REVISIONS			
LTR	**DESCRIPTION**	**DATE**	**APPROVED**
A	Make corrections to sheet 1 title block. Delete pHMET and replace with pHEMT. Delete MONOLITHIC SILICON and replace with GALLIUM ARSENIDE. Make changes to RF_{IN}, P_D, and T_J limits as specified under paragraph 1.3.- ro	20-03-06	J. ESCHMEYER

Prepared in accordance with ASME Y14.24

Vendor item drawing

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REV STATUS OF PAGES	**REV**		A	A	A	A	A	A	A	A	A	A	A									
	PAGE		1	2	3	4	5	6	7	8	9	10	11									

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 17-11-16	**CHECKED BY** RAJESH PITHADIA **APPROVED BY** CHARLES F. SAFFLE	TITLE MICROCIRCUIT, LINEAR, 0.01 GHz to 10 GHz, MMIC, pHEMT RF GAIN BLOCK, GALLIUM ARSENIDE
	SIZE **A** / **CODE IDENT. NO.** **16236**	**DWG NO.** **V62/17615**
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DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

AMSC N/A

5962-V026-20

1. SCOPE

Scope. This drawing documents the general requirements of a high performance 0.01 GHz to 10 GHz, monolithic microwave integrated circuit (MMIC), gallium arsenide (GaAs), pseudomorphic high electron mobility transistor (pHEMT) radio frequency (RF) gain block microcircuit, with an operating temperature range of -55°C to +105°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:

V62/17615	-	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	HMC788A-EP	0.01 GHz to 10 GHz, MMIC, GaAs, pHEMT RF gain block

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	6	See figure 1	Lead frame chip scale package (LFCSP)

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 (V_{CC})	7 V
Radio frequency (RF) input (RF_{IN}) (V_{CC} = 5 V)	20 dBm
Continuous power dissipation (P_D): 2/	
T_{CASE} = 85°C	0.76 W
T_{CASE} = 105°C	0.59 W
Junction temperature range (T_J)	+175°C
Storage temperature range (T_{STG})	-65°C to +150°C
Thermal resistance, junction to case (θ_{JC})	118.0°C/W 3/
Electrostatic discharge (ESD) sensitivity:	
Human body model (HBM)	Class 1A (250 V)

1.4 Recommended operating conditions. 4/

Supply voltage (V_{CC})	5 V
Operating free-air temperature range (T_A)	-55°C to +105°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/ For maximum power dissipation versus case temperature, see figure 3.
3/ Thermal impedance simulated values are based on a JEDEC 2S2P thermal test board with nine thermal vias. See JEDEC JESD51.
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

JEDEC JESD51 – Methodology for the Thermal Measurement of Component Packages (Single Semiconductor Device)
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.

3.5.3 Maximum power dissipation versus case temperature. The maximum power dissipation versus case temperature graph shall be as shown in figure 3.

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions 2/	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Overall function							
Frequency range			25°C	01	0.01	10	GHz
Gain		0.01 GHz to 6.0 GHz	25°C	01	14 typical		dB
					12		
		6.0 GHz to 10.0 GHz			12 typical		
					9		
Gain variation over temperature		0.01 GHz to 6.0 GHz	25°C	01	0.004 typical		dB/°C
		6.0 GHz to 10.0 GHz			0.007 typical		
Reverse isolation		0.01 GHz to 6.0 GHz	25°C	01	23 typical		dB
		6.0 GHz to 10.0 GHz			20 typical		
Radio frequency (RF) input interface							
Input return loss		0.01 GHz to 6.0 GHz	25°C	01	16 typical		dB
		6.0 GHz to 10.0 GHz			9 typical		
RF output interface							
Output power for 1 dB compression	P1dB	0.01 GHz to 6.0 GHz	25°C	01	20 typical		dBm
					18		
		6.0 GHz to 10.0 GHz			18 typical		
					15		
Output return loss		0.01 GHz to 6.0 GHz	25°C	01	9 typical		dB
		6.0 GHz to 10.0 GHz			12 typical		

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions 2/	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Distortion and noise							
Output third order intercept	OIP3	0.01 GHz to 6.0 GHz	25°C	01	33 typical		dBm
		6.0 GHz to 10.0 GHz			30 typical		
Noise floor	NF	0.01 GHz to 6.0 GHz	25°C	01	6 typical		dB
		6.0 GHz to 10.0 GHz			7 typical		
Power interface							
Supply voltage			25°C	01	5 typical		V
					4.5	5.5	
Supply current	I_{CC}	V_{CC} = 4.5 V	25°C	01	65 typical		mA
					60		
		V_{CC} = 5 V			76 typical		
		V_{CC} = 5.5 V			87 typical		
						90	

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, collector bias voltage (V_{CC}) = 5 V, case temperature (T_C) = 25°C, 6.35 μH external inductor between V_{CC} and radio frequency output (RF_{OUT}), 50 Ω system.

