

# 1.0 A Positive Voltage Regulators

These voltage regulators are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area compensation. With adequate heatsinking they can deliver output currents in excess of 1.0 A. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

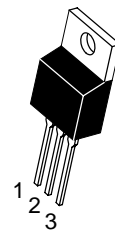
- Output Current in Excess of 1.0 A
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage Offered in 2% and 4% Tolerance
- Available in Surface Mount D<sup>2</sup>PAK, DPAK and Standard 3-Lead Transistor Packages
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes
- Pb-Free Packages are Available

**MAXIMUM RATINGS** (T<sub>A</sub> = 25°C, unless otherwise noted)

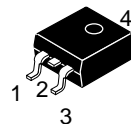
Rating	Symbol	Value			Unit
Input Voltage (5.0 – 18 V)	V <sub>I</sub>	35			Vdc
Power Dissipation	P <sub>D</sub>	Internally Limited			W
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	92	65	Figure 14	°C/W
Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	5.0	5.0	5.0	°C/W
Storage Junction Temperature Range	T <sub>stg</sub>	-65 to +150			°C
Operating Junction Temperature	T <sub>J</sub>	+150			°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

NOTE: ESD data available upon request.

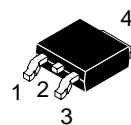


TO-220



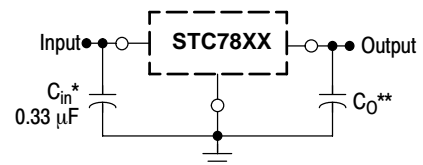
Pin 1. Input  
2. Ground  
3. Output  
**D<sup>2</sup>PAK**

Heatsink surface (shown as terminal 4 in case outline drawing) is connected to Pin 2.



**DPAK**

**STANDARD APPLICATION**



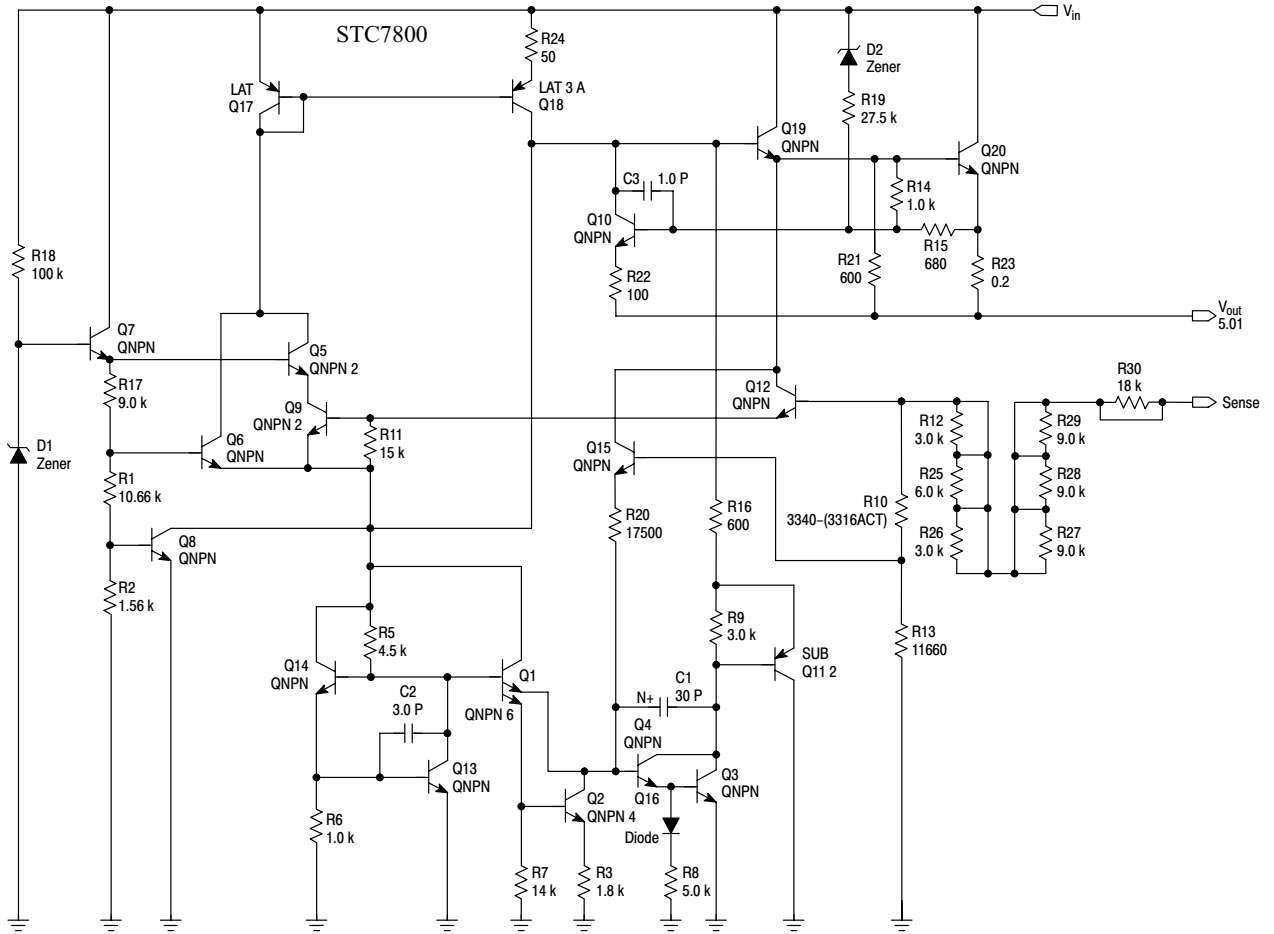
A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

