

## ST650C..L SERIES

### PHASE CONTROL THYRISTORS

### Hockey Puk Version

790A

#### Features

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

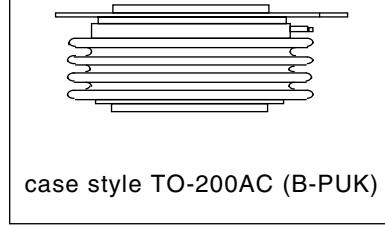
#### Typical Applications

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

#### Major Ratings and Characteristics

Parameters	ST650C..L	Units
$I_{T(AV)}$	790	A
@ $T_{hs}$	55	°C
$I_{T(RMS)}$	1557	A
@ $T_{hs}$	25	°C
$I_{TSM}$	10100	A
@ 60Hz	10700	A
$I^2t$	510	KA <sup>2</sup> s
@ 60Hz	475	KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	2000 to 2400	V
$t_q$ typical	200	μs
$T_J$	- 40 to 125	°C

case style TO-200AC (B-PUK)



## ST650C..L Series

Bulletin I25203 rev. B 04/00

International  
**IR** Rectifier

### 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
ST650C..L	20	2000	2100	80
	22	2200	2300	
	24	2400	2500	

#### On-state Conduction

Parameter	ST650C..L	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Heatsink temperature	790 (324)	A	180° conduction, half sine wave double side (single side) cooled
	55 (85)	°C	
$I_{T(RMS)}$ Max. RMS on-state current	1857	A	DC @ 25°C heatsink temperature double side cooled
$I_{TSM}$ Max. peak, one-cycle non-repetitive surge current	10100		Sinusoidal half wave, Initial $T_J = T_{J\max}$ .
	10700		
	8600		
	9150		
$I^2t$ Maximum $I^2t$ for fusing	510	KA <sup>2</sup> s	No voltage reapplied
	475		
	370		
	347		
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	5100	KA <sup>2</sup> \sqrt{s}	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	1.04	V	(16.7% x $\pi x I_{T(AV)}$ < $I$ < $\pi x I_{T(AV)}$ ), $T_J = T_{J\max}$ .
$V_{T(TO)2}$ High level value of threshold voltage	1.13		( $I$ > $\pi x I_{T(AV)}$ ), $T_J = T_{J\max}$ .
$r_{t1}$ Low level value of on-state slope resistance	0.61	mΩ	(16.7% x $\pi x I_{T(AV)}$ < $I$ < $\pi x I_{T(AV)}$ ), $T_J = T_{J\max}$ .
$r_{t2}$ High level value of on-state slope resistance	0.35		( $I$ > $\pi x I_{T(AV)}$ ), $T_J = T_{J\max}$ .
$V_{TM}$ Max. on-state voltage	2.07	V	$I_{pk} = 1700A$ , $T_J = T_{J\max}$ , $t_p = 10ms$ 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	ST650C..L	Units	Conditions
di/dt	Max. non-repetitive rate of rise of turned-on current	1000	A/μs
t <sub>d</sub>	Typical delay time	1.0	μs
t <sub>q</sub>	Typical turn-off time	200	I <sub>TM</sub> = 750A, T <sub>j</sub> = T <sub>j</sub> max, di/dt = 60A/μs, V <sub>R</sub> = 50V dv/dt = 20V/μs, Gate 0V 100Ω, t <sub>p</sub> = 500μs

### Blocking

Parameter	ST650C..L	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/μs
I <sub>DRM</sub> I <sub>RRM</sub>	Max. peak reverse and off-state leakage current	80	mA

### Triggering

Parameter	ST650C..L	Units	Conditions
P <sub>GM</sub>	Maximum peak gate power	10.0	
P <sub>G(AV)</sub>	Maximum average gate power	2.0	
I <sub>GM</sub>	Max. peak positive gate current	3.0	A
+V <sub>GM</sub>	Maximum peak positive gate voltage	20	
-V <sub>GM</sub>	Maximum peak negative gate voltage	5.0	V
I <sub>GT</sub>	DC gate current required to trigger	TYP. 200 100 50	mA
V <sub>GT</sub>	DC gate voltage required to trigger	MAX. - 200 3.0 -	
I <sub>GD</sub>	DC gate current not to trigger	10	mA
V <sub>GD</sub>	DC gate voltage not to trigger	0.25	V

T<sub>j</sub> = T<sub>j</sub> max, t<sub>p</sub> ≤ 5ms  
 T<sub>j</sub> = T<sub>j</sub> max, f = 50Hz, d% = 50  
 T<sub>j</sub> = T<sub>j</sub> max, t<sub>p</sub> ≤ 5ms  
 T<sub>j</sub> = T<sub>j</sub> max, t<sub>p</sub> ≤ 5ms  
 T<sub>j</sub> = -40°C  
 T<sub>j</sub> = 25°C  
 T<sub>j</sub> = 125°C  
 T<sub>j</sub> = -40°C  
 T<sub>j</sub> = 25°C  
 T<sub>j</sub> = 125°C  
 T<sub>j</sub> = T<sub>j</sub> max

