TK12

Phase Control Thyristor

Replaces January 2000 version, DS4252-4.0

DS4252-5.0 July 2001

FEATURES

- High Surge Capability

APPLICATIONS

- High Power Drives
- High Voltage Power Supplies
- DC Motor Control
- Welding
- Battery Chargers

KEY PARAMETERS

V_{DRM} 2000V

$I_{T(AV)}$ 75A

I_{TSM} 1400A

dVdt* 200V/μs

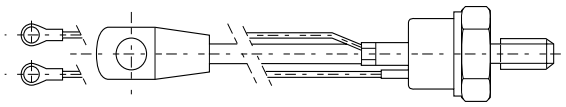
dI/dt 500A/μs

***Higher dV/dt selections available**

VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages V_{DRM} V_{RRM} V	Conditions
TK12 20 M or K TK12 18 M or K TK12 16 M or K TK12 14 M or K	2000 1800 1600 1400	T_{vj} = 0˚ to 125˚C, I_{DRM} = I_{RRM} = 100mA, V_{DRM}, V_{RRM} t_p = 10ms, V_{DSM} & V_{RSM} = V_{DRM} & V_{RRM} + 100V Respectively

Lower voltage grades available.



Outline type code: TO94.
See Package Details for further information.

Fig. 1 Package outline

ORDERING INFORMATION

When ordering, select the required part number shown in the Voltage Ratings selection table, then:-

Add K to type number for 1/2" 20 UNF thread, e.g. **TK12 18K**.

or

Add M to type number for M12 thread, e.g. **TK12 14M**.

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

CURRENT RATINGS

T_{case} = 60˚C unless stated otherwise.

Symbol	Parameter	Conditions	Max.	Units
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	104	A
$I_{T(RMS)}$	RMS value	-	163	A
I_T	Continuous (direct) on-state current	-	139	A

T_{case} = 80˚C unless stated otherwise.

Symbol	Parameter	Conditions	Max.	Units
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	75	A
$I_{T(RMS)}$	RMS value	-	120	A
I_T	Continuous (direct) on-state current	-	100	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine; T_{case} = 125°C	1.12	kA
I^2t	I^2t for fusing	V_R = 50% V_{RRM} - 1/4 sine	6.2 x 10^3	A^2s
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine; T_{case} = 125°C	1.4	kA
I^2t	I^2t for fusing	V_R = 0	9.8 x 10^3	A^2s

THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	dc	-	0.24	°C/W
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Mounting torque 15.0Nm with mounting compound	-	0.08	°C/W
T_{vj}	Virtual junction temperature	On-state (conducting)	-	125	°C
		Reverse (blocking)	-	125	°C
T_{stg}	Storage temperature range		–40	150	°C
-	Mounting torque		12.0	15.0	Nm

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Conditions		Min.	Max.	Units
V_{TM}	Maximum on-state voltage	At 150A peak, T_{case} = 25°C		-	2.0	V
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V_{RRM}/V_{DRM}, T_{case} = 125°C		-	10	mA
dV/dt	Maximum linear rate of rise of off-state voltage	To 60% V_{DRM} T_j = 125°C, Gate open circuit		-	200	V/µs
dI/dt	Rate of rise of on-state current	Gate source 20V, 20Ω $t_r \leq 0.5\mu s$, T_j = 125˚C	Repetitive 50Hz	-	500	A/µs
			Non-repetitive	-	800	A/µs
$V_{T(TO)}$	Threshold voltage	At T_{vj} = 125°C		-	1.4	V
r_T	On-state slope resistance	At T_{vj} = 125°C		-	4.0	mΩ
t_{gd}	Delay time	V_D = 300V, I_G = 1A, I_T = 50A, dI/dt = 50A/µs, dI_G/dt = 1A/µs, T_j = 25°C		-	1.5	µs
I_L	Latching current	T_j = 25°C, V_D = 12V		-	-	mA
I_H	Holding current	T_j = 25°C, V_D = 12V, I_{TM} = 1A		-	50	mA

GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Conditions	Typ.	Max.	Units
V_{GT}	Gate trigger voltage	V_{DRM} = 12V, T_{case} = 25°C, R_L = 6Ω	-	3.0	V
I_{GT}	Gate trigger current	V_{DRM} = 12V, T_{case} = 25°C, R_L = 6Ω	-	125	mA
V_{GD}	Gate non-trigger voltage	At V_{DRM} T_{case} = 125°C, R_L = 12Ω	-	0.2	V
V_{FGM}	Peak forward gate voltage	Anode positive with respect to cathode	-	3.0	V
V_{FGN}	Peak forward gate voltage	Anode negative with respect to cathode	-	0.25	V
V_{RGM}	Peak reverse gate voltage		-	5	V
I_{FGM}	Peak forward gate current	Anode positive with respect to cathode	-	4	A
P_{GM}	Peak gate power	-	-	16	W
$P_{G(AV)}$	Mean gate power		-	3	W

CURVES

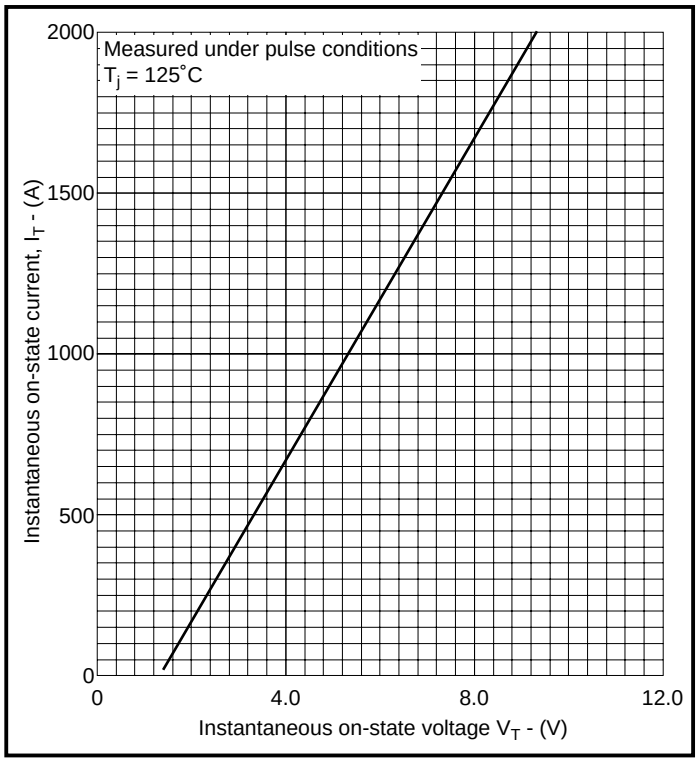
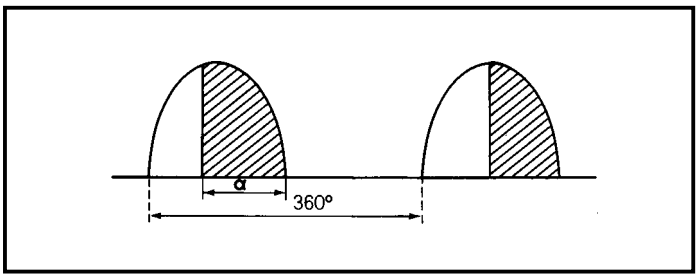
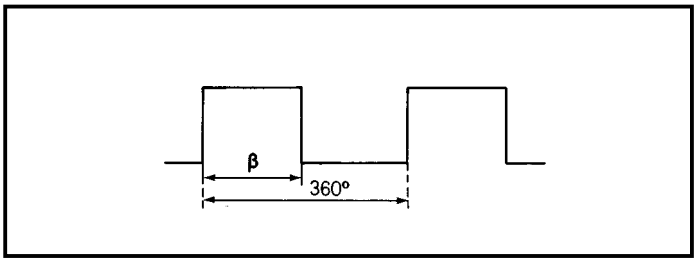


