

## 4, 5 TERMINAL LOW DROP VOLTAGE REGULATOR [Low Quiescent Current-Type]

The KIA78R × × × ZF/ZPI Series are Low Dropout Voltage Regulator suitable for various electronic equipments. The Regulator has multi function such as over current protection, overheat protection.

### FEATURES

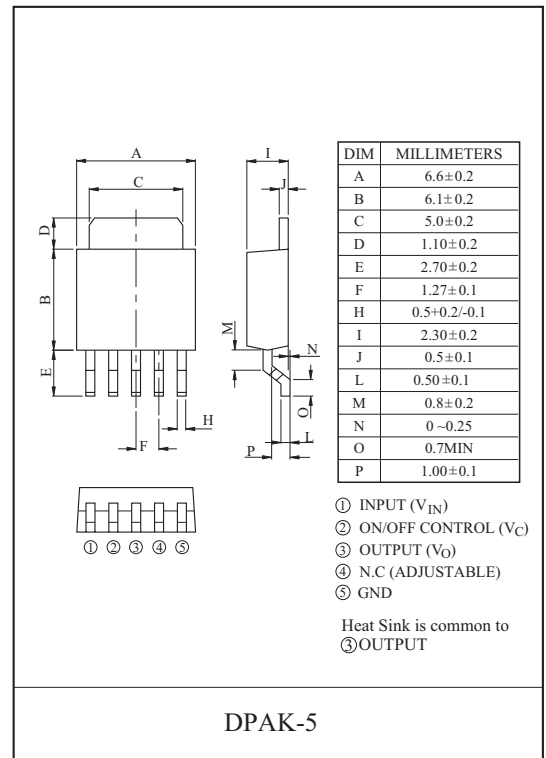
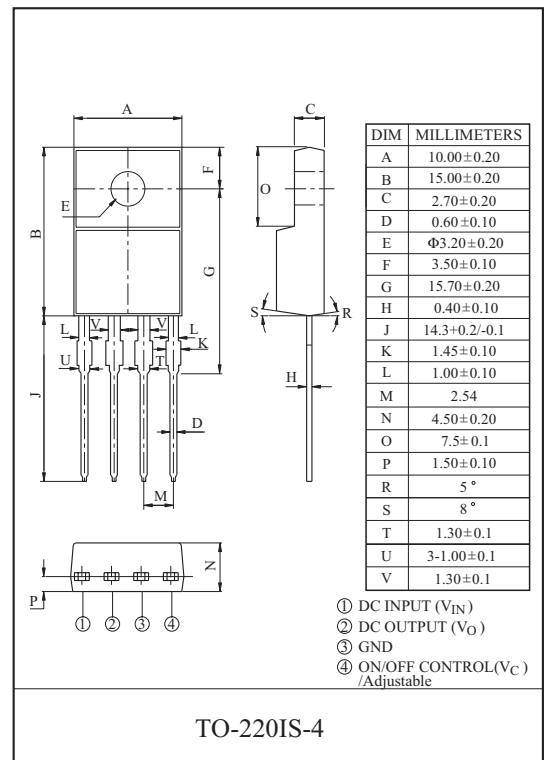
- 1.0A Output Low Drop Voltage Regulator.
- Built in ON/OFF Control Terminal. (Active High)
- Built in Over Current Protection, Over Heat Protection Function.
- ASO Protection Function.
- Low Quiescent Current (Output OFF mode) : 0.1μA(Typ.)
- Adjustable Outut Voltage Type :  $V_{OUT} = 1.5\sim 14V$
- Low Voltage Operation :  $V_{opr(min.)} = 2.35V$

