

TC74LCX257F, TC74LCX257FN, TC74LCX257FT

LOW VOLTAGE QUAD 2-CHANNEL MULTIPLEXER (3-STATE) WITH 5V TOLERANT INPUTS AND OUTPUTS

The TC74LCX257 is a high performance CMOS MULTIPLEXER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

The device is designed for low-voltage (3.3V) V_{CC} applications, but it could be used to interface to 5V supply environment for inputs.

It is composed of four independent 2-channel multiplexers with common SELECT and $\overline{\text{OUTPUTENABLE}}$ ($\overline{\text{OE}}$).

If $\overline{\text{OE}}$ is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled. Conversely, when SELECT is high, "B" data inputs are enabled.

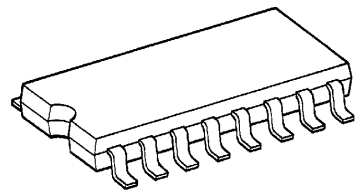
All inputs are equipped with protection circuits against static discharge.

FEATURES

- Low voltage operation : $V_{CC} = 2.0 \sim 3.6\text{V}$
- High speed operation : $t_{pd} = 6.0\text{ns}$ (Max.)
($V_{CC} = 3.0 \sim 3.6\text{V}$)
- Output current : $|I_{OH}| / I_{OL} = 24\text{mA}$ (Min.)
($V_{CC} = 3.0\text{V}$)
- Latch-up performance : $\pm 500\text{mA}$
- Available in JEDEC SOP, JEITA SOP and TSSOP
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 257 type.

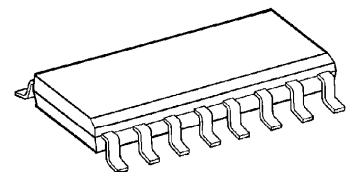
(Note) The JEDEC SOP (FN) is not available in Japan.

TC74LCX257F



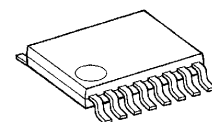
SOP16-P-300-1.27

TC74LCX257FN



SOL16-P-150-1.27

TC74LCX257FT

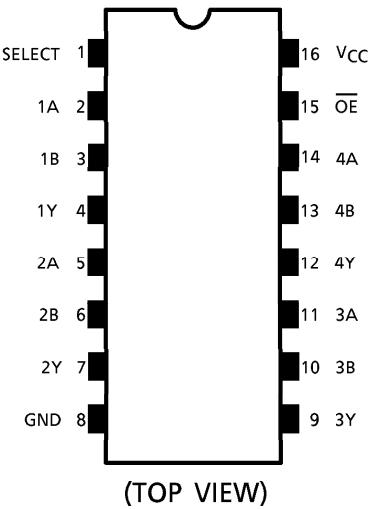


TSSOP16-P-0044-0.65

Weight

SOP16-P-300-1.27	: 0.18g (Typ.)
SOL16-P-150-1.27	: 0.12g (Typ.)
TSSOP16-P-0044-0.65	: 0.06g (Typ.)

PIN ASSIGNMENT

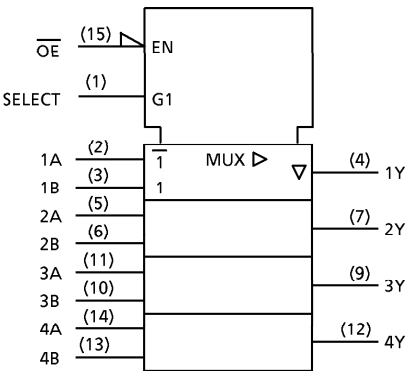


TRUTH TABLE

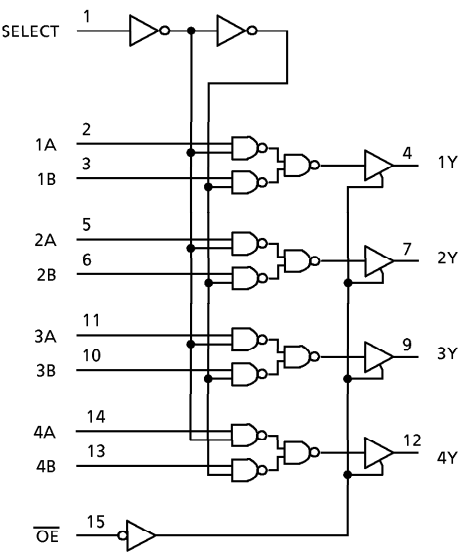
INPUTS				OUTPUTS
$\overline{OE}$	SELECT	A	B	Y
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

