

Inverter Grade Thyristors (Hockey PUK Version), 620 A



B-PUK (TO-200AC)



**RoHS
COMPLIANT**

FEATURES

- Metal case with ceramic insulator
- All diffused design
- Center amplifying gate
- Guaranteed high dV/dt
- Guaranteed high dI/dt
- International standard case B-PUK (TO-200AC)
- High surge current capability
- Low thermal impedance
- High speed performance
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

TYPICAL APPLICATIONS

- Inverters
- Choppers
- Induction heating
- All types of force-commutated converters

PRIMARY CHARACTERISTICS	
Package	B-PUK (TO-200AC)
Circuit configuration	Single SCR
$I_{T(AV)}$	620 A
V_{DRM}/V_{RRM}	400 V, 800 V
V_{TM}	1.96 V
I_{TSM} at 50 Hz	11 000 A
I_{TSM} at 60 Hz	11 500 A
I_{GT}	200 mA
T_C/T_{hs}	55 °C

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		620	A
	T_{hs}	55	°C
$I_{T(RMS)}$		1230	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	11 000	A
	60 Hz	11 500	
I^2t	50 Hz	605	kA ² s
	60 Hz	553	
V_{DRM}/V_{RRM}		400 to 800	V
t_q	Range	10 to 30	μs
T_J		-40 to +125	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS				
TYPE NUMBER	VOLTAGE CODE	V_{DRM}/V_{RRM} , MAXIMUM REPETITIVE PEAK VOLTAGE V	V_{RSM} , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I_{DRM}/I_{RRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA
VS-ST333C..L	04	400	500	50
	08	800	900	



CURRENT CARRYING CAPABILITY							
FREQUENCY							UNITS
50 Hz	1430	1250	2340	1940	6310	5620	A
400 Hz	1670	1170	2310	1940	3440	5030	
1000 Hz	1080	880	2090	1800	2040	1750	
2500 Hz	530	400	1190	990	990	800	
Recovery voltage V_R	50		50		50		V
Voltage before turn-on V_D	V_{DRM}		V_{DRM}		V_{DRM}		
Rise of on-state current di/dt	50		-		-		A/ μ s
Heatsink temperature	40	55	40	55	40	55	$^{\circ}$ C
Equivalent values for RC circuit	10 / 0.47		10 / 0.47		10 / 0.47		Ω/μ F

ABSOLUTE MAXIMUM RATINGS						
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS	
Maximum average on-state current at heatsink temperature	$I_{T(AV)}$	180 $^{\circ}$ conduction, half sine wave double side (single side) cooled		620 (305)	A	
				55 (75)	$^{\circ}$ C	
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 $^{\circ}$ C heatsink temperature double side cooled		1230		
Maximum peak, one half cycle, non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ max.	11 000	A
		t = 8.3 ms			11 500	
		t = 10 ms	100 % V_{RRM} reapplied		9250	
		t = 8.3 ms			9700	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		605	kA 2 s
		t = 8.3 ms			553	
		t = 10 ms	100 % V_{RRM} reapplied		428	
		t = 8.3 ms			391	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied		6050	kA $^2\sqrt{s}$	
Maximum peak on-state voltage	V_{TM}	$I_{TM} = 1810$ A, $T_J = T_J$ maximum, $t_p = 10$ ms sine wave pulse		1.96	V	
Low level value of threshold voltage	$V_{T(TO)1}$	$(16.7 \% \times \pi \times I_{T(AV)}) < I < \pi \times I_{T(AV)}$, $T_J = T_J$ max.		0.91		
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 forward slope resistance	r_{f1}	$(16.7 \% \times \pi \times I_{T(AV)}) < I < \pi \times I_{T(AV)}$, $T_J = T_J$ max.		0.58	m Ω	
High level value of forward slope resistance	r_{f2}	$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max.		0.58		
Maximum holding current	I_H	$T_J = 25$ $^{\circ}$ C, $I_T > 30$ A		600	mA	
Typical latching current	I_L	$T_J = 25$ $^{\circ}$ C, $V_A = 12$ V, $R_a = 6$ Ω , $I_G = 1$ A		1000		

SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum non-repetitive rate of rise of turned-on current	di/dt	$T_J = T_J$ max., $V_{DRM} =$ rated V_{DRM} , $I_{TM} = 2 \times di/dt$		1000	A/ μ s
Typical delay time	t_d	$T_J = 25$ $^{\circ}$ C, $V_{DM} =$ rated V_{DRM} , $I_{TM} = 50$ A DC, $t_p = 1$ μ s Resistive load, gate pulse: 10 V, 5 Ω source		1.1	μ s
Maximum turn-off time	t_q	minimum		10	
		maximum		30	



BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	T _J = T _J max., linear to 80 % V _{DRM} , higher value available on request	500	V/μs
Maximum peak reverse and off-state leakage current	I _{RRM} , I _{DRM}	T _J = T _J max., rated V _{DRM} /V _{RRM} applied	50	mA

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P _{GM}	T _J = T _J max., f = 50 Hz, d % = 50	60	W
Maximum average gate power	P _{G(AV)}		10	
Maximum peak positive gate current	I _{GM}	T _J = T _J max., t _p ≤ 5 ms	10	A
Maximum peak positive gate voltage	+V _{GM}		20	V
Maximum peak negative gate voltage	-V _{GM}		5	
Maximum DC gate current required to trigger	I _{GT}		T _J = 25 °C, V _A = 12 V, R _a = 6 Ω	200
Maximum DC gate voltage required to trigger	V _{GT}	3		V
Maximum DC gate current not to trigger	I _{GD}	T _J = T _J max., rated V _{DRM} applied	20	mA
Maximum 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	0.05	
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 max.	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

