

■ Features

- High Power GaN HEMT for DC to 3GHz
- High Power: 102W @ 3GHz
- High Efficiency: 56% @ 3GHz
- CW Operable
- Broad Band Operation
- Small Flangeless Package


■ Description

Sumitomo Electric's GaN-HEMT SGCA101M1H offers high power, high efficiency, ease of matching and greater consistency for DC to 3GHz high power applications with 50V operation.

ABSOLUTE MAXIMUM RATINGS (Case Temperature $T_c=25\text{deg.C}$)

Item	Symbol	Condition	Rating	Unit
Operating-Voltage	V_{DS}		55	V
Drain-Source Voltage	V_{DS}	$V_{GS}=-10V$	200	V
Gate-Source Voltage	V_{GS}		-15	V
Total Power Dissipation	P_t		156	W
Storage Temperature	T_{stg}		-55 to +125	deg.C
Channel Temperature	T_{ch}		+250	deg.C

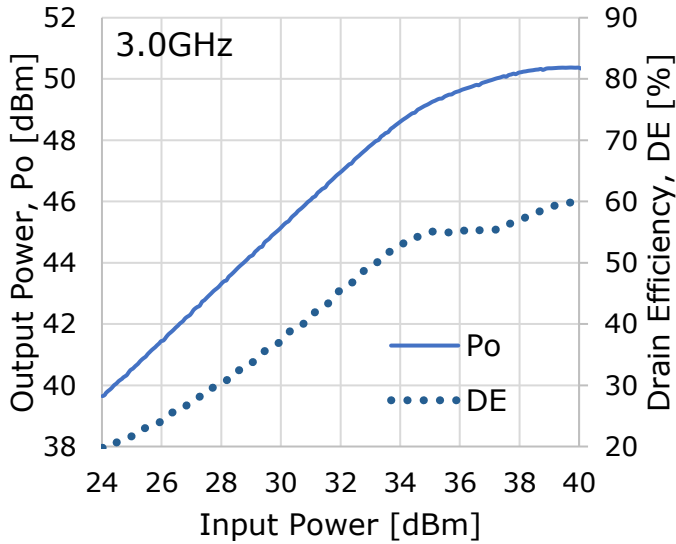
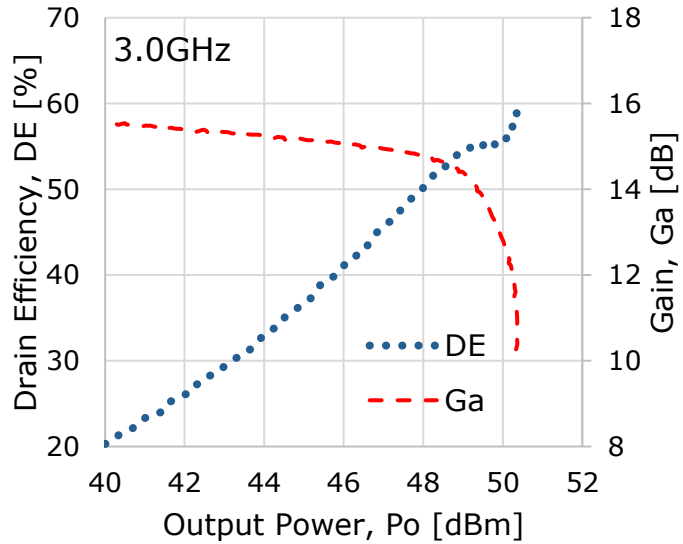
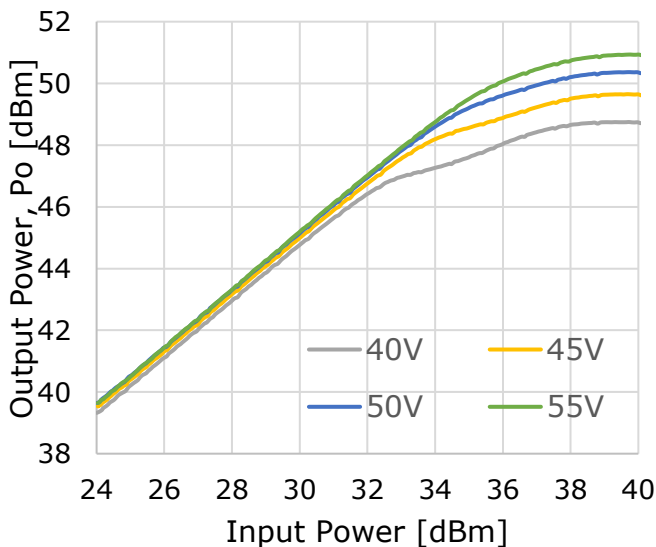
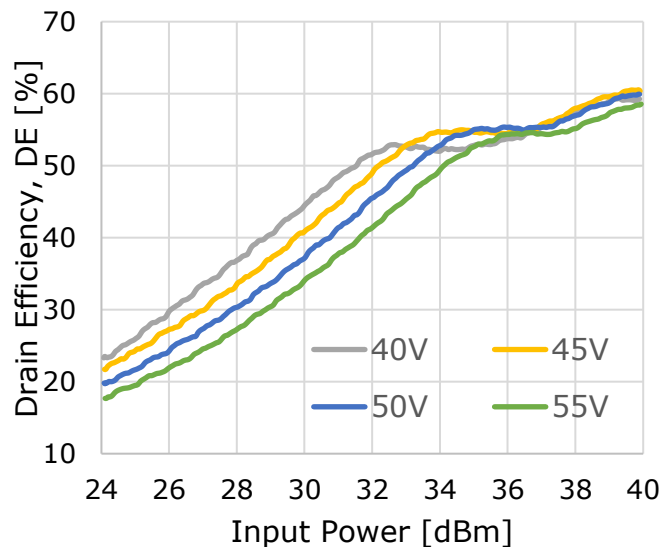
RECOMMENDED OPERATING CONDITION

