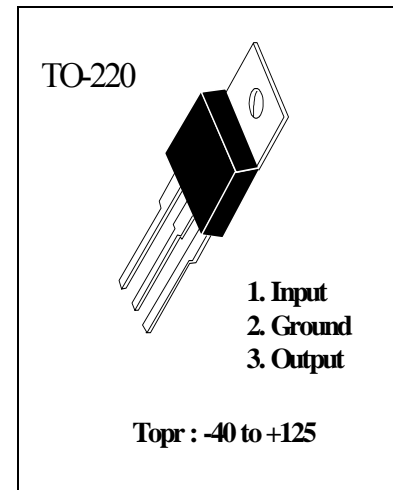# POSITIVE VOLTAGE REGULATOR   KK78xx

3- TERMINAL 1A POSITIVE VOLTAGE REGULATORS

The KK78xx series of three-terminal positive regulators are available in the TO-220 package and with several fixed output voltage, marking them useful in a wide range of applications.

These applications include on-card regulation for elimination of noise and distribution problems associated with single point regulation with single point regulation. In addition, they can be used with power pass elements to make high current voltage regulators.

If adequate heat sinking is provided, each of these regulator can deliver over 1A of output current.
Although designed primarily as fixed voltage regulators, these devices can
be used with external components to obtain adjustable voltage and currents.
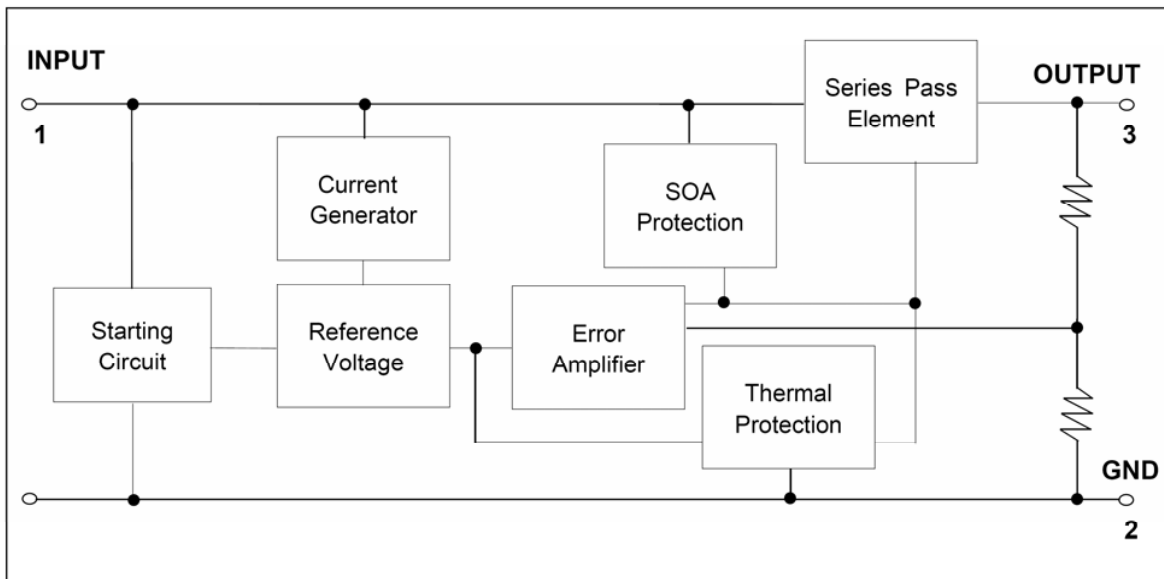
TO-220

1. Input
2. Ground
3. Output

Topr : -40 to +125

FEATURES

◇ Output current up to 1A
◇ No external components required
◇ Internal short circuit current limiting
◇ Intermal thermal overload protection
◇ Output transistor safe-area compensation
◇ Output voltage offered in 4% tolerance

