April 2015

MC78XXE
3-Terminal 1A Positive Voltage Regulator

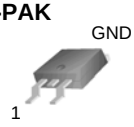
Features

- Output Current up to 1 A
- Output Voltages of 5 V, 12 V
- Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area Protection

Description

The MC78XXE series of three terminal positive regulators are available in the 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 1 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

D-PAK



1. Input 2. GND 3. Output

Ordering Information

Product Number	Marking	Package	Packing Method	Output Voltage Tolerance	Operating Temperature
MC7805ECDTX	MC7805	TO-252 3L (D-PAK)	Tape and Reel	±4%	-40 to +125°C
MC7812ECDTX	MC7812	TO-252 3L (D-PAK)	Tape and Reel		

Block Diagram

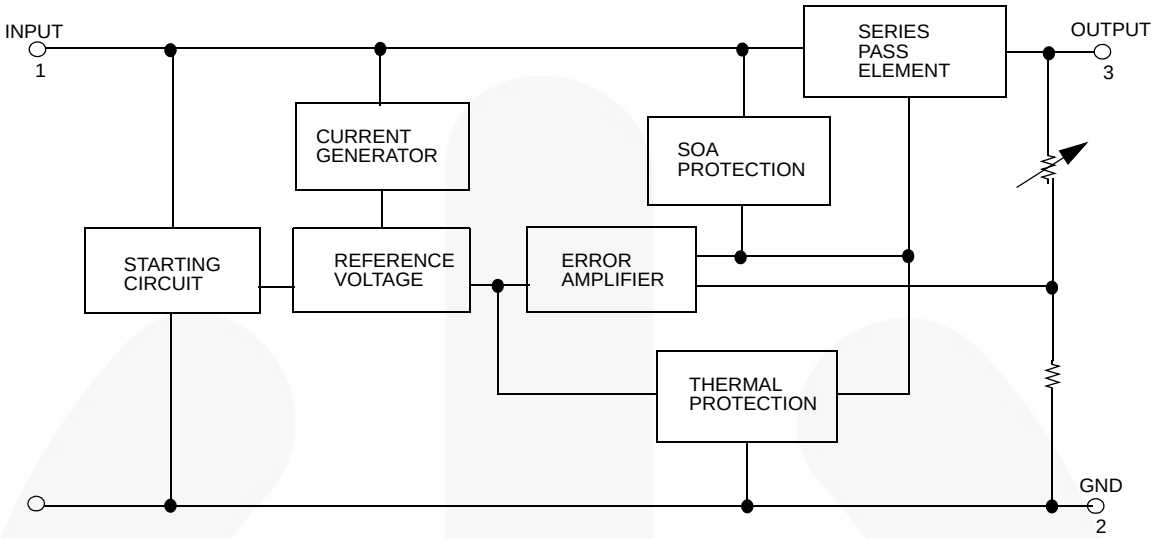


Figure 1. Block Diagram

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter		Value	Unit
V_I	Input Voltage	V_O = 5 V to 18 V	35	V
T_{OPR}	Operating Temperature Range		-40 to +125	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C

Electrical Characteristics (MC7805E)

Refer to test circuit, -40°C < T_J < 125°C, I_O = 500 mA, V_I = 10 V, C_I = 0.33 µF, C_O = 0.1 µF, unless otherwise specified.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = +25°C		4.80	5.00	5.20	V
		5.0 mA ≤ I_O ≤ 1.0 A, P_O ≤ 15 W, V_I = 7 V to 20 V		4.75	5.00	5.25	
Regline	Line Regulation(1)	T_J = +25°C	V_I = 7 V to 25 V		4	100	mV
			V_I = 8 V to 12 V		1.6	50	
Regload	Load Regulation(1)	T_J = +25°C	I_O = 5.0 mA to 1.5 A		9	100	mV
			I_O = 250 mA to 750 mA		4	50	
I_Q	Quiescent Current	T_J = +25°C			5	8	mA
ΔI_Q	Quiescent Current Change	I_O = 5 mA to 1.0 A			0.03	0.50	mA
		V_I = 7 V to 25 V			0.3	1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift(2)	I_O = 5 mA			-0.8		mV/°C
V_N	Output Noise Voltage	f = 10 Hz to 100 kHz, T_A = +25°C			42		µV
RR	Ripple Rejection(2)	f = 120 Hz, V_O = 8 V to 18 V		62	73		dB
V_{Drop}	Dropout Voltage	I_O = 1 A, T_J = +25°C			2		V
r_O	Output Resistance(2)	f = 1 kHz			15		mΩ
I_{SC}	Short Circuit Current	V_I = 35 V, T_A = +25°C			230		mA
I_{PK}	Peak Current(2)	T_J = +25°C			2.2		A