Item	Symbol	Condition	Limit	Unit
DC Input Voltage	V_{DS}		≤ 50	V
Forward Gate Current	I_{GF}	$R_G=51\text{ ohm}$	≤ 44.9	mA
Reverse Gate Current	I_{GR}	$R_G=51\text{ ohm}$	≥ -4	mA
Channel Temperature	T_{ch}		$< +200$	deg.C
Output Power	P_{out}		$\leq P5dB$	dBm

ELECTRICAL CHARACTERISTICS (Case Temperature $T_c=25\text{deg.C}$)

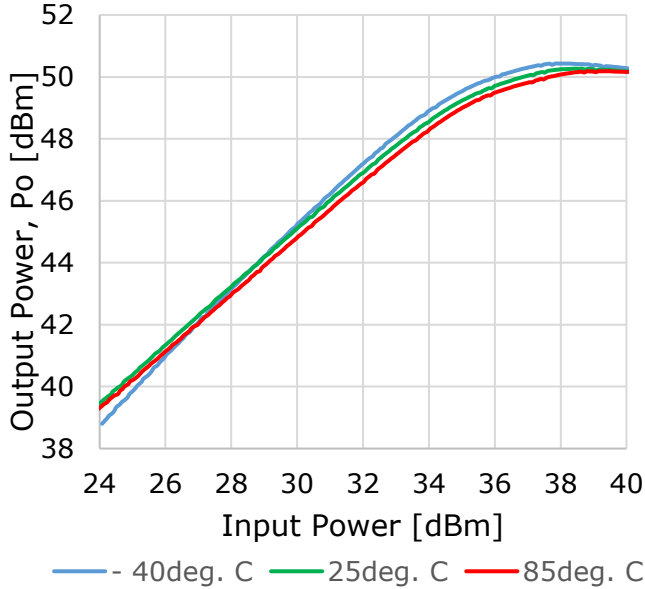
Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Pinch-off Voltage	V_P	$V_{DS}=50V, I_{DS}=5.9mA$	-	-4.5	-	V
Saturated Power	P_{sat}	$V_{DS}=50V, I_{DS(DC)}=650mA$ $f=3\text{ GHz}, P_{in}=38dBm$ $PW=200\mu\text{sec.}, \text{Duty}=10\%$	49.1	50.1	-	dBm
Drain Efficiency	DE		-	56	-	%
Power Gain	Gp		-	12.1	-	dB
Thermal Resistance	R_{th}	Channel to Case $P_{DC}=32.7W$	-	1.2	1.44	deg.C/W

