



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 V_{DRM} and V_{RRM} V | Conditions |
|---------------------------|--|---|
| DCR1110F52* DCR1110F50 | 5200 5000 | $T_{vj} = -40^{\circ}\text{C}$ 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.
*5000V @ -40°C , 5200V @ 0°C

KEY PARAMETERS

| | |
|-------------|---------------------------------------|
| V_{DRM} | 5200V |
| $I_{T(AV)}$ | 1107A |
| I_{TSM} | 14800A |
| dV/dt^* | 1500V/μs |
| dI/dt | 800A/μs |

* Higher dV/dt selections available

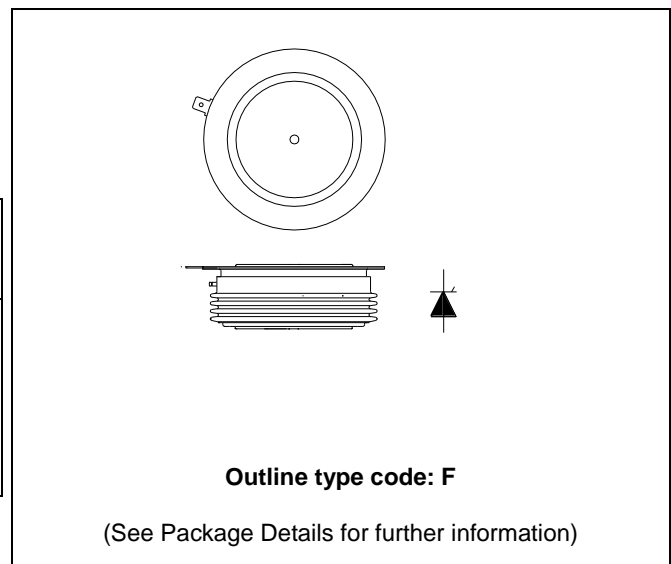


Fig. 1 Package outline

ORDERING INFORMATION

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

For example:

DCR1110F52

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 | 1107 | A |
| $I_{T(RMS)}$ | RMS value | - | 1739 | A |
| I_T | Continuous (direct) on-state current | - | 1684 | A |

SURGE RATINGS

| Symbol | Parameter | Test Conditions | Max. | Units |
|-----------|---|--|-------|-----------------------|
| I_{TSM} | Surge (non-repetitive) on-state current | 10ms half sine, $T_{case} = 125^{\circ}\text{C}$ | 14.8 | kA |
| I^2t | I^2t for fusing | $V_R = 0$ | 1.097 | 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 | - | 0.0184 | $^{\circ}\text{C/W}$ |
| | | Single side cooled | Anode DC | - | 0.0333 | $^{\circ}\text{C/W}$ |
| | | | Cathode DC | - | 0.0418 | $^{\circ}\text{C/W}$ |
| $R_{th(c-h)}$ | Thermal resistance – case to heatsink | Clamping force 23kN (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/ μ s | |
| dI/dt | Rate of rise of on-state current | From 67% V_{DRM} to $2x I_{T(AV)}$ | Repetitive 50Hz | - | 200 | A/ μ s |
| | | Gate source 30V, 10 Ω , $t_r < 0.5\mu$ s, $T_j = 125^{\circ}C$ | Non-repetitive | - | 800 | A/ μ s |
| $V_{T(TO)}$ | Threshold voltage – Low level | 300A to 750A at $T_{case} = 125^{\circ}C$ | - | 0.948 | V | |
| | Threshold voltage – High level | 750A to 4000A at $T_{case} = 125^{\circ}C$ | - | 1.078 | V | |
| r_T | On-state slope resistance – Low level | 300A to 750A at $T_{case} = 125^{\circ}C$ | - | 0.783 | m Ω | |
| | On-state slope resistance – High level | 750A to 4000A at $T_{case} = 125^{\circ}C$ | - | 0.610 | 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 | μ s | |
| t_q | Turn-off time | $T_j = 125^{\circ}C$, $V_R = 100V$, $dI/dt = 5A/\mu$ s, $dV_{DR}/dt = 20V/\mu$ s linear to 2000V | - | 1000 | μ s | |
| Q_S | Stored charge | $I_T = 1000A$, $t_p = 1000\mu$ s, $T_j = 125^{\circ}C$, $dI/dt = 5A/\mu$ s, | 2200 | 3800 | μ C | |
| I_{RR} | Reverse recovery current | | 90 | 115 | A | |
| 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 | 10 | mA |

