TOSHIBA

Toshiba T6K04 Handbook

Cmos digital integrated circuit silicon monolithic column row driver lsi for a dot matrix graphic lcd

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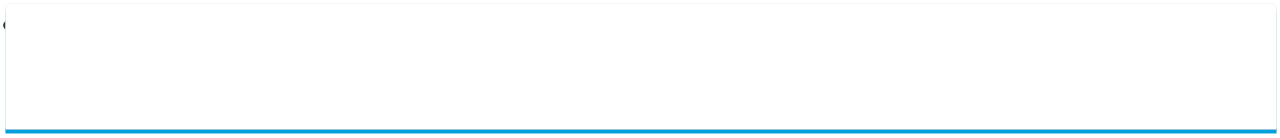

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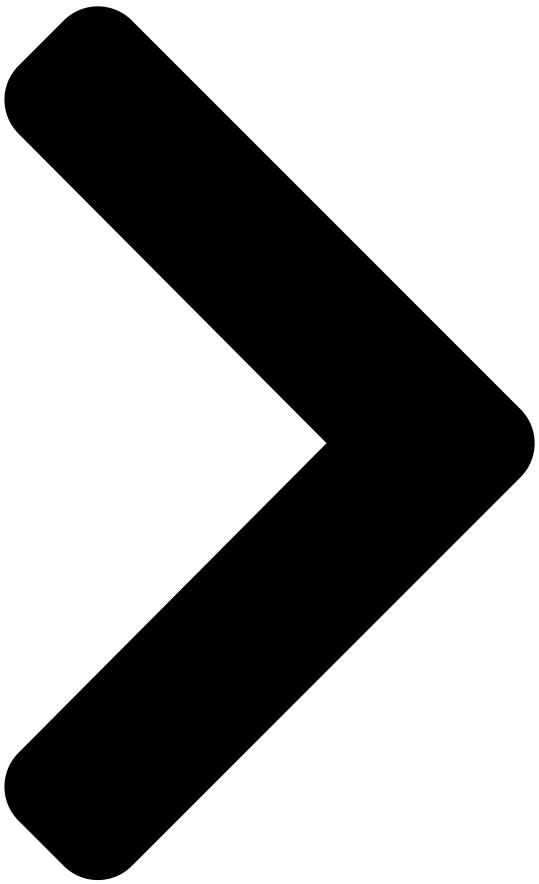
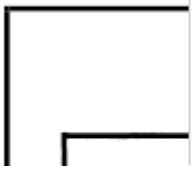


TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

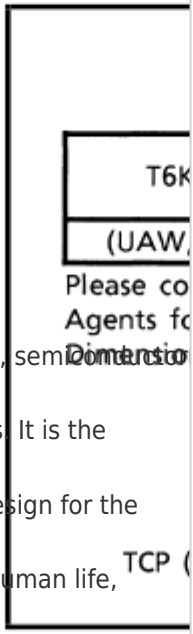
COLUMN ROW DRIVER LSI FOR A DOT MATRIX GRAPHIC LCD

The TOSHIBA T6K04 is a driver for a small or medium scale dot matrix graphic LCD. It has a 8 bit interface circuit. It generates all timing signals for display with on−chip oscillator. It receives 8 bit data from a MPU, laches the data to on−chip RAM, and display the image on LCD (The data on the display RAM correspond to the dots of display.). It has 128 column driver outputs and 64 row driver outputs so as to drive 128 dots by 64 dots LCD on a single. The other functions, It has resistors to divide bias voltage, power supply OP−Amp, DC−DC converter (doubler, tripler, quadrupler) and contrast control circuit so as to drive LCD with a single power supply.



Features

On−chip display RAM
Display RAM data
(1) Display data = "1" ..... LCD turn on.
(2) Display data = "0" ..... LCD turn off.
1 / 32, 1 / 48, 1 / 56, 1 / 64 duty cycle
Word length of display data can changed 8 bit / word or 6 bit / word in compliance with a character font.
LCD driver outputs 128 column driver outputs and 64 row driver outputs.
Interfacing with 80 series MPU.
On−chip oscillator with one external resistor.
Low power consumption
On−chip resistors to divide bias voltage, on−chip OP−Amp for LCD supply, on−chip DC−DC converter, on−chip
contrast control circuit.
CMOS process.
Operating voltage expect LCD drive signal: 2.7~5.5 V
Operating voltage of LCD drive signal.
Must maintain V
DD
Package: TCP



T6K04

Capacity: 128 × 64 = 8192 bit

– V
≤ 16.5 V, V
– V
EE1
DD
≤ 16.5 V, V
≤ V
EE2
EE1
EE2

T6K04

000707EBE2

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Related Manuals for Toshiba T6K04

