LINFINITY
MICROELECTRONICS

NEGATIVE FIXED VOLTAGE REGULATOR

DESCRIPTION

The SG7900A/SG7900 series of negative regulators offer self-contained, fixed-voltage capability with up to 1.5A of load current. With a variety of output voltages and four package options this regulator series is an optimum complement to the SG7800A/SG7800, SG140 line of three terminal regulators.

These units feature a unique band gap reference which allows the SG7900A series to be specified with an output voltage tolerance of ±1.5%. The SG7900A 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 (SG7900 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, especially for the SG120 series.

These devices are available in hermetically sealed TO-257, TO-3, TO-39 and LCC package.

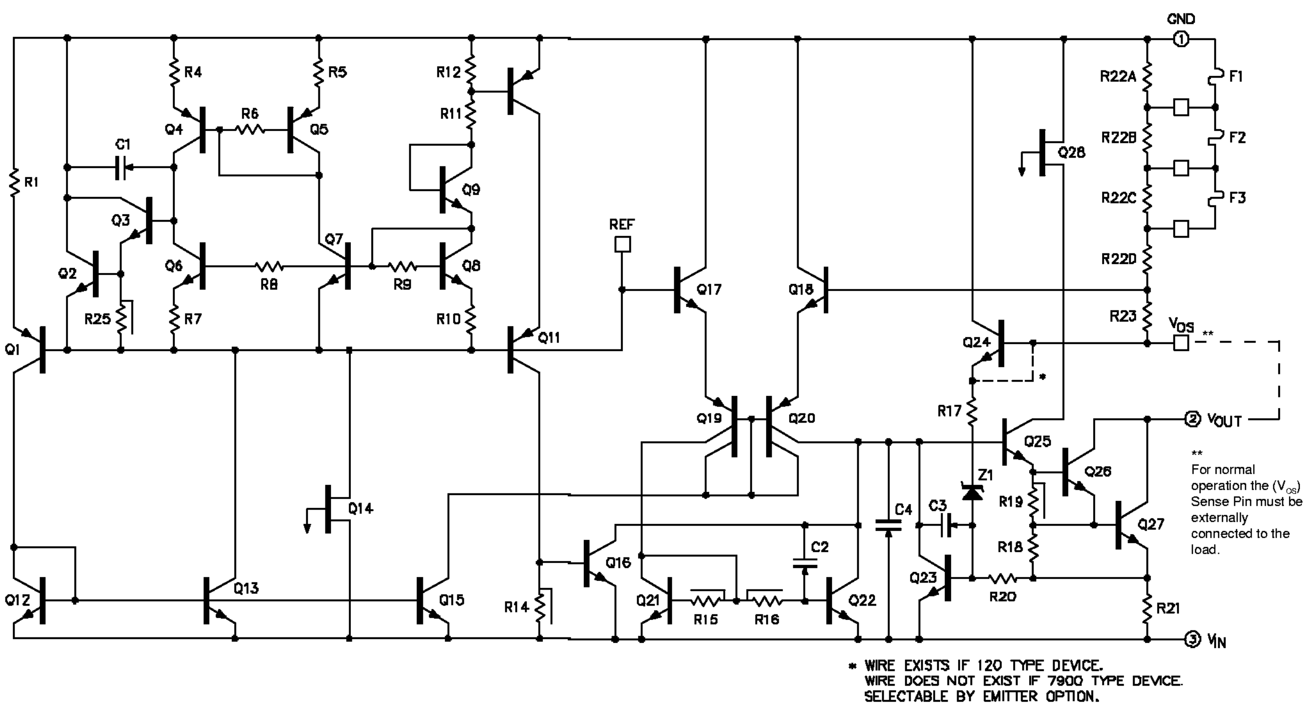
FEATURES

- **Output voltage set internally to ±1.5% on SG7900A**
- **Output current 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 - SG7900A/SG7900

