

Inverter Grade Thyristors (Hockey PUK Version), 370 A



TO-200AB (A-PUK)

FEATURES

- Metal case with ceramic insulator
- All diffused design
- Center amplifying gate
- International standard case TO-200AB (A-PUK)
- Guaranteed high dV/dt
- Guaranteed high dI/dt
- High surge current capability
- Low thermal impedance
- High speed performance
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

PRODUCT SUMMARY

Package	TO-200AB (A-PUK)
Diode variation	Single SCR
$I_{T(AV)}$	370 A
V_{DRM}/V_{RRM}	400 V, 800 V
V_{TM}	1.80 V
I_{TSM} at 50 Hz	4900 A
I_{TSM} at 60 Hz	5130 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
$I_{T(RMS)}$		690	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	4900	A
	60 Hz	5130	
I^2t	50 Hz	120	kA ² s
	60 Hz	110	
V_{DRM}/V_{RRM}		400 to 800	V
t_q	Range	10 to 20	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-ST183C..C	04	400	500	40
	08	800	900	

**CURRENT CARRYING CAPABILITY**

FREQUENCY							UNITS
50 Hz	770	660	1220	1160	5450	4960	A
400 Hz	730	600	1270	1090	2760	2420	
1000 Hz	600	490	1210	1040	1600	1370	
2500 Hz	350	270	860	730	800	680	
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/μs
Heatsink temperature	40	55	40	55	40	55	°C
Equivalent values for RC circuit	47/0.22		47/0.22		47/0.22		Ω/μF

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 (130)	A	
					55 (85)	°C	
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled			690	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	4900		
		t = 8.3 ms			5130		
		t = 10 ms	100 % V_{RRM} reapplied		4120		
		t = 8.3 ms			4310		
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		120	kA ² s	
		t = 8.3 ms			110		
		t = 10 ms	100 % V_{RRM} reapplied		85		
		t = 8.3 ms			78		
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied			1200	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			1.80	V	
Low level value of threshold voltage	$V_{T(TO)1}$	$(16.7 \% \times \pi \times I_{T(AV)}) < I < \pi \times I_{T(AV)}$, $T_J = T_J$ maximum			1.40		
High level value of threshold voltage	$V_{T(TO)2}$	$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum			1.45		
Low level value of forward slope resistance	r_{t1}	$(16.7 \% \times \pi \times I_{T(AV)}) < I < \pi \times I_{T(AV)}$, $T_J = T_J$ maximum			0.67	mΩ	
High level value of forward slope resistance	r_{t2}	$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum			0.58		
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	1.1	μ s
Maximum turn-off time	t_q	$T_J = T_J$ 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	10	
			20	

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
	Single Side	Double Side	Single Side	Double Side	
180°	0.015	0.016	0.011	0.011	$T_J = T_J \text{ maximum}$
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	
					K/W

