Comparing the TNETX15VE and TNETX15AE EALE Devices

APPLICATION BRIEF: SDNA014

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Contents

Tables

Comparing the TNETX15VE and TNETX15AE EALE Devices

Abstract

This application brief highlights the operational differences between the Texas Instruments (TI™) TNETX15VE and TNETX15AE Address Lookup Engine (EALE) devices. The EALE devices supplement the internal address handling capabilities of TI ethernet switch devices.

Both the TNETX15VE and TNETX15AE are based on a table lookup but include diverse design features targeted for different market segments. The TNETX15AE handles a large address pool but lacks the controls required to implement Spanning Tree and VLAN. The TNETX15VE supports a smaller address pool but adds the necessary control structure for Spanning Tree and VLAN.

1. Product Support

1.1 Related Documentation

The following list specifies product names, part numbers, and the literature numbers of corresponding documentation.

- *VLAN-Engine Address-Lookup Device (TNETX15VE) Data Sheet*, Literature number SPWS028.
- *Address-Lookup Device (TNETX15AE) Data Sheet*, Literature Number SPWS041
- *ThunderSWITCH™ (TNETX3150) 15-Port 10/100 Mbit/s Ethernet Switch Data Sheet*, Literature number SPWS027
- *Evaluation Board and Software Manual for the ThunderSWITCH™ Evaluation Platform*

1.2 World Wide Web

Our World Wide Web site at **www.ti.com** contains the most up to date product information, revisions, and additions. New users must register with TI&ME before they can access the data sheet archive. TI&ME allows users to build custom information pages and receive new product updates automatically via email.

1.3 Email

For technical issues or clarification on switching products, please send a detailed email to **networks@ti.com**. Questions receive prompt attention and are usually answered within one business day.

2. Spanning Tree Algorithm/VLAN Support

Table 1 compares the Spanning Tree algorithm and VLAN support features of the TNETX15AE and TNETX15VE.

Table 1. Spanning Tree Algorithm/VLAN Support

Feature	TNETX15AE	TNETX15VE
VLAN support?	No	Yes. Supports 4 port-based VLANs
Can VLANs be extended beyond TNETX3150 when EALE is connected as an edge device?	No	Yes. 15 Tag VLAN registers identify VLAN when port 0 is uplink. TNETX3150 passes pretag information to TNETX15VE.
Duplicate address allowed?	No. VLAN masks are not related to MAC addresses; thus, duplicate MAC addresses are not supported.	Yes. VLANs are part of the MAC addresses internally; thus MAC addresses are allowed to be duplicated per VLAN.
Are VLANs supported between cascaded switch devices?	No	Yes. Supports VLANs across cascaded interface between two TNETX3150 devices
Can (Spanning Tree) address learning be disabled?	On port 0 only	Yes. NLRNports (16-bit) register disables learning addresses for each port in which the corresponding bit is set. Used to support Spanning Tree blocking state.
Can (Spanning Tree) Receive be blocked by port?	No	Yes. The RxBlock register controls the receiving of packets on each port. If the corresponding bit is set, packets received on that port are ignored unless the source address has the NBLCK bit set in the address table.
Can (Spanning Tree) Receive Block be overridden for specific addresses?	No	Yes. The new NBLCK bit is stored in the address table for each address. The RxBlock register can be overwritten if the destination address has the NBLCK bit set in the lookup table.
Can (Spanning Tree) Receive Block overrides have the source port identified?	No	Some internal RAM is used as a FIFO to store the packet source address and receiving port number for addresses with the NBLCK bit set. The NBLCK interrupt is asserted when the FIFO has a valid table entry. A FIND can then be executed to search the FIFO for the table entry.

Feature	TNETX15AE	TNETX15VE
Can (Spanning Tree) Transmit be blocked by port?	No	Yes. The TxBlock register controls the forwarding state of each port. If the corresponding bit is set, that port does not forward traffic.
Can (Spanning Tree) Transmit Blocks be overridden?	No	Yes. The Transmit Routing Code register overrides the TxBlock register. Packets must be identified as to the source port and the forwarding port before they are transmitted into the switch. This is used to respond to BPDUs (bridge protocol data units) during Spanning Tree.

3. Performance Enhancements

Table 2 compares the performance enhancements of the TNETX15AE and TNETX15VE.