- ♦ **Available to MIL-STD - 883**
- ♦ **MIL-M38510/11501BXA - JAN7905T**
- ♦ **MIL-M38510/11505BYA - JAN7905K**
- ♦ **MIL-M38510/11502BXA - JAN7912T**
- ♦ **MIL-M38510/11506BYA - JAN7912K**
- ♦ **MIL-M38510/11503BXA - JAN7915T**
- ♦ **MIL-M38510/11507BYA - JAN7915K**
- ♦ **Scheduled for MIL-M-38510 QPL listing**
- ♦ **Radiation data available**
- ♦ **LMI level "S" processing available**

SCHEMATIC DIAGRAM



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ABSOLUTE MAXIMUM RATINGS (Note 1)

Device Output Voltage	Input Voltage	Input Voltage Differential (Output shorted to ground)
-5V	-35V	35V
-12V	-35V	35V
-15V	-40V	35V

Operating Junction Temperature
Hermetic (K, T, IG & L - Packages) .... 150°C

Storage Temperature Range .... -65°C to 150°C
Lead Temperature (Soldering, 10 Seconds) .... 300°C

Note 1. Values beyond which damage may occur.

THERMAL DATA

K Package:
Thermal Resistance-Junction to Case, θ_{JC} .... 3.0°C/W
Thermal Resistance-Junction to Ambient, θ_{JA} .... 35°C/W
T Package:
Thermal Resistance-Junction to Case, θ_{JC} .... 15°C/W
Thermal Resistance-Junction to Ambient, θ_{JA} .... 120°C/W
IG Package:
Thermal Resistance-Junction to Case, θ_{JC} .... 3.5°C/W
Thermal Resistance-Junction to Ambient, θ_{JA} .... 42°C/W
L Package:
Thermal Resistance-Junction to Case, θ_{JC} .... 35°C/W
Thermal Resistance-Junction to Ambient, θ_{JA} .... 120°C/W

Note A. Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
Note B. The above numbers for θ_{JC} are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The θ_{JA} 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 (Note 2)

Operating Junction Temperature Range:
SG7900A/7900 .... -55°C to 150°C

Note 2. Range over which the device is functional.

CHARACTERISTIC CURVES

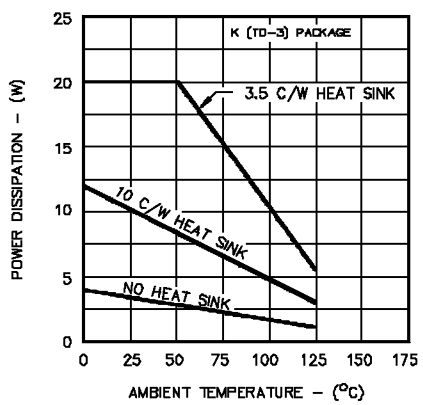

FIGURE 1.
MAXIMUM AVERAGE POWER DISSIPATION

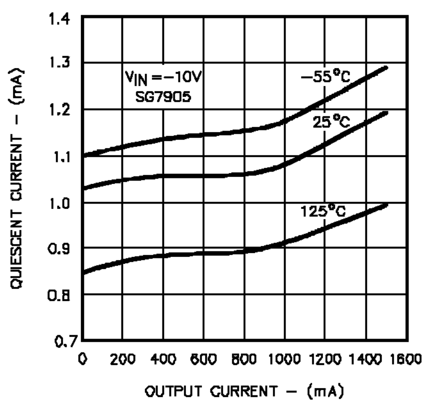

FIGURE 2.
QUIESCENT CURRENT VS. LOAD

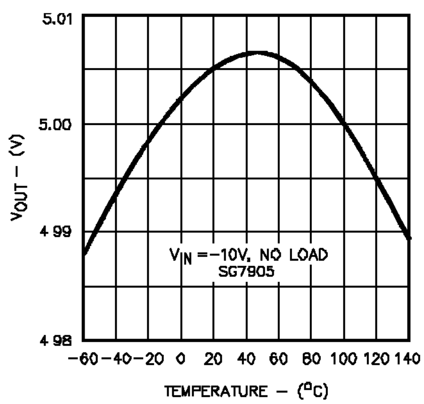

FIGURE 3.
TEMPERATURE COEFFICIENT

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CHARACTERISTIC CURVES (continued)

