

DCR890F65

Phase Control Thyristor



DS5924-3 August 2014 (LN31844)

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* DCR890F60 DCR890F55 DCR890F50	6500 6000 5500 5000	$\begin{split} T_{vj} &= \text{-}40^{\circ}\text{C to }125^{\circ}\text{C},\\ I_{DRM} &= I_{RRM} = 200\text{mA},\\ V_{DRM}, V_{RRM}t_p &= 10\text{ms},\\ V_{DSM}\&V_{RSM} &=\\ V_{DRM}\&V_{RRM} + 100V\\ respectively \end{split}$

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

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.

KEY PARAMETERS

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

* Higher dV/dt selections available

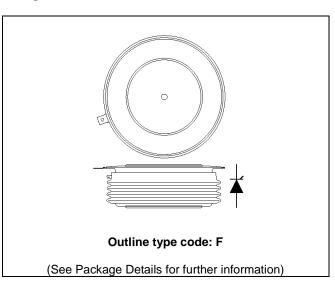


Fig. 1 Package outline





CURRENT RATINGS

T_{case} = 60°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
Double Si	de Cooled			
I _{T(AV)}	Mean on-state current	Half wave resistive load	894	А
I _{T(RMS)}	RMS value	-	1404	А
I _T	Continuous (direct) on-state current	-	1371	А

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I _{TSM}	Surge (non-repetitive) on-state current	10ms half sine, T _{case} = 125°C	12.0	kA
l ² t	I ² t for fusing	$V_R = 0$	0.72	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	-	0.0184	°C/W
		Single side cooled	Anode DC	-	0.0333	°C/W
			Cathode DC	-	0.0418	°C/W
R _{th(c-h)}	Thermal resistance – case to heatsink	Clamping force 23 kN	Double side	-	0.004	°C/W
		(with mounting compound)	Single side	-	0.008	°C/W
T _{vj}	Virtual junction temperature	Blocking V _{DRM} / _{VRRM}		-	125	°C
T _{stg}	Storage temperature range			-55	125	°C
Fm	Clamping force			20.0	25.0	kN





DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditio	ns	Min.	Max.	Units
I _{RRM} /I _{DRM}	Peak reverse and off-state current	At V _{RRM} /V _{DRM} , T _{case} = 125°C		-	200	mA
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V _{DRM} , T _j = 125°C, ga	ate open	-	1500	V/µs
dl/dt	Rate of rise of on-state current	From 67% V _{DRM} to 2x I _{T(AV)}	Repetitive 50Hz	-	100	A/µs
		Gate source 30V, 10Ω,	Non-repetitive	-	200	A/µs
		$t_r < 0.5 \mu s, T_j = 125 ^{\circ} C$				
V _{T(TO)}	Threshold voltage – Low level	100A to 870A at T _{case} = 125°	С	-	1.000	V
	Threshold voltage – High level	870A to 3000A at T _{case} = 125	5°C	-	1.1847	V
r _T	On-state slope resistance – Low level	100A to 870A at T _{case} = 125°C		-	1.1429	mΩ
	On-state slope resistance – High level	870A to 3000A at T _{case} = 125°C		-	0.9472	mΩ
t _{gd}	Delay time	$V_D = 67\% \ V_{DRM}$, gate source 30V, 10Ω		-	3	μs
		$t_r = 0.5 \mu s, T_j = 25^{\circ}C$				
tq	Turn-off time	T_j = 125°C, I _{peak} = 1000A, t_p = 1000us, V_R = 100V, dI/dt = 5A/ μ s,		600	1000	μs
		dV _{DR} /dt = 20V/μs linear to 25	500V			
I _{RR}	Reverse Recovery current	I _T = 1000A, tp = 1000us,T _i = 125°C,		90	120	Α
Qs	Stored charge	$dI/dt = -5A/\mu s$, $V_{Rpeak} = 100V$		2500	4000	μC
IL	Latching current	$T_j = 25^{\circ}C, V_D = 5V$		-	3	Α
IH	Holding current	$T_j = 25^{\circ}C, R_{G-K} = \infty, I_{TM} = 50^{\circ}$	0A, 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

