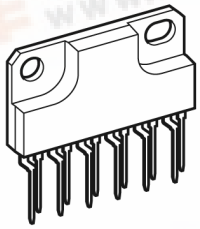
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8440H,TA8440F

DC MOTOR FULL BRIDGE DRIVER
F TYPE: UNDER DEVELOPMENT

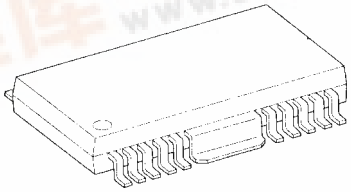
The TA8440H is a full−bridge driver for selecting the forward and reverse running of a motor with brushes and is able to control 4 modes of forward, reverse, stop and braking.
The motor driving unit and the control unit have a separate power supply line, independently and the TA8440H is also usable as a stepping motor driver.

TA8440H



HZIP12-P-1.78B

TA8440F (Under development)



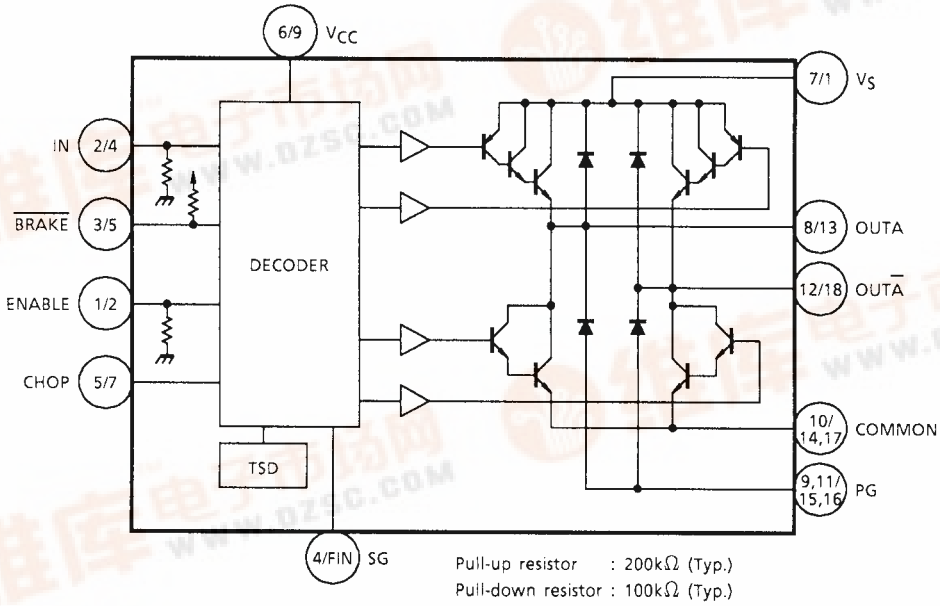
HSOP20-P-450-1.00

Weight
HZIP12-P-1.78B: 4.04 g (Typ.)
HSOP20-P-450-1.00: 0.79 g (Typ.)

FEATURES

- Output current is as large as 1.5A (AVE) and 3.0A (PEAK).
- 4 modes of forward, reverse, stop, and braking are available and a counter−electromotive force absorbing diode has been built−in.
- Thermal shutdown circuit incorporated.
- Input is compatible with CMOS.
- Built−in input pull−up resistor. BRAKE = 200 kΩ (Typ.)
- Built−in input pull−down resistor. IN, ENABLE = 100 kΩ (Typ.)

BLOCK DIAGRAM



TA8440H/TA8440F

TA8440F: 3, 6, 8, 10, 11, 12, 19, 20 pin is No Connection.

