

FEATURES

- Double Side Cooling
- High Surge Capability
- Very Low Cosmic Ray FIT Rating
- High dV/dt Rating

APPLICATIONS

- Multi-level VSC Bypass Thyristor for HVDC

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V_{DRM} and V_{RRM} (V)	Conditions
ACR2900VR45	1000 / 4500	$T_{vj} = -40^{\circ}\text{C}$ to 125°C , $I_{DRM} = I_{RRM} = 400\text{mA}$, $V_{DRM}, V_{RRM} t_p = 10\text{ms}$

ORDERING INFORMATION

When ordering, select the required part number shown in the Voltage Ratings selection table.

For example:

ACR2900VR45

Note: Please use the complete part number when ordering and quote this number in any future correspondence relating to your order.

KEY PARAMETERS

V_{DRM}	1000V
V_{DRM}	4500V
$I_{T(AV)}$	2920A
I_{TSM}	39000A
dV/dt	10kV/μs
dI/dt	400A/μs

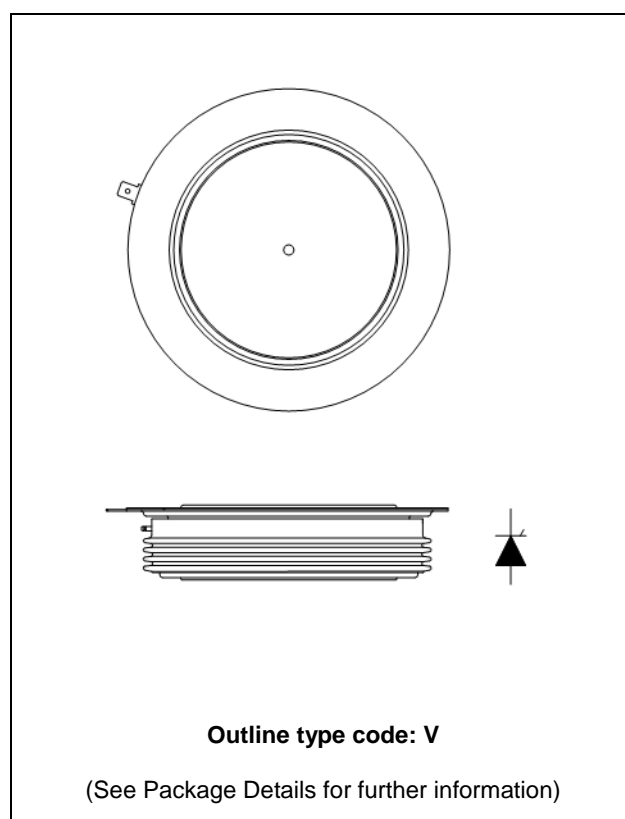


Fig. 1 Package outline

CURRENT RATINGS

$T_{case} = 60^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
Double Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	2920	A
$I_{T(RMS)}$	RMS value	-	4590	A
I_r	Continuous (direct) on-state current	-	4400	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$ $V_R = 0$	39.0	kA
I^2t	I^2t for fusing		7.6	MA ² s

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	Double side cooled	DC	-	7.5	$^{\circ}\text{C/kW}$
		Single side cooled	Anode DC	-	13.0	$^{\circ}\text{C/kW}$
			Cathode DC	-	17.8	$^{\circ}\text{C/kW}$
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 54kN (with mounting compound)	Double side	-	2.0	$^{\circ}\text{C/kW}$
			Single side	-	4.0	$^{\circ}\text{C/kW}$
T_{vj}	Virtual junction temperature	Blocking V_{DRM} / V_{RRM}		-	125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range			-55	125	$^{\circ}\text{C}$
F_m	Clamping force			48	59	kN

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditions		Typ.	Max.	Units
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V _{RRM} /V _{DRM} , T _{case} = 125°C		-	400	mA
V_{TM}	Instantaneous forward voltage	At 5000A peak, T _j = 125°C		1.90	2.10	V
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V _{DRM} , T _j = 60°C, gate open		-	10000	V/μs
dI/dt	Rate of rise of on-state current	From 67% V _{DRM} to 2x I _{T(AV)} Gate source 30V, 10Ω tr < 0.5μs, T _j = 125°C	Non-repetitive	-	400	A/μs
V_{T(TO)}	Threshold voltage - Low level	300A to 2600A at T _{case} = 125°C		-	0.82	V
	Threshold voltage - High level	2600A to 8000A at T _{case} = 125°C		-	1.08	V
r_T	On-state slope resistance - Low level	300A to 2600A at T _{case} = 125°C		-	0.30	mΩ
	On-state slope resistance - High level	2600A to 8000A at T _{case} = 125°C		-	0.20	mΩ
t_{gd}	Delay time	V _D = 67% V _{DRM} , I _g = 3A tr = 0.5μs, T _j = 25°C, tp = 40μs		-	3	μs
V_{pu}	Pick-up Voltage	I _g = 3A, tr = 0.5μs, T _j = 25°C, tp = 40μs		-	2	V
I_L	Latching current	T _j = 25°C, V _D = 5V		-	3	A
I_H	Holding current	T _j = 25°C, R _{G-K} = ∞, I _{TM} = 500A, I _T = 5A		-	300	mA

GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
V_{GT}	Gate trigger voltage	$V_{DRM} = 5V$, $T_{case} = 25^{\circ}C$	1.5	V
V_{GD}	Gate non-trigger voltage	At 50% V_{DRM} , $T_{case} = 125^{\circ}C$	0.4	V
I_{GT}	Gate trigger current	$V_{DRM} = 5V$, $T_{case} = 25^{\circ}C$	350	mA
I_{GD}	Gate non-trigger current	At 50% V_{DRM} , $T_{case} = 125^{\circ}C$	15	mA

CURVES

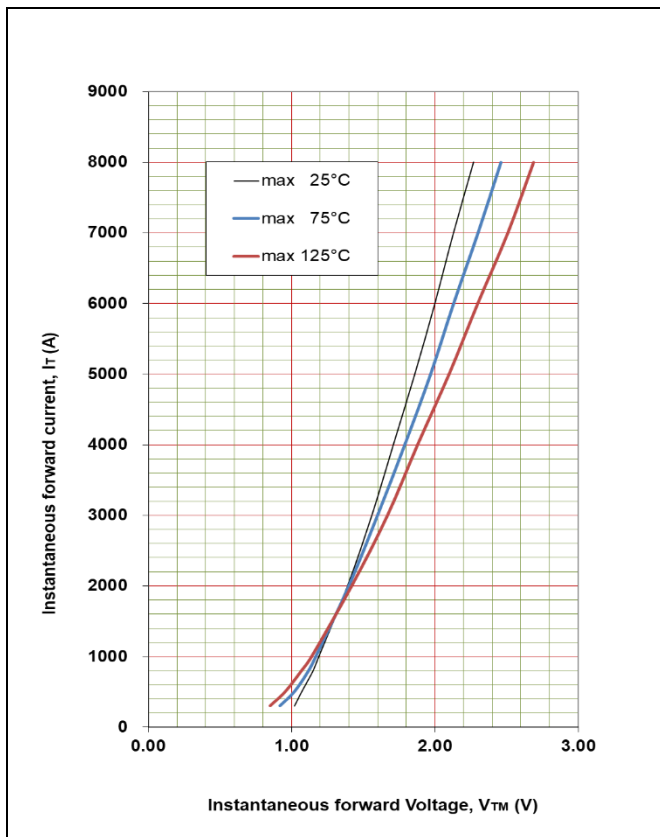


Fig. 2 Maximum on state characteristics

V_{TM} EQUATION

$$V_{TM} = A + B \cdot \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

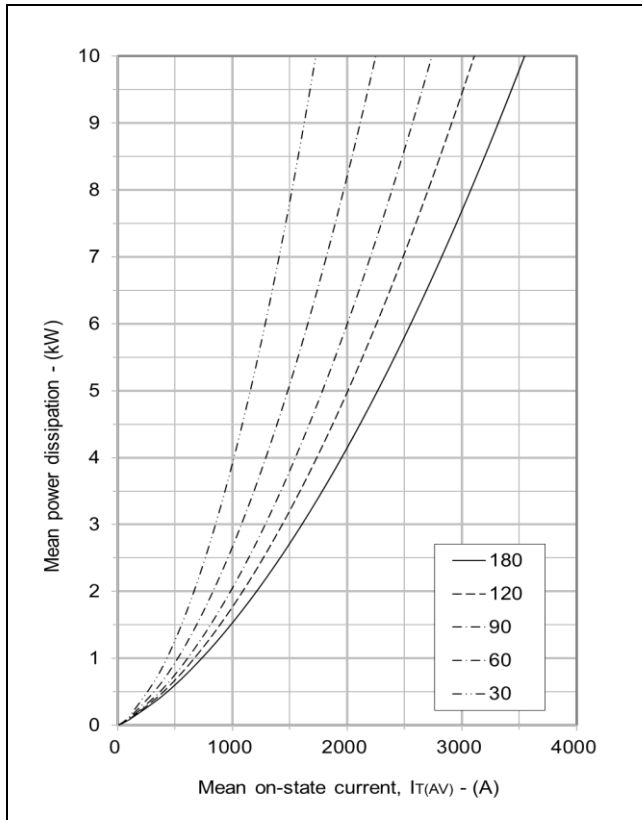
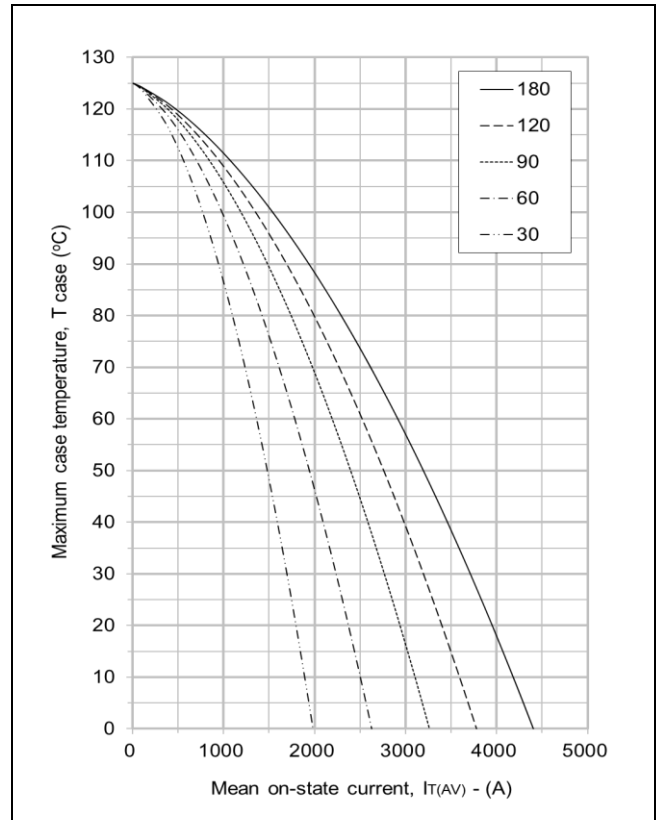
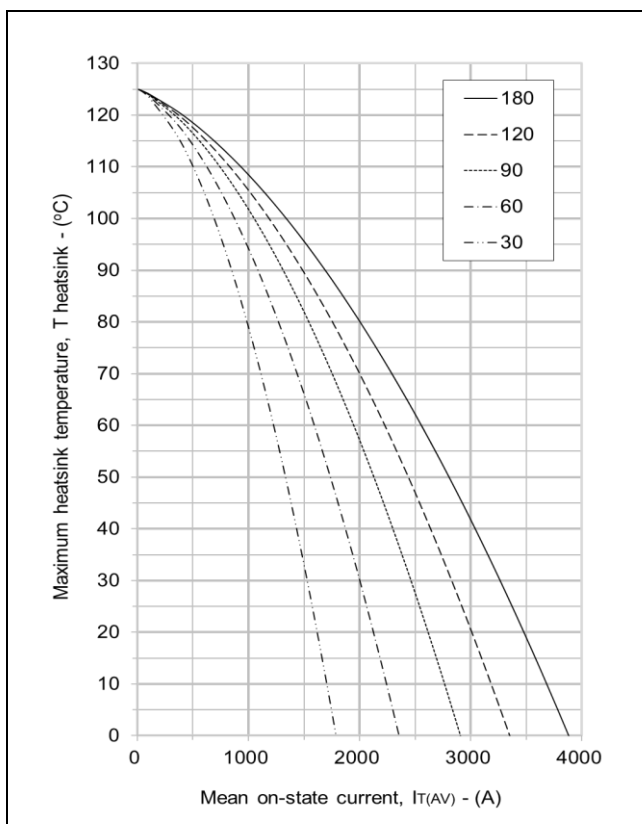
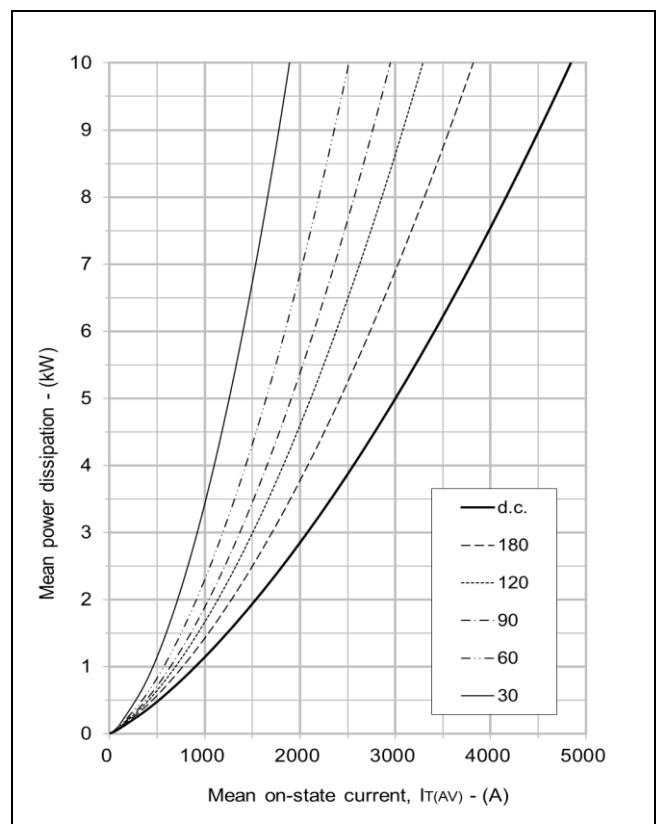
Where $A = 0.232417$

