

KA78TXX

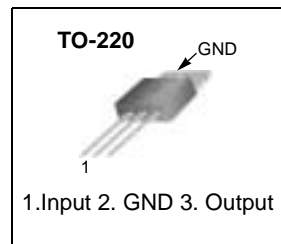
3-Terminal 3A Positive Voltage Regulator

Features

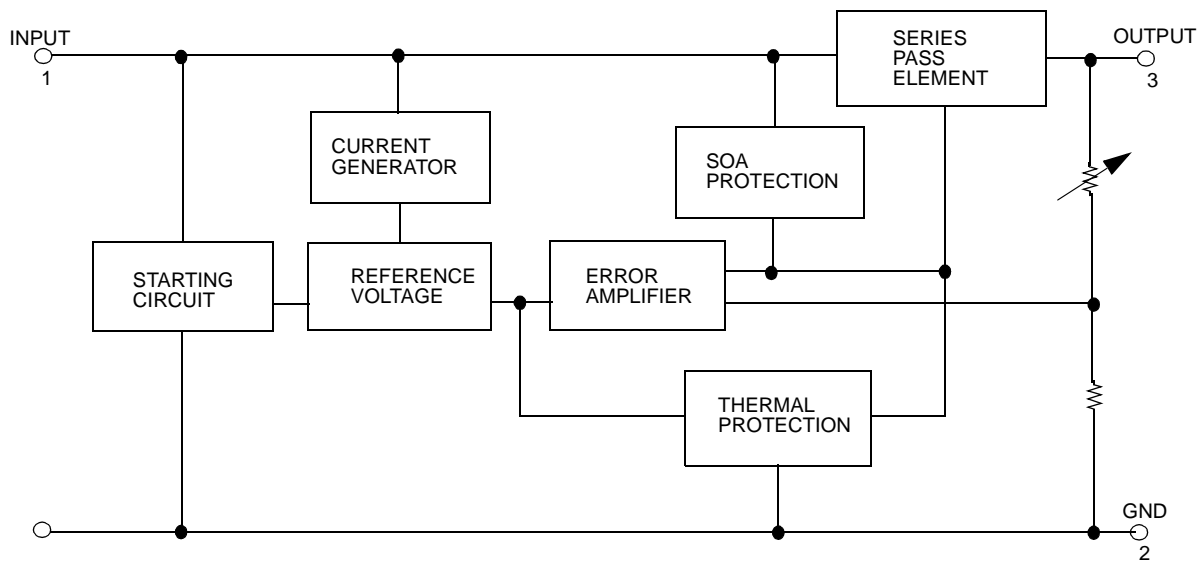
- Output Current in Excess of 3.0A
- Output Transistor Safe Operating Area Compensation
- Power Dissipation: 25W
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- Output Voltage Offered in 4% Tolerance
- No External Components Required
- Output Voltage of 5, 12 and 15V

Description

This family of fixed voltage regulators are monolithic integrated circuit capable of driving loads in excess of 3.0A.



Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for $V_O = 5V$ to $12V$) (for $V_O = 15V$)	V_I	35 40	V V
Power Dissipation	PD	Internally limited	-
Thermal Resistance, Junction to Air (Note1, 2) $T_a = +25^\circ\text{C}$	$R_{\theta JA}$	65	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note1) $T_c = +25^\circ\text{C}$	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
Operating Junction Temperature Range	T_J	0 ~ +125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 ~ +150	$^\circ\text{C}$

Note:

- Thermal resistance test board
Size: 76.2mm * 114.3mm * 1.6mm(1S0P)
JEDEC standard: JESD51-3, JESD51-7
- Assume no ambient airflow.

Electrical Characteristics(KA78T05)

