PQxxxEF01SZH Series

TO-220 Type,Low Voltage Operation
Low Power-Loss Voltage Regulators

■ Features

1. Low voltage operation
   (Minimum operating voltage: 2.35V)
   2.5V input → available 1.5 to 1.8V output
2. Low dissipation current
   (Dissipation current at no load: MAX. 2mA
   Output OFF-state dissipation current: MAX.5μA)
3. Low power-loss
   Dropout voltage: MAX.0.5V
4. Built-in overcurrent and overheat protection functions
5. RoHS directive compliant

■ Applications

1. Peripheral equipment of personal computers
2. Power supplies for various electronic equipment such as DVD player or STB
3. LBP

■ Model Line-up

Output voltage	Model No.	Output voltage	Model No.
1.5V	PQ015EF01SZH	2.5V	PQ025EF01SZH
1.8V	PQ018EF01SZH	3.3V	PQ033EF01SZH

■ Absolute Maximum Ratings

(Ta=25°C)

Parameter	Symbol	Rating	Unit
[*1] Input voltage	V_{IN}	10	V
[*1] ON/OFF control terminal voltage	V_C	10	V
Output current	I_O	1.0	A
[*2] Power dissipation	P_{D1}	1.4	W
	P_{D2}	15	
[*3] Junction temperature	T_j	150	°C
Operating temperature	T_{opr}	-40 to +85	°C
Storage temperature	T_{stg}	-40 to +150	°C
Soldering temperature	T_{sol}	260(10s)	°C

*1 All are open except GND and applicable terminals.
*2 P_{D1}: No heat sink, P_{D2}: With infinite heat sink.
*3 Overheat protection may operate at Tj=125°C to 150°C

■ Outline Dimensions

(Unit : mm)

( ) : Typical dimensions
Product mass:(1.5g)

① DC input (V_{IN})
② DC output (V_O)
③ GND
④ ON/OFF control terminal (V_C)

Internal connection diagram

① DC input
② DC output
③ GND
④ ON/OFF control terminal
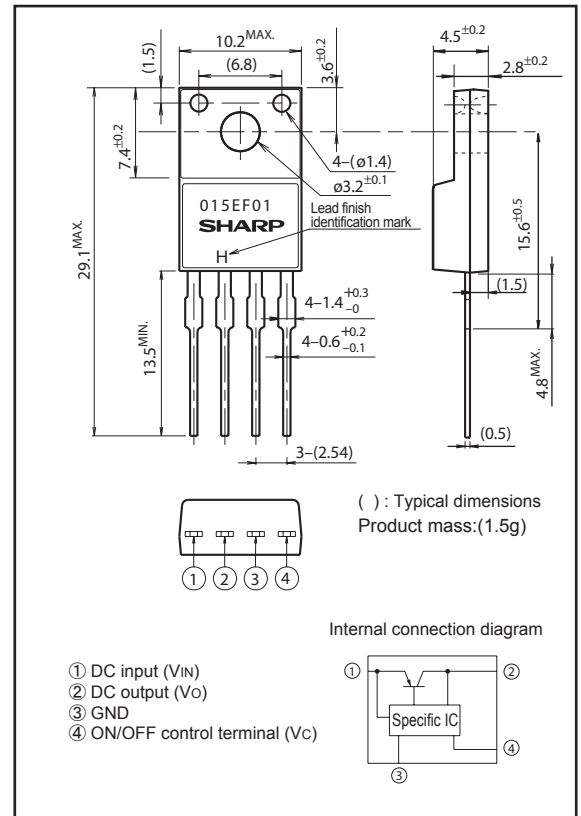
Specific IC

Lead finish:Lead-free solder plating
(Composition: Sn2Cu)