Note

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

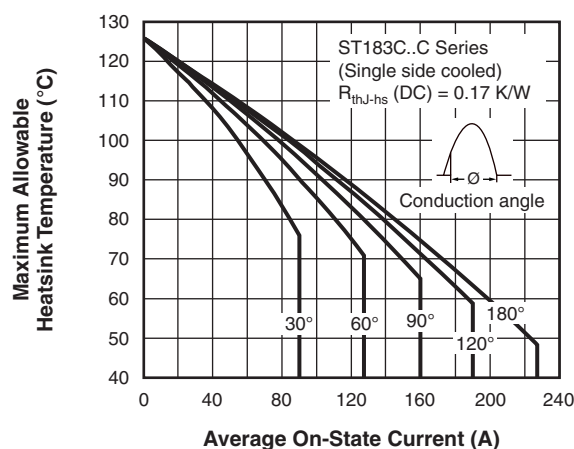


Fig. 1 - Current Ratings Characteristics

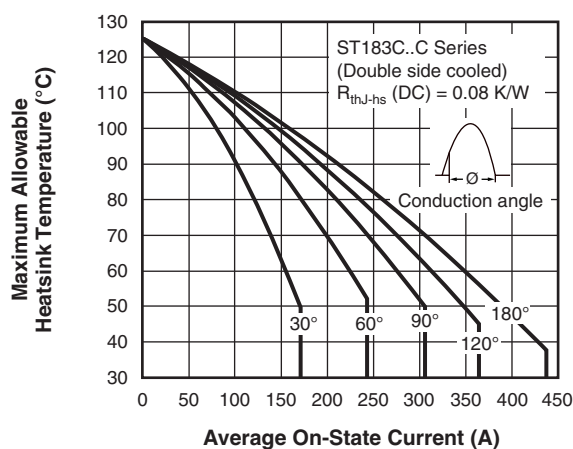


Fig. 3 - Current Ratings Characteristics

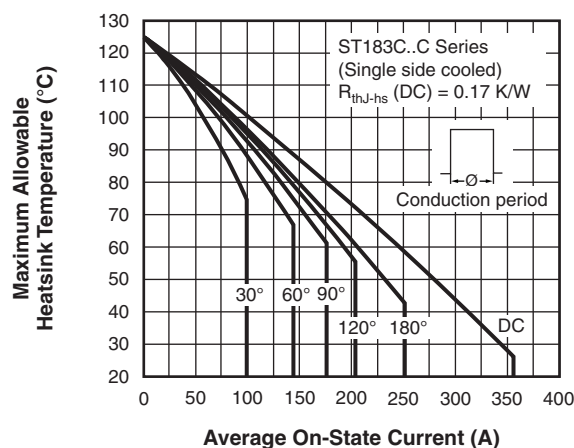


Fig. 2 - Current Ratings Characteristics

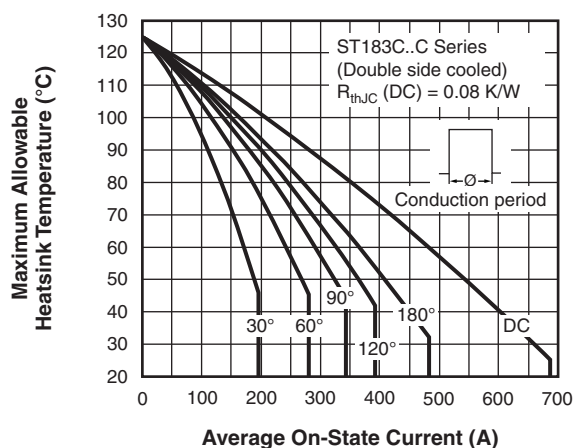


Fig. 4 - Current Ratings Characteristics

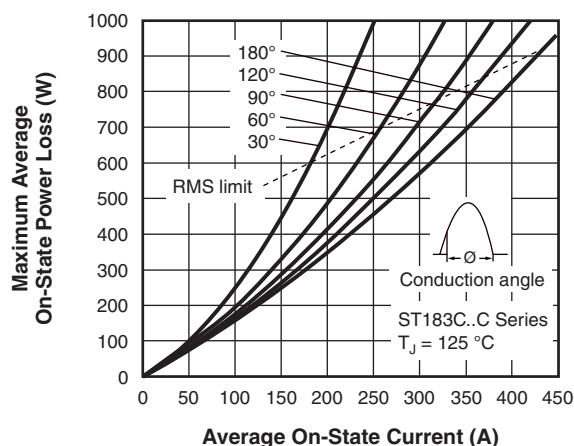


