KEC
KOREA ELECTRONICS CO.,LTD.

SEMICONDUCTOR

TECHNICAL DATA

KIA78S05P~ KIA78S24P

BIPOLAR LINEAR INTEGRATED CIRCUIT

THREE TERMINAL POSITIVE VOLTAGE REGULATORS
5V, 6V, 7V, 8V, 9V, 10V, 12V, 13V, 15V, 18V, 20V, 24V.

FEATURES
· Suitable for TTL, DTL, HTL, C-MOS Power Supply.
· Internal Short-Circuit Current Limiting.
  Internal Thermal Overload Protection.
· Maximum Output Current of 150mA (T_j=25℃).
· Packaged in TO-92.

MAXIMUM RATINGS (Ta=25℃)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Input Voltage	(5V~15V)	V_{IN}	35	V
	(18V~24V)		40	V
Power Dissipation		P_D	600	mW
Operating Junction Temperature		T_j	-30~150	℃
Operating Temperature		T_{opr}	-30~75	℃
Storage Temperature		T_{stg}	-55~150	℃

DIM	MILLIMETERS
A	4.70 MAX
B	4.80 MAX
C	3.70 MAX
D	0.45
E	1.00
F	1.27
G	0.85
H	0.45
J	14.00±0.50
K	0.55 MAX
L	2.30
M	0.45 MAX
N	1.00

1. OUTPUT
2. COMMON
3. INPUT

TO-92
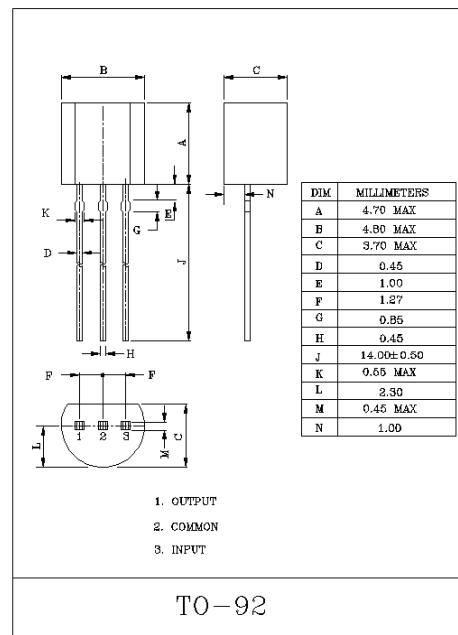
EQUIVALENT CIRCUIT
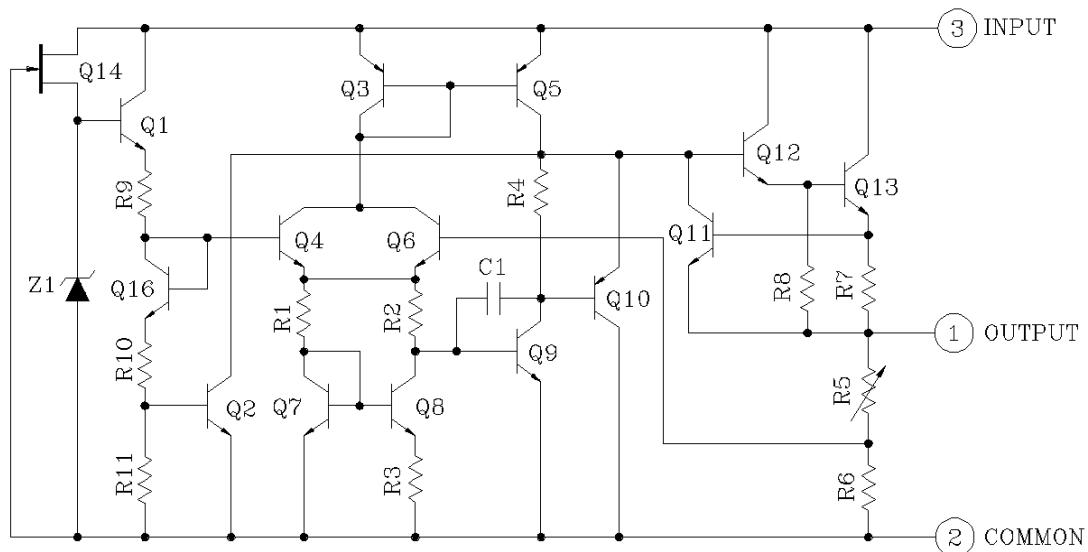
KIA78S05P~KIA78S24P

