

FEATURES

- Double Side Cooling
- High Surge Capability

APPLICATIONS

- Medium Voltage Soft Starts
- High Voltage Power Supplies
- Static Switches

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V_{DRM} and V_{RRM} V	Conditions
DCR890F65*	6500	$T_{vj} = -40^{\circ}\text{C}$ to 125°C , $I_{DRM} = I_{RRM} = 200\text{mA}$, $V_{DRM}, V_{RRM} t_p = 10\text{ms}$, $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively
DCR890F60	6000	
DCR890F55	5500	
DCR890F50	5000	

Lower voltage grades available.
 *6200V @ -40°C , 6500V @ 0°C

KEY PARAMETERS

V_{DRM}	6500V
$I_{T(AV)}$	894A
I_{TSM}	12000A
dV/dt^*	1500V/μs
dI/dt	200A/μs

* Higher dV/dt selections available

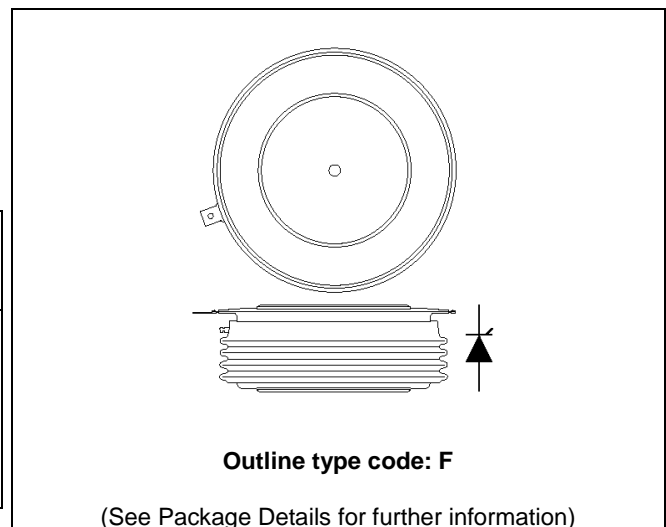


Fig. 1 Package outline

ORDERING INFORMATION

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

For example:

DCR890F65

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	894	A
$I_{T(RMS)}$	RMS value	-	1404	A
I_T	Continuous (direct) on-state current	-	1371	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	12.0	kA
I^2t	I^2t for fusing	$V_R = 0$	0.72	MA^2s

THERMAL AND MECHANICAL RATINGS

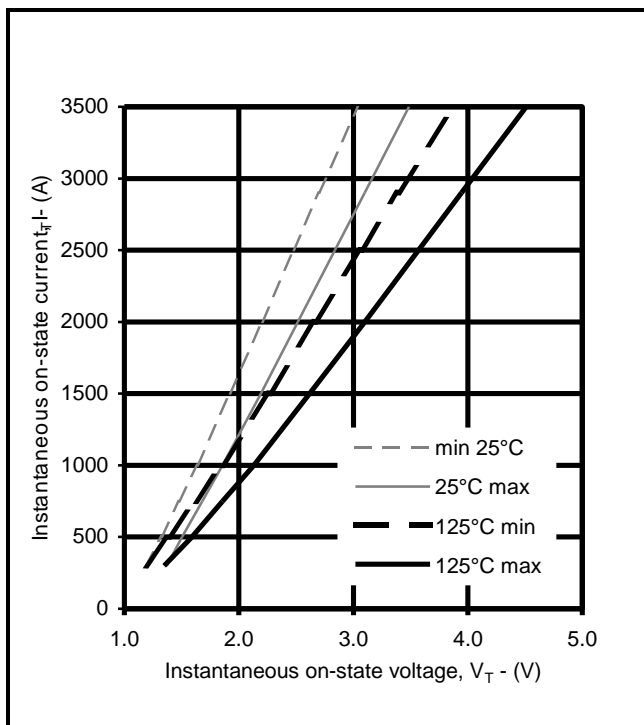
Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.0184	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.0333	$^{\circ}\text{C/W}$
			Cathode DC	-	0.0418	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 23 kN (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		20.0	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} , $T_{case} = 125^{\circ}C$	-	200	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/ μ s	
di/dt	Rate of rise of on-state current	From 67% V_{DRM} to $2x I_{T(AV)}$	Repetitive 50Hz	-	100	A/ μ s
		Gate source 30V, 10 Ω , $t_r < 0.5\mu$ s, $T_j = 125^{\circ}C$	Non-repetitive	-	200	A/ μ s
$V_{T(TO)}$	Threshold voltage – Low level	100A to 870A at $T_{case} = 125^{\circ}C$	-	1.000	V	
	Threshold voltage – High level	870A to 3000A at $T_{case} = 125^{\circ}C$	-	1.1847	V	
r_T	On-state slope resistance – Low level	100A to 870A at $T_{case} = 125^{\circ}C$	-	1.1429	m Ω	
	On-state slope resistance – High level	870A to 3000A at $T_{case} = 125^{\circ}C$	-	0.9472	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	μ s	
t_q	Turn-off time	$T_j = 125^{\circ}C$, $I_{peak} = 1000A$, $t_p = 1000\mu$ s, $V_R = 100V$, $di/dt = 5A/\mu$ s, $dV_{DR}/dt = 20V/\mu$ s linear to 2500V	600	1000	μ s	
I_{RR}	Reverse Recovery current	$I_T = 1000A$, $t_p = 1000\mu$ s, $T_j = 125^{\circ}C$, $di/dt = -5A/\mu$ s, $V_{Rpeak} = 100V$	90	120	A	
Q_S	Stored charge		2500	4000	μ C	
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	350	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 $A = 0.874878$
 $B = 0.001945$
 $C = 0.000808$
 $D = 0.013372$

