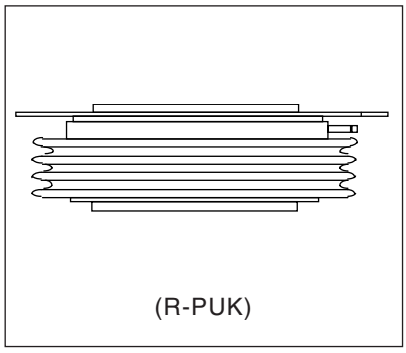
Bulletin I25197 rev. B 02/00

International
IOR Rectifier

ST1900C..R SERIES

PHASE CONTROL THYRISTORS **Hockey Puk Version**

1940A



(R-PUK)

Features

- Double side cooling
- High surge capability
- High mean current
- Fatigue free

Typical Applications

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

Major Ratings and Characteristics

Parameters		ST1900C..R	Units
$I_{T(AV)}$		1625	A
	@ T_C	80	°C
$I_{T(AV)}$		1940	A
	@ T_{hs}	55	°C
$I_{T(RMS)}$		3500	A
	@ T_{hs}	25	°C
I_{TSM}	@ 50Hz	27500	A
	@ 60Hz	29000	A
I^2t	@ 50Hz	3780	KA^2s
	@ 60Hz	3490	KA^2s
V_{DRM}/V_{RRM}		4500 to 5200	V
t_q	typical	500	µs
T_J	max.	125	°C

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM}, max. repetitive peak and off-state voltage V	V_{RSM}, maximum non-repetitive peak voltage V	I_{DRM}/I_{RRM} max. @ T_C = 125°C mA
ST1900C..R	45	4500	4600	250
	46	4600	4700	
	48	4800	4900	
	50	5000	5100	
	52	5200	5300	

On-state Conduction

	Parameter	ST1900C..R	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	1625 (1030)	A	180° conduction, half sine wave double side (single side [anode side]) cooled		
	@ Case temperature	80	°C			
$I_{T(AV)}$	Max. average on-state current	1940 (800)	A			
	@ Heatsink temperature	55 (85)	°C			
$I_{T(RMS)}$	Max. RMS on-state current	3500	A	DC @ 25°C heatsink temperature double side cooled		
I_{TSM}	Max. peak, one-cycle non-repetitive surge current	27500	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial T_C = 125°C
		29000		t = 8.3ms		
		22000		t = 10ms	50% V_{RRM} reapplied	
		23500		t = 8.3ms		
I^2t	Maximum I^2t for fusing	3780	KA^2s	t = 10ms	No voltage reapplied	
		3490		t = 8.3ms		
		2420		t = 10ms	50% V_{RRM} reapplied	
		2290		t = 8.3ms		
$V_{T(TO)}$	Max. value of threshold voltage	1.4	V	$T_J = T_J$ max.		
r_t	Max. value of on-state slope resistance	0.31	mΩ	$T_J = T_J$ max.		
V_{TM}	Max. on-state voltage	2.1	V	I_{pk} = 2900A, T_C = 25°C		
I_L	Typical latching current	300	mA	T_J = 25°C, V_D = 5V		

Switching

	Parameter	ST1900C..R	Units	Conditions
di/dt	Max. repetitive 50Hz (no repetitive) rate of rise of turned-on current	150 (300)	A/µs	From 67% V_{DRM} to 1000A gate drive 20V, 10Ω, t_r = 0.5µs to 1A, $T_J = T_J$ max.
t_d	Maximum delay time	2.5	µs	Gate drive 30V, 15Ω, V_d = 67% V_{DRM}, T_J = 25°C Rise time 0.5µs
t_q	Typical turn-off time	500		I_T = 1000A, t_p = 1ms, $T_J = T_J$ max, V_{RM} = 50V, dI_{RR}/dt = 20A/µs, V_{DR} = 67% V_{DRM}, dV_{DR}/dt = 8V/µs linear

Blocking

	Parameter	ST1900C..R	Units	Conditions
dv/dt	Maximum linear rate of rise of off-state voltage	500	V/µs	$T_J = T_J$ max. to 67% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	250	mA	T_J = 125°C rated V_{DRM}/V_{RRM} applied