ELECTRICAL CHARACTERISTICS
KIA78S05P
(Unless otherwise specified, V_{IN}=10V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃$\leq$T$_j$$\leq$125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T$_j$=25℃		4.8	5.0	5.2	V
Input Regulation	Reg line	1	T$_j$=25℃	7.0V$\leq$$V_{IN}$$\leq$20V	–	55	150	mV
				8.0V$\leq$$V_{IN}$$\leq$20V	–	45	100	
Load Regulation	Reg load	1	T$_j$=25℃	1.0mA$\leq$$I_{OUT}$$\leq$100mA	–	11	60	mV
				1.0mA$\leq$$I_{OUT}$$\leq$40mA	–	5.0	30	
Output Voltage	V_{OUT}	1	7.0V$\leq$$V_{IN}$$\leq$20V 1.0mA$\leq$$I_{OUT}$$\leq$40mA		4.75	–	5.25	V
			V_{IN}=10V, 1.0mA$\leq$$I_{OUT}$$\leq$70mA		4.75	–	5.25	
Quiescent Current	I_B	1	T$_j$=25℃		–	3.1	6.0	mA
			T$_j$=125℃		–	–	5.5	
Quiescent Current Change	ΔI_B	1	8.0V$\leq$$V_{IN}$$\leq$20V		–	–	1.5	mA
			1.0mA$\leq$$I_{OUT}$$\leq$40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz$\leq$f$\leq$100kHz		–	40	–	μV$_{rms}$
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	12	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 8.0V$\leq$$V_{IN}$$\leq$18V, T$_j$=25℃		41	49	–	dB
Dropout Voltage	| V_{IN}-V_{OUT} |	1	T$_j$=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-0.6	–	mV/℃

ELECTRICAL CHARACTERISTICS
KIA78S06P
(Unless otherwise specified, V_{IN}=11V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃$\leq T_j \leq$125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		5.76	6.0	6.24	V
Input Regulation	Reg line	1	T_j=25℃	8.1V$\leq V_{IN} \leq$21V	–	50	150	mV
				9.0V$\leq V_{IN} \leq$21V	–	45	110	
Load Regulation	Reg load	1	T_j=25℃	1.0mA$\leq I_{OUT} \leq$100mA	–	12	70	mV
				1.0mA$\leq I_{OUT} \leq$40mA	–	5.5	35	
Output Voltage	V_{OUT}	1	8.1V$\leq V_{IN} \leq$21V 1.0mA$\leq I_{OUT} \leq$40mA		5.7	–	6.3	V
			V_{IN}=11V, 1.0mA$\leq I_{OUT} \leq$70mA		5.7	–	6.3	
Quiescent Current	I_B	1	T_j=25℃		–	3.1	6.0	mA
			T_j=125℃		–	–	5.5	
Quiescent Current Change	ΔI_B	1	9.0V$\leq V_{IN} \leq$20V		–	–	1.5	mA
			1.0mA$\leq I_{OUT} \leq$40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz$\leq f \leq$100kHz		–	40	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	14	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 9.0V$\leq V_{IN} \leq$19V, T_j=25℃		39	47	–	dB
Dropout Voltage	$\mid V_{IN}-V_{OUT} \mid$	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-0.7	–	mV/℃

