

Inverter Grade Thyristors (Hockey PUK Version), 940 A



TO-200AC (B-PUK)

FEATURES

- Metal case with ceramic insulator
- All diffused design
- Center amplifying gate
- Guaranteed high dV/dt
- Guaranteed high dI/dt
- International standard case TO-200AC (B-PUK)
- 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



RoHS
COMPLIANT

PRODUCT SUMMARY

Package	TO-200AC (B-PUK)
Diode variation	Single SCR
$I_{T(AV)}$	940 A
V_{DRM}/V_{RRM}	400 V, 800 V
V_{TM}	1.63 V
I_{TSM} at 50 Hz	20 000 A
I_{TSM} at 60 Hz	20 950 A
I_{GT}	200 mA
T_C/T_{hs}	55 °C

TYPICAL APPLICATIONS

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

MAJOR RATINGS AND CHARACTERISTICS

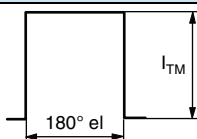
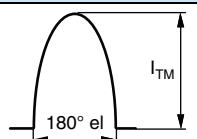
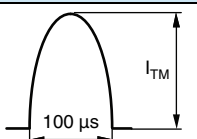
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		940	A
	T_{hs}	55	°C
$I_{T(RMS)}$		1900	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	20 000	A
	60 Hz	20 950	
I^2t	50 Hz	2000	kA ² s
	60 Hz	1820	
V_{DRM}/V_{RRM}		400 to 800	V
t_q	Range	10 to 20	μs
T_J		-40 to +125	°C

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-ST733CL	04	400	500	75
	08	800	900	

**CURRENT CARRYING CAPABILITY**

FREQUENCY							UNITS
50 Hz	2200	1900	3580	3100	6800	5920	A
400 Hz	2050	1660	3600	3130	3750	3240	
1000 Hz	1370	1070	2900	2450	2120	1780	
2500 Hz	500	370	1220	980	960	770	
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/μs
Heatsink temperature	40	55	40	55	40	55	°C
Equivalent values for RC circuit	10/0.47		10/0.47		10/0.47		Ω/μF

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			940 (350)	A
					55 (85)	°C
Maximum RMS on-state current	I _{T(RMS)}	DC at 25 °C heatsink temperature double side cooled			1900	
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 maximum	20 000	A
		t = 8.3 ms			20 950	
		t = 10 ms	100 % V _{RRM} reapplied		16 800	
		t = 8.3 ms			17 600	
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		2000	kA ² s
		t = 8.3 ms			1820	
		t = 10 ms	100 % V _{RRM} reapplied		1410	
		t = 8.3 ms			1290	
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied			20 000	kA ² √s
Maximum peak on-state voltage	V _{TM}	I _{TM} = 1700 A, T _J = T _J maximum, t _p = 10 ms sine wave pulse			1.63	V
Low level value of threshold voltage	V _{T(TO)1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			1.09	
High level value of threshold voltage	V _{T(TO)2}	(I > π × I _{T(AV)}), T _J = T _J maximum			1.20	
Low level value of forward slope resistance	r _{t1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			0.32	mΩ
High level value of forward slope resistance	r _{t2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.29	
Maximum holding current	I _H	T _J = 25 °C, I _T > 30 A			600	mA
Typical latching current	I _L	T _J = 25 °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	$T_J = T_J$ maximum, $V_{DRM} = \text{Rated } V_{DRM}$, $I_{TM} = 2 \times di/dt$ Gate pulse: 20 V 20 Ω , 10 μs 0.5 μs rise time	1000	A/ μs
Typical delay time	t_d	$T_J = 25^\circ C$, $V_{DM} = \text{Rated } V_{DRM}$, $I_{TM} = 50$ A DC, $t_p = 1 \mu s$ Resistive load, gate pulse: 10 V, 5 Ω source	1.5	μs
Maximum turn-off time	t_q	$T_J = T_J$ maximum, $I_{TM} = 550$ A, commutating di/dt = 40 A/ μs , $V_R = 50$ V, $t_p = 500 \mu s$, dV/dt: see table in device code	10	
			20	

