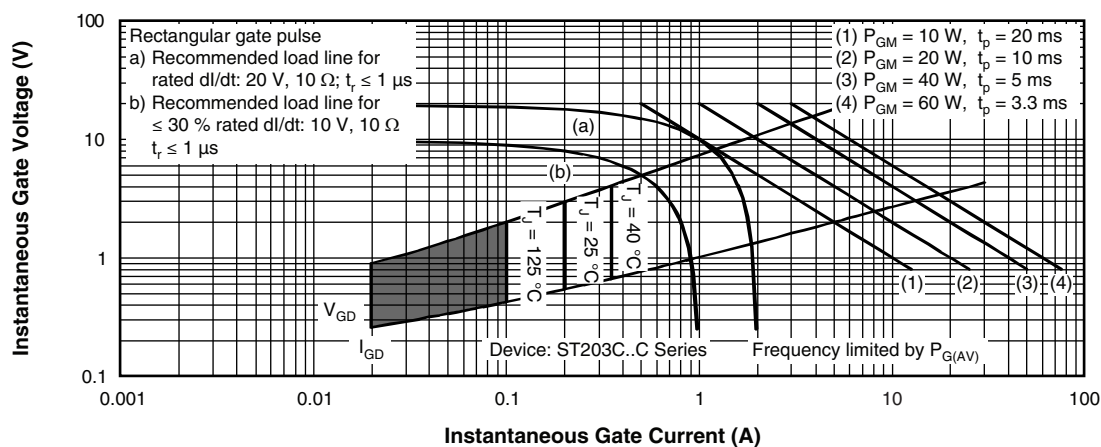


Fig. 17 - Gate Characteristics

**ORDERING INFORMATION TABLE**

Device code	VS-	ST	20	3	C	12	C	H	H	1	-
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪

1 - Vishay Semiconductors product

2 - Thyristor

3 - Essential part number

4 - 3 = Fast turn-off

5 - C = Ceramic PUK

6 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)

7 - C = PUK case TO-200AB (A-PUK)

8 - Reapplied dV/dt code (for t_q test condition)

9 - t_q code

10 - 0 = Eyelet terminals

(gate and auxiliary cathode unsoldered leads)

1 = Fast-on terminals

(gate and auxiliary cathode unsoldered leads)

2 = Eyelet terminals

(gate and auxiliary cathode soldered leads)

3 = Fast-on terminals

(gate and auxiliary cathode soldered leads)

11 - Critical dV/dt:

• None = 500 V/ μ s (standard value)

• L = 1000 V/ μ s (special selection)

dV/dt - t _q combinations available						
dV/dt (V/μs)		20	50	100	200	400
t _q (μs)	20	CK	DK	EK	-	-
	25	CJ	DJ	EJ	FJ*	-
	30	CH	DH	EH	FH	HH

* Standard part number.

All other types available only on request.

LINKS TO RELATED DOCUMENTS

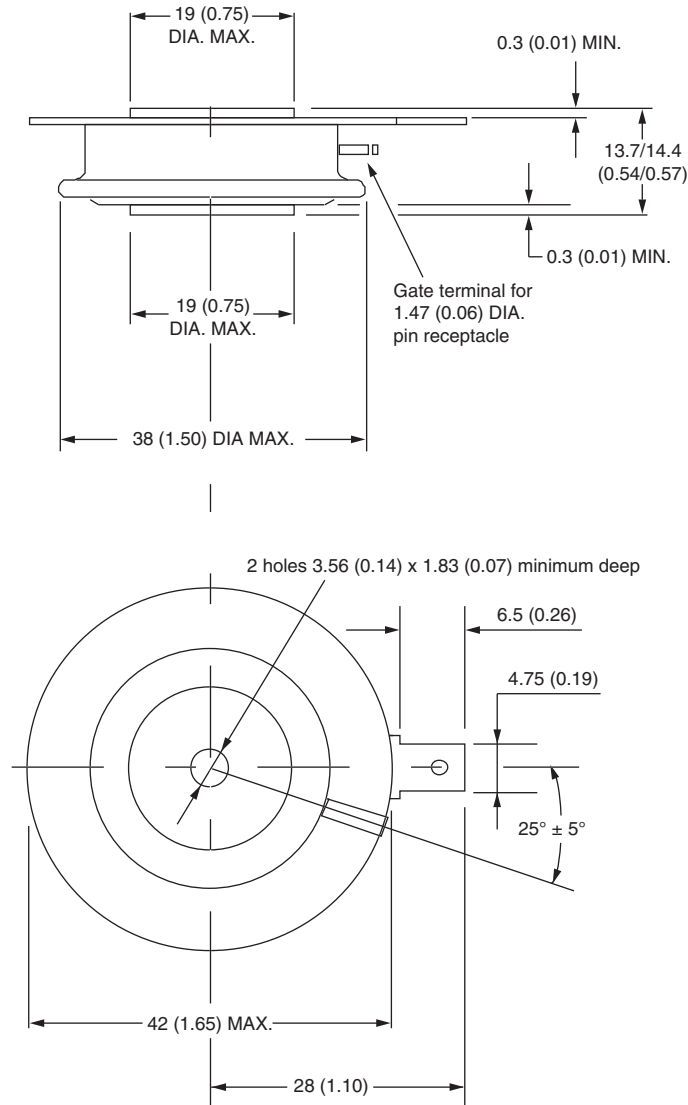
Dimensions

www.vishay.com/doc?95074

TO-200AB (A-PUK)

DIMENSIONS in millimeters (inches)

Anode to gate
Creepage distance: 7.62 (0.30) minimum
Strike distance: 7.12 (0.28) minimum



Quote between upper and lower pole pieces has to be considered after application of mounting force (see thermal and mechanical specification)



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