

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance isolated, 4 amp dual channel gate driver 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>V62/16622</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>Circuit function</u>
01	ADuM3221	Isolated, 4 amp dual channel gate driver

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	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:

<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 ranges (VDD): 2/

VDD1 -0.5 V to +7.0 V

VDD2 -0.5 V to +20 V

Input voltage range (VIA, VIB) -0.5 V to VDDI + 0.5 V 2/ 3/

Output voltage range (VOA, VOB) -0.5 V to VDDO + 0.5 V 2/ 3/

Average output current per pin (IO) -23 mA to +23 mA 4/

Common mode transients (CMH, CML) -100 kV/μs to +100 kV/μs 5/

Storage temperature range -55°C to +150°C

1.4 Recommended operating conditions. 6/

Operating junction temperature range (TJ) -55°C to +125°C

Supply voltage ranges (VDD): 2/

VDD1 +3.0 V to +5.5 V

VDD2 +7.6 V to +18 V

VDD1 rise time (tVDD1) 1 V/μs maximum

Common mode transient immunity, input to output -25 kV/μs minimum, +25 kV/μs maximum

Input signal rise and fall times 1 ms maximum

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 voltages are relative to their respective ground.

3/ VDDI and VDDO refer to the supply voltages on the input and output sides of a given channel, respectively.

4/ See figure 4 for information about maximum allowable current for various temperatures.

5/ Refers to common mode transients across the insulation barrier. Common mode transients exceeding the absolute maximum rating can cause latch up or permanent damage.

6/ 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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1.5 Maximum continuous working voltage. 7/

Parameter	Maximum	Unit	Constraint
AC bipolar voltage	565	V peak	50 year minimum lifetime
AC unipolar voltage	1131	V peak	50 year minimum lifetime
DC voltage	1131	V peak	50 year minimum lifetime

1.6 Package characteristics.

Parameter	Symbol	Conditions	Limits	Unit
Resistance (input to output) <u>8/</u>	RI-O		10^{12} typical	Ω
Capacitance (input to output) <u>8/</u>	CI-O	f = 1 MHz	1.0 typical	pF
Input capacitance	CI		4.0 typical	pF
Integrated circuit junction to case thermal resistance, side 1	θ_{JC1}	Thermocouple located at center of package underside.	46 typical	$^{\circ}\text{C/W}$
Integrated circuit junction to case thermal resistance, side 2	θ_{JC2}	Thermocouple located at center of package underside.	41 typical	$^{\circ}\text{C/W}$
Integrated circuit junction to ambient thermal resistance	θ_{JA}	Thermocouple located at center of package underside.	85 typical	$^{\circ}\text{C/W}$

7/ Refers to the continuous voltage magnitude imposed across the isolation barrier.

8/ The device is considered a 2 terminal device; pin 1 through pin 4 are shorted together, and pin 5 through pin 8 are shorted together.

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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 Truth table. The truth table shall be as shown in figure 3.

3.5.4 Thermal derating curve. The thermal derating curve shall be as shown in figure 4.

3.5.5 Supply current for isolator side 1 versus frequency graph. The supply current for isolator side 1 versus frequency graph shall be as shown in figure 5.

3.5.6 Supply current for isolator side 2 versus frequency with 2 nF load graph. The supply current for isolator side 2 versus frequency with 2 nF load graph shall be as shown in figure 6.

