

# KA79MXX

## 3-Terminal 0.5A Negative Voltage Regulator

### Features

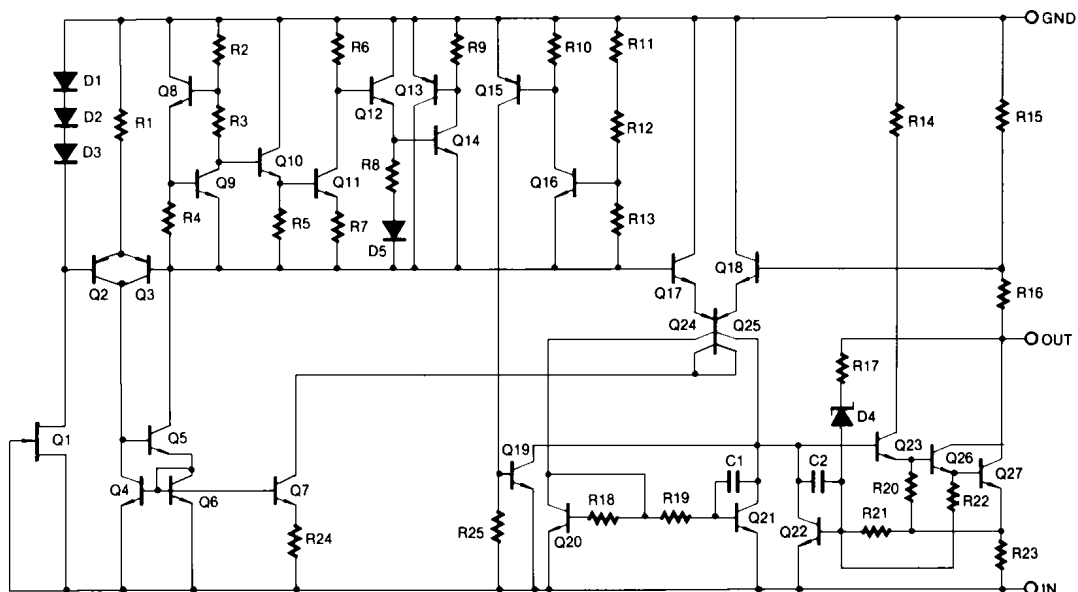
- No external components required
- Output current in excess of 0.5A
- Internal thermal overload
- Internal short circuit current limiting
- Output transistor safe area compensation
- Output voltages of -5V,-6V,-8V, -12V,-15V,-18V,-24V

### Description

The KA79MXX series of 3-Terminal medium current negative voltage regulators are monolithic integrated circuits designed as fixed voltage regulators. These regulators employ internal current limiting, thermal shutdown and safe area compensation making them essentially indestructible.



### Schematic Diagram



## Absolute Maximum Ratings

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

## Electrical Characteristics (KA79M05/KA79M05R)

(Refer to test circuit,  $0^{\circ}C \leq T_J \leq +125^{\circ}C$ ,  $I_O = 350mA$ ,  $V_I = -10V$ , unless otherwise specified,  $C_I = 0.33\mu F$ ,  $C_O = 0.1\mu F$ )

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}C$	-4.8	-5	-5.2	V	
		$I_O = 5mA$ to $350mA$ $V_I = -7V$ to $-25V$	-4.75	-5	-5.25		
Line Regulation (Note1)	$\Delta V_O$	$T_J = +25^{\circ}C$	$V_I = -7V$ to $-25V$	-	7.0	50	mV
			$V_I = -8V$ to $-25V$	-	2.0	30	
Load Regulation (Note1)	$\Delta V_O$	$I_O = 5mA$ to $500mA$ $T_J = +25^{\circ}C$	-	30	100	mV	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}C$	-	3.0	6.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5mA$ to $350mA$	-	-	0.4	mA	
		$I_O = 200mA$ $V_I = -8V$ to $-25V$	-	-	0.4		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$	-	-0.2	-	mV/ $^{\circ}C$	
Output Noise Voltage	$V_N$	$f = 10Hz, 100KHz$ $T_A = +25^{\circ}C$	-	40	-	$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ $V_J = -8V$ to $-18V$	54	60	-	dB	
Dropout Voltage	$V_D$	$T_J = +25^{\circ}C$ , $I_O = 500mA$	-	1.1	-	V	
Short Circuit Current	$I_{SC}$	$T_J = +25^{\circ}C$ , $V_I = -35V$	-	140	-	mA	
Peak Current	$I_{PK}$	$T_J = +25^{\circ}C$	-	650	-	mA	