Fig. 5 - On-State Power Loss Characteristics

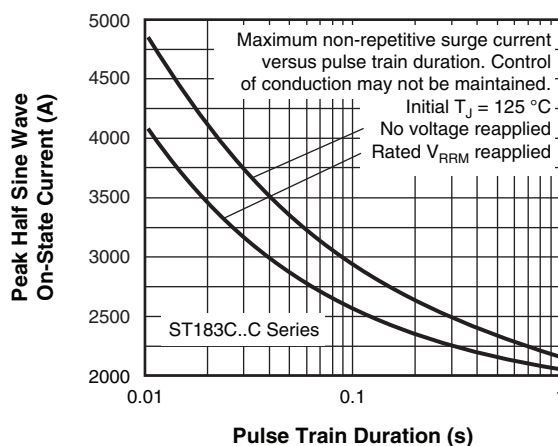


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

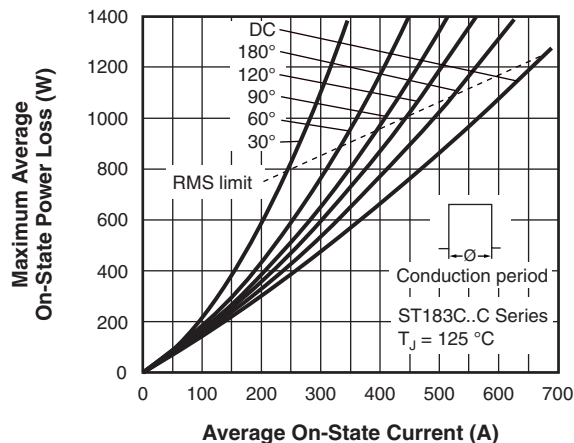


Fig. 6 - On-State Power Loss Characteristics

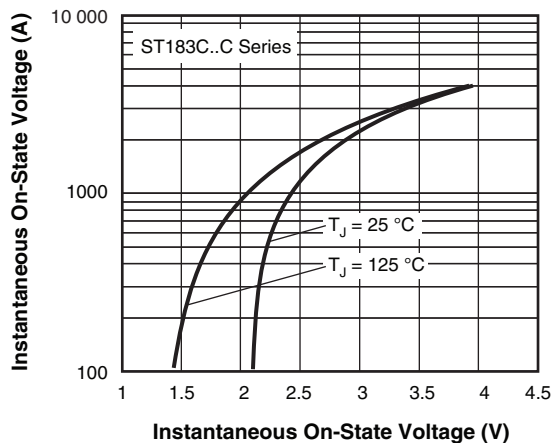


Fig. 9 - On-State Voltage Drop Characteristics

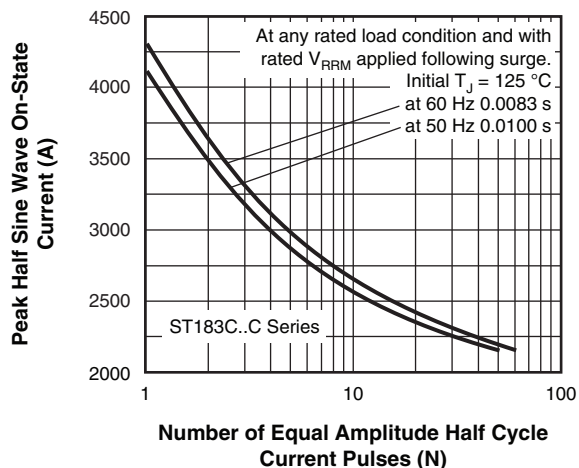
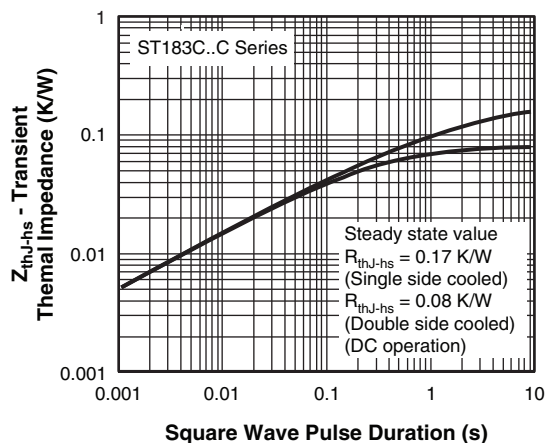


