FFH50US60S-F085 50A, 600V Stealth Diode

Features
- Stealth Recovery (t_r=163ns(Typ.) @ I_F=50A)
- Low Forward Voltage (V_F=1.69V(Max.) @ I_F=50A)
- Avalanche Energy Rated
- AEC-Q101 Qualified

Applications
- Automotive DCDC Converter
- Automotive On Board Charger
- Switching Power Supply
- Power Switching Circuits

Pin Assignments

```
1. Cathode
2. Anode
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Absolute Maximum Ratings  \(T_C = 25°C\) unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_RRM</td>
<td>Peak Repetitive Reverse Voltage</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>V_RWM</td>
<td>Working Peak Reverse Voltage</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>V_R</td>
<td>DC Blocking Voltage</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>I_F(AV)</td>
<td>Average Rectified Forward Current (T_C = 25°C)</td>
<td>50</td>
<td>A</td>
</tr>
<tr>
<td>I_FSM</td>
<td>Non-repetitive Peak Surge Current (1A, 40mH)</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>E_AVL</td>
<td>Avalanche Energy (1A, 40mH)</td>
<td>20</td>
<td>mJ</td>
</tr>
<tr>
<td>T_J, T_STG</td>
<td>Operating Junction and Storage Temperature</td>
<td>-55 to +175</td>
<td>°C</td>
</tr>
</tbody>
</table>

Thermal Characteristics  \(T_C = 25°C\) unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_JUC</td>
<td>Maximum Thermal Resistance, Junction to Case</td>
<td>0.71</td>
<td>°C/W</td>
</tr>
<tr>
<td>R_JUA</td>
<td>Maximum Thermal Resistance, Junction to Ambient</td>
<td>30</td>
<td>°C/W</td>
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</tbody>
</table>

Package Marking and Ordering Information

<table>
<thead>
<tr>
<th>Device Marking</th>
<th>Device</th>
<th>Package</th>
<th>Tube</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>FFH50US60S</td>
<td>FFH50US60S-F085</td>
<td>TO-247-2L</td>
<td>-</td>
<td>30</td>
</tr>
</tbody>
</table>

50A, 600V Stealth Diode

The FFH50US60S-F085 is a Stealth™ diode optimized for low loss performance in output rectification. The STEALTH™ family exhibits low reverse recovery current (t_r), low \(V_F\) and soft recovery under typical operating conditions. It has a low forward-voltage drop and is of silicon nitride passivated.

This device is intended for use as a freewheel/clamping diode in various automotive switching power supplies and other power switching applications. Its low stored charge as well as Stealth™ and soft recovery characteristics minimize ringing and electrical noise while reduce the overall power loss.
## Electrical Characteristics  \( T_C = 25\,^\circ\text{C} \) unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>( I_R )</td>
<td>Instantaneous Reverse Current</td>
<td>( V_R = 600,\text{V} )</td>
<td>( T_C = 25,^\circ\text{C} )</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_C = 175,^\circ\text{C} )</td>
<td>-</td>
<td>-</td>
<td>1000</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>( V_{FM} )</td>
<td>Instantaneous Forward Voltage</td>
<td>( I_F = 50,\text{A} )</td>
<td>( T_C = 25,^\circ\text{C} )</td>
<td>1.27</td>
<td>1.69</td>
<td>( \text{V} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_C = 175,^\circ\text{C} )</td>
<td>1.19</td>
<td>1.57</td>
<td>( \text{V} )</td>
<td></td>
</tr>
<tr>
<td>( \tau_{rr} )</td>
<td>Reverse Recovery Time</td>
<td>( I_F = 1,\text{A}, ,\text{di/dt} = 200,\text{A/\mu s}, , V_R = 390,\text{V} )</td>
<td>( T_C = 25,^\circ\text{C} )</td>
<td>41</td>
<td>82</td>
<td>( \text{ns} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_C = 175,^\circ\text{C} )</td>
<td>163</td>
<td>364</td>
<td>( \text{ns} )</td>
<td></td>
</tr>
<tr>
<td>( I_a )</td>
<td>Reverse Recovery Time</td>
<td>( I_F = 50,\text{A}, ,\text{di/dt} = 200,\text{A/\mu s}, , V_R = 390,\text{V} )</td>
<td>( T_C = 25,^\circ\text{C} )</td>
<td>65</td>
<td>98</td>
<td>( \text{ns} )</td>
</tr>
<tr>
<td>( I_b )</td>
<td>Reverse Recovery Charge</td>
<td>( I_F = 50,\text{A}, ,\text{di/dt} = 200,\text{A/\mu s}, , V_R = 390,\text{V} )</td>
<td>( T_C = 25,^\circ\text{C} )</td>
<td>886</td>
<td>-</td>
<td>( \text{nC} )</td>
</tr>
</tbody>
</table>

### Notes:
1. Pulse : Test Pulse width = 300\( \mu\text{s} \), Duty Cycle = 2\%
2. Guaranteed by design

### Test Circuit and Waveforms

**t_{rr} Test Circuit**

**t_{rr} Waveforms and Definitions**

### Avalanche Energy Test Circuit

\( I = 1\,\text{A} \)
\( L = 40\,\text{mH} \)
\( R < 0.1\,\Omega \)
\( E_{AVL} = \frac{1}{2}LI^2 \left[ V_{R(\text{AVL})} / (V_{R(\text{AVL})} - V_{DD}) \right] \)

\( Q_1 = \text{IGBT (BVCES > DUT V_{R(\text{AVL})})} \)

### Avalanche Current and Voltage Waveforms
Typical Performance Characteristics

Figure 1. Typical Forward Voltage Drop vs. Forward Current

Figure 2. Typical Reverse Current vs. Reverse Voltage

Figure 3. Typical Junction Capacitance

Figure 4. Typical Reverse Recovery Time vs. \( \frac{dI}{dt} \)

Figure 5. Typical Reverse Recovery Current vs. \( \frac{dI}{dt} \)

Figure 6. Forward Current Derating Curve
Typical Performance Characteristics (Continued)

Figure 7. Reverse Recovery Charge

![Graph showing reverse recovery charge, Qrr, vs di/dt for different temperatures.]

Figure 8. Transient Thermal Response Curve

![Graph showing transient thermal response, ZthJC(t), vs pulse duration, t1, for different duty factors, D.]

Notes:
1. \( Z_{thJC}(t) = 0.71 \) CW Typ.
2. Duty Factor, \( D = \frac{t_1}{t_2} \)
3. \( T_{JM} - T_C = P_{DM} \cdot Z_{thJC}(t) \)
Mechanical Dimensions

TO-247-2L

NOTES: UNLESS OTHERWISE SPECIFIED
B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DRAWING CONFORMS TO ASME Y14.5 - 1994
E. DOES NOT COMPLY JEDEC STANDARD VALUE
F. NOTCH MAY BE SQUARE
G. DRAWING FILENAME: MKT-TO247B02_REV02

Dimensions in Millimeters