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PQ1Xxx1M2ZP Series

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

■ Features

- Compact surface mount package (2.9×1.6×1.1mm)
- Low power-loss
  (Dropout voltage: TYP. 0.11 V/MAX. 0.26V at I_O=60mA)
- Also compatible ceramic capacitors because of suppressing oscillation level
- High ripple rejection (TYP. 70dB)
- Low dissipation current
  (Dissipation current at no load: TYP. 150μA)
- Built-in ON/OFF control function
  (Dissipation current at OFF-state: MAX. 1μA)
- Built-in overcurrent and overheat protection functions

*It is available for every 0.1V of output voltage (1.3V to 5.0V)

■ Applications

- Cellular phones
- Cordless phones
- Personal information tools
- Cameras/Camcorders
- PCMCIA cards for notebook PCs

■ Model Line-up

Output Voltage (TYP.)	Model No.	Output Voltage (TYP.)	Model No.
2.5V	**PQ1X251M2ZP**	3.8V	**PQ1X381M2ZP**
2.8V	**PQ1X281M2ZP**	4.0V	**PQ1X401M2ZP**
3.0V	**PQ1X301M2ZP**	4.2V	**PQ1X421M2ZP**
3.3V	**PQ1X331M2ZP**	4.5V	**PQ1X451M2ZP**
3.6V	**PQ1X361M2ZP**	5.0V	**PQ1X501M2ZP**

■ Absolute Maximum Ratings

(Ta=25°C)

Parameter	Symbol	Rating	Unit
[1]Input voltage	V_{IN}	9	V
[1]ON/OFF control terminal voltage	V_C	9	V
Output current	I_O	300	mA
[2]Power dissipation	P_D	350	mW
[3]Junction temperature	T_j	150	°C
Operating temperature	T_{opr}	−30 to +80	°C
Storage temperature	T_{stg}	−55 to +150	°C
Soldering temperature	T_{sol}	260 (10s)	°C

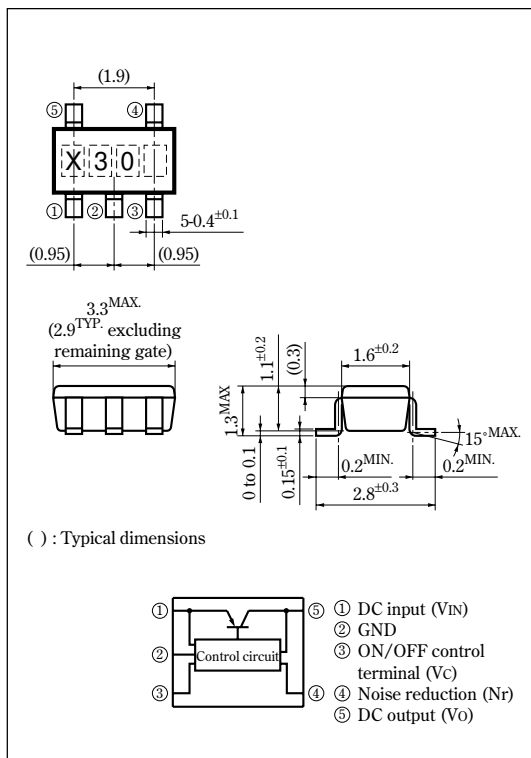[1] All are open except GND and applicable terminals
[2] At mounted on PCB
[3] Overheat protection may operate at T_j:125°C to 150°C

■ Outline Dimensions

(Unit : mm)

( ) : Typical dimensions

① DC input (V_{IN})
② GND
③ ON/OFF control terminal (V_C)
④ Noise reduction (Nr)
⑤ DC output (V_O)

- Please refer to the chapter " Handling Precautions ".

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■ **Electrical Characteristics** (Unless otherwise specified, $V_{IN}=V_O(TYP)+1.0V$, $I_o=30mA$, $V_C=1.8V$, $Ta=25°C$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	V_O	–	Refer to the following table.1			V
[※4]Output peak current	I_{op}	–	180	300	–	mA
Recommended output current	–	–	–	–	150	mA
Load regulation	$R_{eg}L1$	I_o=5 to 60mA	–	10	50	mV
	$R_{eg}L2$	I_o=5 to 100mA	–	20	100	mV
	$R_{eg}L3$	I_o=5 to 150mA	–	40	160	mV
Line regulation	$R_{eg}I$	$V_{IN}=V_O(TYP)+1V$ to $V_O(TYP)+6V(MAX. 9.0V)$	–	3.0	20	mV
Temperature coefficient of output voltage	T_CV_O	I_o=10mA, T_J=−25 to +75°C	–	0.05	–	mV/°C
Ripple rejection	RR	Refer to Fig.2	–	70	–	dB
Output noise voltage	$V_{no (rms)}$	10Hz<f<100kHz, C_n=0.1μF, I_o=30mA	Refer to the following table.2			μV
Dropout voltage	$V_{I-O}1$	I_o=60mA [※5]	–	0.11	0.26	V
	$V_{I-O}2$	I_o=150mA [※5]	–	0.20	0.4	
[※6]ON-state voltage for control	$V_{C (ON)}$	–	1.8	–	–	V
ON-state current for control	$I_{C (ON)}$	V_C=1.8V	–	5	30	μA
OFF-state voltage for control	$V_{C (OFF)}$	–	–	–	0.4	V
Quiescent current	I_q	I_o=0mA	–	150	200	μA
Output OFF-state dissipation current	I_{qs}	V_C=0.2V	–	–	1	μA