$B = 0.081909$

$C = 0.000146$

$D = 0.006188$

These values are valid for $T_j = 125^{\circ}C$ for I_T 300A to 8000A


Fig. 3 On-state power dissipation - sine wave

Fig. 4 Maximum permissible case temperature, double side cooled - sine wave

Fig. 5 Maximum permissible heatsink temperature, double side cooled - sine wave

Fig. 6 On-state power dissipation - rectangular wave

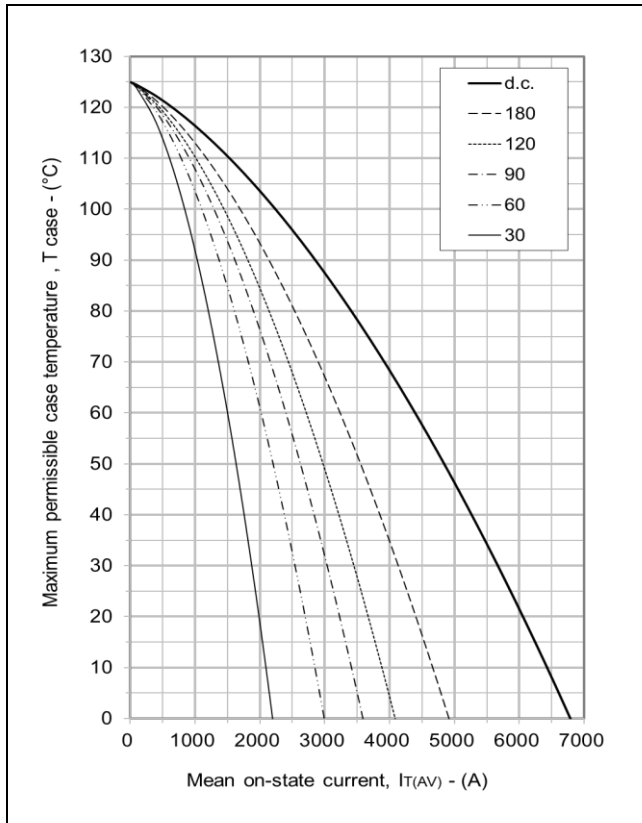


Fig. 7 Maximum permissible case temperature, double side cooled - rectangular wave

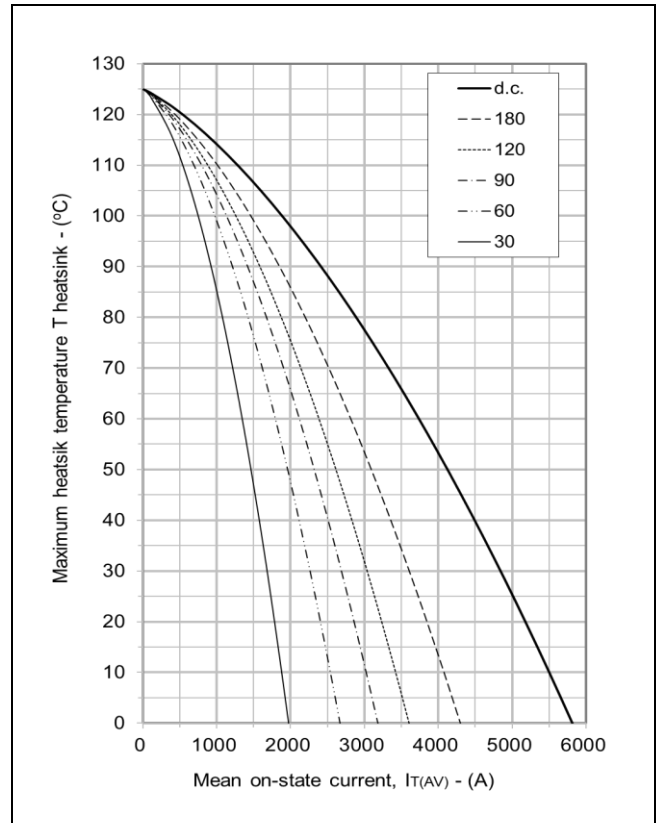


Fig. 8 Maximum permissible heatsink temperature, double side cooled - rectangular wave

