

## Phase Control Thyristor

DS6018-1 April 2011 (LN28229)

### FEATURES

- Double Side Cooling
- High Surge Capability

### APPLICATIONS

- High Power Drives
- High Voltage Power Supplies
- Static Switches

### VOLTAGE RATINGS

| Part and Ordering Number | Repetitive Peak Voltages<br>$V_{DRM}$ and $V_{RRM}$<br>V | Conditions                                                                                                                                                                                                               |
|--------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DCR950D14                | 1400                                                     | $T_{vj} = -40^{\circ}\text{C to } 125^{\circ}\text{C}$ ,<br>$I_{DRM} = I_{RRM} = 50\text{mA}$ ,<br>$V_{DRM}, V_{RRM} t_p = 10\text{ms}$ ,<br>$V_{DSM} \& V_{RSM} =$<br>$V_{DRM} \& V_{RRM} +100\text{V}$<br>respectively |
| DCR950D12                | 1200                                                     |                                                                                                                                                                                                                          |
| DCR950D10                | 1000                                                     |                                                                                                                                                                                                                          |
| DCR950D08                | 800                                                      |                                                                                                                                                                                                                          |
| DCR950D06                | 600                                                      |                                                                                                                                                                                                                          |

Lower voltage grades available.

### ORDERING INFORMATION

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

For example:

#### DCR950D14

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

### KEY PARAMETERS

|             |                       |
|-------------|-----------------------|
| $V_{DRM}$   | 1400 V                |
| $I_{T(AV)}$ | 950 A                 |
| $I_{TSM}$   | 12800 A               |
| $dV/dt^*$   | 1000 V/ $\mu\text{s}$ |
| $dI/dt$     | 200 A/ $\mu\text{s}$  |

\* Higher  $dV/dt$  selections available

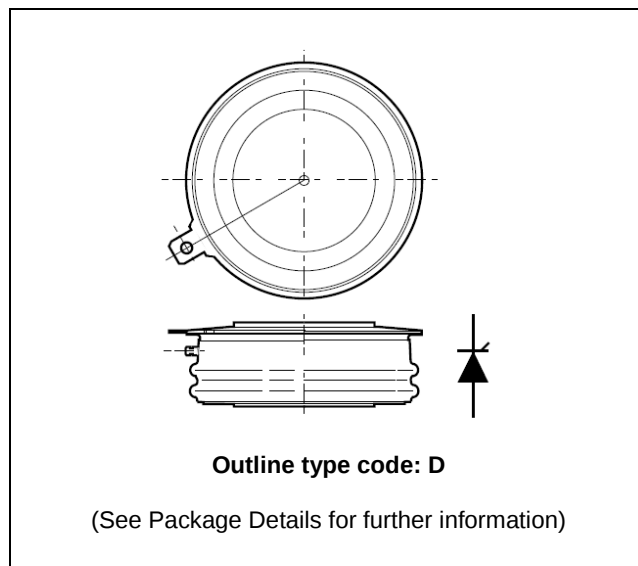


Fig. 1 Package outline

## CURRENT RATINGS

$T_{case} = 60^{\circ}\text{C}$  unless stated otherwise

| Symbol                    | Parameter                            | Test Conditions          | Max. | Units |
|---------------------------|--------------------------------------|--------------------------|------|-------|
| <b>Double Side Cooled</b> |                                      |                          |      |       |
| $I_{T(AV)}$               | Mean on-state current                | Half wave resistive load | 950  | A     |
| $I_{T(RMS)}$              | RMS value                            | -                        | 1490 | A     |
| $I_T$                     | Continuous (direct) on-state current | -                        | 1340 | A     |

## SURGE RATINGS

| Symbol    | Parameter                               | Test Conditions                                  | Max.  | Units                 |
|-----------|-----------------------------------------|--------------------------------------------------|-------|-----------------------|
| $I_{TSM}$ | Surge (non-repetitive) on-state current | 10ms half sine, $T_{case} = 125^{\circ}\text{C}$ | 12.8  | kA                    |
| $I^2t$    | $I^2t$ for fusing                       | $V_R = 0$                                        | 0.819 | $\text{MA}^2\text{s}$ |

## THERMAL AND MECHANICAL RATINGS

| Symbol        | Parameter                             | Test Conditions              | Min. | Max.  | Units                |
|---------------|---------------------------------------|------------------------------|------|-------|----------------------|
| $R_{th(j-c)}$ | Thermal resistance – junction to case | Double side cooled           | -    | 0.035 | $^{\circ}\text{C/W}$ |
| $R_{th(c-h)}$ | Thermal resistance – case to heatsink | Double side cooled           | -    | 0.01  | $^{\circ}\text{C/W}$ |
| $T_{vj}$      | Virtual junction temperature          | Blocking $V_{DRM} / V_{RRM}$ | -    | 125   | $^{\circ}\text{C}$   |
| $T_{stg}$     | Storage temperature range             |                              | -40  | 140   | $^{\circ}\text{C}$   |
| $F_m$         | Clamping force                        |                              | 8    | 12    | kN                   |

