

# 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			
KA7808AE / KA7809AE			
KA7810AE			
KA7812AE/KA7815AE			
KA7818AE/KA7824AE			
KA7805ER / KA7806ER	±4%	D-PAK	0 to +125°C
KA7808ER / KA7809ER			
KA7812ER			

### Block Diagram

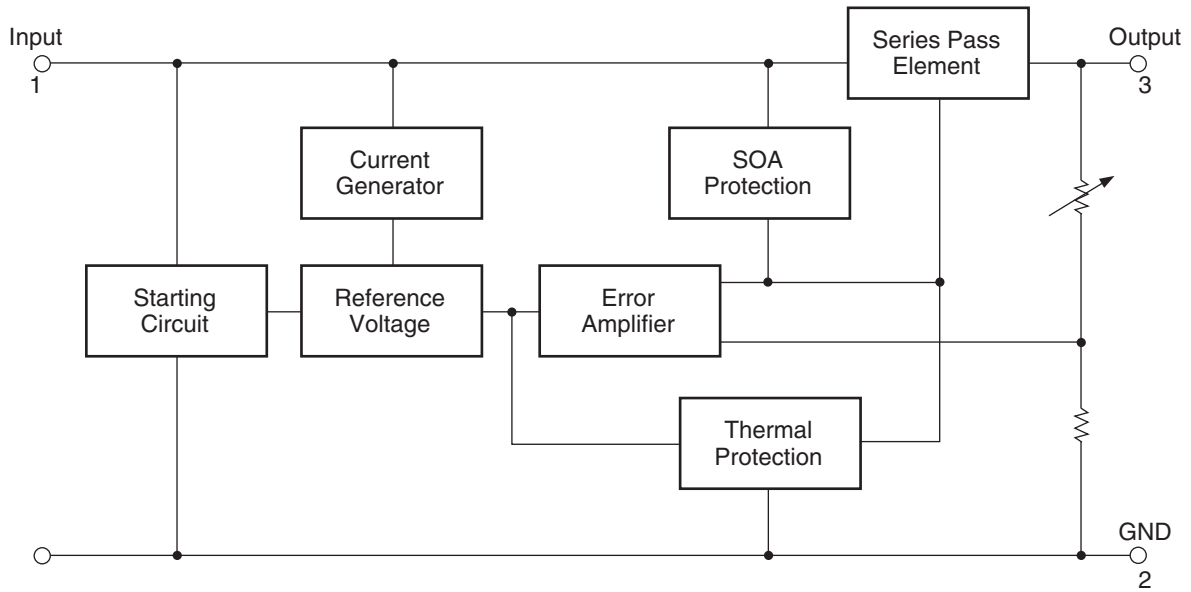


Figure 1.

### Pin Assignment

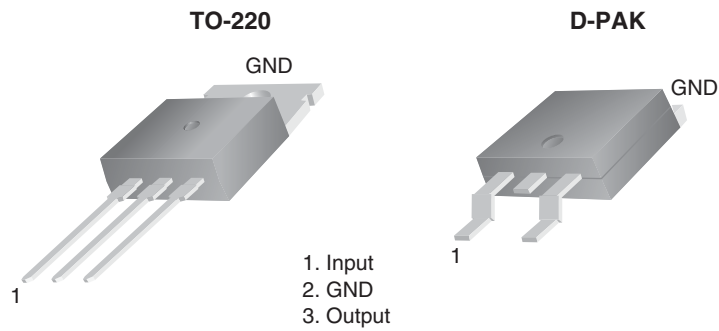


Figure 2.

