



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 |
|--------------------------|--|---|
| DCR1150N42 DCR1150N40 | 4200 4000 | $T_{vj} = -40^{\circ}\text{C}$ to 125°C , $I_{DRM} = I_{RRM} = 100\text{mA}$, $V_{DRM}, V_{RRM} t_p = 10\text{ms}$, V_{DSM} & $V_{RSM} =$ V_{DRM} & $V_{RRM} + 100\text{V}$ respectively |

Lower voltage grades available.

KEY PARAMETERS

| | |
|-------------|----------------------|
| V_{DRM} | 4200V |
| $I_{T(AV)}$ | 1150A |
| I_{TSM} | 16800A |
| dV/dt^* | 1500V/ μs |
| di/dt | 1000A/ μs |

* Higher dV/dt selections available

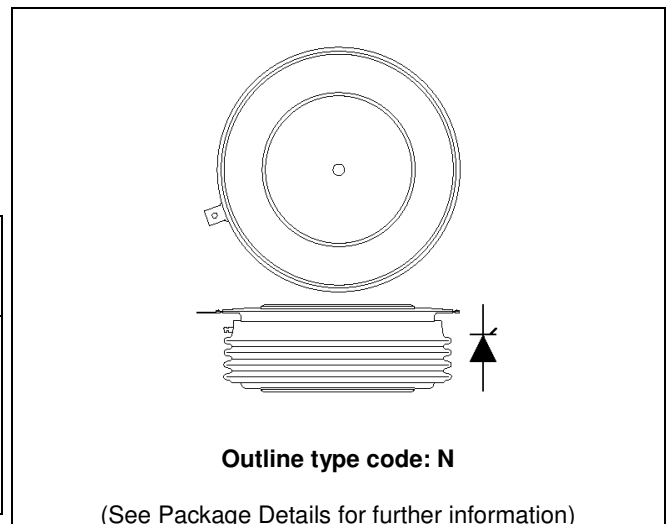


Fig. 1 Package outline

ORDERING INFORMATION

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

For example:

DCR1150N42

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

CURRENT RATINGS

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

| Symbol | Parameter | Test Conditions | Max. | Units |
|---------------------------|--------------------------------------|--------------------------|------|-------|
| Double Side Cooled | | | | |
| $I_{T(AV)}$ | Mean on-state current | Half wave resistive load | 1150 | A |
| $I_{T(RMS)}$ | RMS value | - | 1806 | A |
| I_T | Continuous (direct) on-state current | - | 1665 | A |

SURGE RATINGS

| Symbol | Parameter | Test Conditions | Max. | Units |
|-----------|---|--|------|-----------------------|
| I_{TSM} | Surge (non-repetitive) on-state current | 10ms half sine, $T_{case} = 125^{\circ}\text{C}$ | 16.8 | kA |
| I^2t | I^2t for fusing | $V_R = 0$ | 1.41 | MA^2s |

THERMAL AND MECHANICAL RATINGS

| Symbol | Parameter | Test Conditions | Min. | Max. | Units | |
|---------------|---------------------------------------|--|-------------|------|--------------------|----------------------|
| $R_{th(j-c)}$ | Thermal resistance – junction to case | Double side cooled | DC | - | 0.0221 | $^{\circ}\text{C/W}$ |
| | | Single side cooled | Anode DC | - | 0.041 | $^{\circ}\text{C/W}$ |
| | | | Cathode DC | - | 0.0516 | $^{\circ}\text{C/W}$ |
| $R_{th(c-h)}$ | Thermal resistance – case to heatsink | Clamping force 23 kN (with mounting compound) | Double side | - | 0.004 | $^{\circ}\text{C/W}$ |
| | | | Single side | - | 0.008 | $^{\circ}\text{C/W}$ |
| T_{vj} | Virtual junction temperature | Blocking V_{DRM} / V_{RRM} | - | 125 | $^{\circ}\text{C}$ | |
| T_{stg} | Storage temperature range | | -55 | 125 | $^{\circ}\text{C}$ | |
| F_m | Clamping force | | 20.0 | 25.0 | kN | |