Case Style	M1H
RoHS Compliance	YES

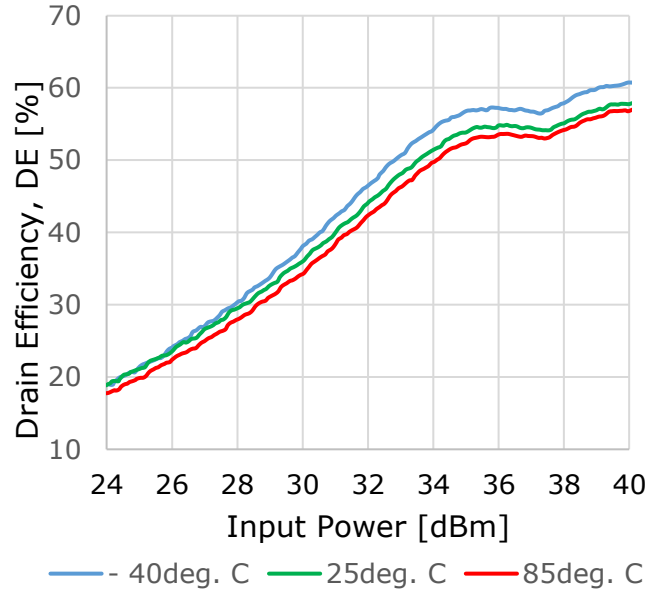
RF Characteristics
Output Power & Drain Efficiency vs. Input Power
 $V_{DS}=50V, I_{DS(DC)}=0.65A$
 $PW=200\mu\text{sec.}, \text{Duty}=10\%$

Drain Efficiency & Gain vs. Output Power
 $V_{DS}=50V, I_{DS(DC)}=0.65A$
 $PW=200\mu\text{sec.}, \text{Duty}=10\%$

Output Power vs. Input Power by Drain Voltage
 $f=3.0\text{GHz}, I_{DS(DC)}=0.65A$
 $PW=200\mu\text{sec.}, \text{Duty}=10\%$

Drain Efficiency vs. Input Power by Drain Voltage
 $f=3.0\text{GHz}, I_{DS(DC)}=0.65A$
 $PW=200\mu\text{sec.}, \text{Duty}=10\%$


RF Characteristics
**Output Power vs. Input Power
by case temperature**

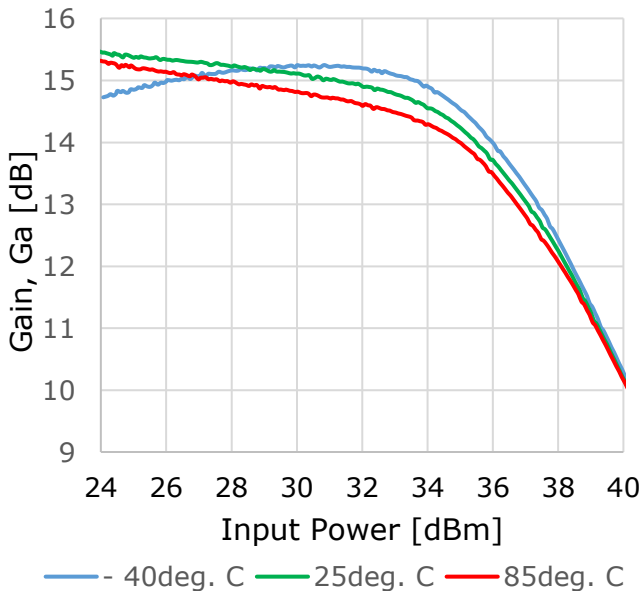
$f=3.0\text{GHz}$, $V_{DS}=50\text{V}$, $I_{DS(DC)}=0.65\text{A}$
 $PW=200\mu\text{sec.}$, Duty=10%


**Drain Efficiency vs. Input Power
by case temperature**

$f=3.0\text{GHz}$, $V_{DS}=50\text{V}$, $I_{DS(DC)}=0.65\text{A}$
 $PW=200\mu\text{sec.}$, Duty=10%


**Gain vs. Input Power
by case temperature**

$f=3.0\text{GHz}$, $V_{DS}=50\text{V}$, $I_{DS(DC)}=0.65\text{A}$
 $PW=200\mu\text{sec.}$, Duty=10%