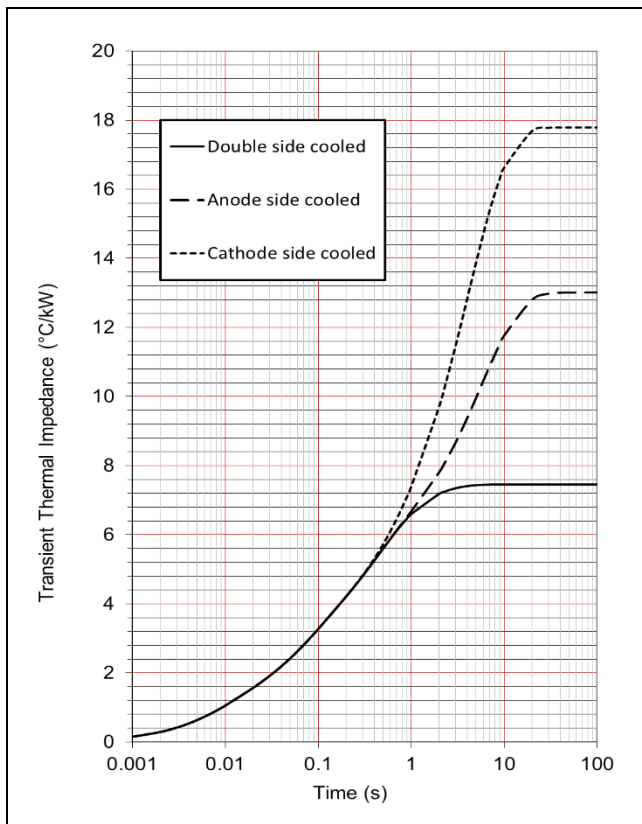


Fig. 9 Maximum (limit) transient thermal impedance – junction to case (degC/kW)

		1	2	3	4
Double side cooled	Ri(°C/kW)	0.921	1.830	3.402	1.304
	Ti(s)	0.008	0.058	0.408	1.209
Anode side cooled	Ri(°C/kW)	0.903	1.672	3.010	7.427
	Ti(s)	0.008	0.054	0.314	5.624
Cathode side cooled	Ri(°C/kW)	0.948	2.066	1.688	13.085
	Ti(s)	0.008	0.065	0.389	4.145

$$Z_{th} = \sum_{i=1}^4 R_i \cdot \left(1 - \exp\left(-\frac{T}{T_i}\right)\right)$$

$\Delta R_{th(j-c)}$ Conduction

Tables show the increments of thermal resistance $R_{th(j-c)}$ when the device operates at conduction angles other than d.c.

Double side cooling			Anode Side Cooling			Cathode Sided Cooling		
θ°	$\Delta Z_{th}(z)$		θ°	$\Delta Z_{th}(z)$		θ°	$\Delta Z_{th}(z)$	
	sine	rect.		sine	rect.		sine	rect.
180	1.34	0.88	180	1.34	0.88	180	1.33	0.88
120	1.57	1.30	120	1.57	1.30	120	1.57	1.29
90	1.83	1.54	90	1.84	1.54	90	1.83	1.53
60	2.08	1.81	60	2.08	1.81	60	2.07	1.80
30	2.27	2.11	30	2.28	2.11	30	2.26	2.10
15	2.36	2.28	15	2.37	2.28	15	2.35	2.26

