SG79xxA/SG79xx

Negative Fixed Voltage Regulator

DESCRIPTION

The SG79xxA/SG79xx series of negative regulators offer self-contained, fixed-voltage capability with up to 1.5A of load current and input voltage up to -30V. With a variety of output voltages this regulator series is an optimum complement to the SG7800A/SG7800 positive three terminal regulators.

These units feature a unique band gap reference which allows the SG79xxA series to be specified with an output voltage tolerance of ±1.5%.

The SG79xxA versions also offer much improved line regulation characteristics.

All protective features of thermal shutdown, current limiting, and safe-area control have been designed into these units and since these regulators require only a single output capacitor (SG79xx series) or a capacitor and 5mA minimum load (SG120 series) for satisfactory performance, ease of application is assured.

Although designed as fixed-voltage regulators, the output voltage can be increased through the use of a simple voltage divider. The low quiescent drain current of the device insures good regulation when this method is used.

These devices are available in hermetically sealed TO-257 (both case grounded ‘G’ and isolated ‘IG’), TO-3, TO-39, and LCC packages.

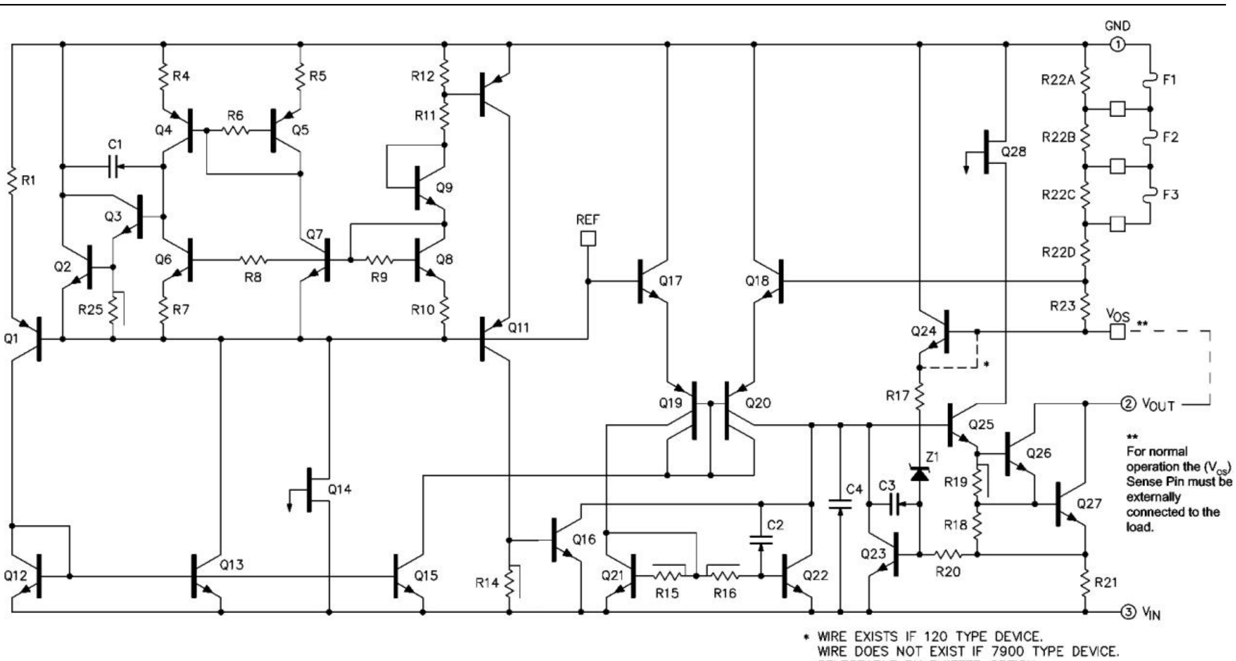
FEATURES

- Output Voltage Set Internally to ±1.5% on SG79xxA
- Output Current up to 1.5A
- Excellent Line and Load Regulation
- Foldback Current Limiting
- Thermal Overload Protection
- Voltages Available: -5V, -12V, -15V
- Contact Factory for Other Voltage Options
- Available in Surface Mount Package

HIGH RELIABILITY FEATURES

- Available to MIL-STD - 883, ¶ 1.2.1
- MIL-M38510/11501BXA - SG7905T-JAN
- MIL-M38510/11505BYA - SG7905K-JAN
- MIL-M38510/11502BXA - SG7912T-JAN
- MIL-M38510/11506BYA - SG7912K-JAN
- MIL-M38510/11503BXA - SG7915T-JAN
- MIL-M38510/11507BYA - SG7915K-JAN
- MIL-M38510/11508BYA - SG7924K-JAN
- MSC-AMS level "S" Processing Available
- Available to DSCC Standard Microcircuit Drawing (SMD)

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Value	Units
Device Output Voltage	-5, -12, -15	V
Input Voltage	-35, -40 ($V_{OUT} \leq$ -15V)	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

Note: 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.

