

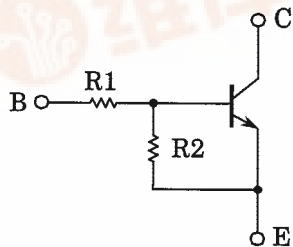
TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process)

**RN2301,RN2302,RN2303  
RN2304,RN2305,RN2306**

Switching, Inverter Circuit, Interface Circuit  
And Driver Circuit Applications

- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN1301~1306

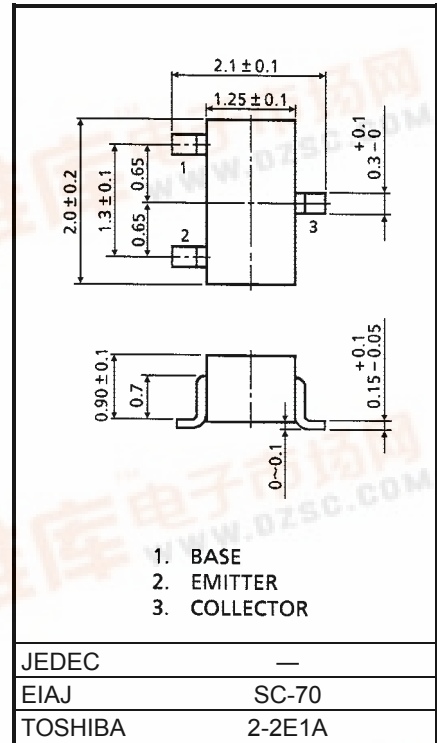
**Equivalent Circuit**



**Bias Resistor Values**

Type No.	R1 (kΩ)	R2 (kΩ)
RN2301	4.7	4.7
RN2302	10	10
RN2303	22	22
RN2304	47	47
RN2305	2.2	47
RN2306	4.7	47