Notes:

1. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
2. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (MC7812E)

Refer to test circuit, -40°C < T_J < 125°C, I_O = 500 mA, V_I =19 V, C_I = 0.33 µF, C_O = 0.1 µF, unless otherwise specified.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = +25°C		11.5	12.0	12.5	V
		5.0 mA ≤ I_O ≤ 1.0 A, P_O ≤ 15 W, V_I = 14.5 V to 27 V		11.4	12.0	12.6	
Regline	Line Regulation(3)	T_J = +25°C	V_I = 14.5 V to 30 V		10	240	mV
			V_I = 16 V to 22 V		3	120	
Regload	Load Regulation(3)	T_J = +25°C	I_O = 5 mA to 1.5 A		11	240	mV
			I_O = 250 mA to 750 mA		5	120	
I_Q	Quiescent Current	T_J = +25°C			5.1	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5 mA to 1.0 A			0.1	0.5	mA
		V_I = 14.5 V to 30 V			0.5	1.0	
$\Delta V_O/\Delta T$	Output Voltage Drift(4)	I_O = 5 mA			-1		mV/°C
V_N	Output Noise Voltage	f = 10 Hz to 100 kHz, T_A = +25°C			76		µV
RR	Ripple Rejection(4)	f = 120 Hz, V_I = 15 V to 25 V		55	71		dB
V_{Drop}	Dropout Voltage	I_O = 1 A, T_J = +25°C			2		V
r_O	Output Resistance(4)	f = 1 kHz			18		mΩ
I_{SC}	Short Circuit Current	V_I = 35 V, T_A = +25°C			230		mA
I_{PK}	Peak Current(4)	T_J = +25°C			2.2		A

Notes:

3. 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.
4. These parameters, although guaranteed, are not 100% tested in production.