THERMAL DATA

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

Notes:
1: Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
2: The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

CHARACTERISTIC CURVES

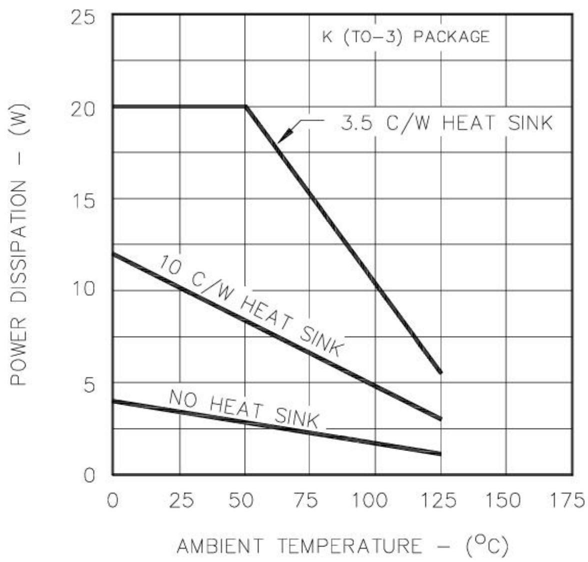


Figure 1 – Maximum Average Power Dissipation

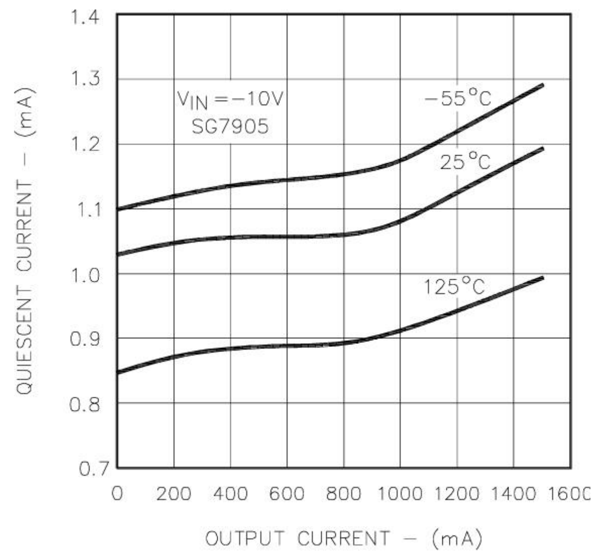


Figure 2 – Quiescent Current vs. Load

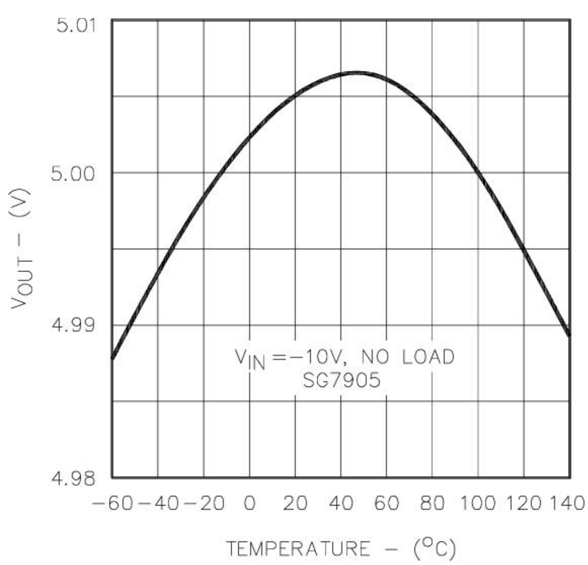


Figure 3 – Temperature Coefficient

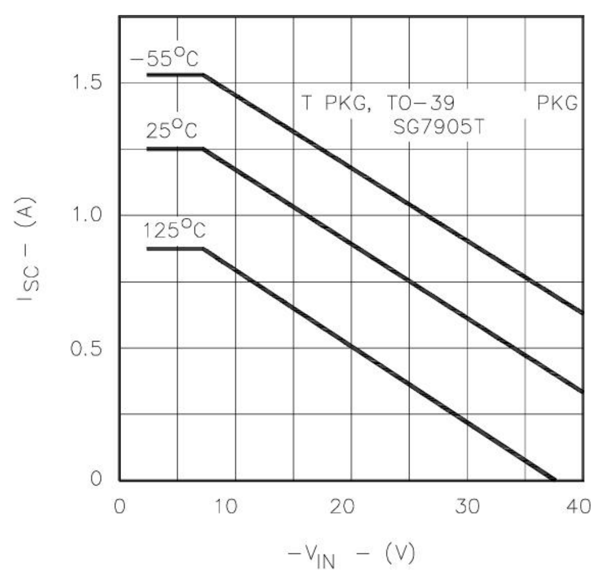


Figure 4 – Short-circuit Current vs. V_{IN}

CHARACTERISTIC CURVES (continued)