Unit: mm



JEDEC	—
EIAJ	SC-70
TOSHIBA	2-2E1A

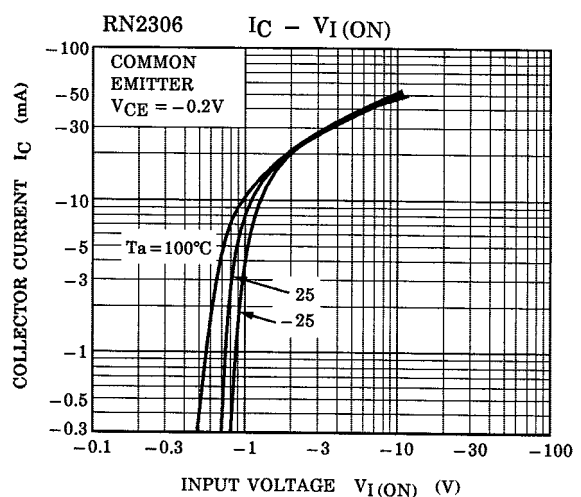
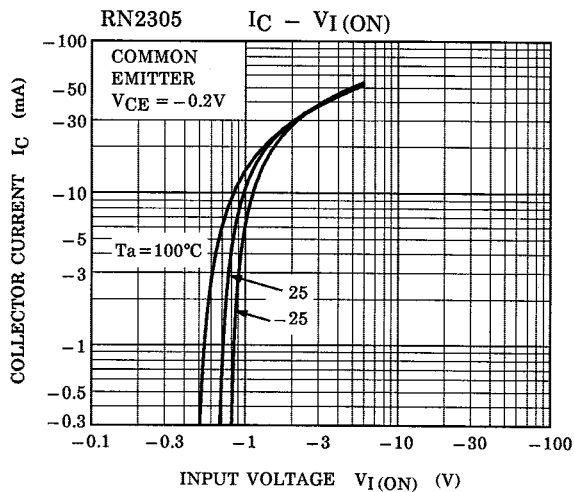
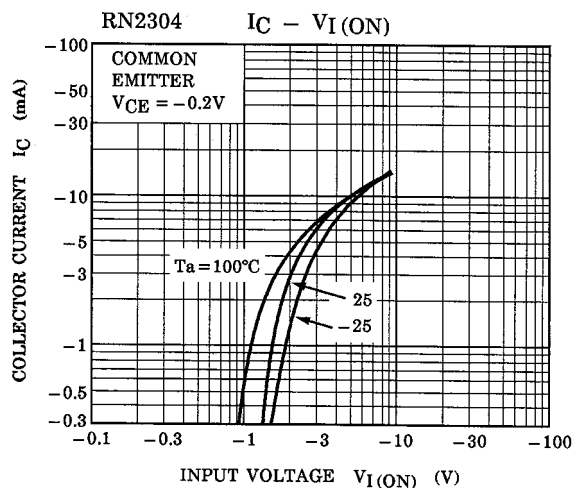
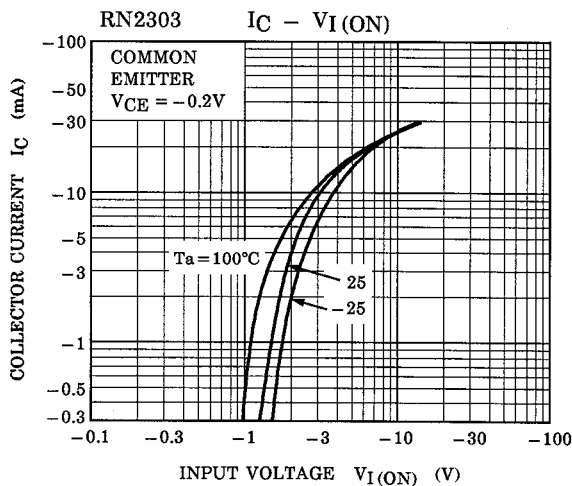
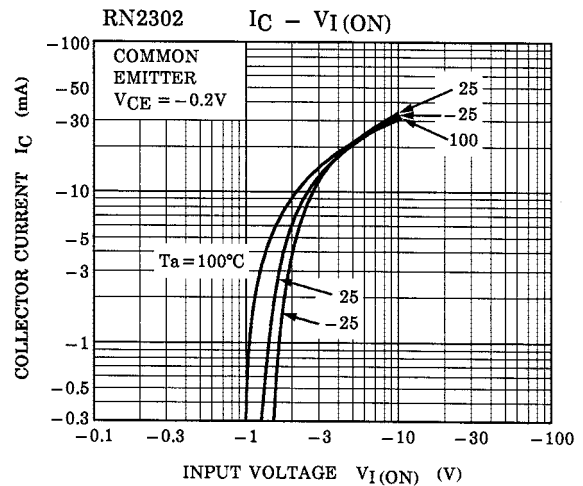
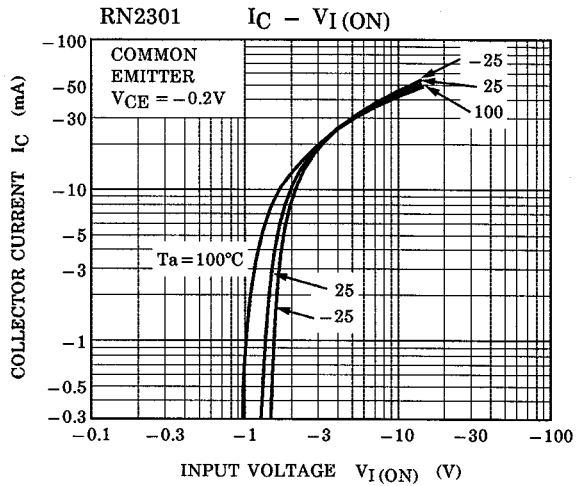
Weight: 0.006g

