Application note

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Subject	Expansion of the PCI Request/Grant Pairs (Busmaster)
Related Products	All **Kontron** PCI products

Date	Edited by	Alteration to previous document revision
05.10.2001	C. Hoch	Initial release
03.01.2002	C. Hoch	Modified PAL Equations
29.04.2002	D. Gunter	English proofreading
23.08.2002	H. Bruhn	Changed to Kontron style

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2   INTRODUCTION

For some applications, the needed number of PCI busmaster (PCI cards or PCI devices on a back-plane) could be limited by the amount of Request and Grant pairs available on the Kontron CPU board.
To ensure that all PCI slots/devices have the ability to be busmaster, this application note shows an example of how to increase the number of possible PCI busmaster by expanding the REQ#/GNT# signal lines.

NOTE: **Information about the amount of supported PCI slots/devices can be found in the board specific manual, design guide or application notes.**

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3   DESIGN GUIDELINES

The described PAL example allows the expansion of a REQ#/GNT# pair into three pairs.

3.1   Specifications

- REQ#/GNT# Signals expanded to REQ0#/GNT0#, REQ1#/GNT1# and REQ2#/GNT2#
- Priority of the Request: REQ0# highest, REQ2# lowest.
- **Speed of used PAL: 5ns**

3.2   Operation Mode

The PAL is programmed as a state machine, clocked by the PCI clock. The three incoming REQx# signals are encoded by the state machine (4- to 2-bit priority encoder) into an 2-bit internal code:

REQSEL1	REQSEL0	state
0	0	no incoming REQ#
0	1	REQ0# active
1	0	REQ1# active
1	1	REQ2# active

The three REQx# are combined into a common signal which is sent to the processor's REQ# input. The processor responds with the GNT# signal, which is assigned by the PAL's state machine to the corresponding GNTx# signal.

3.2.1   Block Diagram
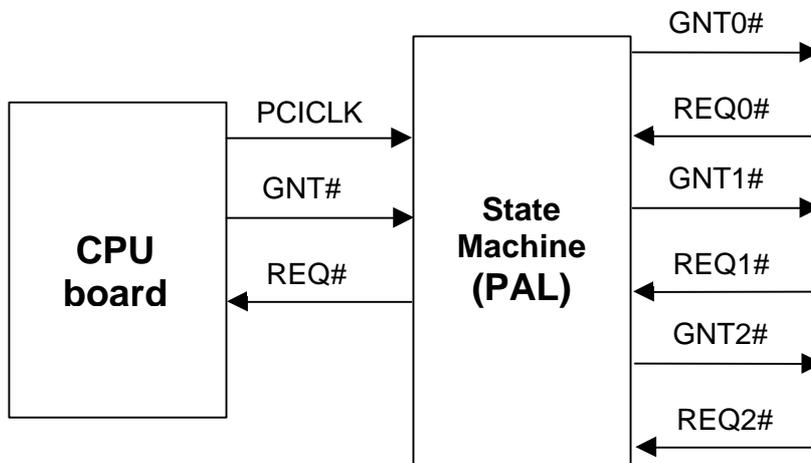
3.2.2 PAL Equations

The PAL equations do not have the appropriate syntax for a PAL compiler so they need to be properly edited before being used.

Inputs: GNT, REQ0, REQ1, REQ2
Outputs: REQ, GNT0, GNT1, GNT2

Equations:

/REQ = /REQ0 + /REQ1 + /REQ2

/GNT0 = REQSEL0 * /REQSEL1 * /GNT
/GNT1 = /REQSEL0 * REQSEL1 * /GNT
/GNT2 = REQSEL0 * REQSEL1 * /GNT

CLOCKED REQSEL1 =	/REQ1 * REQSEL1 * /REQSEL0 +	; MSB of 4- to 2-bit encoder
	/REQ2 * REQSEL1 * REQSEL0 +	
	/REQ1 * REQ0 +	; REQ0 highest priority and
	/REQ2 * REQ0	; REQ2 lowest priority
CLOCKED REQSEL0 =	/REQ0 * /REQSEL1 +	; LSB of 4- to 2-bit encoder
	/REQ0 * REQSEL0 +	
	/REQ2 * REQSEL1 * REQSEL0 +	
	REQ1 * /REQ0 +	; REQ0 highest priority and
	/REQ2 * REQ1	; REQ2 lowest priority