PQ3RF23/PQ3RF33

3.3V Output, High Output Current(2A, 3.5A)Type Low Power-loss Voltage Regulators

■ Features

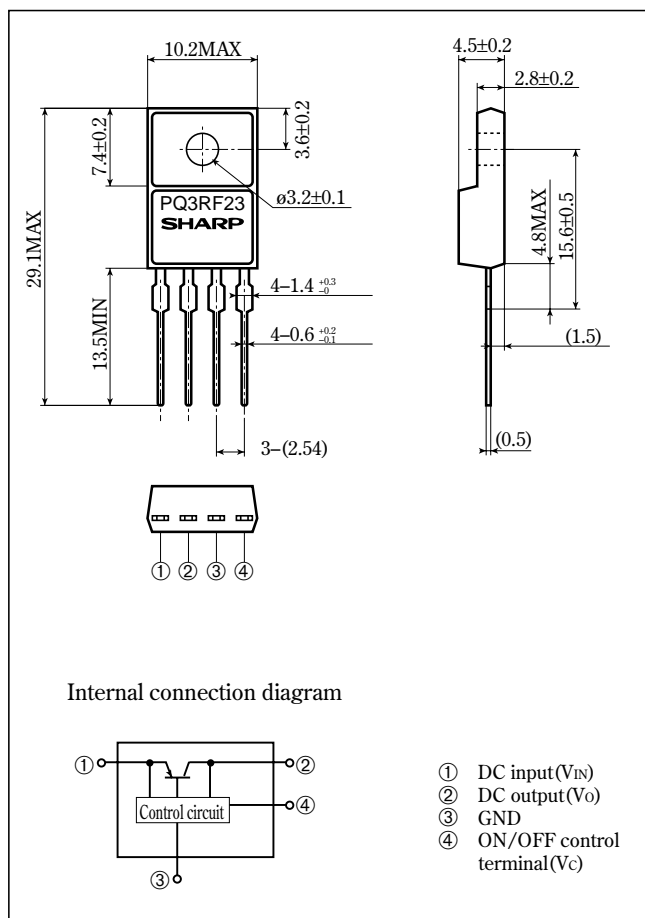- 3.3V output
- High output current
  2A type:PQ3RF23
  3.5A type:PQ3RF33
- Compact resin full-mold package(TO-220 package)
- Low power-loss(Dropout voltage:MAX. 0.5V)
- High-precision output voltage type
  Output voltage precision:±2.5%
- Built-in ON/OFF control function
- Built-in overcurrent protection, overheat protection function

■ Applications

- Power supplies for various electronic equipment such as personal computers

■ Outline Dimensions

(Unit : mm)

Internal connection diagram

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

■ Absolute Maximum Ratings

(T_a=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	PQ3RF23	2	A
		PQ3RF33	3.5	
Power dissipation(No heat sink)	P_{D1}	PQ3RF23	1.5	W
		PQ3RF33	1.8	
Power dissipation(With infinite heat sink)	P_{D2}	18		W
[2] Junction temperature	T_j	150		˚C
Operating temperature	T_{opr}	−20 to +80		˚C
Storage temperature	T_{stg}	−40 to +150		˚C
Soldering temperature	T_{sol}	260(For 10s.)		˚C

[1] All are open except GND and applicable terminals.

[2] Overheat protection may operate at $125 <= T_j <= 150$˚C.

- Please refer to the chapter " Handling Precautions ".

