

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Add device type 02. Update boilerplate to current revision. - CFS	06-06-22	Thomas M. Hess
B	Make correction to the number of pins from "20" to "8" under paragraph 1.2.2. Editorial changes throughout. - ro	08-11-10	Robert M. Heber
C	Update boilerplate to current MIL-PRF-38535 requirements. - PHN	14-12-22	Thomas M. Hess
D	Update boilerplate to current MIL-PRF-38535 requirements. - PHN	20-05-26	Muhammad A. Akbar

**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

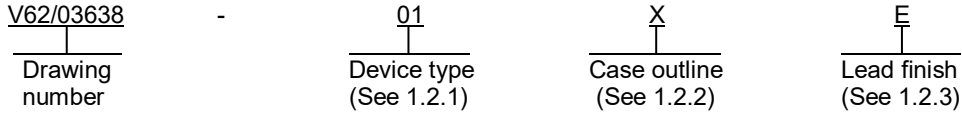
REV																				
PAGE																				
REV																				
PAGE																				
REV STATUS OF PAGES	REV	D	D	D	D	D	D	D	D	D	D	D								
	PAGE	1	2	3	4	5	6	7	8	9	10									

PMIC N/A	PREPARED BY Phu H. Nguyen	DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990	
Original date of drawing YY-MM-DD  03-09-04	CHECKED BY Phu H. Nguyen	TITLE MICROCIRCUIT, LINEAR, DIFFERENTIAL COMPARATOR WITH STROBES, MONOLITHIC SILICON	
	APPROVED BY Thomas M. Hess		
	SIZE A	CODE IDENT. NO. 16236	DWG NO. <b>V62/03638</b>
	REV D		PAGE 1 OF 10

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance differential comparator with strobes microcircuit, with an operating temperature range of -40°C to +125°C for device 01, and an operating temperature range of -55°C to +125°C for device 02.

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). 1/

<u>Device</u>	<u>Generic number</u>	<u>Operating temperature range</u>	<u>Circuit function</u>
01	LM211-EP	-40°C to +125°C	Differential comparator with strobes
02	LM211-EP	-55°C to +125°C	Differential comparator with strobes

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	JEDEC MS-012	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
F	Tin-lead alloy
Z	Other

1/ Users are cautioned to review the manufacturers data manual for additional user information relating to these devices.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	SIZE <b>A</b>	CODE IDENT NO. <b>16236</b>	DWG NO. <b>V62/03638</b>
		REV    D	PAGE    2

1.3 Absolute maximum ratings. 2/

Supply voltage:

VCC+ .....	+18.0 V	3/
VCC- .....	-18.0 V	3/
VCC+ - VCC- .....	+36.0 V	3/
Differential input voltage, (VID) .....	±30.0 V	4/
Input voltage, (VI) (either input) .....	±15.0 V	3/ 5/
Voltage from emitter output to VCC- .....	+30.0 V	
Voltage from collector output to VCC- .....	+50.0 V	
Duration of output short circuit .....	10 s	6/
Junction temperature, (TJ) .....	+148°C	
Package thermal impedance (θJA) .....	+97°C/W	7/
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds .....	+260°C	
Storage temperature range, (TSTG) .....	-65°C to +150°C	8/

1.4 Recommended operating conditions.

Supply voltage (VCC+ - VCC-) .....	+3.5 V to +30.0 V
Input voltage, (VI) ( VCC±  ≤ 15.0 V) .....	VCC- +0.5 V to VCC+ -1.5 V
Operating ambient temperature range, (TA):	
Device 01 .....	-40°C to +125°C
Device 02 .....	-55°C to +125°C

2/ 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.

3/All voltage values, unless otherwise noted, are with respect to the midpoint between VCC+ and VCC-.

4/ Differential voltages are at IN+ with respect to IN-.

5/The magnitude of the input voltage must never exceed the magnitude of the supply voltage or ±15 V, whichever is less.

6/The output may be shorted to ground or either power supply.

7/The package thermal impedance is calculated in accordance with JESD 51-7.

8/ Long-term high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03638</b>
		REV D	PAGE 3

2. APPLICABLE DOCUMENTS

JEDEC – SOLID STATE TECHNOLOGY ASSOCIATION (JEDEC)

- JEP95 – Registered and Standard Outlines for Semiconductor Devices
- JESD51-7 – High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages

(Applications for copies should be addressed to the Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834 or 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.

