

Date: - 20th March, 2014

Data Sheet Issue:- 2

Rectifier Diode Types W1748LC180 to W1748LC250

Previous Type No.: SW02-22CXC805

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{RRM}	Repetitive peak reverse voltage, (note 1)	1800-2500	V
V _{RSM}	Non-repetitive peak reverse voltage, (note 1)	1900-2600	V

	OTHER RATINGS	MAXIMUM LIMITS	UNITS
I _{F(AV)M}	Maximum average forward current, T _{sink} =55°C, (note 2)	1748	А
I _{F(AV)M}	Maximum average forward current. T _{sink} =100°C, (note 2)	1288	Α
I _{F(RMS)M}	Nominal RMS forward current, T _{sink} =25°C, (note 2)	3157	Α
I _{F(d.c.)}	D.C. forward current, T _{sink} =25°C, (note 3)	2371	Α
I _{FSM}	Peak non-repetitive surge t _p =10ms, V _{rm} =60%V _{RRM} , (note 4)	15.4	kA
I _{FSM2}	Peak non-repetitive surge t _p =10ms, V _{rm} ≤10V, (note 4)	17.7	kA
l ² t	I ² t capacity for fusing t _p =10ms, V _{rm} =60%V _{RRM} , (note 4)	1.18×10 ⁶	A ² s
l ² t	I²t capacity for fusing t _p =10ms, V _{rm} ≤10V, (note 4)	1.56×10 ⁶	A ² s
T _{j op}	Operating temperature range	-40 to +175	°C
T _{stg}	Storage temperature range	-40 to +200	°C

Notes:-

- 1) De-rating factor of 0.13% per °C is applicable for T_j below 25°C.
- 2) Double side cooled, single phase; 50Hz, 180° half-sinewave.
- 3) Double side cooled.
- 4) Half-sinewave, 175°C T_j initial.



Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS (Note 1)	UNITS
V _{FM}	Maximum peak forward voltage	-	-	1.93	I _{FM} =3770A	V
V _{T0}	Threshold voltage	-	-	0.87		V
r⊤	Slope resistance	-	-	0.28		mΩ
I _{RRM}	Peak reverse current	-	-	30	Rated V _{RRM}	mA
D	Thermal registeres innetion to be stainly	-	-	0.033	Double side cooled	K/W
R _{thJK}	Thermal resistance, junction to heatsink	-	-	0.065	Single side cooled	K/W
F	Mounting force	10	-	20	Note 2	kN
W_t	Weight		340			g

Notes:-

- 1) Unless otherwise indicated $T_j=175$ °C.
- 2) For other clamp forces, please consult factory.



Notes on Ratings and Characteristics

1.0 Voltage Grade Table

Voltage Grade	V _{RRM} V	V _{RSM} V	V _R DC V
18	1800	1900	1150
22	2200	2300	1350
25	2500	2600	1500

2.0 Extension of Voltage Grades

This report is applicable to other voltage grades when supply has been agreed by Sales/Production.

3.0 De-rating Factor

A blocking voltage de-rating factor of 0.13%/°C is applicable to this device for T_i below 25°C.

4.0 Snubber Components

When selecting snubber components, care must be taken not to use excessively large values of snubber capacitor or excessively small values of snubber resistor. Such excessive component values may lead to device damage due to the large resultant values of snubber discharge current. If required, please consult the factory for assistance.

5.0 Computer Modelling Parameters

5.1 Device Dissipation Calculations

$$I_{AV} = \frac{-V_{T0} + \sqrt{{V_{T0}}^2 + 4 \cdot ff^2 \cdot r_T \cdot W_{AV}}}{2 \cdot ff^2 \cdot r_T} \qquad \qquad W_{AV} = \frac{\Delta T}{R_{th}}$$
 and:
$$\Delta T = T_{j \max} - T_K$$

Where $V_{T0}=0.87V$, $r_{T}=0.28m\Omega$,

 R_{th} = Supplementary thermal impedance, see table below and

ff = Form factor, see table below.

Supplementary Thermal Impedance					
Conduction Angle	6 phase (60°)	3 phase (120°)	½ wave (180°)	d.c.	
Square wave Double Side Cooled	0.0455	0.0393	0.0362	0.0319	
Square wave Cathode Side Cooled	0.0753	0.0711	0.0687	0.0646	
Sine wave Double Side Cooled	0.0397	0.0350	0.0313		
Sine wave Cathode Side Cooled	0.0699	0.0677	0.0653		

Form Factors					
Conduction Angle 6 phase (60°) 3 phase (120°) ½ wave (180°) d.c.					
Square wave	2.449	1.732	1.414	1	
Sine wave	2.778	1.879	1.57		



5.2 Calculating V_F using ABCD Coefficients

The on-state characteristic I_F vs. V_F, on page 8 is represented in two ways;

- (i) the well established V_{T0} and r_T tangent used for rating purposes and
- (ii) a set of constants A, B, C, D, forming the coefficients of the representative equation for V_F in terms of I_F given below:

$$V_F = A + B \cdot \ln(I_F) + C \cdot I_F + D \cdot \sqrt{I_F}$$

The constants, derived by curve fitting software, are given below for characteristics at the maximum junction temperature of 175°C. The resulting values for V_F agree with the true device characteristic over a current range, which is limited to that plotted.

