

3-Terminal 1 A Positive Voltage Regulator

Description

The LM78MxxA series of three-terminal positive regulators are available in the TO252-2 package with several fixed output voltages making it useful in a wide range of applications.



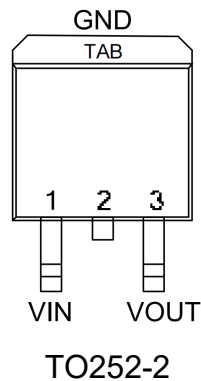
Features

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

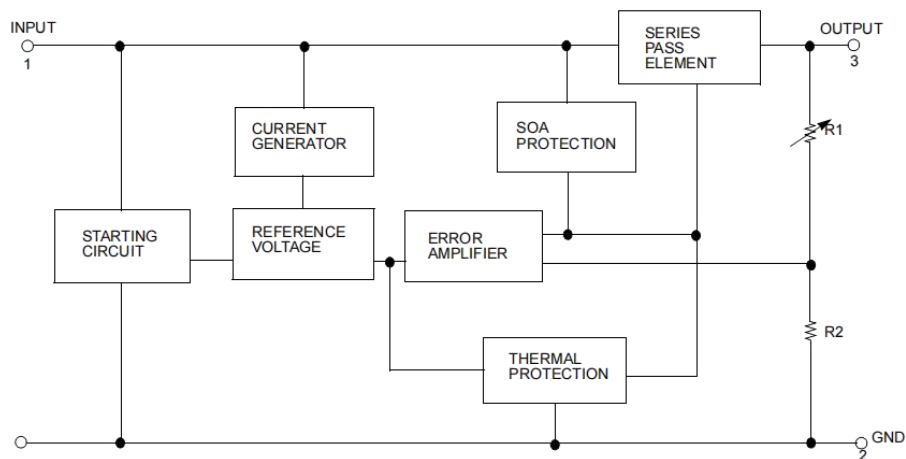
Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM78M05ADT/TR	TO252-2	78M05A	REEL	2500pcs/reel
LM78M06ADT/TR	TO252-2	78M06A	REEL	2500pcs/reel
LM78M08ADT/TR	TO252-2	78M08A	REEL	2500pcs/reel
LM78M12ADT/TR	TO252-2	78M12A	REEL	2500pcs/reel
LM78M15ADT/TR	TO252-2	78M15A	REEL	2500pcs/reel
LM78M18ADT/TR	TO252-2	78M18A	REEL	2500pcs/reel
LM78M24ADT/TR	TO252-2	78M24A	REEL	2500pcs/reel

PIN CONFIGURATION



Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for $V_O = 5V$ to $18V$)	V_I	35	V
(for $V_O = 24V$)	V_I	40	V
Thermal Resistance Junction-Case TO-252-2 ($T_c = +25\text{ }^\circ\text{C}$)	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
Thermal Resistance Junction-Air TO-252-2 ($T_a = +25\text{ }^\circ\text{C}$)	$R_{\theta JA}$	92	$^\circ\text{C/W}$
Operating Junction Temperature Range	T_{OPR}	$0 \sim +125$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-65 \sim +150$	$^\circ\text{C}$

Electrical Characteristics (LM78M05A)

(Refer to the test circuits, $-40 < T_J < +85^{\circ}\text{C}$, $I_O=1\text{A}$, $V_I=10\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V _O	T _J = +25°C	4.8	5	5.2	V
		I _O =5mA to 1A V _I =7V to 20V	4.75	5	5.25	
Line Regulation (Note3)	ΔV _O	I _O = 200mA V _I = 7V to 25V	-	-	100	mV
		T _J =+25°C V _I = 8V to 25V	-	-	50	
Load Regulation (Note3)	ΔV _O	I _O = 5mA to 0.5A, T _J =+25°C	-	-	100	mV
		I _O = 5mA to 200mA, T _J =+25°C	-	-	50	
Quiescent Current	I _Q	T _J =+25°C	-	4.0	6.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA to 350mA	-	-	0.5	mA
		I _O = 200mA V _I = 8V to 25V	-	-	0.8	
Output Voltage Drift	ΔV/ΔT	I _O = 5mA T _J = -40 to +85°C	-	-0.5	-	mV/°C
Output Noise Voltage	V _N	f = 10Hz to 100kHz	-	40	-	μV/V _O
Ripple Rejection	RR	f = 120Hz, I _O = 300mA V _I = 8V to 18V, T _J =+25°C	-	80	-	dB
Dropout Voltage	V _D	T _J =+25°C, I _O = 500mA	-	2	-	V
Short Circuit Current	I _{SC}	T _J =+25°C, V _I = 35V	-	300	-	mA
Peak Current	I _{PK}	T _J =+25°C	-	700	-	mA