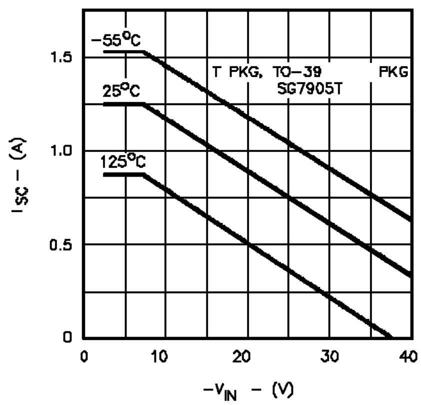

FIGURE 4.
SHORTCIRCUIT CURRENT VS. V_{IN}

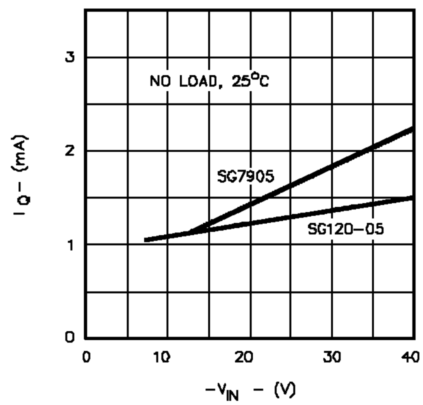

FIGURE 5.
QUIESCENT CURRENT VS. V_{IN}

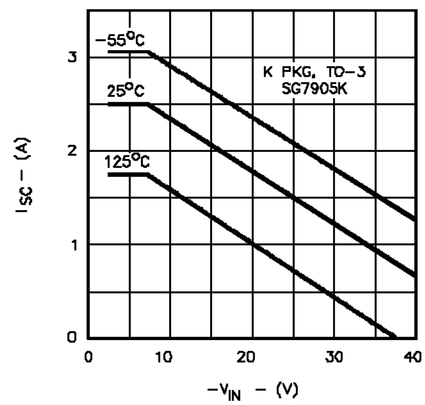

FIGURE 6.
SHORT CIRCUIT CURRENT VS. V_{IN}

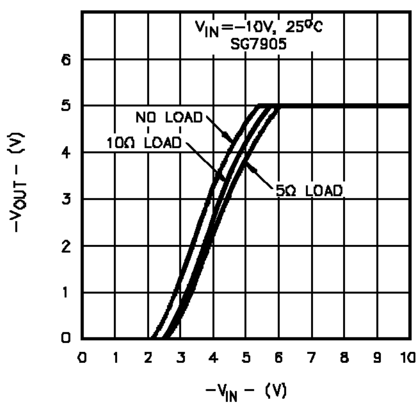

FIGURE 7.
DROPOUT CHARACTERISTICS

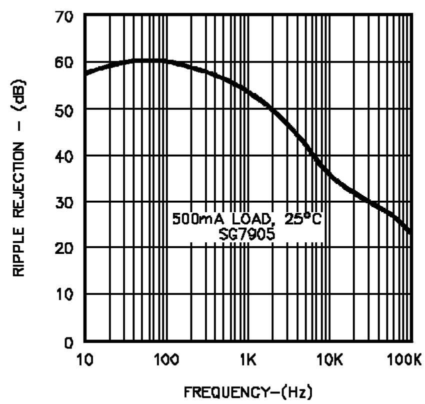

FIGURE 8.
RIPPLE REJECTION VS. FREQUENCY

APPLICATIONS

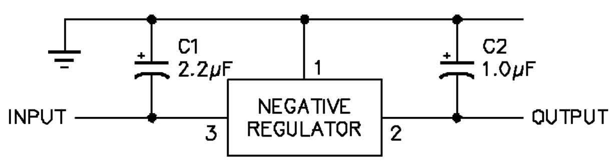

FIGURE 9 - FIXED OUTPUT REGULATOR

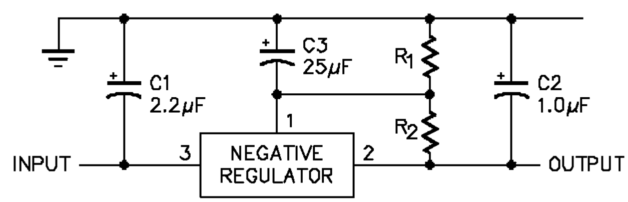

FIGURE 10 - CIRCUIT FOR INCREASING OUTPUT VOLTAGE

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 electrolytics are used, at least 10 times values shown should be selected.
3. If large output capacities are used, the regulators must be protected from momentary input shorts. A high current diode

NOTE: C3 optional for improved transient response and ripple rejec

$$V_{OUT} = V\,(\text{REGULATOR})\frac{R_1 + R_2}{R_1} \qquad R_2 = \frac{V(\text{REG})}{15\text{mA}}$$

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ELECTRICAL SPECIFICATIONS (Note 1)

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG7905A/SG7905 with -55°C $\leq T_A \leq$ 150°C, V_{IN} = -10V, I_O = 500mA for the K and IG -Power Packages-, I_O = 100mA for the T and L packages, C_{IN} = 2µF, and C_{OUT} = 1.0µF. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

SG7905A/SG7905

Parameter	Test Conditions	SG7905A			SG7905			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Output Voltage	T_J = 25°C	-4.92	-5.00	-5.08	-4.8	-5.0	-5.2	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 = 25°C		5	30		5	100	mV
Total Output Voltage	V_{IN} = -8V to -20V							
Tolerance	Power Pkgs: I_O = 5mA to 1.0A, P ≤ 20W	-4.85	-5.00	-5.15	-4.70	-5.00	-5.30	V
	T - Pkg: I_O = 5mA to 500mA, P ≤ 2W	-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 Packages)			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	1000hrs. at T_J = 125°C		20			20		mV