XX, These two digits of the type number indicate nominal voltage.

\* C<sub>in</sub> is required if regulator is located an appreciable distance from power supply filter.

\*\* C<sub>O</sub> is not needed for stability; however, it does improve transient response. Values of less than 0.1 μF could cause instability.

# STC7800 Series



This device contains 22 active transistors.

**Figure 1. Representative Schematic Diagram**

## STC7800 Series

### ELECTRICAL CHARACTERISTICS ( $V_{in} = 10\text{ V}$ , $I_O = 1.0\text{ A}$ , $T_J = T_{low}$ to $T_{high}$ (Note 1), unless otherwise noted)

Characteristic	Symbol	STC7805			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = 25^\circ\text{C}$ )	$V_O$	4.9	5.0	5.1	Vdc
Output Voltage ( $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P_D \leq 15\text{ W}$ ) $7.5\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$	$V_O$	4.8	5.0	5.2	Vdc
Line Regulation (Note 2) $7.5\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ , $I_O = 500\text{ mA}$ $8.0\text{ Vdc} \leq V_{in} \leq 12\text{ Vdc}$ , $I_O = 1.0\text{ A}$ $8.0\text{ Vdc} \leq V_{in} \leq 12\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ $7.3\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$	$Reg_{line}$	–	0.5 0.8 1.3 4.5	10 12 4.0 10	mV
Load Regulation (Note 2) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	$Reg_{load}$	–	1.3 0.8 0.53	25 25 15	mV
Quiescent Current	$I_B$	–	3.2	6.0	mA
Quiescent Current Change $8.0\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ , $I_O = 500\text{ mA}$ $7.5\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	$\Delta I_B$	–	0.3 – 0.08	0.8 0.8 0.5	mA
Ripple Rejection $8.0\text{ Vdc} \leq V_{in} \leq 18\text{ Vdc}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$	RR	68	83	–	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ )	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ( $T_A = 25^\circ\text{C}$ ) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	$V_n$	–	10	–	$\mu\text{V}/V_O$
Output Resistance ( $f = 1.0\text{ kHz}$ )	$r_O$	–	0.9	–	$\text{m}\Omega$
Short Circuit Current Limit ( $T_A = 25^\circ\text{C}$ ) $V_{in} = 35\text{ Vdc}$	$I_{SC}$	–	0.2	–	A
Peak Output Current ( $T_J = 25^\circ\text{C}$ )	$I_{max}$	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	$TCV_O$	–	–0.3	–	$\text{mV}/^\circ\text{C}$

1.  $T_{low} = 0^\circ\text{C}$  for STC7800 Series       $T_{high} = +125^\circ\text{C}$  for STC7800 Series

2. 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.