### Note:

1. 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.

## Electrical Characteristics (KA79M06)

(Refer to test circuit,  $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$ ,  $I_O = 350\text{mA}$ ,  $V_I = -11\text{V}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	- 5.75	- 6.0	- 6.25	V	
		$I_O = 5\text{mA to } 350\text{mA}$ $V_I = -8.0\text{V to } -25\text{V}$	- 5.7	- 6.0	- 6.3		
Line Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$V_I = -8\text{V to } -25\text{V}$	-	7.0	60	mV
			$V_I = -9\text{V to } -19\text{V}$	-	2.0	40	
Load Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	-	30	120	mV	
Quiescent Current	$I_Q$	$T_J = +25\text{ }^{\circ}\text{C}$	-	3	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 350\text{mA}$	-	-	0.4	mA	
		$V_I = -8\text{V to } -25\text{V}$	-	-	0.4		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	0.4	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{KHz}$ , $T_A = +25\text{ }^{\circ}\text{C}$	-	50	-	$\mu\text{V}$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_I = -9\text{V to } -19\text{V}$	54	60	-	dB	
Dropout Voltage	$V_D$	$I_O = 500\text{mA}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	1.1	-	V	
Short Circuit Current	ISC	$V_I = -35\text{V}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	140	-	mA	
Peak Current	IPK	$T_J = +25\text{ }^{\circ}\text{C}$	-	650	-	mA	

### Note:

1. 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.

## Electrical Characteristics (KA79M08/KA79M08R)

(Refer to test circuit,  $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$ ,  $I_O = 350\text{mA}$ ,  $V_I = -14\text{V}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	- 7.7	- 8.0	- 8.3	V	
		$I_O = 5\text{mA}$ to $350\text{mA}$ $V_I = -10.5\text{V}$ to $-25\text{V}$	- 7.6	- 8.0	- 8.4		
Line Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$V_I = -10.5\text{V}$ to $-25\text{V}$	-	7.0	80	mV
			$V_I = -11\text{V}$ to $-21\text{V}$	-	2.0	50	
Load Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	-	30	160	mV	
Quiescent Current	$I_Q$	$T_J = +25\text{ }^{\circ}\text{C}$	-	3	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA}$ to $350\text{mA}$	-	-	0.4	mA	
		$V_I = -8\text{V}$ to $-25\text{V}$	-	-	0.4		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-0.6	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to $100\text{kHz}$ , $T_A = +25\text{ }^{\circ}\text{C}$	-	60	-	$\mu\text{V}$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_I = -9\text{V}$ to $-19\text{V}$	54	59	-	dB	
Dropout Voltage	$V_D$	$I_O = 500\text{mA}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	1.1	-	V	
Short Circuit Current	ISC	$V_I = -35\text{V}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	140	-	mA	
Peak Current	IPK	$T_J = +25\text{ }^{\circ}\text{C}$	-	650	-	mA	

### Note:

1. 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.