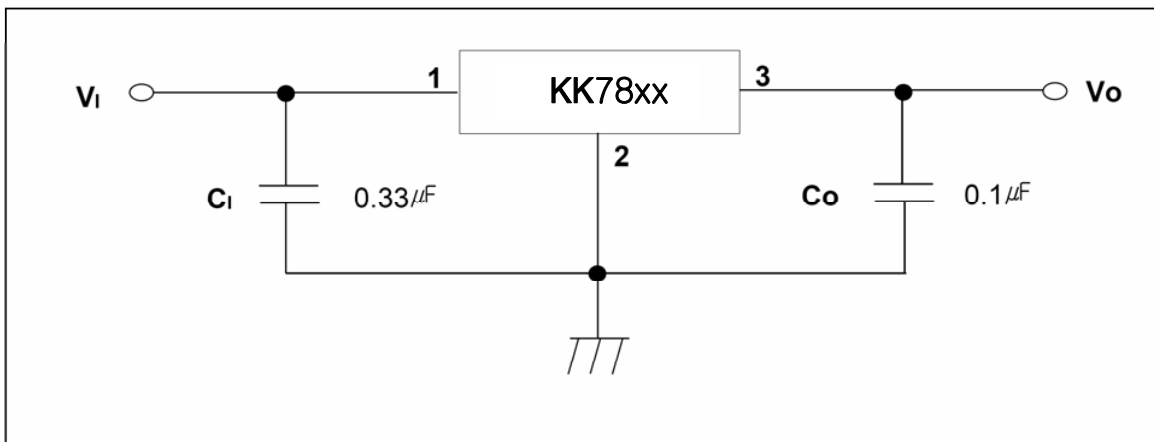## ABSOLUTE MAXIMUM RATINGS

Characteristics		Symbol	Value	Unit
Input Voltage	IL7805 ~ IL7818	VI	35	v
	IL7824	VI	40	
Operating junction temperature		Topr	-40 ~ +125	° C
Power Dissipation (Tc=25° C)		PD	20	W
Power Dissipation (Without Heatsink)		PD	1.2	W
Operating temperature		Topr	-40 ~ +125	° C
Storage temperature		Tstg	-60 ~ +150	° C

1

1. BLOCK DIAGRAM

2. TYPICAL APPLICATIONS

Notes :

(1) To specify an output voltage, substitute voltage value for "XX"

(2) C_I is required if regulator is located in appreciable distance from power supply filter.

(3) Co improves stability and transient response.

IL7805 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=10V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		4.8	5.0	5.2	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 7V to 20V VI = 8V to 20V		4.75	5.0	5.25	
Line Regulation	△Vo	Tj = 25° C	VI = 7V to 25V		4.0	100	mV
			VI = 8V to 12V		1.6	50	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		9	100	
			Io = 250mA to 750mA		4	50	
Quiescent current	Iq	Tj = 25° C			5	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A			0.03	0.5	mA
		VI = 7V to 25V			0.3	1.3	
		VI = 8V to 25V					
Output voltage Drift	△Vo/△T	Io = 5mA			-0.8		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			42		μV
Ripple Rejection	RR	f = 120Hz, VI = 8V to 18V		62	73		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			15		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			230		mA

 * Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects
   must be taken into account separately. Pulse testing with low duty is used.

3

IL7806 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=11V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		5.75	6.0	6.25	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 8V to 21V VI = 9V to 21V		5.7	6.0	6.3	
Line Regulation	△Vo	Tj = 25° C	VI = 8V to 25V		5	120	mV
			VI = 9V to 13V		1.5	60	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		9	120	
			Io = 250mA to 750mA		3	60	
Quiescent current	Iq	Tj = 25° C			5	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A				0.5	mA
		VI = 8V to 25V				1.3	
		VI = 9V to 25V					
Output voltage Drift	△Vo/△T	Io = 5mA			-0.8		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			45		μV
Ripple Rejection	RR	f = 120Hz, VI = 9V to 19V		59	75		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			19		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			250		mA

 * Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

4

IL7808 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=14V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		7.7	8.0	8.3	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 10.5V to 23V VI = 11.5V to 23V		7.6	8.0	8.4	
Line Regulation	△Vo	Tj = 25° C	VI = 10.5V to 25V		5.0	160	mV
			VI = 11.5V to 17V		2.0	80	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		10	160	
			Io = 250mA to 750mA		5	80	
Quiescent current	Iq	Tj = 25° C			5	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A			0.05	0.5	mA
		VI = 10.5V to 25V			0.5	1.0	
		VI = 11.5V to 25V					
Output voltage Drift	△Vo/△T	Io = 5mA			-0.8		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			52		μV
Ripple Rejection	RR	f = 120Hz, VI = 11.5V to 21.5V		56	73		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			17		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			230		mA

 * Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects
   must be taken into account separately. Pulse testing with low duty is used.