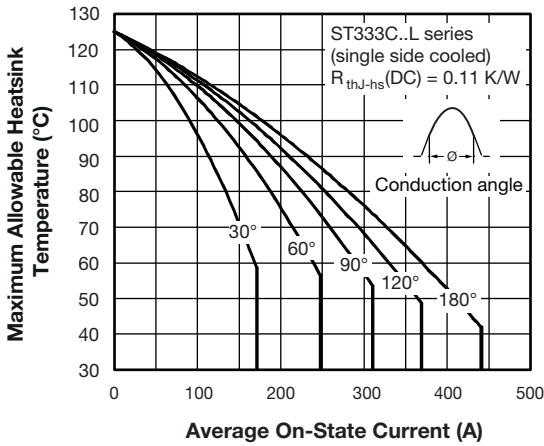


Fig. 1 - Current Ratings Characteristics

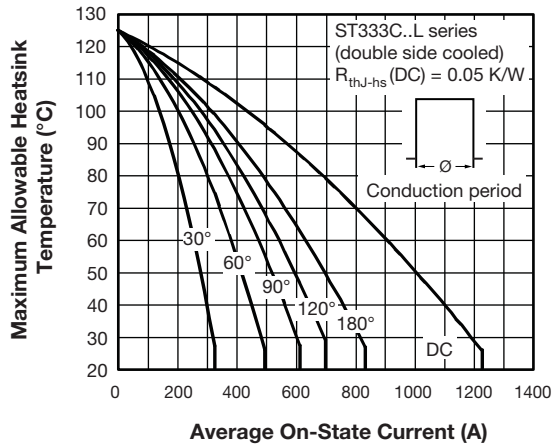


Fig. 4 - Current Ratings Characteristics

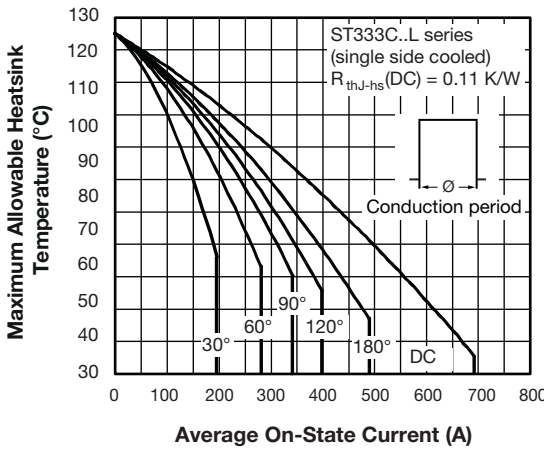


Fig. 2 - Current Ratings Characteristics

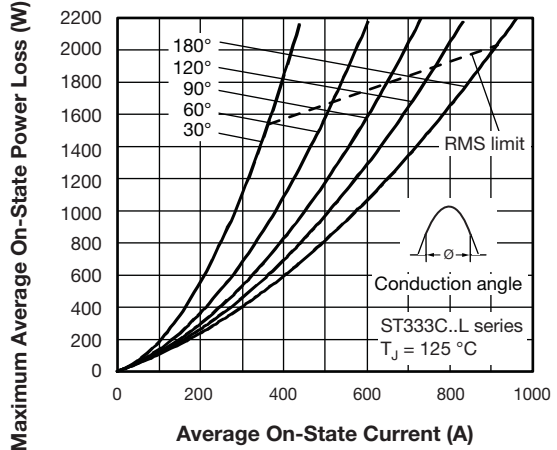


Fig. 5 - On-State Power Loss Characteristics

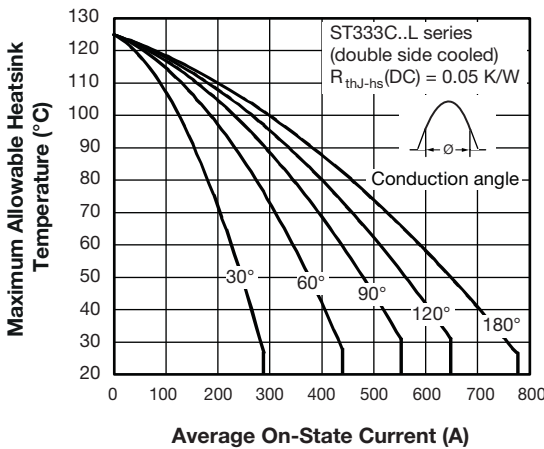


Fig. 3 - Current Ratings Characteristics

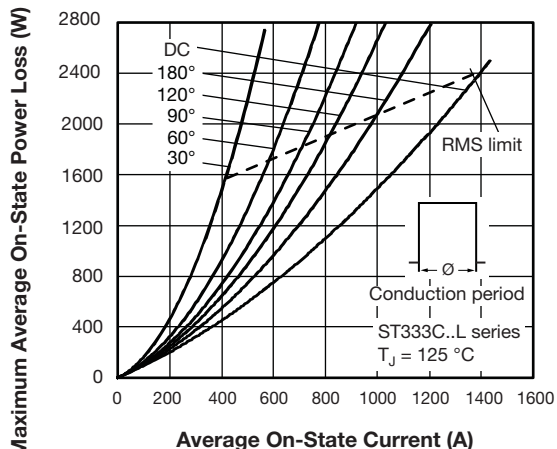


