

## 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


**RoHS  
COMPLIANT**
**PRODUCT SUMMARY**

$I_{T(AV)}$	370 A
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**TYPICAL APPLICATIONS**

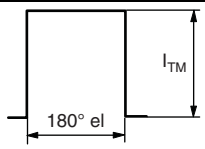
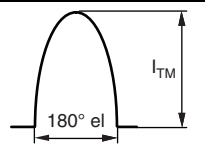
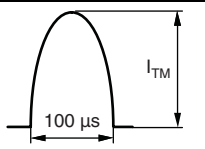
- Inverters
- Choppers
- Induction heating
- All types of force-commutated converters

**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 <sup>2</sup> 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
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/ $\mu$ s
Heatsink temperature	40	55	40	55	40	55	$^{\circ}$ C
Equivalent values for RC circuit	47/0.22		47/0.22		47/0.22		$\Omega/\mu$ F

ON-STATE CONDUCTION						
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at heatsink temperature	$I_{T(AV)}$	180 $^{\circ}$ conduction, half sine wave double side (single side) cooled			370 (130)	A
					55 (85)	$^{\circ}$ C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 $^{\circ}$ C heatsink temperature double side cooled			690	A
Maximum peak, one half cycle, non-repetitive surge current	$I_{TSM}$	t = 10 ms	No voltage reappplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	4900	
		t = 8.3 ms			5130	
		t = 10 ms	100 % $V_{RRM}$ reappplied		4120	
		t = 8.3 ms			4310	
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms	No voltage reappplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	120	kA $^2$ s
		t = 8.3 ms			110	
		t = 10 ms	100 % $V_{RRM}$ reappplied		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 reappplied			1200	kA $^2\sqrt{s}$
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	m $\Omega$
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	$I_H$	$T_J = 25$ $^{\circ}$ C, $I_T > 30$ A			600	mA
Typical latching current	$I_L$	$T_J = 25$ $^{\circ}$ C, $V_A = 12$ V, $R_a = 6$ $\Omega$ , $I_G = 1$ 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/ $\mu$ s
Typical delay time	$t_d$	$T_J = 25^\circ\text{C}$ , $V_{DM} = \text{Rated } V_{DRM}$ , $I_{TM} = 50 \text{ A DC}$ , $t_p = 1 \mu\text{s}$ Resistive load, gate pulse: 10 V, 5 $\Omega$ source	1.1	$\mu$ s
Maximum turn-off time	minimum	$T_J = T_J$ maximum, $I_{TM} = 300 \text{ A}$ , commutating di/dt = 20 A/ $\mu$ s $V_R = 50 \text{ V}$ , $t_p = 500 \mu\text{s}$ , dV/dt: See table in device code	10	
	maximum		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/ $\mu$ 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, $f = 50 \text{ Hz}$ , $d\% = 50$	60	W
Maximum average gate power	$P_{G(AV)}$		10	
Maximum peak positive gate current	$I_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5 \text{ ms}$	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	$I_{GT}$	$T_J = 25^\circ\text{C}$ , $V_A = 12 \text{ V}$ , $R_a = 6 \Omega$	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, $\pm 10\%$			4900 (500)	N (kg)
Approximate weight			50	g
Case style		See dimensions - link at the end of datasheet	TO-200AB (A-PUK)	

$\Delta R_{thJ-hs}$ CONDUCTION						
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION		RECTANGULAR CONDUCTION		TEST CONDITIONS	UNITS
	SINGLE SIDE	DOUBLE SIDE	SINGLE SIDE	DOUBLE SIDE		
180°	0.015	0.016	0.011	0.011	T <sub>J</sub> = T <sub>J</sub> 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