Fig.2 Maximum (limit) on-state characteristics

SINUSOIDAL CURRENT WAVEFORM



RECTANGULAR CURRENT WAVEFORM



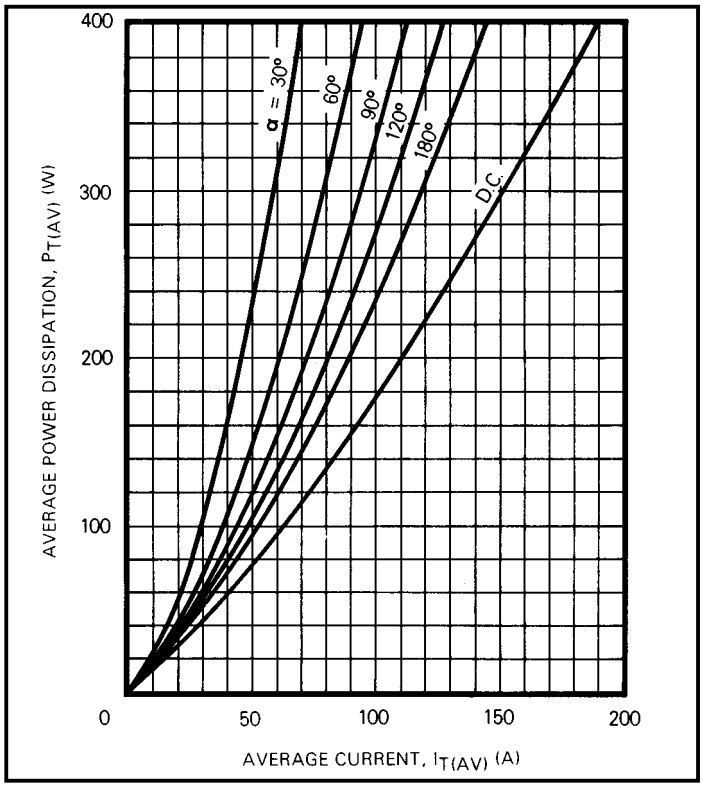


Fig.3 Maximum on-state power dissipation for sinusoidal current waveform

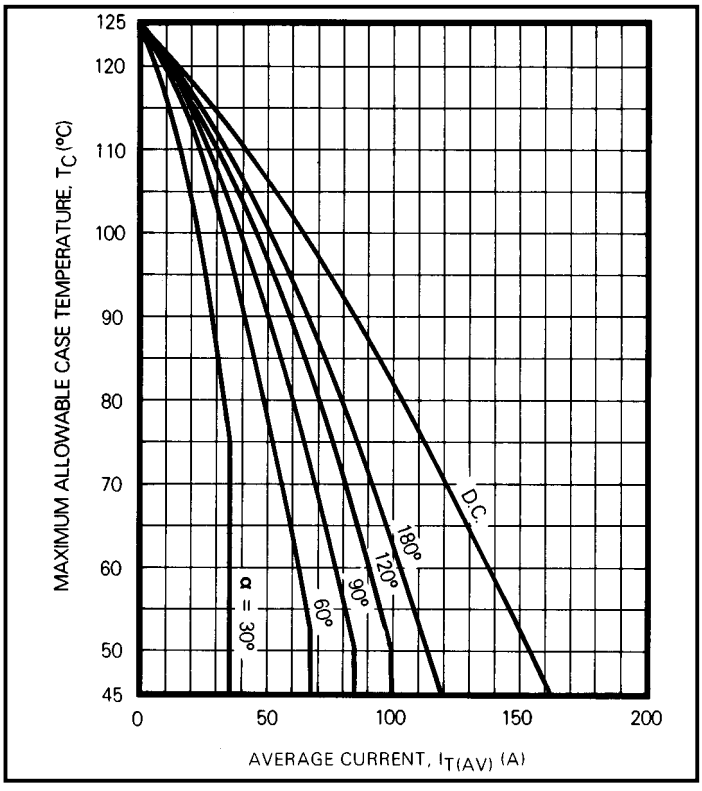


Fig.4 Maximum allowable case temperature for sinusoidal current waveform