## STC7800 Series

### ELECTRICAL CHARACTERISTICS ( $V_{in} = 11\text{ V}$ , $I_O = 1.0\text{ A}$ , $T_J = T_{low}$ to $T_{high}$ (Note 3), unless otherwise noted)

Characteristic	Symbol	STC7806			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = 25^\circ\text{C}$ )	$V_O$	5.88	6.0	6.12	Vdc
Output Voltage ( $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P_D \leq 15\text{ W}$ ) $8.6\text{ Vdc} \leq V_{in} \leq 21\text{ Vdc}$	$V_O$	5.76	6.0	6.24	Vdc
Line Regulation (Note 4) $8.6\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ , $I_O = 500\text{ mA}$ $9.0\text{ Vdc} \leq V_{in} \leq 13\text{ Vdc}$ , $I_O = 1.0\text{ A}$	$Reg_{line}$	–	5.0	12	mV
Load Regulation (Note 4) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	$Reg_{load}$	–	1.3	25	mV
Quiescent Current	$I_B$	–	3.3	6.0	mA
Quiescent Current Change $9.0\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ , $I_O = 500\text{ mA}$ $9.0\text{ Vdc} \leq V_{in} \leq 21\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	$\Delta I_B$	–	–	0.8	mA
Ripple Rejection $9.0\text{ Vdc} \leq V_{in} \leq 19\text{ Vdc}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$	RR	58	65	–	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ )	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ( $T_A = 25^\circ\text{C}$ ) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	$V_n$	–	10	–	$\mu\text{V}/V_O$
Output Resistance ( $f = 1.0\text{ kHz}$ )	$r_O$	–	0.9	–	$\text{m}\Omega$
Short Circuit Current Limit ( $T_A = 25^\circ\text{C}$ ) $V_{in} = 35\text{ Vdc}$	$I_{SC}$	–	0.2	–	A
Peak Output Current ( $T_J = 25^\circ\text{C}$ )	$I_{max}$	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	$TCV_O$	–	–0.3	–	$\text{mV}/^\circ\text{C}$

3.  $T_{low} = 0^\circ\text{C}$  for STC7800 Series       $T_{high} = +125^\circ\text{C}$  for STC7800 Series

4. 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.

## STC7800 Series

### ELECTRICAL CHARACTERISTICS ( $V_{in} = 14\text{ V}$ , $I_O = 1.0\text{ A}$ , $T_J = T_{low}$ to $T_{high}$ (Note 5), unless otherwise noted)

Characteristic	Symbol	STC7808			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = 25^\circ\text{C}$ )	$V_O$	7.84	8.0	8.16	Vdc
Output Voltage ( $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P_D \leq 15\text{ W}$ ) $10.6\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$	$V_O$	7.7	8.0	8.3	Vdc
Line Regulation (Note 6) $10.6\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ , $I_O = 500\text{ mA}$ $11\text{ Vdc} \leq V_{in} \leq 17\text{ Vdc}$ , $I_O = 1.0\text{ A}$ $10.4\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$ , $T_J = 25^\circ\text{C}$	$Reg_{line}$	–	6.0	15	mV
Load Regulation (Note 6) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	$Reg_{load}$	–	1.4	25	mV
Quiescent Current	$I_B$	–	3.3	6.0	mA
Quiescent Current Change $11\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ , $I_O = 500\text{ mA}$ $10.6\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	$\Delta I_B$	–	–	0.8	mA
Ripple Rejection $11.5\text{ Vdc} \leq V_{in} \leq 21.5\text{ Vdc}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$	RR	56	62	–	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ )	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ( $T_A = 25^\circ\text{C}$ ) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	$V_n$	–	10	–	$\mu\text{V}/V_O$
Output Resistance $f = 1.0\text{ kHz}$	$r_O$	–	0.9	–	$\text{m}\Omega$
Short Circuit Current Limit ( $T_A = 25^\circ\text{C}$ ) $V_{in} = 35\text{ Vdc}$	$I_{SC}$	–	0.2	–	A
Peak Output Current ( $T_J = 25^\circ\text{C}$ )	$I_{max}$	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	$TCV_O$	–	–0.4	–	$\text{mV}/^\circ\text{C}$

5.  $T_{low} = 0^\circ\text{C}$  for STC7800 Series       $T_{high} = +125^\circ\text{C}$  for STC7800 Series

6. 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.

