

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

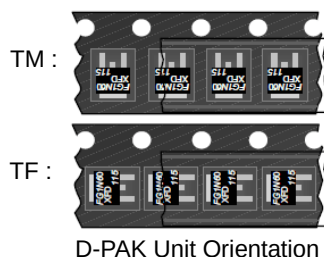
General Description

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
KA7805ETU	±4%	TO-220 (Dual Gauge)	0°C to +125°C
KA7806ETU			
KA7808ETU			
KA7809ETU			
KA7810ETU			
KA7812ETU			
KA7815ETU			
KA7818ETU			
KA7824ETU			
KA7805AETU	±2%		
KA7809AETU			
KA7810AETU			
KA7812AETU			
KA7815AETU			
KA7824AETU			
KA7805ERTF	±4%	D-PAK	
KA7805ERTM			
KA7808ERTM			
KA7809ERTM			
KA7812ERTM			

* Refer to below figure for TM / TF Suffix for DPAK



Block Diagram

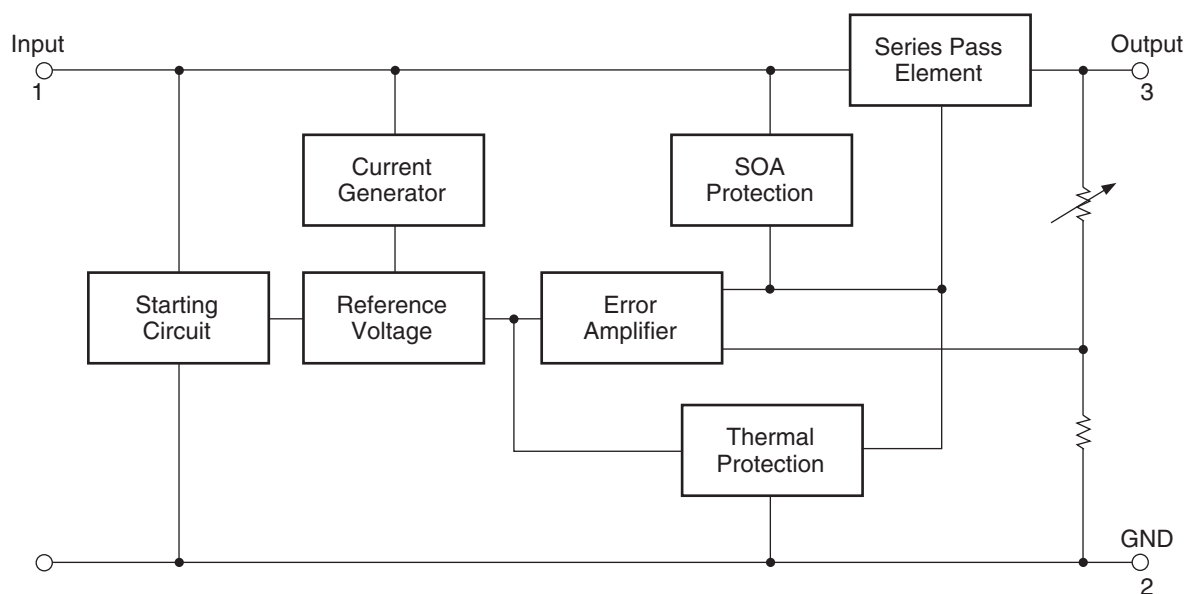


Figure 1.

Pin Assignment

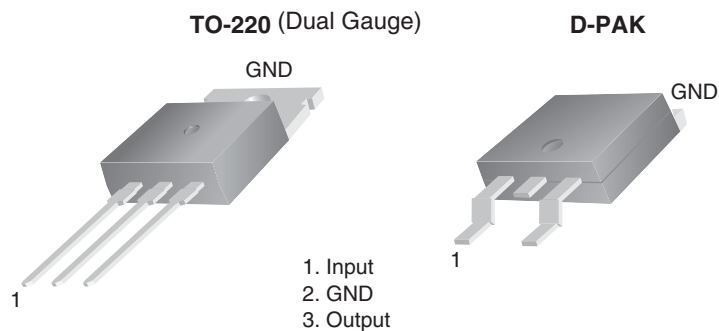


Figure 2.

