Apple MacIntosh Ethernet Add-In Card

National Semiconductor
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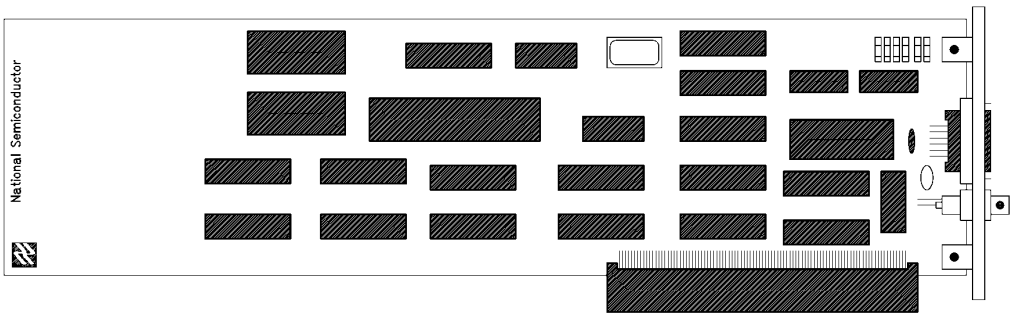

TL/F/10858–2

SYSTEM DESCRIPTION

Local Area Networks have emerged as a widely accepted, practical method for connecting personal computers, printers, and workstations together to form workgroups and corporate networks. Ethernet®, the IEEE 802.3 standard, has the largest installed LAN base because of its low cost and high performance, easy to use characteristics. Ethernet networks have been dominated by IBM® PCs and compatibles. However, Apple MacIntosh connectivity to the work group is a key emerging application. An Ethernet adapter board receives and transmits, packets of data through the cable implementing a CSMA/CD (Carrier Sense, Multiple Access, Collision Detect) protocol to ensure the integrity of data transmission and reception. It encodes the data to Manchester code for transmission and decodes to Non Return Zero at reception. The data is processed through the controller by IEEE 802.3 protocols and buffered into local memory. This data must be accessed efficiently in and out of the bus. A software driver must be written to interface the adapter card to the Network Operating System.

For the Apple MacIntosh II adapter, the Ethernet controller must have the capability to address 32 bits, interface to the Mac II Nubus, have an efficient memory buffer scheme, implement a low-cost solution, perform a high data throughput, and have a simple interface to the software. The transceiver must conform to IEEE 802.3 standards to interoperate with other Ethernet components on the network.

DESIGN CHALLENGES

1. Physical Layer Conformance and Reliability must meet system design requirements.
2. Maximize data throughput in a shared memory architecture implemented in the design without adding cost.
3. Simple interface to Nubus I/O needs the Ethernet controller to have byte swapping capabilities, a low interface chip count, support a 32-bit bus, and support transfers to registers and requests through arbitration logic.
4. Physical Address ROM to contain the unique address assigned to each Ethernet node.

COMPONENTS

1. Coaxial Transceiver Interface, and the Serial Network Interface (Manchester Encoder/Decoder) meet IEEE 802.3 standards. Use minimal external components, have collision detect, squelch, jabber and CD Heartbeat in the transceiver; plus, jitter tolerance, loopback capability, and reliable phase lock loop in the Encoder/Decoder.
2. Network Interface Controller is the Ethernet protocol controller with memory management.
3. PAL 16R4 and 74651 for synchronous sequencer logic, and data transceivers for the 32-bit Nubus transfers.
4. LS471 ROM is the physical address for the card and contains the configuration data and has the ability to also contain the device driver data.
5. 616A SRAM is local buffer memory.

