Product Brief

Bipolar Integrated Technology Inc.

B2028
16-Way Asynchronous Arbiter

Introduction:

Fast resource sharing requires fast arbitration of multiple requests for that resource. Many designs cannot guarantee that all requests arrive synchronous to a common clock. This requires designers to register the requests first and wait for a metastable resolving period. These synchronous arbiters typically have a latency of 30-50ns. Multiple request priorities and round-robin capabilities are rare. A fast-settling arbiter cell and redundant internal states give the B2028 a synchronous request to grant time of 10ns, with no metastability effects on the grant signals. If multiple requests are pending, the B2028 can switch from one grant to another in 3ns. This helps achieve peak resource usage by multiple users. Fast arbitrations reduce the latency to memory for RISC processors, improve the deliverable multi-master bandwidth on buses, and can help in removing the need for a common clock distributed to all boards in a system.

The B2028 has two request signals per grant: one high priority, one low priority. A round-robin mode can be enabled that guarantees a fair distribution of grants over time. (If a requestor receives a grant, a future request by that requestor won't get a grant until all other requests received in the interim are granted). Round-robin arbitration provides a significant system performance increase in multi-processor like applications, compared to fixed-priority and first-come, first-served arbitration.

If the B2028 is idle, a transition on any request signal initiates an arbitration, and GRANT is asserted for that requestor. GRANT is released when the request is released. The release of the request snapshots all other pending requests. These requests are then GRANT'ed in order. A round-robin token saves a 4-bit binary encoding that identifies the last GRANT. It is used to change the priority for servicing multiple requests. Assume the last GRANT was to requestor 5. After request 5 is released, any pending requests are resolved with this priority: 4-0, 15-5. (high to low). The round-robin token is reloaded with each GRANT. All pending high priority requests are granted before low priority requests. Note that no new requests are recognized internally, until all previously latched requests are serviced. Once asserted, requests should not be removed until granted. A special case is provided that may be useful with some bus protocols: If another request is currently granted, you can remove a request without receiving a grant, as long as the other request/grant is maintained for 15ns after this removal. PRIORITY_MODE should only be changed when all requests are unasserted.

All inputs and outputs are TTL levels.

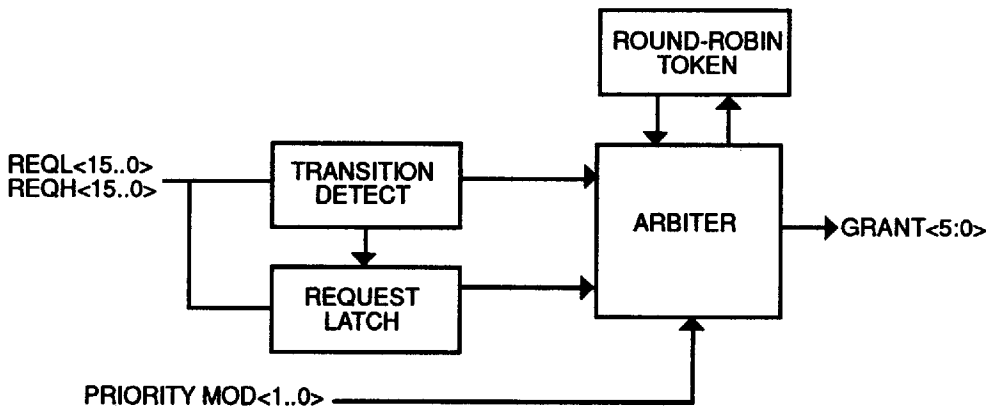

Figure 1 - 16-Way Asynchronous Arbiter

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16-Way Asynchronous Arbiter

Pin Descriptions

REQL<15..0> (I) 16 asynchronous low priority requests.

REQH<15..0> (I) 16 asynchronous high priority requests.

GRANT<15..0> (O) 16 asynchronous grants. Only 1 grant is asserted at a time.

PRIORITY MODE <1..0> (I) If PRIORITY_MODE==11, round-robin mode is enabled. The round-robin token is loaded with a binary encoding representing the last grant. This is used to reorder the prioritization of multiple requests.

If PRIORITY_MODE==10, random mode is enabled. The round-robin token is loaded with a pseudo-random value after each grant. This provides a random priority ordering for multiple requests.

If PRIORITY_MODE==01, fixed mode is enabled. The round-robin token is forced to always be 0.

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