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 ⁽¹⁾	$T_J = +25^{\circ}\text{C}$				mV
		$V_O = 7\text{V to } 25\text{V}$	–	4.0	100	
		$V_I = 8\text{V to } 12\text{V}$	–	1.6	50	
Regload	Load Regulation ⁽¹⁾	$T_J = +25^{\circ}\text{C}$				mV
		$I_O = 5.0\text{mA to } 1.5\text{A}$	–	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	8.0	mA
ΔI_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 ⁽²⁾	$I_O = 5\text{mA}$	–	-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 ⁽²⁾	$f = 120\text{Hz}$, $V_O = 8\text{V to } 18\text{V}$	62	73	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2	–	V
r_O	Output Resistance ⁽²⁾	$f = 1\text{kHz}$	–	15	–	m Ω
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	230	–	mA
I_{PK}	Peak Current ⁽²⁾	$T_J = +25^{\circ}\text{C}$	–	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) (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⁾	$T_J = +25^{\circ}\text{C}$ $V_I = 8\text{V to } 25\text{V}$	—	5	120	mV
		$V_I = 9\text{V to } 13\text{V}$	—	1.5	60	
Regload	Load Regulation ⁽³⁾	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	—	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
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	$T_J = +25^{\circ}\text{C}$	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 ⁽⁷⁾	$T_J = +25^{\circ}\text{C}$				mV
		$V_I = 11.5\text{V to } 25\text{V}$	–	6	180	
		$V_I = 12\text{V to } 17\text{V}$	–	2	90	
Regload	Load Regulation ⁽⁷⁾	$T_J = +25^{\circ}\text{C}$				mV
		$I_O = 5\text{mA to } 1.5\text{A}$	–	12	180	
		$I_O = 250\text{mA to } 750\text{mA}$	–	4	90	
I_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.0	8.0	mA
ΔI_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 ⁽⁸⁾	$I_O = 5\text{mA}$	–	-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 ⁽⁸⁾	$f = 120\text{Hz}$ $V_I = 13\text{V to } 23\text{V}$	56	71	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2	–	V
r_O	Output Resistance ⁽⁸⁾	$f = 1\text{kHz}$	–	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 ⁽⁸⁾	$T_J = +25^{\circ}\text{C}$	–	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 ⁽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_Q	Quiescent Current	$T_J = +25^{\circ}\text{C}$	–	5.2	8.0	mA
		$I_O = 5\text{mA to } 1.0\text{A}$	–	–	0.5	
ΔI_Q	Quiescent Current Change	$V_I = 17.5\text{V to } 30\text{V}$	–	–	1.0	mA
			–	–	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 (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 ⁽²¹⁾	$V_I = 11.7\text{V to } 25\text{V}$, $I_O = 500\text{mA}$	–	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 ⁽²¹⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.0\text{A}$	–	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
ΔI_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 ⁽²²⁾	$I_O = 5\text{mA}$	–	-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 ⁽²²⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 12\text{V to } 22\text{V}$	–	62	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽²²⁾	$f = 1\text{kHz}$	–	17	–	$\text{m}\Omega$
I_{SC}	Short Circuit Current	$V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$	–	250	–	mA
I_{PK}	Peak Current ⁽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 (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 ⁽²³⁾	$V_I = 12.8\text{V to } 26\text{V}$, $I_O = 500\text{mA}$	–	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 ⁽²³⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	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 ⁽²⁴⁾	$I_O = 5\text{mA}$	–	-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 ⁽²⁴⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	–	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 ⁽²⁴⁾	$f = 1\text{kHz}$	–	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 ⁽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 (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 ⁽²⁵⁾	$V_I = 14.8\text{V to } 30\text{V}$, $I_O = 500\text{mA}$	–	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 ⁽²⁵⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	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 ⁽²⁶⁾	$I_O = 5\text{mA}$	–	-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 ⁽²⁶⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	–	60	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽²⁶⁾	$f = 1\text{kHz}$	–	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 ⁽²⁶⁾	$T_J = +25^{\circ}\text{C}$	–	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 (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 ⁽²⁷⁾	$V_I = 17.9\text{V to } 30\text{V}$, $I_O = 500\text{mA}$	–	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 ⁽²⁷⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	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 ⁽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	–	$\mu\text{V}/V_O$
RR	Ripple Rejection ⁽²⁸⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 18.5\text{V to } 28.5\text{V}$	–	58	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽²⁸⁾	$f = 1\text{kHz}$	–	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 ⁽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 (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 ⁽²⁹⁾	$V_I = 27\text{V to } 38\text{V}$, $I_O = 500\text{mA}$	–	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 ⁽²⁹⁾	$T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$	–	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 ⁽³⁰⁾	$I_O = 5\text{mA}$	–	-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 ⁽³⁰⁾	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 28\text{V to } 38\text{V}$	–	54	–	dB
V_{Drop}	Dropout Voltage	$I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$	–	2.0	–	V
r_O	Output Resistance ⁽³⁰⁾	$f = 1\text{kHz}$	–	20	–	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.

