

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance current shunt monitors microcircuit, with an operating temperature range of -55°C to +125°C.

1.2 Vendor Item Drawing Administrative Control Number. The manufacturer's PIN is the item of identification. The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation:

<u>V62/07638</u>	-	<u>01</u>	<u>X</u>	<u>E</u>
Drawing number		Device type (See 1.2.1)	Case outline (See 1.2.2)	Lead finish (See 1.2.3)

1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Gain</u>	<u>Circuit function</u>
01	INA193A	20 V/V	Current shunt monitors
02	INA194A	50 V/V	Current shunt monitors
03	INA195A	100 V/V	Current shunt monitors
04	INA196A	20 V/V	Current shunt monitors
05	INA197A	50 V/V	Current shunt monitors
06	INA198A	100 V/V	Current shunt monitors

1.2.2 Case outline(s). The case outline(s) are as specified herein.

<u>Outline letter</u>	<u>Number of pins</u>	<u>JEDEC PUB 95</u>	<u>Package style</u>
X	5	MO-178-AA	Plastic surface mount

1.2.3 Lead finishes. The lead finishes are as specified below or other lead finishes as provided by the device manufacturer:

<u>Finish designator</u>	<u>Material</u>
A	Hot solder dip
B	Tin-lead plate
C	Gold plate
D	Palladium
E	Gold flash palladium
Z	Other

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1.3 Absolute maximum ratings. 1/

Supply voltage (V_S)	18 V maximum
Analog input voltage range	
Differential ($+V_{IN} - (-V_{IN})$)	-18 V to +18 V
Common mode	-16 V to +80 V <u>2/</u>
Analog output voltage range (OUT)	GND – 0.3 V to $+V_S + 0.3 V$ <u>2/</u>
Input current into any pin	5 mA maximum <u>2/</u>
Operating temperature range	-55°C to +150°C
Storage temperature range (T_{STG})	-65°C to +150°C
Junction temperature range (T_J)	+150°C maximum
Electrostatic discharge (ESD) ratings:	
Human body model (HBM)	4000 V maximum
Charged device model (CDM)	1000 V maximum

1.4 Recommended operating conditions. 3/

Supply voltage range (V_S)	12 V
Operating free-air temperature range (T_A)	-55°C to +125°C

1/ Stresses beyond those listed under “absolute maximum rating” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

2/ Input voltage at any pin may exceed the voltage shown if the current at that pin is limited to 5 mA.

3/ Use of this product beyond the manufacturers design rules or stated parameters is done at the user’s risk. The manufacturer and/or distributor maintain no responsibility or liability for product used beyond the stated limits.

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2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices

(Applications for copies should be addressed to the Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834 or online at <http://www.jedec.org>)

3. REQUIREMENTS

3.1 Marking. Parts shall be permanently and legibly marked with the manufacturer's part number as shown in 6.3 herein and as follows:

- A. Manufacturer's name, CAGE code, or logo
- B. Pin 1 identifier
- C. ESDS identification (optional)

3.2 Unit container. The unit container shall be marked with the manufacturer's part number and with items A and C (if applicable) above.

3.3 Electrical characteristics. The maximum and recommended operating conditions and electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.4 Design, construction, and physical dimension. The design, construction, and physical dimensions are as specified herein.

