

PQ1Txx1M2ZP Series

■ Features

1. Compact surface mount package (2.9×1.6×1.1mm)
 2. Low power-loss
(Dropout voltage:TYP. 0.10 V/MAX. 0.15V at $I_o=60\text{mA}/V_o=3.0\text{V}$)
 3. High ripple rejection (TYP. 70dB)
 4. Low current operation type
(Dissipation current at no load:TYP. 35 μA)
 5. Built-in ON/OFF control function
(Dissipation current at OFF-state:MAX. 1 μA)
 6. Low voltage operation type
(Input voltage:MIN. 1.8V)
 7. Overcurrent protection functions
- *It is available for every 0.1V(1.8V to 5.5V)

■ Applications

1. Cellular phones
2. Cordless phones
3. Personal information tools(PDA)
4. Cameras/Camcoders
5. PCMCIA cards for notebook PCs

■ Model Line-up

Output Voltage (TYP.)	Model No.	Output Voltage (TYP.)	Model No.
1.8V	PQ1T181M2ZP	3.3V	PQ1T331M2ZP
2.5V	PQ1T251M2ZP	3.5V	PQ1T351M2ZP
2.7V	PQ1T271M2ZP	3.6V	PQ1T361M2ZP
2.8V	PQ1T281M2ZP	3.8V	PQ1T381M2ZP
3.0V	PQ1T301M2ZP	4.0V	PQ1T401M2ZP
3.2V	PQ1T321M2ZP	5.0V	PQ1T501M2ZP

■ Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
*1 Input voltage	V_{IN}	9	V
*1 Output control voltage	V_C	0 to V_{IN}	V
Output current	I_o	400	mA
*2 Power dissipation	P_D	350	mW
Junction temperature	T_j	125	°C
Operating temperature	T_{opr}	-40 to +80	°C
Storage temperature	T_{stg}	-55 to +150	°C
Soldering temperature	T_{sol}	260 (10s)	°C

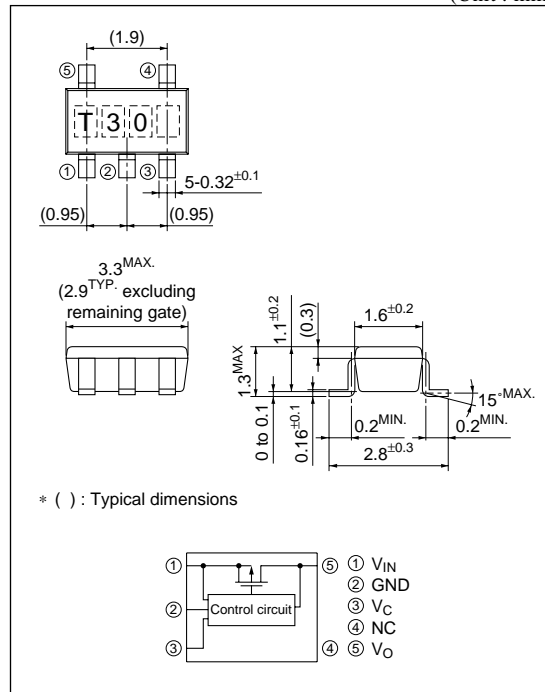
*1 All are open except GND and applicable terminals

*2 At mounting PCB

Low Output Current, Compact Surface Mount Type Low Power-Loss Voltage Regulators

■ Outline Dimensions

(Unit : mm)



