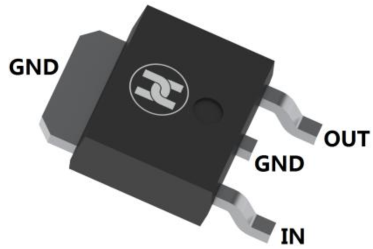
PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

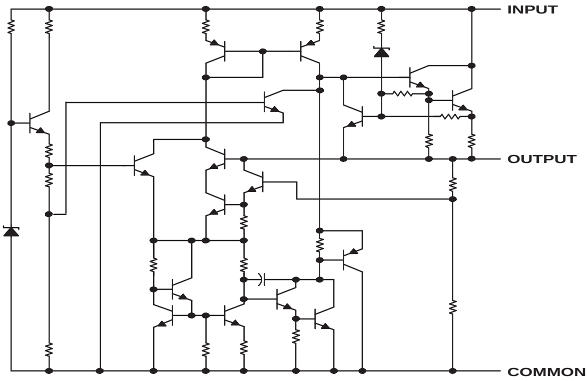
FEATURES

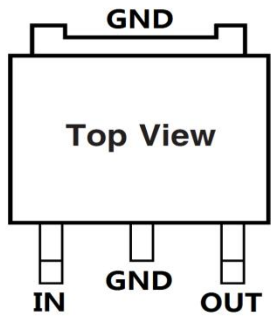
- Maximum Output Current I_O: 1.5A
- Output Voltage V_O: 5V,6V,8V,9V,10V,12V,15V,18V,24V;
- Continuous Total Dissipation
  P_D: 1.25 W (Ta= 25 ℃)
- Surface Mount device



TO-252

SCHEMATIC DIAGRAM





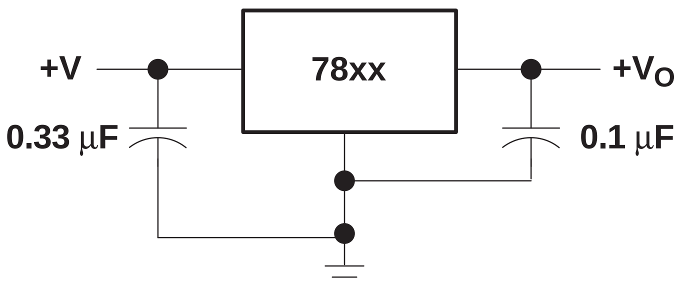
MECHANICAL DATA

- Case: TO-252
- Case Material: Molded Plastic. UL flammability
- Classification Rating: 94V-0
- Weight: 0.055 grams (approximate)

MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

Parameter		Symbol	Value	Unit
Input Voltage	V_O=5.0-18V	V_i	35	V
	V_O=20-24V		40	
Power Dissipation		P_D	Internally Limited	mW
Thermal Resistance from Junction to Ambient		$R_{\theta JA}$	80	°C/W
Operating Junction Temperature		T_J	150	°C
Storage Temperature Range		T_{STG}	-65 ~+150	°C

TYPICAL APPLICATION



Note: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as Possible to the regulators.

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PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

ELECTRICAL CHARACTERISTICS OF 7805 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=10V,Io=500mA,Ci=0.33uF,,Co=0.1uF, -25°C≤TJ≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	4.80	5.0	5.20	V	T_J=+25°C
		4.75	5.0	5.25	V	7V≤V_i≤20V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O		3	100	mV	7V≤V_i≤25V,T_J=+25°C
			1	50	mV	8V≤V_i≤12V,T_J=+25°C
Load Regulation	ΔV_O			100	mV	I_O=5mA~1.5A,T_J=+25°C
				50	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			8	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			0.8	mA	8V≤V_i≤25V,-25°C≤T_J≤+125°C
				0.5	mA	5mA≤I_O≤1.0A,-25°C≤T_J≤+125°C
Output Noise Voltage	V_N		40		μV/V_O	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	62			dB	8V≤V_i≤18V,f=120Hz
Dropout Voltage	V_d		2		V	I_O=1.0A,T_J=+25°C
Output Resistance	R_O		17		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.75		A	V_i=35V,T_J=+25°C
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1.1		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note: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 cycle is used.

ELECTRICAL CHARACTERISTICS OF 7806 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=11V,Io=500mA,Ci=0.33uF,,Co=0.1uF,-25°C≤TJ≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	5.75	6.0	6.25	V	T_J=+25°C
		5.70	6.0	6.30	V	8V≤V_i≤21V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			120	mV	8V≤V_i≤25V,I_O=500mA,T_J=+25°C
				60	mV	9V≤V_i≤13V,I_O=500mA,T_J=+25°C
Load Regulation	ΔV_O			120	mV	I_O=5mA~1.5A,T_J=+25°C
				60	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			8	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1.3	mA	8V≤V_i≤25V,-25°C≤T_J≤+125°C
				0.5	mA	5mA≤I_O≤1A,-25°C≤T_J≤+125°C
Output Noise Voltage	V_N		45		μV/V_O	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	59			dB	9V≤V_i≤19V,f=120Hz
Dropout Voltage	V_d		2		V	I_O=1.0A,T_J=+25°C
Output Resistance	R_O		19		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.55		A	V_i=35V,T_J=+25°C
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-0.8		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note: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 cycle is used.