175°C Coefficients					
A 0.3867852					
В	0.05612815				
С	0.240698×10 ⁻³				
D	2.821743×10-3				



5.3 D.C. Thermal Impedance Calculation

$$r_{t} = \sum_{p=1}^{p=n} r_{p} \cdot \left(1 - e^{\frac{-t}{\tau_{p}}}\right)$$

Where p = 1 to n, n is the number of terms in the series and:

t = Duration of heating pulse in seconds.

 r_{t} = Thermal resistance at time t.

 r_p = Amplitude of p_{th} term.

 τ_p = Time Constant of r_{th} term.

The coefficients for this device are shown in the tables below:

D.C. Double Side Cooled						
Term	Term 1 2 3 4					
r_p	0.017719	4.2406×10 ⁻³	6.9638×10 ⁻³	3.04366×10 ⁻³		
$ au_{\mathcal{P}}$	0.708578	0.1435833	0.036152	2.1308×10 ⁻³		

	D.C. Single Side Cooled						
Term	1	2	3	4	5		
r_{ρ}	0.04013	6.3388×10 ⁻³	0.011408	6.0275×10 ⁻³	7.2098×10 ⁻⁴		
$ au_{\mathcal{P}}$	4.07311	2.15774	0.19931	9.0689×10 ⁻³	4.66345×10 ⁻⁴		



Curves

Figure 1 – Mean forward current vs. power dissipation– Double side cooled

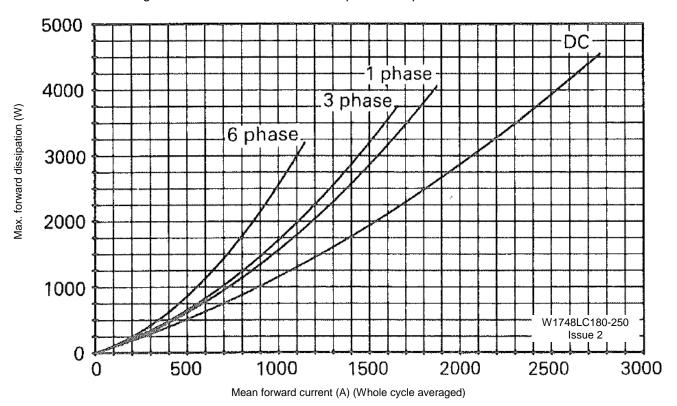
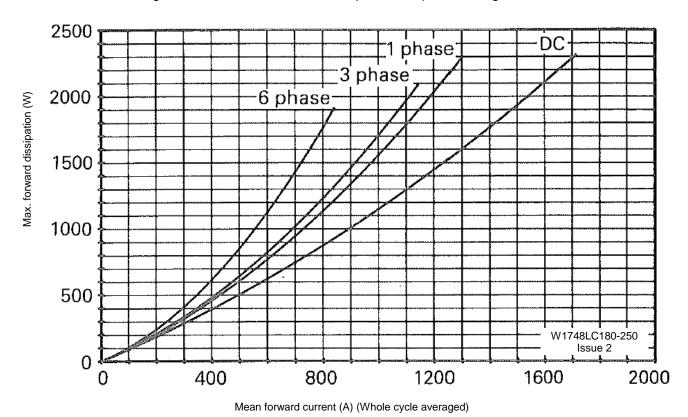
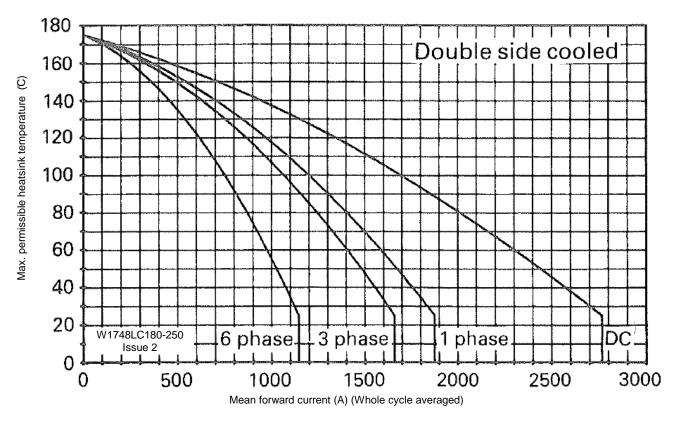


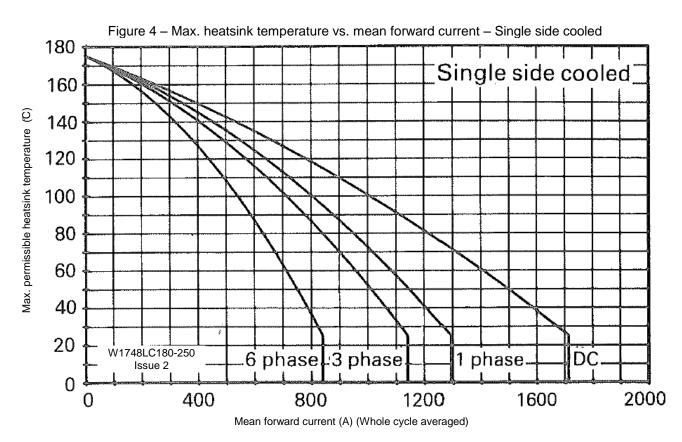
Figure 2 - Mean forward current vs. power dissipation - Single side cooled