■ Electrical Characteristics

(Unless otherwise specified, $V_{IN}=V_O(TYP)+1.0V$, $I_O=30mA$, $V_C=1.8V$, $T_a=25^\circ C$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	V_O	–	Refer to the following table.1			V
^{*3} Output peak current	I_{op}	–	310	370	–	mA
Recommended output current	–	–	–	–	150	mA
Load regulation	R_{egL1}	$I_O=5$ to 80mA	–	6	36	mV
	R_{egL2}	$I_O=5$ to 150mA	–	12	80	mV
	R_{egL3}	$I_O=5$ to 300mA	–	25	150	mV
Line regulation	R_{egI}	$V_{IN}=V_O(TYP)+1V$ to $V_O(TYP)+6V(MAX. 9.0V)$	–	0.02	0.15	%/V
Temperature coefficient of output voltage	$T_c V_O$	$I_O=10mA$, $T_j=-25$ to $+75^\circ C$	–	± 50	–	ppm/ $^\circ C$
^{*4} Ripple rejection	RR	Refer to Fig.2	–	70	–	dB
^{*4} Output noise voltage	$V_{no (rms)}$	10Hz< f <100kHz, $I_O=30mA$	–	60	–	μV
Dropout voltage	V_{I-o1}	$I_O=60mA$ ^{*5}	Refer to the following table.2			V
	V_{I-o2}	$I_O=150mA$ ^{*5}	Refer to the following table.3			
	V_{I-o3}	$I_O=300mA$ ^{*5}	Refer to the following table.4			
^{*6} ON-state voltage for control	$V_{C(ON)}$	–	1.8	–	–	V
ON-state current for control	$I_{C(ON)}$	$V_{IN}=V_C=9.0V$	–	2	4	μA
OFF-state voltage for control	$V_{C(OFF)}$	–	–	–	0.8	V
Quiescent current	I_q	$I_O=0mA$	–	35	65	μA
Output OFF-state consumption current	I_{qs}	$V_C=0.2V$	–	–	1	μA

^{*3} Output current shall be the value when output voltage lowers 0.3V from the voltage at $I_O=30mA$ Temperature coefficient of Output peak current:Around 1.3mA/ $^\circ C$

(In case of low temperature, current work is lower.)

^{*4} Typical value of 3.0V output type^{*5} Input voltage when output voltage falls 0.1V from that at $V_{IN}=V_O(TYP)+1.0V$.^{*6} In case that the control terminal (Ⓢ pin) is non-connection, output voltage should be OFF state.

Table.1 Output Voltage Line-up

 $(V_{IN}=V_O(TYP)+1.0V, I_O=30mA, V_C=1.8V, T_a=25^\circ C)$

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	V_O	1.770	1.8	1.830	V
PQ1T251M2ZP	V_O	2.462	2.5	2.538	V
PQ1T271M2ZP	V_O	2.659	2.7	2.741	V
PQ1T281M2ZP	V_O	2.758	2.8	2.842	V
PQ1T301M2ZP	V_O	2.955	3.0	3.045	V
PQ1T321M2ZP	V_O	3.152	3.2	3.248	V
PQ1T331M2ZP	V_O	3.250	3.3	3.350	V
PQ1T351M2ZP	V_O	3.447	3.5	3.553	V
PQ1T361M2ZP	V_O	3.546	3.6	3.654	V
PQ1T381M2ZP	V_O	3.743	3.8	3.857	V
PQ1T401M2ZP	V_O	3.940	4.0	4.060	V
PQ1T501M2ZP	V_O	4.925	5.0	5.075	V

Table.2 Dropout voltage Line-up($I_O=60mA$) $(V_{IN}(*5), V_C=1.8V, I_O=60mA, T_a=25^\circ C)$

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	V_{i-o1}	–	0.17	0.35	V
PQ1T251M2ZP	V_{i-o1}	–	0.13	0.18	V
PQ1T271M2ZP	V_{i-o1}	–	0.12	0.17	V
PQ1T281M2ZP	V_{i-o1}	–	0.11	0.16	V
PQ1T301M2ZP	V_{i-o1}	–	0.10	0.15	V
PQ1T321M2ZP	V_{i-o1}	–	0.10	0.14	V
PQ1T331M2ZP	V_{i-o1}	–	0.10	0.14	V
PQ1T351M2ZP	V_{i-o1}	–	0.09	0.14	V
PQ1T361M2ZP	V_{i-o1}	–	0.09	0.13	V
PQ1T381M2ZP	V_{i-o1}	–	0.09	0.13	V
PQ1T401M2ZP	V_{i-o1}	–	0.08	0.12	V
PQ1T501M2ZP	V_{i-o1}	–	0.07	0.10	V

^{*5} Input voltage when output voltage falls 0.1V from that at $V_{IN}=V_O(TYP)+1.0V$.

