

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

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.

Ordering Information

Product Number	Output Voltage Tolerance	Package	Operating Temperature
KA7805E / KA7806E	±4%	TO-220 (Dual Gauge)	0°C 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			

Block Diagram

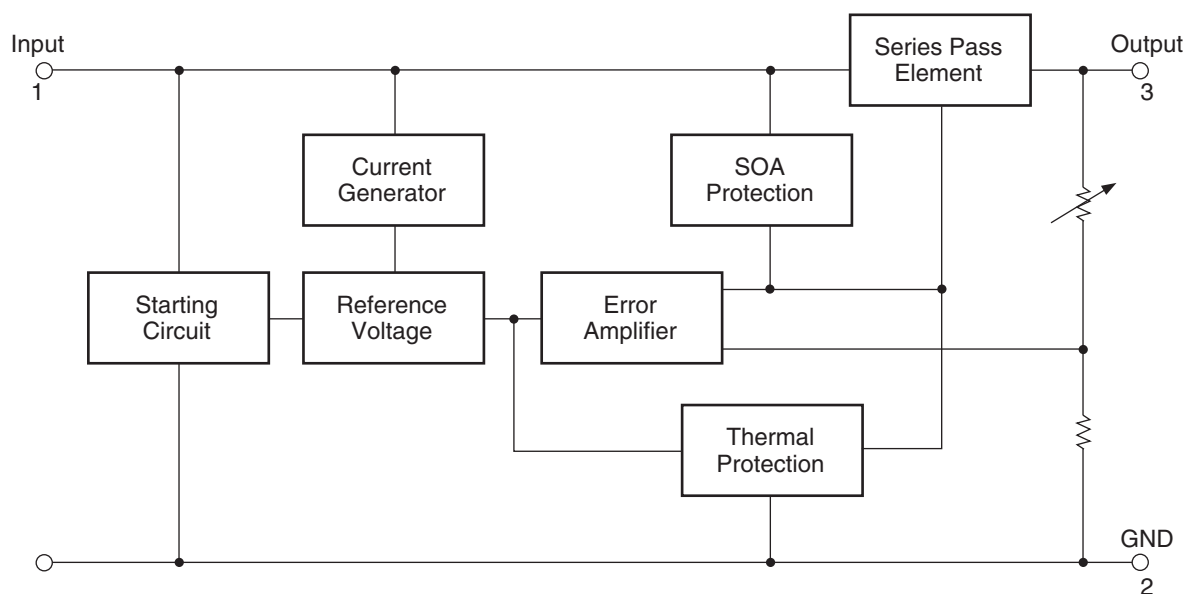


Figure 1.

Pin Assignment

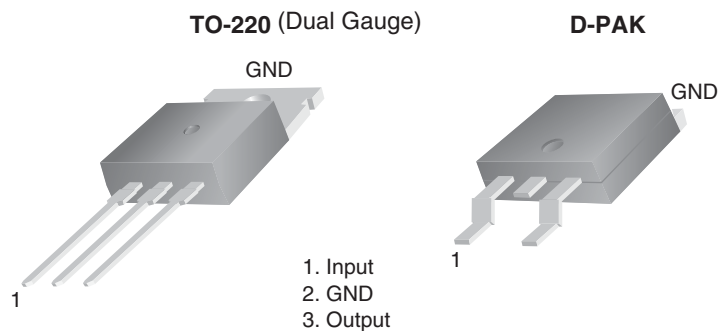


Figure 2.

Absolute Maximum Ratings

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

Electrical Characteristics (KA7805E/KA7805ER)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 10\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, 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	
ΔV _O /ΔT	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, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 11\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

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

Notes:

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

Electrical Characteristics (KA7808E/KA7808ER) (Continued)Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 14\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

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

Notes:

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

Electrical Characteristics (KA7809E/KA7809ER) (Continued)Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 15\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, 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	
ΔV _O /ΔT	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/V _O
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, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 16\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7810E			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	9.6	10.0	10.4	V
		$5\text{mA} \leq I_O \leq 1\text{A}$, $P_O \leq 15\text{W}$ $V_I = 12.5\text{V to } 25\text{V}$	9.5	10.0	10.5	
Regline	Line Regulation ⁽⁹⁾	$T_J = +25^{\circ}\text{C}$				mV
		$V_I = 12.5\text{V to } 25\text{V}$	–	10.0	200	
Regload	Load Regulation ⁽⁹⁾	$T_J = +25^{\circ}\text{C}$				mV
		$I_O = 5\text{mA to } 1.5\text{A}$	–	12.0	200	
		$I_O = 250\text{mA to } 750\text{mA}$	–	4.0	400	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.1	8.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1\text{A}$	–	–	0.5	mA
		$V_I = 12.5\text{V to } 29\text{V}$	–	–	1.0	
$\Delta V_O / \Delta T$	Output Voltage Drift ⁽¹⁰⁾	$I_O = 5\text{mA}$	–	-1.0	–	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	–	58.0	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽¹⁰⁾	$f = 120\text{Hz}$ $V_O = 13\text{V to } 23\text{V}$	56.0	71.0	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽¹⁰⁾	$f = 1\text{kHz}$	–	17.0	–	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	250	–	mA
I_{PK}	Peak Current ⁽¹⁰⁾	$T_J = +25^{\circ}\text{C}$	–	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, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 19\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7812E/ER			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	11.5	12	12.5	V
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$, $P_O \leq 15\text{W}$ $V_I = 14.5\text{V to } 27\text{V}$	11.4	12	12.6	
Regline	Line Regulation ⁽¹¹⁾	$T_J = +25^{\circ}\text{C}$ $V_I = 14.5\text{V to } 30\text{V}$	—	10	240	mV
		$V_I = 16\text{V to } 22\text{V}$	—	3.0	120	
Regload	Load Regulation ⁽¹¹⁾	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	—	11	240	mV
		$I_O = 250\text{mA to } 750\text{mA}$	—	5.0	120	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	—	5.1	8.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1.0\text{A}$	—	0.1	0.5	mA
		$V_I = 14.5\text{V to } 30\text{V}$	—	0.5	1.0	
$\Delta V_O / \Delta T$	Output Voltage Drift ⁽¹²⁾	$I_O = 5\text{mA}$	—	-1	—	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	—	76	—	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽¹²⁾	$f = 120\text{Hz}$ $V_I = 15\text{V to } 25\text{V}$	55	71	—	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	—	2	—	V
r_O	Output Resistance ⁽¹²⁾	$f = 1\text{kHz}$	—	18	—	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	—	230	—	mA
I_{PK}	Peak Current ⁽¹²⁾	$T_J = +25^{\circ}\text{C}$	—	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, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 23\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7815E			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	14.4	15	15.6	V
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$, $P_O \leq 15\text{W}$ $V_I = 17.5\text{V to } 30\text{V}$	14.25	15	15.75	
Regline	Line Regulation ⁽¹³⁾	$T_J = +25^{\circ}\text{C}$				mV
		$V_I = 17.5\text{V to } 30\text{V}$	–	11	300	
Regload	Load Regulation ⁽¹³⁾	$T_J = +25^{\circ}\text{C}$				mV
		$I_O = 5\text{mA to } 1.5\text{A}$	–	12	300	
		$I_O = 250\text{mA to } 750\text{mA}$	–	4	150	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.2	8.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1.0\text{A}$	–	–	0.5	mA
		$V_I = 17.5\text{V to } 30\text{V}$	–	–	1.0	
$\Delta V_O/\Delta T$	Output Voltage Drift ⁽¹⁴⁾	$I_O = 5\text{mA}$	–	-1	–	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	–	90	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽¹⁴⁾	$f = 120\text{Hz}$ $V_I = 18.5\text{V to } 28.5\text{V}$	54	70	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2	–	V
r_O	Output Resistance ⁽¹⁴⁾	$f = 1\text{kHz}$	–	19	–	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	250	–	mA
I_{PK}	Peak Current ⁽¹⁴⁾	$T_J = +25^{\circ}\text{C}$	–	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, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 27\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7818E			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	17.3	18	18.7	V
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$, $P_O \leq 15\text{W}$ $V_I = 21\text{V to } 33\text{V}$	17.1	18	18.9	
Regline	Line Regulation ⁽¹⁵⁾	$T_J = +25^{\circ}\text{C}$ $V_I = 21\text{V to } 33\text{V}$	—	15	360	mV
		$V_I = 24\text{V to } 30\text{V}$	—	5	180	
Regload	Load Regulation ⁽¹⁵⁾	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	—	15	360	mV
		$I_O = 250\text{mA to } 750\text{mA}$	—	5.0	180	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	—	5.2	8.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1.0\text{A}$	—	—	0.5	mA
		$V_I = 21\text{V to } 33\text{V}$	—	—	1	
$\Delta V_O / \Delta T$	Output Voltage Drift ⁽¹⁶⁾	$I_O = 5\text{mA}$	—	-1	—	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	—	110	—	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽¹⁶⁾	$f = 120\text{Hz}$ $V_I = 22\text{V to } 32\text{V}$	53	69	—	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	—	2	—	V
r_O	Output Resistance ⁽¹⁶⁾	$f = 1\text{kHz}$	—	22	—	$\text{m}\Omega$
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	—	250	—	mA
I_{PK}	Peak Current ⁽¹⁶⁾	$T_J = +25^{\circ}\text{C}$	—	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, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 33\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7824E			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	23	24	25	V
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$, $P_O \leq 15\text{W}$ $V_I = 27\text{V to } 38\text{V}$	22.8	24	25.25	
Regline	Line Regulation ⁽¹⁷⁾	$T_J = +25^{\circ}\text{C}$ $V_I = 27\text{V to } 38\text{V}$	–	17	480	mV
