

# **Connection Diagrams and Ordering Information**

Ambient Temperature	Туре	Package	Part Number	Packaging Type	Connection Diagram
			SG78xxAK-883B		
			SG7805AK-DESC		
			SG7812AK-DESC		V <sub>IN</sub>
			SG7815AK-DESC		
-55 °C to	к	3-Terminal	SG78xxAK	TO-3	
125 °C	, r	Metal Can	SG78xxK-883B	10-3	
			SG7805K-JAN		
			SG7812K-JAN		V <sub>OUT</sub> Case is Ground
			SG7815K-JAN		
			SG78xxK		
			SG78xxAT-883B		
			SG7805AT-DESC		
			SG7812AT-DESC		Vout
			SG7815AT-DESC		
-55 °C to	т	3-Pin Metal Can	SG78xxAT	TO 20	
125 °C		3-Pin Metal Can	SG78xxT-883B	TO-39	<sub>GND</sub> (3) (1) V <sub>IN</sub>
			SG7805T-JAN		
			SG7812T-JAN		Case is Ground
			SG7815T-JAN		
			SG78xxT		
		3-Pin Hermetic SG7812AIG-DESC			
			SG7805AIG-DESC		
EE °C to			SG7812AIG-DESC		
-55 °C to 125 °C	IG	Isolated	SG7815AIG-DESC	TO-257	Ground
120 0		Package	SG78xxAIG		
			SG78xxIG-883B		
			SG78xxIG		
			SG7805AL-DESC		
			SG7812AL-DESC		
			SG7815AL-DESC		N.C.) 4 18 N.C.
-55 °C to 125 °C	L	20-Pin Ceramic Package	SG78xxL-883B	Leadless Chip Carrier	N.C. $5$ N.C. $6$ GND 7 N.C. $8$ 9 10 11 12 13 0 5 Z $5See Notes 5 and 6$
			SG78xxAG-883B		
			SG7805AG-DESC		Vour
			SG7812AG-DESC		Ground
-55 °C to 125 °C	G	3-Pin Hermetic	SG7815AG-DESC	TO-257	
120 0		Package	SG78xxAG		Case is Ground
			SG78xxG-883B		
			SG78xxG		



Notes:

- 1. Contact factory for JAN and DESC product availability.
- 2. All parts are viewed from the top.
- 3. "xx" to be replaced by output voltage of specific fixed regulator.
- 4. Some products will be available in hermetic flat pack (F). Consult factory for price and availability.
- 5. Both inputs and outputs must be externally connected together at the device terminals.
- 6. For normal operation, the V<sub>0</sub> SENSE pin must be externally connected to the load.

# Absolute Maximum Ratings

Parameter	Value	Units
Device Output Voltage	5, 12, 15	V
Input Voltage	35	V
Input Voltage (Transient) (Note 2)	50	V
Input Voltage Differential (Output Shorted to Ground)	35	V
Operating Junction Temperature	150	°C
Storage Temperature Range	-65 to 150	°C
Lead Temperature (Soldering 10 seconds)	300	°C
Madam	•	

Notes:

1. Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

2. Operation at high input voltages is dependent upon load current. When load current is less than 5 mA, output will rise out of regulation as input-output differential increases beyond 30 V. Note also from Figure 2, that maximum load current is reduced at high voltages. The 50 V input rating of the SG78xxA series refers to ability to withstand high line or transient conditions without damage. Since the regulator's maximum current capability is reduced, the output may fall out of regulation at high input voltages under nominal loading.