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TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions <u>2/</u> 5 V operation	Temperature, T _J	Device type	Limits		Unit
					Min	Max	
DC specifications.							
Input supply current, two channels, quiescent	IDDI(Q)		25°C	01	1.2 typical		mA
			-55°C to +125°C			1.5	
Output supply current, two channels, quiescent	IDDO(Q)		25°C	01	4.7 typical		mA
			-55°C to +125°C			10	
Total supply current, <u>3/</u> two channels, VDD1 supply current	IDD1(Q)	DC to 1 MHz logic signal frequency	25°C	01	1.4 typical		mA
			-55°C to +125°C			1.7	
Total supply current, <u>3/</u> two channels, VDD2 supply current	IDD2(Q)	DC to 1 MHz logic signal frequency	25°C	01	1.1 typical		mA
			-55°C to +125°C			17	
Input currents	I _{IA} , I _{IB}	0 V ≤ V _{IA} , V _{IB} ≤ VDD1	25°C	01	+0.01 typical		μA
			-55°C to +125°C		-10	+10	
Logic high input threshold	V _{IH}		-55°C to +125°C	01	0.7 x VDD1		V
Logic low input threshold	V _{IL}		-55°C to +125°C	01		0.3 x VDD1	V
Logic high output voltages	VOAH, VOBH	I _{OX} = -20 mA, <u>4/</u> V _{IX} = V _{IXH} <u>5/</u>	25°C	01	VDD2 typical		V
			-55°C to +125°C		VDD2 – 0.1		
Logic low output voltages	VOAL, VOBL	I _{OX} = +20 mA, <u>4/</u> V _{IX} = V _{IXH} <u>6/</u>	25°C	01	0 typical		V
			-55°C to +125°C			0.15	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> 5 V operation – continued.	Temperature, T _J	Device type	Limits		Unit
					Min	Max	
DC specifications - continued.							
Undervoltage lockout VDD2 supply.							
Positive going threshold	VDD2UV+		25°C	01	7.0 typical		V
			-55°C to +125°C			7.5	
Negative going threshold	VDD2UV-		25°C	01	6.5 typical		V
			-55°C to +125°C		6.0		
Hysteresis	VDD2UVH		25°C	01	0.5 typical		V
Output short circuit <u>7/</u> pulsed current	IOA(SC),	VDD2 = 10 V	25°C	01	4.0 typical		A
	IOB(SC)		-55°C to +125°C		2.0		
Output pulsed source resistance	ROA, ROB	VDD2 = 10 V	25°C	01	1.3 typical		Ω
			-55°C to +125°C		0.3	3.0	
Output pulsed sink resistance	ROA, ROB	VDD2 = 10 V	25°C	01	0.9 typical		Ω
			-55°C to +125°C		0.3	3.0	
Switching specifications.							
Pulse width <u>8/</u>	PW	CL = 2 nF, VDD2 = 10 V	-55°C to +125°C	01	50		ns
Data rate <u>9/</u>		CL = 2 nF, VDD2 = 10 V	-55°C to +125°C	01		1	MHz
Propagation delay <u>10/</u>	tDLH, tDHL	CL = 2 nF, VDD2 = 10 V	25°C	01	45 typical		ns
			-55°C to +125°C		35	60	
		CL = 2 nF, VDD2 = 7.6 V	25°C		50 typical		
			-55°C to +125°C		36	68	
Propagation delay <u>11/</u> skew	tPSK	CL = 2 nF, VDD2 = 10 V	-55°C to +125°C	01		12	ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> 5 V operation – continued.	Temperature, T _J	Device type	Limits		Unit
					Min	Max	
Switching specifications - continued.							
Channel to <u>12/</u> channel matching	tPSKCD	CL = 2 nF, VDD2 = 10 V	25°C	01	1 typical		ns
			-55°C to +125°C			5	
		CL = 2 nF, VDD2 = 7.6 V	25°C		1 typical		
			-55°C to +125°C			7	
Output rise/fall time (10% to 90%)	tR / tF	CL = 2 nF, VDD2 = 10 V	25°C	01	20 typical		ns
			-55°C to +125°C		14	25	
Dynamic input supply current per channel	IDDI(D)	VDD2 = 10 V	25°C	01	0.05 typical		mA/ Mbps
Dynamic output supply current per channel	IDDO(D)	VDD2 = 10 V	25°C	01	1.5 typical		mA/ Mbps
Refresh rate	fr		25°C	01	1.2 typical		Mbps

