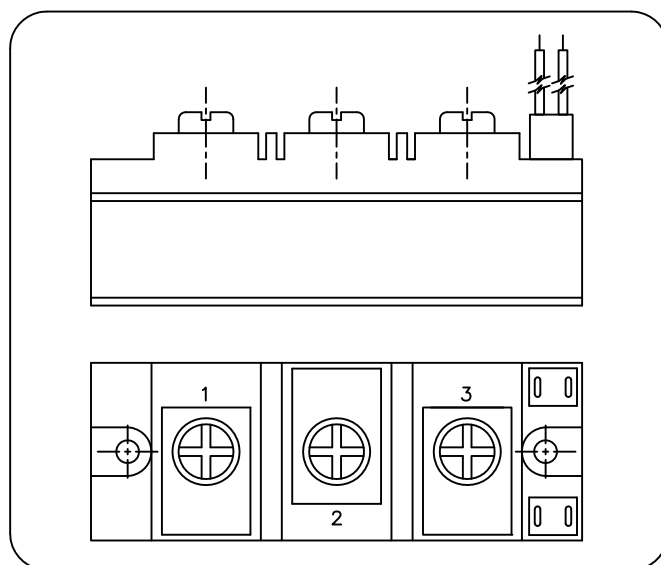


### IRK.. 115 Series High Voltage Thyristor/ Diode and Thyristor/ Thyristor

#### FEATURES

- # Electrically isolated base plate.
- # 3000Vrms isolating voltage.
- # Industrial standard package.
- # Simplified mechanical designs, rapid assembly.
- # High surge capability.
- # Large creepage distance.
- # Aluminum Nitride.



#### DESCRIPTION

These IRK series of Power Modules use power diodes and thyristor in four basic configuration. The semiconductors are electrically isolated from the metal base, allowing common heat sinks and compact assemblies to be built. They can be interconnected to form single phase or three phase bridges or AC controller. These modules are connected in anti-parallel

These module are intended for general purpose applications such as battery chargers, welders and plating equipment.

#### MAJOR RATING & CHARACTERISTICS

| Parameters           | IRK. 115     | Units             |
|----------------------|--------------|-------------------|
| $I_{T(AV)}$ @Tc-85°C | 115          | A                 |
| $I_{T(RMS)}$         | 180          | A                 |
| $I_{TSM}$ @ 50Hz     | 3000         | A                 |
| $I^2t$ @ 50Hz        | 41           | kA <sup>2</sup> s |
| $V_{RRM}$            | 3000 to 3600 | V                 |
| $T_J$                | -40 to 125   | °C                |

## POWER MODULES

### IRK.. 115 Series

#### ELECTRICAL SPECIFICATION VOLTAGE RATINGS

| Type Number | Voltage Code | $V_{RRM}$ max. repetitive peak reverse and off-state blocking voltage<br>V | $V_{RSM}$ max.non-repetitive peak reverse voltage<br>V | $I_{DRM} / I_{RRM}$ max.<br>@ 130°C Max.<br>mA |
|-------------|--------------|----------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------|
| IRK.115     | 30           | 3000                                                                       | 3100                                                   | 70                                             |
|             | 32           | 3200                                                                       | 3200                                                   |                                                |
|             | 34           | 3400                                                                       | 3500                                                   |                                                |
|             | 36           | 3600                                                                       | 3700                                                   |                                                |