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Internet   Internet address for Electronic Components Group   http://sharp-world.com/ecg/

■ **Electrical Characteristics** (Unless otherwise specified, conditions shall be I_O=1.0A[PQ3RF23]/I_O=1.5A[PQ3RF33], V_{IN}=5V, T_a=25˚C)

| Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage		V_O	–	3.218	3.3	3.382	V
Load regulation	PQ3RF23	$R_{eg}L$	I_O=5mA to 2.0A	–	0.2	2	%
	PQ3RF33		I_O=5mA to 3.5A	–	0.2	2	
Line regulation		$R_{eg}I$	V_{IN}=4 to 10V	–	0.5	2.5	%
Temperature coefficient of output voltage		T_CV_O	T_j=0 to 125˚C	–	±0.02	–	%/˚C
Ripple rejection		RR	–	45	55	–	dB
Dropout voltage	PQ3RF23	$V_{i\text{-}o}$	※3, I_O=2.0A	–	–	0.5	V
	PQ3RF33		※3, I_O=3.0A	–	–	0.5	
※4 ON-state voltage for control		$V_{C(ON)}$	–	2	–	–	V
ON-state current for control		$I_{C(ON)}$	V_C=2.7V	–	–	20	μA
OFF-state voltage for control		$V_{C(OFF)}$	–	–	–	0.8	V
OFF-state current for control		$I_{C(OFF)}$	V_C=0.4V	–	–	−0.4	mA
Quiescent current		I_q	I_O=0A	–	–	10	mA

※3 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.

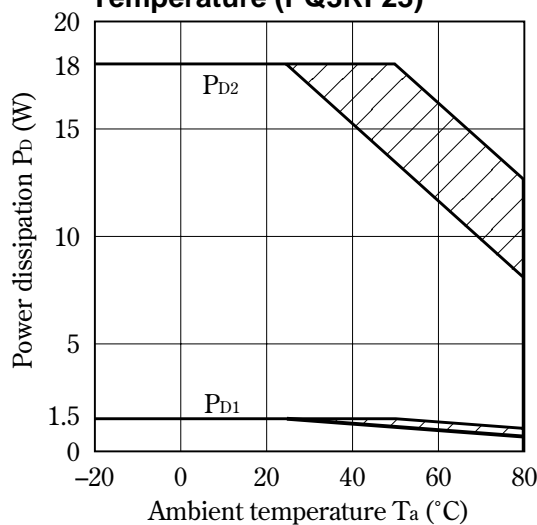※4 In case of opening control terminal ④, output voltage turns on.

Fig. 1 Test Circuit
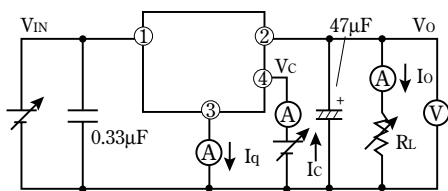
Fig. 2 Test Circuit of Ripple Rejection

f=120Hz(sine wave)
ei(rms)=0.5V
V_{IN}=5V
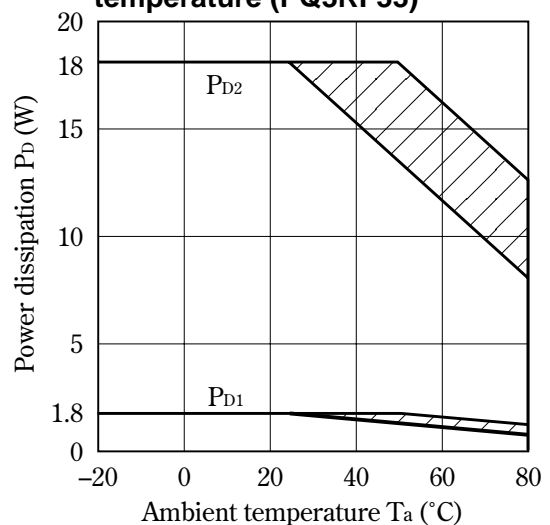I_O=0.5A
RR=20 log(ei(rms)/eo(rms))
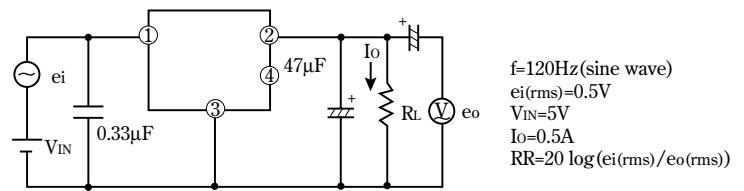
**Fig. 3 Power Dissipation vs. Ambient Temperature (PQ3RF23)**