			–	6	240	
Regload	Load Regulation ⁽¹⁷⁾	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	–	15	480	mV
			–	5.0	240	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.2	8.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1.0\text{A}$	–	0.1	0.5	mA
		$V_I = 27\text{V to } 38\text{V}$	–	0.5	1	
$\Delta V_O/\Delta T$	Output Voltage Drift ⁽¹⁸⁾	$I_O = 5\text{mA}$	–	-1.5	–	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	–	60	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽¹⁸⁾	$f = 120\text{Hz}$ $V_I = 28\text{V to } 38\text{V}$	50	67	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2	–	V
r_O	Output Resistance ⁽¹⁸⁾	$f = 1\text{kHz}$	–	28	–	$\text{m}\Omega$
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	230	–	mA
I_{PK}	Peak Current ⁽¹⁸⁾	$T_J = +25^{\circ}\text{C}$	–	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 10\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7805AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	4.9	5	5.1	V
		$I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$ $V_I = 7.5\text{V to } 20\text{V}$	4.8	5	5.2	
Regline	Line Regulation ⁽¹⁹⁾	$V_I = 7.5\text{V to } 25\text{V}$ $I_O = 500\text{mA}$	—	5	50	mV
		$V_I = 8\text{V to } 12\text{V}$	—	3	50	
		$T_J = +25^{\circ}\text{C}$ $V_I = 7.3\text{V to } 20\text{V}$	—	5	50	
		$V_I = 8\text{V to } 12\text{V}$	—	1.5	25	
Regload	Load Regulation ⁽¹⁹⁾	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	—	9	100	mV
		$I_O = 5\text{mA to } 1\text{A}$	—	9	100	
		$I_O = 250\text{mA to } 750\text{mA}$	—	4	50	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	—	5.0	6.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1\text{A}$	—	—	0.5	mA
		$V_I = 8\text{V to } 25\text{V}$, $I_O = 500\text{mA}$	—	—	0.8	
		$V_I = 7.5\text{V to } 20\text{V}$, $T_J = +25^{\circ}\text{C}$	—	—	0.8	
$\Delta V/\Delta T$	Output Voltage Drift ⁽²⁰⁾	$I_O = 5\text{mA}$	—	-0.8	—	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$ $T_A = +25^{\circ}\text{C}$	—	10	—	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽²⁰⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 8\text{V to } 18\text{V}$	—	68	—	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	—	2	—	V
r_O	Output Resistance ⁽²⁰⁾	$f = 1\text{kHz}$	—	17	—	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	—	250	—	mA
I_{PK}	Peak Current ⁽²⁰⁾	$T_J = +25^{\circ}\text{C}$	—	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 11\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7806AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	5.58	6	6.12	V
		$I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$ $V_I = 8.6\text{V to } 21\text{V}$	5.76	6	6.24	
Regline	Line Regulation ⁽²¹⁾	$V_I = 8.6\text{V to } 25\text{V}$, $I_O = 500\text{mA}$	—	5	60	mV
		$V_I = 9\text{V to } 13\text{V}$	—	3	60	
		$T_J = +25^{\circ}\text{C}$ $V_I = 8.3\text{V to } 21\text{V}$	—	5	60	
		$V_I = 9\text{V to } 13\text{V}$	—	1.5	30	
Regload	Load Regulation ⁽²¹⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	—	9	100	mV
		$I_O = 5\text{mA to } 1\text{A}$	—	9	100	
		$I_O = 250\text{mA to } 750\text{mA}$	—	5.0	50	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	—	4.3	6.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1\text{A}$	—	—	0.5	mA
		$V_I = 9\text{V to } 25\text{V}$, $I_O = 500\text{mA}$	—	—	0.8	
		$V_I = 8.5\text{V to } 21\text{V}$, $T_J = +25^{\circ}\text{C}$	—	—	0.8	
$\Delta V/\Delta T$	Output Voltage Drift ⁽²²⁾	$I_O = 5\text{mA}$	—	-0.8	—	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	—	10	—	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽²²⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 9\text{V to } 19\text{V}$	—	65	—	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	—	2	—	V
r_O	Output Resistance ⁽²²⁾	$f = 1\text{kHz}$	—	17	—	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	—	250	—	mA
I_{PK}	Peak Current ⁽²²⁾	$T_J = +25^{\circ}\text{C}$	—	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 14\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7808AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	7.84	8	8.16	V
		$I_O = 5\text{mA}$ to 1A , $P_O \leq 15\text{W}$ $V_I = 10.6\text{V}$ to 23V	7.7	8	8.3	
Regline	Line Regulation ⁽²³⁾	$V_I = 10.6\text{V}$ to 25V , $I_O = 500\text{mA}$	—	6	80	mV
		$V_I = 11\text{V}$ to 17V	—	3	80	
		$T_J = +25^{\circ}\text{C}$ $V_I = 10.4\text{V}$ to 23V $V_I = 11\text{V}$ to 17V	—	6	80	
			—	2	40	
Regload	Load Regulation ⁽²³⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA}$ to 1.5A	—	12	100	mV
		$I_O = 5\text{mA}$ to 1A	—	12	100	
		$I_O = 250\text{mA}$ to 750mA	—	5	50	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	—	5.0	6.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA}$ to 1A	—	—	0.5	mA
		$V_I = 11\text{V}$ to 25V , $I_O = 500\text{mA}$	—	—	0.8	
		$V_I = 10.6\text{V}$ to 23V , $T_J = +25^{\circ}\text{C}$	—	—	0.8	
$\Delta V/\Delta T$	Output Voltage Drift ⁽²⁴⁾	$I_O = 5\text{mA}$	—	-0.8	—	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz}$ to 100kHz , $T_A = +25^{\circ}\text{C}$	—	10	—	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽²⁴⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 11.5\text{V}$ to 21.5V	—	62	—	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	—	2	—	V
r_O	Output Resistance ⁽²⁴⁾	$f = 1\text{kHz}$	—	18	—	$\text{m}\Omega$
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	—	250	—	mA
I_{PK}	Peak Current ⁽²⁴⁾	$T_J = +25^{\circ}\text{C}$	—	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 15\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, 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 ≤ 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	
			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	
ΔV/ΔT	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/V _o
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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 16\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7810AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	9.8	10.0	10.2	V