Table.3 Dropout voltage Line-up(Io=150mA)

(VIN:(*5), VC=1.8V, Io=150mA, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	V _{i-o2}	—	0.40	0.68	V
PQ1T251M2ZP	V _{i-o2}	—	0.31	0.43	V
PQ1T271M2ZP	V _{i-o2}	—	0.28	0.40	V
PQ1T281M2ZP	V _{i-o2}	—	0.27	0.39	V
PQ1T301M2ZP	V _{i-o2}	—	0.25	0.37	V
PQ1T321M2ZP	V _{i-o2}	—	0.24	0.35	V
PQ1T331M2ZP	V _{i-o2}	—	0.24	0.35	V
PQ1T351M2ZP	V _{i-o2}	—	0.23	0.34	V
PQ1T361M2ZP	V _{i-o2}	—	0.22	0.33	V
PQ1T381M2ZP	V _{i-o2}	—	0.22	0.32	V
PQ1T401M2ZP	V _{i-o2}	—	0.21	0.31	V
PQ1T501M2ZP	V _{i-o2}	—	0.18	0.27	V

*5 Input voltage when output voltage falls 0.1V from that at Vin=Vo(TYP)+1.0V.

Table.4 Dropout voltage Line-up(Io=300mA)

(VIN:(*5), VC=1.8V, Io=300mA, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	V _{i-o3}	—	0.64	0.85	V
PQ1T251M2ZP	V _{i-o3}	—	0.54	0.74	V
PQ1T271M2ZP	V _{i-o3}	—	0.52	0.72	V
PQ1T281M2ZP	V _{i-o3}	—	0.51	0.71	V
PQ1T301M2ZP	V _{i-o3}	—	0.50	0.70	V
PQ1T321M2ZP	V _{i-o3}	—	0.48	0.68	V
PQ1T331M2ZP	V _{i-o3}	—	0.47	0.67	V
PQ1T351M2ZP	V _{i-o3}	—	0.46	0.65	V
PQ1T361M2ZP	V _{i-o3}	—	0.45	0.64	V
PQ1T381M2ZP	V _{i-o3}	—	0.44	0.62	V
PQ1T401M2ZP	V _{i-o3}	—	0.43	0.60	V
PQ1T501M2ZP	V _{i-o3}	—	0.35	0.50	V

*5 Input voltage when output voltage falls 0.1V from that at Vin=Vo(TYP)+1.0V.