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

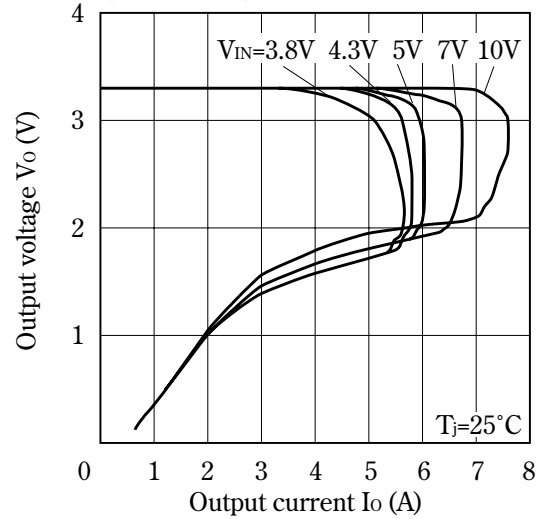**Fig. 4 Power dissipation vs. Ambient temperature (PQ3RF33)**

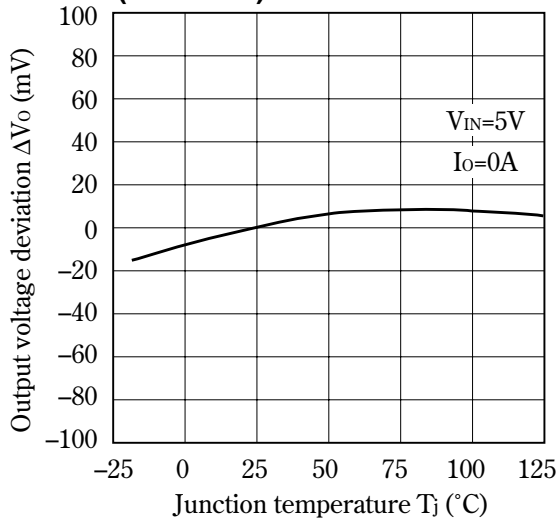Note)   Oblique line portion : Overheat protection may operate in this area.

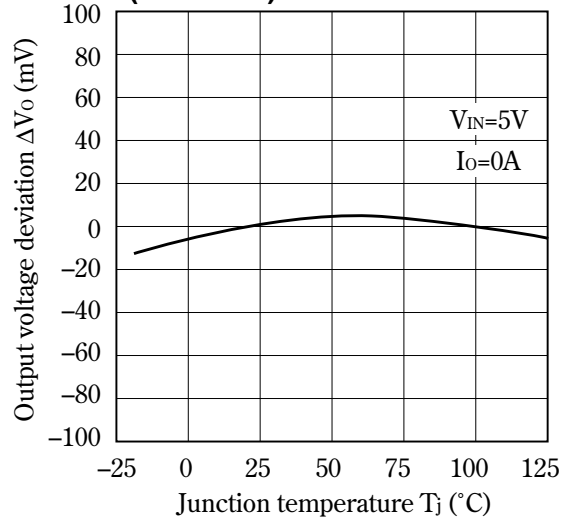**SHARP**

Fig. 5 Overcurrent Protection Characteristics (PQ3RF23)

$T_j=25°C$ $V_{IN}=3.8V$ 4.3V 5V 7V 10V

Output voltage V_O (V)

Output current I_O (A)
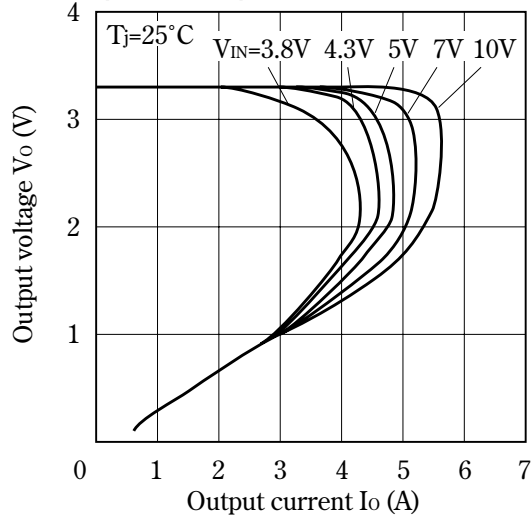
Fig. 6 Overcurrent Protection Characteristics (PQ3RF33)