※4 Output current shall be the value when output voltage lowers 0.3V from the voltage at I_o=30mA.
※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 (③ pin) is open, 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, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1X251M2ZP	V_O	2.440	2.5	2.560	V
PQ1X281M2ZP	V_O	2.740	2.8	2.860	V
PQ1X301M2ZP	V_O	2.940	3.0	3.060	V
PQ1v331M2ZP	V_O	3.234	3.3	3.366	V
PQ1X361M2ZP	V_O	3.528	3.6	3.672	V
PQ1X381M2ZP	V_O	3.724	3.8	3.876	V
PQ1X401M2ZP	V_O	3.920	4.0	4.080	V
PQ1X421M2ZP	V_O	4.116	4.2	4.284	V
PQ1X451M2ZP	V_O	4.410	4.5	4.590	V
PQ1X501M2ZP	V_O	4.900	5.0	5.100	V

Table.2 Output Noise Voltage Line-up

($V_{IN}=V_O(TYP)+1.0V$, I_o=30mA, V_C=1.8V, C_n=0.1μF, 10Hz<f<100kHz, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1X251M2ZP	$V_{no(rms)}$	–	25	–	μV
PQ1X281M2ZP	$V_{no(rms)}$	–	25	–	μV
PQ1X301M2ZP	$V_{no(rms)}$	–	30	–	μV
PQ1X331M2ZP	$V_{no(rms)}$	–	30	–	μV
PQ1X361M2ZP	$V_{no(rms)}$	–	35	–	μV
PQ1X381M2ZP	$V_{no(rms)}$	–	35	–	μV
PQ1X401M2ZP	$V_{no(rms)}$	–	40	–	μV
PQ1X421M2ZP	$V_{no(rms)}$	–	40	–	μV
PQ1X451M2ZP	$V_{no(rms)}$	–	45	–	μV
PQ1X501M2ZP	$V_{no(rms)}$	–	50	–	μV

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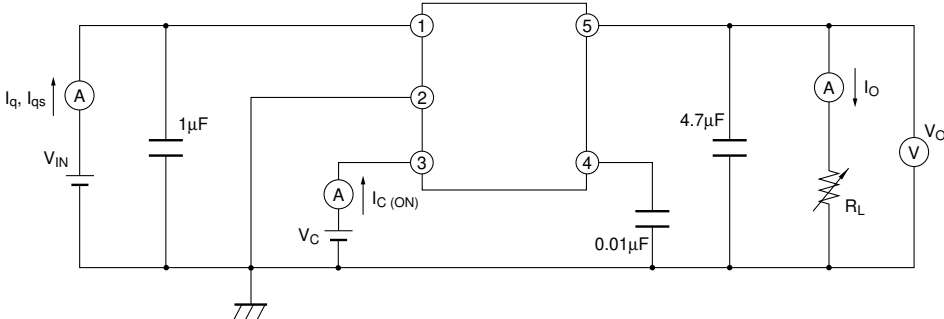
Fig.2 Test Circuit for Ripple Rejection