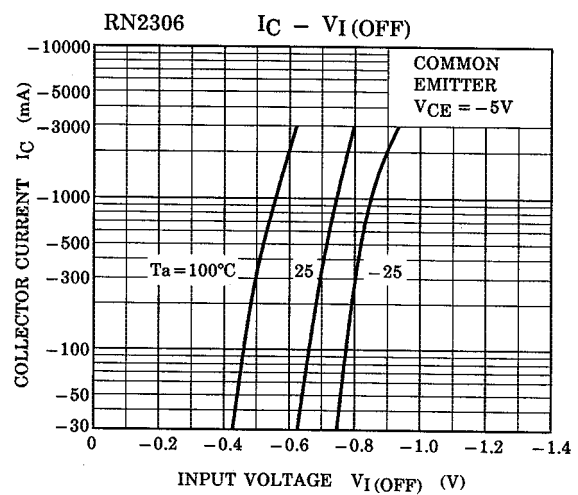
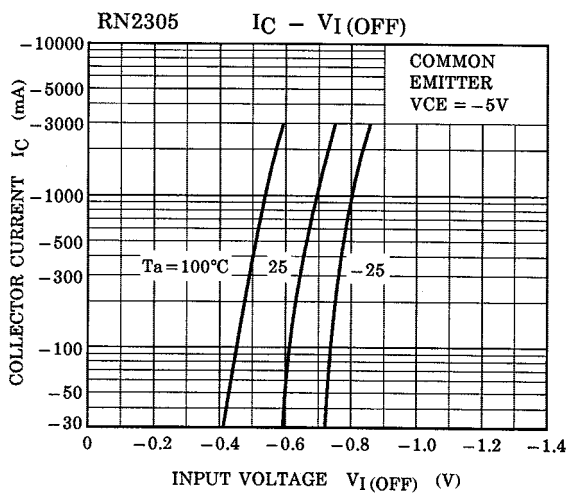
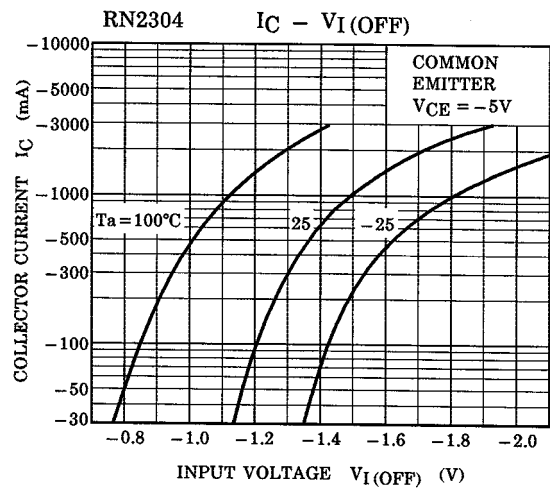
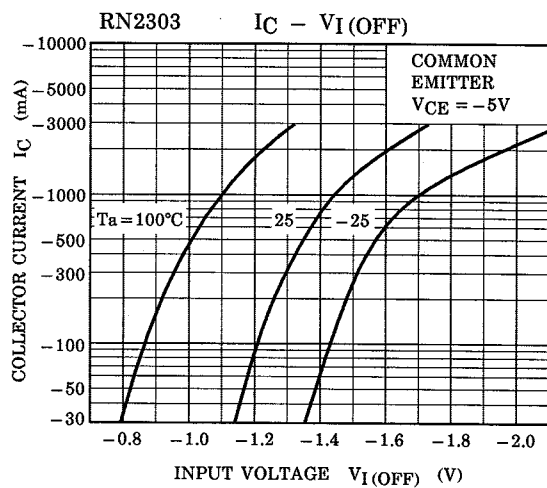
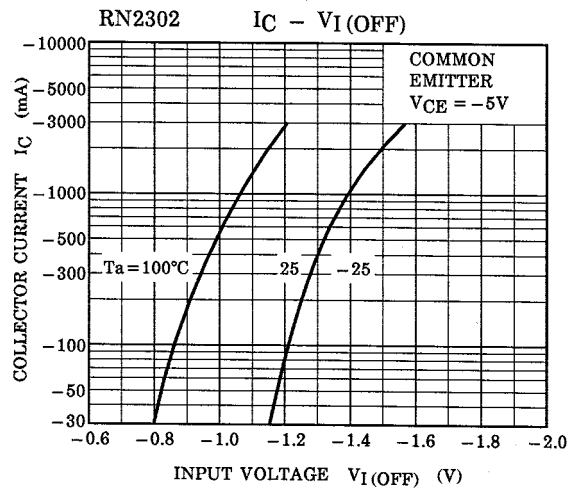
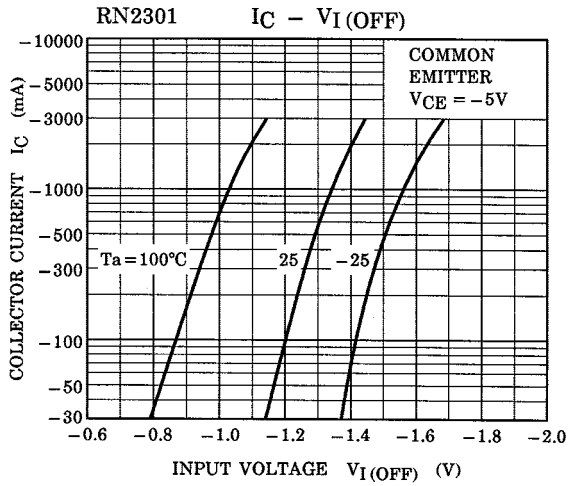
**Maximum Ratings (Ta = 25°C)**