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 % V_{DRM} , higher value available on request	500	V/ μs
Maximum peak reverse and off-state leakage current	I_{RRM} , I_{DRM}	$T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied	75	mA

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $f = 50$ Hz, $d\% = 50$	60	W
Maximum average gate power	$P_{G(AV)}$		10	
Maximum peak positive gate current	I_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ 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}	$T_J = 25^\circ C$, $V_A = 12$ V, $R_a = 6 \Omega$	200	mA
Maximum DC gate voltage required to trigger	V_{GT}		3	V
Maximum DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum, 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	$^\circ C$
Maximum storage temperature range	T_{Stg}		-40 to +150	
Maximum thermal resistance, junction to heatsink	R_{thJ-hs}	DC operation single side cooled	0.073	K/W
		DC operation double side cooled	0.031	
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, $\pm 10\%$			14 700 (1500)	N (kg)
Approximate weight			255	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
	SINGLE SIDE	DOUBLE SIDE	SINGLE SIDE	DOUBLE SIDE	
180°	0.009	0.009	0.006	0.006	$T_J = T_J \text{ maximum}$
120°	0.011	0.011	0.011	0.011	
90°	0.014	0.014	0.015	0.015	
60°	0.020	0.021	0.021	0.022	
30°	0.036	0.036	0.036	0.036	
					K/W