Typical Performance Characteristics

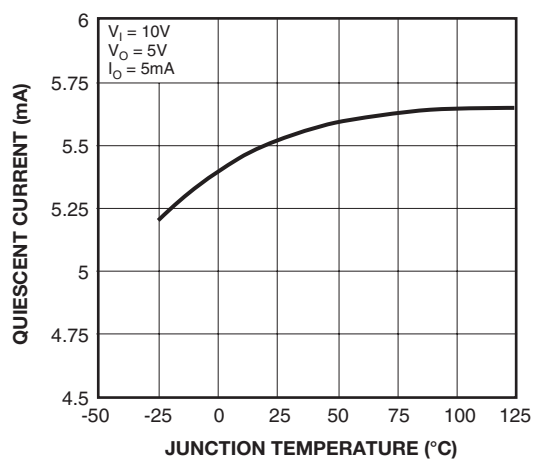


Figure 3. Quiescent Current

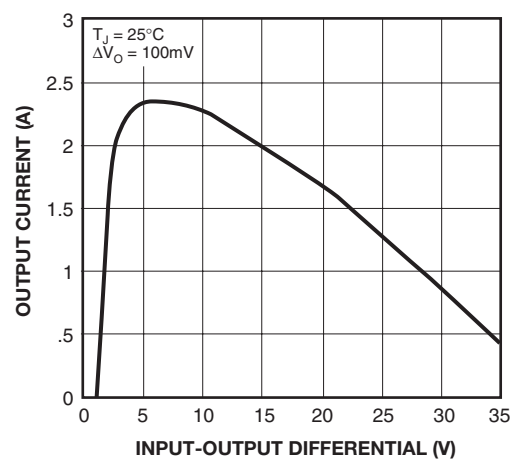


Figure 4. Peak Output Current

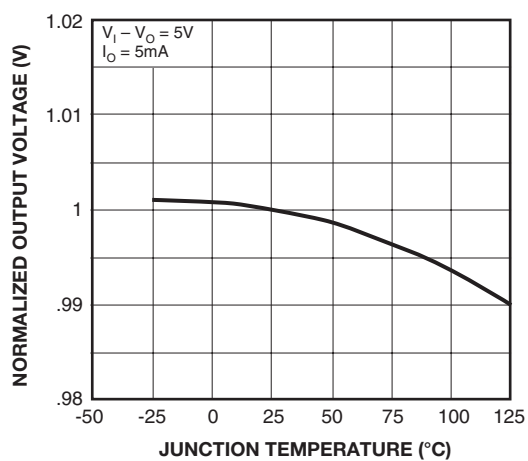


Figure 5. Output Voltage

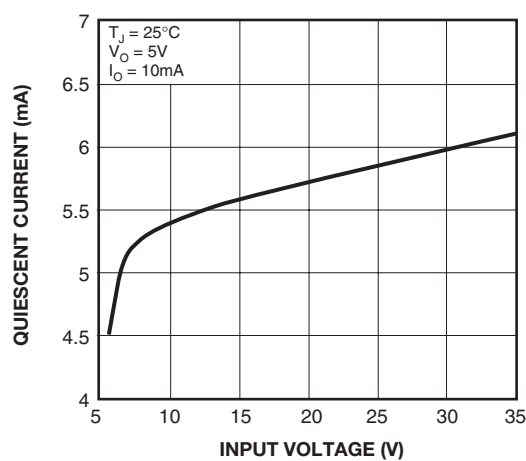


Figure 6. Quiescent Current