 $\label{eq:figure 3-Max.} Figure \ 3-Max. \ heatsink \ temperature \ vs. \ mean \ forward \ current-Double \ side \ cooled$







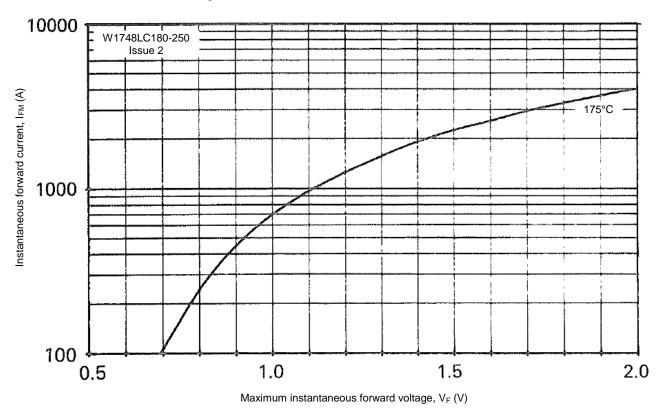
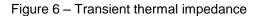


Figure 5 – Forward characteristics of limit device



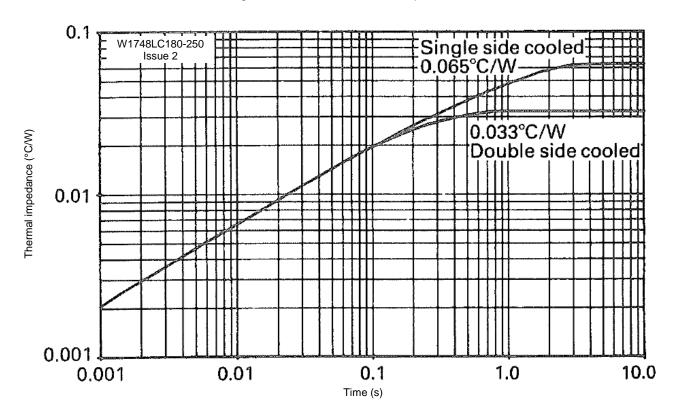
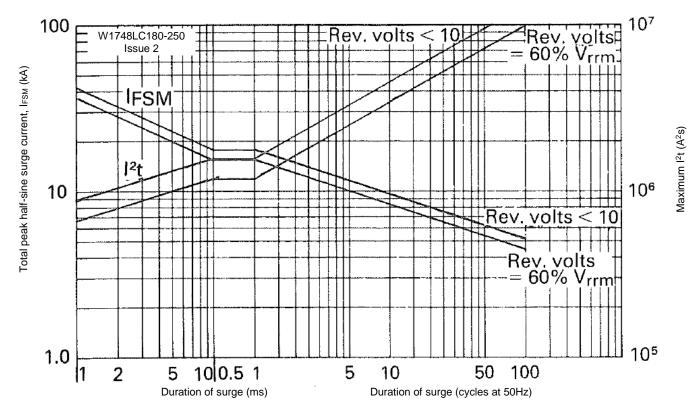


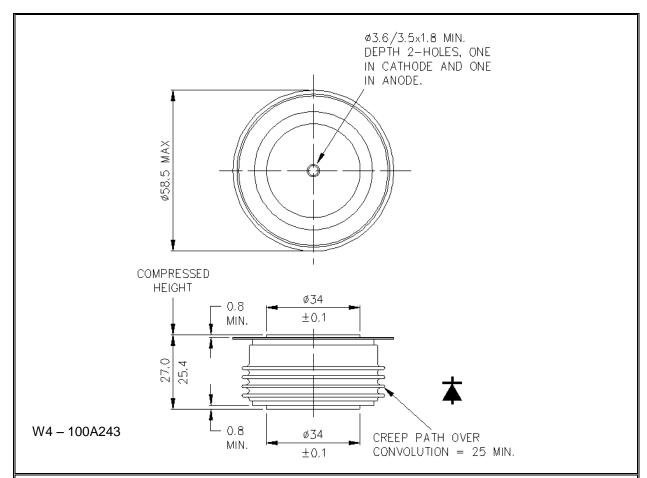


Figure 7 – Maximum non-repetitive surge current at initial junction temperature 160°C





Outline Drawing & Ordering Information



ORDERING INFORMATION

(Please quote 10 digit code as below)

W1748	LC	**	0
Fixed Type Code	Fixed Outline Code	Voltage code V _{RRM} /100 18-25	Fixed code

Order code: W1748LC250 - 2500V V_{RRM}, 27mm clamp height capsule.

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