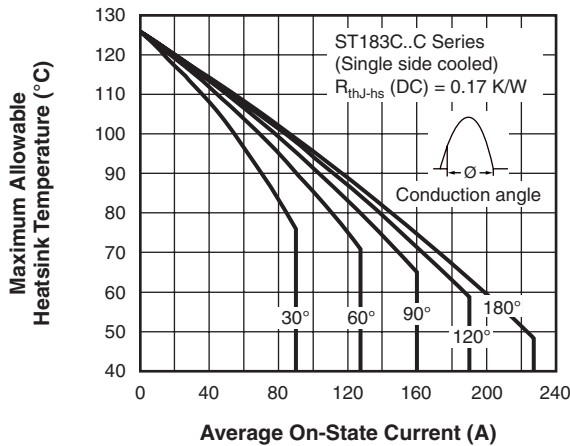


Fig. 1 - Current Ratings Characteristics

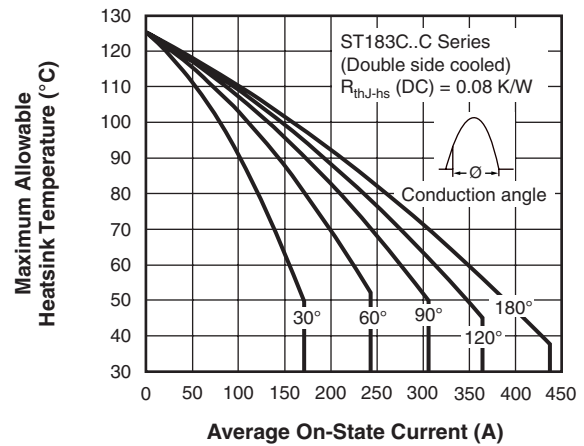


Fig. 3 - Current Ratings Characteristics

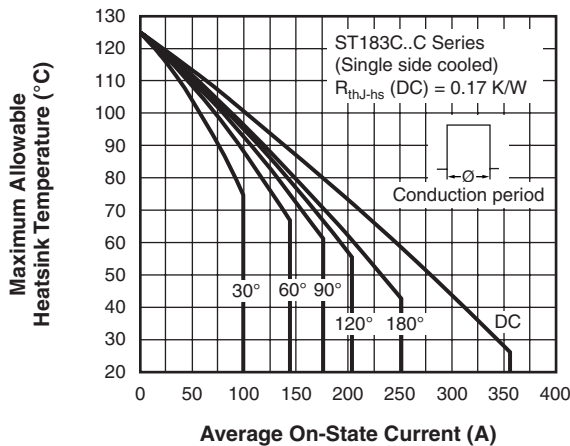


Fig. 2 - Current Ratings Characteristics

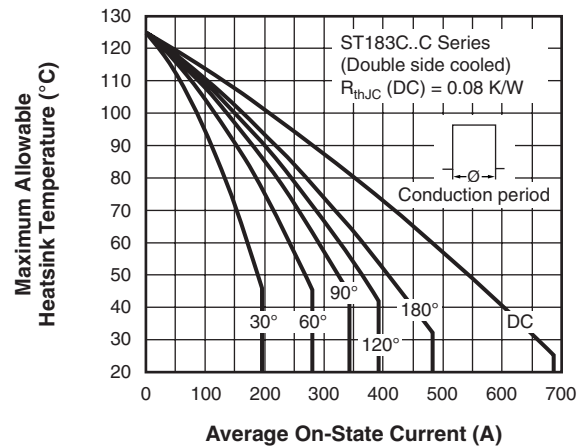


Fig. 4 - Current Ratings Characteristics

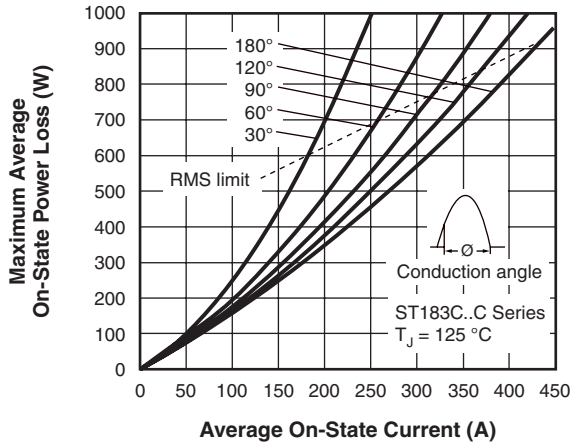


Fig. 5 - On-State Power Loss Characteristics

