

FEATURES

- Double Side Cooling
- High Surge Capability

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
DCR1770F22 DCR1770F20	2200 2000	$T_{vj} = -40^{\circ}\text{C}$ to 125°C , $I_{DRM} = I_{RRM} = 100\text{mA}$, $V_{DRM}, V_{RRM} t_p = 10\text{ms}$, $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively

Lower voltage grades available.

KEY PARAMETERS

V_{DRM}	2200V
$I_{T(AV)}$	1770A
I_{TSM}	23800A
dV/dt^*	1500V/μs
dI/dt	1000A/μs

* Higher dV/dt selections available

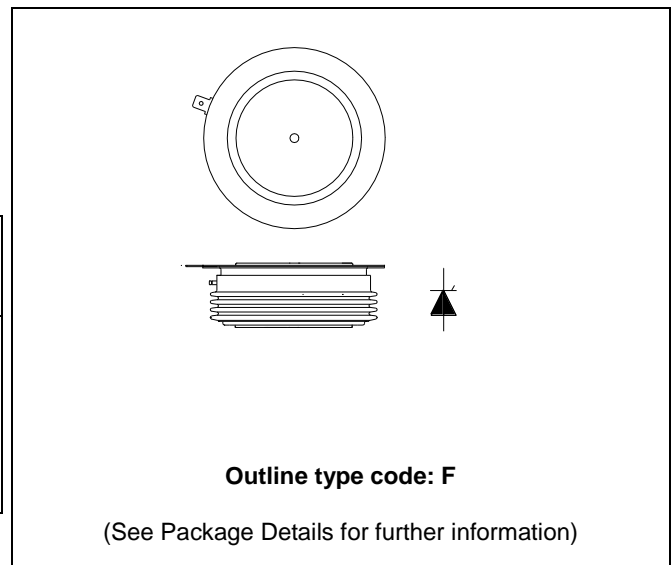


Fig. 1 Package outline

ORDERING INFORMATION

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

For example:

DCR1770F22

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

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	1770	A
$I_{T(RMS)}$	RMS value	-	2780	A
I_T	Continuous (direct) on-state current	-	2565	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	23.8	kA
I^2t	I^2t for fusing	$V_R = 0$	2.83	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	-	0.0184	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.0333	$^{\circ}\text{C/W}$
			Cathode DC	-	0.0418	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 23kN (with mounting compound)	Double side	-	0.004	$^{\circ}\text{C/W}$
			Single side	-	0.008	$^{\circ}\text{C/W}$
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		22.0	25.0	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} , $T_{case} = 125^{\circ}C$	-	100	mA	
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V_{DRM} , $T_j = 125^{\circ}C$, gate open	-	1500	V/ μs	
dI/dt	Rate of rise of on-state current	From 67% V_{DRM} to $2x I_{T(AV)}$	Repetitive 50Hz	-	250	A/ μs
		Gate source 30V, 10 Ω , $t_r < 0.5\mu s$, $T_j = 125^{\circ}C$	Non-repetitive	-	1000	A/ μs
$V_{T(TO)}$	Threshold voltage – Low level	100A to 1500A at $T_{case} = 125^{\circ}C$	-	0.792	V	
	Threshold voltage – High level	1500A to 4000A at $T_{case} = 125^{\circ}C$	-	0.903	V	
r_T	On-state slope resistance – Low level	100A to 1500A at $T_{case} = 125^{\circ}C$	-	0.268	m Ω	
	On-state slope resistance – High level	1500A to 4000A at $T_{case} = 125^{\circ}C$	-	0.184	m Ω	
t_{gd}	Delay time	$V_D = 67\% V_{DRM}$, gate source 30V, 10 Ω $t_r = 0.5\mu s$, $T_j = 25^{\circ}C$	-	3	μs	
t_q	Turn-off time	$T_j = 125^{\circ}C$, $V_R = 100V$, $dI/dt = 5A/\mu s$, $dV_{DR}/dt = 20V/\mu s$ linear to 2000V	-	300	μs	
Q_S	Stored charge	$I_T = 1000A$, $t_p = 1000\mu s$, $T_j = 125^{\circ}C$, $dI/dt = 5A/\mu s$,	1180	2900	μC	
I_{RR}	Reverse recovery current		75	120	A	
I_L	Latching current	$T_j = 25^{\circ}C$, $V_D = 5V$	-	3	A	
I_H	Holding current	$T_j = 25^{\circ}C$, $R_{G-K} = \infty$, $I_{TM} = 500A$, $I_T = 5A$	-	300	mA	

GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
V _{GT}	Gate trigger voltage	V _{DRM} = 5V, T _{case} = 25°C	1.5	V
V _{GD}	Gate non-trigger voltage	At 50% V _{DRM} , T _{case} = 125°C	0.4	V
I _{GT}	Gate trigger current	V _{DRM} = 5V, T _{case} = 25°C	250	mA
I _{GD}	Gate non-trigger current	At 50% V _{DRM} , T _{case} = 125°C	10	mA

CURVES

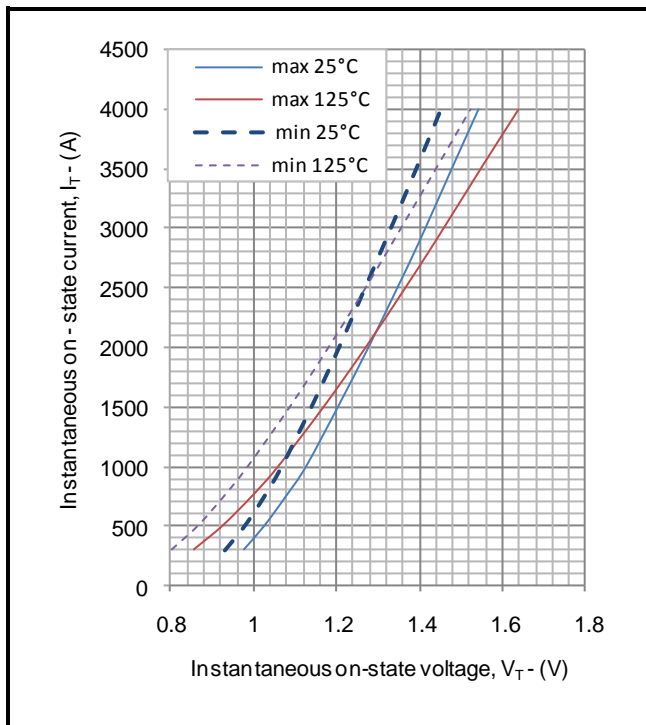


Fig.2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

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

Where A = 0.262971
 B = 0.101091
 C = 0.000169
 D = -0.002225