Microcontrollers Toshiba H1 Series Data Book

32bit micro controller tlcs-900/h1 series (751 pages)

Microcontrollers Toshiba TXZ Family Reference Manual

32-bit risc microcontroller txz family reference manual comparator (comp-b) (15 pages)

Microcontrollers Toshiba TLCS-900/H1 Series Manual

Original cmos 32-bit microcontroller (544 pages)

Microcontrollers Toshiba TLCS-900/H1 Series Manual

Original cmos 32-bit microcontroller (652 pages)

Microcontrollers Toshiba TLCS-900/H1 Series Data Book

32bit micro controller (495 pages)

Microcontrollers Toshiba TLCS-900/H1 Series Manual

Original cmos 32-bit microcontroller (68 pages)

Microcontrollers TOSHIBA TXZ SERIES Reference Manual

Oscillation frequency detector (20 pages)

Microcontrollers Toshiba TXZ Series Reference Manual

32-bit risc microcontroller. can controller (can-a) (54 pages)

Microcontrollers Toshiba TXZ Series Reference Manual

32-bit risc microcontroller advanced encoder input circuit (32-bit) (55 pages)

Microcontrollers Toshiba TXZ Series Reference Manual

32-bit risc microcontroller, serial peripheral inteface tspi-b (67 pages)

Microcontrollers Toshiba TXZ Series Reference Manual

32-bit risc microcontroller (17 pages)

Microcontrollers TOSHIBA TXZ Reference Manual

32-bit risc microcontroller (120 pages)

Microcontrollers Toshiba TMP91C824F Data Book

16bit microcontroller tlcs-900/l1 series (255 pages)

Microcontrollers Toshiba TMP96C141AF Manual

Cmos 16-bit microcontroller (178 pages)

Microcontrollers Toshiba TLCS-870/C Series Manual

8 bit microcontroller (205 pages)

Microcontrollers Toshiba TLCS-90 Series Data Book

8 bit microcontroller (364 pages)

Summary of Contents for Toshiba T6K04

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 • The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use.

Page 3: Pin Configuration

T6K04 Pin Configuration Note: Above drawing describes pin configuration of the LSI Chip, it doesn't define the tape carrier package. 2001-03-13 3/30...

Page 4: Pin Function

Input for standby signal ● Usually connect to V / STB ● / STB = "L" → T6K04 is the state of standby and it cannot accept the command or data Column driver signal and row driver signal is V level...

Page 5 Input for Master / Slave selects M / S ● M / S = "H" → T6K04 is master chip ● M / S = "L" → T6K04 is slave chip When using a internal clock oscillator, connect a resistor between OSC1 and OSC2.

Page 6: Function Of Each Block

T6K04 Function of Each Block ● Interface logic The T6K04 can be operated with 80 series MPU. Fig. 1 shows an example of interface. Fig. 1 ● Input register The register stores 8 bit data from MPU. D / I signal discriminate between command data and display data.

Page 7 Fig. 2 ● Oscillator The T6K04 has an on−chip oscillator. When using this oscillator, connect an external resistor between OSC1 and OSC2, when using external clock, input the clock to OSC1 and open OSC2, as shown in Fig. 3. Fig. 3 ●...

Page 8 M (internal signal) and the data from the sift register. Details of row driver circuit are shown in Fig. 5. Fig. 5 ● DC−DC converter The T6K04 has an on−chip DC−DC converter. The DC−DC converter generates ×2 (V × 2) level, ×3 (V × 3) level and ×4 (V ×...

Page 9 T6K04 Doubler (×2) mode Fig. 6 (1) Tripler (×3) mode Fig. 6 (2) Quadrupler (×4) mode Fig. 6 (3) When using external power supply, input the voltage to V and V and Unconnect the capacitance. 2001-03-13 9/30...

Page 10 T6K04 ● Voltage divider resistors, contrast control circuit The T6K04 has on−chip resistors to divide bias voltage with OP−Amp., and a contrast control circuit. The voltage bias is changed by the value of R and R . Details of resisters to divide bias voltage and contrast control circuit are shown in Fig.

Page 11 T6K04 ● OP−Amp., OP−Amp. control register The T6K04 has 5 operational amplifier for supplying LCD driving levels. Power supplying ability of these OP−Amp. are controlled by the contents of OP−Amp. control register so as to match for various LCD panels.

Page 12 T6K04 8 bits per word mode 6 bits per word mode Fig. 9 2001-03-13 12/30...

Page 13: Command Definitions

T6K04 Command Definitions Command D / I / WR Function Name 1 / 0 Word Length 8 bit / 6 bit 1 / 0 Display ON / OFF Counter Select: DB1 Y (1) / X (0) 1 / 0 1 / 0...

