Product Selector Guide
DC-DC Products

September 2008
**Features & Benefits**

The DPA-Switch Family combines a 220 V power MOSFET with a controller that provides current monitoring, undervoltage and over temperature protection, soft start and other control functions in a single device, saving up to 30 external components in the power supply design. Combining the key switching elements into a single package reduces design complexity and ensures rapid, low-risk development of highly cost-effective power supplies.

**Superior Performance and Flexibility.** The DPA-Switch family supports a range of power requirements in either forward or flyback topologies and offers a variety of package options to maximize design flexibility. A DIP-8 package is available for low-cost designs, and a thermally efficient TO-263-7C R package (2 °C/Watt) is available for higher power applications.

**Product Highlights**
- Supports flyback and forward topology
- Programmable internal current sense eliminates external sense components
- Built-in auto-restart for output overload/open loop protection
- Line undervoltage (UV) detection: meets ETSI standards
- Line overvoltage (OV) shutdown protection
- Fully integrated soft-start for minimum stress/overshoot
- Hysteretic thermal shutdown for over temperature protection and automatic recovery
- Source connected tab for low EMI

**EcoSmart® Energy Efficiency**
- Extremely low consumption at no-load (10 mA typ.) and in remote off (2 mA max.)
- Cycle skipping at light load for high standby efficiency

**Package Information**
- P and G packages have Pb-free finish (100% matte tin), are RoHS compliant and meet requirements of JEDEC standard J-STD-020C table 4.2. The R package is not available in Pb-free finish.

**Typical Applications**
- PoE applications: VoIP phones, WLAN, security cameras
- Telco central office equipment: xDSL, ISDN, PABX
- Distributed power architectures (24 V/48 V bus)
- Industrial controls
- LED lighting
# Product Selector Guide

<table>
<thead>
<tr>
<th>Package</th>
<th>DPA422</th>
<th>DPA423</th>
<th>DPA424</th>
<th>DPA425</th>
<th>DPA426</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Power (W)</td>
<td>0.5 W</td>
<td>1 W</td>
<td>2.5 W</td>
<td>4 W</td>
<td>6 W</td>
</tr>
<tr>
<td><strong>DPA422</strong></td>
<td>7.5 W</td>
<td>10 W</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>DPA423</strong></td>
<td>12 W</td>
<td>16 W</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>DPA424</strong></td>
<td>16 W</td>
<td>23 W</td>
<td>35 W</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>DPA425</strong></td>
<td>23 W</td>
<td>32 W</td>
<td>50 W</td>
<td>62 W</td>
<td>-</td>
</tr>
<tr>
<td><strong>DPA426</strong></td>
<td>25 W</td>
<td>35 W</td>
<td>55 W</td>
<td>70 W</td>
<td>83 W</td>
</tr>
</tbody>
</table>

Notes:
1. Maximum output power is limited by device internal current limit.
2. See Applications Considerations section of the DPA-Switch data sheet for complete description of assumptions and for output powers with other input voltage ranges.
3. For device dissipation of 1.5 W or below, use P or G packages. Device dissipation above 1.5 W is possible with R packages.
4. Packages: P: DIP-8, G: SMD-8, R: TO-263-7C. For lead-free package options, see Part Ordering section of the DPA-Switch data sheet.
5. Available in R package only.
6. Due to higher switching losses, the DPA425 may not deliver additional power compared to a smaller device.
7. Available in P and G package only.

## Integrated Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV-FET Rating</td>
<td>220 V</td>
</tr>
<tr>
<td>Switching Frequency (kHz)</td>
<td>400/300</td>
</tr>
<tr>
<td>Max. Duty Cycle (DCmax)</td>
<td>75%</td>
</tr>
<tr>
<td>Control Method</td>
<td>PWM</td>
</tr>
<tr>
<td>Soft Start</td>
<td>Yes</td>
</tr>
<tr>
<td>Fully Integrated Current Sensing</td>
<td>Yes</td>
</tr>
<tr>
<td>Adjustable Current Limit</td>
<td>Yes</td>
</tr>
<tr>
<td>Hysteretic Thermal Shutdown</td>
<td>Yes</td>
</tr>
<tr>
<td>Power Limiting</td>
<td>Yes</td>
</tr>
<tr>
<td>Line UV Detection</td>
<td>Yes</td>
</tr>
<tr>
<td>Line OV Detection</td>
<td>Yes</td>
</tr>
<tr>
<td>Remote ON/OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>EcoSmart® Low Standby/No-load Power Consumption</td>
<td>Yes</td>
</tr>
<tr>
<td>Synchronizable to Lower External Clock Frequency</td>
<td>Yes</td>
</tr>
<tr>
<td>Remote ON/OFF</td>
<td>Yes</td>
</tr>
</tbody>
</table>
DPA-Switch in PoE Applications

Power over Ethernet (PoE) is a method whereby power is transmitted to Ethernet-connected equipment (VoIP telephones, WLAN transmitters, security cameras) from the central switch. Power Integrations has developed circuits for highly cost-effective IEE802.3af compliant power supplies. Tested by the University of New Hampshire’s Interoperability Consortium (UNH-IOC), PI solutions have been shown to work with all available Power Sourcing Equipment (PSE). The results of the UNH-IOC testing are shown on the PI website.

