



### IRK.166, .196, .236 SERIES High Voltage Diode/Diode

#### FEATURES

- ❖ *High voltage.*
- ❖ *Electrically isolated base plate.*
- ❖ *3000 V<sub>RMS</sub> isolating voltage.*
- ❖ *Industrial standard package.*
- ❖ *Simplified mechanical designs, rapid assembly.*
- ❖ *High surge capability.*
- ❖ *Large creepage distances.*
- ❖ *Aluminum Nitride*

#### DESCRIPTION

This IRK series of Power Modules uses power diodes in three basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. They can be interconnected to form single phase or three phase bridges. These modules are intended for general purpose applications such as battery chargers, welders and plating equipment.

#### MAJOR RATINGS & CHARACTERISTICS

| Parameters                              | IRK.166    | IRK.196    | IRK.236    | Units                      |
|---|------------|------------|------------|----------------------------|
| $I_{F(AV)}$ @ $T_c = 100^\circ\text{C}$ | 165        | 195        | 230        | A                          |
| $I_{F(RMS)}$                            | 260        | 305        | 360        | A                          |
| $I_{FSM}$ @ 50 Hz                       | 4000       | 4750       | 6540       | A                          |
| $I^2t$ @ 50 Hz                          | 80         | 113        | 214        | kA <sup>2</sup> s          |
| $I^2\sqrt{t}$                           | 798        | 1130       | 2140       | kA <sup>2</sup> $\sqrt{s}$ |
| $V_{RRM}$ range                         | Up to 1600 | Up to 1600 | Up to 1600 | V                          |
| $T_J$                                   | -40 to 135 |            |            | $^\circ\text{C}$           |

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### ELECTRICAL SPECIFICATION

#### VOLTAGE RATINGS

| Type Number | Voltage Code | $V_{RRM}$ , max. repetitive peak reverse and off-state voltage blocking voltage<br>V | $V_{RSM}$ , max. non-repetitive peak reverse voltage<br>V | $I_{RRM}$ max.<br>@ 150°C<br>mA |
|-------------|--------------|--|---|---------------------------------|
|             | 04           | 400  | 500   | 50                              |
| IRK.166     | 06           | 600  | 700   | 50                              |
| IRK.196     | 08           | 800  | 900   | 50                              |
| IRK.236     | 10           | 1000   | 1100  | 50                              |
|             | 12           | 1200   | 1300  | 50                              |
|             | 14           | 1400   | 1500  | 50                              |
|             | 16           | 1600   | 1700  | 50                              |

#### FORWARD CONDUCTION

|               | Parameters  | IRK.166 | IRK.196 | IRK.236 | Units              | Conditions  |
|---------------|---|---------|---------|---------|--------------------|---|
| $I_{F(AV)}$   | Max. average forward current                              | 165     | 195     | 230     | A                  | 180°C conduction, half sine wave  |
|               | @ case temperature  | 100     | 100     | 100     | °C                 |   |
| $I_{F(RMS)}$  | Max. RMS forward current                                  | 260     | 305     | 360     | A                  | as AC switch  |
| $I_{FSM}$     | Max. peak, one cycle forward non-repetitive surge current | 4000    | 4750    | 6540    | A                  | t = 10ms  |
| $I^2t$        | Maximum $I^2t$ for fusing                                 | 80      | 113     | 214     | kA <sup>2</sup> s  | t = 10ms  |
| $I^2\sqrt{t}$ | Maximum $I^2\sqrt{t}$ for fusing                          | 798     | 1130    | 2140    | kA <sup>2</sup> √s | t = 0.1 to 10ms. No voltage reapplied.  |
| $V_{F(TO)}$   | Threshold voltage   | 0.70    | 0.75    | 0.79    | V                  | $T_J = T_J$ max.  |
| $r_t$         | Forward slope resistance                                  | 1.69    | 0.92    | 0.64    | mΩ                 | $T_J = T_J$ max.  |
| $V_{FM}$      | Max. forward voltage drop                                 | 1.57    | 1.32    | 1.26    | V                  | $I_{FM} = \pi \times I_{F(AV)}$ , $T_J = T_J$ max., 180° conduction<br>AV. power = $V_{F(TO)} \times I_{F(AV)} + r_t \times (I_{F(RMS)})^2$ |

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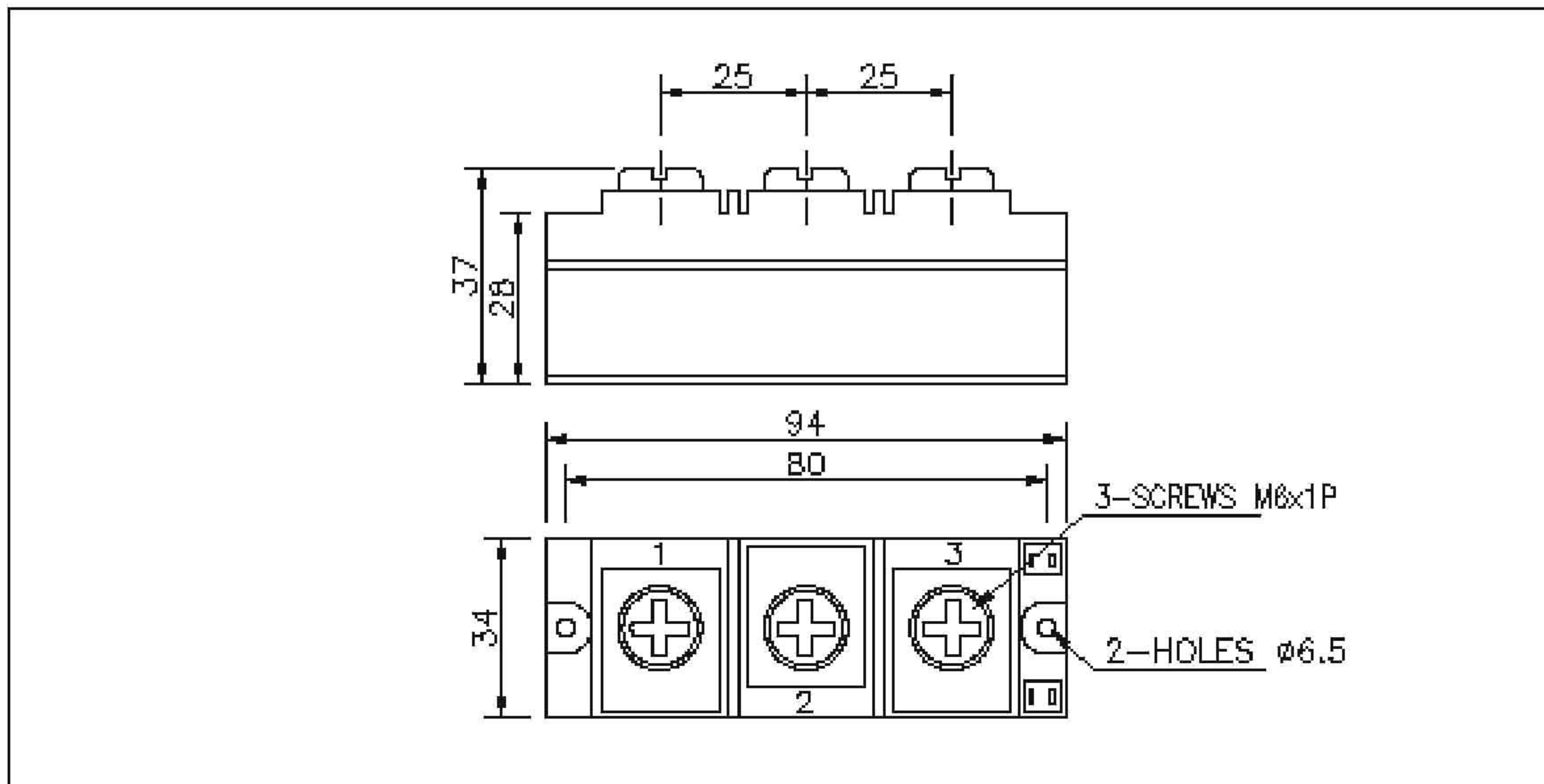
### THERMAL AND MECHANICAL SPECIFICATIONS