Triggering

	Parameter	ST1900C..R	Units	Conditions	
P_{GM}	Maximum peak gate power	150	W	t_p = 100µs	
$P_{G(AV)}$	Maximum average gate power	10			
I_{GM}	Max. peak positive gate current	30	A	Anode positive with respect to cathode	
V_{GM}	Max. peak positive gate voltage	30	V	Anode positive with respect to cathode	
$-V_{GM}$	Max. peak negative gate voltage	0.25	V	Anode negative with respect to cathode	
I_{GT}	Maximum DC gate current required to trigger	400	mA	T_C = 25°C, V_{DRM} = 5V	
V_{GT}	Maximum gate voltage required to trigger	4	V	T_C = 25°C, V_{DRM} = 5V	
V_{GD}	DC gate voltage not to trigger	0.25	V	T_C = 125°C	Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied

Thermal and Mechanical Specification

	Parameter	ST1900C..R	Units	Conditions	
T_J max.	Max. operating temperature	125	°C	On-state (conducting)	
T_{stg}	Max. storage temperature range	-55 to 125			
R_{thJ-C}	Thermal resistance, junction to case	0.019 0.0095	K/W	DC operation single side cooled DC operation double side cooled	
$R_{th(C-h)}$	Thermal resistance, case to heatsink	0.004 0.002	K/W	Single side cooled Double side cooled	Clamping force 43KN with mounting compound
F	Mounting force ± 10%	43000 (4400)	N (Kg)		
wt	Approximate weight	1600	g		
	Case style	(R-PUK)		See Outline Table	

ΔR_{thJ-C} Conduction

(The following table shows the increment of thermal resistence R_{thJ-C} when devices operate at different conduction angles than DC)

Conduction angle	Single side	Double side	Units	Conditions
180°	0.0010	0.0010	K/W	$T_J = T_J$ max.
120°	0.0017	0.0017		
60°	0.0044	0.0044		

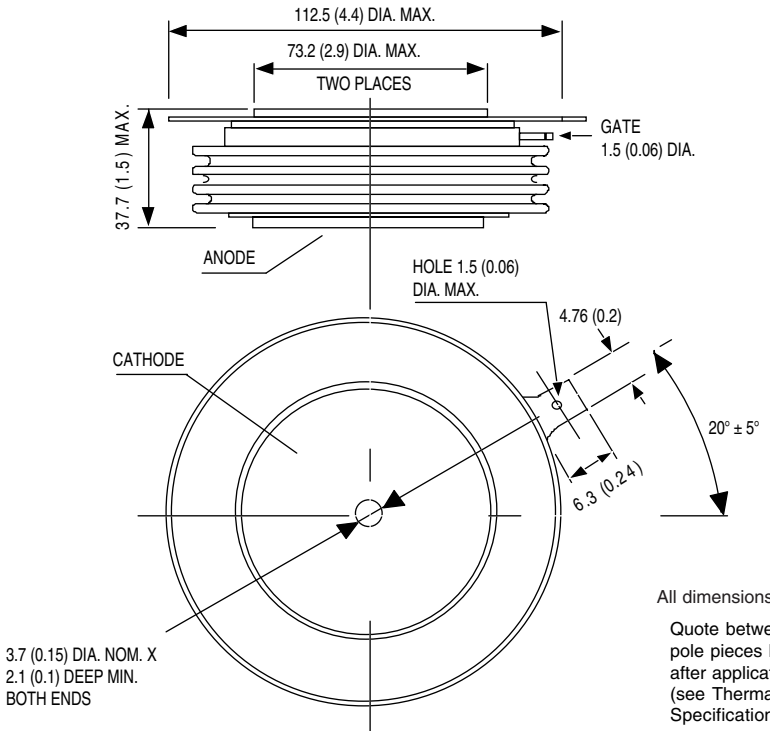
Ordering Information Table

Device Code

ST	190	0	C	52	R	1	
1	2	3	4	5	6	7	8

1 - Thyristor
2 - Essential part number
3 - 0 = Converter grade
4 - C = Ceramic Puk
5 - Voltage code: Code x 100 = V_{RRM} (See Voltage Rating Table)
6 - R = Puk Case
7 - 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)
8 - Critical dv/dt: None = 500V/µsec (Standard selection)
L = 1000V/µsec (Special selection)