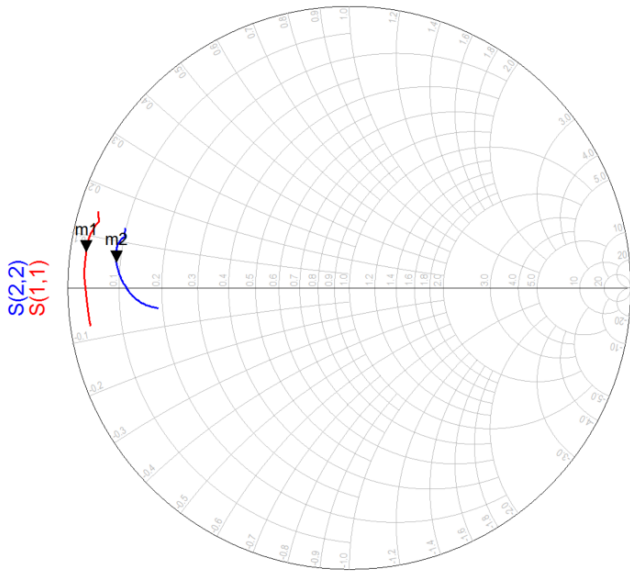


S-parameters

$V_{DS}=50V$, $I_{DS(DC)}=0.65A$, $f=0.5$ to $4.5GHz$, $Z_I=Z_S=50$ ohm, Marker: 3.0GHz

m1
freq=3.000 GHz
S(1,1)=0.944 / 172.223
impedance = $Z_0 * (0.029 + j0.068)$

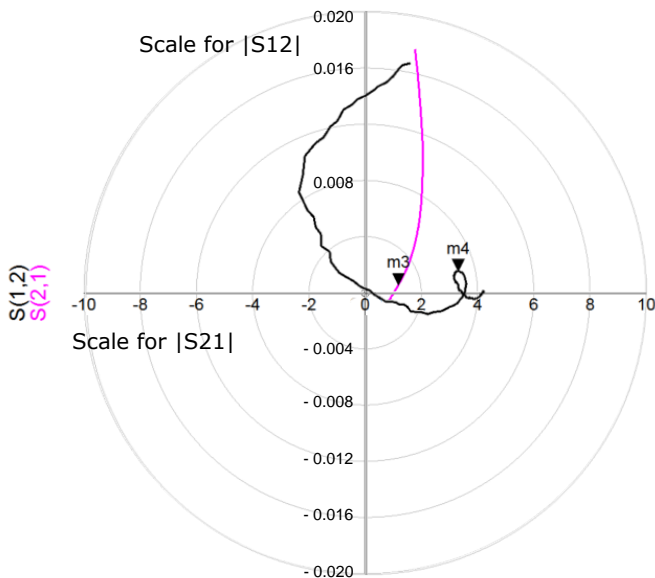
m2
freq=3.000 GHz
S(2,2)=0.833 / 173.706
impedance = $Z_0 * (0.092 + j0.055)$



freq (500.0 MHz to 4.500 GHz)