PIN FUNCTION

Pin No.		SYMBOL	FUNCTIONAL DESCRIPTION
H	F		
1	2	ENABLE	ENABLE terminal
2	4	IN	Forward rotation / reverse rotation switch terminal
3	5	$\overline{\text{BRAKE}}$	BRAKE terminal
4	FIN	SG	Signal GND
5	7	CHOP	PWM signal input terminal
6	9	V_{CC}	Power voltage supply terminal for control
7	1	V_S	Power voltage supply terminal for motor driver
8	13	OUTA	Output terminal
9	15	PG	Power GND
10	14, 17	COMMON	COMMON terminal
11	16	PG	Power GND
12	18	OUT $\overline{\text{A}}$	Output terminal

TA8440F: 3, 6, 8, 10, 11, 12, 19, 20 pin is No Connection.

FUNCTION

INPUT				OUTPUT		MODE
IN	$\overline{\text{BRAKE}}$	ENABLE	CHOP	OUTA	OUT $\overline{\text{A}}$	MOTOR
H	H	H	L	H	L	CW / CCW
L	H	H	L	L	H	CCW / CW
(*)	(*)	L	(*)	∞	∞	Stop
(*)	L	H	(*)	L	L	Brake
H	H	H	H	∞	L	Chop
L	H	H	H	L	∞	Chop

* : Don't care ∞: High impedance

MAXIMUM RATING (Ta = 25°C)

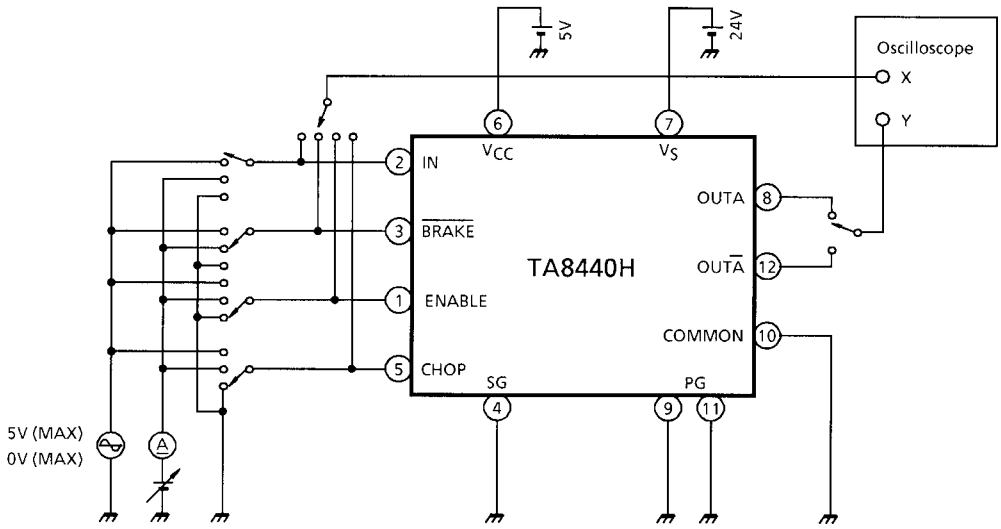
CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	7	V
		V_S	50	
Input Voltage		V_{IN}	−0.3~V_{CC}	V
Output Current	AVE	$I_{O\ (AVE.)}$	1.5	A
	PEAK	$I_{O\ (PEAK)}$	3.0 (Note 1)	A
Power Dissipation		P_D	2.52 (Note 2)	W
			25.0 (Note 3)	
Operating Temperature		T_{opr}	−30~75	°C
Storage Temperature		T_{stg}	−55~150	°C