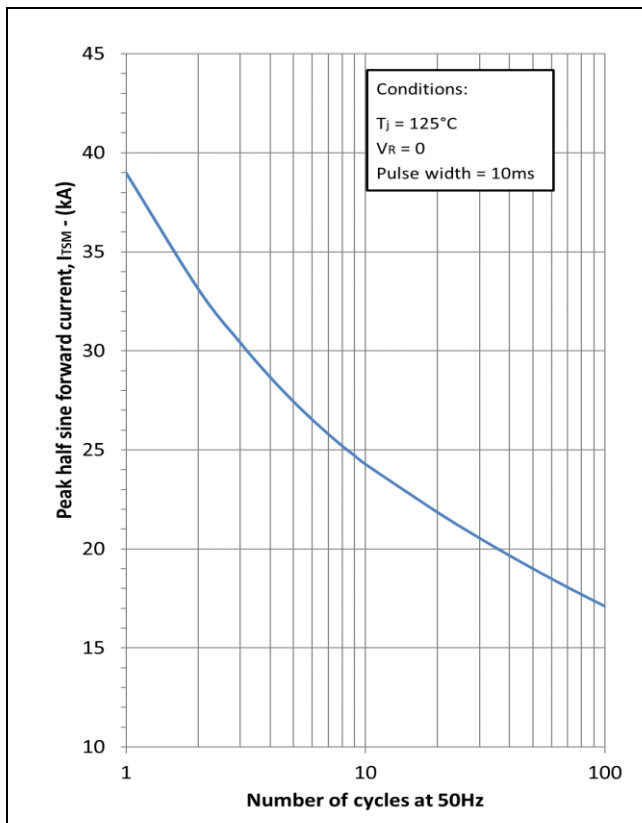


Fig. 10 Multi-cycle surge current

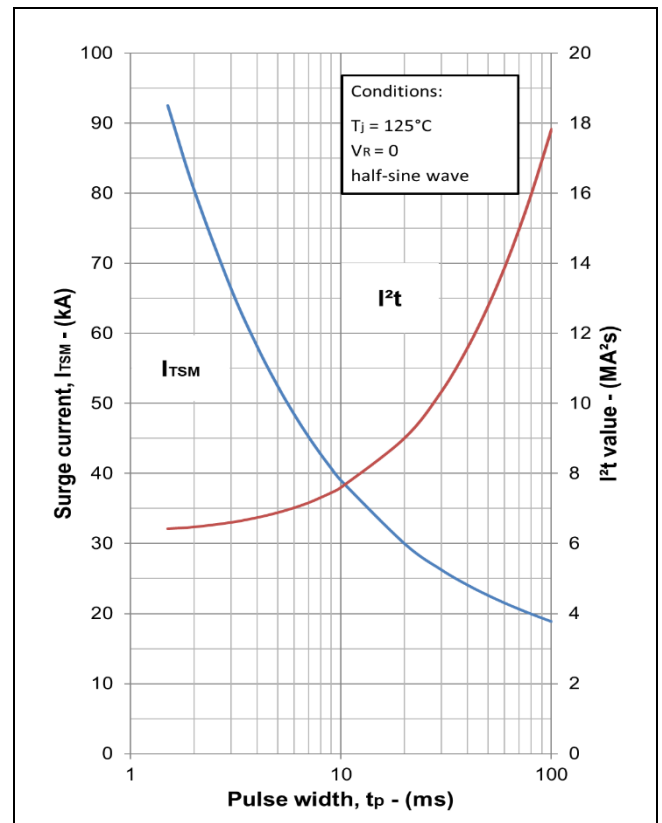


Fig. 11 Single-cycle surge current

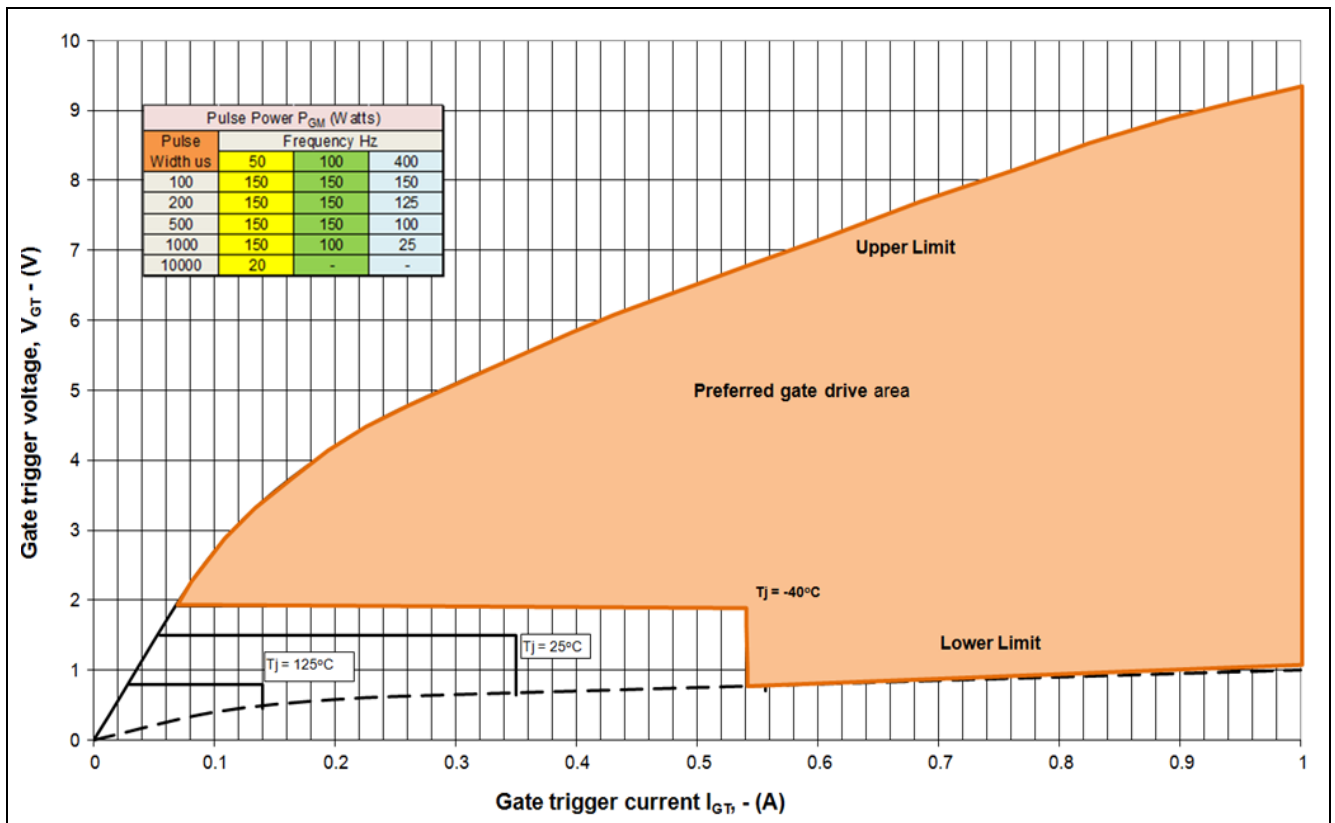


