FAIRCHILD SEMICONDUCTOR®

May 2006

KA78XXE/KA78XXAE
3-Terminal 1A Positive Voltage Regulator

Features

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

Description

The KA78XXE/KA78XXAE series of three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Ordering Information

Part Number	Output Voltage Tolerance	Package	Operating Temperature
KA7805E / KA7806E	±4%	TO-220	0 to +125°C
KA7808E / KA7809E			
KA7810E			
KA7812E / KA7815E			
KA7818E / KA7824E			
KA7805AE / KA7806AE	±2%		
KA7808AE / KA7809AE			
KA7810AE			
KA7812AE/KA7815AE			
KA7818AE/KA7824AE			
KA7805ER / KA7806ER	±4%	D-PAK	
KA7808ER / KA7809ER			
KA7812ER			

©2006 Fairchild Semiconductor Corporation

Block Diagram

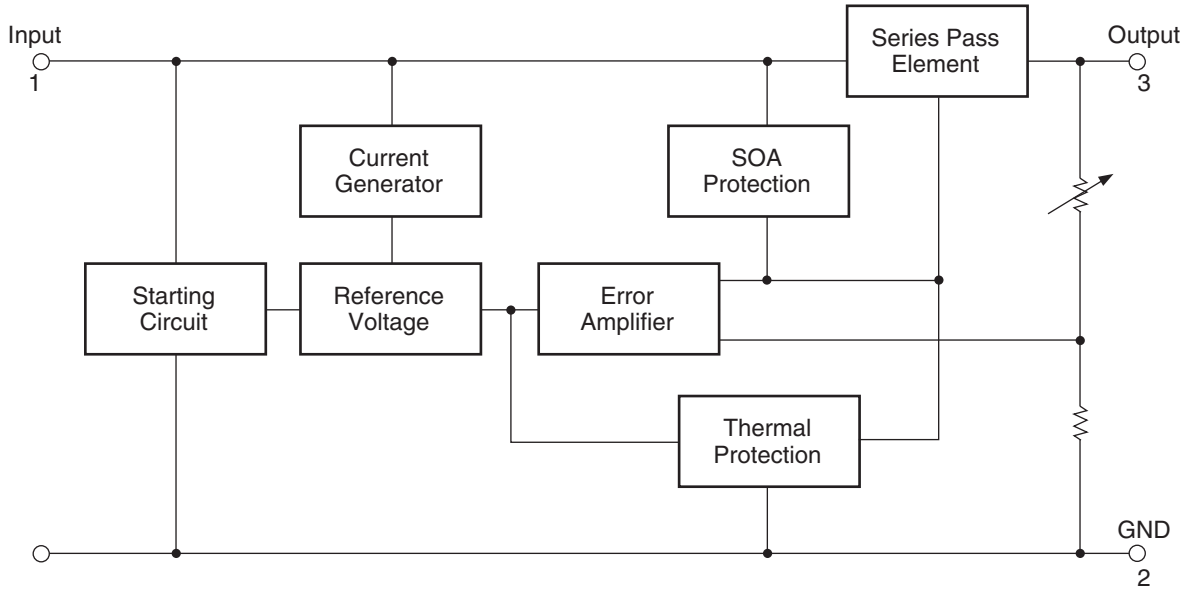


Figure 1.

Pin Assignment

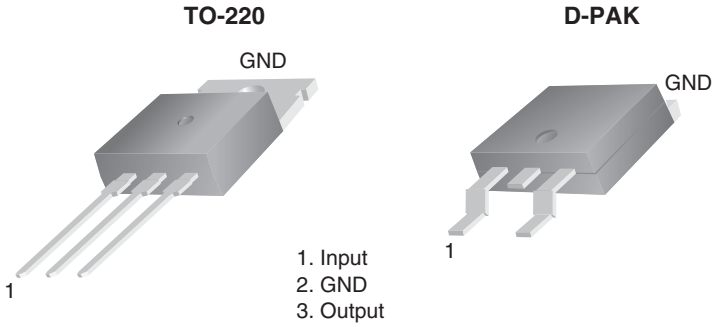


Figure 2.

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_I	Input Voltage	V_O = 5V to 18V	35	V
		V_O = 24V	40	
$R_{\theta JC}$	Thermal Resistance Junction-Cases (TO-220)		5	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Air (TO-220)		65	°C/W
T_{OPR}	Operating Temperature Range (KA78XXE/AE/ER)		0 to +125	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C

Electrical Characteristics (KA7805E/KA7805ER)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 10V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7805E/ER			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		4.8	5.0	5.2	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 7V to 20V		4.75	5.0	5.25	
Regline	Line Regulation(1)	T_J = +25°C	V_O = 7V to 25V	–	4.0	100	mV
			V_I = 8V to 12V	–	1.6	50	
Regload	Load Regulation(1)	T_J = +25°C	I_O = 5.0mA to1.5A	–	9	100	mV
			I_O = 250mA to 750mA	–	4	50	
I_Q	Quiescent Current	T_J = +25°C		–	5.0	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1.0A		–	0.03	0.5	mA
		V_I = 7V to 25V		–	0.3	1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift(2)	I_O = 5mA		–	-0.8	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	42	–	µV/V_O
RR	Ripple Rejection(2)	f = 120Hz, V_O = 8V to 18V		62	73	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(2)	f = 1kHz		–	15	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	230	–	mA
I_{PK}	Peak Current(2)	T_J = +25°C		–	2.2	–	A

Notes:

1. Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulse testing with low duty is used.
2. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7806E/KA7806ER) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 11V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7806E/ER			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		5.75	6.0	6.25	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 8.0V to 21V		5.7	6.0	6.3	
Regline	Line Regulation(3)	T_J = +25°C	V_I = 8V to 25V	–	5	120	mV
			V_I = 9V to 13V	–	1.5	60	
Regload	Load Regulation(3)	T_J = +25°C	I_O = 5mA to 1.5A	–	9	120	mV
			I_O = 250mA to 750mA	–	3	60	
I_Q	Quiescent Current	T_J = +25°C		–	5.0	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1A		–	–	0.5	mA
		V_I = 8V to 25V		–	–	1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift(4)	I_O = 5mA		–	-0.8	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	45	–	µV/Vo
RR	Ripple Rejection(4)	f = 120Hz V_I = 9V to 19V		59	75	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(4)	f = 1kHz		–	19	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(4)	T_J = +25°C		–	2.2	–	A

Notes:

3. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
4. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7808E/KA7808ER) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 14V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7808E/ER Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = +25°C		7.7	8.0	8.3	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 10.5V to 23V		7.6	8.0	8.4	
Regline	Line Regulation(5)	T_J = +25°C	V_I = 10.5V to 25V	–	5.0	160	mV
			V_I = 11.5V to 17V	–	2.0	80	
Regload	Load Regulation(5)	T_J = +25°C	I_O = 5.0mA to 1.5A	–	10	160	mV
			I_O = 250mA to 750mA	–	5.0	80	
I_Q	Quiescent Current	T_J = +25°C		–	5.0	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1.0A		–	0.05	0.5	mA
		V_I = 10.5A to 25V		–	0.5	1.0	
$\Delta V_O/\Delta T$	Output Voltage Drift(6)	I_O = 5mA		–	-0.8	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	52	–	µV/Vo
RR	Ripple Rejection(6)	f = 120Hz, V_I = 11.5V to 21.5V		56	73	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(6)	f = 1kHz		–	17	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	230	–	mA
I_{PK}	Peak Current(6)	T_J = +25°C		–	2.2	–	A