## DYNAMIC CHARACTERISTICS

| Symbol                             | Parameter                                     | Test Conditions                                                                                                                    |                 | Min. | Max.  | Units |
|------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|-------|-------|
| I <sub>RRM</sub> /I <sub>DRM</sub> | Peak reverse and off-state current            | At V <sub>RRM</sub> /V <sub>DRM</sub> , T <sub>case</sub> = 125°C                                                                  |                 | -    | 50    | mA    |
| dV/dt                              | Max. linear rate of rise of off-state voltage | To 67% V <sub>DRM</sub> , T <sub>j</sub> = 125°C, gate open                                                                        |                 | 1000 | -     | V/μs  |
| dI/dt                              | Rate of rise of on-state current              | From 67% V <sub>DRM</sub> to 1000A<br><br>Gate source 30V, 10Ω,<br><br>t <sub>r</sub> < 0.5μs, T <sub>j</sub> = 125°C              | Repetitive 50Hz | -    | 200   | A/μs  |
|                                    |                                               |                                                                                                                                    | Non-repetitive  | -    | 1000  | A/μs  |
| V <sub>T</sub>                     | On-state voltage                              | I <sub>T</sub> = 1500A, T <sub>case</sub> = 125°C                                                                                  |                 |      | 1.45  | V     |
| V <sub>T(TO)</sub>                 | Threshold voltage                             | T <sub>case</sub> = 125°C                                                                                                          |                 | -    | 0.87  | V     |
| r <sub>T</sub>                     | On-state slope resistance                     | T <sub>case</sub> = 125°C                                                                                                          |                 | -    | 0.382 | mΩ    |
| t <sub>gd</sub>                    | Delay time                                    | V <sub>D</sub> = 67% V <sub>DRM</sub> , gate source 30V, 10Ω<br><br>t <sub>r</sub> = 0.5μs, T <sub>j</sub> = 25°C                  |                 | -    | 3.0   | μs    |
| t <sub>q</sub>                     | Turn-off time                                 | T <sub>j</sub> = 125°C, V <sub>R</sub> = 100V, dI/dt = 10A/μs,<br><br>dV <sub>DR</sub> /dt = 20V/μs linear to 67% V <sub>DRM</sub> |                 | -    | 150   | μs    |
| Q <sub>S</sub>                     | Stored charge                                 | I <sub>T</sub> = 1000A, t <sub>p</sub> = 1000us,T <sub>j</sub> = 125°C,<br>dI/dt =10A/μs,                                          |                 | -    | 1500  | μC    |
| I <sub>RR</sub>                    | Reverse recovery current                      |                                                                                                                                    |                 | -    | 100   | A     |
| I <sub>L</sub>                     | Latching current                              | T <sub>j</sub> = 25°C,                                                                                                             |                 | -    | 1     | A     |
| I <sub>H</sub>                     | Holding current                               | T <sub>j</sub> = 25°C,                                                                                                             |                 | -    | 200   | mA    |

## GATE TRIGGER CHARACTERISTICS AND RATINGS

| Symbol   | Parameter                | Test Conditions                              | Max. | Units |
|----------|--------------------------|----------------------------------------------|------|-------|
| $V_{GT}$ | Gate trigger voltage     | $V_{DRM} = 5V$ , $T_{case} = 25^{\circ}C$    | 3    | V     |
| $V_{GD}$ | Gate non-trigger voltage | At 40% $V_{DRM}$ , $T_{case} = 125^{\circ}C$ | TBD  | V     |
| $I_{GT}$ | Gate trigger current     | $V_{DRM} = 5V$ , $T_{case} = 25^{\circ}C$    | 300  | mA    |
| $I_{GD}$ | Gate non-trigger current | At 40% $V_{DRM}$ , $T_{case} = 125^{\circ}C$ | TBD  | mA    |

