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datasheet *Boundary-Scan I/O Products*

Digital I/O Scan (DIOS)

Socket Test Modules (STM)

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Product line overview

The boundary-scan I/O modules provide an effective means of increasing test coverage on the target board and improving the diagnostic resolution of boundary-scan testing. The modules are grouped into two general classifications: general purpose digital I/O scan (DIOS) modules and socket test modules (STM). All of the DIOS and STM modules are fully supported by JTAG ProVision, the unified graphical development tool for preparation of boundary-scan test and programming applications, as well as by the earlier Classic development tools. Both ProVision and Classic automatically integrate the I/O modules with the target board design.

Four types of DIOS modules are available, JT 2111/MPV (DIN and IDC), JT 2122/MPV, JT 2124, and JT 2128. The JT 2111/MPV is designed for desk-top use and provides 64 channels of I/O. The other three DIOS types are packaged in DIMM modules and provide either 128 or 133 digital I/Os, accessible via boundary-scan over a range of power supply and I/O voltages. The JT 2128 DIOS modules add programmable functionality to facilitate combining boundary-scan testing with functional testing.

The JT 2127 STM is currently available with five standard DIMM connector pinouts: 184, 144so (small-outline), 200so (DDR I type), 200so2 (DDR II type), and 244so2. The STM includes the capability to measure the power pins and ground pins individually and to verify their voltages to be within a certain range. Therefore, it is ideal for testing DIMM connector sockets on target boards.

All of the DIMM DIOS and STM modules are compatible with JEDEC Standard 21-C.

JT 2111/MPV-IDC

JT 2111/MPV-DIN

JT 2122/MPV

Digital Input/Output Scan Modules, Functional Description

JT 2111/MPV DIOS Module

The JT 2111/MPV (multi-purpose, multi-voltage) DIOS module is encased in a plastic housing for desk-top use and provides 64 bi-directional I/Os, each accessible via boundary-scan. By driving and sensing I/O logic values, the structural integrity of edge and on-board connectors and logic clusters can be verified. Additional JT 2111/MPV modules can be connected serially to increase the number of parallel access points for testing and/or in-system programming. Two versions of the module are available:

JT 2111/MPV – DIN Equipped with a single 96-pin DIN connector
JT 2111/MPV – IDC Equipped with four 20-pin IDC connectors

The five TAP signals (TDI, TDO, TMS, TCK and TRST*) are implemented on two separate 10-pin connectors, one for TAP-in and the other for TAP-out which can be used to daisy-chain to another DIOS module or to a scan chain on the target board.

The 64 I/Os are grouped in four segments of 16 pins. Each segment can be bypassed in order to shorten the chain, thereby providing faster programming of flash devices.

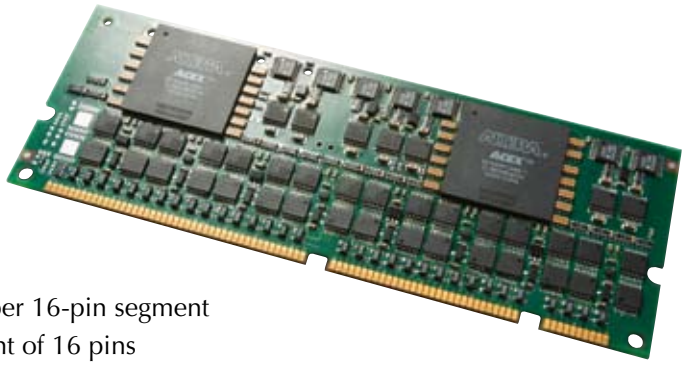
The JT 2111/MPV derives its power from an AC adaptor. The input power supply voltage is hardware or software selectable at 1.5V, 1.8V, 2.5V or 3.3V. If 3.3V is selected, the voltage input is 5V tolerant.