these values are valid for T_j = 125°C for I_T 100A to 4000A

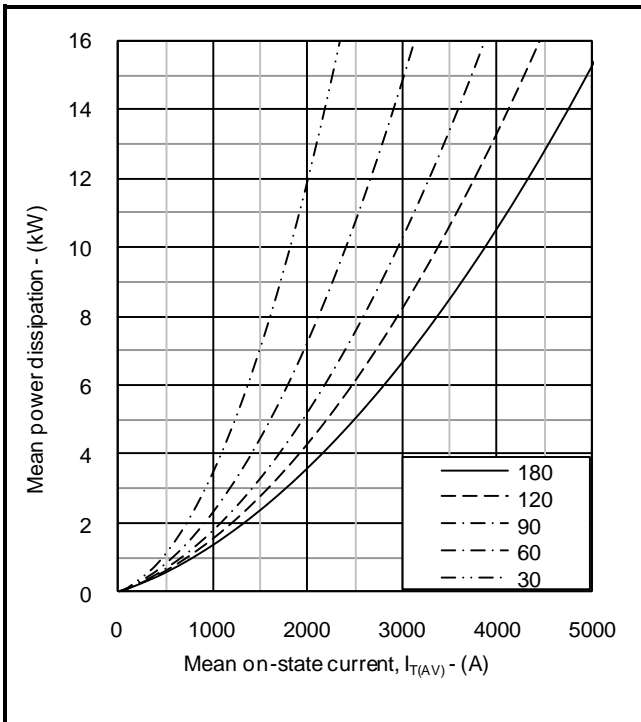


Fig.3 On-state power dissipation – sine wave

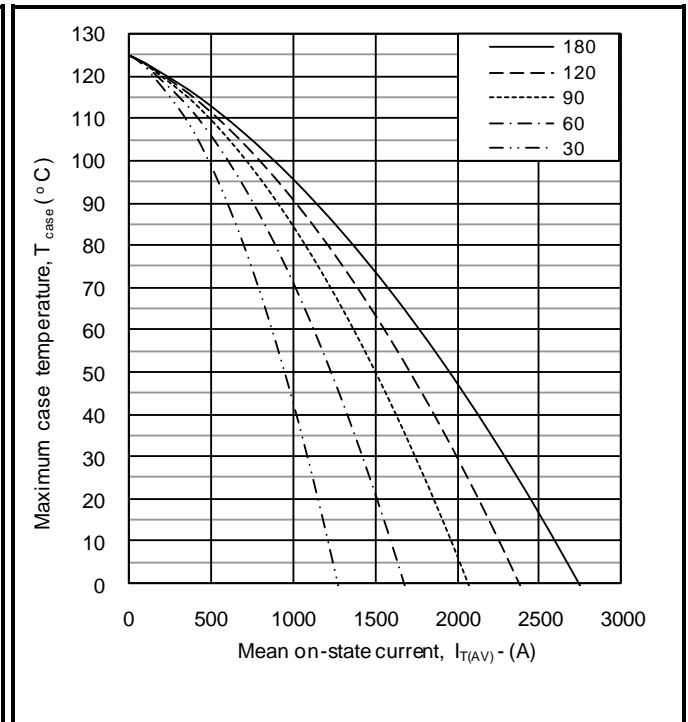


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

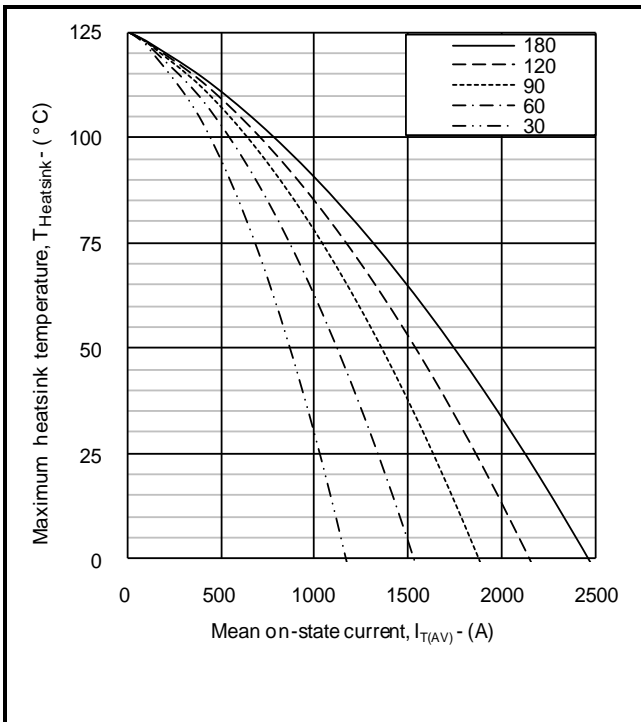


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

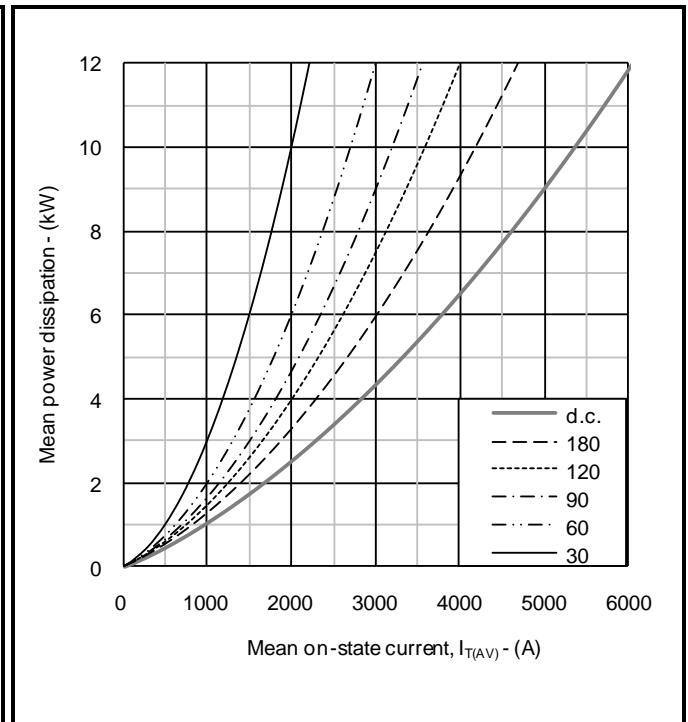


Fig.6 On-state power dissipation – rectangular wave

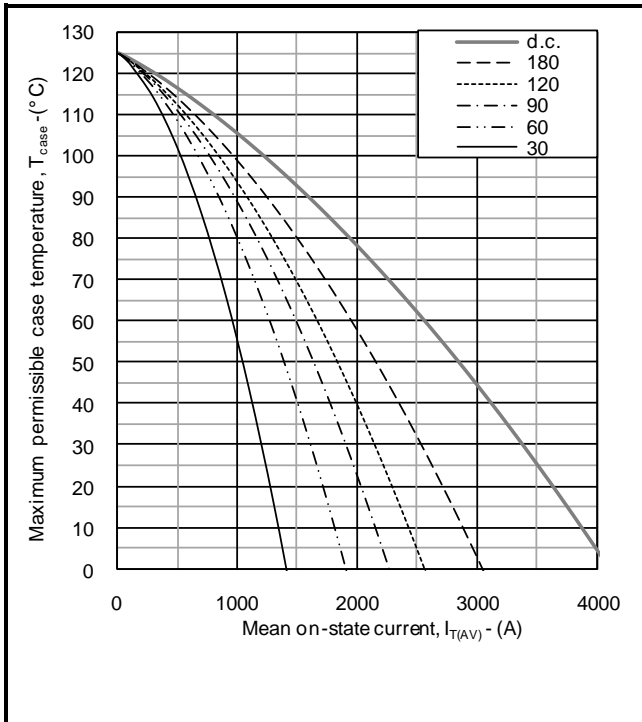


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

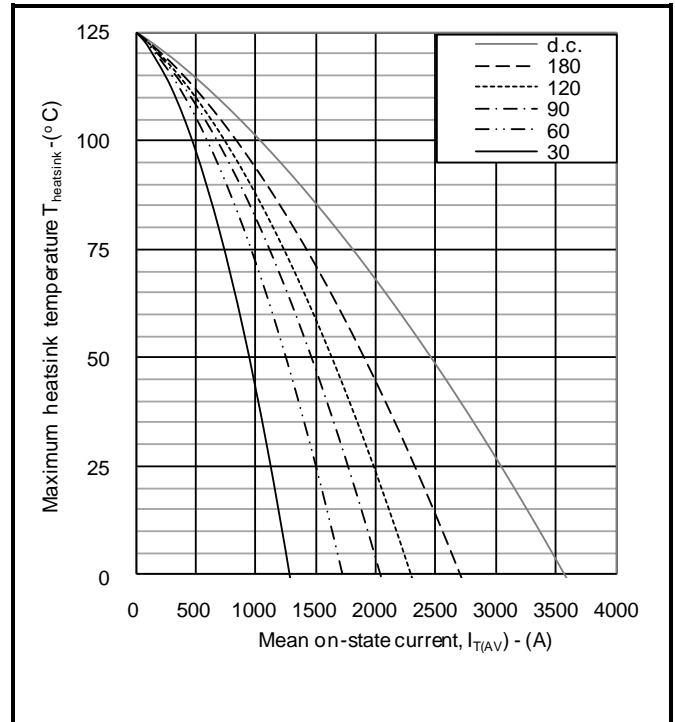


