

Phase Control Thyristor

Preliminary Information

DS6162-1 November 2014 (LN32181)

FEATURES

- Double Side Cooling
- High Surge Capability

KEY PARAMETERS

V_{DRM}	4200V
$I_{T(AV)}$	6650A
I_{TSM}	98560A
dV/dt^*	2000V/ μ s
dI/dt	200A/ μ s

* Higher dV/dt selections available

APPLICATIONS

- High Power Drives
- High Voltage Power Supplies
- Static Switches

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V_{DRM} and V_{RRM} V	Conditions
DCR6650H42	4200	$T_{vj} = -40^{\circ}\text{C}$ to 125°C , $I_{DRM} = I_{RRM} = 600\text{mA}$, $V_{DRM}, V_{RRM} t_p = 10\text{ms}$, $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively
DCR6650H40	4000	
DCR6650H38	3800	

Lower voltage grades available.

ORDERING INFORMATION

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

For example:

DCR6650H42

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

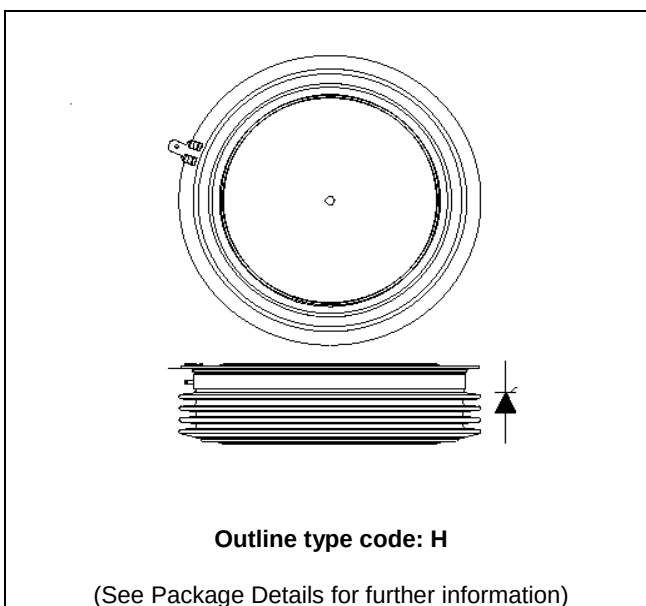


Fig. 1 Package outline

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	6650	A
$I_{T(RMS)}$	RMS value	-	10446	A
I_T	Continuous (direct) on-state current	-	9134	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	98.56	kA
I^2t	I^2t for fusing	$V_R = 0$	48.57	MA^2s

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.004255	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.008	$^{\circ}\text{C/W}$
			Cathode DC	-	0.0093	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 135.0kN (with mounting compound)	Double side	-	0.0009	$^{\circ}\text{C/W}$
			Single side	-	0.0018	$^{\circ}\text{C/W}$
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			120	155	kN

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
I _{RRM} /I _{DRM}	Peak reverse and off-state current	At V _{RRM} /V _{DRM} , T _{case} = 125°C		-	600	mA
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V _{DRM} , T _j = 125°C, gate open		-	2000	V/μs
dI/dt	Rate of rise of on-state current	From 67% V _{DRM} to 2x I _{T(AV)}	Repetitive 50Hz	-	200	A/μs
		Gate source 30V, 10Ω, t _r < 0.5μs, T _j = 125°C	Non-repetitive	-	500	A/μs
V _{T(TO)}	Threshold voltage – Low level	500 to 4000A at T _{case} = 125°C		-	0.775	V
	Threshold voltage – High level	4000 to 8000A at T _{case} = 125°C		-	0.977	V
r _T	On-state slope resistance – Low level	500A to 4000A at T _{case} = 125°C		-	0.124	mΩ
	On-state slope resistance – High level	4000A to 8000A at T _{case} = 125°C		-	0.076	mΩ
t _{gd}	Delay time	V _D = 67% V _{DRM} , gate source 30V, 10Ω t _r = 0.5μs, T _j = 25°C		-	3	μs
t _q	Turn-off time	I _T = 3000A, T _j = 125°C, V _R = 200V, dI/dt = 1A/μs, dV _{DR} /dt = 20V/μs linear			700	μs
Q _S	Stored charge	I _T = 3000A, T _j = 125°C, dI/dt – 1A/μs, V _{Rpeak} ~2520V, V _R ~ 1680V		2800	6760	μC
I _{RR}	Reverse recovery current			42	70	A
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% $V_{DRM}, T_{case} = 125^{\circ}C$	10	mA

