ON Semiconductor®

SCD7800, SCD7800A

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.

Features

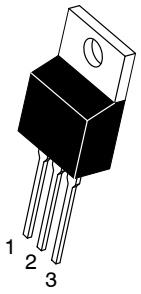
- Output Current in Excess of 1.0 A
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe−Area Compensation
- Output Voltage Offered in 2% and 4% Tolerance
- Pb−Free Packages are Available

MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted)

Rating	Symbol	Value	Unit
Input Voltage (5.0 – 18 V) (24 V)	V_I	35 40	Vdc
Power Dissipation	P_D	Internally Limited	W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	65	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	5.0	°C/W
Storage Junction Temperature Range	T_{stg}	−65 to +150	°C
Operating Junction Temperature	T_J	+150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015.
Machine Model Method 200 V.

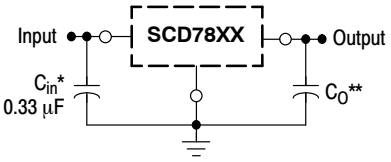


Pin 1. Input
2. Ground
3. Output

TO−220−3
T SUFFIX
CASE 221AB

Heatsink surface connected to Pin 2.

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_{in} is required if regulator is located an appreciable distance from power supply filter.

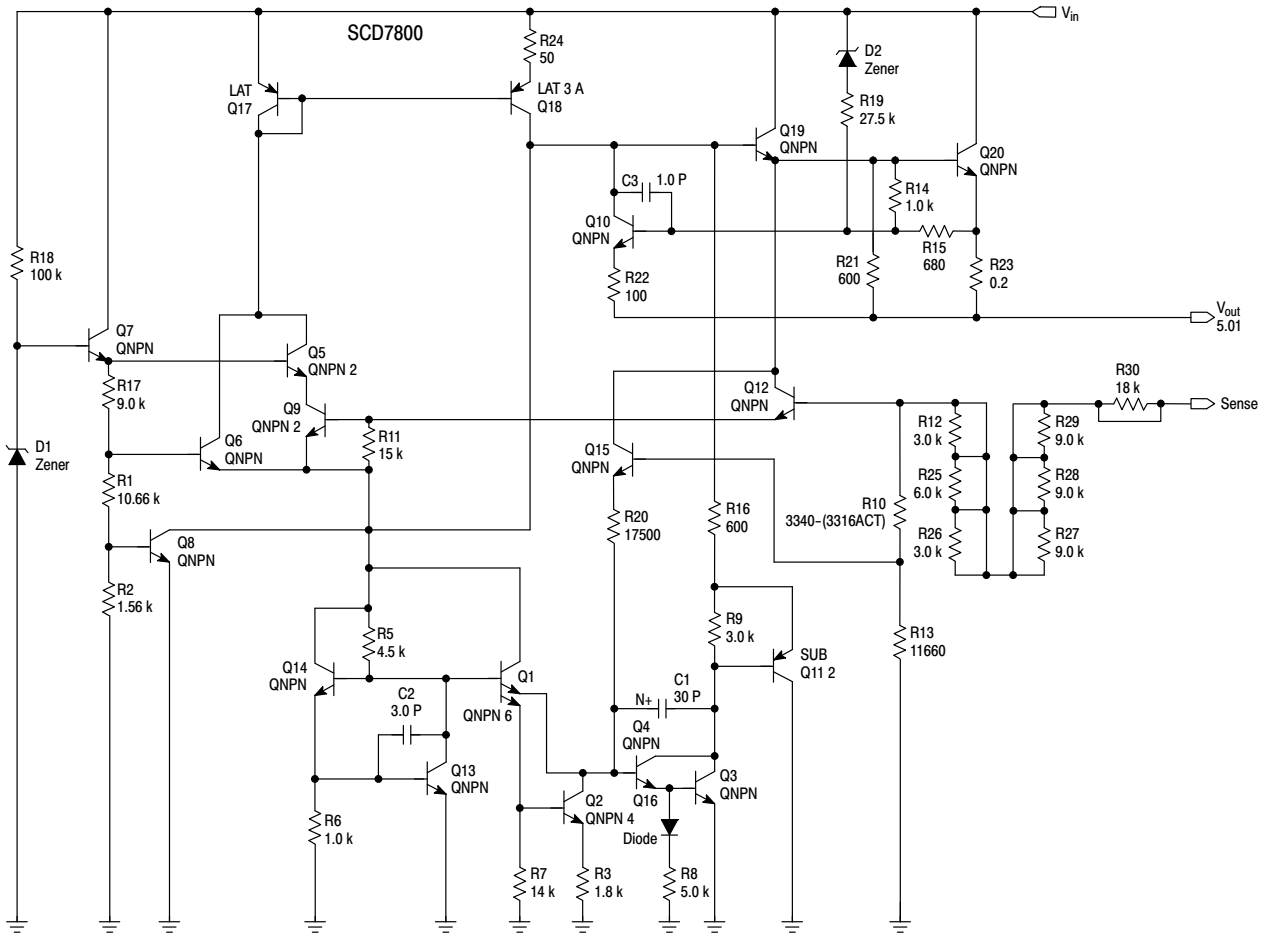
** C_O is not needed for stability; however, it does improve transient response. Values of less than 0.1 μF could cause instability.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 18 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 19 of this data sheet.