CURVES

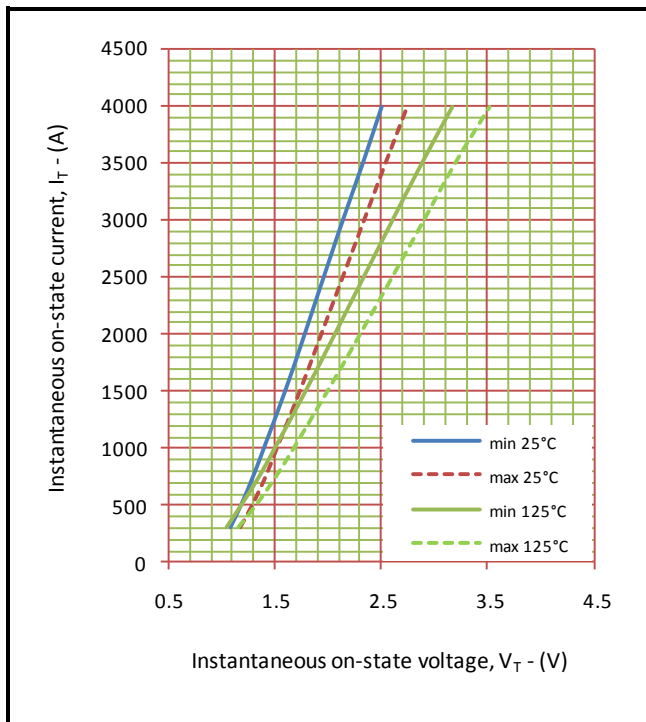


Fig.2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

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

Where A = -0.069834
 B = 0.220863
 C = 0.000638
 D = -0.013352

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

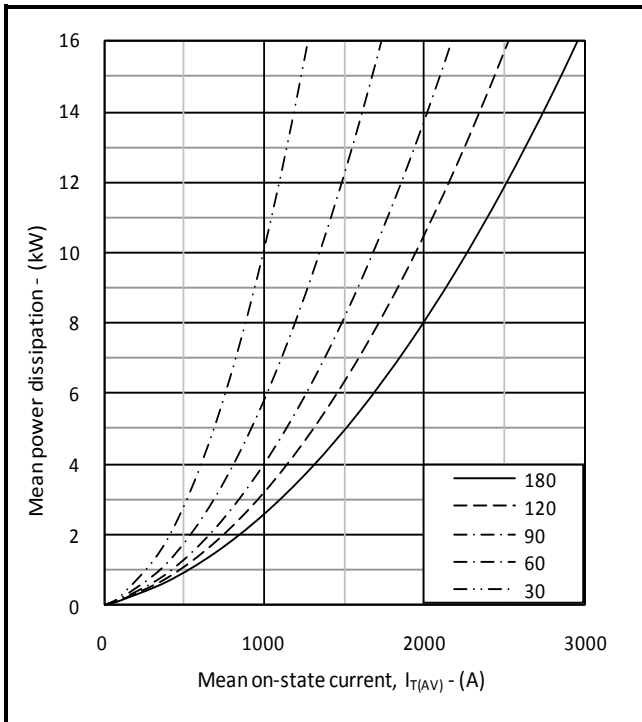


Fig.3 On-state power dissipation – sine wave

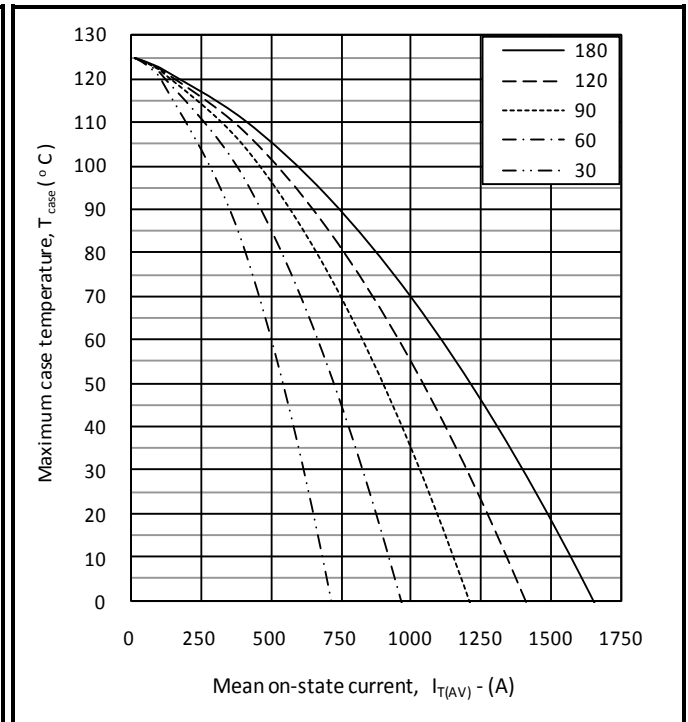


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

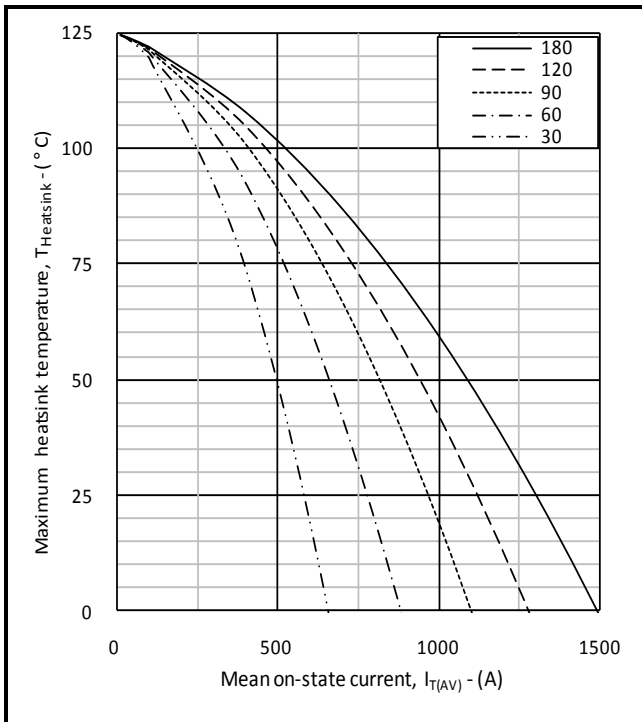