| Parameters  | IRK.166  | IRK.196            | IRK.236 | Units                   | Conditions  |  |
|-------------|--|--------------------|---------|-------------------------|---|--|
| $T_J$       | Junction operating temperature                     |                    |         | -40 to 135              | °C  |  |
| $T_{stg}$   | Storage temperature range                          |                    |         | -40 to 150              | °C  |  |
| $R_{thj-c}$ | Max. internal thermal resistance, junction to case |                    |         | 0.20    0.20    0.17    | K/W    IRKD../IRKJ../IRKC..    Per junction, DC operation |  |
| $R_{thc-s}$ | Thermal resistance, case to heatsink               |                    |         | 0.035    0.035    0.035 | K/W    Mounting surface flat, smooth and greased          |  |
| T           | Mounting torque $\pm 10\%$                         | Module to heatsink | 4 to 6  |                         | Nm  | A mounting compound is recommended and the torque should be rechecked after a period of about 3 hours to allow for the spread of the compound. |
|             |  | Busbar to module   | 4 to 6  |                         | Nm  |  |
| Wt          | Approximate weight                                 |                    |         | 350                     | g   |  |

### BLOCKING

| Parameter | IRK.166                           | IRK.196 | IRK.236 | Units                | Conditions  |
|-----------|-----------------------------------|---------|---------|----------------------|---|
| $I_{RRM}$ | Max. peak reverse leakage current |         |         | 50    50    50       | mA $T_J = 150^\circ\text{C}$  |
| $V_{INS}$ | RMS isolation voltage             |         |         | 3000    3000    3000 | V    50 Hz, circuit to base, all terminals shorted, $t=1\text{sec}$ |