Sheet No.: OP06048

■ Electrical Characteristics

(Unless otherwise specified,condition shall be $V_{IN}=V_O$(TYP.)+1V,I_O=0.5A,V_C=2.7V,T_a=25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input voltage	V_{IN}	–	Refer to the table below			V
Output voltage	V_O	–	Refer to the table below			V
Load regulation	R_{egL}	I_O=5mA to 1A	–	0.2	2	%
Line regulation	R_{egl}	$V_{IN}=V_O$(TYP.)+1V to V_O(TYP.)+6V , I_O=5mA	–	0.1	1	%
Temperature coefficient of output voltage	T_CV_O	T_j=0 to +125°C, I_O=5mA	–	±0.01	–	%/°C
Ripple rejection	RR	–	45	60	–	dB
*5 Dropout voltage	V_{I-O}	I_O=0.5A(at V_O=0.95V)	–	–	0.5	V
*4 ON-state voltage for control	$V_{C(ON)}$	–	2	–	–	V
ON-state current for control	$I_{C(ON)}$	–	–	–	200	µA
OFF-state voltage for control	$V_{C(OFF)}$	I_O=0A	–	–	0.8	V
OFF-state current for control	$I_{C(OFF)}$	I_O=0A,V_C=0.4V	–	–	2	µA
Quiescent current	I_q	I_O=0A	–	1	2	mA
Output OFF-state dissipation current	I_{qs}	I_O=0A, V_C=0.4V	–	–	5	µA

*4 In case of opening control terminal ④, output voltage turns off.

*5 In case of **PQ033EF01SZH**,apply to **PQ033EF01SZH** specification sheet.

Table.1 Input Voltage Range

Model No.	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
PQ015EF01SZH	V_{IN}	I_O=0.5A, V_C=2.7V, T_a=25°C	2.35	–	10	V
PQ018EF01SZH			2.35	–	10	
PQ025EF01SZH			3.0	–	10	
PQ033EF01SZH			3.8	–	10	

Table.2 Output Voltage

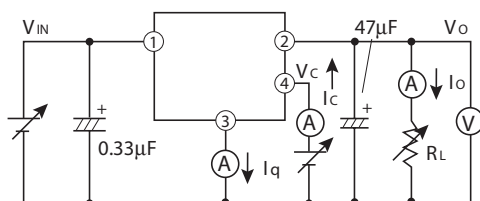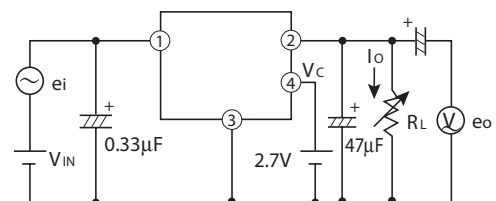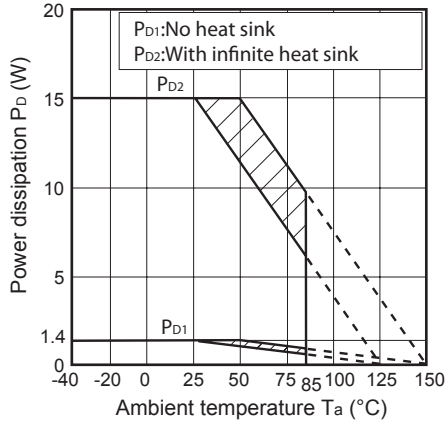| Model No.	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
PQ015EF01SZH	V_O	$V_{IN}=V_O$ (TYP.)+1V, I_O=0.5A, V_C=2.7V, T_a=25°C	1.45	1.5	1.55	V
PQ018EF01SZH			1.75	1.8	1.85	
PQ025EF01SZH			2.438	2.5	2.562	
PQ033EF01SZH			3.218	3.3	3.382	

Fig.1 Test Circuit

Fig.2 Test Circuit of Ripple Rejection

f=120Hz (sine wave)
e_i(rms)=0.5V
$V_{IN}=V_O$(TYP)+2V
I_O=0.3A
RR=20 log(e_i(rms)/e_o(rms))

Fig.3 Power Dissipation vs. Ambient
Temperature

Note) Oblique line portion:Overheat protection may operate in this area.