Note:

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 (LM78M06A) (Continued)

 (Refer to the test circuits, $-40 < T_J < +85\text{ }^\circ\text{C}$, $I_O=1\text{A}$, $V_I=11\text{V}$, unless otherwise specified, $C_I=0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V _O	T _J = +25°C	5.75	6	6.25	V
		I _O = 5mA to 1A V _I = 8V to 21V	5.7	6	6.3	
Line Regulation (Note1)	ΔV _O	I _O = 200mA	-	-	V _I = 8V to 25V	100
		T _J = +25°C			V _I = 9V to 25V	50
Load Regulation (Note1)	ΔV _O	I _O = 5mA to 0.5A, T _J = +25°C	-	-	120	mV
		I _O = 5mA to 200mA, T _J = +25°C	-	-	60	
Quiescent Current	I _Q	T _J = +25°C	-	4.0	6.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA to 350mA	-	-	0.5	mA
		I _O = 200mA V _I = 9V to 25V	-	-	0.8	
Output Voltage Drift	ΔV/ΔT	I _O = 5mA T _J = -40 to +85°C	-	-0.5	-	mV/°C
Output Noise Voltage	V _N	f = 10Hz to 100kHz	-	45	-	μV/V _O
Ripple Rejection	RR	f = 120Hz, I _O = 300mA V _I = 9V to 19V, T _J = +25°C	-	80	-	dB
Dropout Voltage	V _D	T _J = +25°C, I _O = 500mA	-	2	-	V
Short Circuit Current	I _{SC}	T _J = +25°C, V _I = 35V	-	300	-	mA
Peak Current	I _{PK}	T _J = +25°C	-	700	-	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 (LM78M08A) (Continued)

 (Refer to the test circuits, $-40 < T_J < +85\text{ }^\circ\text{C}$, $I_O=1\text{A}$, $V_I=14\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V _O	T _J = +25°C	7.7	8	8.3	V
		I _O = 5mA to 1A V _I = 10.5V to 23V	7.6	8	8.4	
Line Regulation (Note1)	ΔV _O	I _O = 200mA	-	-	V _I = 10.5V to 25V	100
		T _J = +25°C			V _I = 11V to 25V	50
Load Regulation (Note1)	ΔV _O	I _O = 5mA to 0.5A, T _J = +25°C	-	-	160	mV
		I _O = 5mA to 200mA, T _J = +25°C	-	-	80	
Quiescent Current	I _Q	T _J = +25°C	-	4.0	6.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA to 350mA	-	-	0.5	mA
		I _O = 200mA V _I = 10.5V to 25V	-	-	0.8	
Output Voltage Drift	RR	I _O = 5mA T _J = -40 to +85°C	-	0.5	-	mV/°C
Output Noise Voltage	V _N	f = 10Hz to 100kHz	-	52	-	V/V _O
Ripple Rejection	RR	f = 120Hz, I _O = 300mA V _I = 11.5V to 21.5V, T _J = +25°C	-	80	-	dB
Dropout Voltage	V _D	T _J = +25°C, I _O = 500mA	-	2	-	V
Short Circuit Current	I _{SC}	T _J = +25°C, V _I = 35V	-	300	-	mA
Peak Current	I _{PK}	T _J = +25°C	-	700	-	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 (LM78M12A) (Continued)