JT 2122/MPV DIOS Module

The JT 2122/MPV (multi-purpose, multi-voltage) is a drop-in replacement for previous-generation JT 2122/168 and JT 2122/F168 DIOS modules, sharing the same BSDL file and the same 168-conductor pin-out as the earlier models. It provides bi-directional parallel-scan access to up to 128 or 133 I/Os. By driving and sensing I/O logic values, the structural integrity of edge and on-board connectors and logic clusters can be verified. Additional JT 2122/MPV modules can be connected serially to increase the number of parallel access points for testing and in-system programming.

The five TAP-in and TAP-out signals (TDI, TDO, TMS, TCK, and TRST*) are included among the 168 pins on the module connector or on two separate 10-pin connectors TAP-in is the actual test access port for the module, and TAP-out can be used to daisy-chain to another DIOS module or to a scan chain on the target board. The two TAP configurations, within the board edge connector or on two separate connectors, allow the module to be inserted in a standard DIMM socket either in a test fixture or directly on the target board, respectively. Selection of the configuration is performed automatically.

The I/O's are grouped in eight segments of 16 pins, each of which can be individually bypassed. The JT 2122/MPV works with a self-adapting supply voltage between 1.8 and 5.0 volts. The I/O voltage is between 1.8 and 3.3 volts, determined by the applied supply voltage at the edge connector. The maximum sustained TCK rate is 45 MHz.



JT 2124/F168 DIOS Module

The JT 2124/F168 DIOS module is similar in function and features to the JT 2122/MPV with the following differences:

- Power supply voltage range is 0.9-5.5V
- 128 I/Os
- Maximum sustained TCK rate 40 MHz
- I/O input threshold adjustable from 0.0-4.1V, programmable per 16-pin segment
- I/O voltage output high is 1.5-3.6V, programmable per segment of 16 pins
- I/Os are configurable with pull-up or pull-down resistors, as selected for all I/Os by a pin on one of the programmable devices on the module. The pull-up/pull-down feature is relevant when the I/Os are tri-stated or disconnected.

TAP connections for the JT 2124/F168 are provided on the module's edge connector.

JT 2128 DIOS Module

As with the other DIOS modules, the JT 2128 increases the coverage and improves the diagnostic resolution of boundary-scan testing. It is fully supported by JTAG Technologies development tools, Classic and JTAG Pro-Vision. The JT 2128 provides bi-directional parallel-scan access to up to 133 I/O channels grouped in three segments, each of which can be individually bypassed. Additional JT 2128 modules can be connected serially for supplemental parallel access points for testing and in-system programming.

The JT 2128 is designed for easy insertion in standard 168-pin DIMM sockets either on a target board as illustrated above or in a test fixture. The five TAP-in and TAP-out signals (TDI, TDO, TMS, TCK, and TRST*) are included among the 168 pins on the module connector and on two separate 10-pin connectors. TAP-in is the actual test access port for the module, and TAP-out can be used to daisy-chain to another DIOS module or to a scan chain on the target board.

JT 2128 as well as JT 2122/MPV and JT 2124/F168 DIOS modules are compatible with JTAG Technologies' standard fixtures such as JT 2702/PCI-Slot, JT 2702/PCI32, JT 2702/PCI64 and JT 2702/DDC Dual DIMM Carrier for custom or standard applications. These applications use the TAP signals on the edge connector of the DIOS and support testing the board connectors or other nodes on the target board via a standard boundary-scan inter-connect test.

The JT 2128 contains a built-in 10 MHz oscillator for use in tests that require a known clock frequency for timing or for other purposes. In addition, the JT 2128 includes programmable logic to facilitate combining boundary-scan with functional testing. The PLDs may be programmed by the user via boundary-scan for custom functions. For example, a counter or function generator can be programmed within the PLDs on the JT 2128, eliminating the need for a separate discrete instrument. If spare I/O channels are available, external instruments can be connected to the target and routed through the JT 2128. An internal bus between the PLDs allows building larger applications with access possible to all I/O-pins. Additional JT 2128 modules operating at the same voltage may be connected serially, allowing expansion of the number of I/O channels available for supplemental parallel access points for testing and in-system programming.