### 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	$T_J = +25^{\circ}\text{C}$	4.8	5.0	5.2	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 7\text{V to } 20\text{V}$	4.75	5.0	5.25		
Regline	Line Regulation <sup>(1)</sup>	$T_J = +25^{\circ}\text{C}$	$V_O = 7\text{V to } 25\text{V}$	–	4.0	100	mV
			$V_I = 8\text{V to } 12\text{V}$	–	1.6	50	
Regload	Load Regulation <sup>(1)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5.0\text{mA to } 1.5\text{A}$	–	9	100	mV
			$I_O = 250\text{mA to } 750\text{mA}$	–	4	50	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.0	8.0	mA	
$\Delta I_Q$	Quiescent Current Change	$I_O = 5\text{mA to } 1.0\text{A}$	–	0.03	0.5	mA	
		$V_I = 7\text{V to } 25\text{V}$	–	0.3	1.3		
$\Delta V_O/\Delta T$	Output Voltage Drift <sup>(2)</sup>	$I_O = 5\text{mA}$	–	-0.8	–	mV/ $^{\circ}\text{C}$	
$V_N$	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	–	42	–	$\mu\text{V}/V_O$	
RR	Ripple Rejection <sup>(2)</sup>	$f = 120\text{Hz}$ , $V_O = 8\text{V to } 18\text{V}$	62	73	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(2)</sup>	$f = 1\text{kHz}$	–	15	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	230	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(2)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(3)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 8\text{V to } 25\text{V}$	–	5	120	mV
			$V_I = 9\text{V to } 13\text{V}$	–	1.5	60	
Regload	Load Regulation <sup>(3)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	–	9	120	mV
			$I_O = 250\text{mA to } 750\text{mA}$	–	3	60	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.0	8.0	mA	
$\Delta I_Q$	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 <sup>(4)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(4)</sup>	$f = 120\text{Hz}$ $V_I = 9\text{V to } 19\text{V}$	59	75	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(4)</sup>	$f = 1\text{kHz}$	–	19	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(4)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(5)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 10.5\text{V to } 25\text{V}$	–	5.0	160	mV
			$V_I = 11.5\text{V to } 17\text{V}$	–	2.0	80	
Regload	Load Regulation <sup>(5)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5.0\text{mA to } 1.5\text{A}$	–	10	160	mV
			$I_O = 250\text{mA to } 750\text{mA}$	–	5.0	80	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.0	8.0	mA	
$\Delta I_Q$	Quiescent Current Change	$I_O = 5\text{mA to } 1.0\text{A}$	–	0.05	0.5	mA	
		$V_I = 10.5\text{V to } 25\text{V}$	–	0.5	1.0		
$\Delta V_O/\Delta T$	Output Voltage Drift <sup>(6)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(6)</sup>	$f = 120\text{Hz}$ , $V_I = 11.5\text{V to } 21.5\text{V}$	56	73	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(6)</sup>	$f = 1\text{kHz}$	–	17	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	230	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(6)</sup>	$T_J = +25^{\circ}\text{C}$	–	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	$T_J = +25^{\circ}\text{C}$	8.65	9	9.35	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 11.5\text{V to } 24\text{V}$	8.6	9	9.4		
Regline	Line Regulation <sup>(7)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 11.5\text{V to } 25\text{V}$	–	6	180	mV
			$V_I = 12\text{V to } 17\text{V}$	–	2	90	
Regload	Load Regulation <sup>(7)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	–	12	180	mV
			$I_O = 250\text{mA to } 750\text{mA}$	–	4	90	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.0	8.0	mA	
$\Delta I_Q$	Quiescent Current Change	$I_O = 5\text{mA to } 1.0\text{A}$	–	–	0.5	mA	
		$V_I = 11.5\text{V to } 26\text{V}$	–	–	1.3		
$\Delta V_O/\Delta T$	Output Voltage Drift <sup>(8)</sup>	$I_O = 5\text{mA}$	–	-1	–	mV/ $^{\circ}\text{C}$	
$V_N$	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	–	58	–	$\mu\text{V}/V_O$	
RR	Ripple Rejection <sup>(8)</sup>	$f = 120\text{Hz}$ $V_I = 13\text{V to } 23\text{V}$	56	71	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(8)</sup>	$f = 1\text{kHz}$	–	17	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(8)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(9)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 12.5\text{V to } 25\text{V}$	–	10.0	200	mV
			$V_I = 13\text{V to } 25\text{V}$	–	3.0	100	
Regload	Load Regulation <sup>(9)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	–	12.0	200	mV
			$I_O = 250\text{mA to } 750\text{mA}$	–	4.0	400	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.1	8.0	mA	
$\Delta I_Q$	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 <sup>(10)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(10)</sup>	$f = 120\text{Hz}$ $V_O = 13\text{V to } 23\text{V}$	56.0	71.0	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2.0	–	V	
$r_O$	Output Resistance <sup>(10)</sup>	$f = 1\text{kHz}$	–	17.0	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(10)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(11)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 14.5\text{V to } 30\text{V}$	–	10	240	mV
			$V_I = 16\text{V to } 22\text{V}$	–	3.0	120	
Regload	Load Regulation <sup>(11)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	–	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	
$\Delta I_Q$	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 <sup>(12)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(12)</sup>	$f = 120\text{Hz}$ $V_I = 15\text{V to } 25\text{V}$	55	71	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(12)</sup>	$f = 1\text{kHz}$	–	18	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	230	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(12)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(13)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 17.5\text{V to } 30\text{V}$	–	11	300	mV
			$V_I = 20\text{V to } 26\text{V}$	–	3	150	
Regload	Load Regulation <sup>(13)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	–	12	300	mV
			$I_O = 250\text{mA to } 750\text{mA}$	–	4	150	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.2	8.0	mA	
$\Delta I_Q$	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 <sup>(14)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(14)</sup>	$f = 120\text{Hz}$ $V_I = 18.5\text{V to } 28.5\text{V}$	54	70	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(14)</sup>	$f = 1\text{kHz}$	–	19	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(14)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(15)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 21\text{V to } 33\text{V}$	–	15	360	mV
			$V_I = 24\text{V to } 30\text{V}$	–	5	180	
Regload	Load Regulation <sup>(15)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	–	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	
$\Delta I_Q$	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 <sup>(16)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(16)</sup>	$f = 120\text{Hz}$ $V_I = 22\text{V to } 32\text{V}$	53	69	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(16)</sup>	$f = 1\text{kHz}$	–	22	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(16)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(17)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 27\text{V to } 38\text{V}$	–	17	480	mV
			$V_I = 30\text{V to } 36\text{V}$	–	6	240	
Regload	Load Regulation <sup>(17)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	–	15	480	mV
			$I_O = 250\text{mA to } 750\text{mA}$	–	5.0	240	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.2	8.0	mA	
$\Delta I_Q$	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 <sup>(18)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(18)</sup>	$f = 120\text{Hz}$ $V_I = 28\text{V to } 38\text{V}$	50	67	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(18)</sup>	$f = 1\text{kHz}$	–	28	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	230	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(18)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(19)</sup>	$V_I = 7.5\text{V to } 25\text{V}$ $I_O = 500\text{mA}$	–	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 <sup>(19)</sup>	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	–	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