## Electrical Characteristics (KA79M12)

(Refer to test circuit,  $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$ ,  $I_O = 350\text{mA}$ ,  $V_I = -19\text{V}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	-11.5	-12	-12.5	V	
		$I_O = 5\text{mA}$ to $350\text{mA}$ $V_I = -14.5\text{V}$ to $-30\text{V}$	-11.4	-12	-12.6		
Line Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$V_I = -14.5\text{V}$ to $-30\text{V}$	-	8.0	80	mV
			$V_I = -15\text{V}$ to $-25\text{V}$	-	3.0	50	
Load Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$I_O = 5.0\text{mA}$ to $500\text{mA}$	-	30	240	mV
Quiescent Current	$I_Q$	$T_J = +25\text{ }^{\circ}\text{C}$	-	3	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA}$ to $350\text{mA}$	-	-	0.4	mA	
		$V_I = -14.5\text{V}$ to $-30\text{V}$	-	-	0.4		
Output Voltage Drift	$\Delta V_O/\Delta T$	$I_O = 5\text{mA}$	-	-0.8	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to $100\text{kHz}$ , $T_A = +25\text{ }^{\circ}\text{C}$	-	75	-	$\mu\text{V}$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_I = -15\text{V}$ to $-25\text{V}$	54	60	-	dB	
Dropout Voltage	$V_D$	$I_O = 500\text{mA}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	1.1	-	V	
Short Circuit Current	ISC	$V_I = -35\text{V}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	140	-	mA	
Peak Current	IPK	$T_J = +25\text{ }^{\circ}\text{C}$	-	650	-	mA	

### Note:

1. 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.

## Electrical Characteristics (KA79M15)

(Refer to test circuit,  $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$ ,  $I_O = 350\text{mA}$ ,  $V_I = -23\text{V}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	- 14.4	- 15	- 15.6	V	
		$I_O = 5\text{mA to } 350\text{mA}$ $V_I = -17.5\text{V to } -30\text{V}$	-14.25	- 15	-15.75		
Line Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$V_I = -17.5\text{V to } -30\text{V}$	-	9.0	80	mV
			$V_I = -18\text{V to } -28\text{V}$	-	5.0	50	
Load Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$I_O = 5.0\text{mA to } 500\text{mA}$	-	30	240	mV
Quiescent Current	$I_Q$	$T_J = +25\text{ }^{\circ}\text{C}$	-	3	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 350\text{mA}$		-	-	0.4	mA
		$V_I = -17.5\text{V to } -28\text{V}$		-	-	0.4	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$		-	-1.0	-	mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}, T_A = +25\text{ }^{\circ}\text{C}$		-	90	-	$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}, V_I = -18.5\text{V to } -28.5\text{V}$		54	59	-	dB
Dropout Voltage	$V_D$	$I_O = 500\text{mA}, T_J = +25\text{ }^{\circ}\text{C}$		-	1.1	-	V
Short Circuit Current	ISC	$V_I = -35\text{V}, T_J = +25\text{ }^{\circ}\text{C}$		-	140	-	mA
Peak Current	IPK	$T_J = +25\text{ }^{\circ}\text{C}$		-	650	-	mA

### Note:

1. 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.

## Electrical Characteristics (KA79M18)

(Refer to test circuit,  $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$ ,  $I_O = 350\text{mA}$ ,  $V_I = -27\text{V}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	- 17.3	- 18	- 18.7	V	
		$I_O = 5\text{mA to } 350\text{mA}$ $V_I = -21\text{V to } -33\text{V}$	- 17.1	- 18	- 18.9		
Line Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$V_I = -21\text{V to } -33\text{V}$	-	9.0	80	mV
			$V_I = -24\text{V to } -30\text{V}$	-	5.0	80	
Load Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$I_O = 5.0\text{mA to } 500\text{mA}$	-	30	360	mV
Quiescent Current	$I_Q$	$T_J = +25\text{ }^{\circ}\text{C}$	-	3	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 350\text{mA}$		-	-	0.4	mA
		$V_I = -21\text{V to } -33\text{V}$		-	-	0.4	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$		-	-1.0	-	mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}, T_A = +25\text{ }^{\circ}\text{C}$		-	110	-	$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}, V_I = -22\text{V to } -32\text{V}$		54	59	-	dB
Dropout Voltage	$V_D$	$I_O = 500\text{mA}, T_J = +25\text{ }^{\circ}\text{C}$		-	1.1	-	V
Short Circuit Current	$I_{SC}$	$V_I = -35\text{V}, T_J = +25\text{ }^{\circ}\text{C}$		-	140	-	mA
Peak Current	$I_{PK}$	$T_J = +25\text{ }^{\circ}\text{C}$		-	650	-	mA

### Note;

1. 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.