m3
freq=3.000 GHz
S(2,1)=1.213 / 13.013

m4
freq=3.000 GHz
S(1,2)=0.007 / 13.314



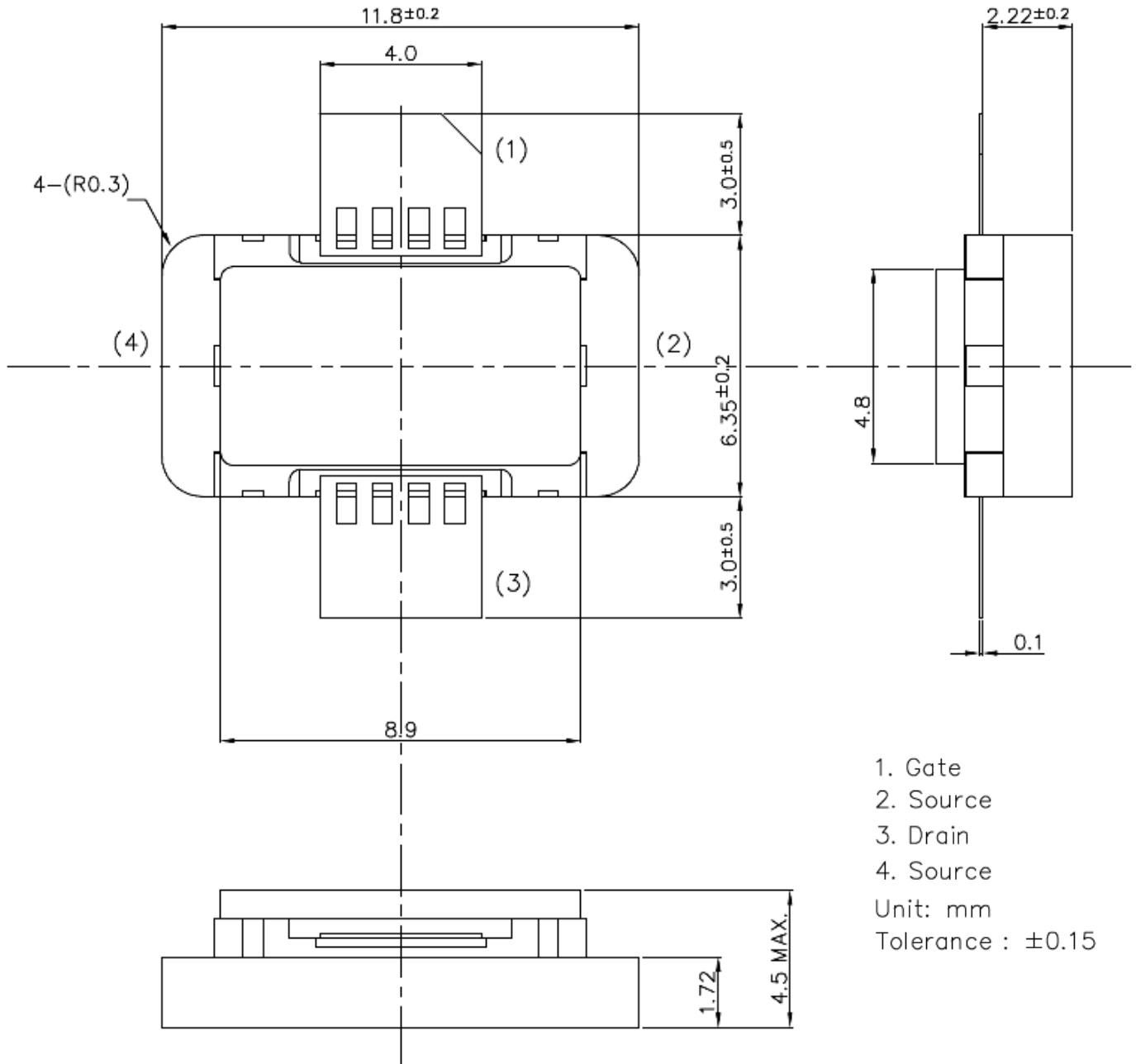
freq (500.0 MHz to 4.500 GHz)

