

Phase Control Thyristors (Hockey PUK Version), 1350 A


TO-200AC (B-PUK)

FEATURES

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AC (B-PUK)
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


**RoHS
COMPLIANT**

TYPICAL APPLICATIONS

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

PRODUCT SUMMARY

Package	TO-200AC (B-PUK)
Diode variation	Single SCR
$I_{T(AV)}$	1350 A
V_{DRM}/V_{RRM}	400 V, 600 V
V_{TM}	1.31 V
I_{GT}	100 mA
T_J	-40 °C to 125 °C

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		1350	A
	T_{hs}	55	°C
$I_{T(RMS)}$		2700	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	24 400	A
	60 Hz	25 600	
I^2t	50 Hz	2986	kA ² s
	60 Hz	2726	
V_{DRM}/V_{RRM}		400 to 600	V
t_q	Typical	150	μs
T_{JV}		-40 to 125	°C

ELECTRICAL SPECIFICATIONS

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-ST780C..L	04	400	500	80
	06	600	700	



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			1350 (500)	A
					55 (85)	°C
Maximum RMS on-state current	I _{T(RMS)}	DC at 25 °C heatsink temperature double side cooled			2700	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	24 400	
		t = 8.3 ms			25 600	
		t = 10 ms	100 % V _{RRM} reapplied		20 550	
		t = 8.3 ms			21 500	
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		2986	kA ² s
		t = 8.3 ms			2726	
		t = 10 ms	100 % V _{RRM} reapplied		2112	
		t = 8.3 ms			1928	
Maximum I ² /√t for fusing	I ² /√t	t = 0.1 to 10 ms, no voltage reapplied			29 860	kA ² /√s
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			0.80	V
High level value of threshold voltage	V _{T(TO)2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.90	
Low level value of on-state slope resistance	r _{t1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			0.14	mΩ
High level value of on-state slope resistance	r _{t2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.13	
Maximum on-state voltage	V _{TM}	I _{pk} = 3600 A, T _J = T _J maximum, t _p = 10 ms sine pulse			1.31	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 ≤ 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 ≤ 5 ms		3.0		A
Maximum peak positive gate voltage	+ V _{GM}	T _J = T _J maximum, t _p ≤ 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-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-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	TO-200AC (B-PUK)	

ΔR_{thJ-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-hs} when devices operate at different conduction angles than DC