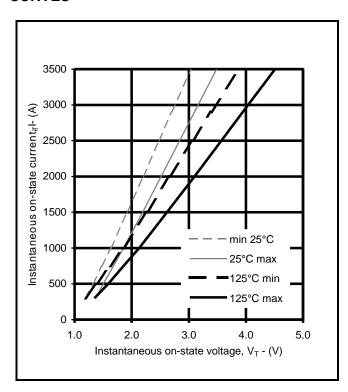


Fig.2 Maximum & minimum on-state characteristics

 V_{TM} EQUATION Where A = 0.874878 B = 0.001945

 $V_{TM} = A + Bln (I_T) + C.I_T + D.\sqrt{I_T}$ C = 0.000808

D = 0.013372

these values are valid for $T_j = 125$ °C for $I_T 300$ A to 3500A



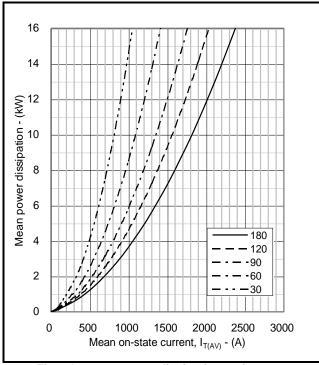


Fig.3 On-state power dissipation – sine wave

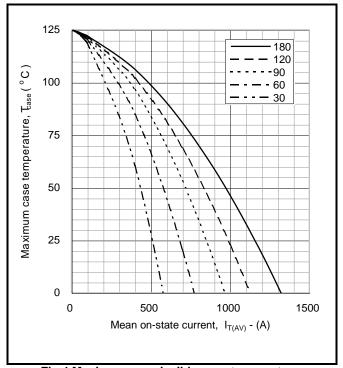


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

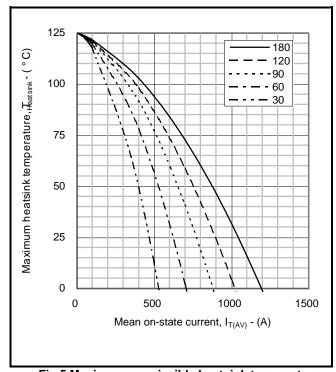


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

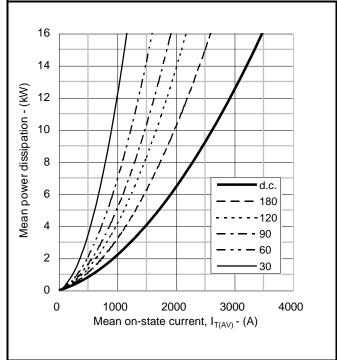


Fig.6 On-state power dissipation - rectangular wave



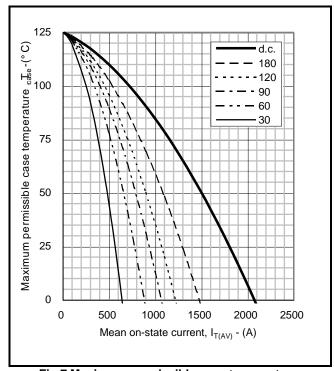


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

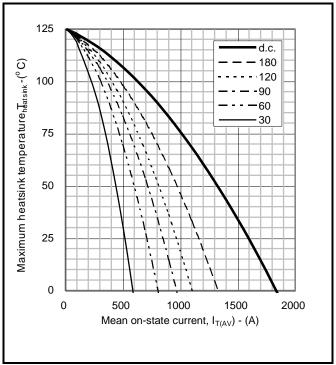
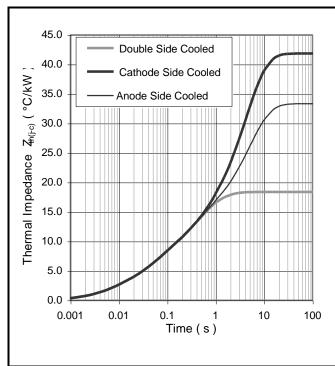


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave



		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

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

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

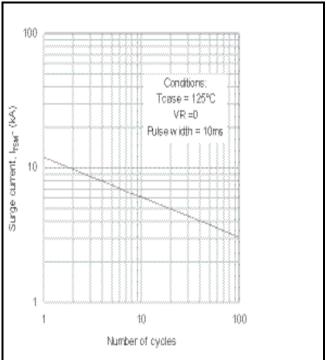
Tables show the increments of thermal resistance $R_{\text{th(j-c)}}$ when the device operates at conduction angles other than d.c.

			_			
Double side cooling					Anode Side	Cooling
	$\Delta Z_{th}(z)$				ΔZ_t	_h (z)
θ °	sine.	rect.		θ°	sine.	rect.
180	3.19	2.14		180	2.97	2.03
120	3.72	3.10		120	3.43	2.89
90	4.29	3.64		90	3.92	3.36
60	4.81	4.23		60	4.36	3.87
30	5.22	4.88		30	4.69	4.41
15	5.40	5.22		15	4.84	4.70

Ca	thode Sided Cooling				
	$\Delta Z_{th}(z)$				
θ°	sine.	rect.			
180	2.95	2.02			
120	3.40	2.87			
90	3.88	3.34			
60	4.31	3.84			
30	4.64	4.37			
15	4.79	4.65			