$\Delta I_Q$	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 <sup>(20)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(20)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 8\text{V to } 18\text{V}$	–	68	–	dB
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V
$r_O$	Output Resistance <sup>(20)</sup>	$f = 1\text{kHz}$	–	17	–	m $\Omega$
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA
$I_{\text{PK}}$	Peak Current <sup>(20)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(21)</sup>	$V_I = 8.6\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	–	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 <sup>(21)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.5\text{A}$	–	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	
$\Delta I_Q$	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 <sup>(22)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(22)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 9\text{V to } 19\text{V}$	–	65	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(22)</sup>	$f = 1\text{kHz}$	–	17	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(22)</sup>	$T_J = +25^{\circ}\text{C}$	–	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	
		$I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 10.6\text{V to } 23\text{V}$	7.7	8	8.3		
Regline	Line Regulation <sup>(23)</sup>	$V_I = 10.6\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	–	6	80	mV	
		$V_I = 11\text{V to } 17\text{V}$	–	3	80		
		$T_J = +25^{\circ}\text{C}$	$V_I = 10.4\text{V to } 23\text{V}$ $V_I = 11\text{V to } 17\text{V}$	–	6		80
		–		2	40		
Regload	Load Regulation <sup>(23)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.5\text{A}$	–	12	100	mV	
		$I_O = 5\text{mA to } 1\text{A}$	–	12	100		
		$I_O = 250\text{mA to } 750\text{mA}$	–	5	50		
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.0	6.0	mA	
$\Delta I_Q$	Quiescent Current Change	$I_O = 5\text{mA to } 1\text{A}$	–	–	0.5	mA	
		$V_I = 11\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	–	–	0.8		
		$V_I = 10.6\text{V to } 23\text{V}$ , $T_J = +25^{\circ}\text{C}$	–	–	0.8		
$\Delta V/\Delta T$	Output Voltage Drift <sup>(24)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(24)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 11.5\text{V to } 21.5\text{V}$	–	62	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2	–	V	
$r_O$	Output Resistance <sup>(24)</sup>	$f = 1\text{kHz}$	–	18	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(24)</sup>	$T_J = +25^{\circ}\text{C}$	–	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	$T_J = +25^{\circ}\text{C}$	8.82	9.0	9.18	V	
		$I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 11.2\text{V to } 24\text{V}$	8.65	9.0	9.35		
Regline	Line Regulation <sup>(25)</sup>	$V_I = 11.7\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	–	6	90	mV	
		$V_I = 12.5\text{V to } 19\text{V}$	–	4	45		
		$T_J = +25^{\circ}\text{C}$	$V_I = 11.5\text{V to } 24\text{V}$	–	6		90
		$V_I = 12.5\text{V to } 19\text{V}$	–	2	45		
Regload	Load Regulation <sup>(25)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.0\text{A}$	–	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	$T_J = +25^{\circ}\text{C}$	–	5.0	6.0	mA	
$\Delta I_Q$	Quiescent Current Change	$V_I = 11.7\text{V to } 25\text{V}$ , $T_J = +25^{\circ}\text{C}$	–	–	0.8	mA	
		$V_I = 12\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	–	–	0.8		
		$I_O = 5\text{mA to } 1.0\text{A}$	–	–	0.5		
$\Delta V/\Delta T$	Output Voltage Drift <sup>(26)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(26)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 12\text{V to } 22\text{V}$	–	62	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2.0	–	V	
$r_O$	Output Resistance <sup>(26)</sup>	$f = 1\text{kHz}$	–	17	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(26)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(27)</sup>	$V_I = 12.8\text{V to } 26\text{V}$ , $I_O = 500\text{mA}$	–	8.0	100	mV
		$V_I = 13\text{V to } 20\text{V}$	–	4.0	50.0	
		$T_J = +25^{\circ}\text{C}$	–	8.0	100	
		$V_I = 12.5\text{V to } 25\text{V}$ $V_I = 13\text{V to } 20\text{V}$				
Regload	Load Regulation <sup>(27)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.5\text{A}$	–	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
$\Delta I_Q$	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 <sup>(28)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(28)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	–	62.0	–	dB
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
$r_O$	Output Resistance <sup>(28)</sup>	$f = 1\text{kHz}$	–	17.0	–	m $\Omega$
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA
$I_{\text{PK}}$	Peak Current <sup>(28)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(29)</sup>	$V_I = 14.8\text{V to } 30\text{V}$ , $I_O = 500\text{mA}$	–	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 <sup>(29)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.5\text{A}$	–	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
$\Delta I_Q$	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 <sup>(30)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(30)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	–	60	–	dB
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
$r_O$	Output Resistance <sup>(30)</sup>	$f = 1\text{kHz}$	–	18	–	m $\Omega$
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA
$I_{\text{PK}}$	Peak Current <sup>(30)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(31)</sup>	$V_I = 17.9\text{V to } 30\text{V}$ , $I_O = 500\text{mA}$	–	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 <sup>(31)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.5\text{A}$	–	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
$\Delta I_Q$	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 <sup>(32)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(32)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 18.5\text{V to } 28.5\text{V}$	–	58	–	dB
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
$r_O$	Output Resistance <sup>(32)</sup>	$f = 1\text{kHz}$	–	19	–	m $\Omega$
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA
$I_{\text{PK}}$	Peak Current <sup>(32)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(33)</sup>	$V_I = 21\text{V to } 33\text{V}$ , $I_O = 500\text{mA}$	–	15	180	mV
		$V_I = 21\text{V to } 33\text{V}$	–	5	180	
		$T_J = +25^{\circ}\text{C}$	–	15	180	
		$V_I = 20.6\text{V to } 33\text{V}$ $V_I = 24\text{V to } 30\text{V}$				
Regload	Load Regulation <sup>(33)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.5\text{A}$	–	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
$\Delta I_Q$	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 <sup>(34)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(34)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 22\text{V to } 32\text{V}$	–	57	–	dB
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
$r_O$	Output Resistance <sup>(34)</sup>	$f = 1\text{kHz}$	–	19	–	m $\Omega$
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA
$I_{\text{PK}}$	Peak Current <sup>(34)</sup>	$T_J = +25^{\circ}\text{C}$	–	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 <sup>(35)</sup>	$V_I = 27\text{V to } 38\text{V}$ , $I_O = 500\text{mA}$	–	18	240	mV	
		$V_I = 21\text{V to } 33\text{V}$	–	6	240		
		$T_J = +25^{\circ}\text{C}$	$V_I = 26.7\text{V to } 38\text{V}$ $V_I = 30\text{V to } 36\text{V}$	–	18		240
		–		6	120		
Regload	Load Regulation <sup>(35)</sup>	$T_J = +25^{\circ}\text{C}$ , $I_O = 5\text{mA to } 1.5\text{A}$	–	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	
$\Delta I_Q$	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 <sup>(36)</sup>	$I_O = 5\text{mA}$	–	-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 <sup>(36)</sup>	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 28\text{V to } 38\text{V}$	–	54	–	dB	
$V_{\text{Drop}}$	Dropout Voltage	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	–	2.0	–	V	
$r_O$	Output Resistance <sup>(36)</sup>	$f = 1\text{kHz}$	–	20	–	m $\Omega$	
$I_{\text{SC}}$	Short Circuit Current	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	–	250	–	mA	
$I_{\text{PK}}$	Peak Current <sup>(36)</sup>	$T_J = +25^{\circ}\text{C}$	–	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

