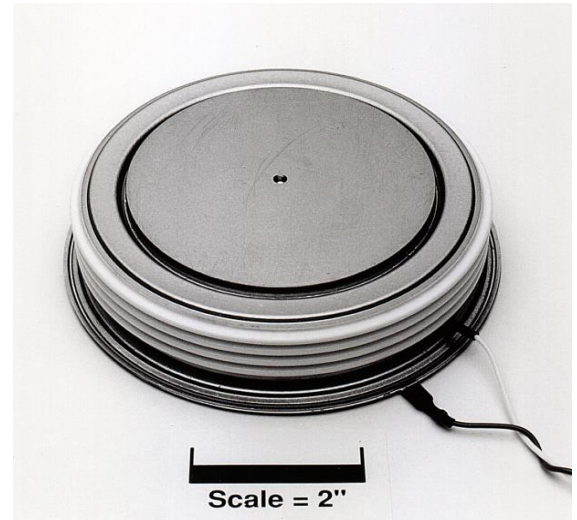
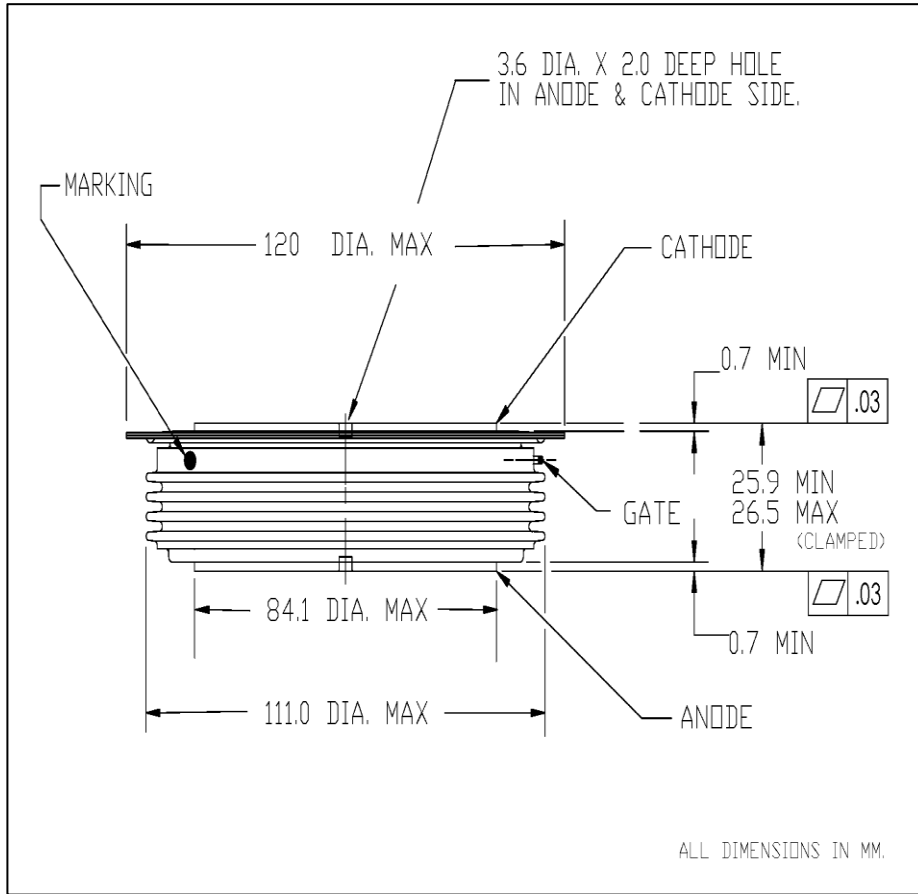




The TCU4 is a high voltage, high current disc pack SCR employing a high di/dt gate structure. This gate design allows the SCR to be reliably operated at high di/dt and dv/dt conditions in various phase control applications.

### FEATURES:

- Low On-State Voltage
- High di/dt Capability
- High dv/dt Capability
- Hermetic Ceramic Package
- Excellent Surge and  $I^2t$  Ratings

### APPLICATIONS:

- DC Power Supplies
- Motor Controls
- SS Contactors

### ORDERING INFORMATION

Select the complete 12 digit Part Number using the table below.  
 EXAMPLE: TCU428340HDH is a 2800V-3400A SCR with 250ma IGT and standard 12 inch gate and cathode potential leads.