This device contains 22 active transistors.

Figure 1. Representative Schematic Diagram

ELECTRICAL CHARACTERISTICS (V_{in} = 10 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 1), unless otherwise noted)

Characteristic	Symbol	SCD7805B			SCD7805C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	4.8	5.0	5.2	4.8	5.0	5.2	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 7.0 Vdc ≤ V_{in} ≤ 20 Vdc 8.0 Vdc ≤ V_{in} ≤ 20 Vdc	V_O	 – 4.75	 – 5.0	 – 5.25	 4.75 –	 5.0 –	 5.25 –	Vdc
Line Regulation (Note 4) 7.5 Vdc ≤ V_{in} ≤ 20 Vdc, 1.0 A 8.0 Vdc ≤ V_{in} ≤ 12 Vdc	Reg_{line}	 – –	5.0 1.3	100 50	– –	0.5 0.8	20 10	mV
Load Regulation (Note 4) 5.0 mA ≤ I_O ≤ 1.0 A 5.0 mA ≤ I_O ≤ 1.5 A (T_A = 25°C)	Reg_{load}	 – –	 1.3 0.15	 100 50	 – –	 1.3 1.3	 25 25	mV
Quiescent Current	I_B	–	3.2	8.0	–	3.2	6.5	mA
Quiescent Current Change 7.0 Vdc ≤ V_{in} ≤ 25 Vdc 5.0 mA ≤ I_O ≤ 1.0 A (T_A = 25°C)	ΔI_B	 – –	 – –	 – 0.5	 – –	 0.3 0.08	 1.0 0.8	mA
Ripple Rejection 8.0 Vdc ≤ V_{in} ≤ 18 Vdc, f = 120 Hz	RR	–	68	–	62	83	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	V_n	–	10	–	–	10	–	μV/V_O
Output Resistance f = 1.0 kHz	r_O	–	0.9	–	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	–	0.2	–	–	0.6	–	A
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.3	–	–	−0.3	–	mV/°C

1. T_{low} = 0°C for SCD78XXAC, C, T_{high} = +125°C for SCD78XXAC
   = −40°C for SCD78XXB, SCD78XXAB
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.

ELECTRICAL CHARACTERISTICS (V_{in} = 10 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 3), unless otherwise noted)

Characteristic	Symbol	SCD7805AB/SCD7805AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	4.9	5.0	5.1	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 7.5 Vdc ≤ V_{in} ≤ 20 Vdc	V_O	4.8	5.0	5.2	Vdc
Line Regulation (Note 4)	Reg_{line}				mV
7.5 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA		–	0.5	10	
8.0 Vdc ≤ V_{in} ≤ 12 Vdc, I_O = 1.0 A		–	0.8	12	
8.0 Vdc ≤ V_{in} ≤ 12 Vdc, I_O = 1.0 A, T_J = 25°C		–	1.3	4.0	
7.3 Vdc ≤ V_{in} ≤ 20 Vdc, I_O = 1.0 A, T_J = 25°C		–	4.5	10	
Load Regulation (Note 4)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		–	1.3	25	
5.0 mA ≤ I_O ≤ 1.0 A		–	0.8	25	
250 mA ≤ I_O ≤ 750 mA		–	0.53	15	
Quiescent Current	I_B	–	3.2	6.0	mA
Quiescent Current Change	ΔI_B				mA
8.0 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA		–	0.3	0.8	
7.5 Vdc ≤ V_{in} ≤ 20 Vdc, T_J = 25°C		–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		–	0.08	0.5	
Ripple Rejection 8.0 Vdc ≤ V_{in} ≤ 18 Vdc, f = 120 Hz, I_O = 500 mA	RR	68	83	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	V_n	–	10	–	$\mu V/V_O$
Output Resistance (f = 1.0 kHz)	r_O	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	–	0.2	–	A
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.3	–	mV/°C

3. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
   = −40°C for SCD78XXB, SCD78XXAB
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.