		$I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$ $V_I = 12.8\text{V to } 25\text{V}$	9.6	10.0	10.4	
Regline	Line Regulation ⁽²⁷⁾	$V_I = 12.8\text{V to } 26\text{V}$, $I_O = 500\text{mA}$	–	8.0	100	mV
		$V_I = 13\text{V to } 20\text{V}$	–	4.0	50.0	
		$T_J = +25^{\circ}\text{C}$ $V_I = 12.5\text{V to } 25\text{V}$	–	8.0	100	
		$V_I = 13\text{V to } 20\text{V}$	–	3.0	50.0	
Regload	Load Regulation ⁽²⁷⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	12.0	100	mV
		$I_O = 5\text{mA to } 1\text{mA}$	–	12.0	100	
		$I_O = 250\text{mA to } 750\text{mA}$	–	5.0	50.0	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.0	6.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5\text{mA to } 1\text{A}$	–	–	0.5	mA
		$V_I = 12.8\text{V to } 25\text{V}$, $I_O = 500\text{mA}$	–	–	0.8	
		$V_I = 13\text{V to } 26\text{V}$, $T_J = +25^{\circ}\text{C}$	–	–	0.5	
$\Delta V_O/\Delta T$	Output Voltage Drift ⁽²⁸⁾	$I_O = 5\text{mA}$	–	-1.0	–	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	–	10.0	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽²⁸⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	–	62.0	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽²⁸⁾	$f = 1\text{kHz}$	–	17.0	–	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	250	–	mA
I_{PK}	Peak Current ⁽²⁸⁾	$T_J = +25^{\circ}\text{C}$	–	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 19\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7812AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	11.75	12	12.25	V
		$I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$ $V_I = 14.8\text{V to } 27\text{V}$	11.5	12	12.5	
Regline	Line Regulation ⁽²⁹⁾	$V_I = 14.8\text{V to } 30\text{V}$, $I_O = 500\text{mA}$	–	10	120	mV
		$V_I = 16\text{V to } 22\text{V}$	–	4	120	
		$T_J = +25^{\circ}\text{C}$ $V_I = 14.5\text{V to } 27\text{V}$	–	10	120	
		$V_I = 16\text{V to } 22\text{V}$	–	3	60	
Regload	Load Regulation ⁽²⁹⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	12	100	mV
		$I_O = 5\text{mA to } 1.0\text{A}$	–	12	100	
		$I_O = 250\text{mA to } 750\text{mA}$	–	5	50	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.1	6.0	mA
ΔI_Q	Quiescent Current Change	$V_I = 15\text{V to } 30\text{V}$, $T_J = +25^{\circ}\text{C}$	–	–	0.8	mA
		$V_I = 14\text{V to } 27\text{V}$, $I_O = 500\text{mA}$	–	–	0.8	
		$I_O = 5\text{mA to } 1.0\text{A}$	–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift ⁽³⁰⁾	$I_O = 5\text{mA}$	–	-1.0	–	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	–	10	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽³⁰⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	–	60	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽³⁰⁾	$f = 1\text{kHz}$	–	18	–	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	250	–	mA
I_{PK}	Peak Current ⁽³⁰⁾	$T_J = +25^{\circ}\text{C}$	–	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 23\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7815AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	14.7	15	15.3	V
		$I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$ $V_I = 17.7\text{V to } 30\text{V}$	14.4	15	15.6	
Regline	Line Regulation ⁽³¹⁾	$V_I = 17.9\text{V to } 30\text{V}$, $I_O = 500\text{mA}$	–	10	150	mV
		$V_I = 20\text{V to } 26\text{V}$	–	5	150	
		$T_J = +25^{\circ}\text{C}$ $V_I = 17.5\text{V to } 30\text{V}$	–	11	150	
		$V_I = 20\text{V to } 26\text{V}$	–	3	75	
Regload	Load Regulation ⁽³¹⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	12	100	mV
		$I_O = 5\text{mA to } 1.0\text{A}$	–	12	100	
		$I_O = 250\text{mA to } 750\text{mA}$	–	5	50	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.2	6.0	mA
ΔI_Q	Quiescent Current Change	$V_I = 17.5\text{V to } 30\text{V}$, $T_J = +25^{\circ}\text{C}$	–	–	0.8	mA
		$V_I = 17.5\text{V to } 30\text{V}$, $I_O = 500\text{mA}$	–	–	0.8	
		$I_O = 5\text{mA to } 1.0\text{A}$	–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift ⁽³²⁾	$I_O = 5\text{mA}$	–	-1.0	–	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	–	10	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽³²⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 18.5\text{V to } 28.5\text{V}$	–	58	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽³²⁾	$f = 1\text{kHz}$	–	19	–	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	250	–	mA
I_{PK}	Peak Current ⁽³²⁾	$T_J = +25^{\circ}\text{C}$	–	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 27\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Symbol	Parameter	Conditions	KA7818AE			Unit
			Min.	Typ.	Max.	
V_O	Output Voltage	$T_J = +25^{\circ}\text{C}$	17.64	18	18.36	V
		$I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$ $V_I = 21\text{V to } 33\text{V}$	17.3	18	18.7	
Regline	Line Regulation ⁽³³⁾	$V_I = 21\text{V to } 33\text{V}$, $I_O = 500\text{mA}$	–	15	180	mV
		$V_I = 21\text{V to } 33\text{V}$	–	5	180	
		$T_J = +25^{\circ}\text{C}$ $V_I = 20.6\text{V to } 33\text{V}$	–	15	180	
		$V_I = 24\text{V to } 30\text{V}$	–	5	90	
Regload	Load Regulation ⁽³³⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	15	100	mV
		$I_O = 5\text{mA to } 1.0\text{A}$	–	15	100	
		$I_O = 250\text{mA to } 750\text{mA}$	–	7	50	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.2	6.0	mA
ΔI_Q	Quiescent Current Change	$V_I = 21\text{V to } 33\text{V}$, $T_J = +25^{\circ}\text{C}$	–	–	0.8	mA
		$V_I = 21\text{V to } 33\text{V}$, $I_O = 500\text{mA}$	–	–	0.8	
		$I_O = 5\text{mA to } 1.0\text{A}$	–	–	0.5	
$\Delta V/\Delta T$	Output Voltage Drift ⁽³⁴⁾	$I_O = 5\text{mA}$	–	-1.0	–	mV/ $^{\circ}\text{C}$
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$	–	10	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽³⁴⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 22\text{V to } 32\text{V}$	–	57	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽³⁴⁾	$f = 1\text{kHz}$	–	19	–	$\text{m}\Omega$
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	250	–	mA
I_{PK}	Peak Current ⁽³⁴⁾	$T_J = +25^{\circ}\text{C}$	–	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. $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 33\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