 (Refer to the test circuits, $-40 < T_J < +85^{\circ}\text{C}$, $I_O=1\text{A}$, $V_I=19\text{V}$, unless otherwise specified, $C_I=0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	$T_J = +25^{\circ}\text{C}$	11.5	12	12.5	V
		$I_O = 5\text{mA to } 1\text{A } V_I = 14.5\text{V to } 27\text{V}$	11.4	12	12.6	
Line Regulation (Note1)	ΔV_O	$I_O = 200\text{mA}$ $T_J = +25^{\circ}\text{C}$	-	-	100	mV
		$V_I = 14.5\text{V to } 30\text{V}$ $V_I = 16\text{V to } 30\text{V}$	-	-	50	
Load Regulation (Note1)	ΔV_O	$I_O = 5\text{mA to } 0.5\text{A}$, $T_J = +25^{\circ}\text{C}$	-	-	240	mV
		$I_O = 5\text{mA to } 200\text{mA}$, $T_J = +25^{\circ}\text{C}$	-	-	120	
Quiescent Current	I_Q	$T_J = +25^{\circ}\text{C}$	-	4.1	6.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA to } 350\text{mA}$	-	-	0.5	mA
		$I_O = 200\text{mA}$ $V_I = 14.5\text{V to } 30\text{V}$	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$ $T_J = -40 \text{ to } +85^{\circ}\text{C}$	-	-0.5	-	mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz to } 100\text{kHz}$	-	75	-	$\mu\text{V}/V_O$
Ripple Rejection	RR	$f = 120\text{Hz}$, $I_O = 300\text{mA}$ $V_I = 15\text{V to } 25\text{V}$, $T_J = +25^{\circ}\text{C}$	-	80	-	dB
Dropout Voltage	V_D	$T_J = +25^{\circ}\text{C}$, $I_O = 500\text{mA}$	-	2	-	V
Short Circuit Current	ISC	$T_J = +25^{\circ}\text{C}$, $V_I = 35\text{V}$	-	300	-	mA
Peak Current	IPK	$T_J = +25^{\circ}\text{C}$	-	700	-	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 (LM78M15A) (Continued)

 (Refer to the test circuits, $-40 < T_J < +85^{\circ}\text{C}$, $I_O=1\text{A}$, $V_I=23\text{V}$, unless otherwise specified, $C_I=0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	$T_J = +25^{\circ}\text{C}$	14.4	15	15.6	V
		$I_O = 5\text{mA to } 1\text{A } V_I = 17.5\text{V to } 30\text{V}$	14.25	15	15.75	
Line Regulation (Note1)	ΔV_O	$I_O = 200\text{mA}$ $T_J = +25^{\circ}\text{C}$	-	-	100	mV
		$V_I = 17.5\text{V to } 30\text{V}$ $V_I = 20\text{V to } 30\text{V}$	-	-	50	
Load Regulation (Note1)	ΔV_O	$I_O = 5\text{mA to } 0.5\text{A}$, $T_J = +25^{\circ}\text{C}$	-	-	300	mV
		$I_O = 5\text{mA to } 200\text{mA}$, $T_J = +25^{\circ}\text{C}$	-	-	150	
Quiescent Current	I_Q	$T_J = +25^{\circ}\text{C}$	-	4.1	6.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA to } 350\text{mA}$	-	-	0.5	mA
		$I_O = 200\text{mA}$ $V_I = 17.5\text{V to } 30\text{V}$	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$ $T_J = -40 \text{ to } +85^{\circ}\text{C}$	-	-1	-	mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz to } 100\text{kHz}$	-	100	-	V/ V_O
Ripple Rejection	RR	$f = 120\text{Hz}$, $I_O = 300\text{mA}$ $V_I = 18.5\text{V to } 28.5\text{V}$, $T_J = +25^{\circ}\text{C}$	-	70	-	dB
Dropout Voltage	V_D	$T_J = +25^{\circ}\text{C}$, $I_O = 500\text{mA}$	-	2	-	V
Short Circuit Current	ISC	$T_J = +25^{\circ}\text{C}$, $V_I = 35\text{V}$	-	300	-	mA
Peak Current	IPK	$T_J = +25^{\circ}\text{C}$	-	700	-	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 (LM78M18A) (Continued)

