Inverter Grade Thyristors (Hockey PUK Version), 370 A

A-PUK (TO-200AB)

PRIMARY CHARACTERISTICS	
Package	A-PUK (TO-200AB)
Circuit configuration	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

FEATURES

- Metal case with ceramic insulator
- All diffused design
- Center amplifying gate
- Guaranteed high dV/dt
- International standard case A-PUK (TO-200AB)
- 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?99912

Pb-free
RoHS
COMPLIANT

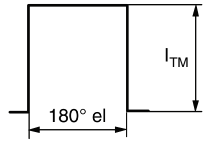
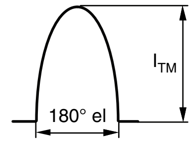
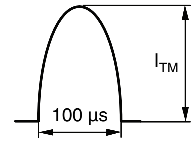
TYPICAL APPLICATIONS

- 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^2s
	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/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 (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, No voltage reapplied	5510	
		t = 10 ms, 100 % V_{RRM} reapplied	4420	
		t = 8.3 ms, 100 % V_{RRM} reapplied	4630	
Maximum I^2t for fusing	I^2t	t = 10 ms, No voltage reapplied	138	kA^2s
		t = 8.3 ms, No voltage reapplied	126	
		t = 10 ms, 100 % V_{RRM} reapplied	98	
		t = 8.3 ms, 100 % V_{RRM} reapplied	89	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied	1380	$kA^2\sqrt{s}$
Maximum peak on-state voltage	V_{TM}	I_{TM} = 600 A, $T_J = T_J$ maximum, t_p = 10 ms sine wave pulse	1.72	V
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ maximum	1.17	
High level value of threshold voltage	$V_{T(TO)2}$	($I > \pi$ x $I_{T(AV)}$), $T_J = T_J$ maximum	1.22	
Low level value of forward slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ maximum	0.92	mΩ
High level value of forward slope resistance	r_{t2}	($I > \pi$ x $I_{T(AV)}$), $T_J = T_J$ 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} = Rated V_{DRM} I_{TM} = 2 x dI/dt	1000	A/µs
Typical delay time	t_d	T_J = 25 °C, V_{DM} = Rated V_{DRM}, I_{TM} = 50 A DC, t_p = 1 µs Resistive load, gate pulse: 10 V, 5 Ω source	0.8	µs
Maximum turn-off time minimum	t_q	$T_J = T_J$ maximum, I_{TM} = 300 A, commutating dI/dt = 20 A/µs V_R = 50 V, t_p = 500 µs, dV/dt: See table in device code	20	
Maximum turn-off time 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/μs
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 currrent required to trigger	I_{GT}	$T_J = 25$ °C, $V_A = 12$ 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	°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	A-PUK (TO-200AB)	

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	$T_J = T_J$ 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