## Electrical Characteristics (KA79M24)

(Refer to test circuit,  $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$ ,  $I_O = 350\text{mA}$ ,  $V_I = -33\text{V}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	- 23	- 24	- 25	V	
		$I_O = 5\text{mA}$ to $350\text{mA}$ $V_I = -27\text{V}$ to $-38\text{V}$	- 22.8	- 24	- 25.2		
Line Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	$V_I = -27\text{V}$ to $-38\text{V}$	-	9.0	80	mV
			$V_I = -30\text{V}$ to $-36\text{V}$	-	5.0	70	
Load Regulation (Note1)	$\Delta V_O$	$T_J = +25\text{ }^{\circ}\text{C}$	-	30	300	mV	
Quiescent Current	$I_Q$	$T_J = +25\text{ }^{\circ}\text{C}$	-	3	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA}$ to $350\text{mA}$	-	-	0.4	mA	
		$V_I = -27\text{V}$ to $-38\text{V}$	-	-	0.4		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-1.0	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to $100\text{kHz}$ , $T_A = +25\text{ }^{\circ}\text{C}$	-	180	-	$\mu\text{V}$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_I = -28\text{V}$ to $-38\text{V}$	54	58	-	dB	
Dropout Voltage	$V_D$	$I_O = 500\text{mA}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	1.1	-	V	
Short Circuit Current	ISC	$V_I = -35\text{V}$ , $T_J = +25\text{ }^{\circ}\text{C}$	-	140	-	mA	
Peak Current	IPK	$T_J = +25\text{ }^{\circ}\text{C}$	-	650	-	mA	

### Note:

1. 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.