Case X

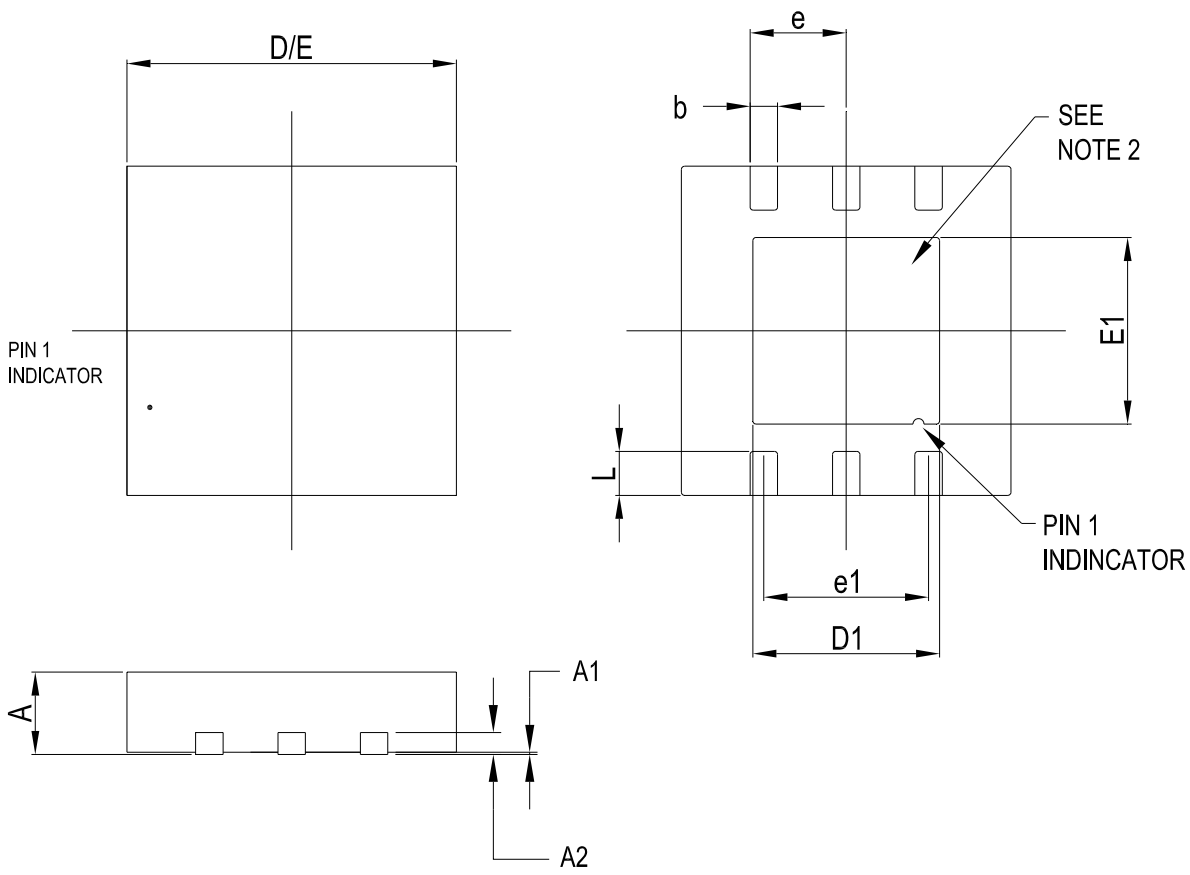

FIGURE 1. Case outline.

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Case X – continued.