CURVES

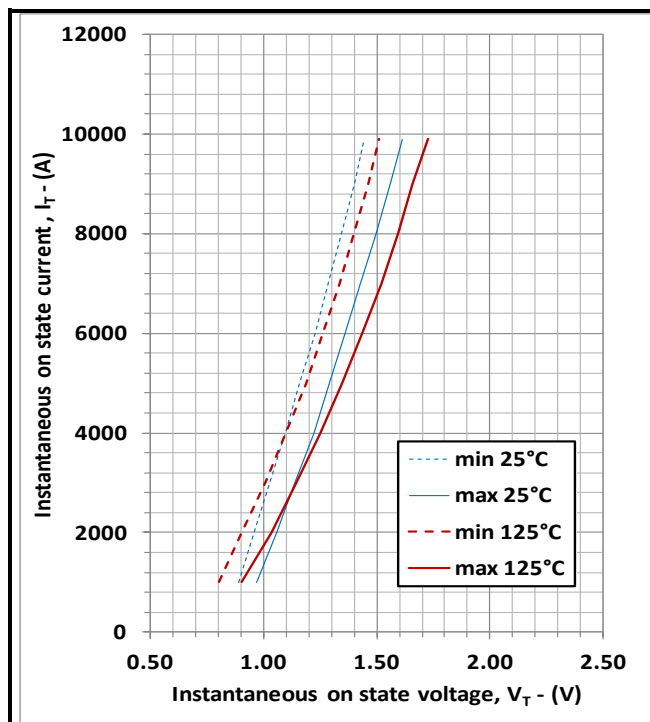


Fig.2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

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

Where

$$\begin{aligned} A &= 1.07503 \\ B &= -0.0939 \\ C &= 0.000004 \\ D &= 0.01483 \end{aligned}$$