## Typical Applications

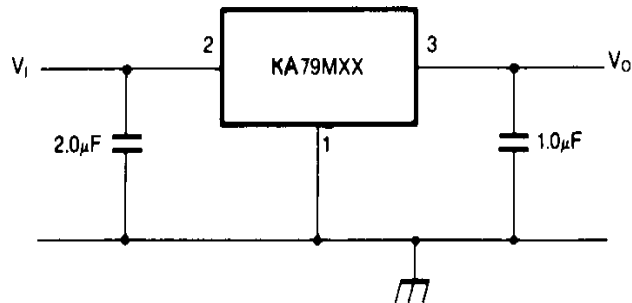


Figure 1. Fixed Output Regulator

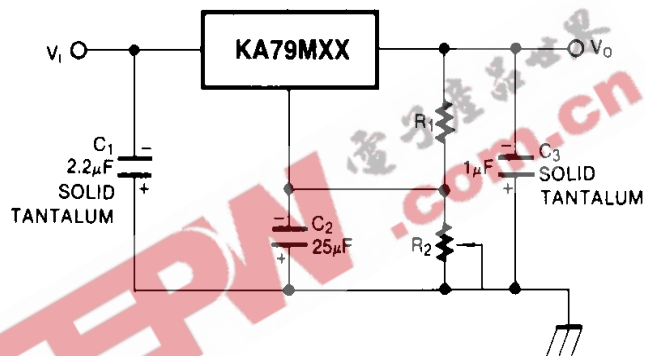


Figure 2. Variable Output

### Notes:

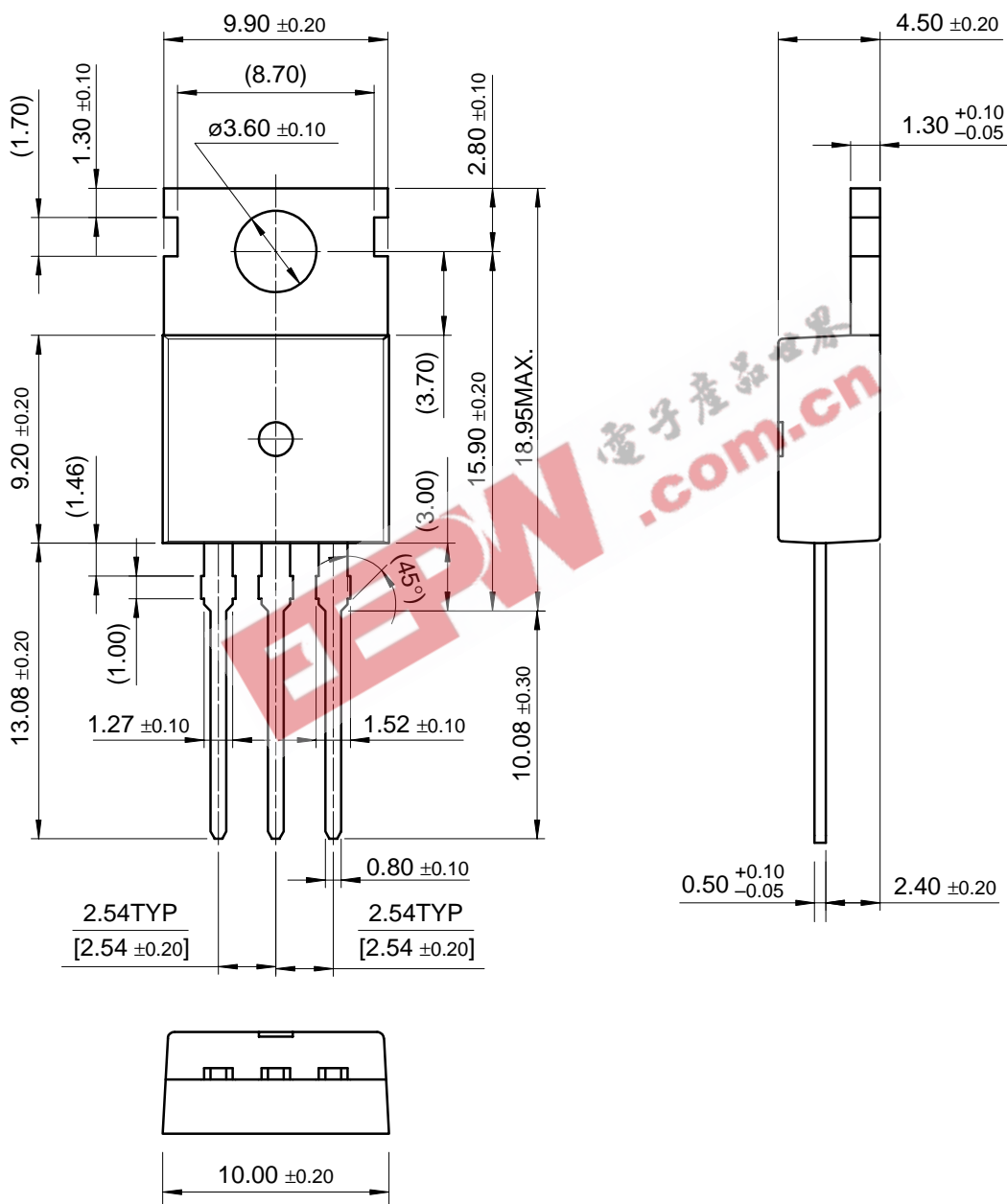
1. Required for stability. For value given, capacitor must be solid tantalum. 25µF aluminum electrolytic may be substituted.
2. C2 improves transient response and ripple rejection. Do not increase beyond 50µF.