DYNAMIC CHARACTERISTICS

| Symbol | Parameter | Test Conditions | Min. | Max. | Units | |
|-------------------|---|--|-----------------|-------|------------|------------|
| I_{RRM}/I_{DRM} | Peak reverse and off-state current | At V_{RRM}/V_{DRM} , $T_{case} = 125^{\circ}C$ | - | 100 | mA | |
| dV/dt | Max. linear rate of rise of off-state voltage | To 67% V_{DRM} , $T_j = 125^{\circ}C$, gate open | - | 1500 | V/ μs | |
| di/dt | Rate of rise of on-state current | From 67% V_{DRM} to $2x I_{T(AV)}$ | Repetitive 50Hz | - | 250 | A/ μs |
| | | Gate source 30V, 10 Ω , $t_r < 0.5\mu s$, $T_j = 125^{\circ}C$ | Non-repetitive | - | 1000 | A/ μs |
| $V_{T(TO)}$ | Threshold voltage – Low level | 300A to 850A at $T_{case} = 125^{\circ}C$ | - | 0.86 | V | |
| | Threshold voltage – High level | 850A to 4000A at $T_{case} = 125^{\circ}C$ | - | 1.0 | V | |
| r_T | On-state slope resistance – Low level | 300A to 850A at $T_{case} = 125^{\circ}C$ | - | 0.611 | m Ω | |
| | On-state slope resistance – High level | 850A to 4000A at $T_{case} = 125^{\circ}C$ | - | 0.444 | m Ω | |
| t_{gd} | Delay time | $V_D = 67\% V_{DRM}$, gate source 30V, 10 Ω $t_r = 0.5\mu s$, $T_j = 25^{\circ}C$ | - | 3 | μs | |
| t_q | Turn-off time | $T_j = 125^{\circ}C$, $I_{peak} = 1000A$, $t_p = 1000\mu s$, $V_{RM} = 100V$, $di/dt = -5A/\mu s$, $dV_{DR}/dt = 20V/\mu s$ linear to 2500V | - | 800 | μs | |
| I_{RR} | Reverse recovery current | $I_T = 1000A$, $t_p = 1000\mu s$, $T_j = 125^{\circ}C$, $di/dt = -5A/\mu s$, $V_R = 100V$ | 81 | 121 | A | |
| Q_S | Stored charge | | 2000 | 3500 | μC | |
| I_L | Latching current | $T_j = 25^{\circ}C$, $V_D = 5V$ | - | 3 | A | |
| I_H | Holding current | $T_j = 25^{\circ}C$, $R_{G-K} = \infty$, $I_{TM} = 500A$, $I_T = 5A$ | - | 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 | 15 | mA |