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

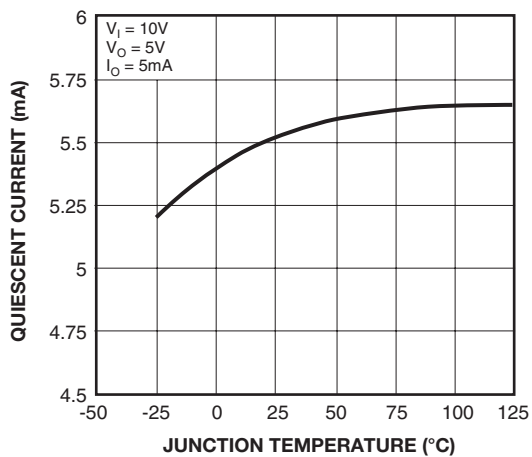


Figure 3. Quiescent Current

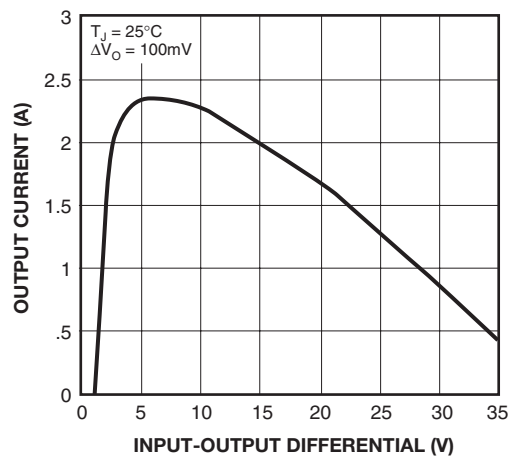


Figure 4. Peak Output Current

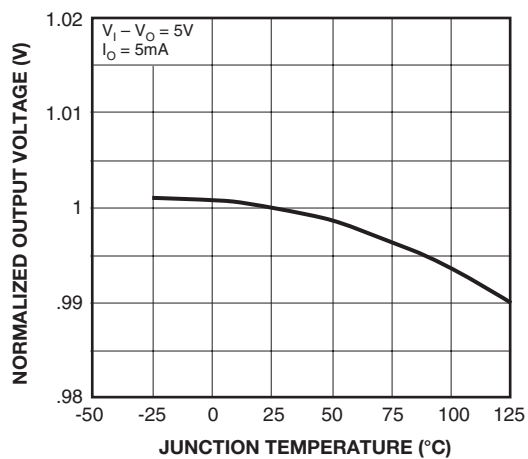


Figure 5. Output Voltage

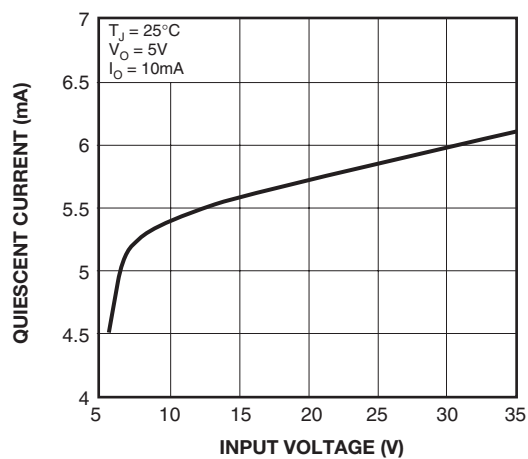


Figure 6. Quiescent Current

Typical Applications

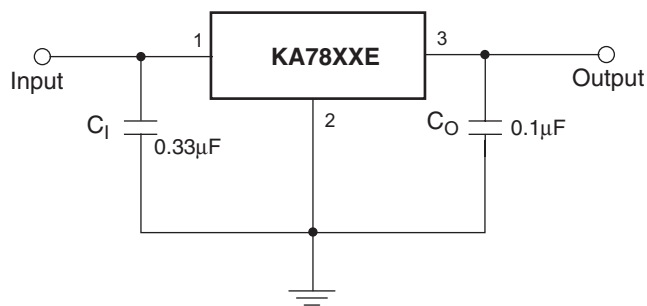


Figure 7. DC Parameters

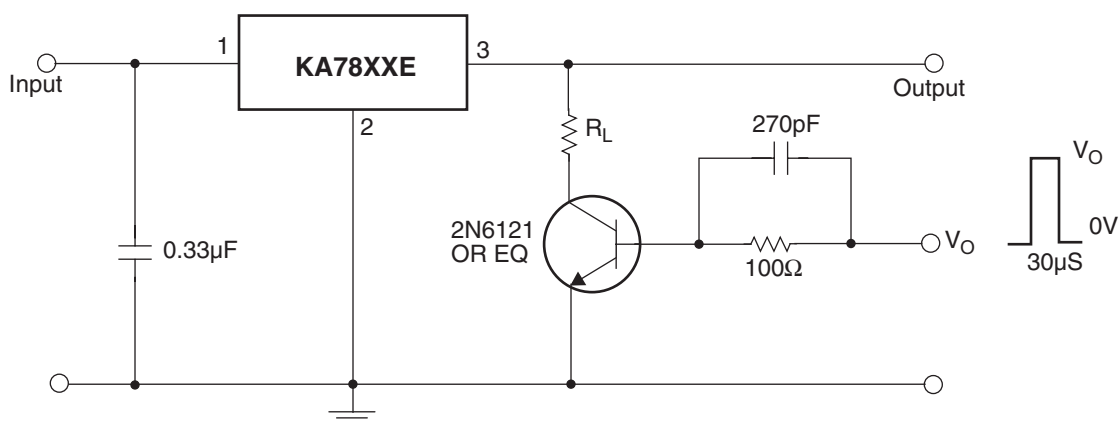


Figure 8. Load Regulation

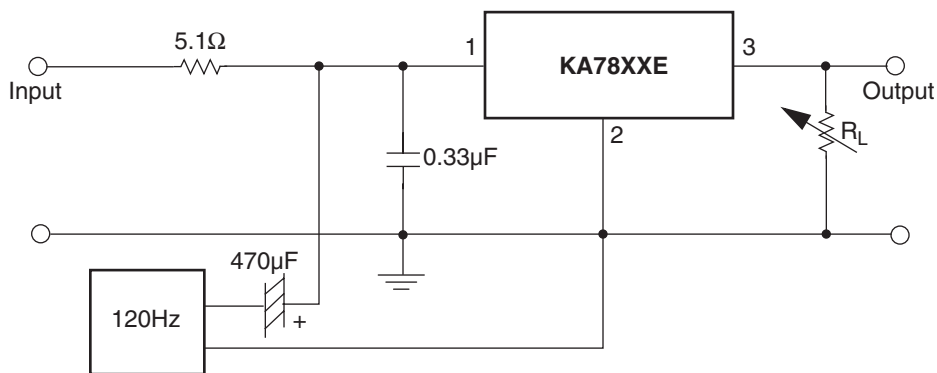


Figure 9. Ripple Rejection

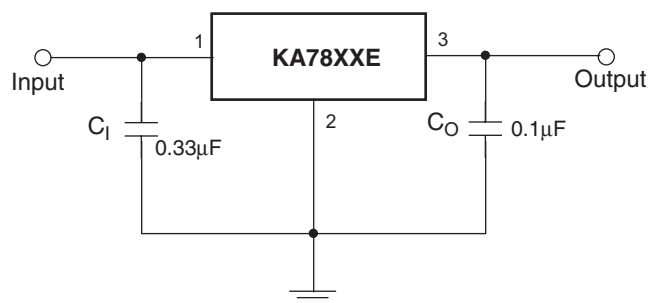


Figure 10. Fixed Output Regulator

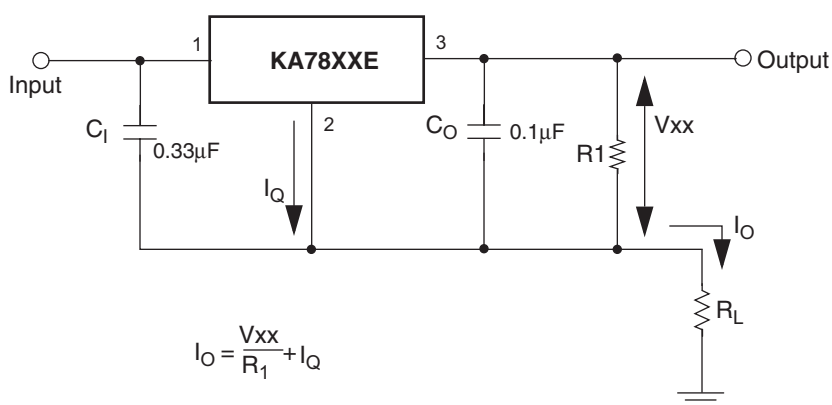


Figure 11. Constant Current Regulator

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_1 is required if regulator is located an appreciable distance from power Supply filter.
3. C_0 improves stability and transient response.