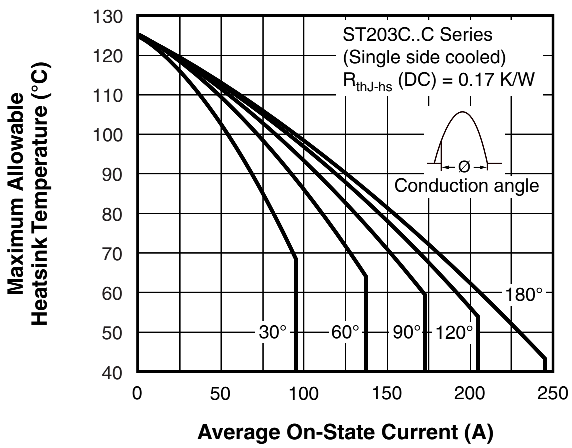


Fig. 1 - Current Ratings Characteristics

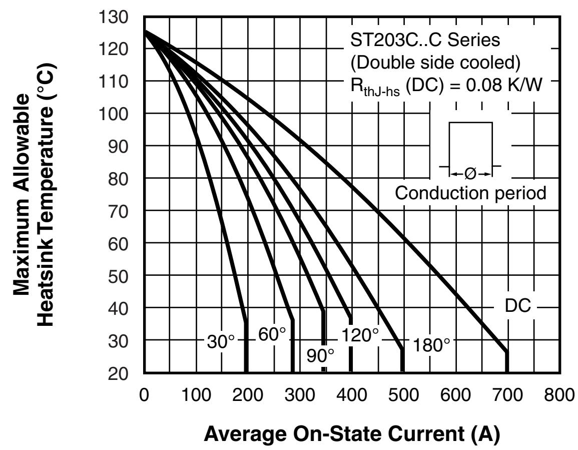


Fig. 4 - Current Ratings Characteristics

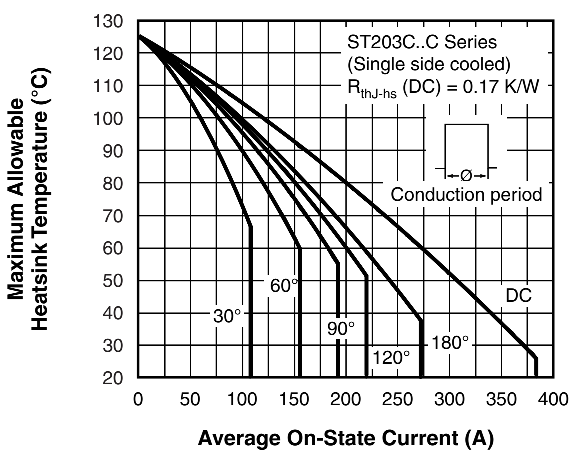


Fig. 2 - Current Ratings Characteristics

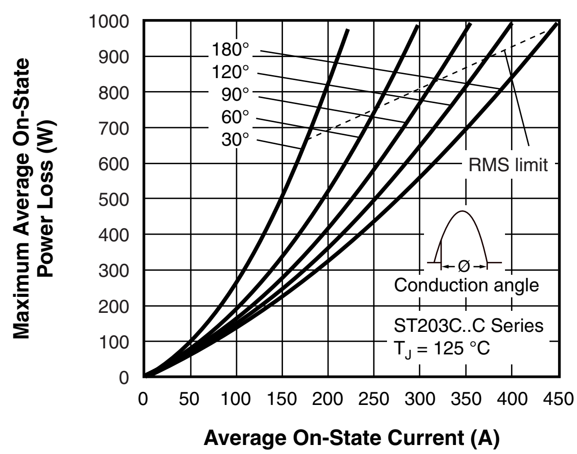


