

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance 24 V low dropout regulator 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>V62/08619</u> Drawing number	-	<u>01</u> Device type (See 1.2.1)	<u>X</u> Case outline (See 1.2.2)	<u>E</u> Lead finish (See 1.2.3)
--	---	--	--	---

1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Circuit function</u>
01	TPS71501-EP	24 V low dropout regulator

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-203-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 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
Z	Other

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 2

1.3 Absolute maximum ratings. 1/ 2/

Input voltage range (V_{IN})	-0.3 V to 24 V
Output voltage range (V_{OUT})	-0.3 V to 6 V
Peak output current	Internally limited
Continuous total power dissipation (P_D)	See 1.5 dissipation rating table
Junction temperature range (T_J)	-55°C to +150°C
Storage temperature range (T_{STG})	-65°C to +150°C
Electrostatic discharge (ESD) rating:	
Human body model (HDM)	2000 V
Charge device model (CDM)	500 V

1.4 Recommended operating conditions. 3/

Operating free-air temperature range (T_A)	-55°C to +125°C
--	-----------------

1.5 Dissipation rating table.

Board	θ_{JC}	θ_{JA}	Derating factor above $T_A = 25^\circ\text{C}$	$T_A \leq 25^\circ\text{C}$ power rating	$T_A = 70^\circ\text{C}$ power rating	$T_A = 85^\circ\text{C}$ power rating
Low K <u>4/</u>	165°C/W	395°C/W	2.52 mW/°C	250 mW	140 mW	100 mW
High K <u>5/</u>	165°C/W	315°C/W	3.18 mW/°C	320 mW	175 mW	130 mW

-
- 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/ All voltage values are within respect to the network ground terminal.
 - 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.
 - 4/ The JEDEC Low K (1s) board design used to derive this data was a 3 inch x 3 inch, two layer board with 2 ounce copper traces on top of the board.
 - 5/ The JEDEC High K (2s2p) board design used to derive this data was a 3 inch x 3 inch, multilayer board with 1 ounce internal power and ground planes and 2 ounce copper traces on top and bottom of the board.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 3

2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices

(Copies of these documents are available online at <http://www.jedec.org> or from JEDEC – Solid State Technology Association, 3103 North 10th Street, Suite 240–S, Arlington, VA 22201-2107).

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.

3.5.3 Block diagram. The block diagram shall be as shown in figure 3.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 4

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions 2/	Temperature, T _J	Device type	Limits		Unit
					Min	Max	
Input voltage 3/	V _{IN}	I _O = 10 mA	-55°C to +125°C	01	2.5	24	V
		I _O = 50 mA			3	24	
Voltage range	V _{OUT}		-55°C to +125°C	01	1.2	15	V
V _{OUT} accuracy 3/ over V _{IN} , I _{OUT} , and temperature	V _{OUT}	V _{IN} + 1.0 V ≤ V _{IN} ≤ 24 V, 100 μA ≤ I _{OUT} ≤ 50 mA	-55°C to +125°C	01	-6.25	+6.25	%
Ground pin current 4/	I _{GND}	0 mA ≤ I _{OUT} ≤ 50 mA	-40°C to +85°C	01		4.2	μA
		0 mA ≤ I _{OUT} ≤ 50 mA	-55°C to +125°C			4.8	
		0 mA ≤ I _{OUT} ≤ 50 mA, V _{IN} = 24 V				5.8	
Load regulation	ΔV _{OUT} / ΔI _{OUT}	I _{OUT} = 100 μA to 50 mA	+25°C	01	22 typical		mV
Output voltage 3/ line regulation	ΔV _{OUT} / ΔV _{IN}	V _{OUT} + 1 V < V _{IN} ≤ 24 V	-55°C to +125°C	01		75	mV
Output noise voltage	V _n	BW = 200 Hz to 100 kHz, C _{OUT} = 10 μF, I _{OUT} = 50 mA	+25°C	01	575 typical		μVrms
Output current limit	I _{CL}	V _{OUT} = 0 V, V _{IN} ≥ 3.5 V	-55°C to +125°C	01	125	750	mA
		V _{OUT} = 0 V, V _{IN} < 3.5 V			90	750	
Power supply ripple rejection	PSRR	f = 100 kHz, C _{OUT} = 10 μF	+25°C	01	60 typical		dB
Dropout voltage V _{IN} = V _{OUT(NOM)} - 1 V	V _{DO}	I _{OUT} = 50 mA	-55°C to +125°C	01		750	mV

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_{IN} = V_{OUT(NOM)} + 1 V, I_{OUT} = 1 mA, and C_{OUT} = 1 μF.

3/ Minimum V_{IN} = V_{OUT} + V_{DO} or the value shown for input voltage in this table, whichever is greater.