Fig. 6 - On-State Power Loss Characteristics

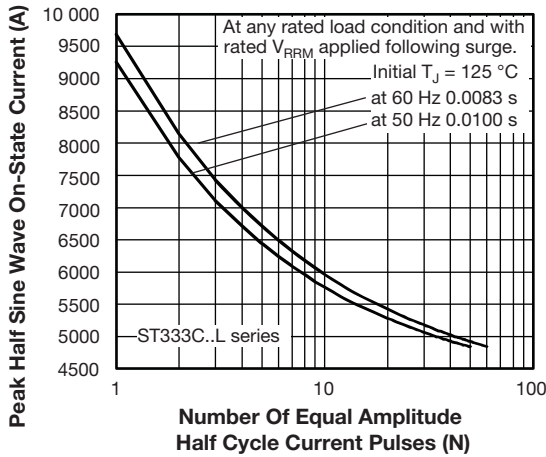


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

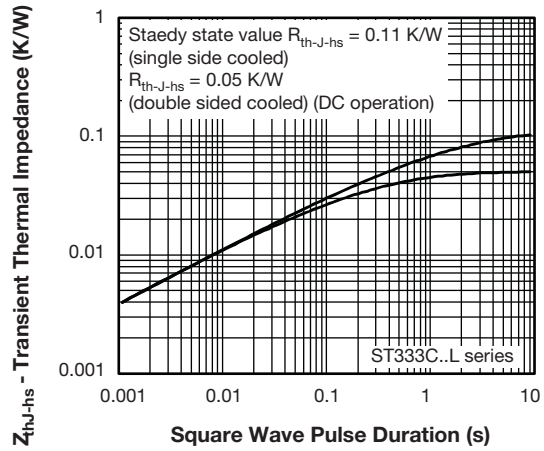


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

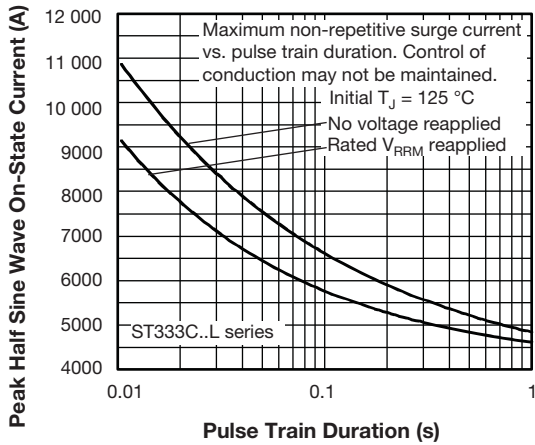


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

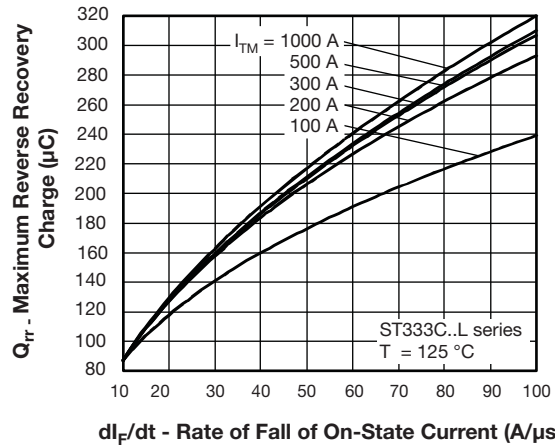


Fig. 11 - Reverse Recovered Charge Characteristics

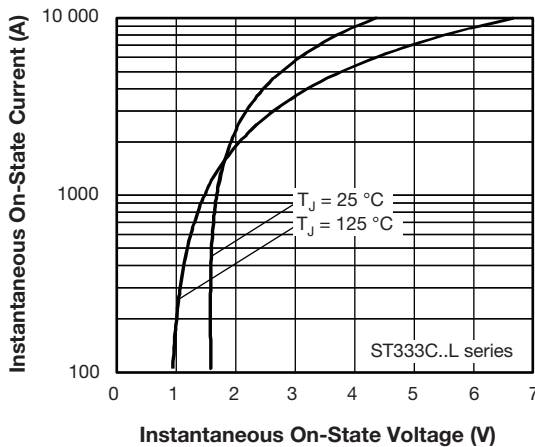