Typical Performance Characteristics

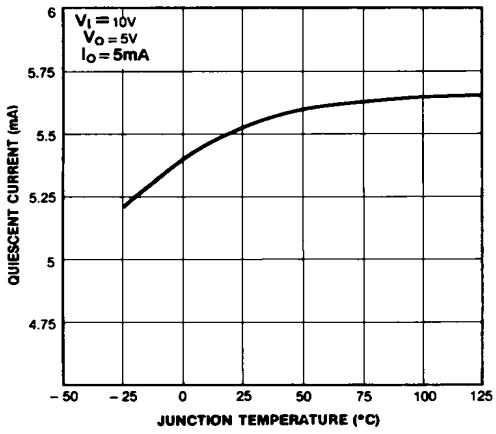


Figure 2. Quiescent Current

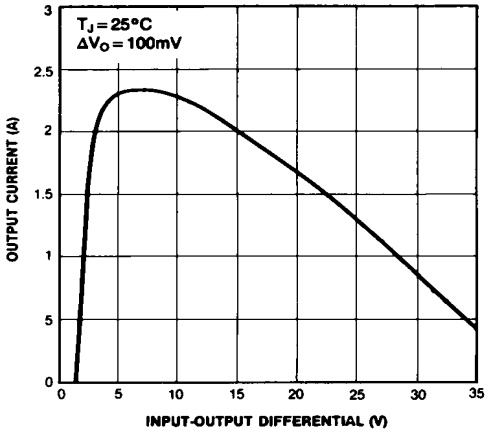


Figure 3. Peak Output Current

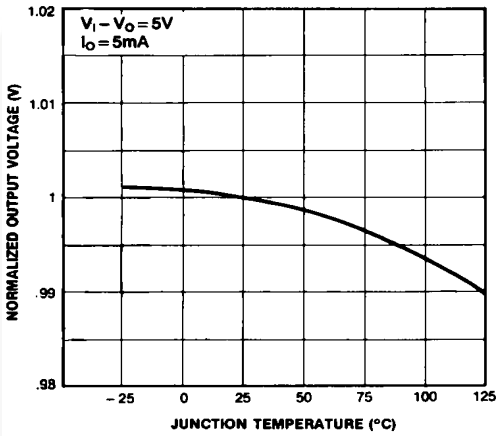


Figure 4. Output Voltage

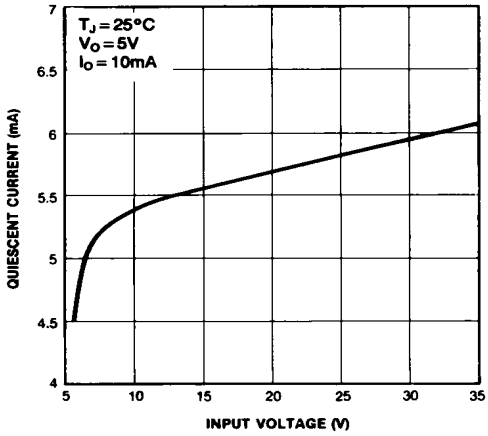


Figure 5. Quiescent Current

Typical Applications

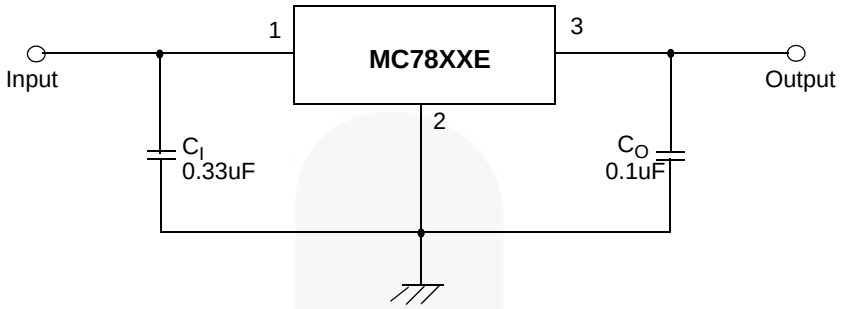


Figure 6. DC Parameters

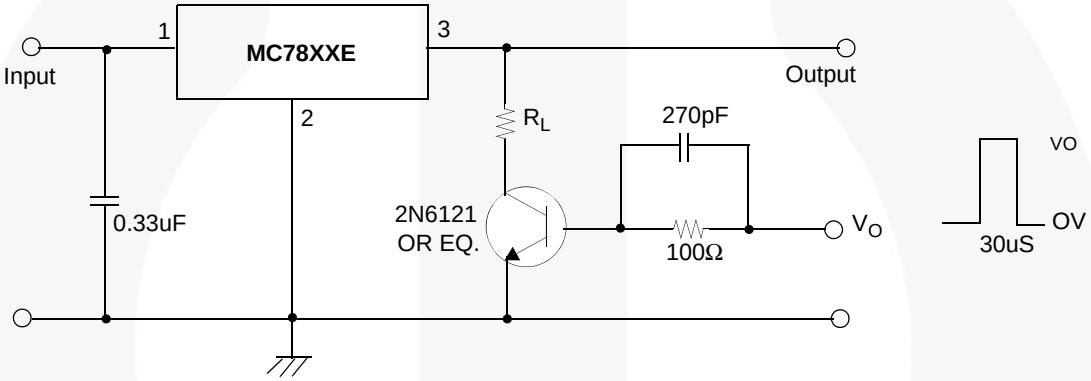


Figure 7. Load Regulation

