

# KIA78L05BP/BPV ~ KIA78L24BP/BPV

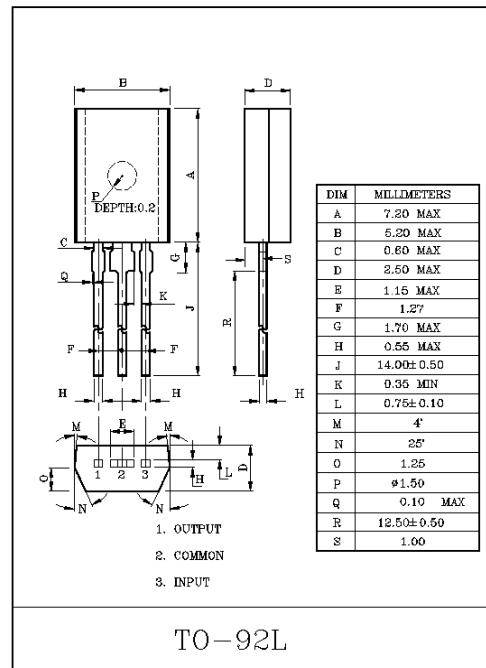
THREE TERMINAL POSITIVE VOLTAGE REGULATORS  
5V, 6V, 7V, 8V, 9V, 10V, 12V, 13V, 15V, 18V, 20V, 24V.

**FEATURES**

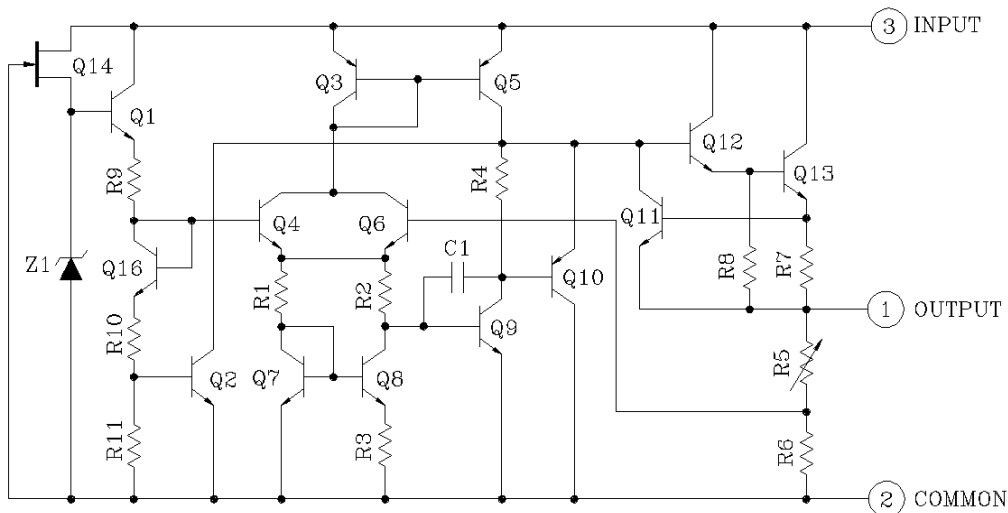
- Suitable for C-MOS, TTL, DTL, HTL Power Supply.
- Internal Short-Circuit Current Limiting.
- Internal Thermal Overload Protection.
- Maximum Output Current of 150mA ( $T_j=25^{\circ}\text{C}$ ).
- Packaged in TO-92L.

**MAXIMUM RATINGS ( $T_a=25^{\circ}\text{C}$ )**

CHARACTERISTIC	SYMBOL	RATING	UNIT	
Input Voltage	$V_{IN}$	(5V~15V)	35	V
		(18V~24V)	40	
Power Dissipation	$P_D$	800	mW	
Operating Junction Temperature	$T_j$	-30~150	$^{\circ}\text{C}$	
Operating Temperature	$T_{opr}$	-30~75	$^{\circ}\text{C}$	
Storage Temperature	$T_{stg}$	-55~150	$^{\circ}\text{C}$	



**EQUIVALENT CIRCUIT**



## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**
**KIA78L05BP/BPV**

 (Unless otherwise specified,  $V_{IN}=10V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j=25^{\circ}C$	4.8	5.0	5.2	V	
Input Regulation	Reg line	1	$T_j=25^{\circ}C$	$7.0V \leq V_{IN} \leq 20V$	-	55	150	mV
				$8.0V \leq V_{IN} \leq 20V$	-	45	100	
Load Regulation	Reg load	1	$T_j=25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	-	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	$T_j=25^{\circ}C$	-	3.1	6.0	mA	
			$T_j=125^{\circ}C$	-	-	5.5		
Quiescent Current Change	$\Delta I_B$	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	$T_a=25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	-	40	-	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1		-	12	-	mV/ 1.0kHrs	
Ripple Rejection Ratio	RR	2	$f=120Hz$ , $8.0V \leq V_{IN} \leq 18V$ , $T_j=25^{\circ}C$	41	49	-	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j=25^{\circ}C$	-	1.7	-	V	
Average Temperature Coefficient of Output Voltage	$TC_{VO}$	1	$I_{OUT}=5mA$	-	-0.6	-	mV/ $^{\circ}C$	