these values are valid for $T_j = 125^{\circ}C$ for I_T 500A to 8000A

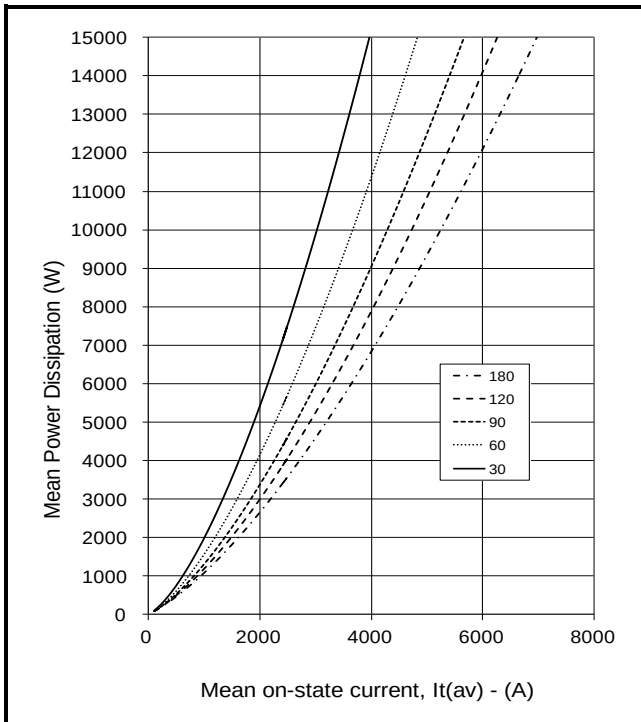


Fig.3 On-state power dissipation – sine wave

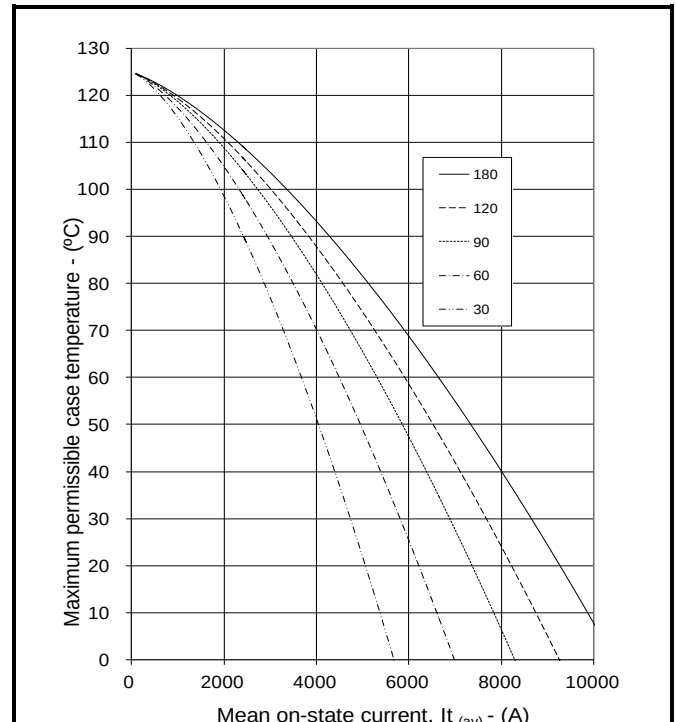


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

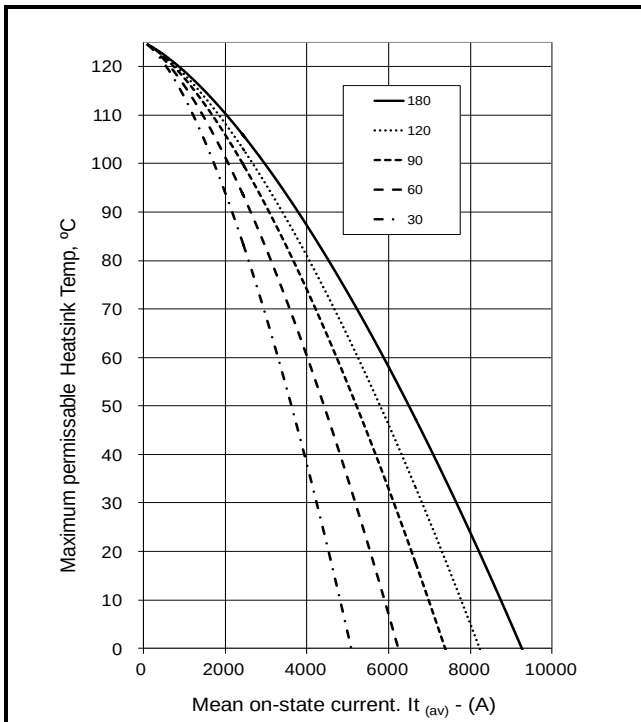


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

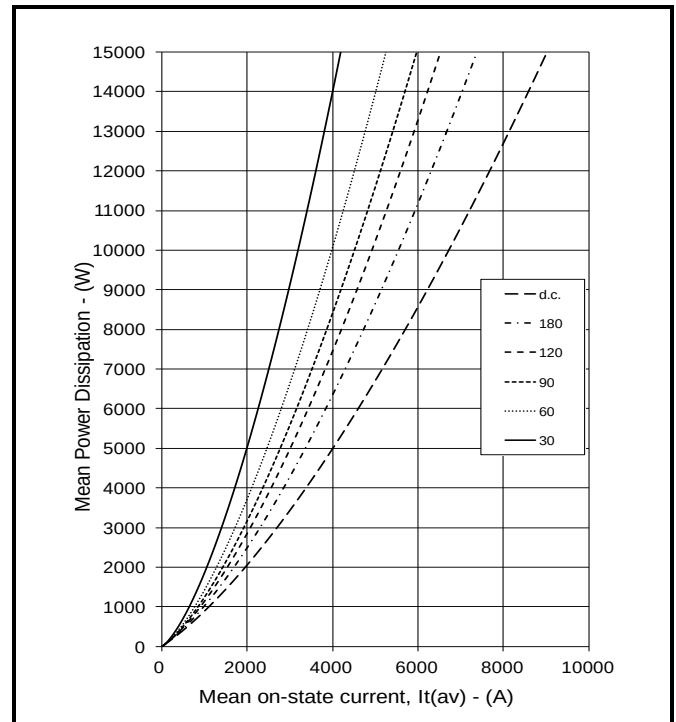


Fig.6 On-state power dissipation – rectangular wave

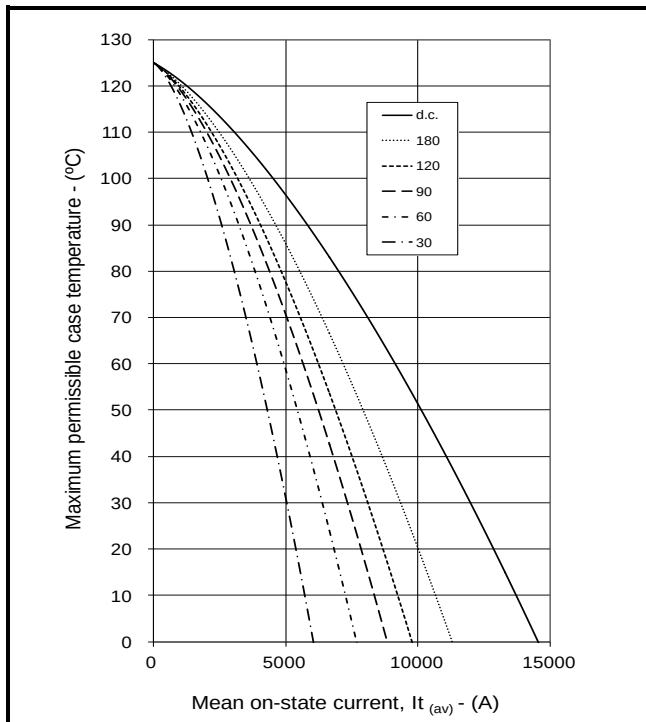


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