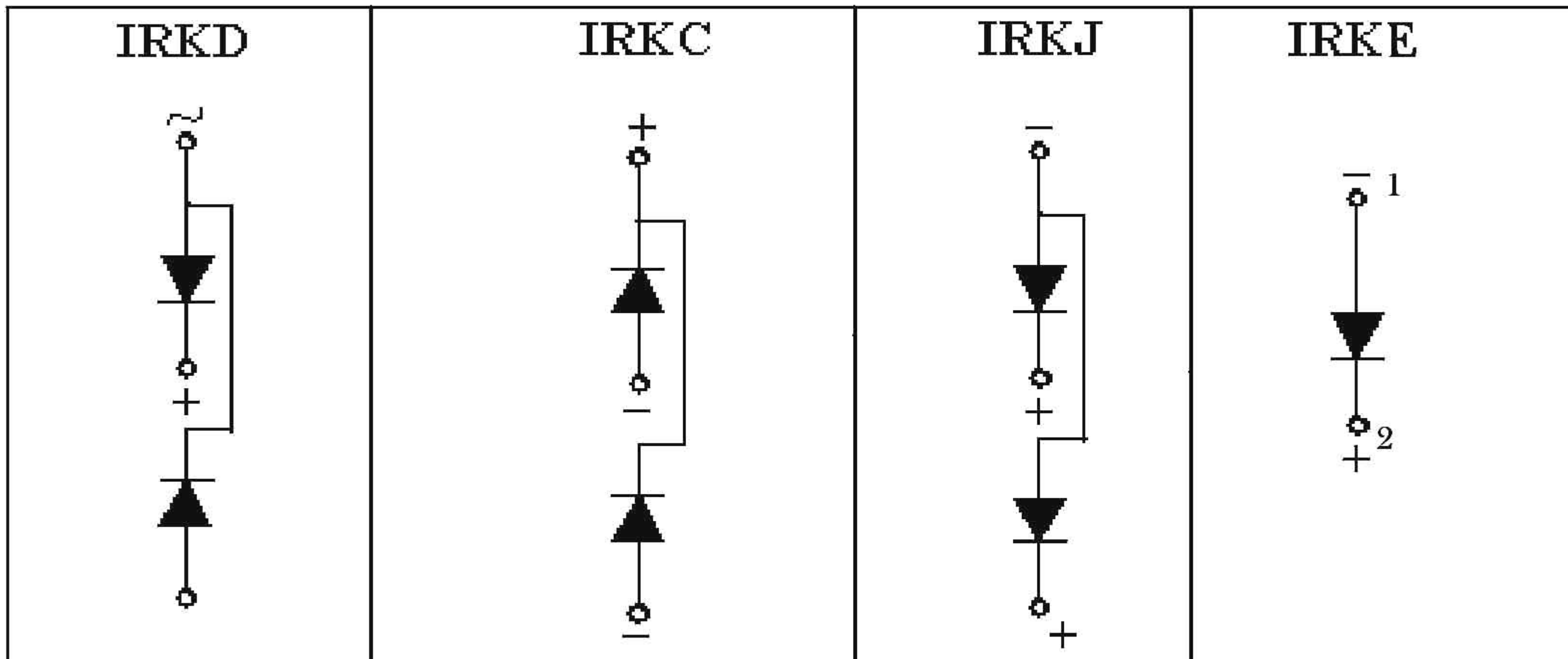
### OUTLINE DIAGRAM



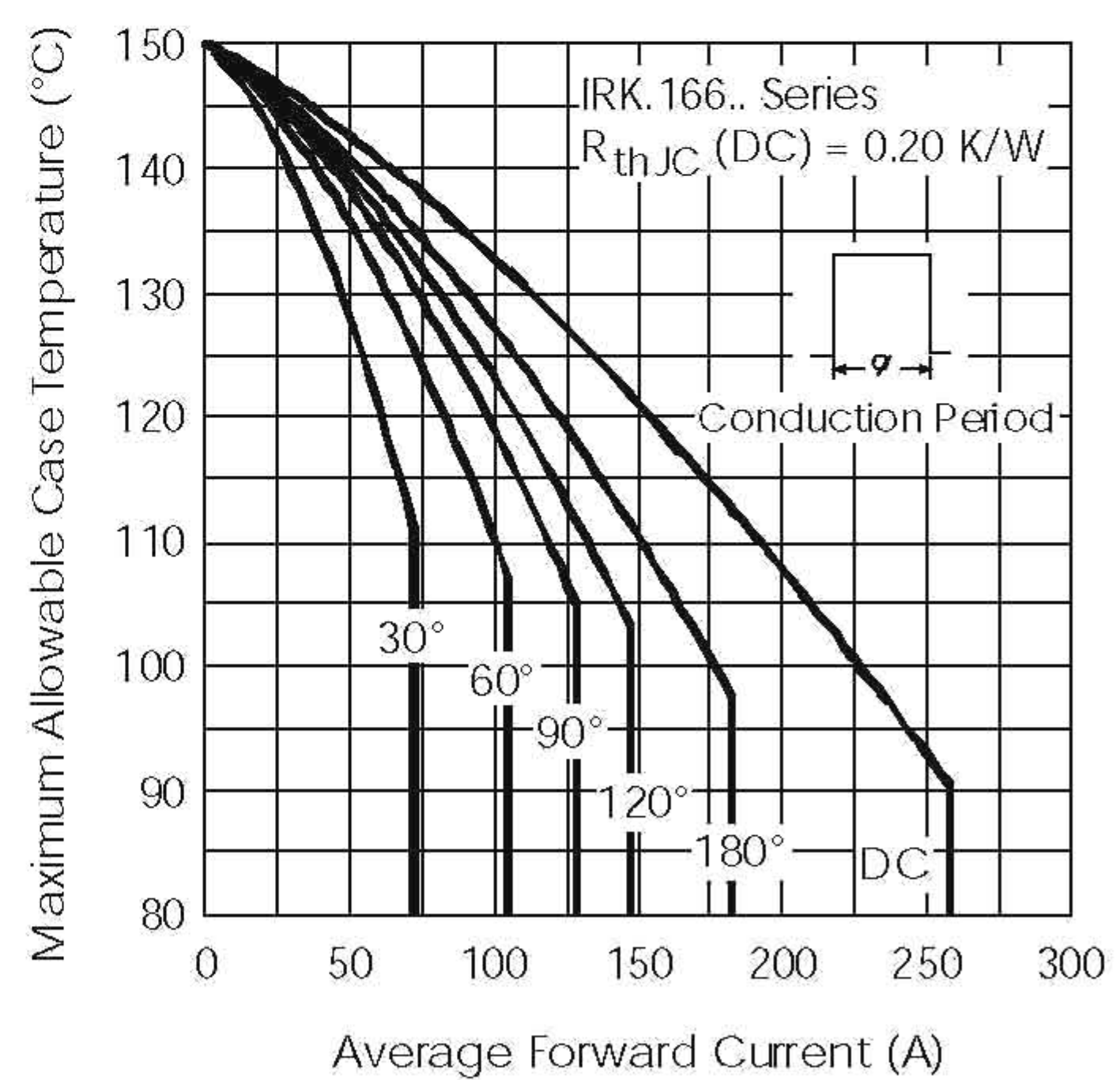
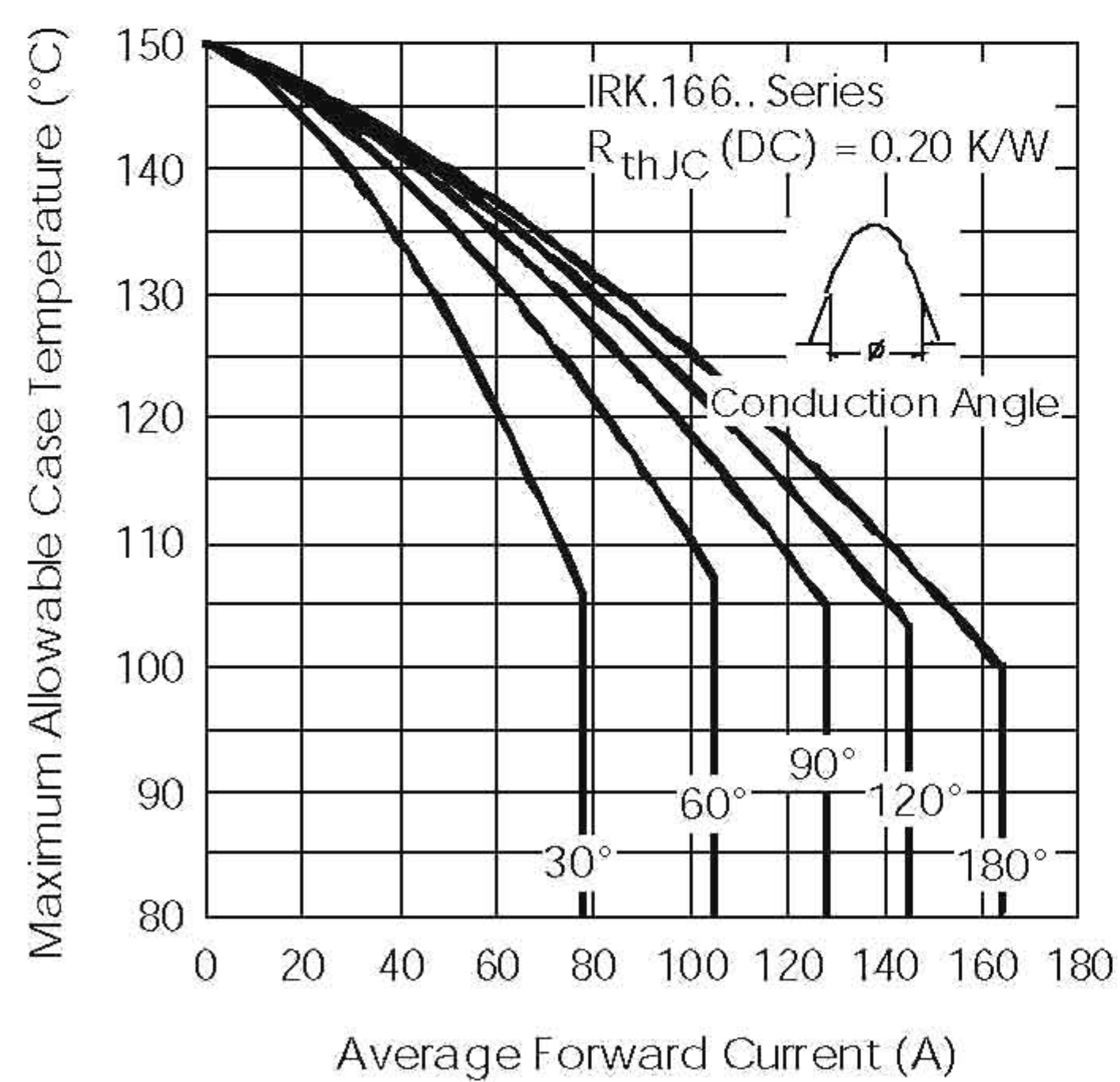