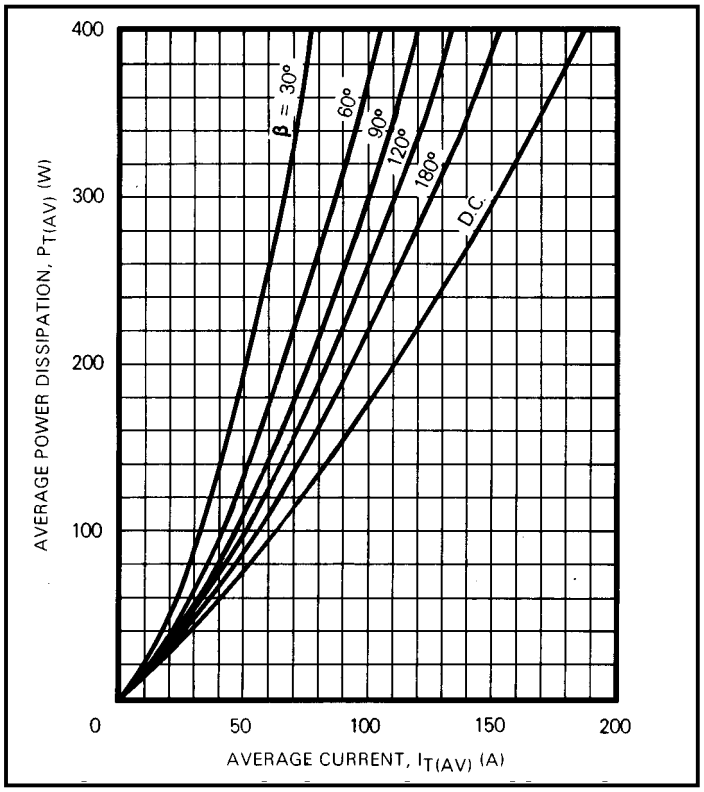


Fig.5 Maximum on-state power dissipation for rectangular current waveform

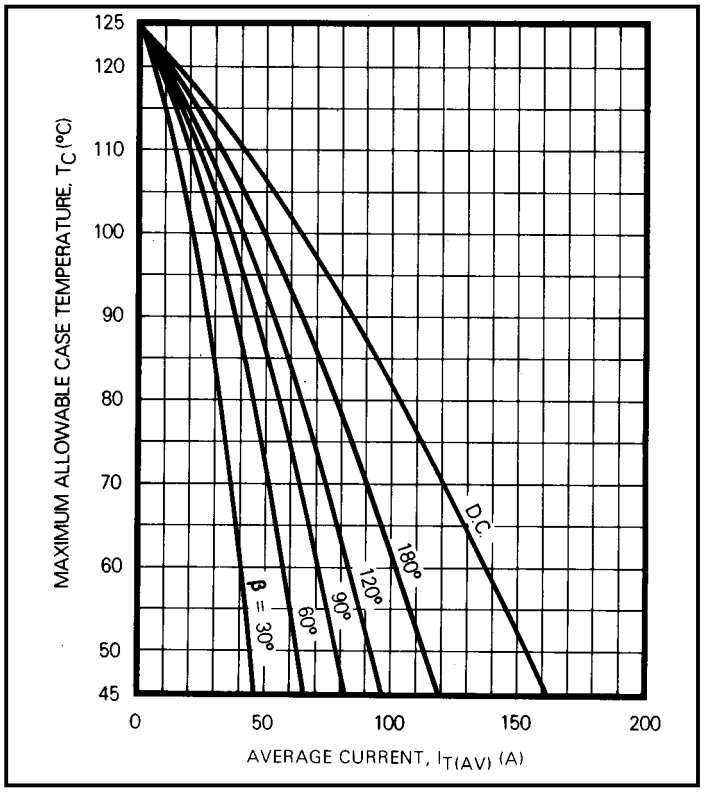


Fig.6 Maximum allowable case temperature for rectangular current waveform

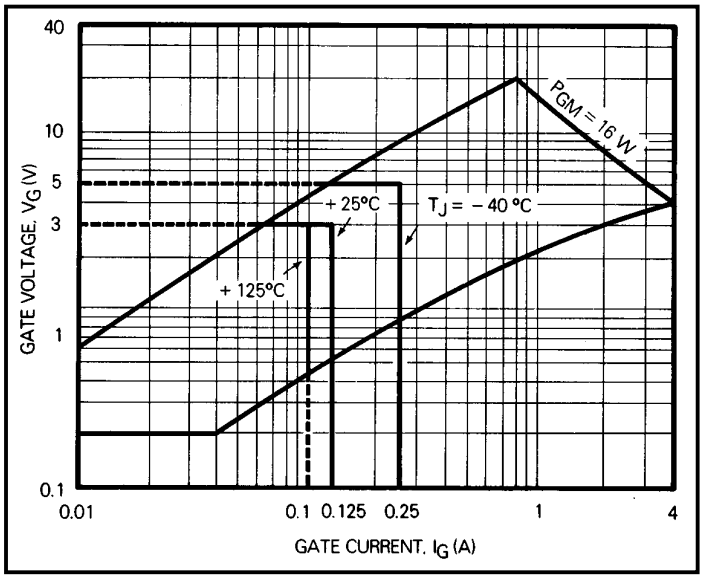
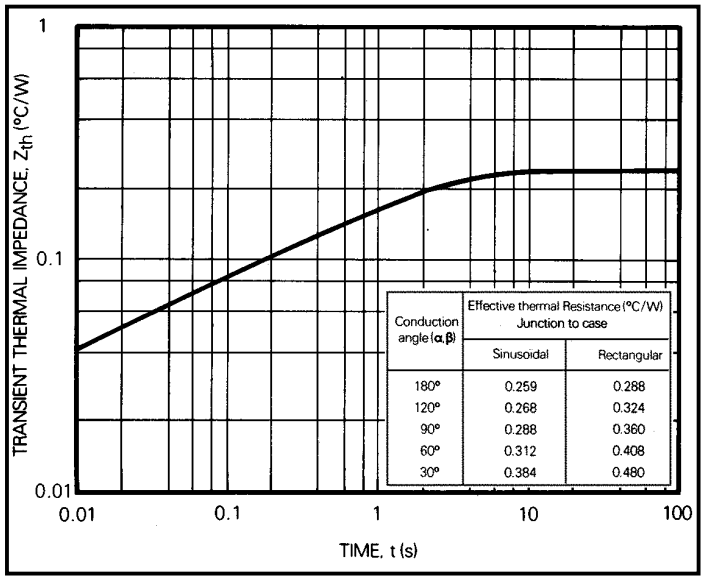


Fig.7 Gate trigger characteristics