X : Don't Care
Z : High-impedance

IEC LOGIC SYMBOL



SYSTEM DIAGRAM



MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim 7.0$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim 7.0$ (Note 1)	V
		$-0.5 \sim V_{CC} + 0.5$ (Note 2)	
Input Diode Current	I_{IK}	-50	mA
Output Diode Current	I_{OK}	± 50 (Note 3)	mA
DC Output Current	I_{OUT}	± 50	mA
Power Dissipation	P_D	180	mW
DC V_{CC} /Ground Current	I_{CC}/I_{GND}	± 100	mA
Storage Temperature	T_{stg}	$-65 \sim 150$	°C

(Note 1) Output in Off-State

(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.(Note 3) $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	2.0~3.6	V
		1.5~3.6 (Note 4)	
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~5.5 (Note 5)	V
		0~ V_{CC} (Note 6)	
Output Current	I_{OH}/I_{OL}	± 24 (Note 7)	mA
		± 12 (Note 8)	
Operating Temperature	T_{opr}	$-40 \sim 85$	°C
Input Rise And Fall Time	dt/dv	0~10 (Note 9)	ns/V

(Note 4) Data Retention Only

(Note 5) Output in Off-State

(Note 6) High or Low State

(Note 7) $V_{CC} = 3.0 \sim 3.6V$ (Note 8) $V_{CC} = 2.7 \sim 3.0V$ (Note 9) $V_{IN} = 0.8 \sim 2.0V$, $V_{CC} = 3.0V$

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (Ta = -40~85°C)

PARAMETER		SYMBOL	TEST CONDITION			MIN.	MAX.	UNIT	
					V _{CC} (V)				
Input Voltage	"H" Level	V _{IH}				2.7~3.6	2.0	—	V
	"L" Level	V _{IL}				2.7~3.6	—	0.8	
Output Voltage	"H" Level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = - 100μA	2.7~3.6	V _{CC} - 0.2	—	V	
				I _{OH} = - 12mA	2.7	2.2	—		
				I _{OH} = - 18mA	3.0	2.4	—		
				I _{OH} = - 24mA	3.0	2.2	—		
	"L" Level	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 100μA	2.7~3.6	—	0.2		
				I _{OL} = 12mA	2.7	—	0.4		
				I _{OL} = 16mA	3.0	—	0.4		
				I _{OL} = 24mA	3.0	—	0.55		
Input Leakage Current		I _{IN}	V _{IN} = 0~5.5V			2.7~3.6	—	± 5.0	μA
3-State Output Off-State Current		I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = 0~5.5V			2.7~3.6	—	± 5.0	μA
Power Off Leakage Cuurent		I _{OFF}	V _{IN} / V _{OUT} = 5.5V			0	—	10.0	μA
Quiescent Supply Current		I _{CC}	V _{IN} = V _{CC} or GND			2.7~3.6	—	10.0	μA
			V _{IN} / V _{OUT} = 3.6~5.5V			2.7~3.6	—	± 10.0	
Increase In I _{CC} Per Input		ΔI _{CC}	V _{IH} = V _{CC} - 0.6V			2.7~3.6	—	500	μA

AC CHARACTERISTICS (Ta = -40~85°C)

PARAMETER		SYMBOL	TEST CONDITION		V _{CC} (V)	MIN.	MAX.	UNIT
Propagation Delay Time (A, B-Y)	t _{pLH} t _{pHL}	(Fig.1, 2)			2.7	—	6.5	ns
					3.3 ± 0.3	1.5	6.0	
Propagation Delay Time (SELECT-Y)	t _{pLH} t _{pHL}	(Fig.1, 2)			2.7	—	8.5	ns
					3.3 ± 0.3	1.5	7.0	
Output Enable Time	t _{pZL} t _{pZH}	(Fig.1, 3)			2.7	—	8.5	ns
					3.3 ± 0.3	1.5	7.0	
Output Disable Time	t _{pLZ} t _{pHZ}	(Fig.1, 3)			2.7	—	6.0	ns
					3.3 ± 0.3	1.5	5.5	
Output To Output Skew	t _{osLH} t _{osHL}	(Note 10)			2.7	—	—	ns
					3.3 ± 0.3	—	1.0	

(Note 10) Parameter guaranteed by design.