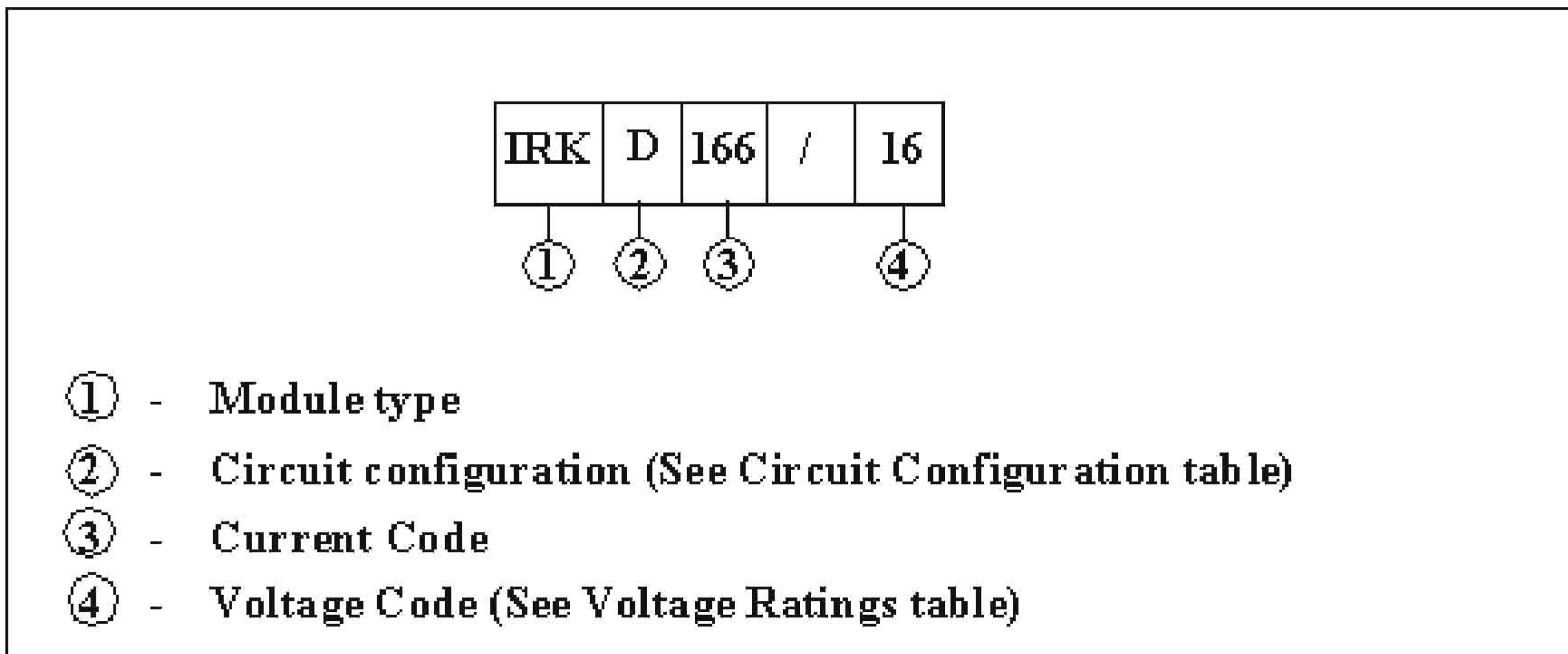
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## Circuit Configuration Table