# **Thermal Data**

Parameter	Value	Units
K Package TO-3 3-Terminal Metal Can (Two pins and case)		
Thermal Resistance-Junction to Case, $\theta_{JC}$	3	°C/W
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	35	°C/W
T Package TO-39 3-Pin Metal Can		
Thermal Resistance-Junction to Case, $\theta_{JC}$	15	°C/W
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	120	°C/W
G Package TO-257 3-Pin Hermetic		
Thermal Resistance-Junction to Case, $\theta_{JC}$	3.5	°C/W
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	42	°C/W
IG Package TO-257 3-Pin Hermetic (Isolated)		
Thermal Resistance-Junction to Case, $\theta_{JC}$	4	°C/W
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	42	°C/W
L Package Leadless Chip Carrier 20-Pin Ceramic		
Thermal Resistance-Junction to Case, $\theta_{JC}$	35	°C/W
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	120	°C/W

 Junction Temperature Calculation: T<sub>J</sub> = T<sub>A</sub> + (P<sub>D</sub> × θ<sub>JA</sub>).
The θ<sub>JA</sub> numbers are meant to be guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

# **Recommended Operating Conditions**

Peremeter	S	G78xx / 78xx/	Unito	
Parameter	Min	Тур	Max	Units
Operating Junction Temperature Range	-55		150	°C
Note: Range over which the device is functional.				



## **Electrical Characteristics**

Unless specified, these specifications apply over the operating ambient temperatures for SG7805A / SG7805 with -55 °C  $\leq$  T<sub>A</sub>  $\leq$  125 °C, V<sub>IN</sub> = 10 V, I<sub>O</sub> = 500 mA for the K, G, and IG – Power Packages, I<sub>O</sub> = 100 mA for the T and L packages, C<sub>IN</sub> = 0.33 µF and C<sub>OUT</sub> = 0.1 µF. Low duty cycle pulse testing techniques are used, which maintains junction and case temperatures equal to the ambient temperature.

Devenueter	Test Conditions		G780	)5A	SG7805			11
Parameter			Тур	Max	Min	Тур	Max	Units
Output Voltage	$T_J = 25 \ ^{\circ}C$	4.92	5	5.08	4.80	5	5.20	V
Line Regulation	$V_{IN} = 7.5$ V to 20 V, $T_J = 25$ °C		5	25		5	25	mV
(Note 1)	$V_{IN} = 8 \text{ V to } 12 \text{ V},  \text{T}_{\text{J}} = 25 ^{\circ}\text{C}$		2	12		2	25	mV
	Power Pkgs: $I_0 = 5$ mA to 1.5 A, $T_J = 25$ °C		15	50		15	50	mV
Load Regulation (Note 1)	$I_0 = 250 \text{ mA to } 750 \text{ mA}, T_J = 25^{\circ}\text{C}$		5	25		5	25	mV
	T, L – Pkg: I_0 = 5 mA to 500 mA, T_J = 250 °C		5	25		20	25	mV
Total Output Voltage	$V_{IN} = 8 V \text{ to } 20 V$ Power Pkgs: $I_0 = 5 \text{ mA to } 1.0 \text{ A}, P \le 20W$	4.85	5	5.15	4.65	5	5.35	V
Tolerance	$V_{IN} = 8 V \text{ to } 20 V$ T, L – Pkg: I <sub>0</sub> = 5 mA to 500 mA, P ≤ 2 W	4.85	5	5.15	4.65	5	5.35	V
Outerent Ourrent	Over Temperature Range			7			7	mA
Quiescent Current	T <sub>J</sub> = 25 °C		4	6		4	6	mA
Quiescent Current Change	With Line: $V_{IN} = 8 V$ to 25 V			0.8			0.8	mA
	With Load: $I_0 = 5 \text{ mA}$ to 1.0 A (Power Pkgs)			0.5			0.5	mA
	I <sub>O</sub> = 5 mA to 500 mA (T, L)			0.5			0.5	mA
Dropout Voltage	$\Delta V_{O}$ = 100 mV, T <sub>J</sub> = 25 °C Power Pkgs: I <sub>O</sub> = 1.0 A, T, L -Pkg: I <sub>O</sub> = 500 mA		2	2.5		2	2.5	V
Peak Output Current	Power Pkgs: $V_{IN}$ = 10 V, T <sub>J</sub> = 25 °C	1.5	2	3.3	1.5	2	3.3	Α
Feak Oulput Current	T, L – Pkg: V <sub>IN</sub> = 10 V, T <sub>J</sub> = 25 °C	0.5	1	2	0.5	1	2	А
Short Circuit Current	Power Pkgs: $V_{IN}$ = 35 V, T <sub>J</sub> = 25 °C			1.2			1.2	Α
Short Circuit Current	T, L – Pkg: V <sub>IN</sub> = 35V, T <sub>J</sub> = 25 °C			0.7			0.7	Α
Ripple Rejection	$\Delta V_{IN} = 10 \text{ V}, \text{ f} = 120 \text{ Hz}, \text{ T}_{J} = 25 \text{ °C}$	68			68			dB
Output Noise Voltage (rms)	f = 10 Hz to 100 kHz (Note 2)			40			40	μV/V
Long Term Stability	1000 hours @ T <sub>J</sub> = 125 °C		20			20		mV
Thermal Shutdown	I <sub>O</sub> = 5 mA		175			175		°C