Note 1: t = 100 ms
Note 2: No heat sink
Note 3: Tc = 75°C

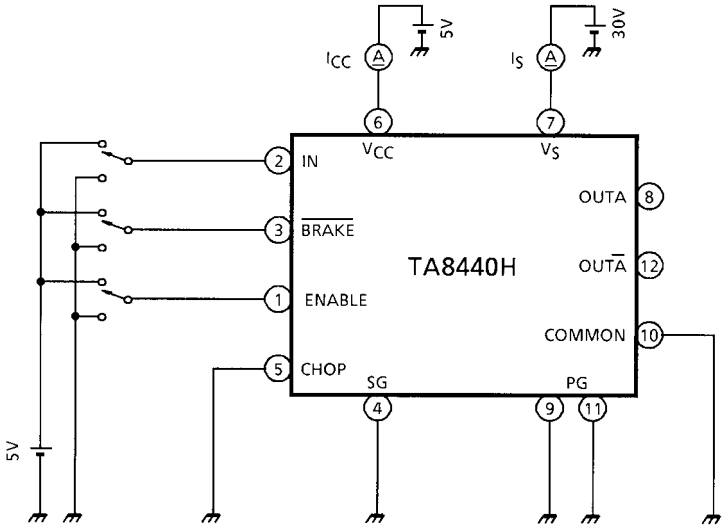
ELECTRICAL CHARACTERISTICS (V_{CC} = 5 V, V_S = 24 V, Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN	TYP.	MAX	UNIT
Input Voltage	High	$V_{IN\ (H)}$	1	IN, CHOP, ENABLE, $\overline{BRAKE}$		3.5	—	V_{CC}	v
	Low	$V_{IN\ (L)}$				GND	—	1.5	
Input Current	High	$I_{IN-1\ (H)}$	1	CHOP	V_{IN} = 5 V	—	5	52	µA
		$I_{IN-2\ (H)}$		IN, ENABLE		—	40	60	
		$I_{IN-3\ (H)}$		$\overline{BRAKE}$		—	0	5.5	
Input Current	Low	$I_{IN-1\ (L)}$		CHOP	V_{IN} = 0 V Source type	—	0	5.5	
		$I_{IN-2\ (L)}$		IN, ENABLE		—	0	5.5	
		$I_{IN-3\ (L)}$		$\overline{BRAKE}$		—	25	52	
Current Consumption (I)		I_{CC1}	2	Stop		—	6	10.5	mA
		I_{CC2}		Forward / reverse		—	10	14.5	
		I_{CC3}		Brake		—	14	18.5	
Current Consumption (II)		I_{S1}	2	Stop		—	2	4.2	mA
		I_{S2}		Forward / reverse		—	3.5	5.0	
		I_{S3}		Brake		—	2.5	3.7	
Output saturation voltage	Upper Side	V_{sat-U1}	3	I_{OUT} = 1.5A		1.5	2.0	2.7	V
	Under Side	V_{sat-L1}				0.7	1.25	1.9	
	Upper Side	V_{sat-U2}		I_{OUT} = 3.0A		2.7	3.0	3.9	
	Under Side	V_{sat-L2}				1.7	2.0	2.9	
Diode Forward Orientation Voltage	Upper Side	V_{F-U1}	—	I_{OUT} = 1.5A		—	3.5	—	V
	Under Side	V_{F-L1}				—	1.3	—	
Output Leakage Current	Upper Side	I_{OH}	4	V_S = 30V		—	—	200	µA
	Under Side	I_{OL}				—	—	100	
Shut Down Temperature		T_{SD}	—	—		—	170	—	°C
Transfer Time		t_{pLH}	—	IN−OUT		—	2.7	—	µs
		t_{pHL}				—	1.2	—	
		t_{pLH}		CHOP−OUT		—	0.7	—	
		t_{pHL}				—	2.5	—	
		t_{pLH}		ENABLE−OUT		—	2.9	—	
		t_{pHL}				—	1.1	—	
		t_{pLH}		$\overline{BRAKE}$ −OUT		—	45	—	
		t_{pHL}				—	45	—	