### LINE UP

ITEM	OUTPUT VOLTAGE (V)	PACKAGE
KIA78R000ZF/ZPI	Adjustable ( $V_{rf} = 1.25V$ )	ZF : DPAK-5 ZPI : TO-220IS-4
KIA78R015ZF/ZPI	1.5	
KIA78R018ZF/ZPI	1.8	
KIA78R020ZF/ZPI	2.0	
KIA78R025ZF/ZPI	2.5	
KIA78R030ZF/ZPI	3.0	
KIA78R033ZF/ZPI	3.3	
KIA78R050ZF/ZPI	5.0	

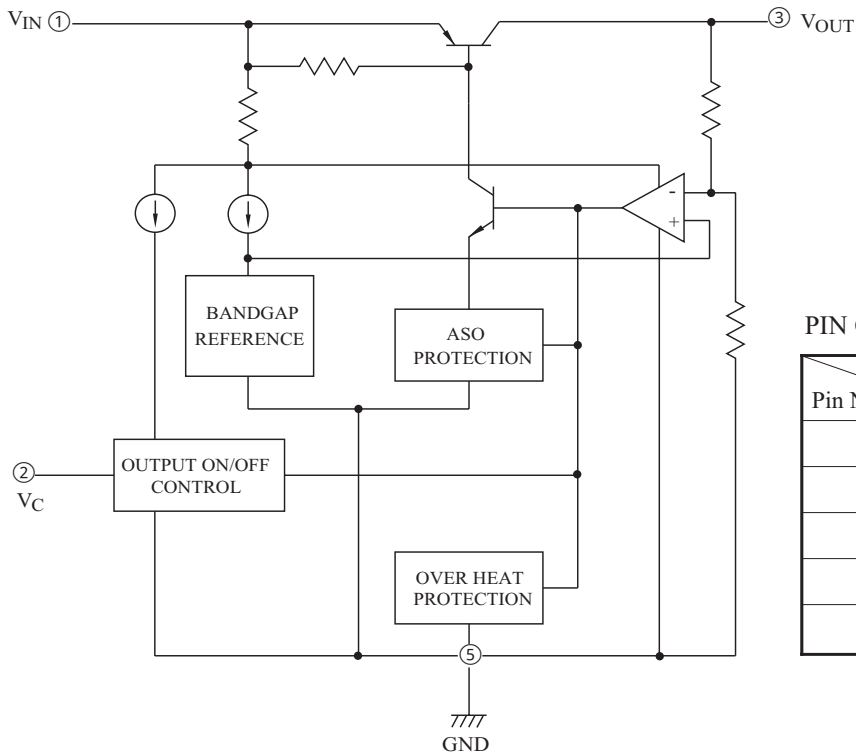
### MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Input Voltage	$V_{IN}$	15	V
ON/OFF Control Voltage	$V_C$	15	V
Output Adjustment Terminal Voltage	$V_{ADJ}$	10	V
Output Current	$I_{OUT}$	1	A
Power Dissipation -1 (No heatsink)	ZF	1.3	W
	ZPI	1.5	
Power Dissipation -2 (Infinite heatsink)	ZF	13	W
	ZPI	15	
Junction Temperature	$T_j$	150	$^\circ C$
Operating Junction Temperature	$T_{opr}$	-40 ~ 125	$^\circ C$
Storage Temperature	$T_{stg}$	-55 ~ 150	$^\circ C$