2. This test is guaranteed but is not tested in production.



# **Electrical Characteristics**

Unless specified, these specifications apply over the operating ambient temperatures for SG7812A / SG7812 with -55 °C  $\leq$  T<sub>A</sub>  $\leq$  125 °C, V<sub>IN</sub> = 19 V, I<sub>O</sub> = 500 mA for the K, G, and IG – Power Packages, I<sub>O</sub> = 100 mA for the T and L packages, C<sub>IN</sub> = 0.33 µF and C<sub>OUT</sub> = 0.1 µF. Low duty cycle pulse testing techniques are used, which maintains junction and case temperatures equal to the ambient temperature.

<b>.</b>	Test Conditions		SG7812A			SG7812		
Parameter			Тур	Max	Min	Тур	Max	Units
Output Voltage	T <sub>J</sub> = 25 °C	11.8	12	12.2	11.5	12	12.5	V
Line Regulation	$V_{IN}$ = 14.5 V to 30 V, $T_J$ = 25 °C		12	60		12	120	mV
(Note 1)	$V_{IN}$ = 16 V to 22 V, $T_J$ = 25 °C		6	30		6	60	mV
Laad Damidatian	Power Pkgs: $I_0 = 5 \text{ mA to } 1.5 \text{ A}, T_J = 25 \text{ °C}$		28	80		28	120	mV
Load Regulation (Note 1)	$I_{O}$ = 250 mA to 750 mA, $T_{J}$ = 25 °C		10	40		10	60	mV
<b>`</b> ,	T, L – Pkg: $I_0$ = 5 mA to 500 mA, T <sub>J</sub> = 25 °C		10	40		10	60	mV
Total Output Voltage	$V_{\rm IN}$ = 15.5 V to 27 V Power Pkgs: $I_{\rm O}$ = 5 mA to 1.0 A, P $\leq$ 20 W	11.7	12	12.3	11.4	12	12.6	V
Tolerance	$V_{\rm IN}$ = 15.5 V to 27 V T, L – Pkg: I_0 = 5 mA to 500 mA, P $\leq$ 2 W	11.7	12	12.3	11.4	12	12.6	V
Quiescent Current	Over Temperature Range			7			7	mA
Quescent Ourrent	$T_J = 25 \text{ °C}$		4	6		4	6	mA
	With Line: $V_{IN} = 15 \text{ V}$ to 30 V			0.8			0.8	mA
Quiescent Current Change	With Load: $I_0 = 5 \text{ mA}$ to 1.0 A (Power Pkgs)			0.5			0.5	mA
0	$I_0 = 5 \text{ mA to } 500 \text{ mA (T, L)}$			0.5			0.5	mA
Dropout Voltage	$\Delta V_{O}$ = 100 mV, T_{J} = 25 °C Power Pkgs: I_{O} = 1.0 A, T, L – Pkg: I_{O} = 500 mA		2	2.5		2	2.5	V
Book Output Current	Power Pkgs: T <sub>J</sub> = 25 °C	1.5	2	3.3	1.5	2	3.3	А
Peak Output Current	T, L – Pkg: T <sub>J</sub> = 25 °C	0.5	1	1.7	0.5	1	1.7	А
Short Circuit Current	Power Pkgs: $V_{IN}$ = 35 V, $T_J$ = 25 °C			1.2			1.2	А
Short Gricuit Guirent	T, L – Pkg: V <sub>IN</sub> = 35 V, T <sub>J</sub> = 25 °C			0.7			0.7	А
Ripple Rejection	$\Delta V_{IN}$ = 10 V, f = 120 Hz, T <sub>J</sub> = 25 °C	61			61			dB
Output Noise Voltage (rms)	f = 10 Hz to 100 kHz (Note 2)			40			40	μV/V
Long Term Stability	1000 hours @ T <sub>J</sub> = 125 °C		48			48		mV
Thermal Shutdown	I <sub>O</sub> = 5 mA		175			175		°C