Typical Applications

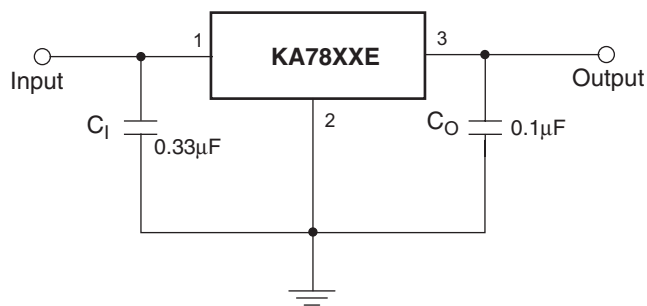


Figure 7. DC Parameters

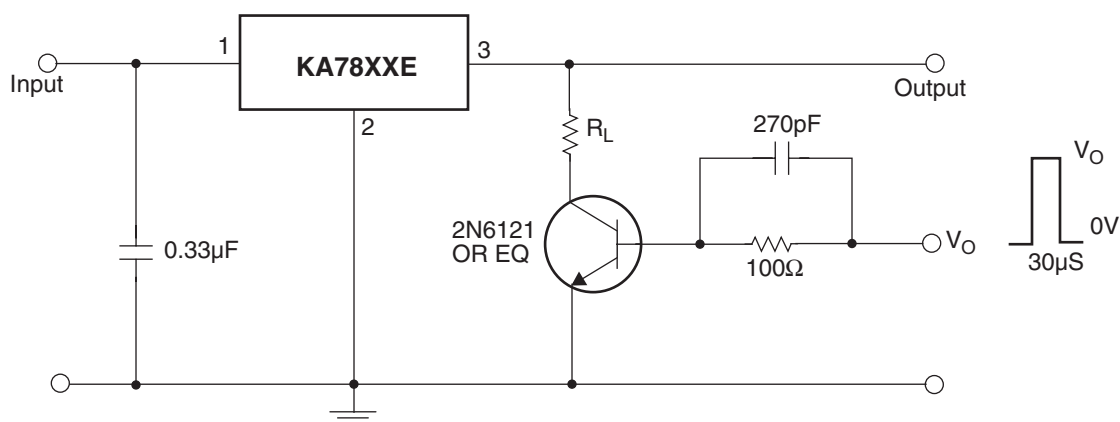


Figure 8. Load Regulation

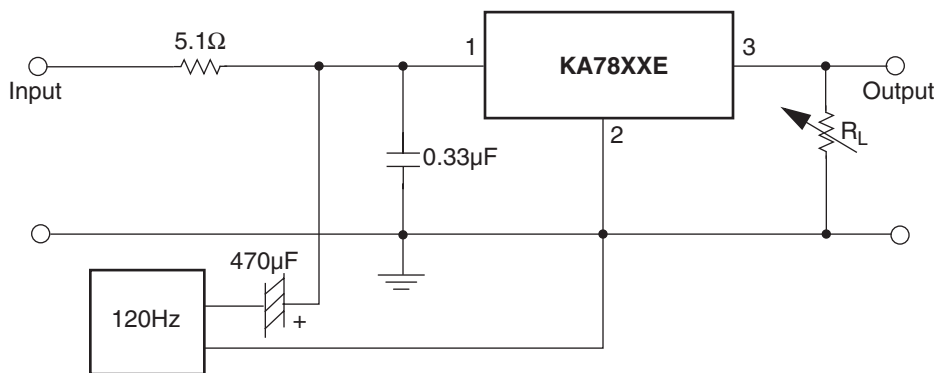


Figure 9. Ripple Rejection

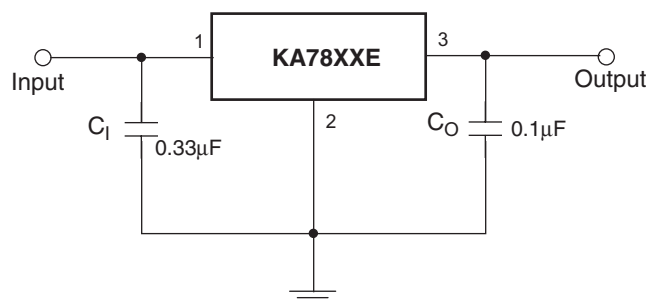


Figure 10. Fixed Output Regulator