 these values are valid for $T_j = 125^\circ\text{C}$ for I_T 300A to 3500A

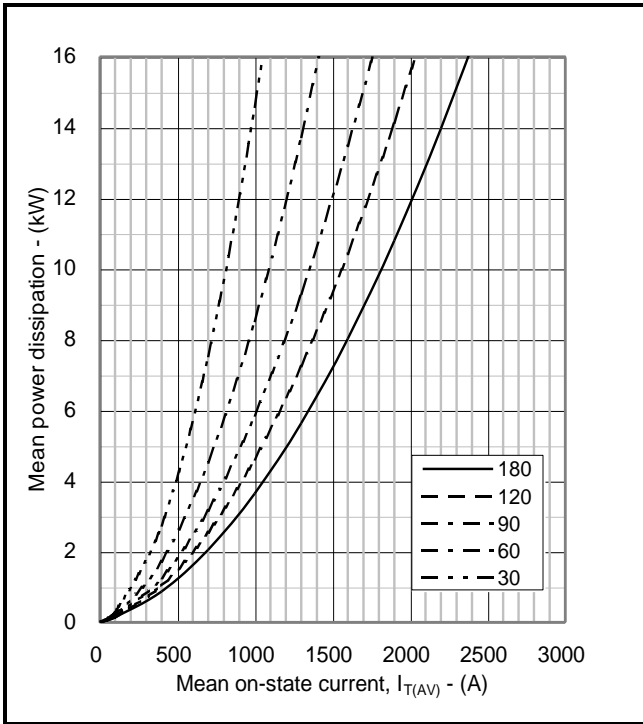


Fig.3 On-state power dissipation – sine wave

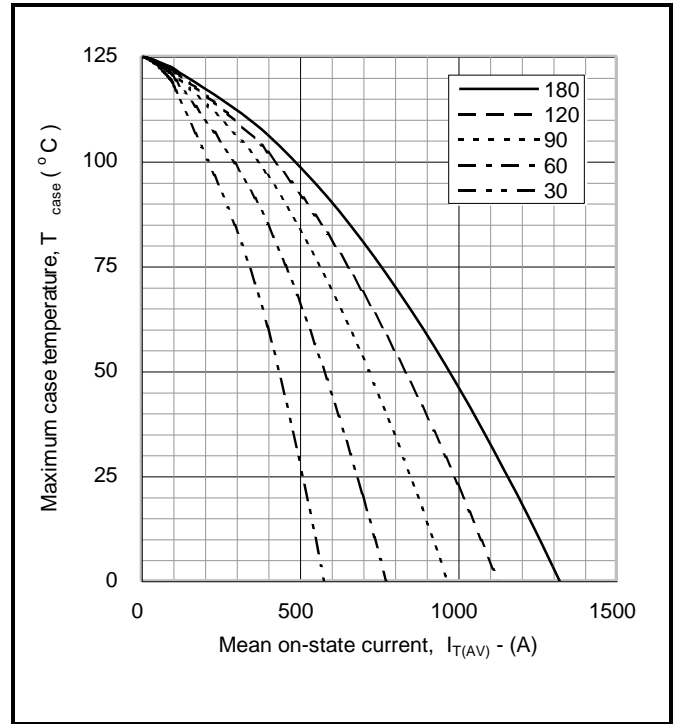


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