| PART                                                                                                                            | Voltage Rating<br>$V_{DRM}$ - $V_{RRM}$ | Voltage Code | Current Rating<br>$I_{avg}$ | Current Code | Turn-Off<br>$T_q$ | Gate<br>$I_{GT}$ | Leads      |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------|-----------------------------|--------------|-------------------|------------------|------------|
| <b>TCU4</b>                                                                                                                     | 2800                                    | <b>28</b>    | 3400                        | <b>34</b>    | <b>0</b>          | <b>H</b>         | <b>DH</b>  |
|                                                                                                                                 | 2600                                    | <b>26</b>    |                             |              |                   |                  | <b>TM*</b> |
|                                                                                                                                 | 2400                                    | <b>24</b>    |                             |              | 500us             | 250ma            | 12" std.   |
|                                                                                                                                 | 2200                                    | <b>22</b>    |                             |              | (typ.)            | (max)            |            |
| * Optional TM lead consist of 20AWG FEP insulated twisted pair wires 17.5 inches in length with ¼" insulated fast-on terminals. |                                         |              |                             |              |                   |                  |            |

Revised:

10/28/2015

**Absolute Maximum Ratings**

| Characteristic                                      | Symbol                          | Rating        | Units                |
|-----------------------------------------------------|---------------------------------|---------------|----------------------|
| Repetitive Peak Voltage                             | $V_{\text{DRM}}-V_{\text{RRM}}$ | 2800          | Volts                |
| Average On-State Current, $T_C=70^{\circ}\text{C}$  | $I_{\text{T(Avg.)}}$            | 3400          | A                    |
| RMS On-State Current, $T_C=70^{\circ}\text{C}$      | $I_{\text{T(RMS)}}$             | 5341          | A                    |
| Average On-State Current, $T_C=54^{\circ}\text{C}$  | $I_{\text{T(Avg.)}}$            | 4000          | A                    |
| RMS On-State Current, $T_C=54^{\circ}\text{C}$      | $I_{\text{T(RMS)}}$             | 6283          | A                    |
| Peak One Cycle Surge Current, 60Hz, $V_R=0\text{V}$ | $I_{\text{TSM}}$                | 80,000        | A                    |
| Peak One Cycle Surge Current, 50Hz, $V_R=0\text{V}$ | $I_{\text{TSM}}$                | 75,424        | A                    |
| Fuse Coordination $I^2t$ , 60Hz                     | $I^2t$                          | 2.67E+07      | $\text{A}^2\text{s}$ |
| Fuse Coordination $I^2t$ , 50Hz                     | $I^2t$                          | 2.84E+07      | $\text{A}^2\text{s}$ |
| Critical Rate-of-Rise of On-State Current           | $di/dt$                         | 200           | A/us                 |
| Repetitive                                          |                                 |               |                      |
| Critical Rate-of-Rise of On-State Current           | $di/dt$                         | 400           | A/us                 |
| Non-Repetitive                                      |                                 |               |                      |
| Peak Gate Power, 100us                              | $P_{\text{GM}}$                 | 16            | Watts                |
| Average Gate Power                                  | $P_{\text{G(avg)}}$             | 5             | Watts                |
| Operating Temperature                               | $T_j$                           | -40 to+125    | $^{\circ}\text{C}$   |
| Storage Temperature                                 | $T_{\text{Stg.}}$               | -50 to+150    | $^{\circ}\text{C}$   |
| Approximate Weight                                  |                                 | 3.2           | lb                   |
|                                                     |                                 | 1.45          | Kg                   |
| Mounting Force                                      |                                 | 12,000-15,000 | lbs                  |
|                                                     |                                 | 53 - 67       | Knewtons             |

Information listed is based upon Powerex testing and projected ratings and is subject to change without notice. Powerex makes no implicit or explicit claim to reliability, capability, performance or suitability of this product for a users application. Powerex makes no guarantee of future availability of this product.