## STC7800 Series

### ELECTRICAL CHARACTERISTICS ( $V_{in} = 19\text{ V}$ , $I_O = 1.0\text{ A}$ , $T_J = T_{low}$ to $T_{high}$ (Note 7), unless otherwise noted)

Characteristic	Symbol	STC7812			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = 25^\circ\text{C}$ )	$V_O$	11.75	12	12.25	Vdc
Output Voltage ( $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P_D \leq 15\text{ W}$ ) $14.8\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$	$V_O$	11.5	12	12.5	Vdc
Line Regulation (Note 8) $14.8\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 500\text{ mA}$ $16\text{ Vdc} \leq V_{in} \leq 22\text{ Vdc}$ , $I_O = 1.0\text{ A}$ $14.5\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$ , $T_J = 25^\circ\text{C}$	$Reg_{line}$	–	3.8	18	mV
Load Regulation (Note 8) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	$Reg_{load}$	–	–	25	mV
Quiescent Current	$I_B$	–	3.4	6.0	mA
Quiescent Current Change $15\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 500\text{ mA}$ $14.8\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$	$\Delta I_B$	–	–	0.8	mA
Ripple Rejection $15\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$	RR	55	60	–	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ )	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ( $T_A = 25^\circ\text{C}$ ) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	$V_n$	–	10	–	$\mu\text{V}/V_O$
Output Resistance ( $f = 1.0\text{ kHz}$ )	$r_O$	–	1.1	–	$\text{m}\Omega$
Short Circuit Current Limit ( $T_A = 25^\circ\text{C}$ ) $V_{in} = 35\text{ Vdc}$	$I_{SC}$	–	0.2	–	A
Peak Output Current ( $T_J = 25^\circ\text{C}$ )	$I_{max}$	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	$TCV_O$	–	–0.8	–	$\text{mV}/^\circ\text{C}$

7.  $T_{low} = 0^\circ\text{C}$  for STC7800 Series       $T_{high} = +125^\circ\text{C}$  for STC7800 Series

8. 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.

## STC7800 Series

### ELECTRICAL CHARACTERISTICS ( $V_{in} = 23\text{ V}$ , $I_O = 1.0\text{ A}$ , $T_J = T_{low}$ to $T_{high}$ (Note 9), unless otherwise noted)

Characteristic	Symbol	MC78MC7815			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = 25^\circ\text{C}$ )	$V_O$	14.7	15	15.3	Vdc
Output Voltage ( $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P_D \leq 15\text{ W}$ ) $17.9\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$	$V_O$	14.4	15	15.6	Vdc
Line Regulation (Note 10) $17.9\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 500\text{ mA}$ $20\text{ Vdc} \leq V_{in} \leq 26\text{ Vdc}$ $17.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$	$Reg_{line}$	–	8.5	20	mV
Load Regulation (Note 10) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	$Reg_{load}$	–	1.8	25	mV
Quiescent Current	$I_B$	–	3.5	6.0	mA
Quiescent Current Change $17.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 500\text{ mA}$ $17.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	$\Delta I_B$	–	–	0.8	mA
Ripple Rejection $18.5\text{ Vdc} \leq V_{in} \leq 28.5\text{ Vdc}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$	RR	60	80	–	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ )	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ( $T_A = 25^\circ\text{C}$ ) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	$V_n$	–	10	–	$\mu\text{V}/V_O$
Output Resistance $f = 1.0\text{ kHz}$	$r_O$	–	1.2	–	$\text{m}\Omega$
Short Circuit Current Limit ( $T_A = 25^\circ\text{C}$ ) $V_{in} = 35\text{ Vdc}$	$I_{SC}$	–	0.2	–	A
Peak Output Current ( $T_J = 25^\circ\text{C}$ )	$I_{max}$	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	$TCV_O$	–	–1.0	–	$\text{mV}/^\circ\text{C}$

9.  $T_{low} = 0^\circ\text{C}$  for STC7800 Series       $T_{high} = +125^\circ\text{C}$  for STC7800 Series

10. 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.