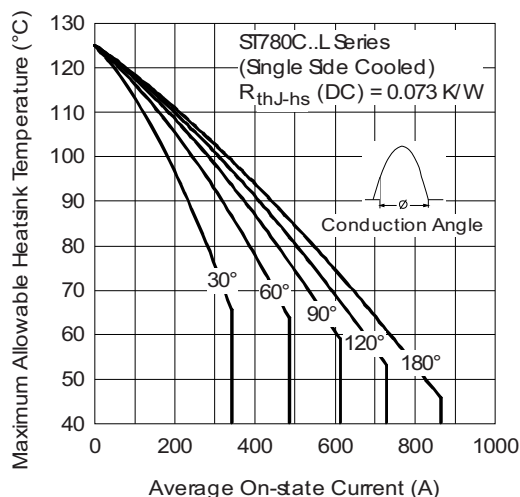


Fig. 1 - Current Ratings Characteristics

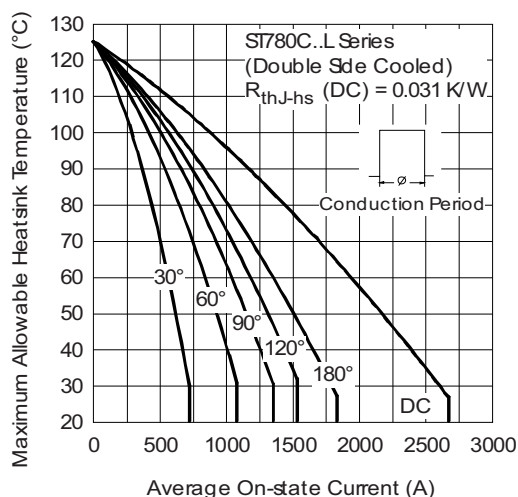


Fig. 4 - Current Ratings Characteristics

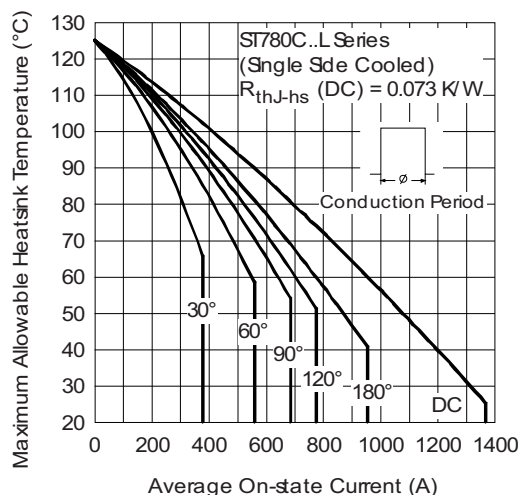


Fig. 2 - Current Ratings Characteristics

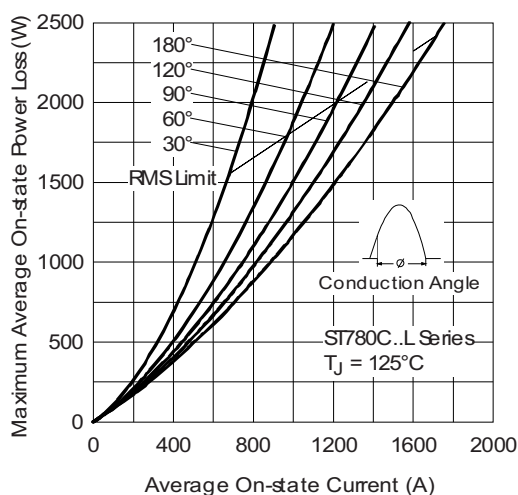


Fig. 5 - On-State Power Loss Characteristics

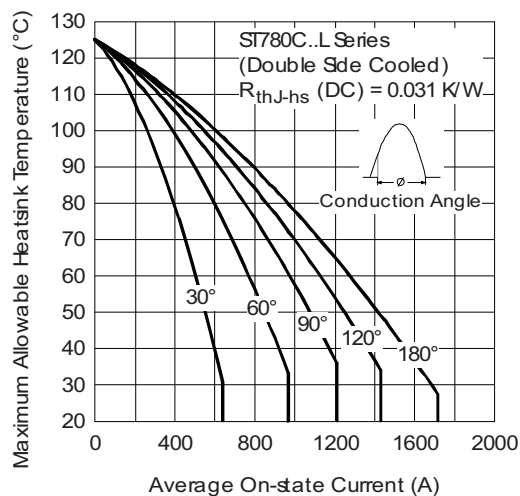


Fig. 3 - Current Ratings Characteristics

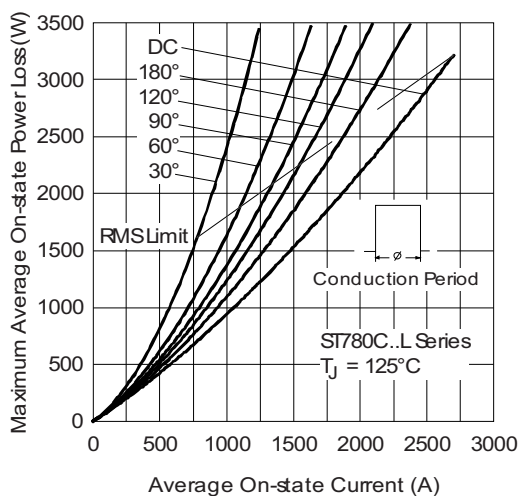