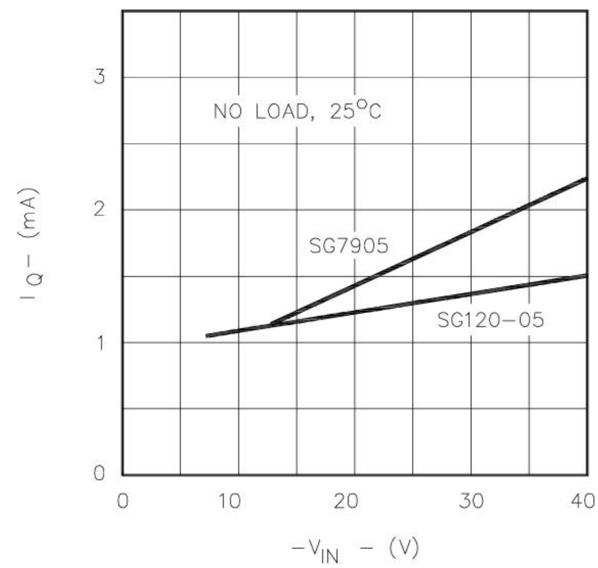


Figure 5 – Quiescent Current vs. V_{IN}

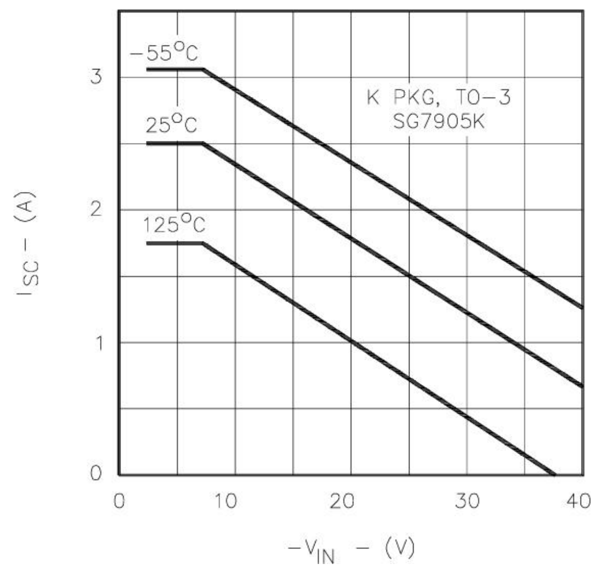


Figure 6 – Short-circuit Current vs. V_{IN}

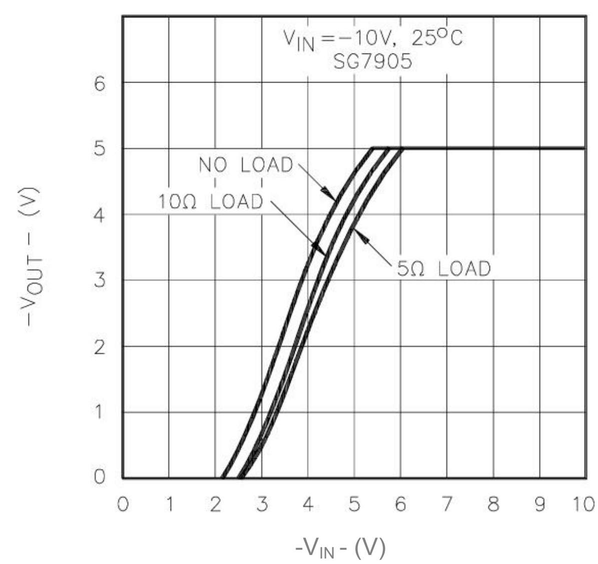


Figure 7 – Dropout Characteristics

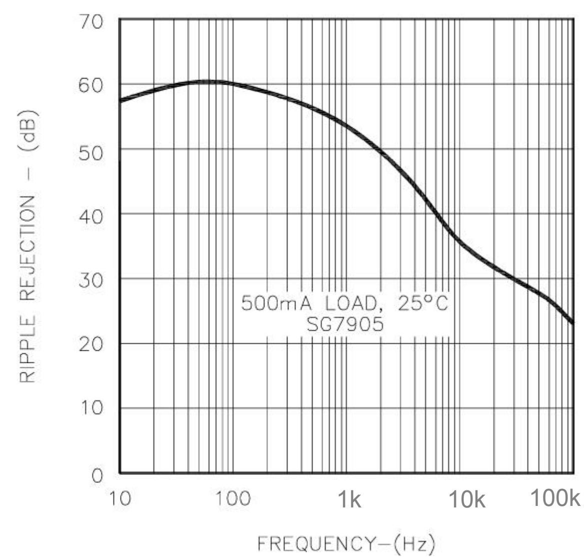


Figure 8 – Ripple Rejection vs. Frequency

APPLICATION INFORMATION

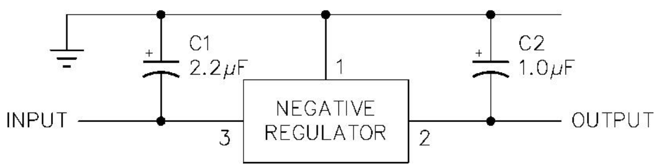


Figure 9 – Fixed Output Regulator

Note: 1. C1 is required only if regulator is separated from rectifier filter.
2. Both C1 and C2 should be low E.S.R. types such as solid tantalum. If aluminum electrolytic capacitors are used, at least 10 times values shown should be selected.
3. If large output capacitors are used, the regulators must be protected from momentary input shorts. A high current diode is indicated from output to input.

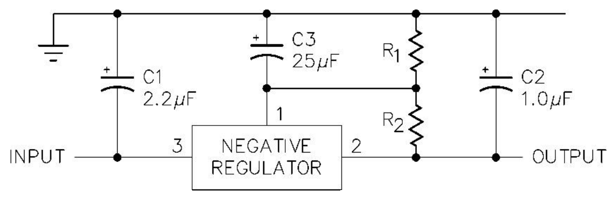


Figure 10 – Circuit for Increasing Output Voltage

Note: C3 optional for improved transient response and ripple rejection.

$$V_{OUT} = V(\text{REGULATOR})\frac{R_1 + R_2}{R_1}$$

$$R_2 = \frac{V(\text{REG})}{15\text{mA}}$$

RECOMMENDED OPERATING CONDITIONS

Parameter	SG79xx / 79xxA			Units
	Min	Typ	Max	
Operating Junction Temperature Range (Note 2)	-55		150	°C

Note 2: Range over which the device is functional.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG7905A / SG7905 with -55°C ≤ T_A ≤ 125°C, V_{IN} = -10V, I_O = 500mA for the K, G, and IG - Power Packages, I_O = 100mA for the T and L packages, C_{IN} = 2µF, and C_{OUT} = 1µF. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.

