Phase Control Thyristors (Hockey PUK Version), 910 A

B-PUK (TO-200AC)

FEATURES

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case B-PUK (TO-200AC)
- 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

- DC motor controls
- Controlled DC power supplies
- AC controllers

PRIMARY CHARACTERISTICS	
$I_{T(AV)}$	910 A
V_{DRM}/V_{RRM}	1200 V, 1600 V, 1800 V, 2000 V
V_{TM}	1.80 V
I_{GT}	100 mA
T_J	-40 °C to +125 °C
Package	B-PUK (TO-200AC)
Circuit configuration	Single SCR

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		910	A
	T_{hs}	55	°C
$I_{T(RMS)}$		1857	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	15 700	A
	60 Hz	16 400	
I^2t	50 Hz	1232	kA^2s
	60 Hz	1125	
V_{DRM}/V_{RRM}		1200 to 2000	V
t_q	Typical	150	µs
T_J		-40 to 125	°C

VOLTAGE RATINGS				
TYPE NUMBER	VOLTAGE CODE	V_{DRM}/V_{RRM}, MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I_{DRM}/I_{RRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA
VS-ST700CL	12	1200	1300	80
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

ABSOLUTE MAXIMUM RATINGS

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	910 (355)	A
			55 (85)	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled	1857	A
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	t = 10 ms, No voltage reapplied, Sinusoidal half wave, initial $T_J = T_J$ maximum	15 700	A
		t = 8.3 ms, No voltage reapplied	16 400	
		t = 10 ms, 100 % V_{RRM} reapplied	13 200	
		t = 8.3 ms, 100 % V_{RRM} reapplied	13 800	
Maximum I^2t for fusing	I^2t	t = 10 ms, No voltage reapplied, Sinusoidal half wave, initial $T_J = T_J$ maximum	1232	kA^2s
		t = 8.3 ms, No voltage reapplied	1125	
		t = 10 ms, 100 % V_{RRM} reapplied	871	
		t = 8.3 ms, 100 % V_{RRM} reapplied	795	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied	12 321	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum	1.00	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum	1.13	
Low level value of on-state slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum	0.40	mΩ
High level value of on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum	0.35	
Maximum on-state voltage	V_{TM}	I_{pk} = 2000 A, $T_J = T_J$ maximum, t_p = 10 ms sine pulse	1.80	V
Maximum holding current	I_H	T_J = 25 °C, anode supply 12 V resistive load	600	mA
Typical latching current	I_L		1000	

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum non-repetitive rate of rise of turned-on current	dI/dt	Gate drive 20 V, 20 Ω, $t_r \leq 1$ µs $T_J = T_J$ maximum, anode voltage ≤ 80 % V_{DRM}	1000	A/µs
Typical delay time	t_d	Gate current 1 A, dI_g/dt = 1 A/µs V_d = 0.67 % V_{DRM}, T_J = 25 °C	1.0	µs
Typical turn-off time	t_q	I_{TM} = 750 A, $T_J = T_J$ maximum, dI/dt = 60 A/µs, V_R = 50 V, dV/dt = 20 V/µs, gate 0 V 100 Ω, t_p = 500 µs	150	

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 % rated V_{DRM}	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	80	mA

TRIGGERING						
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES		UNITS
				Typ.	Max.	
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms		10.0		W
Maximum average gate power	$P_{G(AV)}$	$T_J = T_J$ maximum, f = 50 Hz, d% = 50		2.0		
Maximum peak positive gate current	I_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms		3.0		A
Maximum peak positive gate voltage	$+V_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms		20		V
Maximum peak negative gate voltage	$-V_{GM}$			5.0		
DC gate current required to trigger	I_{GT}	T_J = -40 °C	Maximum required gate trigger/ current/voltage are the lowest value which will trigger all units 12 V anode to cathode applied	200	-	mA
		T_J = 25 °C		100	200	
		T_J = 125 °C		50	-	
DC gate voltage required to trigger	V_{GT}	T_J = -40 °C		2.5	-	V
		T_J = 25 °C		1.8	3.0	
		T_J = 125 °C		1.1	-	
DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum	Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated V_{DRM} anode to cathode applied	10		mA
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	$R_{thJ\text{-}hs}$	DC operation single side cooled	0.073	K/W
		DC operation double side cooled	0.031	
Maximum thermal resistance, case to heatsink	$R_{thC\text{-}hs}$	DC operation single side cooled	0.011	
		DC operation double side cooled	0.006	
Mounting force, ± 10 %			14 700 (1500)	N (kg)
Approximate weight			255	g
Case style		See dimensions - link at the end of datasheet	B-PUK (TO-200AC)	