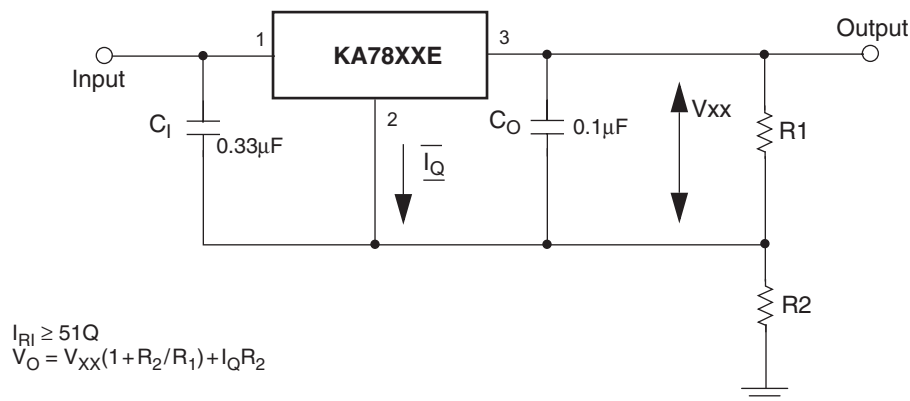


Figure 12. Circuit for Increasing Output Voltage

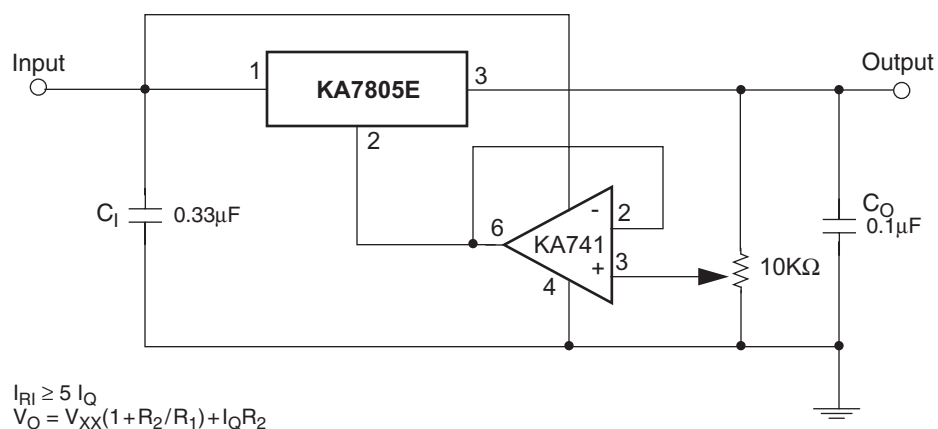


Figure 13. Adjustable Output Regulator (7 to 30V)