Fig. 9 - On-State Voltage Drop Characteristics

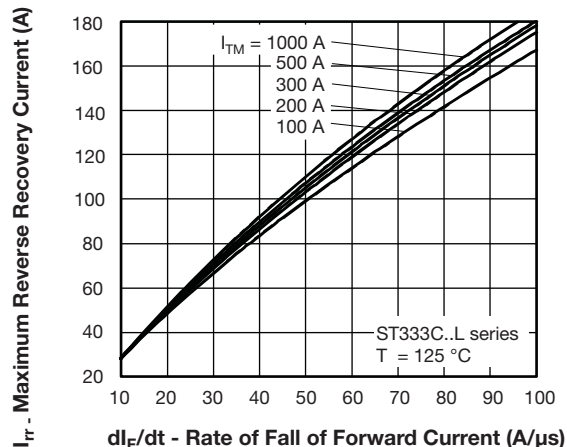


Fig. 12 - Reverse Recovery Current Characteristics

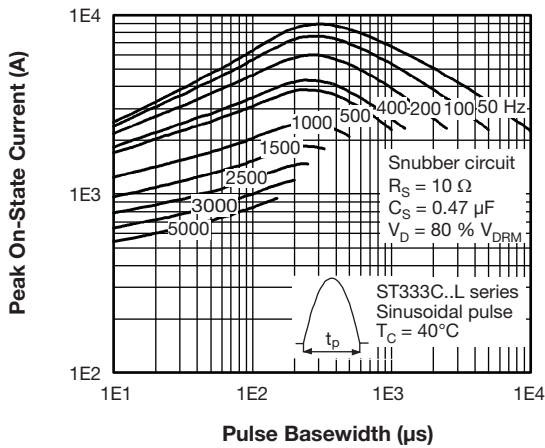


Fig. 13a - Frequency Characteristics

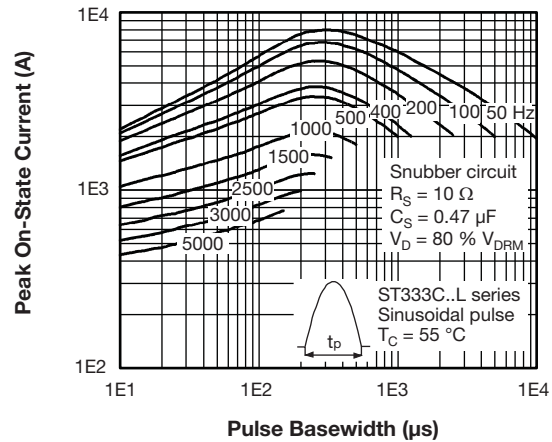


Fig. 13b - Frequency Characteristics

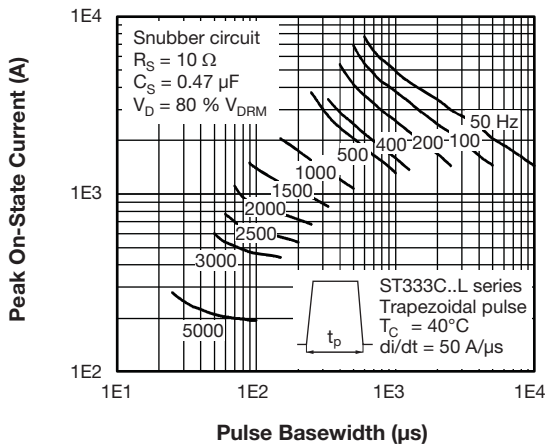


Fig. 14a - Frequency Characteristics

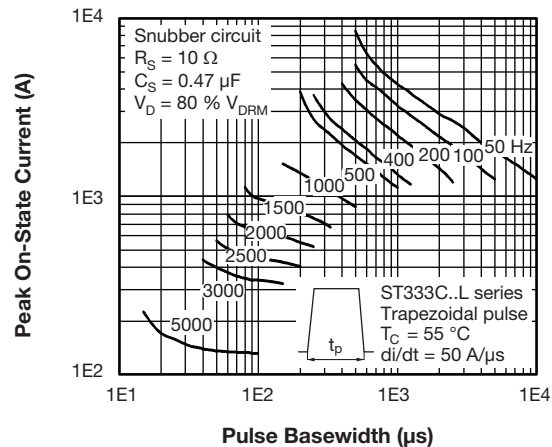


Fig. 14b - Frequency Characteristics

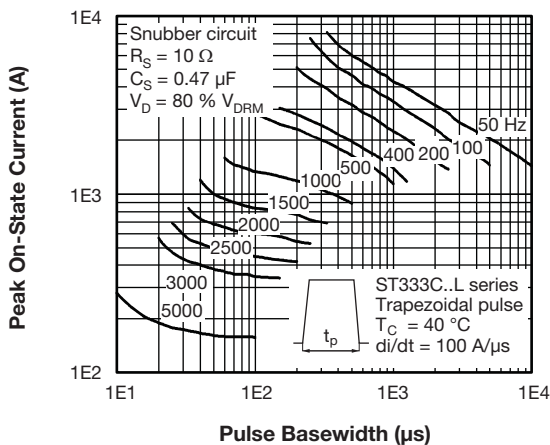


