DATA SHEET
(Tentative)

Part No.	AN33017UA
Package Code No.	HQFP048-P-0707B

Contents

AN33017UA (Tentative)

1-channel DCDC Controller IC with Current Feedback

■ Overview

AN33017UA is a DC-DC controller which can be configured for step-down configuration.
The operating input voltage is between 5 V to 39 V.

■ Features

- Internal reference voltage is within ±1% accuracy
- Switching frequency is adjustable within the range of 200 kHz to 2 MHz by an external resistor
- Standby mode consumes less than 1 μA current
- Adjustable output voltage
- Output over voltage protection (OVP) function
- Output ground short protection function
- Over-current protection (OCP) with adjustable threshold.
- Power supply under-voltage lockout (UVLO) function
- Adjustable soft-start function
- Output Current feedback function

■ Application

- Car audio etc.

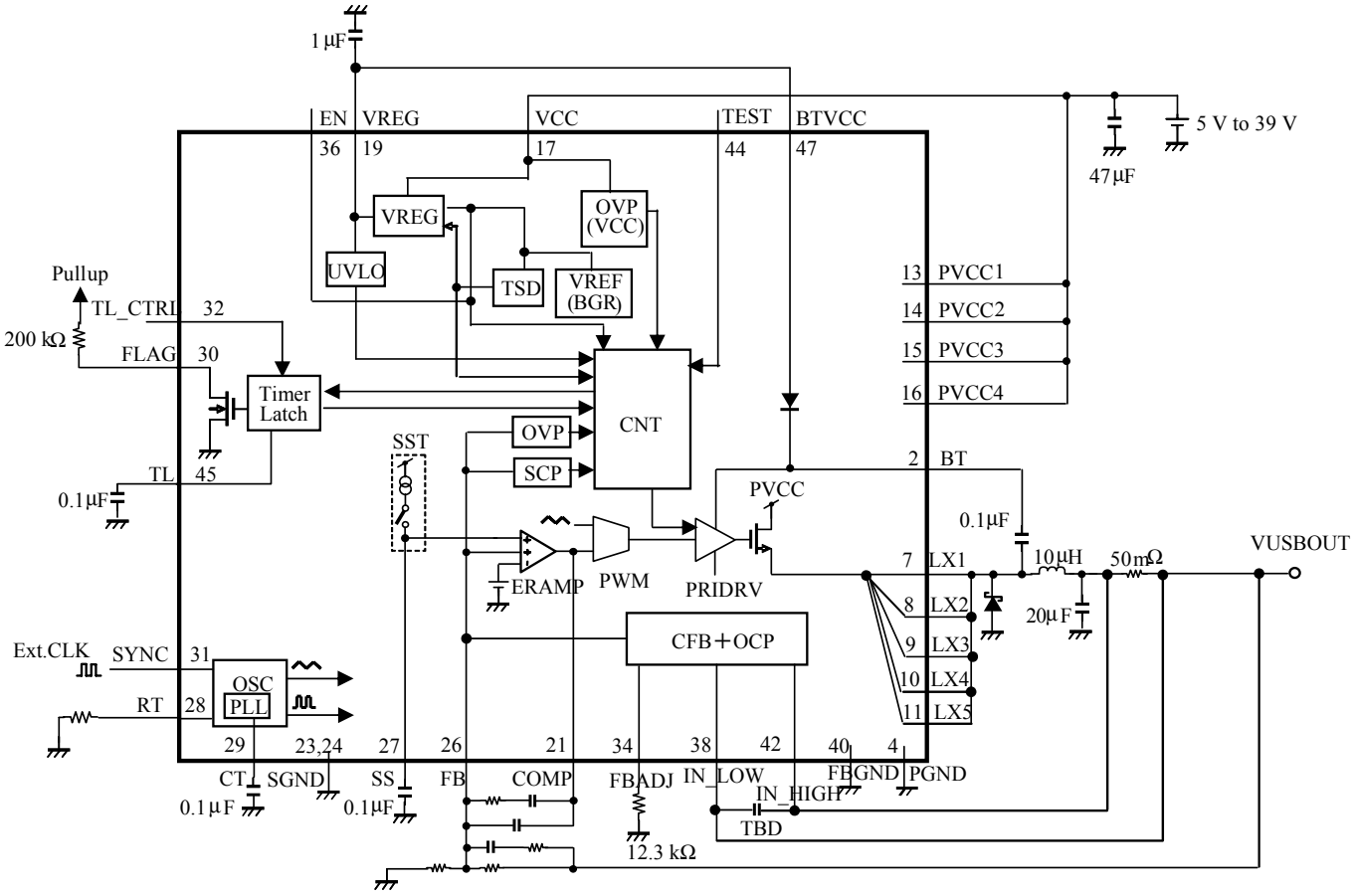
■ Package

- 48 Pin Plastic Quad Flat Package With Heat Sink (QFP)

■ Type

- Bi-CMOS IC

■ Application Circuit Example (Block Diagram)



Notes) • This application circuit is an example. The operation of mass production set is not guaranteed. Perform enough evaluation and verification on the design of mass production set.

• This block diagram is for explaining functions. The part of the block diagram may be omitted, or it may be simplified.

■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	NC	—	No connection
2	BT	Input	Connect to an external capacitor for Boot strap
3	NC	—	No connection
4	PGND	Ground	Power ground pin
5	NC	—	No connection
6	NC	—	No connection
7	LX1	Output	Connect to an external inductor and schottky diode
8	LX2	Output	Connect to an external inductor and schottky diode
9	LX3	Output	Connect to an external inductor and schottky diode
10	LX4	Output	Connect to an external inductor and schottky diode
11	LX5	Output	Connect to an external inductor and schottky diode