Outline Table



(R-PUK)

All 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)

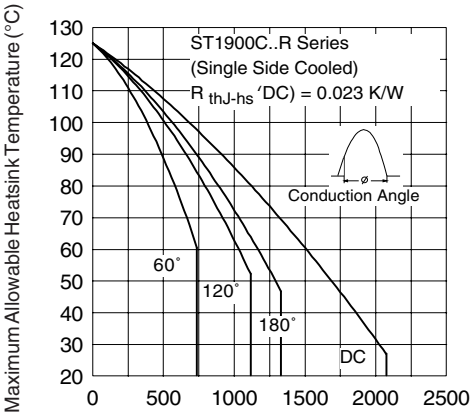


Fig. 1 - Current Ratings Characteristics

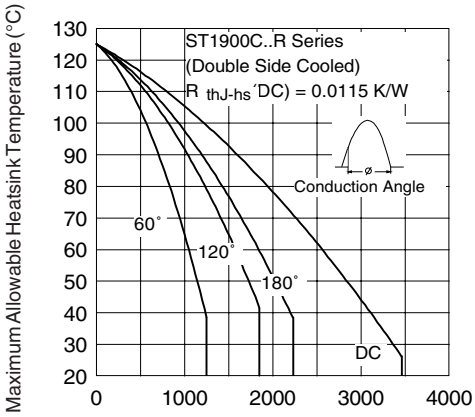


Fig. 2 - Current Ratings Characteristics

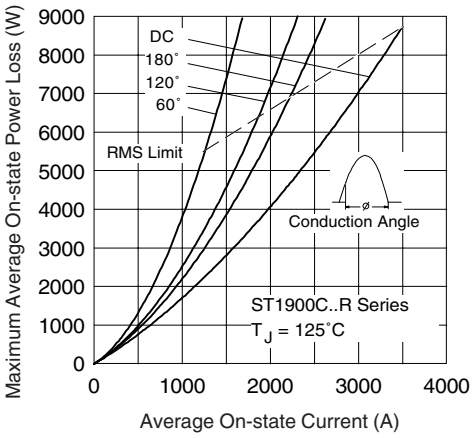


Fig. 3- On-state Power Loss Characteristics

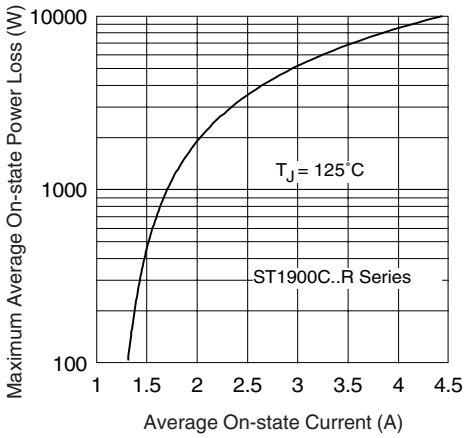


Fig. 4- On-state Power Loss Characteristics

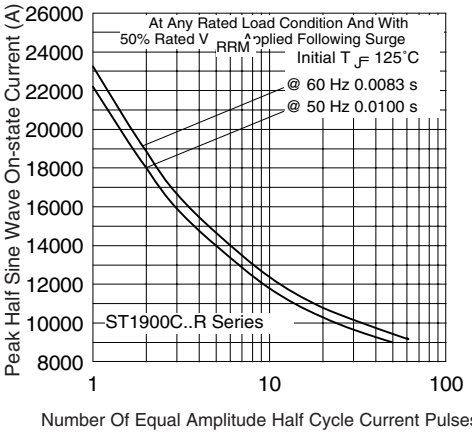