CURVES

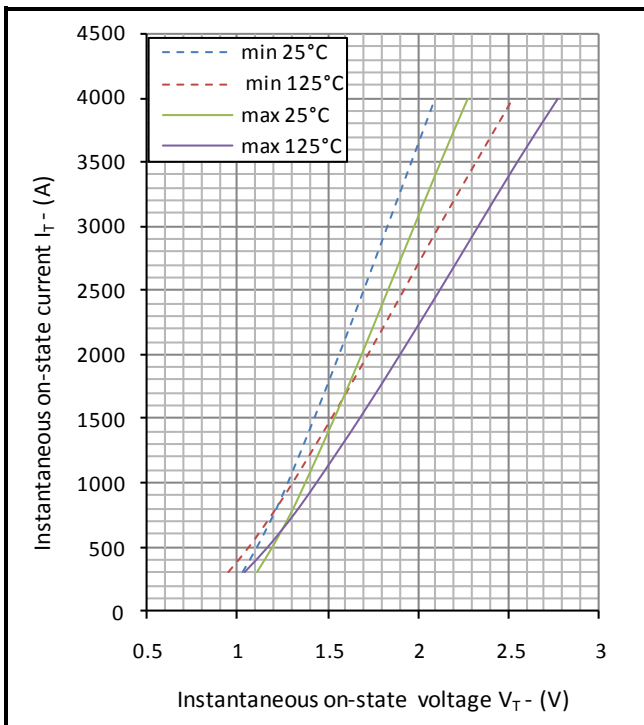


Fig.2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

$$V_{TM} = A + B \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

Where A = 0.259886
 B = 0.122742
 C = 0.000418
 D = -0.002452

these values are valid for T_j = 125°C for I_T 300A to 4000A

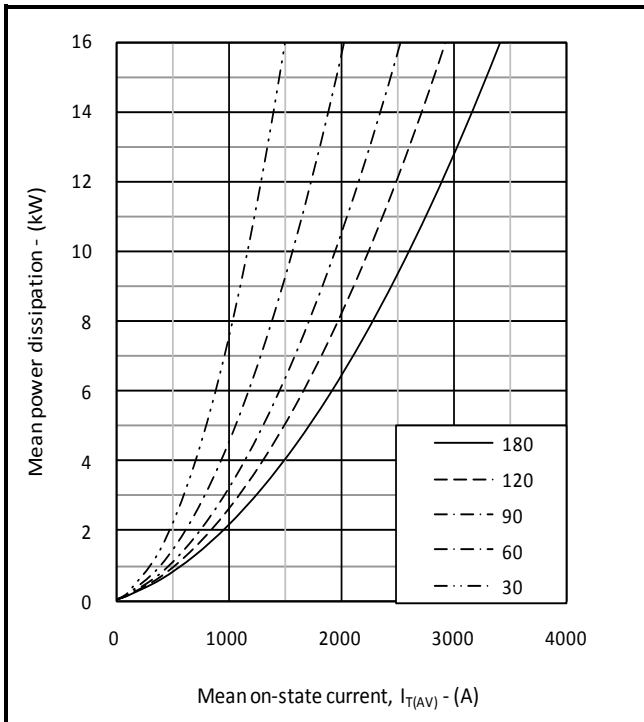


Fig.3 On-state power dissipation – sine wave

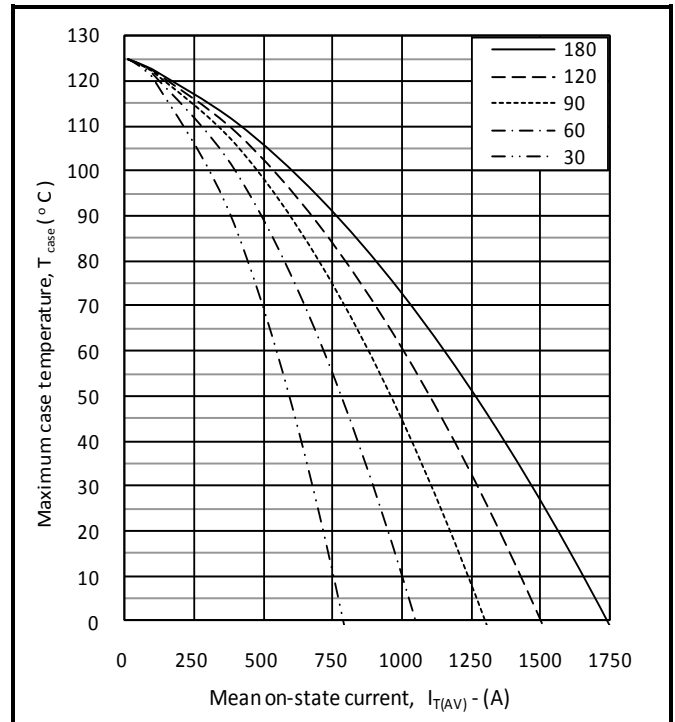


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

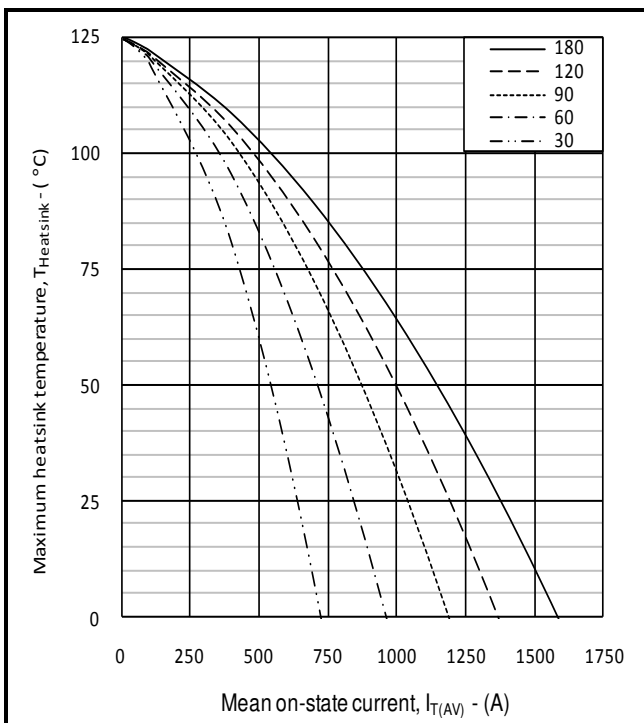


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

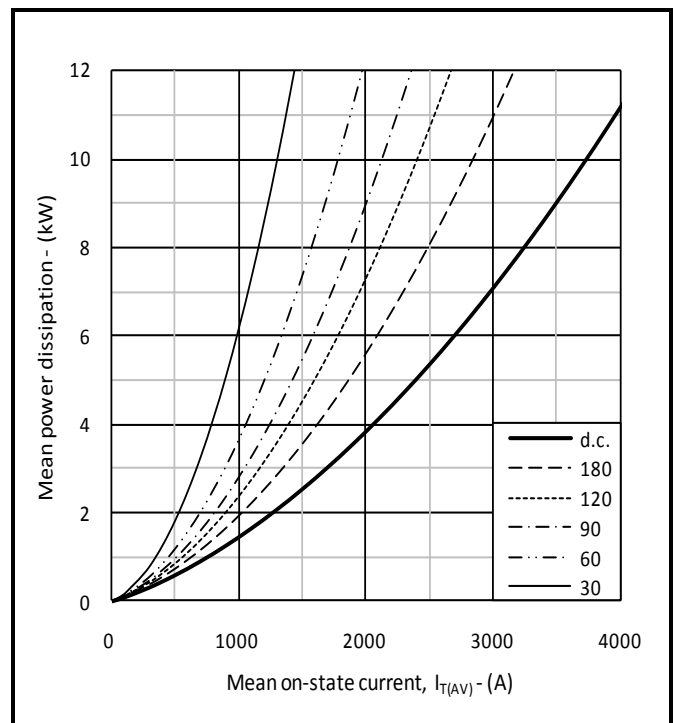


Fig.6 On-state power dissipation – rectangular wave

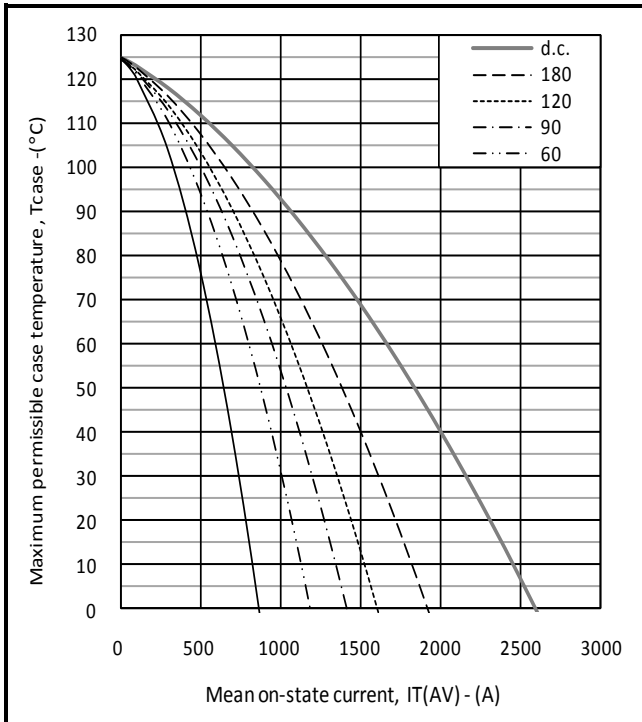