Fig.4 Overcurrent Protection Characteristics
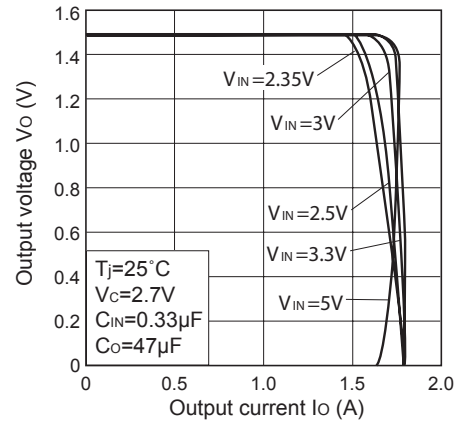(Typical Value, **PQ015EF01SZH**)

Fig.5 Overcurrent Protection Characteristics
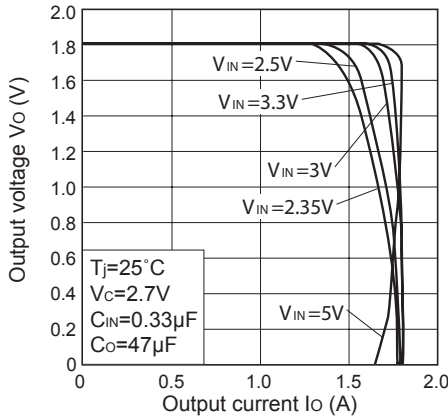(Typical Value, **PQ018EF01SZH**)

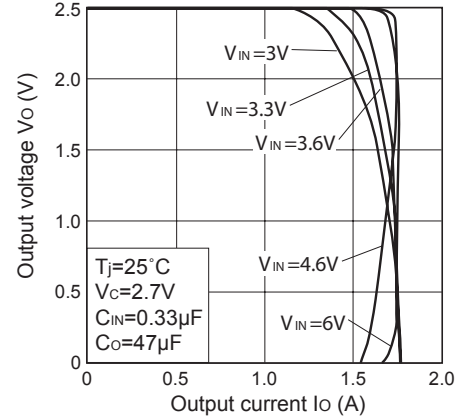Fig.6 Overcurrent Protection Characteristics
(Typical Value, **PQ025EF01SZH**)

Fig.7 Overcurrent Protection Characteristics
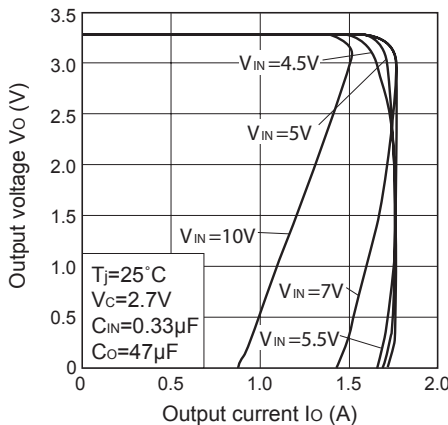(Typical Value, **PQ033EF01SZH**)

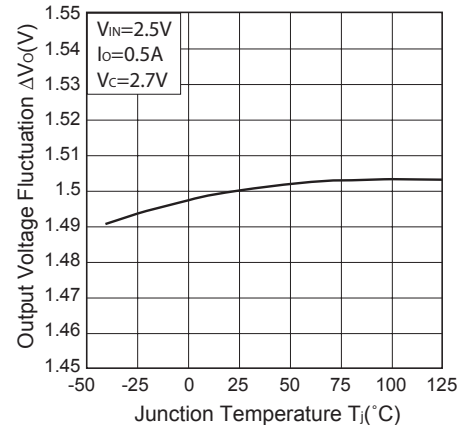Fig.8 Output Voltage Fluctuation vs. Junction
Temperature (**PQ015EF01SZH**)