#### ON-STATE CONDUCTION

|                     | Parameter                                                   | IRK. 115  | Unit              | Conditions                                                                                                                                                                                                   |                                                                      |
|---------------------|-------------------------------------------------------------|-----------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| I <sub>T(AV)</sub>  | Max, average On-state current @ case temperature            | 115<br>85 | A<br>°C           | 180°C conduction, half sine wave                                                                                                                                                                             |                                                                      |
| I <sub>T(RMS)</sub> | Max, RMS on-state current                                   | 180       | A                 | as AC switch                                                                                                                                                                                                 |                                                                      |
| I <sub>TSM</sub>    | Max, peak, one cycle on-state, non-repetitive surge current | 3000      | A                 | t = 10ms                                                                                                                                                                                                     | Sinusoidal half wave<br>initial T <sub>j</sub> = T <sub>j</sub> max. |
| I <sup>2</sup> t    | Maximum I <sup>2</sup> t for fusing                         | 41        | kA <sup>2</sup> s | t = 10ms                                                                                                                                                                                                     |                                                                      |
| V <sub>T(TO)</sub>  | Max, value of Threshold voltage                             | 0.95      | V                 | T <sub>j</sub> = T <sub>j</sub> max.                                                                                                                                                                         |                                                                      |
| r <sub>t</sub>      | Max, value of on-state slope resistance                     | 3.00      | mΩ                | T <sub>j</sub> = T <sub>j</sub> max,                                                                                                                                                                         |                                                                      |
| V <sub>TM</sub>     | Max, on-state voltage drop                                  | 2.54      | V                 | I <sub>TM</sub> = π x I <sub>T(AV)</sub> , T <sub>j</sub> = T <sub>j</sub> Max, 180° conduction<br>AV Power = V <sub>T(TO)</sub> x I <sub>T(AV)</sub> + r <sub>1</sub> x (I <sub>T(RMS)</sub> ) <sup>2</sup> |                                                                      |
| I <sub>H</sub>      | Maximum holding current                                     | 250       | mA                | Anode supply = 12V initial I <sub>T</sub> = 30A, T <sub>J</sub> = 25°C                                                                                                                                       |                                                                      |
| I <sub>L</sub>      | Max, latching current                                       | 500       | mA                | Anode supply = 12V resistive Load = 1Ω, gate pulse. 10V, 100μs, T <sub>j</sub> = 25°C                                                                                                                        |                                                                      |

#### SWITCHING

|                |                       |     |    |                                                                                                                                    |                                                                             |
|----------------|-----------------------|-----|----|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| t <sub>d</sub> | Typical delay time    | 3.0 | μs | T <sub>j</sub> = 25°C                                                                                                              | Gate current = 1A dig/dt = 1A/μS<br>V <sub>d</sub> = 0.67% V <sub>DRM</sub> |
| T <sub>R</sub> | Typical rise time     | 2.0 | μs | T <sub>j</sub> = 25°C                                                                                                              |                                                                             |
| t <sub>q</sub> | Typical turn-off time | 200 | μs | I <sub>TM</sub> = 300A, di/dt = 15A/μs, T <sub>j</sub> = T <sub>j</sub> max,<br>V <sub>r</sub> = 50V, dv/dt = 20/μs. Gate 0V, 100Ω |                                                                             |

# POWER MODULES

## IRK.. 115 Series

### BLOCKING

|                                      | Parameter                                                                            | IRK. 115 | Unit       | Conditions                                                   |
|--------------------------------------|--------------------------------------------------------------------------------------|----------|------------|--------------------------------------------------------------|
| dv/dt                                | Max, critical rate of rise of off-state voltage                                      | 1000     | V/ $\mu$ s | Tj = 125°C exponential to 0.67% rated V <sub>DRM</sub> .     |
| I <sub>RRM</sub><br>I <sub>DRM</sub> | Max. peak reverse and off state leakage current at V <sub>RRM</sub> V <sub>DRM</sub> | 70       | mA         | Tj = 125°C, rated V <sub>DRM</sub> /V <sub>RRM</sub> Applied |
| V <sub>INS</sub>                     | RMS Isolation voltage                                                                | 3000     | V          | 50Hz, Circuit to base, all terminal shorted, 25°C t=1 min.   |