2. This test is guaranteed but is not tested in production.



# **Electrical Characteristics**

Unless specified, these specifications apply over the operating ambient temperatures for SG7815A / SG7815 with -55 °C  $\leq$  T<sub>A</sub>  $\leq$  125 °C, V<sub>IN</sub> = 23 V, I<sub>O</sub> = 500 mA for the K, G, and IG – Power Packages, I<sub>O</sub> = 100 mA for the T and L packages, C<sub>IN</sub> = 0.33 µF and C<sub>OUT</sub> = 0.1 µF. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.

-	Test Conditions		G7815	5A	SG7815			11
Parameter			Min Typ Max		Min Typ Max		Units	
Output Voltage	$T_J = 25 \text{ °C}$	14.8	15	15.2	14.4	15	15.6	V
Line Regulation	$V_{IN} = 17.5 \text{ V to } 30 \text{ V}, \text{ T}_{J} = 25 \text{ °C}$		15	75		15	150	mV
(Note 1)	$V_{IN}$ = 20 V to 26 V, $T_J$ = 25 °C		8	40		8	75	mV
	Power Pkgs: $I_0 = 5 \text{ mA to } 1.5 \text{ A}, T_J = 25 \text{ °C}$		30	100		30	150	mV
Load Regulation (Note 1)	$I_{\rm O}$ = 250 mA to 750 mA, $T_{\rm J}$ = 25 °C		12	50		12	75	mV
	T, L – Pkg: $I_0$ = 5 mA to 500 mA, T <sub>J</sub> = 25 °C		12	50		12	75	mV
Total Output Voltage	$V_{\rm IN}$ = 18.5 V to 30 V Power Pkgs: $I_{\rm O}$ = 5 mA to 1.0 A, P $\leq$ 20 W	14.6	15	15.4	14.3	15	15.7	V
Tolerance	$V_{\rm IN}$ = 18.5 V to 30 V T, L – Pkg: I_0 = 5 mA to 500 mA, P $\leq$ 2 W		15	15.4	14.3	15	15.7	V
Quiescent Current	Over Temperature Range			7			7	mA
Quiescent Current	T <sub>J</sub> = 25 °C		4	6		4	6	mA
	With Line: $V_{IN}$ = 18.5 V to 30 V			0.8			0.8	mA
Quiescent Current Change	With Load: $I_0 = 5 \text{ mA to } 1.0 \text{ A}$ (Power Pkgs)			0.5			0.5	mA
	I <sub>O</sub> = 5 mA to 500 mA (T, L)			0.5			0.5	mA
Dropout Voltage	$\Delta V_{O}$ = 100 mV, T <sub>J</sub> = 25 °C Power Pkgs: I <sub>O</sub> = 1.0 A, T, L – Pkg: I <sub>O</sub> = 500 mA		2	2.5		2	2.5	V
Peak Output Current	Power Pkgs: $T_J = 25 \text{ °C}$	1.5	2.2	3.3	1.5	2.2	3.3	А
r cak output ourient	T, L – Pkg: T <sub>J</sub> = 25 °C	0.5	0.9	1.7	0.5	0.9	1.7	А
Short Circuit Current	Power Pkgs: $V_{IN}$ = 35 V, $T_J$ = 25 °C			1.2			1.2	А
Chort Chout Current	T, L – Pkg: $V_{IN}$ = 35 V, T <sub>J</sub> = 25 °C			0.7			0.7	А
Ripple Rejection	$\Delta V_{IN}$ = 10 V, f = 120 Hz, T <sub>J</sub> = 25 °C	60			60			dB
Output Noise Voltage (rms)	f = 10 Hz to 100 kHz (Note 2)			40			40	μV/V
Long Term Stability	1000 hours @ T <sub>J</sub> = 125 °C		60			60		mV
Thermal Shutdown	I <sub>O</sub> = 5 mA		175			175		°C