$V_{IN}=3.8V$ 4.3V 5V 7V 10V

$T_j=25°C$

Output voltage V_O (V)

Output current I_O (A)

Fig. 7 Output Voltage Deviation vs. Junction Temperature (PQ3RF23)

$V_{IN}=5V$

$I_O=0A$

Output voltage deviation ΔV_O (mV)

Junction temperature T_j (°C)

Fig. 8 Output Voltage Deviation vs. Junction Temperature (PQ3RF33)

$V_{IN}=5V$

$I_O=0A$

Output voltage deviation ΔV_O (mV)

Junction temperature T_j (°C)

Fig. 9 Output Voltage vs. Input Voltage (PQ3RF23)

$T_j=25°C$

$R_L=\infty$

$R_L=3.3\Omega$

$R_L=1.65\Omega$

Output voltage V_O (V)

Input voltage V_{IN} (V)

Fig.10 Output Voltage vs. Input Voltage (PQ3RF33)

$T_j=25°C$

$R_L=\infty$

$R_L=3.3\Omega$

$R_L=1.65\Omega$

$R_L=0.94\Omega$

Output voltage V_O (V)

Input voltage V_{IN} (V)

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Fig.11 Circuit Operating Current vs. Input Voltage (PQ3RF23)

Circuit operating current I_{BIAS} (mA)

$T_j=25°C$

$R_L=1.65Ω$

$R_L=3.3Ω$

$R_L=∞$

Input voltage V_{IN} (V)

Fig.12 Circuit Operating Current vs. Input Voltage (PQ3RF33)

Circuit operating current I_{BIAS} (mA)

$T_j=25°C$

$R_L=0.94Ω$

$R_L=1.65Ω$

$R_L=3.3Ω$

$R_L=∞$

Input voltage V_{IN} (V)

Fig.13 Dropout Voltage vs. Junction Temperature (PQ3RF23)

Dropout voltage V_{i-o} (V)

$I_O=2.0A$

$I_O=1.5A$

$I_O=1.0A$

$I_O=0.5A$

Junction temperature T_j (°C)

Fig.14 Dropout Voltage vs. Junction Temperature (PQ3RF33)

Dropout voltage V_{i-o} (V)

$I_O=3.5A$

$I_O=3.0A$

$I_O=2.0A$

$I_O=1.0A$

Junction temperature T_j (°C)

Fig.15 Quiescent Current vs. Junction Temperature (PQ3RF23)

Quiescent current I_q (mA)

$V_{IN}=5V$
$I_O=0A$

Junction temperature T_j (°C)

Fig.16 Quiescent Current vs. Junction Temperature (PQ3RF33)

Quiescent current I_q (mA)

$V_{IN}=5V$
$I_O=0A$

Junction temperature T_j (°C)