**Electrical Characteristics, Tj=25°C unless otherwise specified**

| Characteristic                              | Symbol    | Test Conditions                                                        | Rating |     |          | Units |
|---------------------------------------------|-----------|------------------------------------------------------------------------|--------|-----|----------|-------|
|                                             |           |                                                                        | min    | typ | max      |       |
| Repetitive Peak Forward Leakage Current     | $I_{DRM}$ | $T_j=125^{\circ}\text{C}$ , $V_{DRM}=\text{Rated}$                     |        |     | 250      | ma    |
| Repetitive Peak Reverse Leakage Current     | $I_{RRM}$ | $T_j=125^{\circ}\text{C}$ , $V_{RRM}=\text{Rated}$                     |        |     | 250      | ma    |
| Peak On-State Voltage                       | $V_{TM}$  | $T_j=125^{\circ}\text{C}$ , $I_{TM}=3000\text{A}$                      |        |     | 1.35     | V     |
| $V_{TM}$ Model, Low Level                   | $V_0$     | $T_j=125^{\circ}\text{C}$                                              |        |     | 0.978    | V     |
| $V_{TM} = V_0 + r \cdot I_{TM}$             | $r$       | $15\% I_{TM} - \pi \cdot I_{TM}$                                       |        |     | 0.112    | mΩ    |
| $V_{TM}$ Model, High Level                  | $V_0$     | $T_j=125^{\circ}\text{C}$                                              |        |     | 1.012    | V     |
| $V_{TM} = V_0 + r \cdot I_{TM}$             | $r$       | $\pi \cdot I_{TM} - I_{TSM}$                                           |        |     | 0.1059   | mΩ    |
| $V_{TM}$ Model, 4-Term                      | A         | $T_j=125^{\circ}\text{C}$                                              |        |     | 0.150    |       |
| $V_{TM} = A + B \cdot \ln(I_{TM}) +$        | B         | $15\% I_{TM} - I_{TSM}$                                                |        |     | 0.140    |       |
| $C \cdot (I_{TM}) + D \cdot (I_{TM})^{1/2}$ | C         |                                                                        |        |     | 0.000115 |       |
|                                             | D         |                                                                        |        |     | -0.00500 |       |
| Turn-On Delay Time                          | $t_d$     | $V_D = 0.5 \cdot V_{DRM}$<br>Gate Drive: 40V - 20Ω                     |        | 2.5 |          | us    |
| Turn-Off Time                               | $t_q$     | $T_j=125^{\circ}\text{C}$<br>$dv/dt = 20\text{V/us}$ to $80\% V_{DRM}$ |        |     | 400      | us    |
| $dv/dt_{(Crit)}$                            | $dv/dt$   | $T_j=125^{\circ}\text{C}$ Exp. Waveform<br>$V_D = 80\% \text{ Rated}$  | 1000   |     |          | V/us  |
| Gate Trigger Current                        | $I_{GT}$  | $T_j=25^{\circ}\text{C}$ $V_D = 12\text{V}$                            | 30     | 100 | 250      | ma    |
| Gate Trigger Voltage                        | $V_{GT}$  |                                                                        | 0.8    | 2.0 | 4.5      | V     |
| Peak Reverse Gate Voltage                   | $V_{GRM}$ |                                                                        |        |     | 5        | V     |

**Thermal Characteristics**

| Characteristic     | Symbol         | Test Conditions    | Rating |        |       | Units   |
|--------------------|----------------|--------------------|--------|--------|-------|---------|
|                    |                |                    | min    | typ    | max   |         |
| Thermal Resistance |                |                    |        |        |       |         |
| Junction to Case   | $R\theta_{jc}$ | Double side cooled |        | 0.007  | 0.008 | °C/Watt |
| Case to Sink       | $R\theta_{cs}$ | Double side cooled |        | 0.0015 | 0.002 | °C/Watt |

Thermal Impedance Model  $Z\theta_{jc}$  Double side cooled

$$Z\theta_{jc}(t) = \sum(A(N) \cdot (1 - \exp(-t/\tau(N))))$$

where:

N =

1

2

3

4

A(N) =

1.43E-04

9.08E-04

2.37E-03

4.60E-03

 $\tau(N) =$ 

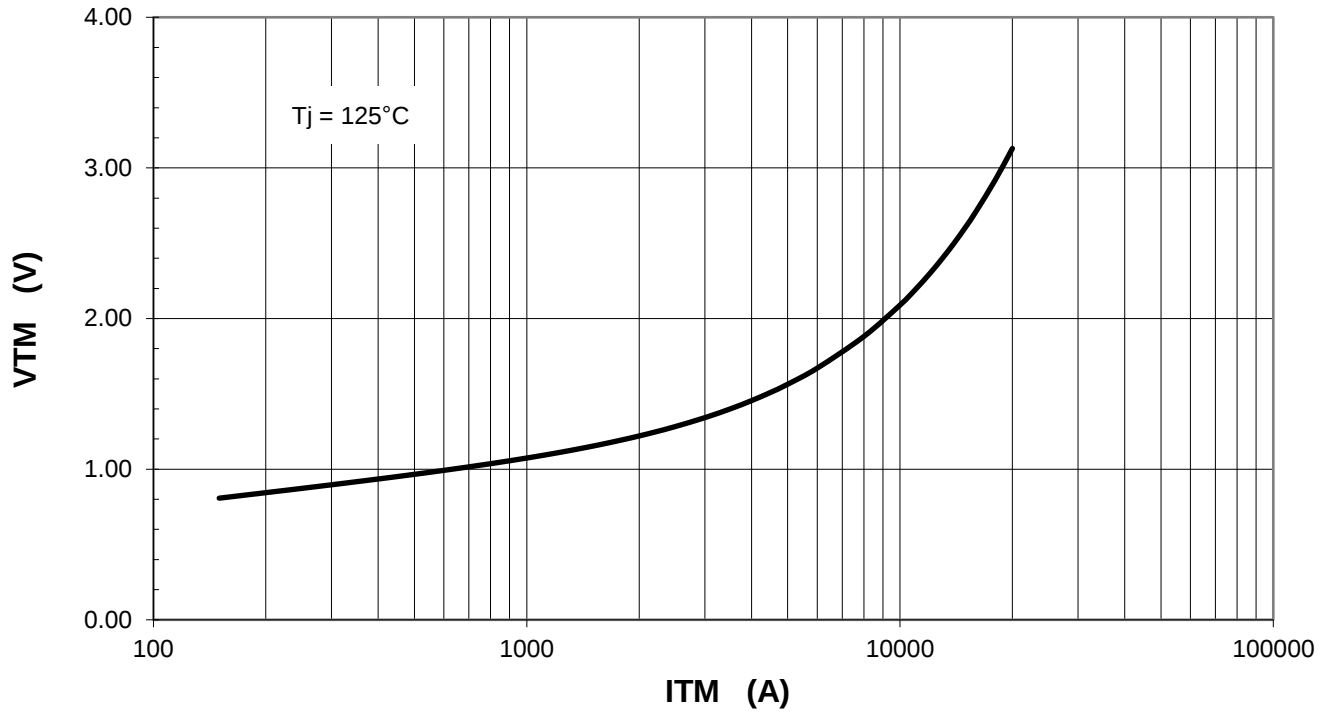
2.62E-03

2.31E-02

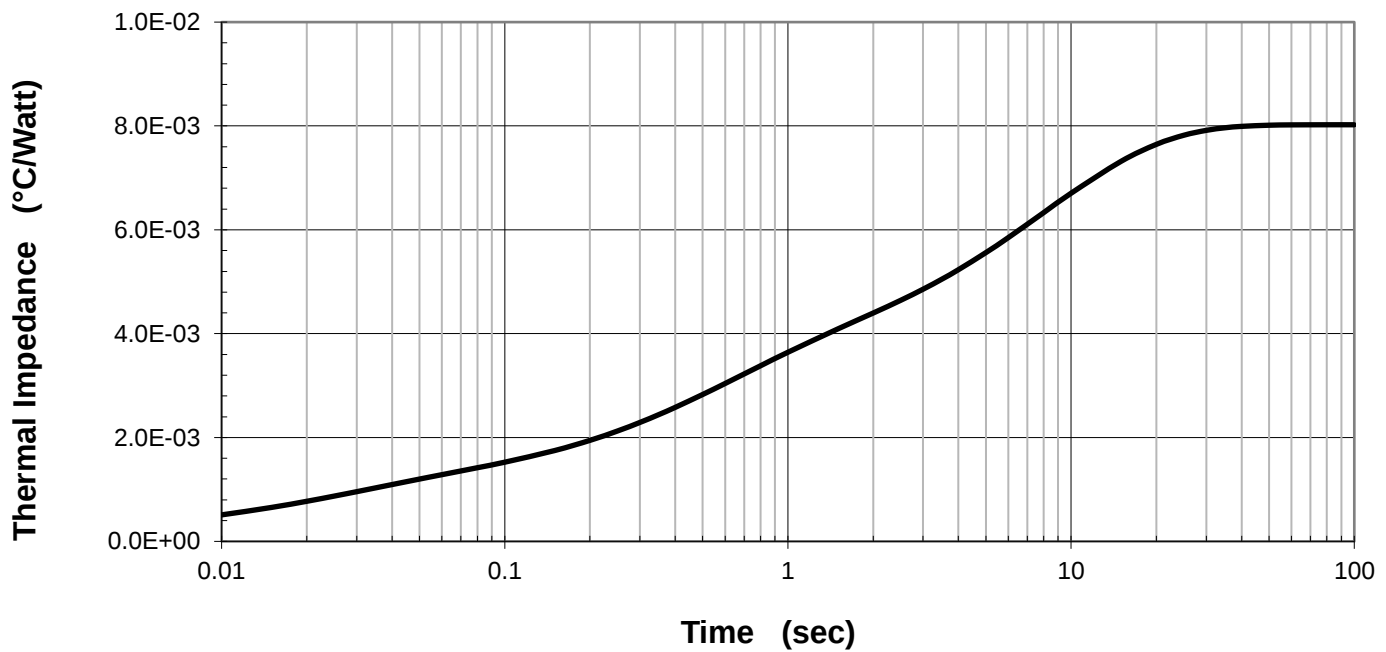