$\Delta R_{thJ\text{-}hs}$ CONDUCTION						
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION		RECTANGULAR CONDUCTION		TEST CONDITIONS	UNITS
	SINGLE SIDE	DOUBLE SIDE	SINGLE SIDE	DOUBLE SIDE		
180°	0.009	0.009	0.006	0.006	$T_J = T_J$ maximum	K/W
120°	0.011	0.011	0.011	0.011		
90°	0.014	0.014	0.015	0.015		
60°	0.020	0.020	0.021	0.021		
30°	0.036	0.036	0.036	0.036		

Note

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

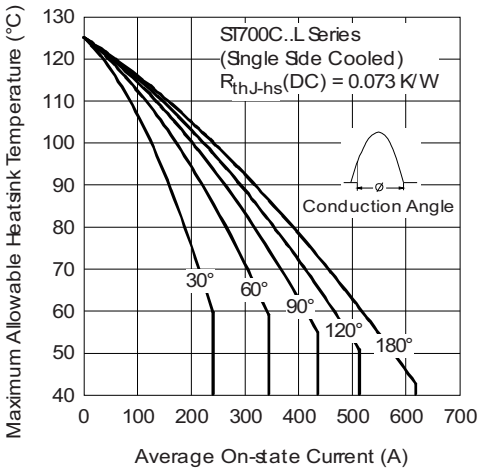


Fig. 1 - Current Ratings Characteristics

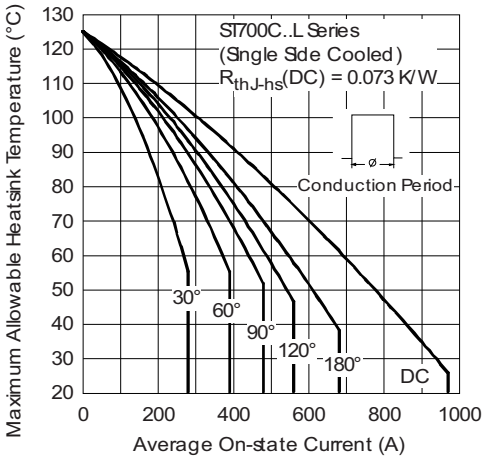


Fig. 2 - Current Ratings Characteristics

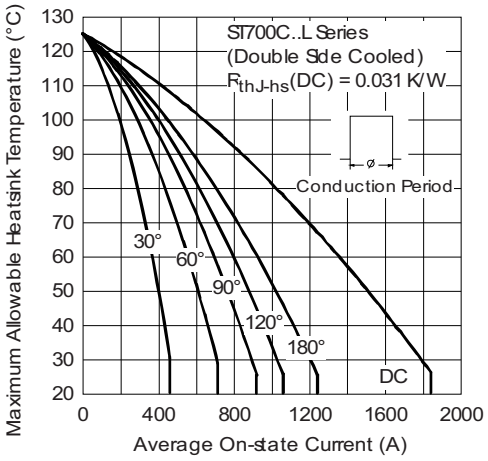


Fig. 3 - Current Ratings Characteristics

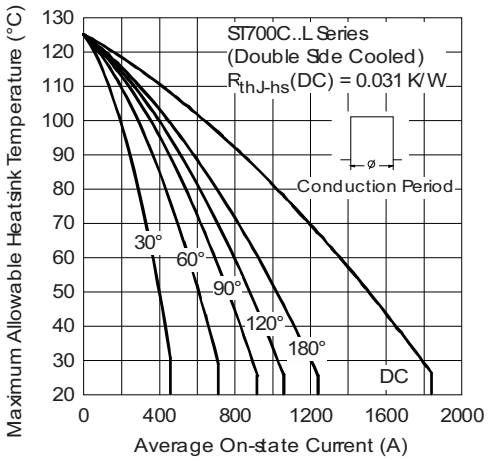


Fig. 4 - Current Ratings Characteristics