ELECTRICAL CHARACTERISTICS
KIA78S07P

(Unless otherwise specified, V_{IN}=12V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃ ≦ T_j ≦ 125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		6.72	7.0	7.28	V
Input Regulation	Reg line	1	T_j=25℃	9.2V ≦ V_{IN} ≦ 22V	–	50	160	mV
				10V ≦ V_{IN} ≦ 22V	–	45	115	
Load Regulation	Reg load	1	T_j=25℃	1.0mA ≦ I_{OUT} ≦ 100mA	–	13	75	mV
				1.0mA ≦ I_{OUT} ≦ 40mA	–	6.0	40	
Output Voltage	V_{OUT}	1	9.2V ≦ V_{IN} ≦ 22V 1.0mA ≦ I_{OUT} ≦ 40mA		6.65	–	7.35	V
			V_{IN}=12V, 1.0mA ≦ I_{OUT} ≦ 70mA		6.65	–	7.35	
Quiescent Current	I_B	1	T_j=25℃		–	3.1	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	10V ≦ V_{IN} ≦ 22V		–	–	1.5	mA
			1.0mA ≦ I_{OUT} ≦ 40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz ≦ f ≦ 100kHz		–	50	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	17	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 10V ≦ V_{IN} ≦ 20V, T_j=25℃		37	46	–	dB
Dropout Voltage	| V_{IN}-V_{OUT} |	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-0.75	–	mV/℃

ELECTRICAL CHARACTERISTICS
KIA78S08P

(Unless otherwise specified, V_{IN}=14V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃ ≤ T_j ≤ 125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		7.7	8.0	8.3	V
Input Regulation	Reg line	1	T_j=25℃	10.5V ≤ V_{IN} ≤ 23V	–	20	175	mV
				11V ≤ V_{IN} ≤ 23V	–	12	125	
Load Regulation	Reg load	1	T_j=25℃	1.0mA ≤ I_{OUT} ≤ 100mA	–	15	80	mV
				1.0mA ≤ I_{OUT} ≤ 40mA	–	7.0	40	
Output Voltage	V_{OUT}	1	10.5V ≤ V_{IN} ≤ 23V 1.0mA ≤ I_{OUT} ≤ 40mA		7.6	–	8.4	V
			V_{IN}=14V, 1.0mA ≤ I_{OUT} ≤ 70mA		7.6	–	8.4	
Quiescent Current	I_B	1	T_j=25℃		–	3.1	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	11V ≤ V_{IN} ≤ 23V		–	–	1.5	mA
			1.0mA ≤ I_{OUT} ≤ 40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz ≤ f ≤ 100kHz		–	60	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	20	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 12V ≤ V_{IN} ≤ 23V, T_j=25℃		37	45	–	dB
Dropout Voltage	$\| V_{IN}-V_{OUT} \|$	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	–0.8	–	mV/℃

ELECTRICAL CHARACTERISTICS
KIA78S09P
(Unless otherwise specified, V_{IN}=15V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃≤T_j≤125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		8.64	9.0	9.36	V
Input Regulation	Reg line	1	T_j=25℃	11.4V≤V_{IN}≤24V	–	80	200	mV
				12V≤V_{IN}≤24V	–	20	160	
Load Regulation	Reg load	1	T_j=25℃	1.0mA≤I_{OUT}≤100mA	–	17	90	mV
				1.0mA≤I_{OUT}≤40mA	–	8.0	45	
Output Voltage	V_{OUT}	1	11.4V≤V_{IN}≤24V 1.0mA≤I_{OUT}≤40mA		8.55	–	9.45	V
			V_{IN}=15V, 1.0mA≤I_{OUT}≤70mA		8.55	–	9.45	
Quiescent Current	I_B	1	T_j=25℃		–	3.2	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	11.5V≤V_{IN}≤26V		–	–	1.5	mA
			1.0mA≤I_{OUT}≤40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz≤f≤100kHz		–	65	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	21	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 12V≤V_{IN}≤24V, T_j=25℃		36	44	–	dB
Dropout Voltage	| V_{IN}-V_{OUT} |	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-0.85	–	mV/℃

KIA78S05P~KIA78S24P

ELECTRICAL CHARACTERISTICS
KIA78S10P
(Unless otherwise specified, V_{IN}=16V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃≦T_j≦125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		9.6	10	10.4	V
Input Regulation	Reg line	1	T_j=25℃	12.5V≦V_{IN}≦25V	–	80	230	mV
				13V≦V_{IN}≦25V	–	30	170	
Load Regulation	Reg load	1	T_j=25℃	1.0mA≦I_{OUT}≦100mA	–	18	90	mV
				1.0mA≦I_{OUT}≦40mA	–	8.5	45	
Output Voltage	V_{OUT}	1	12.5V≦V_{IN}≦25V 1.0mA≦I_{OUT}≦40mA		9.5	–	10.5	V
			V_{IN}=16V, 1.0mA≦I_{OUT}≦70mA		9.5	–	10.5	
Quiescent Current	I_B	1	T_j=25℃		–	3.2	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	13V≦V_{IN}≦25V		–	–	1.5	mA
			1.0mA≦I_{OUT}≦40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz≦f≦100kHz		–	70	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	22	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 13V≦V_{IN}≦24V, T_j=25℃		36	43	–	dB
Dropout Voltage	| V_{IN}-V_{OUT} |	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-0.9	–	mV/℃