Parameter	Test Conditions	SG7905A			SG7905			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage	T_J = 25°C	-4.95	-5.00	-5.05	-4.80	-5.00	-5.20	V
Line Regulation (Note 1)	V_{IN} = -7.5V to -25V, T_J = 25°C		5	25		3	50	mV
	V_{IN} = -8V to -12V, T_J = 25°C		3	12		1	25	mV
Load Regulation (Note 1)	Power Pkgs: I_O = 5mA to 1.5A, T_J = 25°C		15	75		15	100	mV
	I_O = 250mA to 750mA, T_J = 25°C		15	25		15	25	mV
	T – Pkg: I_O = 5mA to 500mA, T_J = 250°C		5	30		5	100	mV
Total Output Voltage Tolerance	V_{IN} = -8V to -20V Power Pkgs: I_O = 5mA to 1.0A, P ≤ 20W	-4.85	-5.00	-5.15	-4.70	-5.00	-5.30	V
	V_{IN} = -8V to -20V T – Pkg: I_O = 5mA to 500mA, P ≤ 20W	-4.85	-5.00	-5.15	-4.70	-5.00	-5.30	V
Quiescent Current	Over Temperature Range			2.5			2.5	mA
	T_J = 25°C			2.0			2.0	mA
Quiescent Current Change	With Line: V_{IN} = -8V to -25V			1.3			1.3	mA
	With Load: I_O = 5mA to 1.0A (Power Pkgs.)			0.5			0.5	mA
	I_O = 5mA to 500mA (T)			0.5			0.5	mA
Dropout Voltage	ΔV_O = 100mV, T_J = 25°C Power Pkgs: I_O = 1.0A, T-Pkg: I_O = 500mA		1.1	2.3		1.1	2.3	V
Peak Output Current	Power Pkgs: T_J = 25°C	1.5		3.3	1.5		3.3	A
	T – Pkg: T_J = 25°C	0.5		1.4	0.5		1.4	A
Short Circuit Current	Power Pkgs: V_{IN} = -35V, T_J = 25°C			1.2			1.2	A
	T – Pkg: V_{IN} = -35V, T_J = 25°C			0.6			0.6	A
Ripple Rejection	ΔV_{IN} = 10V, f = 120Hz, T_J = 25°C	54			54			dB
Output Noise Voltage (rms)	f = 10Hz to 100kHz (Note 2)		25	80		25	80	µV/V
Long Term Stability	1000 hours @ T_J = 125°C		20			20		mV
Thermal Shutdown	I_O = 5mA		175			175		°C