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

3.5.4 Schematic diagram. The schematic diagram shall be as shown in figure 4.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03638</b>
		<b>REV D</b>	<b>PAGE 4</b>

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Test conditions $V_{CC\pm} = \pm 15\text{ V}$ unless otherwise specified	Temperature, $T_A$ 2/	Limits		Unit
				Min	Max	
Input offset voltage	$V_{IO}$	3/	25°C		3	mV
			Full range		4	
Input offset current	$I_{IO}$	3/	25°C		10	nA
			Full range		20	
Input bias current	$I_{IB}$		25°C		100	nA
			Full range		150	
Low level strobe current 4/	$I_{IL(S)}$	$V_{(strobe)} = 0.3\text{ V}$ , $V_{ID} \leq -10\text{ mV}$	25°C	-3 typical		mA
Common-mode input voltage range	$V_{ICR}$		Full range	13 to -14.5		V
Large signal differential voltage amplification	$A_{VD}$	$V_O = 5\text{ V to } 35\text{ V}$ , $R_L = 1\text{ k}\Omega$	25°C	40		V/mV
High level (collector) output leakage current	$I_{OH}$	$I_{(strobe)} = -3\text{ mA}$ , $V_{OH} = 35\text{ V}$ , $V_{ID} = 5\text{ mV}$	25°C		10	nA
			Full range		0.5	$\mu\text{A}$
Low level (collector to emitter) output voltage	$V_{OL}$	$I_{OL} = 50\text{ mA}$ , $V_{ID} = -5\text{ mV}$	25°C		1.5	V
		$V_{CC+} = 4.5\text{ V}$ , $V_{CC-} = 0$ , $V_{ID} = -6\text{ mV}$ , $I_{OL} = 8\text{ mA}$	Full range		0.4	
Supply current from $V_{CC+}$ , output low	$I_{CC+}$	$V_{ID} = -10\text{ mV}$ , no load	25°C		6	mA
Supply current from $V_{CC-}$ , output high	$I_{CC-}$	$V_{ID} = 10\text{ mV}$ , no load	25°C		-5	mA
Response time, low to high level output		$R_C = 500\ \Omega$ to $5\text{ V}$ , $C_L = 5\text{ pF}$ 5/	25°C	115 typical		ns
Response time, high to low level output				165 typical		ns

- 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 noted, all characteristics are measured with BALANCE and BAL/STRB open and EMIT OUT grounded. Full range is -40°C to +125°C for device 01 and -55°C to +125°C for device 02.
- 3/ The offset voltages and offset currents given are the maximum values required to drive the collector output up to 14 V or down to 1 V with a pullup resistor of 7.5 k $\Omega$  to  $V_{CC+}$ . These parameters actually define an error band and take into account the worst-case effects of voltage gain and input impedance.
- 4/ The strobe should not be shorted to ground; it should be current driven at -3 mA to -5 mA.
- 5/ The response time specified is for a 100 mV input step with 5 mV overdrive and is the interval between the input step function and the instant when the output crosses 1.4 V.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03638</b>
		<b>REV D</b>	<b>PAGE 5</b>