Notes:

5. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
6. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7809E/KA7809ER) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 15V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7809E/ER			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		8.65	9	9.35	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 11.5V to 24V		8.6	9	9.4	
Regline	Line Regulation(7)	T_J = +25°C	V_I = 11.5V to 25V	–	6	180	mV
			V_I = 12V to 17V	–	2	90	
Regload	Load Regulation(7)	T_J = +25°C	I_O = 5mA to 1.5A	–	12	180	mV
			I_O = 250mA to 750mA	–	4	90	
I_Q	Quiescent Current	T_J = +25°C		–	5.0	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1.0A		–	–	0.5	mA
		V_I = 11.5V to 26V		–	–	1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift(8)	I_O = 5mA		–	-1	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	58	–	µV/Vo
RR	Ripple Rejection(8)	f = 120Hz V_I = 13V to 23V		56	71	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(8)	f = 1kHz		–	17	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(8)	T_J = +25°C		–	2.2	–	A

Notes:

7. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
8. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7810E) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 16V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7810E			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		9.6	10.0	10.4	V
		5mA ≤ I_O ≤ 1A, P_O ≤ 15W V_I = 12.5V to 25V		9.5	10.0	10.5	
Regline	Line Regulation(9)	T_J = +25°C	V_I = 12.5V to 25V	–	10.0	200	mV
			V_I = 13V to 25V	–	3.0	100	
Regload	Load Regulation(9)	T_J = +25°C	I_O = 5mA to 1.5A	–	12.0	200	mV
			I_O = 250mA to 750mA	–	4.0	400	
I_Q	Quiescent Current	T_J = +25°C		–	5.1	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1A		–	–	0.5	mA
		V_I = 12.5V to 29V		–	–	1.0	
$\Delta V_O/\Delta T$	Output Voltage Drift(10)	I_O = 5mA		–	-1.0	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	58.0	–	µV/Vo
RR	Ripple Rejection(10)	f = 120Hz V_O = 13V to 23V		56.0	71.0	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2.0	–	V
r_O	Output Resistance(10)	f = 1kHz		–	17.0	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(10)	T_J = +25°C		–	2.2	–	A

Notes:

9. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
10. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7812E/KA7812ER) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 19V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7812E/ER			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		11.5	12	12.5	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 14.5V to 27V		11.4	12	12.6	
Regline	Line Regulation(11)	T_J = +25°C	V_I = 14.5V to 30V	–	10	240	mV
			V_I = 16V to 22V	–	3.0	120	
Regload	Load Regulation(11)	T_J = +25°C	I_O = 5mA to 1.5A	–	11	240	mV
			I_O = 250mA to 750mA	–	5.0	120	
I_Q	Quiescent Current	T_J = +25°C		–	5.1	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1.0A		–	0.1	0.5	mA
		V_I = 14.5V to 30V		–	0.5	1.0	
$\Delta V_O/\Delta T$	Output Voltage Drift(12)	I_O = 5mA		–	-1	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	76	–	µV/Vo
RR	Ripple Rejection(12)	f = 120Hz V_I = 15V to 25V		55	71	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(12)	f = 1kHz		–	18	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	230	–	mA
I_{PK}	Peak Current(12)	T_J = +25°C		–	2.2	–	A

Notes:

11. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
12. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7815E) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 23V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7815E			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		14.4	15	15.6	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 17.5V to 30V		14.25	15	15.75	
Regline	Line Regulation(13)	T_J = +25°C	V_I = 17.5V to 30V	–	11	300	mV
			V_I = 20V to 26V	–	3	150	
Regload	Load Regulation(13)	T_J = +25°C	I_O = 5mA to 1.5A	–	12	300	mV
			I_O = 250mA to 750mA	–	4	150	
I_Q	Quiescent Current	T_J = +25°C		–	5.2	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1.0A		–	–	0.5	mA
		V_I = 17.5V to 30V		–	–	1.0	
$\Delta V_O/\Delta T$	Output Voltage Drift(14)	I_O = 5mA		–	-1	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	90	–	µV/Vo
RR	Ripple Rejection(14)	f = 120Hz V_I = 18.5V to 28.5V		54	70	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(14)	f = 1kHz		–	19	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(14)	T_J = +25°C		–	2.2	–	A

Notes:

13. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
14. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7818E) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 27V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7818E			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		17.3	18	18.7	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 21V to 33V		17.1	18	18.9	
Regline	Line Regulation(15)	T_J = +25°C	V_I = 21V to 33V	–	15	360	mV
			V_I = 24V to 30V	–	5	180	
Regload	Load Regulation(15)	T_J = +25°C	I_O = 5mA to 1.5A	–	15	360	mV
			I_O = 250mA to 750mA	–	5.0	180	
I_Q	Quiescent Current	T_J = +25°C		–	5.2	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1.0A		–	–	0.5	mA
		V_I = 21V to 33V		–	–	1	
$\Delta V_O/\Delta T$	Output Voltage Drift(16)	I_O = 5mA		–	-1	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	110	–	µV/Vo
RR	Ripple Rejection(16)	f = 120Hz V_I = 22V to 32V		53	69	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(16)	f = 1kHz		–	22	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(16)	T_J = +25°C		–	2.2	–	A

Notes:

15. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
16. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7824E) (Continued)

Refer to test circuit, 0°C < T_J < 125°C, I_O = 500mA, V_I = 33V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7824E			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		23	24	25	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 27V to 38V		22.8	24	25.25	
Regline	Line Regulation(17)	T_J = +25°C	V_I = 27V to 38V	–	17	480	mV
			V_I = 30V to 36V	–	6	240	
Regload	Load Regulation(17)	T_J = +25°C	I_O = 5mA to 1.5A	–	15	480	mV
			I_O = 250mA to 750mA	–	5.0	240	
I_Q	Quiescent Current	T_J = +25°C		–	5.2	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1.0A		–	0.1	0.5	mA
		V_I = 27V to 38V		–	0.5	1	
$\Delta V_O/\Delta T$	Output Voltage Drift(18)	I_O = 5mA		–	-1.5	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	60	–	µV/Vo
RR	Ripple Rejection(18)	f = 120Hz V_I = 28V to 38V		50	67	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(18)	f = 1kHz		–	28	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	230	–	mA
I_{PK}	Peak Current(18)	T_J = +25°C		–	2.2	–	A

Notes:

17. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
18. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7805AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 10V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions	KA7805AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C	4.9	5	5.1	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 7.5V to 20V	4.8	5	5.2	
Regline	Line Regulation[19]	V_I = 7.5V to 25V I_O = 500mA	–	5	50	mV
		V_I = 8V to 12V	–	3	50	
		T_J = +25°C, V_I = 7.3V to 20V	–	5	50	
		T_J = +25°C, V_I = 8V to 12V	–	1.5	25	
Regload	Load Regulation[19]	T_J = +25°C I_O = 5mA to 1.5A	–	9	100	mV
		I_O = 5mA to 1A	–	9	100	
		I_O = 250mA to 750mA	–	4	50	
I_Q	Quiescent Current	T_J = +25°C	–	5.0	6.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1A	–	–	0.5	mA
		V_I = 8 V to 25V, I_O = 500mA	–	–	0.8	
		V_I = 7.5V to 20V, T_J = +25°C	–	–	0.8	
$\Delta V/\Delta T$	Output Voltage Drift[20]	I_O = 5mA	–	-0.8	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz T_A = +25°C	–	10	–	µV/Vo
RR	Ripple Rejection[20]	f = 120Hz, I_O = 500mA V_I = 8V to 18V	–	68	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C	–	2	–	V
r_O	Output Resistance[20]	f = 1kHz	–	17	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C	–	250	–	mA
I_{PK}	Peak Current[20]	T_J = +25°C	–	2.2	–	A