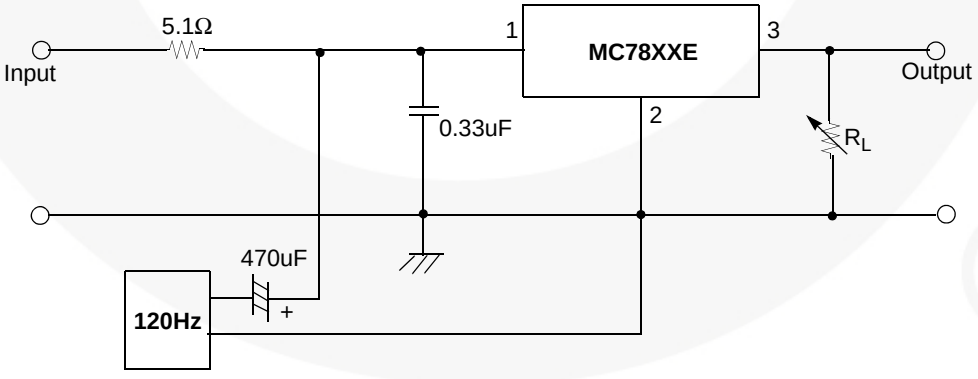


Figure 8. Ripple Rejection

Typical Applications (Continued)

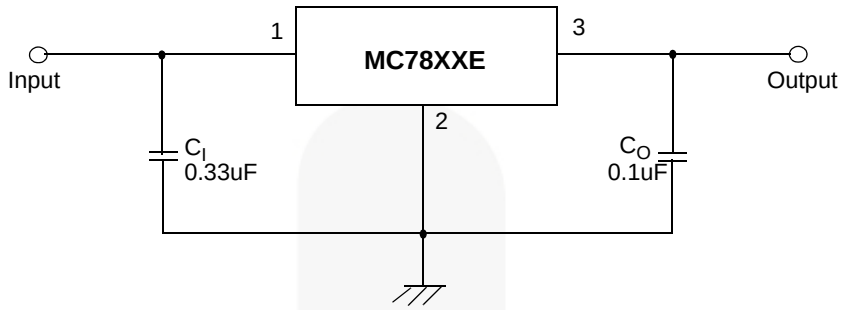


Figure 9. Fixed Output Regulator

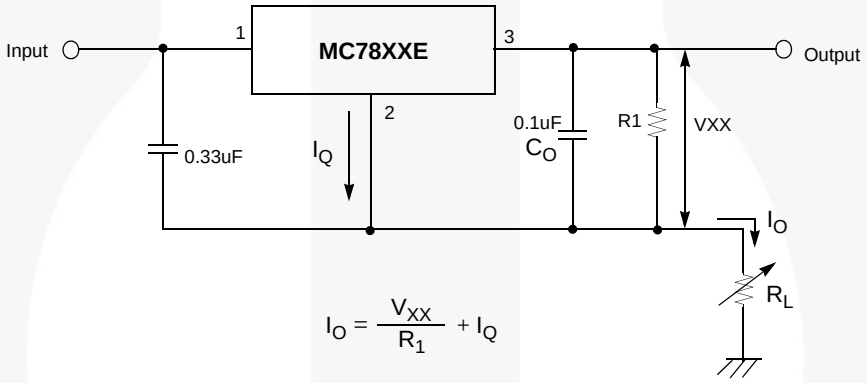


Figure 10. Constant Current Regulator

Notes:

5. 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.
6. C_I is required if regulator is located an appreciable distance from power Supply filter.
7. C_O improves stability and transient response.