## Ordering Information Table



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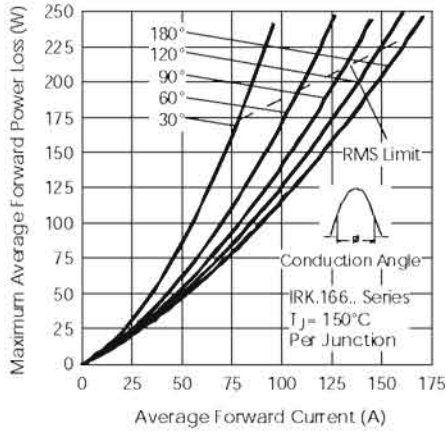


Fig. 3 - Forward Power Loss Characteristics

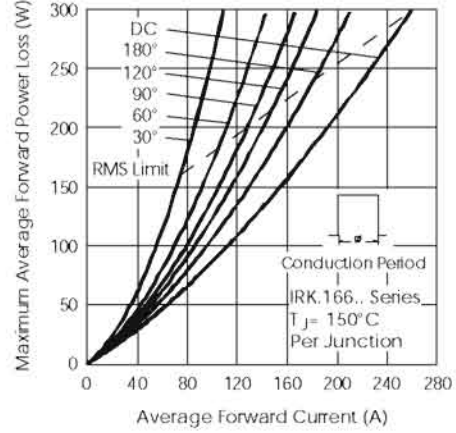


Fig. 4 - Forward Power Loss Characteristics

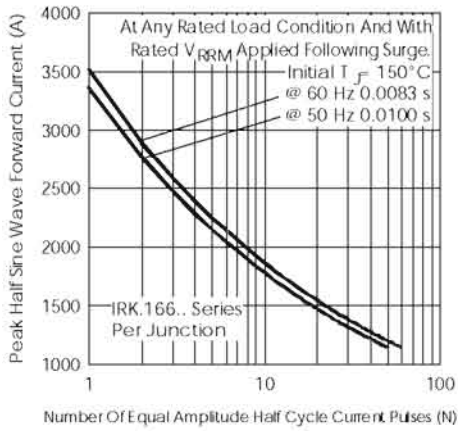


Fig. 5 - Maximum Non-Repetitive Surge Current

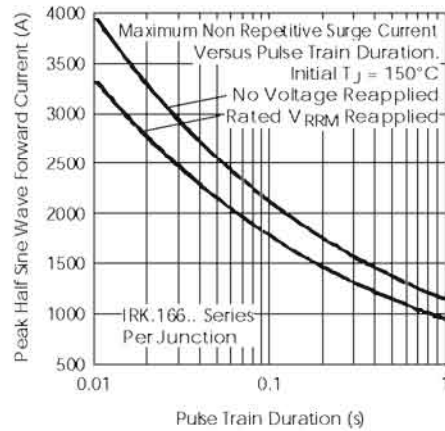


Fig. 6 - Maximum Non-Repetitive Surge Current

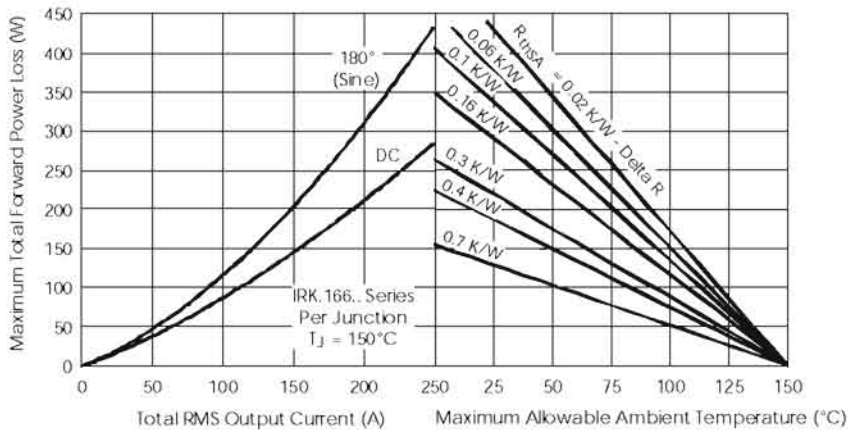


Fig. 7 - Forward Power Loss Characteristics

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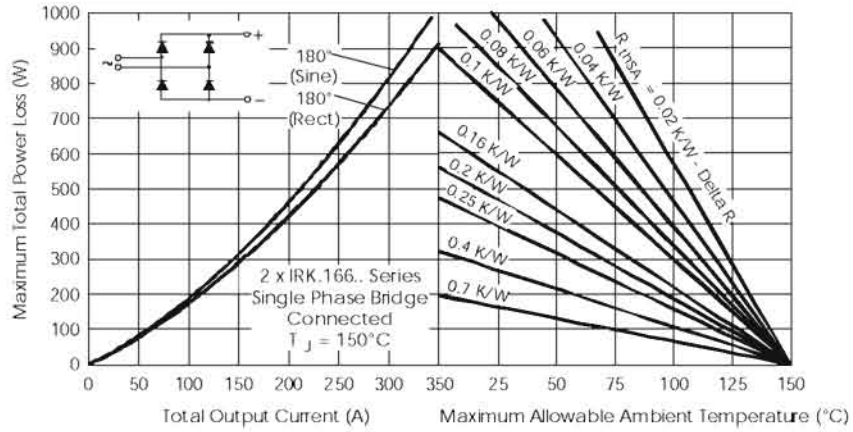


Fig. 8 - Forward Power Loss Characteristics

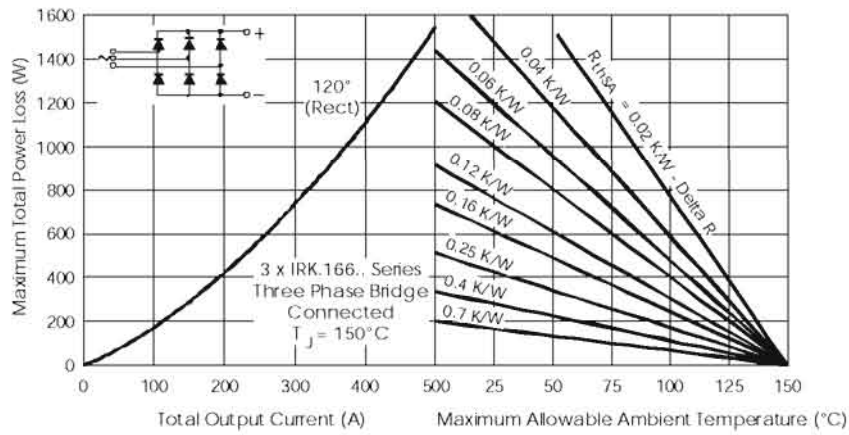


Fig. 9 - Forward Power Loss Characteristics

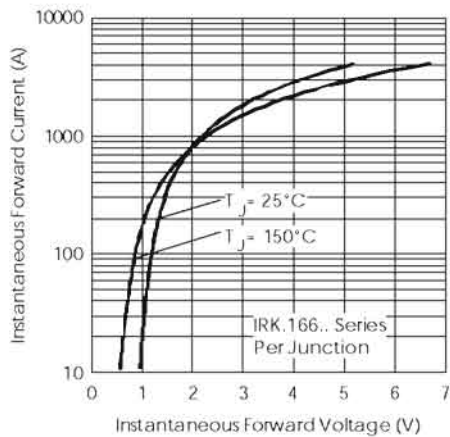


Fig. 10 - Forward Voltage Drop Characteristics

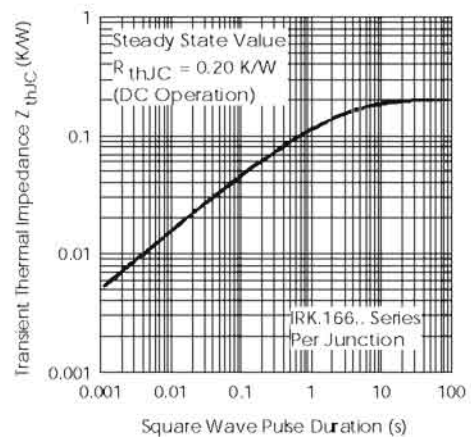


Fig. 11 - Thermal Impedance  $Z_{\theta JC}$  Characteristic

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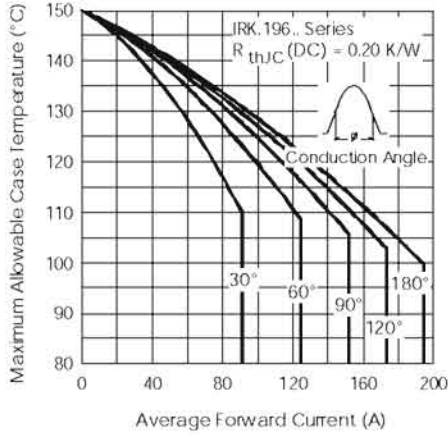