Notes:

19. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

20. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7806AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 11V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7806AE			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		5.58	6	6.12	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 8.6V to 21V		5.76	6	6.24	
Regline	Line Regulation(21)	V_I = 8.6V to 25V, I_O = 500mA		–	5	60	mV
		V_I = 9V to 13V		–	3	60	
		T_J = +25°C	V_I = 8.3V to 21V	–	5	60	
			V_I = 9V to 13V	–	1.5	30	
Regload	Load Regulation(21)	T_J = +25°C, I_O = 5mA to 1.5A		–	9	100	mV
		I_O = 5mA to 1A		–	9	100	
		I_O = 250mA to 750mA		–	5.0	50	
I_Q	Quiescent Current	T_J = +25°C		–	4.3	6.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1A		–	–	0.5	mA
		V_I = 9V to 25V, I_O = 500mA		–	–	0.8	
		V_I = 8.5V to 21V, T_J = +25°C		–	–	0.8	
$\Delta V/\Delta T$	Output Voltage Drift(22)	I_O = 5mA		–	-0.8	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	10	–	µV/Vo
RR	Ripple Rejection(22)	f = 120Hz, I_O = 500mA V_I = 9V to 19V		–	65	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2	–	V
r_O	Output Resistance(22)	f = 1kHz		–	17	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(22)	T_J = +25°C		–	2.2	–	A

Notes:

21. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

22. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7808AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 14V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions	KA7808AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C	7.84	8	8.16	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 10.6V to 23V	7.7	8	8.3	
Regline	Line Regulation(23)	V_I = 10.6V to 25V, I_O = 500mA	–	6	80	mV
		V_I = 11V to 17V	–	3	80	
		T_J = +25°C, V_I = 10.4V to 23V	–	6	80	
		T_J = +25°C, V_I = 11V to 17V	–	2	40	
Regload	Load Regulation(23)	T_J = +25°C, I_O = 5mA to 1.5A	–	12	100	mV
		I_O = 5mA to 1A	–	12	100	
		I_O = 250mA to 750mA	–	5	50	
I_Q	Quiescent Current	T_J = +25°C	–	5.0	6.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1A	–	–	0.5	mA
		V_I = 11V to 25V, I_O = 500mA	–	–	0.8	
		V_I = 10.6V to 23V, T_J = +25°C	–	–	0.8	
$\Delta V/\Delta T$	Output Voltage Drift(24)	I_O = 5mA	–	-0.8	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C	–	10	–	µV/Vo
RR	Ripple Rejection(24)	f = 120Hz, I_O = 500mA V_I = 11.5V to 21.5V	–	62	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C	–	2	–	V
r_O	Output Resistance(24)	f = 1kHz	–	18	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C	–	250	–	mA
I_{PK}	Peak Current(24)	T_J = +25°C	–	2.2	–	A

Notes:

23. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

24. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7809AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 15V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions	KA7809AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C	8.82	9.0	9.18	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 11.2V to 24V	8.65	9.0	9.35	
Regline	Line Regulation(25)	V_I = 11.7V to 25V, I_O = 500mA	–	6	90	mV
		V_I = 12.5V to 19V	–	4	45	
		T_J = +25°C, V_I = 11.5V to 24V	–	6	90	
		T_J = +25°C, V_I = 12.5V to 19V	–	2	45	
Regload	Load Regulation(25)	T_J = +25°C, I_O = 5mA to 1.0A	–	12	100	mV
		I_O = 5mA to 1.0A	–	12	100	
		I_O = 250mA to 750mA	–	5	50	
I_Q	Quiescent Current	T_J = +25°C	–	5.0	6.0	mA
ΔI_Q	Quiescent Current Change	V_I = 11.7V to 25V, T_J = +25°C	–	–	0.8	mA
		V_I = 12V to 25V, I_O = 500mA	–	–	0.8	
		I_O = 5mA to 1.0A	–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift(26)	I_O = 5mA	–	-1.0	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C	–	10	–	µV/Vo
RR	Ripple Rejection(26)	f = 120Hz, I_O = 500mA V_I = 12V to 22V	–	62	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C	–	2.0	–	V
r_O	Output Resistance(26)	f = 1kHz	–	17	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C	–	250	–	mA
I_{PK}	Peak Current(26)	T_J = +25°C	–	2.2	–	A

Notes:

25. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

26. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7810AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 16V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions	KA7810AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C	9.8	10.0	10.2	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 12.8V to 25V	9.6	10.0	10.4	
Regline	Line Regulation(27)	V_I = 12.8V to 26V, I_O = 500mA	–	8.0	100	mV
		V_I = 13V to 20V	–	4.0	50.0	
		T_J = +25°C, V_I = 12.5V to 25V	–	8.0	100	
		T_J = +25°C, V_I = 13V to 20V	–	3.0	50.0	
Regload	Load Regulation(27)	T_J = +25°C, I_O = 5mA to 1.5A	–	12.0	100	mV
		I_O = 5mA to 1mA	–	12.0	100	
		I_O = 250mA to 750mA	–	5.0	50.0	
I_Q	Quiescent Current	T_J = +25°C	–	5.0	6.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1A	–	–	0.5	mA
		V_I = 12.8V to 25V, I_O = 500mA	–	–	0.8	
		V_I = 13V to 26V, T_J = +25°C	–	–	0.5	
$\Delta V_O/\Delta T$	Output Voltage Drift(28)	I_O = 5mA	–	-1.0	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C	–	10.0	–	µV/Vo
RR	Ripple Rejection(28)	f = 120Hz, I_O = 500mA V_I = 14V to 24V	–	62.0	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C	–	2.0	–	V
r_O	Output Resistance(28)	f = 1kHz	–	17.0	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C	–	250	–	mA
I_{PK}	Peak Current(28)	T_J = +25°C	–	2.2	–	A

Notes:

27. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

28. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7812AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 19V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions	KA7812AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C	11.75	12	12.25	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 14.8V to 27V	11.5	12	12.5	
Regline	Line Regulation(29)	V_I = 14.8V to 30V, I_O = 500mA	–	10	120	mV
		V_I = 16V to 22V	–	4	120	
		T_J = +25°C, V_I = 14.5V to 27V	–	10	120	
		T_J = +25°C, V_I = 16V to 22V	–	3	60	
Regload	Load Regulation(29)	T_J = +25°C, I_O = 5mA to 1.5A	–	12	100	mV
		I_O = 5mA to 1.0A	–	12	100	
		I_O = 250mA to 750mA	–	5	50	
I_Q	Quiescent Current	T_J = +25°C	–	5.1	6.0	mA
ΔI_Q	Quiescent Current Change	V_I = 15V to 30V, T_J = +25°C	–	–	0.8	mA
		V_I = 14V to 27V, I_O = 500mA	–	–	0.8	
		I_O = 5mA to 1.0A	–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift(30)	I_O = 5mA	–	-1.0	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C	–	10	–	µV/Vo
RR	Ripple Rejection(30)	f = 120Hz, I_O = 500mA V_I = 14V to 24V	–	60	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C	–	2.0	–	V
r_O	Output Resistance(30)	f = 1kHz	–	18	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C	–	250	–	mA
I_{PK}	Peak Current(30)	T_J = +25°C	–	2.2	–	A

