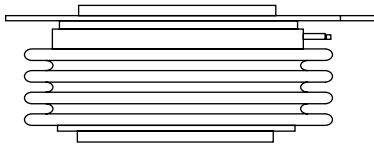




**Phase Control Thyristors
(Hockey PUK Version), 650 A**



TO-200AC (B-PUK)

FEATURES

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AC (B-PUK)
- High profile hockey PUK
- Lead (Pb)-free
- Designed and qualified for industrial level



**RoHS
COMPLIANT**

PRODUCT SUMMARY

$I_{T(AV)}$	650 A
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TYPICAL APPLICATIONS

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

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		650	A
	T_{hs}	55	°C
$I_{T(RMS)}$		1230	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	9000	A
	60 Hz	9420	
I^2t	50 Hz	405	kA ² s
	60 Hz	370	
V_{DRM}/V_{RRM}		400 to 2000	V
t_q	Typical	100	µs
T_J		- 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
ST330C..L	04	400	500	50
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

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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		650 (314)	A
				55 (75)	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled		1230	
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	9000	A
		t = 8.3 ms		9420	
		t = 10 ms	100 % V_{RRM} reapplied	7570	
		t = 8.3 ms		7920	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied	405	kA ² s
		t = 8.3 ms		370	
		t = 10 ms	100 % V_{RRM} reapplied	287	
		t = 8.3 ms		262	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied		4050	kA ² √s
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ maximum		0.91	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > $\pi \times I_{T(AV)}$), $T_J = T_J$ maximum		0.93	
Low level value of on-state slope resistance	r_{t1}	(16.7 % $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ maximum		0.57	mΩ
High level value of on-state slope resistance	r_{t2}	(I > $\pi \times I_{T(AV)}$), $T_J = T_J$ maximum		0.57	
Maximum on-state voltage	V_{TM}	$I_{pk} = 1730$ A, $T_J = T_J$ maximum, $t_p = 10$ ms sine pulse		1.90	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	$I_{TM} = 550$ A, $T_J = T_J$ maximum, $di/dt = 40$ A/μs, $V_R = 50$ V, $dV/dt = 20$ V/μs, gate 0 V 100 Ω, $t_p = 500$ μs		100	

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		50	mA



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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	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	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	0.11	K/W
		DC operation double side cooled	0.06	
Maximum thermal resistance, case to heatsink	R_{thC-hs}	DC operation single side cooled	0.011	
		DC operation double side cooled	0.005	
Mounting force, ± 10 %			9800 (1000)	N (kg)
Approximate weight			250	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°	0.012	0.010	0.008	0.008	$T_J = T_J$ maximum	K/W
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		

Note

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

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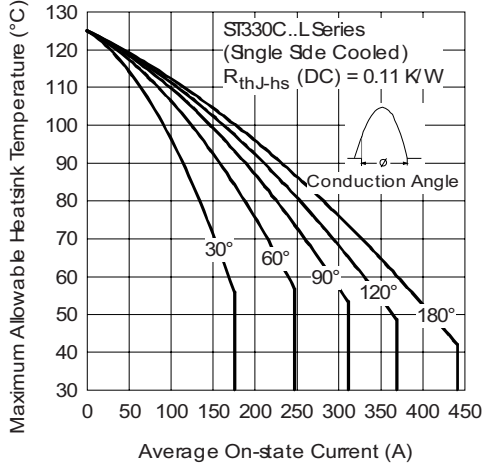