Fig.1 Standard Test Circuit

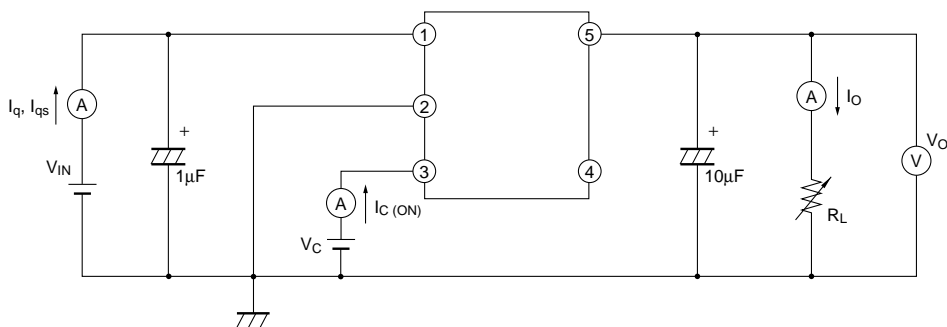


Fig.2 Test Circuit for Ripple Rejection

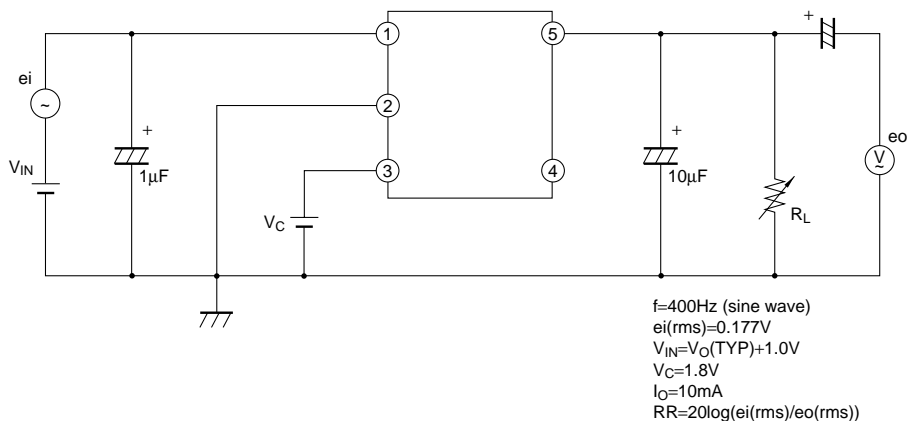


Fig.3 Power Dissipation vs. Ambient Temperature

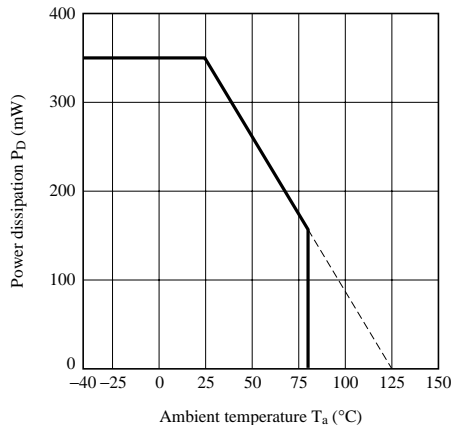


Fig.4 Overcurrent Protection Characteristics (Typical Value)

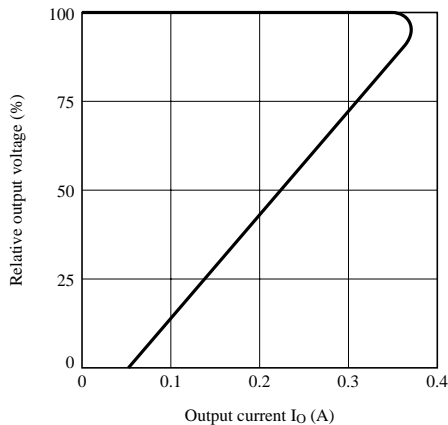


Fig.5 Output Voltage Fluctuation vs. Junction Temperature (PQ1T301M2ZP)(Typical Value)

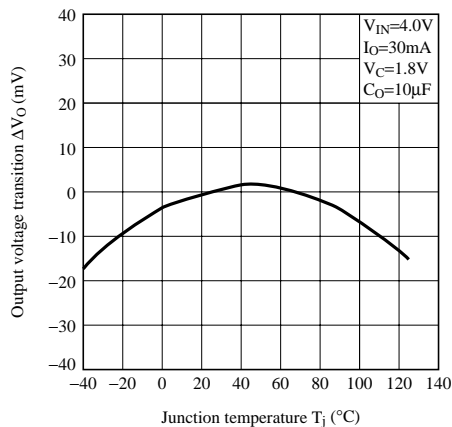


Fig.6 Output Voltage vs. Input Voltage (PQ1T301M2ZP)(Typical Value)

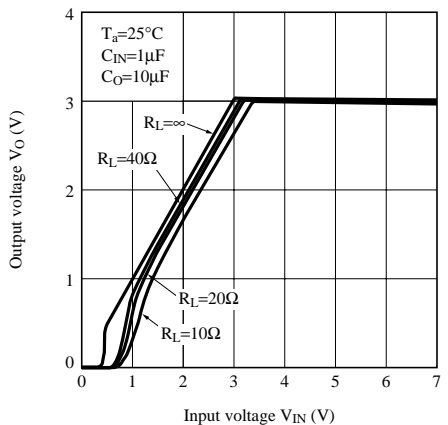


Fig.7 Circuit Operating Current vs. Input Voltage (PQ1T301M2ZP)(Typical Value)