 (Refer to the test circuits, $-40 < T_J < +85$ °C, $I_O=1A$, $V_I=26V$, 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	$T_J = +25^\circ C$	17.3	18	18.7	V
		$I_O = 5mA$ to $1A$ $V_I = 20.5V$ to $33V$	17.1	18	18.9	
Line Regulation (Note1)	ΔV_O	$I_O = 200mA$ $V_I = 21V$ to $33V$	-	-	100	mV
		$T_J = +25^\circ C$ $V_I = 24V$ to $33V$	-	-	50	
Load Regulation (Note1)	ΔV_O	$I_O = 5mA$ to $0.5A$, $T_J = +25^\circ C$	-	-	360	mV
		$I_O = 5mA$ to $200mA$, $T_J = +25^\circ C$	-	-	180	
Quiescent Current	I_Q	$T_J = +25^\circ C$	-	4.2	6.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $350mA$	-	-	0.5	mA
		$I_O = 200mA$ $V_I = 21V$ to $33V$	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5mA$ $T_J = -40$ to $85^\circ C$	-	-1.1	-	mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100kHz$	-	100	-	V/ V_O
Ripple Rejection	RR	$f = 120Hz$, $I_O = 300mA$, $V_I = 22V$ to $32V$ $T_J = +25^\circ C$	-	70	-	dB
Dropout Voltage	V_D	$T_J = +25^\circ C$, $I_O = 500mA$	-	2	-	V
Short Circuit Current	ISC	$T_J = +25^\circ C$, $V_I = 35V$	-	300	-	mA
Peak Current	IPK	$T_J = +25^\circ C$	-	700	-	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 (LM78M24A) (Continued)

 (Refer to the test circuits, $-40 < T_J < +85$ °C, $I_O=350mA$, $V_I=33V$, 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	$T_J = +25^\circ C$	23	24	25	V
		$I_O = 5mA$ to $1A$ $V_I = 27V$ to $38V$	22.8	24	25.2	
Line Regulation (Note1)	ΔV_O	$I_O = 200mA$ $V_I = 27V$ to $38V$	-	-	100	mV
		$T_J = +25^\circ C$ $V_I = 28V$ to $38V$	-	-	50	
Load Regulation (Note1)	ΔV_O	$I_O = 5mA$ to $0.5A$, $T_J = +25^\circ C$	-	-	480	mV
		$I_O = 5mA$ to $200mA$, $T_J = +25^\circ C$	-	-	240	
Quiescent Current	I_Q	$T_J = +25^\circ C$	-	4.2	6.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $350mA$	-	-	0.5	mA
		$I_O = 200mA$ $V_I = 27V$ to $38V$	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5mA$ $T_J = -40$ to $+85^\circ C$	-	-1.2	-	mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100kHz$	-	170	-	$\mu V/V_O$
Ripple Rejection	RR	$f = 120Hz$, $I_O = 300mA$ $V_I = 28V$ to $38V$, $T_J = +25^\circ C$	-	70	-	dB
Dropout Voltage	V_D	$T_J = +25^\circ C$, $I_O = 500mA$	-	2	-	V
Short Circuit Current	ISC	$T_J = +25^\circ C$, $V_I = 35V$	-	300	-	mA
Peak Current	IPK	$T_J = +25^\circ C$	-	700	-	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