Fig. 15a - Maximum On-State Energy Power Loss Characteristics

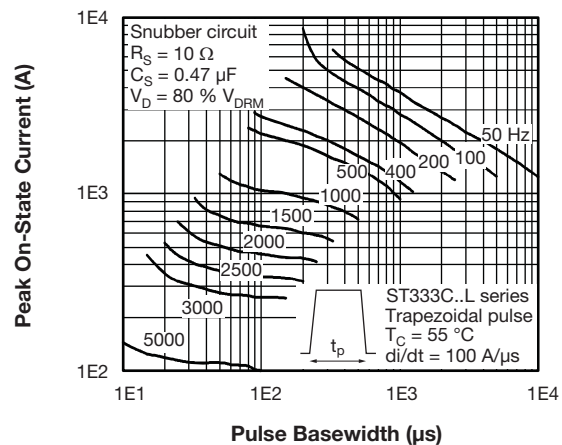


Fig. 15b - Maximum On-State Energy Power Loss Characteristics

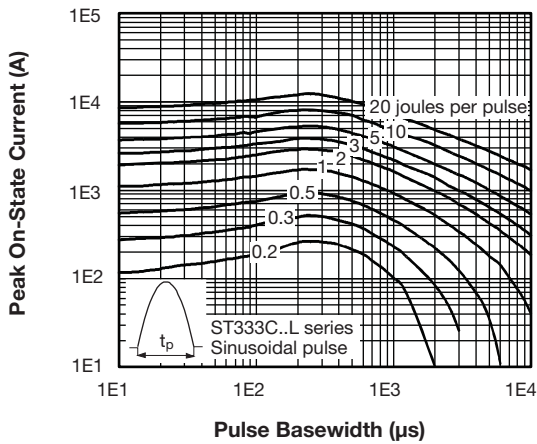


Fig.16a - Maximum On-State Energy Power Loss Characteristics

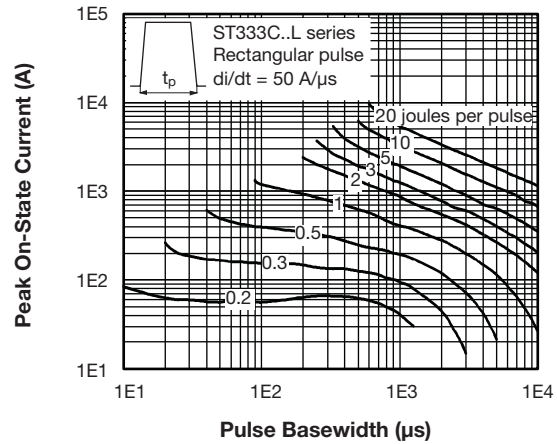


Fig.16b - Maximum On-State Energy Power Loss Characteristics

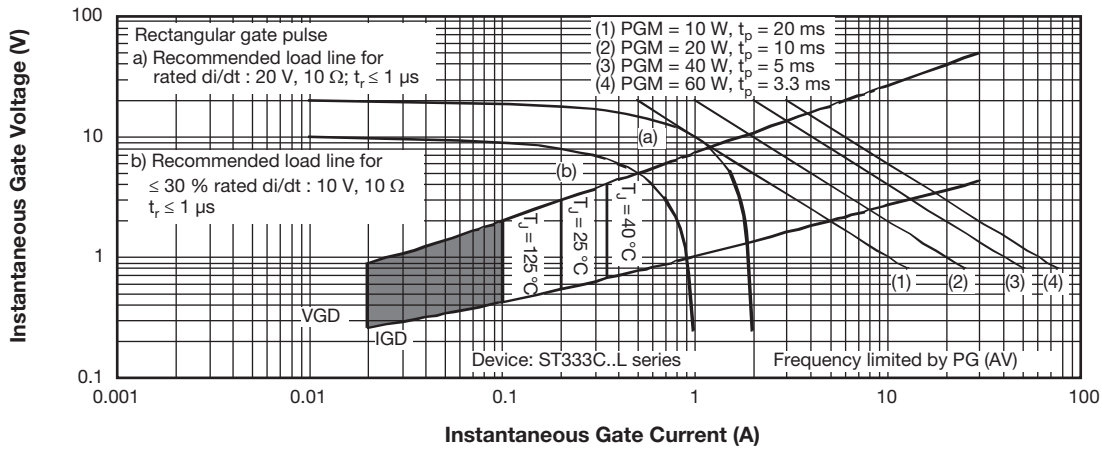
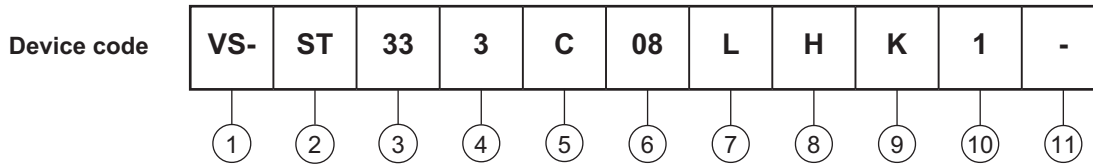