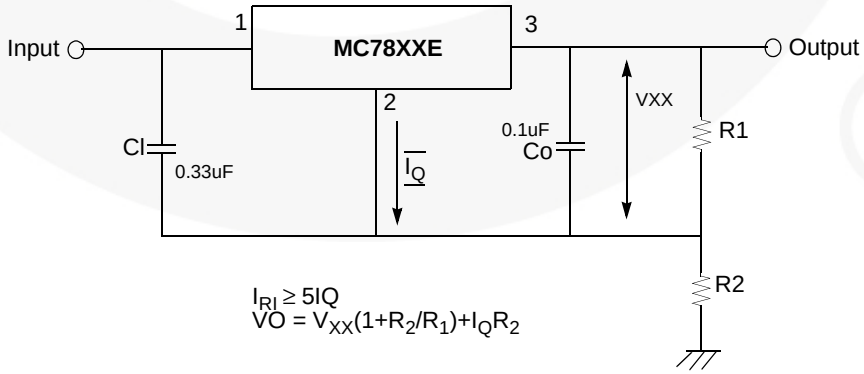


Figure 11. Circuit for Increasing Output Voltage

Typical Applications (Continued)

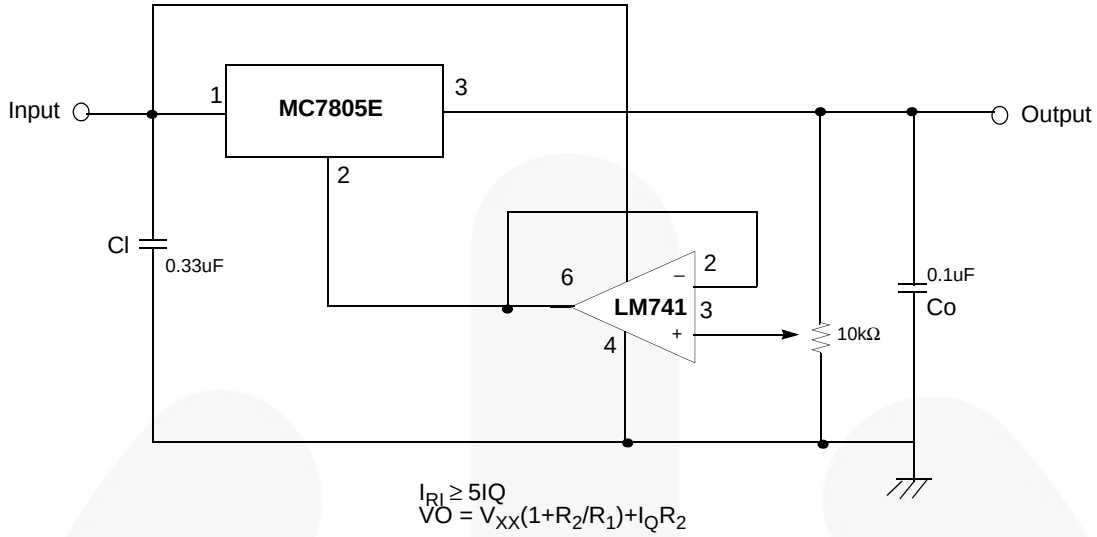


Figure 12. Adjustable Output Regulator (7 to 30V)