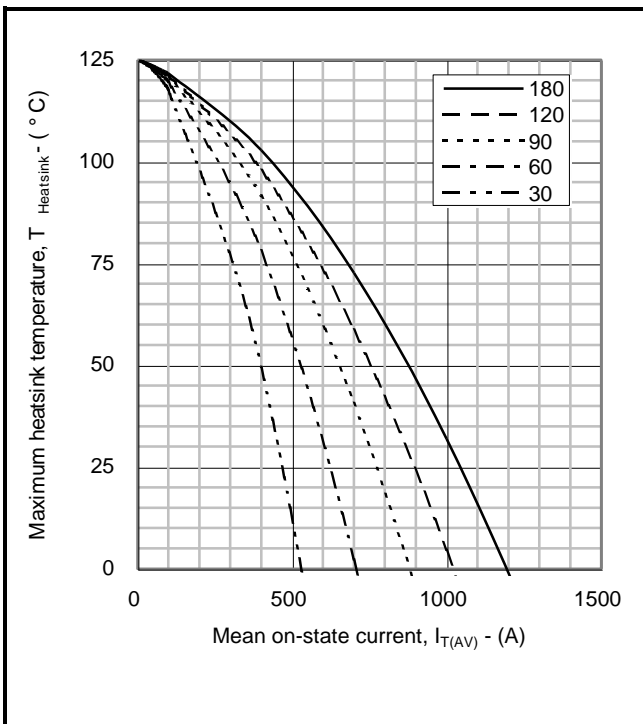


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

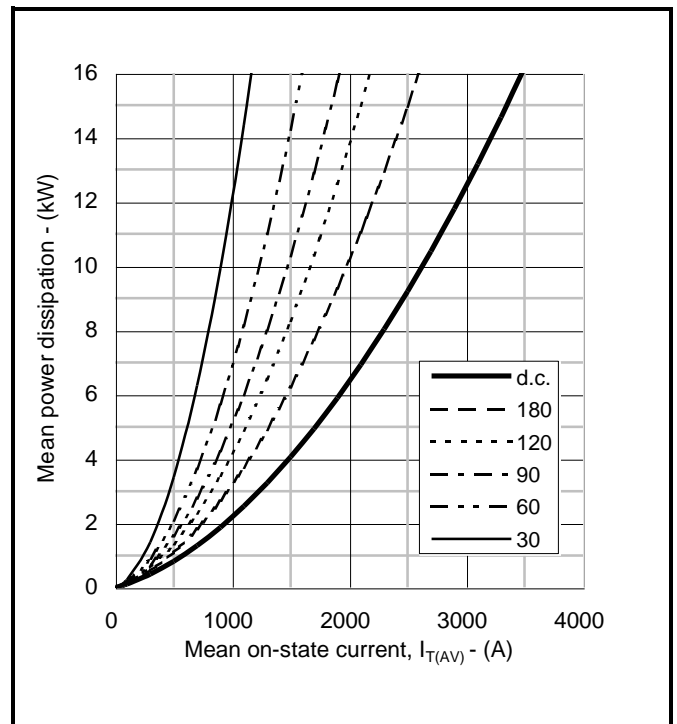


Fig.6 On-state power dissipation – rectangular wave

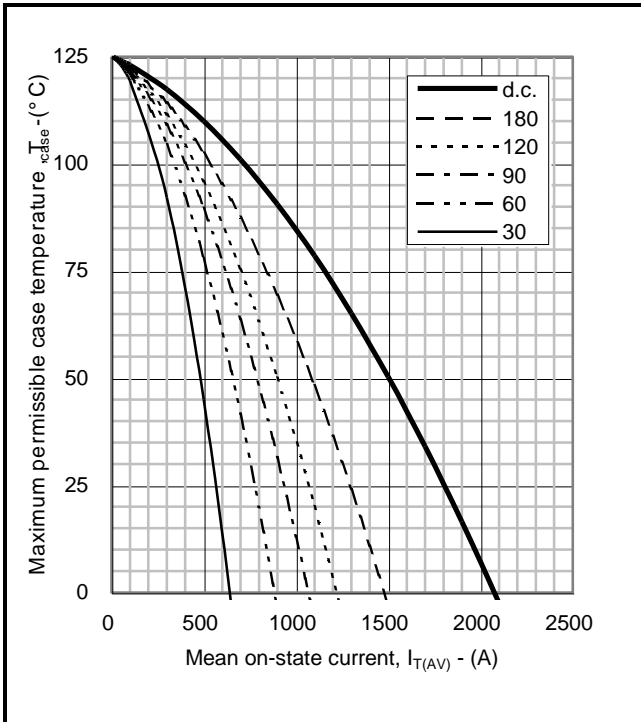


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