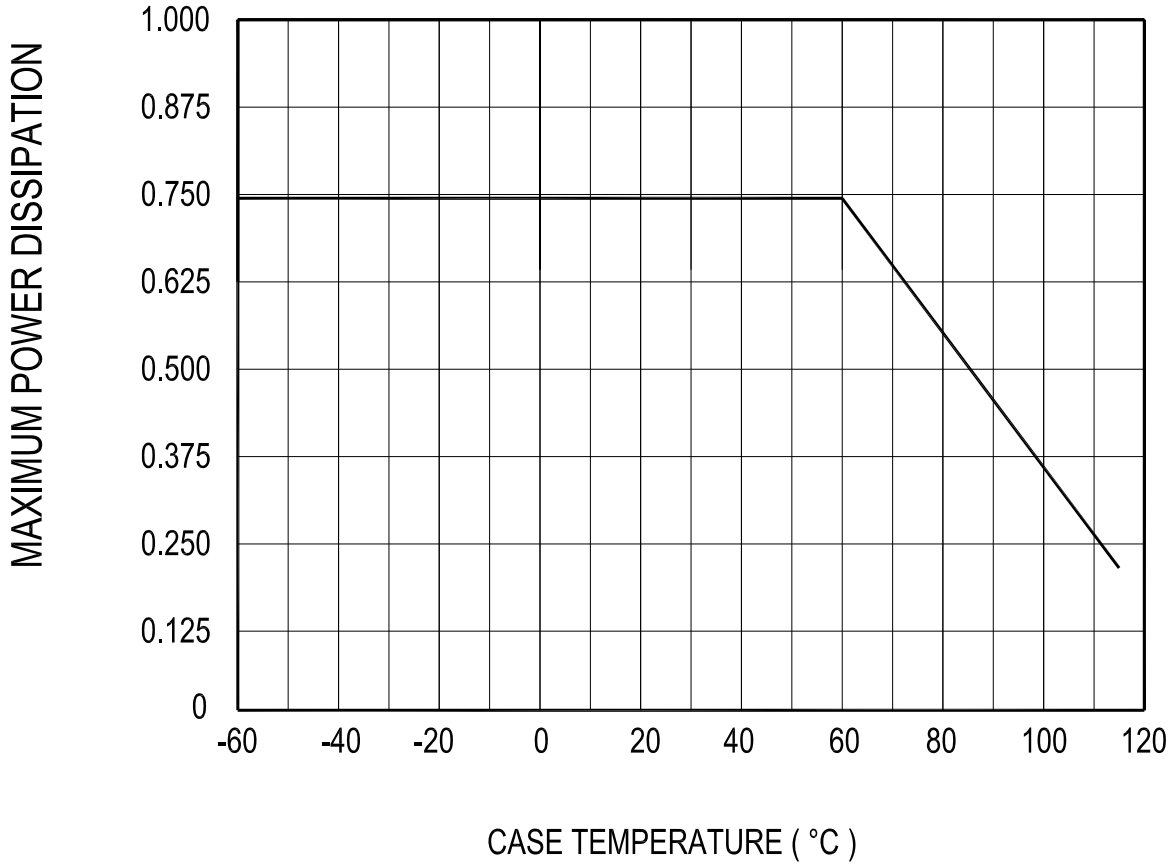
Symbol	Dimensions					
	Inches			Millimeters		
	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum
A	.0314	.0334	.0354	0.80	0.85	0.90
A1	.0007	.0031 COPLANARITY	.0019	0.02	0.08 COPLANARITY	0.05
A2	.0079 REF			0.203 REF		
b	.0078	.0098	.0118	0.20	0.25	0.30
D/E	.0767	.0787	.0807	1.95	2.00	2.05
D1	.0511	.0551	.059	1.30	1.40	1.50
E1	.0275	.0314	.0354	0.70	0.80	0.90
e	.0255 BSC			0.65 BSC		
e1	.0511 REF			1.30 REF		
L	.0118	.0137	.0157	0.30	0.35	0.40

NOTE:
1. Controlling dimensions are millimeter, inch dimensions are given for reference only.
2. For proper connection of the exposed pad, refer to the pin configuration and function descriptions section of the manufacturer's datasheet.

FIGURE 1. Case outline - Continued.

Device type	01	
Case outline	X	
Terminal number	Terminal symbol	Description
1	NIC	Not internally connected. The pins are not connected internally; however, all data shown herein was measured with these pins connected to GND externally.
2	RF_{IN}	RF input. This pin is dc coupled and ac matched to 50 Ω. An external dc blocking capacitor is required on this pin.
3	GND	Ground. This pin must be connected to ground.
4	NIC	Not internally connected. The pins are not connected internally; however, all data shown herein was measured with these pins connected to GND externally.
5	RF_{OUT}	RF output. This pin is ac matched to 50 Ω and supplies dc bias for the output stage.
6	NIC	Not internally connected. The pins are not connected internally; however, all data shown herein was measured with these pins connected to GND externally.
	EPAD	Exposed pad. The exposed pad must be connected to GND for proper operation.

FIGURE 2. Terminal connections.



NOTE: Power dissipation measured in watts.

FIGURE 3. Maximum power dissipation versus case temperature.

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
V62/17615-01XE	24355	Reel, 50 units	Y6V	HMC788ACPSZ-EP-PT
		Reel, 500 units	Y6V	HMC788ACPSZ-EP-R7

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