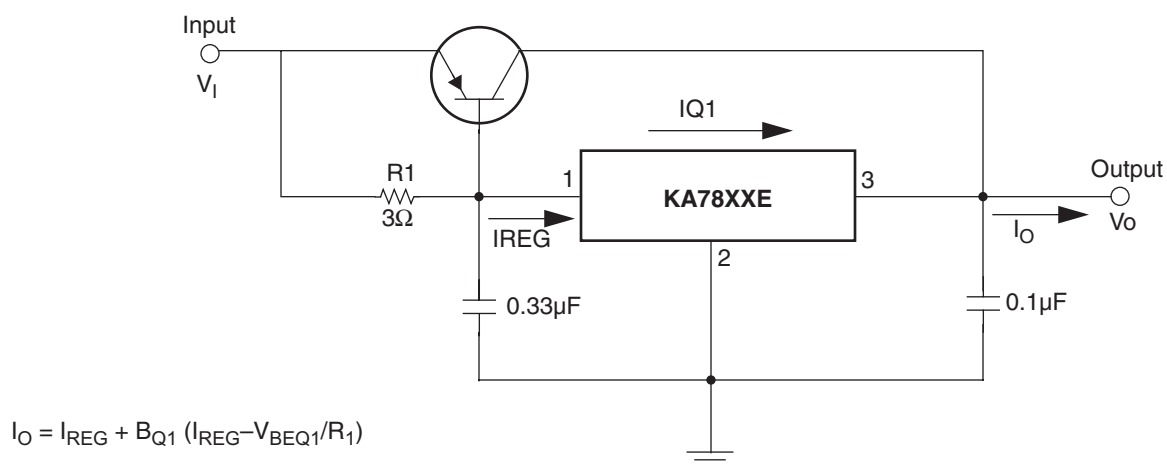


Figure 14. High Current Voltage Regulator

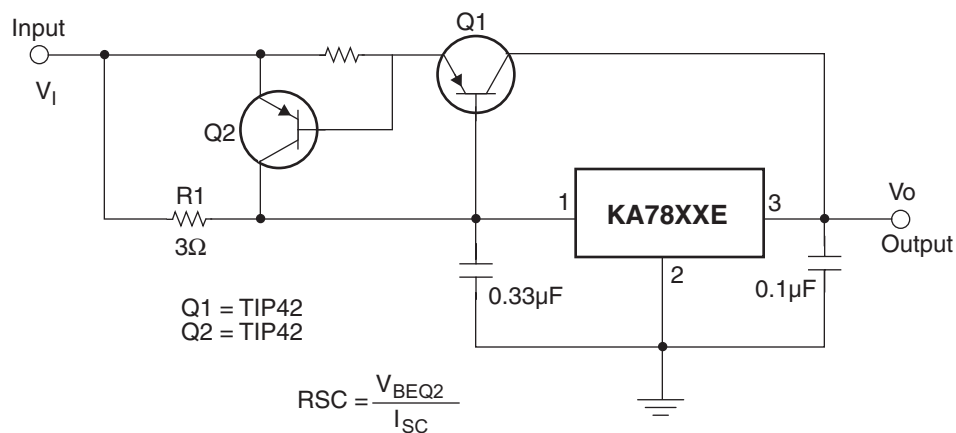


Figure 15. High Output Current with Short Circuit Protection

The circuit diagram shows a differential amplifier with two op-amp ICs, KA7815E and KA7915E, connected in a differential configuration. The KA7815E is powered by a +20V supply (pin 1) and a +15V supply (pin 3). The KA7915E is powered by a -20V supply (pin 1) and a -15V supply (pin 3). Both ICs have their non-inverting inputs (pin 2) connected to ground. The output of the KA7815E (pin 3) is connected to the non-inverting input of the KA7915E (pin 2) through a 0.1μF capacitor. The output of the KA7915E (pin 3) is connected to the non-inverting input of the KA7815E (pin 2) through a 0.1μF capacitor. The output of the KA7815E (pin 3) is also connected to a 1N4001 diode, which is connected to ground. The output of the KA7915E (pin 3) is also connected to a 1N4001 diode, which is connected to ground. The input of the KA7815E (pin 1) is connected to a +20V supply through a 0.33μF capacitor. The input of the KA7915E (pin 1) is connected to a -20V supply through a 2.2μF capacitor. The output of the KA7815E (pin 3) is connected to a 1μF capacitor, which is connected to ground. The output of the KA7915E (pin 3) is connected to a 1μF capacitor, which is connected to ground.

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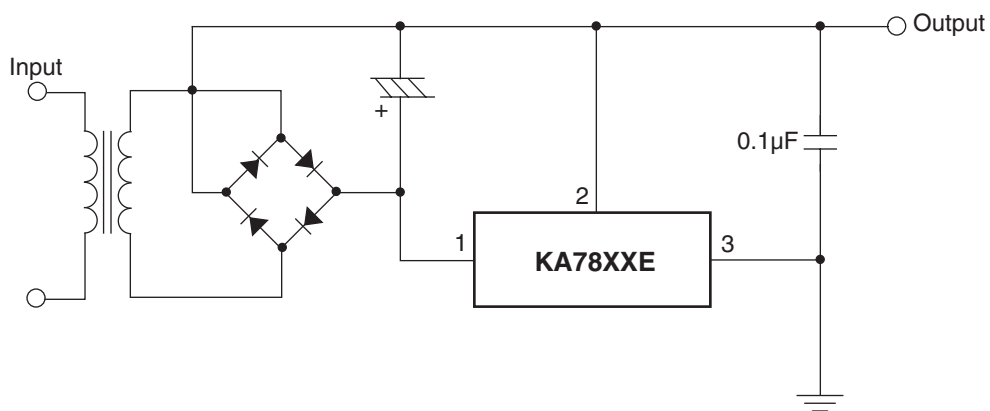


Figure 18. Negative Output Voltage Circuit

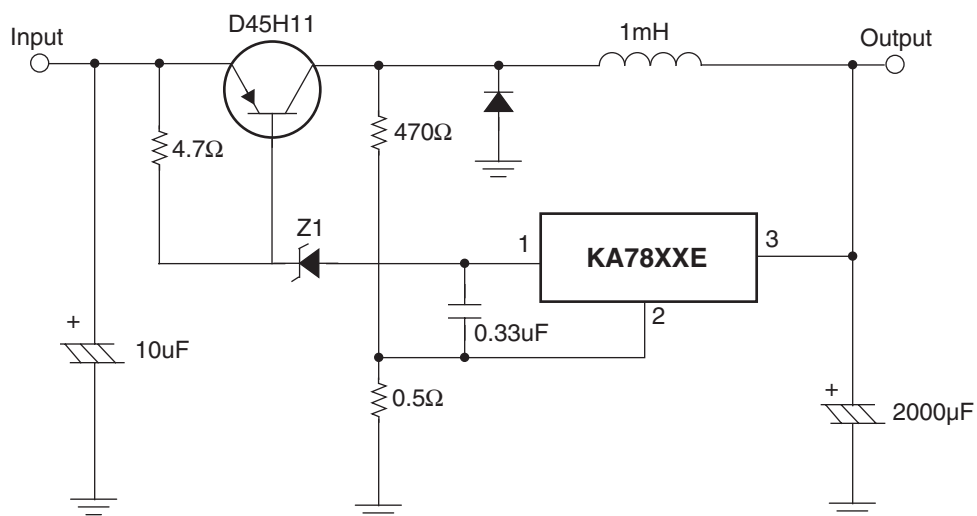
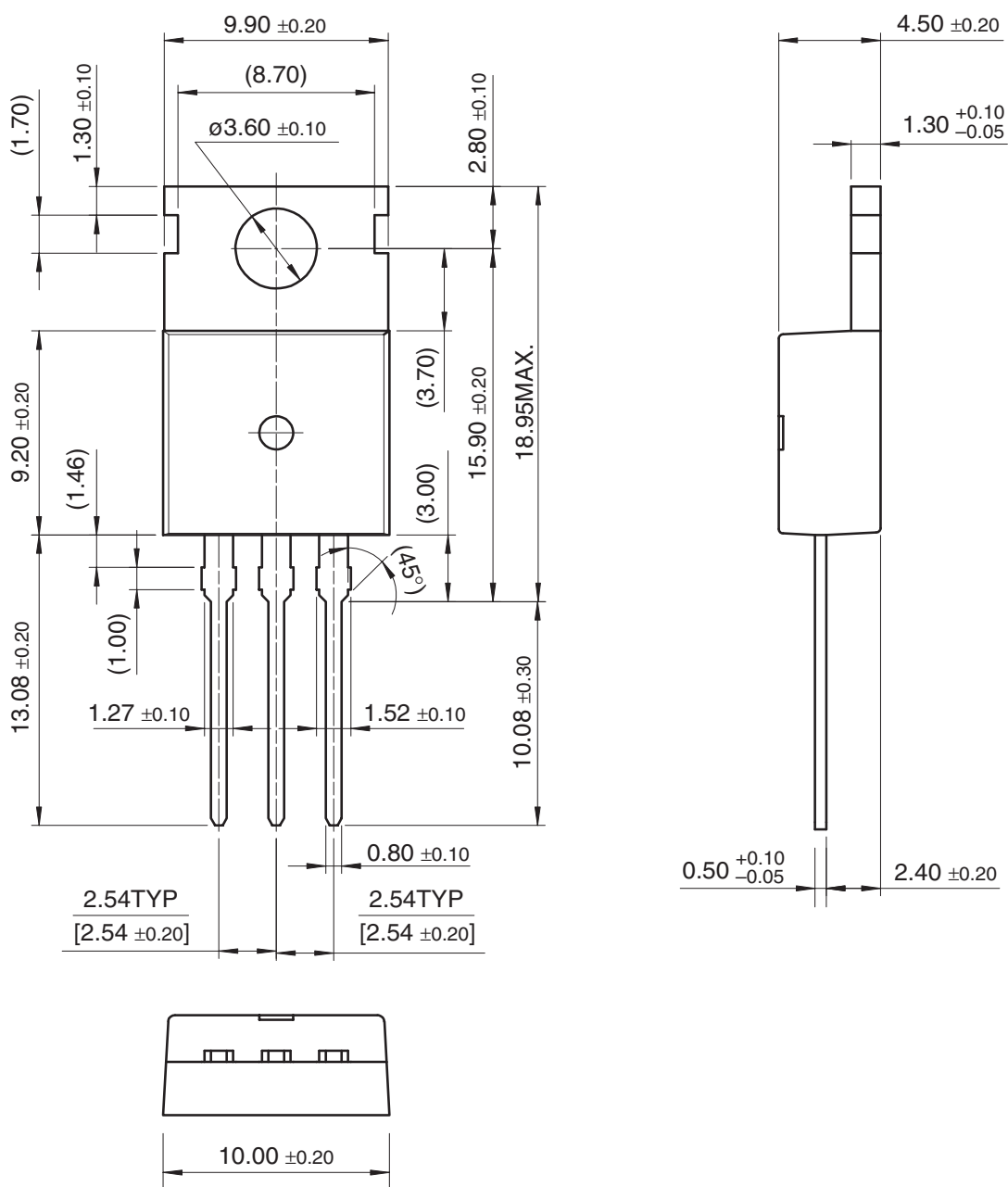