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>13</u> / 3.3 V operation	Temperature, T _J	Device type	Limits		Unit
					Min	Max	
DC specifications.							
Input supply current, two channels, quiescent	IDDI(Q)		25°C	01	0.7 typical		mA
			-55°C to +125°C			1.0	
Output supply current, two channels, quiescent	IDDO(Q)		25°C	01	4.7 typical		mA
			-55°C to +125°C			10	
Total supply current, <u>3</u> / two channels, VDD1 supply current	IDD1(Q)	DC to 1 MHz logic signal frequency	25°C	01	0.8 typical		mA
			-55°C to +125°C			1.0	
Total supply current, <u>3</u> / two channels, VDD2 supply current	IDD2(Q)	DC to 1 MHz logic signal frequency	25°C	01	11 typical		mA
			-55°C to +125°C			17	
Input currents	I _{IA} , I _{IB}	0 V ≤ V _{IA} , V _{IB} ≤ VDD1	25°C	01	+0.01 typical		μA
			-55°C to +125°C		-10	+10	
Logic high input threshold	V _{IH}		-55°C to +125°C	01	0.7 x VDD1		V
Logic low input threshold	V _{IL}		-55°C to +125°C	01		0.3 x VDD1	V
Logic high output voltages	VOAH, VOBH	I _{OX} = -20 mA, <u>4</u> / V _{IX} = V _{IXH} <u>5</u> /	25°C	01	VDD2 typical		V
			-55°C to +125°C		VDD2 – 0.1		
Logic low output voltages	VOAL, VOBL	I _{OX} = -20 mA, <u>4</u> / V _{IX} = V _{IXH} <u>6</u> /	25°C	01	0 typical		V
			-55°C to +125°C			0.15	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>13/</u> 3.3 V operation – continued.	Temperature, T _J	Device type	Limits		Unit
					Min	Max	
DC specifications - continued.							
Undervoltage lockout VDD2 supply.							
Positive going threshold	VDD2UV+		25°C	01	7.0 typical		V
			-55°C to +125°C			7.5	
Negative going threshold	VDD2UV-		25°C	01	6.5 typical		V
			-55°C to +125°C		6.0		
Hysteresis	VDD2UVH		25°C	01	0.5 typical		V
Output short circuit <u>7/</u> pulsed current	IOA(SC),	VDD2 = 10 V	25°C	01	4.0 typical		A
	IOB(SC)		-55°C to +125°C		2.0		
Output pulsed source resistance	ROA, ROB	VDD2 = 10 V	25°C	01	1.3 typical		Ω
			-55°C to +125°C		0.3	3.0	
Output pulsed sink resistance	ROA, ROB	VDD2 = 10 V	25°C	01	0.9 typical		Ω
			-55°C to +125°C		0.3	3.0	
Switching specifications.							
Pulse width <u>8/</u>	PW	CL = 2 nF, VDD2 = 10 V	-55°C to +125°C	01	50		ns
Data rate <u>9/</u>		CL = 2 nF, VDD2 = 10 V	-55°C to +125°C	01		1	MHz
Propagation delay <u>10/</u>	tDLH, tDHL	CL = 2 nF, VDD2 = 10 V	25°C	01	48 typical		ns
			-55°C to +125°C		36	62	
		CL = 2 nF, VDD2 = 7.6 V	25°C		53 typical		
			-55°C to +125°C		37	72	
Propagation delay <u>11/</u> skew	tPSK	CL = 2 nF, VDD2 = 10 V	-55°C to +125°C	01		12	ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>13/</u> 3.3 V operation – continued.	Temperature, T _J	Device type	Limits		Unit
					Min	Max	
Switching specifications - continued.							
Channel to <u>12/</u> channel matching	t _{PSKCD}	C _L = 2 nF, V _{DD2} = 10 V	25°C	01	1 typical		ns
			-55°C to +125°C			5	
Output rise/fall time (10% to 90%)	t _R / t _F	C _L = 2 nF, V _{DD2} = 10 V	25°C	01	20 typical		ns
			-55°C to +125°C		14	25	
		C _L = 2 nF, V _{DD2} = 7.6 V	25°C		22 typical		
			-55°C to +125°C		14	28	
Dynamic input supply current per channel	I _{DDI} (D)	V _{DD2} = 10 V	25°C	01	0.025 typical		mA/ Mbps
Dynamic output supply current per channel	I _{DDO} (D)	V _{DD2} = 10 V	25°C	01	1.5 typical		mA/ Mbps
Refresh rate	f _r		25°C	01	1.1 typical		Mbps