Fig. 5 - On-State Power Loss Characteristics

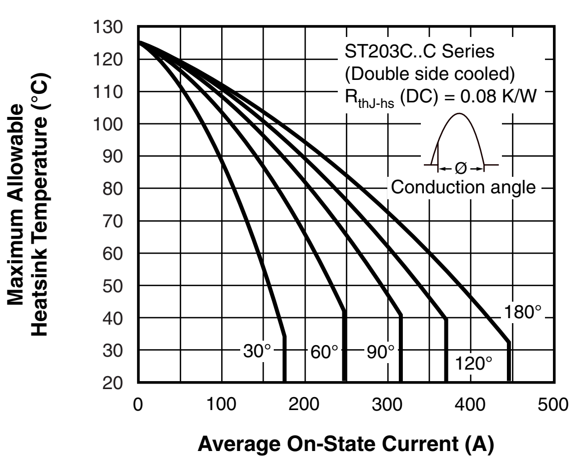


Fig. 3 - Current Ratings Characteristics

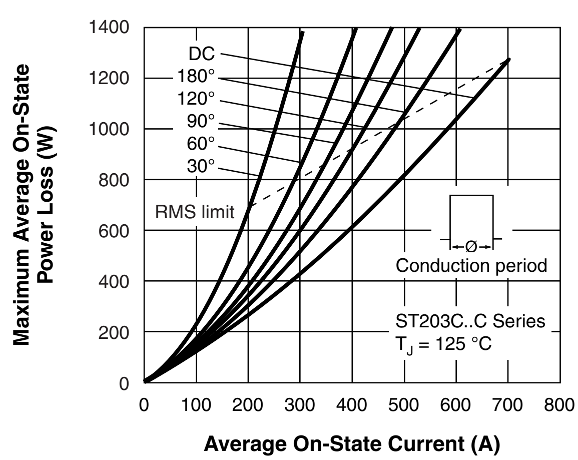


Fig. 6 - On-State Power Loss Characteristics

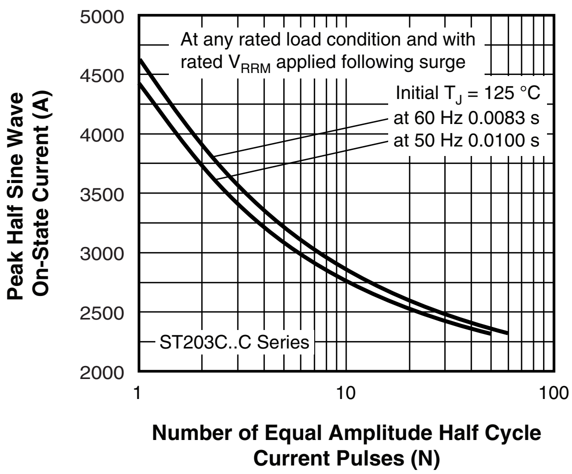


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