ELECTRICAL CHARACTERISTICS (V_{in} = 11 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 5), unless otherwise noted)

Characteristic	Symbol	SCD7806B			SCD7806C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	5.75	6.0	6.25	5.75	6.0	6.25	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
8.0 Vdc ≤ V_{in} ≤ 21 Vdc		–	–	–	5.7	6.0	6.3	
9.0 Vdc ≤ V_{in} ≤ 21 Vdc		5.7	6.0	6.3	–	–	–	
Line Regulation, T_J = 25°C (Note 6)	Reg_{line}							mV
8.0 Vdc ≤ V_{in} ≤ 25 Vdc		–	5.5	120	–	0.5	24	
9.0 Vdc ≤ V_{in} ≤ 13 Vdc		–	1.4	60	–	0.8	12	
Load Regulation, T_J = 25°C (Note 6)	Reg_{load}	–	1.3	120	–	1.3	30	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current (T_J = 25°C)	I_B	–	3.3	8.0	–	3.3	8.0	mA
Quiescent Current Change	ΔI_B							mA
8.0 Vdc ≤ V_{in} ≤ 25 Vdc		–	–	–	–	0.3	1.3	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	0.08	0.5	
Ripple Rejection	RR	–	65	–	58	65	–	dB
9.0 Vdc ≤ V_{in} ≤ 19 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	0.9	–	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.3	–	–	−0.3	–	mV/°C

5. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC
   = −40°C for SCD78XXB, SCD78XXAB
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.

ELECTRICAL CHARACTERISTICS (V_{in} = 14 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 7), unless otherwise noted)

Characteristic	Symbol	SCD7808B			SCD7808C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	7.7	8.0	8.3	7.7	8.0	8.3	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
10.5 Vdc ≤ V_{in} ≤ 23 Vdc		–	–	–	7.6	8.0	8.4	
11.5 Vdc ≤ V_{in} ≤ 23 Vdc		7.6	8.0	8.4	–	–	–	
Line Regulation, T_J = 25°C, (Note 8)	Reg_{line}							mV
10.5 Vdc ≤ V_{in} ≤ 25 Vdc		–	6.0	160	–	6.0	32	
11 Vdc ≤ V_{in} ≤ 17 Vdc		–	1.7	80	–	1.7	16	
Load Regulation, T_J = 25°C (Note 8)	Reg_{load}	–	1.4	160	–	1.4	35	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.3	8.0	–	3.3	8.0	mA
Quiescent Current Change	ΔI_B							mA
10.5 Vdc ≤ V_{in} ≤ 25 Vdc		–	–	–	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	62	–	56	62	–	dB
11.5 Vdc ≤ V_{in} ≤ 18 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	0.9	–	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.4	–	–	–0.4	–	mV/°C

7. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
   = −40°C for SCD78XXB, SCD78XXAB
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.

ELECTRICAL CHARACTERISTICS (V_{in} = 15 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 9), unless otherwise noted)

Characteristic	Symbol	SCD7809B			SCD7809C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	8.65	9.0	9.35	8.65	9.0	9.35	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
11.5 Vdc ≤ V_{in} ≤ 24 Vdc		8.55	9.0	9.45	8.55	9.0	9.45	
Line Regulation, T_J = 25°C (Note 10)	Reg_{line}							mV
11 Vdc ≤ V_{in} ≤ 26 Vdc		–	6.2	32	–	6.2	32	
11.5 Vdc ≤ V_{in} ≤ 17 Vdc		–	1.8	16	–	1.8	16	
Load Regulation, T_J = 25°C (Note 10)	Reg_{load}	–	1.5	35	–	1.5	35	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.4	8.0	–	3.4	8.0	mA
Quiescent Current Change	ΔI_B							mA
11.5 Vdc ≤ V_{in} ≤ 26 Vdc		–	–	1.0	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	56	61	–	56	61	–	dB
11.5 Vdc ≤ V_{in} ≤ 21.5 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.0	–	–	1.0	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.5	–	–	–0.5	–	mV/°C

9. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
   = −40°C for SCD78XXB, SCD78XXAB
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.

ELECTRICAL CHARACTERISTICS (V_{in} = 15 V, I_O = 1.0 A, T_J = 0°C to 125°C, unless otherwise noted)