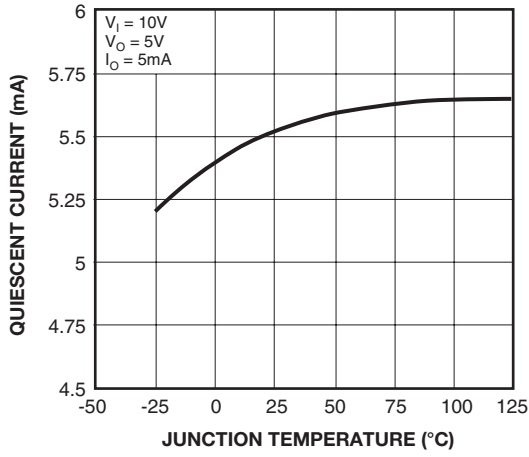


Figure 3. Quiescent Current

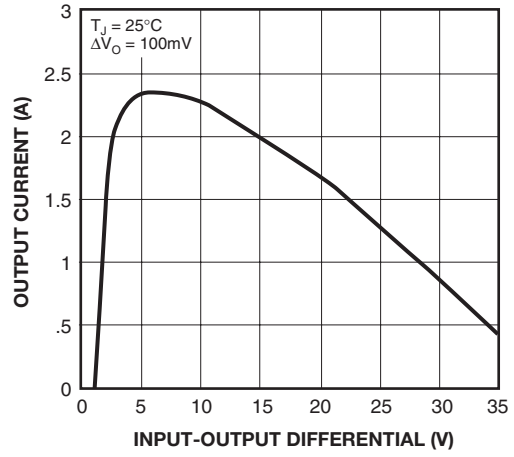


Figure 4. Output Voltage

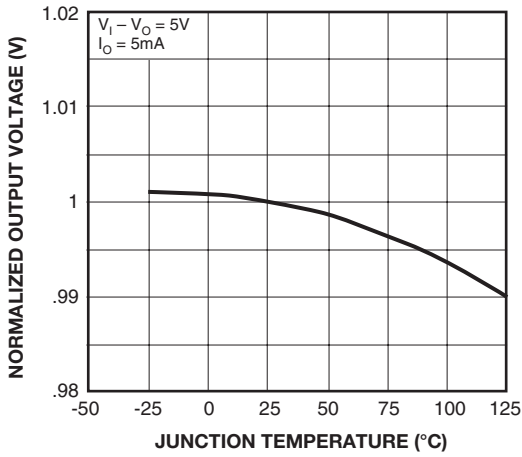


Figure 5. Peak Output Current

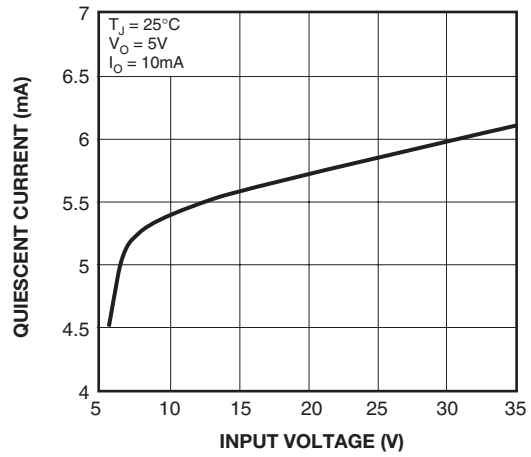


Figure 6. Quiescent Current

Typical Applications

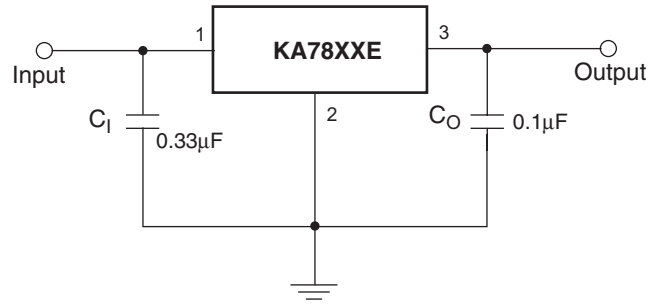


Figure 7. DC Parameters

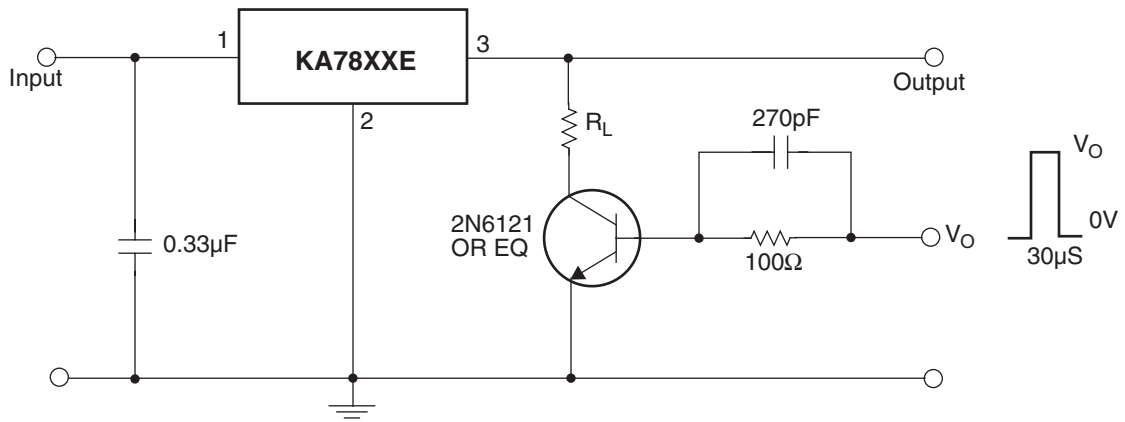


Figure 8. Load Regulation

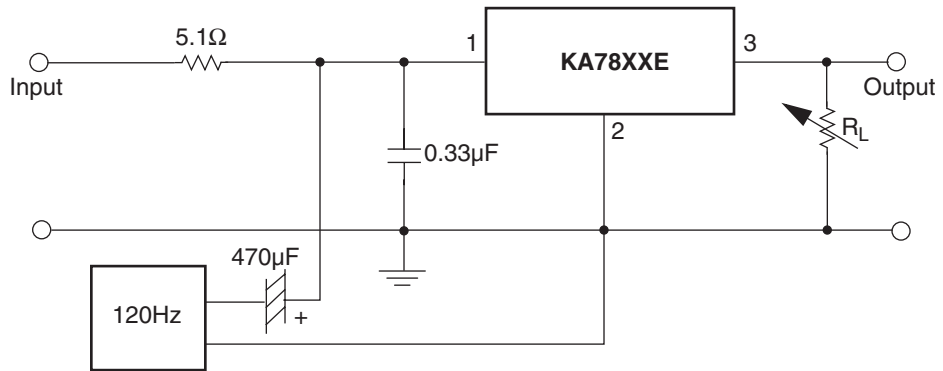