Note

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

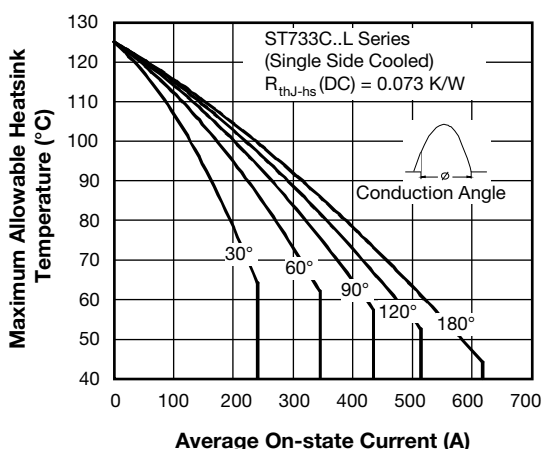


Fig. 1 - Current Ratings Characteristics

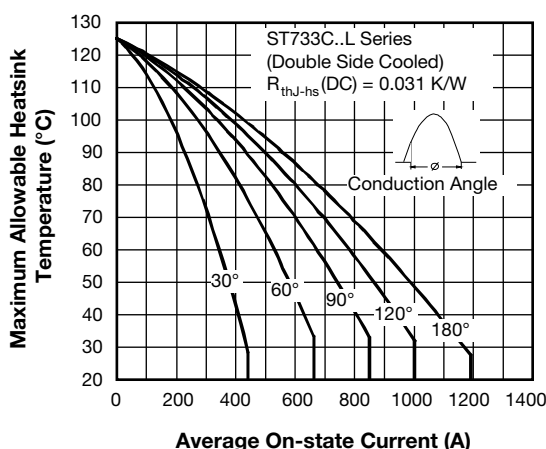


Fig. 3 - Current Ratings Characteristics

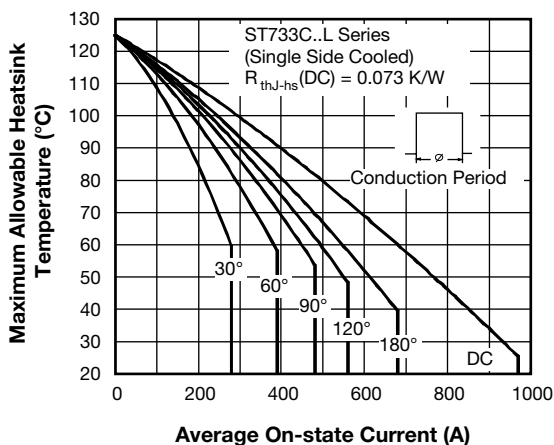


Fig. 2 - Current Ratings Characteristics

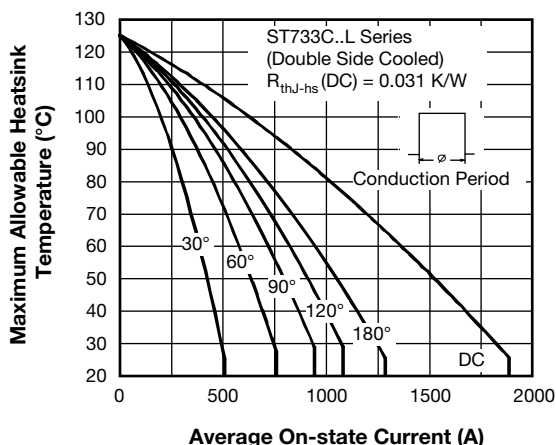


Fig. 4 - Current Ratings Characteristics

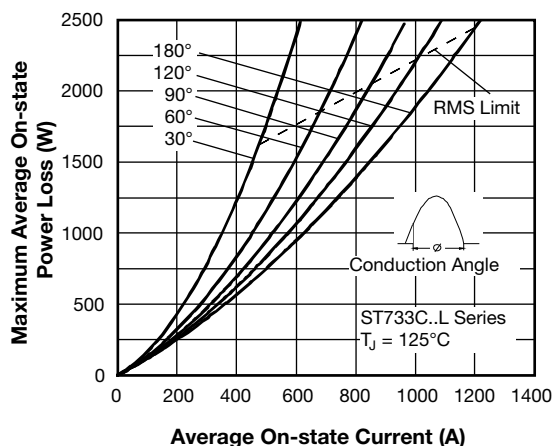