Characteristic	Symbol	SCD7809AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	8.82	9.0	9.18	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 11.5 Vdc ≤ V_{in} ≤ 24 Vdc	V_O	8.65	9.0	9.35	Vdc
Line Regulation (Note 11)	Reg_{line}				mV
11.5 Vdc ≤ V_{in} ≤ 26 Vdc, I_O = 500 mA		–	6.2	16	
12 Vdc ≤ V_{in} ≤ 17 Vdc, I_O = 1.0 A		–	1.8	7.0	
11.5 Vdc ≤ V_{in} ≤ 24 Vdc, T_J = 25°C		–	5.2	16	
Load Regulation (Note 11)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		–	–	25	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	25	
250 mA ≤ I_O ≤ 750 mA		–	–	15	
Quiescent Current	I_B	–	3.3	6.0	mA
Quiescent Current Change	ΔI_B				mA
11.5 Vdc ≤ V_{in} ≤ 26 Vdc, I_O = 500 mA		–	–	0.8	
11.5 Vdc ≤ V_{in} ≤ 24 Vdc, I_O = 1.0 A, T_J = 25°C		–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	
Ripple Rejection 11.5 Vdc ≤ V_{in} ≤ 21.5 Vdc, f = 120 Hz, I_O = 500 mA	RR	56	61	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	V_I _ V_O		2.0		Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	Vn	–	10	–	μV/V_O
Output Resistance f = 1.0 kHz	r_O	–	1.0	–	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	–	0.2		A
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.5	–	mV/°C

11. 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 (V_{in} = 19 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 12), unless otherwise noted)

Characteristic	Symbol	SCD7812B			SCD7812C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	11.5	12	12.5	11.5	12	12.5	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
14.5 Vdc ≤ V_{in} ≤ 27 Vdc		–	–	–	11.4	12	12.6	
15.5 Vdc ≤ V_{in} ≤ 27 Vdc		11.4	12	12.6	–	–	–	
Line Regulation, T_J = 25°C (Note 13)	Reg_{line}							mV
14.5 Vdc ≤ V_{in} ≤ 30 Vdc		–	7.5	240	–	3.8	24	
16 Vdc ≤ V_{in} ≤ 22 Vdc		–	2.2	120	–	0.3	24	
14.8 Vdc ≤ V_{in} ≤ 27 Vdc, I_O = 1.0 A		–	–	–	–	–	48	
Load Regulation, T_J = 25°C (Note 13)	Reg_{load}	–	1.6	240	–	8.1	60	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.4	8.0	–	3.4	6.5	mA
Quiescent Current Change	ΔI_B							mA
14.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		–	–	–	–	–	0.7	
15 Vdc ≤ V_{in} ≤ 30 Vdc		–	–	1.0	–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	60	–	55	60	–	dB
15 Vdc ≤ V_{in} ≤ 25 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.1	–	–	1.1	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.8	–	–	−0.8	–	mV/°C

12. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
= −40°C for SCD78XXB, SCD78XXAB
13. 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 (V_{in} = 19 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 14), unless otherwise noted)

Characteristic	Symbol	SCD7812AB/SCD7812AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	11.75	12	12.25	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O	11.5	12	12.5	Vdc
14.8 Vdc ≤ V_{in} ≤ 27 Vdc					
Line Regulation (Note 15)	Reg_{line}				mV
14.8 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		–	3.8	18	
16 Vdc ≤ V_{in} ≤ 22 Vdc, I_O = 1.0 A		–	2.2	20	
14.5 Vdc ≤ V_{in} ≤ 27 Vdc, T_J = 25°C		–	6.0	120	
Load Regulation (Note 15)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		–	–	25	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	25	
Quiescent Current	I_B	–	3.4	6.0	mA
Quiescent Current Change	ΔI_B				mA
15 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		–	–	0.8	
14.8 Vdc ≤ V_{in} ≤ 27 Vdc, T_J = 25°C		–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A, T_J = 25°C		–	–	0.5	
Ripple Rejection	RR	55	60	–	dB
15 Vdc ≤ V_{in} ≤ 25 Vdc, f = 120 Hz, I_O = 500 mA					
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz					
Output Resistance (f = 1.0 kHz)	r_O	–	1.1	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	A
V_{in} = 35 Vdc					
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.8	–	mV/°C

14. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
= −40°C for SCD78XXB, SCD78XXAB
15. 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 (V_{in} = 23 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 16), unless otherwise noted)

Characteristic	Symbol	SCD7815B			SCD7815C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	14.4	15	15.6	14.4	15	15.6	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
17.5 Vdc ≤ V_{in} ≤ 30 Vdc		–	–	–	14.25	15	15.75	
18.5 Vdc ≤ V_{in} ≤ 30 Vdc		14.25	15	15.75	–	–	–	
Line Regulation, T_J = 25°C (Note 17)	Reg_{line}							mV
17.9 Vdc ≤ V_{in} ≤ 30 Vdc		–	8.5	300	–	8.5	30	
20 Vdc ≤ V_{in} ≤ 26 Vdc		–	3.0	150	–	3.0	28	
Load Regulation, T_J = 25°C (Note 17)	Reg_{load}	–	1.8	300	–	1.8	55	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.5	8.0	–	3.5	6.5	mA
Quiescent Current Change	ΔI_B							mA
17.5 Vdc ≤ V_{in} ≤ 30 Vdc		–	–	–	–	–	0.8	
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		–	–	1.0	–	–	0.7	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	58	–	54	58	–	dB
18.5 Vdc ≤ V_{in} ≤ 28.5 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.2	–	–	1.2	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–1.0	–	–	–1.0	–	mV/°C

16. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
= −40°C for SCD78XXB, SCD78XXAB
17. 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 (V_{in} = 23 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 18), unless otherwise noted)

Characteristic	Symbol	SCD7815AB/SCD7815AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	14.7	15	15.3	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O	14.4	15	15.6	Vdc
17.9 Vdc ≤ V_{in} ≤ 30 Vdc					
Line Regulation (Note 19)	Reg_{line}				mV
17.9 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		–	8.5	20	
20 Vdc ≤ V_{in} ≤ 26 Vdc		–	3.0	22	
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		–	7.0	20	
Load Regulation (Note 19)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		–	1.8	25	
5.0 mA ≤ I_O ≤ 1.0 A		–	1.5	25	
250 mA ≤ I_O ≤ 750 mA		–	1.2	15	
Quiescent Current	I_B	–	3.5	6.0	mA
Quiescent Current Change	ΔI_B				mA
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		–	–	0.8	
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	
Ripple Rejection	RR	60	80	–	dB
18.5 Vdc ≤ V_{in} ≤ 28.5 Vdc, f = 120 Hz, I_O = 500 mA					
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz					
Output Resistance f = 1.0 kHz	r_O	–	1.2	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	A
V_{in} = 35 Vdc					
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–1.0	–	mV/°C

18. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
= −40°C for SCD78XXB, SCD78XXAB
19. 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 (V_{in} = 27 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 20), unless otherwise noted)

Characteristic	Symbol	SCD7818B			SCD7818C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	17.3	18	18.7	17.3	18	18.7	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
21 Vdc ≤ V_{in} ≤ 33 Vdc		–	–	–	17.1	18	18.9	
22 Vdc ≤ V_{in} ≤ 33 Vdc		17.1	18	18.9	–	–	–	
Line Regulation, (Note 21)	Reg_{line}							mV
21 Vdc ≤ V_{in} ≤ 33 Vdc		–	9.5	360	–	9.5	50	
24 Vdc ≤ V_{in} ≤ 30 Vdc		–	3.2	180	–	3.2	25	
Load Regulation, (Note 21)	Reg_{load}	–	2.0	360	–	2.0	55	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.5	8.0	–	3.5	6.5	mA
Quiescent Current Change	ΔI_B							mA
21 Vdc ≤ V_{in} ≤ 33 Vdc		–	–	–	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	57	–	53	57	–	dB
22 Vdc ≤ V_{in} ≤ 33 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_{il} - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.3	–	–	1.3	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−1.5	–	–	−1.5	–	mV/°C

20. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
= −40°C for SCD78XXB, SCD78XXAB

21. 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 (V_{in} = 33 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 22), unless otherwise noted)

Characteristic	Symbol	SCD7824B			SCD7824C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	23	24	25	23	24	25	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
27 Vdc ≤ V_{in} ≤ 38 Vdc		–	–	–	22.8	24	25.2	
28 Vdc ≤ V_{in} ≤ 38 Vdc		22.8	24	25.2	–	–	–	
Line Regulation, (Note 23)	Reg_{line}							mV
27 Vdc ≤ V_{in} ≤ 38 Vdc		–	11.5	480	–	2.7	60	
30 Vdc ≤ V_{in} ≤ 36 Vdc		–	3.8	240	–	2.7	48	
Load Regulation, (Note 23)	Reg_{load}	–	2.1	480	–	4.4	65	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.6	8.0	–	3.6	6.5	mA
Quiescent Current Change	ΔI_B							mA
27 Vdc ≤ V_{in} ≤ 38 Vdc		–	–	–	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	54	–	50	54	–	dB
28 Vdc ≤ V_{in} ≤ 38 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.4	–	–	1.4	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–2.0	–	–	–2.0	–	mV/°C

22. T_{low} = 0°C for SCD78XXAC, C T_{high} = +125°C for SCD78XXAC, C
= −40°C for SCD78XXB, SCD78XXAB
23. 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.