Max. required gate trigger/ current/voltage are the lowest value which will trigger all units 12V anode-to-cathode applied  
 Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated V<sub>DRM</sub> anode-to-cathode applied

**ST650C..L Series**

Bulletin I25203 rev. B 04/00

International  
**IR** Rectifier

## Thermal and Mechanical Specification

Parameter	ST650C..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	0.073 0.031	K/W
$R_{thC-hs}$	Max. thermal resistance, case to heatsink	0.011 0.006	K/W
F	Mounting force, ± 10%	14700 (1500)	N (Kg)
wt	Approximate weight	255	g
Case style	TO - 200AC (B-PUK)	See Outline Table	

## $\Delta R_{th,l-hs}$ Conduction

(The following table shows the increment of thermal resistance  $R_{th,Lhs}$  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°	0.009	0.009	0.006	0.006	K/W	$T_J = T_{J \max}$
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		

## Ordering Information Table

Device Code								
	ST	65	0	C	24	L	1	
1	2	3	4	5	6	7	8	
9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	
25	26	27	28	29	30	31	32	
33	34	35	36	37	38	39	40	
41	42	43	44	45	46	47	48	
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721	722	723	724	725	726	727	728	
729	730	731	732	733	734	735	736	
737	738	739	740	741	742	743	744	
745	746	747	748	749	750	751	752	
753	754	755	756	757	758	759	760	
761	762	763	764	765	766	767	768	
769	770	771	772	773	774	775	776	
777	778	779	780	781	782	783	784	
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795	796	797	798	799	800	801	802	
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813	814	815	816	817	818	819	820	
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837	838	839	840	841	842	843	844	
845	846	847	848	849	850	851	852	
853	854	855	856	857	858	859	860	
861	862	863	864	865	866	867	868	
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937	938	939	940	941	942	943	944	
945	946	947	948	949	950	951	952	
953	954	955	956	957	958	959	960	
961	962	963	964	965	966	967	968	
969	970	971	972	973	974	975	976	
977	978	979	980	981	982	983	984	
986	987	988	989	990	991	992	993	
995	996	997	998	999	1000	1001	1002	

Outline Table

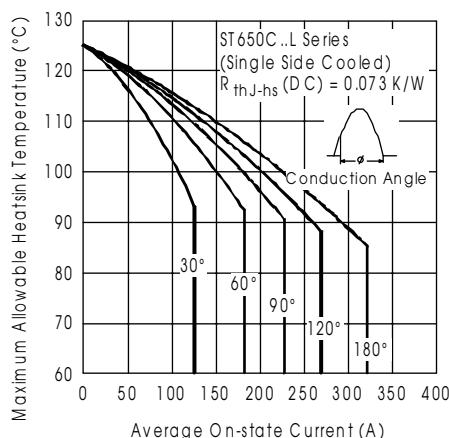
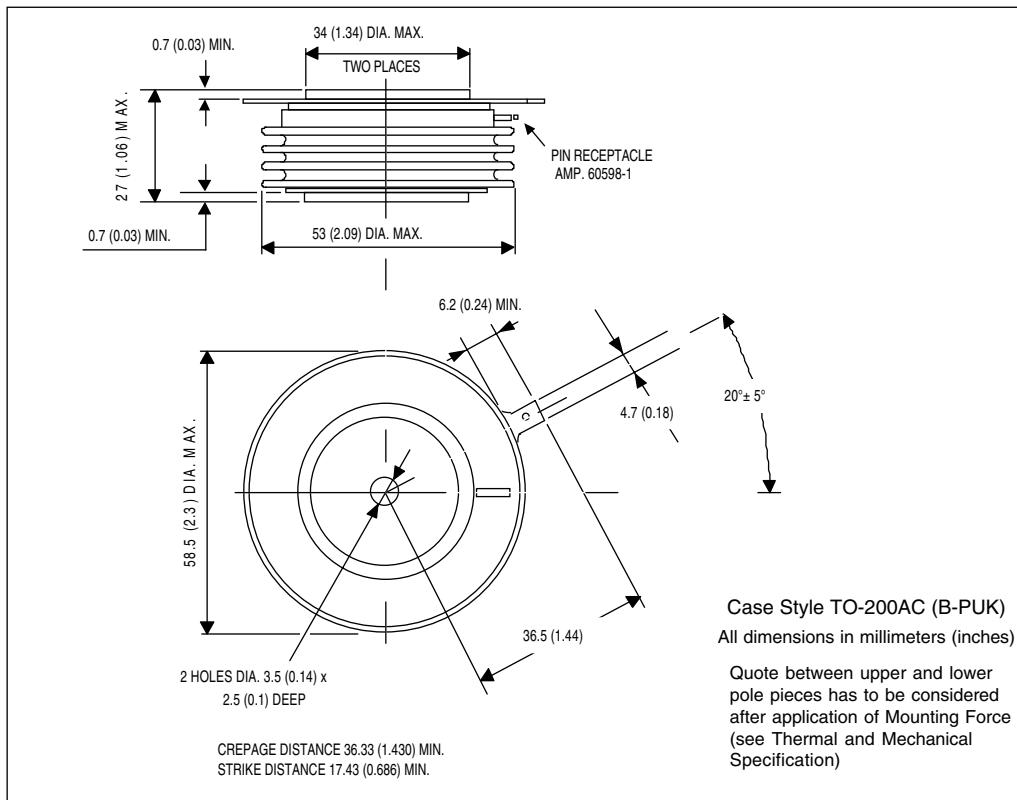