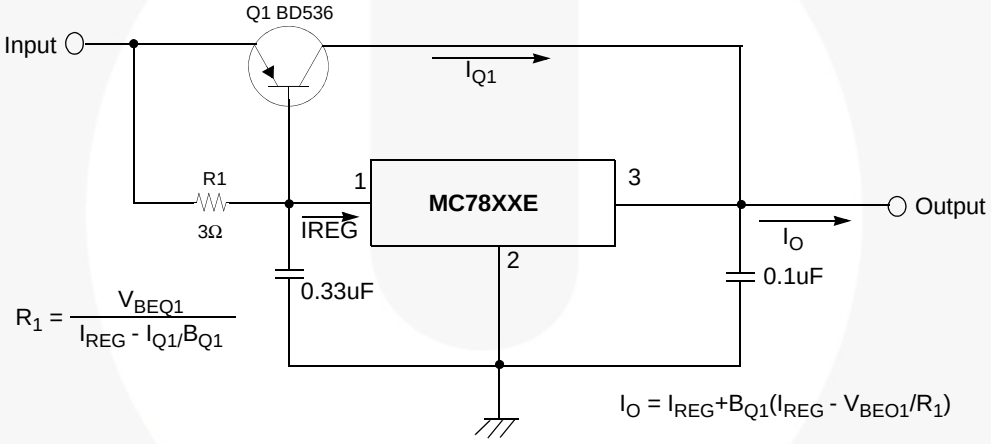


Figure 13. High Current Voltage Regulator

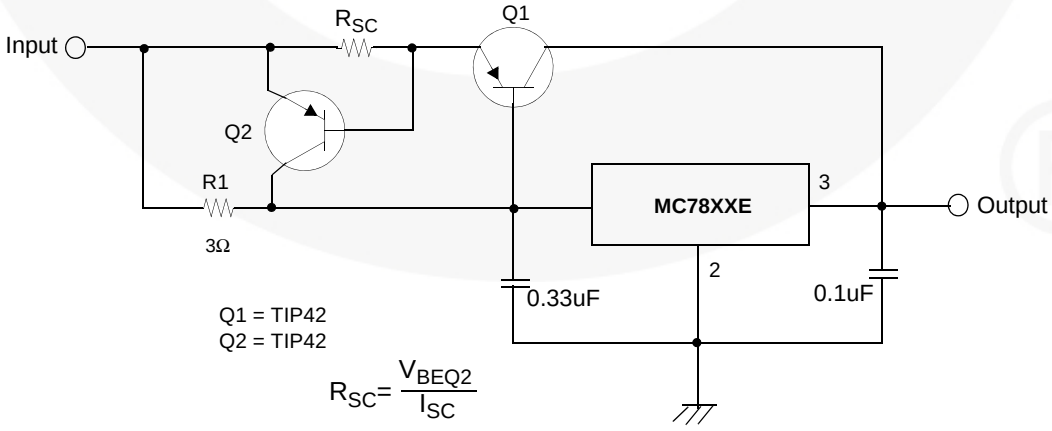


Figure 14. High Output Current with Short Circuit Protection

Typical Applications (Continued)

