Introduction to DIODESTAR™ Rectifiers
Presentation focused on 600V Rectifiers for power supply PFC stages
• DIODESTAR™ is a proprietary process platform that combines the expertise of the MOSFET and Bipolar process technology to manufacture next generation high voltage products > 400V

• Developed at Diodes’ wafer fab in Oldham, UK

• Target to meet the needs of new energy efficiency standards driven by legislation including high volume Power Factor Correction (PFC) solutions

• Initial product family is optimised for PFC applications in power supplies for consumer electronics e.g. LCD-LED TV, notebooks and desktop PCs
## Ordering Information

Standard packaging option in tube with 50pcs/tube (TO-220AC) and 80pcs/tube (TO-252)

"-13" = Tape & Reel option of 13" reel and 2,500/reel (TO-252)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Package</th>
<th>Forward $V_F$ @ rated $I_F$ (V)</th>
<th>Leakage $I_R$ @ $V_R=500$V Typ. (Note 1) (μA)</th>
<th>$T_{rr}$ Typ. (Note 2) (ns)</th>
<th>$T_J$ Max. (°C)</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSR15V600</td>
<td>15 Amps / 600 Volts High Efficiency &quot;V&quot; DIODESTAR Rectifier</td>
<td>TO-220AC</td>
<td>2.6</td>
<td>0.25</td>
<td>23</td>
<td>175</td>
<td>Available Now!</td>
</tr>
<tr>
<td>DSR15U600</td>
<td>15 Amps / 600 Volts High Efficiency &quot;U&quot; DIODESTAR Rectifier</td>
<td>TO-220AC</td>
<td>2.0</td>
<td>0.15</td>
<td>28</td>
<td>175</td>
<td>Available Now!</td>
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<tr>
<td>DSR8V600</td>
<td>8 Amps / 600 Volts High Efficiency &quot;V&quot; DIODESTAR Rectifier</td>
<td>TO-220AC</td>
<td>2.4</td>
<td>0.50</td>
<td>18</td>
<td>175</td>
<td>Available Now!</td>
</tr>
<tr>
<td>DSR8U600</td>
<td>8 Amps / 600 Volts High Efficiency &quot;U&quot; DIODESTAR Rectifier</td>
<td>TO-220AC</td>
<td>1.9</td>
<td>0.50</td>
<td>23</td>
<td>175</td>
<td>Available Now!</td>
</tr>
<tr>
<td>DSR6V600D1</td>
<td>6 Amps / 600 Volts High Efficiency &quot;V&quot; DIODESTAR Rectifier</td>
<td>TO-252</td>
<td>2.6</td>
<td>0.60</td>
<td>19 (Note 3)</td>
<td>175</td>
<td>Available Now!</td>
</tr>
<tr>
<td>DSR6U600D1</td>
<td>6 Amps / 600 Volts High Efficiency &quot;U&quot; DIODESTAR Rectifier</td>
<td>TO-252</td>
<td>2.1</td>
<td>0.50</td>
<td>21 (Note 3)</td>
<td>175</td>
<td>Available Now!</td>
</tr>
</tbody>
</table>

Notes:
1. Measured at junction temperature $T_J = 25°C$
2. Reverse recovery time ($T_{rr}$) measured with $dI/dt = 100A/μS$, $I_F = 1A$ and $V_R = 30V$
3. $T_J$ measured under standard test condition of $I_F = 0.5A$, $I_R = 1A$, $I_{mr} = 0.25A$. 

### Package
- Industry standard TO-220AC, TO-252
- "Green" mold compound (TO-252)
- Moisture Sensitivity Level (MSL) = 1

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What is Power Factor Correction?
PFC reduces the loading effects on the AC electrical mains and overall increases AC-DC efficiency conversion and improves AC power quality.

Regulation from Public-Sector
AC-DC power supplies need to be fully compliant with imposing restrictions on Power Factor (PF) and Total Harmonic Distortion (THD) for applications > 75W and for offline lighting > 25W:

- CCC (or '3'C) in China
- JISC61000-3-2 in Japan
- IEC1000-3-2/EN61000-3-2 in Europe
- 80PLUS in America (Energy Star)

Regulation requires PFC in power supplies > 75W and offline lighting > 25W.
Target Application: 600V Boost Diode in AC/DC Switch Mode Power Supply (SMPS). The requirement needed is a blocking voltage of at least 450V, with surge current ruggedness to handle large inrush and over currents in higher power applications. To minimize the power loss and increase the efficiency, the key parameters to this boost diode are *ultra fast, soft switching* $T_{RR} (<30nS)$ combined with *low forward voltage drop* $V_F$. 

**Target Application:** 600V *Boost Diode* in the Power Factor Correction (PFC) circuit of AC-DC power supplies.
How does boost diode of CCM work?

- CCM PFC boost diode will turn OFF when $I_{\text{DIODE}}$ is not equal to zero
- The reverse recovery energy ($Q_{RR}$) from the PFC boost diode will flow into the MOSFET and the energy will be dissipated as a turn-on switching loss in the MOSFET
- Large $Q_{RR}$ causes substantial power dissipation in the MOSFET resulting in increased loss and possible failure
- High $I_{\text{RRM}}$ coupled with a snappy reverse-recovery increases EMI emission
- For CCM PFC diode, focus must be on low $T_{RR}(<30\text{ns})$ and low $Q_{RR}$
How does boost diode of BCM work?

- PFC diode turns OFF at zero current with negligible reverse recovery energy ($Q_{RR}$) from the diode
- Soft switching reduces switching loss as MOSFET turns ON at zero current and minimum voltage
- Higher peak current leads to larger MOSFET and diode conduction loss
- BCM is for power supplies < 200W due to the large switching variation which will cause EMI to significantly increase at power levels above 250W
- For BCM PFC diode, ultra-fast reverse recovery ($T_{RR}$<30ns) must be combined with low $V_F$
DIODESTAR™ DSR8V600

- 600V rectifier optimised for PFC
- Ultra-Fast recovery speed with $T_{rr} < 30\text{ns}$
- Soft reverse recovery to reduce EMI
- High temperature stability
- Enables Energy Star 80+ compliance
- $T_{rr}$, $Q_{rr}$ and $I_{rr}$ comparable to industry
- Second-Source equivalent to industry standard 600V ultra-fast rectifiers