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled


Fig. 10 - Thermal Impedance Z_{thJC} Characteristics

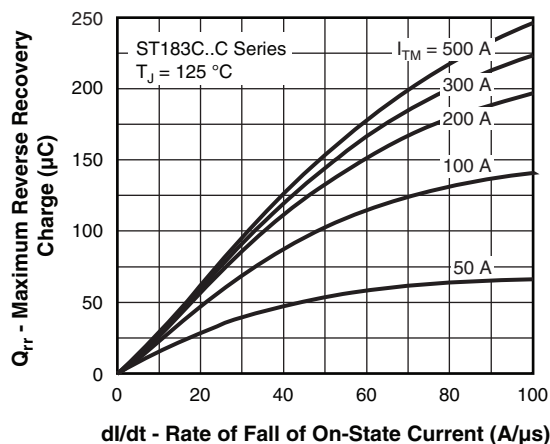


Fig. 11 - Reverse Recovered Charge Characteristics

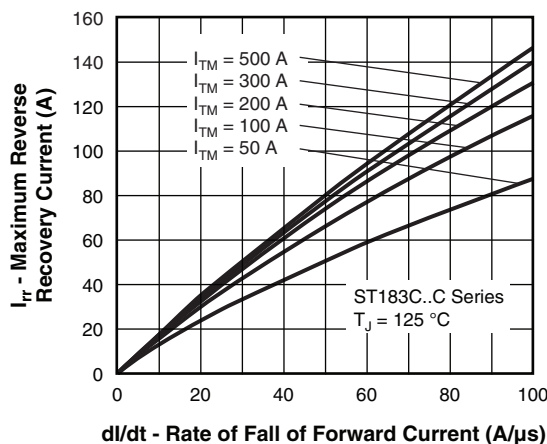


Fig. 12 - Reverse Recovery Current Characteristics

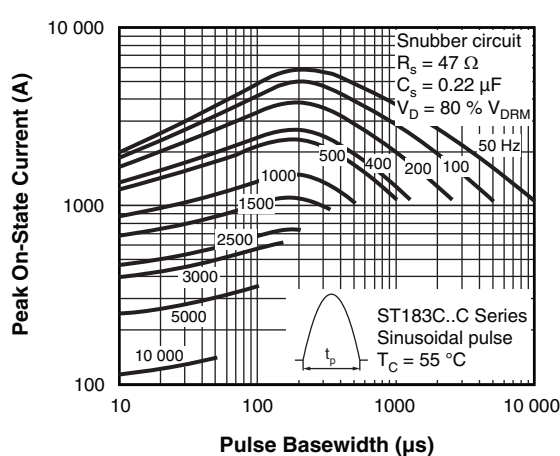
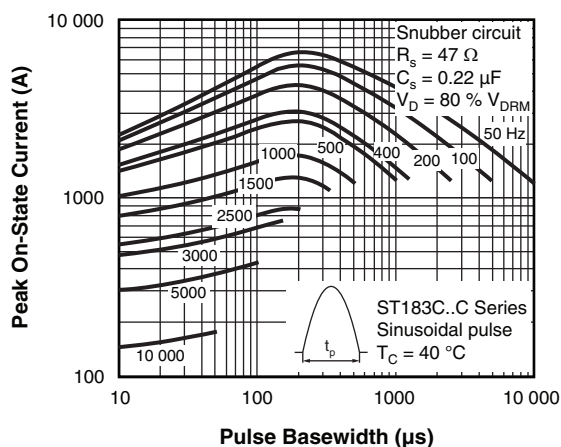


Fig. 13 - Frequency Characteristics

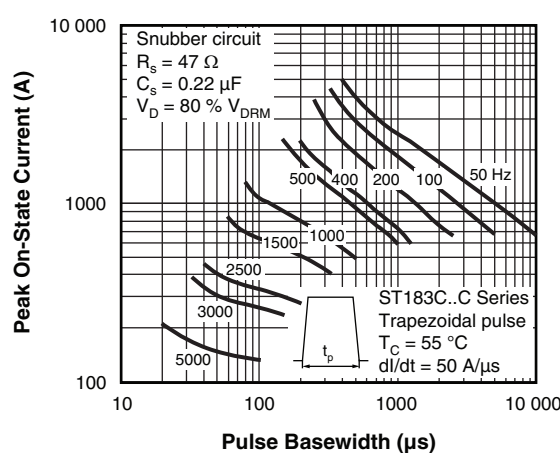
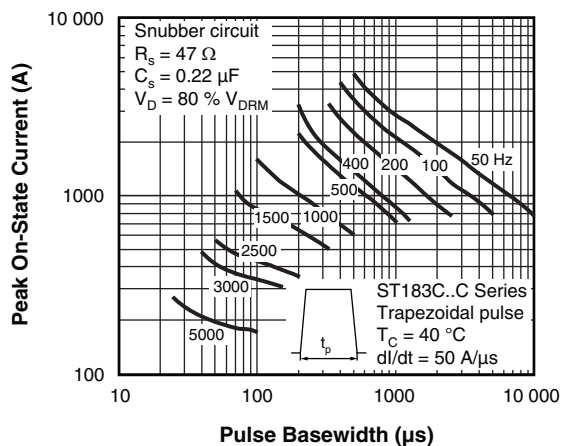