Fig.9   Output Voltage Fluctuation vs. Junction
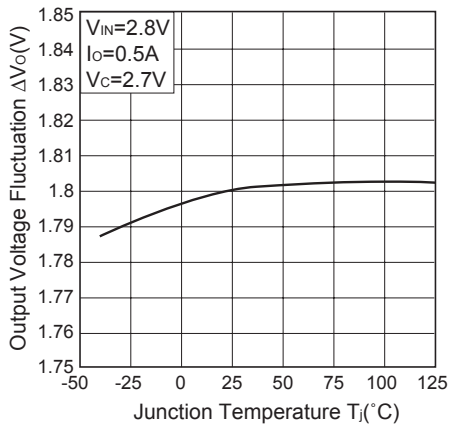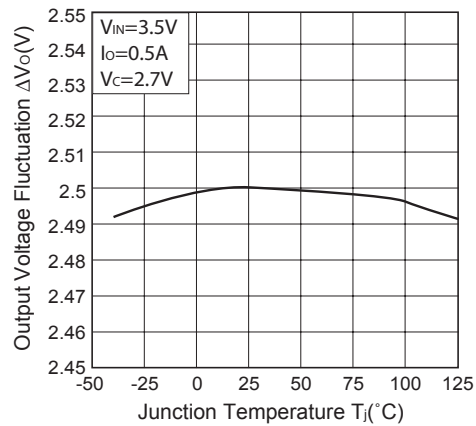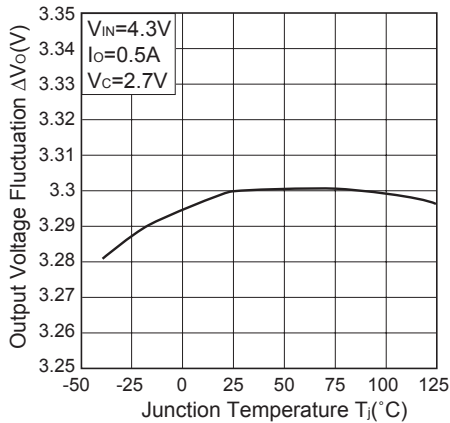   Temperature (**PQ018EF01SZH**)

$V_{IN}=2.8V$
$I_O=0.5A$
$V_C=2.7V$

Output Voltage Fluctuation ΔV_O(V) vs. Junction Temperature T_j(°C)

Fig.10   Output Voltage Fluctuation vs. Junction
         Temperature (**PQ025EF01SZH**)

$V_{IN}=3.5V$
$I_O=0.5A$
$V_C=2.7V$

Output Voltage Fluctuation ΔV_O(V) vs. Junction Temperature T_j(°C)

Fig.11   Output Voltage Fluctuation vs. Junction
         Temperature (**PQ033EF01SZH**)

$V_{IN}=4.3V$
$I_O=0.5A$
$V_C=2.7V$

Output Voltage Fluctuation ΔV_O(V) vs. Junction Temperature T_j(°C)

Fig.12   Output Voltage vs. Input Voltage
         (**PQ015EF01SZH**)

$T_j=25°C$
$V_C=2.7V$
$C_{IN}=0.33\mu F$
$C_O=47\mu F$

$R_L=1.5\Omega(I_O=1A)$
$R_L=3\Omega(I_O=0.5A)$
$R_L=\infty\Omega(I_O=0A)$

Output Voltage V_O (V) vs. Input Voltage V_{IN} (V)

Fig.13   Output Voltage vs. Input Voltage
         (**PQ018EF01SZH**)

$T_j=25°C$
$V_C=2.7V$
$C_{IN}=0.33\mu F$
$C_O=47\mu F$

$R_L=1.8\Omega(I_O=1A)$
$R_L=3.6\Omega(I_O=0.5A)$
$R_L=\infty\Omega(I_O=0A)$

Output Voltage V_O (V) vs. Input Voltage V_{IN} (V)

Fig.14   Output Voltage vs. Input Voltage
         (**PQ025EF01SZH**)