ELECTRICAL CHARACTERISTICS OF 7808 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE (Vi=14V,Io=500mA,Ci=0.33uF,,Co=0.1uF,-25°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	7.7	8.0	8.3	V	T_J=+25°C
		7.6	8.0	8.4	V	10.5V≤V_i≤25V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			160	mV	10.5V≤V_i≤25V,I_O=500mA,T_J=+25°C
				80	mV	11V≤V_i≤17V,I_O=500mA,T_J=+25°C
Load Regulation	ΔV_O			160	mV	I_O=5mA~1.5A,T_J=+25°C
				80	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			8	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	10.5V≤V_i≤25V,-25°C≤T_J≤+125°C
				0.5	mA	5mA≤I_O≤1A,-25°C≤T_J≤+125°C
Output Noise Voltage	V_N		52		μV/Vo	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	56			dB	11.5V≤V_i≤21.5V,f=120Hz
Dropout Voltage	V_d		2		V	I_O=1.0A,T_J=+25°C
Output Resistance	R_O		16		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.45		A	V_i=35V,T_J=+25°C
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-0.8		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note:Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS OF 7809 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE (Vi=15V,Io=500mA,Ci=0.33uF,,Co=0.1uF, -25°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	8.65	9.0	9.35	V	T_J=+25°C
		8.55	9.0	9.45	V	11.5V≤V_i≤26V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			180	mV	11.5V≤V_i≤26V,T_J=+25°C
				90	mV	12V≤V_i≤18V,T_J=+25°C
Load Regulation	ΔV_O			180	mV	I_O=5mA~1.5A,T_J=+25°C
				90	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			8	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	11.5V≤V_i≤26V,-25°C≤T_J≤+125°C
				0.5	mA	5mA≤I_O≤1A,-25°C≤T_J≤+125°C
Output Noise Voltage	V_N		70		μV/Vo	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	55			dB	12V≤V_i≤23V,f=120Hz
Dropout Voltage	V_d		2		V	I_O=1.0A,T_J=+25°C
Output Resistance	R_O		17		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.4		A	V_i=35V,T_J=+25°C
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note:Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS OF 7810 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=16V,Io=500mA,Ci=0.33uF,,Co=0.1uF, -25°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	9.6	10	10.4	V	T_J=+25°C
		9.5	10	10.5	V	12.5V≤V_i≤26V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			200	mV	12.5V≤V_i≤26V,T_J=+25°C
				100	mV	13.5V≤V_i≤19V,T_J=+25°C
Load Regulation	ΔV_O			200	mV	I_O=5mA~1.5A,T_J=+25°C
				100	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	Iq			8	mA	T_J=+25°C
Quiescent Current Change	ΔIq			1	mA	12.5V≤V_i≤26V,-25°C≤T_J≤+125°C
				0.5	mA	5mA≤I_O≤1A,-25°C≤T_J≤+125°C
Output Noise Voltage	V_N		70		μV/Vo	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	65			dB	13V≤V_i≤23V,f=120Hz
Dropout Voltage	V_d		2		V	I_O=1.0A,T_J=+25°C
Output Resistance	R_O		17		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.40		mA	V_i=35V,T_J=+25°C
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note:Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS OF 7812 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=19V,Io=500mA,Ci=0.33uF,,Co=0.1uF, -25°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	11.5	12	12.5	V	T_J=+25°C
		11.4	12	12.6	V	14.5V≤V_i≤27V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			240	mV	14.5V≤V_i≤30V,T_J=+25°C
				120	mV	16V≤V_i≤22V,T_J=+25°C
Load Regulation	ΔV_O			240	mV	I_O=5mA~1.5A,T_J=+25°C
				120	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	Iq			8	mA	I_O=1.0A,T_J=+25°C
Quiescent Current Change	ΔIq			1	mA	14.5V≤V_i≤30V
				0.5	mA	5mA≤I_O≤1A
Output Noise Voltage	V_N		75		μV/Vo	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	55			dB	15V≤V_i≤25V,f=120Hz
Dropout Voltage	V_d		2		V	I_O=1.0A,T_J=+25°C
Output Resistance	R_O		18		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.35		A	V_i=35V,T_J=+25°C
Peak Current	I_{pk}		2.2		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1		mV/°C	I_O=10mA,-25°C≤T_J≤+125°C

Note:Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS OF 7815 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(V_i=23V,I_o=500mA,C_i=0.33uF,,C_o=0.1uF, 0°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	14.4	15	15.6	V	T_J=+25°C
		14.25	15	15.75	V	17.5V≤V_i≤30V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			300	mV	17.5V≤V_i≤30V,T_J=+25°C
				150	mV	20V≤V_i≤26V,T_J=+25°C
Load Regulation	ΔV_O			300	mV	I_O=5mA~1.5A,T_J=+25°C
				150	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			8	mA	I_O=0,T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	17.5V≤V_i≤30V
				0.5	mA	5mA≤I_O≤1A,
Output Noise Voltage	V_N		90		μV/V_O	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	54			dB	18.5V≤V_i≤28.5V,f=120Hz
Dropout Voltage	V_d		2		V	I_O=1.0A,T_J=+25°C
Output Resistance	R_O		19		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.23		A	V_i=35V,T_J=+25°C
Peak Current	I_{PK}		2.2		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note: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 cycle is used.

ELECTRICAL CHARACTERISTICS OF 7818 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(V_i=26V,I_o=500mA,C_i=0.33uF, C_o=0.1uF, -25°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	17.3	18	18.7	V	T_J=+25°C
		17.1	18	18.9	V	21V≤V_i≤33V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			360	mV	21V≤V_i≤33V,T_J=+25°C
				180	mV	24V≤V_i≤30V,T_J=+25°C
Load Regulation	ΔV_O			360	mV	I_O=5mA~1.5A,T_J=+25°C
				180	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	I_q			8	mA	T_J=+25°C
Quiescent Current Change	ΔI_q			1	mA	21V≤V_i≤33V
				0.5	mA	5mA≤I_O≤1.0A
Output Noise Voltage	V_N		110		μV/V_O	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	53			dB	22V≤V_i≤32V,f=120Hz
Dropout Voltage	V_d		2		V	T_J=+25°C,I_O=1A
Output Resistance	R_O		22		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.2		A	V_i=35V,T_J=+25°C
Peak Current	I_{PK}		2.1		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note: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 cycle is used.

PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

ELECTRICAL CHARACTERISTICS OF 7820 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=29V,Io=500mA,Ci=0.33uF,Co=0.1uF,-25°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	19.2	20	20.8	V	T_J=+25°C
		19	20	21	V	23V≤V_i≤35V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			400	mV	22.5V≤V_i≤35V,T_J=+25°C
				200	mV	26V≤V_i≤32V,T_J=+25°C
Load Regulation	ΔV_O			400	mV	I_O=5mA~1.5A,T_J=+25°C
				200	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	Iq			8	mA	T_J=+25°C
Quiescent Current Change	ΔIq			1	mA	23V≤V_i≤35V,T_J=+25°C
				0.5	mA	5mA≤I_O≤1A,T_J=+25°C
Output Noise Voltage	V_N		150		μV/V_O	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	52			dB	24V≤V_i≤35V,f=120Hz
Dropout Voltage	V_d		2		V	T_J=+25°C,I_O=1.0A
Output Resistance	R_O		24		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.18		A	V_i=35V,T_J=+25°C
Peak Current	I_{PK}		2.1		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note: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 cycle is used.

ELECTRICAL CHARACTERISTICS OF 7824 AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE

(Vi=33V,Io=500mA,Ci=0.33uF,,Co=0.1uF,-25°C≤T_J≤+125°C unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Output voltage	V_O	23	24	25	V	T_J=+25°C
		22.8	24	25.2	V	27V≤V_i≤38V,I_O=5mA~1A,P_D≤15W
Line regulation	ΔV_O			480	mV	27V≤V_i≤38V,T_J=+25°C
				240	mV	30V≤V_i≤36V,T_J=+25°C
Load Regulation	ΔV_O			480	mV	I_O=5mA~1.5A,T_J=+25°C
				240	mV	I_O=250mA~750mA,T_J=+25°C
Quiescent Current	Iq			8	mA	T_J=+25°C
Quiescent Current Change	ΔIq			1	mA	27V≤V_i≤38V
				0.5	mA	5mA≤I_O≤1.0A
Output Noise Voltage	V_N		170		μV/V_O	10Hz≤f≤100kHz,T_J=+25°C
Ripple Rejection	RR	50			dB	28V≤V_i≤38V,f=120Hz
Dropout Voltage	V_d		2		V	T_J=+25°C,I_O=1.0A
Output Resistance	R_O		28		mΩ	f=1kHz
Short Circuit Current	I_{SC}		0.15		A	V_i=35V,T_J=+25°C
Peak Current	I_{PK}		2.1		A	T_J=+25°C
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_J$		-1.5		mV/°C	I_O=5mA,-25°C≤T_J≤+125°C

Note: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 cycle is used.

PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

Typical Characteristics

Figure 1:
Dropout Voltage vs Junction Temperature

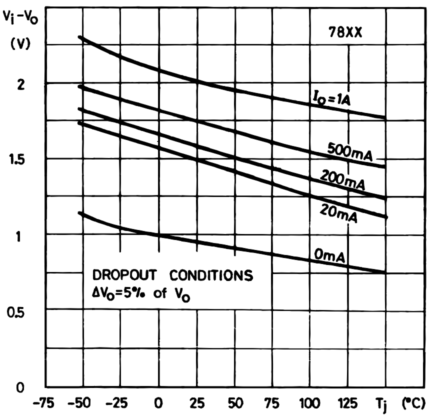


Figure 2:
Peak Output Current vs Input/output Differential Voltage

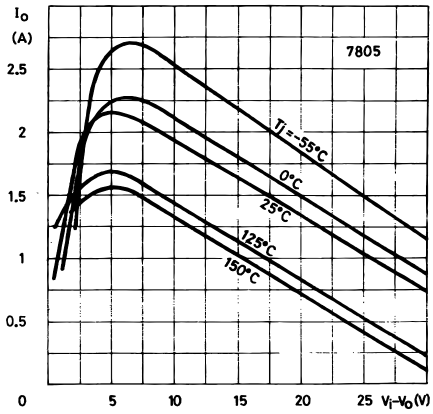


Figure 3:
Supply Voltage Rejection vs Frequency

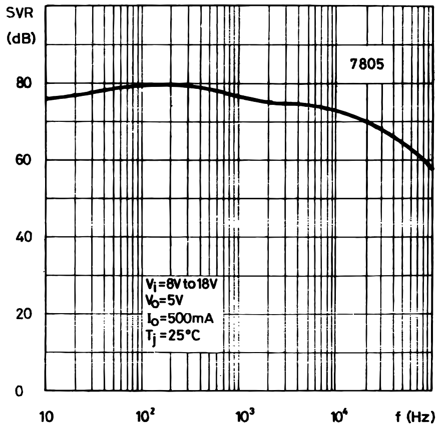


Figure 4:
Quiescent Current vs Junction Temperature

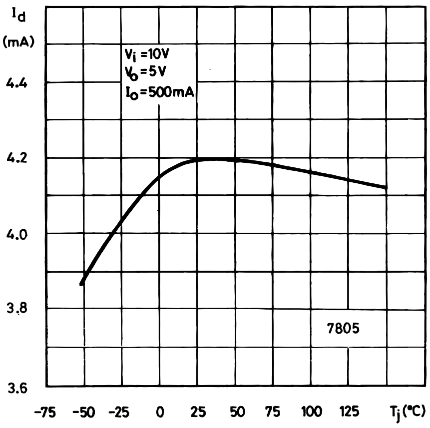


Figure 5:
Output Voltage vs Junction Temperature

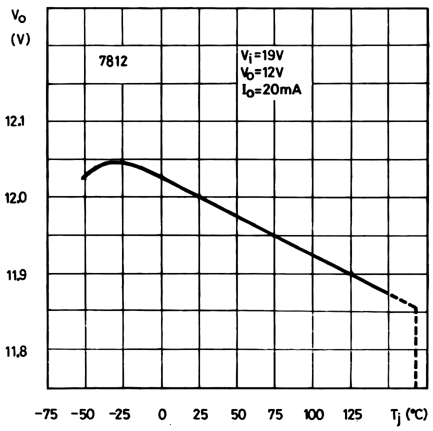


Figure 6:
Load Transient Response

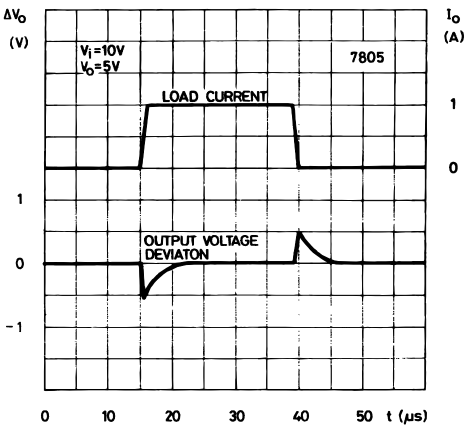


Figure 7:
Output Impedance vs Frequency

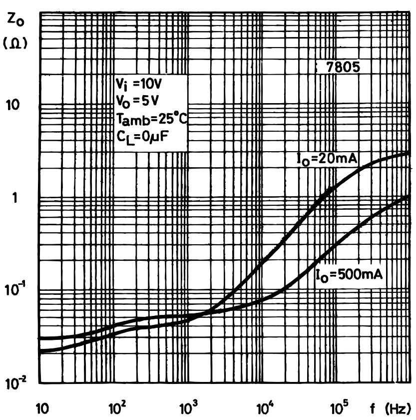


Figure 8:
Line Transient Response

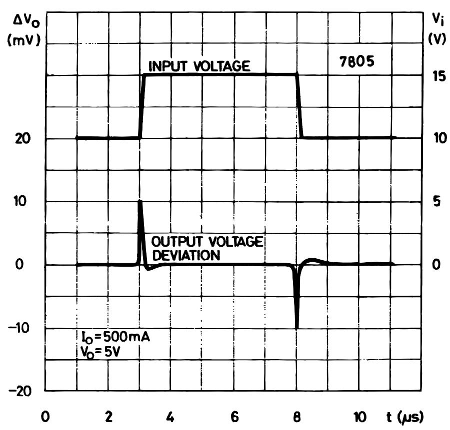
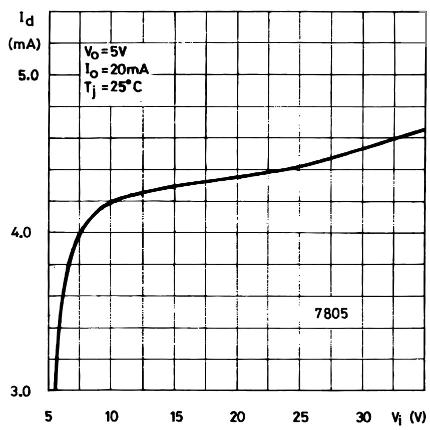
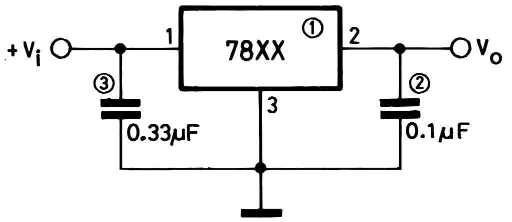


Figure 9:
Quiescent Current vs Input Voltage



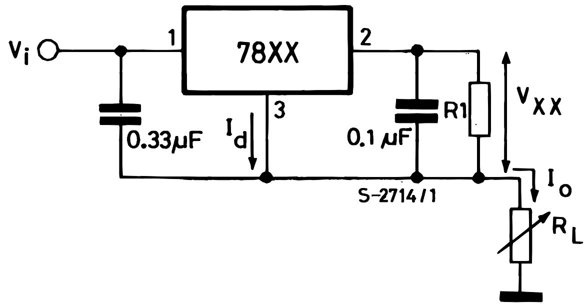
PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

Figure 10: Fixed Output Regulator



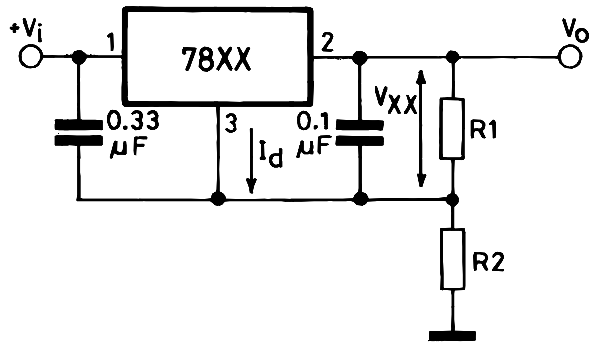
NOTE:
1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is need for stability, it does improve transient response.
3. Required if regulator is locate an appreciable distance from power supply filter.

Figure 11: Current Regulator



$$I_O = \frac{V_{xx}}{R_1} + I_d$$

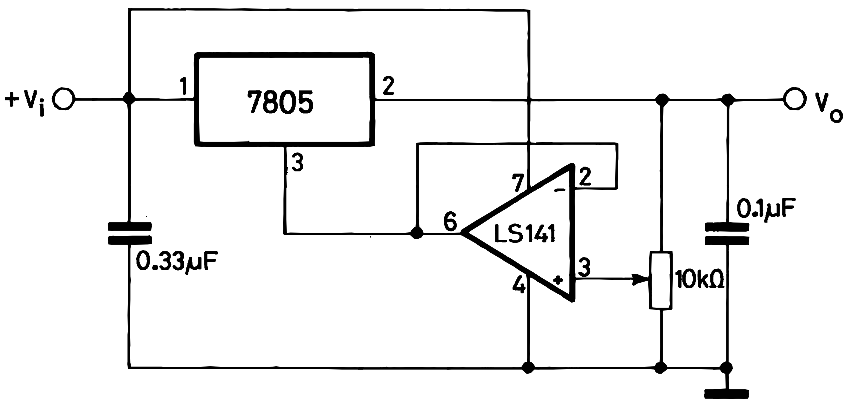
Figure 12: Circuit for Increasing Output Voltage