## STC7800 Series

### ELECTRICAL CHARACTERISTICS ( $V_{in} = 27\text{ V}$ , $I_O = 1.0\text{ A}$ , $T_J = T_{low}$ to $T_{high}$ (Note 11), unless otherwise noted)

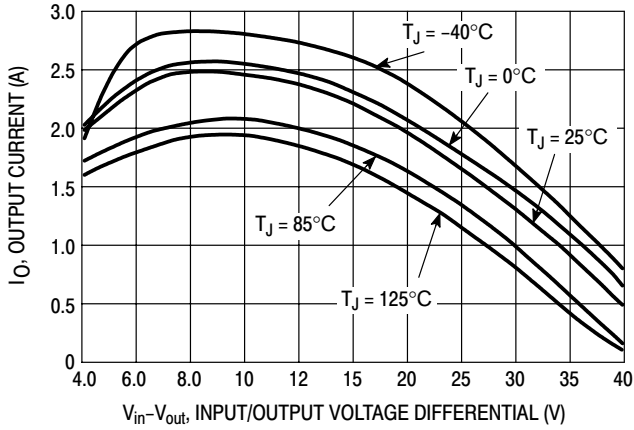
Characteristic	Symbol	STC7818			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = 25^\circ\text{C}$ )	$V_O$	17.64	18	18.36	Vdc
Output Voltage ( $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P_D \leq 15\text{ W}$ ) $21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$	$V_O$	17.3	18	18.7	Vdc
Line Regulation (Note 12) $21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$ , $I_O = 500\text{ mA}$ $24\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 1.0\text{ A}$ $24\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ $20.6\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$ , $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$	$Reg_{line}$	–	9.5	22	mV
Load Regulation (Note 12) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	$Reg_{load}$	–	2.0	25	mV
Quiescent Current	$I_B$	–	3.5	6.0	mA
Quiescent Current Change $21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$ , $I_O = 500\text{ mA}$ $21.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$ , $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	$\Delta I_B$	–	–	0.8	mA
Ripple Rejection $22\text{ Vdc} \leq V_{in} \leq 32\text{ Vdc}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$	RR	53	57	–	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = 25^\circ\text{C}$ )	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ( $T_A = 25^\circ\text{C}$ ) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	$V_n$	–	10	–	$\mu\text{V}/V_O$
Output Resistance $f = 1.0\text{ kHz}$	$r_O$	–	1.3	–	$\text{m}\Omega$
Short Circuit Current Limit ( $T_A = 25^\circ\text{C}$ ) $V_{in} = 35\text{ Vdc}$	$I_{SC}$	–	0.2	–	A
Peak Output Current ( $T_J = 25^\circ\text{C}$ )	$I_{max}$	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	$TCV_O$	–	–1.5	–	$\text{mV}/^\circ\text{C}$

11.  $T_{low} = 0^\circ\text{C}$  for STC7800 Series       $T_{high} = +125^\circ\text{C}$  for STC7800 Series

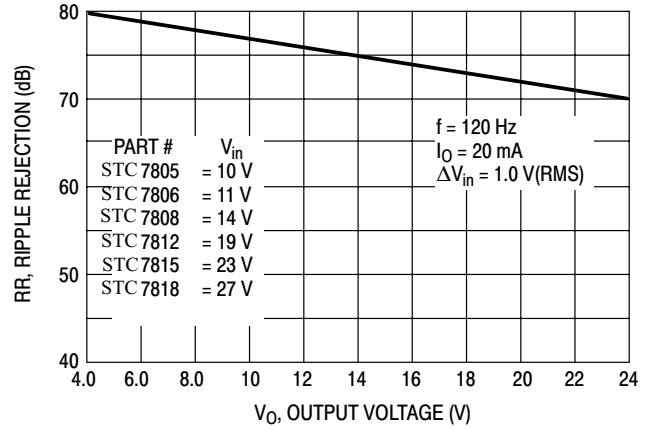
12. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.