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

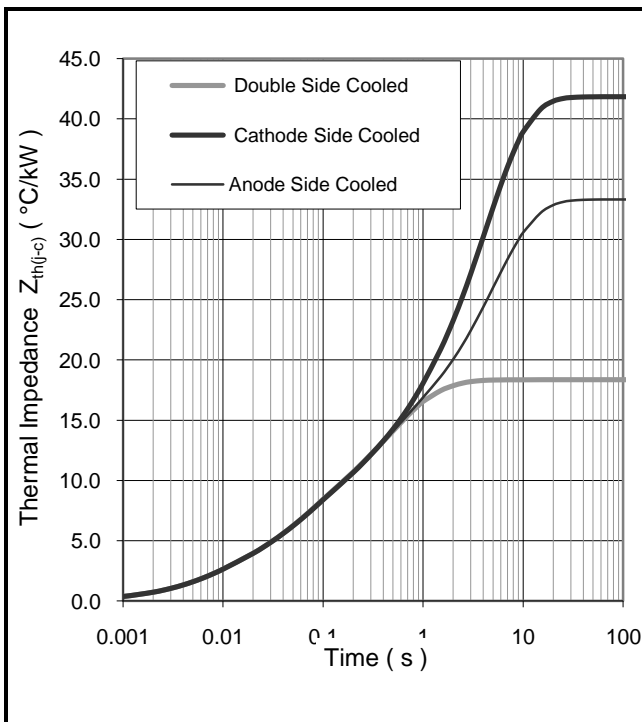


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

		1	2	3	4
Double side cooled	R _i (°C/kW)	7.5608	4.0772	3.8420	2.8671
	T _i (s)	0.6877	0.2537	0.0614	0.0101
Anode side cooled	R _i (°C/kW)	6.7211	4.6219	15.5387	14.8631
	T _i (s)	0.1910	0.0158	5.0011	3.3169
Cathode side cooled	R _i (°C/kW)	11.5564	8.5810	4.7942	8.3643
	T _i (s)	4.2216	6.0269	0.0166	0.2255

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

ΔR_{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.