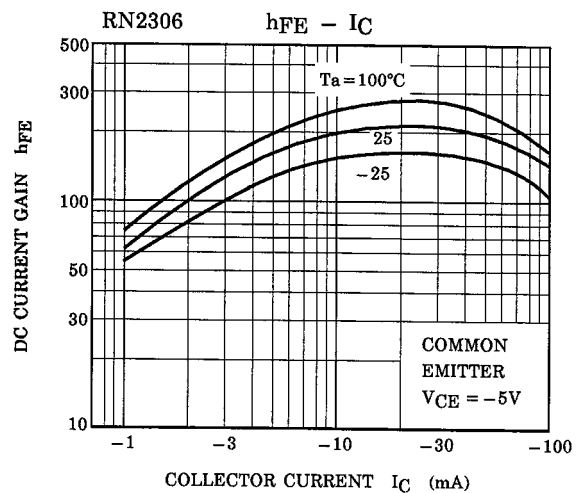
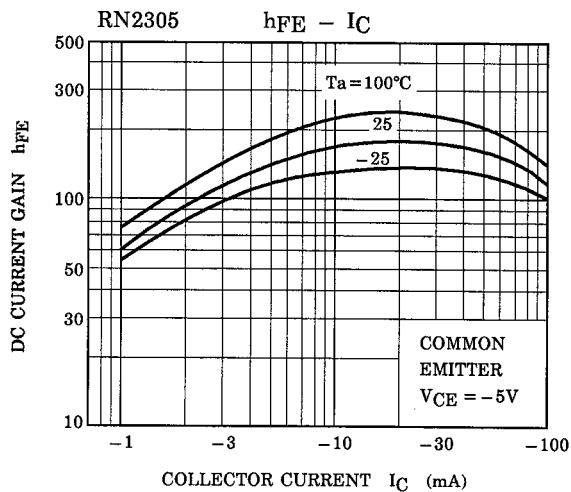
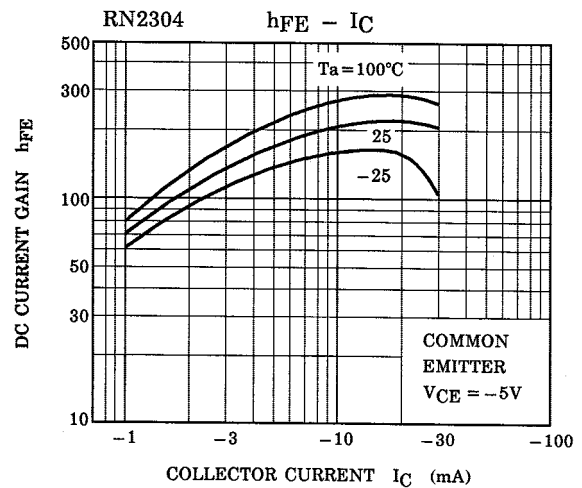
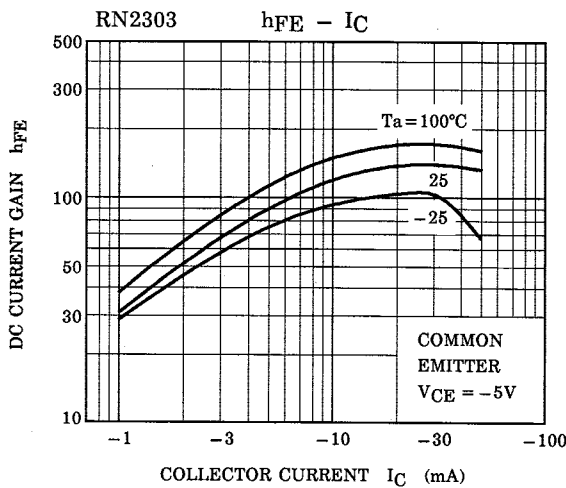
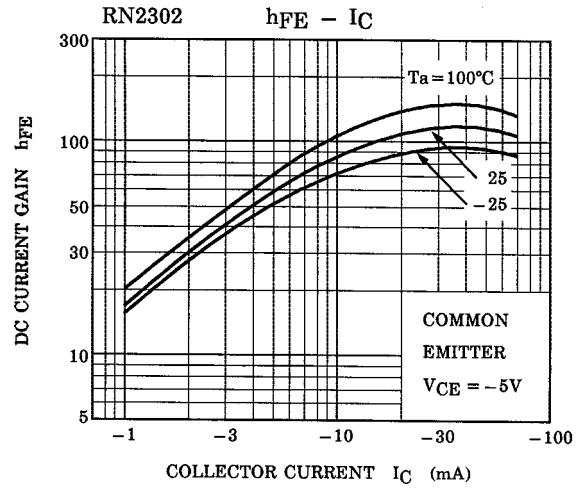
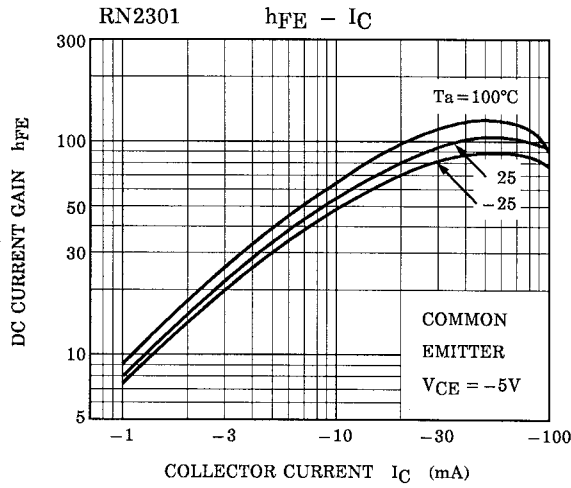
Characteristic	Symbol	Rating	Unit
Collector-base voltage	RN2301~2306	V <sub>CBO</sub>	-50
Collector-emitter voltage		V <sub>CEO</sub>	-50
Emitter-base voltage	RN2301~2304	V <sub>EBO</sub>	-10
	RN2305, 2306		-5
Collector current	I <sub>C</sub>	-100	mA
Collector power dissipation	RN2301~2306	P <sub>C</sub>	100
Junction temperature		T <sub>j</sub>	150
Storage temperature range		T <sub>stg</sub>	-55~150

