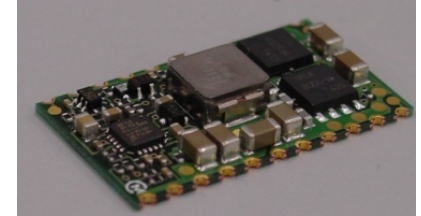


Feature Guide



MPDRX - Series

High-Speed DC-DC Converter



Murata High-Speed Response Converter

Features

- **Ultra High Speed Transient Response:** The Murata MPDRX series is an ideal solution for implementation in unforgiving environments such as those where FPGAs or μ Processors may be used. In many of these applications a device's multiple gate on / off operation can generate changes in load-current large enough to force a serious fluctuation in a typical dc-dc converter's output voltage. That voltage fluctuation, entering the device's Vccint supply terminal (for example), can generate errors and even damage a delicate FPGA. The MPDRX series is designed to eliminate a device's exposure to such variations by as much as 85%.
- **Elimination of External Capacitance:**
A typical dc-dc converter can of course be utilized given that the correct amount of capacitance is mounted at the output of the converter (e.g., 22,000 μ F) to reduce the effect of the load-current transients. However, as the MPDRX series achieves the smallest possible Vout variation with only a single 100 μ F ceramic capacitor on the output a significant amount of board space (up to 73%), component count and material cost is considerably minimized (See fig. 6).



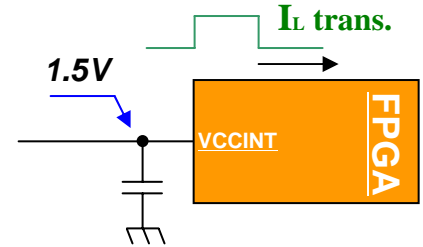
- **Low Cost:** Murata's devices are priced competitively when compared with traditional response POL converters. However considering the cost of the output filtering capacitors that are eliminated AND the board-space real estate saved, the TOTAL solution cost savings is significant.
- **How?:** A Novel Control Method – Murata has developed a ripple detection technique that enables extremely tight regulation, even when exposed to high transients, with superior efficiencies. Generation of a very small ripple-voltage from the output voltage for comparison to a reference voltage is used to modulate the drive circuit. In this way a precise output voltage is maintained even when hit with variation current flow from the load OR un-regulated voltage swings on the converter's input.

What is the Murata MPDRX series ?



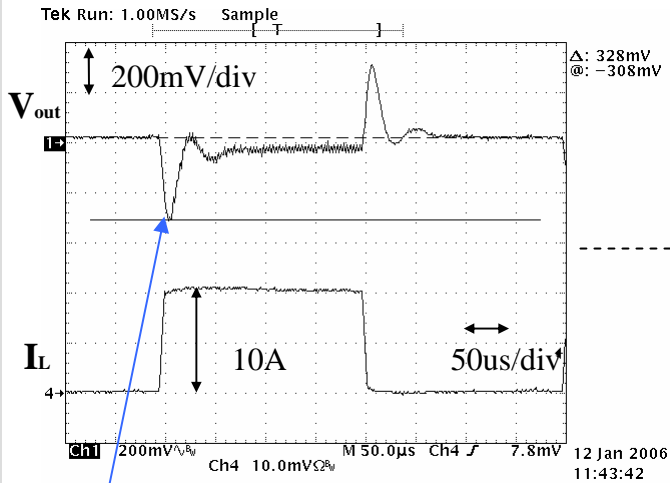
REQUIRED : Higher Speeds

SOLUTION : Tighter Line Voltage Regulation.



Typical Solution:

A standard POL DC-DC Converter module utilizes PWM switching to create an efficient dc-voltage conversion. Load transients from devices such as FPGAs can de-stabilize the Vout of the POL converter resulting in an output voltage behavior that resembles the plot in Figure 1 (below).