## CURVES

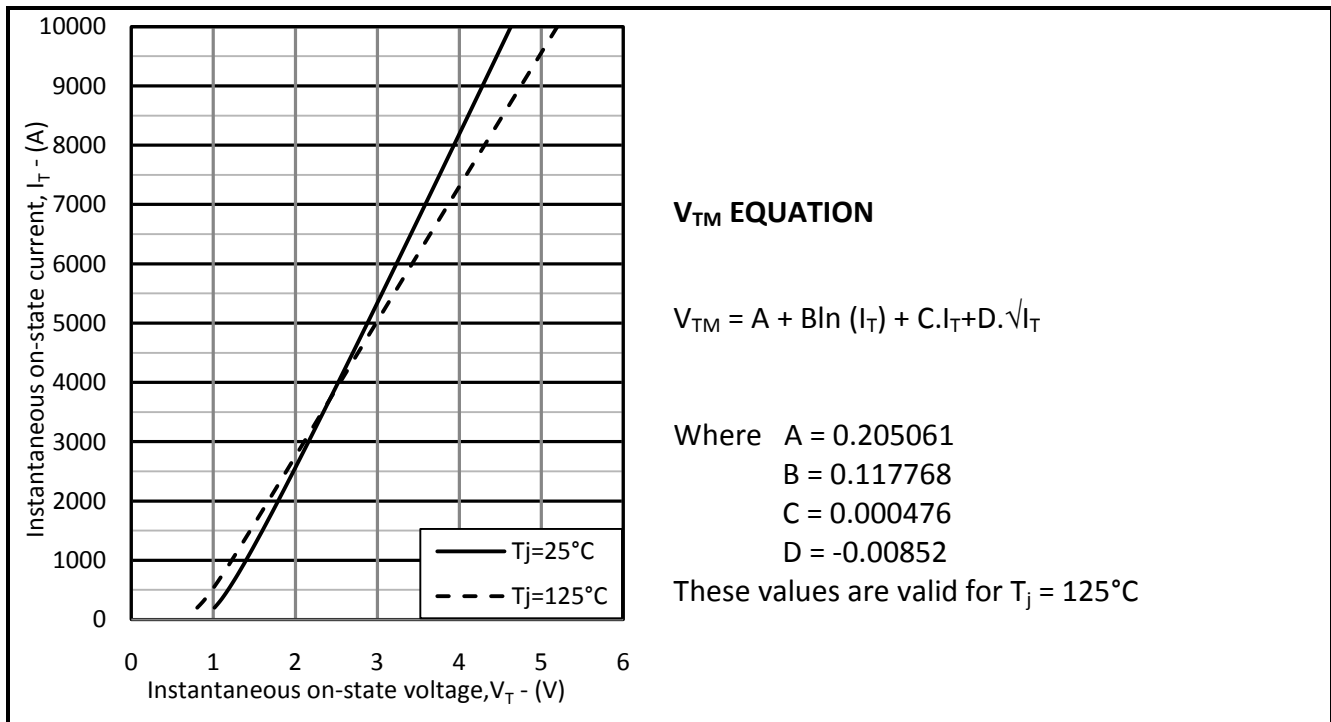


Fig.2 Maximum & minimum on-state characteristics

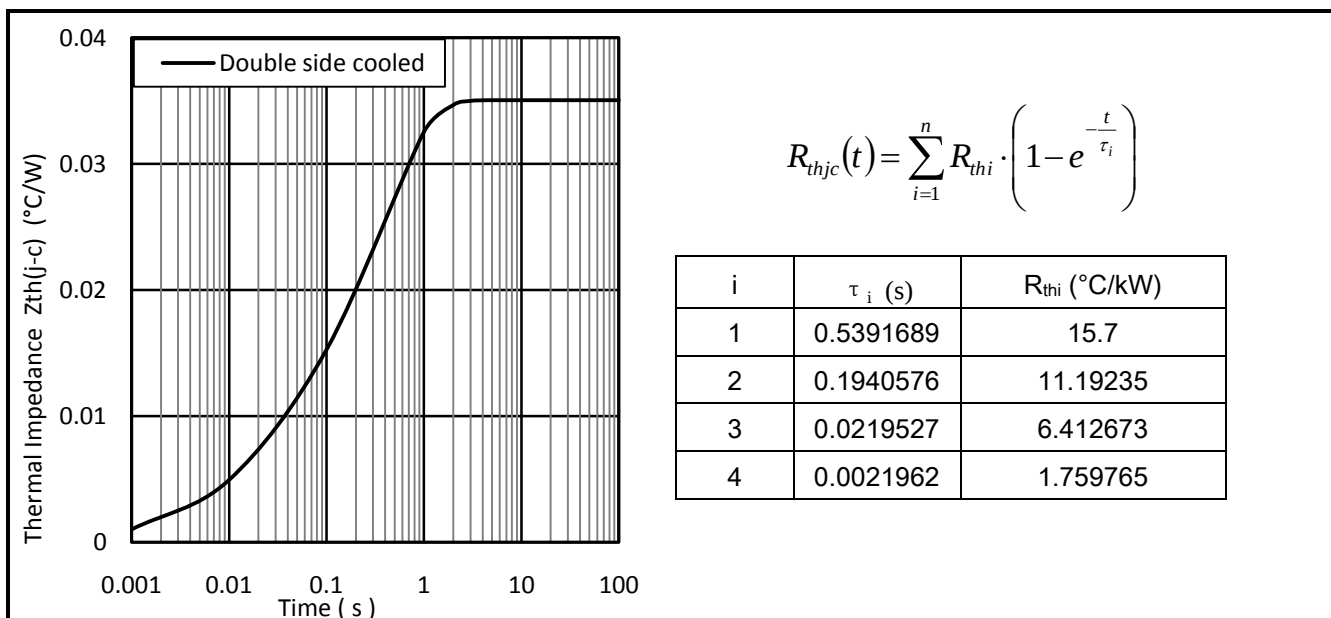


Fig.3 Maximum (limit) transient thermal impedance – junction to case (°C/W)