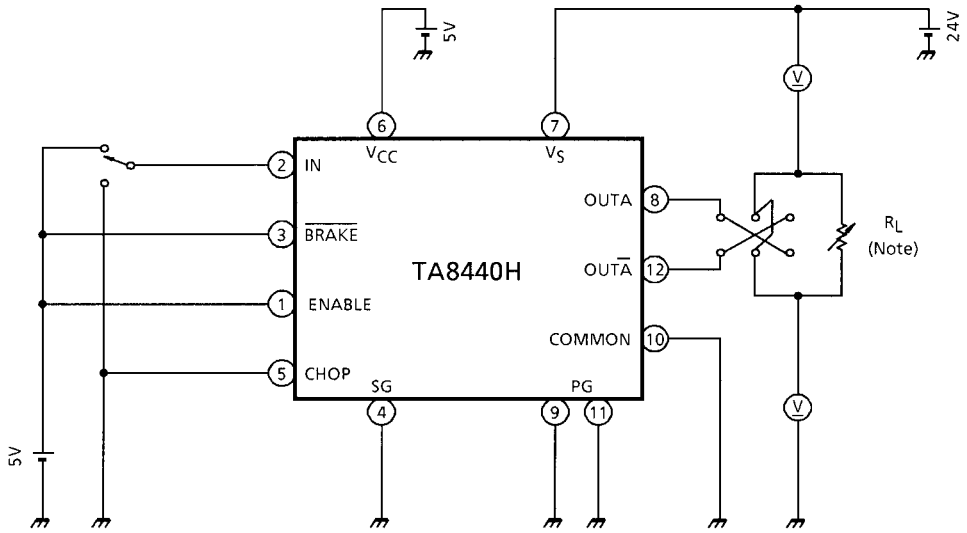
TEST CIRCUIT 1. $V_{IN\ (H)}$, $V_{IN\ (L)}$, $I_{IN\ (H)}$, $I_{IN\ (L)}$