3.5 Diagrams.

3.5.1 Case outline. The case outline shall be as shown in 1.2.2 and figure 1.

3.5.2 Terminal connections. The terminal connections shall be as shown in figure 2.

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TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions <u>2/</u>	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Input section							
Full scale input voltage	V _{SENSE}	V _{SENSE} = +V _{IN} - -V _{IN}	+25°C	All		(V _S - 0.2) / Gain	V
Common mode input range	V _{CM}		-55°C to +125°C	All	-16	80	V
Common mode rejection	CMR	+V _{IN} = -16 V to 80 V	+25°C	All	80		dB
		+V _{IN} = 12 V to 80 V	-55°C to +125°C		100		
Offset voltage, referred to input (RTI)	V _{OS}		+25°C	All		2	mV
			-55°C to +125°C			3	
Offset voltage, (RTI) versus temperature	ΔV _{OS} / ΔT		+25°C	All	2.5 typical		μV / °C
Offset voltage, (RTI) versus power supply	PSR	V _S = 2.7 V to 18 V, +V _{IN} = 18 V	-55°C to +125°C	All		100	μV / V
Input bias current at -V _{IN} pin	I _B		-55°C to +125°C	All		±23	μA
Output section (V _{SENSE} ≥ 20 mV)							
Gain	G		+25°C	All	01,04	20 typical	V/V
					02,05	50 typical	
					03,06	100 typical	
Gain error		V _{SENSE} = 20 mV to 100 mV	+25°C	All		±1	%
			-55°C to +125°C			±2	
Total output error <u>3/</u>			+25°C	All		±2.2	%
			-55°C to +125°C			±3	
Nonlinearity error		V _{SENSE} = 20 mV to 100 mV	+25°C	All		±0.1	%
Output impedance	R _O		+25°C	All	1.5 typical		Ω
Maximum capacitive load		No sustained oscillation	+25°C	All	10 typical		nF

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u>	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Output section (V _{SENSE} < 20 mV) <u>4/</u>							
Output voltage		-16 V ≤ V _{CM} < 0 V	+25°C	All	300 typical		mV
		0 V ≤ V _{CM} ≤ V _S , V _S = 5 V	+25°C	01,04		0.4	V
				02,05		1	
				03,06		2	
V _S < V _{CM} ≤ 80 V	+25°C	All	300 typical		mV		
Voltage output section <u>5/</u>							
Swing to +V _S power supply rail		R _L = 100 kΩ to GND	-55°C to +125°C	All		+V _S -0.2	V
Swing to GND <u>6/</u>		R _L = 100 kΩ to GND	-55°C to +125°C	All		V _{GND} + 50	mV
Frequency response section							
Bandwidth	BW	C _{LOAD} = 5 pF	+25°C	01,04	500 typical		kHz
				02,05	300 typical		
				03,06	200 typical		
Phase margin	PM	C _{LOAD} < 10 nF	+25°C	All	40 typical		Degrees
Slew rate	SR		+25°C	All	1 typical		V/μs
Settling time (1 %)	t _S	V _{SENSE} = 10 mV to 100 mV _{PP} , C _{LOAD} = 5 pF	+25°C	All	2 typical		μs
Referred to input (RTI) noise section							
Voltage noise density			+25°C	All	40 typical		nV / √Hz
Power supply section							
Operating range	V _S		-55°C to +125°C	All	2.7	18	V
Quiescent current	I _Q	V _{OUT} = 2 V	-55°C to +125°C	All		1300	μA
		V _{SENSE} = 0 mV				950	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u>	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Temperature range section							
Thermal resistance, junction to ambient	θ _{JA}		+25°C	All	200 typical		°C/W

1/ Testing and other quality control techniques are used to the extent deemed necessary to assure product performance over the specified temperature range. Product may not necessarily be tested across the full temperature range and all parameters may not necessarily be tested. In the absence of specific parametric testing, product performance is assured by characterization and/or design.

2/ Unless otherwise specified, V_S = +12 V, +V_{IN} = 12 V, and V_{SENSE} = 100 mV.

3/ Total output error includes effects of gain error and V_{OS}.

4/ For details on this region of operation, see the Accuracy variations as a result of V_{SENSE} and common mode voltage section in the applications information of the manufacturer's datasheet.

5/ See figure 3.

6/ Specified by design.

