

International  
**IR** Rectifier

## 40HF(R) SERIES

STANDARD RECOVERY DIODES

Stud Version

### Features

- High surge current capability
- Stud cathode and stud anode version
- Leaded version available
- Types up to 1600V  $V_{RRM}$

40 A

### Typical Applications

- Battery charges
- Converters
- Power supplies
- Machine tool controls
- Welding

### Major Ratings and Characteristics

| Parameters      | 40HF(R)     |             | Units            |
|-----------------|-------------|-------------|------------------|
|                 | 10 to 120   | 140, 160    |                  |
| $I_{F(AV)}$     | 40          | 40          | A                |
| @ $T_C$         | 140         | 110         | °C               |
| $I_{F(RMS)}$    | 62          |             | A                |
| $I_{FSM}$       | @ 50Hz      | 570         | A                |
|                 | @ 60Hz      | 595         | A                |
| $I^2t$          | @ 50Hz      | 1600        | A <sup>2</sup> s |
|                 | @ 60Hz      | 1450        | A <sup>2</sup> s |
| $V_{RRM}$ range | 100 to 1200 | 1400, 1600  | V                |
| $T_J$ range     | - 65 to 190 | - 65 to 160 | °C               |



## 40HF(R) Series

Bulletin I20201 rev. C 03/04

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### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

| Type number | Voltage Code | $V_{RRM}$ , maximum repetitive peak reverse voltage<br>V | $V_{RSM}$ , maximum non-repetitive peak reverse voltage<br>V | $I_{RRM}$ max.<br>@ $T_J = T_{J\text{ max.}}$<br>mA |
|-------------|--------------|----------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------|
| 40HF(R)     | 10           | 100                                                      | 200                                                          | 9                                                   |
|             | 20           | 200                                                      | 300                                                          |                                                     |
|             | 40           | 400                                                      | 500                                                          |                                                     |
|             | 60           | 600                                                      | 700                                                          |                                                     |
|             | 80           | 800                                                      | 900                                                          |                                                     |
|             | 100          | 1000                                                     | 1100                                                         |                                                     |
|             | 120          | 1200                                                     | 1300                                                         |                                                     |
|             | 140          | 1400                                                     | 1500                                                         | 4.5                                                 |
| 160         | 1600         | 1700                                                     |                                                              |                                                     |

#### Forward Conduction

| Parameter                                                            | 40HF(R)   |          | Units             | Conditions                                                         |                           |                                                         |
|----------------------------------------------------------------------|-----------|----------|-------------------|--------------------------------------------------------------------|---------------------------|---------------------------------------------------------|
|                                                                      | 10 to 120 | 140, 160 |                   |                                                                    |                           |                                                         |
| $I_{F(AV)}$ Max. average forward current @ Case temperature          | 40        | 40       | A                 | 180° conduction, half sine wave                                    |                           |                                                         |
| $I_{F(RMS)}$ Max. RMS forward current                                | 140       | 110      | °C                |                                                                    |                           |                                                         |
| $I_{FSM}$ Max. peak, one-cycle forward, non-repetitive surge current | 62        | 570      | A                 | t = 10ms                                                           | No voltage reappplied     | Sinusoidal half wave, Initial $T_J = T_{J\text{ max.}}$ |
|                                                                      | 595       | 480      |                   | t = 8.3ms                                                          | 100% $V_{RRM}$ reappplied |                                                         |
|                                                                      | 480       | 500      |                   | t = 10ms                                                           | No voltage reappplied     |                                                         |
|                                                                      | 500       | 1150     |                   | t = 8.3ms                                                          | 100% $V_{RRM}$ reappplied |                                                         |
| $I^2t$ Maximum $I^2t$ for fusing                                     | 1600      | 1450     | A <sup>2</sup> s  | t = 10ms                                                           | No voltage reappplied     | Sinusoidal half wave, Initial $T_J = T_{J\text{ max.}}$ |
|                                                                      | 1450      | 1150     |                   | t = 8.3ms                                                          | 100% $V_{RRM}$ reappplied |                                                         |
|                                                                      | 1150      | 1050     |                   | t = 10ms                                                           | No voltage reappplied     |                                                         |
|                                                                      | 1050      | 1050     |                   | t = 8.3ms                                                          | 100% $V_{RRM}$ reappplied |                                                         |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing                       | 16000     |          | A <sup>2</sup> /s | t = 0.1 to 10ms, no voltage reappplied                             |                           |                                                         |
| $V_{F(TO)}$ Value of threshold voltage (up to 1200V)                 | 0.65      |          | V                 | $T_J = T_{J\text{ max.}}$                                          |                           |                                                         |
| $V_{F(TO)}$ Value of threshold voltage (for 1400V, 1600V)            | 0.76      |          | V                 | $T_J = T_{J\text{ max.}}$                                          |                           |                                                         |
| $r_f$ Value of forward slope resistance (up to 1200V)                | 4.29      |          | mΩ                | $T_J = T_{J\text{ max.}}$                                          |                           |                                                         |
| $r_f$ Value of forward slope resistance (for 1400V, 1600V)           | 3.8       |          | mΩ                | $T_J = T_{J\text{ max.}}$                                          |                           |                                                         |
| $V_{FM}$ Max. forward voltage drop                                   | 1.30      | 1.50     | V                 | $I_{pk} = 125A, T_J = 25^\circ C, t_p = 400\mu s$ rectangular wave |                           |                                                         |