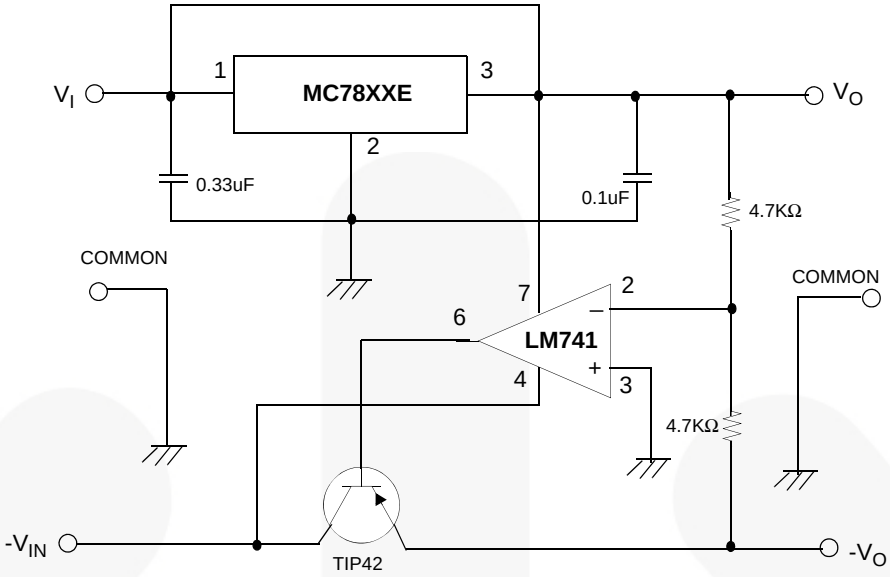


Figure 15. Tracking Voltage Regulator

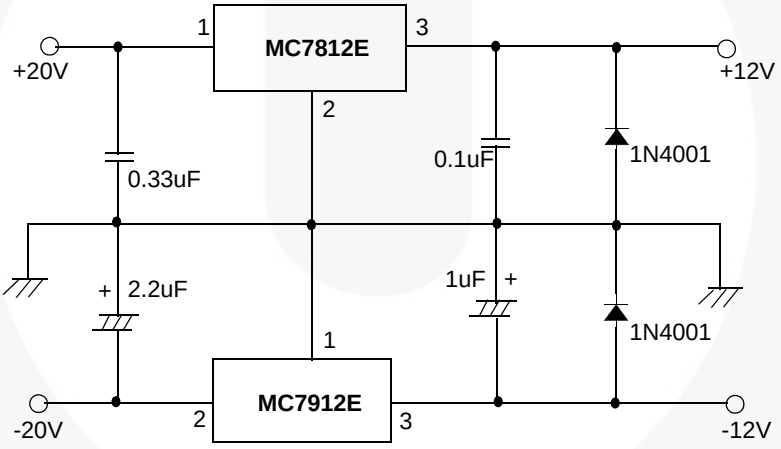


Figure 16. Split Power Supply (±12 V - 1 A)

Typical Applications (Continued)