Output Voltage (VCCINT=1.5V)

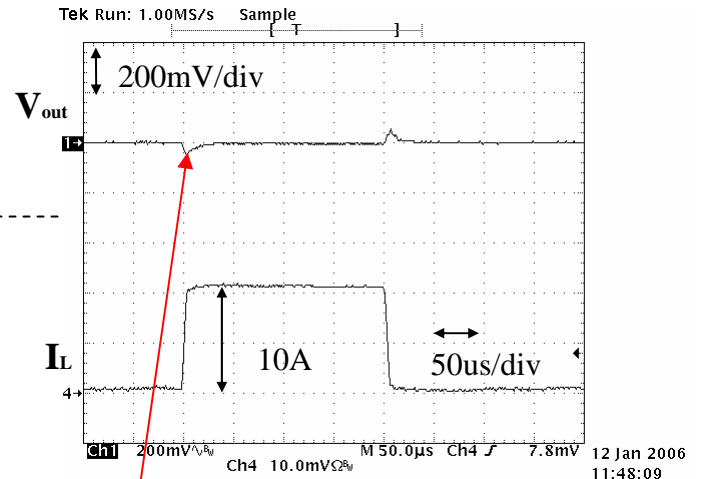
Load Current (Output Current)
Io=0A-10A
di/dt=2A/us

$\Delta V = 328mV (C_{out}=100\mu F) (= 22\% \text{ of } V_{ccint})$
(Figure 1)

Does NOT meet a typical VCCINT requirement of +/-5%

Murata's High Speed Solution: (P/N : MPDRX002S)

Murata's ripple-detection technique of converting dc enables the most stable possible output voltage. Under the same load-current transient conditions experienced by the typical dc-dc converter module (Figure 1) Murata's MPDRX002S Vout maintains a line regulation that ensures FPGA operations remain un-effected (Figure 2).



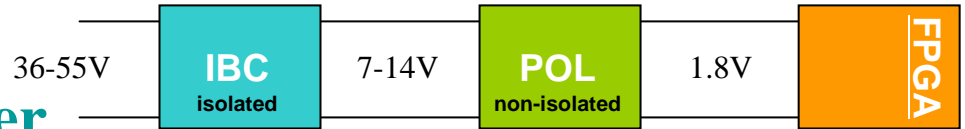
$\Delta V = 50mV (C_{out}=100\mu F) (= 3\% \text{ of } V_{ccint})$
(Figure 2)

Easily MEETS the +/-5% VCCINT requirement

Application Study / MPDRX Series



**REQUIRED : IBC-Friendly
POL Converter**

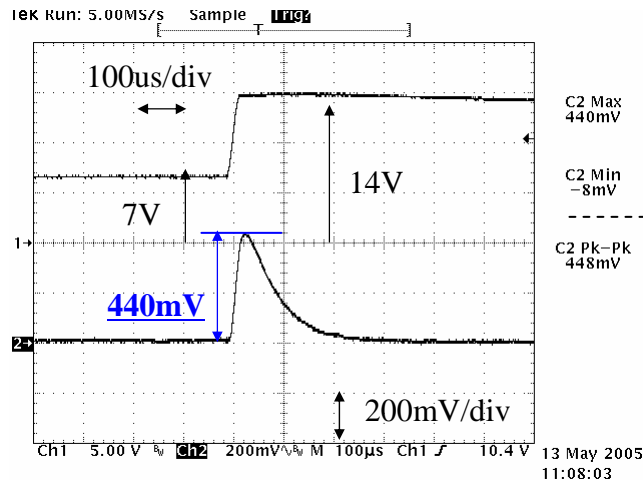


Input voltage disturbance of POL feeds through to the output voltage.

SOLUTION: Improved feed-through regulation

Conventional Solution:

When the un-regulated voltage output of an intermediate bus converter enters a typical POL converter a load such as an FPGA is vulnerable to resulting swings in the POL's Vout. In Figure 3 it can be seen that a **440mV** Vout can result from a 7V Vin variation from an IBC un-regulated input.



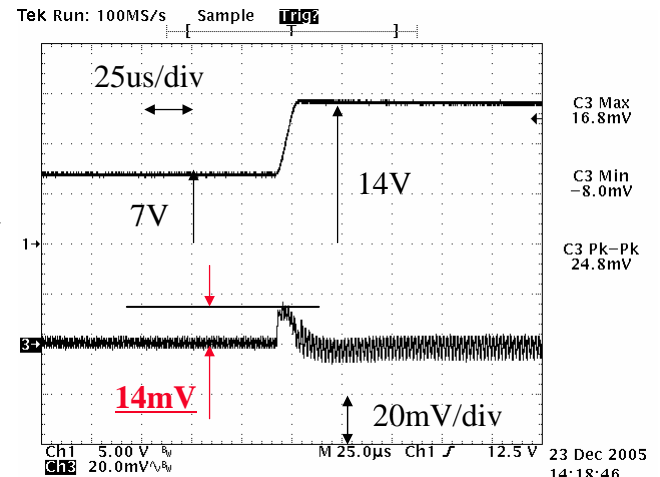
(Figure 3)