5

IL7809 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=15V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		8.65	9.0	9.35	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 11.5V to 24V VI = 12.5V to 24V		8.6	9.0	9.4	
Line Regulation	△Vo	Tj = 25° C	VI = 11.5V to 25V		6.0	180	mV
			VI = 12V to 25V		2	90	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		12	180	
			Io = 250mA to 750mA		4	90	
Quiescent current	Iq	Tj = 25° C			5.0	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A				0.5	mA
		VI = 11.5V to 26V				1.3	
		VI = 12.5V to 26V					
Output voltage Drift	△Vo/△T	Io = 5mA			-1		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			58		μV
Ripple Rejection	RR	f = 120Hz, VI = 13V to 23V		56	71		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			17		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			250		mA

  * Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

6

IL7810 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=16V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		9.6	10.0	10.4	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 12.5V to 25V VI = 13.5V to 25V		9.5	10.0	10.5	
Line Regulation	△Vo	Tj = 25° C	VI = 12.5V to 25V		10	200	mV
			VI = 13V to 25V		3	100	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		12	200	
			Io = 250mA to 750mA		4	400	
Quiescent current	Iq	Tj = 25° C			5.1	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A				0.5	mA
		VI = 12.5V to 29V				1	
		VI = 13.5V to 29V					
Output voltage Drift	△Vo/△T	Io = 5mA			-1		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			58		μV
Ripple Rejection	RR	f = 120Hz, VI = 13V to 23V		56	71		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			17		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			250		mA

* Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

IL7812 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=19V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		11.5	12	12.5	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 14.5V to 27V VI = 15.5V to 27V		11.4	12	12.6	
Line Regulation	△Vo	Tj = 25° C	VI = 14.5V to 30V		10	240	mV
			VI = 16V to 22V		3	120	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		11	240	
			Io = 250mA to 750mA		5	120	
Quiescent current	Iq	Tj = 25° C			5.1	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A			0.1	0.5	mA
		VI = 14.5V to 30V			0.5	1.0	
		VI = 15V to 30V					
Output voltage Drift	△Vo/△T	Io = 5mA			-1		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			76		μV
Ripple Rejection	RR	f = 120Hz, VI = 15V to 25V		55	71		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			17		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			230		mA

 * Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects
   must be taken into account separately. Pulse testing with low duty is used.

8

IL7815 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=23V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		14.4	15	15.6	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 17.5V to 30V VI = 18.5V to 30V		14.25	15	15.75	
Line Regulation	△Vo	Tj = 25° C	VI = 17.5V to 30V		11	300	mV
			VI = 20V to 26V		3	150	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		12	300	
			Io = 250mA to 750mA		4	150	
Quiescent current	Iq	Tj = 25° C			5.2	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A				0.5	mA
		VI = 17.5V to 30V				1.0	
		VI = 18.5V to 30V					
Output voltage Drift	△Vo/△T	Io = 5mA			-1		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			90		μV
Ripple Rejection	RR	f = 120Hz, VI = 18.5V to 28.5V		54	70		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			19		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			250		mA

* Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

9

IL7818 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=27V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		17.3	18	18.7	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 21V to 33V VI = 22V to 33V		17.1	18	18.9	
Line Regulation	△Vo	Tj = 25° C	VI = 21V to 33V		15	360	mV
			VI = 24V to 30V		5	180	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		15	360	
			Io = 250mA to 750mA		5	180	
Quiescent current	Iq	Tj = 25° C			5.2	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A				0.5	mA
		VI = 21V to 33V				1.0	
		VI = 22V to 33V					
Output voltage Drift	△Vo/△T	Io = 5mA			-1		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			110		μV
Ripple Rejection	RR	f = 120Hz, VI = 22V to 32V		53	69		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			22		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			250		mA

* Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.
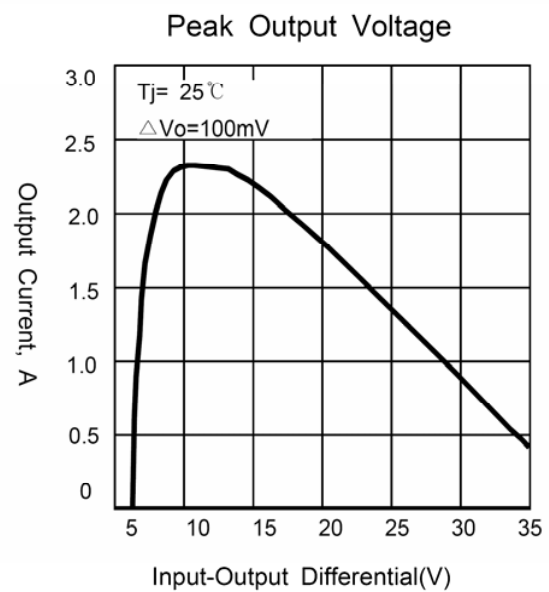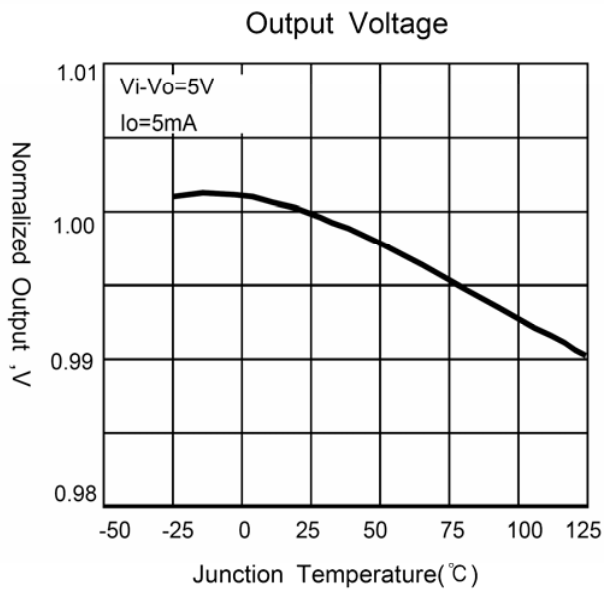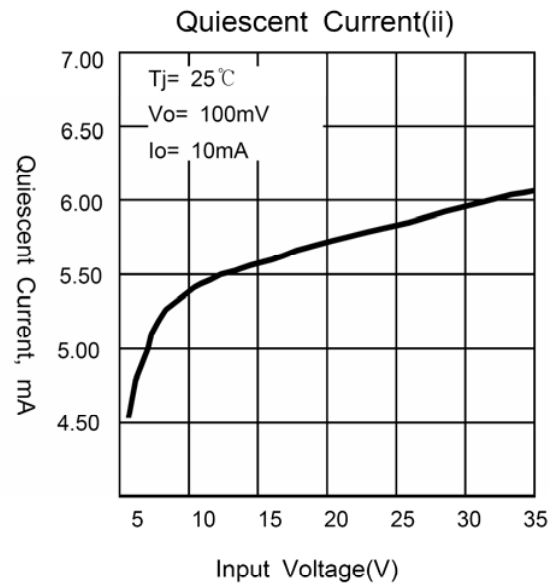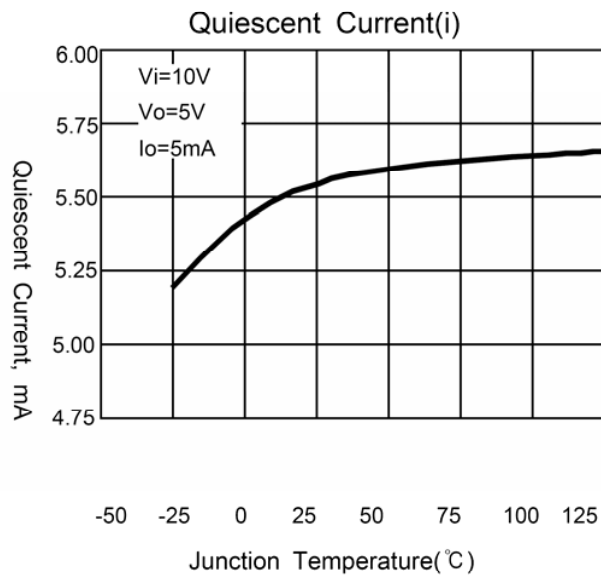
IL7824 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, Tmin<Tj<Tmax, Io=500mA, VI=33V, Ci=0.33 μF, Co=0.1 μF, unless otherwise sprcified)