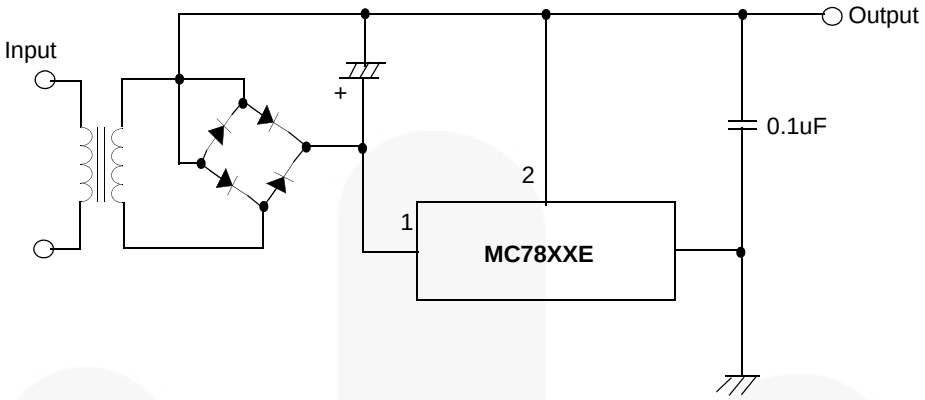


Figure 17. Negative Output Voltage Circuit

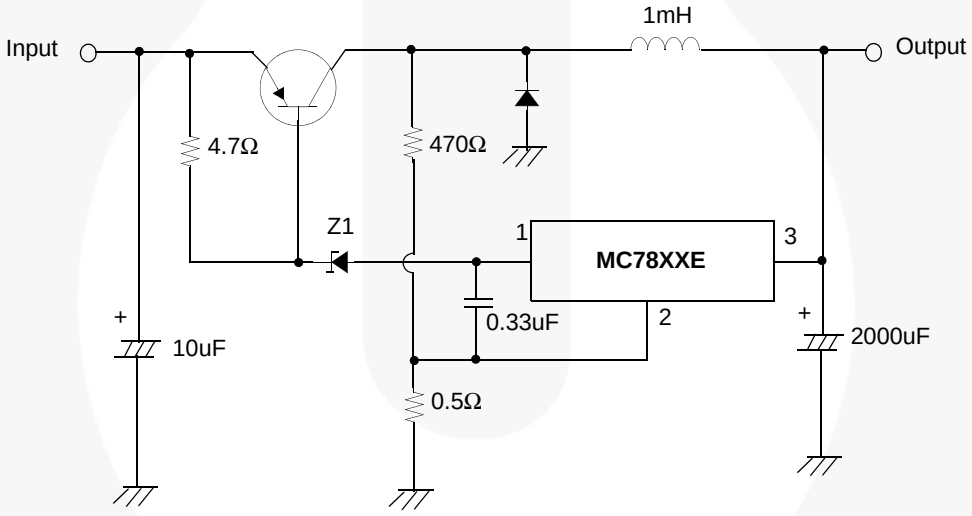


Figure 18. Switching Regulator

Physical Dimensions

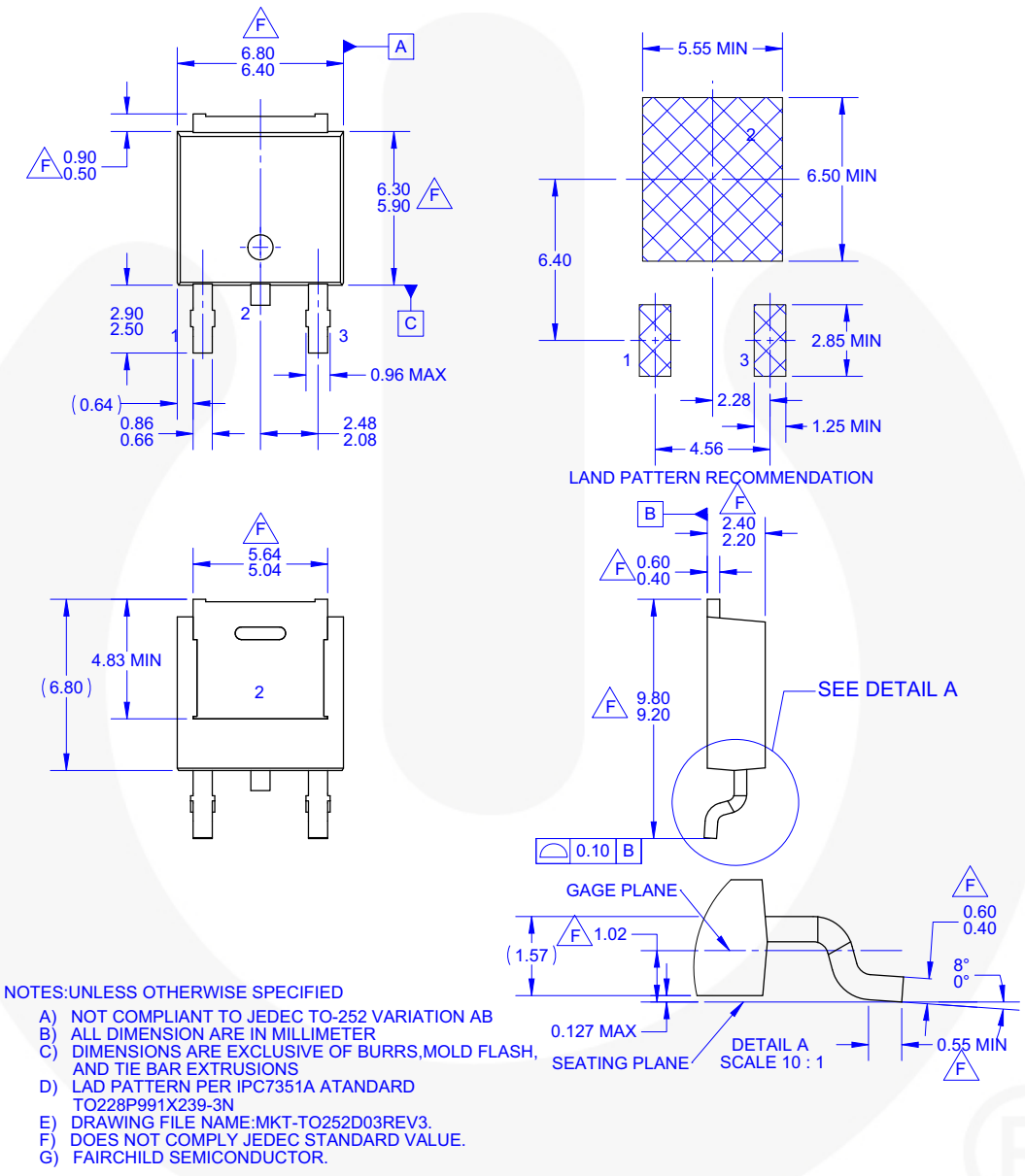


Figure 19. 3LEAD, TO-252, NOT COMPLIANT JEDEC TO-252 VAR. AB, SURFACE MOUNT (DPAK)

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Rev. I74