θ°	Double side cooling		Anode Side Cooling		Cathode Sided Cooling	
	sine.	rect.	sine.	rect.	sine.	rect.
180	3.19	2.14	2.97	2.03	2.95	2.02
120	3.72	3.10	3.43	2.89	3.40	2.87
90	4.29	3.64	3.92	3.36	3.88	3.34
60	4.81	4.23	4.36	3.87	4.31	3.84
30	5.22	4.88	4.69	4.41	4.64	4.37
15	5.40	5.22	4.84	4.70	4.79	4.65

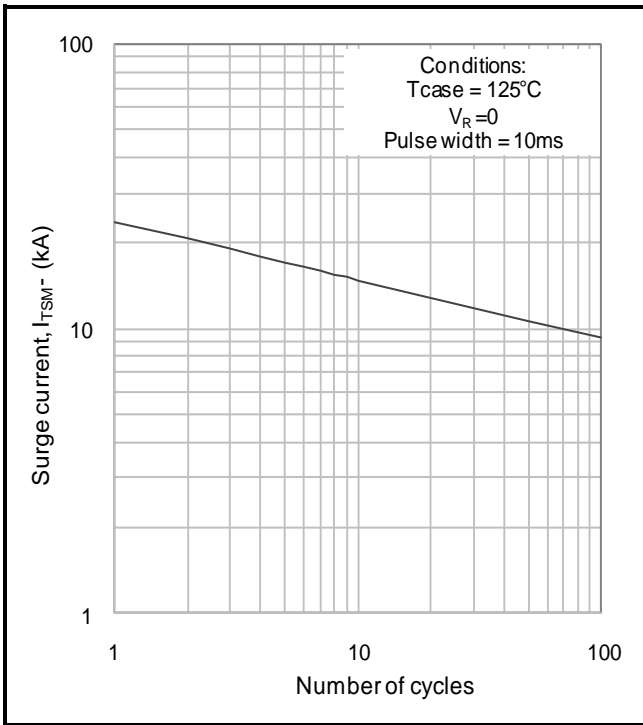


Fig.10 Multi-cycle surge current

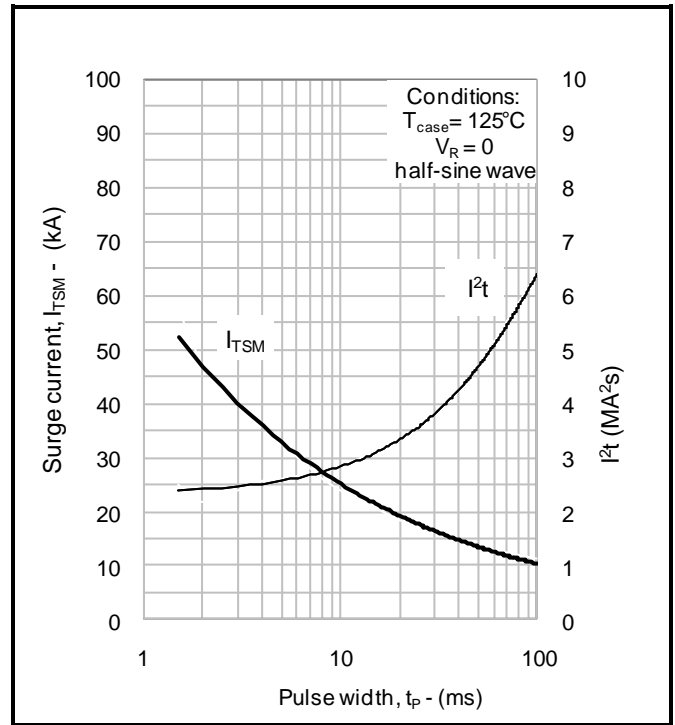


Fig.11 Single-cycle surge current

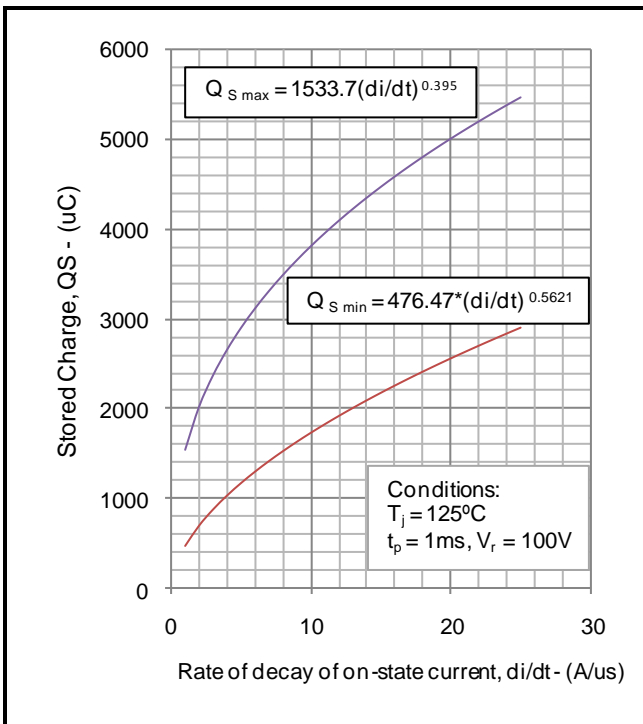


Fig.12 Stored charge vs di/dt