Thermal Shutdown	I_O = 5mA		175			175		°C

Note 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.

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ELECTRICAL SPECIFICATIONS (Note 1)

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG7912A/SG7912 with -55°C ≤ T_A ≤ 150°C, V_{IN} = -19V, I_O = 500mA for the K and IG -Power Packages-, I_O = 100mA for the T and L packages, C_{IN} = 2µF, and C_{OUT} = 1.0µF. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

SG7912A/SG7912

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		4	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 ≤ 20W	-11.7	-12.0	-12.3	-11.4	-12.0	-12.6	V
	T - Pkg: I_O = 5mA to 500mA, P ≤ 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 Packages)			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			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	1000hrs. at T_J = 125°C		60			60		mV
Thermal Shutdown	I_O = 5mA		175			175		°C

Note 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.

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ELECTRICAL SPECIFICATIONS (Note 1)

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG7915A/SG7915 with -55°C ≤ T_A ≤ 150°C, V_{IN} = -23V, I_O = 500mA for the K and IG -Power Packages-, I_O = 100mA for the T and L packages, C_{IN} = 2µF, and C_{OUT} = 1.0µF. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

SG7915A/SG7915

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	V_{IN} = -18.5V to -30V							
Tolerance	Power Pkgs: I_O = 5mA to 1.0A, P ≤ 20W	-14.6	-15.0	-15.4	-14.25	-15.00	-15.75	V
	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 Packages)			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	1000hrs. at T_J = 125°C		60			60		mV
Thermal Shutdown	I_O = 5mA		175			175		°C

Note 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.