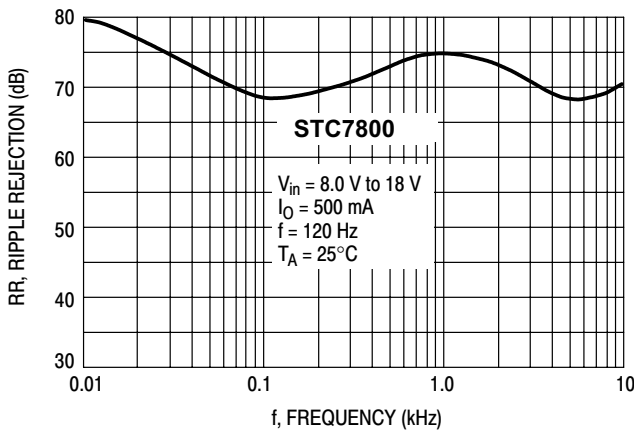
## STC7800 Series



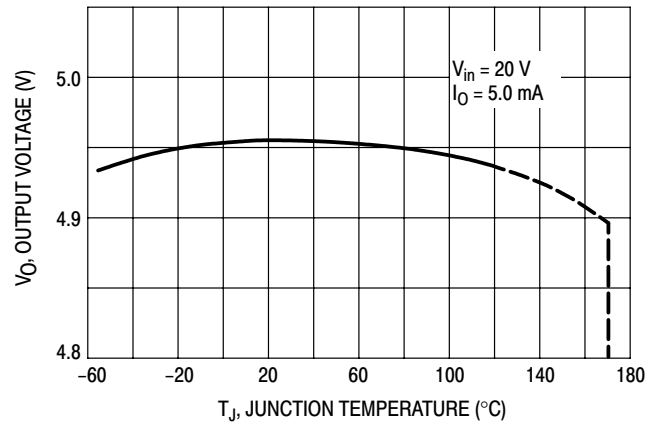
**Figure 2. Peak Output Current as a Function of Input/Output Differential Voltage**



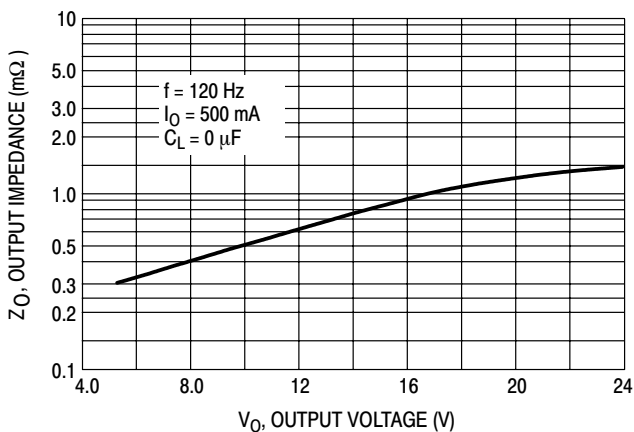
**Figure 3. Ripple Rejection as a Function of Output Voltages**



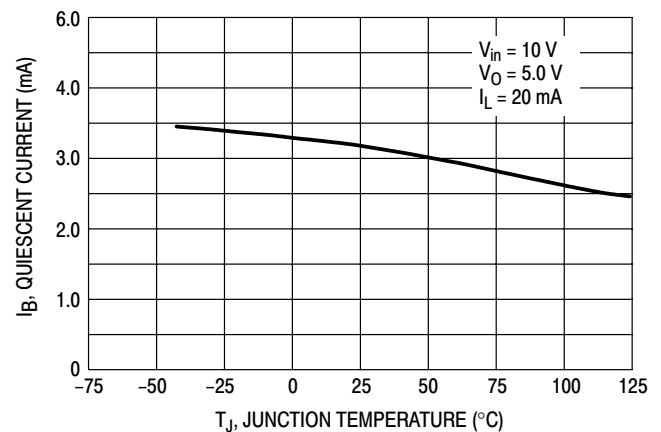
**Figure 4. Ripple Rejection as a Function of Frequency**



**Figure 5. Output Voltage as a Function of Junction Temperature (STC7805)**



**Figure 6. Output Impedance as a Function of Output Voltage**



**Figure 7. Quiescent Current as a Function of Temperature**

# STC7800 Series

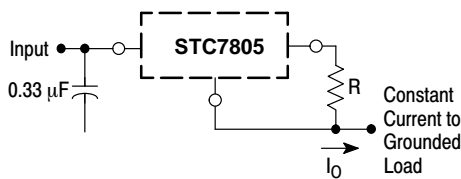
## APPLICATIONS INFORMATION

### Design Considerations

The STC7800 Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, Internal Short Circuit Protection that limits the maximum current the circuit will pass, and Output Transistor Safe-Area Compensation that reduces the output short circuit current as the voltage across the pass transistor is increased.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long

wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A 0.33  $\mu\text{F}$  or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.



