

# DESIGN NOTES

## Hot Swap Solution Meets AMC and MicroTCA Standards

Design Note 437

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### Introduction

The LTC<sup>®</sup>4223 is a dual Hot Swap<sup>™</sup> controller that meets the power requirements of the Micro Telecommunication Computing Architecture (MicroTCA) specification recently ratified by the PCI Industrial Computer Manufacturers Group (PICMG).

The LTC4223 includes an internal pass FET for the 3.3V auxiliary supply and a driver for an external N-channel pass FET for the 12V payload supply. Inrush current for both supplies is controlled: the auxiliary supply has a fixed 240mA active current limit and the 12V ramp rate is controlled by an external capacitor. A timed circuit breaker and fast current limit protect both supplies against severe overcurrent faults. It also features an adjustable analog current limit with a circuit breaker timeout for the 12V supply.

The LTC4223 monitors 12V load current by sensing voltage across an external resistor and outputs a ground-referenced voltage (at the 12IMON pin) proportional to the load current. It also provides separate power-good outputs for the two supplies and a single, common fault output. Additional features include card detection and independent control of the two supplies. The LTC4223-1 latches off after a circuit breaker fault timeout expires while the LTC4223-2 provides automatic retry after a fault. A fault on the 12V supply shuts down only the 12V path, leaving the 3.3V auxiliary power available for system management functions. A fault on the 3.3V AUX supply shuts down both supplies.

### Advanced Mezzanine Card Application

Figure 1 shows a typical MicroTCA application. The current limit on the 12V rail is 7.6A, determined by the 6m $\Omega$

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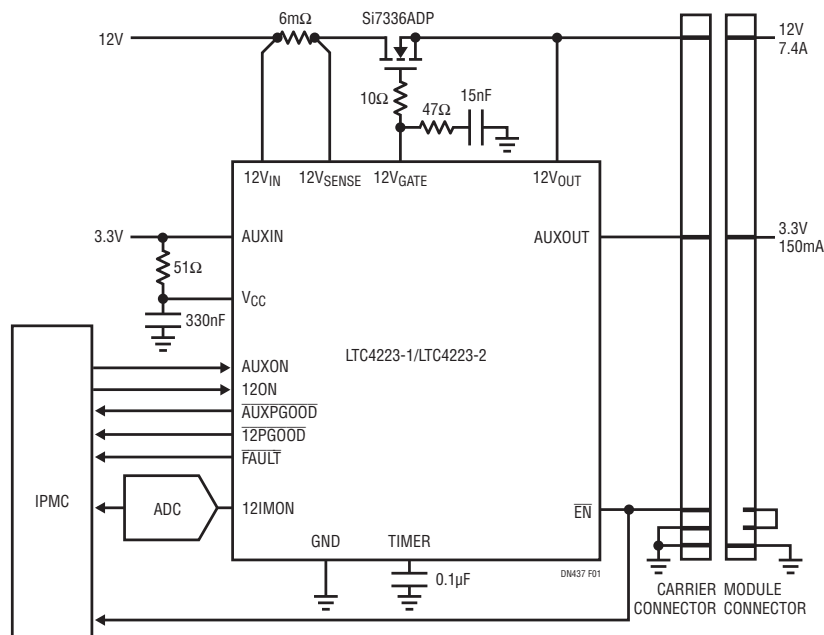


Figure 1. Advanced Mezzanine Card Application

sense resistor. Auxiliary rail current limit is internally set to 240mA. (Section 4.2.1 of the MicroTCA specification details the requirements for payload and auxiliary voltage, current, and protection.) Figure 2 shows the power-up transients when a card is inserted. Figures 3 and 4 show

the two modes of overcurrent protection on the 12V supply. In Figure 3, the load current is increased above the analog current limit (ACL) threshold. The LTC4223 responds by reducing the current to the ACL threshold, allowing the card to ride out short overcurrent faults. If the fault persists, the timer expires and power is turned off. In the event of a severe overcurrent fault, load current is reduced to the ACL limit in 8 $\mu$ s as shown in Figure 4. Once again, if the fault persists and the timer expires, power is turned off entirely.

### Conclusion

The LTC4223 aims to simplify Hot Swap control for Advanced Mezzanine Cards in ATCA and MicroTCA systems. It succeeds by meeting all MicroTCA requirements for controlling both payload and auxiliary power with only a 5mm  $\times$  4mm DFN package and a few minimal external components. Individual card monitoring and control functions are further simplified by LTC4223's status and control lines.

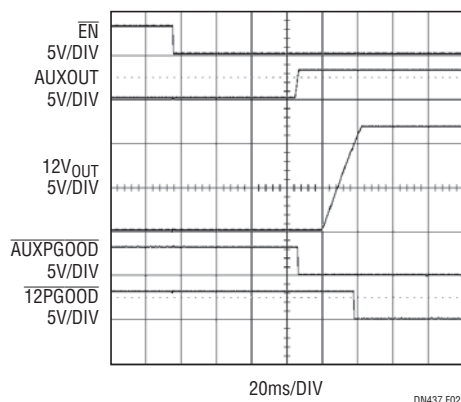


Figure 2. Normal Power-Up Waveform

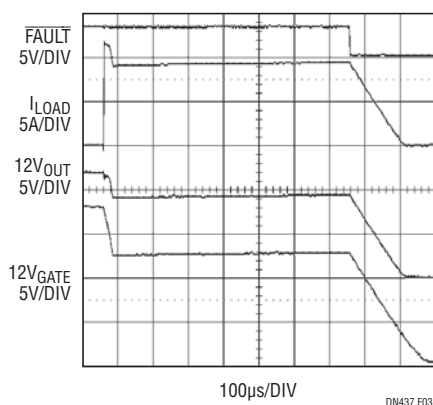


Figure 3. Overcurrent Fault on 12V Output

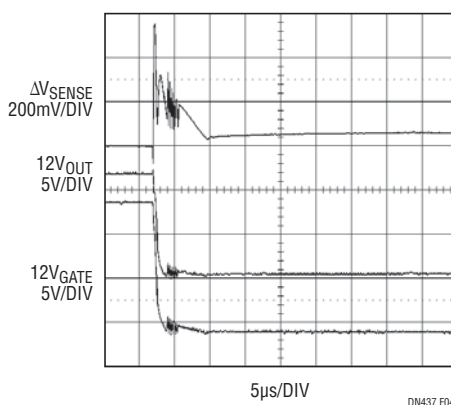


Figure 4. Short-Circuit Fault on 12V Output

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