Notes:

29. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

30. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7815AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 23V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7815AE			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		14.7	15	15.3	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 17.7V to 30V		14.4	15	15.6	
Regline	Line Regulation(31)	V_I = 17.9V to 30V, I_O = 500mA		–	10	150	mV
		V_I = 20V to 26V		–	5	150	
		T_J = +25°C	V_I = 17.5V to 30V	–	11	150	
			V_I = 20V to 26V	–	3	75	
Regload	Load Regulation(31)	T_J = +25°C, I_O = 5mA to 1.5A		–	12	100	mV
		I_O = 5mA to 1.0A		–	12	100	
		I_O = 250mA to 750mA		–	5	50	
I_Q	Quiescent Current	T_J = +25°C		–	5.2	6.0	mA
ΔI_Q	Quiescent Current Change	V_I = 17.5V to 30V, T_J = +25°C		–	–	0.8	mA
		V_I = 17.5V to 30V, I_O = 500mA		–	–	0.8	
		I_O = 5mA to 1.0A		–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift(32)	I_O = 5mA		–	-1.0	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	10	–	µV/Vo
RR	Ripple Rejection(32)	f = 120Hz, I_O = 500mA V_I = 18.5V to 28.5V		–	58	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2.0	–	V
r_O	Output Resistance(32)	f = 1kHz		–	19	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(32)	T_J = +25°C		–	2.2	–	A

Notes:

31. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

32. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7818AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 27V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7818AE			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		17.64	18	18.36	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 21V to 33V		17.3	18	18.7	
Regline	Line Regulation(33)	V_I = 21V to 33V, I_O = 500mA		–	15	180	mV
		V_I = 21V to 33V		–	5	180	
		T_J = +25°C	V_I = 20.6V to 33V	–	15	180	
			V_I = 24V to 30V	–	5	90	
Regload	Load Regulation(33)	T_J = +25°C, I_O = 5mA to 1.5A		–	15	100	mV
		I_O = 5mA to 1.0A		–	15	100	
		I_O = 250mA to 750mA		–	7	50	
I_Q	Quiescent Current	T_J = +25°C		–	5.2	6.0	mA
ΔI_Q	Quiescent Current Change	V_I = 21V to 33V, T_J = +25°C		–	–	0.8	mA
		V_I = 21V to 33V, I_O = 500mA		–	–	0.8	
		I_O = 5mA to 1.0A		–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift(34)	I_O = 5mA		–	-1.0	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	10	–	µV/Vo
RR	Ripple Rejection(34)	f = 120Hz, I_O = 500mA V_I = 22V to 32V		–	57	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2.0	–	V
r_O	Output Resistance(34)	f = 1kHz		–	19	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(34)	T_J = +25°C		–	2.2	–	A

Notes:

33. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

34. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7824AE) (Continued)

Refer to the test circuits. 0°C < T_J < +125°C, I_O = 1A, V_I = 33V, C_I = 0.33µF, C_O = 0.1µF, unless otherwise specified.

Symbol	Parameter	Conditions		KA7824AE			Unit
				Min.	Typ.	Max.	
V_O	Output Voltage	T_J = +25°C		23.5	24	24.5	V
		I_O = 5mA to 1A, $P_O \leq$ 15W V_I = 27.3V to 38V		23	24	25	
Regline	Line Regulation(35)	V_I = 27V to 38V, I_O = 500mA		–	18	240	mV
		V_I = 21V to 33V		–	6	240	
		T_J = +25°C	V_I = 26.7V to 38V	–	18	240	
			V_I = 30V to 36V	–	6	120	
Regload	Load Regulation(35)	T_J = +25°C, I_O = 5mA to 1.5A		–	15	100	mV
		I_O = 5mA to 1.0A		–	15	100	
		I_O = 250mA to 750mA		–	7	50	
I_Q	Quiescent Current	T_J = +25°C		–	5.2	6.0	mA
ΔI_Q	Quiescent Current Change	V_I = 27.3V to 38V, T_J = +25°C		–	–	0.8	mA
		V_I = 27.3V to 38V, I_O = 500mA		–	–	0.8	
		I_O = 5mA to 1.0A		–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift(36)	I_O = 5mA		–	-1.5	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = 25°C		–	10	–	µV/Vo
RR	Ripple Rejection(36)	f = 120Hz, I_O = 500mA V_I = 28V to 38V		–	54	–	dB
V_{Drop}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2.0	–	V
r_O	Output Resistance(36)	f = 1kHz		–	20	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	250	–	mA
I_{PK}	Peak Current(36)	T_J = +25°C		–	2.2	–	A

Notes:

35. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

36. These parameters, although guaranteed, are not 100% tested in production.

Typical Performance Characteristics

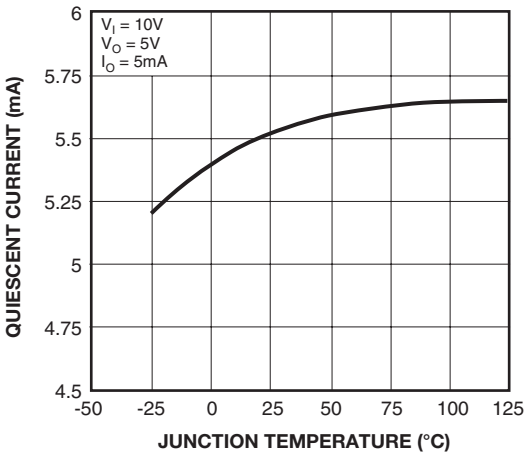


Figure 3. Quiescent Current

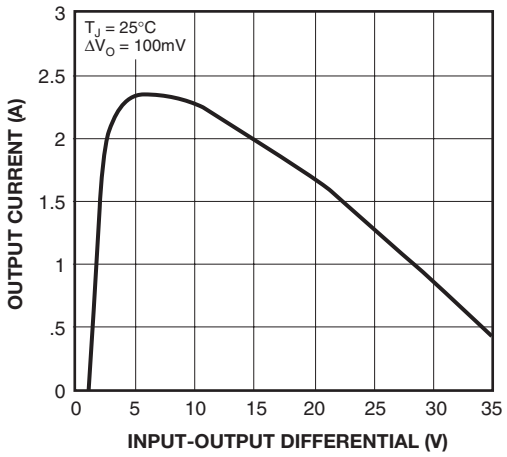


Figure 4. Output Voltage

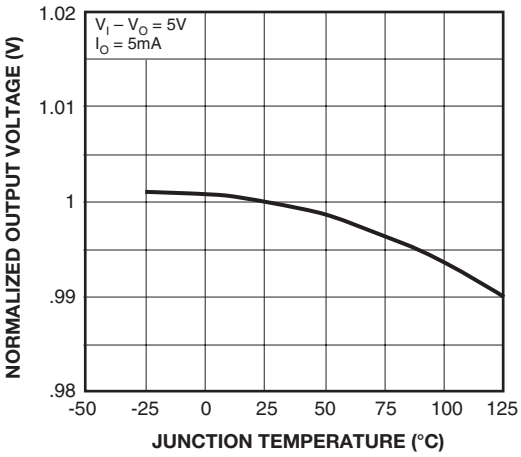


Figure 5. Peak Output Current

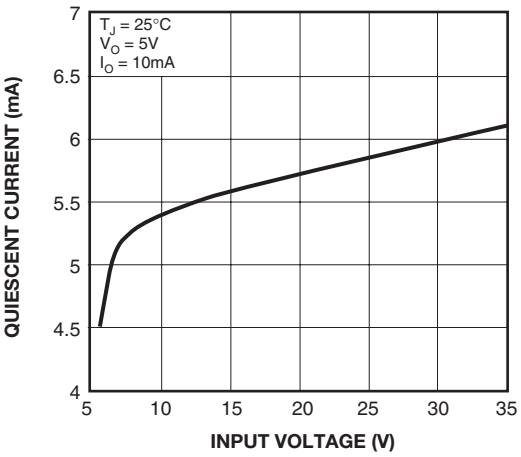


Figure 6. Quiescent Current

Typical Applications

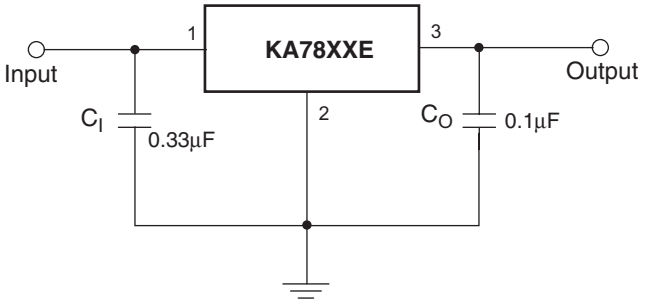


Figure 7. DC Parameters

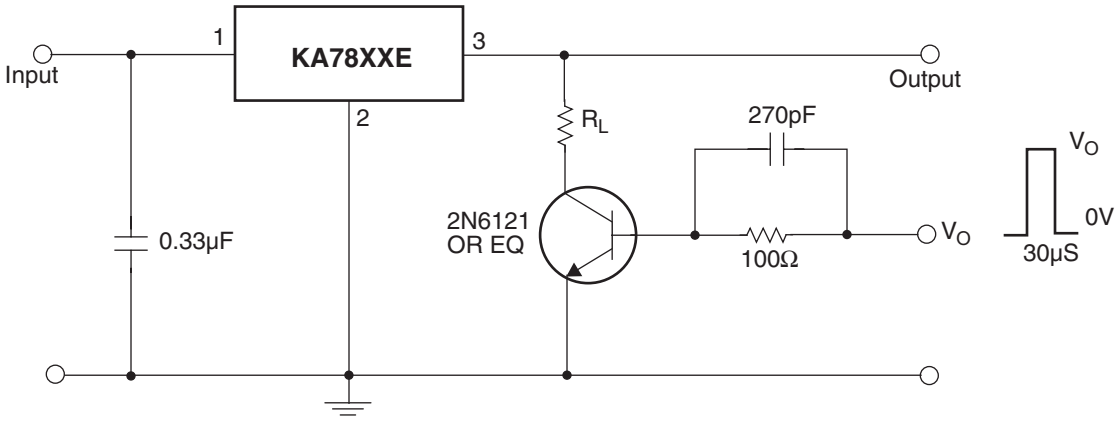


Figure 8. Load Regulation

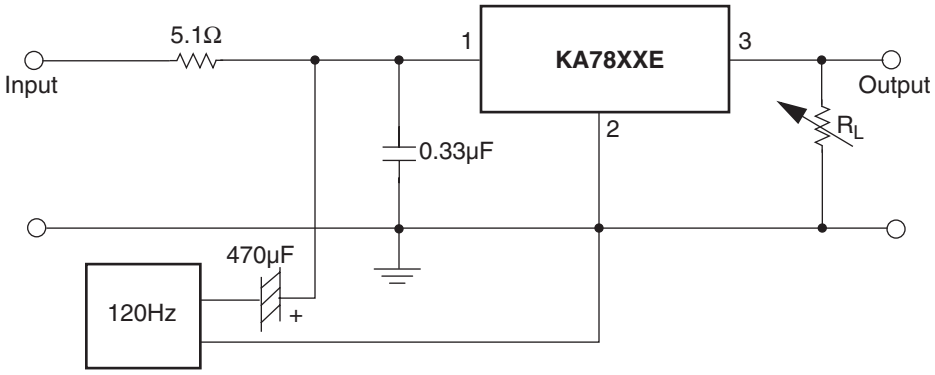


Figure 9. Ripple Rejection

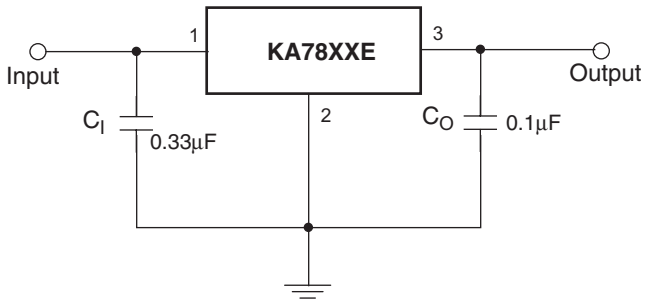


Figure 10. Fixed Output Regulator

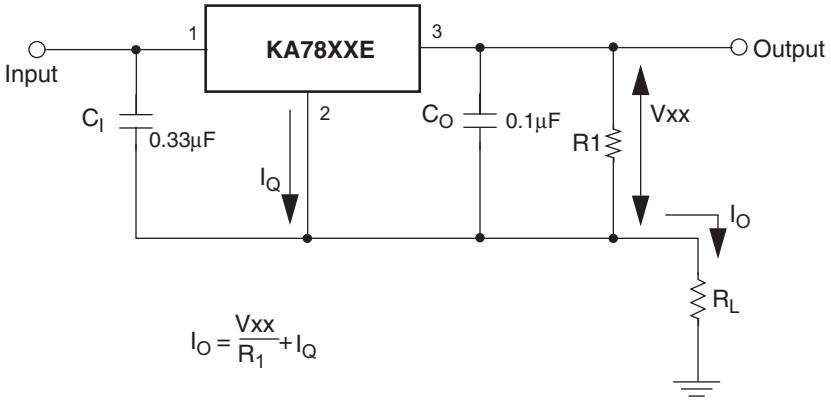


Figure 11. Constant Current Regulator

Notes:

1. To specify an output voltage. substitute voltage value for "XX." A common ground is required between the input and the Output voltage. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.
2. C_I is required if regulator is located an appreciable distance from power Supply filter.
3. C_O improves stability and transient response.