# KIA78R000ZF/ZPI~KIA78R050ZF/ZPI

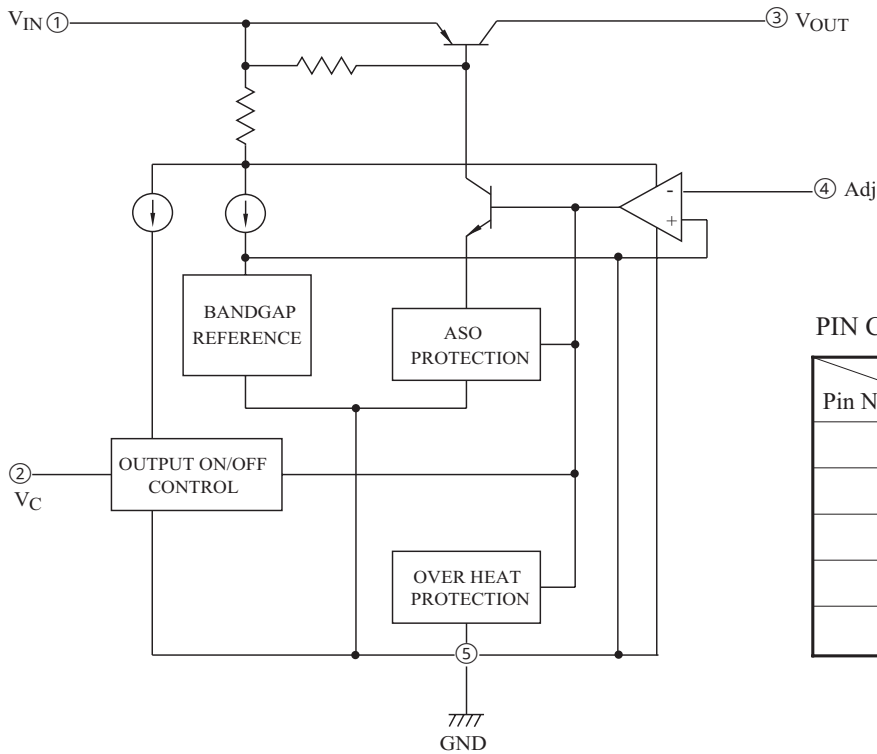
Fig.1 BLOCK DIAGRAM -1(Fixed - Type)



PIN CONNECTION

Pin No. \ Item	KIA78R***ZPI (TO-220IS-4)	KIA78R***ZF (DPAK-5)
1	V <sub>IN</sub>	V <sub>IN</sub>
2	V <sub>OUT</sub>	V <sub>C</sub>
3	GND	V <sub>OUT</sub>
4	V <sub>C</sub>	NC
5	-	GND

Fig.2 BLOCK DIAGRAM -2(Adjustable - Type)



PIN CONNECTION

Pin No. \ Item	KIA78R000ZPI (TO-220IS-4)	KIA78R000ZF (DPAK-5)
1	V <sub>IN</sub>	V <sub>IN</sub>
2	V <sub>OUT</sub>	V <sub>C</sub>
3	GND	V <sub>OUT</sub>
4	Adj	Adj
5	-	GND

# KIA78R000ZF/ZPI~~KIA78R050ZF/ZPI

## ELECTRICAL CHARACTERISTICS (KIA78R000ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=3.5V$ ,  $V_O=2.5V$ ,  $I_O=0.5A$ ,  $R_1,R_2=1k\Omega$ ,  $T_j=25^\circ C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage	$V_{IN}$	-	2.35	-	15	V
Output Voltage	$V_{OUT}$	-	1.5	-	14	V
Reference Voltage	$V_{REF}$	$V_{IN}=2.5V$ , $I_{OUT}=0.5A$	1.22	1.25	1.28	V
Load Regulation	Reg Load	$I_O=5mA \sim 1A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=3.5V \sim 8.5V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^\circ C$ , $I_O=5mA$	-	$\pm 1.0$	$\pm 2.0$	%
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$ , $V_{IN}=4V$	45	60	-	dB
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	$I_O=0$	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$	-	0.1	5	$\mu A$

## ELECTRICAL CHARACTERISTICS (KIA78R015ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=V_O+1V$ ,  $I_O=0.5A$ ,  $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage	$V_{IN}$	-	2.35	-	15	V
Output Voltage	$V_O$	-	1.45	1.50	1.55	V
Load Regulation	Reg Load	$I_O=5mA \sim 1A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=2.5V \sim 6.5V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^\circ C$ , $I_O=5mA$	-	$\pm 0.02$	$\pm 0.05$	%/ $^\circ C$
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$	45	60	-	dB
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	-	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0A$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$ , $I_O=0A$	-	0.1	5	$\mu A$