Notes 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.

ELECTRICAL CHARACTERISTICS (continued)

Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG7912A / SG7912 with -55°C $\leq T_A \leq$ 125°C, V_{IN} = -19V, I_O = 500mA for the K, G, and IG - Power Packages, I_O = 100mA for the T and L packages, C_{IN} = 2µF, and C_{OUT} = 1µF. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.

Parameter	Test Conditions	SG7912A			SG7912			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage	T_J = 25°C	-11.8	-12.0	-12.2	-11.5	-12.0	-12.5	V
Line Regulation (Note 1)	V_{IN} = -14.5V to -30V, T_J = 25°C		4	60		10	120	mV
	V_{IN} = -16V to -22V, T_J = 25°C		3	30		3	60	mV
Load Regulation (Note 1)	Power Pkgs: I_O = 5mA to 1.5A, T_J = 25°C		20	90		12	120	mV
	I_O = 250mA to 750mA, T_J = 25°C		10	40		10	60	mV
	T – Pkg: I_O = 5mA to 500mA, T_J = 25°C		10	40		10	240	mV
Total Output Voltage Tolerance	V_{IN} = -14.5V to -27V Power Pkgs: I_O = 5mA to 1.0A, P $\leq$ 20W	-11.7	-12.0	-12.3	-11.4	-12.0	-12.6	V
	V_{IN} = -14.5V to -27V T – Pkg: I_O = 5mA to 500mA, P $\leq$ 2W	-11.7	-12.0	-12.3	-11.4	-12.0	-12.6	V
Quiescent Current	Over Temperature Range			4			4	mA
	T_J = 25°C			3			3	mA
Quiescent Current Change	With Line: V_{IN} = -14.5V to -30V			1.0			1.0	mA
	With Load: I_O = 5mA to 1.0A (Power Pkgs.)			0.5			0.5	mA
	I_O = 5mA to 500mA (T)			0.5			0.5	mA
Dropout Voltage	ΔV_O = 100mV, TJ = 25°C Power Pkgs: I_O = 1.0A, T – Pkg: I_O = 500mA		1.1	2.3		1.1	2.3	V
Peak Output Current	Power Pkgs: T_J = 25°C	1.5		3.3	1.5		3.3	A
	T – Pkg: T_J = 25°C	0.5		1.4	0.5		1.4	A
Short Circuit Current	Power Pkgs: V_{IN} = -35V, T_J = 25°C			1.2			0.2	A
	T – Pkg: V_{IN} = -35V, T_J = 25°C			0.6			0.6	A
Ripple Rejection	ΔV_{IN} = 10V, f = 120Hz, T_J = 25°C	54			54			dB
Output Noise Voltage (rms)	f = 10Hz to 100kHz (note 2)		25	80		25	80	µV/V
Long Term Stability	1000 hours @ T_J = 125°C		60			60		mV
Thermal Shutdown	I_O = 5mA		175			175		°C

Notes 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.

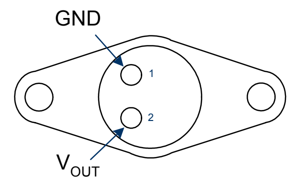
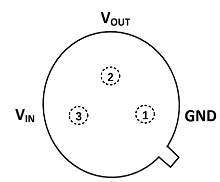
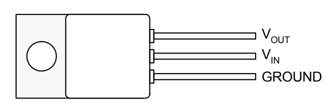
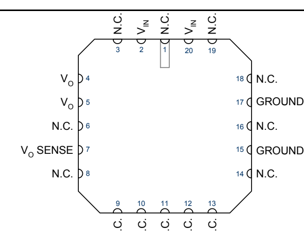
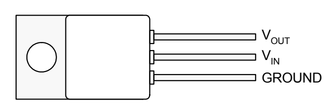
ELECTRICAL CHARACTERISTICS (continued)

Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG7915A / SG7915 with -55°C ≤ T_A ≤ 125°C, V_{IN} = -23V, I_O = 500mA for the K, G, and IG - Power Packages, I_O = 100mA for the T and L packages, C_{IN} = 2µF, and C_{OUT} = 1µF. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.

