Reverse Conducting Drives Fast
Higher Efficiency at High Speed Switching Applications

A high speed switching capable variant of the well established RC-Drives Automotive IGBT was developed to meet the rising demand for high frequency applications. This new variant is called RC-Drives Fast Automotive (RC-DFA).

A typical automotive application for this family amongst others are Piezo Injection systems. Within these system space is limited and therefore DPAK solutions are most required. Piezo Injection is used for diesel and gasoline systems to improve efficiency and reduce the fuel consumption. The system itself is split into four sections with different requirements to its components.

A flyback converter transforms the low-volt battery voltage to a high voltage of several hundred volts. These high-voltage is used to charge/discharge the Piezo Injection elements. Especially these charging/discharging switches (IGBT/diode) are operating at high average switching frequencies above 10kHz over the injection cycle. Correspondingly fast switching IGBTs and diodes are the most suitable solution.

**Product Brief**

- Operating range of DC up to 30kHz
- Maximum junction temperature 175°C
- Short circuit capability of 5µs
- Very tight parameter distribution
- Smooth switching performance leading to low EMI emission
- Best-in-Class current versus package size performance
- Complementary to RC-DA devices

**Features**

- Excellent cost/performance for hard switching applications
- Outstanding temperature stability
- Very good EMI behavior
- Up to 60% space saving on the PCB
- Higher reliability due to monolithically integrated IGBT and diode due to less thermal cycling during switching

**Benefits**

- Piezo Injection
- HID Lighting
- Low Power Motor Drives

**Applications**

www.infineon.com/discrete-automotive-igbt
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Compared to competition a significant reduction of turn-off losses has been achieved resulting in a decrease of the total switching and thus total power losses. Improved performance leads to higher efficiency and lower junction temperature which as well has a positive influence on the product lifetime and reliability.

For the stop switch section, the conduction losses are dominating the power losses. Hence, Infineon’s Reverse Conducting Drives Fast (RC-DFA) as well as its complementary variant, the Reverse Conducting Drives (RC-DA) technology can be used for such a stop switch.

The cylinder select switches (IGBT/diode) are operating at low average frequencies below 1kHz for charging and discharging. Here RC-DA would be Infineon’s preferred suggestion but also the RC-DFA is a suitable semiconductor product for these switches.

### Product Portfolio Reverse Conducting Drives Fast

<table>
<thead>
<tr>
<th>Product</th>
<th>Package</th>
<th>Blocking Voltage</th>
<th>25°C</th>
<th>175°C</th>
<th>25°C</th>
<th>175°C</th>
<th>Qr, @ 25°C / 175°C</th>
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<tbody>
<tr>
<td>IKD04N60ORA</td>
<td>DPAK</td>
<td>600V</td>
<td>4A</td>
<td>1.65V</td>
<td>1.85V</td>
<td>1.7V</td>
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<td></td>
<td>6A</td>
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<td>0.37 / 0.80µC</td>
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<td>10A</td>
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<td>0.56 / 1.22µC</td>
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<td>15A</td>
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<td>0.76 / 1.70µC</td>
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<td></td>
<td>2.5A</td>
<td>2.2V</td>
<td>2.3V</td>
<td>2.1V</td>
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<td>4A</td>
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<td>0.09 / 0.26µC</td>
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<td>6A</td>
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<td>0.16 / 0.34µC</td>
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<td>0.27 / 0.62µC</td>
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<td>15A</td>
<td></td>
<td></td>
<td></td>
<td>0.42 / 1.00µC</td>
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</tbody>
</table>

**Efficiency Comparison:** 30% improvement in \( E_{\text{off}} \) @ 150°C

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