Thermal and Mechanical Specifications

| Parameter                                                   | 40HF(R)        |            | Units    | Conditions                                 |
|-------------------------------------------------------------|----------------|------------|----------|--------------------------------------------|
|                                                             | 10 to 120      | 140 to 160 |          |                                            |
| T <sub>J</sub> Max. junction operating temperature range    | -65 to 190     | -65 to 160 | °C       |                                            |
| T <sub>stg</sub> Max. storage temperature range             | -65 to 190     | -65 to 160 |          |                                            |
| R <sub>thJC</sub> Max. thermal resistance, junction to case | 0.95           |            | K/W      | DC operation                               |
| R <sub>thCS</sub> Max. thermal resistance, case to heatsink | 0.25           |            |          | Mounting surface, smooth, flat and greased |
| T Max. allowed mounting torque ±10%                         | 2.3 - 3.4      |            | Nm       | Not lubricated threads                     |
|                                                             | 20 - 30        |            | lbf · in |                                            |
| wt Approximate weight                                       | 17 (0.6)       |            | g (oz)   | unleaded device                            |
| Case style                                                  | DO-203AB (DO5) |            |          | See Outline Table                          |

$\Delta R_{thJC}$  Conduction

(The following table shows the increment of thermal resistance R<sub>thJC</sub> when devices operate at different conduction angles than DC)

| Conduction angle | Sinusoidal conduction | Rectangular conduction | Units | Conditions                           |
|------------------|-----------------------|------------------------|-------|--------------------------------------|
| 180°             | 0.14                  | 0.10                   | K/W   | T <sub>J</sub> = T <sub>J</sub> max. |
| 120°             | 0.16                  | 0.17                   |       |                                      |
| 90°              | 0.21                  | 0.22                   |       |                                      |
| 60°              | 0.30                  | 0.31                   |       |                                      |
| 30°              | 0.50                  | 0.50                   |       |                                      |

Ordering Information Table

| Device Code |                                                                                                                                                     |   |     |   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|---|
| 40          | HF                                                                                                                                                  | R | 160 | M |
| ①           | ②                                                                                                                                                   | ③ | ④   | ⑤ |
| <b>1</b>    | - 40 = Standard device<br>41 = Not isolated lead<br>42 = Isolated lead with silicone sleeve<br>(Red = Reverse polarity)<br>(Blue = Normal polarity) |   |     |   |
| <b>2</b>    | - Standard diode                                                                                                                                    |   |     |   |
| <b>3</b>    | - None = Stud Normal Polarity (Cathode to Stud)<br>R = Stud Reverse Polarity (Anode to Stud)                                                        |   |     |   |
| <b>4</b>    | - Voltage code: Code x 10 = V <sub>RRM</sub> (See Voltage Ratings table)                                                                            |   |     |   |
| <b>5</b>    | - None = Stud base DO-203AB (DO-5) 1/4" 28UNF-2A<br>M = Stud base DO-203AB (DO-5) M6 X 1                                                            |   |     |   |