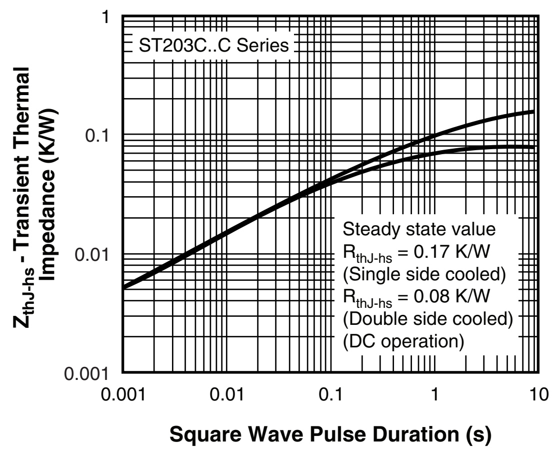


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

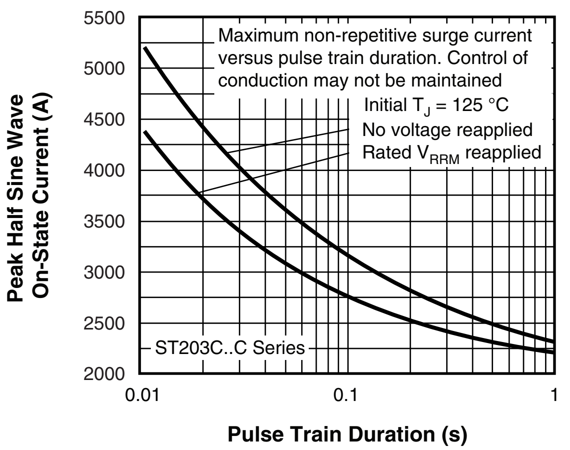


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

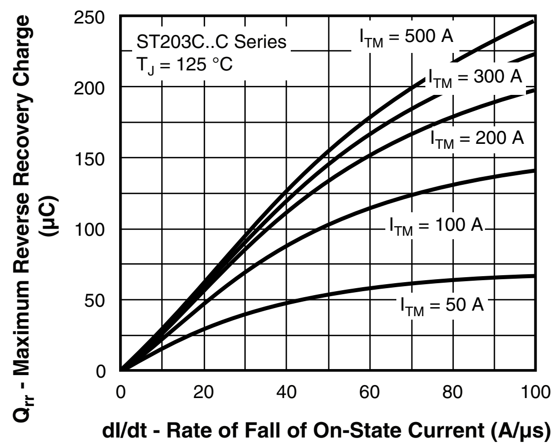


Fig. 11 - Reverse Recovered Charge Characteristics

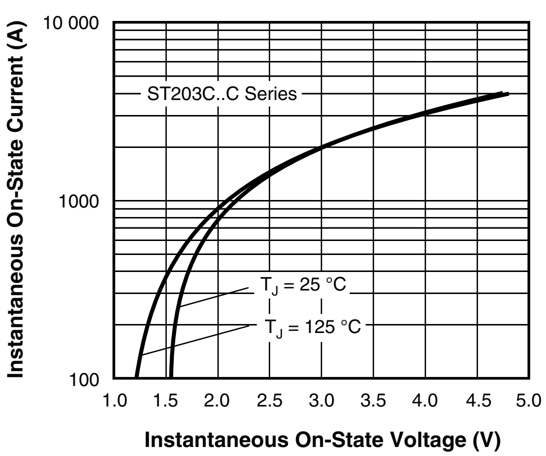


