



DISCRETE POWER DIODES and THYRISTORS
DATA BOOK



ST330C..L SERIES

PHASE CONTROL THYRISTORS

Hockey Puk Version

Features

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

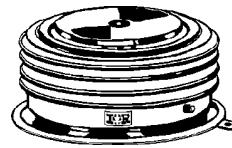
650A

Typical Applications

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

Major Ratings and Characteristics

Parameters	ST330C..L	Units
$I_{T(AV)}$	650	A
@ T_{hs}	55	°C
$I_{T(RMS)}$	1230	A
@ T_{hs}	25	°C
I_{TSM}	9000	A
@ 50Hz	9000	A
@ 60Hz	9420	A
I^2t	405	KA ² s
@ 50Hz	405	KA ² s
@ 60Hz	370	KA ² s
V_{DRM}/V_{RRM}	400 to 1600	V
t_q typical	100	μs
T_J	- 40 to 125	°C



case style TO-200AC (B-PUK)

ST330C..L Series

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. @ $T_J = T_{J\max}$ mA
ST330C..L	04	400	500	50
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

On-state Conduction

Parameter	ST330C..L	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Heatsink temperature	650 (314)	A	180° conduction, half sine wave double side (single side) cooled
	55 (75)	°C	
$I_{T(RMS)}$ Max. RMS on-state current	1230	A	DC @ 25°C heatsink temperature double side cooled
I_{TSM} Max. peak, one-cycle non-repetitive surge current	9000		$t = 10ms$ No voltage reapplied
	9420		$t = 8.3ms$ 100% V_{RRM} reapplied
	7570		$t = 10ms$ 100% V_{RRM} reapplied
	7920		$t = 8.3ms$ 100% V_{RRM} reapplied
I^2t Maximum I^2t for fusing	405	KA ² s	Sinusoidal half wave, Initial $T_J = T_{J\max}$.
	370		$t = 10ms$ No voltage reapplied
	287		$t = 8.3ms$ 100% V_{RRM} reapplied
	262		$t = 8.3ms$ 100% V_{RRM} reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	4050	KA ² s	$t = 0.1$ to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.91	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_{J\max}$.
$V_{T(TO)2}$ High level value of threshold voltage	0.93		$(I > \pi \times I_{T(AV)})$, $T_J = T_{J\max}$.
r_{t1} Low level value of on-state slope resistance	0.57	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_{J\max}$.
r_{t2} High level value of on-state slope resistance	0.57		$(I > \pi \times I_{T(AV)})$, $T_J = T_{J\max}$.
V_{TM} Max. on-state voltage	1.90	V	$I_{pk} = 1730A$, $T_J = T_{J\max}$, $t_p = 10ms$ sine pulse
I_H Maximum holding current	600	mA	$T_J = 25^\circ C$, anode supply 12V resistive load
I_L Typical latching current	1000		

Switching

Parameter	ST330C..L	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/μs	Gate drive 20V, 20Ω, $t_r \leq 1\mu s$ $T_J = T_{J\max}$, anode voltage ≤ 80% V_{DRM}
t_d Typical delay time	1.0	μs	Gate current 1A, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ C$
t_q Typical turn-off time	100		$I_{TM} = 550A$, $T_J = T_{J\max}$, $di/dt = 40A/\mu s$, $V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 100Ω, $t_p = 500\mu s$