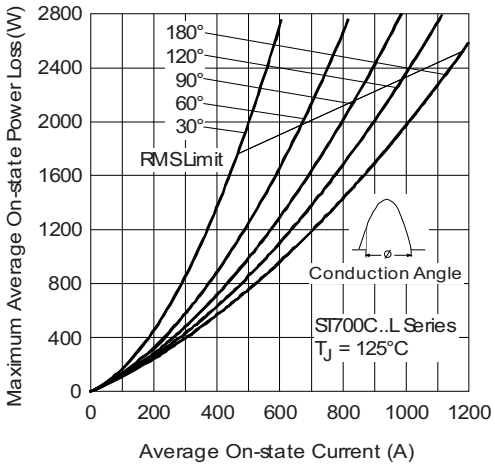


Fig. 5 - On-State Power Loss Characteristics

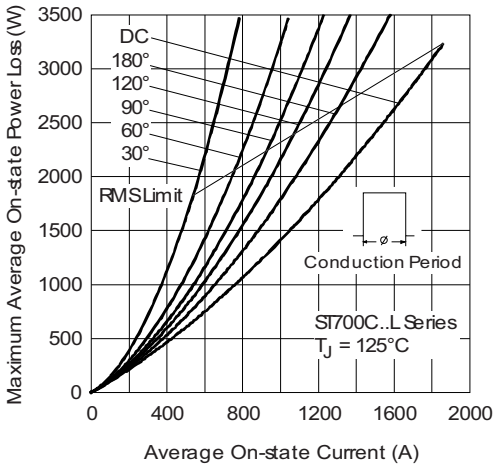


Fig. 6 - On-State Power Loss Characteristics

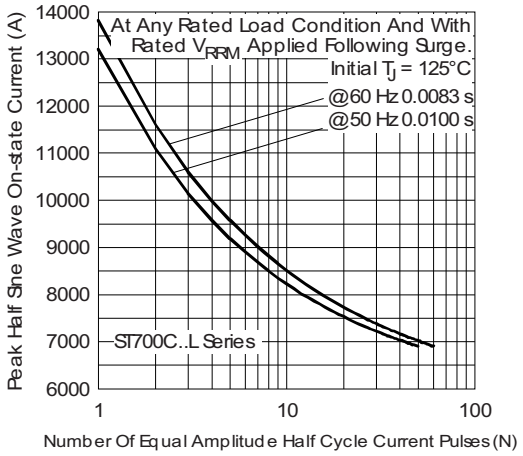


Fig. 7 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

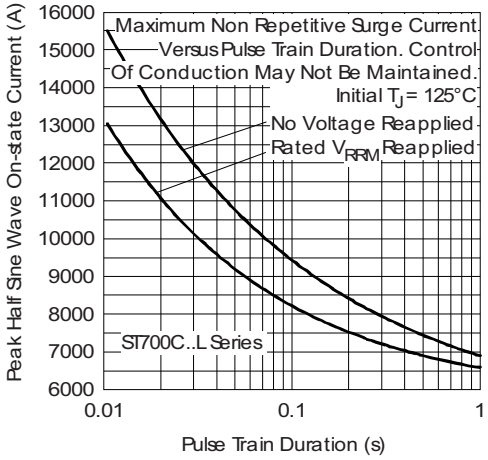


Fig. 8 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

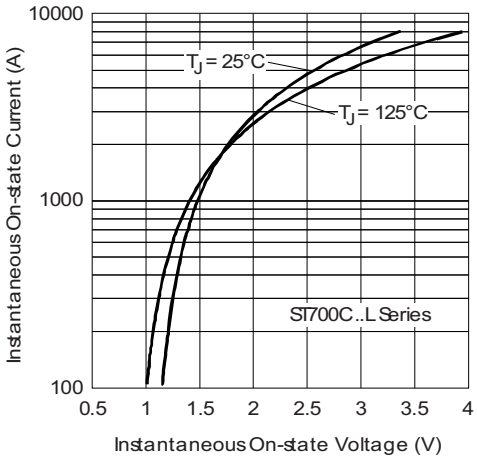


Fig. 9 - On-State Voltage Drop Characteristics

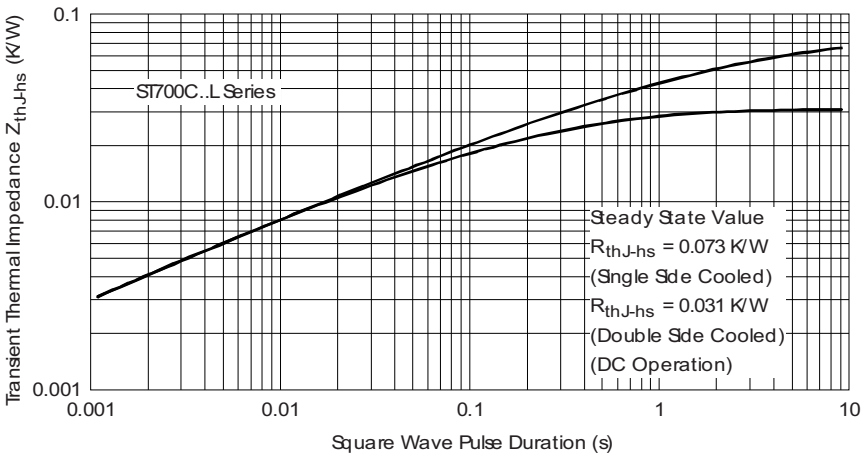


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

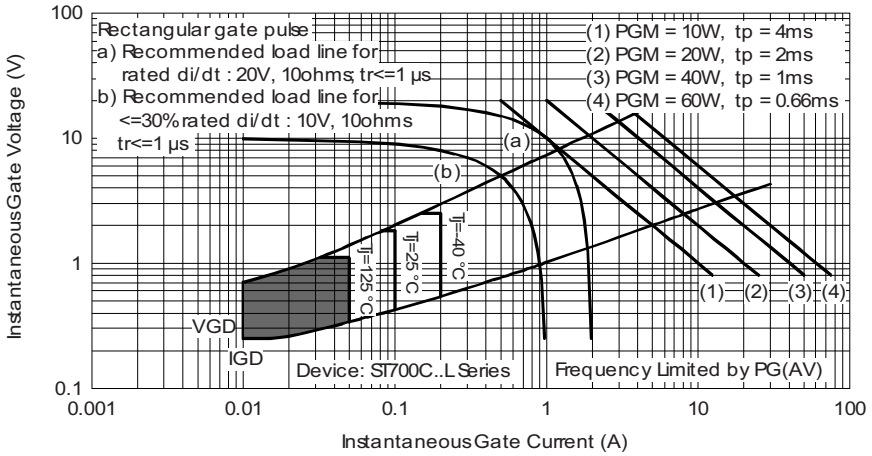


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	ST	70	0	C	20	L	1	-
1	2	3	4	5	6	7	8	9

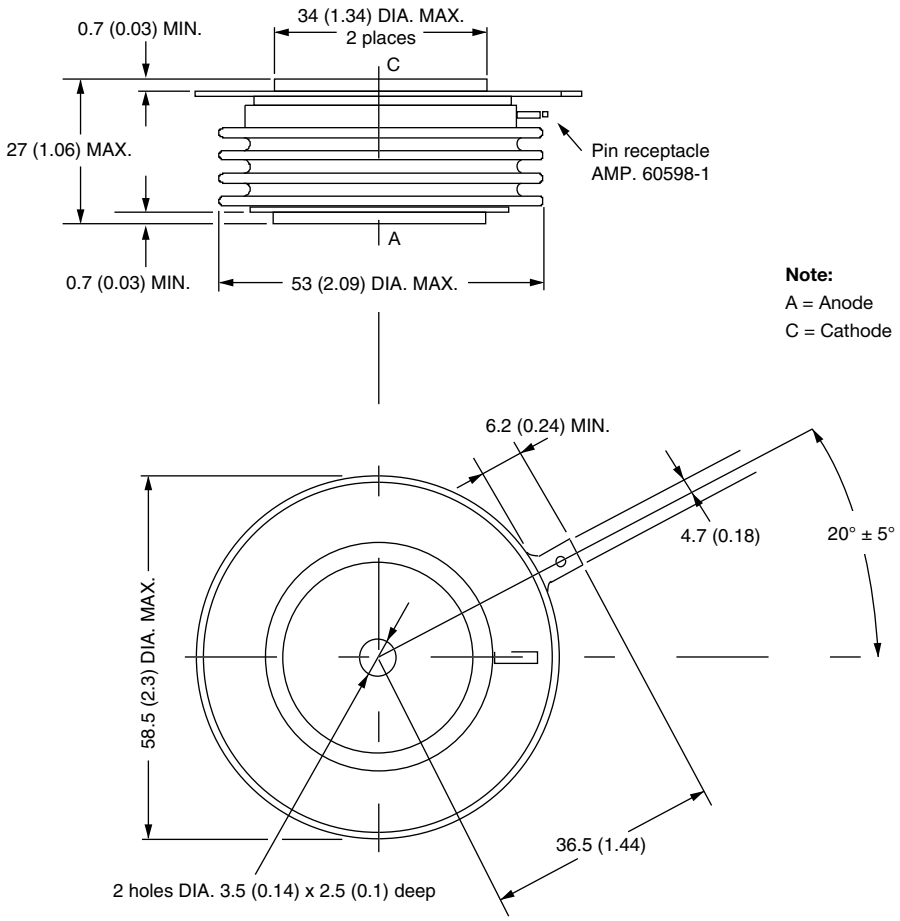
- **1** - Vishay Semiconductors product
- **2** - Thyristor
- **3** - Essential part number
- **4** - 0 = converter grade
- **5** - C = ceramic PUK
- **6** - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
- **7** - L = PUK case B-PUK (TO-200AC)
- **8** - 0 = eyelet terminals (gate and auxiliary 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)
- **9** - Critical dV/dt:
  - None = 500 V/µs (standard selection)
  - L = 1000 V/µs (special selection)

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95076

B-PUK (TO-200AC)

DIMENSIONS in millimeters (inches)

Creepage distance: 36.33 (1.430) minimum
Strike distance: 17.43 (0.686) minimum



Note:
A = Anode
C = Cathode

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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