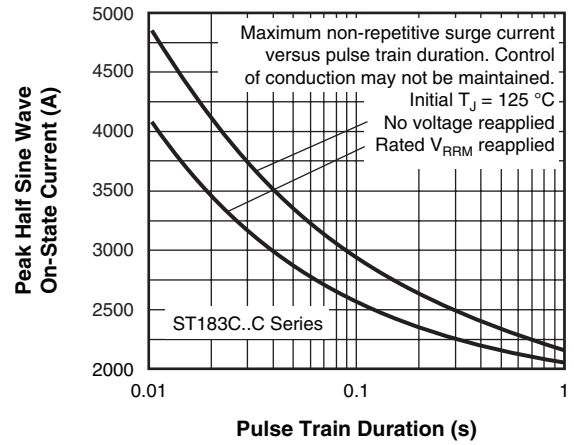


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

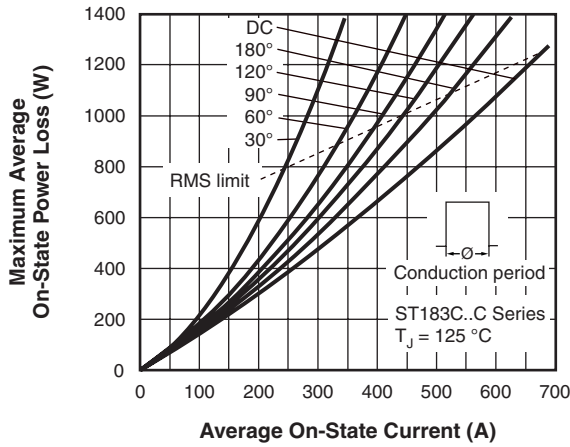


Fig. 6 - On-State Power Loss Characteristics

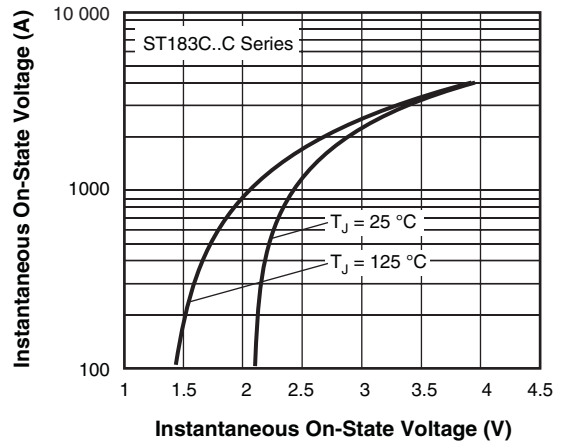


Fig. 9 - On-State Voltage Drop Characteristics

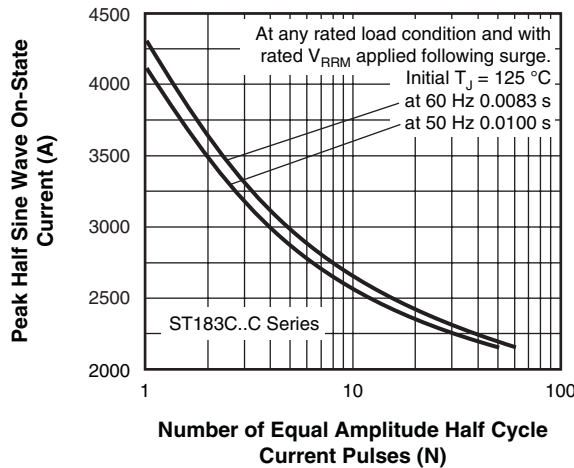


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

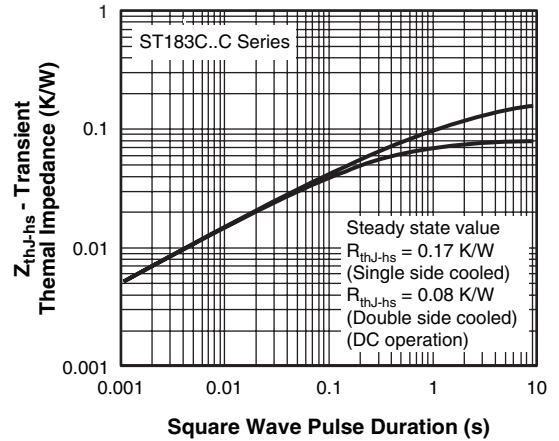