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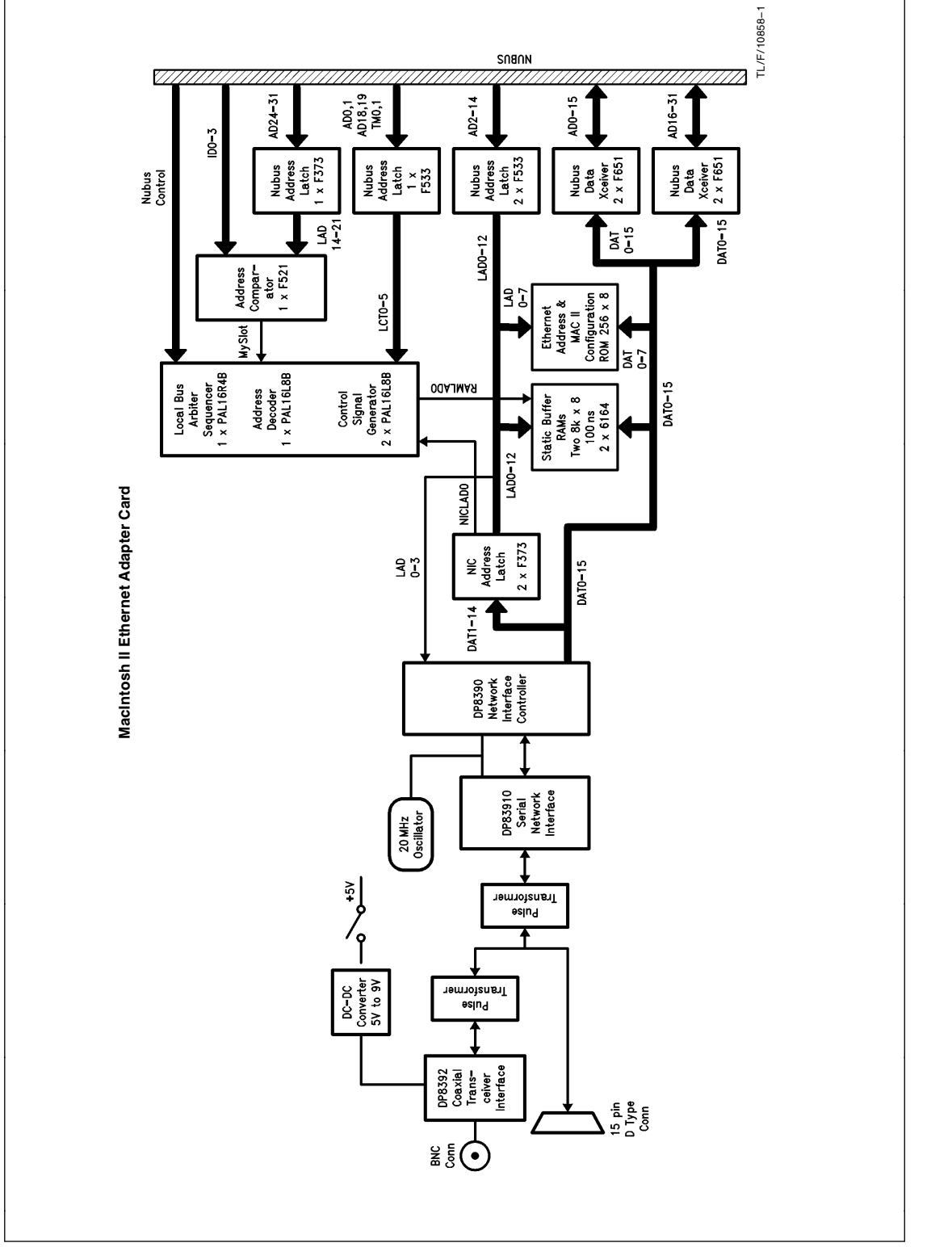
MAC II PARTS LIST

Function	Description	NSC Part	Other	Qty
Transceiver	Coax Transceiver Interface	DP8392		1
	DC−DC Converter		✓	1
Network Interface	Serial Network Interface	DP83910		1
	Network Interface Controller	DP8390		1
Address/Data Interface	PAL	PAL16R4B		1
	PAL	PAL16L8B		3
	Address Latch	74373		2
	Address Comparator	74521		1
	Nubus Address Latch	74533		3
	Nubus Address Latch	74373		1
	Nubus Data Transceiver	74651		4
Memory	Static Buffer Ram	6164		2
	256 x 8 ROM	74LS471		1


Macintosh II Ethernet Adapter Card
TL/F/10858–1
NUBUS
Nubus Control
ID0–3
AD24–31
AD0,1 AD18,19 TM0,1
AD2–14
AD0–15
AD16–31
Nubus Address Latch 1 x F373
Nubus Address Latch 1 x F533
Nubus Address Latch 2 x F533
Nubus Data Xceiver 2 x F651
Nubus Data Xceiver 2 x F651
LAD 14–21
LAD0–12
DAT 0–15
DAT0–15
Address Compar-ator 1 x F521
MySlot
LCT0–5
LAD 0–7
Ethernet Address & MAC II Configuration ROM 256 x 8
DAT 0–7
Local Bus Arbiter Sequencer 1 x PAL16R4B
Address Decoder 1 x PAL16L8B
Control Signal Generator 2 x PAL16L8B
RAMLAD0
Static Buffer RAMs Two 8k x 8 100 ns 2 x 6164
LAD0–12
NICLAD0
DAT0–15
LAD 0–3
NIC Address Latch 2 x F373
DAT1–14
DP8390 Network Interface Controller
20 MHz Oscillator
DP83910 Serial Network Interface
Pulse Transformer
+5V
DC-DC Converter 5V to 9V
Pulse Transformer
DP8392 Coaxial Trans-ceiver Interface
BNC Conn
15 pin D Type Conn

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