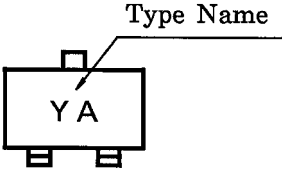
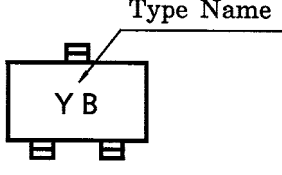
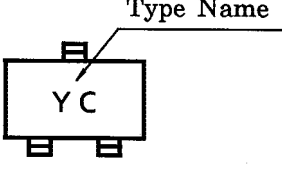
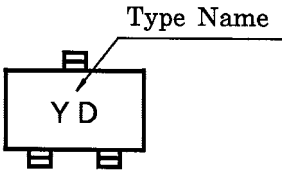
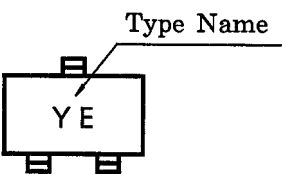
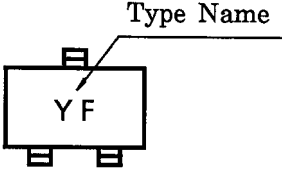
## Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2301~2306	$I_{CBO}$	—	$V_{CB} = -50V, I_E = 0$	—	—	-100	nA
		$I_{CEO}$	—	$V_{CE} = -50V, I_B = 0$	—	—	-500	
Emitter cut-off current	RN2301	$I_{EBO}$	—	$V_{EB} = -10V, I_C = 0$	-0.82	—	-1.52	mA
	RN2302		—		-0.38	—	-0.71	
	RN2303		—		-0.17	—	-0.33	
	RN2304		—	-0.082	—	-0.15		
	RN2305		—	$V_{EB} = -5V, I_C = 0$	-0.078	—	-0.145	
	RN2306		—		-0.074	—	-0.138	
DC current gain	RN2301	$h_{FE}$	—	$V_{CE} = -5V$ $I_C = -10mA$	30	—	—	—
	RN2302		—		50	—	—	
	RN2303		—		70	—	—	
	RN2304		—		80	—	—	
	RN2305		—		80	—	—	
	RN2306		—		80	—	—	
Collector-emitter saturation voltage	RN2301~2306	$V_{CE(sat)}$	—	$I_C = -5mA$ $I_B = -0.25mA$	—	-0.1	-0.3	V
Input voltage (ON)	RN2301	$V_{I(ON)}$	—	$V_{CE} = -0.2V$ $I_C = -5mA$	-1.1	—	-2.0	V
	RN2302		—		-1.2	—	-2.4	
	RN2303		—		-1.3	—	-3.0	
	RN2304		—		-1.5	—	-5.0	
	RN2305		—		-0.6	—	-1.1	
	RN2306		—		-0.7	—	-1.3	
Input voltage (OFF)	RN2301~2304	$V_{I(OFF)}$	—	$V_{CE} = -5V,$ $I_C = -0.1mA$	-1.0	—	-1.5	V
	RN2305, 2306		—		-0.5	—	-0.8	
Translation frequency	RN2301~2306	$f_T$	—	$V_{CE} = -10V,$ $I_C = -5mA$	—	200	—	MHz
Collector output capacitance	RN2301~2306	$C_{ob}$	—	$V_{CB} = -10V, I_E = 0$ $f = 1MHz$	—	3	6	pF
Input resistor	RN2301	R1	—	—	3.29	4.7	6.11	kΩ
	RN2302		—		7	10	13	
	RN2303		—		15.4	22	28.6	
	RN2304		—		32.9	47	61.1	
	RN2305		—		1.54	2.2	2.86	
	RN2306		—		3.29	4.7	6.11	
Resistor ratio	RN2301~2304	R1/R2	—	—	0.9	1.0	1.1	—
	RN2305		—		0.0421	0.0468	0.0515	
	RN2306		—		0.09	0.1	0.11	







Type Name	Marking
RN2301	
RN2302	
RN2303	
RN2304	
RN2305	
RN2306	

**RESTRICTIONS ON PRODUCT USE**

000707EAA

- 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 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.