Figure 19. Switching Regulator

Mechanical Dimensions

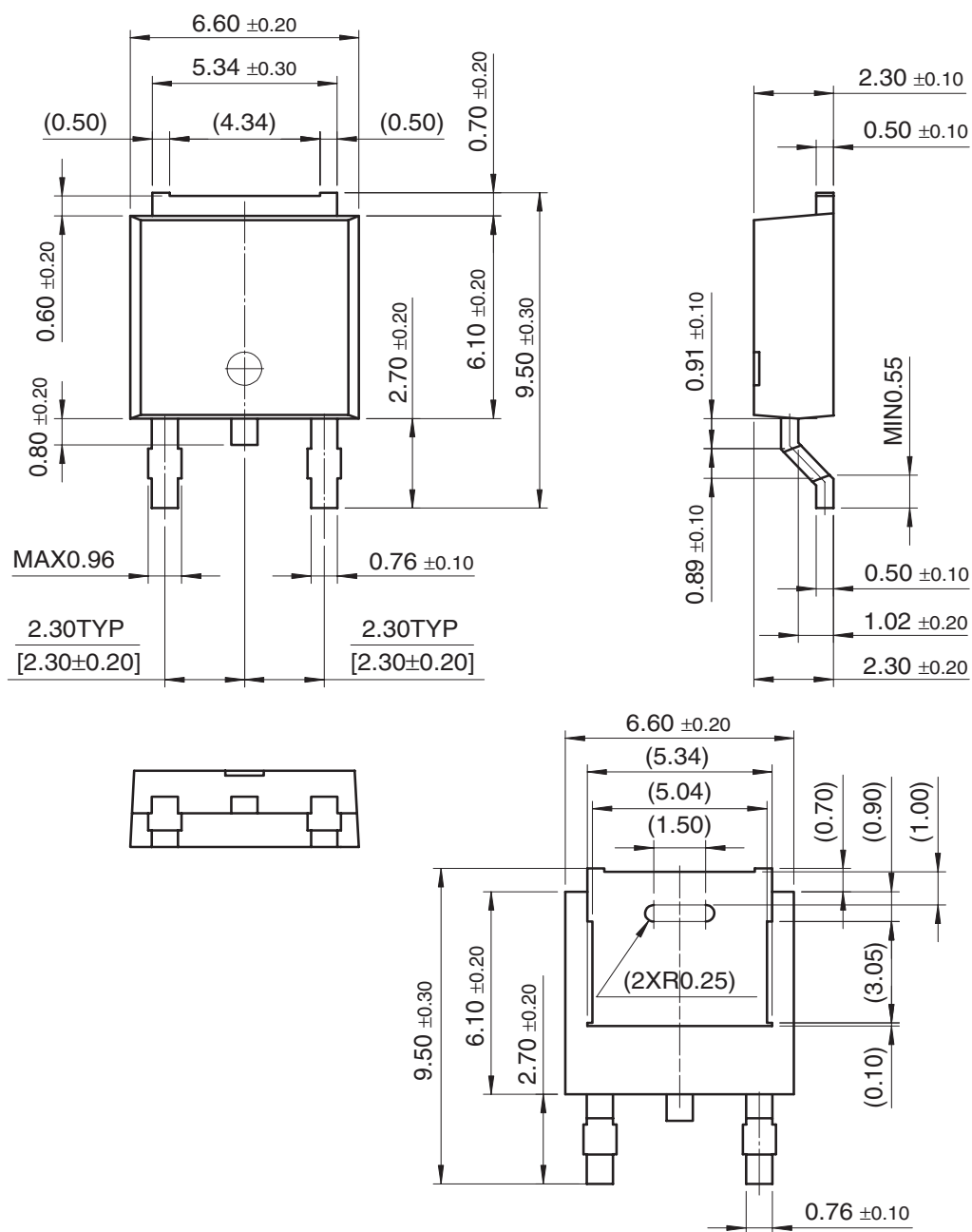
Dimensions in millimeters

TO-220 [DUAL GAUGE]



Mechanical Dimensions (Continued)

Dimensions in millimeters

D-PAK



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