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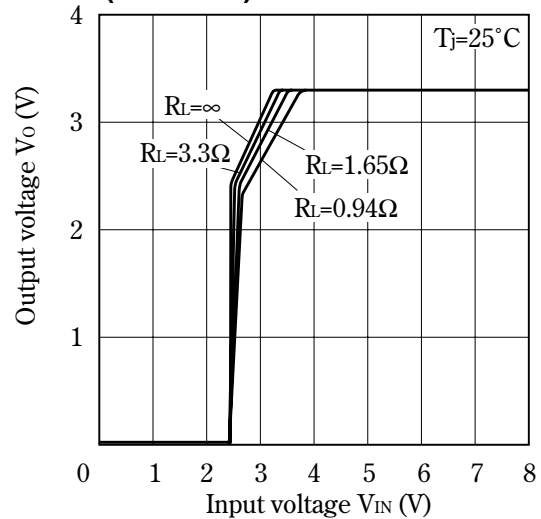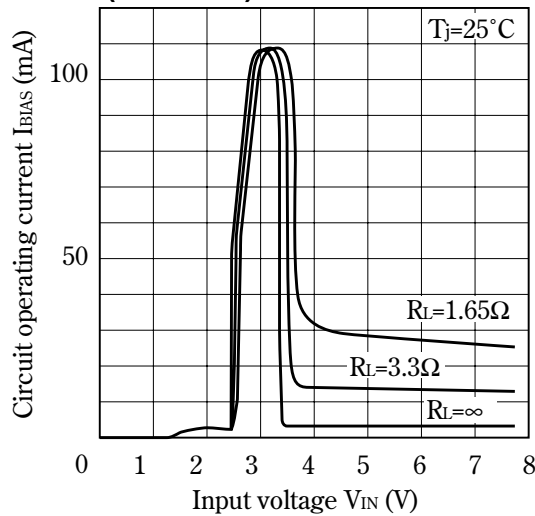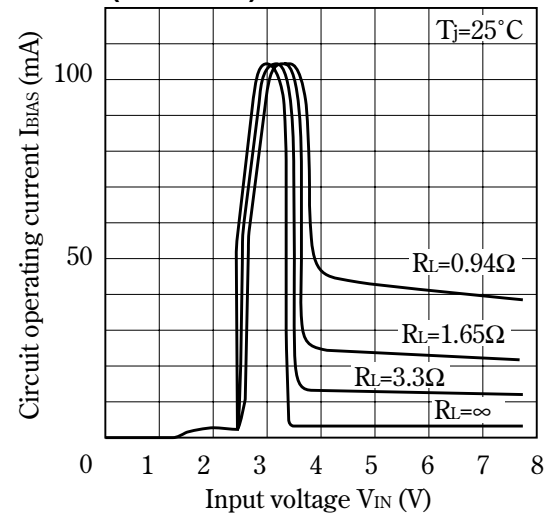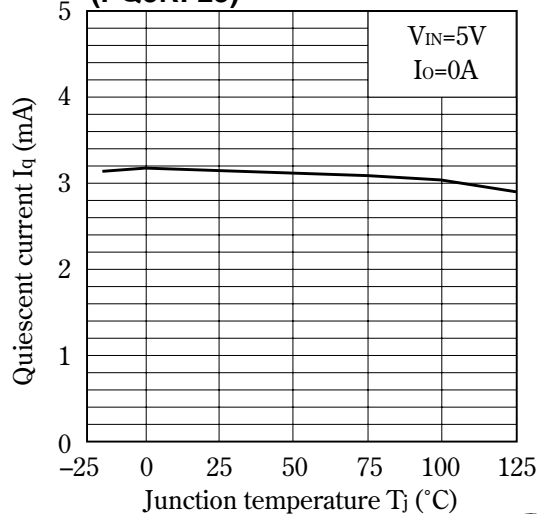
Fig.17 Ripple Rejection vs. Input Ripple Frequency (PQ3RF23)

Ripple rejection RR (dB) vs. Input ripple frequency f (kHz)

$V_{IN}=5V$
$I_O=0.5A$
$ei(rms)=0.5V$
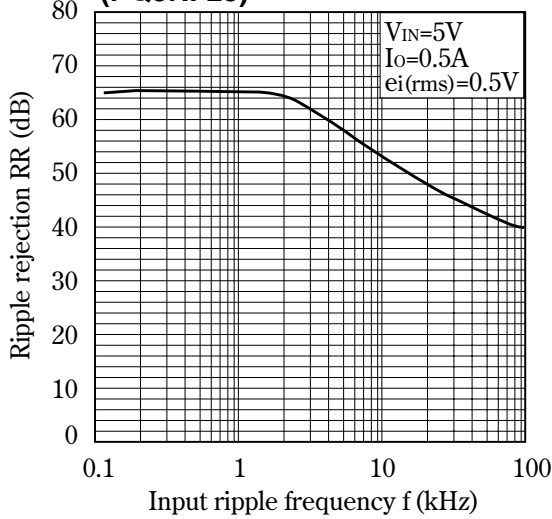
Fig.18 Ripple Rejection vs. Input Ripple Frequency (PQ3RF33)