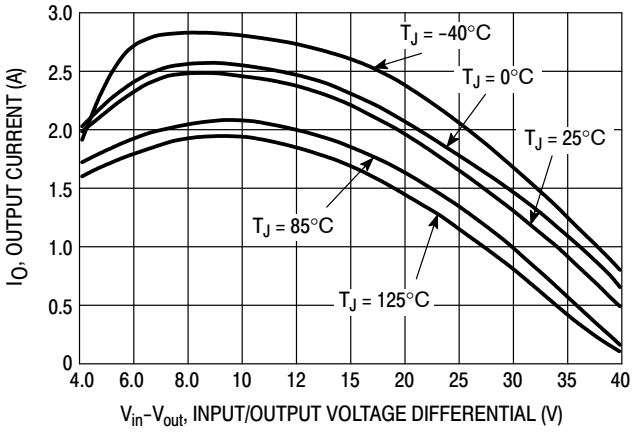


Figure 2. Peak Output Current as a Function of Input/Output Differential Voltage (SCD78XXC, AC, B)

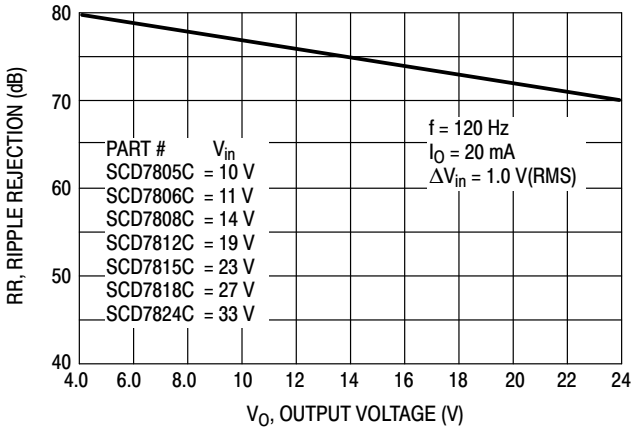


Figure 3. Ripple Rejection as a Function of Output Voltages (SCD78XXC, AC, B)

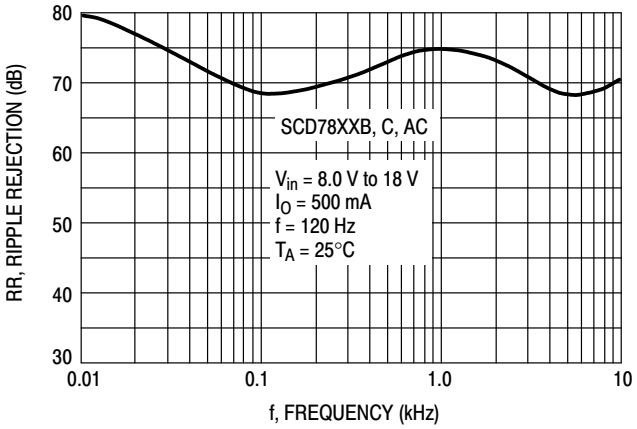


Figure 4. Ripple Rejection as a Function of Frequency (SCD78XXC, AC, B)

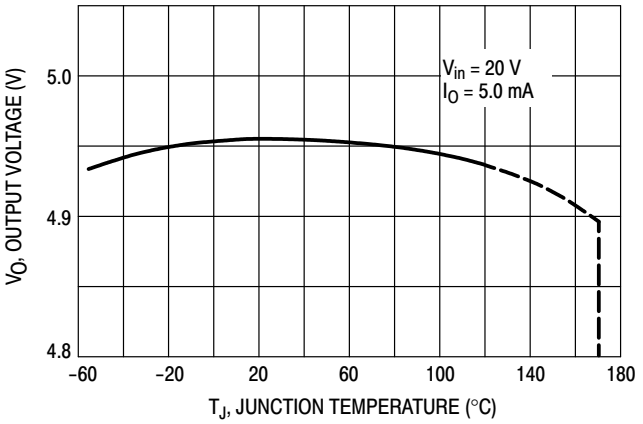


Figure 5. Output Voltage as a Function of Junction Temperature (SCD7805C, AC, B)

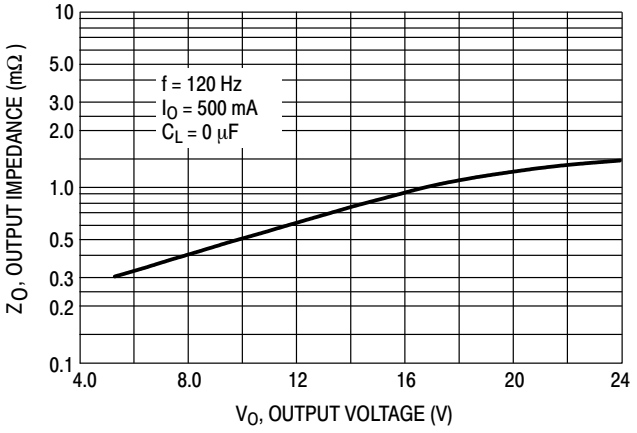


Figure 6. Output Impedance as a Function of Output Voltage (SCD78XXC, AC, B)