### ELECTRICAL SPECIFICATION TRIGGERING

|                    | Parameter                                                  | IRK. 115 | Unit       | Conditions                                                         |
|--------------------|------------------------------------------------------------|----------|------------|--------------------------------------------------------------------|
| P <sub>GM</sub>    | Max, peak gate power                                       | 10       | W          | Tj = 125°C, t <sub>p</sub> ≤ 5ms                                   |
| P <sub>G(AV)</sub> | Maximum average gate power                                 | 2.0      |            | Tj = 125°C, f = 50Hz, d% = 50                                      |
| I <sub>GM</sub>    | Max, peak positive gate current                            | 3.0      | A          | Tj = 125°C, t <sub>p</sub> ≤ 5ms                                   |
| +V <sub>GM</sub>   | Max. peak positive gate voltage                            | 20       | V          | Tj = 125°C, t <sub>p</sub> ≤ 5ms                                   |
| -V <sub>GM</sub>   | Max. peak negative gate voltage                            | 5.0      | V          |                                                                    |
| I <sub>GT</sub>    | DC gate current required to trigger                        | 200      | mA         | Tj = 25°C                                                          |
| V <sub>GT</sub>    | DC gate voltage required to trigger                        | 3.0      | V          | Tj = 25°C                                                          |
| V <sub>GD</sub>    | DC gate voltage not to trigger                             | 0.30     | V          | Tj = 125°C                                                         |
| I <sub>GD</sub>    | DC gate current not to trigger                             | 10       | mA         |                                                                    |
| di/dt              | Max, critical rate of rise on state current non repetitive | 200      | A/ $\mu$ s | Tj = 125°C I <sub>TM</sub> = 400A, rated V <sub>DRM</sub> applied. |

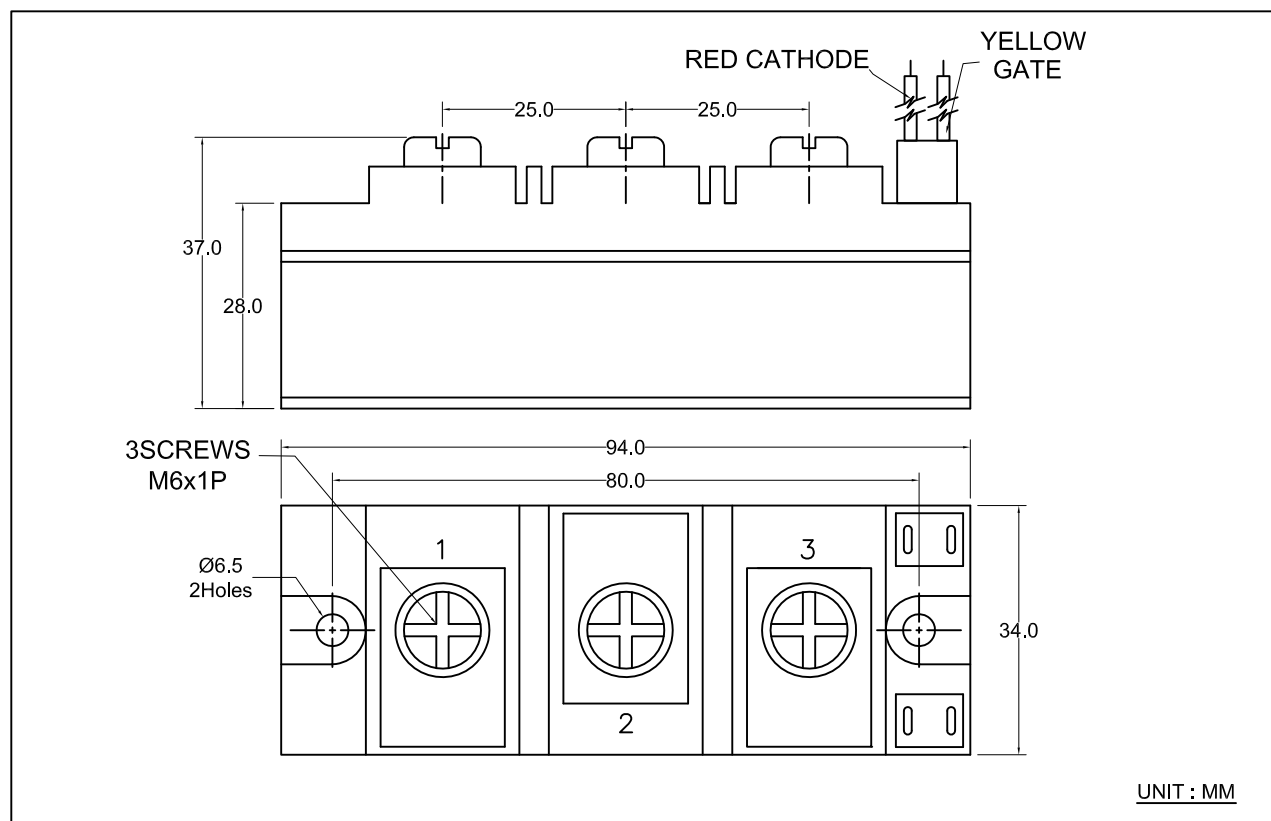
### THERMAL AND MECHANICAL SPECIFICATION