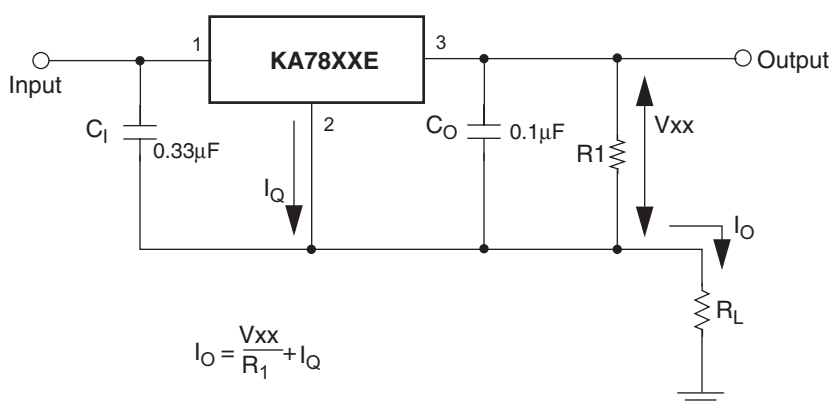


Figure 11. Constant Current Regulator

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.

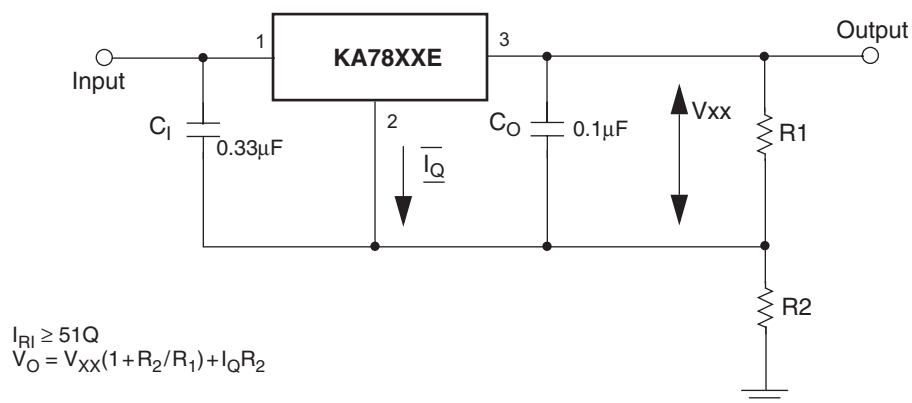


Figure 12. Circuit for Increasing Output Voltage

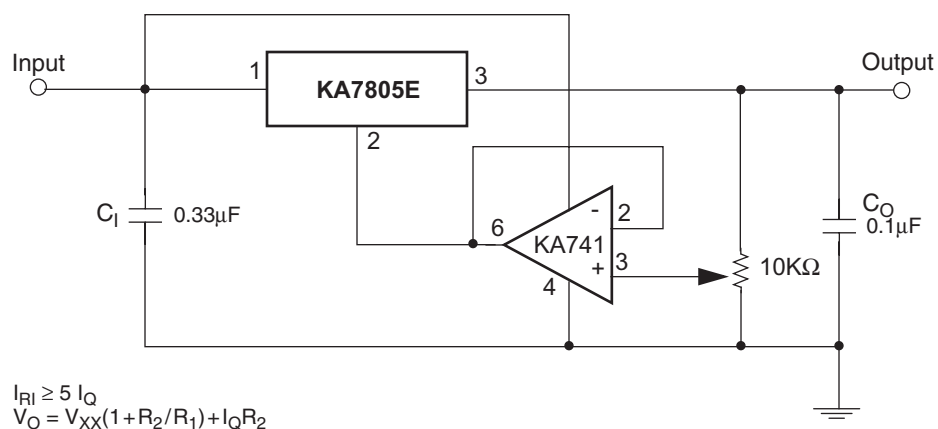


Figure 13. Adjustable Output Regulator (7 to 30V)