(t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)

DYNAMIC SWITCHING CHARACTERISTICS ($T_a = 25^\circ\text{C}$, Input $t_r = t_f = 2.5\text{ns}$, $C_L = 50\text{pF}$, $R_L = 500\Omega$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	UNIT
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	$V_{IH} = 3.3\text{V}$, $V_{IL} = 0\text{V}$	3.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	$ V_{OLV} $	$V_{IH} = 3.3\text{V}$, $V_{IL} = 0\text{V}$	3.3	0.8	V

CAPACITIVE CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	UNIT
Input Capacitance	C_{IN}	—	3.3	7	pF
Output Capacitance	C_{OUT}	—	3.3	8	pF
Power Dissipation Capacitance	C_{PD}	$f_{IN} = 10\text{MHz}$ (Note 11)	3.3	25	pF

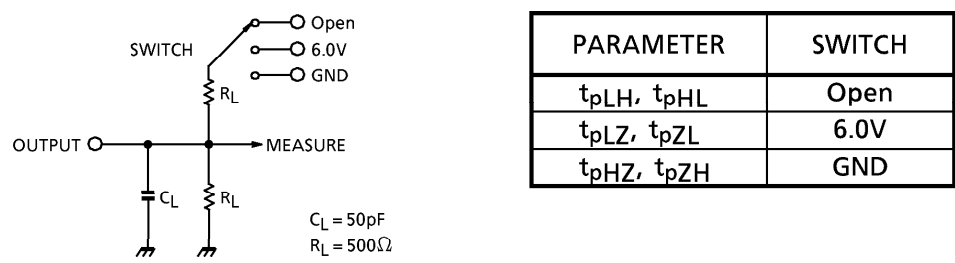
(Note 11) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