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

- 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/ 5 V operation. All voltages are relative to their respective ground. Unless otherwise specified, $4.5\text{ V} \leq \text{VDD1} \leq 5.5\text{ V}$ and $7.6\text{ V} \leq \text{VDD2} \leq 18\text{ V}$. All minimum/maximum specifications apply over $T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$. All typical specifications are at $T_J = 25^\circ\text{C}$, $\text{VDD1} = 5\text{ V}$ and $\text{VDD2} = 10\text{ V}$. Switching specifications are tested with CMOS signal levels.
- 3/ The supply current values for both channels are combined when running at identical data rates. Output supply current values are specified with no output load present. See figure 5 and figure 6 for total VDD1 and VDD2 supply currents as function of frequency.
- 4/ IOX is the channel x output current, where x = A or B.
- 5/ V_{IxH} is the input side logic high.
- 6/ V_{IxL} is the input side logic low.
- 7/ Short circuit duration less than $1\text{ }\mu\text{s}$. Average power must conform to the limit shown in the absolute maximum ratings section.
- 8/ The minimum pulse width is the shortest pulse width at which the specified timing parameter is guaranteed.
- 9/ The maximum data rate is the fastest data rate at which the specified timing parameter is guaranteed.
- 10/ tDLH propagation delay is measured from the time of the input rising logic high threshold (V_{IH}), to the output rising 10% threshold of the VOx signal. tDHL propagation delay is measured from the input falling logic low threshold (V_{IL}), to the output falling 90% threshold of the VOx signal.
- 11/ tPSK is the magnitude of the worst case difference in tDLH and/or tDHL that is measured between units at the same operating temperature, supply voltages, and output load within the recommended operating conditions.
- 12/ Channel to channel matching is the absolute value of the difference in propagation delays between any two channels with inputs on the same side of the isolation barrier.
- 13/ 3.3 V operation. All voltages are relative to their respective ground. Unless otherwise specified, $3.0\text{ V} \leq \text{VDD1} \leq 3.6\text{ V}$ and $7.6\text{ V} \leq \text{VDD2} \leq 18\text{ V}$. All minimum/maximum specifications apply over $T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$. All typical specifications are at $T_J = 25^\circ\text{C}$, $\text{VDD1} = 3.3\text{ V}$ and $\text{VDD2} = 10\text{ V}$. Switching specifications are tested with CMOS signal levels