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

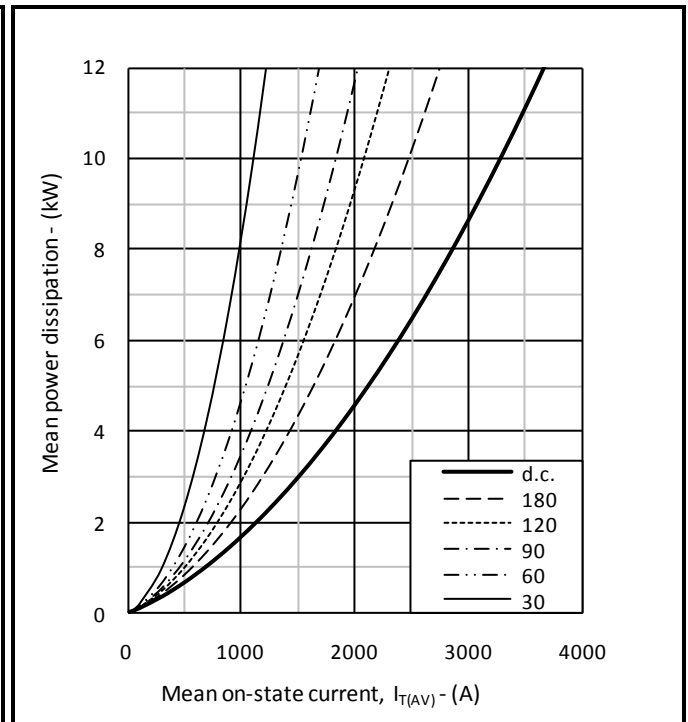


Fig.6 On-state power dissipation – rectangular wave

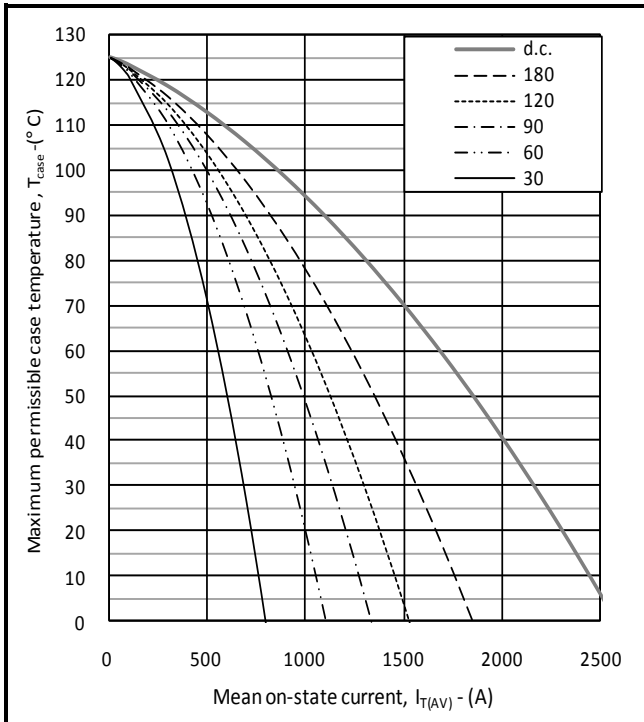


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

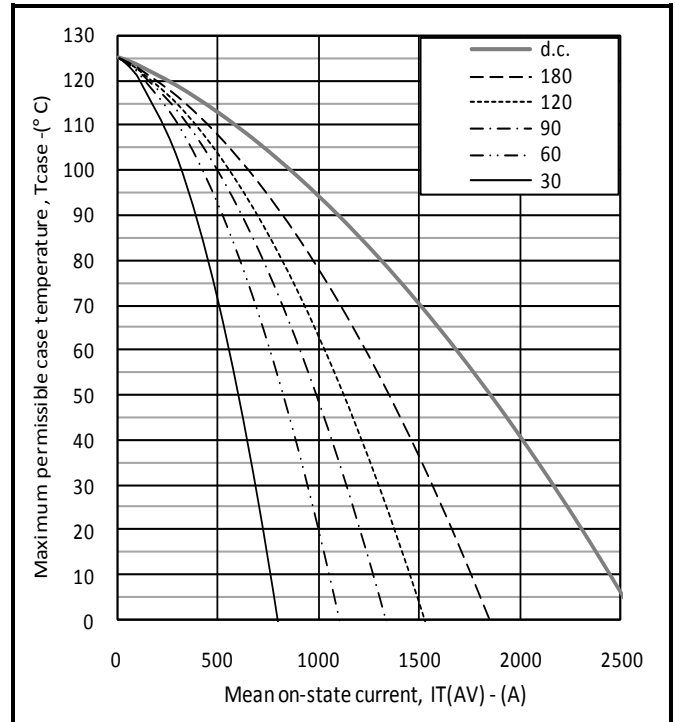


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

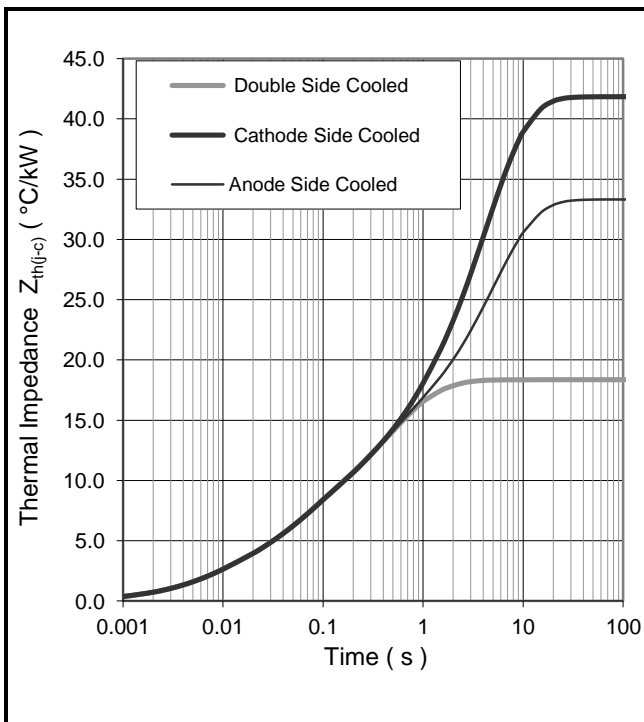


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

| | | 1 | 2 | 3 | 4 |
|---------------------|------------------------|---------|--------|---------|---------|
| Double side cooled | R _i (°C/kW) | 7.5608 | 4.0772 | 3.8420 | 2.8671 |
| | T _i (s) | 0.6877 | 0.2537 | 0.0614 | 0.0101 |
| Anode side cooled | R _i (°C/kW) | 6.7211 | 4.6219 | 15.5387 | 14.8631 |
| | T _i (s) | 0.1910 | 0.0158 | 5.0011 | 3.3169 |
| Cathode side cooled | R _i (°C/kW) | 11.5564 | 8.5810 | 4.7942 | 8.3643 |
| | T _i (s) | 4.2216 | 6.0269 | 0.0166 | 0.2255 |

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

ΔR_{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.