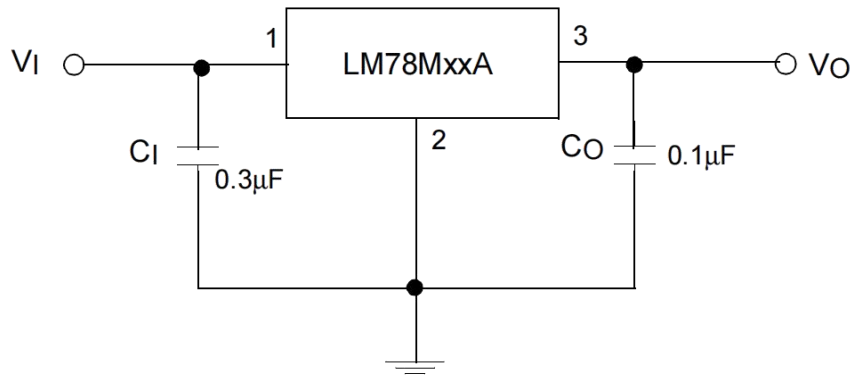


Figure 1. Fixed Output Regulator

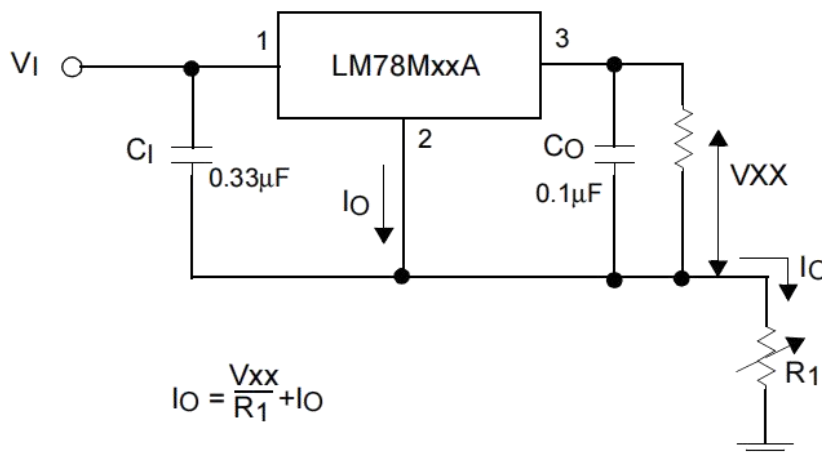


Figure 2. Constant Current Regulator

Notes:

1. To specify an output voltage, substitute voltage value for "XX"
2. Although no output capacitor is needed for stability, it does improve transient response.
3. CI is required if regulator is located an appreciable distance from power Supply filter