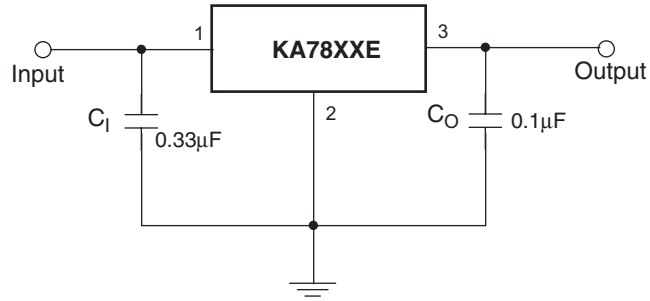
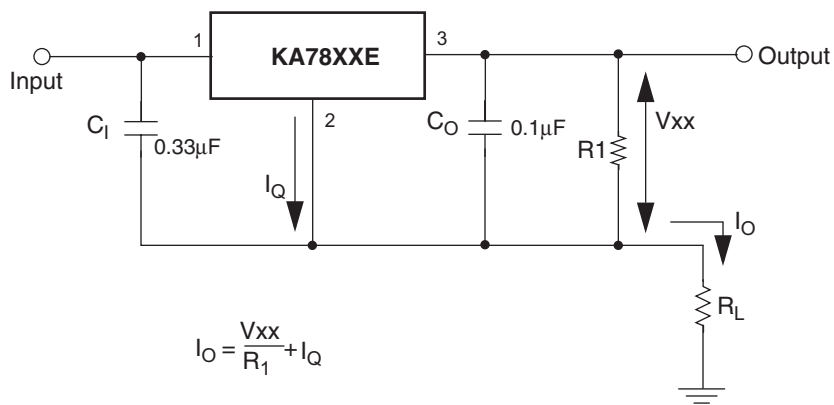


Figure 9. Ripple Rejection



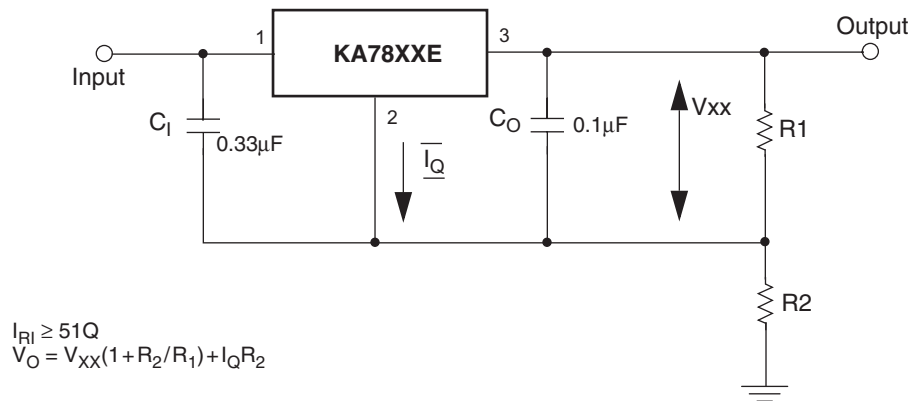
**Figure 10. Fixed Output Regulator**



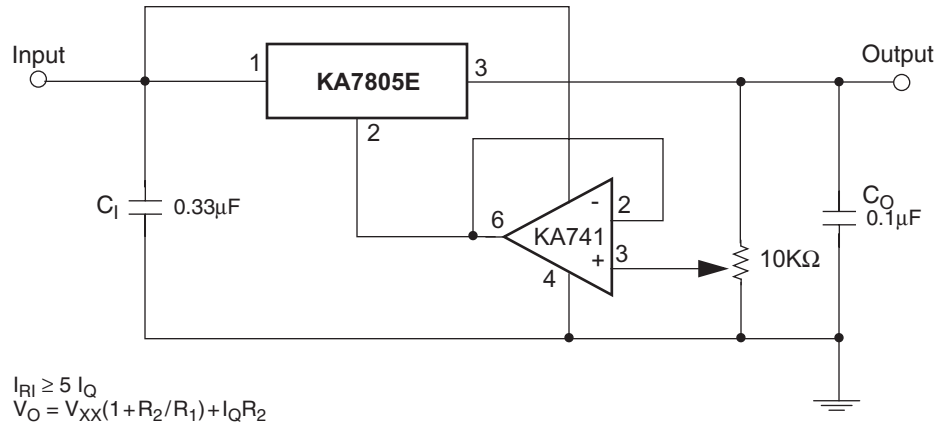
**Figure 11. Constant Current Regulator**

**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<sub>1</sub> is required if regulator is located an appreciable distance from power Supply filter.
3. C<sub>0</sub> improves stability and transient response.