f=400Hz (sine wave)
ei(rms)=100mV
$V_{IN}=V_O(TYP)+1.0V$
$V_C=1.8V$
$I_O=10mA$
RR=20log(ei(rms)/eo(rms))
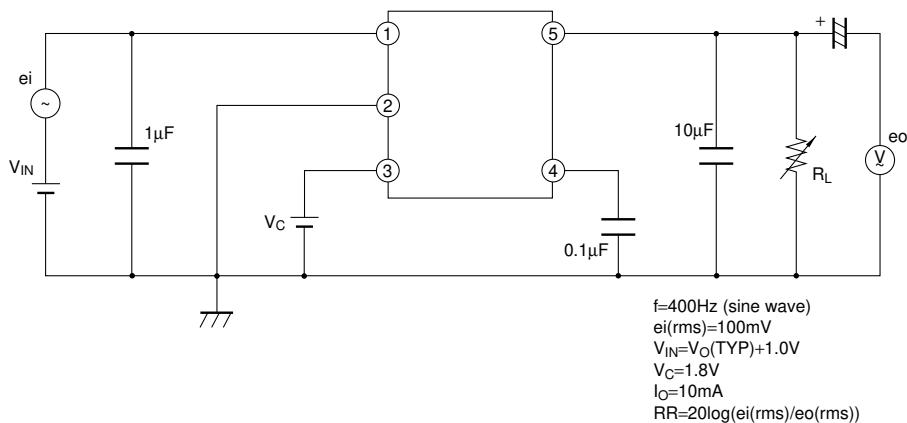
Fig.3 Power Dissipation vs. Ambient Temperature

Power dissipation P_D (mW)

Ambient temperature T_a (°C)
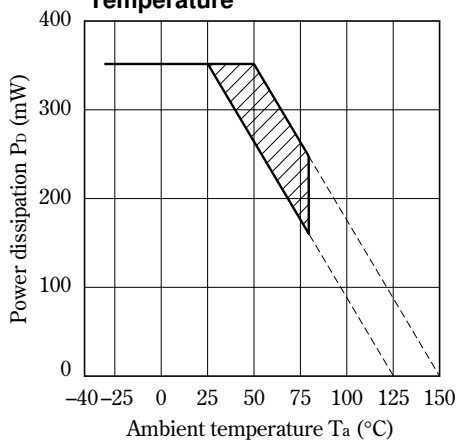
Note) Oblique line portion:Overheat protection may operate in this area.

Fig.4 Overcurrent Protection Characteristics (Typical Value)

Relative output voltage (%)

Output current I_O (A)

Fig.5 Output Voltage Fluctuation vs. Junction Temperature (PQ1X301M2ZP)(Typical Value)

Output voltage fluctuation ΔV_O (mV)

$V_{IN}=3.8V$
$I_O=30mA$
$V_C=1.8V$
$C_O=4.7\mu F$
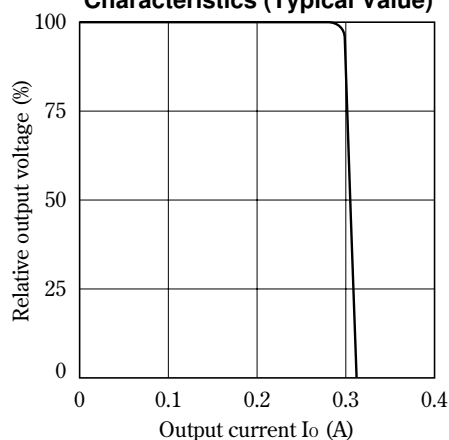(Ceramic capacitor)

Junction temperature T_j (°C)

Fig.6 Output Voltage vs. Input Voltage (PQ1X301M2ZP)(Typical Value)

Output voltage V_O (V)

$R_L=20\Omega$
$R_L=\infty$
$R_L=40\Omega$

$T_a=25°C$
$C_{IN}=1\mu F$
(Ceramic capacitor)
$C_O=4.7\mu F$
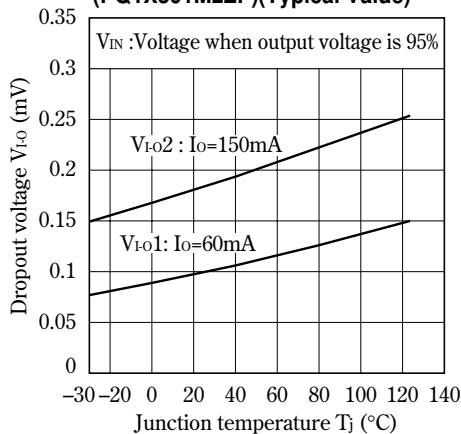(Ceramic capacitor)

Input voltage V_{IN} (V)

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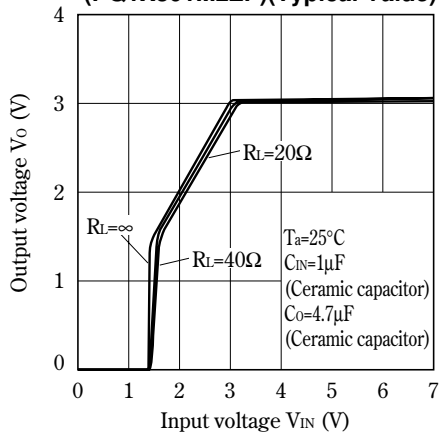
Fig.7 Circuit Operating Current vs. Input Voltage (PQ1X301M2ZP)(Typical Value)