Fig. 9 - On-State Voltage Drop Characteristics

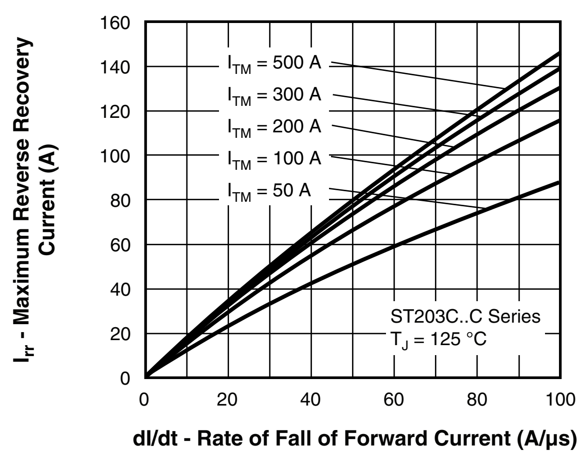


Fig. 12 - Reverse Recovery Current Characteristics

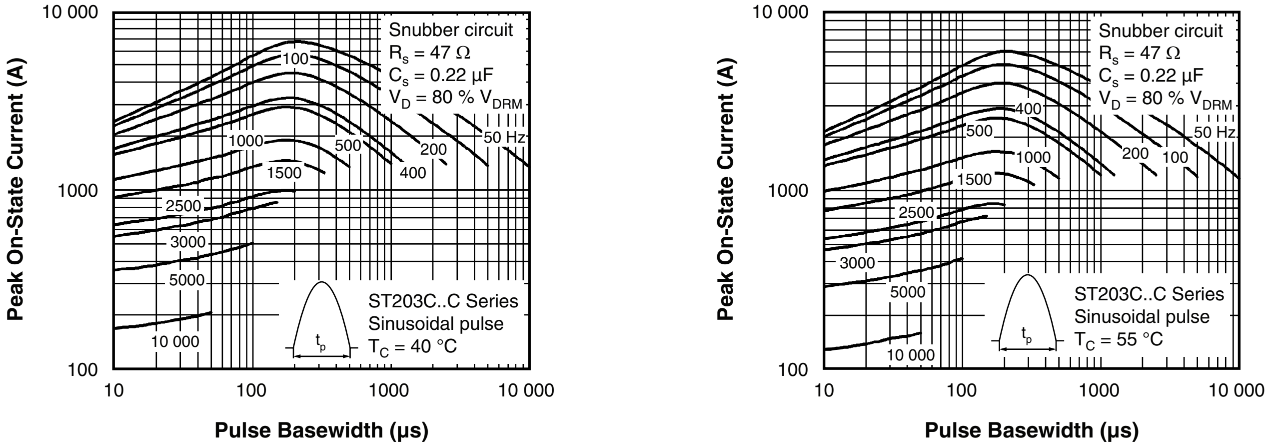


Fig. 13 - Frequency Characteristics

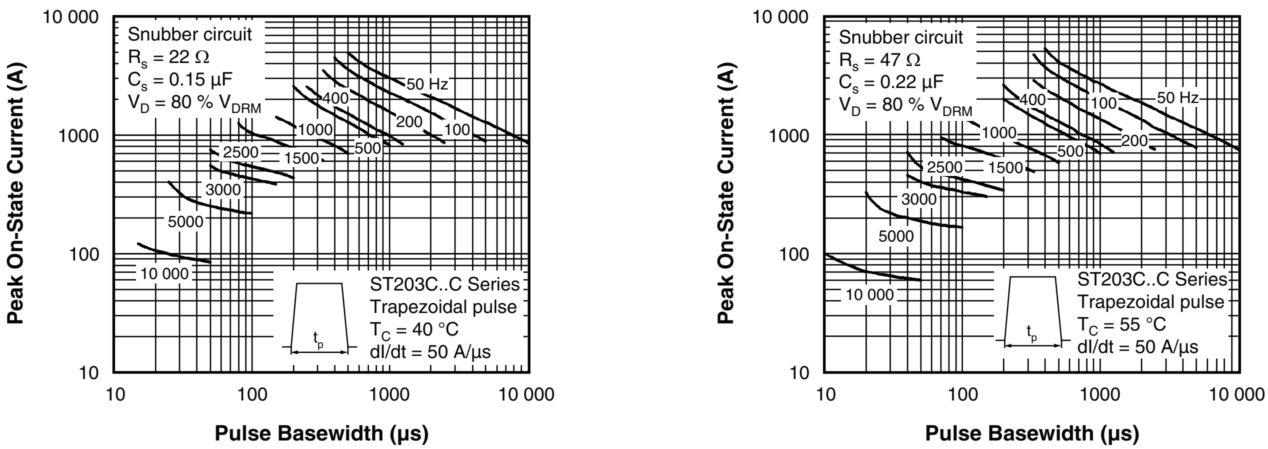


Fig. 14 - Frequency Characteristics