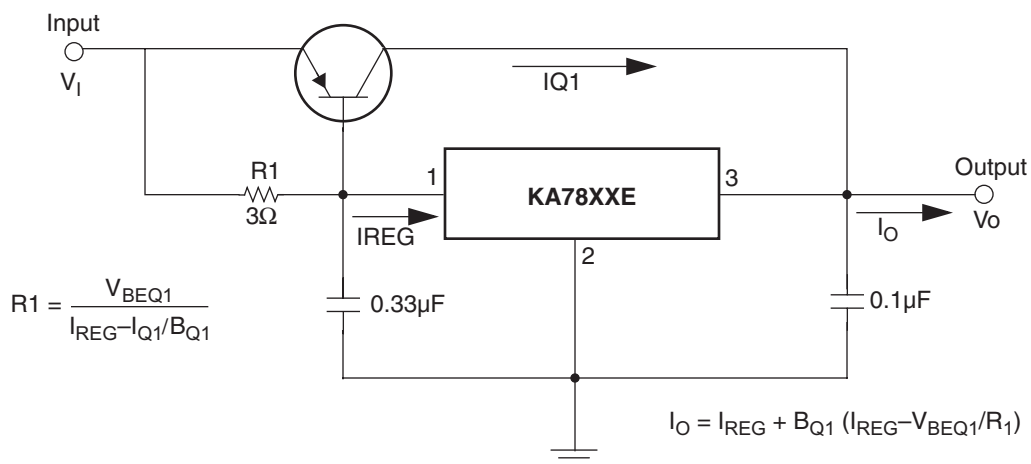


Figure 14. High Current Voltage Regulator

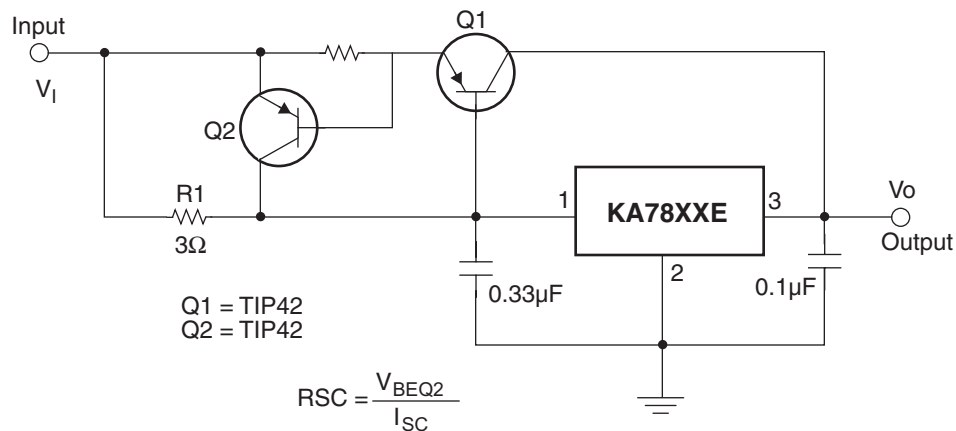


Figure 15. High Output Current with Short Circuit Protection

The circuit diagram shows a differential amplifier with two input stages. The top stage uses a KA7815E regulator (labeled 1) and the bottom stage uses a KA7915E regulator (labeled 2). The input signals are +20V and -20V. The output signals are +15V and -15V. The circuit includes several capacitors: 0.33μF, 0.1μF, 2.2μF, and 1μF. Two 1N4001 diodes are connected in series between the +15V and -15V outputs. The KA7815E regulator is connected to the +20V input and the +15V output. The KA7915E regulator is connected to the -20V input and the -15V output. The 0.33μF capacitor is connected between the +20V input and the KA7815E regulator. The 0.1μF capacitor is connected between the +15V output and the KA7815E regulator. The 2.2μF capacitor is connected between the +15V output and the KA7915E regulator. The 1μF capacitor is connected between the -15V output and the KA7915E regulator. The two 1N4001 diodes are connected in series between the +15V and -15V outputs.