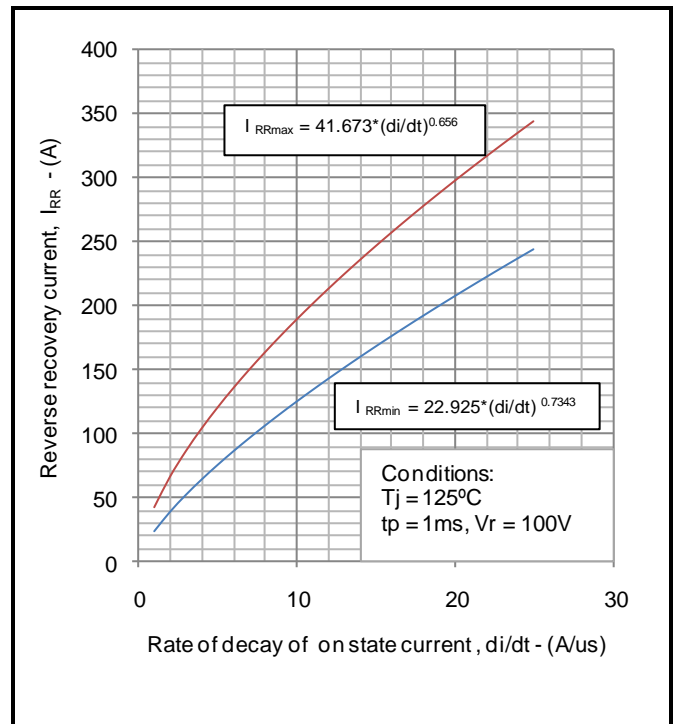


Fig.13 Reverse recovery current vs di/dt

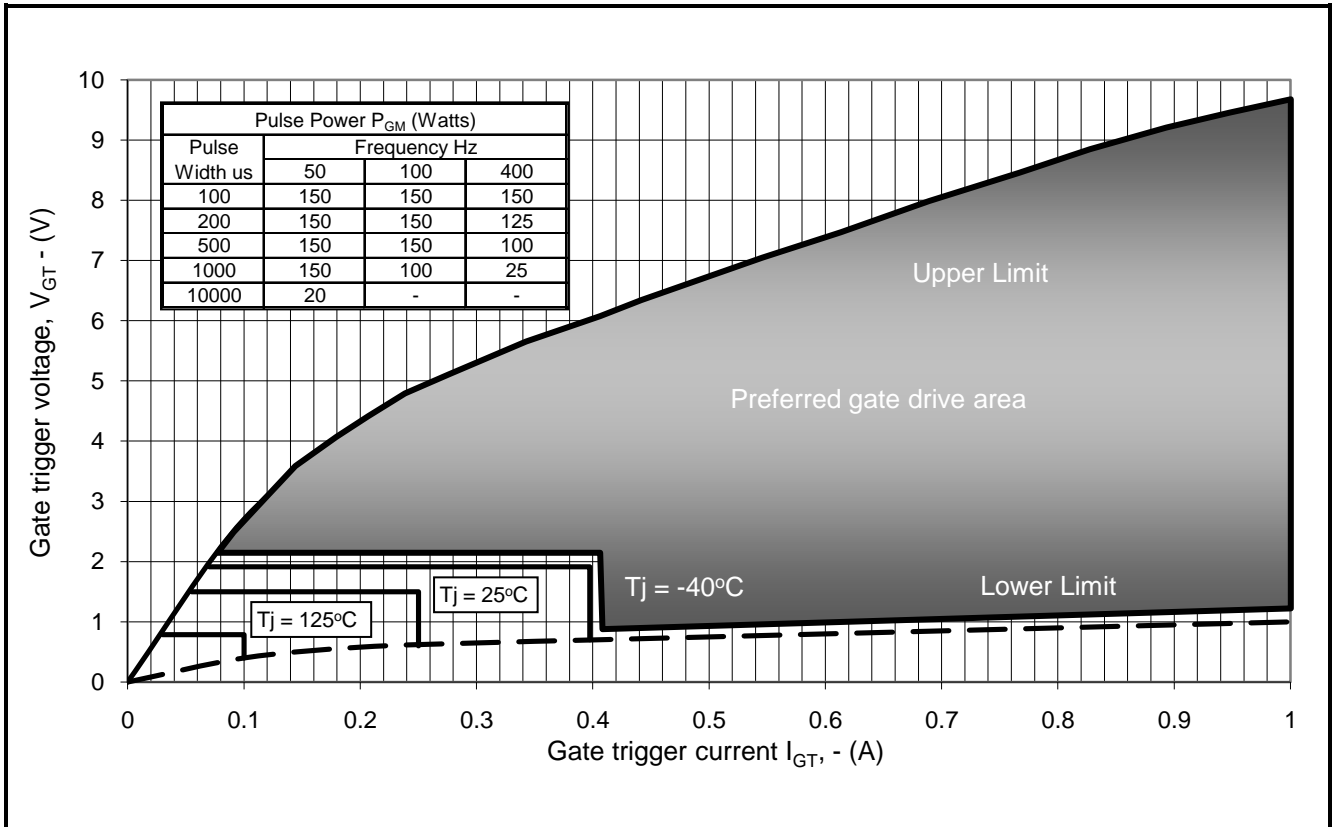


Fig14 Gate Characteristics

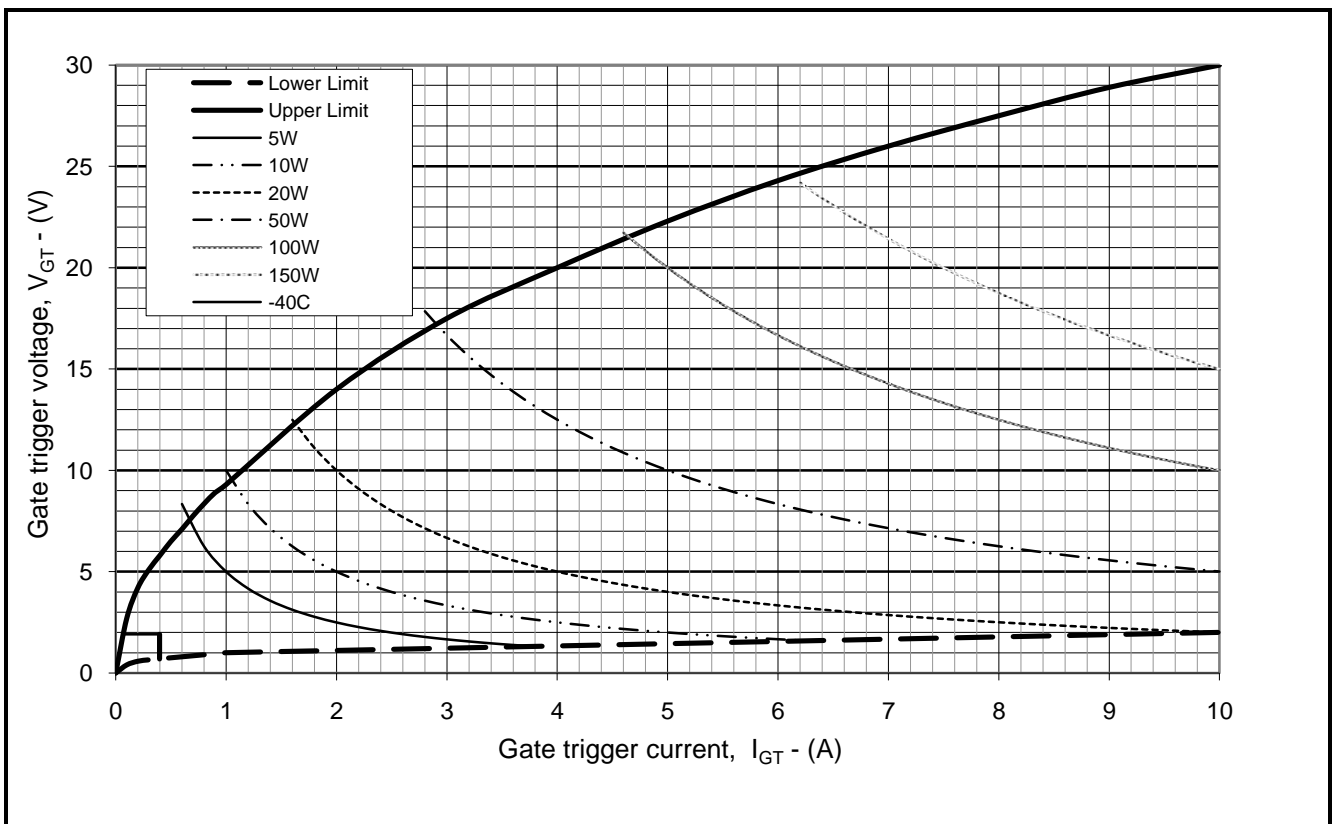


Fig. 15 Gate characteristics

PACKAGE DETAILS