5.00E-01

8.00E+00

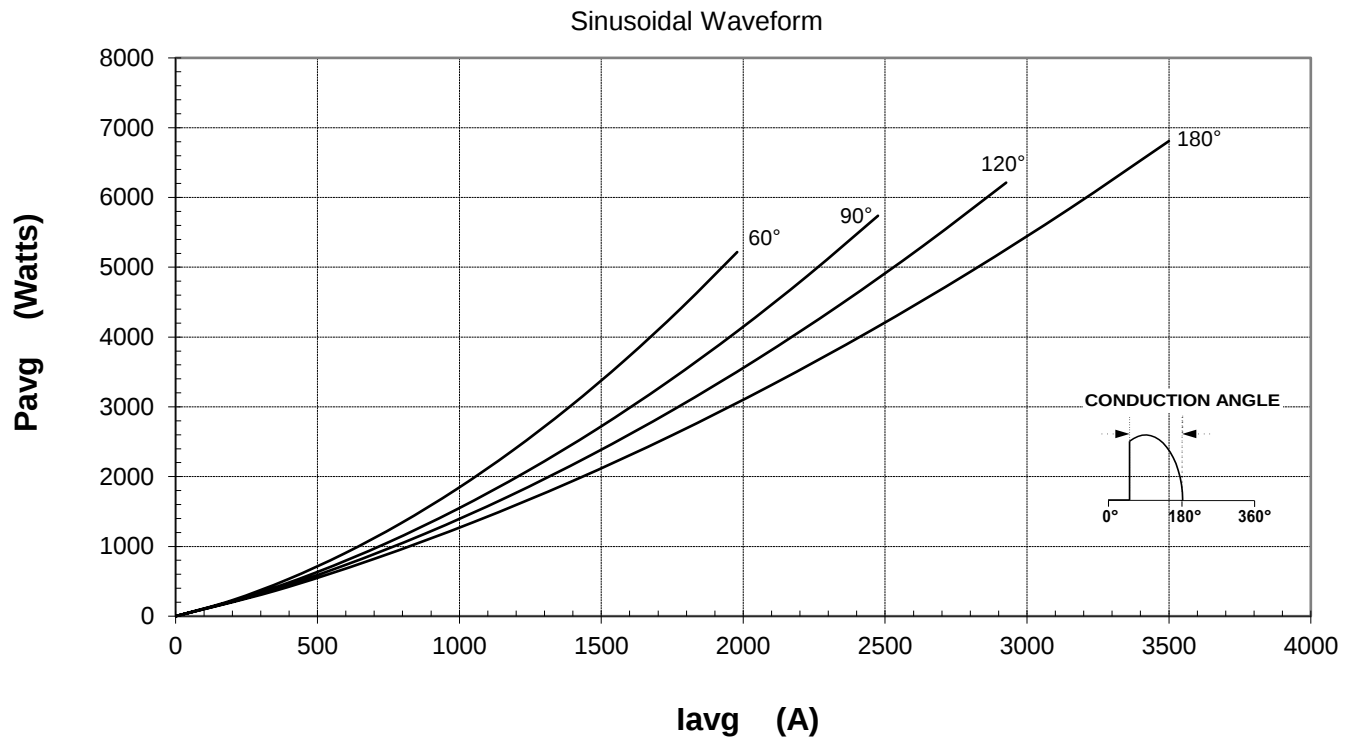
## Maximum On-State Voltage Drop



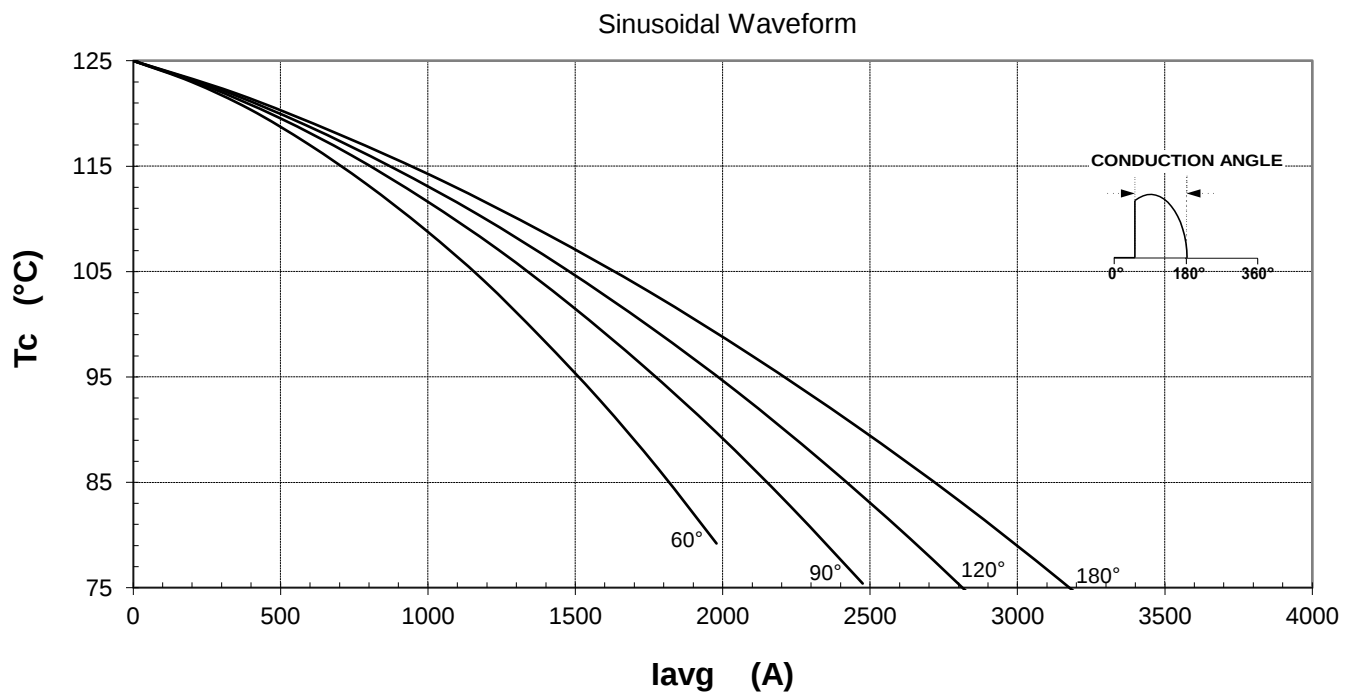