Fig.17 - Gate Characteristics



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Thyristor
- 3** - Essential part number
- 4** - 3 = fast turn-off
- 5** - C = ceramic PUK
- 6** - Voltage code x 100 = V_{RRM}
(see Voltage Ratings table)
- 7** - L = PUK case B-PUK (TO-200AC)
- 8** - Reapplied dV/dt code (for t_q test condition)
- 9** - t_q code
- 10** - 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)
- 11** - Critical dV/dt:
 - None = 500 V/ μ s (standard value)
 - L = 1000 V/ μ s (special selection)

dV/dt - t_q combinations available						
dV/dt (V/ μ s)		20	50	100	200	400
t_q (μ s)	10	CN	DN	EN	-	-
	12	CM	DM	EM	FM*	-
	15	CL	DL	EL	FL*	HL
	18	CP	DP	EP	FP	HP
	20	CK	DK	EK	FK	H
	25	--	--	--	FJ	HJ
30	--	--	--	--	HH	

* Standard part number.
All other types available only on request.

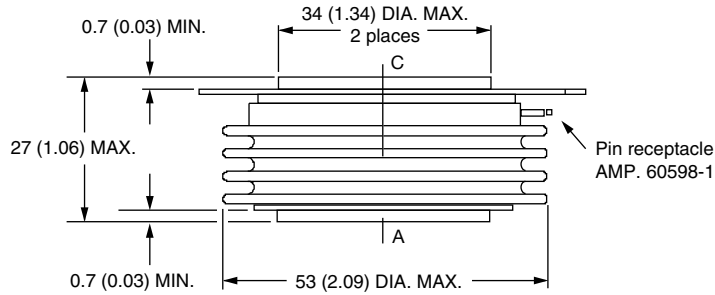
LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95076



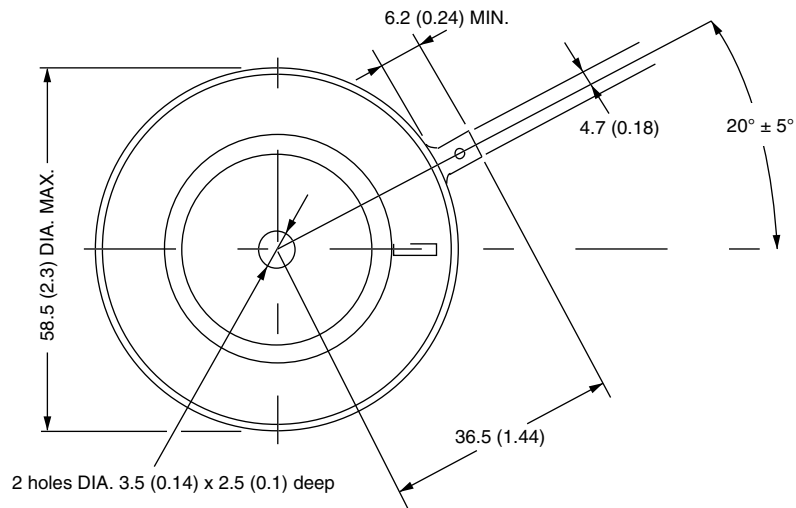
B-PUK (TO-200AC)

DIMENSIONS in millimeters (inches)

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



Note:
A = Anode
C = Cathode



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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