4/ See figure 3. This device employs a leakage null control circuit. This circuit is active only if output current is less than pass field effect transistor (FET) leakage current. The circuit is normally active when output load is less than 5 μA, V_{IN} is greater than 18 V, and die temperature is greater than 100°C.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 5

Case X

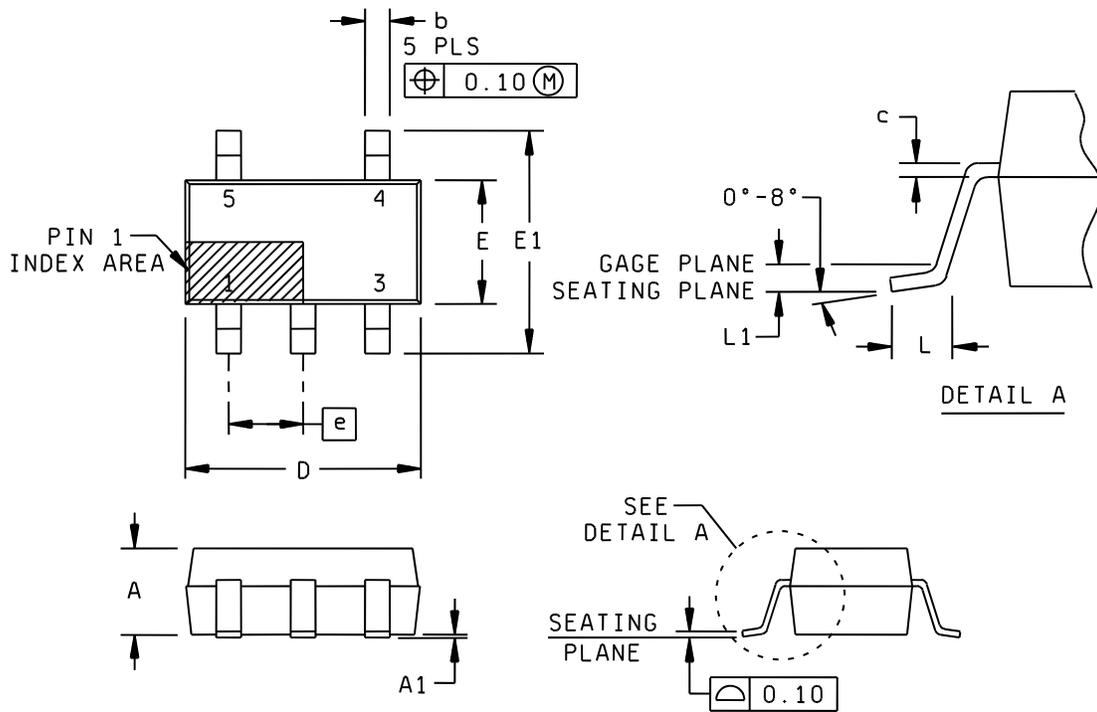


FIGURE 1. Case outline.

<p>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 16236</p>	<p>DWG NO. V62/08619</p>
		<p>REV A</p>	<p>PAGE 6</p>

Case X

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.031	.043	0.80	1.10
A1	.000	.003	0.00	0.10
b	.005	.011	0.15	0.30
c	.003	.008	0.08	0.22
D	.072	.084	1.85	2.15
E	.043	.055	1.10	1.40
E1	.070	.094	1.80	2.40
e	.025 BSC		0.65 BSC	
L	.010	.018	0.26	0.46
L1	.005 BSC		0.15 BSC	

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 (0.005 inch) per side.
3. Falls within JEDEC MO-203-AA.

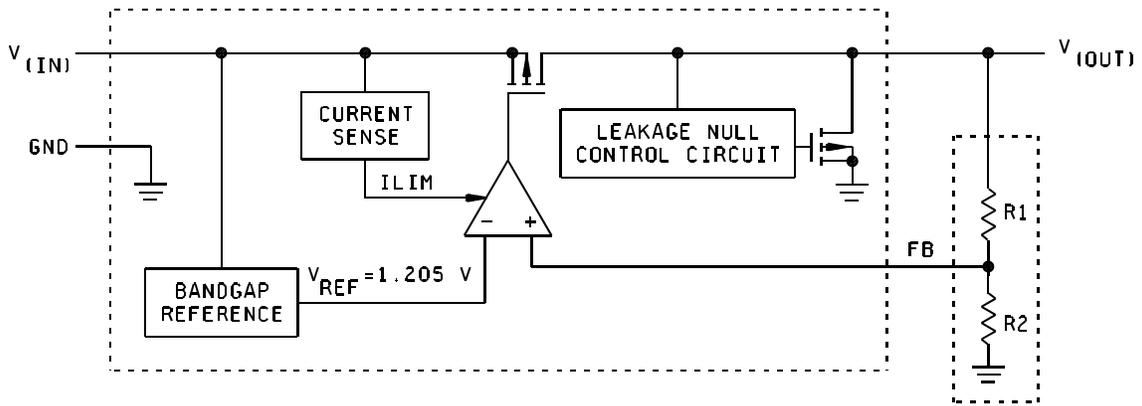
FIGURE 1. Case outline - continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 7

Device type	01	
Case outline	X	
Terminal number	Terminal symbol	Description
1	FB	Feedback. This terminal is used to set the output voltage.
2	GND	Ground.
3	NC	No connection.
4	IN	Input supply.
5	OUT	Output of the regulator, any output capacitor $\geq 0.47 \mu\text{F}$ can be used for stability.

FIGURE 2. Terminal connections.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 8



Output voltage programming guide table

Output voltage	R1	R2
1.8 V	0.499 MΩ	1 MΩ
2.8 V	1.33 MΩ	1 MΩ
5.0 V	3.16 MΩ	1 MΩ

FIGURE 3. Block diagram.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 9

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/ 2/</u>	Device manufacturer CAGE code	Package <u>3/</u>	Top side marking	Vendor part number
V62/08619-01XE	01295	Reel of 3000	CVP	TPS71501MDCKREP

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, thermal data, and symbolization are available from the manufacturer.

<u>CAGE code</u>	<u>Source of supply</u>
01295	Texas Instruments, Inc. Semiconductor Group 8505 Forest Lane 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

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08619
		REV A	PAGE 10