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

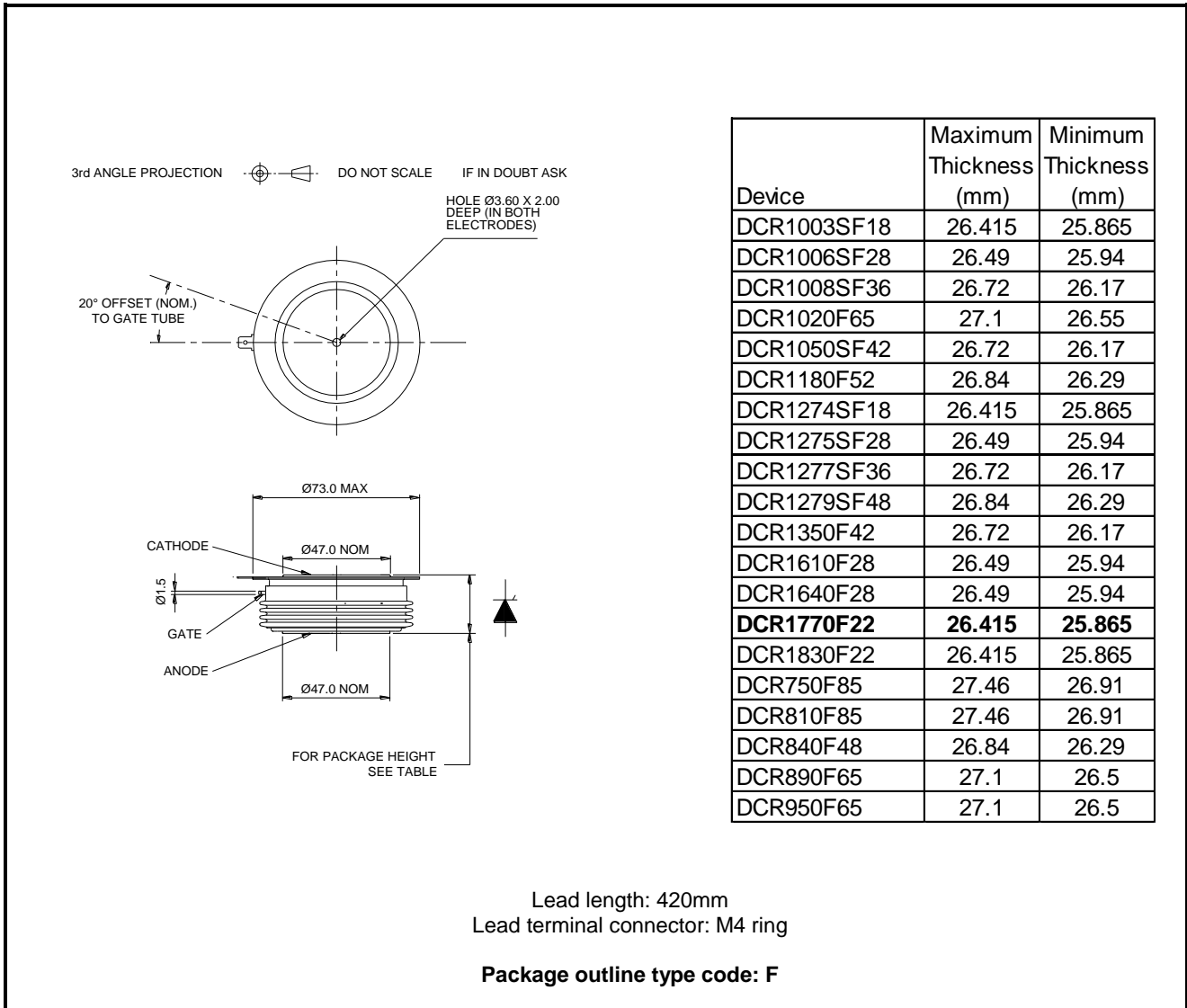


Fig.16 Package outline

Stresses above those listed in this data sheet may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed.

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