$I_{R1} \geq 5\ Id$

$$V_O = V_{XX}\left(1+\frac{R_2}{R_1}\right) + I_d R_2$$

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



PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

Figure 14: 0.5 to 10V Regulator

$$V_O = V_{xx}\frac{R_4}{R_1}$$

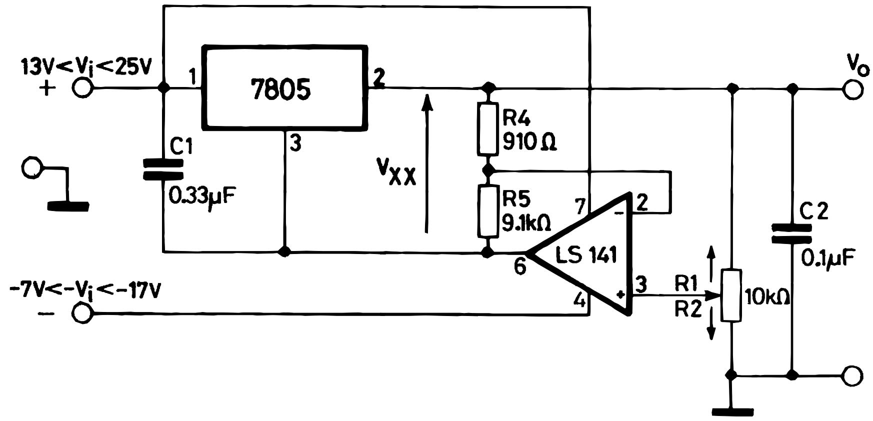


Figure 15: High Current Voltage Regulator

$$R_1 = \frac{V_{BEQ1}}{I_{REQ} - \frac{I_{Q1}}{\beta_{Q1}}}$$

$$I_O = I_{REG} + Q_1 (I_{REG} - \frac{V_{BEQ1}}{R_1})$$

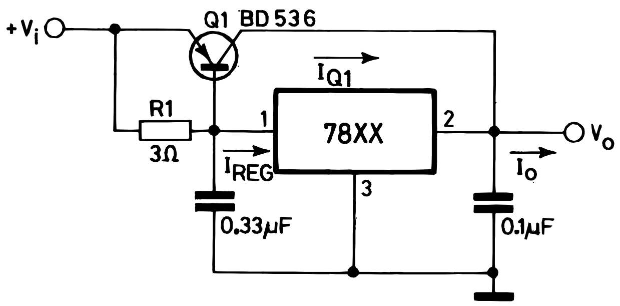


Figure 16: High Output Current with Short Circuit Protection

$$R_{SC} = \frac{V_{BEQ2}}{I_{SC}}$$

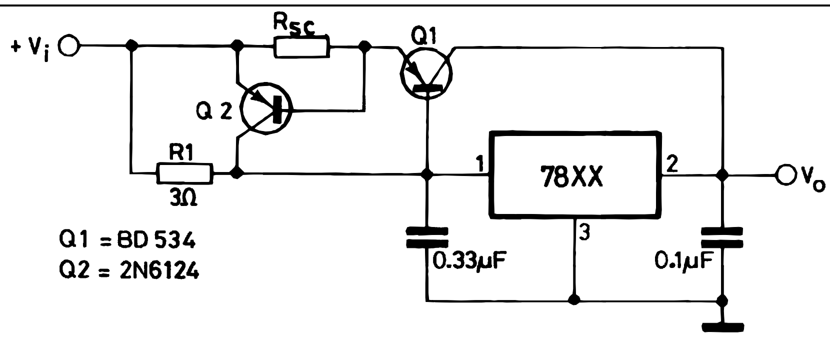


Figure 17: Tracking Voltage Regulator

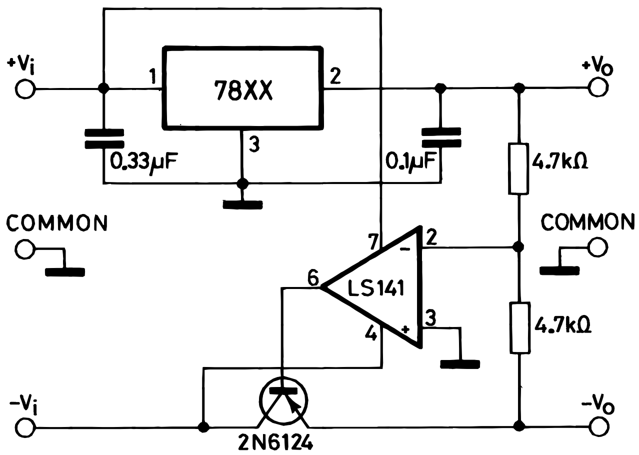
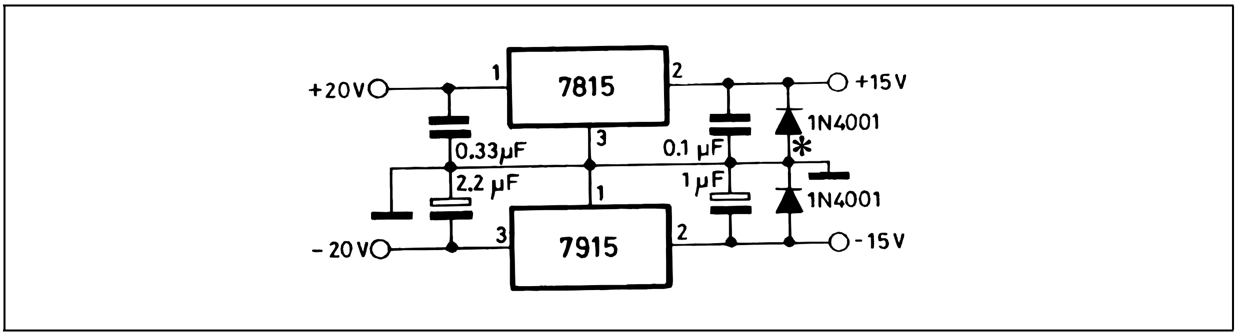


Figure 18: Split Power Supply (± 15V - 1 A)



* Against potential latch-up problems.