Fig. 1 - Current Ratings Characteristics

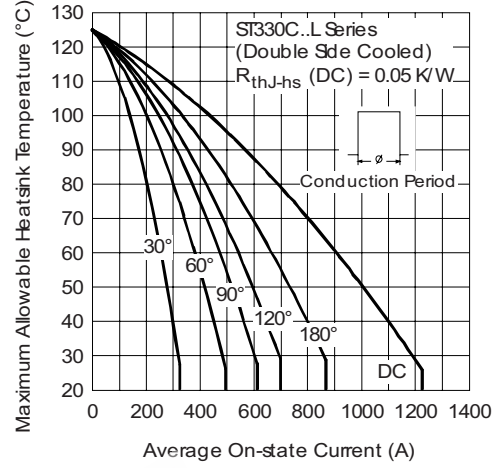


Fig. 4 - Current Ratings Characteristics

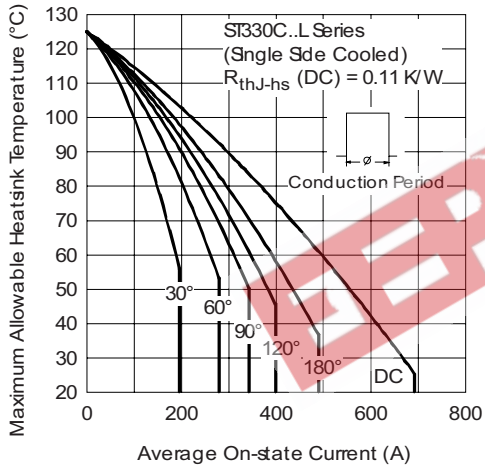


Fig. 2 - Current Ratings Characteristics

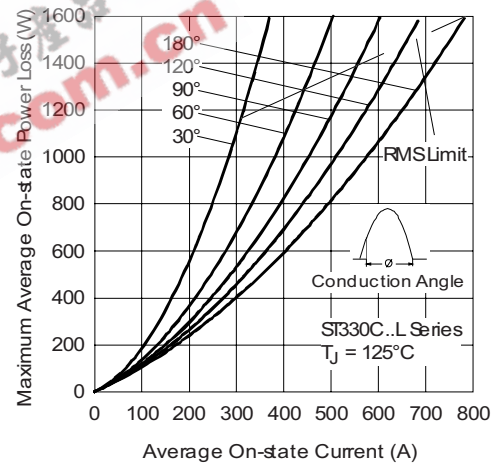


Fig. 5 - On-State Power Loss Characteristics

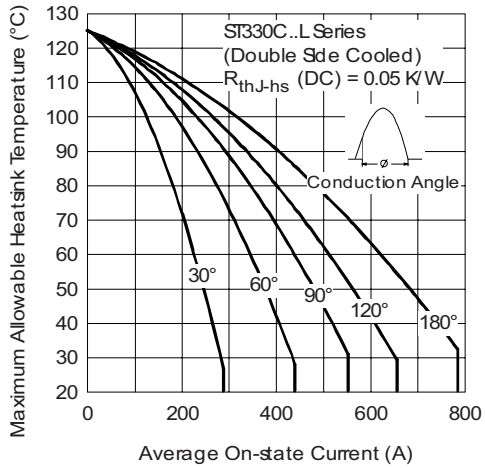


Fig. 3 - Current Ratings Characteristics

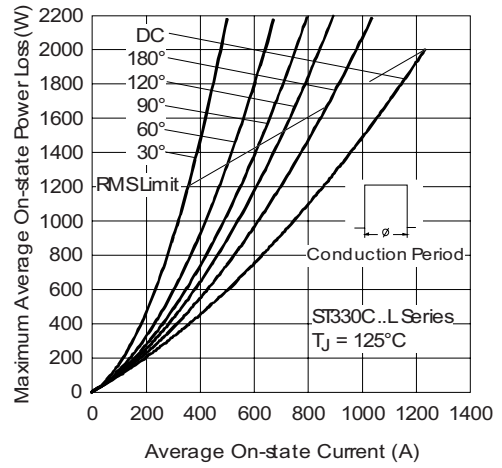


Fig. 6 - On-State Power Loss Characteristics



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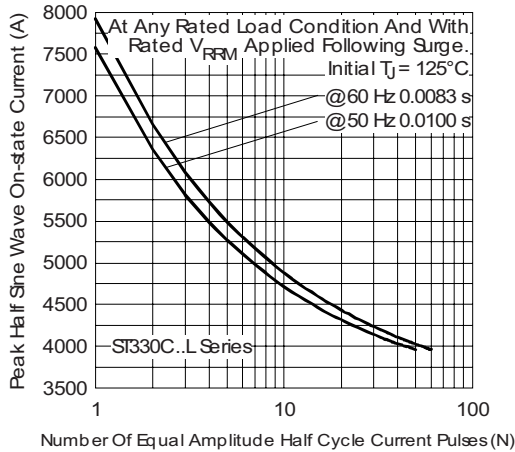