1. All regulation tests are made at constant junction temperature with low duty cycle testing.

2. This test is guaranteed but is not tested in production.



### **Characteristic Curves**

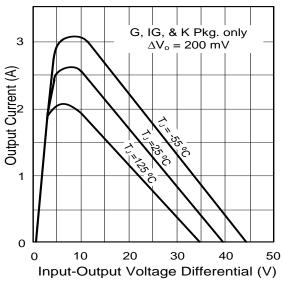


Figure 2 - Peak Output Current versus Input-Output Differential

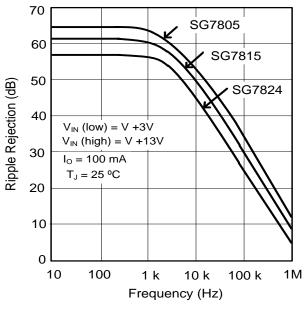


Figure 4 - Ripple Rejection versus Frequency

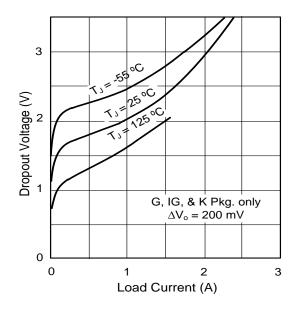
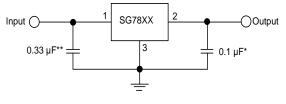


Figure 3 - Minimum Input-Output Voltage versus Load Current

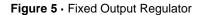


# **Application Information**



\* Increasing value of output capacitor improves system transient response

\*\*Required only if regulator is located an appreciable distance from power supply filter



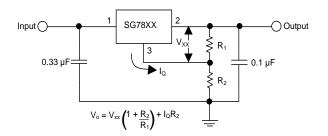


Figure 6 - Circuit for Increasing Output Voltage

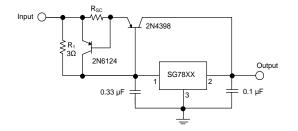


Figure 7 - High Output Current, Short Circuit Protected

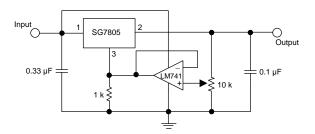
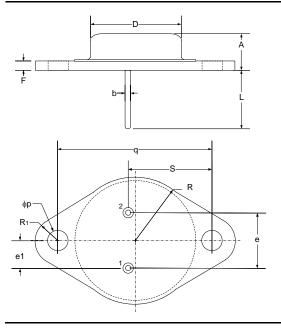


Figure 8 - Adjustable Output Regulator, 7 V to 30 V



# Package Outline Dimensions

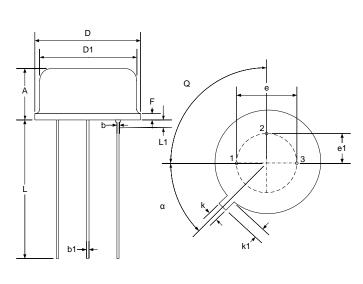


Controlling dimensions are	e in inches. r	metric equivalents a	are shown f	or general information.

Dim	MILLIM	ETERS	INC	HES
Dim	MIN	MAX	MIN	MAX
А	6.86	7.62	0.270	0.300
q	29.90	30.40	1.177	1.197
b	0.97	1.09	0.038	0.043
D	19.43	19.68	0.765	0.775
S	16.64	17.14	0.655	0.675
е	10.67	11.18	0.420	0.440
e1	5.21	5.72	0.205	0.225
F	1.52	2.03	0.060	0.080
фр	3.84	4.09	0.151	0.161
L	10.79	12.19	0.425	0.480
R1	3.33	4.78	0.131	0.188
R	12.57	13.34	0.495	0.525

**Note:** Dimensions do not include protrusions; these shall not exceed 0.155 mm (0.006") on any side. Lead dimension shall not include solder coverage.