Fig. 12 Gate characteristics

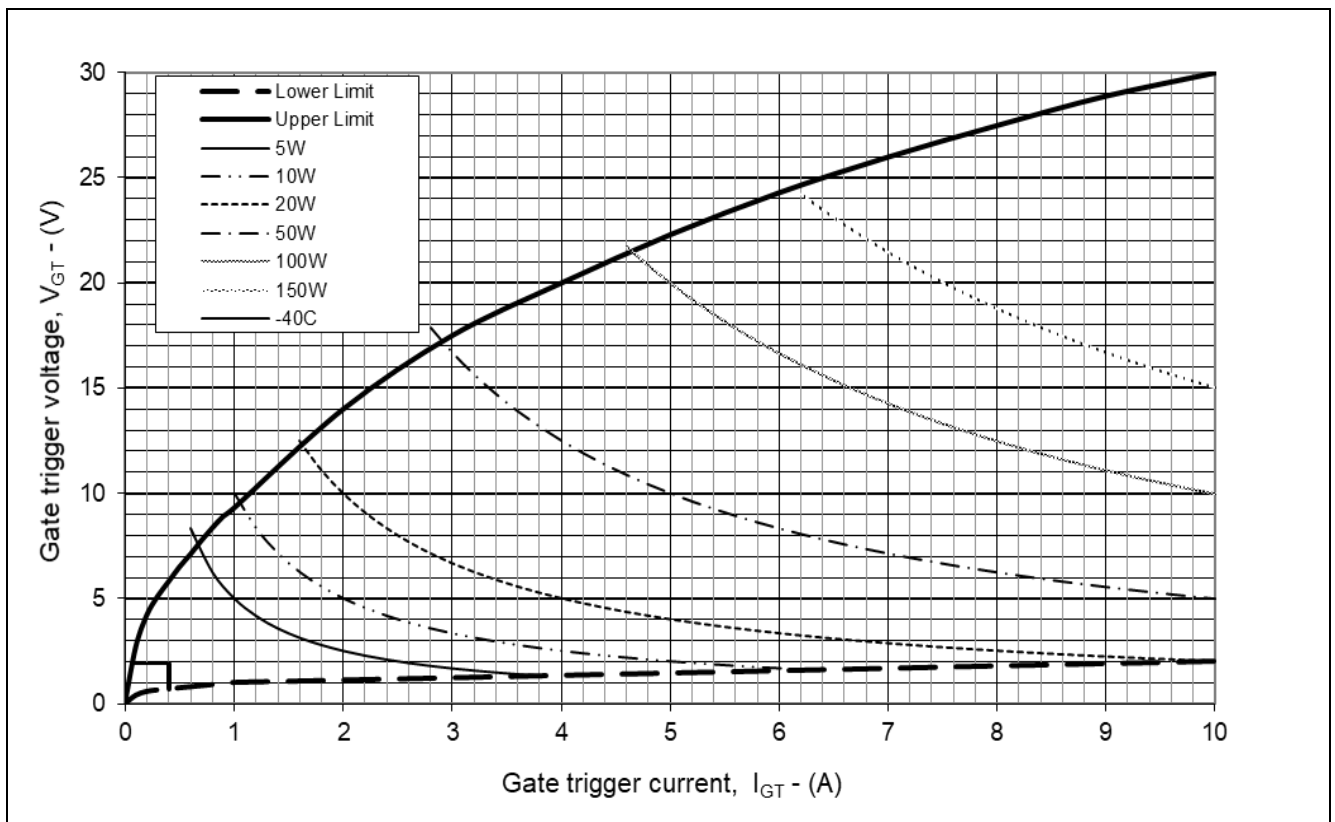


Fig. 13 Gate characteristics

PACKAGE DETAILS

For further package information, please contact Customer services.