# KIA78R000ZF/ZPI~KIA78R050ZF/ZPI

## ELECTRICAL CHARACTERISTICS (KIA78R018ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=V_O+1V$ ,  $I_O=0.5A$ ,  $T_a=25^{\circ}C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage	$V_{IN}$	-	2.45	-	15	V
Output Voltage	$V_O$	-	1.75	1.8	1.85	V
Load Regulation	Reg Load	$I_O=5mA \sim 1A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=2.5V \sim 7V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^{\circ}C$ , $I_O=5mA$	-	$\pm 0.02$	$\pm 0.05$	%/ $^{\circ}C$
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$	45	60	-	dB
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	-	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0A$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$ , $I_O=0A$	-	0.1	5	$\mu A$

## ELECTRICAL CHARACTERISTICS (KIA78R020ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=V_O+1V$ ,  $I_O=0.5A$ ,  $T_a=25^{\circ}C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_O$	-	1.944	2.0	2.056	V
Load Regulation	Reg Load	$I_O=5mA \sim 1A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=3V \sim 8V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^{\circ}C$ , $I_O=5mA$	-	$\pm 0.02$	$\pm 0.05$	%/ $^{\circ}C$
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$	45	60	-	dB
Dropout Voltage	$V_D$	$I_O=1A$ , $V_{IN}=0.95V_{OUT}$	-	-	0.5	V
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	-	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0A$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$ , $I_O=0A$	-	0.1	5	$\mu A$

# KIA78R000ZF/ZPI~~KIA78R050ZF/ZPI

## ELECTRICAL CHARACTERISTICS (KIA78R025ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=V_O+1V$ ,  $I_O=0.5A$ ,  $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_O$	-	2.438	2.50	2.562	V
Load Regulation	Reg Load	$I_O=5mA \sim 2.0A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=3.5V \sim 8.5V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^\circ C$ , $I_O=5mA$	-	$\pm 0.02$	$\pm 0.05$	%/ $^\circ C$
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$	45	60	-	dB
Dropout Voltage	$V_D$	$I_O=1A$ , $V_{IN}=0.95V_{OUT}$	-	-	0.5	V
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	-	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0A$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$ , $I_O=0A$	-	0.1	5	$\mu A$

## ELECTRICAL CHARACTERISTICS (KIA78R030ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=V_O+1V$ ,  $I_O=0.5A$ ,  $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_O$	-	2.928	3.0	3.072	V
Load Regulation	Reg Load	$I_O=5mA \sim 1A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=4V \sim 9V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^\circ C$ , $I_O=5mA$	-	$\pm 0.02$	$\pm 0.05$	%/ $^\circ C$
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$	45	60	-	dB
Dropout Voltage	$V_D$	$I_O=1A$ , $V_{IN}=0.95V_{OUT}$	-	-	0.5	V
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	-	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0A$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$ , $I_O=0A$	-	0.1	5	$\mu A$

# KIA78R000ZF/ZPI~KIA78R050ZF/ZPI

## ELECTRICAL CHARACTERISTICS (KIA78R033ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=V_O+1V$ ,  $I_O=0.5A$ ,  $T_a=25^{\circ}C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_O$	-	3.221	3.30	3.379	V
Load Regulation	Reg Load	$I_O=5mA \sim 1A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=4V \sim 9V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^{\circ}C$ , $I_O=5mA$	-	$\pm 0.02$	$\pm 0.05$	%/ $^{\circ}C$
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$	45	60	-	dB
Dropout Voltage	$V_D$	$I_O=1A$ , $V_{IN}=0.95V_{OUT}$	-	-	0.5	V
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	-	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0A$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$ , $I_O=0A$	-	0.1	5	$\mu A$