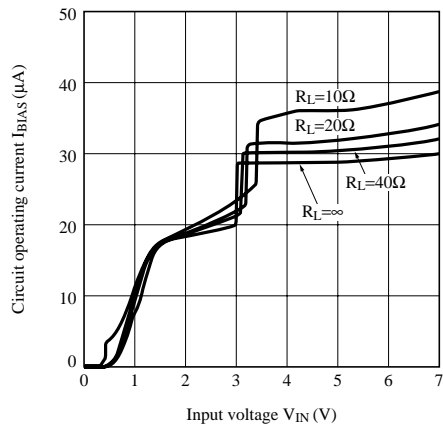


Fig.8 Dropout Voltage vs. Junction Temperature (PQ1T301M2ZP)(Typical Value)

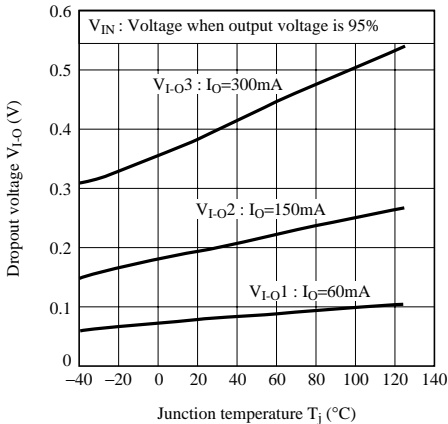


Fig.9 Quiescent Current vs. Junction Temperature (Typical Value)

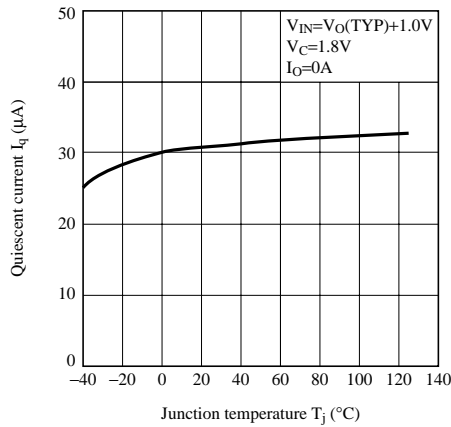


Fig.10 Ripple Rejection vs. Input Frequency

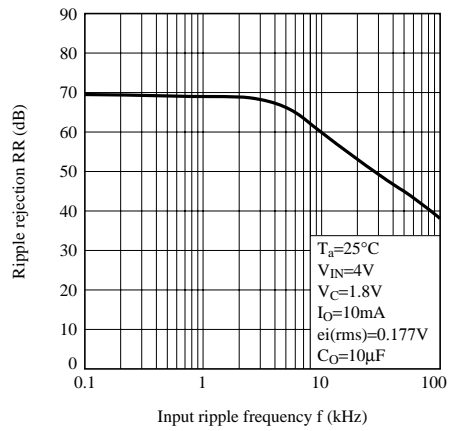


Fig.11 Dropout Voltage vs. Output Current (PQ1T301M2ZP)