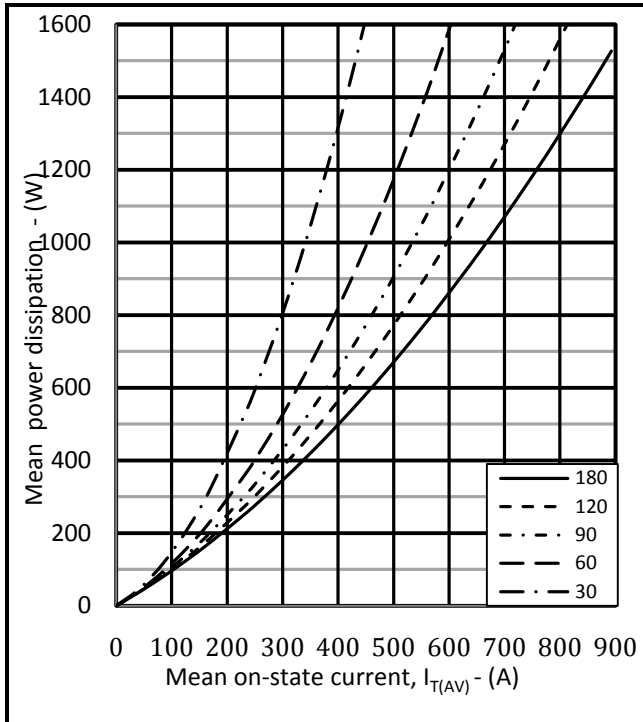


Fig.4 On-state power dissipation – sine wave

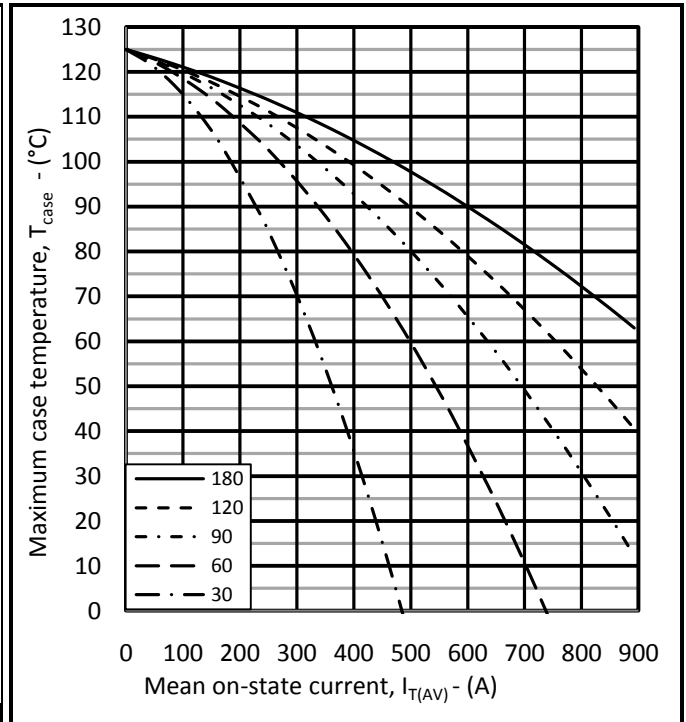


Fig.5 Maximum permissible case temperature, double side cooled – sine wave

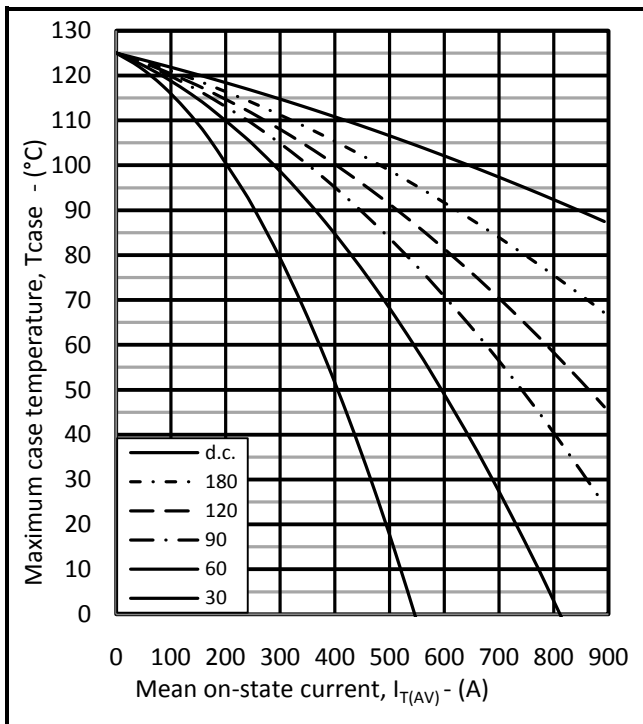


Fig.6 Maximum permissible case temperature, double side cooled – rectangular wave