| Double side cooling | | | Anode Side Cooling | | | Cathode Sided Cooling | | |
|---------------------|----------------------|-------|--------------------|----------------------|-------|-----------------------|----------------------|-------|
| θ° | ΔZ _{th} (z) | | θ° | ΔZ _{th} (z) | | θ° | ΔZ _{th} (z) | |
| | sine. | rect. | | sine. | rect. | | sine. | rect. |
| 180 | 3.19 | 2.14 | 180 | 2.97 | 2.03 | 180 | 2.95 | 2.02 |
| 120 | 3.72 | 3.10 | 120 | 3.43 | 2.89 | 120 | 3.40 | 2.87 |
| 90 | 4.29 | 3.64 | 90 | 3.92 | 3.36 | 90 | 3.88 | 3.34 |
| 60 | 4.81 | 4.23 | 60 | 4.36 | 3.87 | 60 | 4.31 | 3.84 |
| 30 | 5.22 | 4.88 | 30 | 4.69 | 4.41 | 30 | 4.64 | 4.37 |
| 15 | 5.40 | 5.22 | 15 | 4.84 | 4.70 | 15 | 4.79 | 4.65 |

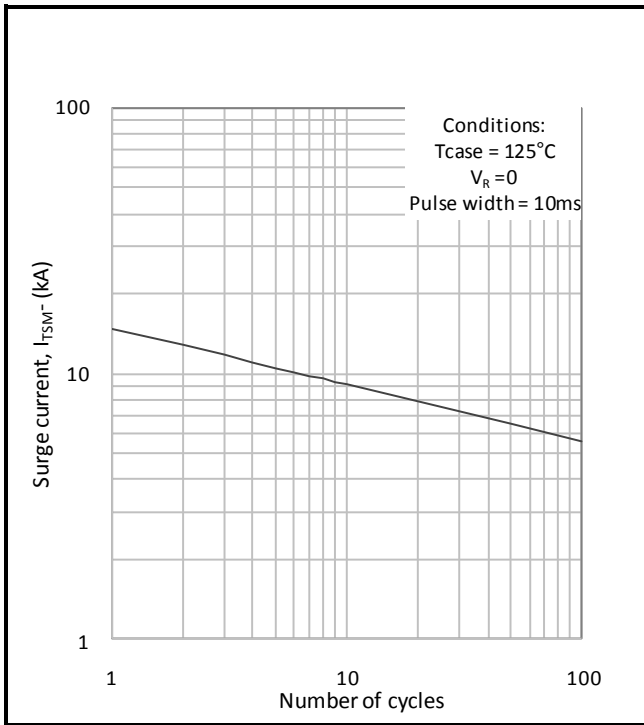


Fig.10 Multi-cycle surge current

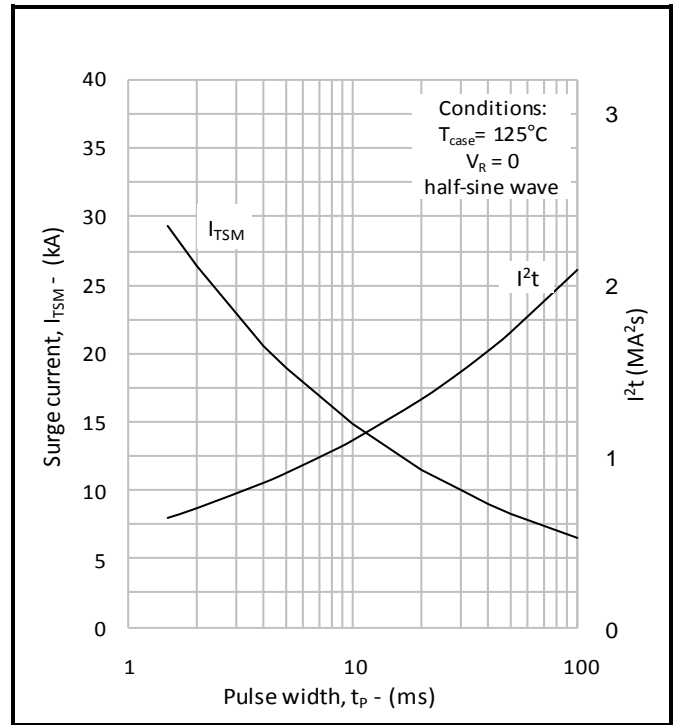


Fig.11 Single-cycle surge current

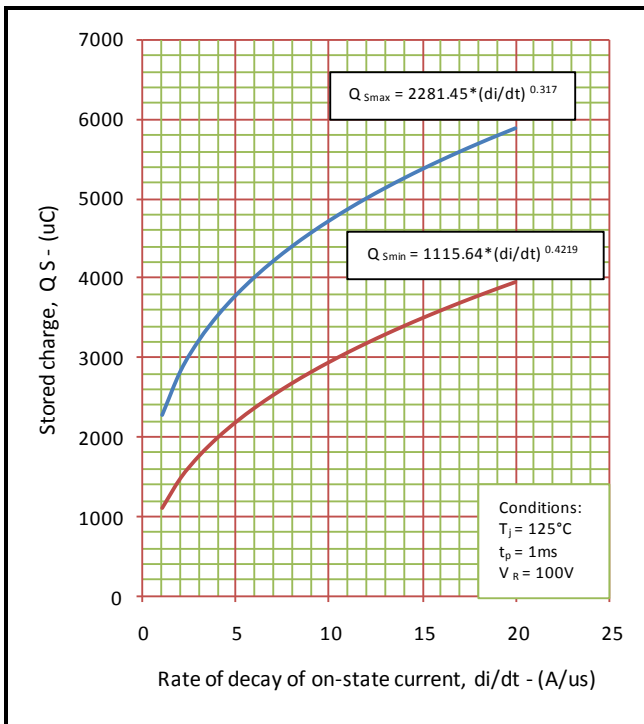


Fig.12 Stored charge vs di/dt

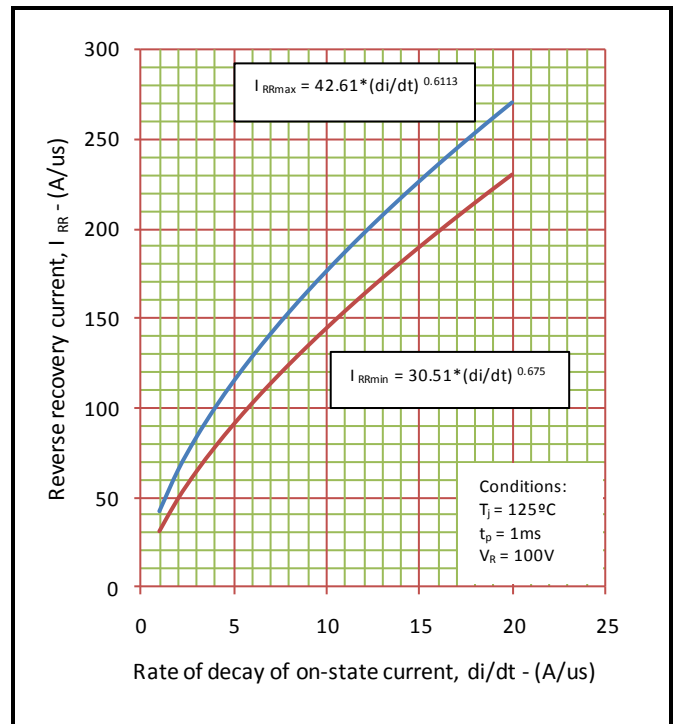


Fig.13 Reverse recovery current vs di/dt