Fig. 5 - On-State Power Loss Characteristics

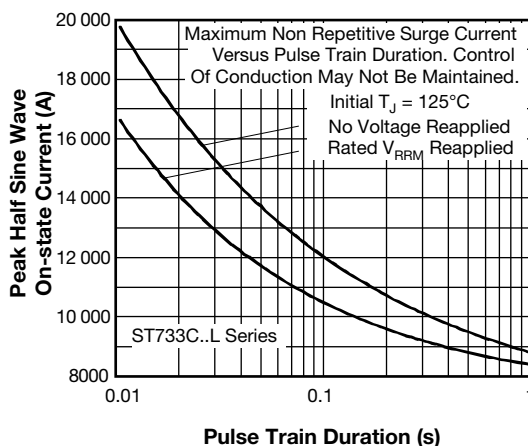


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

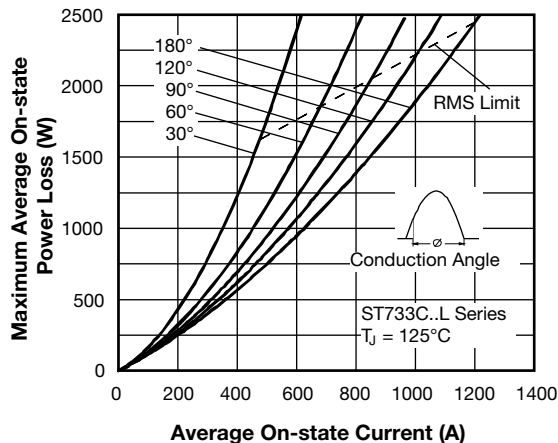


Fig. 6 - On-State Power Loss Characteristics

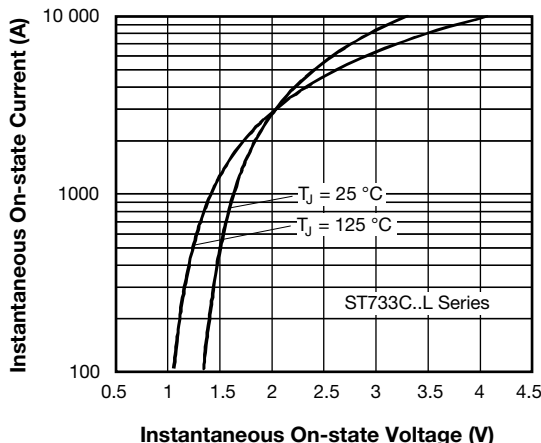


Fig. 9 - On-State Voltage Drop Characteristics

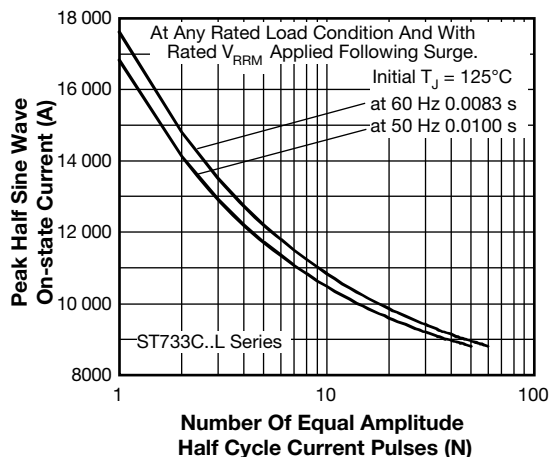


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

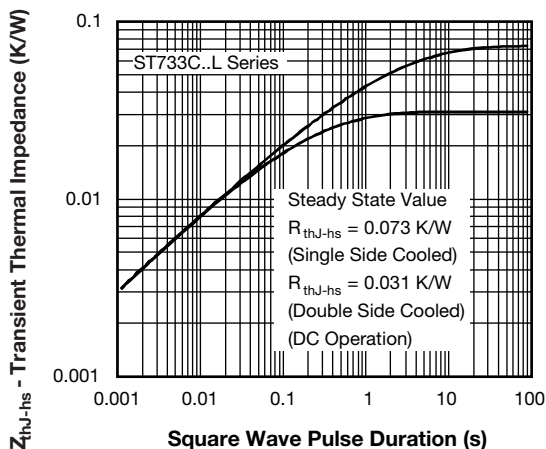