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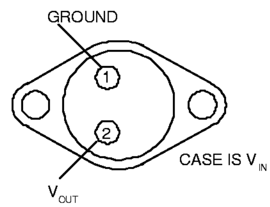
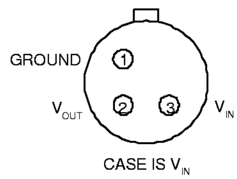
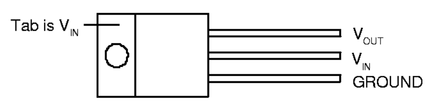
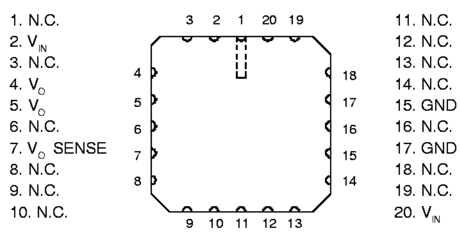
CONNECTION DIAGRAMS & ORDERING INFORMATION (See Notes Below)

Package	Part No.	Ambient Temperature Range	Connection Diagram
3-TERMINAL TO-3 METAL CAN K-PACKAGE	SG79XXAK/883B SG7905AK/DESC SG7912AK/DESC SG7915AK/DESC SG79XXAK SG79XXK/883B JAN7905K JAN7912K JAN7915K SG79XXK SG79XXK	-55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C 0°C to 125°C	
3-PIN TO-39 METAL CAN T-PACKAGE	SG79XXAT/883B SG7905AT/DESC SG7912AT/DESC SG7915AT/DESC SG79XXAT SG79XXT/883B JAN7905T JAN7912T JAN7915T SG79XXT	-55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C	
3-PIN HERMETIC TO-257 IG-PACKAGE (Isolated)	SG79XXAIG/883B SG7905AIG/DESC SG7912AIG/DESC SG7915AIG/DESC SG79XXAIG SG79XXIG/883B SG79XXIG	-55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C -55°C to 125°C	
20-PIN CERAMIC LEADLESS CHIP CARRIER L- PACKAGE	SG79XXL/883B SG79XXL	-55°C to 125°C -55°C to 125°C	(See Notes 5 & 6) 

Note 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.

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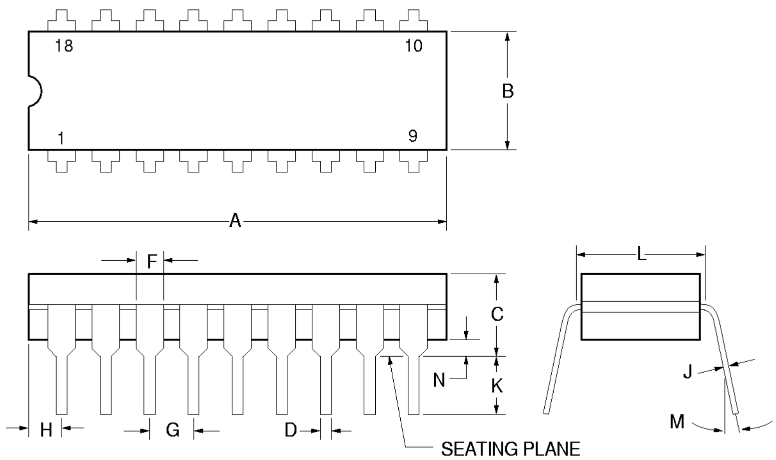
Package Information