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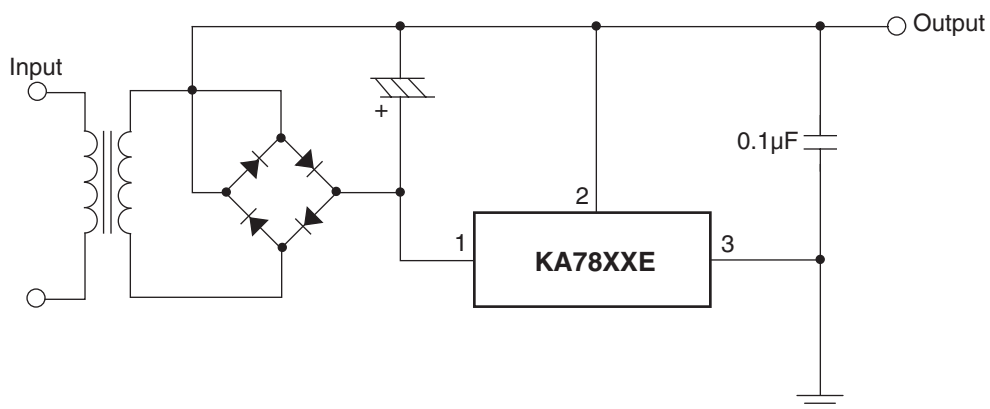


Figure 18. Negative Output Voltage Circuit

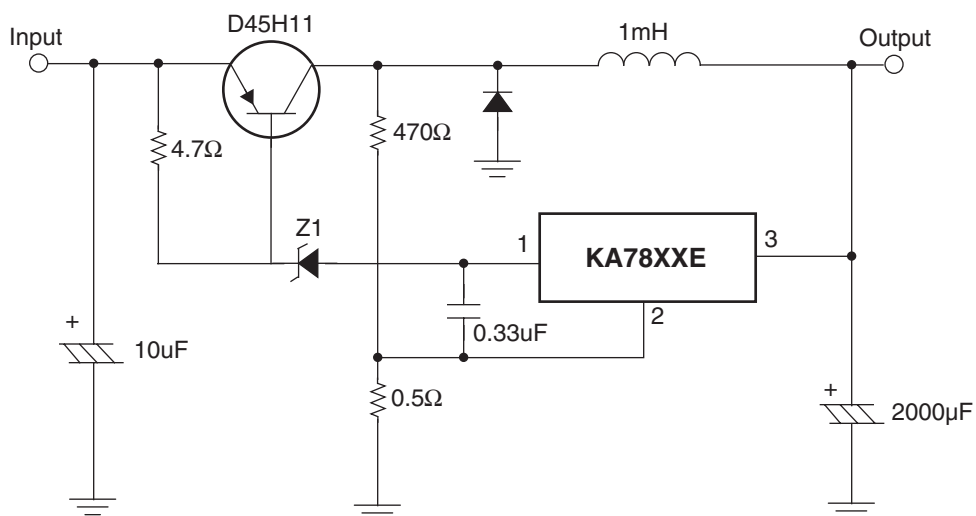
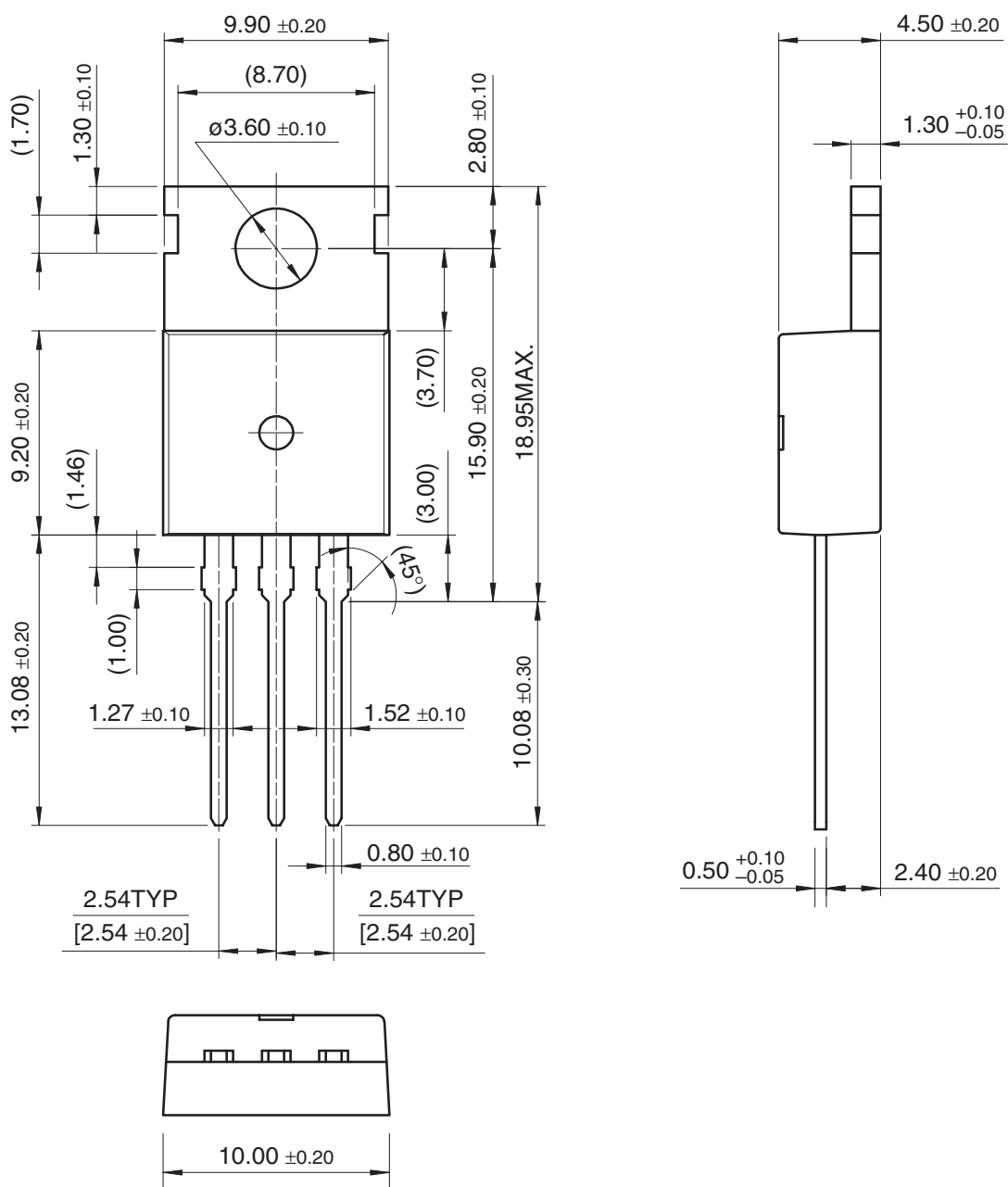