Figure 19: Negative Output Voltage Circuit

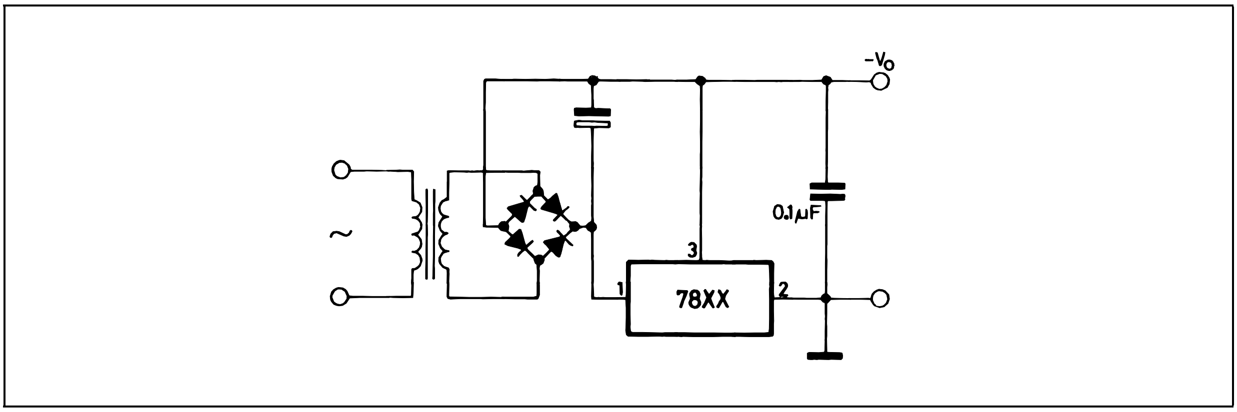


Figure 20: Switching Regulator

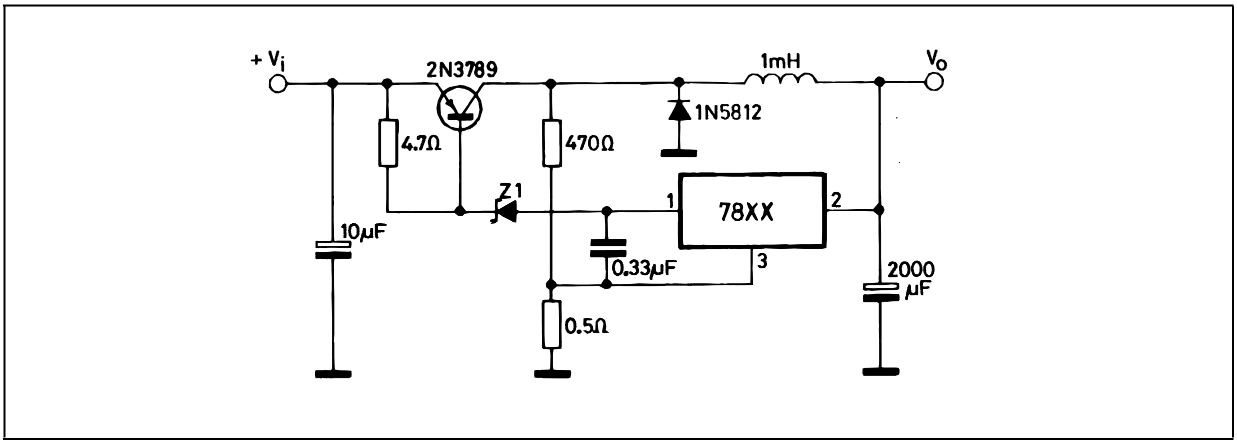


Figure 21: High Input Voltage Circuit

$V_{IN} = V_I - (V_Z + V_{BE})$

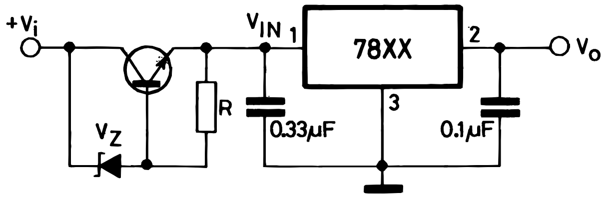


Figure 22: High Input Voltage Circuit

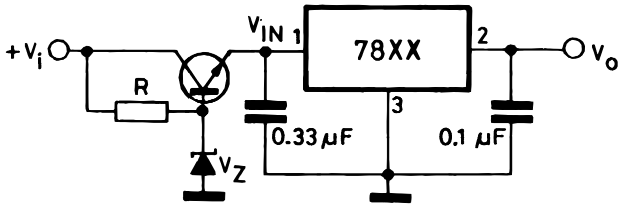


Figure 23: High Output Voltage Regulator

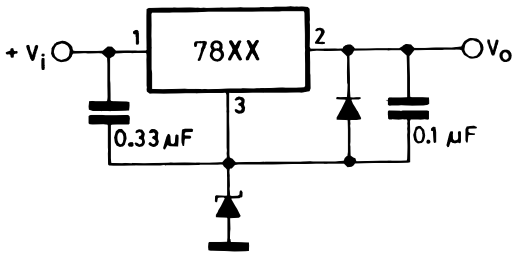


Figure 24: High Input and Output Voltage

$V_O = V_{XX} + V_{Z1}$

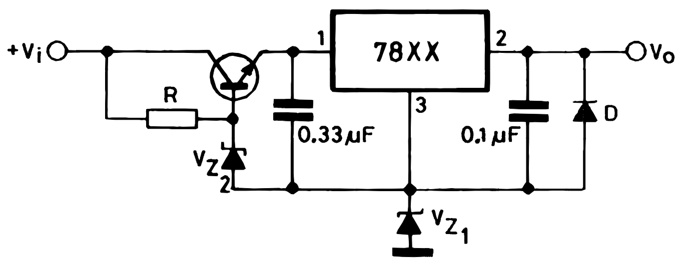


Figure 25: Reducing Power Dissipation with Dropping Resistor

$$R = \frac{V_{I(min)} - V_{XX} - V_{DROP(max)}}{I_{O(max)} + I_{d(max)}}$$

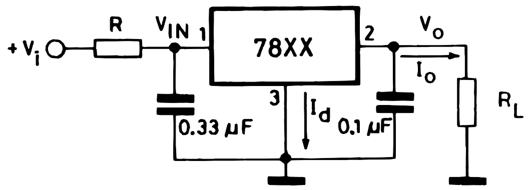


Figure 26: Remote Shutdown

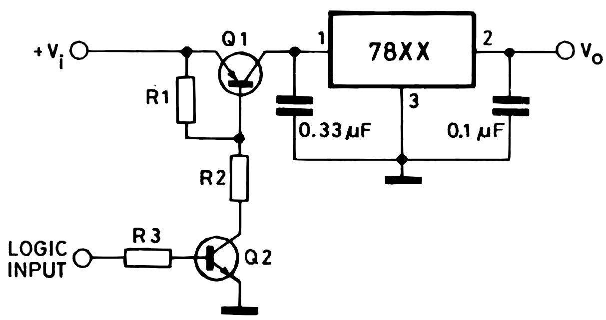
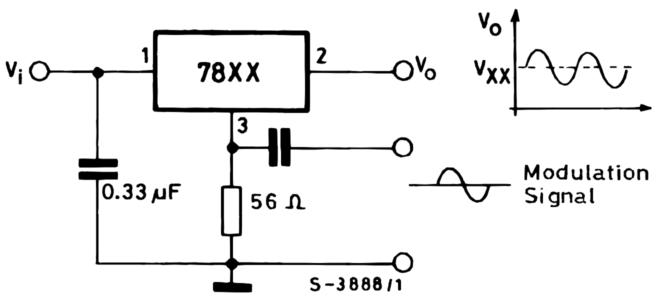
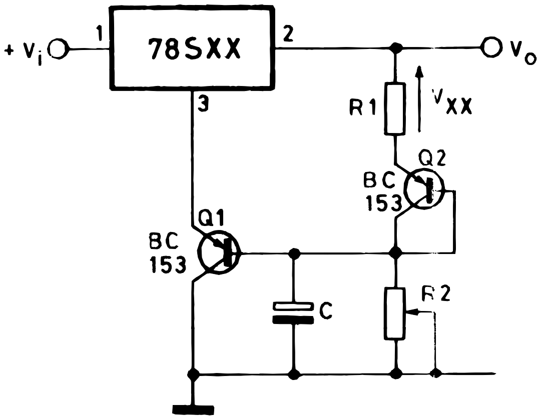


Figure 27: Power AM Modulator (unity voltage gain, $I_O \leq 0.5$)



NOTE: The circuit performs well up to 100 KHz.