Ripple rejection RR (dB) vs. Input ripple frequency f (kHz)

$V_{IN}=5V$
$I_O=0.5A$
$ei(rms)=0.5V$
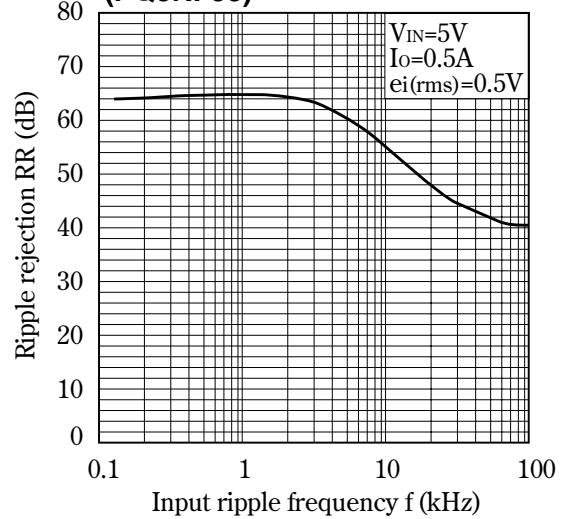
Fig.19 Ripple Rejection vs. Output Current (PQ3RF23)

Ripple rejection RR (dB) vs. Output current I_O (A)

$V_{IN}=5V$
$ei(rms)=0.5V$
$f=120Hz$
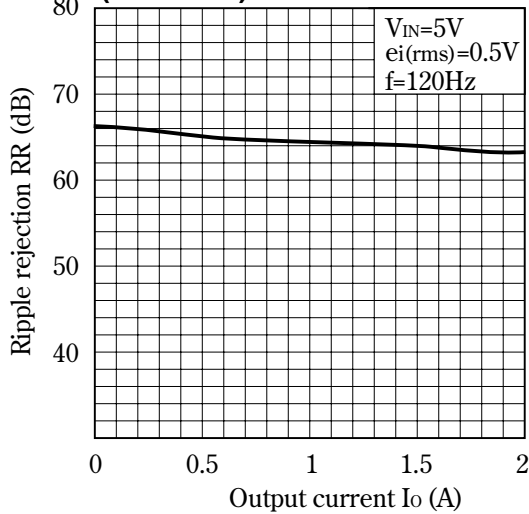
Fig.20 Ripple Rejection vs. Output Current (PQ3RF33)
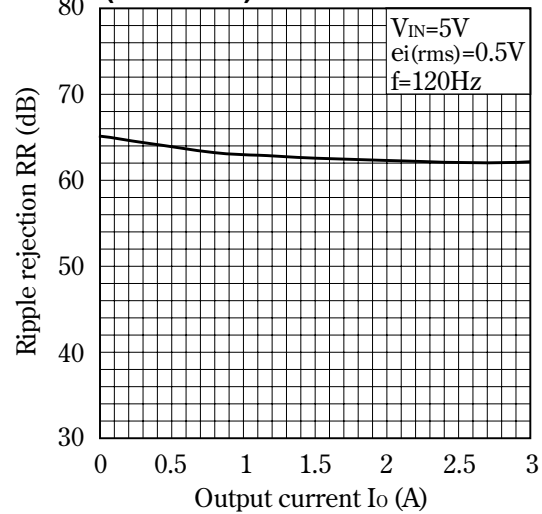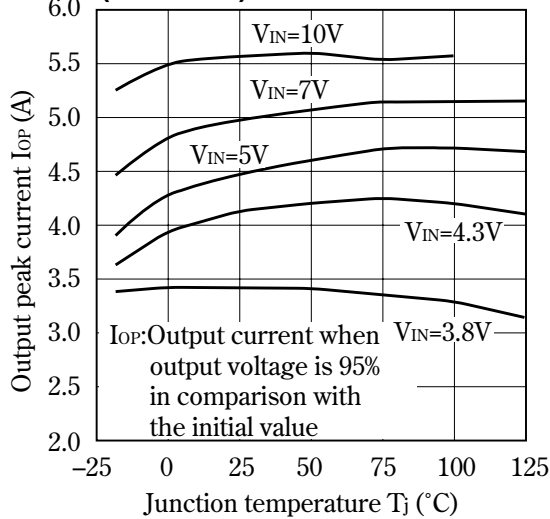
Ripple rejection RR (dB) vs. Output current I_O (A)