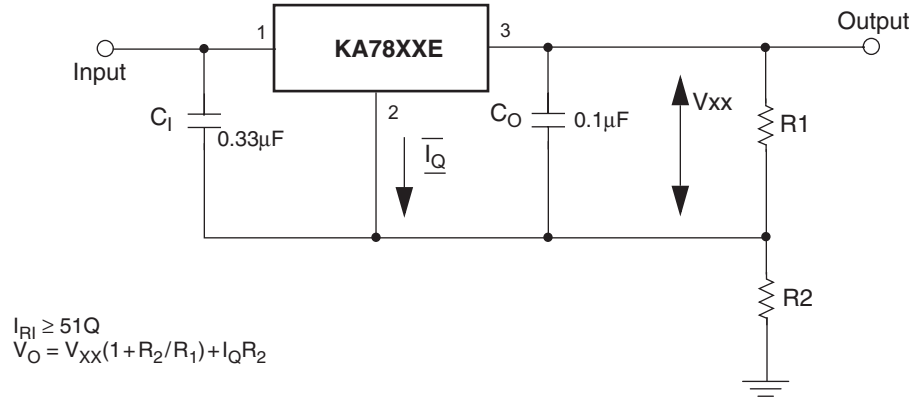


Figure 12. Circuit for Increasing Output Voltage

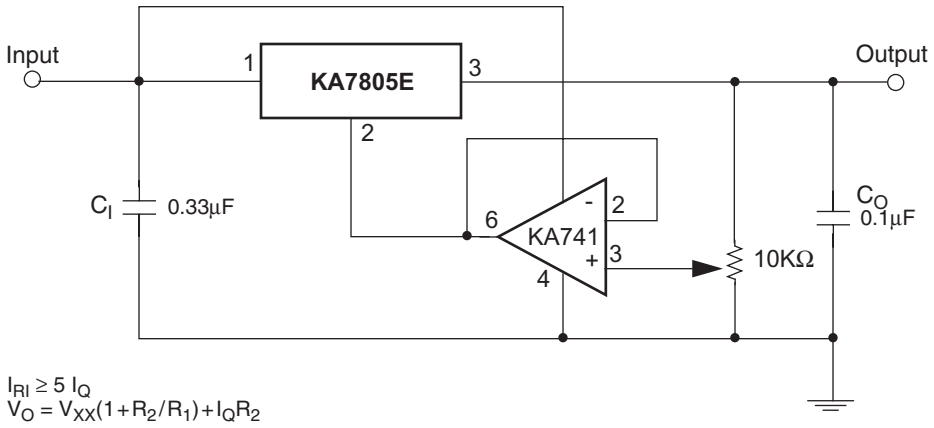


Figure 13. Adjustable Output Regulator (7 to 30V)

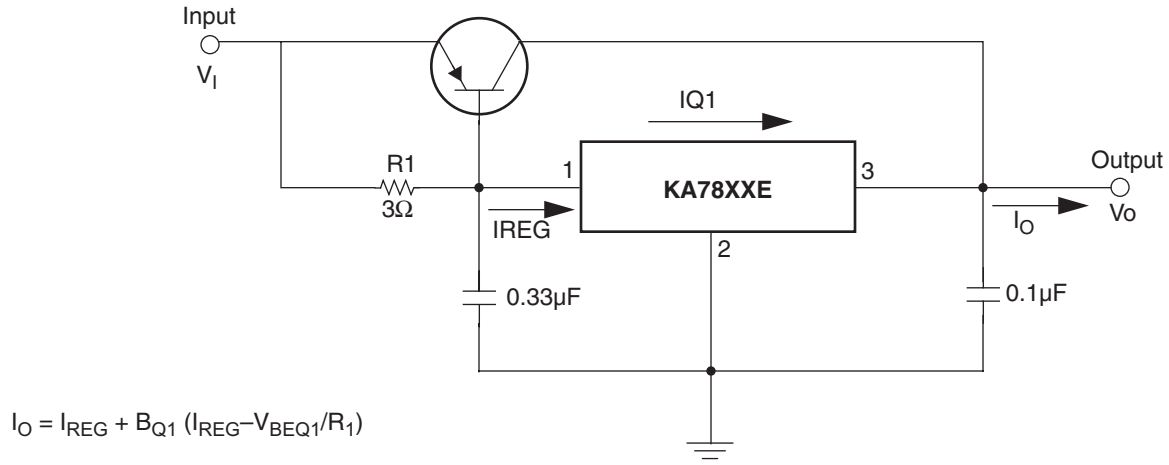


Figure 14. High Current Voltage Regulator

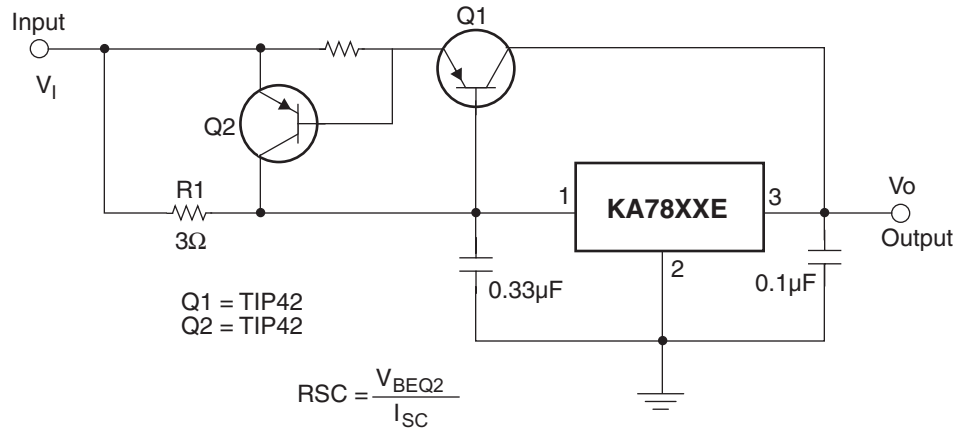


Figure 15. High Output Current with Short Circuit Protection

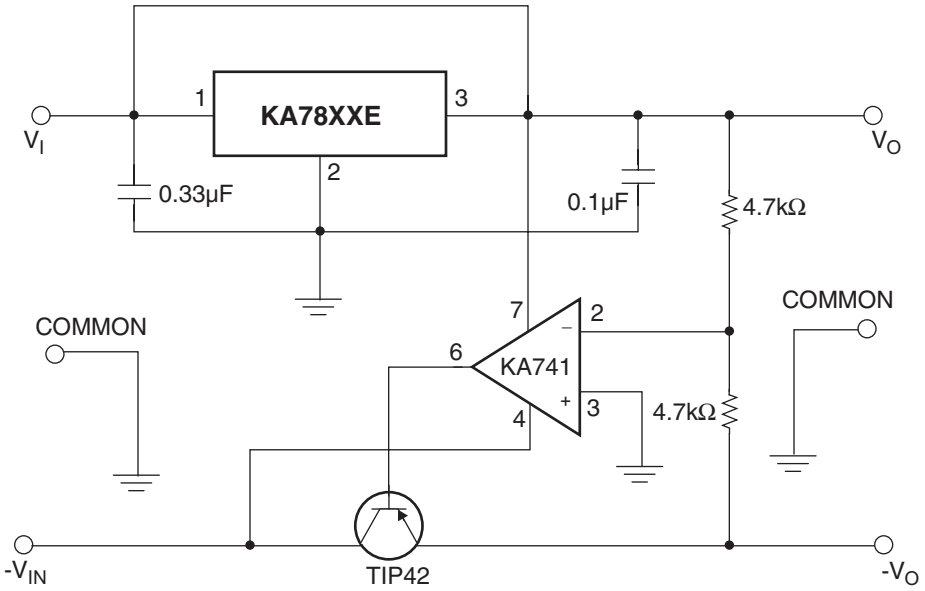


Figure 16. Tracking Voltage Regulator

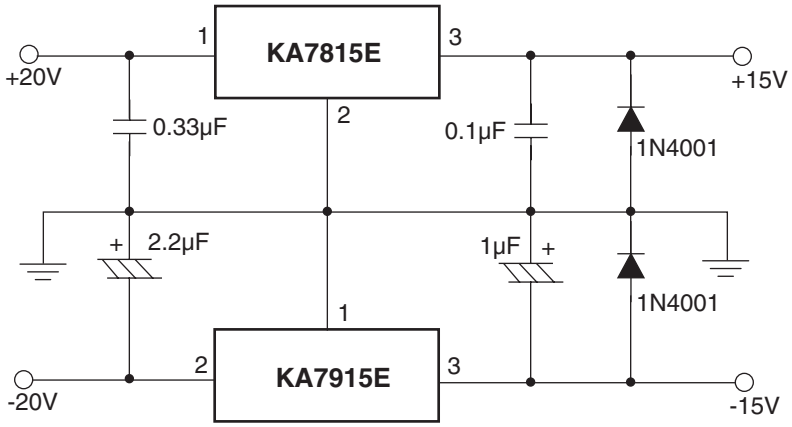


Figure 17. Split Power Supply (±15V-1A)