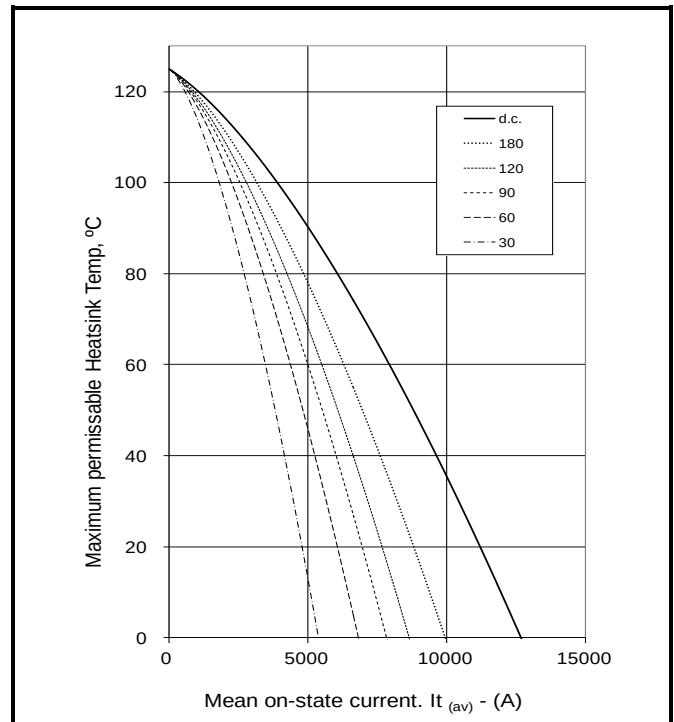


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

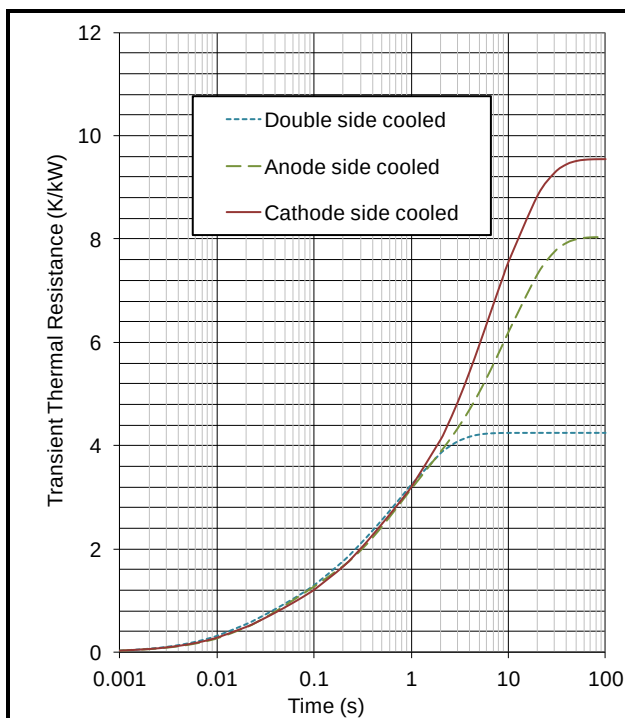


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

		1	2	3	4
Double side cooled	R_i (°C/kW)	1.24786361	0.8334561	0.60621847	1.56769894
	T_i (s)	0.67007122	0.14563223	0.01981569	1.28702484
Anode side cooled	R_i (°C/kW)	0.51177271	1.94595762	0.91956601	4.66635596
	T_i (s)	2.89822124	0.50524092	0.0358286	10.6466908
Cathode side cooled	R_i (°C/kW)	2.41723953	1.53684913	0.62607497	4.9592331
	T_i (s)	3.44130269	0.26943359	0.02350127	10.172444