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Case X

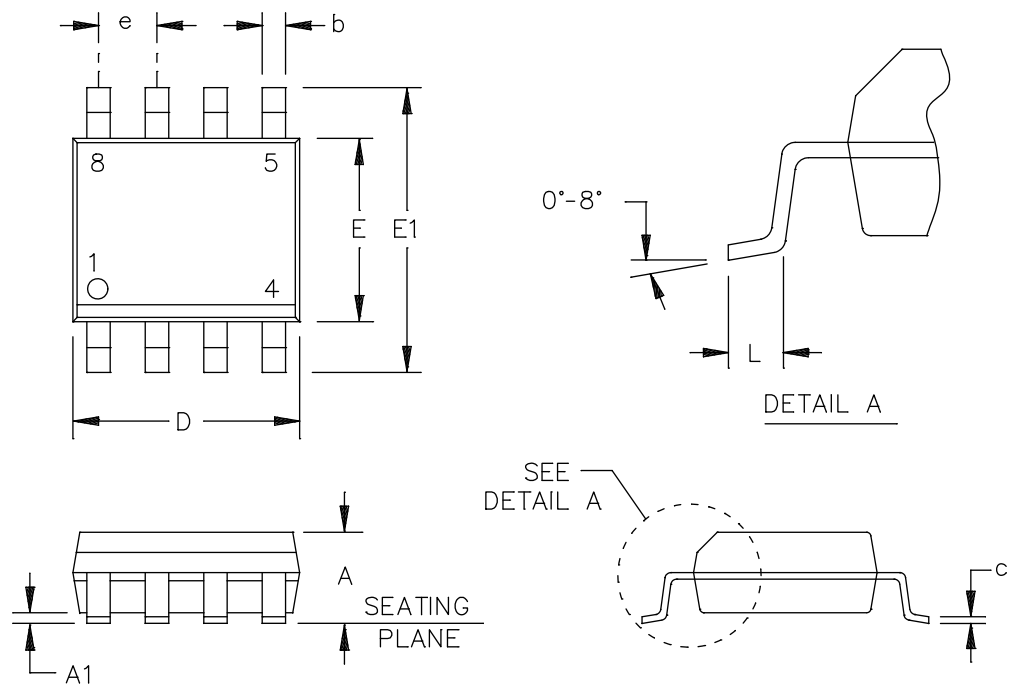


FIGURE 1. Case outline.

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Case X – continued.

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.0532	.0688	1.35	1.75
A1	.0039	.0098	0.10	0.25
b	.0500 BSC		1.27 BSC	
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
L	.0157	.5000	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.

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Device type	01	
Case outline	X	
Terminal number	Terminal symbol	Description
1	VDD1	Supply voltage for isolator side 1, 3.0 V to 5.5 V.
2	VIA	Logic input A.
3	VIB	Logic input B.
4	GND 1	Ground 1. GND 1 is the ground reference for isolator side 1.
5	GND 2	Ground 2. GND 2 is the ground reference for isolator side 2.
6	VOB	Logic output B.
7	VOA	Logic output A.
8	VDD2	Supply voltage for isolator side 2, 7.6 V to 18 V.

FIGURE 2. Terminal connections.

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Positive logic

VIA input	VIB input	VDD1 state	VDD2 state	VOA output	VOB output	Notes
Low	Low	Powered	Powered	Low	Low	
Low	High	Powered	Powered	Low	High	
High	Low	Powered	Powered	High	Low	
High	High	Powered	Powered	High	High	
Don't care	Don't care	Unpowered	Powered	Low	Low	Outputs return to the input state within 1 μ s of VDD1 power restoration.
Don't care	Don't care	Powered	Unpowered	Low	Low	Outputs return to the input state within 1 μ s of VDD2 power restoration.

FIGURE 3. Truth table.

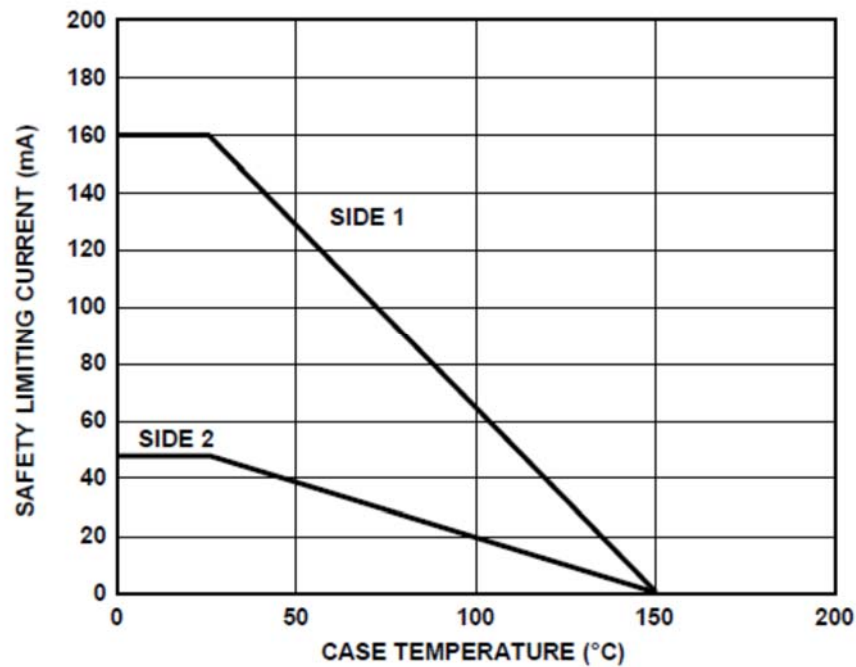


FIGURE 4. Thermal derating curve.