Fig. 10 - Thermal Impedance  $Z_{thJC}$  Characteristics

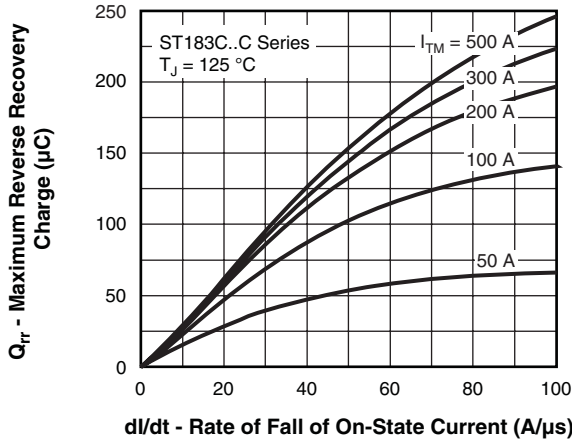


Fig. 11 - Reverse Recovered Charge Characteristics

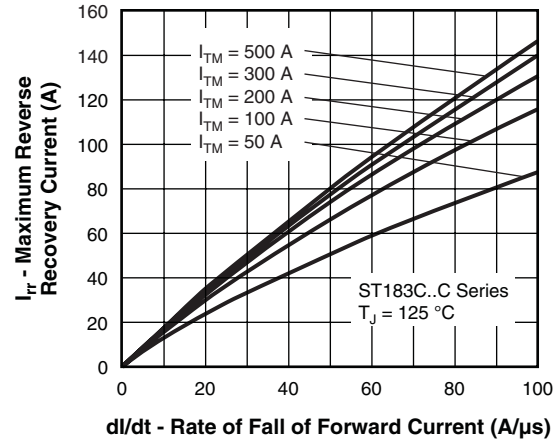


Fig. 12 - Reverse Recovery Current Characteristics

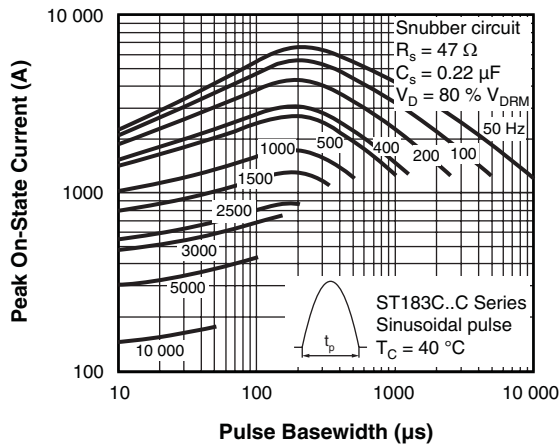


Fig. 13 - Frequency Characteristics

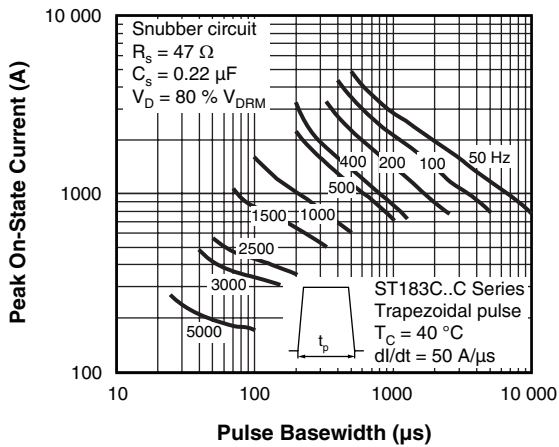
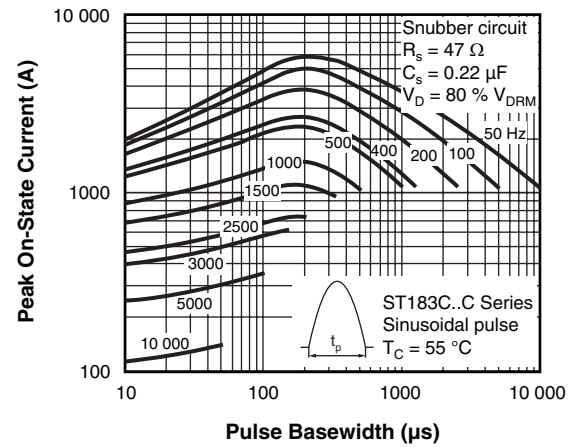
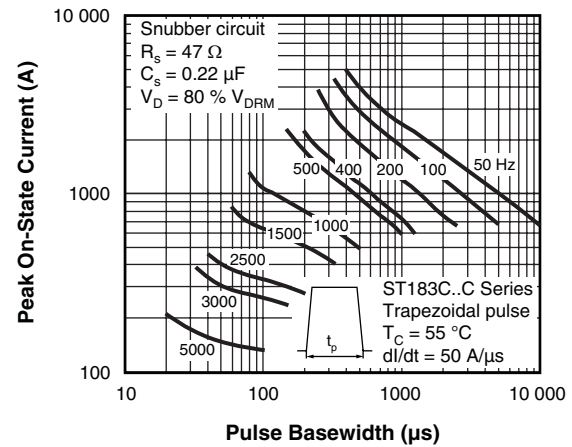