There are two versions of the JT 2128, distinguished by voltage range. The JT 2128/A168 supports a logic family voltage range of 3.3 to 5 volts, and the JT 2128/B168 supports a logic family voltage range of 1.8 to 3.3 volts. Output voltage levels and input thresholds are self-adaptive and determined by the supply voltage to match the target board's logic family IC technology. The maximum sustained TCK rate is 25 MHz.

Socket Test Module (STM), Functional Description

JT 2127 STM

The JT 2127 STM family is designed for easy insertion in standard DIMM sockets on a target board as illustrated below. In addition to driving and sensing the input and output pins, analog voltages on the individual power pins (such as Vdd, Vddq, Vref and Vddspd) and also ground can be verified to be within specified ranges, thereby providing a complete structural test of the DIMM sockets.

STMs provide bi-directional access via boundary-scan to all individual conductors in the DIMM sockets on the board under test. Application development tools from JTAG Technologies support automatic integration of the JT 2127 modules with the target board design.

The STM output voltage and input threshold levels are self-adaptive to match the target board's logic family over a range of 1.5V to 3.3V.
The JT 2127 STM is currently available in six versions.

200so

184

144so

200so2

244so2

JT 2127/MPV-DIN

Product	Inputs / Outputs	JEDEC Std. 21-C		Outline
		Section	Release	
JT 2127/144so	108 in 2 segments	4.5.5	R5-7r9	MO-190, 144 pins
		4.5.6	R5-7r9	
		4.5.8	R8r9r10	
		4.5.9	R9	
		4.20.3	R11	
JT 2127/184	135 in 2 segments	4.5.10	R9r12	MO-206, 184 pins
		4.5.11	R10	
		4.5.12	R10	
		4.20.4	R13	
		4.20.5	R13	
		4.20.7	R16	
		4.20.8	R13	
JT 2127/200so	131 in 2 segments	4.20.6	R13	MO-224, 200 pins
JT 2127/200so2	129 in 2 segments	4.20.11	R15	MO-224, 200 pins
JT 2127/240	152 in 2 segments	4.5.14	R12	MO-237, 240 pins
		4.20.10	R16	
		4.20.13	R15	
JT 2127/244so2	156 in 2 segments	4.20.14	R16	MO-244, 244 pins

so = Small-outline

Each segment contains its own boundary-scan device and can be bypassed independently. Furthermore, each I/O pin is independently programmable for sense, drive, bi-directional, and tri-state operation.

TAP signals are normally implemented via external TAP-in and TAP-out connectors.
Daisy-chaining of additional JT 2127 modules operating at the same voltage is supported using the external connectors for supplemental parallel access points for testing and in-system programming. The TAP signals can also be provided by means of the DIMM edge connector, in which case the number of I/Os available is 5 fewer than shown above. The hardware automatically recognizes the TAP routing configuration in use.

The JT 2127 is fully-compatible with JTAG standard IEEE 1149.1 and operates with a high-speed TCK of up to 30 MHz for maximum performance. Input thresholds and output voltages of the I/O channels are self-adaptive, matching the target board's IC technology. Two LEDs are provided for visual indications of status and other conditions occurring during functional testing.