TEST CIRCUIT

Fig.1



AC WAVEFORM

Fig.2 t_{pLH} , t_{pHL}

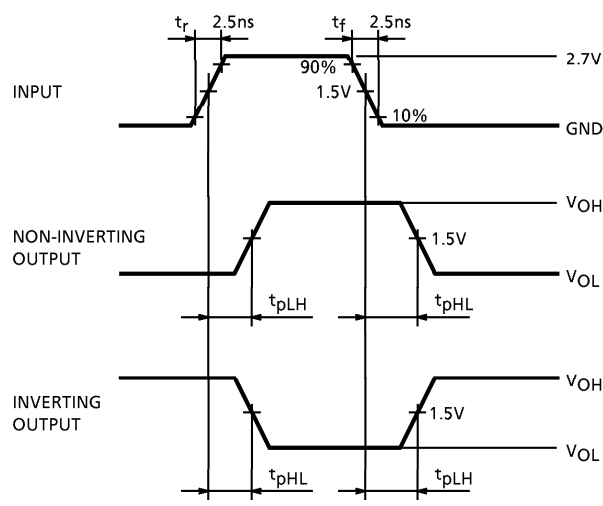
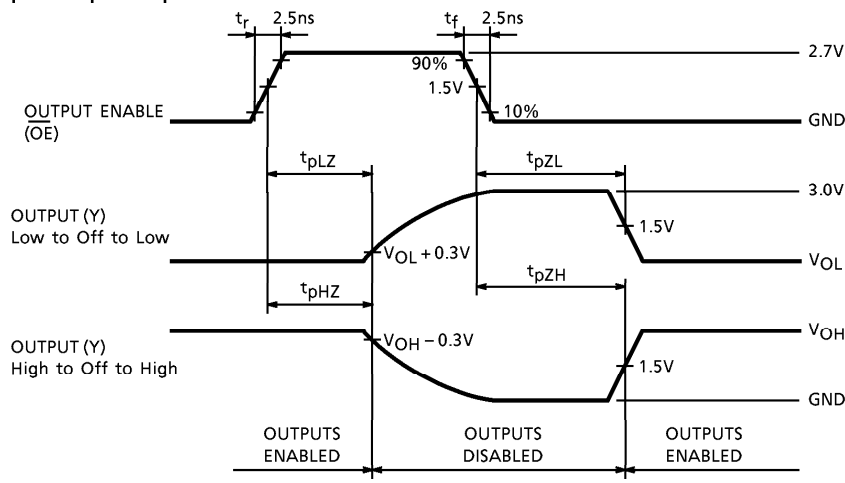
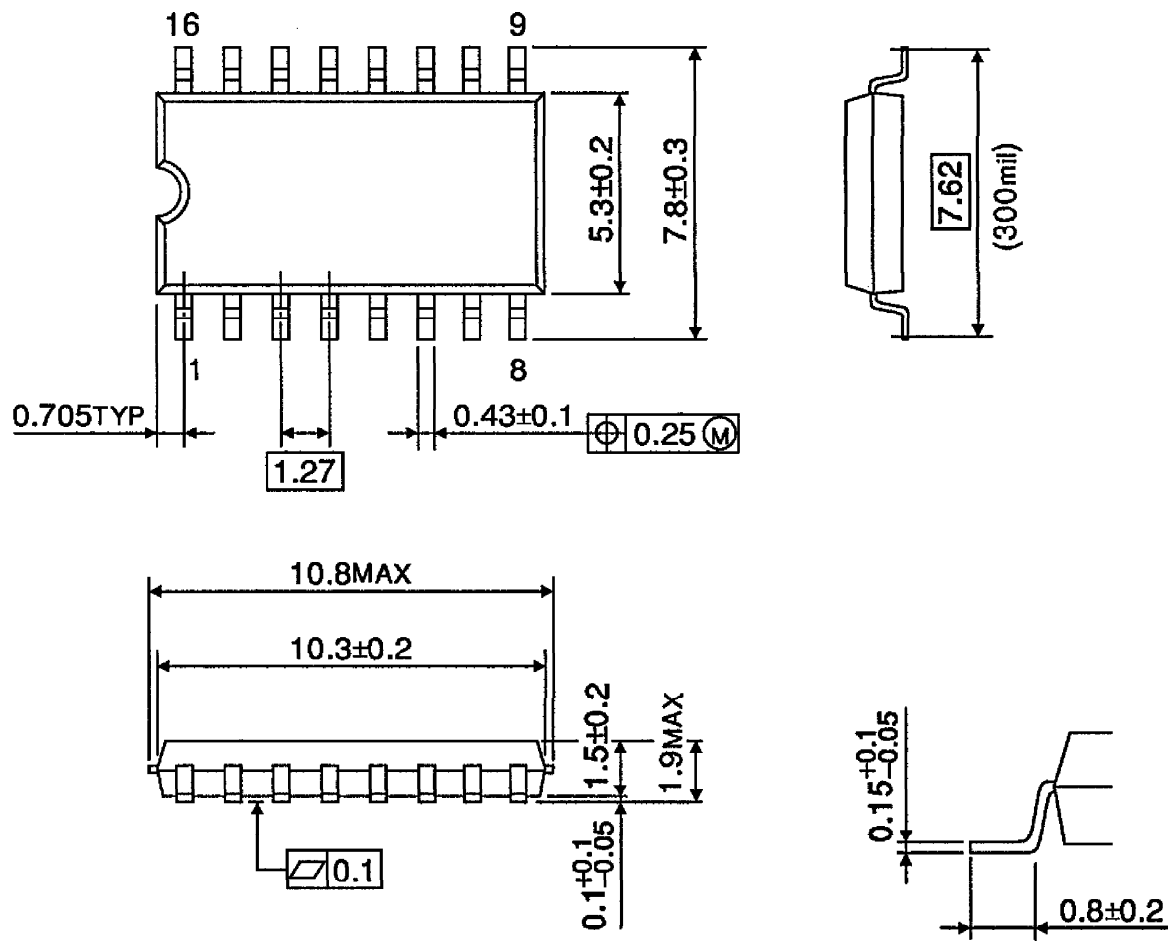