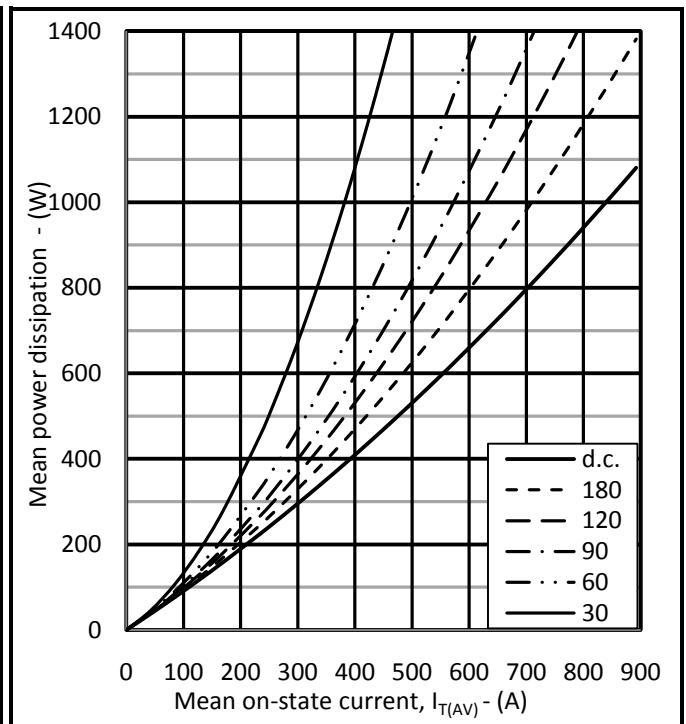


Fig.7 On-state power dissipation – rectangular wave

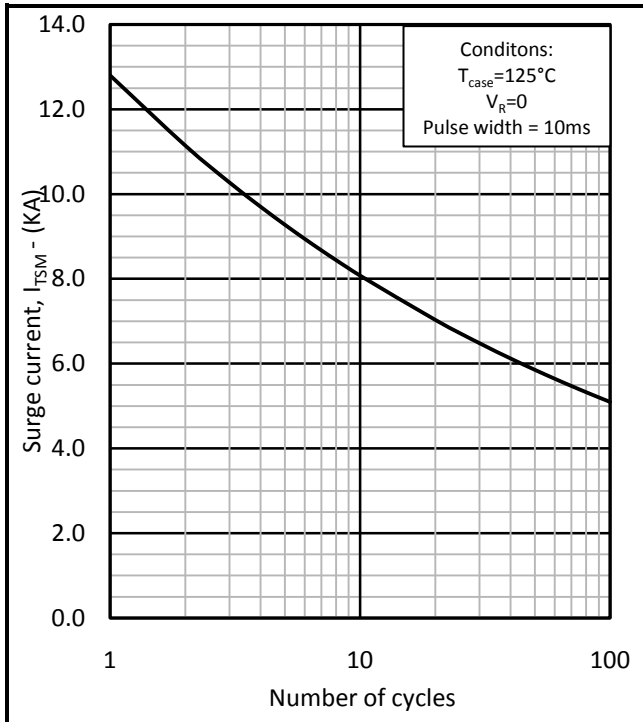


Fig.8 Multi-cycle surge current

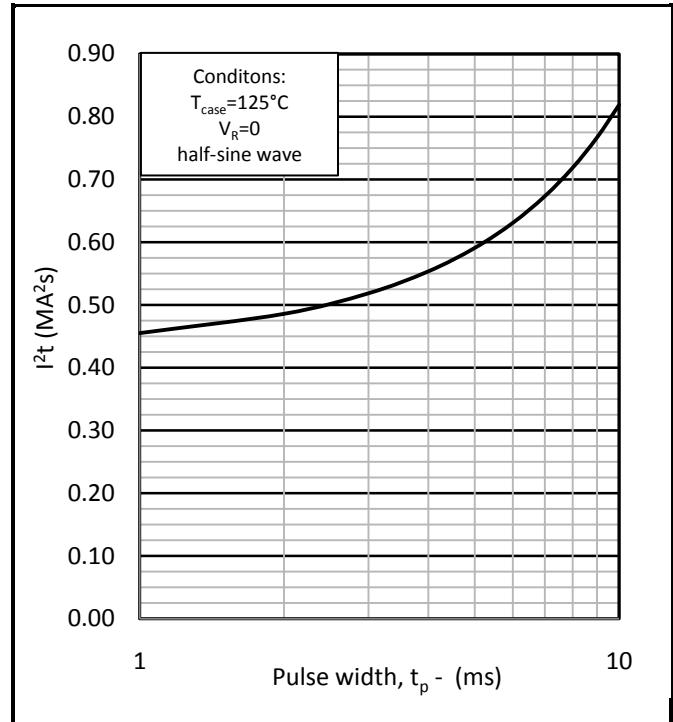


