REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

Prepared in accordance with ASME Y14.24

Vendor item drawing

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PMIC N/A	**PREPARED BY** RICK OFFICER	**DLA LAND AND MARITIME** **COLUMBUS, OHIO 43218-3990** **https://www.dla.mil/LandandMaritime**
Original date of drawing YY-MM-DD 20-04-01	**CHECKED BY** RAJESH PITHADIA **APPROVED BY** JAMES R. ESCHMEYER	TITLE MICROCIRCUIT, LINEAR, PRECISION MICROPOWER, LOW DROPOUT VOLTAGE REFERENCE, MONOLITHIC SILICON
	SIZE **A** **CODE IDENT. NO.** **16236**	**DWG NO.** **V62/20605**
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DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

AMSC N/A

5962-V032-20

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance precision micropower, low dropout voltage reference 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:

V62/20605	-	01	X	E
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).

Device type	Generic	Circuit function
01	REF191-EP	Precision micropower, low dropout voltage reference

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

Outline letter	Number of pins	JEDEC PUB 95	Package style
X	8	MS-012-AA	Small outline package

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

Finish designator	Material
A	Hot solder dip
B	Tin-lead plate
C	Gold plate
D	Palladium
E	Gold flash palladium
F	Tin-lead alloy (BGA/CGA)
Z	Other

1.3 Absolute maximum ratings. 1/

Supply voltage range (V_S)	-0.3 V to +18 V
Output to GND	-0.3 V to V_S + 0.3 V
Output to GND short circuit duration	Indefinite
Power dissipation (P_D)	≤ 100 mW 2/
Junction temperature range (TJ)	-65°C to +150°C
Storage temperature range (T_{STG})	-65°C to +150°C
Lead temperature (soldering 60 seconds)	+260°C
Thermal resistance, junction to case (θ_{JC})	43°C/W 3/
Thermal resistance, junction to ambient (θ_{JA})	158°C/W 3/

1.4 Recommended operating conditions. 4/

Supply voltage (V_S)	3.3 V
Operating 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/ Power should never go above approximately 100 mW and the part shouldn’t even be able to get this high under other absolute maximum ratings.

3/ Thermal impedance simulated values are based on JEDEC specifications. Use these values in compliance with JESD51-12.

4/ 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.

2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

JESD51-12 – Guidelines for Reporting and Using Electronics Package Thermal Information
JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices

(Copies of these documents are available online at https://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.

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions V_S = 3.3 V unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Initial accuracy 2/	V_O	Output current (I_{OUT}) = 0 mA	25°C	01	2.048 typical		V
					2.046	2.050	
Line regulation 3/	$\Delta V_O / \Delta V_{IN}$	3.0 V ≤ V_S ≤ 15 V, I_{OUT} = 0 mA	25°C	01	2 typical		ppm/V
						4	
Load regulation 3/	$\Delta V_O / \Delta V_{LOAD}$	V_S = 5.0 V, 0 mA ≤ I_{OUT} ≤ 30 mA	25°C	01	4 typical		ppm/mA
						11	
Dropout voltage	$V_S - V_O$	V_S = 3.0 V, load current (I_{LOAD}) = 2 mA	25°C	01		0.95	V
		V_S = 3.3 V, I_{LOAD} = 10 mA				1.25	
		V_S = 3.6 V, I_{LOAD} = 30 mA				1.55	
Long term stability 4/	D_{VO}	1000 hours at 125°C	25°C	01	1.2 typical		mV
Noise voltage	e_N	0.1 Hz to 10 Hz	25°C	01	20 typical		μVpp

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions V_S = 3.3 V unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Temperature coefficient 5/ 6/	TCV_O	I_{OUT} = 0 mA	-40°C ≤ T_A ≤ +125°C	01	2 typical		ppm/°C
						5	
Line regulation 3/	$\Delta V_O/\Delta V_{IN}$	3.0 V ≤ V_S ≤ 15 V, I_{OUT} = 0 mA	-40°C ≤ T_A ≤ +125°C	01	5 typical		ppm/V
						10	
Load regulation 3/	$\Delta V_O / \Delta V_{LOAD}$	V_S = 5.0 V, 0 mA ≤ I_{OUT} ≤ 20 mA	-40°C ≤ T_A ≤ +125°C	01	5 typical		ppm/mA
						15	
Dropout voltage	$V_S - V_O$	V_S = 3.0 V, I_{LOAD} = 2 mA	-40°C ≤ T_A ≤ +125°C	01		0.95	V
		V_S = 3.3 V, I_{LOAD} = 10 mA				1.25	
		V_S = 3.6 V, I_{LOAD} = 20 mA				1.55	
Logic high input voltage	V_H		-40°C ≤ T_A ≤ +125°C	01	2.4		V
Logic high input current	I_H		-40°C ≤ T_A ≤ +125°C	01		-8	µA
Logic low input voltage	V_L		-40°C ≤ T_A ≤ +125°C	01		0.8	V
Logic low input current	I_L		-40°C ≤ T_A ≤ +125°C	01		-8	µA
Supply current		No load	-40°C ≤ T_A ≤ +125°C	01		50	µA
Supply current, sleep mode		No load	-40°C ≤ T_A ≤ +125°C	01		15	µA

See footnotes at end of table.