Fig.3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}



PACKAGE DIMENSIONS
SOP16-P-300-1.27

Unit : mm

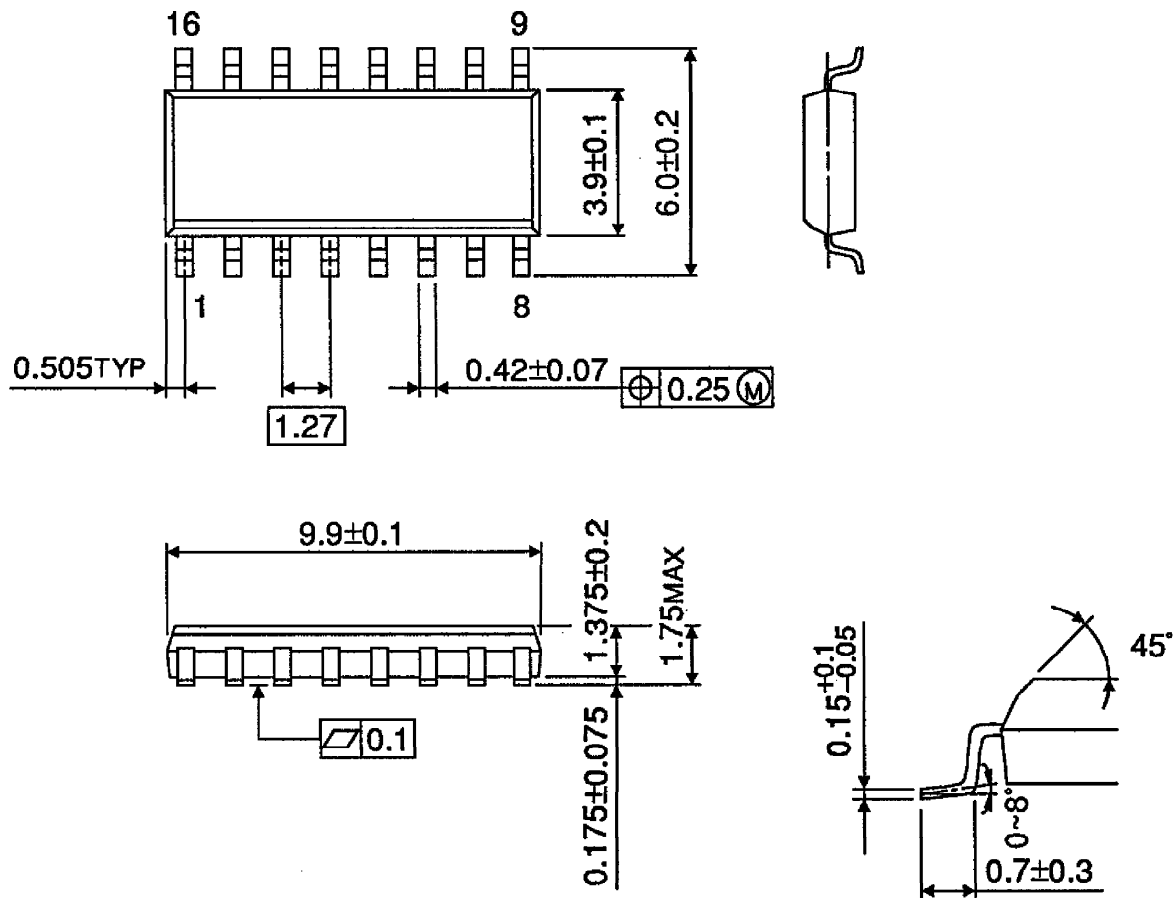


Weight : 0.18g (Typ.)

PACKAGE DIMENSIONS
SOL16-P-150-1.27

Unit : mm

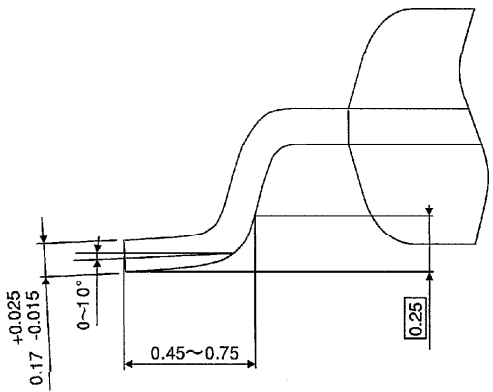
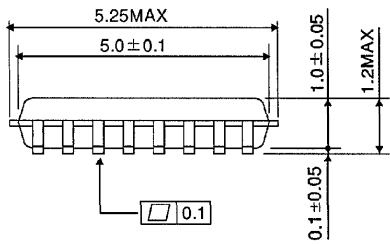
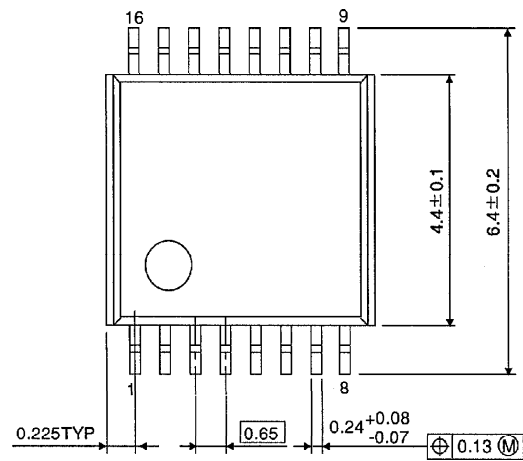
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

PACKAGE DIMENSIONS
TSSOP16-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- 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.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- 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. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.