Table 2. Performance Enhancements

Enhancement	TNETX15AE	TNETX15VE
Can the silicon be identified by software?	Yes. Revision Register = 0x10	Yes. Revision Register = 0x20
Can the table be searched for recently added/moved addresses?	No	Yes. Address table can be searched for addresses added or discovered on new ports automatically via the NEW bit carried for each address.
Can the address table be searched by port and/or VLAN?	No	Yes
Can the RAM space be accessed by the host via DIO?	Yes. Via RAMaddr/RAMdata registers. Since there is no internal RAM, there is no need for the INT/EXT bit in the RAM_addr register	Yes. Via RAMaddr/RAMdata registers. But since the internal RAM and external RAM are separate address spaces, a steering bit is required in the RAM_addr register to indicate which address space is being addressed.
Is there an Interrupt to signal FIND operation complete?	No. Must wait for command bits to go untrue. If FindControl read while FIND state machine running, that I/O cycle will not complete until FIND operation does (no SRDY- until FIND is done).	Yes. Also read/write polling cycles complete while FIND operation underway. Writes are ignored. (SRDY- before FIND is done)
Can management agent delete all addresses on a port or VLAN or both?	No	Yes
Is there a mode to avoid for maximum wire add performance?	Yes. Since one wire add is pending, no other ADD information is saved or acted on. As a result, if CRC checking is turned on and a bad packet arrives on a port followed by silence, no adds take place on any port until a good packet is received on the stalled port.	No. While one wire add is pending, information on a pending add for each port is collected and saved in a small FIFO per port. Each port's add can complete independently. The ADD state machine still can be overpowered, but it is more difficult.
Is there a stronger reset than the control register reset bit?	No	Yes. A software reset as complete as strobing the external RESET pin can be done by writing 0x40 to the DIO ADDR high register.
SRAM speed required	15 ns	12 ns

4. Limitations

Table 3 compares the relative limitations of the TNETX15AE and TNETX15VE.

Table 3. Comparing TNETX15AE and TNETX15VE Limitations

Limitation	TNETV15AE	TNETX15VE
Number of addresses handled?	All RAM is external and can be used for intermediate table or table leaf. Generally, more RAM more addresses can be handled, up to just over half a million.	Table leaves are stored in internal RAM - this places a hard limit on the number of entries in the table at 1954. Use of more than 512K x 16 of external memory is wasted.
Is there special handling of unknown Unicast Frames?	Yes. The UNKUNIPorts register contains a vector for the destination of Unknown Unicast Frames.	No. Unknown Unicast Frames are flooded to the appropriate VLAN ports - they cannot be separated from other broadcast traffic or unknown traffic.
Is there special handling of unknown Multicast Frames?	Yes. The UNKMULTIPorts register contains a vector for the destination of Unknown Multicast Frames.	No. Unknown Multicast Frames are flooded to the appropriate VLAN ports and cannot be separated from other broadcast traffic or unknown traffic.
How are broadcast packets handled?	Broadcast packets go to all ports with a valid link except the originating port.	Broadcast traffic goes to the stations listed in the mask register for the VLAN that the source station belongs to, except the originating port.
Any problems reading the stats counters?	While reading stats counters, LSB then MSB, an increment may occur between DIO reads. If LSByte was 0xff, the carry can cause the count to be 255 too high.	Reading the LSByte of a stats counter loads the MSByte into a holding register so counts are always correct.

5. Comparing the TNETX3150 and the TNETX3150/TNETX15AE and TNETX3150/TNETX15VE Combination Configurations

Table 4 compares the features of the standalone TNETX3150 ThunderSWITCH™ (one address per port) and the TNETX3150/TNETX15AE and TNETX3150 /TNETX15VE combination configurations.

Table 4. Comparing the TNETX3150 and the TNETX3150/TNETX15AE and TNETX3150/TNETX15VE Combination Configurations

Feature	TNETX3150	TNETX3150/TNETX15AE	TNETX3150/TNETX15VE
Number of VLANs?	15 VLAN registers	None	4 VLAN registers
Can a port belong to more than one VLAN?	Each port can belong to more than one overlapping VLAN	Not Applicable	One VLAN per port
Are duplicate addresses supported?	Not allowed	Not allowed	Can support the same MAC address in each of the 4 VLANs
Are VLANs extendible outside chipset?	No	Not Applicable	Yes. Supports VLANs across two cascaded TNETX3150 devices and to uplink.
How many addresses are supported?	1 address per port	>560K addresses supported with required external memory	1.9K addresses supported with required external memory
What management address operands are supported?	Add, Secure, Lock	Add, Find, Delete, Secure Lock on a MAC address	Add, Find, Delete, Secure Lock on a MAC address
What operands operate by port?	None	None	Find, Delete on a port number
What operands operate by VLAN?	None	None	Find, Delete on a VLAN ID
What aging algorithms are supported?	None	Time, table full, and user defined aging	Time, table full, and user defined aging
How is aged out address picked?	Not Applicable	First in, first out aging	First in, first out aging
Is address security available?	Security per port	Security per address	Security per address

Feature	TNETX3150	TNETX3150/TNETX15AE	TNETX3150/TNETX15VE
What debug and traffic monitoring modes are provided?	Supports NMON sniffer-port	1. TNETX3150 NMON port supported 2. Copy any address to arbitrary port added	1. TNETX3150 NMON port supported 2. Copy any address to arbitrary port added 3. Mirror traffic at any port to another port added
What status is available?	SNMP and RMON counters	SNMP and RMON counters (‘3150) + unknown multicast count + unknown unicast count + addresses in table	SNMP and RMON counters (‘3150) + unknown multicast count + unknown unicast count + addresses in table