Parameter	Test Conditions	SG7915A			SG7915			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage	T_J = 25°C	-14.8	-15.0	-15.2	-14.4	-15.0	-15.6	V
Line Regulation (Note 1)	V_{IN} = -17.5V to -30V, T_J = 25°C		5	75		11	150	mV
	V_{IN} = -20V to -25V, T_J = 25°C		3	40		3	75	mV
Load Regulation (Note 1)	Power Pkgs: I_O = 5mA to 1.5A, T_J = 25°C		30	100		12	150	mV
	I_O = 250mA to 750mA, T_J = 25°C		4	50		4	75	mV
	T – Pkg: I_O = 5mA to 500mA, T_J = 25°C		10	50		10	240	mV
Total Output Voltage Tolerance	V_{IN} = -18.5V to -30V Power Pkgs: I_O = 5mA to 1.0A, P ≤ 20W	-14.6	-15.0	-15.4	-14.25	-15.00	-15.75	V
	V_{IN} = -18.5V to -30V T – Pkg: I_O = 5mA to 500mA, P ≤ 2W	-14.6	-15.0	-15.4	-14.25	-15.00	-15.75	V
Quiescent Current	Over Temperature Range			4			4	mA
	T_J = 25°C			3			3	mA
Quiescent Current Change	With Line: V_{IN} = -18.5V to -30V			1.0			1.0	mA
	With Load: I_O = 5mA to 1.0A (Power Pkgs)			0.5			0.5	mA
	I_O = 5mA to 500mA (T)			0.5			0.5	mA
Dropout Voltage	ΔV_O = 100mV, T_J = 25°C Power Pkgs: I_O = 1.0A, T – Pkg: I_O = 500mA		1.1	2.3		1.1	2.3	V
Peak Output Current	Power Pkgs: T_J = 25°C	1.5		3.3	1.5		3.3	A
	T – Pkg: T_J = 25°C	0.5		1.4	0.5		1.4	A
Short Circuit Current	Power Pkgs: V_{IN} = -35V, T_J = 25°C			1.2			1.2	A
	T – Pkg: V_{IN} = -35V, T_J = 25°C			0.6			0.6	A
Ripple Rejection	ΔV_{IN} = 10V, f = 120Hz, T_J = 25°C	54			54			dB
Output Noise Voltage (rms)	f = 10Hz to 100kHz (note 2)		25	80		25	80	µV/V
Long Term Stability	1000 hours @ T_J = 125°C		60			60		mV
Thermal Shutdown	I_O = 5mA		175			175		°C

Notes 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.

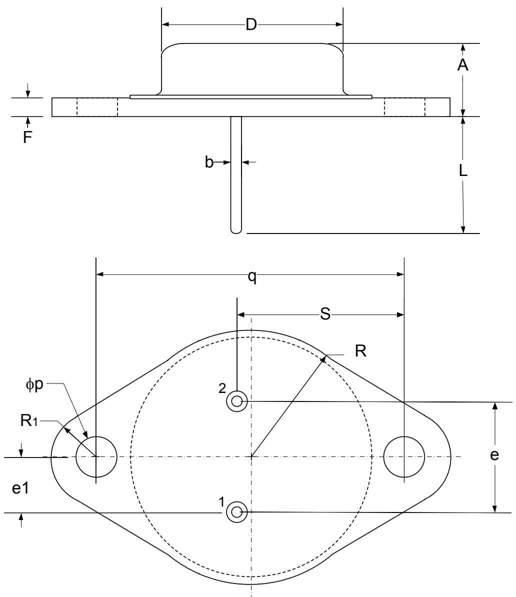
CONNECTION DIAGRAMS & ORDERING INFORMATION (See Notes Below)