Fig. 14 - Frequency Characteristics



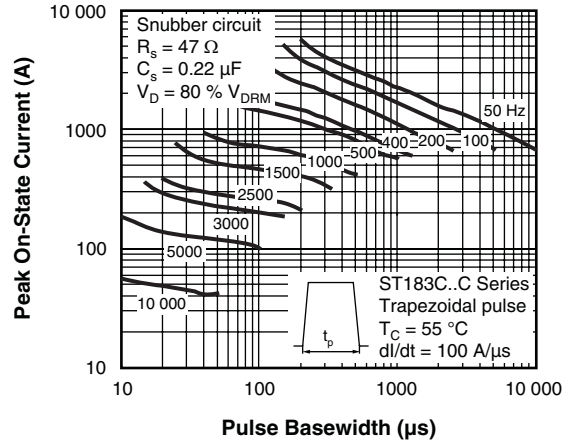
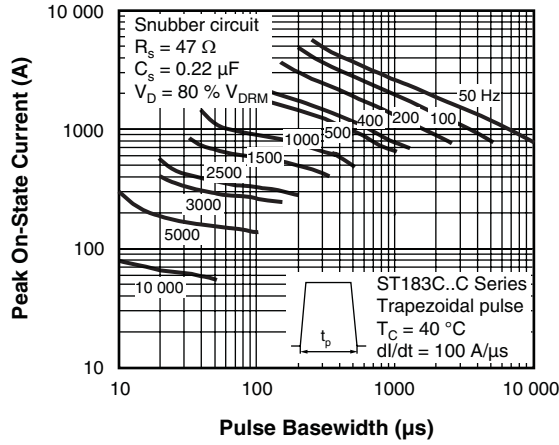


Fig. 15 - Frequency Characteristics

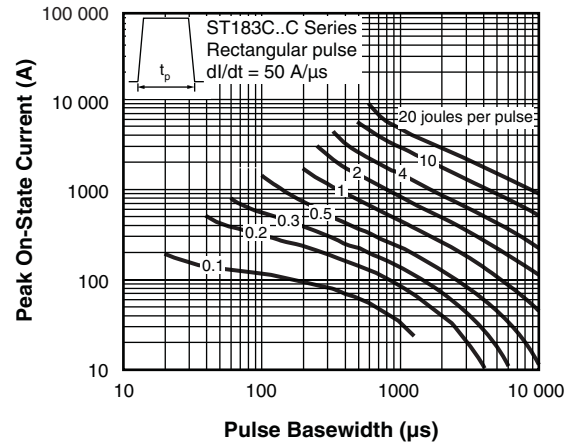
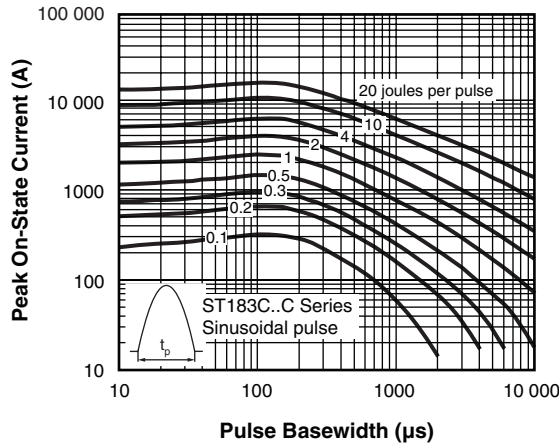