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

### ELECTRICAL CHARACTERISTICS

KIA78L06BP/BPV

(Unless otherwise specified,  $V_{IN}=11V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j=25^{\circ}C$	5.76	6.0	6.24	V	
Input Regulation	Reg line	1	$T_j=25^{\circ}C$	$8.1V \leq V_{IN} \leq 21V$	-	50	150	mV
				$9.0V \leq V_{IN} \leq 21V$	-	45	110	
Load Regulation	Reg load	1	$T_j=25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	-	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	$T_j=25^{\circ}C$	-	3.1	6.0	mA	
			$T_j=125^{\circ}C$	-	-	5.5		
Quiescent Current Change	$\Delta I_B$	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	$T_a=25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	-	40	-	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1		-	14	-	mV/ 1.0kHrs	
Ripple Rejection Ratio	RR	2	$f=120Hz$ , $9.0V \leq V_{IN} \leq 19V$ , $T_j=25^{\circ}C$	39	47	-	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j=25^{\circ}C$	-	1.7	-	V	
Average Temperature Coefficient of Output Voltage	$TC_{VO}$	1	$I_{OUT}=5mA$	-	-0.7	-	mV/ $^{\circ}C$	

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**

**KIA78L07BP/BPV**

(Unless otherwise specified,  $V_{IN}=12V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**

**KIA78L08BP/BPV**

(Unless otherwise specified,  $V_{IN}=14V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**

**KIA78L09BP/BPV**

(Unless otherwise specified,  $V_{IN}=15V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**

**KIA78L10BP/BPV**

(Unless otherwise specified,  $V_{IN}=16V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**
**KIA78L12BP/BPV**

 (Unless otherwise specified,  $V_{IN}=19V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j=25^{\circ}C$	11.5	12	12.5	V	
Input Regulation	Reg line	1	$T_j=25^{\circ}C$	$14.5V \leq V_{IN} \leq 27V$	-	120	250	mV
				$16V \leq V_{IN} \leq 27V$	-	100	200	
Load Regulation	Reg load	1	$T_j=25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	-	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	$T_j=25^{\circ}C$	-	3.2	6.5	mA	
			$T_j=125^{\circ}C$	-	-	6.0		
Quiescent Current Change	$\Delta I_B$	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	$T_a=25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	-	80	-	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1		-	24	-	mV/ 1.0kHrs	
Ripple Rejection Ratio	RR	2	$f=120Hz$ , $15V \leq V_{IN} \leq 25V$ , $T_j=25^{\circ}C$	36	41	-	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j=25^{\circ}C$	-	1.7	-	V	
Average Temperature Coefficient of Output Voltage	$TC_{VO}$	1	$I_{OUT}=5mA$	-	1.0	-	mV/ $^{\circ}C$	



## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**

**KIA78L13BP/BPV**

(Unless otherwise specified,  $V_{IN}=21V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**

**KIA78L15BP/BPV**

(Unless otherwise specified,  $V_{IN}=23V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**
**KIA78L18BP/BPV**

 (Unless otherwise specified,  $V_{IN}=27V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

**ELECTRICAL CHARACTERISTICS**
**KIA78L20BP/BPV**

 (Unless otherwise specified,  $V_{IN}=29V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j=25^{\circ}C$	19.2	20	20.8	V	
Input Regulation	Reg line	1	$T_j=25^{\circ}C$	$23.5V \leq V_{IN} \leq 35V$	-	33	330	mV
				$24V \leq V_{IN} \leq 35V$	-	28	285	
Load Regulation	Reg load	1	$T_j=25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	-	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	$T_j=25^{\circ}C$	-	3.3	6.5	mA	
			$T_j=125^{\circ}C$	-	-	6.0		
Quiescent Current Change	$\Delta I_B$	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	$T_a=25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	-	170	-	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT}/\Delta t$	1		-	49	-	mV/ 1.0kHrs	
Ripple Rejection Ratio	RR	2	$f=120Hz$ , $25V \leq V_{IN} \leq 35V$ , $T_j=25^{\circ}C$	31	37	-	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j=25^{\circ}C$	-	1.7	-	V	
Average Temperature Coefficient of Output Voltage	$TC_{VO}$	1	$I_{OUT}=5mA$	-	-1.7	-	mV/ $^{\circ}C$	