12	NC	—	No connection
13	PVCC1	Power Supply	Power supply pin for internal driver
14	PVCC2	Power Supply	Power supply pin for internal driver
15	PVCC3	Power Supply	Power supply pin for internal driver
16	PVCC4	Power Supply	Power supply pin for internal driver
17	VCC	Power Supply	Power supply pin
18	NC	—	No connection
19	VREG	Output	Connect to an external capacitor for internal regulator
20	NC	—	No connection

■ Pin Descriptions (continued)

Pin No.	Pin name	Type	Description
21	COMP	Output	Error amplifier output
22	NC	—	No connection
23	SGND	Ground	Ground pin
24	SGND	Ground	Ground pin
25	NC	—	No connection
26	FB	Input	Error amplifier negative input
27	SS	Input	Soft-start capacitor connection pin
28	RT	Input	Connect to an external resistor for adjustment of oscillation frequency
29	CT	Output	Low Pass filter function pin for PLL
30	FLAG	Output	Error flag output pin
31	SYNC	Input	External clock input for adjustment of oscillation frequency
32	TL_CTRL	Input	Connect to high to enable over current shut-down function
33	NC	—	No connection
34	FBADJ	Input/Output	Connect to an external resistor for adjustment of current feedback
35	NC	—	No connection
36	EN	Input	Enable pin
37	NC	—	No connection
38	IN_LOW	Input	Connection to current sensing port USB port side
39	NC	—	No connection
40	FBGND	Ground	Ground pin

■ Pin Descriptions (continued)

Pin No.	Pin name	Type	Description
41	NC	—	No connection
42	IN_HIGH	Input	Connection to current sensing port VOUT side
43	NC	—	No connection
44	TEST	Input	Test mode input pin
45	TL	Input	Connect to an external capacitor for adjustment of over-current detection time
46	NC	—	No connection
47	BTVCC	Input	Boot strap input pin
48	NC	—	No connection

■ Absolute Maximum Ratings

Note) Absolute maximum ratings are limit values which do not result in damages to this IC, and IC operation is not guaranteed at these limit values.