Figure 19. Switching Regulator

Mechanical Dimensions

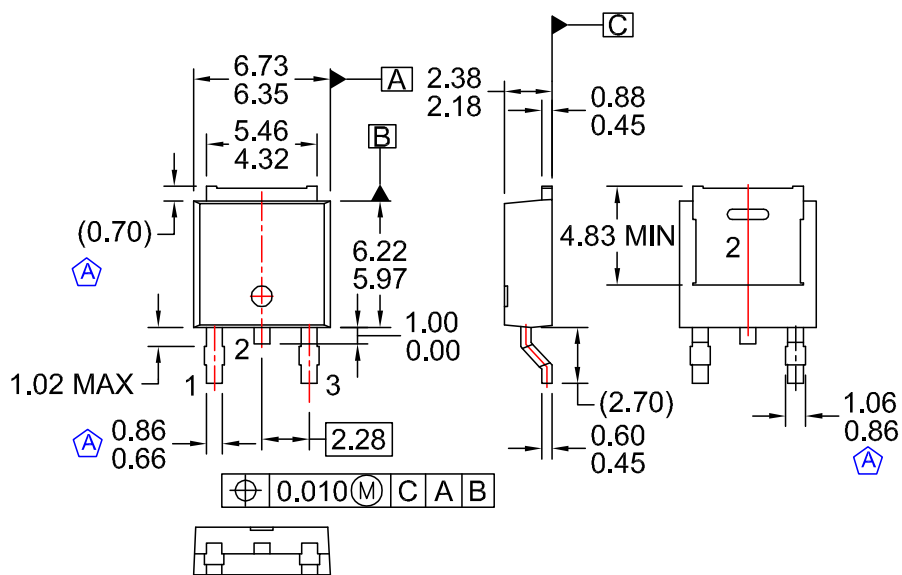
Dimensions in millimeters

TO-220 [DUAL GAUGE]



Mechanical Dimensions (Continued)

Dimensions in millimeters

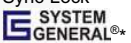
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 - B) ALL DIMENSIONS ARE IN MILLIMETERS.
 - C) DRAWING CONFORMS TO ASME Y14.5M-1994
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