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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor’s system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.
8A, 400V - 600V Hyperfast Diodes

The RHRP840 and RHRP860 are hyperfast diodes with soft recovery characteristics ($t_{rr} < 30$ns). They have half the recovery time of ultrafast diodes and are silicon nitride passivated ion-implanted epitaxial planar construction.

These devices are intended for use as freewheeling/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and hyperfast soft recovery minimize ringing and electrical noise in many power switching circuits reducing power loss in the switching transistors.

Formerly developmental type TA49059.

**Features**

- Hyperfast with Soft Recovery......................... <30ns
- Operating Temperature ......................... $175$°C
- Reverse Voltage Up To ......................... 600V
- Avalanche Energy Rated
- Planar Construction

**Applications**

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

**Ordering Information**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PACKAGE</th>
<th>BRAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHRP840</td>
<td>TO-220AC</td>
<td>RHRP840</td>
</tr>
<tr>
<td>RHRP860</td>
<td>TO-220AC</td>
<td>RHRP860</td>
</tr>
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</table>

NOTE: When ordering, use the entire part number.

**Symbol**

![Symbol Diagram]

**Absolute Maximum Ratings** $T_C = 25$°C, Unless Otherwise Specified

<table>
<thead>
<tr>
<th></th>
<th>RHRP840</th>
<th>RHRP860</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Repetitive Reverse Voltage</td>
<td>$V_{RRM}$</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>Working Peak Reverse Voltage</td>
<td>$V_{RWM}$</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>DC Blocking Voltage</td>
<td>$V_R$</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>Average Rectified Forward Current ($T_C = 150$°C)</td>
<td>$I_{F(AV)}$</td>
<td>8</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive Peak Surge Current (Square Wave, 20kHz)</td>
<td>$I_{FRM}$</td>
<td>16</td>
<td>A</td>
</tr>
<tr>
<td>Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60Hz)</td>
<td>$I_{FSM}$</td>
<td>100</td>
<td>A</td>
</tr>
<tr>
<td>Maximum Power Dissipation</td>
<td>$P_D$</td>
<td>75</td>
<td>W</td>
</tr>
<tr>
<td>Avalanche Energy (See Figures 10 and 11)</td>
<td>$E_{AVL}$</td>
<td>20</td>
<td>mJ</td>
</tr>
<tr>
<td>Operating and Storage Temperature</td>
<td>$T_{STG}, T_J$</td>
<td>-65 to 175</td>
<td>°C</td>
</tr>
</tbody>
</table>
Electrical Specifications  \( T_C = 25^\circ C \), Unless Otherwise Specified

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>TEST CONDITION</th>
<th>RHRP840</th>
<th>RHRP860</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_F )</td>
<td>( I_F = 8A )</td>
<td>-</td>
<td>-</td>
<td>2.1</td>
</tr>
<tr>
<td>( I_F = 8A, T_C = 150^\circ C )</td>
<td>-</td>
<td>-</td>
<td>1.7</td>
<td>-</td>
</tr>
<tr>
<td>( I_R )</td>
<td>( V_R = 400V )</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>( V_R = 600V )</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>( V_R = 400V, T_C = 150^\circ C )</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>-</td>
</tr>
<tr>
<td>( V_R = 600V, T_C = 150^\circ C )</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>( t_{rr} )</td>
<td>( I_F = 1A, \frac{dI_F}{dt} = 200A/\mu s )</td>
<td>-</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>( I_F = 8A, \frac{dI_F}{dt} = 200A/\mu s )</td>
<td>-</td>
<td>-</td>
<td>35</td>
<td>-</td>
</tr>
<tr>
<td>( t_a )</td>
<td>( I_F = 8A, \frac{dI_F}{dt} = 200A/\mu s )</td>
<td>-</td>
<td>18</td>
<td>-</td>
</tr>
<tr>
<td>( t_b )</td>
<td>( I_F = 8A, \frac{dI_F}{dt} = 200A/\mu s )</td>
<td>-</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>( Q_{RR} )</td>
<td>( I_F = 8A, \frac{dI_F}{dt} = 200A/\mu s )</td>
<td>-</td>
<td>56</td>
<td>-</td>
</tr>
<tr>
<td>( C_J )</td>
<td>( V_R = 10V, I_F = 0A )</td>
<td>-</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>( R_{thJC} )</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

**DEFINITIONS**

\( V_F \) = Instantaneous forward voltage (\( pw = 300\mu s, D = 2\% \)).

\( I_R \) = Instantaneous reverse current.

\( t_{rr} \) = Reverse recovery time (See Figure 9), summation of \( t_a \) + \( t_b \).

\( t_a \) = Time to reach peak reverse current (See Figure 9).

\( t_b \) = Time from peak \( I_{RM} \) to projected zero crossing of \( I_{RM} \) based on a straight line from peak \( I_{RM} \) through 25\% of \( I_{RM} \) (See Figure 9).

\( Q_{RR} \) = Reverse recovery charge.

\( C_J \) = Junction capacitance.

\( R_{thJC} \) = Thermal resistance junction to case.

\( pw \) = Pulse width.

\( D \) = Duty cycle.

**Typical Performance Curves**

**FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE**

**FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE**
Typical Performance Curves (Continued)

**FIGURE 3.** $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

**FIGURE 4.** $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

**FIGURE 5.** $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

**FIGURE 6.** CURRENT DERATING CURVE

**FIGURE 7.** JUNCTION CAPACITANCE vs REVERSE VOLTAGE
Test Circuits and Waveforms

FIGURE 8. \( t_{rr} \) TEST CIRCUIT

\[
\begin{align*}
V_{GE} & \text{ AMPLITUDE AND} \\
R_G & \text{ CONTROL } \frac{dI_F}{dt} \\
t_1 \text{ AND } t_2 & \text{ CONTROL } I_F
\end{align*}
\]

FIGURE 9. \( t_{rr} \) WAVEFORMS AND DEFINITIONS

\[
\begin{align*}
I_F & \text{ SOLUTION} \\
d\frac{dI_F}{dt} & \text{ RISE TIME} \\
t_{rr} & \text{ RISE TIME} \\
t_a & \text{ FALL TIME} \\
t_b & \text{ FALL TIME}
\end{align*}
\]

\[
0.25 \cdot I_{RM}
\]

FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

\[
E_{AVL} = \frac{1}{2}LI^2 \left[ \frac{VR(AVL)}{VR(AVL) - VDD} \right]
\]

FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

\[
Q_1 = \text{IGBT (BVCES > DUT} \ VR(AVL))
\]

\[
\begin{align*}
I_{MAX} & = 1A \\
L & = 40mH \\
R & < 0.1 \Omega
\end{align*}
\]
NOTES:

B. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
E. DRAWING FILE NAME: TO220A02REV5