Conduction angle (α, β)	Effective thermal Resistance (°C/W) Junction to case	
	Sinusoidal	Rectangular
180°	0.259	0.288
120°	0.268	0.324
90°	0.288	0.360
60°	0.312	0.408
30°	0.384	0.480

Fig.8 Transient thermal impedance - junction to case

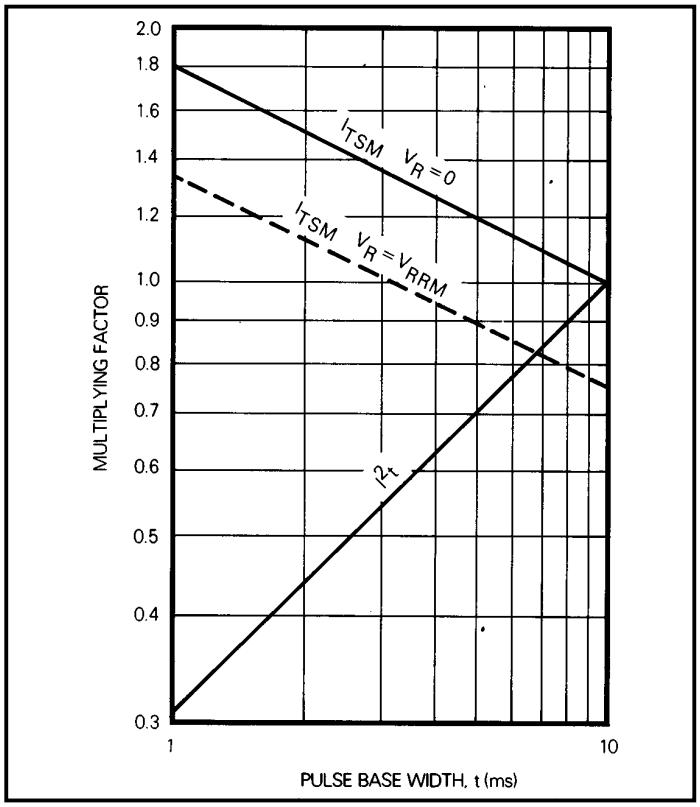


Fig.9 Multiplying factor for non-repetive sub-cycle surge on-state current and I^2t rating