A No.	Parameter	Symbol	Rating	Unit	Notes
1	Supply voltage	V_{CC}	60	V	*1
2	Supply current	I_{CC}	2.5 (TBD)	A	*2
3	Power dissipation	P_D	(TBD)	mW	*3
4	Operating ambient temperature	T_{opr}	–40 to +85	°C	*4
5	Storage temperature	T_{stg}	–55 to +150	°C	*4

Notes) *1 : The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.
V_{CC} is voltage for VCC, PVCC1, PVCC2, PVCC3, PVCC4. VCC = PVCC1 = PVCC2=PVCC3=PVCC4.
*2 : Without power dissipation (P_D) and area of safety operation (ASO) constraint.
$I_{CC} = I_{VCC} + I_{PVCC1} + I_{PVCC2} + I_{PVCC3} + I_{PVCC4}$.
*3 : The power dissipation shown is the value at T_a = 85°C for the independent (unmounted) IC package without a heat sink.
When using this IC, refer to the P_D-T_a diagram of the package standard and design the heat radiation with sufficient margin so that the allowable value might not be exceeded based on the conditions of power supply voltage, load, and ambient temperature.
*4 :Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for T_a = 25°C.

■ Operating Supply Voltage Range

Parameter	Symbol	Range	Unit	Notes
Supply Voltage Range	V_{CC}	5 to 39	V	*5

Note) *5 :The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

■ Electrical Characteristics at V_{CC} = 12 V, V_{OUT} = 5.0 V, RT = 130 kΩ, RADJ = 12.3 kΩ

Note) T_a = 25°C±2°C unless otherwise specified.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Notes
				Min	Typ	Max		
Circuit current consumption								
1	Quiescent current	I_{CQ}	FB = 1.1 V EN = 3.3 V No switching	—	1.2	1.9 (TBD)	mA	—
2	Standby current	I_{STBY}	EN = 0.4 V	—	—	1	µA	—
3	Enable Low input threshold	V_{IL1}	—	—	—	0.4	V	—
4	Enable High input threshold	V_{IH1}	—	2.0	—	—	V	—
5	EN pin input current	V_{IC1}	EN = 3.3 V	—	33	70	µA	—
6	TL_CTRL Low input threshold	V_{IL2}	—	—	—	0.4	V	—
7	TL_CTRL High input threshold	V_{IH2}	—	2.0	—	—	V	—
BGR								
8	Feedback voltage	V_{REF}	FB connected to COMP	0.99	1.0	1.01	V	—
SYNCHRONIZATION (SYNC)								
9	Low input threshold	V_{IL3}	—	—	—	0.4	V	—
10	High input threshold	V_{IH3}	—	2.0	—	—	V	—
11	SYNC pin input current	V_{IC2}	SYNC = 3.3 V	—	33	60	µA	
Oscillator								
12	Oscillator frequency	F_{OUT1}	RT = 130 kΩ	465	490	515	kHz	—
13	Oscillator frequency range	F_{OUT2}		200	—	2000	kHz	—
14	External sync frequency range	F_{SYNC}	RT = 130 kΩ Fout1 = 490 kHz	520	—	730	kHz	—

■ Electrical Characteristics (continued)
at V_{CC} = 12 V, V_{OUT} = 5.0 V, RT = 130 kΩ, RADJ = 12.3 kΩ

Note) T_a = 25°C±2°C unless otherwise specified.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Notes
				Min	Typ	Max		
Over-current protection								
15	Over-current threshold voltage	V_{OCP}	(IN_HIGH – IN_LOW)	(TBD)	125	(TBD)	mV	*1
Over-voltage protection								
16	Over-voltage threshold voltage for VFB	V_{OVP1}	For FB	1.04 (TBD)	1.12	1.20 (TBD)	V	—
17	Over-voltage threshold voltage for VCC	V_{OVP2}	For VCC	40	45	50	V	—
Internal regulator								
18	Internal regulator output voltage	V_{REG}	C_{REG} = 1 µF	4.5	4.9	5.3	V	—
GND short protection								
19	Short detection voltage	V_{SCP}	monitor FB	0.15	0.3	0.45	V	—
Current feedback function								
20	Current feedback output voltage1	V_{CFB1}	monitor FBADJ IN_HIGH=5V , FB=1.1V at IN_HIGH – IN_LOW = 50mV	(TBD)	200	(TBD)	mV	*1
21	Current feedback output voltage2	V_{CFB2}	monitor FBADJ IN_HIGH=5V , FB=1.1V at IN_HIGH – IN_LOW = 105mV	(TBD)	420	(TBD)	mV	*1
22	Current feedback factor	V_{CFBF}	$(V_{CFB2} - V_{CFB1})$/ {4×(105mV – 50mV)}	(TBD)	1	(TBD)	time	—

Note) *1 : This parameter is tested with DC measurement.