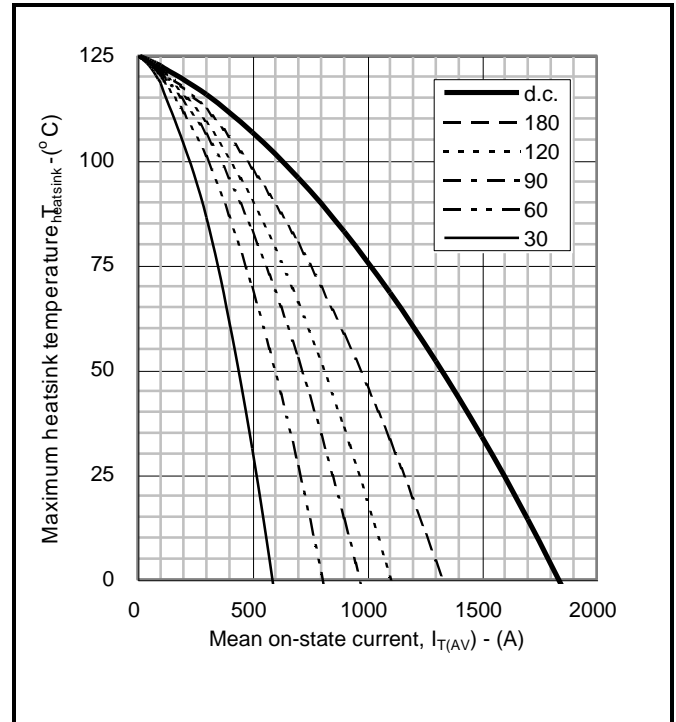


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

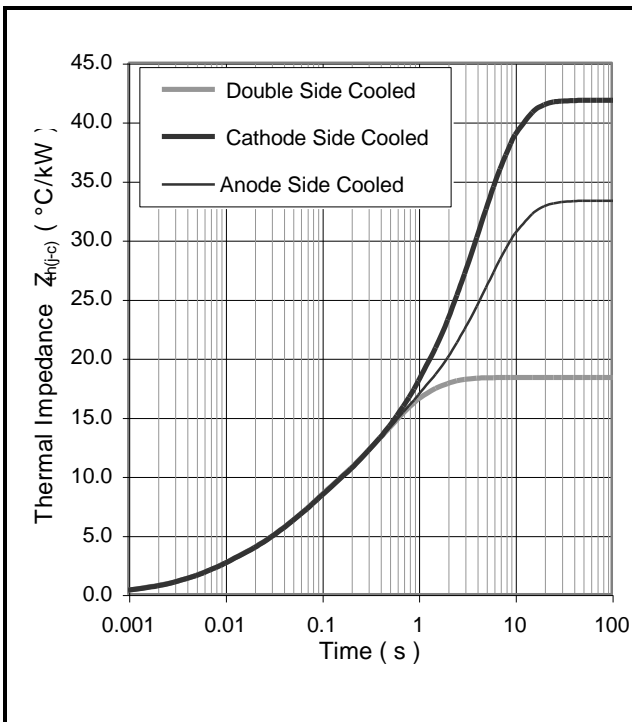


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

		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.