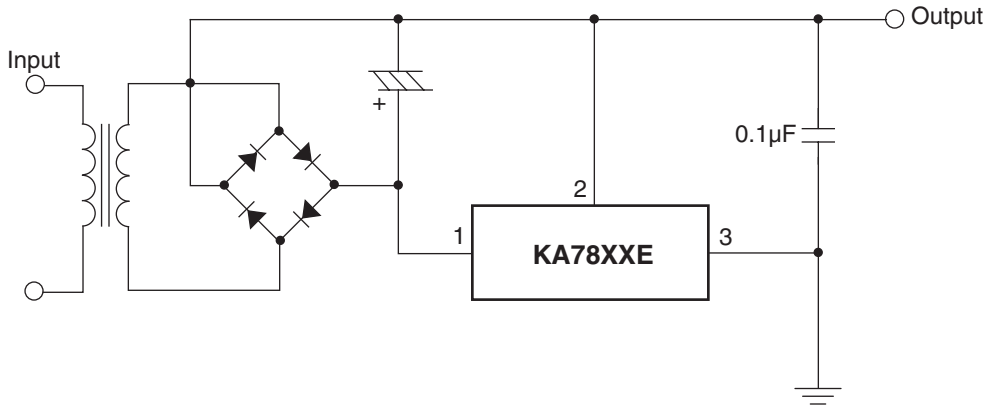


Figure 18. Negative Output Voltage Circuit

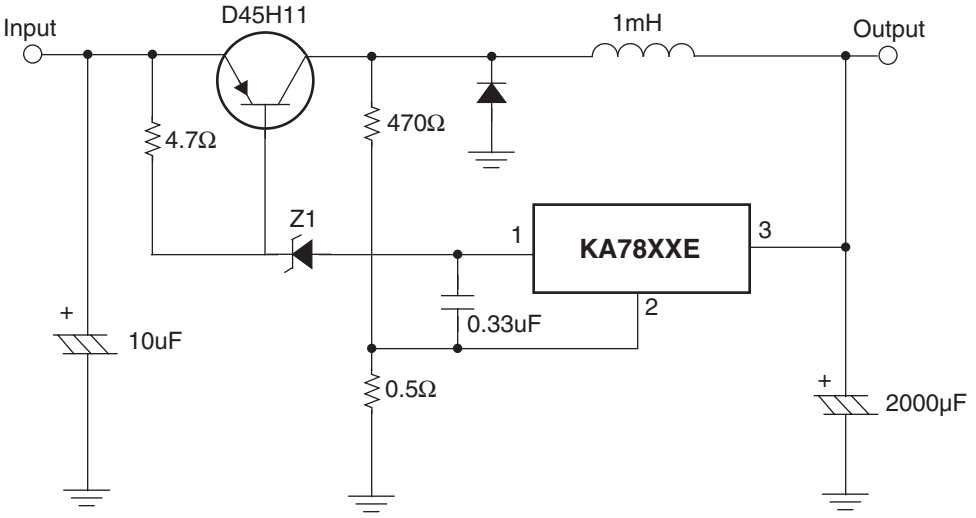
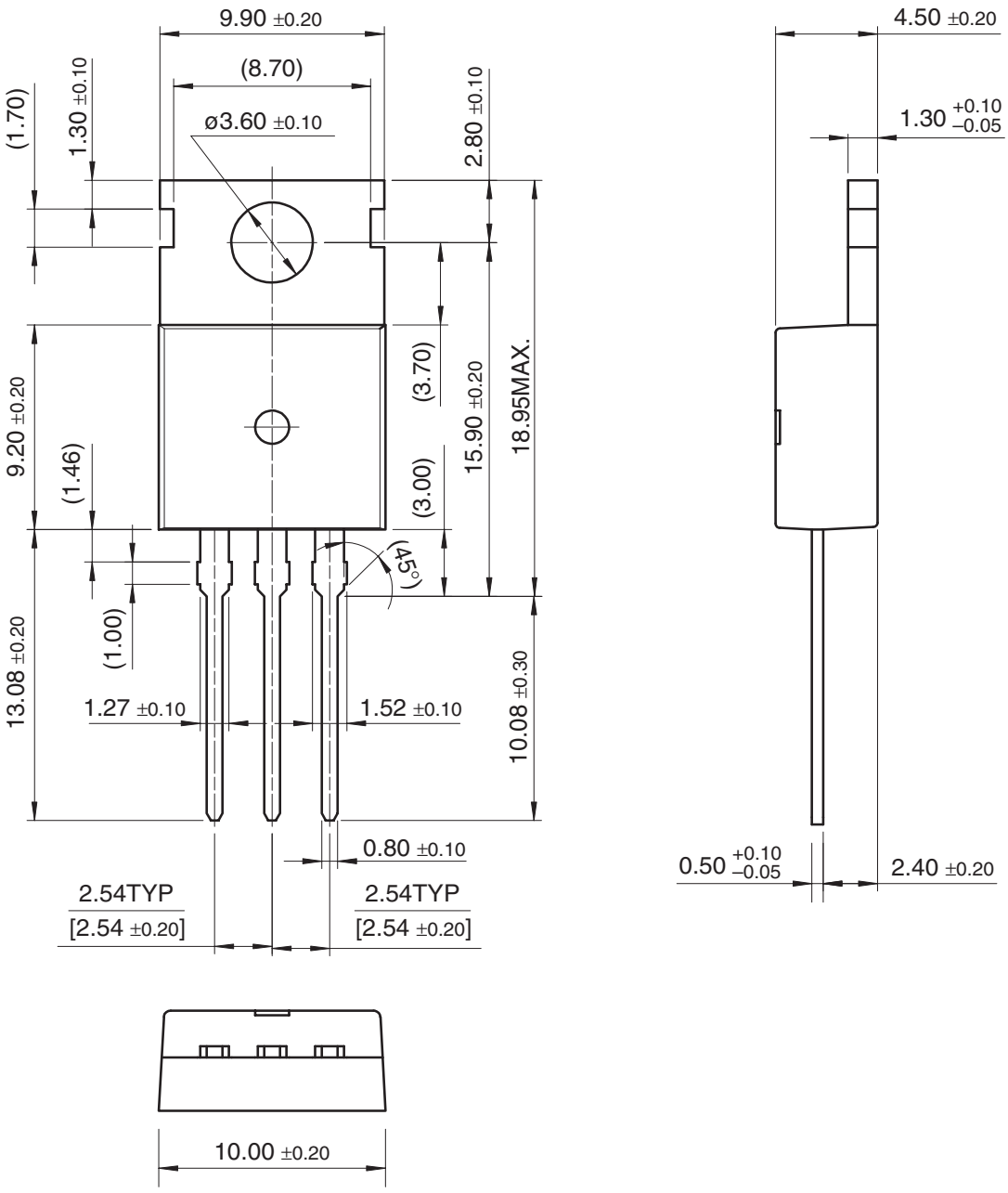