■ Technical Data

1. Current Feedback function

The following expression shows the relation between Current Feedback Adjustment Resistance R_{RADJ} and Sense Resistance RSENSE and Impedance Rcable (ex. External connection cables).

$$R_{RADJ} = Ra \frac{4 \times RSENSE}{Rcable} [\Omega]$$

The following expression shows the relation between Voltage V_USB and R_{RADJ}.

$$V\_USB = \left\{1 + Ra \times \left(\frac{1}{Rb} + \frac{4 \times RSENSE \times IOUT}{R_{RADJ}} \right) \right\} \times 1.0\ V \quad - Rcable \times IOUT\ [V]$$

With respect to above formula,

1) I is current flowing through RSENSE.
2) 1.0 V is the internal reference voltage (VREF) of IC.

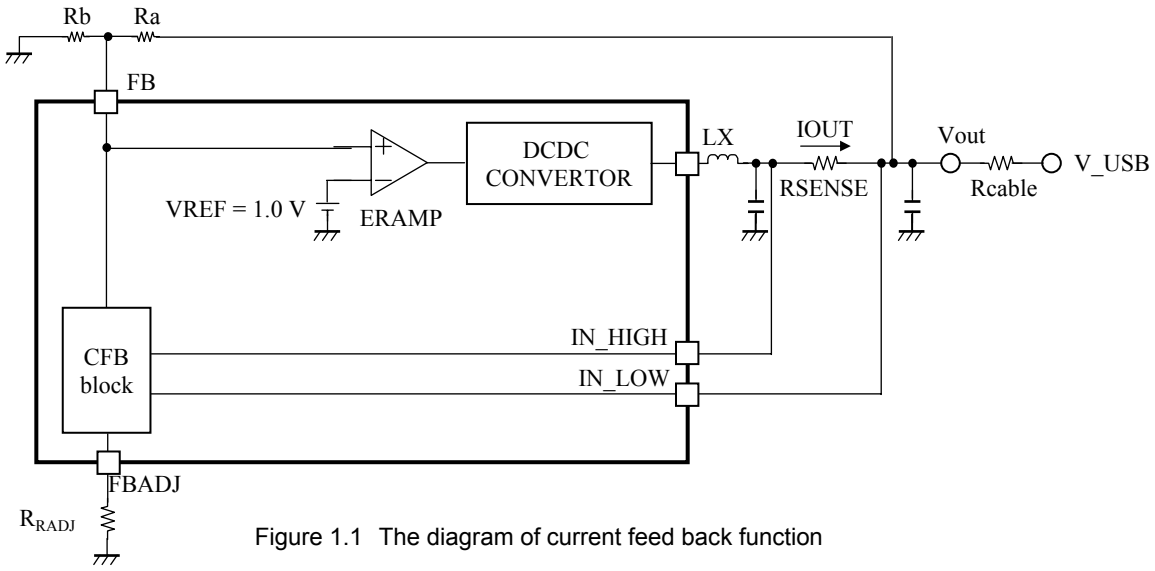


Figure 1.1 The diagram of current feed back function

* This function is suitable at below conditions: output voltage range from 3 V to 7 V, Rcable resistance is equal or less than 0.5 Ω. The voltage of IN_HIGH pin and IN_LOW pin might be higher than its absolute voltage when Rcable is over than 0.5 Ω. And V_USB has the voltage drop of the impedance when Rcable's impedance change to more than 0.5 Ω by external factor such as a heat on the condition of R_{RADJ} setting for Rcable is 0.5 Ω or lower (example: condition of R_{RADJ} setting for Rcable = 0.2 Ω).