ST330C..L Series

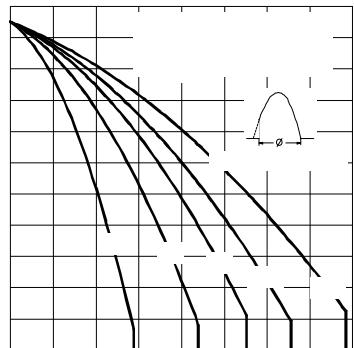


Fig. 3 - Current Ratings Characteristics

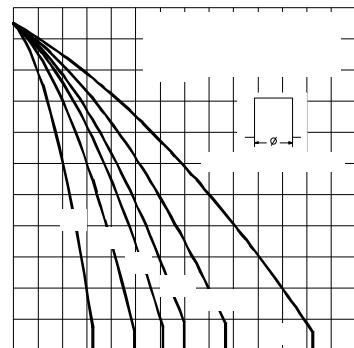


Fig. 4 - Current Ratings Characteristics

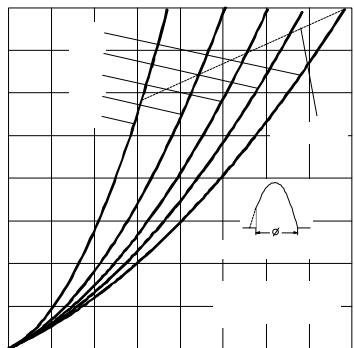


Fig. 5- On-state Power Loss Characteristics

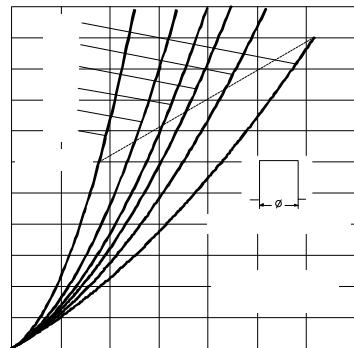


Fig. 6- On-state Power Loss Characteristics

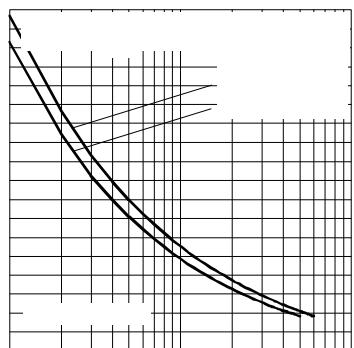


Fig. 7 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

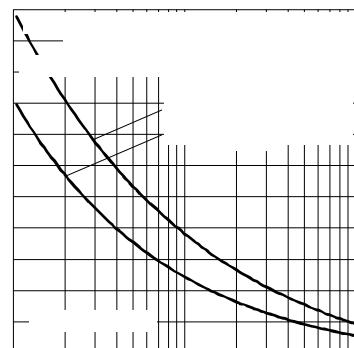


Fig. 8 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

ST330C..L Series

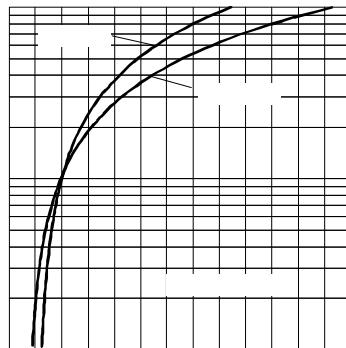


Fig. 9 - On-state Voltage Drop Characteristics

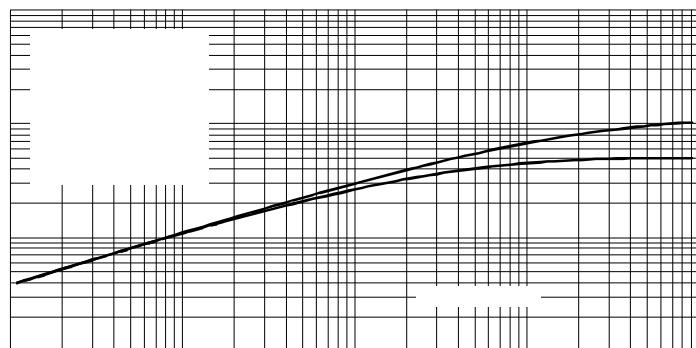


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

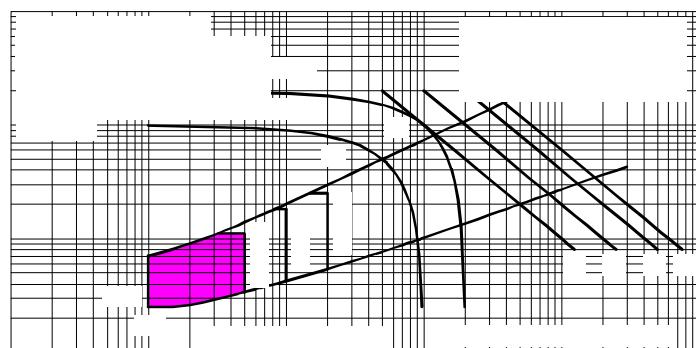


Fig. 11 - Gate Characteristics

ST330C..L Series

Blocking

Parameter	ST330C..L	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/ μ s	$T_J = T_J$ max. linear to 80% rated V_{DRM}
I_{DRM} Max. peak reverse and off-state leakage current	50	mA	$T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied

Triggering

Parameter	ST330C..L	Units	Conditions
P_{GM} Maximum peak gate power	10.0	W	$T_J = T_J$ max, $t_p \leq 5ms$
$P_{G(AV)}$ Maximum average gate power	2.0		$T_J = T_J$ max, $f = 50Hz$, $d\% = 50$
I_{GM} Max. peak positive gate current	3.0	A	$T_J = T_J$ max, $t_p \leq 5ms$
$+V_{GM}$ Maximum peak positive gate voltage	20	V	
$-V_{GM}$ Maximum peak negative gate voltage	5.0		$T_J = T_J$ max, $t_p \leq 5ms$
I_{GT} DC gate current required to trigger	TYP.	MAX.	Max. required gate trigger/ current/voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	200	-	
	100	200	
	50	-	
V_{GT} DC gate voltage required to trigger	2.5	-	$T_J = -40^\circ C$ $T_J = 25^\circ C$ $T_J = 125^\circ C$
	1.8	3.0	
	1.1	-	
I_{GD} DC gate current not to trigger	10	mA	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
V_{GD} DC gate voltage not to trigger	0.25	V	