Operation: PoE Powered Device (PD) fulfills three functions to work in conjunction with the sending end PSE: detection, classification and undervoltage lockout.

Detection Phase: The PSE checks the PD to determine if it is PoE-enabled. During the detection phase, the PSE applies a voltage ramp to the PD and looks for a characteristic impedance from the load (25 kΩ). If the signature impedance is detected, the PSE moves on to the classification phase. The signature identification voltage is a ramp voltage between 2.5 V and 10 V. A 24.9 kΩ resistor provides the correct signature impedance for detection.

Classification Phase: The PSE continues to ramp the voltage to the PD. Between 14.5 V and 20.5 V, the PD must draw a specified current to identify the device class. The classification current describes the amount of power the PD will require during normal operation. A table of classification current and operating PD power requirements is shown below.

<table>
<thead>
<tr>
<th>Class</th>
<th>Power (Min)</th>
<th>Power (Max)</th>
<th>I_CLASS (Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.44 W</td>
<td>12.95 W</td>
<td>4 mA</td>
</tr>
<tr>
<td>1</td>
<td>0.44 W</td>
<td>3.84 W</td>
<td>12 mA</td>
</tr>
<tr>
<td>2</td>
<td>3.84 W</td>
<td>6.49 W</td>
<td>20 mA</td>
</tr>
<tr>
<td>3</td>
<td>6.49 W</td>
<td>12.95 W</td>
<td>30 mA</td>
</tr>
<tr>
<td>4</td>
<td>Reserved</td>
<td>Reserved</td>
<td>44 mA</td>
</tr>
</tbody>
</table>

Table 1. Classification Power Levels.

Turn-on Phase: The PSE continues to ramp the input voltage up to 30 V. When the undervoltage lockout (UVLO) circuit is released the PD is allowed to power up. A typical undervoltage lockout circuit is shown in the Figure above.

For additional information see Design Ideas DI-70 (www.powerint.com/PDFFiles/di70.pdf) & DI-88 (www.powerint.com/PDFFiles/di88.pdf), also Reference Design Kits DAK-68A and DAK-86.
Design Examples

Cost-Effective 6.6 W, 3.3 V Flyback DC-DC Converter (EP-86)

![Circuit Diagram of Cost-Effective 6.6 W, 3.3 V Flyback DC-DC Converter](PI-3806-061704)

15 W Multi-Output DC-DC Converter (DI-69)

![Circuit Diagram of 15 W Multi-Output DC-DC Converter](PI-3799-082404)

Visit www.powerint.com/appcircuits.htm for additional design examples.
Design Tools

Reference Design Kits (RDKs)
RDKs include a working prototype power supply, sample devices, unpopulated pcb, data sheet, comprehensive engineering report and other related documentation.

| DAK-21A  | 30 W, DC-DC Forward Converter |
| DAK-68A  | 6.6 W, Class 0 PoE Converter  |
| DAK-71A  | 6 W, DC-DC Converter         |
| DAK-86   | 6.6 W, Multi-Class Programmable PoE Powered Device |

Power Supply Design Software*
With PI Expert™ Suite, you’re only “mouse clicks” away from determining the key components in your next switching power supply design, including the best Power Integrations power IC and detailed instructions for building the transformer! It’s fast & easy... and best of all, FREE!

DPA-Switch Product and Design Collateral*

| Data Sheet | DPA422-426 | DPA-Switch Family Data Sheet |
| Application Note | AN-31 | DPA-Switch DC-DC Forward Converter Design Guide |
| Design Ideas (2-page technical Circuit Document) | |
| DI-24 | Application: Telecom (36-75 VDC Input): 30 W, 5 V Forward Converter |
| DI-25 | Application: Telecom (36-75 VDC Input): 30 W, 5 V Forward Converter (Sync. Rectification) |
| DI-29 | Application: Telecom (36-75 VDC Input): 25 W, 7 V Flyback Converter |
| DI-31 | Application: Telecom (36-75 VDC Input): 70 W, 5 V Forward Converter |
| DI-37 | Application: Telecom (36-75 VDC Input): 16.5 W, 3.3 V Forward Converter (Sync. Rectification) |
| DI-40 | Application: Telecom (36-75 VDC Input): 20 W, 2.5 V Forward Converter (Sync. Rectification) |
| DI-51 | Application: Telecom (36-75 VDC Input): 5 W, 5 V Flyback Converter |
| DI-52 | Application: Telecom (36-75 VDC Input): 60 W, 12 V Forward Converter (Sync. Rectification) |
| DI-53 | Application: Telecom (36-75 VDC Input): 50 W, 5 V / 3.3 V Forward Converter (Sync. Rectification) |
| DI-56 | Application: Telecom (36-75 VDC Input): 19.2 W, ±12 V Flyback Converter |
| DI-57 | Application: Telecom (36-75 VDC Input): 60 W, 12 V Flyback Converter |
| DI-69 | Application: VoIP Phone, 15 W, 5 V / 7.5 V / 20 V Forward Converter (Sync. Rectification) |
| DI-70 | Application: PoE VoIP Phone, 15 W, 5 V / 7.5 V / 20 V Forward Converter (Sync. Rectification) |
| DI-88 | Application: PoE PD Flyback Converter with Programmable Class |

* Downloadable from www.powerint.com
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