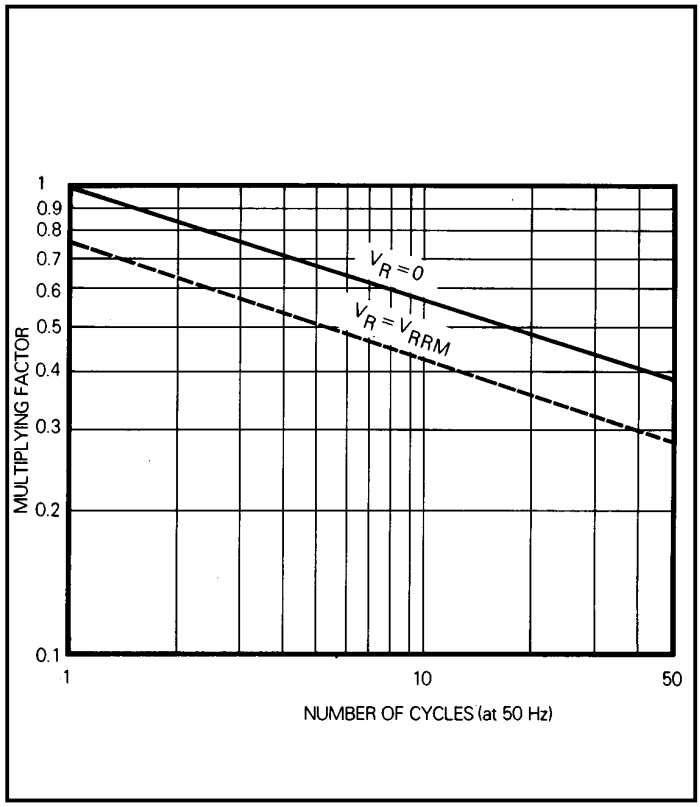
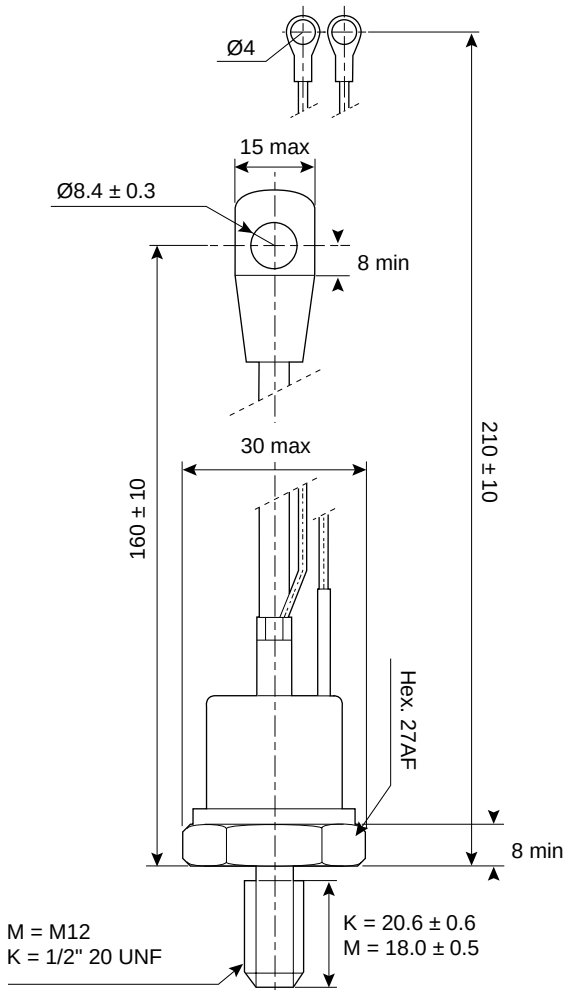


Fig.10 Multiplying factor for non-repetive surge on-state current

PACKAGE DETAILS

For further package information, please contact your nearest Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



Nominal weight: 120g
Mounting torque: 15Nm ±10%
Gate lead colour: White
Cathode lead colour: Red

Package outine type code: TO94

POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

DEVICE CLAMPS

Disc devices require the correct clamping force to ensure their safe operation. The PACS range includes a varied selection of pre-loaded clamps to suit all of our manufactured devices. Types available include cube clamps for single side cooling of 'T' 23mm and 'E' 30mm discs, and bar clamps right up to 83kN for our 'Z' 100mm thyristors and diodes.

Clamps are available for single or double side cooling, with high insulation versions for high voltage assemblies.

Please refer to our application note on device clamping, AN4839

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or customer service office.

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Target Information: This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

Preliminary Information: The product is in design and development. The datasheet represents the product as it is understood but details may change.

Advance Information: The product design is complete and final characterisation for volume production is well in hand.

No Annotation: The product parameters are fixed and the product is available to datasheet specification.