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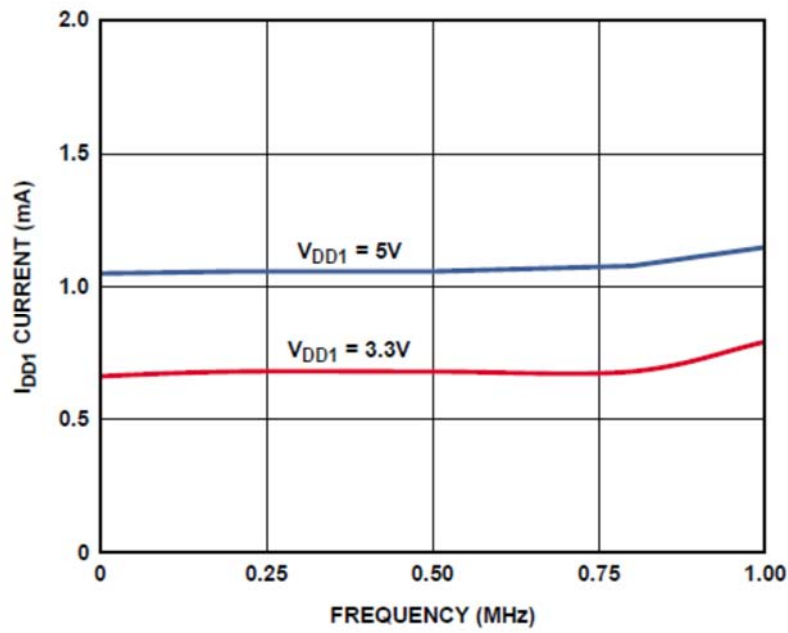


FIGURE 5. Supply current for isolator side 1 versus frequency.

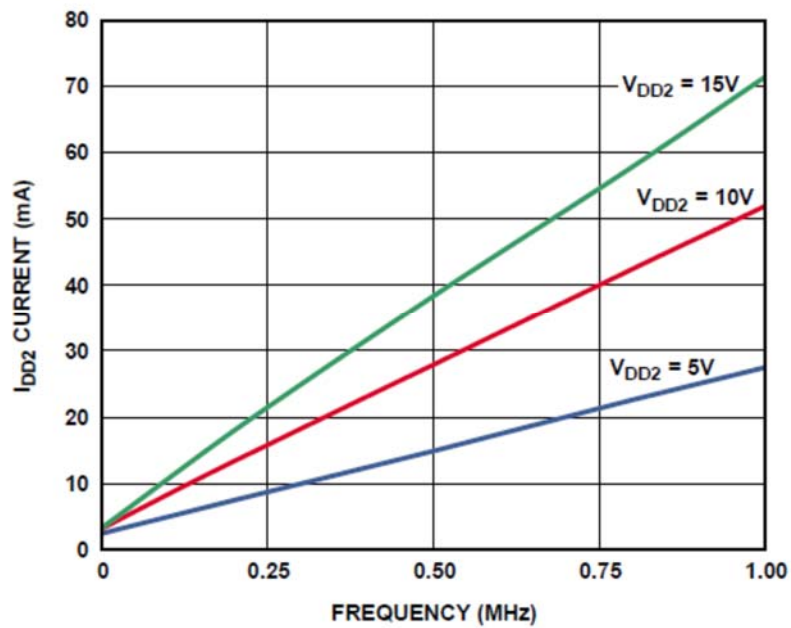


FIGURE 6. Supply current for isolator side 2 versus frequency with 2 nF load.

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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>	Device manufacturer CAGE code	Mode of transportation and quantity	Vendor part number
V62/16622-01XE	24355	Tube, 98 units	ADuM3221TRZ-EP
V62/16622-01XE	24355	Reel, 1000 units	ADuM3221TRZ-EP-RL7

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

CAGE code

24355

Source of supply

Analog Devices
Route 1 Industrial Park
P.O. Box 9106
Norwood, MA 02062
Point of contact: Raheen Business Park
Limerick, Ireland

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