KIA78S05P~KIA78S24P

ELECTRICAL CHARACTERISTICS
KIA78S12P
(Unless otherwise specified, V_{IN}=19V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃$\leq T_j \leq$125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		11.5	12	12.5	V
Input Regulation	Reg line	1	T_j=25℃	14.5V$\leq V_{IN} \leq$27V	–	120	250	mV
				16V$\leq V_{IN} \leq$27V	–	100	200	
Load Regulation	Reg load	1	T_j=25℃	1.0mA$\leq I_{OUT} \leq$100mA	–	20	100	mV
				1.0mA$\leq I_{OUT} \leq$40mA	–	10	50	
Output Voltage	V_{OUT}	1	14.5V$\leq V_{IN} \leq$27V 1.0mA$\leq I_{OUT} \leq$40mA		11.4	–	12.6	V
			V_{IN}=19V, 1.0mA$\leq I_{OUT} \leq$70mA		11.4	–	12.6	
Quiescent Current	I_B	1	T_j=25℃		–	3.2	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	16V$\leq V_{IN} \leq$27V		–	–	1.5	mA
			1.0mA$\leq I_{OUT} \leq$40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz$\leq$f$\leq$100kHz		–	80	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	24	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 15V$\leq V_{IN} \leq$25V, T_j=25℃		36	41	–	dB
Dropout Voltage	| V_{IN}-V_{OUT} |	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-1.0	–	mV/℃

ELECTRICAL CHARACTERISTICS
KIA78S13P
(Unless otherwise specified, V_{IN}=21V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃≦T_j≦125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		12.45	13	13.55	V
Input Regulation	Reg line	1	T_j=25℃	16V≦V_{IN}≦28V	–	125	270	mV
				17V≦V_{IN}≦28V	–	105	225	
Load Regulation	Reg load	1	T_j=25℃	1.0mA≦I_{OUT}≦100mA	–	22	120	mV
				1.0mA≦I_{OUT}≦40mA	–	11	60	
Output Voltage	V_{OUT}	1	16V≦V_{IN}≦28V 1.0mA≦I_{OUT}≦40mA		12.54	–	13.86	V
			V_{IN}=21V, 1.0mA≦I_{OUT}≦70mA		12.54	–	13.86	
Quiescent Current	I_B	1	T_j=25℃		–	3.2	6.5	mA
			T_j=125℃		–	3.2	6.0	
Quiescent Current Change	ΔI_B	1	17V≦V_{IN}≦28V		–	–	1.5	mA
			1.0mA≦I_{OUT}≦40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz≦f≦100kHz		–	90	–	μV$_{rms}$
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	28	–	mV/1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 17V≦V_{IN}≦27V, T_j=25℃		34	41	–	dB
Dropout Voltage	$\|V_{IN}-V_{OUT}\|$	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	–1.2	–	mV/℃

ELECTRICAL CHARACTERISTICS
KIA78S15P
(Unless otherwise specified, V_{IN}=23V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃≦Tj≦125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		14.4	15	15.6	V
Input Regulation	Reg line	1	T_j=25℃	17.5V≦V_{IN}≦30V	–	130	300	mV
				20V≦V_{IN}≦30V	–	110	250	
Load Regulation	Reg load	1	T_j=25℃	1.0mA≦I_{OUT}≦100mA	–	25	150	mV
				1.0mA≦I_{OUT}≦40mA	–	12	75	
Output Voltage	V_{OUT}	1	17.5V≦V_{IN}≦30V 1.0mA≦I_{OUT}≦40mA		14.25	–	15.75	V
			V_{IN}=23V, 1.0mA≦I_{OUT}≦70mA		14.25	–	15.75	
Quiescent Current	I_B	1	T_j=25℃		–	3.3	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	20V≦V_{IN}≦30V		–	–	1.5	mA
			1.0mA≦I_{OUT}≦40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz≦f≦100kHz		–	90	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	30	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 18.5V≦V_{IN}≦28.5V, T_j=25℃		34	40	–	dB
Dropout Voltage	| V_{IN}-V_{OUT} |	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	–1.3	–	mV/℃