Case X

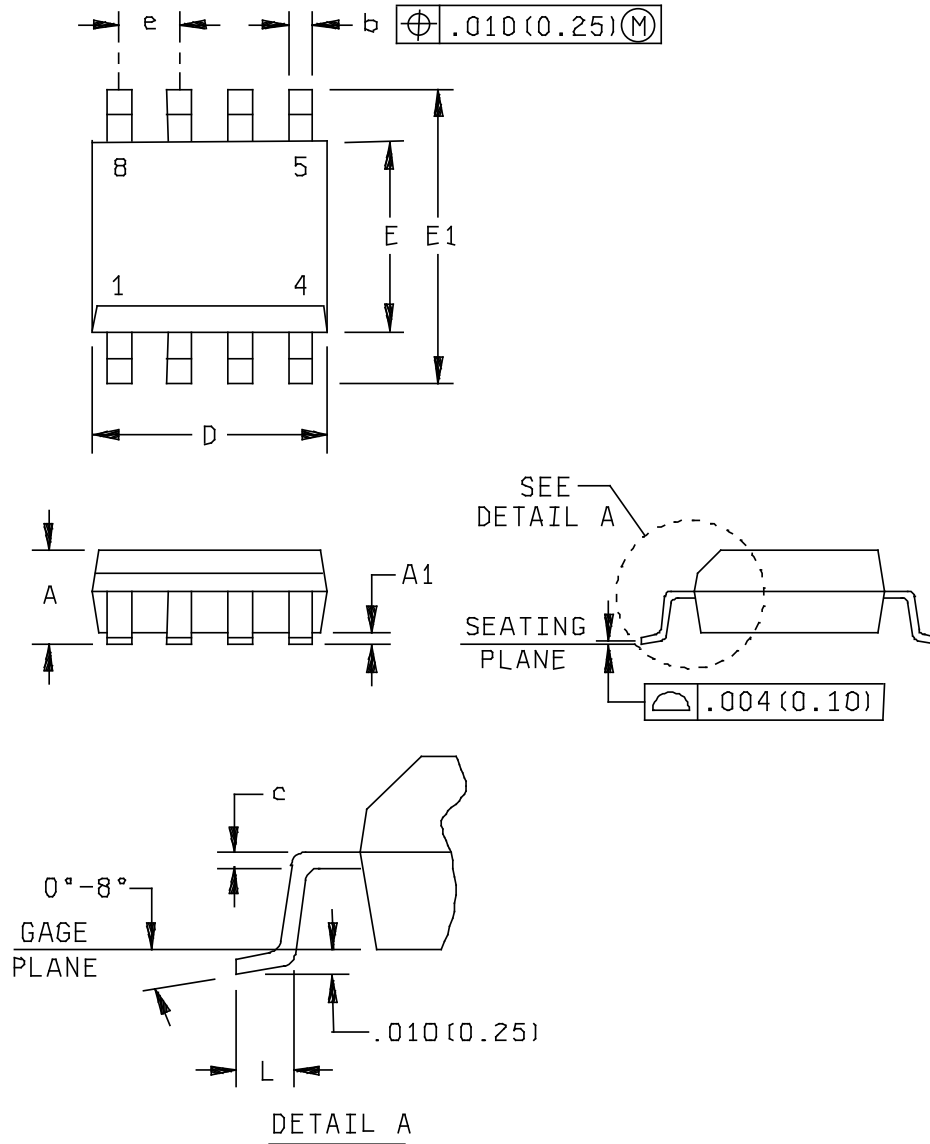


FIGURE 1. Case outline.

<p><b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b></p>	<p><b>SIZE A</b></p>	<p><b>CODE IDENT NO. 16236</b></p>	<p><b>DWG NO. V62/03638</b></p>
		<p>REV D</p>	<p>PAGE 6</p>

Case X

Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	---	0.069	---	1.75
A1	0.004	0.010	0.10	0.25
b	0.014	0.020	0.35	0.51
c	0.008 NOM		0.20 NOM	
D	---	0.197	---	5.00
E	0.150	0.157	3.81	4.00
E1	0.228	0.244	5.80	6.20
e	0.050 BSC		1.27 BSC	
L	0.016	0.044	0.40	1.12

Notes:

1. Controlling dimensions are inch, millimeter dimensions are given for reference only.
2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusions, not to exceed 0.006 inch (0.15 mm).
4. Falls within JEDEC MS-012.

FIGURE 1. Case outline - continued.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03638</b>
		REV D	PAGE 7

Device type	01
Case outline	X
Terminal number	Terminal symbol
1	EMIT OUT
2	INPUT+
3	INPUT-
4	VCC-
5	BALANCE
6	BAL / STRB
7	COL OUT
8	VCC+

FIGURE 2. Terminal connections.