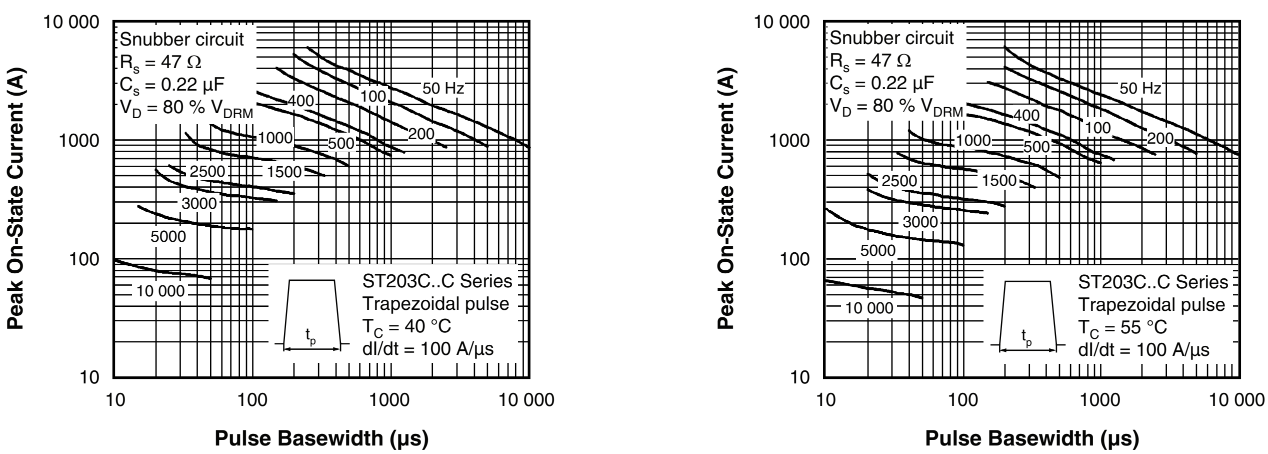


Fig. 15 - Frequency Characteristics

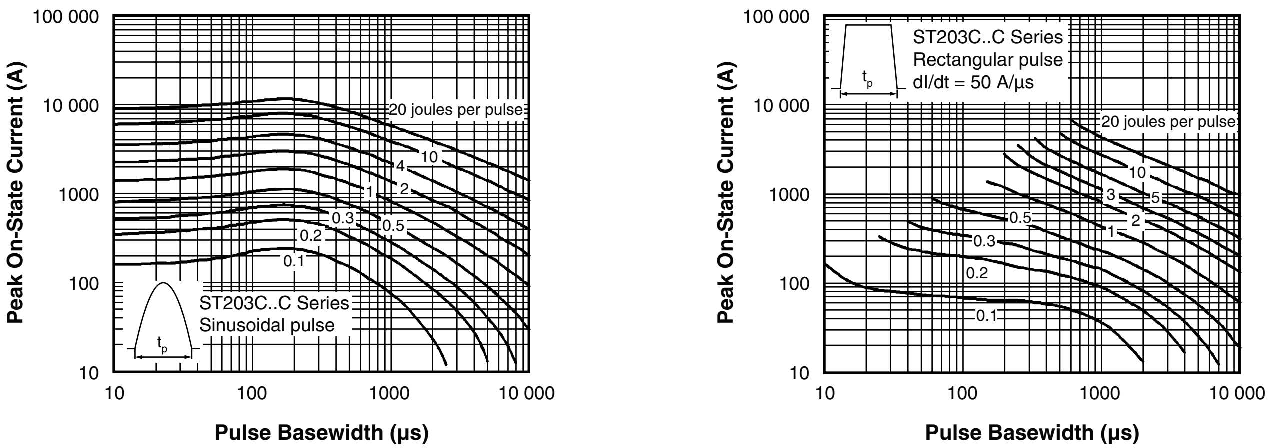


Fig. 16 - Maximum On-State Energy Power Loss Characteristics

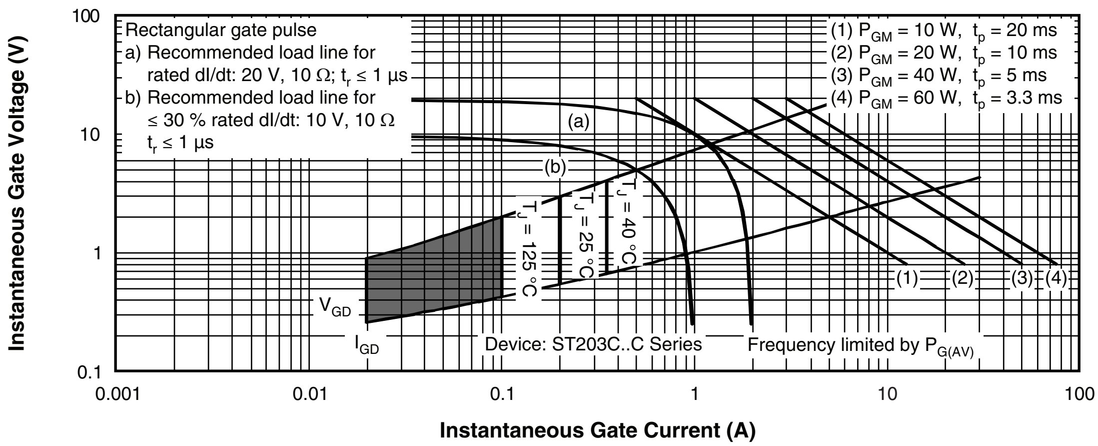


Fig. 17 - Gate Characteristics

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 A-PUK (TO-200AB)