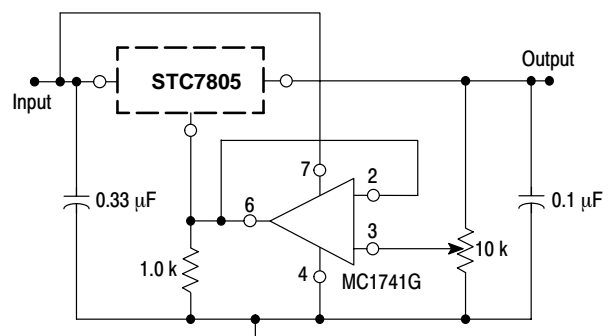
The STC7800 regulators can also be used as a current source when connected as above. In order to minimize dissipation the STC7800 is chosen in this application. Resistor R determines the current as follows:

$$I_O = \frac{5.0\text{V}}{R} + I_B$$

$$I_B \cong 3.2\text{ mA over line and load changes.}$$

For example, a 1.0 A current source would require R to be a 5.0  $\Omega$ , 10 W resistor and the output voltage compliance would be the input voltage less 7.0 V.

Figure 8. Current Regulator

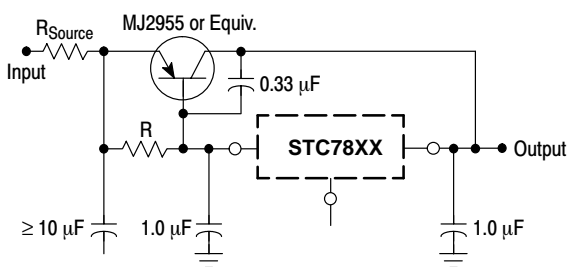


$$V_O = 7.0\text{ V to }20\text{ V}$$

$$V_{IN} = V_O \geq 2.0\text{ V}$$

The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtainable with this arrangement is 2.0 V greater than the regulator voltage.

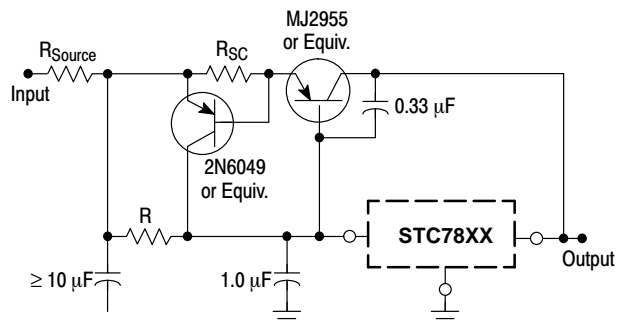
Figure 9. Adjustable Output Regulator



XX = 2 digits of type number indicating voltage.

The STC7800 series can be current boosted with a PNP transistor. The MJ2955 provides current to 5.0 A. Resistor R in conjunction with the  $V_{BE}$  of the PNP determines when the pass transistor begins conducting; this circuit is not short circuit proof. Input/output differential voltage minimum is increased by  $V_{BE}$  of the pass transistor.

Figure 10. Current Boost Regulator

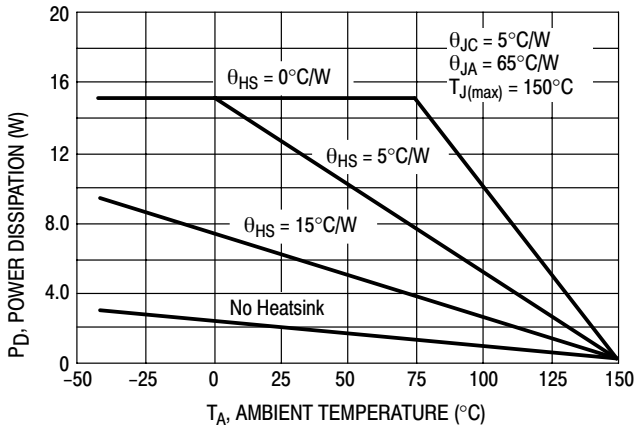


XX = 2 digits of type number indicating voltage.