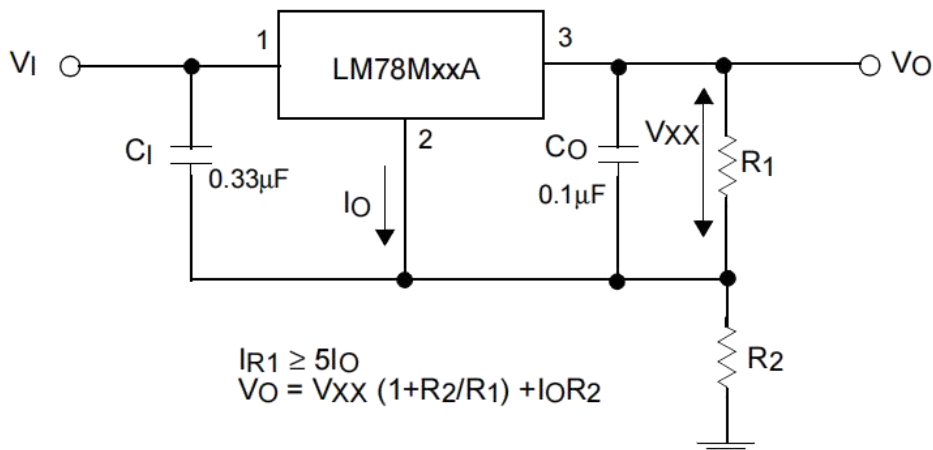


Figure 3. Circuit for Increasing Output Voltage

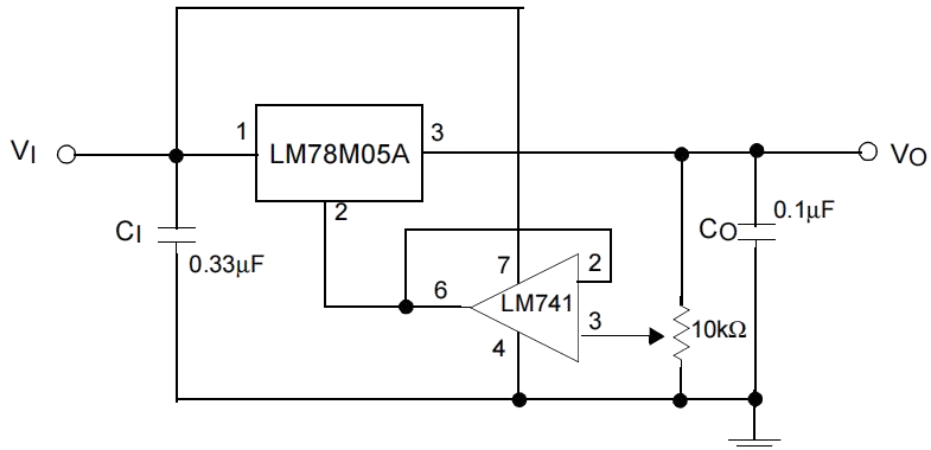


Figure 4. Adjustable Output Regulator (7 to 30V)

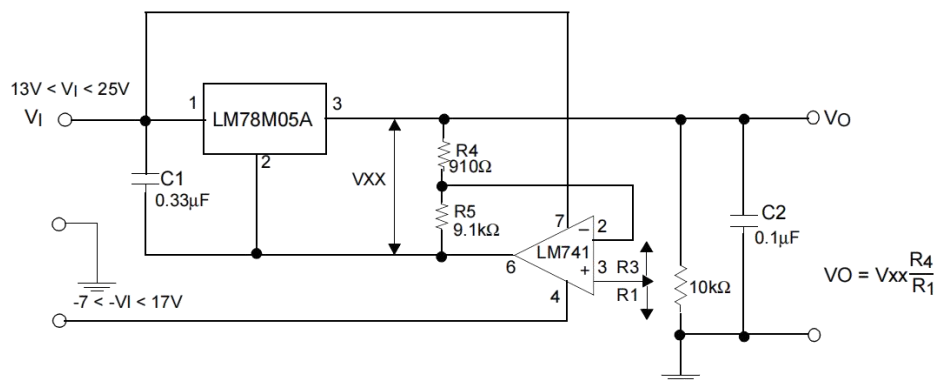
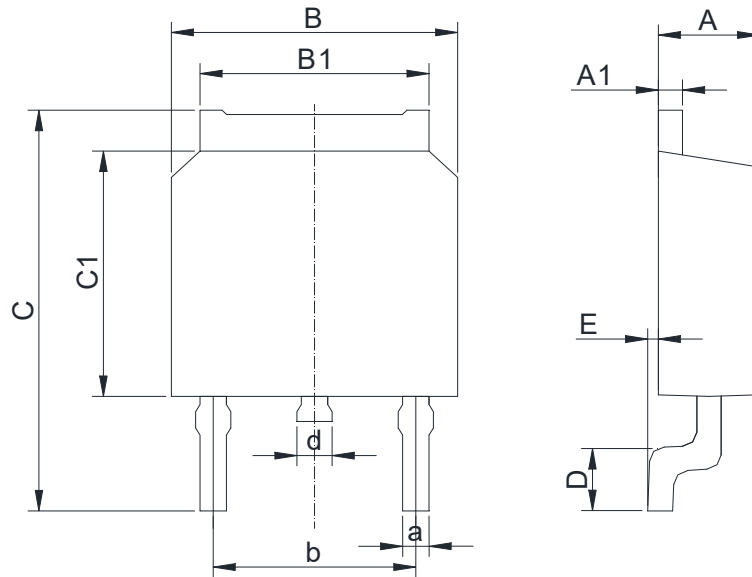


Figure 5. 0.5 to 10V Regulator

Physical Dimensions

TO252-2



Dimensions In Millimeters(TO252-2)											
Symbol:	A	A1	B	B1	C	C1	D	E	a	b	d
Min:	2.10	0.45	6.30	5.10	9.20	5.30	0.90	0	0.50	4.45	0.70
Max:	2.50	0.70	6.75	5.50	10.6	6.30	1.75	0.23	0.80	4.75	1.20

Revision History

DATE	REVISION	PAGE
2018-8-5	New	1-11

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