Fig. 12 - Current Ratings Characteristics

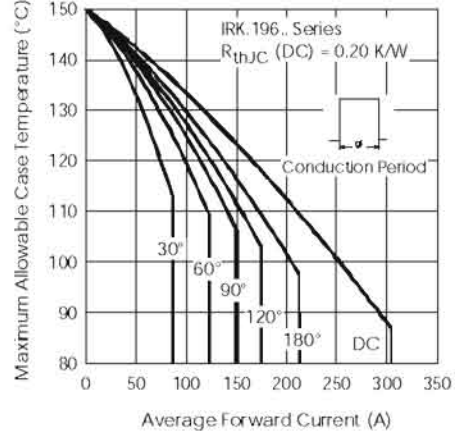


Fig. 13 - Current Ratings Characteristics

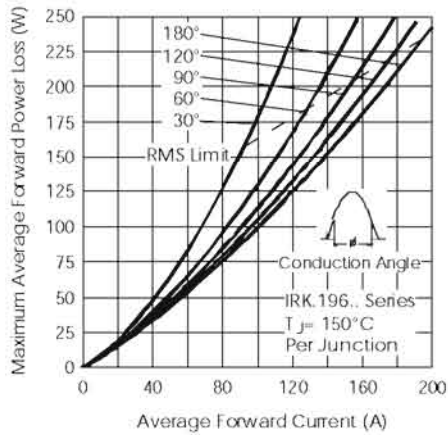


Fig. 14 - Forward Power Loss Characteristics

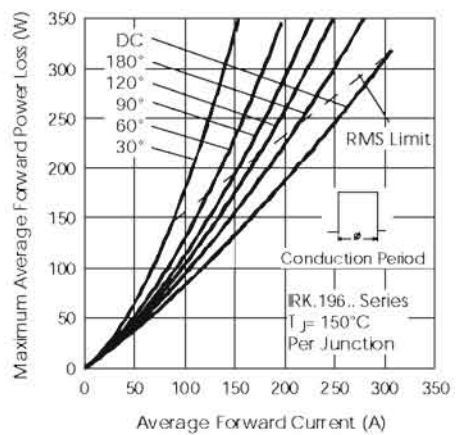


Fig. 15 - Forward Power Loss Characteristics

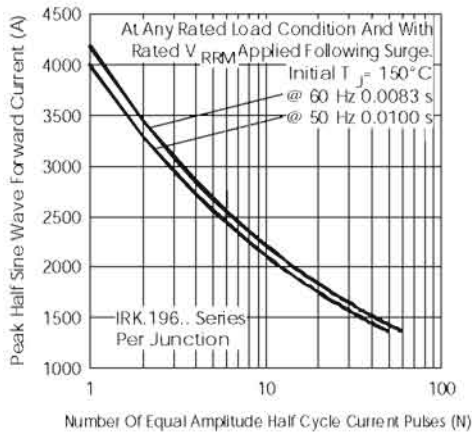


Fig. 16 - Maximum Non-Repetitive Surge Current

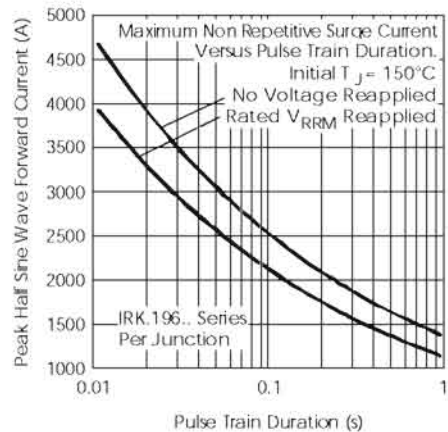


Fig. 17 - Maximum Non-Repetitive Surge Current

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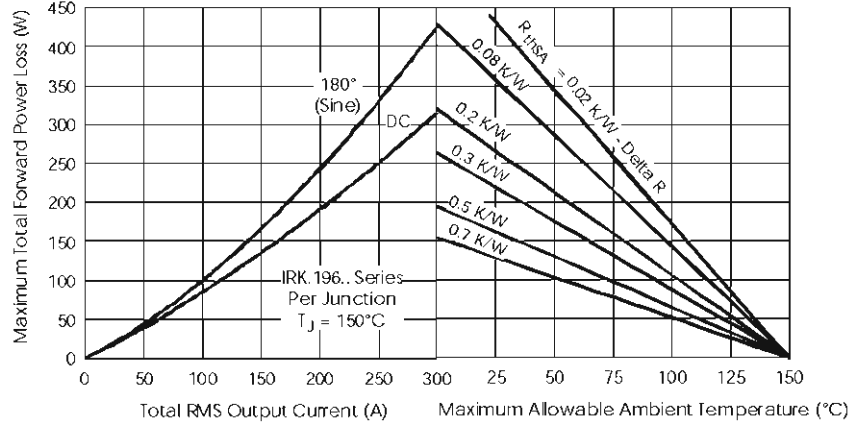