## KIA78L05BP/BPV ~ KIA78L24BP/BPV

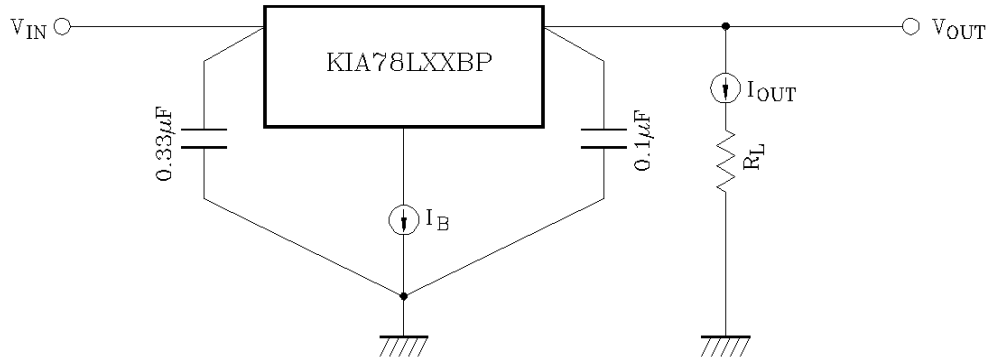
**ELECTRICAL CHARACTERISTICS**
**KIA78L24BP/BPV**

 (Unless otherwise specified,  $V_{IN}=33V$ ,  $I_{OUT}=40mA$ ,  $C_{IN}=0.33\mu F$ ,  $C_{OUT}=0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

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

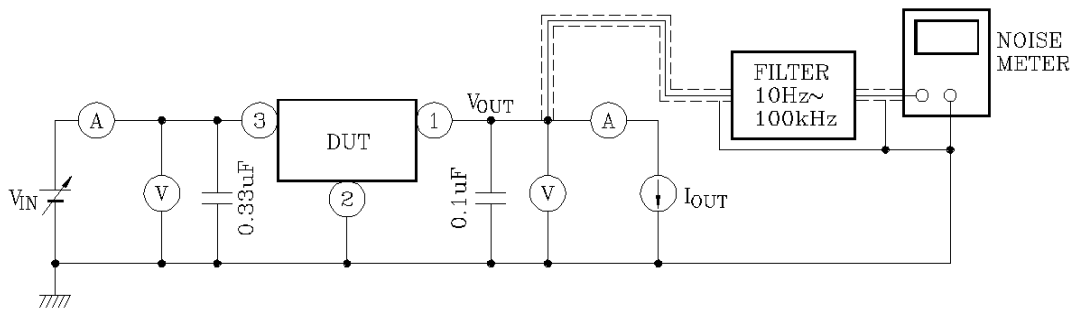
# KIA78L05BP/BPV ~ KIA78L24BP/BPV

## TEST CIRCUIT/STANDARD APPLICATION CIRCUIT

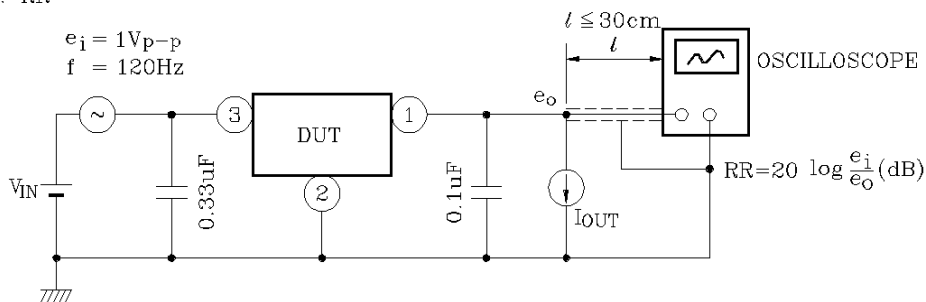


## TEST CIRCUITS

1.  $V_{OUT}$ ,  $R_{reg}$  (line),  $R_{reg}$  (load),  $V_{OUT}$ ,  $I_B$ ,  $\Delta I_B$ ,  $V_{NO}$ ,  $\Delta V_{OUT} / \Delta t$ ,  $|V_{IN} - V_{OUT}|$ ,  $TC_{VO}$