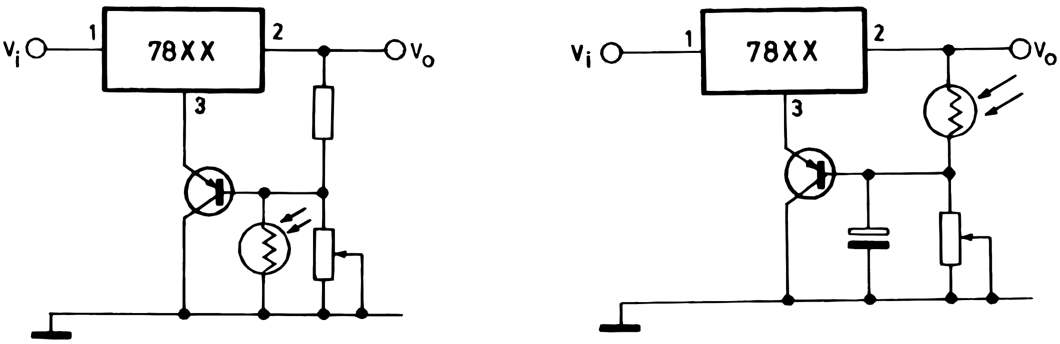
Figure 28: Adjustable Output Voltage with Temperature Compensation



$$V_O = V_{XX}\left(1+\frac{R_2}{R_1}\right) + V_{BE}$$

NOTE: Q_2 is connected as a diode in order to compensate the variation of the Q_1 V_{BE} with the temperature. C allows a slow rise time of the V_O.

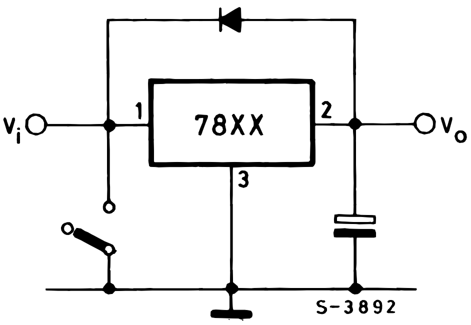
Figure 29: Light Controllers ($V_{Omin} = V_{XX} + V_{BE}$)



V_O falls when the light goes up

V_O rises when the light goes up

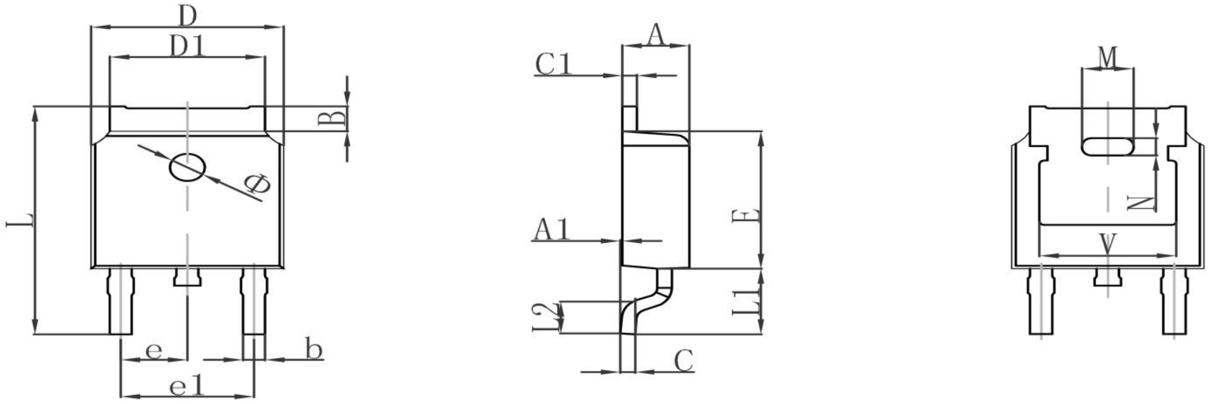
Figure 30: Protection against Input Short-Circuit with High Capacitance Loads



Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see fig. 26) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decrease slowly. The capacitance discharges by means of the Base-Emitter junction of the series pass transistor in the regulator. If the energy is sufficiently high, the transistor may be destroyed. The external diode by-passes the current from the IC to ground.