Fig. 10 - Thermal Impedance Z_{thJC} Characteristics

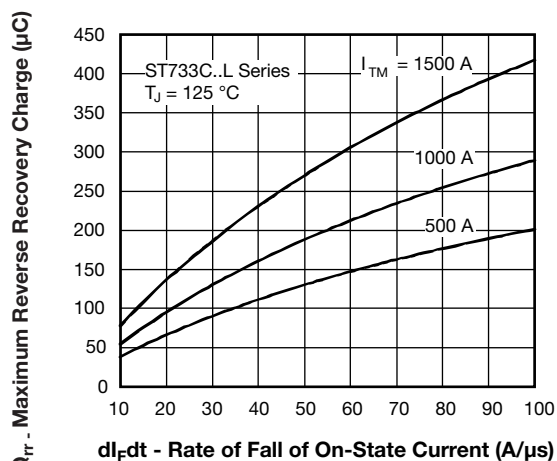


Fig. 11 - Reverse Recovered Charge Characteristics

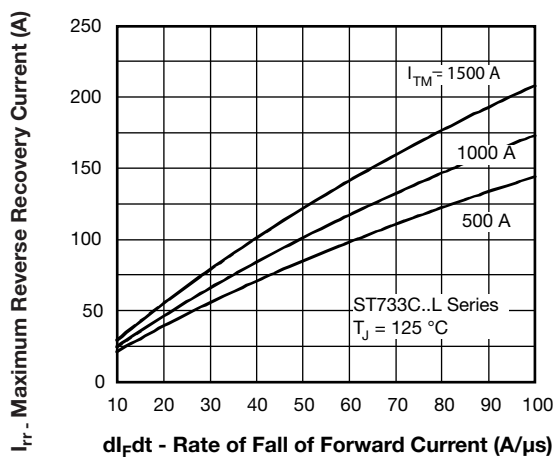


Fig. 12 - Reverse Recovered Current Characteristics

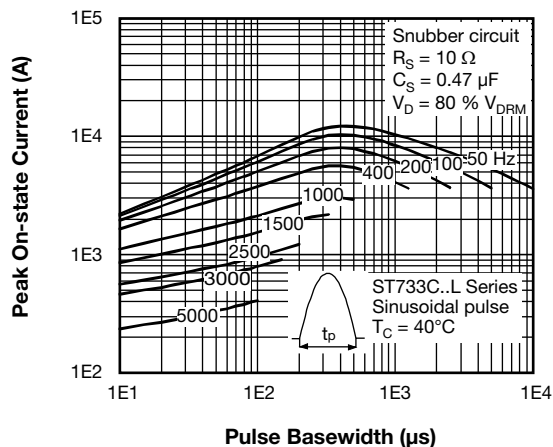


Fig. 13 - Frequency Characteristics

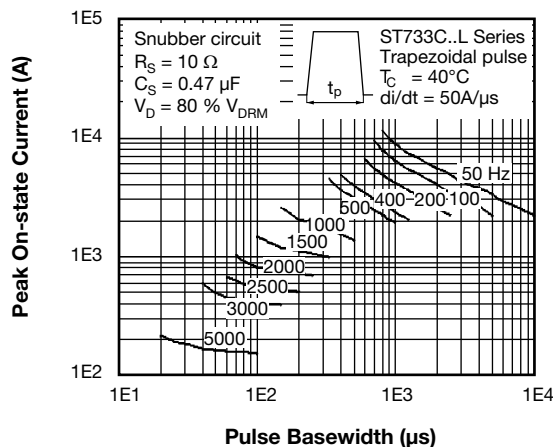
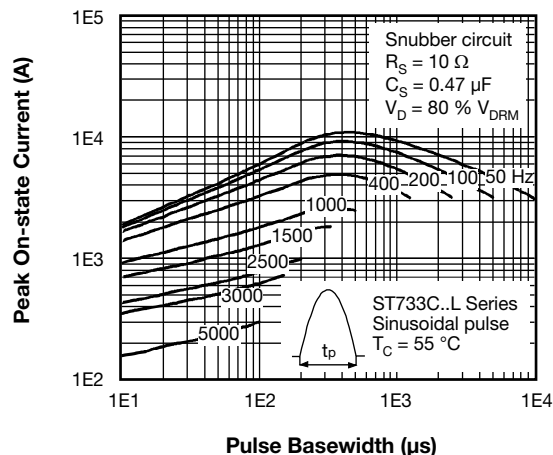
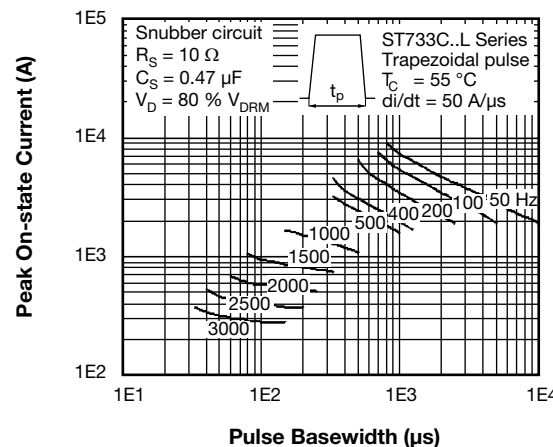