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

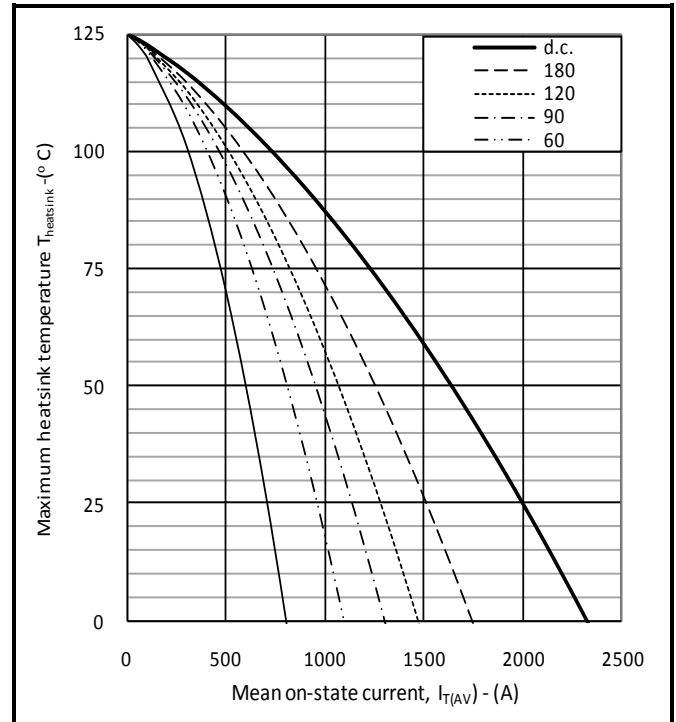


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

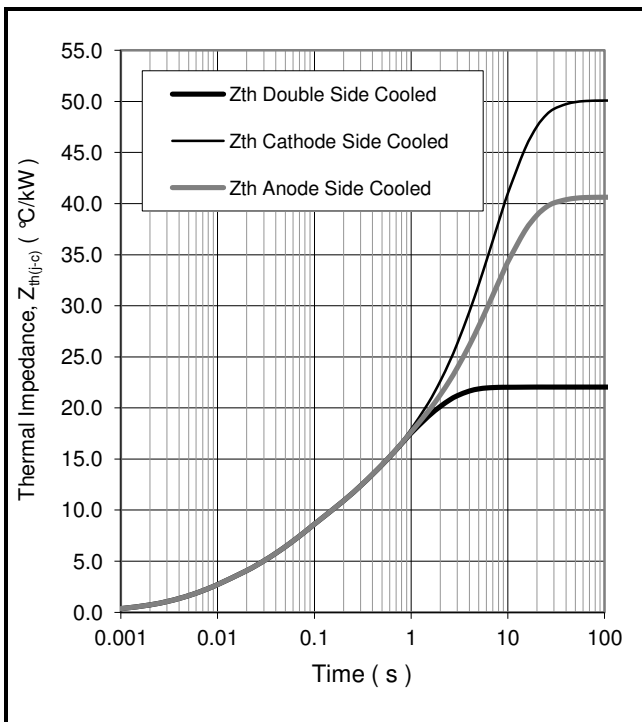


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

| | | 1 | 2 | 3 | 4 |
|---------------------|--------------------------|--------|--------|--------|---------|
| Double side cooled | $R_{\theta j-c}$ (°C/kW) | 3.4733 | 4.9047 | 9.1463 | 4.5220 |
| | T_1 (s) | 0.1457 | 0.0166 | 1.2832 | 0.3767 |
| Anode side cooled | $R_{\theta j-c}$ (°C/kW) | 7.6674 | 5.0530 | 9.7355 | 27.5992 |
| | T_1 (s) | 0.2241 | 0.0169 | 4.0566 | 8.2780 |
| Cathode side cooled | $R_{\theta j-c}$ (°C/kW) | 6.0393 | 4.2782 | 5.1301 | 25.0874 |
| | T_1 (s) | 0.1356 | 0.0143 | 0.6594 | 7.2358 |

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

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

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

| θ° | Double side cooling | | Anode Side Cooling | | Cathode Sided Cooling | |
|----------------|---------------------|-------|--------------------|-------|-----------------------|-------|
| | sine. | rect. | sine. | rect. | sine. | rect. |
| 180 | 3.03 | 2.07 | 3.03 | 2.07 | 3.12 | 2.12 |
| 120 | 3.49 | 2.95 | 3.49 | 2.95 | 3.61 | 3.04 |
| 90 | 3.99 | 3.43 | 3.99 | 3.43 | 4.13 | 3.54 |
| 60 | 4.43 | 3.94 | 4.43 | 3.94 | 4.60 | 4.08 |
| 30 | 4.77 | 4.49 | 4.76 | 4.48 | 4.96 | 4.66 |
| 15 | 4.92 | 4.77 | 4.92 | 4.77 | 5.13 | 4.97 |