$R_L=\infty\Omega(I_O=0A)$
$R_L=5\Omega(I_O=0.5A)$
$R_L=2.5\Omega(I_O=1A)$

$T_j=25°C$
$V_C=2.7V$
$C_{IN}=0.33\mu F$
$C_O=47\mu F$
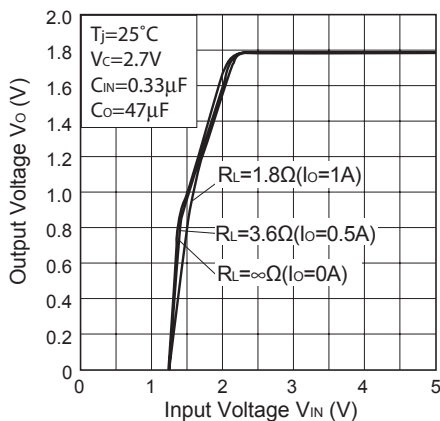
Output Voltage V_O (V) vs. Input Voltage V_{IN} (V)
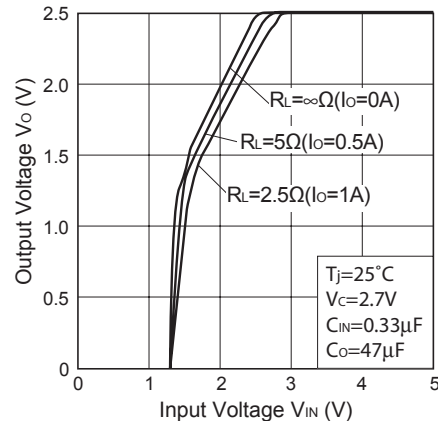
Fig.15 Output Voltage vs. Input Voltage (**PQ033EF01SZH**)
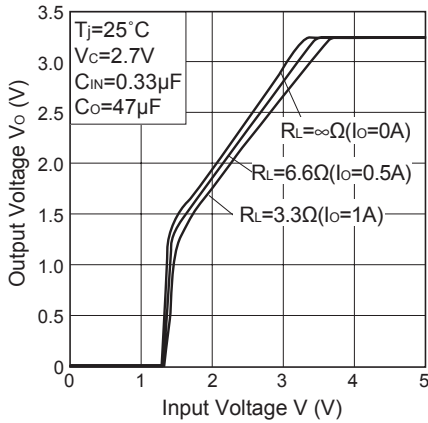

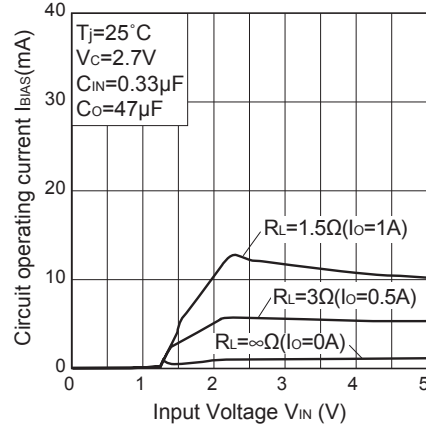Fig.16 Circuit Operating Current vs. Input Voltage (**PQ015EF01SZH**)

Fig.17 Circuit Operating Current vs. Input Voltage (**PQ018EF01SZH**)
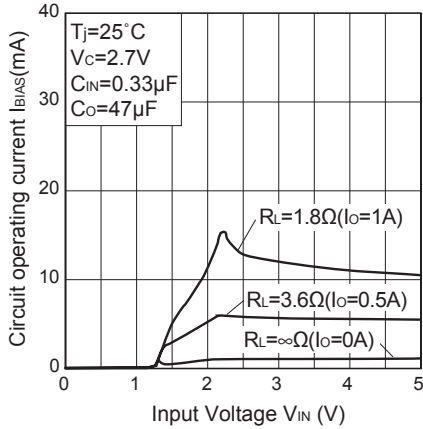

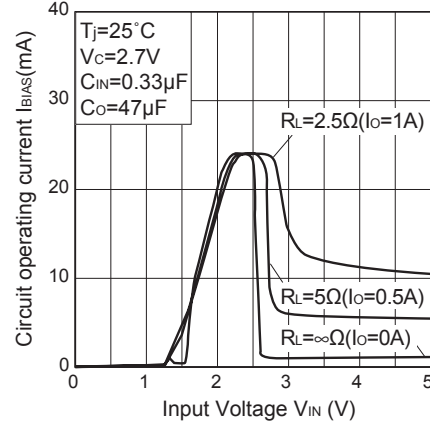Fig.18 Circuit Operating Current vs. Input Voltage (**PQ025EF01SZH**)