Fig. 14 - Frequency Characteristics

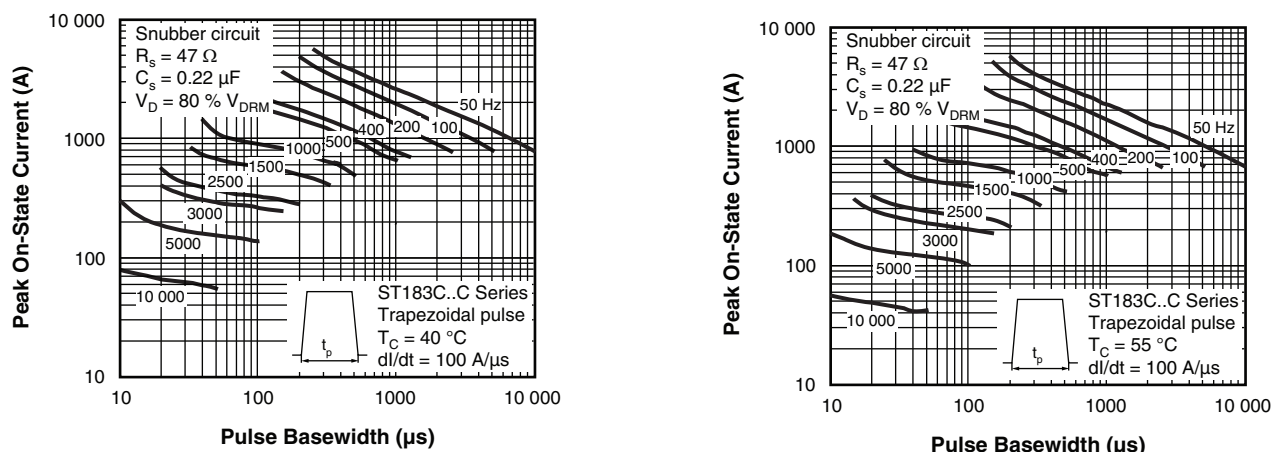


Fig. 15 - Frequency Characteristics

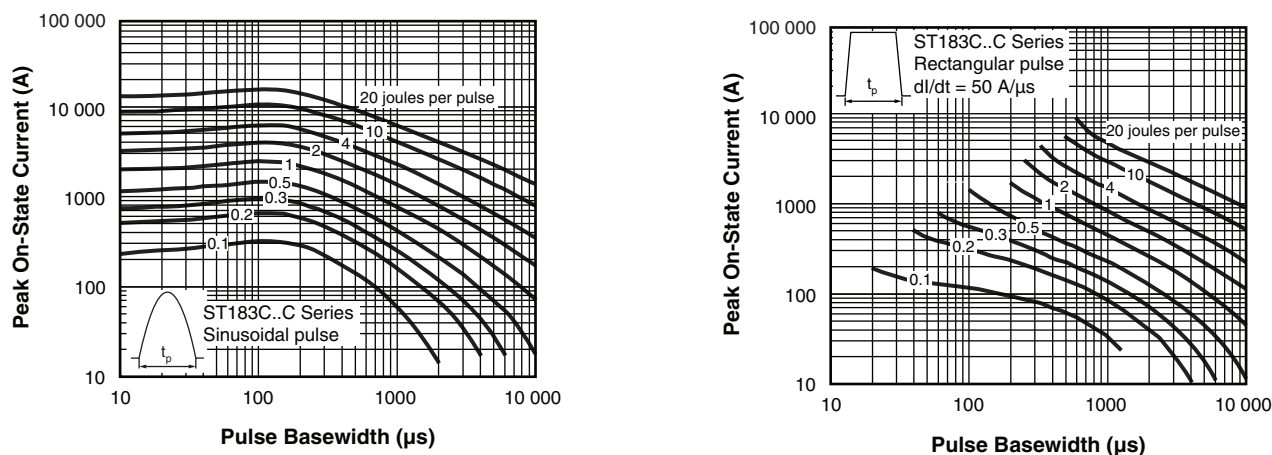


Fig. 16 - Maximum On-State Energy Power Loss Characteristics

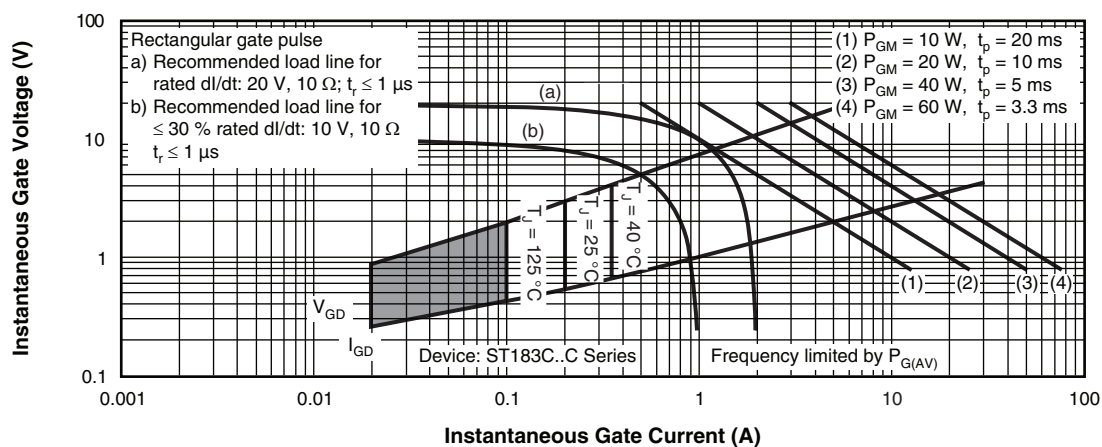


Fig. 17 - Gate Characteristics



ORDERING INFORMATION TABLE

Device code	VS-	ST	18	3	C	08	C	H	K
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 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

dV/dt - t _q combinations available						