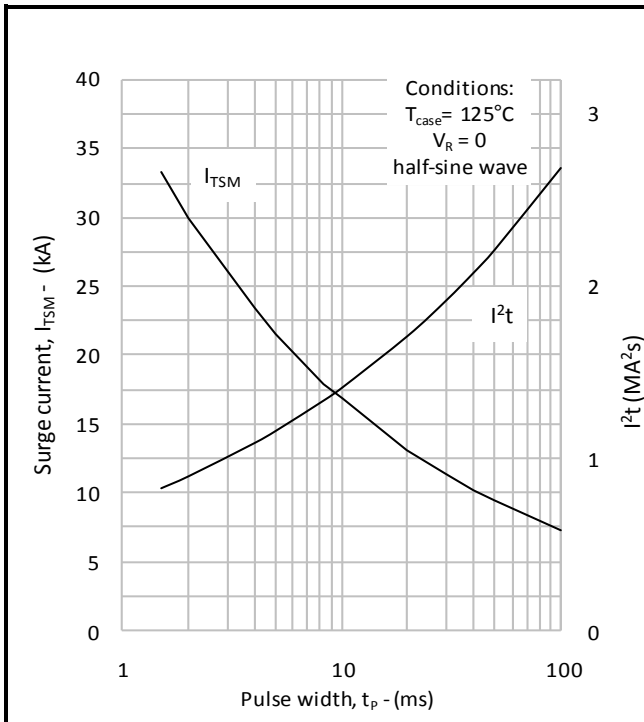


Fig.10 Single-cycle surge current

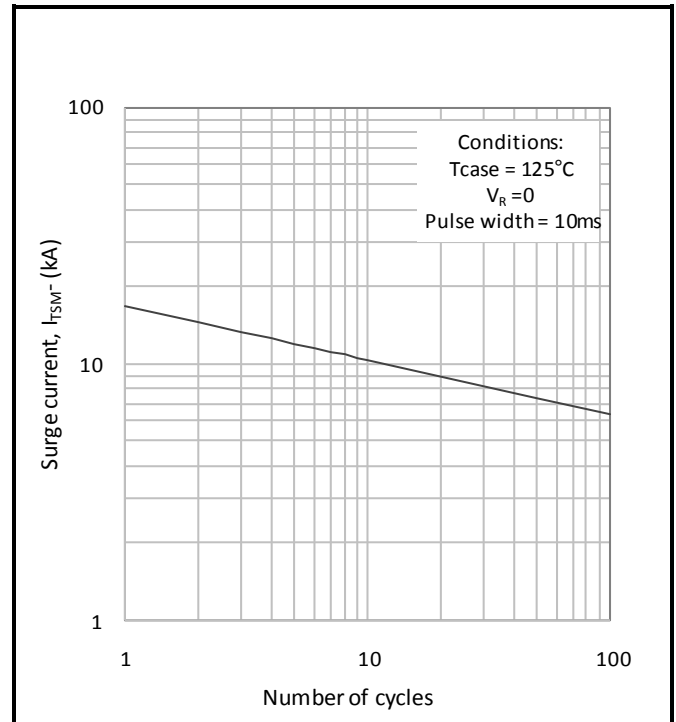


Fig.11 Multi-cycle surge current

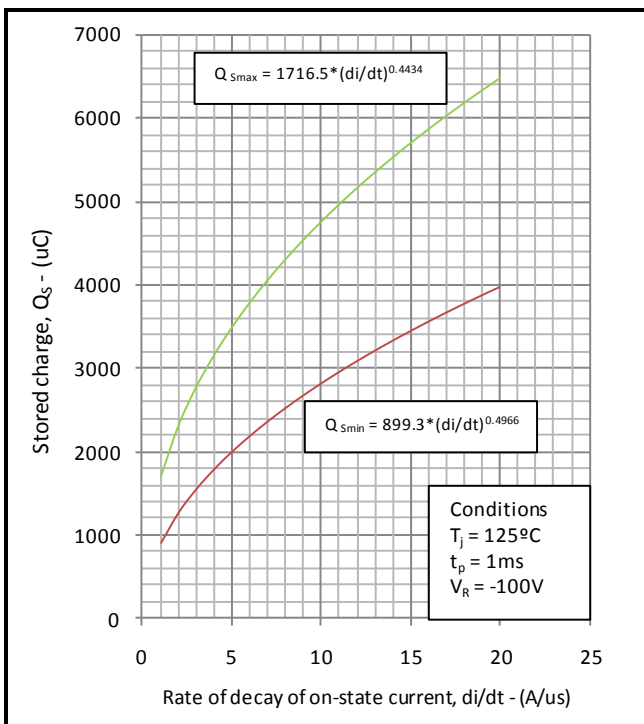


Fig.12 Stored charge