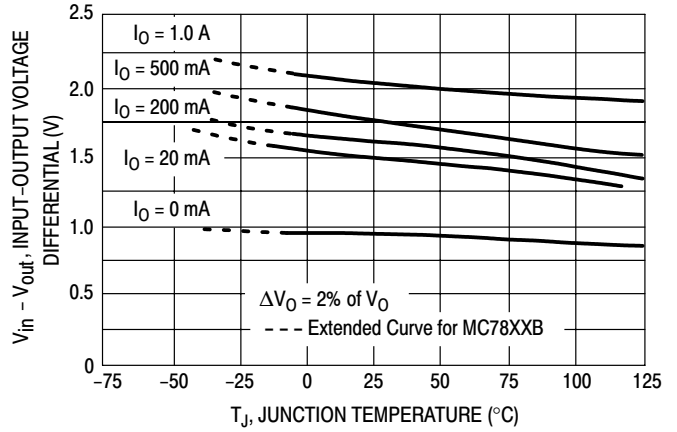
The circuit of Figure 10 can be modified to provide supply protection against short circuits by adding a short circuit sense resistor,  $R_{SC}$ , and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three-terminal regulator. Therefore, a four-ampere plastic power transistor is specified.

Figure 11. Short Circuit Protection

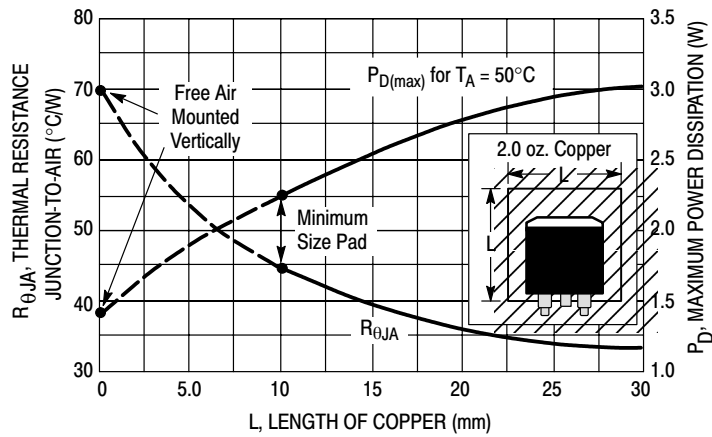
## STC7800 Series



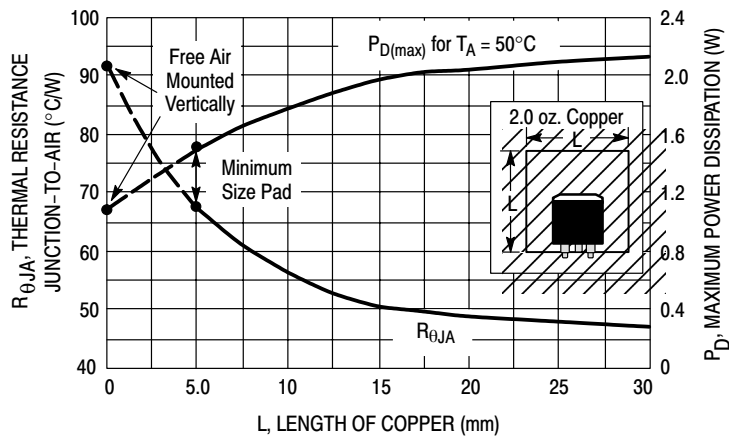
**Figure 12. Worst Case Power Dissipation versus Ambient Temperature**



**Figure 13. Input Output Differential as a Function of Junction Temperature**



**Figure 14. D<sup>2</sup>PAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length**



**Figure 15. DPAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length**