## ELECTRICAL CHARACTERISTICS (KIA78R050ZF/ZPI)

(Unless otherwise specified,  $V_{IN}=V_O+1V$ ,  $I_O=0.5A$ ,  $T_a=25^{\circ}C$ )

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_O$	-	4.88	5.0	5.12	V
Load Regulation	Reg Load	$I_O=5mA \sim 1A$	-	0.2	2.0	%
Line Regulation	Reg Line	$V_{IN}=6V \sim 10V$ , $I_O=5mA$	-	0.2	1.0	%
Temperature Coefficient of Output Voltage	$T_C V_O$	$T_j=0 \sim 125^{\circ}C$ , $I_O=5mA$	-	$\pm 0.02$	$\pm 0.05$	%/ $^{\circ}C$
Ripple Rejection	$R \cdot R$	$I_{OUT}=0.3A$ , $f=120Hz$ , $V_{ripple}=0.5V_{rms}$	45	60	-	dB
Dropout Voltage	$V_D$	$I_O=1A$ , $V_{IN}=0.95V_{OUT}$	-	-	0.5	V
Output ON state for control Voltage	$V_{C(ON)}$	-	2.0	-	-	V
Output ON state for control Current	$I_{C(ON)}$	$V_C=2.7V$	-	-	200	$\mu A$
Output OFF state for control Voltage	$V_{C(OFF)}$	-	-	-	0.8	V
Output OFF state for control Current	$I_{C(OFF)}$	$V_C=0.4V$	-	-	2.0	$\mu A$
Quiescent Current	$I_Q$	$I_O=0A$	-	1	2	mA
Quiescent Current (OFF Mode)	$I_{Q(OFF)}$	$V_C=0.4V$ , $I_O=0A$	-	0.1	5	$\mu A$

# KIA78R000ZF/ZPI ~ KIA78R050ZF/ZPI

Fig. 3 Test Circuit (Fixed-Type)

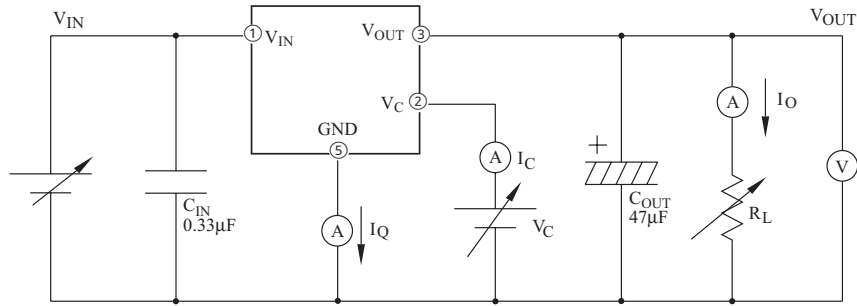
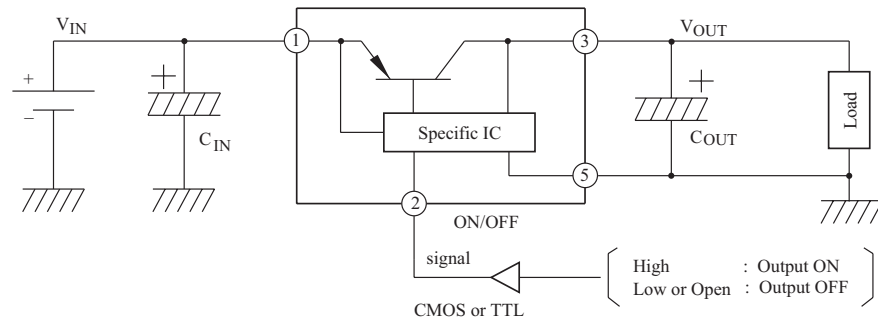


Fig. 4 Application Circuit for Standard (Fixed-Type)



$C_{IN}$  : More than  $0.33\mu F$  required if regulator is located an appreciable distance from power supply filter.

You must use to prevent from the parasitic oscillation.