## MAXIMUM TRANSIENT THERMAL IMPEDANCE



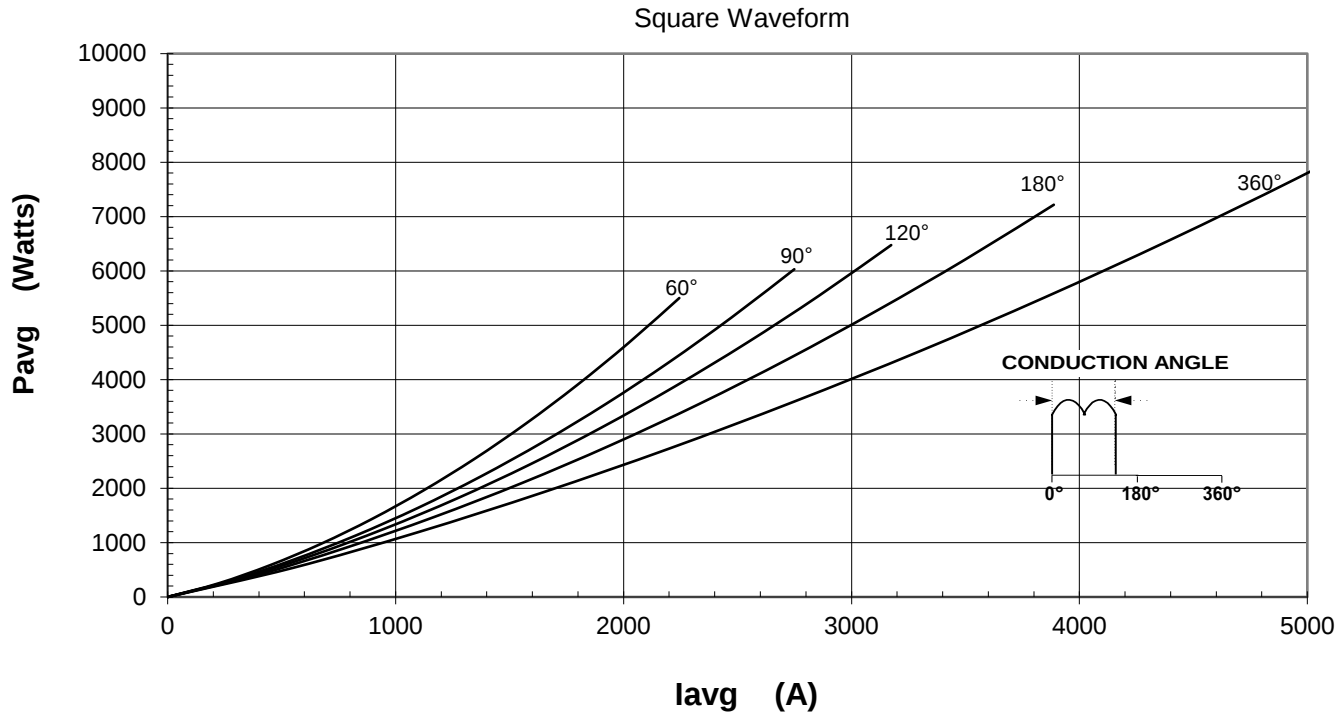
## Maximum On-State Power Dissipation



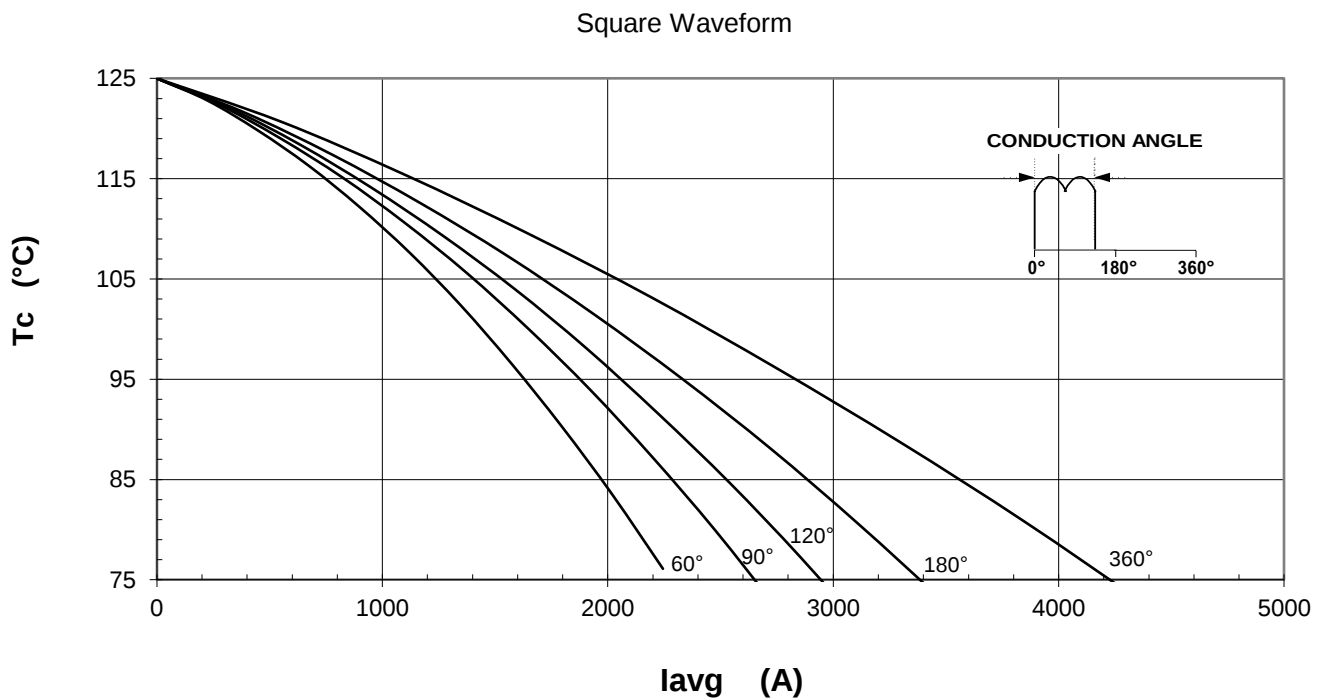