Figure 19. Switching Regulator

Mechanical Dimensions

Dimensions in millimeters

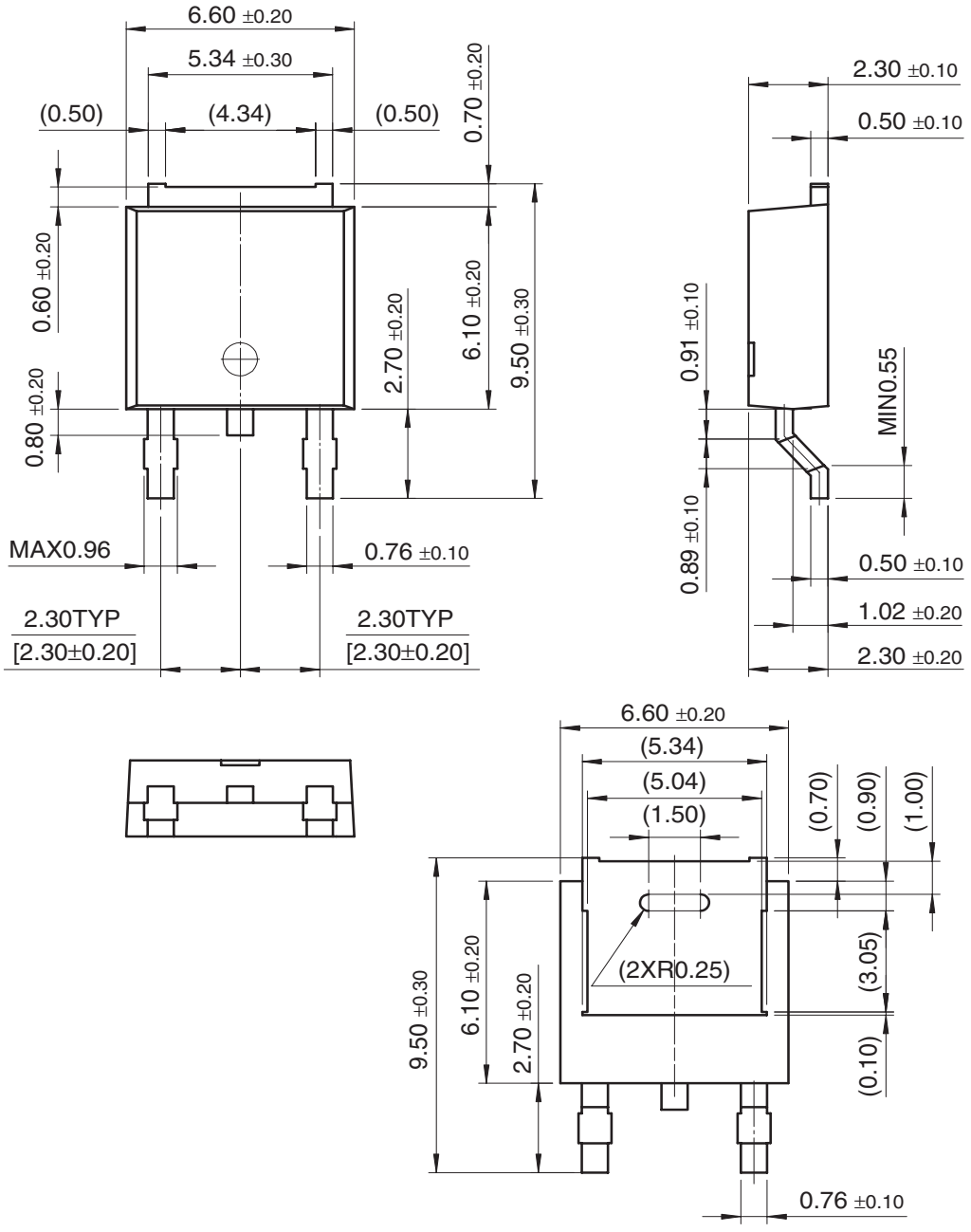
TO-220



Mechanical Dimensions (Continued)

Dimensions in millimeters

D-PAK



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FAST®	ISOPLANAR™	PowerEdge™	SuperFET™
ActiveArray™	FASTr™	LittleFET™	PowerSaver™	SuperSOT™-3
Bottomless™	FPS™	MICROCOUPLER™	PowerTrench®	SuperSOT™-6
Build it Now™	FRFET™	MicroFET™	QFET®	SuperSOT™-8
CoolFET™	GlobalOptoisolator™	MicroPak™	QS™	SyncFET™
CROSSVOLT™	GTO™	MICROWIRE™	QT Optoelectronics™	TCM™
DOME™	HiSeC™	MSX™	Quiet Series™	TinyLogic®
EcoSPARK™	I^2C™	MSXPro™	RapidConfigure™	TINYOPTO™
E^2CMOS™	*i-Lo*™	OCX™	RapidConnect™	TruTranslation™
EnSigna™	ImpliedDisconnect™	OCXPro™	µSerDes™	UHC™
FACT™	IntelliMAX™	OPTOLOGIC®	ScalarPump™	UniFET™
FACT Quiet Series™		OPTOPLANAR™	SILENT SWITCHER®	UltraFET®
Across the board. Around the world.™		PACMAN™	SMART START™	VCX™
The Power Franchise®		POP™	SPM™	Wire™
Programmable Active Droop™		Power247™	Stealth™	

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. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILDíS WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILDíS PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL 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, or (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 significant injury to the user.

2. A critical component is 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. I19

KA7812E

3-Terminal 1A Positive Voltage Regulator

Contents

•General description
•Features
•Product status/pricing/packaging
•Order Samples
•Qualification Support

BUY

Datasheet

Download this datasheet



e-mail this datasheet



This page

Print version

Related Links

- Request samples
- How to order products
- Product Change Notices (PCNs)
- Support
- Sales support
- Quality and reliability
- Design center

General description

The KA78XXE/KA78XXAE series of three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

back to top

Features

- Output current up to 1A
- Output voltages of 5, 6, 8, 9, 12, 15, 18, 24V
- Thermal overload protection
- Short circuit protection
- Output transistor safe operating area protection

back to top

Product status/pricing/packaging

BUY

Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**

KA7812E	Full Production	Full Production	$0.386	TO-220	3	BULK	Line 1: **$Y** (Fairchild logo)
KA7812ERTF	Full Production	Full Production	$0.454	TO-252(DPAK)	2	TAPE REEL	Line 1: KA78
KA7812ERTM	Full Production	Full Production	$0.454	TO-252(DPAK)	2	TAPE REEL	Line 1: KA78 Line 2: 12R Line 3: E&E&3
KA7812ETSTU	Full Production	Full Production	$0.386	TO-220	3	RAIL	N/A
KA7812ETU	Full Production	Full Production	$0.386	TO-220	3	RAIL	Line 1: **$Y** (Fairchild logo)

* Fairchild 1,000 piece Budgetary Pricing
** A sample button will appear if the part is available through Fairchild's on-line samples program. If there is no sample button, please contact a Fairchild distributor to obtain samples

Indicates product with Pb-free second-level interconnect. For more information click here.

Package marking information for product KA7812E is available. Click here for more information .

back to top

Qualification Support

Click on a product for detailed qualification data

Product
KA7812E
KA7812ERTF
KA7812ERTM
KA7812ETSTU
KA7812ETU

back to top

the

© 2007 Fairchild Semiconductor