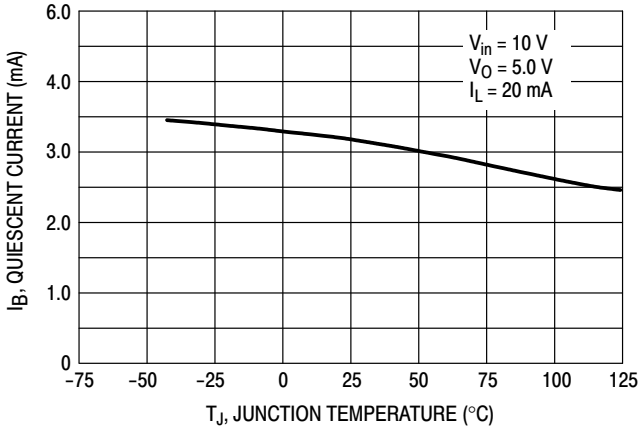


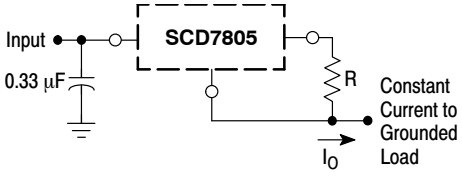
Figure 7. Quiescent Current as a Function of Temperature (SCD78XXC, AC, B)

APPLICATIONS INFORMATION

Design Considerations

The SCD7800 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 μF 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.



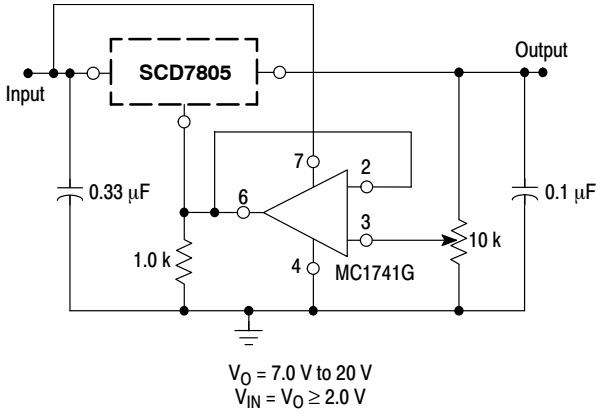
The SCD7800 regulators can also be used as a current source when connected as above. In order to minimize dissipation the SCD7805C is chosen in this application. Resistor R determines the current as follows:

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

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

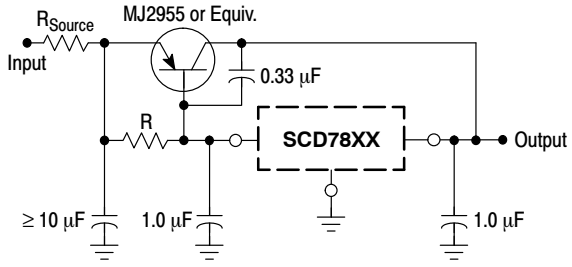
For example, a 1.0 A current source would require R to be a 5.0 Ω, 10 W resistor and the output voltage compliance would be the input voltage less 7.0 V.

Figure 8. Current Regulator



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.

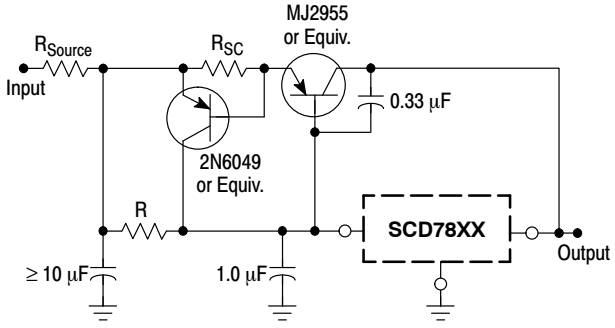
Figure 9. Adjustable Output Regulator



XX = 2 digits of type number indicating voltage.

The SCD7800 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

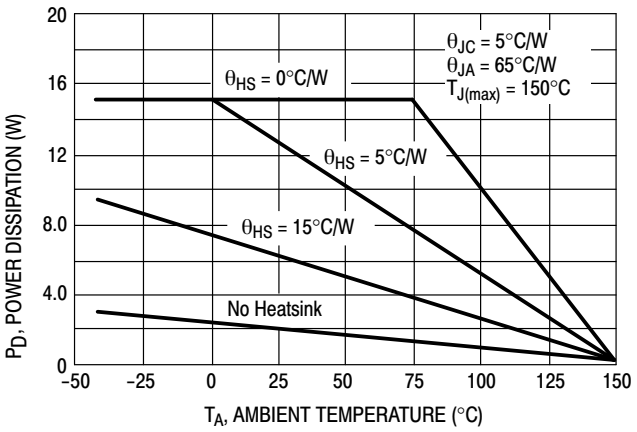


Figure 12. Worst Case Power Dissipation versus Ambient Temperature (Case 221A)