Circuit operating current I_{BIAS} (mA) vs. Input voltage V_{IN} (V)

$T_a=25°C$
$C_{IN}=1\mu F$
(Ceramic capacitor)
$C_O=4.7\mu F$
(Ceramic capacitor)

$R_L=20\Omega$

$R_L=40\Omega$

$R_L=\infty$
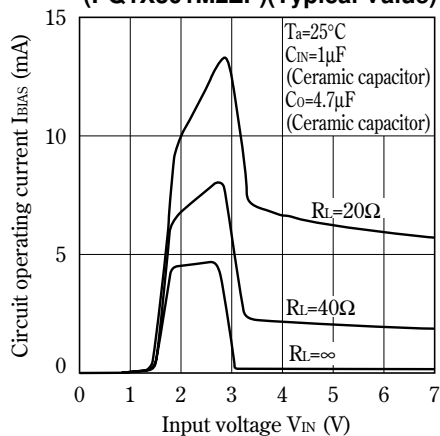
Fig.8 Dropout Voltage vs. Junction Temperature (PQ1X301M2ZP)(Typical Value)

Dropout voltage V_{I-O} (mV) vs. Junction temperature T_j (°C)

V_{IN} :Voltage when output voltage is 95%

$V_{I-O}2$: $I_O=150mA$

$V_{I-O}1$: $I_O=60mA$

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

Quiescent current I_q (µA) vs. Junction temperature T_j (°C)

$V_{IN}=V_O +1V$
$V_C=1.8V$
$I_O=0A$
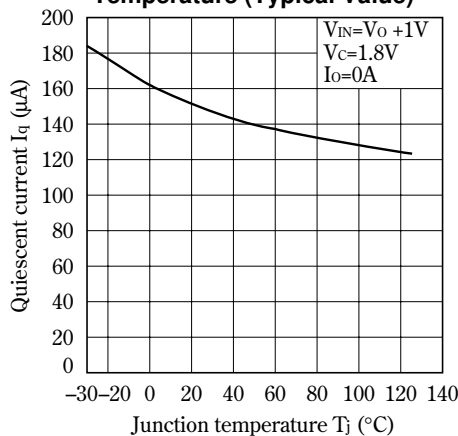
Fig.10 Ripple Rejection vs. Input Ripple Frequency (PQ1X281M2ZP)(Typical Value)

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

$C_n=0.1\mu F$

$C_n=0.01\mu F$

N_o C_n

$T_a=25°C$
$V_{IN}=3.8V$
$V_C=1.8V$
$I_O=10mA$
ei (rms) =100mV
$C_O=10\mu F$
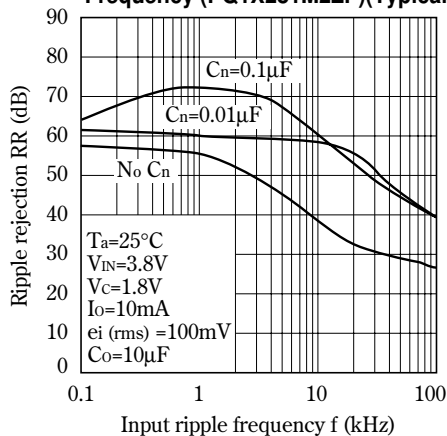
Fig.11 Dropout Voltage vs. Output Current (Typical Value)

Dropout voltage V_{I-O} (V) vs. Output current I_O (mA)

$T_a=25°C$
$C_{IN}=1\mu F$
(Ceramic capacitor)
$C_O=4.7\mu F$
(Ceramic capacitor)
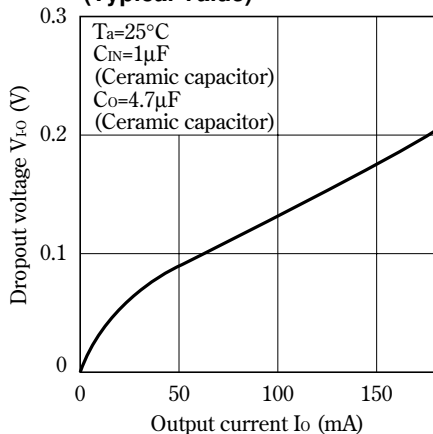
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  --- Office automation equipment
  --- Telecommunication equipment [terminal]
  --- Test and measurement equipment
  --- Industrial control
  --- Audio visual equipment
  --- Consumer electronics

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

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  --- Telecommunication equipment [trunk lines]
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