Thermal and Mechanical Specification

Parameter	ST330C..L	Units	Conditions
T_J Max. operating temperature range	-40 to 125	°C	
T_{stg} Max. storage temperature range	-40 to 150		
R_{thJ-hs} Max. thermal resistance, junction to heatsink	0.11	K/W	DC operation single side cooled
	0.06		DC operation double side cooled
R_{thC-hs} Max. thermal resistance, case to heatsink	0.011	K/W	DC operation single side cooled
	0.005		DC operation double side cooled
F Mounting force, $\pm 10\%$	9800 (1000)	N (Kg)	
wt Approximate weight	250	g	
Case style	TO - 200AC (B-PUK)	See Outline Table	

ST330C..L Series

ΔR_{thJ-hs} Conduction

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

Conduction angle	Sinusoidal conduction		Rectangular conduction		Units	Conditions
	Single Side	Double Side	Single Side	Double Side		
180°	0.012	0.010	0.008	0.008	K/W	$T_J = T_{J \max}$.
120°	0.014	0.015	0.014	0.014		
90°	0.018	0.018	0.019	0.019		
60°	0.026	0.027	0.027	0.028		
30°	0.045	0.046	0.046	0.046		

Ordering Information Table

Device Code	
ST	33 0 C 16 L 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 - L = Puk Case TO-200AC (B-PUK)
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/ μ sec (Standard selection)
 L = 1000V/ μ sec (Special selection)

ST330C..L Series

Outline Table

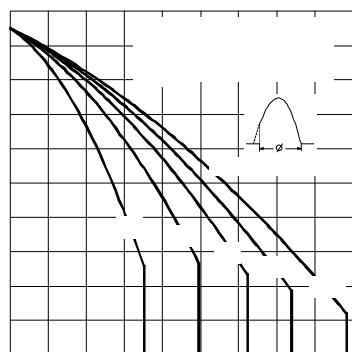
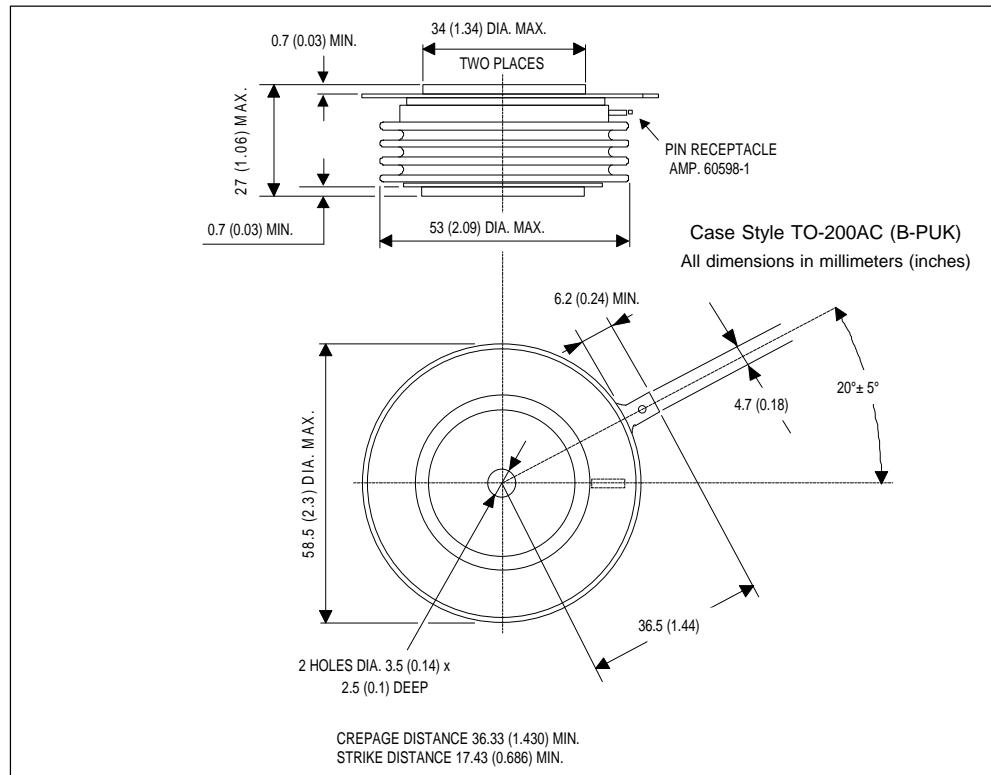


Fig. 1 - Current Ratings Characteristics

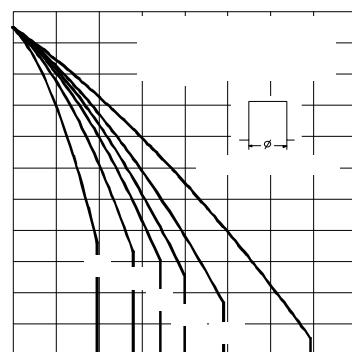


Fig. 2 - Current Ratings Characteristics