$$Z_{th} = \sum_{i=1}^{i=4} [R_i \times (1 - \exp(-T / T_i))]$$

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

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

Double side cooling			Anode Side Cooling			Cathode Sided Cooling		
$\Delta Z_{th} (z)$			$\Delta Z_{th} (z)$			$\Delta Z_{th} (z)$		
θ°	sine.	rect.	θ°	sine.	rect.	θ°	sine.	rect.
180	0.38	0.26	180	0.32	0.23	180	0.33	0.23
120	0.44	0.37	120	0.36	0.31	120	0.38	0.33
90	0.49	0.43	90	0.41	0.36	90	0.43	0.37
60	0.54	0.49	60	0.45	0.40	60	0.47	0.43
30	0.58	0.55	30	0.48	0.45	30	0.51	0.48
15	0.60	0.58	15	0.49	0.48	15	0.52	0.51

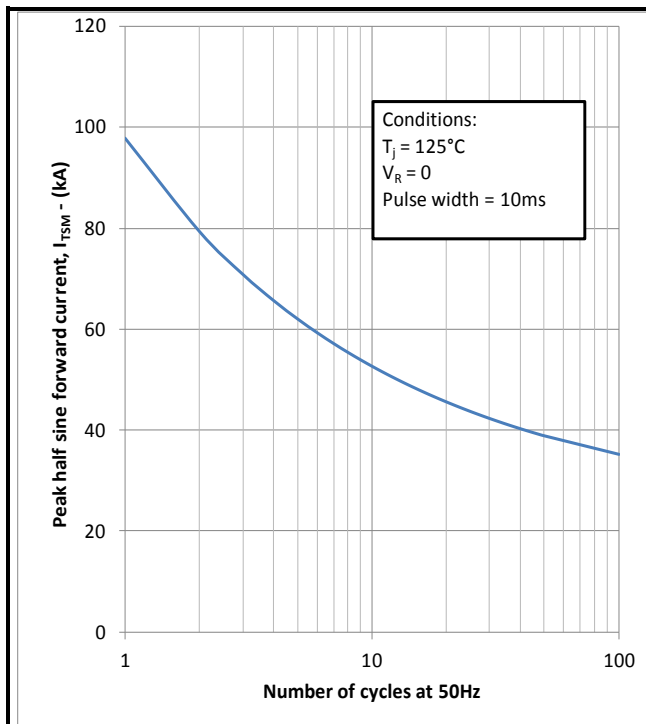


Fig.10 Multi-cycle surge current

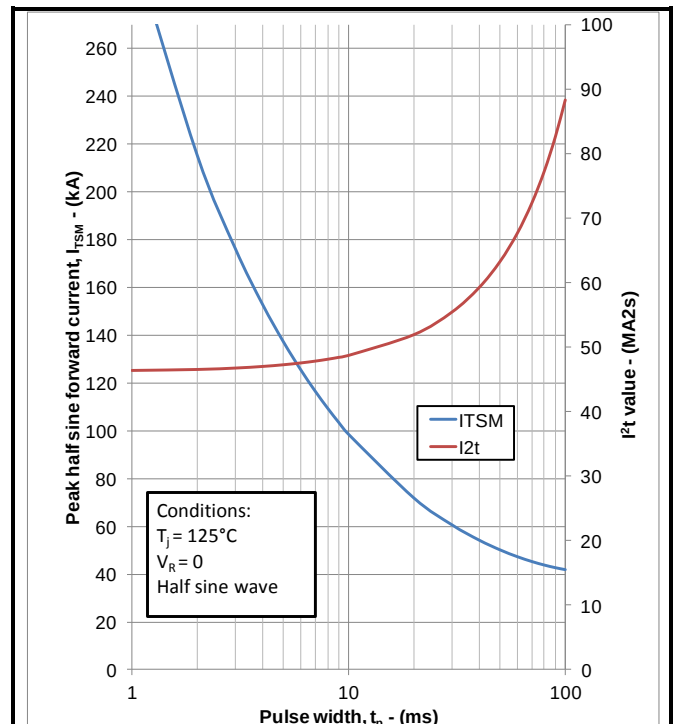


Fig.11 Single-cycle surge current

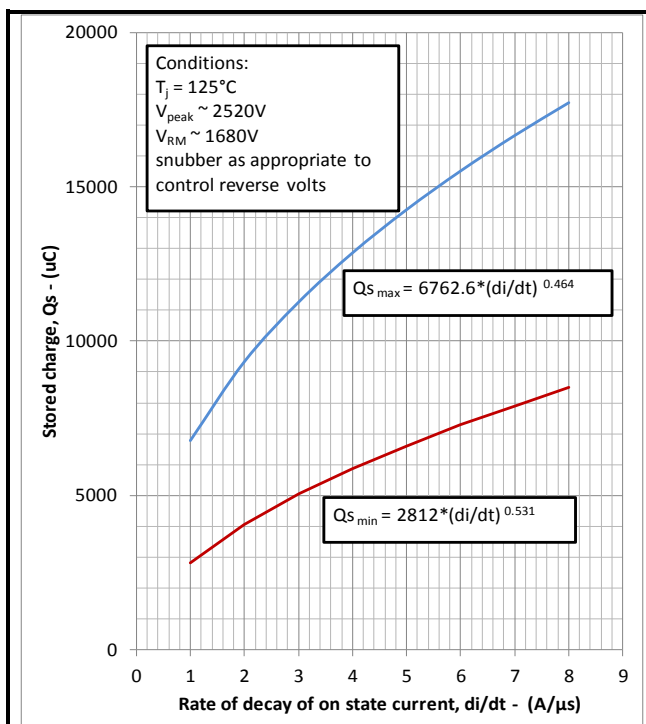


Fig.12 Stored charge