$V_{IN}=5V$
$ei(rms)=0.5V$
$f=120Hz$

Fig.21 Output Peak Current vs. Junction Temperature (PQ3RF23)

Output peak current I_{OP} (A) vs. Junction temperature T_j (°C)

$V_{IN}=10V$
$V_{IN}=7V$
$V_{IN}=5V$
$V_{IN}=4.3V$
$V_{IN}=3.8V$

I_{OP}:Output current when output voltage is 95% in comparison with the initial value

Fig.22 Output Peak Current vs. Junction Temperature (PQ3RF33)

Output peak current I_{OP} (A) vs. Junction temperature T_j (°C)

$V_{IN}=10V$
$V_{IN}=7V$
$V_{IN}=5V$
$V_{IN}=4.3V$
$V_{IN}=3.8V$

I_{OP}:Output current when output voltage is 95% in comparison with the initial value

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■ Typical Application

DC input

Vo

Specific IC

0.33μF

+
Co

Load

ON/OFF Control ⎧ High or Open :output ON ⎫
⎩ Low   :output OFF ⎭
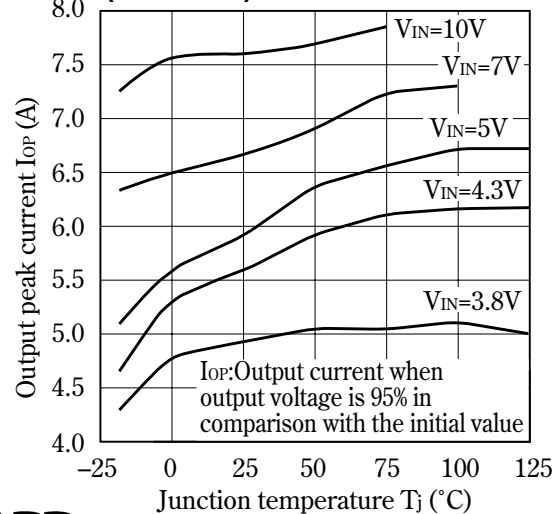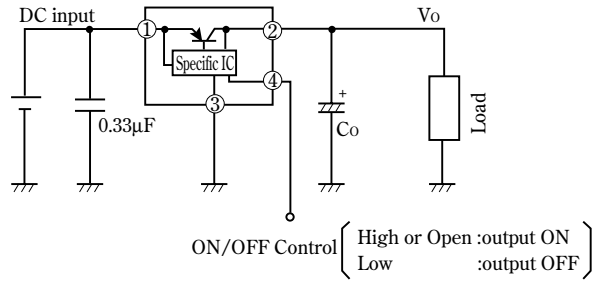
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    --- Office automation equipment
    --- Telecommunication equipment [terminal]
    --- Test and measurement equipment
    --- Industrial control
    --- Audio visual equipment
    --- Consumer electronics

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    --- Traffic signals
    --- Gas leakage sensor breakers
    --- Alarm equipment
    --- Various safety devices, etc.

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    --- Telecommunication equipment [trunk lines]
    --- Nuclear power control equipment
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