

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
B	Add device type 04. - ro	10-11-17	C. SAFFLE
C	Add paragraph 1.5 and delete Thermal resistance, junction to ambient limit from Table I. Add min limits to the Input voltage and Output short circuit parameters under paragraph 1.3. Make change to Input voltage range, add Output current, and add footnotes to Electrostatic discharge parameters to paragraph 1.4. Make changes to Output voltage temperature drift, Line regulation, Load regulation, and Quiescent current tests as specified under Table I. Update document paragraphs to current requirements. - ro	16-06-01	C. SAFFLE
D	Make changes to VIN and IOS limits under paragraph 1.3. Add JEDEC references to paragraphs 1.3 and 2. Make changes to paragraphs 1.4 and 1.5. Make changes to Initial accuracy, Output voltage temperature drift, Line regulation, Load regulation, and Quiescent current tests under Table I. Make change to dimension "c" min limit and note 3 under figure 1. Add I/O column and make changes to descriptions under figure 2.- ro	21-09-02	J. ESCHMEYER



**CURRENT DESIGN ACTIVITY CAGE CODE 16236
HAS CHANGED NAMES TO:
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990**

Prepared in accordance with ASME Y14.24

Vendor item drawing

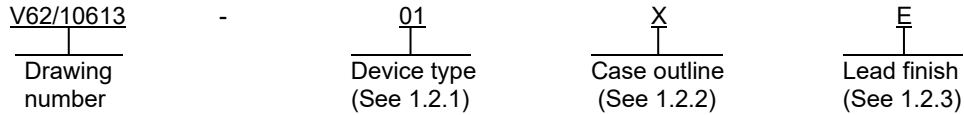
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PMIC N/A	PREPARED BY RICK OFFICER	DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990
Original date of drawing YY-MM-DD 10-05-11	CHECKED BY RAJESH PITHADIA	TITLE MICROCIRCUIT, LINEAR, LOW NOISE, LOW DRIFT, PRECISION VOLTAGE REFERENCE, MONOLITHIC SILICON
	APPROVED BY CHARLES F. SAFFLE	
	SIZE A	CODE IDENT. NO. 16236
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1. SCOPE

1.1 Scope. This drawing documents the general requirements of a low noise, low drift, precision 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:



1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Output voltage</u>	<u>Circuit function</u>
01	REF5020	2.048 V	Low noise, low drift, precision voltage reference
02	REF5040	4.096 V	Low noise, low drift, precision voltage reference
03	REF5050	5.0 V	Low noise, low drift, precision voltage reference
04	REF5025	2.5 V	Low noise, low drift, precision voltage reference

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	8	MS-012-AA	Plastic surface mount with gullwing leads

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

<u>Finish designator</u>	<u>Material</u>
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

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1.3 Absolute maximum ratings. 1/

Input voltage (VIN)	18 V
Output short circuit (IOS)	30 mA
Operating temperature range (TA)	-55°C to +125°C
Storage temperature range (TSTG)	-65°C to +150°C
Junction temperature range (TJ max)	150°C
Power dissipation (PD)	166.66 mW
Electrostatic discharge (ESD) rating:	
Human body model (HBM), per JEDEC JS-001	±3,000 V 2/
Charged device model (CDM), per JEDEC JESD22-C101	±1,000 V 3/

1.4 Recommended operating conditions. 4/

Input voltage range (VIN) per device :

Device types 01, 02, 03, 04	(VOUT + 0.2 V) min, 18 V max
Output current (IOUT)	-10 mA min, 10 mA max
Operating temperature range (TA)	-55°C to +125°C

1.5 Thermal characteristics.

Thermal metric	Symbol	Case X	Unit
Thermal resistance, junction-to-ambient	θ_{JA}	123.8	°C/W
Thermal resistance, junction-to-case (top)	$\theta_{JC(TOP)}$	54.4	°C/W
Thermal resistance, junction-to-board	θ_{JB}	69.3	°C/W
Characterization parameter, junction-to-top	ψ_{JT}	10.2	°C/W
Characterization parameter, junction-to-board	ψ_{JB}	68.1	°C/W
Thermal resistance, junction-to-case (bottom)	$\theta_{JC(BOTTOM)}$	Not applicable	°C/W

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/ JEDEC document JEP155 states that 500 V HBM allows safe manufacturing with a standard ESD control process.