$C_{OUT}$  : More than  $47\mu F$ . You must use the Low-impedance-type(low ESR) capacitor.

Fig. 5 Test Circuit (Adjustable - Type)

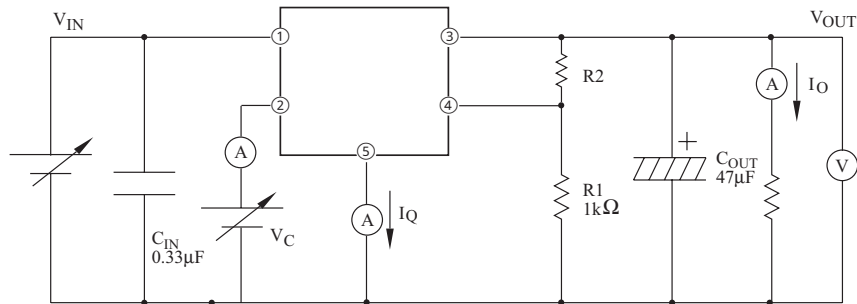
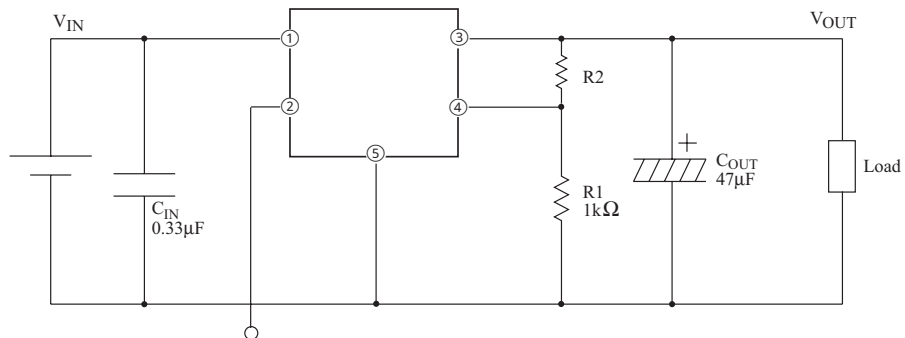


Fig. 6 Application Circuit (Adjustable - Type)



$C_{IN}$  : More than  $0.33\mu F$  required if regulator is located an appreciable distance from power supply filter.

You must use to prevent from the parasitic oscillation.

$C_{OUT}$  : More than  $47\mu F$ . You must use the Low-impedance-type(low ESR) capacitor.