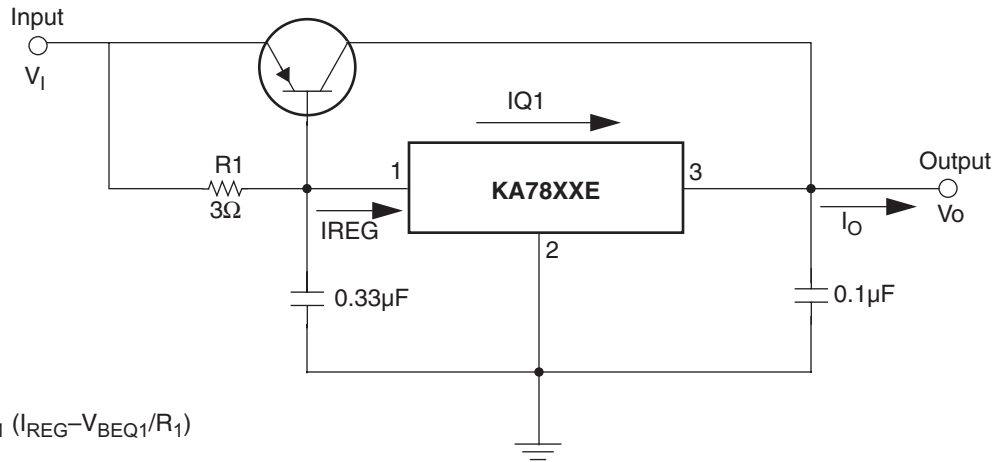
**Figure 12. Circuit for Increasing Output Voltage**



$$I_{R1} \geq 5 I_Q$$

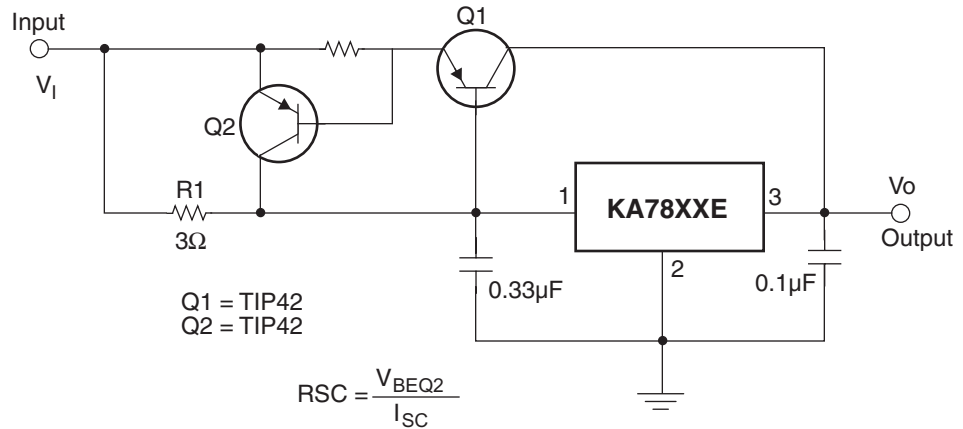
$$V_O = V_{XX}(1 + R_2/R_1) + I_Q R_2$$

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



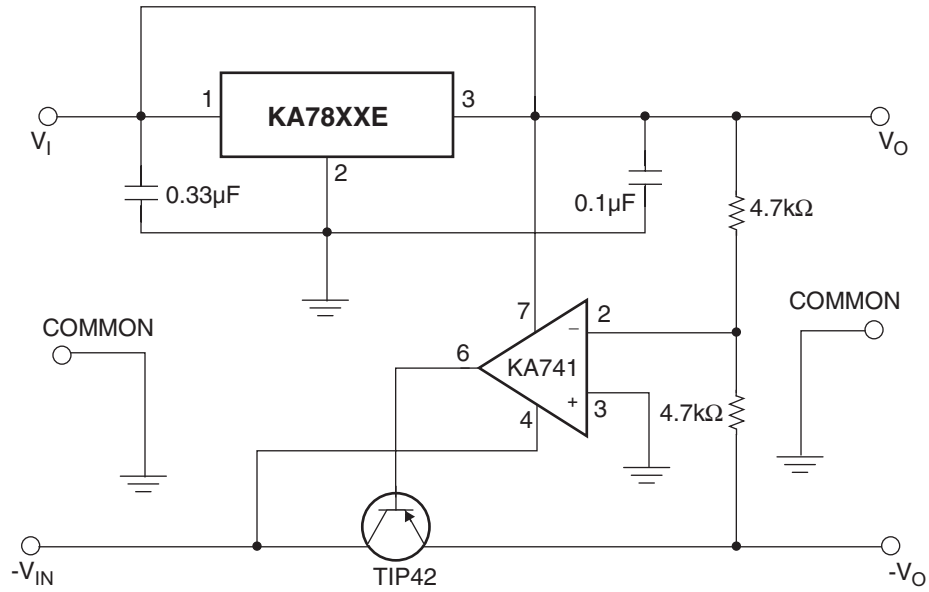
$$I_O = I_{REG} + B_{Q1} (I_{REG} - V_{BEQ1}/R_1)$$