Fig. 16 - Maximum On-State Energy Power Loss Characteristics

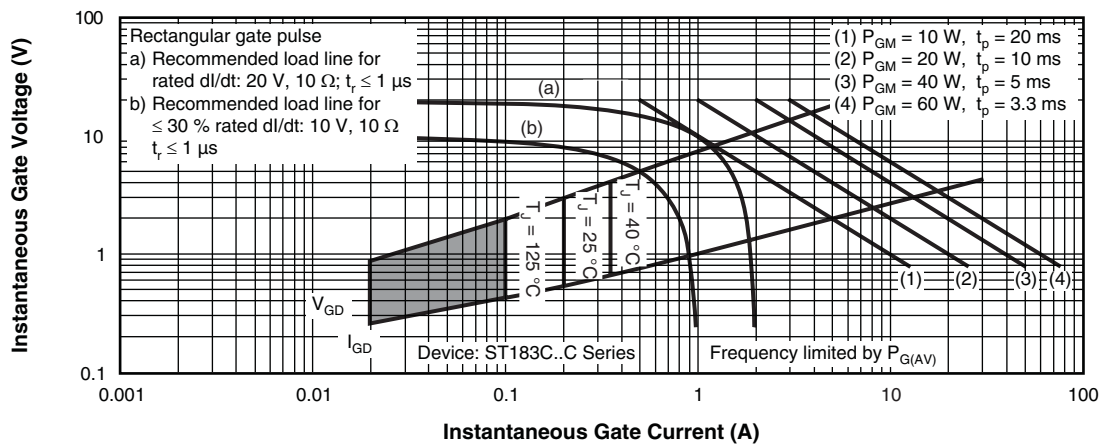


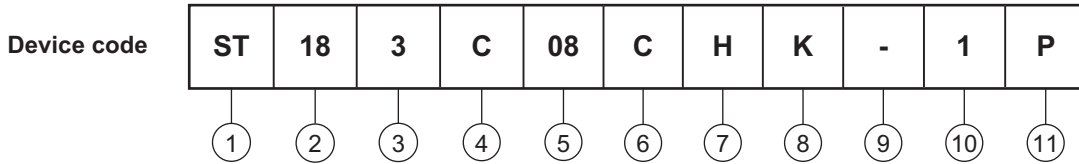
Fig. 17 - Gate Characteristics

# ST183CPbF Series



Vishay High Power Products Inverter Grade Thyristors  
(Hockey PUK Version), 370 A

## ORDERING INFORMATION TABLE



- 1** - Thyristor
- 2** - Essential part number
- 3** - 3 = Fast turn-off
- 4** - C = Ceramic PUK
- 5** - Voltage code x 100 =  $V_{RRM}$  (see Voltage Ratings table)
- 6** - C = PUK case TO-200AB (A-PUK)
- 7** - Reapplied dV/dt code (for  $t_q$  test condition)
- 8** -  $t_q$  code
  - 0 = Eyelet terminals  
(gate and aux. cathode unsoldered leads)
  - 1 = Fast-on terminals  
(gate and aux. cathode unsoldered leads)
  - 2 = Eyelet terminals  
(gate and aux. cathode soldered leads)
  - 3 = Fast-on terminals  
(gate and aux. cathode soldered leads)
- 10** - Critical dV/dt:
  - None = 500 V/ $\mu$ s (standard value)
  - L = 1000 V/ $\mu$ s (special selection)
- 11** - P = Lead (Pb)-free

dV/dt - $t_q$ combinations available					
dV/dt (V/ $\mu$ s)	20	50	100	200	400
10	CN	DN	EN	<b>FN*</b>	HN
12	CM	DM	EM	FM	HM
15	CL	DL	EL	<b>FL*</b>	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	<a href="http://www.vishay.com/doc?95074">http://www.vishay.com/doc?95074</a>



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