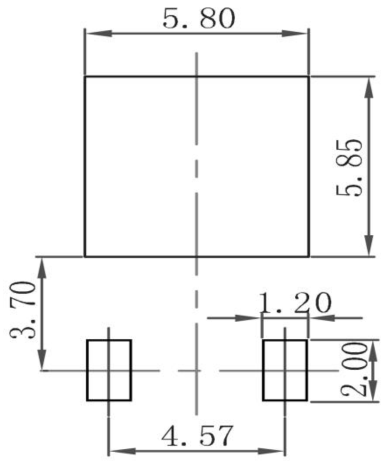
PLASTIC-ENCAPSULATE VOLTAGE REGULATORS

TO-252 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.380	0.087	0.094
A1	0.000	0.100	0.000	0.004
B	0.800	1.400	0.031	0.055
b	0.710	0.810	0.028	0.032
c	0.460	0.560	0.018	0.022
c1	0.460	0.560	0.018	0.022
D	6.500	6.700	0.256	0.264
D1	5.130	5.460	0.202	0.215
E	6.000	6.200	0.236	0.244
e	2.286TYP		0.090TYP	
e1	4.327	4.727	0.170	0.186
M	1.778REF		0.070REF	
N	0.762REF		0.018REF	
L	9.800	10.400	0.386	0.409
L1	2.9REF		0.114REF	
L2	1.400	1.700	0.055	0.067
V	4.830REF		0.190REF	
Φ	1.100	1.300	0.043	0.051

TO-252 Suggested Pad Layout



Note:

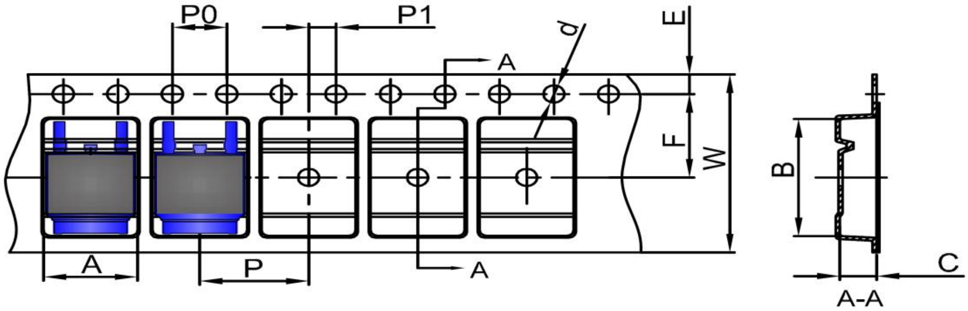
1.Controlling dimension: in millimeters

2.General tolerance: ±0.05mm

3.The pad layout is for reference purposes only

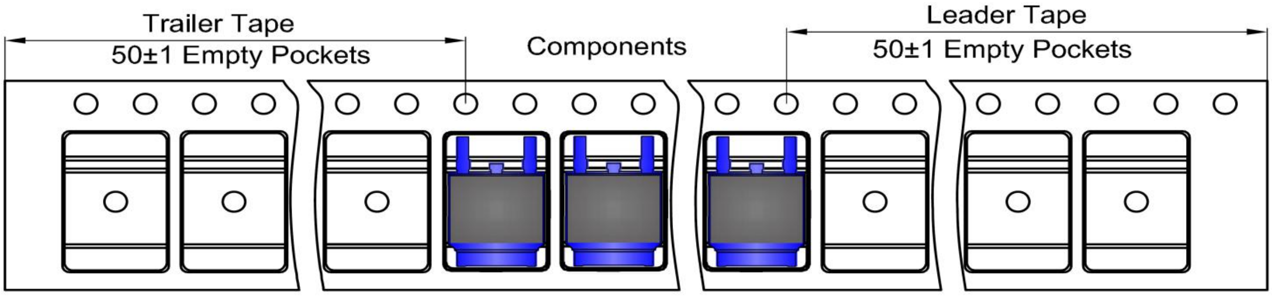
TO-252 Tape and Reel

TO-252 Embossed Carrier Tape

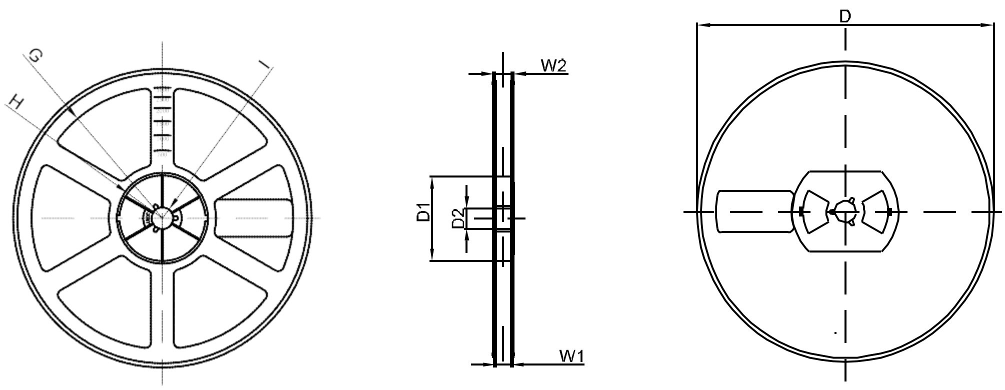


	DIMENSIONS ARE IN MILLIMETER									
TYPE	A	B	C	d	E	F	P0	P	P1	W
TO-252	6.90	10.50	2.70	Ø1.55	1.75	7.50	4.00	8.00	2.00	16.00
TOLERANCE	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1

TO-252 Tape Leader and Trailer



TO-252 Reel



	DIMENSIONS ARE IN MILLIMETER							
REEL OPTION	D	D1	D2	G	H	I	W1	W2
13" DIA	Ø330.00	100.00	Φ21.00	R151.00	R56.00	R6.50	16.40	21.00
TOLERANCE	±2	±1	±1	±1	±1	±1	±1	±1