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

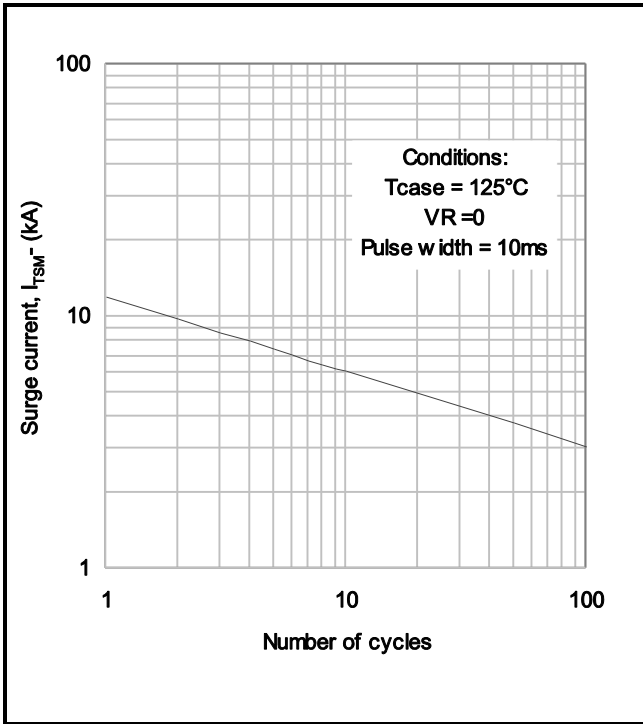


Fig.10 Multi-cycle surge current

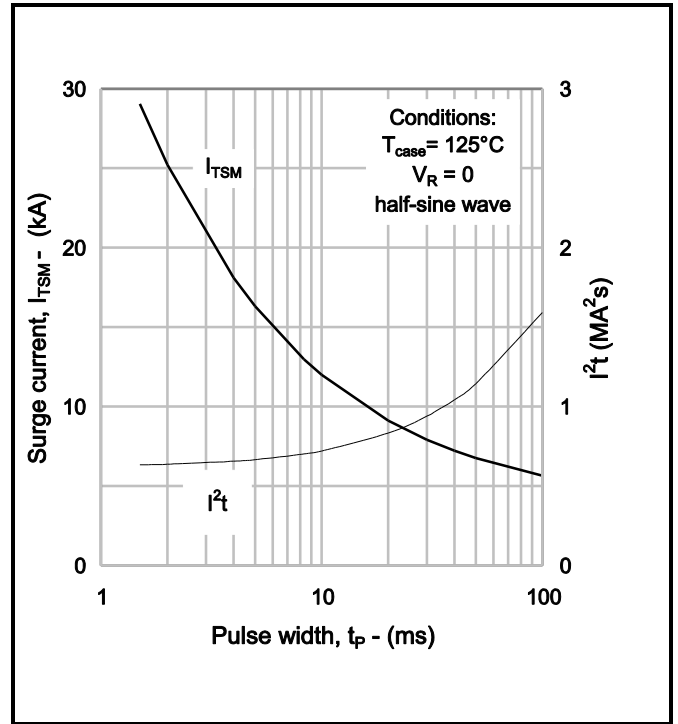