3/ JEDEC document JEP157 states that 250 V HBM allows safe manufacturing with a standard ESD control process.

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.

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2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

- JEDEC JS-001 - Human Body Model Testing of Integrated Circuits
- JEESD22-C101 - Field-Induced Charged-Device Model Test Method for Electrostatic-Discharge-Withstand Thresholds of Microelectronics Components
- JEDEC PUB 95 - Registered and Standard Outlines for Semiconductor Devices
- JEDEC JEP 155 - Recommended ESD Target Levels for HBM/MM Qualification
- JEDEC JEP 157 - Recommended ESD-CDM Target Levels

(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.

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TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions <u>2/</u>	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Output voltage	V _{OUT}	2.7 V < V _{IN} < 18 V <u>3/</u>	+25°C	01	2.048 typical		V
				02	4.096 typical		
				03	5 typical		
				04	2.5 typical		
Initial accuracy			+25°C	All	-0.05	0.05	%
			55°C to +125°C	01, 02, 03	-0.08	0.08	
Output voltage noise		f = 0.1 Hz to 10 Hz	+25°C	01	6 typical		µV _{PP}
				02	12 typical		
				03	15 typical		
				04	7.5 typical		
Output voltage temperature drift	ΔV _{OUT} / ΔT		-55°C to +125°C	01, 02		5	ppm / °C
				03, 04		6.5	
Line regulation	ΔV _{OUT} / ΔV _{IN}	V _{IN} = 2.7 V to 18 V <u>3/</u>	+25°C	01		1	ppm/V
		V _{IN} = V _{OUT} + 0.2 V	+25°C	02, 03, 04		1	
			-55°C to +125°C			3	
Load regulation	ΔV _{OUT} / ΔI _{LOAD}	-10 mA < I _{LOAD} < +10 mA, V _{IN} = 3 V	+25°C	01		30	ppm / mA
		-10 mA < I _{LOAD} < +10 mA, V _{IN} = V _{OUT} + 0.75 V	+25°C	02, 03, 04		30	
			-55°C to +125°C			60	
Short circuit current	ISC	V _{OUT} = 0 V	+25°C	All	25 typical		mA
TEMP pin, voltage output			+25°C	All	575 typical		mV
TEMP pin, temperature sensitivity			-55°C to +125°C	All	2.64 typical		mV/°C
Turn on settling time		To 0.1 % with C _L = 1 µF	+25°C	All	200 typical		µs

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	
Power supply							
Supply voltage	V _S	<u>3/</u>	+25°C	All	V _{OUT} + 0.2	18	V
Quiescent current			+25°C	All		1	mA
			-55°C to +125°C			1.25	
Specified temperature range				All	-55	+125	°C
Operating temperature range				All	-55	+125	°C

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, I_{LOAD} = 0, C_L = 1 μF, and V_{IN} = (V_{OUT} + 0.2 V) to 18 V.

3/ For V_{OUT} ≤ 2.5 V, the minimum supply voltage is 2.7 V.