KEC

KIA78S05P~KIA78S24P

ELECTRICAL CHARACTERISTICS
KIA78S18P
(Unless otherwise specified, V_{IN}=27V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃ $\leqq$ T_j $\leqq$ 125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		17.3	18	18.7	V
Input Regulation	Reg line	1	T_j=25℃	21.4V $\leqq$ V_{IN} $\leqq$ 33V	–	32	325	mV
				22V $\leqq$ V_{IN} $\leqq$ 33V	–	27	275	
Load Regulation	Reg load	1	T_j=25℃	1.0mA $\leqq$ I_{OUT} $\leqq$ 100mA	–	30	170	mV
				1.0mA $\leqq$ I_{OUT} $\leqq$ 40mA	–	15	75	
Output Voltage	V_{OUT}	1	21.4V $\leqq$ V_{IN} $\leqq$ 33V 1.0mA $\leqq$ I_{OUT} $\leqq$ 40mA		17.1	–	18.9	V
			V_{IN}=27V, 1.0mA $\leqq$ I_{OUT} $\leqq$ 70mA		17.1	–	18.9	
Quiescent Current	I_B	1	T_j=25℃		–	3.3	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	22V $\leqq$ V_{IN} $\leqq$ 33V		–	–	1.5	mA
			1.0mA $\leqq$ I_{OUT} $\leqq$ 40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz $\leqq$ f $\leqq$ 100kHz		–	150	–	μV$_{rms}$
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	45	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 23V $\leqq$ V_{IN} $\leqq$ 33V, T_j=25℃		32	38	–	dB
Dropout Voltage	$\lvert V_{IN}-V_{OUT} \rvert$	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-1.5	–	mV/℃

KIA78S05P~KIA78S24P

ELECTRICAL CHARACTERISTICS
KIA78S20P
(Unless otherwise specified, V_{IN}=29V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃$\leq T_j \leq$125℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		19.2	20	20.8	V
Input Regulation	Reg line	1	T_j=25℃	23.5V$\leq V_{IN} \leq$35V	–	33	330	mV
				24V$\leq V_{IN} \leq$35V	–	28	285	
Load Regulation	Reg load	1	T_j=25℃	1.0mA$\leq I_{OUT} \leq$100mA	–	33	180	mV
				1.0mA$\leq I_{OUT} \leq$40mA	–	17	90	
Output Voltage	V_{OUT}	1	23.5V$\leq V_{IN} \leq$35V 1.0mA$\leq I_{OUT} \leq$40mA		19.0	–	21.0	V
			V_{IN}=29V, 1.0mA$\leq I_{OUT} \leq$70mA		19.0	–	21.0	
Quiescent Current	I_B	1	T_j=25℃		–	3.3	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	24V$\leq V_{IN} \leq$35V		–	–	1.5	mA
			1.0mA$\leq I_{OUT} \leq$40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz$\leq$f$\leq$100kHz		–	170	–	μV_{rms}
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	49	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 25V$\leq V_{IN} \leq$35V, T_j=25℃		31	37	–	dB
Dropout Voltage	| V_{IN}-V_{OUT} |	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	-1.7	–	mV/℃

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ELECTRICAL CHARACTERISTICS
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(Unless otherwise specified, V_{IN}=33V, I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF, 0℃≤T_j≤125℃)

| CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j=25℃		23	24	25	V
Input Regulation	Reg line	1	T_j=25℃	27.5V≤V_{IN}≤38V	–	35	350	mV
				28V≤V_{IN}≤38V	–	30	300	
Load Regulation	Reg load	1	T_j=25℃	1.0mA≤I_{OUT}≤100mA	–	40	200	mV
				1.0mA≤I_{OUT}≤40mA	–	20	100	
Output Voltage	V_{OUT}	1	27.5V≤V_{IN}≤38V 1.0mA≤I_{OUT}≤40mA		22.8	–	25.2	V
			V_{IN}=33V, 1.0mA≤I_{OUT}≤70mA		22.8	–	25.2	
Quiescent Current	I_B	1	T_j=25℃		–	3.5	6.5	mA
			T_j=125℃		–	–	6.0	
Quiescent Current Change	ΔI_B	1	28V≤V_{IN}≤38V		–	–	1.5	mA
			1.0mA≤I_{OUT}≤40mA		–	–	0.1	
Output Noise Voltage	V_{NO}	1	Ta=25℃, 10Hz≤f≤100kHz		–	200	–	μV$_{rms}$
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1			–	56	–	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	2	f=120Hz, 29V≤V_{IN}≤39V, T_j=25℃		31	35	–	dB
Dropout Voltage	|V_{IN}-V_{OUT}|	1	T_j=25℃		–	1.7	–	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	1	I_{OUT}=5mA		–	–2.0	–	mV/℃

TEST CIRCUIT/STANDARD APPLICATION CIRCUIT

TEST CIRCUIT

1. V_{OUT} , $R_{eg} \cdot line$, $R_{eg} \cdot load$, V_{OUT} , I_B , ΔI_B , V_{NO} , $\Delta V_{OUT} / \Delta t$, $| V_{IN} - V_{OUT} |$, TC_{VO}

2. RR



$RR = 20 \log \dfrac{e_i}{e_o} (dB)$

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APPLICATION CIRCUIT

(1) STANDARD APPLICATION

D1 : Protection Diode
   High speed diode D1 should be
   connected as shown in the figure
   if the condition $V_{IN} < V_{OUT}$
   might occur by surge voltage or
   power supply ON/OFF.

R_{SD} : Power limiting resistor
   for large V_{IN} , resistor R_{SD} is
   needed to limit IC power
   dissipation.

(2) A. CURRENT BOOST VOLTAGE REGULATOR

Heat sink is needed for Q1

$$R1 \leq \frac{V_{BE1}}{I_{B(MAX)}}$$

where, V_{BE1} : V_{BE} of external
   transistor Q1

   $I_{B(MAX)}$: Quiescent current of IC

B. SHORT-CIRCUIT PROTECTION

$$R_{SC} = \frac{V_{BE2}}{I_{SC}}$$

where, I_{SC} : Short-Circuit
   current

(3) CURRENT REGULATOR

$$I_{OUT} = \frac{V_{OUT}}{R} + I_B$$

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(4) VOLTAGE BOOST REGULATOR

$$V_{OUT} = V_Z + V_{OUT} \text{ (of IC)}$$
A little of current in resistor R
is needed.