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

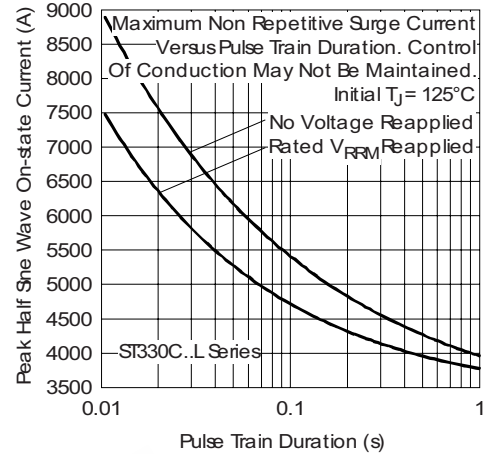


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

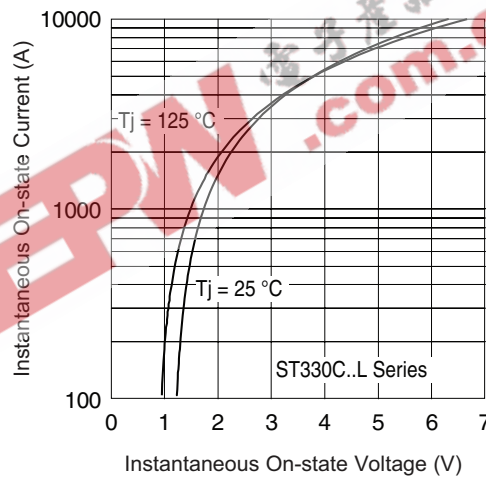


Fig. 9 - On-State Voltage Drop Characteristics

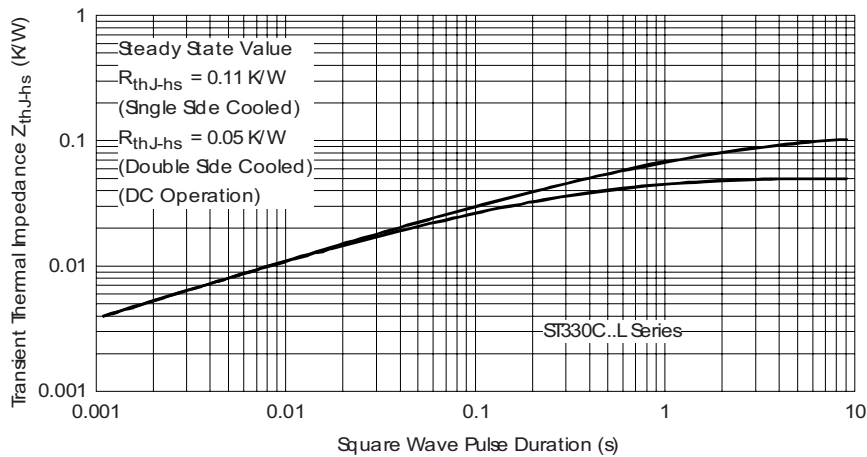


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

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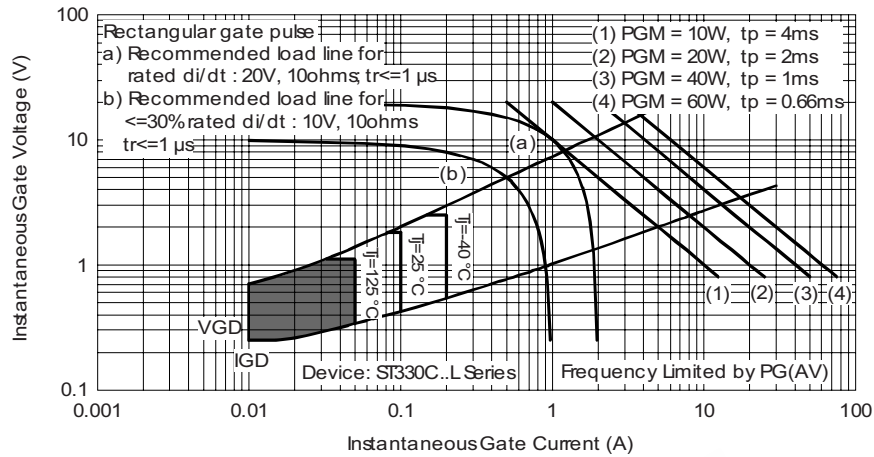


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	ST	33	0	C	16	L	1	-	PbF
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 1** - Thyristor
- 2** - Essential part number
- 3** - 0 = Converter grade
- 4** - C = Ceramic PUK
- 5** - Voltage code x 100 = V_{RRM} (see Voltage Ratings 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 = 500 V/ μs (standard selection)
 • L = 1000 V/ μs (special selection)
- 9** - Lead (Pb)-free

LINKS TO RELATED DOCUMENTS

Dimensions	http://www.vishay.com/doc?95076
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