Fig. 1 - Current Ratings Characteristics

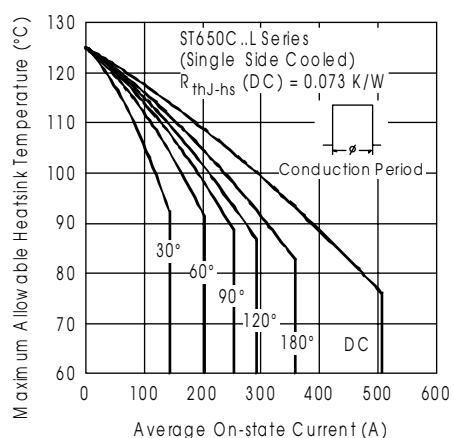


Fig. 2 - Current Ratings Characteristics

## ST650C..L Series

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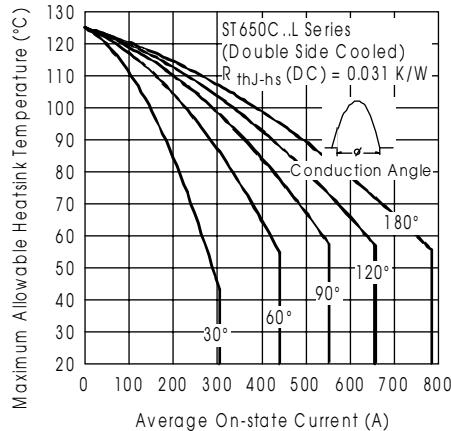