# KIA78R000ZF/ZPI~KIA78R050ZF/ZPI

Fig. 7  $I_O - V_O$

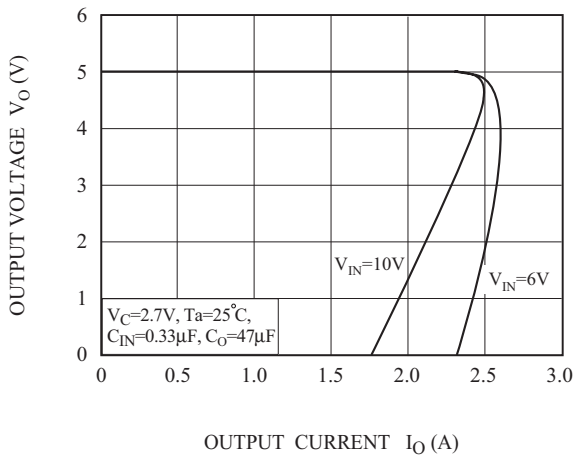


Fig. 8  $T_a - \Delta V_{ref}$

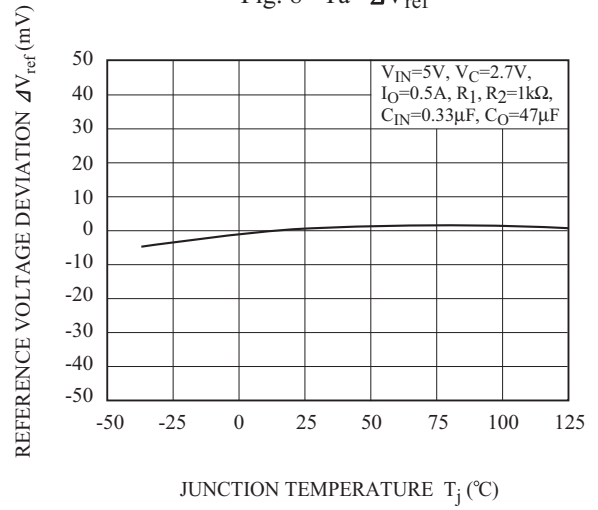


Fig. 9  $V_{IN} - V_O$

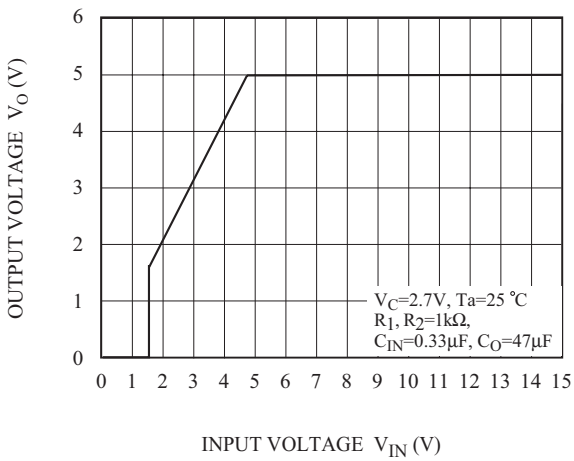


Fig. 10  $V_{IN} - I_{BIAS}$

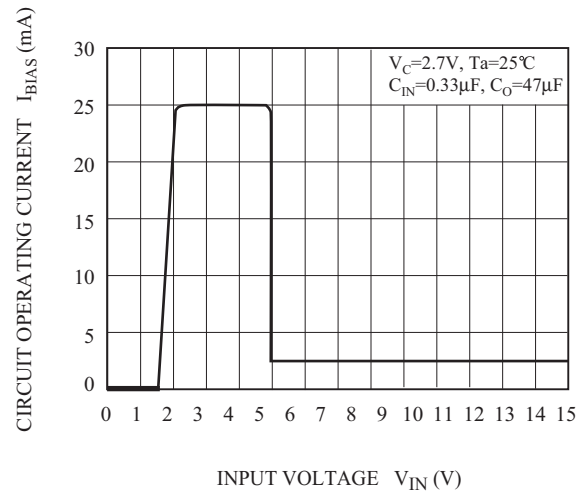


Fig. 11  $T_j - V_D$

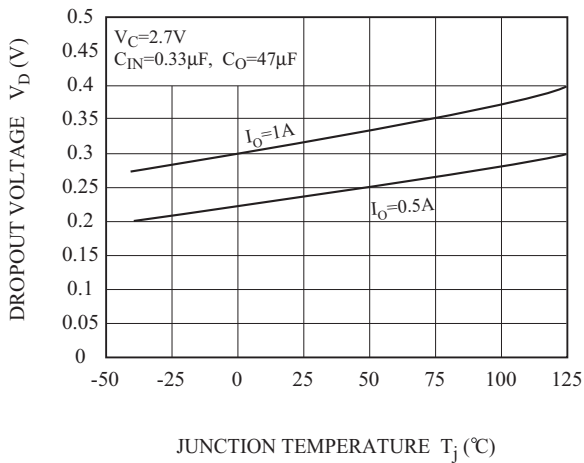
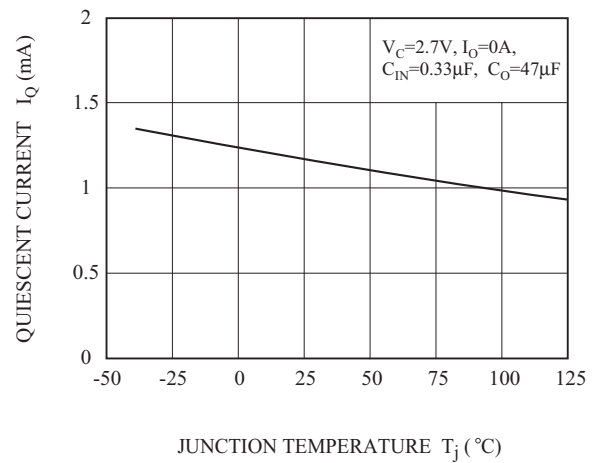