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Case X

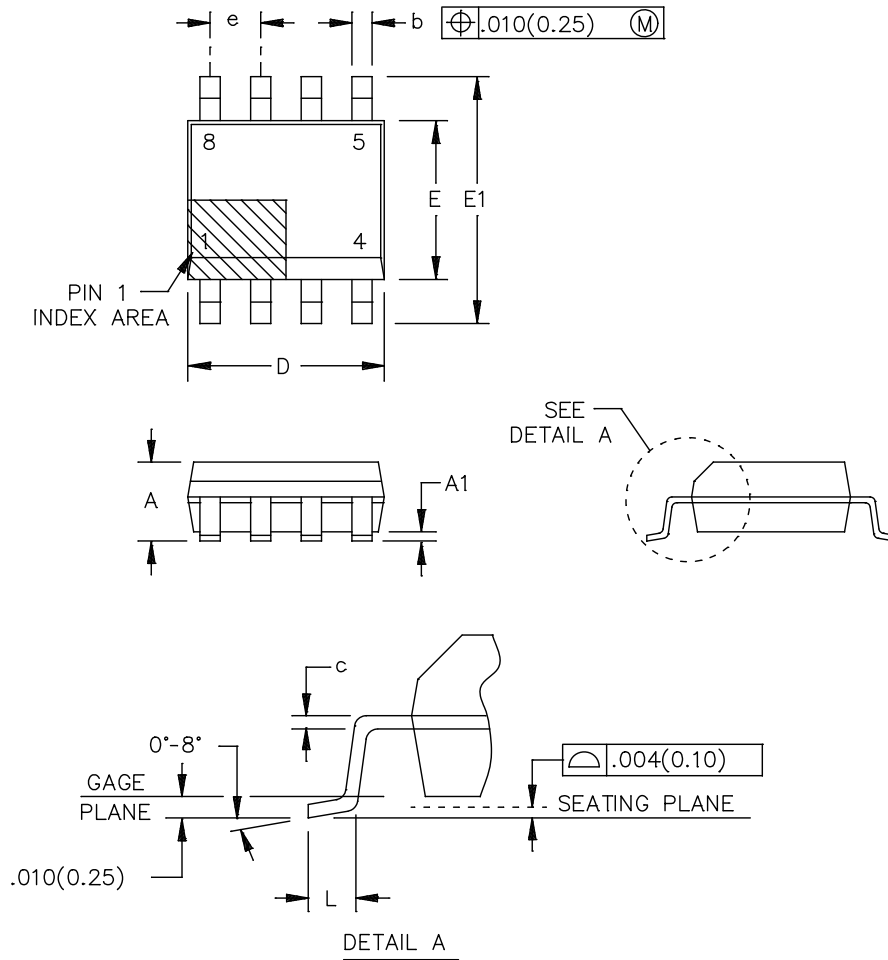


FIGURE 1. Case outline.

<p>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 16236</p>	<p>DWG NO. V62/10613</p>
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Case X

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	---	.069	---	1.75
A1	.004	.010	0.10	0.25
b	.012	.020	0.31	0.51
c	.005	.010	0.13	0.25
D	.189	.197	4.80	5.00
E	.150	.157	3.81	3.99
E1	.228	.244	5.80	6.20
e	.050 BSC		1.27 BSC	
L	.016	.050	0.41	1.27
n	8		8	

NOTES:

1. Controlling dimensions are inch, millimeter dimensions are given for reference only.
2. For dimension D, body length does not include mold flash, protrusion, or gate burrs. Mold flash, protrusion, or gate burrs shall not exceed .006 inch (0.15 mm) per side.
3. For dimension E, body width does not include interlead flash.
4. Falls with JEDEC MS-012-AA.

FIGURE 1. Case outline – Continued.

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Device types	01, 02, 03, 04		
Case outline	X		
Terminal number	Terminal symbol	I/O	Description
1	DNC	---	Do not connect.
2	VIN	Power	Power supply voltage. Range from VOUT + 0.2 V up to 18 V. Recommended bypass capacitor from 1 μ F to 10 μ F.
3	TEMP	O	Temperature monitoring pin provides a temperature dependent voltage output.
4	GND	Power	System ground.
5	TRIM / NR	I	Output adjustment and noise reduction input. Connecting 1 μ F to this pin will create low pass filter at the bandgap and reduce output noise.
6	VOUT	O	Very accurate, factory trimmed voltage output. Recommended bypass capacitor from 1 μ F up to 50 μ F with equivalent series resistance (ESR) between 1 Ω and 1.5 Ω .
7	NC	---	No internal connection.
8	DNC	---	Do not connect.

FIGURE 2. Terminal connections.

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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 <https://landandmaritimeapps.dla.mil/Programs/Smcr/>.

Vendor item drawing administrative control number <u>1/</u> <u>2/</u> <u>3/</u>	Device manufacturer CAGE code	Output voltage	Top side marking	Vendor part number
V62/10613-01XE	01295	2.048 V	5020EP	REF5020MDREP
V62/10613-02XE	01295	4.096 V	5040EP	REF5040MDREP
V62/10613-03XE	01295	5 V	5050EP	REF5050MDREP
V62/10613-04XE	01295	2.5 V	5025EP	REF5025MDTEP

- 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 manufacturer's data sheet.
- 3/ Package drawings, standard packaging quantities, thermal data, symbolization, and printed circuit board (PCB) design guidelines are available from the manufacturer.

CAGE code

01295

Source of supply

Texas Instruments, Inc.
Semiconductor Group
8505 Forest lane
P.O. Box 660199
Dallas, TX 75243

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