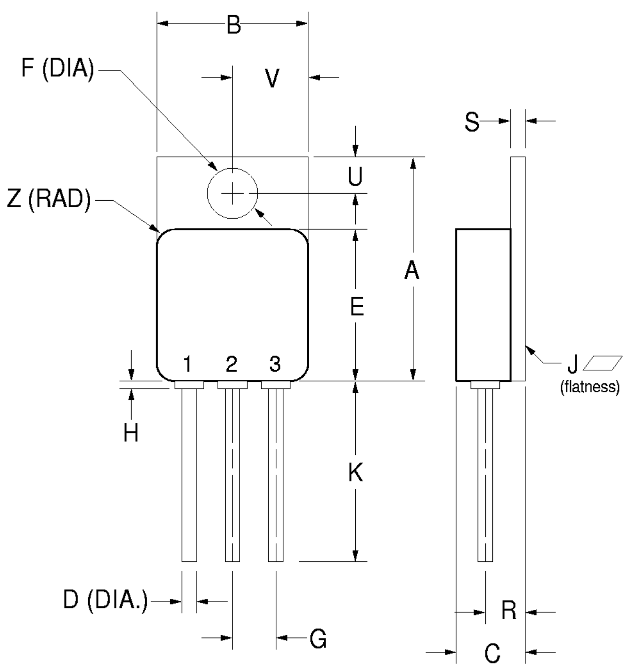
MECHANICAL DIMENSIONS

J 18-Pin Ceramic Dip



DIM	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A		24.38		0.960
B	5.59	7.11	0.220	0.280
C		5.08		0.200
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H		2.03		0.080
J	0.20	0.38	0.008	0.015
K	3.18	5.08	0.125	0.200
L	7.37	7.87	0.290	0.310
M		15		15
N	0.51	0.76	0.020	0.030

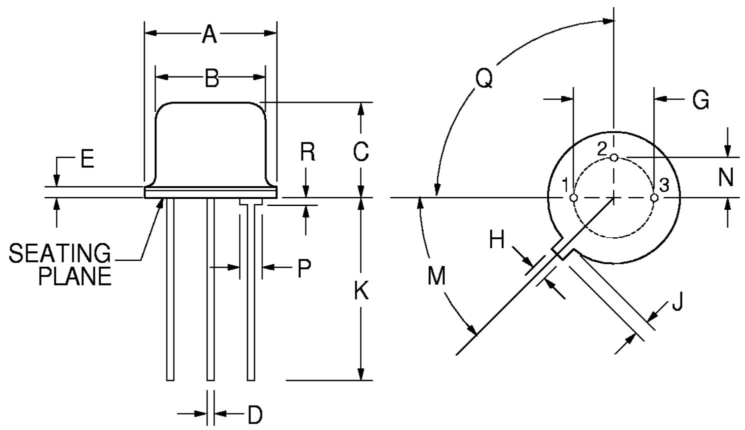
IG 3-Pin Hermetic TO-257 (Isolated)



DIM	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	16.38	16.76	0.645	0.660
* B	10.41	10.67	0.410	0.420
C	4.70	5.21	0.185	0.205
D	0.71	0.81	0.028	0.032
* E	10.41	10.67	0.410	0.420
F	3.56	3.81	0.140	0.150
G	2.54 BSC		0.100 BSC	
H		0.50		0.020
J		0.10		0.004
K	12.70		0.500	
N	5.08 TYP		0.200 TYP	
R	2.92	3.18	0.115	0.125
S	0.89	1.43	0.035	0.045
U	2.87	3.12	0.113	0.123
V	5.13	5.38	0.202	0.212
Z	1.40 TYP		0.055 TYP	

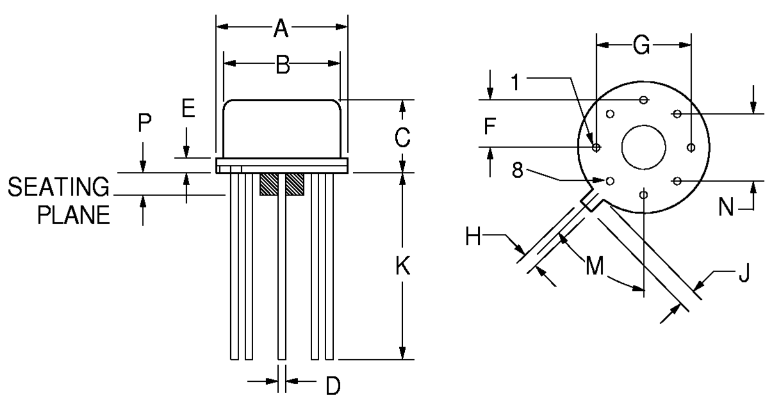
* Excludes weld fillet around lid.