Fig.9 Single-cycle  $I^2t$

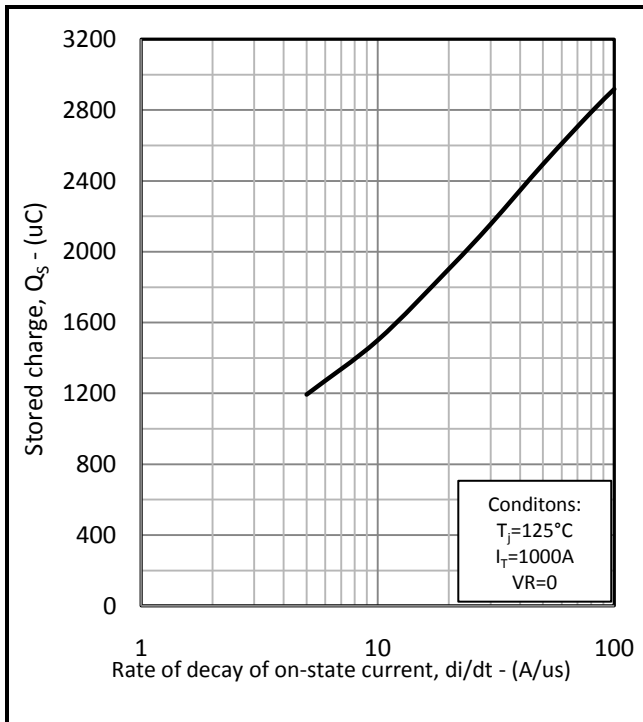


Fig.10 Stored charge vs  $di/dt$

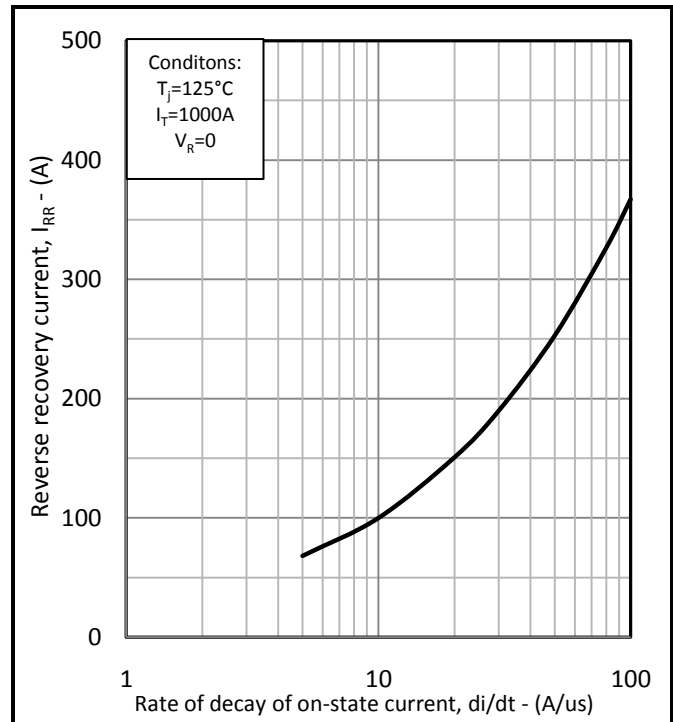


Fig.11 Reverse recovery current vs  $di/dt$

