Toshiba Semiconductor Handling Manual

Toshiba semiconductor handling guide

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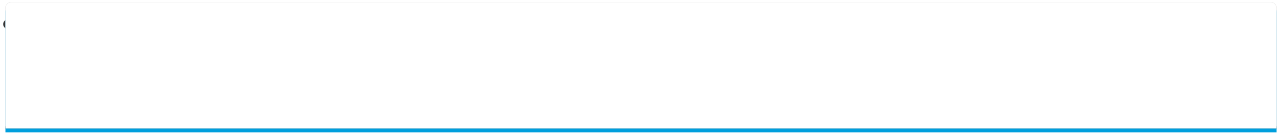

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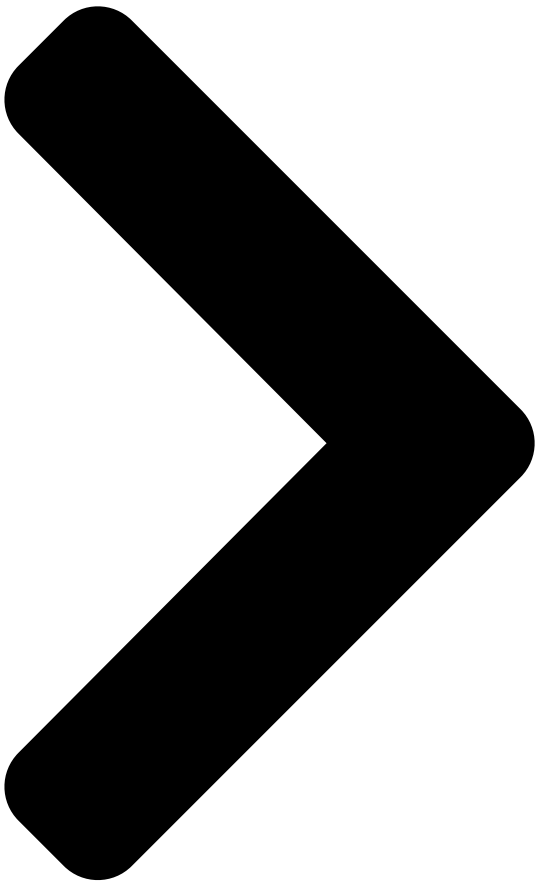

[6] Handling Guide

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1.

Using Toshiba Semiconductors Safely

TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical
sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating

ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the
precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for
usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all
types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be
made at the customer's own risk.

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Related Manuals for Toshiba Semiconductor

Semiconductors Toshiba TPC8402 Handbook

Field effect transistor silicon n, p channel mos type (n-mosvi/u-mosii) (11 pages)

Summary of Contents for Toshiba Semiconductor

Page 1 It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.

Page 2: Safety Precautions

Safety Precautions This section lists important precautions which users of semiconductor devices (and anyone else) should observe in order to avoid injury and damage to property, and to ensure safe and correct use of devices. Please be sure that you understand the meanings of the labels and the graphic symbol described below before you move on to the detailed descriptions of the precautions.

Page 3 [6] Handling Guide General Precautions regarding Semiconductor Devices Do not use devices under conditions exceeding their absolute maximum ratings (e.g. current, voltage, power dissipation or temperature). This may cause the device to break down, degrade its performance, or cause it to catch fire or explode resulting in injury.

Page 4 General Safety Precautions and Usage Considerations This section is designed to help you gain a better understanding of semiconductor devices, so as to ensure the safety, quality and reliability of the devices which you incorporate into your designs. From Incoming to Shipping 3.1.1...

Page 5: Operating Environment

(e) Make sure that sections of the tape carrier which come into contact with installation devices or other electrical machinery are made of a low-resistance material. (f) Make sure that jigs and tools used in the assembly process do not touch devices. (g) In processes in which packages may retain an electrostatic charge, use an ionizer to neutralize the ions.

Page 6 Furthermore, it is known that stress applied to a semiconductor device through the package changes the resistance characteristics of the chip because of piezoelectric effects. In analog circuit design attention must be paid to the problem of package stress as well as to the dangers of vibration and shock as described above.

Page 7 Storage 3.2.1 General Storage • Avoid storage locations where devices will be exposed to moisture or direct sunlight • Follow the instructions printed on the device cartons regarding transportation and storage. • The storage area temperature should be kept within a temperature range of 5°C to 35°C, and relative humidity should be maintained at between 45% and 75%.

Page 8 In the worst case, heat generated in internal circuitry can fuse wiring or cause the semiconductor chip to break down. If storage or operating temperatures exceed rated values, the package seal can deteriorate or the wires can become disconnected due to the differences between the thermal expansion coefficients of the materials from which the device is constructed.