DIOS and STM feature summary and specifications

	JT 2111/MPV	JT 2122/MPV	JT 2124/F168	JT 2127/<s>	JT 2128/ A168 & /B168
Type	Desktop DIOS	DIMM DIOS	DIMM DIOS	DIMM STM	DIMM DIOS
Power supply voltage	9-15V	1.8–5.0V	0.9–5.5V	1.8–3.3V	A168: 3.0–5.5V B168: 1.8-3.3V
I/O voltage	1.5V, 1.8V, 2.5V, 3.3V Hardware and software selectable	1.8–3.3V Output voltage and input threshold adaptive per logic family	Input: 0–4.1V, in steps of 0.1V Output: 1.5–3.6V, programmable per 16-pin segment	1.5/1.8/2.5/3.3V Output voltage and input threshold adaptive per logic family	A168: 2.5/3.3/5.0V B168: 1.8/2.5/3.3V Output voltage and input threshold adaptive per logic family
I/O tolerance	1.8V @ 1.5V 2.5V @ 1.8V 3.3V @ 2.5V 5.0V @ 3.3V	2.5V @ 1.8V 3.3V @ 2.5V 5.0V @ 3.3V	1.8V @ 1.5V 2.5V @ 1.8V 3.3V @ 2.5V 5.0V @ 3.3V	1.8V @ 1.5V 2.5V @ 1.8V 3.3V @ 2.5V 5.0V @ 3.3V	A168: 5.0V B168: 1.8V @ 1.5V 2.5V @ 1.8V 3.5V @ 2.5V 3.6V @ 3.3V
Pinouts	DIN: 96 IDC: 80 (4 by 20)	168	168	<s> = 144so, 184, 200so, 200so2, 240, 244so2 (Note 1)	168
Digital I/O	64	128 / 133	128	144so 103/108 184 130/135 200so 126/131 200so2 124/129 240 147/152 244so2 151/156	128 / 133
Segments	4	8	8	2	3
TCK max	45 MHz	45 MHz	40 MHz	30 MHz	A168: 20 MHz B168: 25MHz
Pull-up resistors Notes	(Note 2) Replacement for JT 2111/LV	(Note 2) Replacement for JT 2122/(F)168. Compatible with JT 2702/DDC (Dual DIMM Carrier)	10 KΩ (Note 3) Shorter I//O scan chain possible. Programmable pull-up/down per 16 I/Os. Compatible with JT 2702 DDC.	(Note 2) Measures all voltage supply pins to be within a selected range (including ground)	Programmable embedded test functions. 10 MHz oscillator on-board. Compatible with JT 2702 DDC.

Note 1. Consult JTAG Technologies for JT 2127 support for additional sockets.

Note 2. Dynamic pull-up resistance over the range 20K to 60K, depending on supply voltage

Note 3. Pull-up or pull-down selectable in groups of 16 bits

The JT 2127 contains the EPM570T144 device from Altera Corp. The JT 2128/A168 contains Altera's EPM7128STC100-15, and the JT 2128/B168 contains Altera's EPM7064BTC100-7. These devices define the electrical specifications that apply to the JT 2127 and JT 2128 boundary-scan I/O channels. Refer to the datasheets of these devices, available on the Altera website.

Ordering Information

Product Number	Description
JT 2111/MPV - DIN	Multi-purpose, multi-voltage DIOS (Digital I/O Scan) module for desk-top use with 96-pin DIN 41612C male connector
JT 2111/MPV - IDC	Multi-purpose, multi-voltage DIOS (Digital I/O Scan) module for desk-top use with four 20-pin IDC male connectors
JT 2122/MPV	Multi-purpose, multi-voltage DIMM DIOS module for use on target board or in test fixture with self-adaptive I/O voltages
JT 2124/F168	DIMM DIOS with programmable I/O voltage for use in test fixture
JT 2127/<s>	DIMM STM (Socket Test Module) with self-adaptive I/O voltage
JT 2128/A168	DIMM DIOS with built-in oscillator, programmable functional test logic and I/O voltage range of 3.3-5.0V
JT 2128/B168	DIMM DIOS with built-in oscillator, programmable functional test logic and I/O voltage range of 1.8-3.3V
JT 2702/PCI-Slot	Test board for PCI plug-in cards
JT 2702/PCI32	32-bit PCI DIOS fixture
JT 2702/PCI64	64-bit PCI DIOS fixture
JT 2702/DDC	Dual DIMM carrier, capacity up to two 168-pin DIMM DIOS modules

<s> specifies the JT 2127 socket type: Options are 144so,184, 200so, 200so2, 240 and 244so2.
Consult JTAG Technologies for additional sockets.

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