T 3-Pin Metal Can TO-39



DIM	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	8.89	9.40	0.350	0.370
B	8.13	8.51	0.320	0.335
C	4.19	4.70	0.165	0.185
D	0.41	0.53	0.016	0.021
E		1.02		0.040
G	5.08 BSC		0.200 BSC	
H	0.71	0.86	0.028	0.034
J	0.74	1.14	0.029	0.045
K	12.70	14.48	0.500	0.570
M	45 TYP		45 TYP	
N	2.54 TYP		0.100 TYP	
P		1.14		0.045
Q	90 TYP		90 TYP	
R		0.64		0.025

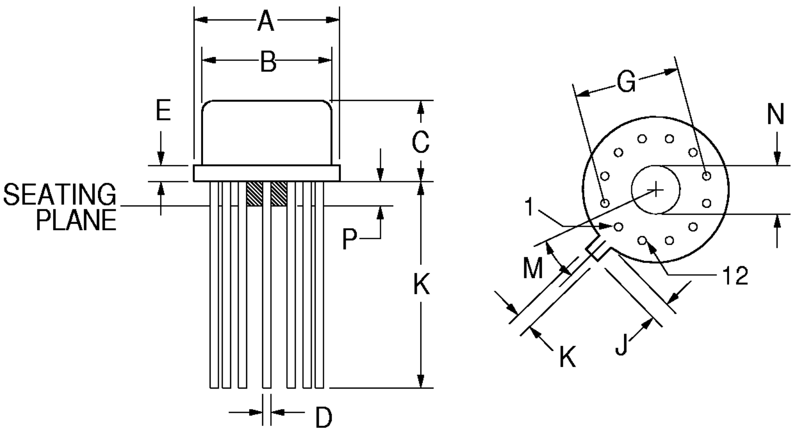
T 8-Pin Metal Can TO-99



DIM	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	8.89	9.40	0.350	0.370
B	8.00	8.51	0.315	0.335
C	4.191	4.699	0.165	0.185
D	0.406	0.533	0.016	0.021
E		1.016		0.040
F	2.54 TYP		0.100 TYP	
G	5.08 TYP		0.200 TYP	
H	0.711	0.864	0.028	0.034
J	0.737	1.14	0.029	0.045
K	12.70	14.48	0.500	0.570
M	45 TYP		45 TYP	
N	3.556	4.064	0.140	0.160
P	0.254	1.016	0.010	0.040

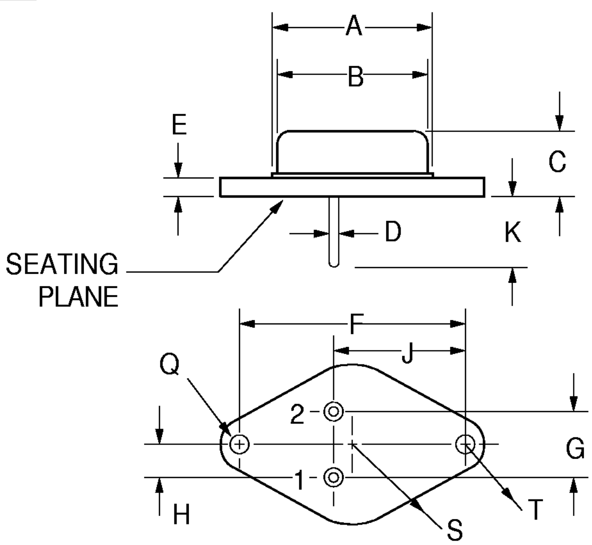
LINFINITY MICROELECTRONICS

T 12-Pin Metal Can TO-101



DIM	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	8.89	9.40	0.350	0.370
B	8.00	8.51	0.315	0.335
C	4.191	4.699	0.165	0.185
D	0.406	0.533	0.016	0.021
E		1.016		0.040
G	5.842 TYP		0.230 TYP	
H	0.711	0.864	0.028	0.034
J	0.737	1.143	0.029	0.045
K	12.70	14.48	0.500	0.570
M	30 TYP		30 TYP	
N	3.556	4.064	0.140	0.160
P	0.254	1.016	0.010	0.040