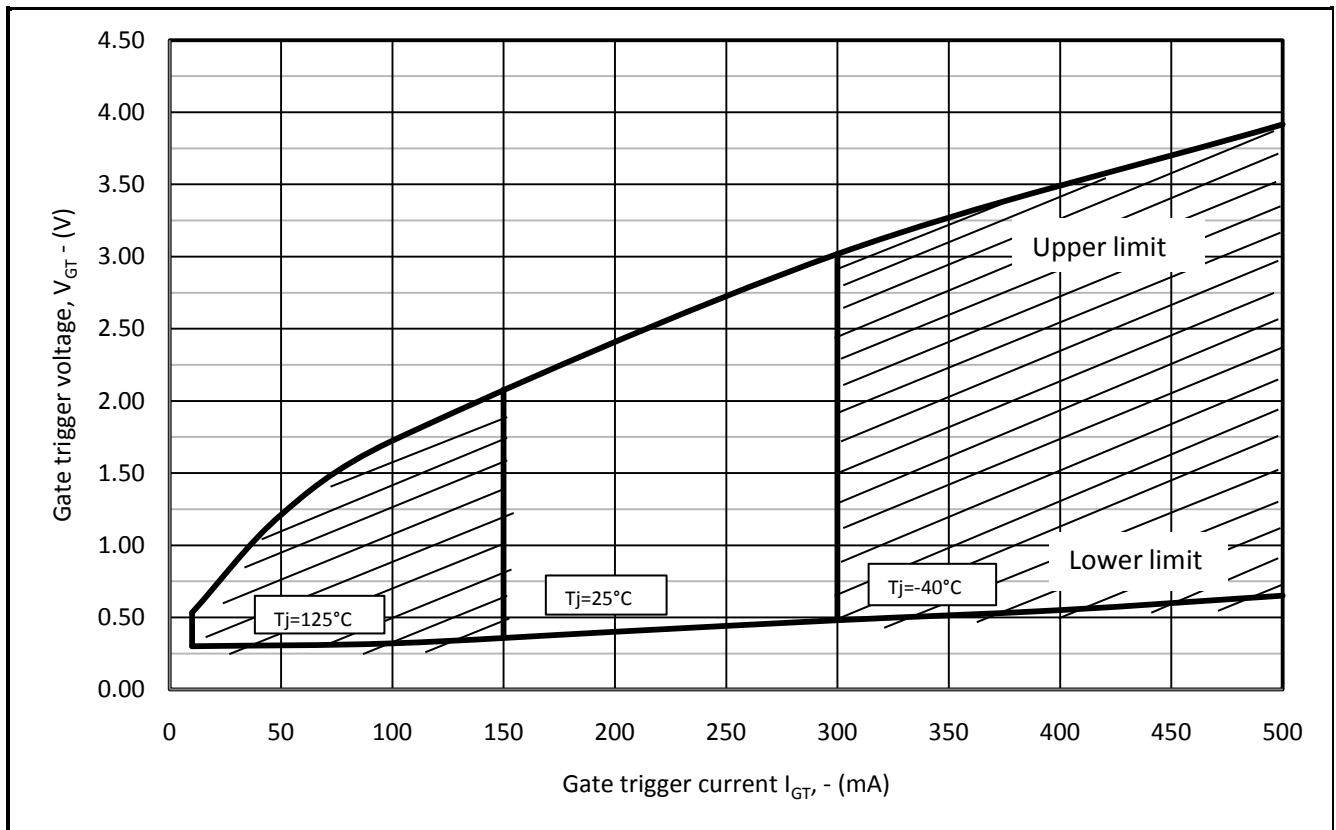


Fig.12 Gate characteristics

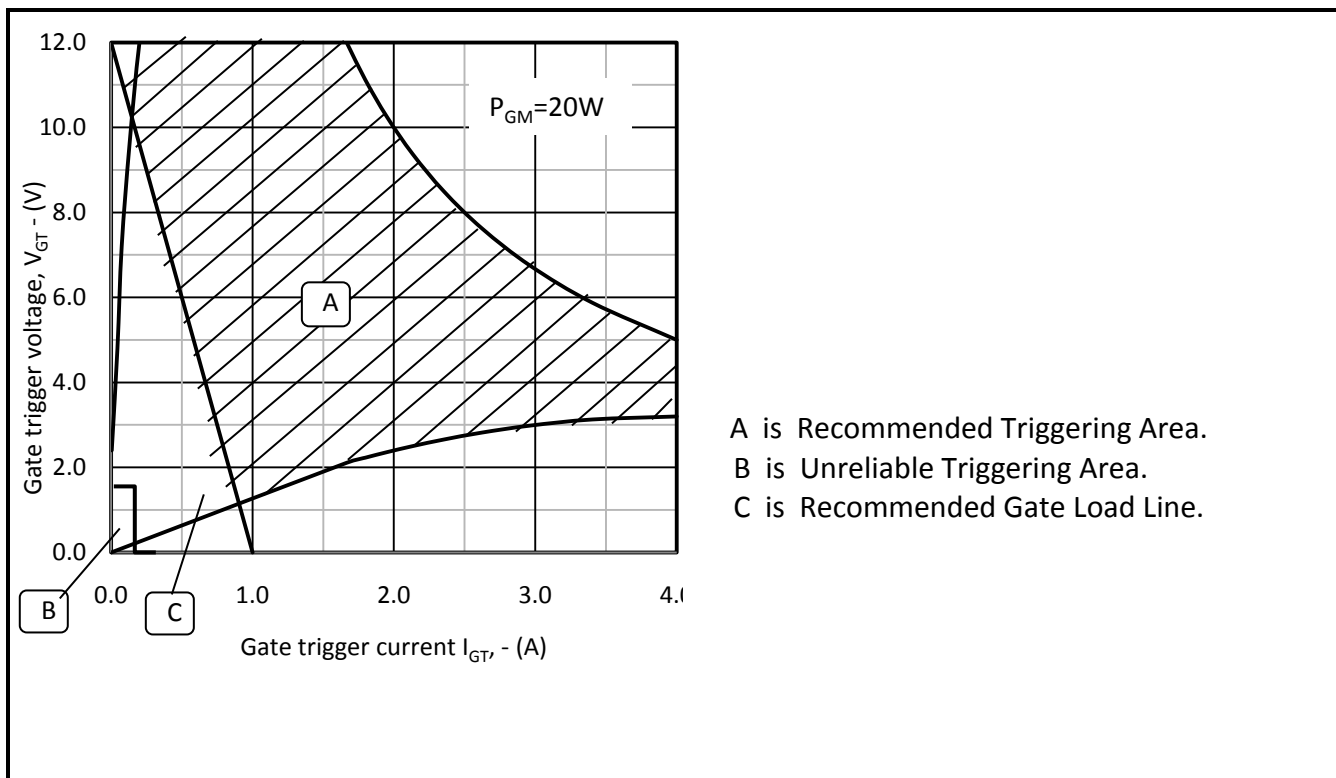
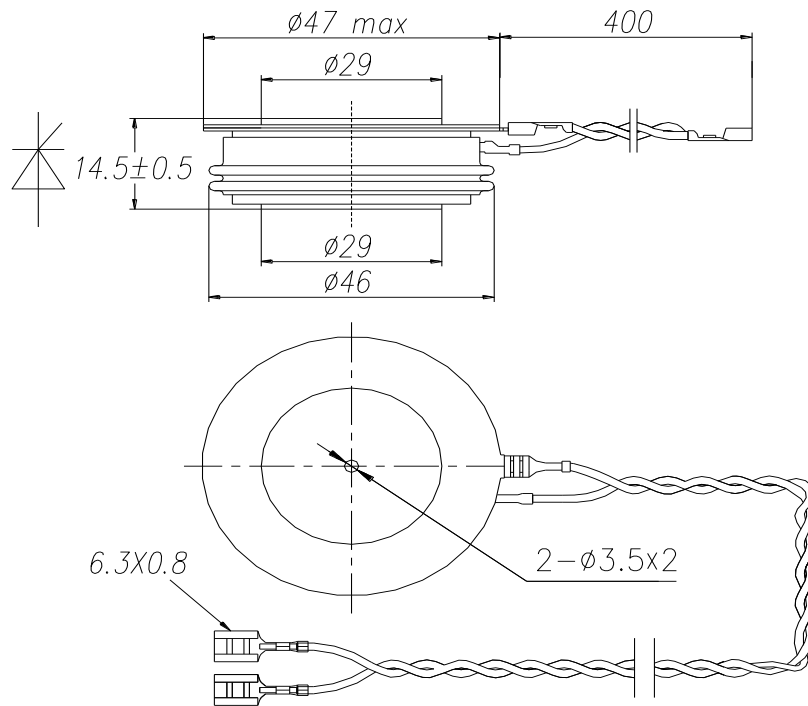


Fig.13 Gate characteristics

## PACKAGE DETAILS

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



Package outline type code: D

Fig.14 Package outline

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