Fig. 14 - Frequency Characteristics



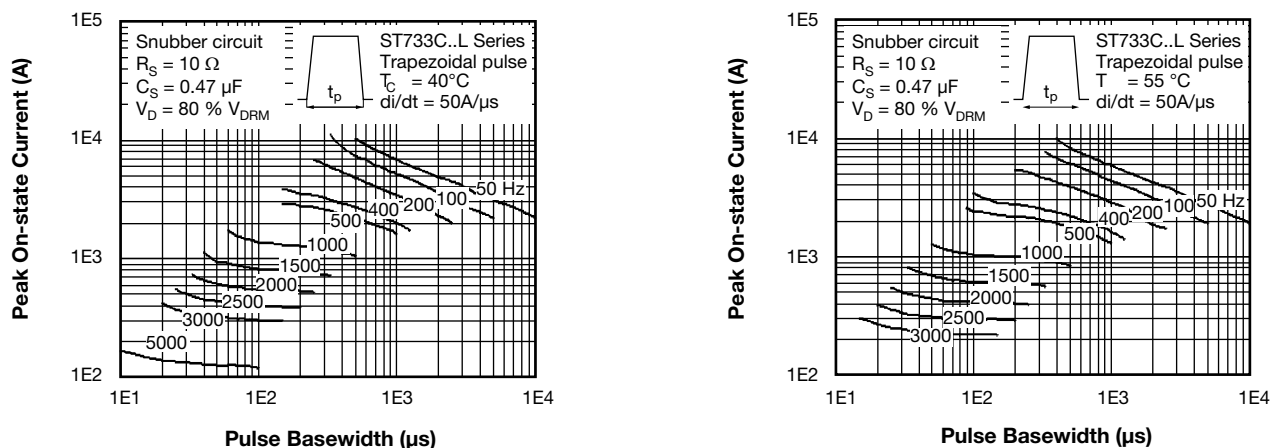


Fig. 15 - Frequency Characteristics

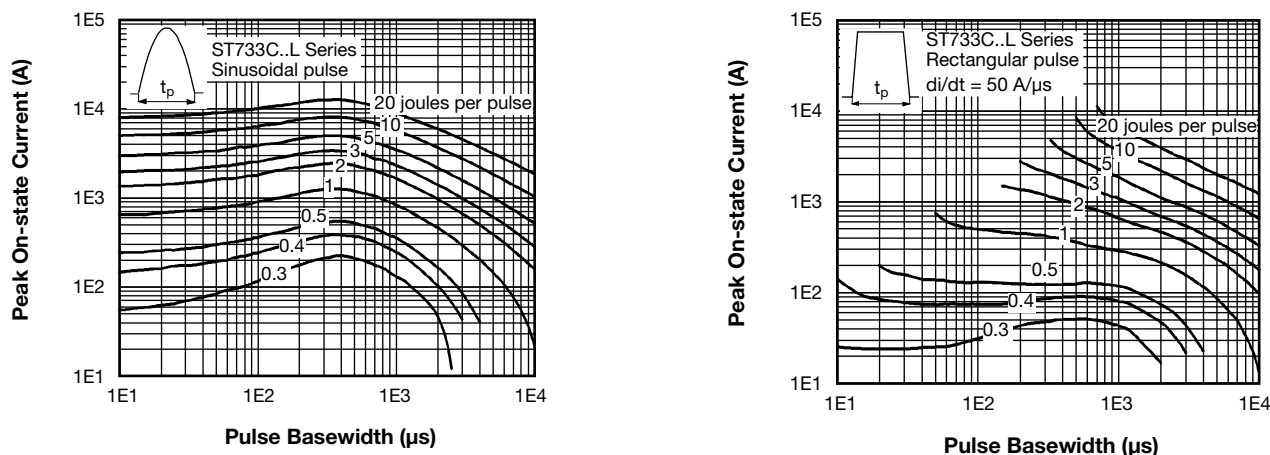


Fig. 16 - Maximum On-State Energy Power Loss Characteristics

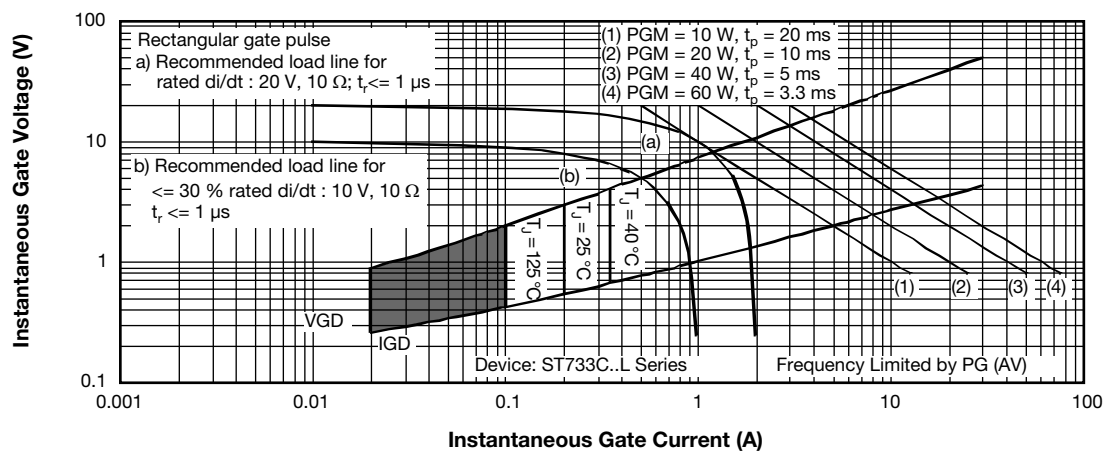


Fig. 17 - Gate Characteristics



ORDERING INFORMATION TABLE

Device code	VS-	ST	73	3	C	08	L	H	K	1	-
	1	2	3	4	5	6	7	8	9	10	11

- 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 TO-200AC (B-PUK)
- 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