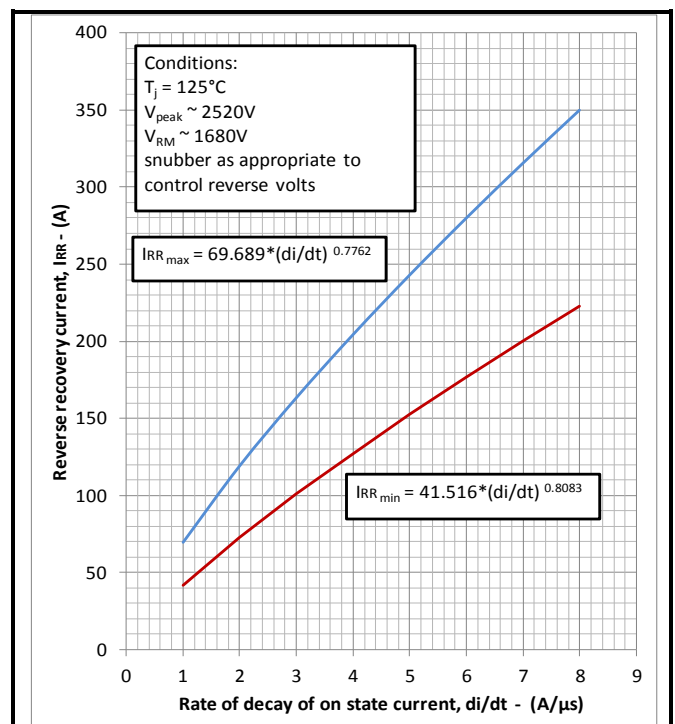


Fig.13 Reverse recovery current

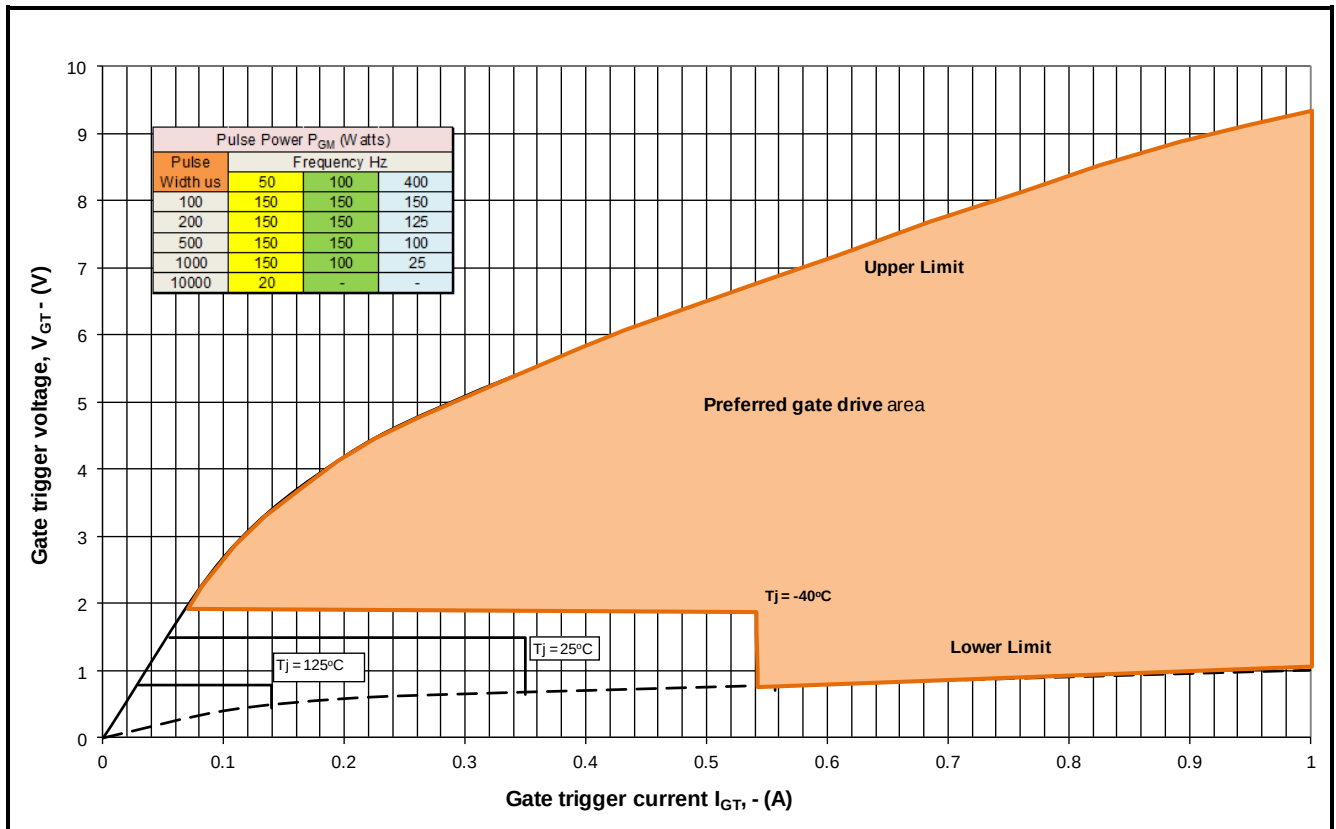


Fig14 Gate Characteristics

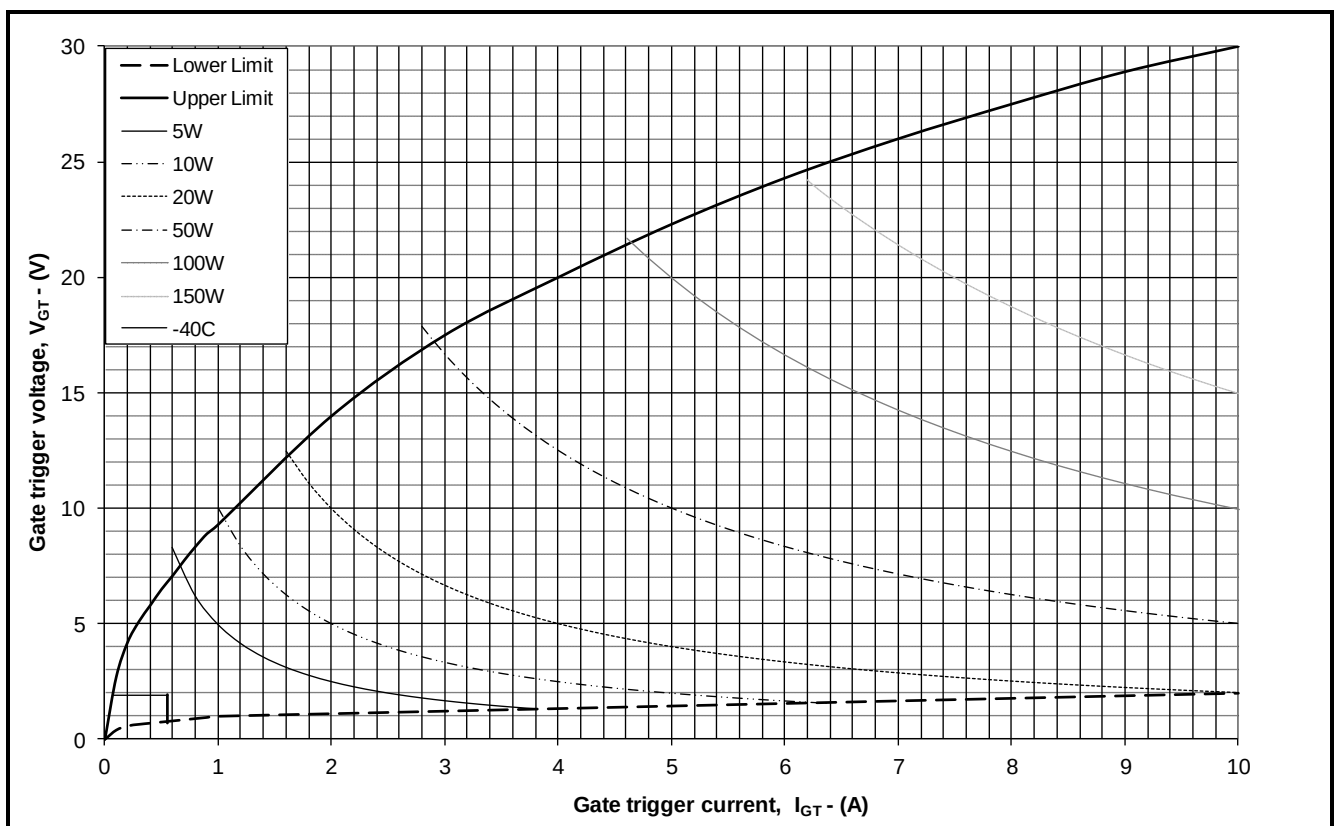
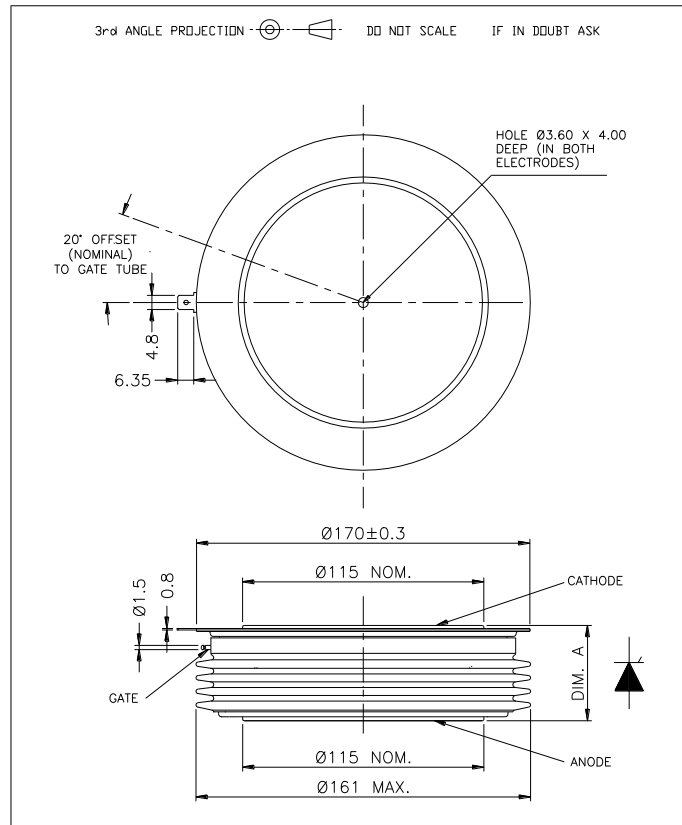


Fig. 15 Gate characteristics

PACKAGE DETAILS

For further package information, please contact Customer Services. All dimensions in mm, unless stated otherwise. DO NOT SCALE.

Device	Maximum Thickness (mm)	Minimum Thickness (mm)
DCRXXXH42	35.15	34.28
DCR6650H42	35.15	34.28
DCR5240H52	35.27	34.4
DCR5890H52	35.27	34.4
DCR4420H65	35.3	34.7
DCR4660H65	35.3	34.7
DCR3640H85	35.65	35.05
DCR3980H85	35.65	35.05



Lead length: 420mm
Lead terminal connector: M4 ring

Package outline type code:H

Fig.16 Package outline

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