Package	Part No.	Ambient Temperature Range	Connection Diagram
3-Terminal TO-3 Metal Can K – Package	SG79xxAK-883B	-55°C to 125°C	 Case is V_{IN}
	SG7905AK-DESC	-55°C to 125°C	
	SG7912AK-DESC	-55°C to 125°C	
	SG7915AK-DESC	-55°C to 125°C	
	SG79xxAK	-55°C to 125°C	
	SG79xxK-883B	-55°C to 125°C	
	SG7905K-JAN	-55°C to 125°C	
	SG7912K-JAN	-55°C to 125°C	
	SG7915K-JAN	-55°C to 125°C	
	SG79xxK	-55°C to 125°C	
3-Pin TO-39 Metal Can T – Package	SG79xxAT-883B	-55°C to 125°C	 Case is V_{IN}
	SG7905AT-DESC	-55°C to 125°C	
	SG7912AT-DESC	-55°C to 125°C	
	SG7915AT-DESC	-55°C to 125°C	
	SG79xxAT	-55°C to 125°C	
	SG79xxT-883B	-55°C to 125°C	
	SG7905T-JAN	-55°C to 125°C	
	SG7912T-JAN	-55°C to 125°C	
	SG7915T-JAN	-55°C to 125°C	
	SG79xxT	-55°C to 125°C	
3-Pin Hermetic TO-257 IG – Package (Isolated)	SG79xxAIG-883B	-55°C to 125°C	
	SG7905AIG-DESC	-55°C to 125°C	
	SG7912AIG-DESC	-55°C to 125°C	
	SG7915AIG-DESC	-55°C to 125°C	
	SG79xxAIG	-55°C to 125°C	
	SG79xxIG-883B	-55°C to 125°C	
	SG79xxIG	-55°C to 125°C	
20-Pin Ceramic Leadless Chip Carrier L – Package	SG79xxL-883B	-55°C to 125°C	 See Notes 5 & 6
	SG79xxL	-55°C to 125°C	
	SG7905AL-DESC	-55°C to 125°C	
	SG7912AL-DESC	-55°C to 125°C	
	SG7912AL-DESC	-55°C to 125°C	
3-Pin Hermetic TO-257 G – Package (Case is V_{IN})	SG79xxAG-883B	-55°C to 125°C	 Case is V_{IN}
	SG7905AG-DESC	-55°C to 125°C	
	SG7912AG-DESC	-55°C to 125°C	
	SG7915AG-DESC	-55°C to 125°C	
	SG79xxAG	-55°C to 125°C	
	SG79xxG-883B	-55°C to 125°C	
	SG79xxG	-55°C to 125°C	

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_O SENSE pin must be externally connected to the load.

PACKAGE OUTLINE DIMENSIONS

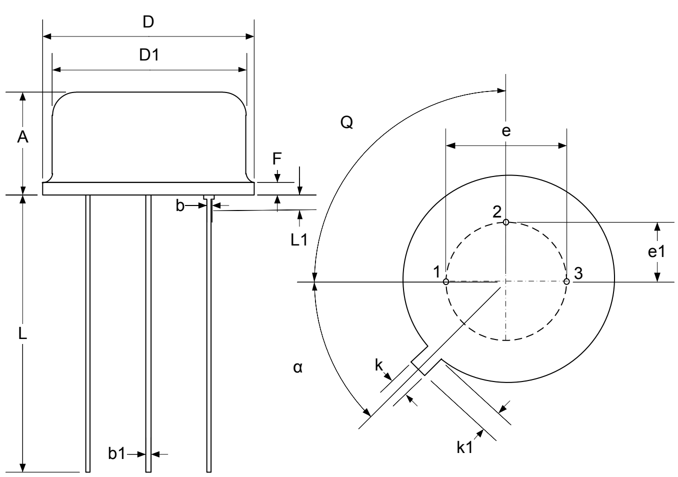
Controlling dimensions are in inches, metric equivalents are shown for general information.



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	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
e	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
ϕp	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 11 · K 3-Pin Metal Can TO-3



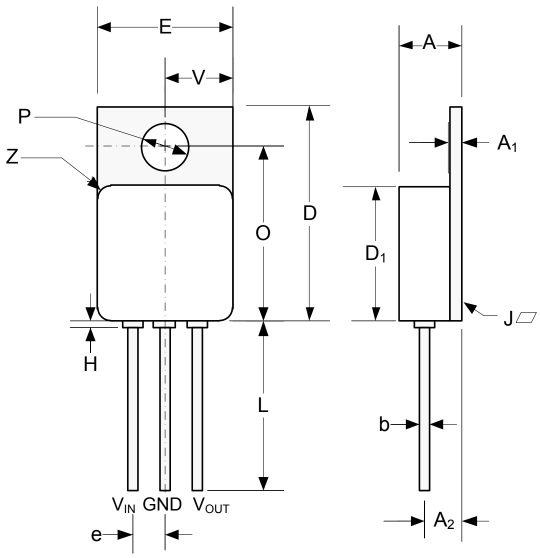
Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.19	4.70	0.165	0.185
b	0.41	0.48	0.016	0.019
b1	0.41	0.53	0.016	0.021
D	8.89	9.40	0.350	0.370
D1	8.13	8.51	0.320	0.335
e	5.08 BSC		0.200 BSC	
e1	2.54 Typ		0.100 Typ	
F	-	1.02	-	0.040
k	0.71	0.86	0.028	0.034
k1	0.74	1.14	0.029	0.045
L	12.70	14.48	0.500	0.570
L1	-	1.27	-	0.050
Q	90° Typ		90° Typ	
α	45° Typ		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 12 · T 3-Pin Metal Can TO-39