Freq. [GHz]	S11 MAG ANG	S21 MAG ANG	S12 MAG ANG	S22 MAG ANG	K	MaxGain* [dB]
0.5	0.930 -171.8	8.824 78.3	0.008 0.8	0.685 -174.0	0.252	30.2
0.6	0.930 -173.4	7.300 74.6	0.008 -0.2	0.692 -174.2	0.308	29.4
0.7	0.932 -174.6	6.214 71.0	0.008 -1.1	0.699 -174.4	0.353	28.8
0.8	0.933 -175.6	5.391 67.7	0.008 -2.1	0.707 -174.5	0.396	28.2
0.9	0.933 -176.3	4.748 64.4	0.008 -2.5	0.714 -174.8	0.466	27.8
1.0	0.933 -177.0	4.226 61.3	0.008 -3.0	0.722 -175.1	0.541	27.4
1.1	0.934 -177.7	3.807 58.3	0.008 -3.0	0.728 -175.3	0.595	27.0
1.2	0.935 -178.2	3.450 55.4	0.007 -2.2	0.736 -175.7	0.672	26.7
1.3	0.936 -178.7	3.152 52.5	0.007 -2.7	0.744 -176.1	0.737	26.4
1.4	0.937 -179.3	2.893 49.8	0.007 -1.4	0.751 -176.6	0.805	26.1
1.5	0.938 -179.8	2.670 47.1	0.007 -1.1	0.759 -177.0	0.864	25.8
1.6	0.938 179.7	2.474 44.5	0.007 -0.3	0.766 -177.5	0.951	25.6
1.7	0.939 179.2	2.303 41.9	0.007 0.9	0.773 -178.1	0.984	25.3
1.8	0.940 178.8	2.156 39.5	0.007 1.6	0.780 -178.6	1.022	24.1
1.9	0.941 178.3	2.023 36.9	0.007 2.9	0.786 -179.4	1.077	23.2
2.0	0.942 177.8	1.906 34.5	0.007 3.6	0.792 -180.0	1.088	22.8
2.1	0.942 177.2	1.796 32.2	0.007 4.7	0.797 179.4	1.165	21.9
2.2	0.942 176.7	1.702 29.9	0.007 5.3	0.803 178.8	1.201	21.4
2.3	0.943 176.2	1.613 27.6	0.007 5.9	0.809 178.1	1.237	21.0
2.4	0.943 175.6	1.538 25.5	0.007 6.8	0.812 177.4	1.275	20.6
2.5	0.944 175.1	1.469 23.3	0.006 7.6	0.817 176.8	1.320	20.2
2.6	0.944 174.5	1.406 21.1	0.006 8.6	0.821 176.1	1.391	19.7
2.7	0.943 174.0	1.350 19.1	0.006 10.7	0.824 175.5	1.474	19.2
2.8	0.943 173.4	1.298 17.0	0.006 11.8	0.827 174.9	1.476	18.9
2.9	0.943 172.9	1.254 15.0	0.007 12.8	0.831 174.3	1.488	18.7
3.0	0.944 172.2	1.213 13.0	0.007 13.3	0.833 173.7	1.460	18.5
3.1	0.944 171.6	1.175 11.0	0.007 12.6	0.835 173.1	1.422	18.5
3.2	0.943 171.0	1.141 9.0	0.007 11.5	0.837 172.4	1.403	18.3
3.3	0.943 170.3	1.112 7.0	0.007 8.7	0.838 171.7	1.407	18.1
3.4	0.943 169.5	1.086 5.1	0.007 4.0	0.839 171.1	1.445	17.9
3.5	0.941 168.8	1.061 3.0	0.007 -4.5	0.839 170.3	1.640	17.3
3.6	0.938 168.1	1.038 0.8	0.006 -13.4	0.837 169.6	2.352	16.2
3.7	0.934 167.4	1.013 -1.1	0.004 -20.4	0.834 168.9	4.158	15.0
3.8	0.932 166.8	0.991 -3.0	0.002 -17.2	0.831 168.3	8.596	14.2
3.9	0.929 166.2	0.971 -4.9	0.000 31.0	0.826 167.7	69.163	13.4
4.0	0.925 165.6	0.953 -6.4	0.002 143.2	0.821 167.3	11.193	12.5
4.1	0.920 165.2	0.940 -8.0	0.006 127.5	0.818 167.1	5.213	11.9
4.2	0.919 165.0	0.933 -9.5	0.011 114.2	0.817 167.0	3.117	11.6
4.3	0.924 164.5	0.929 -11.5	0.013 97.1	0.820 166.6	2.284	12.1
4.4	0.928 163.9	0.922 -13.8	0.015 86.7	0.822 166.0	1.839	12.7
4.5	0.932 163.2	0.906 -16.0	0.017 79.3	0.823 165.3	1.484	13.3

*MaxGain : if $k \leq 1$, then $k = 1$ is used.