TEST CIRCUIT 2. I_{CC1}, I_{CC2}, I_{CC3}, I_{S1}, I_{S2}, I_{S3}

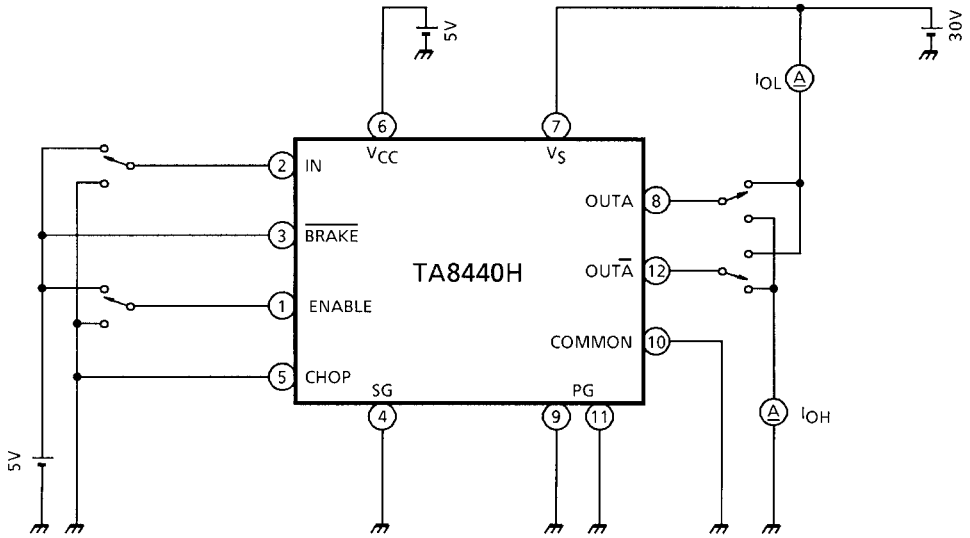


TEST CIRCUIT 3. V_{sat-L}, V_{sat-U}

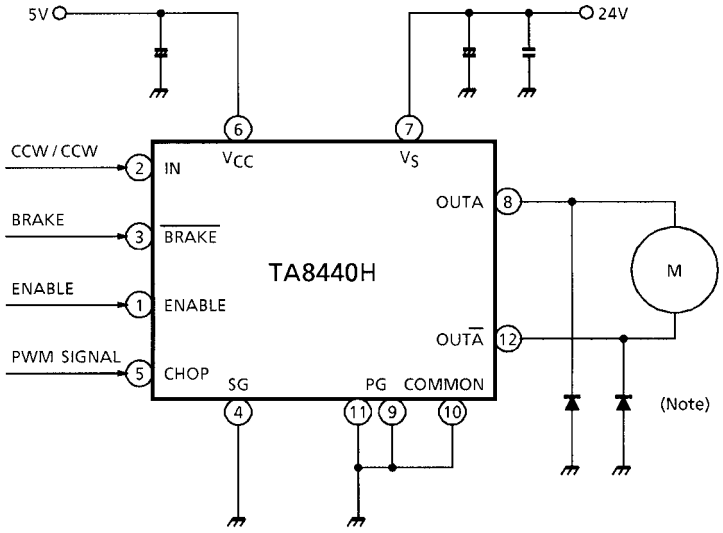


Note: Calibrate I_{OUT} to 1.5 / 3.0 A by R_L.

TEST CIRCUIT 4. I_{OH}, I_{OL}



APPLICATION CIRCUIT

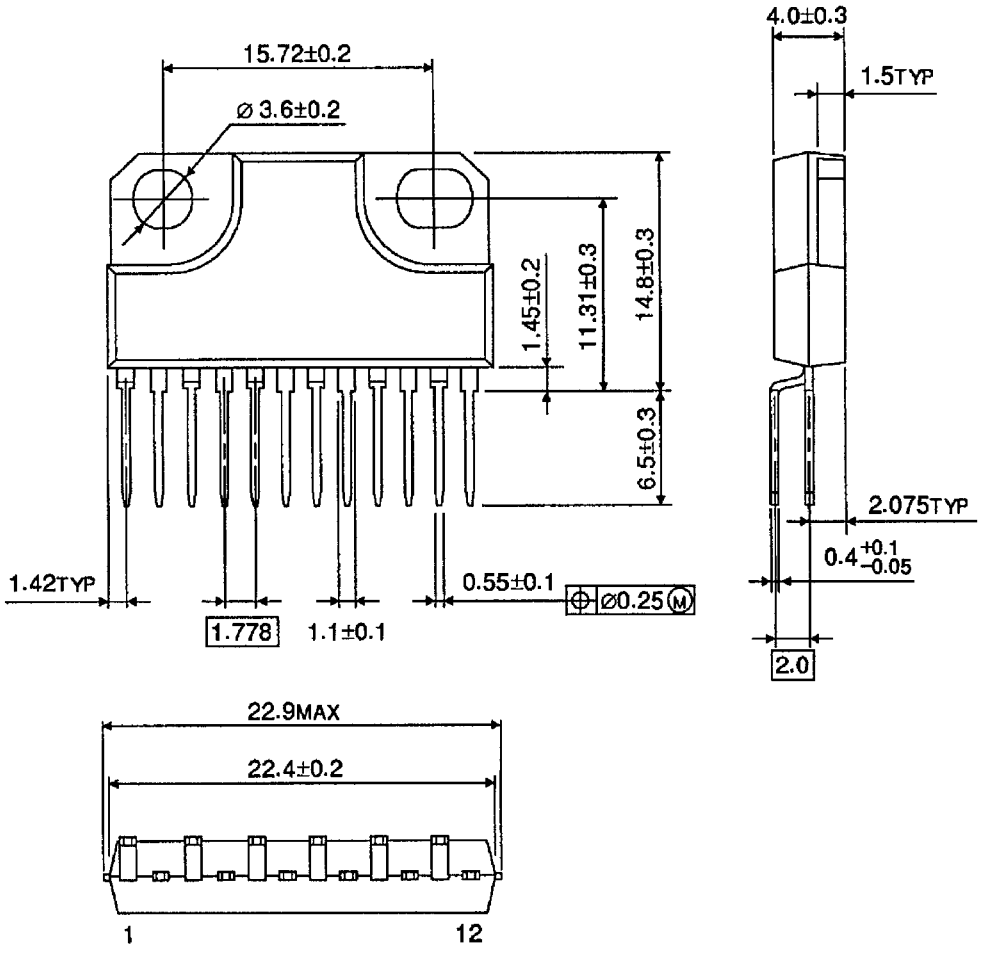


Note 1: Schottky diode (2GWJ42) to be connected additionally between each output (pin 16 / 19 / 20 / 23) and GND for preventing Punch−Through Current.