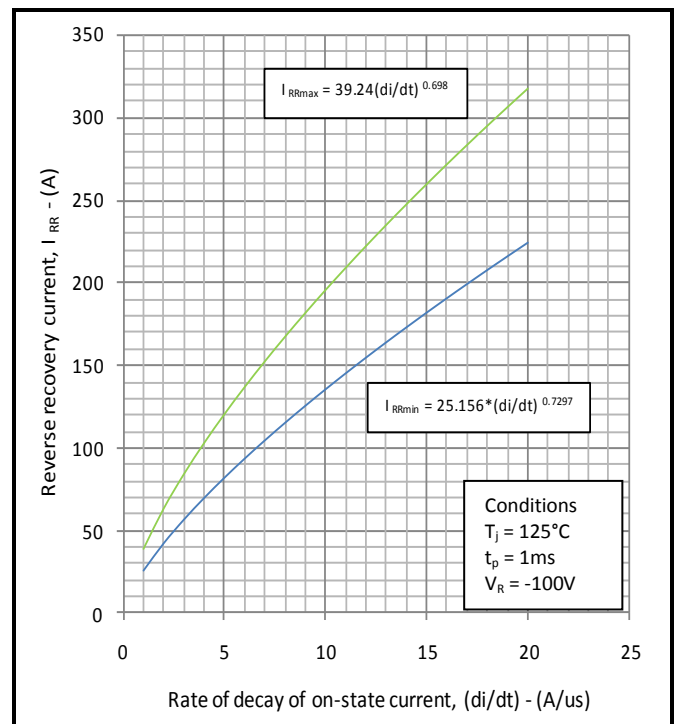


Fig.13 Reverse recovery current

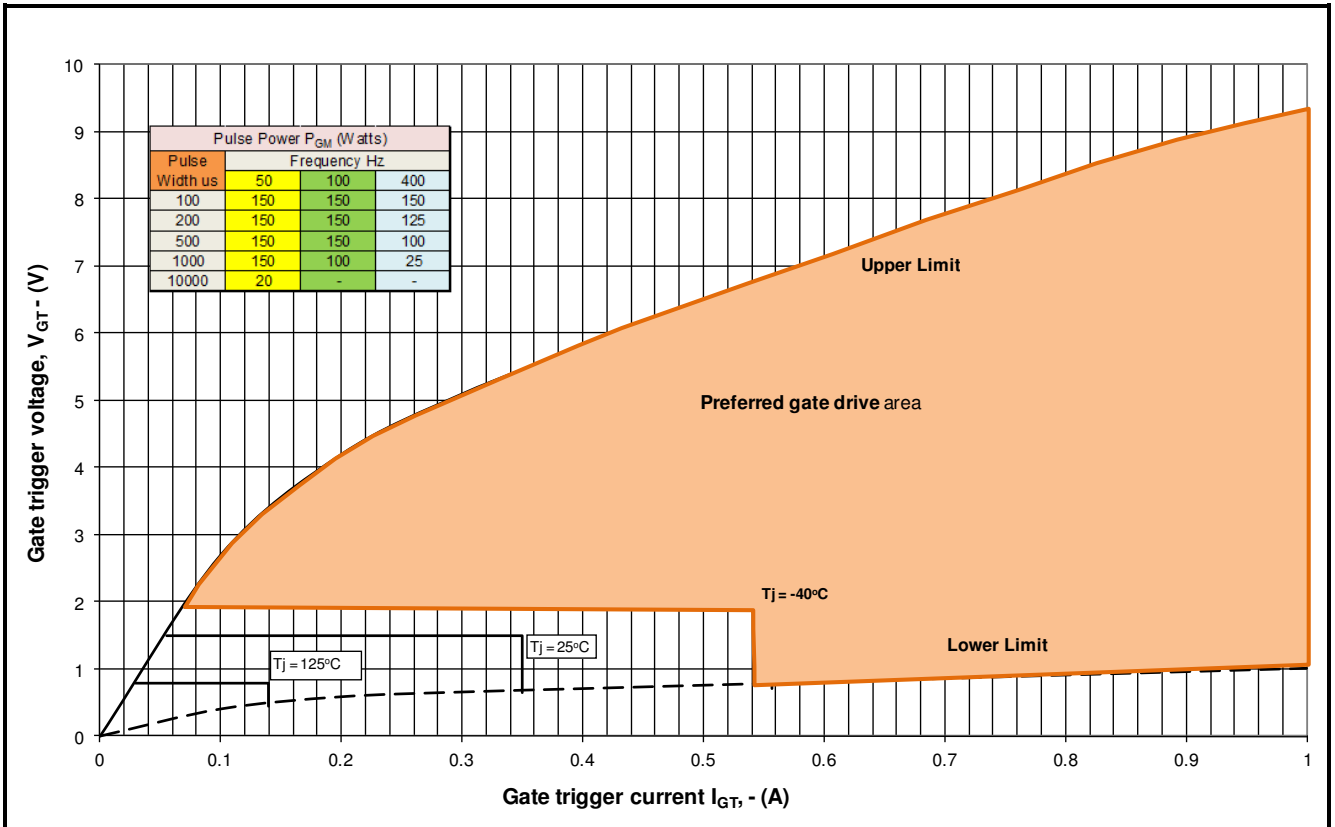


Fig14 Gate Characteristics

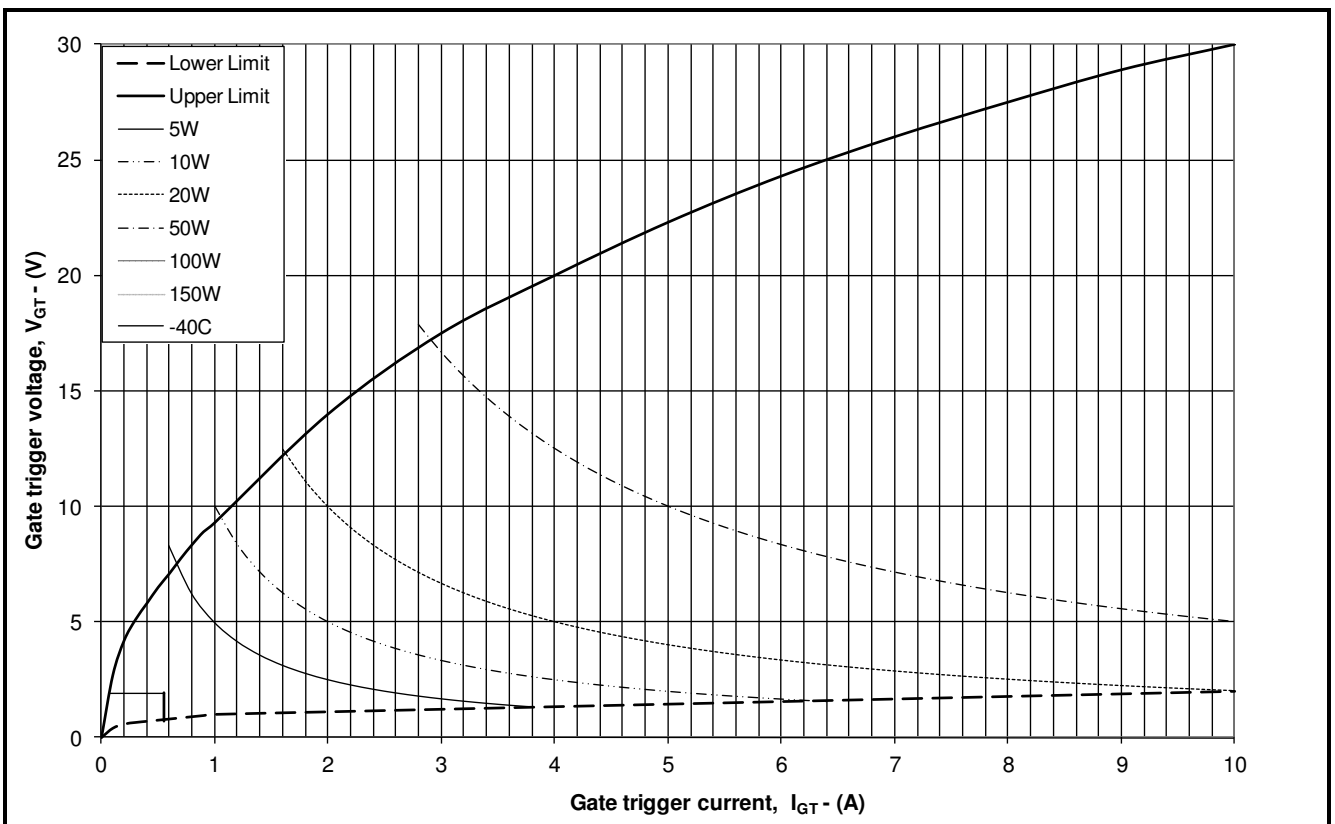