PACKAGE OUTLINE DIMENSIONS (continued)

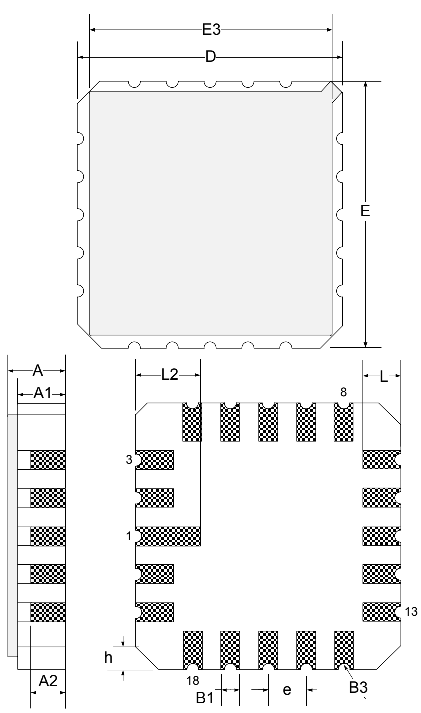


Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.70	5.21	0.185	0.205
A1	0.89	1.14	0.035	0.045
A2	2.92	3.18	0.115	0.125
b	0.71	0.081	0.027	0.032
D	16.38	16.76	0.645	0.660
D1*	10.41	10.92	0.410	0.430
e	2.54 BSC		0.100 BSC	
E*	10.41	10.67	0.410	0.420
H		0.50		0.020
L	12.70		0.500	
O	13.39	13.64	0.527	0.537
P	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 Typ		0.055 Typ	

*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 13 · G/IG 3-Pin Hermetic TO-257



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
D, E	8.64	9.14	0.340	0.360
E3	-	8.128	-	0.320
e	1.270 BSC		0.050 BSC	
B1	0.635 Typ		0.025 Typ	
L	1.02	1.52	0.040	0.060
A	1.626	2.286	0.064	0.090
h	1.016 Typ		0.040 Typ	
A1	1.372	1.68	0.054	0.066
A2	-	1.168	-	0.046
L2	1.91	2.41	0.075	0.95
B3	0.203R		0.008R	

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

Figure 14 · L 20-Pin Ceramic Leadless Chip Carrier

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for communications, defense & security, aerospace and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; security technologies and scalable anti-tamper products; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, Calif., and has approximately 3,400 employees globally. Learn more at **www.microsemi.com**.

Microsemi Corporate Headquarters
One Enterprise, Aliso Viejo,
CA 92656 USA

Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996

E-mail: sales.support@microsemi.com

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Microchip:

SG7905AIG SG7905AK SG7905AT SG7905IG SG7905K SG7905T SG7912AIG SG7912AK SG7912AT SG7912K SG7912T SG7915AIG SG7915AK SG7915AT SG7915IG SG7915K SG7915T SG7915IG-883B SG7905AIG-883B SG7905AL-883B SG7905AL-DESC SG7905IG-883B SG7912T-883B SG7915AIG-883B SG7915AIG-DESC SG7915AL SG7915AL-DESC SG7915AL-DESC-TR SG7915AL-TR SG7915T-883B SG7908K-883B SG7908T SG7912L-883B SG7905AG-DESC SG7905AIG-DESC SG7905AK-883B SG7905AK-DESC SG7905AT-883B SG7905AT-DESC SG7905K-883B SG7905K-JAN SG7905T-883B SG7905T-JAN SG7912AG-DESC SG7912AIG-883B SG7912AIG-DESC SG7912AK-883B SG7912AK-DESC SG7912AT-883B SG7912AT-DESC SG7912K-883B SG7912K-JAN SG7912T-JAN SG7915AK-883B SG7915AK-DESC SG7915AT-883B SG7915AT-DESC SG7915K-883B SG7915K-JAN SG7915T-JAN SG79052AT SG79052AT-883B SG79052AK-883B SG79052AK SG79052K-883B SG79052AIG-883B