Note 2: Utmost care is necessary in the design of the output line, V_S and GND line since IC may be destroyed due to short−circuit between outputs, air contamination fault, or fault by improper grounding.

PACKAGE DIMENSIONS

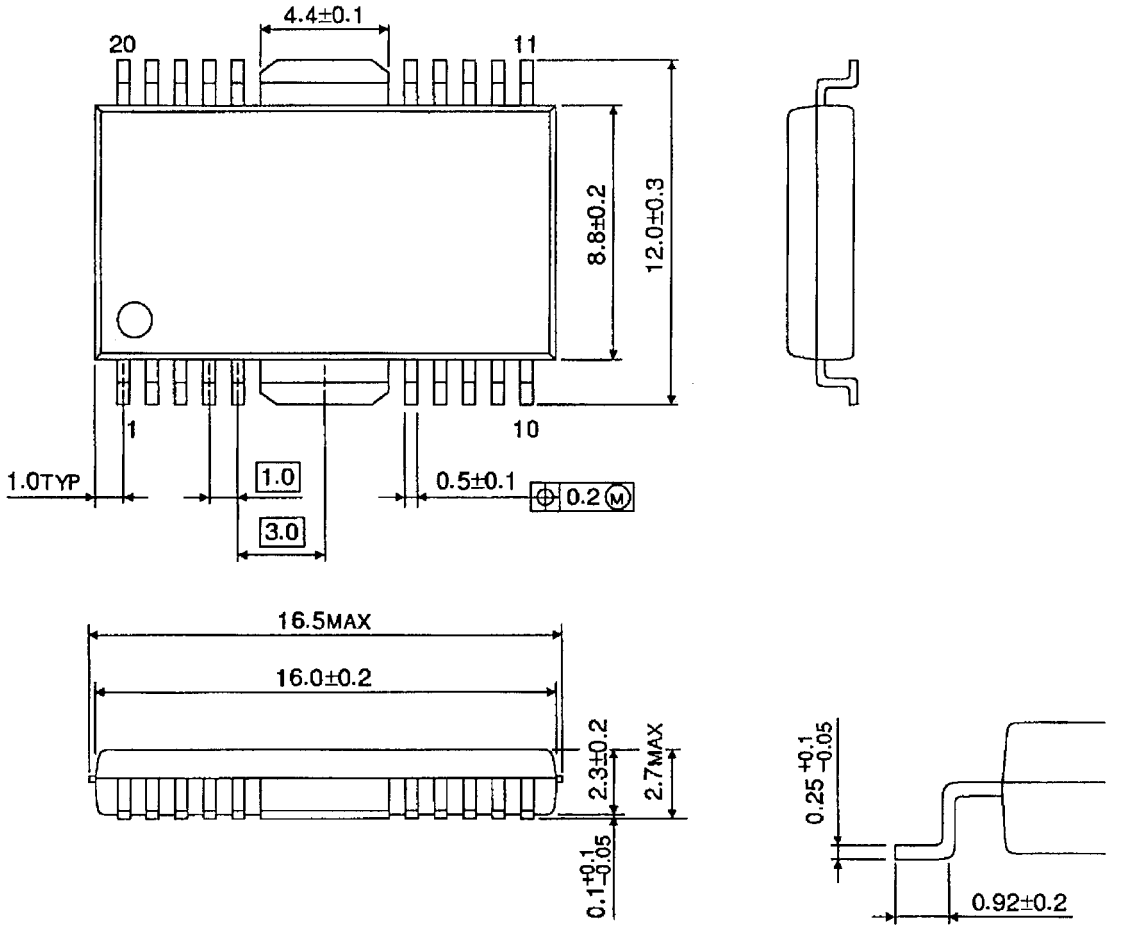
HZIP12−P−1.78B Unit: mm



Weight: 4.04 g (Typ.)

PACKAGE DIMENSIONS

HSOP20-P-450-1.00 Unit : mm



Weight: 0.79 g (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.