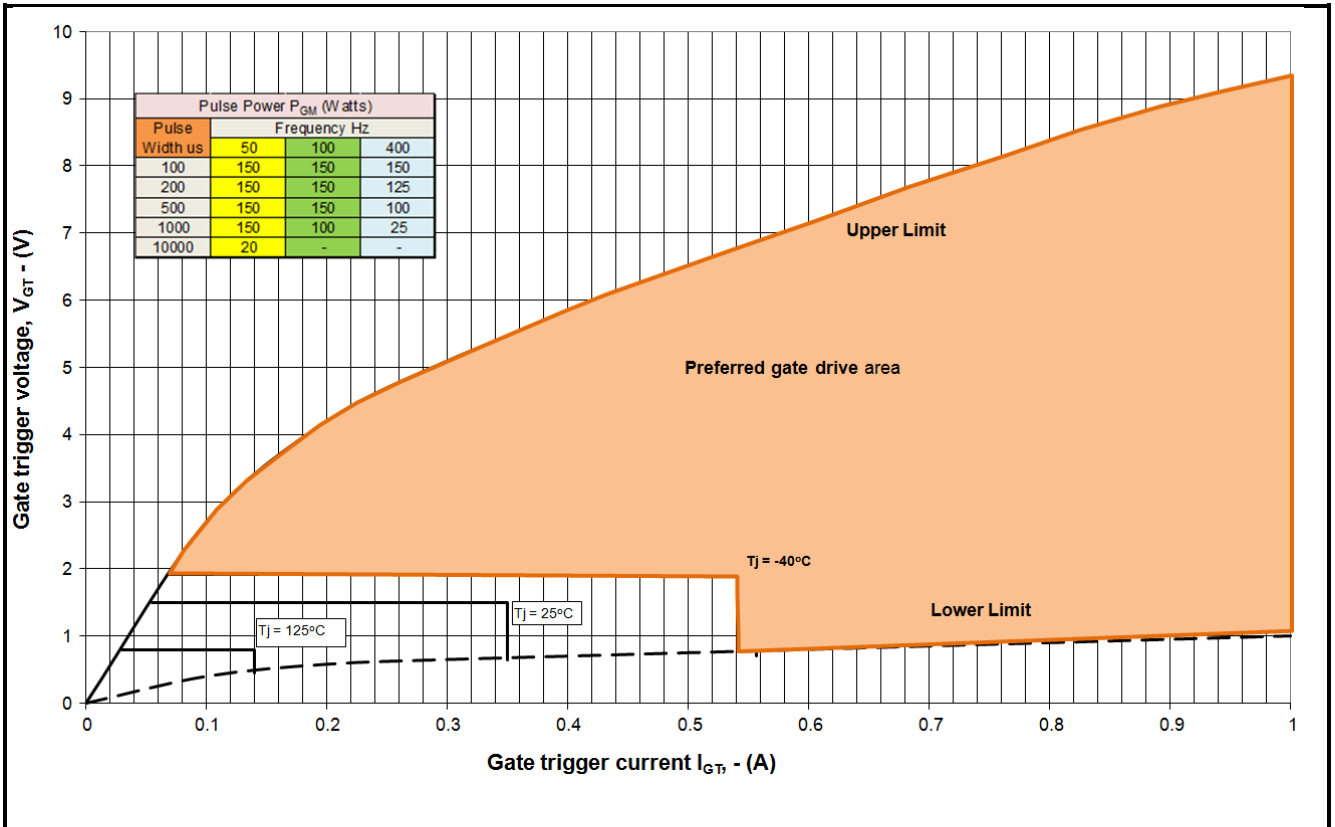


Fig14 Gate Characteristics

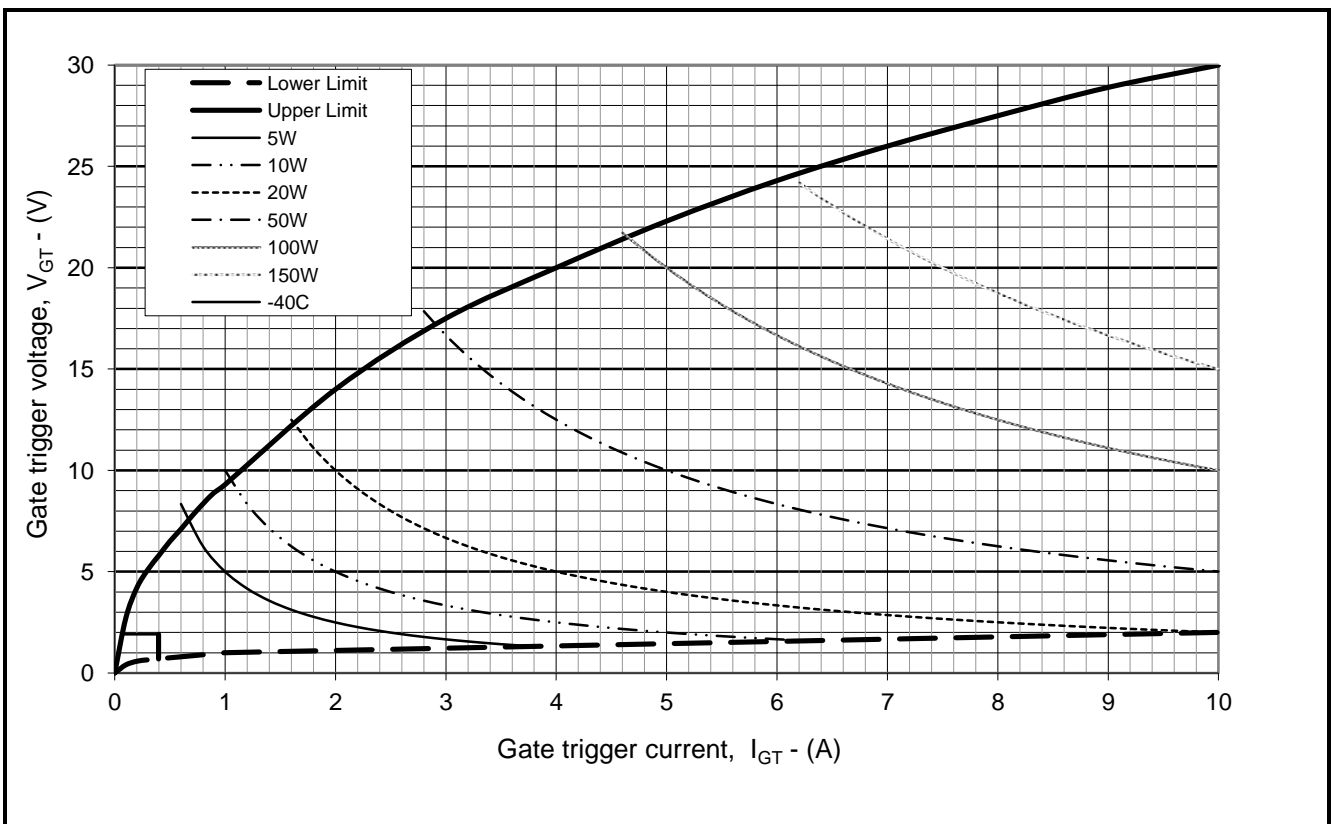


Fig. 15 Gate characteristics

PACKAGE DETAILS

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

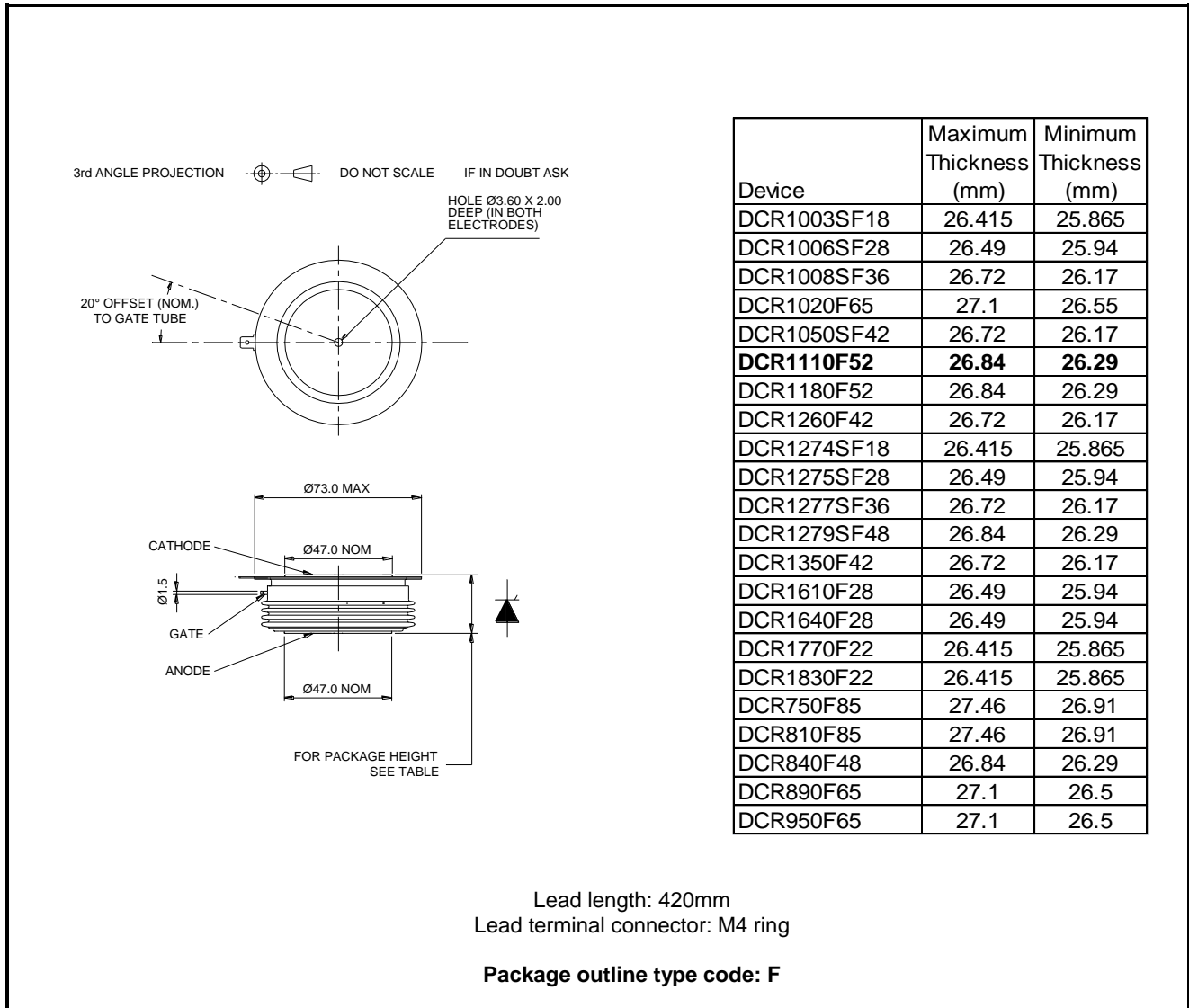


Fig.16 Package outline

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