**Figure 14. High Current Voltage Regulator**

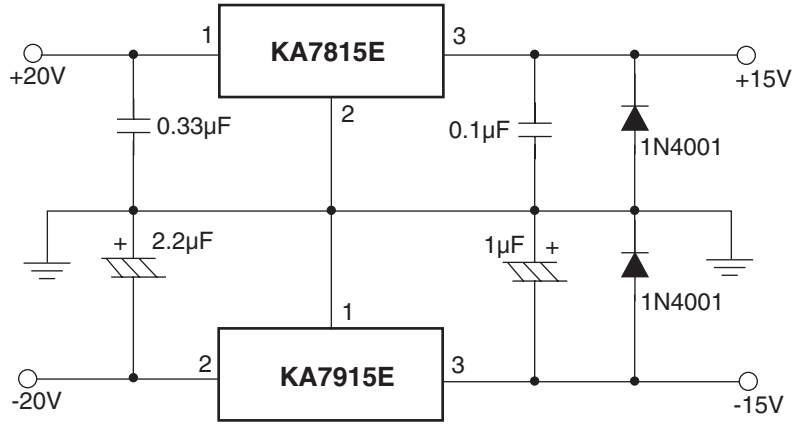


**Figure 15. High Output Current with Short Circuit Protection**

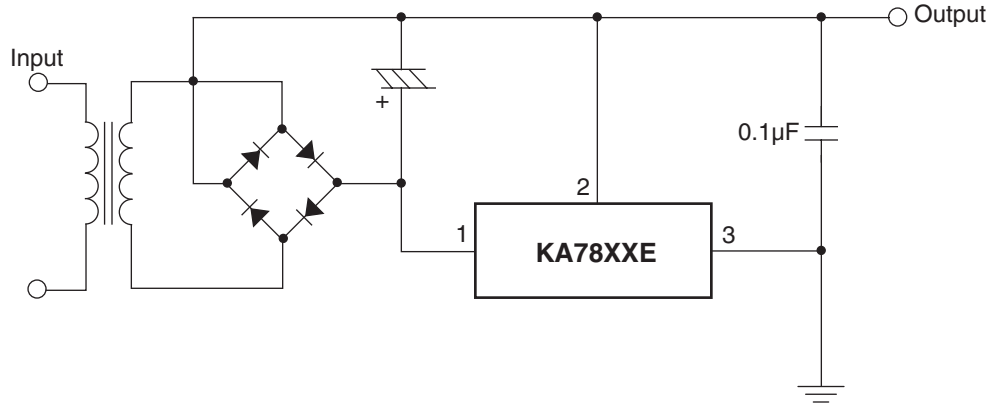




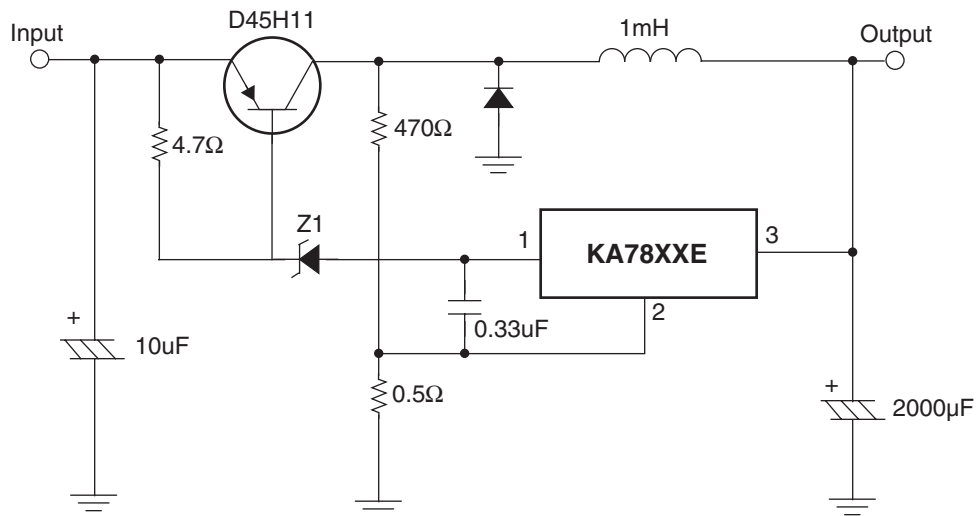
**Figure 16. Tracking Voltage Regulator**