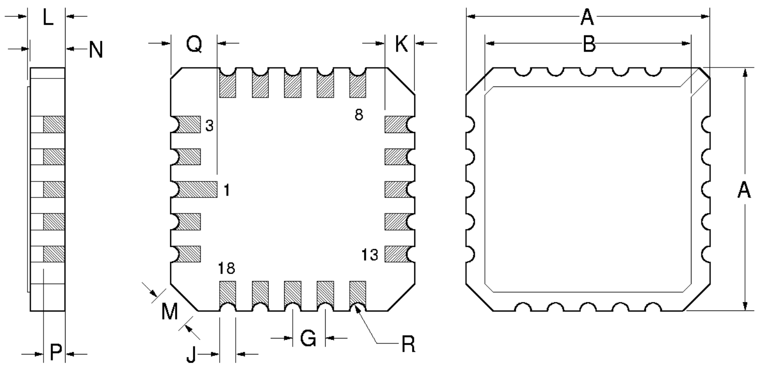
K 3-Pin Metal Can TO-3



DIM	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A		23.62		0.930
B	19.43	19.68	0.765	0.775
C	6.86	7.62	0.270	0.300
D	0.97	1.09	0.038	0.043
E	1.52	2.03	0.060	0.080
F	29.90	30.40	1.177	1.197
G	10.67	11.18	0.420	0.440
H	5.21	5.72	0.205	0.225
J	16.64	17.14	0.655	0.675
K	10.79	12.19	0.425	0.480
Q	3.84	4.09	0.151	0.161
S	12.57	13.34	0.495	0.525
T	4.06R	4.57R	0.160R	0.180R

LINFINITY MICROELECTRONICS

L 20-Pin Ceramic Leadless Chip Carrier (LCC)



DIM	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	8.64	9.14	0.340	0.360
B		8.128		0.320
G	1.270 BSC		0.050 BSC	
J	0.635 TYP		0.025 TYP	
K	1.02	1.52	0.040	0.060
L	1.626	2.286	0.064	0.090
M	1.016 TYP		0.040 TYP	
N	1.372	1.68	0.054	0.066
P		1.168		0.046
Q	1.91	2.41	0.075	0.095
R	0.203R		0.008R	

Notes:
1. All exposed metallized area shall be gold plated 60 micro-inch minimum thickness over nickel plated unless otherwise specified purchase order.

For more information concerning package outlines and dimensions, please contact Linifinity per instructions below.

Package Information Line 714-898-8121

1. Identify your call as a Package Dimension / Package Outline Question.
2. Provide the package type and/or identifier. (e.g., SOIC - DW Package)
3. The receptionist will forward your call to the appropriate Engineer.

IDENTIFICATION OF OFF-SHORE ASSEMBLY LOCATIONS

Linfinity utilizes several off-shore locations to perform assembly and environmental screening operations. This assembly site is identified on the device or unit packaging label according to the following codes:

Country	Preferred Abbreviations	Limited Space Abbreviations
Korea	KOR	A
Philippines	PHIL	S or T
Thailand	THAI	B
U.S.A.	USA	G

SOLDER REFLOW PROCESS INFORMATION (Surface-Mount Packages Only)

IR / Convection or Convection Profile

Ramp-up rate	+6 C/second max.
Temperature maintained at 125(–25) C	120 seconds max.
Temperature maintained above 183 C	120-180 seconds max.
Time at maximum temperature	10-40 seconds
Maximum temperature	220 +5/-0 C
Ramp-down rate	-6 C/second max.

All temperatures refer to top side of the package, measured on the package body surface. The device shall be allowed to cool down for five (5) minutes minimum between VPR, IR/Convection, or Convection cycles.

LINFINITY MICROELECTRONICS