All dimensions in mm, unless stated otherwise.

DO NOT SCALE

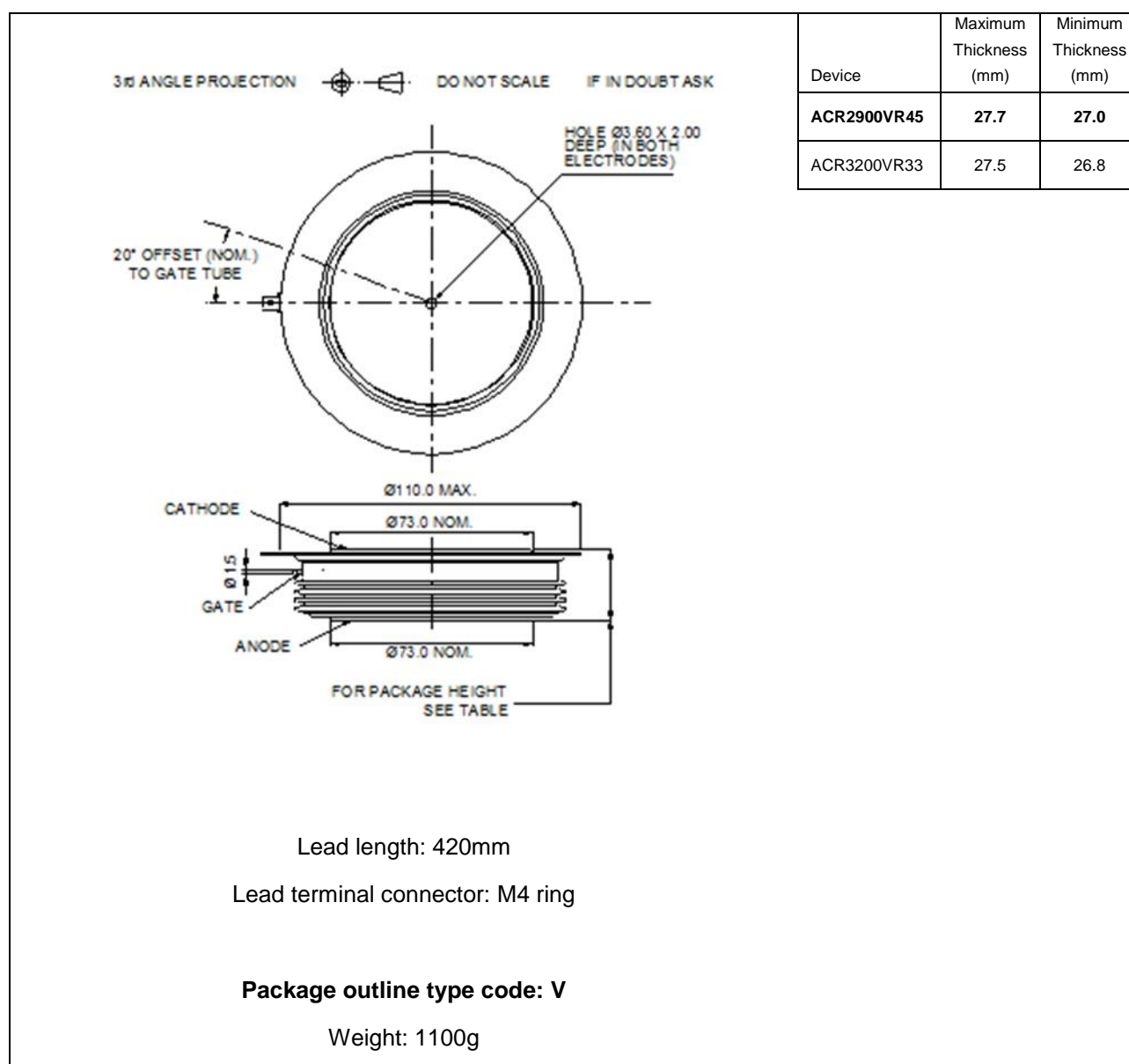


Fig. 14 Package outline

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