## Maximum Allowable Case Temperature



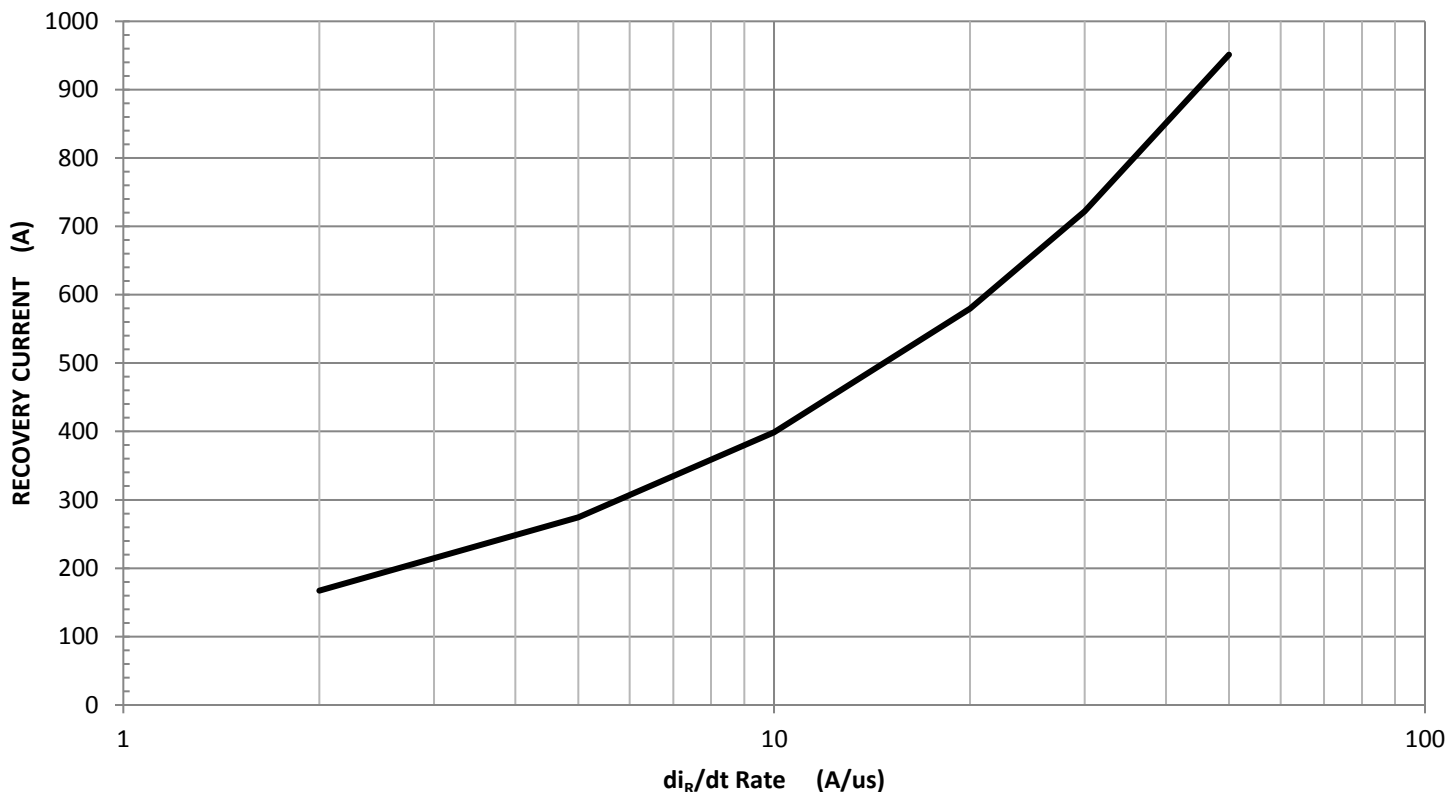
## Maximum On-State Power Dissipation



## Maximum Allowable Case Temperature