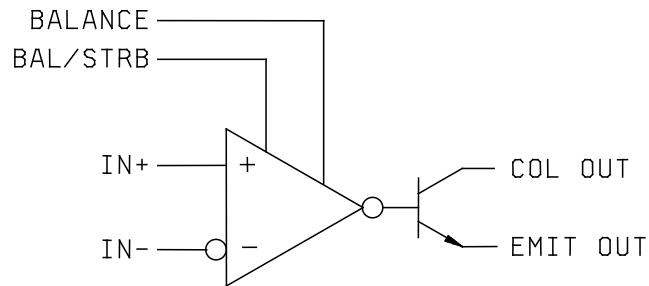
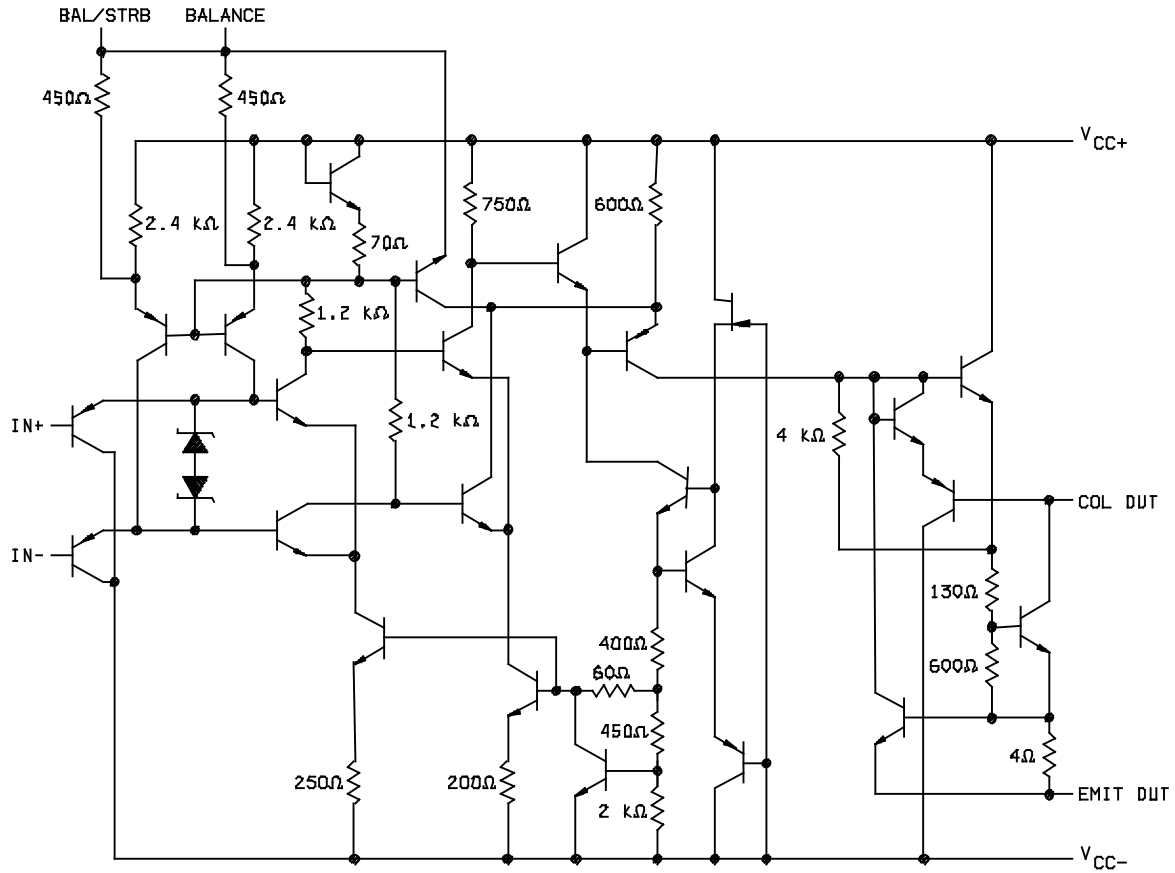


FIGURE 3. Functional block diagram.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03638</b>
		REV D	PAGE 8





NOTE: All resistor values shown are nominal.

FIGURE 4. Schematic diagram.

<p><b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b></p>	<p>SIZE <b>A</b></p>	<p>CODE IDENT NO. <b>16236</b></p>	<p>DWG NO. <b>V62/03638</b></p>
		<p>REV    D</p>	<p>PAGE    9</p>

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>	Device manufacturer CAGE code	Top side marking	Vendor part number <u>2/</u>
V62/03638-01XE	01295	LM211E	LM211QDREP
V62/03638-02XE	01295	LM221M	LM211MDREP

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

2/ The package is available taped and reeled.

CAGE code

01295

Source of supply

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

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03638</b>
		REV D	PAGE 10