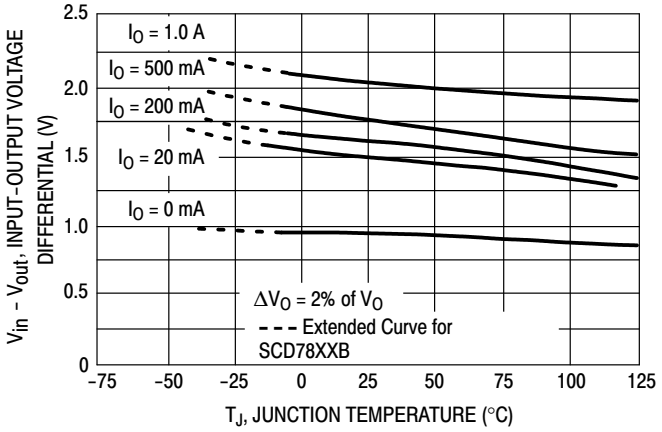


Figure 13. Input Output Differential as a Function of Junction Temperature (SCD78XXC, AC, B)

DEFINITIONS

Line Regulation – The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

Load Regulation – The change in output voltage for a change in load current at constant chip temperature.

Maximum Power Dissipation – The maximum total device dissipation for which the regulator will operate within specifications.

Quiescent Current – That part of the input current that is not delivered to the load.

Output Noise Voltage – The rms ac voltage at the output, with constant load and no input ripple, measured over a specified frequency range.

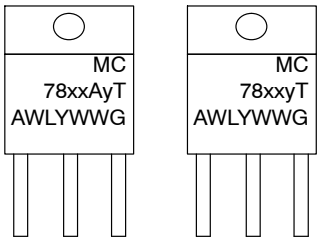
Long Term Stability – Output voltage stability under accelerated life test conditions with the maximum rated voltage listed in the devices' electrical characteristics and maximum power dissipation.

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
SCD7805ACTG	5.0 V	T = 0°C to +125°C	TO 220 (Pb−free)	50 Units /Rail
SCD7805BTG		T = −40°C to +125°C		
SCD7805CTG		T = 0°C to +125°C		
SCD7806CTG	6.0 V	T = 0°C to +125°C		
SCD7808CTG	8.0 V	T = 0°C to +125°C		
SCD7809ACTG	9.0 V	T = 0°C to +125°C		
SCD7809BTG		T = −40°C to +125°C		
SCD7809CTG		T = 0°C to +125°C		
SCD7812ACTG	12 V	T = 0°C to +125°C		
SCD7812BTG		T = −40°C to +125°C		
SCD7812CTG		T = 0°C to +125°C		
SCD7815ACTG	15 V	T = 0°C to +125°C		
SCD7815BTG		T = −40°C to +125°C		
SCD7815CTG		T = 0°C to +125°C		
SCD7818BTG	18 V	T = −40°C to +125°C		
SCD7824BTG	24 V	T = −40°C to +125°C		
SCD7824CTG		T = 0°C to +125°C		

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MARKING DIAGRAMS

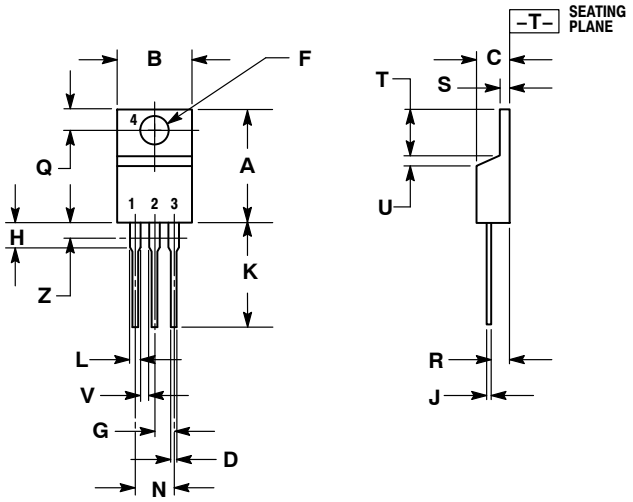


TO−220−3
T SUFFIX
CASE 221AB

xx	= 05, 06, 08, 09, 12, 15, 18, or 24
y	= B or C
A	= Assembly Location
WL	= Wafer Lot
Y	= Year
WW	= Work Week
G	= Pb−Free Device

PACKAGE DIMENSIONS

TO−220, SINGLE GAUGE
CASE 221AB−01
ISSUE A



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. PRODUCT SHIPPED PRIOR TO 2008 HAD DIMENSIONS S = 0.045 − 0.055 INCHES (1.143 − 1.397 MM)

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.020	0.024	0.508	0.61
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

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