Description

The FMNS-4606S is a 600 V, 60 A, fast recovery diode. The maximum $V_F$ of 1.3 V and the maximum $t_{rr}$ of 100 ns ($I_F : I_{RP} = 1 : 2$) are realized by optimizing the trade-off relationship between $V_F$ and $t_{rr}$. The low thermal resistance package achieves high performance in terms of heat dissipation.

Features

- $V_{RM} = 600$ V
- $I_{F(AV)} = 60$ A
- $V_F = 1.3$ V
- $t_{rr} (I_F = I_{RP}) = 150$ ns
- Bare Lead Frame: Pb-free (RoHS Compliant)

Applications

- PFC Circuit (DCM and CRM)
- Freewheel Diode (Offline Buck and Buck-boost Converter)

Package

TO3PF-3L

Not to scale
Absolute Maximum Ratings

Unless otherwise specified, \( T_A = 25 \, ^\circ C \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Repetitive Reverse Voltage</td>
<td>( V_{RSM} )</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Repetitive Reverse Voltage</td>
<td>( V_{RM} )</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Average Forward Current</td>
<td>( I_{(FAV)} )</td>
<td>See Figure 1 and Figure 2</td>
<td>60</td>
<td>A</td>
</tr>
<tr>
<td>Surge Forward Current</td>
<td>( I_{FSM} )</td>
<td>Half cycle sine wave, positive side, 10 ms, 1 shot</td>
<td>200</td>
<td>A</td>
</tr>
<tr>
<td>( \int ) Limiting Value</td>
<td>( I_\int )</td>
<td>( 1 , ms \leq t \leq 10 , ms )</td>
<td>200</td>
<td>A( ^2 )s</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>( T_J )</td>
<td></td>
<td>–40 to 150</td>
<td>( ^\circ C )</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_{STG} )</td>
<td></td>
<td>–40 to 150</td>
<td>( ^\circ C )</td>
</tr>
</tbody>
</table>

Electrical Characteristics

Unless otherwise specified, \( T_A = 25 \, ^\circ C \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Voltage Drop(^{(1)})</td>
<td>( V_F )</td>
<td>( T_J = 25 , ^\circ C, I_F = 30 , A )</td>
<td>—</td>
<td>—</td>
<td>1.3</td>
<td>V</td>
</tr>
<tr>
<td>Reverse Leakage Current(^{(1)})</td>
<td>( I_R )</td>
<td>( V_R = V_{RM} )</td>
<td>—</td>
<td>—</td>
<td>200</td>
<td>( \mu A )</td>
</tr>
<tr>
<td>Reverse Leakage Current Under High Temperature(^{(1)})</td>
<td>( H_I_R )</td>
<td>( V_R = V_{RM}, T_J = 150 , ^\circ C )</td>
<td>—</td>
<td>—</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse Recovery Time(^{(1)})</td>
<td>( t_{r1} )</td>
<td>( I_F = I_{BP} = 500 , mA ) 90% recovery point, ( T_J = 25 , ^\circ C )</td>
<td>—</td>
<td>—</td>
<td>150</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>( t_{r2} )</td>
<td>( I_F = 500 , mA, I_{BP} = 1 , A ) 75% recovery point, ( T_J = 25 , ^\circ C )</td>
<td>—</td>
<td>—</td>
<td>100</td>
<td>ns</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>( R_{th(J-L)} )</td>
<td>Between junction and case</td>
<td>—</td>
<td>—</td>
<td>1.7</td>
<td>( ^\circ C/W )</td>
</tr>
</tbody>
</table>

\(^{(1)}\) The rating of one chip.
Rating and Characteristic Curves

Figure 1. $I_{\text{FAV}}$ vs. Case Temperature Curves ($V_R = 0$ V)

Figure 2. $I_{\text{FAV}}$ vs. Case Temperature Curves ($V_R = 600$ V)

Figure 3. $V_F$ vs. $I_F$ Typical Characteristics

Figure 4. $V_R$ vs. $I_R$ Typical Characteristics
Physical Dimensions

- **TO3PF-3L**

![Diagram of TO3PF-3L physical dimensions]

**NOTES:**
- Dimensions in millimeters
- Bare lead frame: Pb-free (RoHS compliant)
- When soldering the products, be sure to minimize the working time, within the following limits:
  - Flow: 260 ± 5 °C / 10 ± 1 s, 2 times
  - Soldering Iron: 380 ± 10 °C / 3.5 ± 0.5 s, 1 time (Soldering should be at a distance of at least 1.5 mm from the body of the products.)
- The recommended screw torque for TO3PF: 0.686 to 0.882 N·m (7 to 9 kgf·cm)
Marking Diagram

Specific Device Code
YM  DD
Lot Number
Y is the last digit of the year (0 to 9)
M is the month (1 to 9, O, N or D)
DD is the day of the month (01 to 31)

Table 1. Specific Device Code

<table>
<thead>
<tr>
<th>Specific Device Code</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS4606</td>
<td>FMNS-4606S</td>
</tr>
</tbody>
</table>
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