Page 9 3.3.4 Input processing Inputs to CMOS ICs have such a high impedance that the logic level becomes undefined under open input conditions. Should the floating input be neither High nor Low, both P-channel and N-channel transistors turn on, and unnecessary supply current flows. Therefore, as shown in Figure 3.1, be sure to connect unused input lines to V output to

the logic level determined by the inputs.

Page 10 3.3.7 Effect of Slow Rise and Fall Time on Input When a waveform with a slow rise and fall time is applied to a CMOS input, the output will sometimes tend to oscillate around V because the CMOS gate becomes an equivalent linear amplifier in the vicinity of V power source ripples and noise components are amplified and appear in the output.

Page 11 3.3.10 Wiring Precautions (1) Output waveform distortion Since the output impedances of the Mini-MOS Series are very low, distortion is sometimes caused in the output waveform by the L component of the wiring. This occurs when the wiring connected to the output pin is long or when capacitance is connected between the signal line and or GND.

Page 12 3.3.11 Latch-up CMOS devices are subject to latch-up, an undesirable condition in which a parasitic PNPN junction (thyristor) in the CMOS IC conducts. An abnormal current of several hundred mA can flow between and GND, destroying the IC. Latch-up occurs when the voltage applied to the input or output pins exceeds the prescribed absolute maximum rating value, causing a large current to flow in the device, or when the V voltage exceeds (even momentarily) the absolute maximum rating value causing internal components to break down.

Page 13 Name TC7MH244FK TC7MET244AFK TC7MZ244FK TC7MA244FK However, input and output signal lines are long in many cases and have distributed inductance or reactance. Therefore, if these lines are directly connected to CMOS, various problems can arise. Possible problems are malfunction due to induced noise, or destruction of the input/output elements due to a surge.

Page 14 3.3.13 Meta-Stable Characteristics When the setup time or hold-time of a flip-flop is not adhered to the device's output response is uncertain. This phenomenon is called meta-stability. Asynchronous Input Clock Asynchronous Data Clock Output The diagram shown above describes a meta-stable state which can generate a glitch or increase the propagation delay time.

Page 15 3.3.14 Thermal Design The failure rate of semiconductor devices is greatly increased as operating temperatures increase. As shown in Figure 3.9, the internal thermal stress on a device is the sum of the ambient temperature and the temperature rise due to power dissipation in the device. Therefore, to achieve optimum reliability, observe the following precautions concerning thermal design: (1) Keep the ambient temperature (Ta) as low as possible.

Page 16 In most cases semiconductor devices are used with peripheral circuits and components. The input and output signal voltages and currents in these circuits must be chosen to match the semiconductor device's specifications. The following factors must be taken into account.

Page 17 3.3.19 Safety Standards Each country has safety standards which must be observed. These safety standards include requirements for quality assurance systems and design of device insulation. Such requirements must be fully taken into account to ensure that your design conforms to the applicable safety standards. 3.3.20 Other Precautions (1) When designing a system, be sure to incorporate fail-safe and other appropriate measures...

Page 18 3.5.1 Lead Forming Semiconductor devices must undergo a process in which the leads are cut and formed before the devices can be mounted on a printed circuit board. If undue stress is applied to the interior of a device during this process, mechanical breakdown or performance degradation can result. This is attributable primarily to differences between the stress on the device's external leads and the stress...

Page 19 on the internal leads. If the relative difference is great enough, the device's internal leads, adhesive properties or sealant can be damaged. Observe these precautions during the lead-forming process (this does not apply to surface-mount devices): (1) Lead insertion hole intervals on the printed circuit board should match the lead pitch of the device precisely.

Page 20 3.5.3 Soldering Temperature Profile The soldering temperature and heating time vary from device to device. Therefore, when specifying the mounting conditions, refer to the individual datasheets and databooks for the devices used. (1) Using a soldering iron Complete soldering within ten seconds for lead temperatures of up to 260°C, or within three seconds for

lead temperatures of up to 350°C.

Page 21 3.5.4 Flux Cleaning and Ultrasonic Cleaning (1) When cleaning circuit boards to remove flux, make sure that no residual reactive ions such as Na or Cl remain. Note that organic solvents react with water to generate hydrogen chloride and other corrosive gases which can degrade device performance. (2) Washing devices with water will not cause any problems.

Page 22 Therefore, Toshiba recommends that these devices be cleaned. However, if the flux used contains only a small amount of halogen (0.05 W% or less), the devices may be used without cleaning without any problems.

Page 23 Semiconductor devices are generally more sensitive to temperature than are other electronic components. The various electrical characteristics of a semiconductor device are dependent on the ambient temperature at which the device is used. It is therefore necessary to understand the temperature characteristics of a device and to incorporate device derating into circuit design.

Page 24 3.6.8 Fire Semiconductor devices are combustible; they can emit smoke and catch fire if heated sufficiently. When this happens, some devices may generate poisonous gases. Devices should therefore never be used in close proximity to an open flame or a heat-generating body, or near flammable or combustible materials.

This manual is also suitable for:

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