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Case X

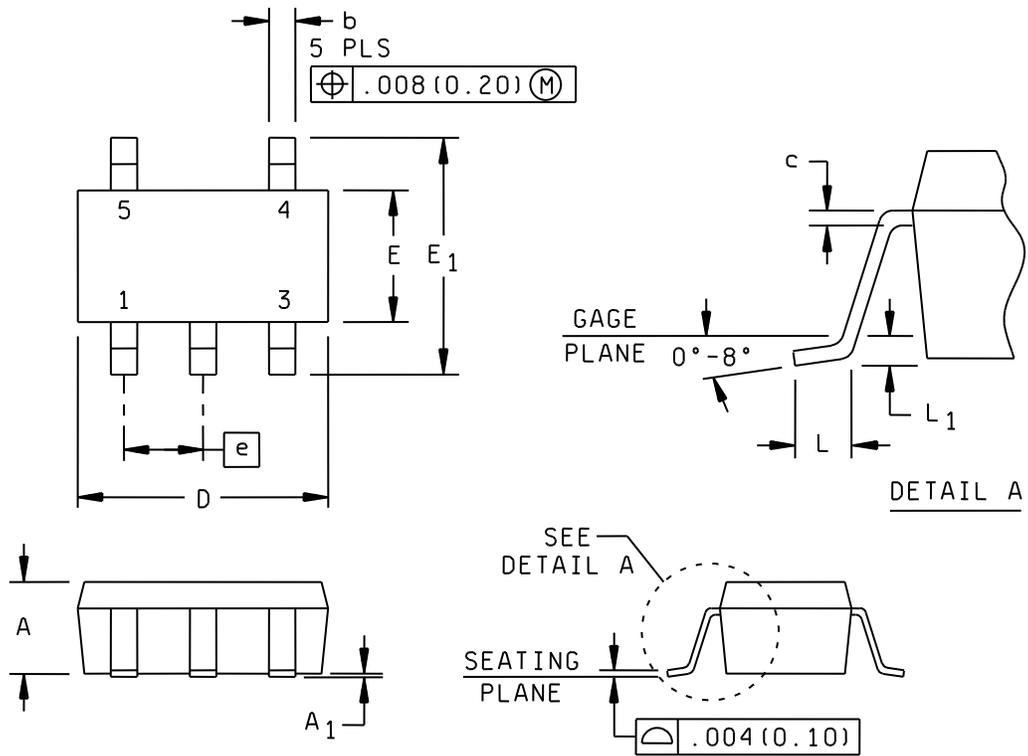


FIGURE 1. Case outline.

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Case X - continued

Symbol	Dimensions			
	Inch		Millimeters	
	Min	Max	Min	Max
A	---	.057	---	1.45
A1	.000	.005	0.00	0.15
b	.011	.019	0.30	0.50
c	.003	.008	0.08	0.22
D	.108	.120	2.75	3.05
E	.057	.068	1.45	1.75
E1	.102	.118	2.60	3.00
e	.037 BSC		0.95 BSC	
L	.011	.021	0.30	0.55
L1	.009 BSC		0.25 BSC	
n	5 leads		5 leads	

NOTES:

1. Controlling dimensions are millimeter, inch dimensions are given for reference only.
2. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 mm (.005 inch) per side
3. Falls with JEDEC MO-178-AA.

FIGURE 1. Case outline – Continued.

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Device types	01, 02, 03	04, 05, 06
Case outline	X	
Terminal number	Terminal symbol	
1	OUT	OUT
2	GND	GND
3	+V _{IN}	+V _S
4	-V _{IN}	+V _{IN}
5	+V _S	-V _{IN}

FIGURE 2. Terminal connections.