dV/dt (V/μs)		20	50	100	200	400
t _q (μs)	10	CN	DN	EN	FN*	HN
	12	CM	DM	EM	FM	HM
	15	CL	DL	EL	FL*	HL
	18	CP	DP	EP	FP	HP
	20	CK	DK	EK	FK	HK

* Standard part number.

All other types available only on request.

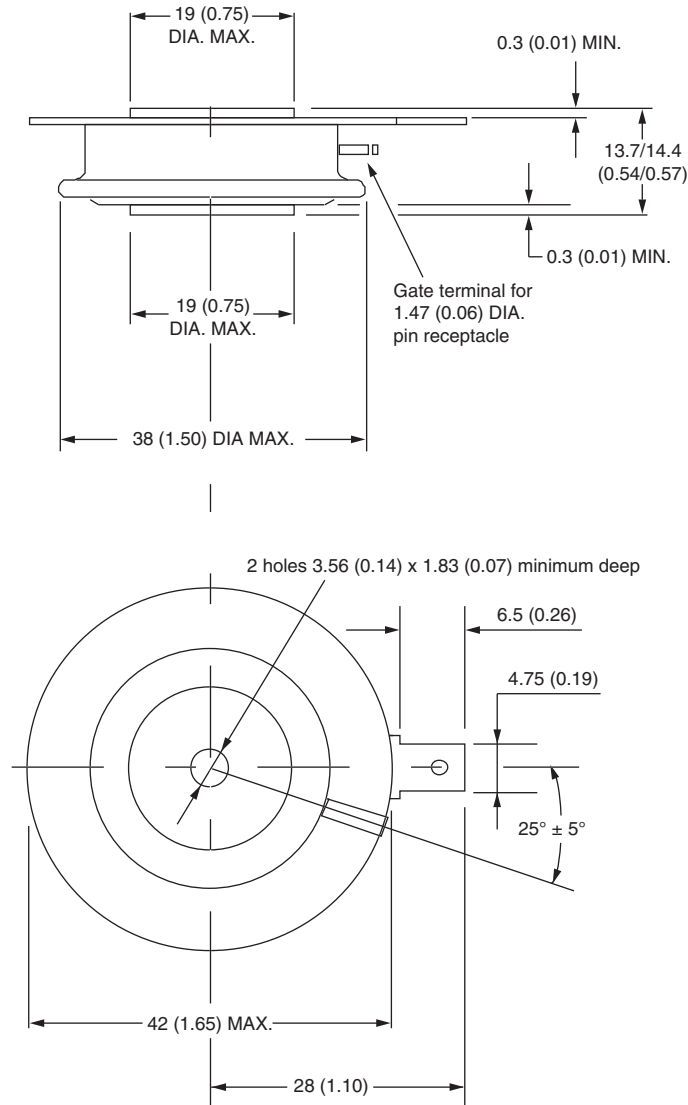
LINKS TO RELATED DOCUMENTS

Dimensions	www.vishay.com/doc?95074
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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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