# Mechanical Dimensions

## Package

Dimensions in millimeters

### TO-220

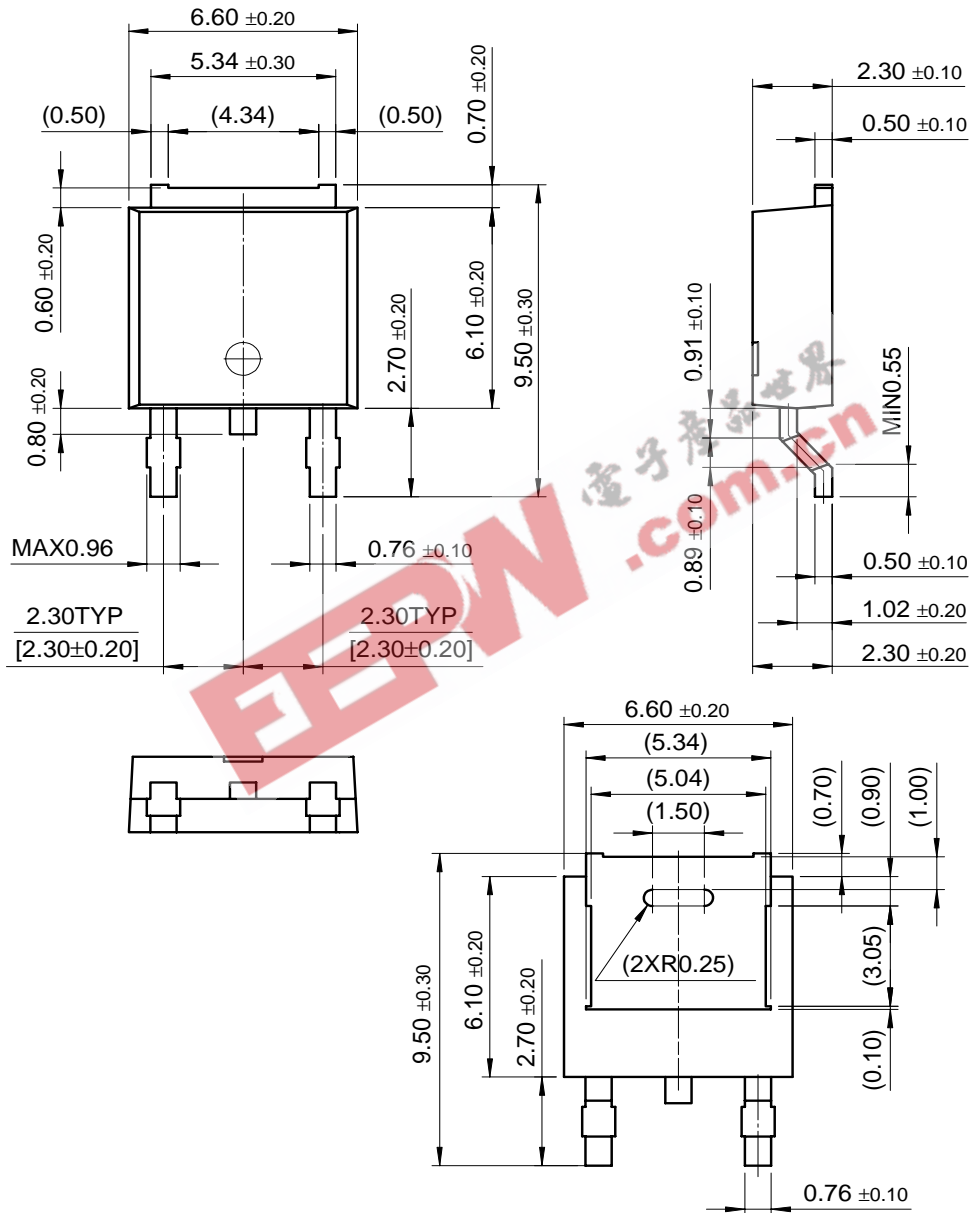


## Mechanical Dimensions (Continued)

### Package

Dimensions in millimeters

### D-PAK



## Ordering Information

Product Number	Package	Operating Temperature
KA79M05	TO-220	0 ~ + 125°C
KA79M06		
KA79M08		
KA79M12		
KA79M15		
KA79M18		
KA79M24		
KA79M05R		
KA79M08R		
KA79M12R		

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