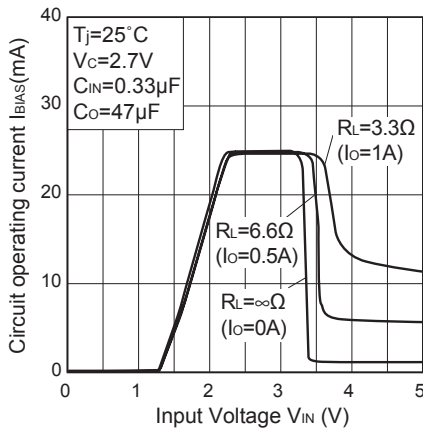Fig.19 Circuit Operating Current vs. Input Voltage (**PQ033EF01SZH**)

Fig.20 Dropout Voltage vs. Junction Temperature (**PQ033EF01SZH**)
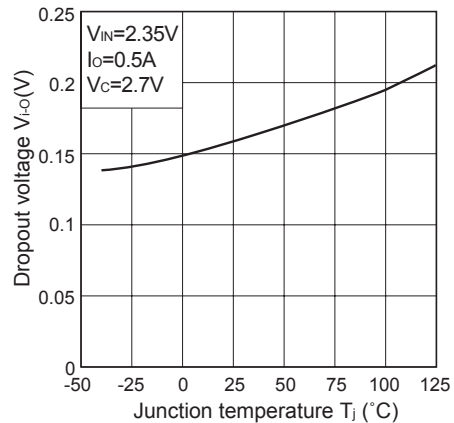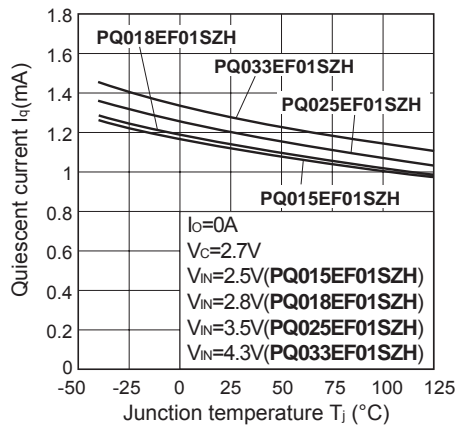
Fig.21 Quiescent Current vs. Junction Temperature

Fig.21 Quiescent Current vs. Junction Temperature

- PQ018EF01SZH
- PQ033EF01SZH
- PQ025EF01SZH
- PQ015EF01SZH

$I_O=0A$
$V_C=2.7V$
$V_{IN}=2.5V$(**PQ015EF01SZH**)
$V_{IN}=2.8V$(**PQ018EF01SZH**)
$V_{IN}=3.5V$(**PQ025EF01SZH**)
$V_{IN}=4.3V$(**PQ033EF01SZH**)

Fig.22 Ripple Rejection vs. Input Ripple Frequency

Fig.22 Ripple Rejection vs. Input Ripple Frequency

- PQ025EF01SZH
- PQ015EF01SZH
- PQ033EF01SZH
- PQ018EF01SZH

$e_i(rms)=0.5V$,
$V_{IN}=V_O(TYP)+2V$
$I_O=0.5A$
$C_O=4.7\mu F$
$T_j=25°C$
$V_C=2.7V$

Fig.23 Ripple Rejection vs. Output Current

Fig.23 Ripple Rejection vs. Output Current

- PQ018EF01SZH
- PQ015EF01SZH
- PQ025EH02ZH
- PQ033EF01SZH

$e_i(rms)=0.5V$,
$f=120Hz$
$V_{IN}=V_O(TYP)+2V$
$C_O=4.7\mu F$
$T_j=25°C$
$V_C=2.7V$

■ Typical Application

DC input

V_{IN}

Vo

Co

Load

ON/OFF signal
High : Output ON
Low or Open : Output OFF