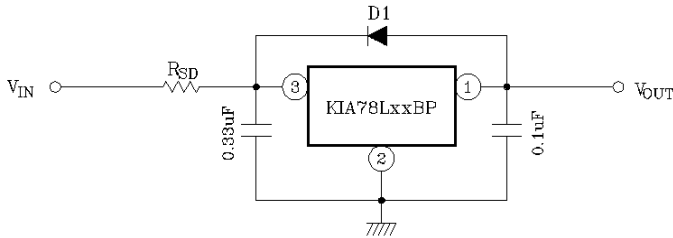


2. RR



# KIA78L05BP/BPV ~ KIA78L24BP/BPV

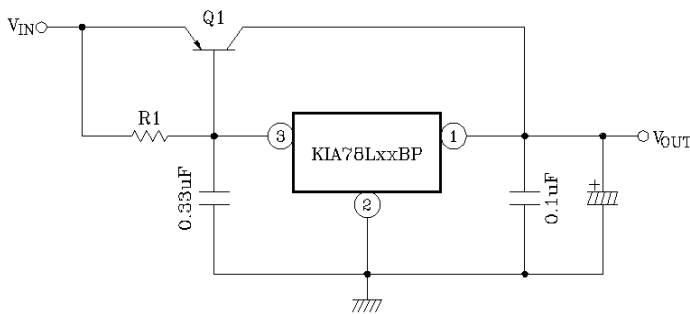
(1) STANDARD APPLICATION



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



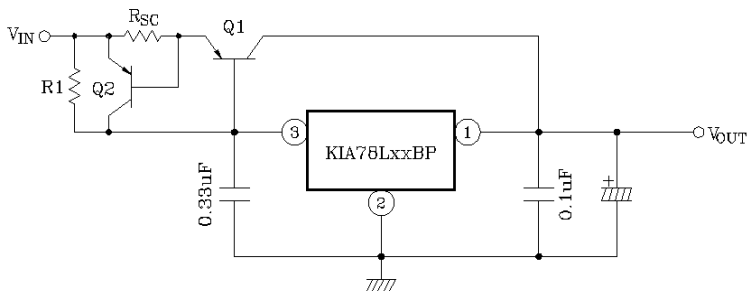
Heat sink is needed for Q1

$$R1 \leq \frac{V_{BE1}}{I_B(\text{MAX})}$$

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

$I_B(\text{MAX})$  : Quiescent current of IC

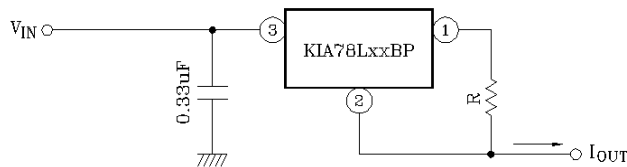
B. SHORT-CIRCUIT PROTECTION



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

where,  $I_{SC}$  : Short-Circuit current

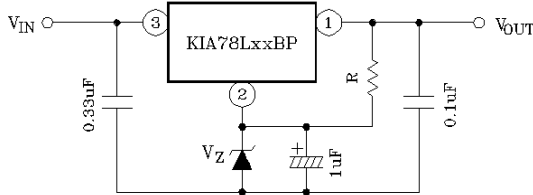
(3) CURRENT REGULATOR



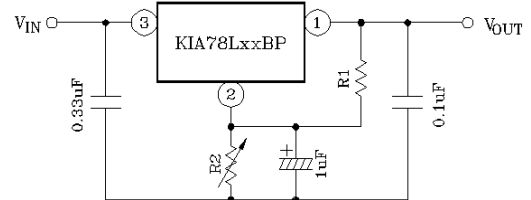
$$I_{OUT} = \frac{V_{OUT}}{R} + I_B$$

# KIA78L05BP/BPV ~ KIA78L24BP/BPV

(4) VOLTAGE BOOST REGULATOR

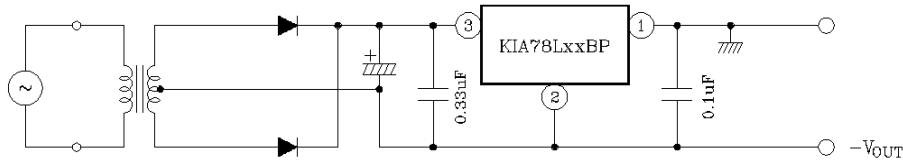


$V_{OUT} = V_Z + V_{OUT} \text{ (of IC)}$   
 A little of current in resistor R is needed.



$$V_{OUT} = R2 \left( I_B + \frac{V_{OUT} \text{ (of IC)}}{R1} \right) + V_{OUT} \text{ (of IC)}$$

(5) NEGATIVE REGULATOR



(6) POSITIVE AND NEGATIVE REGULATOR