Fig.5 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

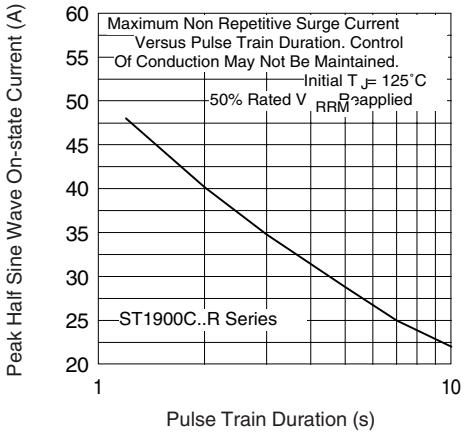
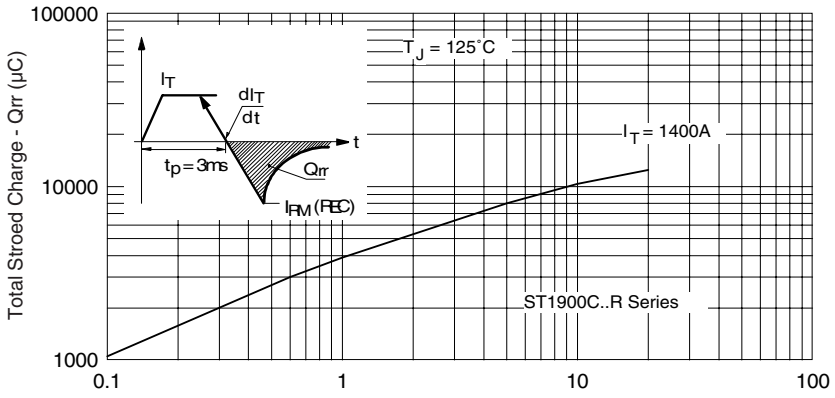
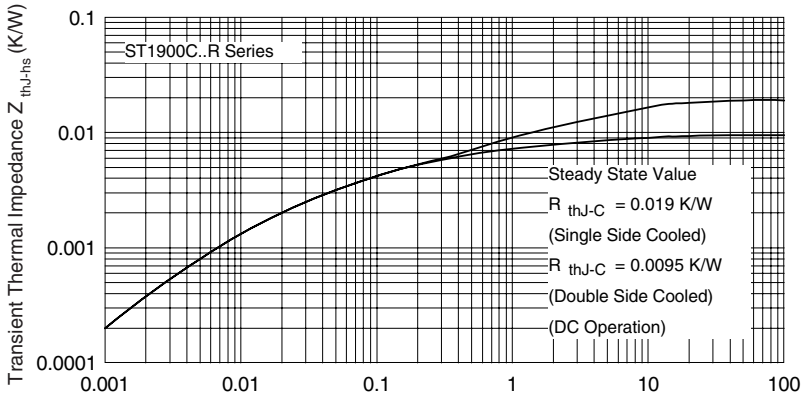


Fig. 6 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled



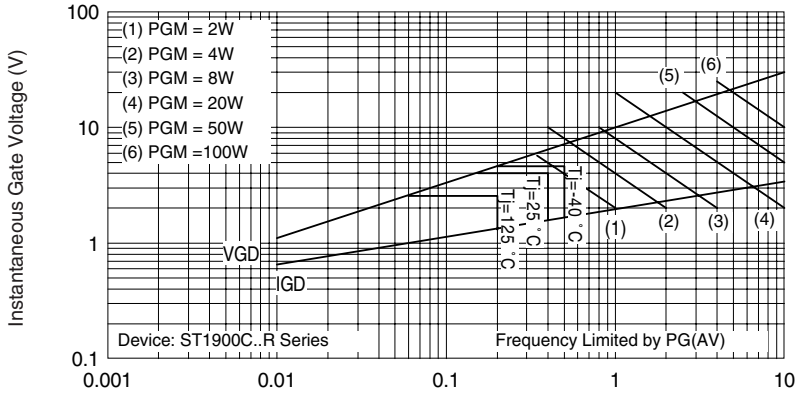
Rate Of Decay Of On-state Current - di/dt (A/µs)

Fig. 7 - Stored Charged



Square Wave Pulse Duration (s)

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



Instantaneous Gate Current (A)

Fig. 11 - Gate Characteristics