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



**Figure 18. Negative Output Voltage Circuit**

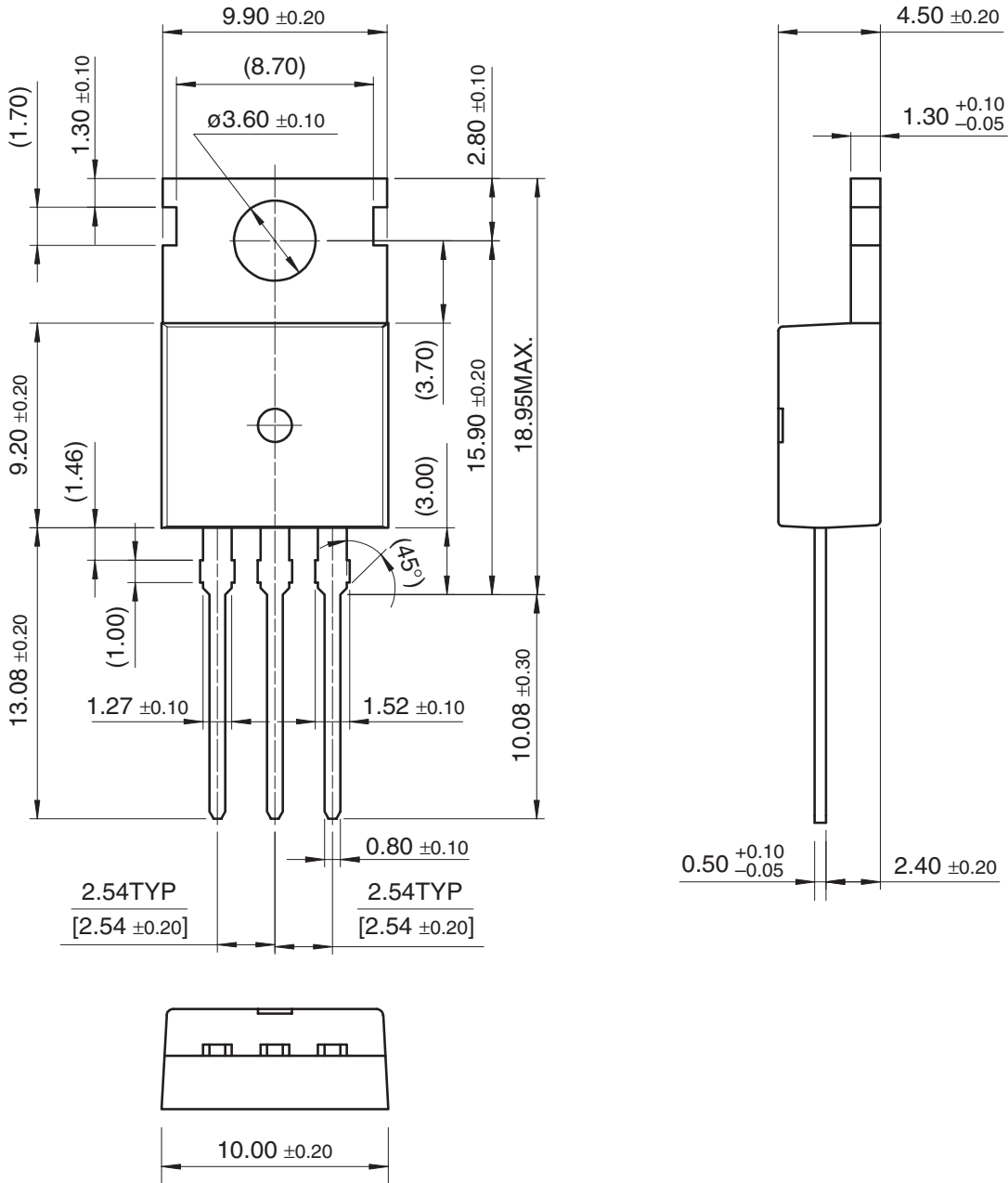


**Figure 19. Switching Regulator**

## Mechanical Dimensions

Dimensions in millimeters

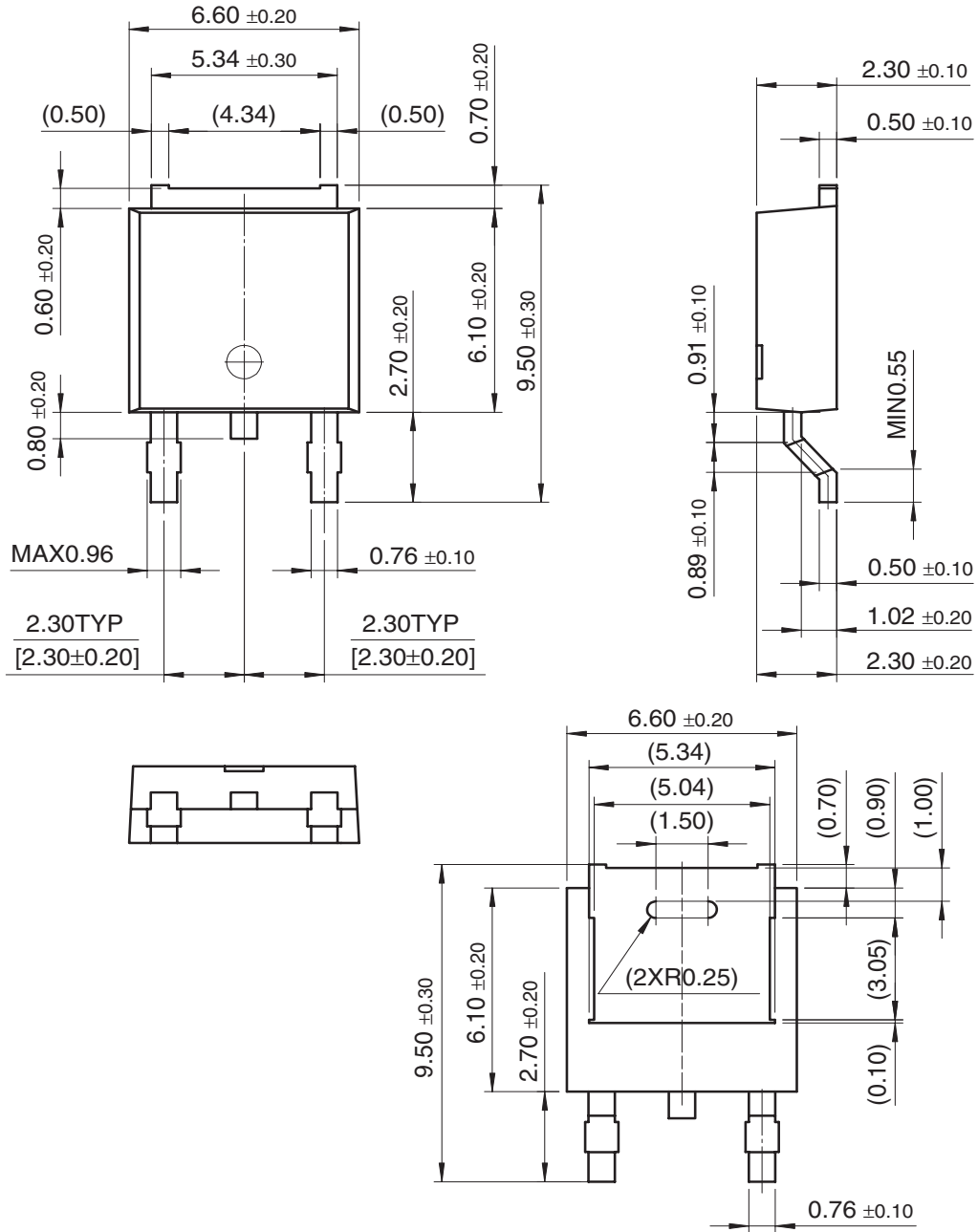
### TO-220



**Mechanical Dimensions** (Continued)

Dimensions in millimeters

**D-PAK**



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