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/μs (standard value)
- L = 1000 V/μs (special selection)

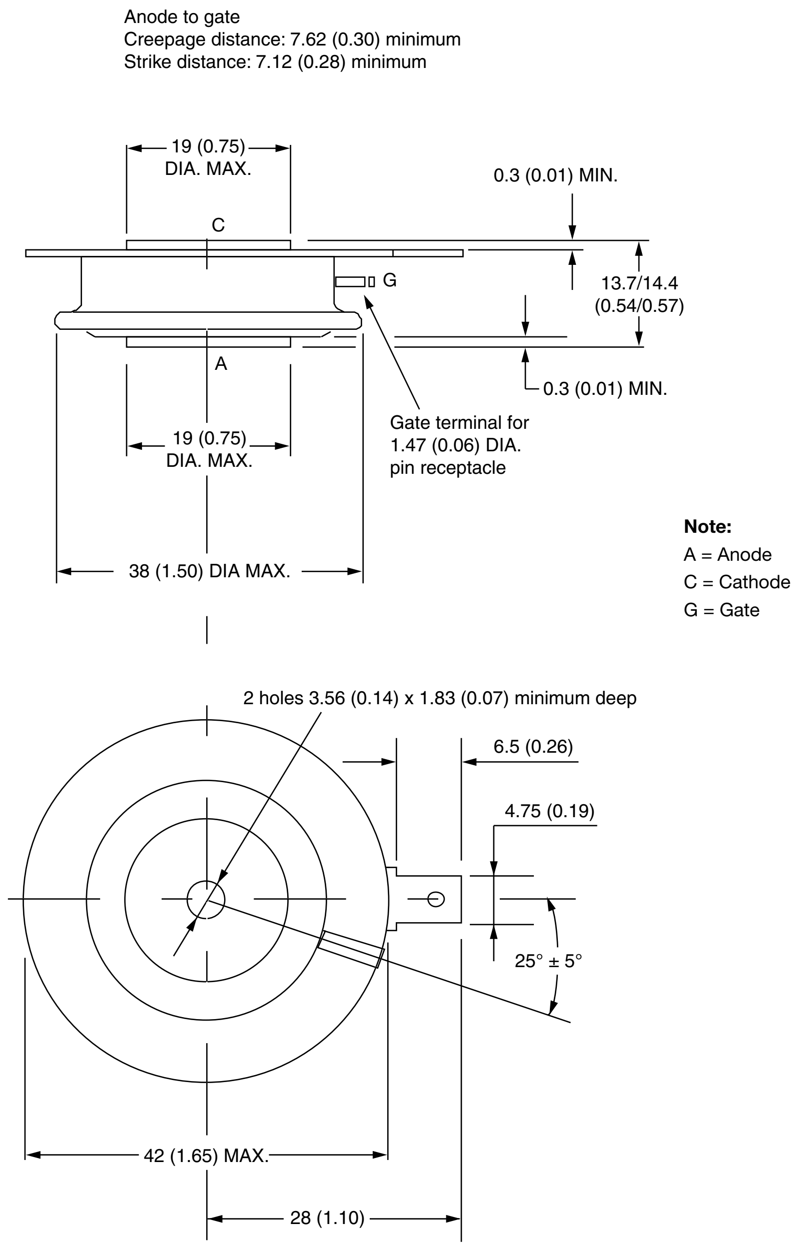
dV/dt - t_q combinations available						
	dV/dt (V/μs)	20	50	100	**200**	400
t_q (μs)	20	CK	DK	EK	-	-
	25	CJ	DJ	EJ	**FJ***	-
	30	CH	DH	EH	FH	HH

* Standard part number.
All other types available only on request.

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95074

A-PUK (TO-200AB)

DIMENSIONS in millimeters (inches)



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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