Fig.11 Single-cycle surge current

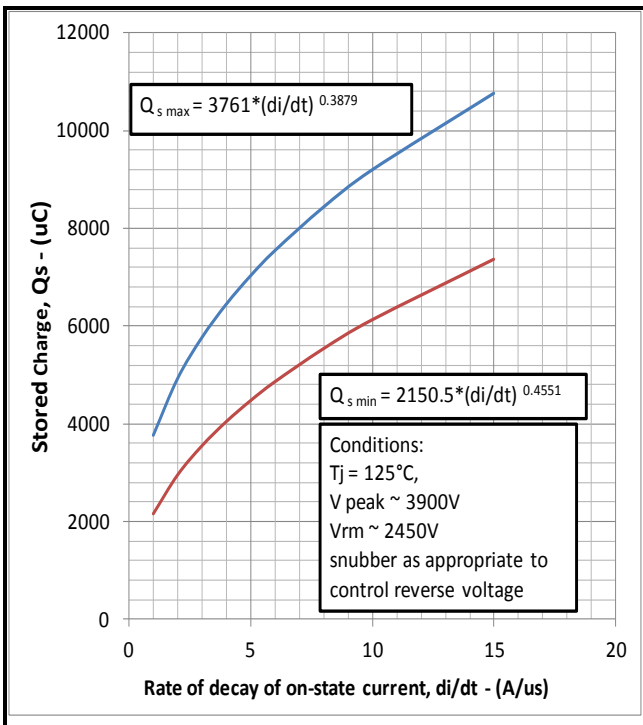


Fig.12 Stored charge

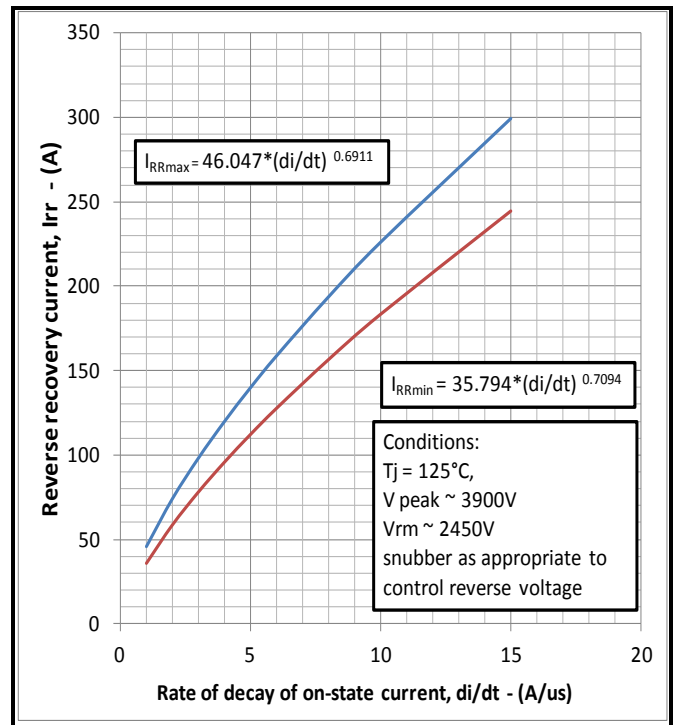


Fig.13 Reverse recovery current

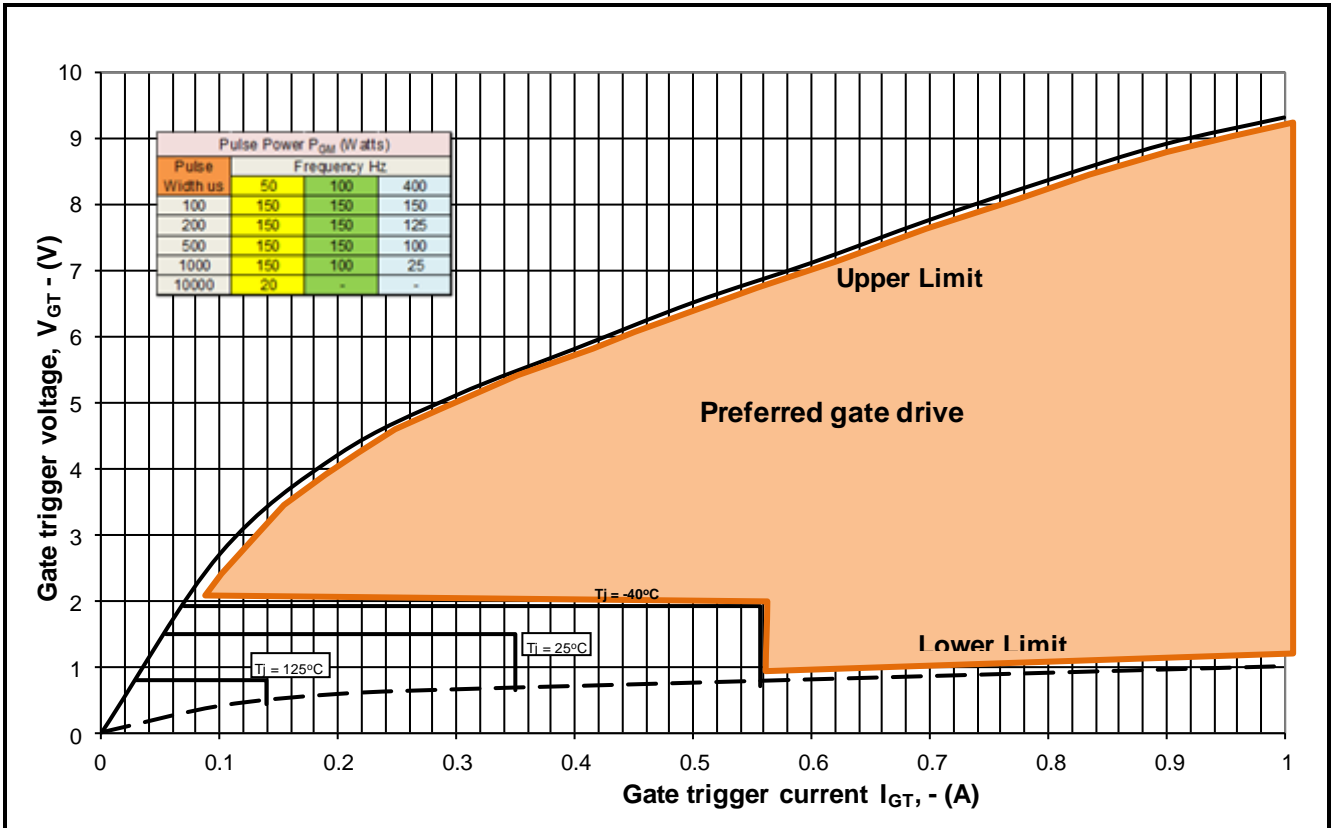