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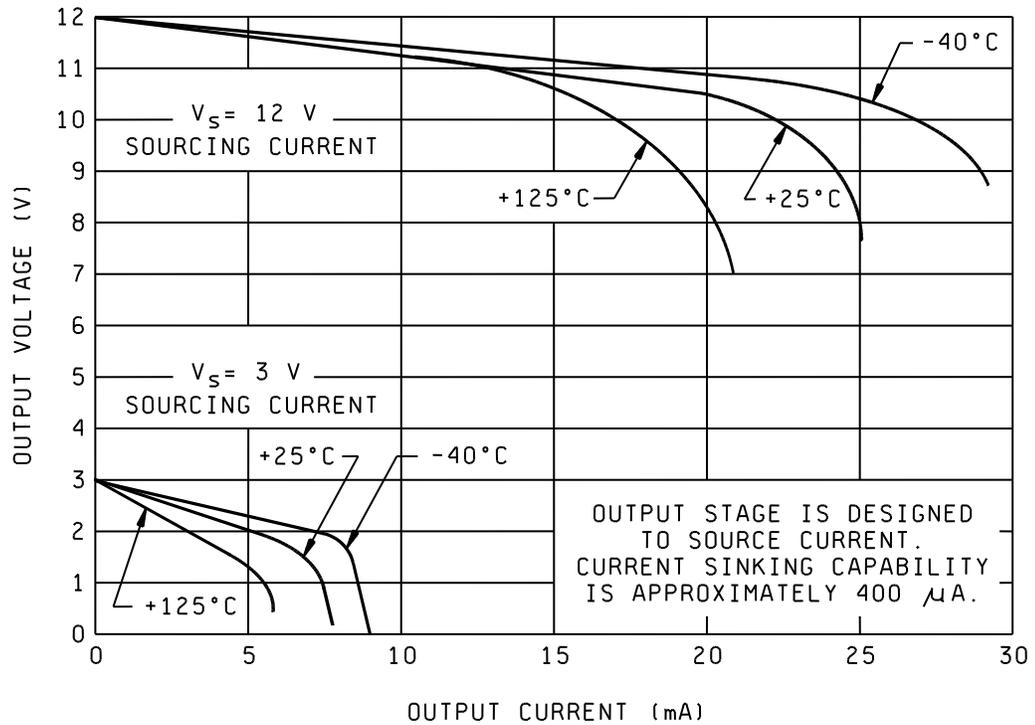


FIGURE 3. Positive output voltage swing versus output current.

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4. VERIFICATION

4.1 Product assurance requirements. The manufacturer is responsible for performing all inspection and test requirements as indicated in their internal documentation. Such procedures should include proper handling of electrostatic sensitive devices, classification, packaging, and labeling of moisture sensitive devices, as applicable.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Preservation, packaging, labeling, and marking shall be in accordance with the manufacturer's standard commercial practices for electrostatic discharge sensitive devices.

6. NOTES

6.1 ESDS. Devices are electrostatic discharge sensitive and are classified as ESDS class 1 minimum.

6.2 Configuration control. The data contained herein is based on the salient characteristics of the device manufacturer's data book. The device manufacturer reserves the right to make changes without notice. This drawing will be modified as changes are provided.

6.3 Suggested source(s) of supply. Identification of the suggested source(s) of supply herein is not to be construed as a guarantee of present or continued availability as a source of supply for the item. DLA Land and Maritime maintains an online database of all current sources of supply at <http://www.landandmaritime.dla.mil/Programs/Smcr/>.

Vendor item drawing administrative control number <u>1/</u>	Device manufacturer CAGE code	Package <u>2/</u>	Top sided marking	Vendor part number
V62/07638-01XE	01295	SOT23-5-DBV	CCC	INA193AMDBVREP
V62/07638-02XE	<u>3/</u>	SOT23-5-DBV	---	INA194AMDBVREP
V62/07638-03XE	<u>3/</u>	SOT23-5-DBV	---	INA195AMDBVREP
V62/07638-04EX	<u>3/</u>	SOT23-5-DBV	---	INA196AMDBVREP
V62/07638-05XE	<u>3/</u>	SOT23-5-DBV	---	INA197AMDBVREP
V62/07638-06XE	<u>3/</u>	SOT23-5-DBV	---	INA198AMDBVREP

1/ The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation.

2/ For the most current package and ordering information, see the package option addendum at the end of the vendor datasheet.

3/ Product preview.

CAGE code

01295

Source of supply

Texas Instruments, Inc.
Semiconductor Group
8505 Forest Ln.
P.O. Box 660199
Dallas, TX 75243
Point of contact: U.S. Highway 75 South
P.O. Box 84, M/S 853
Sherman, TX 75090-9493

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