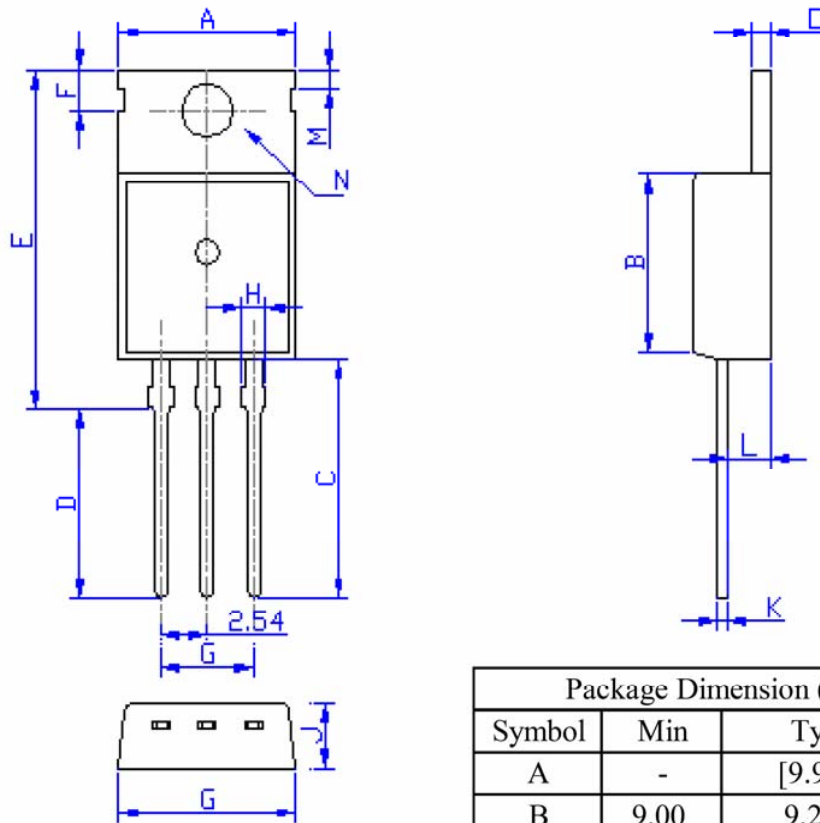| Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	Tj = 25° C		23	24	25	V
		5.0mA ≤Io ≤1.0A, PD ≤15W VI = 27V to 38V VI = 28V to 38V		22.8	24	25.25	
Line Regulation	△Vo	Tj = 25° C	VI = 27V to 38V		17	480	mV
			VI = 30V to 36V		6	240	
Load Regulation	△Vo	Tj = 25° C	Io = 5.0mA to 1.5A		15	480	
			Io = 250mA to 750mA		5	240	
Quiescent current	Iq	Tj = 25° C			5.2	8	mA
Quiescent current Change	△Iq	Io = 5mA to 1A			0.1	0.5	mA
		VI = 27V to 38V			0.5	1.0	
		VI = 28V to 38V					
Output voltage Drift	△Vo/△T	Io = 5mA			-1.5		mV/° C
Output noise voltage	Vn	f = 10Hz to 100KHz, Ta = 25° C			60		μV
Ripple Rejection	RR	f = 120Hz, VI = 28V to 38V		50	67		dB
Dropout voltage	Vd	Io = 1A, Tj = 25° C			2		V
Peak current	Ipk	Tj = 25° C			2.2		A
Output Resistance	Ro	f = 1KHz			28		MΩ
Short circuit current	Isc	Vi = 35V, Ta = 25° C			230		mA

 * Load and lone regulation are specified at constant junction temperature. Changes in Vo due to heating effects
   must be taken into account separately. Pulse testing with low duty is used.

![KODENSHI logo]

TYPICAL PERFORMANCE CHARACTERISTICS

Quiescent Current(i)

Vi=10V
Vo=5V
Io=5mA

Y-axis: Quiescent Current, mA (4.75 to 6.00)
X-axis: Junction Temperature(℃) (-50 to 125)

Quiescent Current(ii)

Tj= 25℃
Vo= 100mV
Io= 10mA

Y-axis: Quiescent Current, mA (4.50 to 7.00)
X-axis: Input Voltage(V) (5 to 35)

Output Voltage

Vi-Vo=5V
Io=5mA

Y-axis: Normalized Output , V (0.98 to 1.01)
X-axis: Junction Temperature(℃) (-50 to 125)

Peak Output Voltage

Tj= 25℃
△Vo=100mV

Y-axis: Output Current, A (0 to 3.0)
X-axis: Input-Output Differential(V) (5 to 35)

Drop Output Voltage

Power Dissipation

PACKAGE OUTLINE DIMENSIONS

Package Dimension (unit:mm)			
Symbol	Min	Typ	Max
A	-	[9.90]	-
B	9.00	9.20	9.40
C	12.88	13.08	13.28
D	9.78	10.08	10.38
E	-	-	18.95
F	2.70	2.80	2.90
G	4.88	5.08	5.28
H	1.42	1.52	1.62
I	9.80	10.00	10.20
J	4.03	4.50	4.70
K	0.45	0.50	0.60
L	2.30	2.40	2.50
M	1.20	1.30	1.40
N	-	[φ3.60]	-
O	1.25	1.30	1.40