Fig. 6 - On-State Power Loss Characteristics

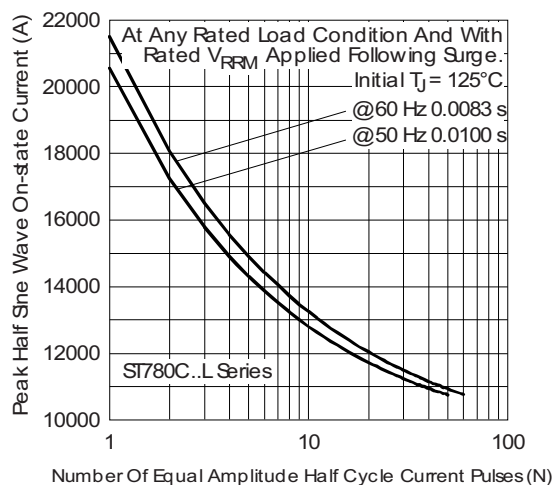


Fig. 7 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

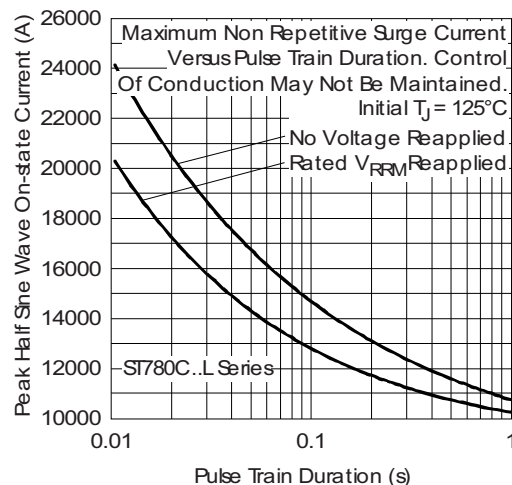


Fig. 8 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

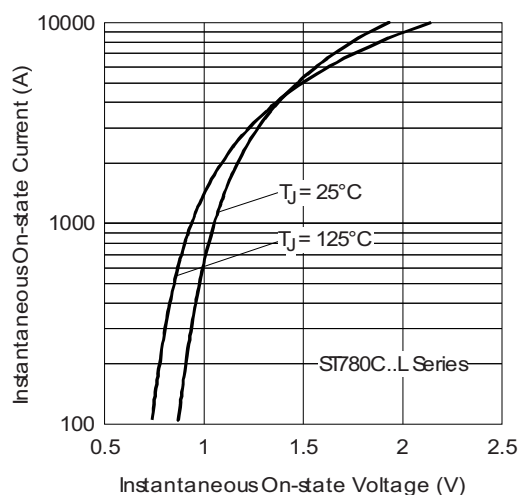


Fig. 9 - On-State Voltage Drop Characteristics

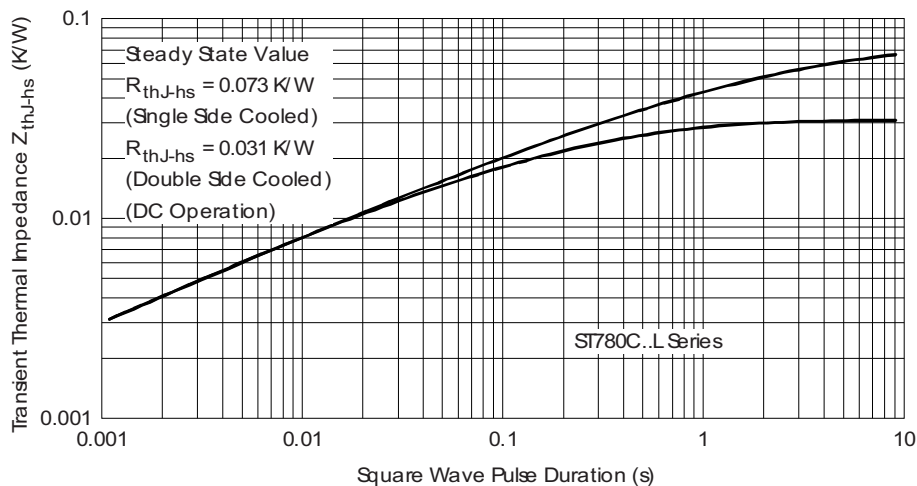


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