■ Technical Data (continued)

1. Current Feedback function (continued)

The following expression shows the relation between IOUT and voltage drop ΔV of Impedance Rcable (ex. External connection cables).

$$\Delta V = Rcable \times IOUT$$

The following expression shows the relation between above formula and Voltage V_USB and R_{RADJ}.

$$\Delta V = \left\{ 1 + Ra \times \left(\frac{1}{Rb} + \frac{4 \times RSENSE \times I}{R_{RADJ}} \right) \right\} \times 1.0\ V - V\_USB\ [V]$$

At this point,

$$Vout = \left\{ 1 + Ra \times \left(\frac{1}{Rb} + \frac{4 \times RSENSE \times I}{R_{RADJ}} \right) \right\} \times 1.0\ V\ [V]$$

The following graph shows the expression of ΔV = Vout – V_USB against IOUT.
The following graph is Ra = 31.2 kΩ, Rb = 7.5 kΩ, RSENSE = 56 mΩ.

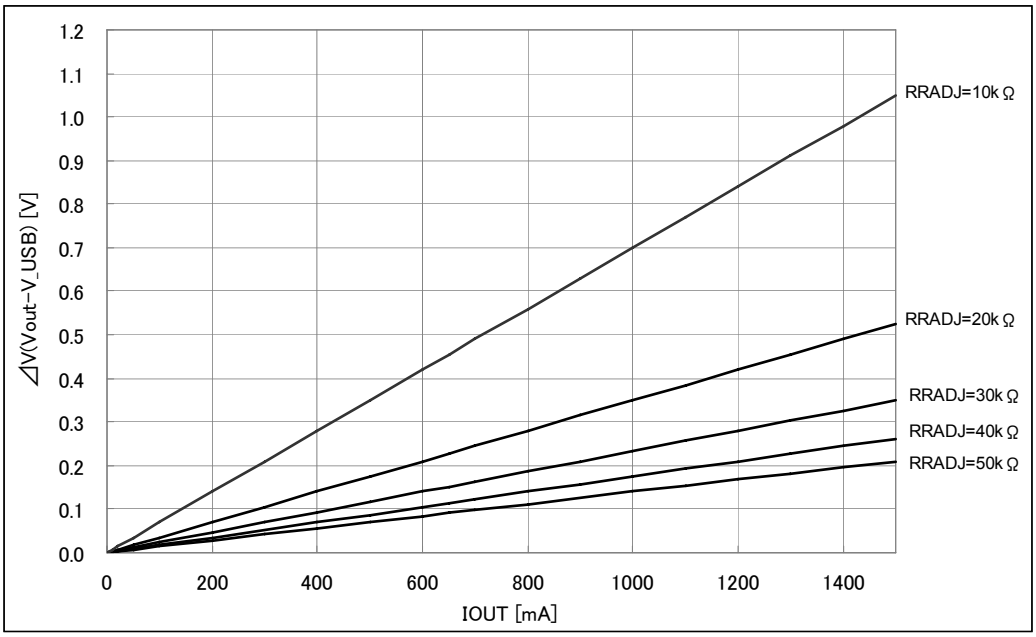


Figure 1.2 The graph of ΔV = Vout – V_USB against IOUT

■ Usage Notes

•Special attention and precaution in using

1. This IC is intended to be used for general electronic equipment.
   Consult our sales staff in advance for information on the following applications:
   ・Special applications in which exceptional quality and reliability are required, or if the failure or malfunction of this IC may directly jeopardize life or harm the human body.
   ・Any applications other than the standard applications intended.
   (1) Space appliance (such as artificial satellite, and rocket)
   (2) Traffic control equipment (such as for automobile, airplane, train, and ship)
   (3) Medical equipment for life support
   (4) Submarine transponder
   (5) Control equipment for power plant
   (6) Disaster prevention and security device
   (7) Weapon
   (8) Others : Applications of which reliability equivalent to (1) to (7) is required
   It is to be understood that our company shall not be held responsible for any damage incurred as a result of or in connection with your using the IC described in this book for any special application, unless our company agrees to your using the IC in this book for any special application.

2. Pay attention to the direction of LSI. When mounting it in the wrong direction onto the PCB (printed-circuit-board), it might smoke or ignite.

3. Pay attention in the PCB (printed-circuit-board) pattern layout in order to prevent damage due to short circuit between pins. In addition, refer to the Pin Description for the pin configuration.