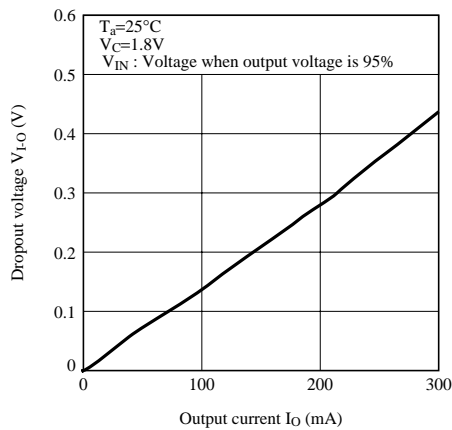
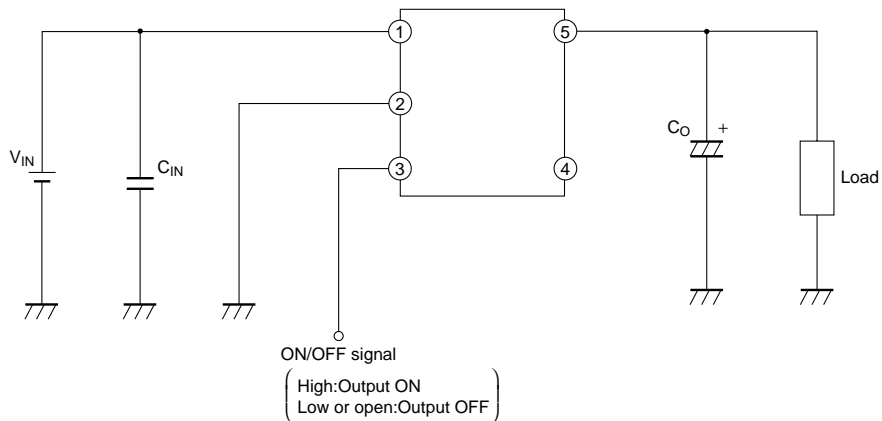
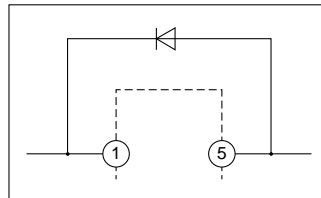


Fig.12 Example of Application



1. External connection

- (1) Please perform shortest wiring for connection between C_O or C_{in} and the individual terminal. There is case that oscillation occurs easily by kinds of capacity capacity and how to wire. Before you use this device, you should confirm output voltage in your actual using conditions.
- (2) The input terminal for ON/OFF output control is compatible with LS-TTL, and direct driving by TTL or C-MOS standard logic (RCA 4000 series) is also available.
- (3) If voltage is applied under the conditions that the device pin is connected divergently or reversely, the deterioration of characteristics or damage may occur. Never allow improper mounting.
- (4) If voltage exceeding the voltage of DC input terminal ① is applied to the output terminal ⑤, the element may be damaged. Especially when the DC input terminal ① is short-circuited to the GND in ordinary operating state, charges accumulated in the output capacitor C_o flow to the input side, causing damage to the element. In this case, connect the ordinary silicon diode as shown in the figure.



2. Thermal protection design

Maximum power dissipation of devices is obtained by the following equation.

$$P_D = V_{IN} \times I_{IN} - V_O \times I_O$$

When ambient temperature T_a and power dissipation P_D (MAX.) during operation are determined, use a heat sink which allows the element to operate within the safety operation area specified by the derating curve. Insufficient radiation gives an unfavorable influence to the normal operation and reliability of the device.

These devices are without built-in overheat protection function.

3. ESD (Electro Static Discharge)

Be careful not to apply electro static discharge to the device since this device employs a CMOS IC and may be damaged by electro static discharge. Followings are some methods against excessive voltage caused by electro static discharge.

- (1) Human body must be grounded to discharge the static electricity from the body or cloth.
- (2) Anything that is in contact with the device such as workbench, inserter, or measuring instrument must be grounded.
- (3) Use a solder dip basin with a minimum leak current (isolation resistance 10M Ω or more) from the commercial power supply. Also the solder dip basin must be grounded.

NOTICE

- The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.
- Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.
- Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:
 - (i) The devices in this publication are designed for use in general electronic equipment designs such as:
 - Personal computers
 - Office automation equipment
 - Telecommunication equipment [terminal]
 - Test and measurement equipment
 - Industrial control
 - Audio visual equipment
 - Consumer electronics
 - (ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
 - Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
 - Traffic signals
 - Gas leakage sensor breakers
 - Alarm equipment
 - Various safety devices, etc.
 - (iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:
 - Space applications
 - Telecommunication equipment [trunk lines]
 - Nuclear power control equipment
 - Medical and other life support equipment (e.g., scuba).
- Contact a SHARP representative in advance when intending to use SHARP devices for any "specific" applications other than those recommended by SHARP or when it is unclear which category mentioned above controls the intended use.
- If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Control Law of Japan, it is necessary to obtain approval to export such SHARP devices.
- This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.
- Contact and consult with a SHARP representative if there are any questions about the contents of this publication.