|                    | Parameter                                    | IRK. 115   | Unit | Conditions                                            |
|--------------------|----------------------------------------------|------------|------|-------------------------------------------------------|
| T <sub>j</sub>     | Junction operating temperature               | -40 to 125 | °C   |                                                       |
| T <sub>stg</sub>   | Max, storage temperature range               | -40 to 125 |      |                                                       |
| R <sub>thJ-C</sub> | Max. thermal resistance, junction to case    | 0.19       | K/W  | Per Junction, DC operation                            |
| R <sub>thC-h</sub> | Max. thermal resistance junction to heatsink | 0.06       | K/W  | Mounting surface flat smooth and greased (per Module) |
| T                  | Mounting torque ±10%                         | 6          | Nm   | For module to heat sink and bus bar to module         |
| Wt                 | Approximate Weight                           | 320        | g    |                                                       |
|                    | Case style                                   | INT-A-PAK  |      |                                                       |

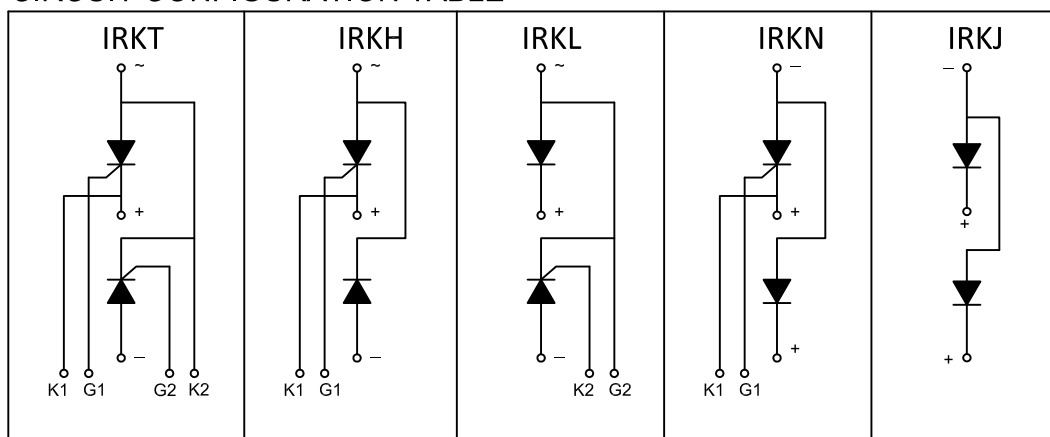
## POWER MODULES

## IRK. 115.. Series

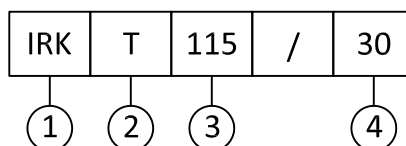
## OUTLINE DIAGRAM



### CIRCUIT CONFIGURATION TABLE



### CIRCUIT CONFIGURATION TABLE



- 1). - Module Type
- 2). - Circuit configuration (See Circuit Configuration table)
- 3). - Current Code
- 4). - Voltage Code (See Voltage Rating Table)