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







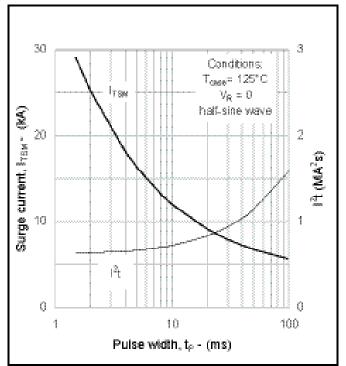


Fig.11 Single-cycle surge current

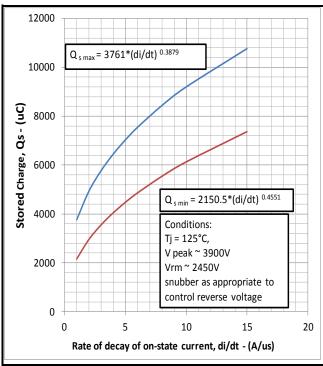


Fig.12 Stored charge

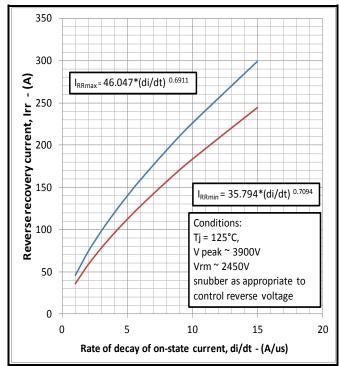


Fig.13 Reverse recovery current

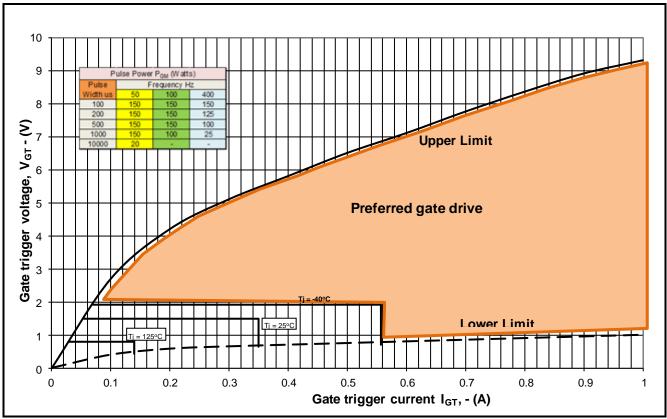


Fig14 Gate Characteristics

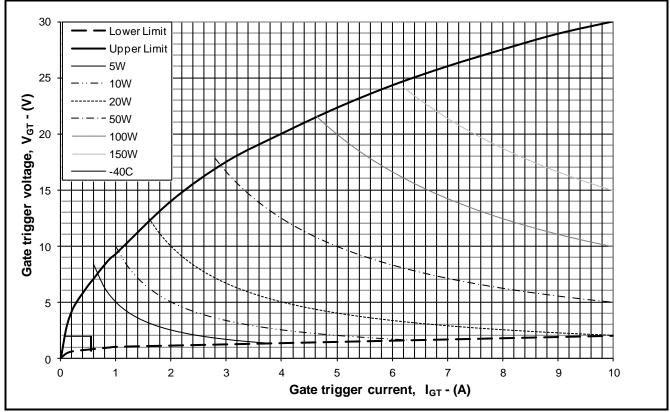


Fig. 15 Gate characteristics

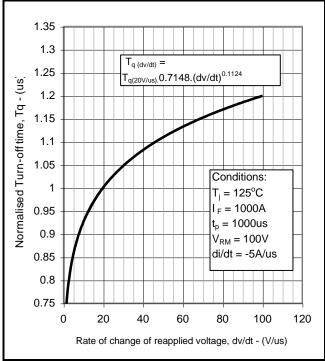


Fig.16 Turn-off time



PACKAGE DETAILS

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

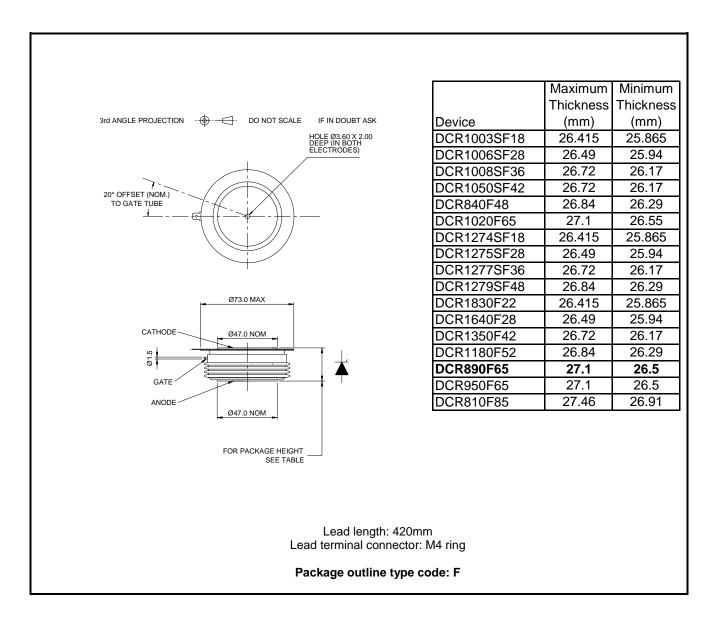


Fig.17 Package outline





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