Fig. 3 - Current Ratings Characteristics

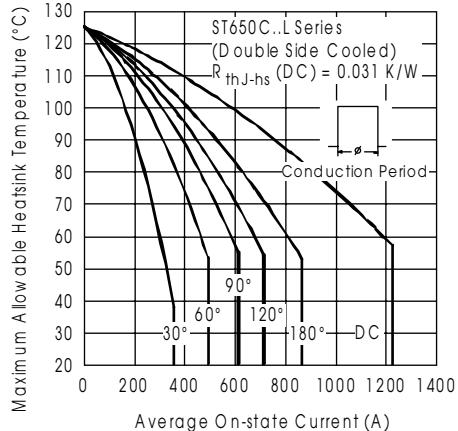


Fig. 4 - Current Ratings Characteristics

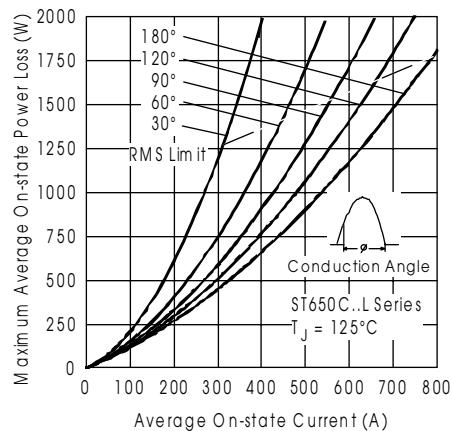


Fig. 5 - On-state Power Loss Characteristics

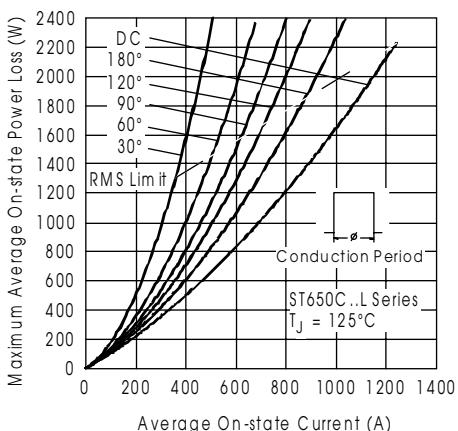


Fig. 6 - On-state Power Loss Characteristics

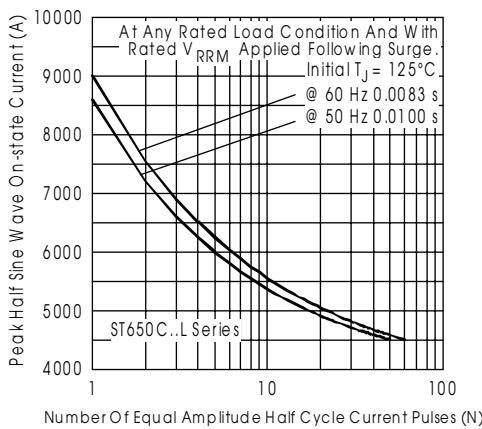


Fig. 7 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

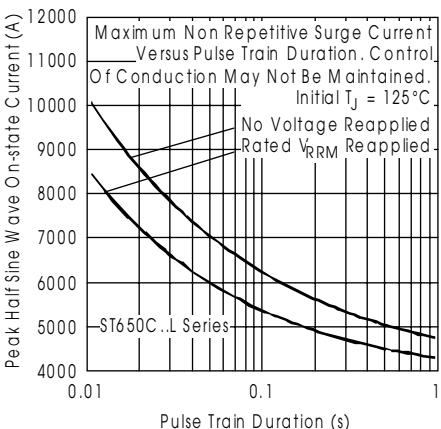


Fig. 8 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

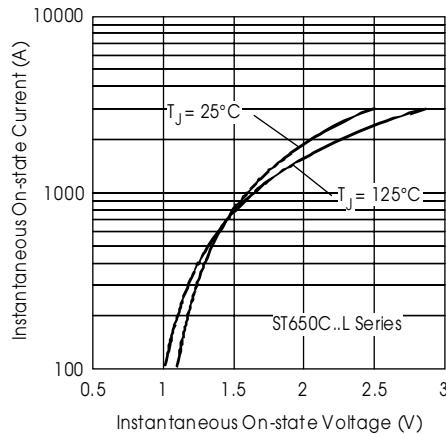


Fig. 9 - On-state Voltage Drop Characteristics

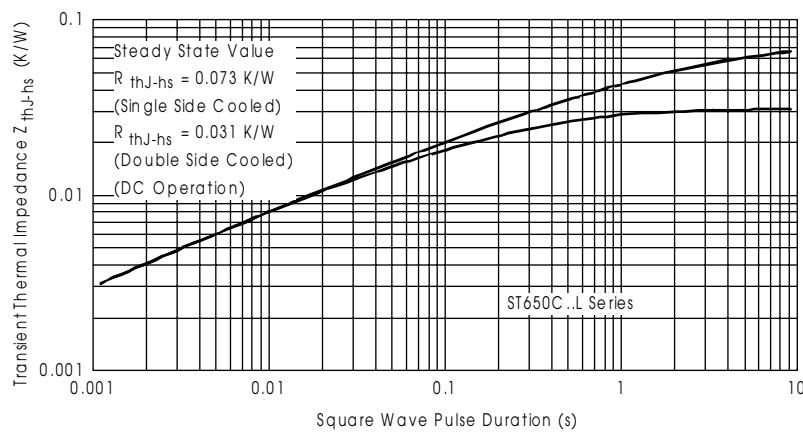


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

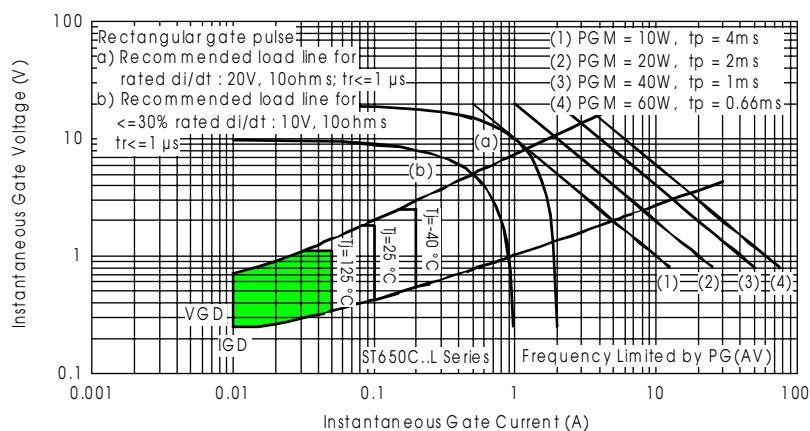


Fig. 11 - Gate Characteristics



### Notice

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