Fig. 18 - Forward Power Loss Characteristics

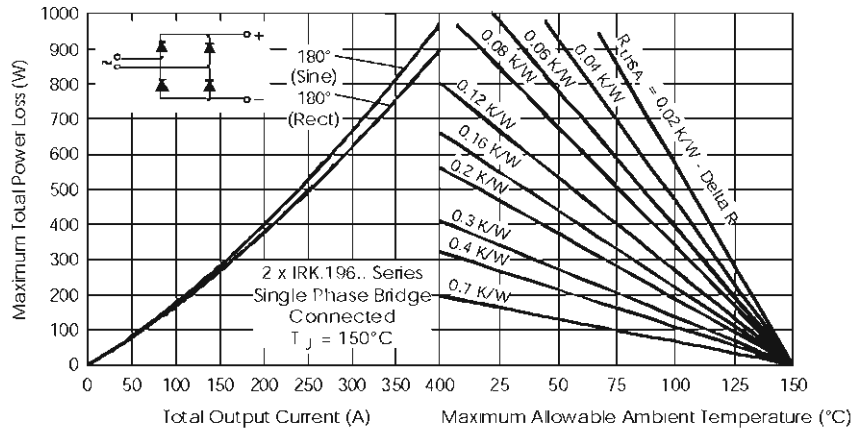


Fig. 19 - Forward Power Loss Characteristics

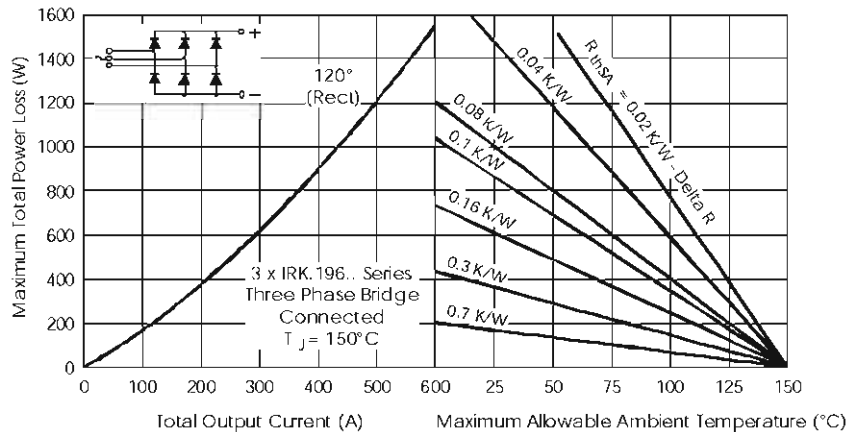


Fig. 20 - Forward Power Loss Characteristics



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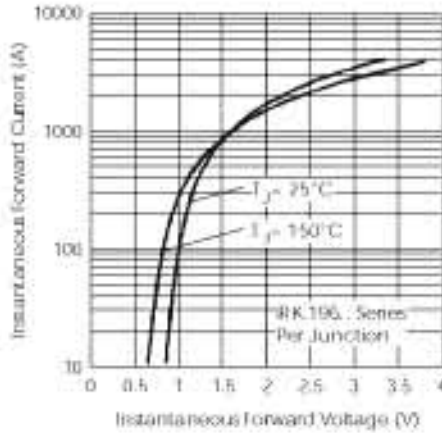


Fig. 21 - Forward Voltage Drop Characteristics

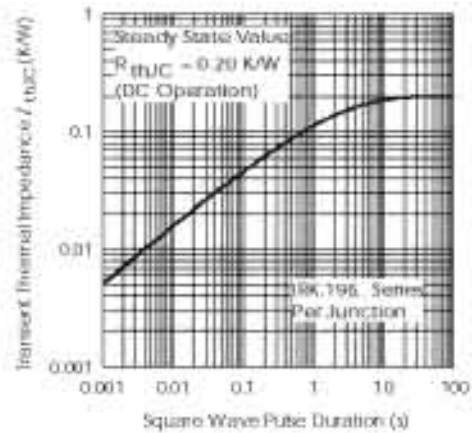


Fig. 22 - Thermal Impedance  $Z_{thJC}$  Characteristic

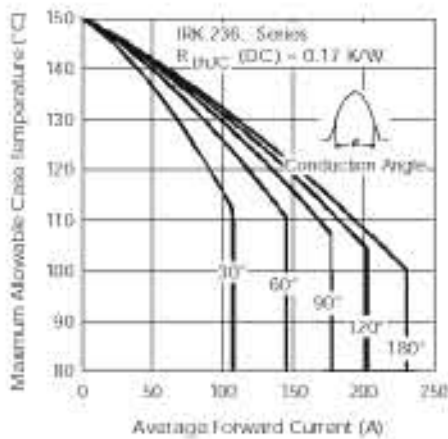


Fig. 23 - Current Ratings Characteristics

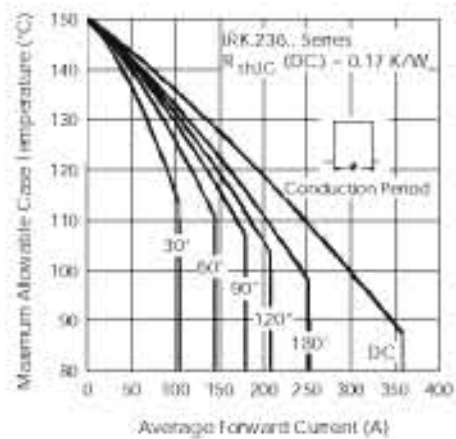


Fig. 24 - Current Ratings Characteristics

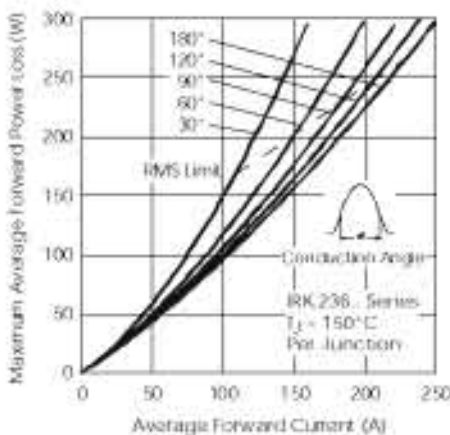


Fig. 25 - Forward Power Loss Characteristics

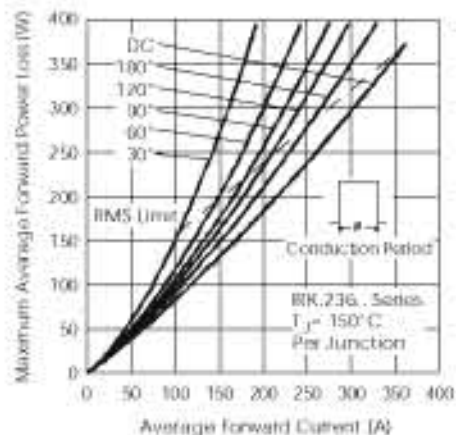


Fig. 26 - Forward Power Loss Characteristics

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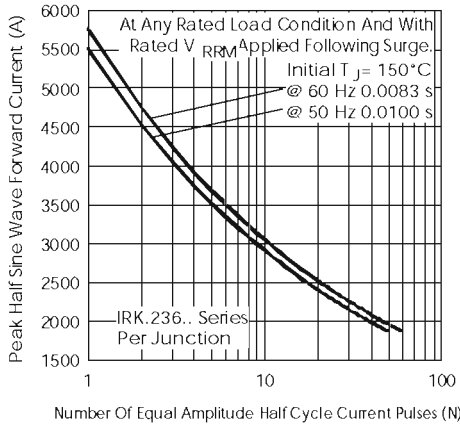