Fig. 12  $T_j - I_Q$





# KIA78R000ZF/ZPI ~ KIA78R050ZF/ZPI

Fig. 13  $f_{IN}$  - R.R

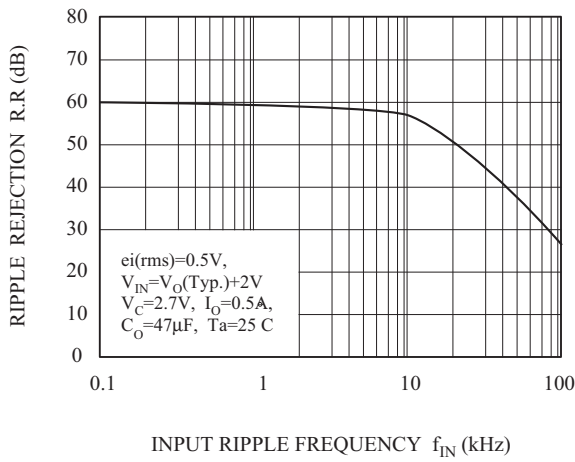


Fig. 14  $I_{OUT}$  - R.R

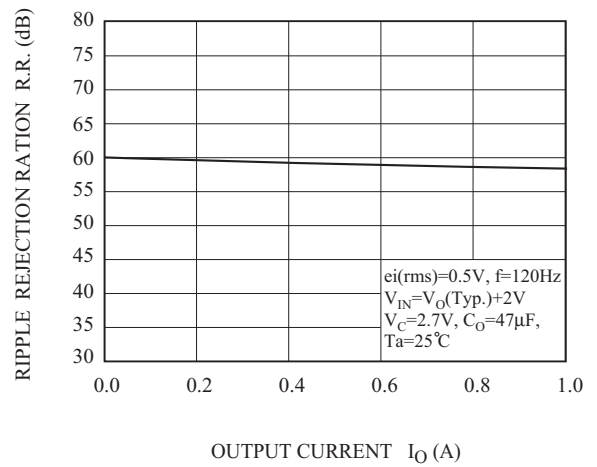


Fig. 15  $P_D$  -  $T_a$  (F-Type : DPAK-5)

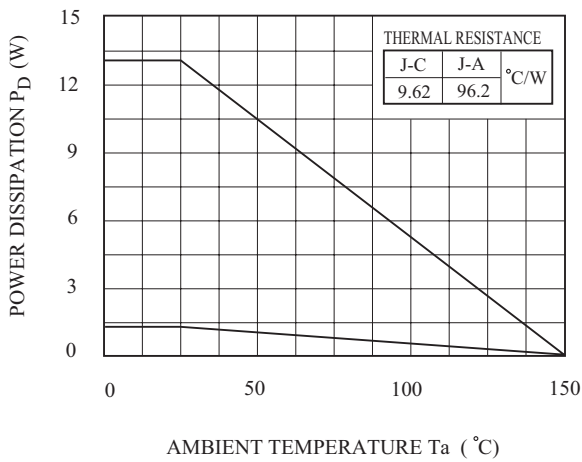


Fig. 16  $P_D$  -  $T_a$  (PI-Type : TO-220IS-4)