Fig14 Gate Characteristics

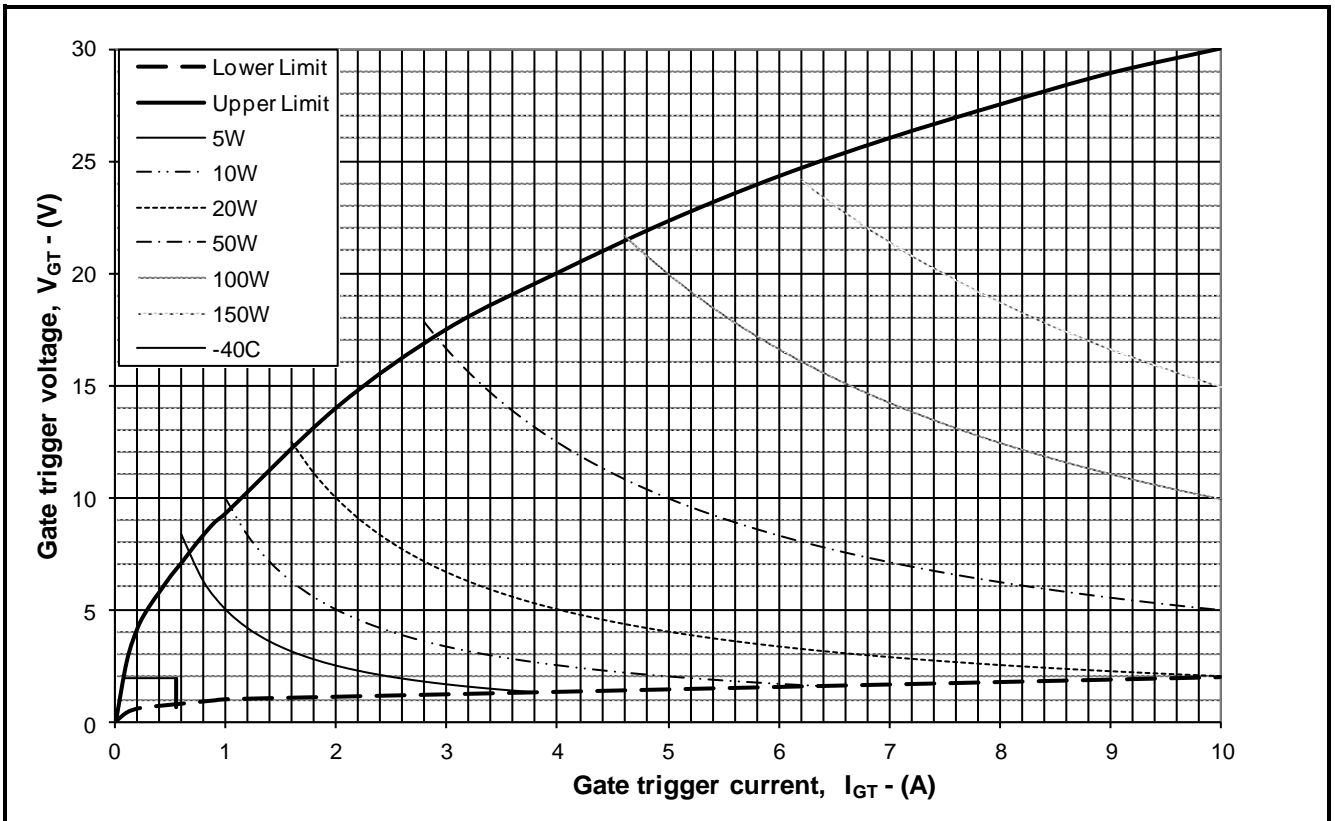


Fig. 15 Gate characteristics

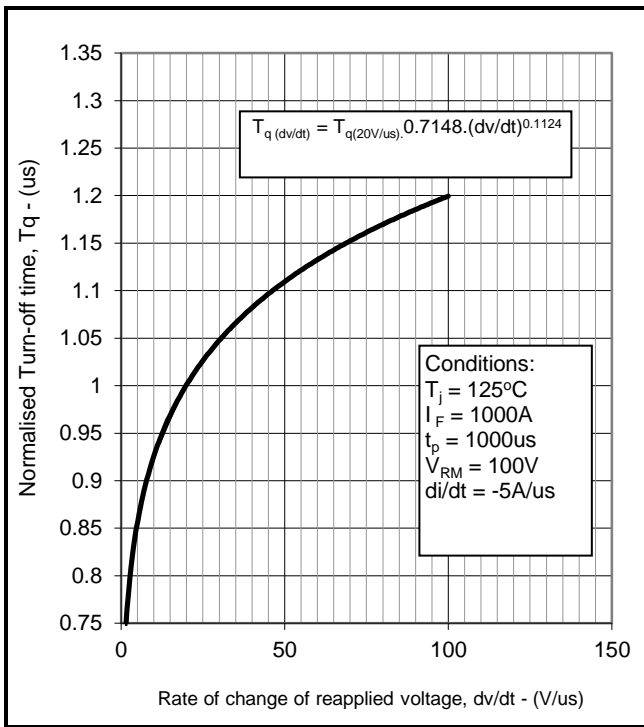
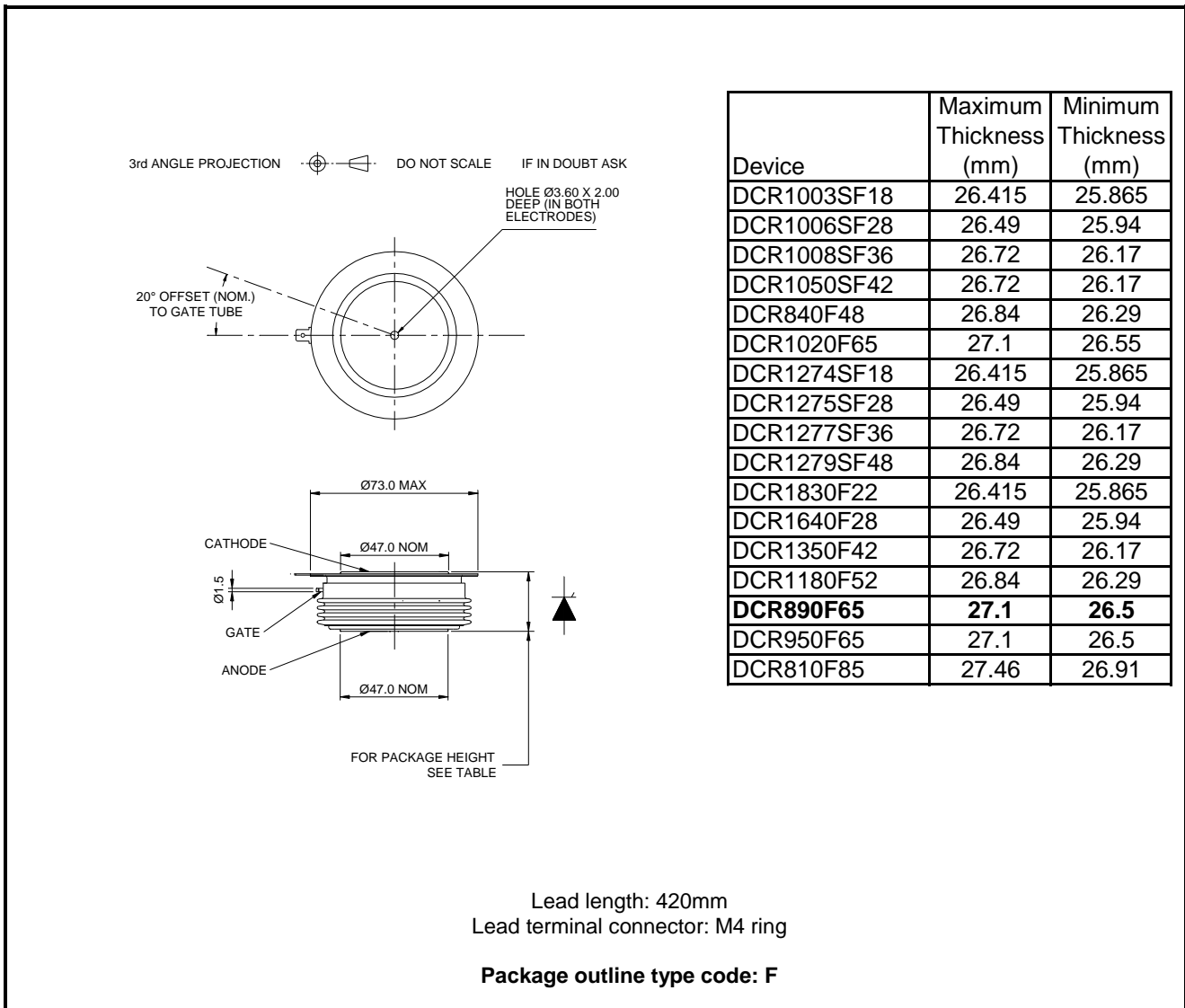


Fig.16 Turn-off time

PACKAGE DETAILS

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


Fig.17 Package outline

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