Page 14 T6K04 ● Display ON / OFF select (DPE) D / I / WR Display ON (03H) Display OFF (02H) This command controls display ON / OFF. It does not affect the data of the display RAM. When input the display OFF command, V is all V level.

Page 15 T6K04 ● Y (Page) −address set (SYE) D / I / WR Set Up Range: 8 bit / WORD: 20H to 2FH (0 Page to 15 Page) 6 bit / WORD: 20H to 35H (0 Page to 21 Page) When operating in 8 bits per word mode, this command selects one of the 16 pages from the display RAM. (Don't instruct more than 16th page.) When operating in 6 bits per word mode, this command selects one of the 22...

Page 16 T6K04 ● X−Address set (SXE) D / I / WR Set Up Range: 80H to BFH (XAD0 to XAD63) This command set X−address (0 to 63). When inputting "L" level to RST , X−address is set up as 0 address.

Page 17 T6K04 ● OP−Amp control 2 (OPA2) D / I / WR / RD Set Up Range: 08H to 0BH This command enhances the power supplying ability of OP−Amp in a shot period from the rising

edge of CL signal. This command selects one of four steps of ability.

Page 18 Y / X U / D B (Busy) : When B = “1”, the T6K04 is executing an internal operation and no instruction will be accepted except STRD. When B = “0”, the T6K04 can accept an instruction. 8 / 6 (Word Length) : When 8 / 6 = “1”, Word Length of the display data is 8 bits per word.

Page 19 T6K04 Detail of Performance ● X−address counter and Y (Page) −address counter Fig. 11 shows a sample operating procedure for the X−address counter. After Reset is executed, X−address becomes XAD = 0, then select X−counter / UP mode. Next set the X−address to 62 by commanding SXE.

Page 20 T6K04 Fig. 12 When operating in 6 bits mode length mode, Y (Page) −address counter becomes 22 counter. In Up−mode and Page = 21, after data has been written to or read, Y (Page) −address becomes Page = 0. In Down−mode and Page = 0, after data has been written to or read, Y (Page) −address becomes Page = 21.

Page 21: Stand−By Function

.....Min. (V EE1, 2 ● Stand−by function When STB = L, the T6K04 is in stand−by state. The internal oscillation is stopped, power consumption is reduced, and power supply for LCD (V) become V ● Busy flag When the T6K04 is executing an internal operation (except command STRD), the busy flag is set at logical “H”.

Page 22 T6K04 ● Expansion function The T6K04 has expansion function, when using this function, the T6K04 (2 chips) can drive 256 × 64 dots LCD panel (maximum). Next table shows the selectable function by using M / S, EXP pins. M / S “H”...

Page 23 T6K04 (2) Expansion mode Fig. 13−2 Fig. 14 2001-03-13 23/30...

Page 24: Maximum Ratings

T6K04 ● LCD Driver Waveform Maximum Ratings (Ta = 25°C) Item Symbol Rating Unit Supply Voltage (1) (Note 1) −0.3~7.0 LC1, 2, 3, 4, 5 Supply Voltage (2) − 18.0~V + 0.3 Input Voltage −0.3~V + 0.3 (Note 1, 2) Operating Temperature −20~75...

Page 25: Electrical Characteristics Dc Characteristics

T6K04 Electrical Characteristics DC Characteristics (1) (Test condition: If not specified, V = 0 V, V = 3.0 V ± 10%, V = 0 V, Ta = 25°C) Test Applicable Item Symbol Test Condition Typ. Unit Circuit Terminal Operating Supply (1) —...

Page 26 T6K04 DC Characteristics (2) (Test condition: If not specified, V = 0 V, V = 5.0 V ± 10%, V = 0 V, Ta = 25°C) Test Applicable Item Symbol Test Condition Typ. Unit Circuit Terminal Operating Supply (1) —...

Page 27: Test Circuit

T6K04 DC Characteristics (3) (Test condition: If not specified, V = 0 V, V = 2.7 to 3.3 V) Test Applicable Item Symbol Test Condition Typ. Unit Circuit Terminal LC1, LC2, Op-Amp Output — (Note 1) −150 — opoff LC3,...

Page 28 T6K04 (2) Tripler mode (3) Quadrupler mode 2001-03-13 28/30...

Page 29: Switching Characteristics

T6K04 Switching Characteristics = 0 V, V = 3.0 V ± 10%, V = 0 V, Ta = 25°C) Load Circuit Item Symbol Unit Enable Cycle Time tcycE 1000 — Enable Pulse Width PWEL — Enable Rise / Fall Time tEr, tEf —...

Page 30 T6K04 2001-03-13 30/30...