Figure 9 · K 3-Pin Metal Can TO-3

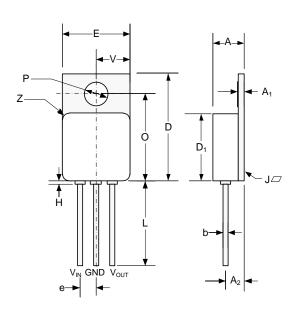


Dim	MILLIM	ETERS	INC	HES	
Dim	MIN	MAX	MIN	MAX	
Α	4.19	4.70	0.165	0.185	
b	0.41	0.48	0.016	0.019	
b1	0.41	0.53	0.016	0.021	
D	8.89	9.40	0.350	0.370	
D1	8.13	8.51	0.320	0.335	
е	5.08	BSC	0.200 BSC		
e1	2.54	Тур	0.100	) Тур	
F	-	1.02	-	0.040	
k	0.71	0.86	0.028	0.034	
k1	0.74	1.14	0.029	0.045	
L	12.70	14.48	0.500	0.570	
L1	-	1.27	-	0.050	
Q	90°	Тур	90°	Тур	
α	45°	Тур	45° Typ		

\* Lead Coplanarity

**Note:** Dimensions do not include protrusions; these shall not exceed 0.155 mm (0.006") on any side. Lead dimension shall not include solder coverage.

Figure 10 - T 3-Pin Metal Can TO-39

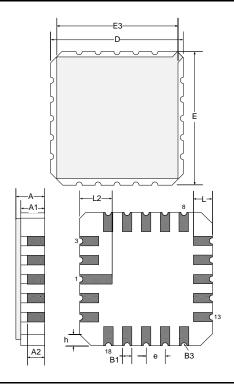


Dim	MILLIME	METERS INCHES			
Dim	MIN	MAX	MIN	MAX	
Α	4.70	5.21	0.185	0.205	
A1	0.89	1.14	0.035	0.045	
A2	2.92	3.18	0.115	0.125	
b	0.71	0.081	0.027	0.032	
D	16.38	16.76	0.645	0.660	
D1*	10.41	10.92	0.410	0.430	
е	2.54 BSC		0.100	) BSC	
E*	10.41	10.67	0.410	0.420	
Н		0.50		0.020	
L	12.70		0.500		
0	13.39	13.64	0.527	0.537	
Р	3.56	3.81	0.140	0.150	
J		0.10		0.004	
V	5.13	5.38	0.202	0.212	
Z	1.40	Тур	0.05	5 Тур	

\*Excludes Weld Fillet Around Lid.

**Note:** Dimensions do not include protrusions; these shall not exceed 0.155 mm (0.006") on any side. Lead dimension shall not include solder coverage.

Figure 11 · G/IG 3-Pin Hermetic TO-257



Dim	MILLIM	ETERS	INC	HES	
Dim	MIN	MAX	MIN	MAX	
D, E	8.64	9.14	0.340	0.360	
E3	-	8.128	-	0.320	
е	1.270	BSC	0.050 BSC		
B1	0.635	5 Тур	0.025 Typ		
L	1.02	1.52	0.040	0.060	
Α	1.626	2.286	0.064	0.090	
h	1.016	3 Тур	0.040	) Тур	
A1	1.372	1.68	0.054	0.066	
A2	-	1.168	-	0.046	
L2	1.91	2.41	0.075	0.95	
B3	0.20	)3R	0.008R		

Note: All exposed metalized area shall be gold plated 60  $\mu$ -inch minimum thickness over nickel plated unless specified in purchase order. Lead dimension shall not include solder coverage

Figure 12 · L 20-Pin Ceramic Leadless Chip Carrier

# Package Outline Dimensions (continued)



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