4. Perform a visual inspection on the PCB before applying power, otherwise damage might happen due to problems such as a solder-bridge between the pins of the semiconductor device. Also, perform a full technical verification on the assembly quality, because the same damage possibly can happen due to conductive substances, such as solder ball, that adhere to the LSI during transportation.

■ Usage Notes (continued)

• Special attention and precaution in using (continued)

5. Take notice in the use of this product that it might break or occasionally smoke when an abnormal state occurs such as output pin-V_{CC} short (Power supply fault), output pin-GND short (Ground fault), or output-to-output-pin short (load short) .
   And, safety measures such as an installation of fuses are recommended because the extent of the above-mentioned damage and smoke emission will depend on the current capability of the power supply.

6. When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
   Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

7. When using the LSI for new models, verify the safety including the long-term reliability for each product.

8. When the application system is designed by using this LSI, be sure to confirm notes in this book.
   Be sure to read the notes to descriptions and the usage notes in the book.

9. Take notice in the use of this product that it might ignite or occasionally smoke when the 5.5 V or 10 V rating pin is short to the 40 V rating (5.5 V or more) pin.
   The 5.5 V rating pin are VREG, FB, COMP, SS, CT, RT, SYNC, FLAG, TL, RADJ and BTVCC.
   The 10 V rating pin are IN_HIGH, and IN_LOW.
   The 60 V rating pin are VCC, PVCC1, PVCC2, PVCC3, PVCC4, BT , LX1 , LX2 , LX3 , LX4 , LX5 and EN.

10. Take notice in the use of this product that it might break or occasionally smoke when an abnormal state occurs such as BT pin-VCC short (Power supply fault), LX pin-GND short (Ground fault).

■ Usage Notes (continued)

- Notes of Power LSI

1. The protection circuit is for maintaining safety against abnormal operation. Therefore, the protection circuit should not work during normal operation.
   Especially for the thermal protection circuit, if the area of safe operation or the absolute maximum rating is momentarily exceeded due to output pin to V_{CC} short (Power supply fault), or output pin to GND short (Ground fault), the LSI might be damaged before the thermal protection circuit could operate.

2. Unless specified in the product specifications, make sure that negative voltage or excessive voltage are not applied to the pins because the device might be damaged, which could happen due to negative voltage or excessive voltage generated during the ON and OFF timing when the inductive load of a motor coil or actuator coils of optical pick-up is being driven.

3. The product which has specified ASO (Area of Safe Operation) should be operated in ASO.

4. Verify the risks which might be caused by the malfunctions of external components.

Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book are intended to be used for general applications (such as office equipment, communications equipment, measuring instruments and household appliances), or for specific applications as expressly stated in this book.
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automotive equipment, traffic signaling equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.

It is to be understood that our company shall not be held responsible for any damage incurred as a result of or in connection with your using the products described in this book for any special application, unless our company agrees to your using the products in this book for any special application.

(4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

20100202

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Switching Voltage Regulators ***category:***

Click to view products by Panasonic ***manufacturer:***

Other Similar products are found below :

FAN53610AUC33X FAN53611AUC123X FAN48610BUC33X FAN48610BUC45X FAN48617UC50X R3 430464BB KE177614 MAX809TTR NCV891234MW50R2G NCP81103MNTXG NCP81203PMNTXG NCP81208MNTXG NCP81109GMNTXG SCY1751FCCT1G NCP81109JMNTXG AP3409ADNTR-G1 NCP81241MNTXG LTM8064IY LT8315EFE#TRPBF LTM4668AIY#PBF NCV1077CSTBT3G XCL207A123CR-G MPM54304GMN-0002 MPM54304GMN-0003 XDPE132G5CG000XUMA1 MP8757GL-P MIC23356YFT-TR LD8116CGL HG2269M/TR OB2269 XD3526 U6215A U6215B U6620S LTC3803ES6#TR LTC3803ES6#TRM LTC3412IFE LT1425IS MAX25203BATJA/VY+ MAX77874CEWM+ XC9236D08CER-G ISL95338IRTZ MP3416GJ-P BD9S201NUX-CE2 MP5461GC-Z MPQ4415AGQB-Z MPQ4590GS-Z MCP1603-330IMC MCP1642B-18IMC