Murata's High Speed Solution: (P/N : MPDRX004S)

One of the advantages of Murata's ripple detection technique is that it provides protection against wide voltage swings on the input. An unregulated Vin swing from 7V to 14V in about 10us results in only a **14mV** variation on the Vout of the MPDRX004S (Fig 4).

Input Voltage
POL (Vin)=7 → 14V

Output Voltage
(Vo = 1.8V)



(Figure 4)

Realized Space and Cost Reduction



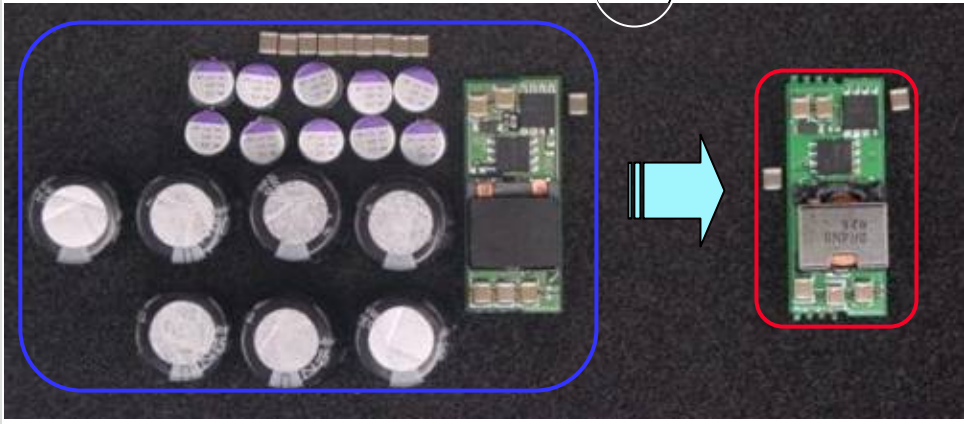
High Speed MPDRX Series

Fewer external components for load-transient compensation.

Space Savings & \$\$ Savings

Conventional Solution

(2,439.4 mm²)



(Figure 5)

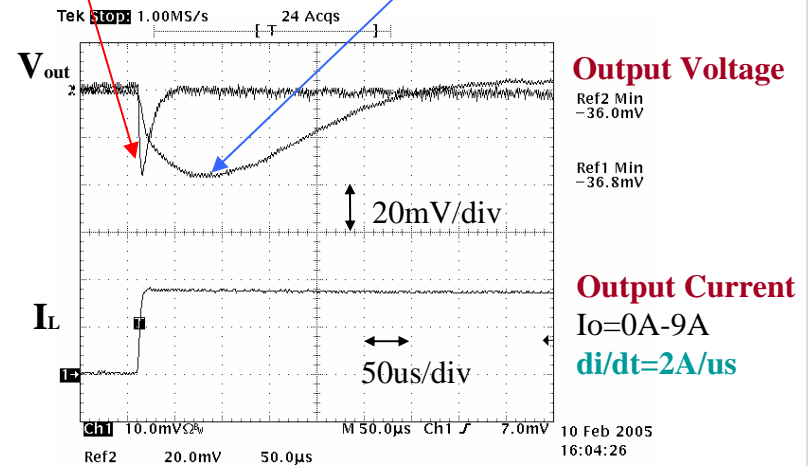
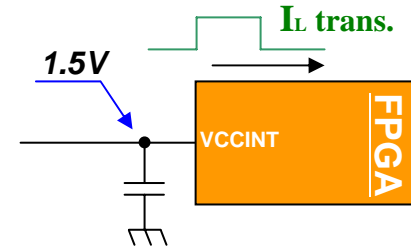
muRata's High-Speed Solution

(669.4 mm²)

-72%

muRata's MPDRX002S + (Cout=100uF)
 $\Delta V=36mV$

Conventional POL Device + (Cout=13,000uF)
 $\Delta V=37mV$



(Figure 6)