t_q (μ s)	10	CN	DN	EN	-
	12	CM	DM	EM	FM*
	15	CL	DL	EL	FL*
	18	CP	DP	EP	FP
	20	CK	DK	EK	FK

* Standard part number.

All other types available only on request.

LINKS TO RELATED DOCUMENTS

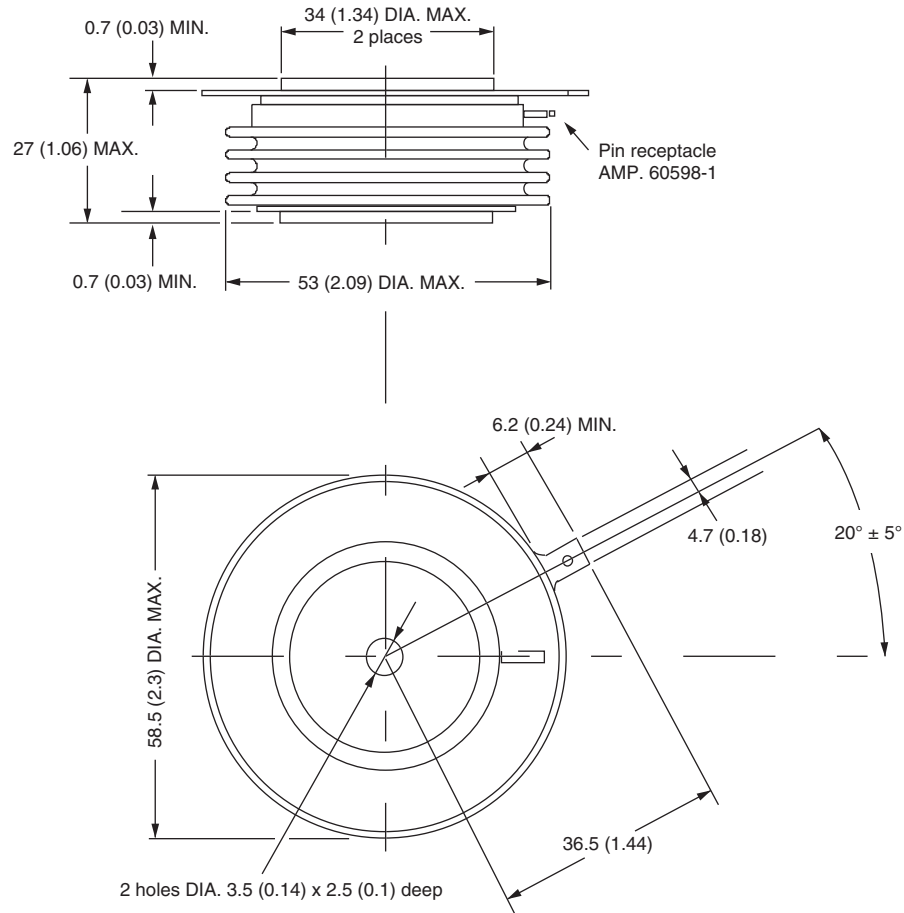
Dimensions

www.vishay.com/doc?95076

TO-200AC (B-PUK)

DIMENSIONS in millimeters (inches)

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



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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