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions V_S = 3.3 V unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Temperature 5/ 6/ coefficient	TCV_O	I_{OUT} = 0 mA	-55°C ≤ T_A ≤ +125°C	01	2 typical		ppm/ °C
Line regulation 3/	$\Delta V_O / \Delta V_{IN}$	3.0 V ≤ V_S ≤ 15 V, I_{OUT} = 0 mA	-55°C ≤ T_A ≤ +125°C	01	10 typical		ppm/ V
Load regulation 3/	$\Delta V_O / \Delta V_{LOAD}$	V_S = 5.0 V, 0 mA ≤ I_{OUT} ≤ 25 mA	+25°C	01	10 typical		ppm/ mA
			-55°C			15	
		V_S = 5.0 V, 0 mA ≤ I_{OUT} ≤ 20 mA	+25°C		10 typical		
			+125°C			15	
Dropout voltage	V_S – V_O	V_S = 3.3 V, I_{LOAD} = 10 mA	-55°C ≤ T_A ≤ +125°C	01		1.25	V
		V_S = 3.6 V, I_{LOAD} = 20 mA				1.55	

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/ Initial accuracy does not include shift due to solder heat effect.

3/ Line and load regulation specifications include the effect of self heating.

4/ Long term stability specification is noncumulative. The drift is subsequent 1000 hour periods is significantly lower than in the first 1000 hour period.

5/ For proper operation, a 1 μF capacitor is required between the output pin and the GND of the device.

6/ TCV_O is defined as the ratio of the output voltage change (between the maximum output voltage (V_{MAX}) and the minimum output voltage (V_{MIN}) with temperature variation to the specified temperature range, expressed in ppm/°C.

$TCV_O = (V_{MAX} – V_{MIN}) / VO(T_{MAX} – T_{MIN})$.

Case X

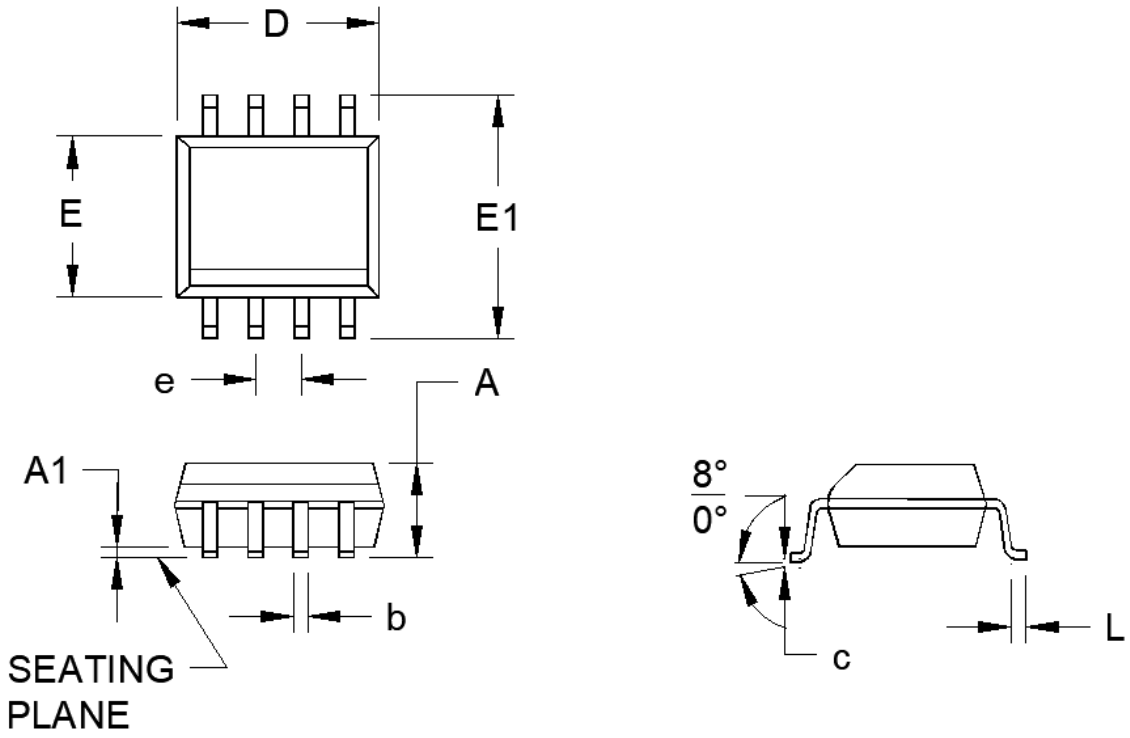


FIGURE 1. Case outline.

Symbol	Dimensions			
	Inches		Millimeters	
	Minimum	Maximum	Minimum	Maximum
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.0122	.0201	0.31	0.51
c	.0067	.0098	0.17	0.25
D	.1890	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
E1	.2284	.2441	5.80	6.20
e	.0500 BSC		1.27 BSC	
L	.0157	.0500	0.40	1.27

NOTES:
1. Controlling dimensions are millimeter, inch dimensions are given for reference only.
2. Falls within reference to JEDEC MS-012-AA.

FIGURE 1. Case outline - Continued.

Device type	01	
Case outline	X	
Terminal number	Terminal symbol	Description
1	TP	TP pins are factory test point, no user connection.
2	V_S	Supply voltage.
3	$\overline{SLEEP}$	Sleep mode control pin, active low.
4	GND	Ground
5	TP	TP pins are factory test point, no user connection.
6	OUTPUT	Device output
7	NIC	No internal connection.
8	NIC	No internal connection.

FIGURE 2. Terminal connections.

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 https://landandmaritimeapps.dla.mil/programs/smcr/.

Vendor item drawing administrative control number 1/	Device manufacturer CAGE code	Mode of transportation and quantity	Top side marking	Vendor part number
V62/20605-01XE	24355	Tray, 98 units	REF191TRZEP	REF191TRZ-EP
		Reel, 2500 units	REF191TRZEP	REF191TRZ-EP-RL

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

CAGE code	Source of supply
24355	Analog Devices Route 1 Industrial Park P.O. Box 9106 Norwood, MA 02062 Point of contact: 20 Alpha Road Chelmsford, MA 01824-4123