($V_I = 10V$, $I_O = 3.0A$, $0^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$, $P_O \leq P_{MAX}$ (Note3), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	$5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$ $7.3\text{V} \leq V_I \leq 20\text{V}$, $5\text{mA} \leq I_O \leq 2.0\text{A}$	4.8 4.75	5.0 5.0	5.2 5.25	V
Line Regulation (Note4)	ΔV_O	$7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 5\text{mA}$, $T_J = +25^\circ\text{C}$ $7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 1.0\text{A}$, $T_J = +25^\circ\text{C}$ $7.5\text{V} \leq V_I \leq 20\text{V}$, $I_O = 2.0\text{A}$, $T_J = +25^\circ\text{C}$ $8.0\text{V} \leq V_I \leq 12\text{V}$, $I_O = 3.0\text{A}$, $T_J = +25^\circ\text{C}$	-	3.0	25	mV
Load Regulation (Note4)	ΔV_O	$5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$ $5\text{mA} \leq I_O \leq 3.0\text{A}$	-	10 15	30 80	mV mV
Thermal Regulation	REG_T	Pulse = 10ms, $P = 20\text{W}$ $T_A = +25^\circ\text{C}$	-	0.002	0.03	% V_O/W
Quiescent Current	I_Q	$5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$ $5\text{mA} \leq I_O \leq 3.0\text{A}$	-	3.5 4.0	5.0 6.0	mA mA
Quiescent Current Change	ΔI_Q	$7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 5\text{mA}$ $T_J = +25^\circ\text{C}$; $7.5\text{V} \leq V_I \leq 20\text{V}$, $I_O = 2.0\text{A}$; $5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$	-	0.1	0.8	mA
Ripple Rejection	RR	$f = 120\text{Hz}$, $8\text{V} \leq V_I \leq 18\text{V}$, $I_O = 2.0\text{A}$ $T_J = +25^\circ\text{C}$	-	75	-	dB
Dropout Voltage	V_D	$I_O = 3\text{A}$, $T_J = +25^\circ\text{C}$	-	2.2	2.5	V
Output Noise Voltage	V_N	$T_A = +25^\circ\text{C}$, $10\text{Hz} \leq f \leq 100\text{kHz}$	-	10	-	$\mu\text{V}/V_O$
Peak Output Current	I_{PK}	$T_A = +25^\circ\text{C}$	-	5.0	-	A
Output Resistance	R_O	$f = 1.0\text{kHz}$	-	2.0	-	$\text{m}\Omega$
Short Circuit Current Limit	I_{SC}	$V_I = 35\text{V}$, $T_J = +25^\circ\text{C}$	-	1.5	2.5	A
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$I_O = 5.0\text{mA}$	-	0.2	-	$\text{mV}/^\circ\text{C}$

Note:

- Although power dissipation is internally limited, specifications apply only for $P_O \leq P_{max}$, $P_{max} = 25\text{W}$
- Load and line regulation are specified at constant junction temperature. Change in V_O due heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics(KA78T12) (Continued)

(VI = 19V, IO = 3.0 A, 0°C ≤ TJ ≤ +125°C, Po ≤ PMAX (Note1), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	Vo	5mA ≤ Io ≤ 3.0A, TJ = +25°C 14.5V ≤ VI ≤ 27V, 5mA ≤ Io ≤ 2.0A	11.5 11.4	12 12	12.5 12.8	V
Line Regulation (Note2)	ΔVO	14.5V ≤ VI ≤ 35V, Io = 5mA, TJ = +25°C 14.5V ≤ VI ≤ 35V, Io = 1.0A, TJ = +25°C 14.9V ≤ VI ≤ 28V, Io = 2.0A, TJ = +25°C 16V ≤ VI ≤ 22V, Io = 3.0A, TJ = +25°C	-	6.0	45	mV
Load Regulation (Note2)	ΔVO	5mA ≤ Io ≤ 3.0A, TJ = +25°C 5mA ≤ Io ≤ 3.0A	-	10 15	30 80	mV mV
Thermal Regulation	REGT	Pulse = 10ms, P = 20W TA = +25°C	-	0.002	0.03	%Vo/W
Quiescent Current	IQ	5mA ≤ Io ≤ 3.0A, TJ = +25°C 5mA ≤ Io ≤ 3.0A	-	3.5 4.0	5.0 6.0	mA mA
Quiescent Current Change	ΔIQ	14.5V ≤ VI ≤ 35V, Io = 5mA TJ = +25°C ; 14.9V ≤ VI ≤ 27V, Io = 2.0A 5mA ≤ Io ≤ 3.0A, TJ = +25°C	-	0.1	0.8	mA
Ripple Rejection	RR	f = 120Hz, 15V ≤ VI ≤ 25V, Io = 2.0A TJ = +25°C	-	67	-	dB
Dropout Voltage	VD	Io = 3A, TJ = +25°C	-	2.2	2.5	V
Output Noise Voltage	VN	TA = +25°C, 10Hz ≤ f ≤ 100kHz	-	10	-	μV/Vo
Peak Output Current	IPK	TA = +25°C	-	5.0	-	A
Output Resistance	Ro	f = 1.0kHz	-	2.0	-	mΩ
Short Circuit Current Limit	Isc	VI = 35V, TJ = +25°C	-	1.5	2.5	A
Average Temperature Coefficient of Output Voltage	ΔVO/ΔT	Io = 5.0mA	-	0.5	-	mV/°C