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### Outlines Table





Fig. 1 - Current Ratings Characteristics



Fig. 2 - Current Ratings Characteristics

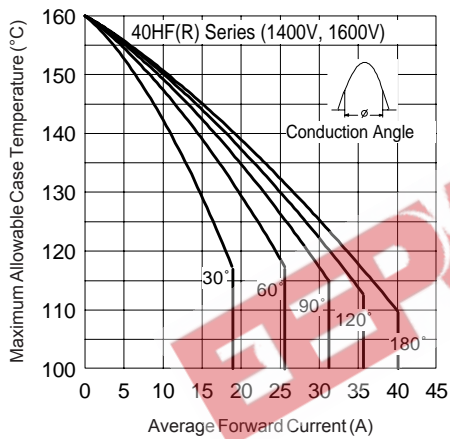


Fig. 3 - Current Ratings Characteristics

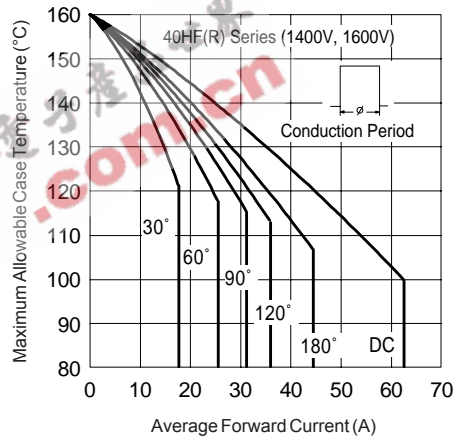


Fig. 4 - Current Ratings Characteristics



Fig. 5 - Forward Power Loss Characteristics

# 40HF(R) Series

Bulletin I20201 rev. C 03/04



Fig. 6 - Forward Power Loss Characteristics

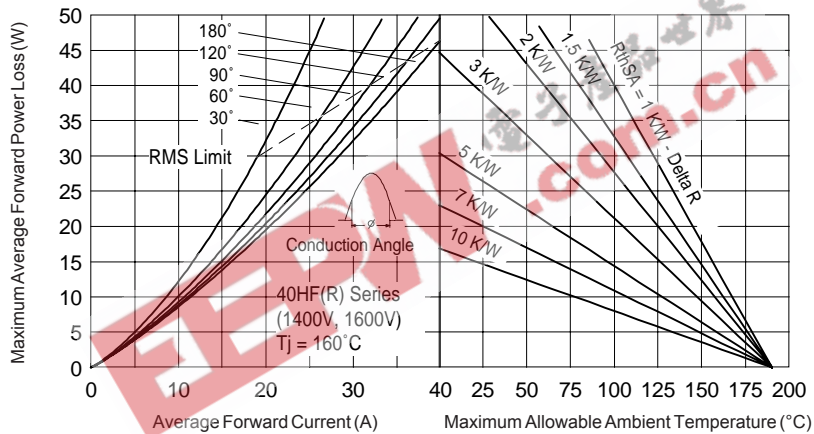


Fig. 7 - Forward Power Loss Characteristics



Fig. 8 - Forward Power Loss Characteristics



Fig. 9 - Maximum Non-Repetitive Surge Current



Fig. 10 - Maximum Non-Repetitive Surge Current

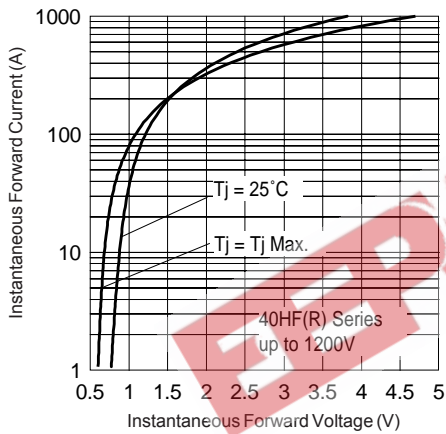


Fig. 11 - Forward Voltage Drop Characteristics (up to 1200V)

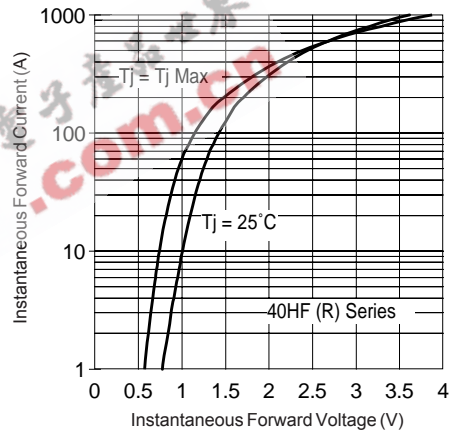


Fig. 12 - Forward Voltage Drop Characteristics (for 1400V, 1600V)



Fig. 13 - Thermal Impedance  $Z_{th,JC}$  Characteristics

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Data and specifications subject to change without notice.  
This product has been designed and qualified for Industrial Level.  
Qualification Standards can be found on IR's Web site.

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