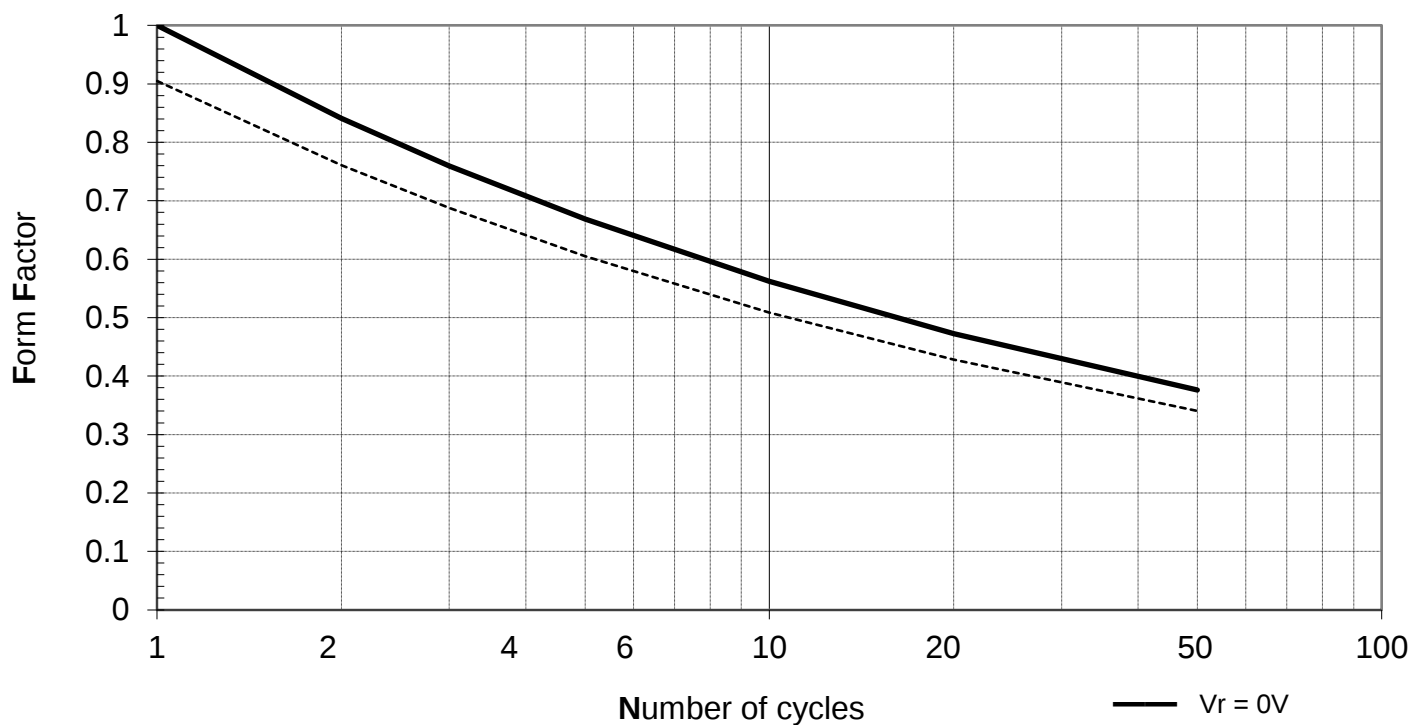


## REVERSE RECOVERY CURRENT



## MULTI-CYCLE SURGE FORM FACTOR

$$ITSM(N) = ITSM(1\sim) \cdot FF(N)$$



## REVERSE RECOVERY CHARGE