Fig. 27 - Maximum Non-Repetitive Surge Current

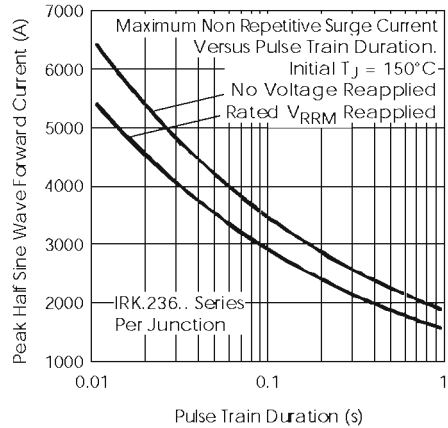


Fig. 28 - Maximum Non-Repetitive Surge Current

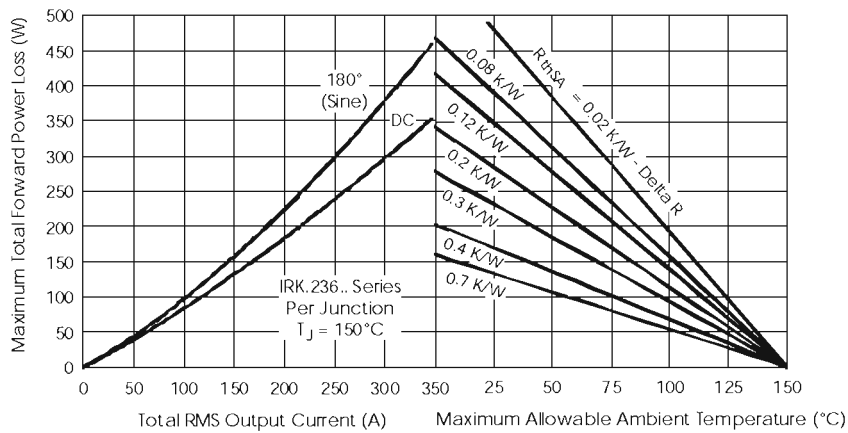


Fig. 29 - Forward Power Loss Characteristics

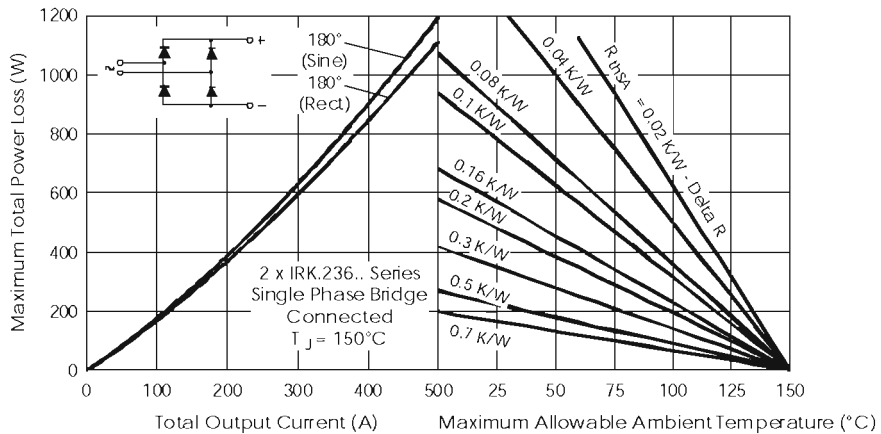


Fig. 30 - Forward Power Loss Characteristics

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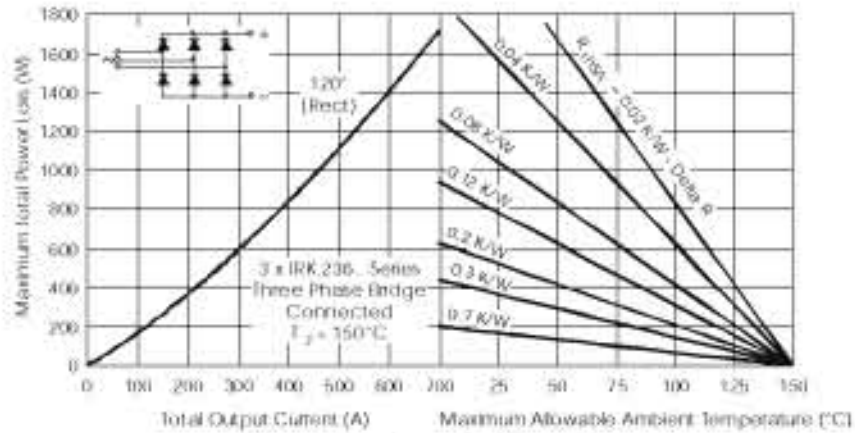


Fig. 31 - Forward Power Loss Characteristics

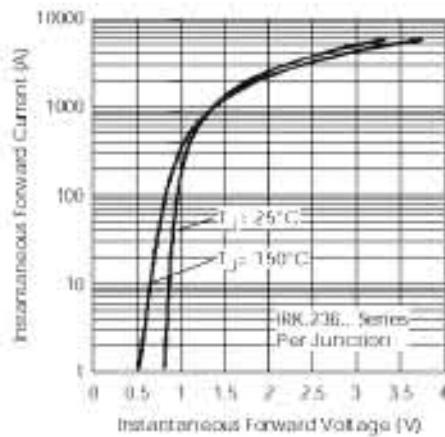


Fig. 32 - Forward Voltage Drop Characteristics

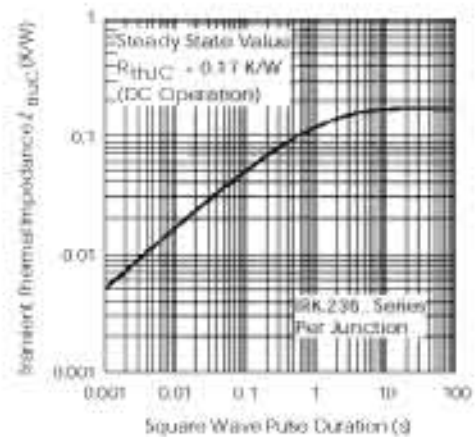


Fig. 33 - Thermal Impedance  $Z_{thJC}$  Characteristic

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