Note:

1. Although power dissipation is internally limited, specifications apply only for PO ≤ Pmax, Pmax = 25W
2. Load and line regulation are specified at constant junction temperature. Change in Vo due heating effects must be taken into account separately. Pulse testing with low duty is used. (PMAX = 25W)

Electrical Characteristics(KA78T15) (Continued)

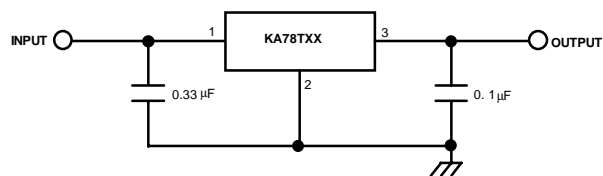
(VI = 23V, IO = 3.0A, 0°C ≤ TJ ≤ +125°C, Po ≤ PMAX (Note1), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	Vo	5mA ≤ Io ≤ 3.0A, TJ = +25°C 17.5V ≤ VI ≤ 30V, 5mA ≤ Io ≤ 2.0A	14.4 14.25	15 15	15.6 15.75	V
Line Regulation (Note2)	ΔVO	17.6V ≤ VI ≤ 40V, Io = 5mA, TJ = +25°C 17.6V ≤ VI ≤ 40V, Io = 1.0A, TJ = +25°C 18V ≤ VI ≤ 30V, Io = 2.0A, TJ = +25°C 20V ≤ VI ≤ 26V, Io = 3.0A, TJ = +25°C	-	7.5	55	mV
Load Regulation (Note2)	ΔVO	5mA ≤ Io ≤ 3.0A, TJ = +25°C 5mA ≤ Io ≤ 3.0A	-	10 15	30 80	mV mV
Thermal Regulation	REGT	Pulse = 10ms, P = 20W TA = +25°C	-	0.002	0.03	%Vo/ W
Quiescent Current	IQ	5mA ≤ Io ≤ 3.0A, TJ = +25°C 5mA ≤ Io ≤ 3.0A	-	3.5 4.0	5.0 6.0	mA mA
Quiescent Current Change	ΔIQ	17.6V ≤ VI ≤ 40V, Io = 5mA TJ = +25°C ; 18V ≤ VI ≤ 30V, Io = 2.0A ; 5mA ≤ Io ≤ 3.0A, TJ = +25°C	-	0.1	0.8	mA
Ripple Rejection	RR	f = 120Hz, 18.5V ≤ VI ≤ 28.5V, Io = 2.0A TJ = +25°C	-	65	-	dB
Dropout Voltage	VD	Io = 3A, TJ = +25°C	-	2.2	2.5	V
Output Noise Voltage	VN	TA = +25°C, 10Hz ≤ f ≤ 100kHz	-	10	-	μV/Vo
Peak Output Current	IPK	TA = +25°C	-	5.0	-	A
Output Resistance	Ro	f = 1.0kHz	-	2.0	-	mΩ
Short Circuit Current Limit	Isc	VI = 40V, TJ = +25°C	-	1.0	2.0	A
Average Temperature Coefficient of Output Voltage	ΔVO/ΔT	Io = 5.0mA	-	0.5	-	mV/°C

Note:

1. Although power dissipation is internally limited, specifications apply only for PO ≤ Pmax, Pmax = 25W
2. Load and line regulation are specified at constant junction temperature. Change in Vo due heating effects must be taken into account separately. Pulse testing with low duty is used. (PMAX = 25W)

Typical Application

**Notes:**

1. To specify an output voltage, substitute voltage value for "XX".
2. Bypass Capacitors are recommend for optimum stability and transient response and should be located as close as possible to the regulator

Ordering Information

Product Number	Package	Operating Temperature
KA78T05	TO-220	0 ~ +125°C
KA78T12		
KA78T15		

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.