Fig. 15 Gate characteristics

PACKAGE DETAILS

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

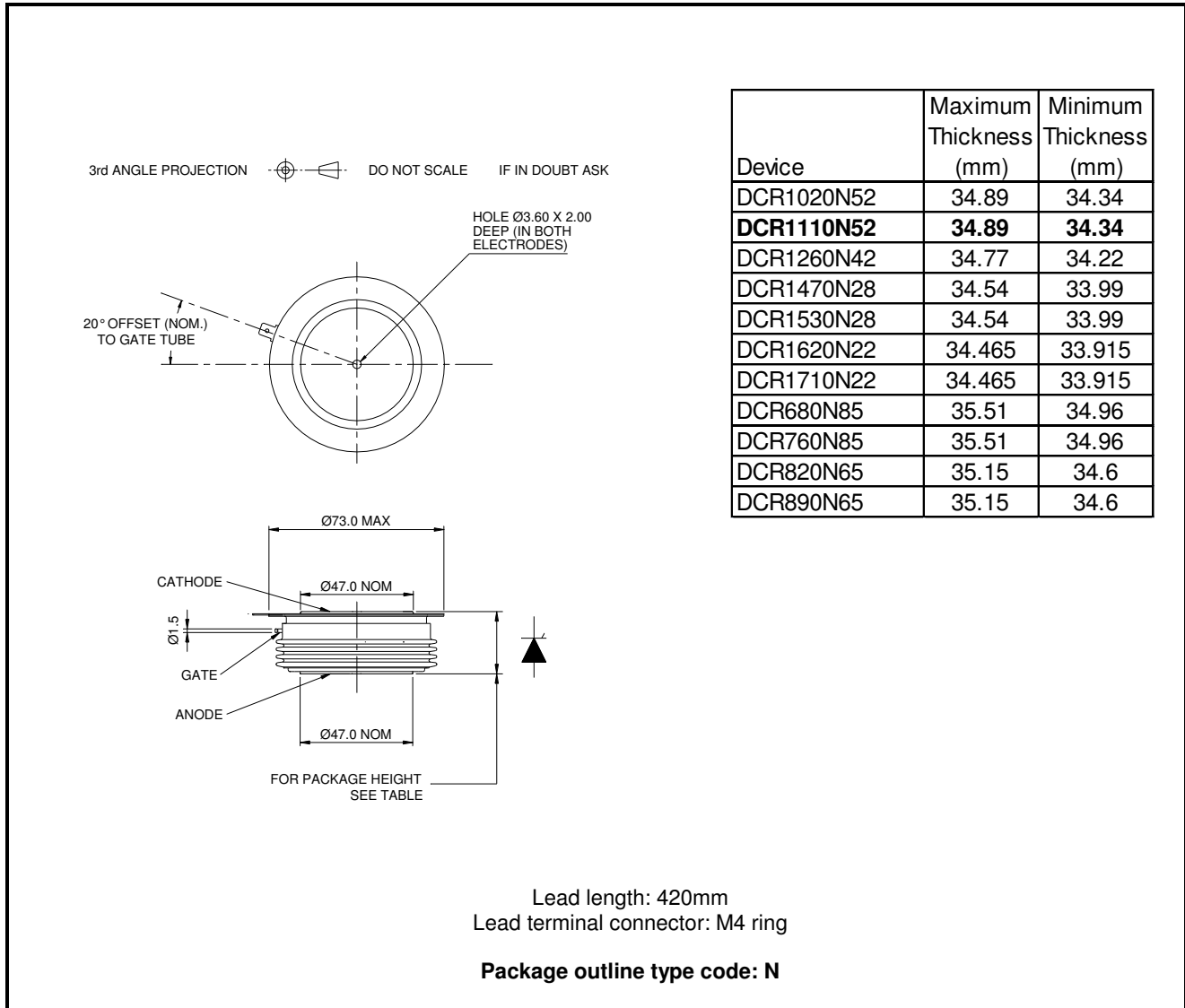


Fig.17 Package outline

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