$$V_{OUT} = R2 \left(I_B + \frac{V_{OUT} \text{ (of IC)}}{R1} \right) + V_{OUT} \text{ (of IC)}$$
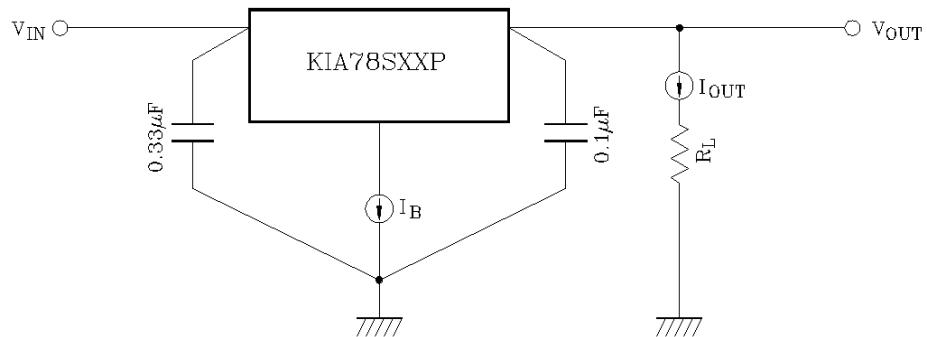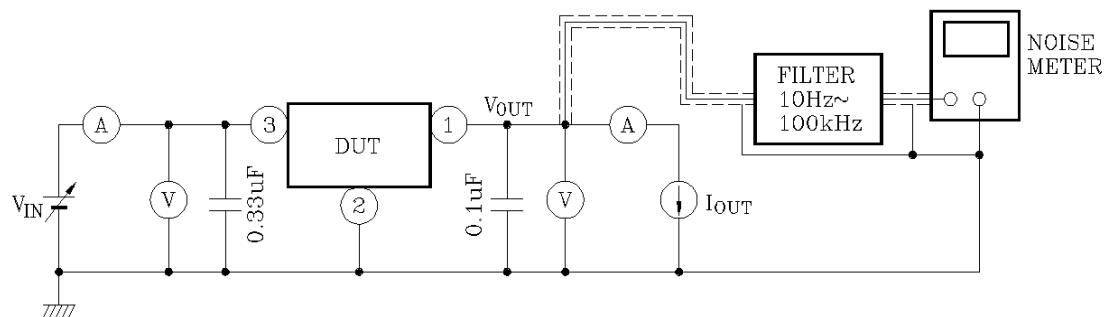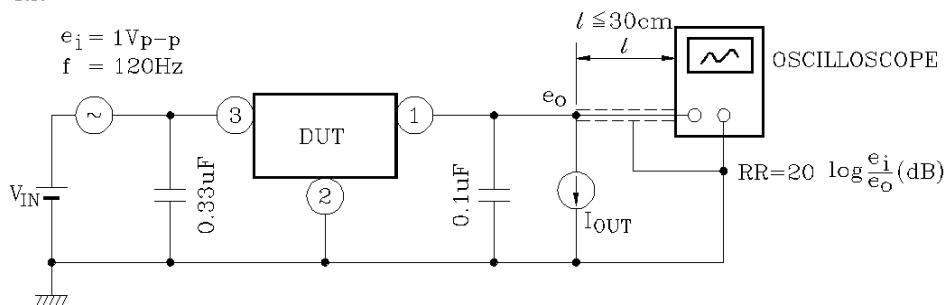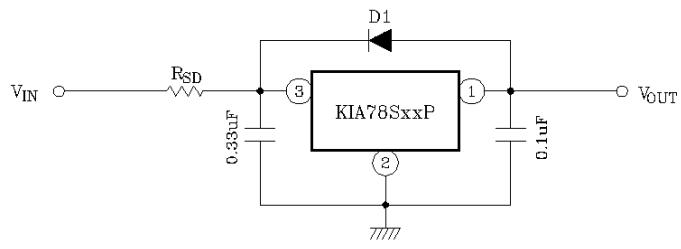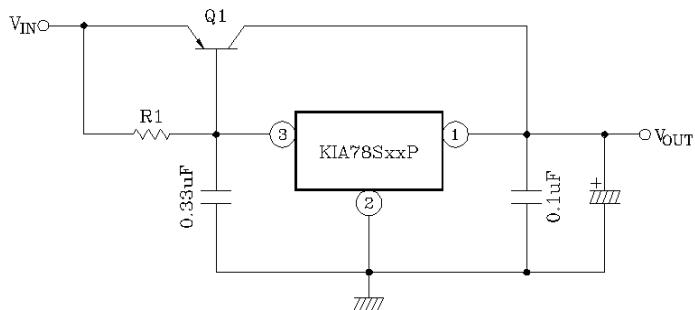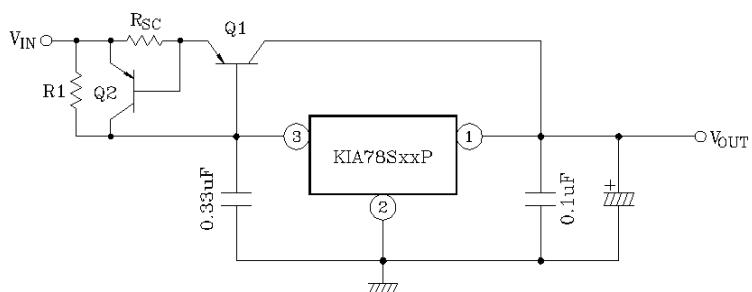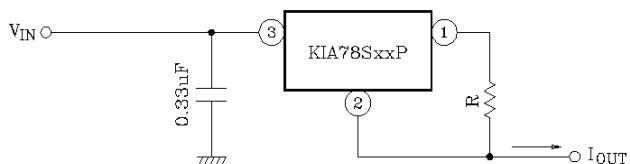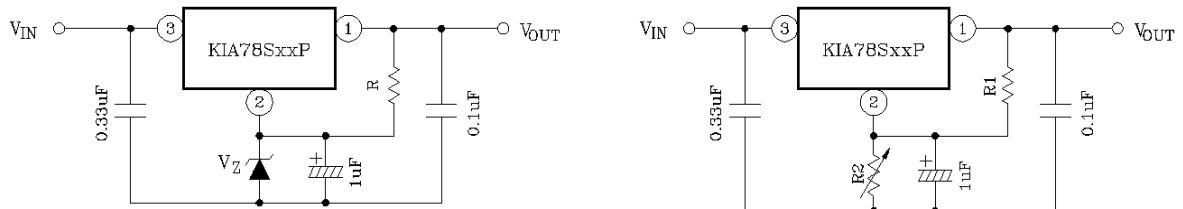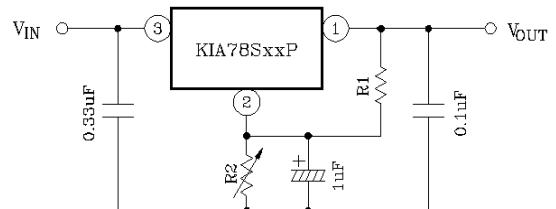
(5) NEGATIVE REGULATOR
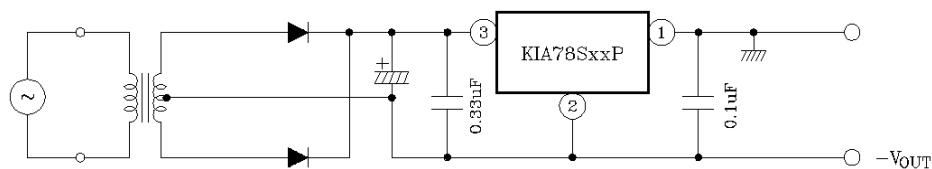
(6) POSITIVE AND NEGATIVE REGULATOR
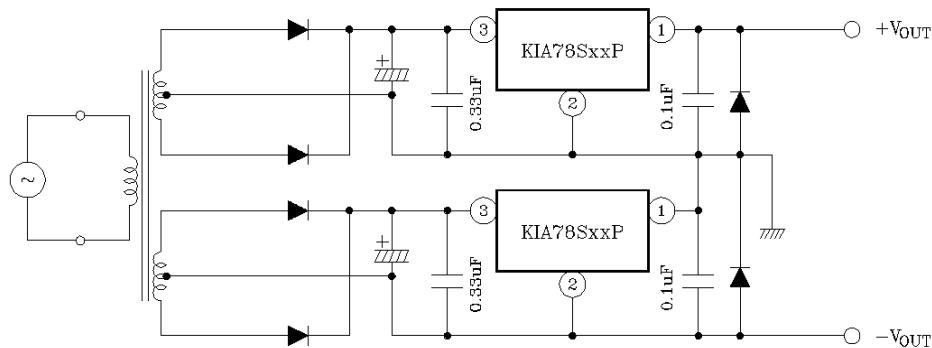
PRECAUTIONS FOR USE

When such a high voltage as exceeds 10V beyond the fixed output voltage (Typ.Value)
of IC is applied to the output terminal of IC, the IC may be destroyed. In such a case, it is advised
to prevent an excessive voltage from being applied to the IC by connecting a zener diode
between the output terminal and the GND. Especially, in the current boost circuit as shown
in example (2) of application circuits, an input voltage may be suddenly applied to the output
terminal of IC in the form of steps, and that in case of light load, an excessive voltage
may be transiently applied to the output terminal of IC: So that great care should be taken
to this matter. In this case, in addition to the above, it may become necessary to consider such
a countermeasure as the output capacitor in use is replaced with a capacitor of larger capacitance,
or as R1 (a resistor for IC bias current) or bypass is replaced with a resistor of smaller
resistance according to circumstances, or as the input voltage is gradually raised.

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P_D MAX $-$ Ta

$|V_{IN} - V_{OUT}| - T_j$

$V_{OUT} - V_{IN}$

$I_B - V_{IN}$

$V_{OUT} - I_{OUT}$