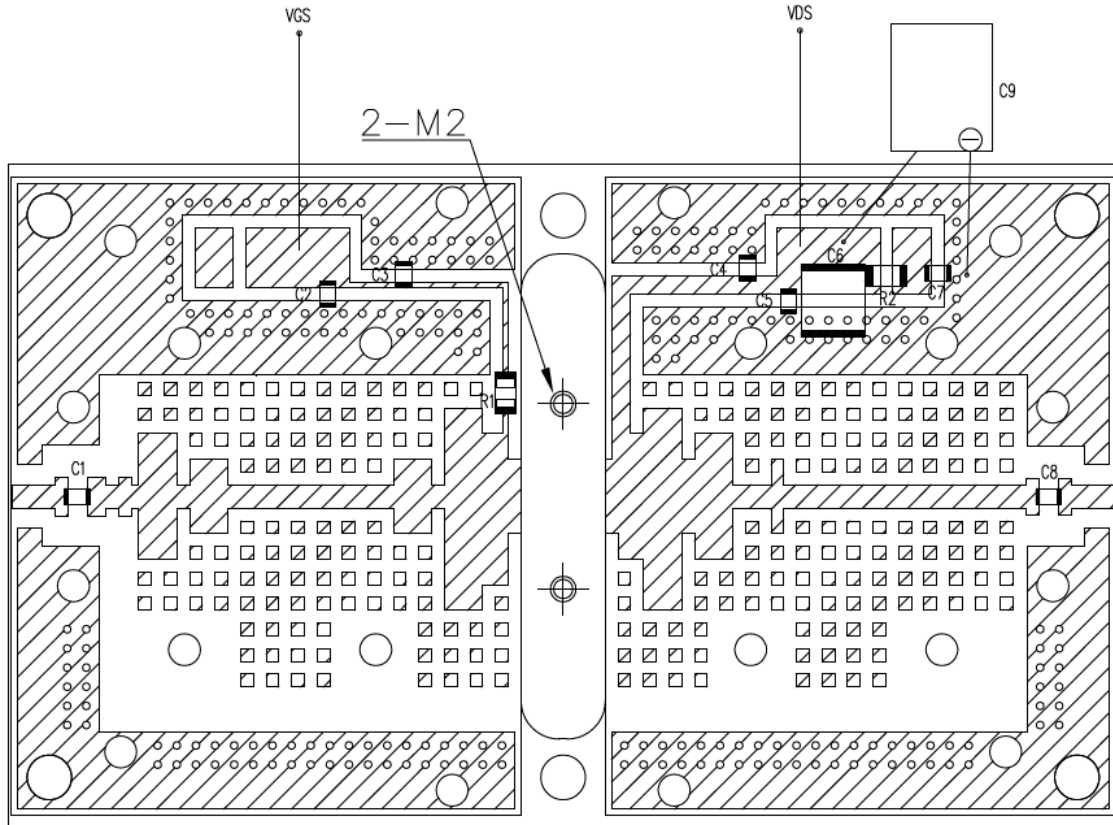
● **Package Outline**

Case Style : M1H
Metal-Ceramic Hermetic Package



1. Gate
2. Source
3. Drain
4. Source
Unit: mm
Tolerance : ±0.15

● Test Fixture

Tuned at 3.0GHz


Part	Description	Part Number	Manufacturer
C1,C3,C4,C8	5pF Chip Capacitor	GQM2195C2E5R0CB12	Murata
C2,C5,C7	1000pF Chip Capacitor	GRM21AR72E102KW01L	Murata
C6	4.7µF Chip Capacitor	GRM55ER72A475KA01L	Murata
C9	470µF 80V Electrolytic Capacitor	EKZN800ELL471ML20S	Nippon Chemi-con
R1,R2	51Ω 1/2W Chip Resistor	ESR18EZPJ510	Rohm
PCB	t=0.8mm, $\epsilon_r=3.3$, Cu thickness=18µm	CS3376C	RISHO KOGYO

* DXF file of this PCB is available.

For Safety, Observe the Following Procedures Environmental Management

- Do not put this product into the mouth.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Respect all applicable laws of the country when discarding this product.
This product must be disposed in accordance with methods specified by applicable hazardous waste procedures.

Any information, such as descriptions of a function and examples of application circuits, in this document are presented solely as a reference for the purpose to show examples of operations and uses of Sumitomo Electric semiconductor device(s); Sumitomo Electric does not warrant the proper operation of the device(s) with respect to its use based on such information. When the user develops equipment incorporating the device(s) based on such information, they must assume full responsibility arising out of using such information. Sumitomo Electric assumes no liability for any damages whatsoever arising out of the use of the information.

Any information in this document, including descriptions of function and schematic diagrams, shall not be construed as a license for the use or exercise of any intellectual property right, such as patent right or copyright, or any other right of Sumitomo Electric or any third party nor does Sumitomo Electric warrant non-infringement of any third-party's intellectual property right or other right by using such information. Sumitomo Electric assumes no liability for any infringement of the intellectual property rights or other rights of third parties which would result from the use of information contained herein.

The products described in this document are designed, developed and manufactured as contemplated for general use, including, without limitation, ordinary industrial use, general office use, personal use, and household use, but are not designed, developed and manufactured as contemplated (1) for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could have a serious effect to the public, and could lead directly to death, personal injury, severe physical damage or other loss (i.e., nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system), or (2) for use requiring extremely high reliability (i.e., submersible repeater and artificial satellite). Please note that Sumitomo Electric will not be liable to the user and/or any third party for any claims or damages arising from the aforementioned uses of the products.

Any semiconductor devices have an inherent chance of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of excessive current levels and other abnormal operating conditions.

If any products described in this document represent goods or technologies subject to certain restrictions on export under the Foreign Exchange and Foreign Trade Law of Japan, the prior authorization of the Japanese government will be required for export of those products from Japan.

<http://www.sedi.co.jp/>

ATTENTION

Information in this document is subject to change without notice.