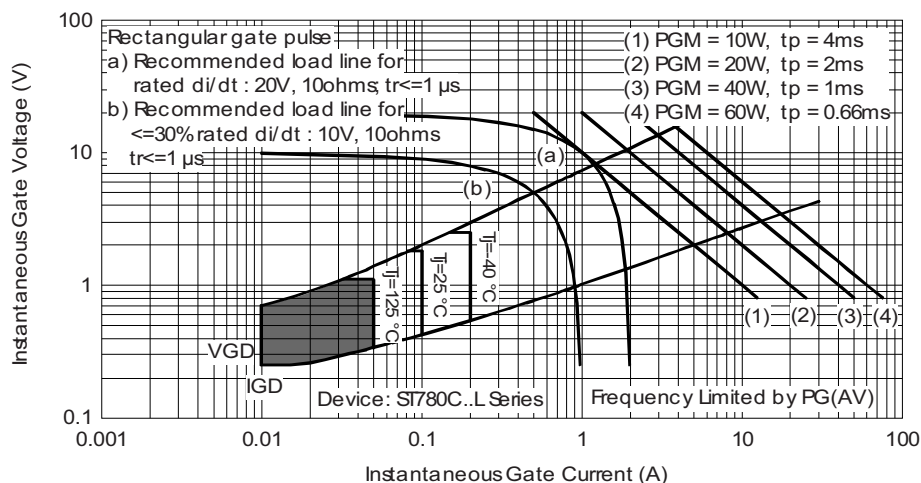


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	ST	78	0	C	06	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 TO-200AC (B-PUK)								
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

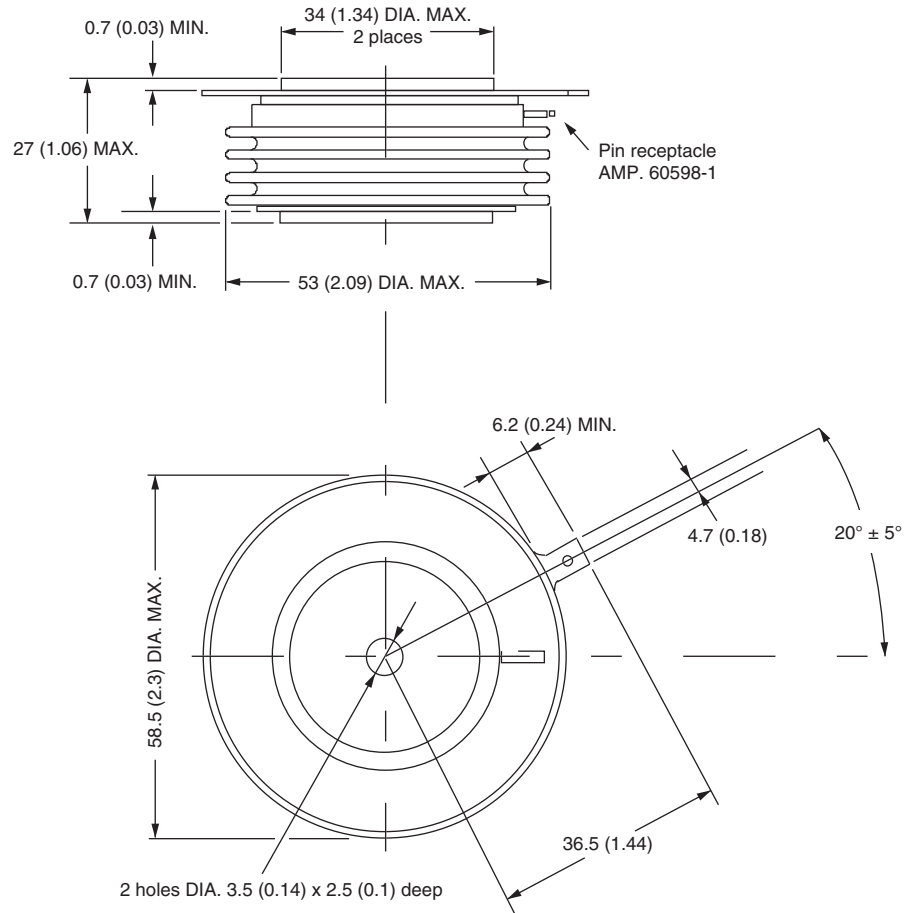
Dimensions

<http://www.vishay.com/doc?95076>

TO-200AC (B-PUK)

DIMENSIONS in millimeters (inches)

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